***Experiment # 3***

**TO Convert Galvanometer into ammeter *PRINCIPAL:***

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

***THEORY***

To convert a galvanometer into an ammeter reading up to 40mA a

suitable small resistance is connected in parallel with its coil. Thus,

***FORMULA USED :***

Rs=Rg Ig/I-Ig

***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. Ammeter:

It Is low resistance galvanometer, used to measure current in circuit. The current to be measured must pass through it. Hence, it is connected In series combination. An ideal ammeter should have zero resistance.

* 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:

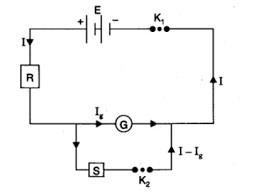
Keys in electric circuit is used to stop or start the current by opening or closing the plug from the key set up respectively.

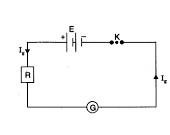
## CIRCUIT DIAGRAMS

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

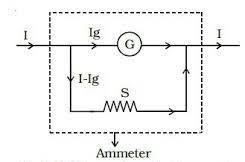
2

.For full scale deflection





### 3.For verification



## Procedure

1. Determination of the resistance of galvanometer by half scale deflection.
   1. Make the connections as shown in figure.
   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. 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 ammeter

To convert galvanometer into an ammeter, connect R in parallel with the galvanometer as shown in fig 3 and take out calculated resistance from L.R.B. **4)** Verification.

**i.** Make the connections as shown in figure 3 by connecting a battery and key in

series with the converted galvanometer and an ammeter of nearly same range in series with H.R.B. **ii**. Close the key K and adjust the current to get some deflection in the galvanometer.

Note the reading of galvanometer and ammeter.

**iii.** convert the galvanometer deflection into amperes 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. |  |  |  |  |  |
| 2. |  |  |  |  |  |
| 3. |  |  |  |  |  |
| 4. |  |  |  |  |  |
| 5. |  |  |  |  |  |

* + - Mean value of the resistance of galvanometer, Rg=110Ω
    - E.m.f of the battery, E= 1.2V
    - Resistance from the full-scale deflection of galvanometer, R = 3,500 Ω(from fig

2)

* + - Current in the galvanometer, Ig = E/R+Rg= 1.2/3500+110= 1.2/3610=0.00030 Amp Now,
    - Range of the ammeter, I=40mA
    - Required resistance , Rs=RgIg/I-Ig=(110)(0.0003)/0.04-

0.00013=0.033/0.039=0.8Ω

From fig 3,

Table (b) calibration of the converted galvanometer

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S  No | Ammeter reading  1 | Galvanometer  Reading, Φ | Galvanometer  Reading in Amp  Ig=40/30 × Φ | Difference  Ig-I |
| 1. | 1.5 | 2 | 2.6 | 1.1 |
| 2. | 0.5 | 1 | 1.3 | 0.3 |
| 3. | 1.5 | 3 | 1.95 | 0.45 |

### Precaution

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