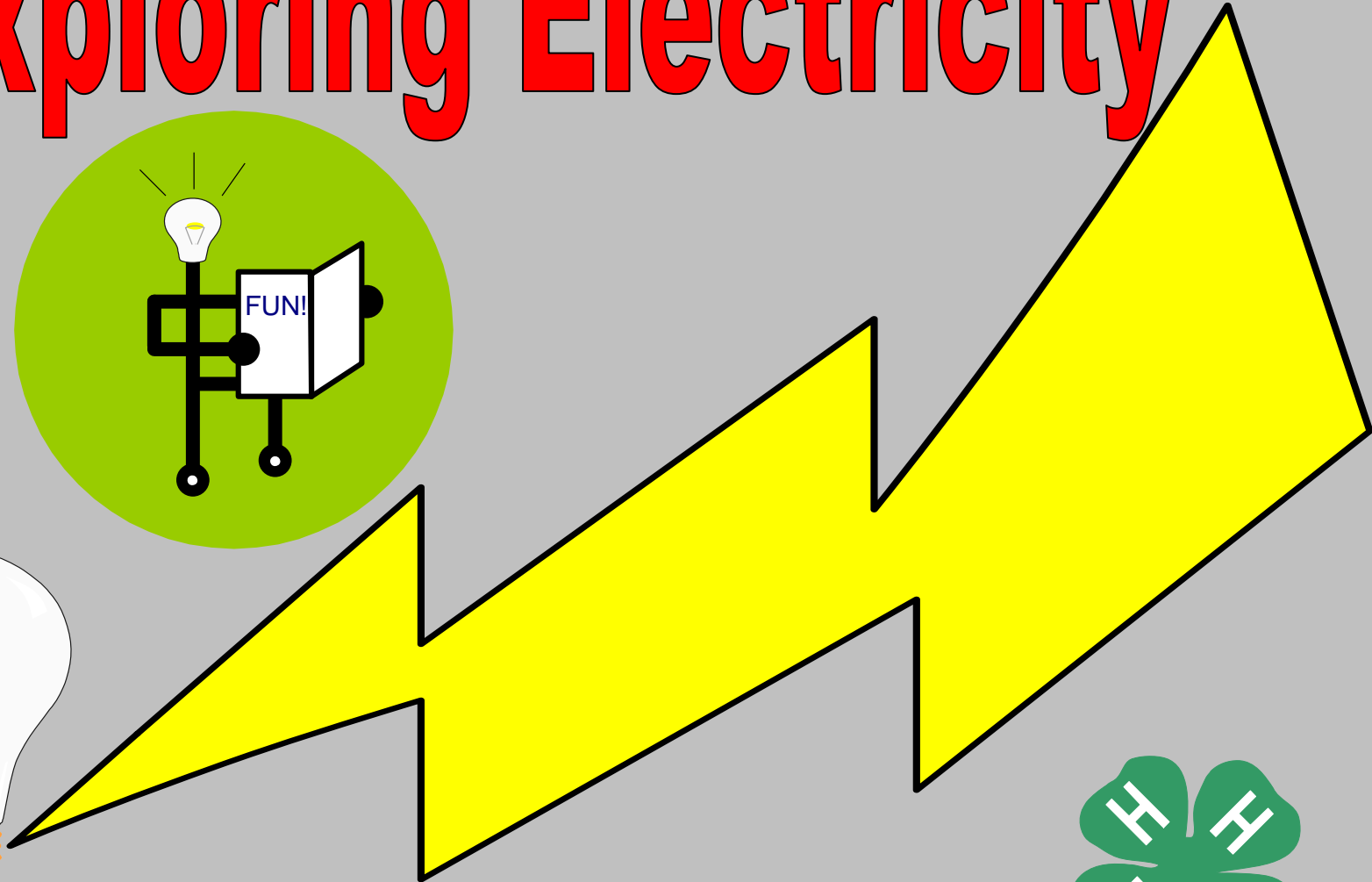
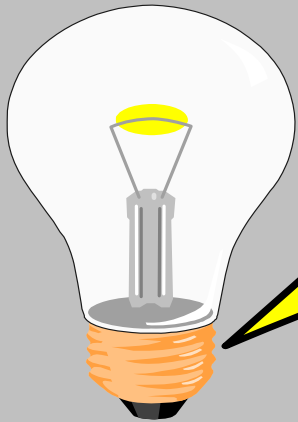
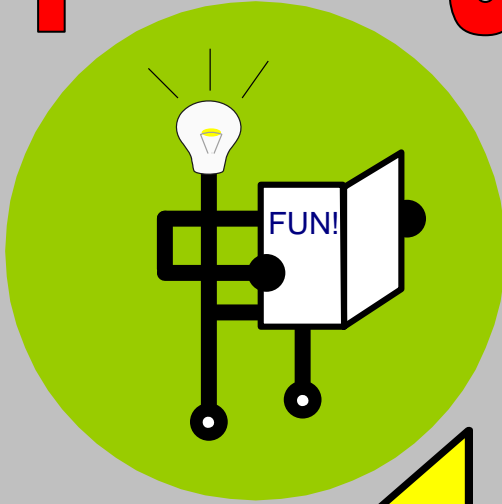


Exploring Electricity



6 Volt Lantern Battery

Spring terminals
(also available in screw terminals)

Alligator Clips

Best method to attach wires to the spring terminals on a lantern battery.

Wire

18 gauge, single conductor. Black, Red, White colors.

6 Volt Miniature Light Bulb

Threaded type to screw into lamp holder

Lamp Holder

Miniature lamp socket

**Knife Switch
Single Pole, Single Throw**

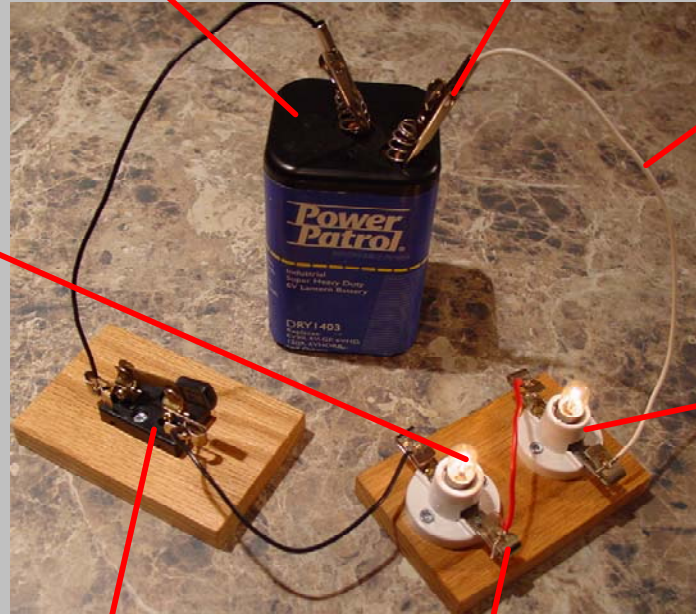
Modified with Fahnestock clips for easier wire hook-up

Fahnestock clips

Allows the wire ends to be connected to switches, lamps, etc. with less tools. Spring loaded clips.



Knife Switch
(close-up)



DC I LAB PARTS

DC I LAB PARTS continued

BILL OF MATERIALS

<u>Designation</u>	<u>Qty</u>	<u>Part Number</u>	<u>Description</u>
Battery	1	7690K131	McMaster-Carr 6 Volt Lantern Battery
Alligator Clips	2	SB23790M	5 black, 5 red per pkg
Wire	3 ft*	8073K671	McMaster-Carr 18AWG solid hook-up, black
	3 ft*	8073K674	McMaster-Carr 18AWG solid hook-up, white
	3 ft*	8073K677	McMaster-Carr 18AWG solid hook-up, red
Lamp Holder	2	SB18052M	miniature lamp, plastic, sold in pkg. of 10
Light Bulb	2	SB08687M	miniature srew base, 5-6 volt
Knife Switch	1	SB09736M	Single Pole Single Throw
(optional)	1	SB24049M	Double Pole Double Throw
(optional)	2	SB09737M	Single Pole Double Throw
Fahnestock clips	6	SB19192M	sold in pkg. Of 100
Base Board	2		½X3X3 oak, LOWES

* wire sold in 100' spools

Part Number in the format 'SBnnnnnM' are fNASCO SCIENCE parts (www.eNasco.com)

McMaster-Carr www.McMaster.com

What is Electricity?

Electricity—invisible **force** created by **opposite charges** in the smallest particles called **electrons and protons**. Opposite charges are categorized as either **positive** or **negative**.

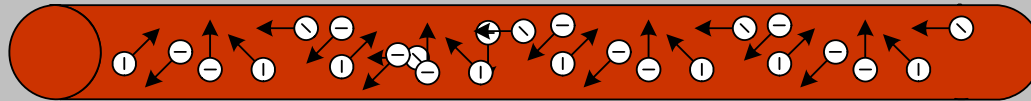
Electricity can produce heat, light, motion, sparks, sound, magnets as just few basic examples.

Electricity can be explained by the terms **Current** and **Voltage**.

Electricity is also an energy source that we rely upon every day.

Electrical Current

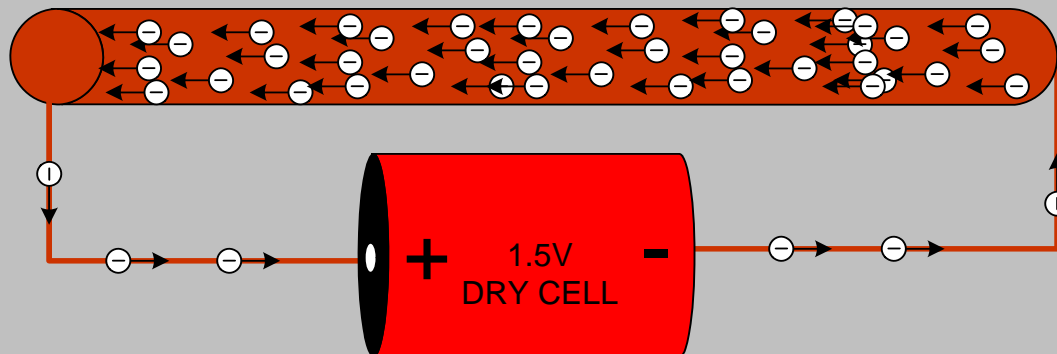
electrons in motion



A conductor at rest. Millions and millions of electrons shooting off in all directions, moving from atom to atom.

Current is flow of electrons. **Amp** is the measure of current.

A conductor under pressure by a battery.
The pressure of the battery causes electrons to align and move quickly to the positive terminal thus, producing electron flow!



Voltage

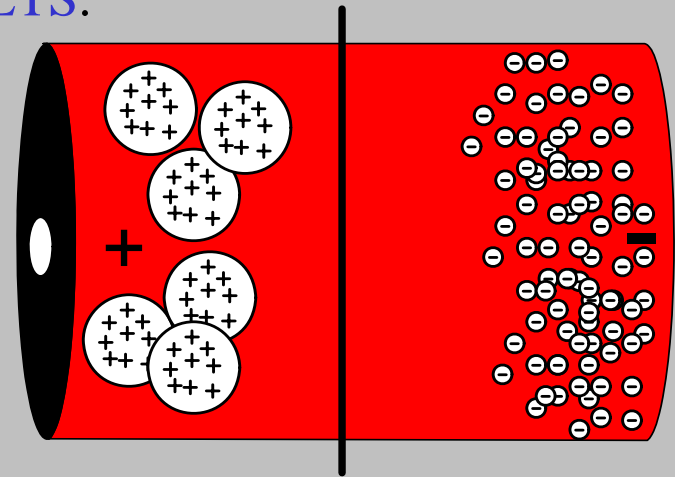
the outside force

or electrical pressure

To produce a charge or to force electrons to flow requires an outside force to separate electrons from their atoms leaving behind the positively charged proton of the atom. Friction, magnetism with motion, and chemical reactions do this electron separation. Separating electrons from their atoms builds up pressure. This electrical pressure is **VOLTAGE!** Voltage is measured in **VOLTS.**

Example of Voltage
is a Battery!

ENERGY SOURCE!



A **Battery** is a container with chemicals that react to separate electrons from atoms producing **VOLTAGE!** A flashlight battery is 1.5 Volts. A lantern battery is 6 Volts. A car battery is 12 Volts.

Conductors and Insulators

Some material's atoms hold on to their electrons and refuse to let them go or great outside forces are necessary to break them free. Thus, they do not conduct electricity very well. These materials are called **insulators**. Plastics, glass, dry wood, and rubber are examples of insulators.

Other materials, such as metals, have ample amounts of free electrons moving about from atom to atom. Such materials conduct electricity very easily and are called **conductors**. Copper is an extremely good conductor and is the popular choice for making electrical wire.

Rubber is an excellent insulator and commonly used as the outside jacket of electrical wire. Insulators around conductors keep electrons contained!

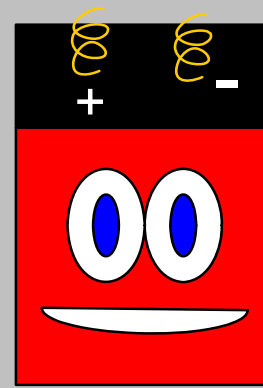
DC Electricity

D.C. stands for **Direct Current**

Direct current electricity flows in one direction all the time. Electricity using batteries is DC electricity.

A.C. electricity is known as **Alternating Current**. The electrical source switches (alternates) polarity many times a second. AC electricity is what comes out our home outlets and is **HIGH VOLTAGE!** *Never play with outlets because HIGH VOLTAGE can HURT you!*

Electrical Circuit—Any arrangement of electrical devices that permits an electrical current to flow.



Hello. I am a 6 Volt lantern battery. Ready to experiment with electricity? Let's go to it!

Electrical Circuit Devices

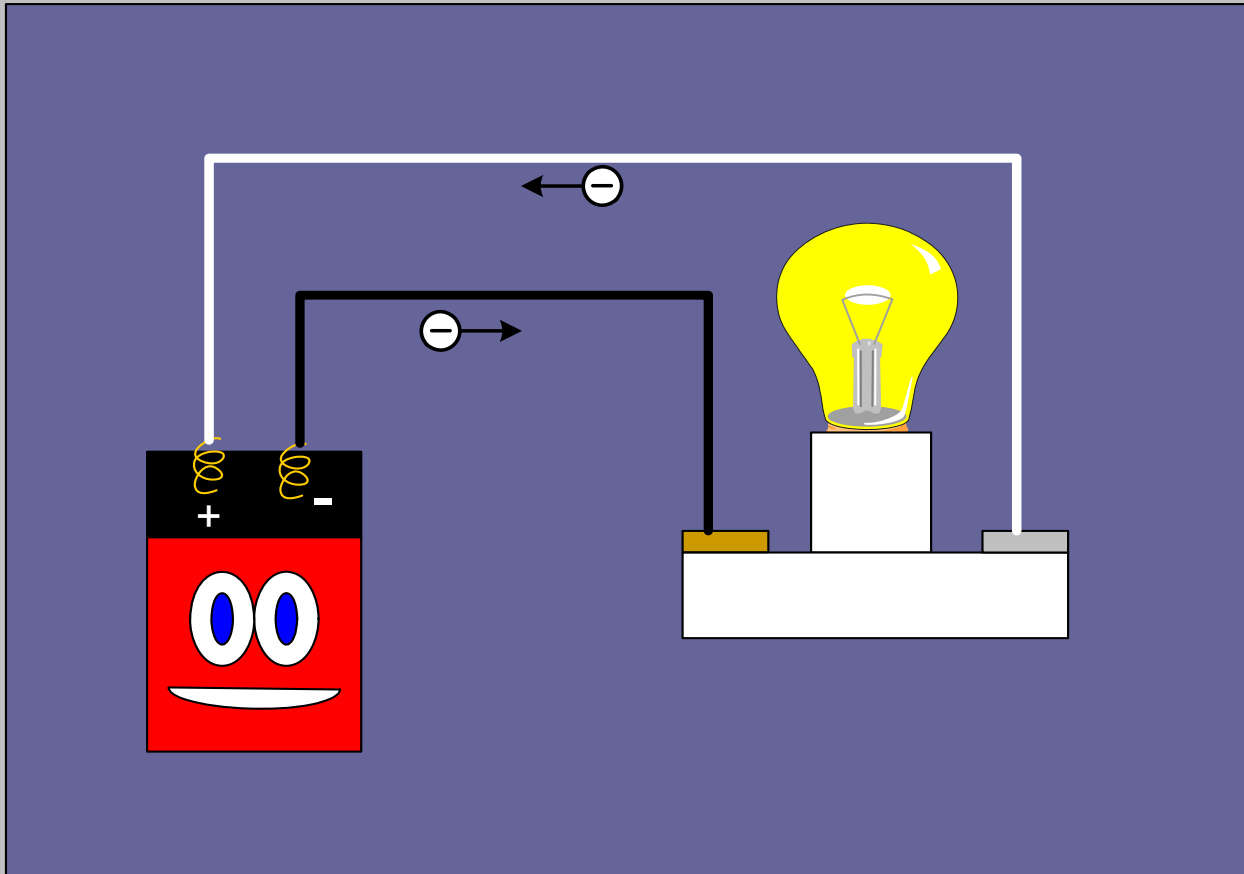
A simple electrical circuit will have the following...

- **Source** of DC Voltage such as a battery
- **Load**, such as a flashlight lamp
- **Conductors**, wires with stripped ends

The part of the circuit that performs the **work** is called the **Load**. The load could be a light (lamp), motor, a heating element, or a buzzer.

The load pushes back electrons making them work harder to get to the positive side. Pushing back is called **resistance**.

The Basic Circuit

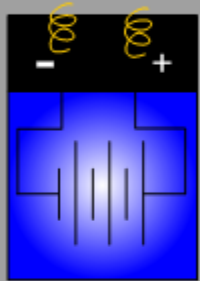


Here is a basic circuit. Can you name the electrical devices? Build this circuit and see what happens!

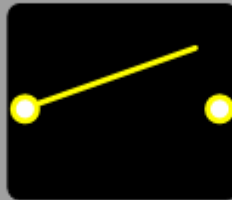
Using wires with to identify the negative and positive terminals. Dark colored wires (black) will always be on the negative side and light color wires (white) will be on the positive.

Electrical Symbols

Symbols are pictures of electrical devices that are used in electrical circuits. Learn the following meaning of the symbols shown below. These symbols will be used together to make a picture map of an electrical circuit. On the following pages you will see many different electrical circuits that you can build.

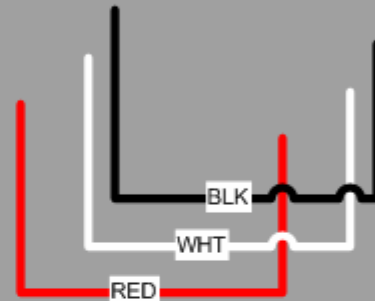


6 Volt Battery



Simple Switch

Also called a Single Pole Single Throw switch (SPST).



Wire



Fuse

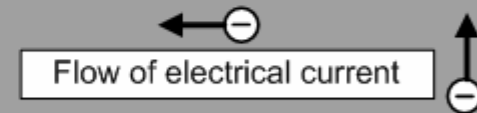
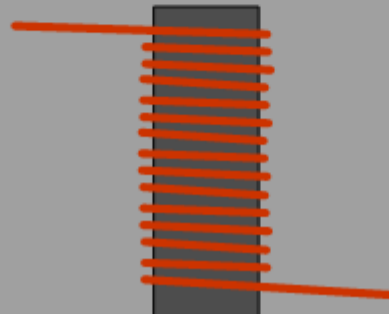


Light bulb with lamp holder

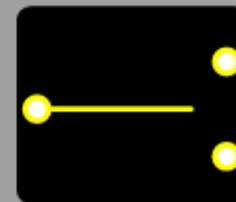


Simply called Lamp.

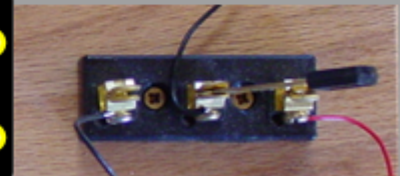
Electromagnet



Flow of electrical current

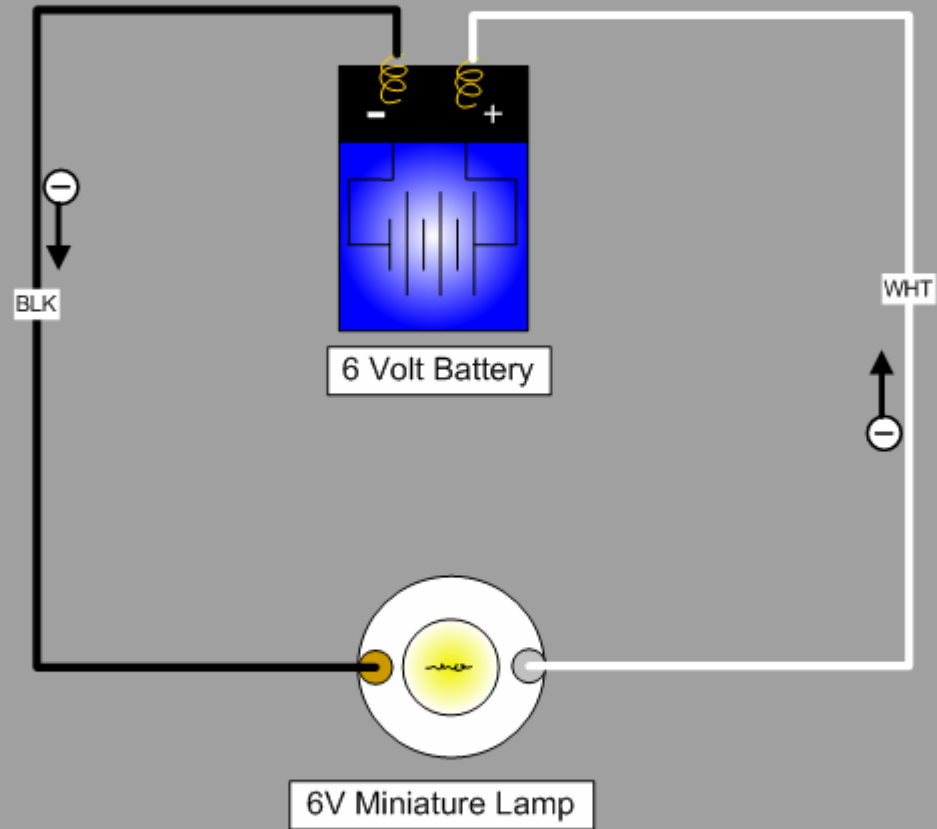


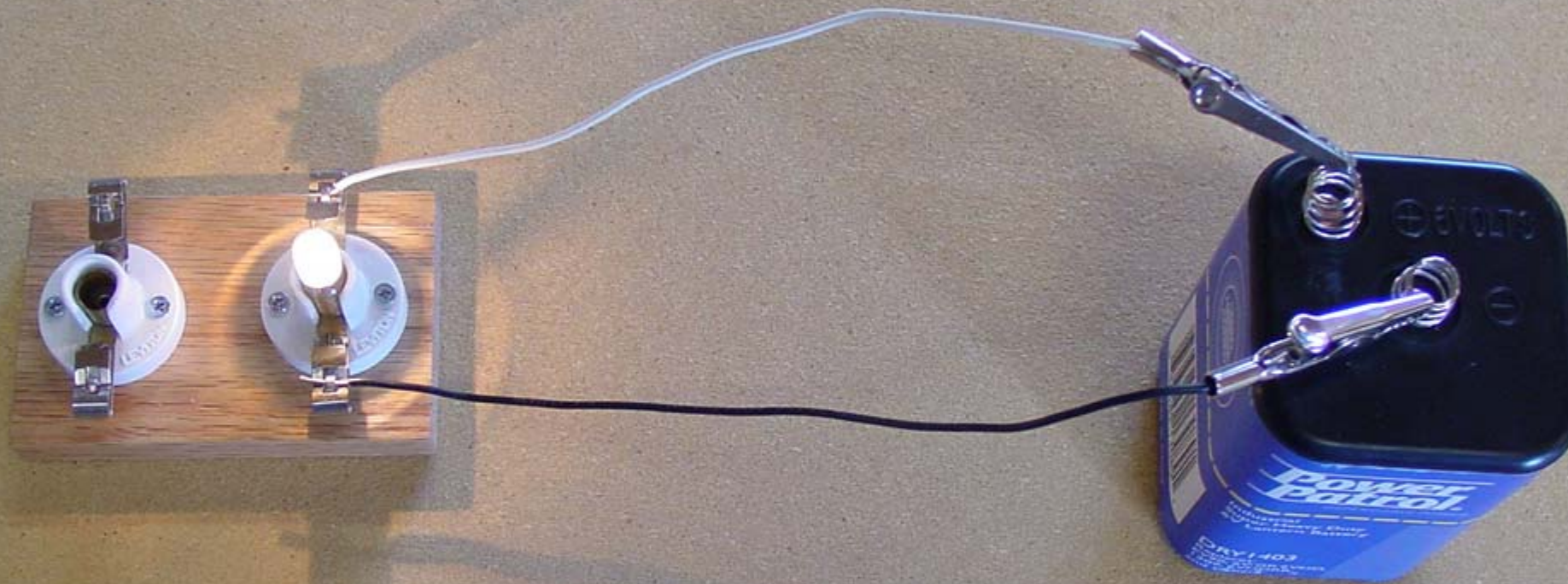
3 Way Switch



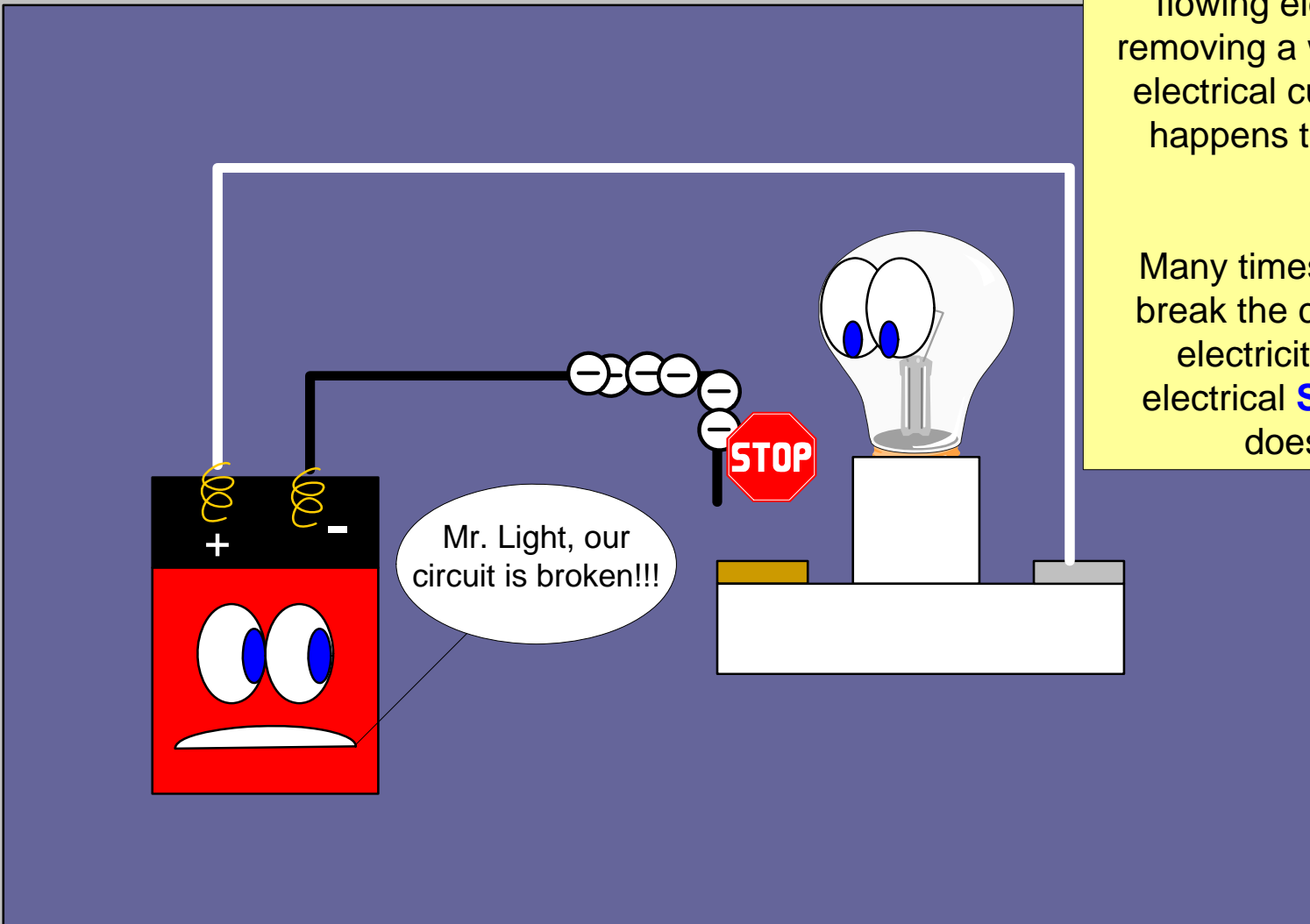
Also called a Single Pole Double Throw switch (SPDT).

Basic Circuit





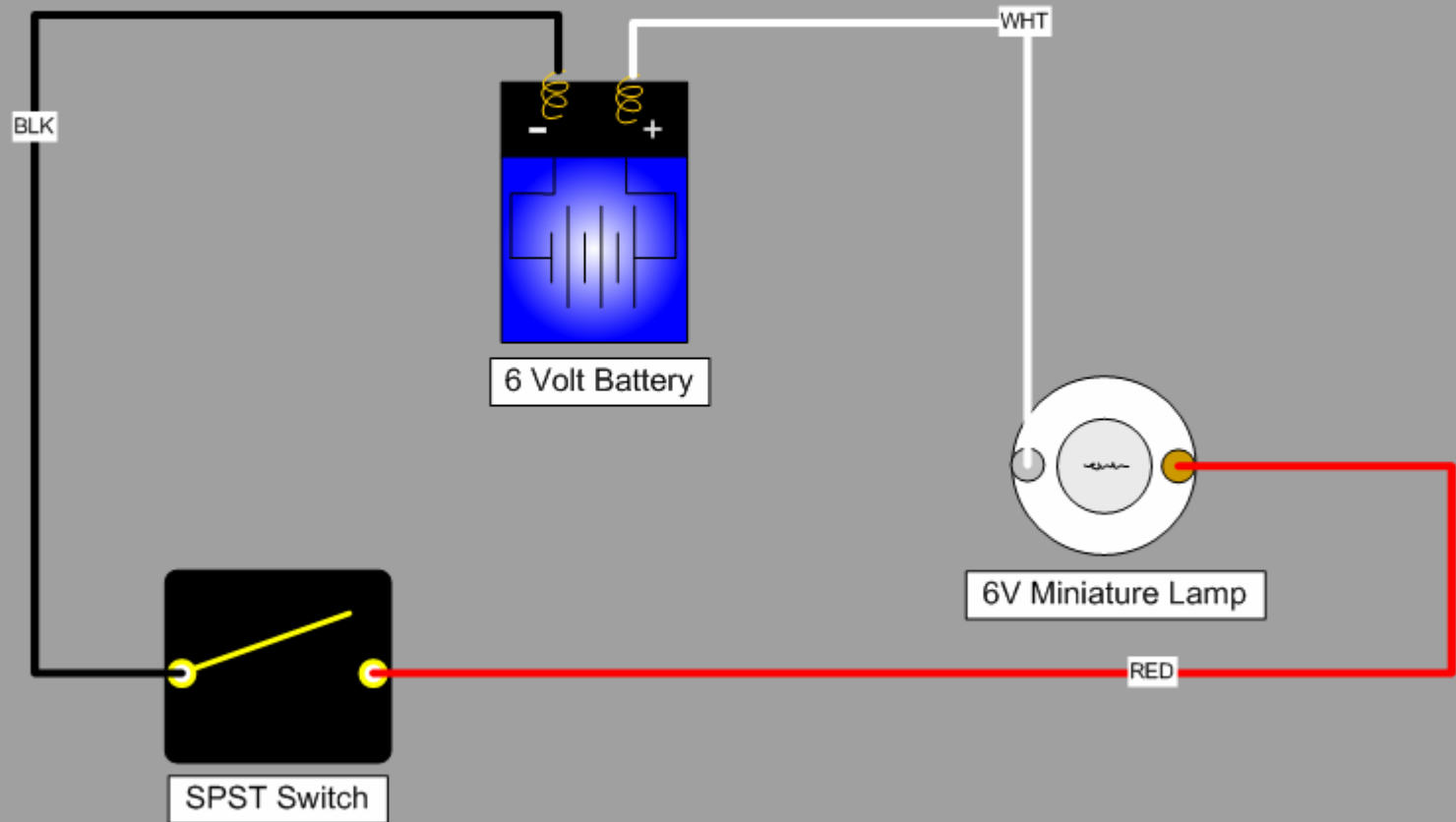
Breaking the circuit



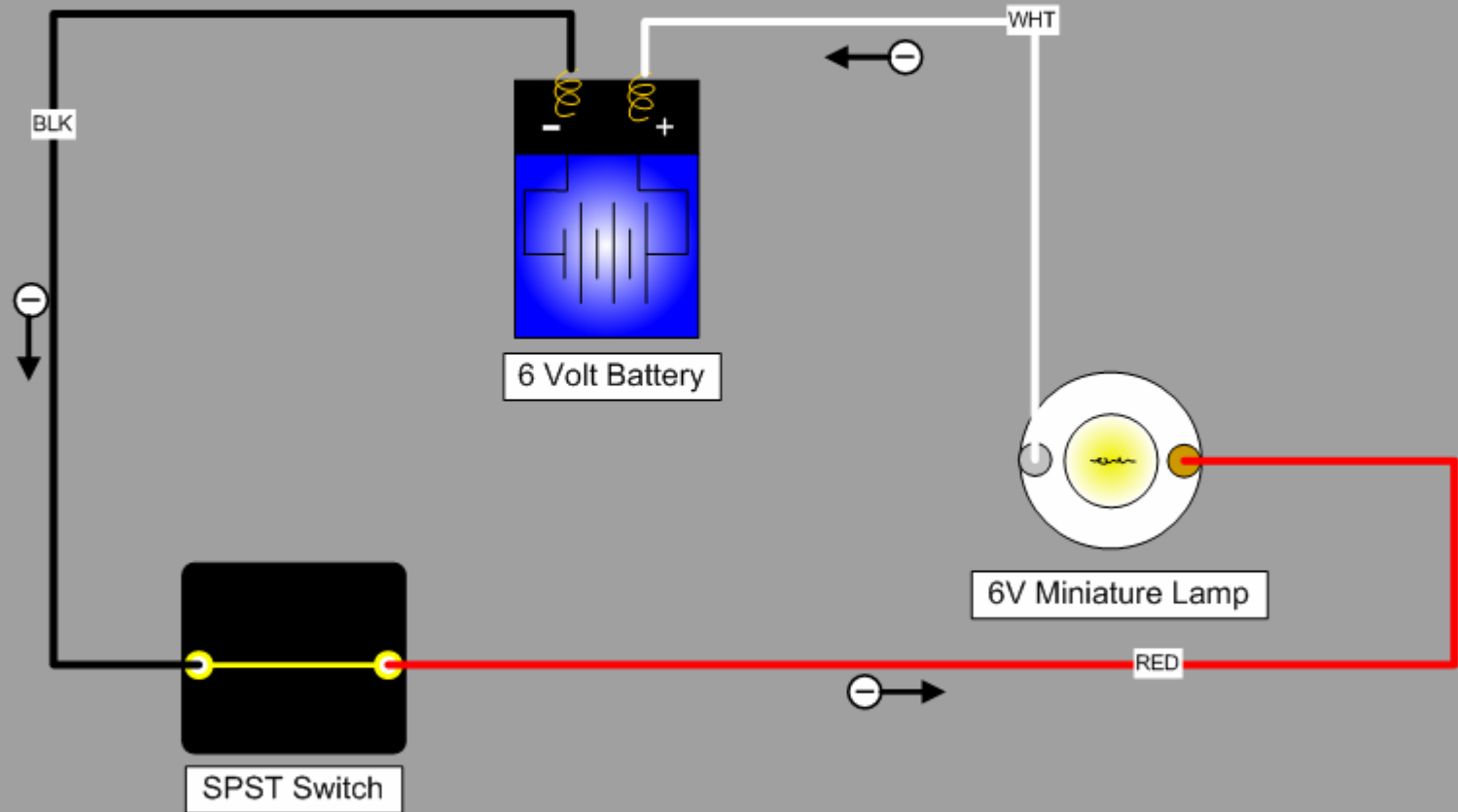
Breaking the path of flowing electrons like removing a wire stops the electrical current. What happens to the lamp?

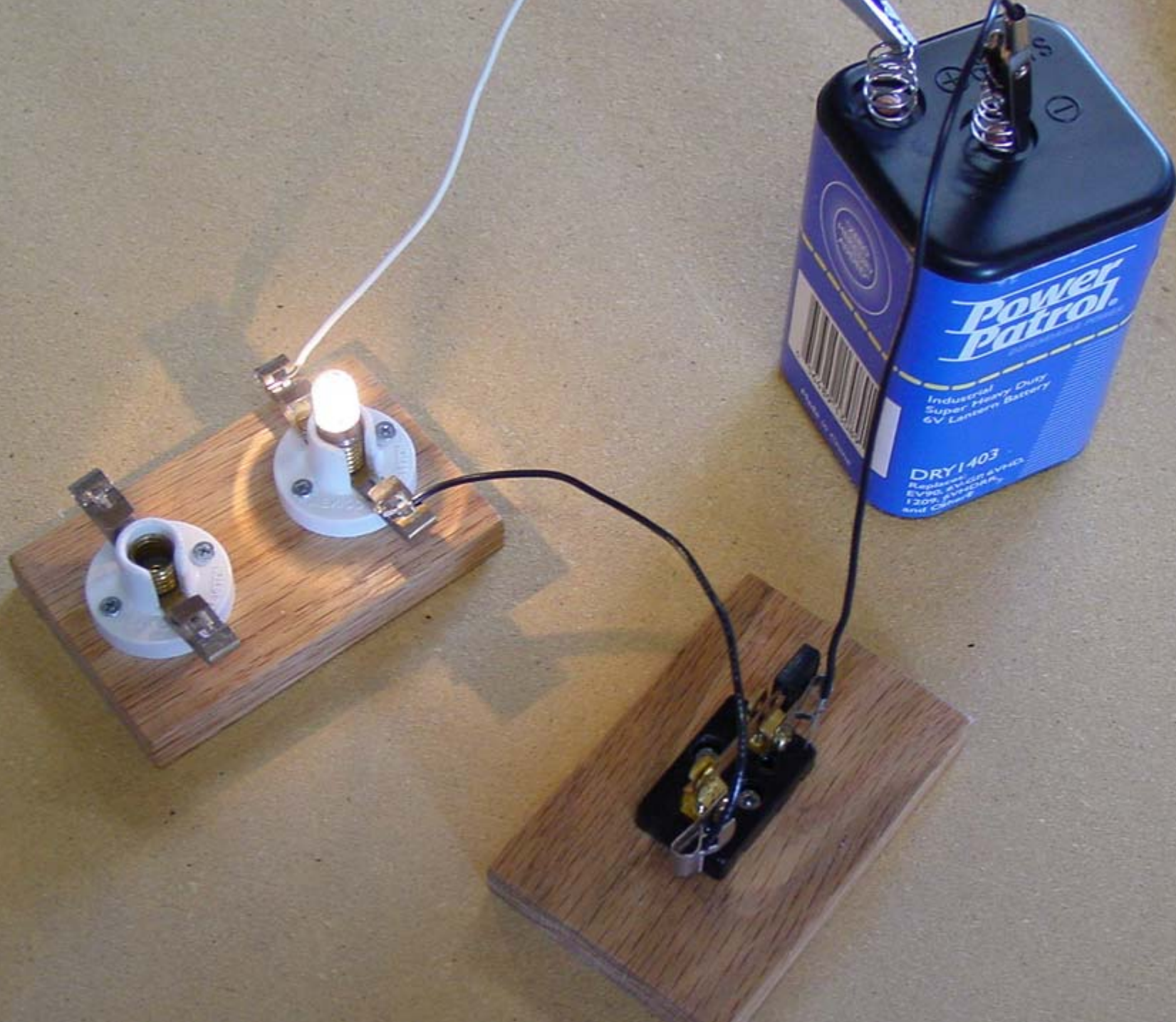
Many times we want to break the circuit to shut electricity off. The electrical **SWITCH** just does that!

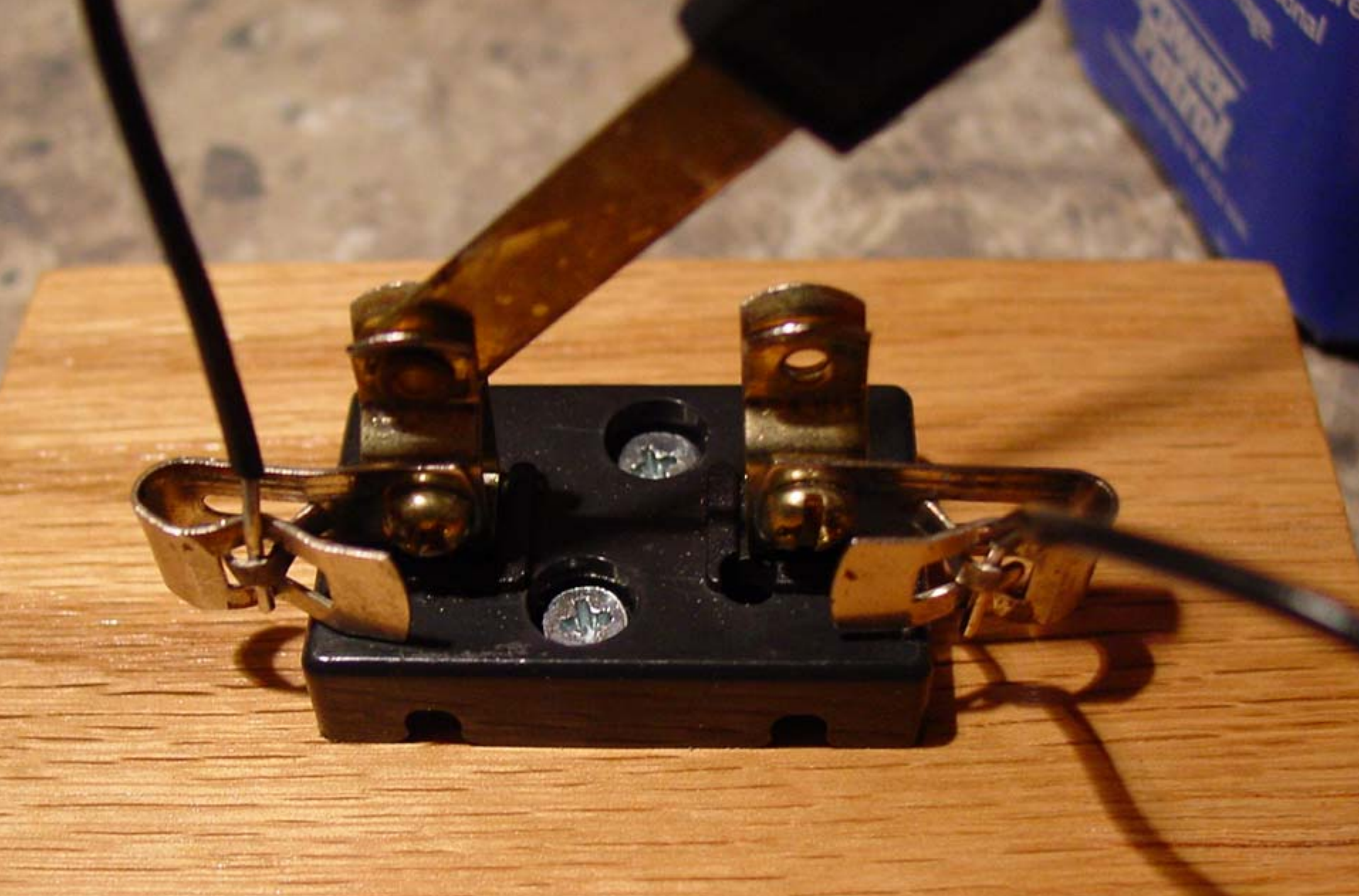
Simple Switch - Switch Open



Simple Switch - Switch Closed

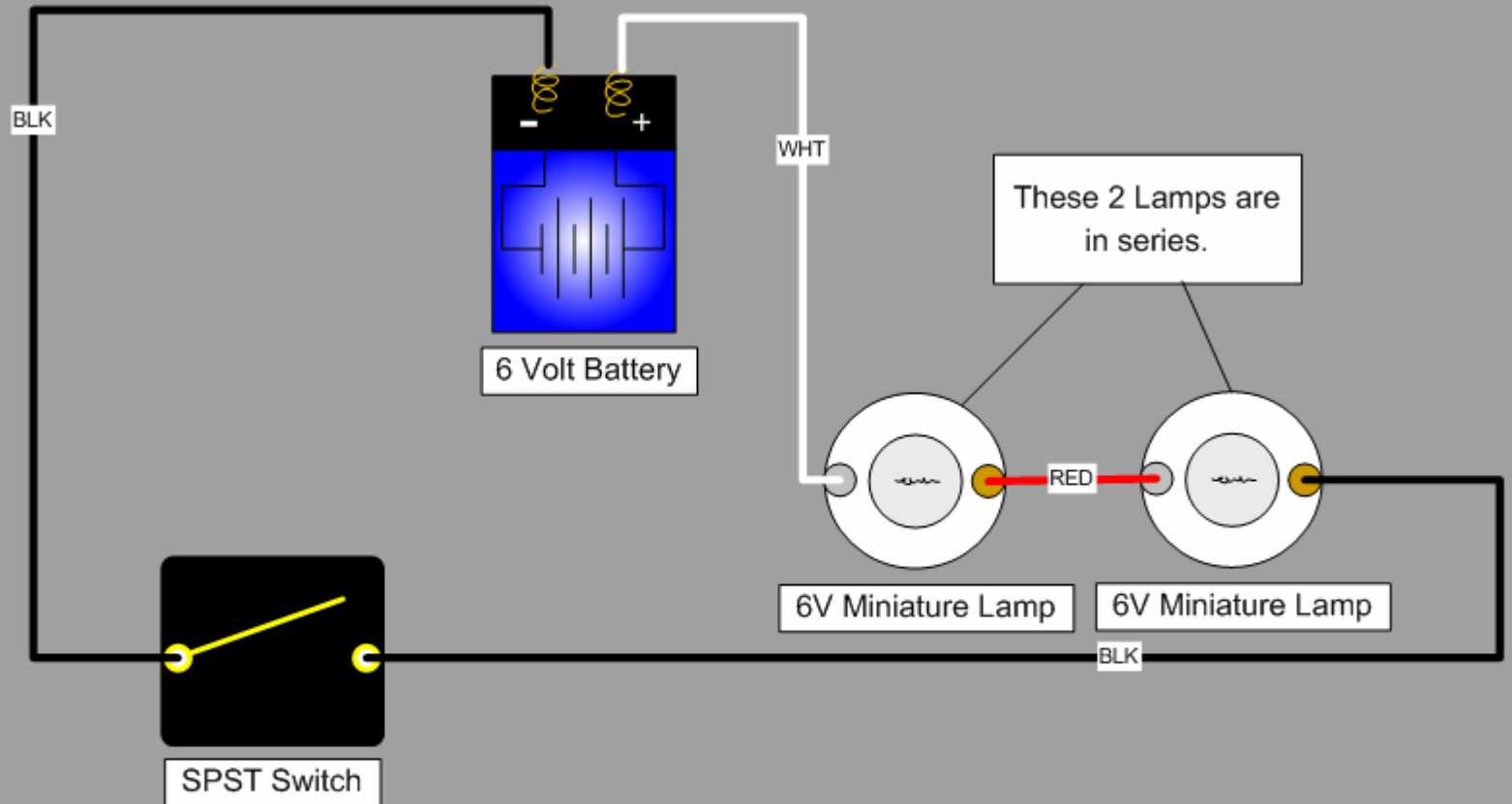




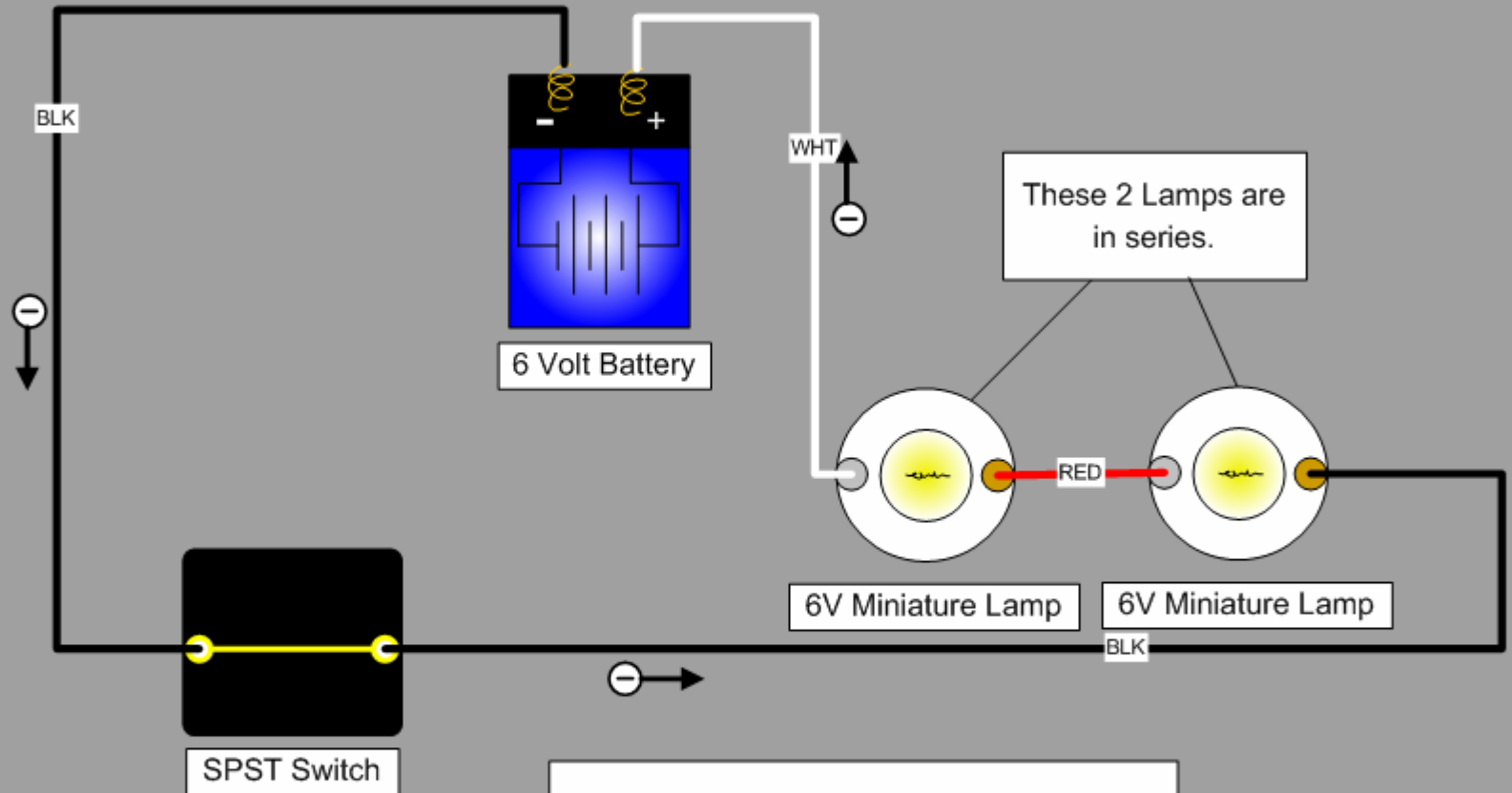


Close-up of the simple single-pole switch and wiring.

Series Circuit - Switch Open



Series Circuit - Switch Closed



Are the lights dim or bright when the switch is closed? What happens when you remove one light bulb?

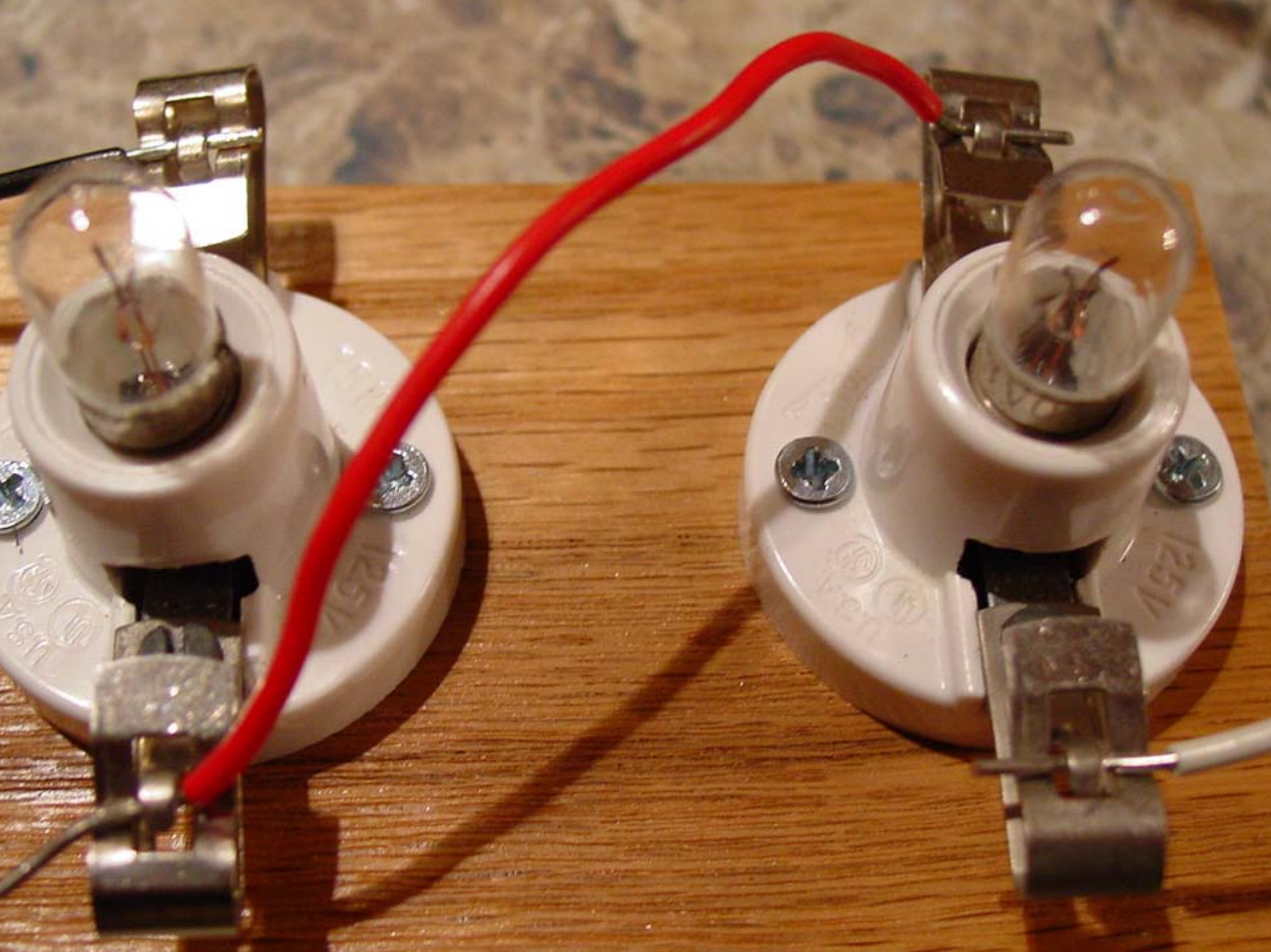


Power Patrol
RECHARGEABLE POWER

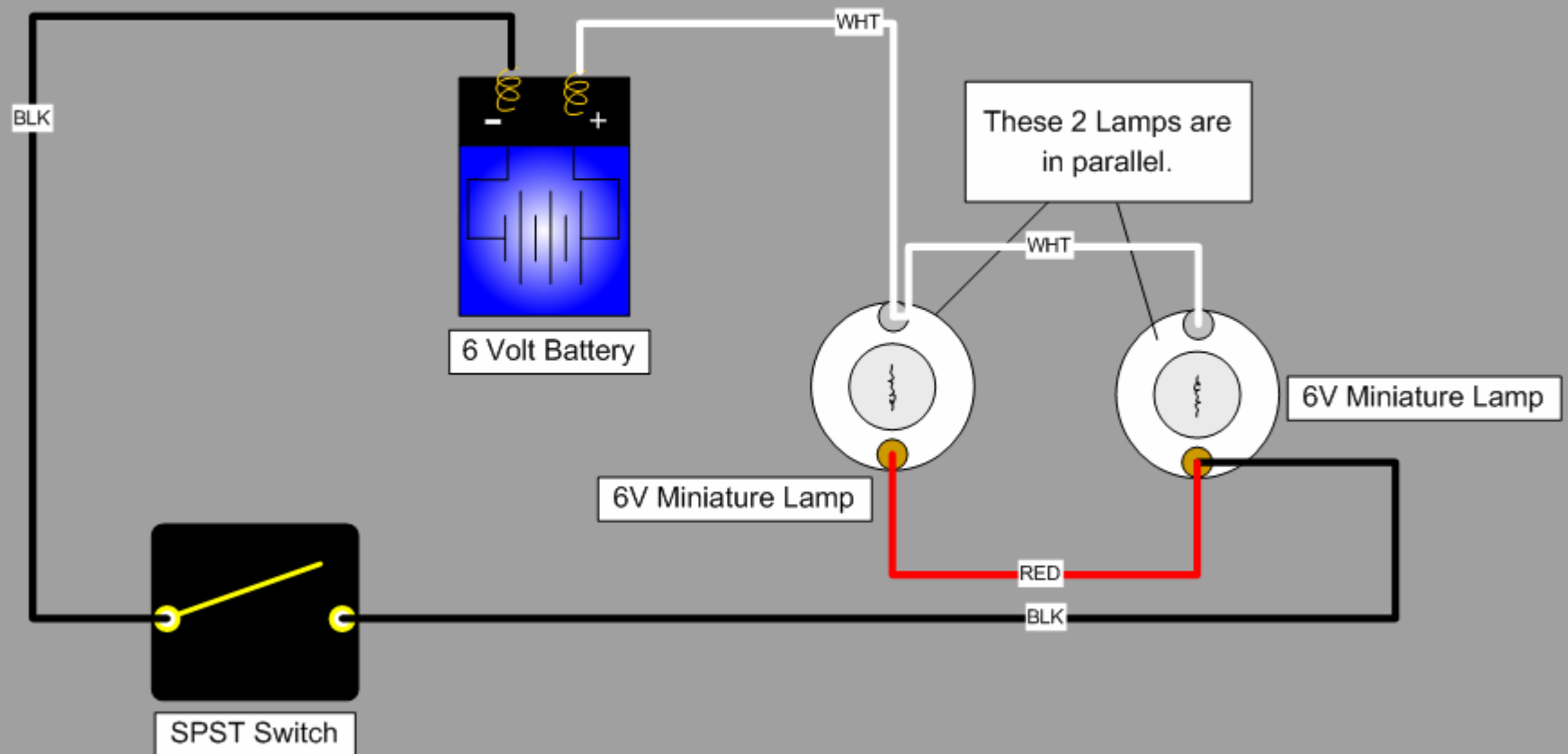
Industrial
Super Heavy Duty
6V Lantern Battery

DRY 1403

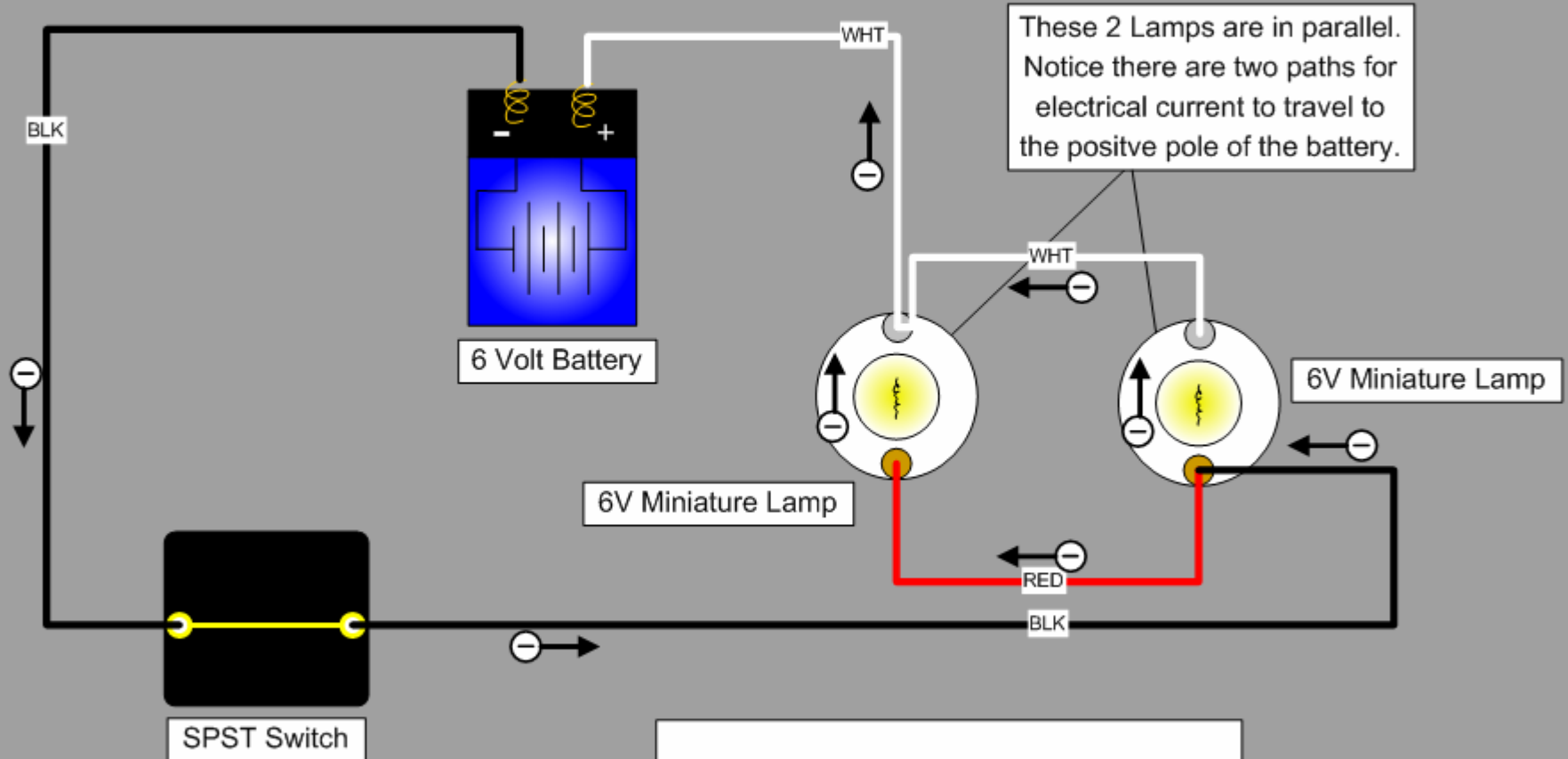
Replaces:
EV90, 6V-GR 6VHD,
1209, 6VHDB,
and Others



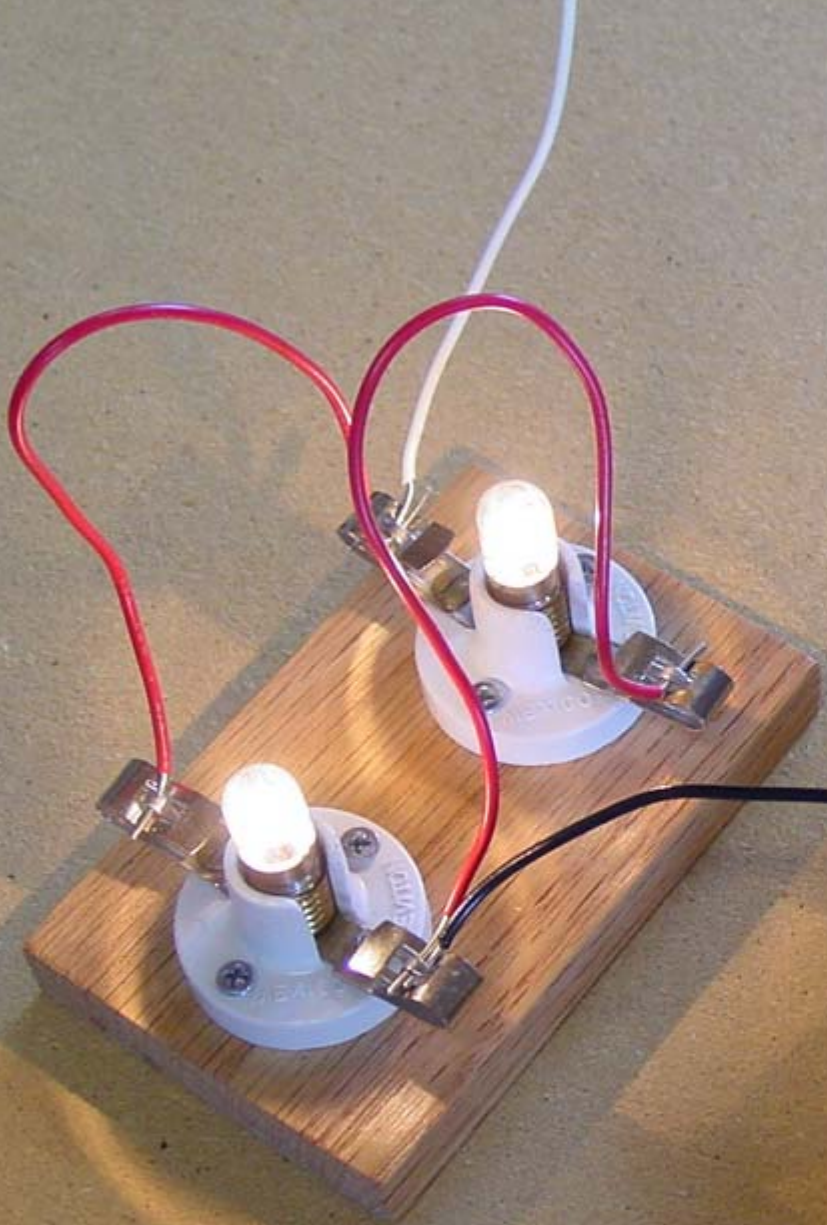
Parallel Circuit - Switch Open



Parallel Circuit - Switch Closed



Are the lights dim or bright when the switch is closed? What happens when you remove one light bulb?



Thank You for Participating!

Hope you
had fun!

