



**American International University- Bangladesh**  
**Department of Electrical and Electronic Engineering**  
 EEE 3120: Digital Electronic Circuits Laboratory

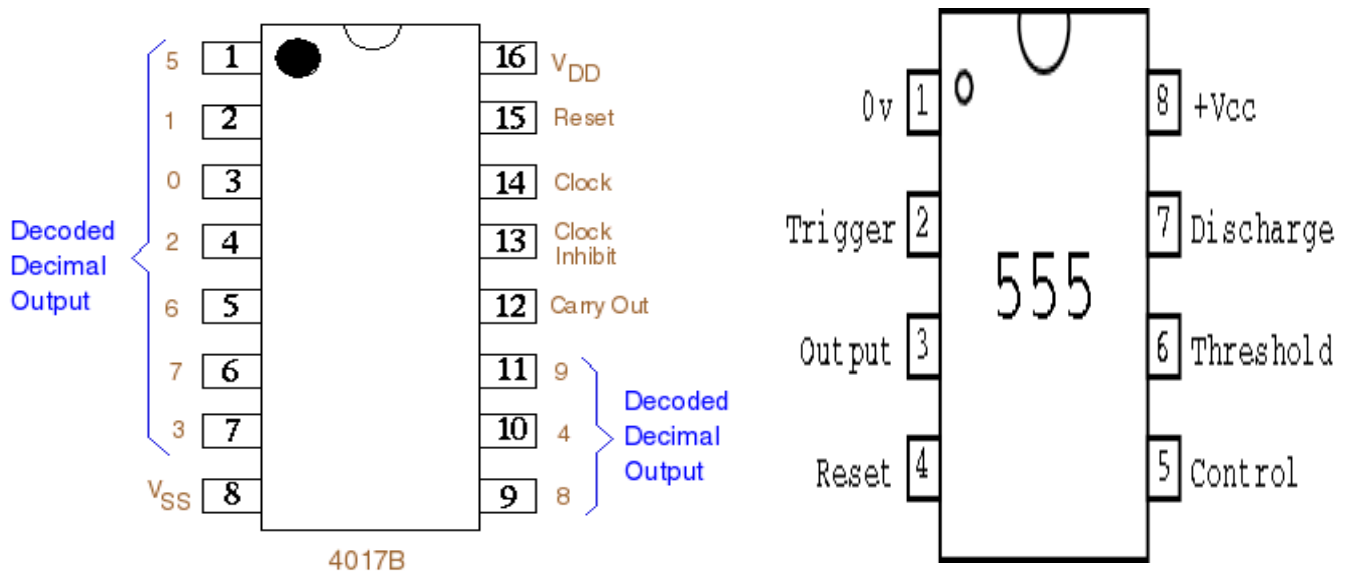
**Title: Designing a simple Traffic Light Controller (TLC) with Timers and Counters**

**Introduction:**

Binary Counters count from 0 to a maximum count. A 4-bit binary counter would count from 0 to 15 in 16 clock cycles when enabled. A decade counter counts up to 9 and goes back to 0 at the next clock cycle.

The 4017 Decade Counter provides a decoded decade count. In other words, rather than outputting 0000, 0001, 0010 to 1001 (9), it outputs 0000000000, 0000000001, 0000000010 to 1000000000. So when enabled, it sets high one of its 10 outputs in each clock cycle.

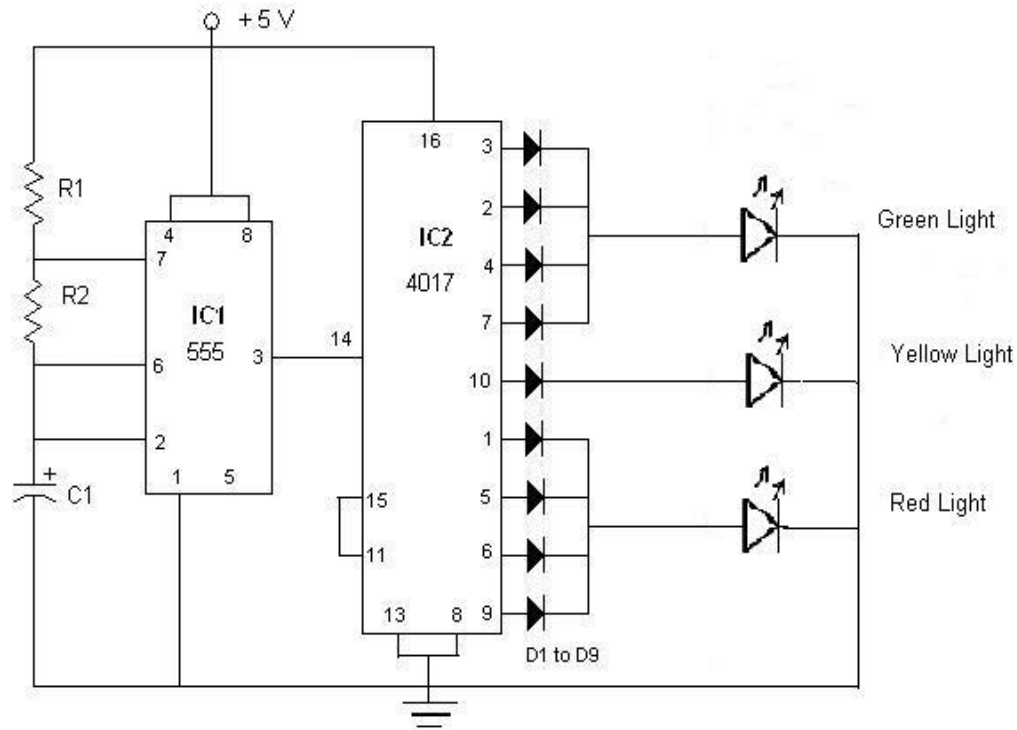
**IC Pin Configurations:**



**Figure 1:** Pin configuration for the 555 timer and 4017 Decade Counter ICs.

**Theory and Methodology:**

Since the Decade counter 4017 outputs a 10-bit decoded output, where only 1-bit is set high for a particular output pattern, in a cyclic manner, it can be used to generate a sequence such as the one needed for a TLC. For example, the following circuit outputs Green for 4 clock cycles, Yellow for 1 clock cycle and Red for 4 clock cycles. To do that D1 (Pin3), D2 (Pin2), D3 (Pin4), and D4 (Pin7) have been connected to the Green output, D5 (10) has been connected to Yellow output and D6 (Pin5), D7 (Pin5), D8 (Pin6), and D9 (Pin9). The D10 (Pin 11) output can be left unconnected for this example design.



**Figure 2:** A Sample TLC Design

### **Pre-Lab Homework:**

Design a device that generates a 1 sec pulse utilizing the 555 timer used as a monostable vibrator. Students will observe the outcome from the experimental setup. Use PSPICE for software simulation.

### **Apparatus:**

555 Timer	1[pcs]
IC-4017(Decade counter)	1[pcs]
Capacitor (C1= 0.022 uF)	1[pcs]
Resistors (R1= 4.7k, R2= 2.2k)	1[pcs] each
LED	3[pcs]
Diodes	9[pcs]

**Precautions:**

Never turn on the DC source before the circuit is placed correctly and checked carefully. Check for short circuits in the circuit.

**Experimental Procedure:**

- Design a TLC using the 555 timer and the 4017 Decade Counter that generates Red for 4 sec, Green for 4 sec and Yellow for 2 sec.
- Design the timer in such a way that it generates a 1 sec pulse utilizing the 555 timer used as a monostable vibrator.

**Result and Findings:**

After completing the experiment, the student will match the result with the formulae and simulation (if performed).

**Reference(s):**

1. Thomas L. Floyd, *Digital Fundamentals*, 9<sup>th</sup> Edition, 2006, Prentice Hall.