Lab 1: Digital Logic Gates

Joseph Martinsen

ECEN 248 – 510

TA: Michael Bass

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**Objectives:**

The purpose of this lab is to allow those performing the labs to become familiarize with basic logic gates and other electronic equipment in a simplified scenario. Through the use of Integrated Circuits (ICs), Dual-Inline Package (DIP) specifically, users become introduced to NOT gates, AND gates, OR gates, NAND gates, NOR, and XOR gates. It is one thing to read about how gates work and to analyze truth tables, it becomes more apparent once someone experiences the circuits hands-on.

**Design:**

Initially the power supply was set to output to five volts. The wire was then connected to the ‘+’ on the breadboard while the COM cable coming from the power supply was connected to ‘-‘ on the breadboard. Next a cable in series with the PWR for the IC (see diagram for appropriate IC) was connected in parallel with ‘+’. A cable in series with GND for the IC (see diagram for appropriate IC) was connected in parallel with ‘-‘. Next, cables coming out from the Oscilloscope were connected to the 1Y cable and to the GND cable in each case in order to measure the Voltage output.

The following are the diagrams for each appropriate Integrated Circuit.

|  |  |
| --- | --- |
| Or Gate | Exclusive or Gate |
| NAND Gates | NOR Gates |
| AND gate | NOT Gate |

All, with the exception of the NOT gate (SN74AS04), had an A and B input resulting in a Y output. The NOT gate had only one input A and one output Y. In order to pass power through the circuit, one cable was connected in series with 1A and other with 1B. The other ends of these cables were then connected to the ‘+’ or ‘-‘ row depending on which one was needed. The results were then recorded.

**Results:**

All the circuits, with the expectation of the first SN7432 IC, functioned properly. The first SN7432 did not seem to carry any current through the circuit. On a second go with a different SN7432N IC, everything functioned properly. The following are truth tables of the results. A and B refer to 1A and 1B in the previous diagrams.

|  |  |  |
| --- | --- | --- |
| **Table 1: Truth Table for Inverter (NOT Gate)** | | |
| **A (High/Low)** | **Y (Volts)** | **Y (High/Low)** |
| **Low** | 5 | H |
| **High** | 1 | L |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 2: Truth Table for AND & OR Gates** | | | | | |
| **A (H/L)** | **B (H/L)** | **AND2 (V)** | **AND2 (H/L)** | **OR2 (V)** | **OR2 (H/L)** |
| **L** | **L** | 0 | L | 0 | L |
| **L** | **H** | 0 | L | 5 | H |
| **H** | **L** | 0 | L | 5 | H |
| **H** | **H** | 5 | H | 5 | H |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3: Truth Table for NAND, NOR, & XOR Gates** | | | | | | | |
| **A (H/L)** | **B (H/L)** | **NAND2 (V)** | **NAND2 (H/L)** | **NOR2 (V)** | **NOR2 (H/L)** | **XOR2 (V)** | **XOR2 (H/L)** |
| **L** | **L** | 5 | H | 4.5 | H | 0 | L |
| **L** | **H** | 5 | H | 0 | L | 5 | H |
| **H** | **L** | 5 | H | 0 | L | 5 | H |
| **H** | **H** | 0 | L | 0 | L | 0 | L |

**Conclusion:**

This lab went very smooth without any major hiccups. I learned the basics of how to use a breadboard as well as its advantages over soldering. I also learned how basic controllers work through basic communication of 1’s and 0’s. This lab allowed me to realize the application of binary and controller communication occur on a first hand basis.

This basic introduction will allow me to be better prepared when trying to learn and complete other labs in the future.

**Questions:**

1. What did you like most about the lab assignment and why? What did you like least about it and why?

I liked being able to build circuits, even though it was the most basic of circuits. The breadboard was not the greatest.

1. Were there any section of the lab manual that were unclear? If so, what was unclear? Do you have any suggestions for improving the clarity?

I did not focus much on the lab manual, the TA made the lab very clear and apparent.

1. What suggestions do you have to improve the overall lab assignment?

A better breadboard.