# 3. METER BRIDGE- Series Combination

**Aim:** To verify the law of combination of resistance in series using a meter bridge.

**Apparatus:**Meterbridge,Battery,2 resistance coils,ResistanceBox,Galvanometer,Pencil Jockey,Connecting wires.

**Theory:** Meter Bridge works on Wheatstone's network principle. When the bridge is in the balanced state($I_g$=0), then

$$\frac{P}{Q}=\frac{R}{S}$$

Where P,Q,R,S are the four resistance in the various arms of the meter bridge.

Hence unknown resistance of the coil, X=$\frac{R(100-l)}{l}$

Where R is the known resistance from the standard resistance box

l is the balancing length when $I_g$=0

When two resistance are connected in series, then the effective resistance of the combination is

$r_s=r_1+r_2$

**Procedure:**

1. Mark two resistors as $r_1$ and $r_2$
2. Set up the circuit as per the circuit diagram.
3. Take suitable resistance from the resistance box(R) and find the balanced length l for each resistance coil when connected separately. Fin the value of $r_1$ and $r_2$

4. Now connect the two resistance coils $r_1$ and $r_2$ in series.Find the balancing length and find the effective resistance $r_s$
5. Repeat the experiment for different values of resistance ®from the resistance box.
6. Record the observation
7. Experimental value of $r_s$ should be close agreement with the calculated value of $r_s$

**Result:**

In Series,Effective resistance

(a)From experiment=.....Ω

(b)From calculation=.....Ω

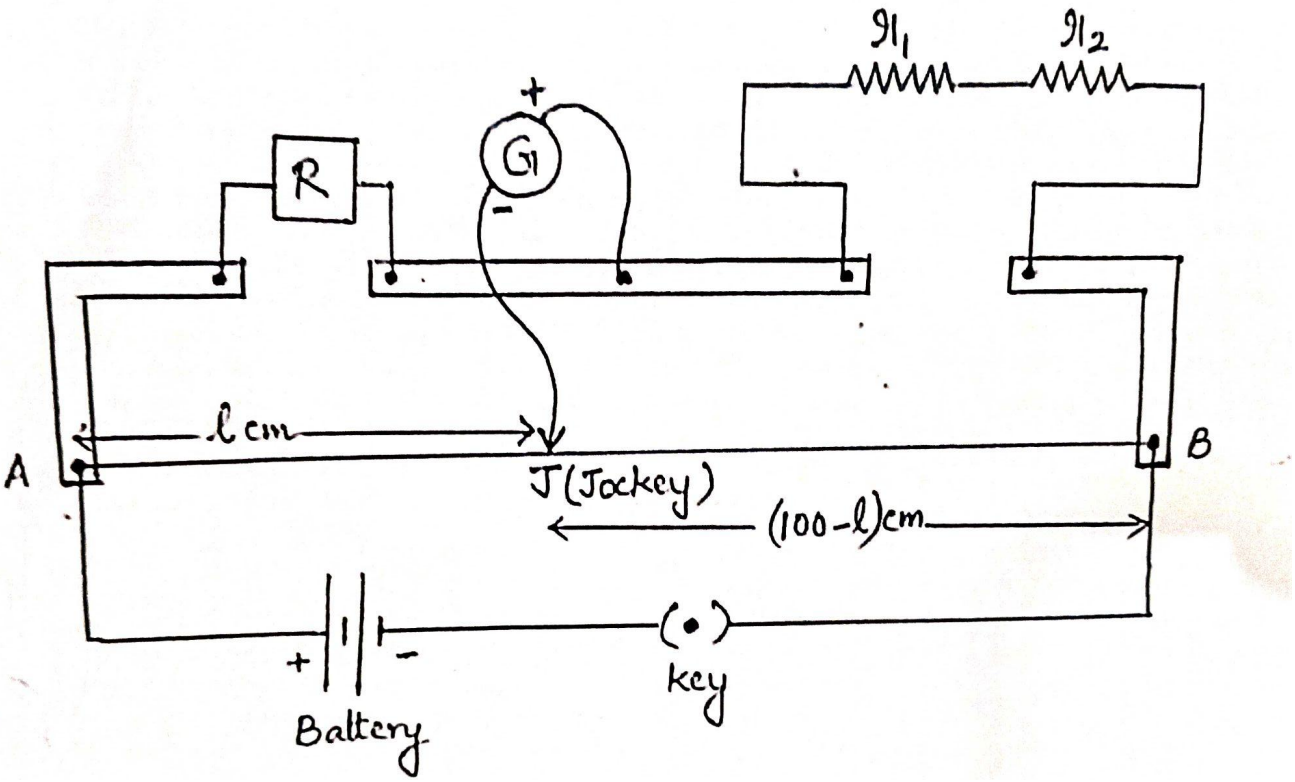
**Precaution:**

1. Connections should be neat,tight and clean
2. Plugs in the resistance box should be fixed tightly.
3. The Jockey should not be pressed too hard on the bridge wire and do not rub over it.
4. Null points should be in the central region of the wire (30 cm to 70 cm).

**Sources of error:**

1. The instrument screws may be loose.
2. The plug may not be clean
3. Error in the measurement of balancing Length.
4. If large current is passed for a sufficiently long time, the wire AC may get heated and its resistance may change considerably during the time of experiment.

Circuit Diagram:




AC=1 m long wire of bridge.

G=Galvanometer

J=Jockey

Observation & Calculation

(a)To verify the law of resistance in series

| Resistance coil | No | Resistance, R (Ω) | Balancing Length(l) cm | (100-l) cm | $X=\frac{R(100-l)}{l}$ (Ω) | Mean |
|---|---|---|---|---|---|---|
| $r_1$ | 1 | | | | | $r_1=$ |
| | 2 | | | | | |
| | 3 | | | | | |
| $r_2$ | 1 | | | | | $r_2=$ |
| | 2 | | | | | |
| | 3 | | | | | |
| $r_s$ | 1 | | | | | $r_s=$ |
| | 2 | | | | | |
| | 3 | | | | | |

$X=\frac{R(100-l)}{l}$

(Showing calculator steps with values)