EE230 - Experiment 9

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1 Measurement of Input Offset Voltage

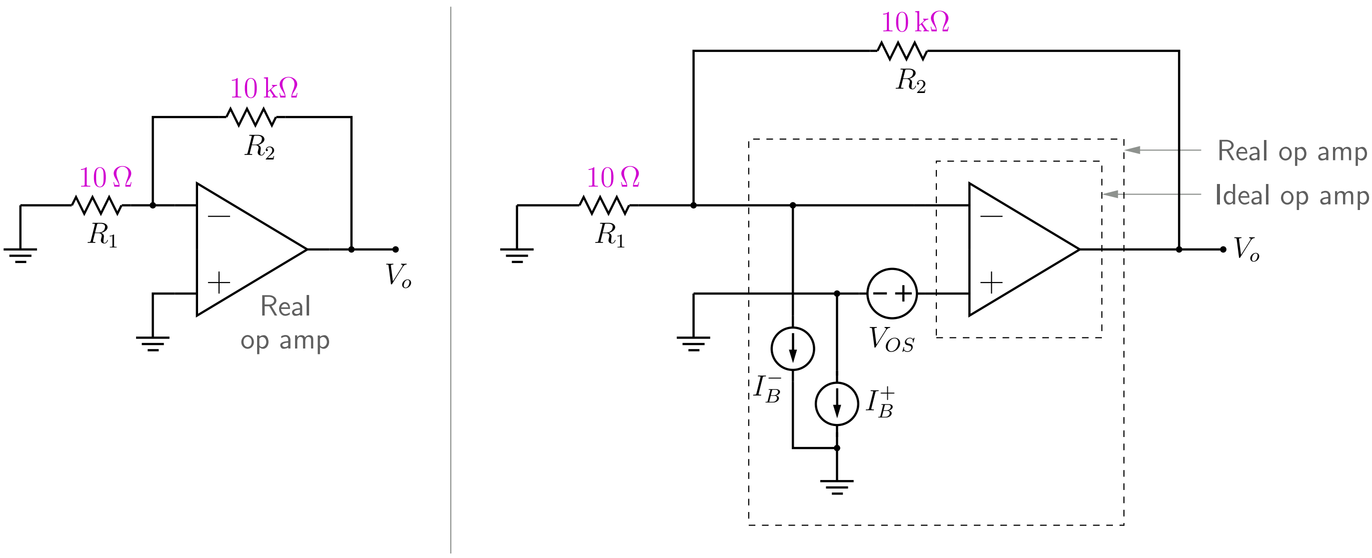

Figure 1: Circuit for measurement of V_{OS}

Now,

$$V_o = V_{OS}\left(1 + \frac{R_2}{R_1}\right) + R_2 I_B^- \Rightarrow V_{OS} \approx \frac{V_o}{1 + \frac{R_2}{R_1}} \approx \frac{V_o}{\frac{R_2}{R_1}} = V_o \frac{R_1}{R_2}$$

2 Measurement of Input Bias Currents

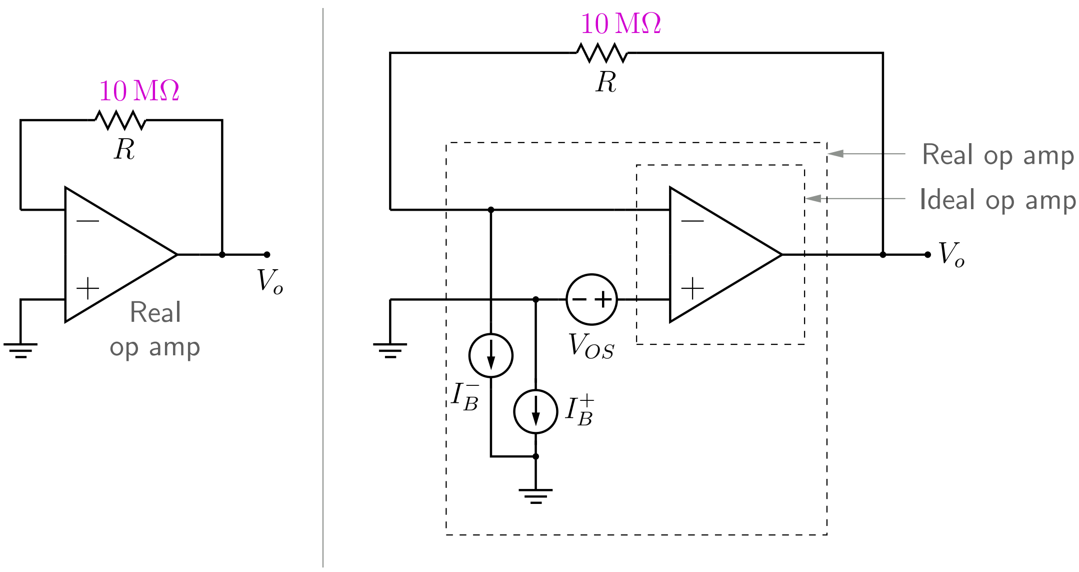

Figure 2: Circuit for measurement of I_B^-

Now,

$$V_o = V_{OS} + I_B^- R \Rightarrow V_{OS} \Rightarrow I_B^- \approx \frac{V_o}{R}$$

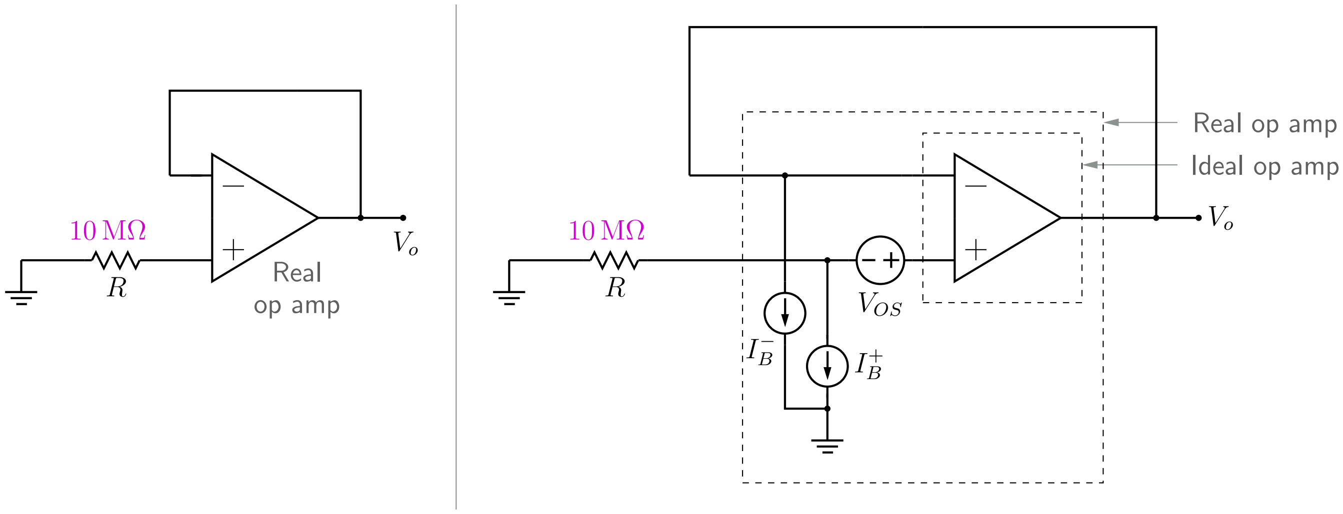

Figure 3: Circuit for measurement of I_B^+

Now,

$$V_o = V_{OS} + I_B^+ R \Rightarrow V_{OS} \Rightarrow I_B^+ \approx \frac{V_o}{R}$$

So,

$$I_B = \frac{I_B^+ + I_B^-}{2} \qquad I_{OS} = |I_B^+ - I_B^-|$$

2.1 Measurement of the Differential Voltage Gain, $A_\mathbf{d}$

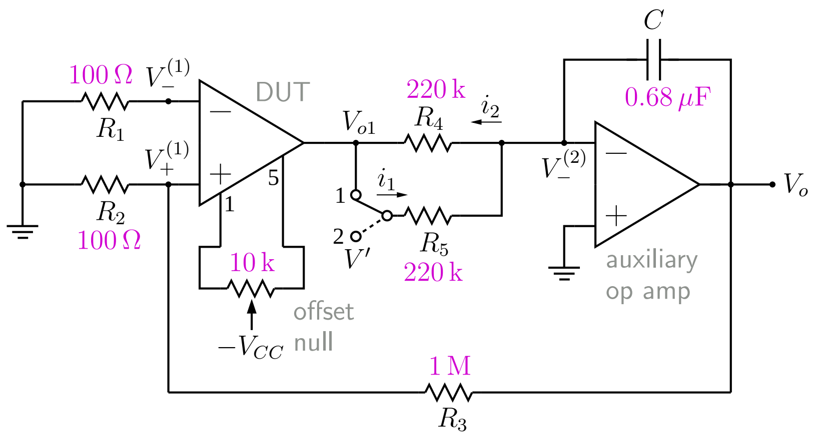

Figure 4: Circuit for measurement of A_{OL}

- When switch is in position 1, minimise V_o by adjusting $10k\Omega$ pot.
- When switch is in position 2, V_{o_1} decreases by $V' = 1V$ as the capacitor behaves like open cicuit. Measure V_o, then

$$A_{OL} = -\frac{V'}{V_o} \cdot \frac{R_2 + R_3}{R_2} \approx -\frac{V'}{V_o}\frac{R_3}{R_2}$$

2.2 Learnings

Learnt to measure the DC parameters of a practical Opamp.

3 Comparison of popular op-amps

Op-Amp	Input Offset Voltage	Input Bias Current	Input Offset Current	DC Open Loop Gain
UA741C	$1mV$	$80nA$	$20nA$	$200V/mV$
TL084	$3mV$	$30pA$	$5pA$	$200V/mV$
LM324	$3mV$	$20nA$	$2nA$	$100V/mV$

Table 3.1: Comparison of **Typical** Parameters (at 25°)

3.1 Learnings

- UA741 has the lowest input offset voltage.
- TL084 has the lowest input bias current and offset current.
- UA741 and LM324 have the highest open loop gain.