Introduction

The purpose of this laboratory was to design a three-bit input circuit that would correctly display the tire pressure state as either Low, Medium, or High to LED outputs.

Requirements

- Inputs:
  - A, B, C
  - A is the most significant bit

- Outputs:
  - L – Low (will generate logic 1 only when ABC <= 2
  - M – Medium (will generate logic 1 only when 2 < ABC < 5
  - H – High (will generate logic 1 only when ABC > 4

- Components must be minimized in order to reduce circuit size and complexity

Design

- Truth Table:

A	B	C	L	M	H
0	0	0	1	0	0
0	0	1	1	0	0
0	1	0	1	0	0
0	1	1	0	1	0
1	0	0	0	1	0
1	0	1	0	0	1
1	1	0	0	0	1
1	1	1	0	0	1

Table 1. Truth Table for Tire Pressure Circut

- Boolean Expressions:
  - A’B’C + A’B’C + A’BC” = L

A’(B’C’ + B’C + BC’) = L
A’[B’(C’ + C) + BC’] = L
A’(B’ + BC’) = L
A’(B’ + C’) = L
A’(BC)’ = L
(A + BC)’ = L

- AB’C + ABC’ + ABC = H

AC(B’ + B) + ABC’ = H
AC + ABC’ = H
A(C + C’B) = H
A(C + B) = H

- (L + H)’ = M

- <u>Gate Design:</u>

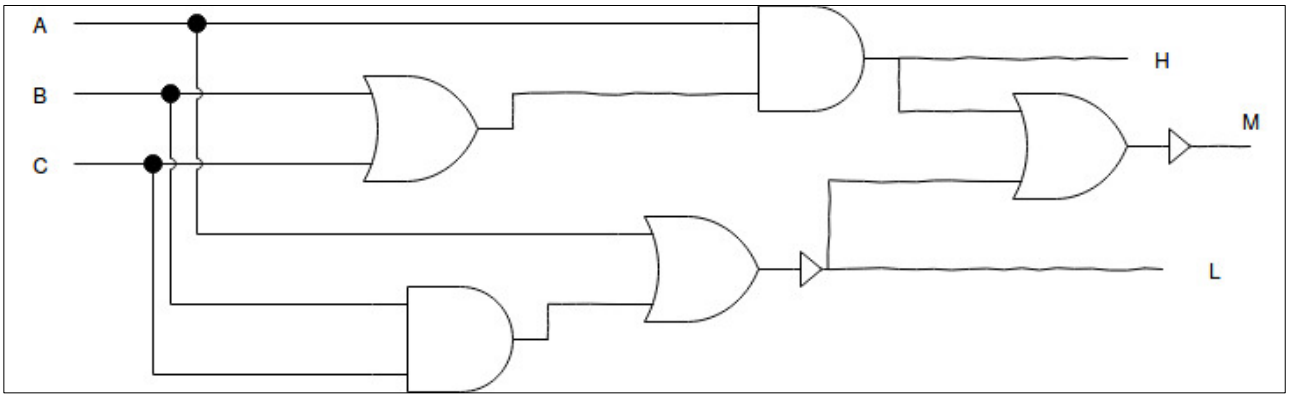

Figure 1. Circuit Design of Tire Pressure Indicator

Implementation

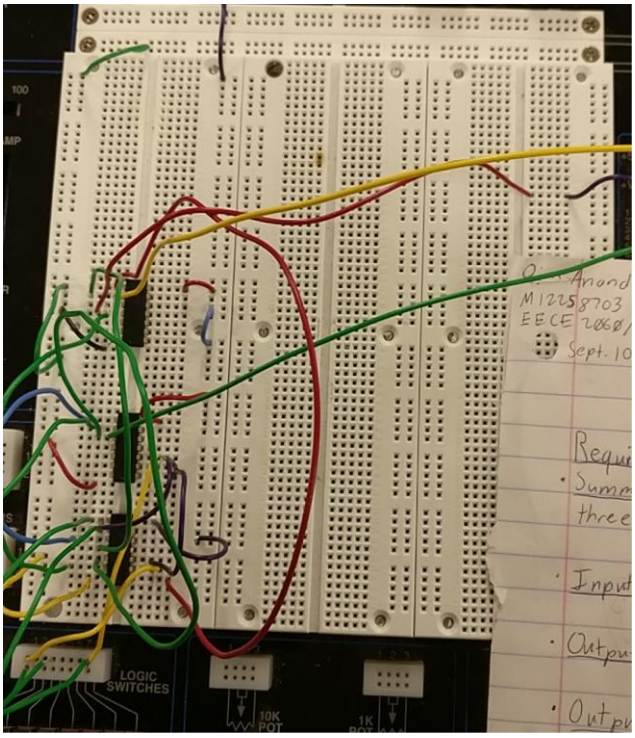

Figure 2. Photograph of circuit implementation

Test Results

A	B	C	L	M	H
0	0	0	1	0	0
0	0	1	1	0	0
0	1	0	1	0	0
0	1	1	0	1	0
1	0	0	0	1	0
1	0	1	0	0	1
1	1	0	0	0	1
1	1	1	0	0	1

Table 2. Test results from implementation

Questions and Answers

1. *What is the utilization of your components(i.e., total number of used gates divided by the number of IC components? Can you think of any way(s) you could improve the component utilization?*

   The component utilization is 7/3. I don't believe that there is any other way it could have been improved.

2. *How many test vectors were required to assure correctness of the circuit?*

Seven test vectors were required in order to fully test all circuit possibilities and, therefore, determine its correctness

3. *Define in detail the contribution of each team member to the accomplishment of the project for each phase (i.e., Pre-lab, In-Lab, and Post-Lab). The idea is that over the quarter all team members share equally in all aspects of the laboratory activity (requirements, design, simulation, test, implementation, and report writing).*

The Pre-Lab, In-Lab, and Post-Lab was performed by myself.