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April 1st, 2010
Renesas Electronics Corporation

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E6000 Emulators for the H8S Family

How to Use the Conditional Trace Function

Overview

This document describes how to use the conditional trace function of the E6000 full-specification emulator for the H8S/2215.

While the operations described in this document can be performed independently on this H8S/2214 E6000 emulator. These functions are also available through all E6000 emulators for the H8S family.

Contents

1. Specifications

The E6000 emulator has an event detection system; this is available for the accurate description of conditions of interest that define events, which are specified combinations of MCU signals.

Applying the event detection system to the trace acquisition function can make the debugging of user systems very efficient.

Note: The data acquisition, condition checking, and actions (such as stopping the user program) specified for event points are processed by the E6000 hardware, and thus the actions are delayed by several cycles from satisfaction of the condition.

2. Functional Descriptions

This document describes how to use the conditional trace function in the H8S/2214 E6000 emulator.

It guides you through the procedures for setting event points in the sample program provided on the CD-ROM for the H8S/2214 E6000 emulator and making conditional trace settings for the event points, and describes the acquisition of trace information on a program in execution.

Product version: E6000 Emulator Software V.6.01 Release 00

3. Software Preparation

3.1 Introduction

Expand the sample program (tutorial workspace) to be used with this document onto your personal computer by installing the software provided on the CD-ROM for the H8S/2214 E6000 emulator.

If the High-performance Embedded Workshop has already been installed on the personal computer where you are installing the software, some dialog boxes in the installation process may be skipped.

3.2 Installing the E8 Emulator Software

Execute setup.exe from the CD-ROM for the H8S/2214 E6000 emulator.

For details on installation, refer to the Setup Guide for the E6000 Emulator and follow the instructions displayed on the screen. The procedure is not described in this document.

3.3 Installing Other Necessary Software

(1) Install the software that corresponds to the type of connection (PCI card, PC card, LAN, or USB adaptor) supported by the host interface board that has been selected for the H8S/2214 E6000 emulator. The installation procedure is described in the manual supplied with the host interface board and is not covered in this document.

(2) The procedures in this document include the modification of part of the sample program before checking program operation. For this purpose, the H8S, H8/300 series C/C++ compiler package is necessary. If you already have the product version of the compiler package, install it.

(3) If you do not have the product version of the compiler package, an evaluation version is available free of charge from the Renesas website. From the top page of the Renesas site, go to [Support] -> [Software Download for Tools], select [Evaluation Software] from [Category:], and search for the H8S, H8/300 series C/C++ compiler package. For the address of the Renesas website, refer to section 5, Related Documents. For restrictions on usage and the procedure for installing the evaluation version of the compiler package, refer to the download page.

4. Operations

This section describes how to activate the High-performance Embedded Workshop (HEW) and how to use the conditional trace function in the following steps.

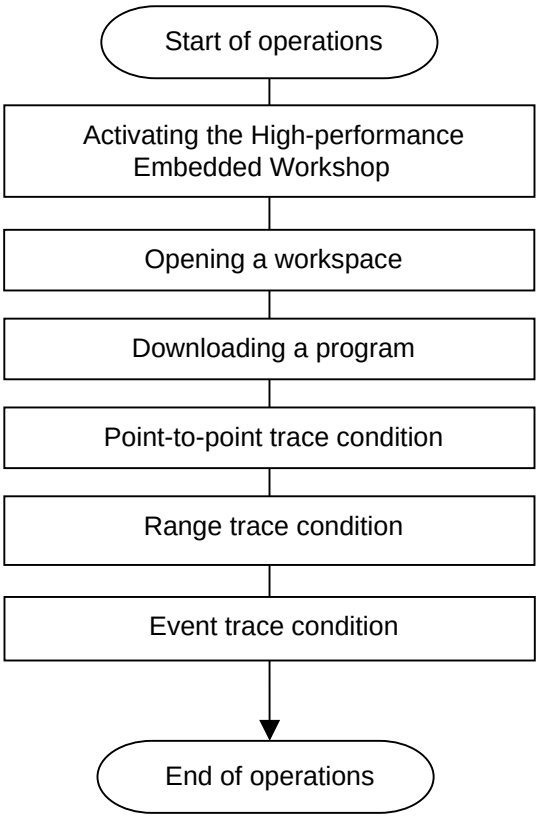
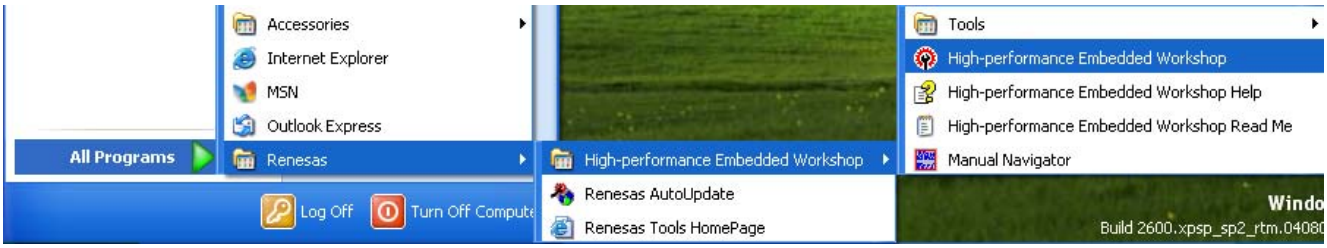


Figure 4.1 Procedure for Sample Program Execution

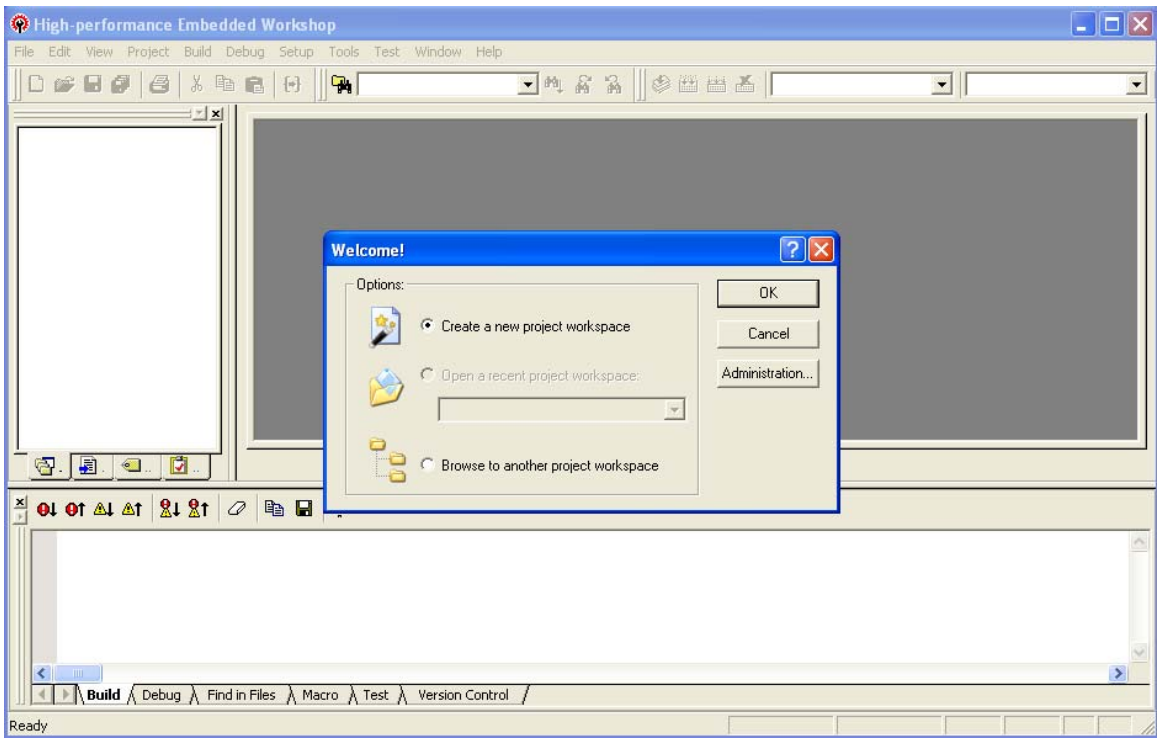
4.1 Activating the High-performance Embedded Workshop

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.



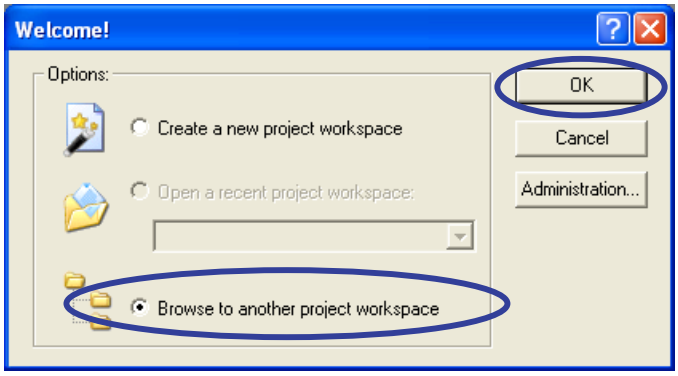
4.2 Opening a Workspace

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

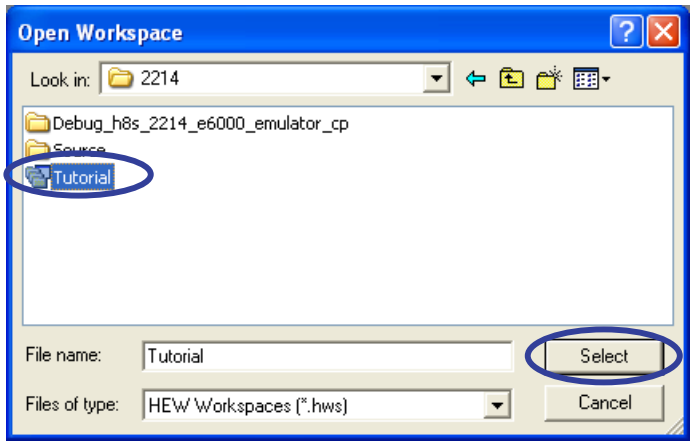


Check that power to the H8S/2214 E6000 emulator is turned on.

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 the emulator has been installed, the workspace "Tutorial.hws" will be in the folder shown below (standard location). Specify the correct location by opening the folders in order. Select the workspace "Tutorial.hws" and click on the [Select] button.

C:¥WorkSpace¥Tutorial¥E6000¥2214¥Tutorial.hws
C:¥WorkSpace └Tutorial └E6000 └2214 └Tutorial.hws

Note: The above directory will not be specifiable for some earlier versions of the High-performance Embedded Workshop. In this case, select the directory indicated below.

<High-performance Embedded Workshop installation directory>

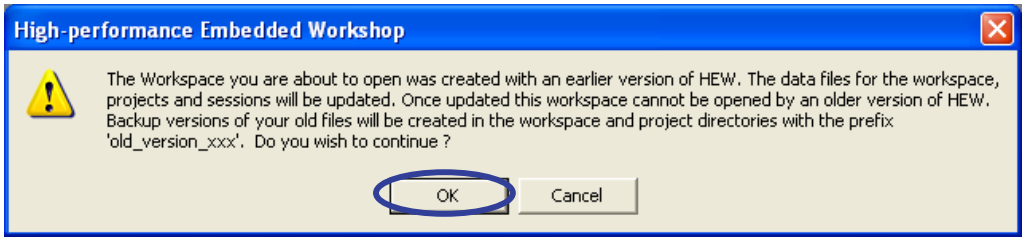
¥Tools¥Renesas¥DebugComp¥Platform¥E6000¥2214¥Tutorial

Examples:

C:¥hew3¥Tools¥Renesas¥DebugComp¥Platform¥E6000¥2214¥Tutorial

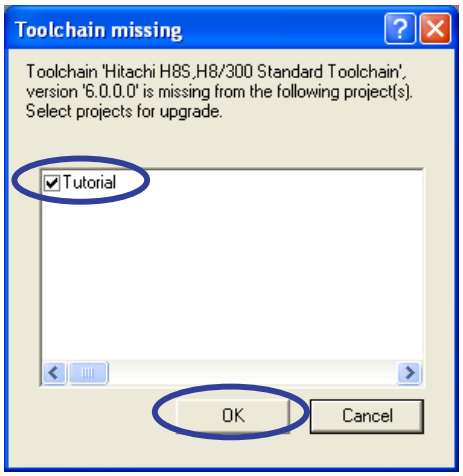
C:¥hew2¥Tools¥Renesas¥DebugComp¥Platform¥E6000¥2214¥Tutorial

(3) If the workspace was made with an old version of the High-performance Embedded Workshop, the following dialog box will appear.

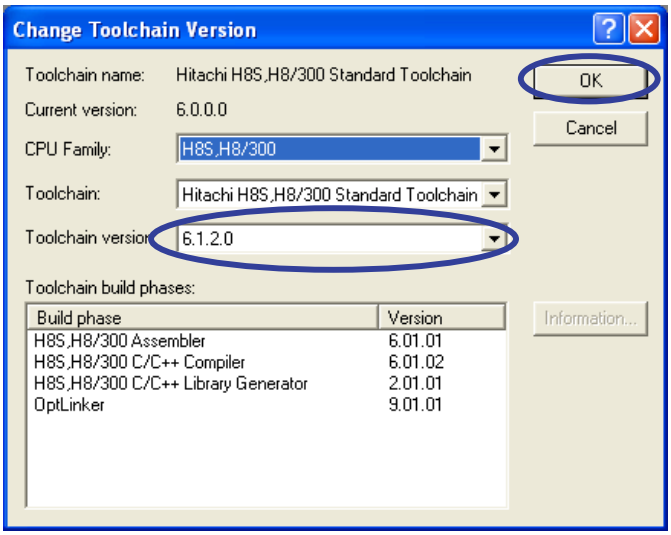


To update it to the new version, click on the [OK] button.

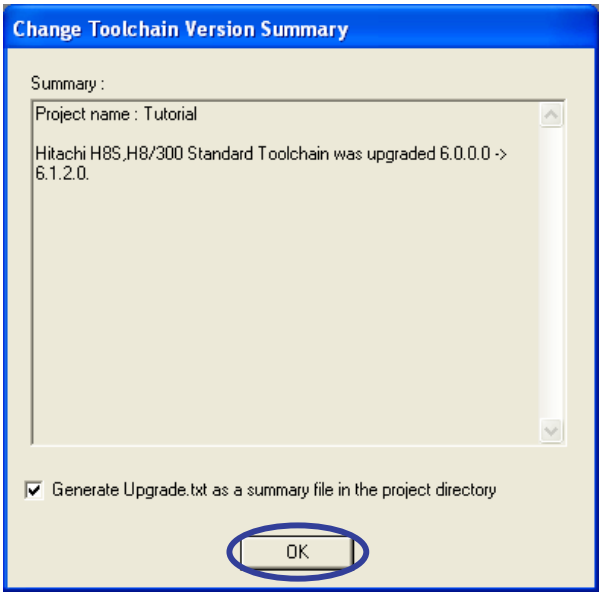
(4) If the [Toolchain Version Not Registered in System] dialog box appears, select the name of the target project and click on the [OK] button.



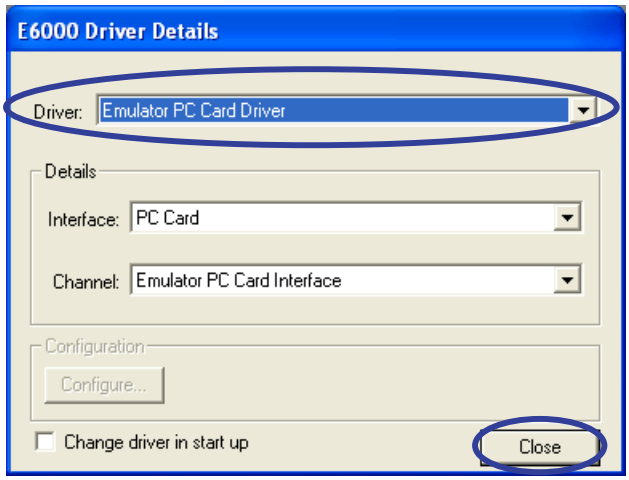
(5) If the [Change Toolchain Version] dialog box appears, select the desired toolchain version and click on the [OK] button.



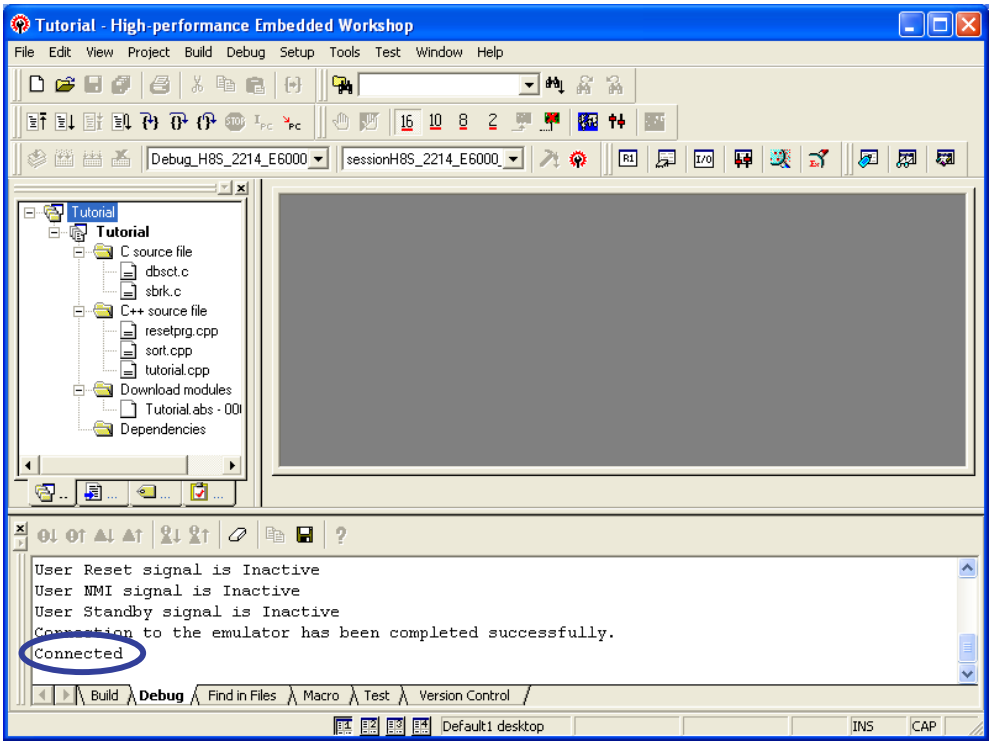
(6) If the [Change Toolchain Version Summary] dialog box appears, just click on the [OK] button.



(7) The workspace will open and the High-performance Embedded Workshop will be automatically connected to the emulator. The [E6000 Driver Details] dialog box may open when the emulator is connected. In this case, select the driver in use and click on the [Close] button.



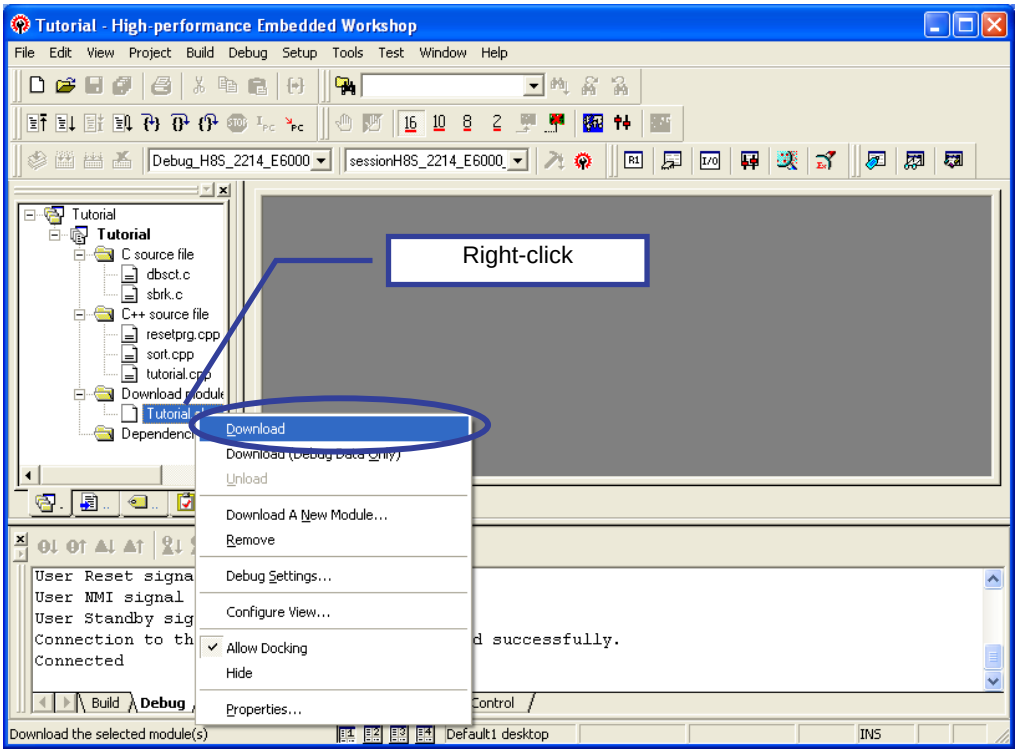
(8) After the workspace has been read, operations in the High-performance Embedded Workshop window can proceed.



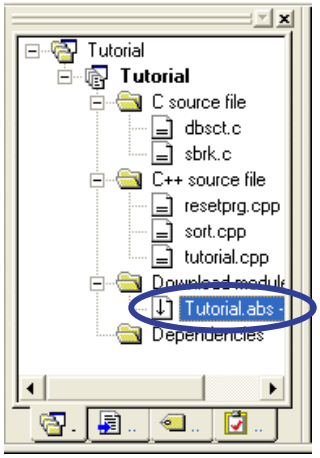
When the E6000 emulator has been successfully connected, "Connected" is displayed in the [Debug] tabbed page of the Output pane.

4.3 Downloading a Program

(1) Right-click on the download module "Tutorial.abs" in the workspace and select [Download] from the menu.

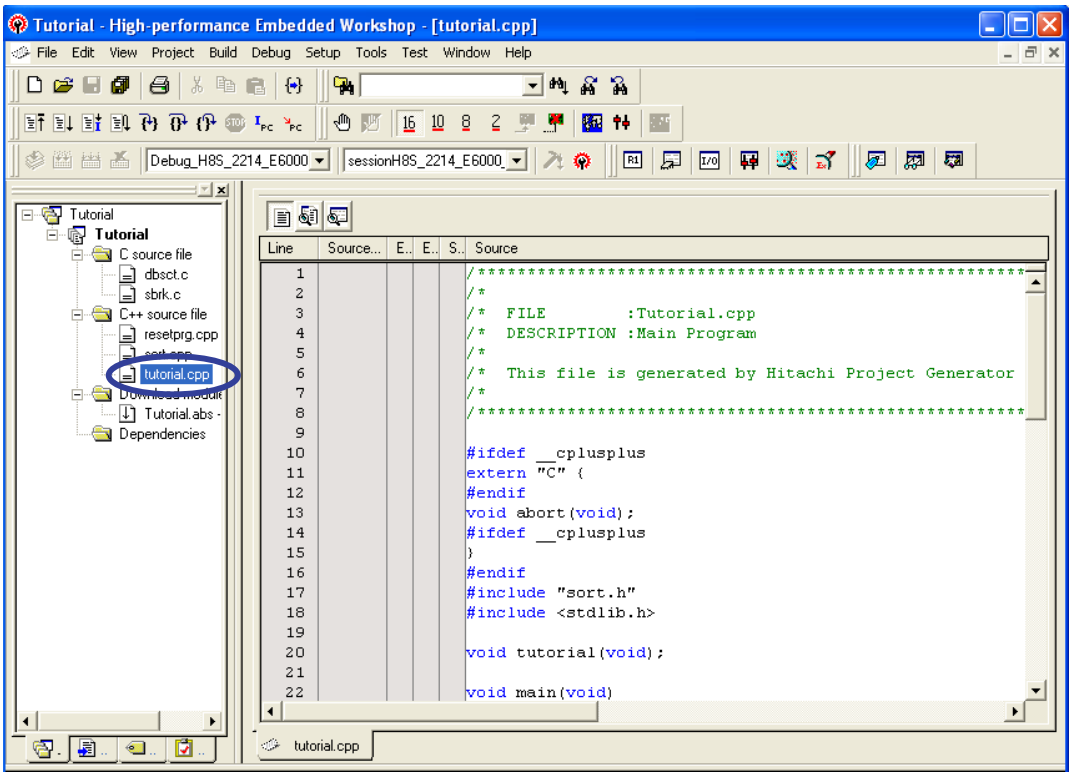


(2) After downloading of the program has been completed, a downward arrow is added to the icon at left of the file name.

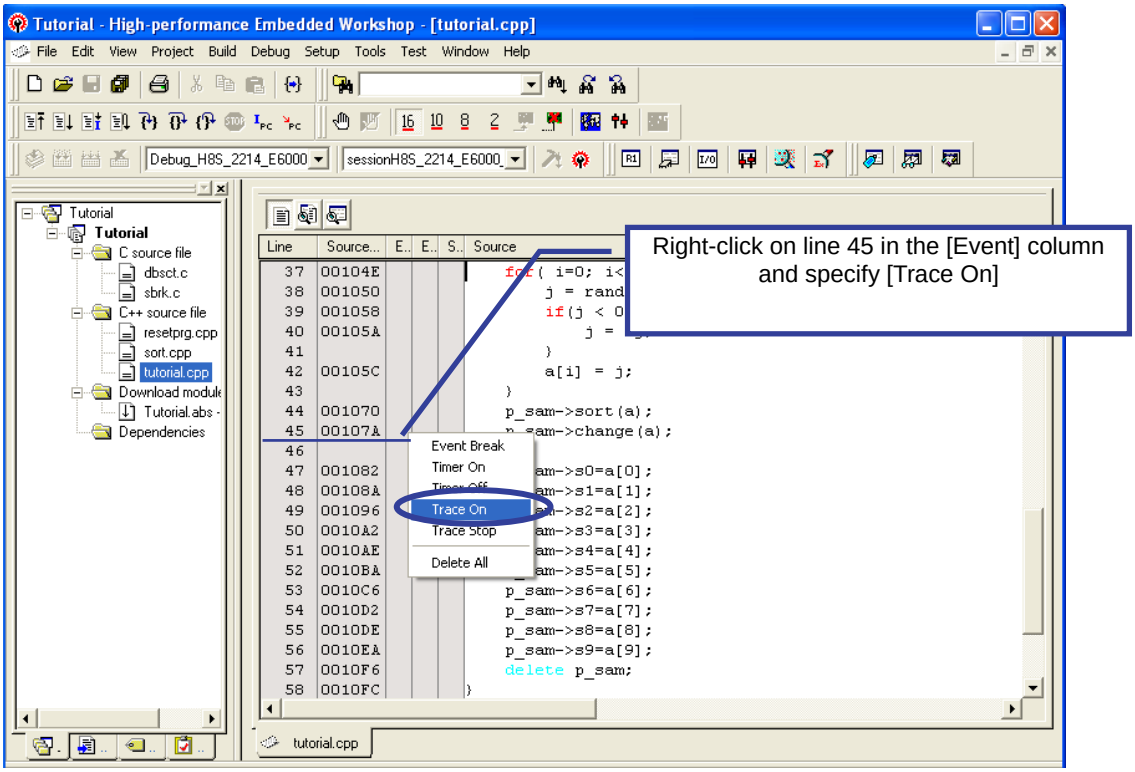


4.4 Point-to-Point Trace Condition

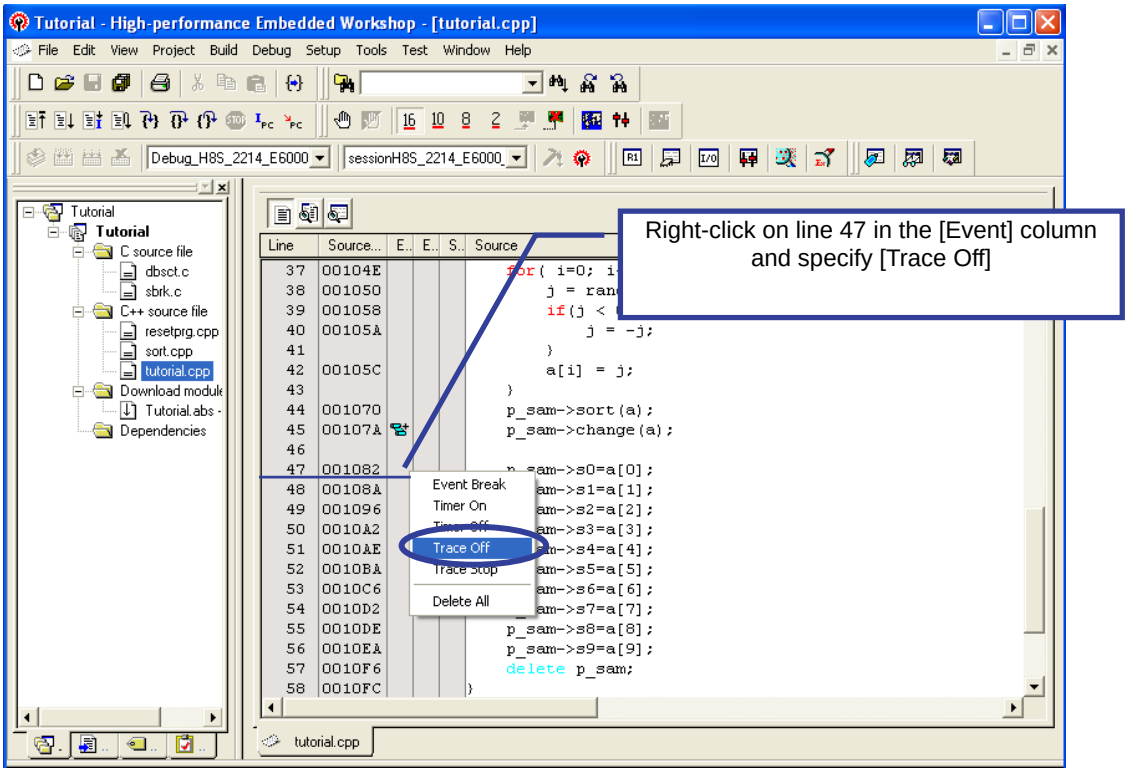
(1) Double-click on the file name "tutorial.cpp" in the workspace so that its contents are displayed in the [Source] pane.



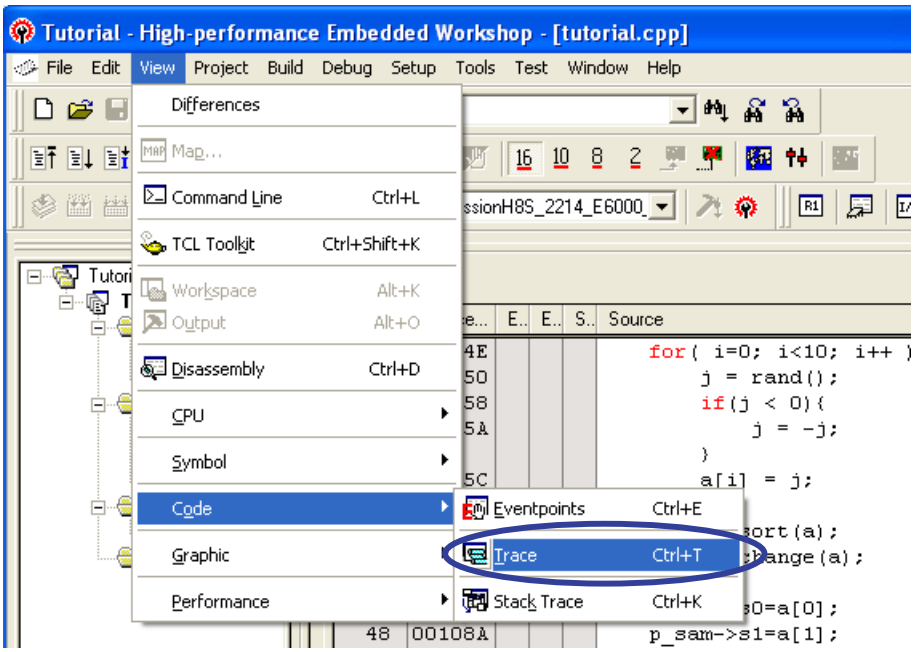
(2) Scroll the [Source] pane down to display the range around line 45. Then, right-click on line 45 in the [Event] column and select [Trace On] from the popup menu.



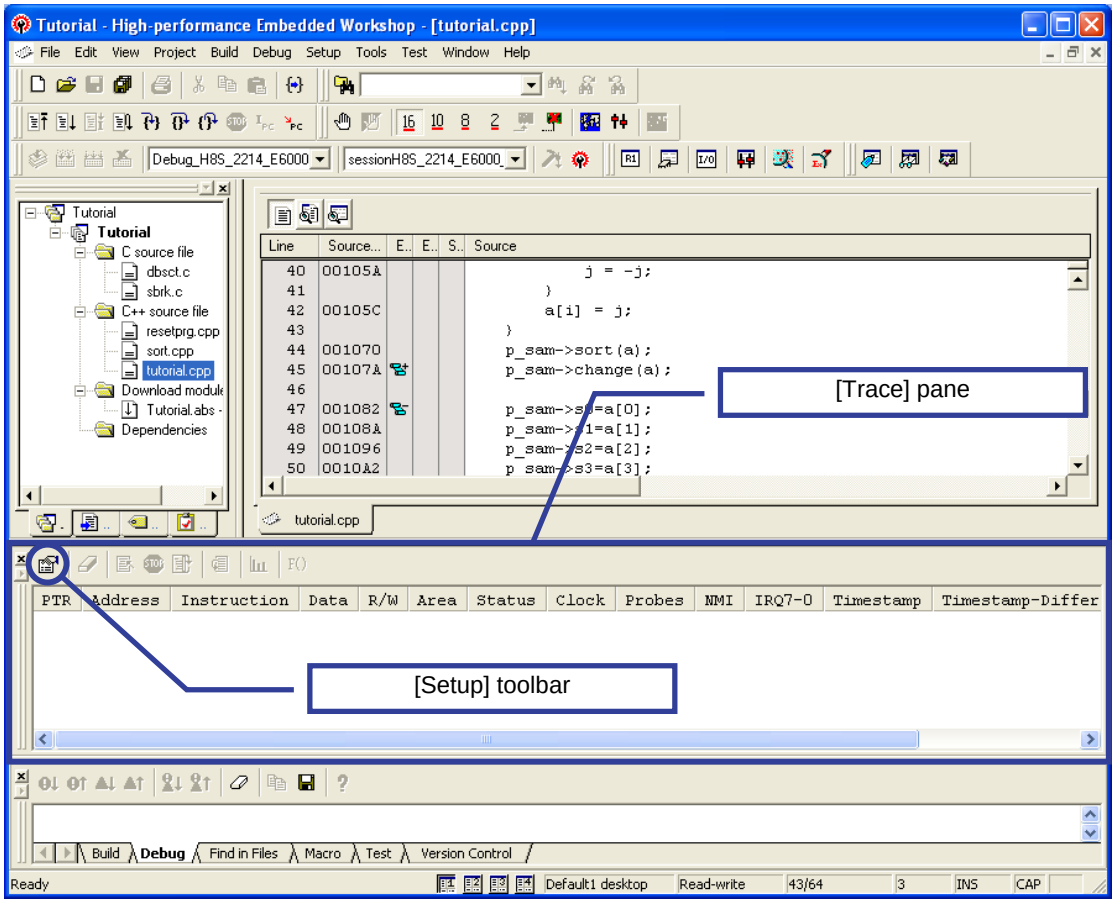
(3) Right-click on line 47 in the [Event] column and specify [Trace Off].



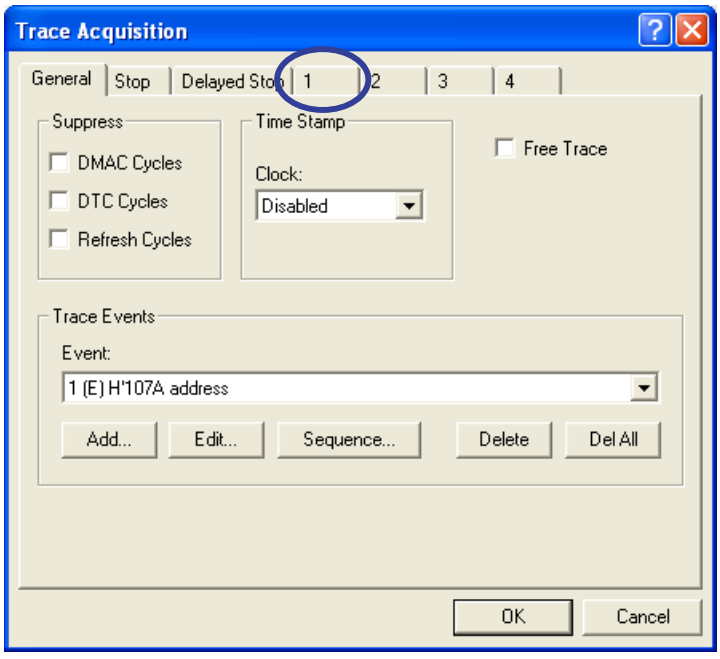
(4) Select [Code] from the [View] menu and click on [Trace] to open the [Trace] pane.



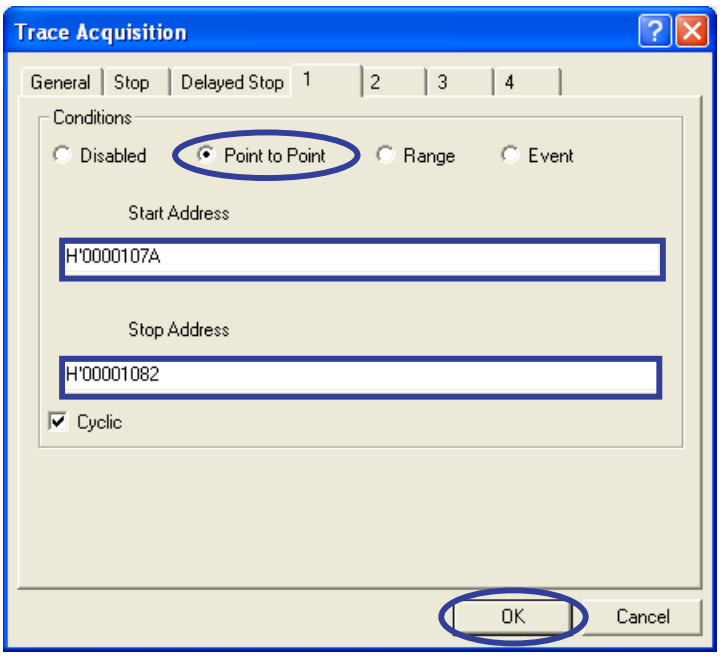
(5) The [Trace] pane will appear. Click on the [Setup] toolbar button in the [Trace] pane.



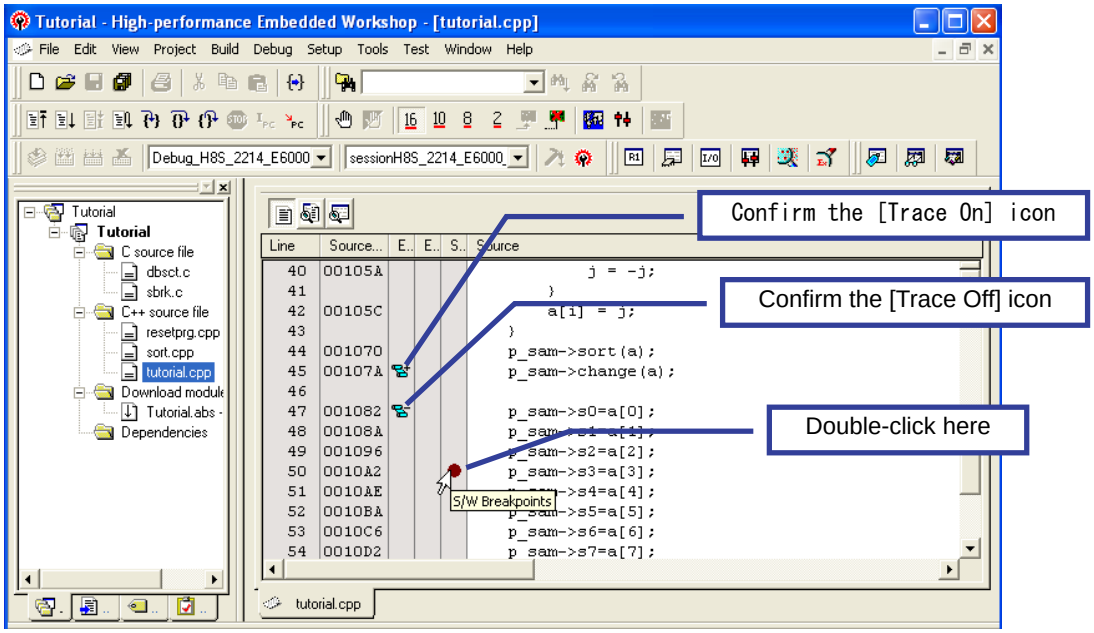
(6) The [Trace Acquisition] dialog box will appear. Click on tab [1].



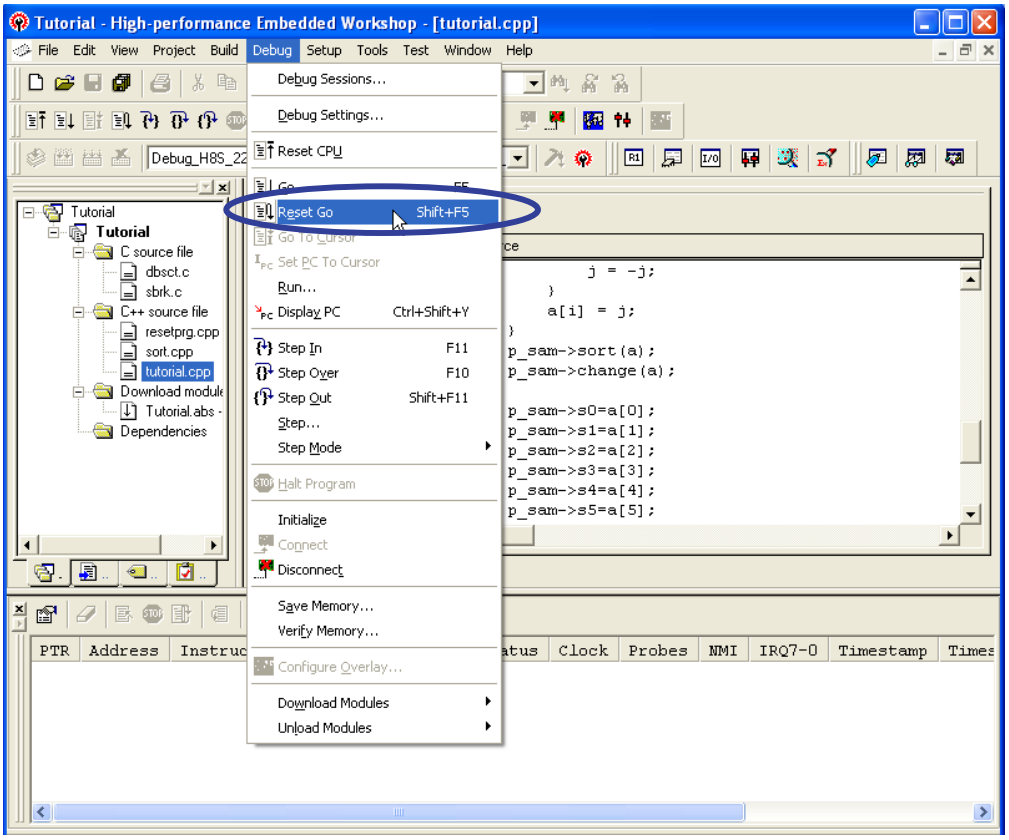
(7) Check that [Point to Point] has been selected for [Conditions] and [Start Address] and [Stop Address] have been set, then click on the [OK] button.



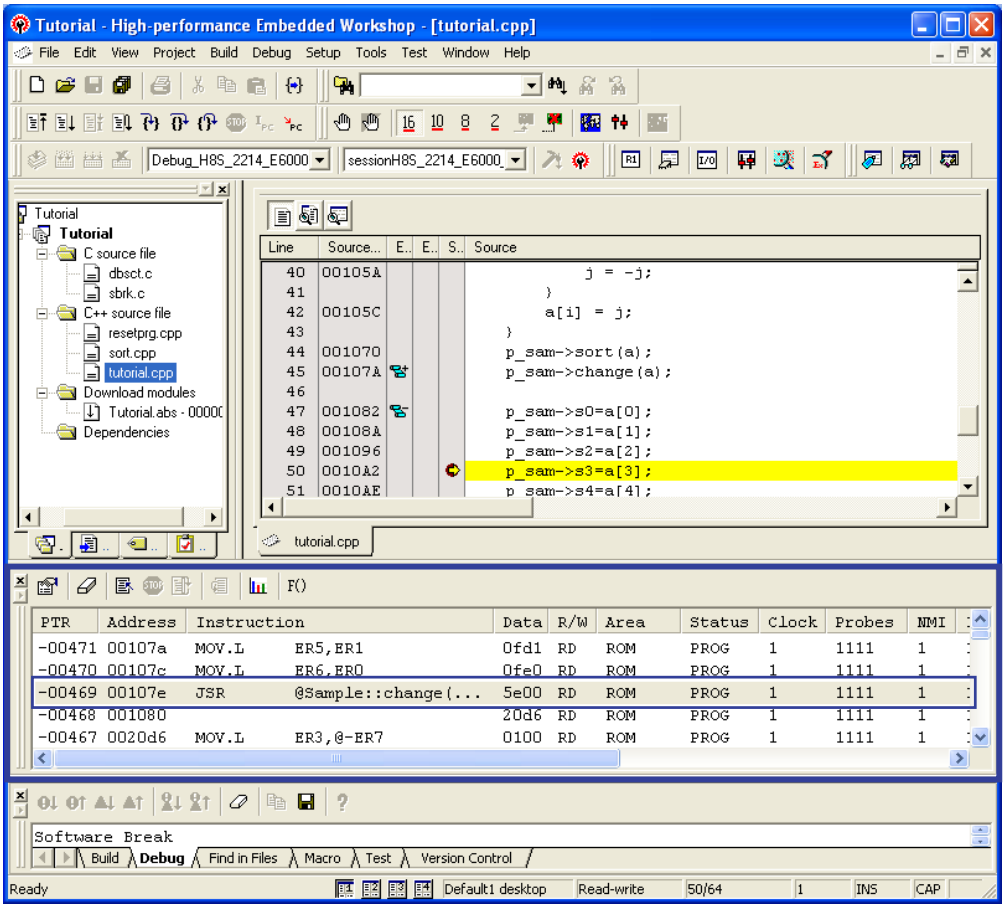
(8) Set a software break on line 50.



(9) Select [Reset Go] from the [Debug] menu to execute the program.

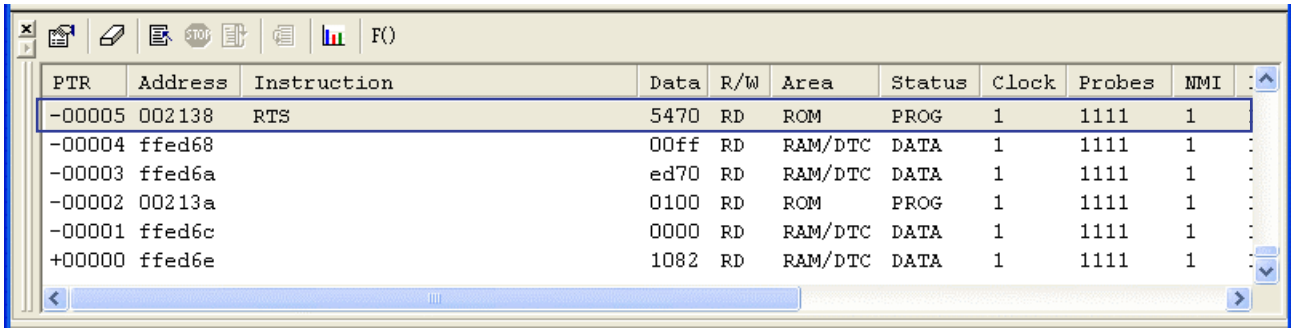


(10)The program is executed and execution stops at the software breakpoint on line 50.



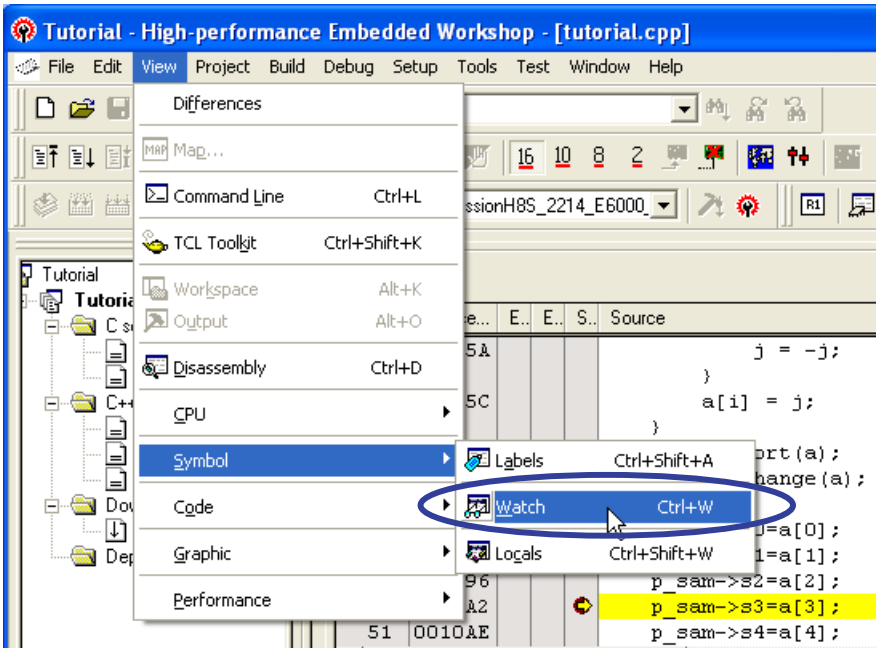
Trace information acquired under the point-to-point condition between [Trace On] and [Trace Off] is displayed in the [Trace] pane; i.e., tracing was continuously performed from the call of function "Sample::change()"on line 45 to the return to line 47 of the source file.

In the [Instruction] column at cycle position "-00469" (under [PTR]), we can confirm the presence of a JSR instruction which corresponds to the call of function "Sample::change()". When the contents of the [Trace] pane are scrolled down until the data for the zeroth cycle position are displayed, we find an RTS instruction under [Instruction] where the value under [PTR] is "-00005". This is the return from subroutine for function "Sample::change()".

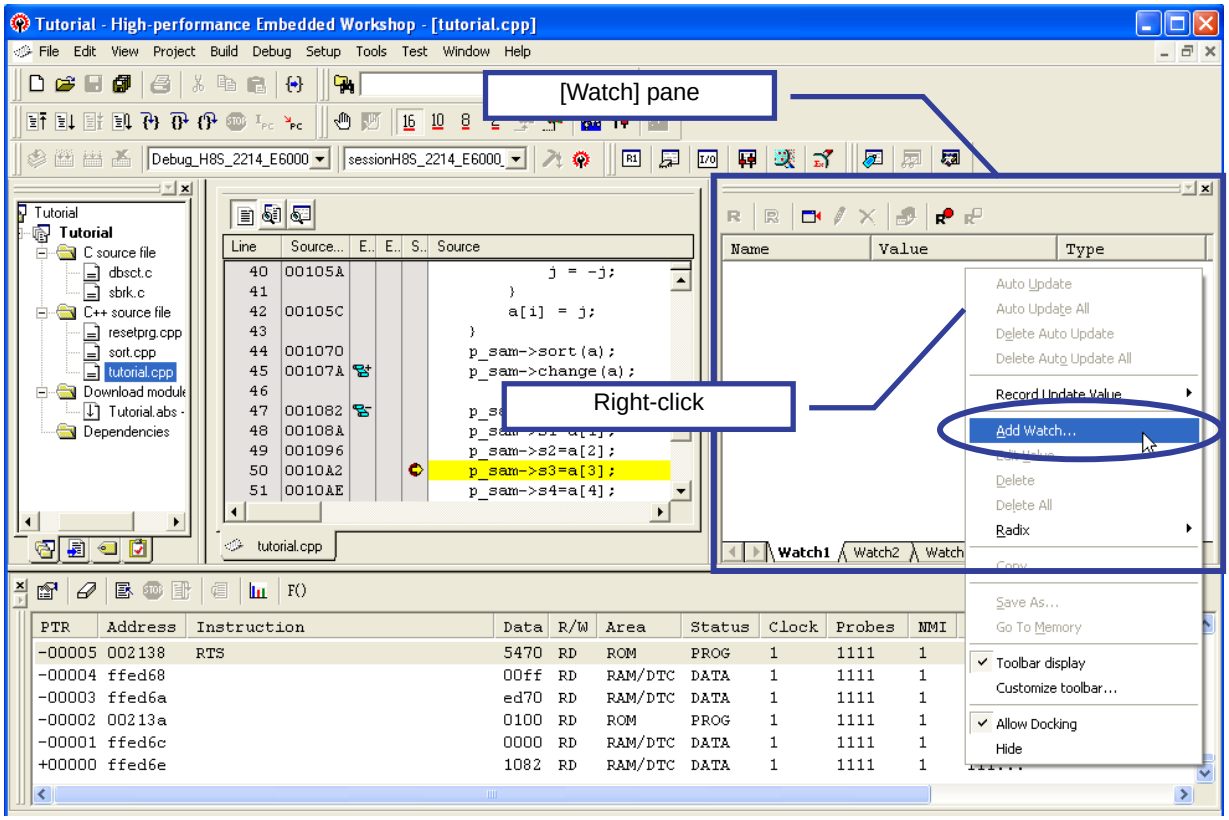


4.5 Range Trace Condition

(1) The following shows an example of the use of a range trace condition. Select [Symbol]->[Watch] from the [View] menu.

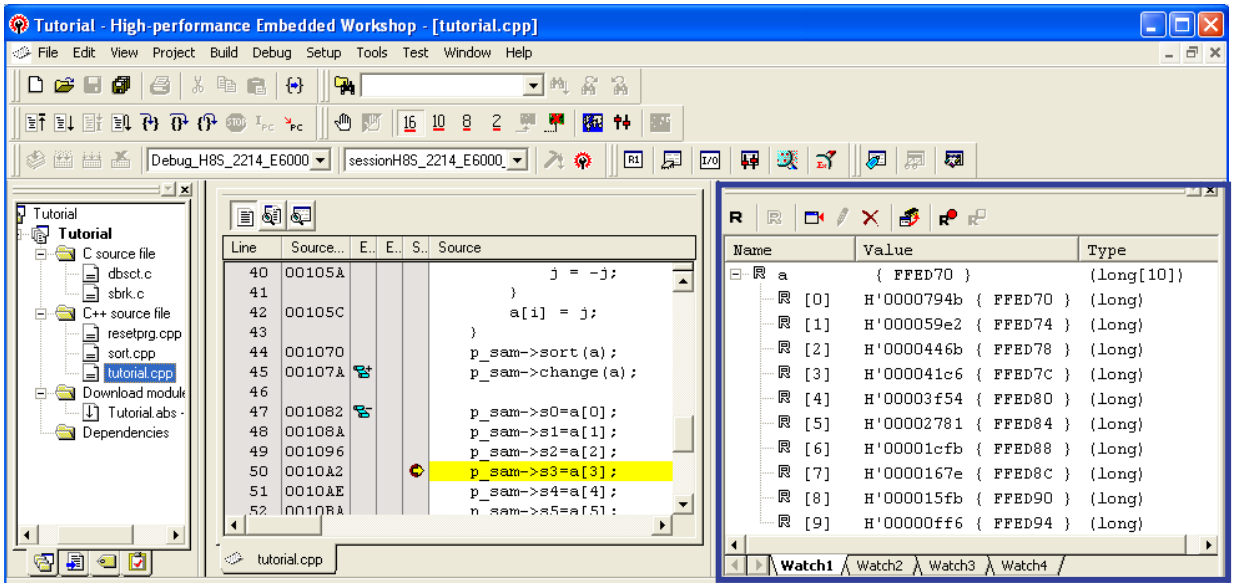


(2) The [Watch] pane will appear. Right-click on the [Watch] pane and select [Add Watch...] from the popup menu.



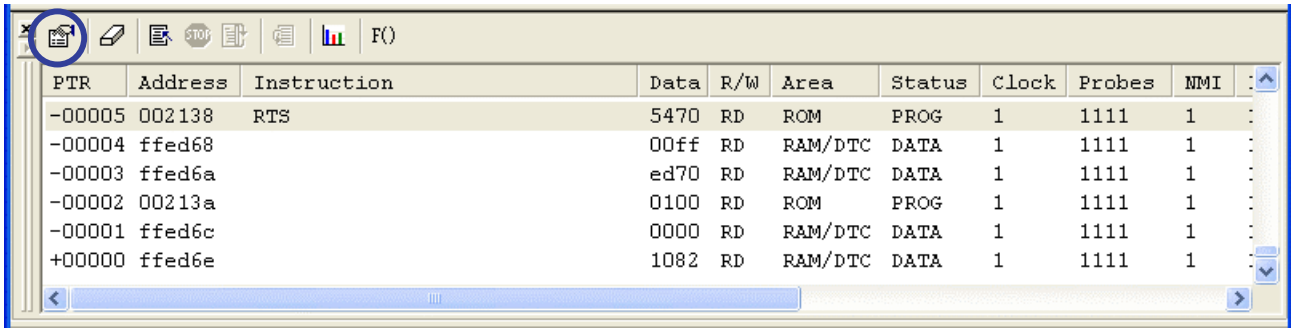
(3) The [Add Watch] dialog box will appear. Enter "a" (symbol name) in the [Variable or expression:] edit box.

(4) Symbol "a" is now registered in the [Watch] pane. Click on [+] to expand the display of "a" and show its contents.

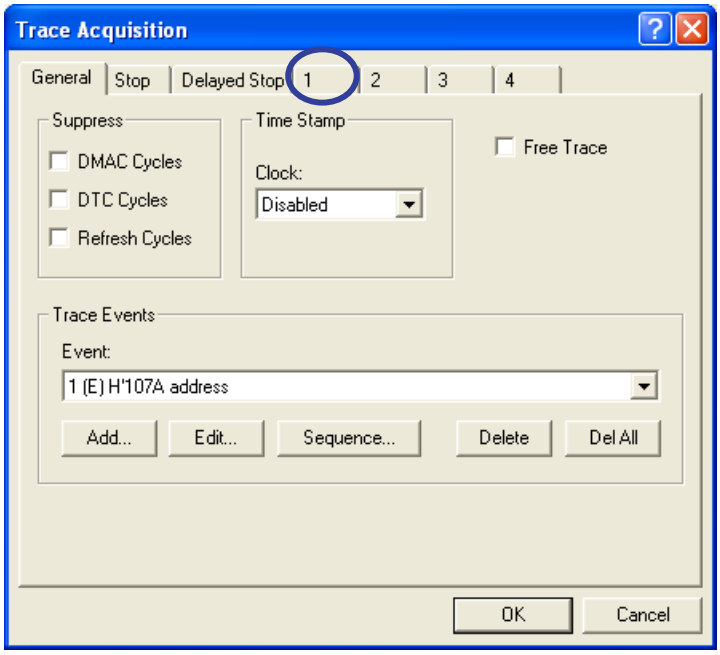


Symbol "a" is an array of ten elements of type long. In this case, the whole array is allocated to the address area from H'FFED70 to H'FFED97.

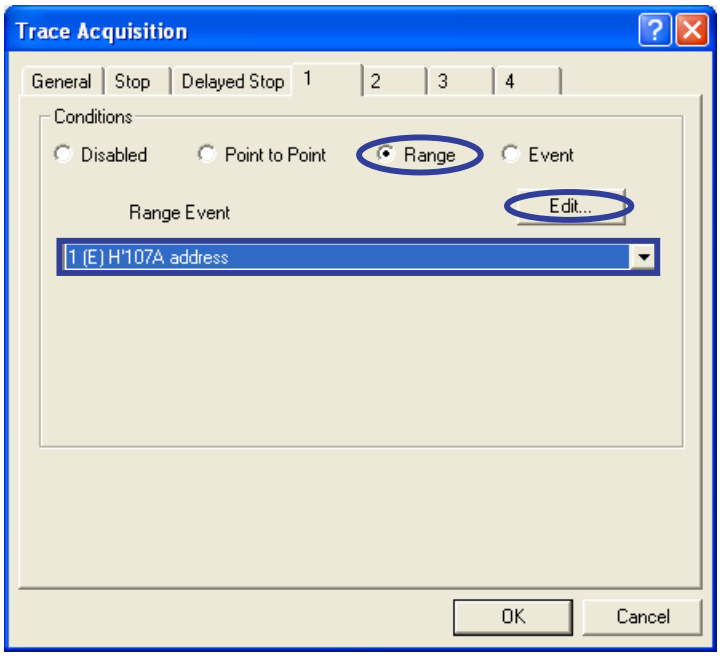
(5) Click on the [Setup] toolbar button in the [Trace] pane.



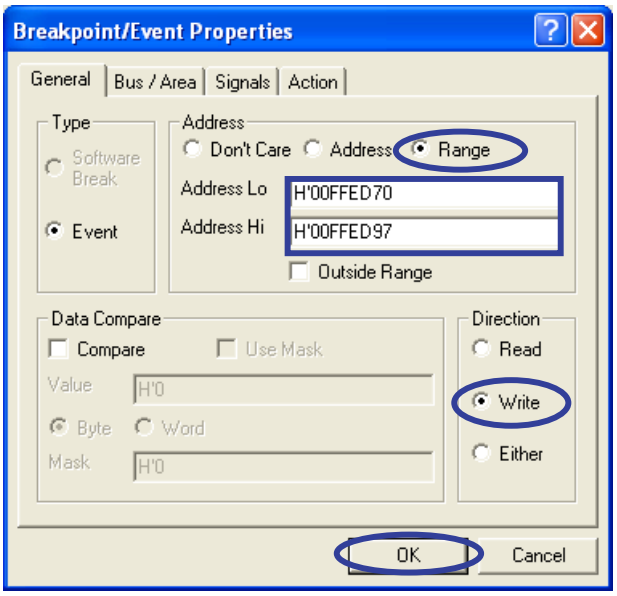
(6) The [Trace Acquisition] dialog box will appear. Click on tab [1].



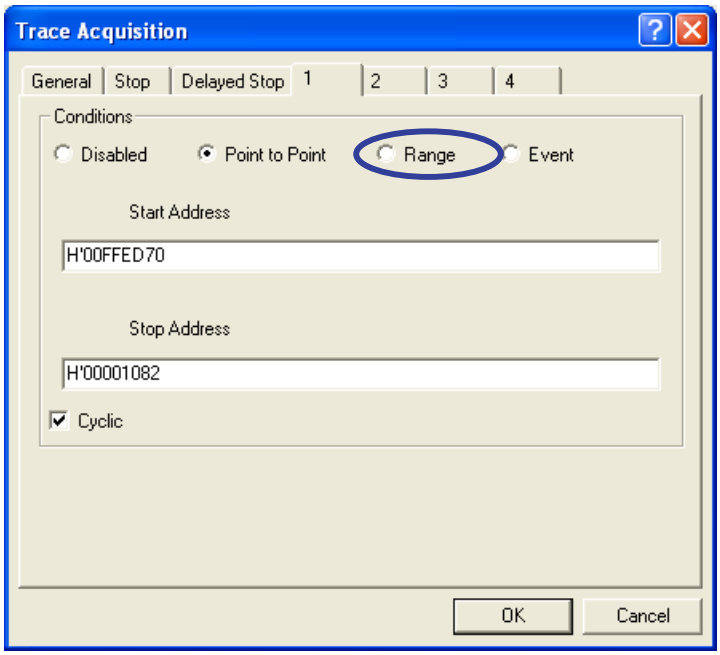
(7) Select the [Range] radio button for [Conditions]. Click on the [Edit] button after selecting the condition of channel 1 for [Range Event].



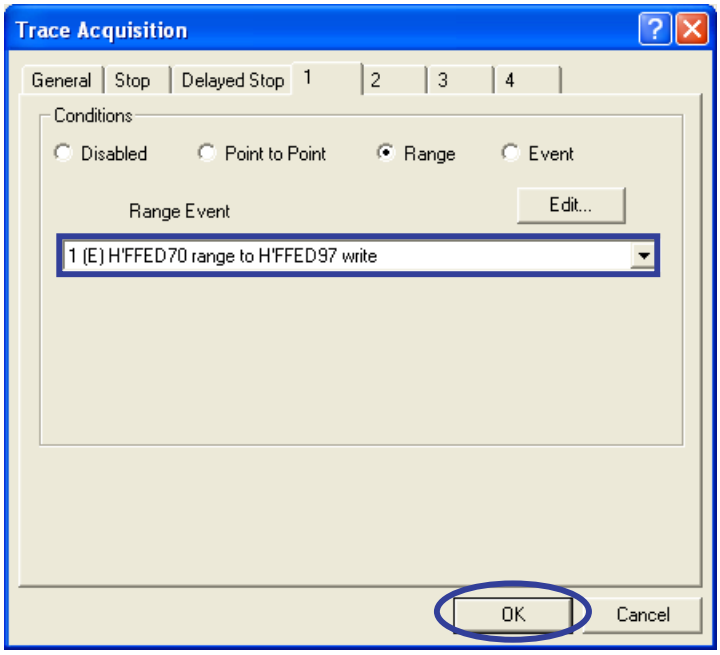
(8) The [Breakpoint/Event Properties] dialog box will appear. Select the [Range] radio button for the condition of [Address] and specify H'00FFED70 and H'00FFED97 for [Address Lo] and [Address Hi], respectively. This address range is the region to which symbol "a" has been allocated, as described in (4) above. Select the [Write] radio button as the [Direction] condition and click on the [OK] button.



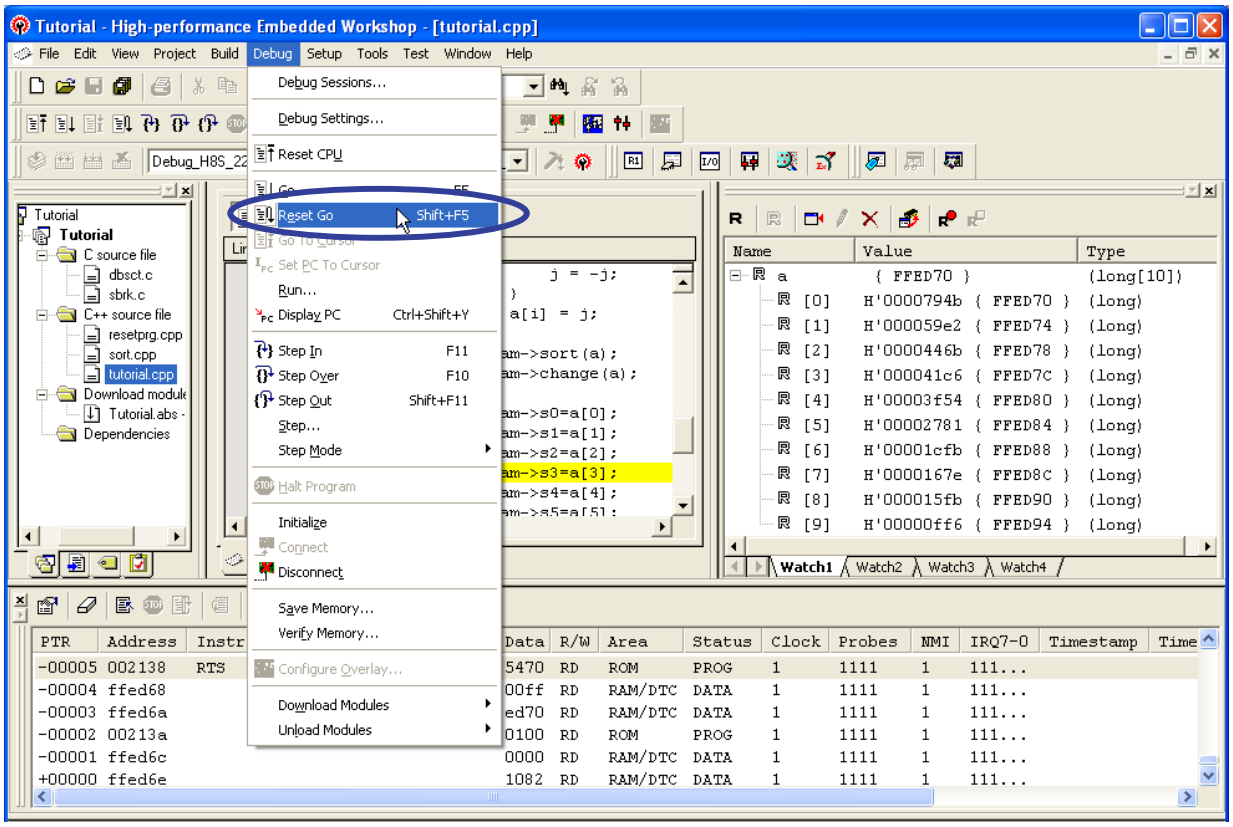
(9) If the condition under [Conditions] has been switched to [Point to Point], specify the condition [Range] again.



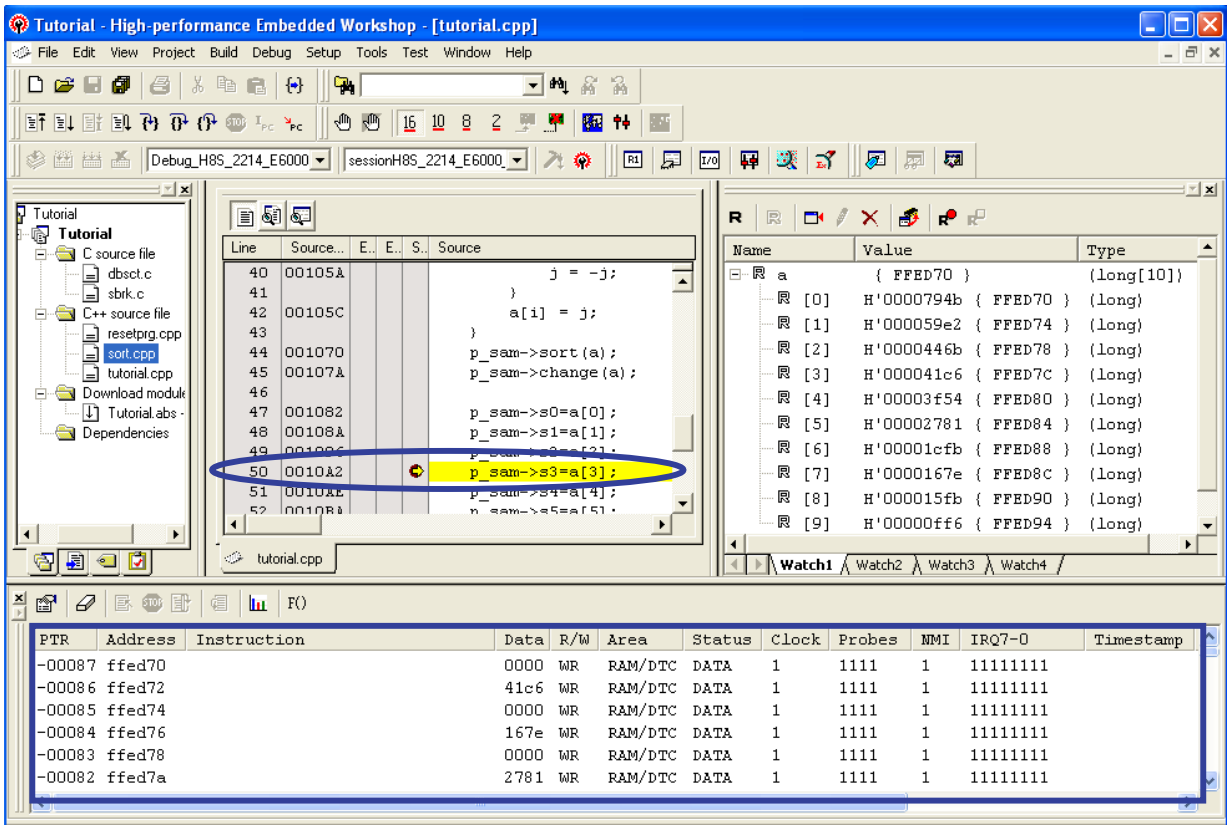
(10)Check the condition under [Range Event] for channel 1 and click on the [OK] button.



(11) Pull down the [Debug] menu and click on [Reset Go].



(12)Here, in the same way as in the previous section, execution of the program is stopped at the software breakpoint on line 50.

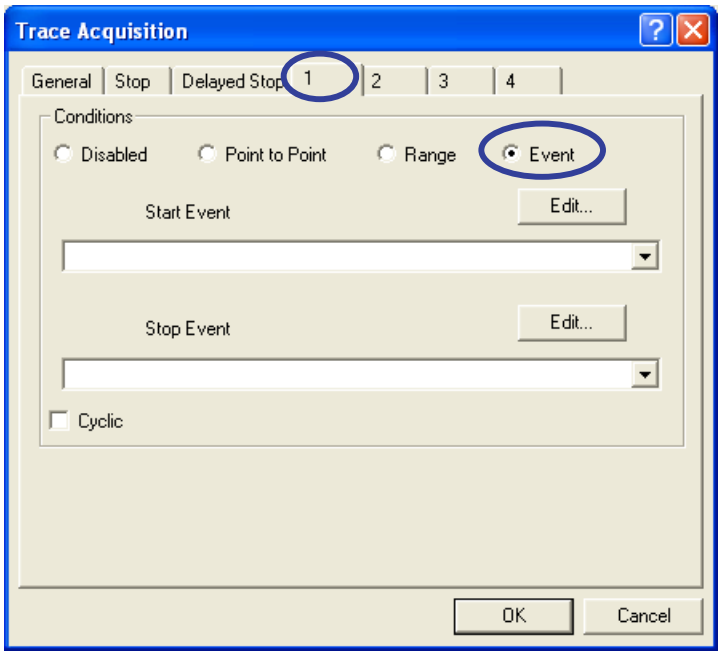


In the trace buffer, data have been acquired on memory-write cycles for the address range specified as the range condition. By checking the [Address] and [Data] columns, we can verify the values that have been written to the memory range we are looking at, and the order in which they were written.

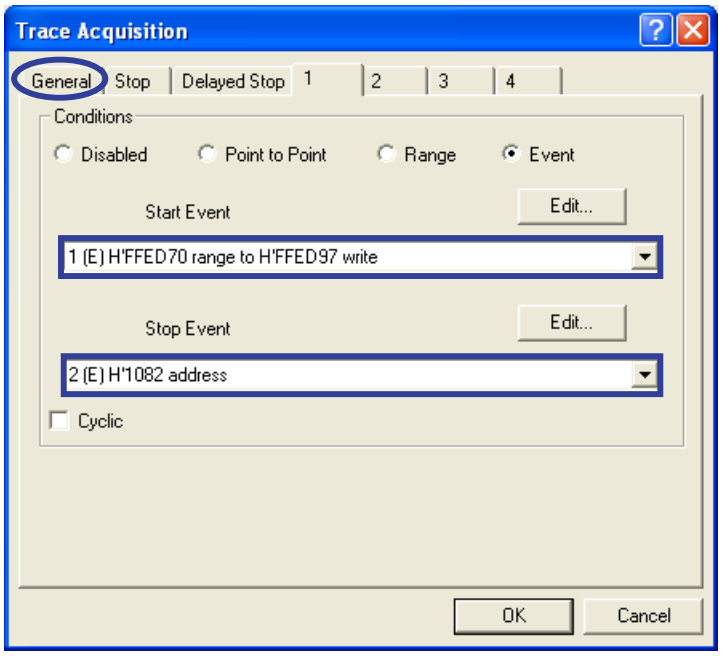
Here, since data-write cycles have only been selected as the conditions of trace acquisition, the [Instruction] column will be blank. By enabling the condition [Time Stamp] in the [Trace Acquisition] dialog box in step (6) above, we can record information on the timing with which the data were written in the corresponding column.

4.6 Event Trace Condition

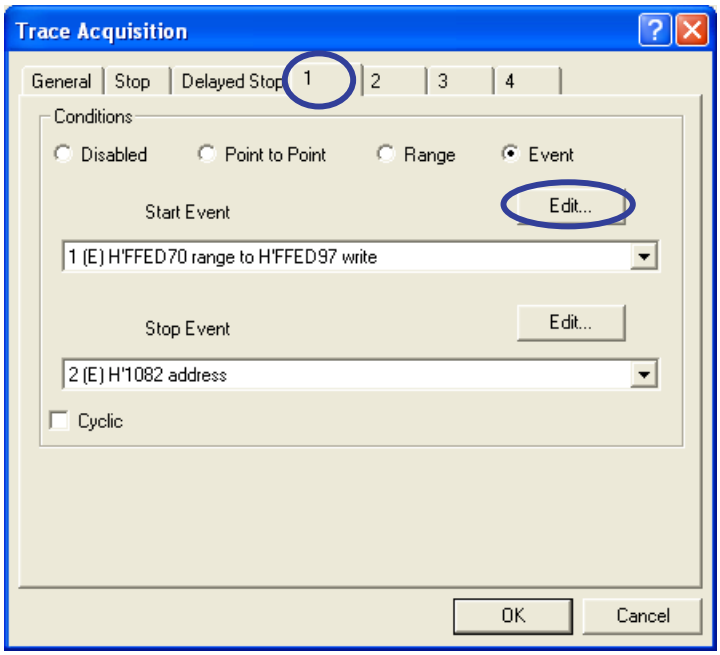
(1) The following shows an example of the use of event trace conditions. Click on the [Setup] toolbar button in the [Trace] pane to open the [Trace Acquisition] dialog box. Then, click on tab [1] and select [Event] under [Condition].



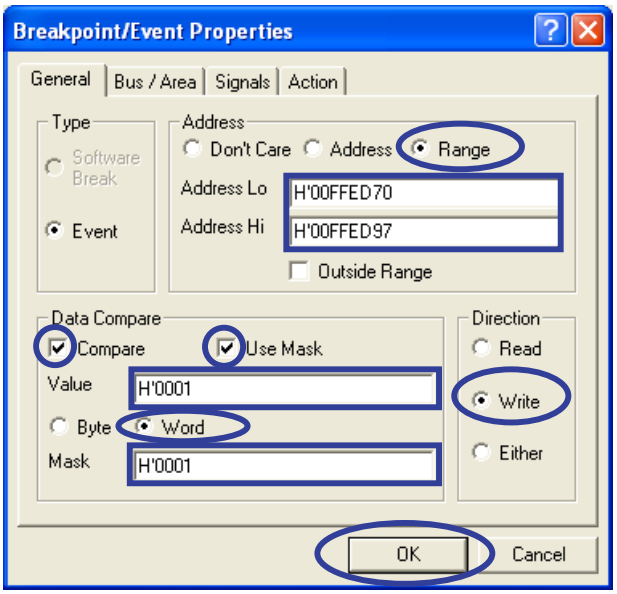
(2) Select the conditions of channels 1 and 2 for [Start Event] and [Stop Event], respectively. The current event conditions of channels 1 and 2 are not relevant at this point. Before editing the individual event conditions, click on the [General] tab.



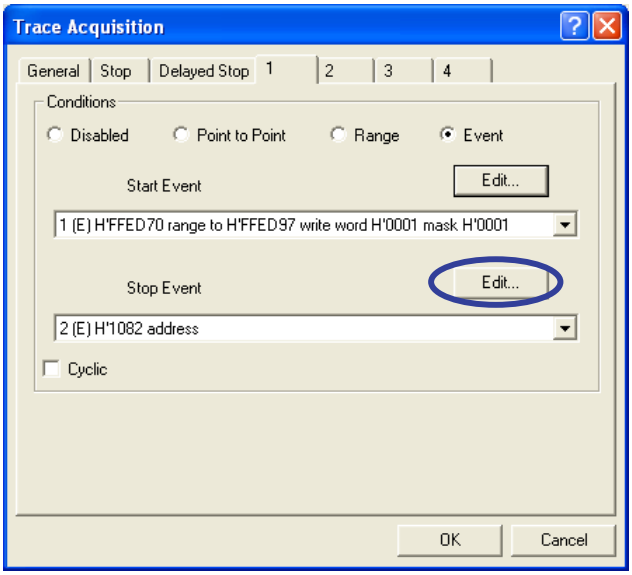
(3) Select tab [1] again and click on the [Edit] button for [Start Event].



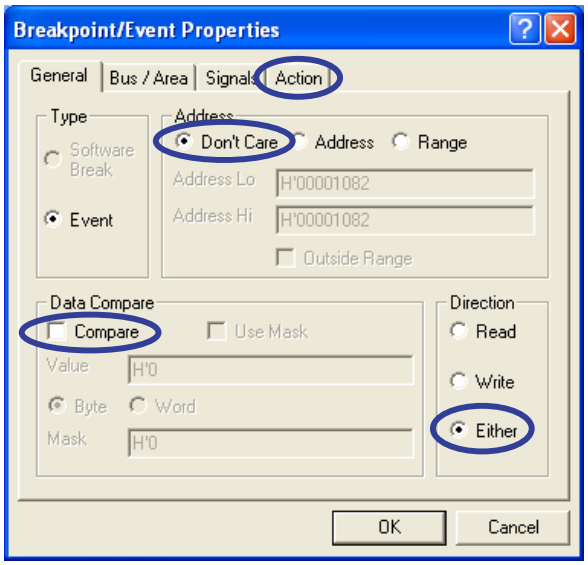
(4) The [Breakpoint/Event Properties] dialog box will appear. Select the [Range] radio button for the condition [Address] and specify the first and last addresses of the range to which symbol "a" has been allocated as [Address Lo] and [Address Hi], respectively. Then, enable [Data Compare] and [Use Mask], specify "H'0001" for [Value] and [Mask], and select the [Word] radio button. Finally, select the [Write] radio button for the condition [Direction] and click on the [OK] button.



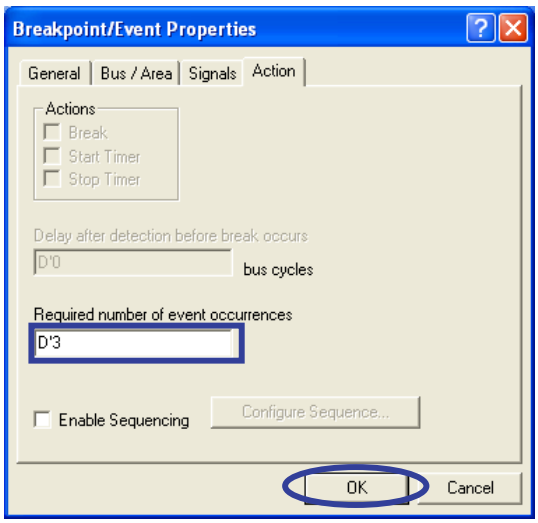
(5) Click on the [Edit] button for [Stop Event].



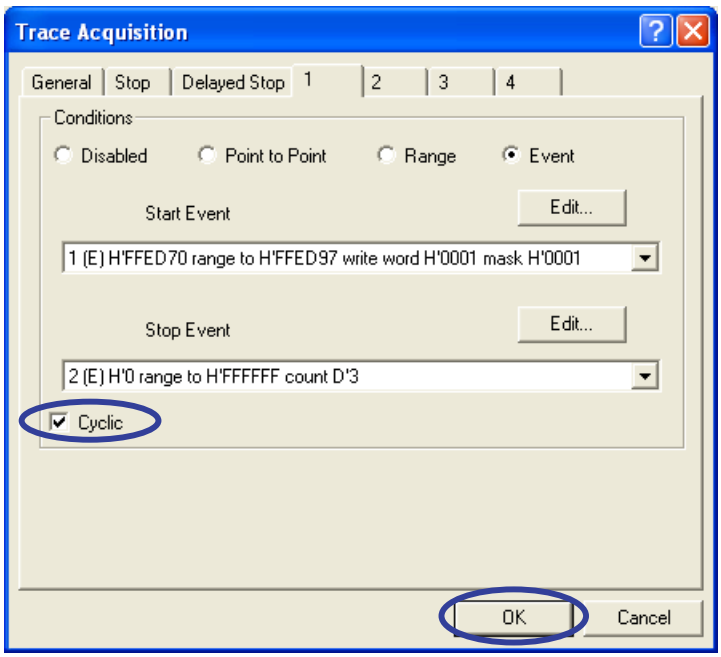
(6) Specify [Don't care] for [Address] on the [General] tabbed page, clear the [Compare] button under [Data Compare], set [Direction] to [Either], and then select the [Action] tabbed page.



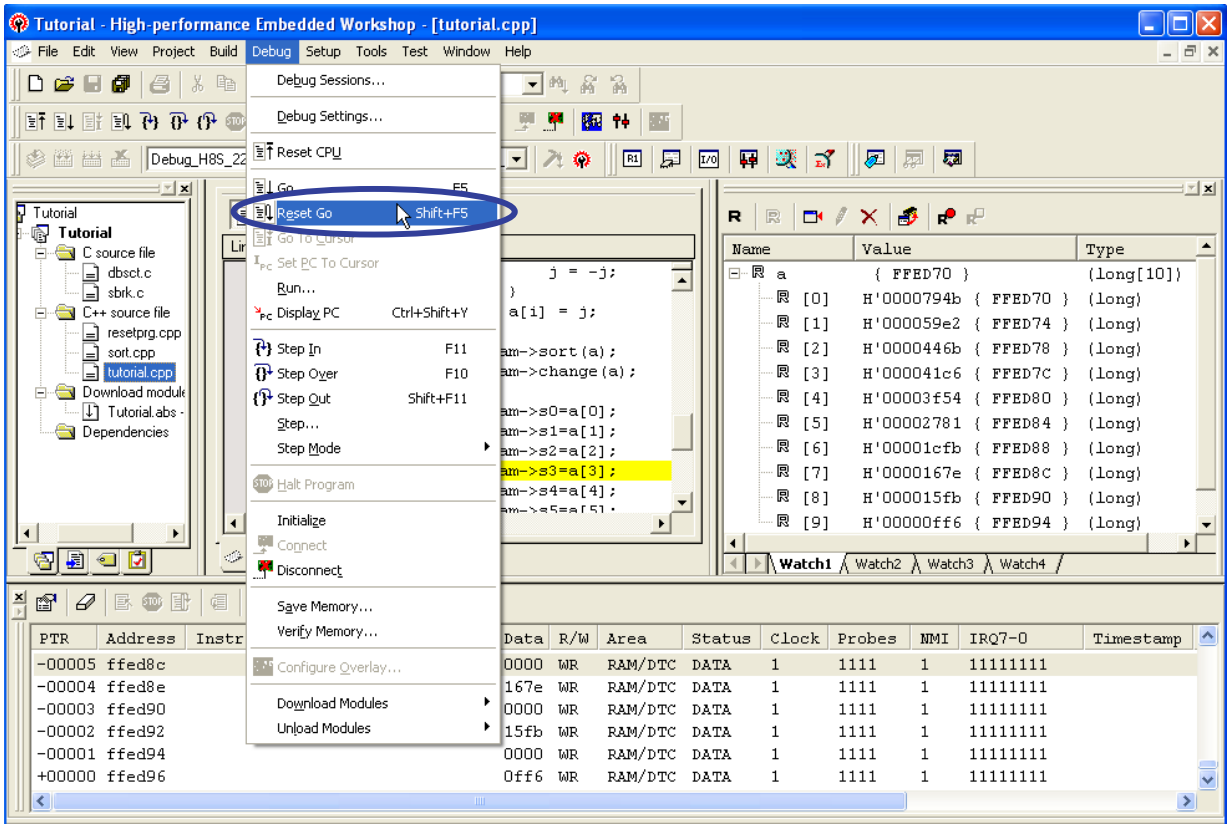
(7) Specify "D'3" under [Required number of event occurrences], ensure that [Enable Sequencing] is disabled, and then click on the [OK] button.



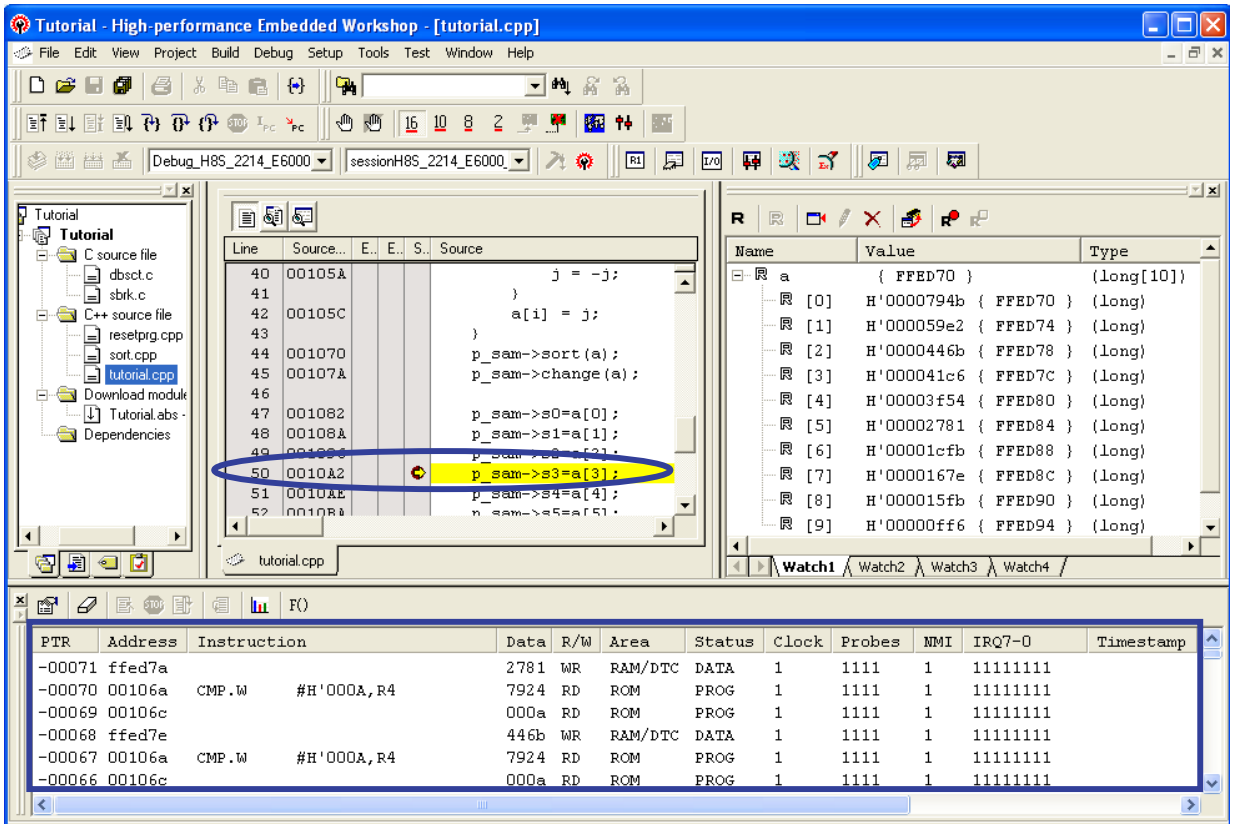
(8) Select [Event] under [Conditions], check the contents of the [Start Event] and [Stop Event] conditions, set [Cyclic] as enabled, and click on the [OK] button.



(9) Pull down the [Debug] menu and click on [Reset Go].



(10)Here, in the same way as in the previous section, execution of the program is stopped at the software breakpoint on line 50.



The trace buffer contains data gathered by trace acquisition that started when odd-valued data was written to an address in the range specified as a condition for [Start Event], with consecutive cycles recorded until three instances of any kind of memory access (the condition for [Stop Event]). Since [Cyclic] has been enabled, the trace information between the two conditions will be recorded whenever they occur in order during emulation.

Thus, trace information including the operation of the microcomputer can be recorded immediately after an event of interest (i.e., writing to memory) has occurred, and we can identify the positions in programs that correspond to particular events.

If we had set the value against [Value] under [Data Compare] in step (4) to "H'0000", the condition would be writing of even data. Similarly, when [Use Mask] is disabled and a fixed value is specified for [Value], we can identify the line in the program responsible for writing that value.

Specifying a large value under [Required number of event occurrences] on the [Action] tabbed page in step (7) increases the number of cycles on which trace information will be acquired. This can be useful for the detailed analysis of program execution.

5. Related Documents

The H8S/2214 E6000 emulator and High-performance Embedded Workshop provide many other useful functions not mentioned in this document. Please refer to the following related documents for important information such as detailed specifications, technical information, or restrictions.

Documents Related to the H8S/2214 E6000 Emulator:

- H8S/2214 E6000 Emulator User's Manual

  Emulator Debugger Part:

  Section 3.2, Complex Event System (CES)

  Section 5.7, Using the Event Points

  Tutorial:

  Section 6.16, Trace Functions

- Precautions on Using the H8S/2214 E6000 Emulator
- PC Card Interface for E6000, E6000H, and E8000 Emulators User's Manual
- Emulator Options 1 (PC I/F-part) documents

Document Related to High-Performance Embedded Workshop

- High-performance Embedded Workshop User's Manual

Documents Related to CPU

- H8S/2214 Group Hardware Manual
- H8S/2600 Series, H8S/2000 Series Software Manual

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

- Notes on Usage of the C/C++ Compiler Package for H8S, H8/300 series
- H8S, H8/300 Series C/C++ Compiler, Assembler, Optimizing Linkage Editor User's Manual

Information on this product is available at the following Renesas websites:

Global site: http://www.renesas.com/e6000

Japanese site: http://japan.renesas.com/e6000

Renesas Website and Customer Support

Renesas Technology Website:
http://www.renesas.com/

Customer Support:
http://www.renesas.com/inquiry
csc@renesas.com

Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Oct.11.07	—	First edition issued

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