

Electrical & Electronics Engineering

EEE Lab Report

Course: Electronic Devices and Circuits & Pulse Techniques Lab

Course Code: EEE 204

Experiment No: 03

Experiment Name: Inverting Amplifier

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Submitted By: Md. Omor Faruk Id No: 192002006 Section: 192 DB Department of Computer Science & Engineering Green University of Bangladesh	Submitted To: Mr. Sharif Nafis Mahmood Lecturer Department of EEE Green University of Bangladesh
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Signature and Date

Mr. Sharif Nafis Mahmood

Lecturer

Department of EEE

Green University of Bangladesh

Experiment No: 03

Experiment Name: Inverting amplifier

Aim: To design and setup an inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.

Objectives: After completion of this experiment, student will be able to design and setup an inverting amplifier using OP AMP. We will be able to design and implement OP AMP inverting amplifier circuit.

Equipments/Components:

Sl. No.	Name and Specification	Quantity
01.	Dual Power supply $\pm 15V$	1
02.	Function generator (0-1MHz)	1
03.	Oscilloscope	1
04.	Bread board	1
05.	IC 741C	1
06.	Resistors	2
07.	Probes and connecting -wires	As required

Principle: It is a closed loop mode application of opamp and employs negative feedback. The R_f and R_i are the feedback and input resistance of the circuit respectively. The input terminals of the opamp draws no current because of the large differential input impedance.

The Potential differences across the input terminals of an opamp is zero because of the large open loop gain.

Due to these two conditions, the inverting terminal is at virtual ground potential. So the current flowing through R_i and R_f are the same.

$$I_i = I_f$$

$$\text{That is } \frac{V_{in}}{R_i} = - \frac{V_o}{R_f}$$

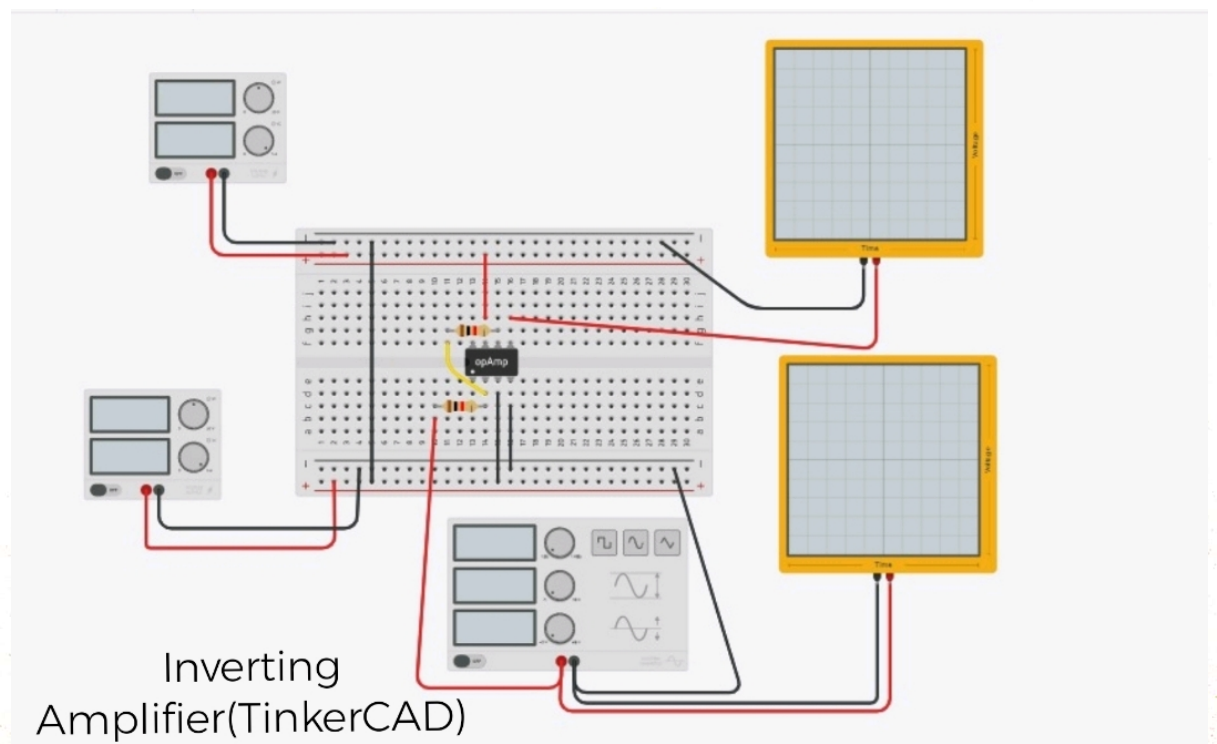
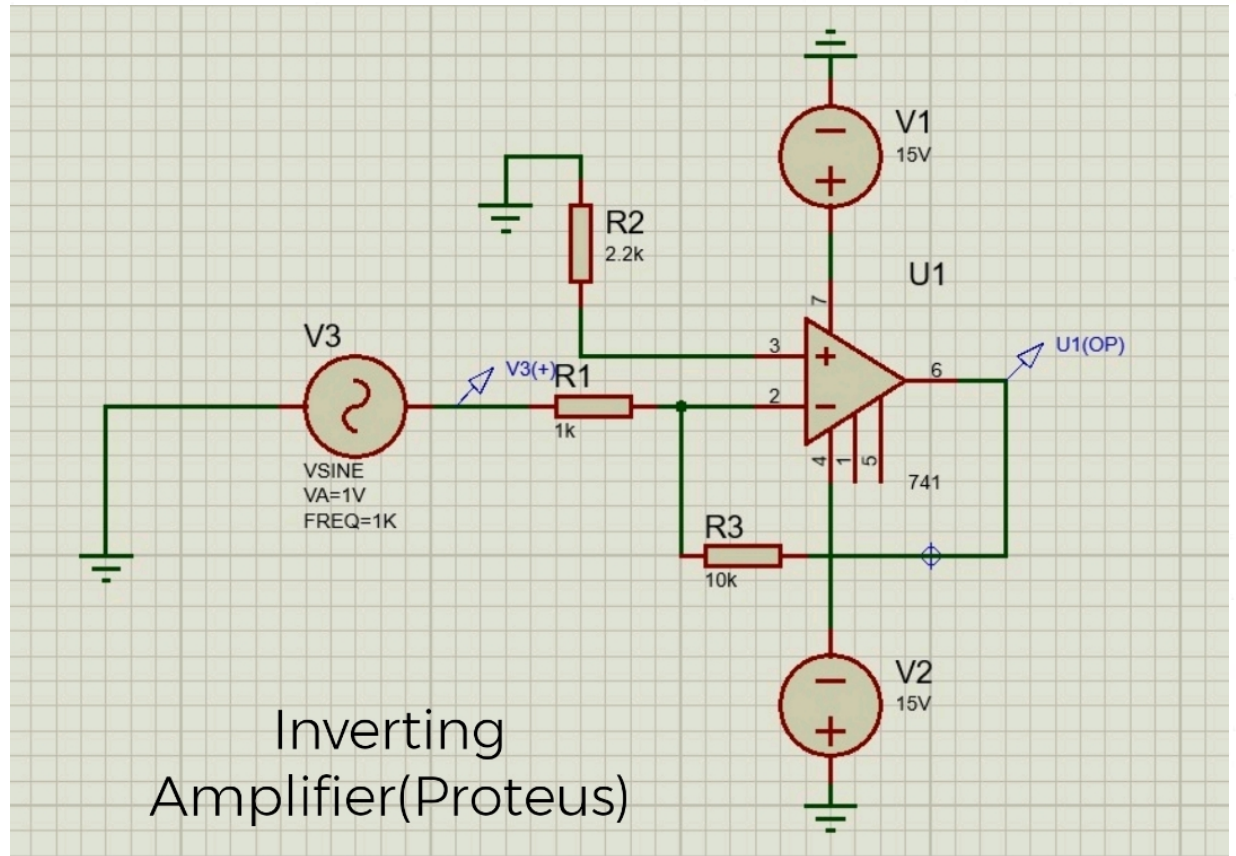
$$\text{Therefore } \frac{V_o}{V_{in}} = A_v = - \frac{R_f}{R_i}$$

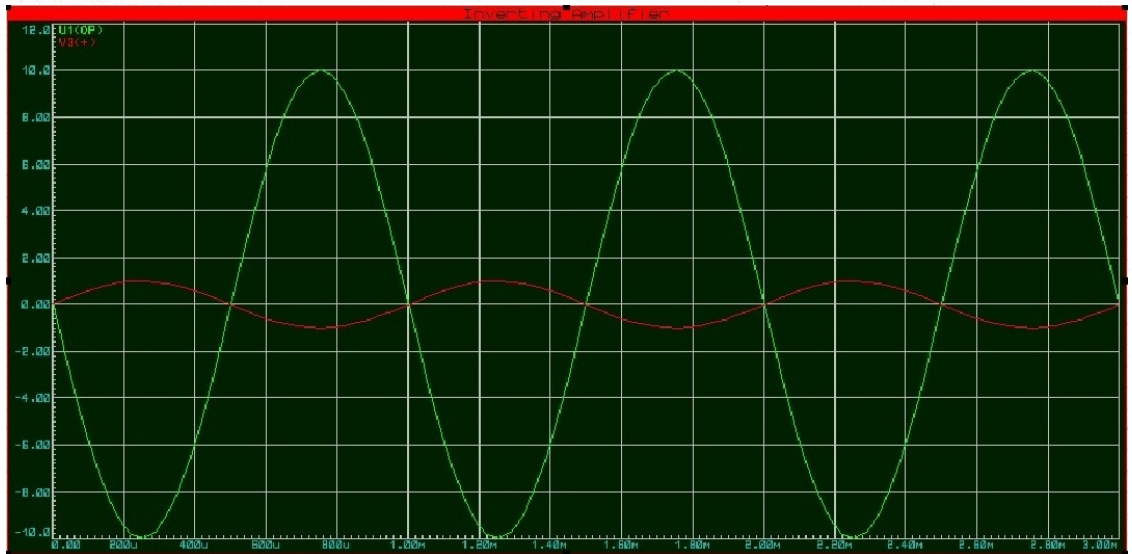
Here the -ve sign indicates that the output will be an amplified wave with 180° phase shift (inverted output). By varying the R_f or R_i , the gain of the amplifier can be varied to any desired value.

Procedure:

1. Check the components.
2. Setup the circuit on the breadboard and check the connections.
3. Switch on the power supply.
4. Give $1 V_{PP}/1\text{KHz}$ sine wave as input.
5. Observe input and output on the two channels of the oscilloscope simultaneously.
6. Note down and draw the input and output waveforms on the graph.
7. Verify the input and output waveforms are out of phase.
8. Verify the obtained gain is same as designed value of gain.

Circuit Diagram:



Graph:

Graph: Inverting Amplifier

Discussion: An inverting amplifier circuit, the operational amplifier inverting input receives feedback from the output of the amplifier. Assuming the op-amp is ideal and applying the concept of virtual short at the input terminals of op-amp, the voltage at the inverting terminal is equal to non-inverting

terminal. The non-inverting input of the operational amplifier is connected to ground. As the gain of the op amp itself is very high and the output from the amplifier is a matter of only a few volts, this means that the difference between the two input terminals is exceedingly small and can be ignored.

As the non-inverting input of the operational amplifier is held at ground potential this means that the inverting input must be virtually at earth potential.

In this experiment - we can see that, the Open Loop Gain, (A_{vo}) of an operational amplifier can be very high. However, this very high gain is of no

real use to us as it makes the amplifier both unstable and hard to control as the smallest of input signals, just a few micro-volts, (μV) would be enough to cause the output voltage to saturate and swing towards one or the other of the voltage supply rails losing complete control of the output.

Finally - we can say that, this experiment is more effective to gain knowledge about inverting amplifier and from this experiment - we can realize that, how inverting amplifier - works. So at last - we can say that, this experiment is most important for us.

Reference:

[1] Lab Manual for EEE 204 Course
[Made & Edited by Mr. Sharif
Nafis Mahmood, Lecturer, Dept.
of EEE, Green University of
Bangladesh]

[2] Electrical devices and circuit theory
by Robert L. Boylestad and
L. Nashelsky (7th Edition) [Page no:
142-145]