University of North Texas, College of Engineering
Department of Electrical Engineering

EENG 3910: Project V - Digital Signal Processing System Design

Assignment 2

Lab Session: Monday, 02/01/2016
Due: Monday, 02/08/2016

Student Name: _____

Important:

- Please create a new assignment folder in your working directory for each assignment, and a new problem folder in the assignment folder for each problem.
- Please backup your files in your own USB drive or your own network drive at the end of each class because the workbench computers may be reimaged without prior notice.

Problem 1. Blink LEDs with Timer0.

- Follow the Getting Started document "Getting_Started_CCS6.pdf" to create a new CCS project for Tiva C Series LaunchPad. You may name the new CCS project as Lab2_1.
- Delete the "main.c" file if you have generated that file automatically when you were creating your new CCS project.
- Copy the source code file "Lab2_1_main.c" into your project folder.
- Build, load, and run your project on Tiva LaunchPad.
- Observe the LED blinking pattern on LaunchPad. Explain the code line-by-line. The references that you will need to read are listed on the page titled Programming Resources in the lecture note. You will need to develop a habit of keeping those references handy and look up information frequently from those files. What you need to explain in your report include what the code in that line does, where the function is defined, what is the definition of the function, what are the input parameters, why the parameters are given the values as in the source code.
- Stop debugging so your CCS returns back to the CCS Edit perspective.
- Turn off your LaunchPad by switching the power switch to the Device position.
- Connect wires to each of the header pin PF2 and the pin GND. Connect an oscilloscope to the wires to measure the signal between PF2 and GND pins.
- Turn on the power to LaunchPad again. Show and describe the signal waveform that you have captured from oscilloscope. Determine the frequency of the signal. With reference to the LaunchPad schematic, explain the interfacing circuit at the PF2 pin.
- Compute the value for TIMER0_FREQ in your source code to change frequency of the signal to 1Hz, 2Hz, 5Hz, and 10 Hz, respectively. Explain your computation and show your captured signals.

Problem 2. Blink LEDs with SysTick timer.

- Follow "Getting_Started_CCS6.pdf" to create a new CCS project with the name of Lab2_2.
- Delete "main.c" if you have generated the file automatically.
- Copy the source code "Lab2_2_main.c" into your project folder.
- Build, load, and run your project on LaunchPad.
- Explain the code line-by-line in your report.
- Measure the signal between PF3 and GND pins using oscilloscope.

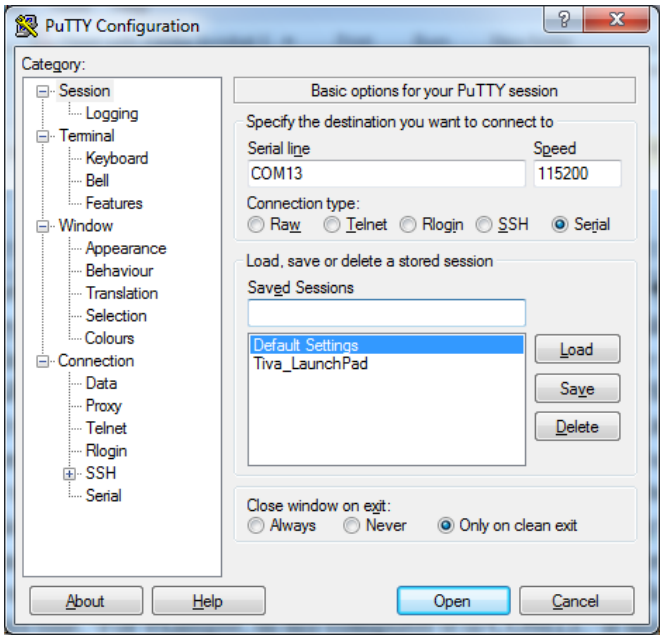
- Change the value of TIMER0_FREQ in the source code according to the table below, then measure the signal frequency from oscilloscope to fill in the table below:

TIMER0_FREQ	10	8	5	2	1
Signal frequency					

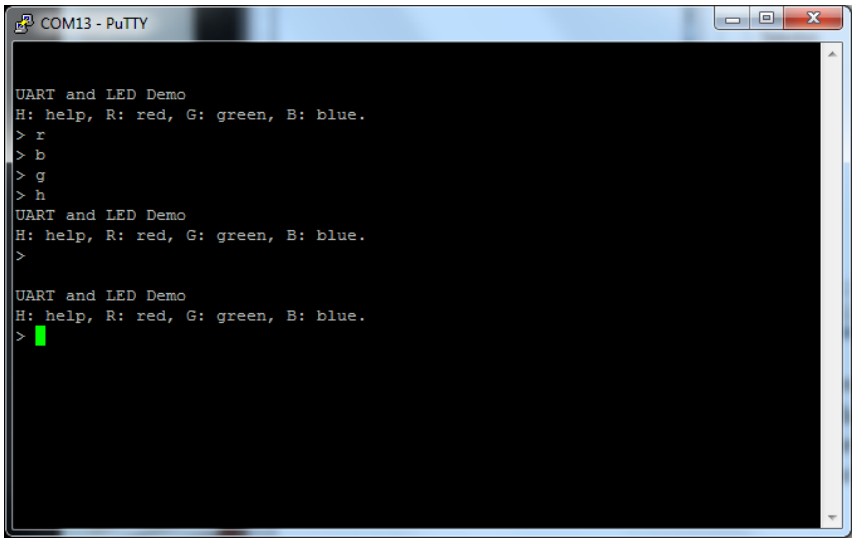
- Explain the results in the table above. What is the smallest signal frequency that you can generate correctly using the SysTick timer?

Problem 3. Serial communication with UART.

- Follow "Getting_Started_CCS6.pdf" to create a new CCS project with the name of Lab2_3.
- Delete "main.c" if you have generated the file automatically.
- Copy the source code "Lab2_3_main.c" into your project folder.
- Define a new pre-defined name "UART_BUFFERED" in the same way as you defined the name "PART_TM4C123GH6PM" (see Getting_started_CCS6.pdf for detailed steps).
- Add the file "uartstdio.c" from the folder location "<TIVAWARE_INSTALL>\utils\" to the project. When you add the file, use the "Link to files" option, instead of the "Copy files" option, in the same way as you included the "driverlib.lib" file (see Getting_started_CCS6.pdf for detailed steps).
- Make sure your LaunchPad is properly connected to PC, then turn on the power on LaunchPad.
- Launch the Windows 7 Control Panel. Select Device Manager – Ports (COM & LPT). Look for the line showing "Stellaris Virtual Serial Port (COM#)". Write down the COM port name that is shown in this line. For example, in my computer it is COM13. It might be a different number in your case. Your Stellaris Virtual Serial Port is COM____.
- Lauch the software PuTTY. Enter the following as shown in the image, Connection type: Serial, Serial line: COM13 (which should be your COM port number), Speed: 115200. Click the Open button.



- In CCS, build, load, and run your project on LaunchPad.
- Bring up the PuTTY window that you just opened, then type on the keyboard “Enter”, “h”, “r”, “b”, “g”. Observe the display on the PuTTY window, and the changes in LEDs on LaunchPad.



- Explain the code line-by-line in your report.
- Once the UART communication is working as described in this problem, you can simply use the following line in your code to display any messages on PuTTY terminal window to help you with the debugging of your code:
  UARTprintf(“You can have any text that you want to display on the terminal!”);
  The function “UARTprintf” works very similar to the standarad C function “printf”. Please look into the document “SW-TM4C-UTILS-UG-2.1.1.71.pdf”, Chapter 20 to learn how to use this function properly.

Problem 4

- Read the following documents:
  “SW-TM4C-DRL-UG-2.1.1.71.pdf”, Chapters 18, 29, 30, 31
  “SW-TM4C-UTILS-UG-2.1.1.71.pdf”, Chapter 20
  “tm4c123gh6pm.pdf”, Chapter 2
- Briefly summarize what you have learned from reading each one of the documents listed above.

Assignment Deliverables:

- Compile your report with pictures, plots, and the codes that you have written or modified.
- Explain in detail what you have done, why you have done in that way, and what you have learnt. Follow the report format outlined in the Introduction lecture notes.
- Email your report and source codes for grading. For source code submission, you will need to zip your working directory and send the zipped file to your TA at VeenaChidurala@my.unt.edu.
- Printout of your source code should be attached to your lab report as appendix. If your source code goes beyond two pages, please only print the part of the source code where you have newly written or modified.