

Hand-made switches

Making hand-made switches is a good way of helping children understand how they work and which would be appropriate for a particular user and purpose in a product. For example, some lights may need to stay on, others to work only when held.

These switches can be put together using: scissors, automatic wire strippers and ruler. Use a card drill or hole punch to make holes in card.

Materials can include card, corrugated plastic sheet, card wheels, paper clips, paper fasteners, click rivets, aluminium foil or self-adhesive copper strip. Make the parts from recycled materials where appropriate.

Tips

- If joining wires twist them together tightly or use a connector block.
- Make sure wires are joined securely to contacts.
- Tape over contacts to help with reliability.
- When connecting wire to screw contacts hook the wire around clockwise.
- To save money card can often be used instead of corrugated plastic.

Information taken from [Let's Get Practical: Developing handmade switches](#).



Push switch

Used to complete a circuit as long as the switch is pressed.

Tools • Wire strippers • Scissors or card snips • Hole punch • Safety ruler	
Materials • Single stranded wire • Paper fasteners • Corrugated plastic or card	
Preparing the base • A safety rule is an ideal width for cutting strips and to use to make folds. • Draw diagonal lines to find the centre of the base. • Use a piece of scrap hardboard or a safety mat to protect surfaces when using a card drill.	
Adding connectors • Pass a fastener through the hole. • Strip back about 20mm of insulation on the wire. • Don't press the paper fastener right down until the wire has been connected. •	
The push switch circuit	

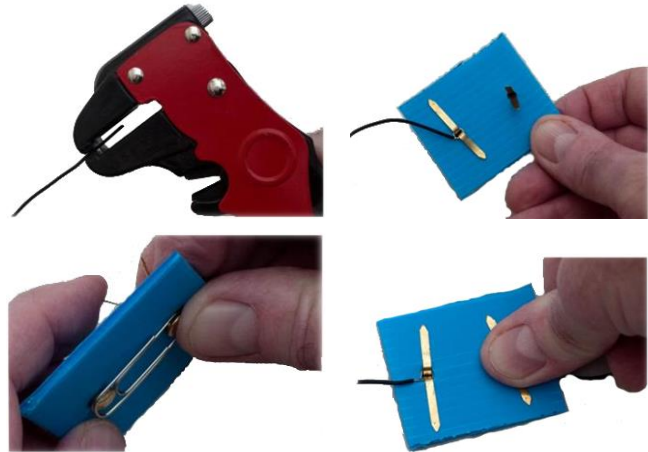
Toggle switch

Either on or off; ideal for using with a powered vehicle so you don't have to hold the switch on all the time.



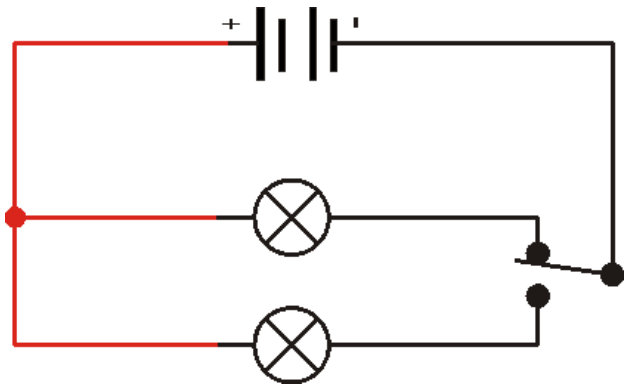
Tools • Wire strippers • Scissors or card snips • Hole punch • Safety ruler	
Materials • Single stranded wire • Paper fasteners • Corrugated plastic or card • Paper clip	
Constructing the base • Use the paperclip to measure the length of strip you need.	
Adding connectors • Use the paperclip to measure the centres of the holes. • Punch the holes and pass paper fasteners through.	

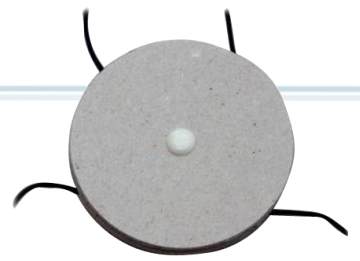
Adding wires



Two-way toggle switch circuit

- A two-way toggle switch could be used to control a torch that has different coloured bulbs.
- Switches with more contacts could be made. Remember to put the contacts on an arc with the 'common' contact as the centre.





Two-way rotary switch

A more complex switch that could be used in a product where two separate components need to be controlled e.g. a bulb and a buzzer.

Tools • Wire strippers • Scissors or card snips • Hole punch or card drill • Safety ruler	
Materials • Single stranded wire • Paper fasteners • Double-sided tape • Paper clip • Click rivet • Aluminium foil • Card discs	
The bottom wheel • The lines should intersect at a right angle. • Mark the positions for the holes equidistant from the edge.	
Adding connectors • Bend back the paper fasteners but don't press them right down until after you have connected the wires	

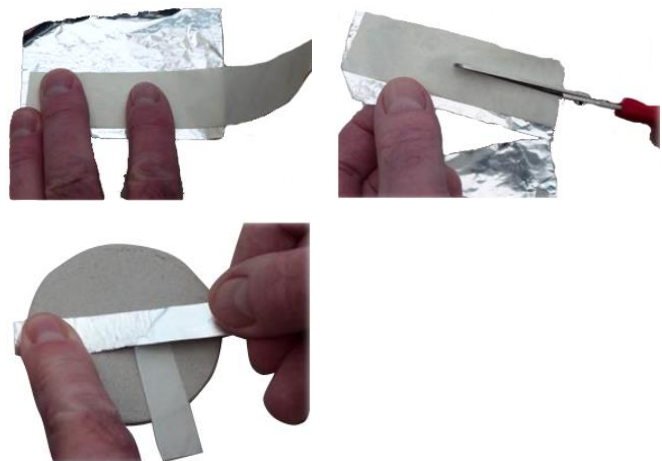
Adding wires

- Strip the wires then wrap the ends tightly around the paper fasteners so you get a good connection.
- Make sure the fasteners aren't touching.
- Press down the fasteners from above to tighten the connection.



Adding foil to the top disc

- Use double sided tape on the foil and cut a strip about 10 to 15mm wide and long enough to go all the way across the diameter of the disc.
- PVA glue could be used instead of the tape.
- An alternative is self-adhesive copper strip.
- Stick the foil across the centre of the disc.



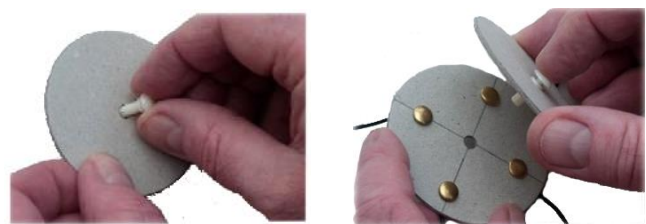
Cleaning up the top disc

- Trim off the excess foil and push a hole through the centre.



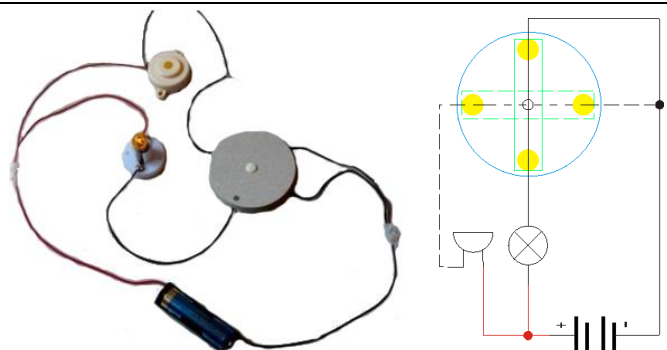
Assembling the discs

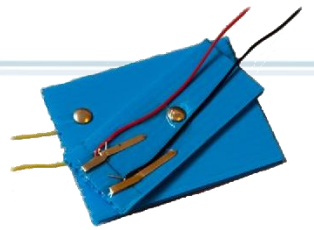
- A click rivet should be used so that the discs are held tightly together without being difficult to turn. A washer could be used to increase the thickness of the switch if the rivet is long.
- A paper fastener may be used instead.



Two-way rotary switch circuit

- Using different coloured wires on the switch would clarify what connects where.
- If the components to be switched are of different voltages then two batteries of the appropriate voltage will need to be used.



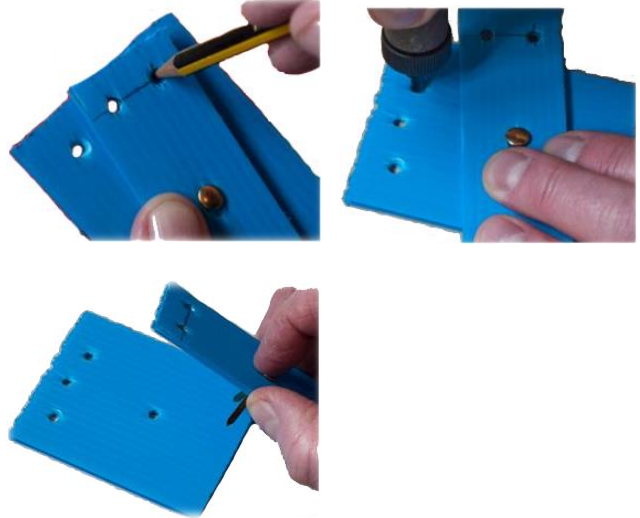


Reversing switch

Use to change the direction of the electricity.

Tools • Wire strippers • Scissors or card snips • Hole punch • Safety ruler	
Materials • Single stranded wire – wire of different colours helps make the circuit clearer • Paper fasteners • Corrugated plastic or card	
Constructing the base and wiper • Measure and cut the corrugated plastic • The wiper should be the same length as the base but half the width	
Holes.... Adding connectors • Place the wiper over the base so the base hole can be marked at the same time • Mark and punch holes through the wiper • Join the two parts so the base contact holes can be marked accurately • Punch the holes in the base as accurately as possible	

- Line up the centre hole to mark the position of the third hole

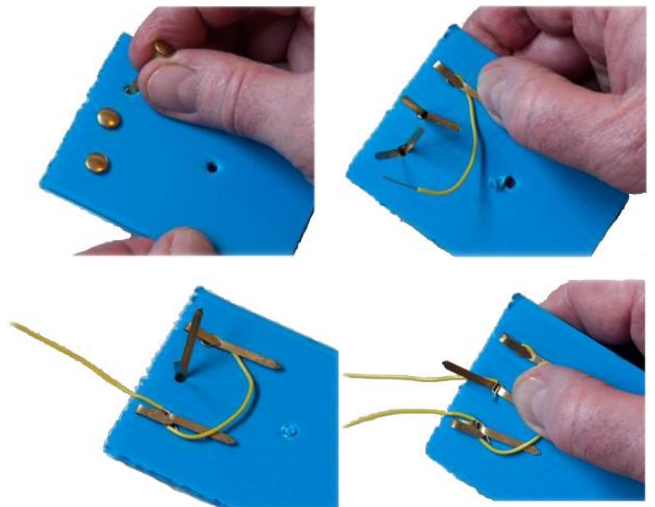


Adding the wiper contacts

- Thread the paper fasteners through the holes and wind the stripped ends of the wires around these
- If the paper fasteners are long they can be bent over
- Using different coloured wires helps to make the circuit easier to understand

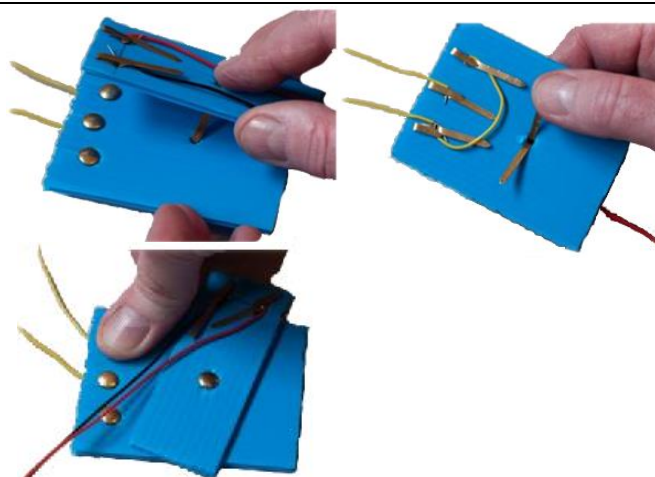


Adding the base wires

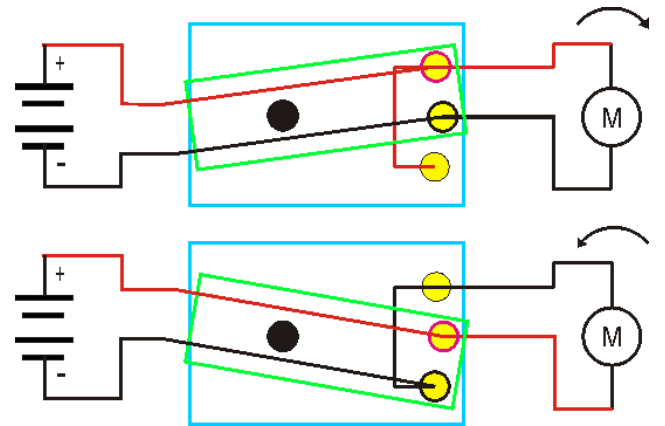


Assembly

- Ensure the paper fasteners don't touch each other
- Pressing the paper fasteners down helps make a good connection



Reversing the switch circuit



Tilt switch

For alarms and games.



Tools • Wire strippers • Scissors or card snips • Safety ruler	
Materials • Single stranded wire • Corrugated plastic or card • Self-adhesive copper tape • Masking tape • Steel ball A marble covered in silver foil could be used in place of the ball Silver foil could be used instead of copper tape	
Marking the base board • The centre piece needs to be wider than the steel ball so it will roll down when the strip is folded • The sides need to be wide enough to contain the steel ball	
Adding contacts • Cut to the width required and the length. The shorter the length the more sensitive the switch • Peeling just a bit of the backing strip off makes it easier to handle • Adding a strip either side will give a larger contact area but isn't essential • Leave the tape long and wrap it around onto the back	
Making holes for the contacts • Only small holes are needed; just large enough to take the wire • Holes at both ends will help to support the sides even if both contacts are not needed	

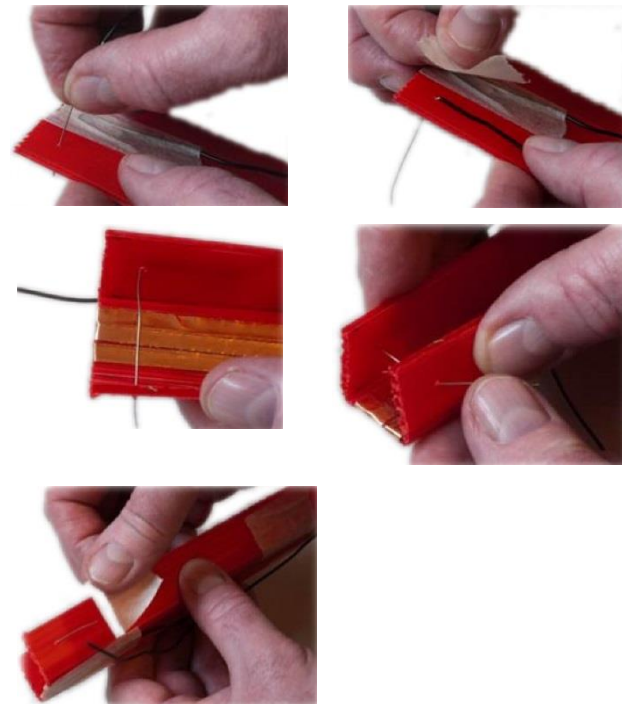
Making the guide

- Strip a good length of insulation off to get a good contact area on the copper tape
- Use a ruler to help fold accurately



Adding the contacts

- Thread the wire through both sides and bend back then tape to hold the sides parallel.

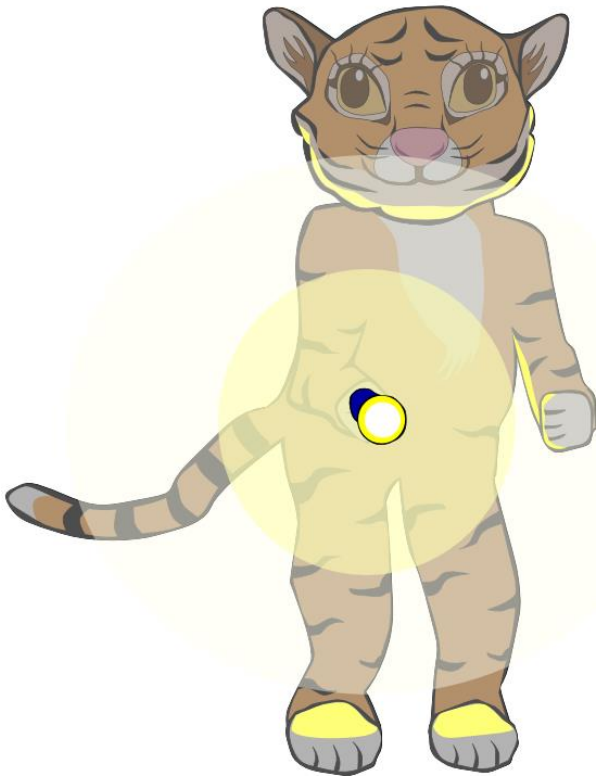


Tilt switch circuit

- Connector blocks are an alternative to joining wires by twisting



Tech Tiger



Resource links

This resource uses content drawn from the [Developing Handmade Switches](#) resource.
Other resources for primary electrical control include:

[Designing and making alarm circuits using inputs with computer control](#)

[Motorised frameworks](#)

[Alarming vehicles](#)

[Fairgrounds](#)

[Torches, Lamps and Lanterns](#)

[Night lights \(links to Literacy\)](#)

[Projects on a Page](#) planners

Year 3/4 Electrical Systems – Simple programming and control

Year 3/4 Electrical Systems – Simple circuits and switches

Year 5/6 Electrical Systems – More complex switches and circuits

Year 5/6 Electrical Systems – Monitoring and control



Projects on a Page

A national scheme of work for design and technology