

Project 1.2.7 Board Game Counter: Analog

Introduction

The field of analog electronics is a unique discipline, distinct from the study of digital electronics. We have only scratched the surface of what you would learn if you continued your studies in this area. This project will be the last activity in our brief journey into the world of analog electronics. In this activity you will use the Circuit Design Software to build and test the complete analog section of the Board Game Counter design.

Equipment

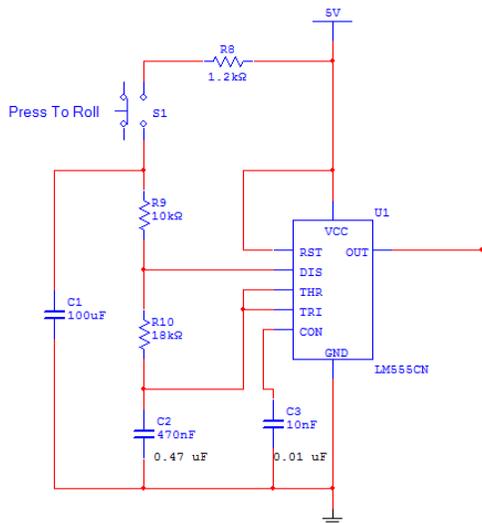
- Paper & pencil, Circuit Design Software (CDS)

Procedure

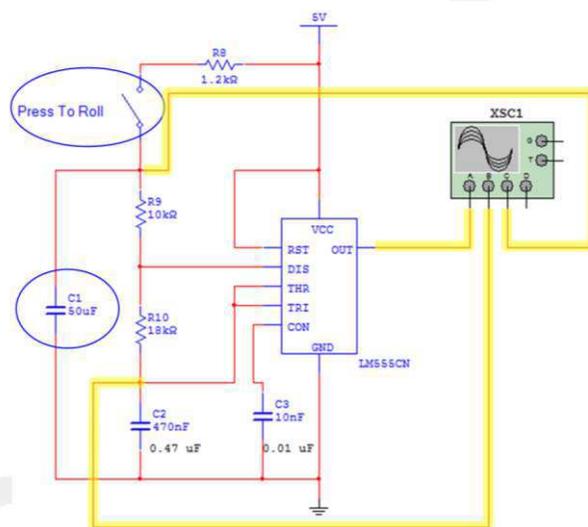
Shown below (LEFT DIAGRAM) is the analog section of the Board Game Counter.

Unfortunately, there are two issues with simulating this circuit as shown. First, it is difficult to obtain accurate simulation results using the push button switch (S1). Additionally, the 100 μf capacitor (C1) causes the simulation to run too long.

To fix these issues, we must make two simple changes to the circuit (RIGHT DIAGRAM). First, replace the push button switch with an SPST switch. Change the 100 μf capacitor to 50 μf . These changes are shown below. Also shown are the oscilloscope connections (highlighted).



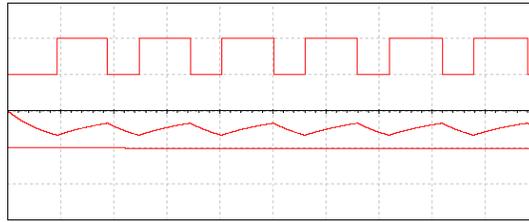
Analog Section – Board Game Counter



Modified Analog Section – Board Game Counter

1. Using the Circuit Design Software (CDS), enter the modified analog section of the Board Game Counter shown. (RIGHT SIDE DIAGRAM).
2. With the switch closed, start the simulation.

- Open the oscilloscope tool and adjust the scale of the timebase and channels so that the three signals are easy to see and measure (see below).



- Restart the simulation.
- After the first few square waves are observed on the output signal, open the switch. Let the simulation run until the output signal stops oscillating. When the oscillation stops, stop the simulation. This may take a few minutes.
- Adjust the oscilloscope to display the first square wave of the output signal. Using the oscilloscope's markers, measure the period of this signal. Use this data to calculate the frequency. Record your result in the table.

Signal	Period	Frequency
First Square Wave		
Middle Square Wave		
Last Square Wave		

- Repeat step (6) for a signal in the middle of the simulation, approximately half way between the first and last square wave observed.
- Repeat step (6) for the last square wave observed prior to the oscillation stop point.

Conclusions

- When you press the push button of the Board Game Counter, the 555 Timer oscillates at approximately 65 Hz. If you want the oscillation to start at 100Hz, what value would you apply to C2?
- The values of R8 & C1 determine the time from when the push button is released to when the oscillation stops. If you wanted to lengthen this time period, what changes would you make to one or both of these components? Explain.