ECE 182 Lab #6 Astable Multivibrator
Day of Submission: 10/10/2025
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Circuit and Schematic

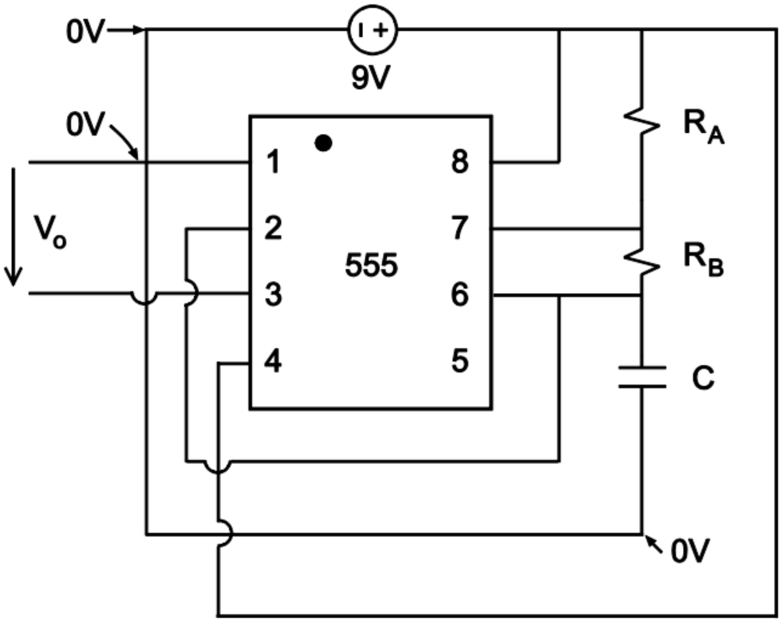


Fig 6a

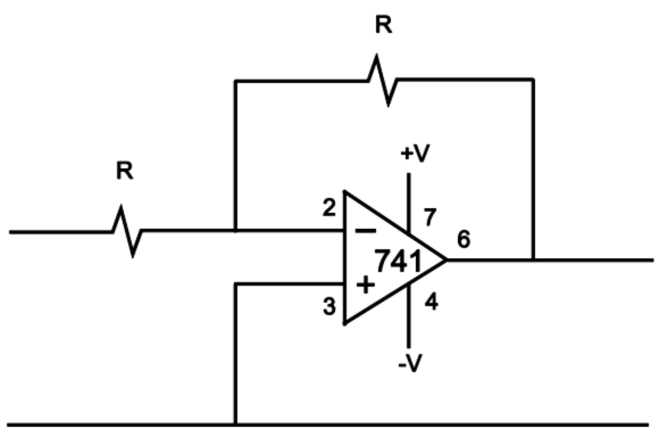


Fig 6b

- Theoretical vs Experimental Figure 6a
- Ra: 1Kohm vs 0.984Kohm
- Rb: 10Kohm vs 9.86Kohm
- C: 100nF vs 99.65nF
- Theoretical vs Experimental Figure 6a
- Ra: 1Kohm vs 0.984Kohm
- Rb: 10Kohm vs 9.86Kohm

Equations for Theoretical Basis

There are multiple equations, so they will be included in the calculations section.

Results and Calculations

Circuit on Breadboard

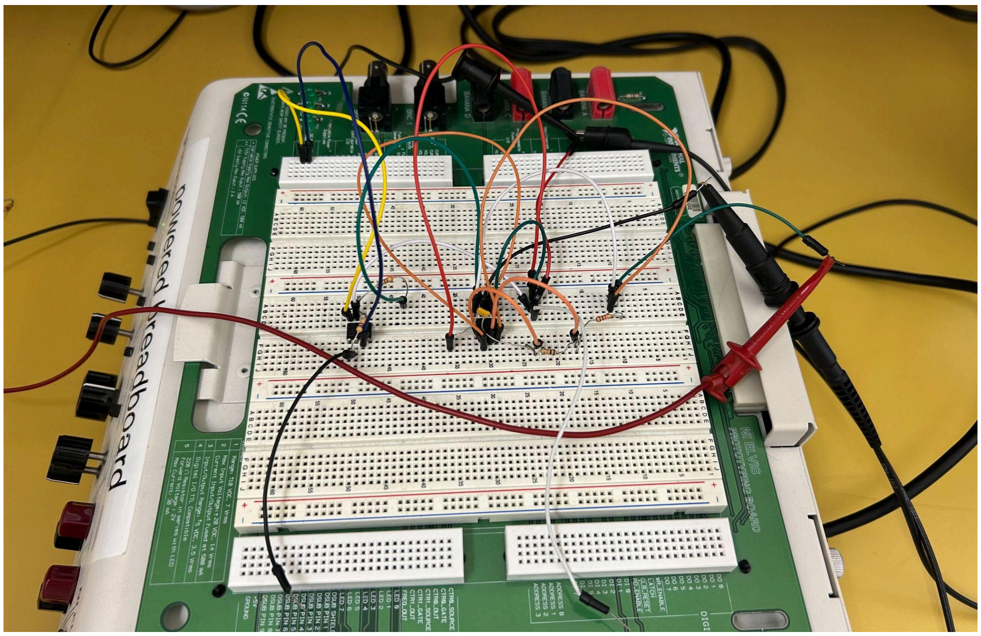


Figure 6a Output Waveform

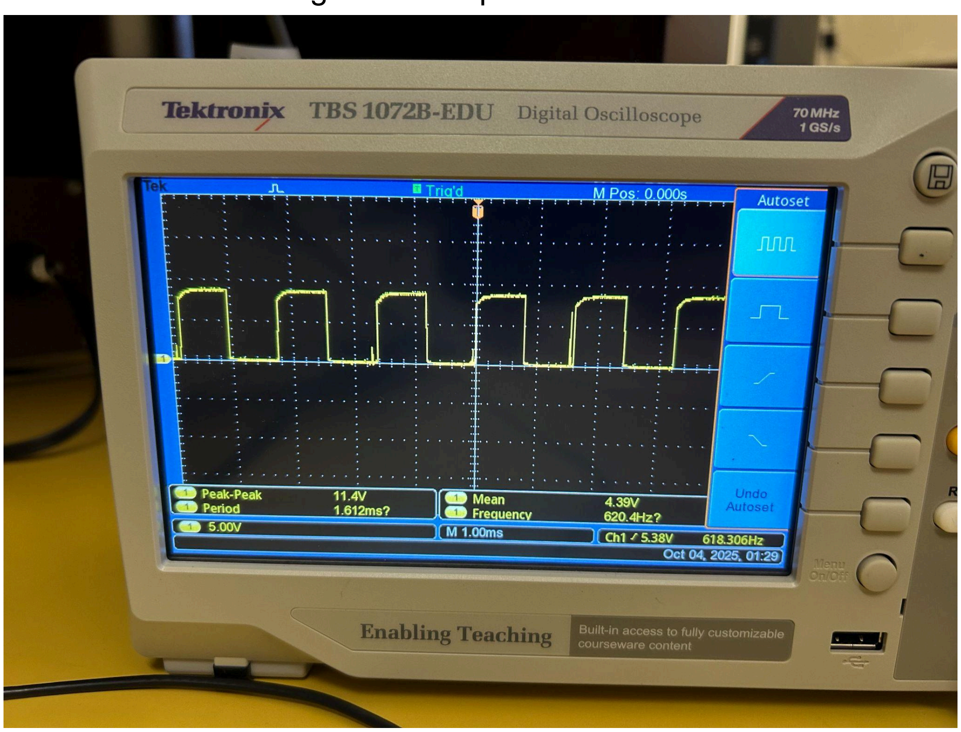
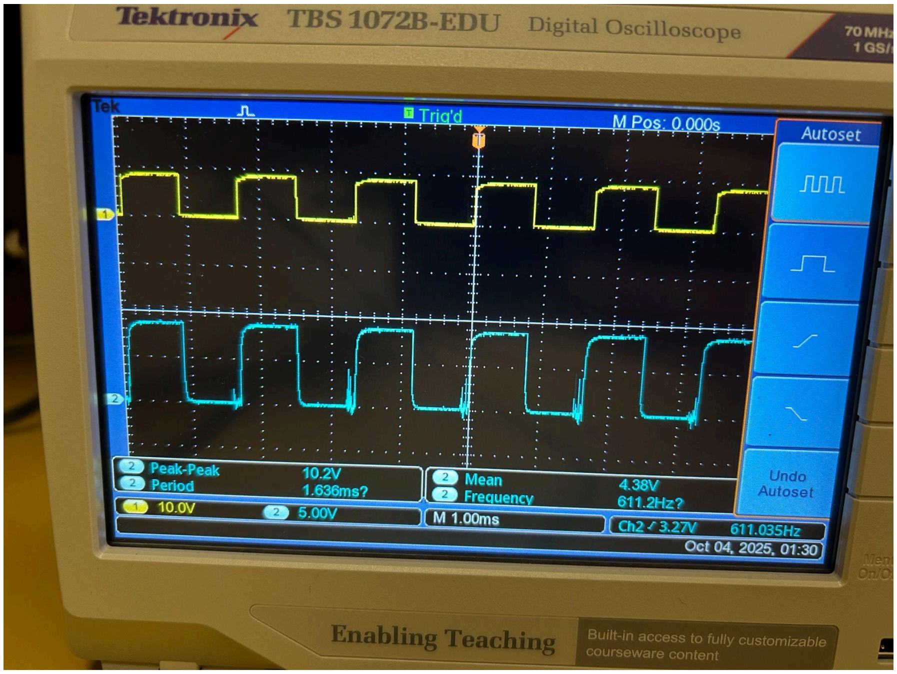


Figure 6b Input/Output Waveform



Calculations

Lab 6

$R_A = 0.984\,k\Omega$

$R_B = 9.86\,k\Omega$

$C = 99.65\,nF$

(b) Timebase equals 1.00ms/div

$T \approx 1.612 \qquad T_{High} \approx 1.00ms$

$T_{low} \approx T - T_{high} = 1.612ms - 1.00ms = 0.612ms$

Duty cycle: $D = \frac{T_{High}}{T} = \frac{1.00}{1.612} = 0.62 = 62\%$

Mark to Space Ratio: $R = \frac{T_{High}}{T_{low}} = \frac{1.00ms}{0.612ms} = 1.63:1$

Measured

Duty Cycle: $D = \frac{R_A + R_B}{R_A + 2R_B}$

$D = \frac{0.984k\Omega + 9.86k\Omega}{0.984k\Omega + 2(9.86k\Omega)}$

$D = 0.523 \approx 52.37\%$

Mark to space ratio: $R = \frac{T_{High}}{T_{low}} = 1 + \frac{R_A}{R_B} = 1 + \frac{0.984k\Omega}{9.86k\Omega}$

$R = 1.0997 = 1.10:1$

Calculated

(c) $T = 1.612ms$

$f = \frac{1}{T} = \frac{1}{1.612ms} = 620.35Hz$

Measured

$T = 0.693(R_A + 2R_B)C$

$T = 0.693(R_A + R_B)C$

$T = 0.693(0.984k\Omega + 9.86k\Omega)\cdot(99.65nF)$

$T = 7.52 \times 10^{-4} s$

$f = \frac{1}{T}$

$f = \frac{1}{7.521 \times 10^{-4}} = 1329.60Hz$

Calculated

Summary

In part a of the lab we analyzed the output of a square wave pulse generator using a 555 timer. In part b of the we analyzed the output of the same pulse generator but added on an amplifier to the output. The results showed deviations between the expected and measured values, this is largely due to the component tolerances/error. The measured vs calculated duty cycle is 62% vs 52% and Mark to space ratio is (1.63:1) vs (1.10:1). In part b of the experiment I noticed that the output waveforms were larger than part a. This is because part b circuit is an amplifier, thus amplifying the output waveform of part a. Overall, with much trial and error I believe this experiment successfully demonstrates the theory of the 555 timer pulse generator with/without an amplifier.