

Lab Assignment #4

Overview

For this lab you will use the LPC1769's I2C subsystem to interface with a TC74A temperature sensor and an MCP23017 I/O expander to a switch and a dual-digit 7-segment LED display to display the resulting temperature in user selectable units (Celsius or Fahrenheit). The user should be able to toggle between the units each time the switch is pressed. The temperature should be displayed as a 2-digit integer (ignore temperatures above 99 F) and updated at least once per second. Note that the switch and 7-segment display interface to the I/O expander, not the LPC1769.

Additional requirements for 3 person teams

Include a second dual-digit 7-segment LED display and show a full 3 digit temperature (do not assume a 99 F maximum) as well as the currently selected unit (C or F).

What to demo

1. After starting your program, select Fahrenheit units.
2. With the temperature sensor exposed, your program should display the ambient room temperature (typically mid 70's F)
3. Hold the temperature sensor between your fingers. The displayed temperature should increase and then stabilize in the 80's or 90's F.
4. Select Celsius units and repeat steps 2 and 3. Your program should show the corresponding Celsius temperatures.

Things to consider when designing

- Determine a suitable value for the I2C bus pull-up resistors.
- Determine a suitable I2C clock frequency and show that the pull-up resistor value results in an I2C rise time that is much less than the I2C clock period.
- Determine the clock divider values needed in the I2CxSCLH and I2CxSCLL registers to achieve the selected I2C clock frequency.
- Determine an appropriate current limiting resistor value for the LEDs so that the I2C bus expander IC's current limits are not exceeded.

What to put in the report

1. The objectives of the lab assignment (essentially, the overview above, but in your own words)
2. The design of your solution (your design calculations, update if needed)
3. Details of your final solution
 - a. The hardware schematic
 - b. The software source code
4. The major (EE, CpE, or other) and individual contributions of each team member.

Due date

March 8th