EL 351 Linear Integrated Circuits Laboratory

INVERTING AND DIFFERENTIAL SUMMING AMPLIFIERS

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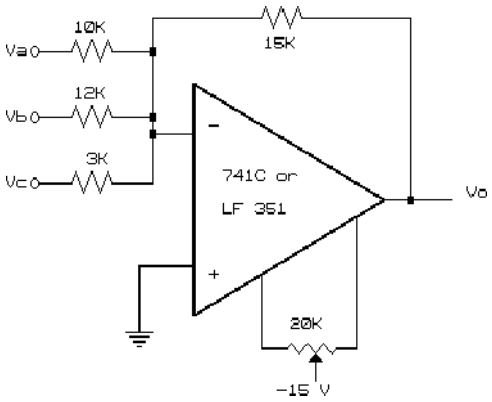
Equipment:

- Agilent 54622A Deep-Memory Oscilloscope
- Agilent E3631A Triple-Output DC power supply
- Agilent 33120A Function Generator
- Agilent 34401A Digital Multimeter

I. Test of an Inverting Summing Amplifier



NOTE: In this schematic, the op-amp power supply pins MUST be connected to +/- 15 V to power the op-amp. ***In addition****, the 20k Ω potentiometer must be connected as shown, with the wiper* ***ALSO*** *connected to -15 V. This potentiometer is used to null the output voltage, Vo, to 0.00 when input voltages V_a, V_b and V_c are quiescent (i.e., connected to 0.00 V, which is ground).*

1. Obtain and measure all resistors. Use measured values in all calculations.
2. Determine, BY CALCULATION, the gain from each input to V_o. Write the equation below with specific numerical gains.

$$V_o = K_aV_a + K_bV_b + K_cV_c$$

3. Connect the circuit and make all inputs quiescent. Null the output.
4. Measure the DC gain from each input separately to the output; be sure to keep other inputs quiescent. Compare measured gains with calculated gains.
5. Apply the following inputs simultaneously:

   V_a = + 5 VDC V_b = - 10 VDC V_c = + 3 VDC

   a. predict V_o, using the measured gains from 4. above.

   b. measure V_o. Compare predicted V_o with measured V_o.

   c. measure I_a, I_b, I_b, and I_o in a way that minimally disturbs the circuit. Discuss how you did this, and what the results were. *Hint: Kirchhoff's laws are always true, Ohm's law works.*

II. Design and Test of a Differential Amplifier

1. Design an amplifier such that: $V_o = 4\ V_a - 5\ V_b - 8\ V_c$
2. Test the circuit to ensure that it performs properly, in two ways:

   Be sure to measure each gain individually, and also subject the amplifier to three simultaneous inputs.

   Choose input voltages for V_a, V_b and V_c that will keep the amplifier in its linear operating range.