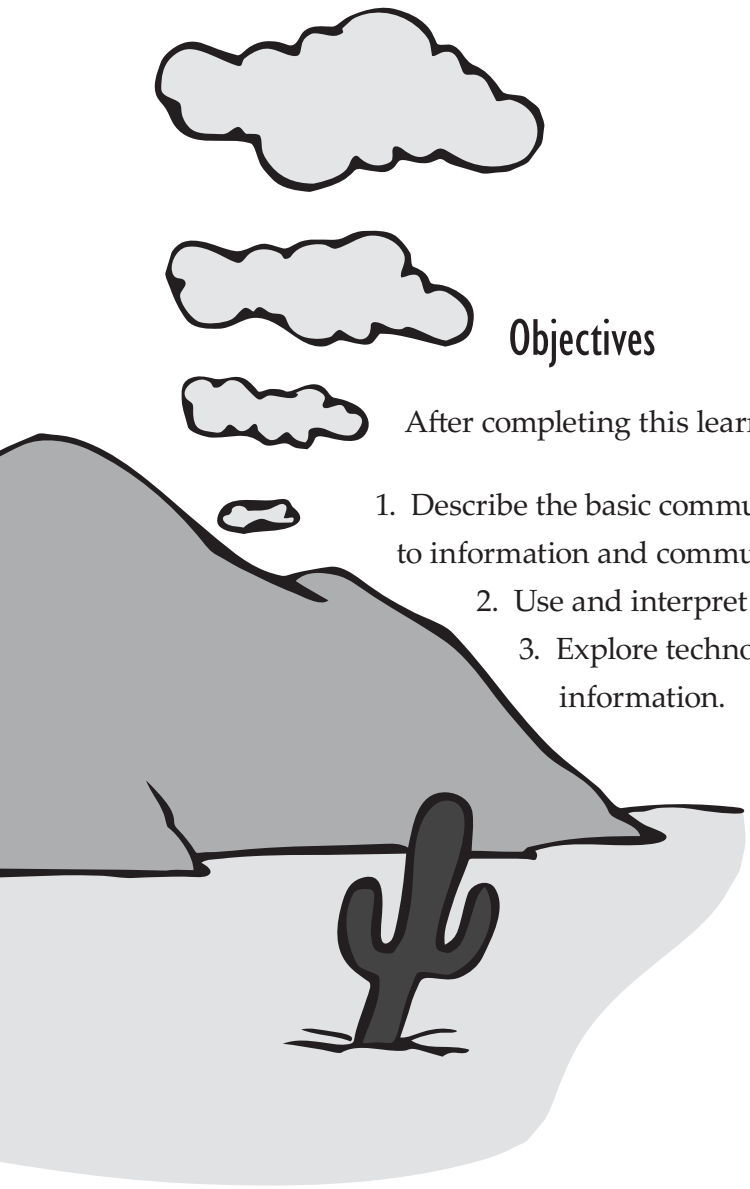


Objectives

After completing this learning cycle, you will be able to:

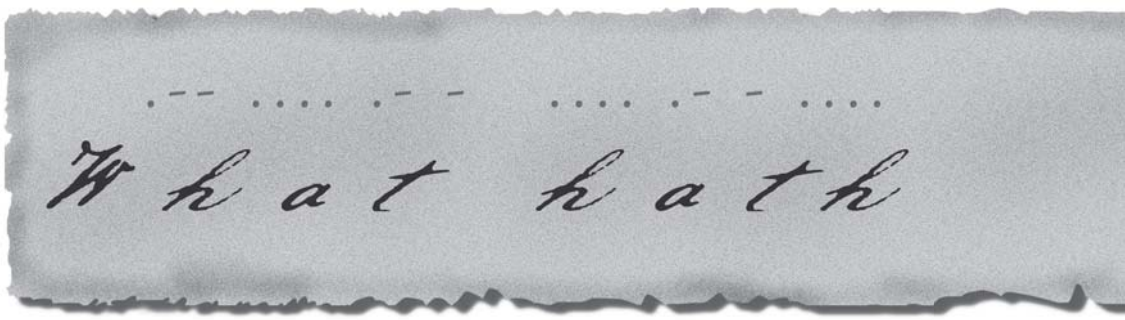
1. Describe the basic communication process and how it relates to information and communication technologies.
2. Use and interpret binary code.
3. Explore technologies that send and transmit information.

Why is reliable long-distance communication so important?

Exploration

The generation of a message from the sender is the beginning process of communication. Once the message is generated, a variety of methods or channels can be used to transmit or send the message. To ensure that the message sent is the same message received, the technology used to transmit the message must be reliable. One of the problems with long-distance communication technologies prior to the telegraph was their lack of reliability. The telegraph, created by Samuel Morse, was the first instrument developed that was capable of transforming information into an electrical form that could be transmitted reliably over long distances.

The first telegraph message, "What hath God wrought?", was sent in 1844 from Washington DC to Baltimore, Maryland. The first telegraph worked by transmitting signals through a wire. The pulses of current deflected an electromagnet, which moved a marker that embossed a piece of paper with dots and dashes. Although the telegraph did not receive wide reception by consumers, bankers realized the profitability of receiving immediate stock price information and other necessary data.



In the following activity you will be creating a "sounder" telegraph machine. Soon after the first telegraph machine was created, it was discovered that people could decipher the noises or clicks the machine made by ear. A sounder telegraph system is basically an electrical current consisting of three parts connected together with a wire. The three parts include a battery that supplies the electricity, a key consisting of two pieces of metal to complete or break the circuit, and an electromagnet. The electromagnet consists of a coil of wire that pulls on a piece of metal when it is charged with electricity.

Obtain the following from your instructor:

- Piece of 1" x 4" wood, 12" long
- Piece of 1" x 4" wood, 6" long
- (9) Small wood screws or fasteners
- (2) Large iron nails
- (3) 4" long strips of ferrous metal
- 7" long strips of ferrous metal
- 20' or more of 22-30 gauge insulated solid wire
- (2) C batteries
- (2) Alligator clip sets
- Hammer
- Sand paper

Follow the steps on the following pages to construct your telegraph machine. If the materials need to be cut to size, do that before proceeding to Step 1.

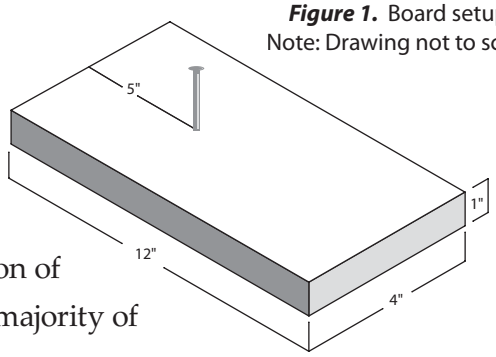


Figure 1. Board setup
Note: Drawing not to scale

1. Hammer one iron nail into the 12" long piece of wood as seen in Figure 1. This will become the sounder portion of the telegraph. Make sure to leave the majority of the nail protruding from the wood.

2. Sand both ends of the wire to remove the clear enamel (the device will not work if you skip this step). Wrap the wire around the nail attached to the board. Leave 5" to 6" of the end of the wire loose. Start from one end of the nail and work your way to the other before starting back. Try to wrap the wire around the nail 100 times. Leave 5" to 6" of wire loose at the other end as well. Figure 2 shows how the wire should be wrapped with both ends having 5" to 6" of wire hanging loose.

3. Take the 7" metal strip and bend one end to make a right angle 1" from the edge. Attach the metal strip onto the board about 2" from the nail with the coil wire. Bend the metal strip over the nail as shown in Figure 3.

4. Attach one 4" metal strip to the board about 2" from the nail, as shown in Figure 2. Bend the metal strip up and measure the distance needed for both C batteries to rest on the board. Attach another 4" metal strip to the other end of the batteries and bend to create a battery holder. Make sure the positive ends face the nail wrapped in wire.

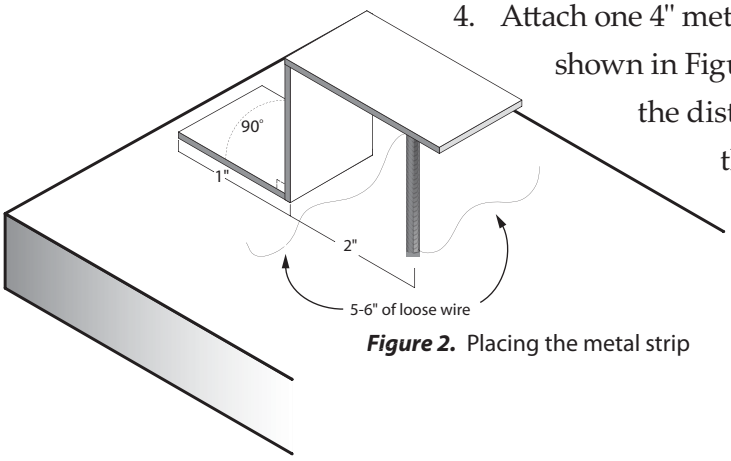


Figure 2. Placing the metal strip

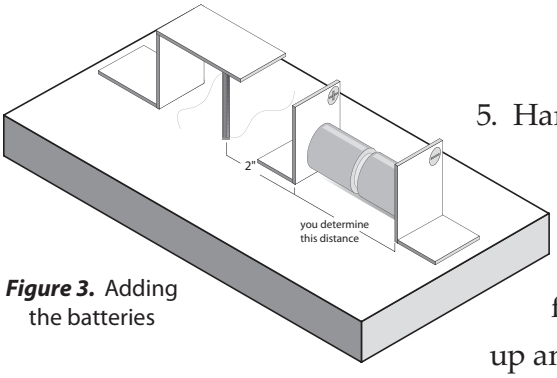
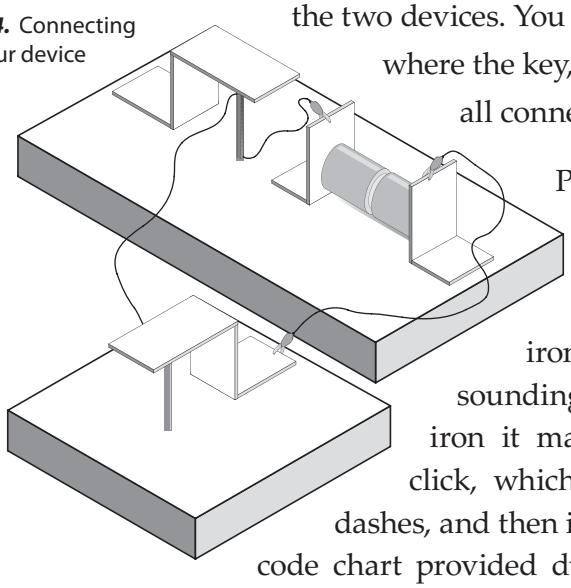


Figure 3. Adding the batteries

5. Hammer the other iron nail to the 6" piece of wood. This will become the key portion of the telegraph. Attach the last 4" metal strip 2" from the nail. Bend the metal strip up and over the nail.

6. Connect the sounder and key together by wrapping one end of the loose wire from the coil in Step 2 to the iron nail on the 6" piece of wood from Step 5. Connect the other loose wire from the coil to the closest side of the battery holder with an alligator clip. Connect the other end of the battery holder to the end of the metal strip on the 6" piece of wood with another alligator clip. See Figure 4 for further guidance in connecting the two devices. You should make a closed circuit where the key, sounder, and battery holder are all connected.

Figure 4. Connecting your device



Practice sending your teammates messages. The messages should be at least ten words long. When the electromagnet pulls on the iron, it makes a more solid, heavy-sounding click and when it releases the iron it makes a thinner, lighter-sounding click, which can be converted into dots or dashes, and then into a message. Refer to the Morse code chart provided during the *Preliminary Challenge* to help you decode each other's messages.

Reflection

In your Inventor's Logbook, answer the following *Reflection* questions.

Logbook 1.1

1. How accurate were the messages your teammates sent to each other? If messages were not received correctly, why not?

2. What role does the key play in the telegraph machine?

3. Using one of the messages you sent with your team's telegraph, draw a diagram using the communication model to show the process the message went through from sender to receiver.