

# gPod Accessible Blood Glucose Meter

Week 2

January 29, 2006

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## Work Completed

During this past week I worked on the glucose circuit. The beginning of the week was focused on getting the analog glucose signal to a useable form for the A/D converters. For the glucose signal to work with the A/D converters in the microprocessor, it must be a positive voltage. Due to the inversion of the voltage in the current-to-voltage converters the raw signal must be negative. To accomplish this, a potential of  $-400\text{mV}$  needs to be applied across the working and reference electrodes. The negative voltage required implies that both a positive and negative voltage sources are required for the meter. The team has decided to try and make a meter using a single battery and a 555 negative voltage generator shown in Figure 1.

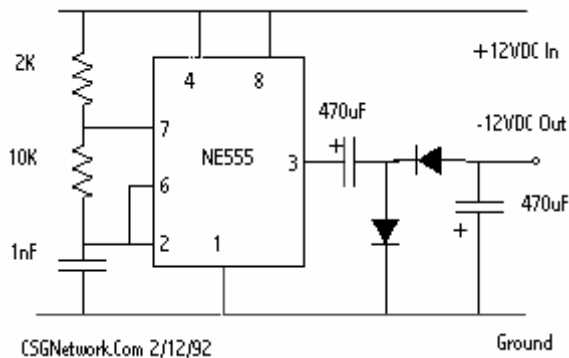


Figure 1, 555 Negative Voltage Generator.

After modifying the glucose circuit for a positive output voltage some problems were encountered with the integrity of the signal. For unknown reasons, at the moment, one of the voltage signals is half the magnitude of the other. The entire week was spent working on solving this apparent gain issue. Figure 2 shows the voltages obtained from the two working electrodes. It can be seen that channel 1 is half the magnitude of channel 2.

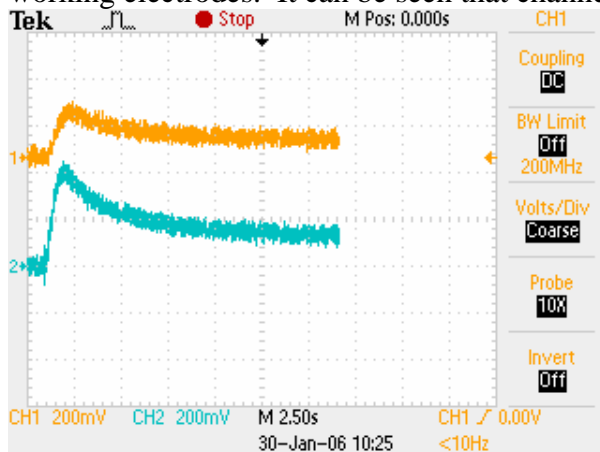


Figure 2, Output voltages.

First we looked into the op-amp circuits to check for connection errors and found no mistakes. The op-amps were replaced with new parts to eliminate the possibility of a damaged op-amp. The circuit was also moved to another location on the protoboard to rule out a damaged section on the protoboard. The voltages measured on the scope were checked for accuracy with a DMM. New scope probes and scope were used to rule out measurement error. A different protoboard was also tried. To confirm that the circuits were operating with the intended gain, a constant current source was used as the input to the circuit. All of the tests confirmed that the circuits were working as intended, but the outputs were still incorrect. The only noticeable and currently untested element of trouble is a difference in the input voltages between the two current-to-voltage converters. A difference of about 1.4mV was observed and more tests run by Mike and Matt next week will work to solve this problem.

### **Future Work**

My plan for the week is to start working with the microprocessor. I would like to successfully convert analog voltages to a digital number by the end of the week. The first few days of the week will be spent getting familiar with MPLab and PICc and the protocols required to initialize the microprocessor. The second half of the week will be spent working out the details of analog-to-digital conversion. Mike and Matt will continue to work on the glucose detection circuit this week. If the orders from this week arrive, work on the speech chip and LCD can begin. Ideally, by the end of the week we would like to have the glucose circuit working correctly again and successfully convert the analog signal to a digital count to be used by the microprocessor. Once the glucose circuit is working with the microprocessor we can then work on the glucose-voltage curve necessary to convert voltage levels to a glucose measurement.

### **Project Review**

Progress on the project was slow this week. The troubles with the glucose detection circuit delayed the entire project by a week. Due to the previous weeks successes the project will be basically on schedule. The timeline for the coming week includes the completion of the glucose circuit and successful A/D conversion. In two weeks work on the LCD and speech chip should be into full swing. In addition to the LCD and speech chip, data collection and conversion algorithms will be generated for the glucose detection circuit. Hopefully problems such as the failure of the glucose circuit will be few and far between allowing the project to stay on schedule. Total costs to date are \$378.24.

### **Hours Worked**

Hours spent on the project for Week 2: 17