Answer on Question #47748, Physics, Electric Circuits

A voltmeter coil has resistance 50 ohm and a resistor of 1.15 kilo ohm is connected in series. It can read potential differences up to 12 volts. If the same coil is used to construct an ammeter which can measure currents up to 2 ampere, what should be the resistance of the shunt used?

Solution:

Resistance of voltmeter is

$$R_V = 50 + 1150 = 1200\ \Omega$$

and it gives full-scale deflection when current

$$I_V = \frac{V}{R_V} = \frac{12\ \text{V}}{1200\ \Omega} = 0.01\ \text{A}$$

is passed through it.

Let a shunt of resistance (R_s) is connected in parallel to voltmeter. If total current through the circuit is I.

Then current through shunt:

$$I_s = (I - I_V)$$

potential difference across the shunt:

$$V_s = I_s R_s$$

or

$$V_s = (I - I_V)R_s$$

But

$$V_s = V$$

$$(I - I_g)R_s = I_V R_V$$

$$R_s = \frac{I_V}{I - I_V} R_V$$

$$R_s = \frac{0.01}{2 - 0.01} \cdot 1200 = 6.03\ \Omega$$

Answer: connect 6.03 Ω in parallel to it.