

# PACE Electrical Engineering

## Circuit Concepts

### Introduction

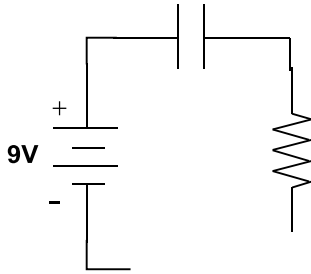
This short lesson covers a few important circuit concepts.

### Circuits

A circuit is an interconnection of electronic components.

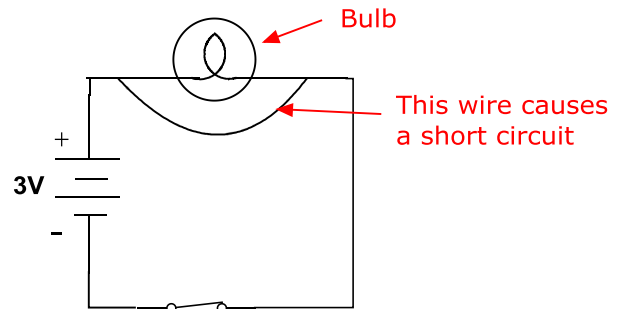
### Open Circuit

A circuit is designed to perform useful functions. In order for an electronic circuit to work, a current must flow through the circuit components in the way the designer intended. For a current to flow there must be a path through the circuit from a source of current, a battery or outlet, for example, to a sink (the other end of the battery or the other slot in the outlet). A break or discontinuity in any path that causes current not to flow through a part of the circuit is an **open circuit**. An open circuit could be one reason why a circuit does not work correctly. Sometimes an open circuit is desirable. A switch in the off position causes an open circuit and thus turns off a light or an appliance. When a fuse blows or a circuit breaker trips it causes an open circuit that protects a component from damage due to excessive current.



### Short Circuit

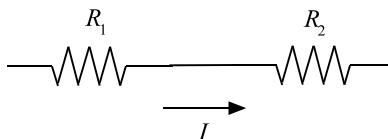
Another condition that can cause a circuit to malfunction is a **short circuit**. A short circuit occurs when a very low resistance alternate route is present in a circuit that diverts current from flowing through a desired circuit element. For example, if a wire is placed between the two connections to a light bulb, current will flow through the wire and not the bulb.



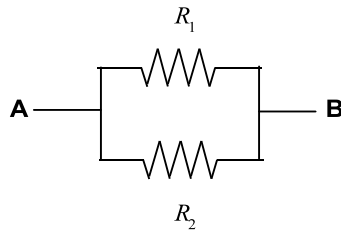
### Series and Parallel Circuit Connections

Circuit elements can be interconnected in a variety of ways. Two important ones are series and parallel connections.

Two or more circuit components are connected in **series** if it is the case that when current flows through one of the elements, the same current must, of necessity flow through all of them. Basically, the elements are connected end-to-end.



Two or more circuit components are connected in **parallel** if each provides an alternate path between two points in a circuit.



In the circuit above,  $R_1$  provides a path from point A to point B.  $R_2$  provides an alternate path between the same two points. Therefore,  $R_1$  and  $R_2$  are in parallel.

Note that elements do not have to be connected in either series or parallel. Notice that in the circuit below, no element is in series or parallel with any other element.

