INTRODUCTION

An operational amplifier (op-amp) is a versatile electronic device that can be used for a variety of signal processing and amplification applications. One of the most commonly used configurations for an op-amp is as a non-inverting amplifier.

In a non-inverting amplifier configuration, the input signal is applied to the non-inverting input of the op-amp, while the output is taken from the output terminal. The input signal is amplified by a factor of (1 + Rf/Rin), where Rf is the feedback resistor and Rin is the input resistor. This configuration provides a high input impedance and low output impedance, making it useful in a wide range of applications.

The non-inverting configuration is particularly useful when the input signal source has a high impedance, as it prevents loading effects and ensures that the signal is not attenuated. Additionally, the output voltage of the non-inverting amplifier is always in phase with the input voltage, which can be useful in many applications where phase relationships are important.

Overall, the non-inverting amplifier configuration is a simple yet powerful way to amplify and process signals using an op-amp, and is widely used in many different types of electronic circuits.

COMPONENTS IN USED :

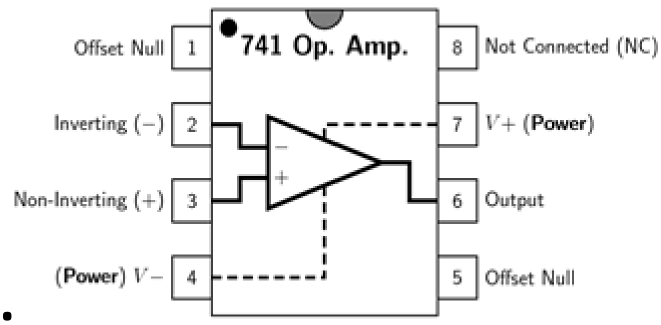
1. 741-OP-AMP: The 741 operational amplifier (op-amp) is a widely used integrated circuit (IC) chip that is commonly used in electronic circuits. It was introduced by Fairchild Semiconductor in 1968 and is still in use today.The 741 op-amp is a high-gain amplifier that can amplify both AC and DC signals. It has a differential input and a single-ended output, and it is commonly used in applications such as amplifiers, filters, oscillators, and voltage regulators.
2. VSINE(A.C. SOURCE):This is a Alternating Current Source used in many applications, including power generation, transmission, and distribution. It refers to voltage sine wave, which is a periodic electrical signal that oscillates in a sinusoidal waveform.
3. RESISTOR:A electronic component that resist the flow of current. It is used to set the gain of the amplifier.
4. DIGITAL OSCILLOSCPE: It Is used to measure the waveform of electrical signals.
5. POWER SUPPLY: It is used to provide the voltage required to operate the operational amplifierand supply the circuit with input signal.

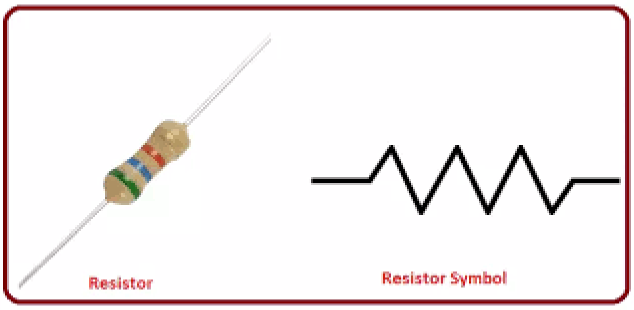
MOTIVATION

1. The project can provide an opportunity for me to learn more about op-amp circuits as compared to last semester.
2. The non inverting amplifier circuit can be used to demonstrate the concept of gain calculation.
3. The non inverting amplifier circuit can be used to amplify input signals to a certain degree. This can be helpful in applications where input signal is weak.
4. This project can provide opportunity to evaluate the working and performance level of non inverting amplifier.
5. It can also be used to condition the input signal by filtering out noise or unwanted frequencies. This can be useful in applications where input signal is contaminated with unwanted noise.

SPECIFICATIONS OF COMPONENTS:

1.



2. 

3. 

4. 

WORKING:

A non-inverting amplifier is an electronic circuit that amplifies an input signal without changing its polarity. It is based on an operational amplifier (op-amp) and typically consists of an op-amp, a feedback resistor, and an input resistor.

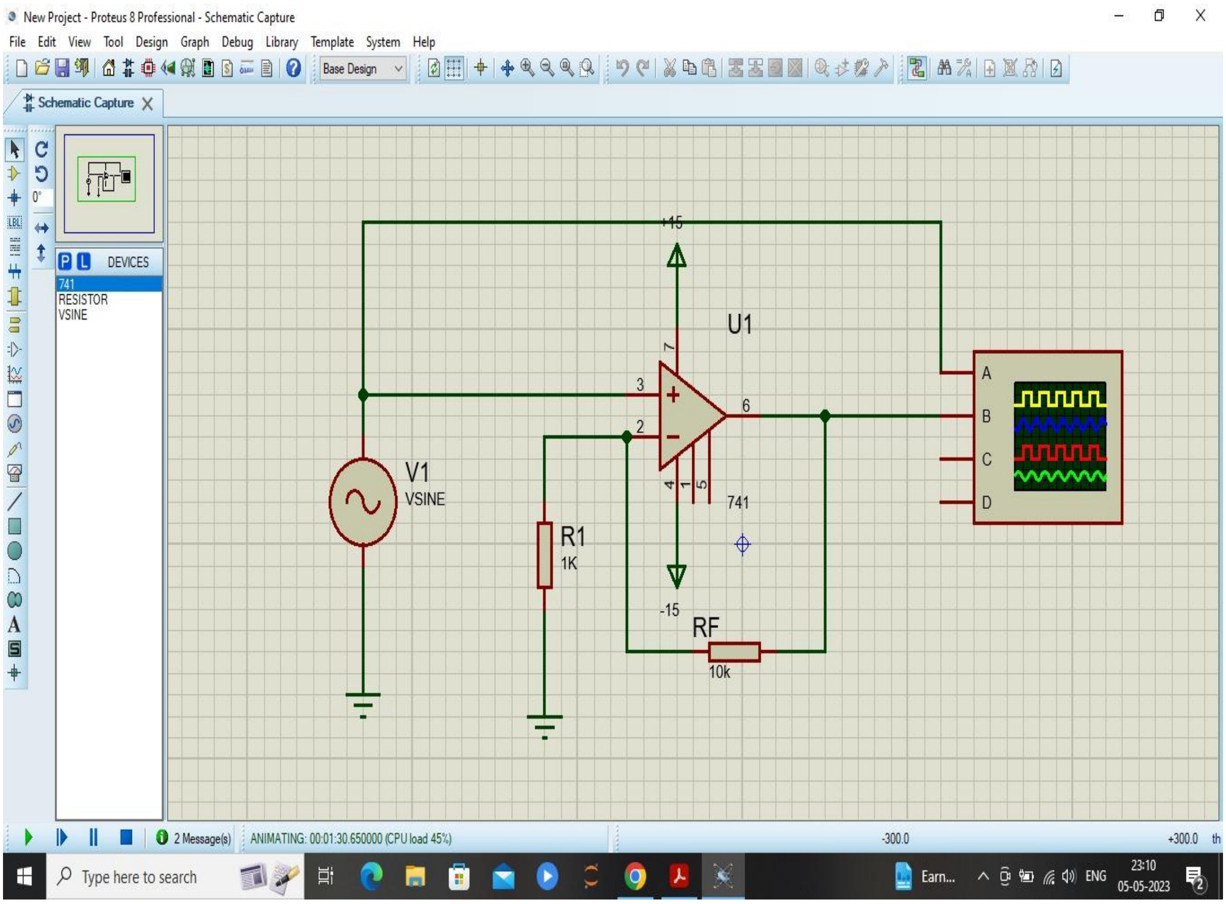
The non-inverting amplifier circuit works by using negative feedback to control the gain of the op-amp. The input signal is applied to the non-inverting input terminal of the op-amp, while the output signal is fed back to the inverting input terminal through a feedback resistor.

The feedback resistor is used to set the gain of the amplifier. The gain is given by the formula (1 + Rf/Rin), where Rf is the resistance of the feedback resistor and Rin is the resistance of the input resistor. By adjusting the value of the feedback resistor, the gain of the amplifier can be set to a desired value.

When an input signal is applied to the non-inverting input terminal, the op-amp compares the voltage at this terminal to the voltage at the inverting input terminal. If the voltage at the non-inverting input terminal is higher than the voltage at the inverting input terminal, the op-amp output will increase in voltage to try to equalize the two inputs.

As the op-amp output voltage increases, the voltage at the inverting input terminal also increases due to the voltage drop across the feedback resistor. This negative feedback causes the op-amp to stabilize and prevents the output voltage from becoming too high.

In this way, the non-inverting amplifier amplifies the input signal without changing its polarity and provides a stable output voltage that is proportional to the input voltage. The amplifier circuit can be designed to provide high gain and low noise, making it useful in many electronic applications such as audio amplification, signal processing, and control systems.



<u>**ADVANTAGES**</u>:

1. The non-inverting op-amp has a very high input impedance, which means that it does not load the input signal. This is particularly useful when the input signal is coming from a high impedance source, such as a sensor or transducer.

2. The non-inverting op-amp does not invert the input signal, so the output signal is always in phase with the input signal. This is useful when the input signal is a voltage that needs to be amplified without changing its polarity, such as in audio amplification.

3. The non-inverting op-amp can provide high gain without causing instability or oscillation. This makes it useful for amplifying weak signals or for providing precise amplification in applications such as signal processing and control systems.

4. The negative feedback in the non-inverting op-amp circuit provides stability and helps to reduce distortion and noise in the output signal.

5. The non-inverting op-amp circuit is relatively simple and easy to design, making it a popular choice for many applications.

6. The gain of the non-inverting op-amp can be easily adjusted by changing the value of the feedback resistor. This allows for flexibility in the circuit design and makes it useful in a variety of applications.

DISADVANTAGES:

1. While the input impedance of the non-inverting amplifier is relatively high, it is still lower than that of the inverting amplifier. This can result in some loading of the input signal, particularly if the source impedance is very high.

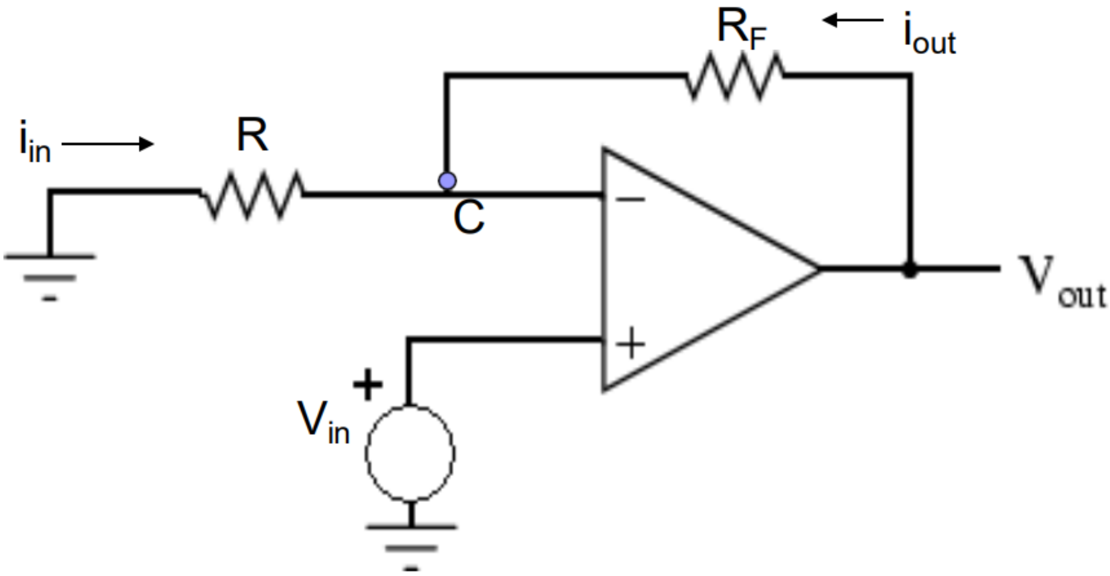
2. The output voltage swing of the non-inverting amplifier is limited by the supply voltage and the op-amp's output voltage range. This can be a limitation in some applications where a larger output voltage range is required.

3. The non-inverting amplifier has reduced noise rejection compared to the inverting amplifier. This is because the input signal is not inverted, so any noise present in the input signal will also be present in the output signal.

4. The non-inverting amplifier is more sensitive to component tolerances than the inverting amplifier. This is because the feedback resistor sets the gain of the amplifier, so any changes in its value will affect the gain of the circuit.

5. In some cases, the non-inverting amplifier can be more prone to instability than the inverting amplifier. This can be particularly true for high gain applications, where careful consideration must be given to the values of the feedback resistor and input resistor to ensure stability.

SOME IMPORTANT DIAGRAMS AND FORMULA:



$$\frac{V_{out}}{V_{in}} = 1 + \frac{R_F}{R}$$

$$V_1 = \frac{R_2}{R_2 + R_F} \times V_{OUT}$$

Ideal Summing Point: $V_1 = V_{IN}$

Voltage Gain, $A_{(V)}$ is equal to: $\dfrac{V_{OUT}}{V_{IN}}$

Then, $A_{(V)} = \dfrac{V_{OUT}}{V_{IN}} = \dfrac{R_2 + R_F}{R_2}$

Transpose to give: $A_{(V)} = \dfrac{V_{OUT}}{V_{IN}} = 1 + \dfrac{R_F}{R_2}$

<u>APPLICATIONS OF NON INVERTING AMPLIFIER</u>:

1. The non-inverting amplifier is commonly used in audio amplification circuits, where it is used to amplify low-level audio signals without changing their polarity.

2.The non-inverting amplifier is used in signal conditioning circuits, where it is used to amplify and filter signals from sensors and other transducers.

3.The non-inverting amplifier is used in instrumentation amplifiers, where it is used to provide high gain and high input impedance for accurate measurement of signals from sensors and other sources.

4.The non-inverting amplifier is used in active filter circuits, where it is used to amplify and filter signals in a wide range of frequency bands.

5.The non-inverting amplifier is used in oscillator circuits, where it is used to provide positive feedback to generate oscillations at a specific frequency.

6.The non-inverting amplifier is used in voltage regulator circuits, where it is used to provide stable output voltage levels.

7.The non-inverting amplifier is used in control systems, where it is used to provide precise amplification and signal processing for feedback control.

NOTE:

The non inverting amplifier can be connected with some sensors so as to increase their voltage and current output signal.

LEARNING OUTCOME:

1. This includes understanding the circuit configuration, the gain equation, and the input/output characteristics of the non-inverting amplifier.
2. This includes understanding how non-inverting amplifier can be used in various applications such as sensor amplification, audio amplification, or feedback control.

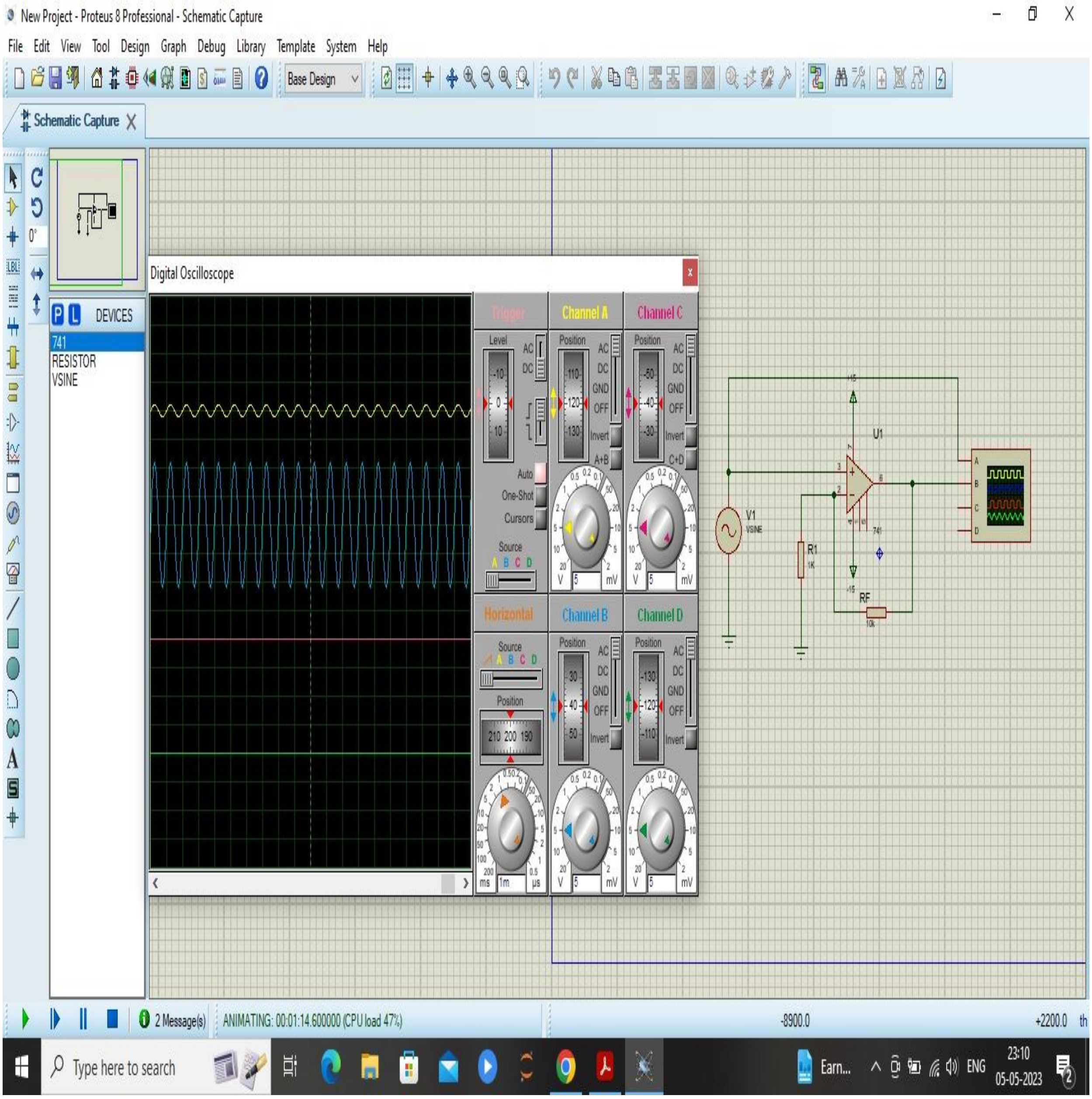
3. This includes understanding the impact of op-amp characteristics and external factors such as temperature and noise on the performance of the non-inverting amplifier circuit.
4. In this output voltage is in phase with the input voltage.

CONCLUSION:

The output produced by a non inverting amplifier is non-inverted in nature and expressed with positive polarity. Thus, the gain of the inverting amplifier is just a ratio of resistances. Hence, the gain of the non-inverting amplifier is the sum of 1 and the ratio of resistances.

REFERENCES:

1. www.Electronics-tutorials.ws
2. www.Electrical4u.com


New Project - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Base Design
Schematic Capture
DEVICES
741
RESISTOR
VSINE
Digital Oscilloscope
Trigger
Channel A
Channel C
Horizontal
Channel B
Channel D
U1
V1
VSINE
R1
RF
741
2 Message(s)
ANIMATING: 00:01:14.600000 (CPU load 47%)
-8900.0
+2200.0
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