



University of British Columbia  
Electrical and Computer Engineering  
ELEC 291

## 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 verify its correct operation using the BB2Scope board. Include in your Canvas submission a screen capture of the scope output.

- 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 EFM8 board and an LCD to measure and display the capacitance. For your reference, an example on how to measure frequency, ‘FreqEFM8.asm’ is provided in the web page of the course. To help you with the calculations and various conversions, a library of 32-bit arithmetic operations (math32.inc) as well as usage example is also included in Canvas (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.