

E. ACTIVITY 1 - SIMPLE CIRCUIT: Learn the basic techniques to build your own simple circuit.

Make sure all conductive tape has been stuck onto the Activity Board.

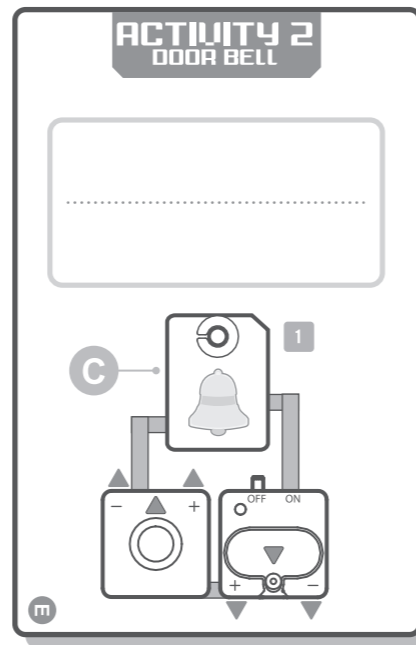
- 1.1 Pull out the plastic tab from the Battery Module (O). Insert it into the holes on the left and slide it towards the middle of Activity Board 1 as shown.
 - 1.2 Make sure the direction arrow on the module aligns with the arrows printed on the Activity Board.
 - 1.3 Place a module clip (V) onto the bottom joints of the Battery Module to create a stable connection with the conductive tape. Repeat with the Light Module (P).
 - 1.4 Make sure that you have stuck conductive tape on the back of the switch (B). Align the switch (B) with the outline marked (B) on Activity Board. Make sure the conductive tape on the switch touches the conductive tape on the Activity Board when it is pressed down. Secure it with a C-ring and peg (T) as shown.
- This modular system is specially designed to allow you to experiment with paper circuit science in a fun and easy way. The modules can be reused with other projects.
- 1.5 Turn the Battery Module on by flipping the switch. The small LED light on top of the module should turn on. (This indicates that the battery is ready to supply energy to the circuit. When the projects are not in use, switch the Battery Module off to avoid draining or short circuiting the battery. Unscrew the battery case cover to replace exhausted batteries.)
 - 1.6 Operation: Press down firmly on the switch (B) to complete the circuit and turn on the light.

HOW IT WORKS

A battery creates potential energy by producing more electrons at one end and less electrons at the other end (creating the positive and negative ends). Once the two ends are connected by a complete circuit, electrons (negatively charged) naturally flow to the positive end of the circuit where there are less electrons. This creates an electrical current which provides electrical energy. The electrical current is more powerful when the amount of electrons is greater in one place than in another.

TROUBLESHOOTING

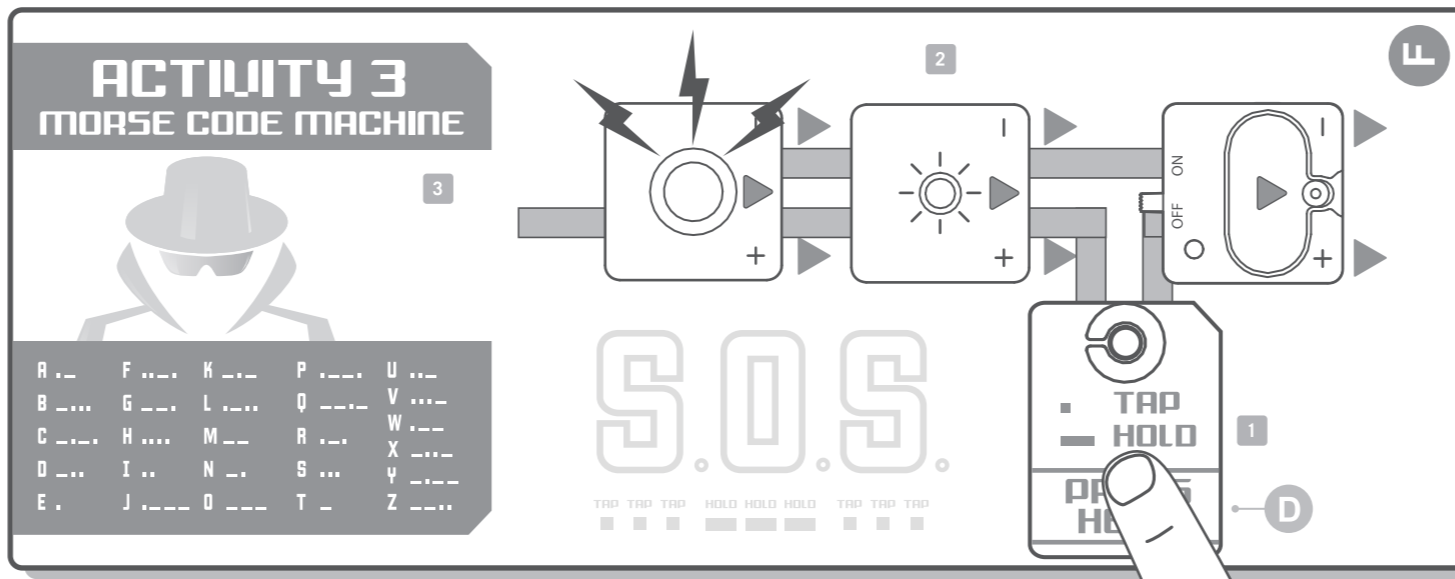
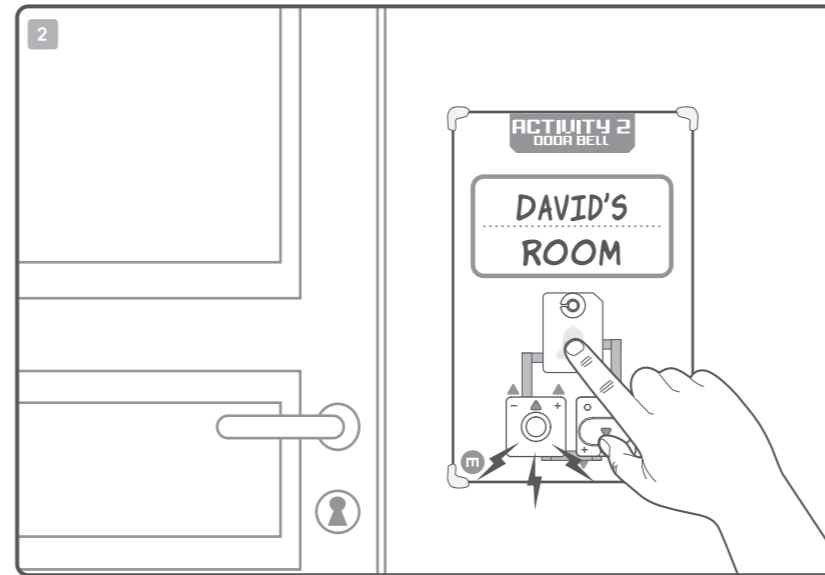
If the Light/Sound Modules do not turn on: • Check if the modules are clipped on securely. Make sure the modules have been inserted according to the direction arrows on the Activity Board. • Check if all the circuits made with conductive tape overlap at every corner for electricity to flow smoothly. Tape an extra piece of conductive tape on top of the existing conductive tape if needed. Press down on the overlapping tape to secure the connection.



ACTIVITY 2 - DOORBELL: Build a cool doorbell to amaze your friends and family!

Make sure all conductive tape has been stuck onto the Activity Board.

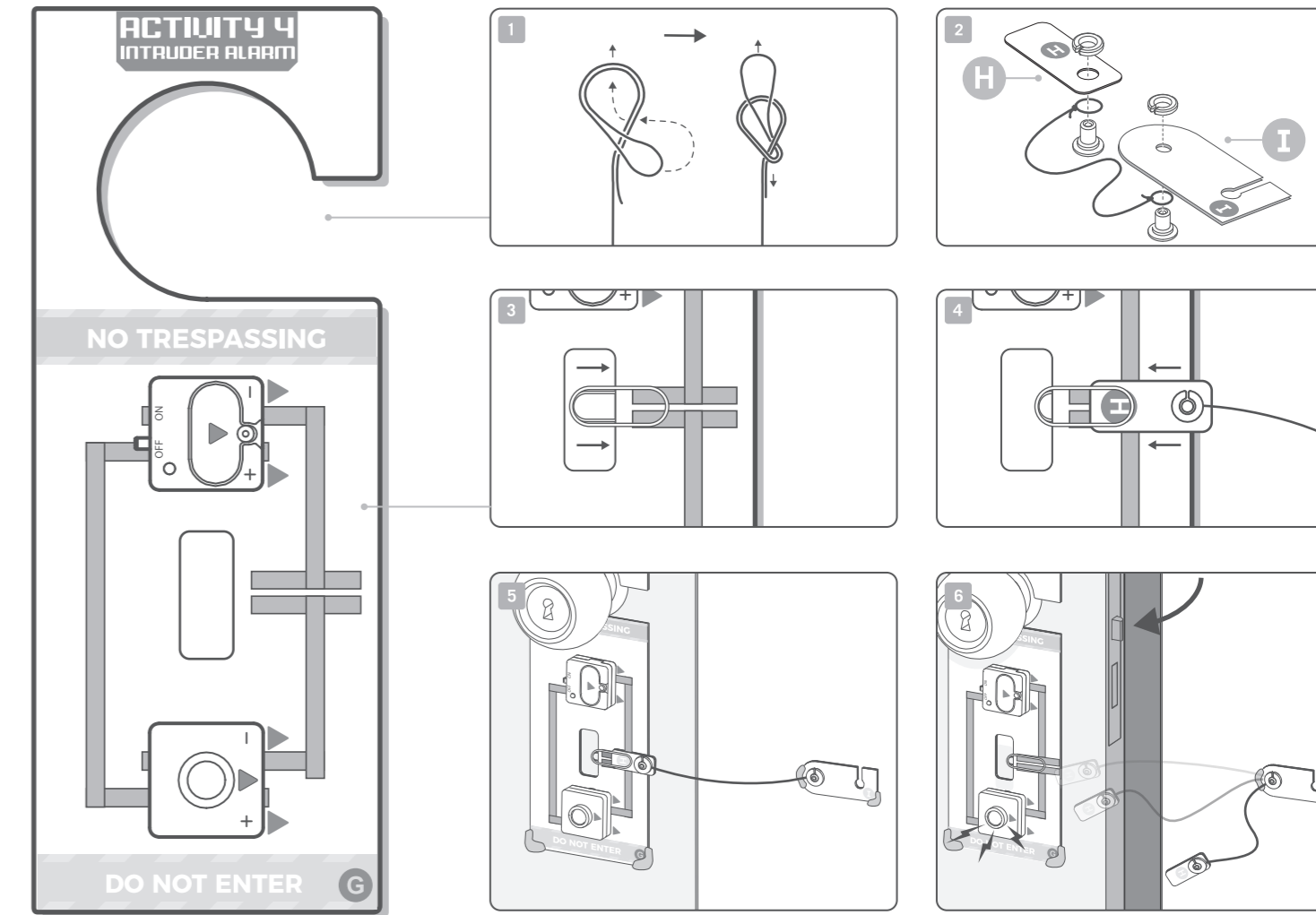
- 2.1 Make sure you have stuck conductive tape to the back of switch (C). Secure switch (C, from Activity Board 1) to the outline marked (C) on Activity Board 2 using a C-ring and peg. Make sure the conductive tape on the switch connects with the conductive tape on the Activity Board. Insert the Battery (O) and Sound Module (Q), and secure them with a module clip as done in Step 1.2/1.3.
- 2.2 Use the adhesive tab (Y) to stick the doorbell onto the wall or door surface. Press down on the switch firmly to complete the circuit and turn the Sound Module on. The action helps the electrons flow through the conductive tape just like in Activity 1!



ACTIVITY 3 - MORSE CODE MACHINE: Create a cool parallel circuit which allows you to communicate with others using Morse Code.

Make sure all conductive tape has been stuck onto the Activity Board.

- 3.1 Make sure you have stuck conductive tape to the back of switch (D). Flip and secure switch template (D, from Activity Board 1) to the outline marked (D) on Activity Board 3 using a C-ring and peg.
 - 3.2 Secure the Battery Module, Light Module and Sound Modules onto the Activity Board with module clips.
 - 3.3 Follow the Morse Code chart printed on the Activity Board when tapping the switch to turn the Light and Sound Modules on and send out Morse Code messages. Example: S.O.S = "... - - -" (3 short, then 3 long and finally 3 short presses of the button).
- How it works: A parallel circuit has two or more paths for an electrical current to flow through. A simple circuit only has one. The voltage is the same across each path of the parallel circuit so every component can turn on simultaneously at full strength.



ACTIVITY 4 - INTRUDER ALARM: Protect any room with this hi-tech security system.

Make sure all conductive tape has been stuck onto the Activity Board.

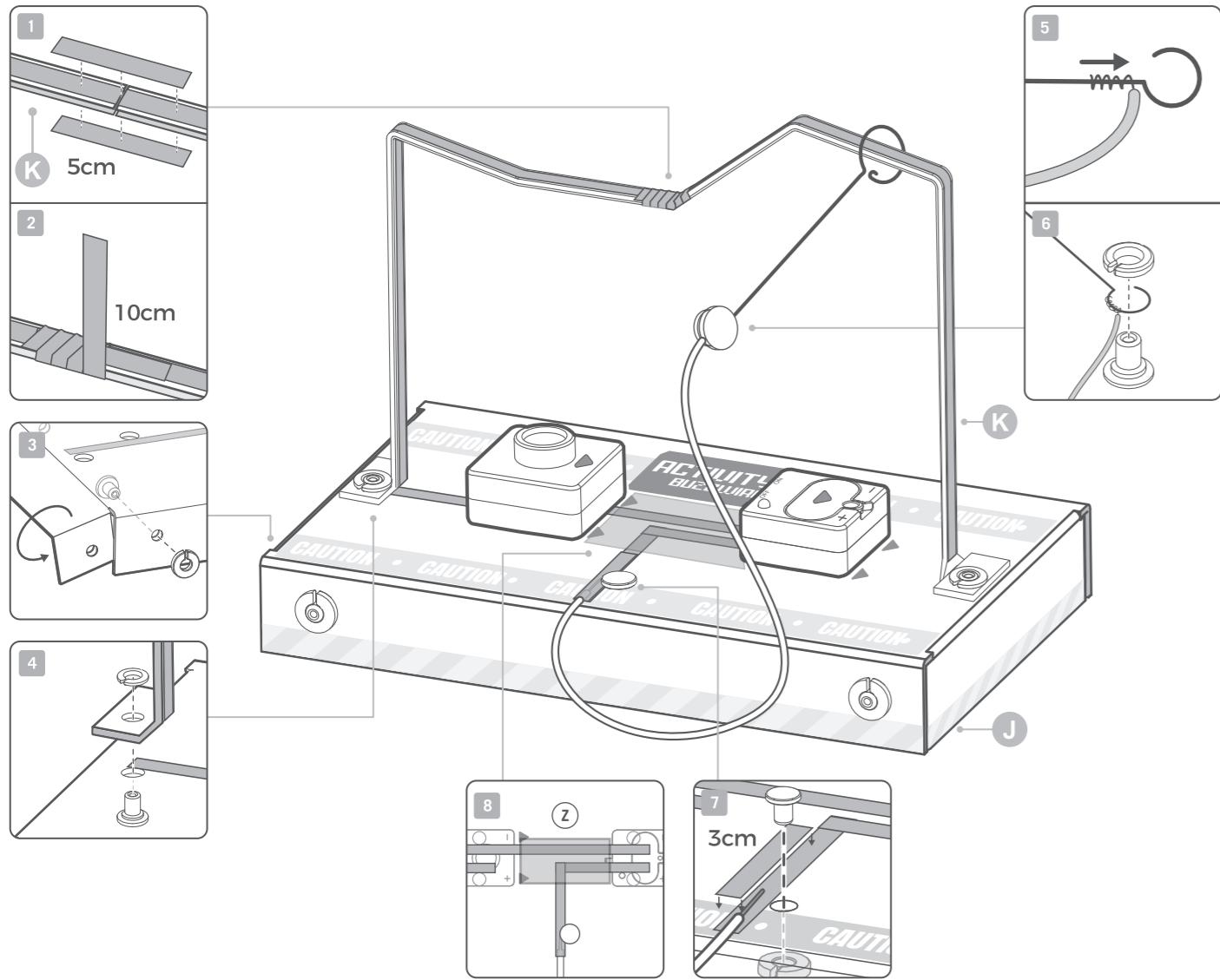
- 4.1 Insert the Battery and Sound Modules and secure with module clips. Take the string (X) provided and create a loop at each end using the technique outlined in the diagram.
 - 4.2 Punch out the cardboard pieces (H, I) in Activity Board 4. Loop one end over a peg and slide it through the hole in cardboard piece (H) and secure it with a C-ring. Repeat this process to secure the other loop to the other cardboard piece (I).
 - 4.3 At the circuit break point in the middle of the Activity Board, slide the paper clip (W) onto it to connect the conductive tape as shown. When the Battery Module is turned on, it will power the Sound Module and produce a beeping sound.
 - 4.4 Slide the smaller piece of cardboard (H) underneath the paper clip. This will break the circuit. The Sound Module should turn off.
 - 4.5 Hook the Intruder Alarm over a doorknob. Stick the remaining piece of cardboard (I) to the wall (or a table/heavy object) using the adhesive tab.
 - 4.6 When any unwanted guests open the door, the cardboard piece (H) is pulled out, the Sound Module will then beep and alert you of the intruder.
- How it works: When the cardboard piece (H) is pulled out, it allows the paper clip to complete the circuit. This allows electrical energy from the Battery Module to flow to the Sound Module and turn it on.

4I-04291 1102020

QUESTION AND COMMENTS: We value you as a customer and your satisfaction with this product is important to us. If you have comments or questions, or you find any part of this kit missing or defective, please do not hesitate to contact our distributor in your country. You will find the address printed on the package. You are also welcome to contact our Marketing Support Team: Email: infodesk@4m-ind.com, Fax (852) 25911566, Tel: (852) 28936241, Web site: WWW.4M-IND.COM

©2020 4M INDUSTRIAL DEVELOPMENT LIMITED. ALL RIGHTS RESERVED.





ACTIVITY 5 - BUZZ WIRE: Put together this amazing Buzz Wire and see if anyone can complete the challenging game.

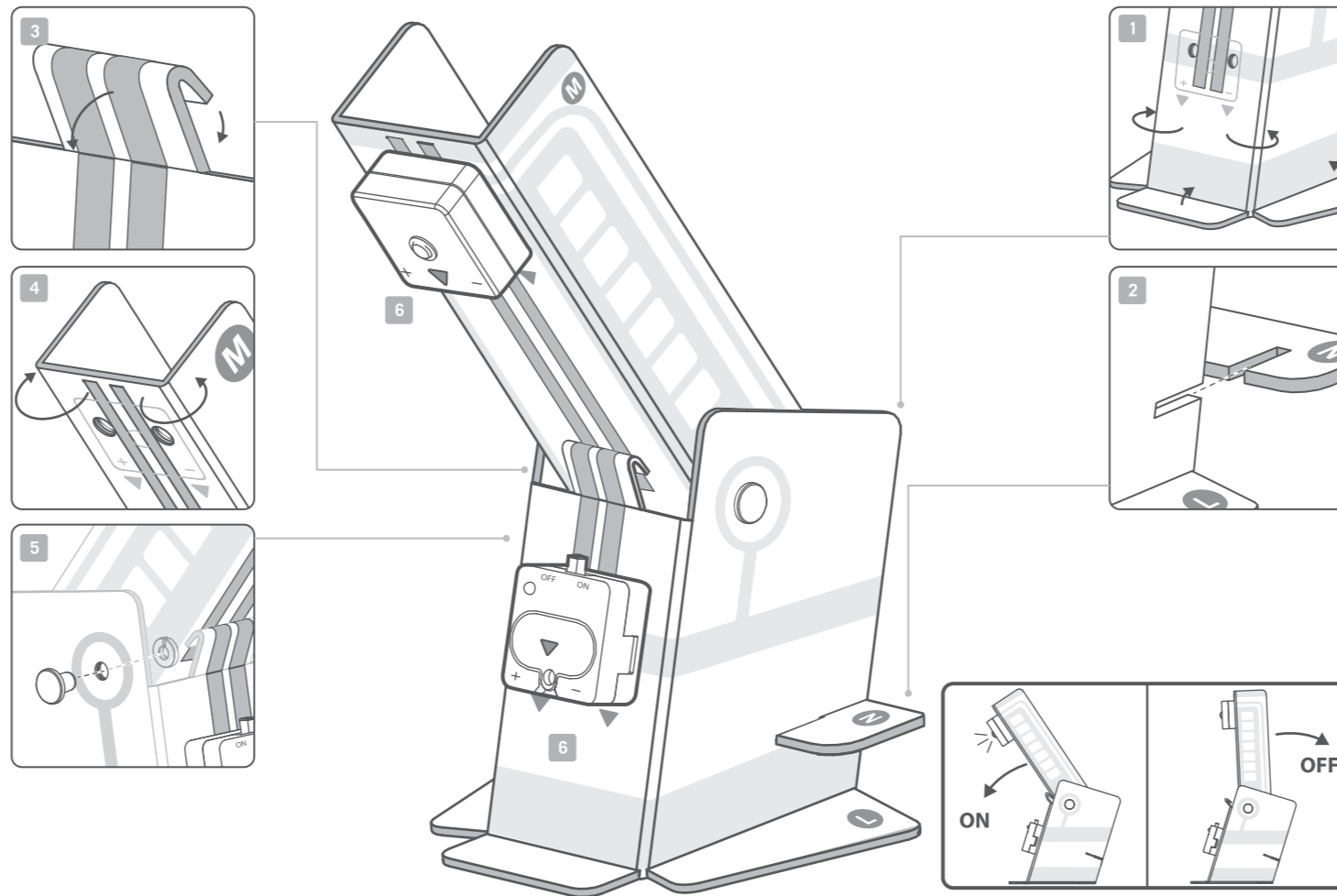
Make sure all conductive tape has been stuck onto the Activity Board.

- 5.1 Take out the long pieces of cardboard strips (K, from Activity Board 5). Make sure to stick conductive tape on BOTH sides. Attach the two cardboard strips to each other with two medium pieces of conductive tape (5 cm) as shown.
- 5.2 Wrap a piece of long conductive tape (10 cm) around the joined area to create a strong connection. Take your time while completing this step. Press down on the tape to ensure the tape is securely connected.
- 5.3 Insert the Battery Module and Sound Module and secure with module clips. Fold the sides of the cardboard base (J, from Activity Board 5). Then fold the end of the two shorter flaps underneath the two long flaps. Attach the sides together with C-rings and pegs to create the base.
- 5.4 Attach each end of the thin cardboard strip (K) to the base with a C-ring and peg as shown. Make sure the conductive tape on the cardboard strip is in contact with the conductive tape on the base.
- 5.5 Loop one end of red wire (S) around the metal wand's (R) small hook and slide the red wire loop into the small hook.
- 5.6 Secure the connection with a C-ring and peg.
- 5.7 Place the other end of the red wire on top of conductive tape on the Buzz Wire's base as shown. Secure it in place with a piece of conductive tape (3cm). Push in the peg and C-ring to keep the wire in place.
- 5.8 Cover the conductive tape on the Buzz Wire's base with transparent tape (Z) to avoid short circuiting the device with the metal wand. Your Buzz Wire is now complete!

How to play: Turn the Battery Module on. Guide the wand from one end to the other without touching the Buzz Wire. Whoever touches the Buzz Wire (triggering a sound) will lose the game. Slightly bend and adjust the shape of the buzz wire to make it more challenging. You can also roll kitchen aluminum foil into strips and replace the Buzz Wire with your design to create more challenging versions of this game.

How it works: The metal wand connected to the base with the Battery Module, Sound Module and the Buzz Wire forms an incomplete circuit. When the wand touches the Buzz Wire, the circuit is complete and an electrical current flow through the circuit to turn the Sound Module on.

Troubleshooting: If the Sound Module does not beep, check if the Battery Module is turned on. Check if all the places where the conductive tape connects are intact (e.g. the connection between the base and the buzz wire, the connection point of the two pieces which form the buzz wire). Press down firmly on the conductive tape or apply another small piece of conductive tape on top of any broken connection.



ACTIVITY 6 - DESK LAMP: Make a desk light that turns on by connecting a circuit together in an interesting way.

Make sure all conductive tape has been stuck onto the Activity Board.

- 6.1 Fold the desk lamp's base (L) as shown.
 - 6.2 Secure the base structure by inserting the small cardboard piece (N) into the slots as shown.
 - 6.3 Fold the joint in the middle of the base backwards then forwards to create the shape shown in the diagram.
 - 6.4 Fold the Desk Light's top (M) flaps backwards as shown.
 - 6.5 Attach it to the base with a C-ring and peg.
 - 6.6 Secure the Battery and Light Modules with module clips. Rotate the top of the lamp forwards to complete the circuit and turn the light on. Rotate it backwards to break the circuit and turn it off.
- How it works:** By pressing the conductive tape on the top part of the lamp to the conductive tape on the base, a complete circuit is formed. This way no switch is needed and the weight of the lamp's top keeps the light on even while you aren't touching it!

FUN FACTS

- Ever wondered why birds that sit on power lines don't get electrocuted? If a bird sits on only one power line it's safe. If the bird touches any part of its body to another line, it creates a circuit for an electrical current to flow, causing electrocution.
- Electricity travels at the speed of light -- more than 186,000 miles per second! That's why it's so hard to see all the electrical currents moving around us every day.
- Electricity is a fundamental force of nature. Without it, our world would not exist at all. After all, the atoms and molecules out of which all the world's material are composed are held together by electrical forces. Electrons, those particles that make up electrical currents can be found everywhere in nature.
- Lightning bolts are one of nature's greatest phenomena and is an example of an electrical current. Inside a thundercloud there are areas with a huge excess of electrons, and other areas where there are too few. So, just like between the poles of a battery, there exists electrical tension, or voltage, between these areas. In a thundercloud, though, the voltage doesn't amount to just a few volts. Often, it will be over 100 million volts. So it discharges itself over and over again in the form of lightning bolts.
- 200 years ago, the Italian researcher Luigi Galvani observed that two different metals will produce an electrical voltage if they are connected by a conductive liquid like lemon juice. The physicist Alessandro Volta used this observation to construct the first electric battery.

TECHCRAFT PAPER CIRCUIT SCIENCE

PLEASE SCAN THE QR CODE FOR VIEWING MULTI-LANGUAGE INSTRUCTIONS.



R. Veuillez scanner le code QR pour afficher les instructions multilingues pour ce kit. DE. Bitte scannen den QR-Code, um die mehrsprachige Anleitung für dieses Set zu sehen. NL. Scan de QR-code om de instructies voor deze set in verschillende talen te bekijken. IT. Scansiona il codice QR per visualizzare le istruzioni multi-lingua per questo kit. ES. Escanea el código QR para ver instrucciones in varios idiomas para este kit. JA. QRコードをスキャンして、キットの多言語説明書をご覧ください。

WARNING:
CHOKING HAZARD - Small parts.
Not for Children under 3 years.

TO PARENTS: PLEASE READ THROUGH THESE INSTRUCTIONS BEFORE GIVING GUIDANCE TO YOUR CHILDREN.

A. SAFETY MESSAGES

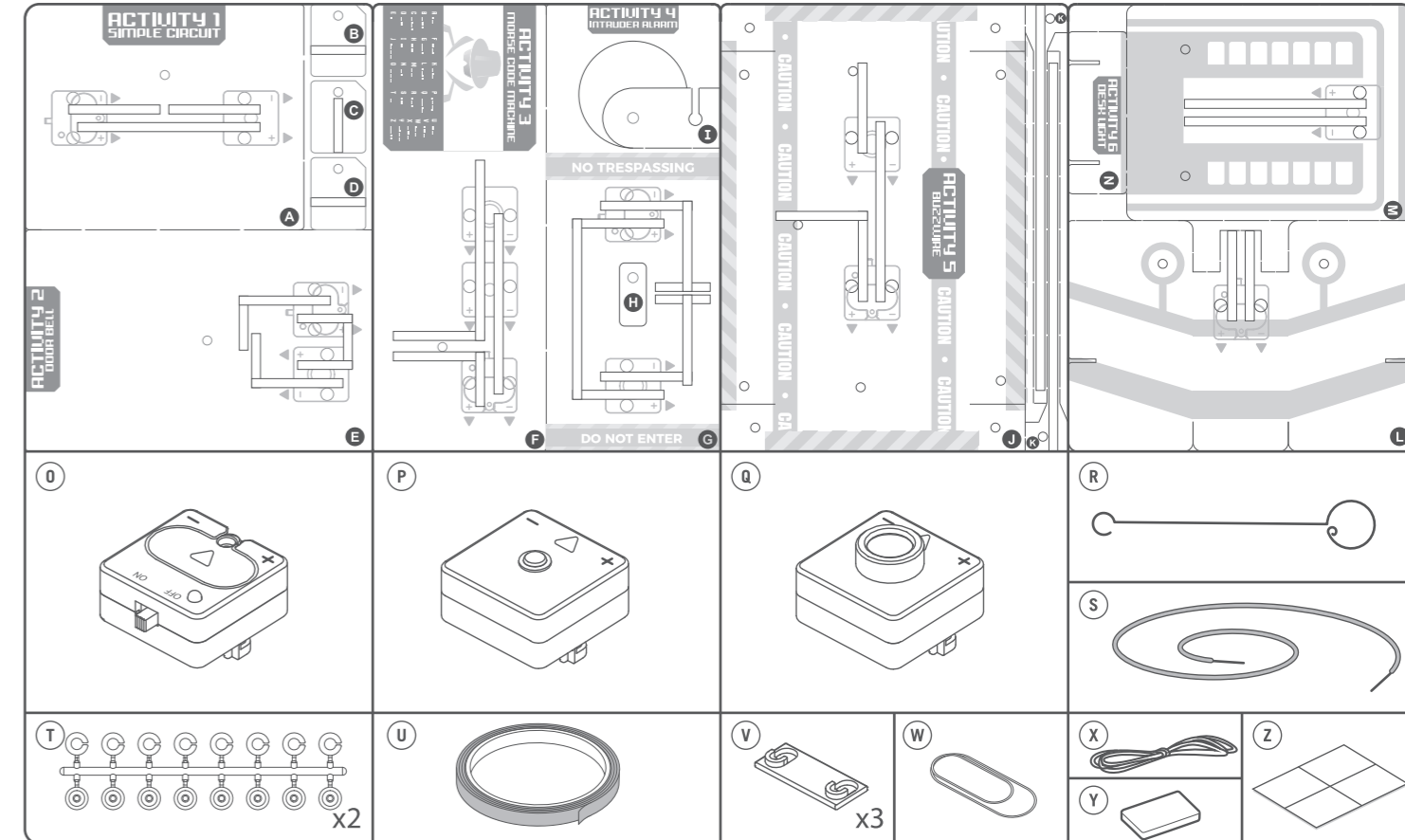
- 1) Adult assistance and supervision are required at all times.
- 2) This kit is intended for children over the age of 5.
- 3) This kit and its finished product contain small parts which may cause choking if misused. Keep away from children under 3 years old.
- 4) Turn the Battery Module off when it is not in use.
- 5) Never touch the conductive tape with any metal objects to avoid possible short circuit.
- 6) Adult supervision is required when using scissors.
- 7) The toy is not to be connected to more than the recommended number of power supplies.

B. USE OF BATTERIES

- 1) Use 2 x 1.5V button cell batteries (Model AG13/LR44).
- 2) For best results, always use fresh batteries.
- 3) Make sure you insert the batteries with the correct polarities (+ and -).
- 4) Remove the batteries from the kit when not in use.
- 5) Replace exhausted batteries straight away to avoid possible damage to the kit.
- 6) Rechargeable batteries must be removed from the kit before recharging.
- 7) Rechargeable batteries should be recharged under adult supervision.
- 8) Make sure that the supply terminals in the battery case are not short-circuited.
- 9) Do not attempt to recharge a non-rechargeable battery.
- 10) Do not mix old and new batteries.
- 11) Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries.
- 12) Unscrew the battery case cover to replace batteries. Adult supervision is required.
- 13) **WARNING:** Dispose of used batteries immediately. Keep new and used batteries away from children. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

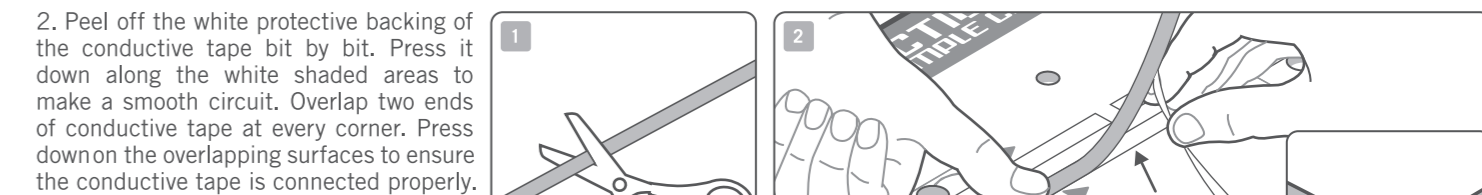
C. CONTENT

A-N: Activity Board x 4, O: Battery Module, P: Light Module, Q: Sound Module, R: Metal Wand, S: Wire, T: C-Ring & Peg x 2 sets, U: Copper Conductive Tape, V: Module Clip x 3, W: Paper Clip, X: String, Y: Adhesive Tab, Z: Transparent Tape. Required but not included in this kit: Scissors, a small crosshead screw driver.



D. PREPARATION

1. Before starting the activities, stick the copper conductive tape (U) over the white shaded areas printed on the Activity Boards. For convenience, tape before taking the small parts out of the Activity Boards. Or you could stick the conductive tape project by project. All conductive tape lengths are standardised as follows: short = 3cm, medium = 5cm, long = 10 cm, and extra-long = 21 cm. Cut 12 short, 19 medium, 8 long and 4 extra-long pieces (for Activity 5, Part K on both sides). Use the ruler printed inside of this instruction manual to measure out the tape.



- 3cm x12
- 5cm x19
- 10cm x8
- 21cm x4