

MORSE KEY & BUZZER Mk2

TEACHER/TUTOR NOTES & WORKSHEETS



The project will take probably four sessions for assembly and test.

Teachers Notes:

Session 1:

Whiteboard:

- Morse - an American inventor - now obsolete for emergency use.
- Electricity - conductors and insulators.
- Electric current - analogy to water flow through a pipe. Pressure of water equivalent to force of electricity which is measured in volts.
- Quantity of water is equivalent to electrical current which is measured in amps.
- Direct current and alternating current.
- Morse key is a switch or a valve in the water analogy.

Practical:

- Assemble morse key.
- Worksheet (1).

Session 2

Whiteboard:

- Revision of previous session
- Electro-magnet - description.
- The pulling force dependent on current and number of turns.
- Iron core of electro-magnet - still get magnetic field without core.
- Circuit testing - Continuity meter or equivalent.

Practical:

- Test Morse key with Continuity meter.
- Assemble core and wind coil.
- Worksheet (1) continued.

Session 3

Whiteboard:

- Revise electromagnets and circuits.

MORSE KEY & BUZZER Mk2



Session 3

Whiteboard:

- Revise electromagnets and circuits.
- Circuit of buzzer.
- Make and break circuit.
- Testing of electromagnet - with a battery and piece of iron.

Practical:

- Assemble buzzer.
- Worksheet (2).

Session 4

Whiteboard:

- Revise electromagnets and circuits.
- Revise make and break circuit.
- Discuss testing of buzzer.
- Adjustment of buzzer.

Practical:

- Adjust buzzer.
- Test buzzer with battery.
- Test buzzer and Morse key circuit with battery.
- Send messages.
- Worksheet (2)

MORSE KEY & BUZZER Mk2



International Morse Code

1. The length of a dot is one unit.
2. A dash is three units.
3. The space between parts of the same letter is one unit.
4. The space between letters is three units.
5. The space between words is seven units.

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	— — ● ●

1	● — — —
2	● ● — — —
3	● ● ● — —
4	● ● ● ● —
5	● ● ● ● ●
6	— ● ● ● ●
7	— — ● ● ●
8	— — — ● ●
9	— — — — ●
0	— — — — —

MORSE KEY & BUZZER Mk2



The Morse Key & Buzzer project brings out two subject areas:

Electromagnetism and circuits

- Electromagnetism can be contrasted with permanent magnetism as represented in the Magnetic Compass project.
- The basic principle is that current flowing through a wire generates a magnetic field around the wire. By winding the wire in a coil, and also giving this coil an iron core (a bolt), the field is concentrated to perform a useful function, in this case to attract a spring strip (the armature).
- In this circuit, when the key is pressed current flows through the coil and pulls the strip towards the bolt. This causes it to leave contact with the pointed screw and so breaks the circuit that generates the magnetic field. It then springs back to contact the pointed screw and make the circuit again. This make and break process is what generates the buzz.

Communications and codes

- Widespread and rapid communication is taken for granted today. It is worth going back through time with the children time to think of how things were before all the modern facilities had been invented. How did people communicate over distance in Roman times? Yes they could send a runner or a horseman to carry the message. But there is evidence that they also used a visual code as illustrated in the Additional Notes.
- Moving forward to the 1800s electricity and magnetism had been demonstrated and explained by Michael Faraday in London. Samuel Morse was aware of the growing need to send messages quickly over 100s of miles, for example as railways developed across America. He heard about electromagnetism and realised this could be used for sending messages and developed his famous Morse code using on-offs pulses of long and short in different combinations.

MORSE KEY & BUZZER Mk2



ADDITIONAL NOTES

You can introduce the project by mentioning the two subject areas.

Assuming the Magnetic Compass has been made as the preceding project it can be used as a **magnetometer**.

- Take the coil of wire in the MK&B kit and scrape the enamel insulation off each end
At this point you can emphasise that the two regular problems with making the kits are failing to scrape off the enamel, and pulling out the wire to make a 'bird's nest' (which takes 10 minutes to untangle) rather than unwinding it.
- Stretch out about 200 mm. Connect each end of the coil to the 6 volt battery (usually 4 AA cells)
- Bring the wire near the compass and see the card swing
- Disconnect the battery before the wire heats up too much

To demonstrate the difference between a permanent and electro magnet it is useful to have a wound coil from a MK&B as a separate item

- Take a horseshoe magnet and show a large paper clip firmly attached
- Connect each end of the coil to a battery and show the paper clip again firmly attached
- Then disconnect the coil and the paper clip drops off.

To illustrate the importance of **communication** you can go back in your time machine before all the modern electrical devices to 600 years ago when the **Incas** developed an empire along the Andes mountains based on a network of royal runners (see pictures). In 100 years this network had grown to 14,000 miles and the empire covered the whole west coast of South America

Even earlier the **Romans** had developed a long range visual communication method using a code

They had regular signalling points throughout their Empire. Remnants of these 'signalling towers' still remain along Hadrian's Wall.

Roman Soldiers could signal by lining up in two groups of five. They were all familiar with the type of grid below. So if two soldiers were standing on the Left-Hand-Side and three soldiers on the Right-Hand-Side that would be read as a letter 'H'.

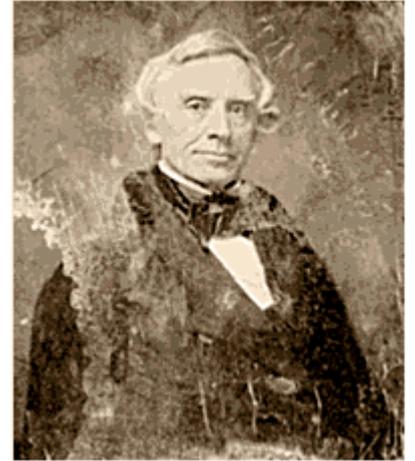
		Right Hand Side					
		1	2	3	4	5	0
Left Hand Side	1	A	B	C	D	E	
	2	F	G	H	I	J	
	3	K	L	M	N	O	
	4	P	Q	R	S	T	
	5	U	V	W	X	Y	Z

MORSE KEY & BUZZER Mk2



SAMUEL F B MORSE

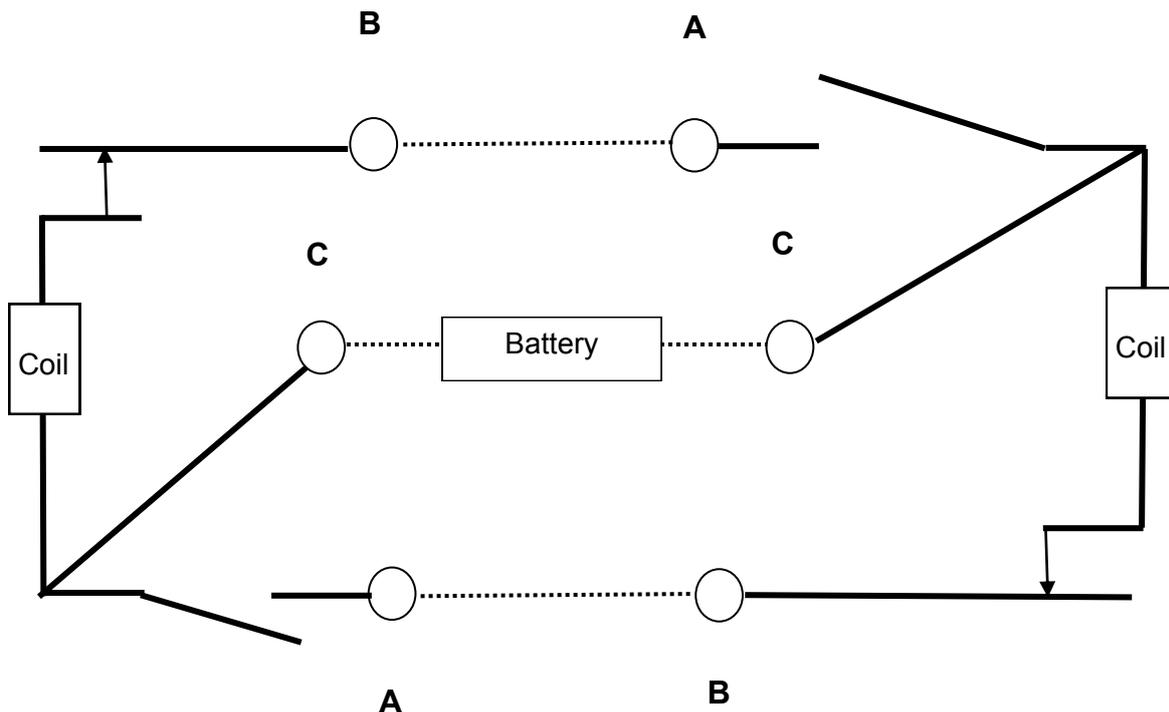
- Born 1791
- Artist
- Lived in England 1811 – 1815, exhibited at Royal Academy
- 1832 appointed Prof Painting & Sculpture in New York
- on voyage to USA overheard discussion on electromagnets – seeded idea
- now remembered for his code
- most significant invention was landline telegraph system



Sound of Morse Code <http://www.learnmorsecode.com/>

Linking 2 Morse Key & Buzzer sets to send messages

Two sets of Morse Key & Buzzer can be linked with a triple cable to send messages between two rooms. Connections (in broken line) to enable two units to communicate with each other.



MORSE KEY & BUZZER Mk2



WORKSHEET 2

1. What is Morse for the initials of your name?
2. How do you make an electro-magnet?
.....
3. What do you have to do to increase the strength of your electro-magnet?
.....
4. If you change the battery terminals over, what happens to the magnet?
.....
5. Draw a 'make and break' circuit
6. Draw the buzzer and colour the parts that conduct electricity red so that someone else can follow the circuit.
7. Write a story about someone who was saved from a burning house by sending a message in Morse.

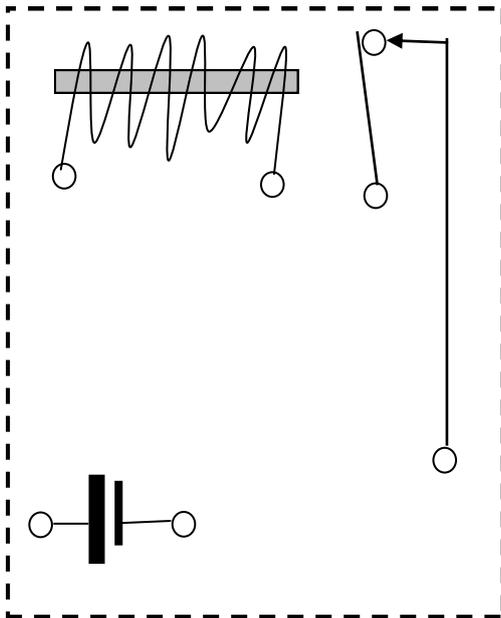
MORSE KEY & BUZZER Mk2



WORKSHEET 3

Complete the following circuits by drawing in the connections between the components then complete the sentences in the “how it works” boxes using the correct words from those supplied.

The Simple Buzzer



Core, switch, circuit, plastic, monkey, aluminium, iron, steel, coil, weaker, stronger, battery, electricity, spring

How it works

Connecting the _____ completes the _____

The electromagnet attracts _____ and _____

The more turns in the _____ the _____ the electromagnet becomes.

The iron _____ makes the magnet stronger.

The Morse Key Buzzer

Core, code, circuit, shopping trolley, armature, iron, coil, elephant, stronger, battery, wheel, key, Morse, electromagnet

How it works

Pressing the _____ completes the _____

The armature is attracted to the _____ which then breaks the circuit and the _____ springs back. The _____ is attracted to the _____ again.

This keeps happening very quickly whilst the _____ is pressed. By pressing and releasing the _____ at different intervals we can send _____ messages to each other.

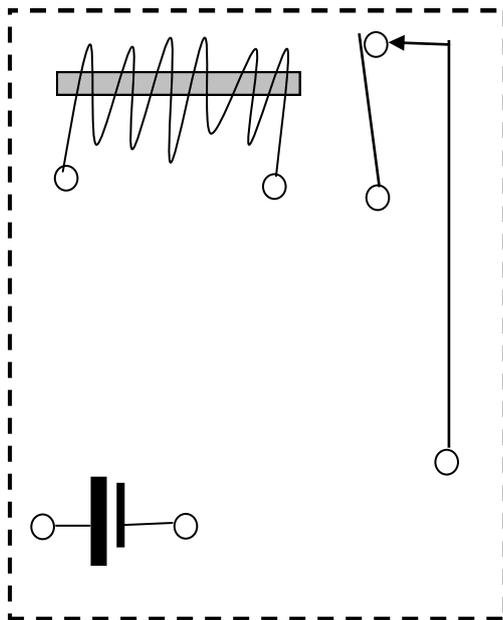
MORSE KEY & BUZZER Mk2



WORKSHEET 3

Complete the following circuits by drawing in the connections between the components then complete the sentences in the “how it works” boxes using the correct words from those supplied.

The Simple Buzzer



Core, switch, circuit, plastic, monkey, aluminium, iron, steel, coil, weaker, stronger, battery, electricity, spring

How it works

Connecting the **BATTERY** completes the **CIRCUIT**

The electromagnet attracts **IRON** and **STEEL**

The more turns in the **COIL** the **STRONGER** the electromagnet becomes.

The iron **CORE** makes the magnet stronger.

The Morse Key Buzzer

Core, code, circuit, shopping trolley, armature, iron, coil, elephant, stronger, battery, wheel, key, Morse, electromagnet

How it works

Pressing the **KEY** completes the **CIRCUIT**

The armature is attracted to the **ELECTRO-MAGNET** which then breaks the circuit and the **ARMATURE** springs back. The **ARMATURE** is attracted to the **ELECTROMAGNET** again.

This keeps happening very quickly whilst the **KEY** is pressed. By pressing and releasing the **KEY** at different intervals we can send **MORSE CODE** messages to each other.