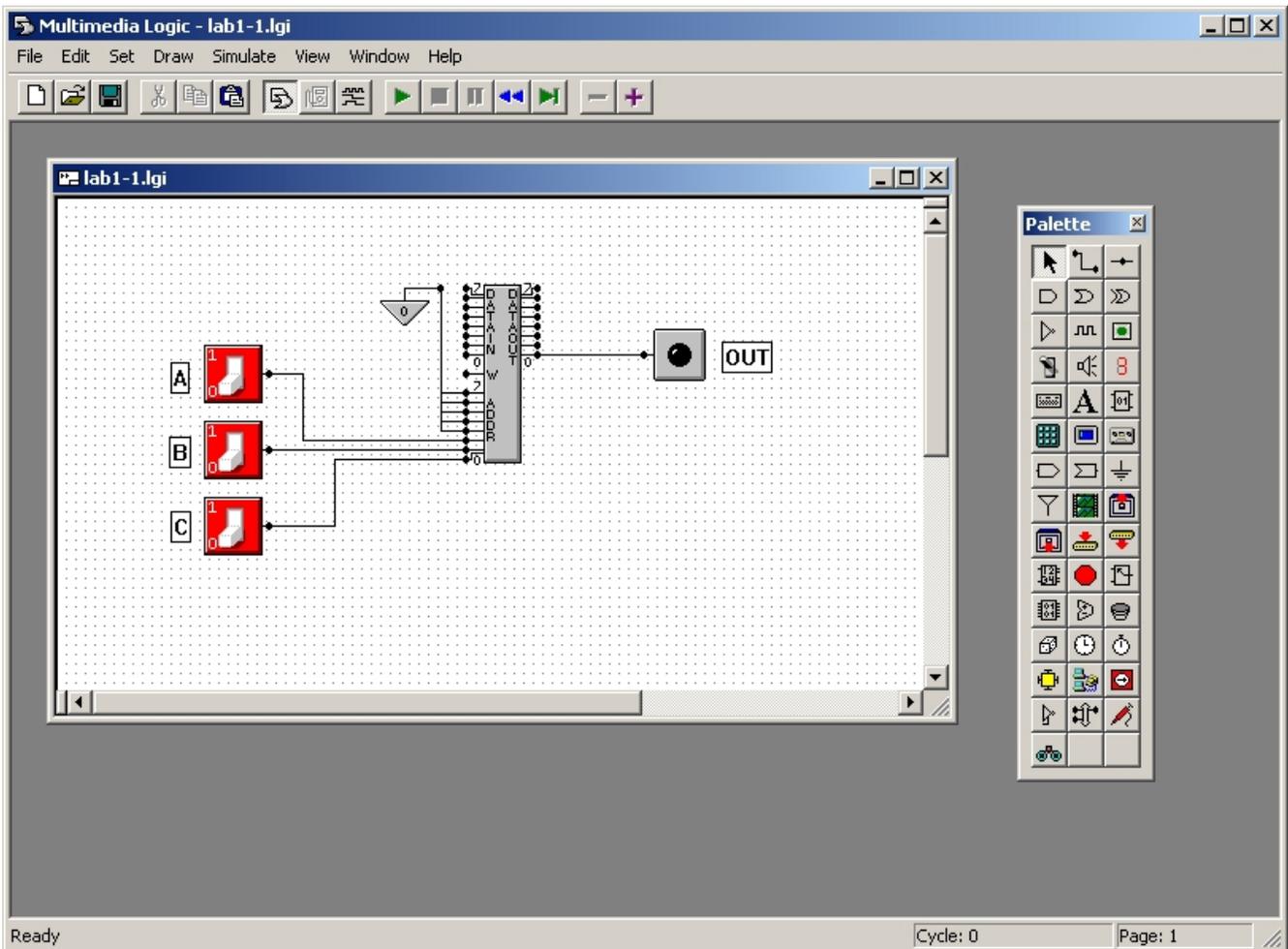


# A Very Brief Introduction to the MultiMedia Logic Simulator

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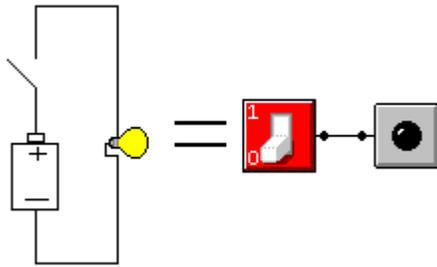
## Introduction

Welcome to one of the most simplest, most powerful, most universal languages known (Digital Logic). Most digital logic drawing systems are just that, drawing systems. Recently, some logic drawing systems allow circuits to be activated as they are drawn for testing purposes. But the input and output to these systems are typically files of numbers. The MultiMedia Logic Simulator has taken this one step further and introduced devices that connect directly to your computers' real devices (e.g. Keyboard, Screen, Serial Ports) including MultiMedia ones (PC speaker, Wave, Bitmaps).

The intent of this system is not to necessarily build the logic circuit you design. The intent is to use what you build, to allow experimentation, to learn and to have fun.

## What is a MultiMedia Logic Simulator

Lets start with, what is a logic simulator? A logic simulator is a high level simulation of a "digital" circuit, the kind used in a computer. At this level of simulation we ignore the details of the "real world" such as power for circuits, how fast circuits are, ground signals, cost and etc. These details are ignored so that you can deal directly with the logical aspect of the problem at hand. In the "real world", when you're ready to build your circuit you can worry about these details. Here is a simple example of real world versus the logic simulated world.



The great thing about the MultiMedia Logic Simulator is you can use your logic circuit without building real hardware, in fact you can connect it to (interface it with) real hardware (such as your keyboard, speaker, sound card, robot or another Logic Simulator).

## States of a node

The MultiMedia Logic Simulator is a 6 state simulator. A node can be in the following states:

- 0 LO (OFF or False)
- 1 HI (ON or True)
- U UNKNOWN (Neither True or False)
- Pulled down, acts like 0 but can be over driven
- + Pulled up, acts like 1 but can be over driven
- ? Floating, acts like U but can be over driven

What is UNKNOWN used for? In many circuits there are conditions where the simulator cannot determine if the state should be 0 or 1. You can think of the old saying "Innocent Until Proven Guilty". A node is UNKNOWN until it is proven to be 1 or 0 by the simulator. What this does is flush out initialization problems in your circuits. There are cases where the simulator cannot behave like an imperfect "real world" device and you need to override this behavior. You can do this by using a Force 0 or Force 1 property on a NODE device.

The +, - and ? are only produced by the Tristate Device and processed by the Bus Device. You don't need to understand these until you get to more advanced circuits.

## Modes of Operation

The Multimedia Logic Simulator can be in several different modes of operation.

- Ready mode, ready to start drawing or start simulator.
- Drawing mode, devices can be added, deleted, moved, wired and modified.
- Running mode, devices can be operated, heard, and seen.
- Pause mode, examine circuits by stepping through them one cycle at a time.

Click  to enter Drawing mode.

Click  to start the simulation.

Click  to stop a simulation that is running.

Click  to pause a simulation that is running.

Click  to reset a simulation that is paused.

Click  to run the simulation for one cycle and then pause.

## Pointer Tool

The pointer tool is the most common tool you will use. Use it to:

- Select a Device (single click on device).
- Select a Wire(s) (single click on end of wire(s)).
- Set Device Properties (double click on device).
- Move a Device (left mouse button down on device and then drag).
- Select a group of Devices (left mouse button and drag around devices).
- Delete Device(s) (Select Device(s) and hit <DEL> key).
- Copy Device(s) (Select Devices(s) and go to Edit Menu->Copy).
- Delete Wire(s) (Select Wire(s) and hit <DEL> key).
- Toggle Select (Hold <Shift> down while selecting).
- Clone Devices(s) (Select Devices(s) and Hold <Ctrl> down while dragging).

Note: Wires cannot be moved, you must delete them and wire again. However, they will be rerouted if you move a Device with wires connected.

## Wiring Tool

The Wiring tool allows you to connect devices.

Rules:

- For most devices, all the inputs nodes should be connected to operate.
- You always wire outputs to inputs.
- Outputs are on the right side of the device.
- Inputs are on the left side of the device.
- Outputs can have many connections.
- Inputs can only accept one connection.

To Wire a device:

- Select the Wiring Tool.
- Click the Left Mouse Button down (and hold it down) on a Node (black dot).
- Now drag it to another Node on another device and let mouse button go.

To Remove a Wire:

- Select the Pointer Tool.
- Click the left mouse button on either end of the wire.
- Hit <DEL>.

See Also:

[Node Tool](#)

See Examples:

WIRE.LGI

## Node Tool •

The Node tool allows you to make your wiring more aesthetically pleasing. It also allows you to override the Unknown state with 0 or 1 and allows you to add pullups or pulldowns.

Rules:

- Only one device may drive the node.
- The node may drive as many devices as you wish.
- You may connect as many nodes together as you wish.
- It is best to start from the driving device and work towards the inputs.
- If you connect two standalone nodes together a direction will be set for you.

To Select a Node once connected:

- Click the left mouse button near the node device, but not on the black dot.

See Also:

[Wiring Tool](#)

See Examples:

WIRE.LGI

[Options:](#)

If Unknown (Default Pass): Pass, Force 1 or Force 0.

If Floating (Default Pass): Pass, Pullup or Pulldown.

## Tutorial

This describes how to build a very simple circuit.

- Start a new circuit by clicking on  from the toolbar.
- Bring up the Tool Palette by clicking on  from the toolbar.
- Select the Switch by clicking on  from the palette.
- Place a switch by clicking the left mouse button on schematic.
- Select an LED by clicking on  from the palette.
- Place an LED by clicking the left mouse button to the right of the switch.
- Select the Wiring device by clicking on  from the palette.
- Click the left mouse button down on the output node (black dot) and hold it.
- Drag the mouse over to the LED input node (black dot) and let mouse go.
- Select the Pointer Tool by clicking on  from the palette.



- Double click on the center of the LED.
- Change the color to Yellow and Click OK.
- Disable the Tool Palette by clicking on  from the toolbar.
- Run the simulator by clicking on  from the toolbar.



- Click on the Switch  on the schematic and notice what happens.
- Stop the simulator by clicking on  from the toolbar.

This tutorial is designed to teach you the basics of using the simulator. It is not an attempt to teach logic design.