User Manual

Welcome to COMP ENG 2D24 Microprocessor Interfacing User Guide. With our manual the user will be able to sample, analyze and conduct the data acquisition of various data. Before we begin, the user must ensure that they have the following available on their desktop or laptop; 3 USB Ports, MATLAB, CodeWarrior IDE Software, Pre-Conditioning Circuit, WaveForms Software, Windows OS, Esduino Xtreme, Jumper cables, USBDMLT and Analog Discovery Module. Once they have the following we can proceed by determining the serial COM port, in order to do this we will follow these procedures;

Right click on My Computer/This PC→Select Properties→click on Hardware Tab→click on Device Manger→right click on USB Serial Port→Select properties→Select Port settings→Click advanced and select a COM port (1,2,3,4) and click OK, ensure to note down this COM Port number as it will be used later.

ESDX Configurations

Now we can start building the device, first we will connect our Esduino Xtreme (ESDX), connect the USBDMLT to ESDX; ensure that the jumper is taken out and the red line from the wire is on top when plugged into ESDX and the USB into the PC. Also connect the micro USB into your PC and the other end to the ESDX's mircoUSB port. We can now connect a jumper cable from the 5V pin of ESDX into the positive terminal on the right side of the breadboard, another jumper from A5 pin into the output pin of the OP-Amp (refer to Fig. 7) and another jumper from the GND pin on ESDX into the negative terminal on the breadboard. Second, we will connect our Analog Discovery Module and connect the blue wire into the output pin of the OP-Amp, connect the yellow wire into the positive terminal on the left side of the breadboard and connect the black wire into ground. Now open WaveForms and select Wave generator and Scope from the menu. Under Wave Generator select sine wave, 50 Hz frequency and 2 V for amplitude. For Scope under channel 2 select range of 1 V/div. Now click on run for both.

CodeWarrior & MATLAB

We are now ready to start programming our microcontroller. Open the CodeWarrior IDE and open the provided code by clicking on file→open→CW_guptasr and press the green arrow to compile the code. Once it has compiled, press the green arrow again to run the program, a bright light should light up on the ESDX. We can now open MATLAB and open the provided code by clicking on file→open→PC_MATLAB_guptasr. Ensure to change the COM port used in this code with the COM port that was noted down before. We can now press the play button on MATLAB and wait for a window to pop up. Once the window pops up click on the start button, the user should see a smooth sinusoidal graph. Congratulations the user has successfully configured and programmed the micro controller to sample data from the input AC voltage and converting it into a digital value which is being displayed on MATLAB.

Next steps

The user can play around with the input frequency from WaveForms and even CodeWarrior by changing up the Baud Rate under the function SCI_Init( ) and using the formula provide below where baud divisor is any positive number. However, every time the baud rate is changed in CodeWarrior ensure the same baud rate is changed on MATLAB code. Enjoy!

$$\text{Baud Rate} = \frac{Bus\ Clock}{(16(Baud\ Divsor))}$$