



ECE-1004 **Signals and Systems**

Transistor equalizer **circuit**

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ABSTRACT:

The equalizer is a series of electronics that serves to fix the tone that will enter into the amplifier.

Equalizer circuit is almost the same as tone control but the difference is if the tone control there is only bass, middle, and treble settings then the equalizer there are 5 channels even 10 or 20 channels also exist.

The most equalizer series easy to find on the market is a series of equalizer 5 channels where there are five quality settings.

In this article admin will discuss around the equalizer circuit 5 channel because the making is very easy.

INTRODUCTION:

This is a transistor equalizer circuit. We use it for controlling the audio frequency. Because some kinds of audio frequency response are not smooth. It helps a frequency offset in a tone control well.

MOTIVATION:

In the early days, there was little or no requirement for mixing. In most cases, the band or orchestra used one microphone, and the amplified output went straight to air for broadcasts or direct to the cutting lathe for recordings. This was before tape or wire recording was used.

Because there was so little need for mixing, very simple schemes could be used. People's expectations were low too - at the time it was sufficiently amazing that recordings or 'wireless' were even possible, so no-one was listening for any of the issues discussed below.

Even though there were issues, there were also ways to ensure that they did not impinge in any way on the listeners' enjoyment of the programme material. If audio circuits had to be switched, master level controls would be reduced momentarily to minimise switching noises for example. As audio broadcasts and recordings became more complex, simple manual techniques were no longer suitable because of the number of channels.

Many of the earliest mixers may have had perhaps 4 channels at most. Even such a small mixer started to become problematic though. As channels were switched in or out there would be level changes on the remaining channels. Likewise, even adjusting a level control (fader) could cause the overall programme level from other channels to change.

Required Components:

- BC548 transistor
- 5 or more 22k resistor (one for each input channel)
- 5 or more .047uF ceramic disc capacitor (one for each input channel)
- 470pF ceramic disc capacitors
- 39pF ceramic disc capacitors
- 10uF Electrolytic capacitors
- 1.2Mk resistors
- 5k resistor
- Audio Jack Female
- Audio Input
- 50k potentiometer
- Separate audio signals for mixing

About the Components:-

About the Transistor:

BC548 is a NPN transistor so the collector and emitter will be left open (Reverse biased) when the base pin is held at ground and will be closed (Forward biased) when a signal is provided to base pin.

BC548 has a gain value of 110 to 800, this value determines the amplification capacity of the transistor. The maximum amount of current that could flow through the Collector pin is 500mA, hence we cannot connect loads that consume more than 500mA using this transistor.

To bias a transistor we have to supply current to base pin, this current (I_B) should be limited to 5mA.

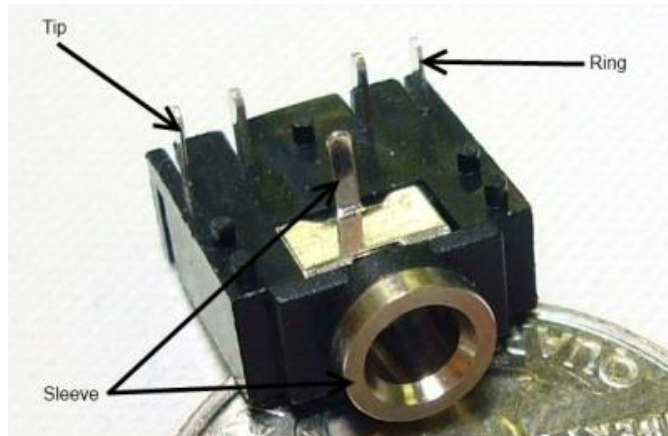
About Potentiometers:

Potentiometers, or **pots**, are a type of resistor used to control the output signal on an electronic device, like a guitar, amplifier, or speaker.

They have a small shaft on top that functions like a knob; when the user turns the shaft, it turns the resistance on the signal up or down. This change in resistance is then used to adjust some aspect of the electrical signal, such as the volume, gain, or power.

To install and wire a pot, you'll need to ground the first terminal, feed the input signal into the third terminal, and then run an output signal through the terminal in the middle.

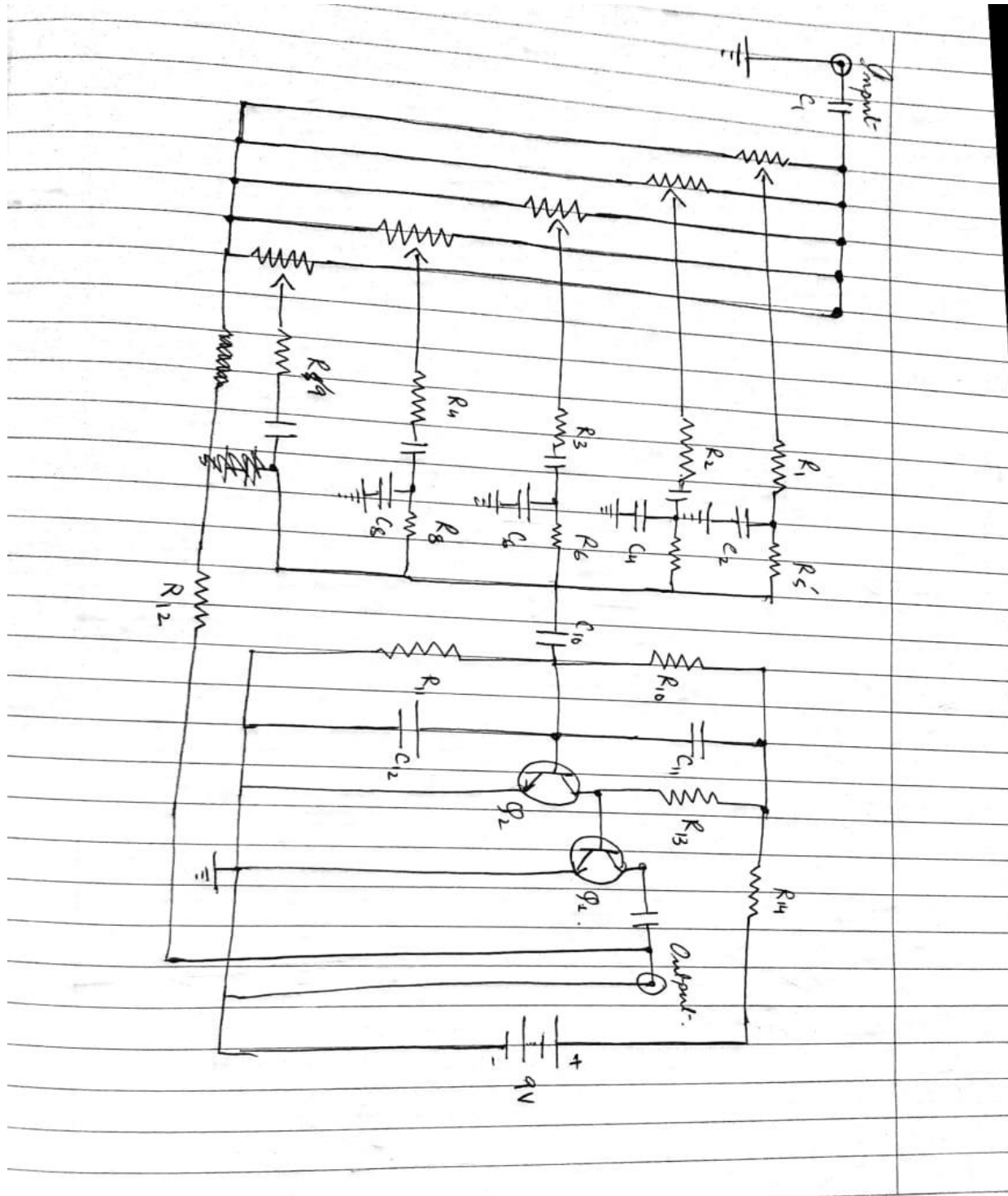
About Board mount Headphone jack:



By matching the respective parts of the plug with the socket, the audio signal can be received into the circuit.

Sleeve is generally used for grounding. Tip for left side and ring for right side. If the equalizer is connected to both of these, it makes a stereo equalizer. But as our project is 'mono', only one of these will be used. The two pins near the tip and ring (as shown in the photo) are shorted with each other, so any one of these terminals can be used.

CIRCUIT DIAGRAM (planning phase):



Working of the Equalizer Circuit:

The equalizer circuit can adjust the frequency to 5 channel is 60 Hz, 100 Hz, 1 kHz, 3 kHz, and 12 kHz. This circuit is Mono. For stereo, another Mono should be added.

When we enter a signal to an input. Then, C1 passes a signal to **coupling** through pin1 each potentiometer (VR1-VR5).

If we adjust VR5 to a higher level in the middle of a potentiometer. This signal will come to a high and low-frequency filter of each band. They include R and C network.

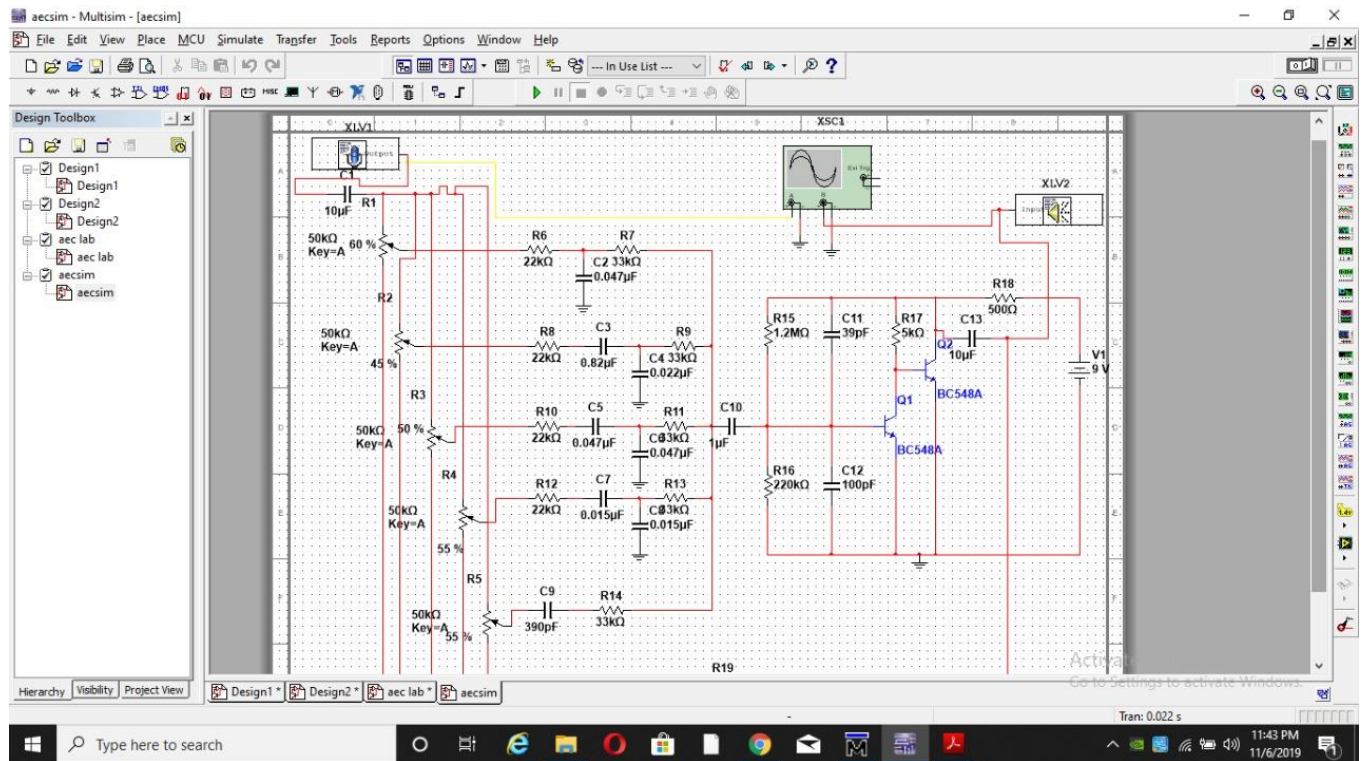
Next, the signal that through each band be combined together.

Then, C10-capacitor passes the signal to coupling to a base of Q1 and Q2. Both transistors are a **common emitter amplifier**. The higher signal goes out of a collector of Q1. It is out of phase with the input.

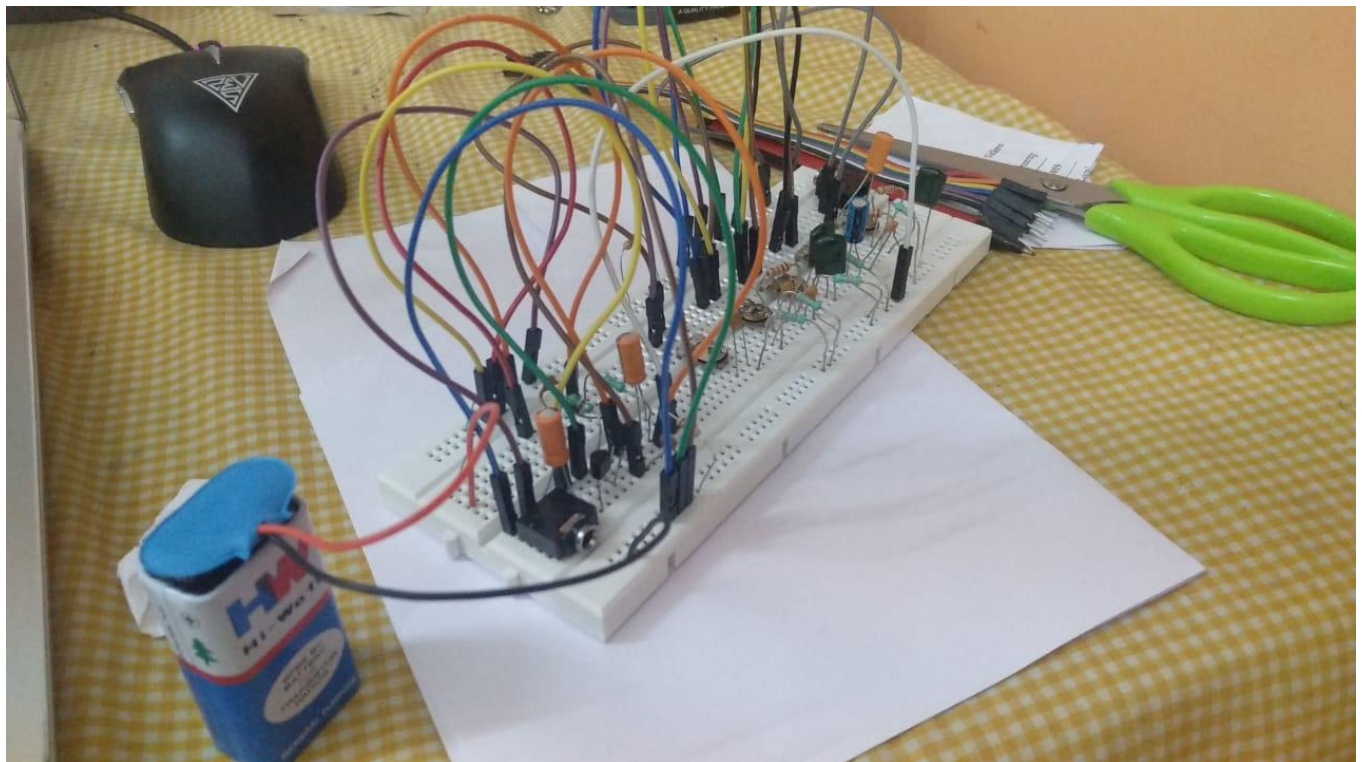
Then, the highest signal or the output signal comes out of emitter of Q2 via C13. And, some signal will give feedback through R12 to each leg 3 of the potentiometer (VR1 to VR5). When we adjust them to this point.

A feedback signal will refute with a input. So, this is cut off point.

EXPERIMENT AND RESULTS:



The Simulation Screenshot (review 2)



The circuit after its assembly

Further Modifications:

The circuit can be further modified and improved by the following

- Circuit can be made on PCB or on small Veroboard to minimize the noise.
- Additional buffers and filters can be added in both the input channels as well as in the output.
- If we connect individual potentiometer in each channel we can control the volume of each audio signal.

REFERENCES:

1. <https://www.eleccircuit.com/transistor-equalizer-circuit-diagram/>
2. <https://learn.sparkfun.com/tutorials/connector-basics/audio-connectors>
3. <https://www.digikey.in/en>
4. Fundamentals of Electric Circuits by Alexander Sadiku

Conclusion

We were able to do research and get necessary information . We were able to simulate the circuit in multisim and got the output we required using audio signals from a microphone and could equalize it.

We designed the same circuit in a breadboard and got the necessary output.