8051 Microcontroller Lab Manual

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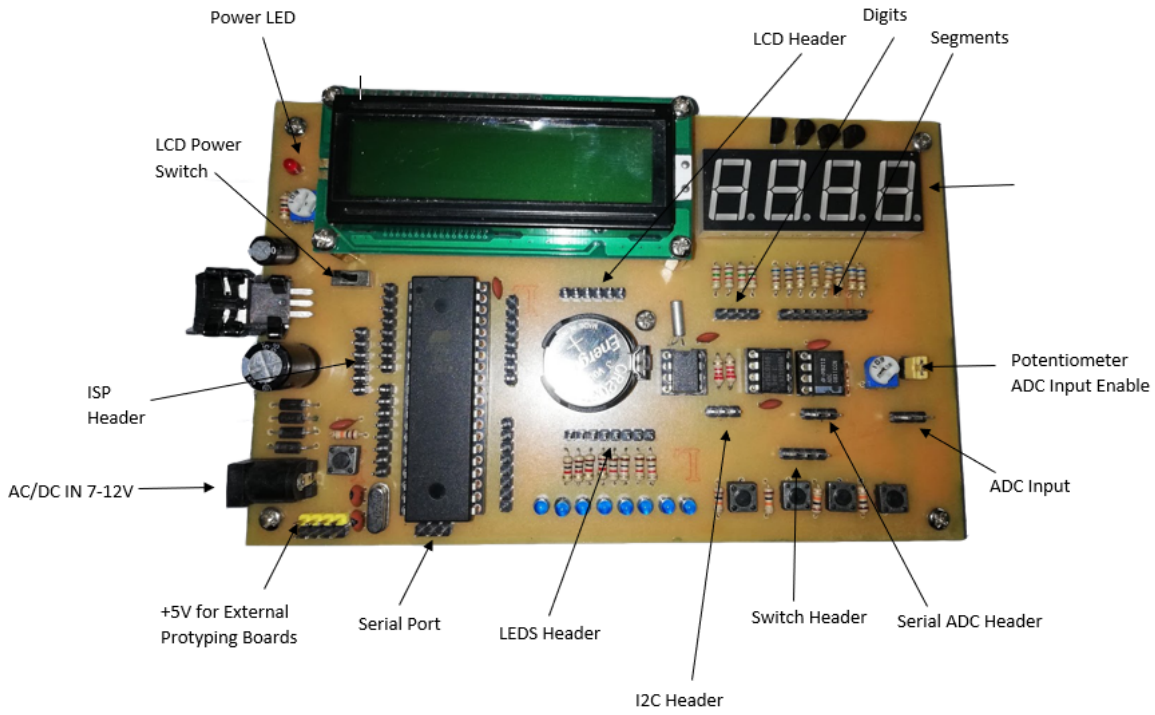
Chapter 1

Introduction

1.1 The Prototyping Board and Programming Dongle

The prototyping board includes the AT89S52 microcontroller, on board voltage regulators, 8 Leds, 4 Switches, HD44780 compatible 2x16 LCD, 4 Digit Seven Segment, DS1307 Real Time Clock, ADC0831 Serial ADC, and a 24C04 Serial EEPROM. Enough to learn the basics of Microcontroller Interfacing and Programming.



The programming dongle is a USBASP based programmer from e-Gizmo Mechatronix Central with modified firmware to support the AT89S52 microcontroller. It is used with AVRDude using AVRDudess IDE.

1.2 Software Toolsuite

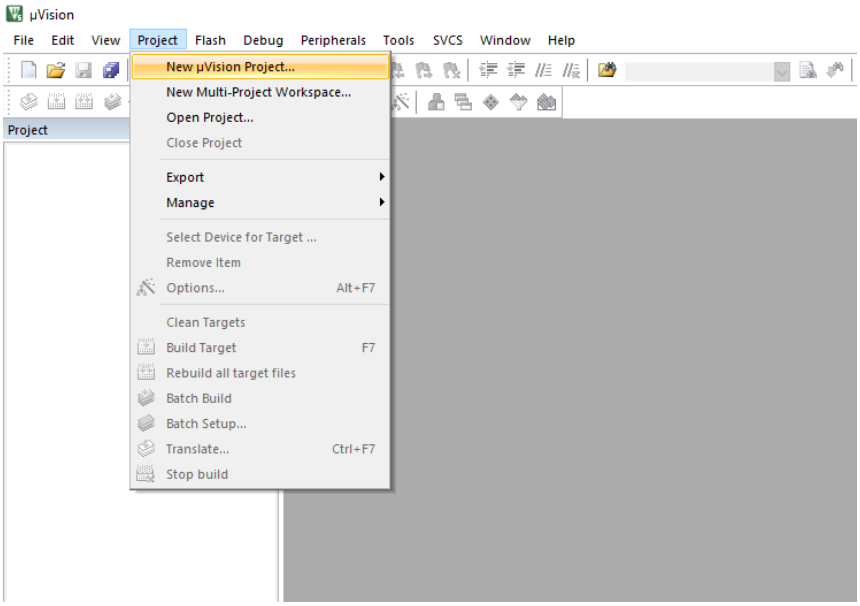
In this section, you will learn how to install the needed toolsuites, install drivers and load your first program to the microcontroller.

1.2.1 Creating a Project with Keil uVision 5

1. Download Keil uVision IDE from https://www.keil.com/download/product/ if not yet installed

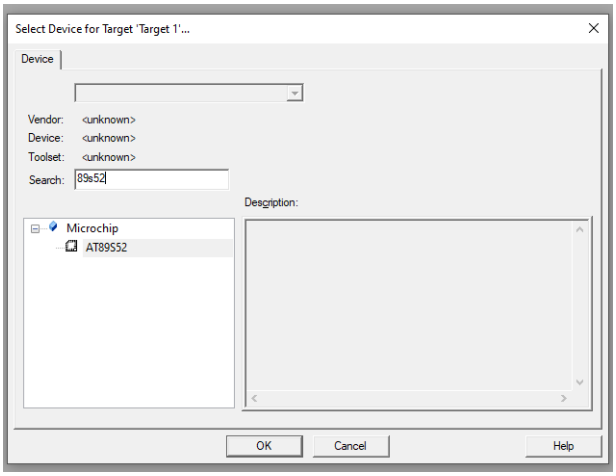
   Keil provides a code limited (2K bytes) evaluation version for 8051 architecture (C51) which is sufficient enough for learning purposes.

2. To create a new 8051 project, Click on **Project** on the Menu bar and select **New uVision Project** as shown in the image below.



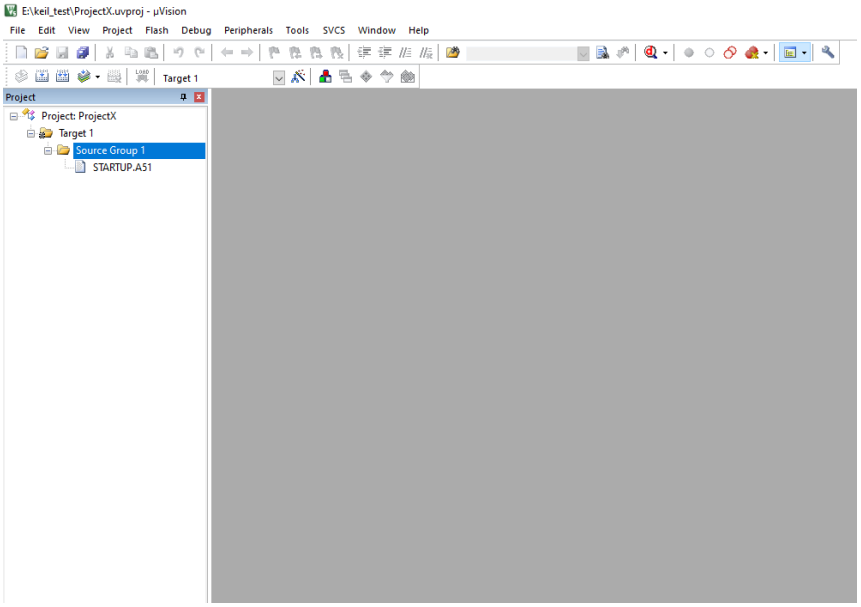
   Now create a folder to store your project and give a name to your Project file for example HelloWorld. It is recommended that you create your own project folder in Drive D of the computer that you are using in the laboratory.

3. You will then be taken to the device selection dialog, type 89S52 in the search bar, click on the AT89S52 under Microchip and clik OK. Select otherwise if you are using a different brand such as STC10F104.

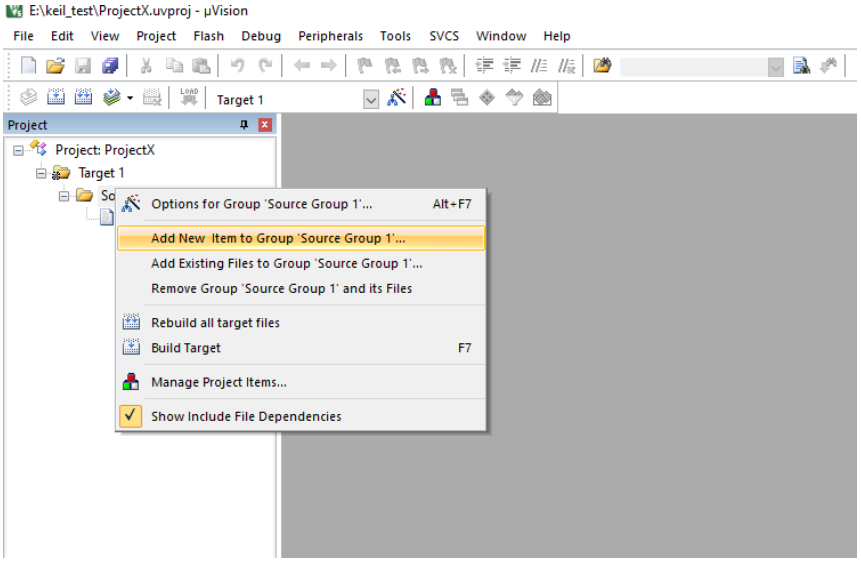


After selecting the device, a dialog box will as you to copy STARTUP.A51, click Yes

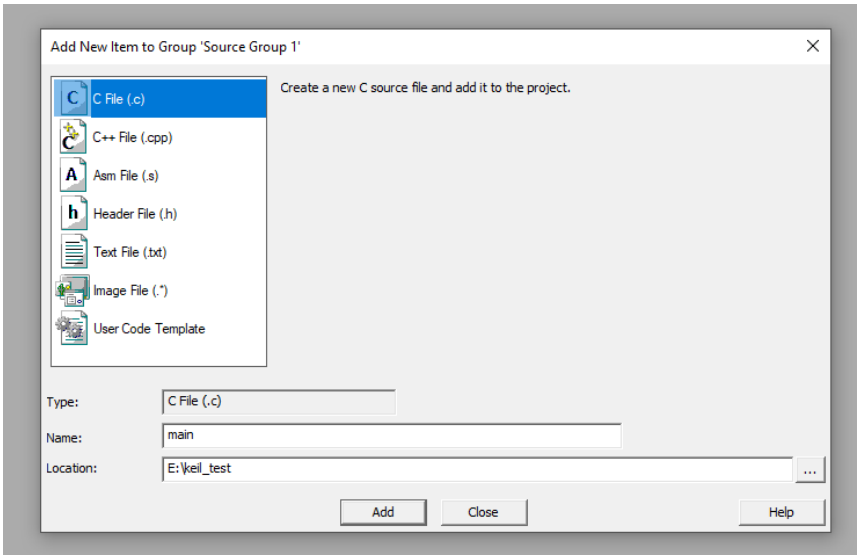
4. The empty project will look like something shown below



5. Add a source file so we can now type our code. Right click on the Source Group1 and click on Add new Item to Group 'Source Group 1'.



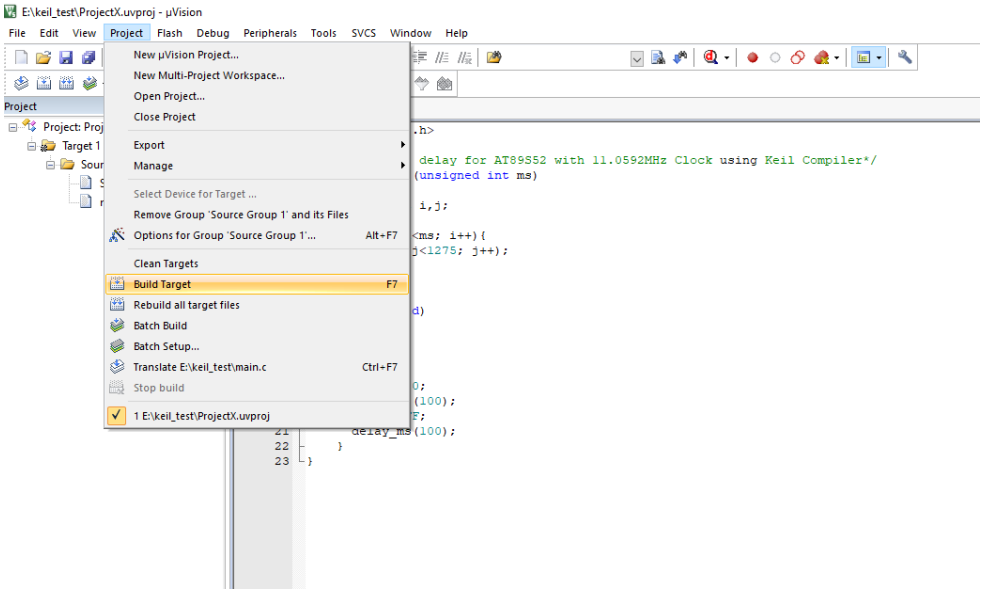
6. Click on C file on the selection and give it a name, for simplicity we use main.c for our main part of the code. Then, Click on Add



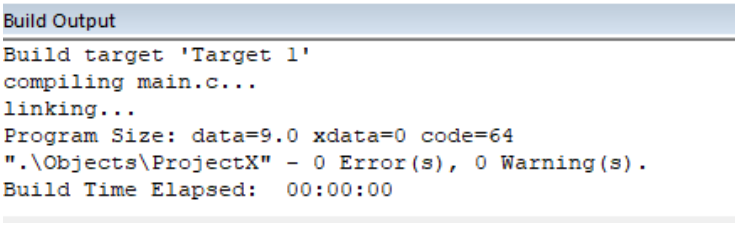
7. Now you can type a sample program to blink LEDS connected to Port2 of the microcontroller

```
/****
LED Blink
MCU: AT89S52
Clock: 11.0592 MHz
****/
include <reg52.h>

/*milliseconds delay for AT89S52 with 11.0592MHz Clock using Keil Compiler*/
void delay_ms (unsigned int ms)
{
   unsigned int i,j;

      for(i=0; i<ms; i++){
         for(j=0; j<1275; j++);
      }
}

void main (void)
{

   while(1)
   {
      P2 = 0x00;
      delay_ms(500);
      P2 = 0xFF;
      delay_ms(500);
   }
}
```

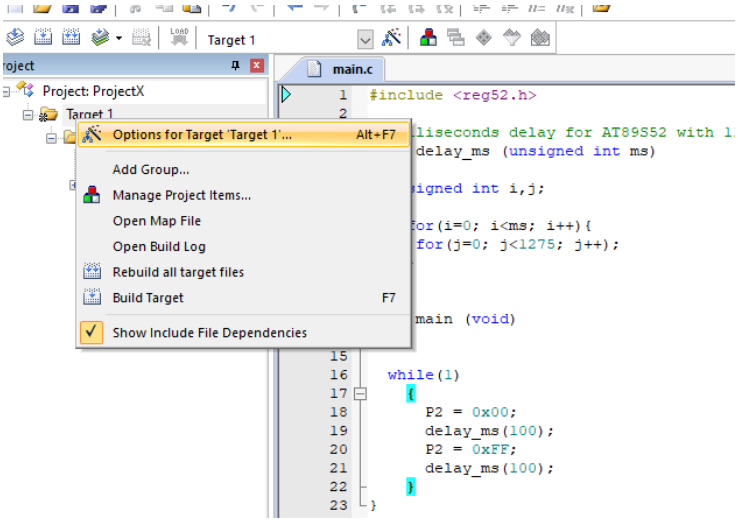
8. Build C Project, Click on Project then click on Build target or by pressing the F7 Key



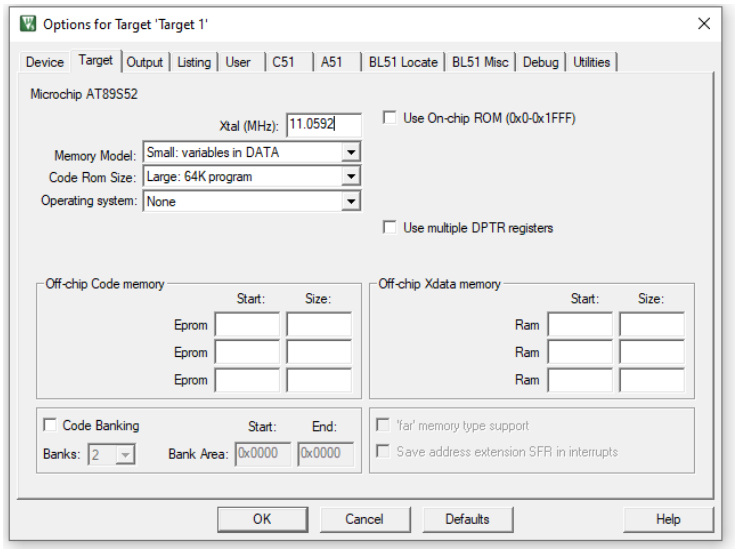
9. If there are no errors, the project should build succesfully with 0 Errors and 0 Warnings



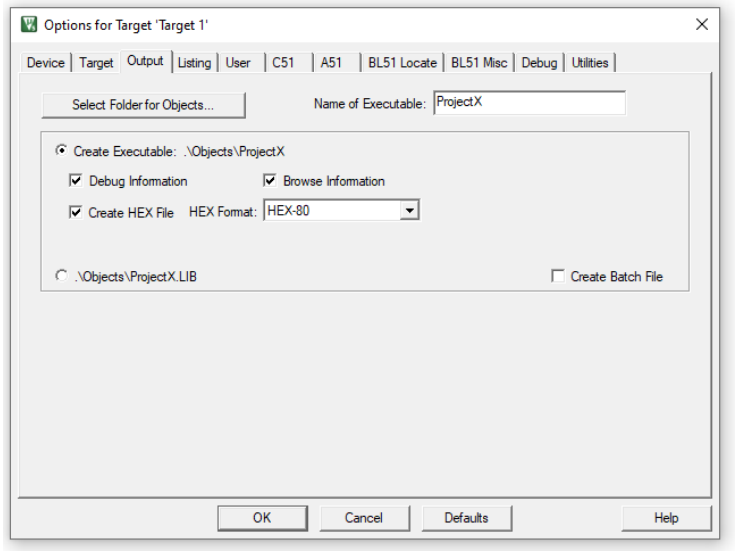
10. In order to load the compiled program to the microcontroller we must tell uVision to create a hex file. Right click on Target 1 and click on options for Target 'Target 1'.



11. Under target tab, change XTAL to 11.0592. The default value is 33



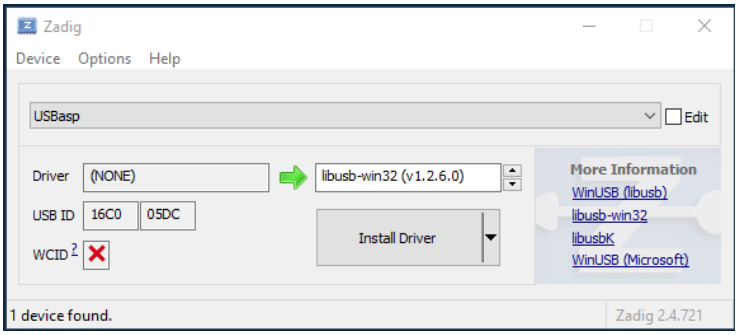
12. Click on the output tab and tick Create HEX File



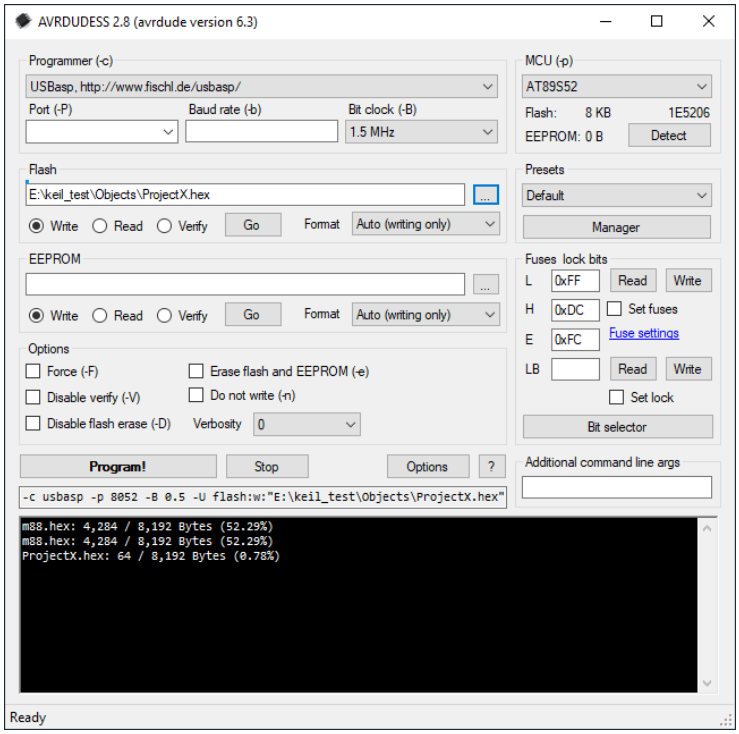
13. You are now ready to load your hex file to your microcontroller.

1.2.2 Loading the hex file using avrdudess

1. Connect the USBASP to the Development board using the included cable.
2. Connect the USBASP to an available USB port on your computer, and apply power to the board.
3. If the USBASP is not detected or has a yellow exclamation point on the device manager, install the libusb-win32 1.2.6 thru the Zadig-2.4 utility. Download from https://github.com/staticsensitive under 8051-samples → Tools



4. Open AVRdudess executable, can also be downloaded from the github page stated above.



5. Select USBasp in the programmer dropdown.
6. Select AT89S52 under the MCU dropdown.
7. Click on the button ... button on the flash section then browse for the hex file generated inside the Objects folder in the project folder that you had created in the previous exercise.
8. Click on **Program!**
9. If there are no error message, you have succesfully loaded the hex file to the microcontroller.

Chapter 2

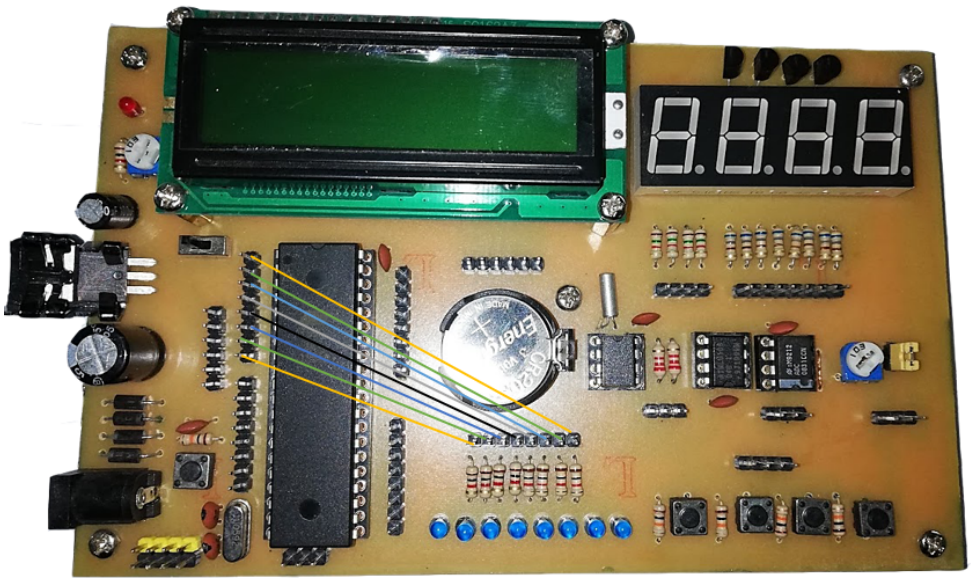
I/O Interfacing - LED Interface

2.1 Materials

- Development Board
- 9V AC Adapter
- USBASP Programming Dongle
- 8pcs Dupont Female-Female Connecting Wires

2.2 Procedures

1. Connect the 8 LEDs to a port of your choice i.e. Port 1. as shown



2. Write a C program to Blink all the LEDS at your chosen port.
3. Modify your Led Blink program to blink slower and blink faster.
4. Write a C program to show a running light pattern.
5. Modify the previous code to show 4 different light patterns.
6. Write a C program to show an 8-bit binary counter.