Driver Project 5: Analog to Digital Conversion (Group Project)

Due Date: as per D2L

Assignment:

In this project, you will verify the working of the Microcontroller's ADC using the potentiometer connected to IO pin 8 (RA3). Design function uint16_t do_ADC(void) in source files ADC.c and ADC.h to perform the following tasks.

1. Perform Analog to Digital conversion on the analog voltage that the potentiometer induces on pin 8 (RA3) of the Microcontroller
2. Generate a bar graph display on a single line of the PC terminal. The width of the bar should change in proportion to the ADC's digital output value.
3. Displays the ADC's digital output value in Hex at the end of the bar graph on the PC terminal.
4. Returns the value of ADC's digital output to the calling function

Additional info:

- Implement the above controller using the hardware kit and your code, which will be designed using basic ANSI C commands; Microcontroller's ADC and prior driver functions provided/designed.
- Function names: ADC function should be named uint16_t do_ADC(void) and placed in source files ADC.c and ADC.h
- Display instructions: All displays on the PC terminal window should be on a single line. Note that display functions carried out at 32 kHz (300 Baud) can affect timer delays. Your code should account for such delays when producing displays on the PC terminal.

Note:

Port RA2 is one of those exceptional ports that is also multiplexed to the input for an external oscillator and an analog input port. To be able to use it as a digital input with a pushbutton, it's multiplexed analog input has to be disabled by including the following line of code in your IOinit() function.

```
AD1PCFG = 0xFFFF; // Turn all analog pins as digital
```

Deliverables:

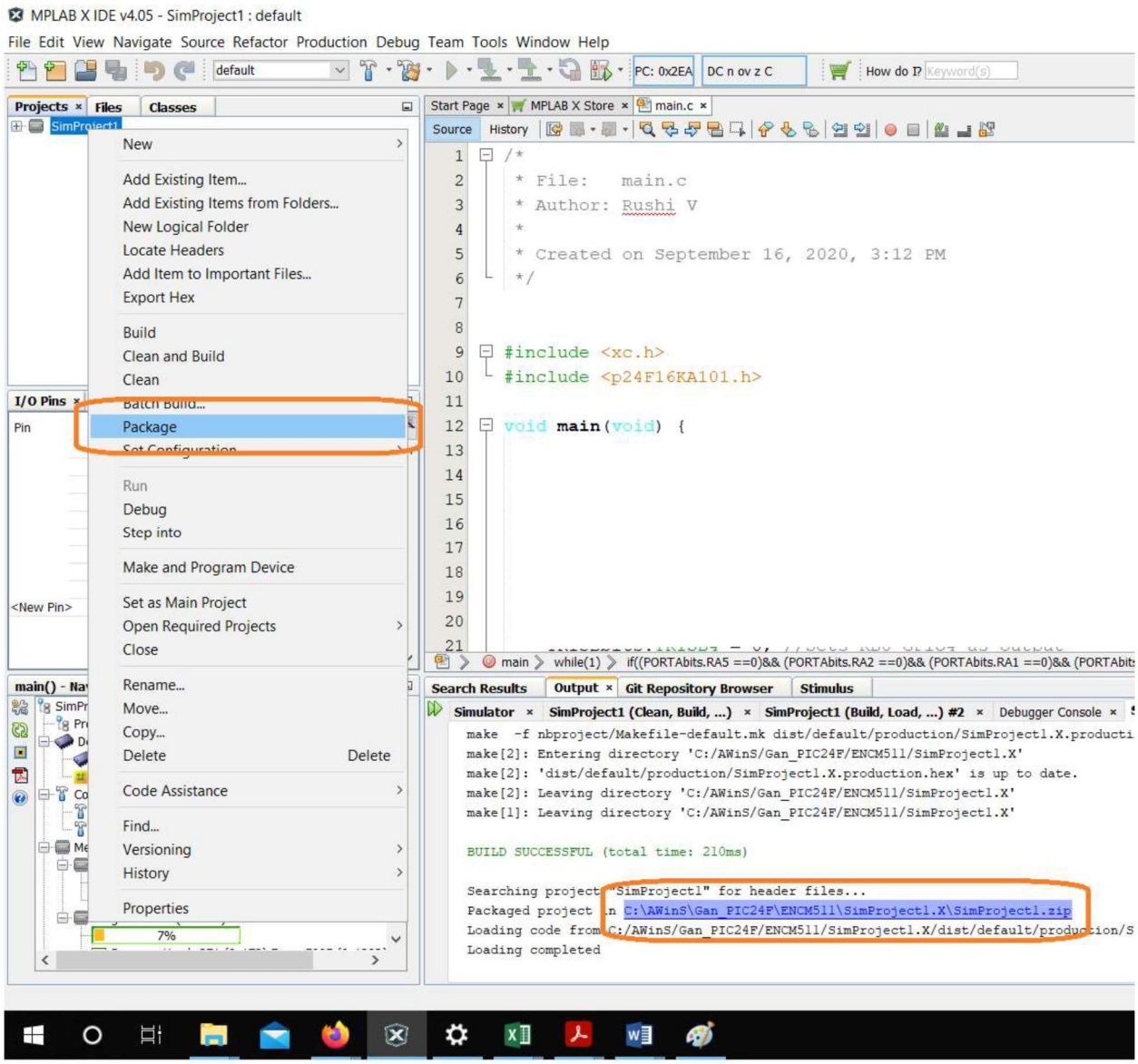
This is a group project. Each group should upload the following onto their respective group D2LDropbox folder created:

1. **Zipped up file of the project. MPLAB projects can be zipped up by right clicking on the project and selecting package (See screenshot below). The zipped project is saved in the same project folder created by user. Make sure your driver code is commented properly especially any mathematical computations used.**

2. **Link to your video demo uploaded on youtube, Vimeo or similar video hosting website along with the zipped up project. Dropbox or Google or OneDrive links are allowed as well but ensure that videos are in .mp4 or .mov format. Videos uploaded in any other format will lose points. Video demo should be as follows:**
    a. **Single recording no more than 2 mins long**
    b. **Show <u>UCID or government issued ID cards of all 3 group members</u> placed in front of the computer with MPLAB and/or hardware running**
    c. **Demo of the code and hardware operation showing the following:**
        i. **The potentiometer being turned from its minimal to its maximal resistance value**
        ii. **The bar graph width adjusting with respect to potentiometer's turn**
        iii. **ADC's digital output value in Hex displayed at the end of the bar graph**
    d. **Explanation of the code organization in MPLAB including any special power or time saving features (i.e. interrupts, clock switching, sleep/idle) used, and respective contribution of each group member towards code development and hardware/software testing.**

Grading rubric: (Total = 10 points)

- Correct setup and use of timers, IOs, UART, ADCs, interrupts and clock modules = 5
- Code optimization for better power savings and time resolution i.e clock switching, interrupts, sleep/idle modes for speedy message displays and power savings = 2
- Proper video and code upload format including commenting of all driver lines of code = 2
- Group participation = 1


MPLAB X IDE v4.05 - SimProject1 : default
File Edit View Navigate Source Refactor Production Debug Team Tools Window Help
Projects
Files
Classes
New
Add Existing Item...
Add Existing Items from Folders...
New Logical Folder
Locate Headers
Add Item to Important Files...
Export Hex
Build
Clean and Build
Clean
Package
Run
Debug
Step into
Make and Program Device
Set as Main Project
Open Required Projects
Close
Rename...
Move...
Copy...
Delete
Code Assistance
Find...
Versioning
History
Properties
I/O Pins
Pin
<New Pin>
Start Page
MPLAB X Store
main.c
Source
History
/*
* File: main.c
* Author: Rushi V
*
* Created on September 16, 2020, 3:12 PM
*/
#include <xc.h>
#include <p24F16KA101.h>
void main(void) {
Search Results
Output
Git Repository Browser
Stimulus
Simulator
SimProject1 (Clean, Build, ...)
SimProject1 (Build, Load, ...) #2
Debugger Console
make -f nbproject/Makefile-default.mk dist/default/production/SimProject1.X.producti
make[2]: Entering directory 'C:/AWinS/Gan_PIC24F/ENCM511/SimProject1.X'
make[2]: 'dist/default/production/SimProject1.X.production.hex' is up to date.
make[2]: Leaving directory 'C:/AWinS/Gan_PIC24F/ENCM511/SimProject1.X'
make[1]: Leaving directory 'C:/AWinS/Gan_PIC24F/ENCM511/SimProject1.X'
BUILD SUCCESSFUL (total time: 210ms)
Searching project "SimProject1" for header files...
Packaged project in C:\AWinS\Gan_PIC24F\ENCM511\SimProject1.X\SimProject1.zip
Loading code from C:/AWinS/Gan_PIC24F/ENCM511/SimProject1.X/dist/default/production/S
Loading completed