USER'S MANUAL

FOR

8051 DEVELOPEMENT BOARD

Manufactured By

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- **NTRODUCTION**

Logsun's open 8051 board has ATMEL 8-bit AT89S52. This board is used extensively to test and validate Programs. At the heart of the development board is AT89S52; this provides advance features like ISP, I2C and IAP. The microcontroller has 8K Bytes of flash memory and 256k Bytes of RAM. The development board comes with USB interface to allow user to program the microcontroller directly from PC. It provides a complete development platform with different modules interface that accelerates the task of designers to run application software on target Controller hardware, thus providing a platform to benchmark their system, save time & expense of building their own application test board and enabling them to get their designs to market quickly.

1. SPECIFICATION

1. 89S52 Central Processing Unit
2. On-chip Flash Program Memory with In-System Programming (ISP) and In-application Programming (IAP) capability
3. Flash EPROM for downloading hex files via UART
4. All ports pins brought on 10 PIN FRC (User selection is possible)
5. Supplied with companion CD includes working sample programs, ISP programming
6. Software, Assembler, disassembles, +12 V supply, USB cable and quick start manual.

2. SETTING FOR 8051 DEVELOPMENT BOARD (DVK) :

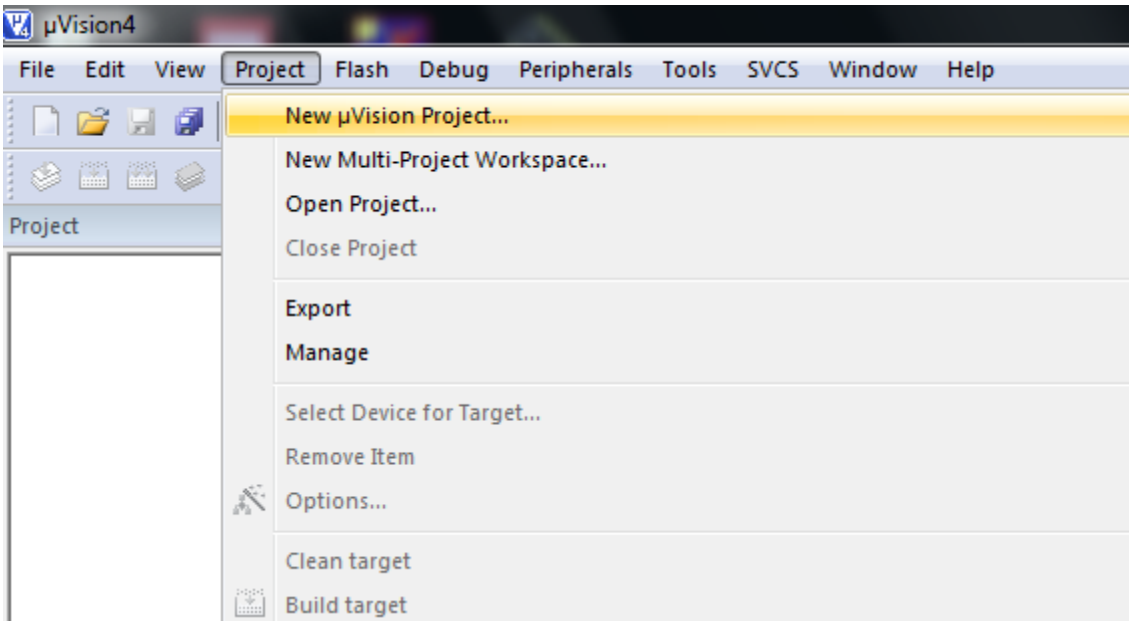
1. Connect the 12V power supply to the Kit.
2. Switch on the board.
3. Connect **USB A-B cable** to the board and PC.
4. Keep switch S3 in down position to upload program.
5. Open **PROG ISP** software on PC. Check the com port shows **USBasp** connected
6. Select the IC (AT89S52).
7. This shows PROG ISP in green color as detected com port.
8. To select program hex File -> click on Load Flash.
9. Select the HEX file.
10. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
11. Connect 10 pin FRC.
12. Press RESET observes output.
13. Jumpers Settings on board.

JP4	SHORT/CONNECT JUMPER
P0 PULLUP	1,2 SHORT
P1 PULL UP	1,2 SHORT
JP9	1,2 SHORT
JP10	1,2 SHORT
JP1	VCC,EA BAR SHORT

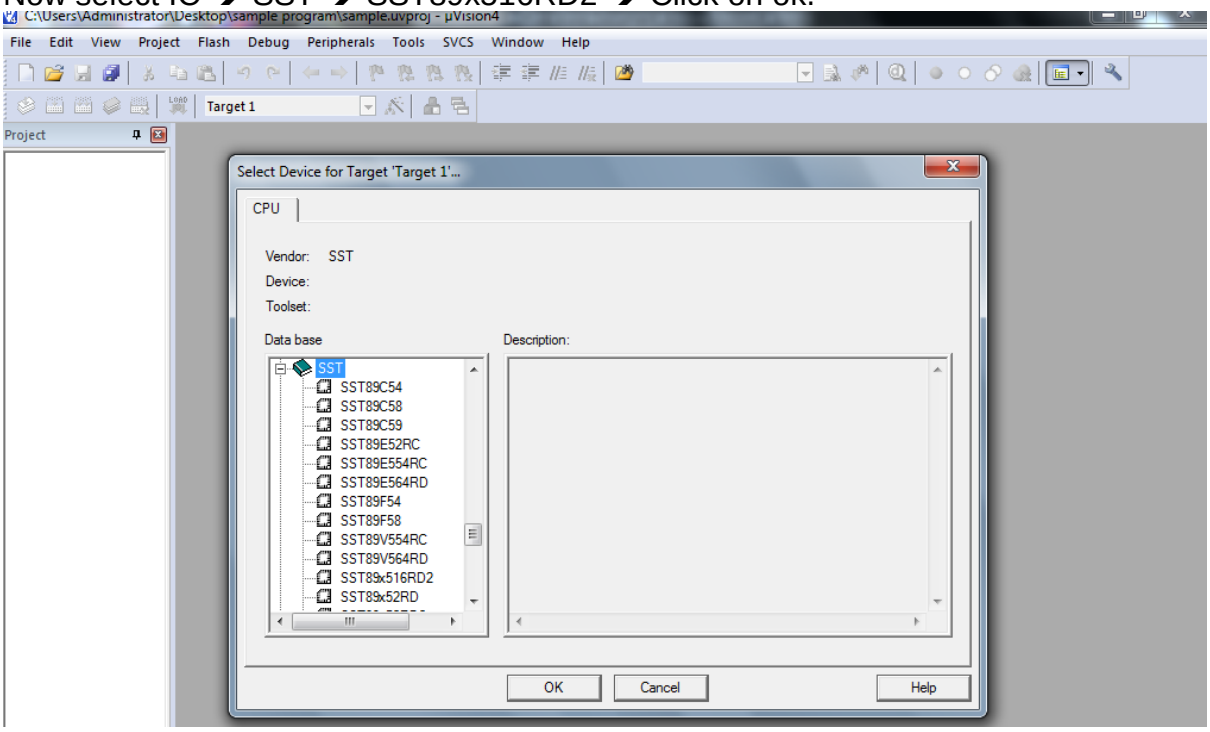
3. HOW TO CREATE PROJECT:

SOFTWARE USED**: KEIL**

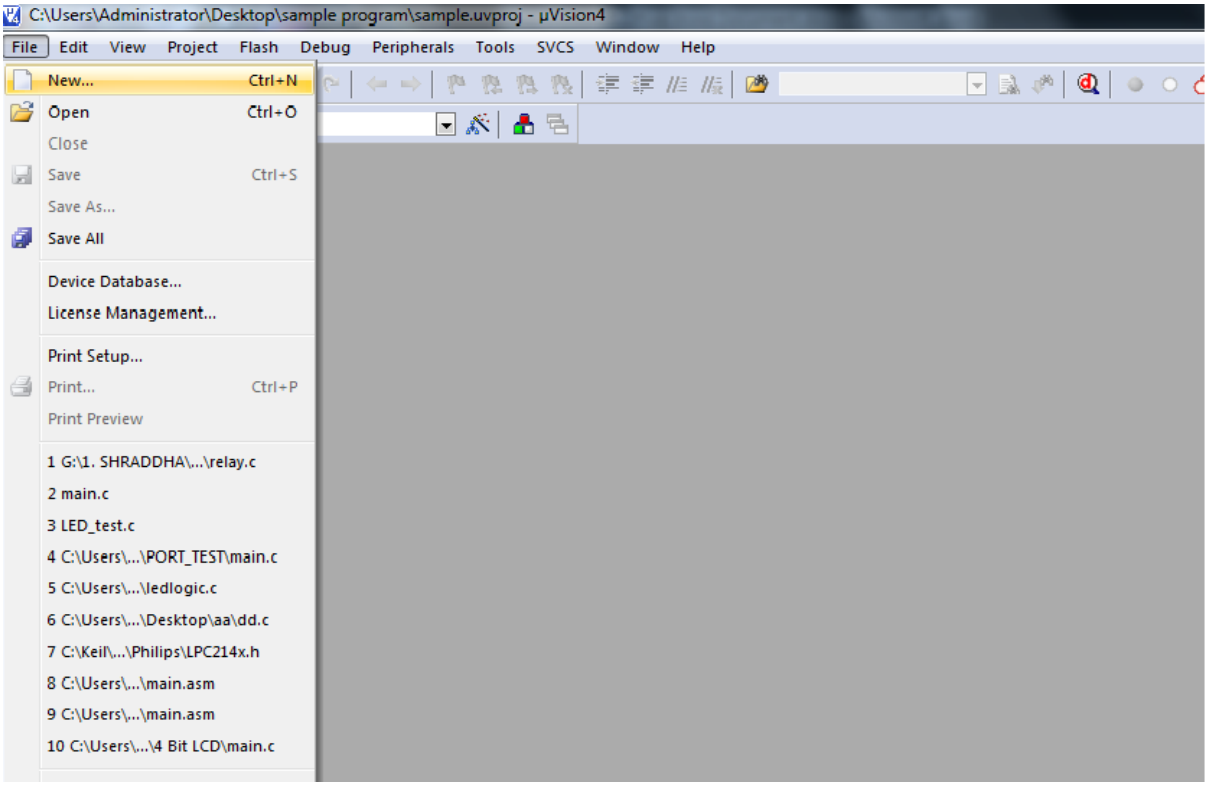
Open Keil software ➔ go to project menu ➔ click on new microVision project ➔ create new folder in that you enter project name and click on ok.



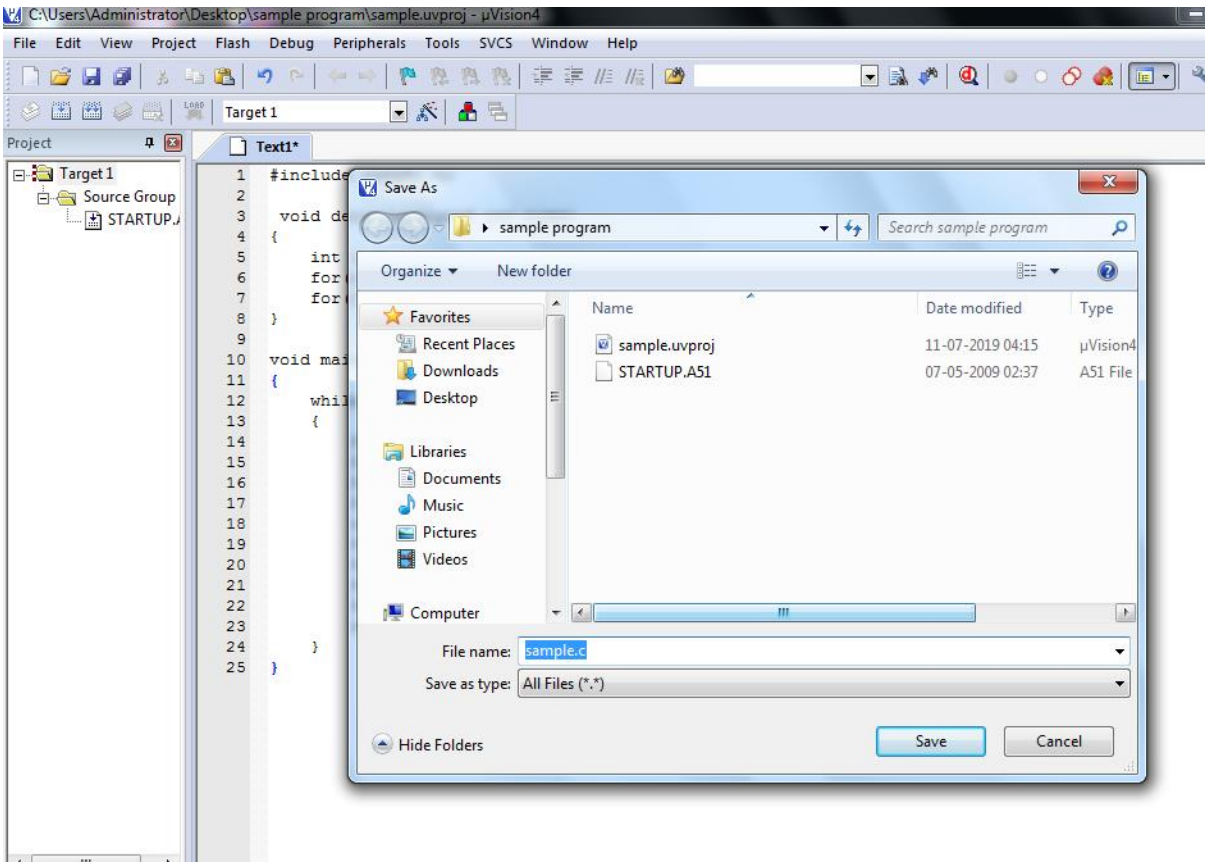
Now select IC ➔ SST ➔ SST89x516RD2 ➔ Click on ok.



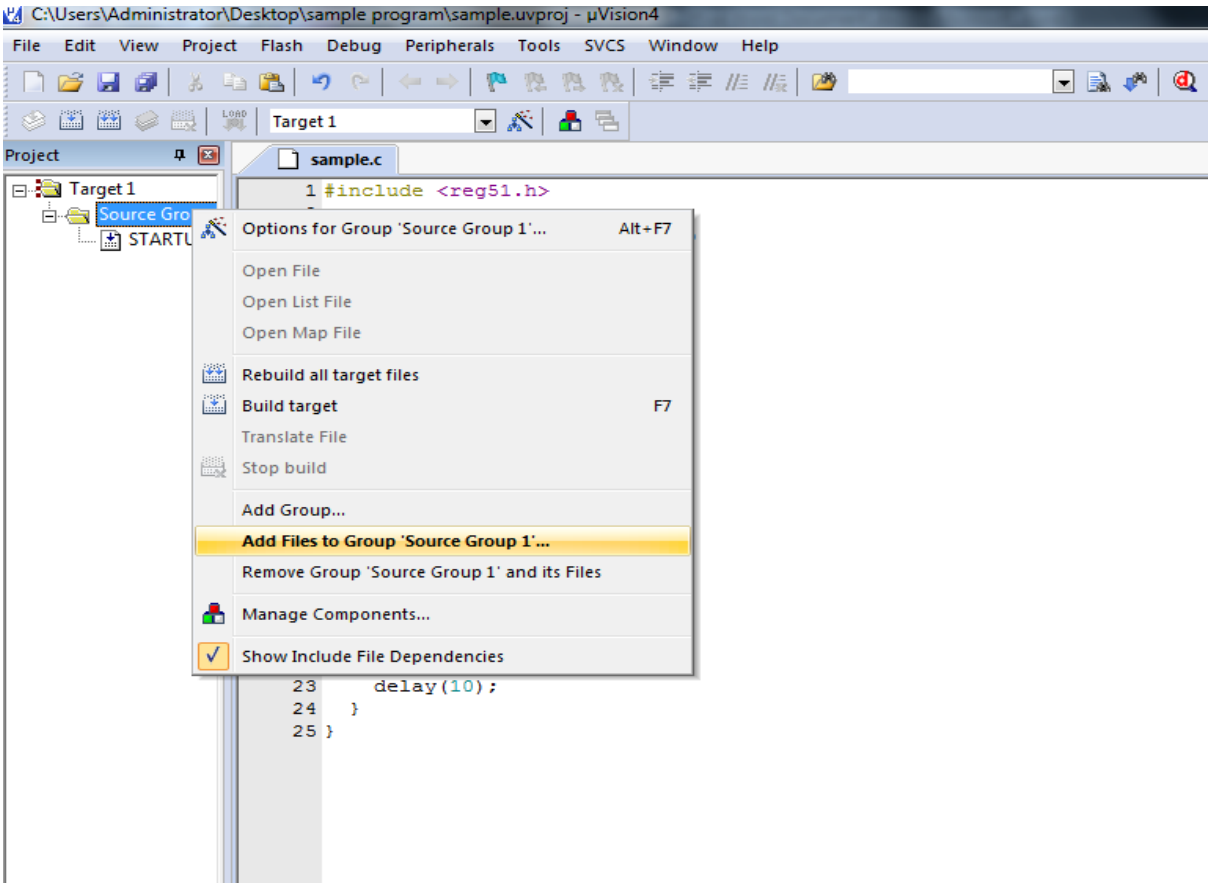
Click on File menu ➔ click on New



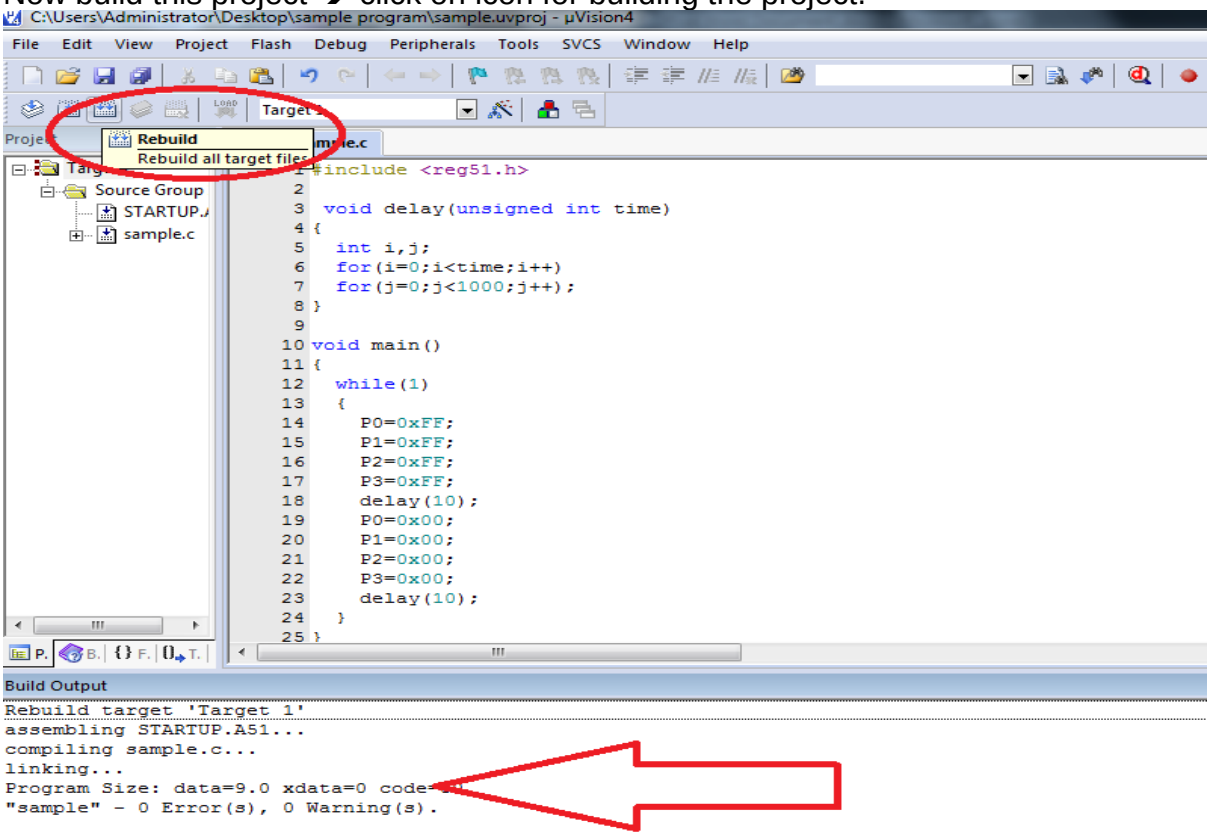
Now write your code ➔ and save your code .c extension.



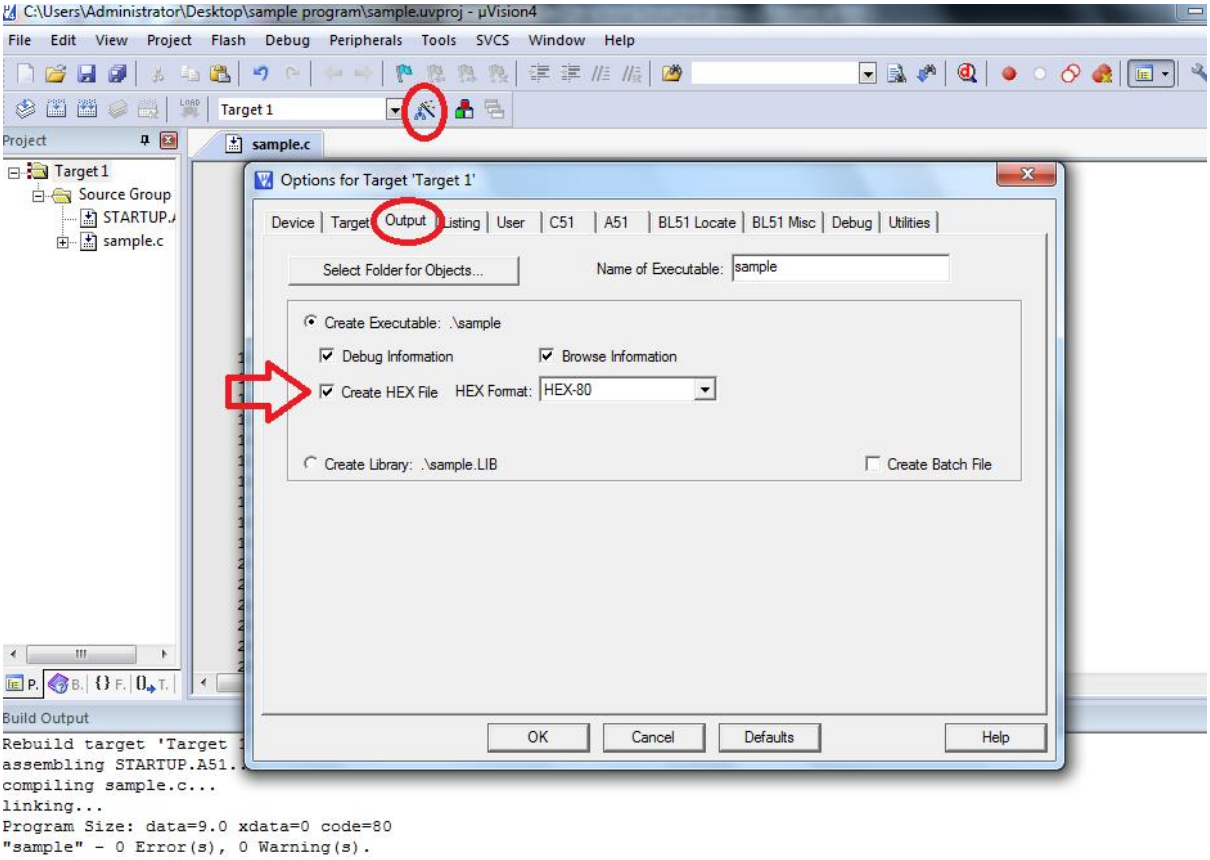
Now add this file on source code ➔ right click on Source code ➔ and click on Add Files to Group ‘source Group 1’ and select sample and add and close this window.



Now build this project ➔ click on icon for building the project.



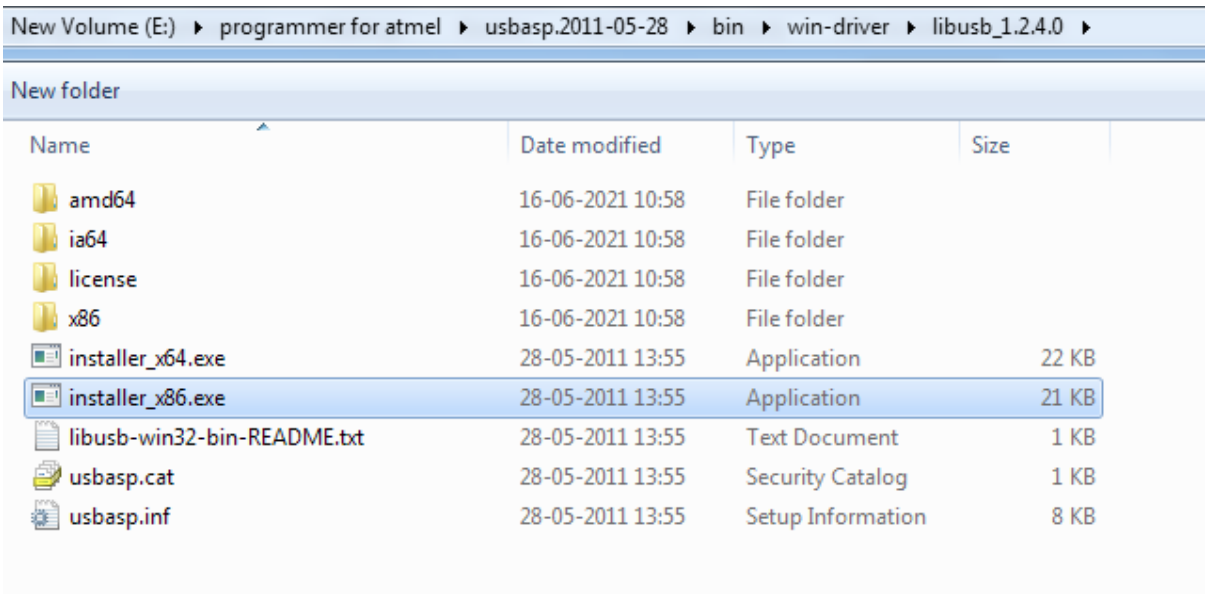
For creating hex file ➔ click on Target option ➔new window will open ➔ click on Output and select Create HEX file



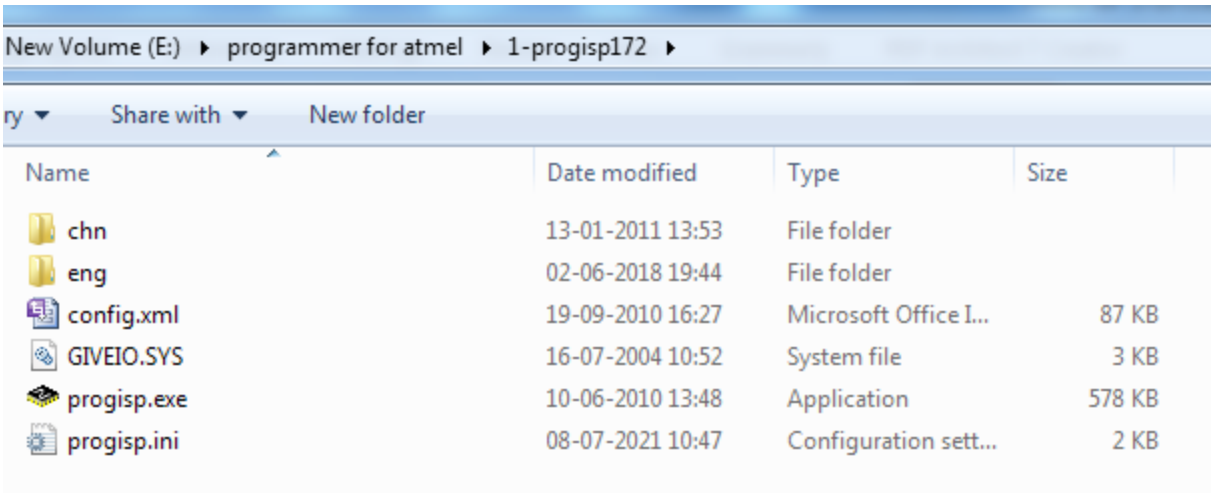
4. ISP PROGRAMMING USING ProgISP Flashing Software using USB ISP Programmer and ProgISP Flashing Software.

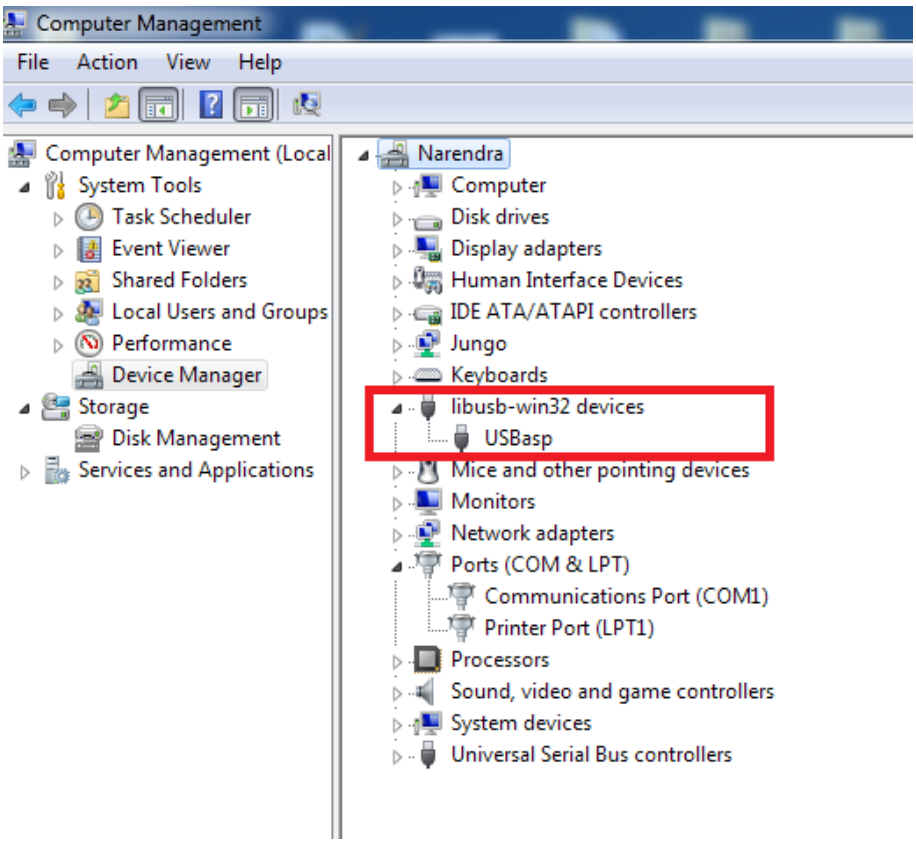
1. Connect 12V power adaptor to board.
2. Keep switch S3 (blue colour) in down position for USB communication to **upload program .hex file.**

Step1: Connect USB A-B cable between PC/Laptop USB port and open 8051.
Install USB ISP Programmer driver.
Keep S3 down.

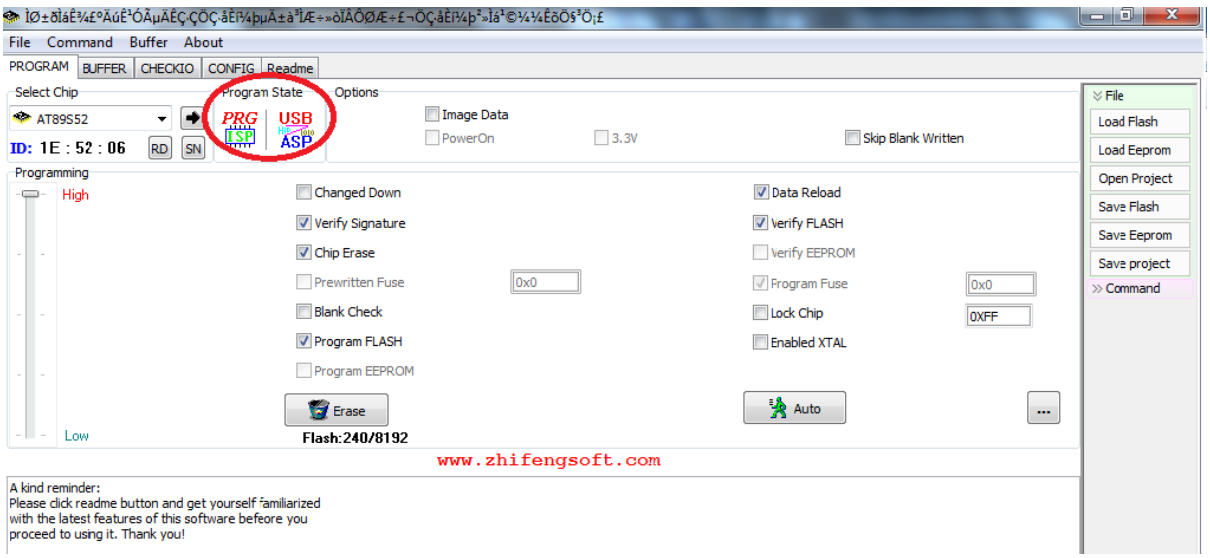


Step 2: RUN software ProgISP.exe

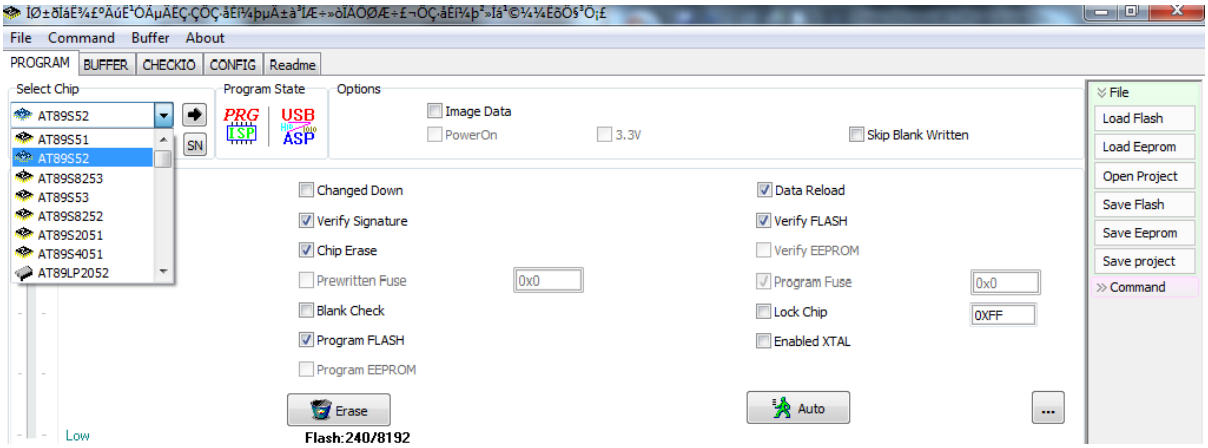




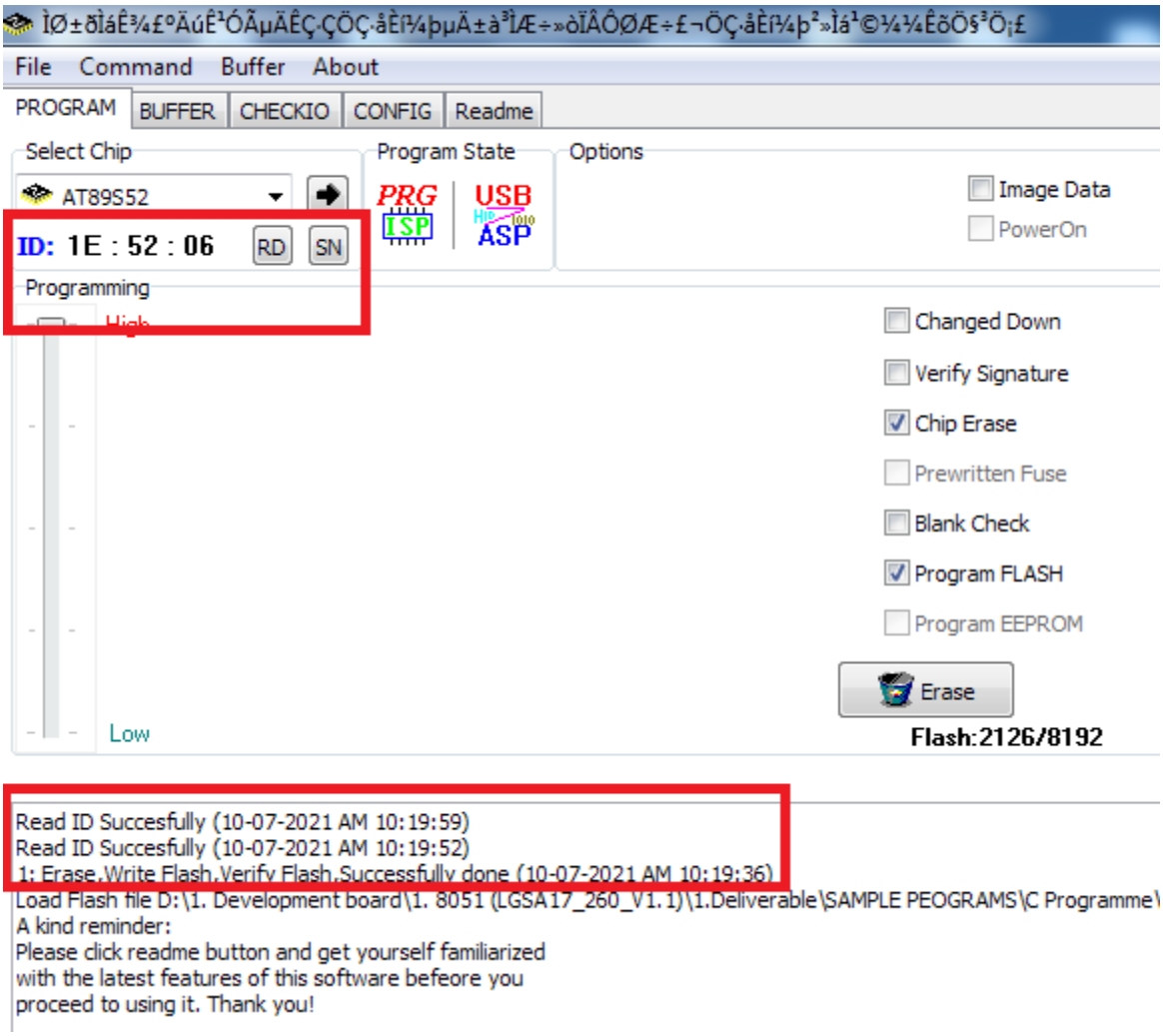
This detects USB programmer.



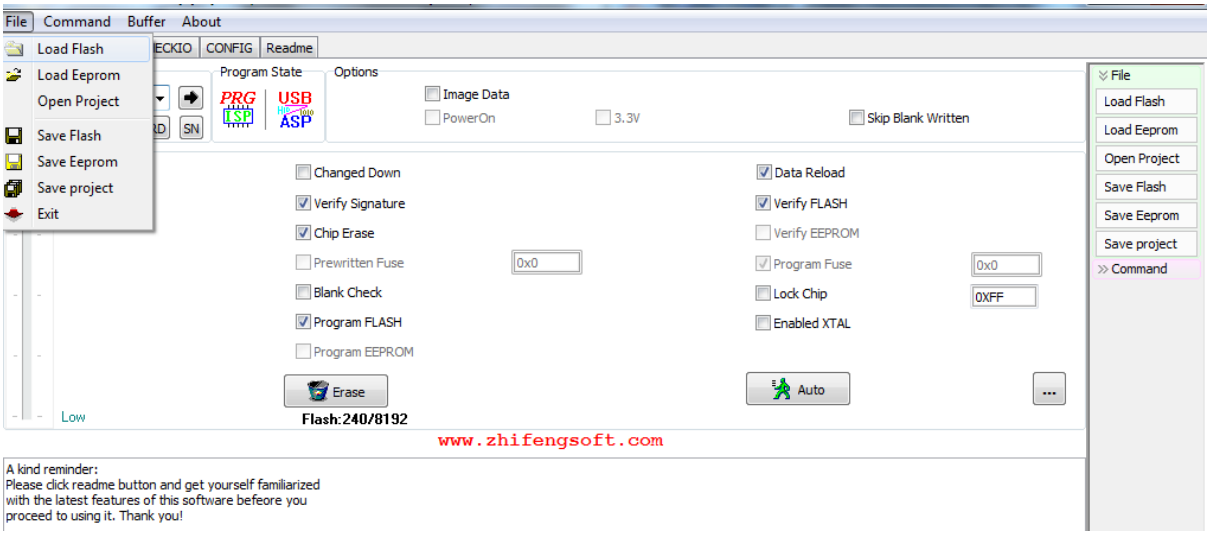
From Select Chip Menu Select your MCU e.g. AT89S52.



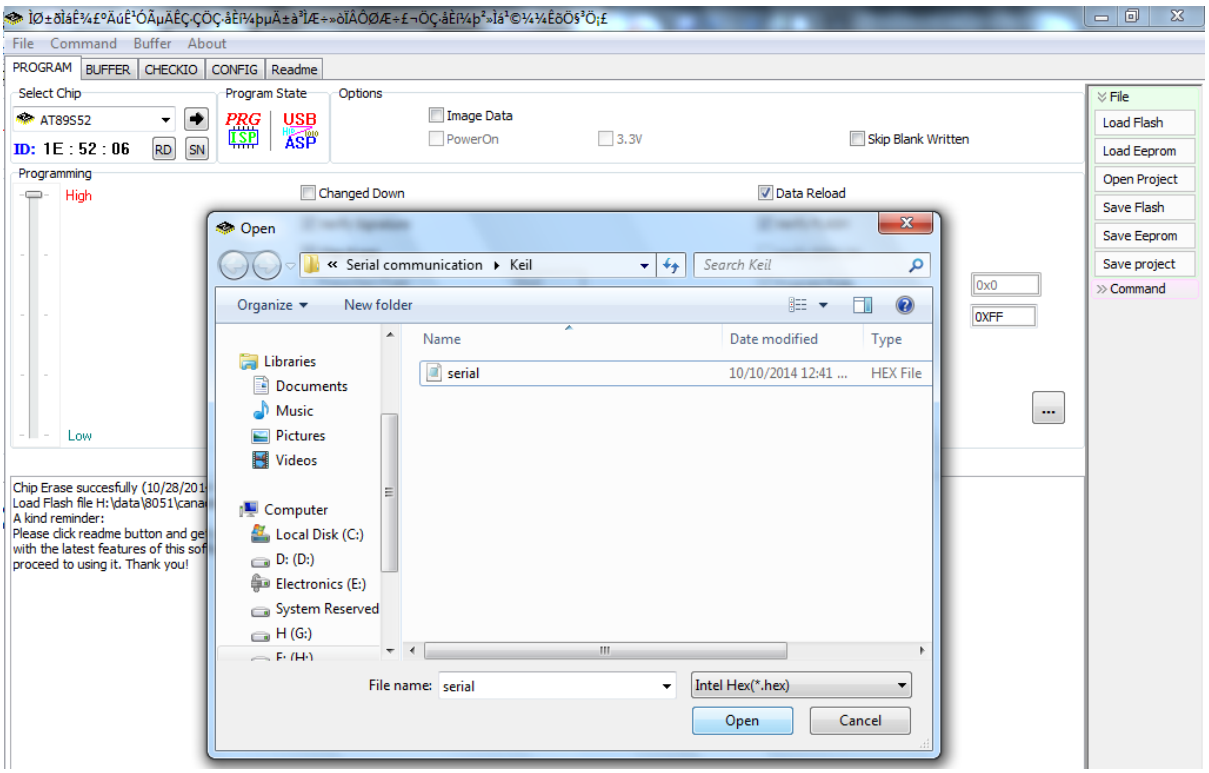
IT READS DEVICE ID



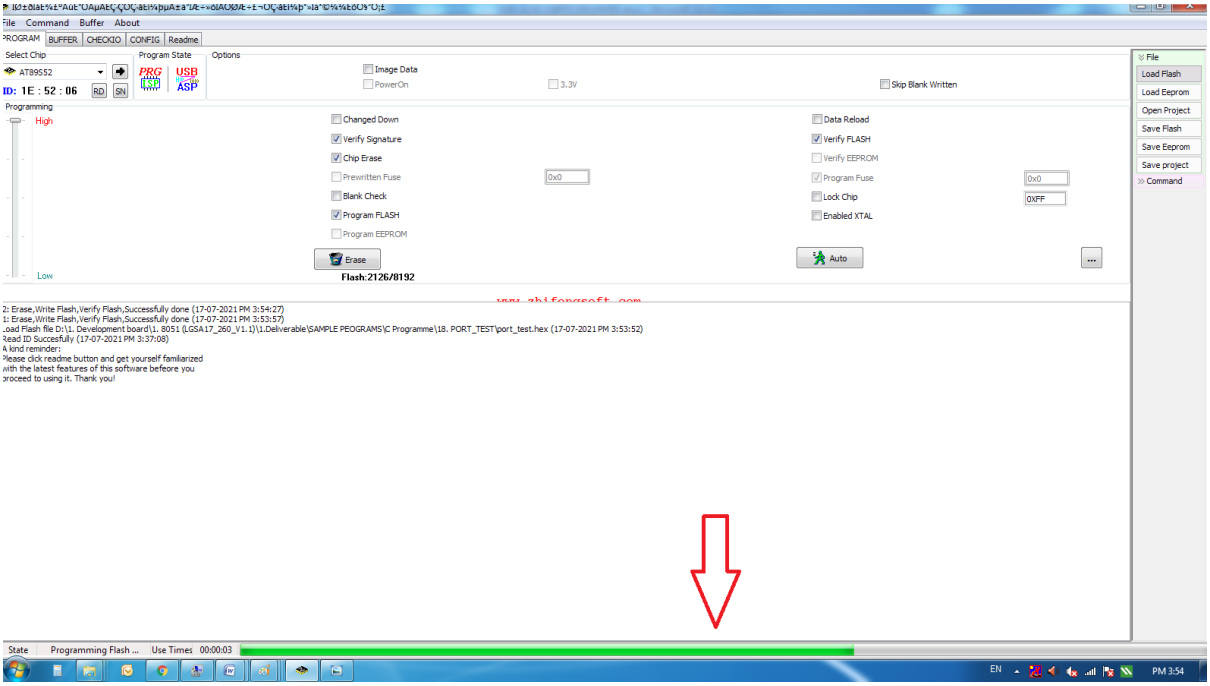
Select File -> click on Load Flash.
Select the HEX file.



Select HEX File.



Click on Auto Button.
This uploads HEX file into microcontroller shown by green bar.



Connect 10 PIN FRC cables to ports and press RESET button.

EXPERIMENT No 1

LED Logic

AIM: To study the interfacing of LED Logic.

REQUIREMENTS: 89S52 DEVELOPMENT BOARD, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB Cable to the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Open ProgISP Flashing Software on PC. Select the IC (AT89S52).

5) Select given ledsw hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.

6) Connect 10 pin FRC Cables. Press RESET and observe output.

PORT 0(J1)	J21 (Digital I/O)
PORT 1(J2)	J22(Digital I/O)

You will observe that LED on as switch press.

Note: FRC port connection must be proper to run the program.

EXPERIMENT No 2.

LCD DISPLAY

AIM: To study the interfacing of LCD with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: DVK BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Open ProgISP Flashing Software on PC. Select the IC (AT89S52).

5) Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.

6) Now if downloading of the program is completed, connect 10 pin FRC cables to the LCD section of the DVK kit

7) You will observe "**LOGSUN SYSTEMS"**.

- **FRC Connections**

J1-J9
J2- J10

THEORY:

Liquid crystal display:

LCD can be connected to the Microcontroller through the port 0. LCD is connected in the 4-bit mode or 8-bit mode. And the standard subroutine is given with the development board. So that the application can be easily demonstrated and also for further implementation the subroutine can be easily embedded for which one has to do very few changes. Wide range of instruction functions: Clear displays, cursor home, display ON/OFF, cursor ON/OFF, cursor shift, display shift.

4-bit mode

RS, RW, EN are 1&2 are short.

8-bit mode

RS, RW, EN are 2&3 are short

EXPERIMENT No 3.

LCD WITH KEYPAD INTERFACING

AIM: To study the interfacing of LCD and Keypad with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB to the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Open ProgISP Flashing Software on PC. Select the IC (AT89S52).

5) Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.

6) Now if downloading of the program is completed, connect 10 pin FRC cables to the LCD section of the DVK kit

7) **You will observe LOGSUN SYSTEMS AND CORRESPONDING KEY PRESSED.**

- **FRC CONNECTIONS:**

  J1- J9 (LCD DATA**)**
  J2- J10 (LCD COMMAND**)**
  J3- J13 (KEYBOARD**)**

4-bit mode
RS, RW, EN are 1&2 are short.
8-bit mode
RS, RW, EN are 2&3 are short

EXPERIMENT NO 4.

SEVEN SEGMENT DISPLAY

AIM: To study the interfacing of SEVEN SEGMENT.

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Now if downloading of the program is completed, connect 10 pin FRC cables to the SEVEN SEGMENT section of the DVK kit
7. You will observe that **Seven segment will Display (0000 To FFFF).**

- **FRC CONNECTION:**

J1- J11 (SEGMENTS)
J2- J12 (DISPLAY)

EXPERIMENT NO 5.

SEVEN SEGMENT + KEYBOARD DISPLAY

AIM: To study the interfacing of SEVEN SEGMENT + KEYBOARD with 89S52 DEVELOPMENT BOARD.

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given SEVEN SEGMENT + KEYBOARD.hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Now if downloading of the program is completed,
7. connect 10 pin FRC cables to the SEVEN SEGMENT section of the DVK kit and observe key pressed.

- **FRC CONNECTIONS:**

J1- J11 (7 SEGMENT**)**
J2- J12 (TRANSISTOR**)**
J3- J13 (KEYPAD**)**

EXPERIMENT NO 6.

8 BIT DAC

AIM: To study the interfacing of DAC with Embedded Trainer board.

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable,USB cable, 12V power supply.
.

THEORY:

D/A converters: Digital to analog converters are broadly classified in three categories: Current output, voltage output and multiplying type.
The current output DAC, as the name suggests, provides current as the output DAC is slower than the current output DAC because of the delay in converting the current signal into the voltage signal. However, in many applications, it is necessary to convert current into voltage by using an external operational amplifier. The multiplying DAC is similar to the other two types except its output represent the product of the input signal and the reference source, and the product is linear over a broad range. Conceptually, there is not much difference between these three types; any DAC can be viewed as a multiplying DAC.
D/A converters are available as integrated circuits. Some are specially designed to be compatible with the micro controller. Typical applications include digital voltmeters, peak detectors, panel meters, and programmable gain and attenuation, and stepping motor drive.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB Cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Connect 10 pin FRC Cables. Press RESET and observe output. Connect CRO/DSO probe on DAC O/P and GND turret.
7. Observe the output on **CRO/DSO**.

- **FRC CONNECTION**

  J2- J18

EXPERIMENT NO 7.

8 BIT ADC 0804

AIM: To study & observe the theoretical knowledge of ADC IC-0804.

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable,USB cable, 12V power supply.

THEORY:

In the ADC section the IC- 0804 is used to convert the input signal in digital. Here we have discussed about the process of A/D and D/A conversion techniques used by these ICs.

A/D conversion: The A/D conversion is quantizing process whereby an analog signal is represented by equivalent binary states; this is opposite to the D/A conversion process. Analog to Digital converters can be classified into two general group based on the conversion technique. One technique involves comparing the given analog signal with internally generated equivalent signal. This group involves successive –approximation, counters, and flash type converters. The second technique involves changing an analog signal into time or frequency and comparing these new parameters to known values. This group involves integrator converters and voltage to frequency converters. 'The tradeoff between the two techniques is based on accuracy vs. speed. The successive – approximation and flash type are faster but generally less accurate than the integrator and the voltage to frequency converters. Furthermore, the flash type is expensive and difficult to design for high accuracy.

The successive – approximation A/D converter are used in applications, such as data loggers and instrumentation, where conversion speed is important. On the other hand, integrating – type converters are used in applications such as digital meters, panel meters and monitoring systems, where the conversion accuracy is critical. The most commonly used A/D converters- successive approximation is discussed in this section with several interfacing examples.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB Cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Connect 10 pin FRC Cables to the 8 Bit ADC section of the DVK kit. Press RESET and observe output.
7. Observe the output of LEDs (00 to FF) through the POT (0 to 5 V) and corresponding value will be shown on LCD screen.

   Note: Keep link at SL4 between 1 &2, SL5 between 2,3 short.

- **FRC CONNECTIONS:**

  J1- J9 (LCD DATA**)**
  J2- J10 (LCD COMMAND**)**
  J3- J16 (ADCDATA**)**
  J4- J17 (ADCCOMMAND**)**

EXPERIMENT NO 8.

DC MOTOR

AIM: To study DC motor speed control using PWM

REQUIREMENTS BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply DC motor card.

APPLICATION: In Industries DC motors are using. In some application speed control is required. Here we have assembly of small DC motor with speed control.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Connect 10 pin FRC Cables to the DC motor section of the DVK kit.
7. Press start switch then increment. You can change the direction of motor by pressing REV switch for keyboard. You can start or stop the motor by pressing the START or STOP keys.
8. Connect Motor card at RL3 on DVK BOARD.

- Jumpers Settings For DC motor :

  JP6, JP7 – 1& 2 short.

- **FRC CONNECTIONS**

J2- J14 (COMMAND SIGNAL)
J3 – J15 (CONTROL SIGNAL (INC,DEC,REV))

EXPERIMENT NO 9.

STEPPER MOTOR

AIM: To study Stepper motor.

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply, Stepper motor card.

INTRODUCTION:

Basically the stepper motor is an electromagnetic device, which converts digital pulses in to discrete mechanical rotational movements.

In rotary step motor, the output shaft of the motor rotates in equal increments, in response to a train of input pulses.

CONSTRUCTION:

The stepping motor is basically a motor with two phases, eight silent poles, toothed iron rotor and a permanent magnet. This rotor is known is hybrid rotor.

The rotor is suspended in the stator by means of sealed ball bearings.

WORKING OF STEPPING MOTOR:

Sequential switching of supply to the two phases of motor causes the stepping action. The stepping motor can be run in two modes,

a) Full Step Mode: In this mode out of the four coils, two coils are energized at each time when we apply the pulses. The step angle in this case is 7.5 degree +/- 0.1. The speed of the motor can vary by varying the time duration between the two pulses.

Applying the pulses sequence in the reverse can change the direction of the motor Direction, that is from BOTTOM to TOP.

b) Half step Mode: In this mode, we get the step angle of 3.75 degree, hence better resolution.

PROCEDURE FOR STEPPER MOTOR:

1. Connect +12V supply to board.
2. Connect the USB Cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Connect 10 pin FRC Cables to the stepper motor section of the DVK kit.
7. Press start switch then increment. You can change the direction of motor by pressing REV switch for keyboard. You can start or stop the motor by pressing the START or STOP keys.

Connect Motor card at RL4 on DVK BOARD.

- Jumpers Settings For stepper motor :

  JP6, JP7 – 2 & 3 short.

FRC CONNECTION:

J2 - J14
J3 – J15

EXPERIMENT NO 10.

RELAY AND BUZZER INTERFACE

AIM: Relay & Buzzer Interface to embedded development board

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Now if downloading of the program is completed, connect 10 pin FRC cables to the Relay section of the DVK kit.

10) **Observe the output Relay ON/OFF by pressing corresponding switch.**

FRC CONNECTIONS:

J3 – J7

EXPERIMENT NO 11.

EEPROM INTERFACE

AIM: EEPROM Interface to embedded development board

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB Cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Now if downloading of the program is completed, connect 10 pin FRC cables to the EEPROM section of the DVK kit.
7. Observe the output of EEPROM on LCD display. As below

   ADDRESS: 0X70

   DATA: BB

- **FRC CONNECTION:**

  J1- J9 (LCD DATA)
  J2 –J10 (LCD COMMAND)
  UEXT- J20 (EEPROM)

EXPERIMENT NO 12.

RTC INTERFACE

AIM: RTC Interface to embedded development board

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable,12V power supply.

PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Now if downloading of the program is completed, connect 10 pin FRC cables to the RTC section of the DVK kit.
   Observe the output of RTC on LCD display.

- **FRC CONNECTION:**

J1- J9 (LCD DATA)
J2 –J10 (LCD COMMAND)
UEXT- J20 (EEPROM)

EXPERIMENT NO 13.

Serial Rx_Tx

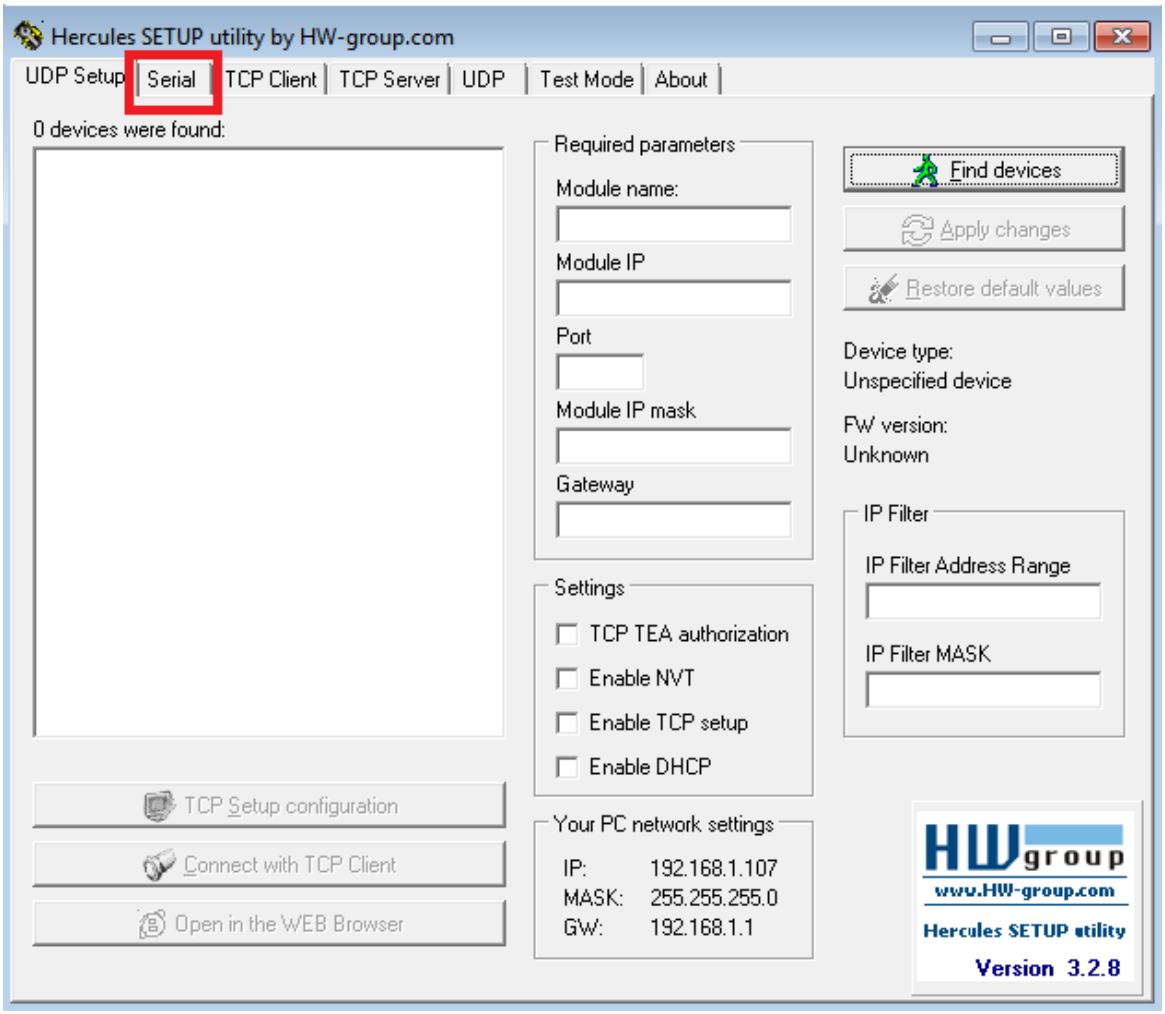
AIM: To check serial communication on embedded development board

REQUIREMENTS: BOARD on AT89S52, 10 pin FRC cable, USB cable, 12V power supply.

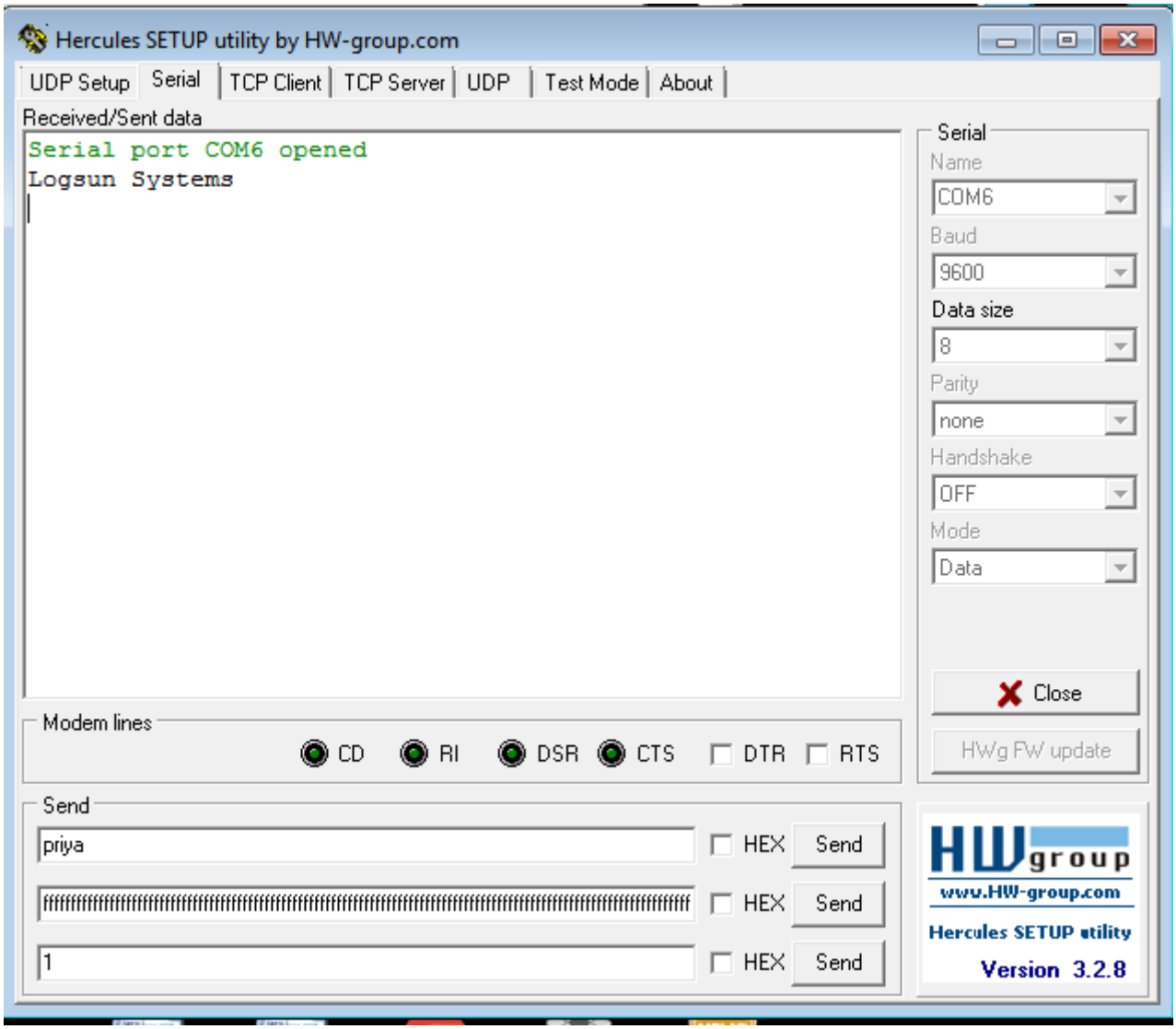
PROCEDURE:

1. Connect +12V supply to board.
2. Connect the USB cable to the micro controller Kit and select COM port of the PC.
3. Switch ON the power supply.
4. Open ProgISP Flashing Software on PC. Select the IC (AT89S52).
5. Select given .hex File -> click on Load Flash. Select the HEX file. Click on Auto Button. This uploads HEX file into microcontroller shown by green bar.
6. Now if downloading of the program is completed, open Hercules software->
7. **Keep S3 switch up while checking the output on hercules.**
8. **Check the output on hercules (baud rate=9600)**

- **PROCEDURE FOR HERCULES:**



SELECT BAUD RATE **9600**, SELECT RESPECTIVE **PORT** OF YOUR PC/LAPTOP WHICH IS CONNECTED TO DVK
KEEP SW3 UP AND CLICK ON **OPEN** YOU CAN SEE FOLLOWING WINDOW AS OUTUT.


Hercules SETUP utility by HW-group.com
UDP Setup
Serial
TCP Client
TCP Server
UDP
Test Mode
About
Received/Sent data
Serial port COM6 opened
Logsun Systems
Serial
Name
COM6
Baud
9600
Data size
8
Parity
none
Handshake
OFF
Mode
Data
Close
HWg FW update
Modem lines
CD
RI
DSR
CTS
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www.HW-group.com
Hercules SETUP utility
Version 3.2.8

FRC CONNECTION DETAILS:

Sr. No.	Experiments	8051 DVK Port No.	Port No.
1	8 Bit ADC	J3	J17 (8-Bit ADC)
2	8 Bit ADC + 8 Bit LCD	J1 J2 J3 J4	J9 (LCD) J10 (LCD) J16 (8-Bit ADC) J17 (8-Bit ADC)
3	8 Bit DAC	J2	J18(8-bit DAC)
4	LCD(4 bit)	J1	J9 (LCD)
5	LCD(8 bit)	J1 J2	J9 (LCD) J10 (LCD)
6	EEPROM	J1 J2 UEXT	J9 (LCD) J10(LCD) J20 (EEPROM)
7	RTC	J1 J2 UEXT	J9 (LCD) J10 (LCD) J20 (RTC)
8	LCD + Keypad	J1 J2 J3	J9 (LCD) J10 (LCD) J13 (Keypad)
9	7 Segment	J1 J2	J11 (7 segment) J12 (7 segment)
10	7 Segment + Keypad	J 1 J2 J3	J11 (7 segment) J12 (7 segment) J13 (Keypad)
11	LED LOGIC	J1 J2	J21 (Digital I/O) J22(Digital I/O)
12	LED sequence+ Relay buzzer	J3	J7 (LED sequence)
13	DC motor	J2 J3	J14 (DC Motor) J15
14	Stepper motor	J2 J3	J14 (Stepper Motor) J15
15	Serial Rx-Tx	Connect A-B USB Cable Between DVK and PC/Laptop. upload the program and open Hercules software, go to serial select COM port and set baud rate at 9600,make SW UP and click on open COM. You can see output **LOGSUN SYSYTEM** .	