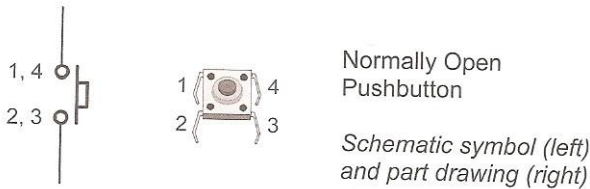# Iona Prep Robotics

Digital Control using a pushbutton [1]

Pushbuttons are ubiquitous, you see them everywhere. They are perhaps the most common way of controlling digital circuitry.

The diagram below shows the schematic symbol and a drawing of a normally open pushbutton.

Normally Open Pushbutton

*Schematic symbol (left) and part drawing (right)*

Note: Pins 1 and 4 are ALWAYS connected. Pins 2 and 3 are ALWAYS connected. When the button is pushed is when all four pins are connected.   Most pushbuttons have only 2 connections. Why does this particular button have 4? This particular button will be used on a breadboard, or perhaps soldered onto a printed circuit board. The extra buttons simply give mechanical strength. You need to connect wires to only two pins in order to make a working circuit.

You might want to control an LED by using the pushbutton. That is very simple. The schematic diagram is shown on the left below.   Another (and far more useful) application would be to use the button to control an input pin of the microcontroller. In that case the program would read the button and, based on the condition of the button, control the program. That schematic is on the right.
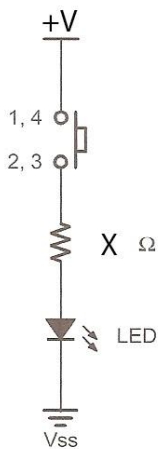
Schematic 1   Schematic 2

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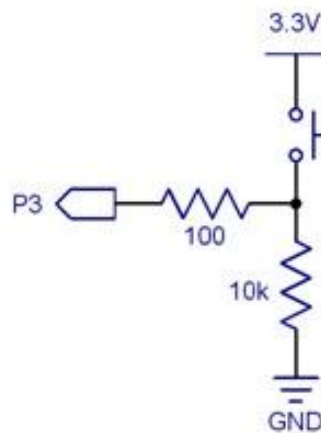
[1]   Virtually all the hardware used in this course is from Parallax, Inc. The illustrations on these pages are from "What is a Microcontroller", published by Parallax.
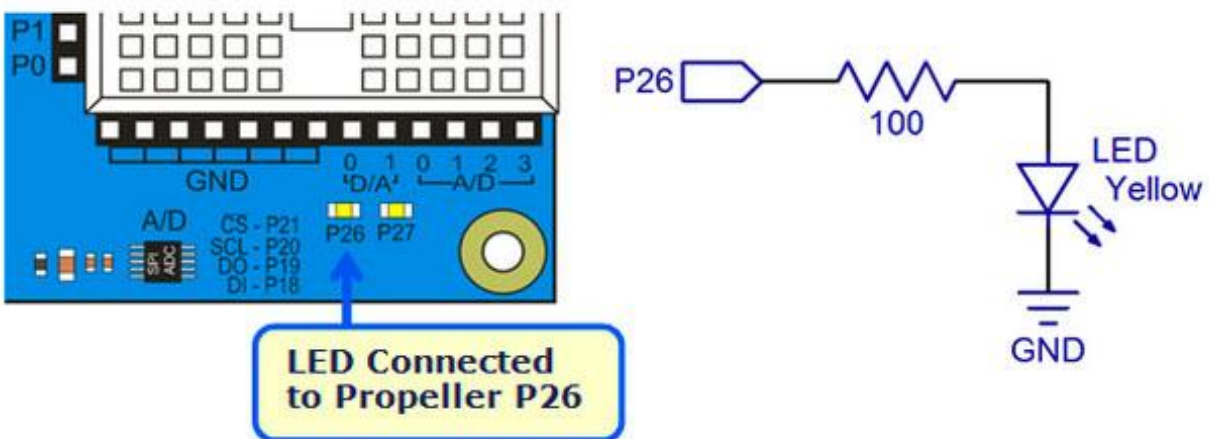
Assignment 1:

1. Use Schematic 1, a pushbutton, and a red LED. Assume +V is 3.3 volts, that Vf for the diode is 1.8V and we want a current of about 0.020A. Calculate resistance of resistor X.
2. Check with your teacher before actually constructing the circuit.
3. Verify that the power switch is in the off (0) position and then construct the circuit of Diagram 1 and verify that it works as expected.
4. Demonstrate the circuit for your teacher.

Using a pushbutton as an input to a microcontroller is a bit more complicated. You need to construct the circuit of Schematic 2, but in order for it to do anything, you must also write a program.

Assignment 2:

1. Verify that the power switch is off.
2. Construct the circuit of Schematic 2.
3. Have your teacher verify the circuit.
4. Write a C program which will read the input and print out on the terminal "The button is pushed" or "The button is not pushed". Have the program loop once each second, printing out the result each second.

Of course it would be more interesting to have the microcontroller actually control something, not just print out a message. But what will we control? The simplest thing might be to control an LED which is already present on the Activity Board and connected to pin 26. Below is a diagram and schematic.

LED Connected to Propeller P26

Assignment 3:

1. Write a program which will read the state of the pushbutton and will turn the LED connected to Pin 26 ON when the button is pushed and off when it is not pushed.
2. Modify the program so that it operates in reverse. Have it turn the light OFF when the button is pushed and ON when the button is NOT pushed.