

Adafruit's Raspberry Pi Lesson 1. Preparing an SD Card for your Raspberry Pi

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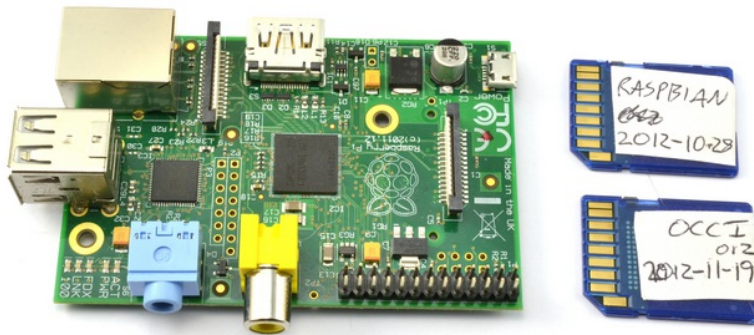
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Overview

When you buy a Raspberry Pi, it may or may not be sold with an SD card. The SD card is important because this is where the Raspberry Pi keeps its operating system and is also where you will store your documents and programs.



Even if your Pi came with an SD card with the operating system on, it is a good idea to update it to the latest version, as improvements and bug fixes are going in all the time. Since putting the operating system onto an SD card wipes everything else off the card, it is worth considering using a USB flash drive for your documents, so that when you install a new version of the operating system, you don't have the complication of copying them off somewhere safe before reformatting the SD card.

If your Pi did not come with an SD card then the minimum size you should get is 4GB, but buy a bigger SD card if you think you will need the space.

This lesson shows you how to create an SD card for your Raspberry Pi.

You Will Need

To prepare an SD card for your computer, you will need:

A 'regular' computer with a built-in SD card reader, or an add-on USB SD card reader. The instructions here are for Windows and Mac. [You can pick up a tiny microSD card reader/writer that is nice and fast and works with all USB-ports at the Adafruit shop \(http://adafru.it/939\)](http://adafru.it/939)



An SD card at least 4GB in capacity. [You can pick one up that is tested guaranteed to work with the Raspberry Pi at the Adafruit shop \(http://adafru.it/102\)](http://adafru.it/102)



Downloading an Image

The operating system that will be installed onto the SD card must be downloaded from the Internet. This will usually be a zip file that then extracts to a file of type .img an image file. Whatever image file you download, the actual installation process is the same.

Choose your Operating System

There are a bewildering number of operating systems that you can install on your Raspberry Pi, if you are a beginner, then do not consider anything except one of the Linux distributions, and if you are an advanced user, then you probably won't be reading this anyway.

Choose your Distribution

Having decided you want to install Linux, that is not the end of the story. You now have to decide which distribution or 'distro' of Linux you want to install. Being an Open Source operating system, anyone can take one of the existing distributions and add things to it or configure it in a certain way before packaging it up as another distribution option for anyone to use. This is how the most common Raspberry Pi distribution 'Raspbian' came into existence. The 'Debian' distribution was configured and kitted out with useful things like IDLE (a python-programming language development editor) and Scratch (a learn-to-program gaming system) to make it suitable for the Pi. Adafruit have then taken Raspbian and configured it to make it as easy as possible to use the GPIO connector to attach DIY electronics to the Pi.

All of the Adafruit tutorials (and nearly every other tutorial online) will work with either so we suggest picking one of the two:

- Raspbian – the Raspberry Pi recommended distribution, best for those that want the 'default standard' - nearly every Pi out there runs Raspbian <http://www.raspberrypi.org/downloads> (<http://adafru.it/aMY>)
- Occidentalis – Adafruit's version of Raspbian configured for hardware support. Best used by people who know they want to connect sensors, LEDs, buttons, servos, etc to their Pi <http://learn.adafruit.com/adafruit-raspberry-pi-educational-linux-distro/> (<http://adafru.it/aTc>)

In fact, if like me, you decide to keep your documents on a separate USB Flash drive, it is no bad thing to buy two SD cards and try both.

In appearance, there is very little to choose from between the two. When it comes to how it behaves, then 'Raspbian' is the more 'standard' distribution, but then Occidentalis is more electronics-hardware ready.

Having said that, both distributions are regularly updated and each will no doubt incorporate features found in the other.

Incidentally, the name Occidentalis come from the Latin name for the raspberry (Rubus Occidentalis).

So, having made your choice, download the zip or img file and if it is in a zip file unzip it onto the Desktop.

Making an SD Card – Using a Windows Vista / 7

There is a very useful utility that we can use to write a SD card available for Windows 7 and Vista. It is not unfortunately available for Windows XP.

Step 1.

Download Fedora ARM Installer from:

http://fedoraproject.org/wiki/Fedora_ARM_Installer#Windows_Vista_.26_.27 (<http://adafru.it/aTd>)

Step 2.

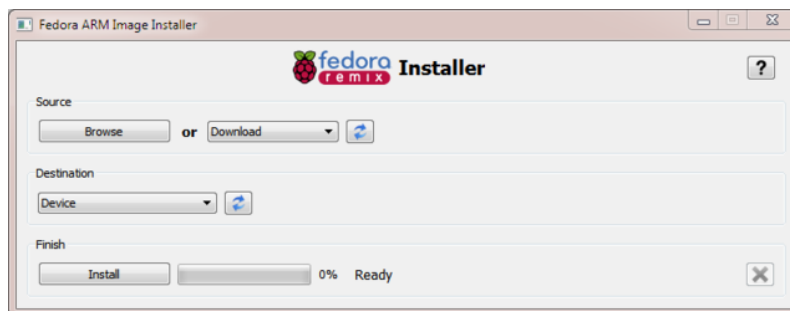
This will download a zip file that you must extract. The result will be a folder called 'fai-1.0.2-3-x32'. If you keep this outside of the Program Files area then you will be able to run it without changing its privileges. You can just leave it on your Desktop.

Step 3.

Eject any external storage devices such as USB flash drives and backup hard disks. This makes it easier to identify the SD card. Then insert the SD card into the slot on your computer or into the reader.

Step 4.

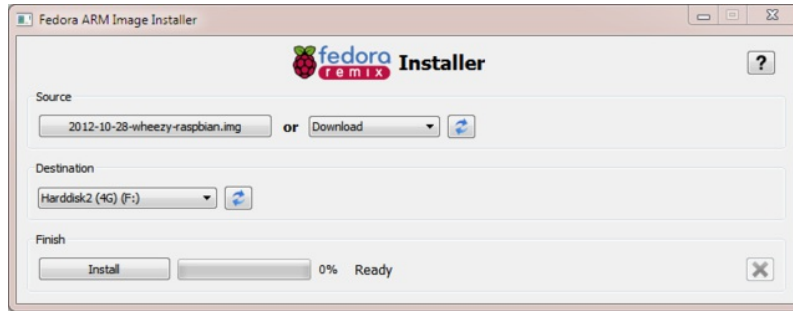
Right click to run the file **fedora-arm-installer.exe** as an administrator. This will launch the following application.



Step 5.

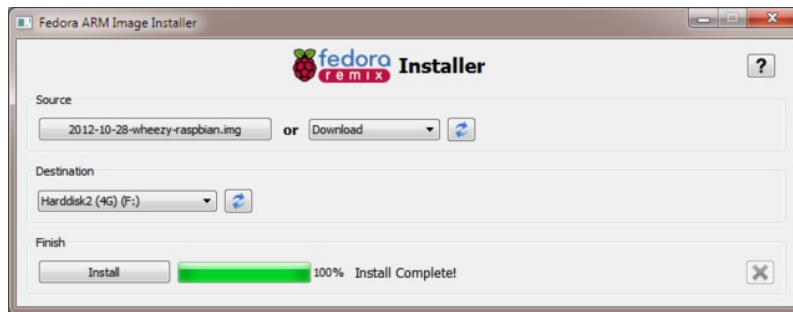
Select the image file and device.

To do this, click the Browse button and navigate to the .img file for the distribution that you want to install and then select the device from the drop-down.



Check that you have the right device, as it will be reformatted, and then click Install.

It will take a few minutes to install, but once the SD card is ready, you will see the following.



That's all there is to it. Your SD card is ready for use in your Raspberry Pi.

Making an SD Card – Using a Mac

Ray Vijoen has created a useful script that makes it really easy to make an SD card using a Mac. It is a shell script that takes all the necessary steps to create the SD card, including formatting it. You still have to run it from the command line.

Step 1.

Download Raspberry-Pi-SD-Installer-OS-X from <https://github.com/RayViljoen/Raspberry-Pi-SD-Installer-OS-X> (<http://adafru.it/aTe>)

Look for the 'zip' button at the top and download it as a single zip file.

Step 2.

Extract the zip file. It will expand into a folder called 'Raspberry-Pi-SD-Installer-OS-X-master'.

Step 3.

Use Finder to move the img file that you downloaded earlier into the Raspberry-Pi-SD-Installer-OS-X-master folder.

You can see here that I have both the Occidentalis and Raspbian images in the folder. That is fine, you can have as many images as you like in the folder.



Step4.

Open the Terminal app – you will find this in the Utilities folder of your Applications folder on your Mac.

Then type the command 'cd' followed by the path of your Raspberry-Pi-SD-Installer-OS-X-master folder.

```
Terminal — bash — 132x35
Simons-Mac:~ si$ cd /Users/si/Desktop/Raspberry-PI-SD-Installer-05-X-master
Simons-Mac:Raspberry-PI-SD-Installer-05-X-master si$
```

Step 5.

Eject any external drives that you have connected to your computer. This just makes it easier to identify the correct drive that corresponds to your SD card.

Insert the SD card that you want to use. Note that all data on this card will be erased.

Step 6.

Run the Pi Installer by typing the following command into the Terminal:

```
> sudo ./install Occidentalis_v02.img
```

'Occidentalis_v02.img' is the name of the img file for the distribution that you want to install.

You will be prompted for your Mac password and then should see this:

```
Terminal — sudo — 132x35
Simons-Mac:~ si$ cd /Users/si/Desktop/Raspberry-PI-SD-Installer-05-X-master
Simons-Mac:Raspberry-PI-SD-Installer-05-X-master si$ sudo ./install Occidentalis_v02.img

  Occidentalis

-----
Filesystem      Size  Used Avail Capacity  Mounted on
-----
1) /dev/disk2s2  233Gi 198Gi  34Gi    86%      /
2) devfs         111Ki  111Ki   0Bi   100%    /dev
3) map -hosts    0Bi    0Bi    0Bi   100%    /net
4) map auto_home 0Bi    0Bi    0Bi   100%    /home
5) /dev/disk1s1  50Mi   37Mi  19Mi    66%    /Volumes/Untitled

Select the disk to use by entering the disk number.
*** MAKE SURE YOU SELECT THE CORRECT DISK ***
*** Refer to the README if uncertain ***

Use disk [ 1, 2, 3, 4, 5 ] #
```

Step 7.

Test & Configure



If you plan to use multiple SD cards, it is not a bad idea to label them. Put the label on the side that shows when the SD card is inserted into the Pi.

Testing the card is easy - insert it into your Pi, then connect a keyboard to the USB port and a NTSC/PAL TV to the composite port or an HDMI monitor to the HDMI Port. Then power it by connecting a Micro USB cable to the Pi and powering it via a computer or a USB wall charger

You should see something like the following, an Adafruit/Raspberry logo in the top left, and a ton of text filling up the screen



In the next tutorial, you will find out how to configure your Raspberry Pi the first time you boot it up.

[Click Here for the](#)

Click Here for the
Next Lesson
<http://adafru.it/aUa>

BONUS! Make a Backup Image!

It took a while to get your SD card set up, didn't it? Bet you don't want to have to do that again, do you?

Well,

Back it up!

Forum user, Mac user, and Adafruit Customer phil.drummond took it upon himself to find the best way to back up his system image.

And he found a fast and easy way - a script which quickly creates a clone of your running Raspberry Pi system, ON THE PI ITSELF!

The script comes to us by way of [Pastebin user BILLW \(http://adafru.it/cCG\)](http://adafru.it/cCG).

Click to get
BILLW's Cloning
Script

<http://adafru.it/cCH>

What You'll Need

- USB SD Card Reader
- Blank SD Card
- Booted and Running Raspberry Pi

Get the Script File

First, get a copy of the script file onto your Pi. You can do that in any one of several ways:

- First, download the file to your computer

Then...

- Use ssh or vnc to transfer the file from the computer to the Pi

...Or...

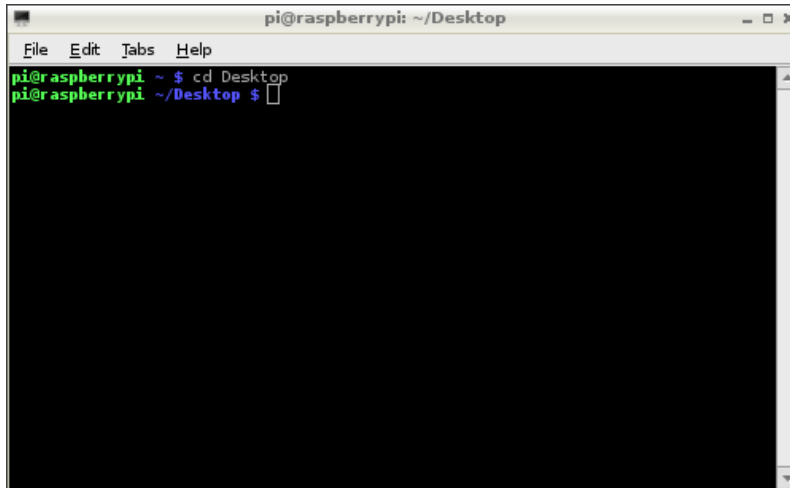
- Pop the blank SD into your USB Card Reader
- Plug the Card Reader into your computer
- Copy the file to the blank SD
- Move the Card Reader to the Pi
- Copy the file from the SD to the Pi

...Or...

- Use the Pi's Web Browser to navigate to this page and download the script file directly

Run the Script

1. Put the blank SD card into your USB Card Reader, and plug it into one of the Pi's USB ports.
2. Open a Terminal window on the Pi
3. Navigate to the folder where you stored the script file. (If you stored the file on the Pi's Desktop, simply type 'cd Desktop')



When you run the script, you will have to specify the name of your SD card. Raspbian and occidentalis assign the names 'sda', 'sdb', etc. to SD cards found on USB. If you only have one USB card reader attached, the name of your new SD card will be 'sda'.

If you're not sure that sda is the right card, you can run this command to list the cards connected to your Pi.

```
sudo fdisk -l
```

The SD card slot with your running Pi system will show up as /dev/mmcblk0. Your blank card will be listed as /dev/sda1 (or possibly /dev/sdb1, if you have more than one USB card readers attached to the Pi).

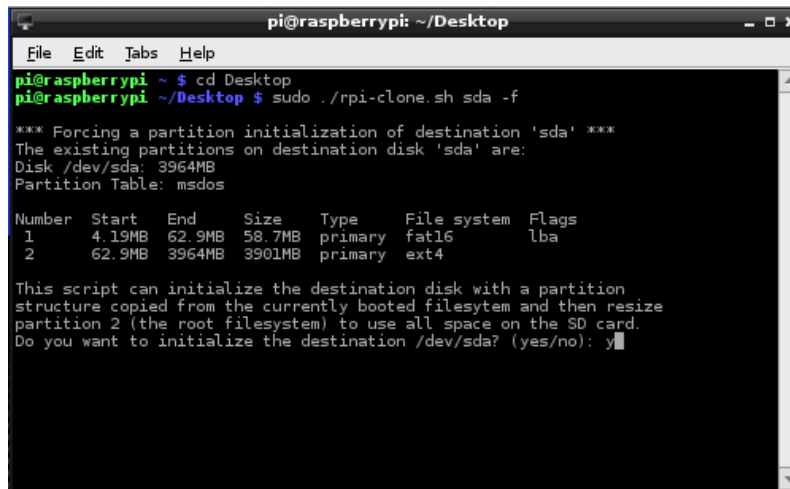
Note that you don't enter the '1' - if your card is listed as '/dev/sda1', then you would still enter 'sda' when you run the script ('sda' is the name of the card, 'sda1' is the name of the first partition on the card).

Ok, so now you should be ready to run the commands

```
chmod +x rpi-clone.sh  
sudo ./rpi_clone sda -f
```


As noted earlier, the first parameter passed to the script is the name of the target SD card, in this case 'sda'. The -f tells the script to entirely re-format the card.

The script will ask you if you're sure you want to initialize the destination card. Type 'y', and hit the return key.



```
pi@raspberrypi: ~/Desktop
File Edit Tabs Help
pi@raspberrypi ~ $ cd Desktop
pi@raspberrypi ~/Desktop $ sudo ./rpi-clone.sh sda -f

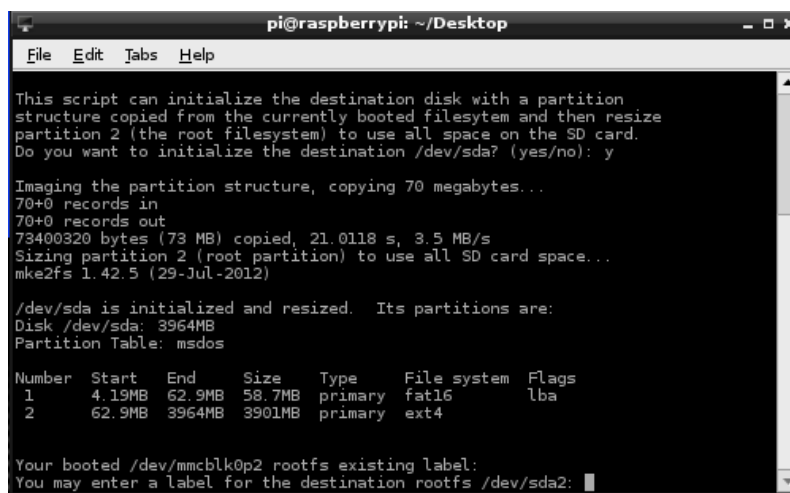
*** Forcing a partition initialization of destination 'sda' ***
The existing partitions on destination disk 'sda' are:
Disk /dev/sda: 3964MB
Partition Table: msdos

Number  Start   End     Size    Type    File system  Flags
  1      4.19MB  62.9MB  58.7MB  primary fat16        lba
  2      62.9MB  3964MB  3901MB  primary ext4

This script can initialize the destination disk with a partition
structure copied from the currently booted filesystem and then resize
partition 2 (the root filesystem) to use all space on the SD card.
Do you want to initialize the destination /dev/sda? (yes/no): y
```

If you see an error message instead, check below for solutions!

Next, the script will ask you if you want to give your new backup a label. It's not necessary to do this - just hit the return key.



```
pi@raspberrypi: ~/Desktop
File Edit Tabs Help

This script can initialize the destination disk with a partition
structure copied from the currently booted filesystem and then resize
partition 2 (the root filesystem) to use all space on the SD card.
Do you want to initialize the destination /dev/sda? (yes/no): y

Imaging the partition structure, copying 70 megabytes...
70+0 records in
70+0 records out
73400320 bytes (73 MB) copied, 21.0118 s, 3.5 MB/s
Sizing partition 2 (root partition) to use all SD card space...
mke2fs 1.42.5 (29-Jul-2012)

/dev/sda is initialized and resized. Its partitions are:
Disk /dev/sda: 3964MB
Partition Table: msdos

Number  Start   End     Size    Type    File system  Flags
  1      4.19MB  62.9MB  58.7MB  primary fat16        lba
  2      62.9MB  3964MB  3901MB  primary ext4

Your booted /dev/mmcblk0p2 rootfs existing label:
You may enter a label for the destination rootfs /dev/sda2:
```

Finally, the script will ask you if you're sure you really want to do this, before it begins creating the backup. Type 'y', and hit the return key.

```
pi@raspberrypi: ~/Desktop
File Edit Tabs Help

70+0 records in
70+0 records out
73400320 bytes (73 MB) copied, 21.0118 s, 3.5 MB/s
Sizing partition 2 (root partition) to use all SD card space...
mke2fs 1.42.5 (29-Jul-2012)

/dev/sda is initialized and resized. Its partitions are:
Disk /dev/sda: 3964MB
Partition Table: msdos

Number Start End Size Type File system Flags
 1 4.19MB 62.9MB 58.7MB primary fat16 lba
 2 62.9MB 3964MB 3901MB primary ext4

Your booted /dev/mmcblk0p2 rootfs existing label:
You may enter a label for the destination rootfs /dev/sda2:

Clone destination disk : sda
Clone destination rootfs : /dev/sda2 (no label) on /mnt/clone
Clone destination bootfs : /dev/sda1 on /mnt/clone/boot
Verbose mode : off
=====
Final check, is it Ok to proceed with the clone (yes/no)? y
```

Now it's time to wait - the process will take a little while.

```
pi@raspberrypi: ~/Desktop
File Edit Tabs Help

/dev/sda is initialized and resized. Its partitions are:
Disk /dev/sda: 3964MB
Partition Table: msdos

Number Start End Size Type File system Flags
 1 4.19MB 62.9MB 58.7MB primary fat16 lba
 2 62.9MB 3964MB 3901MB primary ext4

Your booted /dev/mmcblk0p2 rootfs existing label:
You may enter a label for the destination rootfs /dev/sda2:

Clone destination disk : sda
Clone destination rootfs : /dev/sda2 (no label) on /mnt/clone
Clone destination bootfs : /dev/sda1 on /mnt/clone/boot
Verbose mode : off
=====
Final check, is it Ok to proceed with the clone (yes/no)? y
=> Mounting /dev/sda2 (no label) on /mnt/clone
=> Mounting /dev/sda1 on /mnt/clone/boot
=====
Starting the filesystem rsync to sda
(This may take several minutes)...
```

When the process is complete, the script will ask if it should unmount the card with your new system clone/ Reply with 'y', and you're done!

Now you can shutdown the Pi, swap the clone into the Pi's SD Card Slot, and restart - Bingo! a fully-operational clone of your Raspberry Pi system!

Problems?

If you see an error message like this:

```
pi@raspberrypi: ~/Desktop
File Edit Tabs Help
pi@raspberrypi ~ $ cd Desktop
pi@raspberrypi ~/Desktop $ sudo ./rpi-clone.sh sda -f
A destination partition is busy (mounted) Mount status:
/dev/sda2: /media/10b4c001-2137-4418-b29e-57b7d15a6cbc
/dev/sda1: /media/A1B1-918F
Aborting!
pi@raspberrypi ~/Desktop $
```

...it means that your SD card is mounted in the file system. You have to unmount it before you can proceed. In the picture, I'm writing over an earlier clone of my system, which has two partitions: /dev/sda2 and /dev/sda1. You might only have one partition.

In any case, issue the umount command for each mounted partition on your destination SD card:

```
sudo umount /dev/sda1
```

```
pi@raspberrypi: ~/Desktop
File Edit Tabs Help
pi@raspberrypi ~ $ cd Desktop
pi@raspberrypi ~/Desktop $ sudo ./rpi-clone.sh sda -f
A destination partition is busy (mounted) Mount status:
/dev/sda2: /media/10b4c001-2137-4418-b29e-57b7d15a6cbc
/dev/sda1: /media/A1B1-918F
Aborting!
pi@raspberrypi ~/Desktop $ sudo umount /dev/sda1
pi@raspberrypi ~/Desktop $ sudo umount /dev/sda2
pi@raspberrypi ~/Desktop $
```

Now try to run the script again!