Middle East Technical University

Department of Computer Engineering

CENG 336
Introduction to Embedded Systems Development
Spring 2022
THE1.5 – Simulator Test

Due date: 12 April 2023 23:59

This `THE` will serve as an introductory THE, preparing you for the rest of the semester and ensuring that you are familiar with the tools now. Overall, you are expected to:

- have a working `MPLAB X IDE` (v5.45)

- install and run `PICSimLab`

- install and configure a serial emulator (`tty0tty`)

- have a workflow with all of the above

- test them with the supplied test code `SimTest.hex`,

1   Hand Out Instructions

Along with this homework text, you will receive a demo program `SimTest.hex` which you will use to get familiar with the tools listed above. Documents such as installation and user guides are available under the manuals topic on ODTUClass.

Any clarifications and revisions to the assignment will be posted on the ODTUClass discussion forum.

2   Testing the PICSimLab

If you are a Linux user, download and install PICSimLab and connect it to MPLAB X IDE according to the "PICSimLab Installation Guide", otherwise you can use the provided VM image. After installing the simulator, you will need to test it to ensure that all of its features you need for your THEs are functional. For this purpose, you will first upload the `SimTest.hex` file to the simulator and then test it following the steps detailed below. If you encounter any errors during programming or execution of demo program, please make sure to do the following:

- check whether you have completed all the steps described in the guideline

- record and explain the error(s) you encountered in your log file

- ask for help from TAs or via discussion forum

Start up MPLAB X IDE and create a new project that uses the options given in Figure 1.

Figure 1: New project settings in MPLAB X IDE

Your prebuilt project can be loaded to the PIC18F4620 by using the 'Debug Main Project' button. If you encounter any errors after clicking debug button, try to set the 'Connected Hardware Tool' under 'Project Properties' to 'PicsimLab'.

Important Notes:

- In order to use PICSimLab with MPLAB X IDE, 'Debug' button (on the simulator) should be pressed.

- You should set your Clock rate (MHz) to 10 MHz, i.e. it controls how "quickly" your simulation runs

Step 0:

First, there is a quick LCD test, your simulator should look like Figure 2. You do not have to do anything to move on from this step.

Step 1:

Next, the simulator will test the 7-Segment Display. You should see the message shown in Figure 3 and the 7-Segment Display will flash "8.8.8.8.". Again, just wait to move on to the next step.

Step 2:

In this step you will check the Analog to Digital Conversion (ADC) on the simulator. LCD screen is updated with the current analog ADC value (see Figure 4) obtained from the 'AN0' potentiometer placed at the right side of the LEDs. This value should be around 0
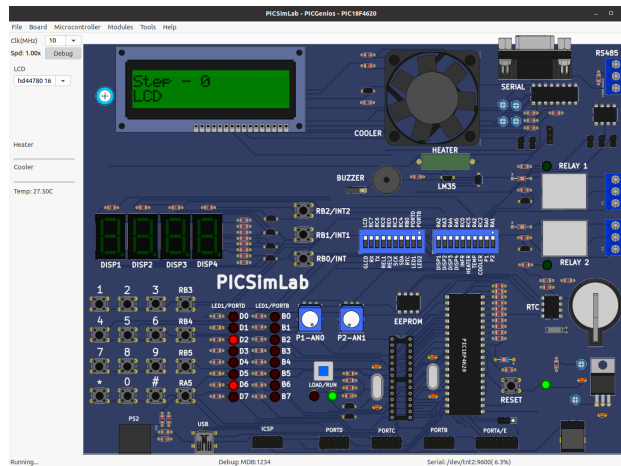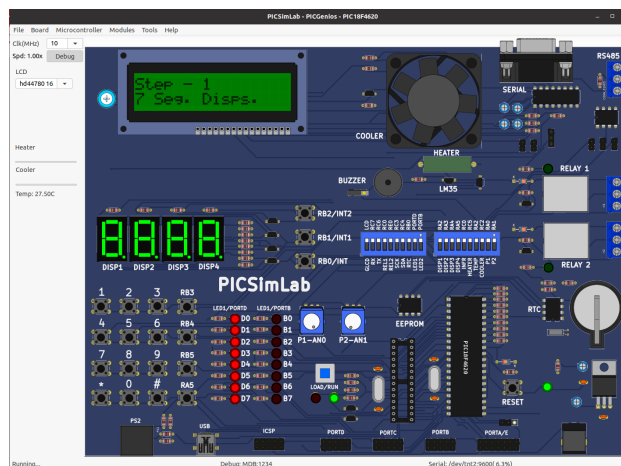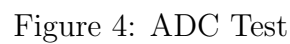
Figure 2: LCD Test

Figure 3: 7-Segment Display Test

and 1023 when you turn the ADC potentiometer to its leftmost and rightmost positions, respectively.

You have to turn the ADC potentiometer from its leftmost and rightmost positions and observe the acceptable range on the LCD to pass to the next step.

Figure 4: ADC Test

Step 3:

In this step, the program will flash all the LEDs (LED1/PORTD and PORTB array, see Figure 5). It is normal that RB0 will not blink. You need to wait the program to switch to Step-4.

Figure 5: LED Test

Step 4:
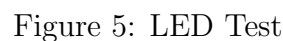
This step will test the buttons. During the test (Figure 6) you should press the buttons in sequence as they are prompted on the LCD screen. Press all the required buttons to
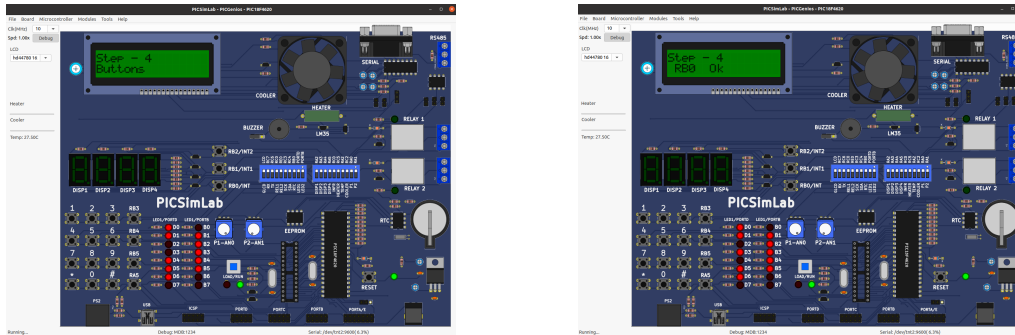
proceed to the next step.

Figure 6: Button Test

Step 5:

This step checks the serial communication with the simulator. You can start CuteCom from **Tools → Serial Terminal** in PICSimLab or start it from command line by using the `cutecom` command.

On the bottom right of the PICSimLab window, you should see the port the simulator is using (`dev/tnt2`). While configuring CuteCom, make sure that you select the complementary port (`dev/tnt3`) to establish the connection as explained here. Also, you need to set up your baudrate, data bits, parity and stop bits, correctly. During your test, you will use the settings given in Figure 7.
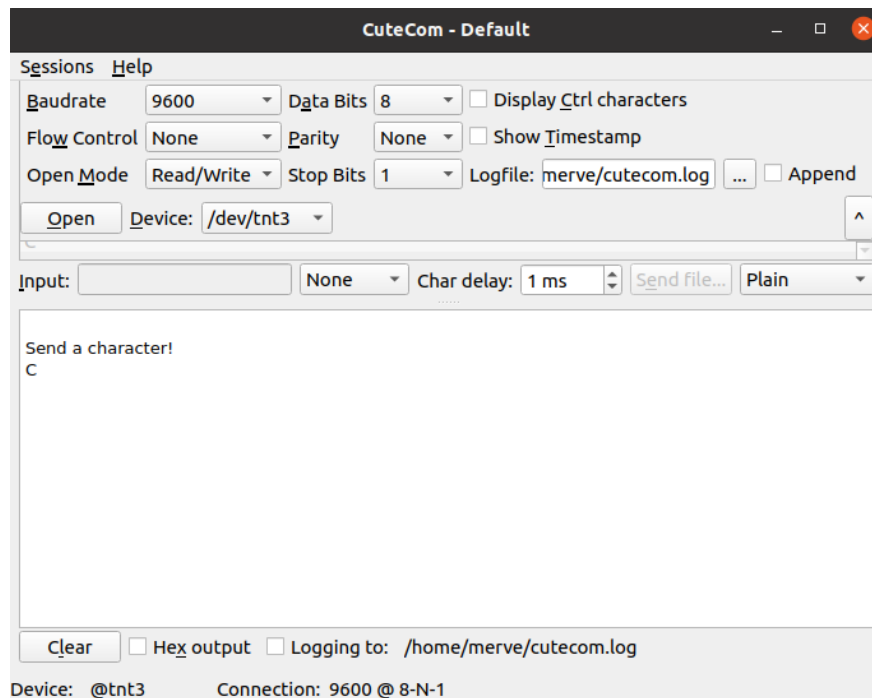

Figure 7: CuteCom Settings

When the program reaches to the state given in Figure 8, it sends "Send a character!" string through the serial port and you should see this string on CuteCom window. You will miss the prompt if you get the CuteCom up after reaching this step.
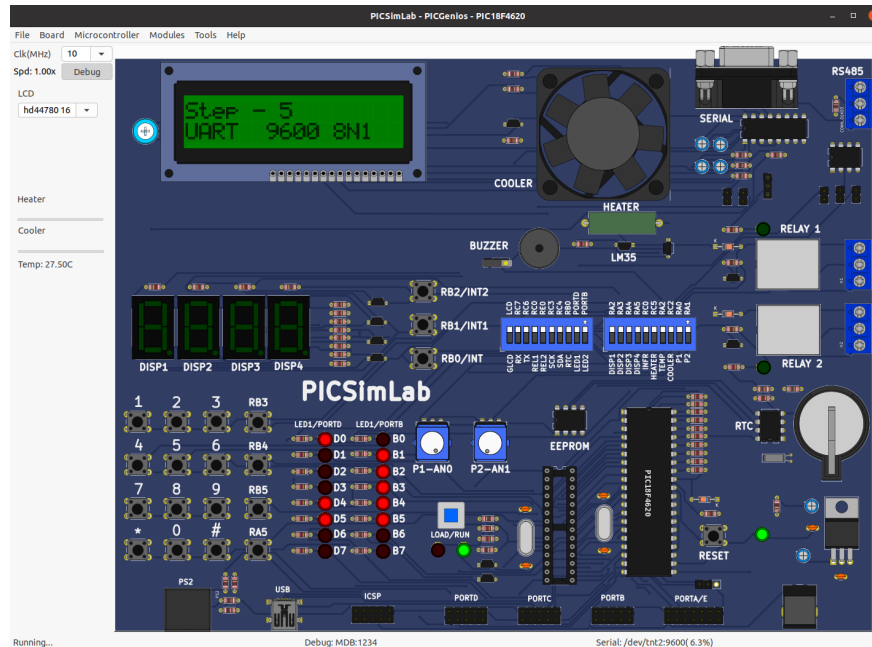

Figure 8: The microprocessor is waiting input through serial

Now, it waits a character to be sent over the serial port. When you type a character to input line of CuteCom and press enter, it should appear in the LCD screen and also in the CuteCom below the "Send a character!" string, since the character is sent back. (see Figure 9)
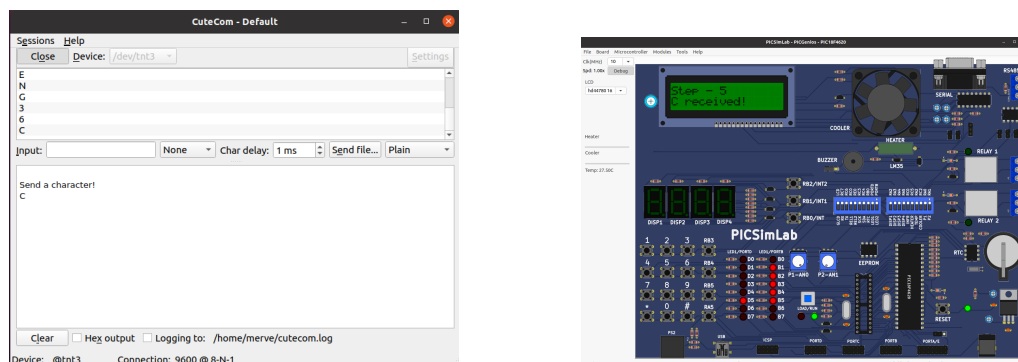

Figure 9: Character sent

If you come to this step and complete it successfully, it means that your simulator and serial emulator passed all the tests and ready to use! You can restart the test by pressing 'Reset' button, if you wish.

3 Hand In Instructions

We are expecting a short plaintext *journal/log* where you will note down:

- steps you have taken to setup your environment in your own words (a walkthrough for yourself if you had to start from scratch)

- configurations, tweaks or anything where you had to deviate from the given instructions