OPERATING INSTRUCTIONS FOR MEASURE LOW RESISTANCE BY CROMPTON POTENTIOMETER

OBJECT:

To measure low resistance by Crompton Potentiometer.

APPARATUS:

Crompton potentiometer New Tech Type NTI – 501, two battery eliminators, two rheostats, two one way keys, one two way key, One Galvanometer, one known resistance of comparatively higher value and given small resistance.

THEORY:

Let *I* current is passing through known resistance R of comparatively higher value R and small unknown resistance r. The balancing length corresponding to potential drop on R is l_1.

$$\therefore \ IR = \sigma \, l_1 \ \ldots\ldots\ldots\ldots.. \ (1)$$
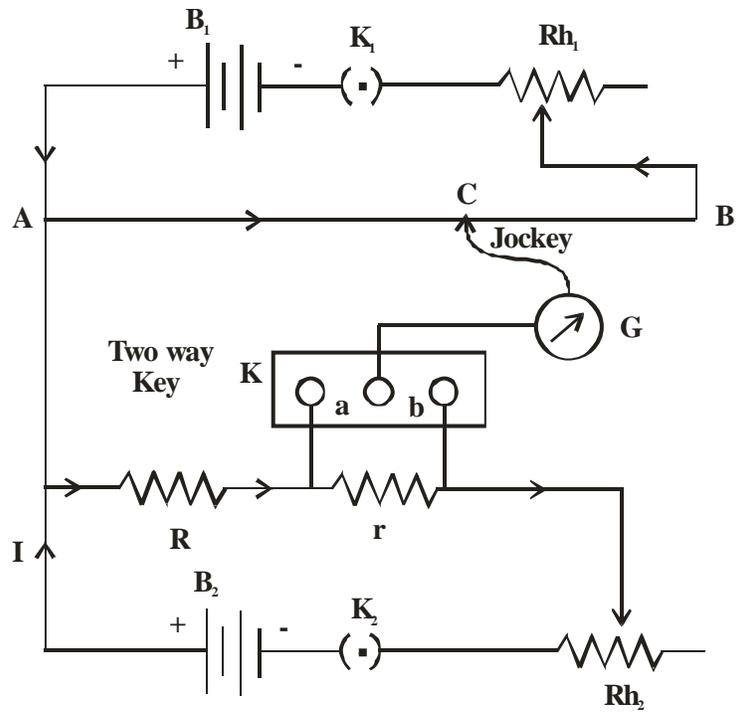
Fig. (1)

Where σ is potential gradient.

If balancing length corresponding to potential drop on $(R + r)$ resistance is l_2.

Then $\qquad$ $I(R + r) = \sigma\, l_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ (2)

$\qquad$ (2) / (1)

$$\frac{R + r}{R} = \frac{l_2}{l_1}$$

or $\qquad 1 + \dfrac{r}{R} = \dfrac{l_2}{l_1}$

or $\qquad \dfrac{r}{R} = \dfrac{l_2 - l_1}{l_1}$

or $\quad r = \dfrac{l_2 - l_1}{l_1} R$ .... (3)

Putting the values of l_1, l_2 and R in this formula the unknown low resistance r is calculated.

PROCEDURE:

(1) Complete the connections as shown in Fig. (1).

(2) Close the keys K_1 and K_2 put plug in 'a' gap of two way key K.

(3) Note down the balancing length l_1 for potential drop on resistance R.

(4) Now take out plug from 'a' gap and put it in 'b' gap of two way key. Adjustments of Rheostats Rh_1 and Rh_2 should not be disturbed. Note down the balancing length l_2 for potential drop on resistance (R + r).

(5) Calculate the value of unknown small resistance r using formula:-

$$r = \dfrac{l_2 - l_1}{l_1} R$$

(6) Different sets of observation are taken by changing currents in primary and secondary circuits.

(7) Mean value of small resistance r is calculated.

OBSERVATIONS:

Sr. No.	Balancing length l_1 for P.D. on R Cm	Balancing length l_2 for P.D. on R Cm	$r = \dfrac{l_2 - l_1}{l_1} R$ Ohm
1.			
2.			
3.			
4.			
5.			

CALCULATIONS:

Putting values of l_1, l_2 and R in the formula the value of unknown small resistance r is calculated in each set of observations. Then mean value of r is determined.

RESULT:

The value of given small resistance as determined using Crompton potentiometer is = ……………. Ohm.

PRECAUTIONS:

1. The E.M.F. of the cell used in primary circuit should be kept more than E.M.F. of the cell in secondary circuit.

2. All the positive terminals should be connected to the same point (A) of the potentiometer.

3. Jokey should not be moved along the potentiometer wire.

4. Electrical connections should be tight.
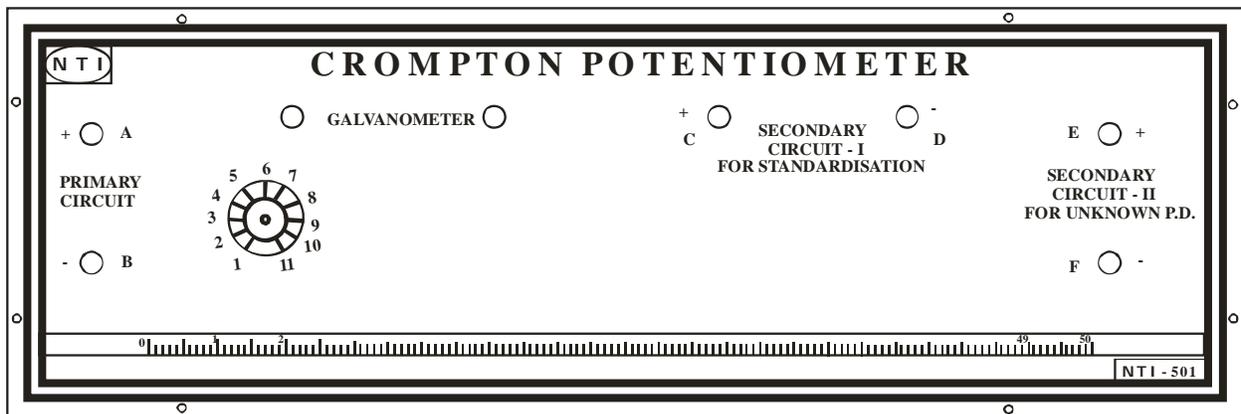
Fig. (2) Panel Diagram

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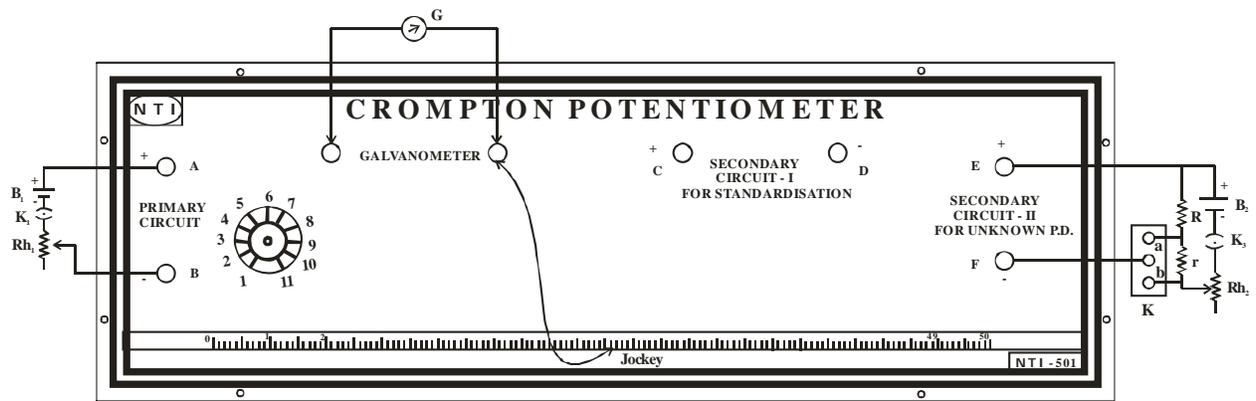
Fig. (3) Connections for Crompton Potentiometer

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