ECGR4101/5101, Fall 2009: Lab 5
Serial I/O with queues

Learning Objectives

You are to write a program that runs on your QSK62P board that transmits and receives serial data.

Laboratory Assignments

In this lab you will be performing serial communications with queuing. This lab will use the on-board UART to communicate between your board and a PC. The LED's will be used for signaling and the LCD can be used to display debugging information. This lab must be demonstrated to the TA using a PC to generate test data.

Your board will be expected to listen for several different command strings. All valid commands will be transmitted in mixed case. The commands that are valid are "No LEDs!", "One LED!", "Two LEDs!", and "Three LEDs!" and light up the appropriate number of LEDs. All other strings should be considered invalid and ignored.

1. The program must rely on interrupts.
2. If a string is received it should be checked for validity.
3. If the command string is valid the program should act accordingly, and return an acknowledgement. Invalid strings should be rejected.

Requirements

Req. 1.   The code generated is written in C for the QSK62P or QSK62P Plus.
Req. 2.   The code is well commented and easy to follow.
Req. 3.   You may not use the BNS functions.
Req. 4.   You do not need to use the LCD, but it may be helpful while you debug your code. Note that the LCD code will negatively add to the code size, which will reduce your score.
Req. 5.   The serial communications should operate at 4800 baud, even parity, 8 data bits, one stop bit.
Req. 6.   The student board will be connected via the RS-232C port transmit, receive, and ground pins to a PC.
Req. 7.   The student board will use interrupts to wait for a character to be sent from the PC HyperTerm program. Received characters will be put in a receive character queue.
Req. 8.   The student board will not process the queue until either the "!" character is received or the queue is full.
Req. 9.   Processing the queue MUST NOT occur in the ISR.
Req. 10.   If "No LEDs!" is received from the PC, then all of the LEDs should be turned off.
Req. 11.   If "One LED!" is received from the PC, then one of the LEDs should be turned on.
Req. 12.   If "Two LEDs!" is received from the PC, then two of the LEDs should be turned on.
Req. 13.   If "Three LEDs!" is received from the PC, then all three of the LEDs should be turned on.
Req. 14.   If the command received by a student board is valid the program should return an acknowledgement with the characters "No LEDs on" or "One LED on" or "Two LEDs on" or "Three LEDs on", depending on the request.
Req. 15.   If the command received is not valid the program should return the not-acknowledgement string "Bad input".

Req. 16.   Each string sent to the PC must use a queue and interrupts. Each string must end with a
             CR and LF.
Req. 17.   The code should be as compact as possible. Lab scores will be based on the size of the
             compiled object file. Smaller compiled code will result in a better score.

Test Procedure

Note: Hand the lab checkout sheet to the TA when you demonstrate your program. You will turn
in your code and report electronically.

Note: These procedures do not have to be run in order of 1, 2, 3.

Procedure 1: From the PC send "No LEDs!", "One LED!", "Two LEDs!", "Three LEDs!" Verify
LEDs and responses to the PC.

Procedure 2: From the PC send "Three LEDs!", "Two LEDs!", "One LED!", "No LEDs!".
Verify LEDs and responses to the PC.

Procedure 3: From the PC send "Silly!", "One LED Two LEDs!", "One LEDs!!", "One LED Two
LEDs Three LEDs No LEDs" and a special test string. Verify LED did not change and all
responses to the PC show invalid.

Lab Report

Include in your lab report observations and procedure like the following:
> *The general learning objectives of this lab were . . .*
> *The general steps needed to complete this lab were . . .*
> *Some detailed steps to complete this lab were . . . .*
> *1. Step one*
> *2. Step two*
> *3.   . . . .*
> *Some important observations while completing/testing this lab were . . .*
> *In this lab we learned . . . .*

Create a single pdf containing:
1. Your lab report
2. Your code (no need to include the sect30.inc, ncrt0.a30, LCD, or any .h files). Include all c
   files that have code that you wrote (but if you are smart, this should be one small file so that
   the code size is small). Ensure you use an 8 or 9 courier font so that most lines of code take
   one line of text.
3. The full map file.). Ensure you use an 8 or 9 courier font so that most lines take one line of
   text.

Upload this pdf to moodle. Name the file xxxxxxx_yyyyyyy_lab5.pdf, where xxxxxxx is the last
name of one lab partner, and yyyyyyy is the last name of the other lab partner.

**FAILURE TO FOLLOW THESE SIMPLE INSTRUCTIONS COULD RESULT IN THE
LOSS OF POINTS.**