Interfacing Raspberry Pi with S2GO MEMSMIC IM69D (Silicon Microphone)
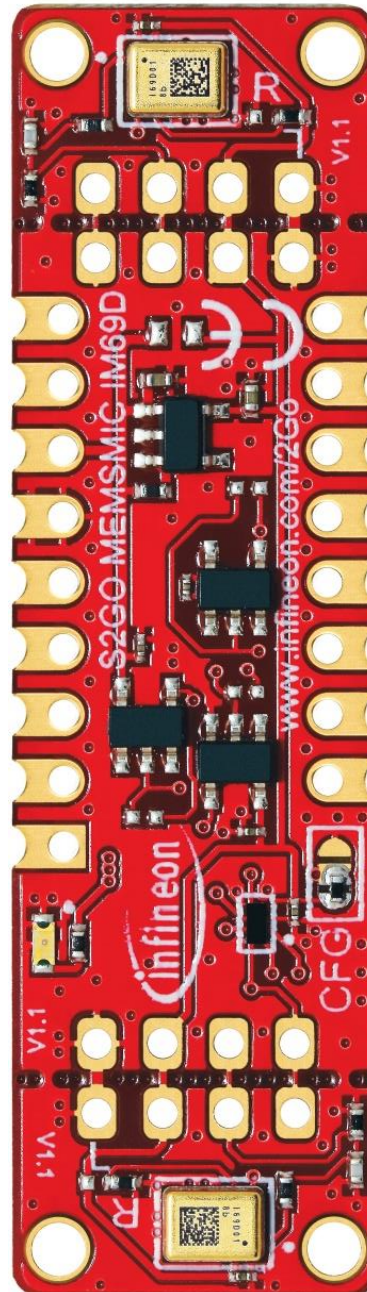
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1   Installation steps

1.1   Pre-requisites

It is assumed that you are reading this document after downloading and installation of Raspbian in a microSD card and Raspberry Pi is booted up with an internet connection as many packeges will be required, to install these packages active internet connection is required.

If this is not the case, and you have opened this document from somewhere else, then please follow the steps given below then proceed further.

Steps

1- Install Balena Etcher software.
   Link

2- One Micro SD card and card reader.
   Recommended atleast 16GB card and Class10 supporting least speed of 48Mb/s.

3- Download Raspbian operating system for Raspberry Pi.
   Link

4- One Display is required to operate the raspberry pi with HDMI input.
   In case display does not support HDMI input then appropriate convertor is required.

5- Active internet connection is required in Raspberry Pi.

Once you are done with these steps you are good to go further in document and do installation of the packages required to run IM69D130-Microphone-S2Go.
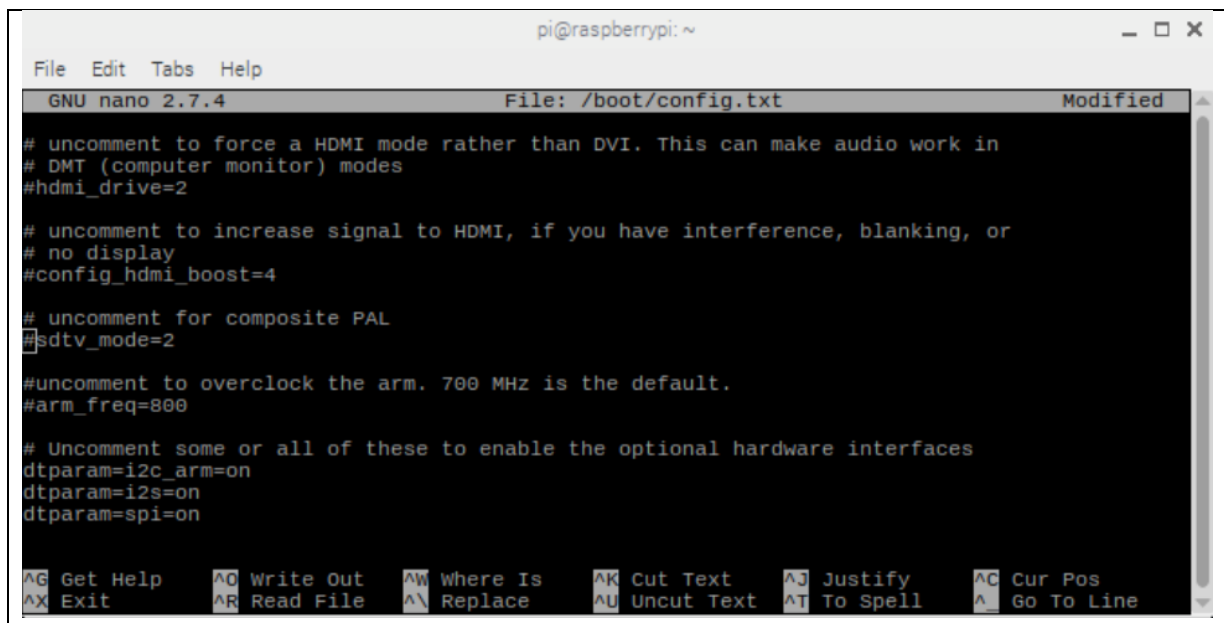
1.2 Enable I2S input in Raspberry Pi

Note: - Log into your Raspberry pi via a terminal, recommended ssh ([Putty](#)) or [VNC Server/Viewer](#) to copy and paste the commands.

- Enable i2s support by editing **/boot/config.txt**
  sudo nano /boot/config.txt

  Uncomment **#dtparam=i2s=on** (Figure 1**)**

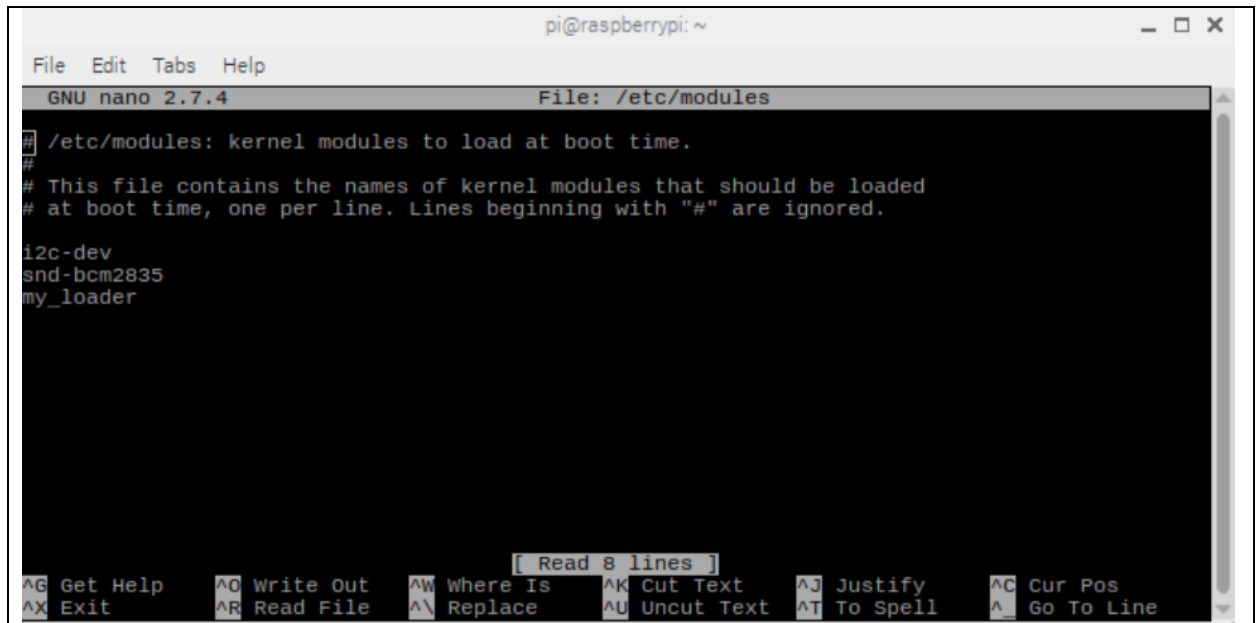 (Remove the # from the start of line) save and exit from the file.

Figure 1   Confirms that I2S is enabled

- Make sure sound support is enabled in the kernel
  sudo nano /etc/modules

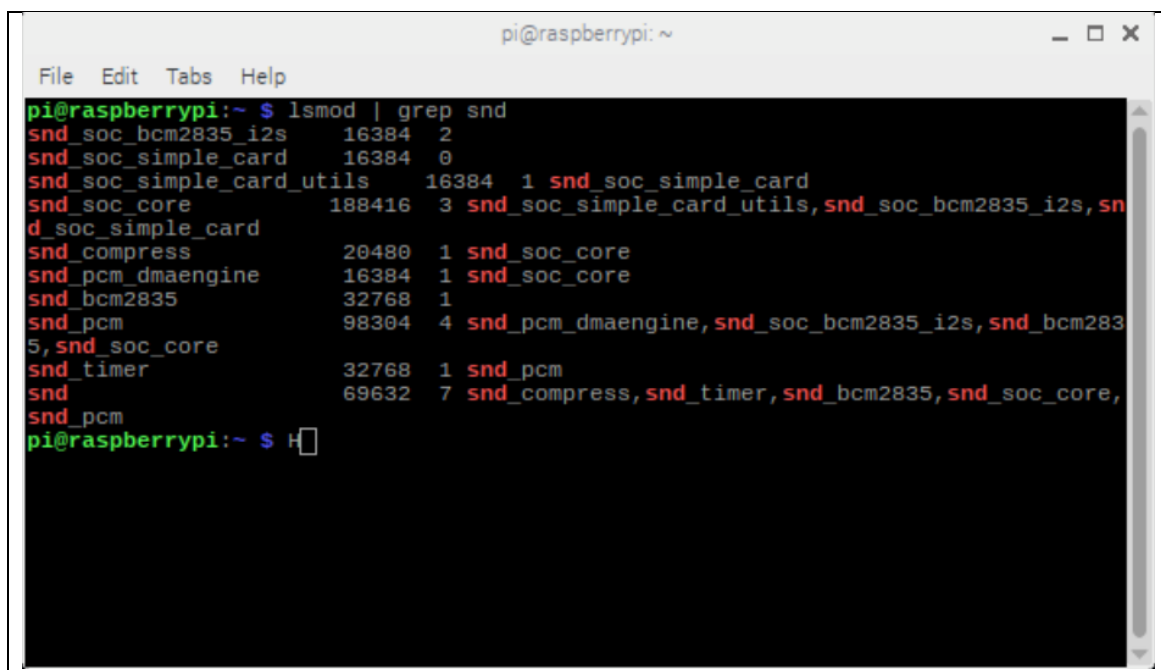 Add a line at the end
  snd-bcm2835

  Save and exit from the file.

Figure 2   **Add snd-bcm2835**

- Now reboot your pi
  sudo reboot

- Enter the following to confirm the modules are loaded.
  lsmod | grep snd

Figure 3   **Generated output after the command**

1.3   Download I2S Module

- Start by updating your Pi:
  sudo apt-get update

  sudo apt-get install rpi-update

  sudo rpi-update

  Reboot to run Pi with updates.

- Install the compilation dependencies:
- **sudo apt-get install git bc libncurses5-dev bison flex libssl-dev**

- Download kernel source & compile:
  (Run all the 4 commands in same sequence)
  sudo wget https://raw.githubusercontent.com/notro/rpi-source/master/rpi-source -O /usr/bin/rpi-source

  sudo chmod +x /usr/bin/rpi-source

  /usr/bin/rpi-source -q --tag-update

  rpi-source --skip-gcc

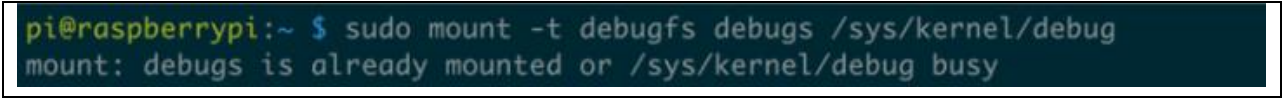 **Note: -** On a Pi 3 this will take time, so don't worry if it's taking 15 minutes.

  If the script pauses at this prompt-
  Code coverage for fuzzing (KCOV) [N/y/?] (NEW)

  Just press enter to accept the default and continue

1.4   Compile I2S Module

- Compile the i2s Module:
  sudo mount -t debugfs debugs /sys/kernel/debug

```
pi@raspberrypi:~ $ sudo mount -t debugfs debugs /sys/kernel/debug
mount: debugs is already mounted or /sys/kernel/debug busy
```

Figure 4   Generated output after the command

If you are getting this you are on right path carry on.

- **sudo cat /sys/kernel/debug/asoc/platforms**

  If you are using Pi 3 or Pi 2 - make sure the module name is **3f203000.i2s**

  You may get the output as "No such file or directory" no problem you can still carry on its because of latest kernel **platforms** file is replaced with **components**.

- Download the module, written by [Paul Creaser](#)

  git clone https://github.com/PaulCreaser/rpi-i2s-audio

  cd rpi-i2s-audio

- Static loading the module:

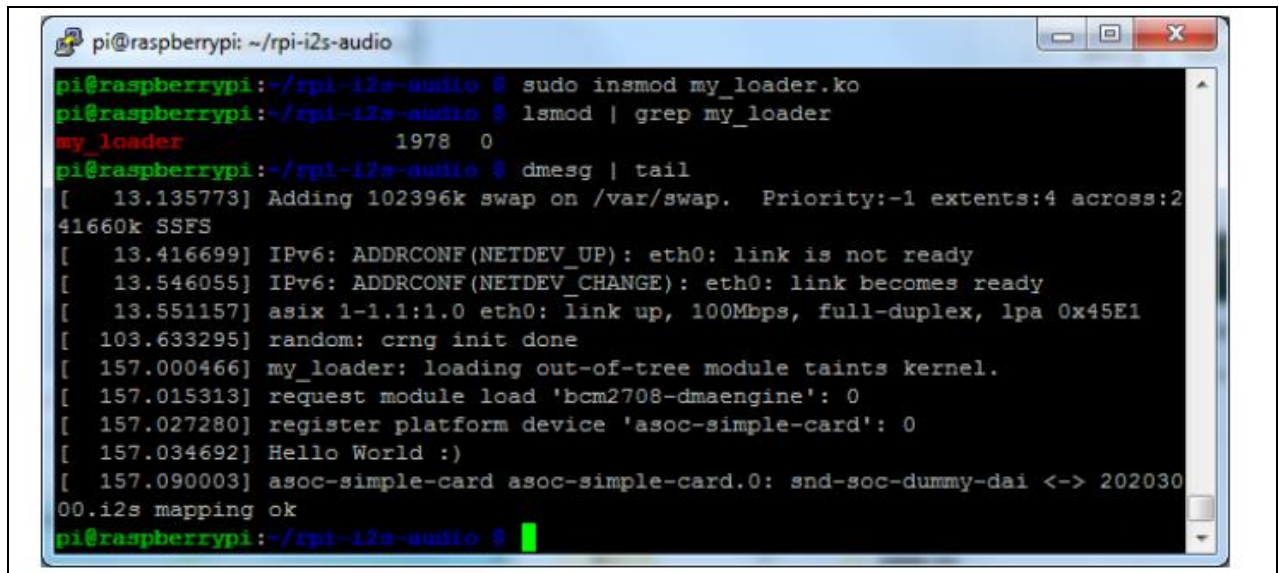 **make -C /lib/modules/$(uname -r)/build M=$(pwd) modules**

  sudo insmod my_loader.ko

- Verify the module is loaded:
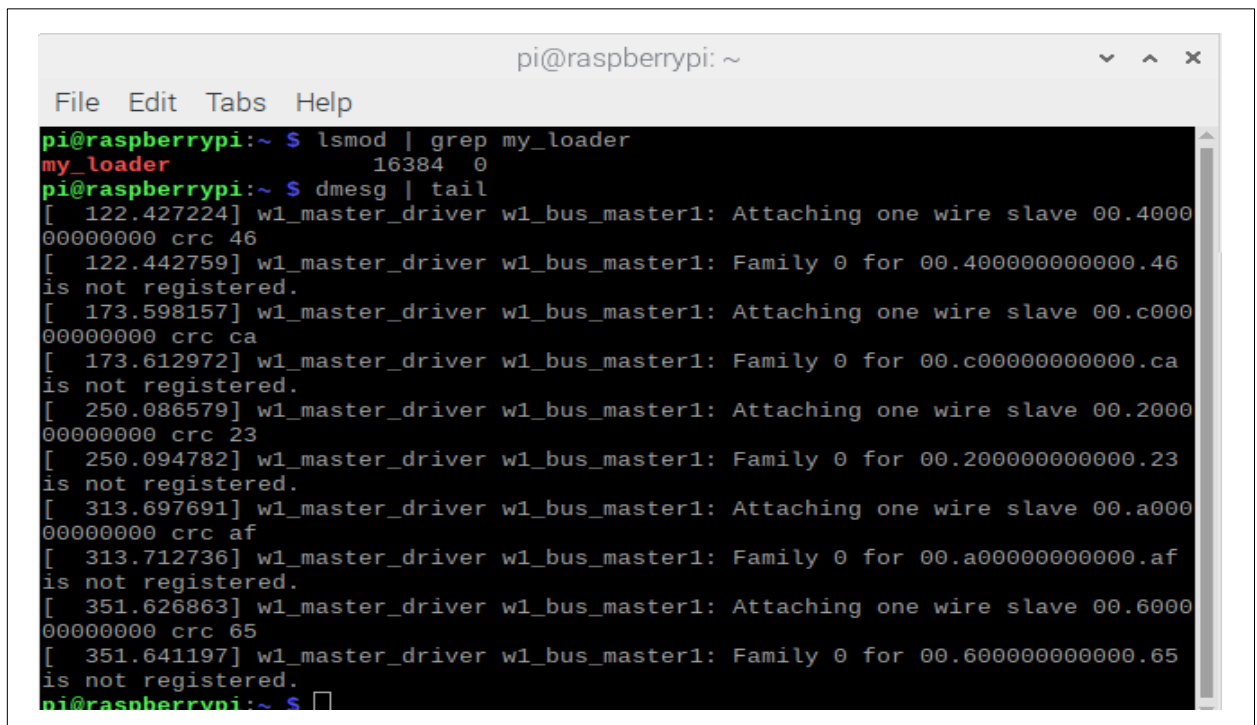 **lsmod | grep my_loader**

  dmesg | tail

Figure 5　　　　**To check in loader I2S mapping**

Note that on the Pi 2/3 you'll see-

asoc-simple-card asoc-simple-card.0: snd-soc-dummy-dai <-> 3F203000.i2s mapping ok

Note: -You may also get some other lines also that's completely fine, you must get **mapping ok** line (Figure 5).
Note: -Depending on the kernel version output may vary (Figure 6).

Figure 6　　　　**To check in loader I2S mapping**

Auto load the module on startup

- **sudo cp my_loader.ko /lib/modules/$(uname -r)**

- **echo 'my_loader' | sudo tee --append /etc/modules > /dev/null**

- **sudo depmod -a**

- **sudo modprobe my_loader**

Reboot your Pi

You are all set to record sound from Mems microphone

- command to list the available input devices:
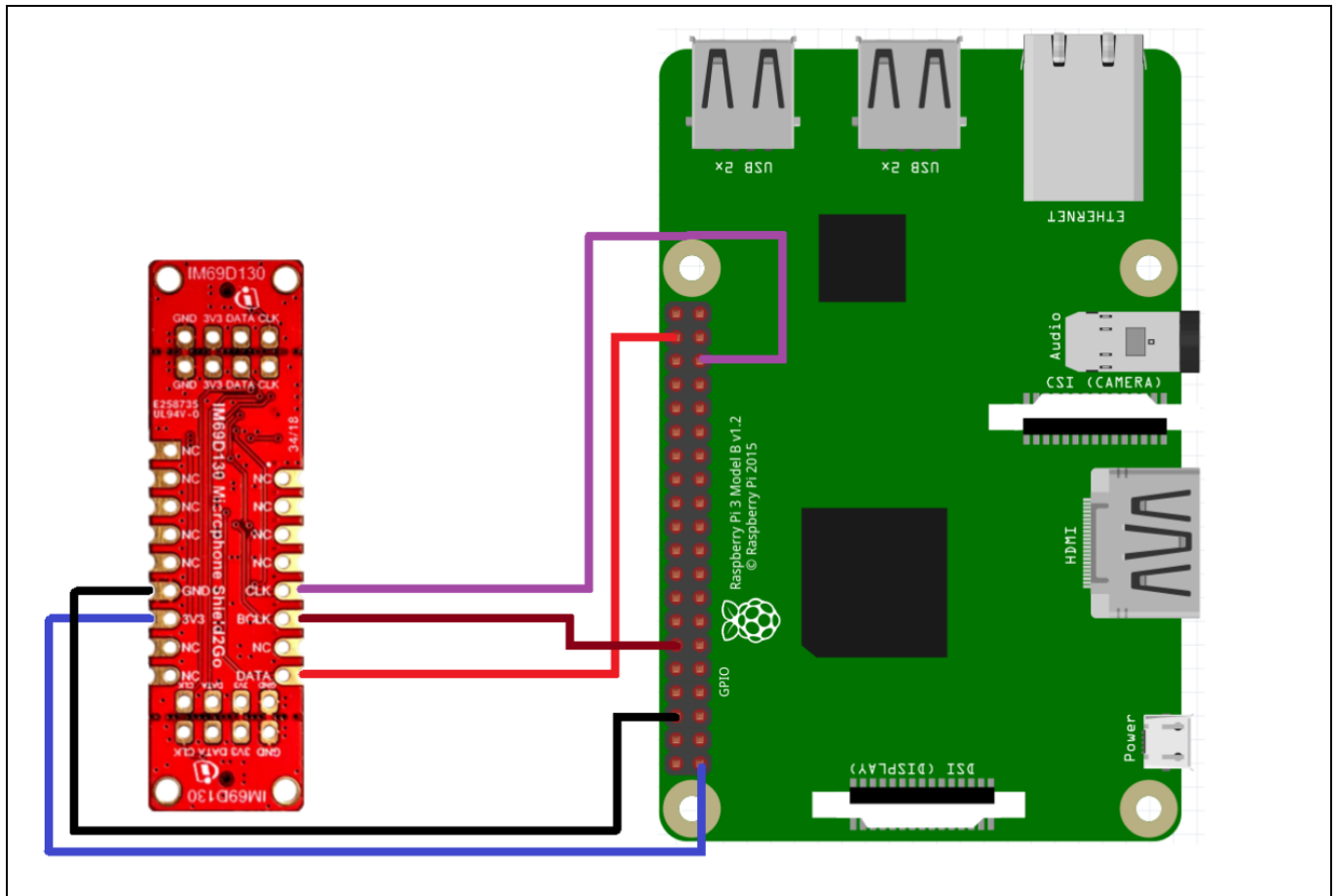
  arecord –l

Figure 6   To check List of Capture Hardware devices

Note: -You should see a **snd_rpi_simple_card**

2 Connection Diagram

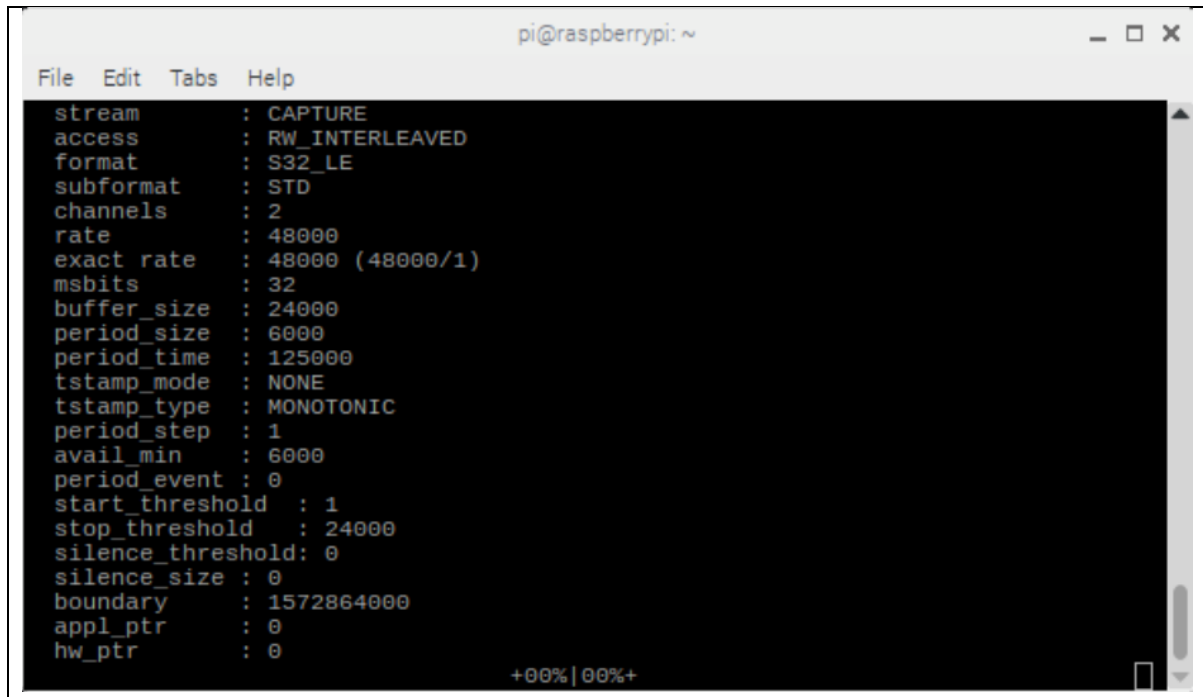**Figure 7   Mems Microphone connection with Raspberry Pi**

Pin to pin connection

GND   –   Pi Ground (pin 6)
3V3   –   Pi 3.3V (pin1)
DATA –   BCM 20 (pin 38)
BCLK –   BCM 18 (pin 12)
CLK   –   BCM 19 (pin 35)

3   Recording and Playback

- You can record a wav file with this command

    arecord -D plughw:1 -c1 -r 48000 -f S32_LE -t wav -V mono -v file.wav

If all is working correctly, you should see the VU meter react at the bottom of the terminal window.

Figure 8   VU meter recording voice

Note: - To stop the recording give keyboard interrupt Ctrl + C.

- Test the recorded file

    aplay file.wav

Note: - If you want to re-record and on giving same command if it shows resource busy then give this command.

    sudo killall -9 arecord

Getting output from 3.5mm jack in Raspberry Pi
There are 3 ways from which you can get audio output from Pi, defined by numbers-
- 0- This is the default setting which is automatic.
- 1- This is for getting the output from headphone jack 3.5mm.
- 2- This output is set to HDMI.

Command to change the audio output-

amixer cset numid=3 1

This will change the output from default to 3.5mm.

Note: - IM69D130-Microphone-S2Go comes with two microphones can work in stereo form as well.

arecord -D plughw:1 –c2 -r 48000 -f S32_LE -t wav -V stereo -v file.wav

Note: - Process of recording and playing back can be done using one simple command with a time limit that it will record for 10 seconds will replay the recorded file.

arecord –duration 10 -D plughw:1 –c2 -r 48000 -f S32_LE -t wav -V stereo -v file.wav && aplay ./file.wav

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