Introduction to AVR Microprocessor Development Board

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This document gives you a brief description on the AVR Microcontroller Development Board and how to use it.

1. Equipment Handling Precaution

A few of precautions are necessary when using the board:

- Your experiment place, either the laboratory or home, can be an environment where it is quite easy for you to build up a static electric charge. **Electrostatic discharge can destroy electronic equipment**, including the circuits on the lab board, without giving any sign of doing so!

  Since you may be carrying a static charge without even realizing it, **you should always discharge yourself**. You can do this painlessly by touching a grounded conductor using a coin, a key or other metallic objects instead of your finger.

- Short circuits may damage certain devices. Please remove any metal items before handling the board. There are no dangerous voltages or currents that will harm you here, but this is a good habit to always act with caution and follow the designed procedure.

- Always turn the power off before connecting or disconnecting any I/O subsystems and don't place the board on a conductive surface when the power is on.

2. AVR Microcontroller Board

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Figure 1 shows the assembled lab board that contains peripherals, connectors, and the Arduino MEGA 2560 R3 microcontroller board (at the back).

To program the board, the following software (available on the course website under the link References) should be first downloaded and installed

- arduino-1.0.6-windows.exe

To connect the board to your computer, use the USB Type-B port on the Arduino (left side). When using the lab computers, use the provided USB cable instead of pulling your own one into the computer.

The communication between the board and the computer requires a correct COM port setting. To work out which COM port the Arduino is connected to, open the system properties of the computer by clicking the start button, right-clicking 'My Computer' then clicking properties. In the 'Hardware' tag, click 'Device Manager'. Scroll down to 'Ports (COM & LPT)'. There should be one item called 'Arduino Mega 2560 (<portname>)'.

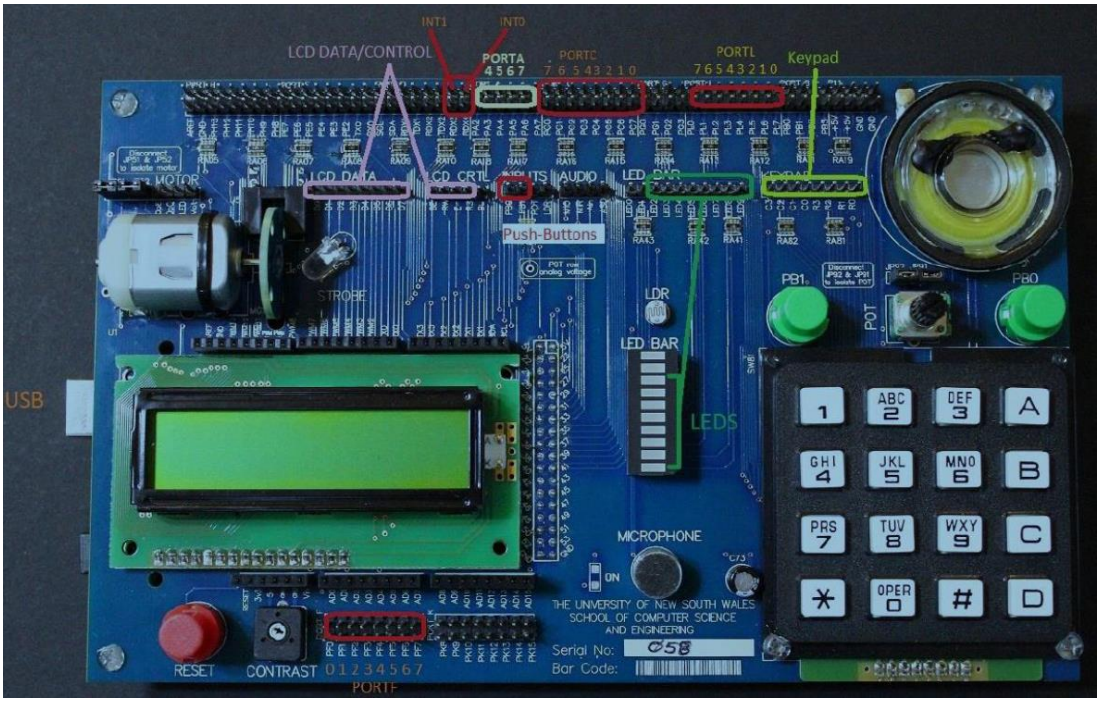

Figure 1: AVR Development Board

3. Download and Run Code on the Board

Below are two ways to download a code (test.hex) on the lab board. For execution of this code, connect the LEDs to PORT C (See Figure 1).

Method 1: download from the command window

Download ‘programmer.zip’ from the Labs page under the link of Lab Board Information on the course website. Extract the files and open the folder.

Run the batch file ‘console.bat’ to open a command window as shown in Figure 2.

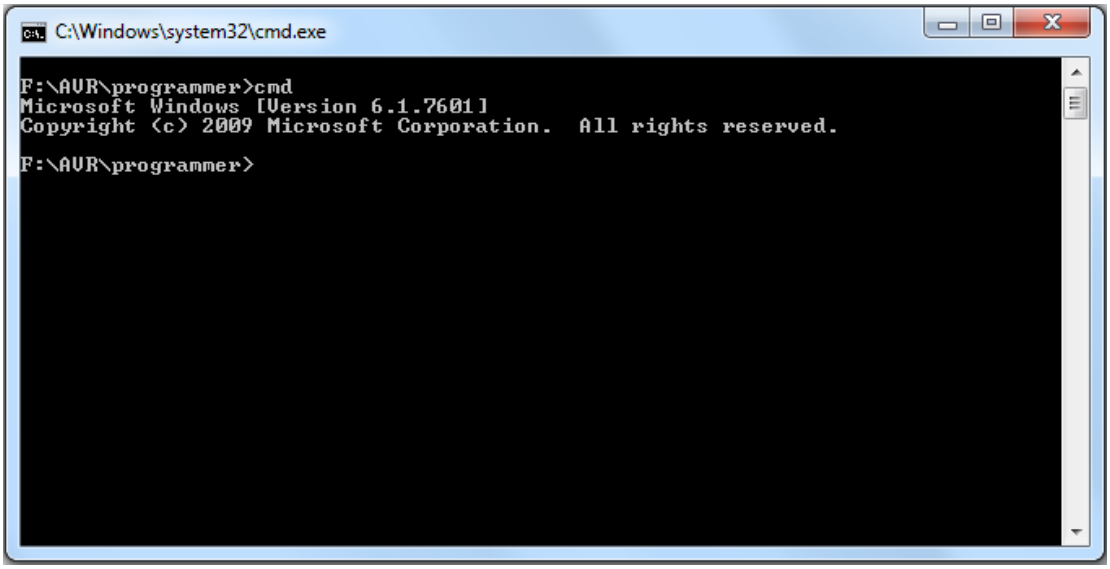

Figure 2

In the window, type the following command to load the test program in the folder with the following download command:

```
download <comport> test.hex
```

Here <comport> is the name of the port you found earlier. E.g. COM5.

A message will be returned to indicate the success of the download, as shown in Figure 3.

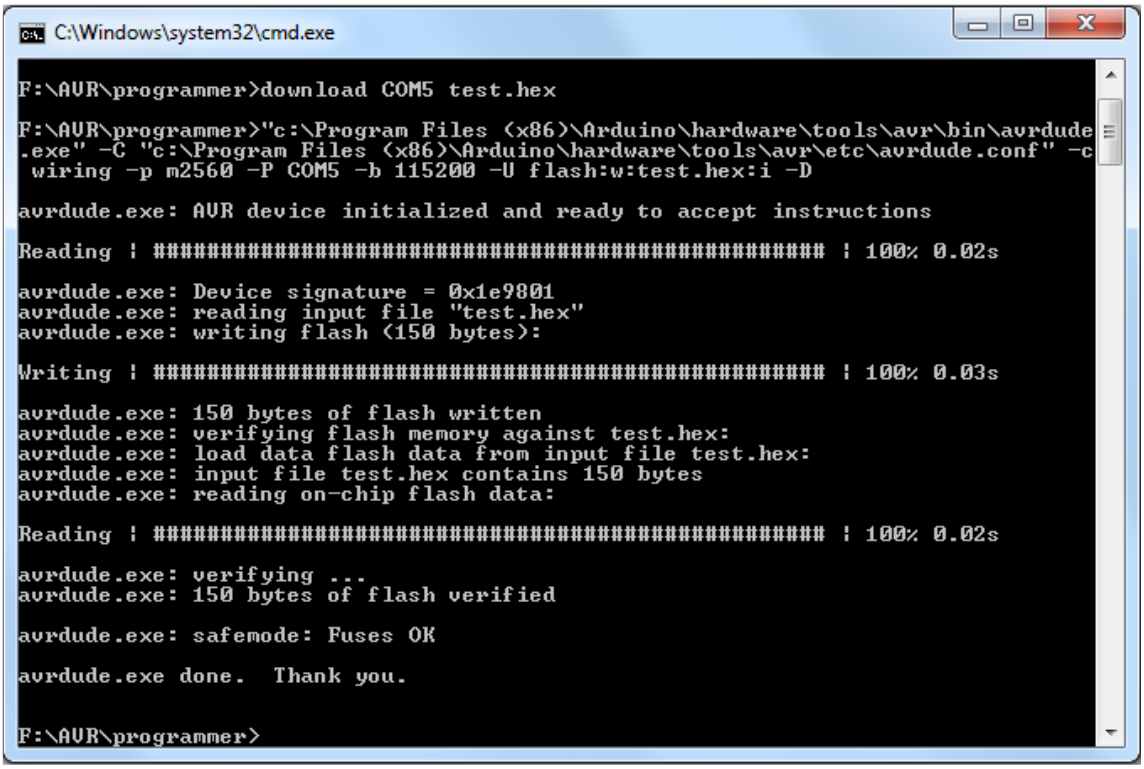

Figure 3

Once the download is complete and the LEDs are connected correctly, the LEDs should start flashing.

You can run your own code generated by the AVR Studio. To download it, replace ‘test.hex’ with the path to your code.

For example,
download <comport> F:\AVR\test2.hex

Method 2: download from Atmel Studio

1) Go to the menu item *Tools->external tools* in Atmel Studio

2) Fill the dialogue box as follows.

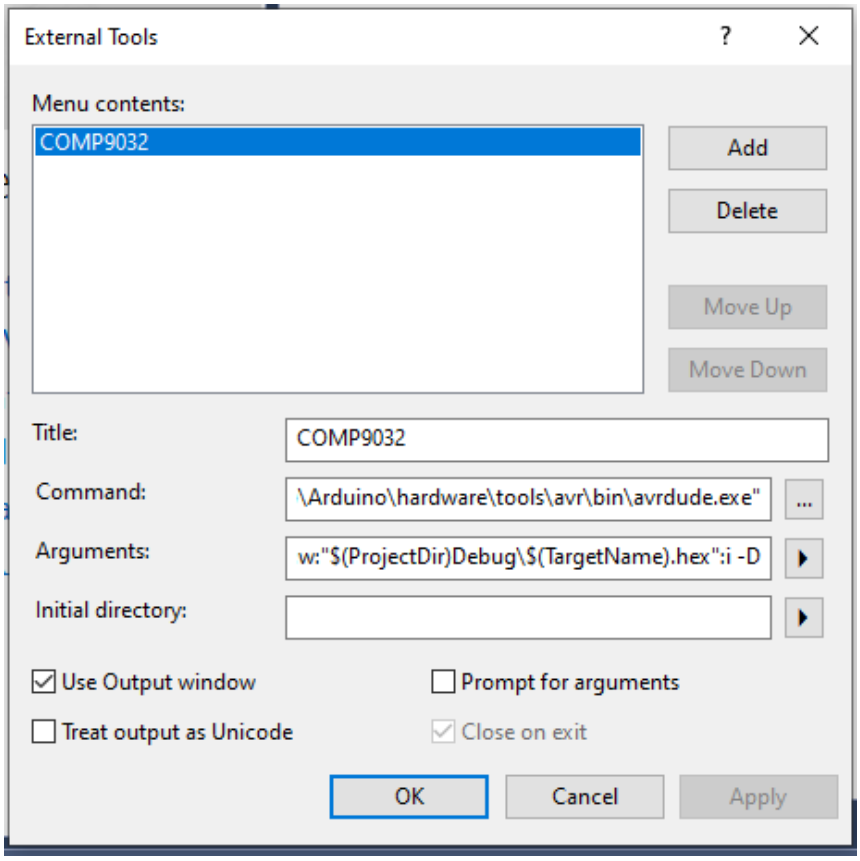

Figure 4

- Give any name you like for the *Title*.
- The *Command* should be the location of the *avrdude* program – the command line program that performs the downloading: *"C:\Program Files (x86)\Arduino\hardware\tools\avr\bin\avrdude.exe"*
- The *Arguments* should be *-C "C:\Program Files (x86)\Arduino\hardware\tools\avr\etc\avrdude.conf" -c wiring -p m2560 -P COMX -b 115200 -U flash:w:"$(ProjectDir)Debug\$(TargetName).hex":i -D*

3) Select Use Output window, then click Apply and OK

4) In an opened project, click on the added tool name, as shown in Figure 5. The .hex file generated in the project will be downloaded.

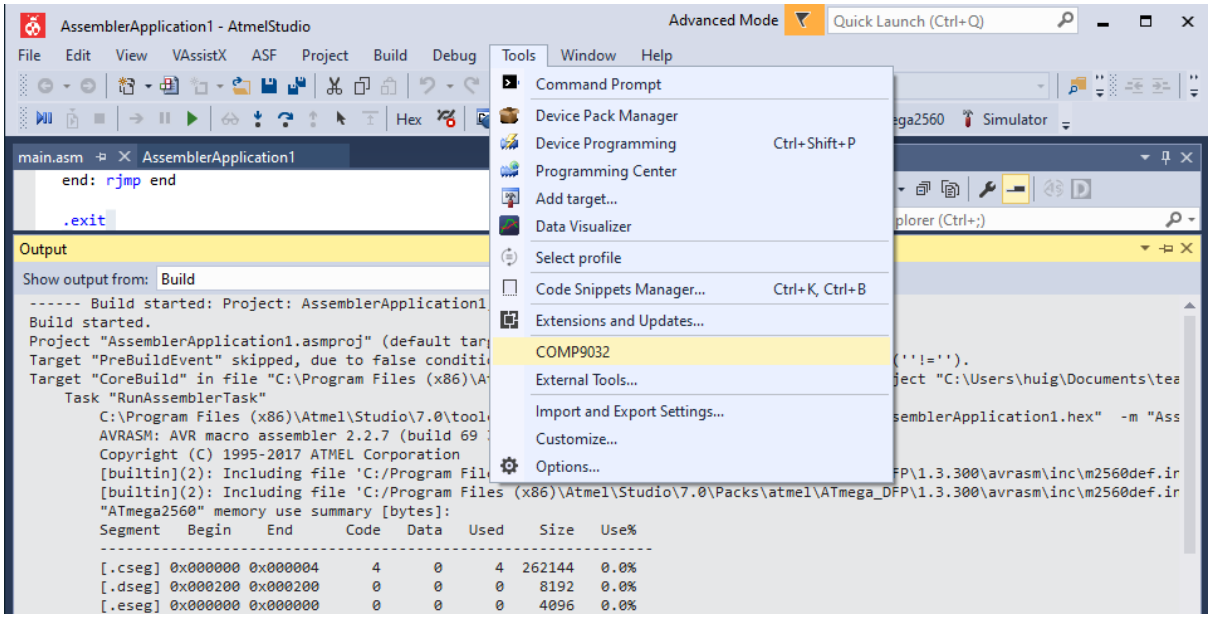

Figure 5

5) You should see the output of the download as shown below.

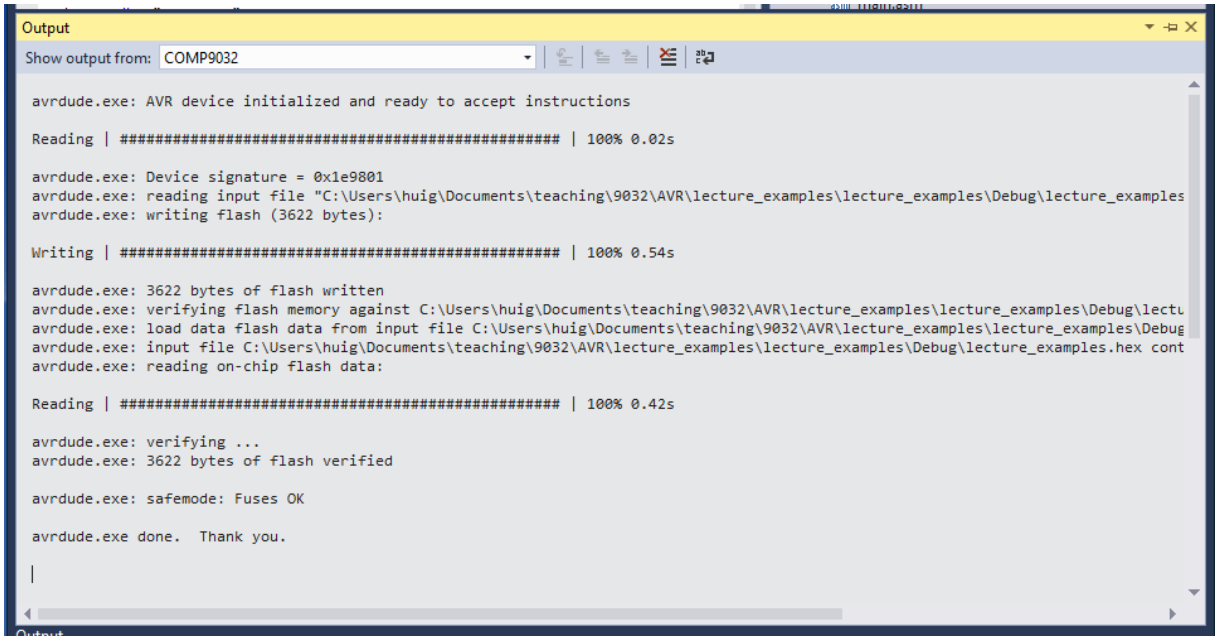

Figure 6

4. Board Test

Before you do experiments with your board, please test its functionality by following the test procedure given in “Board Test Procedure.pdf”.