COMMUNICATION
CIRCUITS

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During the Second World War, both sides laid hundreds of miles of electrical cables to send and receive secret messages. In this activity you will design an electric circuit and investigate how it can be used to send encoded and encrypted messages.

WHAT YOU'LL NEED

- **Power supply**
- **Four connecting leads**
- **Two long connecting leads**
- **A switch**
- **A pin**
- **Two bulbs and holders**
- **Scrambler Template**
- **Writing paper**

ENCODING

Encoding a message means turning it into a digital message that can be sent using electric circuits. In this activity you will investigate how messages can be encoded using Morse code.

ENCRYPTING

Encrypting a message means turning it into a secret message. In this activity you will investigate how to encrypt a message using a scrambler.

WHAT YOU NEED TO DO

1. Working with your partner, design a circuit on paper so that one switch will operate two bulbs – one next to the switch, and the other on long leads in another part of the room, or behind a partition.

2. Connect your circuit. Make sure that the bulbs turn on and off together when the switch is operated. Label the bulb next to the switch "sending station" and the one further away "receiver station".

3. To send a message it must first be encoded. Copy the message below and use the Morse code wheel on the Scrambler Template to finish encoding the message.

Message	R	A	F
Encoded Message	• – •	• –	

4. To send and receive messages, one of you should sit at the sending station and one of you should sit at the receiving station.

(a) Write down your own word and encode it. Don't tell your partner what the word is.

(b) If you are at the sending station, send your message by pushing the switch on and off. If you are at the receiver station, watch the bulb and write down the message before trying to decode it.

   Swap seats so that both of you get to a chance to send and receive messages.

(c) Discuss with your partner. Did you have any problems sending the message? How did you indicate the end of a letter?

(d) Try sending another word to see if you do better on your second attempt.

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5. If your message is intercepted, anyone who knows Morse code will be able to read it. To communicate securely you need a scrambler to encrypt your messages.

Message	R	A	F
Encrypted Message	T		
Encoded-encrypted message	−		

(a) Make your scrambler by cutting out both wheels on the Scrambler Template and putting a pin through their centres.

(b) Test it out by setting the scrambler to **+2** and using it to encrypt and encode the message above (the first letter has been done for you).

6. Your communication link is ready to use

    Decide on your own scrambler setting and write down your own message. Encrypt and encode your message.

    Take it in turns with your partner to send and receive messages by swapping seats. Tell your partner your scrambler setting and see if they can decrypt your message. If you decide to send more than one word, agree how you will indicate a space.

7. Try modifying your circuit design so that you can receive messages as well as sending them from the same position.

SCRAMBLER SETTING

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