"555 Timer" Oscillator Lab

In this experiment, the performance of an integrated circuit oscillator will be investigated. An industry standard device, the LMC555, will be configured as a relaxation oscillator. The performance of the circuit will be observed using an oscilloscope and a USB DAQ unit. The DAQ unit will also be used to provide power (+5V) to the circuit.
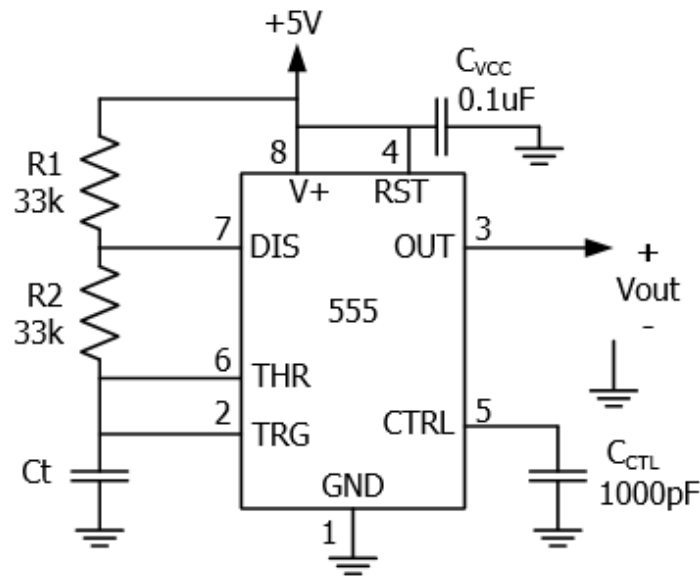

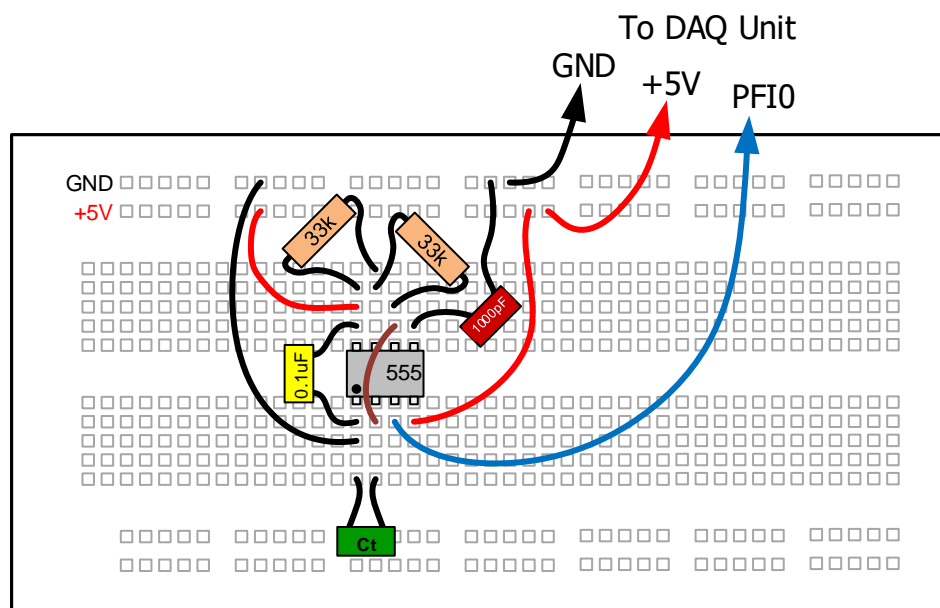Figure 1. 555 Timer Oscillator Circuit Schematic

Figure 2. Suggested circuit construction layout

When the 555 is configured as a relaxation oscillator (also known as an astable multivibrator), the expected frequency of oscillation is given by:

$$f = \frac{1.44}{(R_1 + 2R_2) * C_t}$$

Procedure

1. Construct the circuit as shown in Figures 1 and 2. Be sure to measure and record all component values before installing them in the circuit.
2. Connect the DAQ unit to the PC via a USB port.
3. Download the LabVIEW VI, "DAQ Frequency Counter.vi" from Canvas onto the lab PC desktop.
4. Double click the VI icon to launch LabVIEW and the VI.
5. Select the Devx/ctr0 counter from the pulldown menu. (The "x" will be a number)
6. Run the VI by clicking the "Run" arrow. (The aperture time is fixed at 1s for this VI.)
7. Connect an oscilloscope to the circuit as instructed by the lab instructor.
8. Measure and record the frequency of the circuit output (from the LabVIEW VI) and the output and capacitor waveform min and max values (from the scope).
9. Change the value of the timing capacitance, Ct, as instructed. Measure and record the same quantities as in previous steps.
10. Stop the VI by clicking the STOP button.
11. Calculate the expected frequency from the component measurements in step 1.
12. Calculate % errors for the measured and expected frequencies.

Table 1.

Ct	Measured Frequency	Vout$_{min}$	Vout$_{max}$	Ct V$_{min}$	Ct V$_{max}$	Expected Frequency	% Error
1000pF							
0.1uF							

Homework Submission

Table 1 and the values recorded in step 1.