

## ECE-231 Lab Assignment #8.2

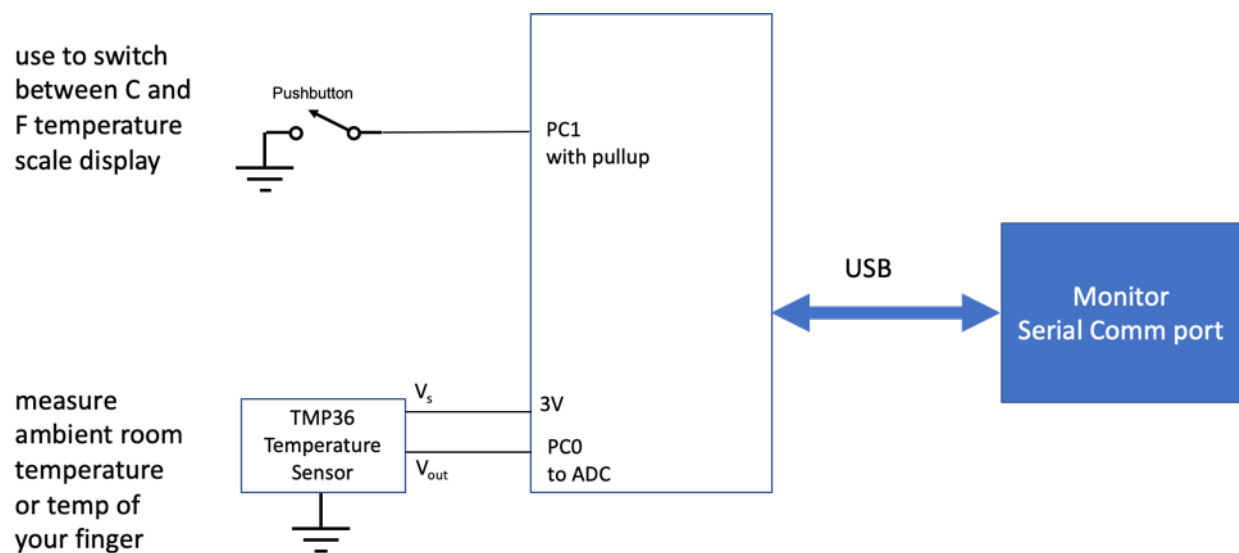
Due: 11:59 pm, Saturday 4/27/24

Version 1.2

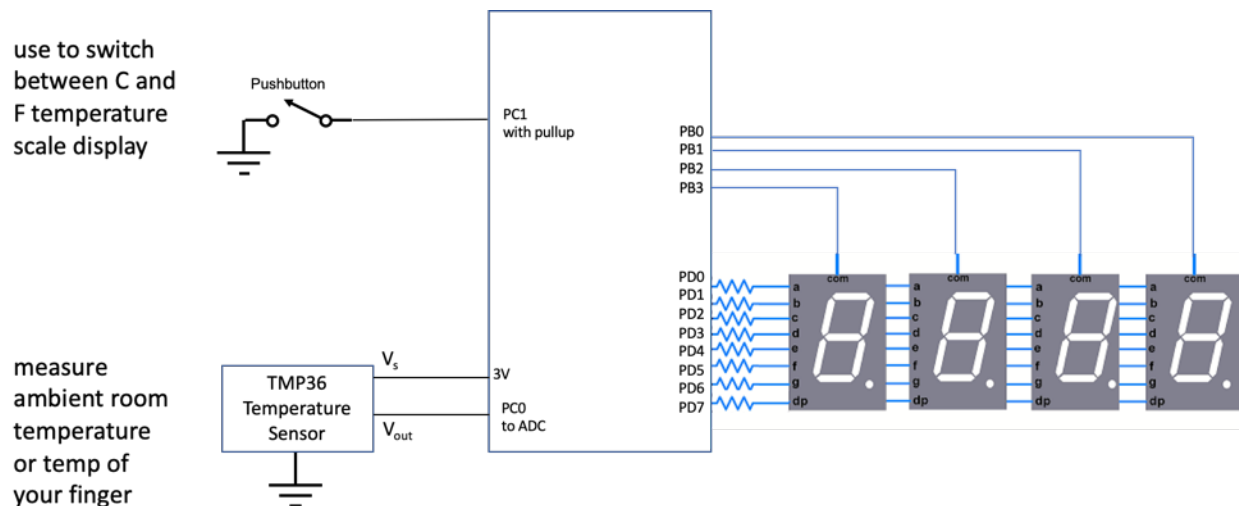
In this assignment, you will implement a digital thermometer that displays temperature in degrees F or degrees C based on the position of a push-button switch. This lab assignment has substantially more complexity than our lab 8.1 assignment, so start early.

This assignment is in two parts.

Part A. Display on temperature on a serial monitor via a comm port. (The specific port pins shown here are only for illustration. These are not necessarily the port pins you should use for your implementation.)



Part B. Display the temperature on the 4-digit, 7-segment display in your kit. (The specific port pins shown here are only for illustration. These are not necessarily the port pins you should use for your implementation.)



For both parts, use the following specification:

1. When a momentary push-button switch is pressed, display the temperature in degrees Celcius. When the button is not pressed, display the temperature in degrees Farenheit.
2. Display the temperature to 3 significant figures with a precision of 0.1 degrees, followed by the letter C or F. For example, with an ambient room temperature of 70.0 degrees F, or 21.1 degrees C, your display should read 70.0F or 21.1C, depending on the position of the pushbutton switch.
3. Your thermometer only needs to display temperatures in the range from 32.0F to 99.9F and 0C to 37.7C (This eliminates the need to display a - sign or add a 5th digit to the display.)

#### What to submit:

- Video showing functioning Part B system.
- Copy of your Part B source code.
- There is nothing to turn in for Part A.

Project components needed:

- TMP36 temp sensor
- 4 digit 7 segment display
- resistors (1kOhm resistors recommended)
- SPST switch
- jumper wires
- Arduino Uno
- 1 or 2 breadboards

### TMP36 Temperature Sensor

[Sparkfun TMP36 SEN-10988](#)

You can find the datasheet for this device at the Sparkfun URL. See figure 4 of the datasheet for the pin configuration. Note that a BOTTOM VIEW is given. The device only needs 3 wires:  $V_s$ , ground, and  $V_{out}$ . Connect  $V_s$  to either the 3.3 or 5V pin on your Arduino Uno, connect  $V_{out}$  to an analog input pin, PC0 - PC5. As noted in the datasheet, this device produces an output voltage of 750 mV at 25°C, increasing by 10 mV/°C.

### 7-Segment Display - 20 mm (White)

[Sparkfun 7-Segment Display COM-11408](#)

This device has four 7-segment (+ decimal point) common-cathode display digits. See the datasheet for the pin diagram. The recommended illumination strategy is to use 8 GPIO bits activate led segments A-G and the decimal point, and 4 GPIO bits to enable each digit in rapid sequence to take advantage of the retinal persistence effect.

This is version 1.2 of this document. Updated 4/10/24 by D. McLaughlin