

Circuit 4B: Temperature Sensor

Want to create a DIY environmental monitor or weather station? You can use a small, low-cost sensor like the TMP36 to make devices that track and respond to temperature. In this activity you will also use the LCD screen to display sensor readings, a common use for LCDs in electronics projects.



LCD DISPLAY



POTENTIOMETER



TEMPERATURE SENSOR



19 JUMPER WIRES

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NEW COMPONENTS

TMP36 TEMPERATURE SENSOR:

This temperature sensor has three legs. One connects to 5V, one to ground, and the voltage output from the third leg varies proportionally to changes in temperature. By doing some simple math with this voltage, we can measure temperature in degrees Celsius or Fahrenheit.



NEW CONCEPTS

ALGORITHMS: An algorithm is a process used in order to achieve a desired result. Often, the information needed to create an algorithm lives in the part's datasheet. This sketch uses a few formulas to turn a voltage value into a temperature value, making them all part of the larger temperature-retrieving algorithm. The first formula takes the voltage read on analog pin 0 and multiplies it to get a voltage value from 0V–5V:

voltage = analogRead(A0) * 0.004882813;

The number we are multiplying by comes from dividing 5V by the number of samples the analog pin can read (1024), so we get: $5 / 1024 = 0.004882813$.

The second formula takes that 0–5V value and calculates degrees Celsius:

degreesC = (voltage - 0.5) * 100.0;

The reason 0.5V is subtracted from the calculated voltage is because there is a 0.5V offset, mentioned on page 8 of the TMP36 datasheet found here: <http://sfe.io/TMP36>. It's then multiplied by 100 to get a value that matches temperature.

The last formula takes the Celsius temperature and converts it to a Fahrenheit temperature using the standard conversion formula:

degreesF = degreesC * (9.0/5.0) + 32.0;

Together, these three formulas make up the algorithm that converts voltage to degrees Fahrenheit.