

Measurement Systems

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LAB 2: Electronic component testing using DMM.

Voltmeter DMM

Q.1
 $R_{in} = 10 \text{ M}\Omega$ $V_{in} = 2000 \text{ V}$

1) $\frac{2000 \times R_s}{10^7} = 200 \text{ mV}$ $R_s = 0$

$R_s = \frac{2 \times 10^2}{2000} = 0.1 \Omega$

$R_s = \frac{0.2 \times 10^7}{2000} = 1 \text{ k}\Omega$

2) $\frac{200 \times (R_s + 1 \text{ k})}{10^7} = 200 \text{ mV}$

$R_s + 1 \text{ k} = \frac{2000 \times 10^3}{200} = 10 \text{ k} - 1 \text{ k} = 9 \text{ k}$

3) $\frac{20 \times (R_s + 10 \text{ k})}{10^7} = \frac{200 \times 10^3}{20} = 10 \text{ k} - 10 \text{ k} = 0$

$\frac{2 \times (R_s + 100 \text{ k})}{10^7} = \frac{2000 \times 10^3}{2} = 1000 \text{ k} - 100 \text{ k} = 900 \text{ k}$

1) $\frac{0.2 \times (R_s + 1000 \text{ k})}{10^7} = \frac{0.2 \times 10^7}{0.2} = 10000 \text{ k} - 900 \text{ k} = 9100 \text{ k} = 9.1 \text{ M}$

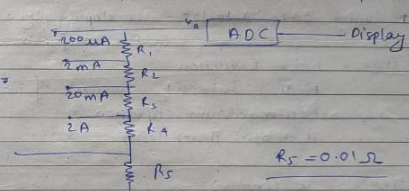
$\frac{100}{100 - 9} = \frac{100}{91} = 1.1 \text{ M}$

Current Ammeter DMM

Q.2
 $20 \text{ A} \times R_a = 200 \text{ mV}$ $R_a = 0.001 \Omega$

$R_a = \frac{200}{20} \times 10^{-3} = 10 \text{ m}\Omega$

Range = $200 \mu\text{A}$, 2 mA , 20 mA , 200 mA , 2 A

Diagram:


$R_s = 0.01 \Omega$

1) 2 A $I_m (R_s + R_1) = 200 \text{ mV}$

$R_s + 0.01 = \frac{0.2}{2} = 0.1$

$R_s = 0.1 - 0.01 = 0.09 \Omega$

2) 200 mA $R_s + 0.2 = \frac{200 \text{ mV}}{200 \text{ mA}} = 1$

$R_s = 1 - 0.2 = 0.8 \Omega$

3) 20 mA $0.02 (R_s + 0.9) = 0.2$

$R_s + 0.9 = \frac{0.2}{0.02} = 10 - 0.9 = 9.1 \Omega$

4) 2 mA $0.002 (R_s + 1.8) = 0.2$

$R_s + 1.8 = \frac{0.2}{0.002} = 100 - 1.8 = 98.2 \Omega$