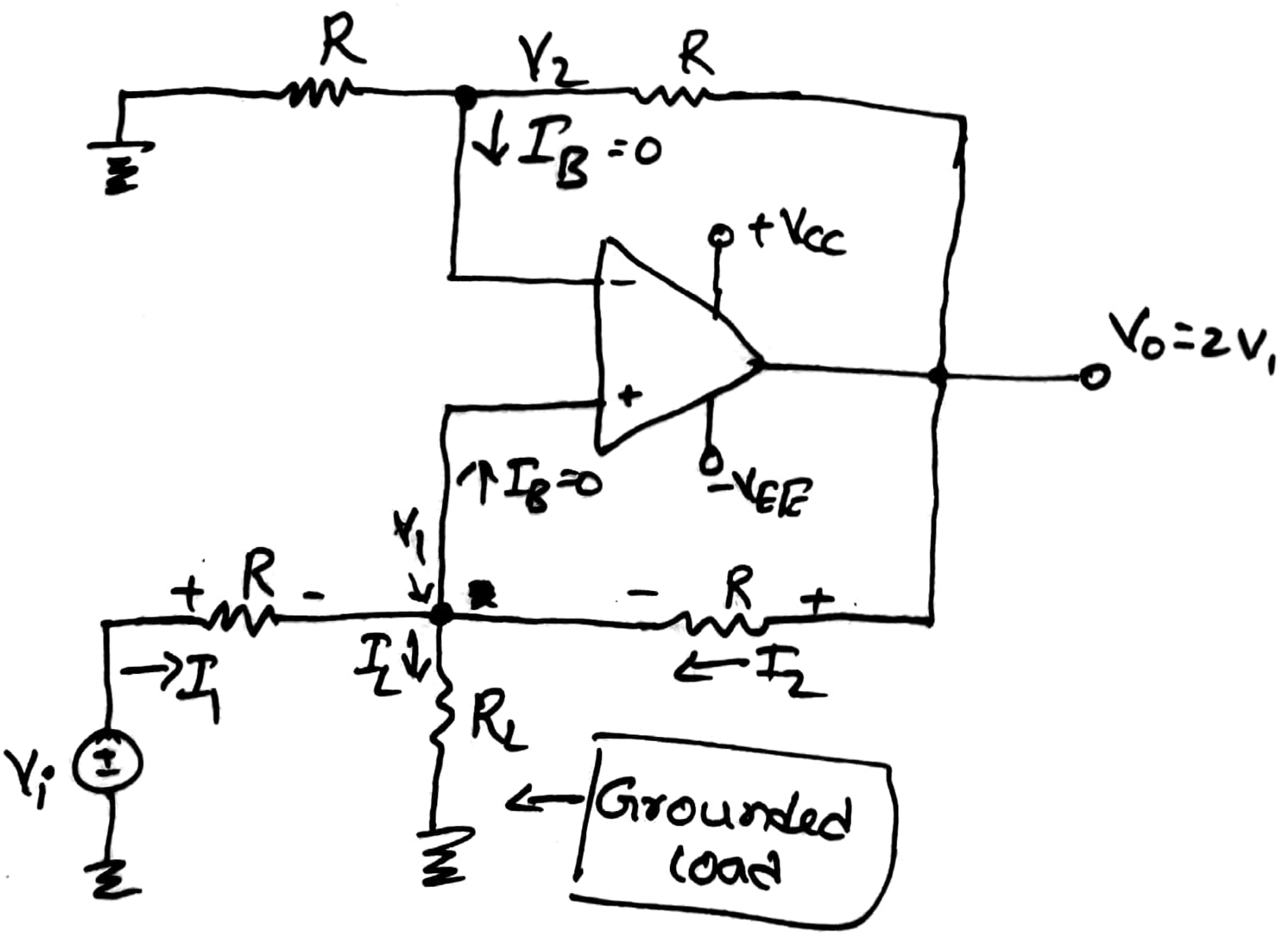
Voltage to current converter with Grounded load :-



In ground type one end R_L is connected to the ground. It is also known as Howland current converter from the name of its inventor.

Applying KCL at node V_1

$$I_1 + I_2 = I_L + I_B \quad (\because I_B = 0)$$

$$I_1 + I_2 = I_L \longrightarrow (1)$$

$$I_1 = \frac{V_i - V_1}{R} \qquad I_2 = \frac{V_o - V_1}{R}$$

Substitute I_1 & I_2 values in eq (1)

$$\frac{V_i - V_1}{R} + \frac{V_o - V_1}{R} = I_L$$

$$\frac{V_i - V_1 + V_o - V_1}{R} = I_L$$

$$V_i + V_o - 2V_1 = I_L R$$

$$-V_1 = \frac{-V_i - V_o + I_L R}{2}$$

$$V_1 = \frac{V_i + V_o - I_L R}{2}$$

$$2V_1 = V_i + V_o - I_L R \quad (\because V_o = 2V_1)$$

$$2V_1 = V_i + 2V_1 - I_L R.$$

$$2V_1 - 2V_1 = V_i - I_L R$$

$$V_i - I_L R = 0$$

$$V_i = I_L R$$

or $$\boxed{I_L = \frac{V_i}{R}}$$

From the above equation we can say that the load current depends on the input voltage "V_i" & resistor (R)

Note:- The gain of op-amp in non-inverting mode is given as $A = 1 + \frac{R_f}{R_1}$,

For this circuit ($R_f = R_1 = R$) so

$1 + \frac{R}{R} = 2$ Hence output is

$V_o = 2V_1$