

Project Identity

Accessible Blood Glucose Monitor Interface

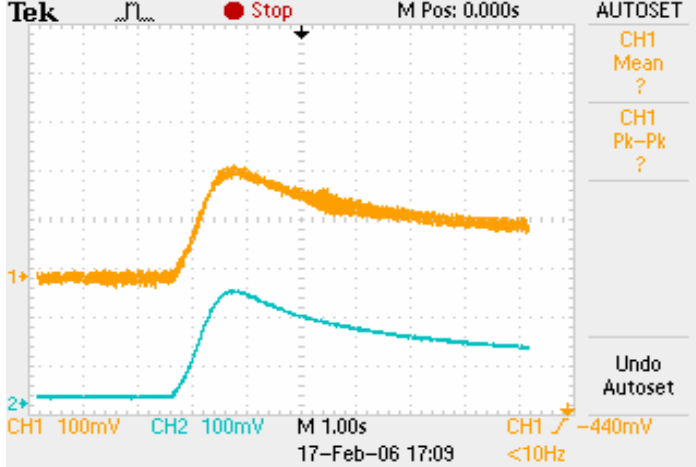
Week # 5 (February 13 – February 19, 2006)

Mike Rivera

Work Completed

Week 5 was primarily spent on filtering the circuit output signal. Up until now I was having little success with building a working filter. I stayed with the same filter design that I had been working on, which was a 4 pole, Sallen-Key filter with a 100 Hz cut-off frequency. What I changed was the op-amp I was using, and I switched all the capacitors to the mylar type. The new op-amp I was used was a dual op-amp TL072CP. This op-amp was successful. Figure 1 shows the filtered signal in comparison to the unfiltered.

Figure 1: Signal Comparison – Channel 1 is Unfiltered, Channel 2 is Filtered



It can be seen that there is a significant different in the amount of noise present in the tow signals. The filtered signal is significantly cleaner which will greatly improve the accuracy of the glucose-voltage relationship. Figure 2 and Figure 3 show the FFT analysis done on the oscilloscope for the unfiltered and filtered signals.

Figure 2: Unfiltered FFT Spectrum

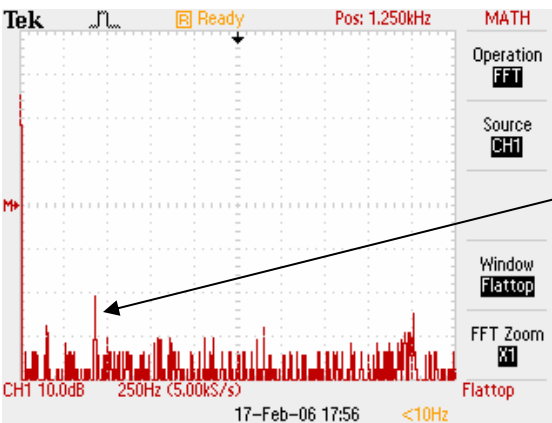
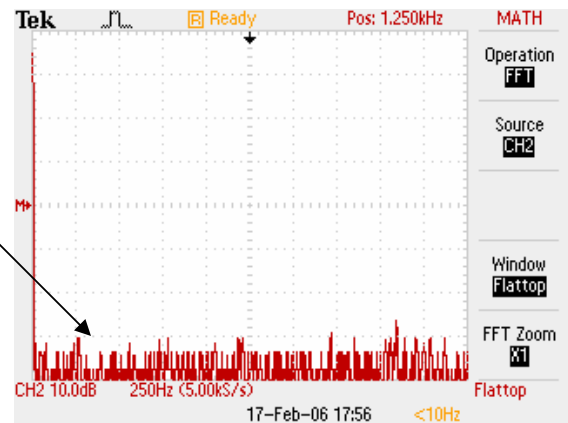


Figure 3: Filtered FFT Spectrum

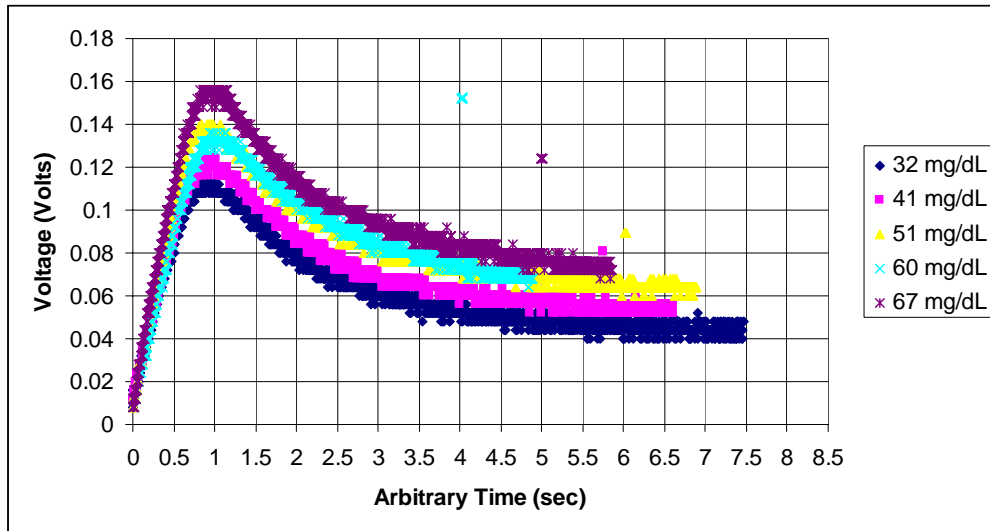


The arrows point to certain noise peaks that have now been eliminated by the filter.

With the filter working successfully on one of the outputs, I rebuilt the same filter, this time for the other working output that comes off the strip. Upon completion, both voltage outputs were now being filtered to a satisfactory level.

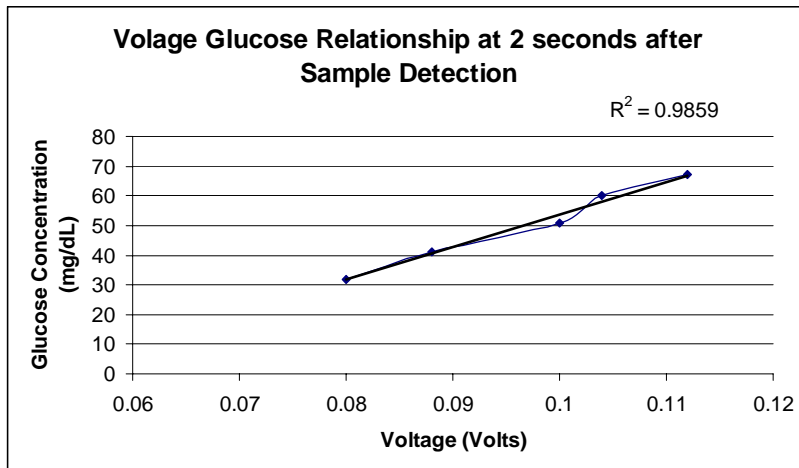
The next step I took was to see how good some trial data would be. I ran 5 trials all with different amounts of glucose as follows: 32, 41, 51, 60, and 67 mg/dL. I then loaded all the oscilloscope data into Excel and did some analysis. Figure 4 shows the 5 trials all beginning at the point of sample detection.

Figure 4: Glucose Curves for the various concentrations tested



Next, I tested the linearity of the curves in relation to their glucose concentrations. This was done by taking the data points at exactly 2 seconds after sample detection. Figure 5 below, shows this relationship. The R^2 value for this data was .9859 which is very good. That value means that there is only a slight variance away from being perfectly linear.

Figure 5: Voltage-Glucose Curve for the Completed Trials



Future Work

In the upcoming week, I plan to receive the High control solution from Lifescan. There was a shipping dilemma in this weeks order. The company who was supposed to send the High control solution last week apparently does not carry the product anymore and sent a normal control solution instead. So, I made a phone call and was able to get us the High control solution sent out free straight from Lifescan. Once I have the High control solution, I can complete the entire Glucose-Voltage relationship that will be used by the microprocessor to compute the reading. Also this week, a timing circuit needs to be developed. This circuit will be able to recognize the point of sample detection, and be able to initiate the 2 second time delay at which point the voltage measurement is taken.

Project Review

So far, so good. Things are running smoothly and we seem to be making good progress. Coming soon we should be bringing all our parts of the project together and beginning to develop a working meter.

Hours Worked: 13