Block diagram
Amplifier circuit
Calculation

According to the datasheet, if we have a supply voltage of 9V, the output voltage swing peak to peak is 8V for infinite Rload, 6V for 8ΩRload. The basic gain of LM386 is 20x, so the input swing for the amplifier should not exceed 0.3V peak to peak or 300mV peak to peak with 8ΩRload.

Thus, we need to adjust the potentiometer to its half position to accept 600mV peak to peak input swing.
One experiment plot (vin: 100mVpp, 1kHz)
Amp description

The amplifier is a typical audio amplifier with 5V to 9V dc power supply. The amplifier takes the output from the transducer as input, the amplifier has a gain around 40dB[2]. In our opinion, the 40dB gain is prepared that if the transducer gives very weak signal output, during the circuit building process, this gain should adjust to a necessary range. Thus a potentiometer is added to the amplifier circuit making the gain adjustable.
1. Adjustable gain from 20dB up to 40dB
2. Input swing limit larger than or equal to 1V.
3. 5kHz bandwidth
4. Flat band from 0Hz to 5kHz.
5. THD less than 10%[4]

1 & 2. Adjust the potentiometer to have maximum gain of the amplifier use a function generator to generate 100mV, 200mV, up to 1V input with 100mV step. Measure the output signal with oscilloscope, for each magnitude of the input signal, calculate the gain, and the gain should be 40dB.

Adjust the amplifier to minimum gain, repeat the steps, the calculated gain should below 20dB.

3 & 4. Use a function generator to input 100mV, 200mV, up to 1V input with 100mV step. Measure the output waveform with oscilloscope. For each magnitude of the input, adjust the input frequency from 0 Hz to 5kHz to see if the magnitude of the output maintain the same.

5. Use a function generator to input 1Vrms sinusoidal wave at 440Hz and collect the amplified signal using an oscilloscope. Use the fourier transform mode to collect the magnitude of the whole signal and the magnitude of the fundamental harmonic magnitude. THD can be calculated:

\[
\text{THD} = \sqrt{\frac{f_{\text{rms}}^2 - f_1^{\text{rms}}}{f_1^{\text{rms}}}} \quad [1].
\]

The calculated THD should less than 10%.
Safety statement

When testing the amplifier, if the power supply is not in use when modifying the circuit, the positive terminal cable should not touch the negative terminal cable. A good way to prevent this is to insert the positive red banana cable back to the positive terminal on the power supply.
Thanks for reading