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April 1st, 2010
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 H8SX/1527F, H8SX/1525F, H8SX/1582F, and H8SX/1527RF

Renesas Microcomputer Development Environment System
H8SX Family / H8SX/1500 Series

E10A-USB for H8SX/1527F HS1527KCU01HE

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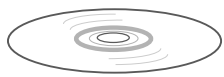
Contents

Section 1 Connecting the Emulator with the User System

1.1 Components of the E10A-USB Emulator

The H8SX/1527F E10A-USB emulator supports the H8SX/1527F, H8SX/1525F, H8SX/1582F, and H8SX/1527RF (hereafter referred to as the MCU unless the description is specific to any of them). Table 1.1 lists the components of the H8SX/1527F E10A-USB 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	H8SX/1527F E10A-USB emulator setup program, H8S, H8SX Family E10A-USB Emulator User's Manual, Supplementary Information on Using the H8SX/1527F, H8SX/1525F, H8SX/1582F, and H8SX/1527RF[*2], and Test program manual for HS0005KCU01H and HS0005KCU02H		1	HS0005KCU01SR, HS0005KCU01HJ-H8S, HS0005KCU01HE-H8S, HS1527KCU01HJ, HS1527KCU01HE, 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 the 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 the connector and recommended circuits shown in this manual.
Before designing the user system, be sure to read the H8S, H8SX Family 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 assignments of the user system connector.

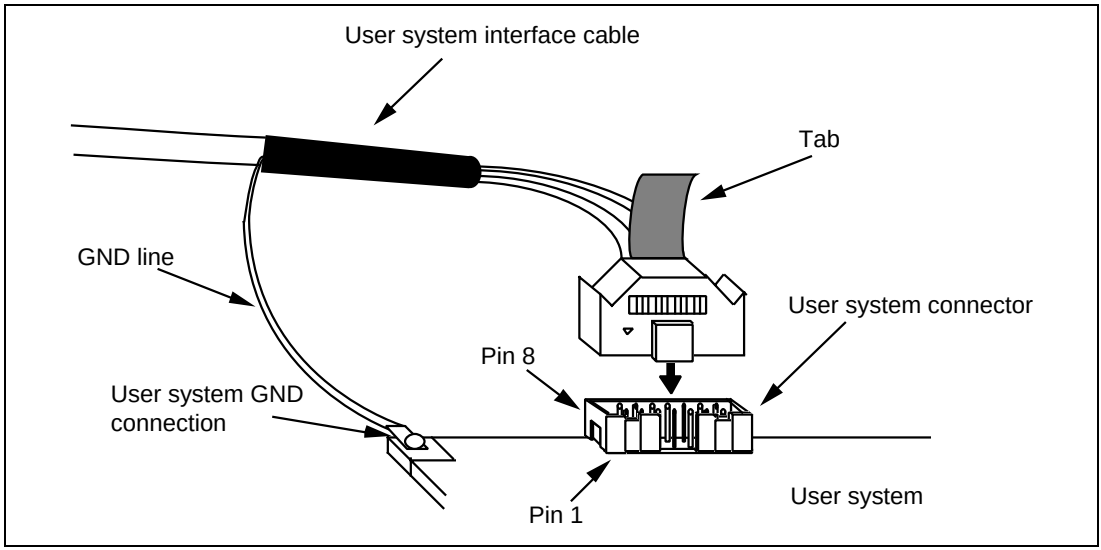


Figure 1.1 Connecting the User System Interface Cable to the User System

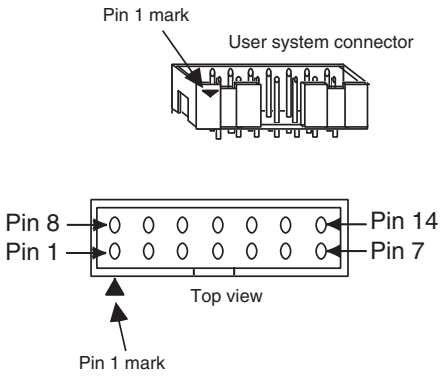
Notes: 1. The pin number assignments of the 14-pin connector differ from those of the E8 emulator; however, the physical location is the same.
2. Do not place any components within 3 mm of the connector.

⚠ 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	Input/Output *1
1	P37/TCK	Input
2	P34/TRST#	Input
3	P63/TDO	Output
4	RES(in)# *2 *5	Input
5	P35/TMS	Input
6	P36/TDI	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, 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.

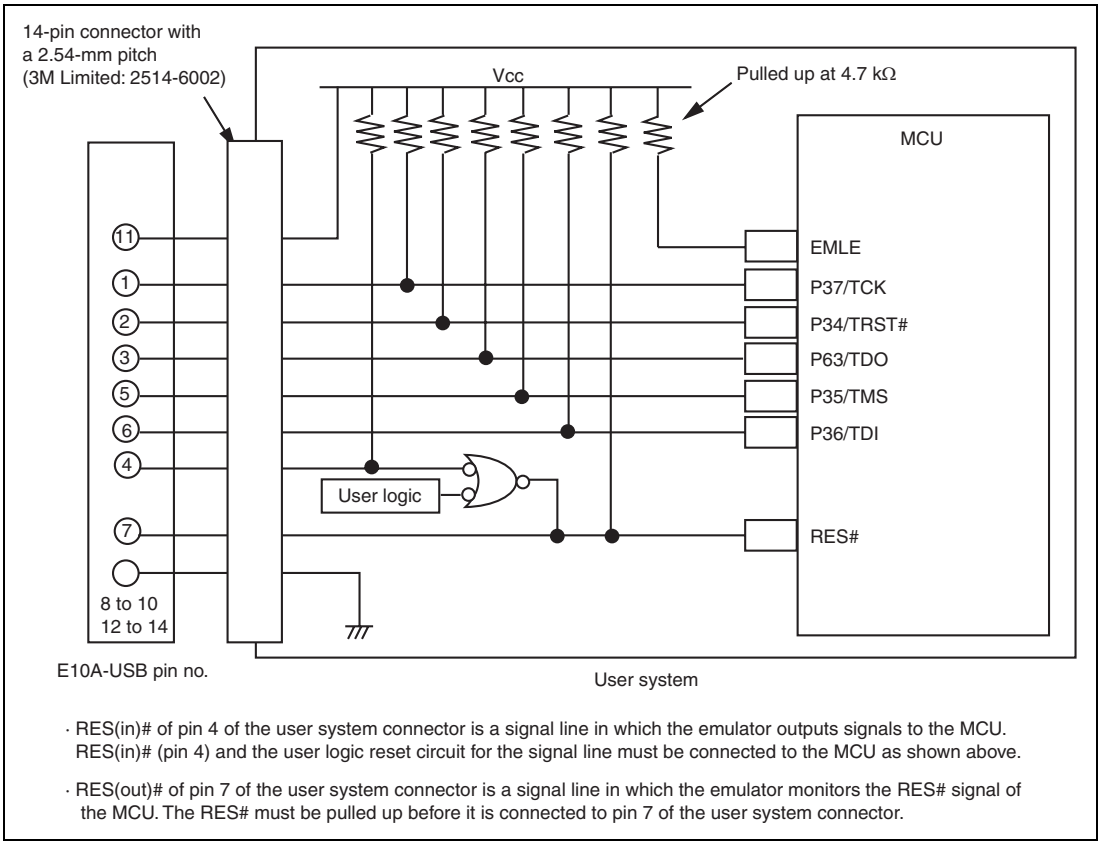


Figure 1.3 Example of Emulator Connection

Notes: 1. P34/TRST#, P37/TCK, P35/TMS, P63/TDO, and P36/TDI are used by the emulator. Pull up and connect the emulator and the MCU pins.

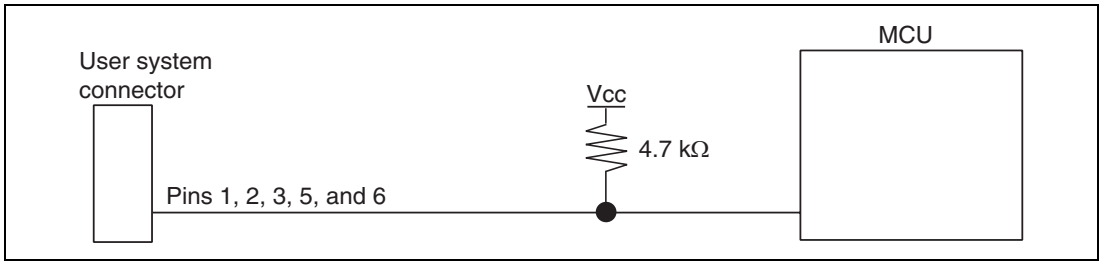


Figure 1.4 Connection of Emulator and MCU

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

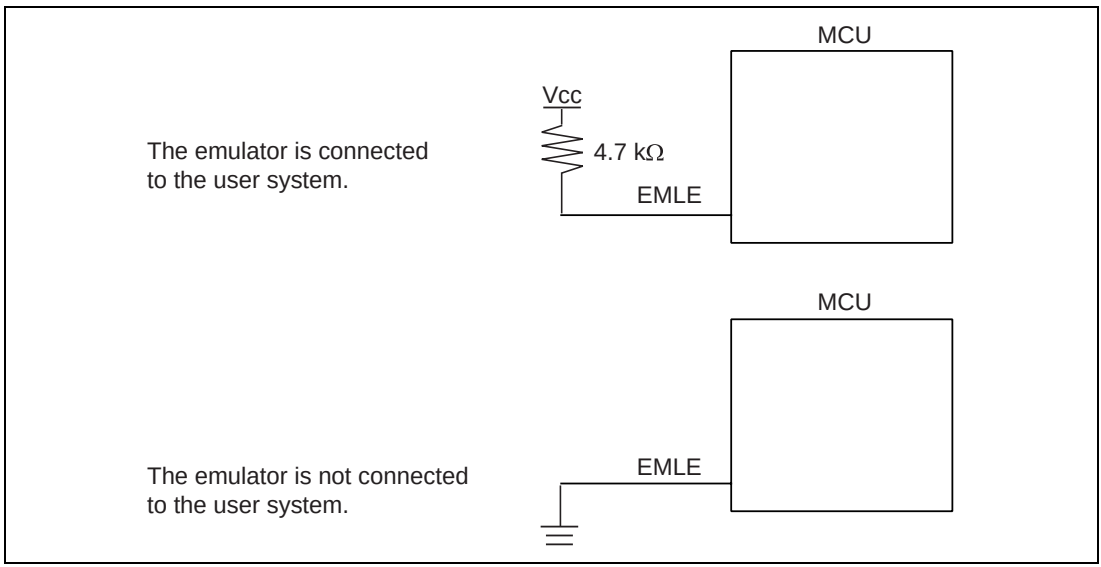


Figure 1.5 Emulator and Pin EMLE

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 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.

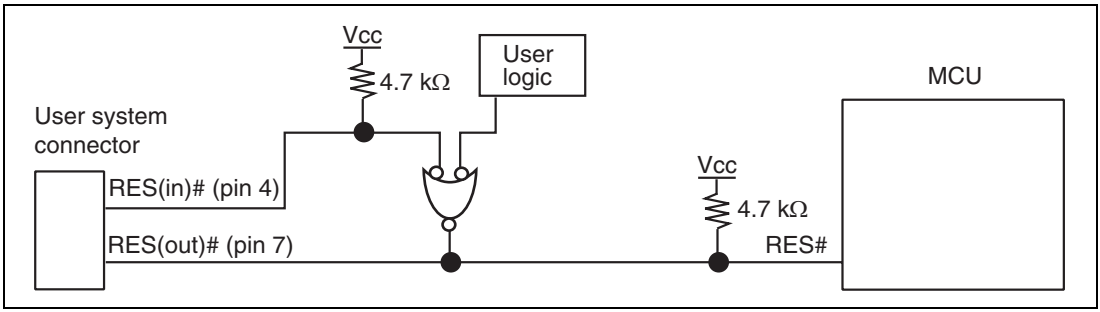


Figure 1.6 Connection of Pin RES#

4. Ground pins 8, 9, 10, 12, 13, and 14 of the user system connector.
5. 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.
6. When the MCU in use is connected to the emulator, the pin functions listed below are not available.

Table 1.2 Pin Functions Not Available

H8SX/1527F, H8SX/1582F, or H8SX/1527RF	H8SX/1525F
P63 and P34 to P37	P63 and P34 to P37
IRQ11-B#	IRQ11-B#
PO12 to PO15	—
TIOCA1 to TIOCA2, TIOCB1 to TIOCB2, TCLKC, and TCLKD	—

The symbol (#) means that the signal is active-low.

Section 2 Specification of the Emulator's Software

2.1 Differences between the H8SX/1527F, H8SX/1525F, H8SX/1582F, H8SX/1527RF, 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.
   For the registers shown in table 2.1, values other than PC or CCR are not changed even if the CPU reset command is issued. If ER7 (SP) is changed as an odd value, it must be modified in the [Register] window.

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
VBR	H'0
SBR	H'FFFFFF00
MACH	H'0
MACL	H'0

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 P34/TRST#, P37/TCK, P35/TMS, P63/TDO, and P36/TDI 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 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 reprogrammed many times, and the MCU is left for a few days, data may be lost due to retention problems.
   If the flash memory is reprogrammed many times, the data will not be erased. If an error message is displayed, exchange the MCU for a new one.

7. MCU Operating Mode
   Use the emulator in mode 3 (single-chip initiation mode).

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 and watchdog timer registers during programming (Go, Step In, Step Out, or Step Over) of the flash memory.

10. Note on Reprogramming the Flash Memory
    While the flash memory is reprogrammed during Go operation, actual reprogramming will not be performed if the flash memory is reprogrammed on the [Memory] window. Therefore, the contents will not be displayed correctly on the [Memory] window.

11. 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).

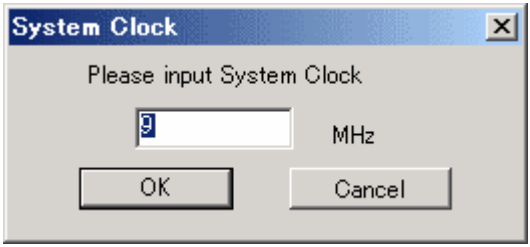


Figure 2.1 [System Clock] Dialog Box

12. Limitation on the Module-Stop Function (MSTPCRC)

    Since the emulator uses the internal RAM, do not set the MSTPC0 or MSTPC1 bit to 1 when the emulator is in use.

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 H8SX/1527F 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 reprogrammed 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 reprogrammed 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 H8SX/1527F E10A-USB emulator, conditions of Break Condition 1,2,3,4 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. It is possible to select whether a break is generated before or after prefetched address execution. When [User mask] is selected, a value to be masked '*' can be set. For masked bits, the condition is satisfied for any values.
Data bus condition	Breaks when the MCU data bus value matches the specified value. Byte, word, or longword can be specified as the access data size. When [User mask] is selected, a value to be masked '*' can be set. For masked bits, the condition is satisfied for any values.
Bus master condition	Breaks when the values of DATA, DTC, and DMA cycles match the specified values.
Read or write condition	Breaks in the read or write cycle.
Execution count condition	The condition specified with Break Condition 1 breaks after the execution count condition specified here has been satisfied.

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	Bus Master Condition	Read or Write Condition	Execution Count Condition
[Break condition 1]	O	O	O	O	O
[Break condition 2]	O	X	O	O	X
[Break condition 3]	O	X	O	O	X
[Break condition 4]	O	X	O	O	X

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 (option <addropt>)	Data Condition (option <dataopt>)	Bus Master Condition (option <accessopt>)	Read or Write Condition (option <r/wopt>)	Execution Count Condition (option <countopt>)
Break condition 1	O	O	O	O	O
Break condition 2	O	X	O	O	X
Break condition 3	O	X	O	O	X
Break condition 4	O	X	O	O	X

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.
4. When [Go To Cursor] is selected, the settings of Break Condition channel 4 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. However, a BREAKPOINT cannot be set to the following addresses:
   - An area other than flash memory or RAM
   - An area occupied by the emulator program
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 Sequential Break Function

The user program is halted when conditions of the Break Condition for channels 2 to 4 are matched. This function can be set in the [Emulation mode] drop-down list box of the [Configuration] dialog box.

Table 2.6 Sequential Break Condition Specification Items

Items	Description
Sequential break Condition 2-1	Halts a program when a condition is satisfied in the order of Break Condition 2, 1. Break Condition 1, 2 must be set.
Sequential break Condition 3-2-1	Halts a program when a condition is satisfied in the order of Break Condition 3, 2, 1. Break Condition 1, 2, 3 must be set.
Sequential break Condition 4-3-2-1	Halts a program when a condition is satisfied in the order of Break Condition 4, 3, 2, 1. Break Condition 1, 2, 3, 4 must be set.

Note: When Sequential break Condition 4-3-2-1 is set, [Go To Cursor] is not available.

2.2.5 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.

2.2.6 Trace Function

The trace function in the emulator uses the eight-branch-instruction trace function in the MCU, and acquires a trace by operating the user program in realtime. The branch-instruction trace function displays the branch-source address, the mnemonic, and the operand.

2.2.7 Parallel Transfer

(1) This emulator supports memory accesses during user program execution using a DTC parallel transfer. To enable the DTC parallel transfer, select [Enable] for [Parallel] in the [Configuration] dialog box.

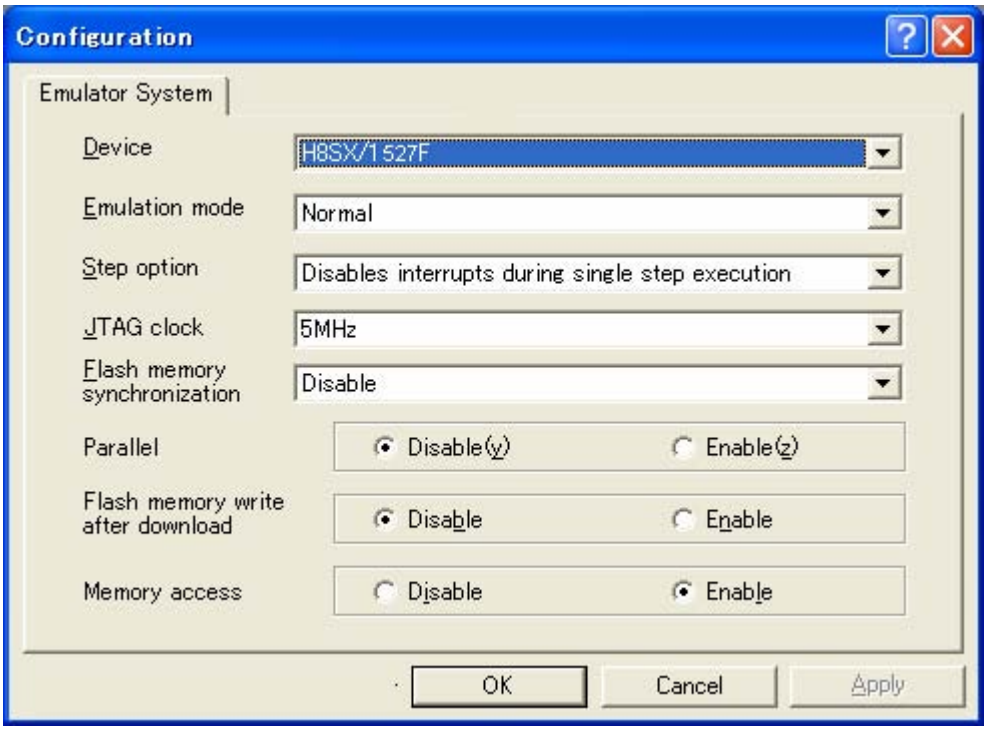


Figure 2.2 [Configuration] Dialog Box

[Parallel] group box: Selects the setting on memory accesses during user program execution.

Table 2.7 [Parallel] Group Box

Disable	Uses no emulator debugging function (DTC parallel transfer) to access memory. A short break occurs. (initial value)
Enable	Uses the emulator debugging function (DTC parallel transfer) to access memory.

(2) Limitations on DTC Parallel Transfer Enabled

— If the reserved area is accessed during DTC parallel transfer, a DMA address error occurs. Be sure to set the interrupt exception processing for the CPU or DMA address error on the user program.

— Use of DTC parallel transfer to access memory is prohibited in software standby mode; H'FF is displayed. If the emulator enters the software standby mode during DTC parallel transfer, correct transfer will not be performed. When the DTC parallel transfer function is used again, reconnect the emulator.

— If the DTC parallel transfer function is used to access I/O registers (I/O areas), accessing memory is prohibited in the range H'FFFF00 to H'FFFF1F (H'FF is displayed).

— If the user program is halted by a breakpoint or a break condition during DTC parallel transfer, correct transfer will not be performed and a dialog box will be displayed. When the DTC parallel transfer function is used again, reconnect the emulator.

Figure 2.3 shows if an access to each area is possible or not during user program execution.

Address area map	DTC Parallel Transfer Disabled (Short Break)		DTC Parallel Transfer Enabled	
	Read	Write	Read	Write
Flash memory	Possible	Possible *1	Possible	Impossible *1
Reserved area	Possible *2	Impossible *3	Impossible *4, *6	Impossible *4, *6
Internal RAM	Possible	Possible	Possible	Possible
Reserved area	Possible *2	Impossible *3	Impossible *4, *6	Impossible *4, *6
Internal I/O area	Possible	Possible	Possible *5	Possible *5
Reserved area	Possible *2	Impossible *3	Impossible *4, *6	Impossible *4, *6
Internal I/O area	Possible	Possible	Possible *5	Possible *5

Notes:
1. Only writes to the internal buffer. Data is actually written to when the flash memory is programmed next time.
2. An undefined value is displayed in the reserved area.
3. This area is reserved and cannot be rewritten.
4. A timeout occurs because the DTC stops the transfer when a DMA address error occurs.
5. Accesses by the DTC may not be possible depending on the register (due to the specifications of the DTC).
6. When the reserved area is accessed, H'FF is displayed.

Figure 2.3 Parallel Accesses in Various Memory Areas

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Additional Document for User's Manual
Supplementary Information on Using the H8SX/1527F, H8SX/1525F, H8SX/1582F, and H8SX/1527RF

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