PROJECT: UART

Preparation

You will need two LaunchPads and one push button. You will use a serial terminal application, such as tera term, Putty, realterm, etc., which can perform serial port communication on the PC.

Book Reading   Textbook Chapter 8, Sections 8.1, and 8.2

Reference Project   UART

Starter project   UART

Purpose

In this lab you will learn how to setup and use UART modules on two TM4C123 Launchpads to establish a communication system shown below: Computer serial terminal ↔ MCU_1 ↔ MCU_2. The system will work on one of the three different modes. A menu will be provided on the PC serial terminal for a user to select a mode.
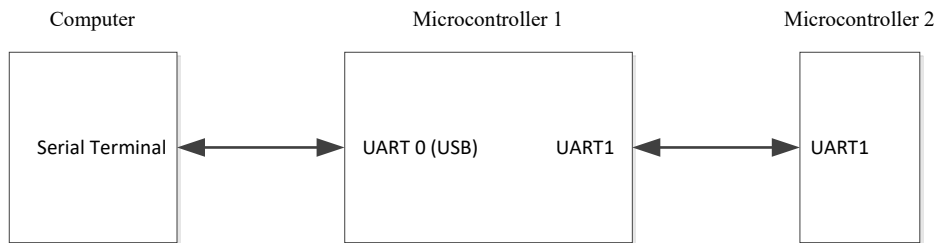
Project Requirements:

The system will start with outputting the following menu on a computer serial terminal and ask a user to select a communication mode:

Welcome to CECS 447 Project 2 – UART

Please choose a communication mode(type 1 or 2 or 3):

1. PC↔MCU_1 only

2. MCU_1↔MCU_2 LED Control

3. PC↔MCU_1↔MCU_2 Messenger

Communication mode descriptions:

1. PC↔MCU_1 only: In this mode, communication is done between a PC serial terminal and a microcontroller MCU_1. The PC terminal will prompt the user to type one of the following letters to control the LED on MCU_1: r(red), g(green), b(blue), p(purple), w(white), d(dark). After the user enter one of the above letter followed by return, MCU_1 should change its LEDs to the specified color. Once MCU_1 has updated its LED state, a confirmation message

will be sent back to the serial terminal. Example confirmation message when 'r' is sent: "Red LED is on".

2. MCU_1↔MCU_2 LED Control: when in this mode, communication will be between the two microcontrollers, MCU_1 and MCU_2, start with MCU_1.

   a. MCU_1 will turn on red LED.

   b. Press sw2 on MCU_1 will initiate the following communication: MCU_1 send current LED color information to MCU_2,

   c. After receiving the color information from MCU_1, MCU_2 will change its color to match MCU_1.

   d. After that, MCU_2 can use sw1 to change its color to the next one in a round robin order according to the following list: (r, g, b, p, w, d). It can either change it once or multiple times. After the color change, press sw2 will send the current color to MCU_1.

   e. Upon receiving the color information from MCU_1, MCU_1 will change its color to match MCU_2.

   f. After that, MCU_1 can use sw1 to change its color to the next one in a round robin order according to the following list: (r, g, b, p, w, d). It can either change it once or multiple times.

   g. As long the system stays in this mode, step b to f will be repeated.

3. PC↔MCU_1↔MCU_2 Messenger

   In this mode, one or more messages will be transferred among PC serial terminal, MCU_1, and MCU_2. The communication will start from the PC serial terminal. MCU_1 will start with green LED on. Here are the details:

   a. At the PC serial terminal, the user will be prompted to enter a message(a string of characters) and press return. Example: It's a beautiful day!.

   b. This message will be sent to MCU_1.

   c. After receiving this message, MCU_1 will forward the message to MCU_2.

   d. After receiving this message, MCU_2 will send an acknowledgement message back to MCU_1. Example: I received "It's a beautiful day!".

   e. MCU_1 will then forward the acknowledgement message to the PC serial terminal.

   f. The PC serial terminal will display the received message.

   g. As long as the system is in this mode, repeat steps a to f.

How to switch modes:

An external switch will be used to switch modes. It will be attached to MCU_1. When this switch is pressed, the system will finish current communication and go back to outputting the same options menu on the PC serial terminal for the user to select the next communication mode.

How to setup serial terminal:
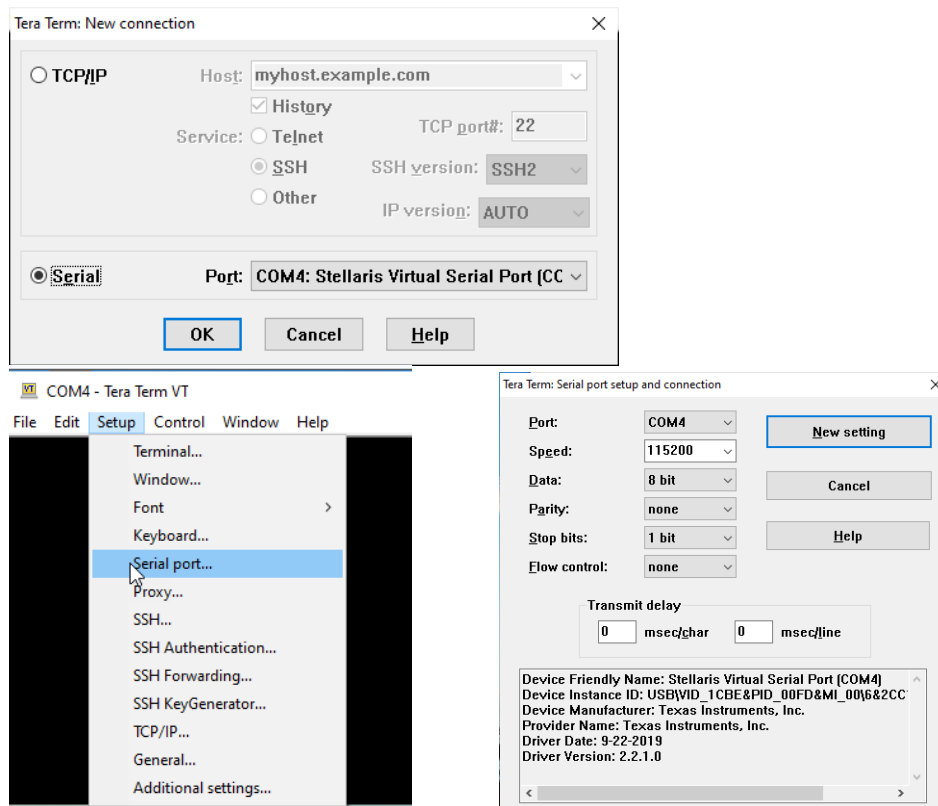
Deliverable:

1. Demonstrate all three modes on your embedded system.
2. Submit a video or a link to your video that records all the required operations of your embedded system.
3. Submit a project report: follow the project report template for report format. The following information needs to be included in your report:
   a. Software source code: use UARTmcu1.c and UARTmcu2.c for the two main programs.
   b. Hardware schematic and picture of your embedded system.