Lab 3 Report

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Objective:

The purpose of this lab is to study the properties of the fundamental operational amplifier building blocks using some Texas Instruments Op Amps. Inverting and non-inverting op amp circuits will be tested. These circuits include the inverting, non-inverting and voltage following op amp circuits. We will also investigate modifying the input offset voltage by using a potentiometer.

Introduction:

First, the input offset current is determined by taking the voltage drop across the input resistors, calculating the current draw, and then taking the difference between the two currents. Then, we measure the output offset voltage of the op amp by creating a circuit with no inputs to the op amp besides power and measure the output. To get the input offset voltage, the output offset voltage is divided by the gain. A potentiometer is then used to set the input offset voltage to 0V. Following this, the inverting op amp was built and tested, followed by the non-inverting and voltage following op amp circuits. The bode plots, time-domain waveforms, maximum voltage and total harmonic distortion plots were take of all three circuits.

Calculations

Simulation Plots

Experimental Plots

Conclusion:

For the most part, the measurements of the simulations and the experimental values was pretty close for almost everything except for the maximum input voltage. The values for the input and output offset voltage were fairly close to what they were supposed to be on the datasheet. The input offset current was close as well. For the gains of each of the circuits, the simulations were almost exactly the same as the experimental values. Any other differences between them could be due to variable resistances within the breadboard itself and the sensitivity of the analog discovery device. The big difference came to the maximum input voltages. The maximum voltages were much higher in the simulation than in the experimental plots. For the inverting and non inverting amplifier, the differences in the voltages were 0.38V and 0.4 V respectively. This is because while the positive amplitudes were generally the same, the negative portion of the amplitude was clipped at a much lower voltage. This also carried over to the voltage follower when there was a 2.01 V difference between the simulated and experimental values. It can only be concluded that the op amps are not the exact same physically as they are on the simulations. For the distortion measurements, the level of distortion was relatively low for all three circuits with the highest level of distortion coming from the inverting op amp at -9.805 dBc. This means that if these op amps were used in any signals environment, they would not produce much noise and their signals would still be relatively clear.