
Tips for Using Logisim

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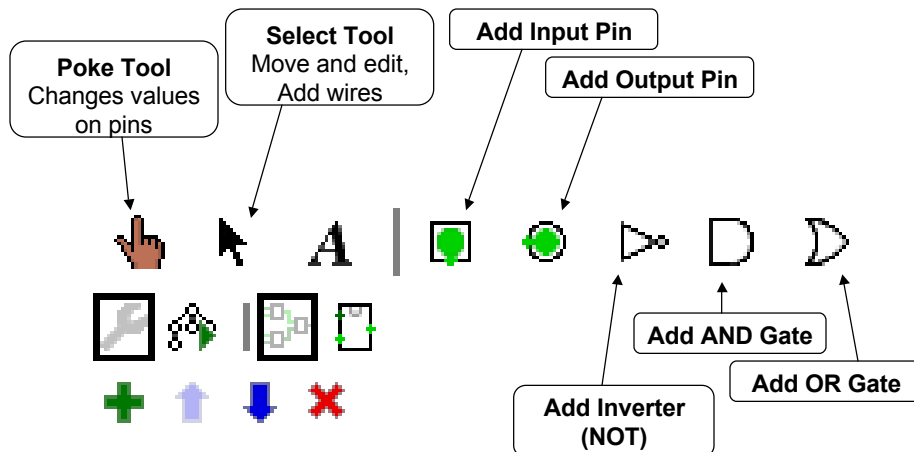
Sketch Your Circuit First

- Sketch your circuit on paper before entering it into Logisim.
- This will be easier than trying to maintain a mental map of your circuit.

Work in Increments

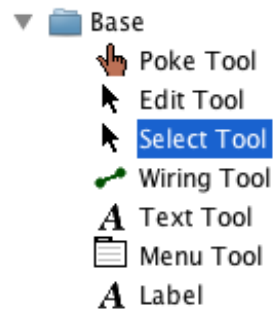
- Don't attempt to do a complex problem in one sitting.
- Instead try to stage the construction into steps.
- Save your work often, so that you don't lose anything.

Menu Bar in Upper Left Corner



Refined Tool Set in Base Menu

- The arrow tool in the upper left corner is multipurpose.
- For refined editing, you may want to select one of the tools in the Base folder.



Undo

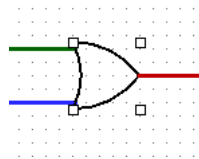
- Use command-z or control-z to undo most recent wires.
- There is no redo.

Select and Multi-Select

- To select multiple features, e.g. for copying or moving, use one of these methods:
Drag around the features in question, or
Shift click to add or subtract features to the current selection.

Selection Info (Lower Left)

- Provides info on, and allows you to adjust, parameters of current selection, such as:
Orientation of part (N, S, E, W)
Orientation of connector
Number of inputs (for gates)
Negation of inputs



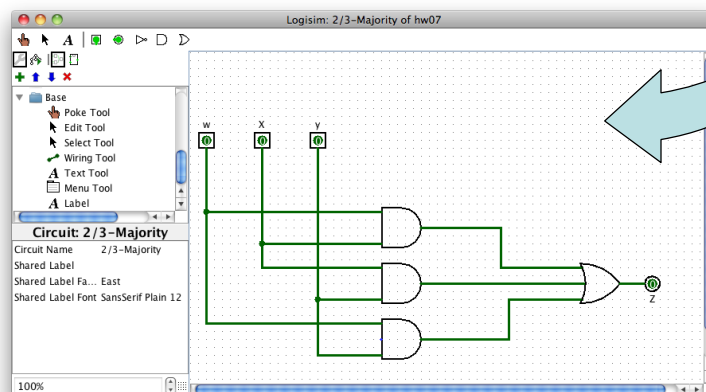
Selection: OR Gate	
Facing	East
Data Bits	1
Gate Size	Medium
Number Of Inputs	2
Output Value	0/1
Label	
Label Font	SansSerif Plain 12
Negate 1 (Top)	No
Negate 2 (Bottom)	No

Connection depends on Orientation

- Even pins have an orientation. If you do not have it set right, you will not be able to connect a wire.
- You can change the orientation of several items at once using multi-select.

Circuit Layout

- This is where the circuit is designed or edited.



Wire Coloring

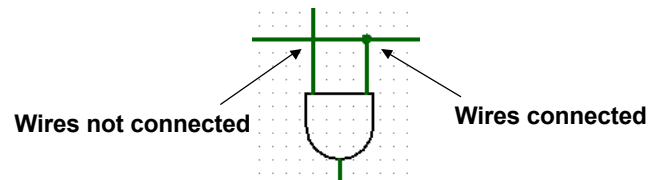
- Light green indicates wire is “hot” (logic 1), or “asserted”.
- Dark green indicates logic 0 is asserted.
- Blue indicates that wire is not connected.
- Red indicates two wires are connected that should not be (an error).

An Apparent Bug

- I’ve run into an apparent bug in Logisim several times.
- The problem is that a wire that is otherwise unconnected immediately turns red when I try to connect to one end of it.
- The remedy is to save everything, restart Logisim, then reload your project.

Wiring

- Sometimes it is easier to just run a wire again than it is to repair a misconnection.
- Using undo, you can make multiple tries at this.
- Look for the **junction dot** that shows whether wires are connected or not.



More on Wires

- Wires can cross, but not lay atop one another; they will get merged into a single wire.
- Wires can be copied and pasted just like gates.
- This is useful if you have to lay out several wires of the same length and orientation.
- Avoid dragging wires into gates and modules. This causes aberrations that are hard to undo.
- When laying a wire, you can drag in at most two orthogonal directions at once. To make more turns, release the mouse and then draw from the point of release.

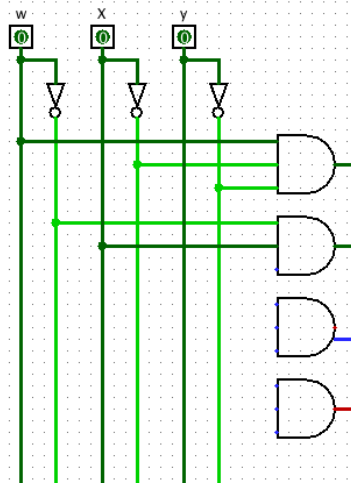
Still More on Wires

- Be careful about wires connected underneath gates, which can be hidden by the gate. These can end up shorting two wires (which will show as red).
- When selecting small wires near gates, the whole gate often gets selected in the mix. Move to the center and shift-click on the gate itself to drop it out.
- To move a connection wire, select the wire first, release (the ends of the wire will have small squares on them), then drag the wire. If you try to drag the wire directly, you may cause it to bud a new connection.

Layout as Rails

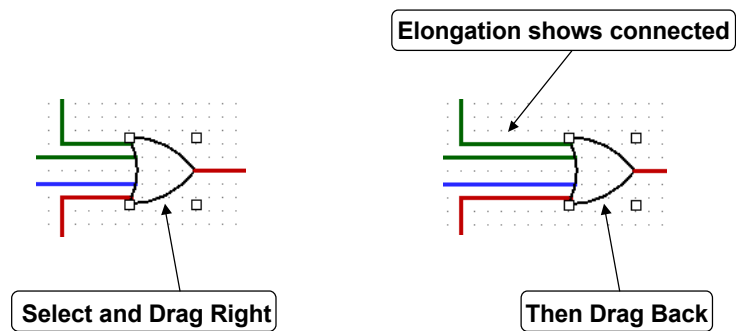
- A uniform and convenient layout scheme is to use vertical rails for inputs and their negations.
- This makes it easier to see what is connected to various gates.
- It is best to plan to use rails from the start.

Layout as Rails

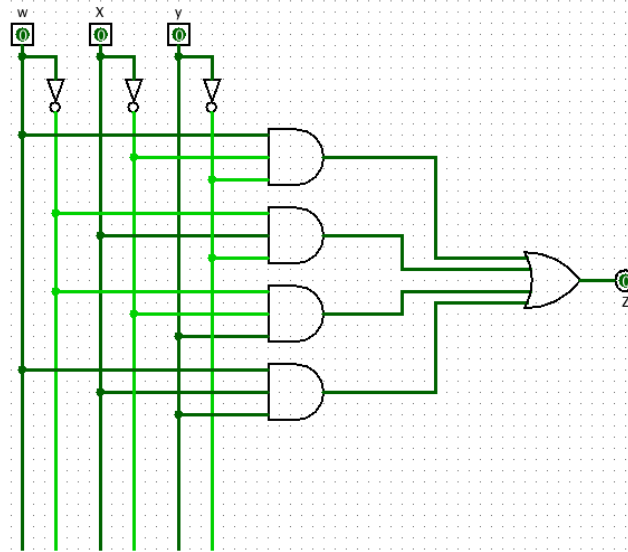


Three Pairs of Rails, one pair for each variable

Jog Parts to Check Connection



A Completed Circuit



Test Your Circuit

- Create a truth-table manually by trying all combinations of input.
- There is currently no automated way to do this, however, logisim will show the values, so they at least do not have to be computed by hand.
- Use the Poke Tool to toggle input pins, and observe output pins.
- Follow a “Gray-code” (reflective) pattern to minimize the amount of toggling.

Truth Table for Previous Circuit (using Gray-code order)

w	x	y	z
0	0	0	0
0	0	1	1
0	1	1	0
0	1	0	1
1	1	0	0
1	1	1	1
1	0	1	0
1	0	0	1

Build Circuits Hierarchically

- Above a certain level, keep basic gates to a minimum.
- Instead, built more complex circuits using other circuits you have designed as building blocks.
- For example, the Full Adder can be designed using just two blocks: a 3-input xor and a 2/3 majority. The ripple-carry adder can be designed using just Full Adders, etc.
- Note the analogy with programming by functional composition.
- Logisim makes it easy to select a circuit constructed, or partially constructed, at one level to be used in a higher level. The lower level circuit can be copied or edited after construction.

Determining Outputs of Modules

- If you hover over a pin of a module, a tool tip will appear giving the label on the pin, as derived from the design of the module.

Clean Up

- Clean up your diagrams when done.
- Just as no one likes to read unformatted code, no one likes to read a messy logic diagram either.