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ENGR1125-02

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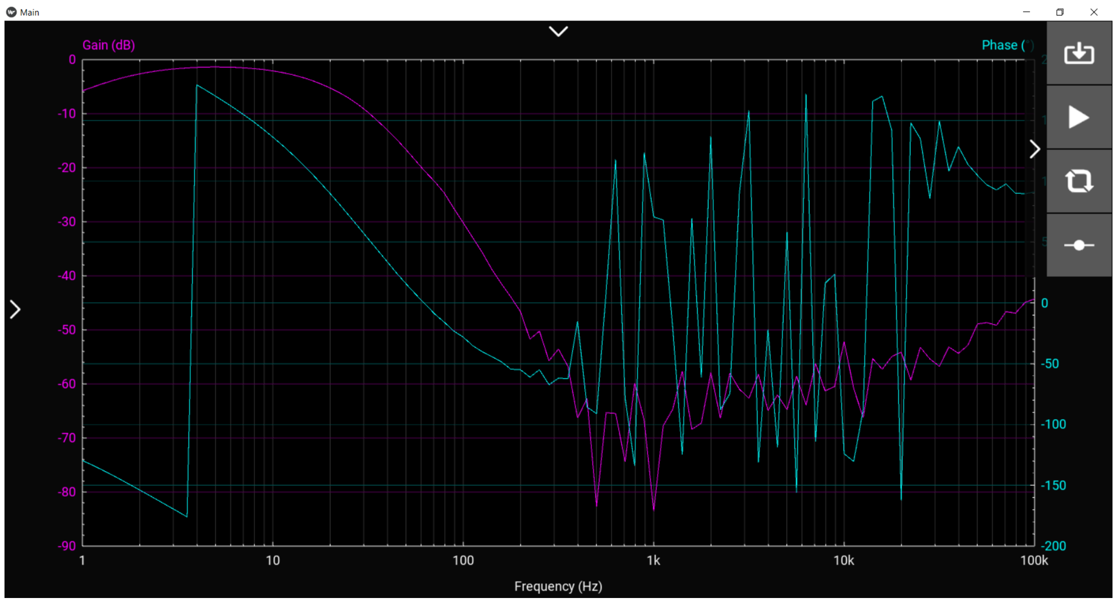
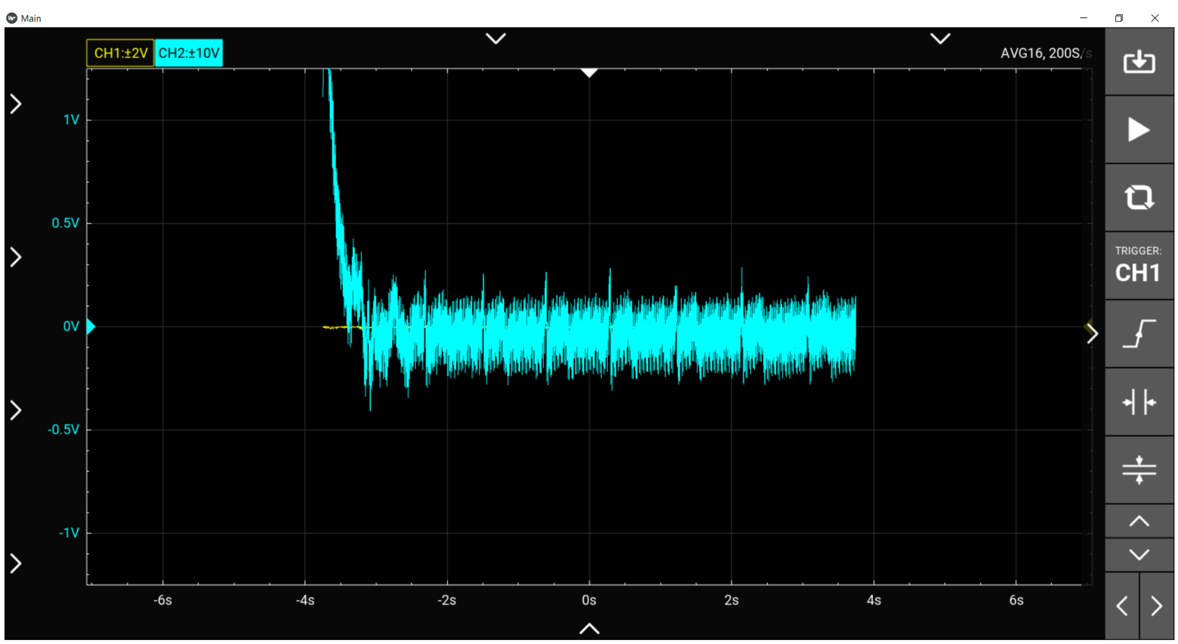
Lab 5 Report

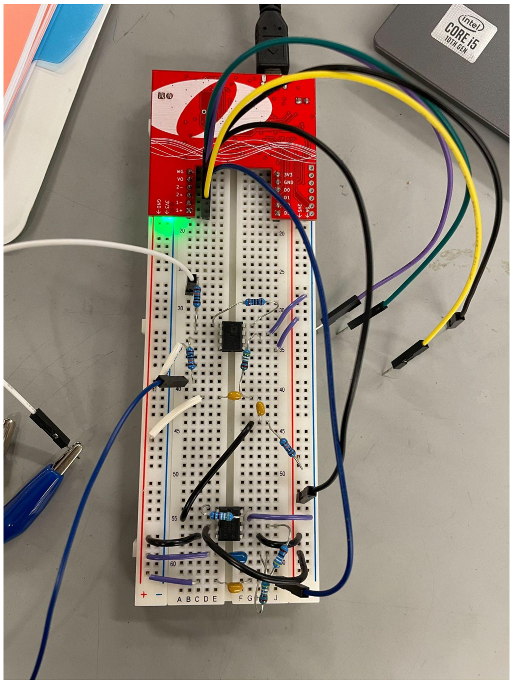
1. A Bode plot

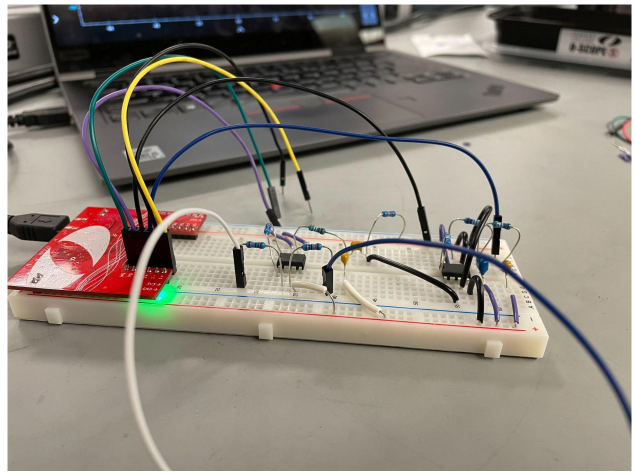


2. A screenshot of an EKG trace and caption.



3. Circuit





4.

We have four filters in this circuit; two per stage. The filter is the pair of resistors and capacitors.

Stage 1 - characteristic frequencies:

$$f_{high} = \frac{1}{2\pi * (4.9 * 10^{3}) * 10^{-6}} = 32.48\ Hz; \quad f_{low} = \frac{1}{2\pi * (100 * 10^{3}) * 10^{-6}} = 1.6\ Hz$$

Stage 2 - characteristic frequencies:

$$f_{low} = \frac{1}{2\pi * 499 * (10 * 10^{-6})} = 31.89\ Hz; \quad f_{high} = \frac{1}{2\pi * (4.9 * 10^{3}) * 10^{-6}} = 32.48\ Hz$$

The Bode plot shows how the signal is attenuated as the frequency gets higher, which makes sense since a heartbeat is low frequency and the circuit is a high-pass filter. In other words, it is able to filter out the noise at higher frequencies since we only want to read heartbeats at low frequencies. In the final circuit, we are amplifying the signal with an initial gain $G = 1 + \frac{100}{2} = 51$ then of $G = 1 + \frac{100}{4.99} = 21$; in other words the original signal was less than a thousandth of a volt. Even with the filters and amplifiers, the circuit appeared to be quite sensitive to disruption; thus requiring me to stay till to obtain a consistent signal reading.