

A.4 - Noise Analysis

A.4.1. Experimental Setup for Super Heterodyne System

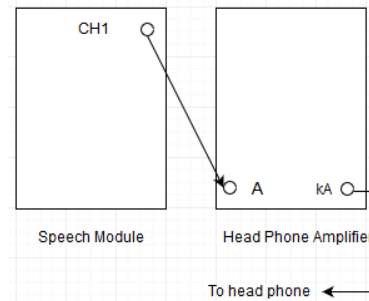


Figure A.4.1.a: Setup to verify recorded speech signal.

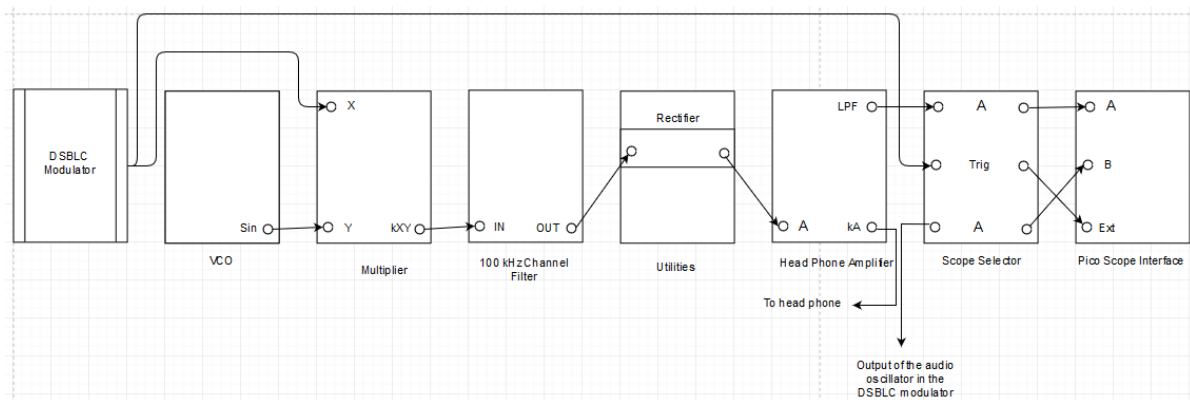


Figure A.4.1.b: Setup for receiver system.

A.4.2. Laboratory Exercise for Super Heterodyne System

- i. Toggle the front panel switch of CH1 of the speech module to record, speak into the mic of the speech module and toggle the front panel switch of CH1 of the speech module to play. Verify the recorded speech signal as shown in the Figure A.4.1.a.
- ii. Make the DSBLC modulator setup with modulation index of 1 and make the receiver system as shown in the Figure A.4.1.b.
- iii. Toggle the on board switch-SW2 of the VCO to VCO, toggle the front panel switch of the VCO to LO, toggle the front panel switch of the multiplier at the receiver to DC, toggle the front panel switch of the 100 kHz channel filters to DC and toggle the front panel switch of the headphone amplifier to IN. Turn the frequency knob of the VCO to minimum and turn the knob of the 100 kHz channel filters to position 2.
- iv. Observe that the receiver system is a combination of the super heterodyne system and the DSBLC demodulator.
- v. Adjust the frequency knob of the VCO to obtain the demodulated message signal.

- vi. Observe that this ensures demodulation is successful for the given receiver system.
- vii. Turn the frequency knob of the VCO to minimum.
- viii. Unplug the signal from output of the audio oscillator to input of the multiplier at the modulator. Plug the signal from output of CH1 of the speech module to input of the multiplier at the modulator.
- ix. Observe that the speech signal is modulated with DSBLC modulation process.
- x. Listen to the demodulated speech signal with the headphone. Adjust the volume at the headphone amplifier if required. Increase the frequency knob of the VCO from minimum to maximum.
- xi. Observe the changes in the demodulated speech signal. What do they signify?
- xii. Toggle the front panel switch of the VCO to HI. Repeat step vii through step xi, accordingly.

A.4.3. Experimental Setup for Noise Analysis of AM System

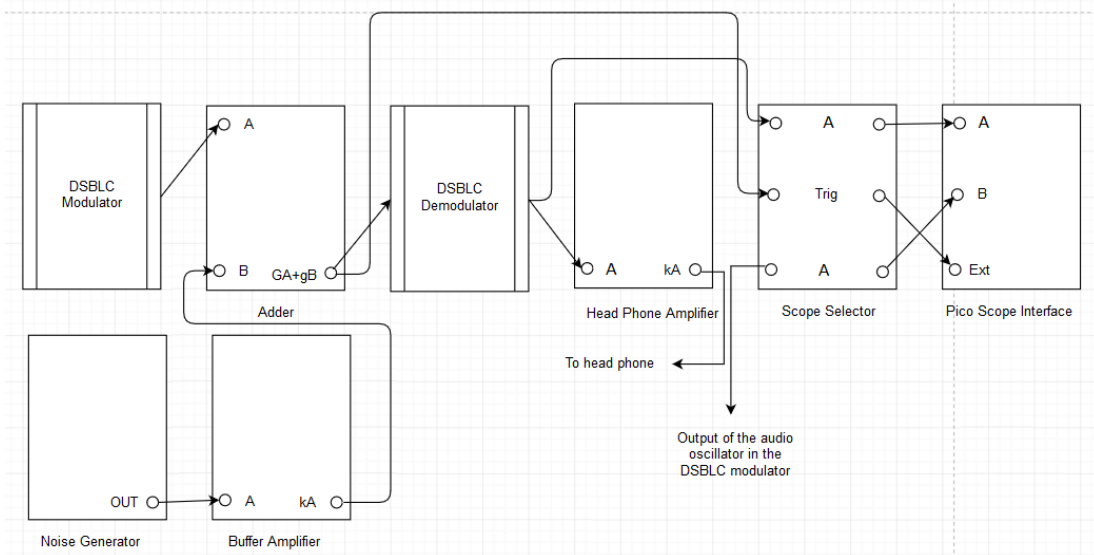


Figure A.4.2: Setup for noise analysis of AM system.

A.4.4. Laboratory Exercise for Noise Analysis of AM System

- i. Record a speech signal with the speech module.
- ii. Make the setup as shown in the Figure A.4.2.
- iii. Toggle the front panel switch of the headphone amplifier to IN. Turn the knob of the buffer amplifier to midway, turn the noise signal at the channel adder to minimum, turn the modulated signal at the channel adder to maximum and turn the knob of the noise generator to 0 dB.
- iv. For modulation index of 1, verify the demodulation process.

- v. Unplug the signal from output of the audio oscillator to input of the multiplier. Plug the signal from output of CH1 of the speech module to input of the multiplier.
- vi. Listen to the demodulated speech signal with the headphone. Adjust the volume at the headphone amplifier if required. Turn the noise signal at the channel adder to maximum.
- vii. Tabulate the observations for modulation index of 1 and noise level of 0 dB, +4 dB, +8 dB, +12 dB, +16 dB and + 20 dB.
- viii. Tabulate the observations for noise level of +6 dB and modulation index of 0, 0.4, 0.8 and 1.

A.4.5. Experimental Setup for Noise Analysis of FM System

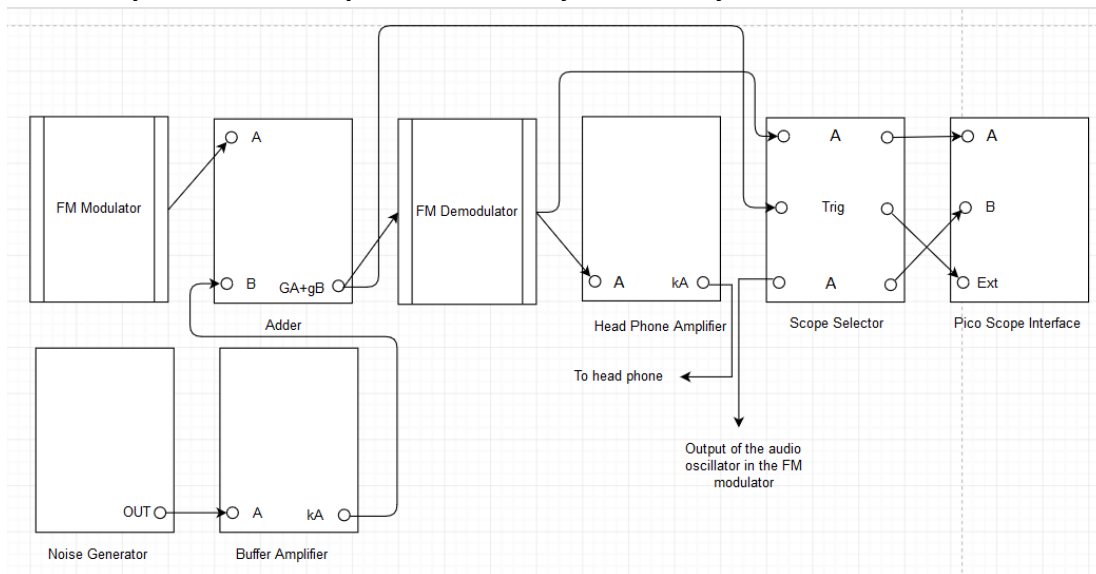


Figure A.4.3: Setup for noise analysis of FM system.

A.4.6. Laboratory Exercise for Noise Analysis of FM System

- i. Record a speech signal with the speech module.
- ii. Make the setup as shown in the Figure A.4.3.
- iii. Toggle the front panel switch of the headphone amplifier to IN. Turn the knob of the buffer amplifier to midway, turn the noise signal at the channel adder to minimum, turn the modulated signal at the channel adder to maximum and turn the knob of the noise generator to 0 dB.
- iv. For modulation index of 1.45, verify the demodulation process.
- v. Unplug the signal from output of the audio oscillator to input of the VCO at the modulator. Plug the signal from output of CH1 of the speech module to input of the VCO at the modulator.

- vi.** Listen to the demodulated speech signal with the headphone. Adjust the volume at the headphone amplifier if required. Turn the noise signal at the channel adder to maximum.
- vii.** Tabulate the observations for modulation index of 1.45 and noise level of 0 dB, +4 dB, +8 dB, +12 dB, +16 dB and + 20 dB.
- viii.** Tabulate the observations for noise level of +6 dB and modulation index of 0.3, 1.45, 2.45 and ≈ 5 .