

# **Audio Power Operational Amplifier**

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ECE 334- 201

Lab No. 10

04/18/01

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## I. Introduction

The purpose of this part of the lab is to investigate the characteristics of an audio amplifier circuit.

## II. Background Information

An audio amplifier is an active circuit designed for the amplification of signals in the audio-frequency range. Some audio amplifiers, such as microphone preamplifiers and radio-receiver audio stages, must amplify very small signal input, but they need not generate much output power. Other audio amplifiers, such as those found in high fidelity or public-address systems must develop large amounts of power output, sometimes thousands of watts. In communications systems, the frequency response of an audio amplifier is restricted to a relatively narrow range. But in a high-fidelity system, a flat response is desired from perhaps 10 Hz to well above the range of human hearing.

Audio power is the power, in watts, dissipated in the output load of an audio amplifier. If the speakers or headphones of an audio system were replaced by noncreative resistors of identical impedance, all the audio power would be sent as heat. It could then be easily and accurately measured. Voltmeters are generally used in audio systems to measure power. They are calibrated in watts according to the impedance of the output.

## III. Materials Used

The following materials were used in this part of the lab: resistors of 100 k $\Omega$ , 1 k $\Omega$  and one 10 k $\Omega$ , DC voltage source, multimeters, banana to alligator wires, resistor substitution box, pieoelement, speaker, LM386 amplifier, capacitors of different values, and the bread board on the Heathkit Trainer.

## IV. Procedure

### PART A

1. The following circuit was setup. Refer to the lab manual.
2. One scope was connected to one leg of the pieoelectric and the other to the second leg of the element.
3. The voltage/Division of the oscilloscope was set to 50mV.
4. The Time/Division of the oscilloscope was set to 20ms.
5. On the top of the pieoelement taps were made with finger. Very small bumps appeared on the scope.
6. The voltage and time scales for the oscilloscope was changed again and set to 10mV and 50 micro second.
7. Sound was directed to the element but not considerable signal appeared except very minute signal.
8. The pieoelement was connected to the speaker.
9. Taping on the element nothing considerable was heard. However, some very small signals was visible on the scope.

### PART B

1. The X20 amplifier circuit was setup. Refer to the lab manual.
2. When the power was turned on, audible sound started from the speaker.
3. Now when taping on the pieoelement, level of the sound from the speaker was high.

4. The voltage level both input and output of the circuit was measure while another person was speaking to the element. The gain of this amplifier was measure to be around 15.

#### PART C

1. A X200 amplifier was setup. Refer to the lab manual.
2. The power was turned on.
3. The voltage level both input and output of the circuit was measure while another person was speaking to the element. The gain of this amplifier was measure to be around 180.

#### PART C

1. The circuit of figure 3 was setup. Refer to the lab manual.
2. A capacitor of value  $0.68 \mu\text{F}$  for C1.
3. The tone from the speaker was observed and the level of the output on the oscilloscope measured.
4. Different values of capacitor was installed in the circuit and the response was measured.

## V. Results

For information about results, please read the above procedure steps.

## VI. Conclusion

### Questions:

In the first part of it became clear that without audio amplifiers, the sound into the piezoelectric will not be heard. Although, some faint signals were visible on the oscilloscope. These signals could be made more visible with the change of scale of time/division and voltage/division. When the speaker was connected nothing was heard on the speaker. In the amplifier circuit (X20) due to some amplification sound was audible from the speaker. The gain for this circuit was not controllable. In the amplifier circuit (X200) the amplification was higher than the X20 circuit. A lot of noise was audible from the speaker and gain was much higher than the circuit of (X20). The circuit of figure 3 also amplifies the signal. The function of the capacitor is to block the dc signals and thus reduces the noise level. As the value of the capacitor increases the level of sound from the speaker get more amplified and clearer.