

ELECTRONICS LABORATORY

PART 6 EXPERIMENTS

Assoc. Prof. Serhan Yarkan

ISTANBUL COMMERCE UNIVERSITY

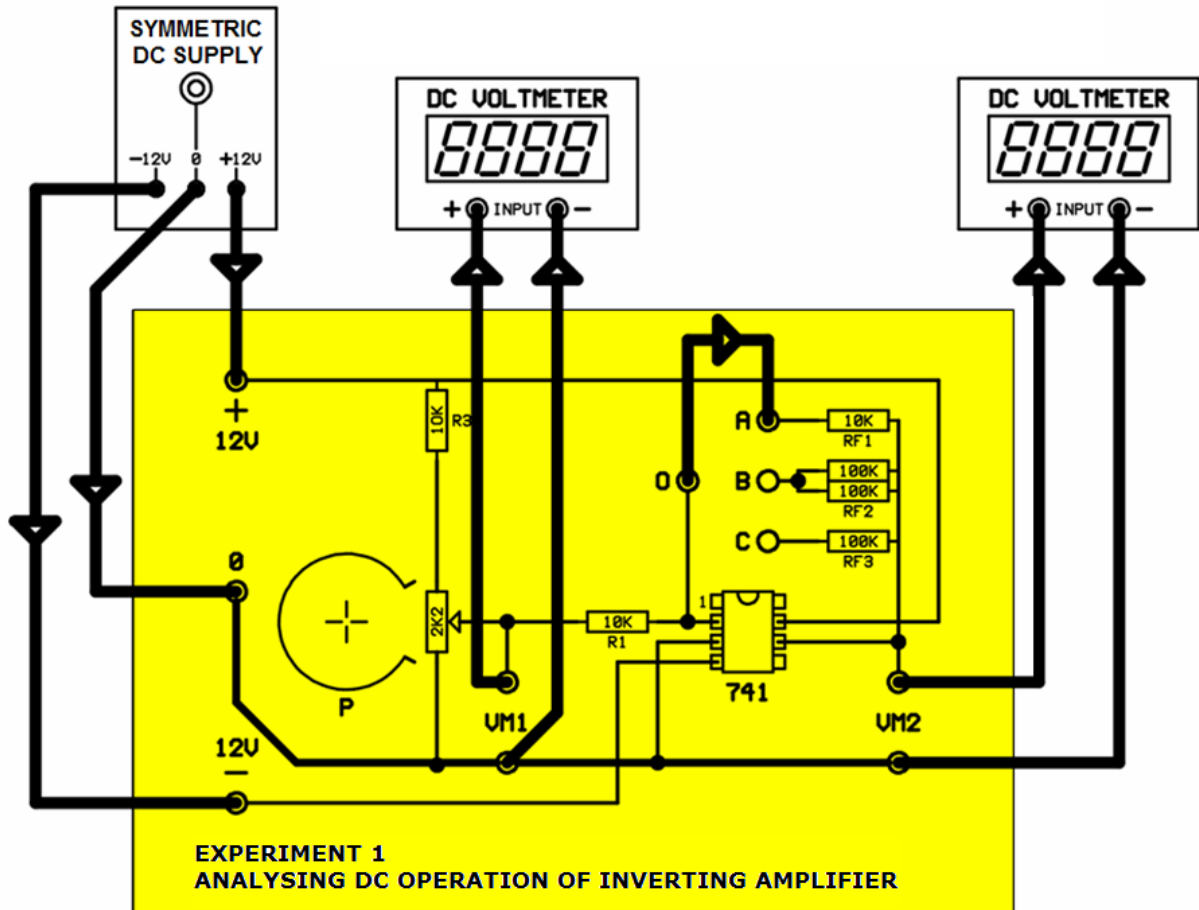
CONTENTS

EXPERIMENT 6.1	2
ANALYZING DC OPERATION OF OPERATIONAL AMPLIFIERS	2
EXPERIMENT 6.2	4
MEASURING OUTPUT OFFSET VOLTAGE OF OPERATIONAL AMPLIFIERS	4
EXPERIMENT 6.3	5
MEASURING THE INPUT BIAS CURRENT OF OPERATIONAL AMPLIFIERS	5
EXPERIMENT 6.4	6
MEASURING THE INPUT OFFSET CURRENT AND INPUT OFFSET VOLTAGE OF OPERATIONAL AMPLIFIERS	6

EXPERIMENT 6.1

ANALYZING DC OPERATION OF OPERATIONAL AMPLIFIERS

EXPERIMENTAL PROCEDURE: Plug the Y-0014/01 module. Make the circuit connections as shown in the figure.



- 1- Apply power to the circuit.
- 2- Adjust the input voltage to values (VM1) given in Table 1 by using potentiometer P. Take note of the output voltage (VM2) in each step.

VM1 (Volt)	VM2 (Volt)
0,200	
0,400	
0,600	

Table 1

- 3- What is the polarity of the output? Why?

4- What is the voltage gain of the circuit?

NOTE: Do not consider the sign of the output signal.

5- What does the gain of the inverting amplifier depend on?

6- Open the short circuit O-A and short circuit O-B. Take note of the output voltages for the inputs given in the 2nd step.

VM1 (Volt)	VM2 (Volt)
0,200	
0,400	
0,600	

Table 2

7- Calculate the gain of the circuit?

8- Does the equation $A = \frac{R_F}{R_1}$ satisfy the gain?

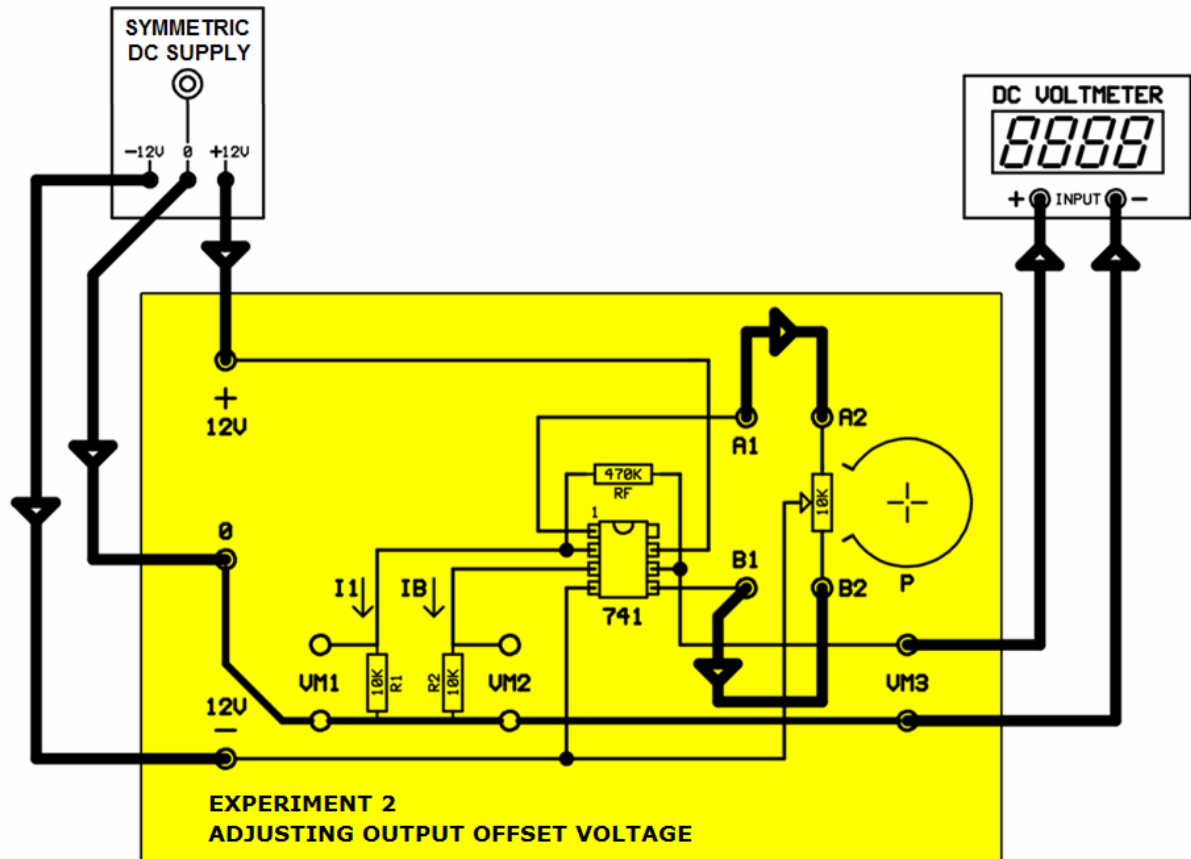
9- Does the operational amplifier operate as DC amplifier?

10- How should the supply be when the operational amplifier is operating as an DC amplifier?

EXPERIMENT 6.2

MEASURING OUTPUT OFFSET VOLTAGE OF OPERATIONAL AMPLIFIERS

EXPERIMENTAL PROCEDURE: Plug the Y-0014/01 module. Make the circuit connections as shown in the figure.



- 1- Apply power to the circuit.
- 2- Set the middle pin of the potentiometer P1 to upper position. Measure the offset voltage.

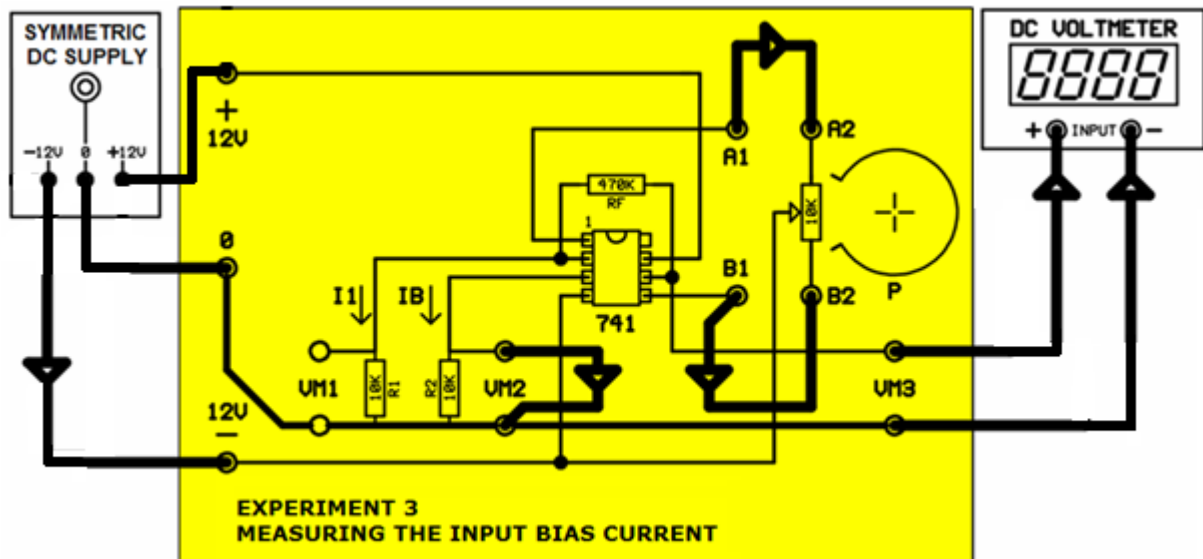
- 3- Set the middle pin of the potentiometer P1 to down position. Measure the offset voltage.

- 4- Adjust the potentiometer P1. Set the output offset voltage to zero. Explain that operation of the circuit.

EXPERIMENT 6.3

MEASURING THE INPUT BIAS CURRENT OF OPERATIONAL AMPLIFIERS

EXPERIMENTAL PROCEDURE: Plug the Y-0014/01 module. Make the circuit connections as shown in the figure.



- 1- Apply power to the circuit.
- 2- The voltage at VM3 changes in a wide range while the middle pin of the potentiometer P is at the down or upper position. In order to understand the experiment set the voltage at VM3 to 75mV.
- 3- What is that voltage measured at step 2? Why is it created?

- 4- Open the short circuit with resistance R2 and measure the output offset voltage.

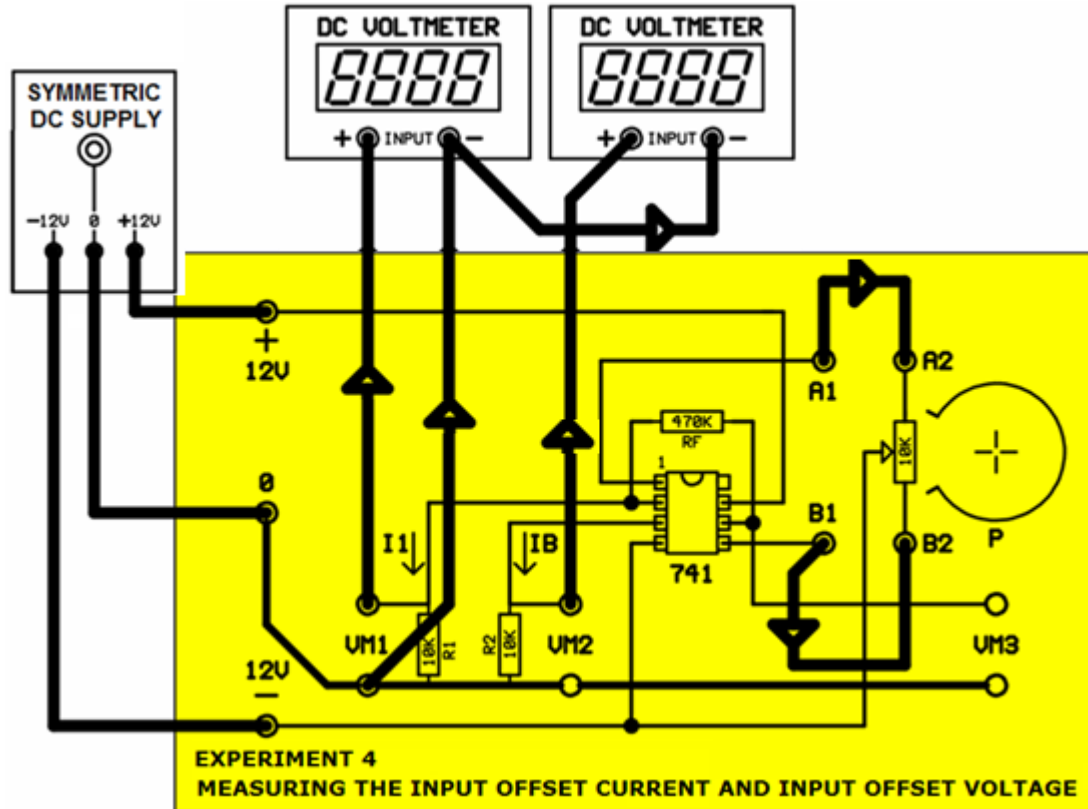
- 5- Why did the output offset voltage decrease?

- 6- Calculate the input bias current (**IB**)?

EXPERIMENT 6.4

MEASURING THE INPUT OFFSET CURRENT AND INPUT OFFSET VOLTAGE OF OPERATIONAL AMPLIFIERS

EXPERIMENTAL PROCEDURE: Plug the Y-0014/01 module. Make the circuit connections as shown in the figure.



- 1- Apply power to the circuit. Set P potentiometer value "0" at VM3
- 2- Read the values at VM1 and VM2.

- 3- Calculate the currents I_1 and I_B ?

- 4- Calculate the input offset current (I_{iO}).

- 5- Calculate output offset voltage created by the input offset current.

- 6- Calculate the input offset voltage (V_{iO}).

7- What is the effect of the resistance R_F on the input impedance?

8- Take Scope2 to terminals of Scope3. Again short the points O-A. Measure the output voltage.

9- Short the points D-E. Adjust the potentiometer P2. Set the output voltage half of its value. Open the points D-E and measure the resistance between the points O-E.

10- What does this resistance value correspond to?

11- Open the short circuit between the points O-A. Short the points O-B. Measure the output voltage.

12- Short the points D-E. Adjust the potentiometer P2. Set the output voltage half of its value. Open short circuit between the points D-E and measure the resistance between the points O-E.

13- Does the resistance R_F affect the output impedance?

14- Short the output pins (**terminals of Scope3**) via an ampermeter (1mA). Read the current value.

15- Short the output terminals. Does the system operate normally? What does this mean?