Micro 2 Lab Assignments

Rules and Helpful tips

TA: Ioannis Smanis

Overview

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TA Info

TA:	Ioannis Smanis
TA Office hours :	Monday, Tuesday, Wednesday - **2.00pm to 5.00pm**
TA Office Location:	Ball Hall, Room #402, Cubicle #48
TA Mailbox:	Ball Hall, Room #301
TA e-mail:	ioannis_smanis@student.uml.edu
Deliverables (ONLY) e-mail:	micro2tamailbox@gmail.com

- Please do not hesitate to discuss with me any difficulty that you cope with

- See me at my office during my office hours or e-mail me for anything related with your Lab assignments and I will find a solution for you as fast as I can !

- Please, expect quick e-mail responses **ONLY** during my office hours.

- Please , **ALWAYS** refer your Group # in the subject of your e-mail (i.e.: subject: "***Group #05 clarification on lab X***")

- Please do not hesitate to bother me out of my office hours **ONLY WHEN** you have an **urgent issue** with your lab assignment (defective parts, need more components, fried parts, etc.). In this case, e-mail me with subject: "***URGENT - Group #xx***" or visit me at my office space

- Please, **NO QUESTIONS** about mid-term exam and final exam are allowed.

Lab Assignments General Info

- Any announcement, update or Lab assignment adjustment is going to be posted on "**Piazza**" *(https://piazza.com/class/j5fnal0lsvb5af) Make sure you get Piazza notification e-mails*

- **You are responsible to follow Piazza** discussion threads or announcement threads

- Lab assignments materials will be uploaded on ***GitHub*** repository: *http://github.com/yanluo-uml/micro2.git*

- Lab assignments are described in the **pdf documents**

- **New lab assignment** will usually be released few days before your prior lab demo time

- It is **your responsibility** to review all given materials from GitHub repo

- It is **your responsibility** to choose the right partners for your team

Lab Reports Rules

- **Lab Report materials:**

  1. Hard-copy: **a printed copy of the PDF document** named **“LabX_name_lastname.pdf”** *(Lab Report document format will be specified on Piazza)*

  2. Soft-copy: a **ZIP** file with name **“LabX_GroupXX.zip”**

     + All group-members PDF documents (all team members actual PDF documents)

     + Shared files that was used to complete the project: *circuit design CAD files (fritzing, Eagle CAD, etc), schematics, images, source code files*

Deliverables: ***both Hard-copies and Soft-copies are required to be delivered on time!!!***

- **Hard-copies :** should be delivered in TA’s physical mailbox **on time** according to the **specified project deadline.**
- **Soft-copies :** should be sent via e-mail to ***micro2tamailbox@gmail.com*** **on time** according to the **specified project deadline.**

e-mail format:

Subject: ***Lab X Group XX***

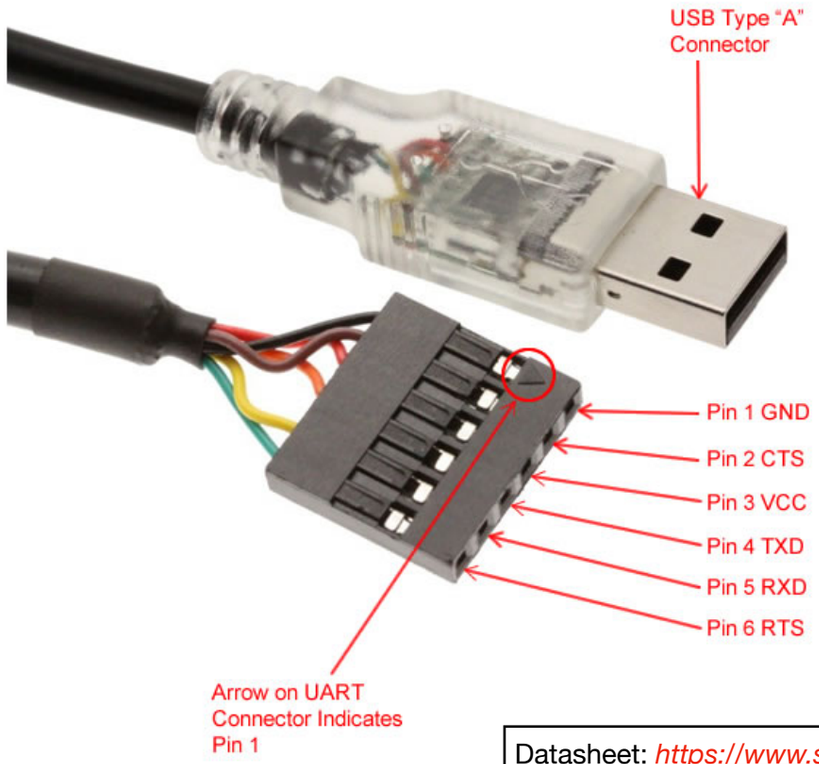
e-mail content: **LabX_GroupXX.zip** *(just the zip file)*

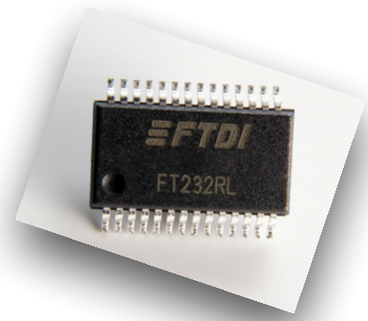
Lab Rules & **Warnings !!**

- Students are **responsible** for any damage to the given Lab Hardware kit
- Students **should return** the Lab Hardware Kit with fully functional components
- If you by mistake **fry or brick** any component, you should order replacement parts before you return your Lab Hardware Kit back
- A Lab Report is **an individual job** - each student should write his/her own lab report document
- **Shared Files between group-members** are only CAD file, schematics, pictures, tables , charts , source code
- **Copied-Pasted** content in the lab reports will be **penalized** from **other students** or from **provided documents**

Tools & Tips: USB-to-UART cable

- What is this ?





Datasheet: *https://www.sparkfun.com/products/9717*

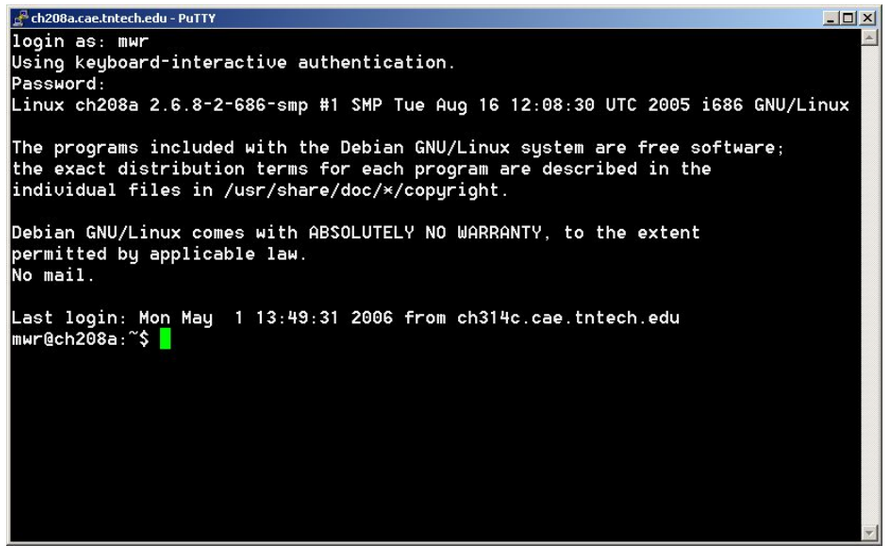
What software you will need ?

MacOSX/Windows/Linux systems:
FTDI drivers

&

Putty.exe for Windows
Terminal app for Mac OSX/Linux

- An a USB RS-323 Serial port adapter at 3.3V



PIC Project requirements

Project (LAB 1): LDR sensor + Servo Motor + LED + PIC micro-controller

Easy Project Debugging: use *UART to Serial cable (Console output)*

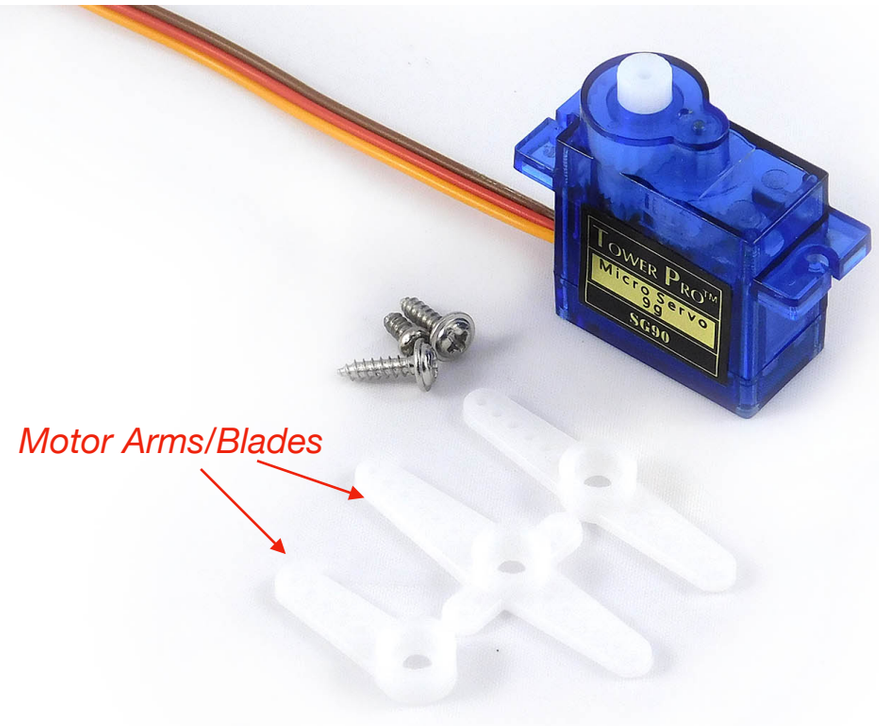
Working with a PIC micro-controller:

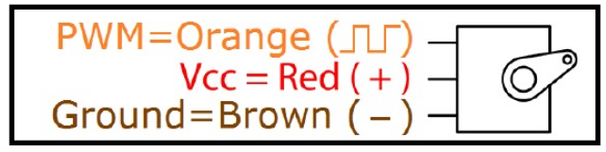
- You need a **PIC Kit 3** Debugger/Programmer *(PICKit3 wiring is provided via specified document)*, an 8bit **PIC** micro-controller and MPLAB X development environment

Programming a PIC microcontroller

PIC Project requirements

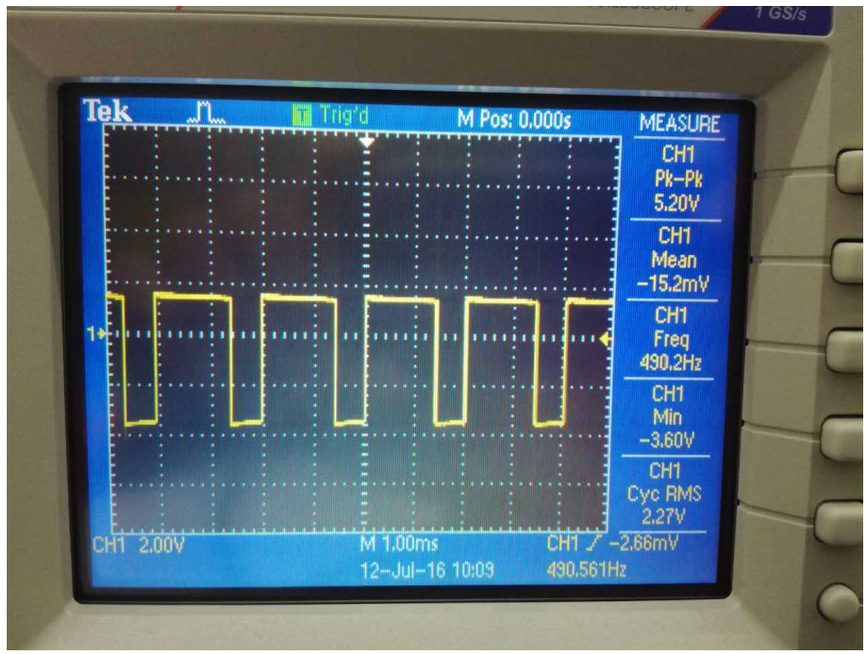
- Servo Motor: **PWM** Signal Input
- Keep **PWM** output **frequency** low ***(close to 50Hz)*** using wait/delay functions
- Change the **Duty Cycle** to set the motor arm to a specific position
- Servo motors **does not** spin around. Rotation range is up to 180 degrees (90 degrees for each direction +/-)
- Refer to its datasheet on git repository





PIC Project - Tips

- How to test your PWM output signal from PIC?
- Increase/Decrease Duty Cycle and see if the square wave pulse changes

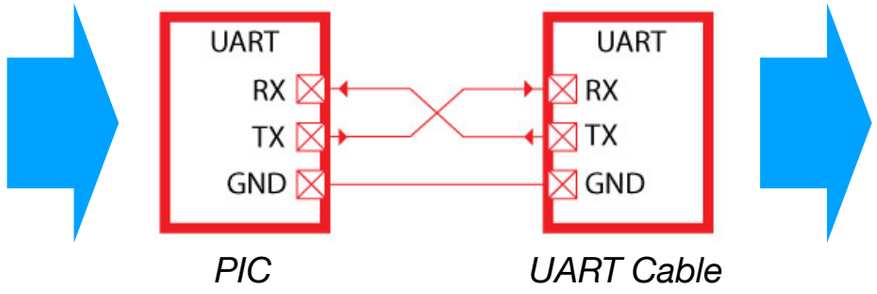


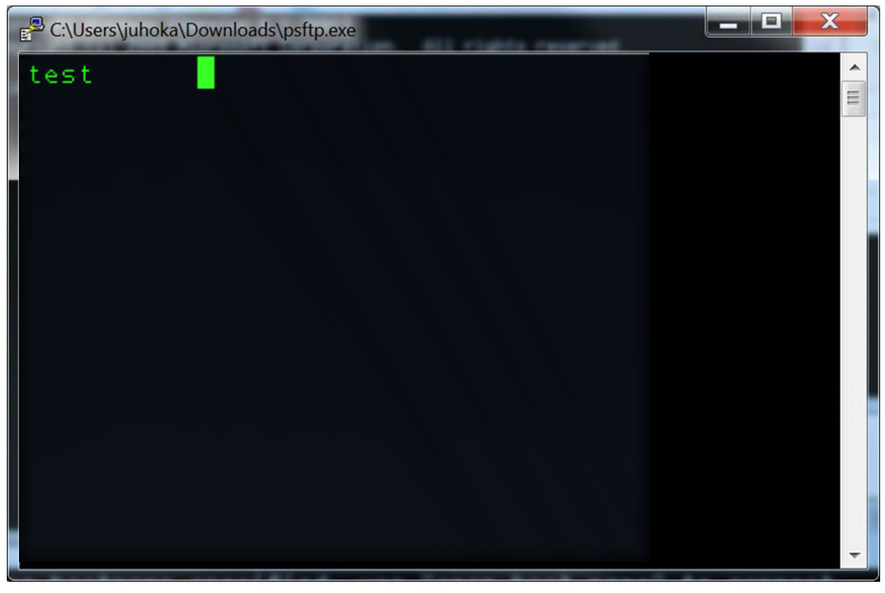
check your PWM signal on the Oscilloscope

- Debugging a PIC application via Serial Cable:

```
void main(void) {

    SYSTEM_Initialize();

    printf("Test \n\r");


}
```

main.c code in MPLAB X IDE: *debugging statement*

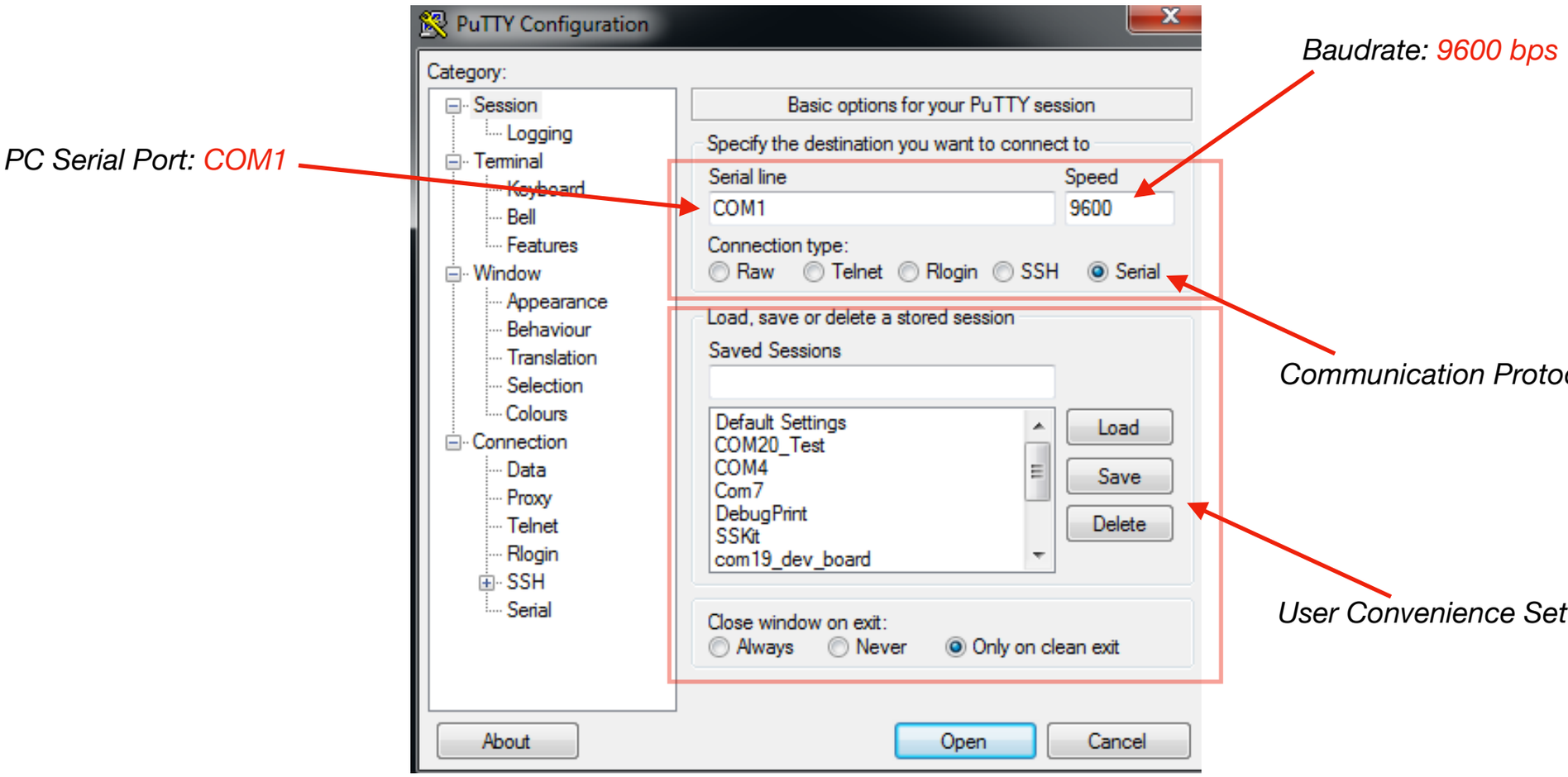




Putty Client: *printed output context*

PIC Project - Tips

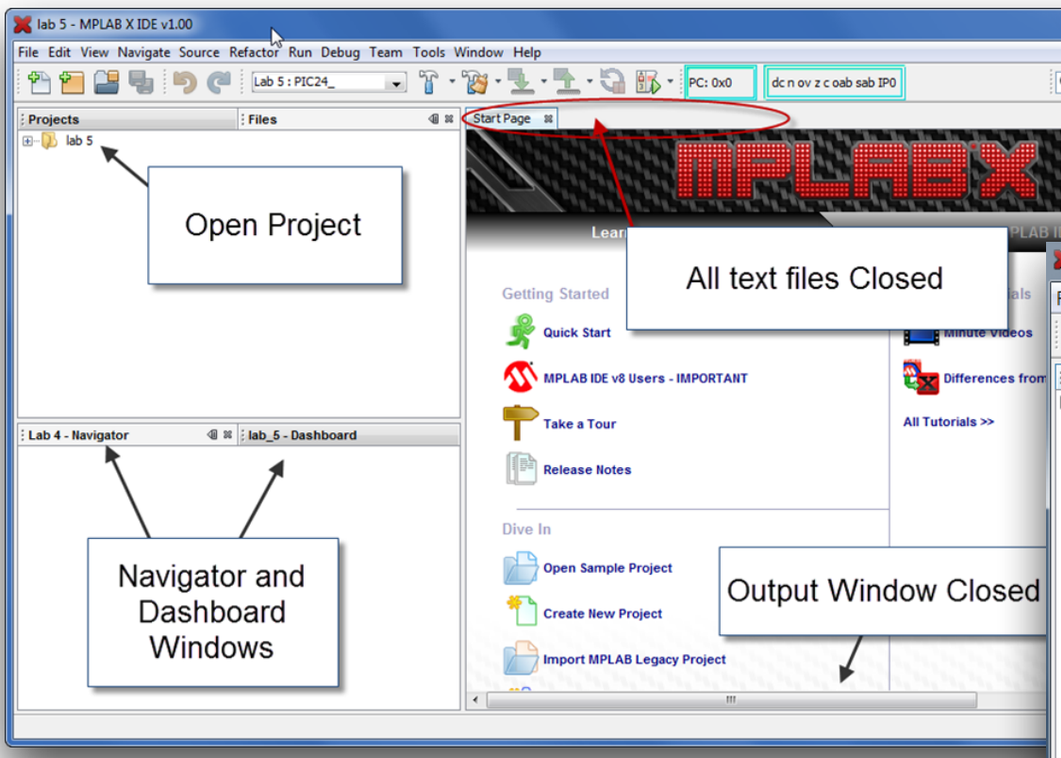
- Setting up a Putty console PC application for Serial port Mode:



Working with a PIC

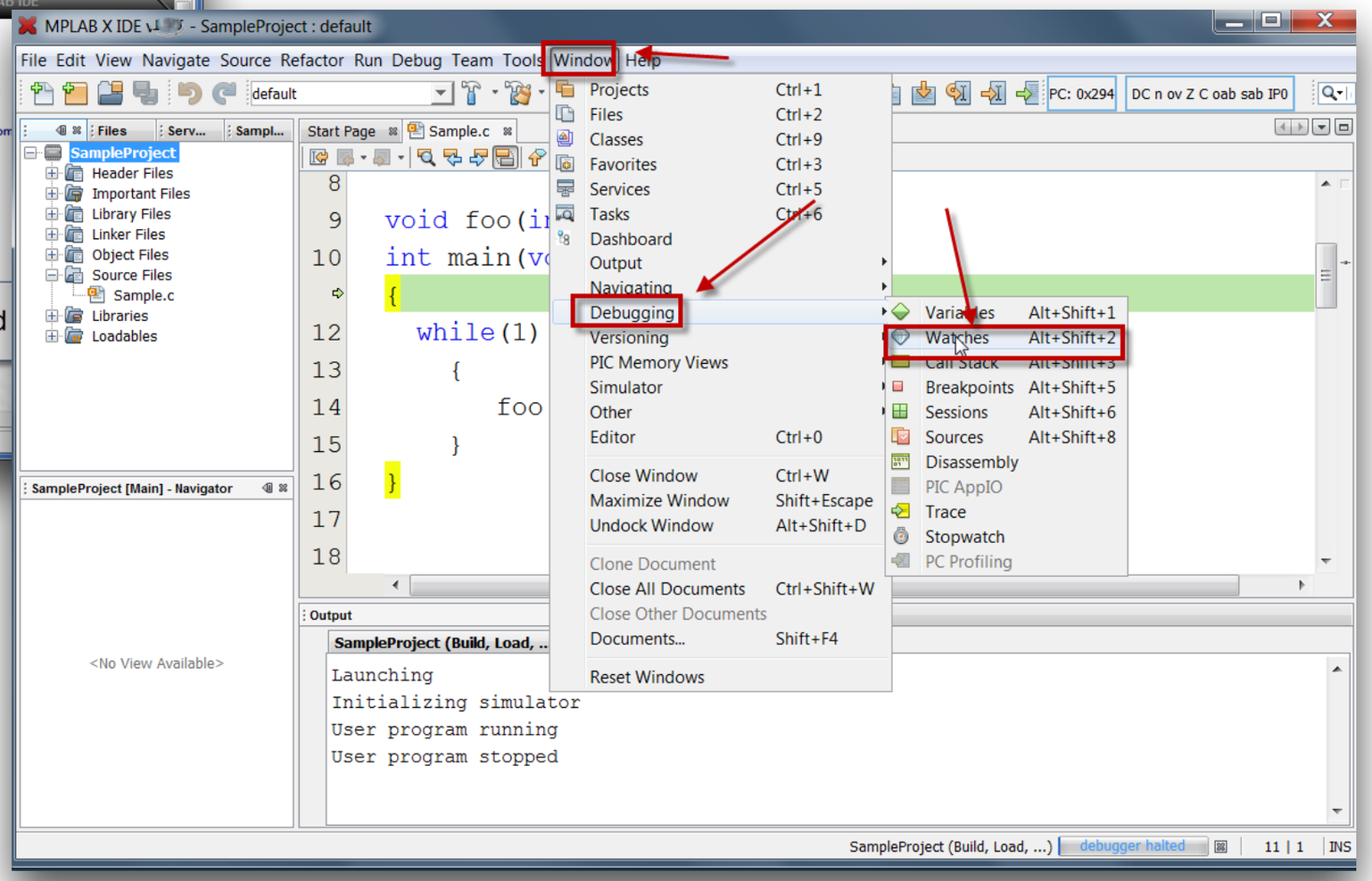
Needed Software: MPLAB X IDE + XC8 compiler

MPLAB X IDE:	http://www.microchip.com/mplab/mplab-x-ide
XC8 compiler:	http://www.microchip.com/mplab/compilers



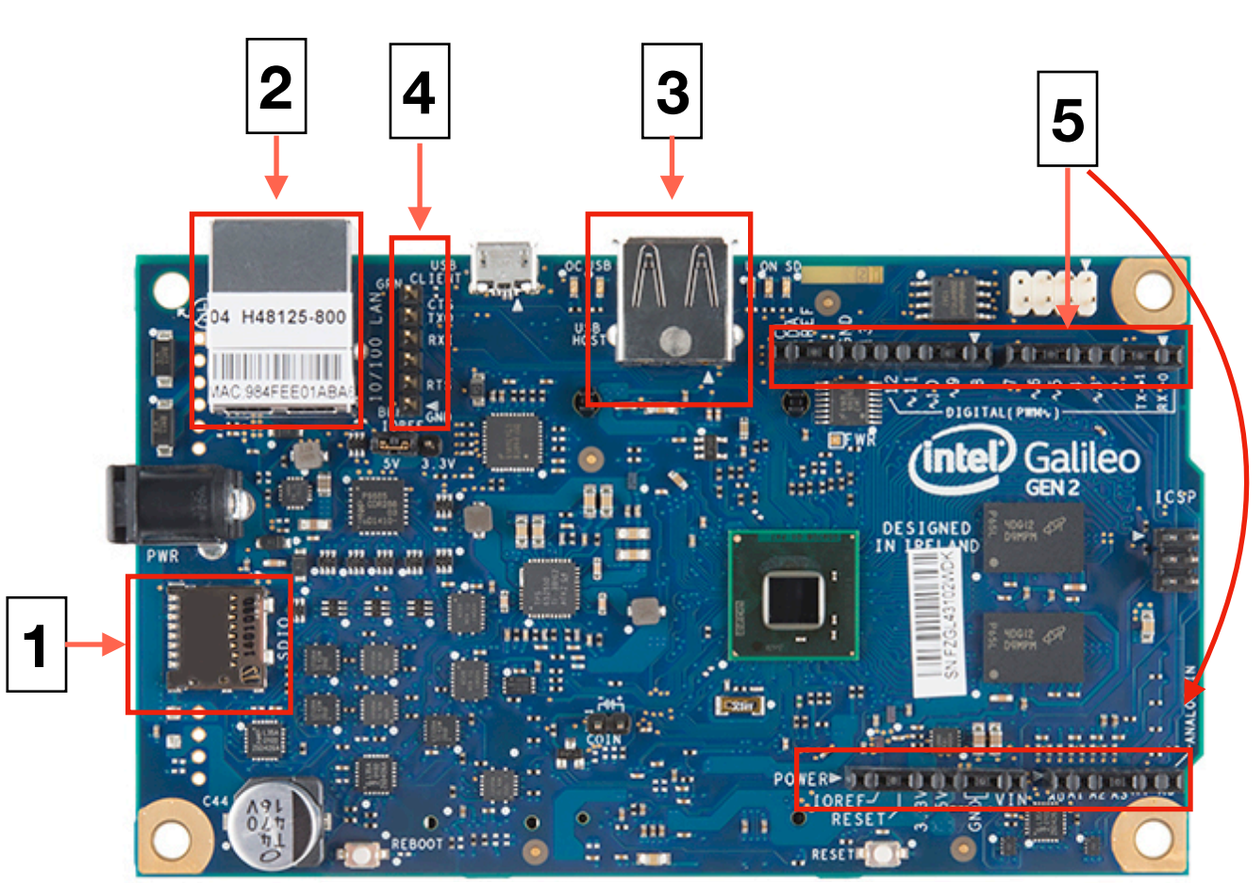
MPLAB X : User Interface

MPLAB X : Debugging - watch a variable



Intel Galileo Projects

- **Embedded-linux x86-32bit platform:** Yocto OS
- Yocto has **terminal-based** User Interface
- C/C++, Python compilers are already installed
- Package manager is not available



Intel Galileo Board Gen 2

Basic Hardware Features Use:

1. SD Card: You should install Yocto OS ***(Do not remove SD Card while the board is ON)***

2. Ethernet Port and Wi-Fi Card installed: connect the board to the internet and use SSH protocol to exchange files remotely

3. USB Host Port: use USB flash drives *(FAT32 formatted)* to transfer files

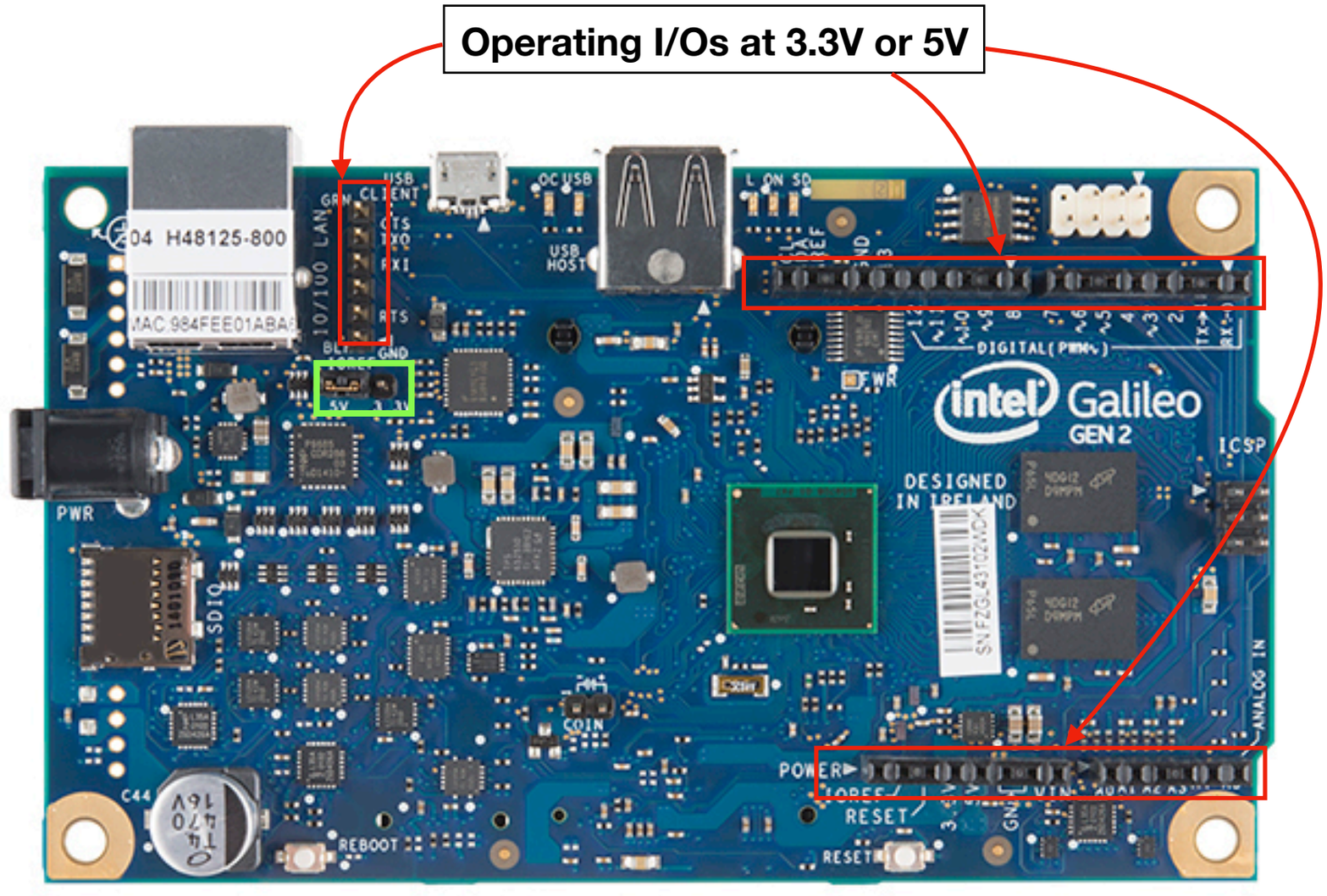
4. UART Port: use the FTDI Cable for console output

5. GPIO ports: programable general purpose I/O pins

Working with Intel Galileo *Gen 2*

Set up the correct operating voltage:

WARNING: use 3.3V (NOT 5V) for Intel Galileo setting the appropriate jumper

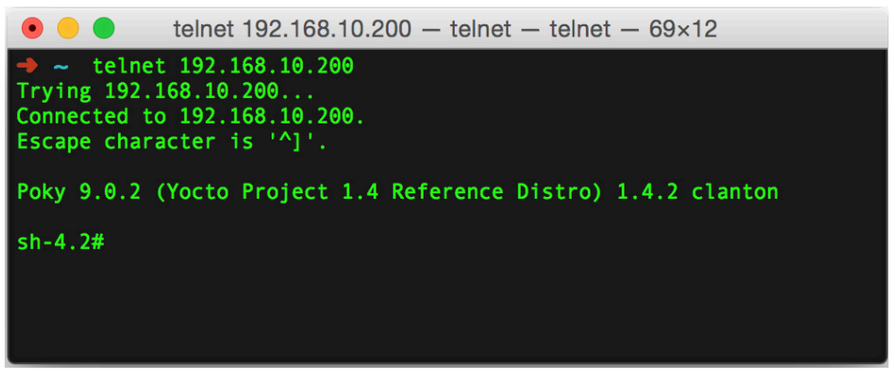


Intel Galileo Board Gen 2

Working with Intel Galileo *Gen 2*

Working with Yocto OS locally

- It is a command line user interface:



- Browsing to the file system of Yocto: basic linux commands you can find here *https://diyhacking.com/linux-commands-for-beginners/*

- It includes a text editor "**vi**" and "**nano**" (use to edit your local files)

- Compiling C or C++ application files via "gcc" or "g++" compilers example:

```
compile:  "gcc HelloWorld_application.c -o HelloWorld_executable_filename"
run    :  "./HelloWorld_executable_filename"
```

use vi: *https://www.washington.edu/computing/unix/vi.html*
use nano: *https://www.howtogeek.com/howto/42980/the-beginners-guide-to-nano-the-linux-command-line-text-editor/*
compile and run c/c++ applications: *http://pages.cs.wisc.edu/~beechung/ref/gcc-intro.html*

Working with Intel Galileo *Gen 2*

Working with Yocto OS remotely

Connecting to a remote machine (Galileo Board)

access the machine by executing the `ssh` command in your local shell.

For example, if `1.2.3.4` is the IP address of your remote machine, you can create an SSH connection to it using this command:

```
ssh  root@1.2.3.4
```

The first time you connect to the remote machine, `ssh` will ask your permission to put the fingerprint of the remote machine in your local `~/.ssh/known_hosts` file.

```
The authenticity of host '1.2.3.4' can't be established.
RSA key fingerprint is 12:23:34:56:21:g3:g9:93:86:af:4r:bb:11:5d:f8:h9.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '1.2.3.4' (RSA) to the list of known hosts.
```

The first time you connect to the server you should type in `yes` to proceed.

Source: https://semaphoreci.com/community/tutorials/getting-started-with-ssh

Working with Intel Galileo *Gen 2*

Working with Yocto OS remotely

- Exchanging files between host machine *(your PC)* and remote machine *(Galileo Board)* via SSH protocol via one command “scp”

```
scp file.txt galileo_username@galileo_ip_address:/some/remote/directory
```

For more options see the link here: http://www.hypexr.org/linux_scp_help.php

Thank you