

EE 230 – Analog Lab - 2021-22/I (Autumn)

Experiment 9: Measurement of Opamp DC Parameters

(Ver 2, Oct 7, 2021)

Introduction

In this experiment we shall measure the DC parameters of a practical Opamp, such as input offset voltage, input bias currents, and dc open loop voltage gain.

We shall use the Lab handout used in Spring 2020 on “Opamp Circuits: Measurement of offset voltage, bias currents and open loop gain” – written by Prof M.B.Patil.

Measurement of DC open-loop gain (Modified Procedure)

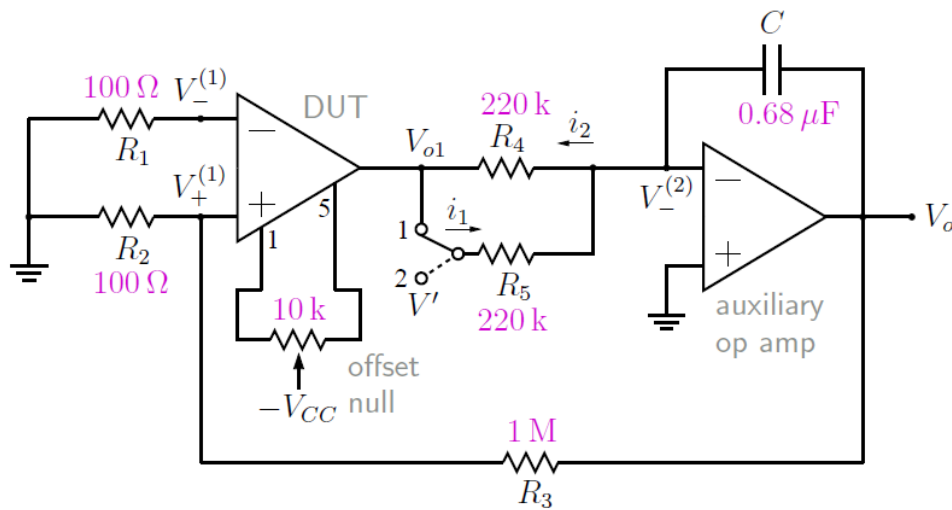


Figure 8: Measurement of DC open-loop gain A_{OL} .

Procedure for measuring the DC Open-loop Gain, A_{OL}

- Wire the circuit shown in Fig.8. The switch position 2 is connected to a voltage V' (say 1 V, 2 V or 3 V).
- With the switch in position 1, use the 10 k pot to nullify the effect of the offset voltage of the DUT to the extent possible, i.e., adjust the pot, to make V_o as small as possible.
- Keep $V' = 1$ V and connect resistor R_5 to position 2.

Because of the high gain of Opamp 2 and the servo connection of the circuit (thereby providing negative feedback), the inverting terminal of Opamp 2 (i.e. $V^{(2)}$) will be at zero potential. Since voltage $V^{(2)} = 0$, and $R_4 = R_5$, the current $i_1 = i_2$. Hence, the DUT Opamp output voltage V_{o1} would adjust itself to be $-V'$.

- Measure V_{o1} and V_o .

In the circuit, since $R_3/R_2 = 10000$, $(R_3 + R_2) \approx R_3$.

We see that, $V_{o1} = [V_o \cdot R_2 / (R_2 + R_3)]$. $A_{OL} \approx [V_o \cdot (R_2 / R_3)] \cdot A_{OL}$

This expression can be used to evaluate A_{OL} from the measured values of V_{o1} and V_o .

Lab Report

1. For Experiment 9, please limit your Lab report to 2 or 3 pages, as detailed below:
Page 1 and 2: Measurement of input offset voltage, and input bias currents
Page 2 or 3: Measurement of dc open loop gain.
Include also on page 2 or 3 a table comparing the input offset voltage, input bias current, input offset current and the dc open loop gain of UA741, TL084 and LM324. Refer to the data sheets in the Expt 9 folder on Moodle.
2. Deadline for Lab Report 9: Oct 10, 2021 (Sunday), 11pm.
3. Please do not email the Lab instructor with late submission requests of Lab Reports. Instead, you may write to your Tutor, who would assess your request, and might allow late submission (by say, a maximum of 12 hours) as a one-time concession.

Note: Request all students to refrain from any unfair means, such as copying Lab Reports of others, in part or in full. Defaulters (both parties) will attract very severe punishment – including negative marks (i.e. minus marks, instead of 0 marks for non-submission), and grade penalty.