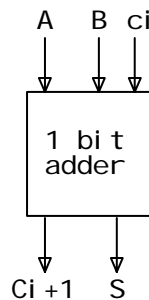


MASSACHUSETTS INSTITUTE OF TECHNOLOGY
6.071 Introduction to Electronics, Signals and Measurement
 Spring 2006

Digital Design

Design and Construct a 1 bit adder

As an example lets design an adder which is able to add two 1 bit digital numbers. This is called a 1 bit adder and schematically has the form



A and B are the digits to be added. Ci is the carry from the previous addition and Ci+1 is the carry after the addition. The basic rules for binary addition are:

- 1 + 1 = 0, Carry = 1
- 1 + 0 = 1, Carry = 0
- 0 + 1 = 1, Carry = 0
- 0 + 0 = 0, Carry = 0

The first thing to do is construct the truth table for this procedure.

A	B	Ci	S	Ci+1
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

As part of your laboratory you will design and then built this 1 bit full adder circuit using fundamental gates.

Download the LabView instrument called **adder_simulation.vi** from the class web site. Take a minute to familiarize yourself with the instrument. Your goal is to construct the circuit by using the gates provided and then run it to see the results which are presented on a timing diagram on the front panel.

Use CNTRL E to switch between the front panel (where you view the results) and the block diagram (where you construct the circuit).

CNTRL B cleans up the diagram of any unconnected wires.

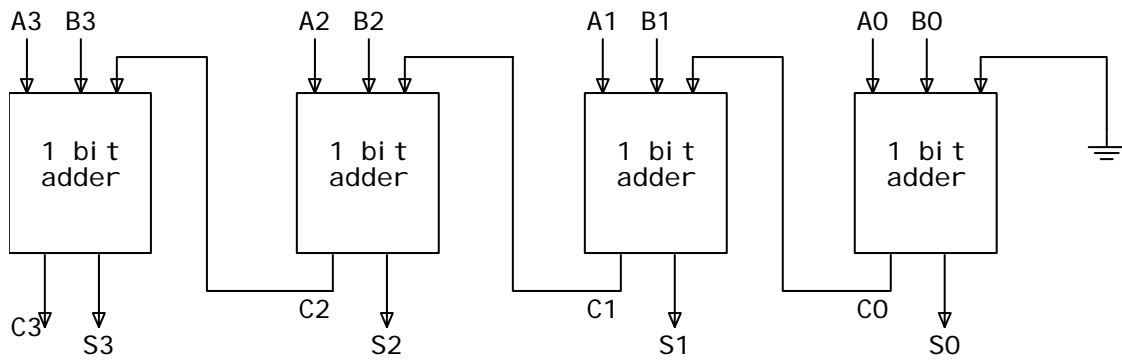
Delete all unused gates when done.

The code is ready to work once the right going arrow on the upper left hand corner is not broken.

Draw your circuit here and then construct it.

Try simplifying your circuit by using the XOR or the XNOR gates.

With this as your basic 1 bit adder circuit you will then built and test an adder circuit for two 4 bit binary numbers. The structure of the circuit is



This circuit will add numbers $A_0A_1A_2A_3$ and $B_0B_1B_2B_3$ by propagating the carry bit. Show the circuit on the space below.