Exercise 2 - Serial Debugging

In this exercise, you will learn how to create a Keil µVision project, and then you will learn how to use the serial debugger.

Step 1 - Connect the serial-to-USB adapter

1. Open EAGLE, then from the menu, open Projects ece395_projects lpc_serial lpc_serial.sch
2. Notice the difference between this schematic and the schematic for lpc_blinky. This schematic shows a 'USB Serial' connector
3. Wire up the USB serial adapter by connecting Rx on the adapter to Tx on the LPC1114 and vice-versa. Also connect GND on the adapter to the common GND

Do NOT connect the 5V pin on the serial adapter to the breadboard's 5V power input! The serial adapter is powered through the USB port.

'Rx' stands for 'Receive' and 'Tx' stands for 'Transmit'. The Rx and Tx labels on a device are from the perspective of that device. Therefore, Tx of one device needs to be connected to Rx of the other device and vice versa.

4. Connect the USB serial adapter to the computer through the mini-USB cable

Step 2 - Create a new Keil project for serial debugging

1. Open Keil Vision through the Start menu
2. From the top menu bar, select Project New µVision Project...
3. A dialog box will open; browse to `C:\ECE395\serial` and then type the name of the project (serial). Then click **Save**.

![Create New Project dialog box](image1)

4. When asked to select a device, change the first drop down to 'Legacy Device Database [no RTE].' Then type 'LPC1114' in the search box and select **NXP LPC1114/102** from the results. Click **OK**.

![Select Device for Target Target 1](image2)
5. Click Yes when asked if you want to copy startup_lpc11xx.s to the Project folder.

6. Then from the left pane, right click on 'Target 1' and select Manage Project Items...
7. Under **Groups**, double-click on "Source Group 1" and rename it to 'Startup'. Then click on **Add Files**... and select 'system_LPC11xx.c'.

The Manage Project Items dialog should now look like this:
8. Create a new group named ‘Serial’ (using the button) and then add the files main.c, Serial.c and Retarget.c to this group.

9. Click OK to return to the main window. From the left pane, right click on ‘Target 1’ again, and select Options for Target ‘Target 1’
10. Go to the *Debug* tab and select the option button next to 'Use: ULINK2/ME Cortex Debugger'.

![Options for Target 'Target 1'](image)

11. Click *OK*
12. Build the project and program the microcontroller

**Step 3 - Open and configure PuTTY**

1. Open PuTTY from the Start menu
2. Open Device Manager and find the COM port for the serial device. In the screenshot shown below, this is COM4. The port may be different on your computer; use the port that is shown on your computer.

![Device Manager](image)

3. Return to PuTTY and configure the settings for the serial port. Use the COM port from your Device Manager, but configure the speed as shown below.

![PuTTY Configuration](image)

4. Click Open
5. Reset the microcontroller to run the program. The PuTTY terminal should start printing debug data from the microcontroller.