**Experiment # 2**

**TO Convert Galvanometer into Voltmeter *PRINCIPAL:***

By connecting a high resistance of suitable value in series with a galvanometer, it is converted into voltmeter, voltmeter is always connected in parallel with the circuit.

***THEORY***

Let Ig be the current for full scale deflection of the galvanometer and let Rg

be the resistance of the galvanometer. Let R be the resistance which should be connected in series with the galvanometer coil to convert it into voltmeter reading upto 3 volts.

***FORMULA USED :***

V=Ig(R + Rg)

R=V/Ig-Rg

***APPARATUS:***

* High resistance box
* Low resistance box
* Galvanometer
* ammeter
* 2 keys
* Battery
* Connecting wires

***Description Of Apparatus***

1.Galvanometer:

An instrument for detecting or measuring a small electric current by movements of a magnetic needle or of a coil in a magnetic field.

* 1. Voltmeter:

Voltmeter, instrument that measures voltages ofeither direct or alternating electric current on a scale usually graduated in volts, millivolts (0.001 volt), or kilovolts (1,000 volts). Many voltmeters are digital, giving readings as numerical displays.

* 1. High resistance box:

The value of the high resistance box lies **from 1Ω to 5000Ω or above** while the value of the low resistance box is between 1 to 500Ω. In fractional resistance box, the value of resistance is in the form of a fraction. The range of fractional box lies between 0.1Ω to 50Ω. The construction of the box is simple and cheap.

* 1. Connecting Wires:

Wire used to extend the firing line or leg wires in an electric blasting circuit.

* 1. Key:

Keys in electric circuit is used to stop or start the current by opening or closing the plug from the key set up respectively.

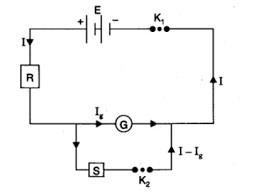
# CIRCUIT DIAGRAMS

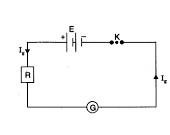
***1.*** For measuring galvanometer’s resistance

2

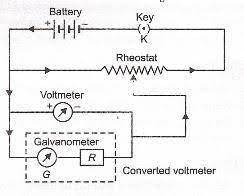
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For full scale deflection





3.Verification



# Procedure

1. Determination of the resistance of galvanometer by half scale deflection.
   1. Make the connections as shown in figure 1.
   2. Take out a high resistance plug from H.R.B and close key k1. Adjust the value of R to get a sufficiently large deflection, Φ in the pointer of Galvanometer.
   3. Then close key k2 and keep R fixed. Adjust the value from the other resistance box so that the deflection of the pointer becomes Φ/2.
   4. Repeat these steps for 5 times with different values of R.
2. Determination of current for full scale deflection.
   1. Make the connections as shown in figure 2.
   2. Adjust the current limit to maximum so that the pointer of galvanometer gets out of scale.
   3. Now take out a high resistance plug from H.R.B so that the pointer of galvanometer comes exactly on 30th position of the galvanometer.
   4. Note down the resistance for full scale deflection.

**v**. Note the e.m.f for the battery and calculate Ig by putting these values in the

respective formula.

1. Conversion of galvanometer into an voltmeter

To convert galvanometer into an voltmeter, connect R in series with the galvanometer as shown in fig 3 and take out calculated resistance from H.R.B.

**4)** Verification.

* + 1. Make the connections as shown in figure 3 by connecting a battery and key in series with the converted galvanometer and a voltmeter of nearly same range in series with H.R.B.
    2. Close the key K and adjust the current to get some deflection in the galvanometer.

Note the reading of galvanometer and voltmeter.

iv. convert the galvanometer deflection into volts and find the difference between the readings of the two instructions, which gives the error in converted galvanometer.

***OBSERVATIONS AND CALCULATIONS***

***From fig 1***

Table (a) for determination galvanometer resistance Rg

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S  NO | Resistance R  (Ω) | Deflection  Φ | Φ/2 | Rg (Ω) | Rg = Rs  (Ω) |
| 1. | 5000 | 25 | 12.5 | 120 | 120 |
| 2. | 5000 | 15 | 7.5 | 120 | 120 |
| 3. | 6000 | 25 | 12.5 | 120 | 120 |
| 4. | 8000 | 14 | 7 | 120 | 120 |
| 5. | 8000 | 15 | 7.5 | 120 | 120 |

* + - Mean value of the resistance of galvanometer, Rg=120Ω
    - E.m.f of the battery, E= 1.2V
    - Resistance from the full-scale deflection of galvanometer, R = 4000 Ω
    - Current in the galvanometer, Ig = E/R+Rg= 1.2/3500+120= 1.2/3610=0.00030 Amp

Now,

* + - Range of the voltmeter, V=3V

Required resistance, R=V/Ig-Rg =10000-120=9800Ω

Table (b) calibration of the converted galvanometer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S  NO | Galvanometer reading In Φ | Galvanometer reading  In volts,  Vg=3/30×Φ | Voltmeter reading, V | Difference |
| 1. |  |  |  |  |
| 2. |  |  |  |  |

Precaution

* 1. The continuity of the connecting wires should be checked before performing the experiment.
  2. Voltmeter should be connected using sign convention.
  3. Voltmeter, used in calibration of shunted galvanometer should be of nearly same range.
  4. In calibration process the readings should be noted from zero.