Lab 2

Digital Logic: Use Of A Breadboard

Purpose

To learn how to wire a basic breadboard and use an LED to test the operation of a gate.

Background Reading And Preparation

Read Chapter 2 to learn about basic logic gates and circuits, and read the beginning sections of this Appendix to learn about breadboards. Attend a lecture on how to properly use the breadboard and related equipment.

Overview

Place a 7400 chip on a breadboard, connect power and ground from a five-volt power supply, connect the inputs of a gate to the four possible combinations of zero and one, and use an LED to observe the output.

Procedure And Details (checkmark as each is completed)

1. Obtain a breadboard, power supply, wiring kit, and parts box with the necessary logic gates. Also verify that you have a copy of the textbook or a data sheet that specifies the pins on a 7400 (quad, two-input NAND gate).
2. Place the 7400 on the breadboard as Figure A1.2† shows.
3. Connect the two wires from a five-volt power supply to two separate sets of sockets near the edge of the board.
4. Add a wire jumper that connects pin 14 on the 7400 to five volts.
5. Add a wire jumper that connects pin 7 on the 7400 to zero volts. NOTE: be sure not to reverse the connections to the power supply or the chip will be damaged.

†Figure A1.2 can be found on page 334.

6. Add a wire jumper that connects pin 1 on the 7400 to zero volts.

7. Add a wire jumper that connects pin 2 on the 7400 to zero volts.

8. Connect the LED, from the lab kit, between pin 3 on the 7400 and ground (zero volts). NOTE: the LED must be connected with the positive lead attached to the 7400.

9. Verify that the LED is lit (it should be lit because both inputs are zero which means the output should be one).

10. Move the jumper that connects pin 2 from zero volts to five volts, and verify that the LED remains lit.

11. Move the jumper that connects pin 2 back to zero volts, move the jumper that connects pin 3 from zero volts to five volts, and verify that the LED remains lit.

12. Keep the jumper from pin 3 on five volts, move the jumper that connects pin 2 to five volts, and verify that the LED goes out.

Optional Extensions (checkmark as each is completed)

13. Wire the breadboard as shown in Figure A1.2 (pin 3 connected to pin 12, and pin 13 acting as an additional input).

14. Connect the LED between pin 11 and ground.

15. Record the LED values for all possible combinations of the three inputs.

16. What Boolean function does the circuit represent?