ECE 2300L

Experiment 4 Lab Report

A digital circuit using basic gates

Thursday 27, 2025

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Introduction

Objective:

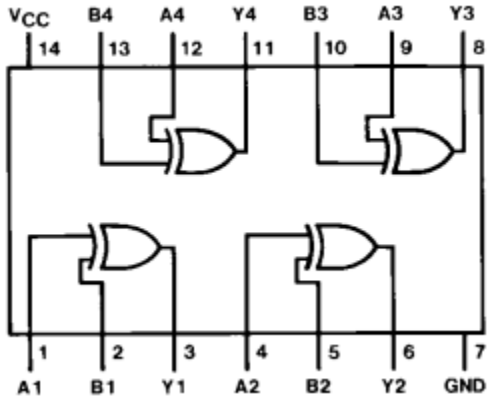
In this experiment, we created a simple circuit using an XOR Gate and an AND Gate with 330 ohm resistors and LEDs to determine if the output and result were similar to a NOT, AND, or an OR gate.

Parts list:

1. Breadboard
2. Battery; 4V-6V
3. LED
4. 330-ohm resistor
5. 7408
6. 7486

Pre-Lab

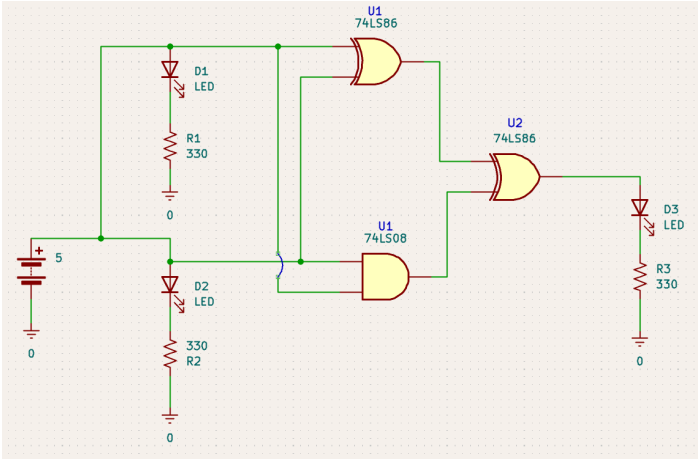
74LS86 data sheet



74LS86 Truth Table

A	B	X
0	0	0
1	0	1
0	1	1
1	1	1

Similar to OR gate truth table



Procedure:

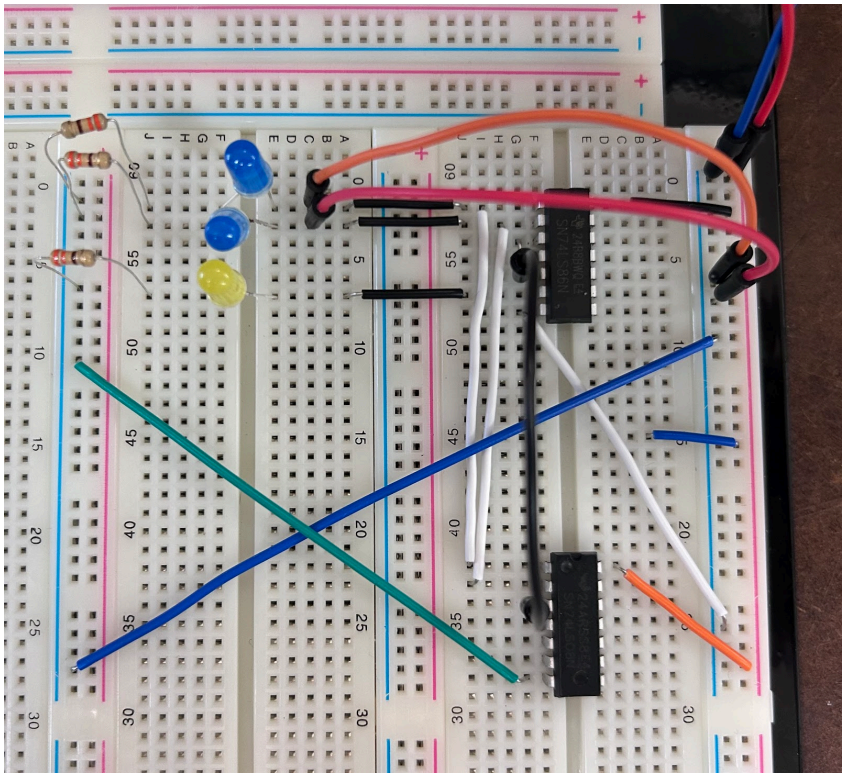


Fig. 1-A: Led A (Blue) Off and Led B (Blue) Off and Led C (Yellow) Off

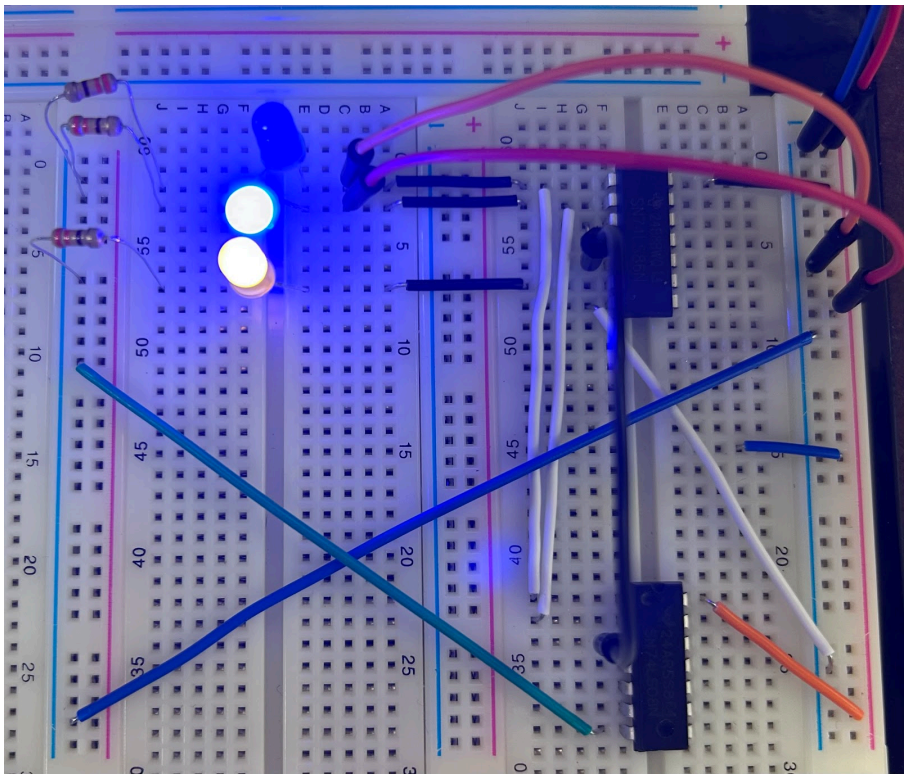


Fig. 1-B: Led A (Blue) Off and Led B (Blue) On and Led C (Yellow) On

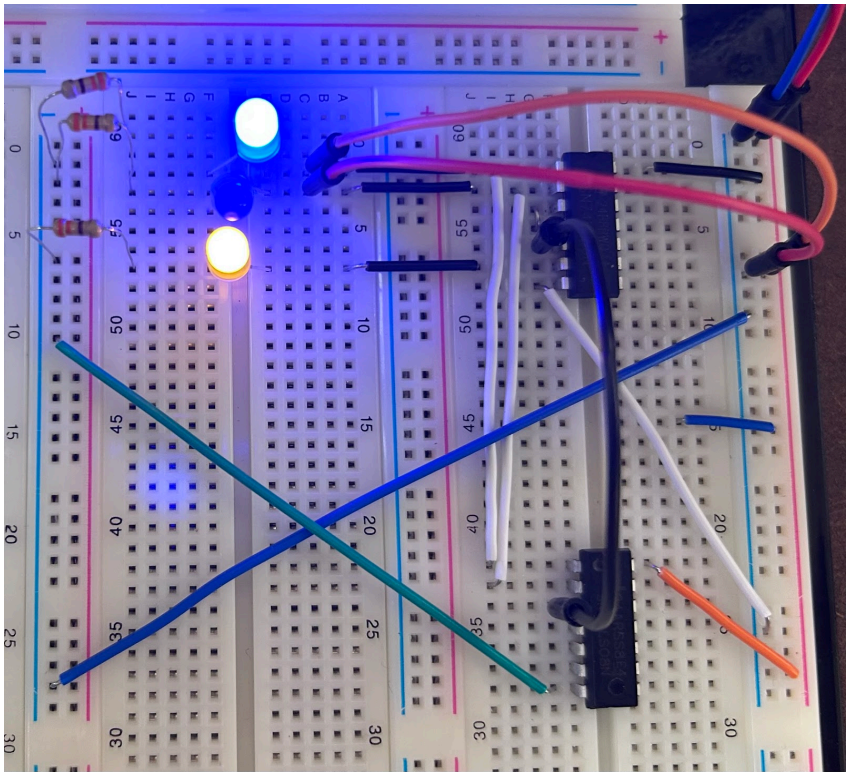


Fig. 1-C: Led A (Blue) On and Led B (Blue) Off and Led C (Yellow) On

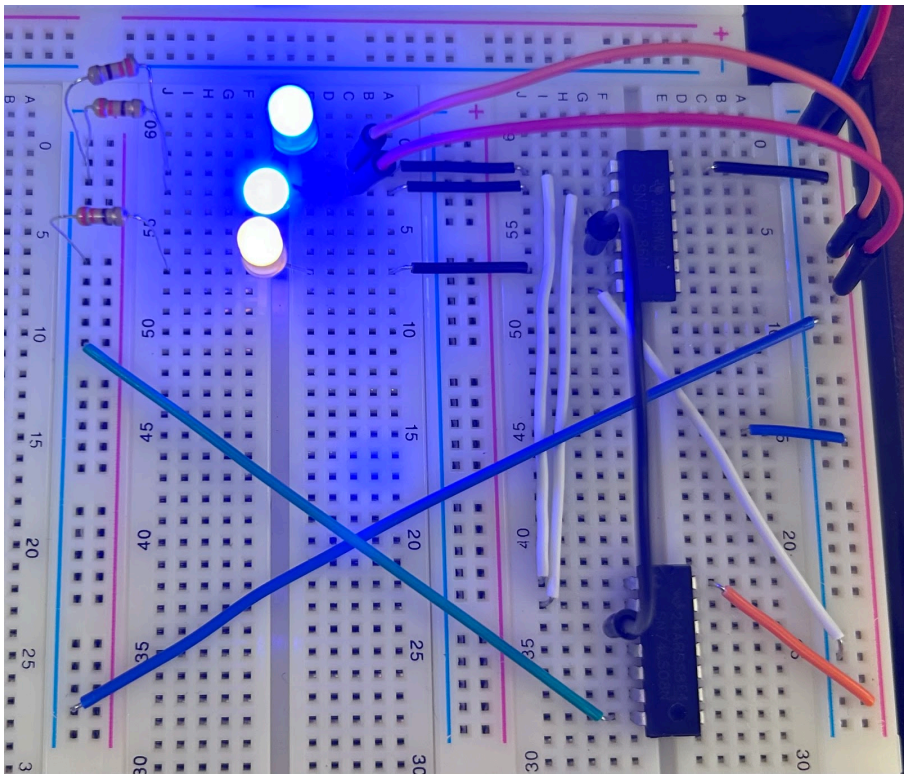
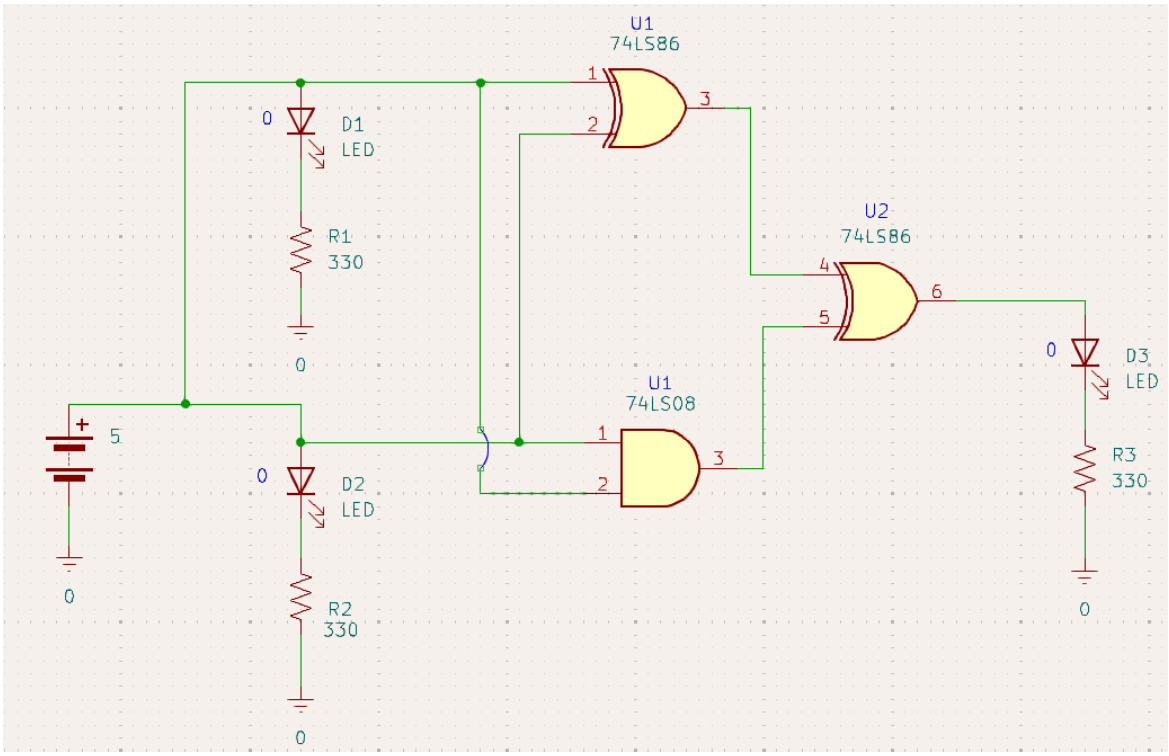
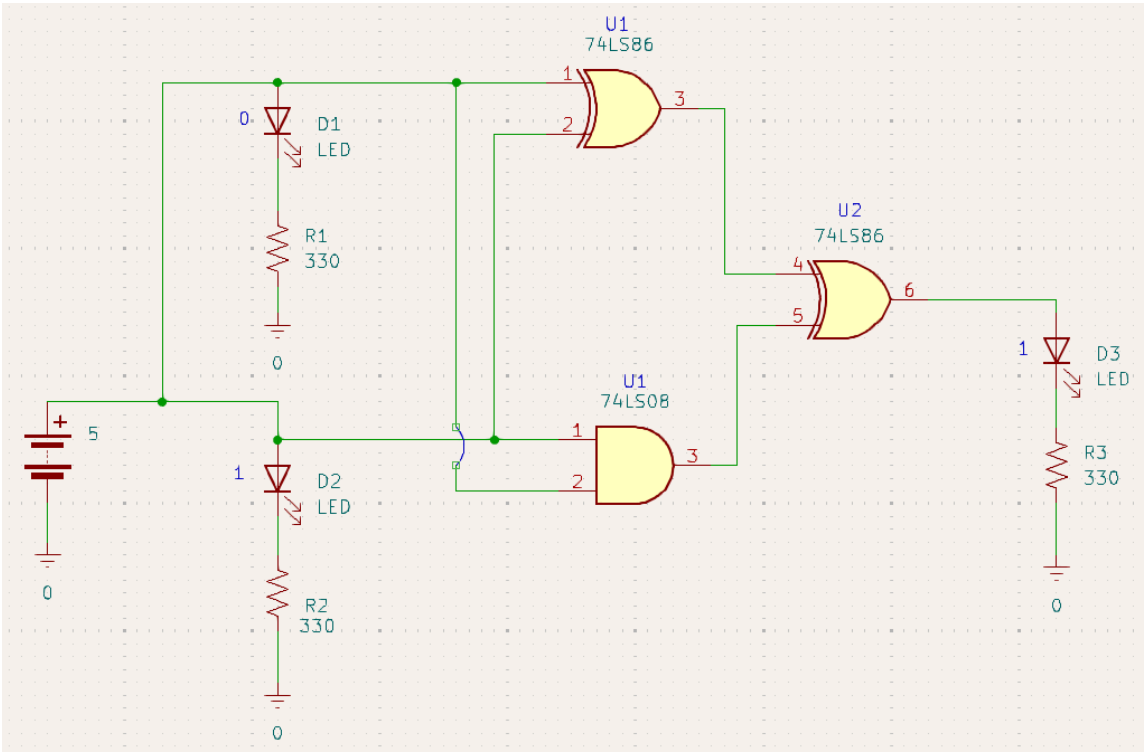


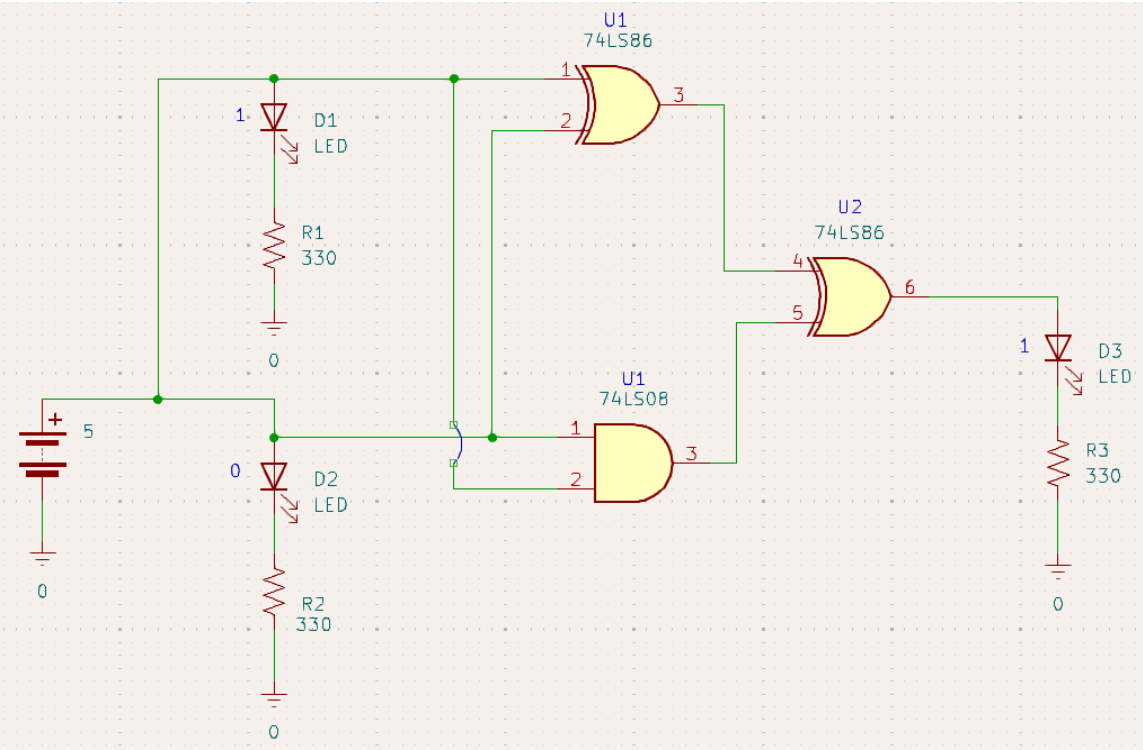
Fig. 1-D: Led A (Blue) On and Led B (Blue) On and Led C (Yellow) On



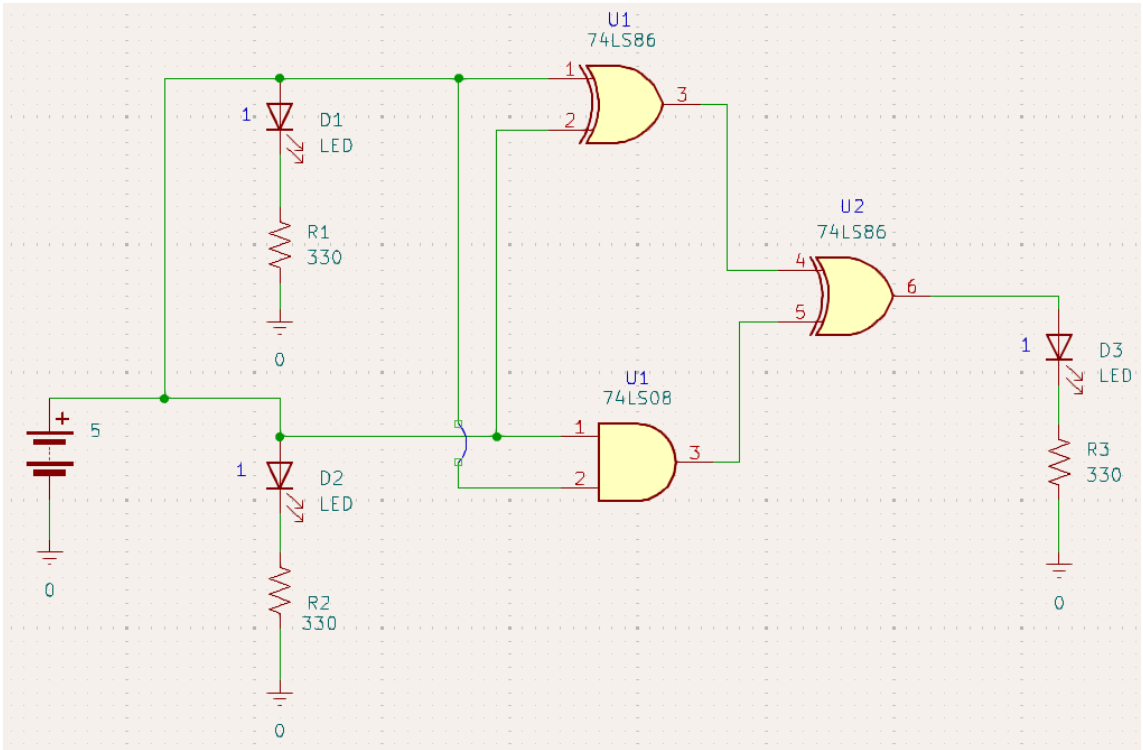
Circuit of Fig. 1-A: Led A (Blue) Off and Led B (Blue) Off and Led C (Yellow) Off



Circuit of Fig. 1-B: Led A (Blue) Off and Led B (Blue) On and Led C (Yellow) On



Circuit of Fig. 1-C: Led A (Blue) On and Led B (Blue) Off and Led C (Yellow) On



Circuit of Fig. 1-D: Led A (Blue) On and Led B (Blue) On and Led C (Yellow) On

Post-lab and Conclusion

Boolean Expressions:

XOR: $C = (\bar{A} * B) + (A * \bar{B}) = A \oplus B$

OR: $C = A * B$

$F = A*B \oplus (A \oplus B)$

Truth Table for F Function:

Key:

0 - Led is off

1 - Led is on

Led A	Led B	Led C $F = A*B \oplus (A \oplus B)$
0	0	0
1	0	1
0	1	1
1	1	1

Conclusion:

We could construct a circuit to represent the function of an OR using the simple AND gate and the XOR gate 74LS86. Using the circuit, we verified the truth table for the OR function. We verified the boolean expression for the circuit: $A*B \oplus (A \oplus B)$, where if either A or B is '1' or on, then C, our output is also '1' and the LED C is on, and if both inputs are '1' then then the output remains '1' and is off. This replicated the same outputs and results of a simple OR gate.