LAB 5

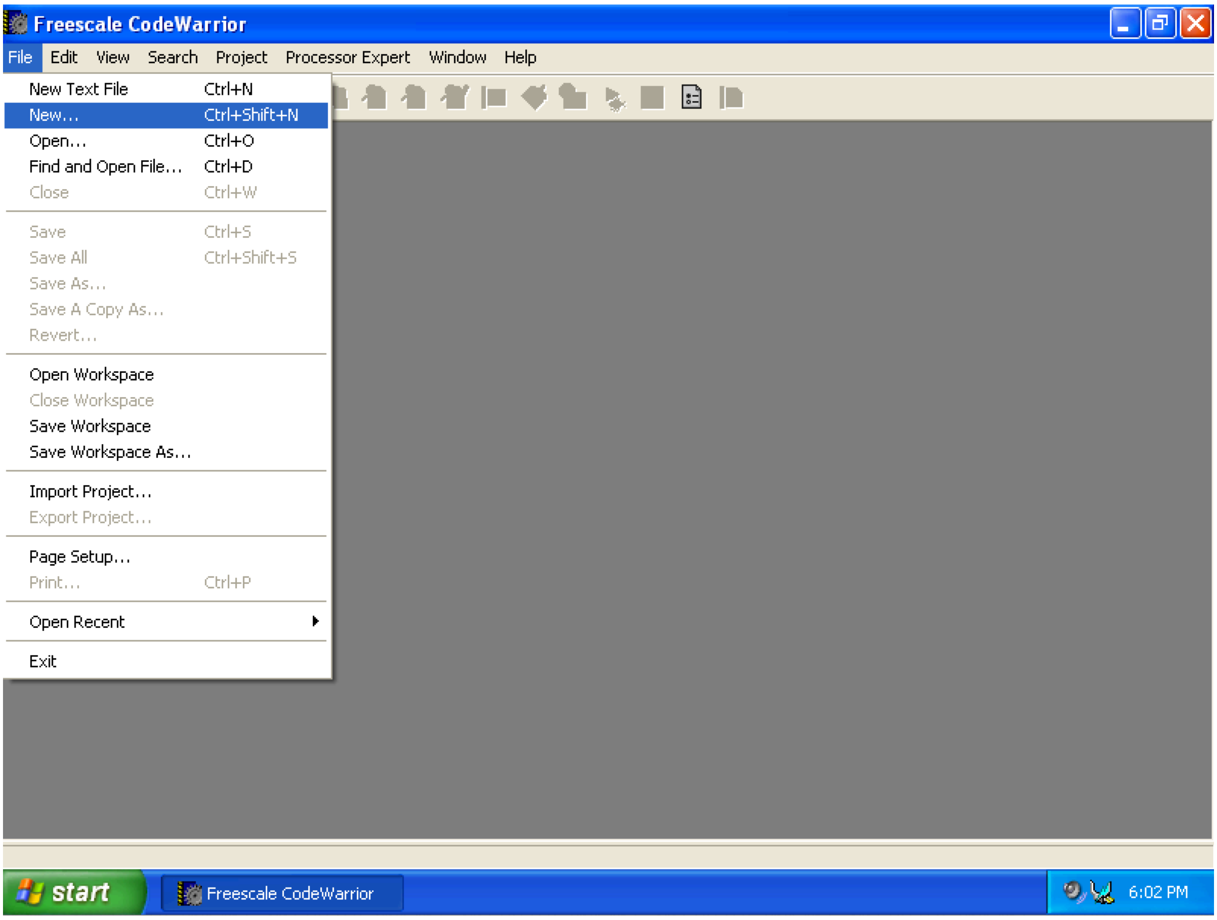
INTRODUCTION TO CSM12C32 KIT

1. INTRODUCTION

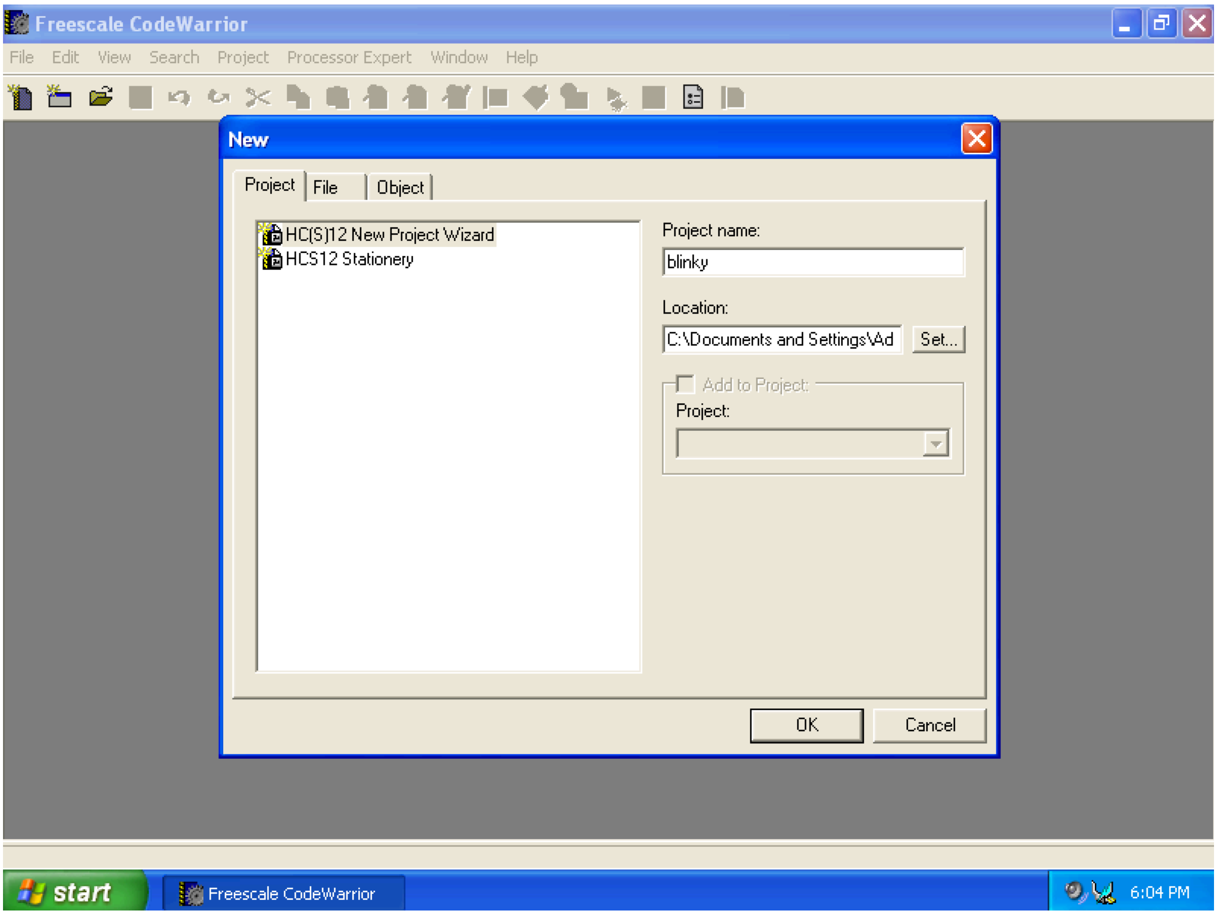
This lab gives information about usage of CSM12C32 Kit. Read the following chapter to create assembly and C project using CodeWarrior. Also read HCS12 instructions document that is on the Ninova Find differences between HCS12 and MC6802. Is HCS12 backward compatible? All documents related to CSM32C32 are on the Ninova.

2. Assembly and C Project Creation

Step1: File->New



Step2: Write project name and choose project location, then click OK.



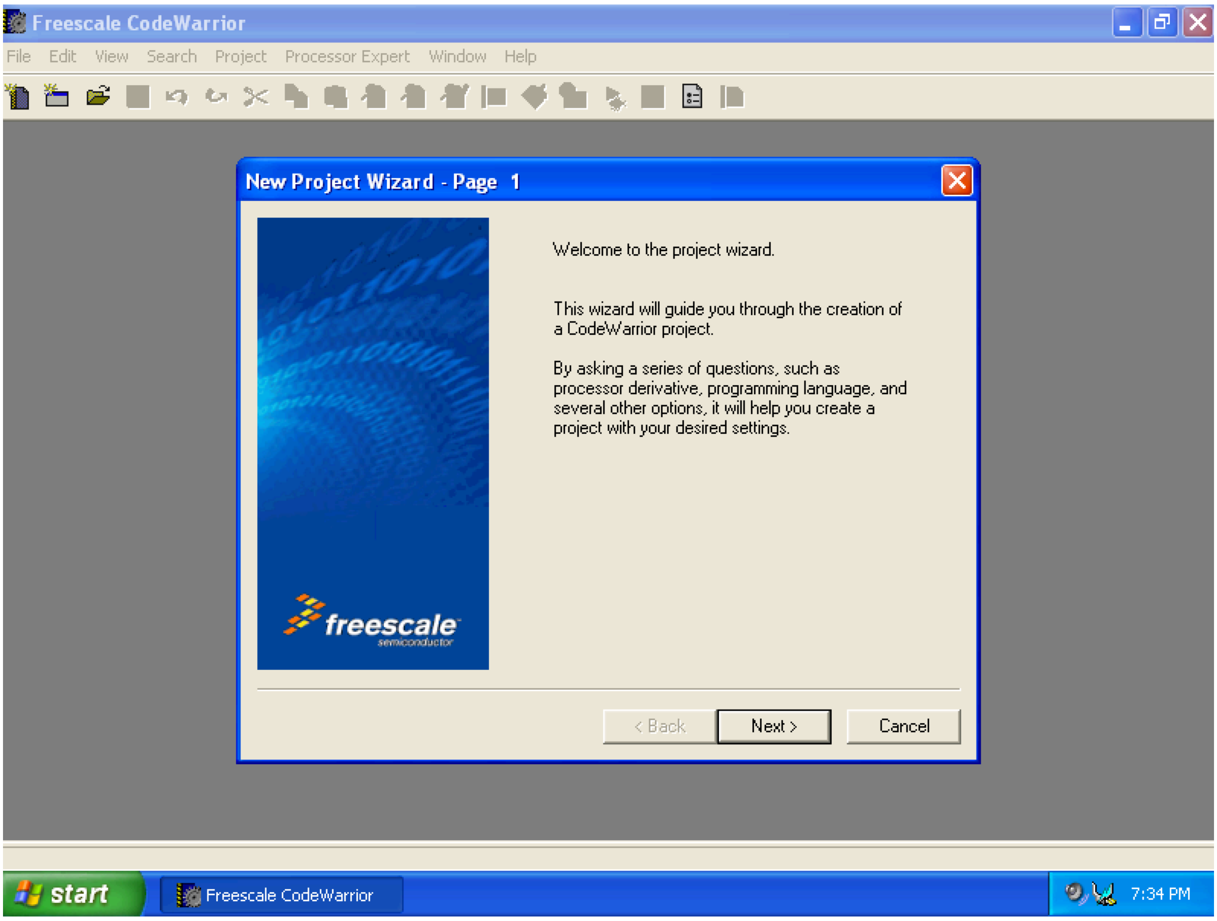
Project name: blinky

Location: C:\Documents and Settings\Ad

□ Add to Project:

Project:

Step3: Click Next.

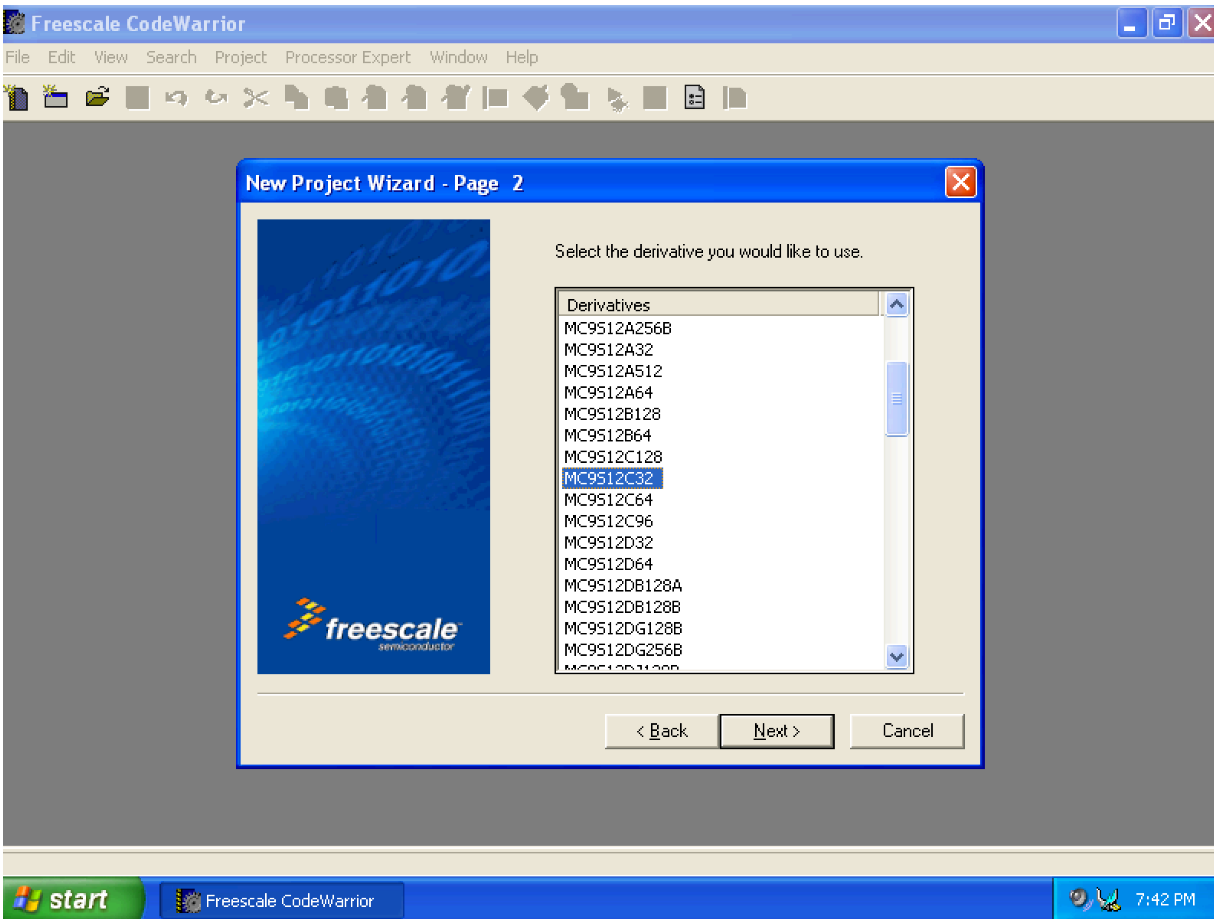


Welcome to the project wizard.

This wizard will guide you through the creation of a CodeWarrior project.

By asking a series of questions, such as processor derivative, programming language, and several other options, it will help you create a project with your desired settings.

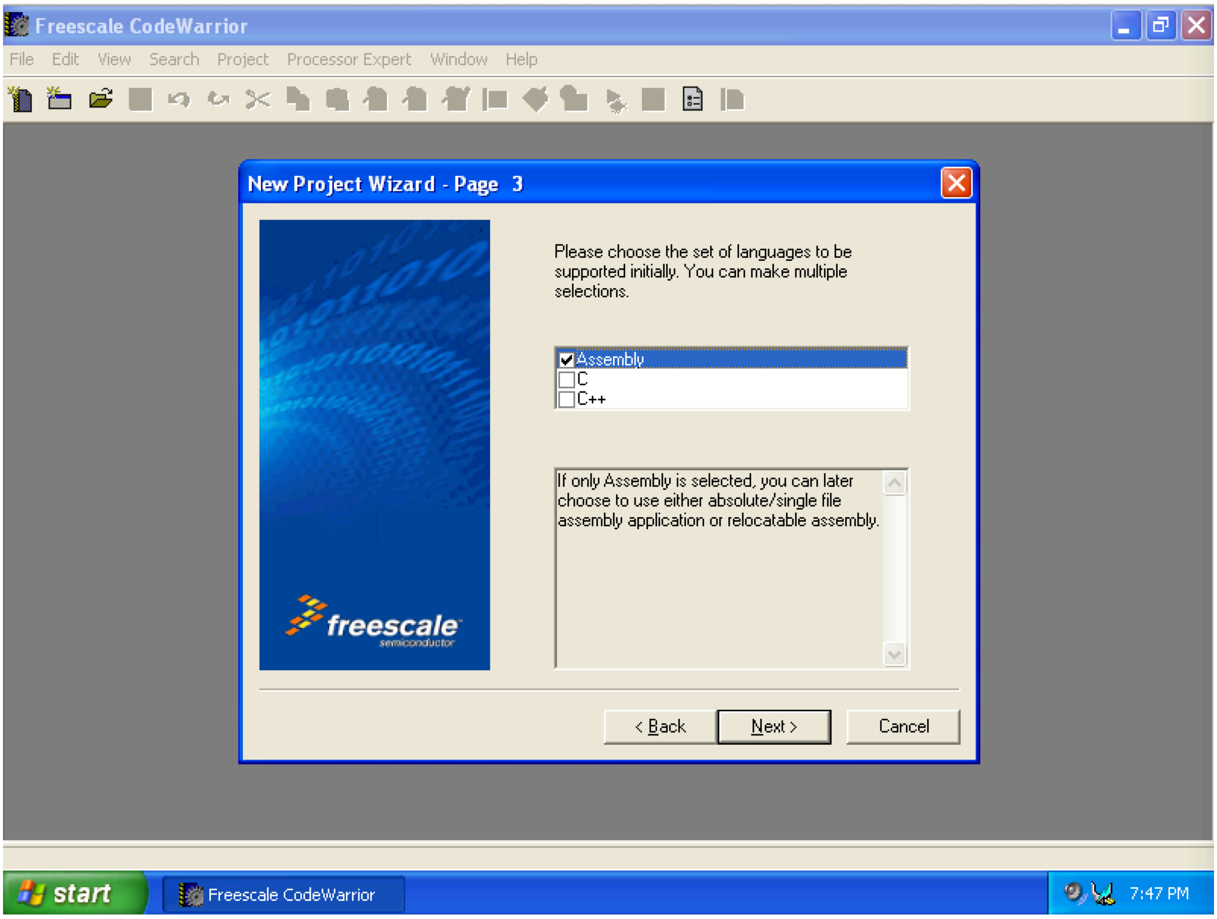
Step4: Select MC9S12C32, and then click Next.



Select the derivative you would like to use.

Derivatives
MC9S12A256B
MC9S12A32
MC9S12A512
MC9S12A64
MC9S12B128
MC9S12B64
MC9S12C128
MC9S12C32
MC9S12C64
MC9S12C96
MC9S12D32
MC9S12D64
MC9S12DB128A
MC9S12DB128B
MC9S12DG128B
MC9S12DG256B

Step5: Select Assembly option, then click Next

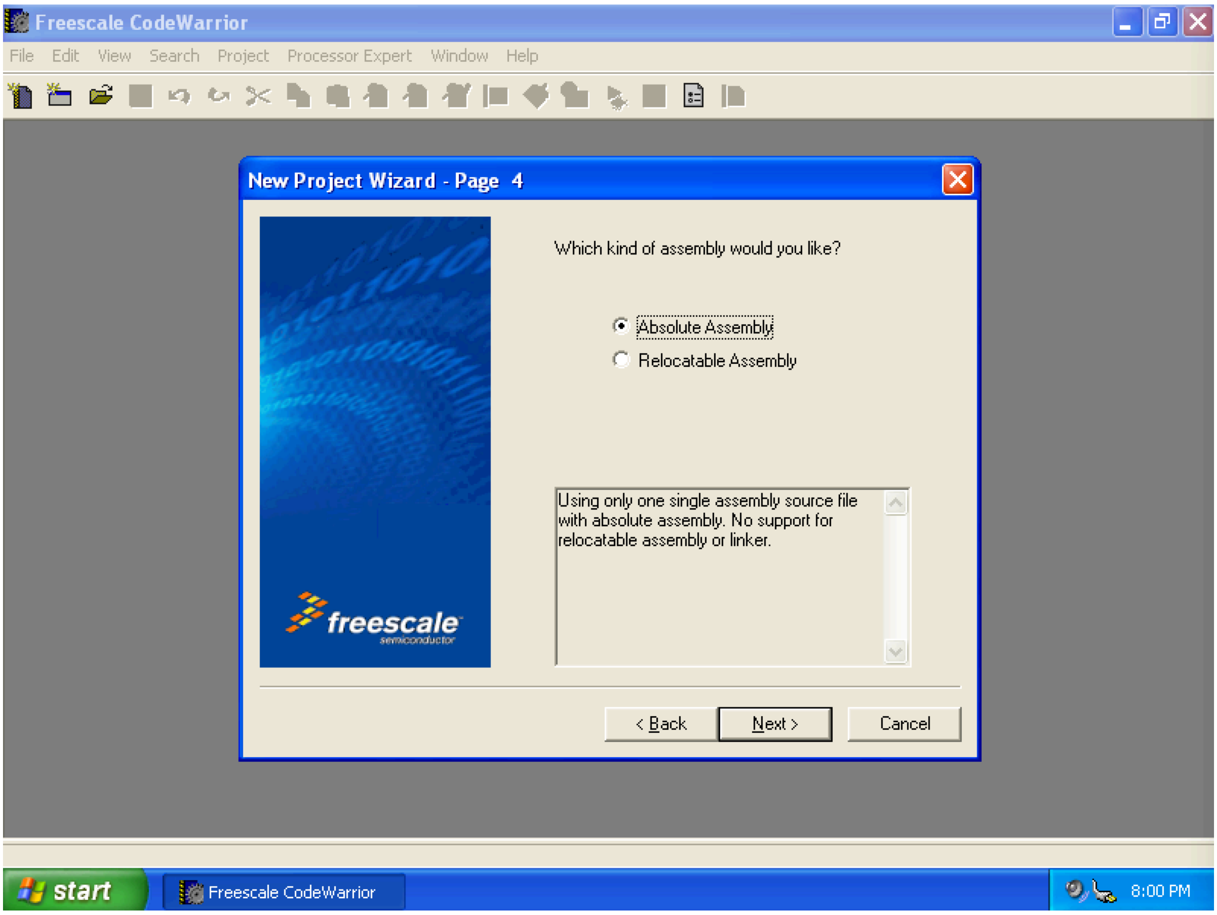


Please choose the set of languages to be supported initially. You can make multiple selections.

☑ Assembly
□ C
□ C++

If only Assembly is selected, you can later choose to use either absolute/single file assembly application or relocatable assembly.

Step6: Select Absolute Assembly option, then click Next



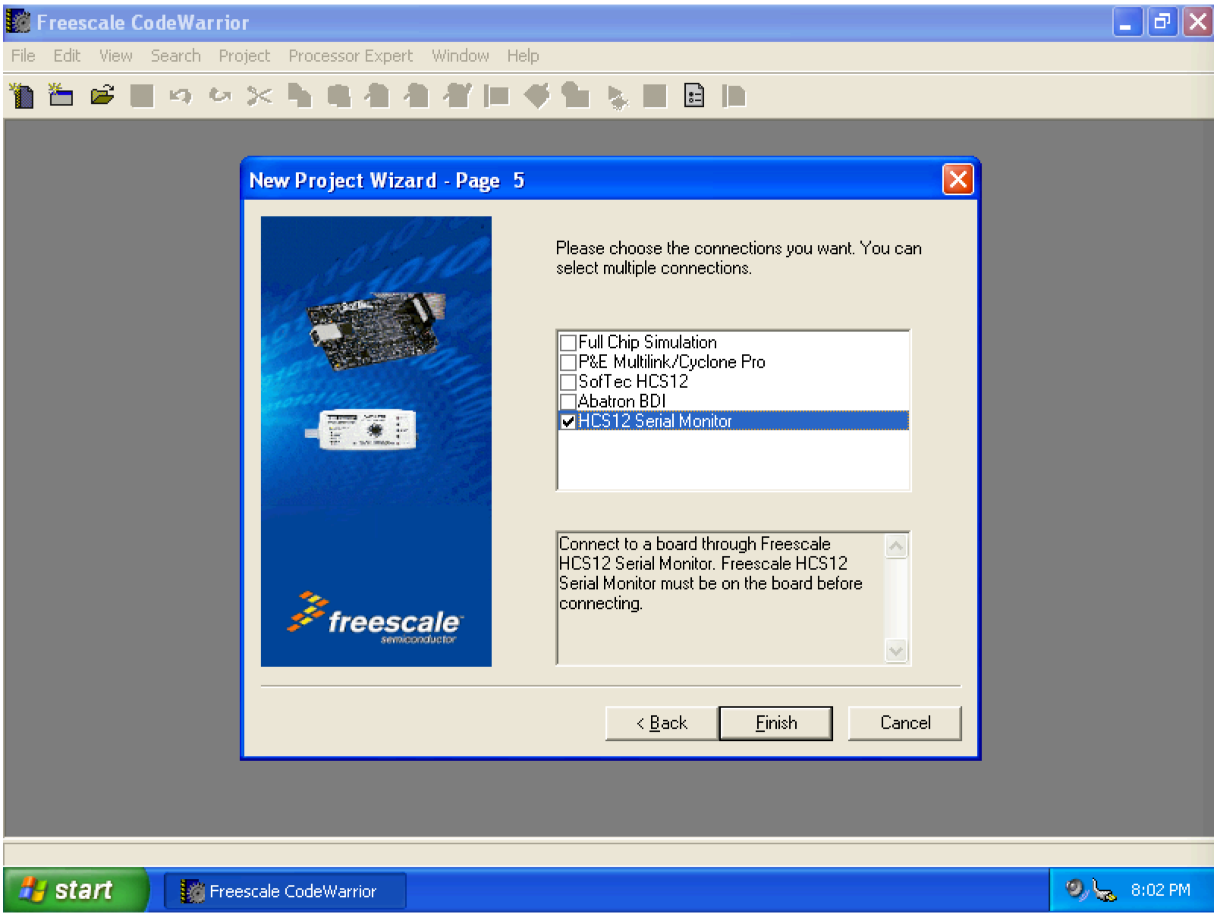
Which kind of assembly would you like?

● Absolute Assembly

○ Relocatable Assembly

Using only one single assembly source file with absolute assembly. No support for relocatable assembly or linker.

Step7: Select HCS12 Serial Monitor, then click Finish.



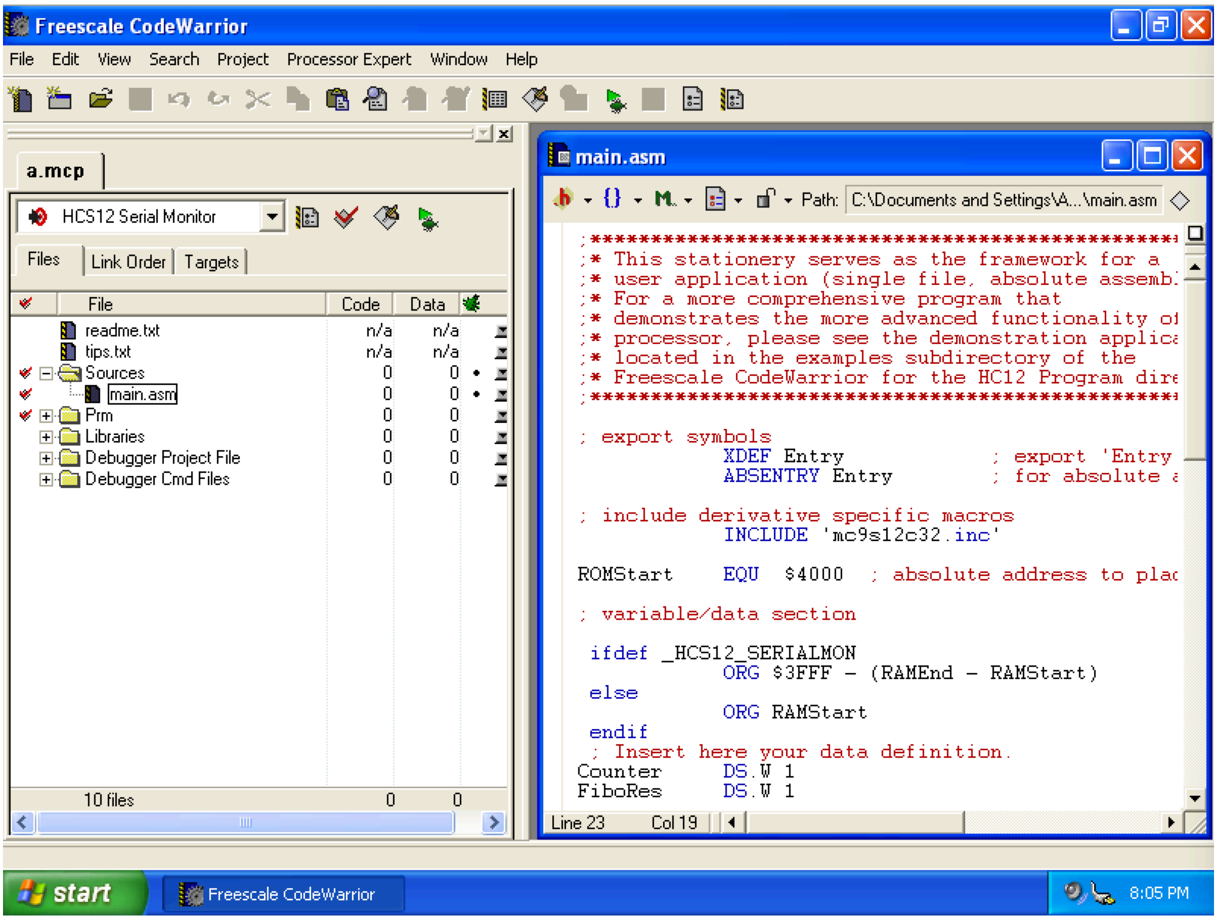
Freescale CodeWarrior
File Edit View Search Project Processor Expert Window Help
New Project Wizard - Page 5
freescale semiconductor

Please choose the connections you want. You can select multiple connections.

□ Full Chip Simulation
□ P&E Multilink/Cyclone Pro
□ SofTec HCS12
□ Abatron BDI
☑ HCS12 Serial Monitor

Connect to a board through Freescale HCS12 Serial Monitor. Freescale HCS12 Serial Monitor must be on the board before connecting.

Step8: Select main.asm under the Sources section. Example code calculates Fibonacci numbers. You can write your assembly codes starting from *Entry* label.

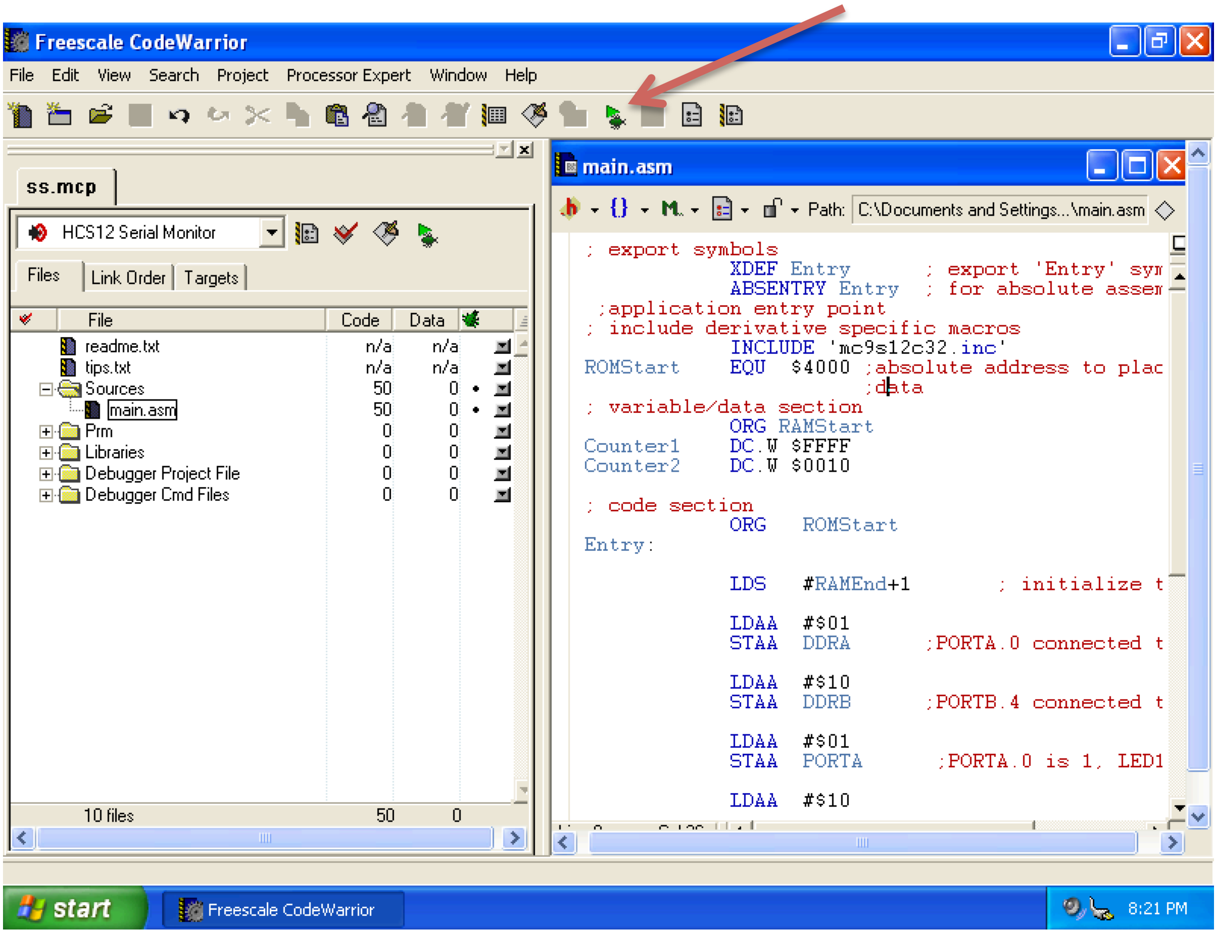


File	Code	Data
readme.txt	n/a	n/a
tips.txt	n/a	n/a
Sources	0	0
main.asm	0	0
Prm	0	0
Libraries	0	0
Debugger Project File	0	0
Debugger Cmd Files	0	0
10 files	0	0

```
;*************************************************
;* This stationery serves as the framework for a
;* user application (single file, absolute assemb
;* For a more comprehensive program that
;* demonstrates the more advanced functionality o
;* processor, please see the demonstration applic
;* located in the examples subdirectory of the
;* Freescale CodeWarrior for the HC12 Program dir
;*************************************************

; export symbols
            XDEF Entry            ; export 'Entry
            ABSENTRY Entry        ; for absolute a

; include derivative specific macros
            INCLUDE 'mc9s12c32.inc'

ROMStart    EQU  $4000  ; absolute address to pla

; variable/data section

 ifdef _HCS12_SERIALMON
            ORG $3FFF - (RAMEnd - RAMStart)
 else
            ORG RAMStart
 endif
 ; Insert here your data definition.
Counter     DS.W 1
FiboRes     DS.W 1
```

Line 23   Col 19

Step9: Clear *main.asm* file, paste the assembly code on the next page. Then click Debug.

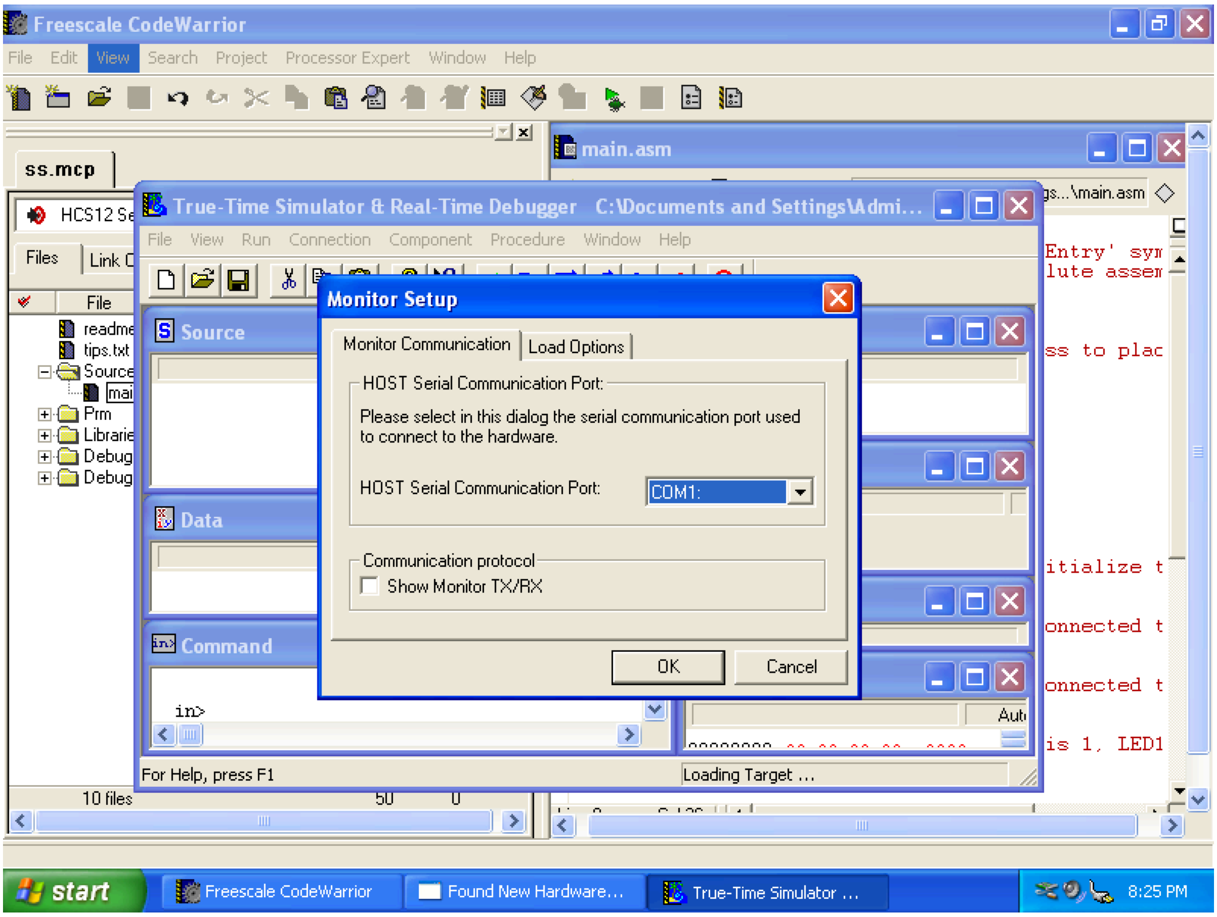


File	Code	Data
readme.txt	n/a	n/a
tips.txt	n/a	n/a
Sources	50	0
main.asm	50	0
Prm	0	0
Libraries	0	0
Debugger Project File	0	0
Debugger Cmd Files	0	0
10 files	50	0

```
; export symbols
            XDEF Entry       ; export 'Entry' sym
            ABSENTRY Entry   ; for absolute assem
 ;application entry point
; include derivative specific macros
            INCLUDE 'mc9s12c32.inc'
ROMStart    EQU  $4000 ;absolute address to plac
                       ;data
; variable/data section
            ORG RAMStart
Counter1    DC.W $FFFF
Counter2    DC.W $0010

; code section
            ORG   ROMStart
Entry:

            LDS   #RAMEnd+1        ; initialize t

            LDAA  #$01
            STAA  DDRA       ;PORTA.0 connected t

            LDAA  #$10
            STAA  DDRB       ;PORTB.4 connected t

            LDAA  #$01
            STAA  PORTA       ;PORTA.0 is 1, LED1

            LDAA  #$10
```

```
; export symbols
            XDEF Entry      ; export 'Entry' symbol
            ABSENTRY Entry  ; for absolute assembly: mark this as
                            ;application entry point
; include derivative specific macros
            INCLUDE 'mc9s12c32.inc'
ROMStart    EQU  $4000 ;absolute address to place my code/constant
                       ;data
; variable/data section
            ORG RAMStart
Counter1    DC.W $FFFF
Counter2    DC.W $0010

; code section
            ORG   ROMStart
Entry:

            LDS   #RAMEnd+1       ; initialize the stack pointer

            LDAA  #$01
            STAA  DDRA      ;PORTA.0 connected to LED1 is output

            LDAA  #$10
            STAA  DDRB      ;PORTB.4 connected to LED2 is output

            LDAA  #$01
            STAA  PORTA      ;PORTA.0 is 1, LED1 is off

            LDAA  #$10
            STAA  PORTB      ;PORTB.4 is 1, LED2 is off


loop:       COMA
            STAA PORTA
            STAA PORTB

            JSR delayS
            BRA loop


delayS:       LDY   Counter2
delaySloop:   JSR   delayMs
              DEY
              BNE   delaySloop
              RTS

delayMs:      LDX   Counter1
delayMsloop:  DEX
              BNE   delayMsloop
              RTS
```

Step10: Select correct COM port (You can use Device Manager to select correct COM port). Then click OK.



Monitor Setup

Monitor Communication | Load Options

HOST Serial Communication Port:

Please select in this dialog the serial communication port used to connect to the hardware.

HOST Serial Communication Port: COM1:

Communication protocol

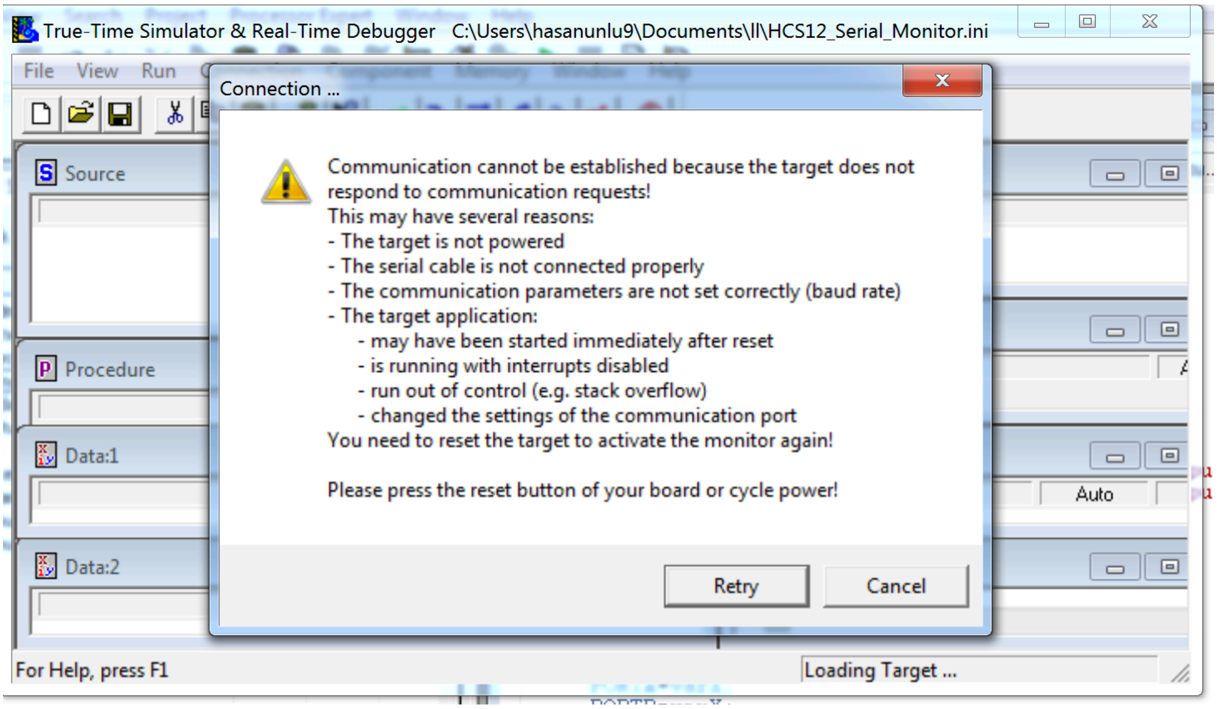
□ Show Monitor TX/RX

OK Cancel

For Help, press F1

Loading Target ...

Step11: If you see the following error, press reset button of the CSM12C32. Then, immediately click Retry. Your program is downloaded to microcontroller.



Communication cannot be established because the target does not respond to communication requests!
This may have several reasons:
- The target is not powered
- The serial cable is not connected properly
- The communication parameters are not set correctly (baud rate)
- The target application:
  - may have been started immediately after reset
  - is running with interrupts disabled
  - run out of control (e.g. stack overflow)
  - changed the settings of the communication port

You need to reset the target to activate the monitor again!

Please press the reset button of your board or cycle power!

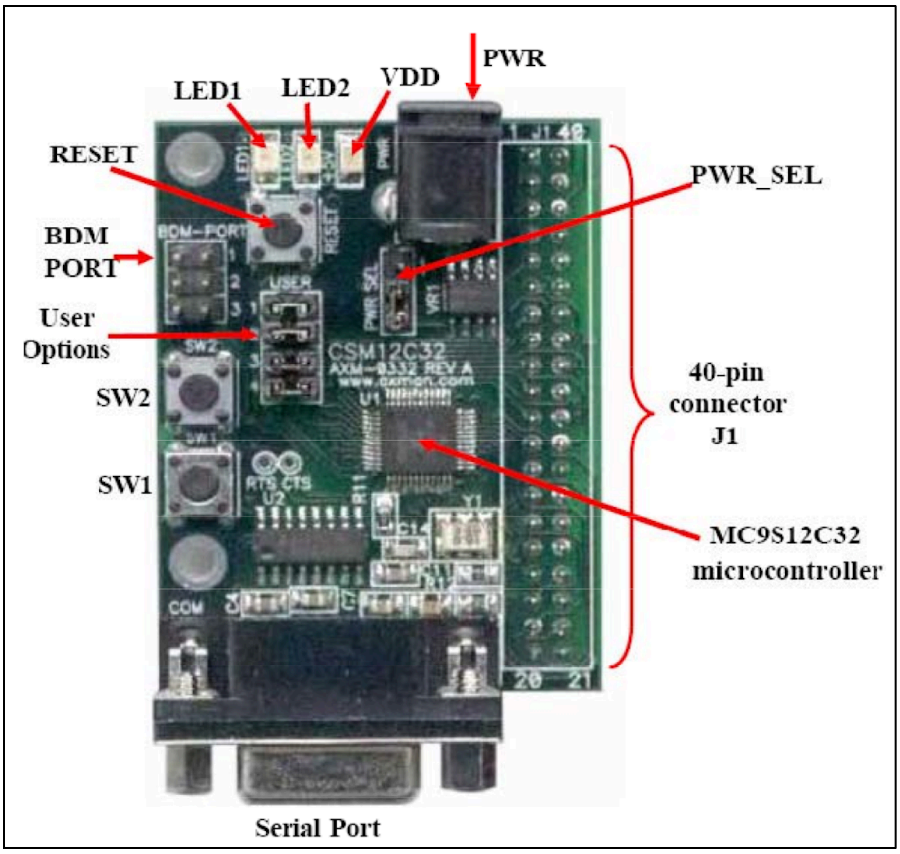
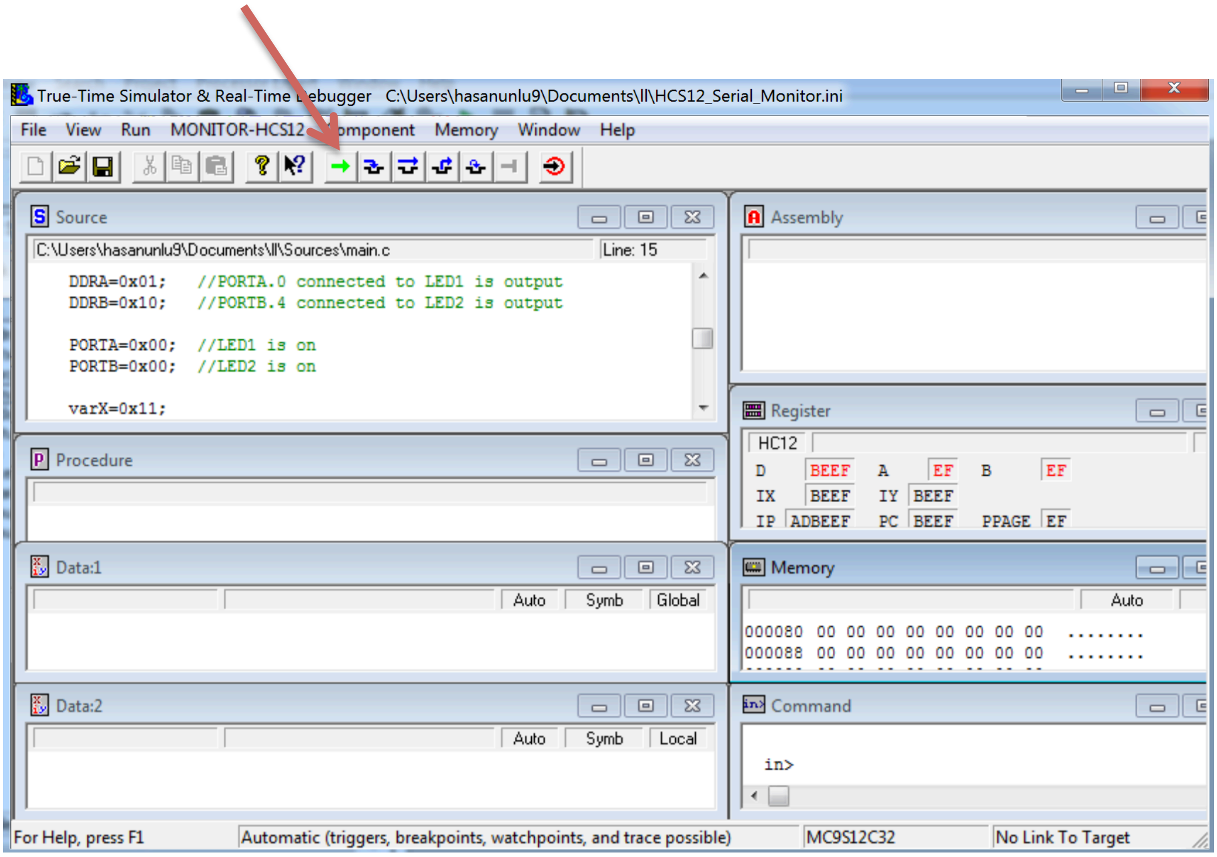


Figure 1. CSM12C32

Step12: Click green arrow to run your code.



True-Time Simulator & Real-Time Debugger C:\Users\hasanunlu9\Documents\ll\HCS12_Serial_Monitor.ini
File View Run MONITOR-HCS12 Component Memory Window Help
Source
Assembly
Register
Procedure
Data:1
Memory
Data:2
Command

C:\Users\hasanunlu9\Documents\ll\Sources\main.c Line: 15

```
    DDRA=0x01;   //PORTA.0 connected to LED1 is output
    DDRB=0x10;   //PORTB.4 connected to LED2 is output

    PORTA=0x00;  //LED1 is on
    PORTB=0x00;  //LED2 is on

    varX=0x11;
```

```
HC12
D   BEEF   A  EF   B      EF
IX  BEEF   IY BEEF
IP  ADBEEF PC BEEF PPAGE  EF
```

Auto Symb Global

```
000080  00 00 00 00 00 00 00 00   ........
000088  00 00 00 00 00 00 00 00   ........
```

Auto Symb Local

```
in>
```

For Help, press F1 | Automatic (triggers, breakpoints, watchpoints, and trace possible) | MC9S12C32 | No Link To Target

Observe Led1 and Led2.

3. EXPERIMENT

Run the following C code on CSM12C32. In Step5, change programing language option. Then, click next until finish except Step7. Connection type should be selected HCS12 Serial Monitor in Step7. Debug and run are same as assembly project. You can download separately assembly and C code from the Ninova.

```
#include <hidef.h>      /* common defines and macros */
#include <mc9s12c32.h>     /* derivative information */
#pragma LINK_INFO DERIVATIVE "mc9s12c32"

byte varX;

void delayS(){
 word i,j;
 for(i=0; i<0x0010; i++)
  for(j=0; j<0xFFFF; j++){}

}

void main(void) {
  DDRA=0x01;   //PORTA.0 connected to LED1 is output
  DDRB=0x10;   //PORTB.4 connected to LED2 is output

  PORTA=0x00;  //LED1 is on
  PORTB=0x00;  //LED2 is on

  varX=0x11;

  for(;;) {

    PORTA=varX;
    PORTB=varX;
    varX=~varX;
    delayS();
  }


}
```

In the report, explain both assembly and C codes and add your observation of Led1 and Led2.