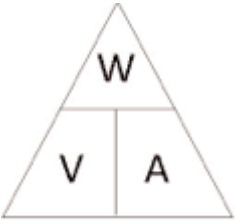
Cables and Fuses

An off grid system will only perform well if it is installed correctly.

A lot of power can be lost because of dodgy wiring and it is a serious safety hazard. It is not rocket science and here are a few essentials to help you install your own off grid power system.

There is one fundamental relationship to remember!

Power in **Watts = Volts x Amps**



So therefore V = W/A and A = W/V

Cable Sizing

The following table shows cable sizes in mm^2 for each maximum load (in Watts) and length of cable required (in metres). These values are valid for a 12 Volt system. Should you be installing a 24 Volt system you just need to divide the value by 4, for a 48 Volt system divide by 16. This illustrates the difference in cable sizes and therefore cost of lower voltage systems.

Minimum cable size in mm^2					
Length	Max load (W)				
(m)	50	100	150	200	300
1	0.5	1	1	1.5	2
2	1	1.5	2	2.5	4
5	2	3.5	5	6.5	9.5
10	3.5	6.5	9.5	12.5	18.5
20	6.5	12.5	18.5	24.5	36.5

Most cable can be bought using the measurement mm^2, however should you need to convert to diameter use the following:

$$\left(\sqrt{\frac{mm^2}{\pi}}\right) \times 2 = Diameter$$

DC

Fuses MUST be used on all power systems. Only one pole (positive or negative) needs to be fused on each connection. Where power is distributed, for example to several 12V lights, it is advisable to fuse each line rather than one large fuse for them all. This reduces fire risk and if there is any problem with individual bulbs you a) still have light and b) only replace one small cheap fuse. For DC connection you can use inline fuses or spade fuses, both readily available from auto-electricians. To size fuses you need to identify the peak power that will be needed along that cable length and using the W=VA relationship work out the peak amps.

Fuses are rated in Amps, so always get the size just above your expected peak current. Eg. If your peak power required is 50W on a 12V system the peak current will be 50/12 = 4.16 Amps. So you will need a 5A fuse.

AC

All AC appliances are fused in the plug. For small systems you can use an RCD (residual current device), if you are fitting a whole house it is advisable to run all power through a conventional consumer unit with trip switches.

EARTH

In DC systems the negative is also the earth. When using AC through an inverter you should put in an earth spike. This is just a long copper spike in the ground attached to the earth in the consumer unit or RCD.

You will need to adopt an earthing system which connects the neutral and earth poles on the supply side of the RCD unit. Failure to do so will render the RCD useless.

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