



**Department of Electrical
& Computer Engineering**
Faculty of Engineering & Architectural Science

Course Title:	Electronics Circuit II
Course Number:	ELE504
Semester/Year	Fall 2019

Instructor:	Prof. Mike Kassam
--------------------	--------------------------

<i>Assignment/Lab Number:</i>	1
<i>Assignment/Lab Title:</i>	Operational Amplifier Circuits

<i>Submission Date:</i>	September 17th, 2019
<i>Due Date:</i>	September 17th, 2019

Student LAST Name	Student FIRST Name	Student Number	Section	Signature*
Aihemaiti	Ankaer	500831325	5	
DiMarcantonio	Jonathan	500836675	5	J.D

*By signing above you attest that you have contributed to this written lab report and confirm that all work you have contributed to this lab report is your own work. Any suspicion of copying or plagiarism in this work will result in an investigation of Academic Misconduct and may result in a "0" on the work, an "F" in the course, or possibly more severe penalties, as well as a Disciplinary Notice on your academic record under the Student Code of Academic Conduct, which can be found online at: <http://www.ryerson.ca/senate/current/pol60.pdf>

Table of Content

1. Introduction.....3

2. Objectives.....3

3. Circuit Under Test3

4. Experiment & Results.....5

5. Conclusions and Remarks.....9

6. Appendix: Signed Pre-lab and TA Copy of Results9

1. Introduction

This lab reviews and investigates various operational amplifier circuit configurations. Specifically, this lab reviews the basic comparator, buffer and switched polarity converter configurations of operational amplifier circuits. This lab will be using the LM 741 Op Amp.

2. Objective

The objective of this lab is to compare the outputs of various operational amplifier circuits based on the circuit configuration. These outputs will be examined to analyze how an op amp must be configured to achieve a desired output.

3. Circuit Under Test

The circuits under test are shown below for each part of this experiment.

Part a)

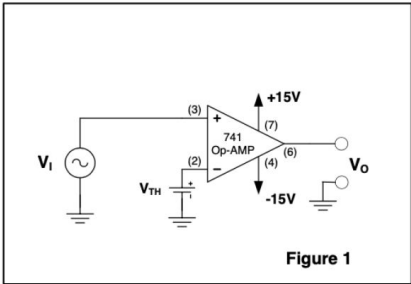


Table 1. Open Loop Configuration

Vi	10 V Peak-Peak @ 100 Hz
Vth	4 V D.C

Part b)

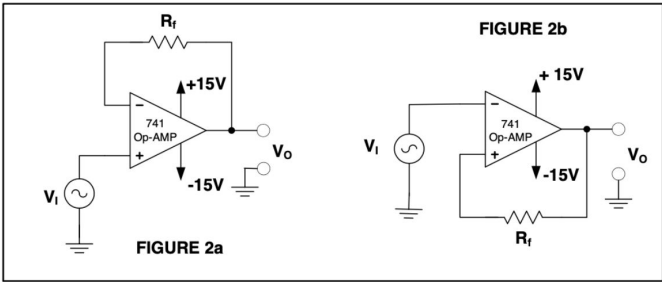


Table 2. Negative Feedback Loop/ Positive Feedback Loop

V_i	10 V Peak-Peak @ 100 Hz
R_f	10 K Ω

Part c)

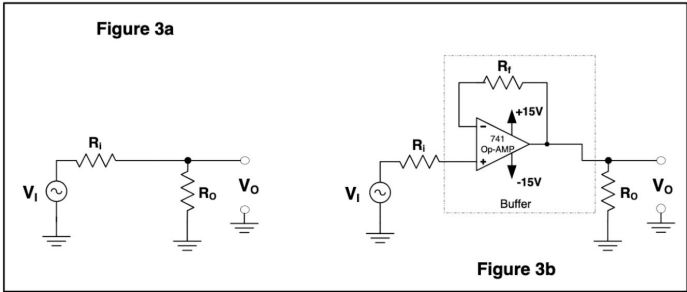


Table 3. Buffer Circuit

V_i	10 V Peak-Peak @ 100 Hz
R_f	100 K Ω
R_o	1 K Ω
R_i	10 K Ω

Part d)

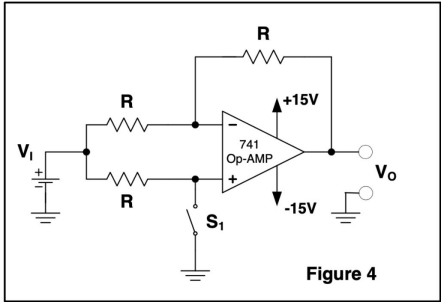


Table 4. Polarity Inversion Circuit

Vi	4 V D.C
R	100k

4. Experimental Results

The waveforms and results are shown below for each part of the experiment.

Part a)

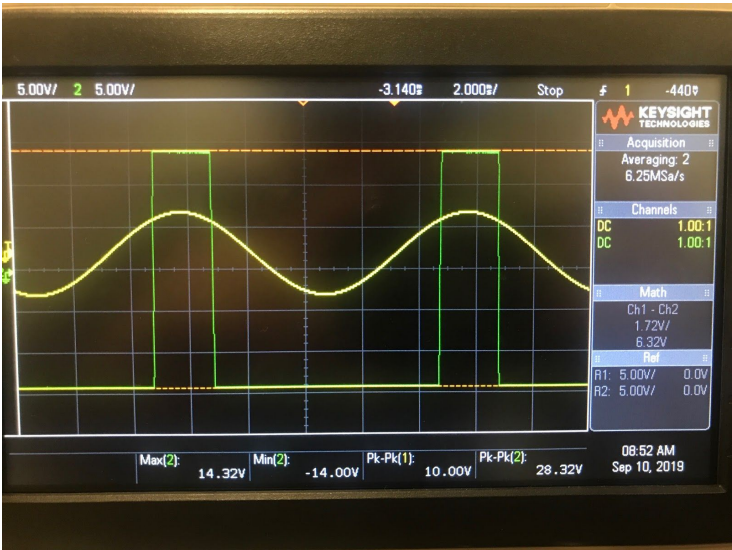


Figure 1. Waveform Corresponding to Circuit in Figure 1

Table 5. Results for Part a)

	Vo (Pre-Lab)	Vo (Simulation)	Vo (Measured)
Vi < VTH	-15 V	-14.73 V	-14 V
Vi > VTH	+15 V	+14.9 V	+14.32 V

Part b)

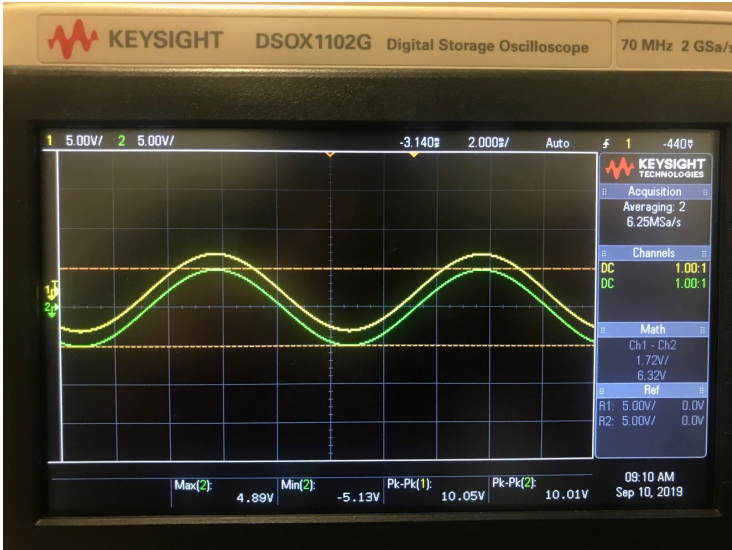


Figure 2. Waveform Corresponding to circuit in Figure 2a

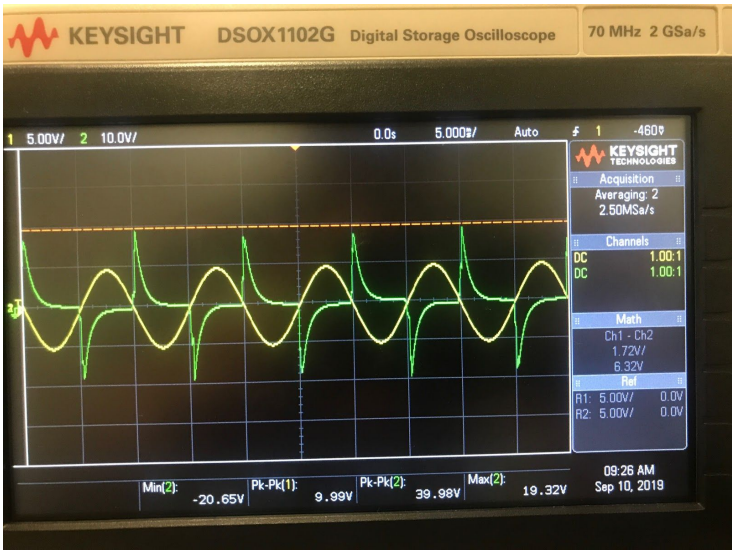


Figure 3. Waveform Corresponding to Circuit in Figure 2b

Part c)

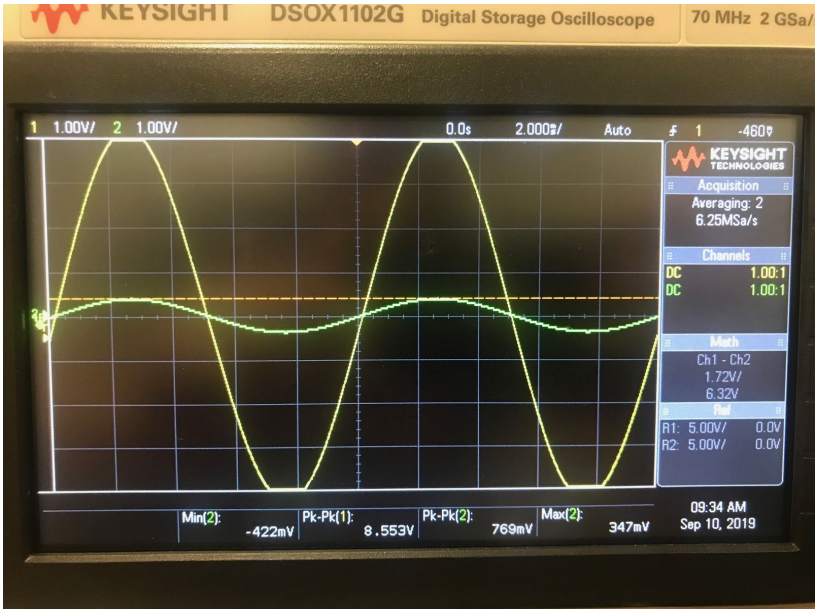


Figure 4. Waveform Corresponding to circuit in Figure 3a

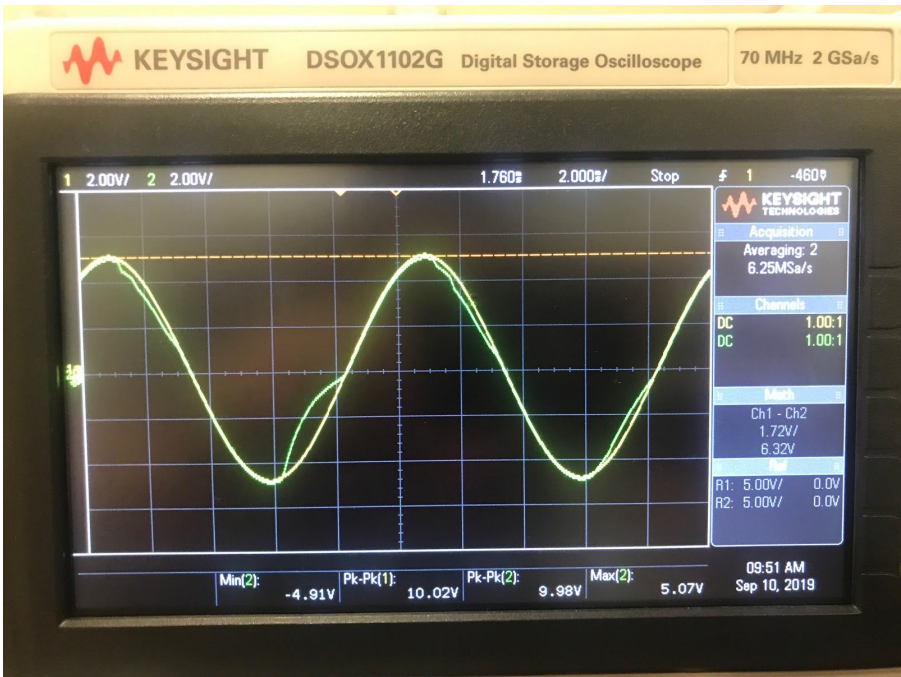


Figure 5. Waveform corresponding to circuit in Figure 3b

Table 6. Results for part c)

	$V_{i_{p-p}}$ Measured	$V_{o_{p-p}}$ Measured	Gain (V_o/V_i) measured	Gain (V_o/V_i) Pre-Lab	Gain (V_o/v_i) Simulation
Fig. 3a no Buffer	8.553 V	455 mV	0.05 V/V	0.09 V/V	0.06 V/V
Fig. 3b with Buffer	10.02 V	9.98 V	0.996 V/V	1 V/V	1 V/V

Part d)

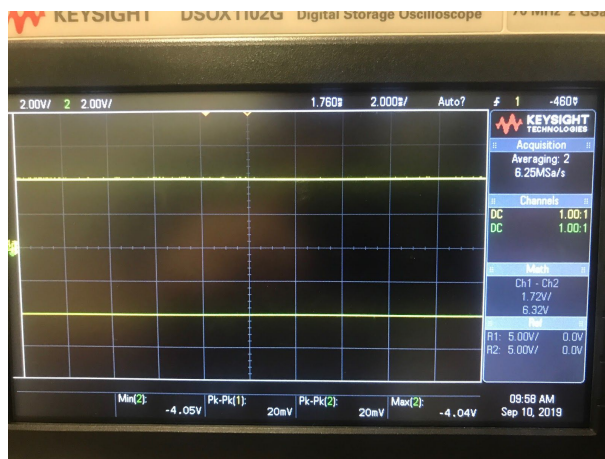


Figure 6. Waveform Corresponding to to circuit in figure 4 when switch is closed



Figure 7. Waveform Corresponding to to circuit in Figure 4 when switch is open

Table 7. Results for Part d)

	Vi	Vo Pre-Lab	Vo Simulation	Vo Measured
Switch Closed	4 V	-4 V	-4 V	-4.05 V
Switch Opened	4 V	4	4 V	4.54 V

5. Conclusions and Remarks

In conclusion, the results obtained in this lab agreed with Pre-Lab calculations and simulations. Experimental results varied slightly from Pre-Lab calculations due to possible errors. Additionally, in part b of the experiment, when the circuit of Figure 2b was implemented, it was expected that the circuit would behave like a comparator due to the positive feedback loop. However, the waveforms did not agree with this and our waveforms showed otherwise.

6. Appendix: Signed Pre-lab and TA Copy of Results