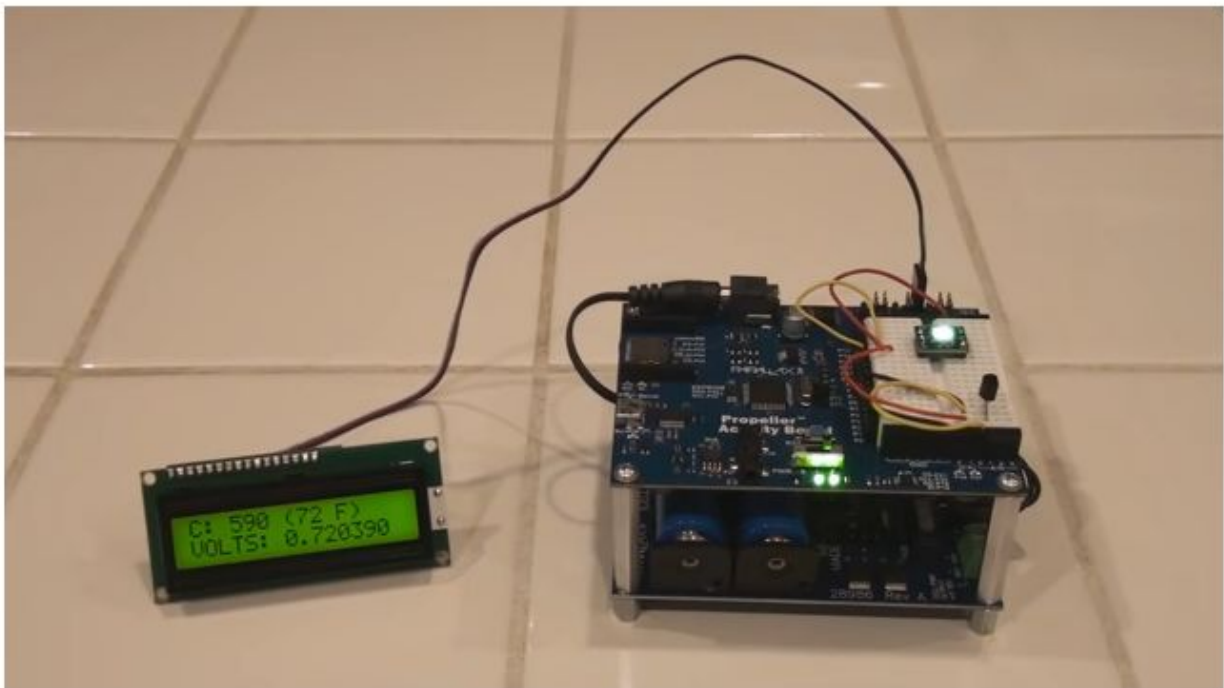


Spin Project: RGB LED Temperature Indicator

Level: Beginner

Time to Complete: 30 minutes - 1 hour

Skills Required: Soldering, SPIN Programming, Basic Mechanical Assembly, Breadboard Circuit Building



View this project's YouTube video on the ParallaxInc YouTube channel:

https://www.youtube.com/watch?v=DSaDmK_1dyU

The Parallax WS2812B REG LED Module is a whole lot of color in a tiny little package! With its 24-bit color capability, you have more than 16 million colors to play around with.

This project starts you off with the basics. You'll learn how to make your LED display one of five programmed colors depending on the temperature recorded using your temperature sensor. In this case, you'll see either Blue, Yellow, Green, Orange, or Red.

What's Needed:

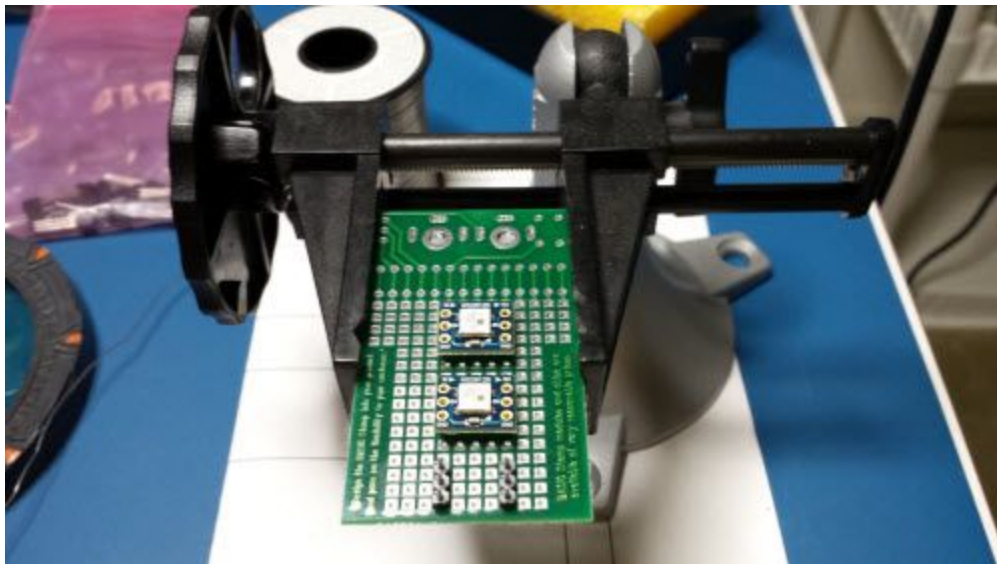
- (1) Propeller Activity Board (#32910 or #32912)
- (1) WS2812B RGB LED + (2) 3-pin headers (#28085)
- (1) LM34 Temperature Sensor (#604-00011)
- Jumper Wires

Optional (for debugging and displaying temperature readings):

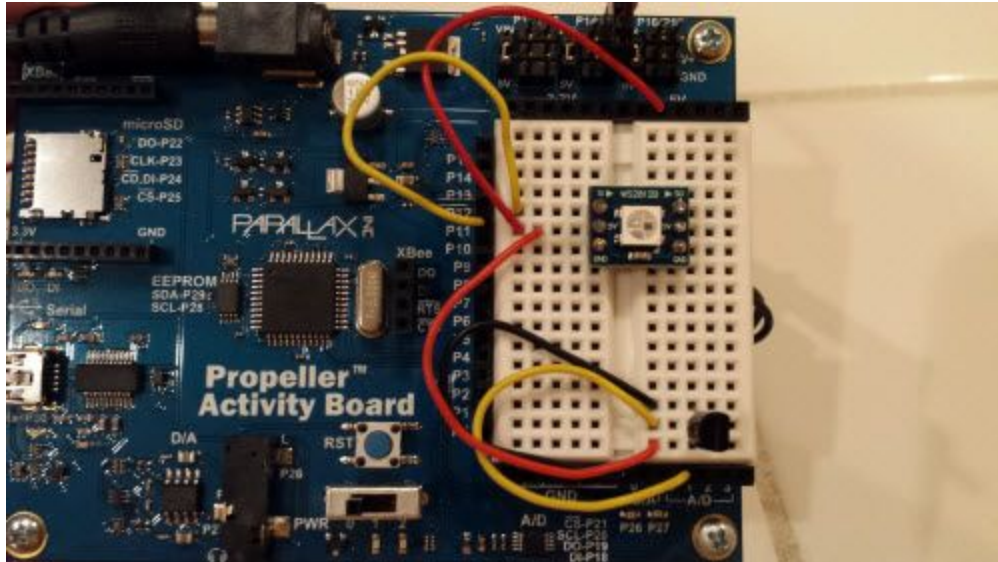
- (1) Parallax 2x16 Serial LCD (#27977)

Assemble the Sensor Unit

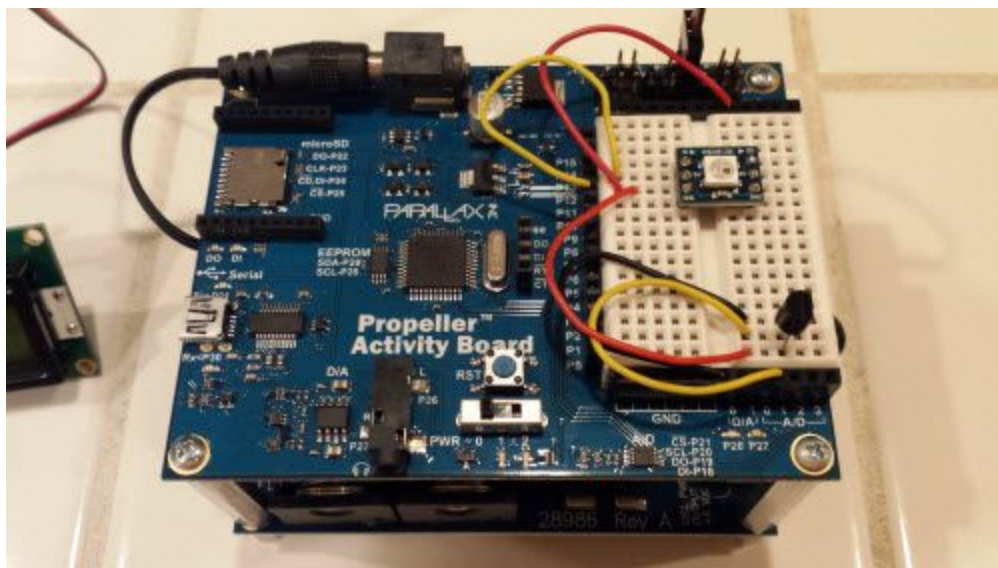
Assembling this project is simple. First, you should start by soldering on the two 3-pin headers to your RGB LED module (they were included with the LED module). Try to setup your soldering station so that your headers are secured in place as you work, like shown in the image below. Do not use a breadboard to keep the headers in place while you solder; it will melt the plastic.



Once that is complete, open the schematic that was included with the project download and set up the circuit on your Activity Board. If you prefer working from an image rather than a schematic, the picture below also shows the completed circuit.

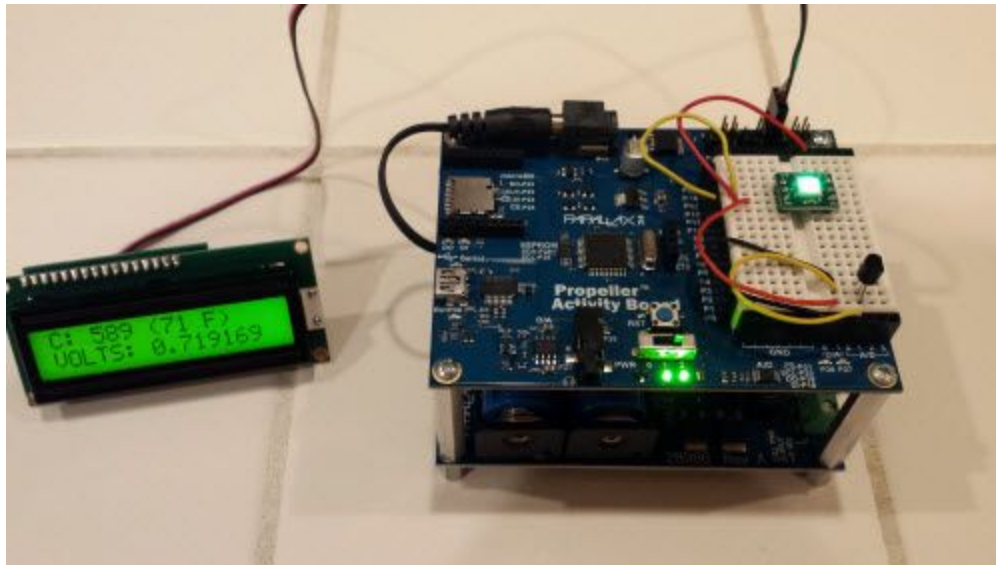


The Activity Board has an on-board ADC, which greatly simplifies the connections for this project. As per the schematic, you can see that the LM34 Temperature Sensor gets connected to 5V and GND, and the output goes to the channel 0 input on the Activity Board (see photos, above/below). P11 connects to the LED SI pin, and it gets 5V and GND connections as well. Again, see the schematic and/or the photo for specifics.



Optional: You can connect a 2x16 Serial LCD to your project, as mentioned in the parts list. Nothing needs to be added to the code to run the LCD, but make sure to pay attention to which pin you connect it to. If you do not use the header pins shown in the image above (P15), you'll need to update your code with the new pin value you chose.

Programming Your Temperature Indicator



Okay, so that's all you need to do to build it.

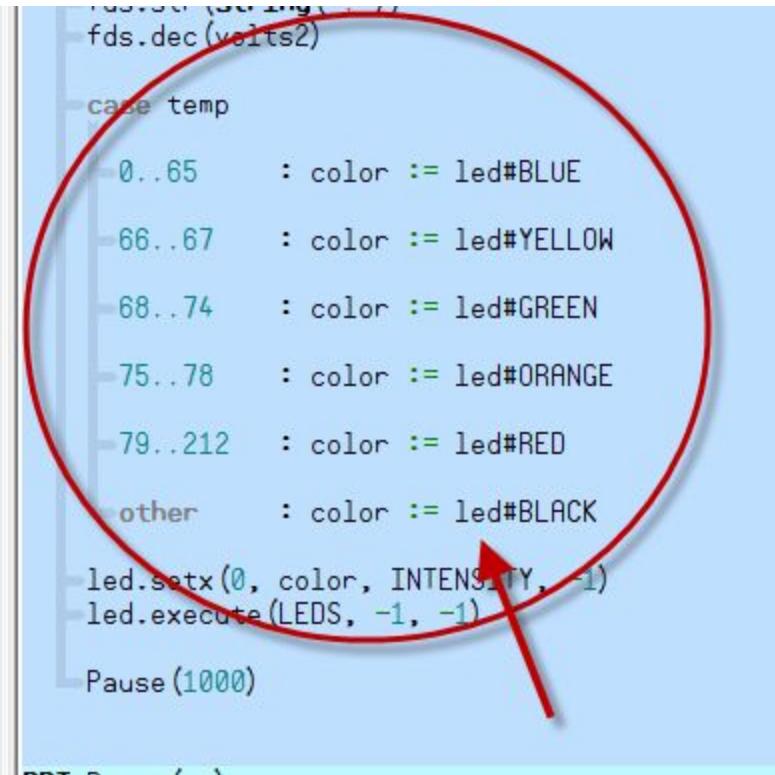
- ✓ Open the code included in the project download, and try it out. Recheck your connections if you don't get the expected result.

The LM34 is a temperature sensor designed to output 10mV per degree F. That voltage is fed into the ADC on the Activity Board and an object is used to read the value from that ADC, which will be between 0-4095 for a 0-5V input.

At 5V, the resolution for the ADC is 0.001221 volts per count from the ADC. Since we don't want to deal with floating point math we have multiplied the count from the ADC by 1221 and then moved the decimal point 6 places to the left by dividing the result by 1,000,000. This gives us the exact voltage going into the ADC and lets us obtain the temperature from that value as well. The count, temperature and ADC voltage can be displayed on an optional 2x16 Serial LCD which is also useful for setting the temperatures used in the case statement for each color.

Try This:

You don't need 5 color values for the ranges, if you want to simplify the output you can choose to use three instead. Simply remove the "yellow" and "orange" sections in the code (see below image).



Remember that if you remove colors in the project (or add in colors, if you'd prefer), you need to adjust the temperature ranges for "blue", "green" and "red" so that there are no gaps or overlaps in the range (0..65, 66..67, etc).

In other words, you don't want to have the "blue" range end at 65 and the "green" one begin at 65 or it will always use the first match it finds. Likewise if "blue" ends at 65 and the next color begins at 67 when the temperature is 66 the case statement will use the "other" range and set the LED to black, which effectively turns it off.

This project could also be modified to be used as a water-temperature sensor. If you externally connect the temperature sensor so that it could be submerged or connected to a probe (being careful not to directly expose your Activity Board to water, or any of its connected components/power source to water), you could record and display temperatures for bathtubs or pool water, or even for solid surfaces. See the LM34 data sheet for operating temperature limits, and the application notes in the datasheet for details on attaching probes. Depending on the length of your probe you may need to add a capacitor to your circuit.