

File Edit Search Project Debug Window Info

```
pi = 3.14159265358979323846;  
twopi = 2 * pi;
```

```
for (i = 0; i < numc; i++) {  
    glBegin(GL_QUAD_STRIP);  
    for (j = 0; j <= numt; j++) {  
        for (k = 1; k >= 0; k--) {  
            s = (i + k) % numc + 0.5;
```

```
            t = j % numt;  
  
            x = cos(t*twopi/numt) * cos(s*twopi/numc);  
            y = sin(t*twopi/numt) * cos(s*twopi/numc);  
            z = sin(s*twopi/numc);  
            glVertex3f(x, y, z);
```

```
twopi = 2 * pi;
```

```
for (i = 0; i < numc; i++) {
```

```
    glBegin(GL_QUAD_STRIP);
```

```
    for (j = 0; j <= numt; j++) {
```

```
        for (k = 1; k >= 0; k--) {
```

```
            s = (i + k) % numc + 0.5;
```

```
            t = j % numt;
```

```
            x = (rt + rc * cos(s*twopi/numc));
```

```
            y = (rt + rc * cos(s*twopi/numc));
```

```
            z = (rt + rc * cos(s*twopi/numc));
```

```
            glVertex3f(x, y, z);
```



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Software Starts Here

## CodeWarrior for HC08, Special Edition Version 2.0 Tutorial

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Director of Technology

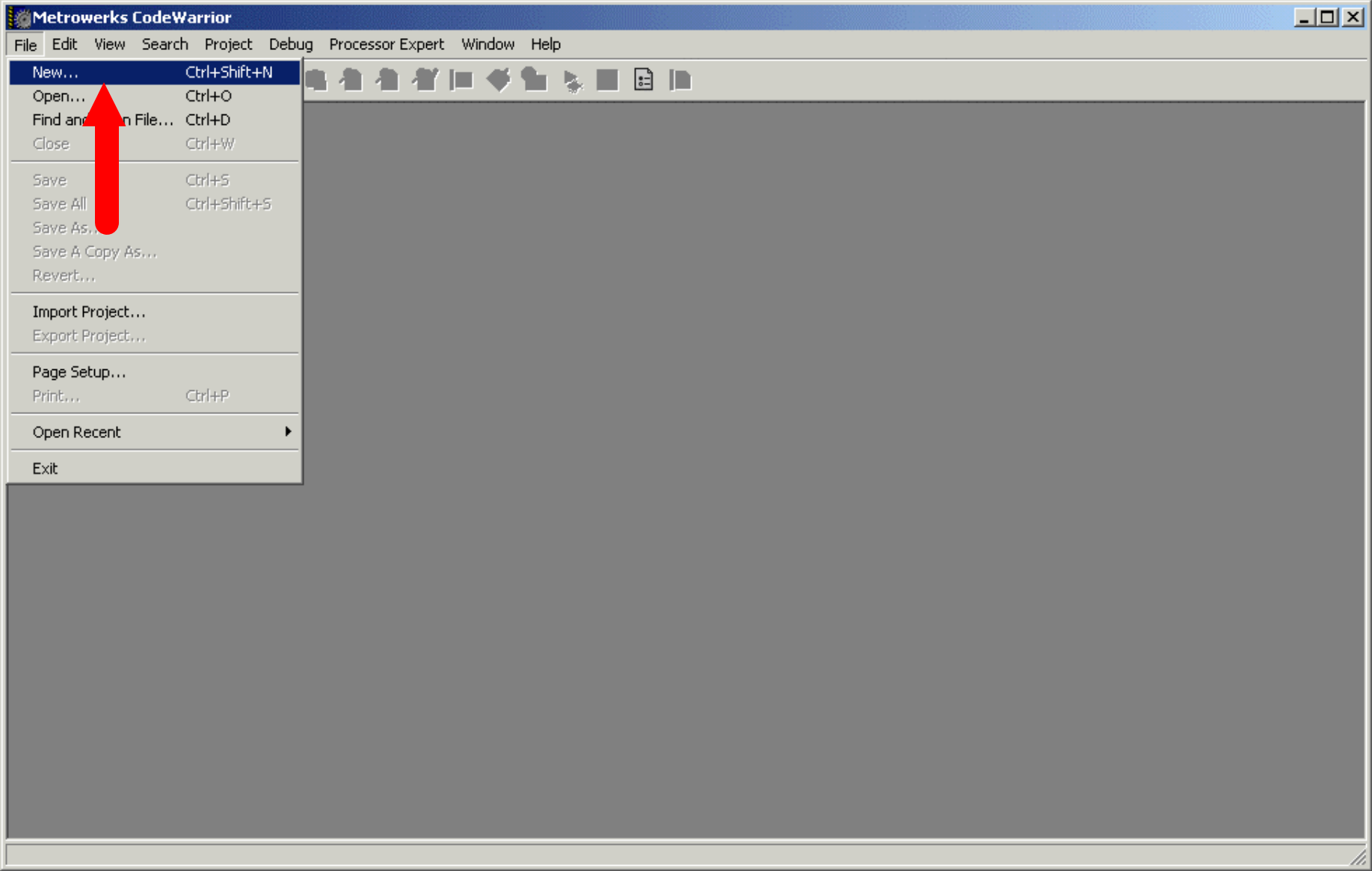
CodeWarrior

May 2, 2002

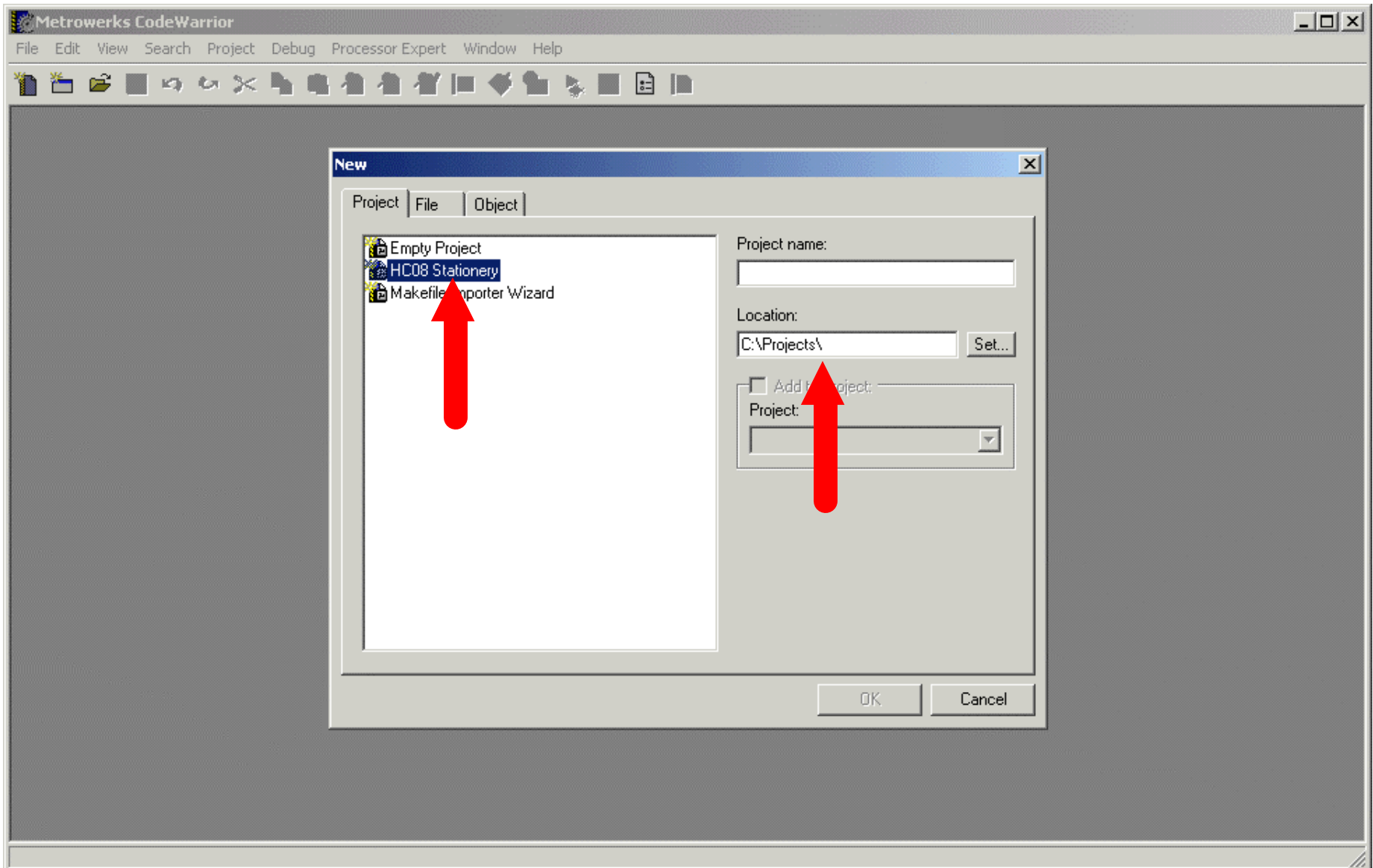


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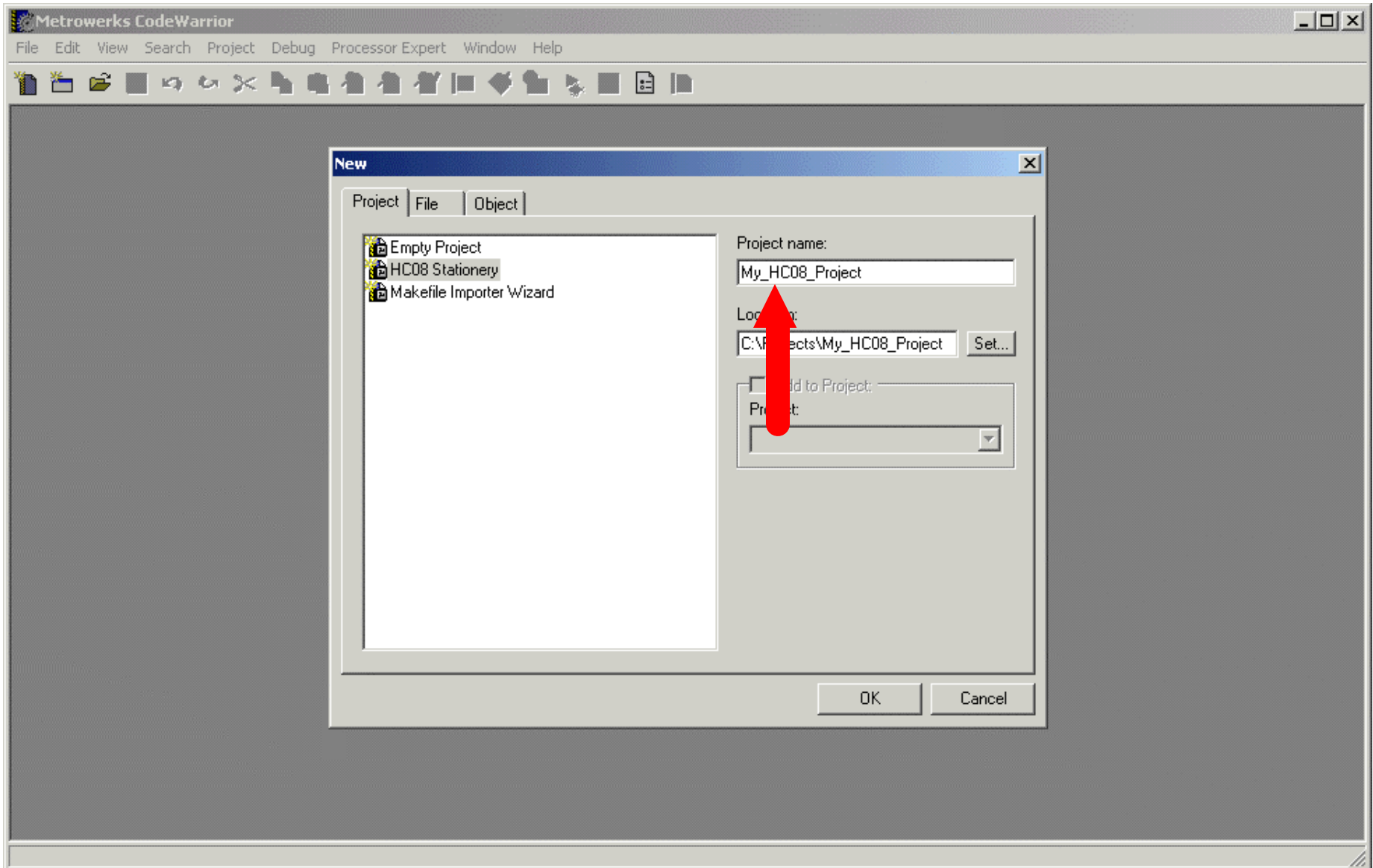
Click on the command "New" in the menu "File" in the CodeWarrior Main panel window



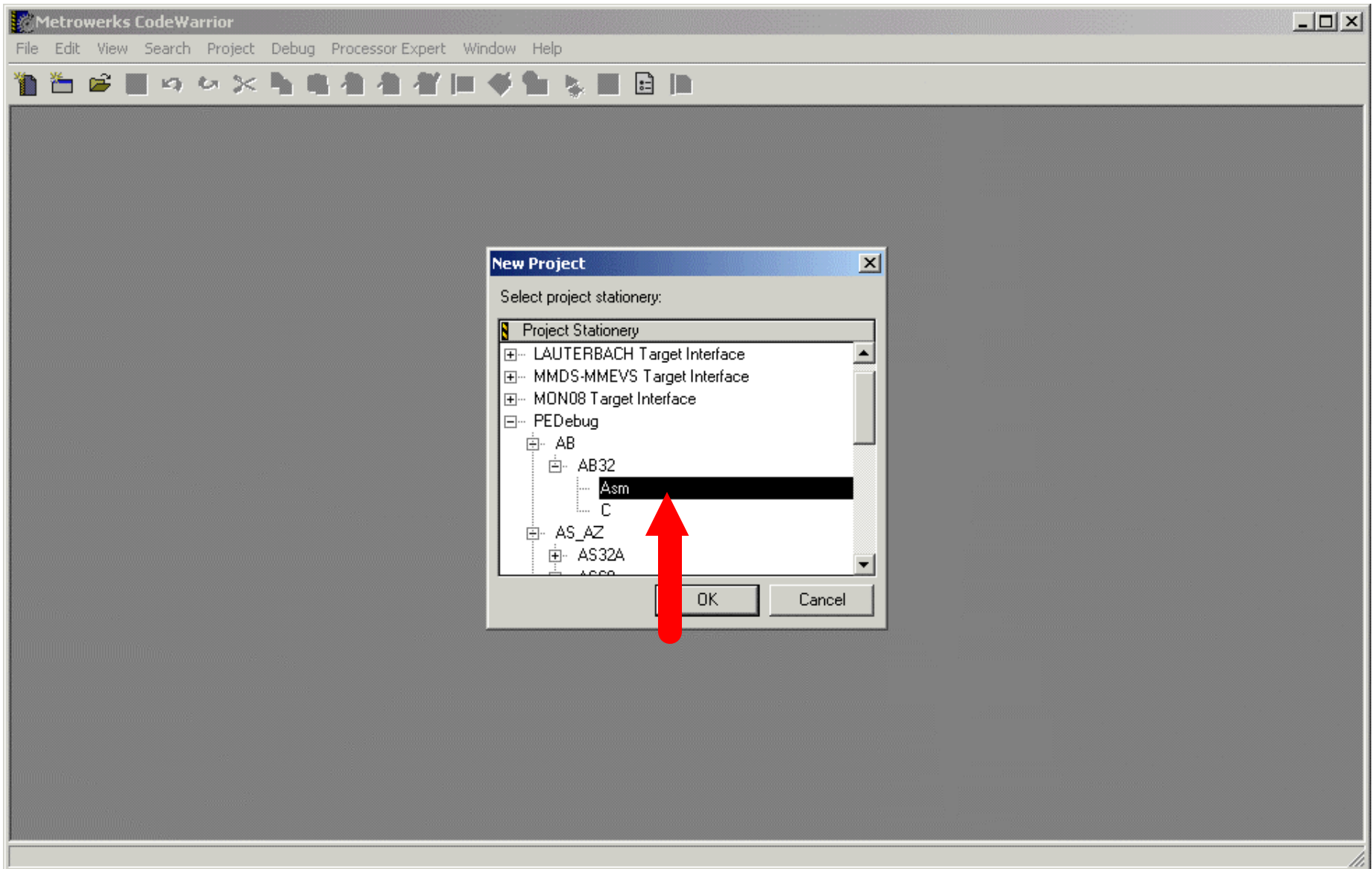
Select HC08 Stationary in the "New" dialog window  
Select the target directory where to create the new project



Enter name of the project – My\_HC08\_Project



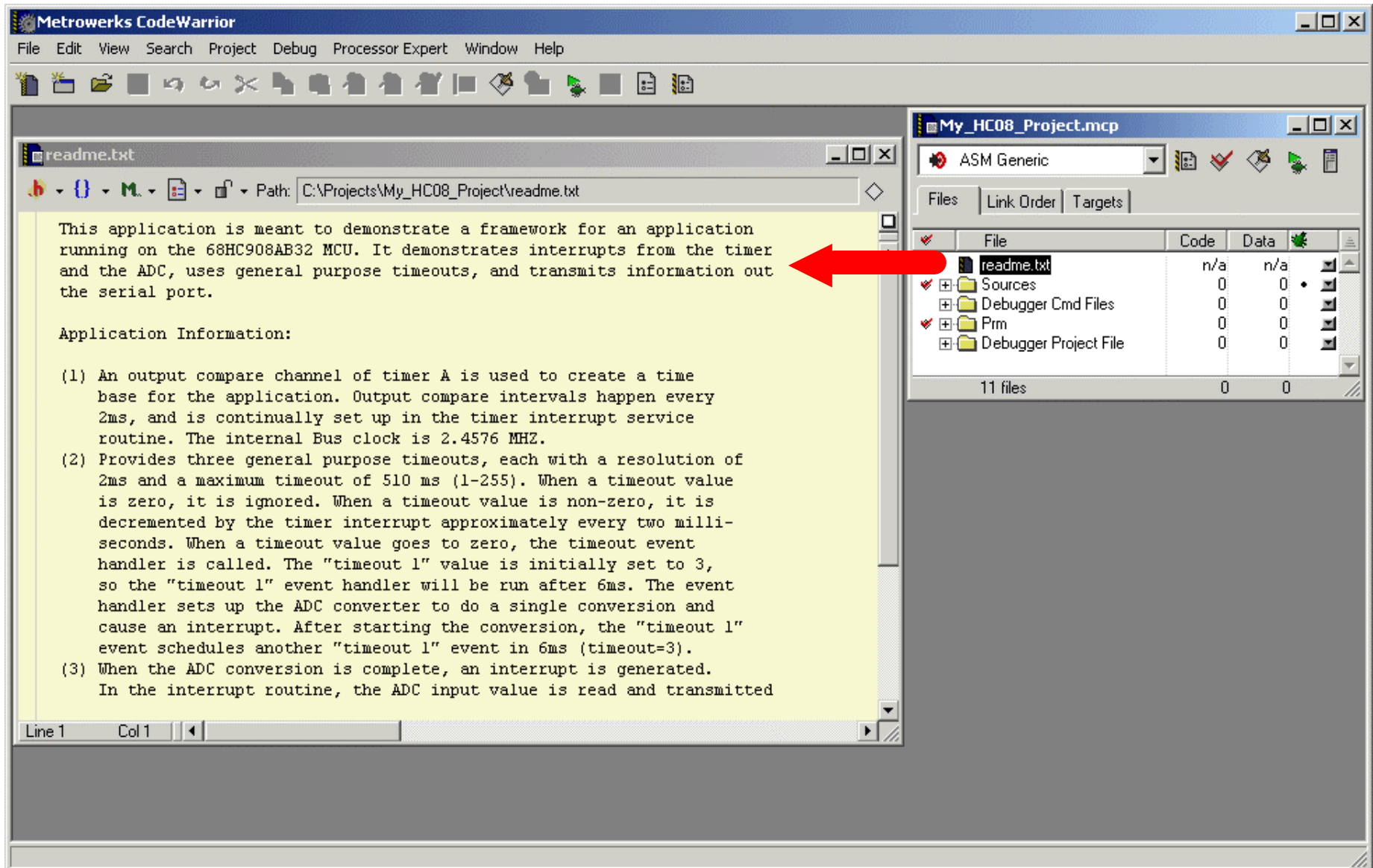
In the PEDebug folder Select MCU family, derivative and programming language





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The project is created and the project window is opened  
Double click on the "Readme.txt" file to open a detailed description of the project





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Double click on the "main.asm" file to open the source file

The screenshot shows the Metrowerks CodeWarrior IDE. The main window displays the source code for `main.asm`. The code includes a section definition for `DEFAULT_ROM` and two initialization routines: `Init_SCI` and `Init_AtoD`. The `Init_SCI` routine configures the SCI peripheral with a baud rate of 9600. The `Init_AtoD` routine sets up the ADC peripheral. The project browser on the right shows the project structure for `My_HC08_Project.mcp`, with a red arrow pointing to the `main.asm` file in the `Sources` folder.

```
Timeout3 ds 1

DEFAULT_ROM SECTION

*****
* Init_SCI - Turns on the asynchronous communications port *
*           for "transmitting only" at 9600 baud N81.   *
*****
Init_SCI:
    mov  #03,SCBR      ; Baud Rate = 9600
    mov  #40,SCC1     ; Enable the SCI peripheral
    mov  #08,SCC2     ; Enable the SCI transmitter
    rts

*****
* Init_AtoD - Sets up the AtoD clock + turns it on      *
*****
Init_AtoD:
    mov  #30,ADCLK    ; Bus Clock / 2
    mov  #ADC_CHANNEL,ADSCR ; Enable the ADC peripheral
    rts
```



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Click on the Make button to build the application

Metrowerks CodeWarrior

File Edit View Search Project Debug Processor Expert Window Help

main.asm Path: C:\Projects\My\_HC08\_Project\sources\main.asm

```
Timeout3 ds 1

DEFAULT_ROM SECTION

*****
* Init_SCI - Turns on the asynchronous communications port *
*           for "transmitting only" at 9600 baud N81. *
*****
Init_SCI:
    mov  #03,SCBR
    mov  #40,SCC1
    mov  #08,SCC2
    rts

*****
* Init_AtoD - Sets up the AtoD clock + turns it on *
*****
Init_AtoD:
    mov  #30,ADCLK ; Bus Clock / 2
    mov  #ADC_CHANNEL,ADSCR ; Enable the ADC peripheral
    rts
```

My\_HC08\_Project.mcp

ASM Generic

Files Link Order Targets Make

File	Code	Dis	...
readme.txt	n/a	/a	
Sources	0	0	
main.asm	0	0	
ab32_regs.inc	0	0	
Debugger Cmd Files	0	0	
Prm	0	0	
11 files			
		0	0

Building My\_HC08\_Project.mcp

Project: My\_HC08\_Project.mcp Target: ASM Generic Stop

File	Task	File Count	Line Count
main.asm	Compiling...	1	0
Totals:		2	0



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Click on the Make button to start the debugger

The screenshot shows the Metrowerks CodeWarrior IDE. The main window displays the assembly file `main.asm` with the following content:

```
Timeout3 ds 1

DEFAULT_ROM SECTION

*****
* Init_SCI - Turns on the asynchronous communications port *
*           for "transmitting only" at 9600 baud N81. *
*****
Init_SCI:
    mov  #03,SCBR      ; Baud Rate = 9600
    mov  #40,SCC1      ; Enable the SCI peripheral
    mov  #08,SCC2      ; Enable the SCI transmitter
    rts

*****
* Init_AtoD - Sets up the AtoD clock + turns it on *
*****
Init_AtoD:
    mov  #30,ADCLK     ; Bus Clock / 2
    mov  #ADC_CHANNEL,ADSCR ; Enable the ADC peripheral
    rts
```

The project manager window on the right shows the project `My_HC08_Project.mcp` with the following files:

File	Code	Data
readme.txt	n/a	n/a
Sources	127	10
main.asm	127	10
ab32_regs.inc	0	0
Debugger Cmd Files	0	0
Prm	0	0
11 files	127	10

A red arrow points to the `Debug` button in the project manager window.

The external debugger is started, the P&E In-Circuit Simulator is initialized and finally the application is loaded!



The screenshot displays the True-Time Simulator & Real-Time Debugger interface. The main window title is "True-Time Simulator & Real-Time Debugger C:\Projects\My\_HC08\_Project\project.ini". The menu bar includes File, View, Run, PEDebug, Component, Memory, Window, and Help. The toolbar contains various icons for file operations and simulation control.

The interface is divided into several panes:

- Source:** Shows the source code for "main:" in "main.dbg". The current line is 212. The code includes comments about initializing registers and handling interrupts.
- Assembly:** Shows the assembly code for the "Entry" point, including instructions like RSP, CLRA, CLRX, and BSR with absolute addresses.
- Register:** Displays the current state of registers for the HC08 CPU. CPU Cycles: 0. Registers shown include A (0), HX (0), SP (FF), SR (68), and PC (8021). Status is VMINZC.
- Memory:** Shows memory contents starting at address 0050, with values represented by "uu" and "uuuuuuuu".
- Procedure:** Shows the "Entry ()" procedure.
- Console:** Displays the startup sequence: "IO registers loaded for 68HC908AB32 from C:\Program Files\Metrowerks\CodeWarr", "Startup command file does not exist.", "RESET", and "A power-on Reset has occurred." The prompt "in>" is visible.
- About:** A dialog box is open, titled "About ICS08AB In-Circuit Simulator", Version 1.09, For Windows 95/98/NT, Copyright 2000, P&E Microcomputer Systems, Inc.

At the bottom of the window, the status bar shows "HC908AB32" and "A power-on Reset has occurred." A footer note says "For Help, press F1".



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Click on the Run button to start the application

The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The main window is titled "True-Time Simulator & Real-Time Debugger C:\Projects\My\_HC08\_Project\project.ini". The menu bar includes File, View, Run, PEDebug, Component, Memory, Window, and Help. The toolbar contains various icons, including a red arrow pointing to the "Start/Continue (F5)" button.

The interface is divided into several panes:

- Source:** Shows the source code for "main.dbg" at line 212. The code includes comments and instructions: `rsp`, `clra`, and `clrX`. A red arrow points to the "Start/Continue (F5)" button in the toolbar.
- Assembly:** Shows the assembly code for "Entry", including instructions like `RSP`, `CLRA`, `CLR X`, and `BSR` with absolute addresses.
- Procedure:** Shows the procedure list, currently displaying "Entry ()".
- Data:** Shows data symbols for "main.dbg", including `temp_long`, `temp_word`, `temp_byte`, and `Timeout1`.
- Register:** Shows the register values for the HC08 CPU, including `A`, `HX`, `SP`, `SR`, and `PC`. The status register is shown as `VHINZC`.
- Memory:** Shows memory addresses and their contents, including `0050`, `0058`, `0060`, and `0068`.
- Command:** Shows the command prompt with the command `!savebp off` and the output `done C:\Projects\My_HC08_Project\bin\AsmGeneric.bpt`. A message indicates that the postload command file does not exist.

The status bar at the bottom shows "Start/Continue program" and "HC908AB32".



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Click on the Halt button to stop the application  
The application will loop in the "main\_loop"

The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The main window displays the source code for the 'main\_loop' function in 'main.dbg'. The code is as follows:

```
main_loop:
    sta copctl          ; service cop control register to prevent reset
    bra main_loop
```

A red arrow points to the 'Halt (F6)' button in the toolbar. The 'Assembly' window shows the following assembly code for the 'main\_loop' function:

```
main_loop
BRA    *-3             ;abs = 8034
LDA    0x39
BRCLR  7,0x16,*+0     ;abs = 803B
STA    0x18
STA    0xA6
RTI
```

The 'Register' window shows the current state of the HC08 registers:

HC08	CPU Cycles: 42682075	Auto
A	0	
HX	0	SP FF
SR	62	Status VHINZC
PC	8037	

The 'Data' window shows the following variables:

temp_long	""	array[4] of unsigned char
temp_word	""	array[2] of unsigned char
temp_byte	0	unsigned char
Timeout1	3	unsigned char

The 'Command' window shows the following output:

```
RUNNING
STOPPING
HALTED
STARTED
RUNNING

in>
```

The status bar at the bottom indicates 'Halt program' and 'HC908AB32 RUNNING'.

Scroll on the Source window to label "AtoD\_ISR", click with the right mouse button on the first assembly instruction and select in the popup menu "Set Breakpoint". This will set a execution breakpoint at this location.



The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The Source window displays the assembly code for the AtoD\_ISR function. A red arrow points to the first instruction, 'lda adr', and another red arrow points to the 'Set Breakpoint' option in the context menu. The Assembly window shows the main\_loop function. The Register window shows the CPU Cycles, A, HX, SR, and PC registers. The Command window shows the status of the simulation (STARTED, RUNNING, STOPPING, HALTED). The Memory window shows the memory dump.

True-Time Simulator & Real-Time Debugger C:\Projects\My\_HC08\_Project\project.ini

File View Run PEDebug Component Source Window Help

Source  
C:\Projects\My\_HC08\_Project\bin\main.dbg Line: 241

```
AtoD_ISR:  
now:  lda adr  
      brclr 7,scsl,n  
      sta scdr  
      sta temp_byte  
      rti
```

Assembly  
main\_loop  
BRA \*-3 ;abs = 8034  
→ LDA 0x39  
BRCLR 7,0x16,\*+0 ;abs = 803B  
STA 0x18  
STA 0xA6  
RTI

Register  
HC08 CPU Cycles: 196260084 Auto  
A 0  
HX 0 SP FF  
SR 62 Status VHINZC  
PC 8037

Command  
A user initiated RESET has occurred.  
STARTED  
RUNNING  
STOPPING  
HALTED  
in>

Memory  
Auto  
0050 uu uu uu uu uu uu uu uu uuuuuuuu  
0058 uu uu uu uu uu uu uu uu uuuuuuuu  
0060 uu uu uu uu uu uu uu uu uuuuuuuu  
0068 uu uu uu uu uu uu uu uu uuuuuuuu  
0070

For Help, press F1 HC908AB32 HALTED



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Enter in the Command window the command "bs T\_ISR" to set a second breakpoint on label "T\_ISR".

The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The main window displays the source code for 'main.dbg' at line 254, with a red arrow pointing to the 'T\_ISR:' label. The assembly window shows the corresponding assembly code, with a red arrow pointing to the 'LDA 0x39' instruction. The register window shows the current state of the HC08 registers, including A, HX, SR, and PC. The command window shows the command 'in>bs T\_ISR' being entered, with a red arrow pointing to the command. The status bar at the bottom indicates 'HC908AB32 HALTED'.

```
True-Time Simulator & Real-Time Debugger C:\Projects\My_HC08_Project\project.ini
File View Run PEDebug Component Source Window Help

Source
C:\Projects\My_HC08_Project\bin\main.dbg Line: 254
T_ISR:
-> pshh
   lda tasc0
   and #7f
   sta tasc0 ; Clear O.C. Flag
   ldhx tach0h
   aix #64D ; Setup another interrupt in ~2ms

Procedure
main_loop ()

Data
main.dbg Auto Symb Global
temp_long "" array[4] of unsigned char
temp_word "" array[2] of unsigned char
temp_byte 0 unsigned char
Timeout1 2 unsigned char

Command
STARTED
RUNNING
STOPPING
HALTED

in>bs T_ISR
in>

Register
HC08 CPU Cycles: 196260084 Auto
A 0
HX 0 SP FF
SR 62 Status VHINZC
PC 8037

Memory
Auto
0050 uu uu uu uu uu uu uu uu uuuuuuuu
0058 uu uu uu uu uu uu uu uu uuuuuuuu
0060 uu uu uu uu uu uu uu uu uuuuuuuu
0068 uu uu uu uu uu uu uu uu uuuuuuuu
0070 uu uu uu uu uu uu uu uu uuuuuuuu

For Help, press F1 HC908AB32 HALTED
```

Click on the Run button to continue the application  
It will run until it will hits either of the two breakpoints



The screenshot displays the True-Time Simulator & Real-Time Debugger interface. The main window shows the source code for the T\_ISR function in main.dbg, with the instruction 'pshh' highlighted. A red arrow points to the 'pshh' instruction, and another red arrow points to the 'Start/Continue (F5)' button in the toolbar. The assembly window shows the corresponding assembly instructions: LDA 0x26, AND #0x7F, STA 0x26, LDHX 0x27, and AIX #77. The register window shows the current state of the HC08 registers: A=0, HX=0, SP=FA, SR=6A, and PC=8043. The command window shows the execution status: 'in>bs T\_ISR', 'Preset breakpoint encountered.', 'STARTED', 'RUNNING', and 'Breakpoint'. The status bar at the bottom indicates 'Start/Continue program' and 'HC908AB32 Breakpoint'.

Configure the simulator to apply stimuli for the ADC:

Open with the menu the "A/D IN" dialog and double click on the first line to edit dialog.

Enter a value and continue this steps for some more entries.

Click on the Cancel button to close the dialog



The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The 'Component' menu is open, showing the 'ADC Module' selected. The 'A/D IN (\$0-\$FF)' dialog is open, displaying a list of memory addresses from \$0011 to \$0099. The first entry, \$0011, is selected. A red arrow points from the 'Queue ADC Input Data (ADDI)' menu item to the first entry in the list. Another red arrow points from the first entry to the 'Enter A/D Value(\$0-\$FF)' dialog, which shows an '8-bit Value' of 11. A third red arrow points from the 'Cancel' button in the 'A/D IN' dialog to the 'Cancel' button in the 'Enter A/D Value' dialog. The background shows the source code for 'T\_ISR' and the assembly code for 'T\_ISR', along with the register window and command window.

Click on the Run button continuously until the application stops at "AtoD\_ISR"  
Click on the Assembly-Step button to execute the "LDA 0x39" instruction that reads the value from the ADC -> the values will be visible in the Register window in register A  
Repeat these steps to see the next values...



The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The main window displays the source code for the AtoD\_ISR function. The Assembly window shows the current instruction being executed: LDA 0x39. The Register window shows the current state of the registers, with register A containing the value 11. The Command window shows the status of the simulation: Preset breakpoint encountered, STARTED, RUNNING, Breakpoint, TRACED.

Source Code (AtoD\_ISR):

```
lda adr ; Get the converted value  
now: brclr 7,scsl,now ; wait until xmitter is ready.  
sta scdr ; Xmit it our serial port  
sta temp_byte ; save it in temp_byte  
rti
```

Assembly:

```
LDA 0x39  
BRCLR 7,0x16,*+0 ;abs = 803B  
STA 0x18  
STA 0xA6  
RTI  
PSHH
```

Register:

HC08	CPU Cycles: 196265885	Auto
A	11	
HX	0	SP FA
SR	68	Status VHINZC
PC	803B	

Command:

```
in> Preset breakpoint encountered.  
STARTED  
RUNNING  
Breakpoint  
TRACED  
in>
```



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Select the debug mode to connect the debugger to the hardware.

The screenshot shows the True-Time Simulator & Real-Time Debugger interface. The PEDebug menu is open, and 'In-Circuit Debug/Programming' is selected. An 'About' dialog box for 'ICD08SZ Debugger' is displayed in the foreground. The interface includes a Source window, Assembly window, Register window, Data window, and Command window.

**PEDebug Menu:**

- Load... (Ctrl+L)
- Reset (Ctrl+R)
- Command Files
- Device : HC908AB32
- Mode : Full Chip Simulation
  - Full Chip Simulation
  - In-Circuit Simulation
  - In-Circuit Debug/Programming
- P&E Micro
- Port Pins Module
- ADC Module
- SPI Module
- SCI Module
- CGM Module
- IRQ Module
- FLASH Module
- View Register Files ...

**Assembly Window:**

```
Entry
RSP
CLRA
CLR X
BSR *-36 ;abs = 8000
BSR *-28 ;abs = 800A
BSR *-23 ;abs = 8011
```

**Register Window:**

HC08 CPU Cycles: 196270887

A 0

**Data Window:**

main.dbg

- temp\_long "" array[4] of unsigned char
- temp\_word "" array[2] of unsigned char
- temp\_byte 0 unsigned char
- Timeout1 3 unsigned char

**Command Window:**

```
RUNNING
Breakpoint
Reset command file does not exist.
RESET
A user initiated RESET has occurred.

in>
```

**Memory Window:**

Auto

```
0050 uu uu uu uu uu uu uu uu uu
0058 uu uu uu uu uu uu uu uu uu
0060 uu uu uu uu uu uu uu uu uu
0068 uu uu uu uu uu uu uu uu uu
```

**About Dialog:**

ICD08SZ Debugger  
For Windows 95/98/NT  
Version 1.54  
Copyright 1999,2001 P&E Microcomputer Systems  
Visit us at WWW.PEMICRO.COM

Specify all the required parameters to connect to the connected hardware



**Attempting to contact target and pass security...**

Target Hardware Type  
Class I - Motorola ICS Board with processor installed. Possible emulation cable connection. (Power controlled via serial DTR line)

Use Power Sequencing hardware (Class V, VI Only)  
 Use Auto Baud rate detection to set baud rate (Class V, VI Only)

Advanced

PC Serial Port and Target Baud Rate Configuration  
Port: COM1 The serial port is open. Close COM Port  
Baud: 9600 Baud Specified Baud: 0

Class V - CYCLONE MON08 Pin Setting for Reset  
Device Type Show MON08 Pins  
Clock Divide Auto

Target MCU Security bytes

- Attempt ALL Known security codes in order
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (Blank Device)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini) (Recent)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini)
- Attempt FF-FF-FF-FF-FF-FF-FF-FF (From security.ini)
- Attempt 00-00-00-00-00-00-00-00 (Blank on some devices)
- User: 00-00-00-00-00-00-00-00 Load from S19
- IGNORE security failure and enter monitor mode.

Status: **Invalid Response or No Response to last attempt to contact target.**

- 0. ICS Hardware loopback detected: **N**
- 1. Device echoed some security bytes: **N (Port?)**
- 2. Device echoed all security bytes: **N**
- 3. Device signaled monitor mode with a break: **N**
- 4. Device entered monitor mode: **N**
- 5. Reset was Power-On Reset.
- 6. ROM is accesible (un-secured):

Show this dialog before attempting to contact the target 68HC08 board

Contact target with these settings ...

Help... Abort

For Help, press F1 HC908AB32 A user initiated RESET has occurred.