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| Four Channel Mixing Board With Shelving Filter |
| MMI 401 Final Project |
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| **Connor McCullough** |
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| Schematics, Transient Analysis, and AC Analysis for basic mixing board consisting of a preamplifier, shelving filter, and a summing amplifier. |

1. **Block Diagram**

Mixer

High and Low Shelving Filter

Preamplifer

1. **Preamplifier**

The preamplifier converts a balanced microphone signal into an unbalanced signal using a balanced/unbalanced transformer that also functions as a step up transformer, stepping up the voltage with a gain of 10. An NE5534 op amp in a non-inverting configuration with 15 volt peak to peak rails provides an additional gain of 100, for a total possible gain of 1000 times, or 60 dB. There is an anti-squeal capacitor built into the op amp to prevent high frequency oscillation, as well as a DC stabilization capacitor to prevent amplification of DC frequencies.

**preamp circuit.wmf**

Preamplifier at Maximum Amplification

**preamp waveforms.wmf**

60 db (x1000) of gain from input to output displayed.

1. **Shelving Filter**

Both the high and low shelving filter have a maximum of 12 dB amplification and attenuation. The low shelving frequency is at 100 hZ and the high shelving frequency is at 10 KhZ. Moving the two potentiometers determines how much the signal is amplified or attenuation. An NE3354 op amp provides amplification to the signal and has rails of 18 Volts peak to peak. The op amp has a built in anti-squeal capacitor to prevent oscillation of high frequencies.

shelvingflatcir.wmf

Shelving Filter at a flat frequency response.

shelvinglowmaxwavedb.wmf

Low shelving at maximum amplification of 12 dB.

shelvinglowminwave.wmfLow shelving at maximum attenuation of 12 dB.

shelvinghighmaxwave.wmf

High shelving at maximum amplification of 12 dB.

shelvinghighminwave.wmf

High shelving at maximum attenuation of 12 dB.

1. **4 Channel Mixer**

This 4 channel mixer has a unity gain buffer on each channel in order to provide a high load impedance for the shelving filter and a low input impedance for the summing amplifier. The summing amplifier has four separate logarithmic pots allowing for adjustment of the level of each signal in the final mix. Each channel has a maximum gain of about 4, or 12 dB. The summing amplifier is in an inverting configuration and has rails of 18 Volts peak to peak.

newmixerfinal2cir.wmf

newmixerfinal2transient1 (1).wmf

Transient diagram of mixer with one channel at maximum amplification of 12db and the other three channels muted (approaching zero).

newmixerfinal2transient2.wmf

Transient diagram of mixer with all four channels at maximum amplification of 12 dB.

newmixerfinal2ac.wmf AC Analysis of mixer displaying bandwidth and maximum amplification of 12 dB.