To our customers,

---

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April 1\textsuperscript{st}, 2010
Renesas Electronics Corporation

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H8 Family E10T-USB Emulator
Additional Document for User’s Manual
Supplementary Information on Using the H8/3048F-ONE and H8/3029F

Renesas Microcomputer Development Environment System
H8 Family / H8/300H Series
E10T-USB for H8/3048F-ONE   HS3048BTCU01HE
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Section 1  Connecting the Emulator with the User System

1.1  Components of the Emulator

The H8/3048F-ONE E10T-USB emulator supports the H8/3048F-ONE and H8/3029F (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>
<thead>
<tr>
<th>Classification</th>
<th>Component</th>
<th>Appearance</th>
<th>Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Emulator box</td>
<td><img src="image" alt="Emulator Box" /></td>
<td>1</td>
<td>HS0005TCU01H: Depth: 65.0 mm, Width: 97.0 mm, Height: 20.0 mm, Mass: 72.9 g</td>
</tr>
<tr>
<td></td>
<td>User system interface cable</td>
<td><img src="image" alt="User Interface Cable" /></td>
<td>1</td>
<td>20-pin type: Length: 200 mm, Mass: 35.0 g</td>
</tr>
<tr>
<td></td>
<td>USB cable</td>
<td><img src="image" alt="USB Cable" /></td>
<td>1</td>
<td>Length: 1500 mm, Mass: 50.6 g</td>
</tr>
<tr>
<td>Software</td>
<td>E10T-USB emulator setup program, H8 Family E10T-USB Emulator User's Manual, Supplementary Information on Using the H8/3048F-ONE and H8/3029F*, and Test program manual for HS0005TCU01H</td>
<td><img src="image" alt="Software" /></td>
<td>1</td>
<td>HS0005TCU01SR, HS0005TCU01HJ, HS0005TCU01HE, HS3048BTCU01HJ, HS3048BTCU01HE, HS0005TM01HJ, and HS0005TM01HE (provided on a CD-R)</td>
</tr>
</tbody>
</table>

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 E10T-USB Emulator with the User System

Before connecting an E10T-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 the connector and recommended circuits shown in this manual. Before designing the user system, be sure to read the E10T-USB emulator user’s manual and the hardware manual for related MCUs.

Table 1.2 shows the recommended connector for the emulator.

Table 1.2 Recommended Connector

<table>
<thead>
<tr>
<th>Type Number</th>
<th>Manufacturer</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2520-6002</td>
<td>3M Limited</td>
<td>20-pin straight type</td>
</tr>
</tbody>
</table>

Connect pins 2, 4, 6, 8, 10, 12, 14, and 16 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](image-url)
Notes:  
1. The pin number assignments of the 20-pin connector differ from those of the E10A emulator.  
2. When designing the connector layout on the user board, do not place any components within 3 mm of the connector.  
3. When the emulator is used in the writer mode, connect the emulator similarly to the user system.

⚠ 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 E10T-USB Connector

Figure 1.2 shows the pin assignments of the connector.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RES#</td>
</tr>
<tr>
<td>2</td>
<td>Vss</td>
</tr>
<tr>
<td>3</td>
<td>FWE</td>
</tr>
<tr>
<td>4</td>
<td>Vss</td>
</tr>
<tr>
<td>5</td>
<td>MD0</td>
</tr>
<tr>
<td>6</td>
<td>Vss</td>
</tr>
<tr>
<td>7</td>
<td>MD1</td>
</tr>
<tr>
<td>8</td>
<td>Vss</td>
</tr>
<tr>
<td>9</td>
<td>MD2</td>
</tr>
<tr>
<td>10</td>
<td>Vss</td>
</tr>
<tr>
<td>11</td>
<td>N.C.</td>
</tr>
<tr>
<td>12</td>
<td>Vss</td>
</tr>
<tr>
<td>13</td>
<td>N.C.</td>
</tr>
<tr>
<td>14</td>
<td>Vss</td>
</tr>
<tr>
<td>15</td>
<td>P91/TxD1</td>
</tr>
<tr>
<td>16</td>
<td>Vss</td>
</tr>
<tr>
<td>17</td>
<td>P93/RxD1</td>
</tr>
<tr>
<td>18</td>
<td>Vcc</td>
</tr>
<tr>
<td>19</td>
<td>P95/SCK1</td>
</tr>
<tr>
<td>20</td>
<td>Vcc</td>
</tr>
</tbody>
</table>

Notes:  
1. The symbol (#) means that the signal is active-low.  
2. Vss (pin 2) detects connection or disconnection with the E10T-USB user system.  
3. Pin 20 is Vcc; however, it can be N.C. if an on-board flash writer (including the third party's product) is not used.
1.4 Example of Emulator Connection

Figure 1.3 shows an example of emulator connection to the MCU.

---

**Figure 1.3  Example of Emulator Connection (Mode 7)**
Notes: 1. P91, P93, and P95 are used by the emulator. Pull up and connect the emulator and MCU pins.

![Figure 1.4 Connection of Emulator and MCU](image1)

2. The FWE signal is used for forced break control by the emulator. Connect the emulator and MCU pins directly.

![Figure 1.5 Connection of Emulator and FWE Pin](image2)
3. The RES# pin is used by the emulator. Create the following circuit so that a reset input from the emulator can be accepted:

Note: Do not connect the load capacity such as a capacitor to the wiring of the RES# pin. The rising waveform of the RES# pin will be delayed and the E10T-USB cannot be used. Set the rising waveform from 0 V to 5.0 V (3.3 V) within the range of 10 μs.

Figure 1.6  Example of Reset Circuits
4. MD0 to MD2 pins are used by the emulator at power-on reset. Connect MD0 to MD2 pins as shown in figure 1.7.

5. Connect Vss and Vcc with the Vss and Vcc of the MCU, respectively.

6. Connect nothing with N.C.

7. The amount of voltage permitted to input to Vcc must be within the guaranteed range of the microcomputer. The H8/3048F-ONE has 4.5- to 5.5-V and 3.0- to 3.6-V input voltages. Use the correct input voltage depending on the microcomputer. The H8/3029F only has 3.0- to 3.6-V input voltage. Do not apply 4.5- to 5.5-V as the input to Vcc.

8. Figure 1.8 shows the interface circuit in the emulator. Use this figure as a reference to decide the pull-up resistance value.

![Figure 1.7 Example of Circuits for Operating Mode Setting Pins](image-url)
Section 1  Connecting the Emulator with the User System

Notes:
1. The symbol ($) means that the signal is active-low.
2. Pins 4, 6, 8, 10, 12, 14, and 16 of the user system port connector are Vss and connected to GND of the emulator.
3. Pin 2 of the user system port connector is set to Vss. However, it is connected to the input circuit equal to that for pin 15 to decide whether the user system is connected or not.
4. Pin 20, as well as pin 18, is set to VCC in accordance with the on-board flash writer. However, pin 20 can be N.C. because it is not connected in the emulator.

Figure 1.8  Interface Circuit in the Emulator (Reference)
9. When the MCU is connected to the emulator, the functions listed below cannot be used.

Table 1.3 Pin Functions Not Available

<table>
<thead>
<tr>
<th>H8/3048F-ONE and H8/3029F</th>
</tr>
</thead>
<tbody>
<tr>
<td>P91, P93, and P95</td>
</tr>
<tr>
<td>TxD1, RxD1, and SCK1</td>
</tr>
<tr>
<td>FWE</td>
</tr>
<tr>
<td>IRQ5#</td>
</tr>
</tbody>
</table>

The symbol (#) means that the signal is active-low.
Section 2   Specification of the E10T-USB Emulator’s Software

2.1 Differences between the MCUs (H8/3048F-ONE and H8/3029F) and the Emulator

1. The emulator supports the operating modes shown in table 2.1.

<table>
<thead>
<tr>
<th>MCU Name</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>H8/3048F-ONE</td>
<td>5, 6, and 7</td>
</tr>
<tr>
<td>H8/3029F</td>
<td>5 and 7</td>
</tr>
</tbody>
</table>

2. When the emulator system is initiated, it initializes the general registers and part of the control registers as shown in table 2.2. 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>
<thead>
<tr>
<th>Register</th>
<th>Emulator at Link Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>Reset vector value in the vector address table</td>
</tr>
<tr>
<td>ER0 to ER6</td>
<td>Undefined</td>
</tr>
<tr>
<td>ER7 (SP)</td>
<td>(16-Mbyte expanded mode with on-chip ROM enabled)</td>
</tr>
<tr>
<td></td>
<td>H8/3048F-ONE: H'FFFF10</td>
</tr>
<tr>
<td></td>
<td>H8/3029F: H'FFFF20</td>
</tr>
<tr>
<td></td>
<td>(Single-chip advanced mode)</td>
</tr>
<tr>
<td></td>
<td>H8/3048F-ONE: H'FFF10</td>
</tr>
<tr>
<td></td>
<td>H8/3029F: H'FFF20</td>
</tr>
<tr>
<td></td>
<td>(1-Mbyte expanded mode with on-chip ROM enabled)</td>
</tr>
<tr>
<td></td>
<td>H8/3048F-ONE: H'FFF10</td>
</tr>
<tr>
<td>CCR</td>
<td>1 for I mask, and others undefined</td>
</tr>
</tbody>
</table>

3. Low-Power Mode
   During a user program break, the CPU operating frequency is forced to $\phi$ for high-speed operation.
4. Reset Signal
The MCU signals are only valid during user program execution started with clicking the GO or
STEP-type button. In command input wait state, the RES signal is not sent to the H8/3048F-
ONE.

Note: Do not start user program execution or access the memory while control input signal
(RES) is being low. A TIMEOUT error will occur. The error will also occur when (RES)
is low during a break.

5. 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.

6. 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.

7. The emulator communicates with the H8/3048F-ONE by using the P95/SCK1, P93/RxD1,
P91/TxD1, RES, FWE, and MD2 to MD0 pins. These pins cannot be used, except for RES and
MD2 to MD0 pins.

8. 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.

9. The emulator uses a two-word stack pointer for values that are stored when user program
execution is started or stopped (i.e., by a break). Therefore, the stack area must accept two-
word addresses.

10. Refresh Controller and DMA Controller
The emulator cannot debug the user program that uses the refresh controller or DMA
controller.
11. Reading the MDCR Register and Setting the P9DDR Register in the Reset Exception Processing

Be sure to read MDCR and set P9DDR in the reset exception processing of the user program. Set bits P91DDR, P93DDR, and P95DDR in the P9DDR register as shown below.

- P91DDR = 1
- P93DDR = 0
- P95DDR = 0

12. Initialization of the Internal I/O Register by Reset Function

In the [Debug] - [Reset CPU], [Debug] - [Reset GO] and RESET commands, the following internal I/O registers are not initialized. Be sure to initialize them by the user program.

[H8/3048F-ONE]
- System control: SYSCR, MSTCR, DIVCR
- Interrupt controller: ISCR, IER, ISR, IPRA, IPRB
- Bus controller: ABWCR, ASTCR, WCR, WCER, BRCR, CSCR
- Watchdog timer: TCSR, TCNT, RSTCSR
- Serial communication interface (channel 1): SMR, BRR, SCR, TDR, SSR, RDR
- Flash memory: FLMCR1, FLMCR2, EBR, RAMCR
- D/A converter: DASTCR

[H8/3029F]
- System control: SYSCR, MSTCR, DIVCR
- Interrupt controller: ISCR, IER, IPRA, IPRB
- Bus controller: ABWCR, ASTCR, WCRH, WCRL, BRCR
- Watchdog timer: TCSR, TCNT, RSTCSR
- Serial communication interface (channel 1):
  - SMR1, BRR1, SCR1, TDR1, SSR1, RDR1, SCMR1
- Flash memory:
  - FPCS, FECS, FEKEY, FMATS, FTDAR, FVADRR, FVADRE, FVADRH, FVADRL
- D/A converter: DASTCR
13. Note on Using Port 9

P91, P93, and P95 of port 9 are used by the emulator. When the P9DDR register is written in
the user program, set bits P91DDR, P93DDR, and P95DDR in that register as shown below.
The P9DDR register is initialized by external reset. Be sure to set P9DDR in the reset
exception processing of the user program.

\[
\begin{align*}
P91DDR &= 1 \\
P93DDR &= 0 \\
P95DDR &= 0
\end{align*}
\]

14. Sum Data Displayed in the Program Flash Mode

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

15. 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

16. Reading Data from H8/3048F-ONE Internal Flash Memory

If the user makes the setting that allows data to be read from the internal flash memory by
inputting the correct ID code and then activates the emulator, the emulator shows all data of
the first address (16 bytes from H’0 to H’F) as H’FF. After activating the emulator, set the
reset vector address again.
2.2  The H8/3048F-ONE E10T-USB Emulator Functions

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 2.3 shows drivers which can be selected in the [E10T-USB Driver Details] dialog box.

Table 2.3  Type Name and Driver

<table>
<thead>
<tr>
<th>Type Name</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS0005TCU01H</td>
<td>Renesas E-Series USB Driver</td>
</tr>
</tbody>
</table>

2.2.2  Hardware Break Functions

**Hardware Break Conditions:** In the emulator, conditions of Break Condition 1, 2 can be set.

Table 2.4 lists the items that can be specified.

Table 2.4  Hardware Break Condition Specification Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address bus condition</td>
<td>Breaks when the MCU address bus value matches the specified value.</td>
</tr>
<tr>
<td>Data bus condition</td>
<td>Breaks when the MCU data bus value matches the specified value. Byte or word can be specified as the access data size.</td>
</tr>
<tr>
<td>Read or write condition</td>
<td>Breaks in the read or write cycle.</td>
</tr>
</tbody>
</table>
Table 2.5 lists the combinations of conditions that can be set in the [Break condition 1] and [Break condition 2] dialog boxes.

**Table 2.5  Conditions Set in [Break condition 1] and [Break condition 2] Dialog Boxes**

<table>
<thead>
<tr>
<th>Dialog Box</th>
<th>Address Bus Condition</th>
<th>Data Condition</th>
<th>Read or Write Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Break condition 1]</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>[Break condition 2]</td>
<td>O</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: O: Can be set by checking the radio button in the dialog box. X: Cannot be set in the dialog box.

Table 2.6 lists the combinations of conditions that can be set by the BREAKCONDITION_SET command.

**Table 2.6  Conditions Set by BREAKCONDITION_SET Command**

<table>
<thead>
<tr>
<th>Channel</th>
<th>Address Bus Condition (addropt&gt; option)</th>
<th>Data Condition (dataopt&gt; option)</th>
<th>Read or Write Condition (r/wopt&gt; option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break condition 1</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Break condition 2</td>
<td>O</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: O: Can be set by the BREAKCONDITION_SET command. X: Cannot 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. 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. Address bus conditions of Break Condition 2 and BREAKCONDITION_SET command:
   - The address bus condition of Break Condition 2 or channel 2 of the BREAKCONDITION_SET command is satisfied only for the instruction prefetch address.
   - The condition is not satisfied for the address bus value other than the instruction prefetch address.
address. In this case, use Break Condition 1 or channel 1 of the BREAKCONDITION_SET command.

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 RAM area. However, a software break cannot be set to the following addresses:
   — An area other than flash memory or RAM
   — An instruction in which Break Condition is satisfied
3. During step operation, 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 operation 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 Trace Function

The trace function in the emulator uses the branch-instruction trace function in the MCU. It displays the four-channel branch-source address, the mnemonic, and the operand. Trace can be acquired in realtime.
H8 Family E10T-USB Emulator
Additional Document for User’s Manual
Supplementary Information on Using
the H8/3048F-ONE and H8/3029F