

Mechatronic Project 234

Laboratory A: Downloading to the microcontroller, driving LEDs

Preliminary reading and reference material:

- Review previous programming notes and material, particularly C language
- The Arduino Mega page at <http://arduino.cc/en/Main/ArduinoBoardMega>
- GNU C reference: <http://www.gnu.org/software/gnu-c-manual/gnu-c-manual.html>
- C reference: <http://en.cppreference.com/w/c>
- You may wish to look at the Atmel ATmega2560 Datasheet: http://www.atmel.com/Images/Atmel-2549-8-bit-AVR-Microcontroller-ATmega640-1280-1281-2560-2561_datasheet.pdf, but be warned it is large

The aim of this laboratory session is to familiarise yourselves with the equipment and software that we will be using for the rest of semester. By the end of the session, you should have confirmed that the Microcontroller, kit board and development environment are all working correctly, and you should have practiced modifying, compiling, and downloading code to the ATMEGA in order to drive some output LEDs.

```
static uint8_t leds = 0x00;

int main(void)
{
    DDRA = 0xFF; //put PORTA into output mode
    PORTA = leds;
    while(1) //main loop
    {
        _delay_ms(500);
        //500 millisecond delay
        leds = leds + 1;
        PORTA = leds; //write leds to port A
    }
    return(1);
} //end main
```

1. Calculate the value of current limiting resistor that would be required in series with an LED to be certain that no more than 25mA is sourced by the microcontroller. **(A1)**
2. Open the provided Atmel Studio project, compile the program, and download it to your board.
3. Use hookup wire to connect PortA (arduino pins 22-29) to some LEDs on the breadboard. Refer to the ArduinoMega schematic to check the correct pin sequence.
4. Power up the board, and observe the results.
5. Describe the program functionality in your logbook. **(A2)**
6. Modify your program so that the LEDs are lit one at a time in sequence from left to right and then from right to left. **(A3)**
7. Use the microcontroller to drive the LEDs in an interesting pattern. **(A4)**
8. Locate the pins on the Arduino that correspond to Ports A,B,C,K,L (all digital pins)
9. Test the program on at least one other port. **(A5*)**
10. Ensure that all of your work is comprehensively documented in your logbook, including pseudocode or flowcharts where necessary. You should be able to use the logbook to reproduce the lab session work very quickly if required later. Show your logbook to a demonstrator.