Capstone Design

## Arduino/555

555 Astable

Build an Astable using a 555.

Use a single power supply, the $100\mu f$ capacitor and 1k ohm resistors.

Calculate the frequency of oscillation and the duty cycle.

Add a voltage divider to the output and make it's impedance large. Since the Arduino reads a maximum of *5 v* and the maximum of v_o= *9v,* make sure that the voltage divider provides a signal less than *5* volts (i.e., $R_{D2}/(R_{D1}+R_{D2})<5/9$).
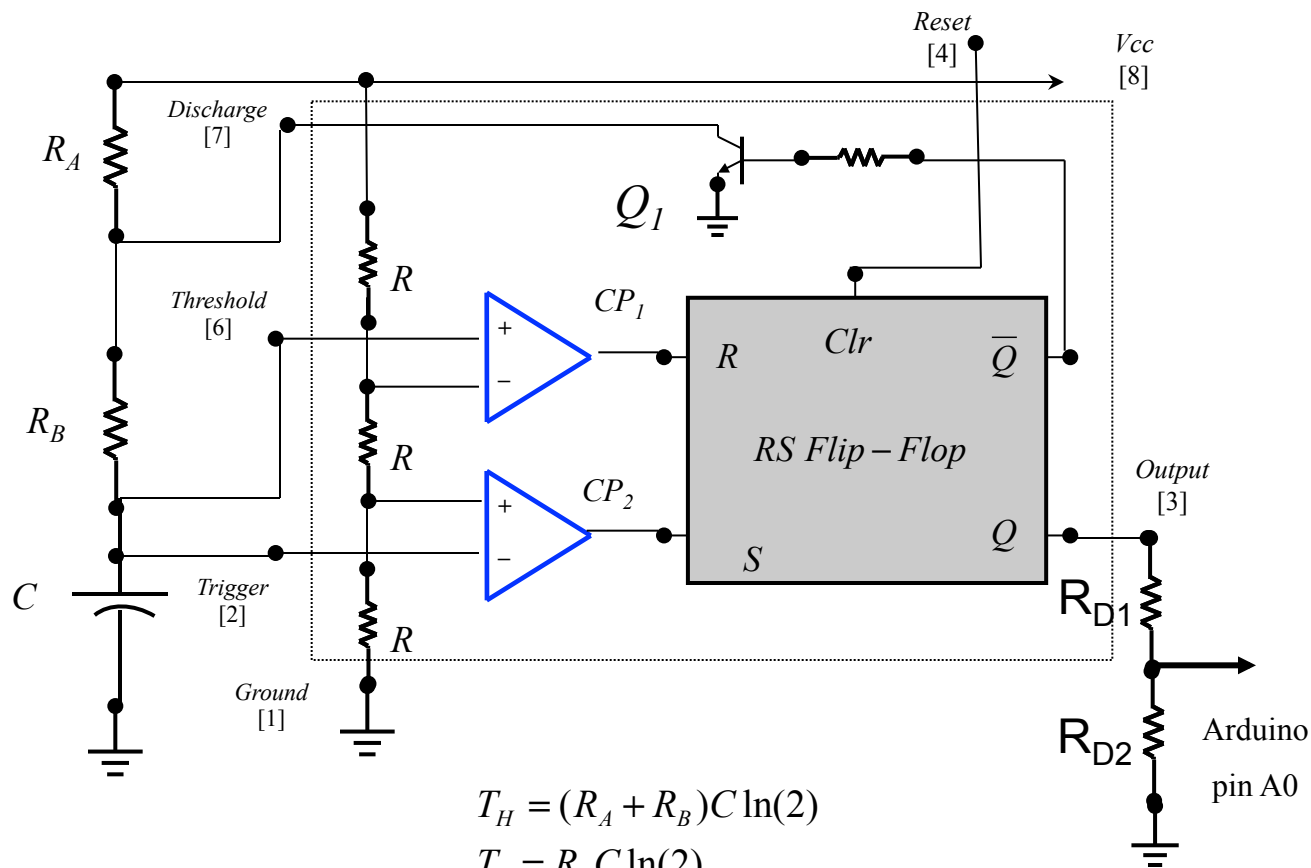
$$T_H = (R_A + R_B)C\ln(2)$$
$$T_L = R_B C\ln(2)$$
$$T = T_H + T_L$$
$$= (R_A + 2R_B)C\ln(2)$$

Arduino

1. Write a sketch that read A0, maps it to a voltage between 0 – 5 volts, and then print it to the Serial Plotter.
2. Vary the potentiometer to demonstrate various frequencies and thereby various pulse widths.
3. From the graph determine frequency and amplitude of the signal.
4. Compare the frequency determined from the plot with the frequency determined from the circuit parameters. Do they align? If not, why?
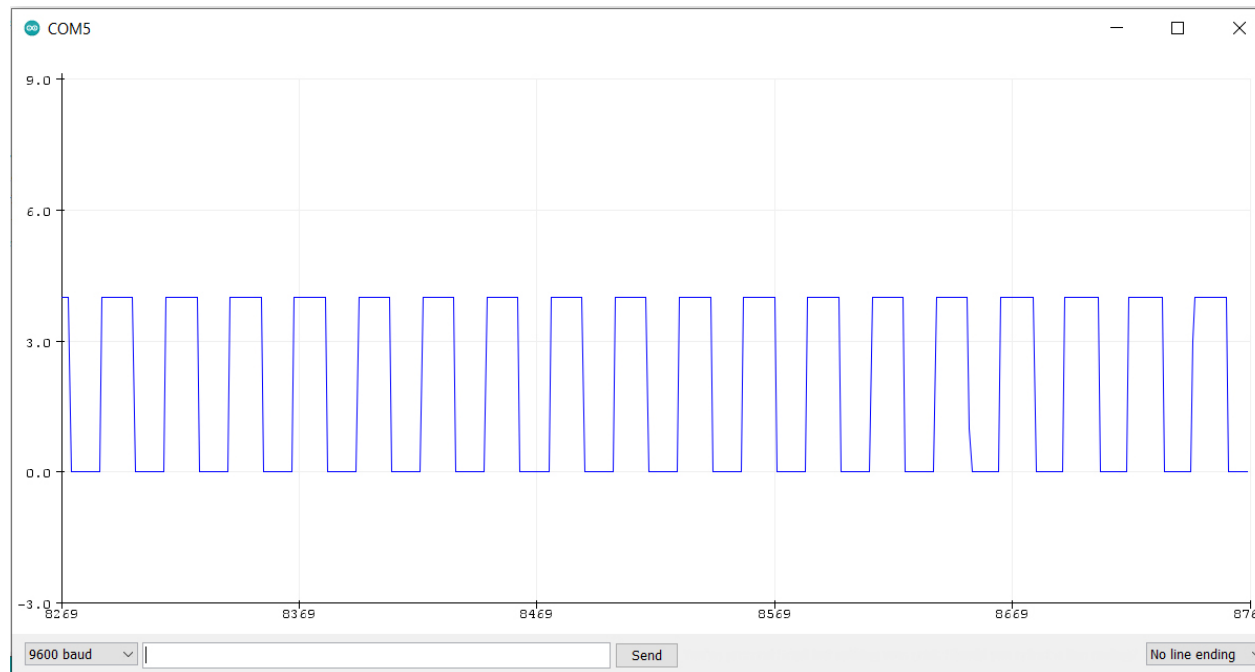
555 Schmitt Trigger
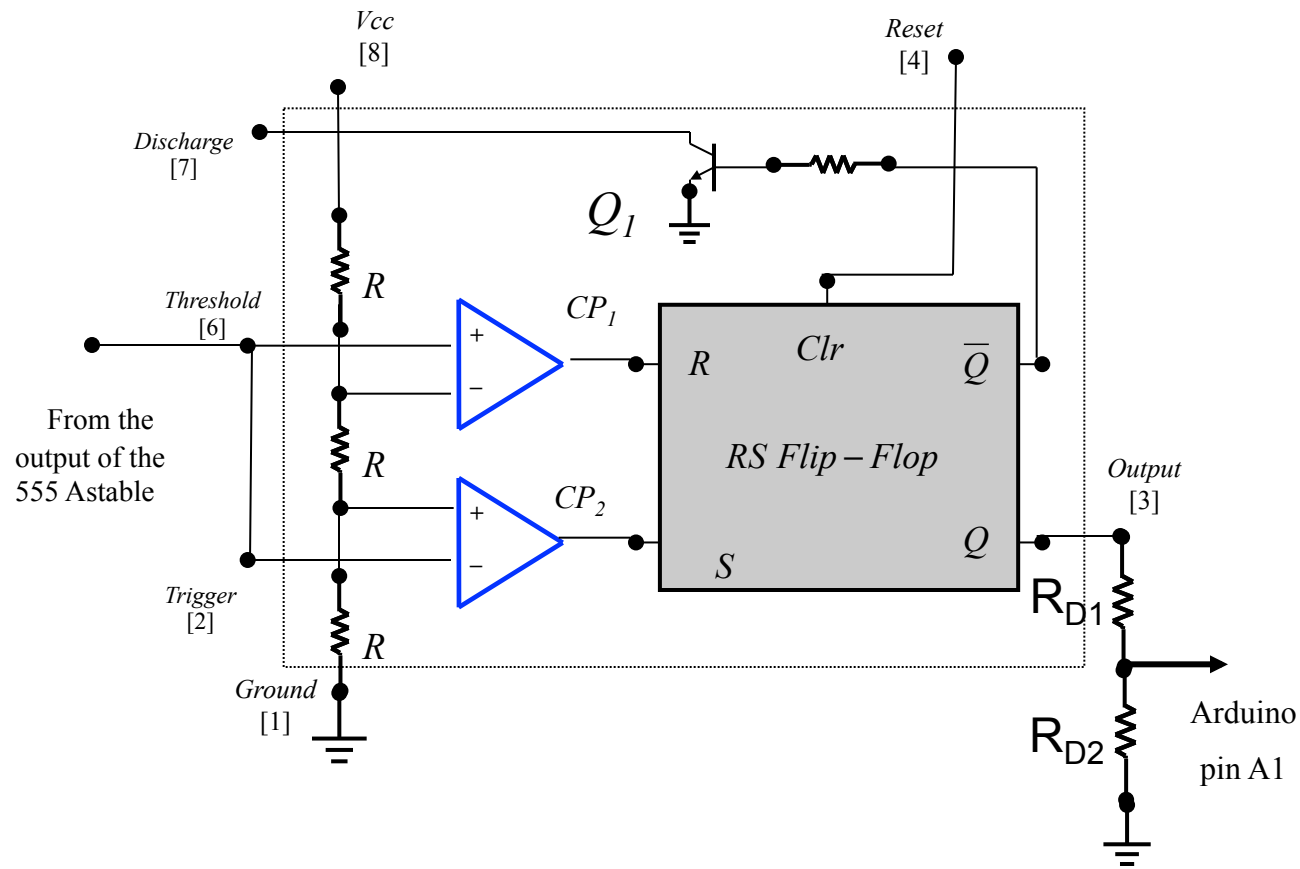
Connect a second 555 configured as a Schmitt Trigger to the output of the 555 Astable.

Use a single power supply, the $100\mu f$ capacitor and 1k ohm resistors.

The output of this should be the same square wave but shifted by 180°.

Extra Credit: Can you plot both signals on the same axis to show that the signals are out of phase.