



Communication and RADAR teacher notes

Key Stage 3

Science:

- Enquiry skills
- Electricity and circuits
- Applications and implications of science

Key Stage 3

Design and Technology:

- Making in resistant materials
- Product development over time

Overview

These activities allow young people to investigate circuits using communication as a context. The principles behind radar are examined. They can be used individually or together in a series of sessions. The activities are:

1. Using electric circuits to transmit signals
2. Design and make a Morse code key
3. Position location and radar

NOTE: a suitable risk assessment must be performed before carrying out any practical activity.



Activity 1: Using electric circuits to transmit signals

Young people make a simple series circuit and use Morse code to transmit a simple message.

Preparation

- wires, bulbs, batteries and push-to-make switches
- signalling circuit activity sheet (can be found attached after activity notes)
- Morse code alphabet sheet (attached below)
- download Morse code messages mp3 audio file

Activity Notes

Explain how Morse code can be used to send messages using a series of short and long beeps (or flashes of light). Illustrate by playing the Morse code messages audio file. A copy of the messages can be found following these notes. Messages can be produced using the on-line Morse code translator at:
<http://morsecode.scphillips.com/jtranslator.html>

Young people set up a simple series circuit containing a bulb, switch and battery. Use this circuit to transmit a simple signal in Morse code using the alphabet sheet supplied.

If space and equipment allow, this could be done in a school hall or outside to show transmission over greater distances. If available, field telephone equipment could be used to show transmission of voice.

As a simpler alternative, young people can devise their own code to transmit signals. For example, three short flashes means 'send help'. This method is more limited as both groups need the corresponding code book and the messages are limited to those that have been predetermined. It is however, a feasible method of sending information.

Young people then develop circuits to send their message to multiple recipients and that will allow some messages to get through, even if part of the circuit is broken.

Extension

Examine how accurate the transmission of a message is when it goes through several relays.

Set the groups up around the classroom. Present the first group with a simple message. This is to be passed on to the second group using Morse code and their light circuit. Continue this around the class in a game of 'Chinese whispers'.

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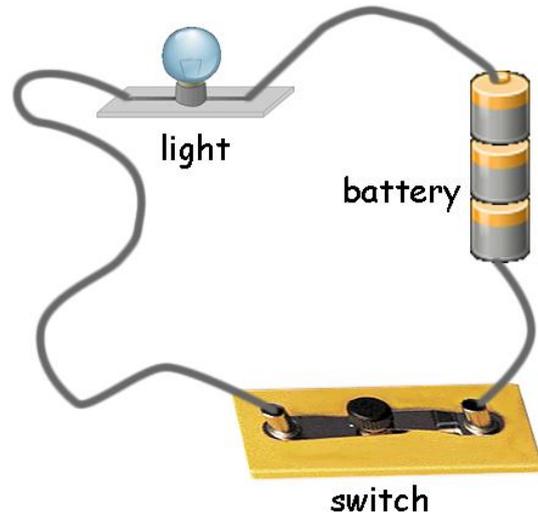
At the end, examine the final and original messages. How accurately has the message been reproduced? What percentage of errors are there? Have young people research how modern communications make sure that data is not degraded as it passes across networks such as the Internet?



Signals with circuits

Make this circuit.

Use the Morse code alphabet to send a simple message.



1. Use symbols to draw a diagram of your circuit.
2. Is your circuit a series or parallel circuit?
Explain your answer.
3. Make a circuit that can transmit a signal to three different people at the same time.
Draw a diagram of this circuit.
4. What would happen if one of your wires got broken or disconnected?
5. Make a circuit where some people will still receive your message, even if one wire gets broken or disconnected.
Draw a diagram of this circuit.

You could send your messages by simply flashing a spotlight or torch, aimed at the person receiving the message.

6. Is making a circuit like yours better or worse than using a flashlight to send messages?
Explain why you think so.

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Letter	Morse code
A	• -
B	- • • •
C	- • - •
D	- • •
E	•
F	• • - •
G	- - •
H	• • • •
I	• •
J	• - - -
K	- • -
L	• - • •
M	- -
N	- •
O	- - -
P	• - - •
Q	- - • -
R	• - •
S	• • •
T	-
U	• • -
V	• • • -
W	• - -
X	- • • -
Y	- • - -
Z	- - • •

Number	Morse code
1	• - - - -
2	• • - - -
3	• • • - -
4	• • • • -
5	• • • • •
6	- • • • •
7	- - • • •
8	- - - • •
9	- - - - •
0	- - - - -

Morse Code Alphabet

• = short flash or short beep

- = long flash or long beep



Activity 2: Design and make a Morse code key

Young people can be challenged to design and make a Morse code key (the switch that operators use to send the signal). This can give young people an opportunity to design, make, test and modify the piece of equipment.

Preparation

- Suitable materials for the production of the Morse key may include wood, plastic, wires, metal and springs
- Signalling circuit activity sheet (can be found attached in activity 2)
- Morse code alphabet sheet (in activity 2)
- Student sheet with illustrations showing a variety of Morse keys (follow these notes)

Activity Notes

From activity 2 described earlier, explain how Morse code can be used to send messages using a series of short and long beeps (or flashes of light). Illustrate by playing the Morse code messages audio file. A copy of the messages can be found following these notes. Messages can be produced using the on-line Morse code translator at: <http://morsecode.scphillips.com/jtranslator.html>

Young people set up a simple series circuit containing a bulb, switch and battery. Use this circuit to transmit a simple signal in Morse code using the alphabet sheet supplied.

Set the challenge to design, make and test a Morse key to replace the simple switch in the circuit they have produced.

Extension

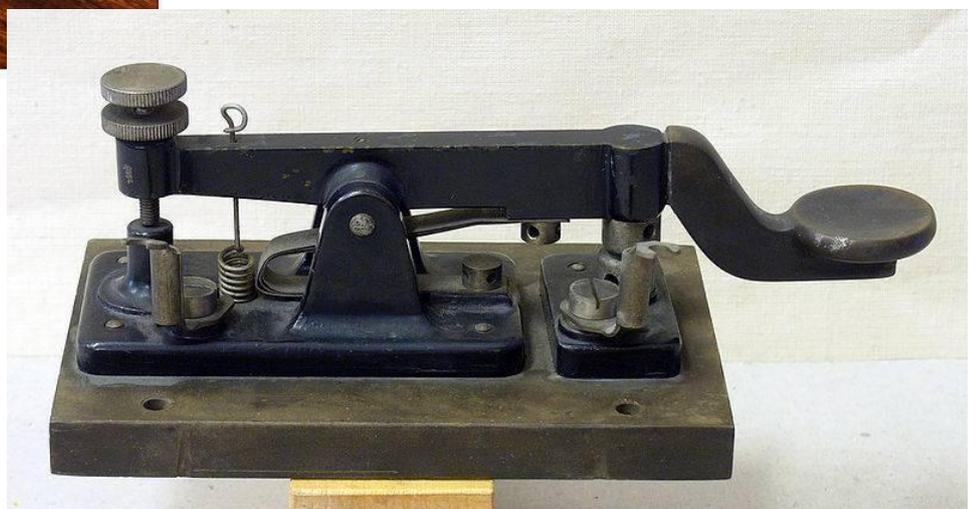
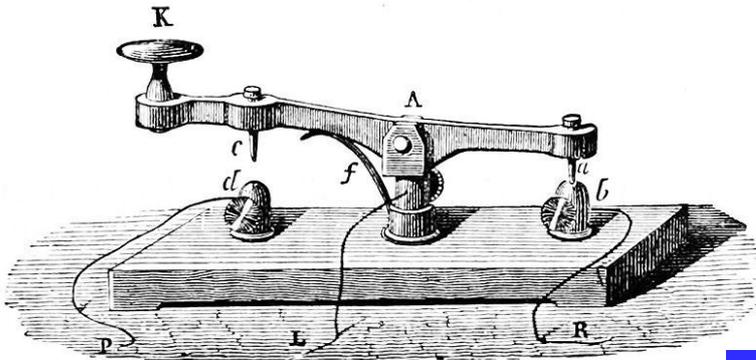
Research and report how Morse code keys have developed over time. Identify how modifications in design and the use of new materials has led to an improved instrument.

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Morse code keys





Activity 3: Position location and radar

Use this activity to demonstrate the principal of radar. A presentation describes how radar is used to locate the position of an aircraft and a simple demonstration illustrates the principle.

Preparation

- Download the RADAR presentation for use on an interactive whiteboard.
- Light source
- Two compasses (North, South, East, West variety) or two protractors.

Activity Notes

Use the presentation to illustrate how radar works. In practice, transmitters and receivers would be co-located. During the War, series of transmitters and receivers were dotted along the South East coast to monitor for aircraft coming from the European mainland.

The illustration shows RAF Digby as the control centre. This system is a forerunner of the air traffic control systems that monitor civilian aircraft today.

A simple activity can be done in class to show the principle of radar location, using the example illustrated below. It works best in a darkened classroom.



Observers report bearing of target person



Light source illuminates target person (to represent radar waves)



Target person



Observers report bearing of target person

Bearings from the two observers can be used to plot the position of the target person in the classroom.

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Extension

Young people can research the development of radar and its use during the Second World War. Go on to look at how its use has been applied to civil aviation and the development of air traffic control systems.