

AVRDUDE on Windows with WSL

This guide to test and program the chip on Windows using WSL (Windows Subsystem for Windows) for embedded systems courses at UC Riverside.

If you are using a Windows machine, using WSL with VS Code is a good way to test your code and program your chip without using a virtual machine.

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Prerequisites

On your Windows machine, these should be installed:

1. WSL installed and initialized
 - Follow [this link](#) to install WSL on your machine, and [this link](#) to initialize it.
 - I recommend you use your name as the UNIX username, because the username will appear as the author in your lab files.
 - You can install any distro you like, but this guide uses Ubuntu.
2. MinGW-x64
 - Download [here](#) via SourceForge;
3. VS Code
 - Download [here](#);

You should also have a GitHub account. You can sign up [here](#).

Now, open Linux Bash.

Setup the Basics in WSL

Working Directory

1. In Windows, create a folder for your CS120B labs as your working directory, it should have **no space** in its directory;
 - Good example: "E:\Desktop\CS_120B\Labs", this directory will be used in all examples below.
2. To access this folder in WSL, do `

```
# Command:
$ cd /mnt/DRIVE_FLAG/FOLDER_DIR

# For example:
$ cd /mnt/e/Desktop/CS_120B/Labs
```

3. (Optional) To quickly access this folder, you can add an alias entry.

```
# Command:
$ alias alias_name="command_to_run"

# For example:
$ alias cs120blab="cd /mnt/e/Desktop/CS_120B/Labs"
```

To make the alias entry permanent, add the entry in `~/.bash_aliases` file (`~/.bashrc` if you are on other distros).

For other helpful aliases for this course, go [here](#).

Git

1. Setting your username and email in Git

```
$ git config --global user.name "Your Name"
$ git config --global user.email "your_email@example.com"
```

2. (Optional) Connecting to GitHub with SSH

You don't have to use a SSH key to access GitHub, but I think it's easier this way. You can also skip this step if you have already done so.

Alternatively, you can also follow [this guide](#) to cache your login credentials and connect with HTTPS.

1. Check if you have ssh key or not

```
$ ls -al ~/.ssh
```

If prompt

```
> ls: cannot access '/home/you/.ssh': No such file or directory
```

continue to the next step;

if prompt

```
> total 8  
...
```

Go to step iv.

2. Create a SSH key in WSL. Replace `your_email@example.com` with your email used in GitHub.

```
$ ssh-keygen -t rsa -b 4096 -C "your_email@example.com"  
  
> Enter a file in which to save the key (/home/you/.ssh/id_rsa):  
[Press enter]  
  
> Enter passphrase (empty for no passphrase): [Type a passphrase]  
> Enter same passphrase again: [Type passphrase again]
```

3. Add SSH key to the ssh-agent.

```
$ eval $(ssh-agent -s)
> Agent pid 59566

$ ssh-add ~/.ssh/id_rsa
```

4. Add SSH key to GitHub account.

```
$ vim ~/.ssh/id_rsa.pub
> ssh-rsa AAAAB3NzaC1yc2
...
your_email@example.com
```

Copy the printout.

Follow [this guide](#) from step 2.

VS Code

1. Install VS Code Server for x64;

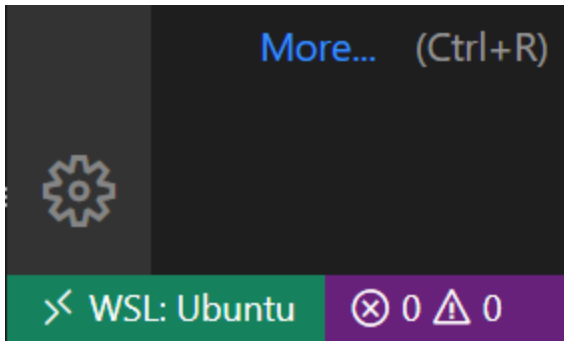
```
# In any directory
$ code .
> Installing VS Code Server for x64 (...)
```

2. Allow firewall connection;

3. Install VS Code "Remote - WSL" extension;

- Should install automatically.

4. On the bottom-left corner, a green icon should appear saying **WSL: your distro**.



Get AVR-ToolChain working on WSL

This part contains steps specific for using [UCRCS120B_AVRTools](#).

1. Install basic components

```
$ sudo apt-get install make zlib1g zlib1g-dev zip
```

2. Install simAVR

1. Install by `apt-get`:

```
$ sudo apt-get install simavr
```

2. Install by `git clone`

```
# Clone it to your home directory
$ cd ~
$ git clone git@github.com:buserror/simavr.git

# If you are using https, do this instead
$ git clone https://github.com/buserror/simavr.git
```

- Note: You need to install simAVR in both ways.
 - `apt-get` gives you access to bash command `simavr`,
 - `git clone` gives the MakeFile access to the installation directory which we will use later.

3. Install AVR-GCC Toolchain

```
$ sudo apt-get install gcc-avr binutils-avr avr-libc gdb-avr
```

- If you are following the AVR-GCC Toolchain [installation guide](#) linked in UCRCS120B_AVRTools' GitHub page, you can skip step 3 and onward since we are using avrdude in Windows instead of WSL.

4. Clone UCRCS120B_AVRTools to your working directory;

```
$ git clone git@github.com:jmcda001/UCRCS120B_AVRTools.git  
  
# If you are using https, do this instead  
$ git clone https://github.com/jmcda001/UCRCS120B_AVRTools.git
```

5. Edit the MakefileTemplate

In `UCRCS120B_AVRTools/templates/MakefileTemplate` file, edit line 14 to be the path to your SimAVR installation.

```
# Edit this  
SIMAVRDIR=SET YOUR SIMAVR DIRECTORY HERE  
  
# To this  
# If simavr is in your home directory like we showed above  
SIMAVRDIR=/home/$(USER)/simavr/simavr/
```

6. Edit createProject.sh

In `UCRCS120B_AVRTools/createProject.sh` file, edit line 76 to be the relative path from your SIMAVRDIR to the `avr_mcu_section.h` file.

```
// Edit this  
#include "include/simavr/avr/avr_mcu_section.h"  
  
// To this
```

```
// If simavr is in your home directory like we showed above
#include "/home/${USER}/simavr/simavr/sim/avr/avr_mcu_section.h"
```

7. Customize createProject.sh (Already implemented on the latest ver. of UCRC120B_AVRTools)

Replace line 114 to 121 with the following code to initialize and push the directory to a GitHub repo automatically:

```
echo -e "Initialize the directory to a GitHub repo."
read -p 'git repo link [press ENTER to skip]: ' link

if [ -n "$link" ]
then
    echo -e 'Initializing repo...'
    cd "$name"
    git init
    git add .
    git commit -m 'Initializing repository'

    echo -e 'Adding repo to GitHub...'
    git remote add origin "$link"
    git remote -v

    echo -e 'Pushing changes to GitHub...'
    git push -u origin master

    echo
    echo -e "\e[42mProject Pushed.\033[0m You can change your
directory and continue working."
else
    echo -e "\e[104mProject not initialized.\033[0m You can change
your directory and continue working."
fi
```

Get AvrDude Working in WSL

In WSL: You need to use avrdude.exe in Windows to program your chip, since WSL does not support libusb devices (such as the Atmel board when using avrdude).

1. Download avrdude on [official website](#);

- Download area click [here](#).
- Select mingw32 version, file name should look like `avrdude-*. *-mingw32.zip`.

2. Unzip and put it in a folder which entire directory has **no space**;

3. Edit MakeFileTemplate

Change `UCRCS120B_AVRTools/templates/MakeFileTemplate` line 37 to `avrdude.exe`'s directory;

If `avrdude.exe` is in `E:\CS_120B\avrdude-6.3`:

```
# Edit this
PROGRAM=avrdude

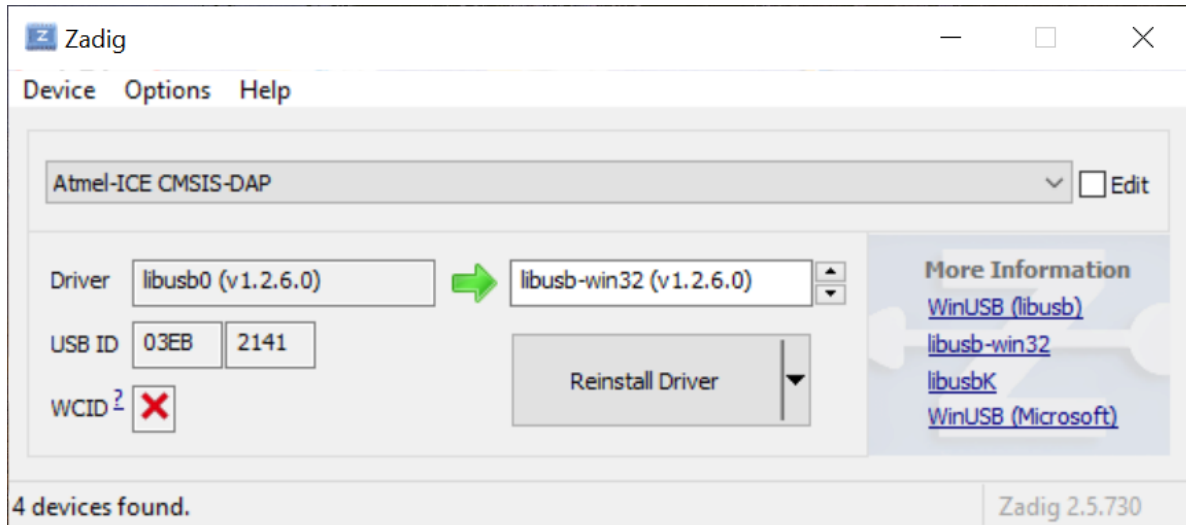
# To this
PROGRAM=/mnt/e/CS_120B/avrdude-6.3/avrdude.exe
```

4. If you are having error (and you most likely are) `avrdude.exe: jtag3_open_common(): Did not find any device matching VID 0x03eb and PID list: 0x2141`, go to [this section](#).

Install Driver for Atmel Programming board

If you are having error in **Windows** or **WSL**, `avrdude.exe: jtag3_open_common(): Did not find any device matching VID 0x03eb and PID list: 0x2141` in `avrdude(ss)`, follow steps below.

1. Download Zadig from its [official website](#);
2. Connect the board to your computer;
3. Open `zadig.exe`;



4. In the dropdown list, select "Atmel-ICE *****";
 - Might be 2-3 devices start with "Atmel-ICE", repeat step 4-7 on all of them.
 - If you don't see it, select "List All Devices" in "Option" menu.
5. Check USB ID, should be 03EB 2141 (might have 01 or 02 in the third box);
6. Select "libusb-win32" as the driver to be installed;
7. Click "Install Driver" or "Replace Driver";
8. In Device Manager, the board should be under "libusb-win32 Devices".