

Control Systems Lab

Experiment No – 4

Noise cancellation in headphones

Aim

To design and implement an analog circuit for noise cancellation in headphones.

Objectives

- a) To achieve an attenuation of 20 dB, when a noise of 100 Hz frequency is applied.
- b) To design an analog compensator to stabilize the system, i.e. loop shaping of the loop transfer function..

Prerequisites

System identification (frequency response analysis), Compensator design and implementation, Matlab coding.

Materials/ Equipments required

Headphone setup, DSO, Function generator, Probes, Amplifier ICs, Breadboard, Wires, Jumpers, Wire stripper.

Open loop block diagram

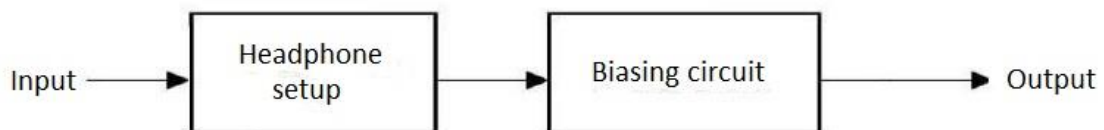


Fig 1: Open loop block diagram

Frequency response

Frequency response analysis is performed on the headphone setup with sinusoidal waves given as input, from the function generator. Both the input and output are observed in the DSO, and then the magnitude and phase are plotted versus frequency.

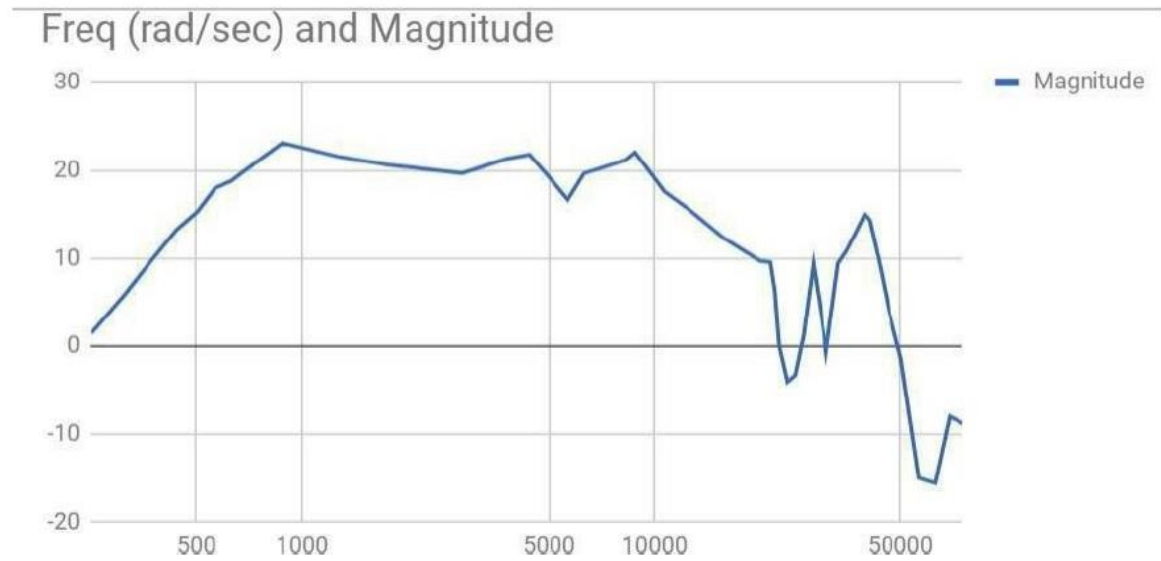


Fig 2: Sample magnitude plot

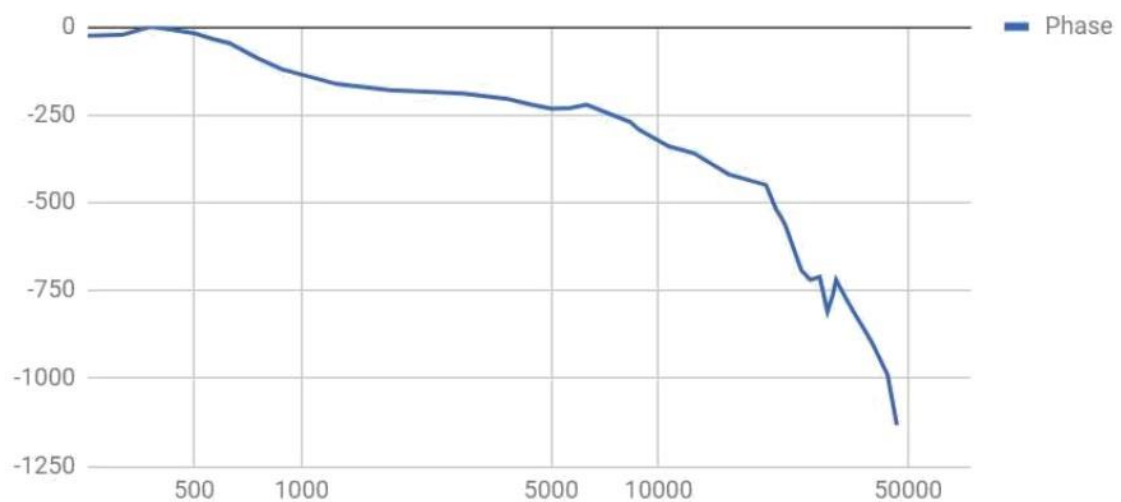


Fig 3: Sample phase plot

Compensator design

Once the frequency response is analysed, a compensator will be designed to stabilize the system without deviating from the required specifications. Then the compensator will be cascaded with the setup, the loop will be closed. Then noise will be fed to the circuit and the signal to noise ratios are measured at frequencies of 100, 500 and 1000 Hz.

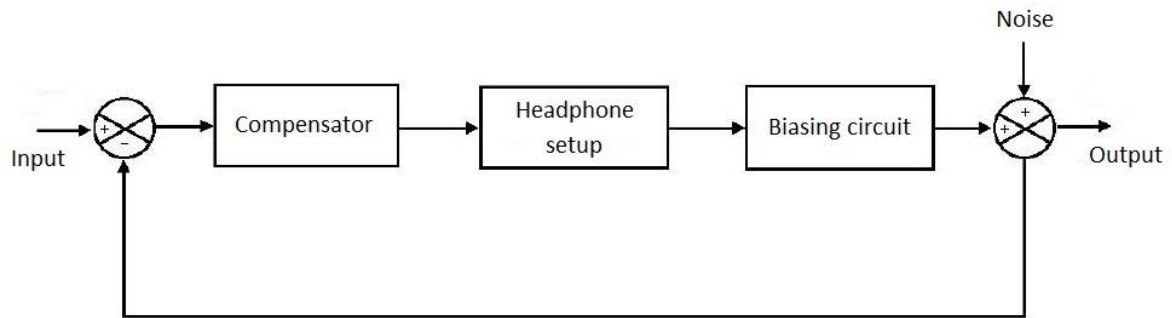


Fig 4: Closed loop block diagram

Biasing circuit

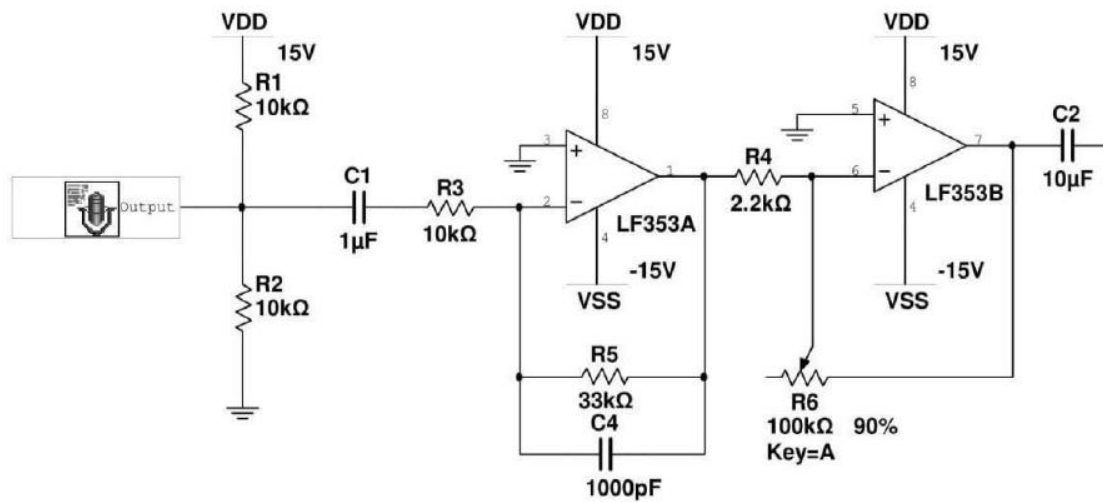


Fig 5: Biasing circuit