



[Home](#) » [Tutorials](#) » [Background](#) » [Multiplexers](#)

Multiplexers

2 min · Justin Rajewski | [Suggest Changes](#)

A multiplexer is a circuit that allows you to **select** one of many inputs to be it's output. The output mirrors the selected input, so when that input is 0 the output is 0, when it is 1 the output is 1.

Multiplexers are often shown like this

One of the inputs **a** through **f** is selected to be passed on through the output **g** by the **sel** input. In this case, the **sel** input is six bits wide and is one-hot encoded. That means when **sel** is 000001 input **a** is selected, while 000100 selects input **c**.

When you draw out circuits you should always use the block shown above as it is very clear what the circuit is doing and it is compact. However, it is important to understand how a multiplexer works. There are actually many ways to implement a multiplexer, each with their own trade offs. The circuit below is one of the more basic implementations.

The input **sel** is split into it's six bits, each being fed into a different and gate. If an input's corresponding **sel** bit is 0 then the input is blocked from the output, however, when the **sel** bit is 1 then the output of the and gate mirrors the input. Since only the selected and gate can be 1 at any time the output **g** is the same as the selected and gate.

This circuit is very useful when you want to implement some conditional logic, like *if X do this, else if Y do this, else do this*. You just have to design a circuit that outputs the correct one-hot code for each condition to select the output you want.

[« PREV](#)[Encodings](#)[NEXT »](#)[Addition](#)



© 2025 Alchitry