- Common-mode operation.
    - In this mode, the signals applied to the base of Q1 and Q2 are derived from the same source. So the two signals are equal in magnitude as well as in phase.
- Common-Mode Rejection Ratio
- For instrumentation amplifier

$$\mathrm{CMRR} = \frac{A_d}{A_{cm}} \quad ; \quad \text{ideally } A_{cm} \to 0 \quad \text{and} \quad \mathrm{CMRR} \to \infty$$

$$A_{cm} = \frac{A_d}{\mathrm{CMRR}}$$

$$V_O = A_d V_d + \frac{A_d}{\mathrm{CMRR}} V_{cm}$$

$$V_2 = -\frac{V_D}{2} + V_{CM}$$

$$V_1 = \frac{V_D}{2} + V_{CM}$$

$$V_1 - V_2 = \frac{V_D}{2} + V_{CM} + \frac{V_D}{2} - V_{CM} = V_D$$

$$V_D = V_1 - V_2$$

$$V_1 + V_2 = \frac{V_D}{2} + V_{CM} - \frac{V_D}{2} + V_{CM} = 2V_{CM}$$

$$V_{CM} = \frac{V_1 + V_2}{2}$$

$$V_0 = A_d V_D + A_{CM} V_{CM}$$

$$V_0 = A_d V_D + A_{CM} V_{CM}$$

$$A_d = \left(\frac{R_3}{R_1 + R_3}\right)\left(\frac{R_2 + R_4}{R_2}\right)\left(\frac{R_A}{R_P} + \frac{1}{2}\right) + \left(\frac{R_4}{R_2}\right)\left(\frac{R_B}{R_P} + \frac{1}{2}\right)$$

$$A_{CM} = \left(\frac{R_3}{R_1 + R_3}\right)\left(\frac{R_2 + R_4}{R_2}\right) - \left(\frac{R_4}{R_2}\right)$$