Lab 3

Digital Logic: Building An Adder From Gates

Purpose

To learn how basic logic gates can be combined to perform complex tasks such as binary addition.

Background Reading And Preparation

Read Chapter 2 about basic logic gates and circuits, and read the beginning sections of this Appendix to learn about breadboards.

Overview

Build a half adder and full adder circuit using only basic logic gates. Combine the circuits to implement a two-bit binary adder with carry 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 as well as lab writeups that describe both the chip pinouts and the logic diagram of an adder circuit.

2. Construct a binary half adder as specified in the logic diagram that your lab instructor provides.

3. Connect the outputs to LEDs, the inputs to switches, and verify that the results displayed on the LED are the correct values for a one-bit adder.

4. Construct a binary full adder as specified in the logic diagram that your lab instructor provides.

5. Connect the outputs to LEDs, the inputs to switches, and verify that the results displayed on the LED are the correct values for a full adder.

6. Chain the half adder circuit to the full adder circuit to make a two-bit adder. Verify that the circuit correctly adds a pair of two-bit numbers and the carry out value is correct.

Optional Extensions (checkmark as each is completed)

7. Draw the logic diagram for a three-bit adder.

8. Draw the logic diagram for a four-bit adder.

9. Give a formula for the number of gates required to implement an n-bit adder.

Notes