

Puzzle Boxes - General

How you use the Puzzle Boxes will depend on the ability of your pupils and also what has been covered in the curriculum. For instance you may wish to remove the box that has a capacitor in it because that has not yet been covered.

The pupils should be given access to a multimeter and a 5V dc supply (alternatively three 1.5V cells could be used). The teacher should make available any additional equipment that pupils request, provided of course, that they can explain how it is going to be used and that it will be used in a safe manner. You may wish to assist your pupils by giving them a copy of the sheet 'A Helping Hand' - this sheet has a list of the components. Even having this list pupils will still have a lot of challenging problems to solve.

Below are some comments on each Puzzle Box:

Tilt Switch: Use the continuity tester on the multimeter and tip the box from side to side.

Capacitor: The capacitor is 10 μ F, 250V. If charged to 5V it can store enough energy to flash an LED. Alternatively you could use a multimeter that measures capacitance. For those in more advanced Physics courses a data logger or scope could be used to examine the charging voltage across a capacitor. Access to a decade resistance box and data logger would be required. Note that since the capacitor is not electrolytic no care needs to be taken regarding the polarity.

Resistors: Two 75k, 0.1% resistors are connected in parallel. When the pupil measures this with their multimeter they will think that there is a 37k5 in the box. As you cannot buy a resistor of this value it could lead on to a discussion about preferred values.

Buzzer: Note that the buzzer has a polarity.

Diode: Some multimeters have a diode testing setting but pupils may not know how to use it and they may not know that the voltage drop across a silicon diode is 0.6V. If they have access to 6V,60mA, MES(E10) lamp then they can show current flow in one direction but not in the other. Note that there is a protection resistor in series with diode but the pupils need not know this.

Lamp: Measure the resistance when cold. Connect to a 5V supply to warm the filament. Remove the power and quickly measure the resistance again. The lamp is rated at 6V, 60mA.

Battery: This a AAA cell.

Resistor: 11k, 0.1%

Note for the Technician: Before using the Puzzle Boxes check that the bulb works and that the battery has not leaked.

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