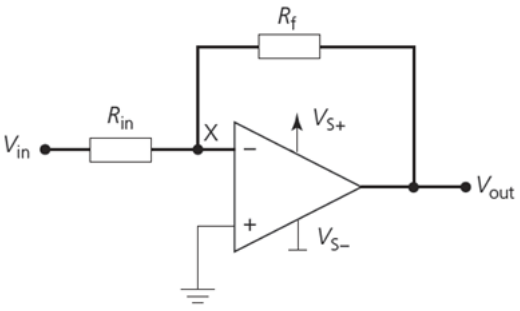
Electronics Option - Operational Amplifier (Op-amp) Circuits

Apparatus

'Locktronics' Circuit Board + Components
Signal Generator
Connecting Wires
'Tops' Stabilised Power Supply
Cathode Ray Oscilloscope

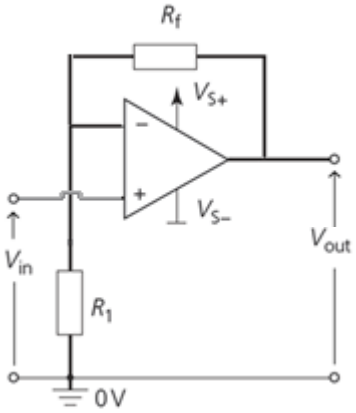
Theory and circuit diagrams

Inverting Amplifier Configuration



$$\text{Gain} = \frac{V_{out}}{V_{in}} = -\frac{R_f}{R_{in}}$$

Non-Inverting Amplifier Configuration



$$\text{Gain} = \frac{V_{out}}{V_{in}} = 1 + \frac{R_f}{R_1}$$

Method

First set up the inverting amplifier circuit using $R_f = R_{in} = 10\ k\Omega$. Note that V_{S+} and V_{S-} should be connected to the ± 15 V output for the 'Tops' supply and the O V terminal should be connected in common with the green earth terminal for the CRO and Signal Generator. You should use 2 channels on the CRO to observe both input and output signals.

Using a suitable input signal of about 500 Hz, sketch the input and output traces produced and measure the peak-to-peak input and output voltages.

Repeat the process with the same input resistor, but with $R_f = 33\ k\Omega$.

Now construct the non-inverting amplifier circuit using $R_f = R_1 = 10\ k\Omega$ and perform the same measurements with this circuit. Repeat the measurements with $R_f = 33\ k\Omega$.

Analysis

For each of your circuits, calculate the gain of the amplifier (V_{out}/V_{in}).

Use the gain formula given to compare the expected gain with the measured gain for each circuit.