



LE202 – Basic Electrical Engineering Lab II

Introduction to Logisim and Digital Board

What is Logisim?

Reference: Logisim official Documentation

Logisim is a simple logic simulator which allows logic circuits to be designed and simulated using a graphical user interface. Logisim is free software designed to run under Windows, Mac OS X, and Linux platforms. This software is very easy to learn and it allows simulation of very simple gate circuits as well as complex logic units. But it cannot handle analog circuit components.

The main window of Logisim is shown in Figure 1.

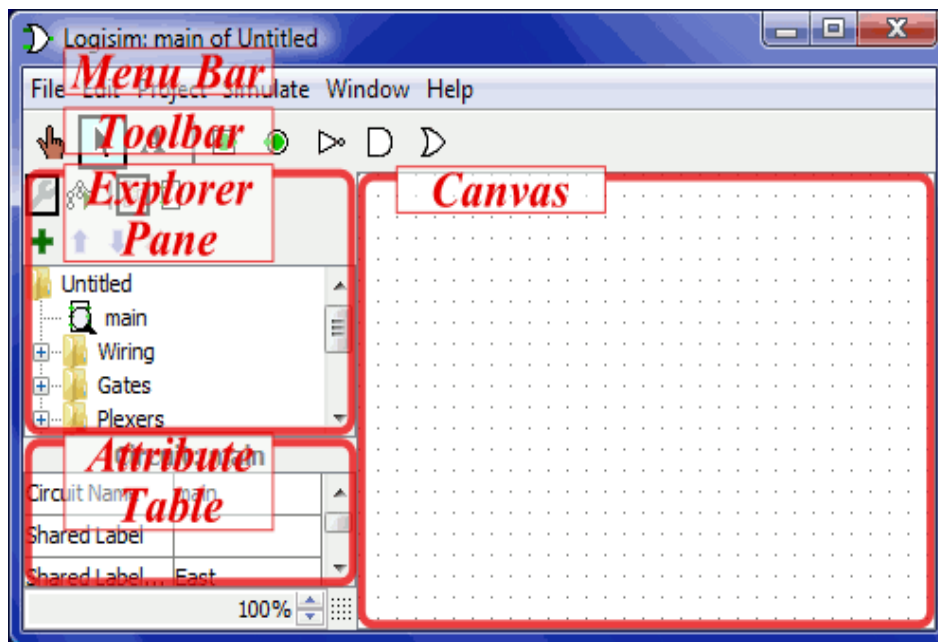


Figure 1. Main Window of Logisim

Let's design our first circuit in Logisim by building the circuit shown in Figure 2.

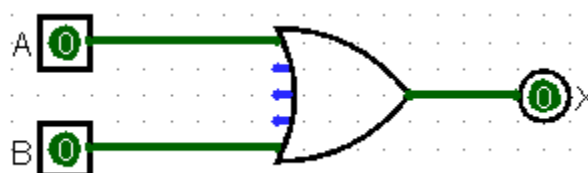


Figure 2. Function $X = A + B$

- Gates can be found in the explorer pane under “Gates”.
- Inputs and outputs can be found in the toolbar pane.
- Click on the required gate and click anywhere in the canvas.
- Label the inputs and the output of the pins in the attribute table
 - Select the pin
 - Go to attribute table
 - Label the inputs and the output (see Figure 3)

Selection: Pin	
Facing	East
Output?	No
Data Bits	1
Three-state?	No
Pull Behavior	Unchanged
Label	X
Label Location	West
Label Font	SansSerif Plain 12

Figure 3.

- Finally connect the wires.
- Wires appear automatically when the mouse is dragged from an input/output of one gate to output/input of another gate

The circuit is being simulated even while you draw it, and the values are updated always. The wire colors represent the logic value of that wire segment

- Blue : floating (unknown)
- Red : error value (unknown)
- Grey : unconnected wire
- Light green: logic HIGH
- Dark green: logic LOW
- Black : wire bundle (bus)
- Orange : The components attached to the wire do not agree in bit width

Try toggling the input values using the poke tool (👉). Fill out the truth table and check whether simulation results are correct

A	B	X
0	0	
0	1	
1	0	
1	1	

You can also get the truth table of the circuit from Logisim by using:

Menu_bar > project > analyze_circuit and click on *Table*

Digital Board and Breadboard

Now we will test an OR gate (IC 7432) by wiring up the circuit on the digital board. The two inputs of the OR gate are connected to “logic switch” and the output of the OR gate is connected to LED as shown in Figure 4. For your reference, Figure 5 shows how a breadboard is inter-connected. Do not forget to wire power and ground. Your circuit should look similar to the one shown in Figure 6. Make sure that your circuit works correctly and show it to your lab instructor.

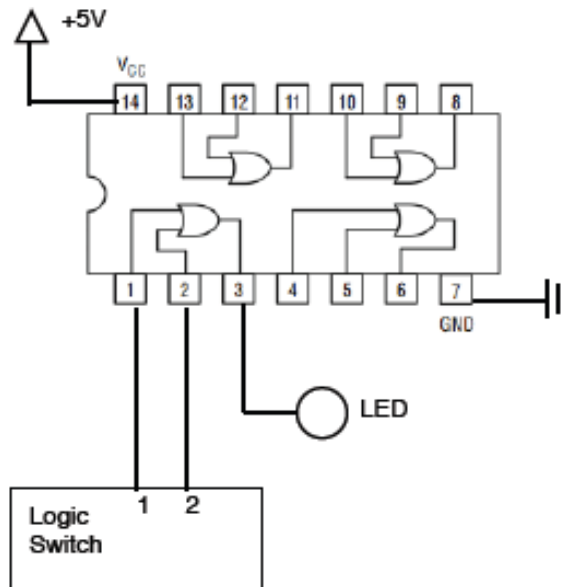


Figure 4

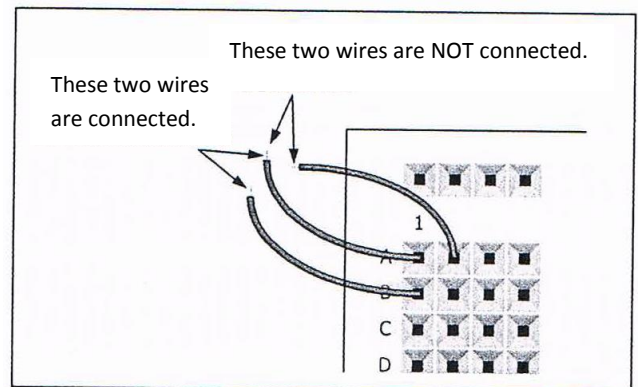
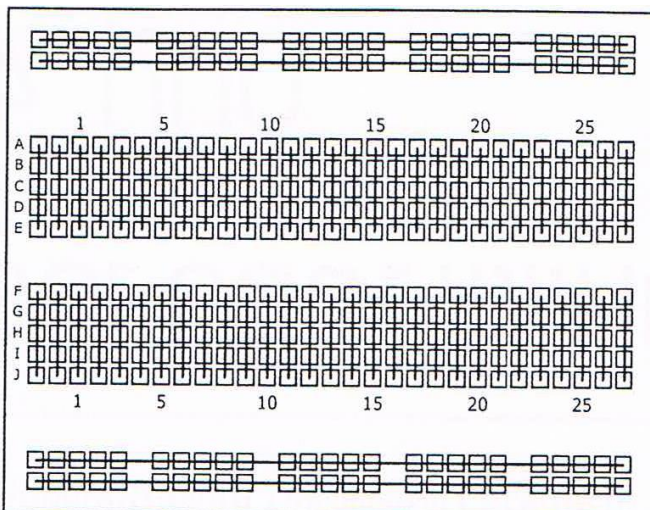


Figure 5. How to use a breadboard.

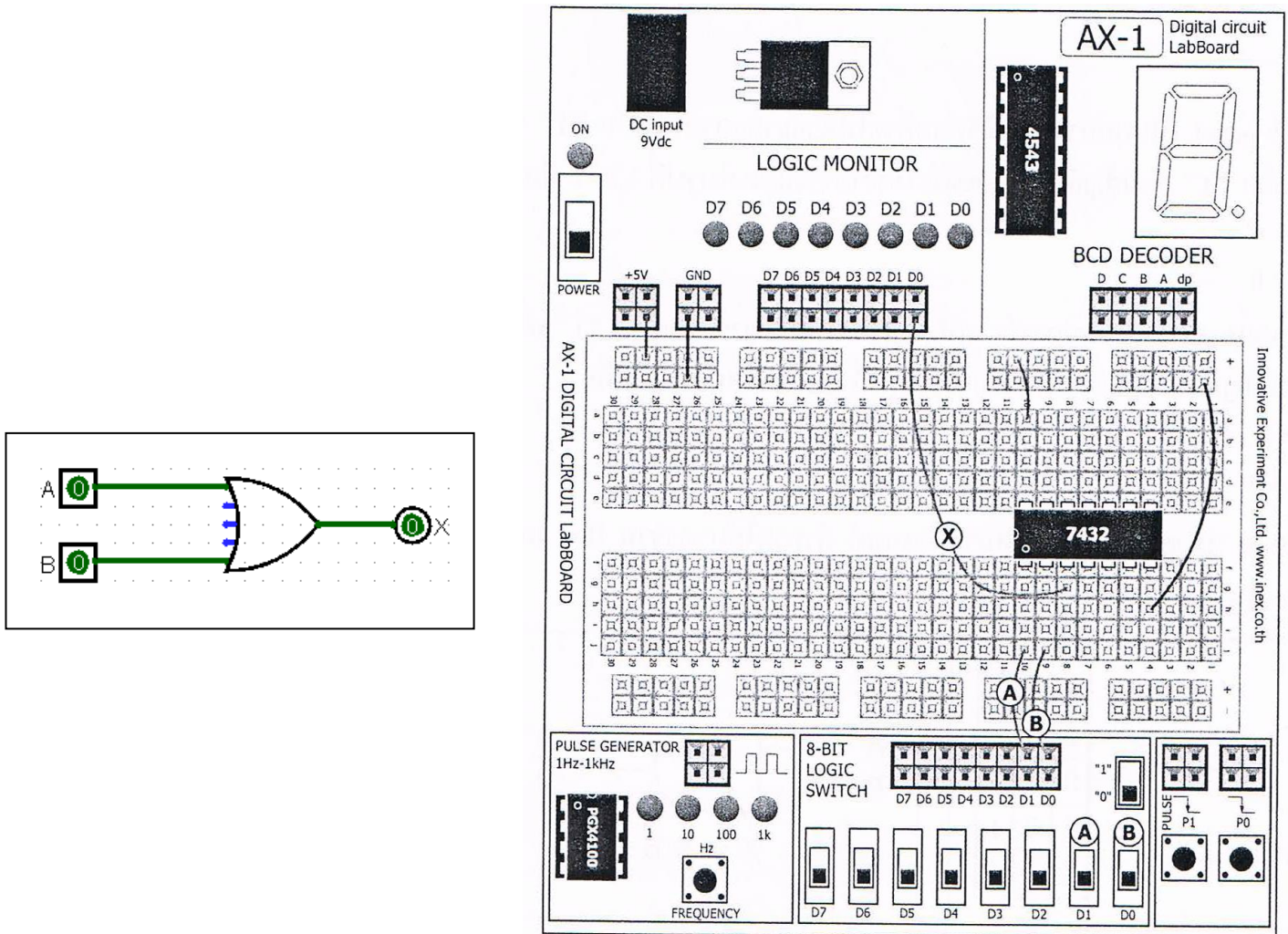


Figure 6. How to build function $X = A + B$ using a digital board.

AND (IC 7408) gate and NOT (IC 7404) gate

Repeat the above procedure but instead use an AND gate and a NOT gate on the digital board. Make sure that your AND and NOT gates are working correctly.