PART 3

Linear Applications of Op-Amp

1. Analyzing Operational Amplifier Operating As Summing Amplifier (2.3)
2. Analyzing Operational Amplifier Operating As Dıfferentıal Amplifier (2.4)
3. Analyzing Operational Amplifier Operating As Dıfferentiator (2.5)
4. Analyzing Operational Amplifier Operating As Integrator (2.6)

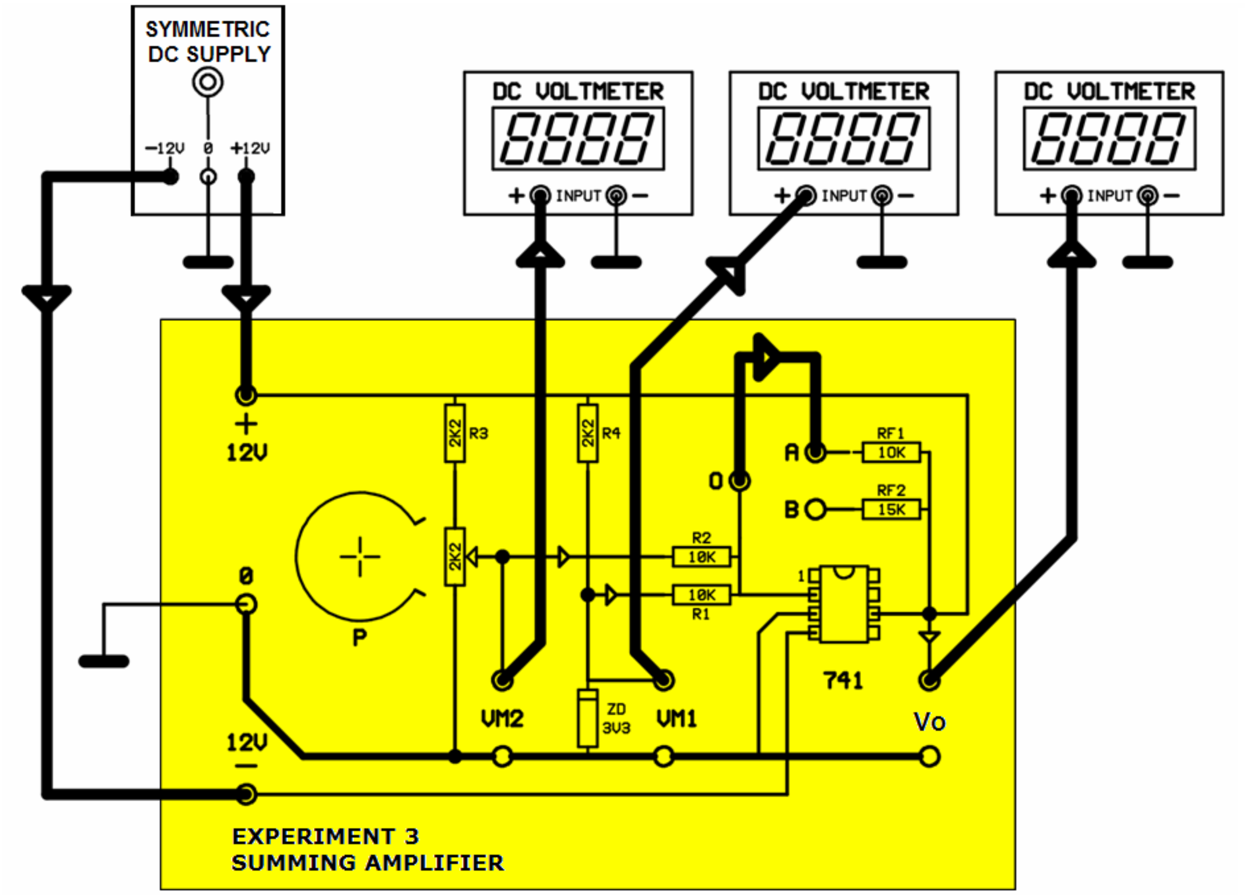
MODULE Y-0014/02

EXPERIMENT: 2.3

ANALYZING OPERATIONAL AMPLIFIER OPERATING AS SUMMING AMPLIFIER

EXPERIMENTAL PROCEDURE:

Connect the circuit as shown in the Figure.



In the experiment, one of the voltages (**VM1**) is constant and the other one (**VM2**) is variable.

1- Apply power to the circuit. Measure the voltage VM1. Take note of the voltage VM1 on Table 1 in each step. Adjust the voltage VM2 by using the potentiometer P in each step. Take note of the output voltage.

Table 1

VM1 (**Volt**)	**VM2** (**Volt**)	**Vo** (**Volt**)

2- Does the summing circuit sum the input voltages?

3- Does the summing circuit operate as inverting amplifier?

4- Calculate the gain of the circuit.

In the circuit RF= , R1= , R2= .

Gain =

5- Open the short circuit between the points O-A. Short the points O-B. Take note of the output voltage for the given voltage values VM1 and VM2 on Table 2.

Table 2

VM1 (**Volt**)	**VM2** (**Volt**)	**Vo** (**Volt**)

6- Calculate the gain of the circuit.

In the circuit RF= , R1= , R2= .

Gain (A) =

7- Did the summing circuit perform summation in each step?

(Theoric) Vo = *(V1+V2).A =*

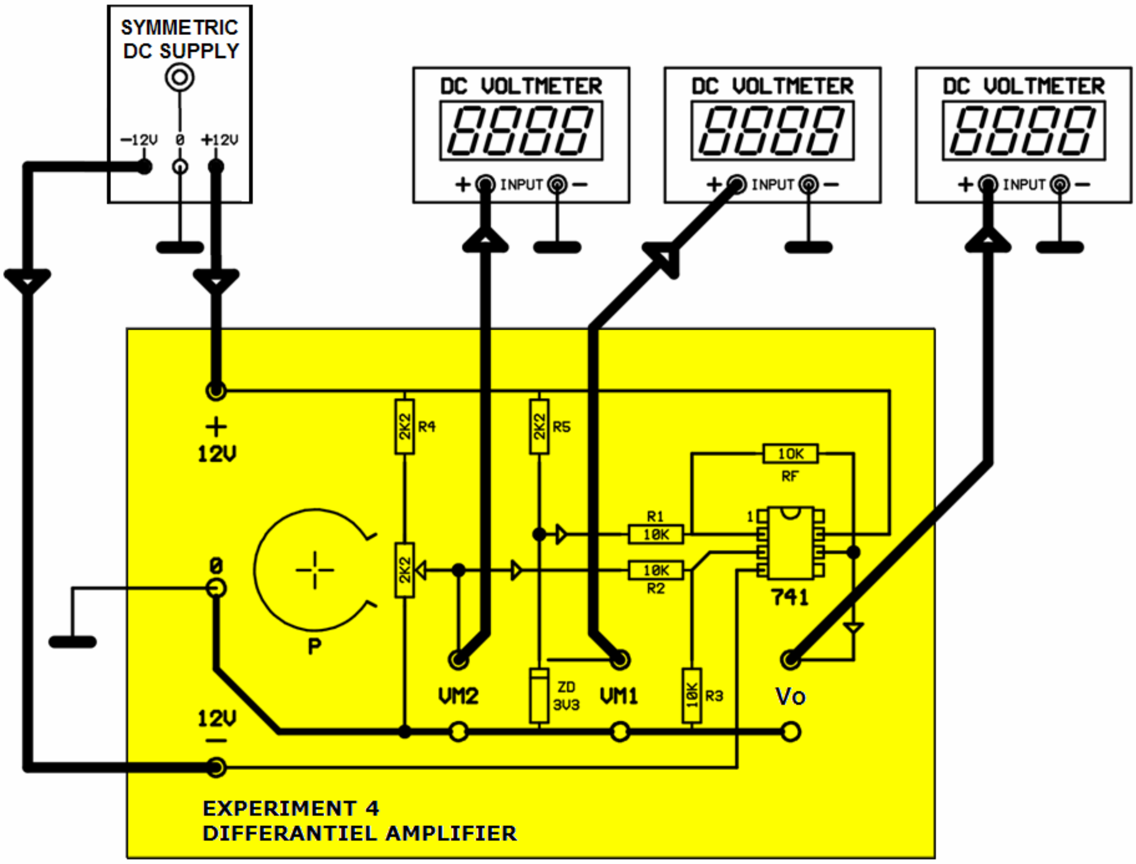
(Measurement)Vo =

EXPERIMENT: 2.4

ANALYZING OPERATIONAL AMPLIFIER OPERATING AS DIFFERENTIAL AMPLIFIER

EXPERIMENTAL PROCEDURE:

Connect the circuit as shown in the figure.



In the experiment, one of the voltages (**VM1**) is constant and the other one (**VM2**) is variable.

1- Apply power to the circuit. Measure the voltage VM1. Take note of the voltage VM1 on Table 1 in each step. Adjust the voltage VM2 by using the potentiometer P in each step. Take note of the output voltage.

Table 1

VM1 (Volts)	**VM2 (Volts)**	**Vo (Volts)**

2- Does the differential circuit perform subtraction?

3- Calculate the gain of the circuit.

Since, R1= , R2= , R3= , R4= .

A (Gain) =

4- How is the sign of the output determined?

5- For the input voltages given step 1, calculate the output voltage assuming R1=R2=10K and R3=RF=20K

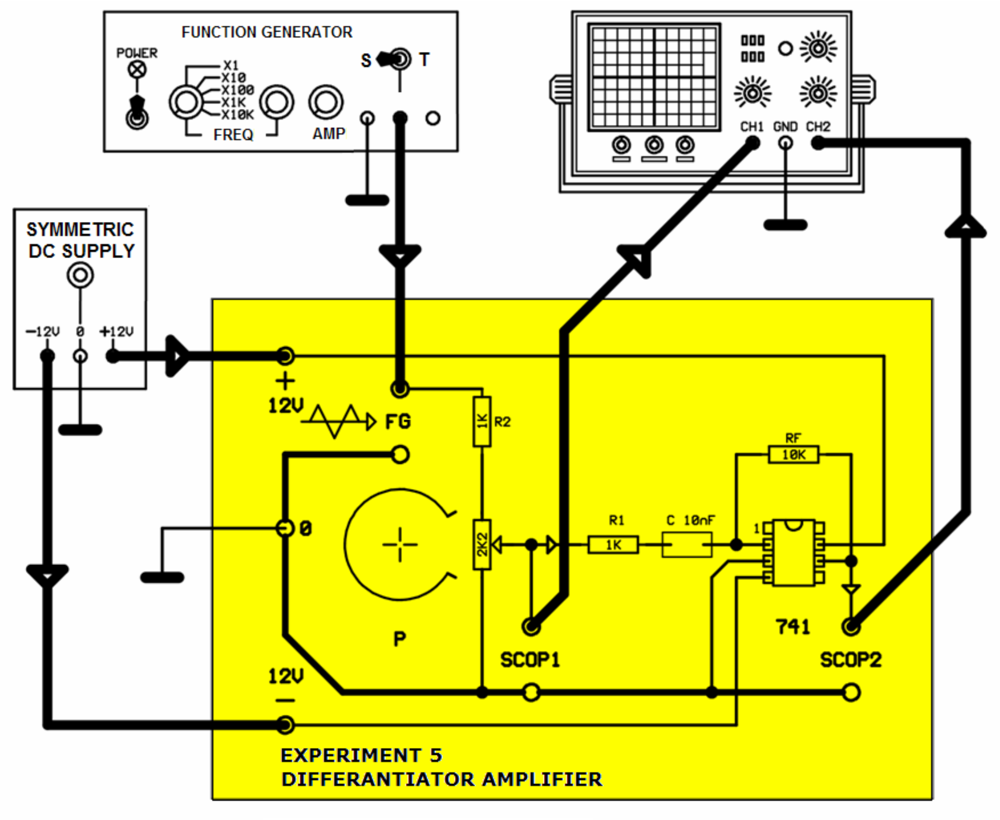
Vo = $-(V1 - V2).\frac{RF}{R1} =$

EXPERIMENT: 2.5

ANALYZING OPERATIONAL AMPLIFIER OPERATING AS DIFFERENTIATOR

EXPERIMENTAL PROCEDURE:

Connect the circuit as shown in the figure.



1- Apply power to the circuit. Set the output of the function generator to triangular wave with frequency 1 KHz and amplitude 1V peak to peak by using scope1.

2- Draw the input and output signals on the oscilloscope screen. Measure the amplitude of the output signal.

Vopp =

3- How does the output signal change with the input signal?

4- Set the frequency of the input signal to 5KHz. Measure the amplitude of the output signal. Explain the reason.

5- Calculate the cut-off frequency (**Fc**) of the circuit.

$$Fc = \frac{1}{2}\pi.R1.C =$$

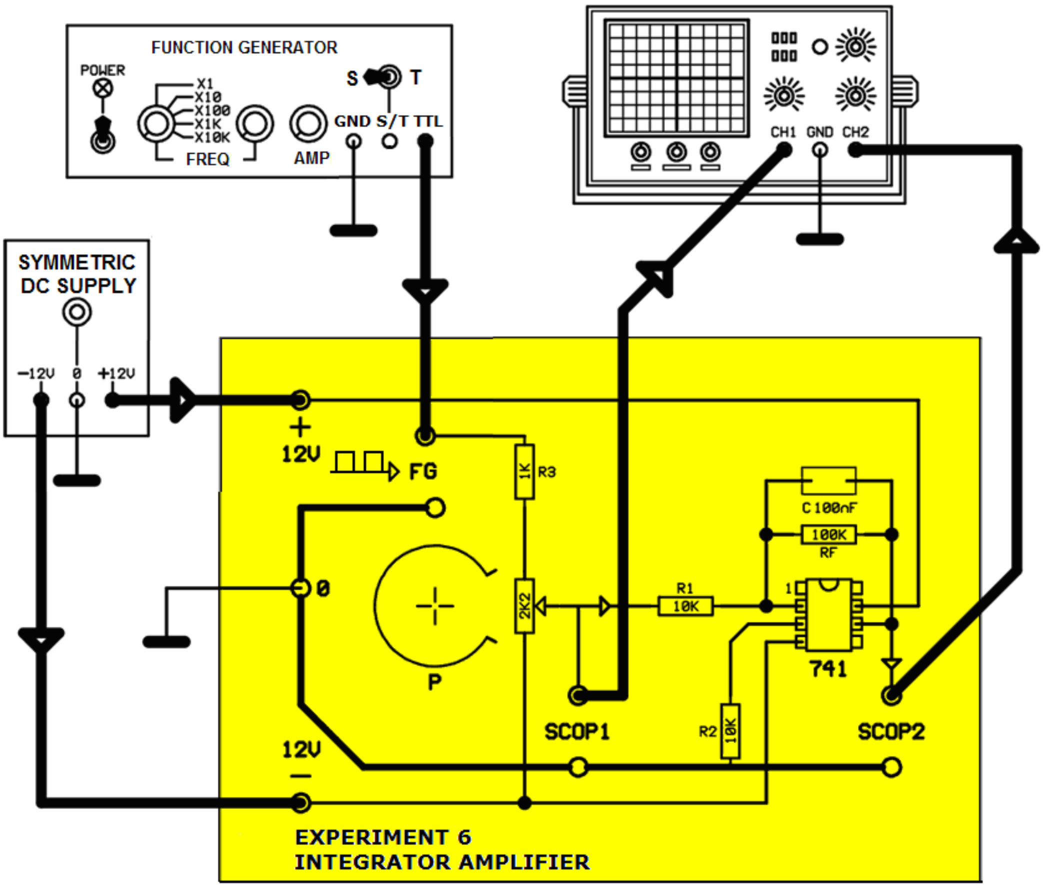
6- Apply a sinusoidal signal to the input with frequency 1 KHz and amplitude 1Vpp. Define the output signal.

EXPERIMENT: 2.6

ANALYZING OPERATIONAL AMPLIFIER OPERATING AS INTEGRATOR

EXPERIMENTAL PROCEDURE:

Connect the circuit as shown in the Figure.



1- Apply power to the circuit. Set the output of the function generator to square wave with frequency 1 KHz and amplitude 1V peak to peak by using scope1.

2- Draw the input and output signals on the oscilloscope screen. Measure the amplitude of the output signal.

Vopp = .

3- How does the output signal change with the input signal?

4- Set the frequency of the input signal to 5KHz. Measure the amplitude of the output signal.

5- Calculate the cut-off frequency of the circuit.

Fc = $\frac{1}{2\pi.RF.C}$ =

6- Apply a sinusoidal signal to the input with frequency 1 KHz and amplitude 1Vpp. Define the output signal.