EXPERIMENT 4

ROLL NO : 20BCS009

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AIM: Write a program for a counter controlled using 8051 microcontroller switches where each switch maps up to a count and on press starts a counter mapped to it.

OUTCOME: Students will learn how to use Keil compiler for writing programs and Flash Magic to build the program in PC.

HARDWARE USED: Microcontroller kit, Power supply, connecting wires.

SOFTWARE USED: Keil μVision 4, Flash Magic. 1.

Keil μVision: The μVision IDE combines project management, run-time environment, build facilities, source code editing, and program debugging in a single powerful environment. μVision is easy-to-use and accelerates your embedded software development.

µVision supports multiple screens and allows you to create individual window layouts anywhere on the visual surface.
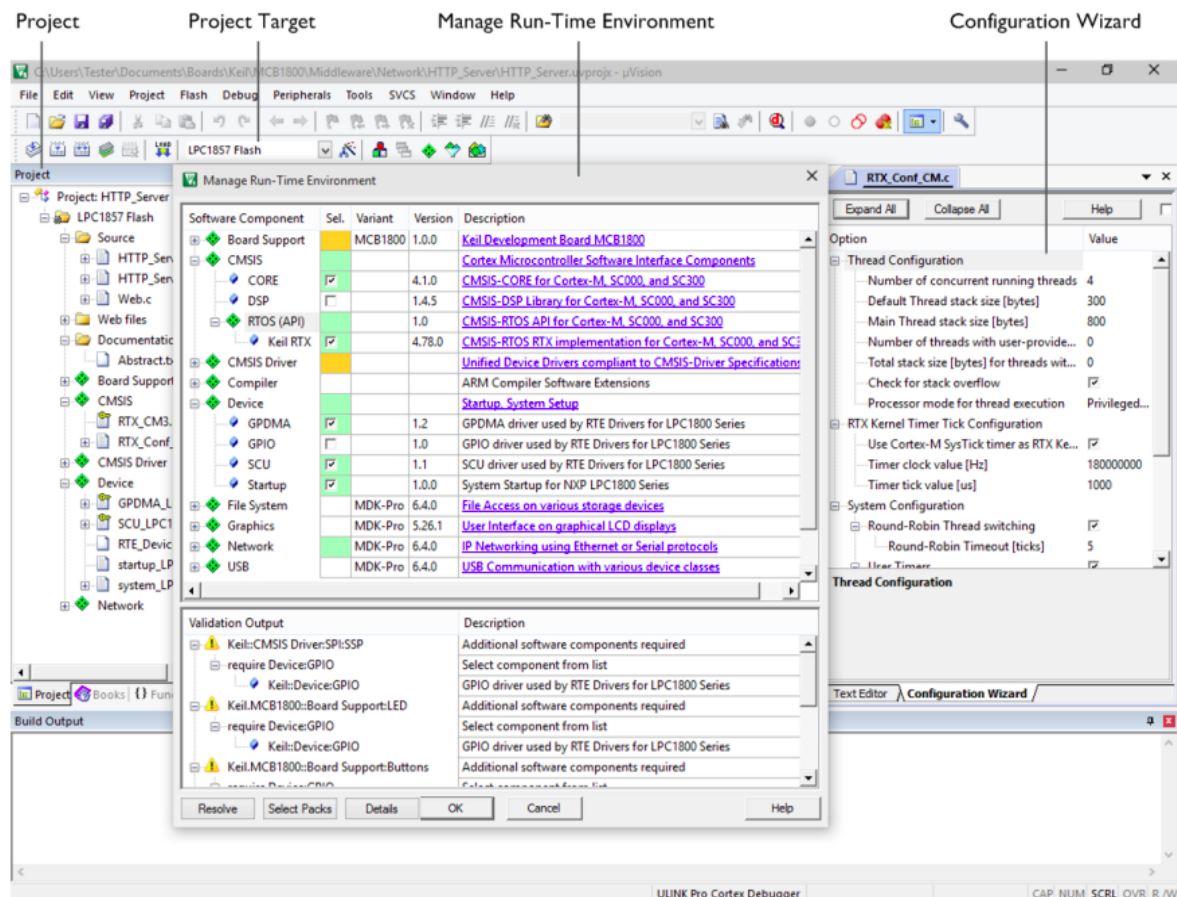

Procedure of using Keil:

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1. To initiate the programming you must create a project using the keil Uvision IDE The option to create a new project will be available under the project tab in the toolbar. Next, you have to store the project in a folder and give a suitable name to it.
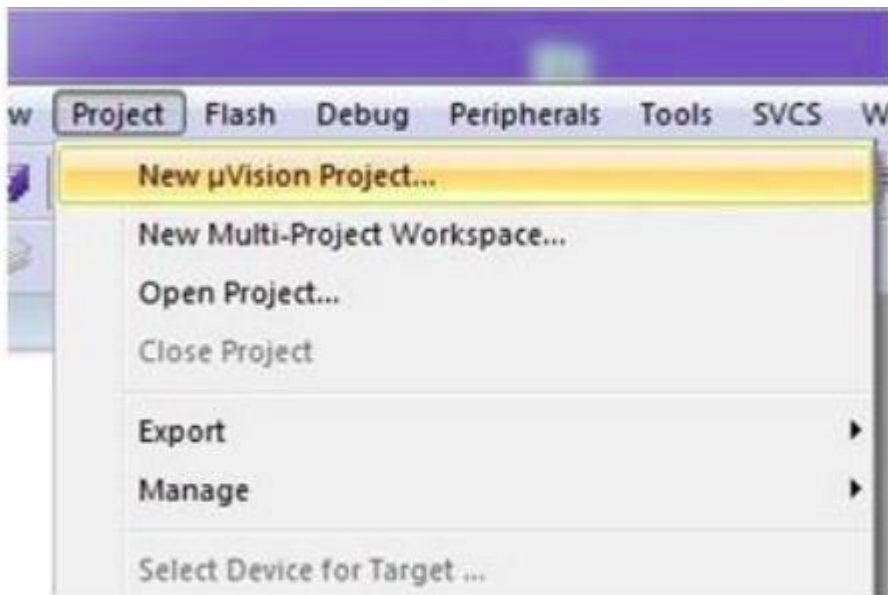
2. Select the type of device you are working with The device selection dialog provides you with the option to select the 8051 derivatives for which you want to develop the program. If you are not sure about your device you can refer to the description of the devices which is displayed on the left pane of the dialog. Accordingly, select your device and click OK to confirm.
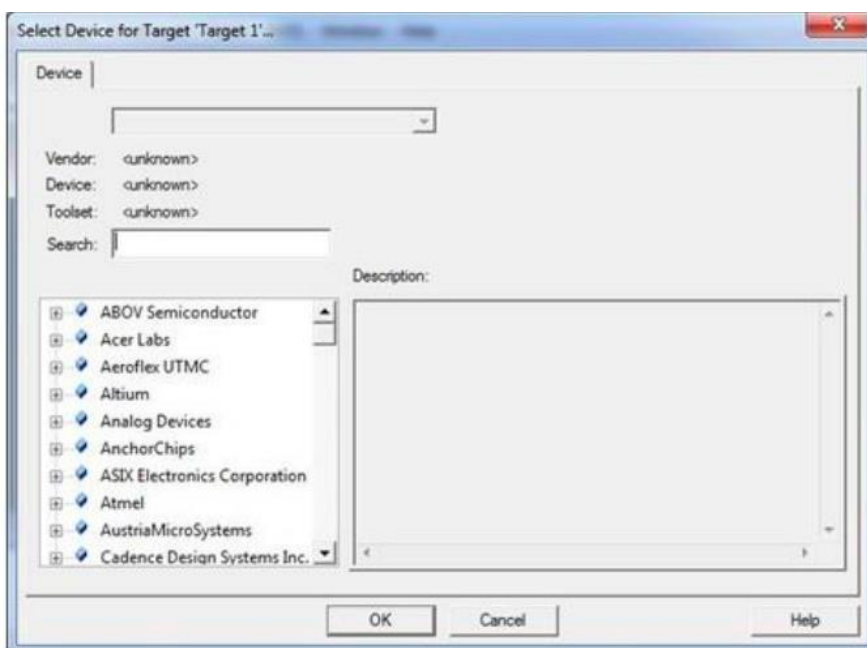
3. Add C files to your project You must add C file to your project before you begin coding. This can be done by right-clicking on your project from the project pane and selection "Add a new item to source group 1". In the next dialog box, you will be given with the choice on what type of file you want to add such as C, C++, header, text etc. Since here we are dealing with Embedded C programming, select C File (.c) option. Provide the necessary name, location and click on add
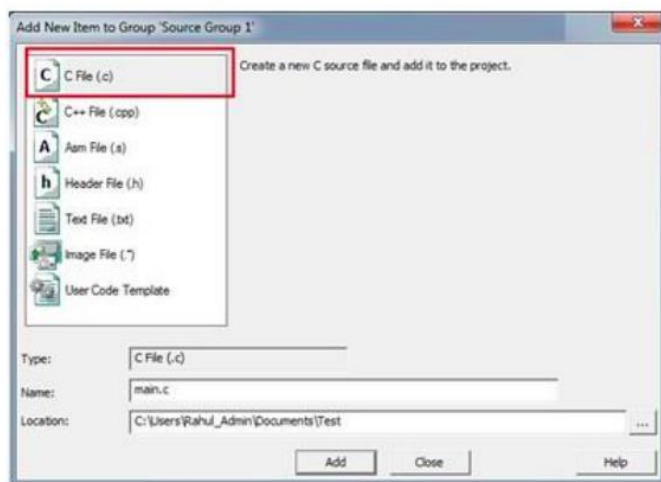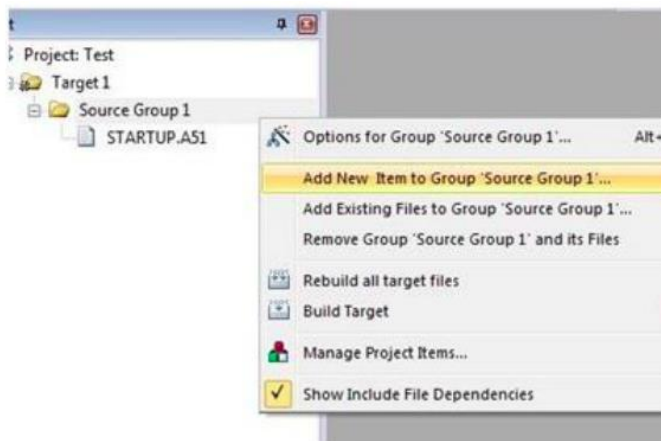
4. Coding in C :The main part has finally arrived, so now you can go along with programming in C with your respective microcontroller.

Our task is to blink two LEDs connected to Port 1 and Port 2 of 8051 microcontroller alternatively.

```c
#include <p89v51rx2.h>

sbit sw1 = P3 ^ 2;
sbit sw2 = P3 ^ 3;
sbit sw3 = P3 ^ 4;
sbit sw4 = P3 ^ 5;

void delay(unsigned int n)
{
    unsigned int i;
    unsigned int j;
    for (i = 0; i < 1000; i++)
    {
        for (j = 0; j <= 3 * n; j++)
        {
        }
    }
}

void counter(unsigned int count)
{
    int i = count, j;
    while (i >= 0)
    {
        j = i;
        RD = !(j & 1);
        j >>= 1;
        WR = !(j & 1);
        j >>= 1;
        TxD = !(j & 1);
        j >>= 1;
        RxD = !(j & 1);
        delay(10);
        i--;
    }
}

void main(void)
{
    sw1 = 1;
    sw2 = 1;
    sw3 = 1;
    sw4 = 1;
    while (1)
    {
        if (sw1 == 0)
        {
            while (1)
            {
                counter(1);
                if (sw2 == 0 || sw3 == 0 || sw4 == 0)
                {
                    break;
                };
            }
        }
        if (sw2 == 0)
        {
```

```c
        while (1)
        {
            counter(3);
            if (sw1 == 0 || sw3 == 0 || sw4 == 0)
            {
                break;
            };
        }
    }
    if (sw3 == 0)
    {

        while (1)
        {
            counter(7);
            if (sw2 == 0 || sw1 == 0 || sw4 == 0)
            {
                break;
            };
        }
    }

    if (sw4 == 0)
    {
        while (1)
        {
            counter(15);
            if (sw2 == 0 || sw3 == 0 || sw1 == 0)
            {

                break;
            };
        }
    }
  }
}
```

5. Compiling and building the C project using Keil Uvision IDE In order to build recently created C program go to Project tab and click on Build Target on the menu bar. An alternate way to do this is by pressing the F7 key. If the code that you have written is correct, the code will successfully compile without any errors. You can check your output in the Build Output pane.
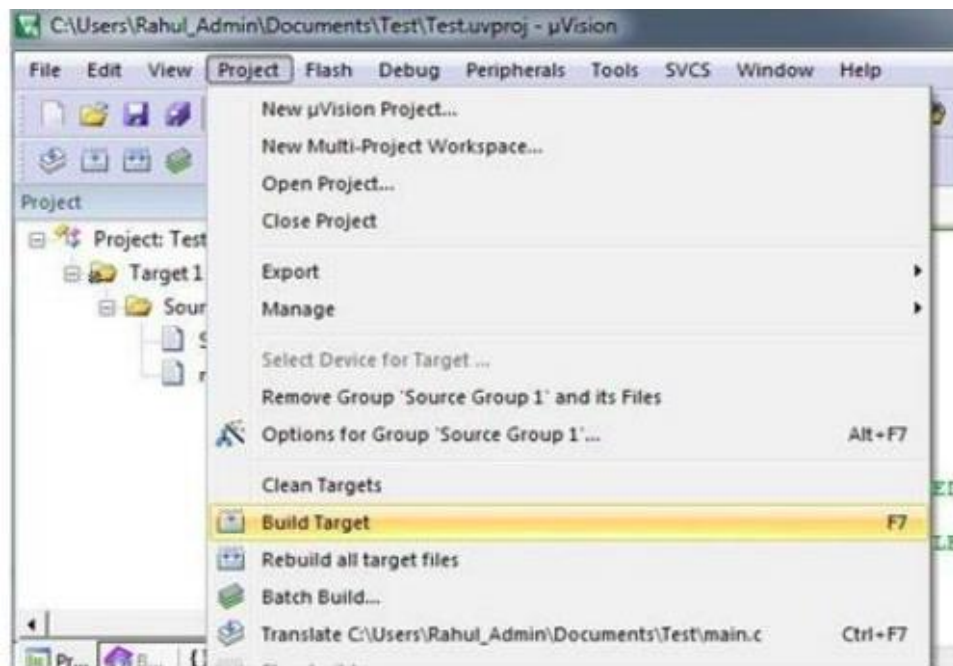
6. Generating the hex file using Keil Uvision IDE The code you compiled cannot be directly fed to the microcontroller, it is not possible. For that purpose, we have to generate the hex code for your respective file. In order to generate the hex code, right click on the 'Target 1' folder and select options for target 'Target 1'. Select the Output tab in the target 'Target 1' dialog box. Make sure Create Hex File option is checked and the HEX format should be HEX-80. Click OK. Again rebuild your project by pressing F7. Your required hex file would have been generated with the same as your project in the Objects folder. If you wish you can also view your hex code by using a notepad
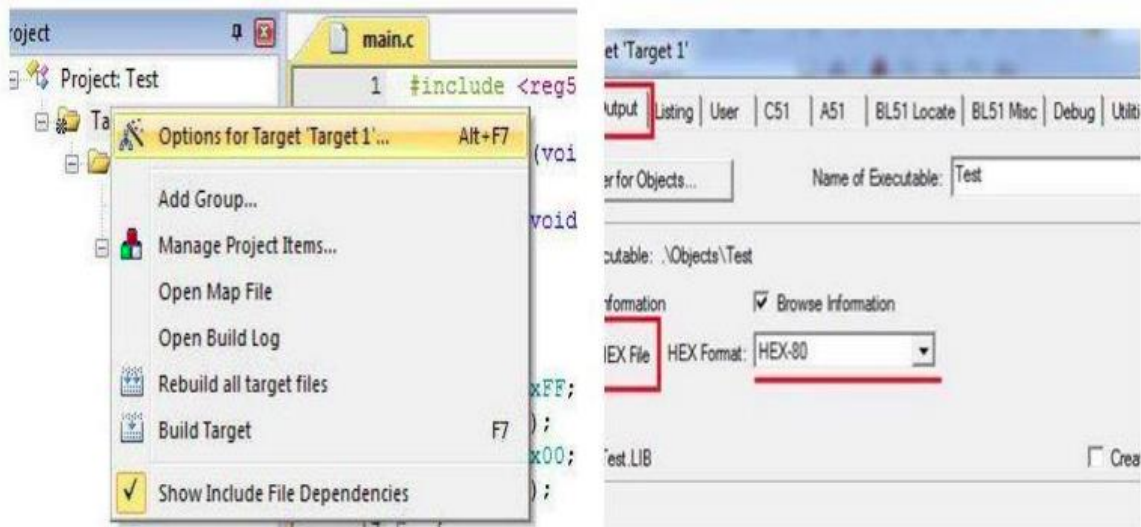
Burning the hex code into 8051 microcontroller In order to burn the hex code to your microcontroller, there are two ways which are specific to the device you are working with. Some devices, for example, P89V51 they have their own builtin bootloader and you can burn the hex code directly through the serial port. Mostly you will require a specific programmer for your 8051 microcontroller through which you can easily upload your hex code by connecting the programmer via normal USB port.

Flash Magic :

Flash Magic is a PC tool for programming flash based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware. Procedure for using Flash Magic:

1. Select the IC from Select Menu.

2. Select the COM Port. Check the device manager for detected Com port.

3. Select Baud rate from 9600-115200

4. Select None Isp Option.

5. Oscillator Freq 12.000000(12Mhz).

6. Check the Erase blocks used by Hex file option

7. Browse and Select the hex file.

8. Check the Verify After Programming Option.

9. If DTR and RTS are used then go to Options->Advanced Options-> Hardware Configuration and select the Use DTR and RTS Option.

10. Hit the Start Button to flash the hex file.

11. Once the hex file is flashed, Reset the board. Now the controller should run your application code.
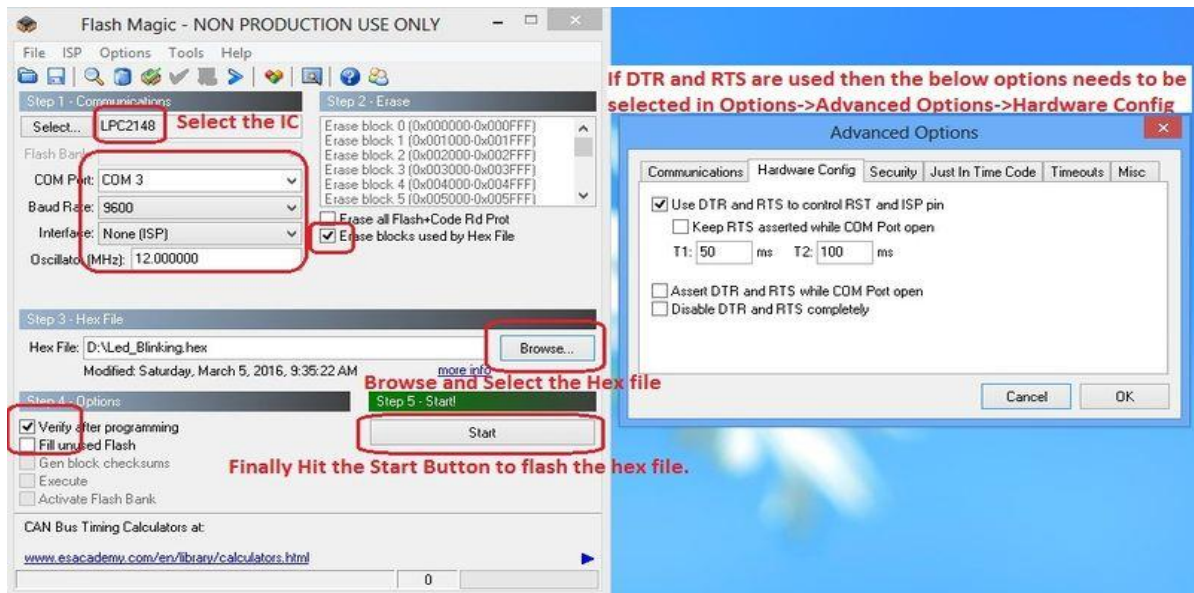
OUTPUT- After the delay the Leds blink to convey the binary output of the count.

Screenshot of the output: