Birzeit University - Faculty of Engineering and Technology
Electrical & Computer Engineering Department - ENCS4330
Real-Time Applications & Embedded Systems - 2^{nd} semester - 2020/21

Project #4
16F877A PICMicro programming under MPLAB
Due: June 19, 2021

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Maternity hospital simulation

We would like to build a firmware for a 16F877A PIC microcontroller that monitors 16 incubators in a maternity hospital. Each incubator returns 2 signals, one analog and one digital:

- The digital signal is the baby heart beat. The allowed value is normal (OFF or 0 which means the heart beat is within acceptable range) or abnormal (ON or 1 which means the heart beat is too low or too high).
- The analog signal is the baby body temperature. The normal range is between 36° and 37.5°.

When any of the above signals is out of range or abnormal, a buzzer should be put ON to draw attention and the incubator number should start blinking on the first row of a 16×2 LCD screen while the second row displays the reason of the alarm situation (either heart beat problem or temperature out of range problem).

If more than one incubator is experiencing an abnormal situation at the same time, the LCD should display the abnormal situations for all incubators one at a time every second.

A push button is also attached to the controller to reset the alarm and turn OFF the buzzer when clicked (assuming the issue has been resolved).

Since you have too many input/output signals than you have pins on the microcontroller to use, you need to use a 32×1 multiplexer. The output of the multiplexer should be taken as input to the microcontroller while 5 pins of the microcontroller should be used as outputs to the multiplexer selection lines. The input lines of the multiplexer come from the incubators (two inputs from each incubator).

What you should do

- Build the controller and interface it to the 16×2 LCD, the multiplexer, the buzzer and the push button. Remember to add a 4MHZ oscillator and a 4.7KΩ pullup resistor to the MCLR pin. Take a picture of the design that you'll do on paper.
- Build the PIC assembly code that implements the behavior described above under MPLAB IDE.
- Assemble your code and make sure you get a successful build. Use the simulator if you wish to make sure the behavior is correct.
- Send the zipped folder that contains your source code and the design picture before the deadline. If the deadline is reached and you are still having problems with your code, just send it as is!