ELCN8005-21F-Sec1-Electronics Design Principles

- **Experiment:** Differential amplifier and instrumentational amplifier
- **Submitted by:**
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- **Date:** 12/10/2021

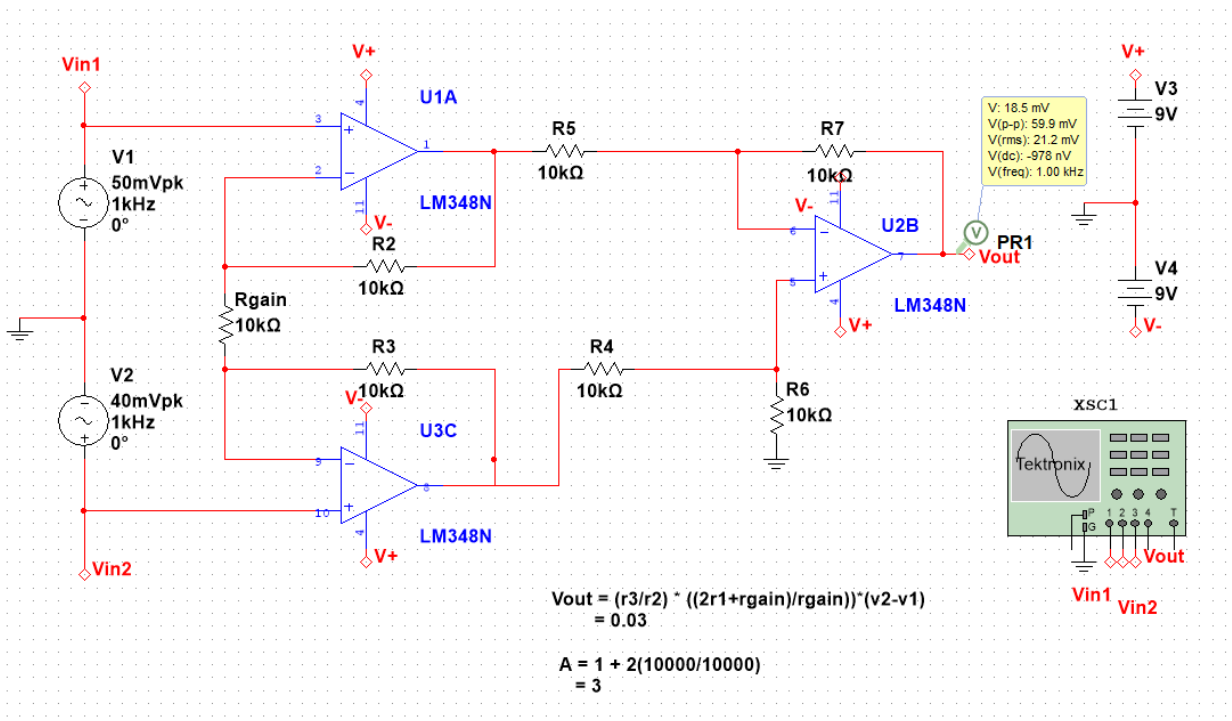
OBJECTIVE:

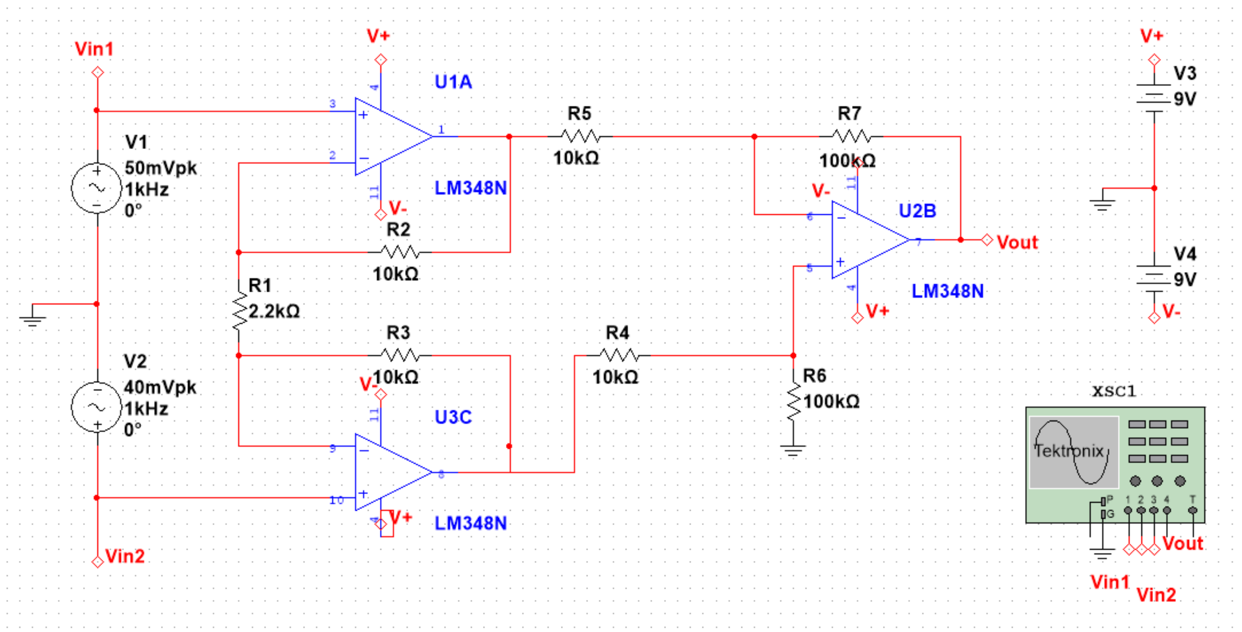
- Design and build an instrumentational Amplifier using an identical R values for all 7 resisters.
- Build a differential amplifier first to test out your circuits before connecting to the rest.

EQUIPMENTS:

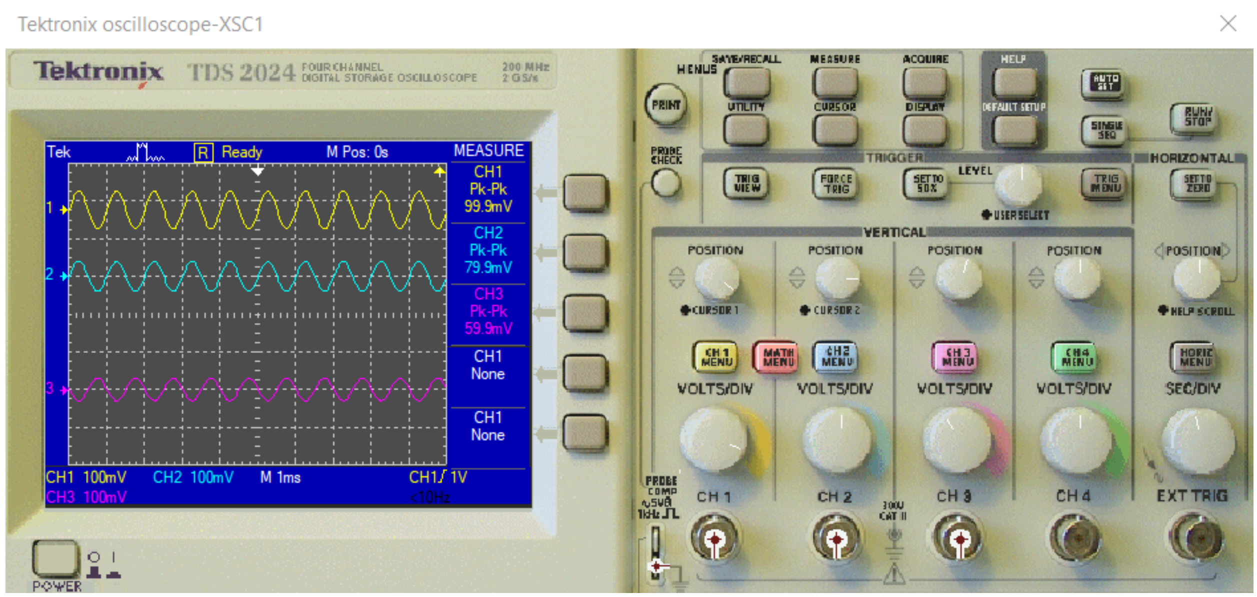
Hardware	Software
LM348 – 1 Resistor – 100k,10k,2.2k Power supply – 9v Multimeter – 1 Breadboard – 1	Multisim

SCHEMATIC IN MULTISIM:





OUTPUT:



INPUT:

Input Voltage:

V1	V2
50mv	40mv
20mv	10mv

5mv	4mv
2mv	1mv
8mv	3mv

CALCULATIONS:

Vout = (R3/R2) {(2R1+Rgain)/Rgain} (V1-V2)

Case 1:

Vout = (R3/R2) {(2R1+Rgain)/Rgain} (V1-V2)

Vout = (100000/10000)x{(2(10000)+2200)/2200}x(0.05-0.04)

Vout = 1.009v

Case 2:

Vout = (R3/R2) {(2R1+Rgain)/Rgain} (V1-V2)

Vout = (100000/10000)x{(2(10000)+2200)/2200}x(0.02-0.01)

Vout = 1.009v

Case 3:

Vout = (R3/R2) {(2R1+Rgain)/Rgain} (V1-V2)

Vout = (100000/10000)x{(2(10000)+2200)/2200}x(0.005-0.004)

Vout = 0.1v

Case 4:

Vout = (R3/R2) {(2R1+Rgain)/Rgain} (V1-V2)

Vout = (100000/10000)x{(2(10000)+2200)/2200}x(0.002-0.001)

Vout = 0.1v

Case 5:

Vout = (R3/R2) {(2R1+Rgain)/Rgain} (V1-V2)

Vout = (100000/10000)x{(2(10000)+2200)/2200}x(0.008-0.003)

Vout = 0.5v

Gain :

A = 1 + 2R3/R1

A = 1 + 2x10000/2200

A = 10

THEORY VS PRACTICAL:

Theory Vout	Practical Vout
1v	1.01v
1v	1.01v
0.1009v	100mv
0.100v	100mv
0.5v	500mv

CONCLUSION:

The instrumentational amplifier has the very low input voltage and the output voltage will be high. The circuit has 3 operational amplifiers with inverting input. The opamp has feed back circuit with Rgain as common resistor. The last opamp is differential amplifier. The voltage gain can be controlled by changing the Rgain.

DISCUSSION:

From performing this experiment, I am able to build the instrumentational amplifier circuit in multi sim and breadboard. Understood the working principle of the scaled adder.

Reference: https://www.elprocus.com/what-is-an-instrumentation-amplifier-circuit-diagram-advantages-and-applications