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RENESAS

M3062PT3-CPE

User's Manual

Compact Emulator for M16C/62P, M16C/30P Groups

User's Manual

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Renesas Technology
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Preface

The M3062PT3-CPE is a compact emulator for the M16C Family M16C/60 Series M16C/62P Group and M16C/30 Series M16C/30P Group MCUs with the real-time trace function.

This user's manual mainly describes specifications of the M3062PT3-CPE compact emulator and how to setup it. For details on the emulator debugger, C compiler M3T-NC30WA (evaluation version) and integrated development environment High-performance Embedded Workshop which are included with the M3062PT3-CPE, refer to each product's online manual.

All the components of this product are shown in "1.1 Package Components" (page 13). If there is any question or doubt about this product, contact your local distributor.

The related manuals for using this product are listed below. You can download the latest manuals from the Renesas Tools homepage (http://www.renesas.com/en/tools).

Related manuals

Item	Manual
Integrated development environment	High-performance Embedded Workshop User's Manual
Emulator debugger	M16C R8C Compact Emulator Debugger User's Manual
C compiler	C compiler package for the R8C/Tiny, M16C/60, 30, Tiny, 20 and 10 Series C compiler User's Manual
Assembler	C compiler package for the R8C/Tiny, M16C/60, 30, Tiny, 20 and 10 Series Assembler User's Manual

Important

Before using this product, be sure to read the user's manual carefully.

Keep this user's manual, and refer to this when you have questions about this product.

Emulator:

The emulator in this document refers to the following products that are manufactured by Renesas Technology Corp.:

        (1) Compact emulator main unit

        (2) Package converter board for connecting the user system

The emulator herein does not include the customer's user system and host machine.

Purpose of use of the emulator:

This emulator is a device to support the development of a system that uses the M16C Family M16C/60 Series M16C/62P Group and M16C/30 Series M16C/30P Group of Renesas 16-bit single-chip MCUs. It provides support for system development in both software and hardware.

Be sure to use this emulator correctly according to said purpose of use. Please avoid using this emulator for other than its intended purpose of use.

For those who use this emulator:

This emulator can only be used by those who have carefully read the user's manual and know how to use it.

Use of this emulator requires the basic knowledge of electric circuits, logical circuits, and MCUs.

When using the emulator:

(1) This product is a development supporting unit for use in your program development and evaluation stages. In mass-producing your program you have finished developing, be sure to make a judgment on your own risk that it can be put to practical use by performing integration test, evaluation, or some experiment else.

(2) In no event shall Renesas Solutions Corp. be liable for any consequence arising from the use of this product.

(3) Renesas Solutions Corp. strives to renovate or provide a workaround for product malfunction at some charge or without charge. However, this does not necessarily mean that Renesas Solutions Corp. guarantees the renovation or the provision under any circumstances.

(4) This product has been developed by assuming its use for program development and evaluation in laboratories. Therefore, it does not fall under the application of Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.

(5) Renesas Solutions Corp. cannot predict all possible situations or possible cases of misuse where a potential danger exists. Therefore, the warnings written in this user's manual and the warning labels attached to this emulator do not necessarily cover all of such possible situations or cases. Please be sure to use this emulator correctly and safely on your own responsibility.

(6) This product is not qualified under UL or other safety standards and IEC or other industry standards. This fact must be taken into account when taking this product from Japan to some other country.

Usage restrictions:

This emulator has been developed as a means of supporting system development by users. Therefore, do not use it as a device used for equipment-embedded applications. Also, do not use it for developing the systems or equipment used for the following purposes either:

    (1) Transportation and vehicular

    (2) Medical (equipment where human life is concerned)

    (3) Aerospace

    (4) Nuclear power control

    (5) Undersea repeater

If you are considering the use of this emulator for one of the above purposes, please be sure to consult your local distributor.

About product changes:

We are constantly making efforts to improve the design and performance of this emulator. Therefore, the specification or design of this emulator or its user's manual may be changed without prior notice.

About the rights:

(1) We assume no responsibility for any damage or infringement on patent rights or any other rights arising from the use of any information, products or circuits presented in this user's manual.

(2) The information or data in this user's manual does not implicitly or otherwise grant a license for patent rights or any other rights belonging to us or third parties.

(3) This user's manual and this emulator are copyrighted, with all rights reserved by us. This user's manual may not be copied, duplicated or reproduced, in whole or part, without prior written consent of us.

About diagrams:

The diagrams in this user's manual may not all represent exactly the actual object.

Precautions for Safety

Definitions of Signal Words

In both the user's manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read this chapter before using this product.

⚠	This symbol represents a warning about safety. It is used to arouse caution about a potential danger that will possibly inflict an injury on persons. To avoid a possible injury or death, please be sure to observe the safety message that follows this symbol.
⚠ **DANGER**	**DANGER** indicates an imminently dangerous situation that will cause death or heavy wound unless it is avoided. However, there are no instances of such danger for the product presented in this user's manual.
⚠ **WARNING**	**WARNING** indicates a potentially dangerous situation that will cause death or heavy wound unless it is avoided.
⚠ **CAUTION**	**CAUTION** indicates a potentially dangerous situation that will cause a slight injury or a medium-degree injury unless it is avoided.
CAUTION	**CAUTION** with no safety warning symbols attached indicates a potentially dangerous situation that will cause property damage unless it is avoided.
IMPORTANT	This is used in operation procedures or explanatory descriptions to convey exceptional conditions or cautions to the user.

In addition to the five above, the following are also used as appropriate.

△means WARNING or CAUTION.
Example: ⚠ CAUTION AGAINST AN ELECTRIC SHOCK

⊘means PROHIBITION.
Example: 🚫 DISASSEMBLY PROHIBITED

●means A FORCIBLE ACTION.
Example: 🔌 UNPLUG THE POWER CABLE FROM THE RECEPTACLE.

⚠ **WARNING**

Warnings for AC Power Supply:

- If the attached AC power cable does not fit the receptacle, do not alter the AC power cable and do not plug it forcibly. Failure to comply may cause electric shock and/or fire.

- Use an AC power cable which complies with the safety standard of the country.

- Do not touch the plug of the AC power cable when your hands are wet. This may cause electric shock.

- This product is connected signal ground with frame ground. If your developing product is transformless (not having isolation transformer of AC power), this may cause electric shock. Also, this may give an unrepairable damage to this product and your developing one.
  While developing, connect AC power of the product to commercial power through isolation transformer in order to avoid these dangers.

- If other equipment is connected to the same branch circuit, care should be taken not to overload the circuit.

- Use the power supply which complies with CE marking requirements.

- When installing this equipment, insure that a reliable ground connection is maintained.

- If you smell a strange odor, hear an unusual sound, or see smoke coming from this product, then disconnect power immediately by unplugging the AC power cable from the outlet.
  Do not use this as it is because of the danger of electric shock and/or fire. In this case, contact your local distributor.

- Before setting up this emulator and connecting it to other devices, turn off power or remove a power cable to prevent injury or product damage.

Warnings to Be Taken for This Product:

- Do not disassemble or modify this product. Personal injury due to electric shock may occur if this product is disassembled and modified. Disassembling and modifying the product will void your warranty.

- Make sure nothing falls into the cooling fan on the top panel, especially liquids, metal objects, or anything combustible.

Warning for Installation:

- Do not set this product in water or areas of high humidity. Make sure that the product does not get wet. Spilling water or some other liquid into the product may cause unrepairable damage.

Warning for Use Environment:

- This equipment is to be used in an environment with a maximum ambient temperature of 35°C. Care should be taken that this temperature is not exceeded.

⚠ CAUTION

Notes on Connecting the Power Supply of the Emulator:

- Do not use any power cable other than the one that is included with the product.

- The power cable included with the product has its positive and negative poles color-coded by red and black, respectively.

- Pay attention to the polarities of the power supply. If its positive and negative poles are connected in reverse, the internal circuit may be broken.

- Do not apply any voltages exceeding the product's rated power supply voltage (5.0 V ±5%). Extreme voltages may cause a burn due to abnormal heat or cause the internal circuit to break down.

Cautions to Be Taken for Turning On the Power:

- Turn ON/OFF the power of the emulator and user system as simultaneously as possible.

- Do not leave either the emulator or user system powered on, because of leakage current the internal circuits may be damaged.

- When turning on the power again after shutting off the power, wait about 10 seconds.

Cautions to Be Taken for Handling This Product:

- Use caution when handling the main unit. Be careful not to apply a mechanical shock.

- Do not touch the connector pins of the emulator main unit and the target MCU connector pins directly. Static electricity may damage the internal circuits.

- Do not pull this emulator by the communications interface cable or the flexible cable for connecting the user system. And, excessive flexing or force may break conductors.

Caution to Be Taken for System Malfunctions:

- If the emulator malfunctions because of interference like external noise, do the following to remedy the trouble.
  (1) Press the RESET switch on the emulator upper panel.
  (2) If normal operation is not restored after step (1), shut OFF the emulator once and then reactivate it.

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User Registration

When you have purchased the emulator presented in this user's manual, please be sure to register it. As the H/W Tool Customer Registration Sheet is included with this product, fill it in and FAX it to your local distributor or email the same contents to the following address. Your registered information is used for only after-sale services, and not for any other purposes. Without user registration, you will not be able to receive maintenance services such as a notification of field changes or trouble information. So be sure to carry out the user registration.

For more information about user registration, please email to the following address.

regist_tool@renesas.com

Terminology

Some specific words used in this user's manual are defined as follows:

Emulator M3062PT3-CPE
This means the compact emulator (this product) for the M16C Family M16C/60 Series M16C/62P Group and M16C/30 Series M16C/30P Group MCUs.

Emulator system
This means an emulator system built around the M3062PT3-CPE emulator. The M3062PT3-CPE emulator system is configured with an emulator main unit M3062PT3-CPE, integrated development environment High-performance Embedded Workshop, emulator debugger and host machine.

Renesas Integrated development environment High-performance Embedded Workshop
This tool provides powerful support for the development of embedded applications for Renesas microcomputers. It has an emulator debugger function allowing for the emulator to be controlled from the host machine via an interface. Furthermore, it permits a range of operations from editing a project to building and debugging it to be performed within the same application. What's more, it supports version management.

Emulator debugger
This means a software tool which starts up in the integrated development environment High-performance Embedded Workshop to control the emulator for the M16C Family and enables debugging.

Firmware
This means a program stored in the flash ROM of the emulator. It analyzes contents of communication with the emulator debugger and controls the emulator M3062PT3-CPE. This program is downloadable from the emulator debugger to upgrade the firmware, etc.

Host machine
This means a personal computer used to control the M3062PT3-CPE emulator system.

Target MCU
This means the microcomputer you are going to debug.

User system
This means a user's application system using the microcomputer to be debugged.

User program
This means a user's application program to be debugged.

Evaluation MCU
This means a microcomputer mounted on the emulator which is operated in the special mode for the emulator.

#
In this user's manual, this symbol is used to show active LOW. (e.g. RESET#)

1. Outline

This chapter describes the package components, the system configuration and the preparation for using this product for the first time.

1.1 Package Components

The M3062PT3-CPE package consists of the following items. When unpacking it, check to see if your M3062PT3-CPE contains all of these items.

Table 1.1 Package components

Item	Quantity
M3062PT3-CPE compact emulator	1
OSC-3 (16MHz) oscillator circuit board	1
OSC-2 oscillator circuit bare board	1
Network resistors for ports P0--P5 pullup (51kΩ x 8)	6
USB interface cable for connecting host machine and emulator	1
Power supply cable for compact emulator	1
Ferrite core for connecting power supply cable	1
H/W Tool Customer Registration Sheet (English)	1
H/W Tool Customer Registration Sheet (Japanese)	1
Repair request sheet (English)	1
Repair request sheet (Japanese)	1
M3062PT3-CPE User's Manual (this manual)	1
M3062PT3-CPE User's Manual (Japanese)	1
M3062PT3-CPE Release Notes (English)	1
M3062PT3-CPE Release Notes (Japanese)	1
CD-ROM - Integrated development environment High-performance Embedded Workshop - Emulator debugger M16C R8C Compact Emulator Debugger - C compiler M3T-NC30WA (evaluation version)	1

* Please keep the M3062PT3-CPE's packing box and cushion material in your place for reuse at a later time when sending your product for repair or other purposes. Always use these packing box and cushion material when transporting this product.

* If there is any question or doubt about the packaged product, contact your local distributor.

1.2 System Configuration

Figure 1.1 shows a configuration of the M3062PT3-CPE system.
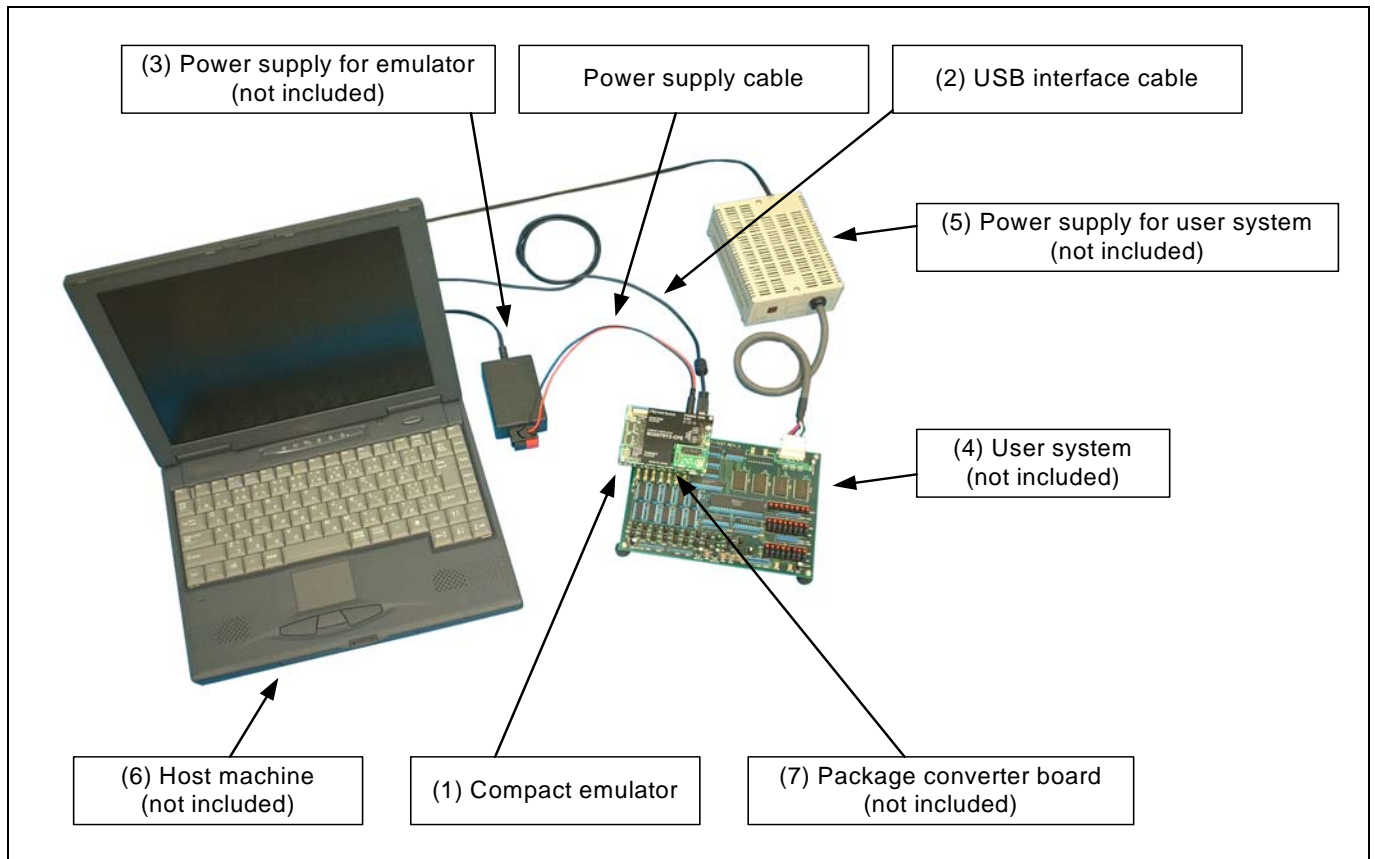
Figure 1.1 System configuration

(1) Compact emulator M3062PT3-CPE (this product)

This is a compact emulator for the M16C/62P and M16C/30P Groups with the real-time trace functions (hereafter, emulator). The M3062PT2-EPBM on which an evaluation MCU is mounted can be also purchased separately.

(2) USB interface cable (included)

This is an interface cable for the host machine and the emulator.

(3) Power supply for emulator

This is a power supply for the emulator. Supply 5.0 V ±5% (DC).

Prepare a power supply which complies with CE marking requirements separately. The power cable is included with this product.

Note: Be aware that there are some AC adapters whose power supply voltage varies rather widely with its load. You are recommended to use an AC adapter with a switching power supply or a stabilized power supply.

(4) User system

This is your application system. This emulator can be used without the user system.

(5) Power supply for the user system

This is a power supply for the user system. As this emulator cannot supply the power to the user system, supply the power to the user system separately from the emulator.

(6) Host machine

This is a personal computer for controlling the emulator.

(7) Package converter board such as M30800T-PTC

This is a package converter board for connecting to an MCU foot pattern on the user system. For details, refer to "2.8 Connecting the User System" (page 32).

1.2.1 Names and Functions of each part of the Emulator

Figure 1.2 shows the names of the LEDs on the upper panel of the emulator.
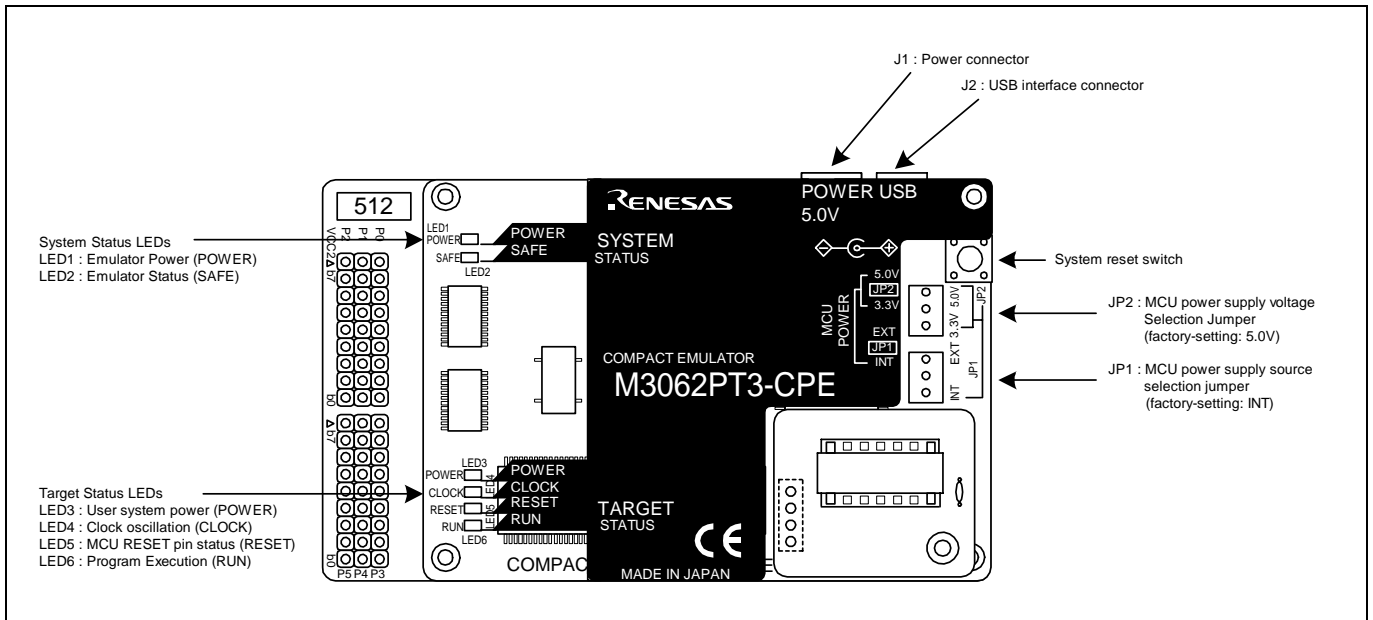
Figure 1.2 Names of the LEDs on the upper panel of the M3062PT3-CPE

(1) System Status LEDs

The system status LEDs indicate the emulator main unit's operating status etc. Table 1.2 lists the definition of the system status LEDs.

Table 1.2 Definitions of the system status LEDs

Name	Number	Color	Status	Meaning
POWER	LED1	Orange	ON	Power is supplied to the emulator.
			OFF	Power is not supplied to the emulator.
SAFE	LED2	Green	ON	Emulator system has started normally.
			OFF	Emulator system has not started normally.

(2) Target Status LEDs

The target status LEDs indicate the target MCU's power supply and operating status. Table 1.3 lists the definition of each target status LED.

Table 1.3 Definitions of the target status LEDs

Name	Number	Color	Status	Meaning
POWER	LED3	Orange	ON	Power is supplied to the target MCU.
			OFF	Power is not supplied to the target MCU.
CLOCK	LED4	Green	ON	The target MCU internal clock is oscillating.
			OFF	The target MCU internal clock is not oscillating.
RESET	LED5	Red	ON	Target MCU is being reset, or reset signal of the user system is held low.
			OFF	Target MCU is not being reset.
RUN	LED6	Green	ON	User program is being executed.
			OFF	User program is not being executed.

IMPORTANT

Note on Usage in Memory Expansion or Microprocessor Mode:
- When you use this product in memory expansion or microprocessor mode, it cannot startup normally if the pins RDY# and HOLD# are at "L" level.

Note on the Target Status POWER LED:
- If your MCU has two or more VCC terminals, the LED does not light unless power is supplied to all the terminals.

(3) System Reset Switch

By pressing the system reset switch, you can initialize the emulator system. Table 1.4 shows the functions of the system reset switch depending on the state of the emulator.

Table 1.4 Functions of the system reset switch

State of Emulator	Function
When the user's program is halted	Initializes the emulator and waits for a command from the emulator debugger
When the user's program is executed	Stops the user's program, initializes the emulator, and waits for a command from the emulator debugger.

IMPORTANT

Notes on a System Reset:
- After pressing the system reset switch, restart the emulator debugger. Otherwise the display of emulator debugger and the actual value (in the emulator) may not match.
- When the emulator debugger does not start up normally even after rebooting, turn off the emulator and then turn on again.

(4) Power Connector (J1)

This is a connector for connecting the power supply to this product. For details, refer to "2.4 Connecting the Power Supply for the Emulator" (page 23).

(5) USB Cable Connector (J2)

This is a USB cable connector for connecting the host machine to this product. For details, "2.5 Connecting the Host Machine" (page 24).

(6) MCU Power Supply Source Selection Jumper (JP1)

This is a jumper switch to set the power supply source to the MCU. For details on this switch, see "2.6.1 MCU Power Supply Source Selection Jumper/MCU Power Supply Voltage Selection Jumper" (page 25).

(7) MCU Power Supply Voltage Selection Jumper (JP2)

This is a jumper switch to set the power supply voltage of the MCU. This setting is valid when the MCU power supply source selection jumper is set to INT only. For details on this switch, see "2.6.1 MCU Power Supply Source Selection Jumper/MCU Power Supply Voltage Selection Jumper" (page 25).

1.3 Specifications

Tables 1.5 and 1.6 list specifications of the M3062PT3-CPE.

Table 1.5 M3062PT3-CPE specifications (1/2)

Applicable MCUs	M16C/60 Series M16C/62P and M16C/30 Series M16C/30P Groups
Usable mode	Single-chip mode, Memory-expansion mode (NORMAL, 4MB), Microprocessor mode (NORMAL, 4MB) [*1]

Maximum ROM/RAM capacity	1. Internal flash ROM : 512KB + 4KB
	   0F000h--0FFFFh, 80000h--FFFFFh
	2. Internal RAM : 31KB
	   00400h--07FFFh

Maximum operating frequency	3.0 to 5.5 V: 24 MHz (when using a PLL) 2.7 V: 10 MHz
Applicable power supply	User system connected VCC1 = VCC2: 2.7--5.5V VCC1 > VCC2: VCC1 = 5.0 ± 0.2V, 2.7V ≤ VCC2 < VCC1 User system not connected 3.3 V or 5.0 V (supplied from the emulator)

Emulation memory [*1]	External area (CS3#--CS0# area)
	In the MAP tab in the MCU setting dialog box of the emulator debugger, memory area assigned to the emulation memory can be allocated up to 4 areas by 4KB.
	- Maximum operating frequency (at 5.0 V) 0 wait: 7 MHz
	                                                                        1 wait: 20 MHz
	                                                                        2 wait, 3 wait: 24 MHz
	- Maximum operating frequency (at 3.0 V) 0 wait: 6 MHz
	                                                                        1 wait: 17 MHz
	                                                                        2 wait, 3 wait: 24MHz

Basic debugging functions	- Download - Address match break (max 8 points) - Software break (max. 64 points) - Program execution/stop (allows free-run execution supporting software breaks) - Memory reference/setting (reference/setting C-variables, run-time execution) - Register reference/setting - Disassemble display - C-level debugging, etc.
Real-time trace function	- 64K-cycle bus information recordable (20-bit address 16-bit data 12-bit MCU status) - 5 trace modes supported (Break/Before/About/After/Full) - Can be recorded ON/OFF by events
Real-time RAM monitor function	- 1,024 bytes (256 bytes x4) - Data/last access result
Hardware break function	2 points (Address match, bus match, max. 255 pass counts) [*2]
Execution time measurement function	Time between program start and stop

*1 Emulation memory board R0E33062PMSRC0 (not included) is necessary for a microprocessor mode and emulation memory function support.

*2 The hardware break function and trace point setting of the real-time trace function cannot be used simultaneously.

Table 1.6 M3062PT3-CPE specifications (2/2)

Connection to user system (see "2.8 Connecting the User System" on page 32) [3]	For 80-pin 0.65mm pitch QFP (PRQP0080JA-A, Previous code: 80P6S-A): M3062PT-80FPB (not included)
	For 100-pin LCC socket: M30800T-PTC (not included) + IC61-1004-051 (not included)

	For 100-pin 0.65mm pitch QFP (PRQP0100JB-A, Previous code: 100P6S-A):
	   (1) M3T-F160-100NRB (not included)
	   (2) M30800T-PTC (not included) + M3T-100LCC-DMS (not included)
	     + M3T-DIRECT100S (not included)
	   (3) M30800T-PTC (not included) + M3T-100LCC-DMS (not included)
	     + M3T-DUMMY100S (not included)
	   (4) M30800T-PTC (not included) + M3T-100LCC-DMS (not included)
	     + M3T-FLX-100NRB (not included)

	For 100-pin 0.5mm pitch LQFP (PLQP0100KB-A, Previous code: 100P6Q-A):
	   (1) M3T-F160-100NSD (not included)
	   (2) M30800T-PTC (not included) + M3T-100LCC-QSD (not included)
	   (3) M30800T-PTC (not included) + M3T-100LCC-DMS (not included)
	     + M3T-FLX-100NSD (not included)

	For 128-pin 0.5mm pitch LQFP (PLQP0128KB-A, Previous code:128P6Q-A): M3T-FLX-128NRD (not included)
Power supply for emulator	DC 5.0 V ±5 %/(2 A) externally supplied (Prepare a power supply which complies with CE marking requirements separately.)
Host machine interface	USB [4] (USB 1.1 full-speed, mini-B standard connector)
Overseas standards	EN55022: 1998 Class A, EN55024: 1998

*3 Set packages which consist of the compact emulator and converter board are available.

*4 Available to connect the host machine that supports USB 2.0. With the USB interface, not all hardware (such as host machine, USB devices, USB hub) combination will work and guaranteed.

1.4 Operating Environment

Be sure to use thins emulator with the operating environmental of the emulator and host machine listed in Tables 1.7 and 1.8.

Table 1.7 Operating environmental conditions

Item	Description
Operating temperature	5 to 35°C (no dew)
Storage temperature	-10 to 60°C (no dew)

Table 1.8 Operating environment of the host machine

Item	Description
Host machine	IBM PC/AT compatibles
OS	Windows 98SE [1] Windows Me Windows XP Windows 2000
CPU	Pentium III 600 MHz or more recommended
Memory	128 MB or more recommended
Host machine interface	USB 1.1 full-speed [2]
Pointing device such as mouse	Mouse or any other pointing device usable with the above OS that can be connected to the main body of the host machine.
CD drive	Needed to install the emulator debugger or refer to the user's manual

*1 Windows and Windows NT are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.

*2 Available to connect the host machine that supports USB 2.0. With the USB interface, not all hardware (such as host machine, USB devices, USB hub) combination will work and guaranteed.

2. Setup

This chapter describes the preparation for using this product, the procedure for starting up the emulator and how to change settings.

2.1 Flowchart of Starting Up the Emulator

The procedure for starting up the emulator is shown in Figure 2.1. For details, refer to each section hereafter. And, when the emulator does not start up normally, refer to "5. Troubleshooting" (page 99).
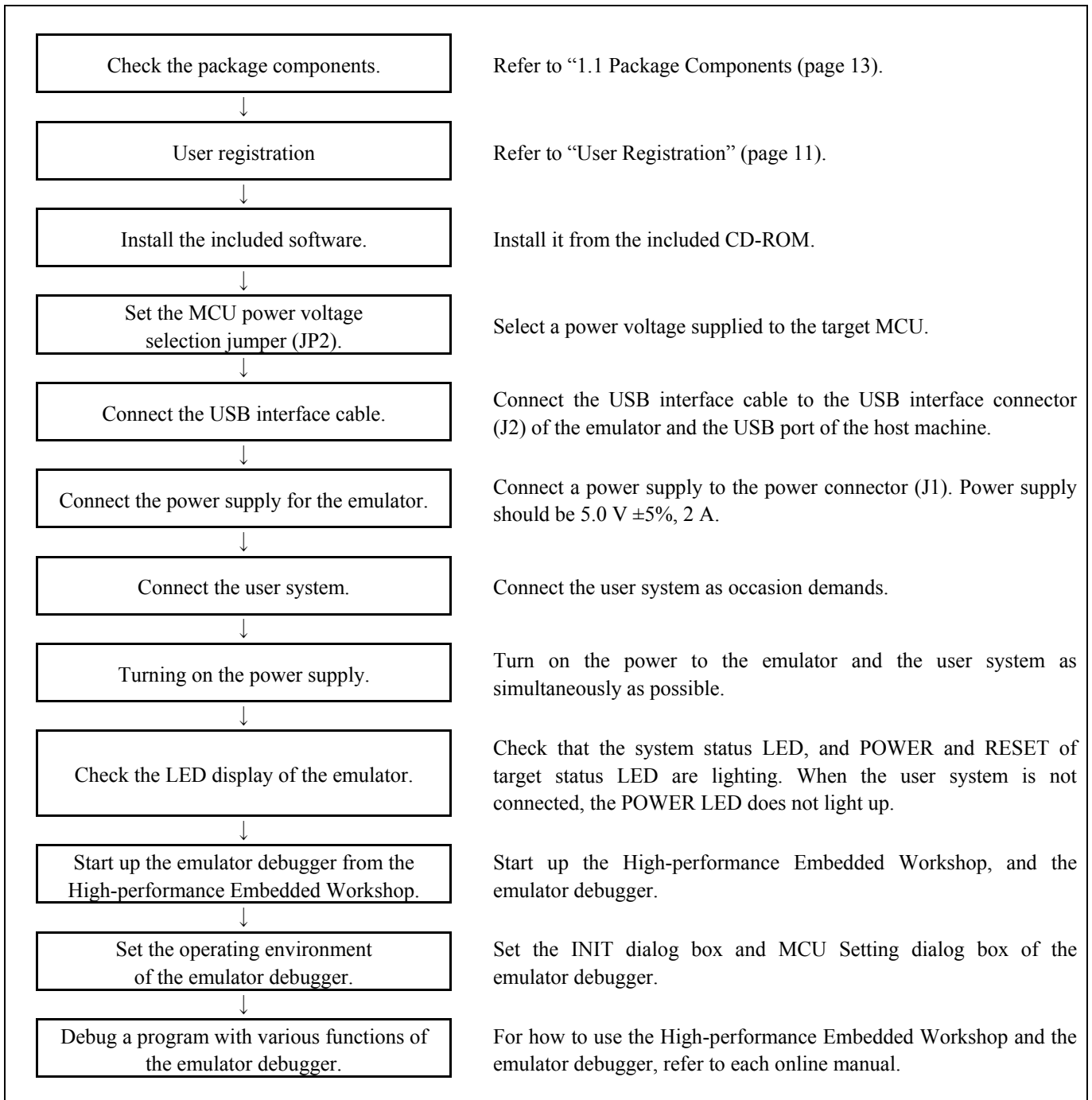
Check the package components.	Refer to "1.1 Package Components (page 13).
↓	
User registration	Refer to "User Registration" (page 11).
↓	
Install the included software.	Install it from the included CD-ROM.
↓	
Set the MCU power voltage selection jumper (JP2).	Select a power voltage supplied to the target MCU.
↓	
Connect the USB interface cable.	Connect the USB interface cable to the USB interface connector (J2) of the emulator and the USB port of the host machine.
↓	
Connect the power supply for the emulator.	Connect a power supply to the power connector (J1). Power supply should be 5.0 V ±5%, 2 A.
↓	
Connect the user system.	Connect the user system as occasion demands.
↓	
Turning on the power supply.	Turn on the power to the emulator and the user system as simultaneously as possible.
↓	
Check the LED display of the emulator.	Check that the system status LED, and POWER and RESET of target status LED are lighting. When the user system is not connected, the POWER LED does not light up.
↓	
Start up the emulator debugger from the High-performance Embedded Workshop.	Start up the High-performance Embedded Workshop, and the emulator debugger.
↓	
Set the operating environment of the emulator debugger.	Set the INIT dialog box and MCU Setting dialog box of the emulator debugger.
↓	
Debug a program with various functions of the emulator debugger.	For how to use the High-performance Embedded Workshop and the emulator debugger, refer to each online manual.

Figure 2.1 Flowchart of starting up the emulator

2.2 Installing the Included Software

If the OS used in your host machine is Windows XP or 2000, this installation must be executed by a user with administrator rights. Be aware that users without administrator rights cannot complete the installation.

Install the software as instructed by the displayed messages by inserting the included CD into the CD-ROM drive.

In process of installation, "user information" dialog box to enter the user information (contractor, section, contact address, and host machine) will open. The supplied information will be turned into a format by which technical support will be provided by e-mail.

2.3 Attaching the Ferrite Core

Attach the ferrite core included with this product close to the DC plug of the power cable. Without the ferrite core it may cause interference.
The power cable should be wound around the ferrite core as shown in Figure 2.2, and close the ferrite core until it clicks.
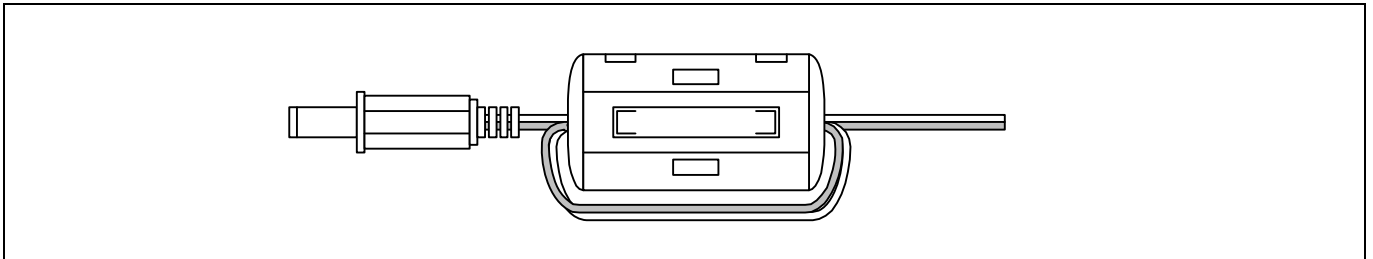

Figure 2.2 Attaching the ferrite core

2.4 Connecting the Power Supply for the Emulator

Connect the power supply for the emulator to the power connector (J1). The specification of the power supply for the emulator is listed in Table 2.1.

Table 2.1 Specification of power supply of the emulator

Power supply voltage	DC 5.0 V±5％/2 A

Figures 2.3 and 2.4 show the specifications of the power connector (J1) and an applicable plug, respectively.
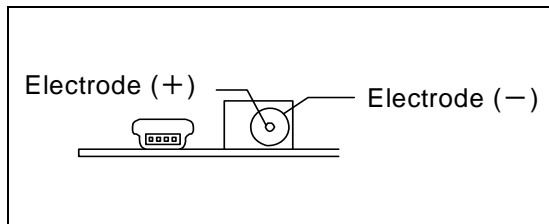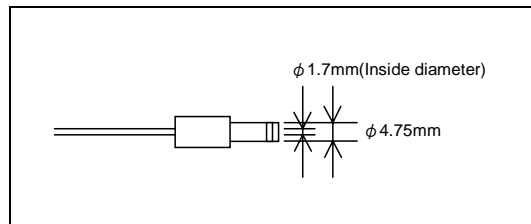

Figure 2.3 Power connector specifications

Figure 2.4 Applicable plug specifications

⚠ CAUTION

Notes on Connecting a Power Supply of the Emulator:

- The power cable included in this product package is colored red (+) and black (-).
- Be careful about the polarity of the power supply. Connecting to the wrong electrode could destroy internal circuits.
- Do not apply a voltage exceeding the specified voltage of the product (5.0 V ±5%), because it may cause burn injuries and the failure of internal circuits.
- Use the power supply which complies with CE marking requirements.

2.5 Connecting the Host Machine

Connect the emulator and the host machine with the USB interface cable.

Connect the USB interface cable (included) to the USB interface connector (J2) and the USB port of the host machine (see Figure 2.5).
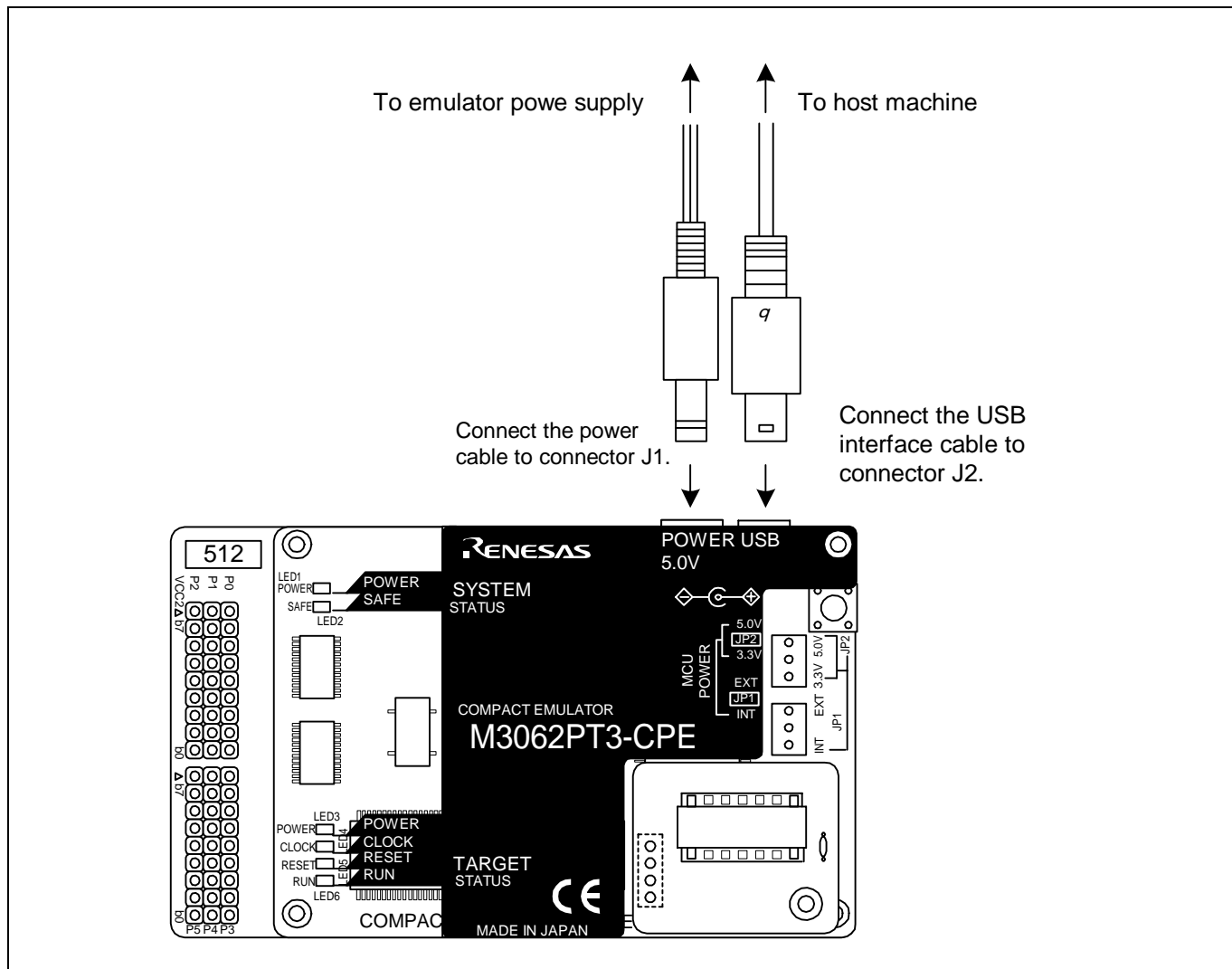

Figure 2.5 Connecting the emulator system

2.6 Turning ON the Power

2.6.1 MCU Power Supply Source Selection Jumper/MCU Power Supply Voltage Selection Jumper

Set the MCU power supply source selection jumper and the MCU power supply voltage selection jumper of the emulator according to conditions of use.
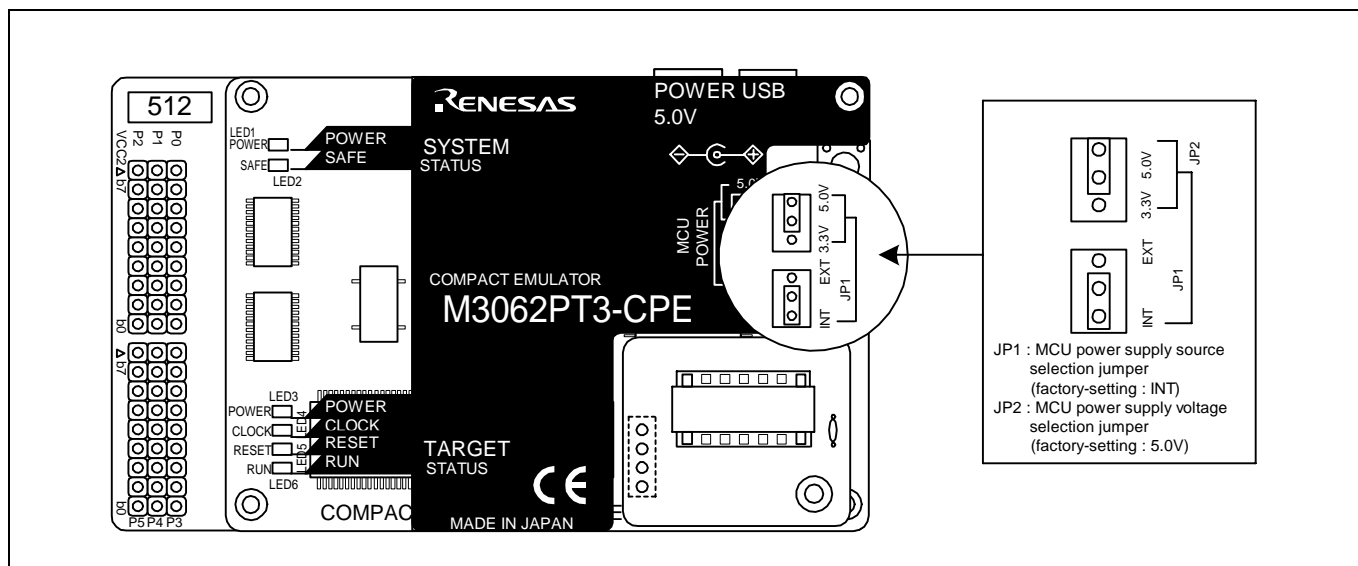

Figure 2.6 Jumper switch locations

These are the jumper switches to select power supply to the MCU and its power voltage. As shown in Table 2.2 below, set the switch according to the connection to the user system.

Table 2.2 Setting jumper switches

Connection to the user system	MCU power supply source selection jumper (JP1)	MCU power supply voltage selection jumper (JP2)	Description
Not connected	INT	3.3 V	Supplied from the emulator. The MCU operating voltage is 3.3 V.
		5.0 V	Supplied from the emulator. The MCU operating voltage is 5.0 V.
Connected	EXT	Invalid	Supplied from the user system. This emulator consumes max. 500mA of electrical current from the user system.

⚠ **CAUTION**

Note on Jumper Switch Settings:

● Always shut OFF the emulator before changing the setting of the jumper switches. Otherwise the internal circuit may cause a break.

2.6.2 VCC1, VCC2 power selection jumper (Jumper of the M3062PT2-EPBM)

Set the VCC1, VCC2 power selection jumper of the M3062PT2-EPBM according to conditions of use.

Figure 2.7 shows the position of the VCC1, VCC2 power selection jumper, and Table 2.3 lists the switch settings of the VCC1, VCC2 power selection jumper.
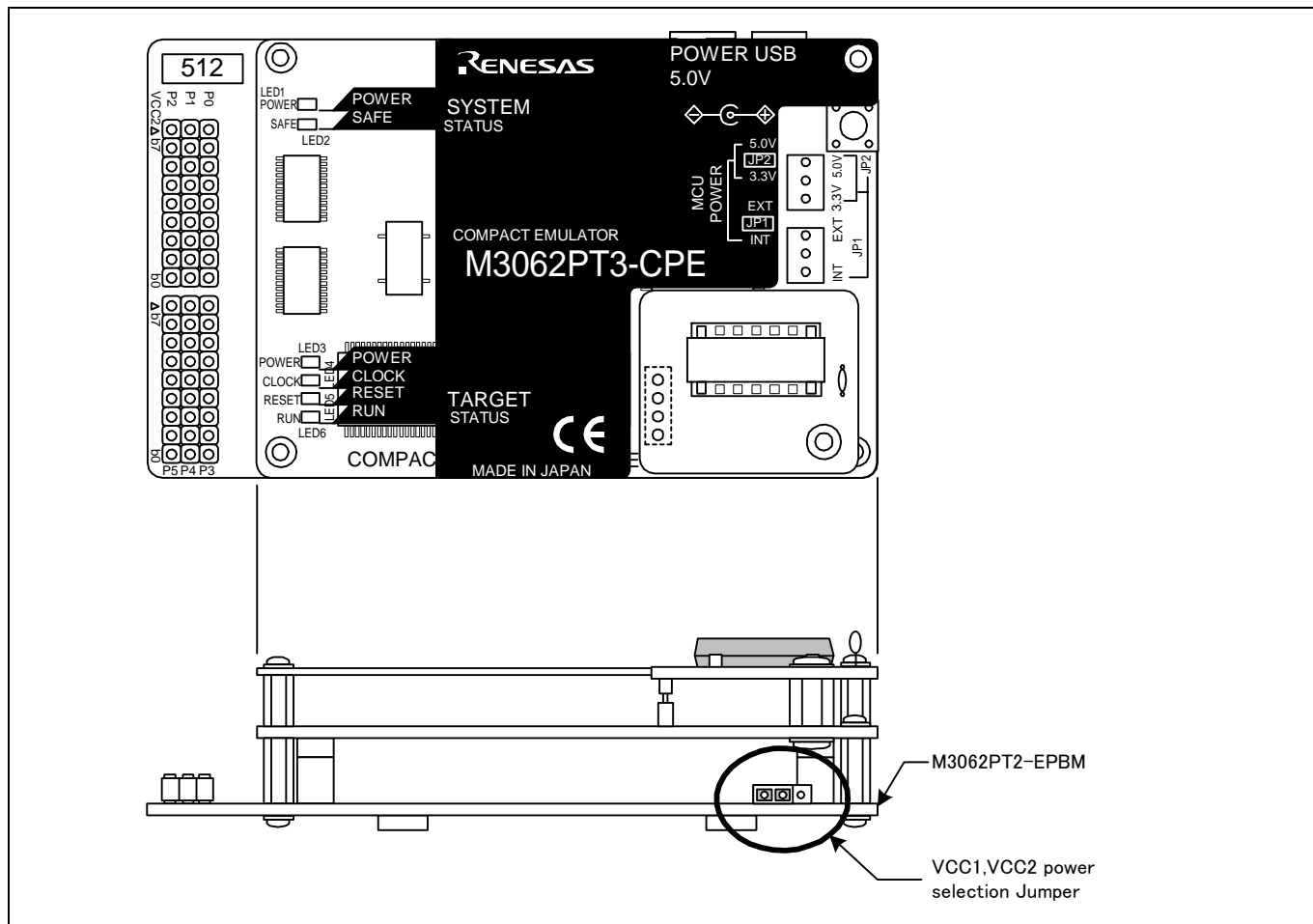

Figure 2.7 Jumper switch locations

Table 2.3 Setting jumper switches

Switch	Setting	Description
VCC1, VCC2 power selection jumper	VCC1=2 VCC1>2 (Factory-settings)	$2.7[V] \leq VCC1 = VCC2 \leq 5.5[V]$
	VCC1=2 VCC1>2	$VCC1 = 5.0 \pm 0.2V$ and $2.7V \leq VCC2 < VCC1$

⚠ CAUTION

Note on Jumper Switch Settings:
- Always shut OFF the emulator before changing the setting of the jumper switches. Otherwise the internal circuit may cause a break.

2.6.3 Checking Connections of the Emulator System

Before turning the power ON, check the connection of the interface cable to the host machine, emulator, and user system.

2.6.4 Turning ON/OFF the Power

Turn ON/OFF the power of the emulator and user system as simultaneously as possible.

Do not leave either the emulator or user system powered on, because of leakage current the internal circuits may be damaged.

When turning ON the power again after shutting OFF the power, wait for about 10 seconds.

IMPORTANT

Notes on Power Supply:

- The emulator's pin VCC is connected to the user system in order to monitor user system voltage. For this reason, the emulator cannot supply power to the user system. Therefore, provide the user system with a separate power supply from that of the emulator.
- This emulator consumes max. 500mA of electrical current from the user system. Please consider the capacity of the power supply of the user system.
- The voltage of the user system should be as follows.
    (1) When VCC1, VCC2 power selection jumper (JP1 of the M3062PT2-EPBM) is set as VCC1 = 2:
        $2.7 \text{ V} \leq \text{VCC1} = \text{VCC2} \leq 5.5 \text{ V}$
    (2) When VCC1, VCC2 power selection jumper (JP1 of the M3062PT2-EPBM) is set as VCC1 > 2:
        $\text{VCC1} = 5.0 \pm 0.2\text{V}$
        $2.7 \text{ V} \leq \text{VCC2} < \text{VCC1}$
- Do not change user system power supply voltage after power has been activated.

2.6.5 LED Display When the Emulator Starts Up Normally

After the emulator starts up, check the status of the LEDs to see whether the emulator operation is enabled or not. Figure 2.8 shows the positions of the emulator status LEDs.
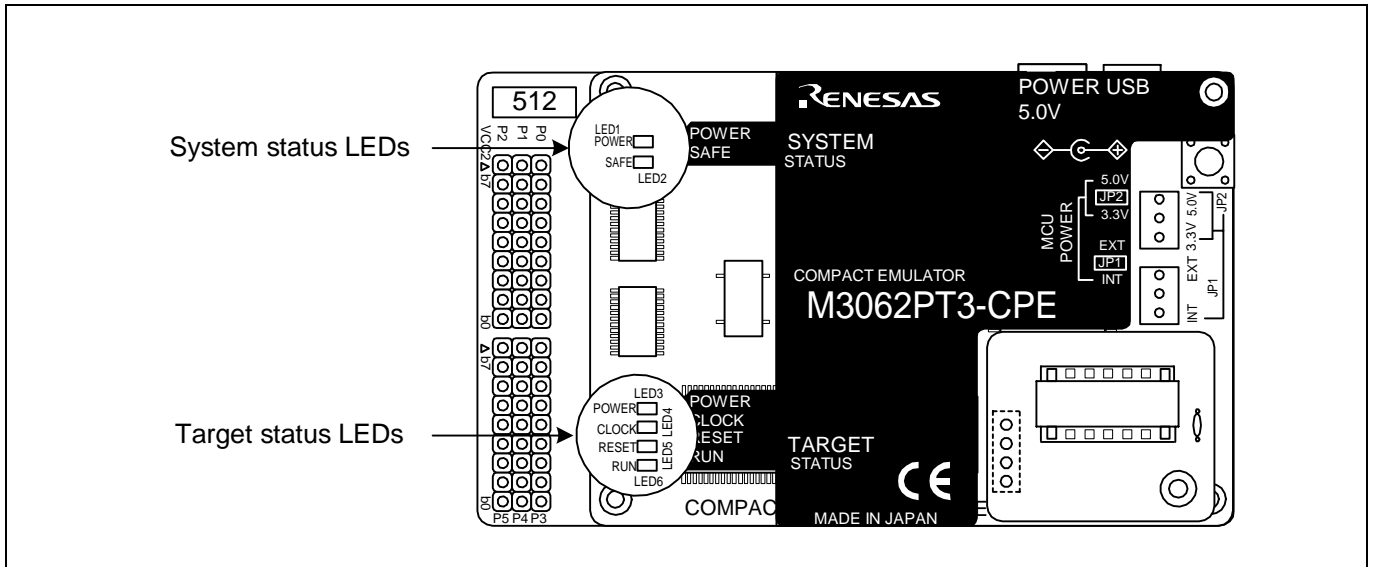

Figure 2.8 Positions of the system status LEDs and target status LEDs

(1) System status LEDs

Check that the LED1 and LED2 of the system status LEDs are lit immediately after the power is activated. If it is not lit, shut off the emulator and check the power supply for the emulator is properly connected.

(2) Target status LEDs

Target status LEDs light as shown in Figure 2.9 when the user system is not connected and as shown in Figure 2.10 when a user system is connected. When the target status LEDs do not display as shown in Figures 2.9 and 2.10, refer to "5. Troubleshooting" (page 99).
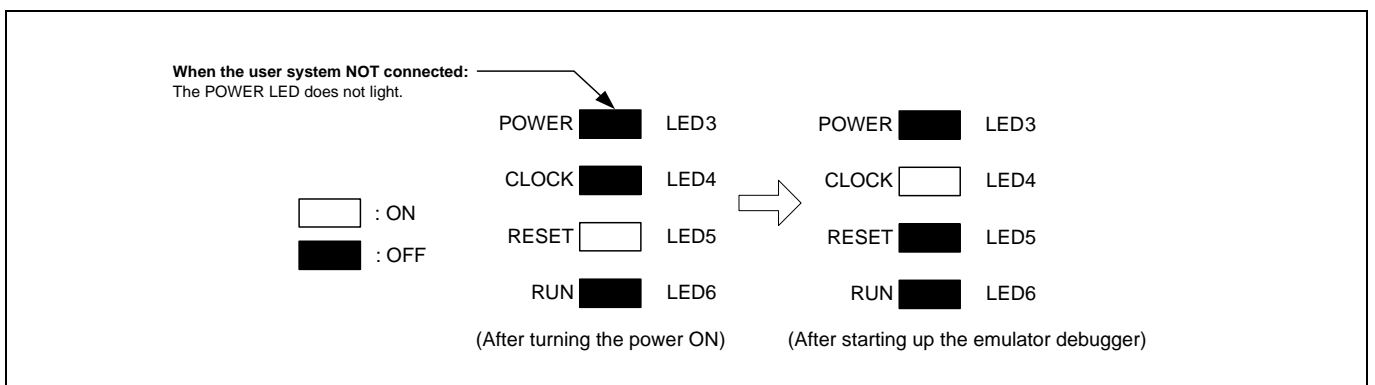

Figure 2.9 Target status LEDs display when the emulator starts up normally (when user system not connected)
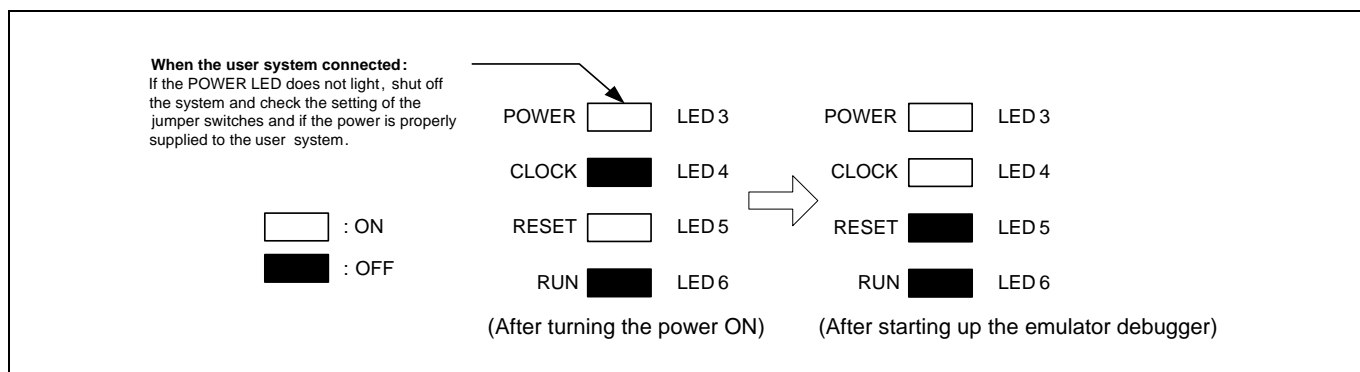
Figure 2.10 Target status LEDs display when the emulator starts up normally (when user system connected)

IMPORTANT

Note on the Target Status CLOCK LED:
- If the LED is not turned on, check the following.
   After the emulator debugger is started up (after the Init dialog box settings are completed):
   - Make sure that the oscillator selected in the Init dialog box is oscillating normally.

2.7 Self-check

2.7.1 Self-check Procedure

To run the self-check of the emulator, do so as explained here below. While the self-check is in progress, the LEDs will change as shown in Figure 2.11.

(1) If the user system is connected, disconnect it.

(2) Set the switches as the factory-settings to execute the self-check (see Table 2.4).

(3) Within 2 seconds of activating power to the emulator, press the system reset switch on the emulator upper panel.

(4) Check the SAFE LED starts flashing and then press the system reset switch again.

(5) The self-check will start. If the normal result is displayed in about 20 seconds, the self-check terminated normally.

Table 2.4 Switch settings for the self-check

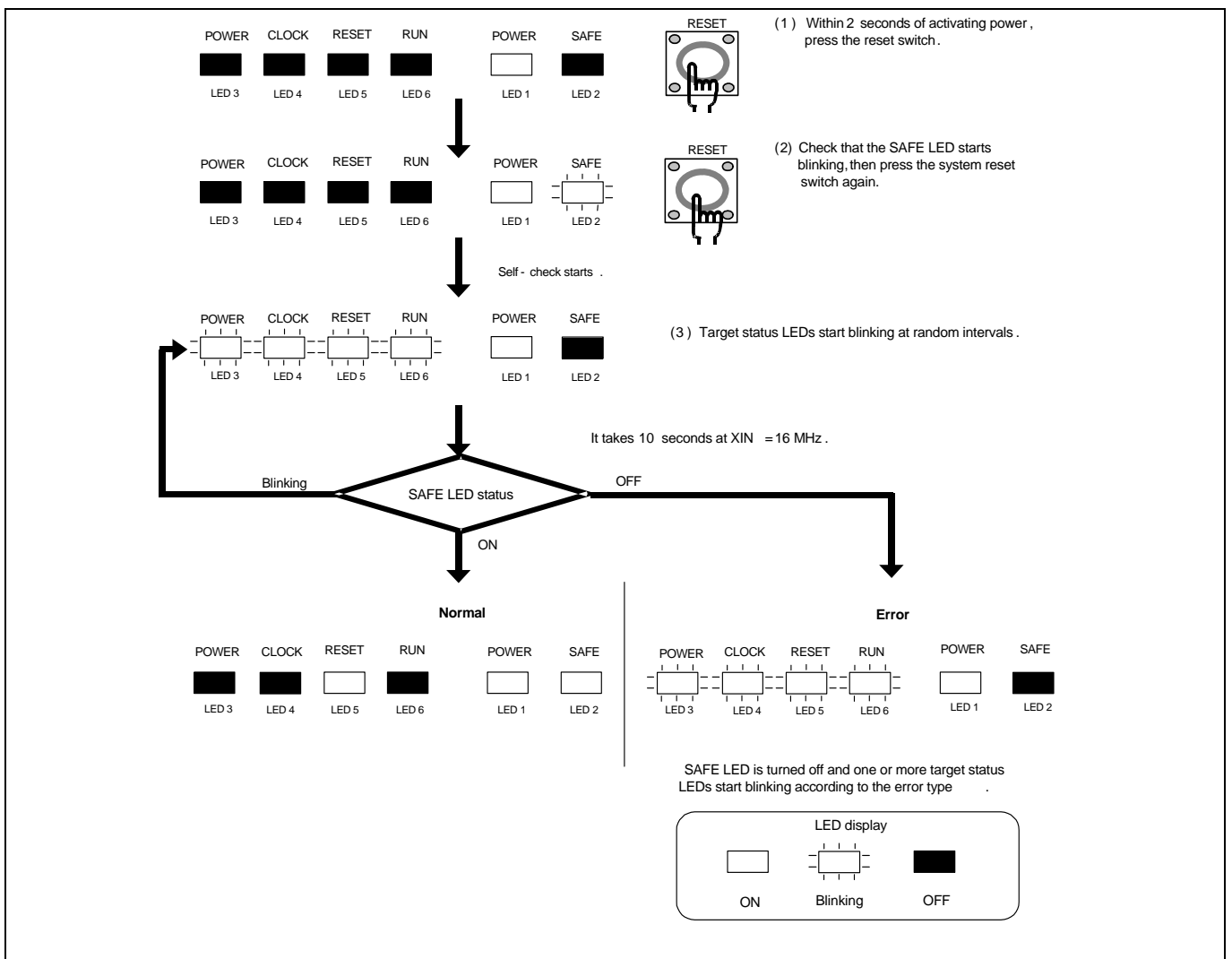| Switch	Setting
MCU power supply source selection jumper (JP1)	INT
MCU power supply voltage selection jumper (JP2)	5V
VCC1, VCC2 power selection jumper (JP1 of the M3062PT2-EPBM)	VCC1=2

Figure 2.11 Self-check procedure

2.7.2 If an Error is Detected in the Self-check

Table 2.5 lists how to remedy the troubles if the target status LED display is abnormal in the self-check. When an error is detected, shut off the emulator and the user system and follow the steps in the Table 2.5.

Table 2.5 Error display in the self-check and how to remedy it

LED display Blinking / OFF				Problem & Remedy
POWER	CLOCK	RESET	RUN	
■	■	■	■	The emulator system is not working properly. - Check that power is supplied to the emulator.
■	■	■	▭(blinking)	- The emulator may be damaged. Contact your local distributor.
■	■	▭(blinking)	■	A clock is not supplied to the emulator. - Check that the oscillator circuit board (OSC-3) is attached.
■	■	▭(blinking)	▭(blinking)	
■	▭(blinking)	■	■	The power is not supplied to the emulator. - Check that the power supply cable is connected properly. - Check of jumper switch settings (see Table 2.2).
■	▭(blinking)	■	▭(blinking)	The vector areas (DBC interrupt vector, single-step interrupt vector and BRK interrupt vector) which are used by the emulator may be rewritten when debugging in CPU rewrite mode. - Start the emulator debugger and execute the program (single-step execution can be used) to reset the vector areas which are used by the emulator. Then, execute the self-check.
■	▭(blinking)	▭(blinking)	▭(blinking)	The emulation memory board R0E33062PMSRC0 (not included) is not working properly. - The emulation memory board may be damaged. Contact your local distributor.
Others				The emulator system is not working properly. - The emulator may be damaged. Contact your local distributor.

IMPORTANT

Notes on the Self-check:

- **Be sure to disconnect the user system** before executing the self-check.
  Use the preinstalled oscillator circuit board OSC-3 (16MHz) to execute the self-check.
- If the self-check does not result normally (excluding target status errors), the emulator may be damaged. Then, contact your local distributor.

2.8 Connecting the User System

Figure 2.12 shows the connection of the M3062PT3-CPE and the user system.
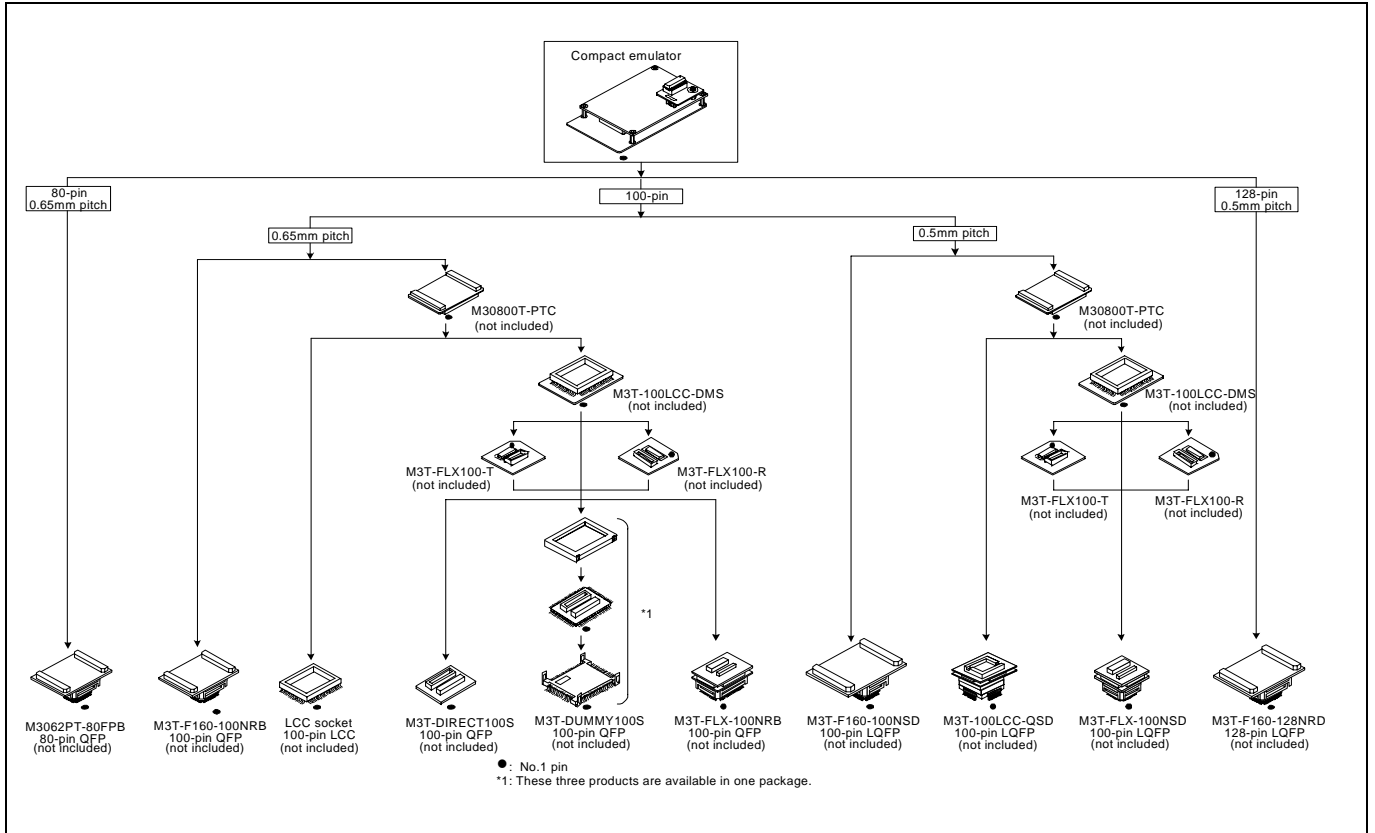
Figure 2.12 Connection of the M3062PT3-CPE and user system

⚠ **CAUTION**

Note on Connecting the User System:

● Take care not to attach the converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

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* NQPACK, YQPACK, YQSOCKET, YQ-GUIDE, HQPACK, TQPACK and TQSOCKET are trademarks of Tokyo Eletech Corporation.

2.8.1 Connecting to an 80-pin 0.65mm pitch Foot Pattern

Here following is a procedure of connecting to an 80-pin 0.65mm pitch foot pattern on the user system using the M3062PT-80FPB (not included). For details on the M3062PT-80FPB (not included), refer to its user's manual.

(1) Attach the NQPACK080SB included with the M3062PT-80FPB to the user system.
(2) Attach the YQPACK080SB included with the M3062PT-80FPB to the NQPACK080SB and secure it with the YQ-GUIDE's.
(3) Attach the CN2 side of the M3062PT-80FPB to the J4 side of the M3062PT3-CPE.
(4) Attach the M3062PT-80FPB to the YQPACK080SB.

Figure 2.13 Connecting to an 80-pin 0.65mm pitch foot pattern

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⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Note on the Connectors of the Converter Board:
- The connectors of the M3062PT-80FPB are guaranteed for only 50 insertion/removal iterations.

2.8.2 Connecting to a 100-pin LCC Socket

Here following is a procedure of connecting to a 100-pin LCC socket (IC61-1004-051 of Yamaichi Electronics Co., Ltd.) on the user system using the M30800T-PTC (not included).

(1) Attach the LCC socket to the user system.
(2) Attach the CN2 side of the M30800T-PTC to the J4 side of the M3062PT3-CPE.
(3) Attach the M30800T-PTC to the 100-pin LCC socket.

Figure 2.14 Connecting to a 100-pin LCC socket

⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Notes on Connectors of the Converter Board:
- The connectors of the M30800T-PTC are guaranteed for only 50 insertion/removal iterations.
- For purchasing the IC61-1004-051 or for technical information, contact Yamaichi Electronics Co., Ltd.

2.8.3 Connecting to a 100-pin 0.65mm pitch Foot Pattern (Part 1)

Here following is a procedure of connecting to a 100-pin 0.65mm pitch foot pattern on the user system using the M3T-F160-100NRB (not included). For details on the M3T-F160-100NRB (not included), refer to its user's manual.

(1) Attach the NQPACK100RB included with the M3T-F160-100NRB to the user system.
(2) Attach the YQPACK100RB included with the M3T-F160-100NRB to the NQPACK100RB and secure it with the YQ-GUIDE's.
(3) Attach the CN2 side of the M3T-F160-100NRB to the J4 side of the M3062PT3-CPE.
(4) Attach the M3T-F160-100NRB to the YQPACK100RB.

Figure 2.15 Connecting to a 100-pin 0.65mm pitch foot pattern (Part 1)

⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Note on Connectors of the Converter Board:
- The connectors of the M3T-F160-100NRB are guaranteed for only 50 insertion/removal iterations.

2.8.4 Connecting to a 100-pin 0.65mm pitch Foot Pattern (Part 2)

Here following is a procedure of connecting to a 100-pin 0.65mm pitch foot pattern on the user system using the M3T-DIRECT100S (not included). For details on the M3T-100LCC-DMS (not included) and M3T-DIRECT100S (not included), refer to each user's manual.

(1) Attach the M3T-DIRECT100S to the user system.
(2) Attach the M3T-100LCC-DMS to the M3T-DIRECT100S.
(3) Attach the CN2 side of the M30800T-PTC to the J4 side of the M3062PT3-CPE.
(4) Attach the M30800T-PTC to the M3T-100LCC-DMS.

Figure 2.16 Connecting to a 100-pin 0.65mm pitch foot pattern (Part 2)

⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Notes on Connectors of the Converter Board:
- The connectors of the M30800T-PTC are guaranteed for only 50 insertion/removal iterations.
- The connectors of the M3T-100LCC-DMS and M3T-DIRECT100S are guaranteed for only 20 insertion/removal iterations.

2.8.5 Connecting to a 100-pin 0.65mm pitch Foot Pattern (Part 3)

Here following is a procedure of connecting to a 100-pin 0.65mm pitch foot pattern on the user system using the M3T-DUMMY100S (not included). For details on the M3T-100LCC-DMS (not included) and M3T-DUMMY100S (not included), refer to each user's manual.

(1) Attach the M3T-DUMMY100S to the user system.
(2) Attach the M3T-100LCC-DMS to the M3T-DUMMY100S.
(3) Attach the CN2 side of the M30800T-PTC to the J4 side of the M3062PT3-CPE.
(4) Attach the M30800T-PTC to the M3T-100LCC-DMS.
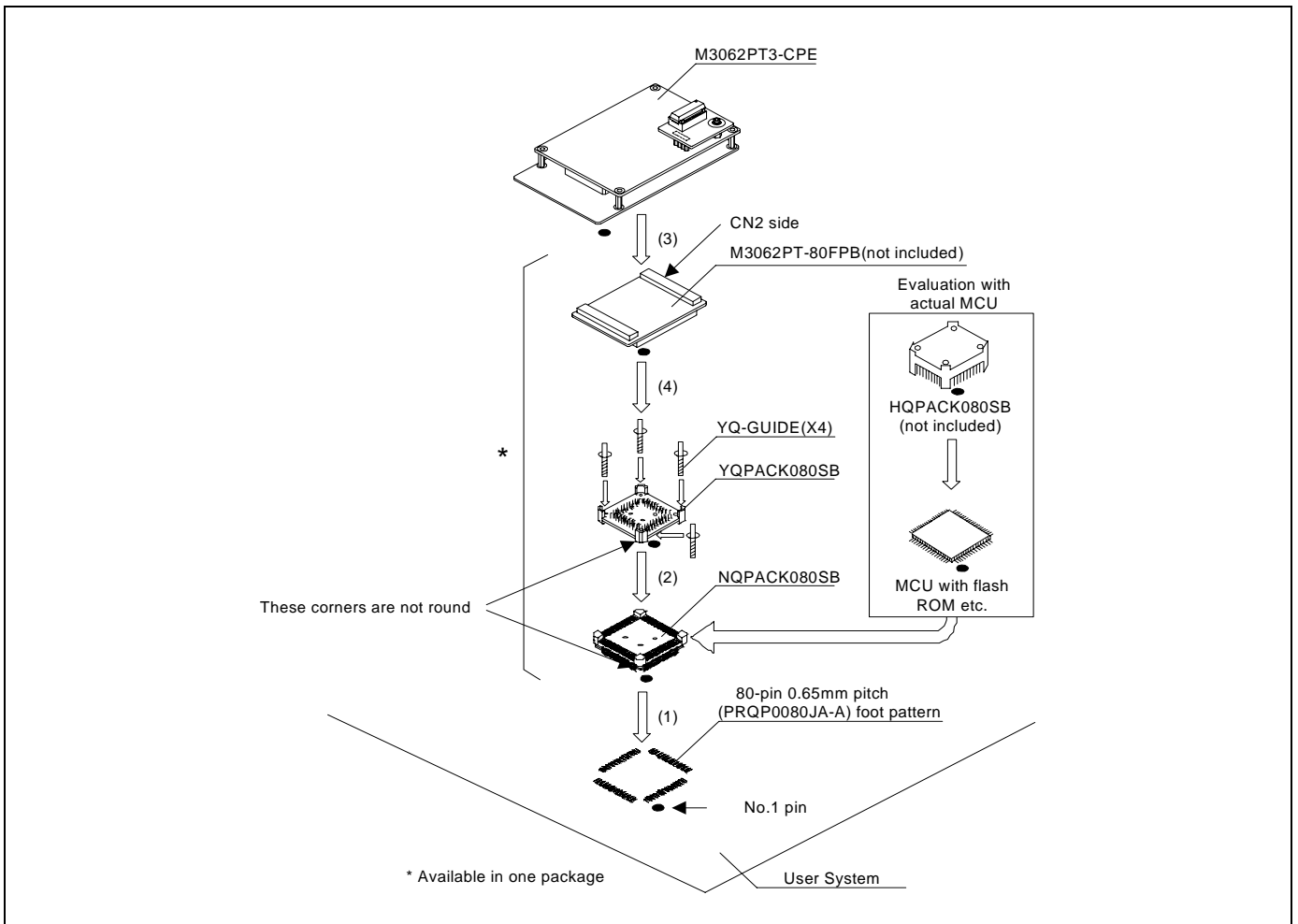
Figure 2.17 Connecting to a 100-pin 0.65mm pitch foot pattern (Part 3)

⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Notes on Connectors of the Converter Board:
- The connectors of the M30800T-PTC are guaranteed for only 50 insertion/removal iterations.
- The connectors of the M3T-100LCC-DMS and M3T-DUMMY100S are guaranteed for only 20 insertion/removal iterations.

2.8.6 Connecting to a 100-pin 0.65mm pitch Foot Pattern (Part 4)

Here following is a procedure of connecting to a 100-pin 0.65mm pitch foot pattern on the user system using the M3T-FLX-100NRB (not included). For details on the M3T-100LCC-DMS (not included) and M3T-FLX-100NRB (not included), refer to each user's manual.

(1) Attach the NQPACK100RB included with the M3T-FLX-100NRB to the user system.

(2) Attach the YQPACK100RB included with M3T-FLX-100NRB to the NQPACK100RB and secure it with the YQ-GUIDE's.

(3) Attach the M3T-FLX-100NRB to the YQPACK100RB.

(4) Attach the M3T-100LCC-DMS to the M3T-FLX-100NRB

(5) Attach the CN2 side of the M30800T-PTC to the J4 side of the M3062PT3-CPE.

(6) Attach the M30800T-PTC to the M3T-100LCC-DMS.

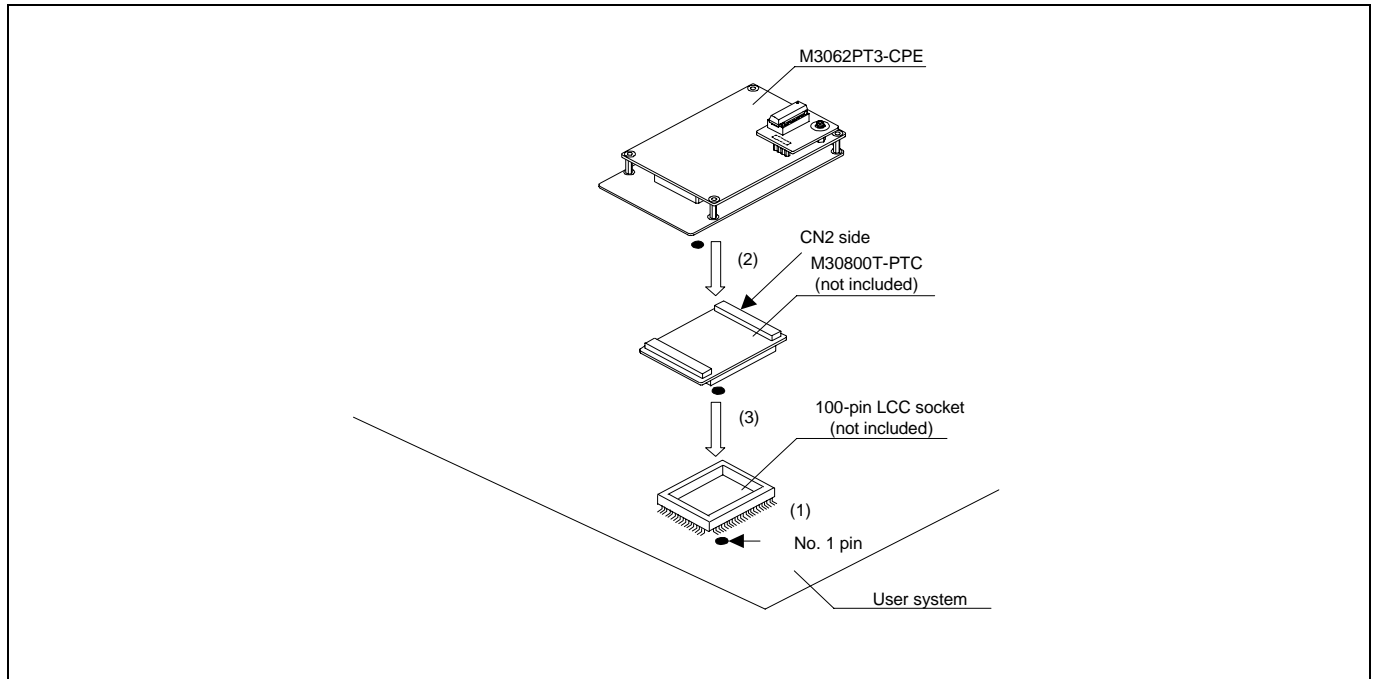Figure 2.18 Connecting to a 100-pin 0.65mm pitch foot pattern (Part 4)

⚠ CAUTION

Note on Connecting the User System:

- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Notes on Connectors of the Converter Board:

- The connectors of the M30800T-PTC are guaranteed for only 50 insertion/removal iterations.
- The connectors of the M3T-100LCC-DMS and M3T-FLX-100NRB are guaranteed for only 20 insertion/removal iterations.

2.8.7 Connecting to a 100-pin 0.5mm pitch Foot Pattern (Part 1)

Here following is a procedure of connecting to a 100-pin 0.5mm pitch foot pattern on the user system using the M3T-F160-100NSD (not included). For details on the M3T-F160-100NSD, refer to its user's manual.

(1) Attach the NQPACK100SD-ND included with the M3T-F160-100NSD to the user system.
(2) Attach the YQPACK100SD included with the M3T-F160-100NSD to the NQPACK100SD-ND and secure it with the YQ-GUIDE's.
(3) Attach the CN2 side of the M3T-F160-100NSD to the J4 side of the M3062PT3-CPE.
(4) Attach the M3T-F160-100NSD to the YQPACK100SD.

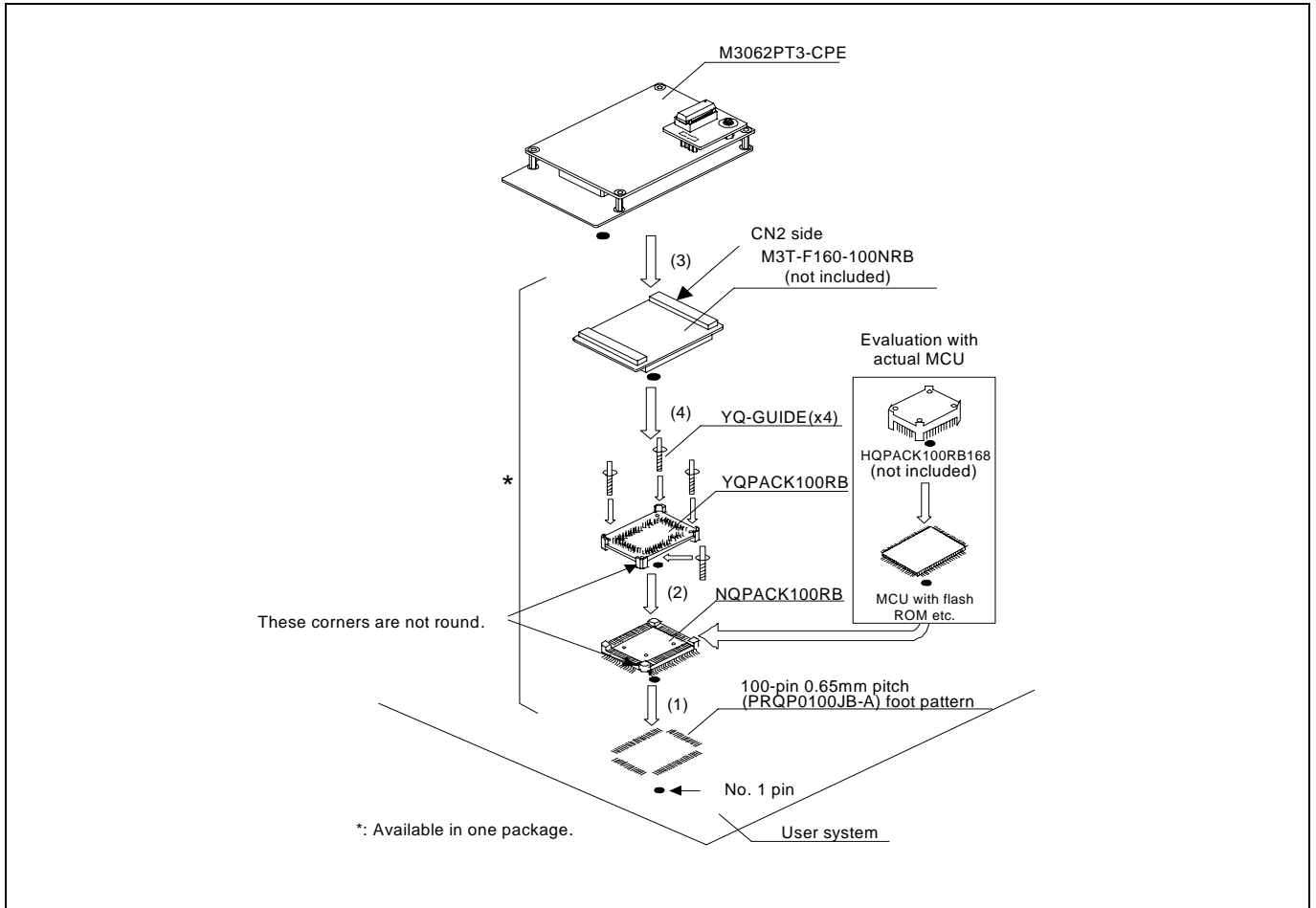Figure 2.19 Connecting to a 100-pin 0.5mm pitch foot pattern (Part 1)

⚠ CAUTION

Note on Connecting the User System:
   ● Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Note on Connectors of the Converter Board:
   ● The connectors of the M3T-F160-100NSD are guaranteed for only 50 insertion/removal iterations.

2.8.8 Connecting to a 100-pin 0.5mm pitch Foot Pattern (Part 2)

Here following is a procedure of connecting to a 100-pin 0.5mm pitch foot pattern on the user system using the M3T-100LCC-QSD (not included). For details on the M3T-100LCC-QSD, refer to its user's manual.

(1) Attach the TQPACK100SD to the user system.

(2) Attach the TQSOCKET100SDG included with the M3T-100LCC-QSD to the TQPACK100SD.

(3) Attach the M3T-100LCC-QSD to the TQSOCKET100SDG.

(4) Attach the CN2 side of the M30800T-PTC to the J4 side of the M3062PT3-CPE.

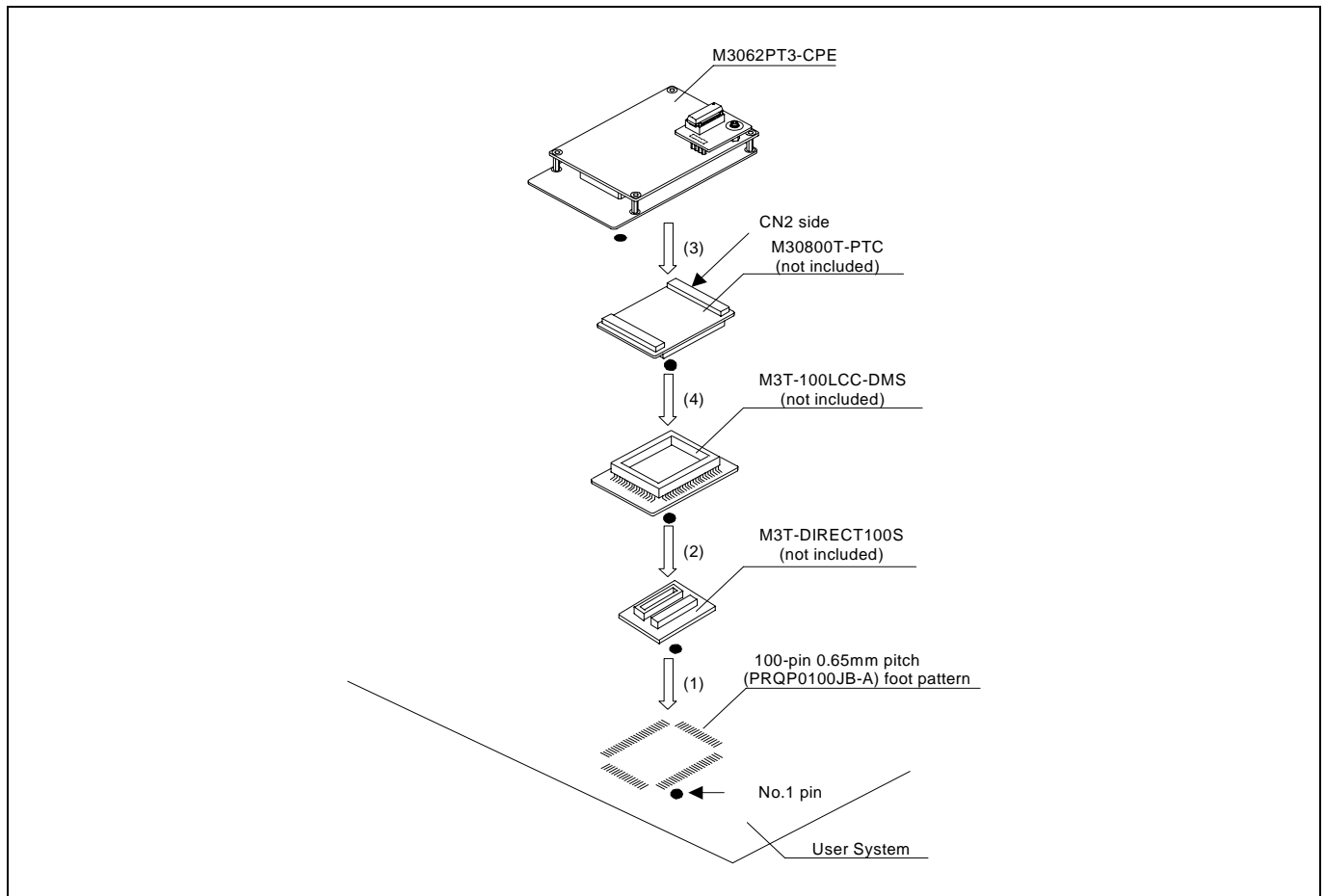(5) Attach the M30800T-PTC to the M3T-100LCC-QSD.
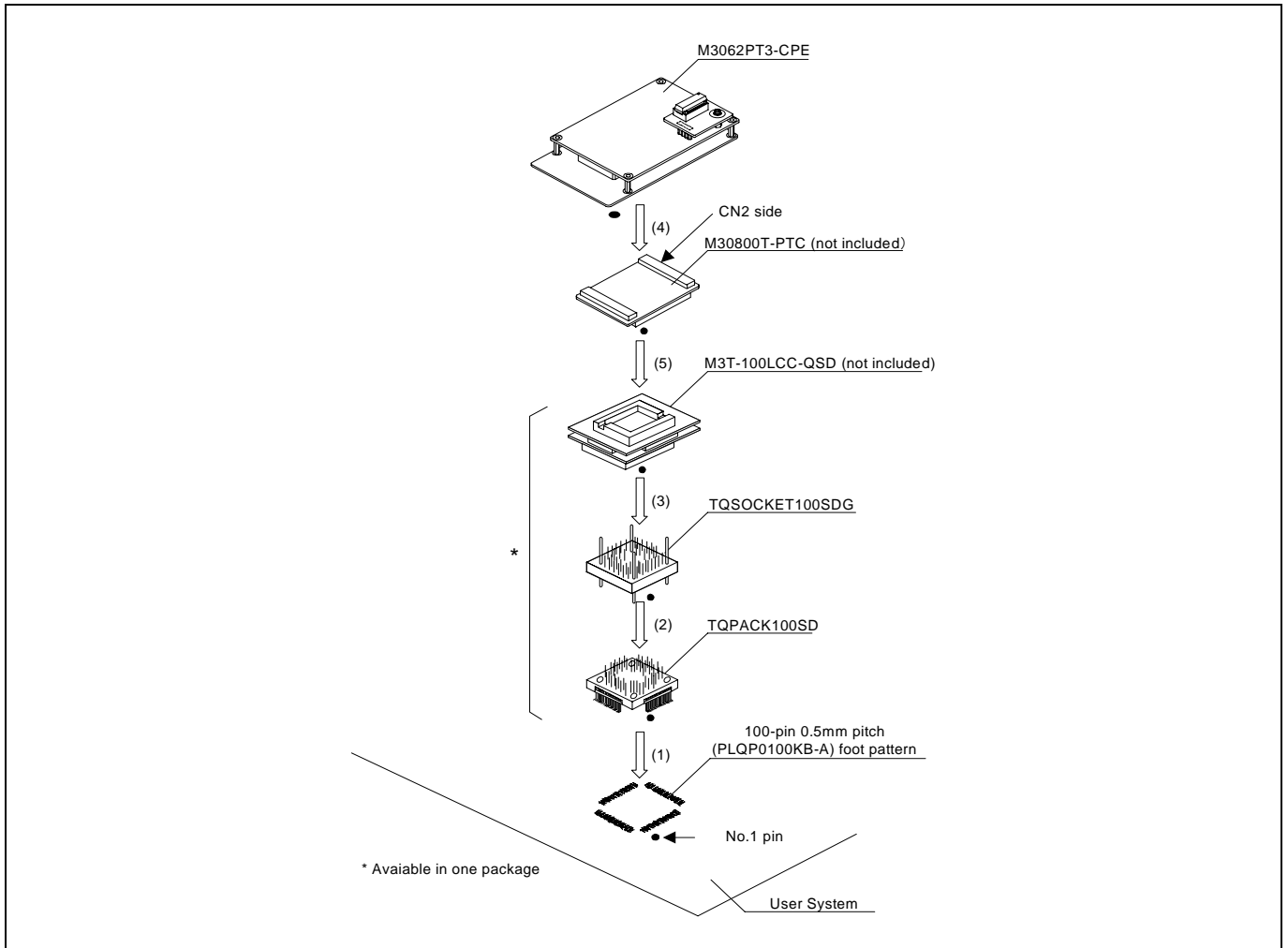
Figure 2.20 Connecting to a 100-pin 0.5mm pitch foot pattern (Part 2)

⚠ CAUTION

Note on Connecting the User System:

- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Note on Connectors of the Converter Board:

- The connectors of the M30800T-PTC and M3T-100LCC-QSD are guaranteed for only 50 insertion/removal iterations.

2.8.9 Connecting to a 100-pin 0.5mm pitch Foot Pattern (Part 3)

Here following is a procedure of connecting to a 100-pin 0.5mm pitch foot pattern on the user system using the M3T-FLX-100NSD (not included). For details on the M3T-100LCC-DMS (not included) and M3T-FLX-100NSD (not included), refer to each user's manual.

(1) Attach the M3T-FLX-100NSD to the user system.

(2) Attach the M3T-100LCC-DMS to the M3T-FLX-100NSD.

(3) Attach the CN2 side of the M30800T-PTC to the J4 side of the M3062PT3-CPE.

(4) Attach the M30800T-PTC to the M3T-100LCC-DMS.
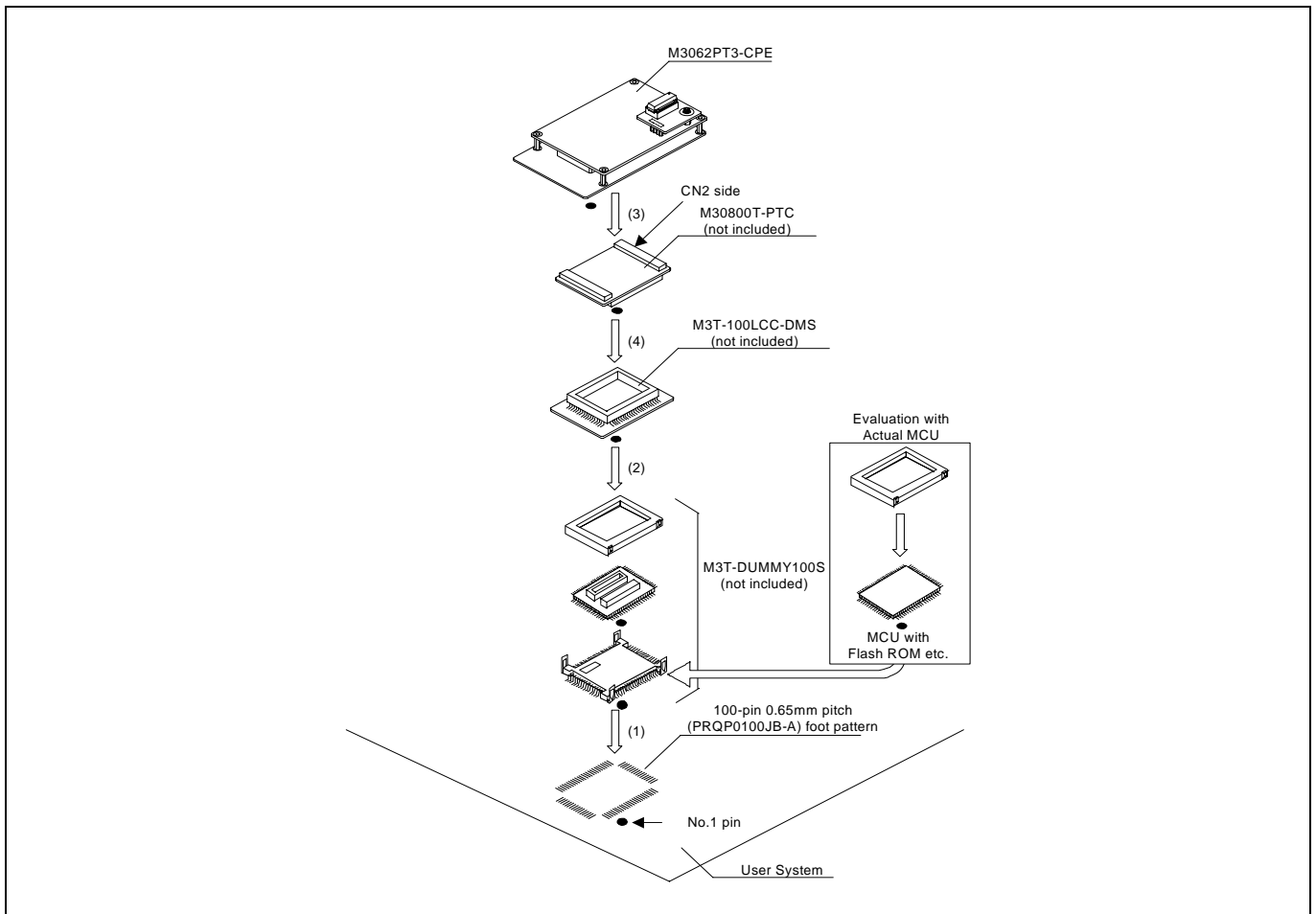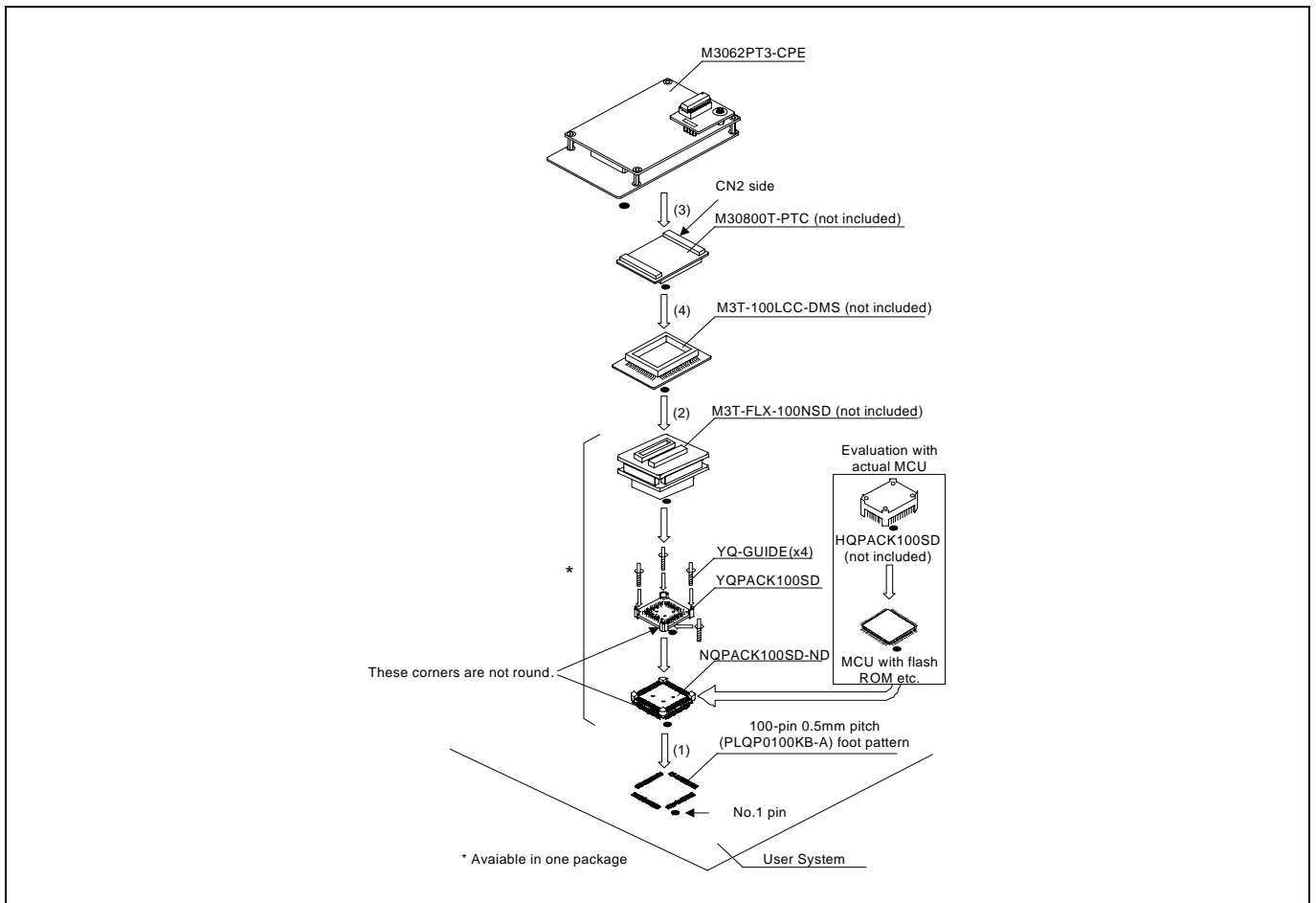

Figure 2.21 Connecting to a 100-pin 0.5mm pitch foot pattern (Part 3)

⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Notes on Connectors of the Converter Board:
- The connectors of the M30800T-PTC are guaranteed for only 50 insertion/removal iterations.
- The connectors of the M3T-100LCC-DMS and M3T-FLX-100NSD are guaranteed for only 20 insertion/removal iterations.

2.8.10 Connecting to a 128-pin 0.5mm pitch Foot Pattern

Here following is a procedure of connecting to a 128-pin 0.5mm pitch foot pattern on the user system using the M3T-F160-128NRD (not included). For details on the M3T-F160-128NRD, refer to its user's manual.

(1) Attach the NQPACK128RD included with the M3T-F160-128NRD to the user system.
(2) Attach the YQPACK128RD included with the M3T-F160-128NRD to the NQPACK128RD and secure it with the YQ-GUIDE's.
(3) Attach the CN2 side of the M3T-F160-128NRD to the J4 side of the M3062PT3-CPE.
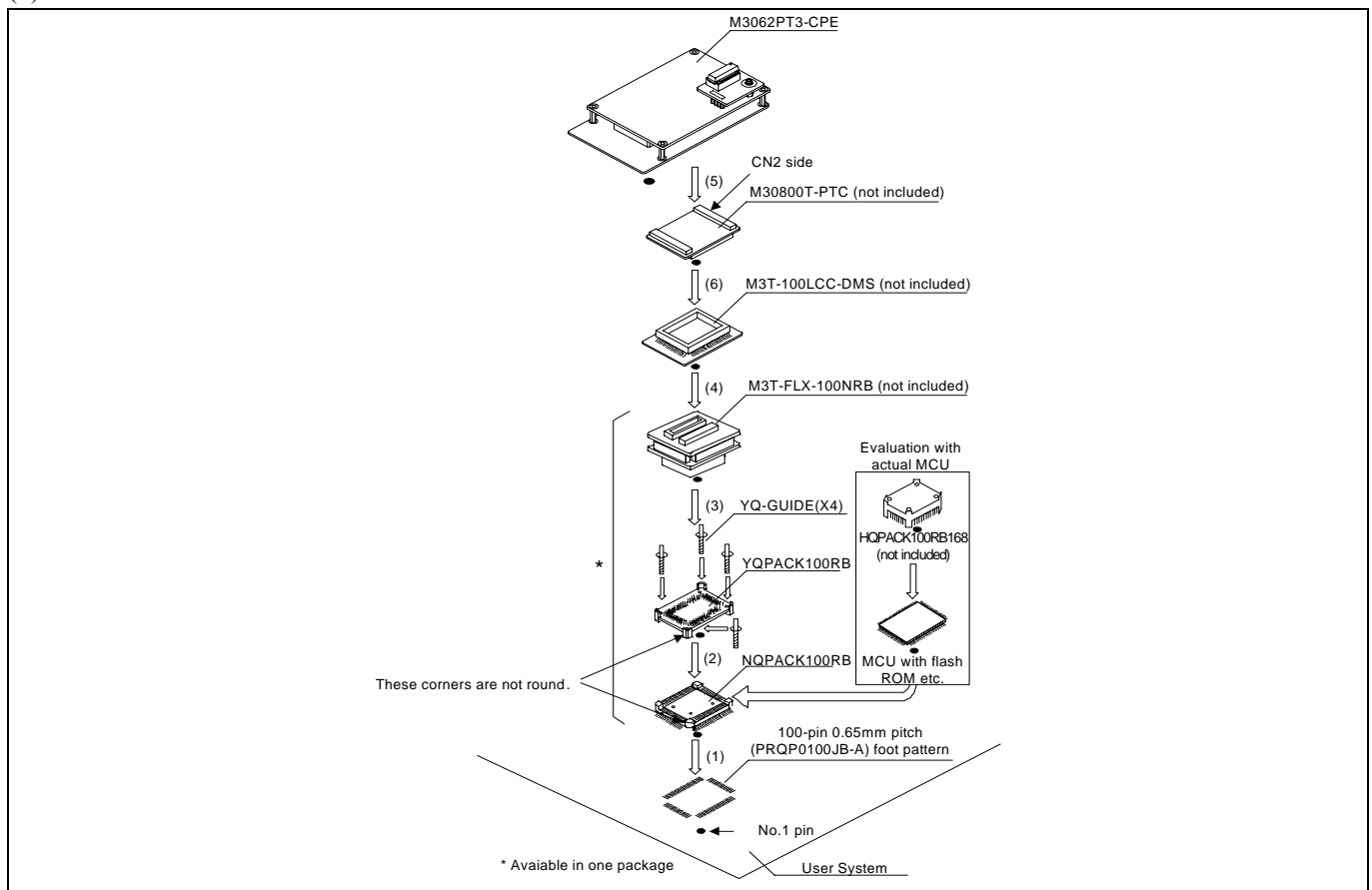(4) Attach the M3T-F160-128NRD to the YQPACK128RD.

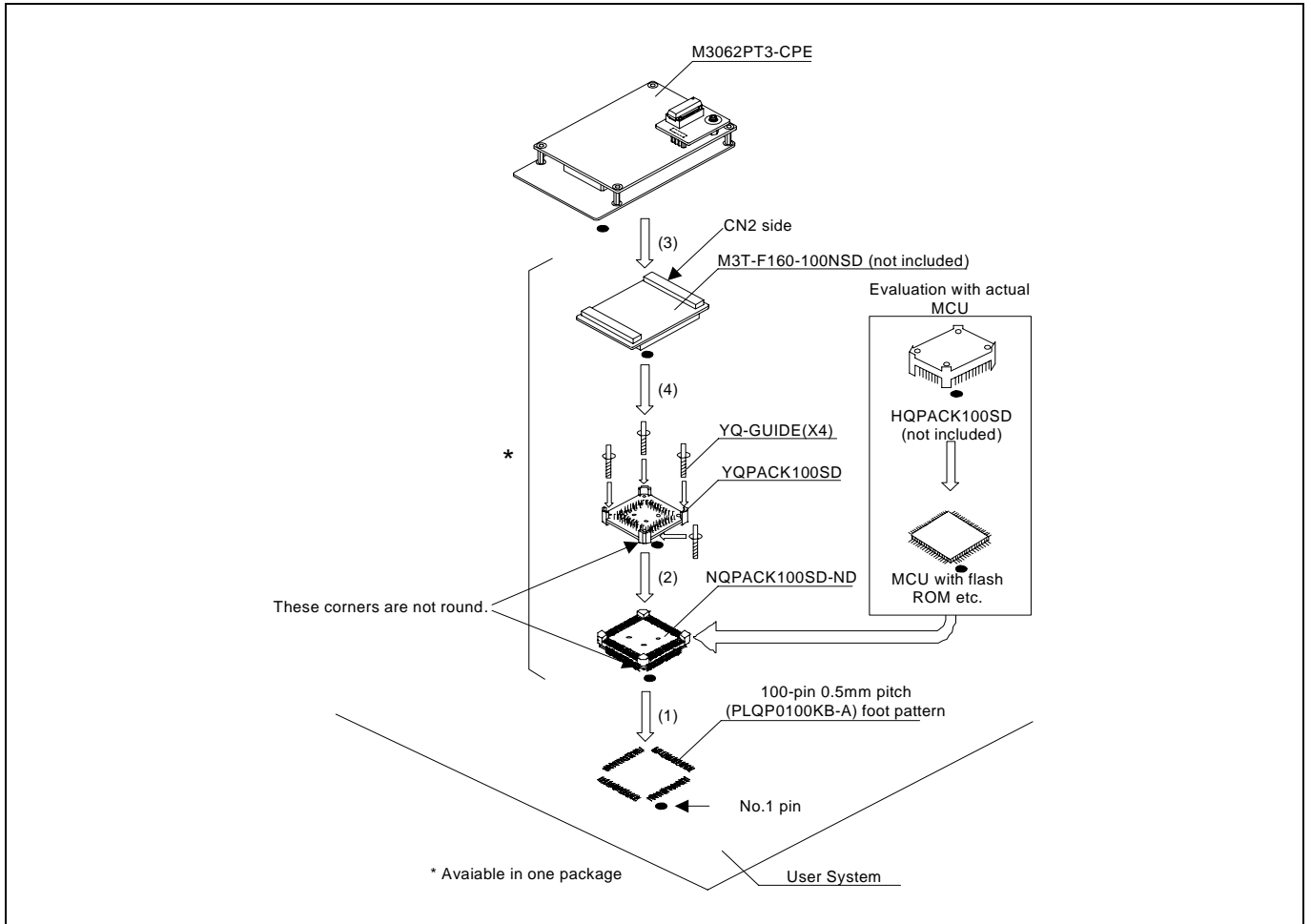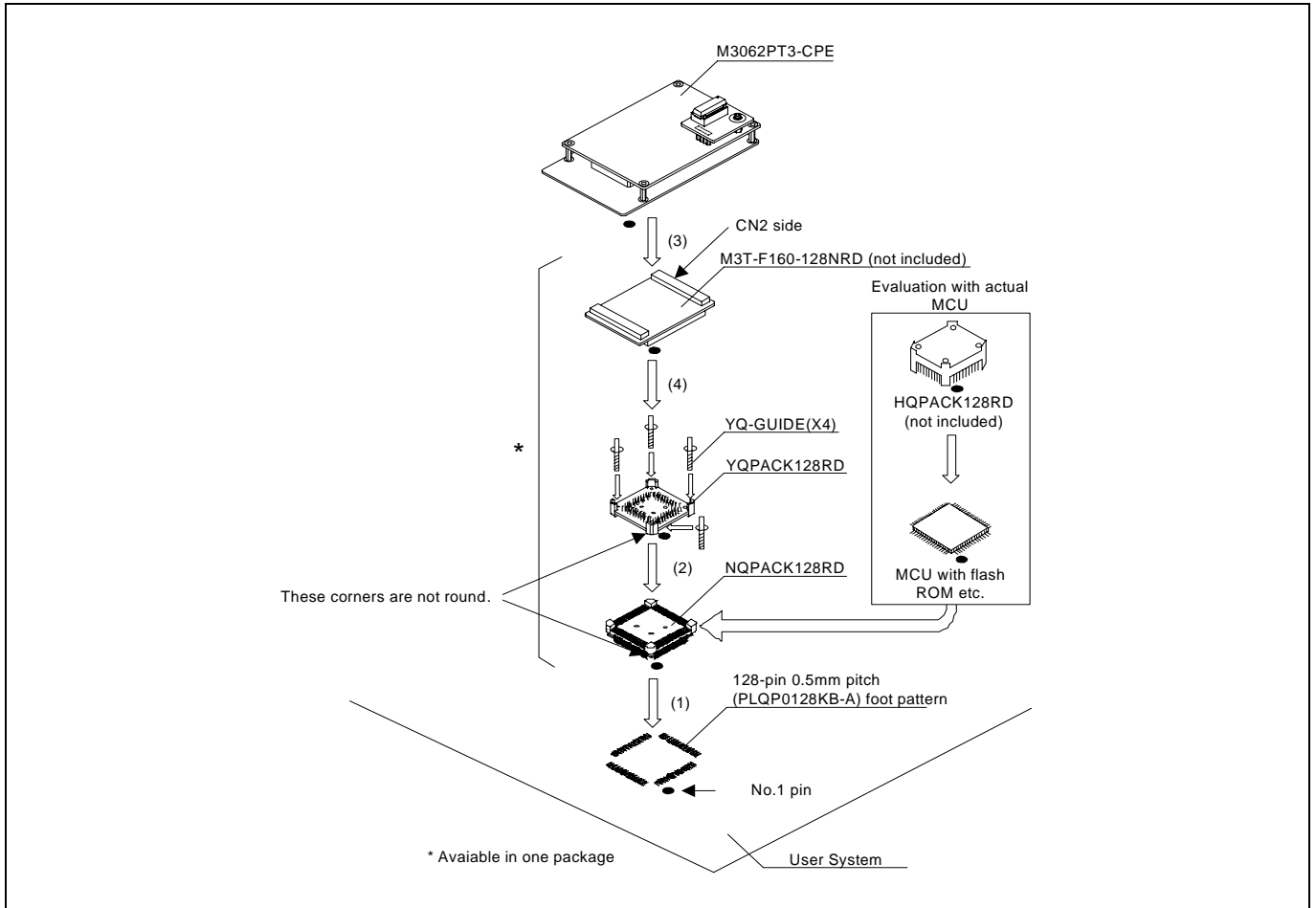Figure 2.22 Connecting to a 128-pin 0.5mm pitch foot pattern

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⚠ CAUTION

Note on Connecting the User System:
- Take care not to attach a converter board in a wrong direction. It may cause a fatal damage to the emulator and user system.

IMPORTANT

Note on Connectors of the Converter Board:
- The connectors of the M3T-F160-128NRD are guaranteed for only 50 insertion/removal iterations.

2.9 Changing Settings

2.9.1 Selecting Clock Supply

You can choose a clock supplied to the evaluation MCU by the Emulator tab in the Init dialog box of the emulator debugger. Table 2.6 shows the clocks and their initial settings.

Table 2.6 Clock supply to the MCU

Clock	Emulator debugger display	Description	Initial setting
Main (X_{IN}-X_{OUT})	Internal	Internal oscillator circuit board (OSC-3 or OSC-2)	Yes
	External	Oscillator circuit on the user system	-
Sub (X_{CIN}-X_{COUT})	Internal	Internal oscillator circuit (32.768 kHz)	-
	External	Oscillator circuit on the user system	Yes

(1) Using an Internal Oscillator Circuit Board

1. Kinds of Oscillator Boards

The M3062PT3-CPE comes with an oscillator circuit board OSC-3 (16MHz). And an oscillator circuit bare board OSC-2 is included with this product. If you use an internal oscillator circuit board of the emulator as a main clock, choose "Internal" in the emulator debugger after replacing oscillator circuit boards to change a clock supplied to an MCU.

2. Replacing Oscillator Circuit Boards

Figure 2.23 shows how to replace the oscillator circuit boards.

The oscillator circuit board of the emulator is in the lower right corner of the board.

Unscrew the screw securing the oscillator circuit board.

Lift off the oscillator circuit board.

Attach the oscillator circuit board for replacement to the connector of the emulator.

Secure the new oscillator circuit board with the screw.
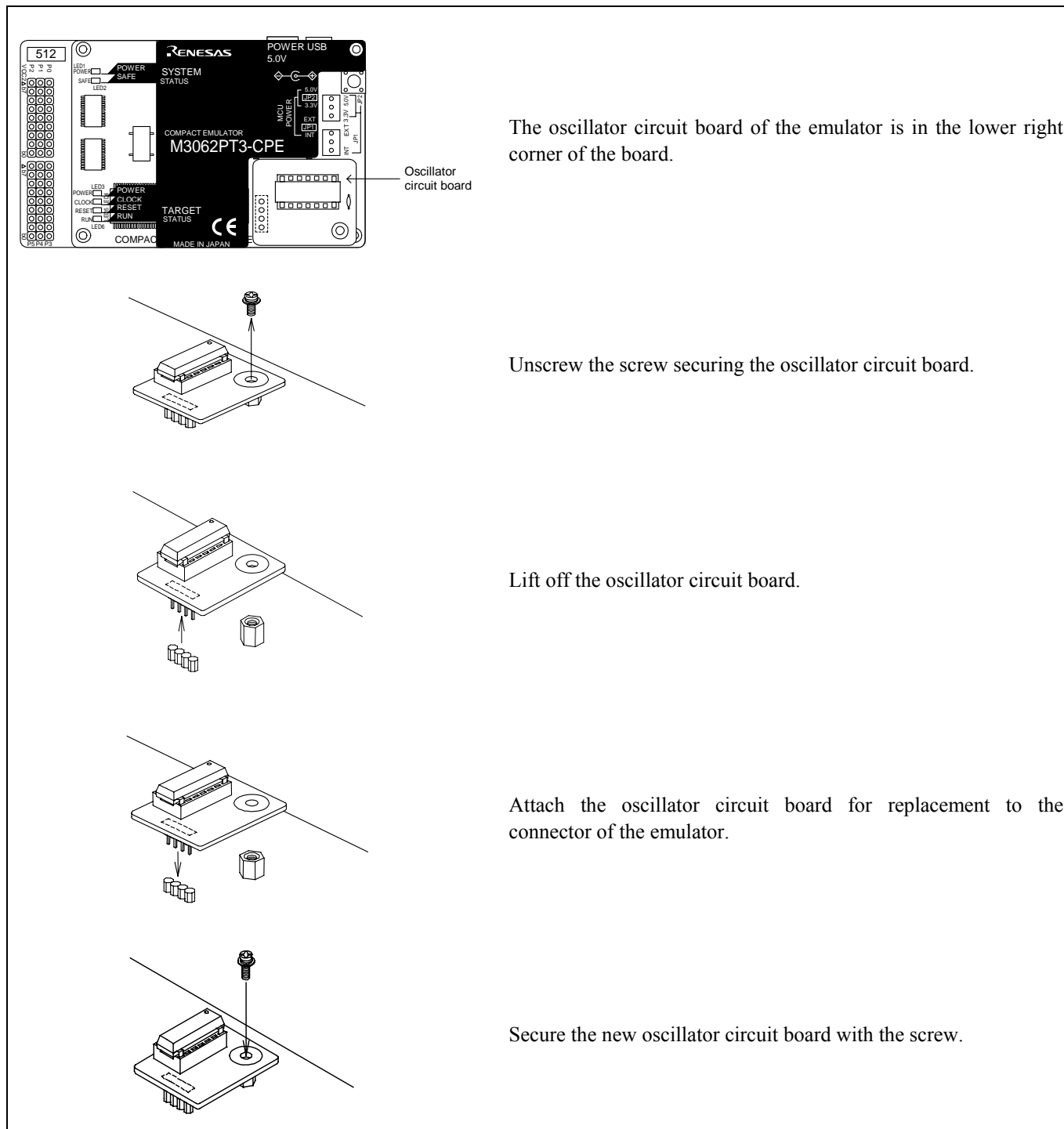
Figure 2.23 Replacing oscillator circuit boards

⚠ CAUTION

Note on Replacing the Oscillator Circuit Board:

● When replacing the oscillator circuit boards, be sure to shut OFF the power supply. Otherwise the internal circuit may cause a break.

3. Using the Internal Oscillator Circuit Bare Board

To use this product at a frequency you like, build a desired oscillator circuit on the included OSC-2 oscillator circuit bare board. Figure 2.24 shows an external view of the OSC-2 oscillator circuit bare board and the connector pin locations. Figure 2.25 shows the circuitry of the oscillator circuit bare board OSC-2. Use the number of oscillator circuits recommended by the oscillator manufacturer.

J1-4: GND
J1-3: Oscillation output
J1-2: GND
J1-1: VCC
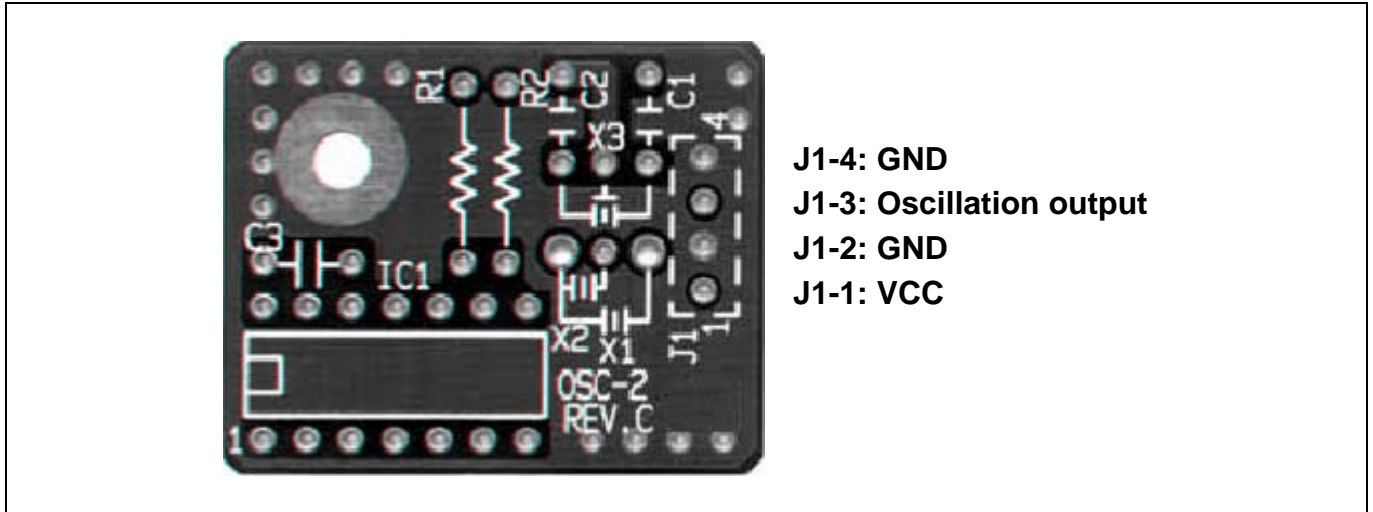
Figure 2.24 External view of the oscillator circuit board OSC-2 and its connector pin locations

*X1:5.08-mm-pitch 2-pin oscillator
X2:2.54-mm-pitch 2-pin oscillator
X3:2.54-mm-pitch 3-pin oscillator

IC1:Inverter (Unbuffer)
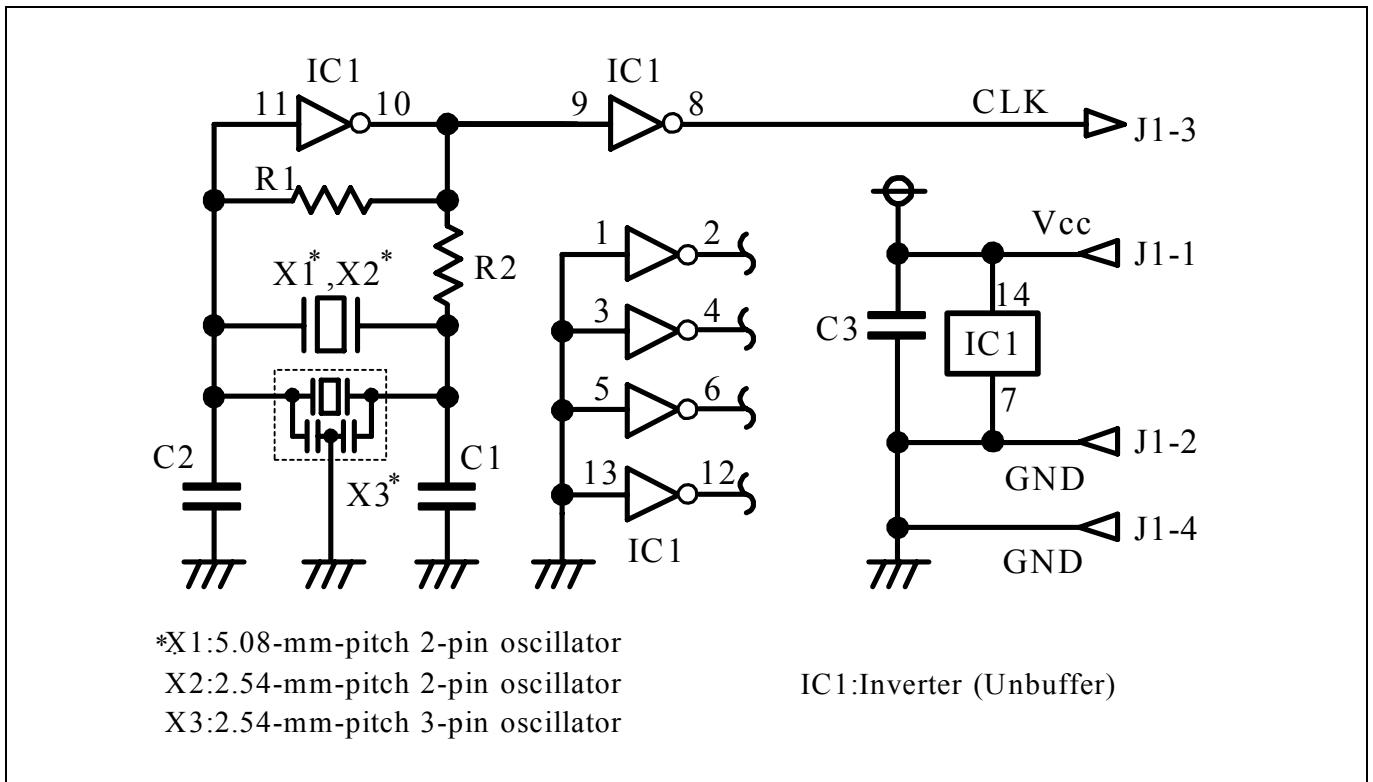
Figure 2.25 Circuits of the oscillator circuit bare board OSC-2

(2) Using an Oscillator Circuit on the User System

To operate this product with an external clock, construct an oscillator circuit as shown in Figure 2.26 in the user system and input the oscillator output at 50% duty (within the operating range of the evaluation MCU) into pin X_{IN}. And pin X_{OUT} should be open. Choose "External" in the emulator debugger to use this clock.
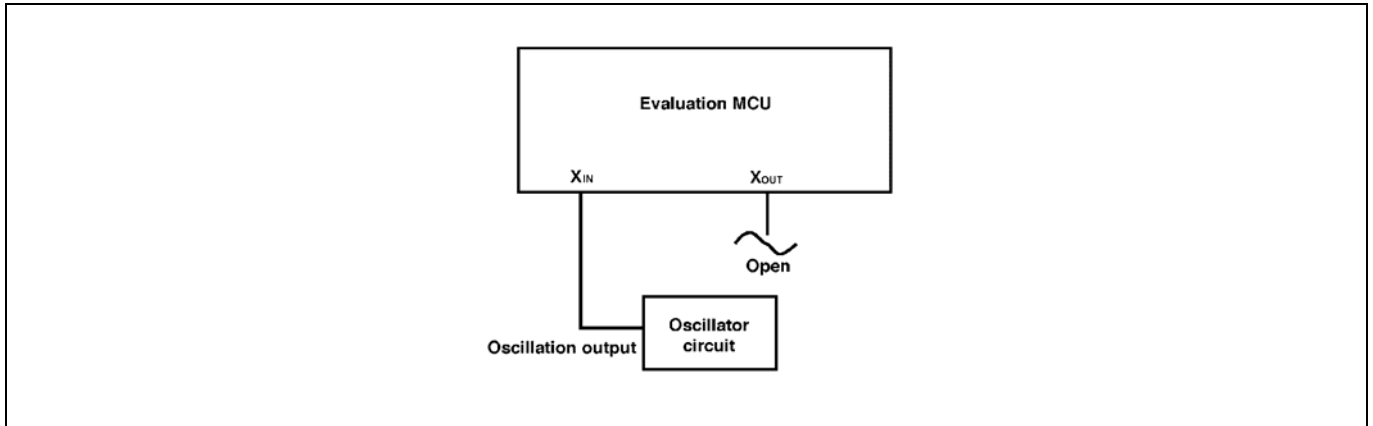
Figure 2.26 External oscillator circuit

Make note that in the oscillator circuit shown in Figure 2.27 where a resonator is connected between pins X_{IN} and X_{OUT}, oscillation does not occur because a package converter board is used between the evaluation MCU and the user system. It is same for sub-clock oscillator circuits (X_{CIN} and X_{COUT}).
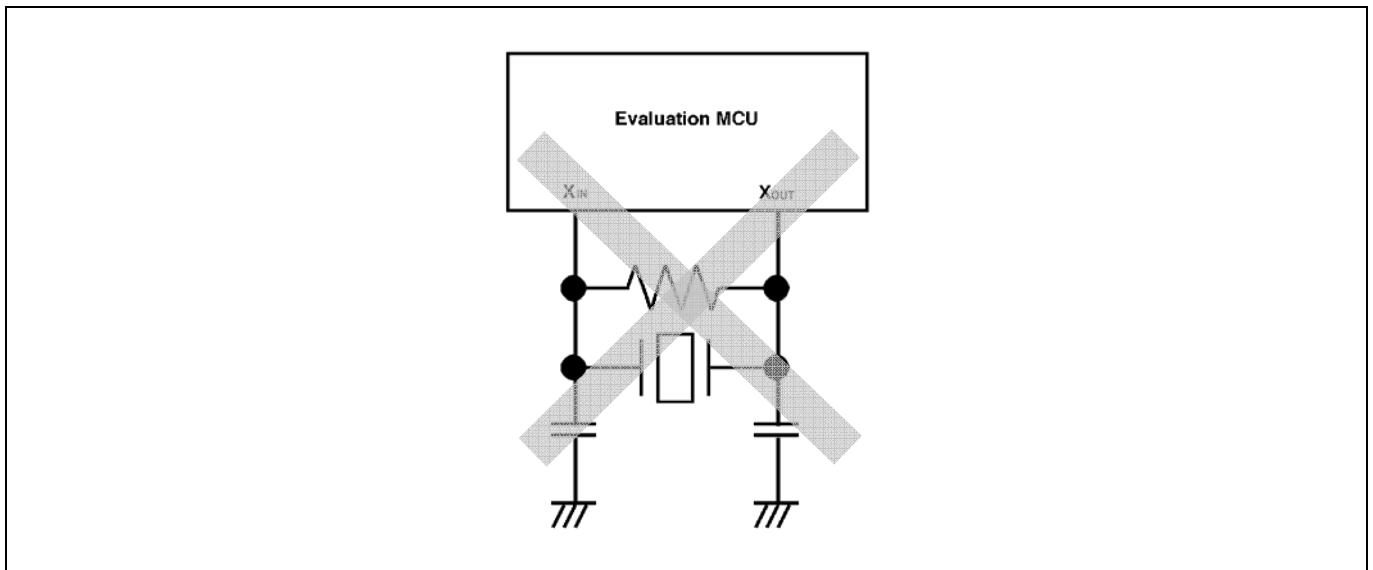
Figure 2.27 Circuit in which oscillation does not occur

2.9.2 A/D Conversion Bypass Capacitors

There is a foot pattern on the M3062PT2-EPBM board for mounting bypass capacitors for an A/D conversion circuit near the MCU. Mount suitable bypass capacitors as occasion demands. Figure 2.28 shows where they are installed and the configuration of this product.
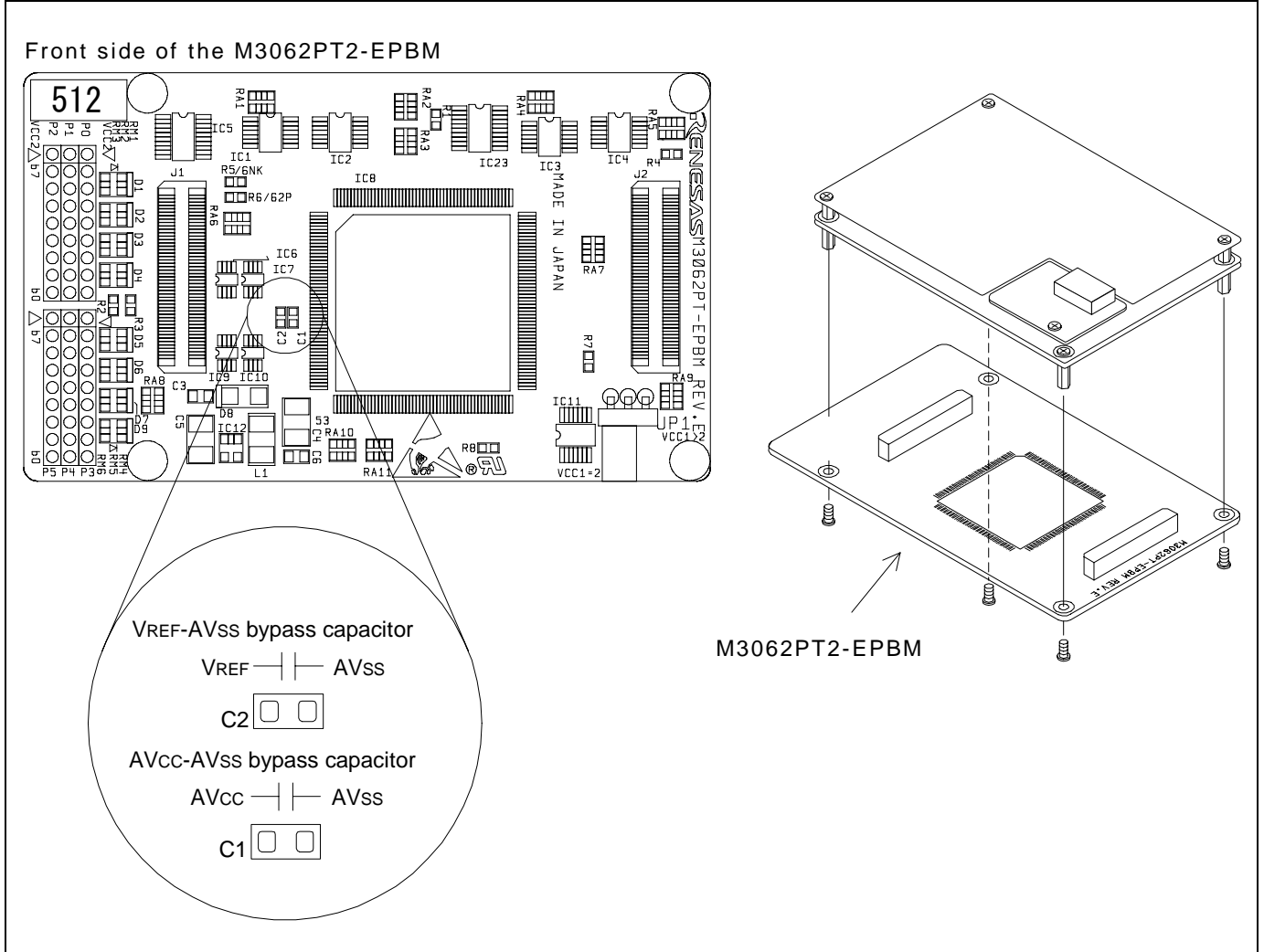
Figure 2.28 Foot pattern for A/D conversion bypass capacitors and the configuration of this product

IMPORTANT

Note on the A/D Converter Function:
- Because a converter board and other devices are used between the evaluation MCU and the user system, the A/D converter operates differently from that of an actual MCU. Make the final evaluation of the A/D converter with an actual MCU.

2.9.3 Pullup of Emulation Ports

Because this product emulates some I/O ports (P0 to P5 and P10), you can not pullup ports P0 to P5 by the pullup control registers. Install the included resistor arrays (51kΩ) as necessary. Figure 2.29 shows the positions of the pullup resistors.
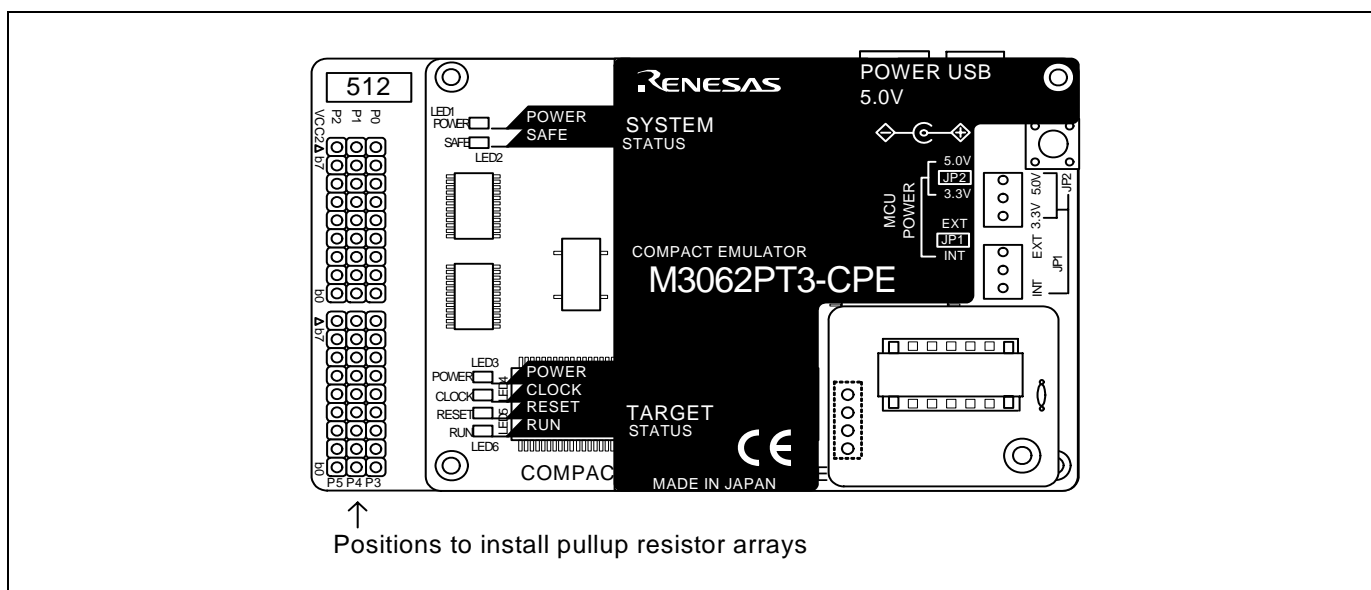
Figure 2.29 Positions of the pullup resistors

Table 2.7 Emulation ports and pullup resistor part numbers

Port	Resistor part
P00--P07	RM1 (51kΩ pullup)
P10--P17	RM2 (51kΩpullup)
P20--P27	RM3 (51kΩpullup)
P30--P37	RM4 (51kΩpullup)
P40--P47	RM5 (51kΩpullup)
P50--P57	RM6 (51kΩpullup)

IMPORTANT

Note on Pullup Control:
● The initial value of pullup control register 1 PUR1 of this product is different from that of an actual MCU. When a VCC level is input to pin CNVss, the value of an actual MCU is "02h" (bit 1 PU11 is "1"), while that of this product is "00h".

3. Usage (How to Use the Emulator Debugger)

This chapter describes how to start up the emulator debugger and how to use the major windows.

3.1 Starting Up the Emulator Debugger

When debugging the completed programs, switch the session. The session can be changed by the drop down list of the tool bar shown below.

You will have as many sessions created as the number of targets you selected when creating a project, so select the session that corresponds to the target to be connected from the drop-down list. To connect to the M16C Compact Emulator, select "SessionM16C_R8C_Compact_Emulator."

3.2 INIT Dialog Box

After specifying the session, an Init dialog box to connect the target is displayed. The Init dialog box is used to set the items that need to be set when the emulator debugger starts up. The contents set in this dialog box remain effective the next time you start the debugger.

When the tab settings of 1 to 4 are completed, click OK button.

(1) MCU tab

1. Specifying the MCU file
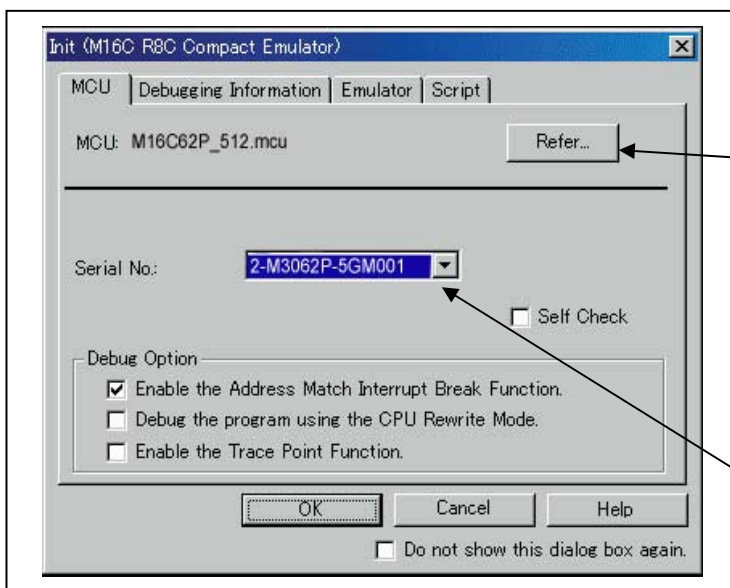
Specifying the MCU file

Click the "Refer..." button.

A Select MCU File dialog box will be displayed, so select the MCU file "M16C62P_512.mcu" for the target MCU.

- The MCU file contains the information specific to the target MCU.
- The MCU file you have selected is displayed in the MCU section of the MCU tab.

Serial No.

Shows the currently connected emulators in list form. Select the serial No. of the emulator you want to be connected.

2. Using or not using the address match break function
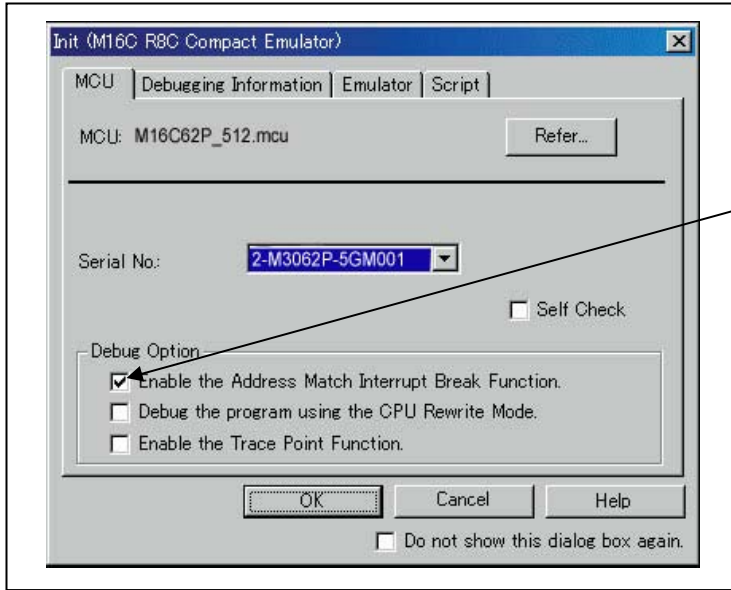
Using or not using the address match break function

Specify whether or not to use the address match break function.

- To use the address match break function (default), select the check box. In this case, the address match interrupt is used by the emulator, and cannot be used in the user program.
- When not using the address match break function, deselect the check box (check mark cleared). In this case, the address match interrupt can be used in the user program.

This option can be selected or deselected only when you are starting up the emulator debugger.

3. Using or not using the CPU rewrite mode
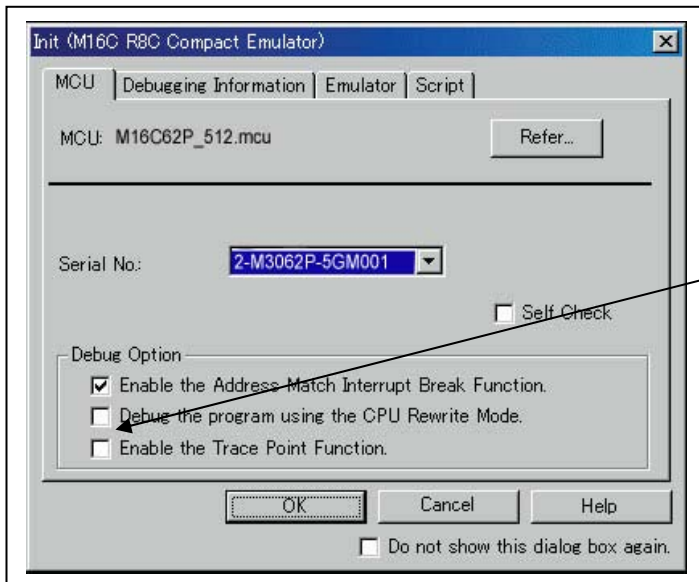
Using or not using CPU rewrite mode

Specify whether or not to debug in CPU rewrite mode. To debug the user system that uses CPU rewrite mode, select the check box. This option can be selected or deselected only when you are starting up the emulator debugger.

[Supplementary explanation]

When debugging in CPU rewrite mode is enabled, the following functions cannot be used:

- Software breakpoint setting in the internal ROM area
- Execution of COME in the internal ROM area

4. Using or not using the trace point function
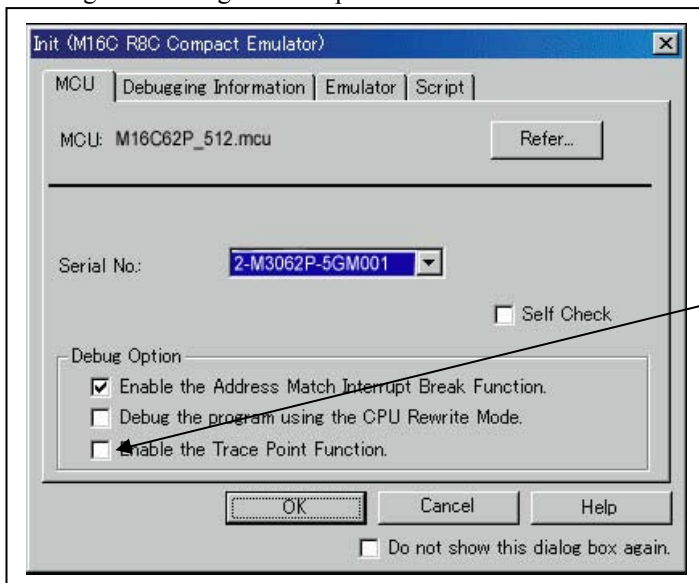
Using or not using the trace point function

The emulator has two-point events, which are shared by the trace function and the hardware break function. Specify whether or not to use the trace point function.

- When not using the trace point function (default), deselect the check box. In this case, the events are used for the hardware break function.
- To use the trace point function, select the check box. In this case, the events are used for the trace point function. The hardware break function is disabled.

5. Executing the self-check
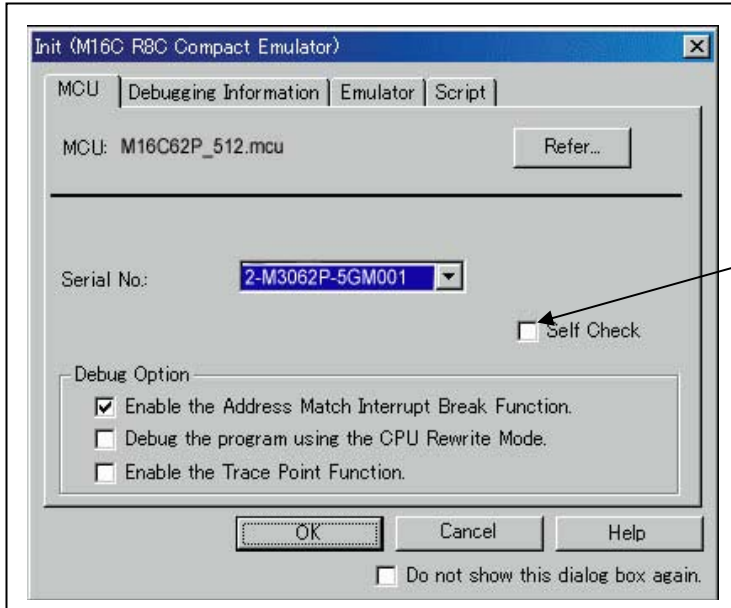
Executing the self-check

Enable this function when you want the emulator to be self-checked at startup. Be sure to select the check box only when you want the emulator to be self-checked at startup.

This function may be enabled in the following cases:

- When you are using the emulator you have just purchased

- When you successfully download the firmware, but fail to start up the emulator

- When you want to confirm whether the emulator is operating normally because, for example, the MCU runs out of control or something is wrong with the trace results

This function can be enabled only when you are starting up the emulator debugger.

(2) Debugging Information tab
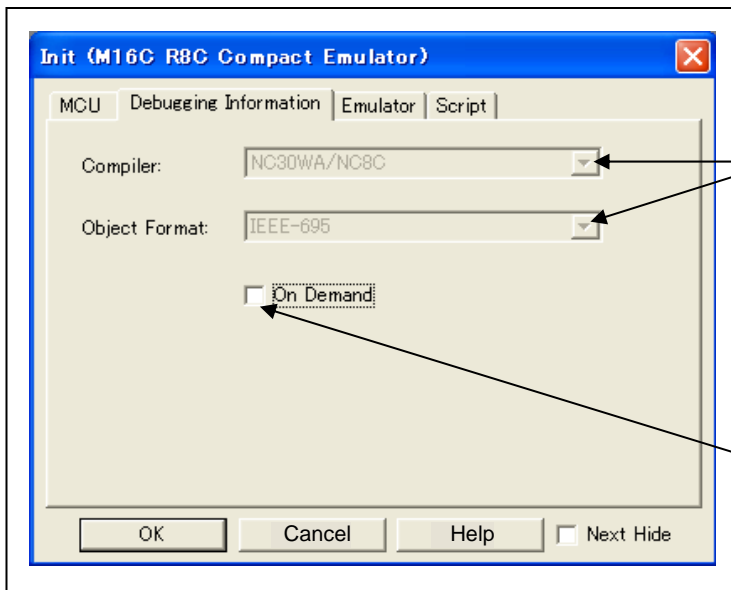
Specifying the compiler used and the object format

Displays the compiler used and its object format.

Please specify the compiler used and its format in the dialog opened by menu [Debug]->[Debug settings…].

Specifying the method for storing debug information

There are two methods for storing debug information: on-memory method and an on-demand method (by default, On Memory is selected).

When selecting the on demand method, check the [On Demand] check box.

- On Memory
  Debugging information is stored in the internal memory of your computer. This method is suitable when the load module (user program) size is small.

- On Demand
  Debugging information is stored in a reusable temporary file on the hard disk of your computer.
  Because the stored debugging information is reused, the next time you download the same load module it can be downloaded at high speed. This method is suitable when the load module (user program) size is large.

(3) Emulator tab
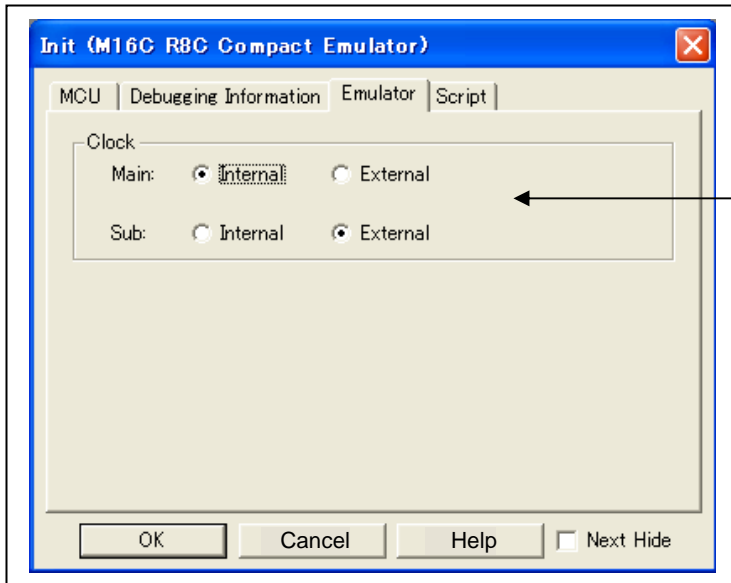
Specifying the target clock

Specify the clock sources supplied to the MCU (main clock and sub clock). Select the appropriate clock sources according to the clock used by your target MCU.

- Internal

  Emulator's internal clock

- External

  User system clock

The option you have specified here remains effective the next time you start up.

(4) Script tab
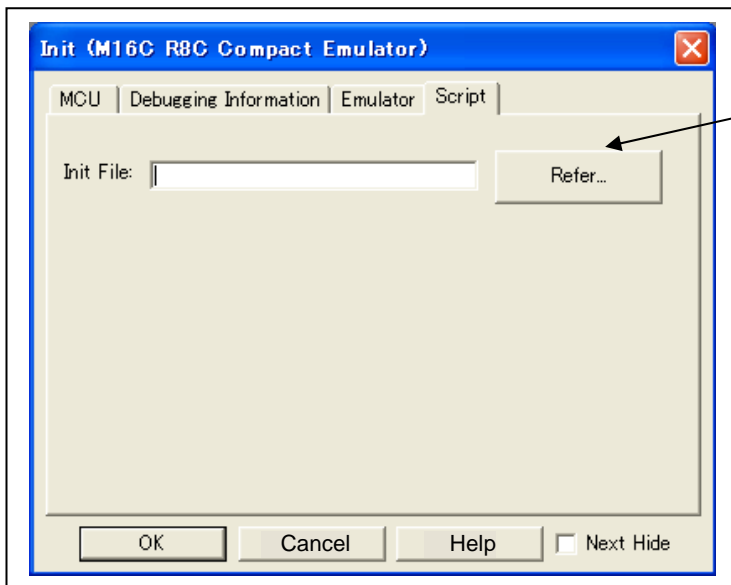
Automatically executing a script command

To automatically execute a script command when starting up the debugger, click the "Refer..." button and specify the script file to be executed.

Clicking the "Refer..." button brings up a file selection dialog box. The script file you have selected is displayed in the Init File: section of the dialog box shown here. If you do not want to automatically execute a script command, delete the character string displayed in the Init File: section of the dialog box.

What you specify here is reflected at only startup. If you specify back again in the Init dialog box after startup, whatever you specified has no effect. (Be sure to restart the emulator debugger.)

.

3.3 MCU Setting Dialog Box

The MCU Setting dialog box is used to set the user system information. It is displayed after you closed the Init dialog box.

When you have finished the settings of 1 to 3, click OK

(1) MCU tab

1. Specifying the processor mode
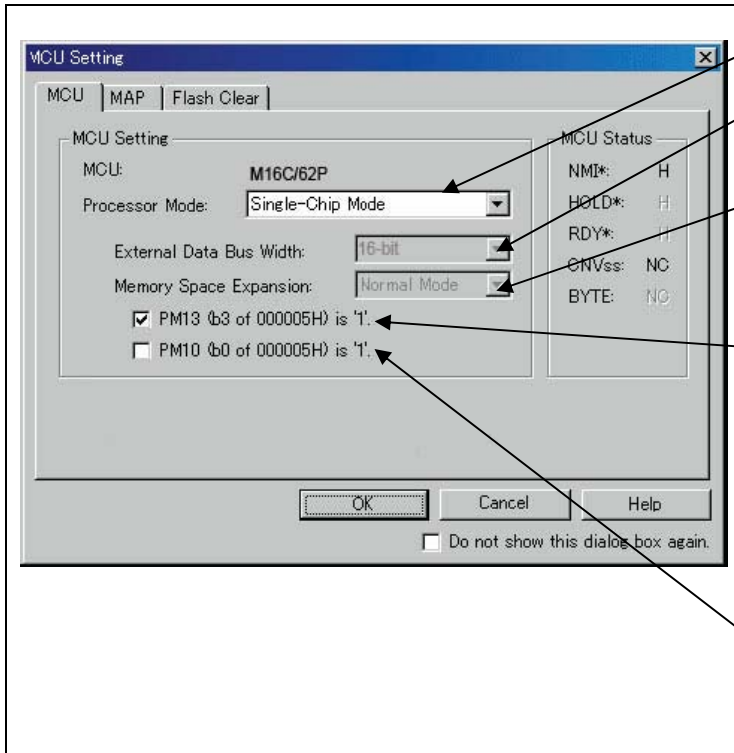
Specifying the processor mode
Select the appropriate processor mode that suits your system.

Specifying the bus width
When specifying memory expansion mode or microprocessor mode, select "16-bit" or "8-bit" for "External Data Bus Width".

Using or not using the memory space expansion function
Specifies whether or not to use the memory space expansion function when selecting memory expansion mode or microprocessor mode. When using the memory space expansion function, select "4MB Mode". When not, select "Normal Mode"

Using or not using the internal reserved area expansion
Specifies whether or not to expand the internal reserved area. Check the box if the internal reserved area expansion bit (PM13) is "1".

PM13 = 0:

Internal RAM area: 00400h--03FFFh

Internal ROM area: D0000h--FFFFFh

PM13 = 1:

Internal RAM area: 00400h--07FFFh
Internal ROM area: 80000h--FFFFFh

Specifying the PM10 (bit 0 of the address 00005h)
When using the CS2 Area Switch Bit (PM10) as "1", check this box. Specify the processor mode according to the user system.

*1 When the emulation memory board R0E33062PMSRC0 (not included) was connected, MAP tab is displayed.

IMPORTANT

Notes on Selecting a Processor Mode:
- When setting single-chip mode or memory expansion mode, the level of pin CNVSS of the MCU status should be "L".
- When setting microprocessor mode, the level of pin CNVSS of the MCU status should be "H".
  (This mode can be set only when using the emulation memory board R0E33062PMSRC0.)
- When setting memory expansion mode or microprocessor mode, pins RDY# and HOLD# of the user system should be "H".
- When the user system is not connected (targetless), following modes are available.
  (1) When not using the emulation memory board, single-chip mode and memory expansion mode are available.
  (2) When using the emulation memory board, all modes are available.

IMPORTANT

Notes on Debugging M16C/30P Group MCUs:

- When debugging the M16C/30P Group MCUs, be sure to deselect the box of the internal reserved area expansion bit (PM13), then start the emulator debugger.
- The M16C/62P Groups MCUs are used as an evaluation MCU for this product. An initial value of the internal reserved area expansion bit (PM13) for the M16C/62P Group is different from that of for the M16C/30P Group.
    - (1) An initial value of the internal reserved area expansion bit (PM13) for the M16C/62P Group: 1
    - (2) An initial value of the internal reserved area expansion bit (PM13) for the M16C/30P Group: 0
- When developing the program for the M16C/30P Group, be sure to set the initial value of the internal reserved area expansion bit (PM13) to "0" in the program.

2. Referring to the MCU Status
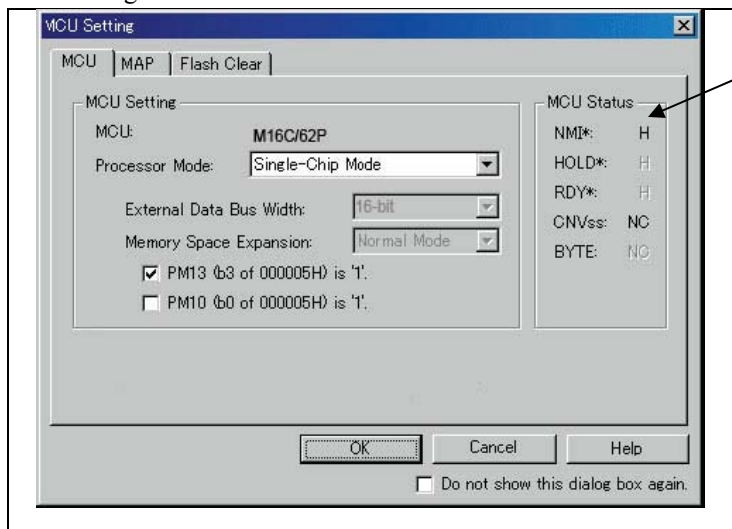
Referring to the MCU Status

It shows the status of each MCU pin. Check it to see if the MCU status matches the selected processor mode. "NC" means that the pin status is indeterminate.

*1 When the emulation memory board R0E33062PMSRC0 (not included) was connected, MAP tab is displayed.

IMPORTANT

Notes on Selecting a Processor Mode:

- The MCU status is shown in "MCU Status" of the MCU setting dialog box. Check that it matches to the processor mode to be set.
- When memory expansion mode or microprocessor mode is selected, check that the RDY# and HOLD# are "H" level. If they are "L" level, the emulator debugger shows an error.

(2) MAP tab
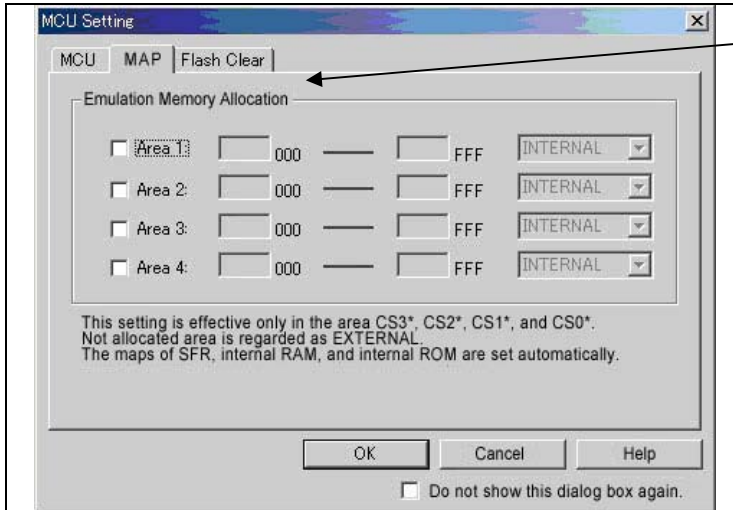
Specifying the emulation memory allocation

Sets the memory area assigned to the emulation memory by 4KB. Up to four areas can be set.

An area set to [INTERNAL] will be allocated to the emulation memory. An unchecked area or an unset area will be allocated to external area. The unselected areas and the areas which have nothing specified are allocated to external areas (on the user system).

The setting is effective only in the CS3#, CS2#, CS1# and CS0#. The maps of SFR, internal ROM and RAM are set automatically.

*1 When the emulation memory board R0E33062PMSRC0 (not included) was connected, MAP tab is displayed.

(3) Flash Clear tab
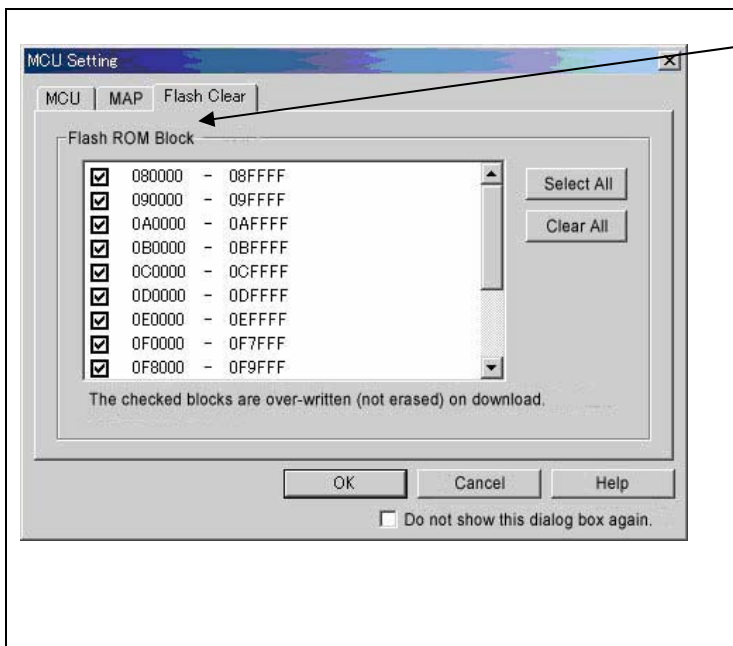
Setting to clear the MCU's internal flash ROM

Specify whether or not you want the MCU's internal flash ROM to be cleared when downloading the user program or data. (When cleared, the content of the flash ROM is initialized to FFh.) The MCU's internal flash ROM is listed in block units.

- Any block which has had its check box selected is not cleared when downloading. The memory content of this block remains intact unless overwritten by downloading.

- Any block which has had its check box deselected is cleared when downloading.

- Click the Select All button, and all blocks will be selected (marked by a check mark, so that none of the blocks is cleared when downloading).

- Click the Clear All button, and all blocks will be deselected (check marks removed, so that all of them are cleared when downloading).

The option you have specified here remains effective the next time you start up.

3.4 Checking Connections of the Emulator System
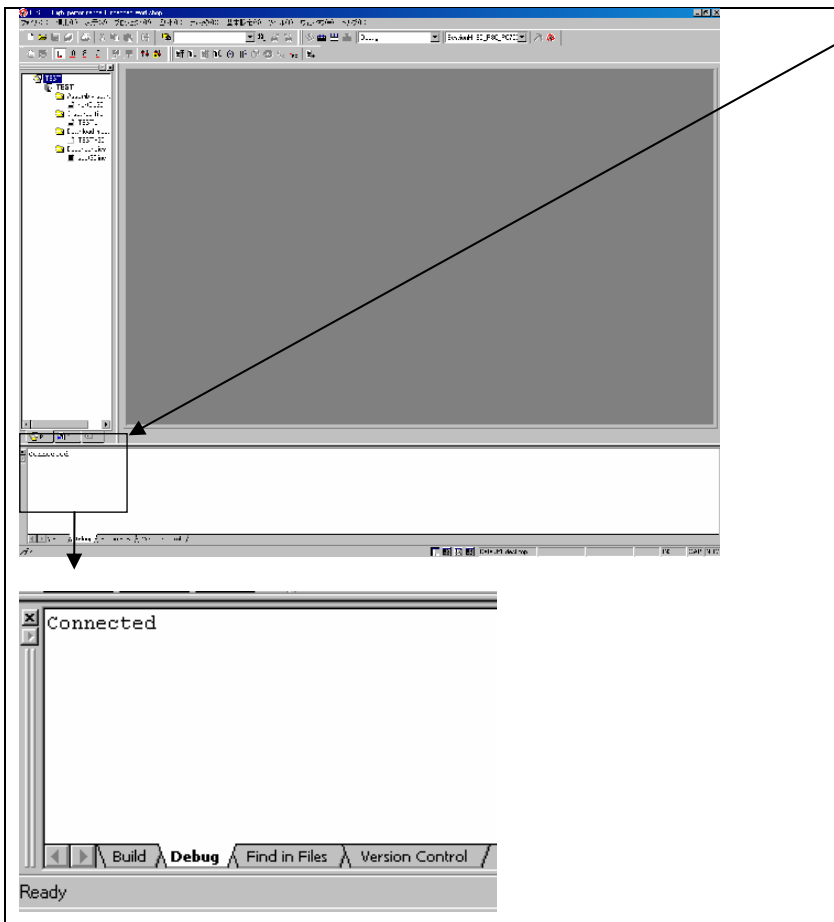
Checking connections of the emulator system

When the emulator debugger is connected correctly to the emulator after you have finished setting up the Init dialog box and the MCU Setting dialog box, you will see a message "Connected" displayed on the Debug tab of the Output window.

3.5 Program Execution

(1) Downloading the program

1. Downloading from the work space window
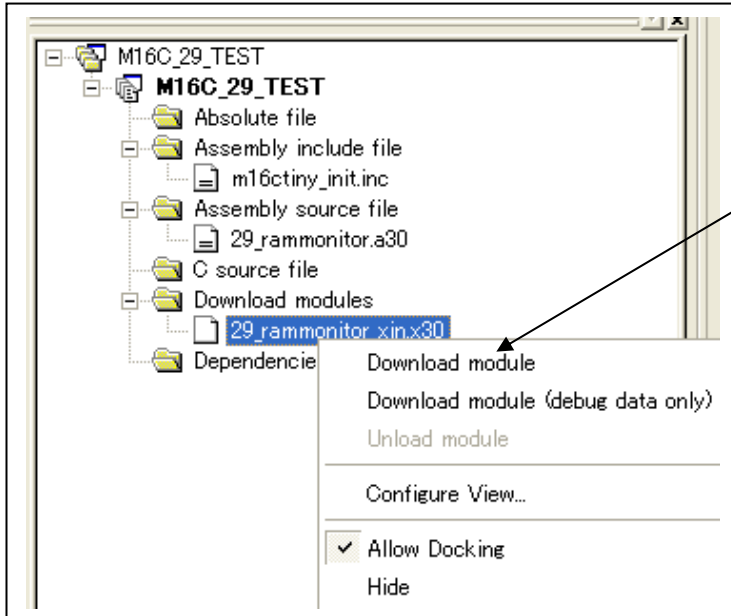
Downloading the program

Download the object program you want to debug.

Select Download from "xxx.x30" of "Download module".

Or you can select "Download module" from the "Debug" menu for the same effect.

2. Showing the source program
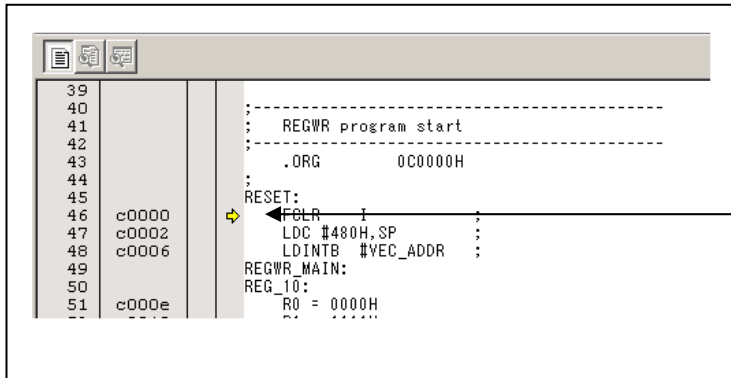
Editor (source) window

The editor (source) window is a window that always shows the content of the source file corresponding to the current position of the program counter (hereafter, PC).

The PC position is marked by a yellow arrow. Here, you can execute the program up to the cursor position, and set or clear software breakpoints.

Because the present emulator uses the MCU's internal flash ROM, the initial value for the ROM area data at the time of purchase is "FFh."

(2) Program execution

1 Resetting the user program
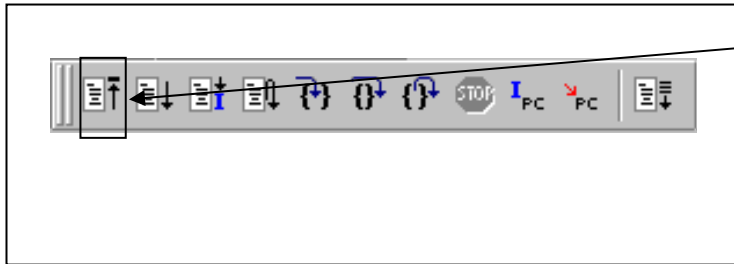
CPU reset

Resets the target MCU.

Or you can select "CPU Reset" from "Debug" menu for the same effect.

2 Executing the user program (Go)
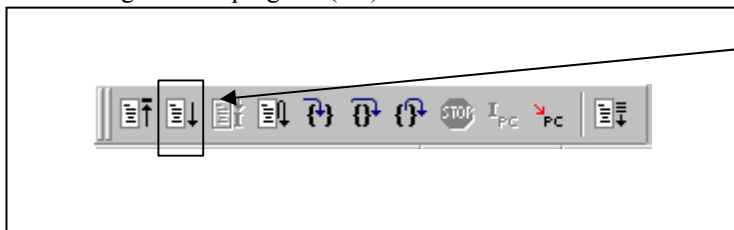
Go

Runs the program beginning with the current PC position.

Or you can select "Go" from "Debug" menu for the same effect.

3 Executing the user program (Go Free)
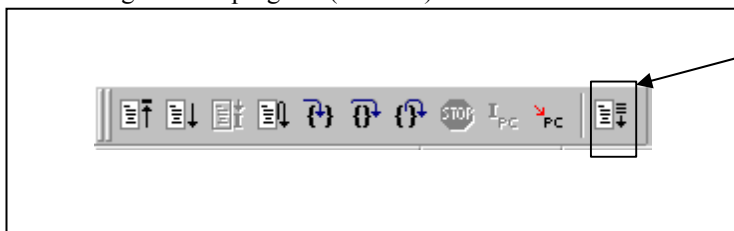
Go Free

Runs the program beginning with the current PC position. The software and hardware breaks set in it are ignored.

4 Executing the user program (Reset Go)
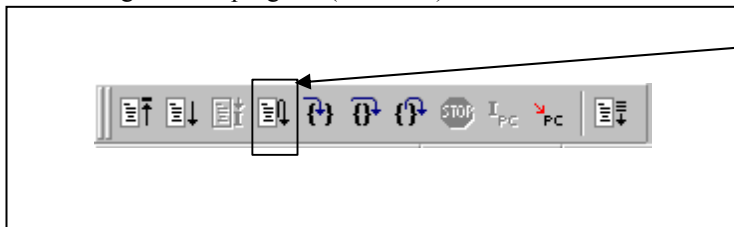
Reset Go

Runs the program after reset.

Or you can select "Reset Go" from "Debug" menu for the same effect.

5 Step execution of the user program
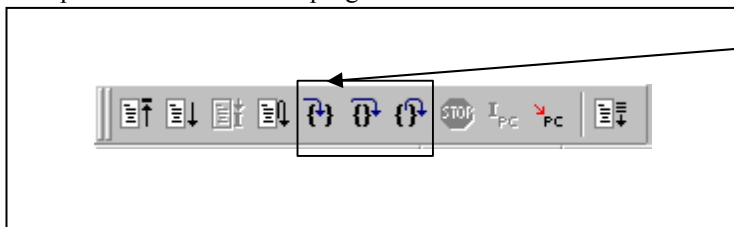
Step In

Single-steps the program executing each statement (including those in functions).

Step Over

Single-steps the program executing each function call as one step.

Step Out

Exists a function and stops at a statement in the program next to the one that called the function.

Or you can select "Step In" or other corresponding commands from "Debug" menu for the same effect.

6 Stopping the user program
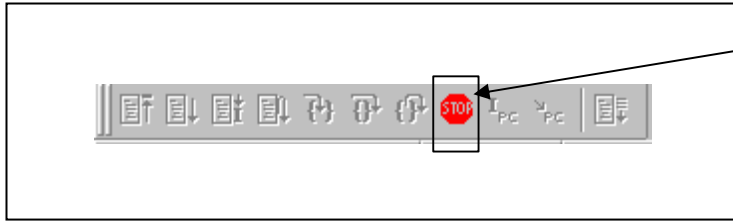
STOP

Stops the program.

Or you can select "Stop" from "Debug" menu for the same effect.

7 Editor (Source) window after you have stopped the user program

```
F0118 6A09              JEQ        F0122H
F011A 75A1              LDE.W      [A1A0],R1
F011C B2               INC.W      A0
F011D B2               INC.W      A0
F011E C923             ADD.W      #2H,R3
F0120 FEF3             JMP.B      F0114H
F0122 F3               RTS
F0123 D902      sw_wait  MOV.W      #0H,R2
F0125 77820F00         CMP.W      #000FH,R2
```

Editor (Source) window

The position at which the user program has stopped is marked by a yellow arrow.

(3) Setting breakpoints

1. Screen after breakpoint setup

Screen after breakpoint setup

There are three types of breakpoints as described below.

- Address match breakpoint

  This breakpoint can be set only when you chose to use the address match break function on the MCU tab of the Init dialog box.

  A breakpoint can be set or cleared by double-clicking in the address match breakpoint display area in the editor (source) window. (A blue circle is displayed at the setting line)

  Up to eight breakpoints can be set.

  The address match break causes the program to stop before executing the address at which a breakpoint is set.

- Software breakpoint

  A software breakpoint can be set or cleared by double-clicking the software breakpoint display area in the editor (source) window (A red circle is displayed at the setting line).

  This is rewritten to a break instruction, therefore, because of rewriting flash ROM, program execution starts with a delay of several seconds after setting ROM area.

  If the breakpoint you set is a software breakpoint, the program stops before executing the instruction at the set breakpoint.

- Hardware breakpoint

  A hardware breakpoint can be set or cleared in the hardware breakpoint setting window.

  If the breakpoint you set is a hardware breakpoint, the program stops after executing the instruction at the set breakpoint (after several cycles).

(4) Executing up to the cursor position

1. Setup procedure for running the program up to the cursor position
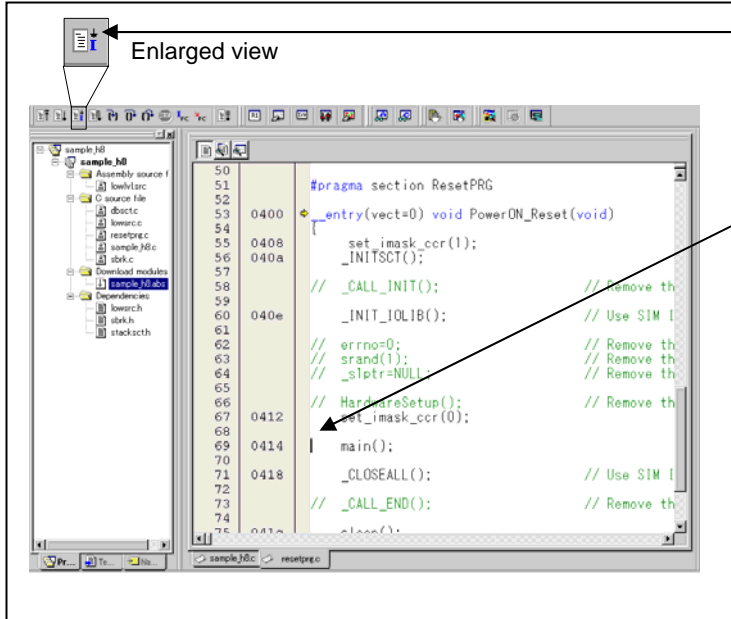
Setup procedure for running the program up to the cursor position

(1) Click the line in the editor (source) window that you want to be executed.

(2) Click the execution button to the cursor position.

Or you can select "Go to Cursor" from "Debug" menu for the same effect.

2. After the execution has finished
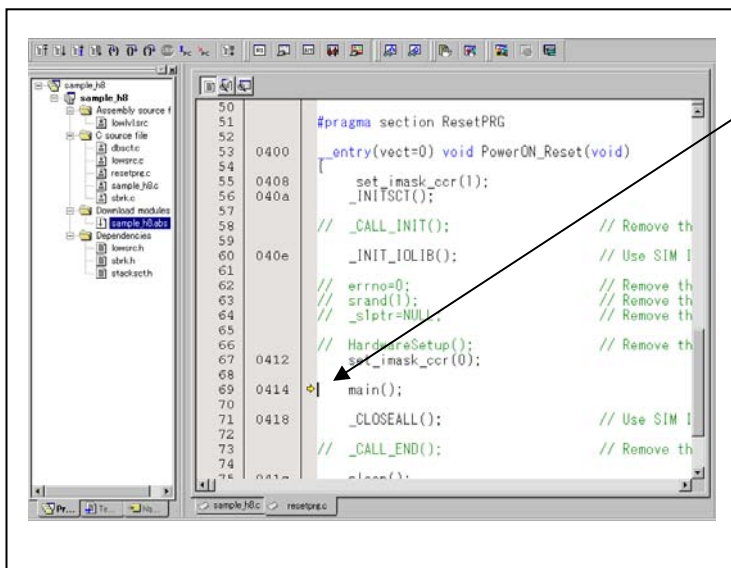
The cursor stops in the position where the come command was executed.
The statement specified with the come command is not executed.

3.6 Hardware Breakpoint Setting Window

(1) Breakpoint setup dialog box

1. Opening the hardware breakpoint setup dialog box
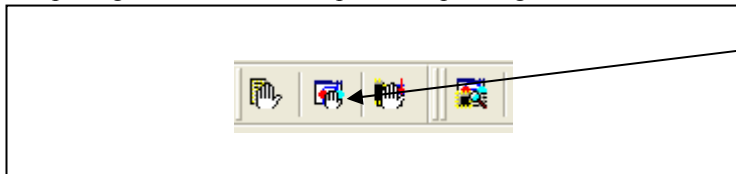
Hardware Break Point
Clicking this button opens the hardware breakpoint setup dialog box.

2. Hardware Break Point Setting Window in initial state
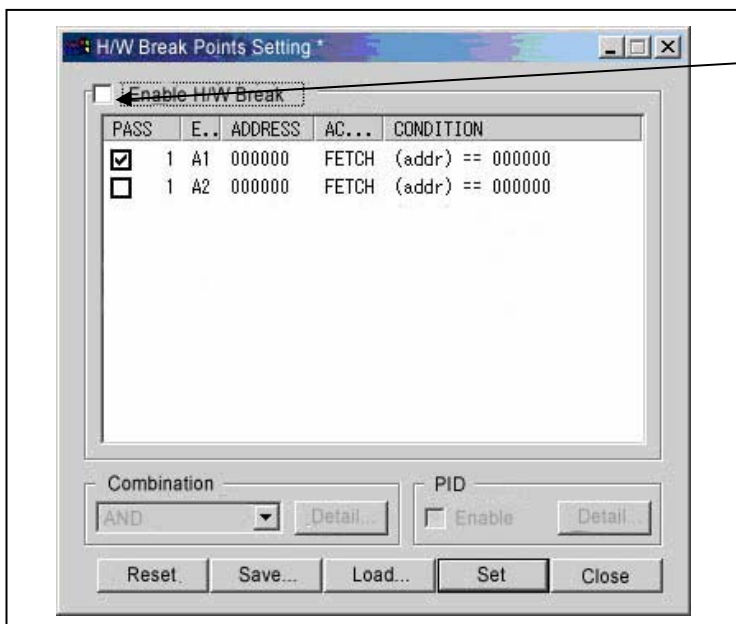
H/W breakpoint Setting Window in initial state
Select the "Enable H/W Break" check box, and this break function will be enabled, allowing you to set hardware breakpoints.

3. Opening the break event setting dialog box
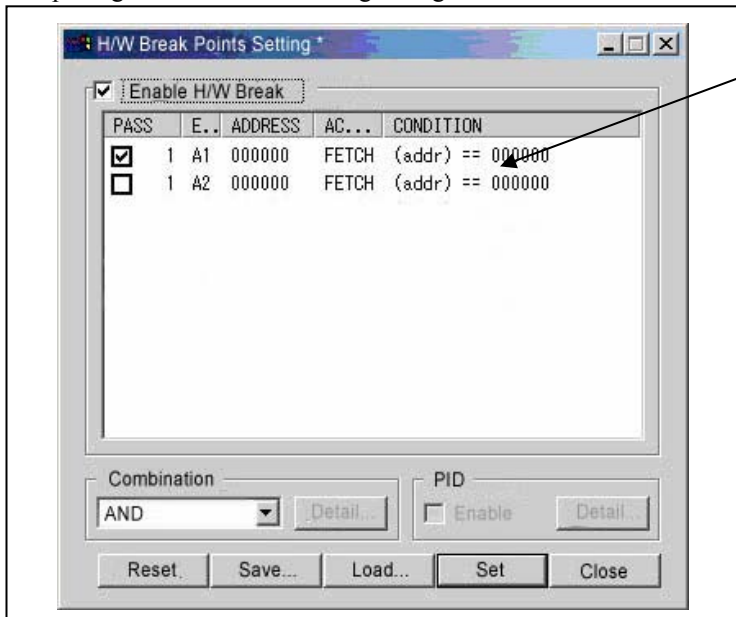
Setting Break Event
Click the event line at which you want set a break event.

4. Opening the break event setting dialog box
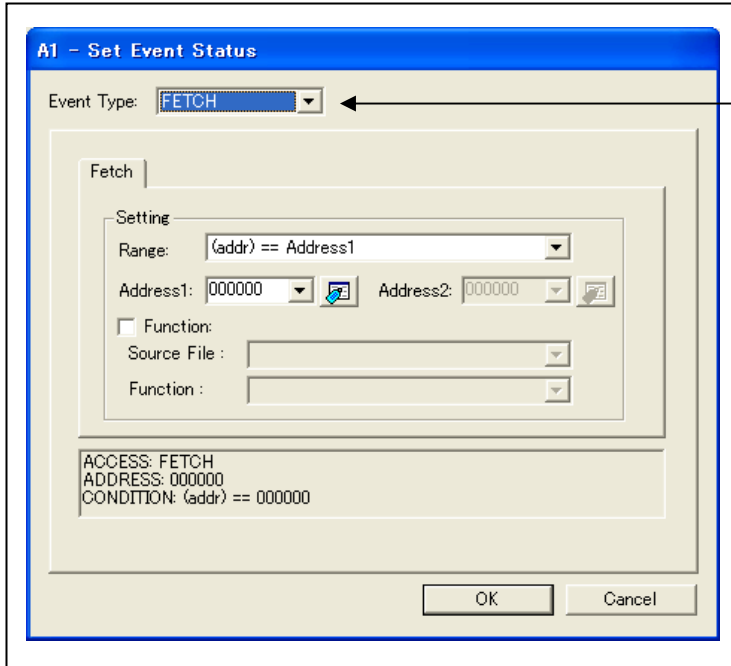
Specifying the event type

Select the event type that you want to set from the drop-down list.

- FETCH

Detects an instruction prefetch.

- DATA ACCESS

Detects a memory access.

- BIT SYMBOL

Detects a bit access.

(2) When FETCH is selected

1. Window for setting addresses
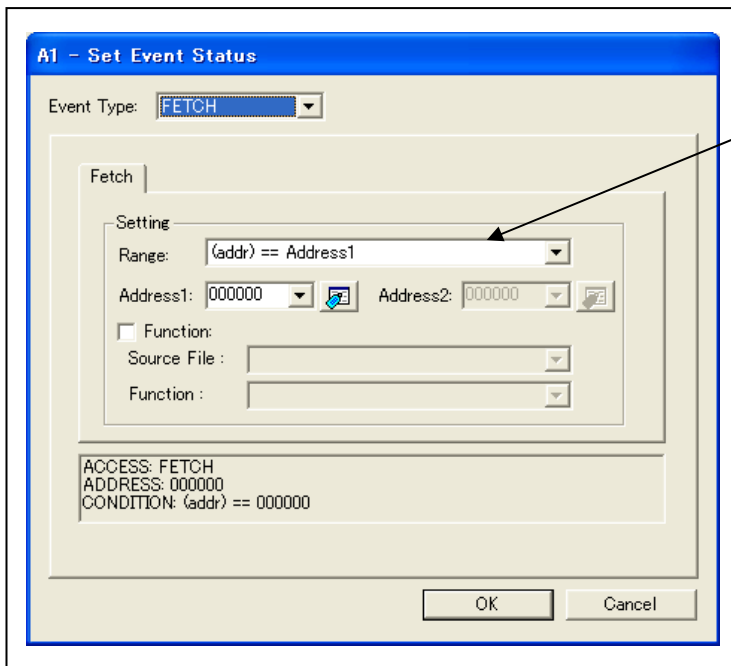
Setting the address

You can set eight conditions, e.g., a specified address, a specified address range, etc. When you have finished setting the address, click OK.

(3) When DATA ACCESS is selected

1. Window for setting the address
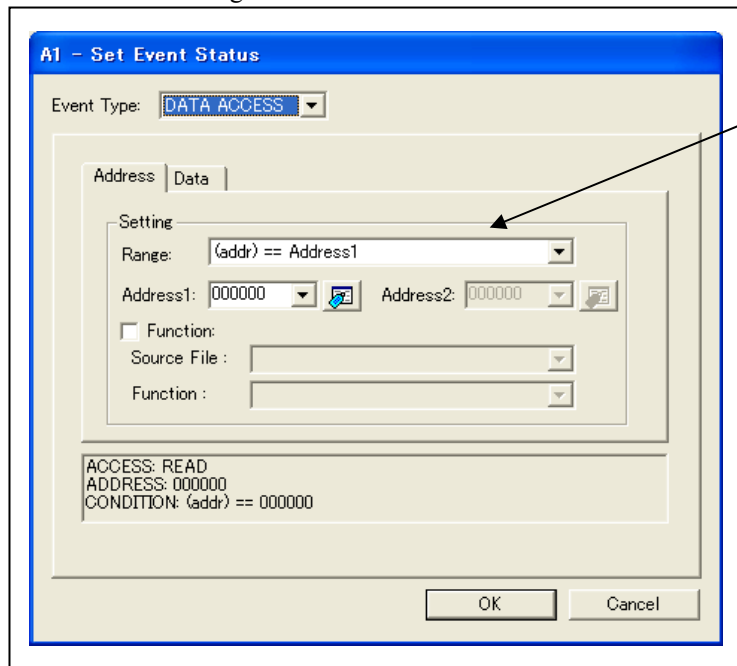
Setting the address

You can set eight conditions, e.g., a specified address, a specified address range, etc.

2. Window for setting data
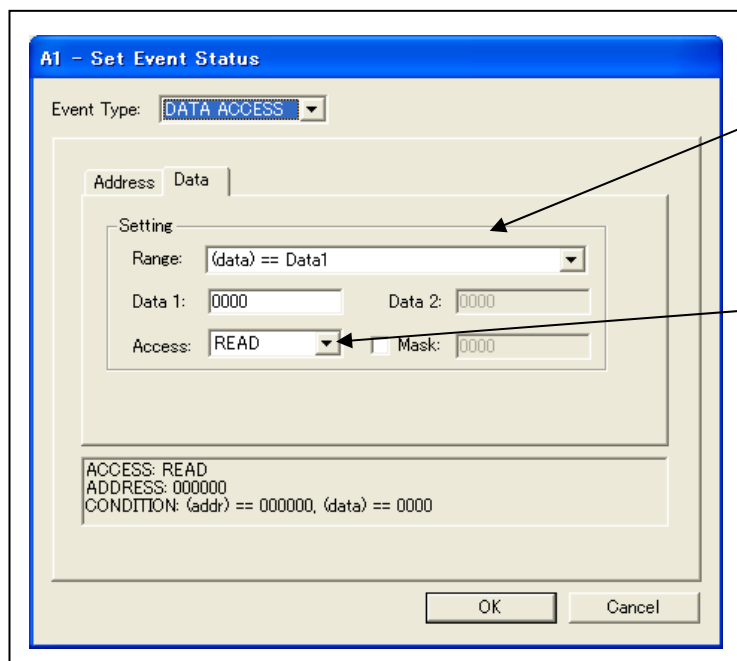
Setting data

You can set two conditions, e.g., specified data or not to compare data.

Setting the access condition

You can set three conditions, e.g., read, write, and read/write. When you have finished setting the data and access condition, click OK.

3. Example Data Settings

Event setting for even-address word access

MOV.W   R0,512h(R0=0203h)

Cycle	Label	Address	Data	BUS	BHE	BIU	R/W	RWT	CPU
-00059		000512	0203	16b	0	DW	W	0	RW

High-order and low-order data effective

Setting a break event

A1

Address 1   : 000512

Data 1   : 0203

MASK   : FFFF

Access   : WRITE

Event setting for odd-address word access

MOV.W   R0,519h(R0=0203h)

Cycle	Label	Address	Data	BUS	BHE	BIU	R/W	RWT	CPU
-00026		000519	0302	16b	0	DW	W	0	CW
-00025		00051A	0302	16b	1	DW	W	0	--

Odd-address high-order data effective

Even-address low-order data effective

Setting a break event (using 2 events)

A1   **A2**

Address 1   : 000519   Address 1   : 00051A

Data 1   : 0300   Data 1   : 0002

MASK   : FF00   MASK   : 00FF

Access   : WRITE   Access   : WRITE

Set the combinatorial events to AND.

Event setting for even-address byte access

MOV.B   R0L,516h(R0L=03h)

Cycle	Label	Address	Data	BUS	BHE	BIU	R/W	RWT	CPU
-00033		000516	0503	16b	1	DB	W	0	RW

Low-order data effective

Setting a break event

A1

Address 1   : 000516

Data 1   : 0003

MASK   : 00FF

Access   : WRITE

Event setting for odd-address byte access

MOV.B   R0L,515h(R0L=03h)

Cycle	Label	Address	Data	BUS	BHE	BIU	R/W	RWT	CPU
-00046		000515	0315	16b	0	DB	W	0	RW

High-order data effective

Setting a break event

A1

Address 1   : 000515

Data 1   : 0300

MASK   : FF00

Access   : WRITE

(4) Setting the hardware breakpoint combinatorial condition

1. Window for setting the combinatorial condition
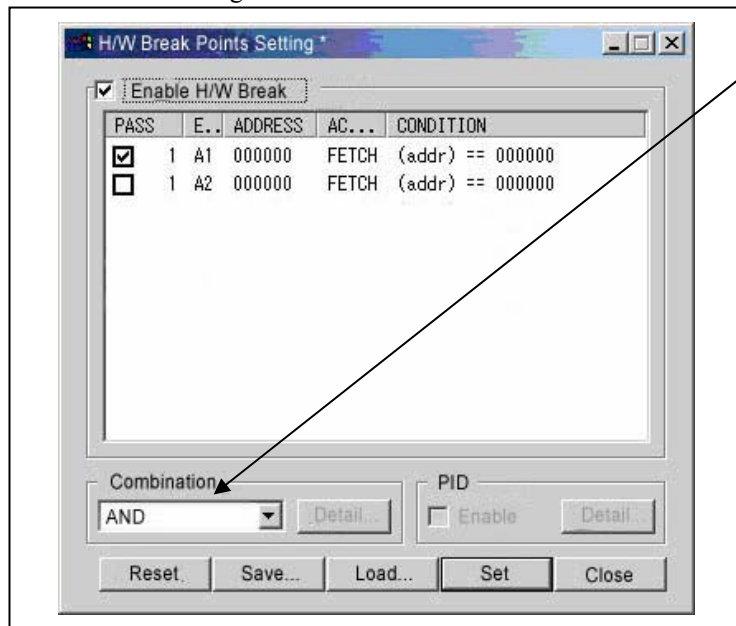
Setting the combinatorial condition

There are following three conditions that you can choose for the combinatorial condition.

- OR

The program breaks when one of the specified events occurs.

- AND

The program breaks when all of the specified events occur.

- AND (Same Time)

The program breaks when the specified events occur at the same time.

For each event, a pass count (number of passing) is specifiable (1--255). When "AND" (same time) is specified for Combination, you can not specify the pass count (fixed to one).

When you have finished setting the combinatorial event condition, click the "Set" button.

3.7 Trace Window

(1) Trace window

1. Opening the trace window
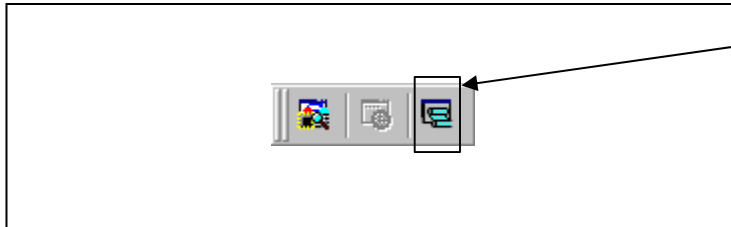
Trace window

Clicking this button opens the trace window.

Or you can select "Trace" from "Trace" of "Display" menu for the same effect.

2. Trace window
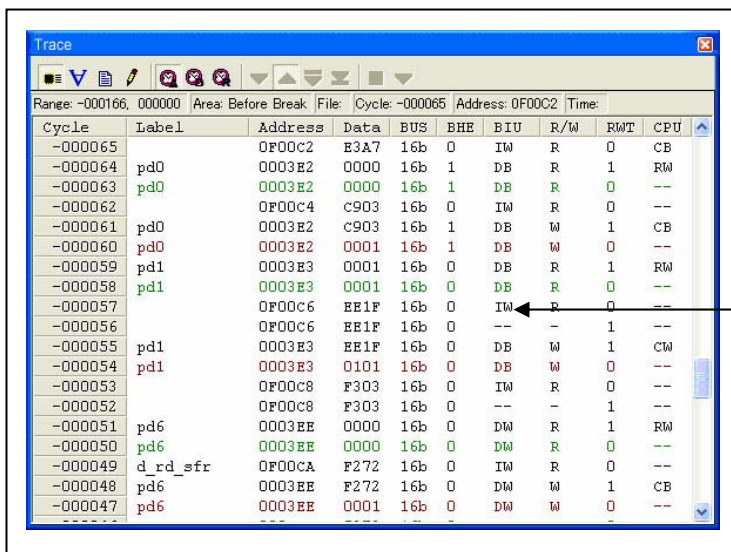
Trace window

The trace window is used to show the results of real-time trace measurements. It has the following three display modes:

- Bus mode
  Bus information per cycle can be inspected. The contents are displayed in order of execution paths.

- Disassemble mode
  The execution paths of the executed instructions can be inspected. The contents are displayed in order of execution paths.

- Source mode
  The execution paths of the source program can be inspected.
  Operating buttons on the tool bar can reference the execution paths.

The trace window shows the measurement result when a real-time trace measurement has finished. The trace window remains blank until the real-time trace measurement in progress finishes.

3. Trace window (bus display)

4. Trace window (disassemble display)
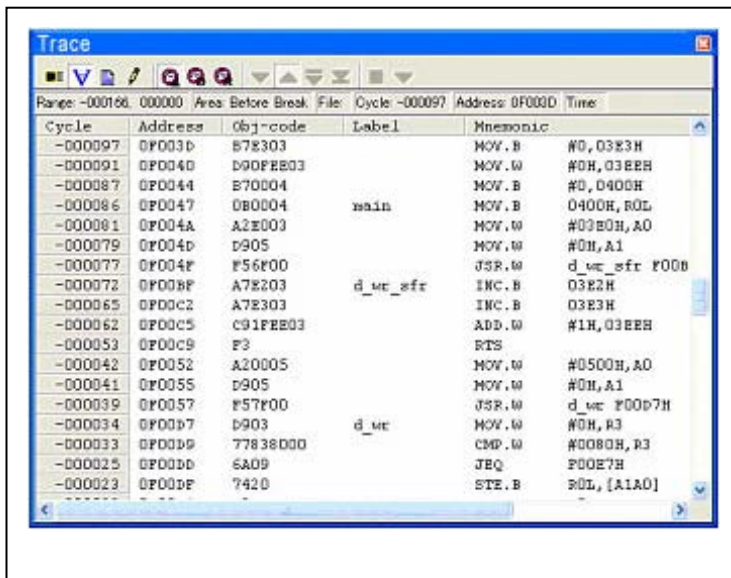
5. Trace window (source display)

Explanation of the trace window (bus display)

The following explains the displayed contents, from left to right.

- Cycle

  Shows trace cycles. Double-click here to bring up a dialog box to change the displayed cycle.

- Label

  Shows labels corresponding to address bus information. Double-click here to bring up a dialog box to search for addresses.

- Address

  Shows the status of the address bus.

- Data

  Shows the status of the data bus.

- BUS

  Shows the width of the external data bus. In the present emulator, "16b" for 16 bits wide bus and "8b" for 8 bits wide bus are displayed.

- BHE

  Shows the status (0 or 1) of the BHE (Byte High Enable) signal. If this signal = 0, the odd-address data is valid.

- BIU

  Shows the status between the BIU (Bus Interface Unit) and memory or I/O.

Symbol	Status
–	Non-active
DMA	Data access by other than the CPU, e.g., by DMA
INT	Interrupt acknowledge cycle start
IB	Instruction code read by the CPU (in bytes)
DB	Data access by the CPU (in bytes)
IW	Instruction code read by the CPU (in words)
DW	Data access by the CPU (in words)

- R/W

  Shows the status of the data bus.

  Displayed as "R" for Read, "W" for Write, and "–" for no access.

- RWT

  This is the signal to indicate a valid bus cycle. When valid, RWT = 0. The Address, Data, and the BIU signals are effective when this signal is 0.

- CPU

  Shows the status between the CPU and BIU (Bus Interface Unit).

Symbol	Status
–	Non-active
CB	Op-code read (in bytes)
RB	Operand read (in bytes)
QC	Instruction queue buffer clear
CW	Op-code read (in words)
RW	Operand read (in words)

(2) Suspending and resuming trace measurement

1. Suspending trace measurement
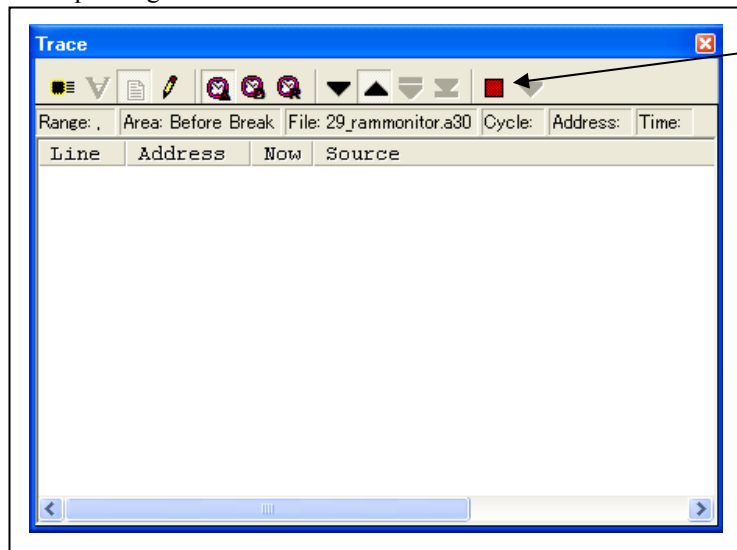
Suspend

Click this toolbar button to suspend the trace measurement in progress.

2. Resuming trace measurement
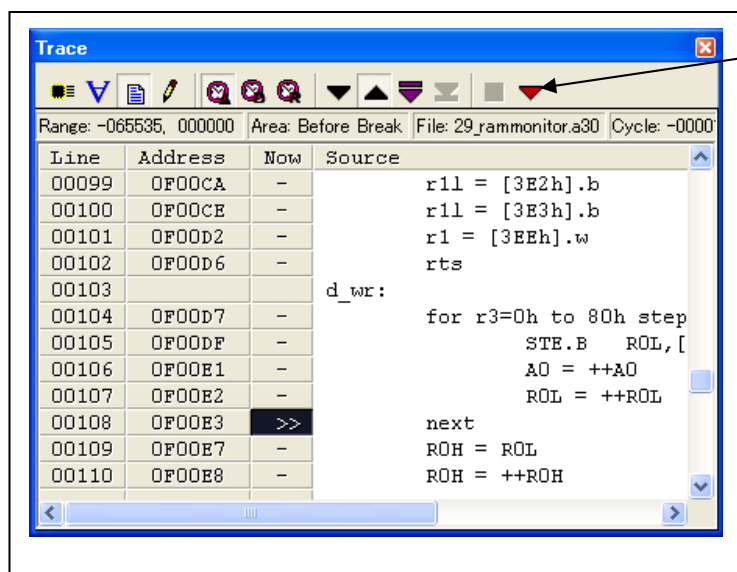
Re-Start

Click this toolbar button to resume the trace measurement in progress.

(3) Trace point setup dialog box

1. Opening the trace point setup dialog box

Trace Point

Clicking this toolbar button opens the trace point setting window.

2. Trace Point Setting Window in initial state
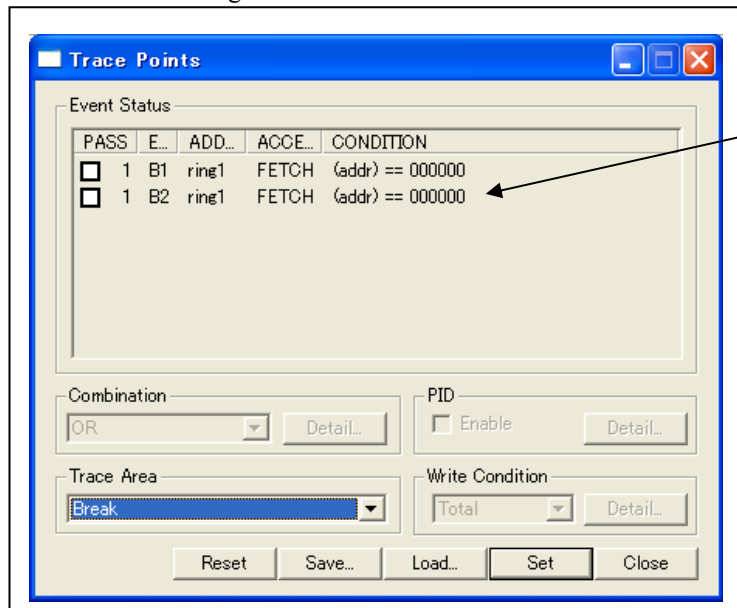
Trace Point Setting Window in initial state

Be sure to select "Enable the trace point" in the Init dialog box before you set up in this window. Here, you can set events in the same way as for the hardware breakpoints.

3. Specifying a trace area
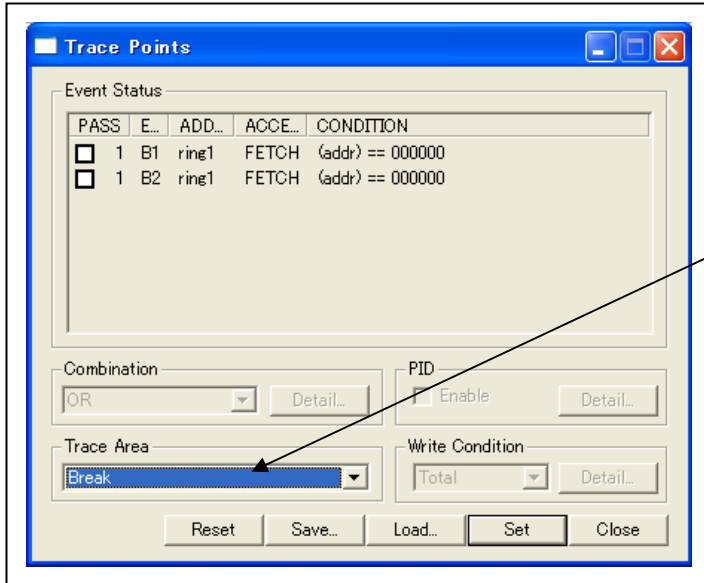
Specifying a trace area

You can specify a trace range for the trace event.

- Break
  64K cycles of instruction execution before the user program stopped is recorded.
- Before
  64K cycles of instruction execution before a trace point condition was met is recorded.
- About
  32K cycles of instruction execution before and after a trace point condition was met is recorded.
- After
  64K cycles of instruction execution after a trace point condition was met is recorded.
- Full
  64K cycles of instruction execution after a trace began is recorded.

4. Setting the trace write condition
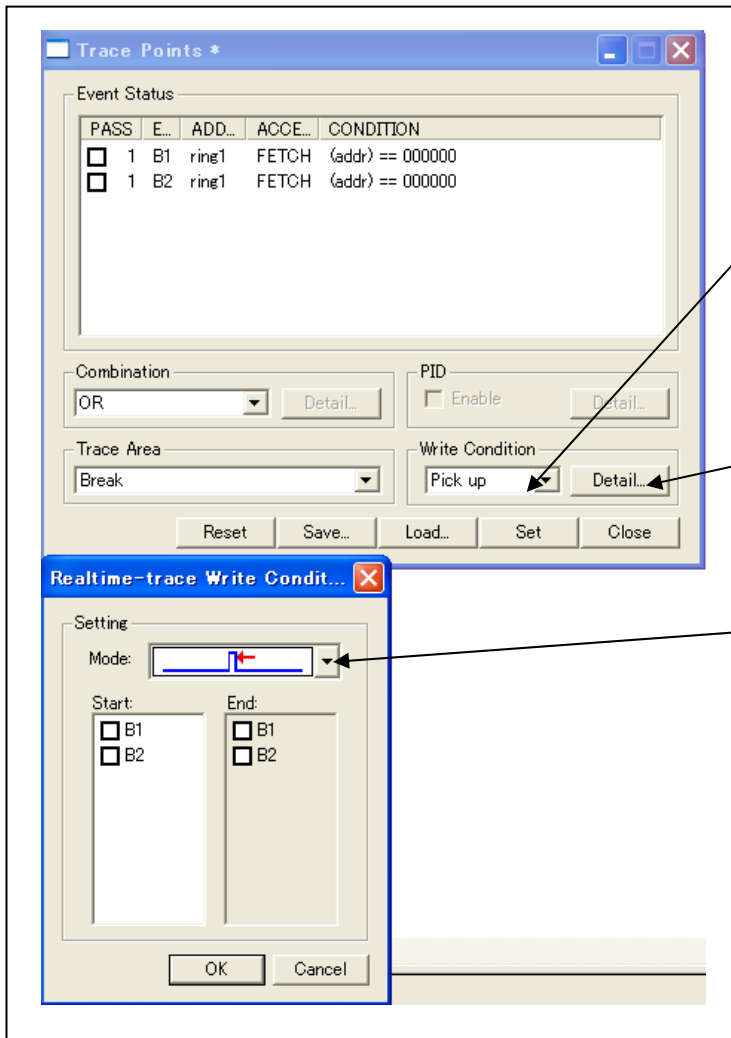
Setting the trace write condition

You can specify a condition for the cycles to be written into the trace memory.

- Total
  All cycles are written into memory.
- Pick up
  Only the cycles in which the specified condition was met are written into memory.
- Exclude
  Only the cycles in which the specified condition was not met are written into memory.

When you have finished setting the trace write condition, click this button. The Realtime-trace Write Condition dialog box shown below will appear.

Realtime-trace Write Condition

Only the cycle in which the specified Start event occurred

A range of cycles from when the specified Start event occurred to when the specified Start event became nonexistent

A range of cycles from when the specified Start event occurred to when the specified End event occurred

3.8 RAM Monitor Window

(1) RAM monitor window

1 Opening the RAM monitor window
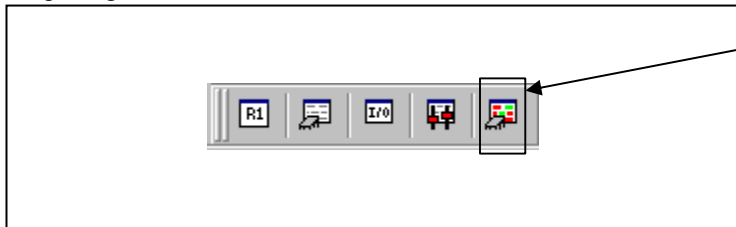
RAM monitor

Clicking this button opens the RAM monitor window.

Or you can select "RAM monitor" from "CPU" of "Display" menu for the same effect.

2. RAM monitor window
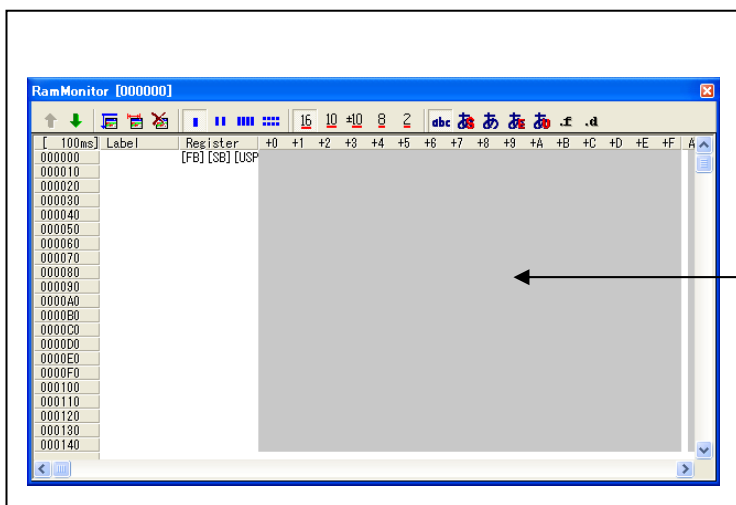
RAM monitor window

This window shows changes of memory contents while the user program is executed. This is accomplished by using the real-time RAM monitor function, and the memory contents corresponding to the RAM monitor area are displayed in dump form. The memory contents displayed here are updated at given intervals (by default, every 100 ms) during user program execution.

(2) RAM monitor area setting window

1. Opening RAM monitor area setting window
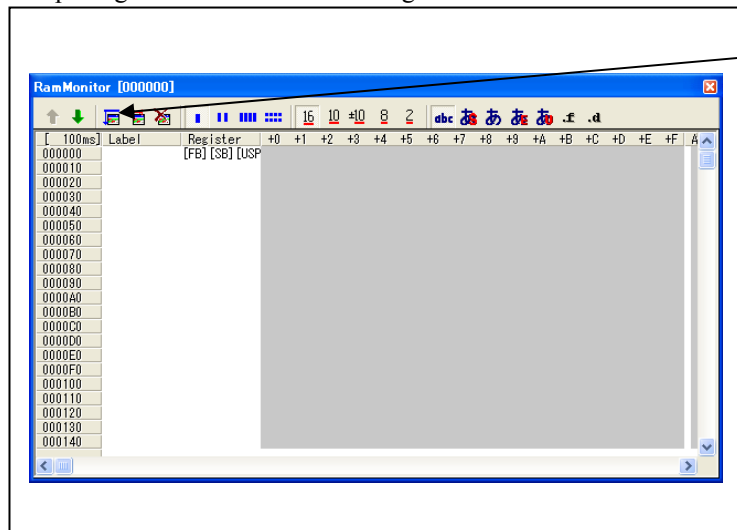
RAM monitor area setting
Clicking this toolbar button opens the RAM monitor area setting window.

2. RAM monitor area setting window in initial state
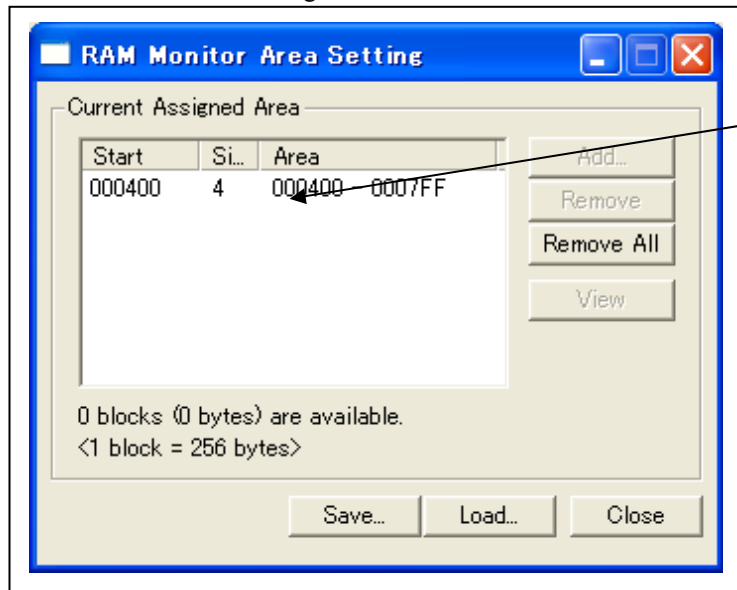
RAM Monitor Area Setting Window in initial state
By default, the monitor area is set to 000400h through 0007FFh. To change it, click the "Add…" or "Remove" button.

3. RAM monitor area setting dialog box
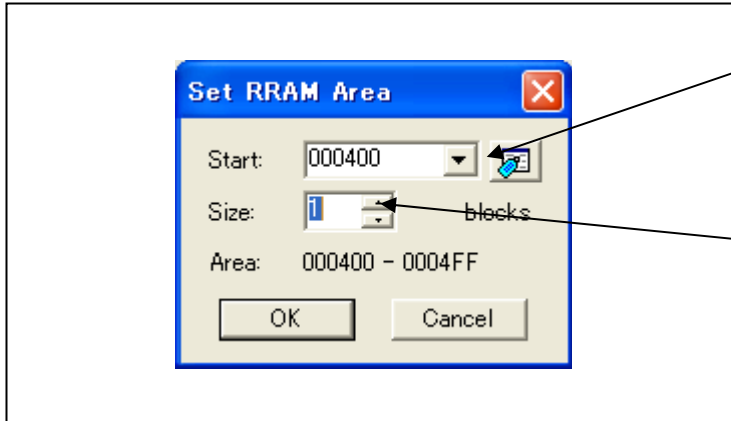
Specifying the start address

You can set the start address of the RAM area to be monitored.

Specifying the size

You can set the size to be monitored by specifying the number of blocks from the start address. One block is 256 bytes in size.

4. RAM monitor area setting dialog box when RAM monitor area is changed from 400h to 1 block
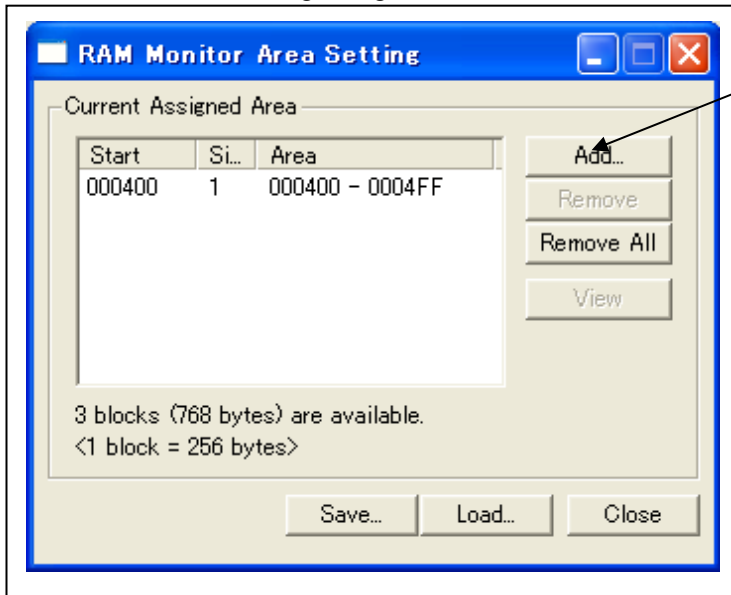
Specifying the start address

You can set the start address of the RAM area to be monitored. To add a RAM monitor area, click the "Add..." button. The RAM Monitor Area Setting Window will be displayed.

5. RAM monitor area setting dialog box
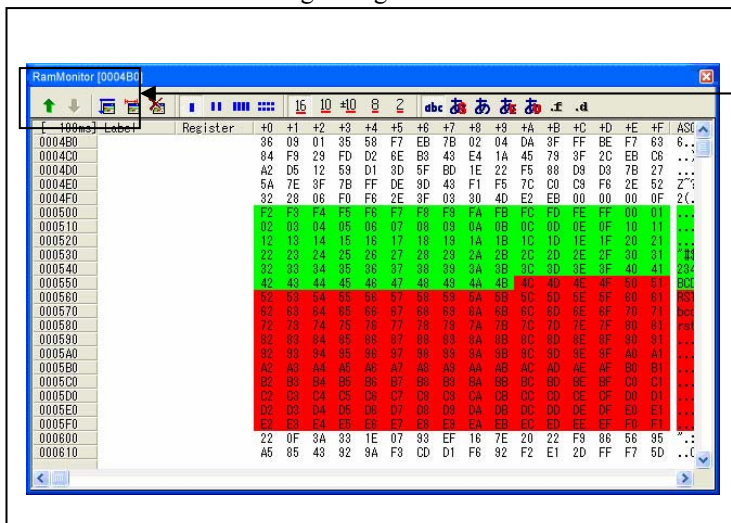
Changing the RAM monitor display area

You can change the manner in which the RAM monitor area you have set in the above dialog box is displayed.

- ↑   Shows the blocks at the preceding addresses.
- ↓   Shows the blocks at the following addresses.

The background colors of the data display and the code display sections change with the access attribute as described below.

- Green   Addresses accessed for read
- Red   Addresses accessed for write
- White   Addresses not accessed

The background colors can be changed as necessary.

4. Hardware Specifications

This chapter describes specifications of this product.

4.1 Target MCU Specifications

Table 4.1 lists the specifications of target MCUs which can be debugged with this product.

Table 4.1 Specifications of target MCUs for the M3062PT3-CPE

Item	Description
Applicable MCU	M16C/60 Series M16C/62P and M16C/30 Series M16C/30P Groups
Evaluation MCU	M30627FJPGP, M30627FHPGP ROM size : 512KB＋4KB , RAM size : 31KB
Applicable MCU mode	Single-chip mode Memory expansion mode (NORMAL, 4MB) Microprocessor mode (NORMAL, 4MB) *

Maximum ROM/RAM capacity	1. Internal flash ROM: 512 KB + 4KB
	   0F000h--0FFFFh, 80000h--FFFFFh
	2. Internal RAM: 31KB
	   00400h--07FFFh

Power supply voltage	VCC1＝VCC2: 2.7--5.5[V] VCC1 > VCC2: VCC1 = 5.0 ± 0.2V, 2.7[V] ≤ VCC2 < VCC1
Operating voltage/frequency	Power supply voltage 3.0--5.5V: 24MHz (when using PLL) Power supply voltage 2.7V: 10MHz

* Emulation memory board R0E33062PMSRC0 (not included) is necessary for a microprocessor mode and emulation memory function support.

4.2 Access Timing

Because this product emulates some ports, access timings are different from those of the actual MCUs. Chapters 4.2.1 and 4.2.2 describe the access timing using this product.

4.2.1 Operation Timing of Memory Expansion Mode and Microprocessor Mode (VCC1=VCC2=5V)

(1) Separate Bus Timing

Table 4.2 and Figure 4.1 show the bus timing in memory expansion mode and microprocessor mode (3 wait, accessing external area).

Table 4.2 Memory expansion mode and microprocessor mode (3 wait, accessing external area)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
td(BCLK-AD)	Address output delay time		25		28
th(BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
th(RD-AD)	Address output hold time (RD standard)	0		-4	
th(WR-AD)	Address output hold time (WR standard)	(*2)		(*3)	
td(BCLK-CS)	Chip-select output delay time		25		See left
th(BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
td(BCLK-ALE)	ALE signal output delay time		25		See left
th(BCLK-ALE)	ALE signal output hold time	-4		See left	
td(BCLK-RD)	RD signal output delay time		25		See left
th(BCLK-RD)	RD signal output hold time	0		See left	
td(BCLK-WR)	WR signal output delay time		25		28
th(BCLK-WR)	WR signal output hold time	0		See left	
td(BCLK-DB)	Data output delay time (BCLK standard)		40		See left
th(BCLK-DB)	Data output hold time (BCLK standard)	4		See left	
td(DB-WR)	Data output delay time (WR standard)	(*1)		See left	
th(WR-DB)	Data output hold time (WR standard)	(*2)		(*3)	

*1 Calculated by the following formula according to the frequency of BCLK.

$$\frac{(n-0.5)\times 10^9}{f(BCLK)} - 40 \quad \text{[ns]} \quad \text{n: "3" for 3 wait}$$

*2 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5\times 10^9}{f(BCLK)} \quad \text{[ns]}$$

*3 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5\times 10^9}{f(BCLK)} - 8 \quad \text{[ns]}$$

Figure 4.1 Memory expansion mode and microprocessor mode (3 wait, accessing external area)

(2) Multiplex Bus Timing

Table 4.3 and Figure 4.2 show the bus timing in memory expansion mode and microprocessor mode (2 wait, accessing external area, using multiplex bus).

Table 4.3 Memory expansion mode and microprocessor mode (2 wait, accessing external area, using multiplex bus)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
td(BCLK-AD)	Address output delay time		25		28
th(BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
th(RD-AD)	Address output hold time (RD standard)	(*1)		(*4)	
th(WR-AD)	Address output hold time (WR standard)	(*1)		(*4)	
td(BCLK-CS)	Chip-select output delay time		25		See left
th(BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
th(RD-CS)	Chip-select output hold time (RD standard)	(*1)		(*4)	
th(WR-CS)	Chip-select output hold time (WR standard)	(*1)		(*4)	
td(BCLK-RD)	RD signal output delay time		25		See left
th(BCLK-RD)	RD signal output hold time	0		See left	
td(BCLK-WR)	WR signal output delay time		25		28
th(BCLK-WR)	WR signal output hold time	0		See left	
td(BCLK-DB)	Data output delay time (BCLK standard)		40		See left
th(BCLK-DB)	Data output hold time (BCLK standard)	4		See left	
td(DB-WR)	Data output delay time (WR standard)	(*2)		See left	
th(WR-DB)	Data output hold time (WR standard)	(*1)		(*4)	
td(BCLK-ALE)	ALE output delay time (BCLK standard)		25		See left
th(BCLK-ALE)	ALE output hold time (BCLK standard)	-4		See left	
td(AD-ALE)	ALE output delay time (Address standard)	(*3)		See left	
th(ALE-AD)	ALE output hold time (Address standard)	30		See left	
td(AD-RD)	After address RD signal output delay time	0		See left	
td(AD-WR)	After address WR signal output delay time	0		See left	
tdz(RD-AD)	Address output floating start time		8		15

*1 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5 \times 10^9}{f(BCLK)} \quad [ns]$$

*2 Calculated by the following formula according to the frequency of BCLK.

$$\frac{(n - 0.5) \times 10^9}{f(BCLK)} - 40 \quad [ns] \quad n: \text{"2" for 2 wait}$$

*3 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5 \times 10^9}{f(BCLK)} - 25 \quad [ns]$$

*4 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5 \times 10^9}{f(BCLK)} - 12 \quad [ns]$$

Figure 4.2 Memory expansion mode and microprocessor mode (2 wait, accessing external area, using multiplex bus)

(3) Timing Requirements

Tables 4.4 and Figure 4.3 list the timing requirements in memory expansion mode and microprocessor mode.

Table 4.4 Timing requirements

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
tsu(DB-RD)	Data input setup time	40		55	
tsu(RDY-BCLK)	RDY# input setup time	30		45	
tsu(HOLD-BCLK)	HOLD# input setup time	40		55	
th(RD-DB)	Data input hold time	0		See left	
th(BCLK-RDY)	RDY# input hold time	0		See left	
th(BCLK-HOLD)	HOLD# input hold time	0		See left	
td(BCLK-HLDA)	HLDA# output delay time		40		See left
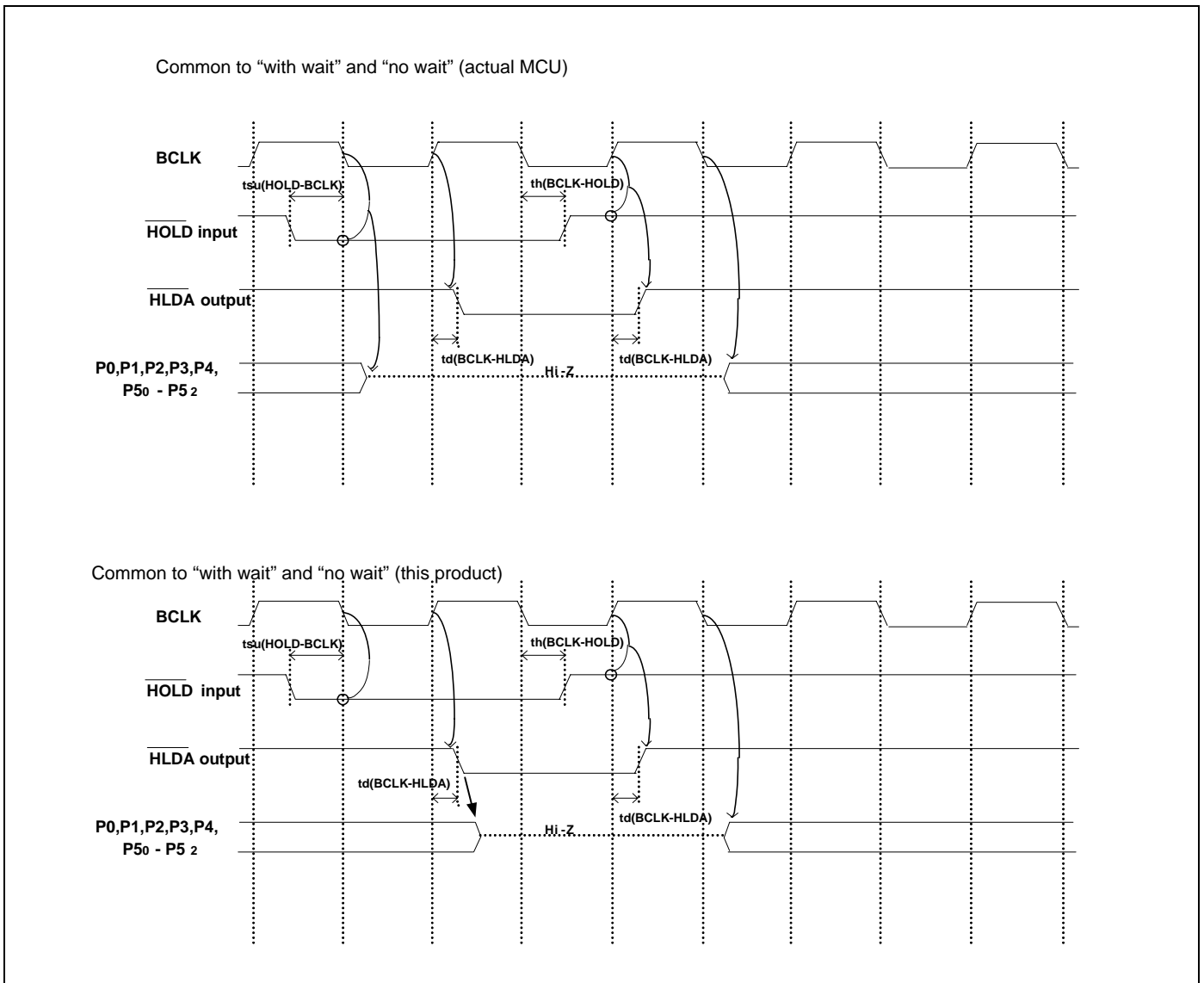
Figure 4.3 Timing requirements

* Compared with an actual MCU, this product enters high-impedance state after a 0.5 cycle delay.

RENESAS

4.2.2 Operation Timing of Memory Expansion Mode and Microprocessor Mode (VCC1=VCC2=3V)

(1) Separate Bus Timing

Table 4.5 and Figure 4.4 show the bus timing in memory expansion mode and microprocessor mode (3 wait, accessing external area).

Table 4.5 Memory expansion mode and microprocessor mode (3 wait, accessing external area)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
td(BCLK-AD)	Address output delay time		30		35
th(BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
th(RD-AD)	Address output hold time (RD standard)	0		-6	
th(WR-AD)	Address output hold time (WR standard)	(*2)		(*3)	
td(BCLK-CS)	Chip-select output delay time		30		See left
th(BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
td(BCLK-ALE)	ALE signal output delay time		30		See left
th(BCLK-ALE)	ALE signal output hold time	-4		See left	
td(BCLK-RD)	RD signal output delay time		30		See left
th(BCLK-RD)	RD signal output hold time	0		See left	
td(BCLK-WR)	WR signal output delay time		30		See left
th(BCLK-WR)	WR signal output hold time	0		See left	
td(BCLK-DB)	Data output delay time (BCLK standard)		40		See left
th(BCLK-DB)	Data output hold time (BCLK standard)	4		See left	
td(DB-WR)	Data output delay time (WR standard)	(*1)		See left	
th(WR-DB)	Data output hold time (WR standard)	(*2)		(*3)	

*1 Calculated by the following formula according to the frequency of BCLK.

$$\frac{(n-0.5)\times10^9}{f(BCLK)}-40 \quad \text{[ns]} \quad \text{n: "3" for 3 wait}$$

*2 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5\times10^9}{f(BCLK)} \quad \text{[ns]}$$

*3 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5\times10^9}{f(BCLK)}-15 \quad \text{[ns]}$$

Read timing

BCLK

td(BCLK-CS)   th(BCLK-CS)

$\overline{\text{CSi}}$

                                                                          th(RD-CS)

tcyc

td(BCLK-AD)   th(BCLK-AD)

ADi
$\overline{\text{BHE}}$

td(BCLK-ALE)   th(BCLK-ALE)   th(RD-AD)

ALE

td(BCLK-RD)   th(BCLK-RD)

$\overline{\text{RD}}$

tac2(RD-DB)

DBi   Hi-Z

                                                   tsu(DB-RD)   th(RD-DB)

Write timing

BCLK

td(BCLK-CS)   th(BCLK-CS)

$\overline{\text{CSi}}$

tcyc   th(WR-CS)

td(BCLK-AD)   th(BCLK-AD)

ADi
$\overline{\text{BHE}}$

td(BCLK-ALE)   th(BCLK-ALE)   th(WR-AD)

ALE

td(BCLK-WR)   th(BCLK-WR)

$\overline{\text{WR}}$,
$\overline{\text{WRL}}$,$\overline{\text{WRH}}$

td(BCLK-DB)   th(BCLK-DB)

DBi   Hi-Z

                      td(DB-WR)   th(WR-DB)
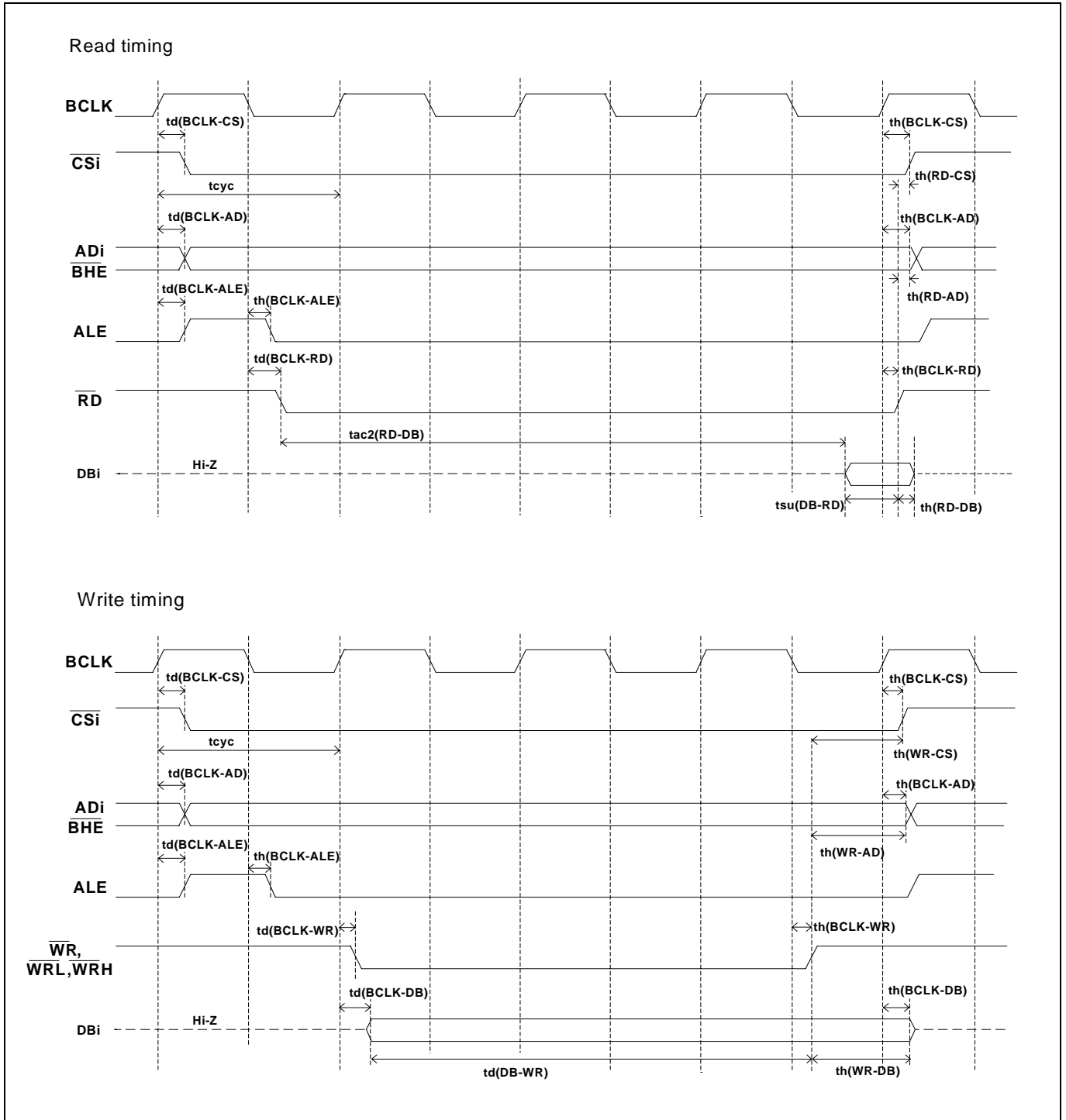
Figure 4.4 Memory expansion mode and microprocessor mode (3 wait, accessing external area)

(2) Multiplex Bus Timing

Table 4.6 and Figure 4.5 show the bus timing in memory expansion mode and microprocessor mode (2 wait, accessing external area, using multiplex bus).

Table 4.6 Memory expansion mode and microprocessor mode (2 wait, accessing external area, using multiplex bus)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
td(BCLK-AD)	Address output delay time		50		See left
th(BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
th(RD-AD)	Address output hold time (RD standard)	(*1)		(*4)	
th(WR-AD)	Address output hold time (WR standard)	(*1)		(*4)	
td(BCLK-CS)	Chip-select output delay time		50		See left
th(BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
th(RD-CS)	Chip-select output hold time (RD standard)	(*1)		(*4)	
th(WR-CS)	Chip-select output hold time (WR standard)	(*1)		(*4)	
td(BCLK-RD)	RD signal output delay time		40		See left
th(BCLK-RD)	RD signal output hold time	0		See left	
td(BCLK-WR)	WR signal output delay time		40		See left
th(BCLK-WR)	WR signal output hold time	0		See left	
td(BCLK-DB)	Data output delay time (BCLK standard)		50		See left
th(BCLK-DB)	Data output hold time (BCLK standard)	4		See left	
td(DB-WR)	Data output delay time (WR standard)	(*2)		See left	
th(WR-DB)	Data output hold time (WR standard)	(*1)		(*4)	
td(BCLK-ALE)	ALE output delay time (BCLK standard)		40		See left
th(BCLK-ALE)	ALE output hold time (BCLK standard)	-4		See left	
td(AD-ALE)	ALE output delay time (Address standard)	(*3)		See left	
th(ALE-AD)	ALE output hold time (Address standard)	30		See left	
td(AD-RD)	After address RD signal output delay time	0		-10	
td(AD-WR)	After address WR signal output delay time	0		-10	
tdz(RD-AD)	Address output floating start time		8		15

*1 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5 \times 10^9}{f(BCLK)} \quad \text{[ns]}$$

*2 Calculated by the following formula according to the frequency of BCLK.

$$\frac{(n - 0.5) \times 10^9}{f(BCLK)} - 50 \quad \text{[ns]} \quad \text{n: "2" for 2 wait}$$

*3 Calculated by the following formula according to the frequency of BCLK.

$$\frac{0.5 \times 10^9}{f(BCLK)} - 40 \quad \text{[ns]}$$

*4 Calculated by the following formula according to the frequency of BCLK.

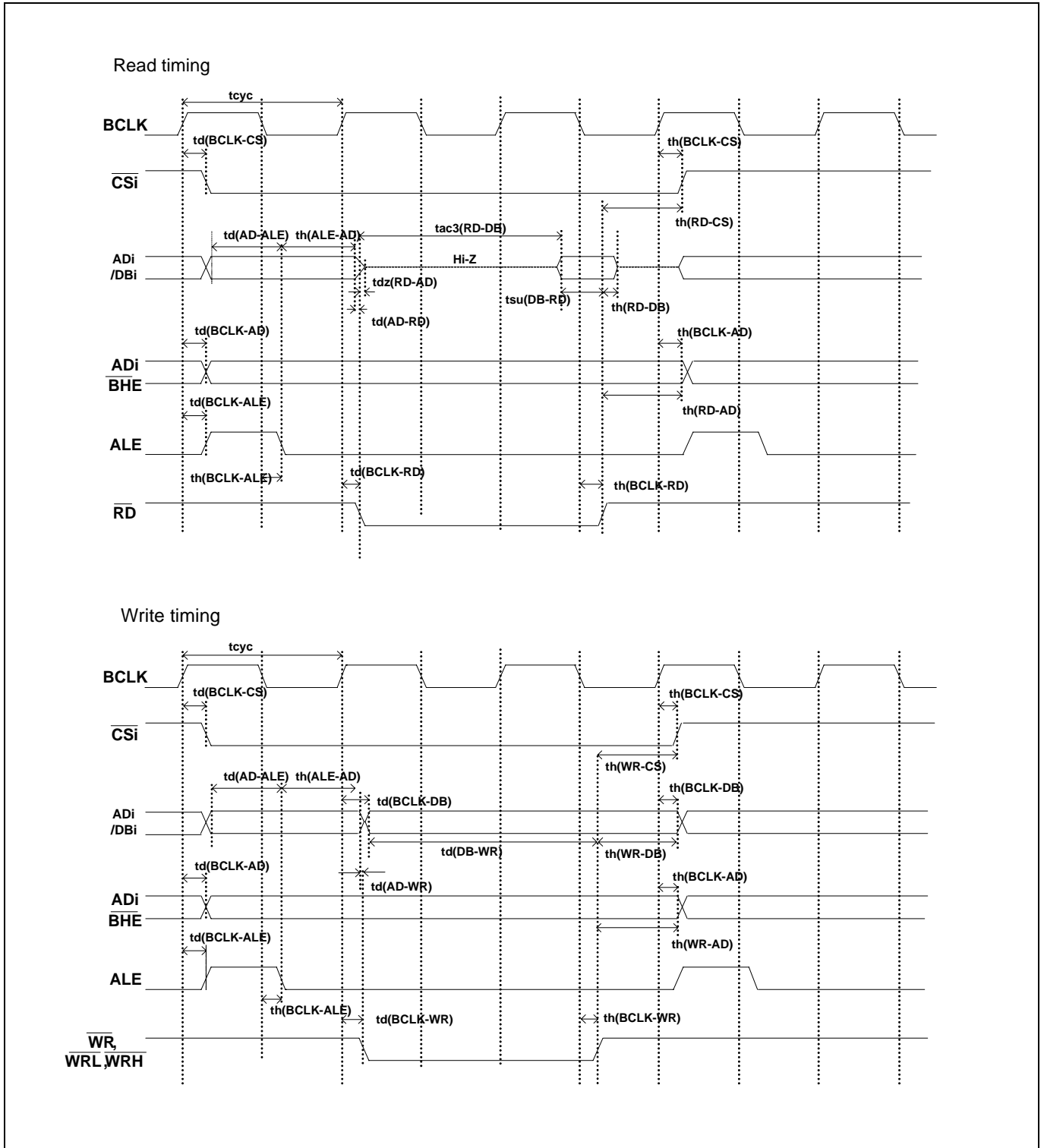$$\frac{0.5 \times 10^9}{f(BCLK)} - 15 \quad \text{[ns]}$$
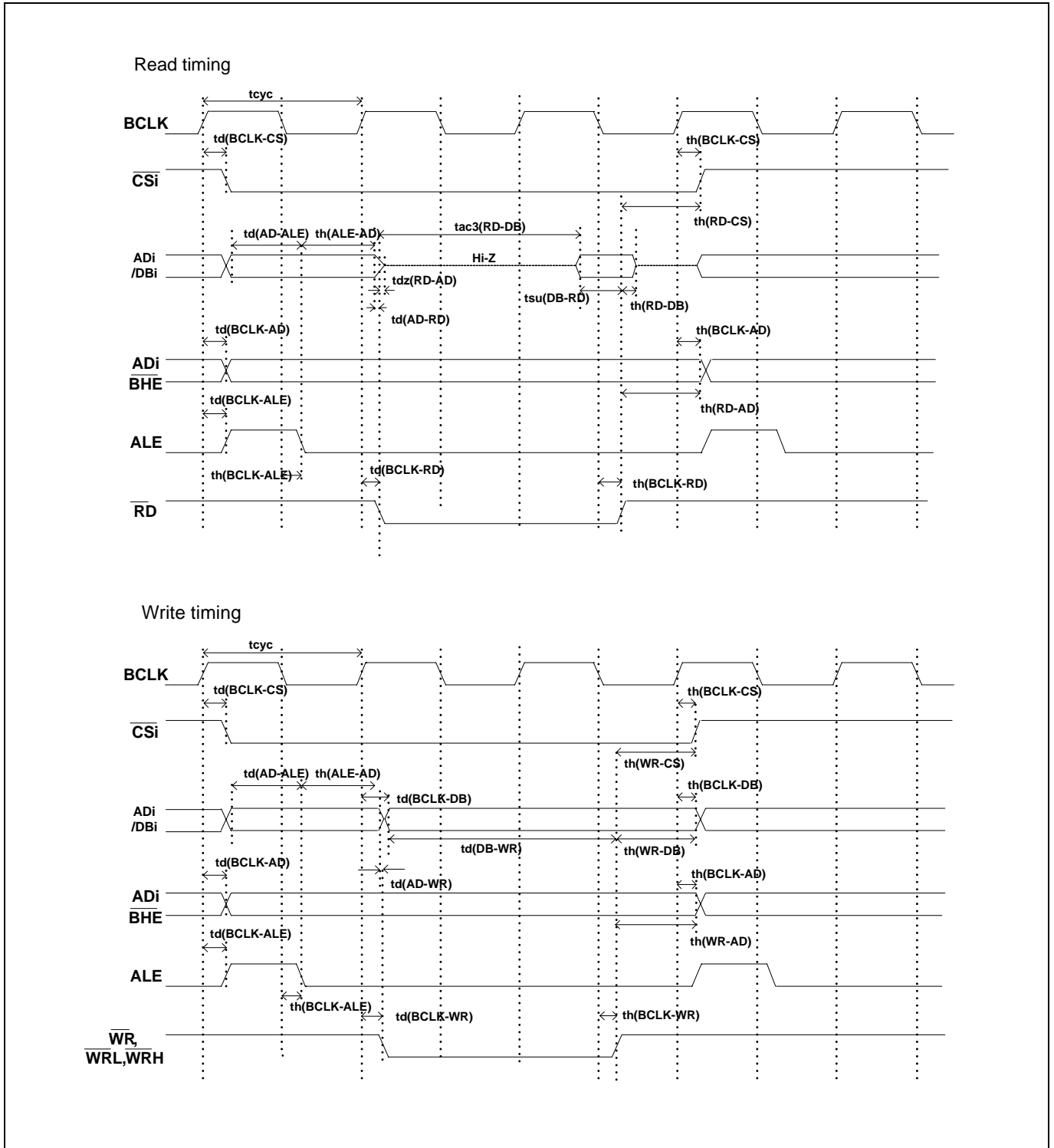
Figure 4.5 Memory expansion mode and microprocessor mode (2 wait, accessing external area, using multiplex bus)

(3) Timing Requirements

Table 4.7 and Figures 4.6 show timing requirements in memory expansion mode and microprocessor mode.

Table 4.7 Timing requirements

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
tsu(DB-RD)	Data input setup time	50		65	
tsu(RDY-BCLK)	RDY# input setup time	40		60	
tsu(HOLD-BCLK)	HOLD# input setup time	50		70	
th(RD-DB)	Data input hold time	0		See left	
th(BCLK-RDY)	RDY# input hold time	0		See left	
th(BCLK-HOLD)	HOLD# input hold time	0		See left	
td(BCLK-HLDA)	HLDA# output delay time		40		See left
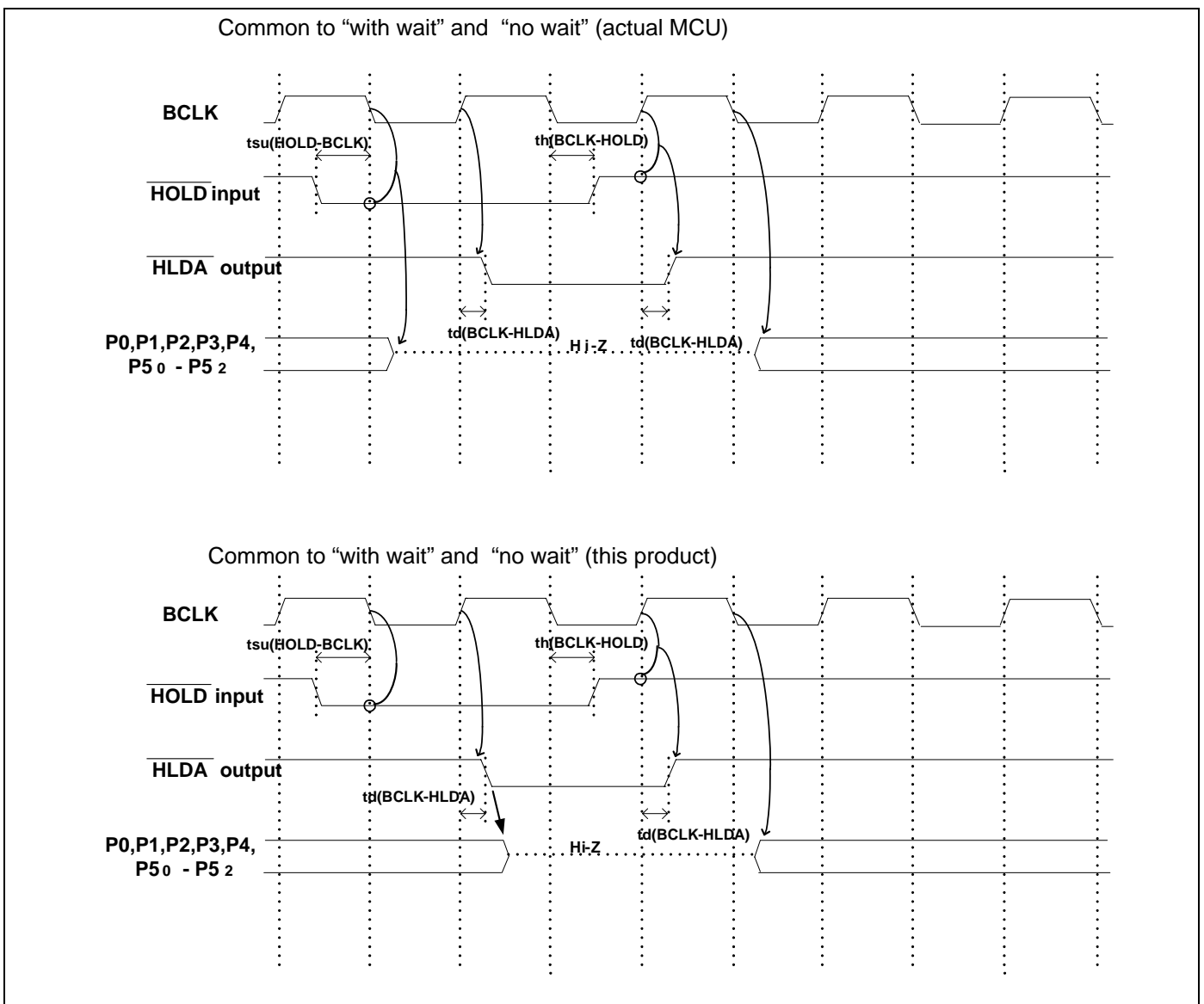
Figure 4.6 Timing requirements

* Compared with an actual MCU, this product enters high-impedance state after a 0.5 cycle delay.

4.3 Differences between the Actual MCU and Emulator

Differences between the actual MCU and emulator are shown below. When debugging the MCU using this product, be careful about the following precautions.

IMPORTANT

Note on Differences between the Actual MCU and Emulator:
- Operations of the emulator system differ from those of actual MCUs as listed below.
  (1) Reset condition
      Set the time for starting up (0.2 VCC to 0.8 VCC) 1 μs or less.
  (2) Initial values of internal resource data of an MCU at power-on
  (3) Interrupt stack pointer (ISP) after a reset is released
  (4) Capacities of the internal memories (ROM and RAM)
      The evaluation MCU of this product has RAM of 31KB (00400h--07FFFh) and flash ROM of 4KB (0F000h--0FFFFh) and 512KB (80000h--FFFFFh).
  (5) Oscillator circuit
      In the oscillator circuit where an oscillator is connected between pins XIN and XOUT, oscillation does not occur because a package converter board is used between the evaluation MCU and the user system. It is same for pins XCIN and XCOUT. For notes on when using an oscillator circuit on the user system, refer to "2.9.1 (2) Using an Oscillator Circuit on the User System" (page 46).
  (6) A/D conversion
      The characteristics of the A/D converter differ from those of actual MCU because there are a converter board and other devices between the evaluation MCU and the user system.
  (7) Ports P0 to P5, P10
      This product emulates some I/O ports (P0 to P5, P10). Therefore, the electrical characteristics of these ports differ from those of an actual MCU.
  (8) Address and status of BHE#
      When the internal RAM or ROM area of an MCU is accessed during user program execution, actual MCUs retain a preceding address and status of BHE#, while this product does not.
  (9) Status of a data bus
      In stop or wait mode, actual MCUs retain a preceding status of a data bus, while with this product a data bus is floating.
  (10) Operation after releasing the reset
      After releasing the reset, for about max. 380 cycles, a program to control the emulator will be executed. Note that this will be included in the user program execution time and tracing result.

Note on RESET# Input:
- A low input to pin RESET# from the user system is accepted during the user program execution (only while the RUN status LED on the emulator's upper panel is lit).

Note on RDY# Input:
- Be sure to input "L" to pin RDY# of the user system during the user program execution (when the RUN status LED on the emulator's upper panel is lit). Inputting "L" to pin RDY# during the user program is being stopped may cause a malfunction of the emulator.

Note on HOLD# Input:
- Be sure to input "L" to pin HOLD# of the user system during the user program execution (when the RUN status LED on the emulator's upper panel is lit). Inputting "L" to pin HOLD# during the user program is being stopped may cause a malfunction of the emulator.

Note on NMI# Input:
- A low input to pin NMI# from the user system is accepted during the user program execution (only while the RUN status LED on the emulator's upper panel is lit).

IMPORTANT

Notes on Maskable Interrupts:

● Even if a user program is not being executed (including when run-time debugging is being performed), the evaluation MCU keeps running so as to control the emulation probe. Therefore, timers and other components do not stop running. If a maskable interrupt is requested when the user program is not being executed (including when run-time debugging is being performed), the maskable interrupt request cannot be accepted, because the emulator disables interrupts. The interrupt request is accepted immediately after the user program execution is started.

● Take note that when the user program is not being executed (including when run-time debugging is being performed), a peripheral I/O interruption is not accepted.

Note on DMA Transfer:

● With this product, the program is stopped with a loop program to a specific address. Therefore, if a DMA request is generated while the program is stopped, DMA transfer is executed. However, make note that DMA transfer while the program is stopped may not be performed correctly. Also note that the below registers have been changed to generate DMA transfer as explained here even when the program is stopped.
(1) DMA0 transfer counter: TCR0
(2) DMA1 transfer counter: TCR1

Note on Voltage Detect Circuit:

● With this product, as the power voltage cannot be change after powering on the user system, the voltage detect circuit (voltage down detect interrupt, voltage down detect reset, etc.) cannot be used with this product.

Note on Access Prohibited Area:

● You cannot use internally reserved areas. Write signals to the areas will be ignored, and values read will be undefined.

Notes on Stack Area:

● With this product, a maximum 8 bytes of the interrupt stack is consumed as a work area. Therefore, ensure the +8 byte maximum capacity used by the user program as the user stack area. If the interrupt stack does not have enough area, do not use areas which cannot be used as stack (SFR area, RAM area which stores data, or ROM area) as work area. Using areas like this is a cause of user program crashes and destabilized emulator control.

● With this product, the interrupt stack pointer (ISP) is set at 00500h and used as a stack area after a reset is released.

Notes on Reset Vector Area:

● Memory in the emulator main unit is always selected as a reset vector area (FFFFCh--FFFFFh) in order to operate the evaluation MCU in the emulator-dedicated mode. Set the contents of the reset vector area in one of the following ways.
(1) Download a user program to an area including the reset vector area.
(2) Set the reset vector using a memory window of the emulator debugger etc.

● You can change data in the reset vector area only when the user program is stopped.

● Do not access the reset vector area as data. It may not be accessed properly, and the program may not run properly in the next bus cycle.

IMPORTANT

Note on Accessing Addresses 00000h and 00001h:

- With the M16C/60 Series MCUs, when a maskable interrupt is generated, the interrupt data (interrupt number and interrupt request level) stored in addresses 00000h and 00001h are read out. Also, the interrupt request bit is cleared when address 00000h or 00001h is read out. Consequently, when the address 00000h or 00001h readout instruction is executed or when address 00000h or 00001h is read out in the cause of a program runaway, a malfunction occurs in that the interrupt is not executed despite the interrupt request, because the request bit of the highest priority interrupt factor enabled is cleared.

Note on Operating Frequency:

- You can not use this product with a main clock (X_{IN}-X_{OUT}) less than 1MHz. To use it with a main clock less than 1MHz, contact your local distributor.

Note on Timeout Setting:

- If you download, execute or single-step a program at a low operating frequency, a communication timeout error may occur.
  Execute the command shown below in the Script Window after starting the emulator debugger.
      [Command]
      _settimeout 300, 300
  Once this command is executed, it remains effective the next time you start the emulator debugger. Therefore, you do not need to execute this command again.
  If the error still occurs in this setting, contact your local distributor.

Notes on Pullup Control:

- Because this product emulates some I/O ports (P0 to P5, P10), you can not pullup ports P0 to P5 by the pullup control registers, Install the included resistor arrays (51kΩ) as necessary.

- The initial value of pullup control register 1 PUR1 of this product is different from that of an actual MCU. When a VCC level is input to pin CNVss, the value of an actual MCU is "02h" (bit 1 PU11 is "1"), while that of this product is "00h".

Note on Setting "1" to Protect Bit 2 (PRC2) with Sub Clock:

- When the CPU clock is set to the sub-clock (low-speed mode or low power dissipation mode), even if you enable the PRC2 bit, writing to the register protected by the PRC2 bit (PD9, S3C and S4C) cannot be done properly. When you enable the PRC2 bit and write to the register protected by the PRC2 (PD9, S3C and S4C), do not set the CPU clock to the sub-clock.

Note on Setting "1" to Protect Bit 2 (PRC2) in Division by 2 Mode:

- Under the following conditions, even if you enable the PRC2 bit, writing to the register protected by the PRC2 bit (PD9, S3C and S4C) cannot be done properly.
  (1) Between when stop mode is released and when a hardware reset is executed
  (2) Between when low power dissipation mode is enabled and when a hardware reset is executed
  Therefore, if the condition (1) or (2) applies, when you enable the PRC2 bit and write to the register protected by the PRC2 (PD9, S3C and S4C), set the CPU clock neither to the main clock in division by 2 mode nor to the on-chip oscillator clock in division by 2 mode.

IMPORTANT

Note on the Input Thresholds for the Pins P1_5/D13/INT3, P1_6/D14/INT4 and P1_7/D15/INT5
- With this product, regarding pins P1_5/D13/INT3, P1_6/D14/INT4 and P1_7/D15/INT5, a device which port or data bus inputs to and a device which INT interrupt inputs to are different as follows:
    - Device which port or data bus inputs to: Port emulation FPGA (input level: TTL)
    - Device which INT interrupt inputs to: Evaluation MCU for emulating peripheral functions (input level: CMOS Schmidt)
    - Therefore, the port input level can be read as "H" immediately after an INT interrupt (falling), and the port input level can be read as "H" immediately before an INT interrupt (rising).

Note on Input Level for KI0# to KI3#:
- With this product, the KI0# to KI3# are TTL input level using the port emulation FPGA although these are the CMOS Schmidt input level with the actual MCU. Therefore, the wrong interrupt may occur near the threshold of the TTL level (2.0V to 0.8V) when the input signal is slow changing.

Note on Debugging M16C/30P Group MCUs:
- When debugging the M16C/30P Group MCUs, be sure to deselect the box of the internal reserved area expansion bit (PM13), then start the emulator debugger.
- The M16C/62P Groups MCUs are used as an evaluation MCU for this product. An initial value of the internal reserved area expansion bit (PM13) for the M16C/62P Group is different from that of for the M16C/30P Group.
    - (1) An initial value of the internal reserved area expansion bit (PM13) for the M16C/62P Group: 1
    - (2) An initial value of the internal reserved area expansion bit (PM13) for the M16C/30P Group: 0
- When developing the program for the M16C/30P Group, be sure to set the initial value of the internal reserved area expansion bit (PM13) to "0" in the program.

Note on Final Evaluation:
- Be sure to evaluate your system with an evaluation MCU. Before starting mask production, evaluate your system and make final confirmation with a CS (Commercial Sample) version MCU.

4.4 Connection Diagram

Figure 4.7 shows a part of the connection diagram of the M3062PT3-CPE. This connection diagram mainly shows the interface section. The circuits not connected to the user system such as the emulator's control system are omitted. The signals not shown in Figure 4.7 connect the evaluation MCU and the user system directly. Tables 4.8 and 4.9 show IC electric characteristics of this product for reference purposes.
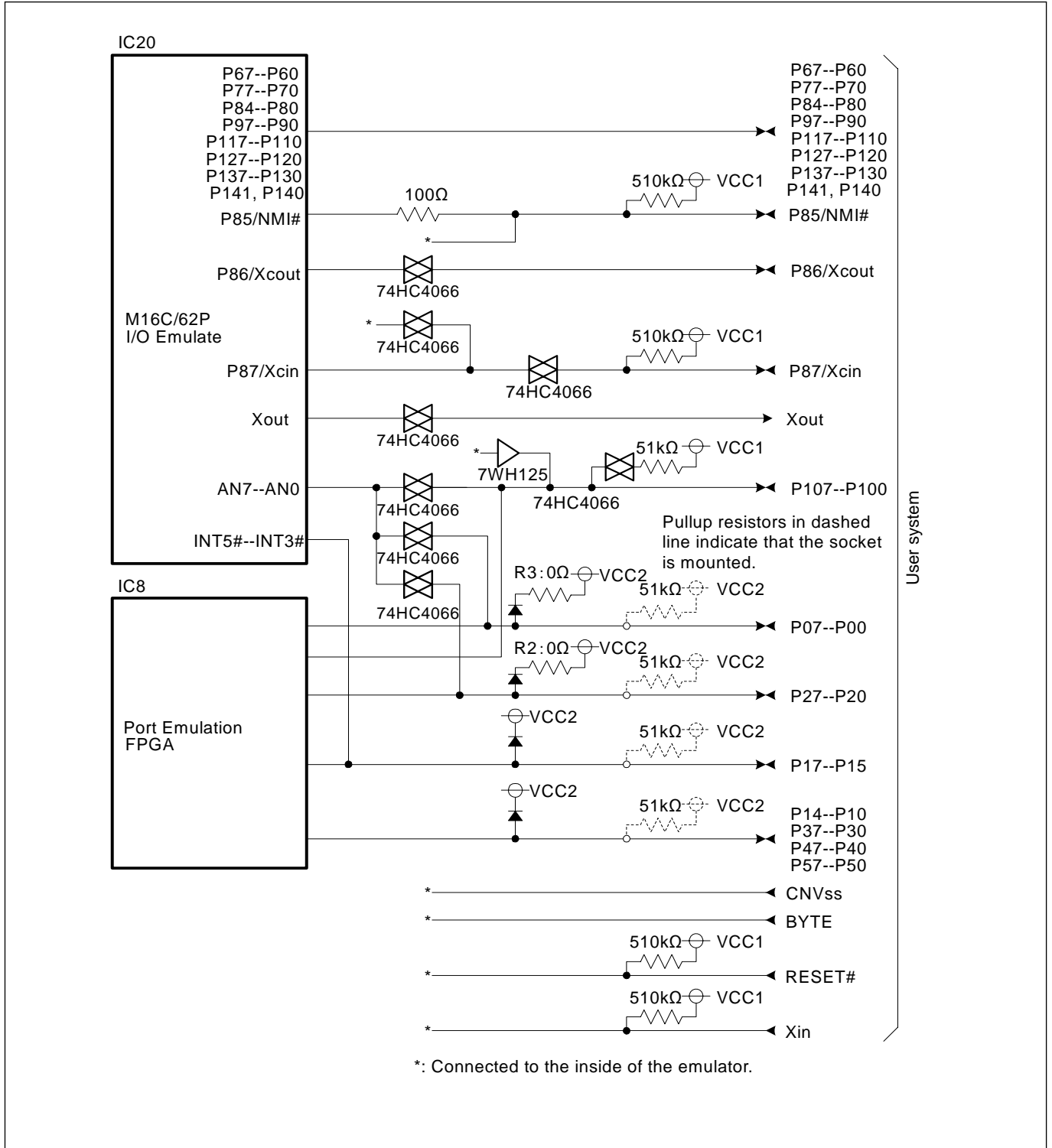
Figure 4.7 Connection diagram

Table 4.8 Electrical characteristics of the 74HC4066

Symbol	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
RON	ON resistor	VCC=4.5V	-	96	200	Ω
ΔRON	ON resistor difference	VCC=4.5V	-	10	-	
IOFF	Leak current (Off)	VCC=12.0V	-	-	±1	μA
IIZ	Leak current (On, output: open)	VCC=12.0V	-	-	±1	

Table 4.9 Electrical characteristics of port emulation FPGA

Symbol	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
VIH	High level input voltage		2.0	-	5.5	V
VIL	Low level input voltage		-0.5	-	0.8	
VOH	High level output voltage	I_{OH}=-8mA DC, VCC=4.75V	2.4	-	-	
		I_{OH}=-8mA DC, VCC=3.00V	2.4	-	-	
VOL	Low level output voltage	I_{OL}=8mA DC, VCC=4.75V	-	-	0.45	
		I_{OL}=8mA DC, VCC=3.00V	-	-	0.45	
IOZ	Leak current (Tristate)	Vo=VCC or GND	-40	-	40	μA
CIN	I/O pin input capacitance	V_{IN}=0V, f=1.0MHz	-	-	8	pF

4.5 External Dimensions

4.5.1 External Dimensions of the Compact Emulator

Figure 4.8 shows external dimensions of the M3062PT3-CPE.
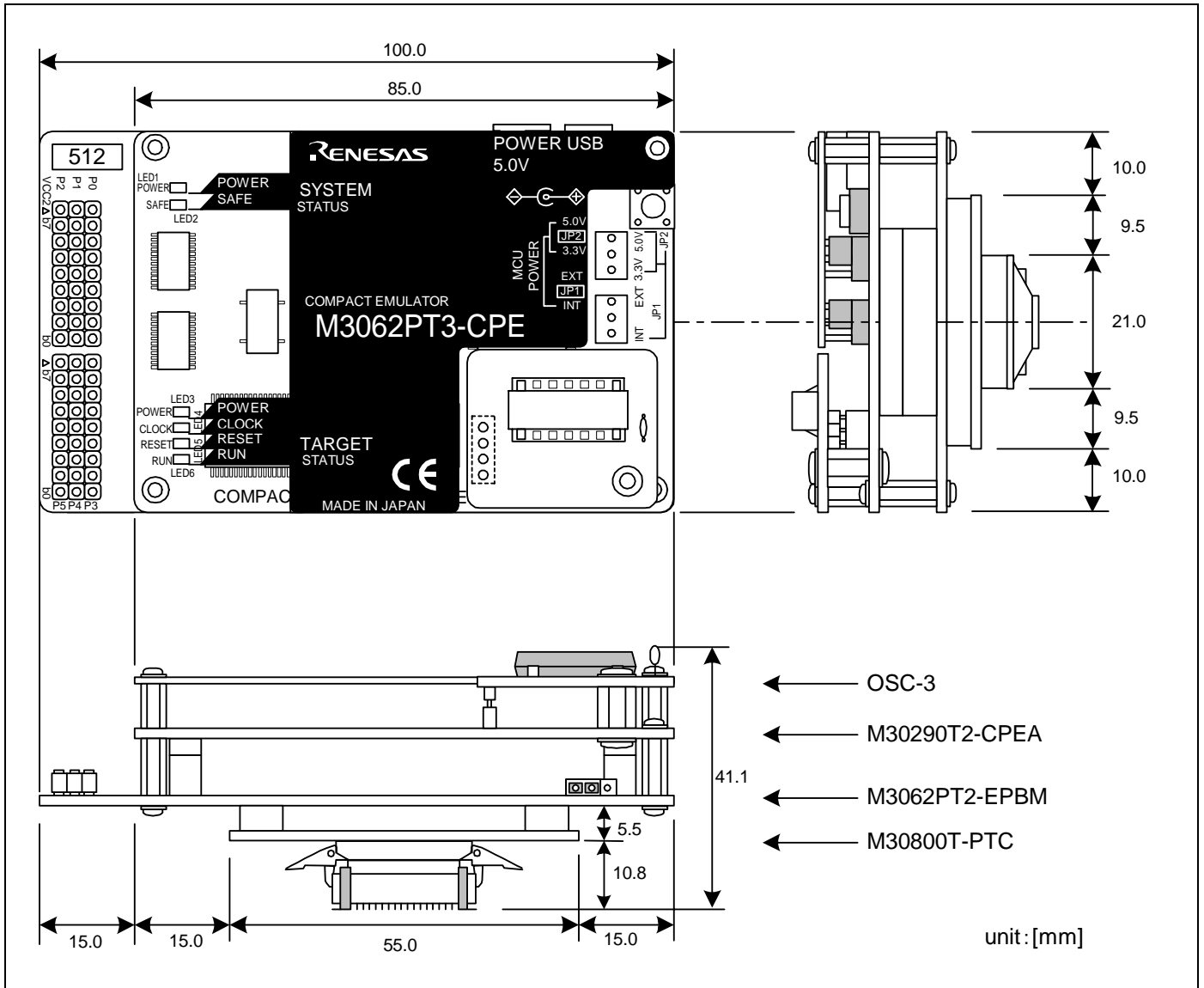
Figure 4.8 External dimensions of the M3062PT3-CPE when the M30800T-PTC (not included) and 100-pin LCC (not included) socket are mounted

4.6 Notes on Using This Product

Notes on using this product are listed below. When debugging the MCU using this product, be careful about the following precautions.

IMPORTANT

Note on the Version of the Emulator Debugger:
- Be sure to use this product with one of the following emulator debuggers.
    M16C R8C Compact Emulator debugger V.1.01 Release 00 or later

Notes on the Self-check:
- If the self-check does not result normally (excluding target status errors), the emulator may be damaged. Then contact your local distributor.
- Run the self-check with the user system not connected.

Note on Quitting the Emulator Debugger:
- To restart the emulator debugger, always shut power to the emulator module off once and then on again.

Notes on the User System (Power Supply, Order of Powering On):
- When the user system is connected, be sure to set the JP1 of the emulator to "EXT".
- This emulator cannot supply the power to the user system. Therefore design your system so that the user system is powered separately.
- This emulator consumes max. 500mA of electric current from the user system.
- The voltage of the user system should be as follows.
    $2.7 \text{ V} \leq \text{VCC} \leq 5.5 \text{ V}$
- Do not change the voltage of the user system after turning on the power.
- Before powering on your emulator system, check that the host machine, the emulator, the converter board and user system are all connected correctly. Next, turn on the power to each equipment following the procedure below.
  (1) Turn ON/OFF the user system and the emulator as simultaneously as possible.
  (2) When the emulator debugger starts up, check the target status LEDs on the emulator to see if this product is ready to operate.
      Is the power supplied?   Check that target status LED (POWER) is ON.[1]
      Is the BCLK is oscillating?   Check that target status LED (CLOCK) is ON.
      *1 When the user system is not connected the target status LED (POWER) does not light.

IMPORTANT

Note on Clock Supply to the MCU:

● A clock supplied to the evaluation MCU is selected by the Emulator tab in the Init dialog box of the emulator debugger.

(1)   When "Internal" is selected:

A clock generated by the oscillator circuit board in the emulator is supplied. It is continually supplied regardless of the status of the user system clock and that of the user program execution.

(2)   When "External" is selected:

A clock generated by the oscillator in the user system is supplied. It depends on the status of the oscillation (on/off) of the user system.

Note on Stop and Wait Modes:

● Do not single step an instruction shifting to stop or wait mode. It may cause communications errors.

Note on Display of MCU Status:

● "MCU status" you can refer to in the MCU tab of the MCU Setting dialog box of the emulator debugger shows pin levels of the user system. Make sure that proper pin levels are specified according to the mode you use.

(1) When single-chip mode is used:

CNVss: Low

(2) When memory expansion mode 16-bit data bus width is used:

CNVss: Low, BYTE: Low, HOLD#: High, RDY#: High

(3) When memory expansion mode 8-bit data bus width is used:

CNVss: Low, BYTE: High, HOLD#: High, RDY#: High

(4) When microprocessor mode 16-bit data bus width is used:

CNVss: High, BYTE: Low, HOLD#: High, RDY#: High

(5) When microprocessor mode 8-bit data bus width is used:

CNVss: High, BYTE: High, HOLD#: High, RDY#: High

Note on Breaks:

● The area displaying break points in the program window of the emulator debugger shows the following breaks.

(1)   Address-match break

This is a debugging function which breaks a program, using the address-match interrupt function of the MCU, immediately before the system executes an instruction at a specified address. The instruction at the preset address will not be executed.

(2)   Software break

This is a debugging function which generates a BRK interruption by changing an instruction at a specified address to a BRK instruction (00h) to break a program immediately before the system executes an instruction at a specified address. The instruction at the preset address will not be executed.

(3)   Hardware break

This is a debugging function which breaks a program by setting the detection of an execution of an instruction at a specified address as a break event. The program will break after the instruction at the specified address is executed.

IMPORTANT

Notes on Address-Match Breaks:
- As the processing speed of setting and canceling address-match breaks is relatively fast, you can save the times of writing into the internal flash ROM of an MCU.
- Address-match breaks can be set only in RAM and ROM areas of an MCU.
- Address-match breaks can be set at up to 8 points.
- Address-match breaks can be set or canceled even when the user program is being executed.

Notes on Address-Match Interrupts:
- When you use the address-match interrupt function in a user program, uncheck "Enable the Address Match Interrupt Break Function" in the MCU tab of the Init dialog box of the emulator debugger. Thus, normal software breaks are used for the internal RAM and ROM areas of an MCU.
- Do not set a software break at an address where an address-match interrupt occurs. Otherwise, a user program may be run out of control. Set a software or hardware break in the top address in address-match interrupt processing.
- When you single step an address where an address-match interrupt occurs, the program stops after executing the first instruction after returning from address-match interrupt processing.

Notes on Software Breaks:
- Software breaks change the instruction at a specified address to a BRK (00h). Therefore, take note that when you reference the result of a trace in bus mode, "00h" is displayed.
- As the BRK instruction is used for the emulator, do not use it in a user program.
- You can neither set nor cancel a software breakpoint in the internal ROM area of an MCU during user program execution, while you can set or cancel it in the internal RAM area of an MCU.

Note on the Watchdog Timer:
- If the reset circuit of the user system has a watchdog timer function, disable it when using the emulator.

Note on Protect Register:
- The protect is not canceled when bit 2 of protect register PRCR (PRC2), which enables writing into the port P9 direction register and the SI/Oi control register, is changed with the below procedure.
  (1) Step execution of an instruction setting PRC2 to "1"
  (2) Setting a break point between an instruction setting PRC2 to "1" and a point where the port P9 direction register or the SI/Oi control register is set
  (3) Setting PRC2 to "1" by the memory window or script window

IMPORTANT

Note on Internal Flash ROM of the MCU:
- Because the number of write/erase cycles of the internal flash ROM of the MCU is limited, it must be replaced at the end of its service-life. If the following errors occur frequently when downloading a program, replace the MCU board.

  (1) Flash ROM erase error occurred ERROR (16258)

  (2) Flash ROM verify error occurred ERROR (16259)

  To purchase products for replacement, contact your local distributor.

Notes on Debugging in CPU Rewrite Mode:
- When you debug M16C/60 Series MCUs in CPU rewrite mode, do not change the block 0 area (FF000h--FFFFFh) of the flash ROM. Otherwise, the emulator will be uncontrollable.
- If you check "Debug the program using CPU Rewrite Mode" in the MCU tab of the Init dialog box of the emulator debugger, you cannot use the following functions.

  (1) Setting software breakpoints in an internal ROM area

  (2) Executing COME in an internal ROM area
- Do not stop the program in CPU rewrite mode or erase suspend mode. And do not single-step the instructions shifting to the CPU rewrite mode. The emulator will go out of control in CPU rewrite mode.
- As the following interrupt vectors are used by the emulator system, the read data is different from expected value.

  (1) BRK instruction (FFFE4h--FFFE7h)

  (2) Address match (FFFE8h--FFFEBh)

  (3) Single-step (FFFECh--FFFEFh)

  (4) DBC (FFFF4h--FFFF7h)

Note on Returning from Stop Mode with the On-chip Oscillator Clock:
- When this product shifts from on-chip oscillator mode or on-chip oscillator low power dissipation mode to stop mode, it cannot be returned with an interrupt other than the NMI.

  Interrupts with which this product cannot return:

  - Key input interrupt

  - INT interrupt

  - Interrupts of timers A and B

  - Serial I/O interrupt

IMPORTANT

Note on Access Prohibited Area:
- You cannot use internally reserved areas. Write signals to the areas will be ignored, and values read will be undefined.

Note on Memory Area Expansion Function (Normal Mode):
- When connecting the emulation memory board R0E33062PMSRC0 (not included) and debugging in memory expansion mode or microprocessor mode with this product, the emulation memory can be allocated. The emulation memory can be specified up to 4 areas by 4 KB in the MAP tab of the MCU setting dialog box of the emulator debugger.

  Each maximum operating frequency is as follows.
  - Maximum operating frequency (at 5.0 V) 0 wait: 7MHz
                                           1 wait: 20MHz
                                           2 wait, 3 wait: 24MHz
  - Maximum operating frequency (at 3.0 V) 0 wait: 6MHz
                                           1 wait: 17MHz
                                           2 wait, 3 wait: 24MHz

Note on Memory Area Expansion Function (4-MByte Mode):
- When connecting the emulation memory board R0E33062PMSRC0 (not included) and using the memory area expansion function (4-Mbyte mode), please note that the memory to which the evaluation MCU is connected varies depending on processor mode and debugger settings. For details, refer to a table below.
  When not connecting the emulation memory board R0E33062PMSRC0, the memory on the user system will be allocated to these areas.

  Areas connected when using the memory area expansion function (4-Mbyte mode)

Processor mode	PM13[*1]	OFS[*2]	Accessed area of target MCU	Banks 0--5	Bank 6	Bank 7
Memory expansion mode	1	0	40000h--7FFFFh	EXT[*3]	EXT	MAP[*4]
		1	40000h--7FFFFh	EXT	EXT	MAP
	0	0	40000h--7FFFFh	EXT	EXT	MAP
			80000h--BFFFFh	EXT	EXT	MAP
		1	40000h--7FFFFh	EXT	EXT	MAP
			80000h--BFFFFh	EXT	MAP	---
Microprocessor mode	---	0	40000h--7FFFFh	EXT	EXT	MAP
			80000h--BFFFFh	EXT	EXT	---
			C0000h--FFFFFh	---	---	MAP
		1	40000h--7FFFFh	EXT	EXT	MAP
			80000h--BFFFFh	EXT	MAP	---

  *1: Indicates bit 3 at address 00005h.
  *2: Indicates bit 2 at address 0000Bh.
  *3: Indicates memory access in the user system.
  *4: Indicates area access dependent on how the MAP tab of the debugger's MCU settings dialog box is set (INT: internal emulation memory of the emulator, EXT: memory in the user system).

IMPORTANT

Notes on Power Supply to the User System:
- Pins VCC1 and VCC2 are connected to the user system to observe the voltage. Therefore, the power is not supplied to the user system from the emulator, design your system so that the user system is powered separately.
- The voltage of the user system should be as follows.
  (1) When VCC1, VCC2 power selection jumper (JP1 of the M3062PT2-EPBM) is set as VCC1 = 2:
    $2.7V \leq VCC1 = VCC2 \leq 5.5V$
  (2) When VCC1, VCC2 power selection jumper (JP1 of the M3062PT2-EPBM) is set as VCC1 > 2:
    $VCC1 = 5.0 \pm 0.2V$,
    $2.7V \leq VCC2 < VCC1$
- Do not change the voltage of the user system after turning on the power.

Notes on CE Declaration of Conformity:
- This product complies with CE marking (EN55022: 1998 Class A, EN55024: 1998). Please use it with care described below.
  * Electrostatic Discharge Precautions must be taken when handling the product.
  * Must not be used within 30 meters of a domestic radio or television receiver.
  * For correct operation of this product, it is recommended that Mobile phones are not used within 10 meters of this product system.
  * This product should be powered down when not in use.
  * Use the power supply which complies with CE marking requirements.
- This product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications.
- If this product causes harmful interference to radio or television reception, which can be determined by turning this product off or on, you are encouraged to try to correct the interference by one or more of the following methods;
  * Ensure attached cables do not lie across the probe board and converter board.
  * Reorient the receiving antenna.
  * Increase the distance between the product and the receiver.
  * Connect the product into an outlet on a circuit different from that to which the receiver is connected.
  * Consult the dealer or experienced radio/TV technician for help.
- Attach the ferrite core included with this product close to the DC plug of the power cable. Without the ferrite core it may cause interference.
  The power cable should be wound around the ferrite core as shown in the figure, and close the ferrite core until it clicks.
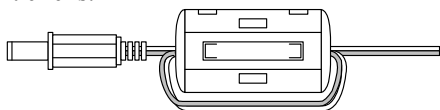
5. Troubleshooting

This chapter describes how to troubleshoot when this product does not work properly.

5.1 Flowchart to Remedy the Troubles

Figure 5.1 shows the flowchart to remedy the troubles from when power to the emulator is activated until the emulator debugger starts up. Check this while the user system is disconnected. For the latest FAQs visit the Renesas Tools Homepage.
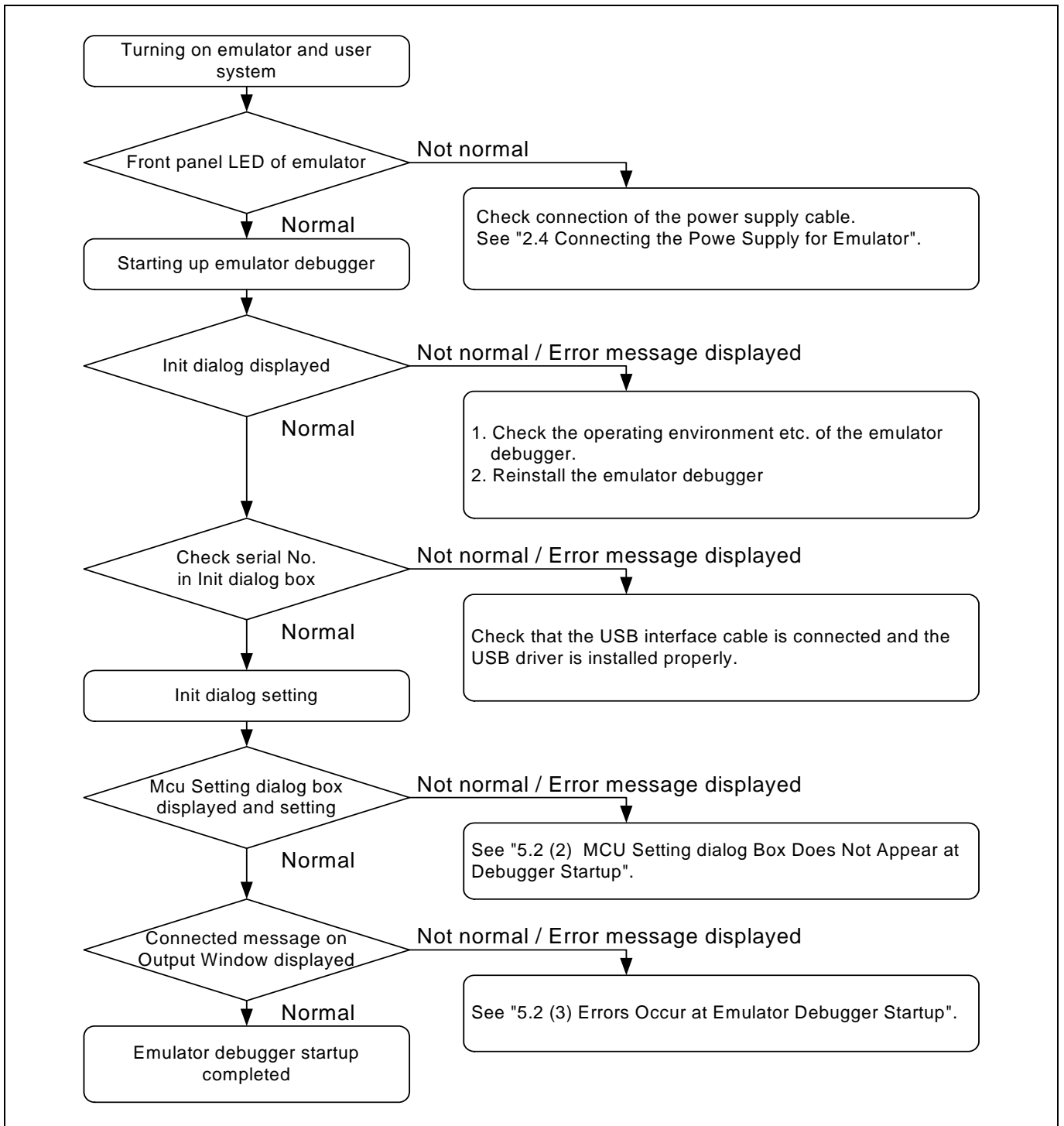
http://www.renesas.com/en/tools

Figure 5.1 Flowchart to remedy the troubles

5.2 When the Emulator Debugger Does Not Start Up Properly

(1) When the LEDs of the M3062PT3-CPE Do Not Display Normally

Table 5.1 Errors LEDs show and their checkpoints

Error	Connection to the user system	Checkpoint
LEDs do not light up.	-	Check that the power cable is connected. *See "2.4 Connecting the Power Supply for the Emulator" (page 23).*
Target Status POWER LED does not light up.	Connected	Check that power (VCC1, VCC2 and GND) is properly supplied to the user system.
Target Status CLOCK LED does not light up.	Not connected	(1) Check that both the main and sub clocks of the emulator debugger are not set to "EXT". *See the CLK command of the emulator debugger.* (2) Check that the oscillator circuit board is properly installed in the emulator and is oscillating. *See "2.9.1 Selecting Clock Supply" (page 43).*
	Connected	When the clock is supplied from an external oscillator, check that the oscillator circuit in the user system is oscillating properly.
Target Status RESET LED does not go out.	Connected	Check that the reset pin of the user system is held high.

(2) MCU Setting Dialog Box Does Not Appear at Debugger Startup

Table 5.2 Checkpoints of errors at debugger startup

Error	Checkpoint
Communication error occurred. Data was not sent to the target.	Check that the USB cable is connected properly. *See "2.5 Connecting the Host Machine" (page 24).*
Not compact emulator.	Check that an emulator other than the compact emulator (such as PC4701, PC7501) is not selected.

(3) Errors Occur at Emulator Debugger Startup

Table 5.3 Checkpoints of errors at debugger startup

Error	Checkpoint
Target MCU is in the reset state.	(1) Check that the reset pin of the user system is pulled up. (2) Check that the reset pin of the user system has changed from Low to High level.
Target MCU cannot be reset.	(1) Check that pin NMI# is held High. (2) In memory expansion mode or microprocessor mode, check pins RDY# and HOLD# are at "H" level. (3) If the reset circuit of the user system has a watchdog timer, disable the timer. (4) Check that power is properly supplied to the user system and that the user system is properly grounded.
Target is in "HOLD" state.	(1) In memory expansion mode or microprocessor mode, check pins RDY# and HOLD# at "H" level. (2) The MCU is either in stop mode or wait mode. Either reset the MCU or cancel the mode with an interrupt. *See MCU specifications.*
Target clock is stopped.	When the clock is supplied from an external oscillator, check that the oscillator circuit in the user system is oscillating properly.
Target MCU is not receiving power.	Check that power is properly supplied to the user system and that the user system is properly grounded.
Target MCU is uncontrollable.	(1) Check that the NQPACK etc. mounted on the user system is soldered properly. (2) Check that the connector is installed properly to the user system. (3) In memory expansion mode or microprocessor mode, check pins RDY# and HOLD# are at "H" level.

5.3 How to Request for Support

After checking the items in "5 Troubleshooting", fill in the text file which is downloaded from the following URL, then send the information to your local distributor.

http://tool-support.renesas.com/eng/toolnews/registration/support.txt

For prompt response, please specify the following information:

(1) Operating environment
- Operating voltage: _____ [V]
- Operating frequency: _____ [MHz]
- Clock supply to the MCU: Internal oscillator/External oscillator

(2) Condition
- The emulator debugger starts up/does not start up
- The error is detected/not detected in the self-check
- Frequency of errors: always/frequency (   )

(3) Problem

6. Maintenance and Guarantee

This chapter describes how to maintenance, repair provisions and how to request for repair.

6.1 User Registration

When you purchase our product, be sure register as a user. For user registration, refer to "User registration" (page 11) of this user's manual.

6.2 Maintenance

(1) If dust or dirt collects on any equipment of your emulation system, wipe it off with a dry soft cloth. Do not use thinner or other solvents because these chemicals can cause the equipment's surface coating to separate.

(2) When you do not use this product for a long period, for safety purposes, disconnect the power cable from the power supply.

6.3 Guarantee

If your product becomes faulty within one year after its purchase while being used under good conditions by observing "IMPORTANT" and "Precautions for Safety" described in this user's manual, we will repair or replace your faulty product free of charge. Note, however, that if your product's fault is raised by any one of the following causes, we will repair it or replace it with new one with extra-charge:

- Misuse, abuse, or use under extraordinary conditions
- Unauthorized repair, remodeling, maintenance, and so on
- Inadequate user's system or misuse of it
- Fires, earthquakes, and other unexpected disasters

In the above cases, contact your local distributor. If your product is being leased, consult the leasing company or the owner.

6.4 Repair Provisions

(1) Repair with extra-charge

The products elapsed more than one year after purchase can be repaired with extra-charge.

(2) Replacement with extra-charge

If your product's fault falls in any of the following categories, the fault will be corrected by replacing the entire product instead of repair, or you will be advised to purchase new one, depending on the severity of the fault.
- Faulty or broken mechanical portions
- Flaw, separation, or rust in coated or plated portions
- Flaw or cracks in plastic portions
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- Wide range of faults that makes replacement less expensive than repair
- Unlocatable or unidentified faults

(3) Expiration of the repair period

When a period of one year elapses after the model was dropped from production, repairing products of the model may become impossible.

(4) Transportation fees at sending your product for repair

Please send your product to us for repair at your expense.

6.5 How to Make Request for Repair

If your product is found faulty, fill in the Repair Request Sheet included with this product, then send it along with this product for repair to your local distributor. Make sure that information in the Repair Request Sheet is written in as much detail as possible to facilitate repair.

⚠ CAUTION

Note on Transporting the Product:
- When sending your product for repair, use the packing box and cushion material supplied with this product when delivered to you and specify handling caution for it to be handled as precision equipment. If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use conductive polyvinyl supplied with this product (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.
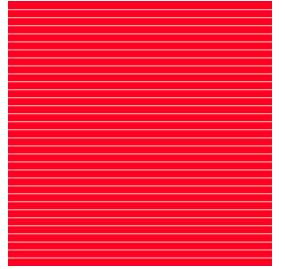

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