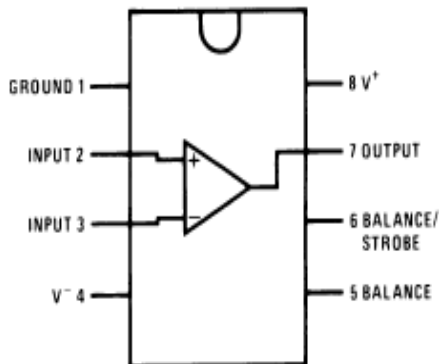


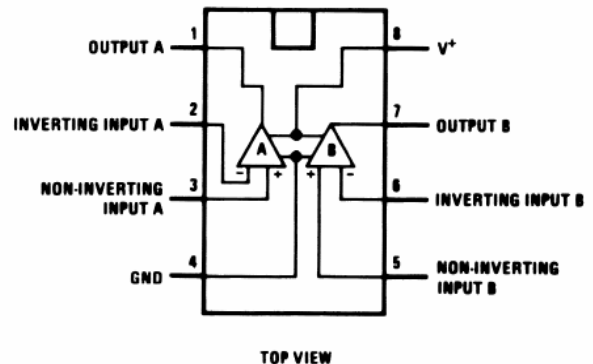
Lab 13: Comparators and Trigger Circuits

1. Connect a LM2903 comparator to measure the “zero-crossings” of a sine wave, with no feedback. Use $\pm 15\text{ V}$ for your supply voltages. Remember that the output must use a “pull-up” resistor. Use a $4.7\text{ K}\Omega$ pull up resistor tied to $+5\text{ V}$. Observe and characterize its output when driven by a 1 kHz sine wave.
2. Add positive feedback to your comparator to generate a total hysteresis of 0.2 V and an offset so that the comparator will switch when the input signal crosses near the $+1\text{ V}$ level (ignoring the hysteresis).
3. **Bonus:** One way to measure your circuit’s hysteresis is using the “x-y” mode on your scope to make a hysteresis plot. Sketch the waveforms resulting from this mode in your notebook and estimate the hysteresis of the waveform. Does the output switch cleanly? What is the smallest input slope that will maintain good behavior?
4. Build a square wave oscillator with 22 kHz frequency. Include your $10\text{ K}\Omega$ pot as a rheostat in series with the resistor in the timing portion of the circuit. Use the pot to fine tune the frequency to 22 kHz if needed. Examine the voltage across the capacitor and the output voltage on your scope at the same time to understand the switching structure.

Important note: You will build the circuit directly onto a prototyping board with all components connected via solder. The webpage has an image of the prototyping board layout.



LM311 pin-out



LM2903 pin-out