

# E8a Emulator

Additional Document for User's Manual  
R0E00008AKCE00EP8

Renesas Microcomputer Development Environment System  
M16C Family / M32C/80 Series  
Notes on Connecting the M32C/84, M32C/85, M32C/86, M32C/87  
and M32C/88

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Electronics Corporation without notice. Please review the latest information published by Renesas Electronics Corporation through various means, including the Renesas Electronics Corporation website (<http://www.renesas.com>).

## Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.

"Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

---

# Contents

---

Section 1	Inside the E8a Emulator User's Manual.....	1
Section 2	E8a Emulator Specifications .....	2
Section 3	Connecting the E8a Emulator to the User System .....	3
Section 4	E8a Connecting Connector Pin Assignments.....	4
Section 5	Examples of E8a Connections.....	5
Section 6	Notes on Using the E8a Emulator.....	13
Section 7	Debugger Setting .....	22
Section 8	Applicable Tool Chain and Third-party Products .....	26

This user's manual is applicable to the E8a emulator software V.1.02 Release 00 or later.

## Section 1 Inside the E8a Emulator User's Manual

The E8a emulator manual consists of two documents: the E8a User's Manual and the E8a Additional Document for User's Manual (this document). Be sure to read BOTH documents before using the E8a emulator.

(1) E8a Emulator User's Manual

The E8a Emulator User's Manual describes the hardware specifications and how to use the emulator debugger.

- E8a emulator hardware specifications
- Connecting the E8a emulator to the host computer or user system
- Operating the E8a emulator debugger
- Tutorial: From starting up the E8a emulator debugger to debugging

(2) E8a Additional Document for User's Manual

The E8a Additional Document for User's Manual describes content dependent on the MCUs and precautionary notes.

- MCU resources used by the E8a emulator
- Example of the E8a emulator connection or interface circuit necessary for designing hardware
- Notes on using the E8a emulator
- Setting the E8a emulator debugger during startup

## Section 2 E8a Emulator Specifications

Table 2.1 shows the E8a emulator specifications for the M32C/80 Series.

Table 2.1 E8a Emulator Specifications for the M32C/80 Series

Target MCUs	M16C Family M32C/80 Series M32C/84, M32C/85, M32C/86, M32C/87 and M32C/88 Groups		
Available operating modes	Single-chip mode, Memory expansion mode * Microprocessor mode is not supported.		
Break functions	- Address match break, 8 points - PC break points (maximum 255 points) - Forced break		
Trace functions	None		
Flash memory programming function	Available		
User interface	Clock-synchronized serial (communication via P64/P65/P66/P67)		
MCU resources to be used	- ROM size: 2 KB (variable assigned address) - RAM size: 256 bytes (variable assigned address) - Stack 20 bytes - UART1 function and P64/P65/P66/P67 - Pins P50 and P55 - Address match interrupt		
Emulator power supply	Unnecessary (USB bus powered, power supplied from the PC)		
Interface with host machine	USB (USB 1.1, full speed) * Also connectable to host computers that support USB 2.0		
Power supply function	Can supply 3.3 V or 5.0 V to the user system (maximum 300 mA)		
Power voltages	M32C/84	Normal-ver.	3.0 V $\pm$ 0.3 V or 5.0 V $\pm$ 0.5 V
	M32C/85	T-ver.	5.0 V $\pm$ 0.5 V
	M32C/86	-	3.0 V $\pm$ 0.3 V or 5.0 V $\pm$ 0.5 V
	M32C/87	-	3.0 V $\pm$ 0.3 V or 5.0 V $\pm$ 0.5 V
	M32C/88	-	5.0 V $\pm$ 0.5 V

Table 2.2 shows the operating environment of the E8a emulator.

Table 2.2 Operating Environment

Temperatures	Active	: 10°C to 35°C
	Inactive	: -10°C to 50°C
Humidity	Active	: 35% RH to 80% RH, no condensation
	Inactive	: 35% RH to 80% RH, no condensation
Vibrations	Active	: maximum 2.45 m/s <sup>2</sup>
	Inactive	: maximum 4.9 m/s <sup>2</sup>
	Transportation	: maximum 14.7 m/s <sup>2</sup>
Ambient gases	No corrosive gases	

## Section 3 Connecting the E8a Emulator to the User System

Before connecting the E8a emulator to the user system, a connector must be installed in the user system so a user system interface cable can be connected. When designing the user system, refer to Figure 4.1 “E8a Connecting Connector Pin Assignments”, and Figures 5.1 to 5.4 “Example of an E8a Connection”.

Before designing the user system, be sure to read the E8a Emulator User’s Manual and related device hardware manuals.

Table 3.1 shows the recommended connector for the emulator.

Table 3.1 Recommended Connector

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

Connect E8a connecting connector pins 2, 6, 10, 12 and 14 firmly to the GND on the user system board. These pins are used as an electric GND and monitor the connection of the user system connector. Note the pin assignments for the user system connector.

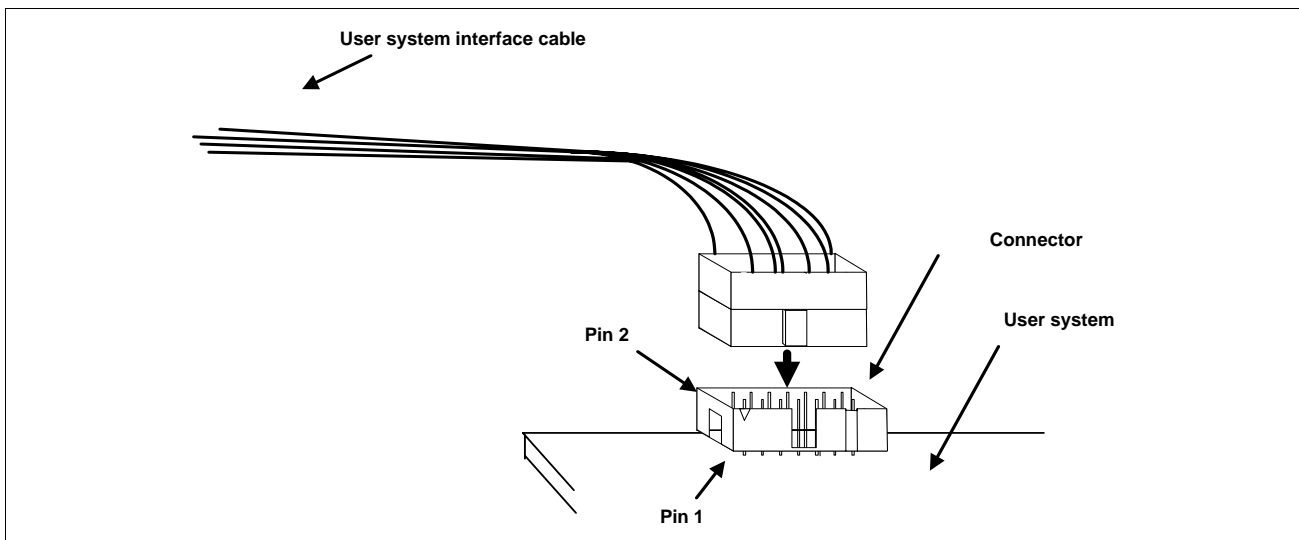


Figure 3.1 Connecting the User System Interface Cable with an E8a Connecting Connector

Notes:

1. Do not place any components within 3 mm area of the connector.
2. When using the E8a emulator as a programmer, connect it to the user system in the same way.

## Section 4 E8a Connecting Connector Pin Assignments

Figure 4.1 shows the pin assignments for the E8a connecting connector.

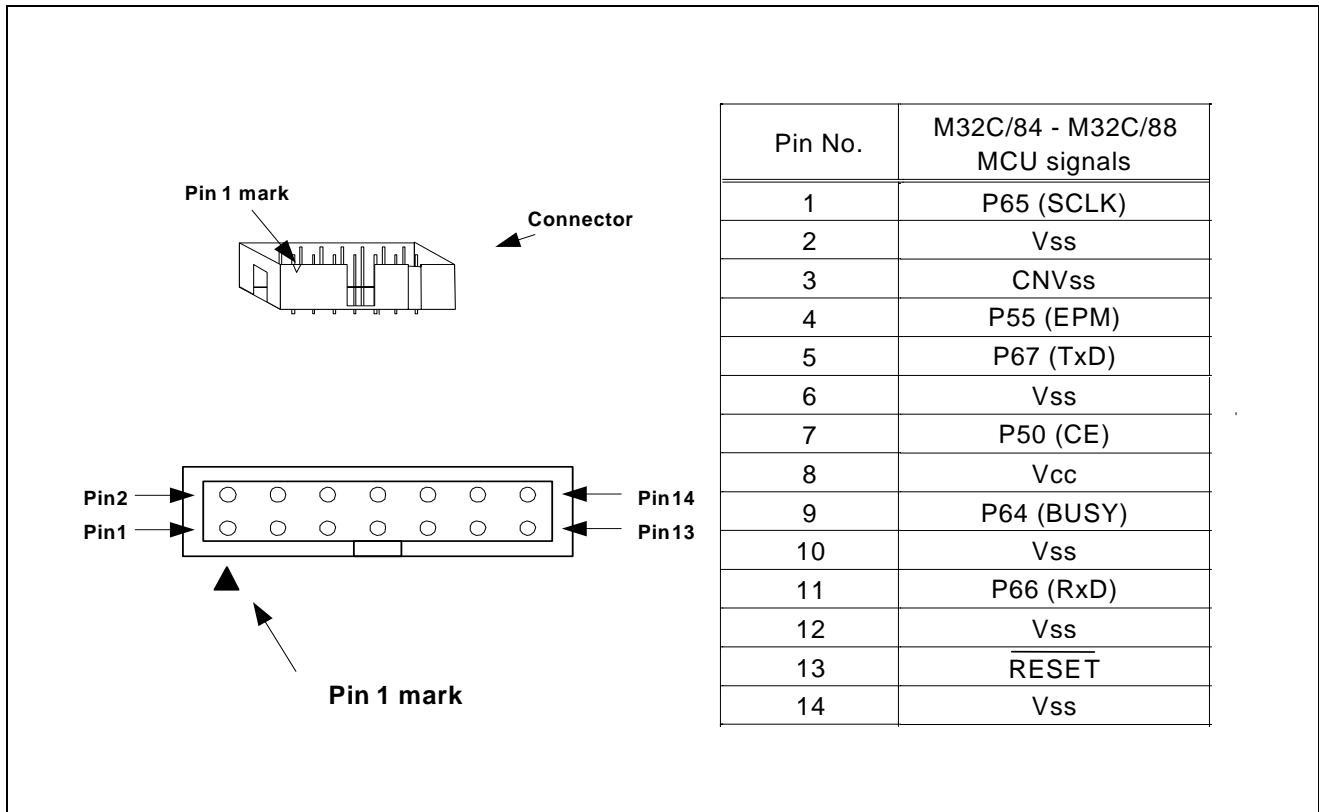


Figure 4.1 E8a Connecting Connector Pin Assignments

Note:

Pin 14 is used for checking the connection between the E8a and the user system, and is not directly connected to the Vss inside the E8a. Make sure pins 2, 6, 10, 12 and 14 are all connected to the Vss.

## Section 5 Examples of E8a Connections

The following show connection examples. When using the emulator as a programmer, the connection specification between the E8a and the MCUs is the same as shown below.

(1) In single power supply and single-chip mode

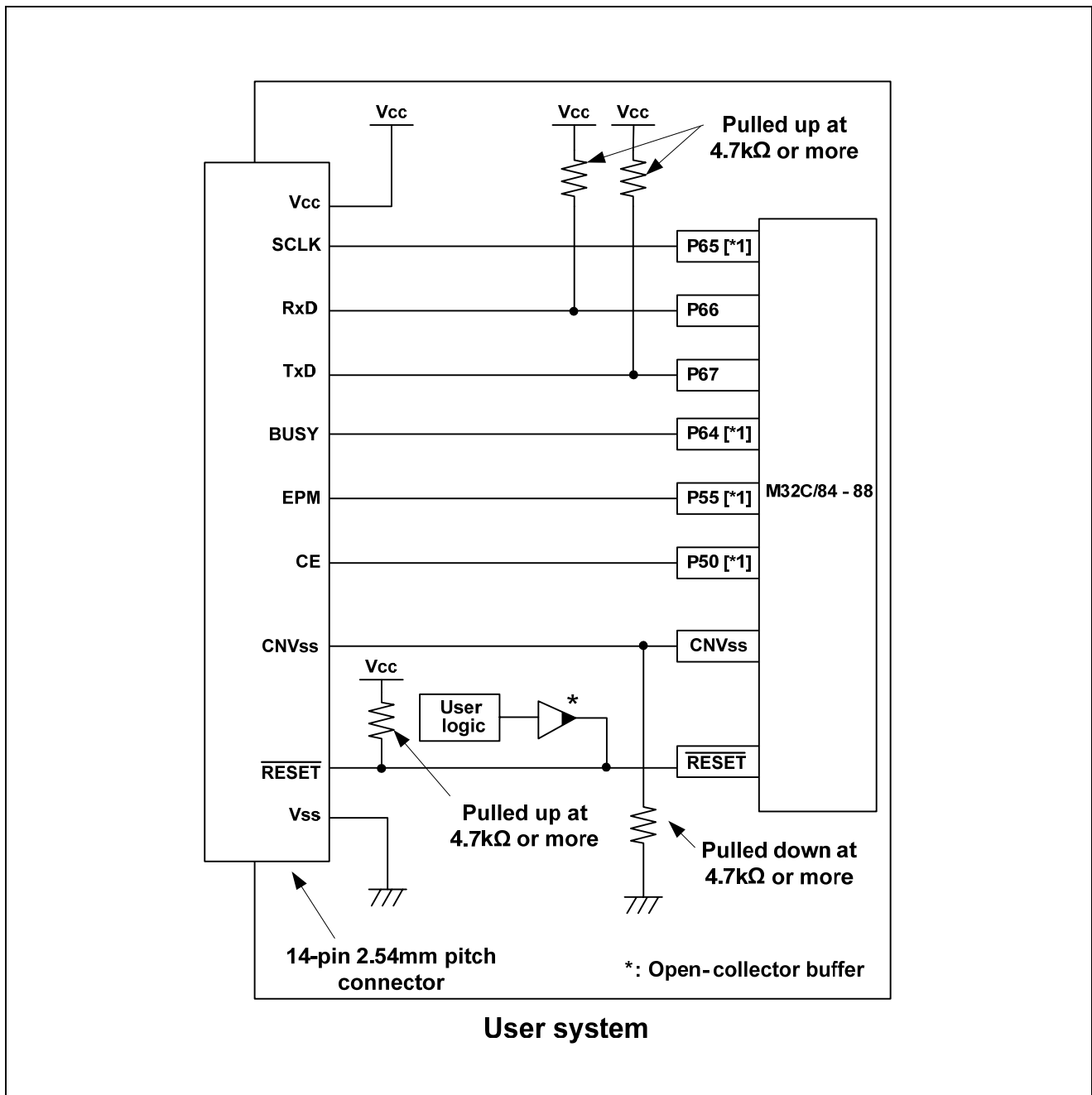


Figure 5.1 Example of an E8a Connection (Single Power Supply and Single-chip Mode)

Note:

1. For details on setting pins P50, P55, P64 and P65, refer to numbers 1 and 2 of “Points to Remember” on page 9.



(2) In single power supply and memory expansion mode

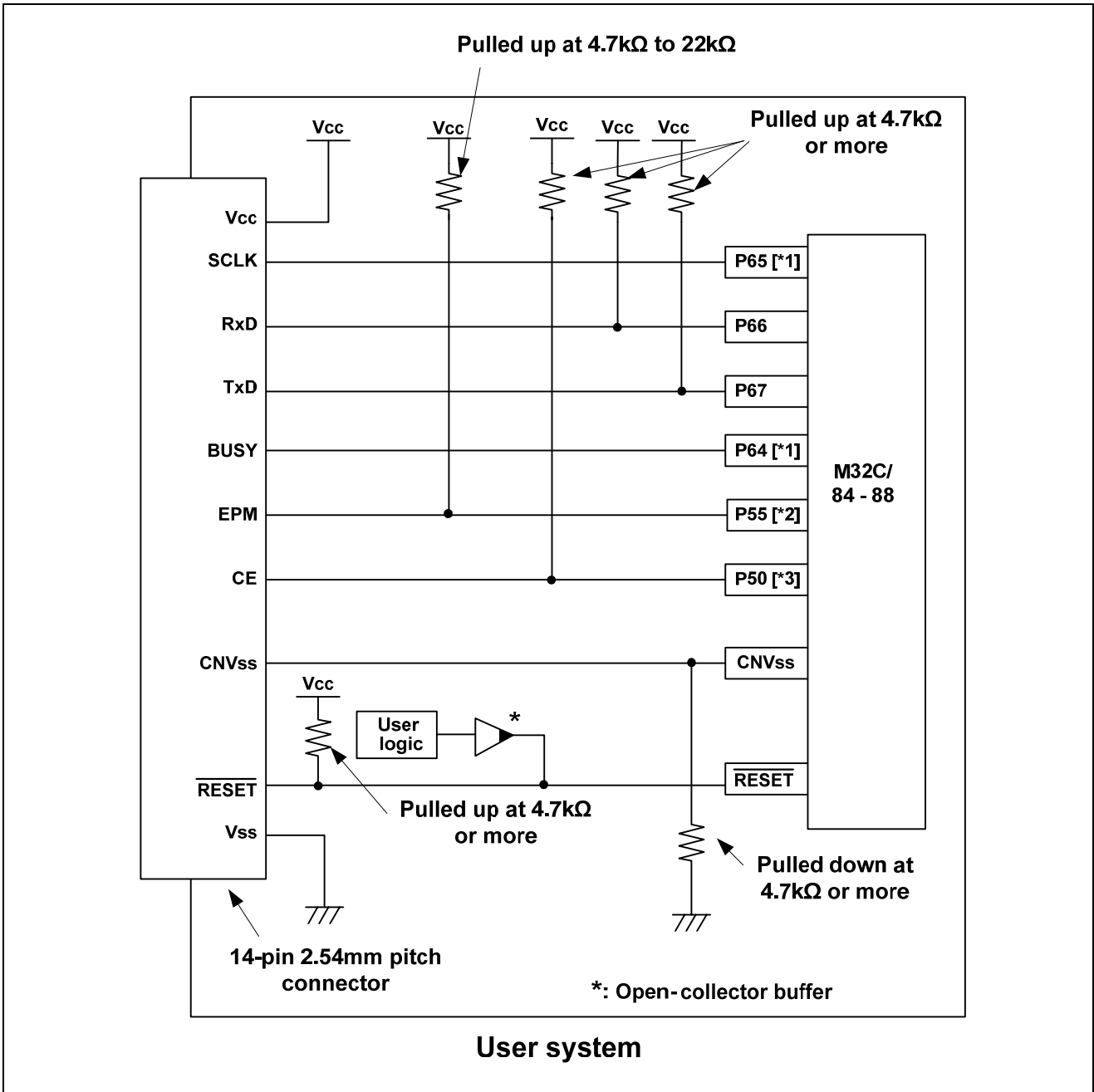


Figure 5.2 Example of an E8a Connection (Single Power Supply and Memory Expansion Mode)

Notes:

1. For details on setting pins P64 and P65, refer to number 1 of “Points to Remember” on page 9.
2. The  $\overline{\text{HOLD}}$  signal cannot be used. Pull up P55 on the user system.
3. P50 is used as the WRL#/WR# pin. The E8a emulator outputs “H” to the CE pin when going to boot mode (resetting the MCU). In other cases, the CE pin is in a Hiz state. This prevents signal collision between the E8a emulator and the MCU. The WRL#/WR# pin does not affect the memory because the pin has a low active signal.

(3) In dual power supply and single-chip mode

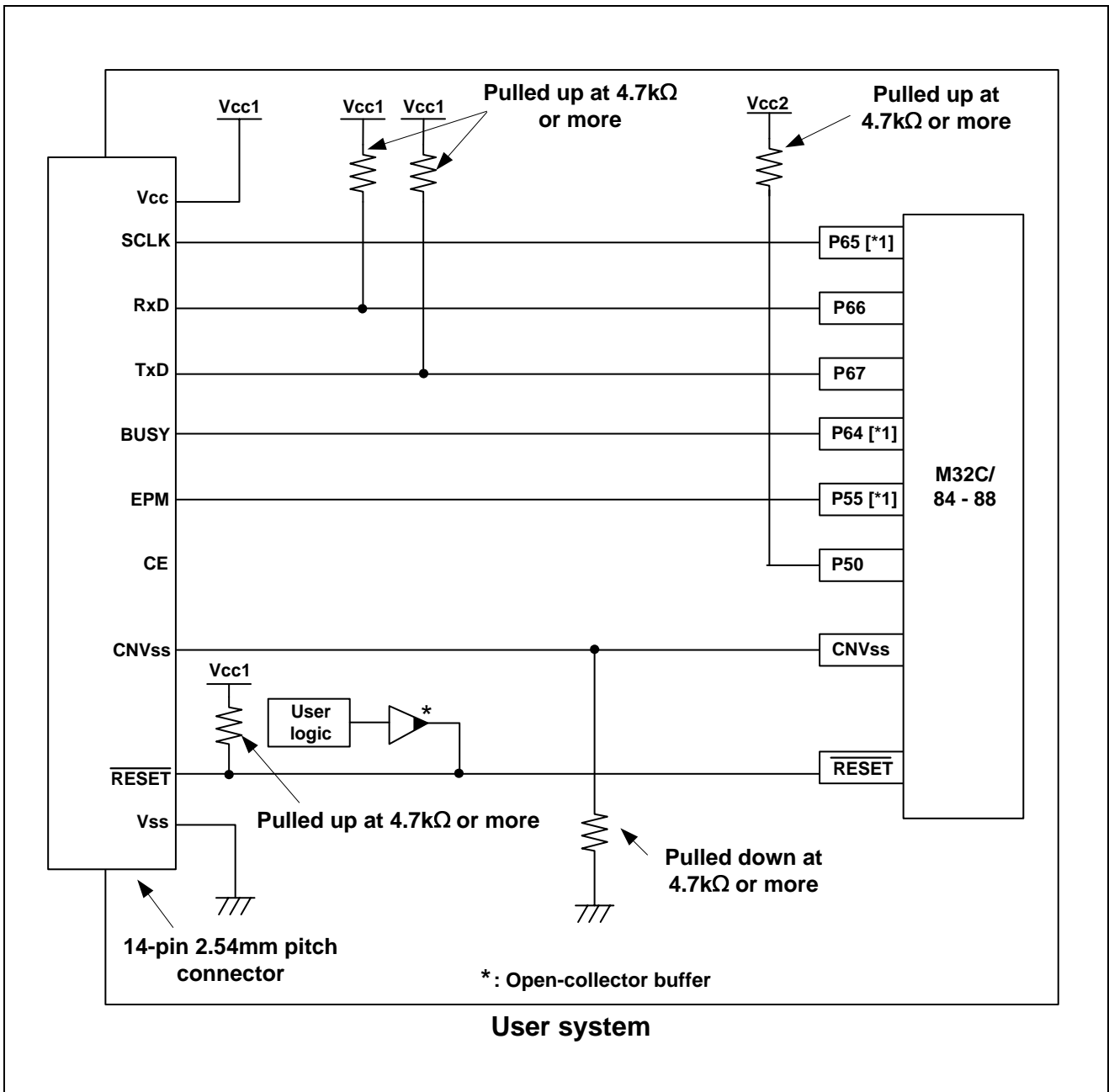


Figure 5.3 Example of an E8a Connection (Dual Power Supply and Single-chip Mode)

Note:

1. For details on setting pins P55, P64 and P65, refer to numbers 1 and 2 of "Points to Remember" on page 9.

(4) In dual power supply and memory expansion mode

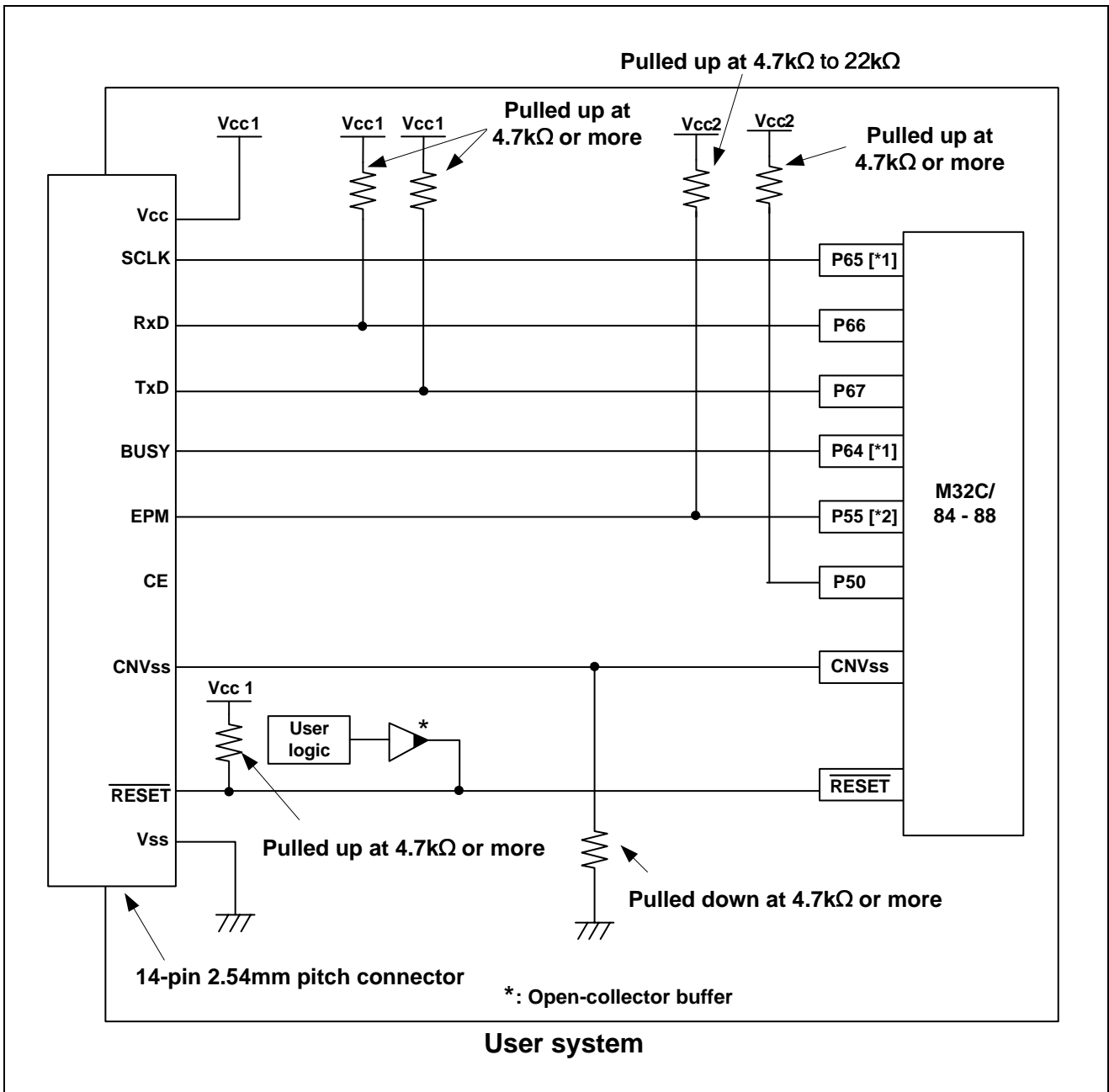


Figure 5.4 Example of an E8a Connection (Dual Power Supply and Memory Expansion Mode)

Notes:

1. For details on setting pins P64 and P65, refer to numbers 1 and 2 of “Points to Remember” on page 9.
2. The HOLD signal cannot be used. Pull up P55 on the user system.

Points to Remember

1. Pins P64, P65, P66 and P67 are used exclusively by the E8a emulator. Connect the E8a emulator to the MCU pins. Connect pins P66 and P67 to the E8a emulator after pulling up the MCU pins at the Vcc (Vcc1) level. For P64 and P65, pull up the pins at the Vcc (Vcc1) level or pull down them according to the MCU pin state after disconnecting the E8a emulator. P64 may be in a Hiz state while the E8a emulator is active. Therefore, set the pin resistance value so the voltage cannot be at the midpoint potential, depending on the voltage dividing of the resistance inside the E8a emulator (Figure 5.12).

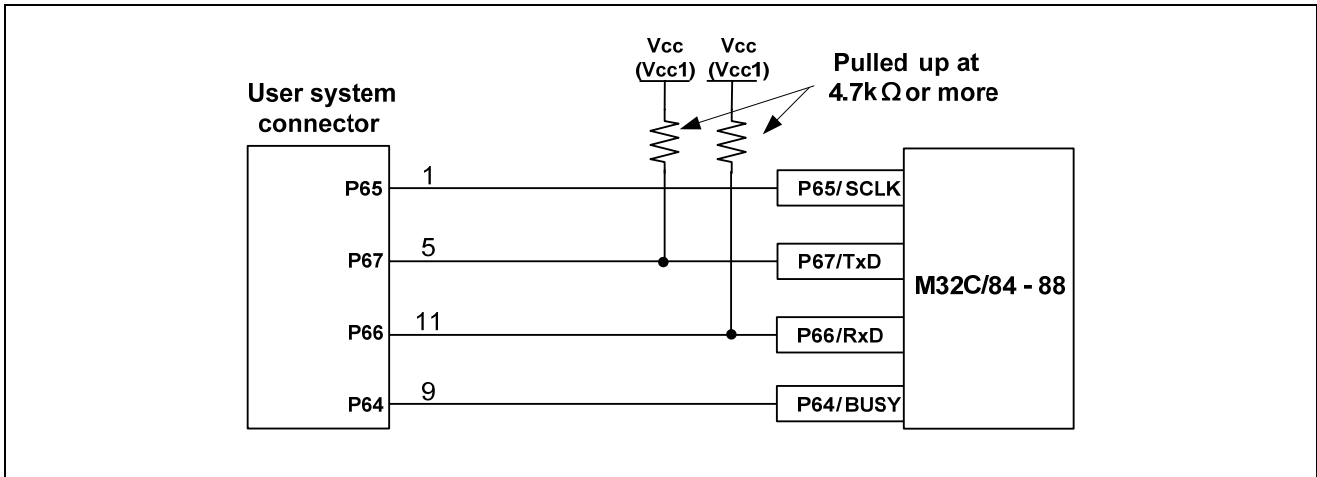


Figure 5.5 E8a Emulator and MCU Connection

2. The E8a emulator uses pins P50 and P55 for MCU control. Connect the E8a emulator to the MCU pins.
  - (1) In single power supply and single-chip mode
 

For P50 and P55, pull up the pins at the Vcc level or pull down them according to the MCU pin state after disconnecting the E8a emulator. P50 and P55 may be in a Hiz state while the E8a emulator is active. Therefore, set the pin resistance value so the voltage cannot be at the midpoint potential, depending on the voltage dividing of the resistance inside the E8a emulator (Figure 5.12).

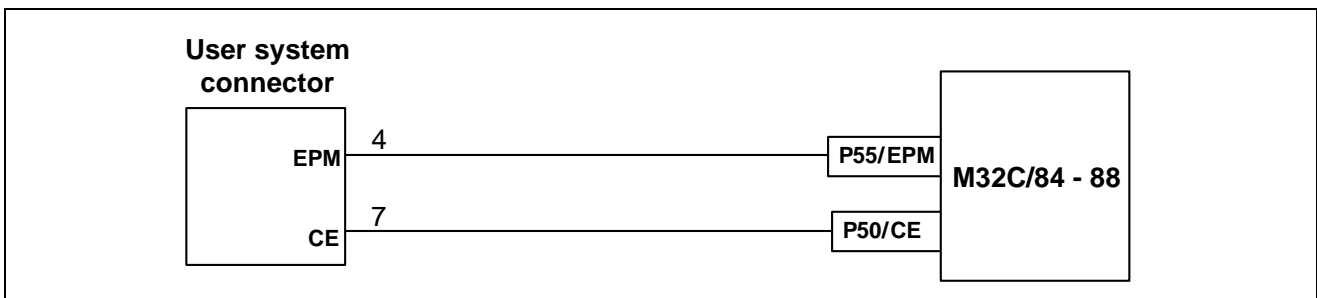


Figure 5.6 Connection of E8a Emulator and Pins P50 and P55 (Single Power Supply and Single-chip Mode)

(2) Single power supply and memory expansion mode

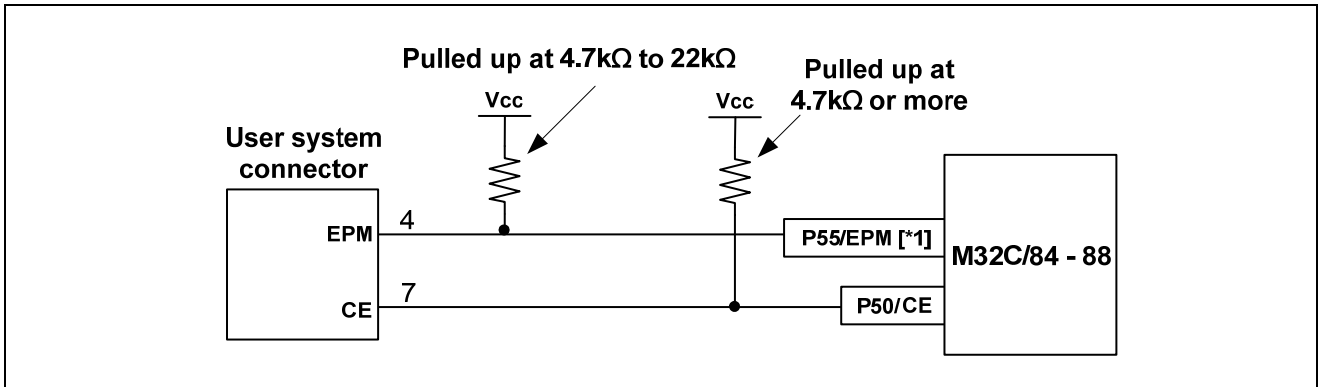


Figure 5.7 Connection of E8a Emulator and Pins P50 and P55 (Single Power Supply and Memory Expansion Mode)

Note:

1. The HOLD signal cannot be used. Pull up P55 at the Vcc level on the user system.

(3) In dual power supply and single-chip mode

Pull up P55 at the Vcc2 level or pull down it according to the MCU pin state after disconnecting the E8a emulator. P55 may be in a Hiz state while the E8a emulator is active. Therefore, set the pin resistance value so the voltage cannot be at the midpoint potential, depending on the voltage dividing of the resistance inside the E8a emulator (Figure 5.12).

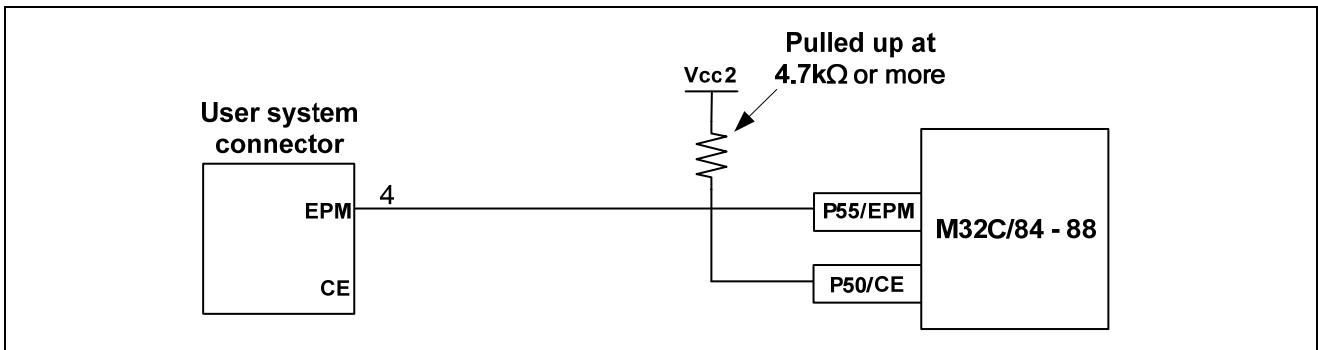


Figure 5.8 Connection of E8a Emulator and Pins P50 and P55 (Dual Power Supply and Single-chip Mode)

(4) In dual power supply and memory expansion mode

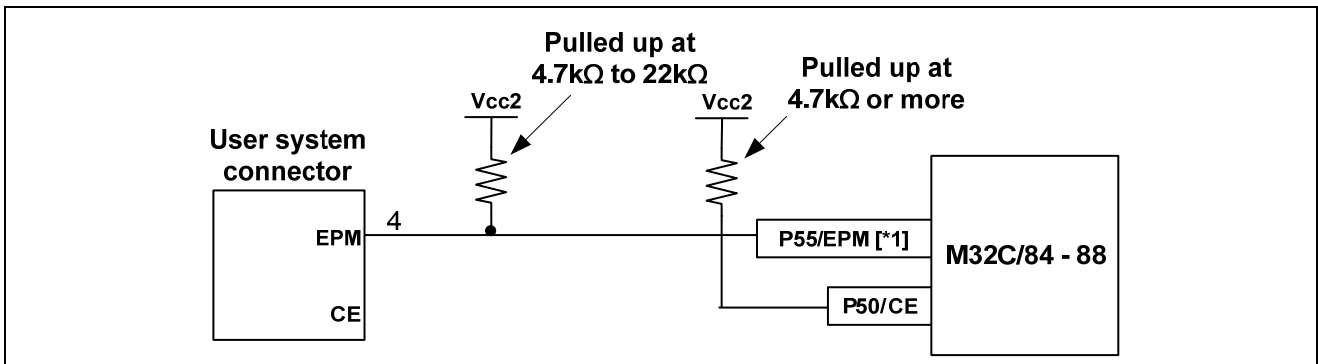


Figure 5.9 Connection of E8a Emulator and Pins P50 and P55 (Dual Power Supply and Memory Expansion Mode)

Note:

1. The HOLD signal cannot be used. Pull up P55 at the Vcc2 level on the user system.

3. The E8a emulator uses the CNVss pin for MCU control. Pull down the E8a emulator and MCU pins and connect the E8a emulator.

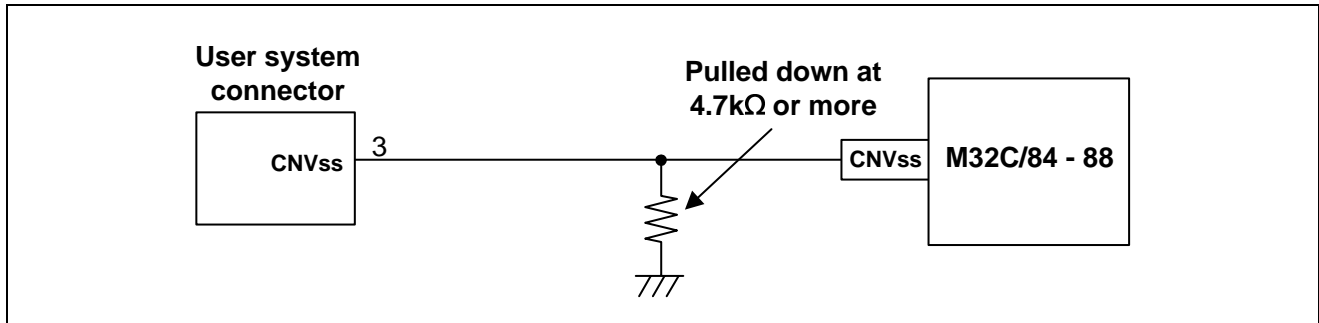


Figure 5.10 E8a Emulator and CNVss Pin Connection

4. The  $\overline{\text{RESET}}$  pin is used by the E8a emulator. Therefore, use an open-collector output buffer or a CR reset circuit as the reset circuit for the user system. The recommended pull-up value is 4.7 k $\Omega$  or more. The MCU can be reset by outputting “L” from the E8a emulator. However, if the reset IC output is “H”, the user system reset circuit cannot be set to “L”. As such, the E8a emulator will not operate normally.

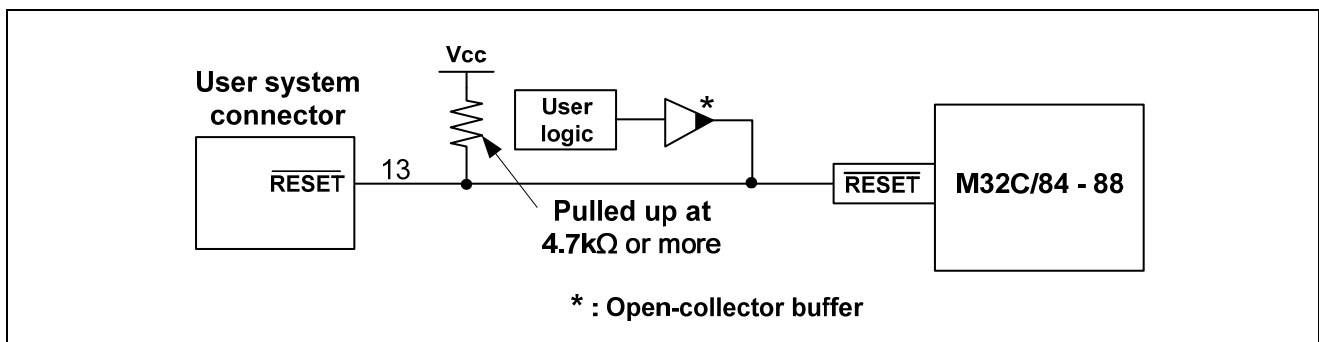


Figure 5.11 Example of a Reset Circuit

5. Connect Vss and Vcc to the Vss and Vcc (Vcc1) of the MCU, respectively.
6. The amount of voltage input to Vcc (Vcc1, Vcc2) must be within the specified range of the MCU.
7. If  $\overline{\text{NMI}}$  interrupts are not used, make sure the  $\overline{\text{NMI}}$  pin is pulled up to the Vcc (Vcc1) pin through a resistor.
8. Pin 14 is used for checking the connection between the E8a and the user system, and is not directly connected to the Vss inside the E8a. Make sure that pins 2, 6, 10, 12 and 14 are all connected to the Vss.

9. Figure 5.12 shows the interface circuit in the E8a emulator. Use this figure as a reference when determining the pull-up resistance value.

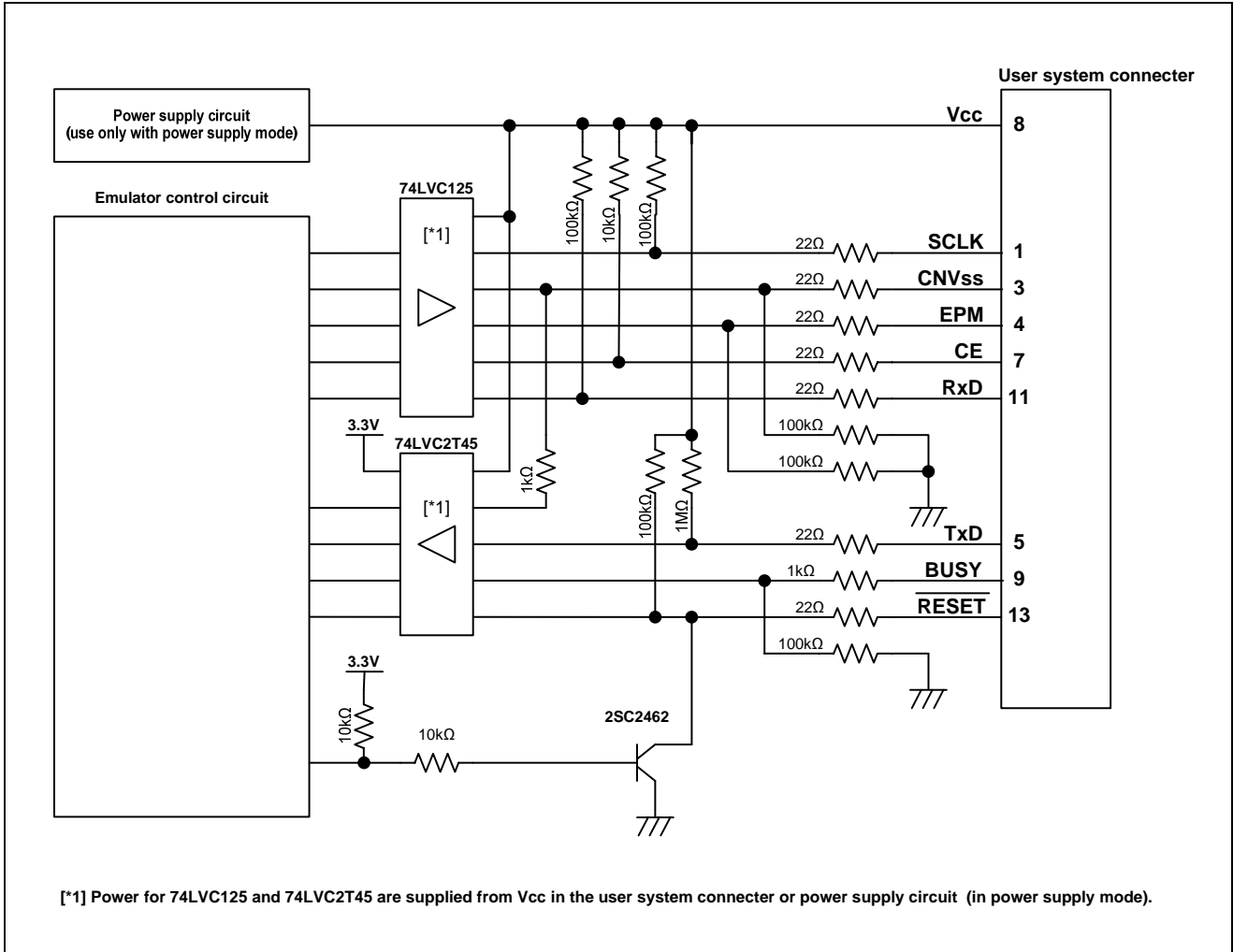


Figure 5.12 Interface Circuit Inside the E8a Emulator (For Reference)

## Section 6 Notes on Using the E8a Emulator

### 1. Program area for the E8a emulator

Table 6.1 lists the program areas allotted for the E8a emulator. Do not change this area allocation, otherwise the E8a emulator will not control the MCU. If settings were changed, disconnect the debugger and then reconnect it.

Table 6.1 Program Area for the E8a Emulator

Group	Part No.	ROM Size		RAM Size	Program Area for E8a Emulator		
		Programming Area	Data Area		Vector Area	ROM Area	RAM Area
M32C/84	M30843FW	320 KB	4 KB	24 KB	FFFFE8h - FFFFEBh, FFFFFCh - FFFFFFh	2 KB of the programming area [*1]	256 bytes [*1]
	M30843FH	384 KB					
	M30843FJ	512 KB					
	M30845FW	320 KB					
	M30845FH	384 KB					
	M30845FJ	512 KB					
M32C/85	M30853FW	320 KB					
	M30853FH	384 KB					
	M30853FJ	512 KB					
	M30855FW	320 KB					
	M30855FH	384 KB					
	M30855FJ	512 KB					
M32C/86	M30865FJ	512 KB					
M32C/87	M30879FL	1 MB		48 KB			
	M3087BFL			24 KB			
	M30873FH	384 KB		31 KB			
	M30875FH						
	M30876FJ	512 KB		48 KB			
	M30878FJ						
	M30879FK	768 KB		18 KB			
	M3087BFK						
M32C/88	M30880FW	320 KB					
	M30882FW	384 KB					
	M30880FH						
	M30882FH	512 KB					
	M30880FJ						
	M30882FJ						

Note:

- When starting the debugger, the [Emulator Setting] dialog box shown in Figure 6.1 is displayed. Specify the area which will not be used in the user system. The data area cannot be specified.



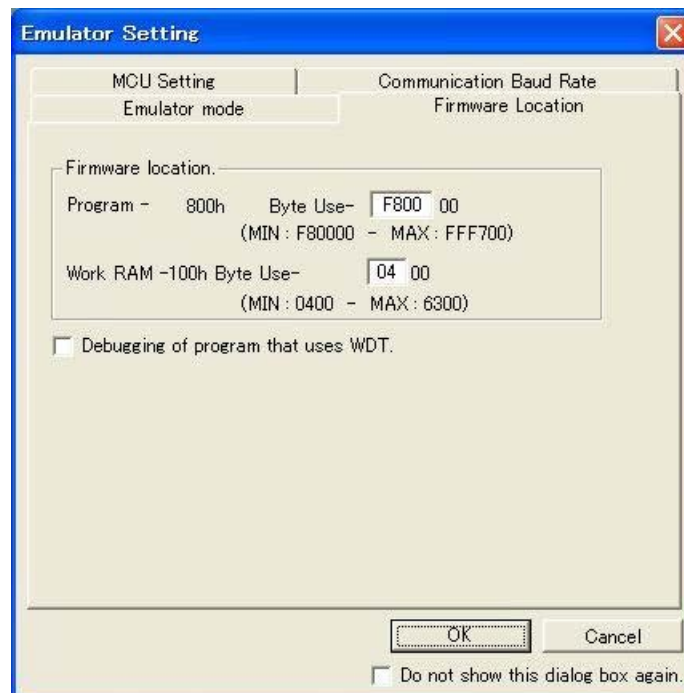


Figure 6.1 [Firmware Location] Tab of the [Emulator Setting] Dialog Box

- When the system is launched, the E8a emulator initializes the general registers and some of the flag registers as shown in Table 6.2.

Table 6.2 E8 Emulator Register Initial Values

Register	Initial Value
R0 to R3 (bank 0, 1)	0000h
A0, A1 (bank 0, 1)	000000h
FB (bank 0, 1)	000000h
SB (bank 0, 1)	000000h
PC	Reset vector value in the vector address table
INTB (bank 0, 1)	000000h
USP	000000h
ISP	Work RAM Address for the E8 emulator + 100h [*1]
SVF	000000h
SVP	000000h
VCT	000000h
DMD0, DMD1	00h
DCT0, DCT1	0000h
DRC0, DRC1	0000h
DMA0, DMA1	000000h
DRA0, DRA1	000000h
DSA0, DSA1	000000h

Note:

- The Work RAM address for the E8 emulator is specified in the [Firmware Location] tab of the [Emulator Setting] dialog box.

3. The E8a emulator controls the MCUs by using the P50, P55, P64, P65, P66, P67, RESET and CNVss pins.
4. The E8a emulator uses up to 20 bytes of the stack pointer (ISP) during a user program break. Therefore, set aside 20 bytes for the stack area.
5. SFRs used by the E8a emulator program  
As the SFRs listed in Table 6.3 are used by the E8a emulator program, do not change any of these values. If these values are changed, the E8a emulator cannot control the MCU. Note that UART1 transmit interrupt control register S1TIC and UART1 receive interrupt control register S1RIC always read out values used by the emulator. These registers are not initialized by selecting [Debug] -> [Reset CPU] or by using the RESET command. If register contents are referred to, a value that has been set in the E8a emulator program will be read out.

Table 6.3 SFRs Used by the E8a Emulator Program

Address	Register	Symbol	Bit	Notes on using the E8a emulator
0009h	Address match interrupt enable register	AIER	All bits	[*1]
0010h - 0012h	Address match interrupt register 0	RMAD0	All bits	[*1]
0014h - 0016h	Address match interrupt register 1	RMAD1	All bits	[*1]
0018h - 001Ah	Address match interrupt register 2	RMAD2	All bits	[*1]
001Ch - 001Eh	Address match interrupt register 3	RMAD3	All bits	[*1]
0028h - 002Ah	Address match interrupt register 4	RMAD4	All bits	[*1]
002Ch - 002Eh	Address match interrupt register 5	RMAD5	All bits	[*1]
0038h - 003Ah	Address match interrupt register 6	RMAD6	All bits	[*1]
003Ch - 003Eh	Address match interrupt register 7	RMAD7	All bits	[*1]
02E8h	UART1 transmit/receive mode register	U1MR	All bits	[*1]
02EAh, 02EBh	UART1 transmit buffer register	U1TB	All bits	[*1]
02ECh	UART1 transmit/receive control register 0	U1C0	All bits	[*1]
02EDh	UART1 transmit/receive control register 1	U1C1	All bits	[*1]
02EEh, 02EFh	UART1 receive buffer register	U1RB	All bits	[*1]
03C0h	Port P6 register	P6	Bits 4, 5, 6 and 7	[*2]
03C2h	Port P6 direction register	PD6	Bits 4, 5, 6 and 7	[*2]
03B0h	Function select register A0	PS0	Bits 4, 5, 6 and 7	[*2]

Notes:

1. Do not change this register value.
2. Do not change the value of the bits listed in the column to the left. When operating this register, make changes using the bit operation instructions to avoid changing the bit values.

#### 6. Interrupts used by the E8a emulator program

The BRK2 instruction interrupt, address match interrupt and single-step interrupt are used by the E8a emulator program. Therefore, make sure the user program does not use any of these interrupts. The E8a emulator changes these interrupt vector values to the values to be used by the emulator. No problems occur if the interrupt vector values are written in the user program.

### 7. Debugging using the watchdog timer

When debugging the user program using the watchdog timer, click the [Debugging of program that uses WDT.] check box in the [Firmware Location] tab of the [Emulator Setting] dialog box. If the watchdog timer is enabled with this box unchecked during debugging, the E8a emulator will not operate normally. By clicking this box, the E8a emulator program refreshes the watchdog timer during program operation. If memory access is executed through memory reference or modification, the watchdog timer will be refreshed by the E8a emulator program. Note that this timing will differ from the actual operational timing.

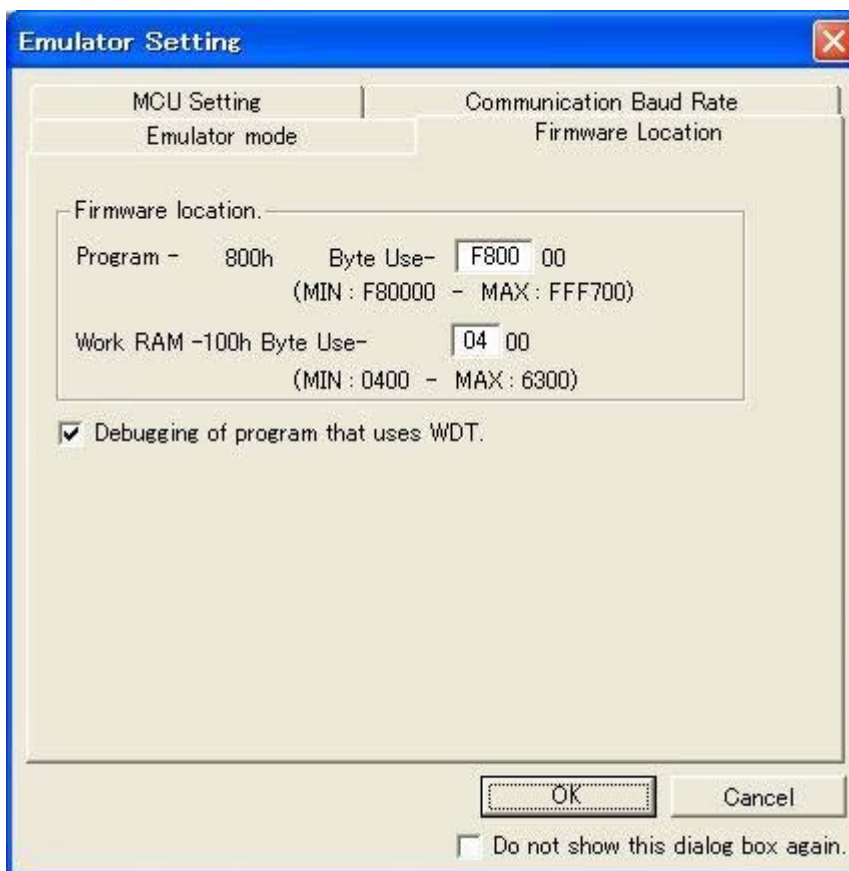


Figure 6.2 [Firmware Location] Tab of the [Emulator Setting] Dialog Box

## 8. Flash memory ID code

This MCU function prevents the Flash memory from being read out by anyone other than the user. The ID code in Table 6.4 written to the flash memory of the MCU must match the ID code displayed in the Figure 6.3 [ID Code verification] dialog box at debugger startup, otherwise the debugger cannot be launched. Note that when the ID code is FFh, FFh, FFh, FFh, FFh, FFh, FFh, the ID code is regarded as undefined. In this case, the ID code is automatically authenticated and the [ID Code verification] dialog box is not displayed.

In 'Program Flash' mode, the contents of the user program are input into the ID code area. When debugging in other modes, FFh, FFh, FFh, FFh, FFh, FFh, FFh is written into the ID code area regardless of the contents of the downloaded user program.

Table 6.4 ID Code Storage Area of M32C

Address	Description
FFFFDFh	First byte of ID code
FFFFE3h	Second byte of ID code
FFFFEBh	Third byte of ID code
FFFFEFh	Fourth byte of ID code
FFFFF3h	Fifth byte of ID code
FFFFF7h	Sixth byte of ID code
FFFFFBh	Seventh byte of ID code

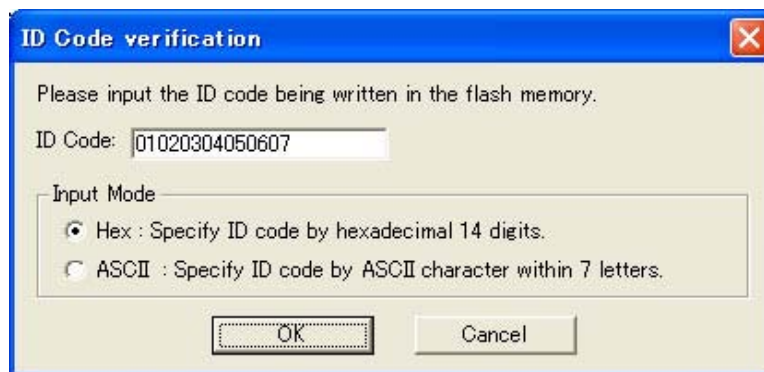


Figure 6.3 [ID Code verification] Dialog Box

Note on 'Program Flash' mode:

When the ID code is specified by the -ID option of the lmc30, download the MOT file or HEX file. When the X30 file is downloaded, the ID code is not valid. When downloading the X30 file, specify the ID code using an assembler directive command such as ".BYTE". The file to which the ID code specified by the assembler directive command ".ID" is output varies depending on the version of the assembler. For details, refer to the Assembler User's Manual.

## 9. Reset

The reset vector is used by the E8a emulator program. If the MCU is reset while executing the user program, control is transferred to the E8a emulator program and the user program is forced to stop. Do not use the hardware reset 2, software reset and watchdog timer reset, otherwise the E8a emulator will not operate normally.

#### 10. Memory access during emulation execution

When referring to or modifying the memory contents, the user program is temporarily halted. For this reason, a real-time emulation cannot be performed. When a real-time emulation is necessary during a program execution, disable the automatic update in the watch window or fix the display in the memory window before running the program so that memory accesses do not occur during an execution.

#### 11. Setting of address match break during user program execution

When adding or cancelling the address match break, the user program is temporarily halted. For this reason, a real-time emulation cannot be performed.

#### 12. When the E8a emulator does not supply power to the user system, it consumes the power voltage of the user system from several mA to more than 10 mA. This is because the user power supply drives 74LVC125, 74LVC1T45 and 74LVC2T45 to make the communication signal level match the user system power supply voltage.

#### 13. When debugging, the Flash memory is frequently rewritten by the E8a emulator. Therefore, do not use an MCU that has been used for debugging in products. Also, as the E8a emulator program is written to the MCU while debugging, do not save the contents of the MCU Flash memory which were used for debugging nor use them as the ROM data for products.

#### 14. NMI interrupt

If NMI interrupts are used, be sure to take the necessary precautions before executing the user program like disabling the automatic update in the watch window or fix the display in the memory window before running the program so that memory accesses do not occur during an execution. If an NMI interrupt occurs while the user program halts or when memory contents are referenced or modified during user program execution, the E8a emulator cannot control the MCU.

#### 15. DMACII transfer complete interrupt

If DMACII transfer complete interrupts are used, be sure to take the necessary precautions before executing the user program like disabling the automatic update in the watch window or fix the display in the memory window before running the program so that memory accesses do not occur during an execution. If a DMACII transfer complete interrupt occurs while the user program halts or when memory contents are referenced or modified during user program execution, the E8a emulator cannot control the MCU.

#### 16. Reserved area

The addresses not specified in the Hardware Manual for M32C/84, M32C/85, M32C/86, M32C/87 and M32C/88 Groups are reserved area. Do not change the contents. Otherwise, the E8a emulator cannot control the MCU.

#### 17. Debugging in stop mode or wait mode

When debugging in stop mode or wait mode, do not operate windows until the program stops at the breakpoint by setting the breakpoint at the line of the program which will be executed after the stop mode or wait mode is cancelled. In addition, disable the automatic update in the watch window or fix the display in the memory window before running the program so memory accesses do not occur during an execution.

When the program is forcibly stopped or when the memory is referred to or modified in stop mode or wait mode, these mode will be cancelled.

#### 18. Peripheral I/Os during a halt

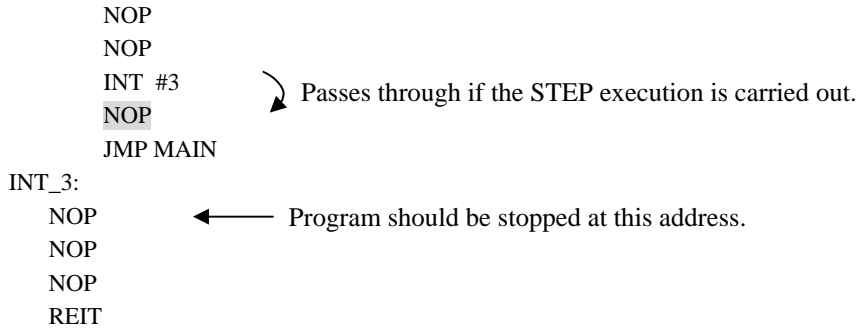
During a user program halt, interrupts are not accepted although peripheral I/Os continue to run. For example, a timer interrupt is not accepted although the timer continues to count when a user program is stopped by a break after the timer started.

19. Exceptional step execution

a) Software interrupt instruction

Step execution cannot be performed in the internal processing of instructions (undefined, overflow, BRK and INT) which generate a software interrupt continuously in the program.

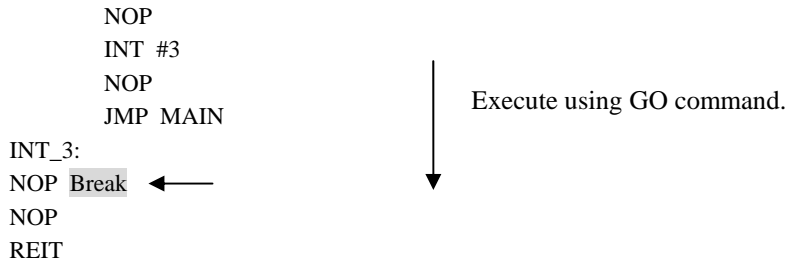
Example: INT instruction



b) INT instruction

To debug the user program with the INT instruction, set a PC break for the internal processing of the INT instruction and execute the program with the GO command.

Example:



20. “Go to cursor” function

The “Go to cursor” function is actualized using an address match break. Therefore, when you execute the “Go to cursor” command, all the address match breaks you set become invalid, while all the PC breaks remain valid.

21. Note on PC break point

When downloading a user program after modifying it, the set address of PC break may not be corrected normally depending on the modification. Therefore, break points other than the set PC breaks may shift. After downloading a user program, check the setting of PC breaks in the event point window and reset it. If a low-speed clock such as the sub clock is used as the operation clock of the MCU, setting or canceling PC breaks may take time. Use address match breaks as the first choice.

## 22. Note on debugging in CPU rewrite mode

When debugging in CPU rewrite mode, do not rewrite in CPU block 0 area (addresses FFF000h - FFFFFFFh) and block containing the E8a emulator program. If these areas are rewritten, the E8a emulator will not control the MCU. Do not halt the user program while setting up the CPU rewrite mode and releasing it. If halted, the E8a emulator may not control the MCU. In addition, disable the automatic update in the watch window or fix the display in the memory window before running the program so memory accesses do not occur during an execution.

To check the data after executing the CPU rewrite mode, halt the program after releasing the CPU rewrite mode and refer to the memory window, etc.

When rewriting the Flash memory in the program area, select Menu -> [Setup] -> [Emulator] -> [System...] to open the [Configuration] dialog box in the High-performance Embedded Workshop. In this dialog box, change the [Flash memory synchronization] setting to [Flash memory to PC] and set the debugger cache to OFF. In this setting, the Flash memory is read whenever a break occurs, which takes some time. Use it with the [Disable] setting except when debugging in CPU rewrite mode.

## 23. Note on rewriting Flash memory

Do not reset the MCU when rewriting the Flash memory.

The Flash memory is rewritten when the “Flash memory write end” is displayed in the output window of the High-performance Embedded Workshop. If the MCU is reset when rewriting the Flash memory, the user program or the E8a emulator program may be disrupted.

Flash memory rewrite occurs:

- When downloading the user program
- After setting PC breaks in the Flash memory and executing the user program
- After canceling PC breaks in the Flash memory and executing the user program
- After rewriting the value of the Flash memory in the memory window and executing the user program

## 24. Note on the E8a emulator power supply

When writing a program with the E8a emulator for mass production processes, the program requires reliability, so do not use the E8a emulator power supply function. Supply power separately to the user system according to the allowable voltage for MCU writing. Voltage supplied from the E8a emulator depends on the quality of the USB power supply of the PC, and as such, precision is not guaranteed. Note that when debugging the system which operates the MCU with a dual power supply, power cannot be supplied from the E8a.

## 25. Low power consumption mode

When debugging in low power consumption mode, do not operate windows until the program stops at the breakpoint by setting the breakpoint at the line of the program which will be executed after the low power consumption mode is cancelled.

## 26. Lock bits

When starting up in program flash mode, lock bits in all the blocks of the flash memory will be unlocked. Note that the lock bits of the downloaded blocks will be unlocked after downloading the user program.

## 27. DMAC and DMACII during a user program halt

When the user program is halted or when the memory is referred to or modified during user program execution, DMA transfer is disabled. In such cases, the E8a emulator sets the registers below as following. Therefore, if you refer to the registers below in the memory window, etc., it shows that DMA is disabled.

- DMA Mode Register 0 (DMD0)
  - Channel 0 transfer mode select bits (bit 1, 0) 00: DMA disabled
  - Channel 1 transfer mode select bits (bit 5, 4) 00: DMA disabled
- DMA Mode Register 1 (DMD1)
  - Channel 2 transfer mode select bits (bit 1, 0) 00: DMA disabled
  - Channel 3 transfer mode select bits (bit 5, 4) 00: DMA disabled
- Interrupt Control Register
  - Interrupt priority level select bits (bit 2, 1, 0) 000: Level 0 (interrupt disabled)
- Interrupt Control Register
  - Interrupt request bit (bit 3) 0: Interrupt not requested [\*1]

Do not enable DMA transfer from the memory window, etc., but enable it in the user program.

### Note

[\*1] When restarting the user program, though the E8a emulator sets back the value of a DMA mode register to the previous value that was set before the program stops, the interrupt request bit remains 0.



## Section 7 Debugger Setting

### 1. [Emulator Setting] dialog box

The [Emulator Setting] dialog box is provided for setting items that need to be set when the debugger is launched. The contents set from this dialog box (excluding [Power Supply] group box items) also become valid the next time the debugger is launched. When launching the debugger for the first time after creating a new project work space, the [Emulator Setting] dialog box is displayed with the Wizard.

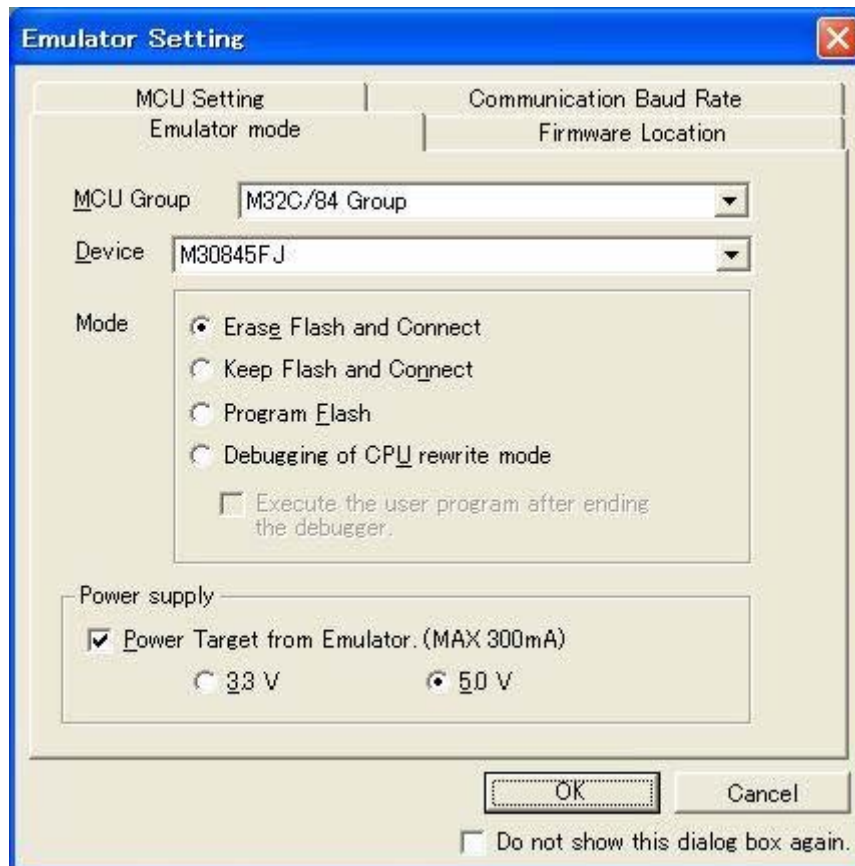


Figure 7.1 [Emulator Setting] Dialog Box

If you check “Do not show this dialog box again.” at the bottom of the [Emulator Setting] dialog box, the [Emulator Setting] dialog box will not be displayed the next time the debugger is launched. You can open the [Emulator Setting] dialog box using one of the following methods:

- After the debugger is launched, select Menu -> [Setup] -> [Emulator] -> [Emulator Setting...].
- Hold down the Ctrl key while launching the debugger.

When “Do not show this dialog box again.” is checked, the E8a does not supply power to the user system.

## 2. [Emulator mode] tab

Device selection, mode specification and power supply setting are made from the [Emulator mode] tab of the [Emulator Setting] dialog box.

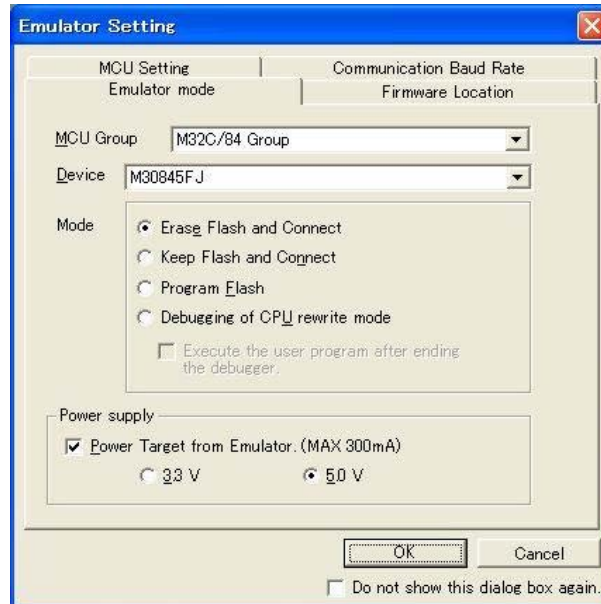


Figure 7.2 [Emulator mode] Tab

**[MCU Group]**

Select the name of the MCU group to be used from the [MCU Group] drop-down list.

**[Device]**

Select the type of MCU to be used from the [Device] drop-down list.

**[Mode]**

- Erase Flash and Connect

When starting the debugger, the E8a emulator erases the Flash memory data for the MCUs and simultaneously writes the E8a emulator program.

- Keep Flash and Connect

When launching the debugger, the E8a emulator retains the Flash memory data for the MCUs. Note that the area for the E8a emulator program and the vector area used by the E8a emulator will change.

- Program Flash

The E8a emulator starts as a simple programmer. When downloaded, the E8a writes only the user program (E8a emulator program is not written). Therefore, the program cannot be debugged in this mode.

- Debugging of CPU rewrite mode

Select this setting when debugging the program which rewrites the CPU. In this mode, the following debug operation which rewrites the Flash memory cannot be executed.

- Setting the PC break points
- Changing the memory contents in the Flash memory area

In this mode, when starting the debugger, the E8a emulator erases the Flash memory data for the MCUs and simultaneously writes the E8a emulator program.

When [Execute the user program after ending the debugger.] is selected, with the E8a emulator connected to the user system, the user program is executed at the same time the debugger is terminated. This check box setting is available only when the [Program Flash] mode is selected.

**[Power supply]**

When supplying power to the user system from the E8a, click the [Power Target from Emulator. (MAX 300mA)] check box. Note that when debugging the system which operates the MCU with a dual power supply, power cannot be supplied from the E8a.

## 3. [Firmware Location] tab

For details, see “1. Program area for the E8a emulator” and “7. Debugging using the watchdog timer” in “Section 6. Notes on Using the E8a Emulator”.

## 4. [MCU Setting] Tab

In the [MCU Setting] tab, set the operating condition of the MCU used in the user system.

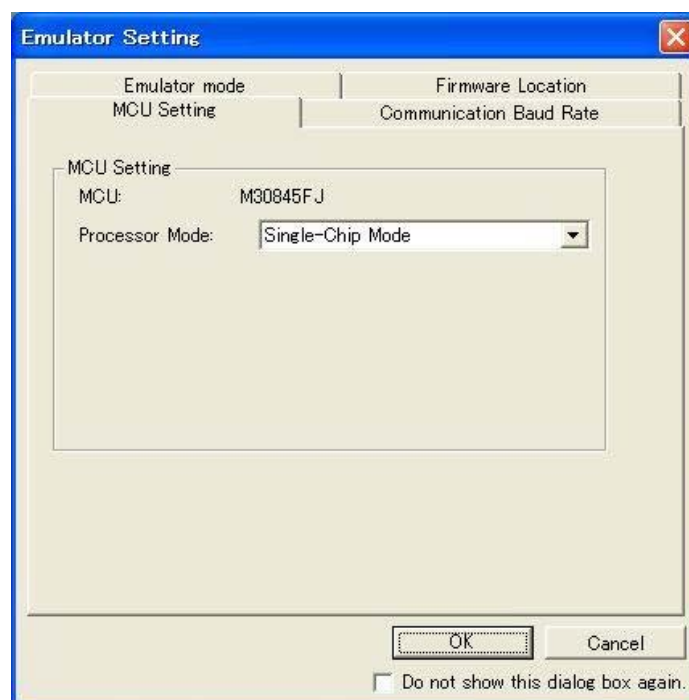


Figure 7.3 [MCU Setting] Tab

**Specify processor mode**

Specify the processor mode according to the user system. One of the following can be specified:

- Single-Chip Mode
- Memory Expansion Mode

**Notes:**

The following describes precautions to be taken when using the emulator in memory expansion mode:

- When the external area cannot be rewritten via normal memory access, software breaks cannot be used in that area.

## 5. [Communication Baud Rate] Tab

Select communication baud rate between the E8a and MCU in the [Communication Baud Rate] tab. 2000000bps (default setting) should be selected.

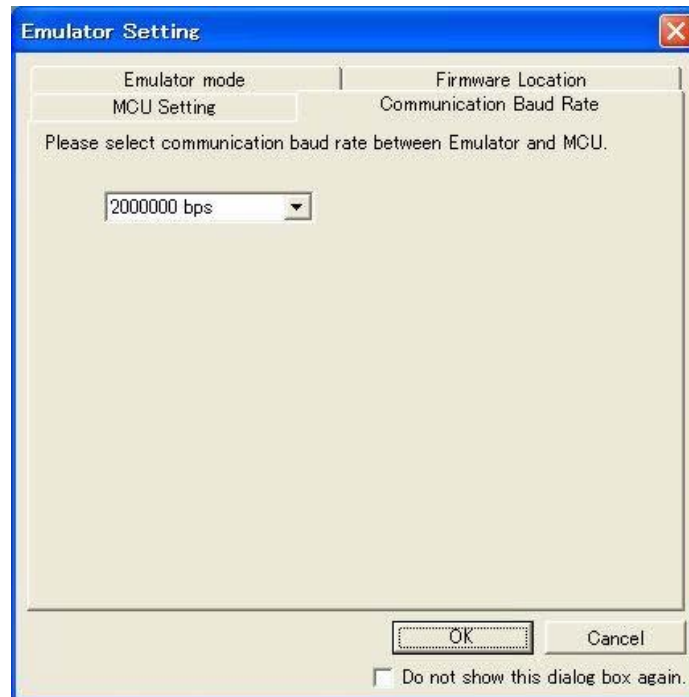


Figure 7.4 [Communication Baud Rate] Tab

## Section 8 Applicable Tool Chain and Third-party Products

With the R32C/80 Series E8a emulator, you can debug a module created by the inhouse tool chain and third-party products listed in Table 8.1 below.

Table 8.1 Applicable Tool Chain and Third-party Products

Tool chain	M3T-NC308WA V.5.20 Release 02 or later
Third-party products	IAR EWM32C V.3.10A or later

---

E8a Emulator (R0E00008AKCE00)  
Additional Document for User's Manual  
Notes on Connecting the M32C/84, M32C/85, M32C/86, M32C/87 and M32C/88

Publication Date: Apr 30, 2010 Rev.4.00

Published by: Renesas Electronics Corporation

Edited by: Microcomputer Tool Development Department 2  
Renesas Solutions Corporation

---



SALES OFFICES

Renesas Electronics Corporation

<http://www.renesas.com>

---

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

Renesas Electronics America Inc.  
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.  
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited  
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada  
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K  
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH  
Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.  
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.  
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China  
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited  
Unit 1601-1613, 16/F, Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.  
7F, No.363 Fu Shing North Road Taipei, Taiwan  
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.  
1 harbourFront Avenue, #06-10, Keppel Bay Tower, Singapore 098632  
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.  
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia  
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.  
11F, Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea  
Tel: +82-2-558-3737, Fax: +82-2-558-5141

E8a Emulator (R0E00008AKCE00)  
Additional Document for User's Manual

