WIRING LEDs

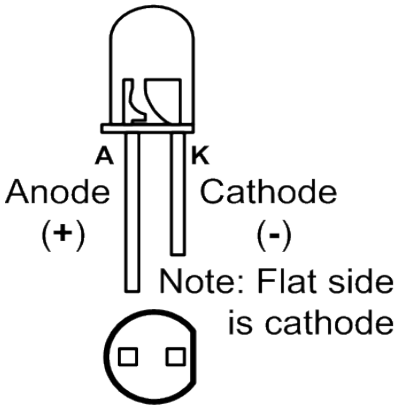
LED stands for Light Emitting Diode – in case you didn't know, and they are a very efficient form of lighting, as there is virtually no heat generated. So almost all the power consumed is converted to light. This also means you can use what seems like a very small (and cheap) power supply to power lots of LEDs. LEDs use low voltage, so they are safe to work with. The only real danger is of shorting something out which damages your power supply or causes a fire.
Mainly because they are not getting hot, LEDs have a very long lifespan. You may never need to replace any LED lights you have set up.

One point I should stress is that the power supply should be "regulated" – that means the output voltage does not change when the current load changes. Most small, modern power supplies are regulated, but some older ones aren't.

Some **LEDs** such as colour changing **LEDs**, flashing **LEDs** and 5V **LEDs** are designed to run off a 5V supply and therefore don't **need a resistor**. All other standard and bright **LEDs** will **need** a current limit **resistor**.

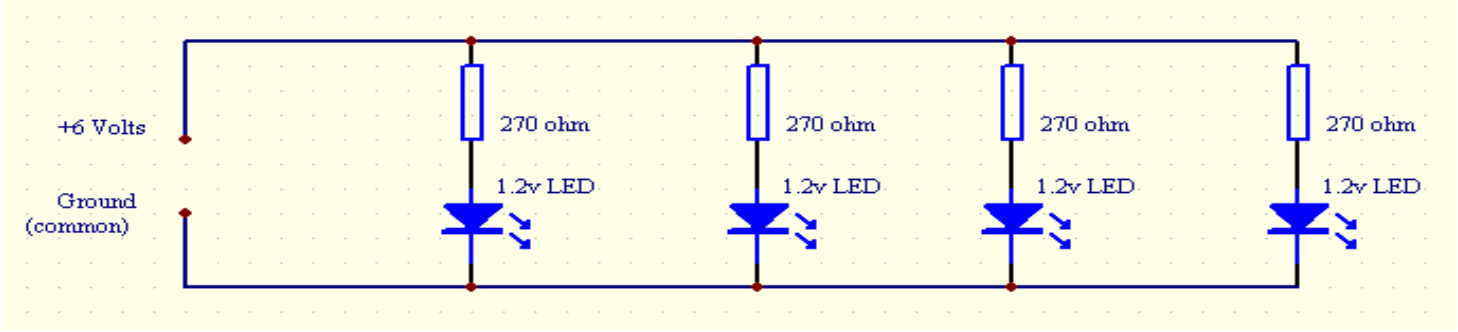
If you are buying some made up items such as miniature street lighting, a commercial supplier will generally state one of:
- Has an integral resistor wired into the unit, and is ready for use with a DC power supply of xx volts
- Comes with xxx ohm resistors suitable for xx volts DC supply – you fit the resistors yourself – or a resistor of a different value if your power supply has a difference DC output voltage.
- If it says nothing – check. You may need to buy some resistors yourself.

If you are buying raw LEDs, you usually need to buy your own resistors. LEDs have a **positive** and a negative terminal, also known as the anode and cathode. The cathode should be connected towards the ground or negative side of the power supply, and the anode toward the **positive** side. The longer leg of the LED is the positive side.



Another way to tell which is the negative side of your LED is to look for the small "flat" on the base of the LED head. This is always on the negative side of the LED

The resistors can be connected to either terminal of the LED. I strongly recommend you wire the LEDS in parallel like in the diagram below; using one resistor for each LED.



How do I know what value to resistor to use
Firstly you need to know the operating voltage of your LED, which is very typically 1.2 volts DC, although some are up to 3.7 volts. Secondly, you need to know the current draw which the manufacturer says is the safe amount to push through your LED. A very common value is 20ma (milliamps) which is a tiny amount. Super modern super LEDs can use a lot more.
Both values should be stated in the sales information for the LEDs.
You can use this formula to calculate your resistor value ®.
" Power Supply Voltage (V) minus Led voltage (Vled) divided by LED current (Iled) "
(also shown as R = Vled / Iled)
- Or you can use a simple spreadsheet which will calculate it for you.
Here is a web link to my calculator http://www.burmac.nz/auslot/ LED powering formula.xls

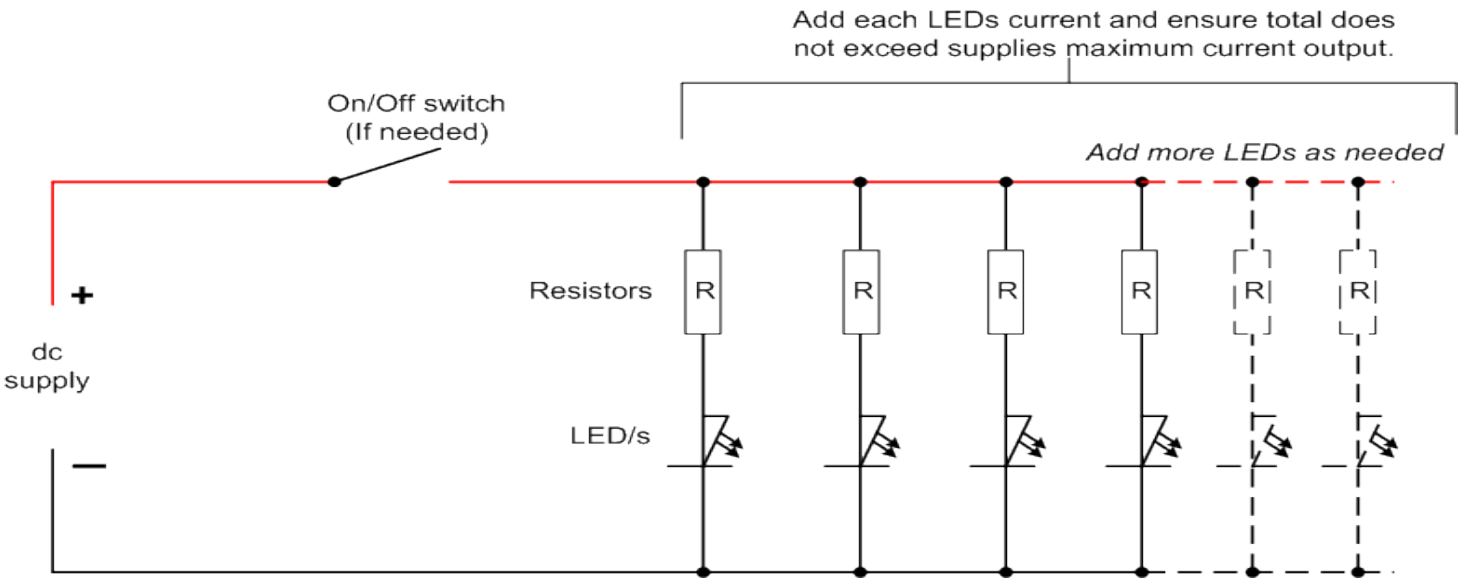
As resistors come in certain standard values, simply choose the nearest resistor value larger than the number calculated. For instance: For 1.2v 20ma LEDs with a 6 volt supply as in the previous diagram, the resistors calculate to 240 ohm, so you would use 270 ohm ones. This is to ensure that you do not allow too much current to flow through the LED and eventually cause it to fail.

The smallest current capacity of resistors which is commonly sold is "1/8th watt"
Trust me, this is plenty and more than you need. But if you have, see for sale some cheap ¼ or ½ watt resistors, you can use those equally well. It will make absolutely no difference to the LEDs or the circuit what current capacity resistors you actually use.

But what if some of the LEDs are of different value voltage or current? – Simply calculate the formula for each value of LED separately, and use the different value resistors applicable to each type of LED. They can all be used alongside each other in the circuit diagram on page one. – Again, it will not cause any difficulty for the circuit.

How big should my power supply be? – Simply add together the current drawn by each LED. In the example above it would be 20ma + 20ma + 20ma + 20ma = 80ma (milliamps)
- The smallest cell phone charger can probably put out at least double this amount…..

How do I put a switch in the circuit – That's dead easy, see below



That should be sufficient to get the average beginner working happily with wiring LED circuits