Filtering White Noise

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Introduction

White noise is a random signal with a spectrum of frequencies with the same average amplitude. When sent through a speaker, white noise will produce a hissing sound comparable to static.

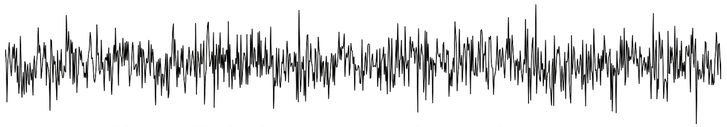

Fig 1. This is what white noise looks

The Goal

I wanted to see if I could filter out specific frequencies of this white noise. In order to do so I combined a white noise generator with a band pass filter which destroys unwanted frequencies and amplify the targeted frequencies in the spectrum.

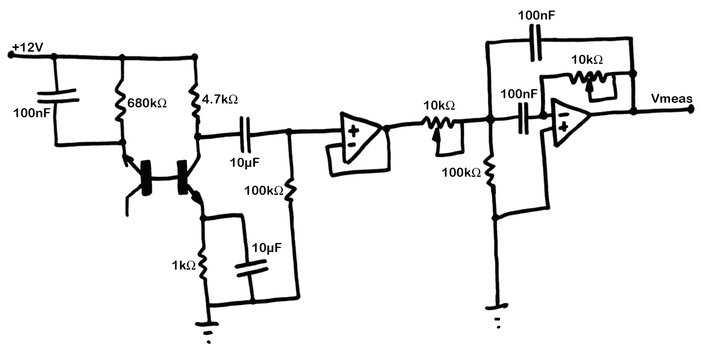

Fig 2. The circuit schematic.

Building the Circuit

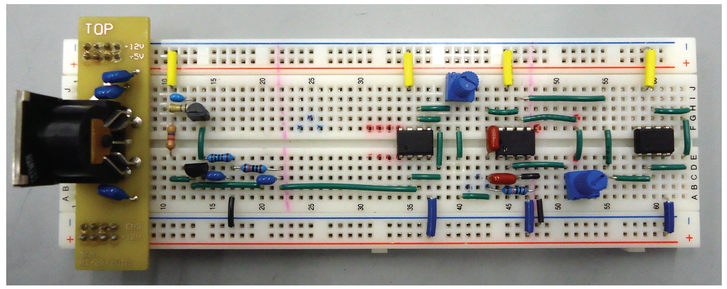

Fig 3. The circuit built on a breadboard.

The white noise generator works by taking advantage of the huge amount of noise generated by a transistor when it reaches its failing state.

The noise produced by the white noise generator is then passed into the band pass filter which will amplify specific frequencies it is tuned for. The potentiometers allows the band pass to have variable frequency amplification.

The buffers put after each system allow for a speaker in order to hear the audible difference. Unfortunately the voltage provided by the white noise generator was not enough to produce an audible noise. The next iteration of this circuit would be to add an amplifier after the white noise generator.

Does it work?

An obvious way to check if my circuit works is to listen for the audio difference before and after my filter, but because I couldn't actually hear my noise I used FFT (Fast Fourier Transform) on the osscilloscope which plotted frequency against decibles. FFT allowed me to see if and which frequencies were being amplifed at different potentiometer values.

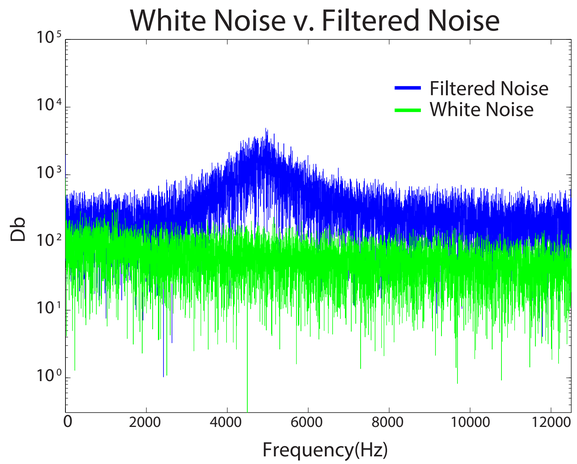

Fig 4. FFT plot of filtered and unfiltered white noise.

The data collected from the oscilloscope shows that the filtered noise peaked at around 5kHz. The band pass I built is not very selective so it will also amplify other frequencies around the peak.