

# Lesson 2: Resistors, Transistors, Capacitors and LED's

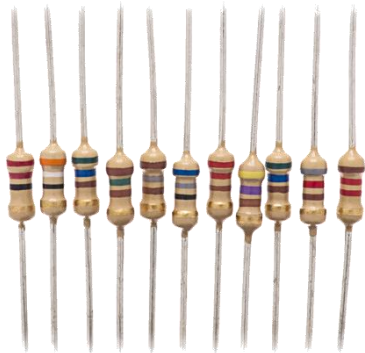
- In this lesson we will learn what resistors, transistors, capacitors and LED's are.
- How to identify them in a circuit diagram.
- How they work. - some of the components can be tricky to understand so do not worry if you don't fully understand them. At this stage it's more important that you recognise them in a circuit diagram.



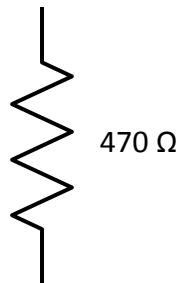
## Lesson Two: Resistors, Transistor, Capacitors and LEDs

What is a Resistor?

- A resistor is a component used in electronics to restrict the amount of voltage and current flowing through a circuit. Imagine a hose pipe watering a garden, if you step on the hose pipe you will notice that the flow of water is reduced. This is how a resistor works in electronics it squeezes and reduces the voltage and therefore the current.
- Resistors come in many values. The Value of a resistor can be identified by the coloured bands that run around the body of the resistors.
- The value of a resistor is measured in Ohms. The symbol of an ohm is  $\Omega$ .



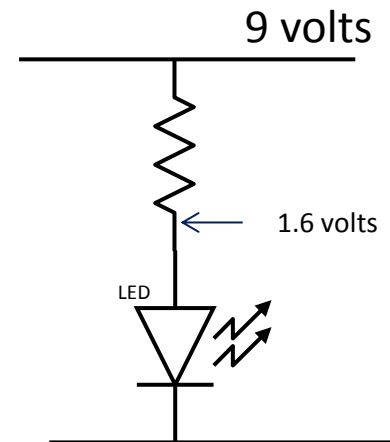
The Value of a resistor can be identified by the coloured bands that run around the body of the resistors.



This is the symbol of a resistor in an electronic circuit. Whenever you see this symbol you know it's a resistor. The number tells you what value it is

In this simple circuit we place a resistor in series with the LED to reduce the voltage to a value that the LED can handle.

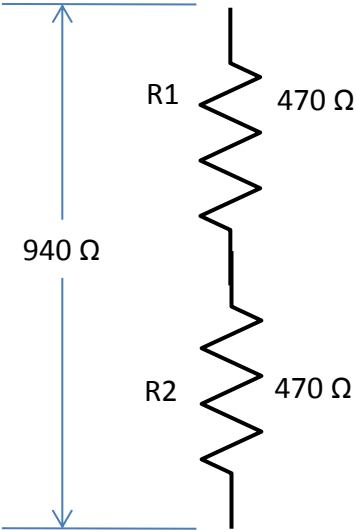
If we did not use the resistor and connected the LED directly to 9 volts it would damage the LED.



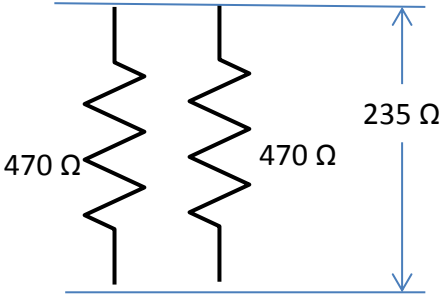
# Resistors in series and parallel

- When you place resistors in series the value of each resistor is added together
- When you place resistors of the same value in parallel the overall value is halved. It gets a bit more complicated when you place unlike values together. We will cover this in a later lesson.

$R1 + R2 = R \text{ Total}$   
 $470 + 470 = 940$



$R1$   
 ----- =  $R \text{ Total}$   
 $R2$   
 470  
 ----- = 235  
 470



Resistor Colour Code Table

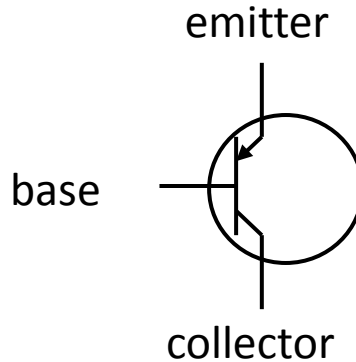
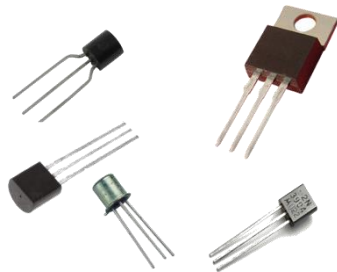
1st Digit	2nd Digit	3rd Digit	Multiplier	Tolerance	Temperature Coefficient
0	0	0	0.01 Silver	±10% Silver	100ppm
1	1	1	0.1 Gold	±5% Gold	50ppm
2	2	2	1	±1%	15ppm
3	3	3	100	±2%	25ppm
4	4	4	1k		
5	5	5	10k	±0.5%	
6	6	6	100k	±0.25%	
7	7	7	1M	±0.1%	
8	8	8	10M		
9	9	9			



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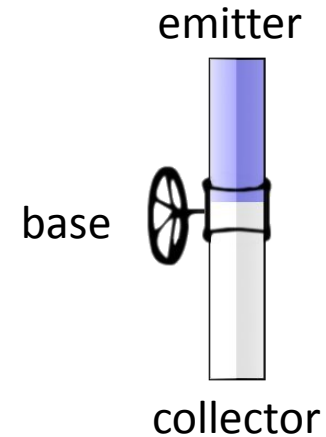
## What is a Transistor?

- A Transistor is a component used in electronics to switch or amplify electrical circuits. In our Electronics and Computer club we will only be using Transistors to switch circuits on and off.
- Transistors come in different sizes and perform different functions. There are two types of transistors they are called NPN and PNP but don't worry about this for now.
- A transistor has three connections called base, emitter and collector. To switch a transistor on you have to apply a small current to the base lead of the transistor. This allows a larger current to flow through the emitter and collector. This can be a bit difficult to understand so imagine a transistor as a water valve. When you turn the valve on it allows water to flow through the pipe, when you turn it off the water stops flowing.



This is the symbol of a resistor  
In electronic circuits.

Whenever you see this symbol  
you know it's a transistor. The  
number tells you what type it is.

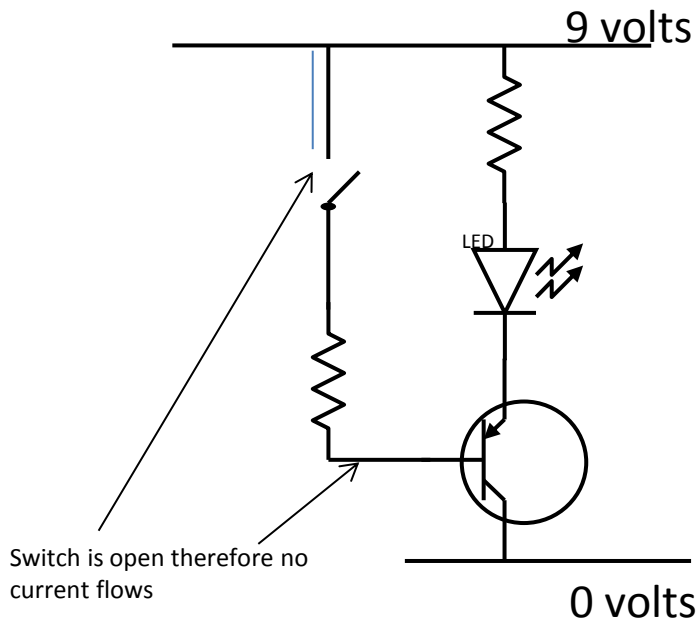


A transistor can be imagined like a water valve,  
turning on the handle will allow water to flow.

On a transistor a small current at the base will  
switch the transistor on. This allows a larger  
current to flow through the transistor.

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Transistors part two: This circuit demonstrates how a transistor is switched on when a current is applied to its base.



Switch is closed allowing for a small current to flow through the base which will switch on the transistor and light the LED

