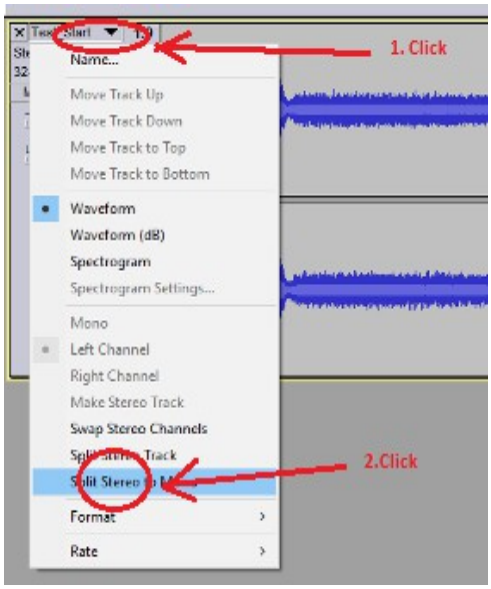
1	2	3
PREPARATION	EDITING	EXPORTING

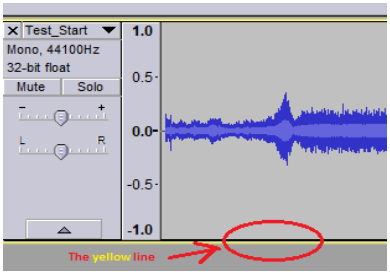
1 PREPARATION

1. Launch Audacity (you will need to install it if not done already).
2. Open a new project (if not opened by default).
3. Open your sound file (.wav, .mp3, etc.) by clicking 'File → Open...' and selecting the appropriate file. **IMPORTANT:** Please make sure to create a backup copy of the original file before starting to edit just in case.
4. Split the track into 'mono' if it is 'stereo'.



5. Delete one of the mono tracks if multiple are present.

6. Drag the 'yellow' bottom line to almost fill the screen height. It will make editing easier later on.



7. OPTIONAL: Amplify the sound file if needed. Or this can be done later on a per sound basis.
8. Keep the project open. We will be copying bits from here to a new project where we will create our sound file.

2
EDITING

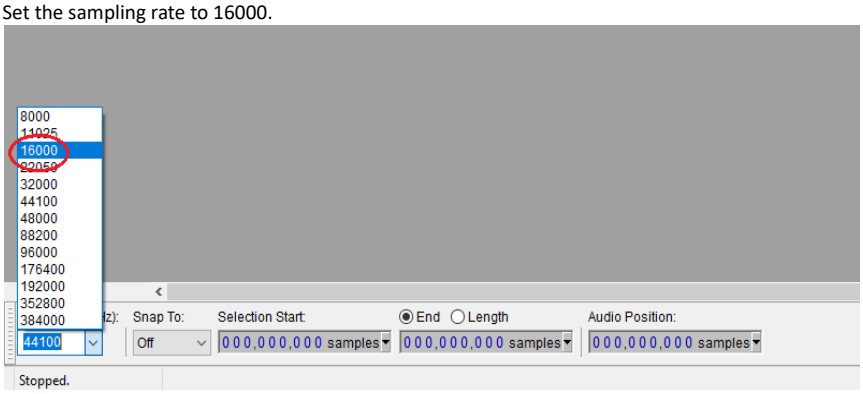
Zero Crossover: This is an important concept before starting to edit sounds. It refers to point of sample number closest to where the sound wave crosses the zero amplitude. The wave could be crossing from below going up or vice versa. Let's use a convention of going up from below.
It is recommended that all edits happen at zero crossovers to avoid hearing 'pops' or 'clicks'. Further, please ensure the direction of crossover is the same. For example, if the wave is crossing from negative to positive, the next edit to join this section should be crossing over from negative to positive as well.

Amplitude adjustment: This will adjust the volume level of the sounds. You can have various sections with different volumes if you wish by selecting the appropriate section and then amplifying or de-amplifying. To amplify, click 'Effect → Amplify...'. DO NOT 'Allow Clipping' as it will distort the sounds and can cause the speaker to burn out prematurely.

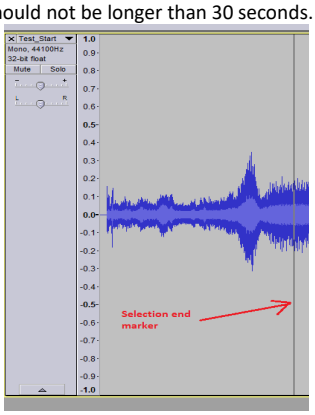
Engine sounds:

1. ### Startup:

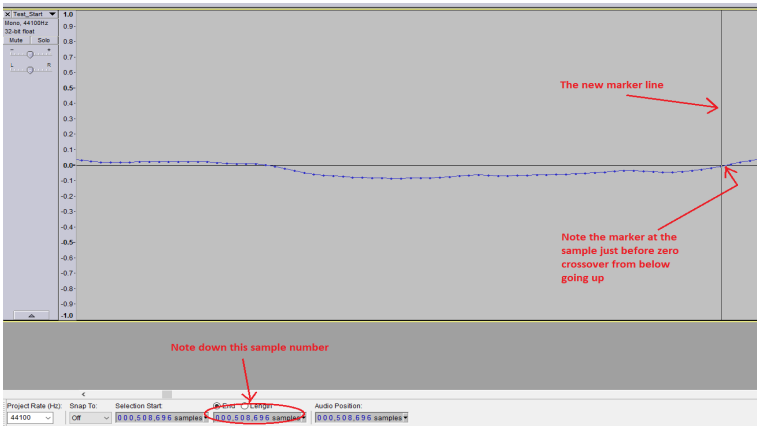
1. Open a new project by clicking 'File → New'.
2. Set the sampling rate to 16000.



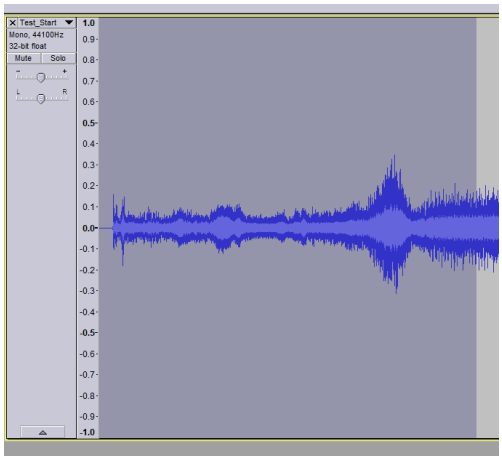
3. Select the startup section from the other project. The selection should approximately end where the sound stabilizes to idle. This section should not be longer than 30 seconds. 10-15 seconds is recommended for most prototypical feel.



4. Zoom in near the end of selection and look for a zero crossover. Following our convention, place the marker just before the zero crossover and note down the sample number.



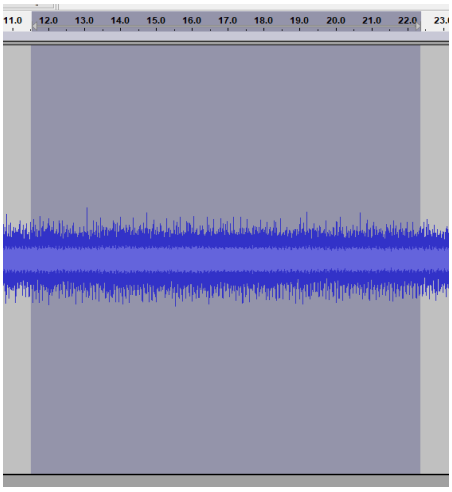
5. After zooming out, click and drag the marker to zero such that the relevant startup section is now selected.



6. Copy and paste this section in the new project.
7. OPTIONAL: Amplify (again) if needed.
8. Save the project. You will have to come back to it later.

2. Idle:

1. Open a new project and set the sample rate to 16000.
2. In the parent open project, select a clip of 10-15 seconds (or whatever you feel appropriate by listening to your sound file) starting right after the sample ended in the previous project. This can even be done by entering the incremented sample number in the selection start box (make sure the units say 'samples').



3. Again, look for zero crossover going from below nearest to the selection end.
4. Copy the selection and paste in the new project.
5. Amplify if necessary e.g. if you want custom loudness in the idle play.
6. Save the project.

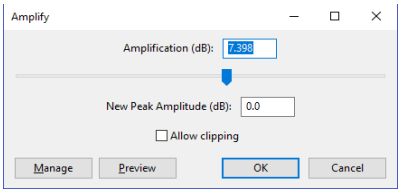
3. Shutdown:

1. Open a new project and set the sample rate to 16000.
2. The rest of the editing is very similar to what we did previously except our selection start is a new point from where we want to start the shutdown sequence.
3. Select the point right after a zero crossover closest to the point currently selected.
4. Drag and select to whatever position you want, copy and paste in the new project. The shutdown section should not be more than 30 seconds. About 10 seconds is recommended for the most prototypical feel.
5. Save the project.

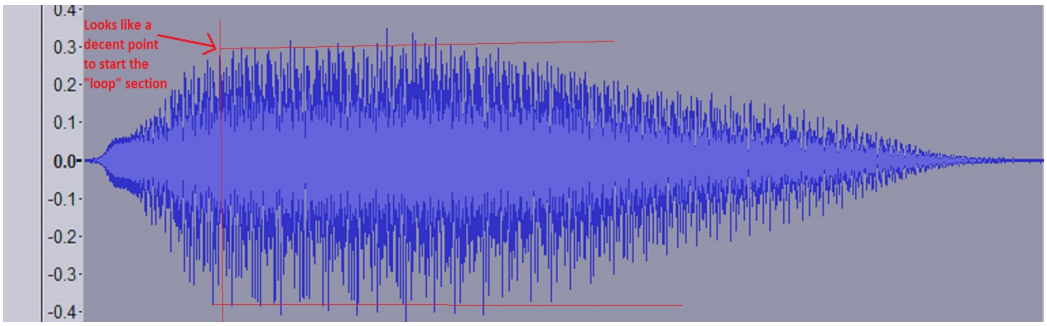
Horn:

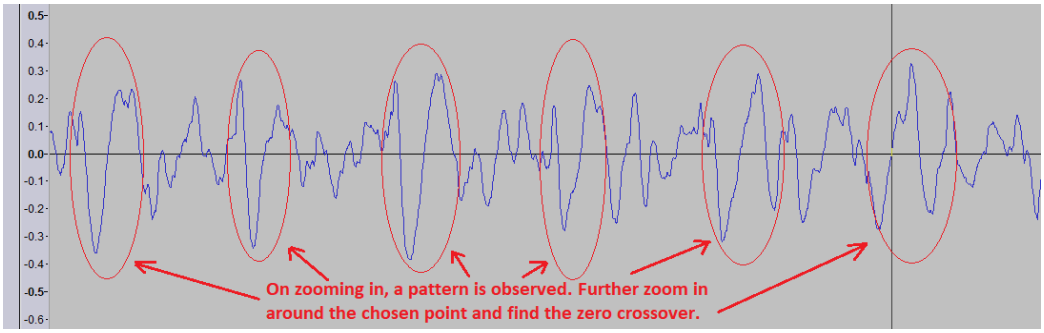
1. NOTE: The following assumes that you have opened a horn file in the 'PREPARATION' section above.
2. Open a new project and set the sampling rate to 16000.
3. We'll be creating three tracks in this project.

4. The first track “attack” is the startup of the horn until it enters in a “loop” mode. The second track “decay” is the end of the horn. It is a lot similar to engine sounds except that both the tracks are in one file.
5. Copy your mono single track horn file into the new project.
6. This time, let's amplify the track for a louder horn.

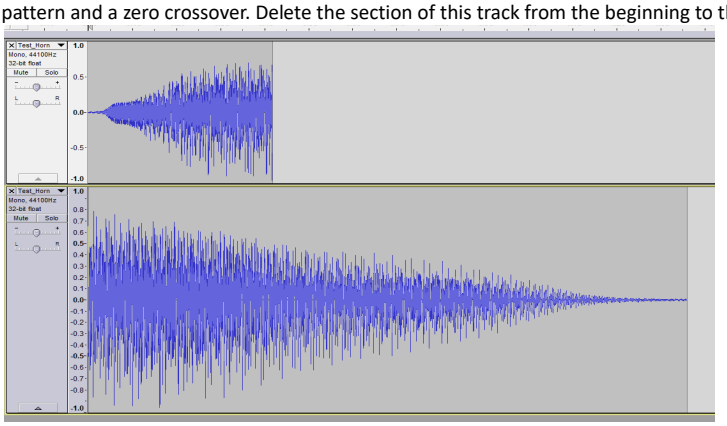


7. Look for the area where the volume starts to stabilize. Zoom in/out little by little to look for macro/micro patterns and the closest zero crossover. Horn “attack” section should be about 0.3s – 0.4s to get the optimized feel. Note down the sample number right after the marker. Let's call it S1. This will go in the horns.txt to be created later. This will end the “attack” and mark the beginning of “loop” section.

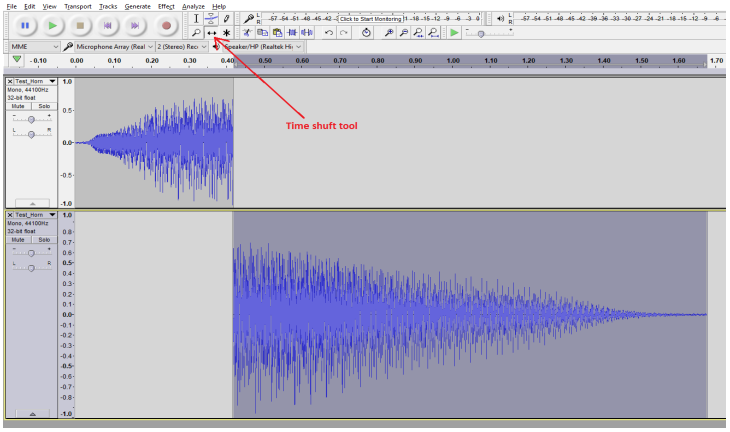




8. Look for a similar pattern after about 0.1s – 0.2s further down to end our “loop” section. Note down the sample number at the marker. Let's call it S2.
9. Select the remaining section starting from the marker to the end of the track, cut it and paste it as a separate track (just click outside the previous track after the section is cut and do the paste operation, it will automatically create a new track).
10. In the new pasted track, find the beginning of the “decay” or the end section of the horn. Follow the same procedure above to look for a pattern and a zero crossover. Delete the section of this track from the beginning to this marker.



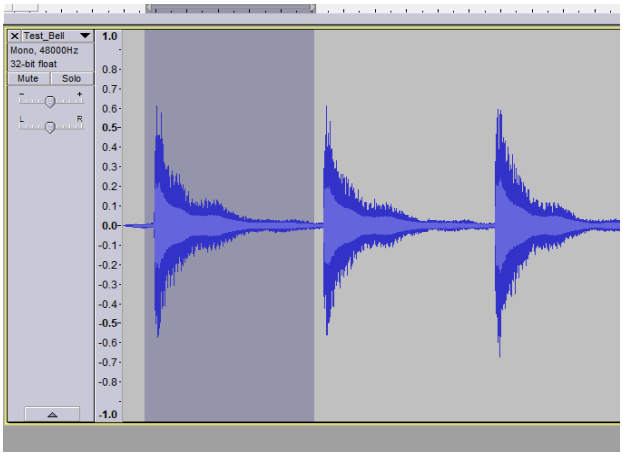
11. Using the 'Time shift tool', drag the bottom track such that the beginning of the second track aligns with the first track. You will see a vertical yellow line highlight when the tracks are aligned. Switch back to the 'Selection tool'.

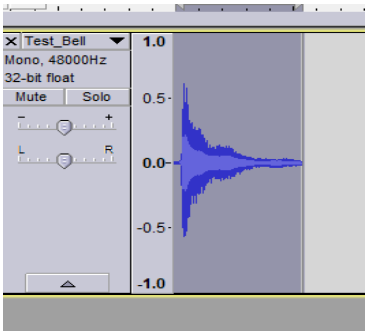


12. Save the project.

Bell:

1. This is the simplest of all. There is virtually no editing involved!
2. From the section 'Preparation', you must have a mono single track of bell sound(s) already open.
3. Copy one instance (if there are repetitions) and paste into a new project with sample rate set to 16000.



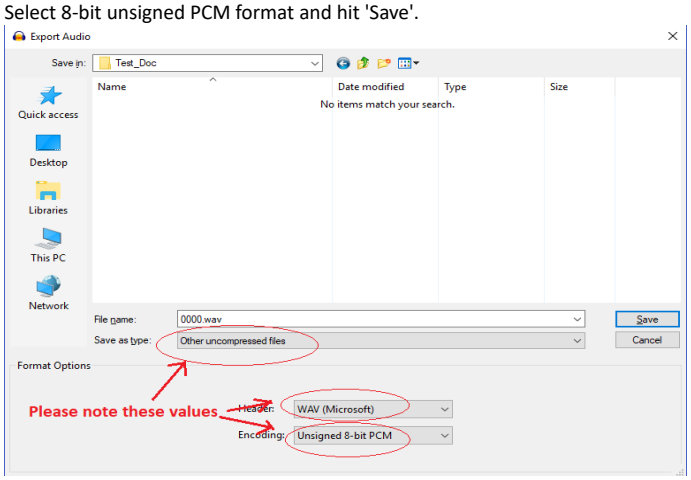


4. Save the project.

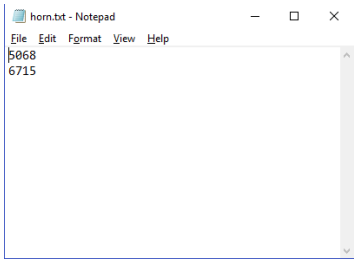
NOTE: Once you are comfortable with the above procedure, you can try producing some cool sound effects by just changing the sampling rate.

3
EXPORTING

1. This is the final step.
2. For each project, click 'File → Export Audio...'.
3. In the dialog, select the location where you want to export your audio before copying it to your microSD card.
4. File names have to be as follows:
   0000.wav – Engine startup
   0001.wav – Engine idle
   0002.wav – Engine shutdown
   0003.wav – Horn
   0004.wav – Bell
5. Select 8-bit unsigned PCM format and hit 'Save'.



6. One special file needs to be created as well called horn.txt. Please enter the S1 and S2 values we noted above in the Horn editing procedure above into this file and save.



7. Congratulations! You are now ready to copy these 6 files (5 .wav + 1 .txt) to the microSD root folder.
8. Try it out and see how it sounds. Some re-visiting the project and tweaking may be necessary to get the best feel.
9. Now was that hard? Did you think you could do your own great sounds? Please write to us and let us know what you think.

If any point you need help, please do not hesitate to get in touch with us at wifimodelrailroad@gmail.com