

Identify and Mount a Drive

This guide assumes you only have 1 external hard drive connected to the Pi. If so then it should be attached to /dev/sda1 – additional drives will use /dev/sdb1 and /dev/sdc1 etc. If you have multiple external hard drives you will need separate mount points for each drive (e.g. /mnt/usbstorage1 and /mnt/usbstorage2).

```
Prepare the Mount Point
First make a directory in which to mount the USB drive
sudo mkdir /mnt/usbstorage
```

```
Make pi the owner of the mounted drive and make its permissions read, write and execute for it
sudo chown -R pi:pi /mnt/usbstorage
sudo chmod -R 775 /mnt/usbstorage
```

```
Set all future permissions for the mount point to pi user and group.
sudo setfacl -Rdm g:pi:rwX /mnt/usbstorage
sudo setfacl -Rm g:pi:rwX /mnt/usbstorage
```

Determine the USB Hard Drive Format

You also need to know the file system the drive is formatted with
sudo blkid

You will see something like this. Again it is the sda1 line we are interested in. Note the TYPE="ext4" at the end, you will need this for the fstab file. It is easiest to copy it now and paste it after running nano in the next step.

```
/dev/sda1: UUID="31db83ca-ac6d-4bc7-b076-848c7c71025e" TYPE="ext2" PARTUUID="279bf5b4-01"
/dev/mmcblk0: PTUUID="0006dd3f" PTYPE="dos"
/dev/mmcblk0p1: LABEL="RECOVERY" UUID="0403-0201" TYPE="vfat" PARTUUID="0006dd3f-01"
/dev/mmcblk0p5: LABEL="SETTINGS" UUID="705f6e2b-fac6-4f33-8611-d57a9c9f04e1" TYPE="ext4"
PARTUUID="0006dd3f-05"
/dev/mmcblk0p6: SEC_TYPE="msdos" LABEL="boot" UUID="1495-189B" TYPE="vfat" PARTUUID="0006dd3f-06"
/dev/mmcblk0p7: LABEL="root0" UUID="759bca6b-5766-4941-b830-cdbfcd861107" TYPE="ext4"
PARTUUID="0006dd3f-07"
/dev/mmcblk0p8: LABEL="boot-rbp2" UUID="200C-EA5B" TYPE="vfat" PARTUUID="0006dd3f-08"
/dev/mmcblk0p9: LABEL="root-rbp2" UUID="26d10fa3-fe0a-4044-b24a-9b85c2079122" TYPE="ext4"
PARTUUID="0006dd3f-09"
```

Update your repositories if your hard drive is anything but ext4 as the TYPE above
sudo apt-get update

Now mount the usb stick in there. If it is NTFS you will need to install some utilities first
sudo apt-get install ntfs-3g -y

If the drive is exfat install these utilities
sudo apt-get install exfat-utils -y

For all drive types mount the usb with this command, -o insures pi is the owner which should avoid permission issues
sudo mount -o uid=pi,gid=pi /dev/sda1 /mnt/usbstorage

```
If you get an error use this syntax
sudo mount -t uid=pi,gid=pi /dev/sda1 /mnt/usbstorage
```

```
If the mount -t command returns an error then use this syntax
sudo mount uid=pi,gid=pi /dev/sda1 /mnt/usbstorage
```

If you are getting this drive is already mounted errors then you are probably using a distro which automounts the drives which you can either continue using but then you should remove the `/etc/fstab` entries. You will have to uninstall the automounting software if you want to mount using the method in this guide.

```
Remove the automounting software with this command
sudo apt-get remove usbmount --purge
```

Automount the USB Hard Drive on Boot

`/mnt/usbstorage` will be the folder in which you store your media. We want it to be automounted on boot. The best way to do this is through the UUID. Get the UUID by using this command

```
sudo ls -l /dev/disk/by-uuid/
```

You will see some output like this. The UUID you want is formatted like this XXXX-XXXX for the `sda1` drive. If the drive is NTFS it can have a longer format like `UUID="BABA3C2CBA3BE413"`. Note this UUID, for me it is `BA8F-FFE8`

```
total 0
```

```
lrwxrwxrwx 1 root root 15 Jan  1  1970 3d81d9e2-7d1b-4015-8c2c-29ec0875f762 -> ../../mmcblk0p2
lrwxrwxrwx 1 root root 15 Jan  1  1970 787C-2FD4 -> ../../mmcblk0p1
lrwxrwxrwx 1 root root 10 Oct 26 21:10 BA8F-FFE8 -> ../../sda1
```

```
Now we will edit fstab to mount the USB by UUID on boot
sudo nano /etc/fstab
```

Add the line in red to the bottom, replace XXXX-XXXX with your UUID and `exfat` with your type if it is different (e.g. `ntfs`, `vfat`, `ext4`). You may or may not need the quotation marks wrapped around the UUID, you do not need quotation marks wrapped around the file system type (`ext4`, `vfat`, `NTFS` etc).

The `umask 0002` sets 775 permissions so the `pi` user and group can read, write and execute files on the external USB drive. To completely eliminate permission issues you can set the `umask` to `0000` which equals 777 permissions so anybody can read, write and execute. Note that 777 permissions are considered a security risk.

If you have issues here then try replacing `uid=pi,gid=pi` with just the word defaults (typical for `ext4`). You can also try replacing the UUID with the `/dev/sda1` line.

```
This is an example for exfat
/dev/mmcblk0p1 /boot vfat defaults 0 2
/dev/mmcblk0p2 / ext4 errors=remount-ro,noatime 0 1
UUID=XXXX-XXXX /mnt/usbstorage exfat nofail,uid=pi,gid=pi 0 0
```

For NTFS, note that it is `ntfs` and not `ntfs-3g`

```
/dev/mmcblk0p1 /boot vfat defaults 0 2
/dev/mmcblk0p2 / ext4 errors=remount-ro,noatime 0 1
UUID=XXXX-XXXX /mnt/usbstorage ntfs nofail,uid=pi,gid=pi 0 0
```

For ext4 using uid and gid is not recommended so use at your own risk as it could cause issues (thanks mk2soldier).

```
/dev/mmcblk0p1 /boot vfat defaults 0 2
/dev/mmcblk0p2 / ext4 errors=remount-ro,noatime 0 1
UUID=XXXX-XXXX /mnt/usbstorage ext4 nofail,uid=pi,gid=pi 0 0
```

If you get any errors you can replace uid=pi,gid=pi with defaults or remove it entirely

```
/dev/mmcblk0p1 /boot vfat defaults 0 2
/dev/mmcblk0p2 / ext4 errors=remount-ro,noatime 0 1
UUID=XXXX-XXXX /mnt/usbstorage ext4 nofail,defaults 0 0
```

For using /dev/sda1 and defaults if you have troubles with UUID

```
/dev/mmcblk0p1 /boot vfat defaults 0 2
/dev/mmcblk0p2 / ext4 errors=remount-ro,noatime 0 1
/dev/sda1 /mnt/usbstorage ext4 nofail 0 0
```

Now test the fstab file works
sudo mount -a

If you didn't get errors reboot, otherwise try the suggestions above to get it working then mount -a again until it succeeds
sudo reboot

You should be able to access the mounted USB drive and list its contents `cd /mnt/usbstorage ls`

Every time you reboot, the drives will be mounted as long as the UUID remains the same. If you delete the partitions or format the USB hard drive or stick the UUID changes so bear this in mind. You can always repeat the process for additional hard drives in the future.

Now you can manage the hard drive power using these guides since it will not spin down automatically on Linux

If you have multiple hard drives you will have to make separate mount points (e.g. /mnt/usbstorage2) for each drive's partition

Fix Raspberry Pi 2 Mounting Issues

Thanks to Jake for bringing this to my attention. Apparently there is a bug in the Pi 2 that messes up automounting. You can fix it by creating a delay.

Open up the /boot/cmdline.txt file `sudo nano /boot/cmdline.txt`

Add this line to the bottom, you can increase this delay if necessary `rootdelay=5`

Hit Ctrl+X, Y and Enter to save and exit, then reboot to see if it automounts now. If the Raspberry Pi hard drive still does not automount we can use rc.local (thanks Julian) `sudo nano /etc/rc.local`

Add this lines before the exit line `sleep 30 sudo mount -a exit`

Ctrl+X, Y and Enter to save

Reboot again to test `sudo reboot`

Identify and Mount a Drive

First we need to identify the disk(s):

```
sudo blkid
```

This will list any recognised devices:

```
/dev/mmcblk0p1: LABEL="RECOVERY" UUID="0403-0201" TYPE="vfat" PARTUUID="0006dd3f-01"  
/dev/mmcblk0p5: LABEL="SETTINGS" UUID="705f6e2b-fac6-4f33-8611-d57a9c9f04e1" TYPE="ext4"  
PARTUUID="0006dd3f-05"  
/dev/mmcblk0p6: SEC_TYPE="msdos" LABEL="boot" UUID="1495-189B" TYPE="vfat" PARTUUID="0006dd3f-06"  
/dev/mmcblk0p7: LABEL="root0" UUID="759bca6b-5766-4941-b830-cdbfcd861107" TYPE="ext4"  
PARTUUID="0006dd3f-07"  
/dev/mmcblk0p8: LABEL="boot-rbp2" UUID="200C-EA5B" TYPE="vfat" PARTUUID="0006dd3f-08"  
/dev/mmcblk0p9: LABEL="root-rbp2" UUID="26d10fa3-fe0a-4044-b24a-9b85c2079122" TYPE="ext4"  
PARTUUID="0006dd3f-09"  
/dev/mmcblk0: PTUUID="0006dd3f" PTTYPE="dos"  
/dev/sda: PTUUID="279bf5b4" PTTYPE="dos"
```

In this example, the first 6 items are the SD card that Raspbian booted from **/dev/mmcblk0px**. The last device **/dev/sda** is a USB Hard Disk. This is the disk I want to add to Raspbian.

Now that we know the disk we wish to work on is **/dev/sda** we can use:

```
sudo fdisk /dev/sda
```

```
enter p to display partition information  
Disk /dev/sda: 298.1 GiB, 320072933376 bytes, 625142448 sectors  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disklabel type: dos  
Disk identifier: 0x279bf5b4
```

We can see the size is 298.1 GB.

```
Use the d command to delete existing partition  
No partition is defined yet!  
Could not delete partition 81165
```

In this case, there are no partitions to delete
To create a new partition, use:

```
n - This creates a new partition  
p - This is for a primary partition  
Enter - To default to partition 1  
Enter - To select first sector  
Enter - To select last sector.
```

You should now have a new partition.

```
p - To display the new partition  
Device      Boot Start      End    Sectors   Size Id Type  
/dev/sda1                2048 625142447 625140400 298.1G 83 Linux
```

The changes need to be written to the partition table:

```
w - To commit changes  
The partition table has been altered.  
Calling ioctl() to re-read partition table.  
Syncing disks.
```

Now run the following command to see your disk, which will now include **/dev/sda1**

```
sudo fdisk -l
```

There will be a large output, but the important part is at the end:

Device	Boot	Start	End	Sectors	Size	Id	Type
/dev/sda1		2048	625142447	625140400	298.1G	83	Linux

/dev/sda1 is the partition we have just created on device /dev/sda

Now we need to create the file system:

```
sudo mkfs /dev/sda1
mke2fs 1.42.12 (29-Aug-2014)
/dev/sda1 contains a ntfs file system labelled '300gb'
Proceed anyway? (y,n) <-----You have to say 'Y' Here.
Depending on drive size, this will take a minute or two
Creating filesystem with 78142550 4k blocks and 19537920 inodes
Filesystem UUID: 6af40af7-759f-4ee5-afea-882e9f58f17e
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000, 7962624, 11239424, 20480000, 23887872, 71663616
Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
```

After the superblocks are created and you get a command prompt, Now you are ready to mount your disk.

Lets create a mount point and call it NewDisk

```
sudo mkdir /mydisk <-- This creates a mount point (a folder) to mount our disk, the folder is
called mydisk
```

To Mount the Disk

```
sudo mount /dev/sda1 /NewDisk <--- bear in mind that your disk might not be sda1
```

Use df to verify disk is mounted. If you reboot you will need to remount it (you might want to add it to /etc/fstab)

```
df
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/root        7928236 3577848   3924612  48% /
devtmpfs         469544      0    469544   0% /dev
tmpfs            473880      0    473880   0% /dev/shm
tmpfs            473880    6520    467360   2% /run
tmpfs             5120        4     5116   1% /run/lock
tmpfs            473880      0    473880   0% /sys/fs/cgroup
/dev/mmcblk0p6   64366    20436    43930  32% /boot
tmpfs            94776      0     94776   0% /run/user/1000
/dev/sda1       307665360 64344 291972508   1% /NewDisk <----- here is our new disk
```

Try writing a file to the disk to test it:

```
sudo touch /NewDisk/test
ls /NewDisk
lost+found test
```

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