EGR326 Prelab 5

Keeping date and time using a Real Time Clock (RTC) peripheral

This week we will be exploring how to use the DS3231 RTC and how to interface it with the MSP432 over the I2C communication bus using a MSP432 eUSCI peripheral. Your lab/project kit contains the DS3231 on a breakout board and a Li cell battery that you will use for lab this week and later to prototype for the design project.

To prepare for this week’s lab:

1. Download and study the datasheet for the DS3231 IC and the schematic for the ZS-042 breakout board (a copy can be found in the Data Sheets folder in Course Documents).

2. **Before** you plug the Li coin cell battery into your RTC breakout board, you need to **disable the charging circuit** as described in the following link for a camper control:

https://campercontrol.org/step-1-assembling-control-box/modifying-rtc-module/.

**After you have completed this step, plug the battery into the holder on the board.**

3. Provide a description in your notebook for why a charging circuit was included on this board and why you should disable it before using the provided battery.

Perhaps the simplest method is to cut a trace on the breakout PCB as suggested in the blog, that way you can solder a jumper back over the cut if you want to restore this part of the circuit.

4. Describe the features of the DS3231 and how it can be used to supply time and date information to a program running on the microcontroller. Include a copy of the schematic diagram in your notebook. Show how it will connect to pins on the MSP432.

5. Download and read the lab 5 exercise document.

6. You will write a program to communicate with the DS3231 RTC IC using the I2C protocol implemented by the MSP432 on-chip hardware peripheral. This hardware peripheral handles the bus timing and control necessary to establish communication between the microcontroller and RTC.

7. There are many sources of code for the MSP432 eUSCI interface including some example code discussed in lecture from Mizidi’s book. You may adapt existing code, however, you must provide attribution to all code that is not yours (in the comments, identify the source of your code and author’s name). Also, you must understand in all detail how the code works (expect to be tested on this with questions in lab, on quizzes and the final).

8. To prepare for lab this week, write C routines that will do the following:

a. Write code to initialize the eUSCI interface in I2C mode on the MSP432 (refer to the Technical Reference manual for details)

b. Create a schematic showing all the connections from the MSP to the RTC module

c. In your notebook, describe in a flow diagram the sequence of events that take place when your program requests the time and date from the RTC over the I2C interface.

This design and program will be an important component of your term project design.