PDHonline Course E277 (4 PDH)

Operational Amplifier Stability and Common-Mode Noise Rejection

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Appendix C
The Noninverting Amplifier

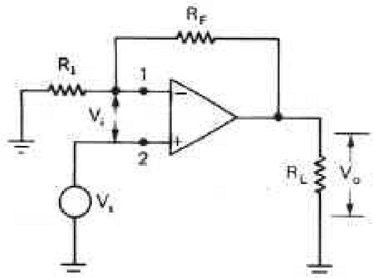

Figure 1C Op Amp wired to work as a Noninverting Amplifier

The closed-loop voltage gain of the nonverting Op Amp configuration can be selected with the following equation:

$$A_v \cong \frac{R_F}{R_1} + 1$$

This equation's derivation can be worked through with Ohm's and Kirchoff's laws while including the Op Amp' s very large open-loop gain A_{VOL}. Because V_{id} is so small compared to signal voltage V_S, this V_S is effectively across resistor R_1. It follows then that the signal current I is the same through resistors R_1 and R_F because the resistance looking into inputs 1 and 2 is relatively very large

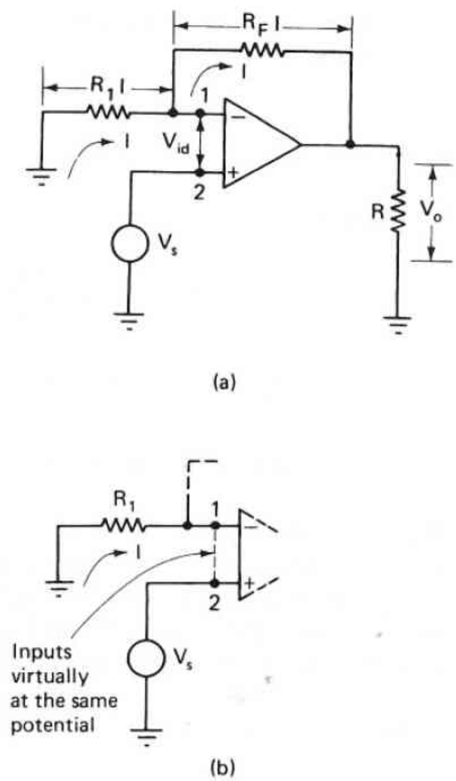

Figure 1C Current Paths resulting from the Applied Input Signal V_S

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In other words, resistors R_1 and R_F are effectively in series and that the sum of the voltages across them is the output voltage V_o.. Therefore we can show that the voltage gain is:

$$A_v = \frac{V_o}{V_s} \cong \frac{(R_F + R_1)I}{R_1 I} = \frac{R_F + R_1}{R_1} = \frac{R_F}{R_1} + 1.$$

The current direction shown in this figure is instantaneous when the input signal voltage V_S is positive with respect to ground at the same instant.