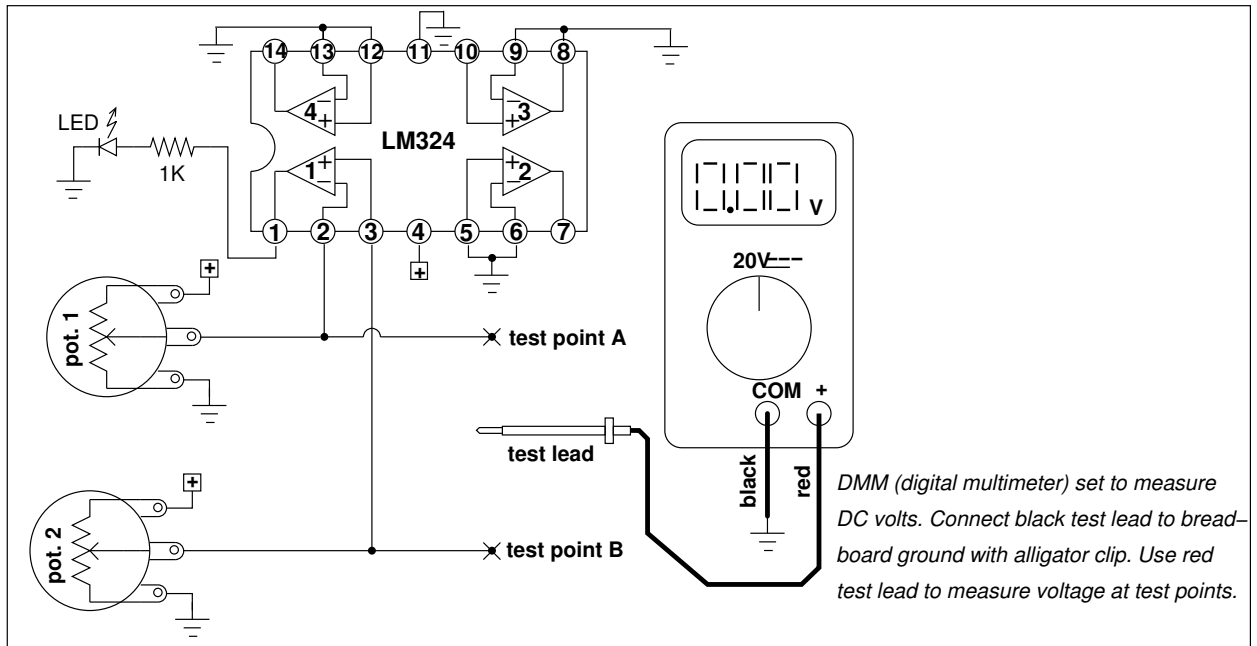


COMPARATOR TEST CIRCUIT

A comparator is an analog circuit with two inputs and one output. It watches and compares two voltages at the inputs and decides if the output should change or not based on the inputs. For example, if the voltage on one of the inputs goes above a fixed trigger voltage on the other input, the output could go from LOW to HIGH. This is only one configuration. There are lots of other possibilities, and the test circuit will help you understand them.

Comparators are good at "conditioning" analog signals and turning them into digital signals. The output can be hooked up directly to any logic input on another chip, a BASIC Stamp, SSR etc. You can hook it up to a transistor (ie. TIP120/122 or TIP125/127) to drive relays, motors, solenoids etc.

We are going to use the LM324 quad operational amplifier (op-amp). There are four general purpose op-amps in the LM324. Each of them can be used as a comparator. We'll start with just one, so connect all unused inputs to ground.



Build this circuit on your breadboard to learn how comparators work. The pots can be any value, but 10K or more is best. The pots supply adjustable voltages to the inputs. Measure and set them with a DMM as described. One pot sets a trip point (reference voltage) called V_{ref} . Another pot simulates a fluctuating voltage signal, called V_{in} . In your projects V_{in} could be from a photocell, flex sensor, microphone etc.

NON-INVERTING COMPARATOR:

1. In this example POT1 is used to set the reference voltage (V_{ref}) and POT2 supplies the input voltage (V_{in}).
2. Use the DMM to measure V_{ref} at TEST POINT A. Turn POT1 to set it. You can set it to whatever you need, but for now let's set it to 3 volts.
3. Now measure V_{in} at TEST POINT B. Turning POT2 changes the voltage up and down.
4. Whenever V_{in} is HIGHER than 3 volts (V_{ref}) the output is HIGH (LED turns on). Whenever V_{in} is LOWER than 3 volts (V_{ref}) the output is LOW (LED turns off).

INVERTING COMPARATOR:

1. In this example POT2 sets V_{ref} and POT1 supplies V_{in} .
2. Use the DMM to measure V_{ref} at TEST POINT B. Turn POT2 to set it. Let's use 3 volts again.
3. Now measure V_{in} at TEST POINT A. Turning POT1 changes the voltage.
4. Whenever V_{in} is HIGHER than 3 volts (V_{ref}) the output is LOW (LED turns off). Whenever V_{in} is LOWER than 3 volts (V_{ref}) the output is HIGH (LED turns on).