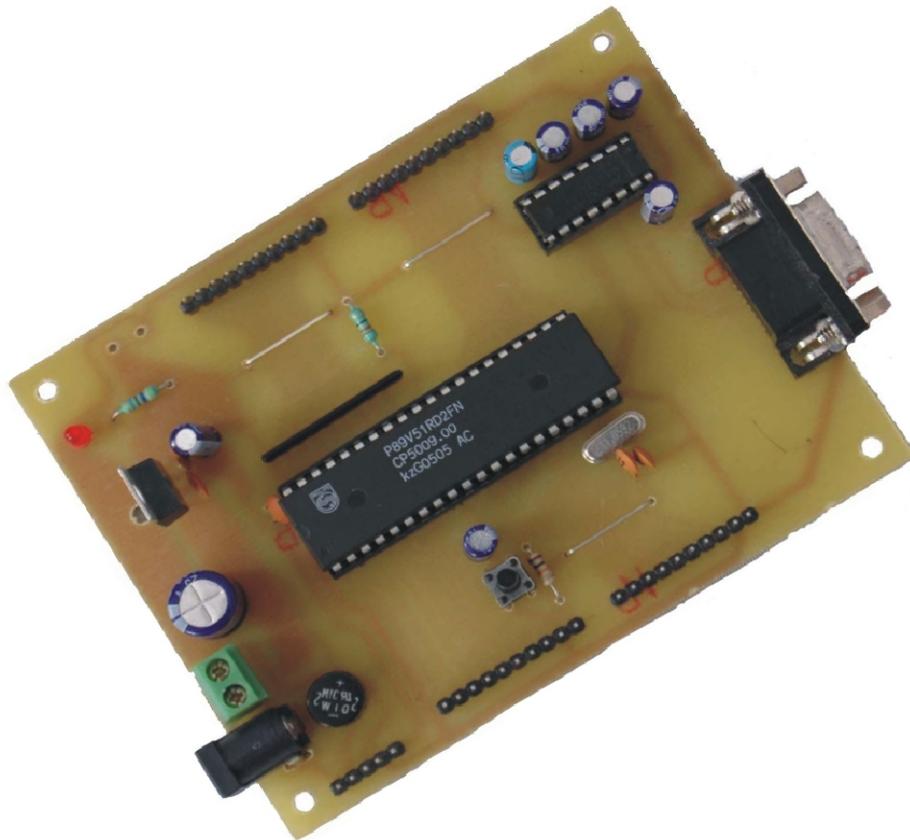


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# Quick Start Guide

## 8051 Development Kit ver 1



Please read this Manual before using  
8051 Development Board

**HPS Technologies Pvt Ltd**

[www.hpsindia.com](http://www.hpsindia.com)

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Thank you for purchasing 8051 development kit.

## **ERRATA**

while great effort is made to assure the accuracy our texts, errors may still exists. If you find an errors, please let us know by sending an email to [support@hpsindia.com](mailto:support@hpsindia.com). We continually strive to improve all of our educational materials and documentation, and frequently revise our texts. Occasionally , an errata sheet with a list of known errors and corrections, for a given text will be posted to our web site, [www.hpsindia.com](http://www.hpsindia.com).

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# Table of contents

Chapter 1: Contents of Development Kit.....	3
Chapter 2: Overview of DEvelopment Board.....	4
Chapter 3: Installing Software's.....	5
Chapter 4: Getting started.....	6
Chapter 5: Projects	
A) Interfacing LED.....	14
B) Interfacing switch and LED.....	16
C) Demonstration of serial communication.....	18
Chapter 6: Frequently asked questions.....	19
Chapter 7: Getting help.....	20

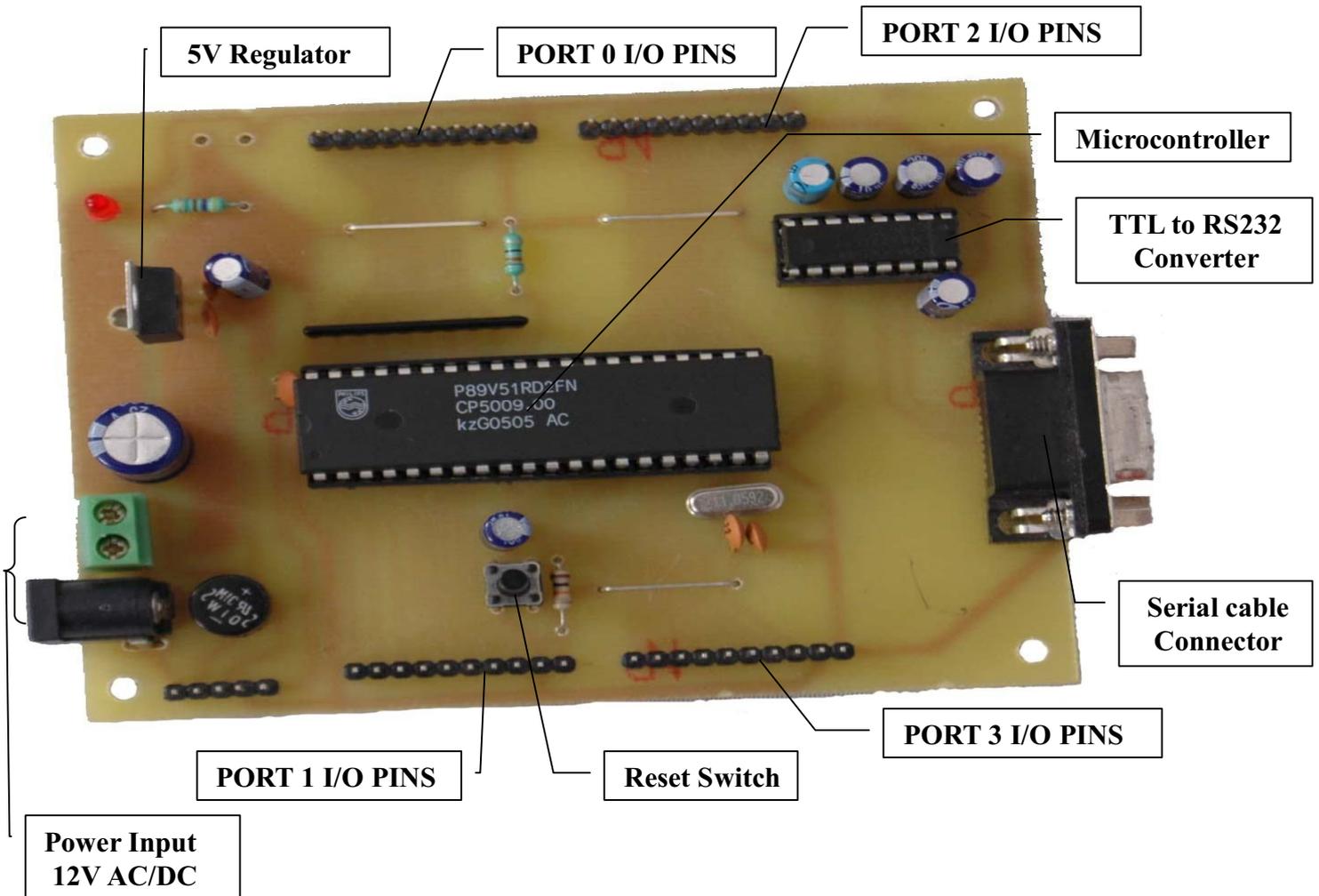
## Chapter 1: Contents of development kit

1. 8051 Development board
2. CD
3. Programming cable
4. Manual

## Chapter 2 : Overview of Development board

This Development Board provides an easy and low cost way to develop projects on 8051 microcontroller without the need to purchase any other equipment such as programmer or emulators. All required software's are available as free download, including a C compiler

Note: All required software's are included in accompanying CD.



### Features

1. Standard 8051 (P89V51RD2) CPU with 11.0592MHz clock.
2. 64K Bytes of on-chip Flash program memory.
3. Port Extension for all Ports.
4. On Board Rs232 to TTL Converter.
5. On Board Regulated Power Supply.
6. 12V, 5V and Ground source for external connection.
7. On Board Switch for ON/OFF.
8. Pull-up resistor's for Port 0.
9. On Board Demo projects.

## Chapter 3: Installing Software's

Software's are required to develop projects

1. Editor – is a program that allows you to edit plain text file including .c, .asm, .txt, html, .php & many more. (Notepad)
2. Compiler – is a program that converts high level language into machine understandable (Binary) language. (SDCC, Keil)
3. Programmer – is a program which programs hex file into microcontroller. (Flash Magic)

Installing Keil Software: Keil is IDE (Integrated Development Environment) for microcontrollers.

1. Open My computer.
2. Within the My Computer window, open the CD Drive, open 8051 Development Kit/Compilers/Keil.
3. Within Drive contains setup file, double click on this file should start installation , then follow the instructions.
4. After installing a keil software if it prompts you to reboot the computer, do it.

Installing SDCC (Small Device C Compiler): is freeware ANSI C compiler that targets Intel 8051 and many more.

Follow the same steps as guided in the previous section, except locate the below file Development kit/compilers/sdcc/sdcc-2.7.0-setup

Installing Flash Magic: is a pc tool for programming flash based Microcontroller  
Follow the same steps as guided in the previous section, except locate the below file Development kit/programmer/ FlashMagic.exe

If errors are encountered during installation, this document will not cover those errors.

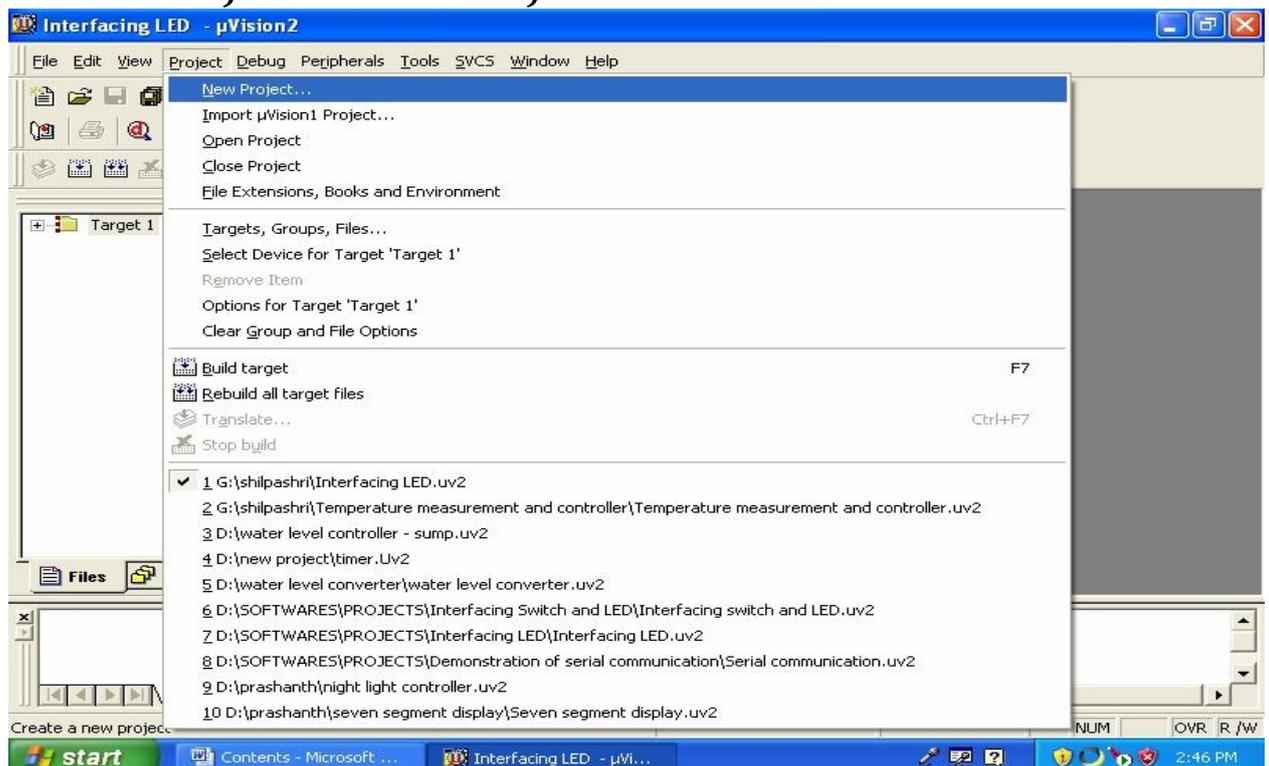
## Chapter 4: Getting Started

After installing software's it's time to play with it. To Compiling the program using Keil uVision. Follow below steps. Figures will guide you.

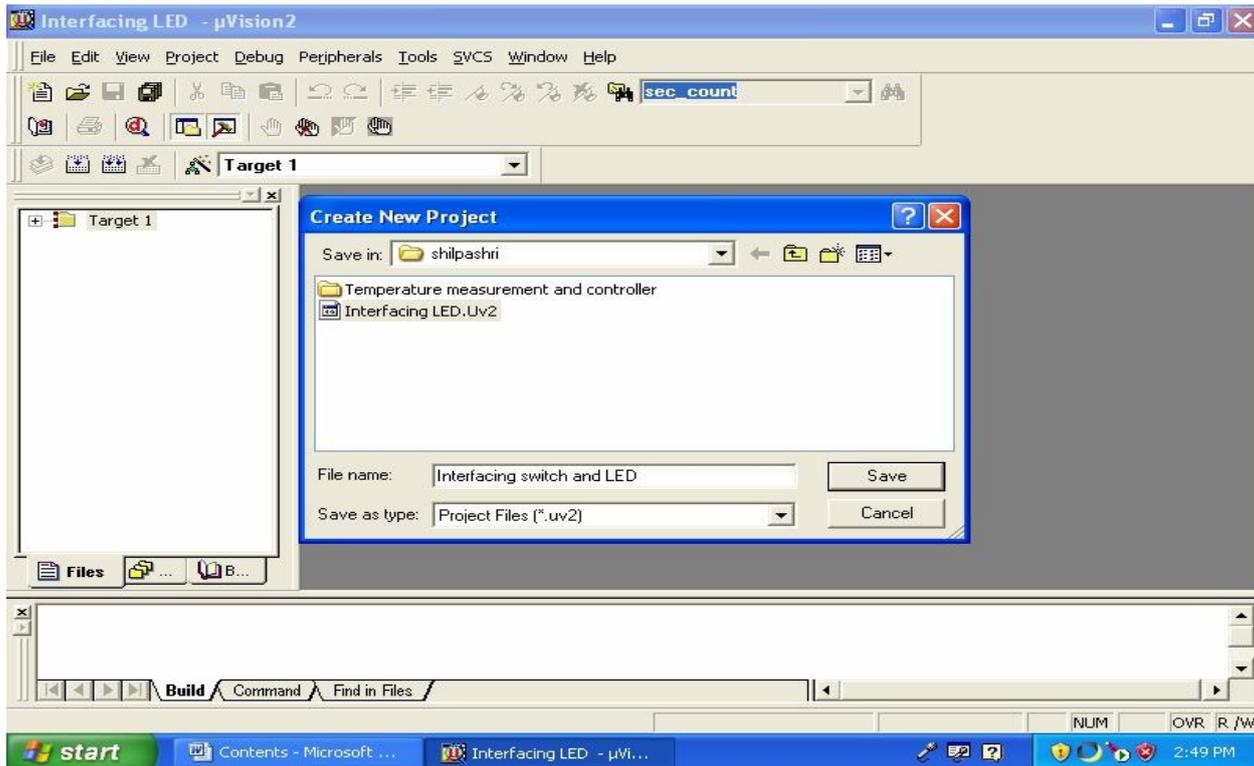
### 1. Run Keil software.



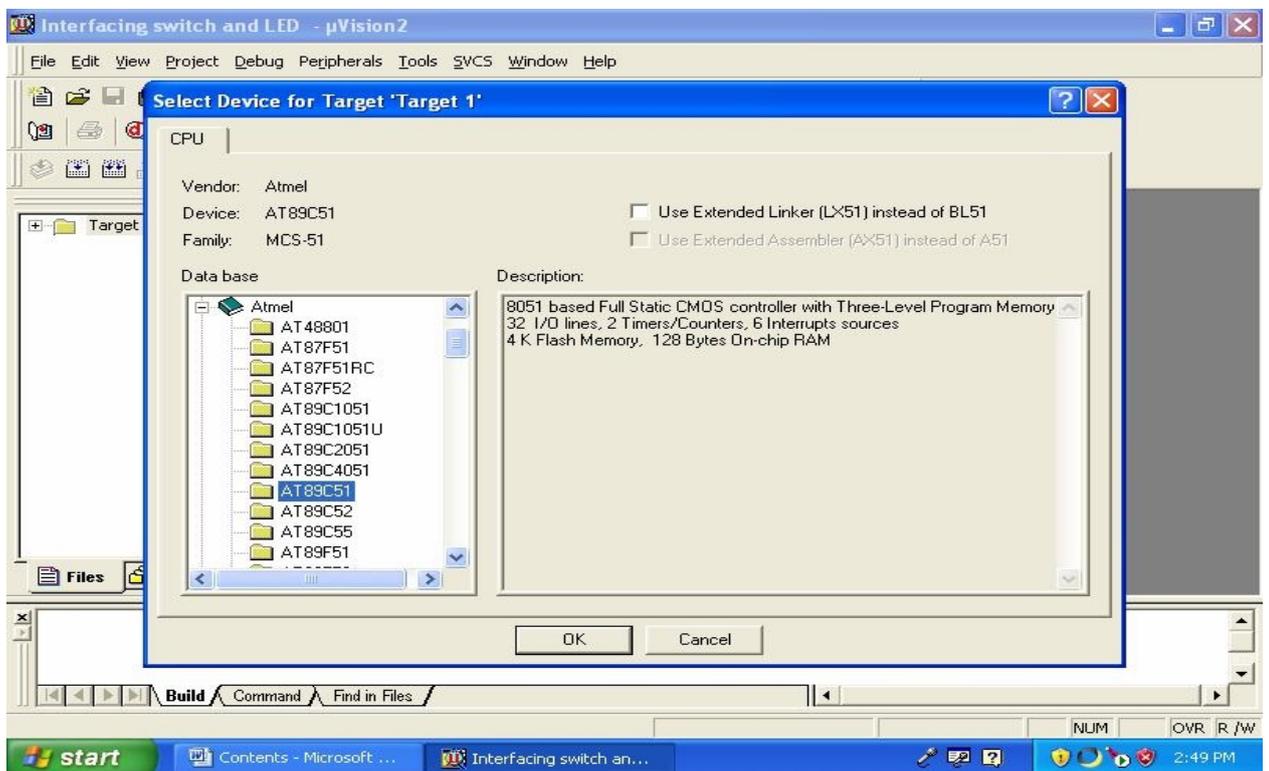
### 2. Select New Project from Project menu.



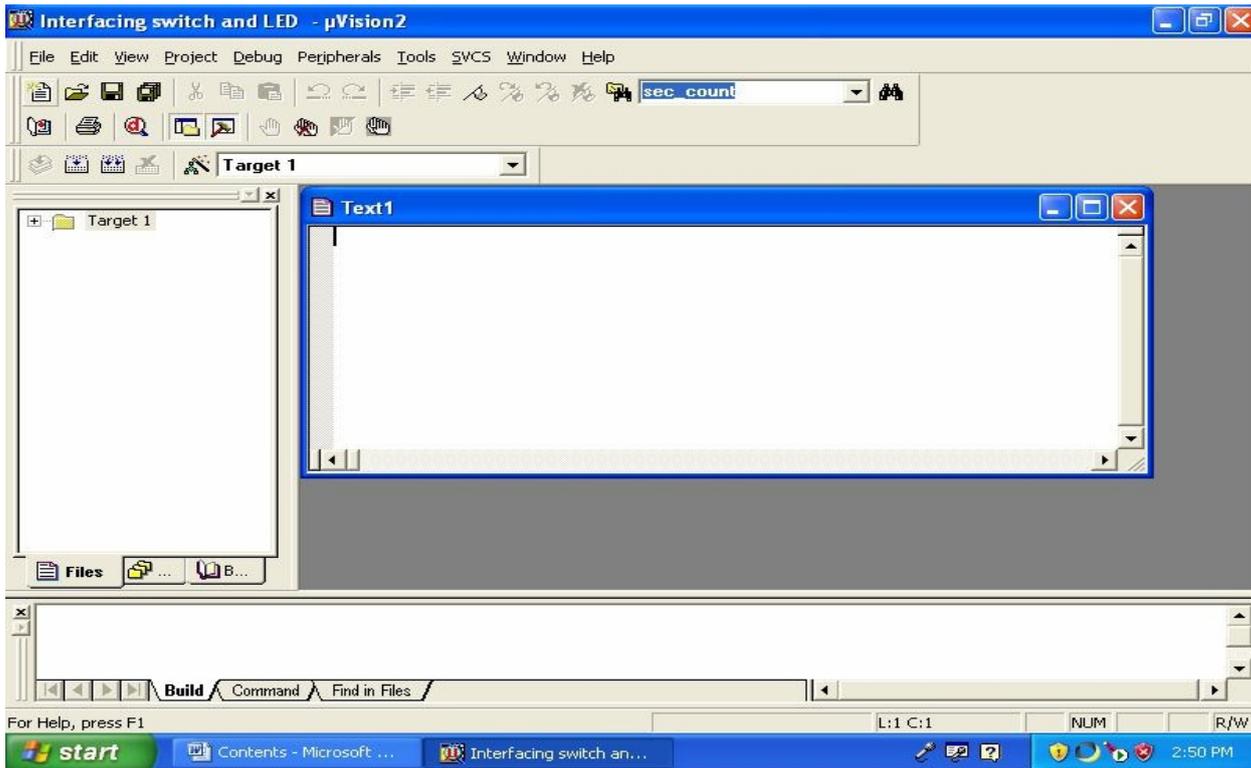
### 3. Type suitable name for the project and click on Save.



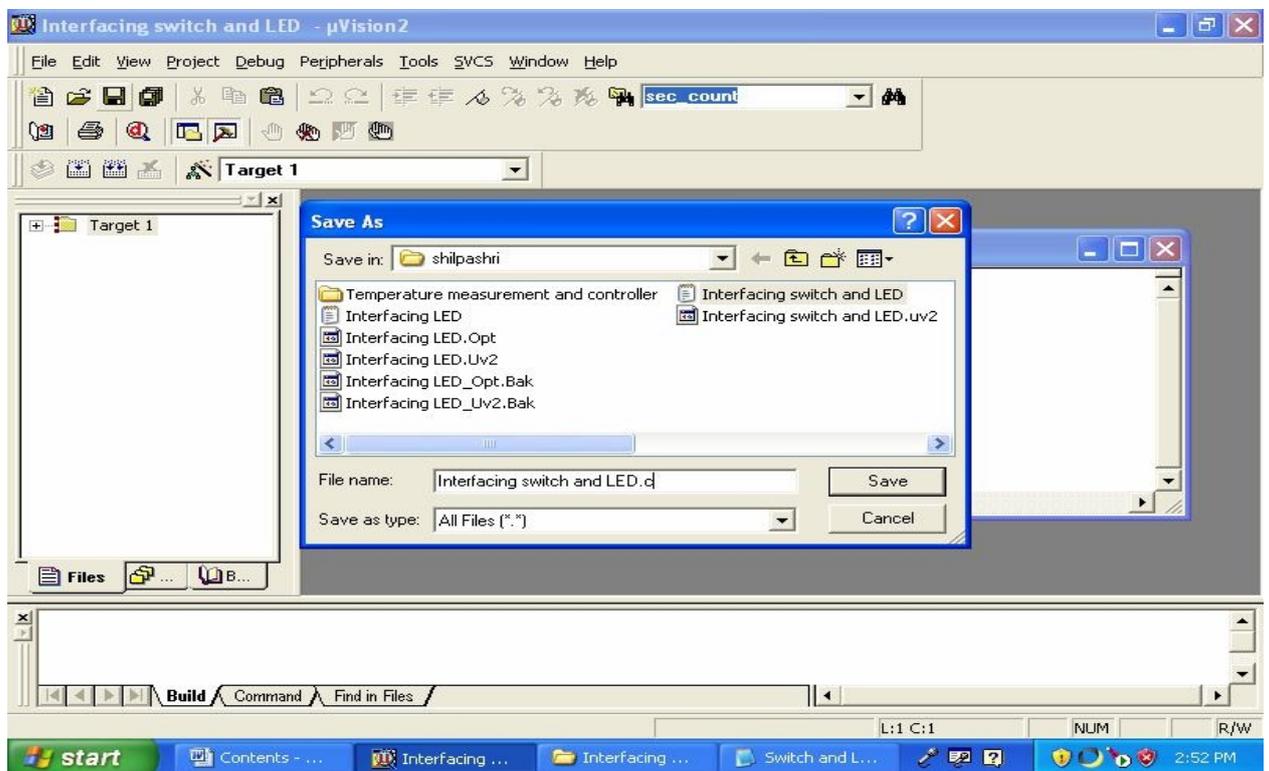
### 4. A window Prompts “ Select Device for Target ‘Target1’ “. 5. Select ATMEL AT89C51 in Data base and on click Ok.



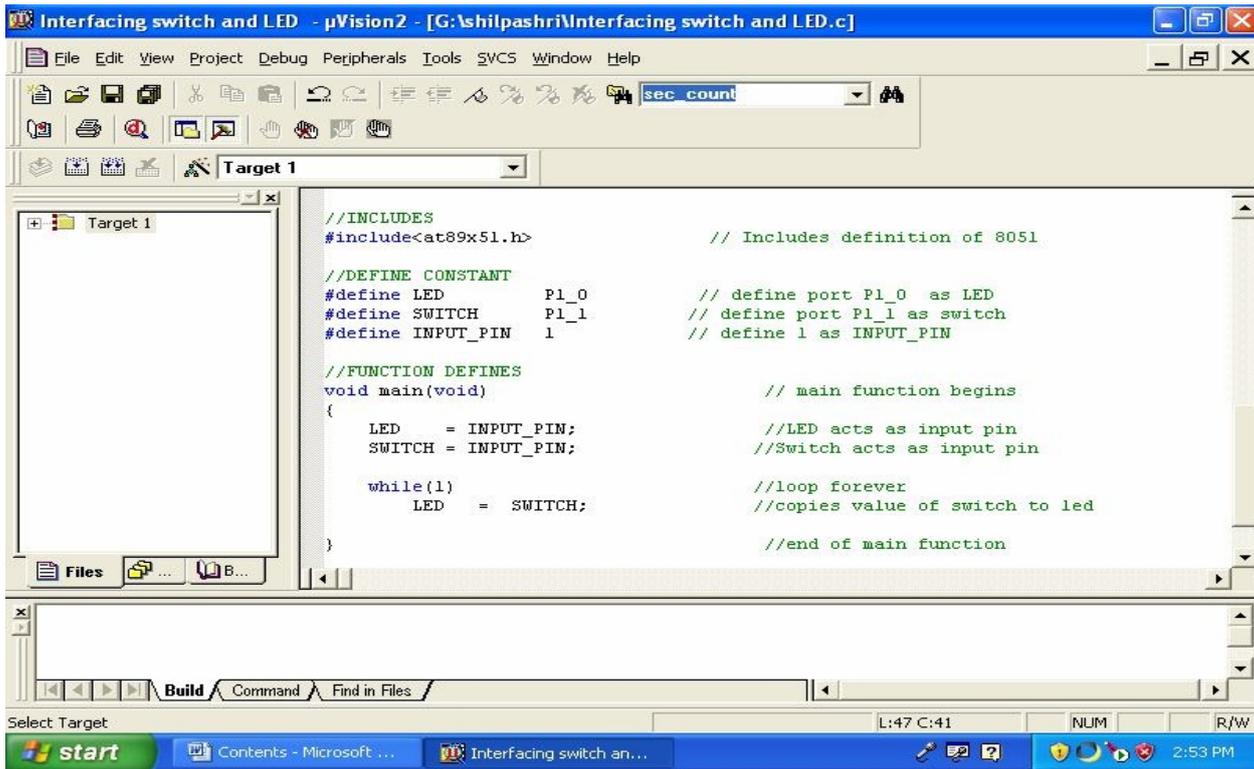
6. From the File Menu select New, a new Text window appears.



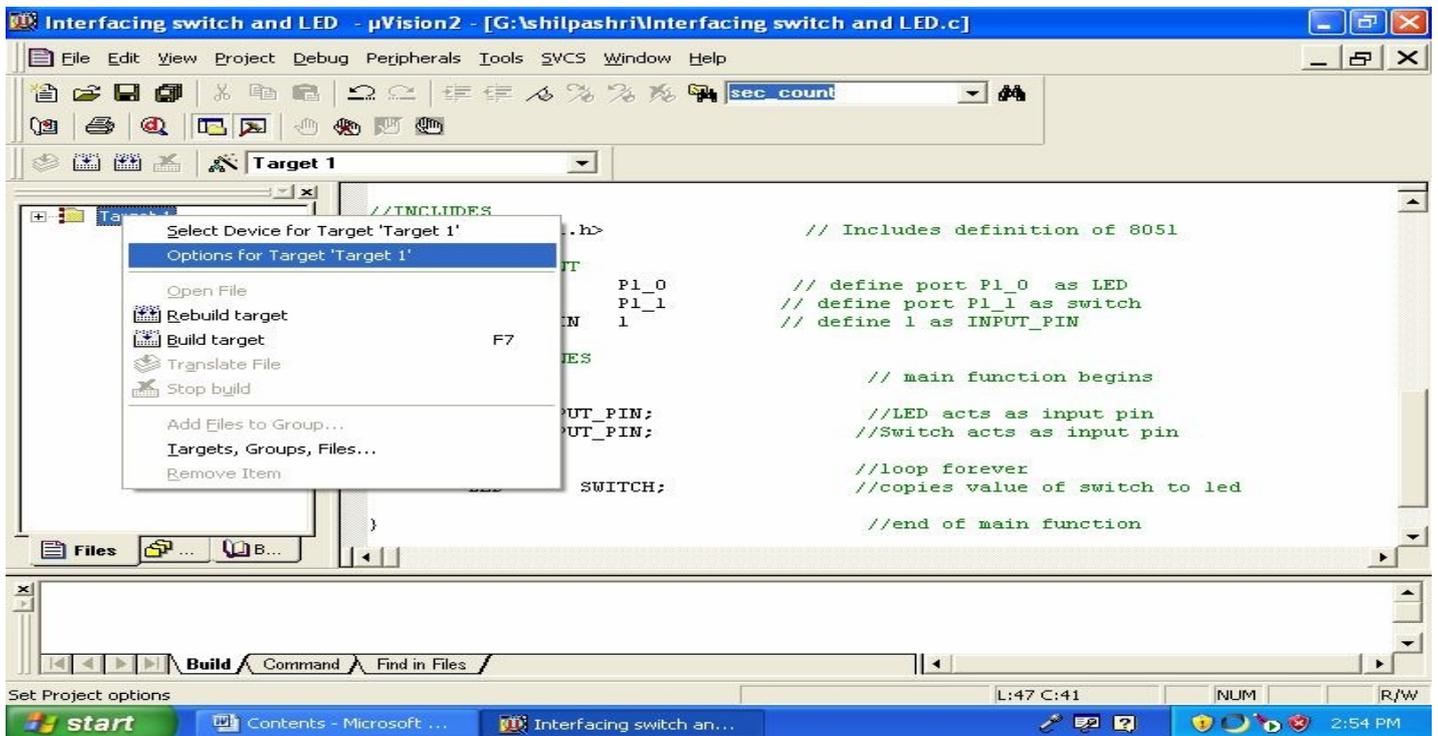
7. Save the file by typing suitable file name with its extension c (or asm)



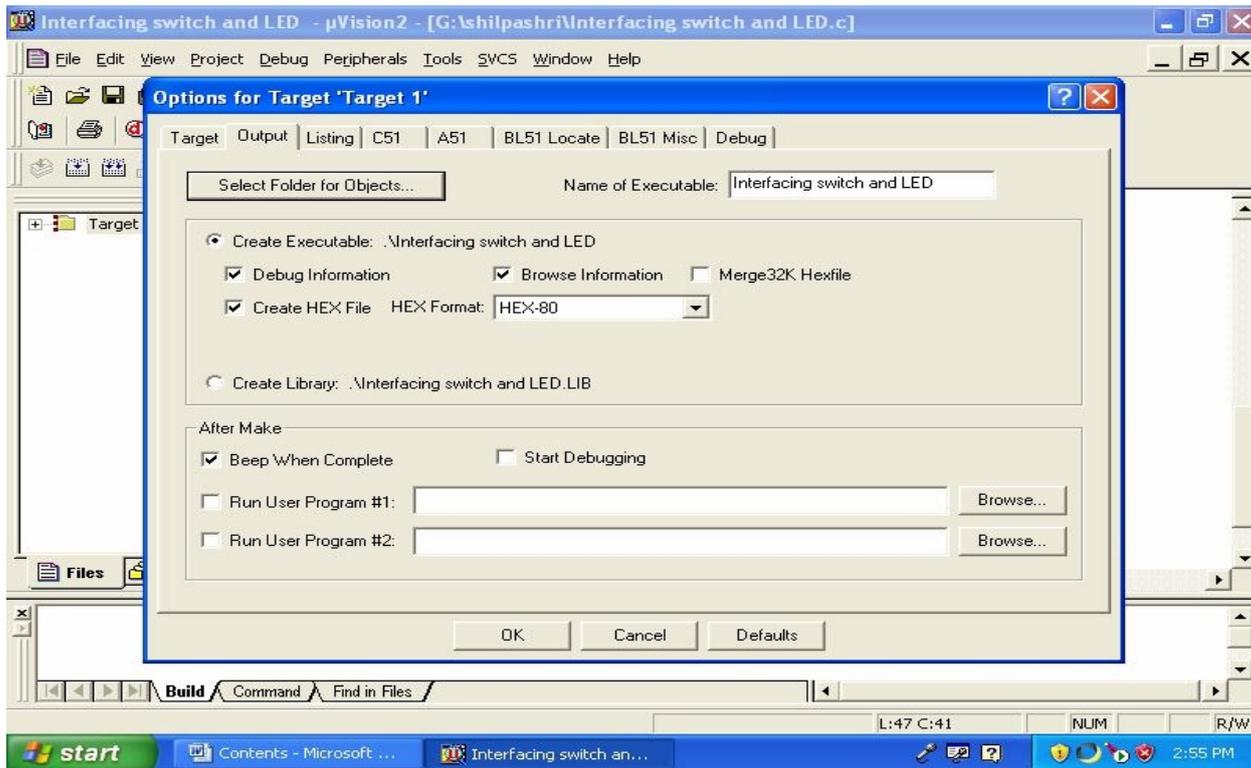
## 8. Type your program and save it.



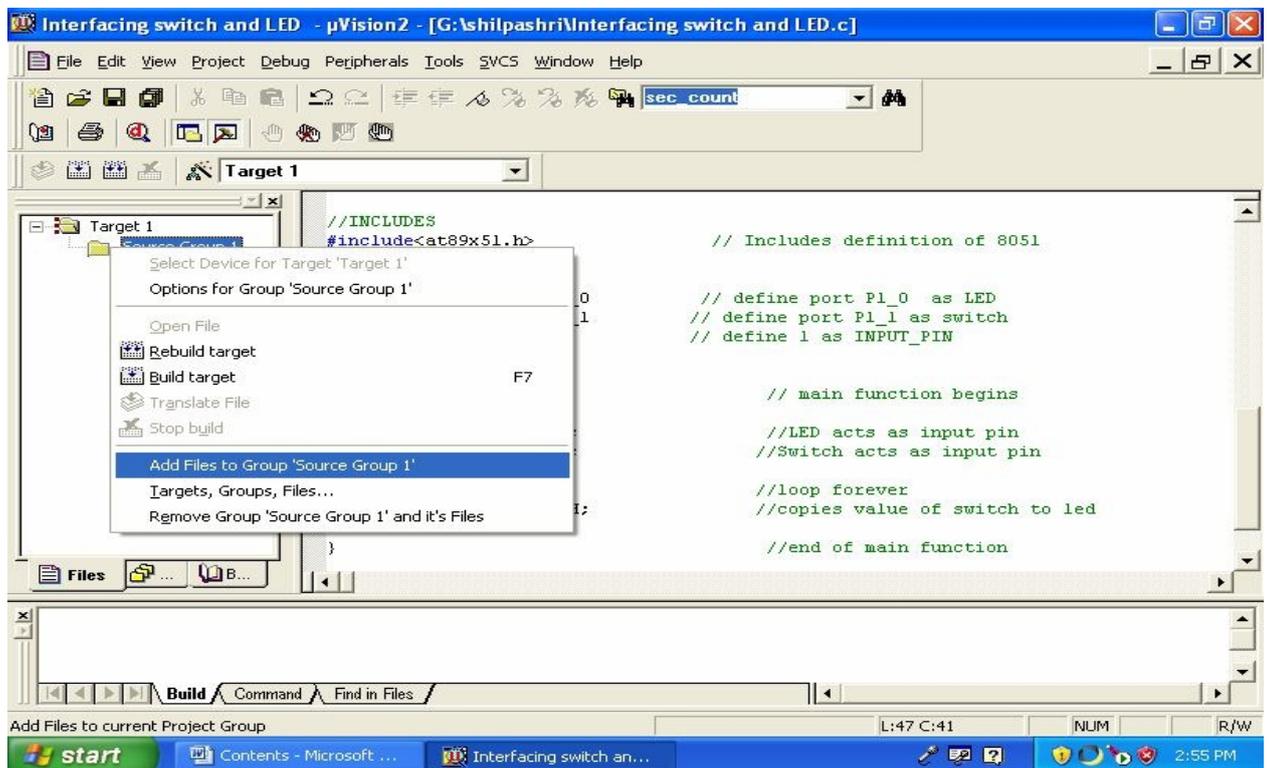
## 9. Right click on the folder named Target1 in the project window and select options for Target 'Target1'



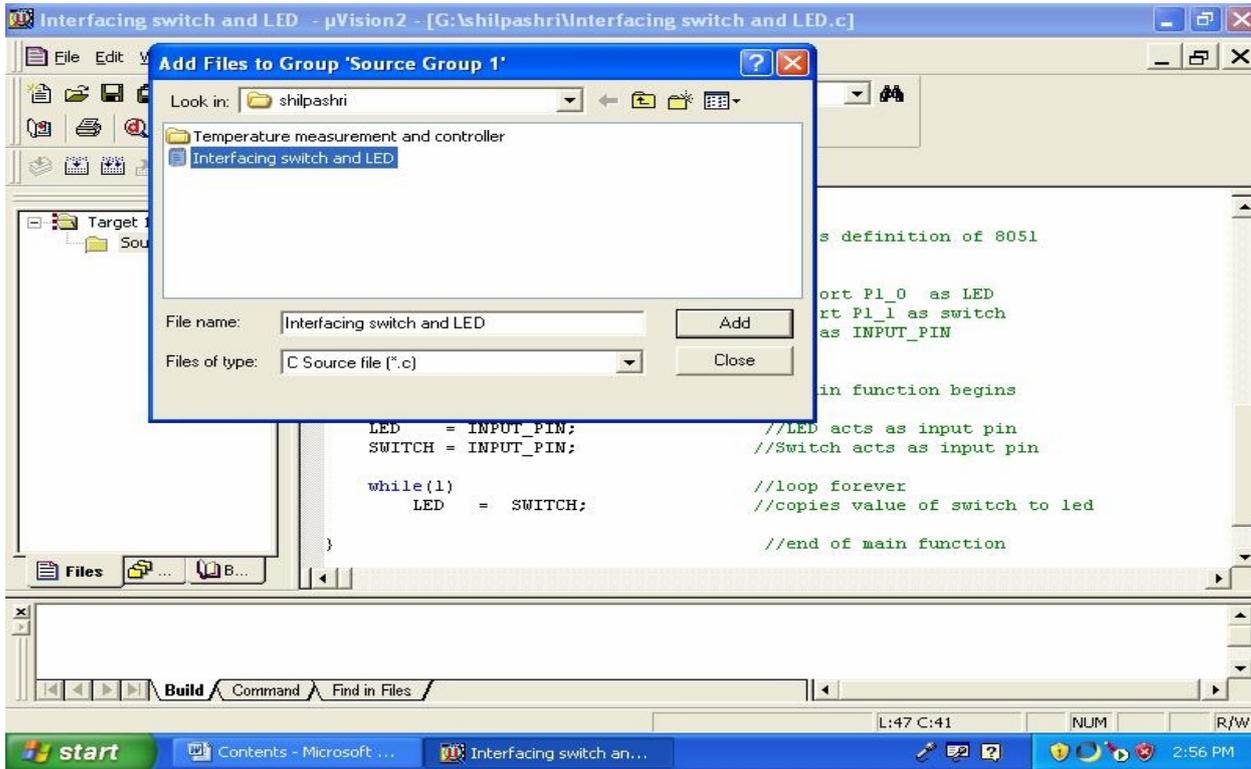
10. In the output tab click on create HEX file and click on OK.



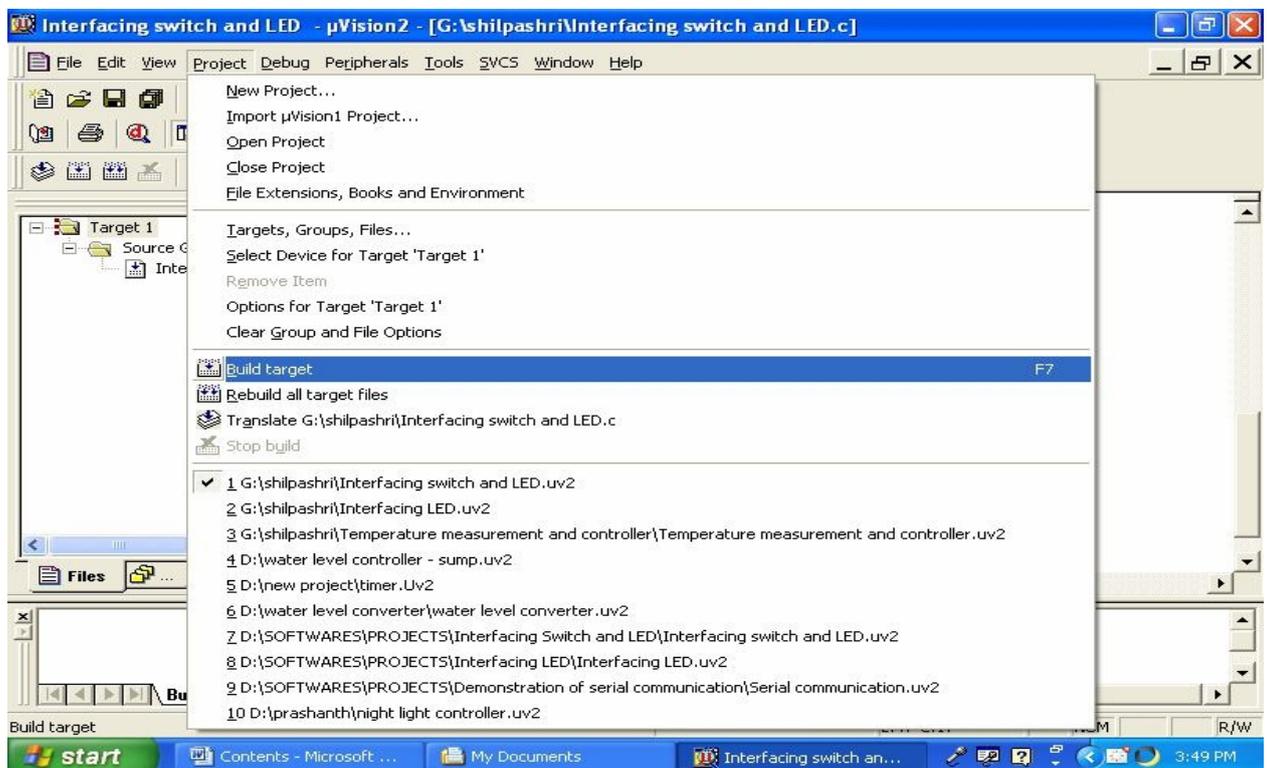
11. Expand Target1, a sub folder Source Group 1 appears in the project window.  
 12. Right click on the Source Group 1 select Add Files to Group 'Source Group 1'



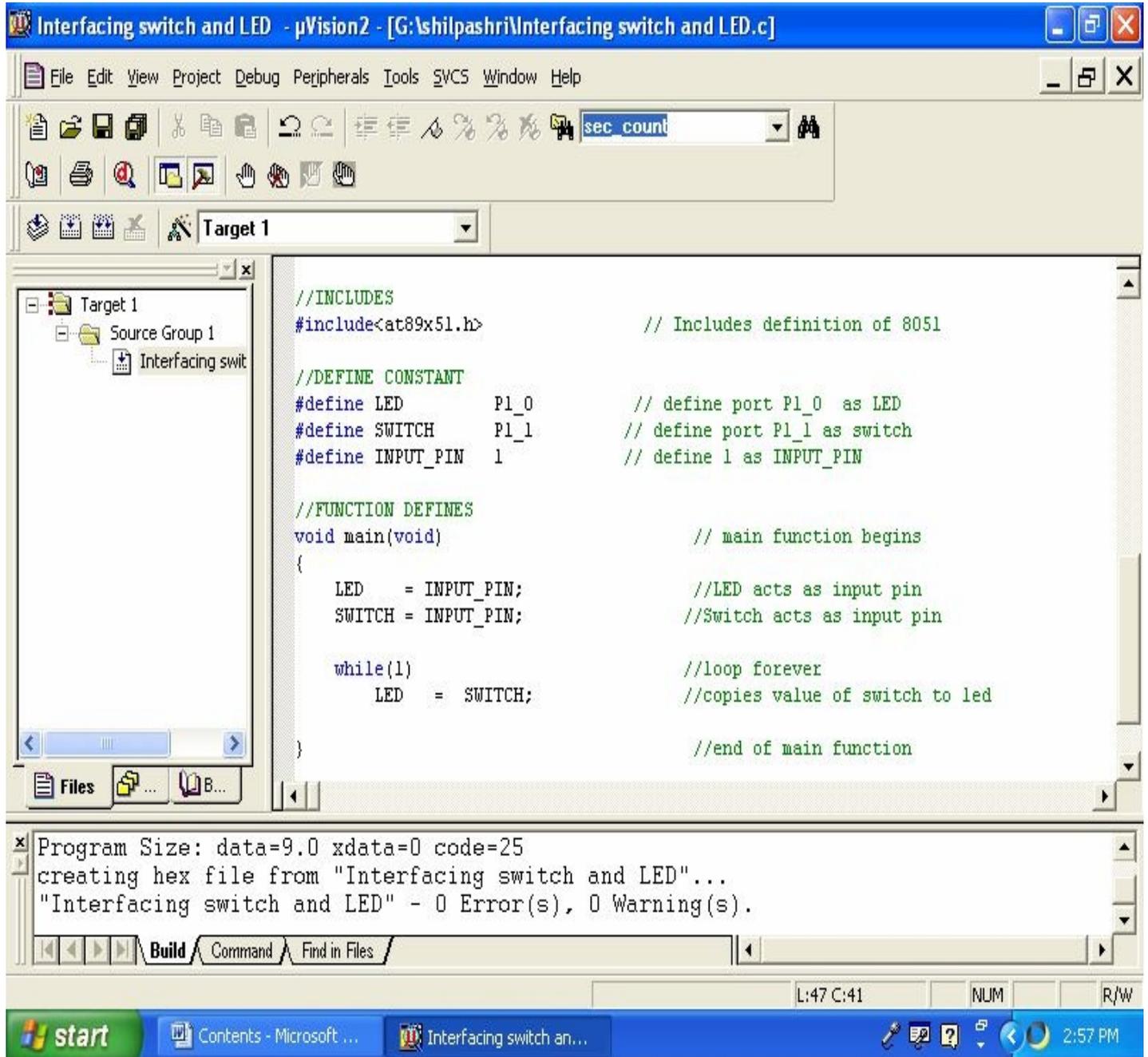
13. Select the file (your program) then click on Add then Close window.



14. Click on Build Target in the Project Menu or press F7



15. If there are no syntax errors a source file is compiled and a hex file is created in the directory in which the project is saved.

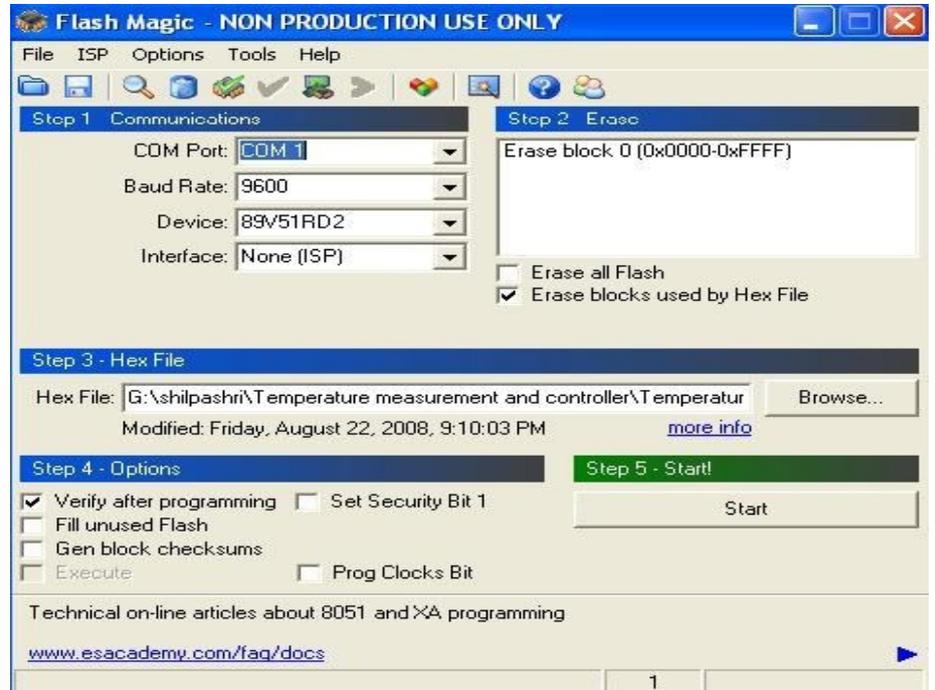


This hex file is programmed into microcontroller using Flash Magic

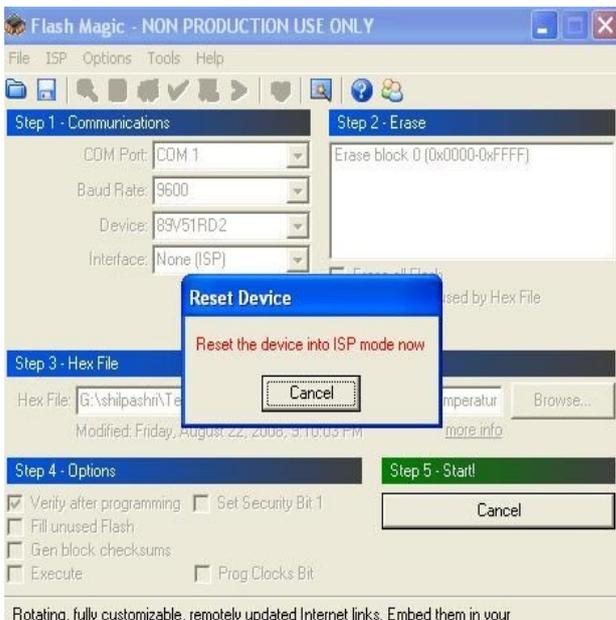
## Configuring Flash Magic

Run Flash Magic and set below parameters.

1. Set com port to which development board is connected.(usually COM1)
2. Baud Rate to 9600.
3. Device as 89V51RD2
4. Interface as None(ISP)
5. Check “Erase Blocks used by Hex File”.
6. Check “Verify after programming”.



## Programming microcontroller by Flash Magic



Connect serial cable to PC and Development Board. Apply power to the board.

Run Flash Magic, Select Hex file and click on Start. A message box appears saying Reset Device Into ISP Mode

Reset the device by pressing push button on the Development Board.

In a few seconds (depends upon the size of the code) Hex file is programmed into microcontroller. Reset device to execute program. That's all.

## Chapter 5: Projects

### A. Interfacing of LED

Interfacing LED to microcontroller is the most basic interfacing which is similar to print “Hello World” on the screen in c programming language.

LED is interfaced to microcontroller port P1\_0 through current limiting resistor 220 ohms.

Anode terminal of LED is connected to Vcc through series resistor and cathode terminal is connected to microcontroller port P1\_0.

When cathode terminal is connected to Vss(GND) , the LED emits light.

When it's is connected to Vcc, the LED does not emit light.

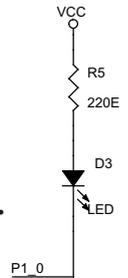


Figure 1 : LED schematic

### Programming

Copy paste (program if it is in pdf format) or Write below program in the keil software and compile (follow Instructions in “Getting Started “ ) to get hex file.

Program this hex file to microcontroller using Flash Magic.

```

/*-----
BlinkingLED.c : Demonstration of interfacing an LED

Designed for 89c51 running at 11.0592Mhz
LED blinks (turn on and off) at rate of 1Hz with crystal of 11.0592Mhz

compile the program in Keil uVision Compiler.
Operation : when MCU power up LED blink continuously at frequency of 1Hz.

Feedback appreciated: support@hpsindia.com
-----*/

//INCLUDES DEFINITION OF 89C51

#include<at89x51.h>

// DEFINE CONSTANT
#define INPUT_PIN          1      // define 1 as INPUT_PIN
#define LOW                0
#define HIGH               1

```

```

//DEFINE PORTS/PINS
#define LED_PIN P1_0           // define port P1_0 as LED

//DEFINE MACROS
#define LEDOn()                LED_PIN = LOW
#define LEDOff()               LED_PIN = HIGH

//FUNCTIONS PROTOYPES
void main(void);
void Delay(unsigned int time);

//main function begins
void main(void)
{
    LED_PIN = INPUT_PIN;      // LED acts as input
    for(;;)                   // loop forever
    {
        LEDOn();              // Turn on led
        Delay(500);           // delay for 500msec = 0.5 sec
        LEDOff();             // Turn off led
        Delay(500);           // delay for 500msec = 0.5 sec
    }                          // end of while loop
}

// end of main function

// PROGRAM ROUTINES
void Delay(unsigned int time)
{
    unsigned char pause;      // Declare variable pause as unsigned char
    while( time > 0)          // loop until time is greater than zero
    {
        pause = 150;          // Initialize pause to 150 (decimal value)
        while(pause--);       // Decrement pause until it becomes zero
        time--;               // Decrement time and loop back until time
    }                          // value becomes zero
}                               // End of Delay function

```

After programming is complete reset the device to execute your program. Now LED blinks approximately at 1Hz.

## B. Interfacing switch and LED

Switch is interfaced to microcontroller port P1\_1. One terminal of switch is connected to port and other is connected to Vss(GND).

Enable the internal pull up resistor of the port P1\_1. The status of the pin will be 0 when the switch is pressed and status will be 1 when it is not pressed.

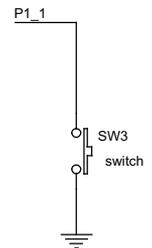


Figure 2 : switch schematic

Interface LED to microcontroller as explained in previous project.

### Programming

copy paste(program if it is in pdf format) or write below program in the keil software and compile ( follow Instructions in “Getting Started “ ) to get hex file.

Program this hex file to microcontroller using Flash Magic.

```

/*-----
switch and led.c : Demonstration of interfacing of switch and LED
Designed for 8051 running at 11.0592Mhz
compile the program in Keil uVision Compiler.
Operation : copies the status of switch to LED, Hence as long as switch
is pressed, LED emits light.

Feedback appreciated: support@hpsindia.com
-----*/

//INCLUDE DEFINITION OF 8051
#include<at89x51.h>

//DEFINE CONSTANT
#define LED_PIN      P1_0          // define port P1_0 as LED
#define SWITCH_PIN   P1_1          // define port P1_1 as switch
#define INPUT_PIN    1            // define 1 as INPUT_PIN
#define PRESSED      0

```

```

//DEFINE MACROS
#define LEDOn()      LED_PIN = 0
#define LEDOff()    LED_PIN = 1

//FUNCTION
void main(void)      // main function begins
{
    bit SwitchState; // Declare a bit "SwitchState"
    LED_PIN = INPUT_PIN; // LED acts as input pin
    SWITCH_PIN = INPUT_PIN; // Switch acts as input pin
    for(;;)          //loop forever
    {
        SwitchState = SWITCH_PIN; //copies value of switch
        if(SwitchState == PRESSED) //check if it is pressed
            LEDOn(); // if yes , led on
        else
            LEDOff(); // if no , led off
    }
} //end of main function
//END OF PROGRAM

```

After programming is complete reset the device to execute your program. Now press the switch, LED emits light, release it, light disappears.

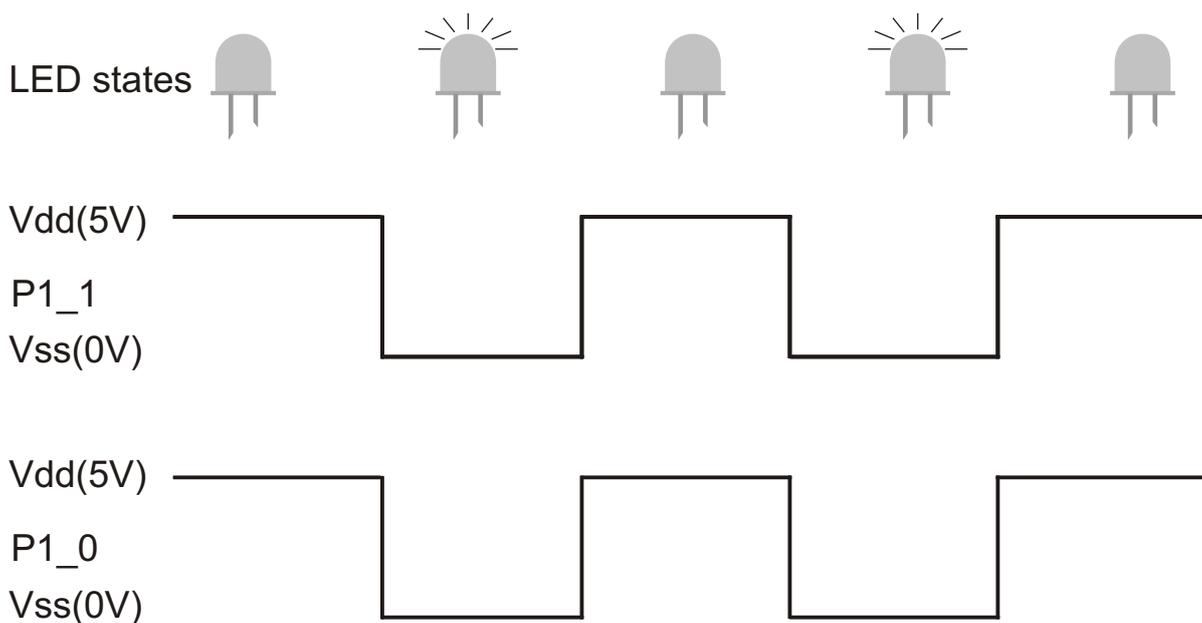


Figure - 3 Timing Diagram

## C. Demonstration of serial communication

programming

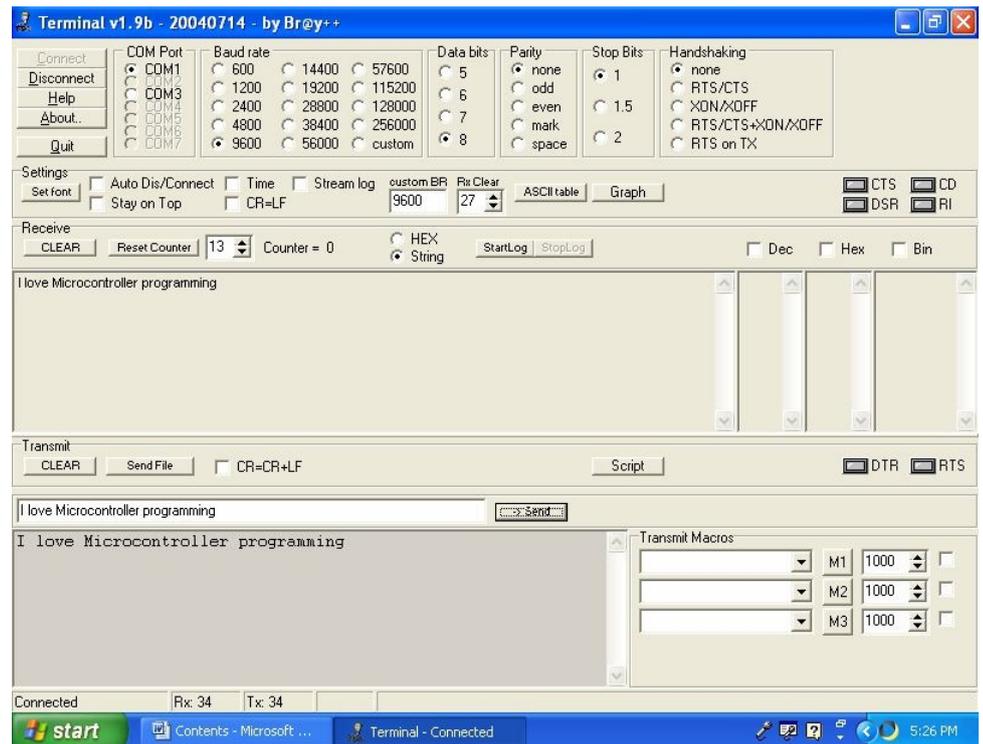
Copy paste (program if it is in pdf format) or write below program in the keil software and compile (follow Instructions in “Getting Started “ ) to get hex file. Program this hex file to microcontroller using Flash Magic.

After programming is complete reset the device to execute your program.

Run Terminal v 1.9 (included in the CD) software.

Set the parameters: COM Port - Com Port number to which development board is connected ( COM1) , Baud rate – 9600, Data bits – 8, Parity – None, Stop bits - 1, Handshaking - None.

Click on connect. Type Text in transmit window and click on send. The Message is echo back from your microcontroller.



```

/*-----
serial communication.c : Demonstration of serial communication - ECHO program
Designed for 8051 running at 11.0592Mhz
compile the program in Keil uVision Compiler.
Note: Hyper Terminal / Terminal v1.9b software required for communication
Operation: receives the data from PC (or any serial device) and transmit
same data back to PC.
Feedback appreciated: support@hpsindia.com
-----*/

//INCLUDE DEFINITION OF 8051
#include<at89x51.h>
//DEFINE CONSTANT
#define Baud_rate 0xFD // 9600 baud rate

```

```

//DEFINE PROTOTYPES
void main(void);
void SerialInitialize(void);
void SendByteSerially(unsigned char ascii);
unsigned char ReceiveByteSerially(void);
//FUNCTIONS
void main(void) // main function begins
{
    unsigned char serialdata; // declare variable serialdata
    SerialInitialize(); // call SerialInitialize routine
    for(;;) // infinite loop
    {
        serialdata = ReceiveByteSerially(); // receive data from serial port
        SendByteSerially(serialdata); // send back to serial port ( PC )
    }
} //end of main function
void SerialInitialize(void) // initialize serial communication
{
    TMOD = (( TMOD & 0x0F) | 0x20); // timer 1 in mode 2
    SCON = 0x50; // serial mode 1
    TH1 = Baud_rate; // load baudrate in timer 1 register
    TR1 = 1; // start timer
}
void SendByteSerially(unsigned char serialdata)
{
    SBUF = serialdata; // load data to serial buffer
    while(TI == 0); // wait until transmission to complete
    TI = 0; // clear flag
}
unsigned char ReceiveByteSerially(void)
{
    while(RI == 0); // wait until data is received
    RI = 0; // clear flag
    return SBUF; // return serial data
} // end of program

```

## Chapter 6: Frequently Asked Questions

### 1. What is the use of this Development kit?

Using this kit you can develop any 8051 based project.

### 2. What is the input voltage for this Development Board?

12 V AC/DC

### 3. Can i program the microcontroller P89V51RD2 using this DB?

Yes

### 4. Can i program the microcontroller 89C51/C52/S51/S52 using this DB?

No

### 5. IS the microcontroller P89V51RD2 is compatible with 8051 ?

Yes.

### 6. How many times i can reprogram the microcontroller P89V51RD2?

1000 times approximately.

### 7. what are the demo projects included?

Three demo projects are included with complete source code and hardware details.

1. Blinking LED
2. LED and switch
3. Communication with PC

### 8. What are items required to complete demo projects?

1. PC with Windows OS and serial port.
2. 12V, 500mA AC/DC adapter.

### 9. Can i use my laptop to program the microcontroller using this DB?

Yes. You require USB-serial converter, since most laptop doesn't have serial port.

## Chapter 7: Getting Help

Regarding doubts in programming the microcontroller using this Development Board please feel free to contact by mail [support@hpsindia.com](mailto:support@hpsindia.com).

For complaints , suggestions and feedback :

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138, Amaravathi 2nd cross,  
HOSPET - 583 201 (karnataka), India.  
Ph: 08394 221364