

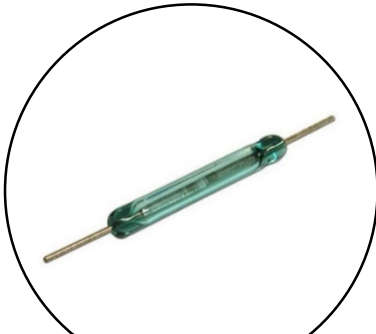
Resources

Mark Sciberras

Investigating Switches

Name: _____

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.



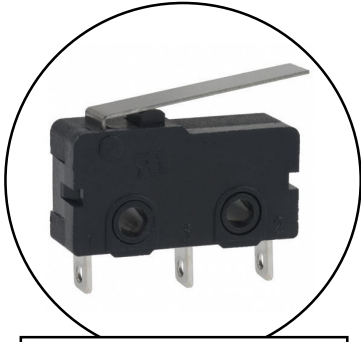
Reed Switch

Large empty rounded rectangular box for recording observations and findings for the Reed Switch.

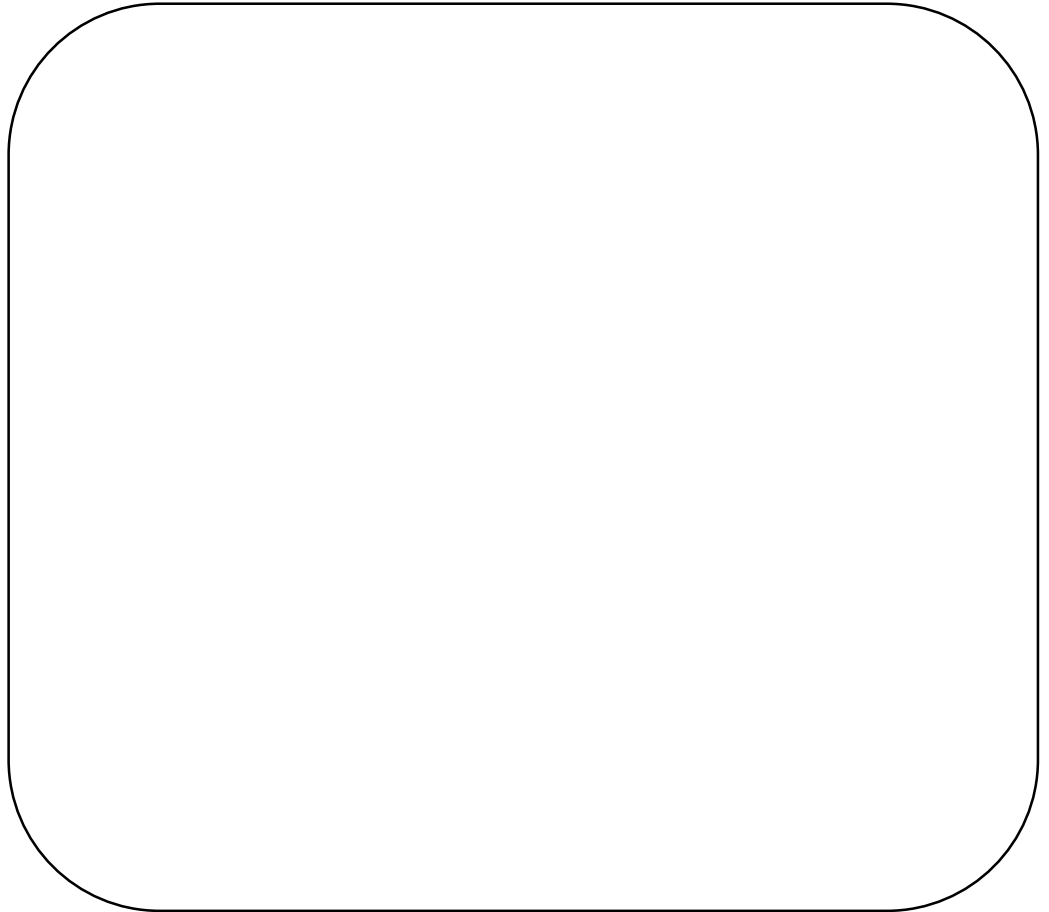


Tilt Switch

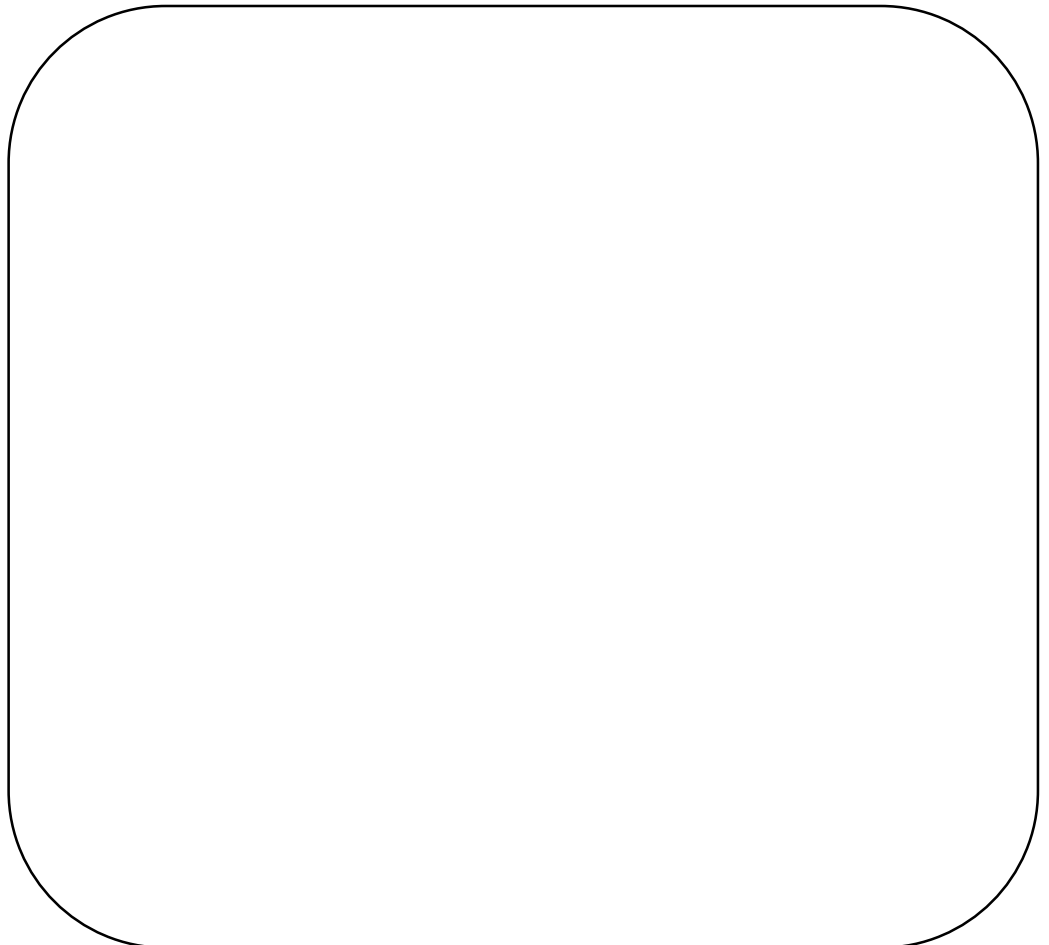
Large empty rounded rectangular box for recording observations and findings for the Tilt Switch.

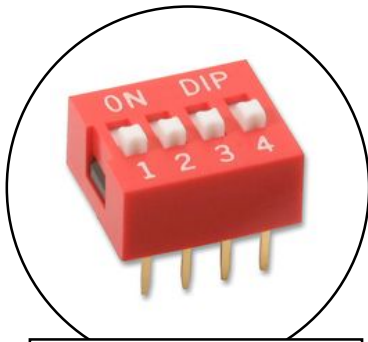


Micro Switch

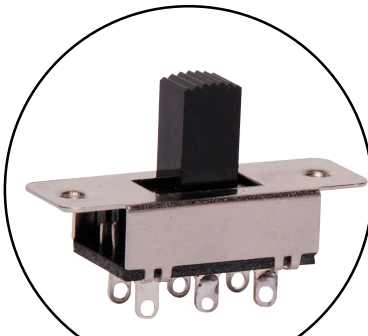


Toggle Switch

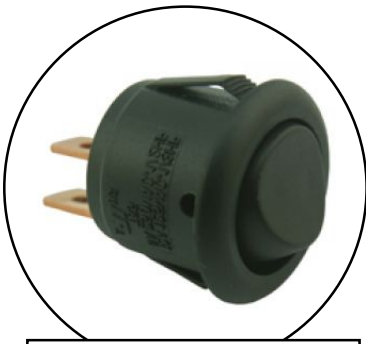




DIP Switch



Slide Switch



Rocker Switch

Large empty rounded rectangular box for notes or diagrams related to the Rocker Switch.



Push Switch

Large empty rounded rectangular box for notes or diagrams related to the Push Switch.

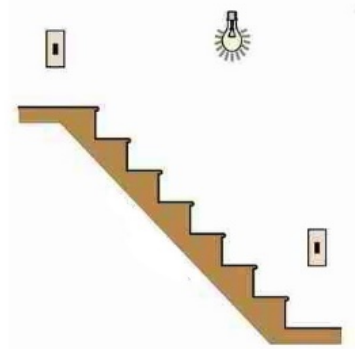
Task 2:

- 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?

- b) How are these switches activated?

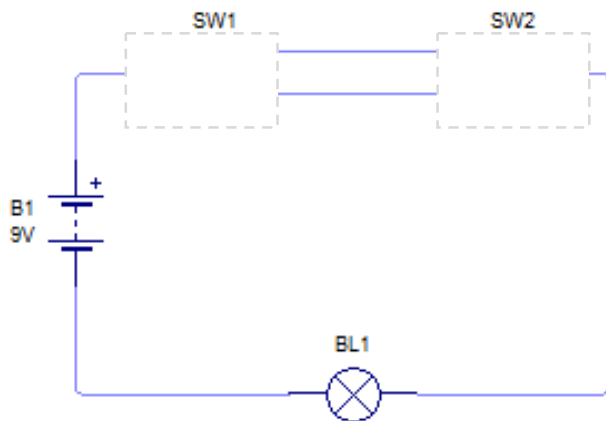


Figure 1 – Circuit 1

In this space insert a photo of circuit 1 using the appropriate switches

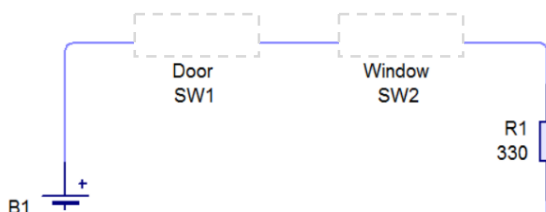
Scenario 2 - Circuit 2

Ensuring not to waste energy, some public places and hotels install an *open / closed 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?

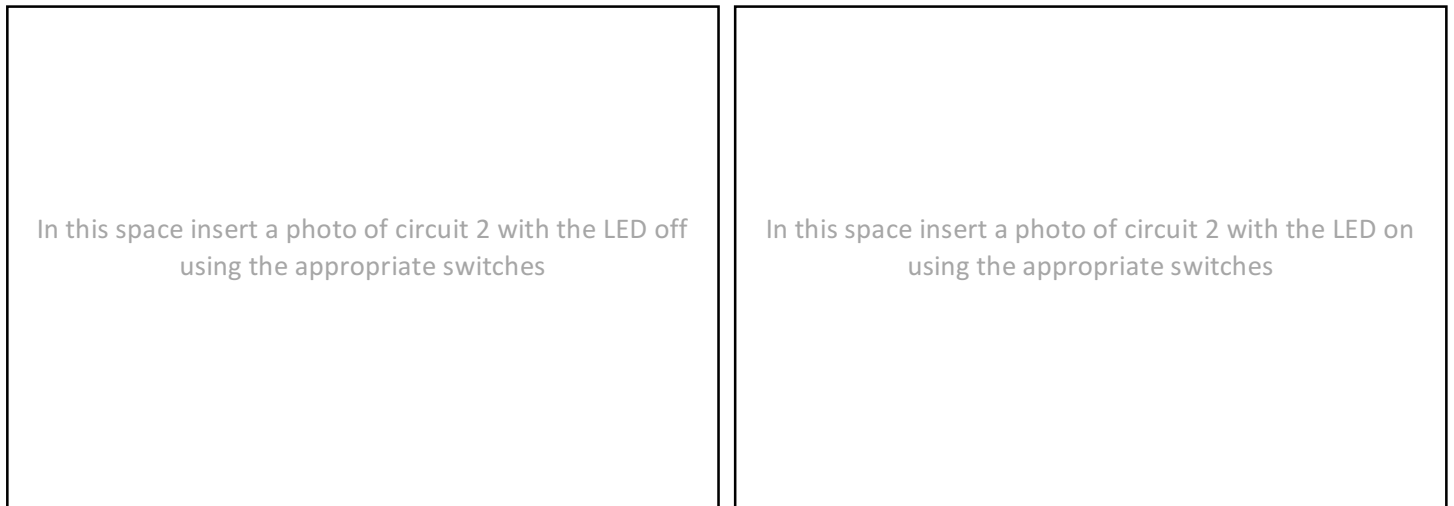
- b) How are these switches activated?



<i>LED Status</i>	<i>Apertures status</i>	<i>Air-condition systems</i>
ON	Closed apertures	Activated
OFF	Open apertures	Deactivated

Table 1

Figure 2 – Circuit 2



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.

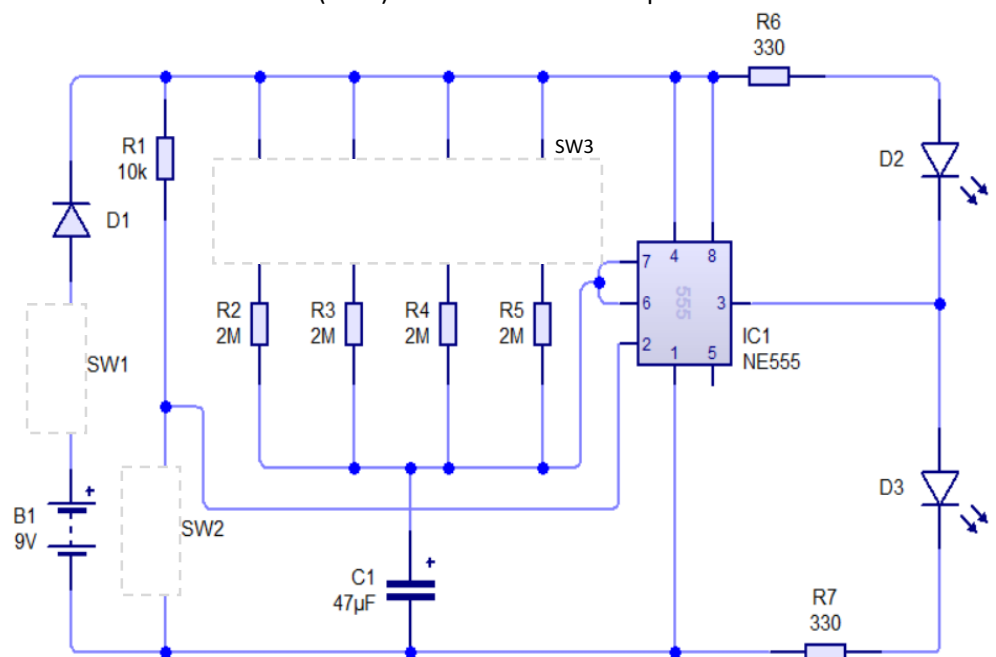


Figure 3 – Circuit 3

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.

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.

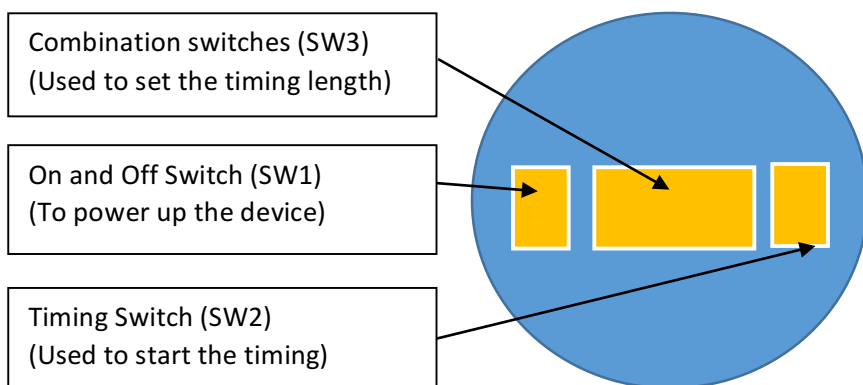


Figure 4 – bottom of egg timer device

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? _____

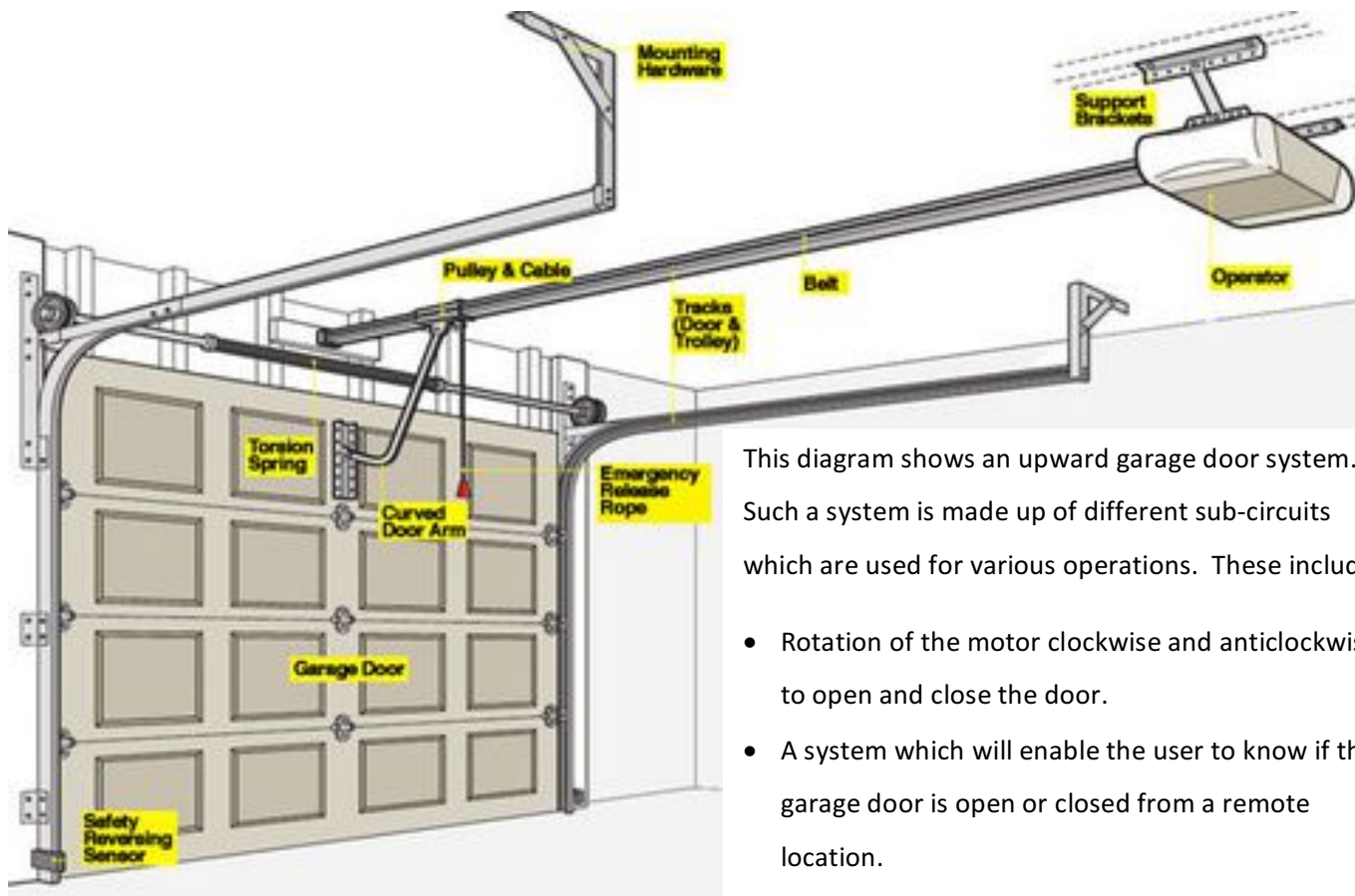
b) Which type of switch would you use for SW2? _____

c) Which type of switch would you use for SW3? _____

In this space insert a photo of circuit 3 with the Green LED on, using the appropriate switches.

In this space insert a photo of circuit 3 with the RED LED on, using the appropriate switches.

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.

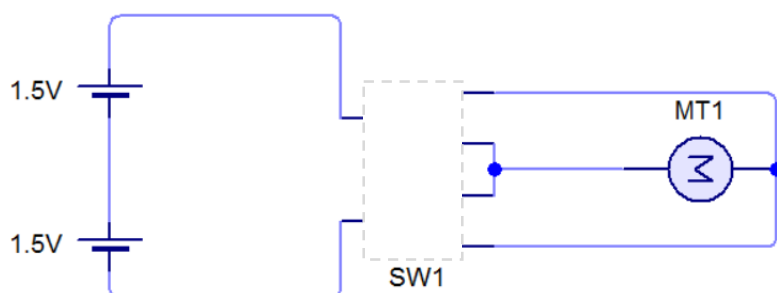


Figure 5 – Circuit 4

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

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.

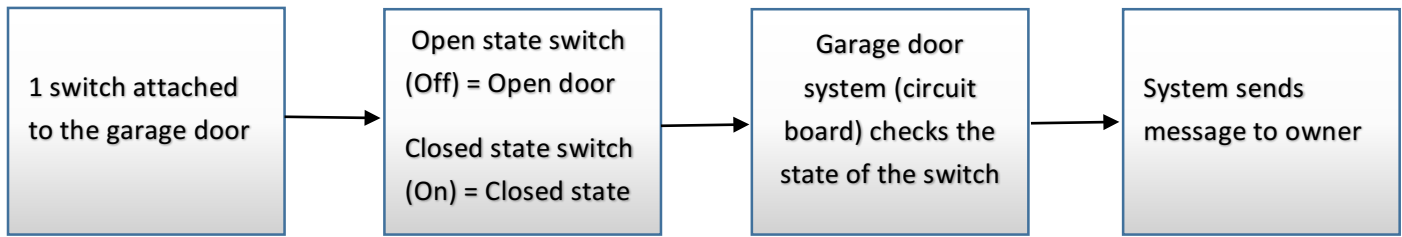


Figure 6

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

- 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.

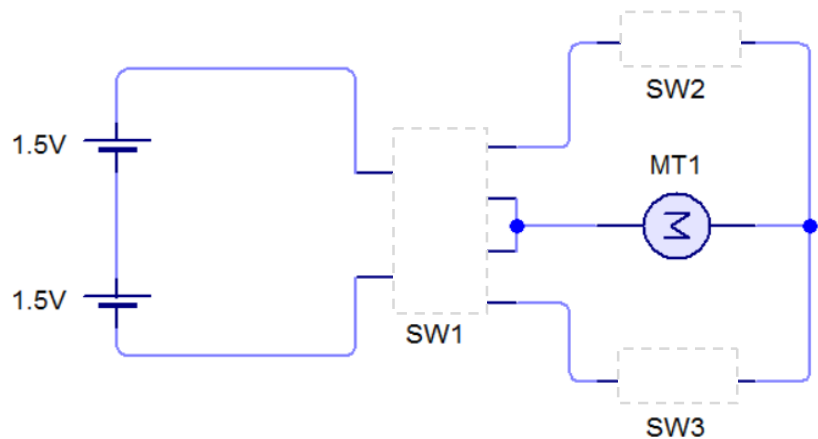


Figure 7 – Circuit 4 amended

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?

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

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