

ECE 447 Lab Assignment #8: USB and I²C

Assigned week of 4/15/2015.

Due Dates:

A hardware demonstration of the assignment is due during your lab section 2 weeks after it is assigned . Zip all your code and submit it on Blackboard. Your code is due before 3:45pm the day of your hardware demonstration.

The lab report is due on Blackboard by 3:45pm the day following the hardware demonstration .

Objectives:

The student will learn to use the MSP430's USCI module to communicate with a barometric pressure sensor via I²C. The student will also become familiar with the USB protocol and the MSP430 USB interface.

Assignment:

In this lab, you will again build on your previous labs. You will keep all the measurements from your previous labs including humidity, temperature, and light intensity; this time, you will add atmospheric pressure by reading from a barometric pressure sensor, and you will send the results to a computer via USB.

The MPL115A2 barometric pressure sensor communicates via the I²C protocol. You must use the MSP430's USCI module to read data from the barometric pressure sensor every second, just as you have done with the previous sensors. Make sure you convert the pressure reading from the device to metric (Pascals).

You must also use the MSP430 USB interface to send the data your device collects across USB to a computer. This time, instead of graphing all the data on the LCD screen, you will run a special program on the host computer which will collect the data sent by your MSP430 and graph it. The graphs that show up on the host computer should be the same as the graphs you generated in Lab 7 (this time with barometric pressure added).

The actual intercepting of the data on the host computer will be performed by a set of scripts written in Python. We will provide these scripts to you – the focus of this assignment is in the microcontroller. TI also provides you with a USB software development pack at the following webpage:

<http://www.ti.com/tool/msp430usbdevpack>.

You should download this package and spend some time becoming familiar with the USB API. Look around in the examples directories and try to understand the code; get some of them running before tackling more advanced communications. In order to actually get the USB COM-port to be visible from the Python scripts you must follow the instructions on the next page. This involves running a so-called 'descriptor' program on your MSP which will configure a link to the MSP430 through USB. In order to test your USB communications using the host-side Python script, see the instructions on page 3 for installing Python and other dependencies.

Please note that this is a two week lab. You should plan to be finished with the barometric pressure sensor after one week so you have plenty of time to figure out the USB communications.

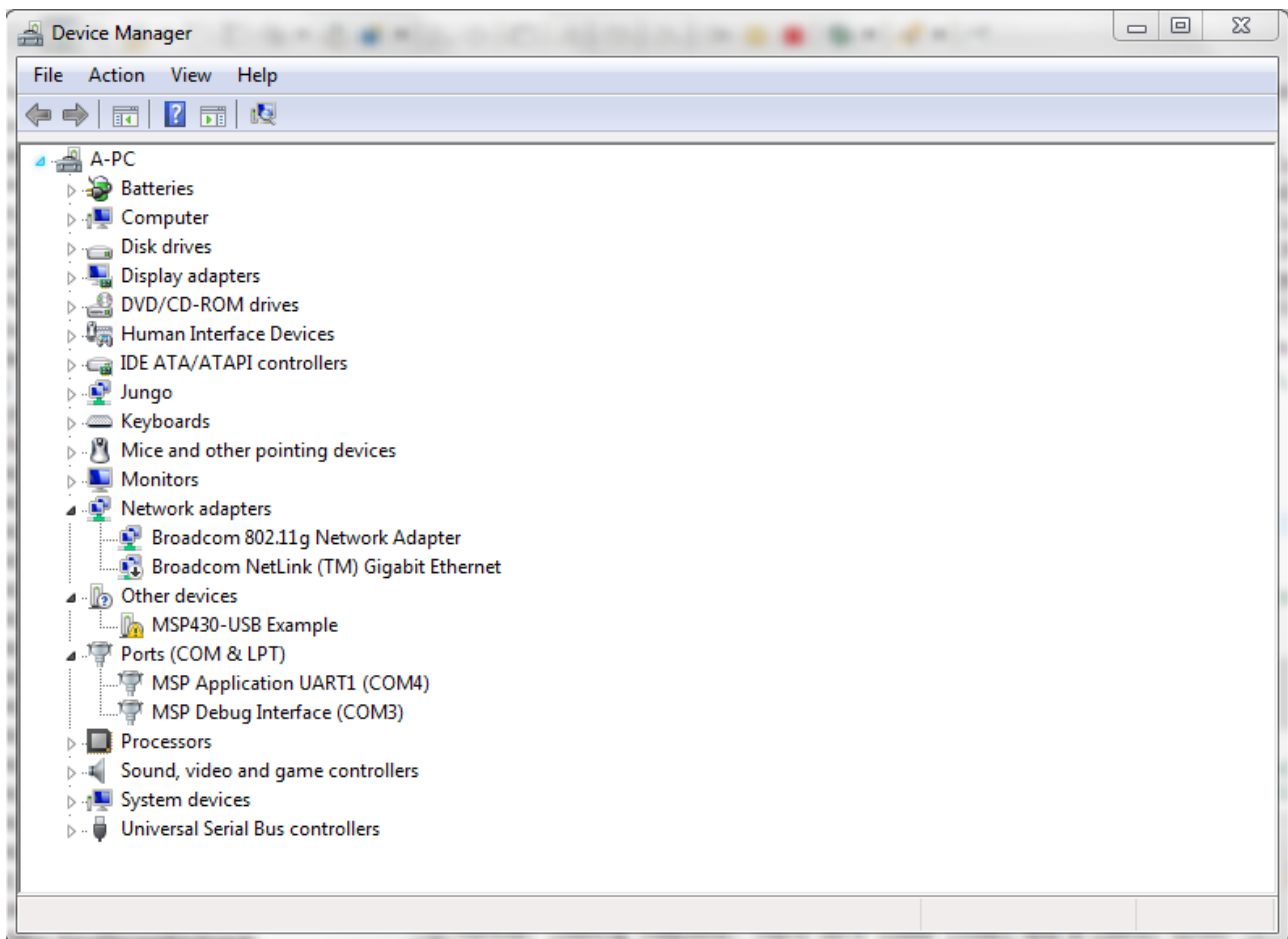
Requirements:

- Maintain buffers of past values for each of the five measurements to be sent to the PC
- Send your data buffers for each measurement across USB to a host computer
- Plot the graphs for each of the measurements on the host computer using the provided Python script
- Organize your code into modules (a single .c file and optional header file) for each sensor
- Same software requirements from previous labs for taking the other measurements

Installing Driver for Virtual Com Port on your PC

Steps:

1. Download MSP430 USB Developers Package from the website <http://www.ti.com/tool/msp430usbdevpack> click on “Get Software” download and unpack the [MSP430USBDevelopersPackage_4_20_00.zip](#) file (or newer).
2. Create a new project: Code Composer Studio (must have installed MSP430Ware) → View → Example Projects → Libraries → USB Developer Package → Example Projects → Empty USB Project
 1. Step 1 Import the Example project
 2. Copy USB Config directory given to you and replace the one from the example.
 3. Add file usb-main.c that was given to you and exclude from build the original main.c
 4. Build, Debug, and Run
3. Open the Device Manager .



4. You can see the virtual com-port named “MSP430-USB Example” . Right click on the Com-port and click Install Drivers/Update Driver Software
5. Select “Browse my computer for driver software”
6. Go to the MSP430DevelopersPackage_4_10_02 from the download and the directory for Driver Software is
MSP430USBDevelopersPackage_4_10_02\MSP430_USB_Software\MSP430_USB_API\exam
ples\CDC_virtualCOMport\C2_ReceiveData\USB_config
7. In the Device Manager, you can see the virtual com-port “MSP430-USB Example” under Ports.

8. Set the com-port number for the virtual com-port in the Python code to the one you saw in the device manager.

Installing Python and Python Libraries on your PC:

Anaconda Python 3.4

<http://continuum.io/downloads>

install

run anaconda shell

type “pip install pyserial”

edit the lab8.py given to you and change the comPort to the one you got from the device manager

run python lab8.py