Reducing The Cost of Thermocoupler Gauges

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1. Introduction
A thermocouple gauge is a simple and effective way of measuring pressure in a vacuum system. It works by measuring the temperature of a filament. The temperature of the filament changes depending on the amount of gas around the filament. While the gauge is fairly cheap (about $50), the read out is very expensive.

The motivation for this project was to construct a digital thermo-couple vacuum gauge using Cypress’ PSoC creator; which would be dramatically cheaper.

2. Methods
Gauge:
• Duniway model DST-06M Thermocouple Vacuum Gauge.

Designed System:
• Cypress CY8CKIT-049 programmable USB interface.
• Lumex S01602 LCD Module wired to the Cypress USB interface via a Jameco J25 bread board.
• USB interface programmed via Cypress’ PSoC Creator 3.0 which uses C programming method to communicate with the USB Interface.

Research/Construction:
• Extensive time was spent researching how exactly to program and build the particular system I was going for.

3. Result

Shown here are the results that I have been able to achieve so far in the research of this project. Pictured are just the final schematics, input wave, source code, and most importantly, the output of the actual gauge when it is plugged into a USB source.

4. Summary
By having a 1kHz square wave input through the thermocouple, and having it vary from 0V to 5V, we will be able to measure the gas temperature, which is in essence the maximum temperature of the gas in the vacuum.

5. Conclusion
In the short time I’ve had on this project, much progress has been made. The physics department, and myself, are hopeful that we will achieve the desired outcome of having a cheaply made yet efficient digital thermo-couple vacuum gauge. Once the goals mentioned above are met, we should be well on our way to finishing up construction of this system.