

## Experiment No. 07

### GALVANOMETER – 2

#### AIM

To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of given range and verify the same.

#### APPARATUS

A Weston type galvanometer of known resistance and figure of merit, a battery, a rheostat, one-way key, A resistance box of the range 0 to 10,000 ohm, a voltmeter of 0-3 volt range, connecting wires etc.

#### THEORY

A galvanometer can be converted into a voltmeter of desired range by connecting a suitable high resistance  $R$  in series with the galvanometer. Let  $G$  is the resistance of the galvanometer which gives full scale deflection when  $I_g$  current flows through it. Let  $V$  is the range of the voltmeter, the series resistance  $R$  required for the conversion is given by,

$$R = \frac{V}{I_g} - G$$

#### PROCEDURE:

Note down the given value of galvanometer resistance  $G$  and its figure of merit  $K$ . Also note the total number of divisions  $n$  on either side of the zero of the galvanometer. Complete the value of  $I_g$  with the help of the relation,  $I_g = Nk$ . Calculate the value of required series resistance  $R$  to be connected in series with the galvanometer for the conversion of the given galvanometer into voltmeter of the given range by the relation,  $R = \frac{V}{I_g} - G$ . Connect the resistance box of range 0 to 10,000 ohm in series with the galvanometer and take out the plugs of resistance  $R$  from it. Now galvanometer with this resistance in series is converted into voltmeter of the given range  $V$  volt.

For verification of the converted voltmeter, make the connections shown in the circuit diagram 2. Take out the plugs of calculated resistance  $R$  from the resistance box of the range 0 to 10,000 ohm and insert the key  $K$  and adjust the rheostat so that the deflection in galvanometer becomes maximum. Note the readings of standard voltmeter and galvanometer. Convert the galvanometer reading into volt and find the difference between them, if any. This difference gives the error. Take the four observations more by changing the resistance with the help of the rheostat over the whole range of the voltmeter. Record all the observations in the table.

#### RESULT

The value of required high resistance to be connected in series with the galvanometer to convert it into voltmeter the given range =        ohm

The value of the current for full scale deflection,  $I_g =$         amp

Hence, conversion of the given galvanometer into voltmeter of the given range is verified.

#### PRECAUTIONS AND SOURCES OF ERROR

All the connections should be neat, clean and tight.

All the plugs in both of the resistance boxes should be tight.

First the high resistance  $R$  from the resistance box should be introduced, then the battery key  $K1$  plug should be inserted to avoid any damage to the galvanometer.

The e.m.f. of the battery should be constant.

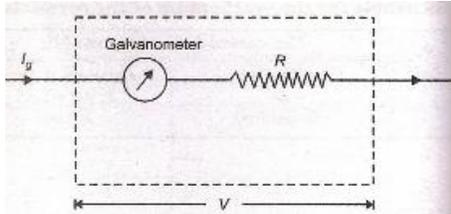
The value of  $R$  should be large as compared to  $G$ .

The plugs of the resistance boxes may not be clean and tight.

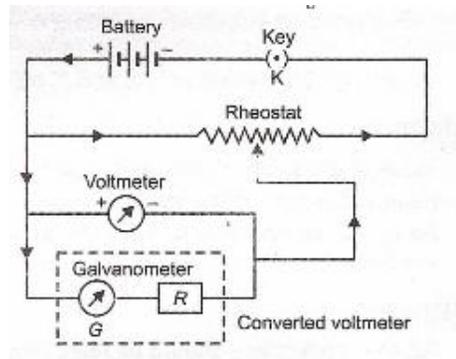
[On the R.H.S]

Circuit Diagrams:

(a) Conversion from Galvanometer to Voltmeter



(b) Verification of the converted voltmeter:



OBSERVATIONS:

Given resistance of the galvanometer,  $G =$  ohm

Given value of the figure of merit of the galvanometer,  $K =$  amp/division

Total number of divisions on either side of the zero of the galvanometer,  $n =$  divisions

Current for full scale deflection,  $I_g = nK =$  amp.

Range of conversion of the converted voltmeter,  $V =$  volt

Value of the required series resistance,  $R = \frac{V}{I_g} - G =$  ohm

Least count of the converted voltmeter  $= \frac{V}{n} =$  volt

Least count of the standard voltmeter  $=$  volt

S. No.	Reading of converted voltmeter		Standard voltmeter reading $V_2$ (volt)	Difference (Error) $V_2 - V_1$ (volt)
	Deflection $\theta$ (division)	Potential difference $V_1 = \theta \times \text{L.C.}$ (volt)		
1				
2				
3				
4				