PRE-EMPHASIS AND DE-EMPHASIS REPORT

Project Title

Design and Assemble the pre emphasis and de-emphasis in transmitter and receiver sides

Team Members

- ARCHANA
- KHADER MYDEEN
- VINOD KUMAR
- MONICA
- HARI
- YOGESH

Objective

The objective of this mini project is to design and implement pre-emphasis and de-emphasis circuits to improve audio signal transmission. By boosting high-frequency components before transmission and attenuating them at the receiver, the project aims to reduce noise, enhance clarity, and maintain signal quality in communication systems.

Project Overview

The mini project titled **"Pre-Emphasis and De-Emphasis Circuits"** focuses on the design, implementation, and analysis of circuits that improve audio signal transmission quality. Pre-emphasis is used to boost the high-frequency components of an audio signal before transmission, helping to combat noise and signal loss during propagation. De-emphasis, applied at the receiver end, restores the original signal balance by attenuating those boosted frequencies. This technique is widely used in FM transmission and audio systems. The project includes theoretical study, circuit design, practical implementation using basic electronic components, and waveform observation using a CRO to validate performance..

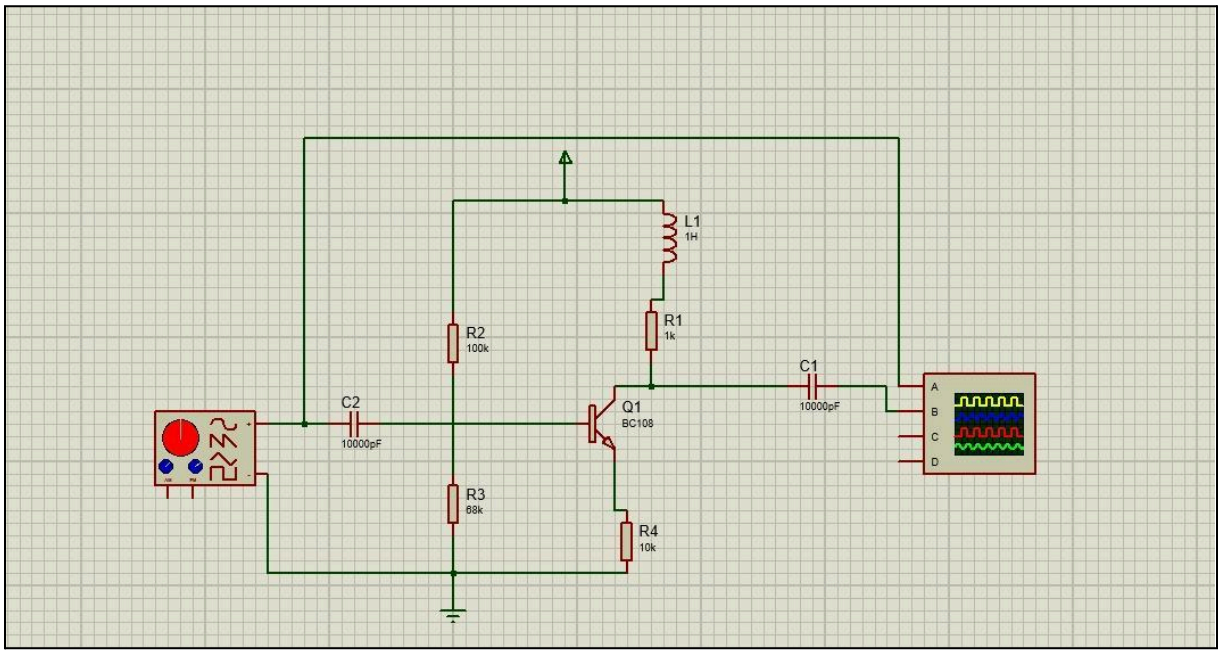
Major Components Used

Components	Description
Transistor	Used to amplify the audio signal and implement the active filter circuit.
AFO (Audio Frequency Oscillator)	Provides the input audio signal
Resistors & Capacitors	Set the gain and frequency response of the pre-emphasis and de-emphasis filters and

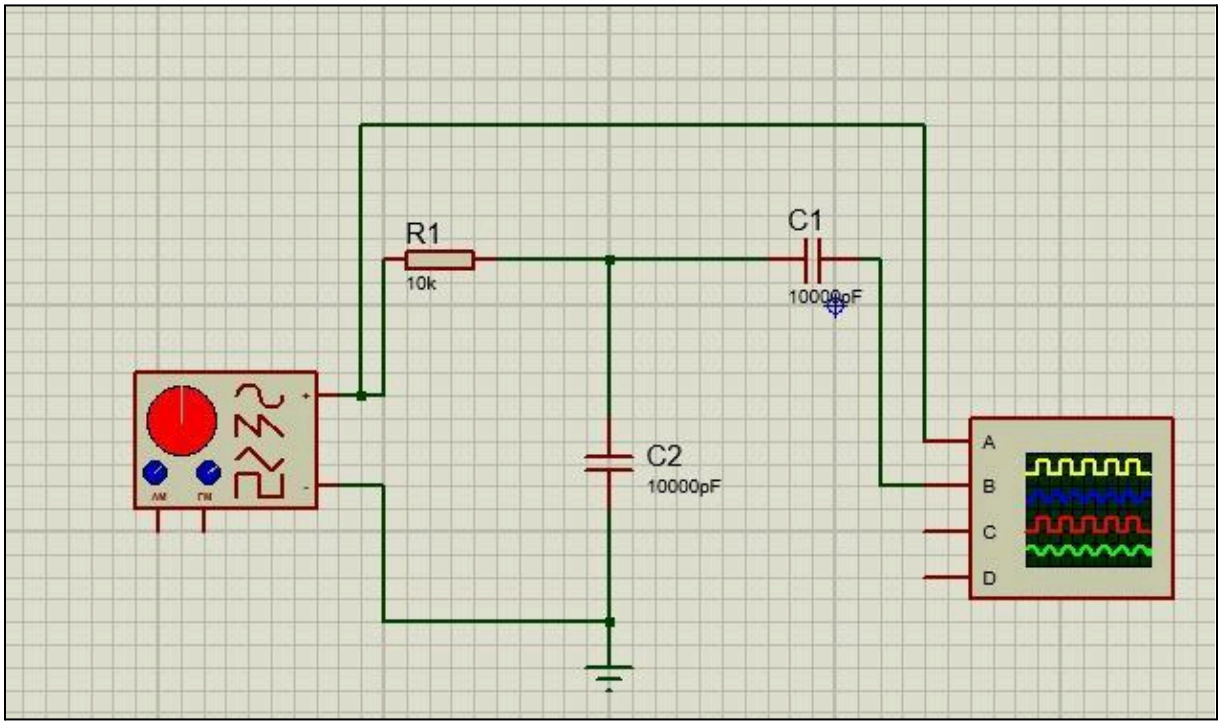
	Works with resistors to shape the frequency characteristics of the signal.
CRO (Cathode Ray Oscilloscope)	Displays the input and output waveforms to analyze signal changes.
RPS (Regulated Power Supply)	Provides a stable DC voltage to power the circuit components.

Circuit Diagram:

Pre-Emphasis

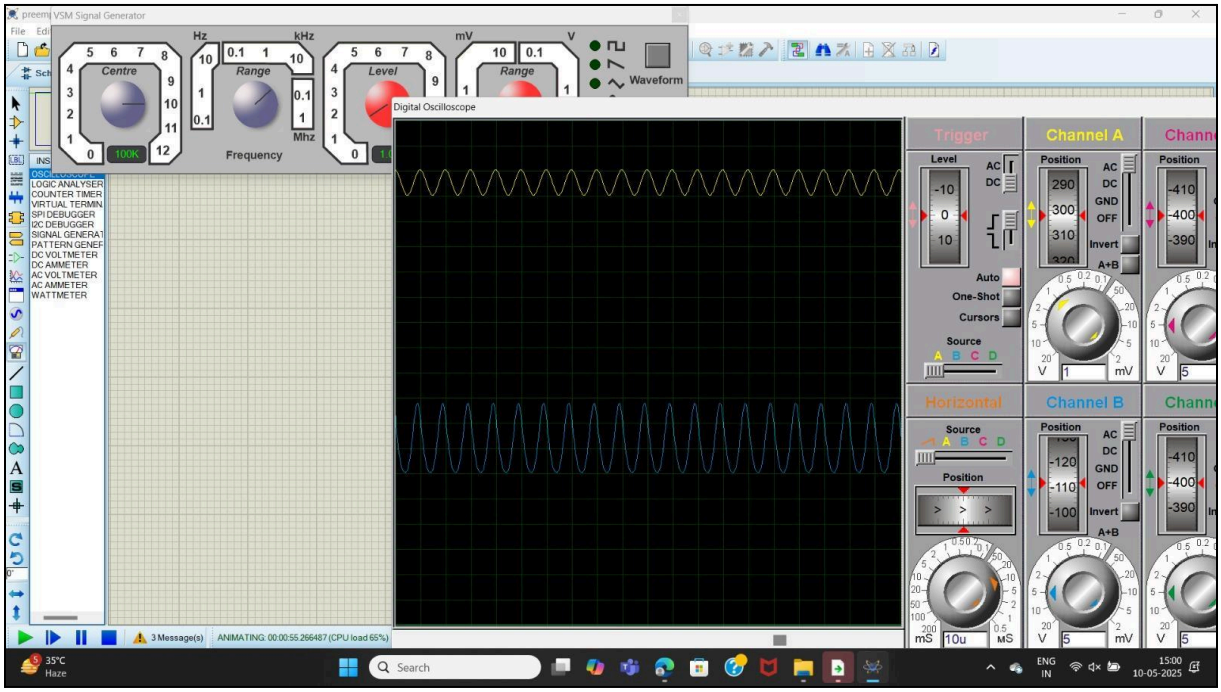


De-Emphasis

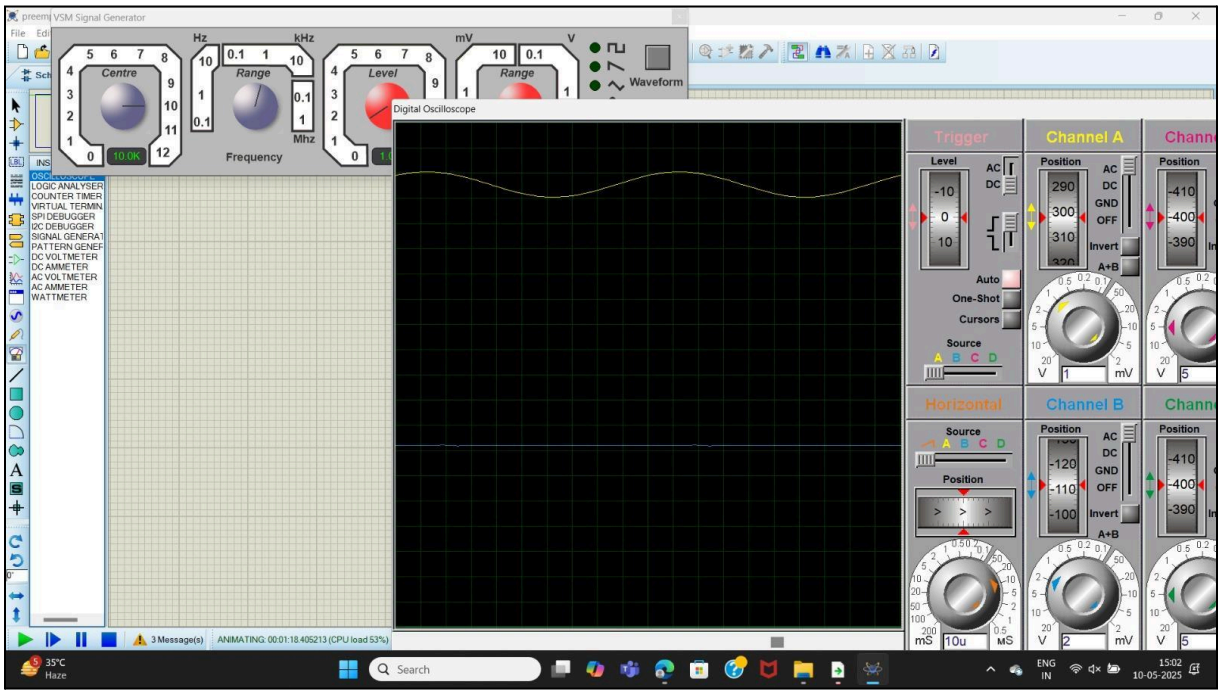


Simulated Output

Pre Emphasis

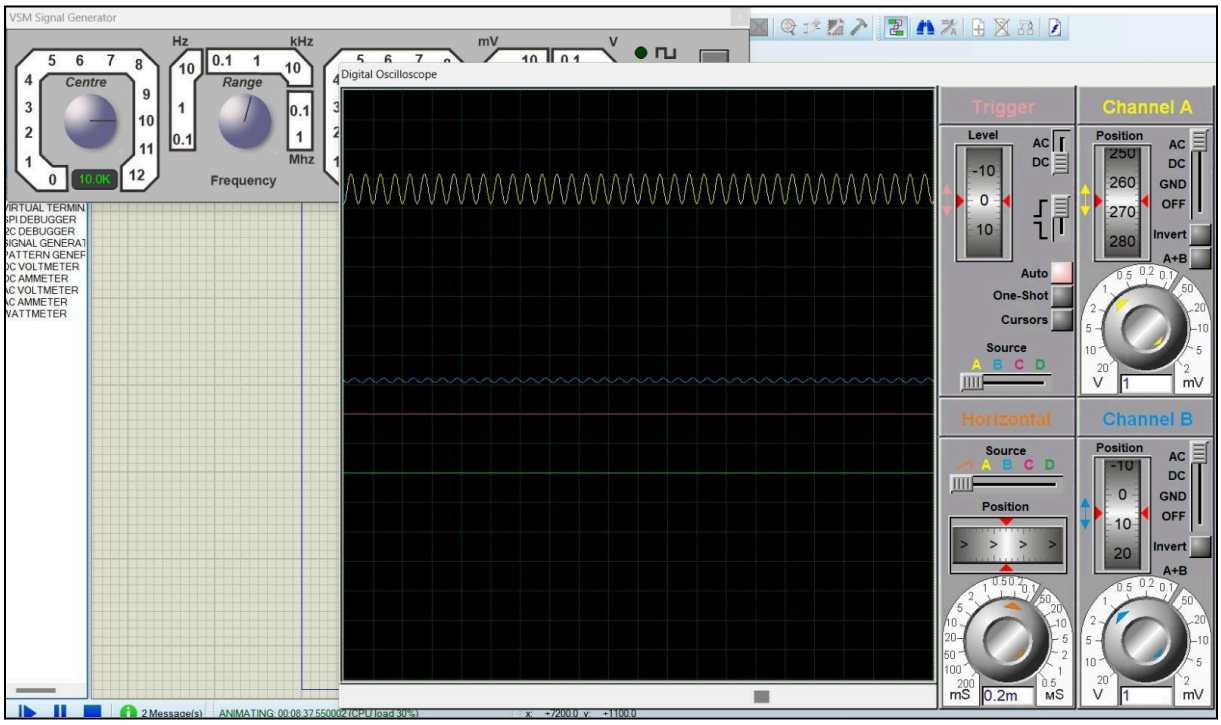


Pre emphasis with 10 KHZ frequency

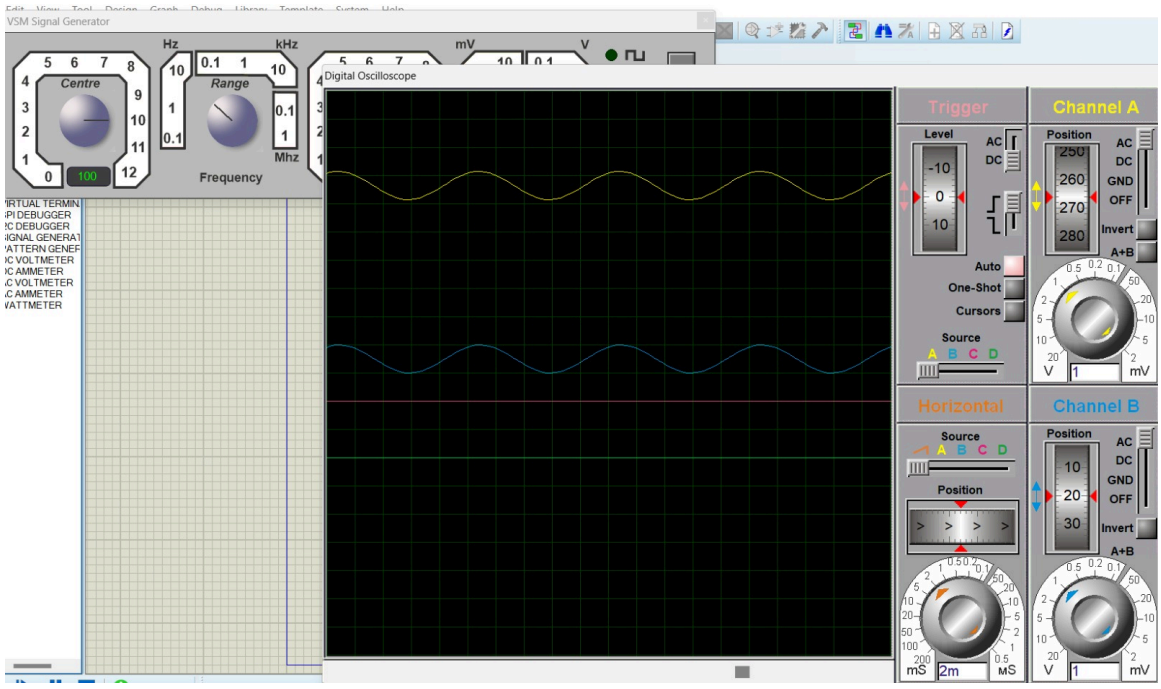


Pre emphasis for 1KHZ

De-Emphasis



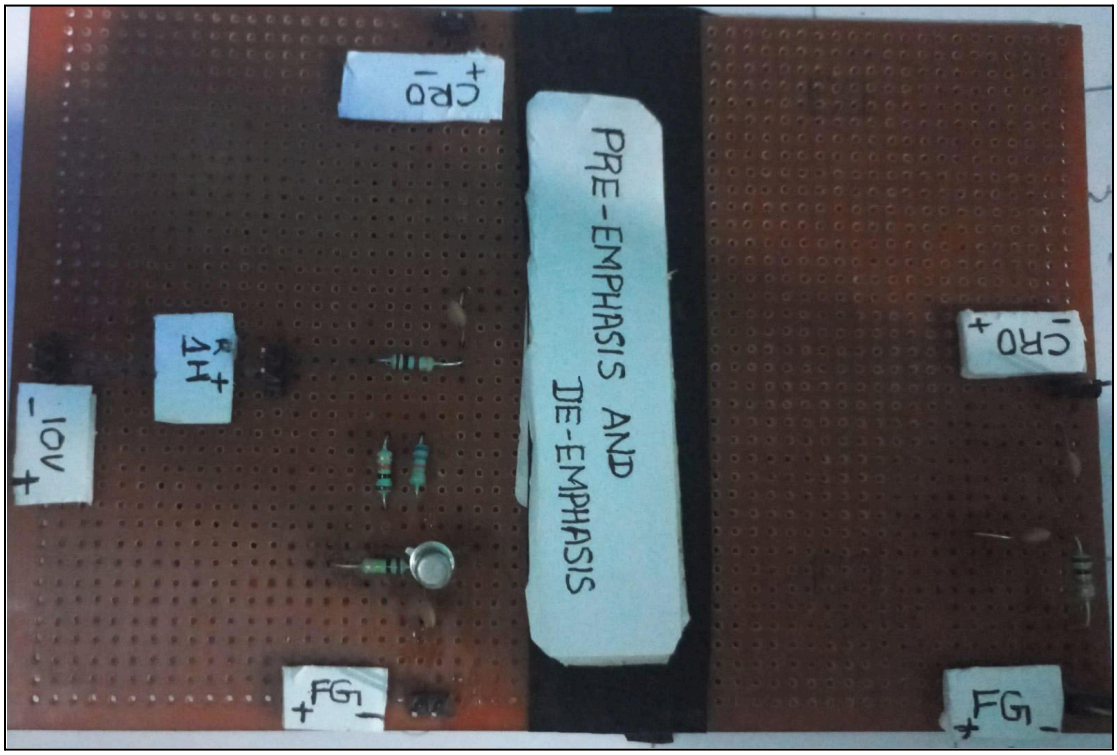
De emphasis with 1 KHZ frequency



De emphasis for 100HZ

Real-Time Circuit:

Connections on DOT Board:



Working Principle:

1. Pre-emphasis Circuit:
This circuit uses an RC high-pass filter to boost high-frequency components of the audio signal. The capacitor passes high frequencies while the resistor limits low frequencies, effectively emphasizing higher frequency signals before transmission. This helps in reducing the relative impact of high-frequency noise during transmission.
2. De-emphasis Circuit:
At the receiver end, a complementary RC low-pass filter is used. The capacitor-resistor arrangement attenuates the high frequencies that were previously boosted, restoring the original signal balance and reducing noise introduced during transmission.
3. Signal Flow:
The audio signal from the Audio Frequency Oscillator (AFO) is fed to the pre-emphasis circuit, then transmitted or passed through a simulated noisy medium, and finally received and filtered by the de-emphasis circuit. The resulting output signal is observed using a CRO for waveform comparison

Assembly Instructions:

1. **Preparation:**
   Gather all components such as resistors, capacitors, transistors, ICs, and wires. Verify their values using color codes or multimeter, and handle the PCB by its edges to prevent contamination.
2. **Component Placement:**
   Insert resistors and capacitors into their marked positions on the PCB. Ensure electrolytic capacitors are placed with correct polarity. Align transistors and ICs (if used) properly with their notches or pin orientations as indicated on the PCB silkscreen.
3. **Soldering:**
   Solder components neatly on the PCB using a soldering iron with a fine tip. Begin with low-profile components (resistors), then move to larger ones (capacitors, transistors, IC sockets). Ensure solid joints and trim excess lead wires.
4. **Testing Connections:**
   After soldering, check for continuity using a multimeter. Look for any cold solder joints or short circuits. Verify component placements before powering the circuit.
5. **Power Supply and Signal Connection:**
   Connect the regulated power supply (RPS) to power the circuit. Use connecting wires to feed the input signal from the Audio Frequency Oscillator (AFO) to the pre-emphasis circuit and observe the output after the de-emphasis stage.
6. **CRO Observation:**
   Connect the output of both stages to a Cathode Ray Oscilloscope (CRO) to observe waveform shaping and verify the effect of emphasis and de-emphasis on the signal.

Conclusion

The Pre-Emphasis and De-Emphasis circuits were successfully designed, assembled, and tested. The project demonstrated how high-frequency components of an audio signal can be emphasized before transmission to reduce the impact of noise, and then restored to their original levels at the receiving end. Through practical implementation and waveform observation on the CRO, the effectiveness of these filtering techniques was clearly validated. This project highlights the importance of signal conditioning in communication systems and provides hands-on experience with frequency-based filtering and circuit assembly