

Inverting Operational Amplifier

Student Group

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Inverting Operational Amplifier

Gain of Op-Amp

Build the following circuit in [figure 1](#) with the power supply and a multimeter.



Fig. 1: Inverting Op-Amp

$U_{DD} = 10\text{ V}$, $U_{SS} = -10\text{ V}$, $R_1 = 100\text{ k}\Omega$

Calculate the necessary value for R_2 , so that the output U_{OUT} is $+1.5\text{ V}$.
Use the supply voltage of the operational amplifier for U_{IN} .

$U_{IN} =$

$$R_2$$

Analysis of inverting input currents

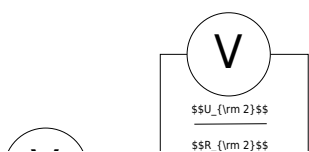


Fig. 2: Inverting Op-Amp: Analysis of currents of the inverting input

$U_{DD} = 10\text{V}$, $U_{SS} = -10\text{V}$, $R_1 = 100\text{k}\Omega$
 Use the values from [figure 1](#) for U_{IN} , U_{OUT} , R_2 .

Complete the reference arrows in the schematic of the circuit.
 Determine the the currents I_1 and I_2 indirectly by measuring the voltage across known resistors
 and calculate the algebraic sum of the currents at node N_{12} using Kirchhoff's Current Law (KCL).

$$U_1 =$$

$$U_2 =$$

$$I_1 =$$

$$I_2 =$$

I_{N12}

Analysis of inverting input voltages

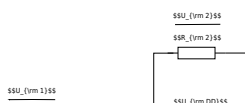


Fig. 3: Inverting Op-Amp: Analysis of virtual GND of the inverting input

$U_{DD} = 10\text{V}$, $U_{SS} = -10\text{V}$, $R_1 = 100\text{k}\Omega$
 Use the values from figure 1 for U_{IN} , U_{OUT} , R_2 .

Complete the reference arrows in the schematic of the circuit.
 Take the values for U_1 , U_2 , U_{OUT} from figure 2.
 Calculate the voltage U_{12} using Kirchhoff's Voltage Law (KVL) within one of the possible circuit loops. Mark the chosen loop in the circuit.
 Verify your calculated result by measuring U_{12} .

$U_1 =$

$U_2 =$

$U_{IN} =$

$U_{OUT} =$

Calculated $U_{12} =$

Measured $U_{12} =$

Analyse the physical significance of the potential at N_{12} relative to GND (defined as U_{12})

in the context of the operational amplifier's input configuration. What do you observe?

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What happens if you short-circuit R_2 (the feedback resistor)? Experimentally verify this effect and explain the observed behavior regarding the output voltage.

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