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# E8 Emulator

Additional Document for User's Manual  
R0E000080KCE00EP34

Renesas Microcomputer Development  
Environment System  
M16C Family / M16C/60 Series  
Notes on Connecting the M16C/64

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This user's manual is applicable to the E8 emulator software V.2.11 Release 00 or later.



## Section 1 Inside the E8 Emulator User's Manual

The E8 emulator manual consists of two documents: the E8 User's Manual and the E8 Additional Document for User's Manual (this document). Be sure to read BOTH documents before using the E8 emulator.

(1) E8 Emulator User's Manual

The E8 Emulator User's Manual describes the hardware specifications and how to use the emulator debugger.

- E8 emulator hardware specifications
- Connecting the E8 emulator to the host computer or user system
- Operating the E8 emulator debugger
- Tutorial: From starting up the E8 emulator debugger to debugging

(2) E8 Additional Document for User's Manual

The E8 Additional Document for User's Manual describes content dependent on the MCUs and precautionary notes.

- MCU resources used by the E8 emulator
- Example of the E8 emulator connection or interface circuit necessary for designing hardware
- Notes on using the E8 emulator
- Setting the E8 emulator debugger during startup





## Section 2 E8 Emulator Specifications

Table 2.1 shows the E8 Emulator specifications for the M16C/64 Group.

Table 2.1 E8 Emulator Specifications for the M16C/64 Group

Target MCUs	M16C Family M16C/60 Series M16C/64 Group
Available operating modes	Single-chip mode, Memory expansion mode * Microprocessor mode is not supported.
Break functions	- Address match break, 4 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: 3 KB (variable assigned address) - RAM size: 128 bytes (variable assigned address) - Stack 14 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	M16C/64      2.7 - 5.5 V (f(BCLK)=25MHz)

Table 2.2 shows the operating environment of the E8 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 E8 Emulator to the User System

Before connecting the E8 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 “E8 Connecting Connector Pin Assignments”, and Figures 5.1 to 5.4 “Example of an E8 Connection”.

Before designing the user system, be sure to read the E8 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 E8 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.

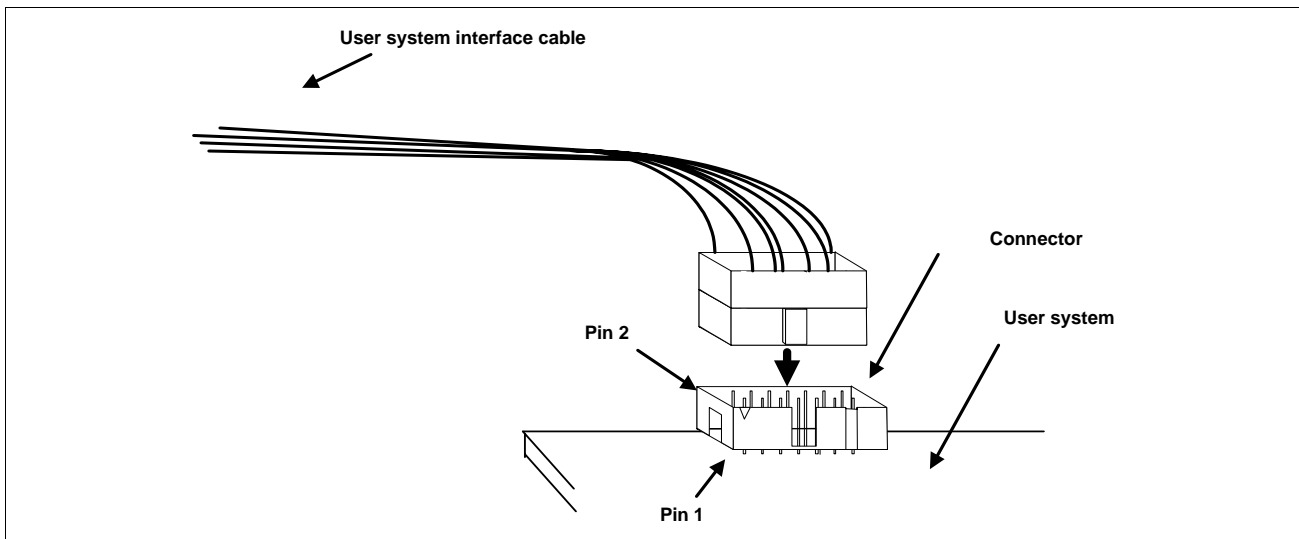


Figure 3.1 Connecting the User System Interface Cable with an E8 Connecting Connector

Notes:

1. Do not place any components within 3 mm area of the connector.
2. When using the E8 emulator as a programmer, connect it to the user system in the same way.



## Section 4 E8 Connecting Connector Pin Assignments

Figure 4.1 shows the pin assignments for the E8 connecting connector.

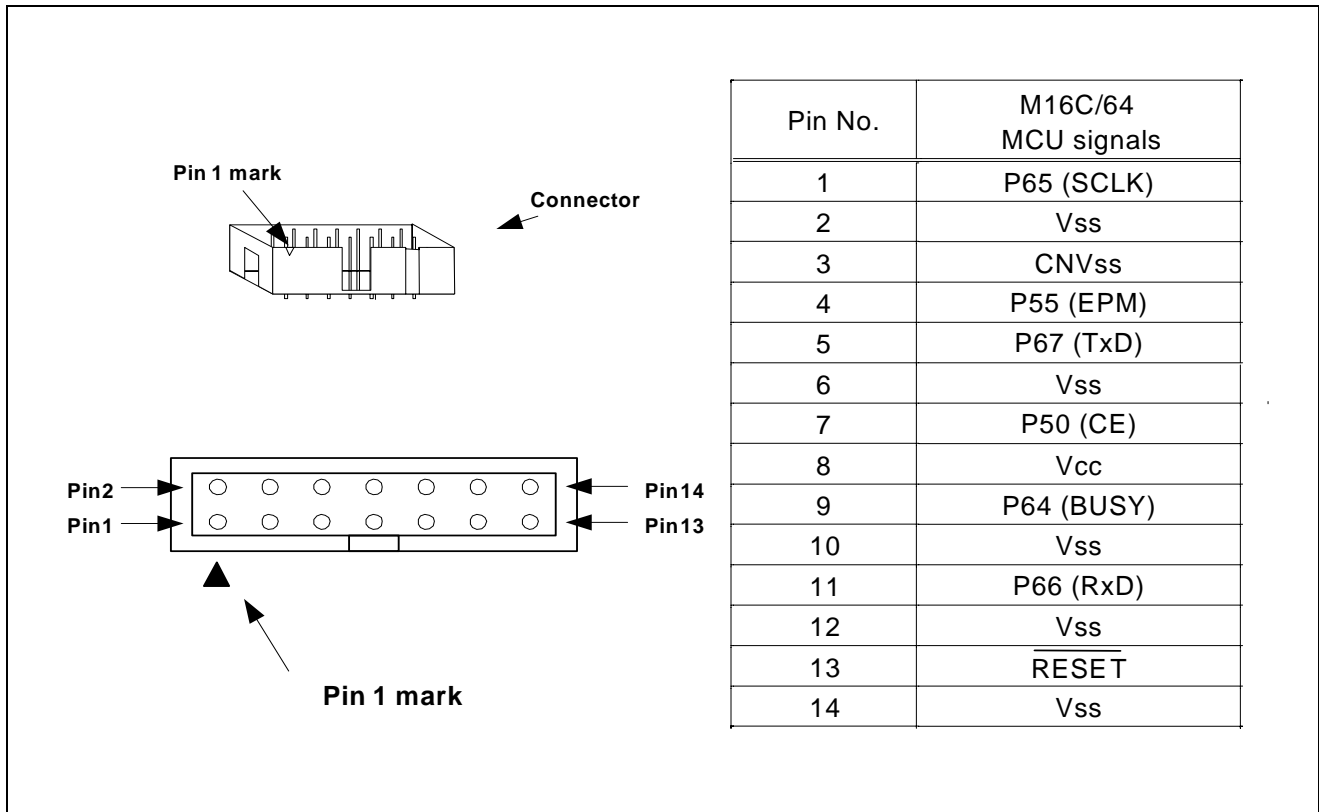


Figure 4.1 E8 Connecting Connector Pin Assignments

Note:

Pin 14 is used for checking the connection between the E8 and the user system, and is not directly connected to the Vss inside the E8. Make sure pins 2, 6, 10, 12 and 14 are all connected to the Vss.



## Section 5 Examples of E8 Connections

The following show connection examples. When using the emulator as a programmer, the connection specification between the E8 and the MCUs is the same as shown below.

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

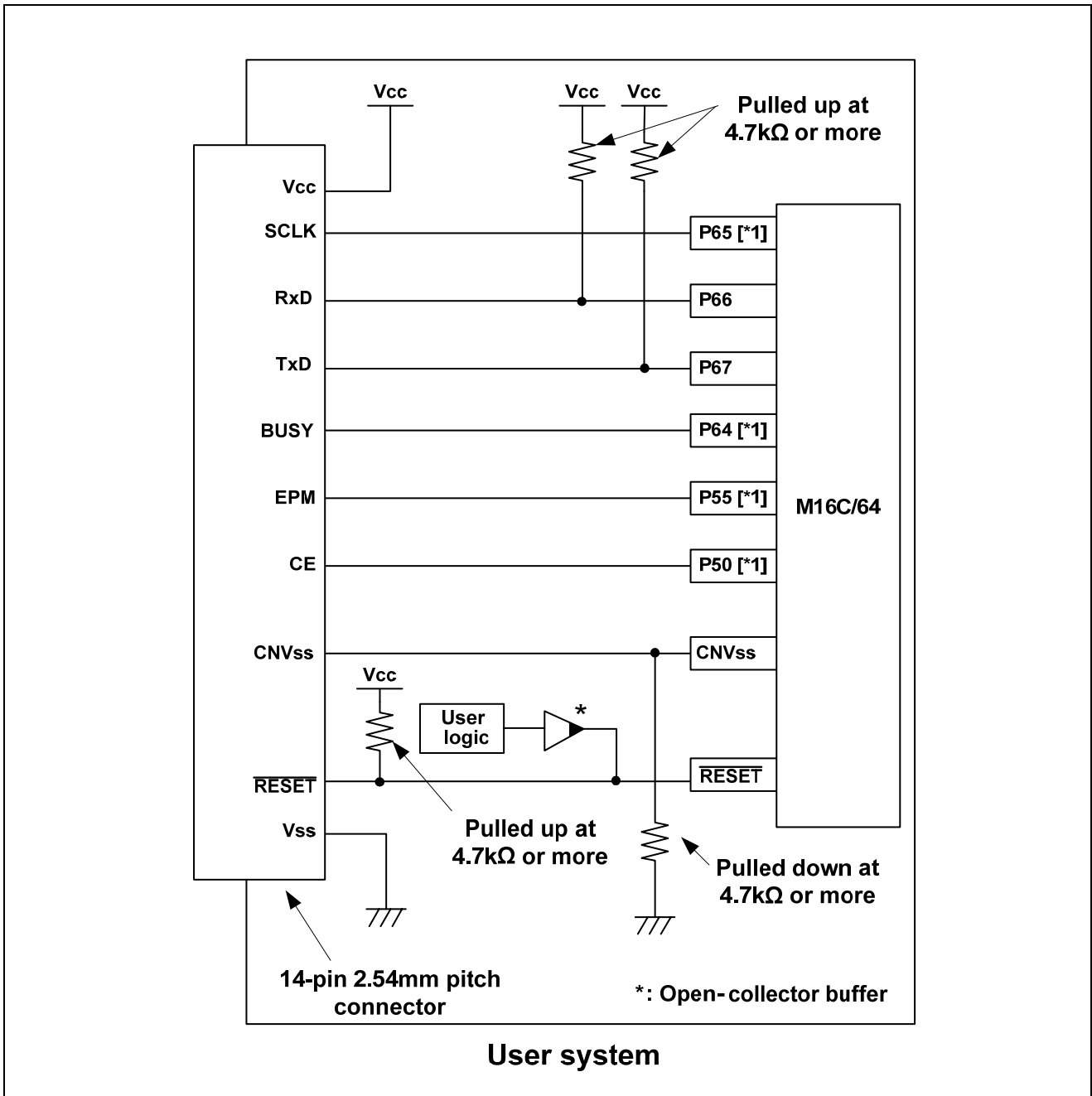


Figure 5.1 Example of an E8 Connection (Single Power Supply and Single-chip Mode)

Note:

1. For details on setting pins P50, P55, P64 and P65, refer to numbers 1 and 2 of “Points to Remember” on page 13.

(2) In single power supply and memory expansion mode

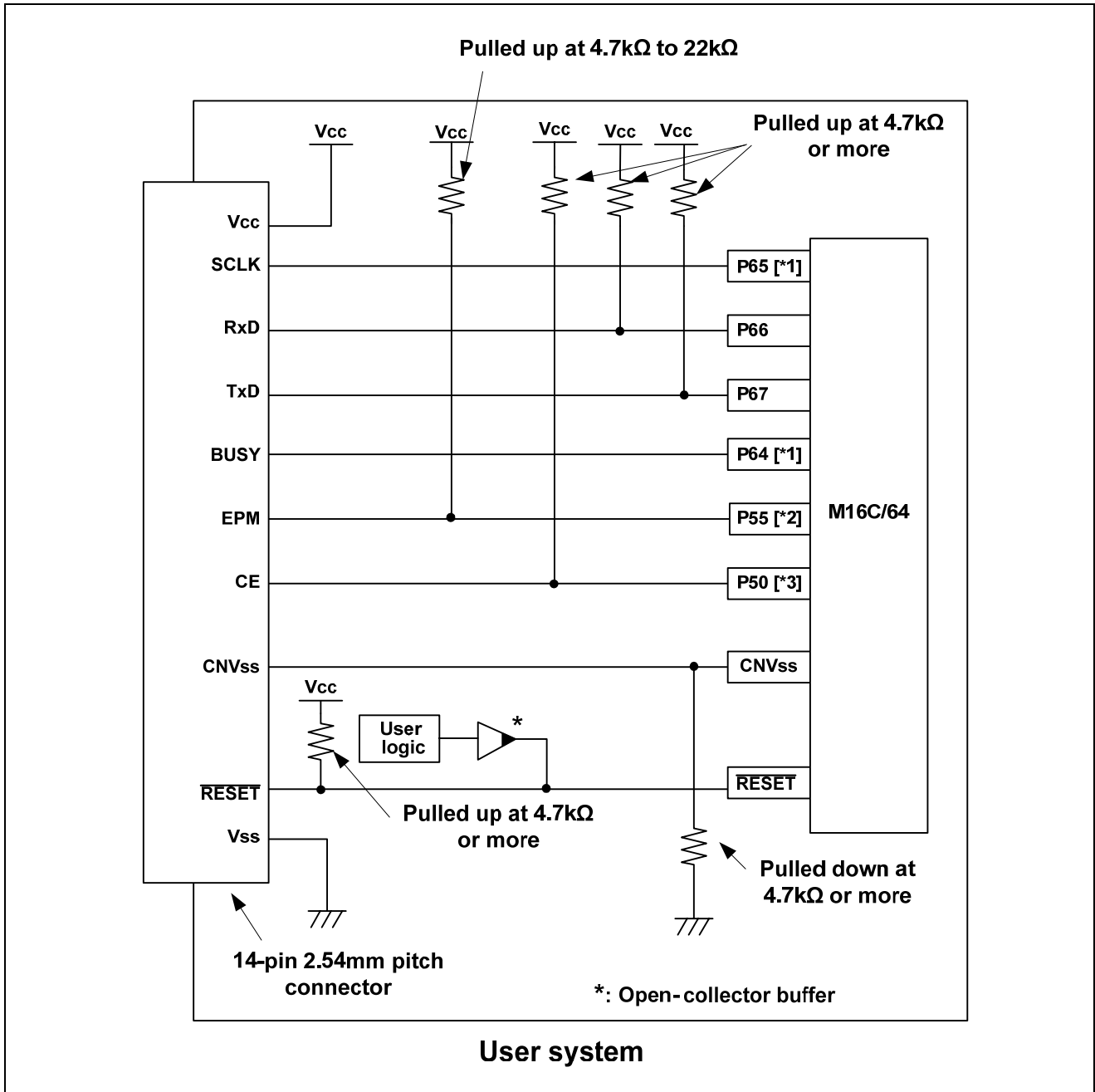


Figure 5.2 Example of an E8 Connection (Single Power Supply and Memory Expansion Mode)

Notes:

1. For details on setting pins P64 and P65, refer to number 1 of “Points to Remember” on page 13.
2. The  $\overline{\text{HOLD}}$  signal cannot be used. Pull up P55 on the user system.
3. P50 is used as the  $\overline{\text{WRL\#/WR\#}}$  pin. The E8 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 E8 emulator and the MCU. The  $\overline{\text{WRL\#/WR\#}}$  pin does not affect the memory because the pin has a low active signal.



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

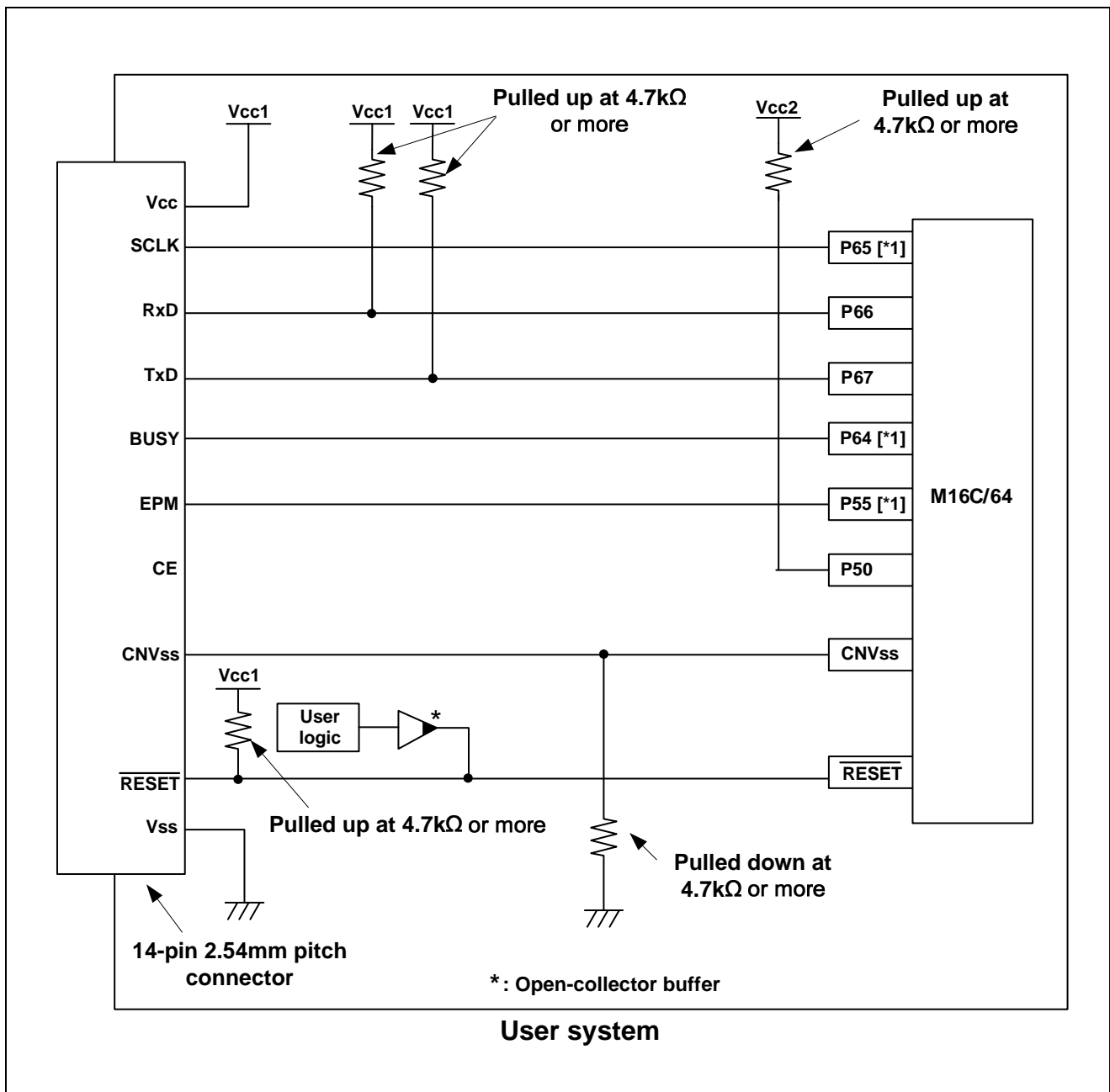


Figure 5.3 Example of an E8 Connection (Dual Power Supply and Single-chip Mode)

Note:

1. For details on setting pins P55, P64 and P65, refer to numbers 1 and 2 of "Points to Remember" on page 13.

(4) In dual power supply and memory expansion mode

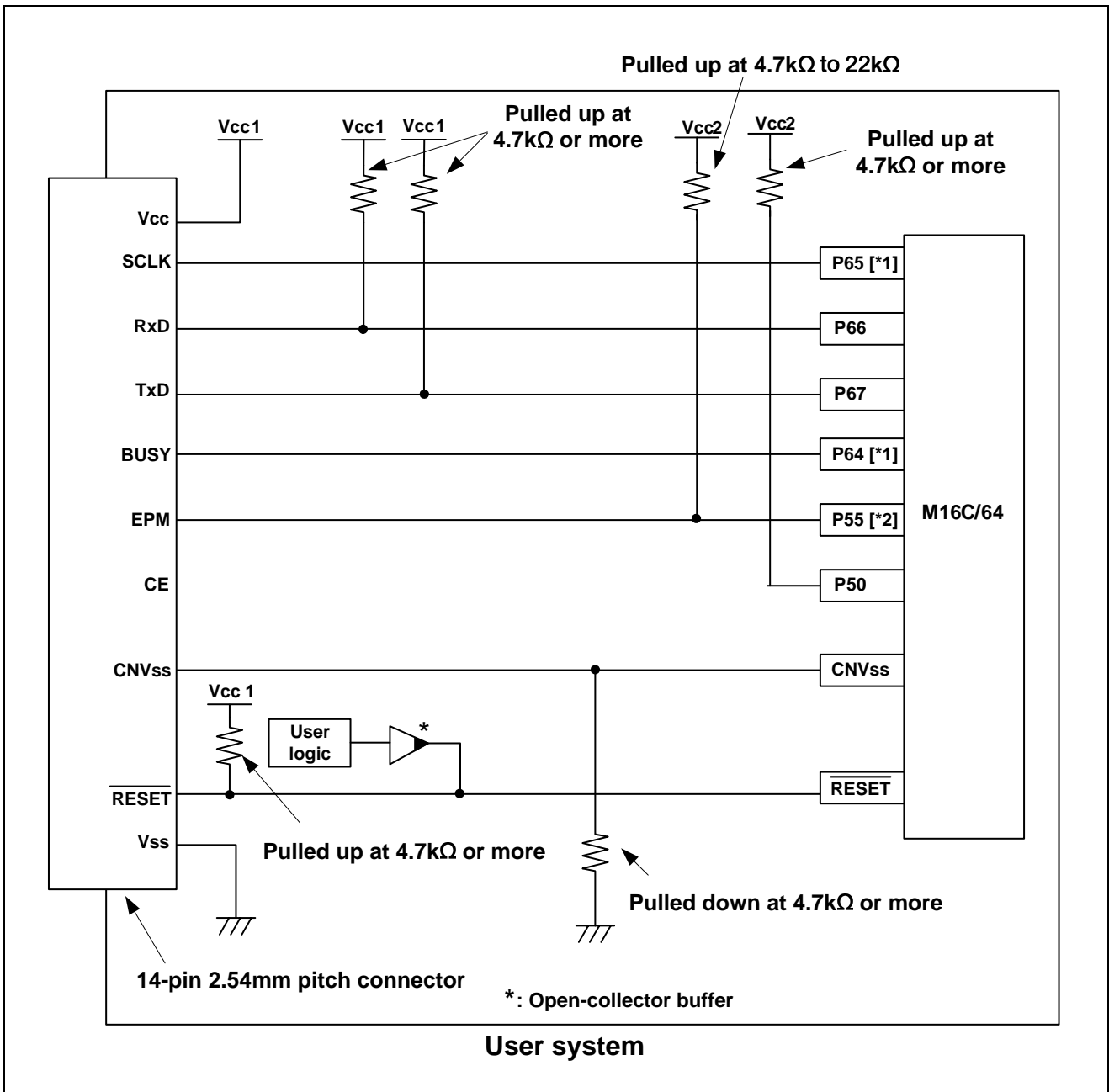


Figure 5.4 Example of an E8 Connection (Dual Power Supply and Memory Expansion Mode)

Notes:

1. For details on setting pins P64 and P65, refer to numbers 1 and 2 of “Points to Remember” on page 13.
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 E8 emulator. Connect the E8 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 E8 emulator. P64 may be in a Hiz state while the E8 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 E8 emulator (Figure 5.12).

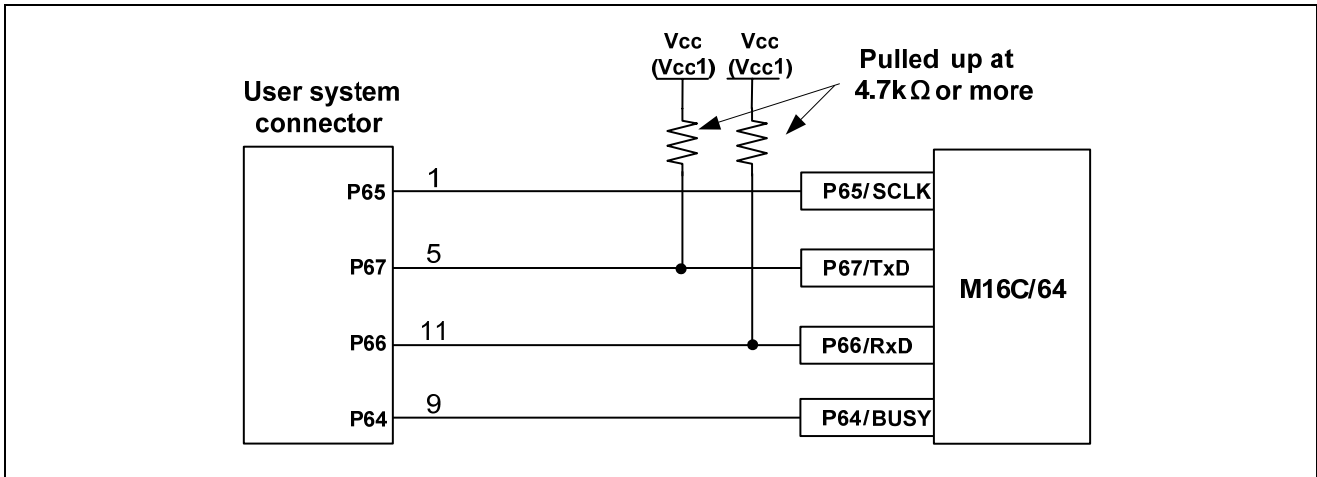


Figure 5.5 E8 Emulator and MCU Connection

2. The E8 emulator uses pins P50 and P55 for MCU control. Connect the E8 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 E8 emulator. P50 and P55 may be in a Hiz state while the E8 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 E8 emulator (Figure 5.12).

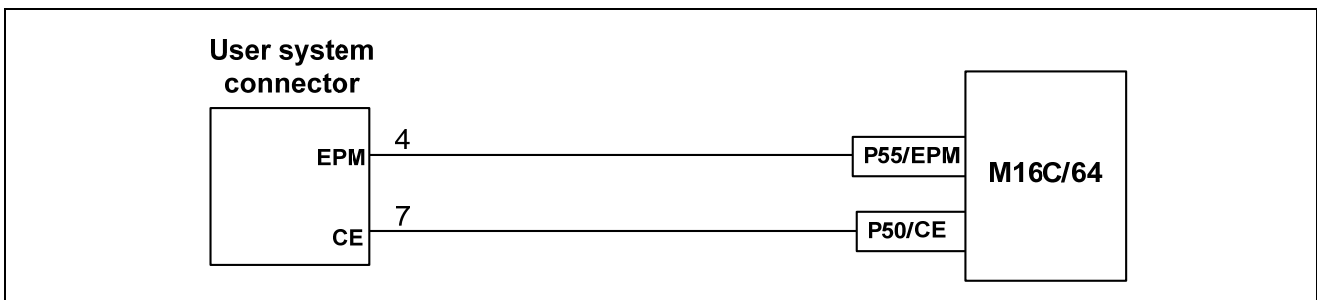


Figure 5.6 Connection of E8 Emulator and Pins P50 and P55 (Single Power Supply and Single-chip Mode)

(2) Single power supply and memory expansion mode

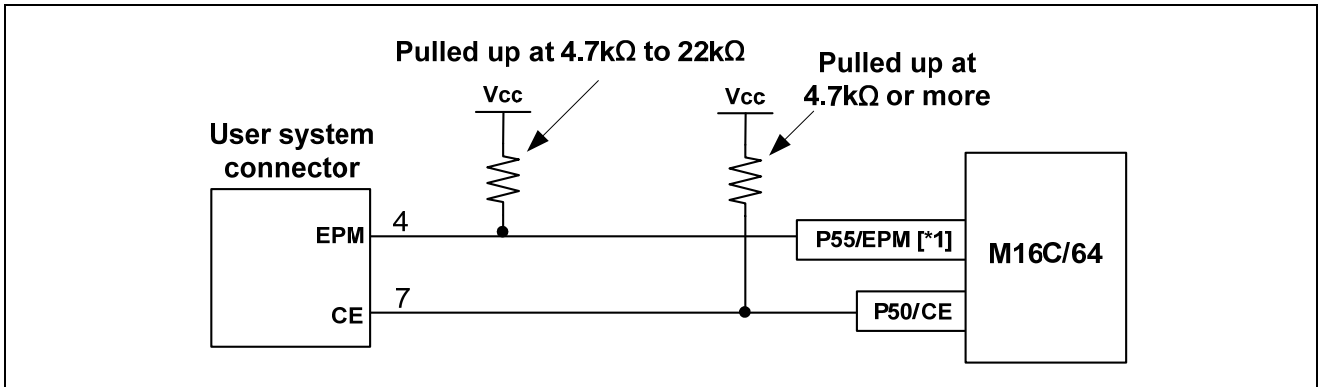


Figure 5.7 Connection of E8 Emulator and Pins P50 and P55 (Single Power Supply and Memory Expansion Mode)

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 E8 emulator. P55 may be in a Hiz state while the E8 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 E8 emulator (Figure 5.12).

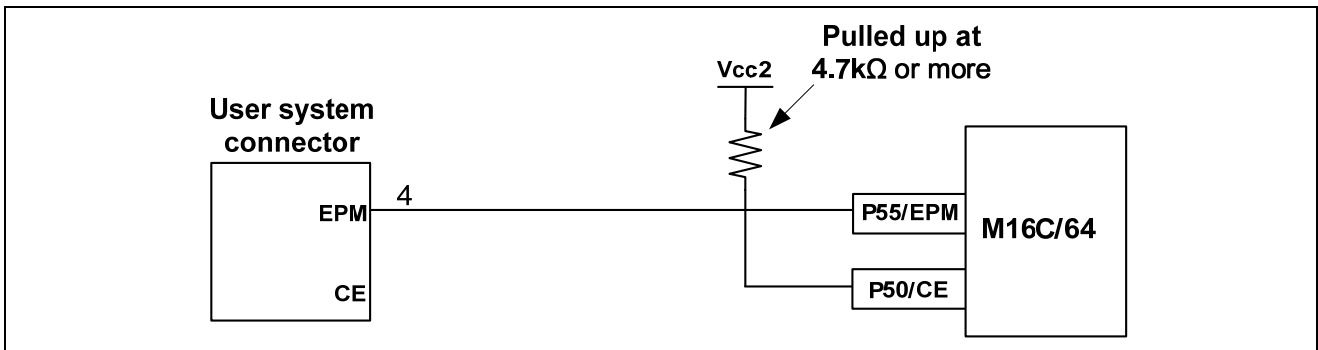


Figure 5.8 Connection of E8 Emulator and Pins P50 and P55 (Dual Power Supply and Single-chip Mode)

(4) In dual power supply and memory expansion mode

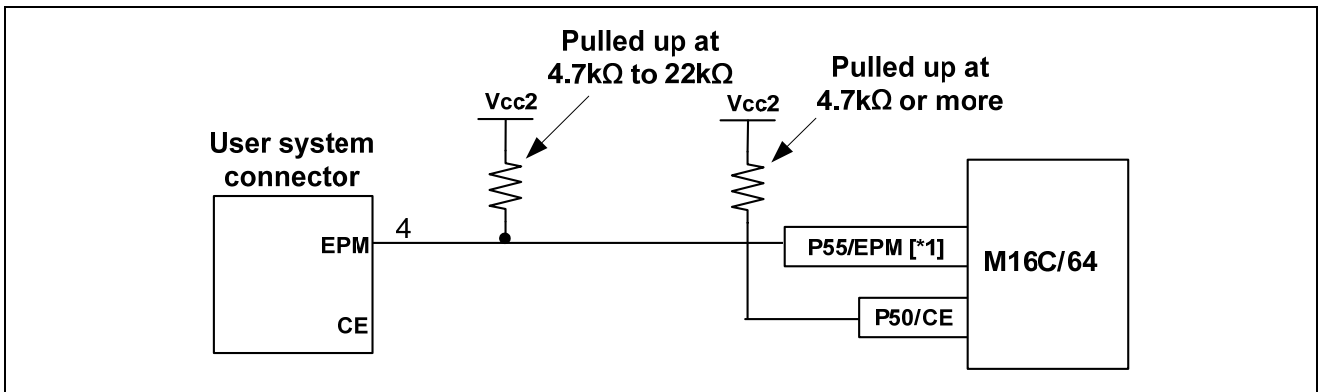


Figure 5.9 Connection of E8 Emulator and Pins P50 and P55 (Dual Power Supply and Memory Expansion Mode)

Note:

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

3. The E8 emulator uses the CNVss pin for MCU control. Pull down the E8 emulator and MCU pins and connect the E8 emulator.

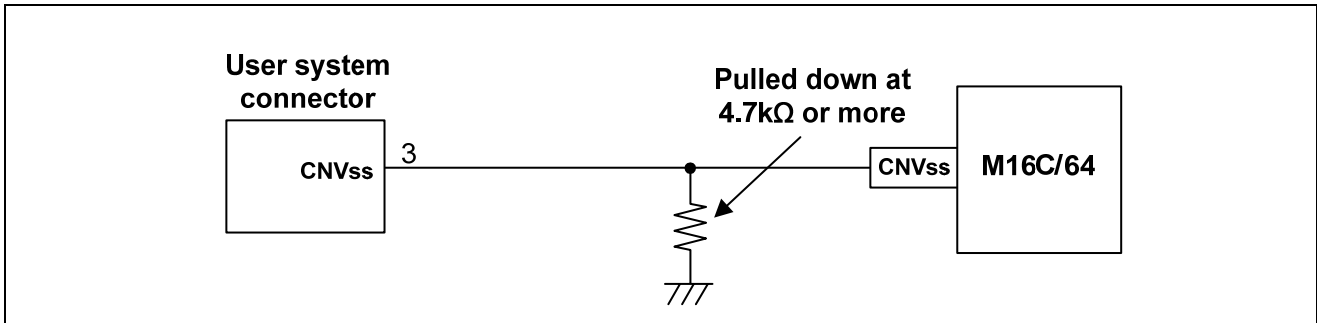


Figure 5.10 E8 Emulator and CNVss Pin Connection

4. The  $\overline{\text{RESET}}$  pin is used by the E8 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 E8 emulator. However, if the reset IC output is “H”, the user system reset circuit cannot be set to “L”. As such, the E8 emulator will not operate normally.

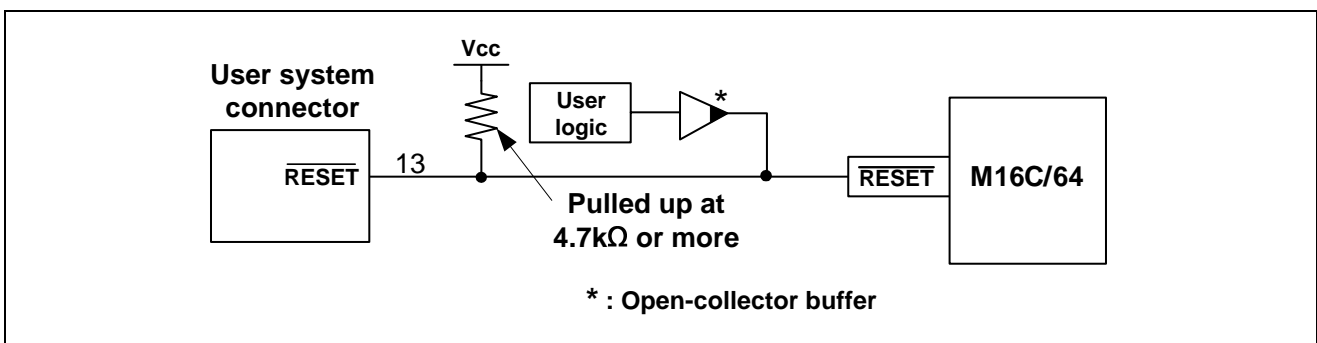


Figure 5.11 Example of a Reset Circuit

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 E8 and the user system, and is not directly connected to the Vss inside the E8. 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 E8 emulator. Use this figure as a reference when determining the pull-up resistance value.

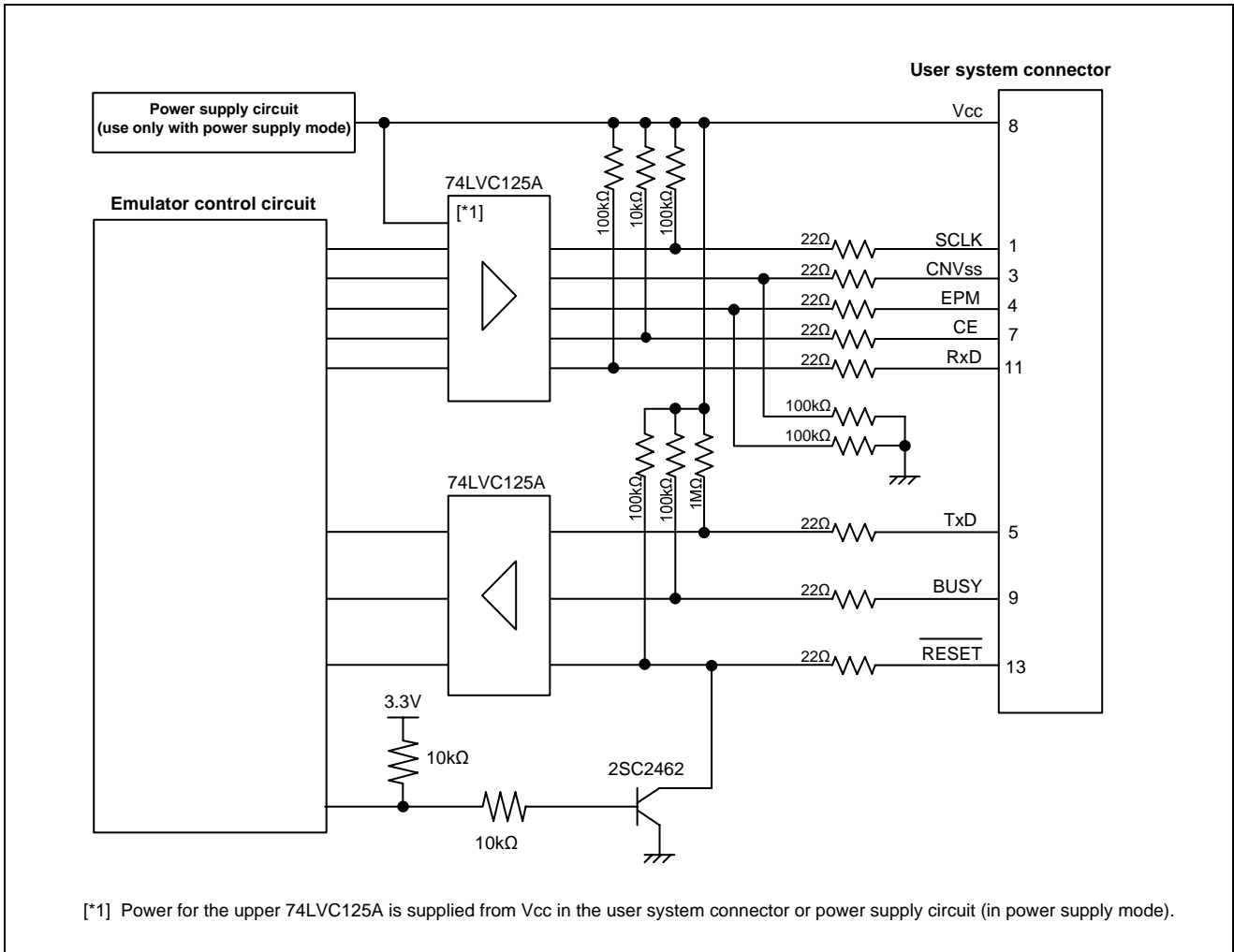


Figure 5.12 Interface Circuit Inside the E8 Emulator (For Reference)

## Section 6 Notes on Using the E8 Emulator

### 1. Program area for the E8 emulator

Table 6.1 lists the program areas allotted for the E8 emulator. Do not change this area allocation, otherwise the E8 emulator will not control the MCU. If settings were changed, disconnect the debugger and then reconnect it.

Table 6.1 Program Area for the E8 Emulator

Group	Part No.	ROM Size			RAM Size	Program Area for E8 Emulator		
		Programming Area 1	Programming Area 2	Data Area		Vector Area	ROM Area	RAM Area
M16C/64	R5F3640D	256 KB	16 KB	4 KB (2 blocks)	16 KB	FFFE4h - FFFE7h, FFFE8h - FFFEBh, FFFECh - FFFEFh, FFFF4h - FFFF7h, FFFFCh - FFFFFh	3 KB of the programming area [*1]	128 bytes [*1]

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.

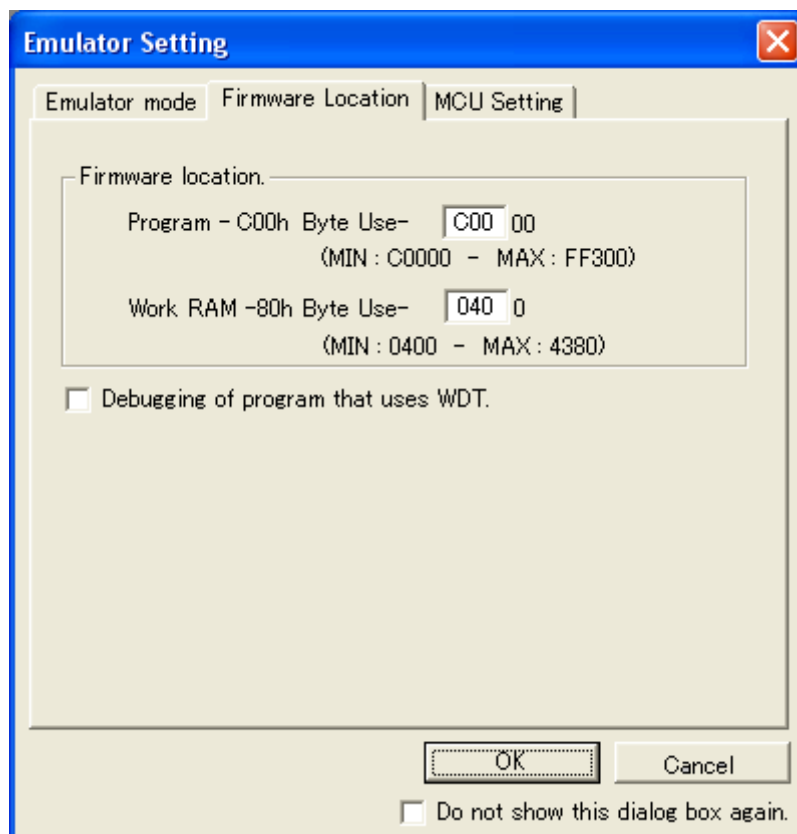


Figure 6.1 [Firmware Location] Tab of the [Emulator Setting] Dialog Box

- When the system is launched, the E8 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

Status	Register	Initial Value
E8 Emulator Activation	PC	Reset vector value in the vector address table
	R0 to R3 (bank 0, 1)	0000h
	A0, A1 (bank 0, 1)	0000h
	FB (bank 0, 1)	0000h
	INTB	0000h
	USP	0000h
	ISP	Work RAM Address for the E8 emulator + 80h [*1]
	SB	0000h
	FLG	0000h

Note:

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

3. The E8 emulator controls the MCUs by using the P50, P55, P64, P65, P66, P67,  $\overline{\text{RESET}}$  and CNVss pins.
4. The E8 emulator uses up to 14 bytes of the stack pointer during a user program break. Therefore, set aside 14 bytes for the stack area.
5. SFRs used by the E8 emulator program  
As the SFRs listed in Table 6.3 are used by the E8 emulator program, do not change any of these values. If these values are changed, the E8 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 E8 emulator program will be read out.

Table 6.3 SFRs Used by the E8 Emulator Program

Address	Register	Symbol	Bit	Notes on Using the E8 Emulator
020Eh	Address match interrupt enable register	AIER	All bits	[*1]
020Fh	Address match interrupt enable register 2	AIER2	All bits	[*1]
0210h - 0212h	Address match interrupt register 0	RMAD0	All bits	[*1]
0214h - 0216h	Address match interrupt register 1	RMAD1	All bits	[*1]
0218h - 021Ah	Address match interrupt register 2	RMAD2	All bits	[*1]
021Ch - 021Eh	Address match interrupt register 3	RMAD3	All bits	[*1]
0250h	UART transmit/receive control register 2	U1CON	Bits 1, 3, 4, 5 and 6	[*2]
0258h	UART1 transmit/receive mode register	U1MR	All bits	[*1]
025Ah, 025Bh	UART1 transmit buffer register	U1TB	All bits	[*1]
025Ch	UART1 transmit/receive control register 0	U1C0	All bits	[*1]
025Dh	UART1 transmit/receive control register 1	U1C1	All bits	[*1]
025Eh, 025Fh	UART1 receive buffer register	U1RB	All bits	[*1]
03ECh	Port P6 register	P6	Bits 4, 5, 6 and 7	[*2]
03EEh	Port P6 direction register	PD6	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 E8 emulator program



The BRK instruction interrupt, address match interrupt, single-step interrupt and DBC interrupt are used by the E8 emulator program. Therefore, make sure the user program does not use any of these interrupts. The E8 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. By clicking this box, the E8 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 E8 emulator program. Note that this timing will differ from the actual operational timing.

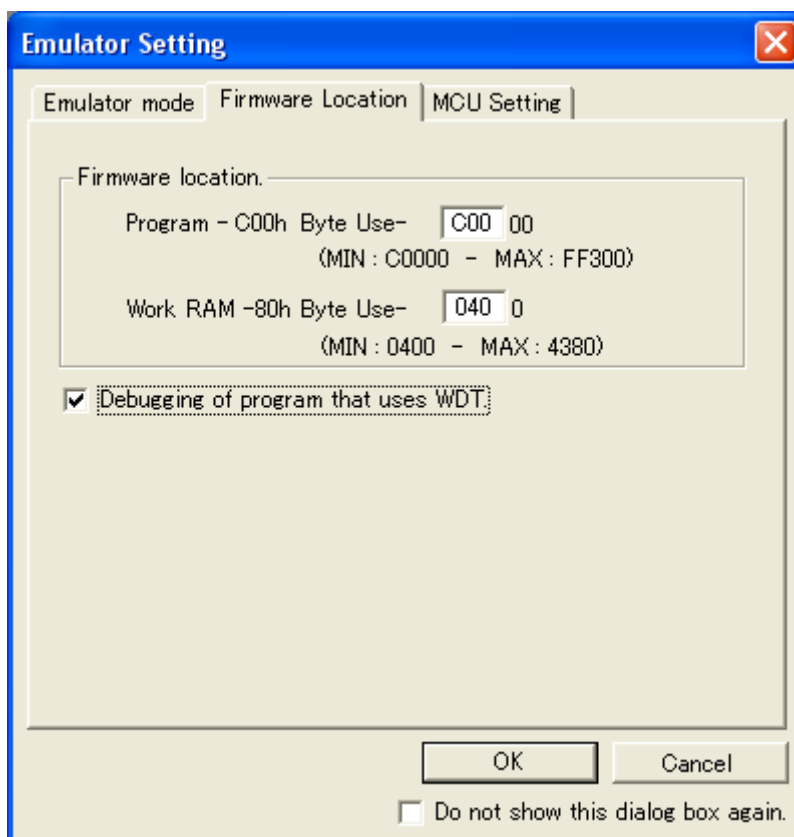


Figure 6.2 [Firmware Location] Tab of the [Emulator Setting] Dialog Box

## 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 M16C/64

Address	Description
FFFDh	First byte of ID code
FFFE3h	Second byte of ID code
FFFE7h	Third byte of ID code
FFFEFh	Fourth byte of ID code
FFFF3h	Fifth byte of ID code
FFFF7h	Sixth byte of ID code
FFFFBh	Seventh byte of ID code

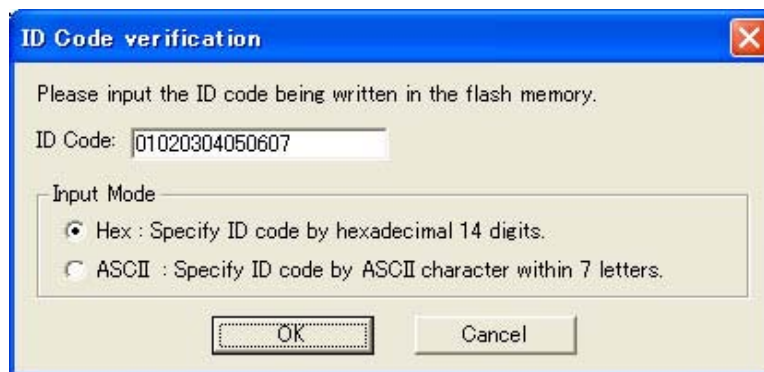


Figure 6.3 [ID Code verification] Dialog Box

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 E8 emulator program. If the MCU is reset while executing the user program, control is transferred to the E8 emulator program and the user program is forced to stop. Do not use the hardware reset 2, software reset, watchdog timer reset and oscillation stop detection reset, otherwise the E8 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. When the E8 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 one 74LVC125A to make the communication signal level match the user system power supply voltage.

12. When debugging, the Flash memory is frequently rewritten by the E8 emulator. Therefore, do not use an MCU that has been used for debugging in products. Also, as the E8 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.

#### 13. 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 E8 emulator cannot control the MCU.

#### 14. Reserved area

The addresses not specified in the Hardware Manual for M16C/64 Group are reserved area. Do not change the contents. Otherwise, the E8 emulator cannot control the MCU.

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

When in stop mode or wait mode, the program cannot be stopped by the E8 emulator. If you attempt to stop the program in stop or wait mode, the emulator will not control the MCU. Do not operate windows until the program stops at the breakpoint by setting the breakpoint at the line of the program where the stop mode or the wait mode is cancelled. When using stop mode or wait mode in the user program, 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.

#### 16. 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.

## 17. 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

```

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

```

## 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:

```

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

```

## 18. "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.

## 19. 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 the 125kHz on-chip oscillator or sub clock is used as the operation clock of the MCU, setting or canceling PC breaks may take time. Use event breaks as the first choice.

#### 20. Note on debugging in CPU rewrite mode

When debugging in CPU rewrite mode, do not rewrite in CPU block 0 area (addresses F0000h - FFFFFh) and block containing the E8 emulator program. If these areas are rewritten, the E8 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 E8 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.

#### 21. Note on lock bits of Flash memory

When starting up in the [Erase Flash and Connect] mode or [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.

#### 22. Notes 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 E8 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

#### 23. Notes on the E8 emulator power supply

When writing a program with the E8 emulator for mass production processes, the program requires reliability, so do not use the E8 emulator power supply function. Supply power separately to the user system according to the allowable voltage for MCU writing. Voltage supplied from the E8 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 E8.

#### 24. Notes on the emulator setup switch

Use the emulator setup switch at the factory setting (upper side 1).

#### 25. Notes on downloading the user program

When the user program is downloaded, the operation clock is switched to Xin. After the download completed, the CPU is reset. Therefore, the CPU is always reset whether the "Reset CPU after download module" checkbox in the [Options] tab of the [Debug Settings] dialog box is selected or not. To open the dialog box, select the [Debug] menu -> [Debug Settings].



## 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.

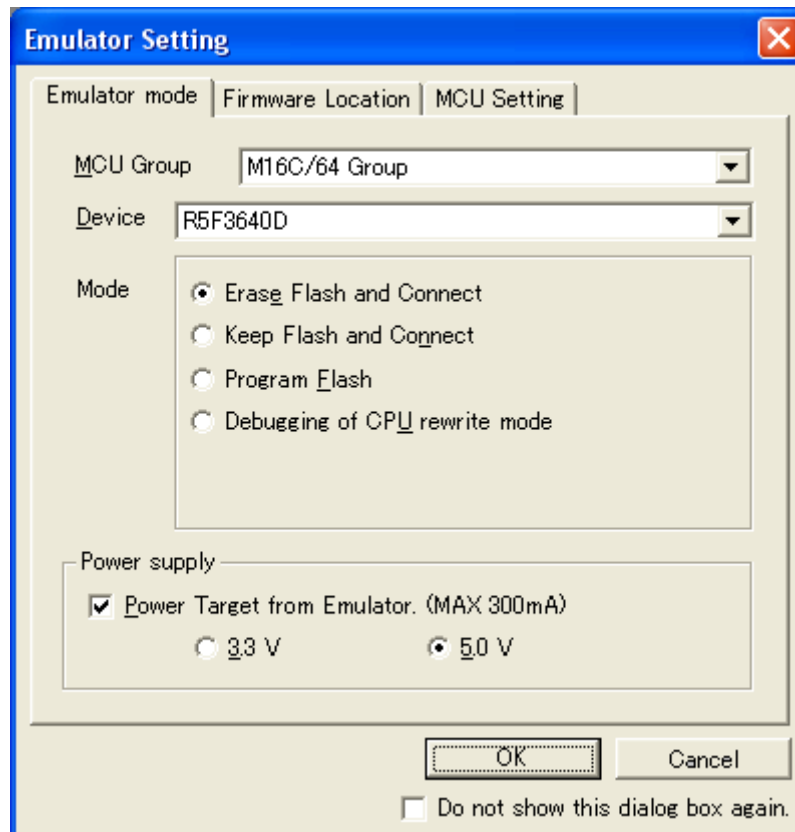


Figure 7.1 [Emulator Setting] Dialog Box

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 E8 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.

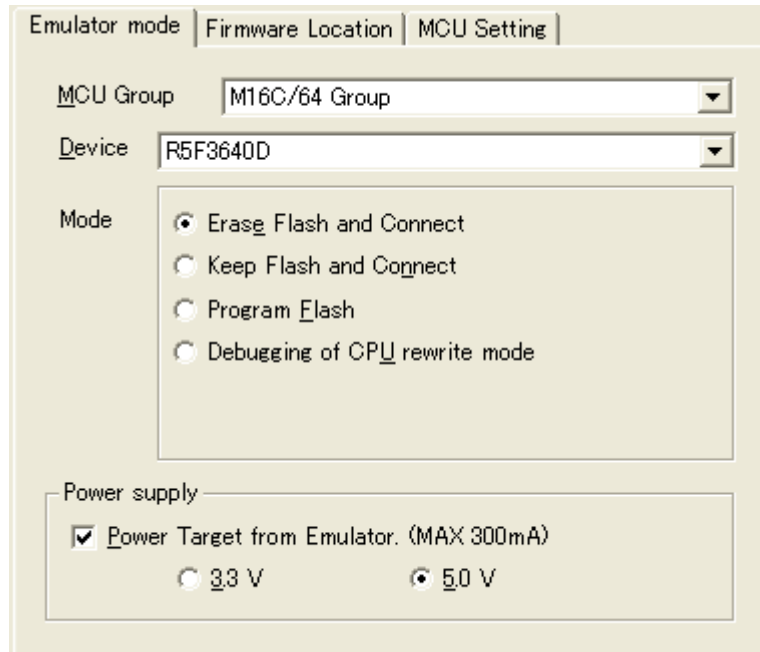


Figure 7.2 [Emulator mode] Tab

### [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 E8 emulator erases the Flash memory data for the MCUs and simultaneously writes the E8 emulator program.
- Keep Flash and Connect  
When launching the debugger, the E8 emulator retains the Flash memory data for the MCUs. Note that the area for the E8 emulator program and the vector area used by the E8 emulator will change.
- Program Flash  
The E8 emulator starts as a simple programmer. When downloaded, the E8 writes only the user program (E8 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 E8 emulator erases the Flash memory data for the MCUs and simultaneously writes the E8 emulator program.

**[Power supply]**

When supplying power to the user system from the E8, 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 E8.

## 3. [Firmware Location] tab

For details, see “1. Program area for the E8 emulator” and “7. Debugging using the watchdog timer” in “Section 6. Notes on Using the E8 Emulator”.

## 4. [MCU Setting] Tab

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

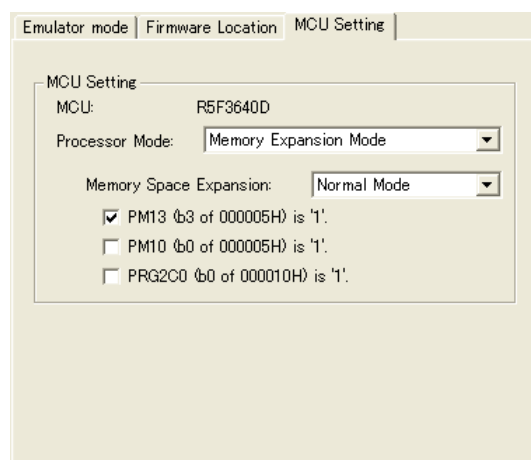


Figure 7.3 [MCU Setting] Tab

**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

**Memory Expansion Mode**

When Memory Expansion Mode is selected, specify whether the memory space expansion function will be used. When using the memory space expansion function, select “4 MB Mode”, and when not using, select “Normal Mode”.

**PM13 (b3 of 000005H) is ‘1’**

Specify whether PM13 (third bit of processor mode register 1) is set. When using the user program with PM13 set to “1”, check this option.

**PM10 (b0 of 000005H) is ‘1’**

Specify whether PM10 (zero bit of processor mode register 1) is set. When using the user program with PM10 set to “1”, check this option.

**PRG2C0 (b0 of 000010H) is ‘1’**

Specify whether PRG2C0 (zero bit of program 2 area control register) is set. When using the user program with PRG2C0 set to “1”, check this option.

**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.
- No address match break can be used in the external memory space.
- The “Go to Cursor” function cannot be used in the external memory space. If this function is used in the external memory space, the program will be in a state of execution.
- To access the memory space expansion area in the download, the editor window (MIX display or disassembled display mode), the memory window or the watch window while operating in the memory space expansion 4 MB mode, be aware that only bank 7 can be accessed. In this case, the data bank offset depends on the offset bits of the data bank register.
- When using the memory space expansion function 4 MB mode, execute the command for the memory space expansion function 4 MB mode to access each bank.

## Section 8 Command for Memory Space Expansion Function 4 MB Mode

### 1. Command for Memory Space Expansion Function 4 MB Mode

The following show the command for memory space expansion function 4 MB mode. These commands can be executed in the command line window.

Command	Description
Memory_Compare_Ext	Compares the memory area (between the start address and the end address) with the memory starting at destination address.
Memory_Display_Ext	Displays memory contents.
Memory_Fill_Ext	Fills an area of memory.
Memory_Find_Ext	Finds a string in a memory range.
Memory_Move_Ext	Moves memory.

### 2. Details of Command for Memory Space Expansion Function 4 MB mode

The following show the details of the command for memory space expansion function 4 MB mode.

#### Memory\_Compare\_Ext

**Abbreviation:** MCE

**Description:** Compares the memory area (between the start address and the end address) with the memory starting at destination address. This cannot be used during program execution.

**Syntax:** MCE <bank> <offsetbit> <start> <end> <destination> [<mode>]

Parameter	Type	Description
<bank>	Numeric	Bank (0 – 7)
<offsetbit> *	Numeric	Offset bit (0: no offset, 1: offset)
<start>	Numeric	Start address
<end>	Numeric	End address (including this address)
<destination>	Numeric	Destination address
<mode>	Keyword	Format (optional, default = BYTE)
	BYTE	1 byte
	WORD	2 bytes
	LONG	4 bytes
	DOUBLE	8 bytes

\*: When "PM13 is 1" is not selected in the MCU setting dialog box, set the offset bit to "0".

**Memory\_Display\_Ext****Abbreviation:** MDE**Description:** Displays memory contents. This cannot be used during program execution.**Syntax:** MDE <bank> <offsetbit> <address> [<length>] [<mode>]

Parameter	Type	Description
<bank>	Numeric	Bank (0 – 7)
<offsetbit> *	Numeric	Offset bit (0: no offset, 1: offset)
<address>	Numeric	Start address
<length>	Numeric	Length (optional, default = 0x100 bytes)
<mode>	Keyword	Display format (optional, default = BYTE)
	BYTE	Bytes
	WORD	Words (2 bytes)
	LONG	Long words (4 bytes)
	ASCII	ASCII
	SINGLE	Single-precision floating-point (4 bytes)
	DOUBLE	Double-precision floating-point (8 bytes)

\*: When “PM13 is 1” is not selected in the MCU setting dialog box, set the offset bit to “0”.

**Memory\_Fill\_Ext****Abbreviation:** MFE**Description:** Fills an area of memory. This cannot be used during program execution.**Syntax:** MFE <bank> <offsetbit> <start> <end> <data> [<mode>] [<verify>]

Parameter	Type	Description
<bank>	Numeric	Bank (0 – 7)
<offsetbit> *	Numeric	Offset bit (0: no offset, 1: offset)
<start>	Numeric	Start address
<end>	Numeric	End address
<data>	Numeric	Data value
<mode>	Keyword	Data size (optional, default = BYTE)
	BYTE	Byte
	WORD	Word (2 bytes)
	LONG	Long word (4 bytes)
	ASCII	ASCII
	SINGLE	Single-precision floating-point (4 bytes)
	DOUBLE	Double-precision floating-point (8 bytes)
<verify>	Keyword	Verify flag (optional, default = V)
	V	Verification
	N	No verification

\*: When “PM13 is 1” is not selected in the MCU setting dialog box, set the offset bit to “0”.

**Memory\_Find\_Ext****Abbreviation:** MIE**Description:** Finds a string in a memory range. This cannot be used during program execution.**Syntax:** MIE <bank> <offsetbit> <start> <end> <string> [<mode>]

Parameter	Type	Description
<bank>	Numeric	Bank (0 – 7)
<offsetbit> *	Numeric	Offset bit (0: no offset, 1: offset)
<start>	Numeric	Start address
<end>	Numeric	End address (including this address)
<string>	Numeric	String to search for
<mode>	Keyword	Format (optional, default = BYTE)
	BYTE	Bytes
	WORD	Words (2 bytes)
	LONG	Long words (4 bytes)
	ASCII	ASCII
	SINGLE	Single-precision floating-point (4 bytes)
	DOUBLE	Double-precision floating-point (8 bytes)

\*: When “PM13 is 1” is not selected in the MCU setting dialog box, set the offset bit to “0”.

**Memory\_Move\_Ext****Abbreviation:** MVE**Description:** Moves memory. This cannot be used during program execution.**Syntax:** MVE <bank> <offsetbit> <start> <end> <destination> [<verify>] [<mode>]

Parameter	Type	Description
<bank>	Numeric	Bank (0 – 7)
<offsetbit> *	Numeric	Offset bit (0: no offset, 1: offset)
<start>	Numeric	Source start address
<end>	Numeric	Source end address (including this address)
<destination>	Numeric	Destination start address
<verify>	Keyword	Verify flag (optional, default = V)
	V	Verification
	N	No verification
<mode>	Keyword	Format (optional, default = BYTE)
	BYTE	1 byte
	WORD	2 bytes
	LONG	4 bytes
	DOUBLE	8 bytes

\*: When “PM13 is 1” is not selected in the MCU setting dialog box, set the offset bit to “0”.



## Section 9 Applicable Tool Chain and Third-party Products

With the M16C/64 Group E8 emulator, you can debug modules created by the inhouse tool chain and third-party products listed in Table 9.1 below.

Table 9.1 Applicable Tool Chain and Third-party Products

Tool chain	M3T-NC30WA V.5.20 Release 01 or later
Third-party products	TASKING M16C C/C++/EC++ Compiler V.2.3r1 or later IAR EWM16C V.2.12 or later

Notes on debugging the load modules created in ELF/DWARF2 format:

If the load module was created in ELF/DWARF2 format using TASKING M16C C/C++/EC++ compiler V3.0r1, the precautionary note described below must be observed when displaying member variables of the base class in the watch window.

Precautionary Note:

If any class object with a base class is defined, the following problems may occur:

Case 1: Member variables of the base class cannot be referenced directly from the class object (\*1).

Case 2: If the PC value resides in any member function of a derived class, member variables of the base class cannot be referenced directly (\*4).

Solution:

If member variables of the base class need to be referenced in the watch window, follow either method described below:

Case 1: Use indirect references from the class object to refer to member variables of the base class (\*2) (\*3).

Case 2: Use indirect references from “this” pointer to refer to member variables of the base class (\*5) (\*6).

<Example code>

```
////////////////////////////////////
```

```
*.h
```

```
class BaseClass
{
public:
    int m_iBase;
public:
    BaseClass() {
        m_iBase = 0;
    }
    void BaseFunc(void);
};

class DerivedClass : public BaseClass
{
public:
    int m_iDerive;
public:
    DerivedClass() {
        m_iDerive = 0;
    }
    void DerivedFunc(void);
};
```

```

*.cpp
main()
{
    class DerivedClass ClassObj;
    ClassObj.DerivedFunc();
    return;
}

void BaseClass::BaseFunc(void)
{
    m_iBase = 0x1234;
}

void DerivedClass::DerivedFunc(void)
{
    BaseFunc();
    m_iDerive = 0x1234;
}

```

```

////////////////////////////////////

```

< Watch window registration example >

```

////////////////////////////////////

```

Case 1: If the PC value resides in the main() function

- (1)"ClassObj.m\_iBase" : Cannot be referenced (\*1)
- (2)"ClassObj.\_\_b\_BaseClass.m\_iBase" : Can be referenced (\*2)
- (3)"ClassObj"
  - "\_\_b\_BaseClass"
  - "m\_iBase" : Can be referenced (\*3)
  - "m\_iDerive"

-: Expansion symbol

Case 2: If the PC value resides in the DerivedClass::DerivedFunc() function

- (1)"m\_iBase" : Cannot be referenced (\*4)
- (2)"this->\_\_b\_BaseClass.m\_iBase" : Can be referenced (\*5)
- (3)"\_\_b\_BaseClass.m\_iBase": Can be referenced (\*5)
- (4)"this"
  - \_"\*"
  - "\_\_b\_BaseClass"
  - "m\_iBase" : Can be referenced (\*6)
  - "m\_iDerive"
- (5)"\_\_b\_BaseClass"
  - "m\_iBase" : Can be referenced (\*6)

```

////////////////////////////////////

```



---

E8 Emulator  
Additional Document for User's Manual  
Notes on Connecting the M16C/64

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# E8 Emulator Additional Document for User's Manual



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