Assignment #1

Clock with Alarm and Serial/Bluetooth Control

Dr. Raed Alqadi

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In this assignment you will design and write the code for a Digital Clock the Interrupts, Serial, and LCD. We will control the Clock remotely by using the Serial or Bluetooth (UART and COM Ports)

Digital Clock:

We will design a simple Digital Clock that displays the time every 1 second. You can use One variable to keep the time in seconds or ***3 Variables***: **Seconds** (0 –59), **Minutes** (0 –59), and **Hours** (0—23). However even if you use one variable you will have to use three temporary variables for the Seconds, minute and hours. Use Timer 0 to create an Interrupt every 1 second. Increment the Seconds every interrupt (rollover on 60 and increment the minutes), increment the Minutes variable every minute (rollover on 60 and increment the hours). Rollover on the hours on 24.

- Use the Interrupt **INT0** to Enable and Disable locally enable/disable the Alarm locally. Pressing **INT0** will toggle the state of the Alarm from Enabled to disabled and Vice versa. Initially it is disabled.
- The Alarm state can also be enabled/disabled through serial commands as described later

Important Note: Do not display or read Analog Inputs in the Interrupt routines, do this in the main Loop.

LCD Display:

On the LCD Display, the followings in a Nice Format.

- Line 1: Display Current time
- Line 2: Display Alarm Time
- Line3: Display Alarm State (ON/)FF). Alarm ON or Alarm OFF
- Line 4: Display your first name and your partner's firs name

Serial Port

Use the **RX** Interrupt to receive the character of the commands of the Protocol explained below. Do not send back the response from the Interrupts. Do it in the Main Loop. Read the first character if it is not one of the starting characters in this table just ignore it. Make the Interrupt set a Flag and handle the command in the main loop when a complete to send back the result.

Use the Serial Terminal that comes with the simulator to send and receive the commands. It allows you to read and write a complete command before you press return. Run it from Tool->Serial Terminal. Use COM2 when you use COM1 for the simulator.

1. Time Read Comm

Read commands start with **[r** and end with **']'**

	Command	**Format**	**Value Read**
1	Read Time	**[rt]**	Reads the clock Time as string in the format ***hh:mm:ss*** ***Example : 03: 15:17***
1	Read Alarm	**[ra]**	Reads the Alarm Time as string. After the time display if Alam id ON of OFF as shown ***hh:mm:ss ON/OFF*** ***Examples:*** ***4:23:20 ON*** *if the Alarm is* ***ON*** ***4:23:20 OFF*** *if the Alarm is* ***OFF***

2. Write Commands

We will just implement simple Digital Set/Clear commands

Write commands start with **[w** or **[W** and end with **]**

Write commands have the following format: [**wx**dd] or [Wxdd]

Where:

x is h, m, s or a as shown in the table

d is a digit 0 – 9

	Command	Format	Examples	Notes
1	Write Clock Hours	[whdd]	[wh13] [wh05]	Hour field is 13 (1 PM) Hour field is 05 which is 5 (1 PM)
2	Write Clock Minutes	[wmdd]	[wm30] [wm08]	Minutes field is 30 Minute is 8
3	Write Clock Seconds	[wsdd]	[ws23] [ws 54]	Seconds field is 30 Seconds field is 54
1	Write Alarm Hours	[Whdd]	[wh13] [wh05]	Hour field is 13 (1 PM) Hour field is 05 which is 5 (1 PM)
2	Write Alarm Minutes	[Wmdd]	[wm30] [wm08]	Minutes field is 30 Minutes field is 8
3	Write Alarm Seconds	[Wsdd]	[ws23] [ws08]	Seconds field is 30 Seconds field is 54
3	Write Alarm Disable Alarm	[Wadd]	[Wa00] [Wa11]	Disables the alarm Enable alarm If dd is 00 disable alarm if dd is not 00(any other value) Enable the Alarm

Important Notes:

- Your code should be executed on the PicSimLab
- Test You commands through the Cute COM terminal that comes with the Simulator.
- You must Test your code also on an Android Phone (Not sure if the Crazy iPhone Bluetooth works).
- To be to do that you need to Activate Bluetooth on your computer and define a Com port on the bluetooth as Explained Below.

Use these steps To Activate Defined COM Ports on a PC

1.Open **Bluetooth Devices**

If using Windows 11, navigate:

Start>Settings>Bluetooth & devices>Devices >More Bluetooth settings

If using Windows 10, navigate: Right-click

Start >Control Panel.I n the search box, enter "Bluetooth" then select

Change Bluetooth settings

2.From the COM Ports tab, click **Add .**

3.Ensure that "Incoming (device initiates the connection)" is selected then click **OK**

4.Click **OK**

Bluetooth Serial Terminal:

- On your Android device download the Serial Bluetooth Terminal.
- Make sure you pair your phone with your pPC with the Bluetooth.
- Configure the PicsimLab to use the Bluetooth port that you added to your computer