

Thermometer

Overview

In this lesson, you will use an LCD display to show the temperature.

Component Required:

1 x Arduino UNO R3

1 x LCD1602 Module

1 x 10k ohm resistor

1 x Thermistor

1 x Potentiometer

1 x 830 tie-points Breadboard

18 x M-M wires (Male to Male jumper wires)

Component Introduction

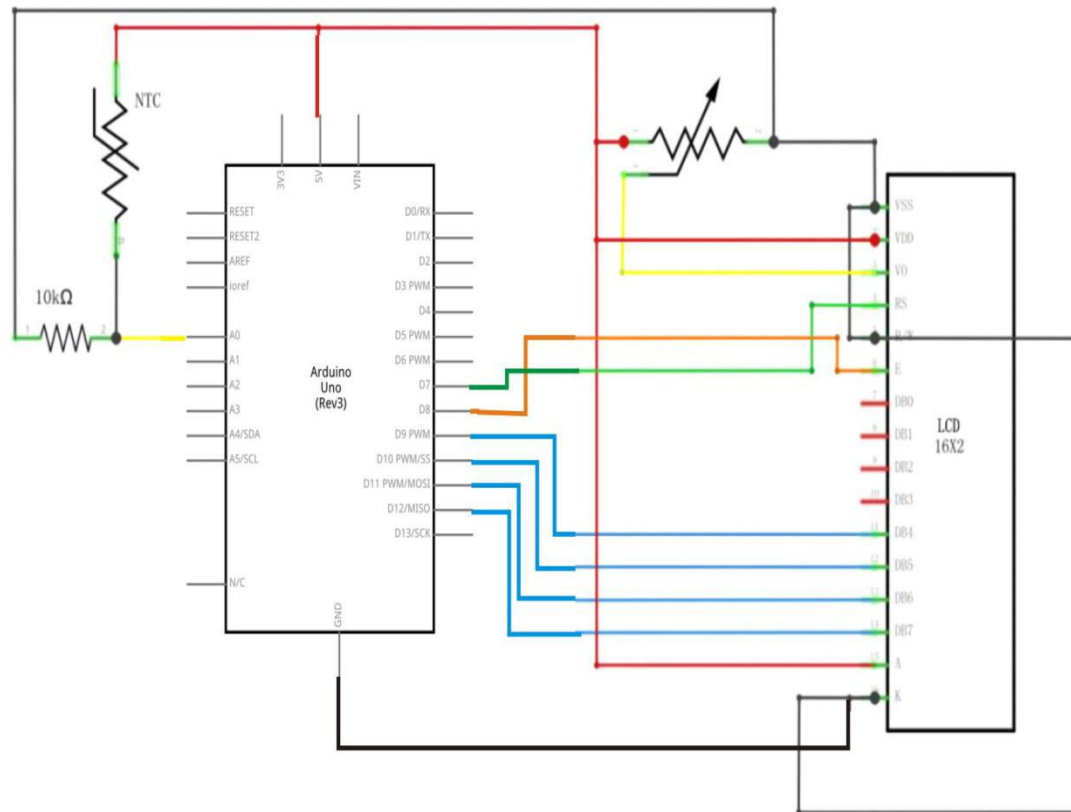
Thermistor

A thermistor is a thermal resistor - a resistor that changes its resistance with temperature. Technically, all resistors are thermistors - their resistance changes slightly with temperature - but the change is usually very small and difficult to measure. Thermistors are made so that the resistance changes drastically with temperature so that it can be 100 ohms or more of change per degree!

There are two kinds of thermistors, NTC (negative temperature coefficient) and PTC (positive temperature coefficient). In general, you will see NTC sensors used for temperature measurement. PTC's are often used as resettable fuses - an increase in temperature increases the resistance which means that as more current passes thru them, they heat up and 'choke back' the current, quite handy for protecting circuits!

Connection

Schematic



Wiring diagram

Code

This makes things easier if you decide to change which pins you use.

In the 'loop' function there are now two interesting things going on. Firstly we have to convert the analog from the temperature sensor into an actual temperature, and secondly we have to work out how to display them.

First of all, let's look at calculating the temperature.

```
int tempReading = analogRead(tempPin);  
double tempK = log(10000.0 * ((1024.0 / tempReading - 1)));  
  
tempK = 1 / (0.001129148 + (0.000234125 + (0.0000000876741 * tempK * tempK )) * tempK );  
float tempC = tempK - 273.15;  
float tempF = (tempC * 9.0)/ 5.0 + 32.0;
```

Displaying changing readings on an LCD display can be tricky. The main problem is that the reading may not always be the same number of digits. So, if the temperature changed from 101.50 to 99.00 then the extra digit from the old reading is in danger of being left on the display.

To avoid this, write the whole line of the LCD each time around the loop.

```
lcd.setCursor(0, 0);  
lcd.print("Temp      C  ");  
  
lcd.setCursor(6, 0);  
lcd.print(tempF);
```

The rather strange comment serves to remind you of the 16 columns of the display. You can then print a string of that length with spaces where the actual reading will go.

To fill in the blanks, set the cursor position for where the reading should appear and then print it.

