Driver Project 4: Analog to Digital Conversion (Group Project)

Due Date: 27 Nov 2021 at 4pm

Assignment:

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

- Perform Analog to Digital conversion on the analog voltage that the potentiometer induces on pin 8 of the Microcontroller after any pushbutton is pressed and released.
- For 10 seconds, store 1000 measurements in 1 second (ensure sample and hold correctly set up for this speed) and average the measurement before sending to the PC terminal.
- Generate a horizontal 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.
- Displays the ADC's digital output value in Hex at the end of the bar graph on the PC terminal.
- Returns the value of ADC's digital output to the calling function
- Return to idle until the button is pressed again. Button pushes during the 10 seconds are ignored.

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. **Provide a state diagram outlining your system.**

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.

Deliverables:

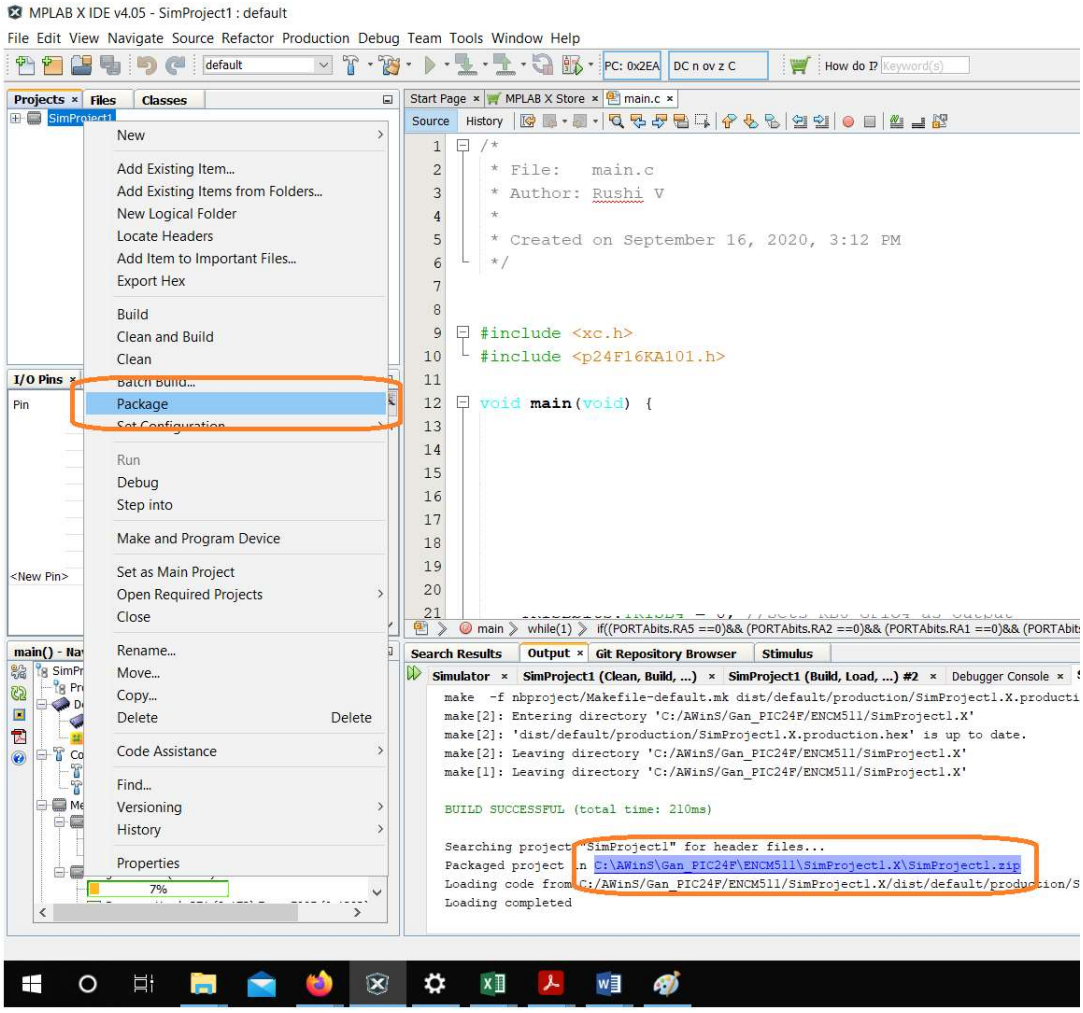
This is a group project. Each group should upload the following onto their respective group D2L-Dropbox folder created:

1. **Zipped up file of the MPLAB 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.
2. **A single pdf document** showing the following:
    a. Names and UCIDs of all students in the group at the top of the document
    b. A State diagram showing the working of your code. Use microcontroller-specific register and bit names wherever application in the state diagram. Include any formulas used to generate the bar graph from the ADC's output
    c. List of tasks performed by each group member

3. **Link to your video demo** uploaded on youtube, Vimeo or similar video hosting website along with the zipped up project. Include the link under description while uploading 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 a single recording and show the following
    a. UCID card of one group member placed in front of the computer with MPLAB and/or hardware running
    b. Demo of the code and hardware operation showing the bar graph and ADC output value on the PC terminal changing while adjusting the potentiometer.

Grading rubric: (Total = 10 points)

- Correct setup use and display of ADC's output on PC terminal = 5 points
- Correct, clear and stable implementation of bar graph on PC terminal = 2point
- Proper video and code upload format including commenting of all driver lines of code = 2 points
- 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
SimProject1
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
Batch Build...
Package
Set Configuration
Run
Debug
Step into
Make and Program Device
Set as Main Project
Open Required Projects
Close
Rename...
Move...
Copy...
Delete
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) {
main > while(1) > if((PORTAbits.RA5 ==0)&& (PORTAbits.RA2 ==0)&& (PORTAbits.RA1 ==0)&& (PORTAbit
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