

Teacher Key to Making a Transmitter

Purpose: To construct a spark gap transmitter capable of transmitting Morse code messages.

Materials per group

- Wooden board, approximately 12" x 12"
- 3" x 1" x 1" block of wood
- Strip of 3" to 5" bendable metal (or a can lid)
- Another strip of bendable metal, 1 inch long. Could be substituted with a large metal paper clip.
- Magnet wire (at least 10 meters)
- 2 iron screws, 3" long
- 3 small screws
- 9-Volt battery
- 2 alligator clip electrical jumper cables
- Screwdriver
- Wood glue
- Sandpaper
- (Duct tape can also be useful)

Additional materials

- RTL-SDR dongle kit (one teacher's kit would be sufficient) and a computer with preloaded software.
- Alternative: use an AM radio receiver.

Procedure

1. Position the wooden block on the board, close to the edge, and glue it to the board. Set it aside to dry.
2. While you wait for the glue to dry, use sandpaper to sand of the metal piece and the nails.
3. Punch a hole in the metal piece, $\frac{1}{2}$ inch from the end. Sand off the area around the hole.
4. Construct an electromagnet by tightly wrapping wire around the iron screw. Leave 3-4 inches of the wire free from the wraps. Complete at least 200 turns around the screw,

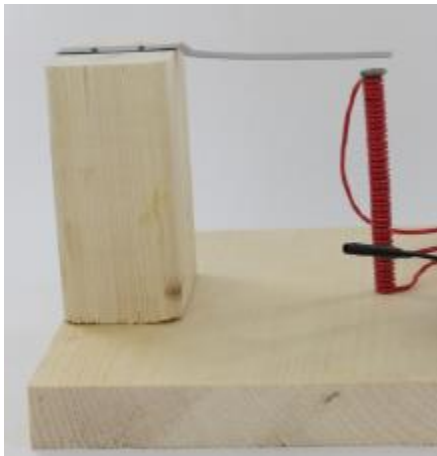
making sure that you leave $\frac{1}{2}$ inch from the tip uncovered so you can screw it to the board.

5. Sand off the insulation from the ends of the electromagnet wire.
6. Assembling the device requires planning. The components have to be positioned just right for it to work. Mark the positions of each screw hole:
 - One end of the metal piece rests on the wooden block and extends beyond it.
 - The electromagnet screw should be under the middle of the extended part of the metal piece.
 - The second long screw should be positioned at the edge of the metal piece.
7. Screw in the electromagnet nail in its position.
8. Use the small screw to secure the metal piece to the wooden block. Leave it a little loose so you can connect the wire and make any necessary adjustments.
9. Screw the other long nail in its position. Screw it until its head hangs over the metal piece and just starts touching it.
10. Connect the wires:
 - Wrap one wire from the electromagnet around the screw holding the metal piece to the board and tighten the screw.
 - Cut two 10-inch pieces of wire and sand off the coating from the ends.
 - Attach one end of the wire to the tall screw, just under its head, and secure it in place. Set the other wire to the side for now.
11. Test your device by touching the other end of the wire and the free end of the electromagnet wire to the terminals of the battery. The metal piece should start vibrating and making rattling noise as it touches the tall screw. Make any necessary adjustments if your device is not working well.
12. Construct the Morse key:
 - Wrap the free end of the electromagnet wire to a small screw and screw it into the wooden board.
 - Wrap one end of the wire you prepare in step 10 to the other small screw.
 - Punch a hole in the short metal strip and use the small screw to secure it to the board so that the other end of the metal piece is over the first screw.
 - Bend the metal up a little so it does not touch the screw under it unless you press it down.
13. Connect the free end of the wire from the key to one of the battery terminals. (Use the alligator jumper cables.)
14. Connect the free end of the electromagnet wire to the other battery terminal. (Use the alligator jumper cables.)
15. Test your device. Use the class testing station or an AM radio receive the signal from your device.
16. Send your first Morse code message and ask your classmates to decode it.

Helpful examples



From <https://www.youtube.com/watch?v=qNY31O1bSXE>



From <https://www.energizer.com/science-center/how-to-make-a-simple-telegraph-set>

Keys:



From <http://w1tp.com/perbuild.htm>



From <https://makeymakey.com/blogs/how-to-instructions/lesson-eight-crafting-and-designing-switches>