



The Circuit Triangle

3 Elements of the Triangle

Power Source

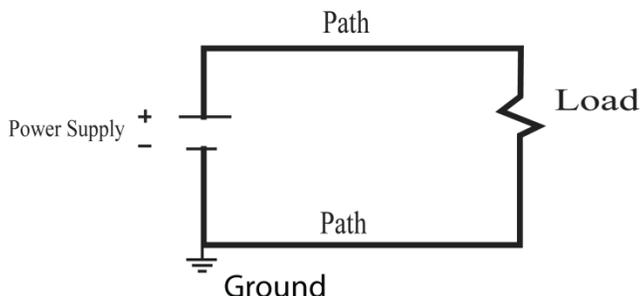
A power source (supply) has a difference of potential and can create sufficient current suitable for the load. For example, a 24 V dc solenoid that is rated at 3 watts requires a power supply capable of supplying 0.125 amperes at 24 V dc (watts = volts x amps).

Completed Path

To make a completed path, there must be a path from the high side of the power supply to the load and separate return path from the load back to the low side of the power supply. This return path is sometimes referred to as neutral or ground, if it is connected to earth ground.

Load

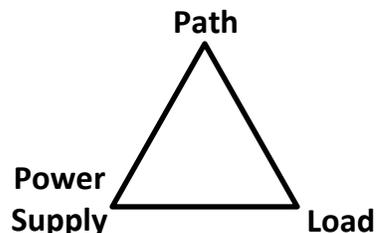
A valid load is the final element. Energizing the load is generally the purpose of the circuit. Prime examples of a load would be the coil of a contactor, a solenoid, a heater or a motor.



Power supplies, loads and circuit paths must be sized for the amperage. It takes physical mass to carry current. If someone tells you "it's broken", then follow these steps to troubleshoot the circuit.

Designing & Troubleshooting

When designing or troubleshooting a control or power circuit, keep the circuit triangle in mind.



- 1) **Power Supply:**
 - a. Check to make sure it is turned on. Is there an indicator lamp? If the lamp isn't lit, that is a sign the power is not on.
 - b. Calculate the load (volts x amps = watts); is the wattage sufficient to power the load? (loads have nameplates or other markings that indicate the wattage used or the voltage and amperage at which they operate)
- 2) **Path:**
 - a. Is the circuit breaker tripped/open?
 - b. Is the fuse blown?
 - c. Are wires loose? Sometimes vibration can loosen previously tight connections.
 - d. Is a start switch open or a stop button depressed? A toggle switch or selector switch may be in the wrong position.
- 3) **Load:**
 - a. Is the load present? Loads use power to do work. The circuit isn't complete without one. A load is typically a pilot light, heating element, motor or receptacle. A receptacle itself only serves as a load when something is plugged into it. Otherwise, it's an open circuit.
 - b. Could there be a short in the load itself or a loose connection inside the load?
 - c. Does the load operate when connected to another power supply?

Always use safe work practices. Refer to OSHA and NFPA 70E Standard for Electrical Safety in the Workplace.

