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April 1st, 2010
Renesas Electronics Corporation

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H8/300H Tiny Series Compact Emulator

Operating Back Trace ([Trace] Window)

Overview

The R0E436640CPE00 compact full-specification emulator for the H8/300H Tiny series incorporates a realtime tracing function which records the history of execution of the target program. The [Trace] window is used to display the results of realtime trace measurement. This document describes how to refer to the paths of execution of the source program in the source-mode display format in the [Trace] window.

Operation as described in this document can be confirmed on the H8/300H Tiny series compact emulator as a stand-alone unit. The same functions are usable with all compact emulators for the H8/300H Tiny series.

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1. Specifications

The realtime tracing function that is incorporated in H8/300H Tiny series compact emulators enables recording of up to 64 k cycles of the history of execution of the target program. When the results of realtime trace measurement are displayed in the source-mode display format within the [Trace] window, the mouse can be used to move a pointer to the source program in single steps along the program's path of execution. As well as single-step execution, operation of the [Come] button, which brings execution to the current cursor position, is available as a kind of step operation. Forward and backward (tracing back) are specifiable as directions for step operation.

2. Functional Description

This document describes how to use the H8/300H Tiny series compact emulator to refer to the path of execution of a source program in the [Trace] window. It guides you through a sample program provided on the CD-ROM for the H8/300H Tiny series compact emulator.

Versions of the individual tools are as follows.

Integrated Development Environment

High-performance Embedded Workshop Version 4.02.00

Compiler Package

H8SX, H8S, H8 compiler package Version 6.01, Release 02

Emulator Software

H8/300H Tiny compact emulator debugger Version 1.01, Release 00

3. Preparing the Software

3.1 Introduction

On your personal computer, install the software provided on the CD-ROM for the H8/300H Tiny series compact emulator. This will also deploy the sample program (tutorial workspace) to be used in this document.

The software on the CD-ROM can also be installed on a personal computer in which the High-performance Embedded Workshop has already been installed. In this case, some dialog boxes may be skipped in the installation process.

3.2 Installing the H8/300H Tiny Series Compact Emulator Software

Execute setup.exe from the CD-ROM for the H8/300H Tiny series compact emulator.

For details on installation, refer to the setup guide for the H8/300H Tiny series compact emulator and follow the instructions on the screen during installation. The installation procedure is omitted here.

3.3 Installing Other Necessary Software

(1) The installation procedure is described in the manual supplied with the optional product; it is not described in this document.

(2) This document describes the checking of operations when a part of the sample program is changed. The H8S, H8/300 series C/C++ compiler package is used for this purpose. Install the product version of the compiler package if you have already purchased it.

(3) If you have not purchased the product version of the compiler package, download the evaluation version from the Renesas website. The evaluation version of the H8S, H8/300 series C/C++ compiler package can be found from the top page by selecting [Support], [Download], [Download Search], and [Select Category], in that order, then selecting [Evaluation Version]. Links to the Renesas website are given in the last section of this document. Notes on restrictions and instructions for installing the evaluation version are available on the download page.

4. Operations

This section describes how to activate the High-performance Embedded Workshop (HEW) and how to use the step-operation function for the [Trace] window in the following steps.

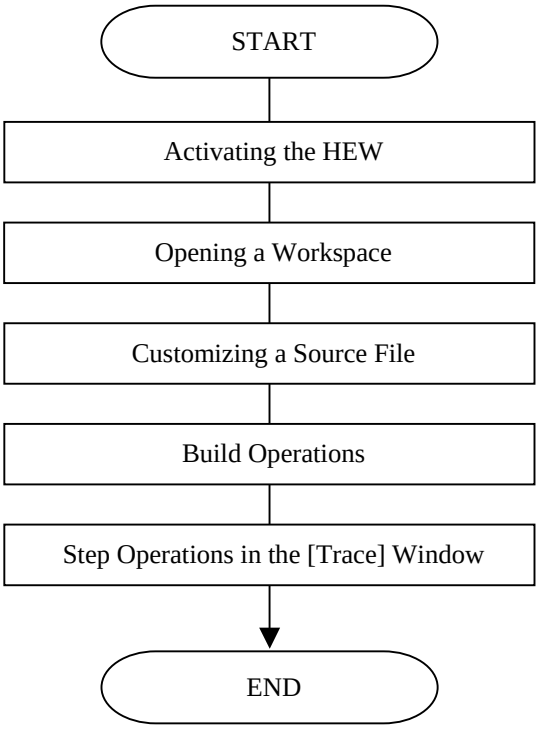
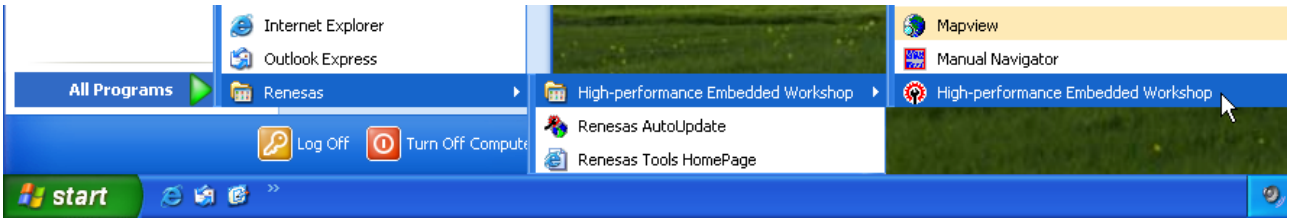


Figure 4.1 Procedures for Sample Program Execution

4.1 Activating the High-Performance Embedded Workshop

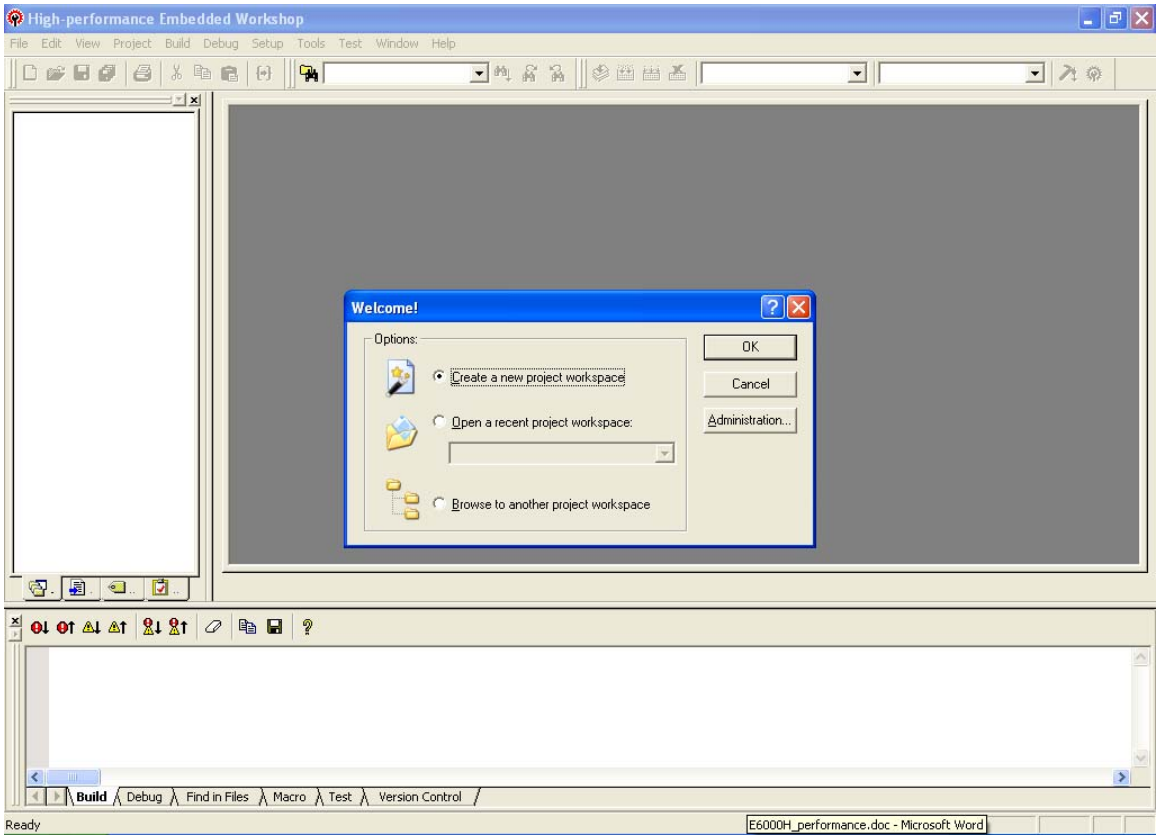
First, connect the H8/300H Tiny series compact emulator to the host computer via the USB cable to check that debugging is available.



Then, activate the High-performance Embedded Workshop by opening the [Start] menu and selecting [All Programs], [Renesas], [High-performance Embedded Workshop], and [High-performance Embedded Workshop] in that order.

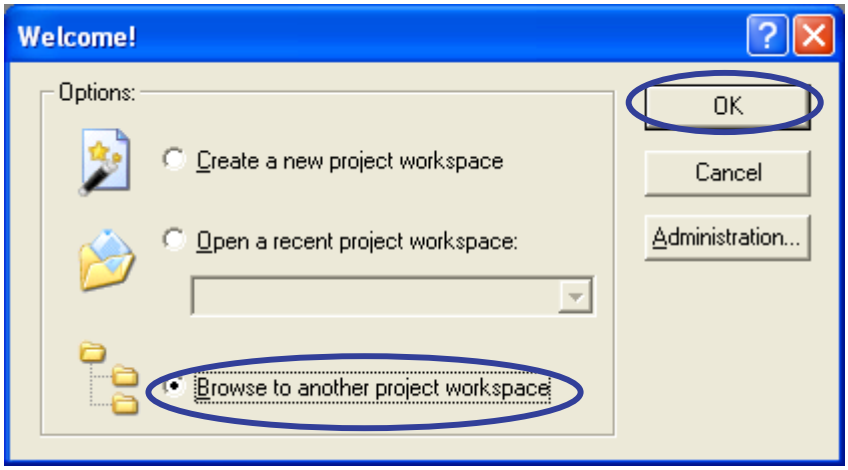
4.2 Opening a Workspace

(1) The [Welcome!] dialog box will appear on the High-performance Embedded Workshop window.

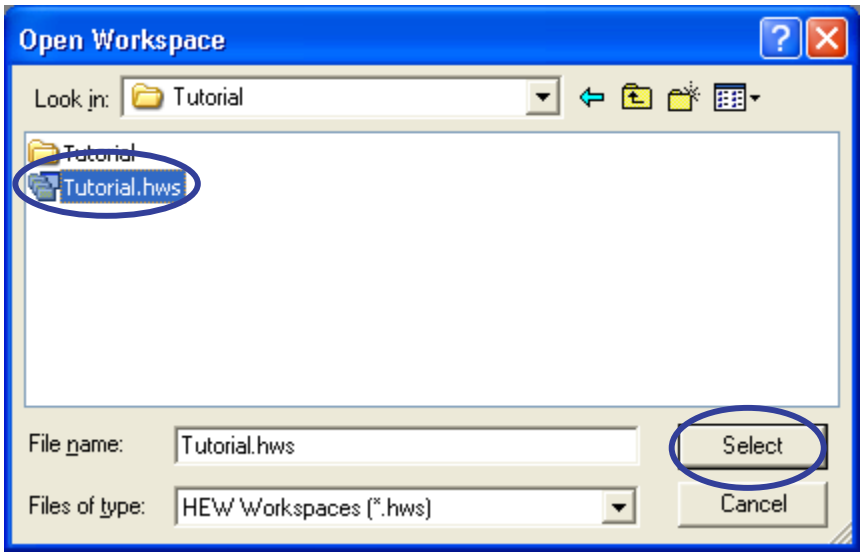


Check that the H8/300H Tiny series compact emulator is turned on.

Select the [Browse to another project workspace] radio button in the [Welcome!] dialog box and click on the [OK] button.



(2) The [Open Workspace] dialog box will appear.



If the software from the CD-ROM for this product has been installed, workspace "Tutorial.hws" will be within the directory structure as shown below (standard location). Specify the correct location by opening the folders in order. Select the workspace "Tutorial.hws" and click on the [Open] button.

C:\WorkSpace\Tutorial\CPE\H8Tiny\Tutorial\Tutorial.hws
C:\WorkSpace └Tutorial └CPE └H8Tiny └Tutorial └Tutorial.hws

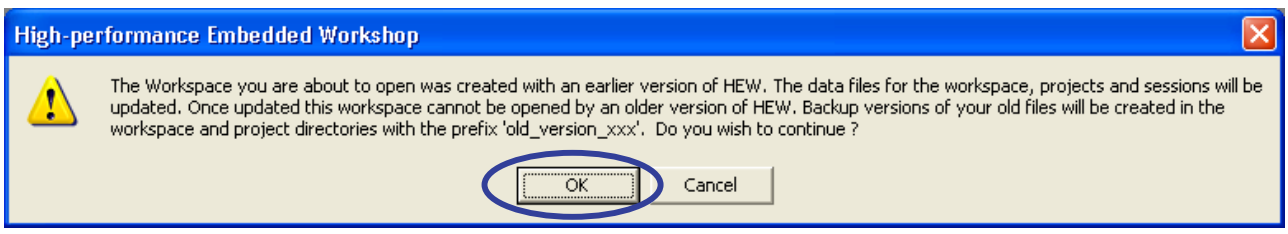
Note: Depending on the software version, the above directory may not be specifiable. In this case, select the following directory.

<High-performance Embedded Workshop installation directory>
\Tools\Renesas\DebugComp\Platform\CPE\H8Tiny\Tutorial

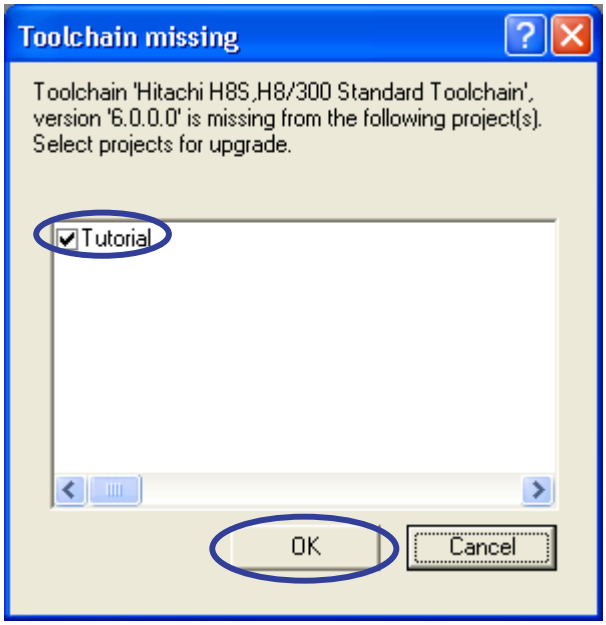
Examples of directory names:

C:\hew3\Tools\Renesas\DebugComp\Platform\CPE\H8Tiny\Tutorial
C:\hew2\Tools\Renesas\DebugComp\Platform\CPE\H8Tiny\Tutorial

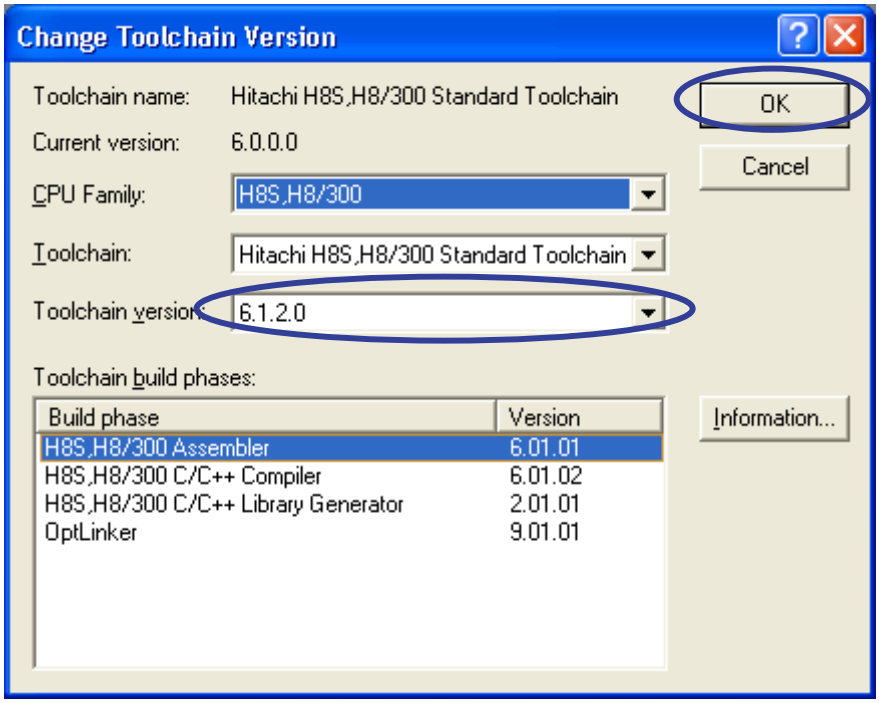
(3) If the workspace is an old version, the following dialog box will appear. To update it to the new version, click on the [OK] button.



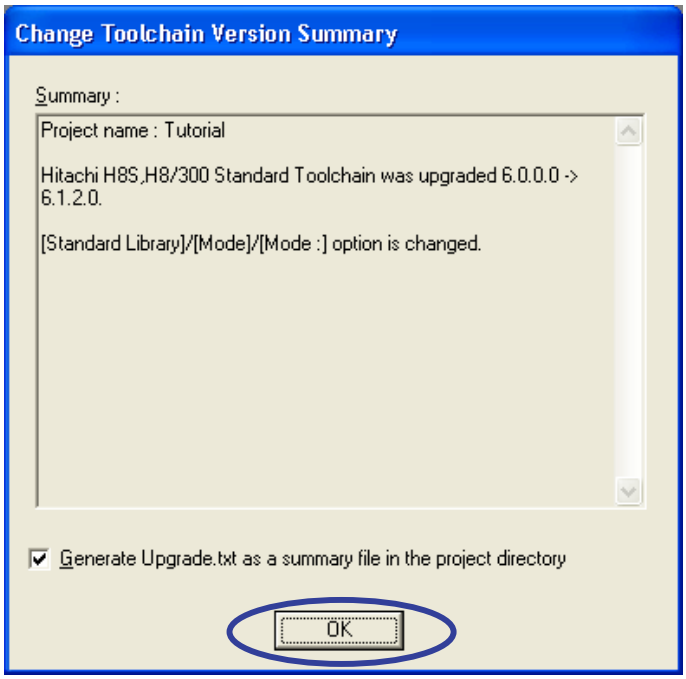
(4) If the [Toolchain missing] dialog box appears, select the name of the target project and click on the [OK] button.



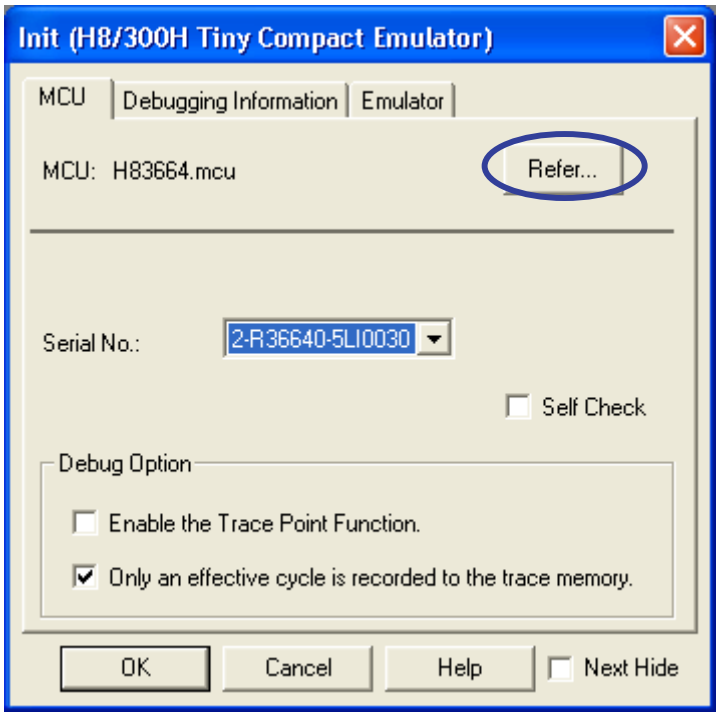
(5) If the [Changing Toolchain Version] dialog box appears, select the desired toolchain version and click on the [OK] button.



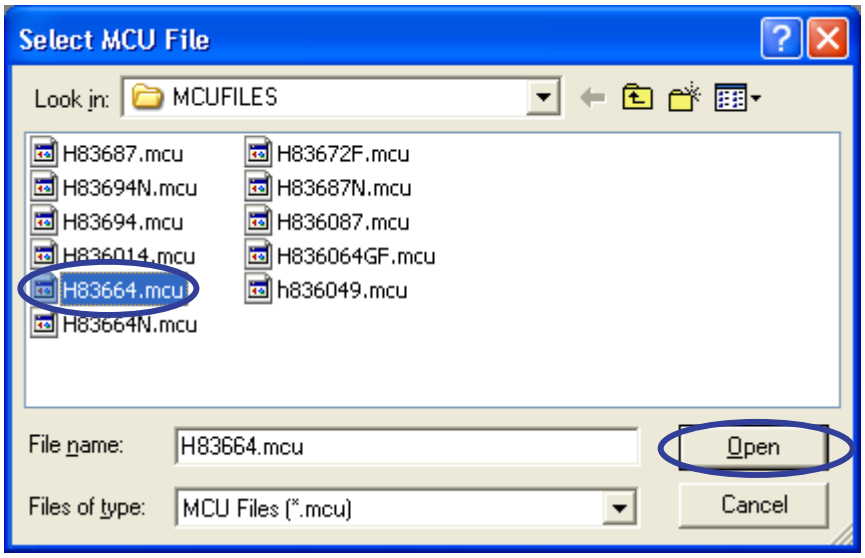
(6) If the [Change Toolchain Version Summary] dialog box appears, just click on the [OK] button.



(7) After the workspace has been opened, the [Init (H8/300H Tiny Compact Emulator)] dialog box will appear. Click on [Browse...].

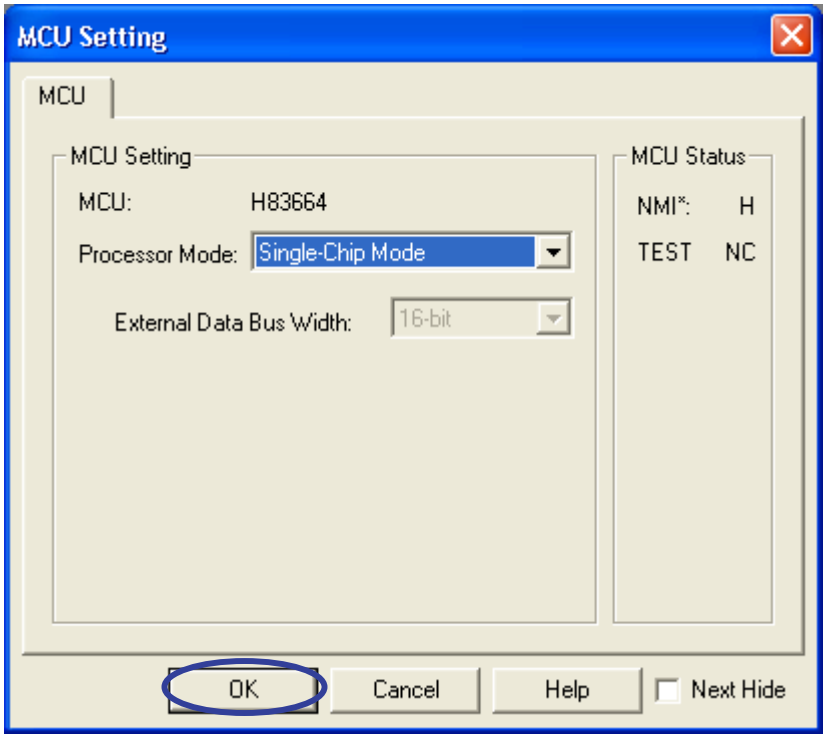


(8) The [Select MCU File] dialog box will appear. Here, select [H83664.mcu] and click on the [Open] button.

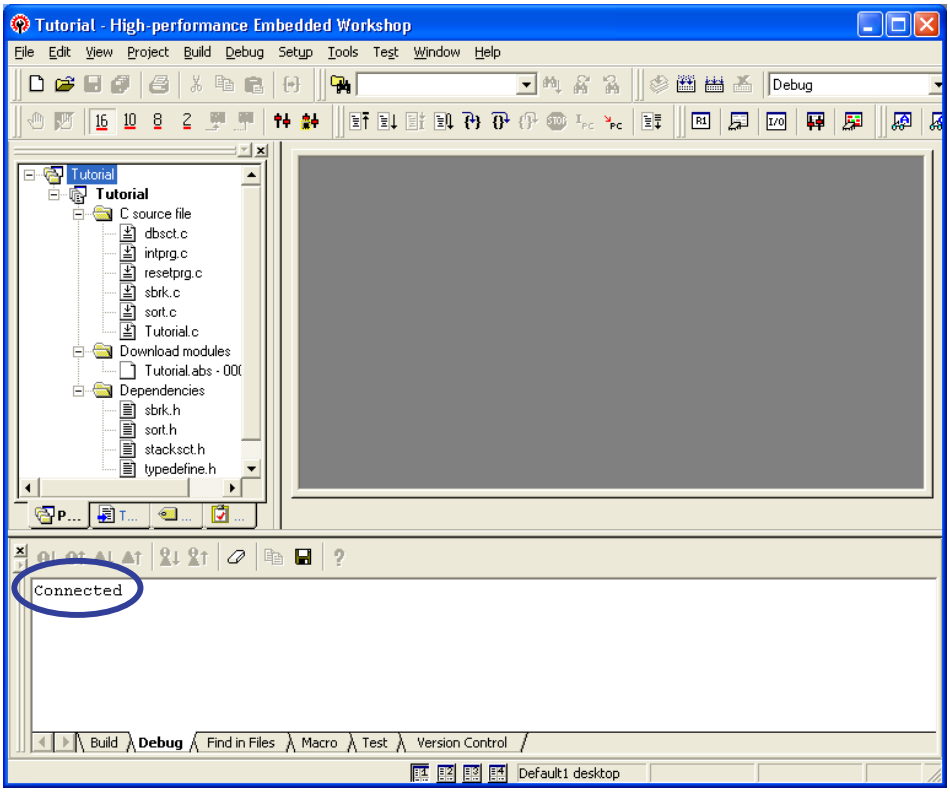


Return to the [Init (H8/300H Tiny Compact Emulator)] dialog box and click on the [OK] button.

(9) The [MCU Setting] dialog box will appear. Check that the processor mode is [Single-Chip Mode] and click on the [OK] button.



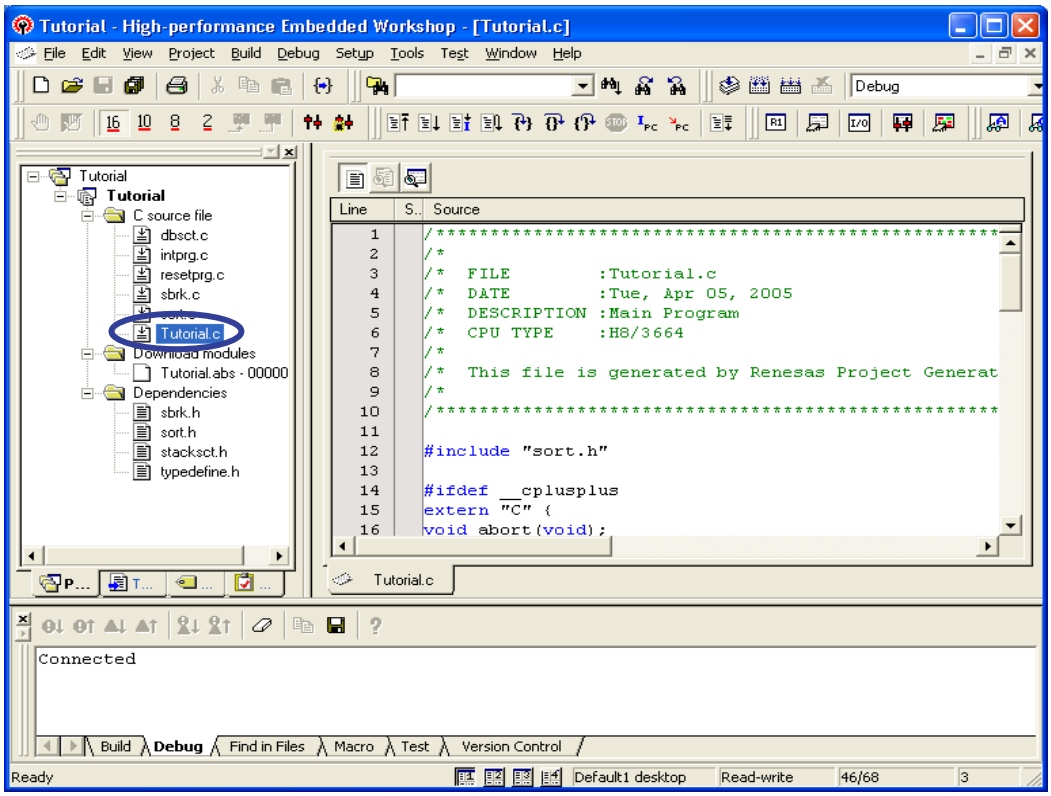
(10) Once the workspace has been read, operations in the High-performance Embedded Workshop screen become possible.



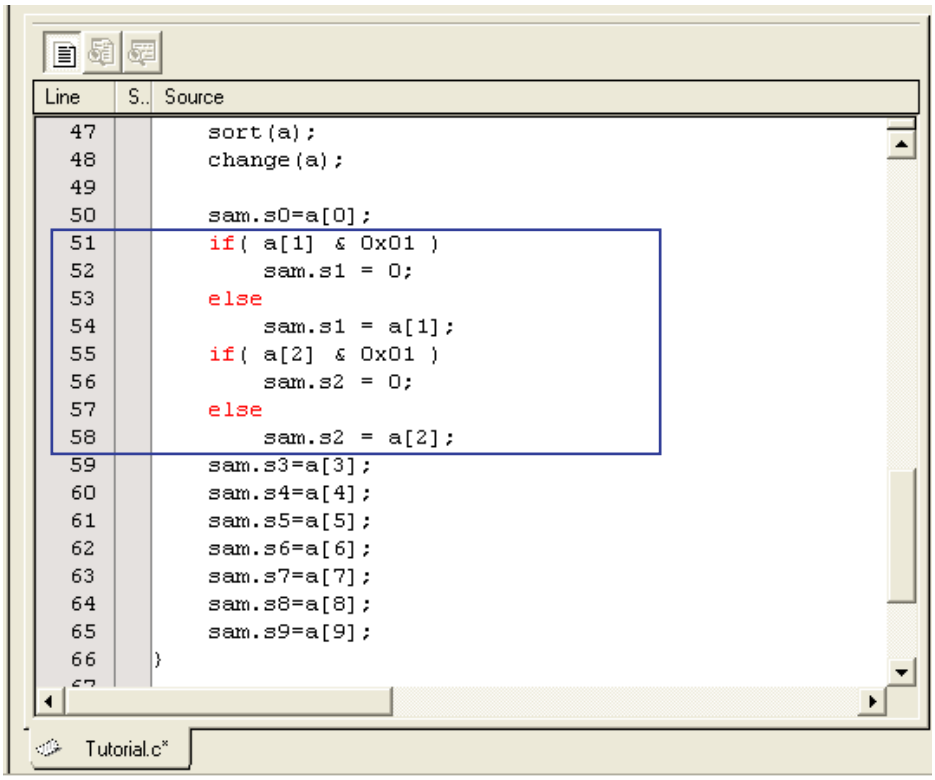
When the H8/300H Tiny series compact emulator is successfully connected, [Connected] is displayed in the [Debug] tab in the [Output] window.

4.3 Customizing a Source File

(1) Open the source file by double-clicking on its name ("Tutorial.c") in the workspace pane.

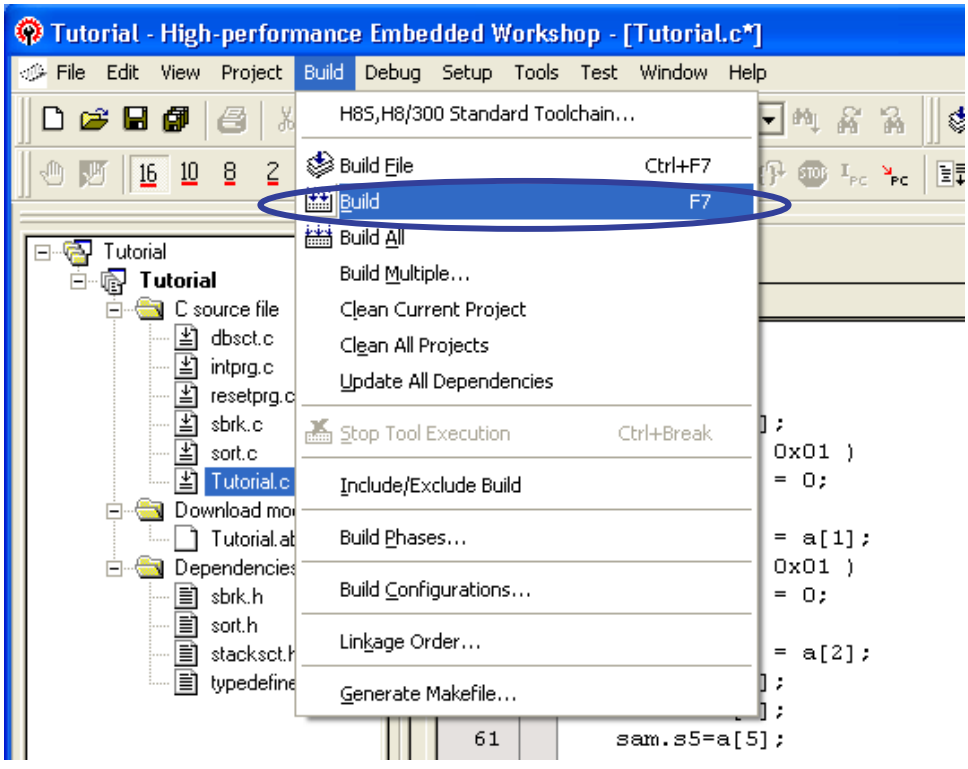


(2) Add if-else statements to lines 51 to 58 in the [Source] window, as shown below.



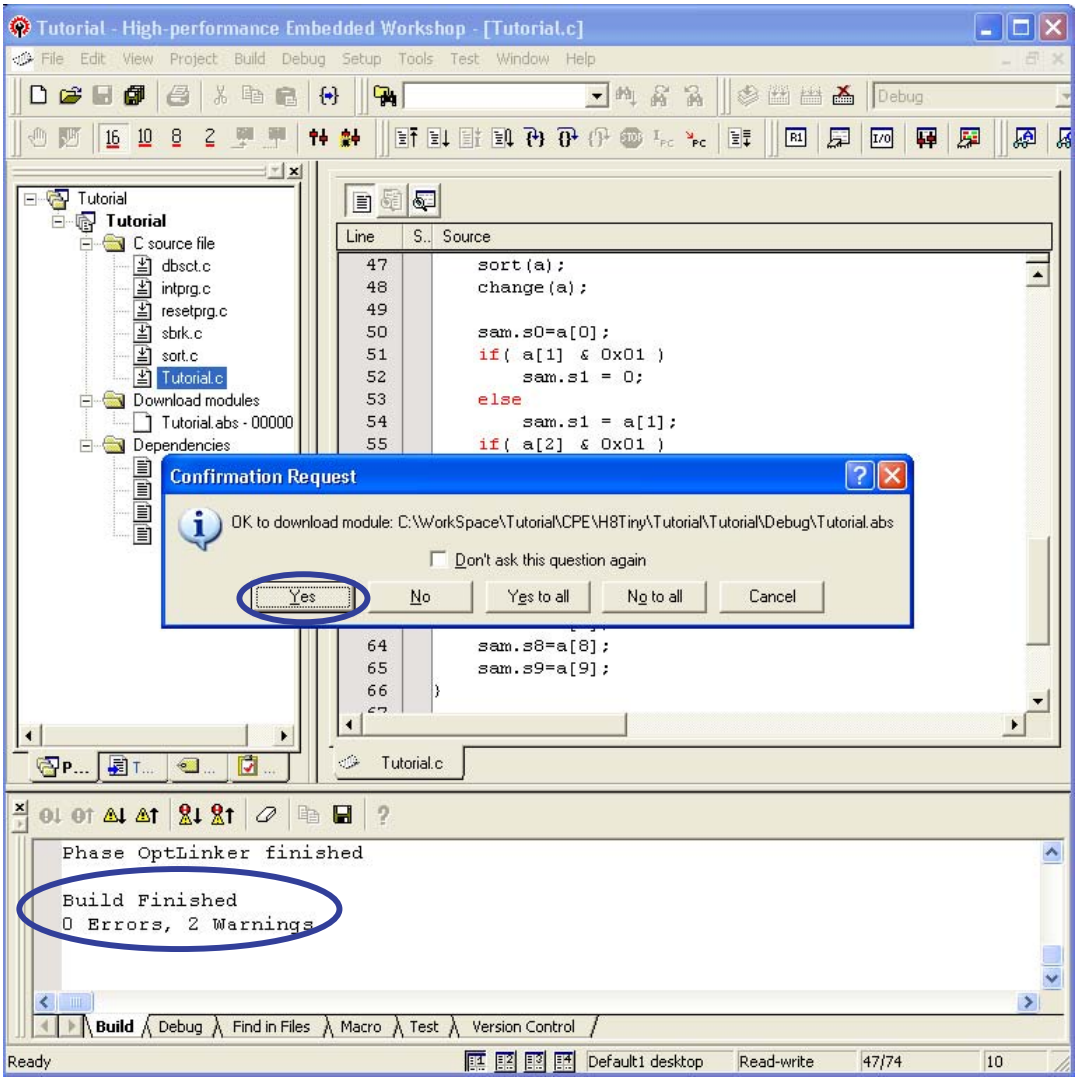
4.4 Build Operations

(1) Before loading of the program for the customized source file, a build operation must be performed. Click on the [Build] item of the [Build] menu.



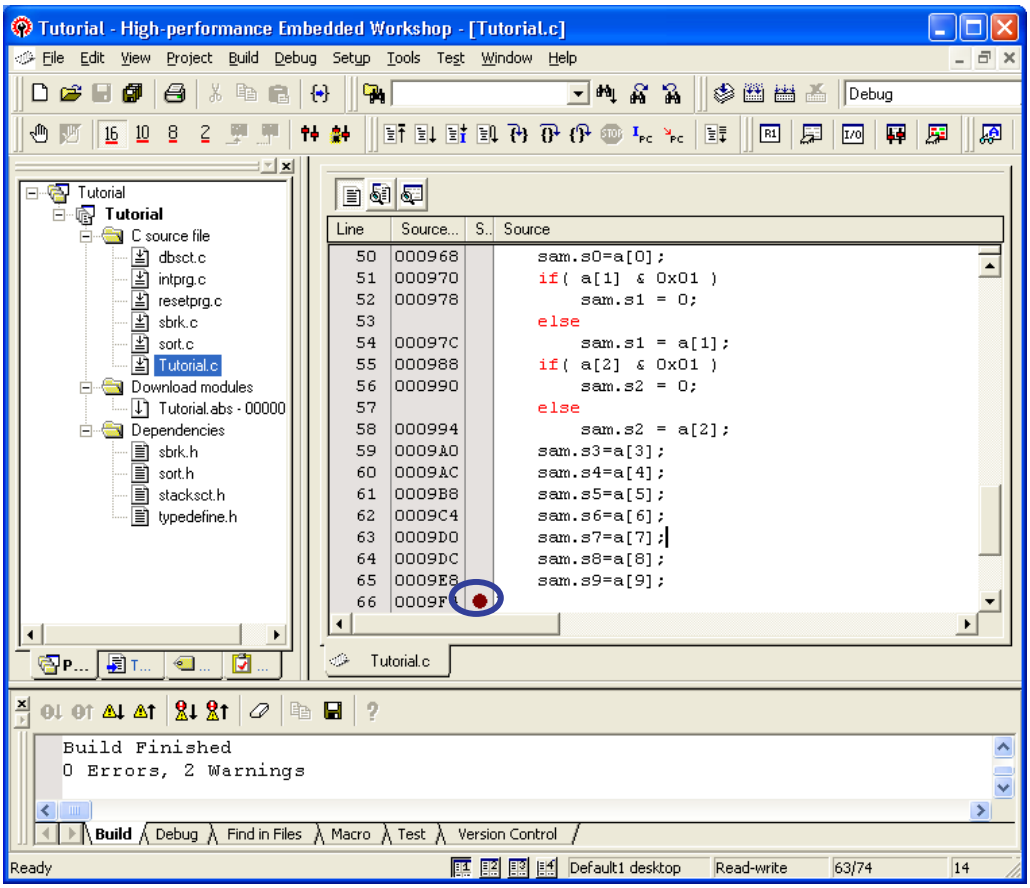
Select the [Build] tab in the [Output] window to check how far building has progressed.

(2) On completion of building, the numbers of errors and warnings that have been generated are displayed in the [Build] tab in the [Output] window. Once downloading is possible, the [Check Request] dialog box for downloading of the program automatically appears. Here, click on the [Yes] button.

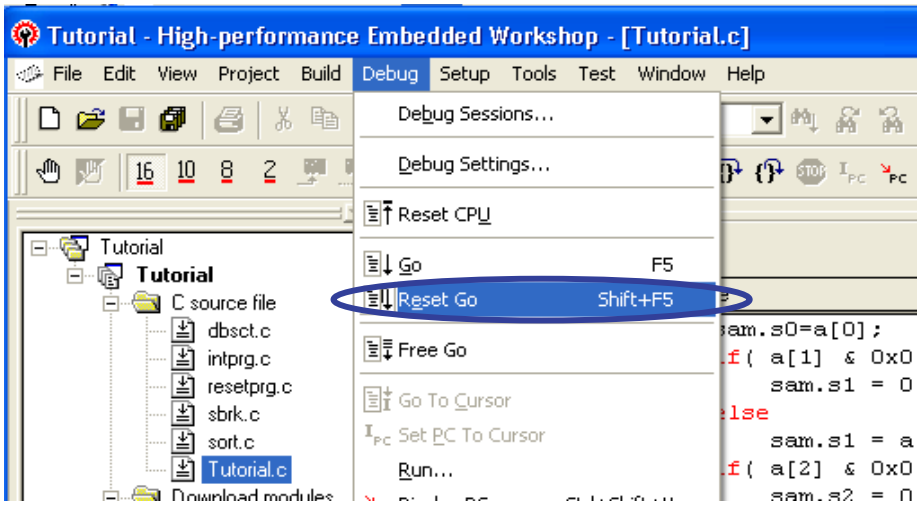


4.5 Step Operations in the [Trace] Window

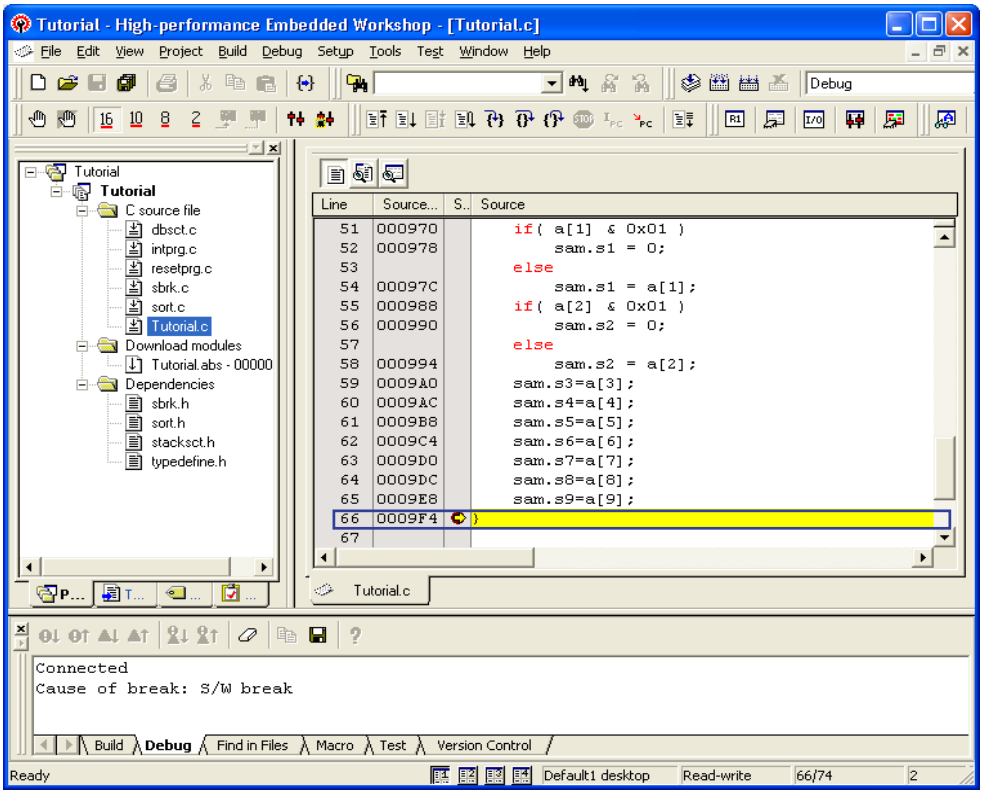
(1) Double-click on the [S/W Breakpoint] column for line 66 of the [Source] window to set a breakpoint.



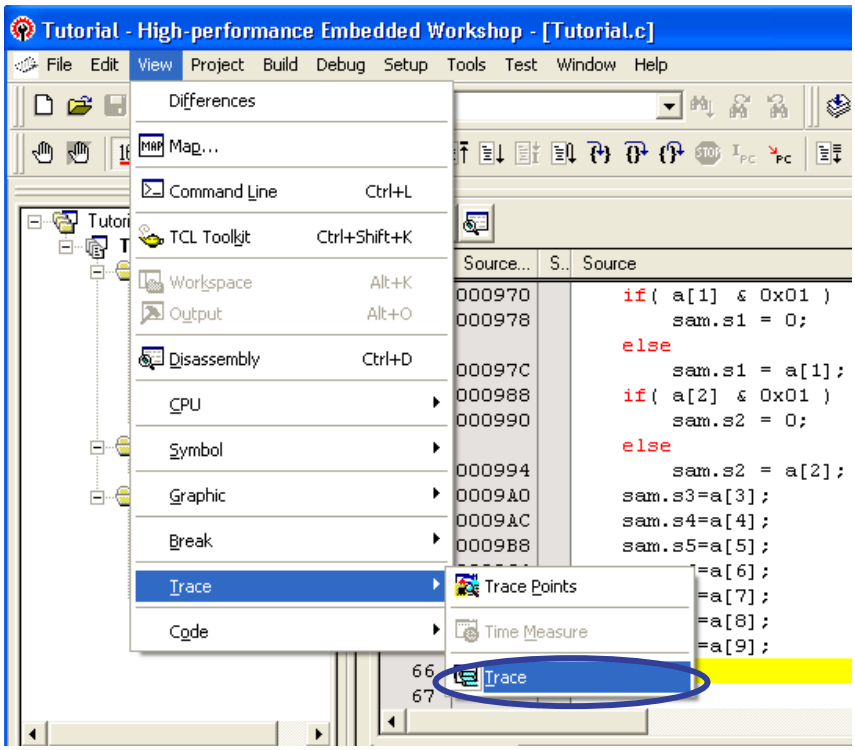
(2) Click on [Reset Go] from the [Debug] menu to run the program.



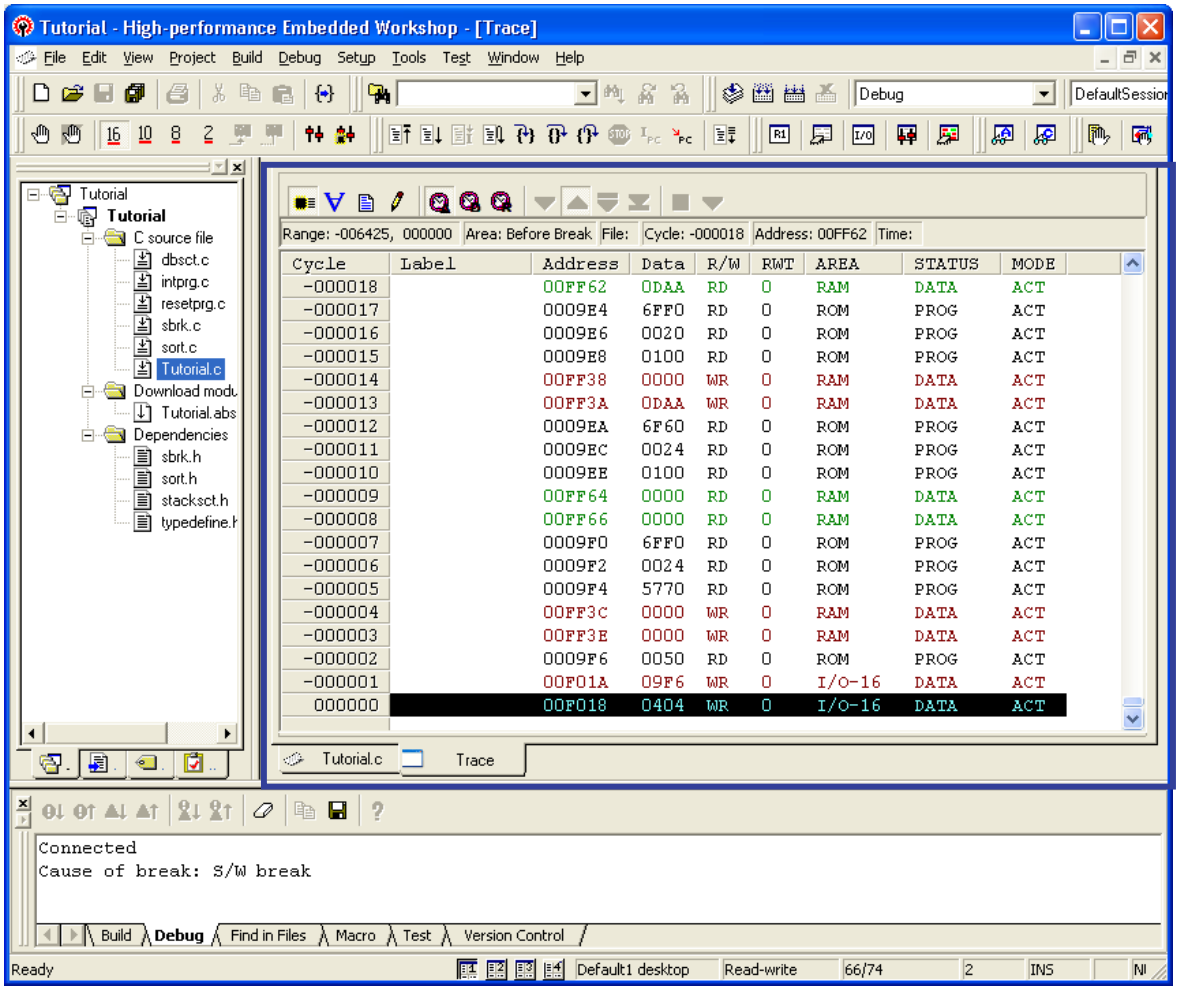
(3) Execution is stopped at line 66 of the source program ("Tutorial.c"). A yellow arrow in the [Source] window indicates the position of the program counter (PC), and the corresponding section of the source code is highlighted in yellow.



(4) Click on [Trace] in the sub-menu for the [Trace] item of the [View] menu.



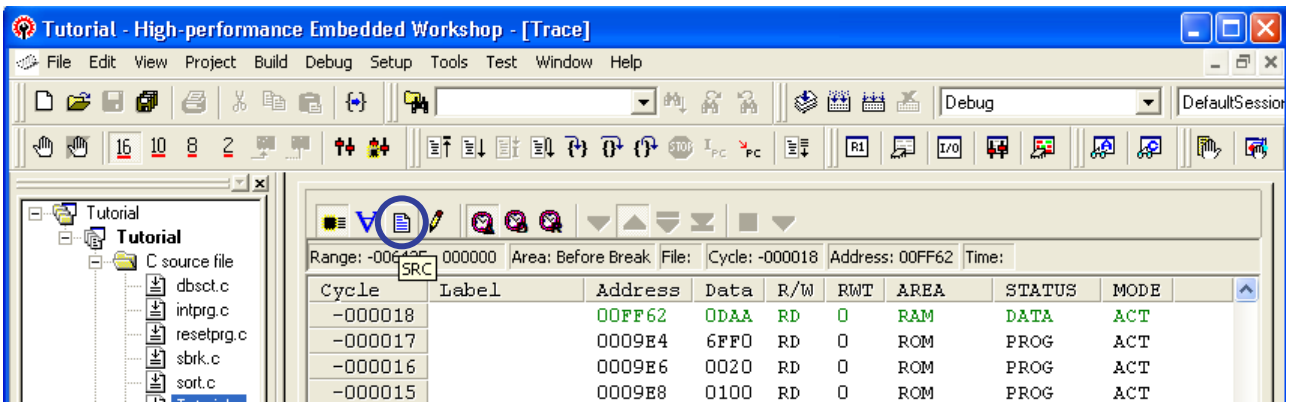
(5) The [Trace] window is displayed.



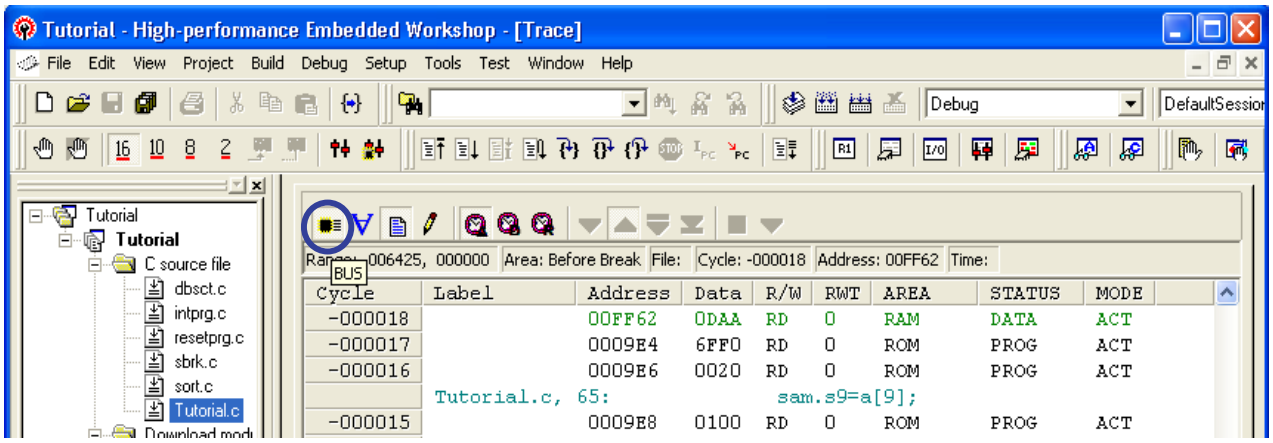
When the docking view has been selected, click the right-hand mouse button with the cursor on the [Trace] window to cancel the [Docking View] item of the popup menu.

The display in the [Trace] window is in one of three modes: bus cycle (BUS), disassembly (DIS), and source (SRC), and these can be mixed. Back-tracing, which is described in this document, is only available for a source (SRC) display.

(6) Click on the [SRC] button in the toolbar for the [Trace] window to enable the source (SRC) mode.

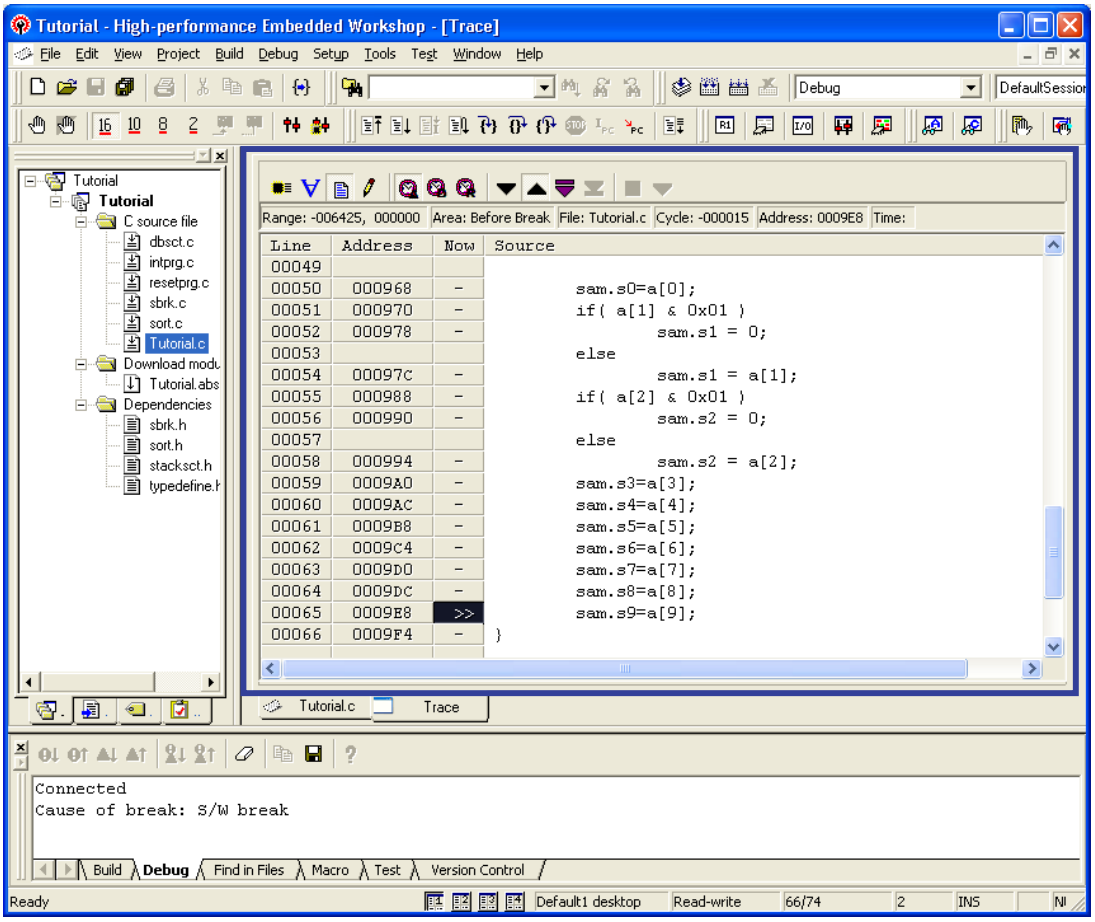


(7) Click on the [BUS] button in the toolbar for the [Trace] window to take the display out of bus-cycle (BUS) mode.



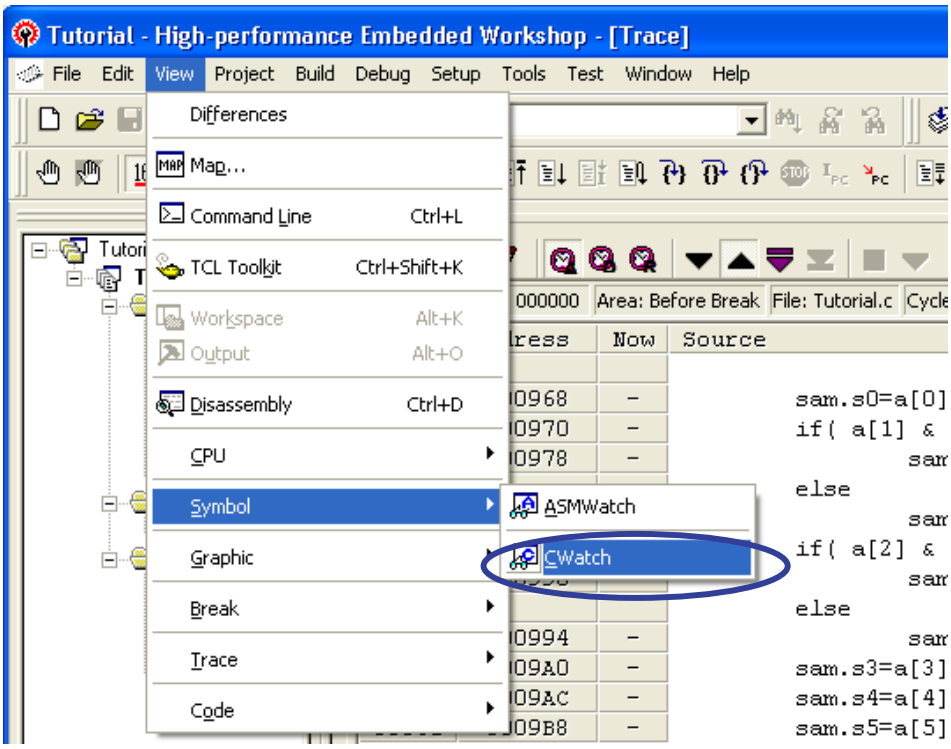
If the disassembly (DIS) mode has also been enabled, click on the [DIS] button in the toolbar to take the display out of this mode.

(8) When only the source (SRC) mode is enabled, an image of lines of source code is displayed in the [Trace] window as shown below.

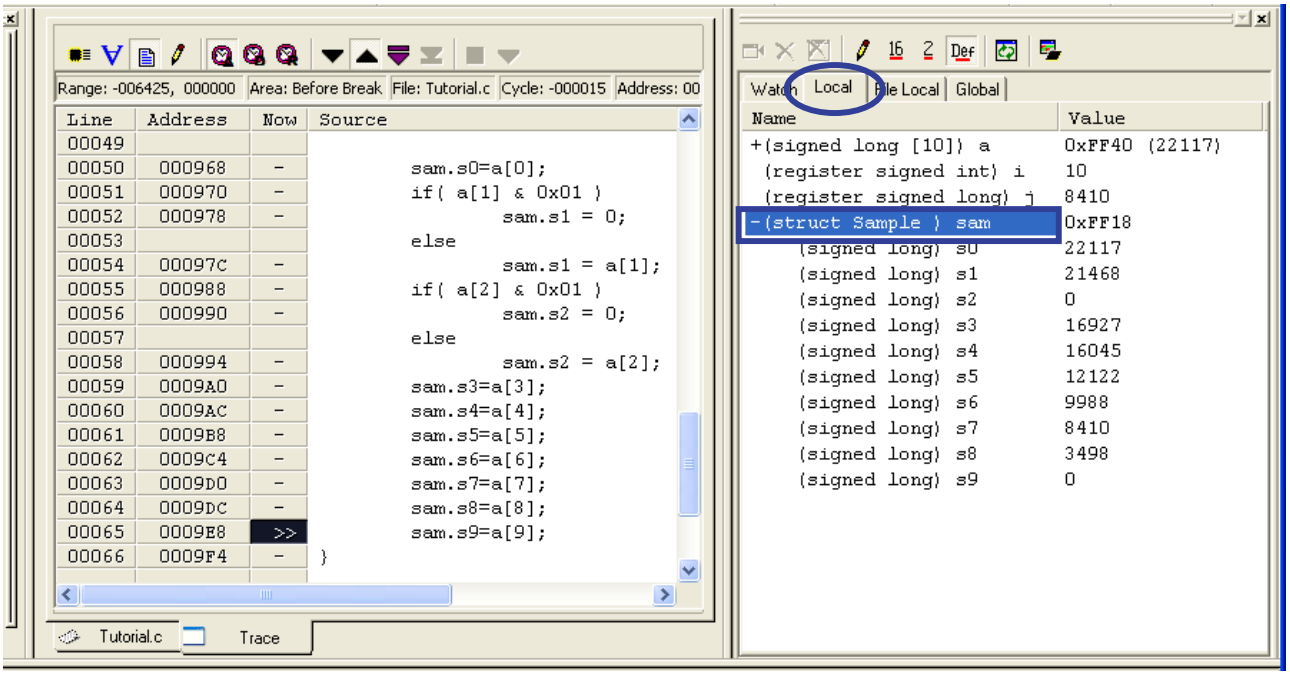


In the [Now] column of the [Trace] window, ">>" is displayed to indicate the cycle currently being referred to. For other lines of source code that have corresponding addresses, "-" is displayed in this column.

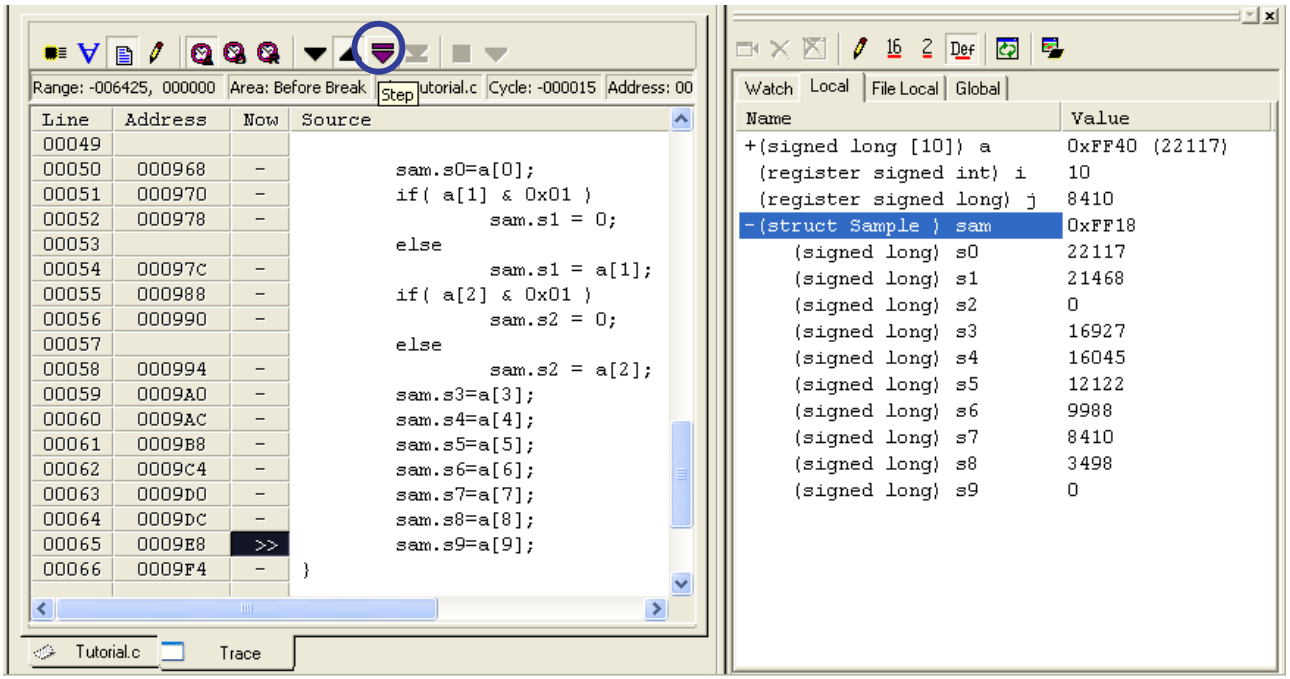
(9) Select [Symbol] from the [View] menu and click on [C Watch].



(10) Once the [C Watch] window has appeared, select the [Local] tab and double-click on the local variable name "sam" so that its display is in the expanded state.

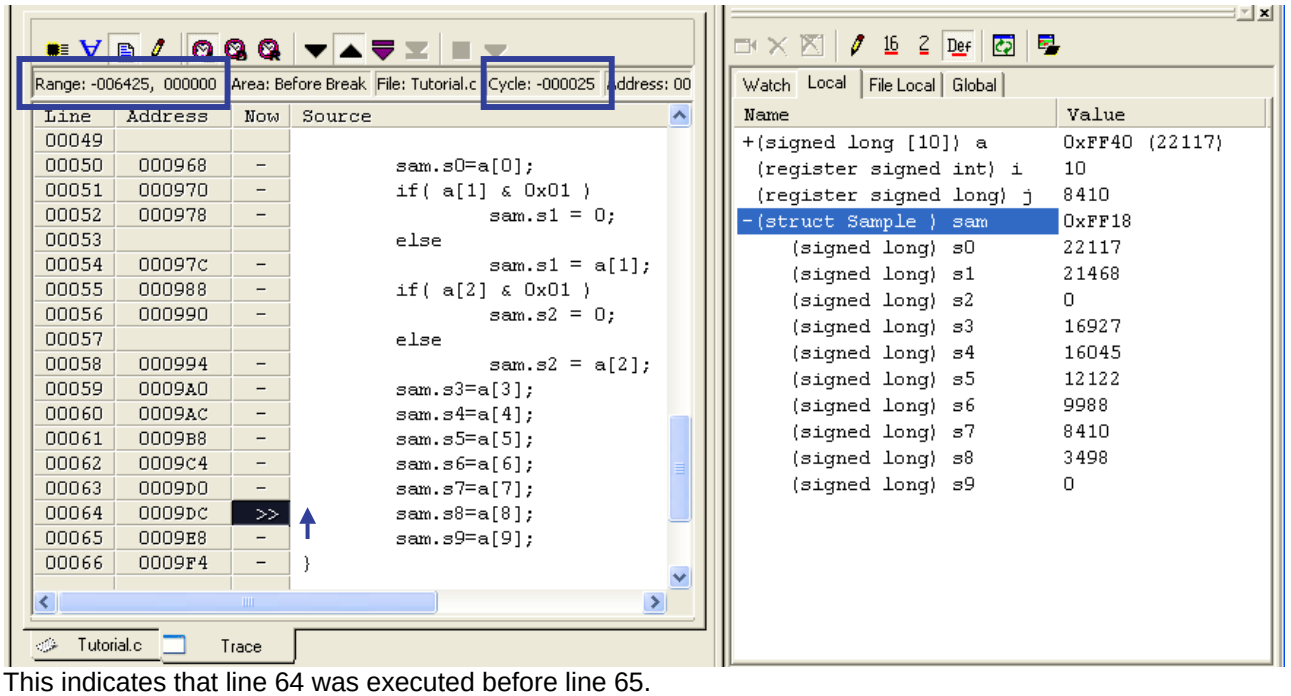


(11) Click on the [Step] button in the toolbar of the [Trace] window.



If the [Backward] button (upward triangle) is not active, click on the button to activate it.

(12) The symbol ">>", indicating the cycle currently being referred to is moved from line 65 to line 64.



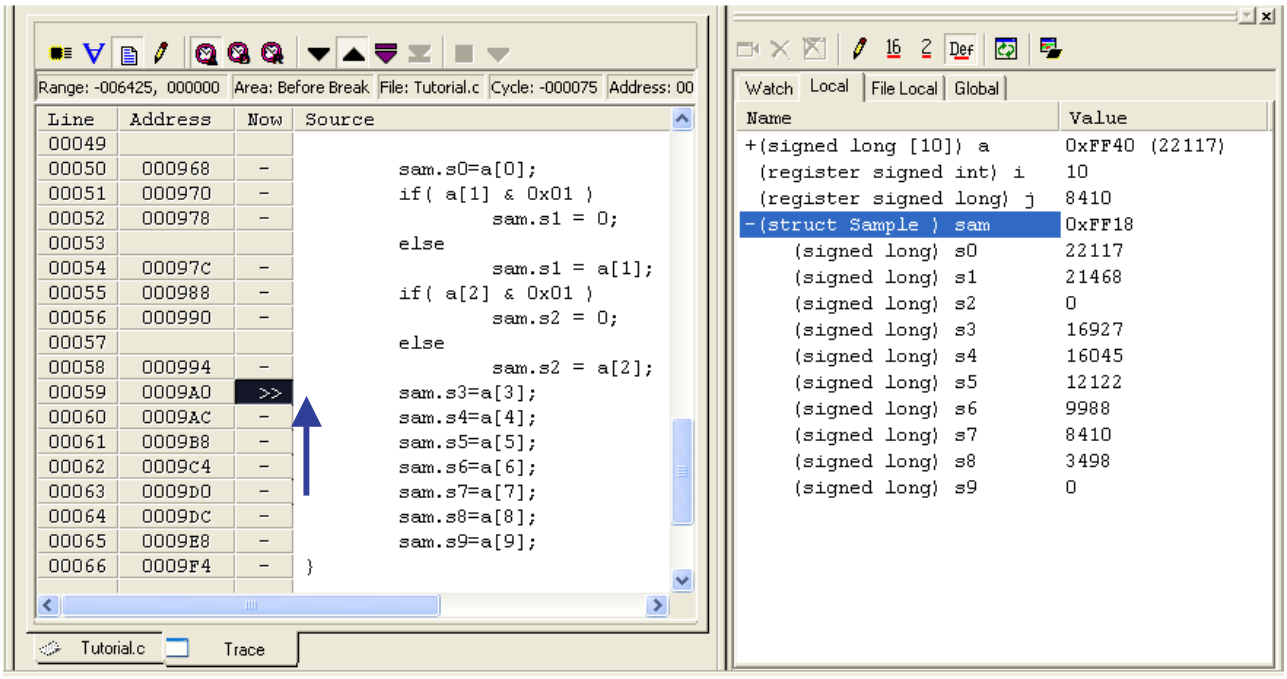
This indicates that line 64 was executed before line 65.

The value for [Cycle], which shows the location of the current cycle in the results of trace measurement, is changed from (-000015) to (-000025). This means that the condition of an address corresponding to source-line information for a search in the negative direction from cycle location (-000015) has been satisfied at cycle location (-000025).

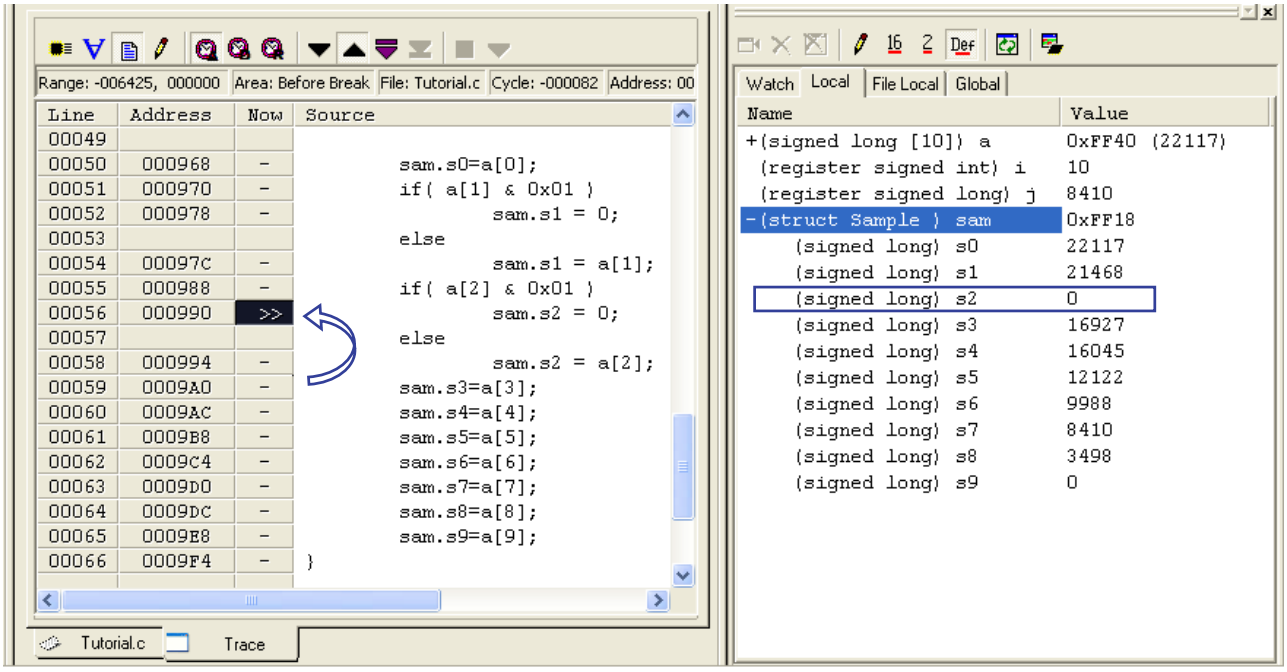
The range of cycles covered by the results of trace measurement is displayed against [Range]. The last cycle for which information was acquired is expressed as (000000), with cycles further in the past having increasing negative values. In the example covered by this document, results of trace measurement have been acquired over 6426 cycles (from (-006425) to (000000)).

In the H8/300H Tiny series compact emulator, results of trace measurement can be acquired for up to 64 kcycles.

(13) Similarly, clicking on the [Step] button five times moves the cycle location one line at a time until the reference cycle symbol indicates line 59 as shown below.

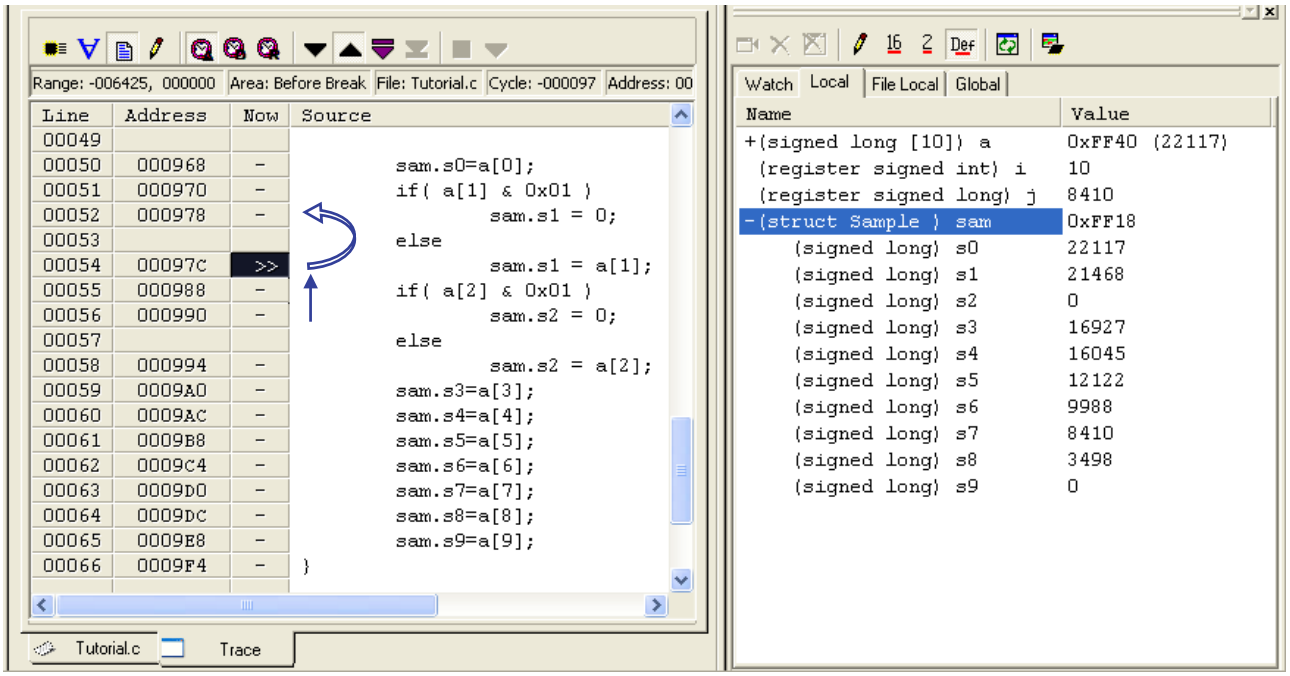


(14) Clicking on the [Step] button again moves the reference cycle symbol from line 59 to line 56.

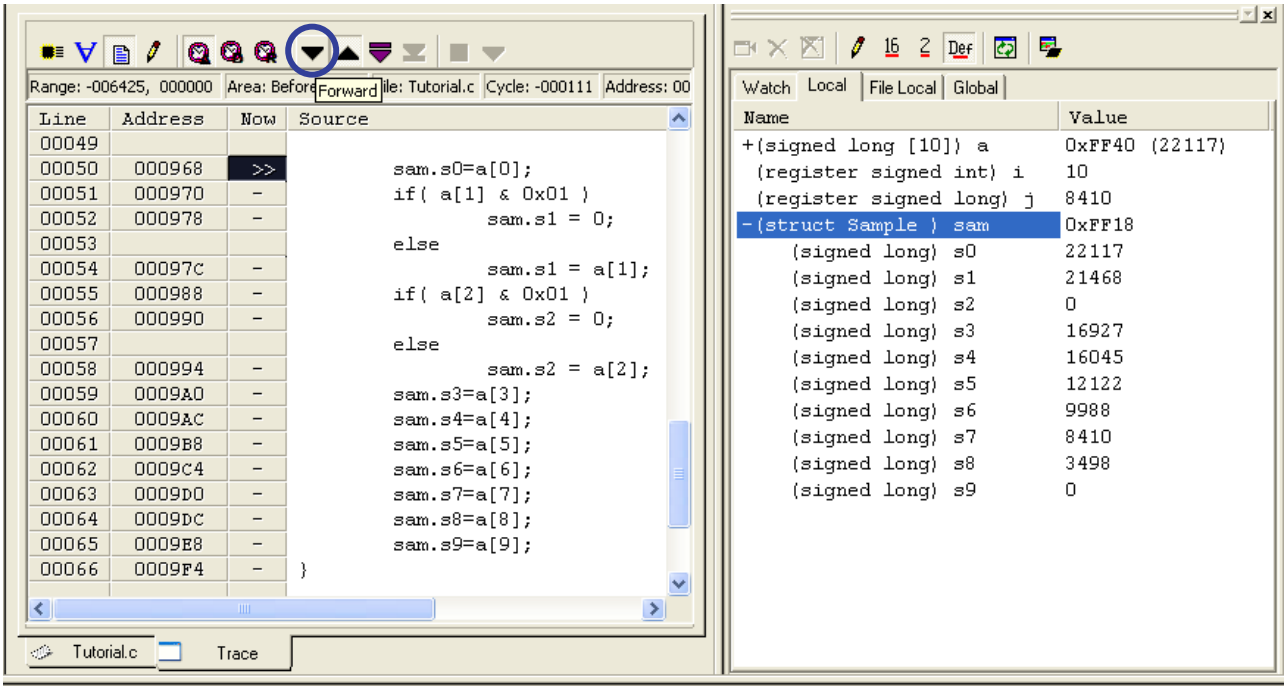


At this point the condition for the if statement on line 55 had been true, so line 56 was executed instead of the statement on line 58, which follows the else statement. Zero has thus been assigned to the local variable "sam.s2".

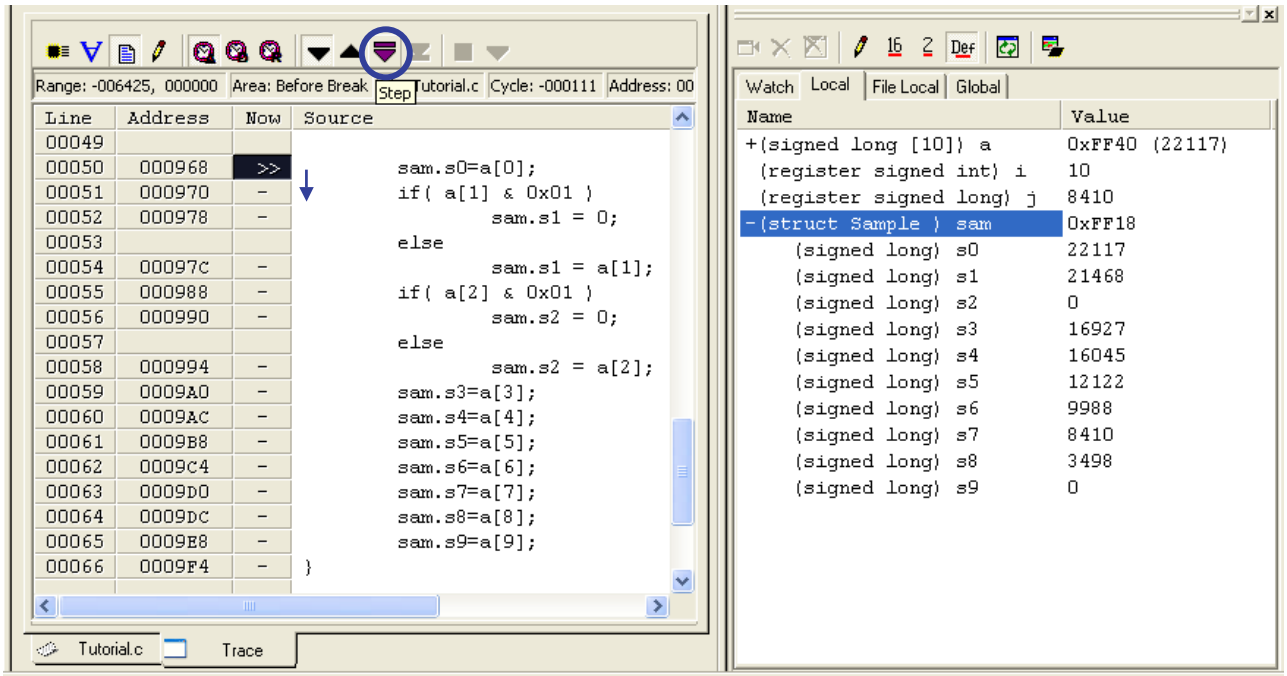
(15) If we continue to follow the trace back by clicking on the [Step] button, we reach the point where line 54 was executed because the condition for the if statement on line 51 had been false.



(16) To change the direction of stepping, click on the [Upward] button (backward triangle) in the toolbar of the [Trace] window.

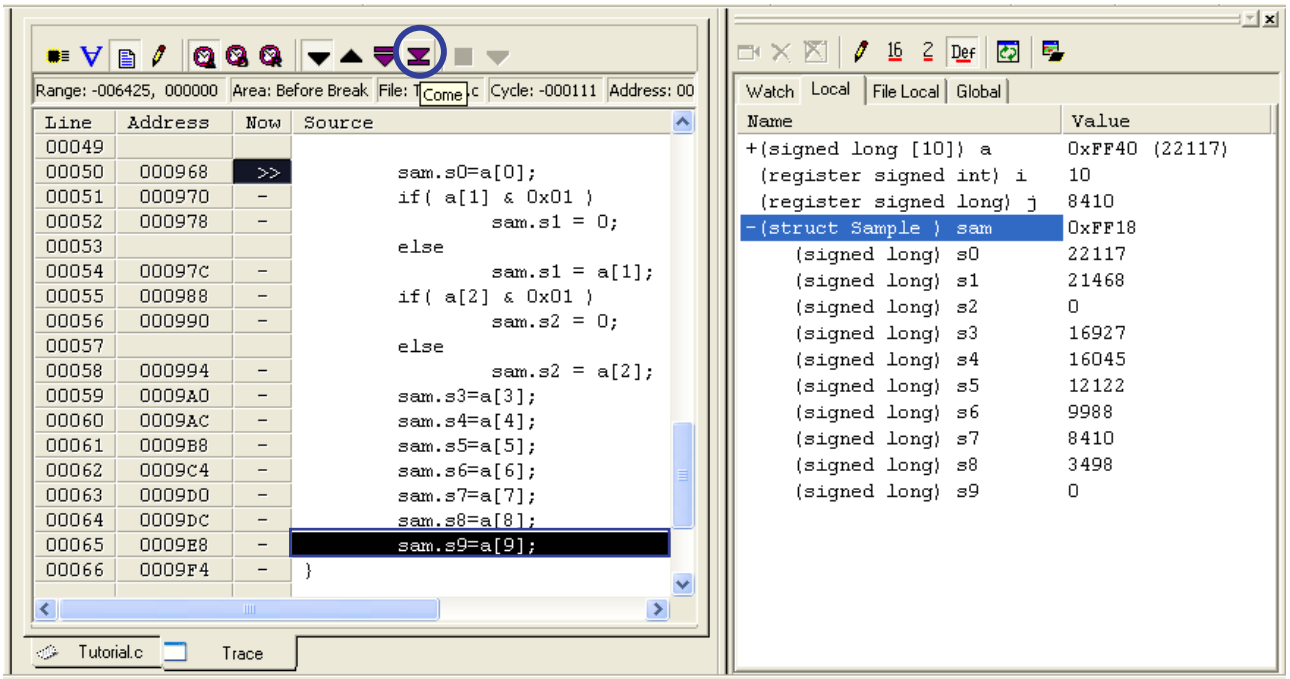


(17) Now, continuing to click on the [Step] button searches through the results of trace measurement for the current line in the positive direction.

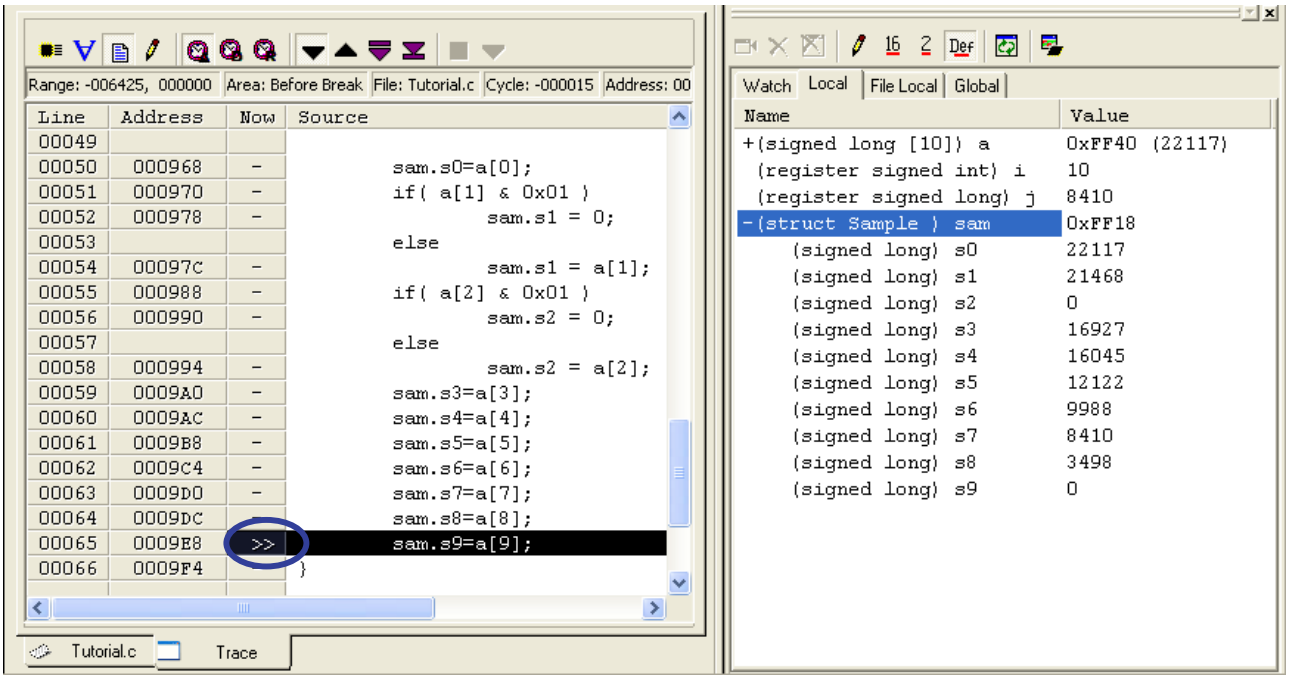


Click on the [Upward] and [Backward] buttons to change the direction of searching at any time. Using the results of trace measurement to check the path of execution of the source program enables efficiency in program debugging and test verification.

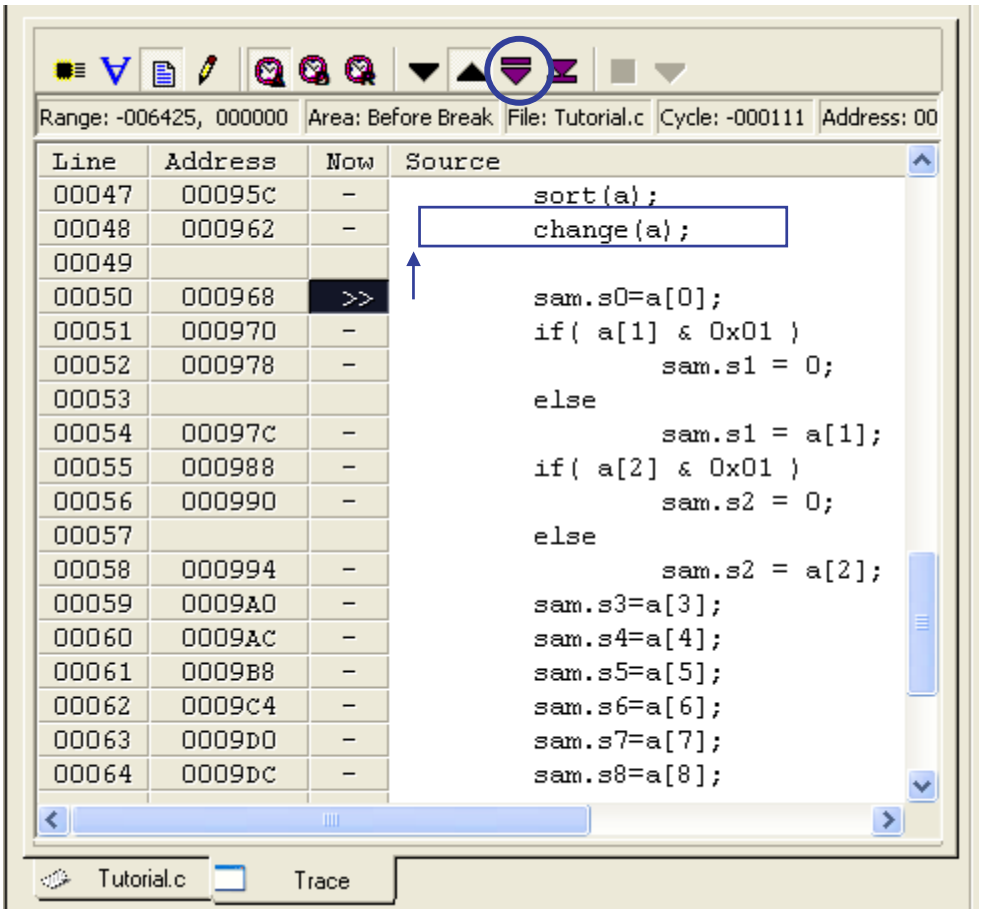
(18) To set a new cycle location for reference, select the line in [Source] and click on the [Come] button.



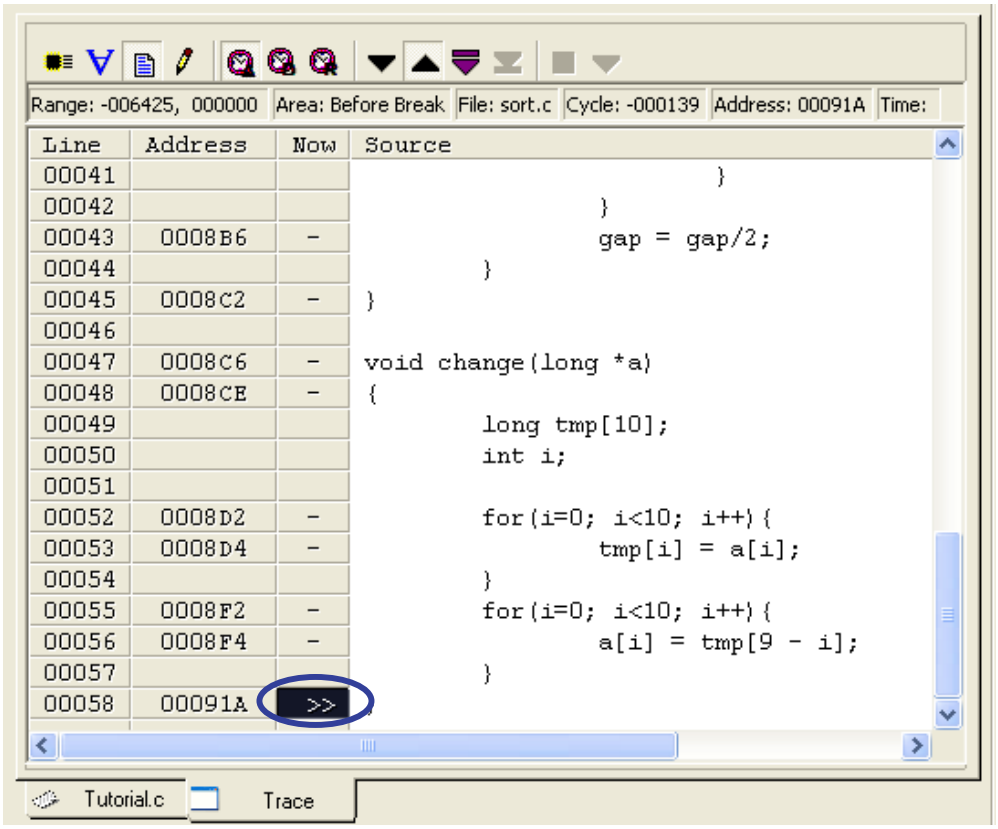
(19) In this case, the reference cycle symbol is set on line 65.



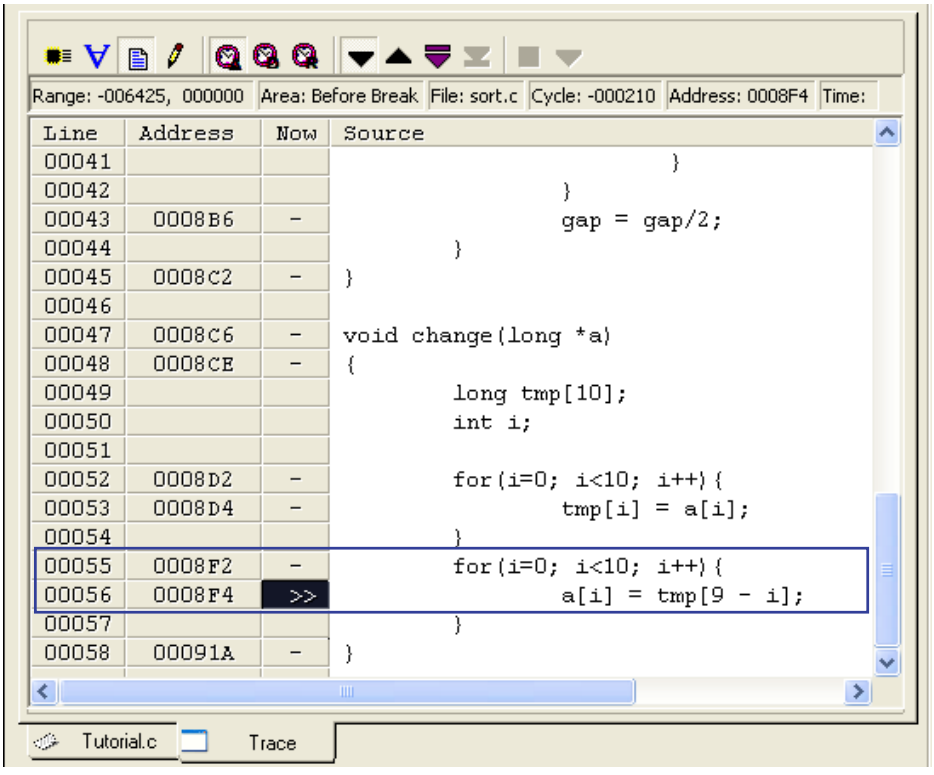
(20) In backward stepping, if exit from a function call immediately precedes the line containing the reference cycle symbol, the function call is indicated by a red arrow.



(21) In this case, the call of function "change" on line 58 is indicated.

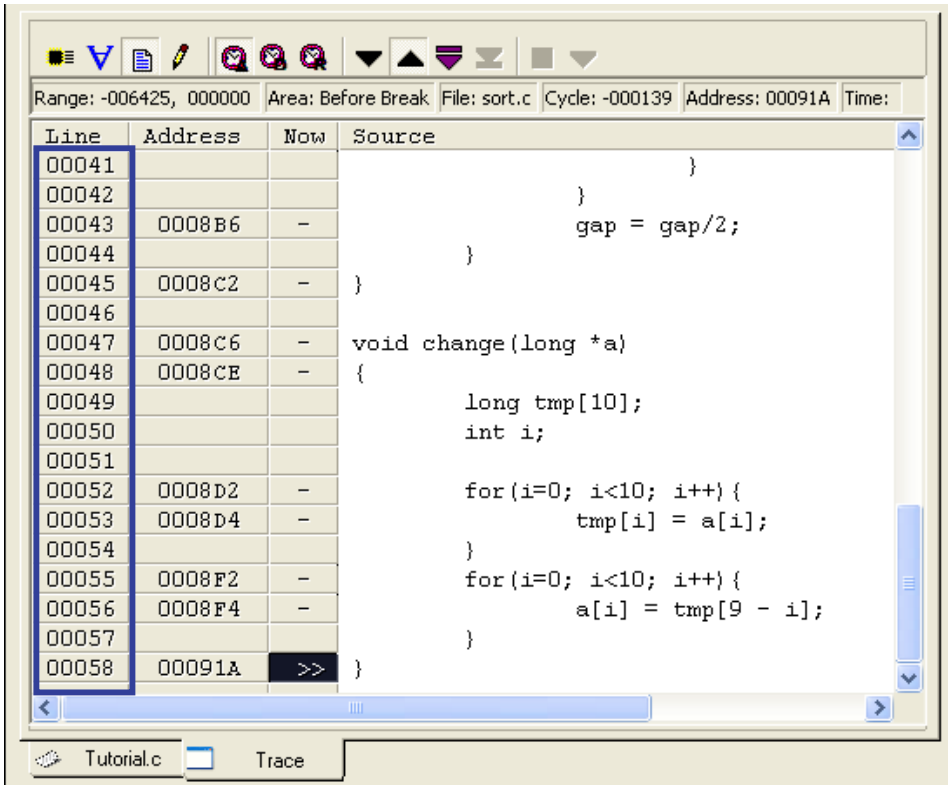


(22) If the program has a loop, the steps are repeated the same number of times as the actual number of iterations of the loop.



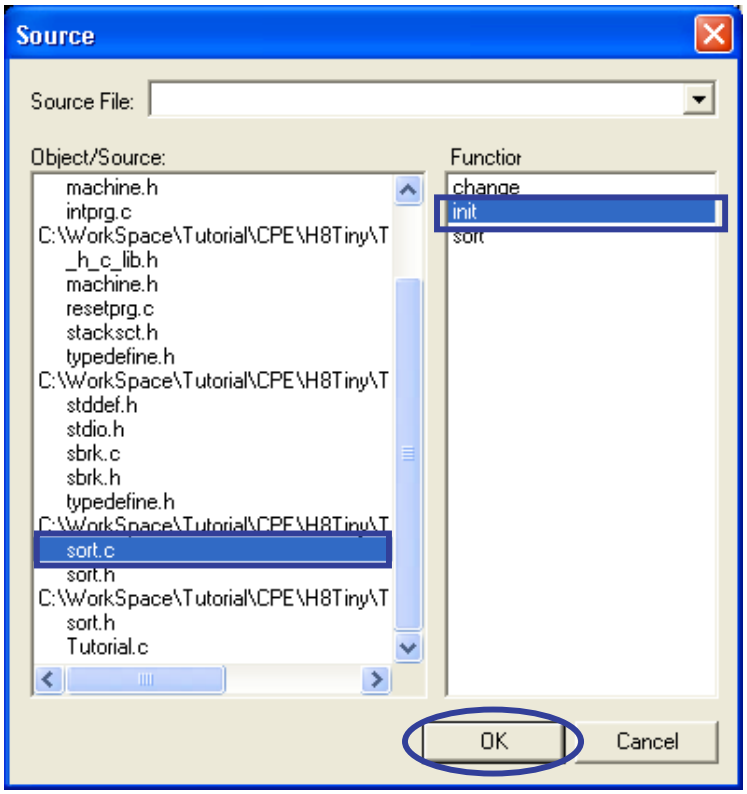
In the example above, line 56 is repeated ten times.

(23) Double-clicking on [Line] in the [Trace] window produces a dialog box that allows changing of the displayed file.

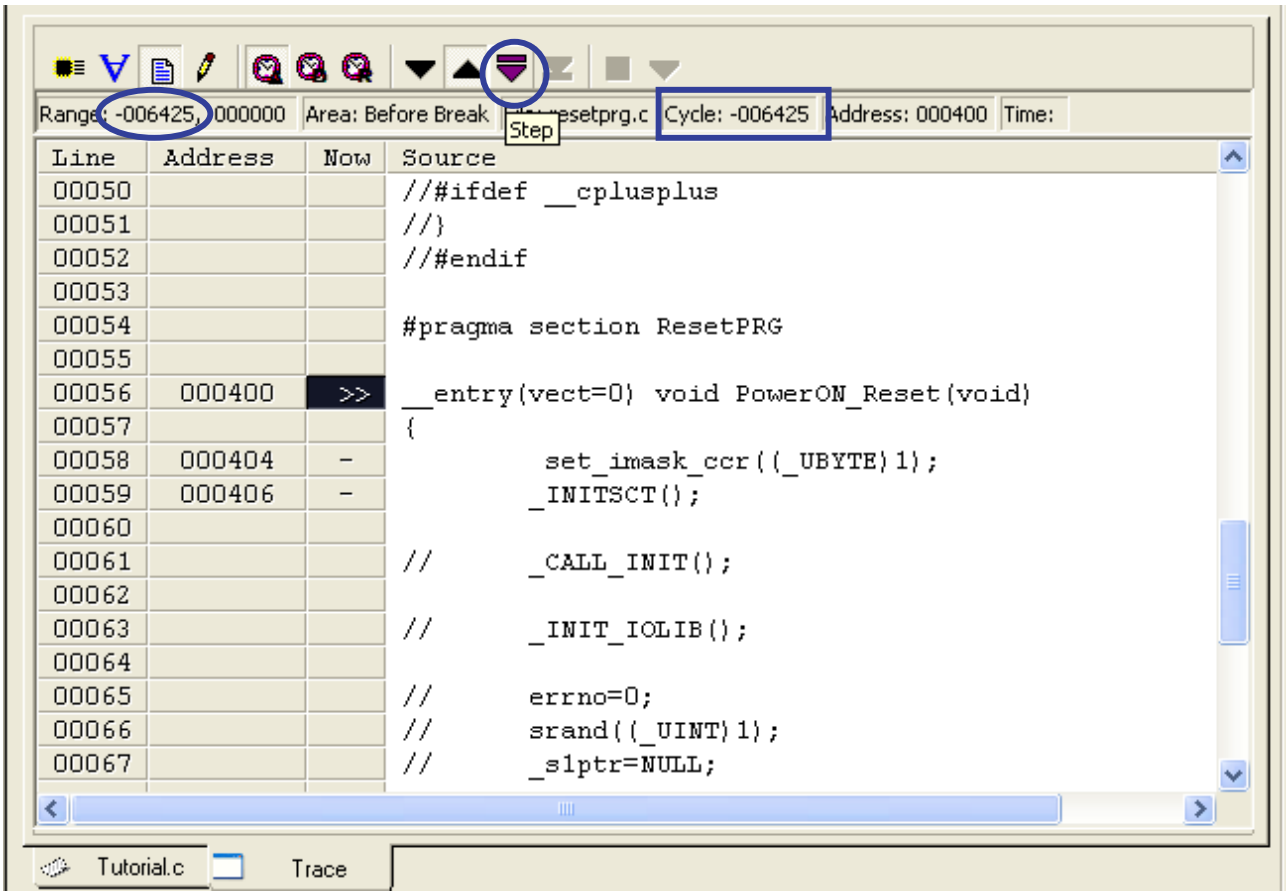


Double-clicking on any position within the column under [Line] has the same effect.

(24) When a file name is selected, a list of the functions it contains is displayed in the box at right. Select the name of the desired function and click on the [OK] button to display the specified function.



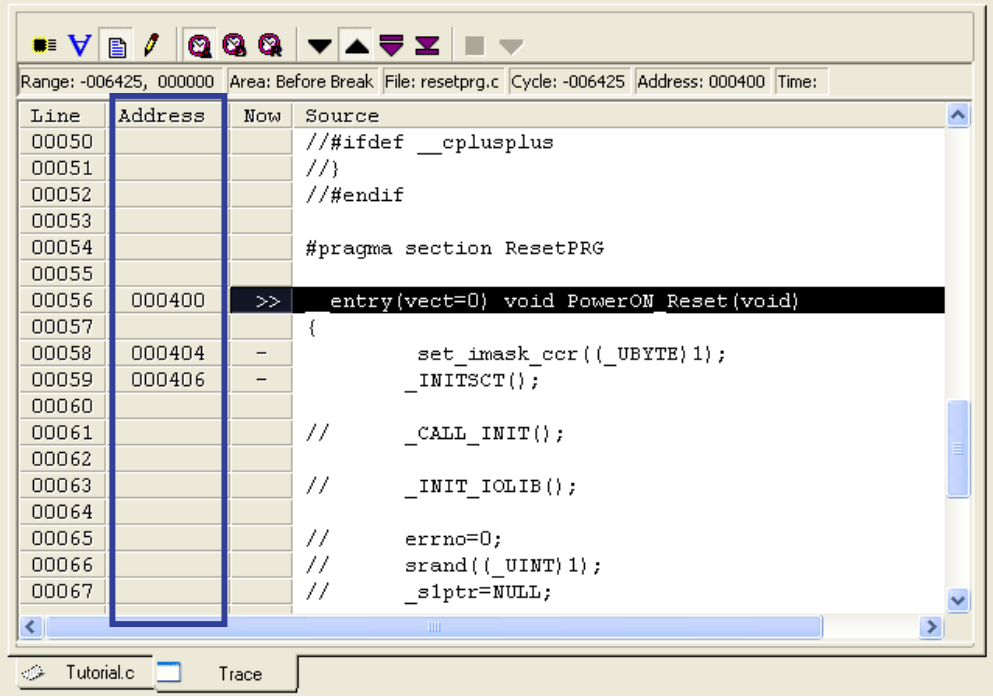
(25) When either end of the range corresponding to results of trace measurement is reached, further stepping in the same direction is not available.



In the example above, where [Range] is from (-006425) to (000000), the following error message is displayed if stepping in the negative direction from (-006425) under [Cycle] is attempted.

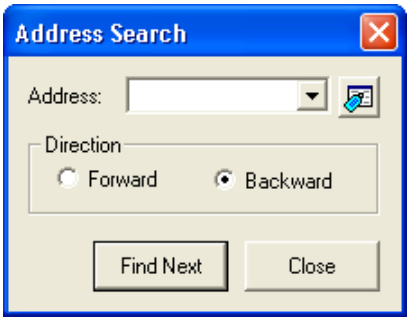
When stepping in the positive direction from (000000) under [Cycle] is attempted, the same error message is displayed.

(26) Double-clicking on [Address] in the [Trace] window produces a dialog box that allows searching for an address.

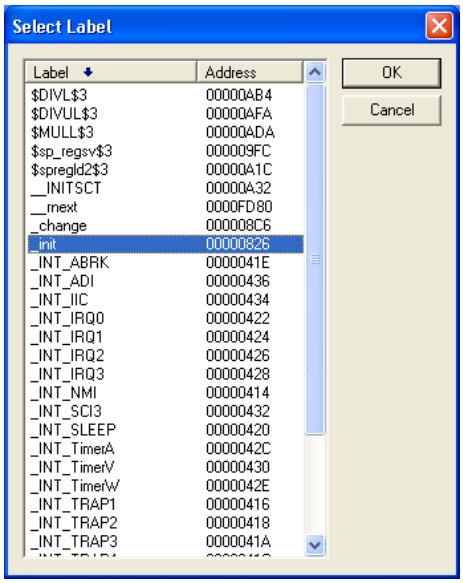


Double-clicking on any position within the column under [Address] has the same effect.

(27) The [Address Search] dialog box is used to search for an address in the specified direction.



The [Address] field can also be specified by clicking on the label-selection button to the right of the field and then using the [Label Select] dialog box.



5. Related Documents

The H8/300H Tiny compact emulator and High-performance Embedded Workshop provide many other useful functions that have not been mentioned in this document. Please refer to the following related documents for important information such as detailed specifications, technical information, and restrictions.

Documents Related to the H8/300H Tiny Compact Emulator:

- H8/300H Tiny Compact Emulator Debugger User's Manual
- H8/300H Tiny Compact Emulator Debugger Release Notes

Document Related to High-Performance Embedded Workshop

- High-performance Embedded Workshop User's Manual

Documents Related to CPU

- H8/3664 Group Hardware Manual
- H8/300H Series Programming Manual

Documents Related to H8S, H8/300 Series C/C++ Compiler Package

- Notes on Usage of the C/C++ Compiler Package for H8SX, H8S, H8 Family V.6.01 Release 02 and Corrections in the User's Manual
- H8S, H8/300 Series C/C++ Compiler, Assembler, Optimizing Linkage Editor User's Manual

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Renesas Website and Customer Support

Renesas Technology Website:

http://www.renesas.com/

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http://www.renesas.com/inquiry

Revision History

Rev.	Publication date	Revisions	
		Page	Description
1.00	Jul 09, 2007	-	First edition

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