

Due: October 24-30, 2017.

20 Points

Objective: Programming experience and realizing that small design decision can have big ramifications to your work load. Also, note that dividing the development into parts, can help make it more tractable.

In part 1 of this assignment, we created a time and temperature system. This required that we rewrite the SPI, so that it would not interfere with the LCD. Now we will want to extend this idea and make the system be able to turn on and off a cooling/heating system based on time and temperature.

Thus the system will need to do the following

- 1) Hold two temperature settings (of type float), one for daytime (from 7:00 to 21:00) and another for nighttime,
- 2) Allow the user to change each of these temperatures, with a precision of 0.5 degrees Fahrenheit
- 3) The temperatures need to be saved to EEPROM, so that they will be retained after a power loss. Attention should be given to not save the temperatures too frequently, so as to not damage the EEPROM.
- 4) Then if the temperature read from the thermocouple is five degrees above the set temperature, based on the time of day, turn on a blue LED. This blue LED will represent cooling, and should remain on until the temperature drops below the set point.
In a similar fashion if the temperature drops five degrees below the set point, turn on a red LED, to represent heating. This LED will stay on until the temperature reach the set temperature again.

It should be noted that actual thermostats have a much smaller temperature range. But having this wider range will simplify testing in the lab.

Three questions will need to be addressed by you in your design, 1) Which pins will you use to drive the LED's? (Purely a personal decision) and 2) How will you display the time, and the current temperature, and the day and night temperatures, and 3) How to indicate the state of the system (running or setting one of the parameters)?

Grading: The demonstration of the program will be the most important. The features are weighted as follows.

- 1) Day and Night temperature displayed and changeable (4 points)
- 2) The two temperature settings stored to EEPROM and Retained on restart. (4 points)
- 3) Temperature Control properly functioning (4 points)

Submission of a report, documenting the program, the hardware (LED hook up and thermocouple) and a basic description of the testing used to verify the program. (8 points)