Lab 4

Digital Logic: Clocks And Demultiplexing

Purpose

To understand how a clock controls a circuit and allows a series of events to occur.

Background Reading And Preparation

Read Chapter 2 to learn about basic logic gates and clocks. Concentrate on understanding how a clock functions.

Overview

Use a switch to simulate a clock, and arrange for the clock to operate a demultiplexor circuit.

Procedure And Details (checkmark as each is completed)

1. Obtain a breadboard, power supply, wiring kit, and parts box with the necessary logic gates as well as lab writeups that describe both the chip pinouts and the logic diagram of a demultiplexing circuit.
2. Use a switch to simulate a slow clock.
3. To verify that the switch is working, connect the output of the switch to an LED, and verify that the LED goes on and off as the switch is moved back and forth.
4. Connect the simulated clock to the input of a four-bit binary counter (a 7493 chip).
5. Use an LED to verify that each time the switch is moved through one cycle, the outputs of the counter move to the next binary value (modulo four).

6. Connect the four outputs from the binary counter to the inputs of a demultiplexor chip (a 74154).

7. Use an LED to verify that as the switch moves through one cycle, exactly one output of the demultiplexor becomes active. Warning: the 74154 is counter-intuitive because the active output is low (logical zero) and all other outputs are high (logical one).

Optional Extensions (checkmark as each is completed)

8. Use a 555 timer chip to construct a 1Hz clock, and verify that the clock is working.

9. Replace the switch with the clock circuit.

10. Use multiple LEDs to verify that the demultiplexor continually cycles through each output.

Notes