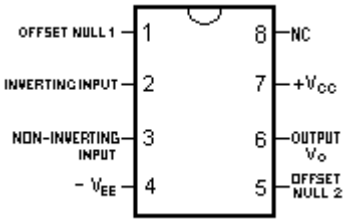
EE 206

Lab 4: *Basic Operational Amplifier Circuits*

Objective: To verify the operation of two common operational amplifier (op amp) circuits.

Equipment Needed: Lab kit, CADET, multimeter (DMM), power supply.

Note: the pin definitions for the LM741 op amp are shown to the right.



Part I. Summing Amplifier

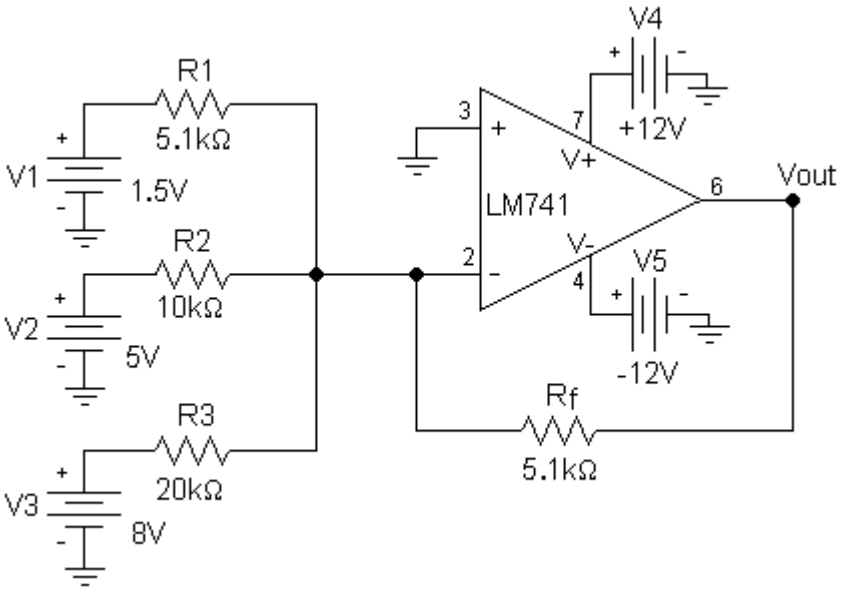


Figure 1. Summing Amplifier

A. Construct the circuit shown in Fig. 1 using parts from your lab kit. Set V+ = 12 V and V- = -12 V (V+ and V- can be obtained from the CADET power supplies).

B. In addition to the values shown, apply at least two different sets of values of V1 and V3 (from the separate power supply), where V1 and V3 are smaller and different from 1.5 V and 8 V, respectively. Use the DMM to measure the input voltages V1, V2, and V3 and output voltage Vout. Show that the following relationship holds for each measurement:

$$\text{Vout} = -\left(\frac{\text{Rf}}{\text{R1}}\right)\times \text{V1} - \left(\frac{\text{Rf}}{\text{R2}}\right)\times \text{V2} - \left(\frac{\text{Rf}}{\text{R3}}\right)\times \text{V3}$$

Part II. Differential Amplifier

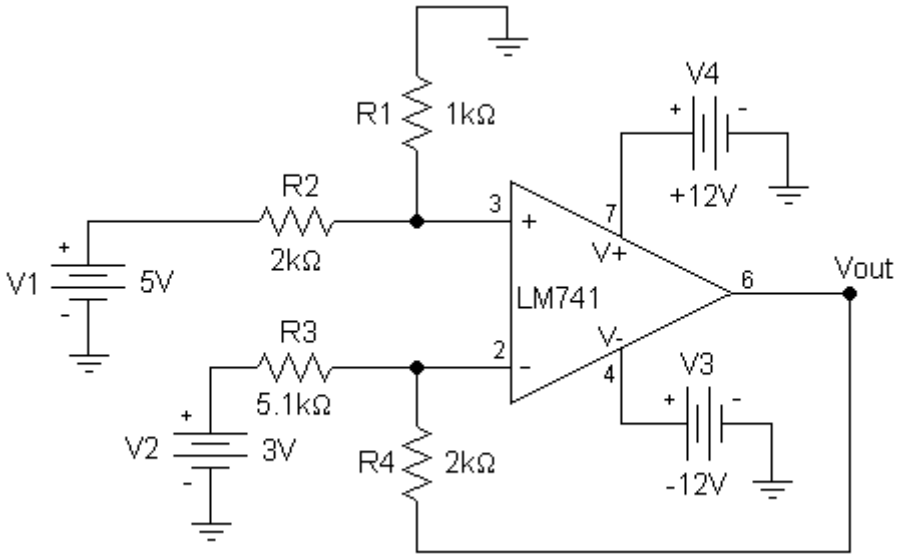


Figure 2. Differential Amplifier

A. Construct the circuit shown in Fig. 2. Again set V+ = 12 V and V- = -12 V.

B. Apply 5.0 V dc to V1 and 3.0 V dc to V2, and then measure Vout. Exchange the resistance value of R4 for the value of R1, and the value of R1 for R4, and measure Vout. Then exchange the values of R2 and R3 in the same manner and measure Vout. Show that the following relationship holds for each measurement:

$$\text{Vout} = \text{V1} \times \left(\frac{(\text{R3} + \text{R4}) \times \text{R1}}{(\text{R1} + \text{R2}) \times \text{R3}} \right) - \text{V2} \times \left(\frac{\text{R4}}{\text{R3}} \right)$$

C. Analytically solve the circuit in Fig. 2 for Vout, assuming the ideal op amp model.

Report:

Your lab report should include all recorded data, calculations, and discussion. Your report is due at the next simulation period.