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Renesas Electronics Corporation

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User's Manual

H8S, H8SX Family E10A-USB Emulator

Additional Document for User's Manual Supplementary Information on Using the H8S/2114RF

Renesas Microcomputer Development Environment System
H8S Family / H8S/2100 Series
E10A-USB for H8S/2114RF HS2114KCU01HE

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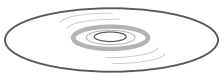
Section 1 Connecting the Emulator with the User System

1.1 Components of the E10A-USB Emulator

The H8S/2114RF E10A-USB emulator supports the H8S/2114RF (hereafter referred to as the MCU unless the description is specific to any of them). Table 1.1 lists the components of the emulator.

Table 1.1 Components of the Emulator

Classi-fication	Component	Appearance	Quan-tity	Remarks
Hard-ware	Emulator box		1	HS0005KCU01H: Depth: 65.0 mm, Width: 97.0 mm, Height: 20.0 mm, Mass: 72.9 g or HS0005KCU02H[*1]: Depth: 65.0 mm, Width: 97.0 mm, Height: 20.0 mm, Mass: 73.7 g
	User system interface cable		1	14-pin type: Length: 20 cm, Mass: 33.1 g
	USB cable		1	Length: 150 cm, Mass: 50.6 g
Soft-ware	H8S/2114RF E10A-USB emulator setup program, H8S, H8SX Family E10A-USB Emulator User's Manual, Supplementary Information on Using the H8S/2114RF[*2], and Test program manual for HS0005KCU01H and HS0005KCU02H		1	HS0005KCU01SR, HS0005KCU01HJ-H8S, HS0005KCU01HE-H8S, HS2114KCU01HJ, HS2114KCU01HE, HS0005TM01HJ, and HS0005TM01HE (provided on a CD-R)

Notes: 1. When HS0005KCU02H is purchased, the 36-pin type cable is provided; however, it is not available for this MCU.

2. Additional document for the MCUs supported by the emulator is included. Check the target MCU and refer to its additional document.

1.2 Connecting the E10A-USB Emulator with the User System

Before connecting an E10A-USB emulator (hereafter referred to as emulator) with the user system, a connector must be installed in the user system so that an user system interface cable can be connected. When designing the user system, refer to an example of recommended connection between the connector and the MCU shown in this manual.
Before designing the user system, be sure to read the E10A-USB emulator user's manual and the hardware manual for related MCUs.

Connect pins 8, 9, 10, 12, 13, and 14 of the user system connector to GND firmly on the PCB. These pins are used as electrical GND and to monitor the connection of the user system connector. Note the pin arrangement of the user system connector.

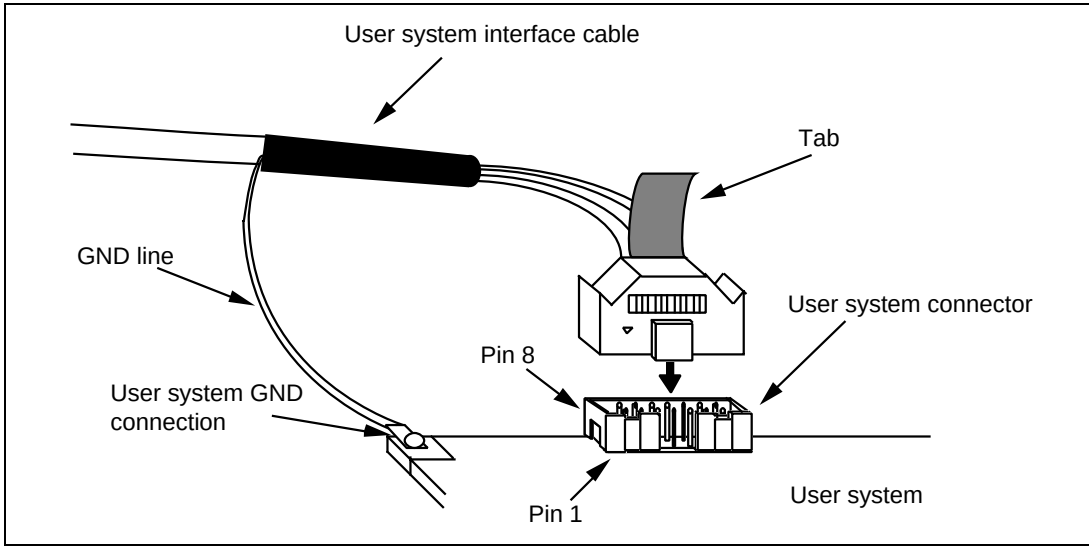


Figure 1.1 Connecting the User System Interface Cable to the User System

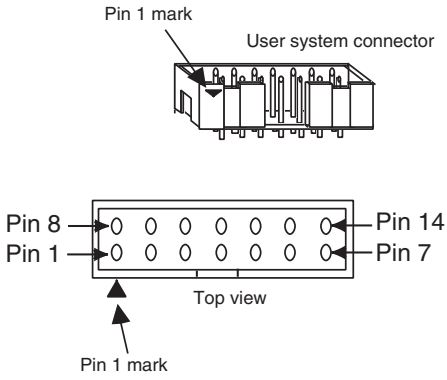
Notes: 1. The pin number assignments of the 14-pin connector differ from those of the E7 emulator; however, the physical location is the same.
2. When designing the connector layout on the user board, do not place any components within 3 mm of the connector.

⚠ WARNING

Be sure to place the GND line of the user system interface cable on the GND of the user system with a screw, etc. Failure to do so will result in a FIRE HAZARD due to an overcurrent and will damage the user system, the emulator product, and the host computer.

1.3 Pin Assignments of the E10A-USB Connector

Figure 1.2 shows the pin assignments of the user system connector.



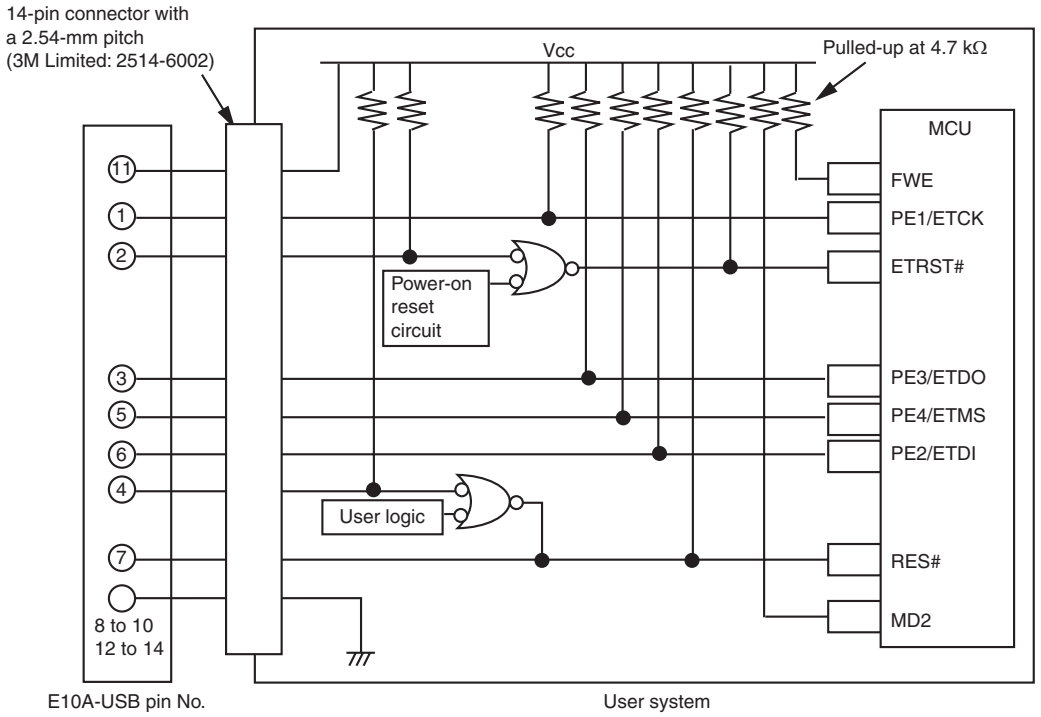
Pin No.	MCU Pin Name H8S/2114RF	Input/Output *1
1	PE1/ETCK	Input
2	ETRST#	Input
3	PE3/ETDO	Output
4	RES(in)# *2 *5	Input
5	PE4/ETMS	Input
6	PE2/ETDI	Input
7	RES(out)# *2	Output
8 to 10 12 to 14	GND *3	—
11	Vcc *4	—

Notes: 1. Input to or output from the user system.
2. The symbol (#) means that the signal is active-low.
3. By detecting GND on the user system side, the emulator decides whether the user system is connected or not.
4. Connect Vcc with the Vcc of the MCU.
5. RES(in) is not the pin name of the MCU. It cannot be directly connected to the MCU pins.

Figure 1.2 Pin Assignments of the User System Connector

1.4 Example of Emulator Connection

The figure shown below is an example of connecting the user system to the emulator.



· RES(in)# of pin 4 of the user system connector is a signal line in which the emulator outputs signals to the MCU. Connect RES(in)# of pin 4 and the user system reset circuit to the MCU, as shown above.

· RES(out)# of pin 7 of the user system connector is a signal line in which the emulator monitors the RES# signal of the MCU. The RES(out)# must be pulled up before it is connected to pin 7 of the user system connector.

Figure 1.3 Example of Emulator Connection

Notes: 1. The emulator uses PE1/ETCK, PE2/ETDI, PE3/ETDO, and PE4/ETMS pins. Pull up the emulator and MCU pins and connect them to the user system connector.

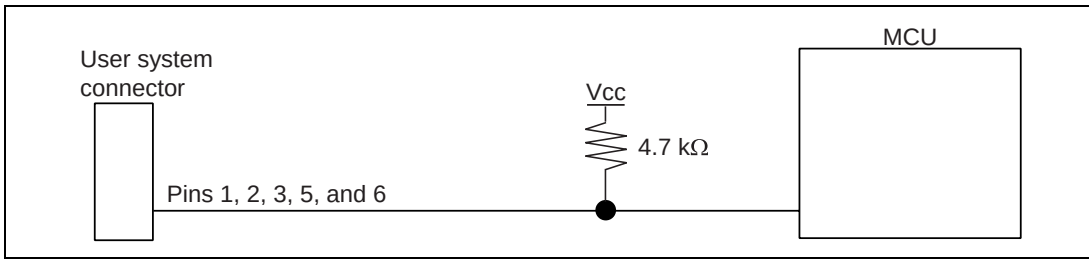


Figure 1.4 Connection of Emulator and the MCU

2. If the emulator is not connected to the user system, ground pin MD2 of the MCU, and when the emulator is connected to the user system, pull up pin MD2.

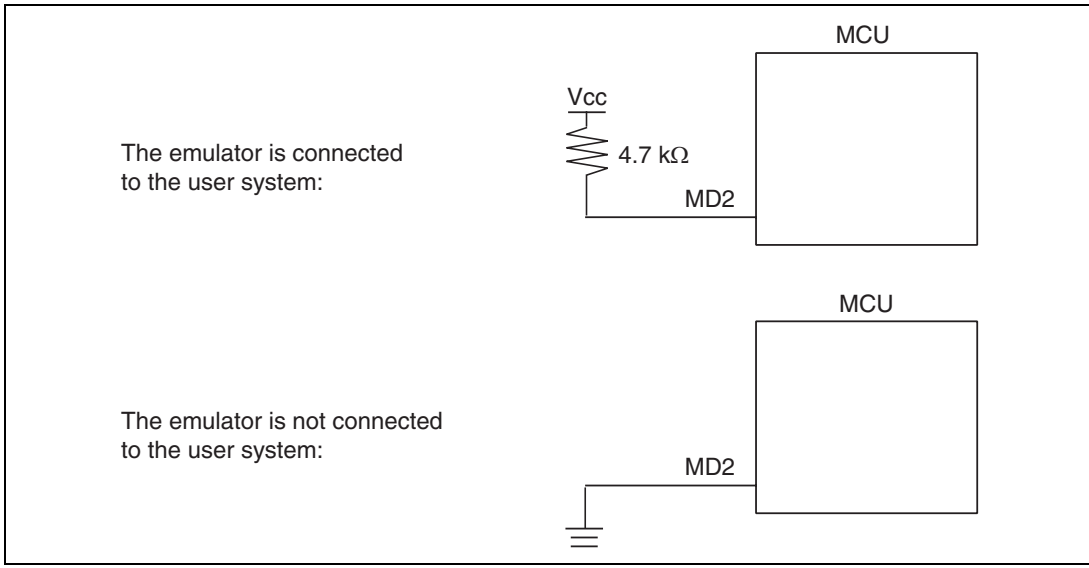


Figure 1.5 Emulator and Pin MD2

3. RES(in)# of pin 4 of the user system connector is a signal line in which the emulator outputs signals to the MCU. RES(in)# of pin 4 and the user logic reset circuit must be connected to the MCU, as shown in figure 1.6. RES(out)# of pin 7 of the user system connector is a signal line in which the emulator monitors pin RES# of the MCU. The RES# must be pulled up before it is connected to pin 7 of the user system connector.

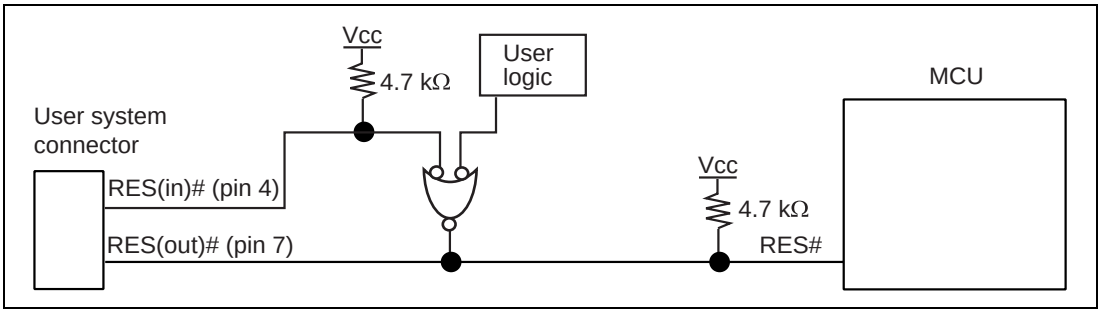


Figure 1.6 Connection of Pin RES#

4. Pin FWE in the H8S/2114RF must be pulled up when connecting with the emulator.

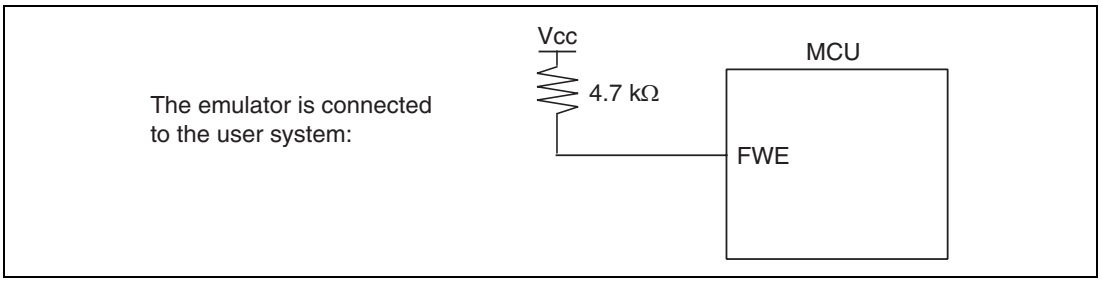


Figure 1.7 Connection of Pin FWE

5. Pin ETRST# must be connected as shown in figure 1.8.

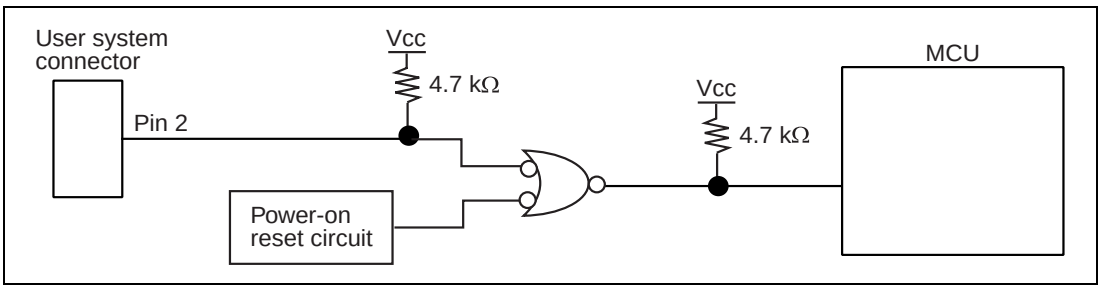


Figure 1.8 Connection of Pin ETRST#

6. Ground pins 8, 9, 10, 12, 13, and 14 of the user system connector.
7. Connect Vcc, pin 11 of the user system connector, to the power supply (Vcc) in the user system. The input voltage, Vcc, is within the range of guaranteed operation of the microcomputer.
8. When the emulator is used, the pin functions listed below are not available.

Table 1.2 Pin Functions Not Available

H8S/2114RF
PE1 to PE4

Section 2 Specification of the Emulator's Software

2.1 Differences between the H8S/2114RF and the Emulator

1. When the emulator system is initiated, it initializes the general registers and part of the control registers as shown in table 2.1. The initial value of the MCU is undefined. When the emulator is initiated from the workspace, a value to be entered is saved in a session.

Table 2.1 Register Initial Values at Emulator Power-On

Register	Initial Value
PC	Reset vector value in the vector address table
ER0 to ER6	H'0
ER7 (SP)	H'10
CCR	1 for I mask, and others undefined
EXR	H'7F

2. System Control Register

   In the emulator, the internal I/O registers can be accessed from the [IO] window. However, be careful when accessing the system control register. The emulator saves the register value of the system control register at a break and returns the value when the user program is executed. Since this is done during a break, do not rewrite the system control register in the [IO] window.

3. Memory Access during Emulation

   If the memory contents are referenced or modified during emulation, realtime emulation cannot be performed because the user program is temporarily halted.

4. The emulator communicates with the MCU by using the PE1/ETCK, PE2/ETDI, PE3/ETDO, and PE4/ETMS pins. These pins cannot be used.

5. The power consumed by the MCU can reach several mA. This is because the user power supply drives one IC to make the communication signal level match the user-system power-supply voltage.

6. Do not use an MCU that has been used for debugging.
   If the flash memory is rewritten many times, and the MCU is left for a few days, data may be lost due to retention problems.

If the flash memory is rewritten many times, the data will not be erased. If an error message is displayed, exchange the MCU for a new one.

7. The H8S/2114RF E10A-USB emulator supports the normal and advanced modes. When the [IO] window is displayed after activating the emulator, register addresses for those modes are displayed. Use the address suitable for the user's environment.

8. Sum Data Displayed in the Writing Flash memory Mode

   Sum data, which is displayed in the 'Writing Flash memory' mode, is a value that data in the whole ROM areas has been added by bytes.

9. Note on Executing the User Program

   The set value is rewritten since the emulator uses flash memory registers during programming (Go, Step In, Step Out, or Step Over) of the flash memory.

10. MCU Operating Mode

    The emulator supports mode 6 (16-Mbyte advanced mode) and mode 7 (64-kbyte normal mode). Use mode 6 and mode 7 for emulation in mode 2 and mode 3, respectively.

11. Programming Flash Memory during Debugging

    The flash memory is programmed in the following functions because they use breakpoints:
    - When executing [Go to cursor]
    - When stepping over the subroutine
    - When executing the subroutine at step-out operation

12. Loading Sessions

    Information in [JTAG clock] of the [Configuration] dialog box cannot be saved by sessions. Thus the TCK value becomes the initial value when loading sessions.

    — When HS0005KCU01H or HS0005KCU02H is used: TCK = 2.5 MHz

13. Note on Using the Watchdog Timer (WDT)

    If a reset occurs by an overflow of the WDT during user program halting, the emulator will not operate correctly. Do not use the reset function by the overflow of the WDT.

14. Value Set in the [System Clock] Dialog Box when Connecting the Emulator

    Input the frequency of the oscillator in use in the [System Clock] dialog box (this also applies when the MCU is multiplied by the PLL circuit).

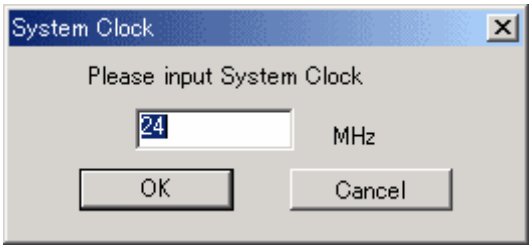


Figure 2.1 [System Clock] Dialog Box

15. Emulation on Programming or Erasing the Internal Flash Memory

    A break cannot be generated while the program for programming or erasing the internal flash memory is being called. Note that the following processing also cannot be performed:

    - Execution of the [STOP] button
    - Auto-update of the watch function and use of the tool-chip watch function
    - Memory operation during executing emulation

2.2 The H8S/2114RF E10A-USB Emulator Specific Functions and Notes

Notes: 1. Do not use an MCU that has been used for debugging.
2. If the flash memory is rewritten many times, and the emulator is left for a few days, data may be lost due to retention problems.
3. If the flash memory is rewritten many times, the data will not be erased. If an error message is displayed, exchange the MCU for a new one.

2.2.1 Emulator Driver Selection

Table 2.2 shows drivers which can be selected in the [Driver Details] dialog box.

Table 2.2 Type Name and Driver

Type Name	Driver
HS0005KCU01H, HS0005KCU02H	Renesas E-Series USB Driver

2.2.2 Hardware Break Functions

Hardware Break Conditions: In the H8S/2114RF E10A-USB emulator, eight break conditions (Break Condition 1,2,3,4,5,6,7,8) can be set. Table 2.3 lists the items that can be specified.

Table 2.3 Hardware Break Condition Specification Items

Items	Description
Address bus condition	Breaks when the MCU address bus value matches the specified value.
Data bus condition	Breaks when the MCU data bus value matches the specified value. High or low byte or word can be specified as the access data size.
Read or write condition	Breaks in the read or write cycle.
Trace acquisition condition	Acquires trace information based on Break Condition 1.*

Note: Refer to section 2.2.5 (3), Setting a Break Condition for Tracing.

Table 2.4 lists the combinations of conditions that can be set in the [Break condition] dialog box.

Table 2.4 Conditions Set in [Break condition] Dialog Box

	Condition		
Dialog Box	**Address Bus Condition**	**Data Condition**	**Read or Write Condition**
[Break condition 1]	O	O	O
[Break condition 2]	O	O	O
[Break condition 3]	O	X	O
[Break condition 4]	O	X	O
[Break condition 5]	O	X	O
[Break condition 6]	O	X	O
[Break condition 7]	O	X	O
[Break condition 8]	O	X	O

Note: O: Can be set by checking the radio button in the dialog box.

Table 2.5 lists the combinations of conditions that can be set by the BREAKCONDITION_SET command.

Table 2.5 Conditions Set by BREAKCONDITION_SET Command

	Condition		
Channel	**Address Bus Condition (<addropt> option)**	**Data Condition (<dataopt> option)**	**Read or Write Condition (<r/wopt> option)**
Break condition 1	O	O	O
Break condition 2	O	O	O
Break condition 3	O	X	O
Break condition 4	O	X	O
Break condition 5	O	X	O
Break condition 6	O	X	O
Break condition 7	O	X	O
Break condition 8	O	X	O

Note: O: Can be set by the BREAKCONDITION_SET command.

Notes on Setting the Break Condition:

1. When [Step In], [Step Over], or [Step Out] is selected, the settings of Break Condition are disabled.
2. The settings of Break Condition are disabled when an instruction to which a BREAKPOINT has been set is executed.
3. When step over function is used, the settings of BREAKPOINT and Break Condition are disabled.

2.2.3 Notes on Setting the [Breakpoint] Dialog Box

1. When an odd address is set, the address is rounded down to an even address.
2. A BREAKPOINT is accomplished by replacing instructions. Accordingly, it can be set only to the flash memory or the RAM area. A BREAKPOINT cannot be set to the following addresses:
   - An area other than flash memory or RAM
   - An area occupied by the emulator program
   - An instruction in which Break Condition is satisfied
3. During step execution, a BREAKPOINT is disabled.
4. A condition set at Break Condition is disabled immediately after starting execution when an instruction at a BREAKPOINT is executed. A break does not occur even if a condition of Break Condition is satisfied immediately after starting the execution.
5. When execution resumes from the breakpoint address after the program execution stops at the BREAKPOINT, single-step execution is performed at the address before execution resumes. Therefore, realtime operation cannot be performed.
6. Settings of BREAKPOINT and Break Condition are invalid while the STEP OVER function is being used.

2.2.4 Note on Using the JTAG Clock (TCK)

When the JTAG clock (TCK) is changed, set the frequency to lower than that of the system clock.

2.2.5 Trace Function

The emulator uses the branch-instruction trace and bus trace functions in the MCU, and acquires a trace by operating the user program in realtime. The branch-instruction trace function displays the four-channel branch-source address, the mnemonic, and the operand. The bus trace function displays and searches the information on the 512-step address bus, data bus, memory access,

interrupt, and bus cycle, the mnemonic, and the operand. The acquisition conditions can also be set.

(1) Setting Trace Acquisition

The acquisition condition on the trace information is set.

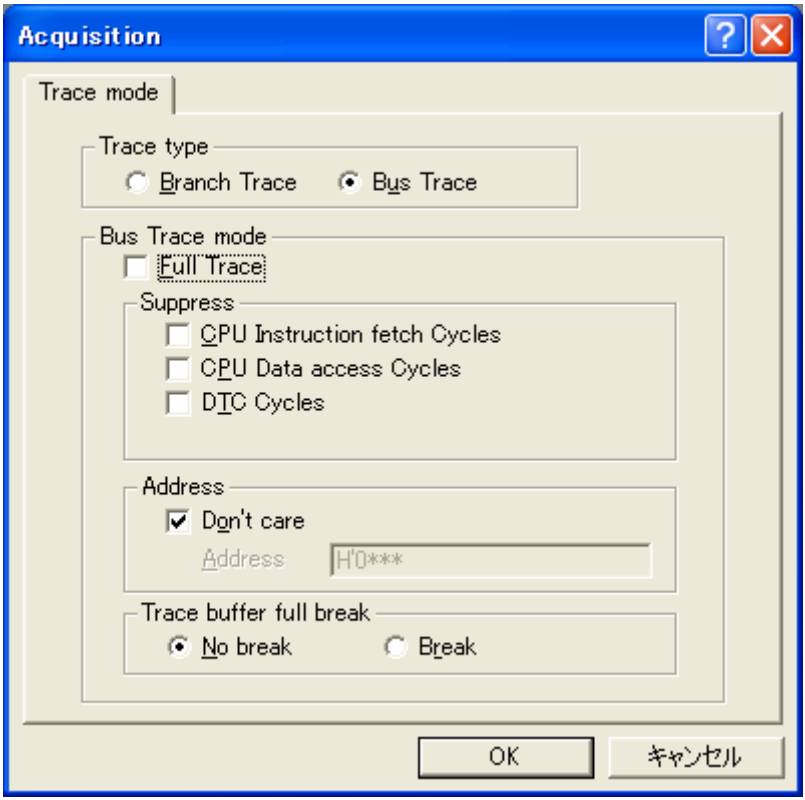


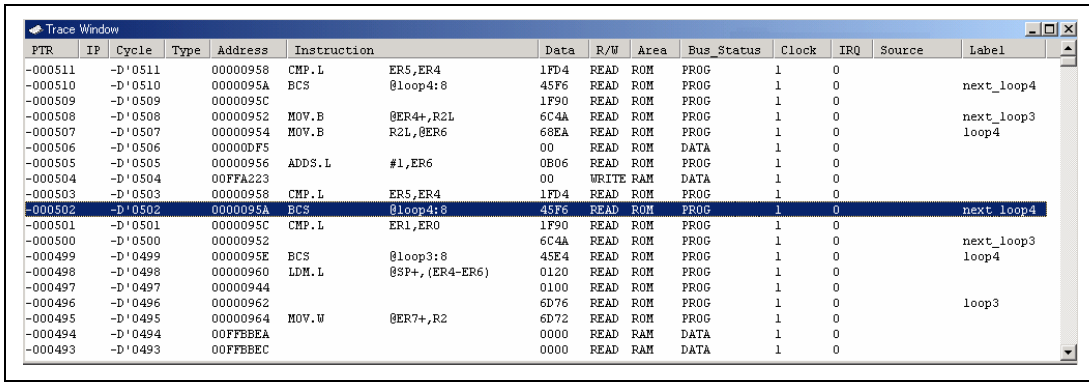
Figure 2.2 [Trace mode] Page

Table 2.6 Setting Trace Acquisition

Acquisition Condition	Description
Trace type	Sets the trace information for acquisition and display. Branch trace: Acquires and displays the branch-instruction trace information. Bus trace: Acquires and displays the bus trace information.
Bus Trace mode	Sets the trace acquisition condition when Bus Trace is selected as Trace type. This is not set when Branch Trace is selected. • [Full Trace] check box Indicates that all cycles are acquired. • [Suppress] group box Sets a cycle to suppress acquisition. CPU Instruction fetch Cycles: Suppresses acquiring the CPU-instruction fetch cycle. CPU Data access Cycles: Suppresses acquiring the CPU-data access cycle. DTC Cycles: Suppresses acquiring the DTC cycle. • [Address] group box Sets the address condition to be acquired. • [Trace buffer full break] group box No break: Acquires the latest information by overwriting the oldest information when the trace buffer becomes full. Break: Generates a break when the trace buffer becomes full.

(2) Displaying a Trace in the Bus Trace Function

The contents of the trace buffer in table 2.7 are displayed in the [Trace] window.



PTR	IP	Cycle	Type	Address	Instruction		Data	R/W	Area	Bus_Status	Clock	IRQ	Source	Label
-000511		-D'0511		00000958	CMP.L	ER5,ER4	1FD4	READ	ROM	PROG	1	0		
-000510		-D'0510		0000095A	BCS	@loop4:8	45F6	READ	ROM	PROG	1	0		next_loop4
-000509		-D'0509		0000095C			1F90	READ	ROM	PROG	1	0		
-000508		-D'0508		00000952	MOV.B	@ER4+,R2L	6C4A	READ	ROM	PROG	1	0		next_loop3
-000507		-D'0507		00000954	MOV.B	R2L,@ER6	68EA	READ	ROM	PROG	1	0		loop4
-000506		-D'0506		00000DF5			00	READ	ROM	DATA	1	0		
-000505		-D'0505		00000956	ADDS.L	#1,ER6	0B06	READ	ROM	PROG	1	0		
-000504		-D'0504		00FFA223			00	WRITE	RAM	DATA	1	0		
-000503		-D'0503		00000958	CMP.L	ER5,ER4	1FD4	READ	ROM	PROG	1	0		
-000502		-D'0502		0000095A	BCS	@loop4:8	45F6	READ	ROM	PROG	1	0		next_loop4
-000501		-D'0501		0000095C	CMP.L	ER1,ER0	1F90	READ	ROM	PROG	1	0		
-000500		-D'0500		00000952			6C4A	READ	ROM	PROG	1	0		next_loop3
-000499		-D'0499		0000095E	BCS	@loop3:8	45E4	READ	ROM	PROG	1	0		loop4
-000498		-D'0498		00000960	LDM.L	@SP+,(ER4-ER6)	0120	READ	ROM	PROG	1	0		
-000497		-D'0497		00000944			0100	READ	ROM	PROG	1	0		
-000496		-D'0496		00000962			6D76	READ	ROM	PROG	1	0		loop3
-000495		-D'0495		00000964	MOV.W	@ER7+,R2	6D72	READ	ROM	PROG	1	0		
-000494		-D'0494		00FFBBEA			0000	READ	RAM	DATA	1	0		
-000493		-D'0493		00FFBBEC			0000	READ	RAM	DATA	1	0		

Figure 2.3 [Trace] Window

Table 2.7 Items in the [Trace] Window

Item	Description
[PTR]	Pointer to a location in the trace buffer (+0 for the last executed instruction) (signed decimal)
[IP]	Instruction pointer
[Cycle]	Cycle
[Type]	Type of trace information BRANCH: Branch source instruction
[Address]	Address value
[Instruction]	Instruction mnemonic
[Data]	Data value
[R/W]	Read or write access
[Area]	Access area
[Bus_Status]	Bus cycle states
[Clock]	Bus cycle counts
[IRQ]	IRQ pins
[Source]	The C/C++ or assembly-language source program in which the trace is acquired
[Label]	Label information

For branch trace, items [Cycle], [Data], [R/W], [Area], [Bus_Status], [Clock], and [IRQ] are not displayed. For bus trace, items [IP] and [Type] are not displayed.

The column width of the [Trace] window can be adjusted by clicking and dragging the vertical separate line between columns. When the window is closed, the new column width is automatically saved.

The capacity of the trace buffer is limited. When the buffer becomes full, the oldest trace information is overwritten.

(3) Setting a Break Condition for Tracing

Selecting the [Trace] radio button in [Action] of the [Break condition 1] dialog box enables the functions listed below. The trace acquisition condition depends on the [Trace buffer full break] setting.

Trace start function:

Starts acquisition of trace information from the address specified in the [Break condition 1] dialog box and stops when the trace buffer becomes full. Select [Break] in [Trace buffer full break] of the [Acquisition] dialog box.

Trace stop function:

Starts acquisition of trace information from the start of the program and stops at the address specified in the [Break condition 1] dialog box. Select [No break] in [Trace buffer full break] of the [Acquisition] dialog box.

(4) Trace Filter Function

The emulator displays all the information that matches the specified conditions for all the trace data. The information is displayed by selecting [Filter…] from the popup menu that is displayed with the right-hand mouse button on the [Trace] window.

The filter condition is set to restrict the cycle to be displayed on the trace buffer.

(i) [General] Page Options

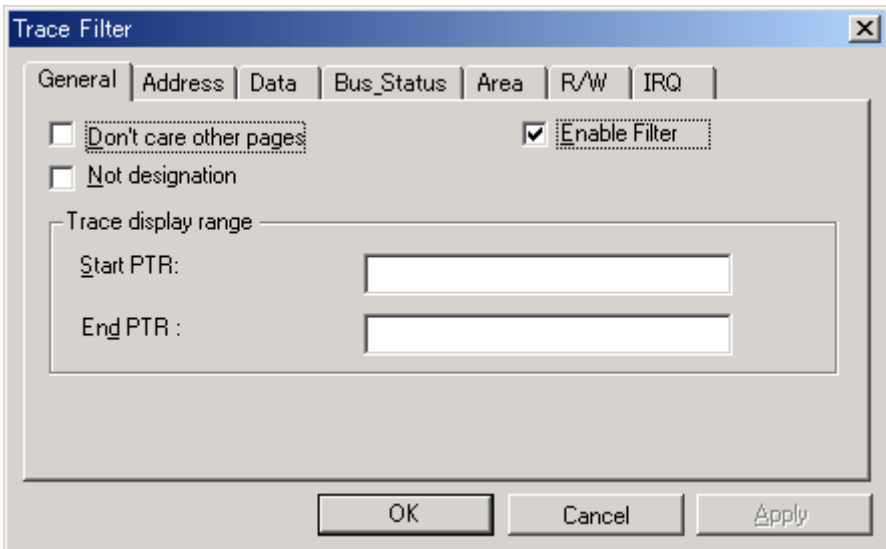


Figure 2.4 [General] Page

Table 2.8 [General] Page Options

Option	Description
[Don't care other pages] check box	Disables settings on other pages than the [General] page.
[Enable Filter] check box	Enables filter conditions.
[Not designation] check box	Designates no conditions.
[Start PTR] edit box	Enters the start pointer in the range that is displayed on the [Trace] window.
[End PTR] edit box	Enters the end pointer in the range that is displayed on the [Trace] window.

(ii) [Address] Page Options

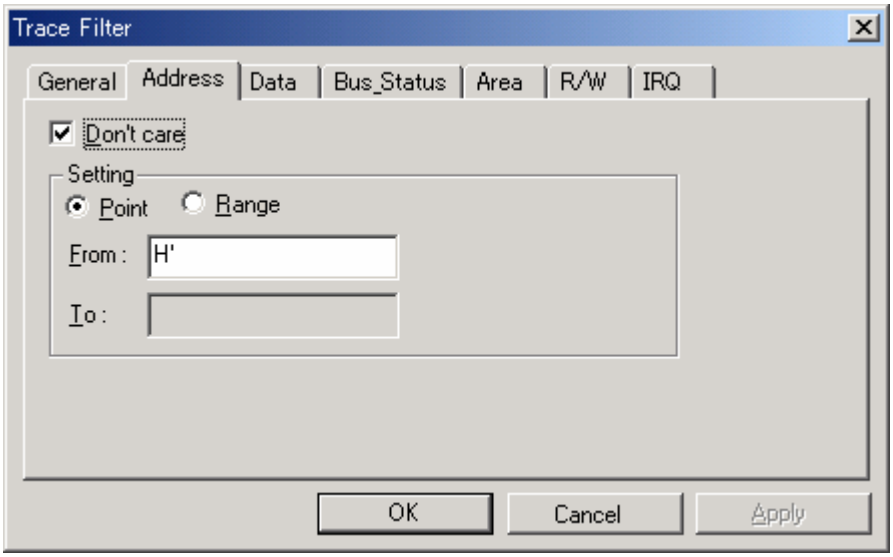


Figure 2.5 [Address] Page

Table 2.9 [Address] Page Options

Option	Description
[Don't care] check box	Indicates that no address condition is set.
[Point] radio button	Specifies the single address.
[Range] radio button	Sets an address range as a display condition.
[From] edit box	Sets the start value of the address range.
[To] edit box	Sets the end value of the address range.

(iii) [Data] Page Options

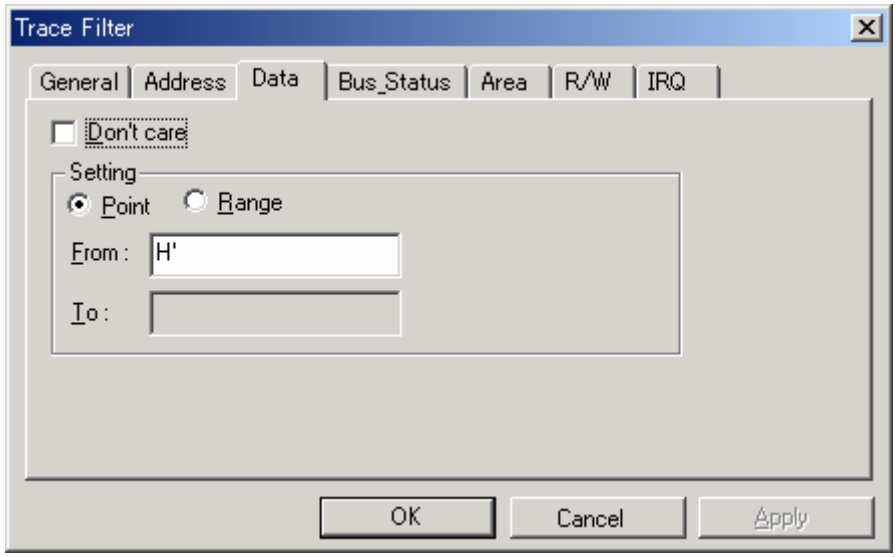


Figure 2.6 [Data] Page

Table 2.10 [Data] Page Options

Option	Description
[Don't care] check box	Indicates that no data condition is set.
[Point] radio button	Specifies the single data value.
[Range] radio button	Sets a range of the data value as a display condition.
[From] edit box	Sets the start value of the data value.
[To] edit box	Sets the end value of the data value.

(iv) [Bus_Status] Page Options

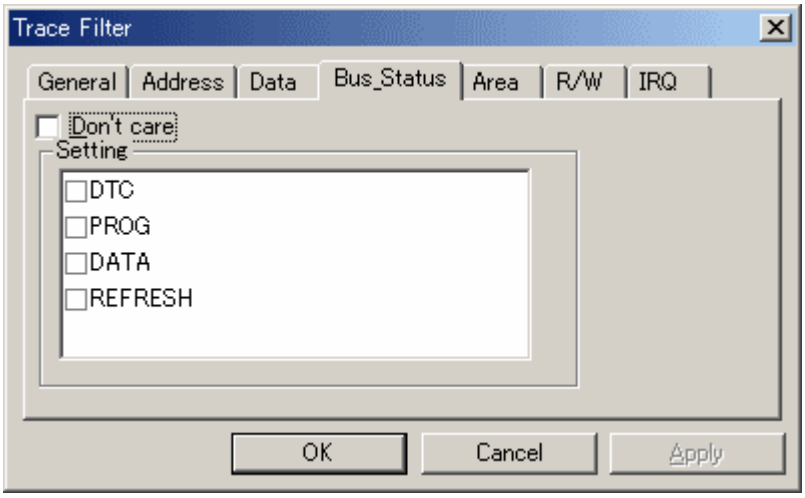


Figure 2.7 [Bus_Status] Page

Table 2.11 [Bus_Status] Page Options

Option	Description
[Don't care] check box	Indicates that no Bus_Status condition is set.
[Setting] group box	Specifies the bus status. DTC: DTC cycle PROG: CPU-instruction fetch cycle DATA: CPU-data access cycle REFRESH: Refresh cycle

(v) [Area] Page Options

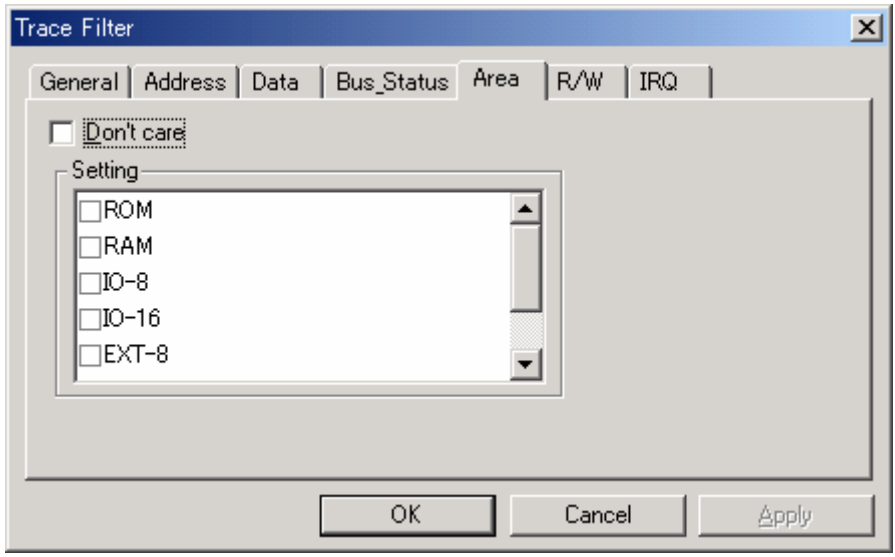


Figure 2.8 [Area] Page

Table 2.12 [Area] Page Options

Option	Description
[Don't care] check box	Indicates that no area condition is set.
[Setting] group box	Specifies the area. ROM: ROM area RAM: RAM area IO-8: IO-8 area IO-16: IO-16 area EXT-8: EXT-8 area EXT-16: EXT-16 area

(vi) [R/W] Page Options

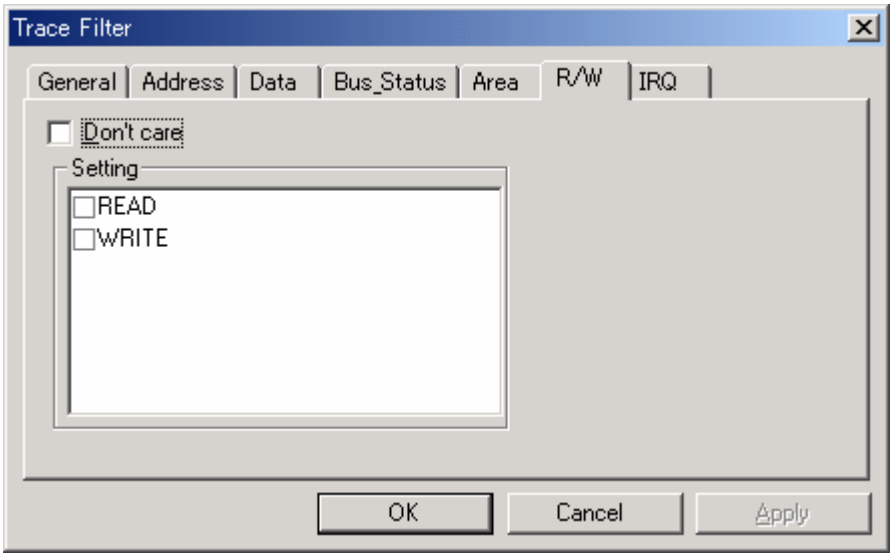


Figure 2.9 [R/W] Page

Table 2.13 [R/W] Page Options

Option	Description
[Don't care] check box	Indicates that no read/write condition is set.
[Setting] group box	Specifies the read/write. READ: Read cycle WRITE: Write cycle

(vii) [IRQ] Page Options

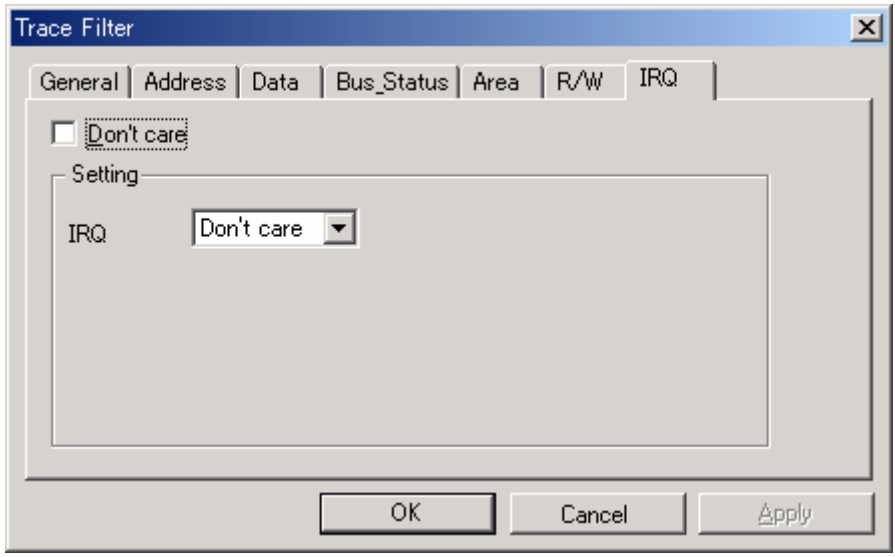


Figure 2.10 [IRQ] Page

Table 2.14 [IRQ] Page Options

Option	Description
[Don't care] check box	Indicates that no IRQ condition is set.
[IRQ] drop-down list	Specifies the IRQ. Don't care: Detects no IRQ. High: IRQ is high. Low: IRQ is low.

(5) Trace Find Function

The emulator jumps to the information that matches the conditions specified by all the trace data on the [Trace] window. The search condition is set in the [Trace Filter] dialog box. The information is displayed by selecting [Find…] from the popup menu that is displayed with the right-hand mouse button on the [Trace] window.

(i) [General] Page Options

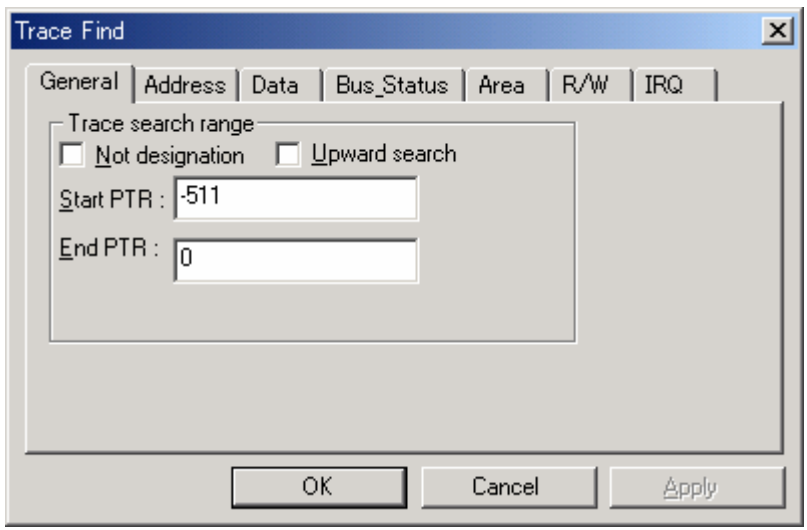


Figure 2.11 [General] Page

Table 2.15 [General] Page Options

Option	Description
[Not designation] check box	Designates no conditions.
[Upward search] check box	Performs upward search.
[Start PTR] edit box	Enters the pointer to start searching conditions.
[End PTR] edit box	Enters the pointer to end searching conditions.

(ii) [Address] Page Options

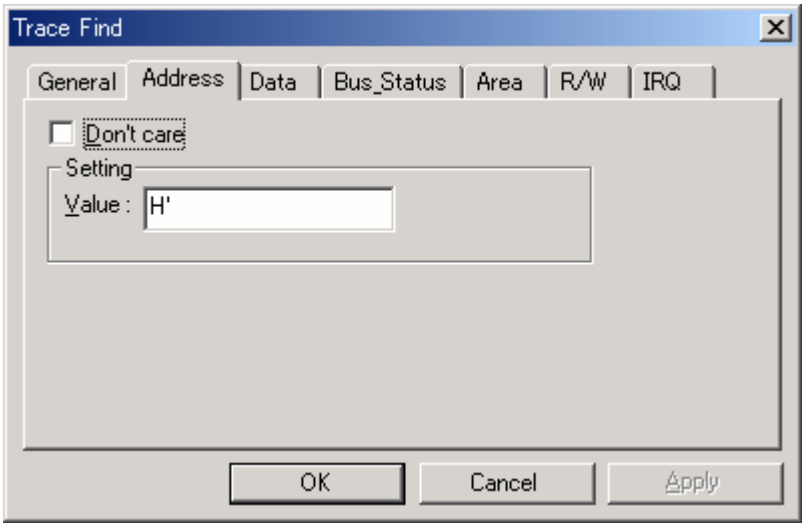


Figure 2.12 [Address] Page

Table 2.16 [Address] Page Options

Option	Description
[Don't care] check box	Indicates that no address condition is set.
[Value] edit box	Enters the address value.

(iii) [Data] Page Options

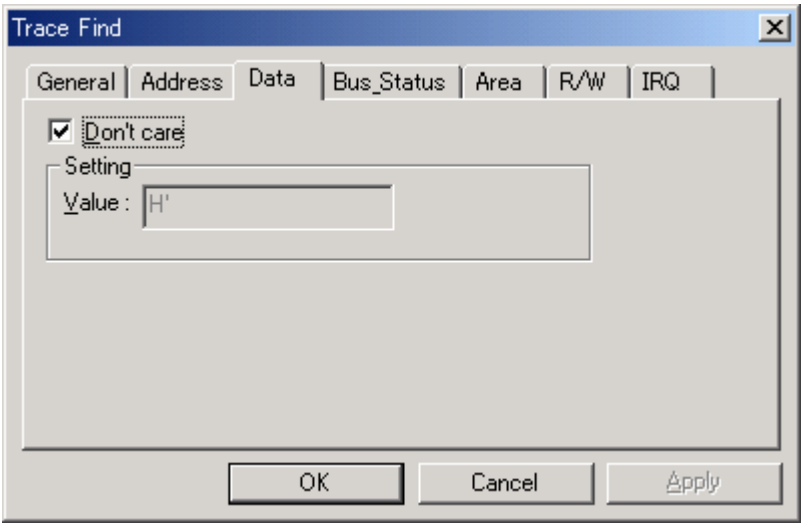


Figure 2.13 [Data] Page

Table 2.17 [Data] Page Options

Option	Description
[Don't care] check box	Indicates that no data condition is set.
[Value] edit box	Enters the data value.

(iv) [Bus_Status] Page Options

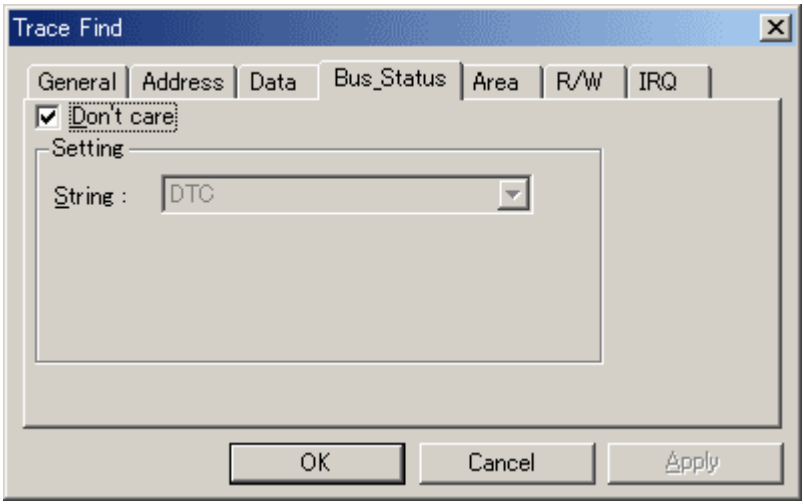


Figure 2.14 [Bus_Status] Page

Table 2.18 [Bus_Status] Page Options

Option	Description
[Don't care] check box	Indicates that no Bus_Status condition is set.
[String] drop-down list	Specifies the bus status. DTC: DTC cycle PROG: CPU-instruction fetch cycle DATA: CPU-data access cycle REFRESH: Refresh cycle

(v) [Area] Page Options

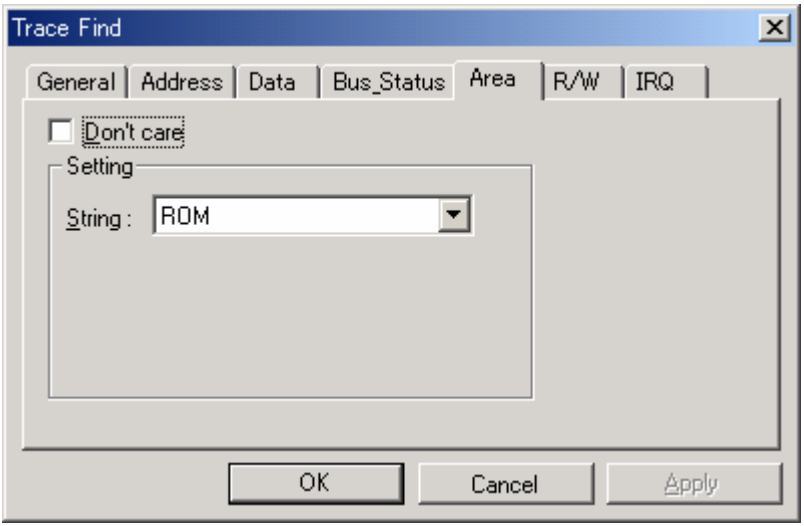


Figure 2.15 [Area] Page

Table 2.19 [Area] Page Options

Option	Description
[Don't care] check box	Indicates that no area condition is set.
[String] drop-down list	Specifies the area. ROM: ROM area RAM: RAM area IO-8: IO-8 area IO-16: IO-16 area EXT-8: EXT-8 area EXT-16: EXT-16 area

(vi) [R/W] Page Options

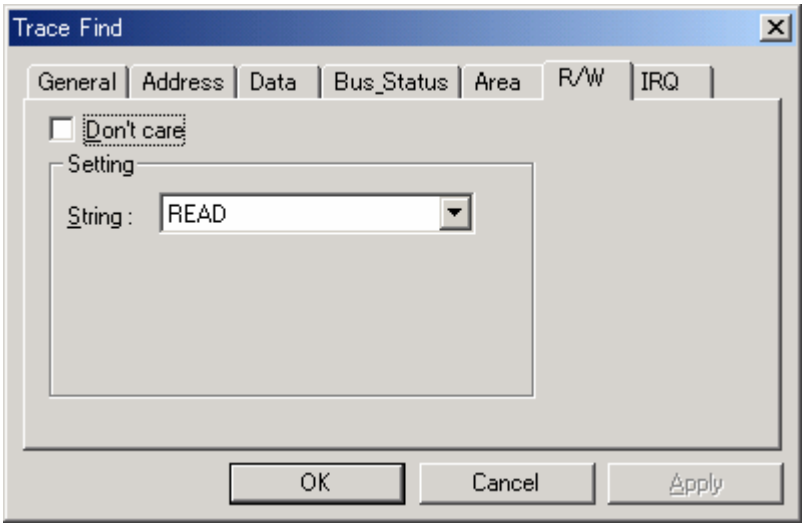


Figure 2.16 [R/W] Page

Table 2.20 [R/W] Page Options

Option	Description
[Don't care] check box	Indicates that no read/write condition is set.
[String] drop-down list	Specifies the read/write. READ: Read cycle WRITE: Write cycle

(vii) [IRQ] Page Options

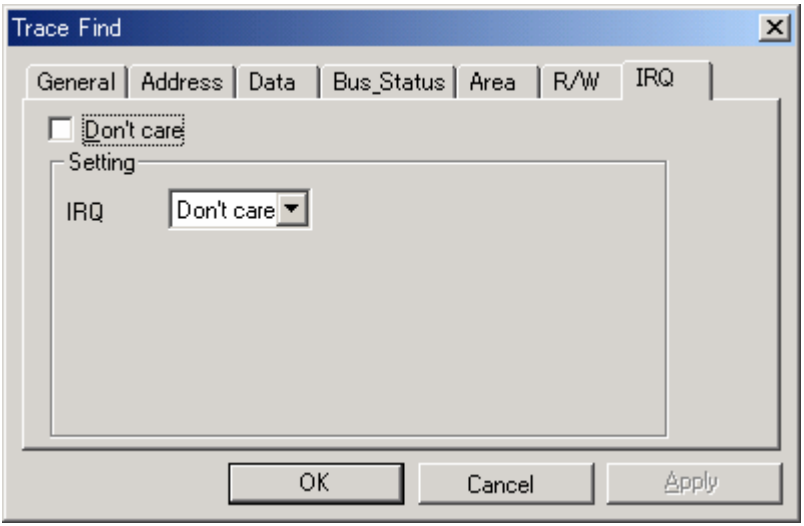


Figure 2.17 [IRQ] Page

Table 2.21 [IRQ] Page Options

Option	Description
[Don't care] check box	Indicates that no IRQ condition is set.
[IRQ] drop-down list	Specifies the IRQ. Don't care: Detects no IRQ. High: IRQ is high. Low: IRQ is low.

H8S, H8SX Family E10A-USB Emulator
Additional Document for User's Manual
Supplementary Information on Using the H8S/2114RF

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