

EECE 544: Digital Systems Design
Lab 7
UART

1. Pre-Lab

- Download, unzip, open, compile and run **UART_Lab7** into your computer.
- Read section 8.2 in your book.
- Study the functions provided in UART.c
- Finish Part 1 before coming to class.

2. Objective

The objective of this lab is to learn how UART works using blind cycle synchronization.

3. Overview

You will be building a serial communication line between two microcontrollers in a full duplex setting. Each team will develop a sender/receiver system and test it using one microcontroller. Once you finish debugging your system, two teams can get together and test the functionality using two microcontrollers. One team will be the sender the other will be the receiver.

4. Function Description

The system will be reading of the on-board switches, SW1 and SW2. If SW1 is pressed, the sender computer will turn on the Blue LED and transmit the letter “b” to the receiver computer. Once the receiver receives “b”, it should display “BLUE” on the LCD. If SW2 is pressed, the sender computer will turn on the Red LED and transmit “r” to the receiver. Similarly, the receiver will display “RED” on the LED.

5. Procedure

Part 1: Port F initialization

Initialize portF to use SW1, SW2, and the red and blue LEDs.

Part 2: UART Initializations

1. Write a function UART_Init to initialize UART as follows:
 - (i) Initialize PORTC to use UART1 on PC4 and PC5
 - (ii) Initialize the UART Baud rate at 115200 bits/sec. Assume your bus frequency is 50MHz.
 - (iii) Enable FIFO, Tx and Rx on the LCRH register
2. Write a function UART_InChar_NB to check if there is data in the Receiver FIFO. If there is data, the function will return one byte, if no data the function will return 0. This synchronization is called non-blocking since the receiver doesn't enter a loop waiting for data to be received.

Part 3: Main Function

Write a main program to perform the following functions:

1. Initialize LCD and PortF.
2. Initialize PLL to run your system at 50MHz.
3. Initialize UART and SysTick.
4. Enter an infinite while loop to do the following:
 - a. Read SW1 and SW2.
 - b. Check if either switch is pressed and perform the required actions.
5. Check to see if there is input in the receive FIFO and perform the required actions as described above.
6. Wait for 30ms between iterations to overcome switch bounce.

6. Demonstration

When demonstrating the program, you are expected to explain each line of code if asked. Each student in a team will be asked a different question to demonstrate his or her understanding of the project at hand.

7. Deliverables

No deliverables are required for this lab. To receive full credit, make sure to get signed off when you finish the lab.