Multimeters

The multimeter is the engineer's best friend, and is able to perform multiple different functions – hence the name.

Setting up
When picking up a multimeter to use, we need to remember that the probes are delicate, and the wires are prone to snapping, so always start by performing a continuity test (below) from one probe straight to the other before using the meter.

Also make sure that the black probe is plugged into the common socket (labelled COM), and the red probed is connected to the VΩmA socket (used to measure voltage, resistance and current).

Continuity. The simplest mode (to be used when the power to the circuit is turned off), the meter will tell you whether or not two things are directly connected (i.e. with no resistors, LEDs, motors, etc in between).

Example Uses…
1. On PCBs where two tracks are very close together, and you can't decide if they're touching or not.
2. At home to test plug fuses – if the fuse has "blown", there'll be no continuity.
3. When troubleshooting circuits to check that the 0V pin on a PIC is connected to the negative end of the battery clip.

Resistance. This is a measure of how much a particular component restricts the flow of electronic current in a circuit, and is measured on Ohms (Ω). To begin, decide what the largest amount of resistance you anticipate measuring will be, then choose the next largest number on the meter. For instance, if I wanted to test a 330Ω resistor, I'd select 2000 on the meter. If I had a 10k resistor, I'd select the 20k setting, and so on.

Once done, the multimeter probes can be placed either side of the component(s) you wish to measure the resistance of.

Example Uses…
1. Checking whether a lightbulb is blown or not (set to 2000),
2. Seeing what the value of a resistor is,
3. Measuring the overall resistance of a circuit.
4. Checking that PIC download sockets are wired correctly, with the right resistors.

Voltage. Sometimes, you need to be able to see whether or not different components are getting voltage. Both batteries and DC power supplies use DC voltage, so we use the “DCV” section of the meter for this.

For instance, if I wanted to measure the across a PIC chip powered by 4.5V, I’d set the meter to 20. If I wanted to measure a 1.5V battery, I’d choose 2000m (2000mV = 2V).

Once done, put the common (black) probe on the negative terminal of the battery (or anywhere on a 0V track on the PCB), and you can use the red probe in different places in the circuit to see what the voltage is.

Example uses….
1. Seeing if a battery is flat. A 9V battery is considered to be flat when its output drops below about 8.5V.
2. Seeing if a Genie C08 PIC chip is getting power, by putting the probe on pins 1 and 8 while it is connected to a power source.
3. Seeing if a motor or LED is getting power by putting the probe on its positive leg or on the voltage track that feeds it.

Recap
Try using a multimeter yourself to measure the following things:

1. Take a PIC project PCB, and test the continuity between pin 8 (0V) and the negative pin of the PP3 battery clip (*the circular one*).

2. Correctly measure the voltage of a battery.

3. Get a couple of resistors out of the component rack, and measure their actual resistance.

4. What’s the resistance of water?

4. Get a diode, and test its continuity. You’ll notice it only works one way around – why do you think that is?