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Module 910: The Buzz about Mosquitos

Section AB/BB:

0 1 2 3 4 5 6 7

8 9 A B C D E F

(circle one)

TA Use ONLY.

Initial to confirm satisfactory completion of this Module:

Initials:

Laboratory Outline

In this module, you will use an oscillator with a variable duty cycle to create a sound through a loudspeaker that (arguably) imitates the buzz of a mosquito. Placing the circuit in an Altoids™ tin will improve the effect! The circuit may be completed at home (use an LED for the loudspeaker until you can get one in the lab). You must demonstrate a clean circuit and an ability to use the oscilloscope to the TA to receive credit.

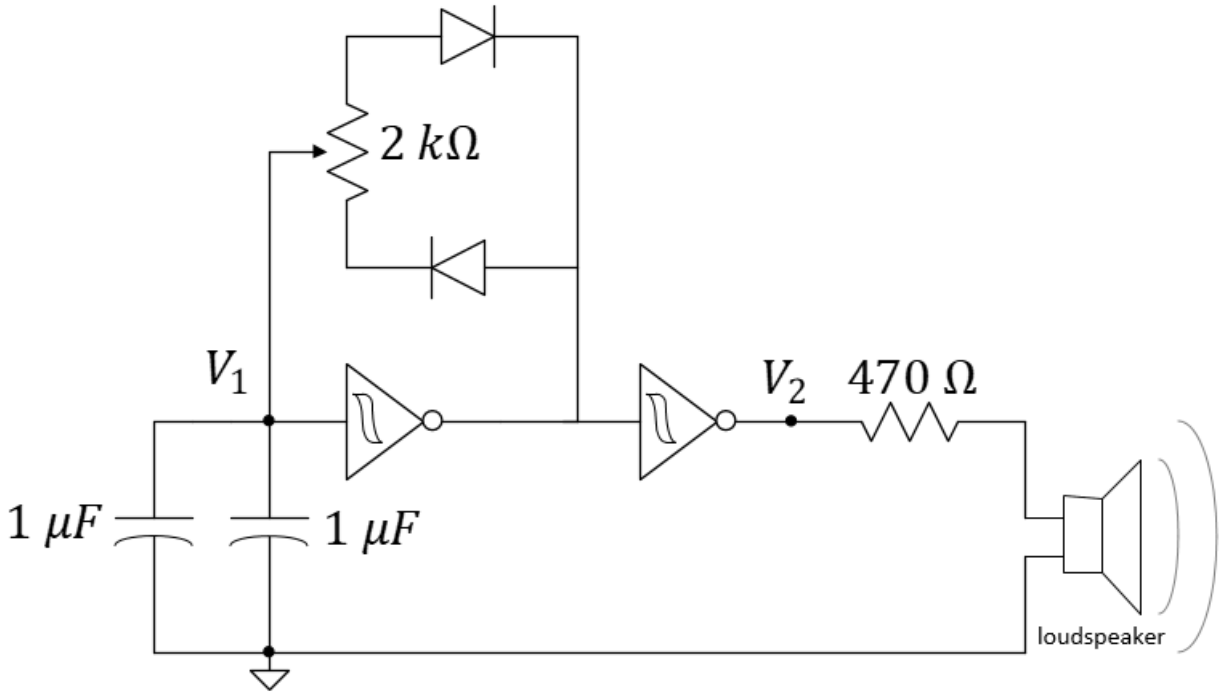

Figure 1: *A loudspeaker circuit.*

Prerequisites

- Reading a datasheet, practical experience bread-boarding, and placing an IC on a breadboard. Oscilloscope usage.

Notes:

Parts Needed

- Two capacitors ($1\ \mu F$), a $2\ k\Omega$ potentiometer, two signal diodes, and a 470 Ω resistor.
- Small loudspeaker
- A fixed-voltage supply (a battery)
- The 40106 Schmitt-trigger inverter

Learning Objectives

- Ability to map a circuit design onto the breadboard in a functional and clean manner.
- Ability to troubleshoot problems that occur during a build.
- Ability to use the oscilloscope and to recover traces after alteration.

Build the circuit of Figure 1. Use the rechargeable NiMH battery to supply power to the Schmitt trigger inverters. Pay attention to a "clean" build, keeping wires short and a reasonable color code for the wires.

Turn on the oscilloscope and press the Default Setup button. Use ***only*** the horizontal and vertical scale adjustments and the trigger and meas menus to complete today's task.

Use the oscilloscope while adjusting the $2\ k\Omega$ potentiometer. View both voltages V_1 and V_2.

Record the frequency of V_2 when the $2\ k\Omega$ potentiometer is tuned to 20% duty cycle and when tuned to 80% duty cycle (use the scope's measuring tools to accurately tune the duty cycle). Let your TA know you are ready for evaluation on your use of the oscilloscope.

TA instructions: Press the "Default Setup" on the oscilloscope, then make an alteration to the circuit. Suggested alterations include removing or adding a capacitor or inserting a resistor between the capacitors and the potentiometer. Have the student demonstrate proficiency on the oscilloscope by recovering a triggered signal and measuring the new duty cycle and frequency of V_2. Mark the module as completed and collect it to enter into your gradebook.