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EE100 Summer 2006 Project
Waveform Generator
Part I: Introduction and Op-amp Subsections

1. Introduction

In this project, you will build a square wave, triangle wave and sine wave generator. This is the first time we are running this project, so there will be a lot of growing pains (translation: we will grade the project very easily).

In the first part, you will just build the op-amp subsection of the project (square and triangle wave generator). This part is worth 80% of your project grade.

2. Examining your kit

ONCE YOU GET THE KIT, PLEASE MAKE SURE YOU HAVE ALL OF THE FOLLOWING COMPONENTS. INFORM YOUR TA AND GET ANY MISSING COMPONENTS BEFORE THE END OF YOUR FIRST PROJECT LAB (lab 7 in Summer 2006). Use the table below to record if the component is present or missing.

Component	Quantity	Missing?
Op284	1	
10k [Brown Black Orange]	5	
1k [Brown Black Red]	3	
5k [Green Brown Red]	3	
20k [Red Black Orange]	1	
4.3k [Yellow Orange Red]	1	
39k [Orange White Orange]	1	
5.5k [Green Black Red]	1	
12k [Brown Red Orange]	1	
5k (potentiometer)	1	
100k (potentiometer)	1	
10 uF	4	
22 uF	2	
0.1 uF	2	
0.022 uF	1	
2N3904	3	
NTE	1	

Capacitors will either be marked with their value or with a code like 223. The code 223 means 22×10^3 pF = 0.022 uF.

Many thanks to Ferenc, Tho and the entire staff the ESG for making this project possible. Prof. Meyer was instrumental in helping start this project with his paper on the Differential Pair as a Triangle-Sine Wave converter

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3. Op-amp subsection schematic

In the first part of the project, you just build the op-amp subsection. A schematic capture of the op-amp subsection from MultiSim is shown below.

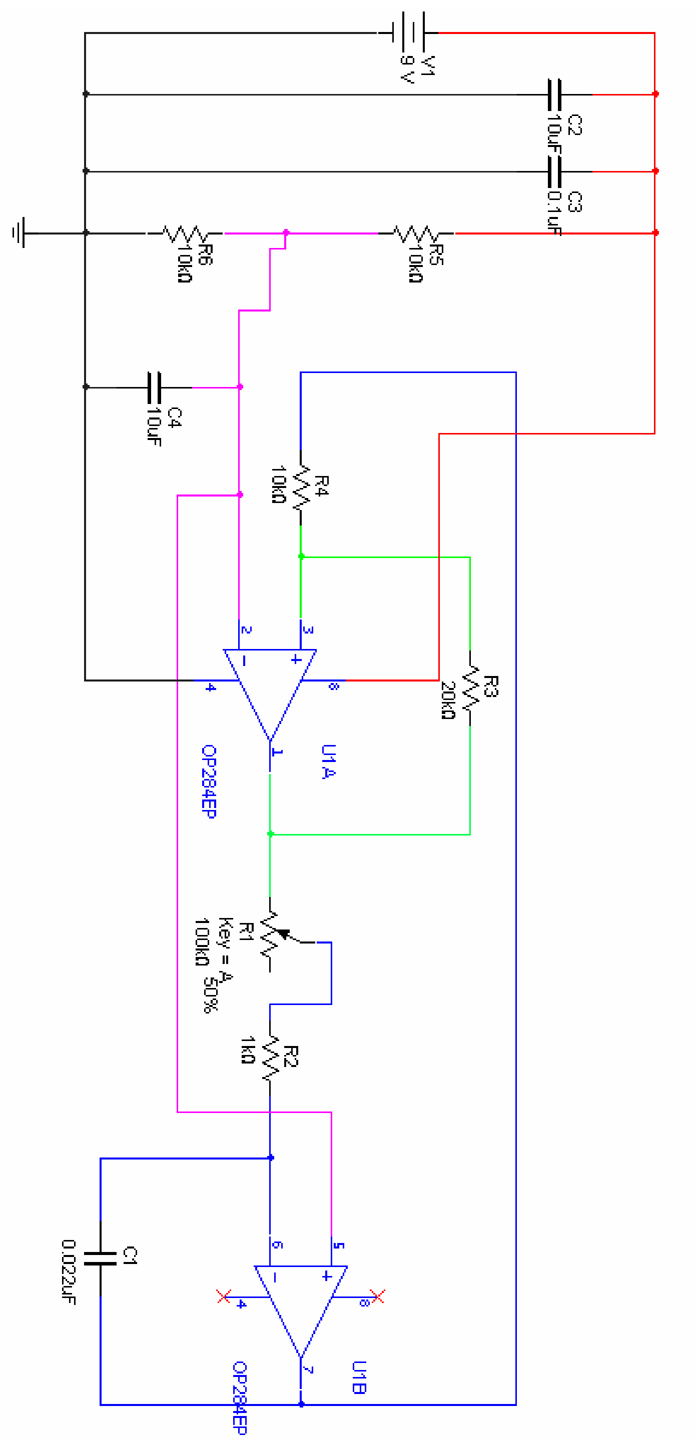

Figure 1. The op-amp sub circuit in MultiSim

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4. Prelab for Part I

1. You should use lecture 14 to understand how this circuit works.
2. Build and simulate the circuit above in MultiSim. You can use the Oscilloscope from the Instruments Toolbar to view the output. Figures 2 and 3 show you how. You should start on this **BEFORE** lab section, although you do have 3 hours in lab to work on it. Turn in the simulation result to your TA before the end of lab (lab 7 in Summer 2006).

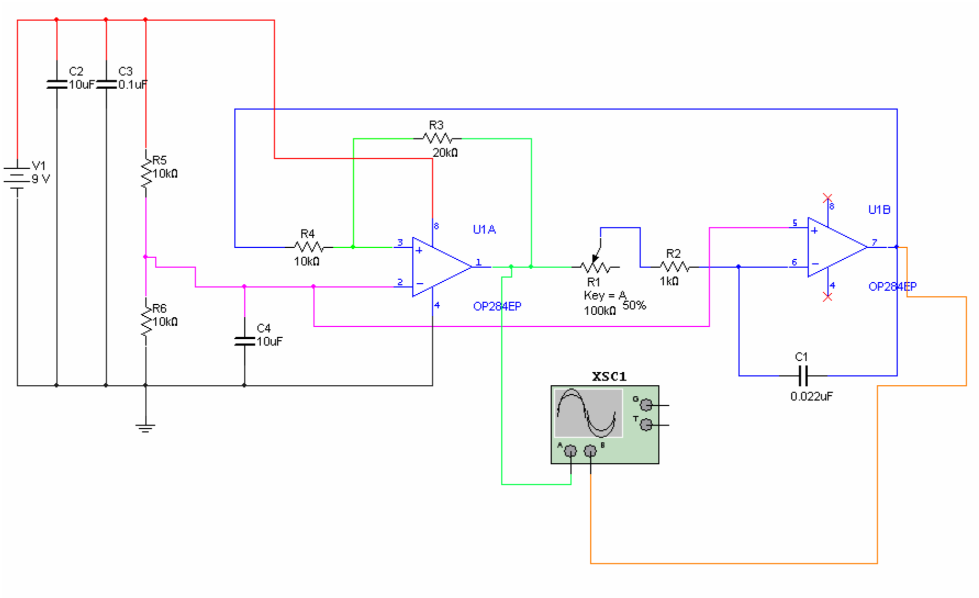

Figure 2. Oscilloscope connection

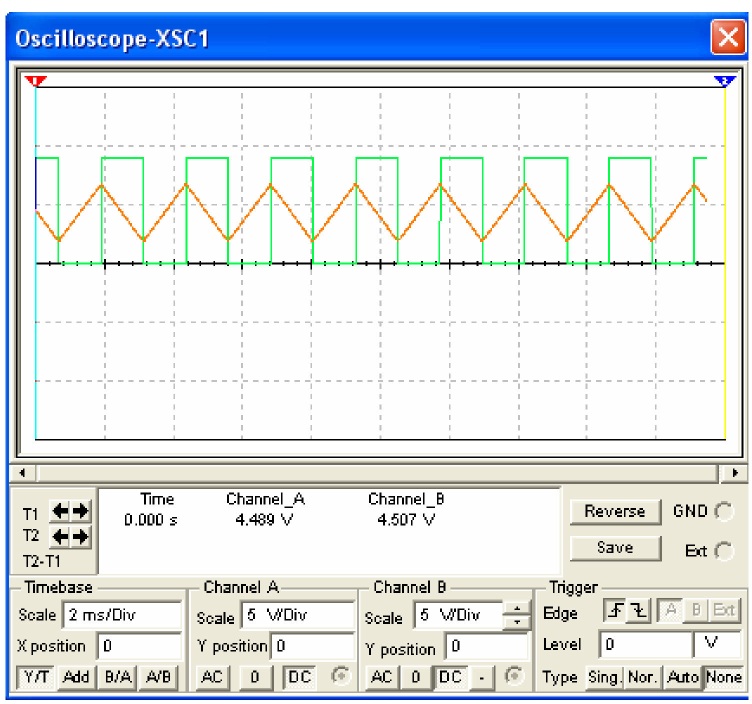

Figure 3. Oscilloscope output. Note: your output will depend on the 100k potentiometer resistance.

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5. Part I Lab

1. Build the circuit from figure 1 and show your TA the circuit works. Change the 100k potentiometer resistance to demonstrate frequency changes.

2. Turn in the check off sheet (one per group) to your TA **BEFORE** the end of your lab section (lab #8 in Summer 2006). There is no take home report.

3. Make sure to take your project kit home, you will need it in two weeks for finishing the transistor part of the project. **WE ARE NOT RESPONSIBLE FOR PROJECT KITS LEFT IN LAB.**

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Part I Checkoff

GROUP MEMBERS:

1. Components check: _________________ (TA signature)

2. Simulation done: _________________ (TA signature)

3. Demonstrated working circuit: _________________ (TA signature)

4. Briefly (≤ 3 sentences) explain why changing the potentiometer resistance changes the frequency of the waveforms.

5. Briefly (≤ 3 sentences) explain why the waveforms have a DC offset of 4.5 V.

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