

Op-Amp Configurations

Electrical Engineering

Six op-amp circuits, with their gain expressions and input impedances.

Ideal expressions, valid while the loop gain stays large.

Circuit	Output	Input impedance
Inverting	$-V_{in} R_f/R_1$	R_1
Non-inverting	$V_{in} (1 + R_f/R_1)$	Very high
Voltage follower	V_{in}	Very high
Summing, inverting	$-R_f \Sigma(V_n/R_n)$	R_n per input
Difference	$(V_2 - V_1) R_f/R_1$	Set by the resistors
Integrator	$-(1/RC) \int V_{in} dt$	R

The difference amplifier's rejection rests entirely on resistor matching: 1% parts hold common-mode rejection to about 46 dB.