

USB Audio Cards with a Raspberry Pi

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Instructions



The Raspberry Pi has an on-board audio jack, which is super handy for all kinds of sound effects and speech, just plug and go! However, for when you want better audio for music playback, a USB audio card can greatly improve the sound quality and volume, this tutorial will show you how...

This tutorial is only for getting the audio output jack working. We don't have a tutorial for the microphone input (yet!)

Pre-requisites

First up, you will need a fully set up Raspberry Pi that is otherwise working and you can log into. [We have tons of tutorials on that front \(http://adafruit.it/ckb\)](http://adafruit.it/ckb), so [get your SD card loaded with Raspbian \(http://adafruit.it/aWq\)](http://adafruit.it/aWq) (that's what we're using in this tutorial), and either [ssh \(http://adafruit.it/aUB\)](http://adafruit.it/aUB) in, log in with a monitor and keyboard, or a [USB console cable \(http://adafruit.it/aUA\)](http://adafruit.it/aUA)

Just a reminder, this tutorial is only known good for the USB audio card in the Adafruit shop. Audio cards all use different chipsets so if you have another card, it may not work here! You'll have to figure out what's different for your model.

Figure out your chipset

Figure out your chipset

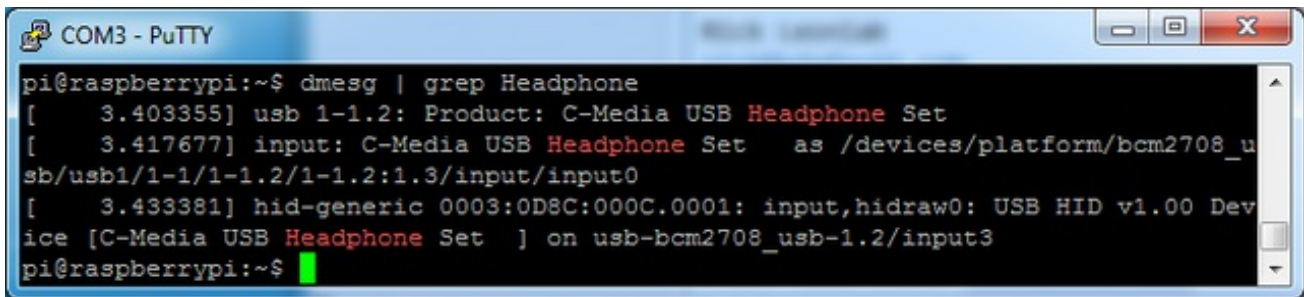
Start by having your Raspi **turned off/shutdown** (perform a clean shutdown!) and then plugging in your USB audio card. Then boot the Pi as normal.

Once you log in, type **dmesg | grep cm109** to look at the boot messages. You should either see some lines about **cm109** if you have a **CM109** chipset

(<http://adafru.it/dgh>)

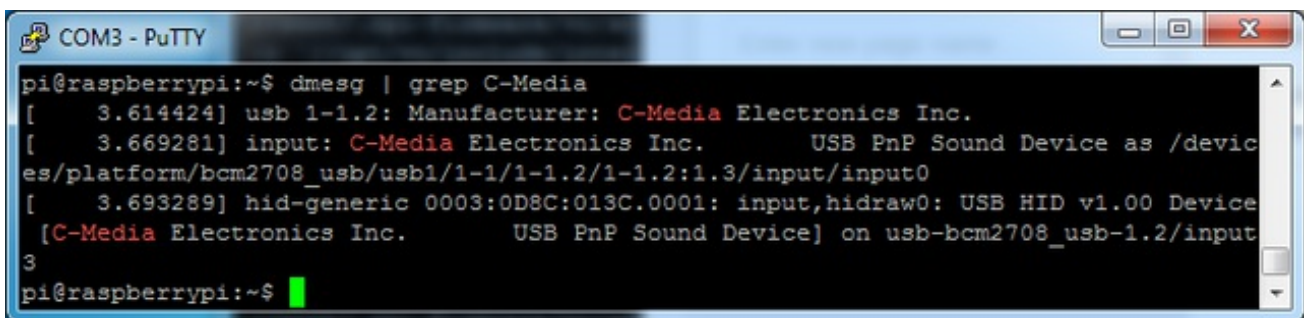
(<http://adafru.it/dgi>)

or if nothing comes up, try **dmesg | grep Headphone** you will see **the C-Media USB Headphone Set** driver. This means its a **CM-headphone**



```
COM3 - PuTTY
pi@raspberrypi:~$ dmesg | grep Headphone
[ 3.403355] usb 1-1.2: Product: C-Media USB Headphone Set
[ 3.417677] input: C-Media USB Headphone Set as /devices/platform/bcm2708_usb/usb1/1-1/1-1.2/1-1.2:1.3/input/input0
[ 3.433381] hid-generic 0003:0D8C:000C.0001: input,hidraw0: USB HID v1.00 Device [C-Media USB Headphone Set ] on usb-bcm2708_usb-1.2/input3
pi@raspberrypi:~$
```

or if nothing comes up, try **dmesg | grep C-Media** you will see some C-Media notes but no mention of the cm109 driver. This means its a **CM108**



```
COM3 - PuTTY
pi@raspberrypi:~$ dmesg | grep C-Media
[ 3.614424] usb 1-1.2: Manufacturer: C-Media Electronics Inc.
[ 3.669281] input: C-Media Electronics Inc. USB PnP Sound Device as /devices/platform/bcm2708_usb/usb1/1-1/1-1.2/1-1.2:1.3/input/input0
[ 3.693289] hid-generic 0003:0D8C:013C.0001: input,hidraw0: USB HID v1.00 Device [C-Media Electronics Inc. USB PnP Sound Device] on usb-bcm2708_usb-1.2/input3
pi@raspberrypi:~$
```

CM108 Type

If you have CM108

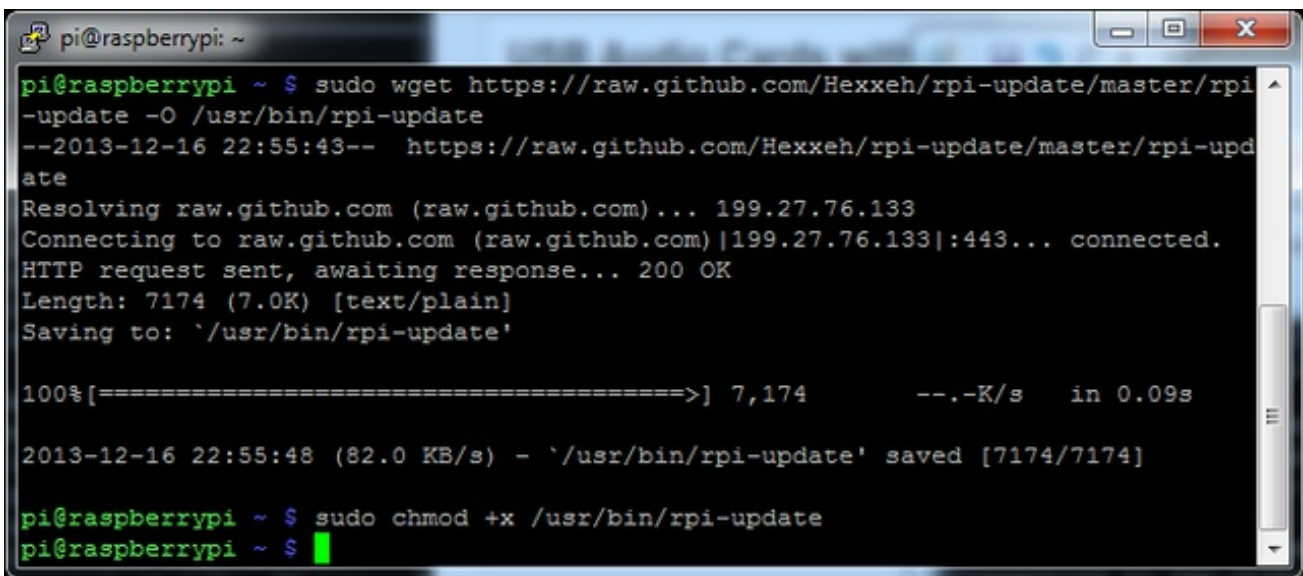
If you type in **lsusb** you should see a reference to **C-Media Electronics, Inc. CM108 Audio Adapter**

A terminal window titled "COM3 - PuTTY" showing the output of the 'lsusb' command on a Raspberry Pi. The output lists several USB devices, including the CM108 Audio Controller.

```
pi@raspberrypi:~$  
pi@raspberrypi:~$ lsusb  
Bus 001 Device 002: ID 0424:9512 Standard Microsystems Corp.  
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub  
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.  
Bus 001 Device 004: ID 0d8c:013c C-Media Electronics, Inc. CM108 Audio Controller  
Bus 001 Device 005: ID 0bda:8176 Realtek Semiconductor Corp. RTL8188CUS 802.11n WLAN Adapter  
pi@raspberrypi:~$
```

We'll need to update the firmware, this requires Internet access but only takes 15 minutes or so. You might want to run **sudo apt-get update** first if you haven't lately. Then run the following commands in order:

```
sudo apt-get install git-core  
sudo wget https://raw.githubusercontent.com/Hexxeh/rpi-update/master/rpi-update -O /usr/bin/rpi-update  
sudo chmod +x /usr/bin/rpi-update  
sudo BRANCH=next rpi-update  
sudo reboot
```

A terminal window showing the execution of 'sudo wget' to download the rpi-update script and 'sudo chmod' to make it executable.

```
pi@raspberrypi: ~ $ sudo wget https://raw.githubusercontent.com/Hexxeh/rpi-update/master/rpi-update -O /usr/bin/rpi-update  
--2013-12-16 22:55:43-- https://raw.githubusercontent.com/Hexxeh/rpi-update/master/rpi-update  
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 199.27.76.133  
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|199.27.76.133|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 7174 (7.0K) [text/plain]  
Saving to: '/usr/bin/rpi-update'  
  
100%[=====>] 7,174 --.-K/s in 0.09s  
  
2013-12-16 22:55:48 (82.0 KB/s) - '/usr/bin/rpi-update' saved [7174/7174]  
  
pi@raspberrypi ~ $ sudo chmod +x /usr/bin/rpi-update  
pi@raspberrypi ~ $
```

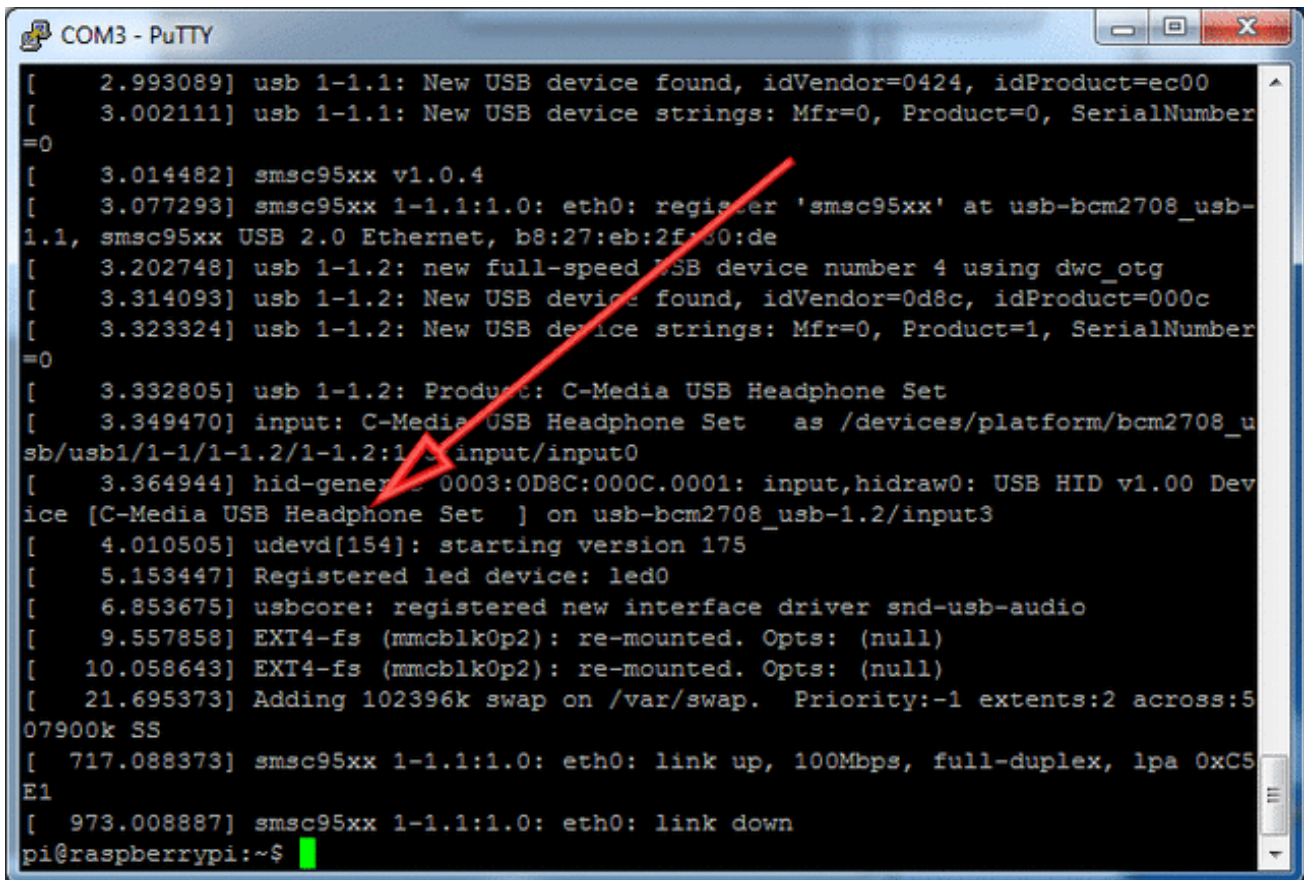
```
pi@raspberrypi: ~  
*** Raspberry Pi firmware updater by Hexxeh, enhanced by AndrewS  
*** Performing self-update  
--2013-12-16 22:56:33-- https://github.com/Hexxeh/rpi-update/raw/master/rpi-upd  
ate  
Resolving github.com (github.com)... 192.30.252.130  
Connecting to github.com (github.com)|192.30.252.130|:443... connected.  
HTTP request sent, awaiting response... 302 Found  
Location: https://raw.githubusercontent.com/Hexxeh/rpi-update/master/rpi-update [following]  
--2013-12-16 22:56:38-- https://raw.githubusercontent.com/Hexxeh/rpi-update/master/rpi-upd  
ate  
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 199.27.75.133  
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|199.27.75.133|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 7174 (7.0K) [text/plain]  
Saving to: '/usr/bin/rpi-update.tmp'  
  
100%[=====>] 7,174      --.-K/s   in 0.03s  
  
2013-12-16 22:56:44 (234 KB/s) - '/usr/bin/rpi-update.tmp' saved [7174/7174]  
  
*** Relaunching after update  
*** Raspberry Pi firmware updater by Hexxeh, enhanced by AndrewS  
*** ARM/GPU split is now defined in /boot/config.txt using the gpu_mem option!  
*** We're running for the first time  
*** Setting up firmware (this may take a few minutes)  
Cloning into '//root/.rpi-firmware'...  
remote: Counting objects: 3200, done.  
remote: Compressing objects: 100% (2674/2674), done.  
Receiving objects: 74% (2383/3200), 33.73 MiB | 46 KiB/s  
Receiving objects: 74% (2383/3200), 35.76 MiB | 78 KiB/s
```

```
pi@raspberrypi: ~  
s.h' -> `//opt/vc/include/interface/vmcs_host/vc_imageconv_defs.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_vchi_filesys.  
h' -> `//opt/vc/include/interface/vmcs_host/vc_vchi_filesys.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_hdmi_property  
.h' -> `//opt/vc/include/interface/vmcs_host/vc_hdmi_property.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vcilcs_common.h'  
-> `//opt/vc/include/interface/vmcs_host/vcilcs_common.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_vchi_fileserv  
ice_defs.h' -> `//opt/vc/include/interface/vmcs_host/vc_vchi_fileservice_defs.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_gencmd_defs.h  
' -> `//opt/vc/include/interface/vmcs_host/vc_gencmd_defs.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_vchi_bufman.h  
' -> `//opt/vc/include/interface/vmcs_host/vc_vchi_bufman.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_dispmanx_type  
s.h' -> `//opt/vc/include/interface/vmcs_host/vc_dispmanx_types.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_dispservice_x  
_defs.h' -> `//opt/vc/include/interface/vmcs_host/vc_dispservice_x_defs.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_cecservice.h'  
-> `//opt/vc/include/interface/vmcs_host/vc_cecservice.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_dispmanx.h' -  
> `//opt/vc/include/interface/vmcs_host/vc_dispmanx.h'  
`//root/.rpi-firmware/vc/sdk/opt/vc/include/interface/vmcs_host/vc_vchi_bufman_d  
efs.h' -> `//opt/vc/include/interface/vmcs_host/vc_vchi_bufman_defs.h'  
*** Running ldconfig  
*** Storing current firmware revision  
*** Syncing changes to disk  
*** If no errors appeared, your firmware was successfully setup  
*** A reboot is needed to activate the new firmware  
pi@raspberrypi ~ $  
pi@raspberrypi ~ $ █
```

Now you can go down to the **update alsa module options** section

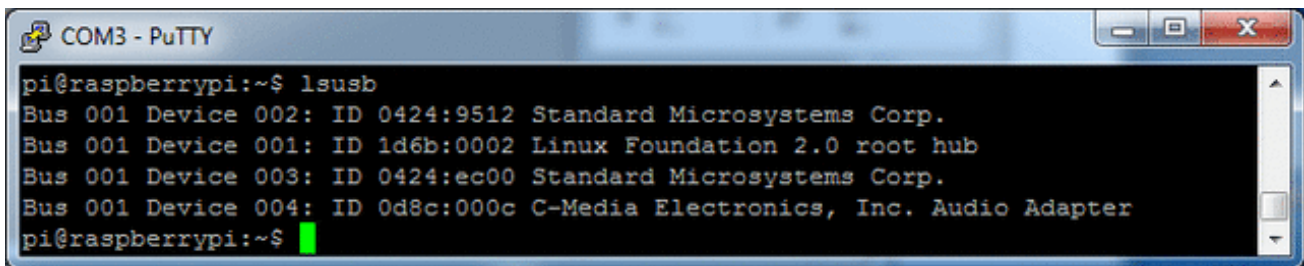
CM-Headphone Type

Type **dmesg** to look at the boot messages. You should see a bunch of lines that talk about **C-Media USB Headphone Set**



```
COM3 - PuTTY
[ 2.993089] usb 1-1.1: New USB device found, idVendor=0424, idProduct=ec00
[ 3.002111] usb 1-1.1: New USB device strings: Mfr=0, Product=0, SerialNumber
=0
[ 3.014482] smsc95xx v1.0.4
[ 3.077293] smsc95xx 1-1.1:1.0: eth0: register 'smc95xx' at usb-bcm2708_usb-
1.1, smsc95xx USB 2.0 Ethernet, b8:27:eb:2f:80:de
[ 3.202748] usb 1-1.2: new full-speed USB device number 4 using dwc_otg
[ 3.314093] usb 1-1.2: New USB device found, idVendor=0d8c, idProduct=000c
[ 3.323324] usb 1-1.2: New USB device strings: Mfr=0, Product=1, SerialNumber
=0
[ 3.332805] usb 1-1.2: Product: C-Media USB Headphone Set
[ 3.349470] input: C-Media USB Headphone Set as /devices/platform/bcm2708_u
sb/usb1/1-1/1-1.2/1-1.2:1.3: input/input0
[ 3.364944] hid-generic 0003:0D8C:000C.0001: input,hidraw0: USB HID v1.00 Dev
ice [C-Media USB Headphone Set ] on usb-bcm2708_usb-1.2/input3
[ 4.010505] udevd[154]: starting version 175
[ 5.153447] Registered led device: led0
[ 6.853675] usbcore: registered new interface driver snd-usb-audio
[ 9.557858] EXT4-fs (mmcblk0p2): re-mounted. Opts: (null)
[ 10.058643] EXT4-fs (mmcblk0p2): re-mounted. Opts: (null)
[ 21.695373] Adding 102396k swap on /var/swap. Priority:-1 extents:2 across:5
07900k SS
[ 717.088373] smsc95xx 1-1.1:1.0: eth0: link up, 100Mbps, full-duplex, lpa 0xC5
E1
[ 973.008887] smsc95xx 1-1.1:1.0: eth0: link down
pi@raspberrypi:~$
```

And if you type in **lsusb** you should see a reference to **C-Media Electronics Audio Adapter** but no mention of **CM108** and the VID/PID is 0x0d8c:0x00c

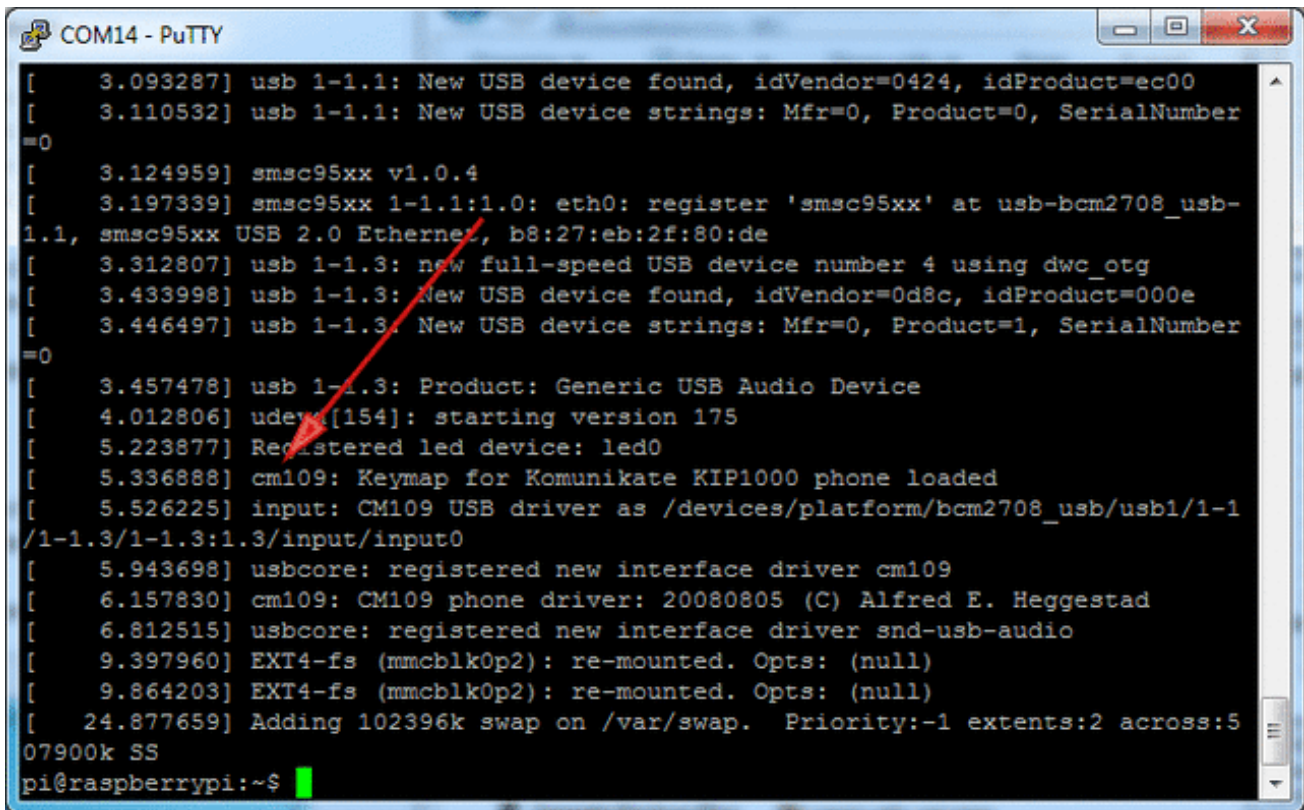


```
COM3 - PuTTY
pi@raspberrypi:~$ lsusb
Bus 001 Device 002: ID 0424:9512 Standard Microsystems Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
Bus 001 Device 004: ID 0d8c:000c C-Media Electronics, Inc. Audio Adapter
pi@raspberrypi:~$
```

Nothing special needs to be done! Hurray! Continue on to the **Updating ALSA Config section**

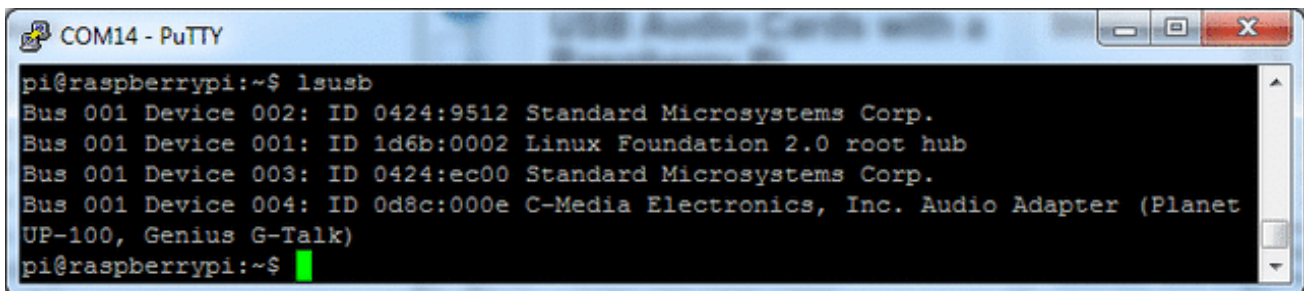
CM109 Type

Type **dmesg** to look at the boot messages. You should see a bunch of lines that talk about **cm109**



```
COM14 - PuTTY
[ 3.093287] usb 1-1.1: New USB device found, idVendor=0424, idProduct=ec00
[ 3.110532] usb 1-1.1: New USB device strings: Mfr=0, Product=0, SerialNumber=0
[ 3.124959] smsc95xx v1.0.4
[ 3.197339] smsc95xx 1-1.1:1.0: eth0: register 'smc95xx' at usb-bcm2708_usb-1.1, smc95xx USB 2.0 Ethernet, b8:27:eb:2f:80:de
[ 3.312807] usb 1-1.3: new full-speed USB device number 4 using dwc_otg
[ 3.433998] usb 1-1.3: New USB device found, idVendor=0d8c, idProduct=000e
[ 3.446497] usb 1-1.3: New USB device strings: Mfr=0, Product=1, SerialNumber=0
[ 3.457478] usb 1-1.3: Product: Generic USB Audio Device
[ 4.012806] udevd[154]: starting version 175
[ 5.223877] Registered led device: led0
[ 5.336888] cm109: Keymap for Komunikate KIP1000 phone loaded
[ 5.526225] input: CM109 USB driver as /devices/platform/bcm2708_usb/usb1/1-1/1-1.3/1-1.3:1.3/input/input0
[ 5.943698] usbcore: registered new interface driver cm109
[ 6.157830] cm109: CM109 phone driver: 20080805 (C) Alfred E. Heggestad
[ 6.812515] usbcore: registered new interface driver snd-usb-audio
[ 9.397960] EXT4-fs (mmcblk0p2): re-mounted. Opts: (null)
[ 9.864203] EXT4-fs (mmcblk0p2): re-mounted. Opts: (null)
[ 24.877659] Adding 102396k swap on /var/swap. Priority:-1 extents:2 across:507900k SS
pi@raspberrypi:~$
```

And if you type in **lsusb** you should see a reference to **C-Media Electronics Audio Adapter** but no mention of **CM108**



```
COM14 - PuTTY
pi@raspberrypi:~$ lsusb
Bus 001 Device 002: ID 0424:9512 Standard Microsystems Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
Bus 001 Device 004: ID 0d8c:000e C-Media Electronics, Inc. Audio Adapter (Planet UP-100, Genius G-Talk)
pi@raspberrypi:~$
```

(<http://adafru.it/dgj>)

Nothing special needs to be done! Hurray! Continue on to the next section

Updating ALSA Config

Updating alsa options

We'll edit the audio system configuration file with

```
sudo nano /etc/modprobe.d/alsa-base.conf
```

For all but the most recent Raspbian releases, look for the line that reads:

```
#options snd-usb-audio index=0
```

Change this to:

```
options snd-usb-audio index=0
```

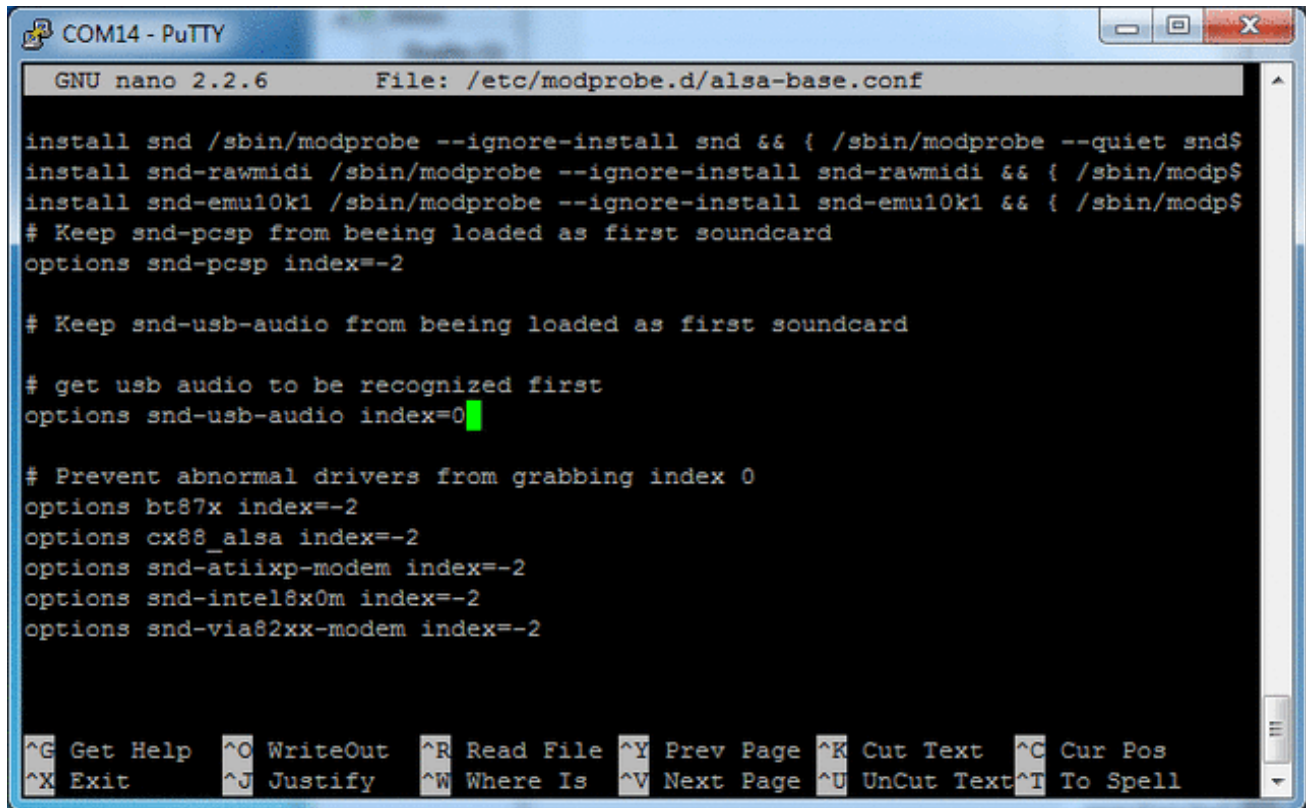
Note we removed the `#` at the start of the line.

For the latest Raspbian versions, look for this line instead:

```
options snd-usb-audio index=-2
```

There's no `#` to remove in this case, just change the index from `-2` to `0`:

```
options snd-usb-audio index=0
```



```
COM14 - PuTTY
GNU nano 2.2.6 File: /etc/modprobe.d/alsa-base.conf
install snd /sbin/modprobe --ignore-install snd && { /sbin/modprobe --quiet snd$
install snd-rawmidi /sbin/modprobe --ignore-install snd-rawmidi && { /sbin/modp$
install snd-emul0k1 /sbin/modprobe --ignore-install snd-emul0k1 && { /sbin/modp$
# Keep snd-pcsp from beeing loaded as first soundcard
options snd-pcsp index=-2

# Keep snd-usb-audio from beeing loaded as first soundcard

# get usb audio to be recognized first
options snd-usb-audio index=0

# Prevent abnormal drivers from grabbing index 0
options bt87x index=-2
options cx88_alsa index=-2
options snd-atiixp-modem index=-2
options snd-intel8x0m index=-2
options snd-via82xx-modem index=-2

^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
```

That's it! Now reboot with **sudo reboot** and log in again, you can test with **speaker-test** by running

```
speaker-test -c2 -D hw:0,0
```

Which will play white noise through the left and right 'speakers' on the audio card. Once you've got something coming out, try to play an audio file with **aplay** (for WAV files, not MP3)

```
aplay /usr/share/scratch/Media/Sounds/Animal/Bird.wav
aplay /usr/share/sounds/alsa/Front_Center.wav
```

If you want to play a stream of music, you can try

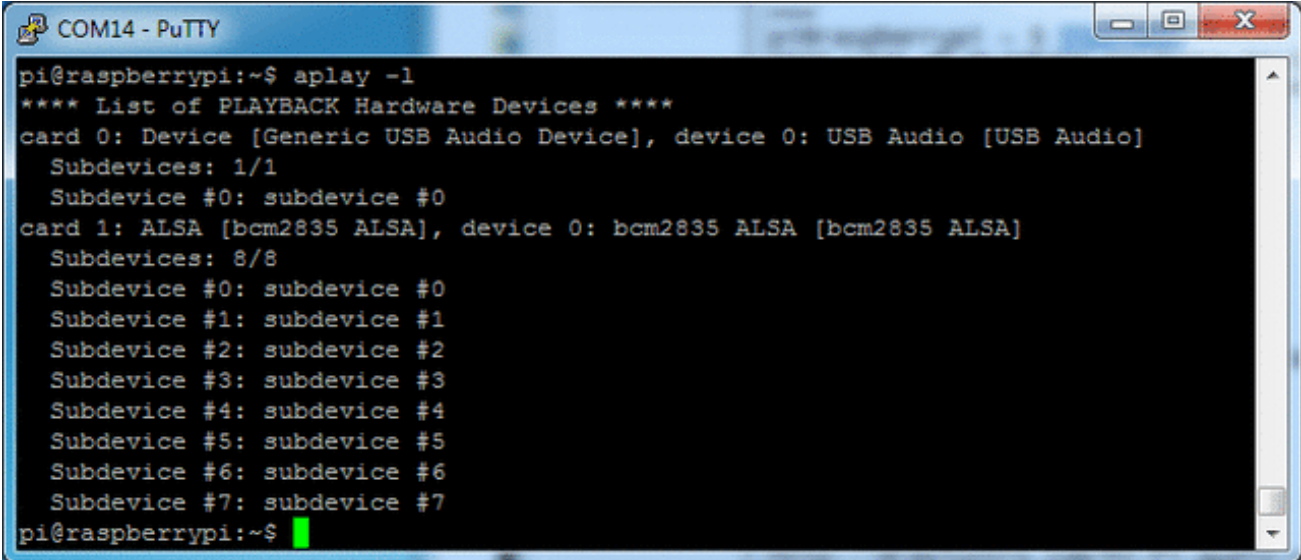
```
sudo apt-get install mpg123
mpg123 http://voxsc1.somafm.com:8882 (http://adafru.it/d26)
```

If you want to play MP3's on command, check out this tutorial which covers how to set that up (<http://adafru.it/aTD>)

Headphone vs Audio card

Don't forget, you still have the built in headphone jack on the Pi, called **card 1** now (not the

default **card 0**)



```
pi@raspberrypi:~$ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: Device [Generic USB Audio Device], device 0: USB Audio [USB Audio]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: ALSA [bcm2835 ALSA], device 0: bcm2835 ALSA [bcm2835 ALSA]
  Subdevices: 8/8
  Subdevice #0: subdevice #0
  Subdevice #1: subdevice #1
  Subdevice #2: subdevice #2
  Subdevice #3: subdevice #3
  Subdevice #4: subdevice #4
  Subdevice #5: subdevice #5
  Subdevice #6: subdevice #6
  Subdevice #7: subdevice #7
pi@raspberrypi:~$
```

If you want to **aplay** through that jack again, specify **card 1** with **-D hw:1,0** instead of **-D hw:0,0**

```
speaker-test -c2 -D hw:1,0
```

Troubleshooting!

If you're using a Raspberry Pi and notice the output isn't totally clean, some USB Audio adapters don't like USB-1.2 and produce crackling in the output. You can work around the problem by adding `dwc_otg.speed=1` to **/boot/cmdline.txt** and setting the USB ports to USB-1.1 mode.