Non-inverting amplifier

Non-inverting Amplifier

Figure shows Non-inverting amplifier. In this configuration the input is applied Non-inverting terminal and the inverting is terminal is connecting to ground.

Since V2=0 and v1=Vin.

Therefore V0=AVin

This means the output voltage is larger then input by Gain A and is in phase with input signal.

The second basic configuration of an operational amplifier circuit is that of a Non-inverting Amplifier. In this configuration, the input voltage signal, (Vin) is applied directly to the Non-inverting (+) input terminal which means that the output gain of the amplifier becomes "Positive" in value in contrast to the "Inverting Amplifier" circuit we saw in the last tutorial and whose output gain is negative in value. Feedback control of the non-inverting amplifier is achieved by applying a small part of the output voltage signal back to the inverting (-) input terminal via a Rf - R2 voltage divider network, again producing negative feedback.

This produces a Non-inverting Amplifier circuit with very good stability, a very high input impedance, Rin approaching infinity (as no current flows into the positive input terminal) and a low output impedance, Rout as shown below.

Non-inverting Amplifier

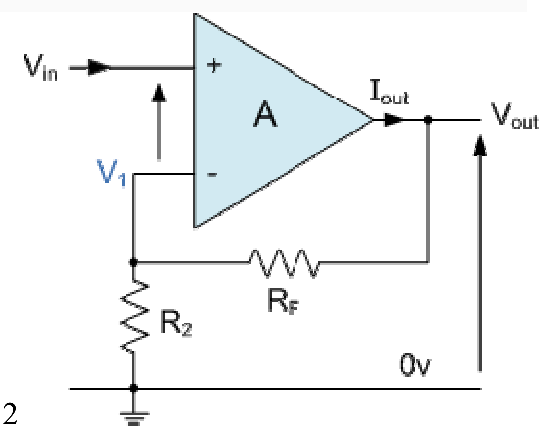

Figure 1.12

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Equivalent Voltage Divider Network

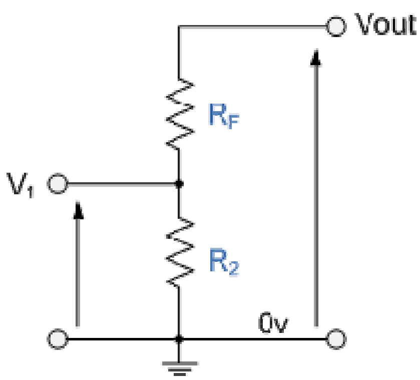

Figure 1.13

Then using the formula to calculate the output voltage of a potential divider network, we can calculate the output Voltage Gain of the **Non-inverting Amplifier** as:

$$V_1 = \frac{R_2}{R_2 + R_F} \times V_{OUT}$$

$$\text{Voltage Gain, } A_{(V)} \text{ is equal to: } \frac{V_{OUT}}{V_{IN}}$$

$$\text{Then, } A_{(V)} = \frac{V_{OUT}}{V_{IN}} = \frac{R_2 + R_F}{R_2}$$

$$\text{Transpose to give: } A_{(V)} = 1 + \frac{R_F}{R_2}$$

Then the closed loop voltage gain of a Non-inverting Amplifier is given as:

$$A_{(V)} = 1 + \frac{R_F}{R_2}$$

We can see that the overall gain of a Non-Inverting Amplifier is greater but never less than 1 (unity), is positive and is determined by the ratio of the values of Rf and R2. If the feedback resistor Rf is zero the gain will be equal to 1 (unity), and if resistor R2 is zero the gain will approach infinity, but in practice it will be limited to the operational amplifiers open-loop differential gain, (A_o).