3D Educational Resources

BUILD YOUR OWN TELEGRAPH KEY

The telegraph was one of the earliest devices to harness the power of electricity to communicate. It revolutionized long-distance communication. The telegraph key was an essential component of this communication device.

ONTARIO CURRICULUM LINKS

Through this activity your students will build a simple circuit with a switch and they will learn some basic aspects of conductivity. This activity can be connected to multiple aspects of the Ontario School Curriculum, our suggested link is:

- Grade 6 Science (Electricity and Electrical Devices)

Grades
4 – 8

Age Range
9 – 13 years

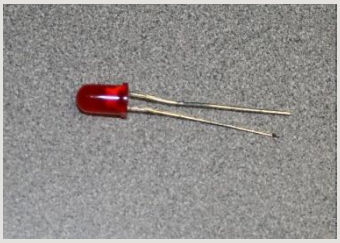
MATERIALS

1 - 9V battery*
1 - 9V battery holder*
1 - Glue gun
1 - Printout of telegraph key parts
1 - 200-300 Ω resistor (optional)
4 - Insulated wires with alligator clips
1 - Rubber band
2 - Brass fasteners (page 2)
1 - Electric buzzer or LED light bulb** (page 2)

* Note: You can also use a different battery and holder (eg. AA)
** Note: You can use anything that indicates the presence of an electrical current. Make sure that whatever you use can handle the voltage of your battery.

An electric buzzer, a brass fastener and a LED light bulb.

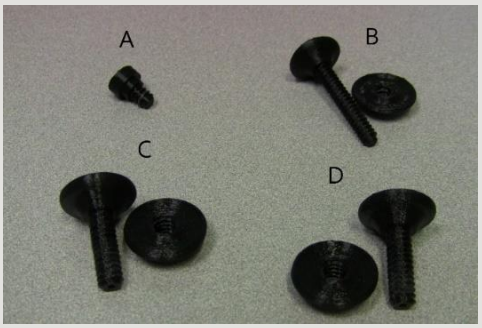




INSTRUCTIONS

ASSEMBLING THE TELEGRAPH KEY

For this activity, we will use the following letters to indicate the various **screws** and **discs** in the device:



Build the Base

1. Fasten the curved handle into the O-shaped base of the telegraph key with Screw A. Make sure that the handle curves toward the base.

2. Twist Discs C and D onto their respective screws. Fasten each of the disc-screw combinations into the side of the base.

Build the Lever

1. Fasten Disc B onto its screw. Fasten the disc-screw combination onto the lever of the telegraphy key.

OPERATING THE TELEGRAPH KEY

Now it's time to add parts to the telegraph key to make it operational.

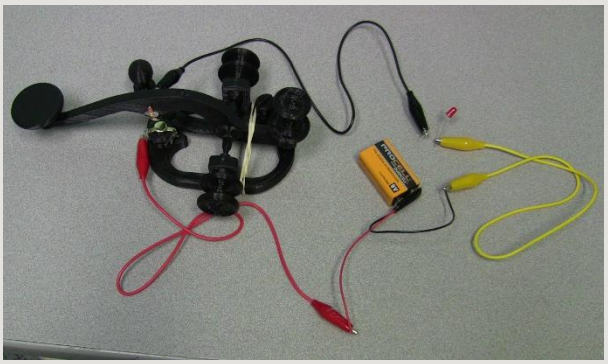
1. Take the two brass fasteners and bend the tip of the longer arm to create a small tab on each.

2. Glue one of the brass fasteners to the hammer of the lever (see image below, on the left). Glue the other brass fastener to the anvil of the base (see image below, on the right). In each case, separate the arms of the brass fastener so that they lie on either side of the object to which they are glued.

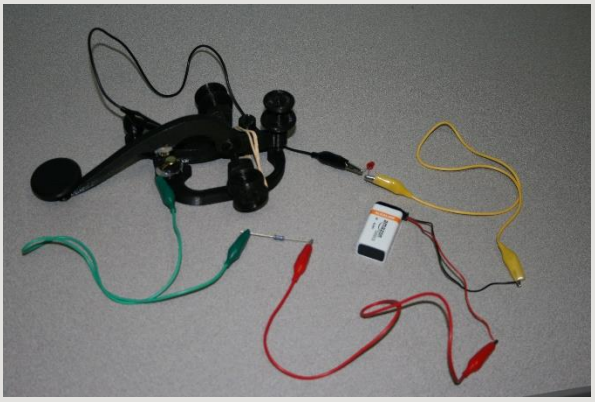
3. Attach the lever to the base by inserting the pointed ends of the lever into Screws C and D (which were fastened to the base earlier).
4. Wrap the rubber band around the lever and the base at the end furthest away from the brass fasteners. This will make the telegraph key bounce back up when used.

5. Attach an alligator clip to the tab on each brass fastener.
6. Attach the other end of one of the alligator clips used in step 5 to positive wire of the 9V battery holder (this is usually the red wire). Attach the other end of the other alligator clip used in step 5 to positive terminal of the light/buzzer (in a LED light, this is the longer lead/wire).
7. Use a third alligator clip to attach the negative terminal of the light/buzzer to the negative wire of the 9V battery holder (this is usually the black wire).

8. Clip the 9V battery into the holder.



9. Optional: If you are using a LED light, the telegraph key can cause it to heat up and burn out if the key is held down for an extended period of time. To prevent this, you can add a resistor to your circuit. A resistor between 200-300 Ω for a 9V battery should be sufficient (see step 10 for an optional calculation). In addition, you will need another insulated wire with alligators clips (we'll call this "Wire 4"). To add a resistor:
    a. Locate the wire with alligator clips that is attached to the positive wire of your battery.
    b. Unhook one of the alligator clips of this wire.
    c. Attach this alligator clip to one end of the resistor.
    d. Attach the other end of the resistor to one of the alligator clips of Wire 4.
    e. Attach the other alligator clip of Wire 4 to where you unhooked the wire in step b.



10. Optional: If you wish to determine the exact resistor needed for your LED light, use the equations below:
    a. Voltage (in V) = Voltage of battery (in V) – Voltage of the LED light (in V)
    b. Resistance of resistor needed (in Ω) = Voltage (in V) ÷ Maximum current of LED light (in A)

    You can usually determine the LED light's voltage and maximum current from its packaging.
11. Your telegraph key is now ready to use!

SCIENTIFIC EXPLANATION

The telegraph is essentially an electrical circuit that, when completed, causes the signal to be sent. Pressing the telegraph key is what completes the circuit. In this activity, when the telegraph key was pressed, the two brass fasteners touched each other. This completed the circuit and caused the buzzer to buzz or a bulb to light up. When the telegraph key was not pressed, the circuit was not complete so nothing happened.

To further explore the concept of conductivity ask your students what they think would happen if different types of material are introduced into the telegraph circuit. Some things to try: a piece of paper, a piece of string and a coin. Then introduce these new materials into the circuit using an insulated wire with alligator clips.

Ingenium – Canada's Museums of Science and Innovation has more than 110 000 artifacts in its collection, including many different telegraph keys. A photo of the telegraph key that was scanned to make the 3D model that you printed can be found below. You can explore other objects in the collection at: ingeniumcanada.org/ingenium/collection-research/collection.php.

A Camelback telegraph key, named for the unique hump found on its arm. This specific key was manufactured between 1848 – 1869 and was used in a telegraph office found in Metcalf, Ontario.

Source: Ingenium – Canada's Museums of Science and Innovation, Artifact no. 1975.0035.