# Exclusive OR gates

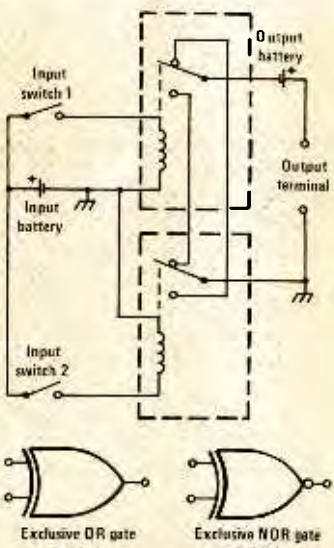
The basic building blocks of all digital circuits are *gates*—AND, OR, NAND and NOR. Using the right combination of these gems you can build circuits that can do just about anything.

AND and NAND gates give you the proper output when all of their input lines are *on* or *high*. OR and NOR gates give their proper output when any combination of input lines are on. So, if you wanted something to happen when either the front or back doorbell was rung, and either the radio or television was on, you'd use two OR gates and one AND gate.

But, suppose you had to design a circuit that did something when *only one* of several signal lines was on? The standard OR and NOR gates will operate when just one of its input lines is on. But, it also operates when more than one of the lines is on. What you need is a gate that is exclusively an OR gate; never an AND gate.

Well, there is a gate that does just that. And, believe it or not, its actually called an *exclusive OR* gate.

One good way to think about gates is in terms of relays. When a relay coil is energized by the proper combination of input lines being on, its contacts close connecting a battery to the output terminal.




As you can see, the output battery circuit includes not one, but two relays. If either one of the relays is energized, the circuit path is completed. However, if the second relay is also energized, the path is opened. Adding a third or fourth input really complicates matters. But the principle is the same.