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User's Manual

Tiny/SLP E7 Emulator

Additional Document for User's Manual
Tiny/SLP E7 HS0007TCU01HEP4

Renesas Microcomputer Development Environment System
M16C Family / R8C/Tiny Series
Notes on Connecting the R8C/13, R8C/12, R8C/11, and R8C/10

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Contents

Section 1 Connecting the Emulator with the User System

Before connecting an E7 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 figure 2.1, Pin Assignments of the E7 Connector, and figure 3.1, Example of E7 connection, shown in this manual.
Before designing the user system, be sure to read the E7 emulator user's manual and the hardware manual for related MCUs.

Table 1.1 shows the recommended connector for the emulator.

Table 1.1 Recommended Connector

Type Number	Manufacturer	Specifications
2514-6002	3M Limited	14-pin straight type

Connect pins 2, 4, 6, 10, 12, 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.

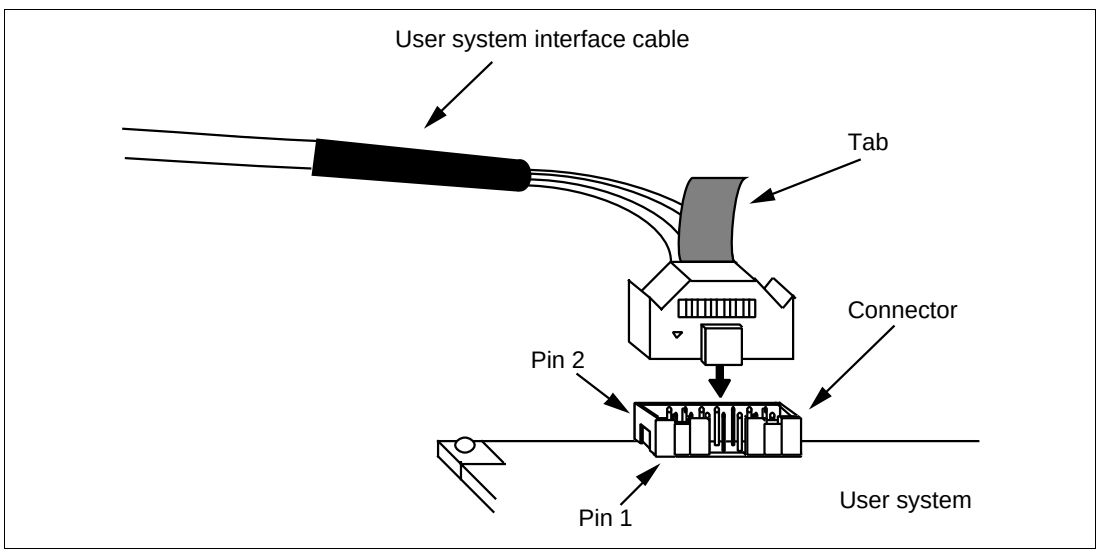
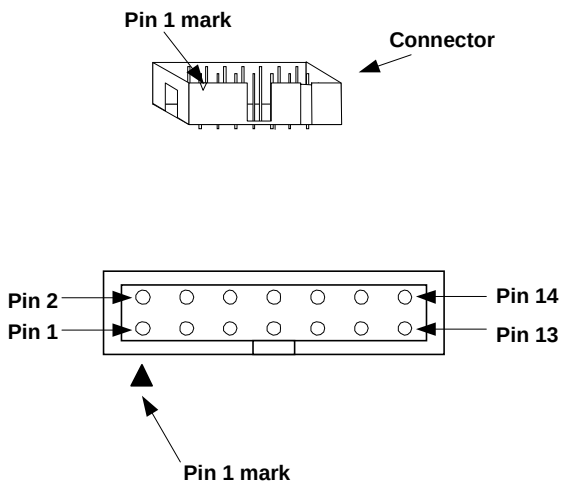


Figure 1.1 Connecting the User System Interface Cable to the User System

Notes: 1. Do not place any components within 3 mm of the connector.
2. When the emulator is used in the writer mode, connect the emulator similarly to the user system.

Section 2 Pin Assignments of the E7 Connector

Figure 2.1 shows the pin assignments of the connector.



Pin No.	Signal Name (R8C/10, R8C/11 R8C/12, R8C/13)
1	**CNVss**
2	Vss
3	N.C.
4	Vss
5	P00/AN7/**TxD11**
6	Vss
7	**MODE**
8	Vcc
9	N.C.
10	Vss
11	P37/TxD10/**RxD1**
12	Vss
13	**$\overline{\text{RESET}}$**
14	Vss

Figure 2.1 Pin Assignments of the E7 Connector

Section 3 Example of E7 Connection

Figure 3.1 shows the connecting example.

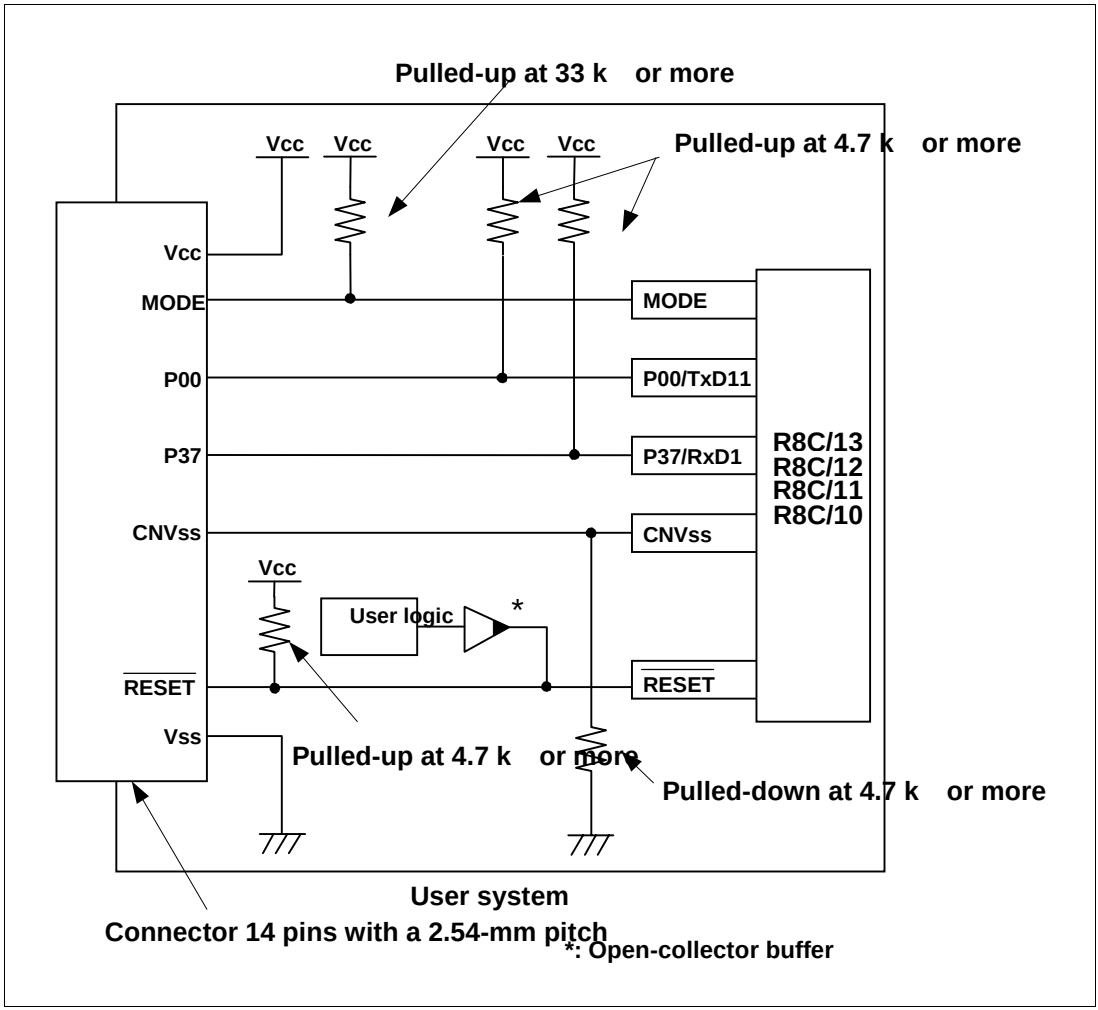


Figure 3.1 Example of E7 Connection

In the ‘Writing Flash memory’ mode, where the user program is simply written to the flash memory, the specification of connection between the E7 and the MCU is the same as that shown in figure 3.1.

Notes: 1. P00 and P37 pins are used by the emulator. Pull up and connect the emulator and MCU pins.

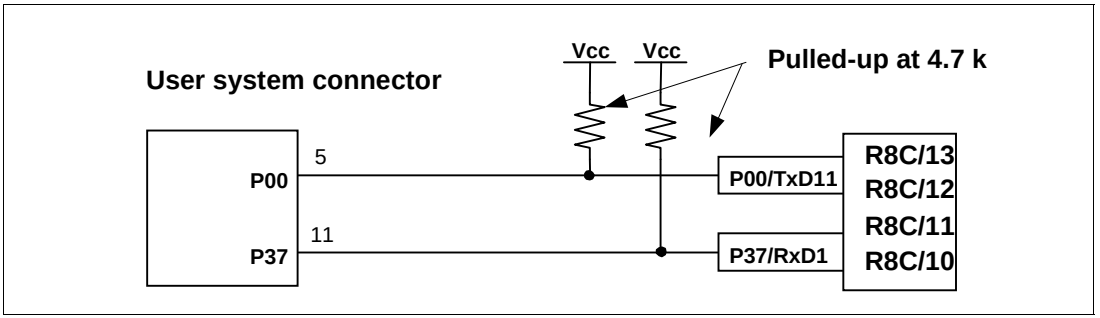


Figure 3.2 Connection of E7 Emulator and MCU

2. The E7 emulator uses the MODE pin for the MCU control and the forced break control. Connect the emulator to the MCU pins through pull-up.

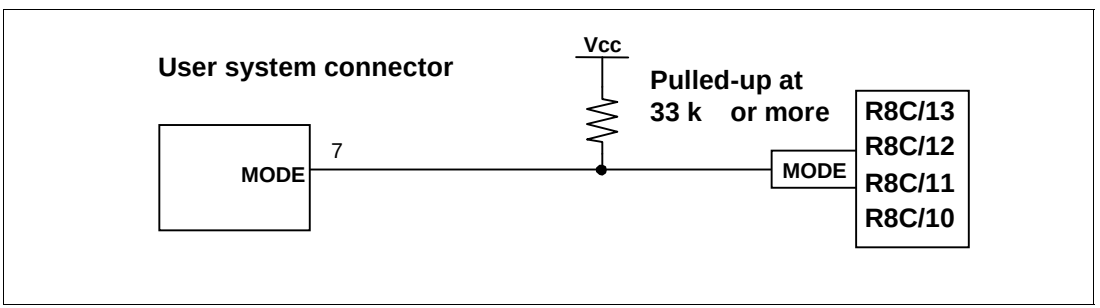


Figure 3.3 Connection of E7 Emulator and MODE Pin

3. The E7 emulator uses the CNVss pin for the MCU control and communication. Connect the emulator to the MCU pins through pull-down.

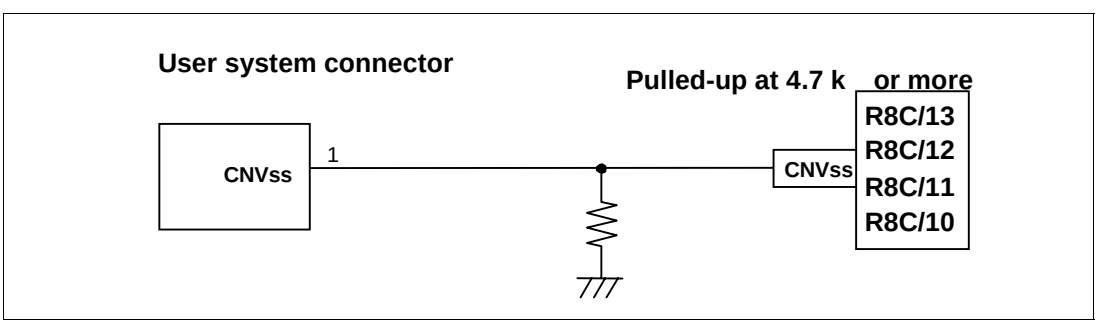


Figure 3.4 Connection of E7 Emulator and CNVss Pin

4. The $\overline{\text{RESET}}$ pin is used by the emulator. Create the following circuit by connecting the open-collector output buffer so that reset input can be accepted from the emulator.

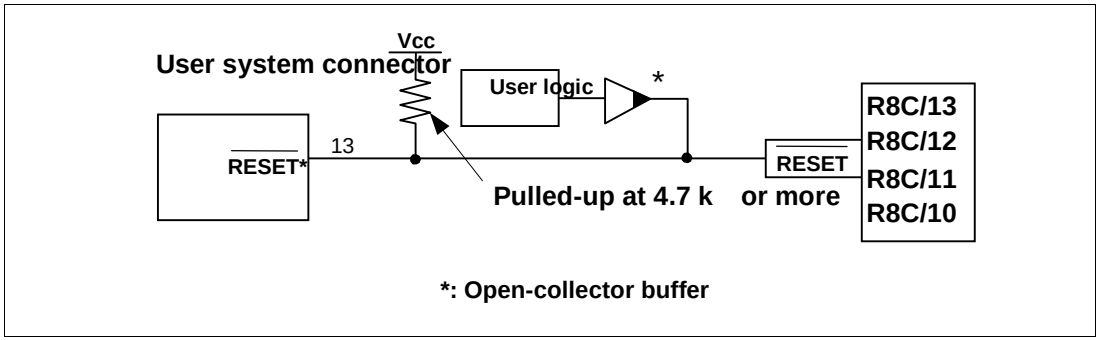


Figure 3.5 Example of a Reset Circuit

5. Connect Vss and Vcc with the Vss and Vcc of the MCU, respectively.
6. Connect nothing with N.C.
7. The input voltage, Vcc, must be connected to the user system Vcc (power supply). The amount of voltage permitted to input to Vcc must be within the guaranteed range of the microcomputer.

8. Figure 3.6 shows the interface circuit in the emulator. Use this figure as a reference when determining the pull-up resistance value.

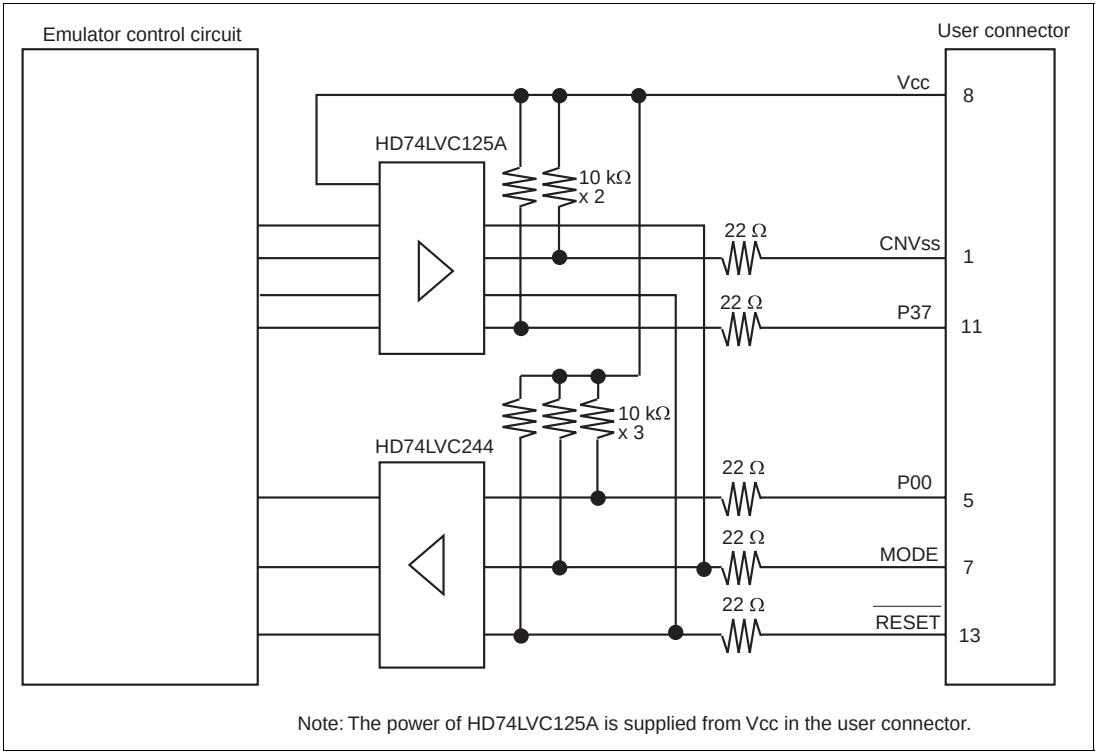


Figure 3.6 Interface Circuit in the Emulator (Reference)

Section 4 Differences between the MCUs 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 4.1.

Table 4.1 Register Initial Values at Emulator Power-On

Status	Register	Initial Value
Emulator Power-On	PC	Reset vector value in the vector address table
	R0 to R3 (bank 0, 1)	0000h
	A0 to A1 (bank 0, 1)	0000h
	FB (bank 0, 1)	0000h
	INTB	0000h
	USP	0000h
	ISP	05FFh
	SB	0000h
	FLG	0000h

2. Operation clock during a break

   During a user program break, the emulator operates with the on-chip oscillator since it is controlled without depending on the user's system clock.

3. $\overline{\text{RESET}}$ signal

   When debugging the R8C/Tiny, do not reset the emulator from the user target system, even in the case during user program execution or break. If the emulator is reset from the user target system, the E7 cannot be controlled. To reset the emulator, use the HEW.

4. Memory access during emulation execution

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

5. The emulator communicates with the MCUs by using the MODE, $\overline{\text{RESET}}$, P00, P37, and CNVss pins.

6. The power consumed by the MCU can reach several mA. This is because the user power supply drives one HD74LV125A to make the communication signal level match the user-system power-supply voltage. The power consumed rises little during user program execution since the emulator does not perform communication; it rises more during a break.

7. Program area for the emulator
   Do not access a part of areas in the flash memory since the emulator program uses these areas for 16-kB version (R5F21104, R5F21114, R5F21124, and R5F21134). If the contents of the program areas for the emulator are changed, the emulator will not operate normally. In this case, restart the emulator with the 'Download emulator firmware' mode.

Table 4.2 Program Area for the E7 Emulator

Device		Program Area	
		Vector, etc.	Flash Memory
R5F21102 R5F21112	R5F21122 R5F21132	FFE4h to FFE7h, FFE8h to FFEBh, FFECh to FFEFh, FFF4h to FFF7h, FFF8h to FFFBh	-
R5F21103 R5F21113	R5F21123 R5F21133		-
R5F21104 R5F21114			C000h to C7FFh
R5F21124 R5F21134			2000h to 27FFh or C000h to C7FFh*

Note: The following dialog box is displayed when starting the emulator, and the location of a firmware can be selected. When the emulator is started with the 'Does not download emulator firmware' mode, select the area where the firmware has been written to previously.

Figure 4.1 [Firmware Location] Dialog Box

8. The emulator uses a two-word stack pointer when a user program breaks. Accordingly, reserve the two-word addresses for the stack area.

9. Do not use an MCU that has been used for debugging. Also, do not save the contents of the MCU's flash memory that have been used for debugging or use them as the ROM data for products.

10. Internal I/O register used by the program for the E7 emulator

    As the internal I/O registers below are used by the emulator program, they are not initialized by selecting [Debug] -> [Reset CPU] or with the RESET command. If their contents are referred to, a value that has been set in the emulator program will be read.
    Do not change the registers related with serial I/O1 because the E7 cannot be controlled. In addition, when the PD3 register is written to, set bit 7 to 0.

    CM0, CM1, HR0, HR1, OCD, PRCR, U1MR, U1BRG, U1C0, U1C1, UCON, U1TB, U1RB, and FLG

11. Debugging in the stop mode or wait mode

    When using the stop mode or wait mode on a user program, firstly disable the automatic update in the [Watch] window or fix the display in the [Memory] window so that the memory access will not occur during execution. In addition, do not operate the window until the program stops at the breakpoint by setting the breakpoint at the processing unit where the stop mode or wait mode is cancelled.

12. Debugging of a watchdog timer

    During firmware operation, if a memory is accessed via the firmware, realtime operation will not be performed because the watchdog timer is being refreshed. Therefore, when the watchdog timer is used on the user program, only a free run can be used. At this time, do not operate the window during execution as well as in the stop mode or wait mode.

13. Peripheral I/Os during a break

    During a break, although interrupts are not accepted, peripheral I/Os continue to be operated. For example, a timer interrupt is not accepted although counting a timer is continued when a user program is stopped by a break after operating a timer.

14. Exceptional step operation

    a) Software-interrupt instruction

    STEP operation cannot be performed by continuously executing the internal processing of instructions (undefined, overflow, BRK, and INT) which generates a software interrupt.

    <Example>

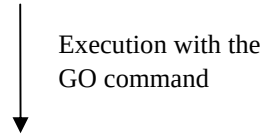
```
        NOP
        NOP
        INT     #3          ↘  Passes through if the STEP operation is
        NOP                    carried out.
        JMP     MAIN
INT_3:
        NOP     ←  The address at which the program should be
        NOP            stopped
        NOP
        REIT
```

b) INT instruction

Debugging of the program using the INT instruction should be used with the GO command by setting a software break for the internal processing of the INT instruction.

<Example>

```
        NOP
        INT  #3
        NOP
        JMP  MAIN
INT_3:
        NOP       Break
        NOP
        REIT
```



15. Debugging while the R8C/Tiny is in use

a) If stepping is executed on a “pushc FLG” instruction, the IPL (interrupt priority level) of FLG restored by “popc FLG” will be 0.

b) If stepping is executed on an “LDC src,FLG” instruction, the I flag may not be cleared.

c) If stepping is executed on an “STC FLG,dest” instruction, the content of bit 6 of the FLG register will be cleared and replaced with the content of bit 1. This value will be saved.

Do not perform the following operations on the instructions mentioned above:

— Setting breakpoints (hardware or software breakpoints)

— Step-in, step-over, and step-out execution

16. Note on Go to cursor function

While the R8C/Tiny is in use, the [Go to cursor] function is realized by event breaks. All event breakpoints being set are thus invalid if [Go to cursor] is executed. Note, however, that all PC breakpoints remain valid.

Tiny/SLP E7 Emulator
Additional Document for User's Manual
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