

ICA PROJECT

TOPIC: IC 741 Project: Audio Spectrum Visualizer

TEAM:

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COMPONENTS REQUIRED:

S.NO	COMPONENTS	QUANTITY
1	IC 741	1
2	Resistors – 10 Ohm, 1 Ohm, 100 Ohm	3
3	Capacitors - 10 μ F, 1 μ F, 0.1 μ F	3
4	LEDs	4
5	Transistors - 2N2222	4
6	Audio Input Jack	1
7	Power Supply	1
8	Breadboard	1
9	Connecting Wires	-
10	Speaker	1

WORKING PRINCIPLE:

The audio signal is first fed into the IC 741, which amplifies it. The gain of the amplifier is set by specific resistors. Capacitors are used as filters to isolate different frequency components of the audio signal. These filtered signals are then sent to various LEDs through diodes and transistors, with each LED representing a different frequency band. When a particular frequency is present in the audio signal, the corresponding transistor turns on and lights up the LED, providing a visual representation of the audio spectrum. The transistors act as switches, turning on the LEDs when activated by the filtered audio signals.

Connections And Testing:

To create an audio spectrum visualizer with an IC 741 operational amplifier, begin by connecting the audio input jack to the non-inverting input (pin 3) of the IC 741, with the ground connected to the sleeve of the jack. Use a $10\text{k}\Omega$ resistor to set the gain of the amplifier by connecting it between the inverting input (pin 2) and output (pin 6) of the IC 741, and connect the inverting input to ground through a $1\text{k}\Omega$ resistor. The IC 741 is powered by connecting pin 7 to the positive terminal of a 9V battery or DC power supply and pin 4 to ground. The amplified audio signal from pin 6 is then passed through band-pass filters consisting of resistors and capacitors to isolate low, mid, and high frequencies. For the low-frequency filter, use a $10\text{k}\Omega$ resistor and a $10\mu\text{F}$ capacitor; for the mid-frequency filter, a $1\text{k}\Omega$ resistor and a $1\mu\text{F}$ capacitor; and for the high-frequency filter, a 100Ω resistor and a $0.1\mu\text{F}$ capacitor, each connected between the output of the IC 741 and ground.

The filtered signals are then sent to the bases of NPN transistors (like the 2N2222) through diodes. The emitters of the transistors are connected to ground, and the collectors are connected to the cathodes of LEDs. The anodes of the LEDs are connected to the positive voltage supply through 330Ω current-limiting resistors. When an audio signal is fed into the input jack, the IC 741 amplifies it, and the band-pass filters isolate different frequency components. These filtered signals drive the transistors, which act as switches to light up the LEDs. The LEDs provide a visual representation of the audio spectrum, with each LED lighting up according to the frequency band it represents.