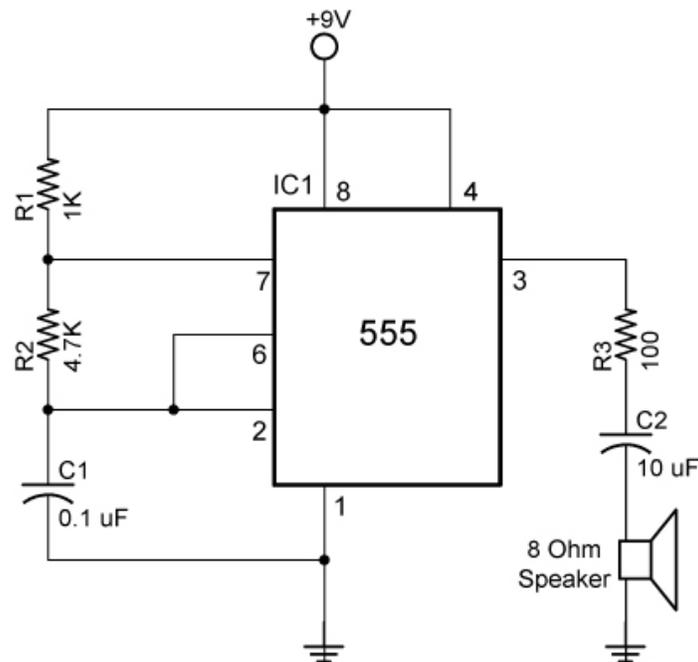
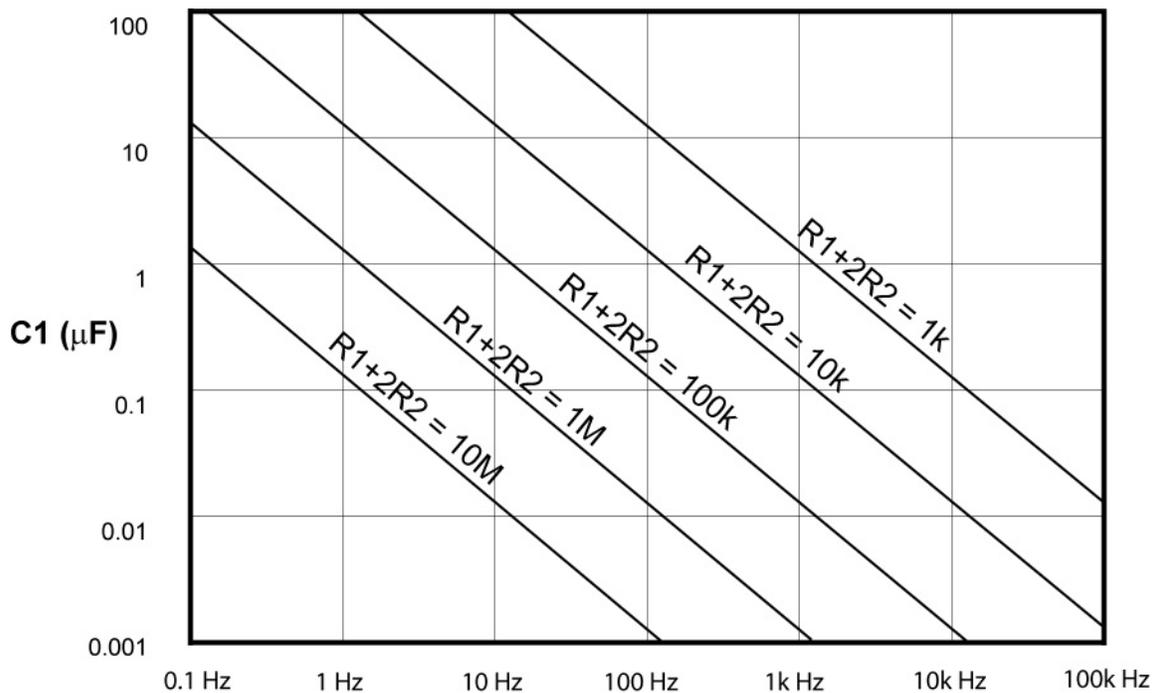


555 Timer Tone Generator



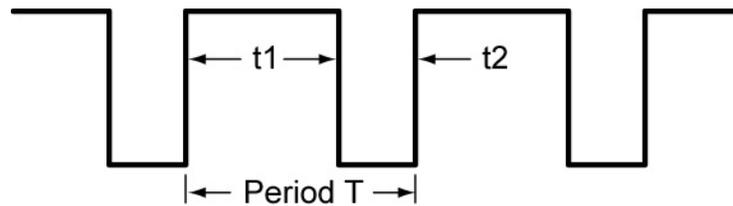
Explanation: The 555 timer is configured in an astable mode. The frequency of the tone is set by the values of R1, R2, and C1. See the 555 Astable (Oscillator) Mode Graph below to determine approximate values for R1, R2, and C1. Our tone has a frequency of about 961 Hz.



$$\text{Frequency} = 1.44 / (R1 + 2R2) * C1$$

555 Timer Astable Mode Frequency vs. R1, R2, & C1 Graph

- Output Waveform from 555 Timer Astable Circuit:



555 Timer Output Pulses for Astable Operation (Duty Cycle > 50%)

- Formulas:

$$t_1 = 0.693(R_1 + R_2) \cdot C_1$$

$$t_2 = 0.693(R_2) \cdot C_1$$

$$f = 1 / T$$

$$f = 1 / (t_1 + t_2)$$

$$f = 1 / (0.693(R_1 + R_2) \cdot C_1 + 0.693R_2 \cdot C_1)$$

$$f = 1 / 0.693(R_1 \cdot C_1 + R_2 \cdot C_1 + R_2 \cdot C_1)$$

$$f = 1.44 / (R_1 + 2R_2) \cdot C_1$$

$$\text{Duty Cycle} = t_1 / T \cdot 100\%$$

$$\text{Duty Cycle} = ((R_1 + R_2) / (R_1 + 2R_2)) \cdot 100\%$$

Where:

t₁ = the time the pulse is HIGH (the charge time) in sec

t₂ = the time the waveform is LOW (the discharge time) in sec

R₁ = resistance of R₁ in Ω

R₂ = resistance of R₂ in Ω

C₁ = capacitance of C₁ in Farads

f = frequency in Hertz

Related Lessons:

http://cornerstonerobotics.org/curriculum/lessons_year2/erii5_555_timer.pdf

http://cornerstonerobotics.org/curriculum/lessons_year2/erii5_555_timer_astable_operation.pdf