

Basic Electronic Circuits Lab

(IEC-103)

Experiment-04

Objective

To realize instrumentation and transconductance amplifier.

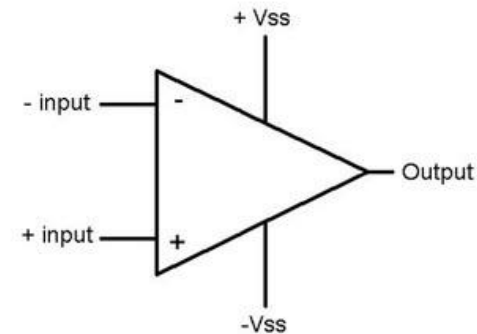
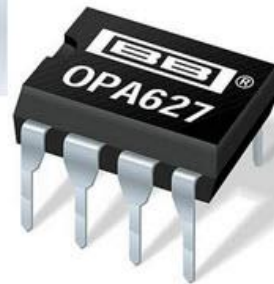
Components

- **Op-amp IC (741)**
- **Resistances** (100 Ω , 220 Ω , 330 Ω , 470, 510 Ω , 5.1 k Ω , 10 k Ω , **and** 20 k Ω)
- **Breadboard**
- **Connecting wires**

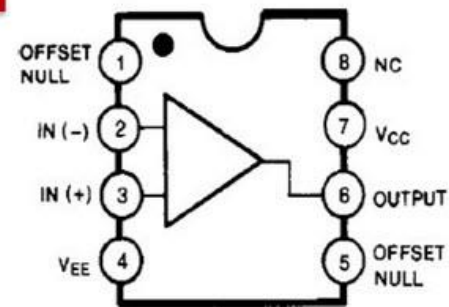
Equipment

- **Function Generator for generating input signals.**
- **Power supplies ($\pm 12\text{ V}$) to power up op-amp.**
- **CRO for input and output voltage measurements.**

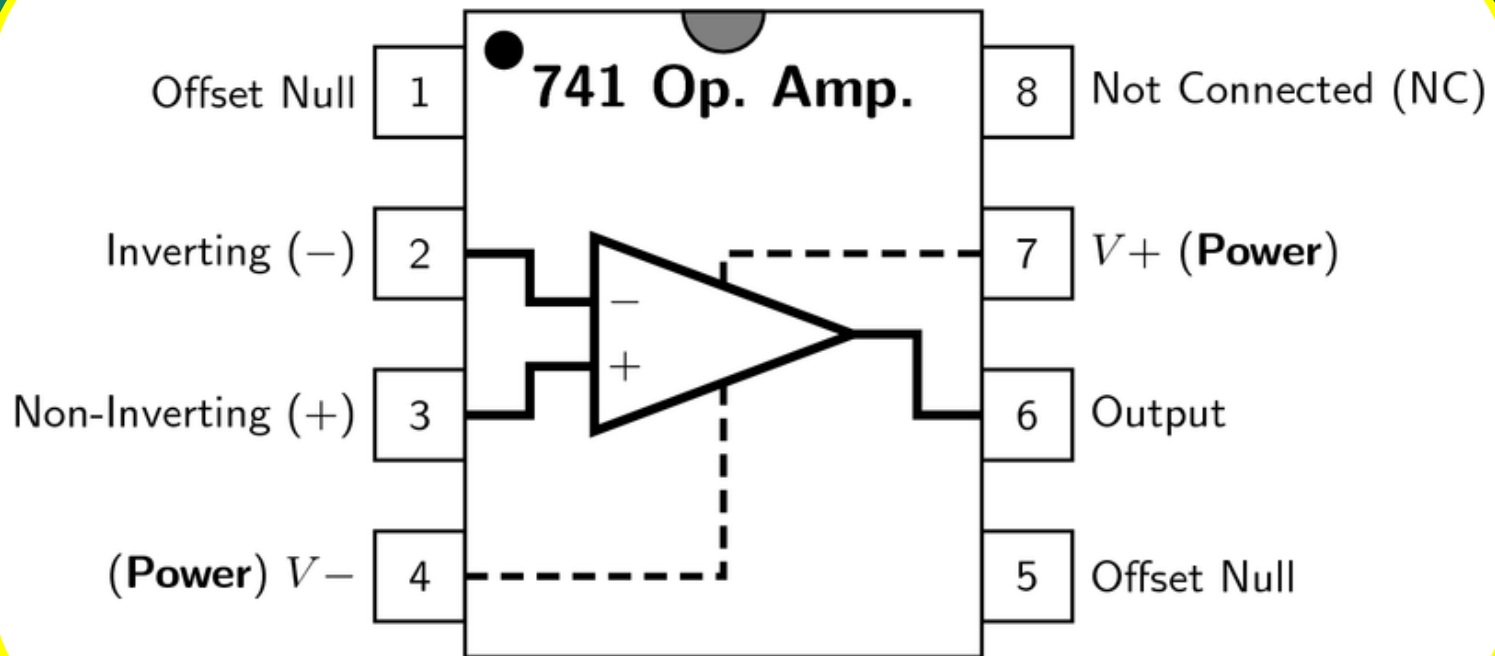
741 Op Amp IC



OP-AMP

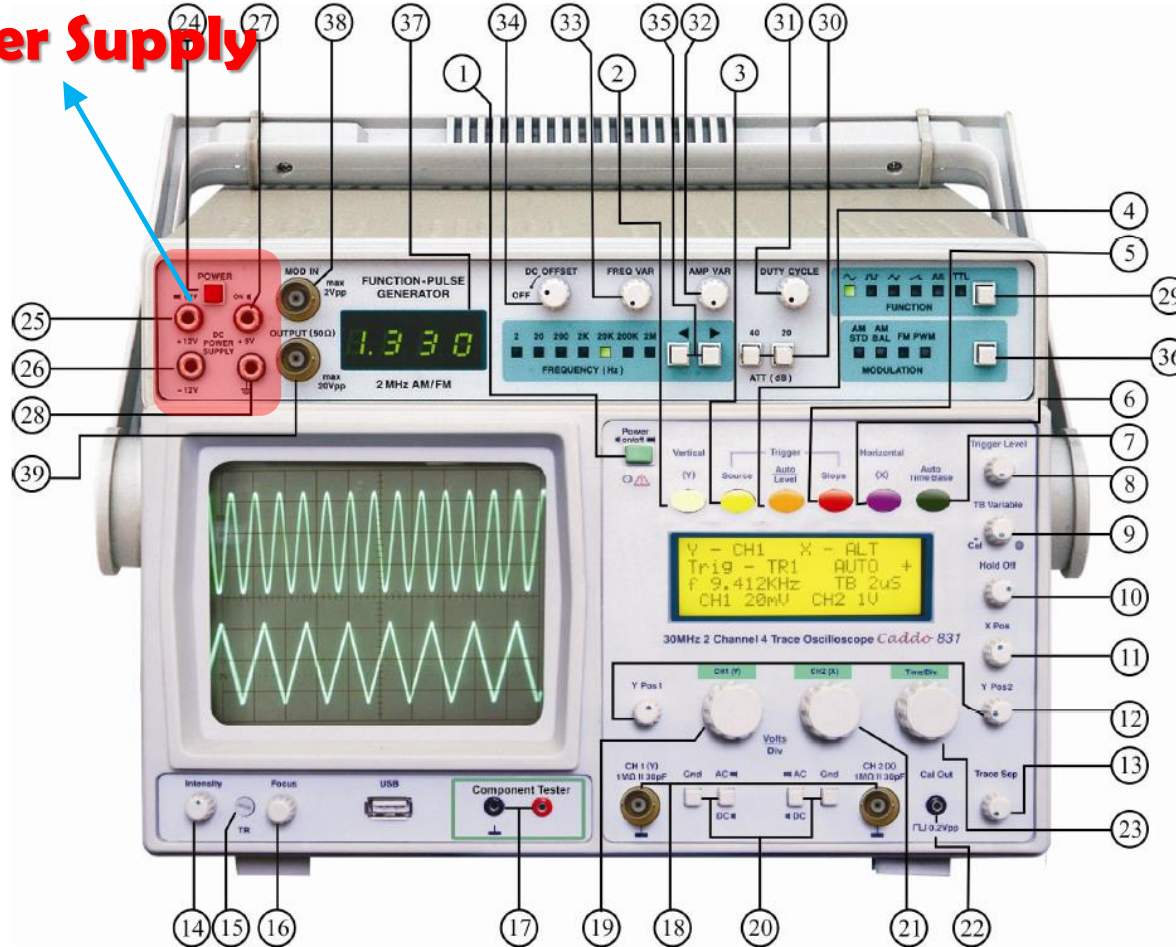


741 Op Amp IC (Pin Diagram)

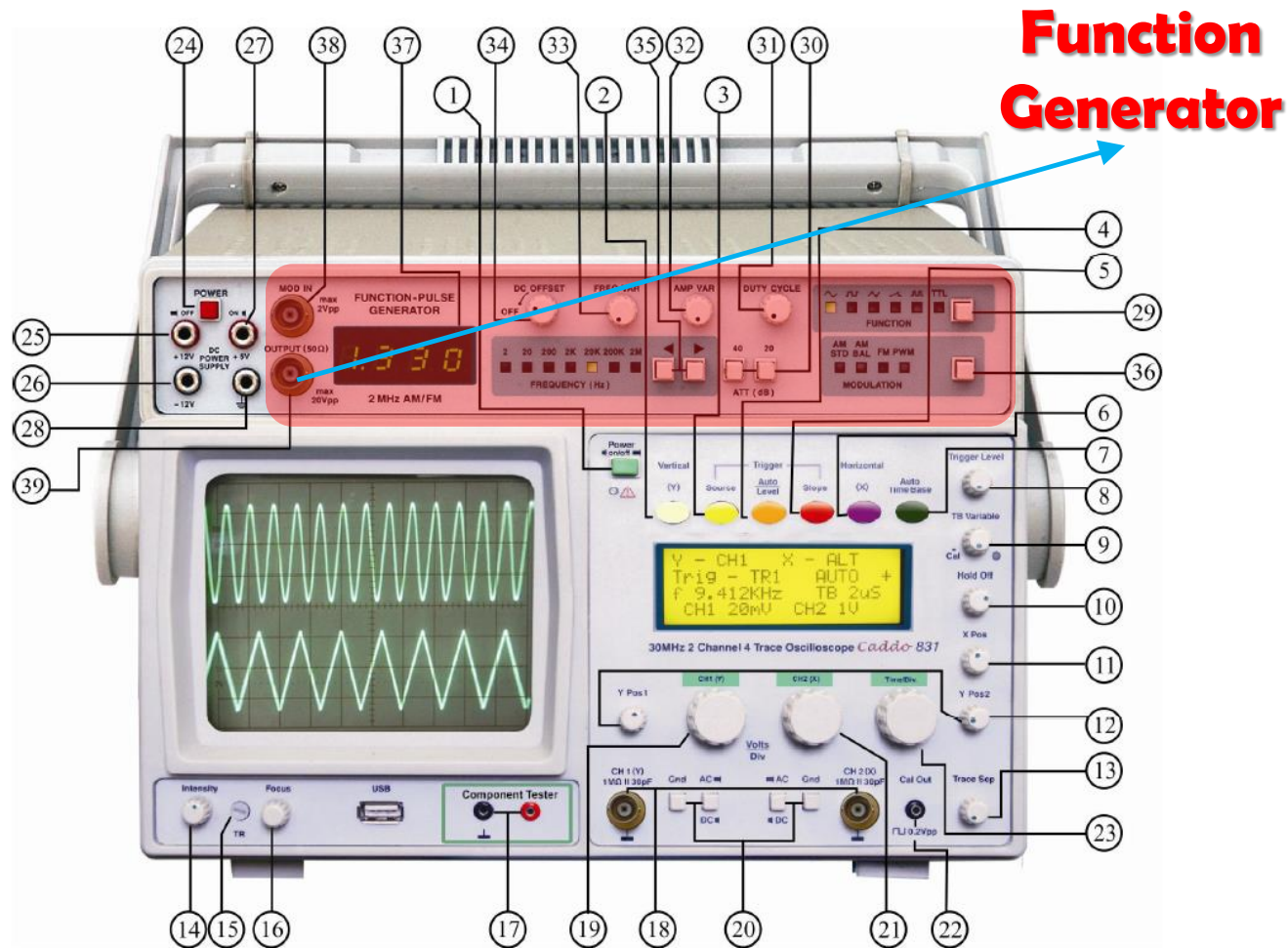


Power Supply (Fixed)

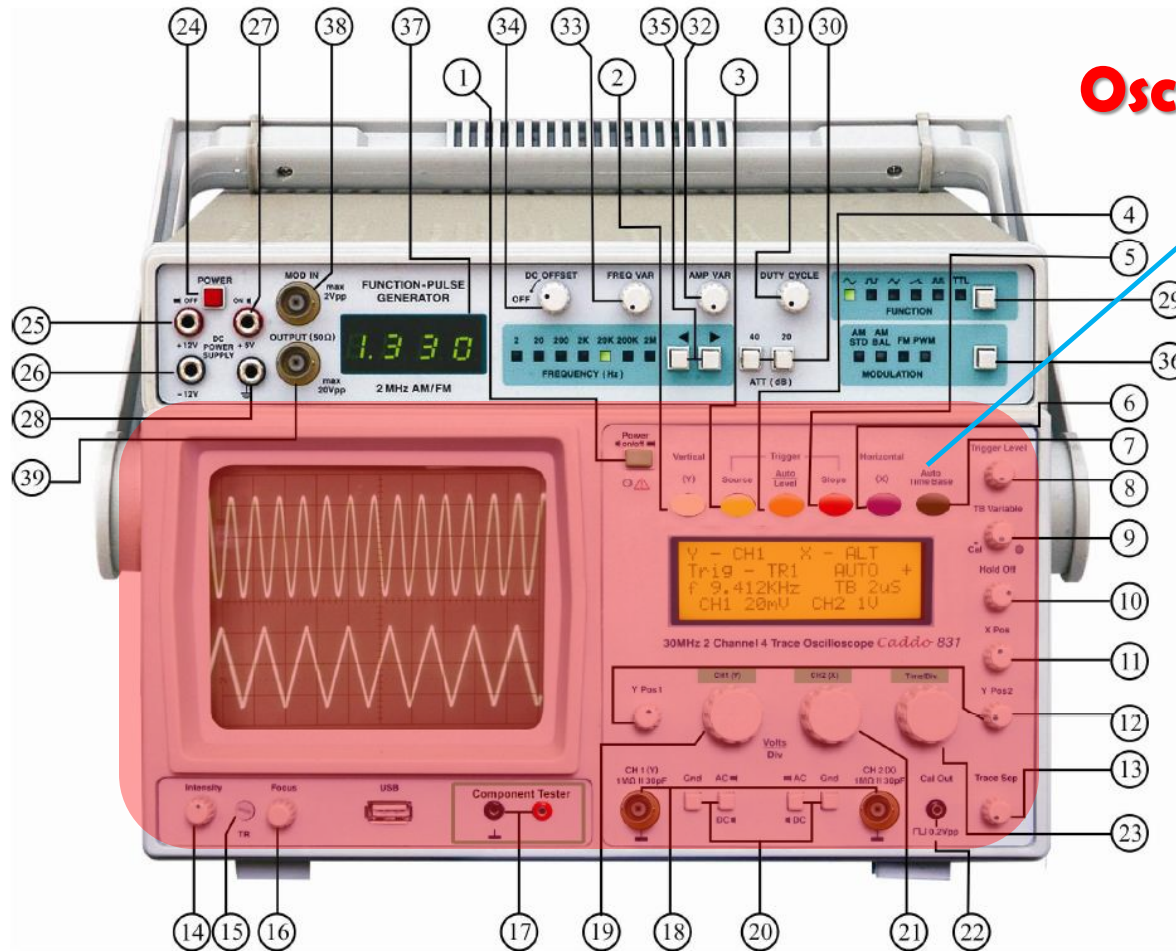
Power Supply



Signal Source

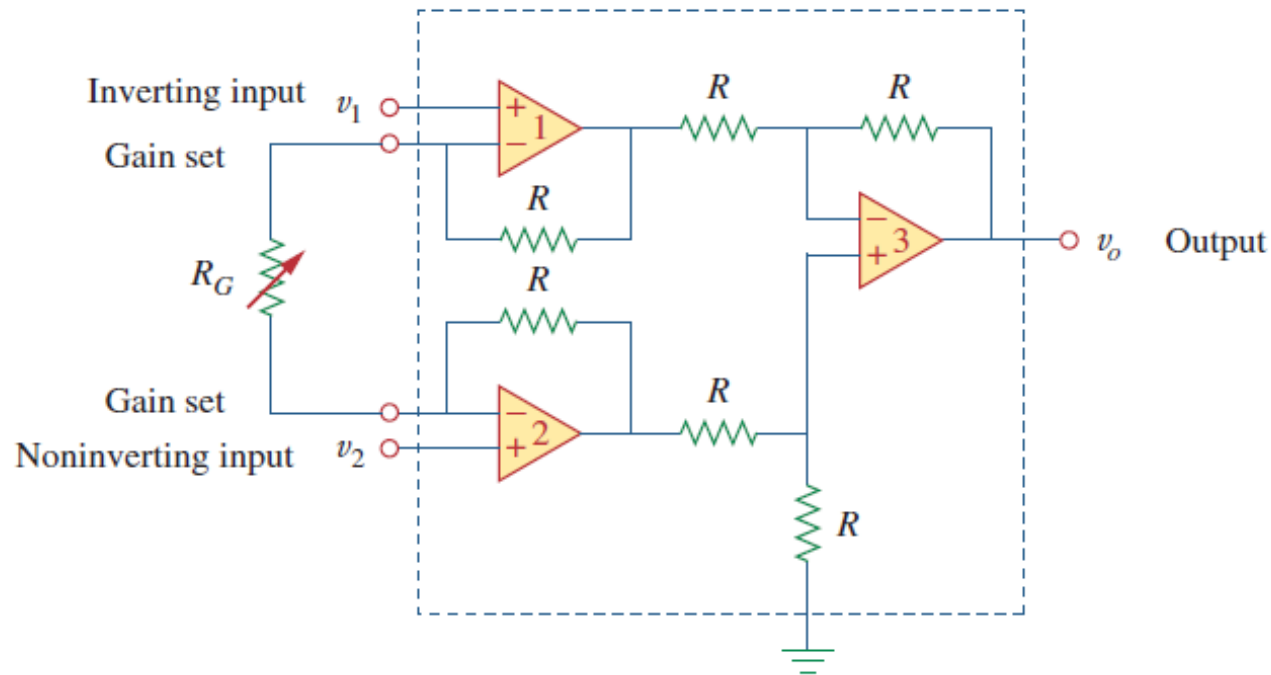


Oscilloscope



Oscilloscope

Instrumentation Amplifier



$R = 10 \text{ k}\Omega$ and $R_G = 5 \text{ k}\Omega, 10 \text{ k}\Omega, \text{ and } 20 \text{ k}\Omega$

Instrumentation Amplifier

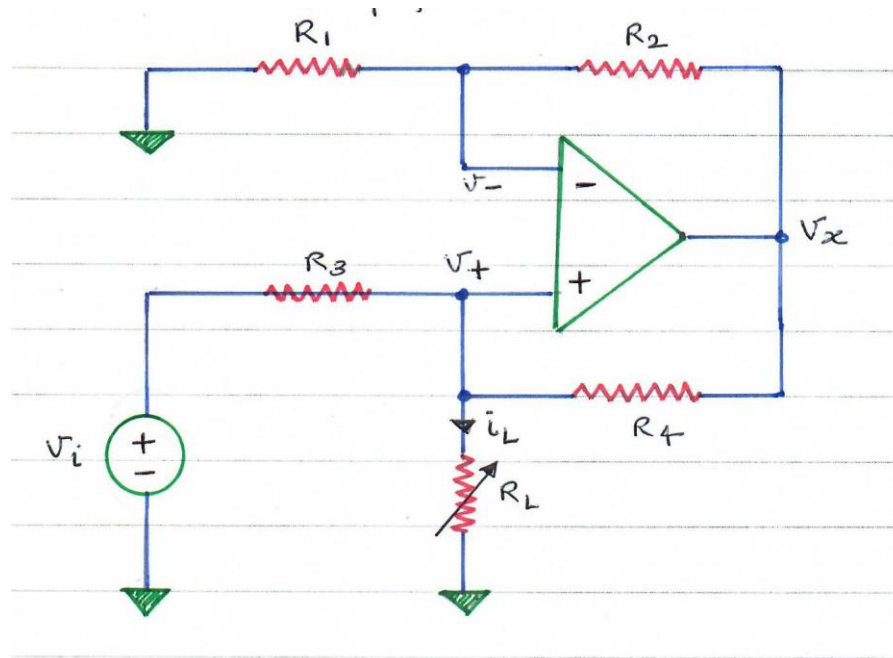
Output voltage

$$v_o = \left(1 + \frac{2R}{R_G} \right) (v_2 - v_1)$$

Observations

S. No	v_1	v_2	R_G	v_{out} (V)
1	0 V	0 V	5 k Ω	
2	1 V (peak)	0 V	5 k Ω	
3	0 V	1 V (peak)	5 k Ω	
4	1 V (peak)	1 V (peak)	5 k Ω	
5	0 V	0 V	10 k Ω	
6	1 V (peak)	0 V	10 k Ω	
7	0 V	1 V (peak)	10 k Ω	
8	1 V (peak)	1 V (peak)	10 k Ω	
9	0 V	0 V	20 k Ω	
10	1 V (peak)	0 V	20 k Ω	
11	0 V	1 V (peak)	20 k Ω	
12	1 V (peak)	1 V (peak)	20 k Ω	

Transconductance Amplifier



$R_1 = R_3 = R_2 = R_4 = R = 10 \text{ k}\Omega$, and $R_L = 100 \Omega, 220 \Omega, 330 \Omega, 470 \Omega, 510 \Omega$

Transconductance Amplifier

Load Current

$$i_L = \frac{v_1}{R}, G_m = \frac{i_L}{v_1} = \frac{1}{R}, v_L = R_L i_L$$

Observations

S. No	v_1	R_L	v_L (mV)	i_L (μ A)
1	0.2 V (peak)	100 Ω		
2	0.2 V (peak)	220 Ω		
3	0.2 V (peak)	330 Ω		
4	0.2 V (peak)	470 Ω		
5	0.2 V (peak)	510 Ω		