

PHY3802L: INTERMEDIATE LAB

IE1.1 Operational amplifier circuits

1. Purpose: Learn about operational amplifiers.

2. Apparatus: power supply (+/- 12V)
oscilloscope
breadboard
electronic components (resistors, op.amp. chip, ..)
DVM

3. Procedure:

(1) Construct the non-inverting amplifier shown in fig. 1. Use a 741 op amp with $R_1 = 4.7 \text{ k}\Omega$ and $R_2 = 47 \text{ }\Omega$. Using a 1 kHz sine wave as input, measure the gain for three different input amplitudes and compare with the predicted value.

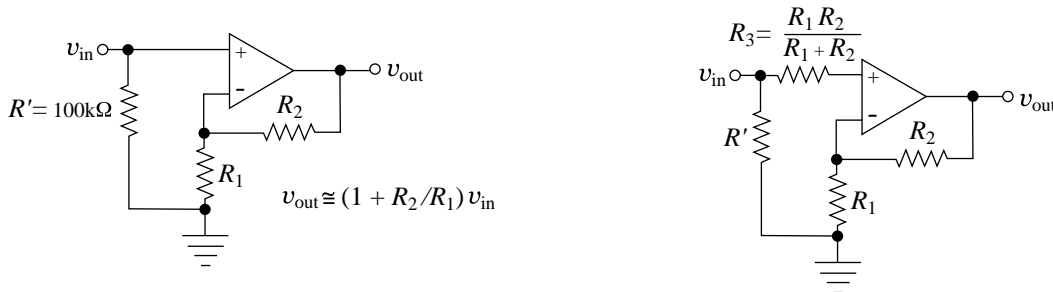


Fig.1: Non-inverting amplifier: (a) basic circuit, (b) compensated for bias current

(2) Construct the difference amplifier shown in fig. 2. Use the same resistance value in the $\text{k}\Omega$ range for all four resistors. Apply a 1 kHz signal to each input separately with the other grounded and measure the sign and magnitude of the amplification factor. Then connect the same signal to both inputs and measure the output magnitude. Compare with predicted values.

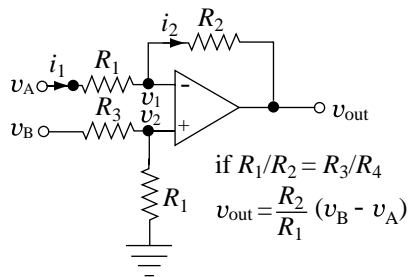


Fig. 2: Difference amplifier

- (2) Construct the summing amplifier shown in fig. 3. (but for two inputs instead of three), using the same resistors as in part (2). Just as in part (2), apply a 1 kHz signal to each input separately with the other grounded and measure the sign and magnitude of the amplification factor. Then connect the same signal to both inputs and measure the output magnitude. Compare with predicted values.

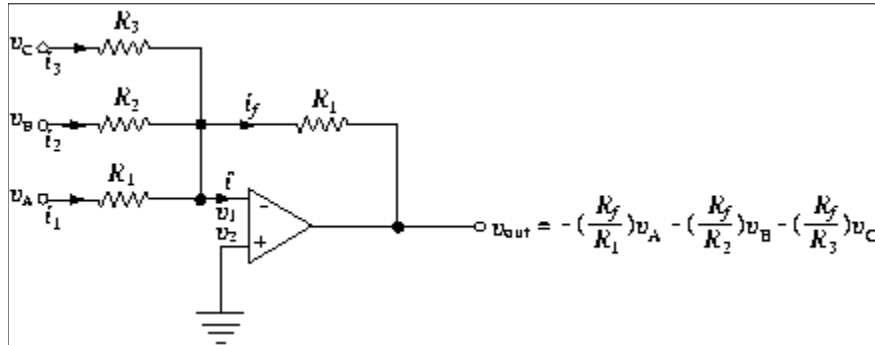


Fig. 3: Summing amplifier

4. About operational amplifiers:

See the separate information in the documentation folder.

5. Bibliography:

There are many books on modern electronics; examples of more useful ones are:

- (1) Robert E. Simpson: Introductory Electronics for Scientists and Engineers, Allyn and Bacon, Newton, Mass. 1987
- (2) William L. Faissler: An Introduction to Modern Electronics John Wiley & Sons, New York 1991
- (3) Paul Horowitz and Winfield Hill: The Art of Electronics, Cambridge University Press, Cambridge 1989
- (4) D.V. Bugg: Electronics Circuits, Amplifiers and Gates, Institute of Physics Publishing, Bristol 1991