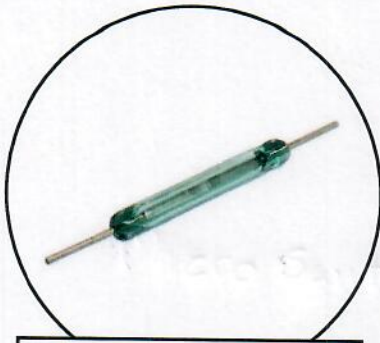


Investigating Switches

Task 1: Your group is being provided with different switches. A switch can either make or break a connection. Different switches are designed to function in particular environments. Use the provided tablets and a multimeter to investigate how these switches operate. Record your observations and findings in the boxes next to each switch.



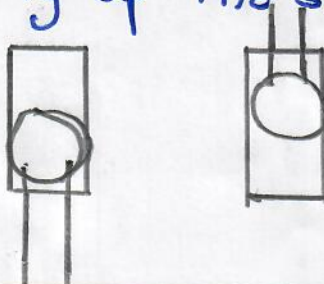
Reed Switch

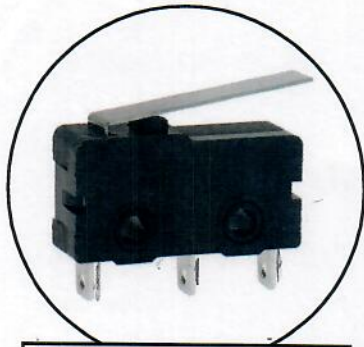
A reed switch is an electro magnet switch used to control the flow of electricity in a circuit. They are made from two or more ferrous reeds encased within a small glass tube-like envelope, which become magnetised and move together or separate when a magnetic field is moved towards the switch.



Tilt Switch

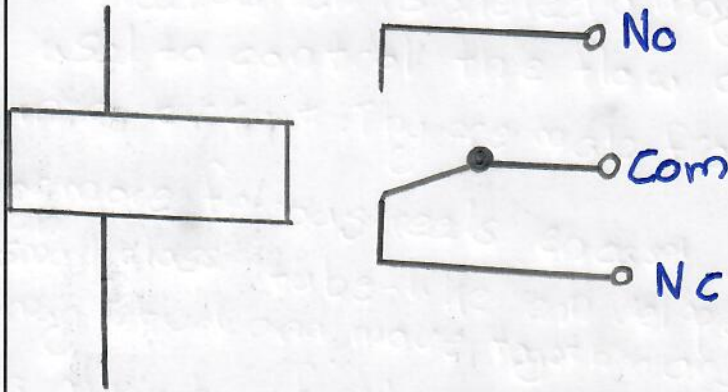
When the multimeter was set into continuity test, we touched the probes to the two leads, it was tilted to determine the angle at which the switch starts and stops operating. When it is pointing down it is an open switch and when it is pointing up the switch is closed.





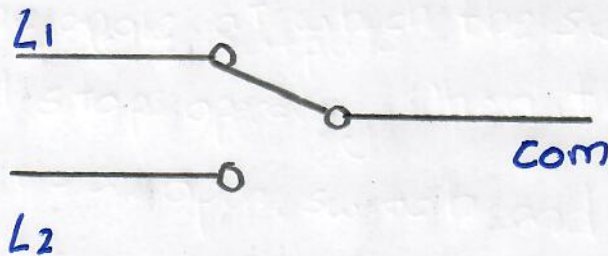
Micro Switch

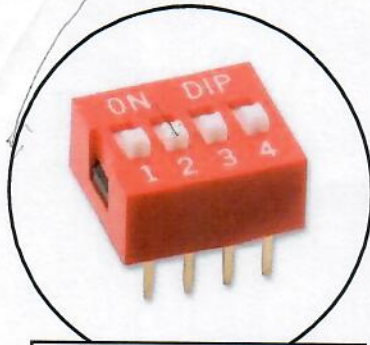
A micro switch is a very sensitive electric switch that can be operated rapidly by a small movement.



Toggle Switch

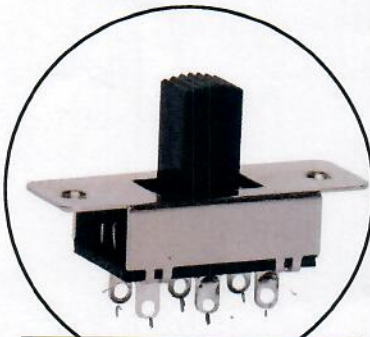
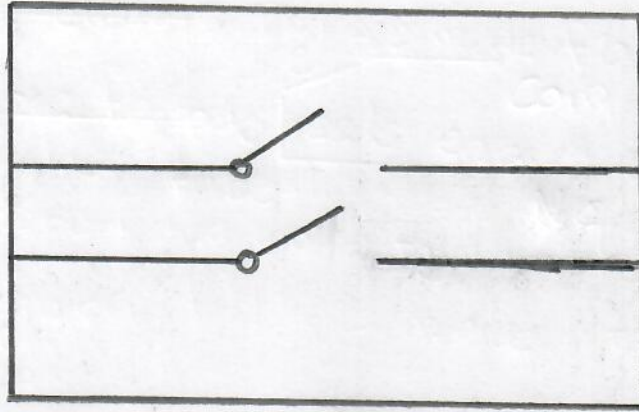
A toggle switch is an electronic switch which is manually activated by a mechanical lever.





DIP Switch

A DIP switch is a set of small switches in a Dip that is used to change the operating mode of a device.



Slide Switch

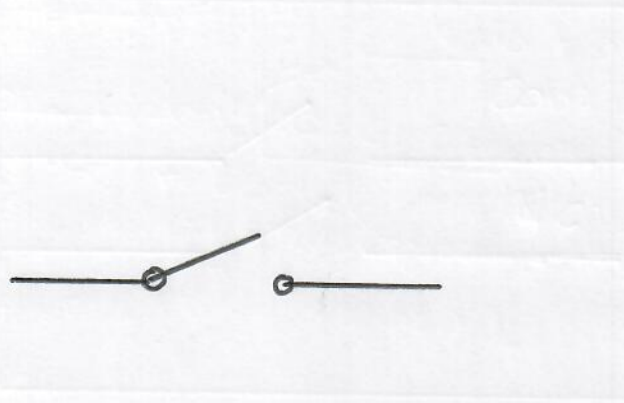
Slide switches are mechanical switches using a slider that moves from the open position to the closed position. They allow control over current flow in a circuit without having to manually cut or splice wires.





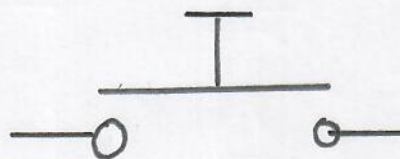
Rocker Switch

A rocker switch is on/off switch that rocks when pressed, which means one side of the switch is raised while the other side is depressed.



Push Switch

A push to make switch allows electricity to flow between its two contacts when held in. When the button is released, the circuit is broken.

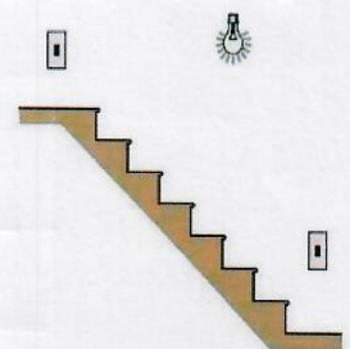


Task 2:

- a) Analyse the following circuit diagrams together with its descriptions and the context in which they are used.
- b) Then discuss and decide with your team members which switch or switches are suitable for a particular circuit.
- c) Use the provided components and equipment to test the given circuit according to your decisions
- d) When you have connected the circuit and its functioning according to given description, take a photo and place it in the given space.

Scenario 1

The circuit shown in figure 1 is much related to stairways, since it gives the possibility to switch on and off a light source for two various locations. In real life, such a circuit operates with a 240Volt AC supply. The circuit shown below uses the same type of connections, however, for safety reasons it operates with a 9V battery.



- a) Which type of switch would you use for SW1 and SW2?

Toggle switch

- b) How are these switches activated? By the mechanical lever of the switch

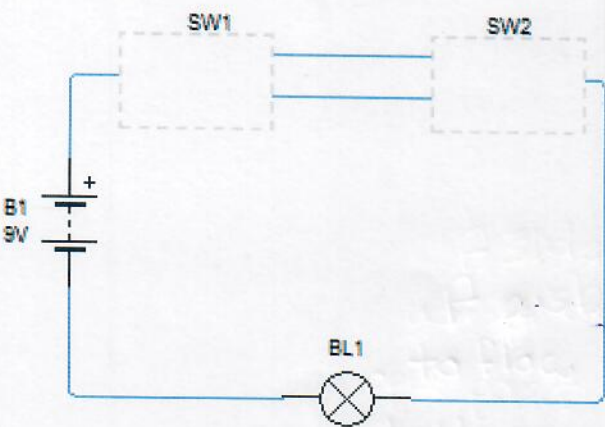
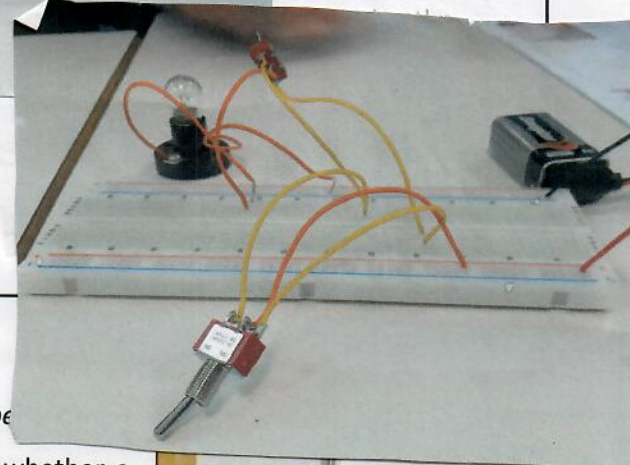
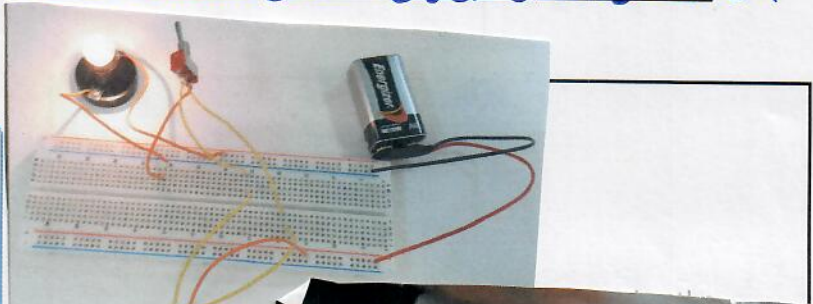


Figure 1 – Circuit 1



Scenario 2 - Circuit 2

Ensuring not to waste energy, some public places and hotels install an *open windows and doors detection system*. Such system is able to identify whether a window or a door is open or closed. This system is connected to the air-conditioning system, allowing it to operate only when the windows and doors are closed. If any door or window is opened, the system stop functioning until it is closed again. The circuit in figure 2 is a simple representation a room which has a door and a window, which both has to be closed so that the air-conditioning system remains on. The red LED represents the signal output to the air-conditioning system as shown in table 1:



- a) Which type of switch would you use for SW1 and SW2? reed switch

- b) How are these switches activated? by putting a magnet close to it

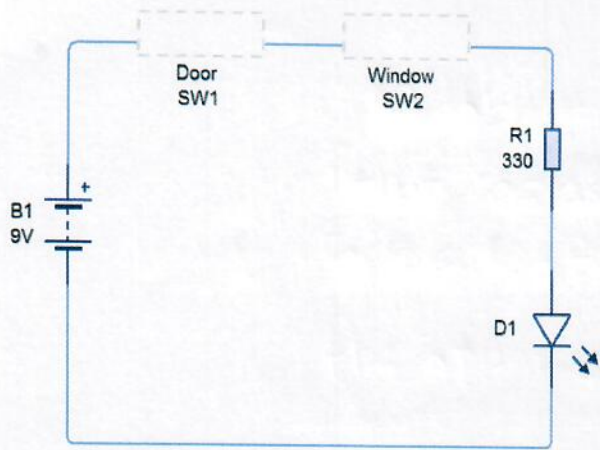
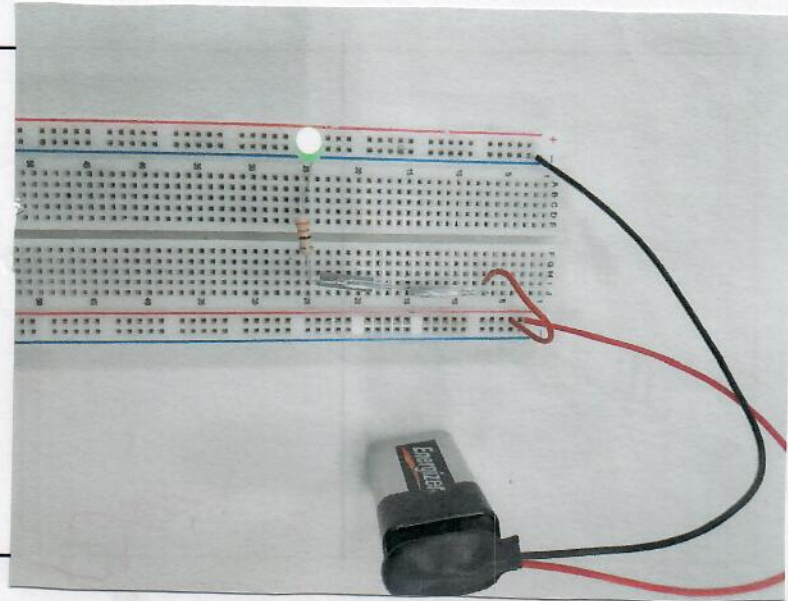
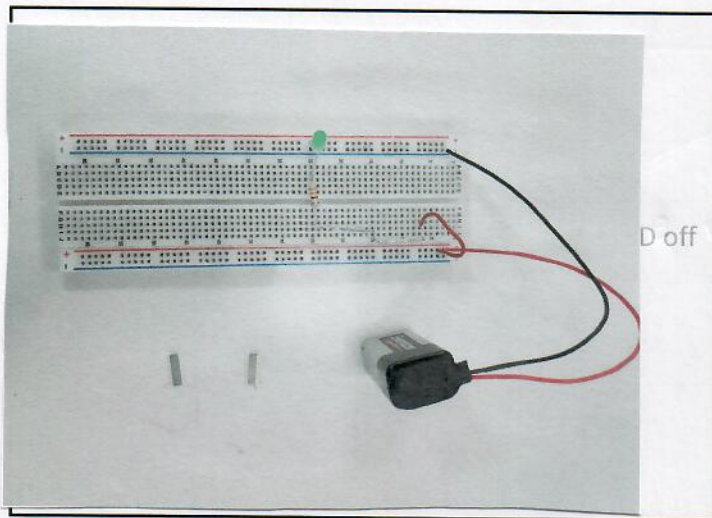


Figure 2 – Circuit 2

| LED Status | Apertures status | Air-condition systems |
|------------|------------------|-----------------------|
| ON | Closed apertures | Activated |
| OFF | Open apertures | Deactivated |

Table 1



Scenario 3 - Circuit 3

Retrotech is a company which produces popular products used in the past, with a fresh design and with an electronic twist. One of the new products that Retrotech will be producing is an egg timer. This gadget will function as a timer for cooking food, however instead of rotating the upper part to set the timing mechanically, the user has to set a specified amount of time by setting a combination of switches (SW3) at the bottom of the product. These switches will only need to be adjusted if the amount of time needs to be changed.

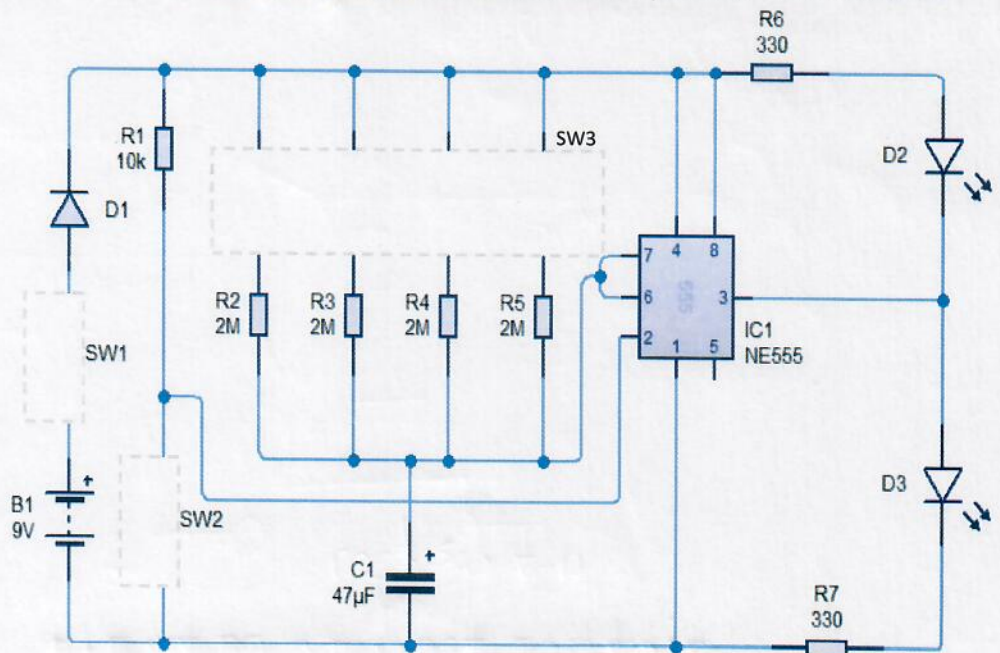


Figure 3 – Circuit 3

To operate the device, the user has to switch it on from a separate switch (SW1) while to start the timing, a button (SW2) needs to be pressed. Both the on and off switch and the activation switch are placed at the bottom of the egg timer.

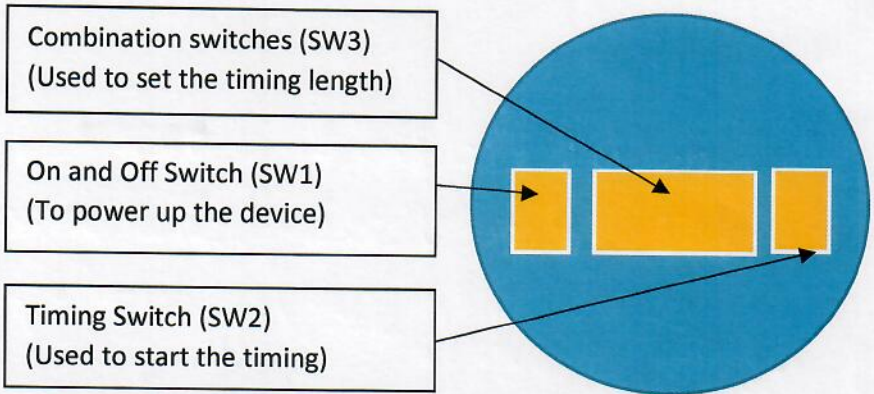


Figure 4 – bottom of egg timer device

The device casing is made out of opaque plastic, therefore when switched on it will

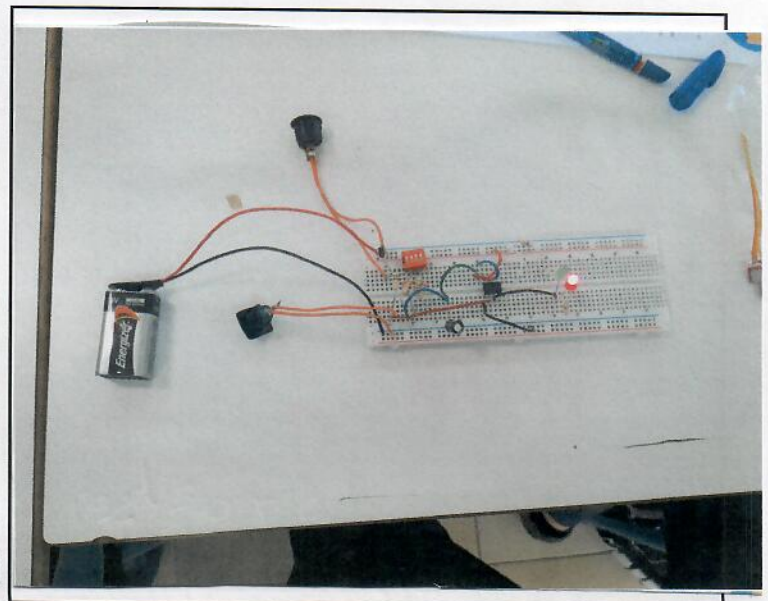
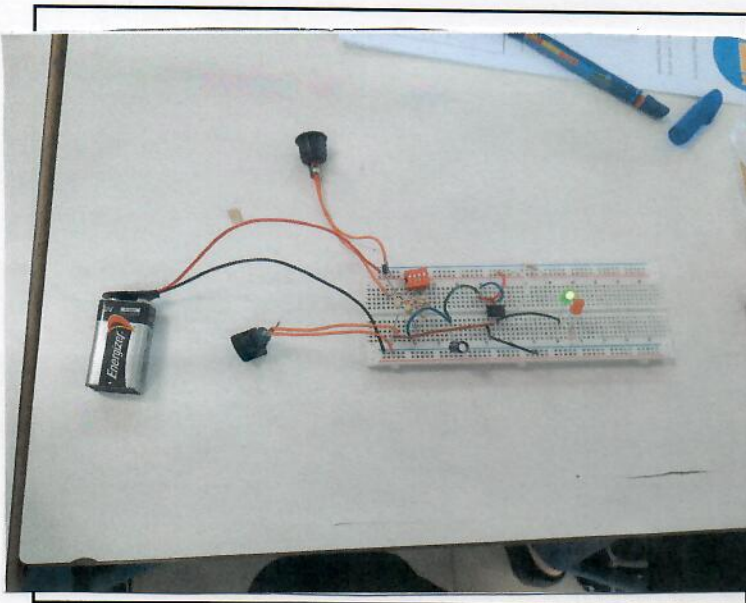
light up in green using a green LED (D2) inside, once the timing button is pressed the device will change its colour to red using a red LED (D3), once the set amount of time ends it will turn on green once again.

Figure 3, is the circuit that the designers have come up with to operate this gadget. While table 2, which will be provided to the user with the product, indicates how the combination switches should be placed to set the required amount of time.

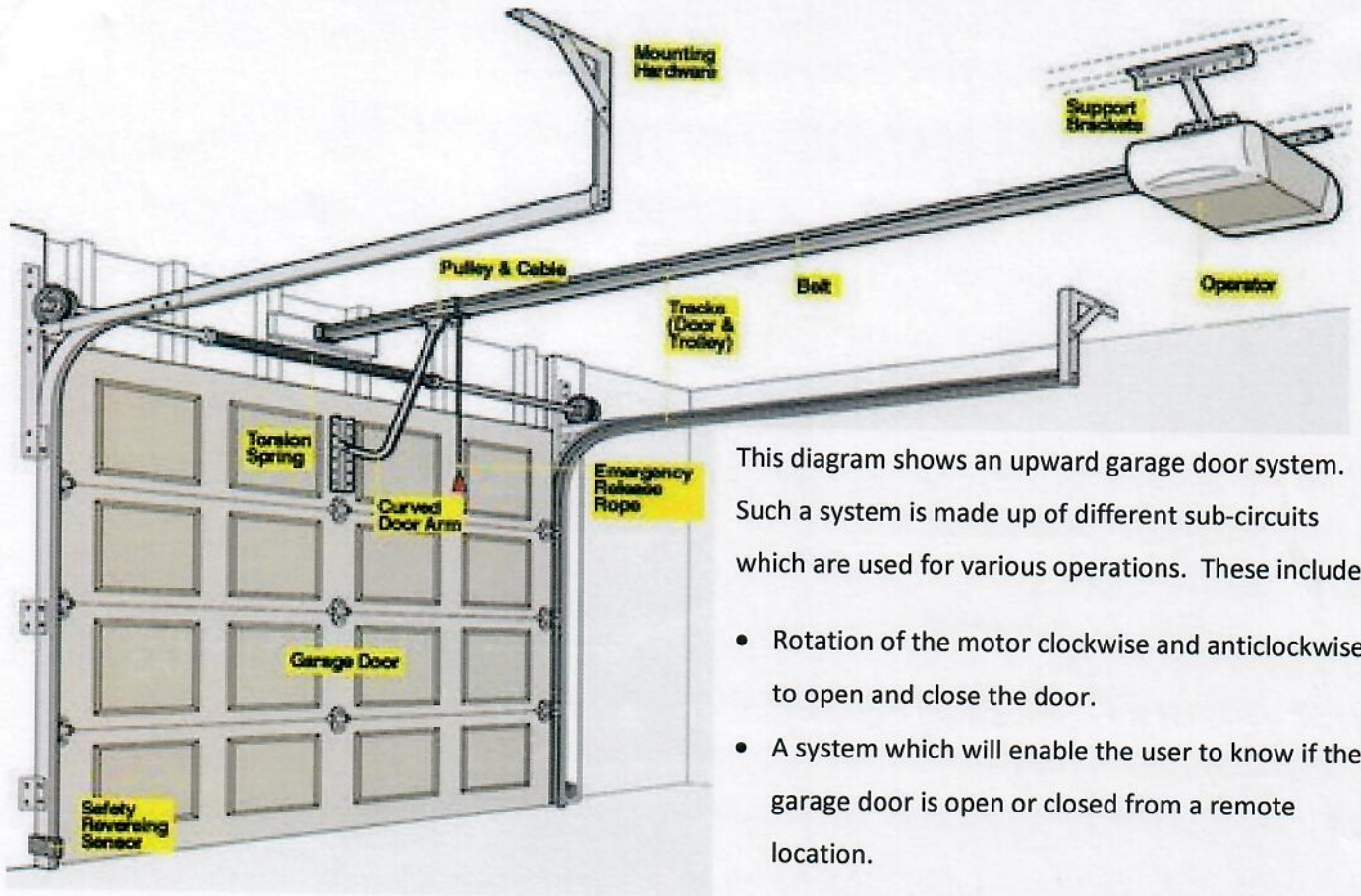
| Switch Information | Example | | | | Approx. Time / sec |
|--------------------|---------|---------|---------|---------|--------------------|
| | SW1 | SW2 | SW3 | SW4 | |
| All switches off | Off (0) | Off (0) | Off (0) | Off (0) | Infinite |
| Any 1 switch on | On (1) | Off (0) | Off (0) | Off (0) | 120 |
| Any 2 switches on | On (1) | On (1) | Off (0) | Off (0) | 60 |
| Any 3 switches on | On (1) | On (1) | On (1) | Off (0) | 40 |
| Any 4 switches on | On (1) | On (1) | On (1) | On (1) | 25 |

Table 2

- a) Which type of switch would you use for SW1? rocker switch
- b) Which type of switch would you use for SW2? Push switch
- c) Which type of switch would you use for SW3? DIP switch



Scenario 4



This diagram shows an upward garage door system. Such a system is made up of different sub-circuits which are used for various operations. These include:

- Rotation of the motor clockwise and anticlockwise to open and close the door.
- A system which will enable the user to know if the garage door is open or closed from a remote location.

a) Opening or closing the garage door requires a switch which is able to rotate the motor in opposite directions. The circuit shown in figure 5 simulates the opening and closing of the garage door by using a specific type of switch which can operate a motor in a clockwise or anticlockwise direction.

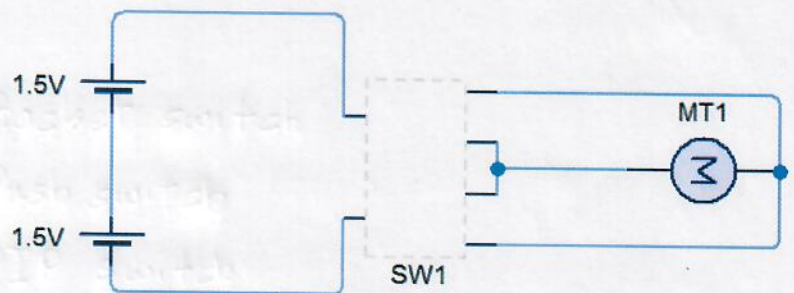


Figure 5 – Circuit 4

i) Which type of switch would you use for SW1? Slide switch

In this space insert a photo of circuit 4 with the motor rotating clockwise, showing the appropriate switch and its position.

In this space insert a photo of circuit 4 with the motor rotating anticlockwise, showing the appropriate switch and its position.

- b) The block diagram in figure 6 shows how the systems is able to detect if the garage door is opened or closed to notify its owner.

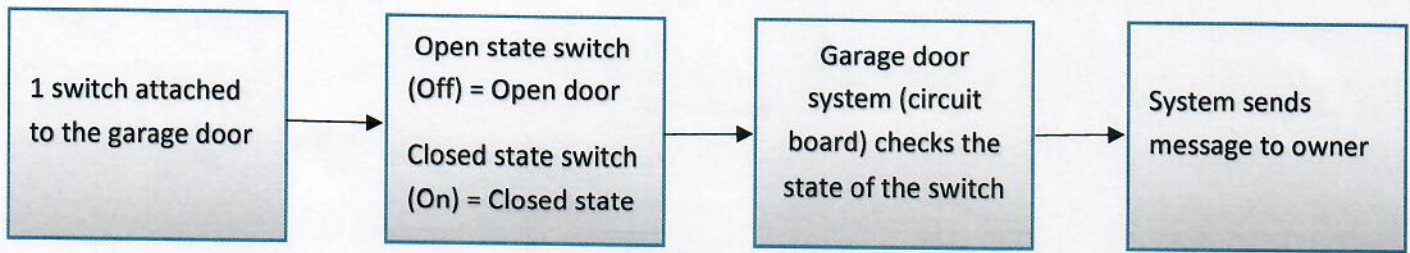


Figure 6

- i) What type of switch is used for the system explained in the block diagram in figure 5?

Micro Switch

- c) The circuit shown in figure 4 has been edited by adding two more switches SW2 and SW3, as shown in figure 7. The purpose of these switches is to turn off the motor when the door has been completely open or shut. These switches will disable the operation of a particular rotation operated from switch SW1.

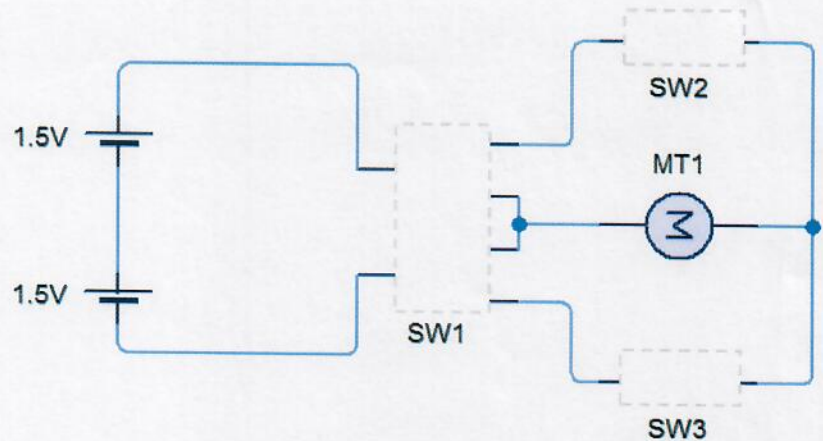


Figure 7 – Circuit 4 amended

Therefore, once one of the switches either SW2 or SW3, is activated the motor will stop rotating in that particular direction, it will only operate in the opposite direction.

- i) What type of switches are used for SW2 and SW3 in figure 7?

Micro Switch

- ii) Suggest one way of how these switches are operated?

It has 1 input and 2 outputs

In this space insert a photo of the circuit shown in figure 6 i.e. by adding two switches, SW2 and SW 3.