



**RESISTIVITY
BOARD**

LA10-412

INSTRUCTIONS FOR USE

RESISTIVITY BOARD LA10-412



INTRODUCTION

This apparatus provides a reliable system for students to investigate and compare the properties of resistance wires. Four resistance wires are conveniently held on a robust baseboard with simple electrical connection facilities and a metric scale alongside.

APPLICATIONS

Resistance measurement
Resistivity determinations
Investigations
Electrical measurements
Graphical analysis

GENERAL DESCRIPTION & SPECIFICATION

The wires are:

Nichrome, an alloy of Nickel and Chromium; resistivity of $108 \times 10^{-8} \text{ Wm}$.

Constantan; resistivity $49 \times 10^{-8} \text{ Wm}$.

Manganin; resistivity $41 \times 10^{-8} \text{ Wm}$.

Brass; resistivity $6 \times 10^{-8} \text{ Wm}$.

All the wire diameters are 0.45mm giving resistances of 3.40, 1.53, 1.29 and 0.4W respectively for the 50cm lengths used on the board. Connection to each wire is by means of a 4mm socket at one end which can be used with a standard

4mm connecting lead. Connection to intermediate points, or the far end can be made by using a jockey or crocodile clip.

METHOD OF USE

Calculate the resistivity of the wires.

The equation for this is

$$s = \frac{R.A}{l} \quad \text{where}$$

s is the resistivity in Ωm
 R is the resistance in Ω
 A is the area in m^2
 l is the length in m

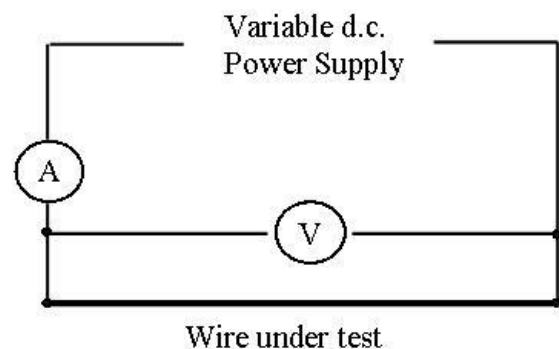
Resistance is calculated from voltage and current. The area of cross section is found from the diameter using :

$$A = \pi d^2/4 \quad (\text{with } d \text{ in metres}).$$

The basic circuit for all investigations is shown overleaf.

NOTE: Resistance wires heat up when a current flows. Thinner wires get hotter than thick ones for the same current. Care must be taken to ensure that students use low voltages and currents to keep the wires no more than warm when in use.

CIRCUIT DIAGRAM



Resistance is calculated using Ohm's Law:

$$R = V/I \quad \text{where } R \text{ is resistance in ohms}$$

V is voltage in volts
 I is current in amps

Other Investigations

Various investigation titles can be given to students and the appropriate amount of guidance given to suit the circumstances. The principal investigations are:

- **For different materials how is the resistance related to the length of wire used?**

The resistance is determined for 10, 20, 30, 40 and 50cm lengths of each wire in turn and a graph plotted. A straight line graph should be obtained with different gradients in each case. If the y-axis is resistance in ohms and the x-axis is length in metres the gradient should be equal to the resistivity divided by the area of cross section in m^2 .

- **Is the resistance of equal lengths of equal diameter wires the same regardless of material?**

In this case four simple resistance measurements can be taken for the whole length of wire. A variation on this would be to ask the question, "Do all metals have the same resistance?" Students could be encouraged to deduce which variables would have to be controlled during the measurements.

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