

Lab 09

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1 Introduction

In this lab we built a ballistocardiograph (BCG). This is a device that measures heartbeat based on changes in one's center of mass.

2 What's Happening

The circuit to turn the output from the scale is composed of 3 components.

The first of these components consisted of the input from the scale. This was followed by some resistors and capacitors to clean up the signal. Finally an amplifier with a gain of $100x$ was placed at the end.

The second stage of the circuit consisted of two bandpass filters with cutoff frequencies of $0.5Hz$ and $16Hz$ and a gain of 33. The bode plot of one of these filters is shown below in Figure 1.

The final stage of the circuit consists of a Sallen-Key second order low-pass filter with a cutoff frequency of $3.2Hz$ and a non-inverting amplifier with a gain of 4. The bode plot for this plot is shown below in Figure 2.

Finally the heartbeat output is shown in Figure 4

3 Figures

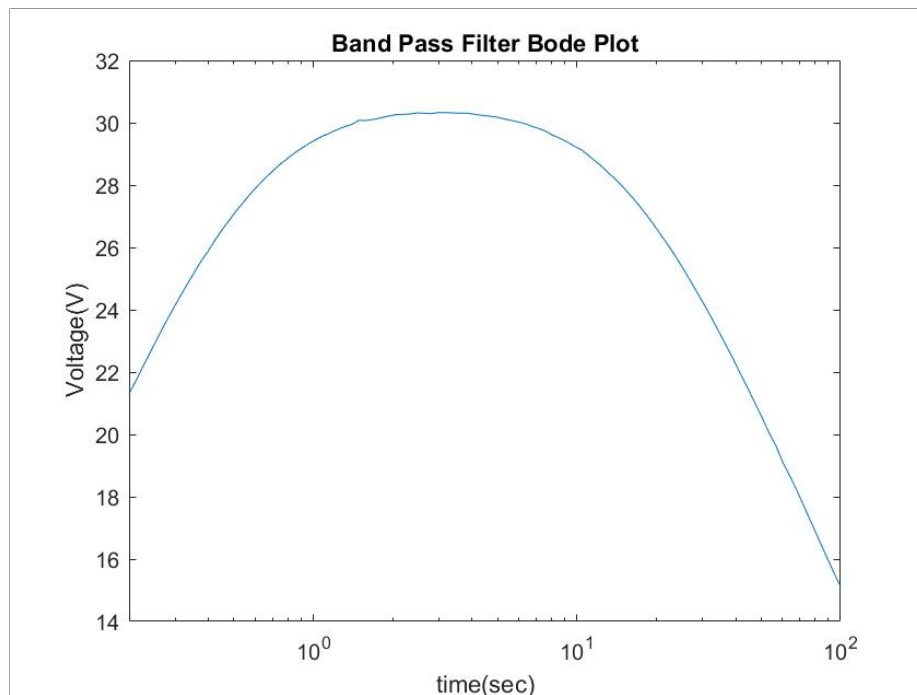


Figure 1: Band Pass Filter Bode Plot

The Figure shows that the band pass lets in frequencies in the range of approximately $0.5Hz$ and $16Hz$. It attenuates frequencies outside of this range.

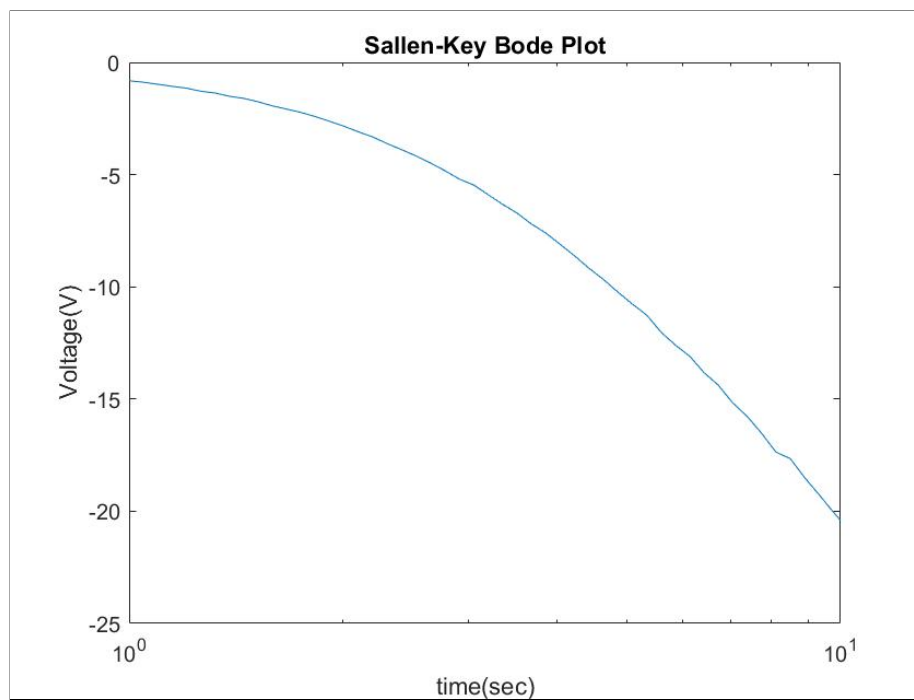


Figure 2: Sallen Key Bode Plot
The Figure shows Sallen Key second order low filter attenuates frequencies that are less then approximately $3.2Hz$

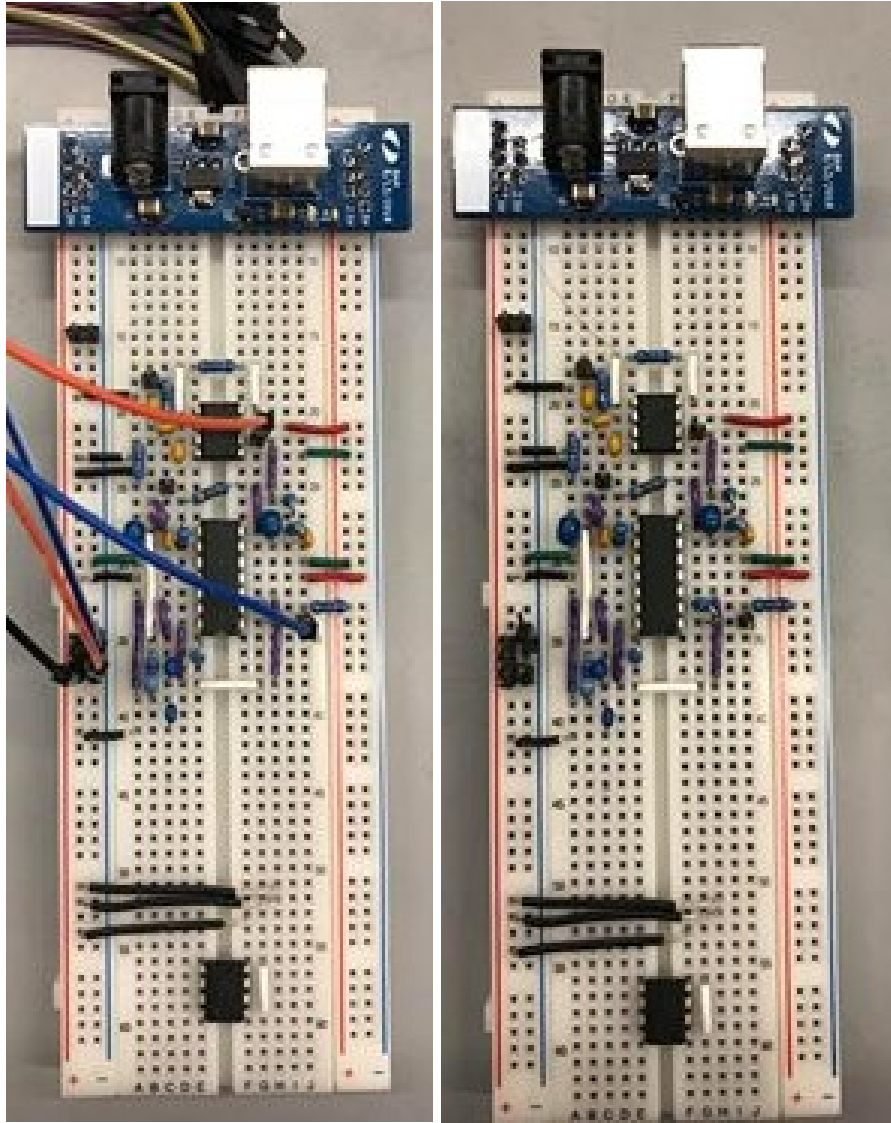


Figure 3: Clean Circuit with and without Analog Discovery Wires

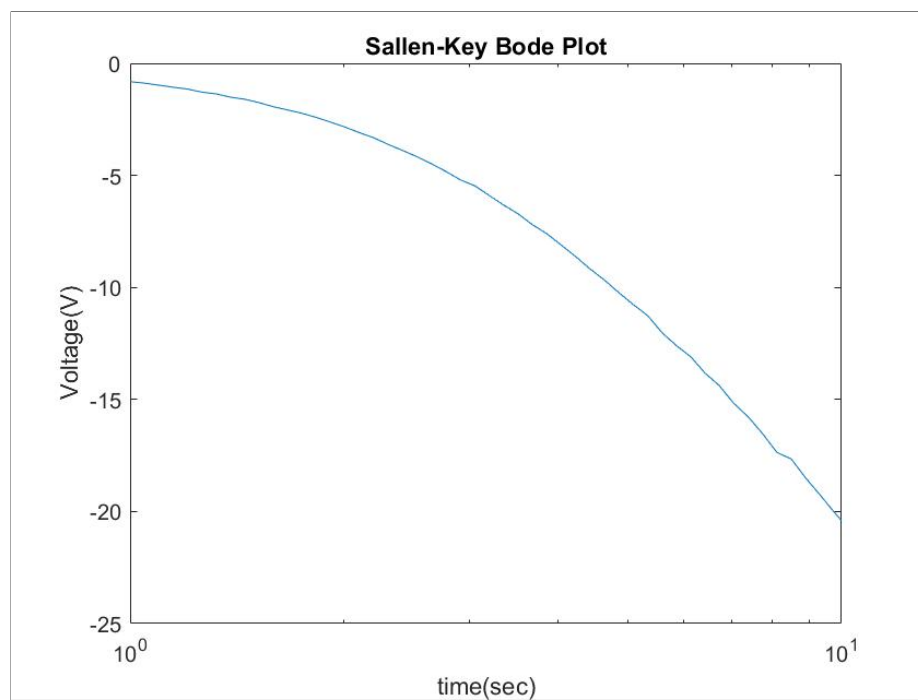


Figure 4: Ballistocardiograph Readout
The Figure shows the readout from the scale after passing through the circuit