

LESSON C-6

ACTIVITY #2: RECORDING AUDIO FILES

In this activity, you will record an audio file using the USB audio device and microphone, and play that recorded file back using the amplifier and speaker.

Step #1

The first step will be to get the USB audio device connected to the Pi. To ensure proper installation of the drivers, the USB audio device should only be inserted with the Pi powered off.

Power off your Raspberry Pi and insert the USB audio device into any available USB port on the Pi. Power the Pi back and the USB audio device will be ready for use.

Step #2

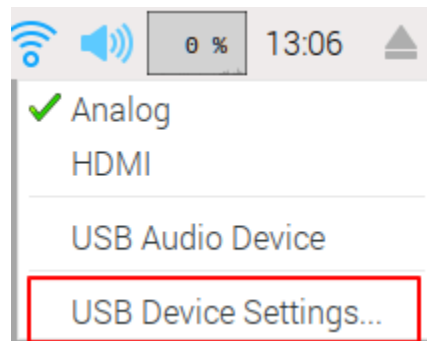
The microphone must be connected to the USB audio device so it can be used to record audio. Insert the 3.5mm plug of the microphone into the microphone input of the USB audio device:



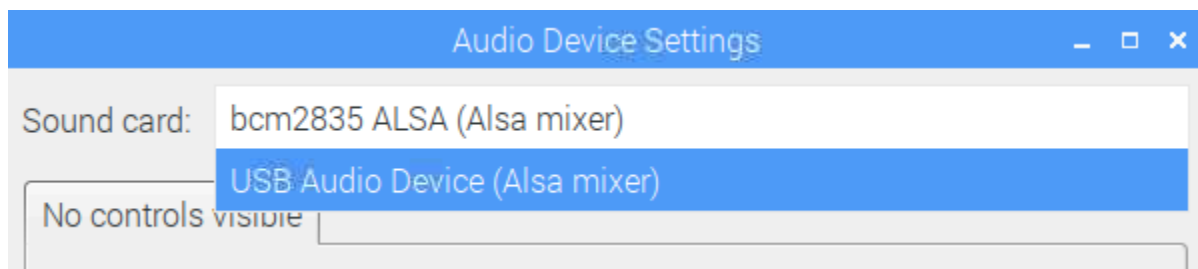
Step #3

The microphone is now available to the Pi for recording, but the recording level has not yet been set. For this, you will need to enable the Microphone Capture level slider in the USB Device Settings.

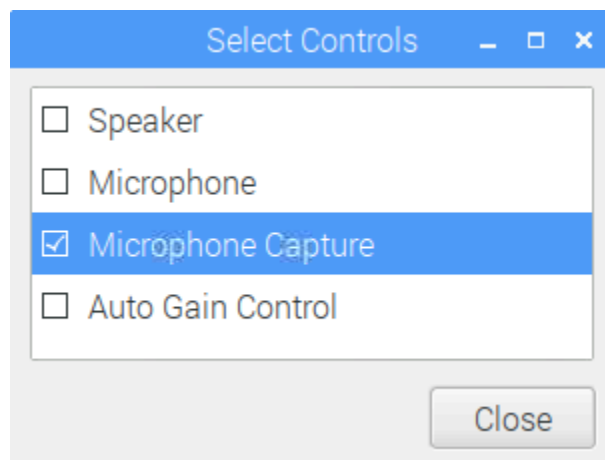
Right-click on the audio icon in the upper-left menu of the desktop and select **USB Device Settings** from the list:



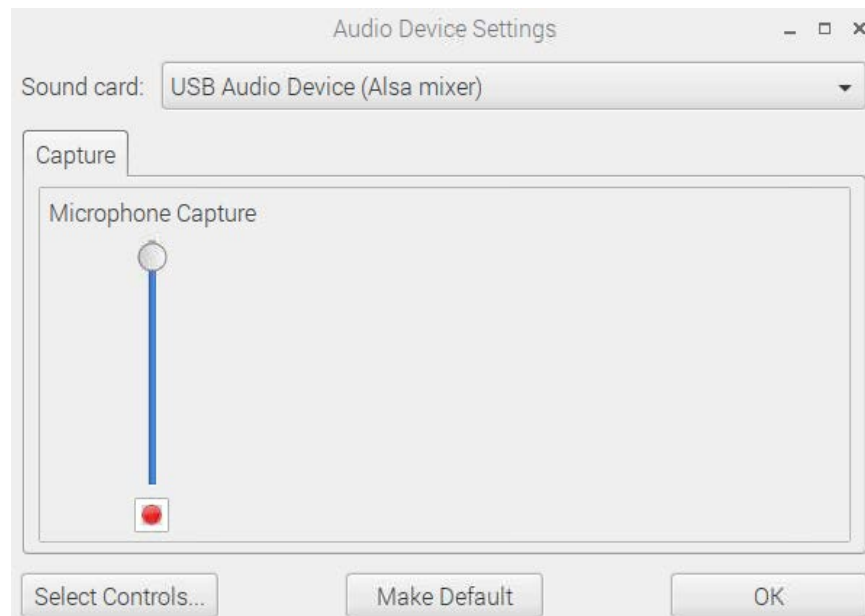
Next, click the drop-down menu next to **Sound Card:** and select **USB Audio Device (Alsa Mixer)** from the list:



You will now be able to modify the settings for the USB Audio Device. Click on the **Select Controls** button to bring up the selection of available controls, and click the box next to **Microphone Capture**:



Click the Close button and the Microphone Capture level slider will now be displayed in the main window:



The red button means that mute is disabled, and the microphone is ready to record. The slider at the top means that maximum gain will be applied to the microphone input, which could lead to distortion if the input signal is too loud. This setting may need to be adjusted to get a good recording based on how loudly you speak into the microphone during recording.

Leave the Microphone Capture slider window open on the Desktop so the recording level can easily be adjusted if needed.

Step #4

The next step in recording your voice will be to open a Terminal window and run an **arecord** command with some extra options. Run the command below in the Terminal window and you will begin recording immediately. Use the CTRL-C keyboard shortcut to stop the recording:

```
arecord --device=hw:1,0 --format S16_LE --rate 48000 -c1 my_voice.wav
```

This command will record the microphone input into a file named **my_voice.wav** in the current directory. Here is an explanation of the reset of the options being used above:

Option	Description
--device=hw:1,0	Use input from card #1, device #0 (this is your USB audio device)
--format S16_LE	Record in 16 Bit Little Endian format
--rate 48000	Sample the input at 48000 Hz (48KHz)
-c1	Record a single channel (mono mode)
my_voice.wav	Name of file to use to store recording

Step #5

The last step will be to play back the recorded file using the **aplay** command in the Terminal. Play back the file using the commands below:

The first command will use WiringPi to switch pin 18 into PWM ALT5 mode so it can output audio:

```
gpio -g mode 18 ALT5
```

After running this command, you may start hearing some noise coming from the speaker. This happens because GPIO18 is now pushing left channel audio out to the amplifier, and any noise on the left channel will now be amplified and heard through the speaker.

The second command will play the recorded sound file through GPIO18:

```
aplay my_voice.wav
```

If you would like to record your voice file again, you can use the same **arecord** command from Step #4 and the **my_voice.wav** file will be replaced with the new recording:

```
arecord --device=hw:1,0 --format S16_LE --rate 48000 -c1 my_voice.wav
```

You can play back the new audio file using the same **aplay** command you used previously:

```
aplay my_voice.wav
```

If you want to adjust the recording level, use the slider in the Microphone Capture window:

- If the recording is too quiet, you can move the slider closer to the top to increase the amount of amplification that will be applied to the microphone signal before it is recorded.
- If the recording is too loud or distorted, you can move the slider down to decrease the amount of amplification that will be applied to the microphone signal before it is recorded.

Try making small adjustments to the capture level and rerecording your voice. Large capture level adjustments can easily cause a recorded file to be too quiet or distorted, so try to make small adjustments until you get a recording that you like. You will use this voice recording in a program in the next activity.

Step #6

Now that recording and playback are done, return GPIO18 to its default state as an input so it's free to be used by other programs. This will also get rid of any audio noise that may still be coming out of the speaker. Run the following command in Terminal:

```
gpio -g mode 18 IN
```

GPIO18 is now back to its default state. You will use GPIO18 to output audio in the next activity, but the commands for setting the output mode to ALT5 or IN will be handled within the program.