



University of British Columbia
Electrical and Computer Engineering
ELEC 291/292

Lab 3 –555 Timer/Capacitance Meter

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Introduction

From clock sources to test signals, timers are often needed when designing and testing electronic circuits. One of such circuits is the iconic ‘555 timer’ introduced by Signetics in 1971 and designed by Hans R. Camenzind. In this laboratory module, you will test a 555 timer and then use it to build a capacitance meter.

References

A51 user manual included with the latest version of CrossIDE.

LM555 timer datasheet available at <http://www.ti.com/lit/ds/symlink/lm555.pdf>

Laboratory

- 1) When the 555 timer is configured as an A-stable oscillator, the output frequency of the pulse waveform is determined by the formula:

$$f = \frac{1}{T} = \frac{1.44}{(R_A + 2R_B)C}$$

Design an A-stable oscillator using the 555 timer that produces a pulse waveform with a frequency in the range 10 kHz to 20 kHz. Assemble the circuit and if possible, verify its correct operation using a multimeter capable of measuring frequency such as the DMR-6500.

- 2) When used as an astable oscillator, the frequency output of a 555 timer is inversely proportional to the capacitance used in the circuit. If such frequency is measured using a microcomputer system, the capacitor value used in the timer circuit can be determined. Build a capacitance **meter** that works in the range 1 nF to 1 uF. Use the AT89LP51RC2 and an LCD to measure and display the capacitance. For your reference, source code examples on how to measure both frequency and period are provided in the web page of the course. To help you with the calculations and various conversions, a library of 32-bit integer arithmetic operations (math32.inc) as well as usage examples are also included in the web page for the course (mathtest.asm). Your Canvas submission must include your assembly source code as well as a video demonstration of your system measuring at least 5 different capacitors in the range required above.