Lab 8 - 4/18/22

Latches and Flip-Flops

EGT 245 - Digital Electronics

Johnny Rivera & Mason Milburn

Northern Kentucky University
Spring 2022

Introduction

The purposes of this experiment are as follows: allow students to build a physical circuit using multiple different components, build familiarity with lab equipment and the mentioned components, and utilize the learned formulae to compute theoretical circuit values, then test those values against real-world models.

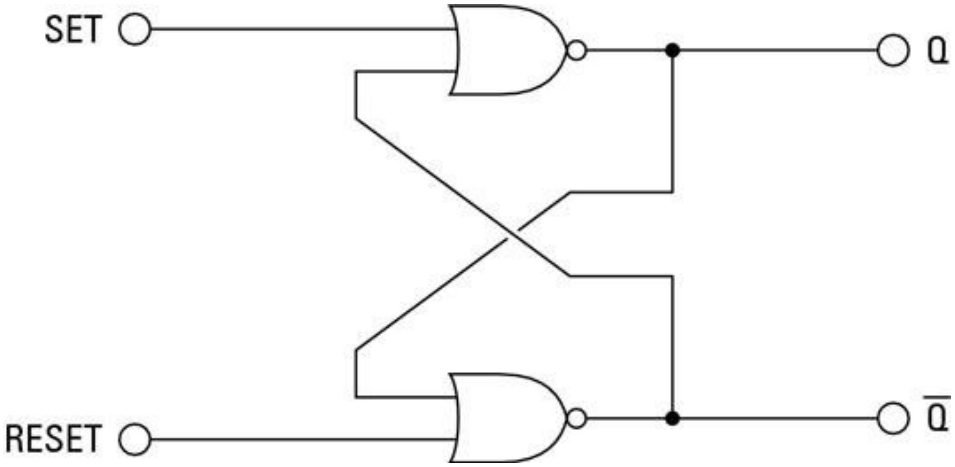
Required Equipment & Components

- 74LS00 (Quad 2-Input NAND Gate)
- 74LS74 (Dual D-Type Flip-Flops)
- Breadboard with Jumper Wires
- SPST Switch (x2)
- 5V Power Supply

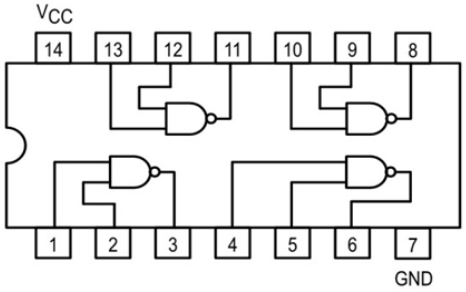
Theory

Two of the four NAND gates will be utilized to create an active-low latch. SW1, in this demonstration, will be debounced using the latch circuit. The output of the latch will be fed into the clock of one of the flip-flops. Each output of the flip-flop will be connected to an LED, indicating the current state of the flip-flop. In the next demonstration, the waveform generator of the electronics trainer will be fed into the clock of the flip-flop, with SW2 being used at the “D” input, providing the timing for the flip.

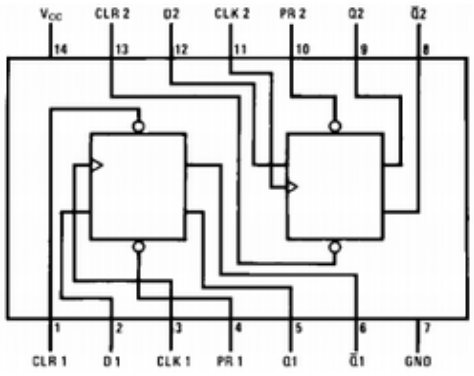
Component Layout



74LS00

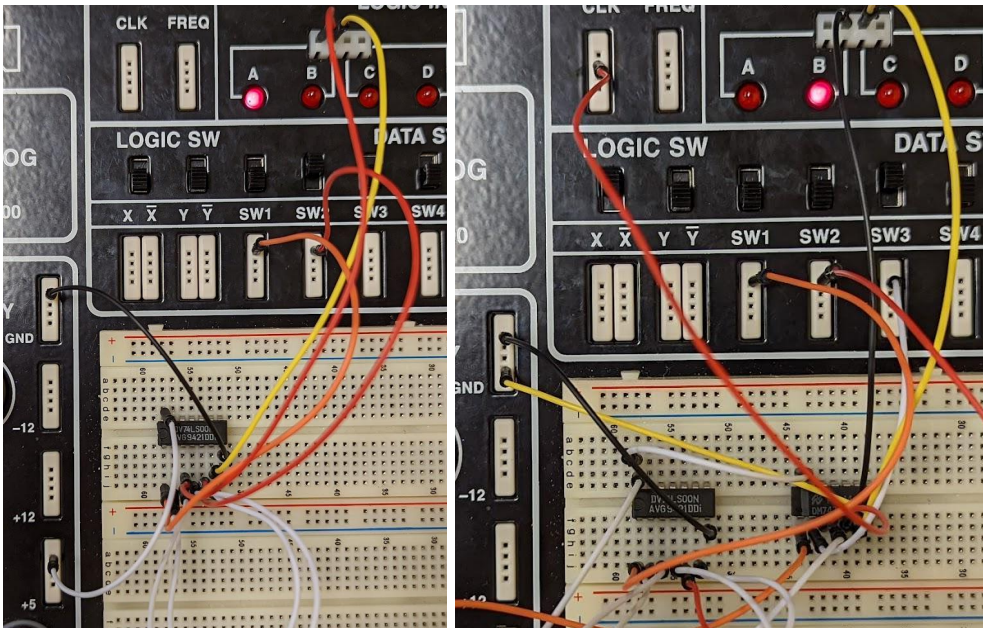


74LS74



Experimental Results

SW2: 1 **SW2: 0**



Conclusion

Through the use of latches and flip-flops we were able to demonstrate the logic behind these integrated circuits (IC). The IC chip that included NAND gates (74LS00) allowed us, when properly setup, to incorporate latches into our lab. The latches would be able to change the output when different inputs were sent through the circuit. The two outputs that were returned by the latch were “set” and “reset”. In order to get a “set” output the set input needed to be a low level while the reset input needed to be a high level, the opposite can be said about a “reset’ output. If by chance the inputs both were high levels then the latch would return the output that was previously given, no change in output. The flip-flop IC chip (74LS74) as the name suggests switches the output that is given by the use of one switch. It will jump from, in our case, one LED to the other sending a high level to light it up. Overall, we believe that through the use of these IC chips we learned valuable practical applications of latches and flip-flops.