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April 1st, 2010
Renesas Electronics Corporation

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H8S, H8SX Family E10A-USB Emulator

Additional Document for User's Manual
Supplementary Information on Using the
H8S/2168F, H8S/2167F, and H8S/2166F

Renesas Microcomputer Development
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H8S Family / H8S/2100 Series

E10A-USB for H8S/2168F HS2168KCU01HE

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Contents




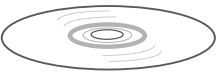
Section 1	Connecting the Emulator with the User System.....	1
1.1	Components of the Emulator	1
1.2	Connecting the E10A-USB Emulator with the User System.....	2
1.3	Pin Assignments of the User System Connector.....	3
1.4	Example of Emulator Connection.....	4
Section 2	Specifications of the Software when Using the H8S/2168F, H8S/2167F, and H8S/2166F.....	9
2.1	Differences between the H8S/2168F, H8S/2167F, H8S/2166F, and the Emulator.....	9
2.2	The H8S/2168F E10A-USB Emulator Specific Functions and Notes	12
2.2.1	Emulator Driver Selection	12
2.2.2	Hardware Break Functions	12
2.2.3	Notes on Setting the [Breakpoint] Dialog Box	14
2.2.4	Note on Using the JTAG Clock (TCK)	14
2.2.5	Trace Function.....	14

Section 1 Connecting the Emulator with the User System

1.1 Components of the Emulator

The H8S/2168F E10A-USB emulator supports the H8S/2168F, H8S/2167F, and H8S/2166F. Table 1.1 lists the components of the emulator.

Table 1.1 Components of the Emulator

Classification	Component	Appearance	Quantity	Remarks
Hardware	Emulator box		1	HS0005KCU01H: Depth: 65.0 mm, Width: 97.0 mm, Height: 20.0 mm, Mass: 72.9 g or HS0005KCU02H: 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
Software	H8S/2168F E10A-USB emulator setup program, H8S, H8SX Family E10A-USB Emulator User's Manual, Supplementary Information on Using the H8S/2168F, H8S/2167F, and H8S/2166F*, and Test program manual for HS0005KCU01H and HS0005KCU02H		1	HS0005KCU01SR, HS0005KCU01HJ-H8S, HS0005KCU01HE-H8S, HS2168KCU01HJ, HS2168KCU01HE, HS0005TM01HJ, and HS0005TM01HE (provided on a CD-R)

Note: 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 the emulator) with the user system, a connector must be installed in the user system so that a 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.

The H8S/2168F, H8S/2167F, and H8S/2166F supported by this emulator are referred to as the MCU unless the description is specific to either of them.

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 assignments of the user system connector.

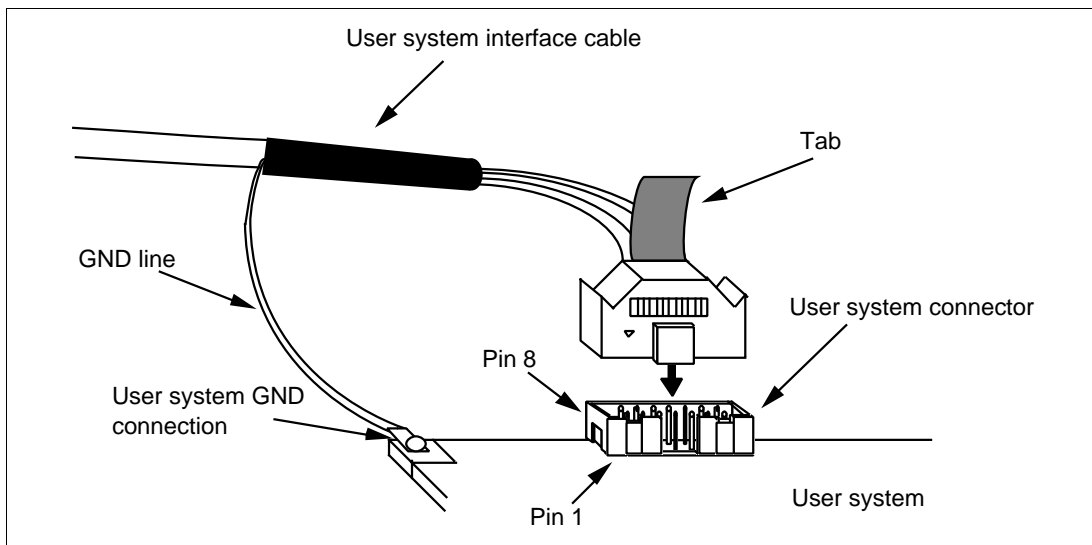


Figure 1.1 Connecting the User System Interface Cable to the User System

- 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.

1.3 Pin Assignments of the User System Connector

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

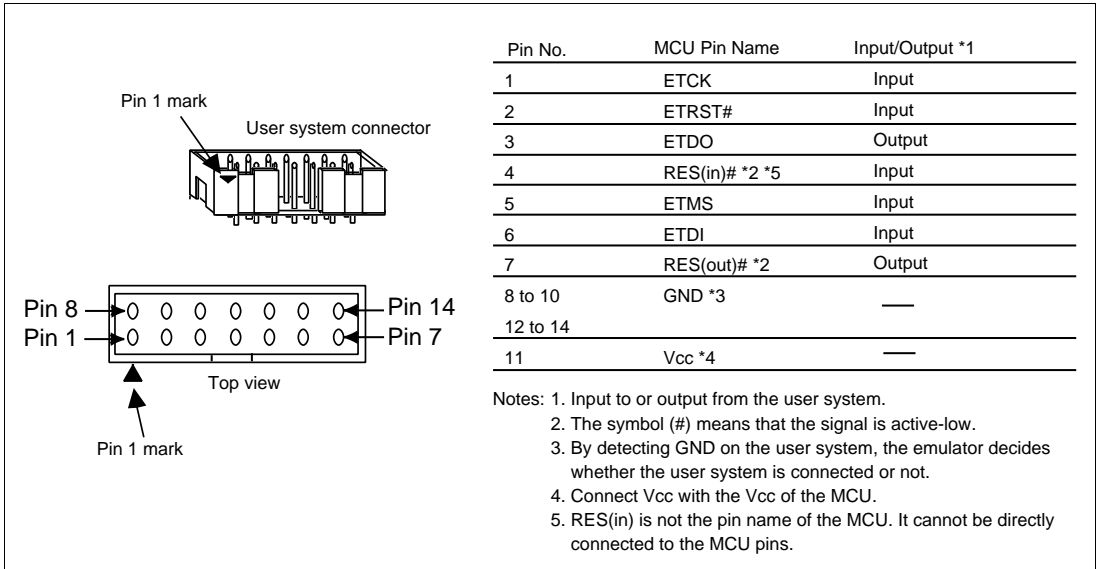


Figure 1.2 Pin Assignments of the User System Connector

1.4 Example of Emulator Connection

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

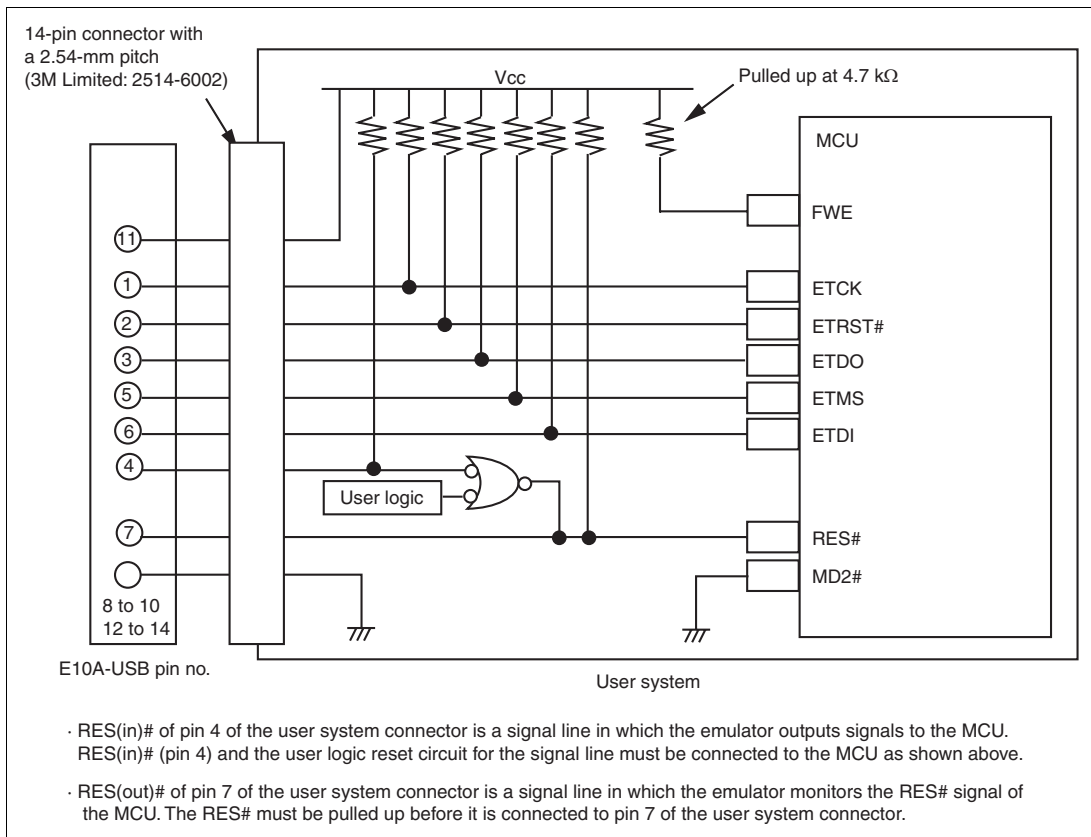


Figure 1.3 Example of Emulator Connection

Notes: 1. ETRST#, ETCK, ETMS, ETDO, and ETDI are used by the emulator. Pull up and connect the emulator and the MCU pins.

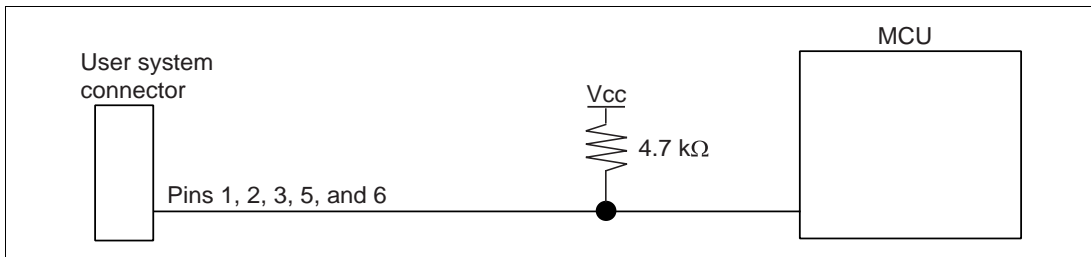


Figure 1.4 Connection of Emulator and MCU

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

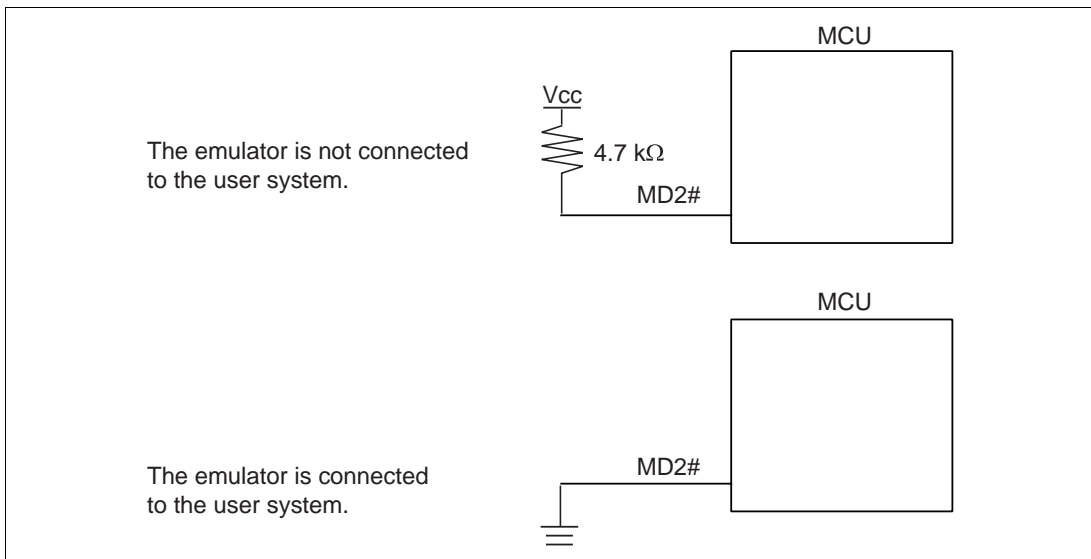


Figure 1.5 Emulator and Pin MD2#

- 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 for the signal line must be connected to pin RES# of 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.

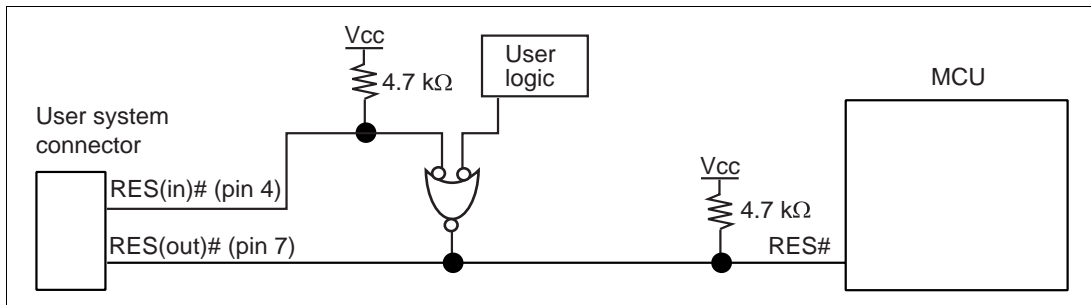


Figure 1.6 Connection of Pin RES#

- Pin FWE must be pulled up if the emulator is connected to the user system.

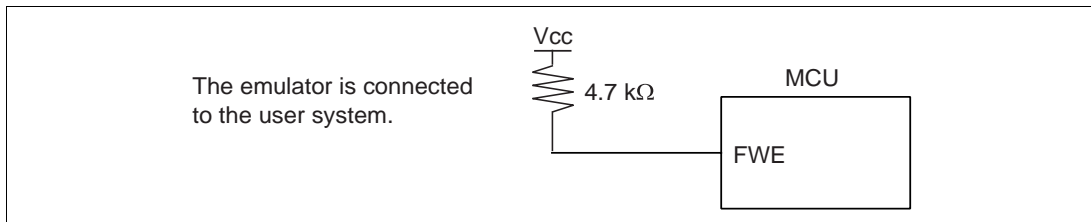


Figure 1.7 Connection of Pin FWE

- Ground pins 8, 9, 10, 12, 13, and 14 of the user system connector.
- Pin 11 of the user system connector must be connected to the user system Vcc (power supply). The amount of voltage permitted to input to the user system connector must be within the guaranteed range of the MCU.
- The H8S/2168F, H8S/2167F, and H8S/2166F incorporate a boundary scan function. When the MCU is used without connecting the emulator, refer to the description in section 21.6, Usage Notes, in the hardware manual of the device, and connect the MCU to the emulator. Special cares must be taken for handling of ETRST#.

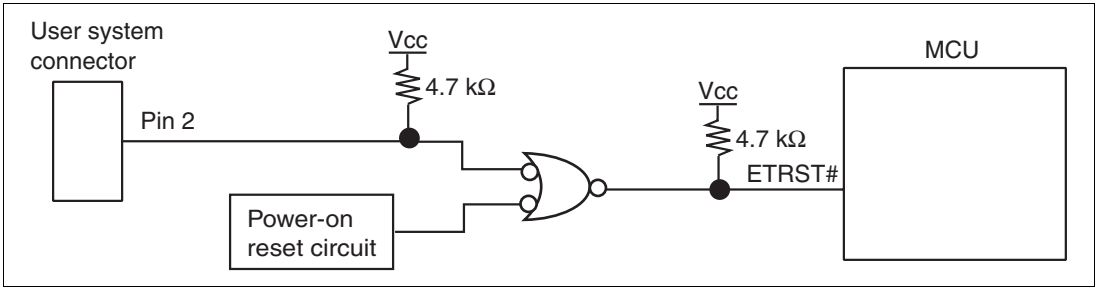


Figure 1.8 Connection of ETRST# (Reference)

When MD2# is connected to ground (when the emulator is connected), ETRST#, ETCK, ETMS, ETDO, and ETDI are not available as the boundary scan function.

Section 2 Specifications of the Software when Using the H8S/2168F, H8S/2167F, and H8S/2166F

2.1 Differences between the H8S/2168F, H8S/2167F, H8S/2166F, 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 RES#, ETRST#, ETCK, ETMS, ETDO, and ETDI pins. These pins cannot be used.

5. When the emulator is used, the power consumed by the MCU can reach several mA. This is because the user power supply drives ICs 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. 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.
8. Note on Executing the User Program
The set value is rewritten since the emulator uses flash memory and watchdog timer registers during programming (Go, Step In, Step Out, or Step Over) of the flash memory.
9. MCU Operating Mode
The emulator supports mode 2 (expanded mode with on-chip ROM enabled or single-chip mode).
10. 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
11. Loading Sessions
Information in [JTAG clock] of the [Configuration] dialog box cannot be recovered by loading sessions. Thus the TCK value will be as follows:
 - When HS0005KCU01H or HS0005KCU02H is used: TCK = 2.5 MHz
12. 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).

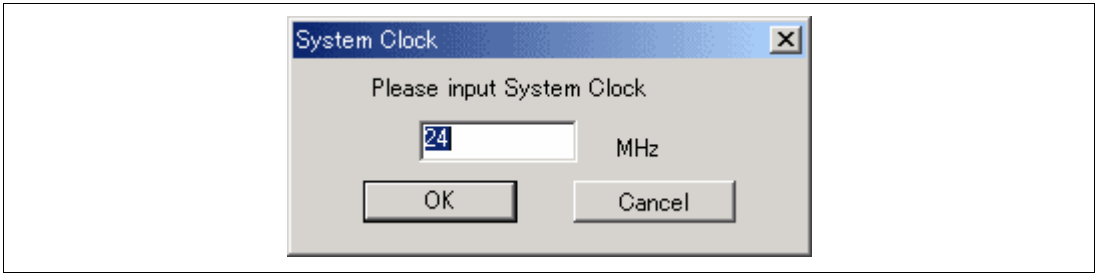


Figure 2.1 [System Clock] Dialog Box

13. 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/2168F 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 [E10A-USB 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/2168F 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.

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

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

Note: ○: 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

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

Note: ○: 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 used, set the frequency to lower than that of the system clock.

2.2.5 Trace Function

The emulator uses the branch-instruction trace function in the MCU. It displays the branch-source address or the mnemonic, and operand can be acquired in realtime.

**H8S, H8SX Family E10A-USB Emulator
Additional Document for User's Manual
Supplementary Information on Using the H8S/2168F,
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