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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.

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#### 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.

High-performance Embedded Workshop			
File Edit View Project Build Debug Setup Tools Test Window Help			
┃ 🖸 🖉 🖉 🖇 🖪 🔂 🙀 🔽 🚽 🗛 式 🖉 🕮 🗄	a 🔏 🗌	•	•
Welcome!   Options:   Image: Create a new project workspace	OK OK Cancel Administration		
Summed A Debug } Find in Files } Macro } Test } Version Control /			
Ready			

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.

Open Works	pace 🤶 🏹
Look in: 🔀	2214 💌 🗲 🖻 💣 🎟 -
Debug_h8:	s_2214_e6000_emulator_cp
Tutorial	
File name:	Tutorial Select
Files of type:	HEW Workspaces (*.hws)

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
<sup>⊥</sup> 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:\u00e4hew3\u00e4Tools\u00e4Renesas\u00e4DebugComp\u00e4Platform\u00e4E6000\u00e42214\u00e4Tutorial

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.

High-p	High-performance Embedded Workshop 🛛 🔀				
♪	The Workspace you are about to open was created with an earlier version of HEW. The data files for the workspace, projects and sessions will be updated. Once updated this workspace cannot be opened by an older version of HEW. Backup versions of your old files will be created in the workspace and project directories with the prefix 'old_version_xxx'. Do you wish to continue ?				
	OK Cancel				

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.

Toolchain missing	<
Toolchain 'Hitachi H8S,H8/300 Standard Toolchain', version '6.0.0.0' is missing from the following project(s). Select projects for upgrade.	
▼ Tutorial	
OK Cancel	

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

Change Toolcha	in Version		? 🛛
Toolchain name: Current version: CPU Family:	Hitachi H8S,H8/300 Stand 6.0.0.0  H8S,H8/300	ard Toolchain	OK Cancel
Toolchain: Toolchain version	Hitachi H85,H8/300 Stand	lard Toolchain 💌	
Toolchain build pha	ises:		
Build phase H85,H8/300 Asse H85,H8/300 C/C H85,H8/300 C/C OptLinker		Version 6.01.01 6.01.02 2.01.01 9.01.01	Information

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

Change Toolchain Version Summary	
Summary :	
Project name : Tutorial	~
Hitachi H8S,H8/300 Standard Toolchain was upgraded 6.0.0.0 -> 6.1.2.0.	
	~
Generate Upgrade.txt as a summary file in the project directory	
ОК	



(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.

E6	000 Driv	er Details			
	Driver: Em	ulator PC Card Driver			
Г	Details				
	Interface:	PC Card	•		
	Channel:	Emulator PC Card Interface	•		
	Configuration				
	Configure				
ſ	Change	driver in start up	Close		

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

🖗 Tutorial - High-performance Embedded Workshop
File Edit View Project Build Debug Setup Tools Test Window Help
j 🖬 🗈 🗗 🖓 🖓 🕼 💀 👷 🐜 🗍 🖑 🔟 🗴 2 🍠 🚰 👪 🚧 🏧
🖉 🕾 🚈 👗 Debug_H85_2214_E6000 🔽   sessionH85_2214_E6000 🔽 🥕 🖗 🛛 🖼 💭 🗛 🐙 🖉
Intonia     Image: Constraint of the source file     Image: Consource file
× 01 01 AL AT   <u>21</u> <u>21</u>   <i>Q</i>   □
User Reset signal is Inactive User NMI signal is Inactive User Standby signal is Inactive Connection to the emulator has been completed successfully. Connected
· ·
Build Debug (Find in Files Macro Test Version Control /
🖪 🔣 Default1 desktop 🛛 🛛 INS 🛛 CAP

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].

Trace Acquisition		? 🛛
General Stop Delayed Suppress DMAC Cycles DTC Cycles Refresh Cycles	I Stop 1 2 3 Time Stamp Clock: Disabled	4
Event: 1 (E) H'107A address		•
Add Edit	Sequence	Delete Del All
		OK Cancel



(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.

Trace Acquisition	? 🗙
General   Stop   Delayed Stop 1   2   3   4	1
Conditions C Disabled Point to Point C Range C Event	
Start Address	
H'0000107A	
Stop Address	
H'00001082	
🔽 Cyclic	
ОК	Cancel

(8) Set a software break on line 50.

🖗 Tutorial - High-performanc	ice Embedded Workshop - [tutorial.cpp]	
🧀 File Edit View Project Build	d Debug Setup Tools Test Window Help 🛛 🗕 🖻 🗙	
] D 😅 🖬 🕼 🏼 🖧   X 🖻	ana   ↔    ¶•	
] ET EL EL EL 79 79 79 49	De Fre Fre 🛛 😷 💯 🔟 8 2 🛒 🚝 👪 🚧 🔤	
11	2214_E6000 🔽   sessionH85_2214_E6000 💌 🥕 🐢 📗 🖻 💭 📭 🐺 🐺 💭 🖉	
Tutorial ⊡ ি Tutorial	Confirm the [Trace On] i	con
🗄 🔄 C source file	Line Source E., S., Source	
dbsct.c	40 00105A j = -j;	
□ 🔄 sbrk.c □ 🛁 C++ source file	41 42 00105c $a[1] = j;$ Confirm the [Trace Off] ic	con
sort.cpp	44 001070 p_sam->sort(a);	
tutorial.cpp	45 00107A 🔂 p_sam->change(a);	
🖻 🔄 Download module	46 47 001082 <b>S</b> p sam->s0=a[0];	
- ↓ Tutorial.abs - Dependencies	47 001082 2 p_sam->s0=a[0]; 48 001081 p_sam->s0=a[0]; p_sam-of_a[1]; Double-click here	
	49 001096 sam->s2=a[2];	
	50 0010A2 p_sam->s3=a[3];	
	51 0010AE 7 52 0010BA 7 52 0010BA 7 534=a[4]; 534=a[4]; 534=a[4]; 534=a[4]; 545=a[5];	
	53 0010C6 p_sam->s6=a[6]; 54 0010D2 p_sam->s7=a[7];	
٠		
- - - - - - - - - - - - - - - - - -	Utorial.cpp	



(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.

Transist Web as forwards Februard Wedgeber, Futbrid and							
Tutorial - High-performance Embedded Workshop - [tutorial.cpp] File Edit View Project Build Debug Setup Tools Test Window Help							
jef el 🗄 el 79 77 79 🚳 🖓 🐜 📗 🕙 🕅 🔟 🧕 2 💆 👫 🚾 👫 🏧							
🤣 🖽 🛃 🛛 Debug_H8S_2214_E6000 🔽 😒 sessionH8S_2214_E6000 🔽 🥕 🖗 🛛 🖾 💭 🙀 💐 🎜 🗖 💭 🐺							
	-1						
Tutorial							
Tutorial Line Source E., E., S., Source							
dbsct.c ↓ 40 00105A j = -j;	퀴						
bline strike str							
□ □ □ utorial.cpp 45 001071. 답 p_sam->change(a); □ □ Download modules 46							
Download includes 1010 0101010 010 010 010 01							
Dependencies 48 00108λ p_sam->s1=a[1];							
49 001096 p_sam->s2=a[2]; 50 0010λ2 ♀ psam->s3=a[3];							
51 0010AE p sam->s4=a[4];	-						
Carl and Car							
PTR Address Instruction Data R/W Area Status Clock Probes NMI							
-00471 00107a MOV.L ER5,ER1 Ofd1 RD ROM PROG 1 1111 1	-						
-00470 00107c MOV.L ER6.ER0 0fe0 RD ROM PROG 1 1111 1	4						
-00469 00107e JSR @Sample::change( 5e00 RD ROM PROG 1 1111 1 -00468 001080 20d6 RD ROM PROG 1 1111 1	-						
-00486 001080 2006 RD ROM PROG 1 1111 1 -00467 0020d6 MOV.L ER3,@-ER7 0100 RD ROM PROG 1 1111 1	-						
Ă OL OT AL AT   \$1 \$1 @   ₽ 🖬 🖬 ?							
Software Break	×						
JJ ◀ ▶ N Build A Debug A Find in Files A Macro A Test A Version Control /							
Ready 🔣 🔣 🔛 Default 1 desktop Read-write 50/64 1 INS CAP	_/						

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()".

×	8	B 🖤 🗄	) 🗐 🖿 F()								
	PTR	Address	Instruction	Data	R/W	Area	Status	Clock	Probes	NMI	^
	-00005	002138	RTS	5470	RD	ROM	PROG	1	1111	1	
	-00004	ffed68		00ff	RD	RAM/DTC	DATA	1	1111	1	-
	-00003	ffed6a		ed70	RD	RAM/DTC	DATA	1	1111	1	: 2
	-00002	00213a		0100	RD	ROM	PROG	1	1111	1	:
	-00001	ffed6c		0000	RD	RAM/DTC	DATA	1	1111	1	:
	+00000	ffed6e		1082	RD	RAM/DTC	DATA	1	1111	1	-
	<										>



## 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.

X	<b>P</b>	🖪 🖤 🗄	+ 🗐 🖬 FO								
	PTR	Address	Instruction	Data	R/W	Area	Status	Clock	Probes	NMI	
	-00005	002138	RTS	5470	RD	ROM	PROG	1	1111	1	:
	-00004	ffed68		OOff	RD	RAM/DTC	DATA	1	1111	1	:
	-00003	ffed6a		ed70	RD	RAM/DTC	DATA	1	1111	1	:
	-00002	00213a		0100	RD	ROM	PROG	1	1111	1	:
	-00001	ffed6c		0000	RD	RAM/DTC	DATA	1	1111	1	:
	+00000	ffed6e		1082	RD	RAM/DTC	DATA	1	1111	1	~
	<										>



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

Trace Acquisition		? 🛛
General Stop Delayed	d Stop 1 2 3	4
Suppress DMAC Cycles DTC Cycles Refresh Cycles Trace Events Event:	Time Stamp Clock: Disabled	Free Trace
Add Edit	Sequence	Delete Del All
		OK Cancel

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

Trace Acquisition	×
General Stop Delayed Stop 1 2 3 4 Conditions	
C Disabled C Point to Point Range C Event	
Range Event Edit	
1 (E) H'107A address	
OK Cancel	



## E6000 Emulators for the H8S Family How to Use the Conditional Trace Function

(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.

Breakpoint/Eve	nt Properties 🛛 ? 🔀
General Bus / /	Area Signals Action
Type C Software Break	Address C Don't Care C Address Address Lo H'00FFED 70 Address Hi H'00FFED 97
	🔲 Outside Range
Data Compare	Direction Use Mask
Value H'0	• Write
🖸 Byte 🔿	Word
Mask. H'O	C Either
	OK Cancel

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

Trace Acquisition	? 🗙
General Stop Delayed Stop 1 2 3 4 Conditions C Disabled © Point to Point C Range C Event	[
Start Address	_
H'00FFED70	- 11
Stop Address	
H'00001082	
🔽 Cyclic	
OK 0	Cancel



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

Trace Acquisition	? 🔀
General Stop Delayed Stop 1 2 3 Conditions C Disabled C Point to Point © Range	C Event
Range Event	E dit
1 (E) H'FFED70 range to H'FFED97 write	•
	OK Cancel

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

P Tutorial - High-performanc	e Embedded Workshop - [tutorial	.cpp]		
🧼 File Edit View Project Build	Debug Setup Tools Test Window	Help		- 8 ×
] D 🛩 🖬 🕼   🖧   % 🗈	Debug Sessions	▲ 401 號 器		
1 1 1 1 1 <b>4 7 7</b> 9	Debug Settings	🔄 🕂 🚾 👬		
] 🤣 🕮 📇 👗   Debug_H8S_2	2 TReset CPU	- 2 🖗 🛯 🗖 🗖	] 🛱 💐 式 🗍 🖉 🖾	
	I Co	I		X
	Reset Go Shift+F5		R R 🗗 🖊 🗙 🍠 📌 🖓	
Imin Tutorial			Name Value	Туре
dbsct.c	I <sub>PC</sub> Set <u>P</u> C To Cursor	j = -j;		(long[10])
sbrk.c	<u>R</u> un			(long)
E-G C++ source file	Pc Display PC Ctrl+Shift+Y	a[i] = j;		(long)
=] resetprg.cpp =] sort.cpp		am->sort(a);	- ℝ [2] H'0000446b { FFED78 }	(long)
	Step Over F10	am->change(a);	- ℝ [3] H'000041c6 { FFED7C }	(long)
🖻 🔄 Download module	Step Out Shift+F11		ℝ [4] H'00003f54 { FFED80 }	(long)
Tutorial.abs	Step	am->s0=a[0];	ℝ [5] H'00002781 { FFED84 }	(long)
	Step Mode	am->s1=a[1]; am->s2=a[2];		(long)
		am->s3=a[3];	思[7] H'0000167e { FFED8C }	(long)
	100 Halt Program	am->s4=a[4];	恩 [8] H'000015fb { FFED90 }	(long)
	Initialize	əm->s5=a[5]:	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	(long)
	Connect			,gi •
	Pisconnec <u>t</u>		Watch1 (Watch2 Watch3 ) Watch4 /	
	Save Memory			
PTR Address Instr	Verify Memory	Data R/W Area Sta	atus Clock Probes NMI IRQ7-0 Tin	nestamp Time 🔼
-00005 002138 RTS	Configure Overlay	5470 RD ROM PR		
-00004 ffed68	Download Modules	OOff RD RAM/DTC DAT		
-00003 ffed6a	Unload Modules	ed70 RD RAM/DTC DA		
-00002 00213a	onjudu Mudules	0100 RD ROM PR		
-00001 ffed6c +00000 ffed6e		0000 RD RAM/DTC DA 1082 RD RAM/DTC DA		~
+00000 TTease		1082 RD RAM/DTC DA	FA 1 1111 1 111	>



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

🛞 Tutorial - High-perfor	mance Embedded Workshop - [tuto	rial.cop]			
-	Build Debug Setup Tools Test Win				_ a ×
] 🗅 😅 🖬 🕼   🍪   🌾	• • • •   ↔    •	► ₩ X X			
] = T = I = I - P - (	👎 🚥 📭 🍬 📗 🔁 💆 🚺	2 🞐 🕂 🌆 🙌 🌃			
🛛 🦃 🖽 🚟 👗 🗍 Debug_H	H8S_2214_E6000 💌 sessionH8S_2214_E	:6000 🔽 🕅 🖗 🖉 🗉	0 🛱 💐 式	<b>F</b>	
Tutorial		[			<u> </u>
Tutorial				× 🛃 🖻 🕫	
🛱 🔄 C source file	Line Source E E S Sour			Value	Type 🔺
dbsct.c	40 001051	; j = _;;	E-Ra	{ FFED70 }	(long[10])
⊡ sbrk.c ⊡ C++ source file	41 42 00105C	, a[i] = j;	- 🛛 🕄 [0]	H'0000794b { FFED70	} (long)
		}		H'000059e2 { FFED74	} (long)
sort.cpp	44 001070	p_sam->sort(a);		H'0000446b { FFED78	2 I DI
tutorial.cpp		p_sam->change(a);		H'000041c6 { FFED7C	} (long)
🖻 🔄 Download module Tutorial.abs -	46 47 001082	p sam->s0=a[0];	- 艮 [4]	H'00003f54 { FFED80	} (long)
	48 00108A	p_sam->s1=a[1];		H'00002781 { FFED84	} (long)
	49 001000			H'00001cfb { FFED88	} (long)
	50 0010A2	p_sam->s3=a[3];	🛛 🕄 🕄 [7]	H'0000167e { FFED8C	} (long)
	51 0010AE	p_sam->s4=a[4]; n_sam->s5=a[5].	🛛 🕄 🕄 🕄	H'000015fb { FFED90	} (long) 🦳
		n sam-ses-arst		H'00000ff6 { FFED94	} (long) -
	tutorial.cpp		▲ ▲ Watch1 ( )	Watch2 \\ Watch3 \\ Watch4 \	
			Wattin A	watchiz X watchis X watch4 1	/
	FO FO				
PTR Address I	nstruction	Data R/W Area St	atus Clock Pr	obes NMI IRQ7-0	Timestamp 🛕
-00087 ffed70		0000 WR RAM/DTC DA	TA 1 11	11 1 11111111	
-00086 ffed72		41c6 WR RAM/DTC DA	TA 1 11	11 1 11111111	
-00085 ffed74		0000 WR RAM/DTC DA			
-00084 ffed76		167e WR RAM/DTC DA			
-00083 ffed78			TA 1 11		
-00082 ffed7a		2781 WR RAM/DTC DA	TA 1 11	11 1 11111111	

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].

Trace Acquisition	?×
General Stop Delayed Stop 1 2 3 4 Conditions O Disabled O Point to Point O Range Event Start Event Edit	
Stop Event Edit	•
	Cancel

(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.

Trace Acquisition	? 🛛		
General Stop   Delayed Stop 1   2   3	4		
C Disabled C Point to Point C Range	Event		
Start Event Edit			
1 (E) H'FFED70 range to H'FFED97 write			
Stop Event Edit			
2 (E) H'1082 address	•		
🖵 Cyclic			
	OK Cancel		



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

Trace Acquisition	? 🔀
General Stop Delayed Stop 1 2 3	4
C Disabled C Point to Point C Range	Event
Start Event	Edit
1 (E) H'FFED70 range to H'FFED97 write	·
Stop Event	E dit
2 (E) H'1082 address	•
🖵 Cyclic	
	OK Cancel

(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.

Breakpoint/Eve	Breakpoint/Event Properties			
General Bus /	Area Signals Action			
Type C Software Break	Address C Don't Care C Address Range Address Lo H'00FFED 70 Address Hi H'00FFED 97			
	🗖 Outside Range			
Data Compare	Use Mask C Read			
Value H'0001				
C Byte Word Mask H'0001				
OK Cancel				



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

Trace Acquisition					
General Stop Delayed Stop 1 2 3	4				
C Disabled C Point to Point C Range	e 💽 Event				
Start Event	E dit				
1 (E) H'FFED70 range to H'FFED97 write word H'0	0001 mask H'0001 👤				
Stop Event Edit					
2 (E) H'1082 address	▼				
🔲 Cyclic					
	OK Cancel				

(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.

Breakpoint/Eve	nt Properties	? 🛛
General Bus / ,	Area Signal Action	
C Software Break	Address C R Address Lo H'00001082	ange
Event	Address Hi H'00001082	
	🗖 Outside Range	
Data Compare		© Read
Value H'0		C Write
C Byte C Mask H'C		© Either
	OK	Cancel

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

Breakpoint/Event Prop	erties ?
General Bus / Area Sig	nals Action
Actions Break Start Timer Stop Timer	
Delay after detection before D'0	e break occurs bus cycles
Required number of event	occurrences
Enable Sequencing	Configure Sequence
	OK Cancel



(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.

Trace Acquisition	×			
General Stop Delayed Stop 1 2 3 4				
Conditions				
◯ Disabled   ◯ Point to Point   ◯ Range   ● Event				
Start EventEdit				
1 (E) H'FFED70 range to H'FFED97 write word H'0001 mask H'0001				
Stop Event Edit				
2 (E) H'0 range to H'FFFFF count D'3				
Cyclic				
OK Cancel				
UK Cancel				

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

A		
<u> </u>	e Embedded Workshop - [tutorial Debug Setup Tools Test Window	
	Debua Sessions	 M % %
ET EL EL EL TO 70 (P 💷	Debug Settings	_ 💯 🥂 🔯 🚧 🏧
	≣¶ Reset CPU	
	ELGO ES	
	🔁 Reset Go 💦 Shift+F5	🕨 🛛 🖪 🗖 🖉 🖉 🖉 🖉
Internal Line Line Line Line Line Line Line Line		Name Value Type
dbsct.c	I <sub>PC</sub> Set <u>PC</u> To Cursor	j = -j;
□ 🔄 sbrk.c □ 🔄 C++ source file	Run Bolay PC Ctrl+Shift+Y	) a[i] = j;
resetprg.cpp	<sup>№</sup> <sub>PC</sub> Display PC Ctrl+Shift+Y	ℝ [1] H'000059e2 { FFED74 } (long)
isot.cpp	₹+} Step In F11	am->sort(a);
tutorial.cpp	3+ Step Over F10	am->change(a);
Download module	{͡} Step Out Shift+F11	am->s0=a[0]; [4] H'00003f54 { FFED80 } (long)
□ ↓ Tutorial.abs -	Step	am->s0=a[0]; am->s1=a[1];
	Step Mode	am->s2=a[2];
	I Halt Program	am->s3=a[3];
		_am->s4=a[4];
↓ ↓ ↓	Initiali <u>z</u> e	▶
	📱 Connect	
	Pisconnec <u>t</u>	Watch1 / Watch2 / Watch3 / Watch4 /
🕺 😰 🖉 🖪 🔍 🗈 🏼 🤤	Save Memory	
PTR Address Instr	Verify Memory	Data R/W Area Status Clock Probes NMI IRQ7-0 Timestamp 🛆
-00005 ffed8c	Configure Overlay	0000 WR RAM/DTC DATA 1 1111 1 1111111
-00004 ffed8e	Download Modules	167e WR RAM/DTC DATA 1 1111 1 1111111
-00003 ffed90	Unload Modules	0000 WR RAM/DTC DATA 1 1111 1 1111111
-00002 ffed92 -00001 ffed94	onijoad Modules	15fb WR RAM/DTC DATA 1 1111 1 11111111 0000 WR RAM/DTC DATA 1 1111 1 1111111
		0000 WR RAM/DTC DATA 1 1111 1 11111111 Off6 WR RAM/DTC DATA 1 1111 1 11111111
<		



(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



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#### **Revision Record**

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