Nellcor SpO2 Sensor Spin Demo

Please Note: This product is not sold by Parallax. This demo was created to support the 2013 National microMedic Contest kits, which are no longer available.

The Nellcor SpO2 Sensor can be used in your project to detect pulse rate and blood oxygenation levels.

This quick example program simply reports the average value of ten raw ADC samples from the Propeller Board of Education's onboard ADC. The photodiode in the Nellcor SpO2 sensor, in this example, is in a voltage divider configuration. In order for the photodiode to act as a variable resistance in a voltage divider network, the resistance needs to be very high. I began seeing good results with a 4.7 mega ohm resistor, which is not included in the microMedic kit. However, an op-amp can be used to amplify the voltage generated by the photodiode. It is up to you to find a photodiode configuration that works best in your project.

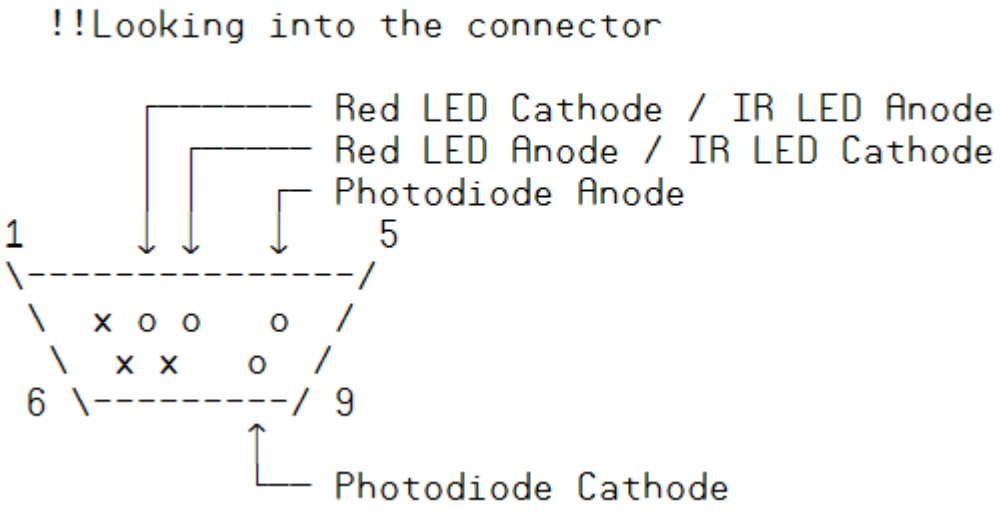
Demo Parts Required

(1) Propeller Board of Education
(1) Nellcor SpO2 Sensor
(1) Jumper Wires
(1) 4.7 mega-ohm resistor (not in kit)

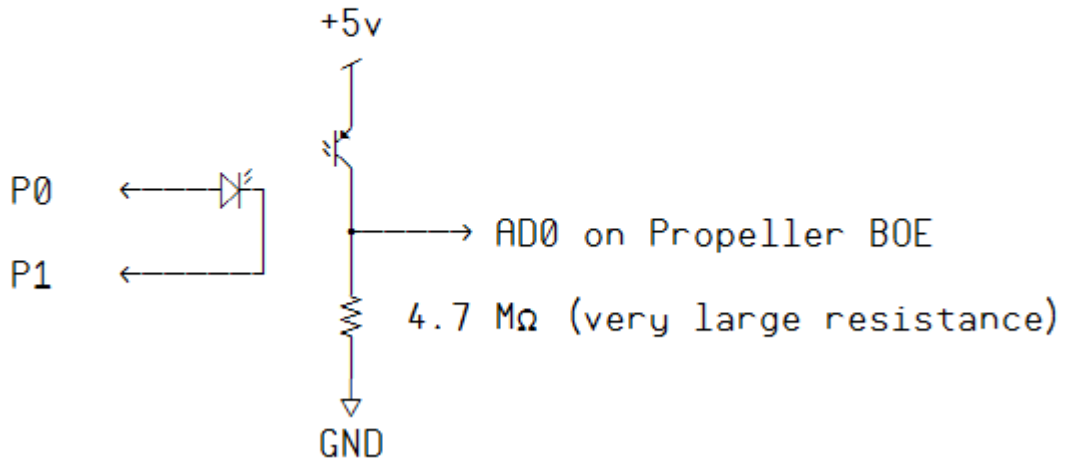
Connections

The connection diagram below shows how to connect the Propeller's I/O pins to the Nellcor SpO2 sensor. The connection diagram also shows you how to connect the temperature sensor to the Propeller Board of Education's ADC input. The diagram can also be found in the source code file "SpO2 DEMO.spin".

=== Nellcor SpO2 Sensor ===



=== SpO2 Sensor example ===

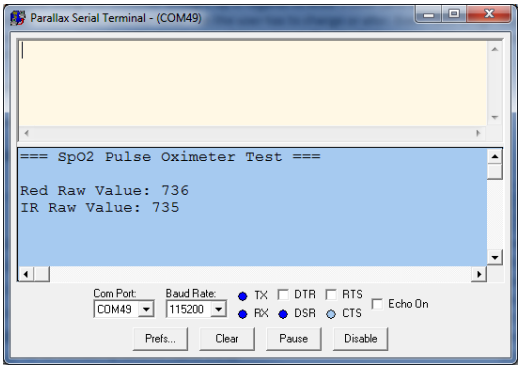


The Nellcor SpO2 sensor works by taking two sepate readings from the photodiode - one reading while the infrared LED is lit and the other while the red LED is lit. Heart rate can be determined by watching the peaks and valleys of the readings over time. When your heart beats, blood is pumped through your vascular system causing some light to be absorbed. The sensor is sensitive enough to measure the slight changes in light levels as blood moves through your finger. Blood oxygenation levels can be determined by looking at the difference in light received on the photodiode between the red and infrared LEDs.

Programming

Once you have correctly wired the SpO2 sensor to the Propeller's I/O pins on the Propeller Board of Education, download the demonstration program to the Propeller. To do this, open the "SpO2 DEMO.spin" source code file with the Propeller Tool. To download the program, click Run>>Compile Current>>Load RAM, or press the F10 key on your keyboard.

To see output on the Parallax Serial Terminal, open the Parallax Serial Terminal program, or press F12 on your keyboard. Then select the correct COM port and Baud Rate. The baud rate you select should match the PC_BAUD setting in the source code; the default baud rate in the source code is 115,200 baud.



The following is a photo of the output of the voltage divider network, which is fed to the input of the Propeller Board of Education's ADC. The rise and fall of the signal represents my pulse. Just after the peak, when the waveform falls – that is a single heartbeat. The voltage height of the signal represents the variation of the amount of light received by the photodiode when the infrared LED is lit versus when the red LED is lit. This ratio is the key to determining blood oxygenation levels. You will have to do some research to find this ratio and relate it to a blood oxygenation percentage.