Relays

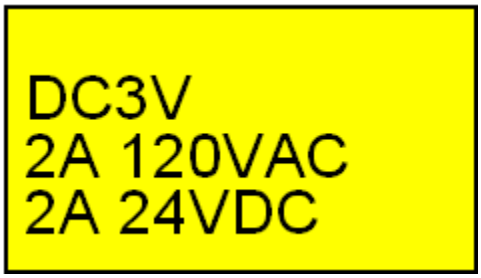
Relays are a special type of electrical switch that opens and closes under the control of another electrical circuit. Destination ImagiNation® teams should spend some time learning about relays because they allow a low voltage circuit to control a much higher voltage circuit. Relays can be used to create some unique technical devices.

In its simplest form a relay switch is operated by an electromagnet to open and close one (or many) sets of contacts. This type of relay is a mechanical relay and you can here the switch "click" when power is applied to the relay and the magnet activates the switch. There are also solid state relays which have no moving parts. The internal operation of mechanical and solid state relays is different but externally they operate basically the same.

Animated picture of a mechanical relay in action.

There are several things teams must consider when using relays. All relays have two basic ratings: A coil rating and a switch rating. The coil rating is the voltage that is required to operate the relay. The switch rating is the amount of current that the relay can safely switch. You may find that many relays have two switch ratings - a DC voltage rating and an AC voltage rating. Usually the AC voltage rating will be much higher than the DC voltage rating because there is less chance of an arc (or short) with AC current.

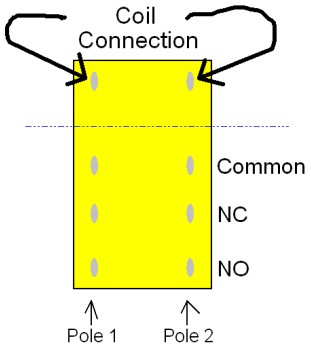
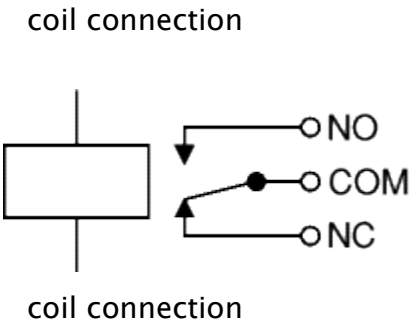
The graphic on the right shows the ratings that you might find on a relay package. In this case, this is what is actually printed on a relay that is used for some of the examples on this website. This indicates that it takes 3 volts (DC power) to switch the relay and that the relay contacts are capable of switching a 2 Amp circuit at 120 Volt AC or at 24 Volts DC.



Since relays are a type of switch, the terminologyused for switches is also used for relays. A relay can switch one or more poles, each of whose contacts can be thrown in

one of several ways. Normally Open Contacts connect the circuit when power is applied to the relay coils. When power is disconnected from the relay coils the circuit is disconnected. Normally Closed Contacts disconnect when power is applied to the relay coils. Power is applied to the circuit when there is no power applied to the relay coils.

Every relay will have 2 coil contacts and two or more switch contacts depending on the type of relay.

This is a sketch of the relay used in the examples in the tinkering section of the tutorials. It has 8 contacts. The top 2 contacts are the coil contacts. This is where you would attach the power leads (3Volts in this case) to turn the relay on and off. On each side below the coil connections are three sets of pins. This is a double pole relay so it can control two circuits. The top pin is the common pin. Typically you would attach one leg of your power supply to this pin. With no power applied to the relay there would be a complete (or closed) circuit between the Common Pin and the NC (Normally Closed) Pin. When power is applied to the relay coils the connection between the common pin and the NC pin would open and there would be a complete (or closed) circuit between the common pin and the NO (Normally Open) pin.	
This is the schematic symbol for a DPDT relay. Schematic drawings are not currently discussed on this website but this schematic helps to understand the connections to a relay. The block on the left side represents the coils and the two wires extending up and down are the coil connections. When no power is applied to the coil the common connection is connected to the normally closed connection. When	

power is applied to the coil leads a connection is made between common and the normally open connection. This opens the normally closed connection.	

The "tinkering with a rc car" section of the tutorials shows some examples of using a relay switch with a remote control car.

One type of relay that teams may wish to investigate is a latching relay. A latching relay is sometimes called a "keep" relay. A latching relay remains in its last state when power to the coil is removed. This is useful because it does not require continuous application of power to the coil to keep the controlled circuit closed. The next time power is applied to the coil the relay reverses it state.

How Stuff Works has an article on relays that may be helpful in understading how relays work.

Source: http://tech.texasdi.org/relays