BECE204P-Microprocessors & Microcontrollers Lab

LAB-8

I/O PORT PROGRAMMING IN 8051

CHALLENGING TASK

1. Write an 8051 assembly language program to toggle the status of the LEDs connected at port 1 pins 0 for every "PQRS" ms, where "PQRS" is last 4-digits of your register number. Assume the crystal frequency as 11.0592 MHz. Verify the output using ESA 8051 Microcontroller kit.

I/O PORTS

- 8051 have 4 I/O ports each comprising 8 bits which can be configured as inputs or outputs. Hence, total 32 i/o pins allow the microcontroller to be connected with the peripheral devices.
- Except port 1 all other ports are used for dual purpose, all ports are bidirectional and they are constructed with a D type output latch.
- Pin configuration, i.e. whether it is to be configured as an input (1) or an output (0), depends on its logic state.
- All the ports upon RESET are configured as input, ready to be used as input ports.
- All ports are byte and bit accessible
  - Byte accessible : P0,P1,P2,P3
  - Bit-accessible : Px.y, where x represents port number ranging from 0 to 3, y represents bit number of the port ranging from 0 to 7

LAB TASK-1

Write an 8051 assembly language program to toggle the status of the LEDs connected at port 1 pins 0 for every 1 seconds (1000 ms). Assume the crystal frequency as 11.0592 MHz. Verify the output using ESA 8051 Microcontroller kit.

```
        ORG 0000H
        CLR P1.0
BACK:   SETB P1.0
        ACALL DELAY
        CLR P1.0
        ACALL DELAY
        SJMP BACK
```

LAB TASK-1

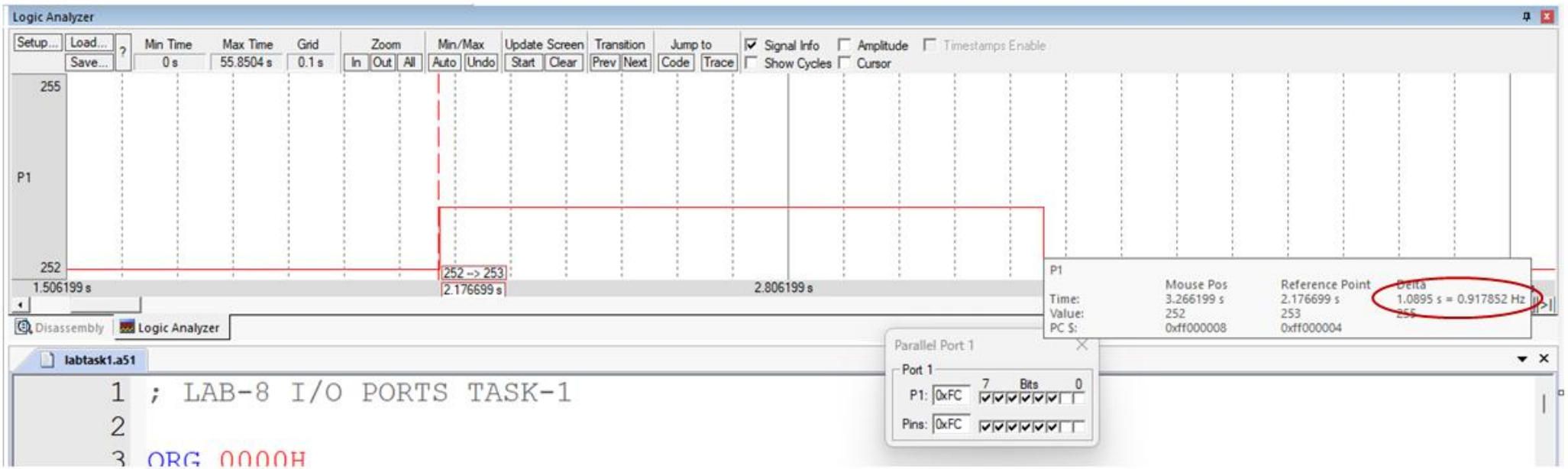
```
DELAY:    MOV R1,#5
LOOP1:    MOV R2, #200      ; 1MC
LOOP2:    MOV R3, #250      ; 1MC
LOOP3:    NOP               ; 1MC
          NOP               ; 1MC
          DJNZ R3, LOOP3    ; 2MC
          DJNZ R2,LOOP2     ; 2MC
          DJNZ R1, LOOP1    ; 2MC
          RET               ; 2MC
```

Delay calculation:

- LOOP3 Time delay : [250x(1+1+2)]x1.085=1085µs
- LOOP2, repeat LOOP3 for 200 times, so 200x1085 µs = 217000 µs. But, "MOV R3,#250" and "DJNZ R2, AGAIN" at the start and end of LOOP2 [200x(1+2)]x1.085 µs = 651 µs. As a result, total time delay of LOOP2 is 217000+651=217651 µs
- Then LOOP3, repeat LOOP2 for 5 times, so 5x 217651 µs = 1088255 µs = 1088 ms or 1.088 seconds. But, "MOV R2,#200" and "DJNZ R1, AGAIN" at the start and end of LOOP1 [5x(1+2)]x1.085 µs = 16 µs. Also "MOV R1,#5" and RET instruction execute once, 3x1.085 = 3 µs. Therefore total time delay generated by the entire delay loop program is 1088255 µs + 16 µs + 3 µs = 1088274 µs.

LAB TASK-1

OUTPUT:

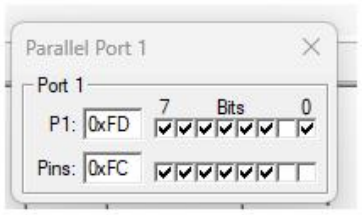


LAB TASK-2

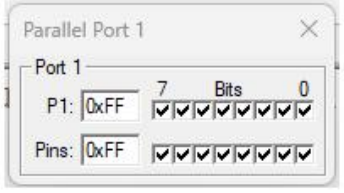
A switch is connected to pin P1.0 and an LED to pin P1.1. Write an 8051program to continuously get the status of the switch and send it to the LED.

```
        SETB P1.0       ; Configure P1.0 as input port pin
        CLR P1.1        ; Configure P1.1 as output port pin
HERE:   MOV C, P1.0     ; Read the Switch status
        JC LEDON        ; Check switch status
        CLR P1.1        ;set LED pin to LOW
        SJMP HERE       ;keep repeating
        SETB P1.1       ;set LED pin to HIGH
        SJMP HERE       ;keep repeating
```

OUTPUT:

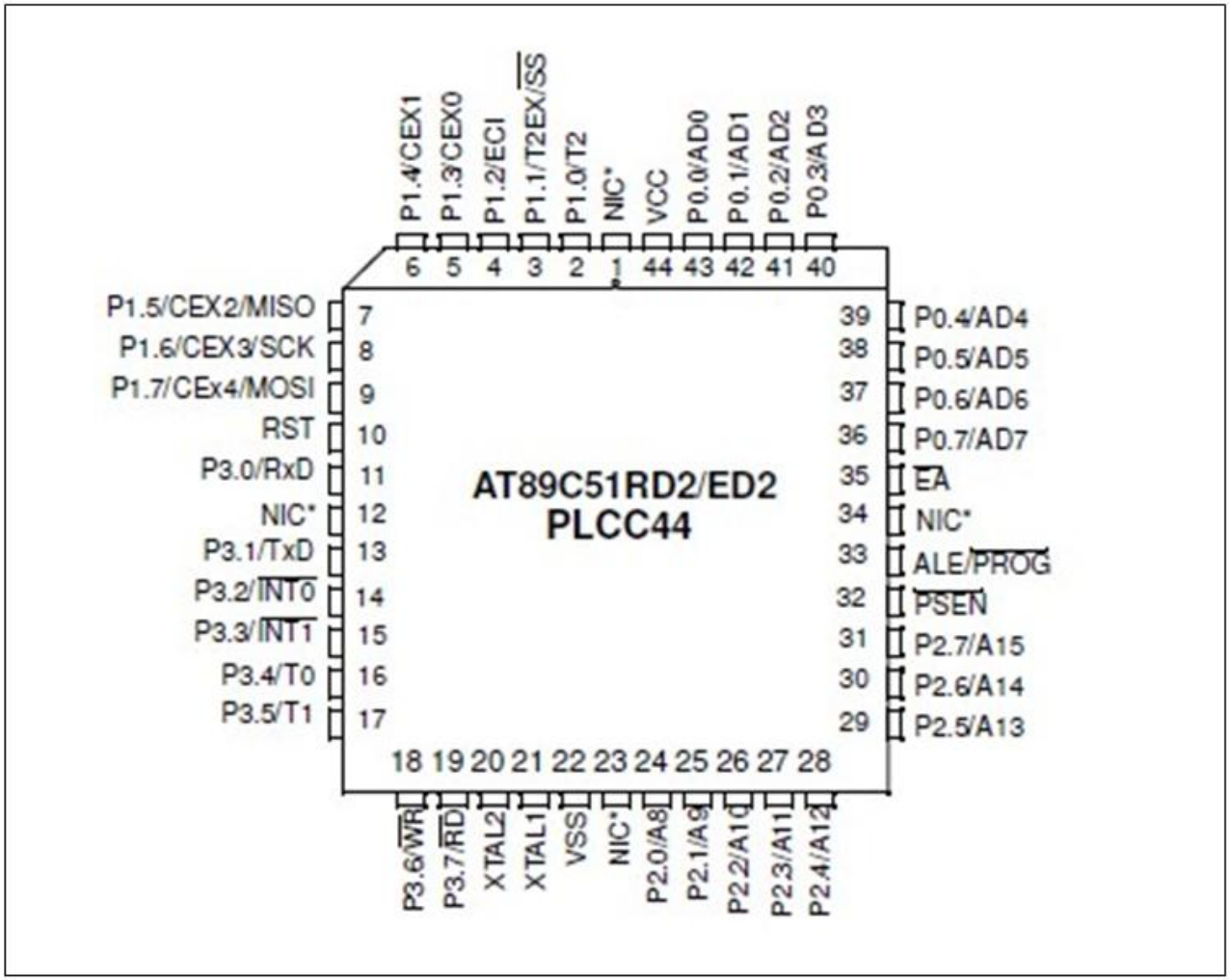


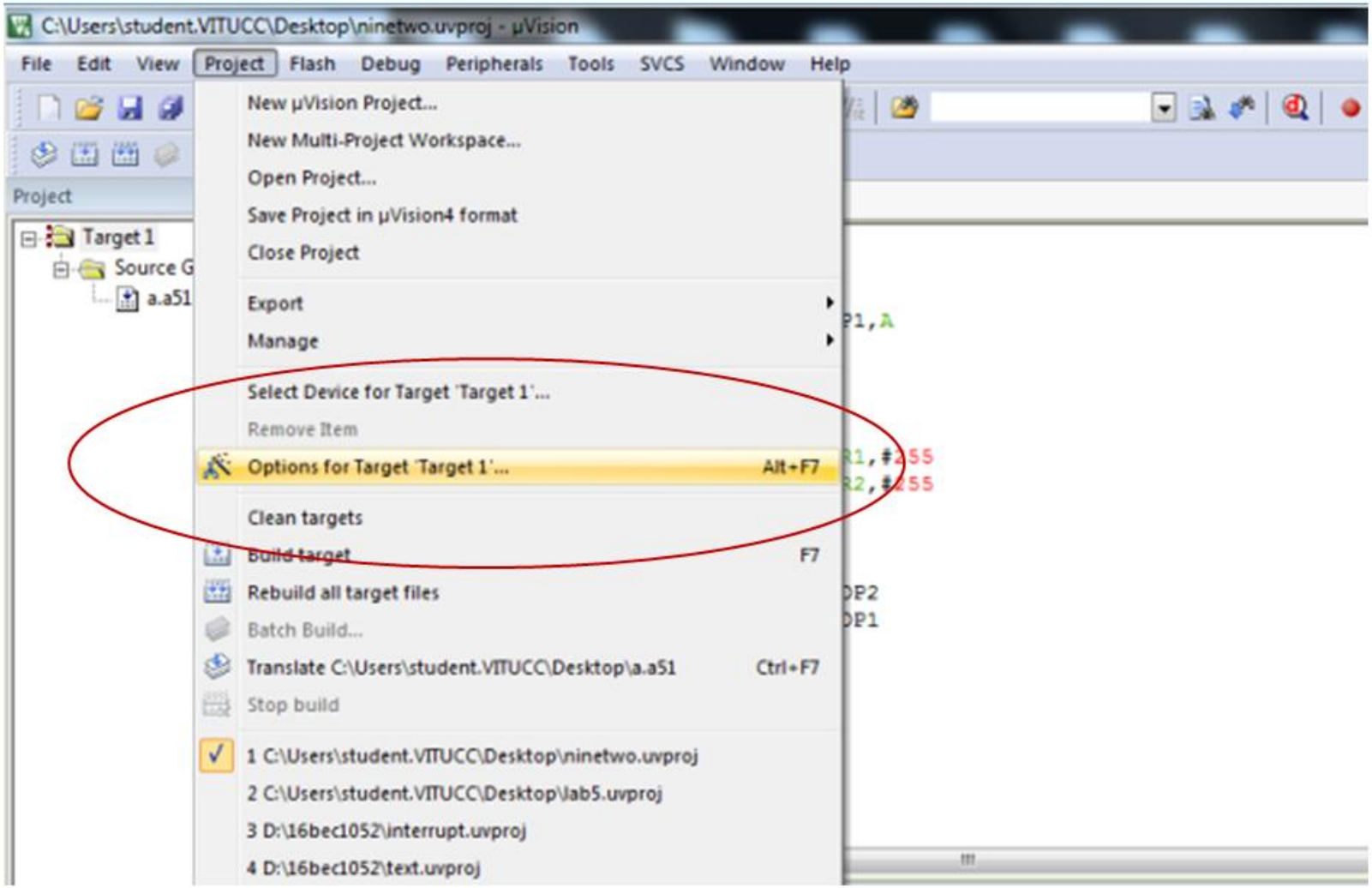
SW is LOW

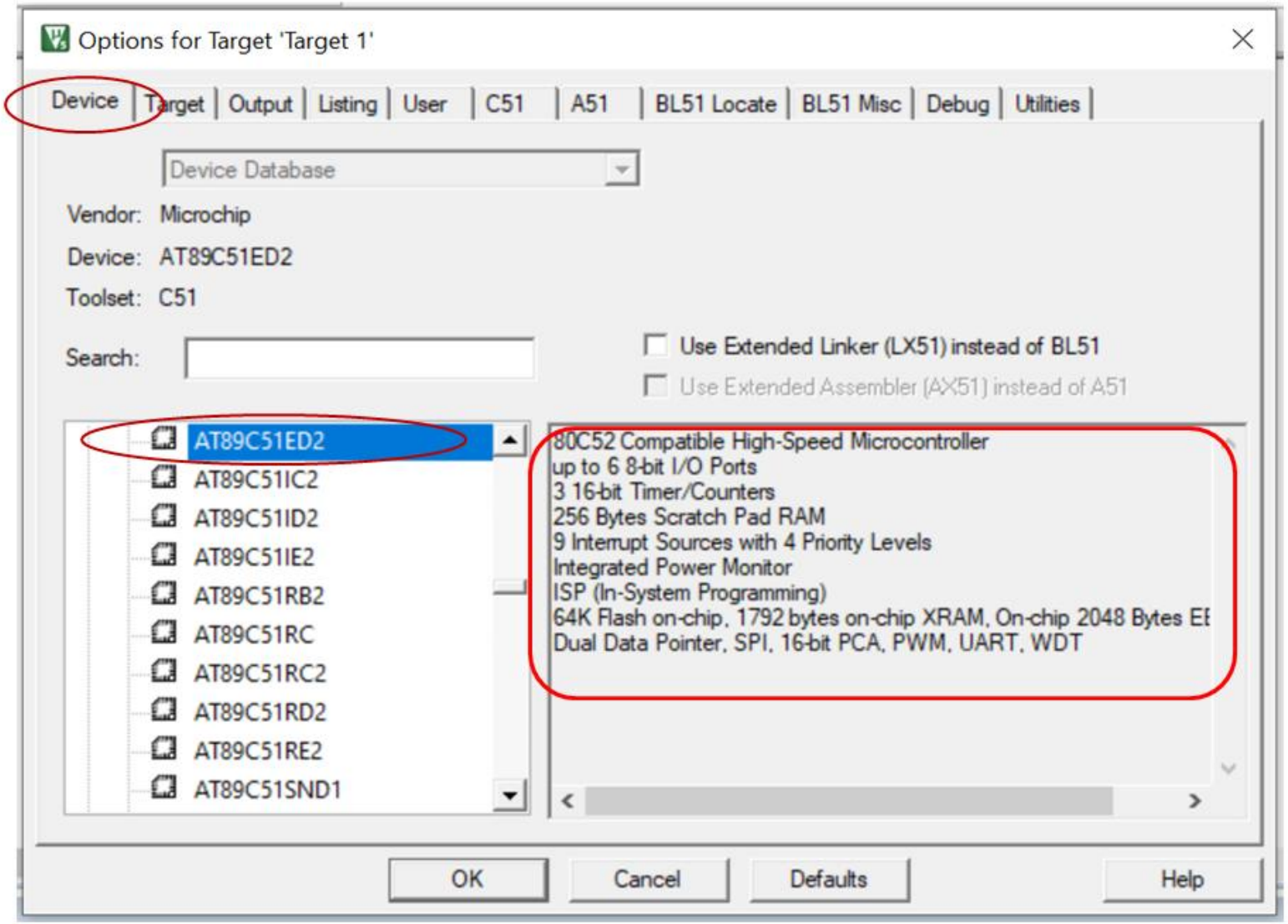


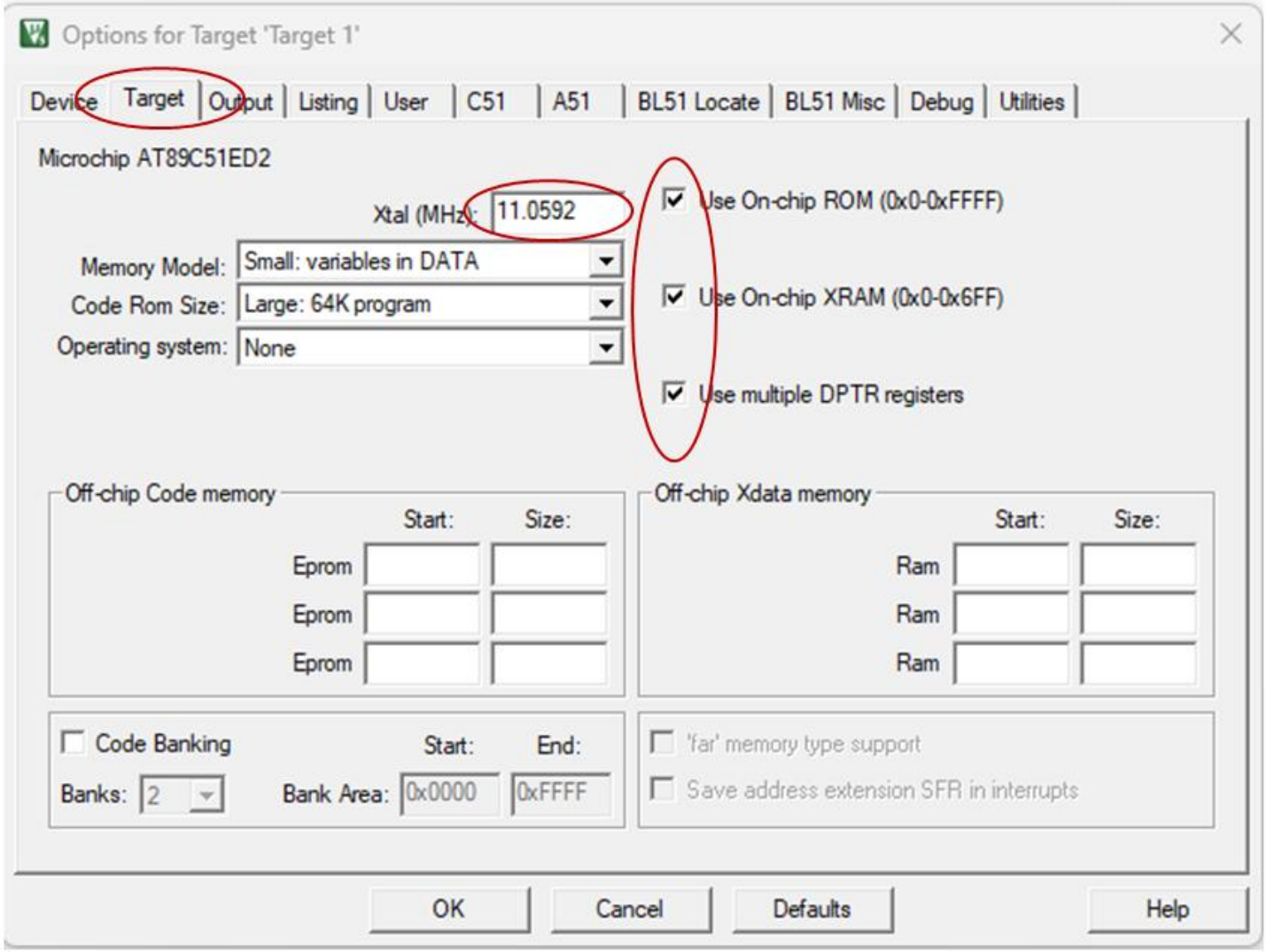
SW is HIGH

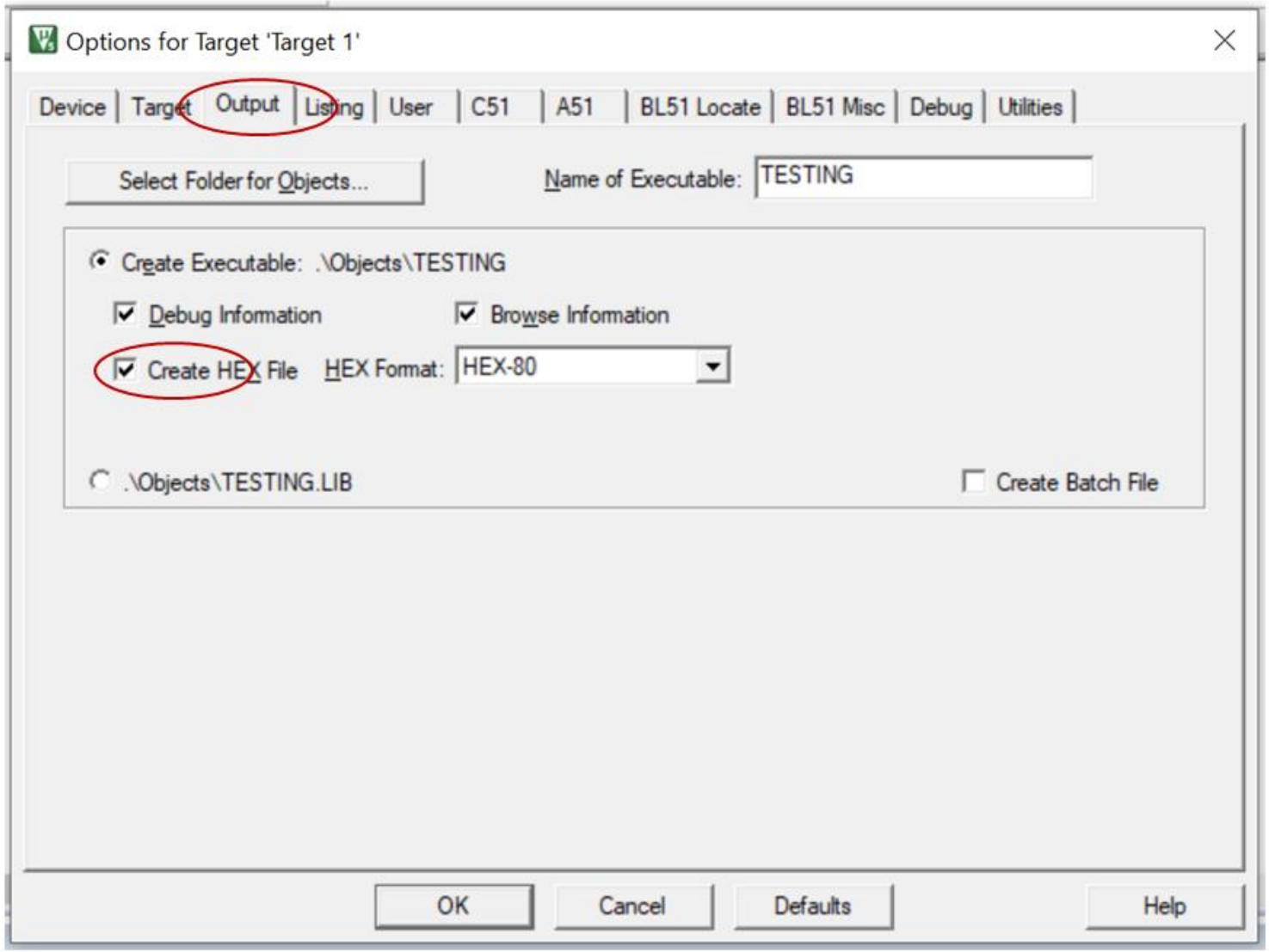
CONFIGURATION SETTINGS TO INTERFACE ESA 8051 KIT WITH KEIL IDE

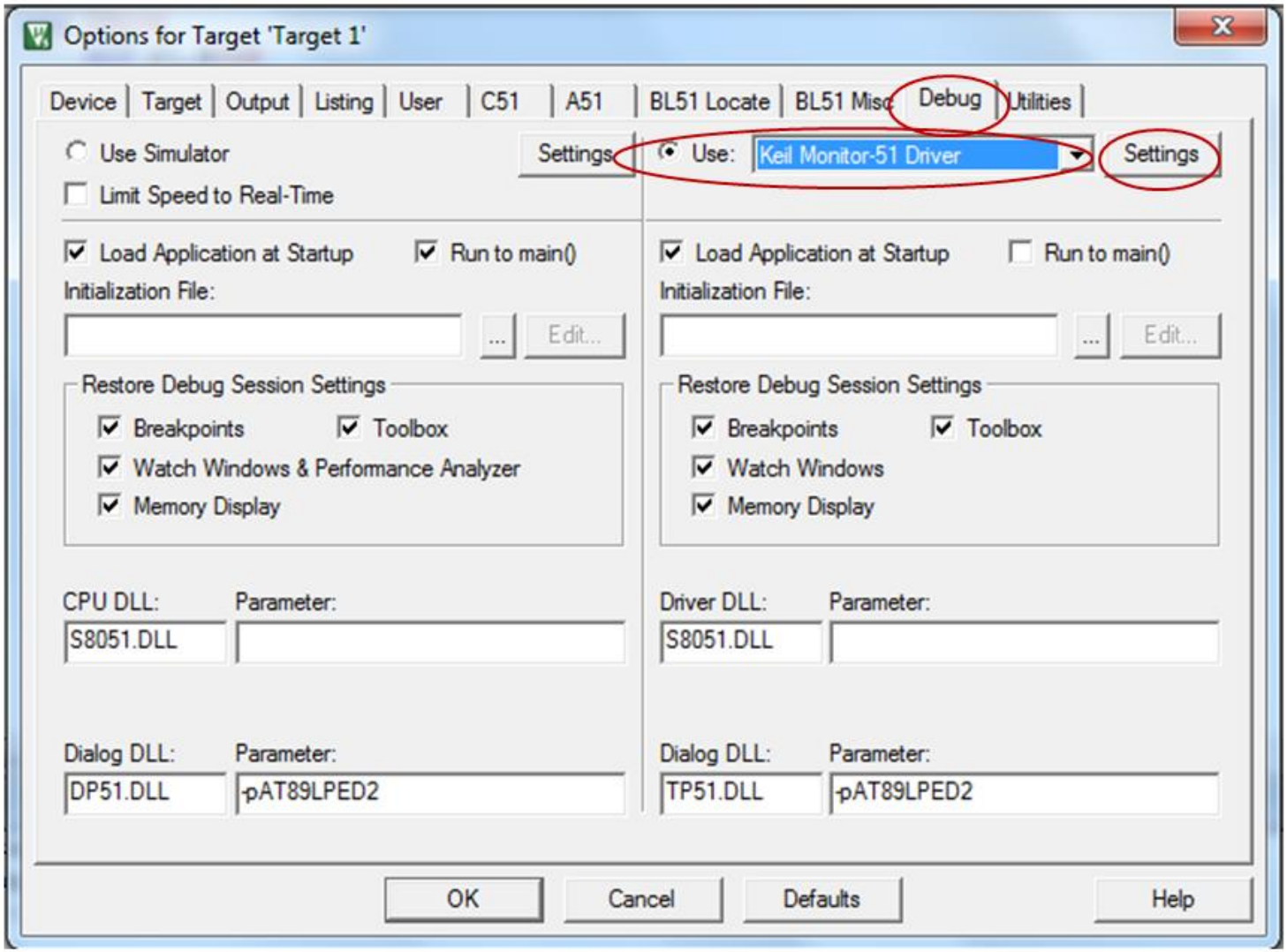

AT89C51RD2/ED2
PLCC44
P1.4/CEX1
P1.3/CEX0
P1.2/ECI
P1.1/T2EX/SS
P1.0/T2
NIC*
VCC
P0.0/AD0
P0.1/AD1
P0.2/AD2
P0.3/AD3
P1.5/CEX2/MISO
P1.6/CEX3/SCK
P1.7/CEx4/MOSI
RST
P3.0/RxD
NIC*
P3.1/TxD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
EA
NIC*
ALE/PROG
PSEN
P2.7/A15
P2.6/A14
P2.5/A13
P3.6/WR
P3.7/RD
XTAL2
XTAL1
VSS
NIC*
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12

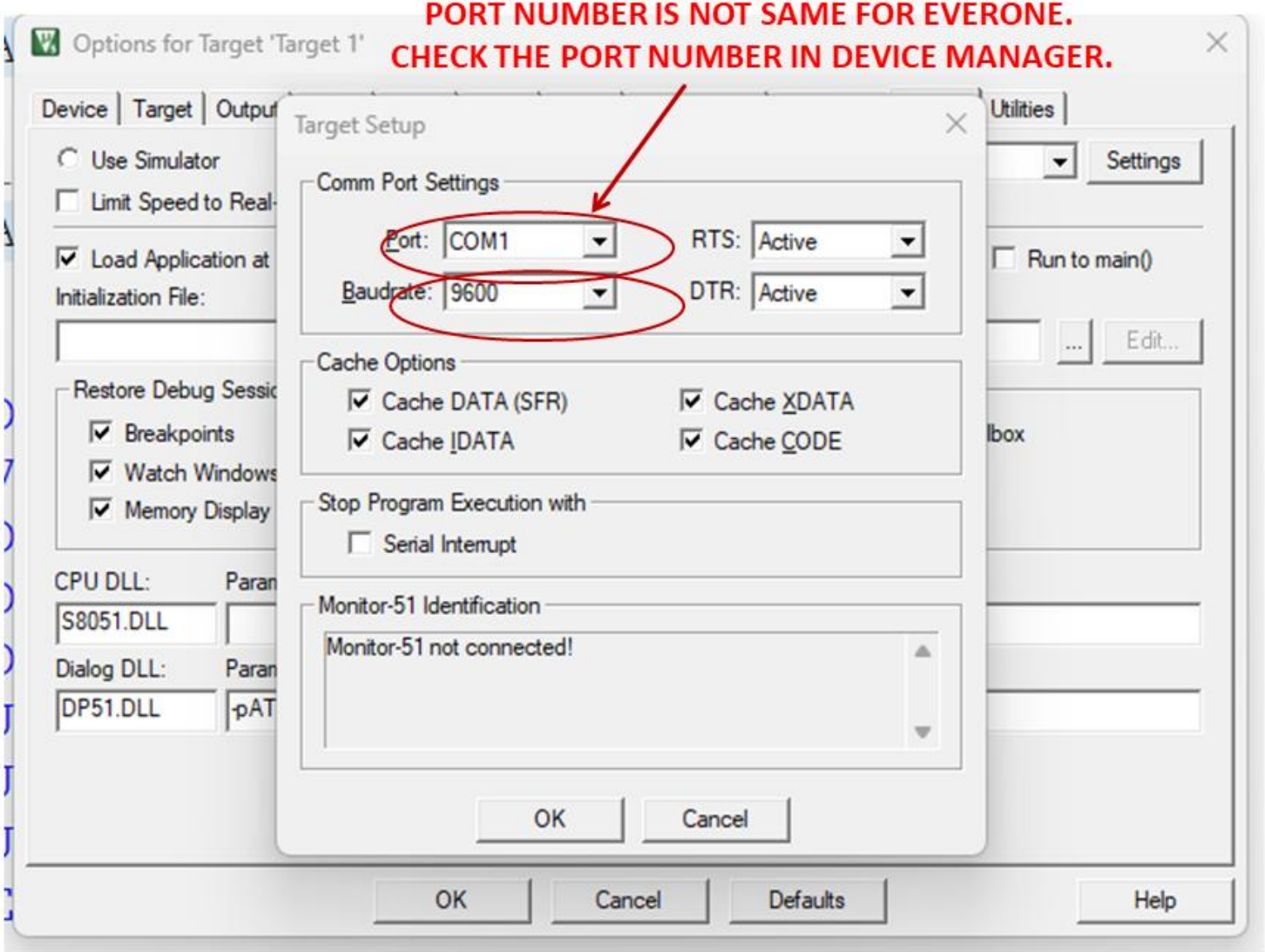

C:\Users\student.VITUCC\Desktop\ninetwo.uvproj - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Project
Target 1
Source G
a.a51
New µVision Project...
New Multi-Project Workspace...
Open Project...
Save Project in µVision4 format
Close Project
Export
Manage
Select Device for Target 'Target 1'...
Remove Item
Options for Target 'Target 1'... Alt+F7
Clean targets
Build target F7
Rebuild all target files
Batch Build...
Translate C:\Users\student.VITUCC\Desktop\a.a51 Ctrl+F7
Stop build
1 C:\Users\student.VITUCC\Desktop\ninetwo.uvproj
2 C:\Users\student.VITUCC\Desktop\lab5.uvproj
3 D:\16bec1052\interrupt.uvproj
4 D:\16bec1052\text.uvproj


Options for Target 'Target 1'
Device
Target
Output
Listing
User
C51
A51
BL51 Locate
BL51 Misc
Debug
Utilities
Device Database
Vendor: Microchip
Device: AT89C51ED2
Toolset: C51
Search:
Use Extended Linker (LX51) instead of BL51
Use Extended Assembler (AX51) instead of A51
AT89C51ED2
AT89C51IC2
AT89C51ID2
AT89C51IE2
AT89C51RB2
AT89C51RC
AT89C51RC2
AT89C51RD2
AT89C51RE2
AT89C51SND1
80C52 Compatible High-Speed Microcontroller
up to 6 8-bit I/O Ports
3 16-bit Timer/Counters
256 Bytes Scratch Pad RAM
9 Interrupt Sources with 4 Priority Levels
Integrated Power Monitor
ISP (In-System Programming)
64K Flash on-chip, 1792 bytes on-chip XRAM, On-chip 2048 Bytes EE
Dual Data Pointer, SPI, 16-bit PCA, PWM, UART, WDT
OK
Cancel
Defaults
Help

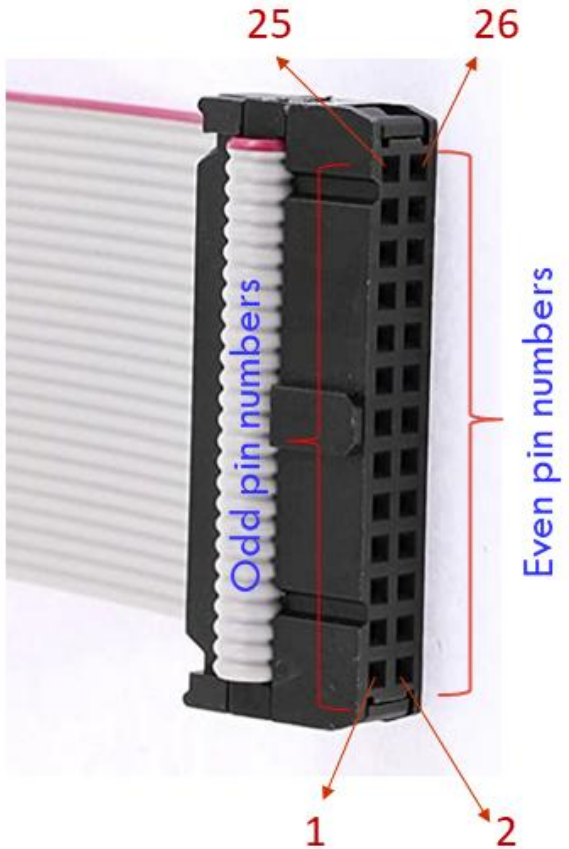

Options for Target 'Target 1'
Device
Target
Output
Listing
User
C51
A51
BL51 Locate
BL51 Misc
Debug
Utilities
Microchip AT89C51ED2
Xtal (MHz): 11.0592
Memory Model: Small: variables in DATA
Code Rom Size: Large: 64K program
Operating system: None
Use On-chip ROM (0x0-0xFFFF)
Use On-chip XRAM (0x0-0x6FF)
Use multiple DPTR registers
Off-chip Code memory
Start:
Size:
Eprom
Eprom
Eprom
Off-chip Xdata memory
Start:
Size:
Ram
Ram
Ram
Code Banking
Start:
End:
Banks: 2
Bank Area: 0x0000 0xFFFF
'far' memory type support
Save address extension SFR in interrupts
OK
Cancel
Defaults
Help


Options for Target 'Target 1'
Device
Target
Output
Listing
User
C51
A51
BL51 Locate
BL51 Misc
Debug
Utilities
Select Folder for Objects...
Name of Executable: TESTING
Create Executable: .\Objects\TESTING
Debug Information
Browse Information
Create HEX File
HEX Format: HEX-80
.\Objects\TESTING.LIB
Create Batch File
OK
Cancel
Defaults
Help


Options for Target 'Target 1'
Device
Target
Output
Listing
User
C51
A51
BL51 Locate
BL51 Misc
Debug
Utilities
Use Simulator
Settings
Use:
Keil Monitor-51 Driver
Settings
Limit Speed to Real-Time
Load Application at Startup
Run to main()
Initialization File:
Edit...
Restore Debug Session Settings
Breakpoints
Toolbox
Watch Windows & Performance Analyzer
Memory Display
CPU DLL:
Parameter:
S8051.DLL
Dialog DLL:
DP51.DLL
-pAT89LPED2
Load Application at Startup
Run to main()
Initialization File:
Edit...
Restore Debug Session Settings
Breakpoints
Toolbox
Watch Windows
Memory Display
Driver DLL:
Parameter:
S8051.DLL
Dialog DLL:
TP51.DLL
-pAT89LPED2
OK
Cancel
Defaults
Help


PORT NUMBER IS NOT SAME FOR EVERONE.
CHECK THE PORT NUMBER IN DEVICE MANAGER.
Options for Target 'Target 1'
Device
Target
Output
Utilities
Use Simulator
Limit Speed to Real-
Load Application at
Initialization File:
Settings
Run to main()
Edit...
Restore Debug Sessio
Breakpoints
Watch Windows
Memory Display
CPU DLL:
S8051.DLL
Dialog DLL:
DP51.DLL
OK
Cancel
Defaults
Help
Target Setup
Comm Port Settings
Port: COM1
Baudrate: 9600
RTS: Active
DTR: Active
Cache Options
Cache DATA (SFR)
Cache XDATA
Cache IDATA
Cache CODE
Stop Program Execution with
Serial Interrupt
Monitor-51 Identification
Monitor-51 not connected!
OK
Cancel

ESA 8051 MICROCONTROLLER KIT PIN DETAILS



J7: 26-Pin Male Connector for Ports P0, P1 and P2

Pin No. on J7	PORT Line	Pin No. on J7	PORT Line
1	P2.4	2	P2.5
3	P2.2	4	P2.3
5	P2.0	6	P2.1
7	P1.6	8	P1.7
9	P1.4	10	P1.5
11	P1.2	12	P1.3
13	P1.0	14	P1.1
15	P0.6	16	P0.7
17	P0.4	18	P0.5
19	P0.2	20	P0.3
21	P0.0	22	P0.1
23	P2.6	24	P2.7
25	Vcc	26	Gnd