To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

Send any inquiries to http://www.renesas.com/inquiry.

Notice

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

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

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

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

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

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

User's Manual

M30620TL-RPD-E

User's Manual

Emulation Pod for M16C/62 Group M16C/62M

Renesas Electronics
www.renesas.com

Rev.1.00 2003.09

Keep safety first in your circuit designs!

- Renesas Technology Corporation and Renesas Solutions Corporation put the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

- These materials are intended as a reference to assist our customers in the selection of the Renesas Technology product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corporation, Renesas Solutions Corporation or a third party.
- Renesas Technology Corporation and Renesas Solutions Corporation assume no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corporation and Renesas Solutions Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corporation, Renesas Solutions Corporation or an authorized Renesas Technology product distributor for the latest product information before purchasing a product listed herein. The information described here may contain technical inaccuracies or typographical errors. Renesas Technology Corporation and Renesas Solutions Corporation assume no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors. Please also pay attention to information published by Renesas Technology Corporation and Renesas Solutions Corporation by various means, including the Renesas home page (http://www.renesas.com).
- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corporation and Renesas Solutions Corporation assume no responsibility for any damage, liability or other loss resulting from the information contained herein.
- Renesas Technology semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corporation, Renesas Solutions Corporation or an authorized Renesas Technology product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of Renesas Technology Corporation and Renesas Solutions Corporation is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination. Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
- Please contact Renesas Technology Corporation or Renesas Solutions Corporation for further details on these materials or the products contained therein.

Precautions to be taken when using this product

- 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.
- In no event shall Renesas Solutions Corporation be liable for any consequence arising from the use of this product.
- Renesas Solutions Corporation 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 Corporation guarantees the renovation or the provision under any circumstances.
- 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.
- Do not attempt to modify this equipment. If modified, your authority to operate this equipment might be voided by FCC.
  Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
  Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

For inquiries about the contents of this document or product, fill in the text file the installer of the emulator debugger generates in the following directory and email to your local distributor.

\SUPPORT\Product-name\SUPPORT.TXT

Renesas Tools Homepage http://www.renesas.com/en/tools

Preface

The M30620TL-RPD-E is an emulation pod for the M16C/62 Group M16C/62M of Renesas 16-bit MCUs. It's used with a PC4701 emulator.

This user's manual mainly describes specifications of the M30620TL-RPD-E emulation pod and how to setup it. For details on the following products, which are used with M30620TL-RPD-E, refer to each product's user's manual.

- Emulator : PC4701 User's Manual
- Emulator debugger : M3T-PD30 User's Manual

All the components of this product are shown in "2.2 Package Components" (page 19) of this user's manual. If there is any question or doubt about this product, contact your local distributor.

To use the product properly

Precautions for Safety

- In both this 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.
- The icons' graphic images and meanings are given in "Chapter 1. Precautions for Safety" (page 8). Be sure to read this chapter before using the product.

When using outside Japan

- When using in Europe, the United States, or Canada, be sure to use both the emulator and the emulation pod which meet local standards. EMI standards are not met when the M30620TL-RPD-E is used with the PC4700H or PC4700L emulator.

Contents

Chapter 1. Precautions for Safety 7

1.1 Safety Symbols and Meanings 8

Chapter 2. Preparation 17

2.1 Terminology 18

2.2 Package Components 19

2.3 Other Tool Products Required for Development 19

2.4 Name of Each Part 20

(1) System Configuration 20

(2) Inside of Emulation Pod 21

2.5 When Using the Emulator for the First Time 22

Chapter 3. Setting Up 23

3.1 Removing the Upper Cover 24

3.2 Setting Switches and Pullup Resistor 25

3.3 Selecting Clock Supply 29

(1) Using the Oscillator Circuit on the Target System 30

(2) Changing the Internal Oscillator Circuit of Emulation Pod 31

(3) Replacing the Oscillator Circuit Boards 32

3.4 Connecting the PC4701 and Emulation Pod 33

(1) Connecting the Cable to the PC4701 33

(2) Connecting the Cable to the Emulation Pod 34

3.5 Connecting the Target System 35

Chapter 4. Usage 37

4.1 Turning On the Power 38

(1) Checking the Connection of Emulator System 38

(2) Turning On the Power 38

(3) LED Display When PC4701 Starts Up Normally 39

4.2 Downloading Firmware 40

(1) When It is Necessary to Download Firmware 40

(2) Downloading Firmware in the Maintenance Mode 40

4.3 Self-checks 41

(1) Self-check Procedure 41

(2) If an Error is Detected in Self-checks 41

Chapter 5. Specifications 43
5.1 Specifications 44
5.2 Operation Timing in Memory Expansion Mode and Microprocessor Mode (3V) 45
(1) Separate Bus, No-wait 45
(2) Separate Bus, With Wait, Accessing External Memory Area 47
(3) Multiplex Bus, With Wait, Accessing External Memory Area 49
(4) Timing Requirements 51
5.3 Connection Diagram 53
5.4 External Dimensions 54
(1) External Dimensions of Emulation Pod 54
(2) External Dimensions of Converter Board (FLX-100LCC) 55
Chapter 6. Troubleshooting 57
6.1 Flowchart to Remedy the Troubles 58
6.2 When the Emulator Debugger Does Not Start Up Properly 59
(1) When the LED Display of PC4701 is Abnormal 59
(2) Errors Occur When the Emulator Debugger Starts Up (When the target system is connected) 60
(3) Errors Occur When the Emulator Debugger Starts Up (When the target system is not connected) 61
6.3 Operation Differs from That of Actual MCUs 62
(1) Cannot Reset from the Target System 62
(2) Data Values of ROM Area at Power-on Are Different 62
(3) HOLD* Control 62
(4) A-D Conversion Values are Different from Expected Values 62
(5) Outputs of ALE, Address and Others are Different from Those of Actual MCUs . 62
Chapter 7. Maintenance and Guarantee 63
7.1 Maintenance 64
7.2 Guarantee 64
7.3 Repair Provisions 64
7.4 How to Request for Repair 65

MEMO

Chapter 1. Precautions for Safety

This chapter describes precautions for using this product safely and properly. For precautions for the emulator main unit and the emulator debugger, refer to each user's manual included with your product.

1.1 Safety Symbols and Meanings 8

WARNING Warning for Installation 9

Warnings for Use Environment 9

CAUTION Caution to Be Taken for Modifying This Product 9

Cautions to Be Taken for Handling This Product 9

IMPORTANT Note on Malfunctions in the PC4701 System 9

Notes on Downloading Firmware 10

Notes on Target System 10

Note on Reset Input 10

Notes on Watchdog Function 10

Note on When the Emulator Debugger Ends 10

Note on DMA Transfer 11

Note on Setting the Work Area 11

Notes on Stack Area 11

Note on Address 00000_{16} Access 11

Note on Stop and Wait Modes 11

Notes on MAP References and Settings 12

Notes on S/W Breaks and H/W Breaks 12

Note on BRK Instruction 12

Note on NMI* Input 13

Note on HOLD* Input 13

Notes on Address Match Interrupt 13

Note on Software Reset 13

Note on Protect Resistor (PRC2) 13

Note on Pullup Control Resistor 13

Note on Differences between Actual MCU and Emulator 14

Chapter 1. Precautions for Safety

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.

1.1 Safety Symbols and Meanings

⚠ **WARNING**	If the requirements shown in the "WARNING" sentences are ignored, the equipment may cause serious personal injury or death.
⚠ **CAUTION**	If the requirements shown in the "CAUTION" sentences are ignored, the equipment may malfunction.
IMPORTANT	It means important information on using this product.

In addition to the three 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.**

The following pages describe the symbols "WARNING", "CAUTION", and "IMPORTANT".

⚠ WARNING

Warning for Installation:

- Do not set this product in water or areas of high humidity. Spilling water or some other liquid into the main unit can cause an unrepairable damage.

Warnings for Use Environment:

- The emulation pod is air-cooled with the ventilation slot. Therefore, do not block the ventilation slot. When heated to high temperatures, the emulation pod may not work properly.
- 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

Caution to Be Taken for Modifying This Product:

- Do not disassemble or modify this product. Disassembling or modifying this product can cause damage. Disassembling and modifying the product will void your warranty.

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. Static electricity may damage the internal circuits.
- Do not pull the emulation pod main unit by the flexible cable (FLX120-RPD) for connecting to the emulator main unit or the flexible cable (FLX64, FLX100 or FLX160) for connecting the target system. The cable may cause a break.
- Flexible cable (FLX120-RPD) for connecting to the emulator main unit and the flexible cable (FLX64, FLX100 or FLX160) for connecting the target system are different from earlier models. The slits make them more flexible. However, excessive flexing or force may break conductors.
- Do not use inch-size screws for this equipment. The screws used in this equipment are all ISO (meter-size) type screws. When replacing screws, use same type screws as equipped before.

IMPORTANT

Note on Malfunctions in the PC4701 System:

- 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 front panel.
  (2) If normal operation is not restored after step (1), shut OFF power to the emulator once and then reactivate it.

IMPORTANT

Notes on Downloading Firmware:

- Before using this product for the first time, it is necessary to download the dedicated firmware (control software for the emulation pod built into the PC4701). Please note that, to do this, it is necessary to start up the PC4701 in the maintenance mode. For firmware download procedures, see "4.2 Downloading Firmware" (page 40). Once the firmware has been downloaded, the product can be used by simply turning on the power.
- Do not shut off the power while downloading the firmware. If this happens, the product will not start up properly. If power is shut off unexpectedly, redownload the firmware.
- Except when a target status error occurs, if self-checks are not completed successfully, there may be trouble with the product. In such case, contact your sales representative. However, perform self-checks in the below setup.

  (1) Target system : Not connected
  (2) Emulation pod internal switches : At their factory settings

Notes on Target System:

- The Vcc pin of emulator is connected to the target system to observe the voltage of the target system. Therefore design your system so that the emulator MCU is powered by the target system.
- The voltage of the target system should be within the range of the MCU specification.
- Do not change the voltage of the target system after turning on the power.
- Before powering on your emulator system, check that the host machine, the emulator main unit, the converter board and target system are all connected correctly. Next, turn on the power to each equipment following the procedure below.

  (1) Turn ON/OFF the target system and the PC4701 emulator as simultaneously as possible.

  (2) When the PC4701 and emulator debugger start up, check the target status LEDs on the emulator main unit's front panel to see if this product is ready to operate.

  • Is the power supplied? Check target status LED (POWER) is ON.

  For details, refer to "Chapter 4. Usage" (page 37).

Note on Reset Input:

- The reset input from the target system is accepted only while a user program is being executed (only while the RUN status LED on the PC4701's front panel is lit).

Notes on Watchdog Function:

- The MCU's watchdog timer can be used only while programs are being executed. To use it otherwise, disable the timer.
- If the reset circuit of the target system has a watchdog timer, disable it when using the emulator.

Note on When the Emulator Debugger Ends:

- To restart the emulator debugger after it ends, always shut power to the emulator module off once and then on again.

IMPORTANT

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 by a timer or other source while the program is stopped, DMA transfer is executed. However, make note of the fact 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.

  DMA0 transfer counter register: TCR0

  DMA1 transfer counter register: TCR1

Note on Setting the Work Area:

- To use this product, it is necessary to set the work area in the internal reserved area of the MCU. However, do not set it in the last 10 bytes of the internal reserved area. And be sure to set the internal reserved area to INTERNAL. (Set the work area by INIT window of emulator debugger M3T-PD30.)

  Example 1: When debugging the program of the MCU whose internal reserved area is $02C00_{16}$ to $03FFF_{16}$, set the work area within the range of $02C00_{16}$ to $03FF6_{16}$.

  Example 2: When debugging the program of the MCU whose internal reserved area is 05400_{16} to $05FFF_{16}$, set the work area within the range of 05400_{16} to $05FF6_{16}$.

  For instance, when setting the work area at $05C00_{16}$, the emulator uses 10 bytes area of $05C00_{16}$ to $05C09_{16}$.

Notes on Stack Area:

- With this product, a maximum 8 bytes of the user stack is consumed.
- If the user 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. Therefore, ensure the +8 bytes maximum capacity used by the user program as the user stack area.

Note on Address 00000_{16} Access:

- With the M16C/62M Group MCUs, when a maskable interrupt is generated, the interrupt data (interrupt No. and interrupt request level) stored in address 00000_{16} is read out. Also, the interrupt request bit is cleared when address 00000_{16} is read out. Consequently, when the address 00000_{16} readout instruction is executed or when address 00000_{16} 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.

  For this malfunction, when the reading out to the address 00000_{16} is generated excluding the interrupt, the yellow LED lights up to alarm. When this LED lights, there is a possibility of wrong access to address 00000_{16}, therefore check the program. This LED is turned off by the RESET switch of the emulator main unit.

Note on Stop and Wait Modes:

- Do not perform step execution at addresses in the stop or wait mode. It may cause communication errors.

IMPORTANT

Notes on MAP References and Settings:

- For details on referencing and setting MAP information, see User's Manual of emulator debugger M3T-PD30.
- Be sure to set the SFR area to EXTERNAL (an external section).
- When setting $0FFFC_{16}$ to $0FFFF_{16}$ to EXTERNAL:
  This product uses the 4 bytes area $0FFFC_{16}$ to $0FFFF_{16}$ as the stack area. If this 4 bytes memory cannot be read or written to, reset cannot be properly effected. As a result, you need to alter the map settings if the condition given below is met.

  (1) With the system which shifts from the single-chip mode to the memory expansion (or microprocessor) mode, using the 4 bytes area of $0FFFC_{16}$ to $0FFFF_{16}$ set to EXTERNAL.

  (2) With the system which starts up in the microprocessor mode, using the 4 bytes area of $0FFFC_{16}$ to $0FFFF_{16}$ set to EXTERNAL and there is not enough memory to read or write.

  The procedures to alter the MAP settings when the conditions (1) or (2) above are met are shown below.

  (1) Set the 4 bytes area of $0FFFC_{16}$ to $0FFFF_{16}$ to INTERNAL.

  (2) Execute the RESET command by use of emulator debugger M3T-PD30.

  (3) Set the stack pointer.

  (Example)

  RESET:

```
        FCLR    I
        LDC     #0480H, SP   <-- Set the stack pointer
          .                      (Stop the program after executing this instruction)
          .
```

  (4) Set the 4 bytes area $0FFFC_{16}$ through $0FFFF_{16}$ to EXTERNAL.

Notes on S/W Breaks and H/W Breaks:

- S/W breaks generate BRK interrupts by substituting the proper instruction to the BRK instruction. Therefore, when referencing the result of a trace in bus mode, "00_{16}" is displayed for the instruction fetch address where a software break is set, and when referencing in reverse assemble mode, "BRK" instruction is displayed.
- It is not possible to use a S/W break and a H/W break at the same time. If doing so, it may not operate normally.
- In the area where the MAP setting is EXTERNAL, S/W breaks cannot be used.

Note on BRK Instruction:

- BRK instruction cannot be used.

IMPORTANT

Note on NMI* Input:

- NMI* input from the target system is accepted only while a user program is being executed (only while the RUN status LED on the PC4701's front panel is lit).

Note on HOLD* Input:

- Be sure to input "L" to the HOLD* pin of the target system during the user program executing (while the RUN status LED on the PC4701's front panel is lit). Inputting "Low" to the HOLD pin when stopping the user program or when run-time debugging may cause a malfunction of the emulator.

Notes on Address Match Interrupt:

- Do not set software breaks at the same addresses as address-match interrupts as the program may run out of control.
- Do not set a hardware break within 4 instructions before an address at which an address-match interrupt occurs. If you do set a hardware break in this range, the program will run out of control.
- When an address at which an address-match interrupt occurs is executed in one-step mode, the program stops after executing the first instruction after returning from the address-match interrupt processing.

Note on Software Reset:

- Do not use a software reset.

Note on Protect Resistor (PRC2):

- Make note of the fact that the protect is not canceled when protect register (PRC2), which enables writing in the port P9 direction register and the SI/O3, 4 control registers, is changed with the below procedure.

  (1) Step execution of the "instruction for setting ("1") PRC2"

  (2) Setting the break point from the "instruction for setting ("1") PRC2" to when the "setting the register for the protect"

  (3) Setting "("1") PRC2" from the dump window or script window

Note on Pullup Control Resistor:

- Ports $P0_0$ to $P5_7$ are not pulled up by the pullup control resistor.

  When pulling up the ports $P0_0$ to $P5_7$, apply a resistance to the inside of the emulator. How to apply it, refer to "3.2 Setting Switches and Pullup Resistor" (page 25).

  Note: Ports $P6_0$ to $P10_7$ are pulled up by the pullup control resistor.
  Note: The pullup control resistor can read and write from $P0_0$ to $P10_7$ properly.

IMPORTANT

Note on Differences between Actual MCU and Emulator:

- Operations of the emulator system differ from those of mask MCUs as listed below.

(1) Reset condition

Set the time for starting up (0.2Vcc to 0.8Vcc) 1μs or less.

(2) Data values of ROM and RAM areas at power-on

(3) Internal memories (ROM and RAM) capacities etc.

(4) Oscillator circuit

- Make note of the fact that in the oscillator circuit where a resonator is connected between the X_{IN} and X_{OUT} pins, oscillation does not occur because a flexible cable, buffer IC and other devices are used between the evaluation MCU and the target system. It is same for sub-clock oscillator circuits (X_{CIN} and X_{COUT}).
- Make note of the fact that if the internal oscillator circuit of the emulator is selected when the MCU is stopping, the oscillation does not stop.

(5) Characteristics of ports $P0_0$ to $P5_7$

Ports $P0_0$ to $P5_7$ are connected via emulation circuit. The device used for the port emulation circuit is as follows.

Device: M60081L-0142FP

(6) HOLD* control

When inputting "Low" to the HOLD* pin to run into the HOLD state, $P0_0$ to $P5_2$ will be in the HOLD state delaying by 2.5 cycles than the actual MCU (see Figure 5.5 and Table 5.5).

(7) DBC, single-step and BRK instruction interrupt vector table addresses

As the emulator uses the DBC, single-step and BRK instruction interrupt vector table addresses, when reading these addresses, the downloaded data cannot be read (see Table 1.1).

Table 1.1 Vector table addresses for the emulator

Factor of interruption	Vector table addresses	Remarks
DBC*1	$FFFF4_{16}$ to $FFFF7_{16}$	Forbidden to use usually
Single-step*1	$FFFEC_{16}$ to $FFFEF_{16}$	Forbidden to use usually
BRK instruction	$FFFE4_{16}$ to $FFFE7_{16}$	Cannot be used as a variable vector

*1 Interruption for the debugger only

(8) A-D conversion

As a flexible cable, a pitch converter board and other devices are used between the evaluation MCU and the target system, some characteristics are slightly different from those of the actual MCU. Therefore, be sure to evaluate your system with an evaluation MCU. Before starting mask production, evaluate your system and make final confirmation with an ES (Engineering Sample) version MCU.

IMPORTANT

(9) Output of the actual MCU and this product

Table 1.2 Differences of outputs between actual MCU and this product (when executing program)

Access area	Signal	Actual MCU	This product	* for difference
SFR area (MAP=EXT)	Address BHE*	Outputs	Outputs	
	Data	Outputs (floating during read operating)	Floating	*
	RD* WR*	Outputs (Low at write cycle, Low at read cycle)	Does not output	*
	CS*	Does not output (fixed to High output)	Does not output (fixed to High output)	
	ALE	Does not output (fixed to Low output)	Outputs	*
Internal RAM Internal ROM	Address BHE*	Retains previous status	Outputs	*
	Data	Floating	Floating	
	RD* WR*	Does not output (fixed to High output)	Does not output (fixed to High output)	
	CS*	Does not output (fixed to High output)	Does not output (fixed to High output)	
	ALE	Does not output (fixed to Low output)	Outputs	*
External area	Address BHE*	Outputs	Outputs	
	Data	Outputs (inputs external data at read cycle)	Outputs (inputs external data at read cycle)	
	RD* WR*	Outputs (Low at write cycle, Low at read cycle)	Outputs (Low at write cycle, Low at read cycle)	
	CS*	Outputs	Outputs	
	ALE	Outputs	Outputs	

IMPORTANT

Table 1.3 Differences of outputs between actual MCU and this product (in stop mode)

Access area	Signal	Actual MCU	This product	* for difference
-	Address BHE*	Retains previous status	Retains previous status	
	Data	Retains previous status	Floating	*
	RD* WR*	Does not output (fixed to High output)	Does not output (fixed to High output)	
	CS*	Retains previous status	Retains previous status	
	ALE	Does not output (fixed to High output)	Does not output (fixed to High output)	

Table 1.4 Differences of outputs between actual MCU and this product (in wait mode)

Access area	Signal	Actual MCU	This product	* for difference
-	Address BHE*	Retains previous status	Retains previous status	
	Data	Retains previous status	Floating	*
	RD* WR*	Does not output (fixed to High output)	Does not output (fixed to High output)	
	CS*	Retains previous status	Retains previous status	
	ALE	Does not output (fixed to High output)	Does not output (fixed to High output)	

Table 1.5 Outputs of this product when the user program is stopping

Signal	This product
Address BHE*	Outputs
Data	Floating
RD* WR*	Only RD* outputs (WR* is fixed to High output)
CS*	Outputs
ALE	Outputs

Chapter 2. Preparation

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

2.1 Terminology 18
2.2 Package Components 19
2.3 Other Tool Products Required for Development 19
2.4 Name of Each Part 20
(1) System Configuration 20
(2) Inside of Emulation Pod 21
2.5 When Using the Emulator for the First Time 22

Chapter 2. Preparation

2.1 Terminology

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

Emulator system

This means an emulator system built around the PC4701 emulator. The PC4701 emulator system is configured with an emulator main unit, emulation pod, host machine and emulator debugger.

Emulator main unit (Hereafter PC4701)

This means a generic name for emulators for 8 and 16-bit MCUs. For details on specific models of PC4701, visit Renesas Tools Homepage.

http://www.renesas.com/en/tools

Emulation pod

This means M30620TL-RPD-E (this product). This emulation pod is for M16C/62 Group M16C/62M.

Host machine

This means a personal computer used to control the emulator and emulation pod.

Emulator debugger

This means a software tool M3T-PD30 to control the emulator from the host machine through an interface.

Firmware

Program that analyzes contents of communication with the emulator debugger and controls the emulator hardware. This program is installed in the EEPROM. This program is downloadable from the emulator debugger to upgrade the firmware or to support other MCUs.

Evaluation MCU

This means the microcomputer mounted on the emulation pod which is operated in the specific mode for tools.

Target MCU

This means the microcomputer you are going to debug.

Target system

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

*****

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

2.2 Package Components

The M30620TL-RPD-E package consists of the following items. When unpacking, check to see if your M30620TL-RPD-E contains all of these items.

Item	Quantity
M30620TL-RPD-E emulation pod main unit	1
FLX120-RPD flexible cable for connecting PC4701	1
FLX100 flexible cable for connecting converter board (pre-installed in emulation pod)	1
FLX-100LCC converter board for connecting target system	1
OSC-3 (10MHz) oscillator circuit board (pre-installed in emulation pod)	1
OSC-2 oscillator circuit board	1
Resistor arrays for pulling up ports $P0_0$ to $P5_7$ (51kΩ)	12
Hardware tool user registration FAX sheet (English)	1
Hardware tool user registration FAX sheet (Japanese)	1
M30620TL-RPD-E user's manual (this manual)	1
M30620TL-RPD-E user's manual (Japanese)	1

Please keep the M30620TL-RPD-E'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 any of these items are missing or found faulty, please contact your local distributor. Also, if there is any question or doubt about the packaged product, contact your local distributor.

2.3 Other Tool Products Required for Development

To bring forward programs development on the M16C/62 Group MCUs, the products listed below are necessary in addition to those contained package above. Get them separately.

Emulator main unit	PC4701
Emulator debugger	M3T-PD30
Converter board (Required for 80-pin MCUs)	FLX-DIRECT613 + DIRECT80S or 100LCC-80QSB *See Figure 3.11 Connecting emulation pod and target systems (page 35)*

To purchase these products, contact your nearest distributer.

2.4 Name of Each Part

(1) System Configuration

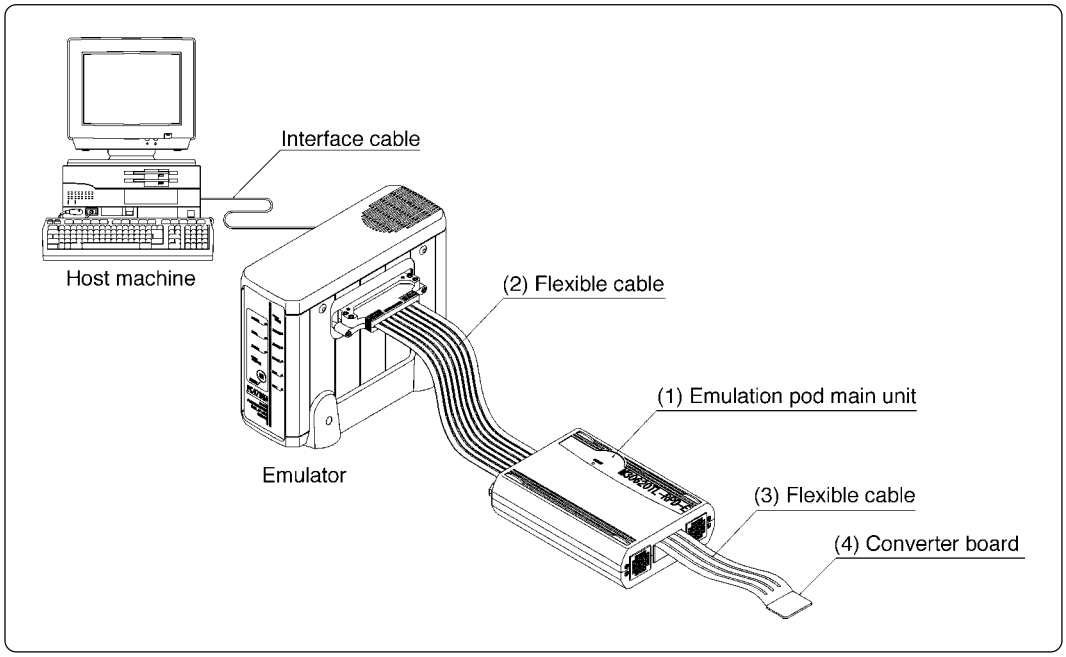


Figure 2.1 System configuration

(1) to (4) in Figure 2.1 are included in this product package.

(1) Emulation pod (M30620TL-RPD-E)

This emulation pod contains an evaluation MCU, emulation memory and circuits to feature the debugging function.

(2) Flexible cable (FLX120-RPD)

This is a 120-pin flexible cable for connecting the PC4701 emulator and the emulation pod.

(3) Flexible cable (FLX100)

This is a 100-pin flexible cable for connecting the emulation pod and the target system.

(4) Converter board

This is a converter board for connecting to the target system. For details, refer to "3.5 Connecting the Target System" (page 35).

(2) Inside of Emulation Pod

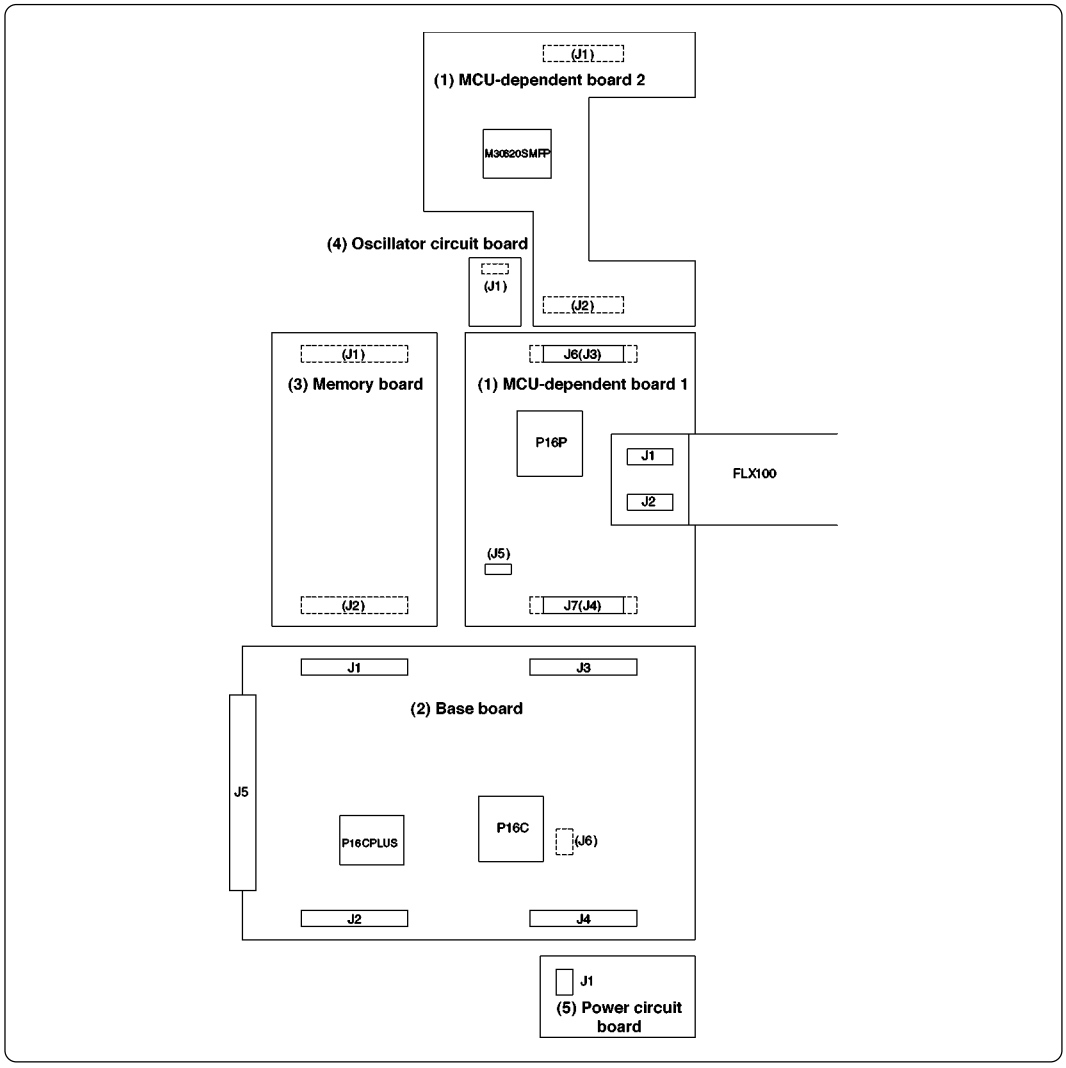


Figure 2.2 Internal view of emulation pod

(1) MCU-dependent boards 1 and 2

Boards grouping parts (pins and added functions) which vary according to MCU model.

(2) Base board

Board for the M16C/60 and M16C/20 Series MCUs which controls the interface with the PC4701 and the evaluation MCU.

(3) Memory board

Board for the M16C/60 and M16C/20 Series MCUs on which the emulation memory (1MB) and the map memory (4 bit×1M) are mounted.

(4) Oscillator circuit board

Oscillator circuit board on which the oscillation module device (10.000MHz) is mounted.

(5) Power circuit board

Power circuit board which determines the power voltage in the pod according to the power voltage level of the target system.

It is planned to enable customers to use future M16C/62M Group models by changing the MCU-dependent boards.

2.5 When Using the Emulator for the First Time

If you have purchased this emulation pod newly, it is necessary to download the firmware. The download procedure is given in Figure 2.3.

Before attempting to download the firmware, check the emulator debugger is installed and the emulator is connected to the host machine. For more information, see each user's manual of the emulator debugger and the PC4701.

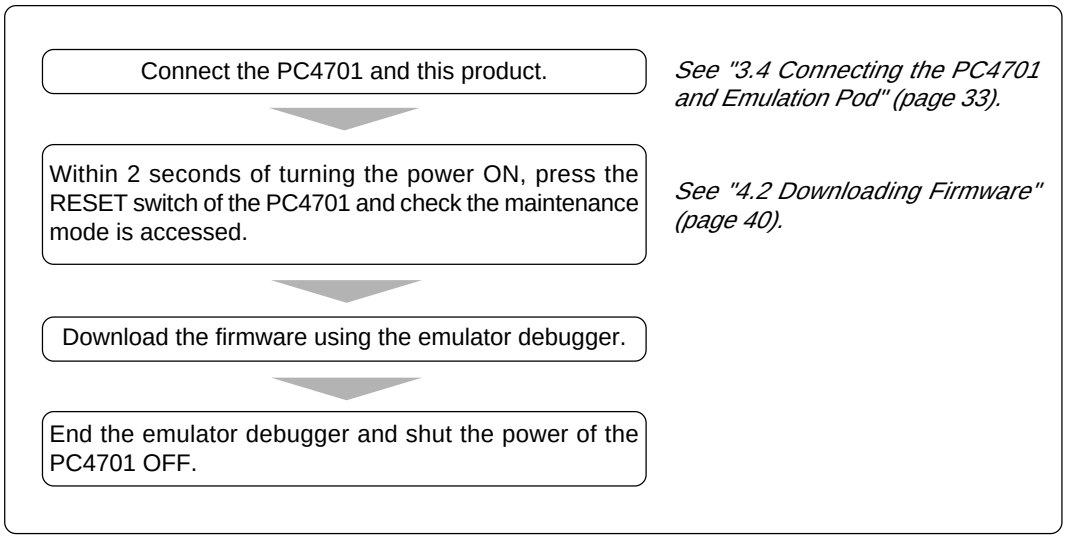


Figure 2.3 Firmware download procedure when emulator is used for the first time

To make sure the emulation pod works properly, run the self-checks. For self-check procedures, see "4.3 Self-checks" (page 41).

Chapter 3. Setting Up

This chapter describes switch settings required for using this product and how to connect this product to the PC4701 and the target system.

3.1 Removing the Upper Cover 24
3.2 Setting Switches and Pullup Resistor 25
3.3 Selecting Clock Supply 29
(1) Using the Oscillator Circuit on the Target System 30
(2) Changing the Internal Oscillator Circuit of Emulation Pod 31
(3) Replacing the Oscillator Circuit Boards 32
3.4 Connecting the PC4701 and Emulation Pod 33
(1) Connecting the Cable to the PC4701 33
(2) Connecting the Cable to the Emulation Pod 34
3.5 Connecting the Target System 35

Chapter 3. Setting Up

To use this emulation pod with your target system, it is necessary to set as follows. Set the following after removing the upper cover.

- Change the oscillation frequency.
- Set the X_{IN}, X_{OUT}, X_{CIN} and X_{COUT} pins for the target system.
- Set the switches for the operating voltage of the target system.
- Install a pullup resistor to ports $P0_0$ to $P5_7$.

3.1 Removing the Upper Cover

The procedure of removing the upper cover is shown below.

(1) Remove the four screws of both sides of this product and lift off the upper cover. (see Figure 3.1)
(2) Set the jumper switches.
(3) Replace the upper cover and secure the four screws.

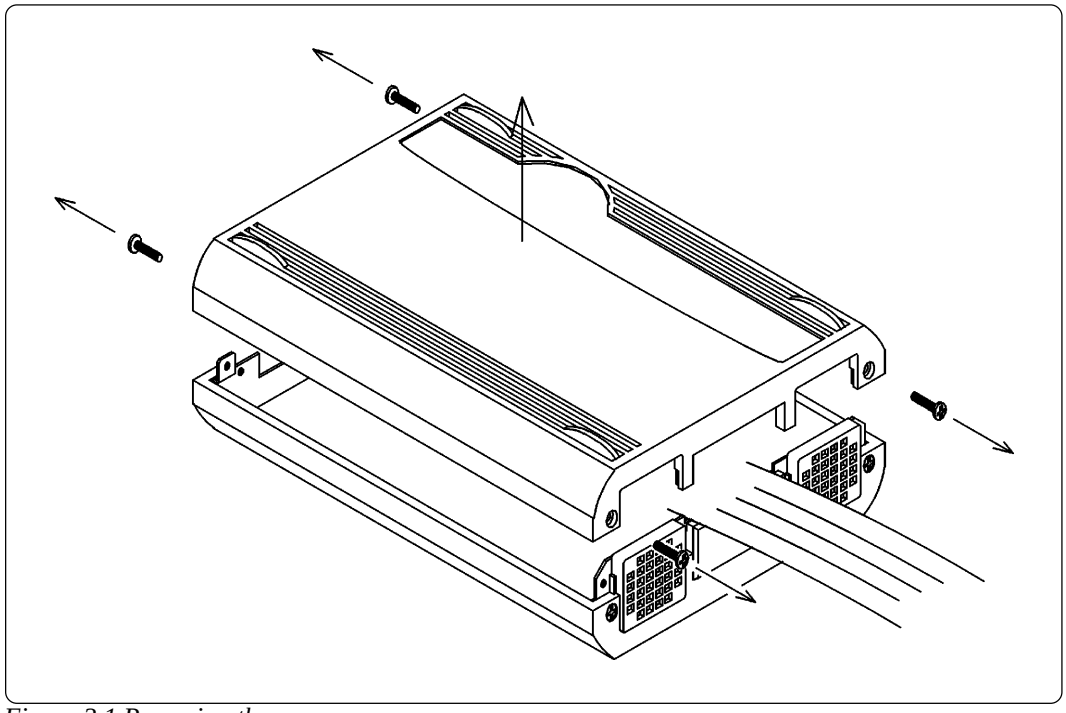


Figure 3.1 Removing the upper cover

⚠ CAUTION

When Removing the Upper Cover:

- Always shut OFF power when removing the upper cover or setting the switches.
- Do not touch the connector pins of the emulator main unit and the target MCU connector pins. Static electricity may damage the internal circuits.

3.2 Setting Switches and Pullup Resistor

Figure 3.2 shows the positions of switches and a position for installing a pullup resistor. Tables 3.1, 3.2 list how to set each switch and Figure 3.3 shows how to install a pullup resistor.

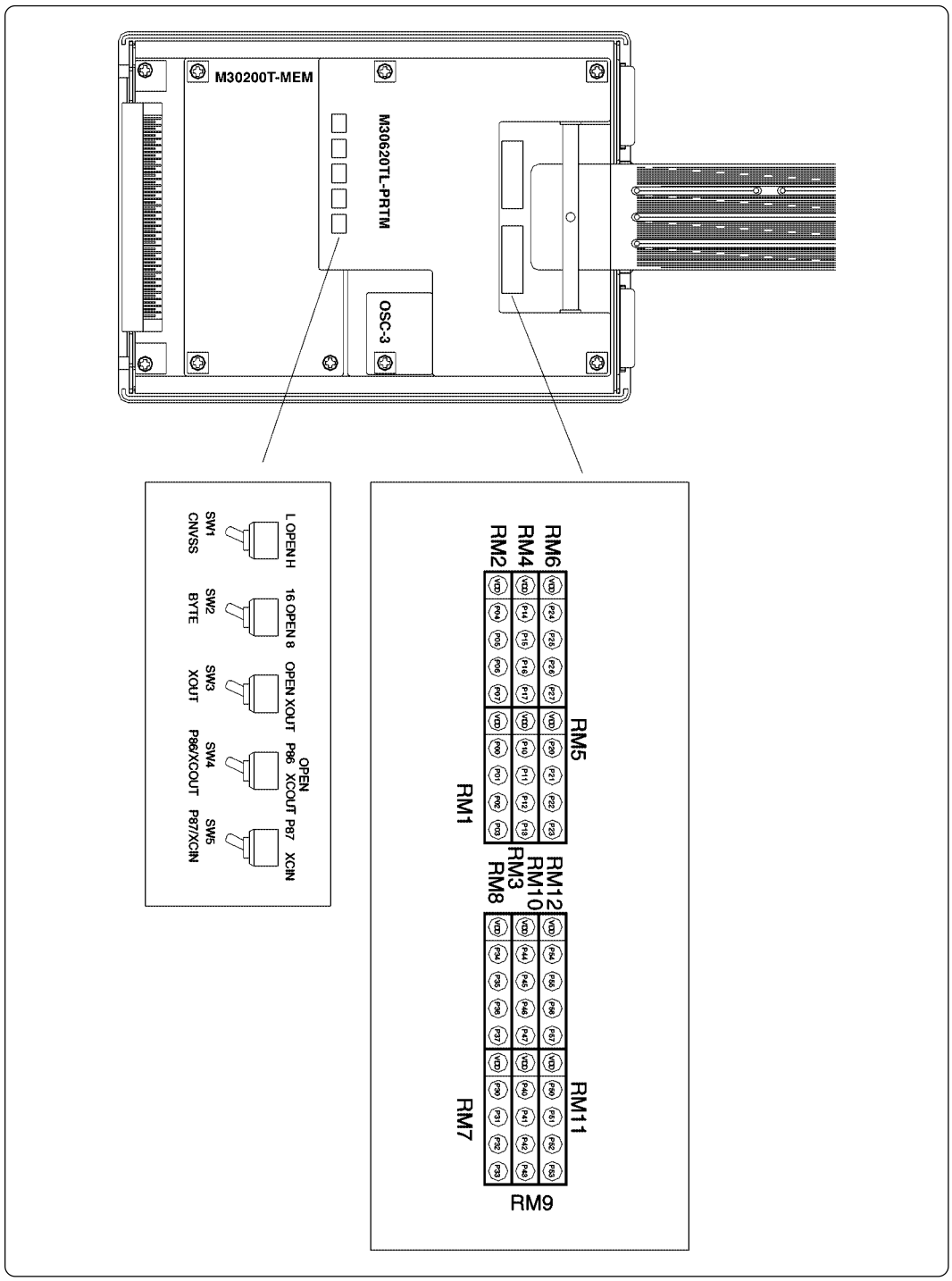


Figure 3.2 Positions of switches and their factory-settings

Table 3.1 Switch settings of M30620TL-RPD-E (1/2)

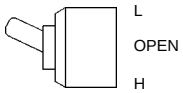
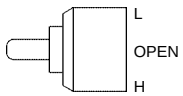
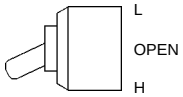
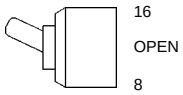
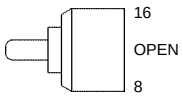
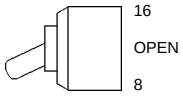
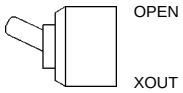
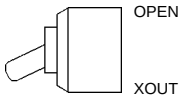
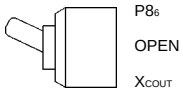
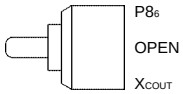
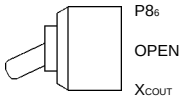
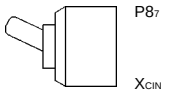
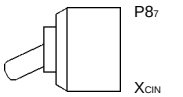
Switch	Signal	Setting	Description
SW1	CNV_{SS}	 SW1 CNV_{SS} (Factory-setting)	Pulls down the CNV_{SS} pin of MCU with a resistance of 33kΩ.
		 SW1 CNV_{SS}	Does not pull down/up the CNV_{SS} pin of MCU.
		 SW1 CNV_{SS}	Pulls up the CNV_{SS} pin of MCU with a resistance of 33kΩ.
SW2	BYTE	 SW2 BYTE (Factory-setting)	Pulls down the BYTE pin of MCU with a resistance of 33kΩ.
		 SW2 BYTE	Does not pull down/up the BYTE pin of MCU.
		 SW2 BYTE	Pulls up the BYTE pin of MCU with a resistance of 33kΩ.
SW3	X_{OUT}	 SW3 X_{OUT} (Factory-setting)	Does not connect the X_{OUT} pin of MCU to the target system.
		 SW3 X_{OUT}	Connects the X_{OUT} pin of MCU to the target system.

Table 3.2 Switch settings of M30620TL-RPD-E (2/2)

Switch	Signal	Setting	Description
SW4	$P8_6/X_{COUT}$	 SW4 $P8_6/X_{COUT}$ (Factory-setting)	Connects the $P8_6/X_{COUT}$ pin of MCU to the target system. (Uses $P8_6/X_{COUT}$ pin as port $P8_6$)
		 SW4 $P8_6/X_{COUT}$	Does not connect the $P8_6/X_{COUT}$ pin of MCU. (Uses $P8_6/X_{COUT}$ pin as X_{COUT} and opens X_{COUT}.)
		 SW4 $P8_6/X_{COUT}$	Connects the $P8_6/X_{COUT}$ pin of MCU to the target system. (Uses $P8_6/X_{COUT}$ pin as X_{COUT} and connect X_{COUT} to the target system.)
SW5	$P8_7/X_{CIN}$	 SW5 $P8_7/X_{CIN}$ (Factory-setting)	Connects the $P8_7/X_{CIN}$ pin of MCU to the target system. (Uses $P8_7/X_{CIN}$ pin as port $P8_7$)
		 SW5 $P8_7/X_{CIN}$	Uses $P8_7/X_{CIN}$ pin as X_{CIN}.

It is not possible to control the pullup by the pullup control resistor of ports $P0_0$ to $P5_7$ (possible to read and write by the pullup control resistor).

However, as this product has a socket for installing the pullup resistor, it is possible to pull up by mounting the resistor array included with this product. Figure 3.3 shows the positions for installing the pullup resistor.

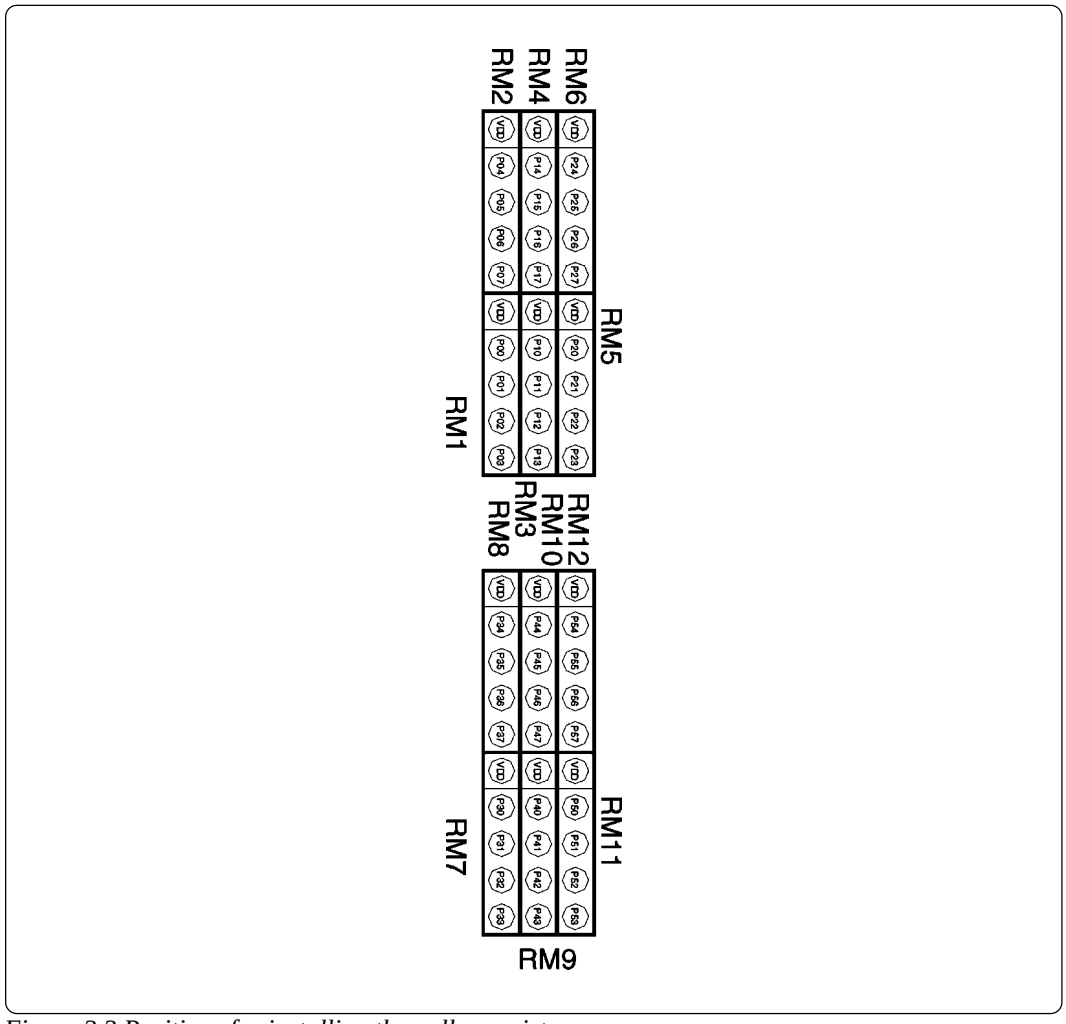


Figure 3.3 Positions for installing the pullup resistor

3.3 Selecting Clock Supply

There are two ways to supply a clock to the MCU, using the oscillator circuit of the emulation pod or using the oscillator circuit on the target system. Table 3.3 lists the factory-settings of each clock supply.

Table 3.3 Clock supply to the MCU

Clock	Description	Display of emulator debugger	Default setting
X_{IN}-X_{OUT}	Internal oscillator circuit of emulation pod (OSC-3: 10.000MHz)	Internal	Yes
	Target System	External	-
X_{CIN}-X_{COUT}	Internal oscillator circuit of emulation pod (32.768kHz)	Internal	Yes
	Target System	External	-

IMPORTANT

Notes on Changing the Clock Supply:

- The clock supply can be set by the Init dialog when starting up the emulator debugger or inputting CLK command on the script window.
- For X_{CIN}-X_{COUT} pins, it is necessary to set switches in the emulation pod. For details, refer to "3.2 Setting Switches and Pullup Resistor" (page 25).

(1) Using the Oscillator Circuit on the Target System

When turning on the power supply, the internal clock of emulation pod is selected to supply the clock to the MCU. To use the external clock on the target system, change the clock by the Init dialog when starting up the emulator debugger or the CLK command on the script window. (For details, refer to the user's manual of the emulator debugger.)

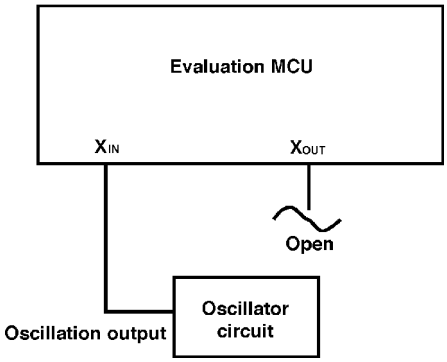


Figure 3.4 External oscillator circuit

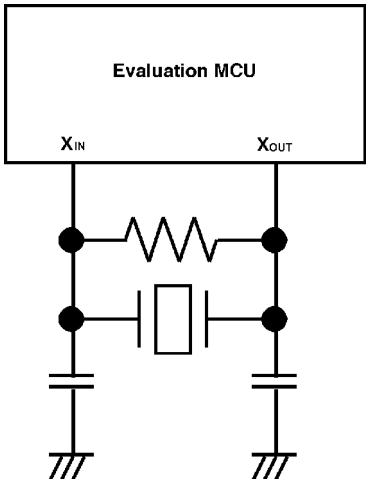


Figure 3.5 Circuit in which oscillation does not occur (same for XCIN-XCOUT)

IMPORTANT

Notes on External Clock:

- To operate the emulation pod with an external clock, construct the oscillator circuit as shown in Figure 3.4 in the target system and input the oscillator output at 50% duty (within the operating range of the evaluation MCU) into the XIN pin. And the XOUT pin should be open.
- Make note of the fact that in the oscillator circuit shown in Figure 3.5 where a resonator is connected between the XIN and XOUT pins, oscillation does not occur because a flexible cable, pitch converter board and other devices are used between the evaluation MCU and the target system. It is same for sub-clock oscillator circuits (XCIN and XCOUT).

(2) Changing the Internal Oscillator Circuit of Emulation Pod

An oscillator circuit board for 10.000MHz is mounted on this product. To use the emulation pod at a frequency other than 10.000MHz, build the desired oscillator circuit on the included OSC-2 oscillator circuit board (bare board) and replace the board installed in the emulation pod when shipped from the factory.

Figure 3.6 shows a view of the OSC-2 oscillator circuit board (bare board) and where connector pins are located. Figure 3.7 shows the circuitry of the OSC-2 oscillator circuit board (bare board). Use the number of oscillator circuits recommended by the oscillator manufacturer.

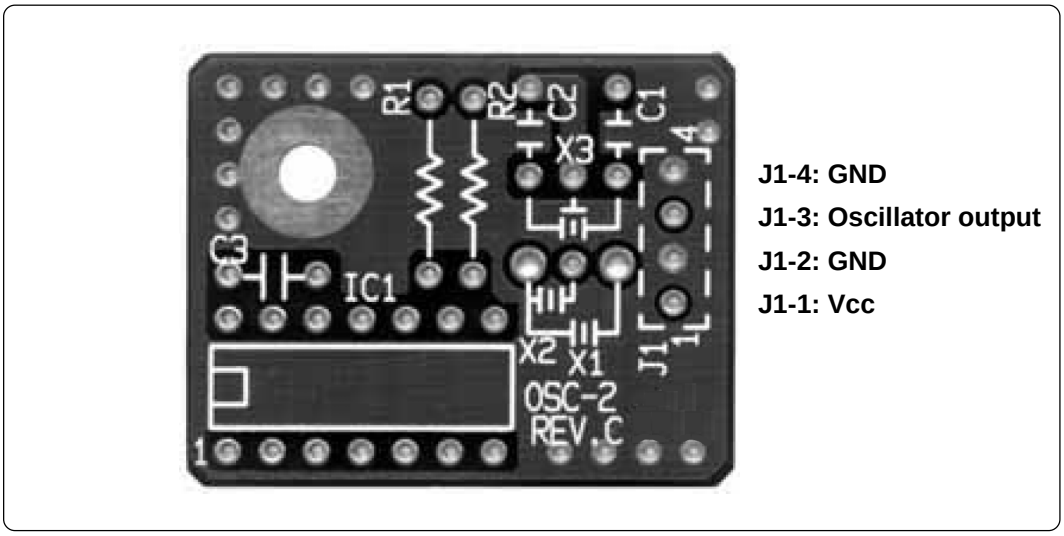


Figure 3.6 External view of oscillator board (OSC-2) and connector pin assignment

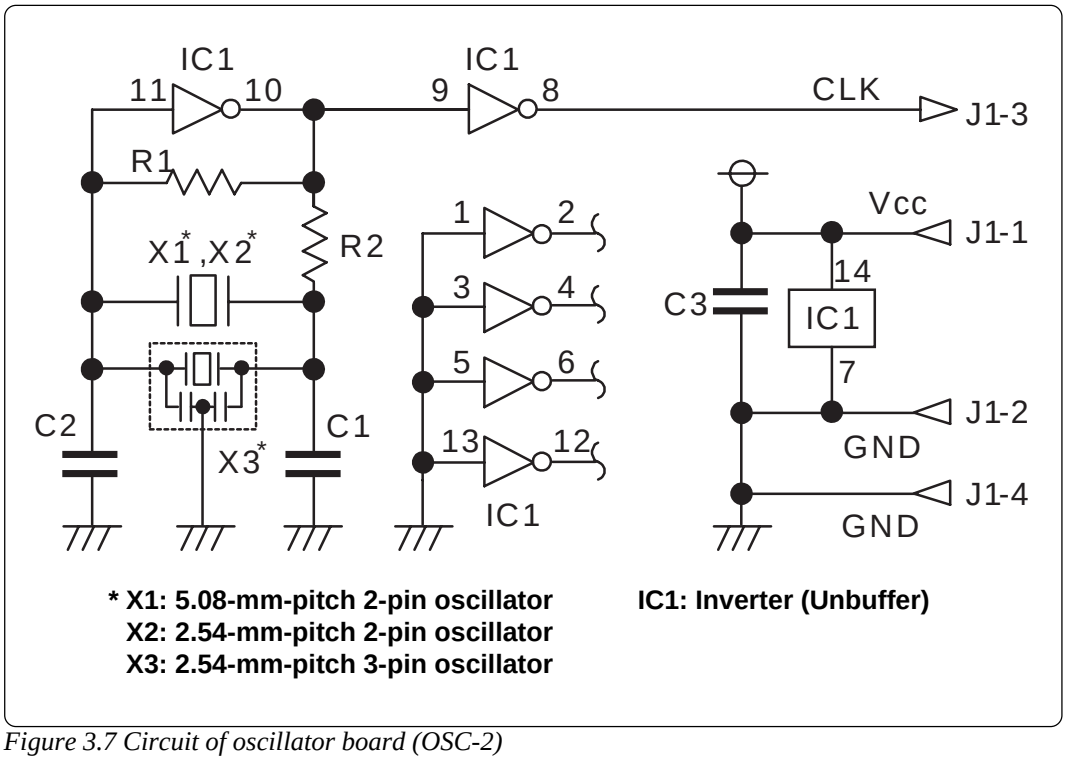
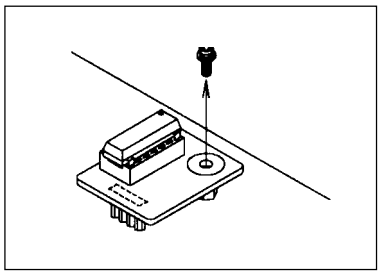


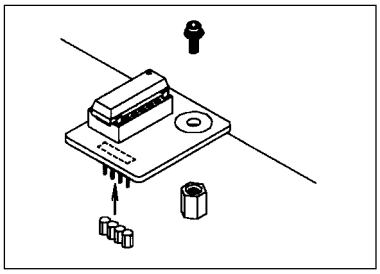
Figure 3.7 Circuit of oscillator board (OSC-2)

(3) Replacing the Oscillator Circuit Boards

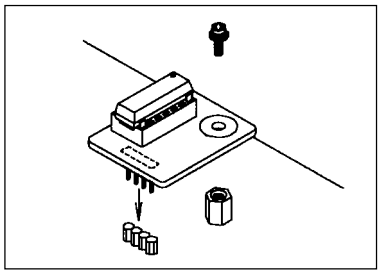
Figure 3.8 shows how to replace the oscillator circuit boards. For the position of the oscillator circuit board, see Figure 3.2.



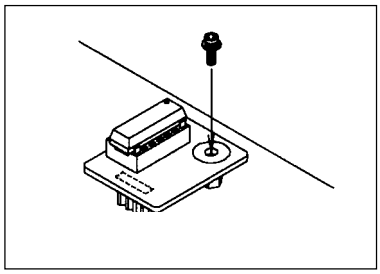
(1) Unscrew the screw connecting the oscillator circuit board.



(2) Lift off the oscillator circuit board.



(3) Attach the J1 connector of another oscillator circuit board for replacement to the connector of the MCU-dependent board.



(4) Secure the oscillator circuit board with the screw.

Figure 3.8 Replacing the oscillator circuit boards

3.4 Connecting the PC4701 and Emulation Pod

To connect the emulation pod to the PC4701, use the FLX120-RPD 120-pin flexible cable included in this product package. Connect the PC4701 side connector of FLX120-RPD to the cable connector of the PC4701, then secure with screws the FLX120-RPD.

(1) Connecting the Cable to the PC4701

Figure 3.9 shows how to connect the PC4701 and FLX120-RPD.

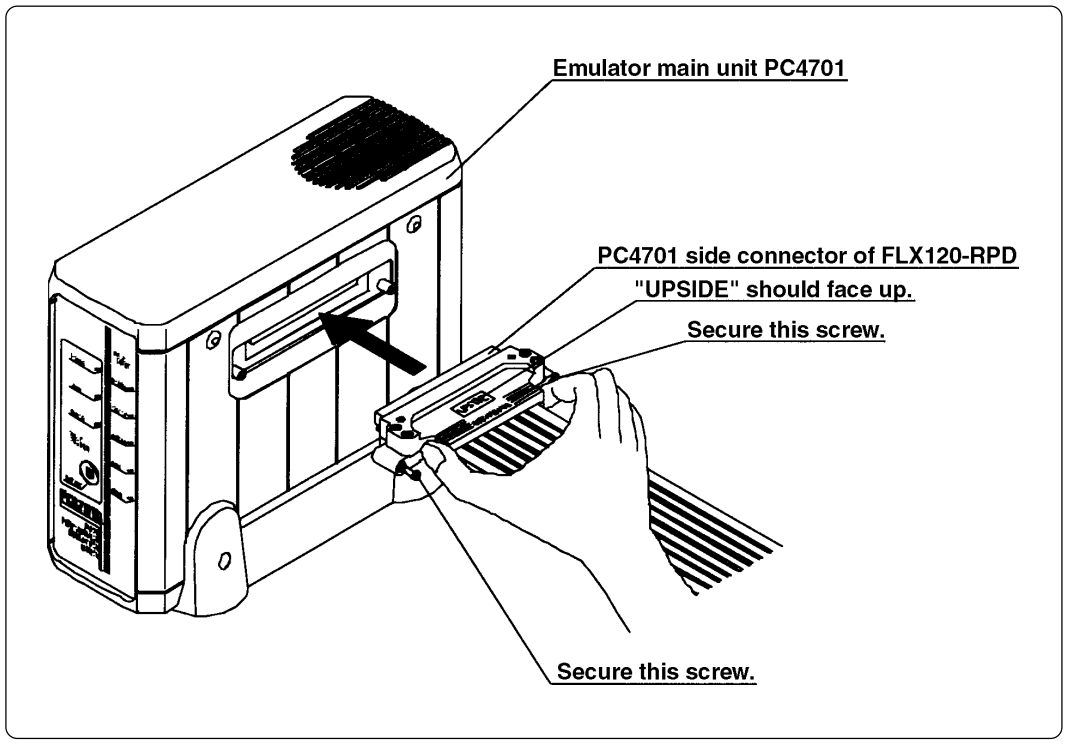


Figure 3.9 Connecting PC4701 and FLX120-RPD

⚠ CAUTION

Notes on Connecting the Cable:

- To connect the FLX120-RPD, be sure to hold the both sides of the PC4701 side connector horizontally with the "UPSIDE" facing up.
- Always shut OFF power before connecting the cable. The power ON state could destroy internal circuits.

Note on Securing the Screws:

- After connecting the cable to the emulator main unit PC4701, be sure to secure the screws mounted in both sides of the connector.

(2) Connecting the Cable to the Emulation Pod

Figure 3.10 shows how to connect the FLX120-RPD and the emulation pod.

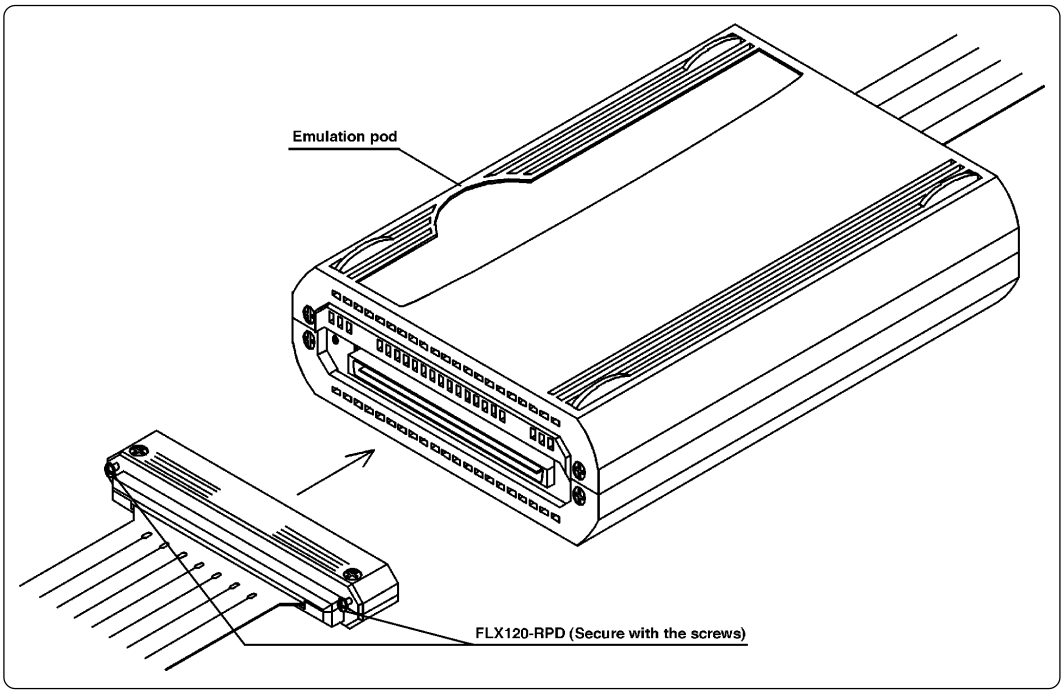


Figure 3.10 Connecting FLX120-RPD and emulation pod

⚠ CAUTION

Note on Connecting the Cable:

- Always shut OFF power before connecting the cable. The power ON state could destroy internal circuits.

Note on Securing the Screws:

- After connecting the cable to the emulation pod, be sure to secure the screws.

3.5 Connecting the Target System

Figure 3.11 shows how to connect this product to the target system.

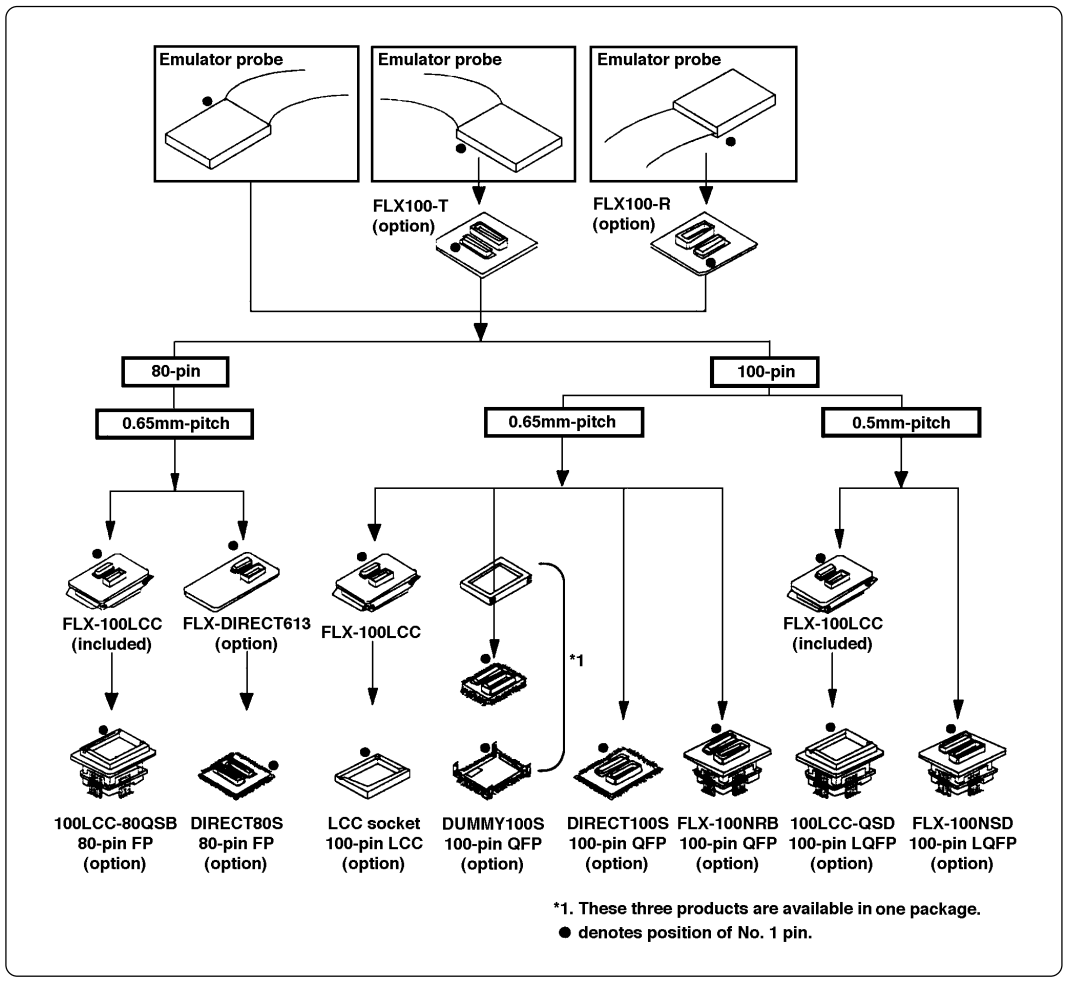


Figure 3.11 Connecting emulation pod and target systems

⚠ CAUTION

Notes on Connecting the Target System:

- Take care not to attach the converter board in a wrong direction. It may cause a fatal damage to the emulation pod.
- The small connectors of FLX100 and FLX-100LCC are guaranteed for only 20 insertion/removal iterations.

MEMO

Chapter 4. Usage

This chapter describes from turning on the power of this product to starting up the emulator debugger.

4.1 Turning On the Power 38
(1) Checking the Connection of Emulator System 38
(2) Turning On the Power 38
(3) LED Display When PC4701 Starts Up Normally 39
4.2 Downloading Firmware 40
(1) When It is Necessary to Download Firmware 40
(2) Downloading Firmware in the Maintenance Mode 40
4.3 Self-checks 41
(1) Self-check Procedure 41
(2) If an Error is Detected in Self-checks 41

Chapter 4. Usage

4.1 Turning On the Power

(1) Checking the Connection of Emulator System

Before turning the power ON, check the connection of the PC4701, emulation pod, converter board and target system.

(2) Turning On the Power

Power ON/OFF the target system and the PC4701 as simultaneously as possible.

⚠ CAUTION

Notes on Power Supply:

- The emulator's V_{CC} pin is connected to the target system in order to monitor target system voltage. For this reason, the emulator cannot supply power to the target system. Therefore, provide the target system with a separate power supply from that of the emulator.
- Keep target system power supply voltage within the MCU's specified range.
- Do not change target system power supply voltage after power has been activated.

(3) LED Display When PC4701 Starts Up Normally

After the emulator starts up, check the status of the LEDs on the front panel to see whether emulation pod operation is enabled or not. Figure 4.1 shows front panel LED lighting status when the emulator is turned ON.

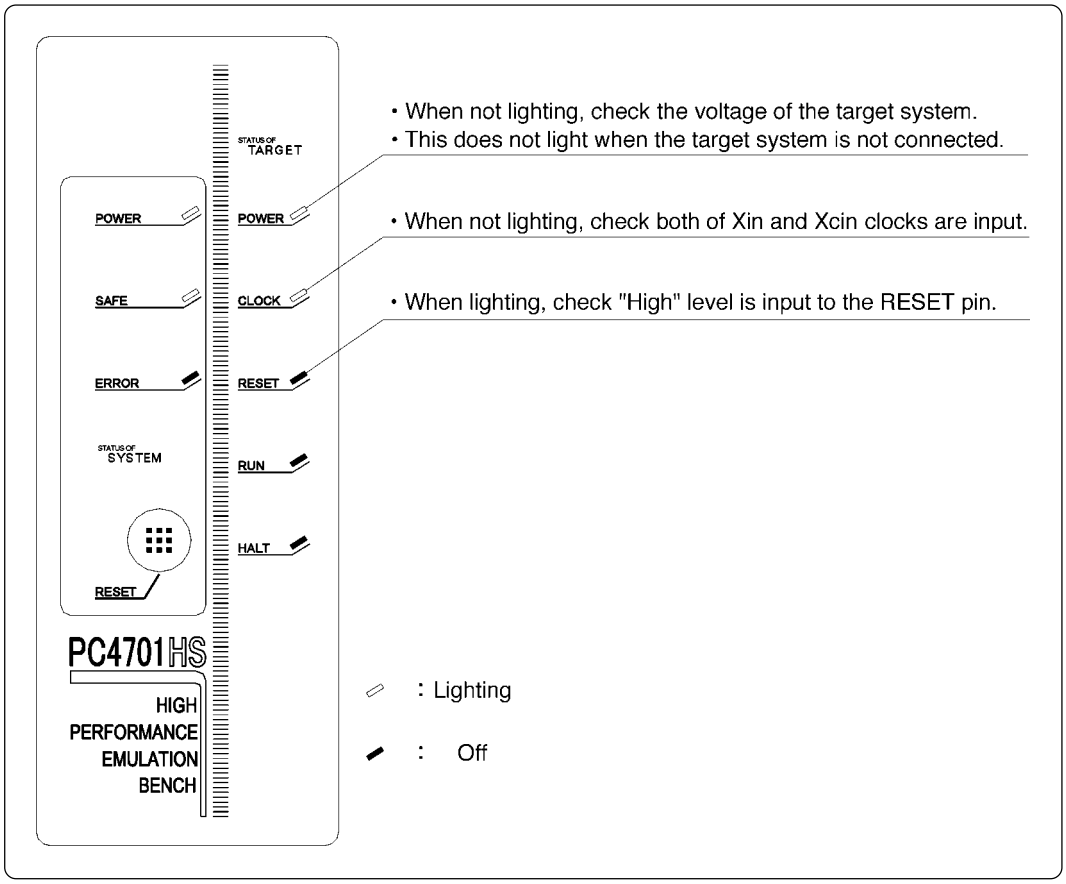


Figure 4.1 LED display when the power turned on

4.2 Downloading Firmware

(1) When It is Necessary to Download Firmware

It is necessary to download firmware;

(1) When you use this product for the first time
(2) When the firmware has been upgraded
(3) When the emulator debugger has been upgraded
(4) When you use this product with a PC4701 which was used with other emulation pod before

(2) Downloading Firmware in the Maintenance Mode

Download the firmware in the maintenance mode as explained here following. The target system must not be connected when downloading the firmware.

(1) Within 2 seconds of activating power to the emulator, press the RESET switch on the emulator front panel. This will switch the emulator to the maintenance mode.
(2) Start up the emulator debugger. When the Init dialog box setup is complete, the dialog which urges to download the firmware will appear. Download the firmware following messages. Required time for downloading the firmware depends on the connection of the interface.

- For the serial interface ..... approx. 7 minutes
- For the parallel interface ..... approx. 30 seconds

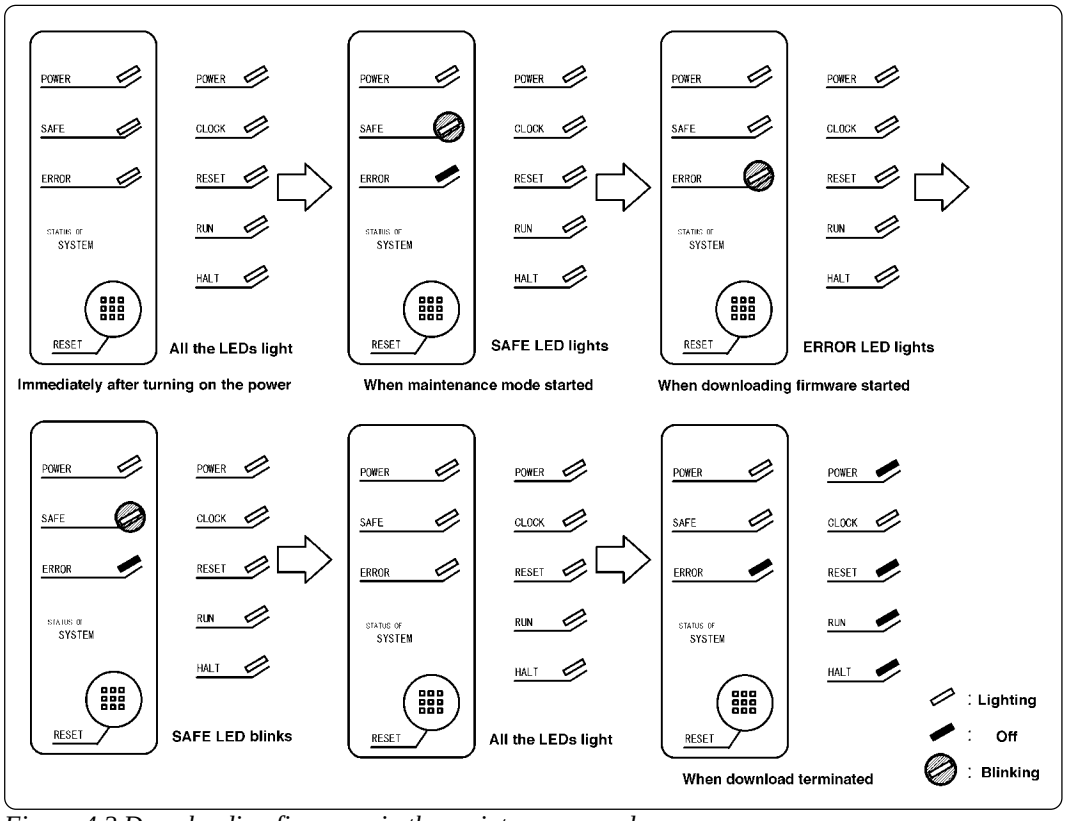


Figure 4.2 Downloading firmware in the maintenance mode

⚠CAUTION

Note on Downloading Firmware:

- Do not shut OFF power while the firmware is being downloaded. Doing so, the emulator will not start up properly. If power is shut OFF by mistake, redownload the firmware in the maintenance mode.

4.3 Self-checks

(1) Self-check Procedure

To run the emulator self-checks, do so as explained here below. While self-checks are in progress, LEDs will change as shown in Figure 4.4.

(1) Set the switches in the emulation pod same as the factory setting (see Figure 4.3).
(2) When the target system is connected, disconnect the target system.
(3) Within 2 seconds of activating power to the emulator, press the RESET switch on the emulator front panel to switch the emulator to the maintenance mode.
(4) Check the "SAFE" LED starts blinking and then press the RESET switch again.
(5) The self-checks will start. If the normal result is displayed in about 2 minutes, self-checks terminated normally.

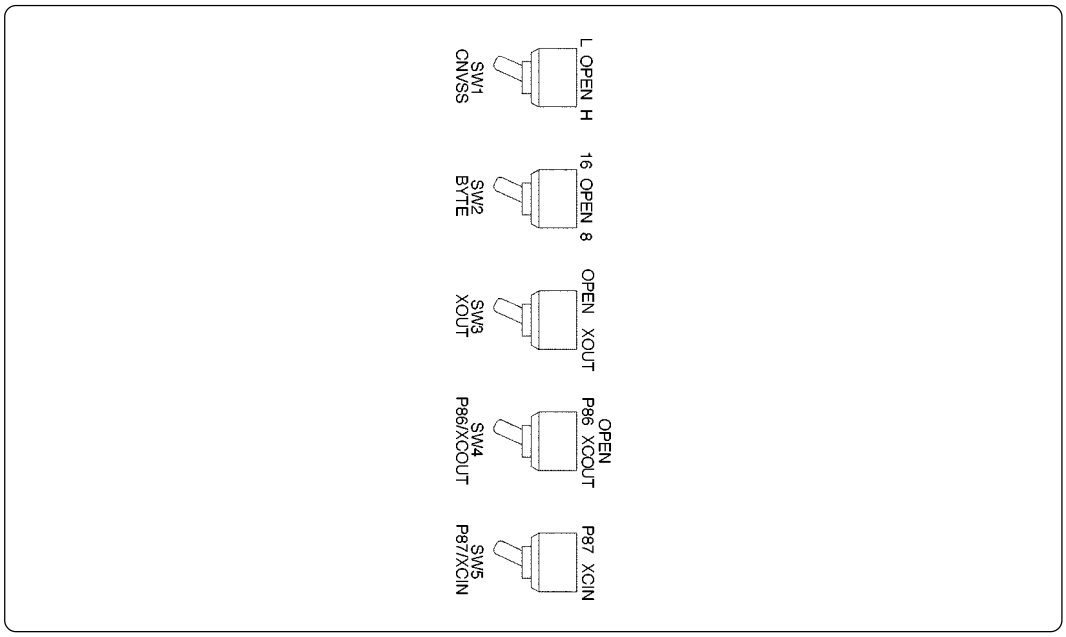


Figure 4.3 Switch settings when running self-checks (factory-settings)

(2) If an Error is Detected in Self-checks

If self-checks do not result normally (system status error or target status error in Figure 4.4), check the following.

- Check the connection of the emulation pod and the PC4701.
- Download the proper firmware.
- Check if the switches in this product are set same as the factory-settings (Figure 4.3).

⚠ CAUTION

Note on Self-checks:

- If self-checks do not result normally (excluding target system errors), the emulation pod may be damaged. Then contact your local distributor.

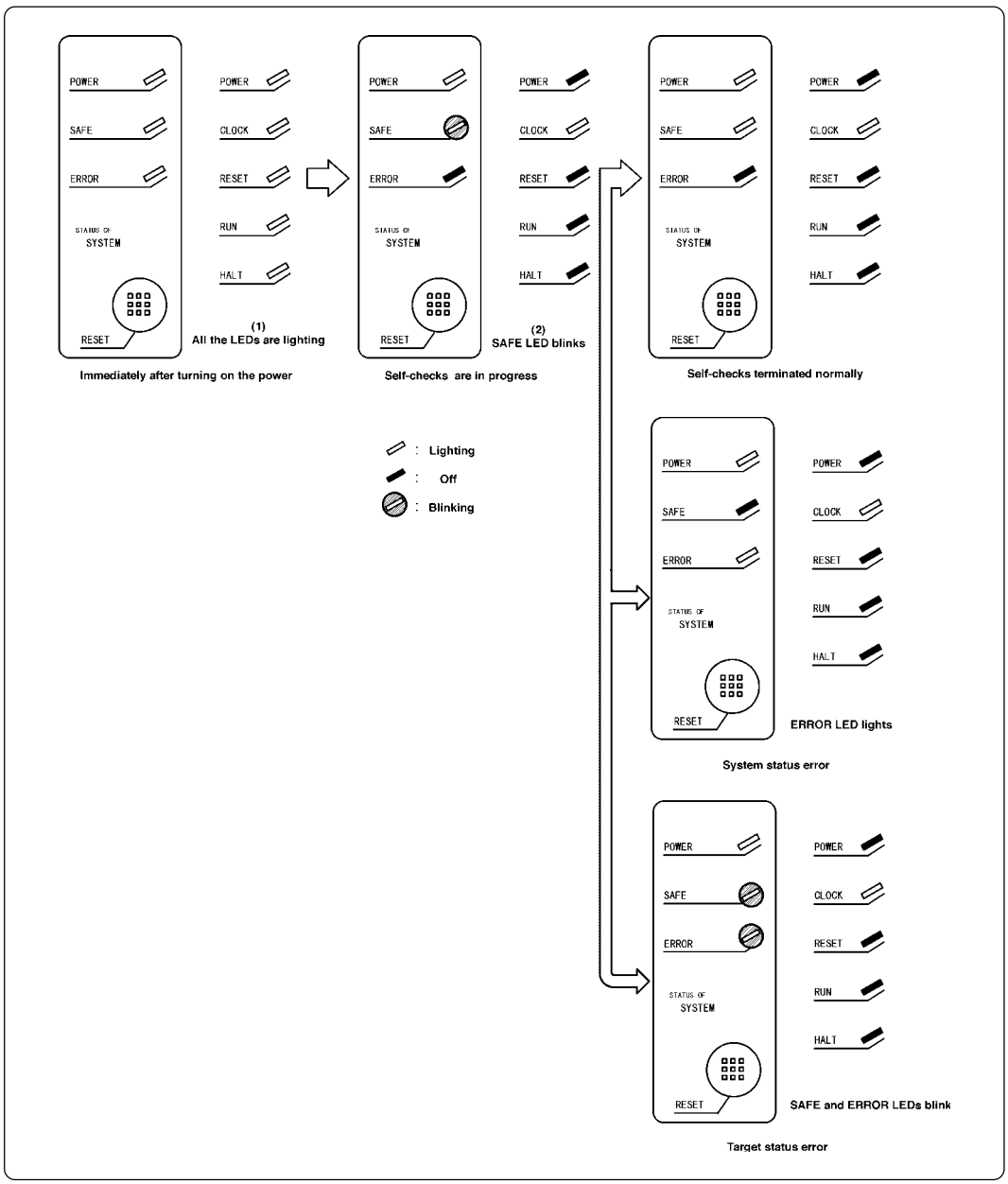


Figure 4.4 Self-check procedure

Chapter 5. Specifications

This chapter describes specifications of this product.

5.1 Specifications 44
5.2 Operation Timing in Memory Expansion Mode and Microprocessor Mode (3V) 45
(1) Separate Bus, No-wait 45
(2) Separate Bus, With Wait, Accessing External Memory Area 47
(3) Multiplex Bus, With Wait, Accessing External Memory Area 49
(4) Timing Requirements 51
5.3 Connection Diagram 53
5.4 External Dimensions 54
(1) External Dimensions of Emulation Pod 54
(2) External Dimensions of Converter Board (FLX-100LCC) 55

Chapter 5. Specifications

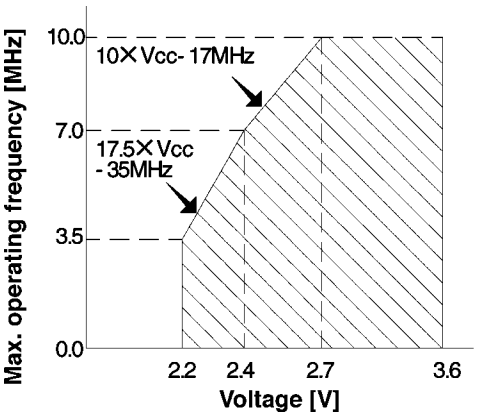
5.1 Specifications

Table 5.1 lists the specifications of M30620TL-RPD-E.

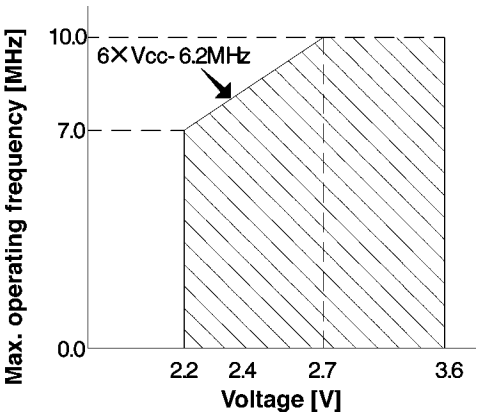
Table 5.1 Specifications of M30620TL-RPD-E

Emulator	PC4701	
Applicable MCUs	M16C/62M Group MCUs	
Evaluation MCU	M30620SMFP	
Usable modes	Single-chip mode Memory expansion mode Microprocessor mode	
Emulation memory	1MB	
Maximum operating frequency	See the charts under this table	
Clock supply	X_{IN}-X_{OUT}	Internal oscillator circuit board (OSC-3) Switchable to external oscillator input.
	X_{CIN}-X_{COUT}	Internal oscillator circuit board Switchable to external oscillator input.
Operating voltage	2.2 to 3.6V	
Operating temperature	5 to 35°C (no dew)	
Storage temperature	-10 to 60°C (no dew)	
Power supply to emulation pod	Supplied from PC4701	
Connection to target system	Refer to "3.5 Connecting the Target System" (page 35).	
International standards	• U.S. EMI standards (FCC part 15 Class A) • CE marking (EN55022, EN50082-1)	

No-wait



With wait



5.2 Operation Timing in Memory Expansion Mode and Microprocessor Mode (3V)

(1) Separate Bus, No-Wait

Table 5.2 and Figure 5.1 show the bus timing in the memory expansion mode and the microprocessor mode (separate bus, no-wait).

Table 5.2 Memory expansion mode and microprocessor mode (separate bus, no-wait)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
Td (BCLK-AD)	Address output delay time		60		See left
Th (BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
Th (RD-AD)	Address output hold time (RD standard)	0		See left	
Th (WR-AD)	Address output hold time (WR standard)	0		See left	
Td (BCLK-CS)	Chip-select output delay time		60		See left
Th (BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
Td (BCLK-ALE)	ALE signal output delay time		60		See left
Th (BCLK-ALE)	ALE signal output hold time	-4		See left	
Td (BCLK-RD)	RD signal output delay time		60		See left
Th (BCLK-RD)	RD signal output hold time	0		See left	
Td (BCLK-WR)	WR signal output delay time		60		See left
Th (BCLK-WR)	WR signal output hold time	0		See left	
Td (BCLK-DB)	Data output delay time (BCLK standard)		80		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)	0		See left	

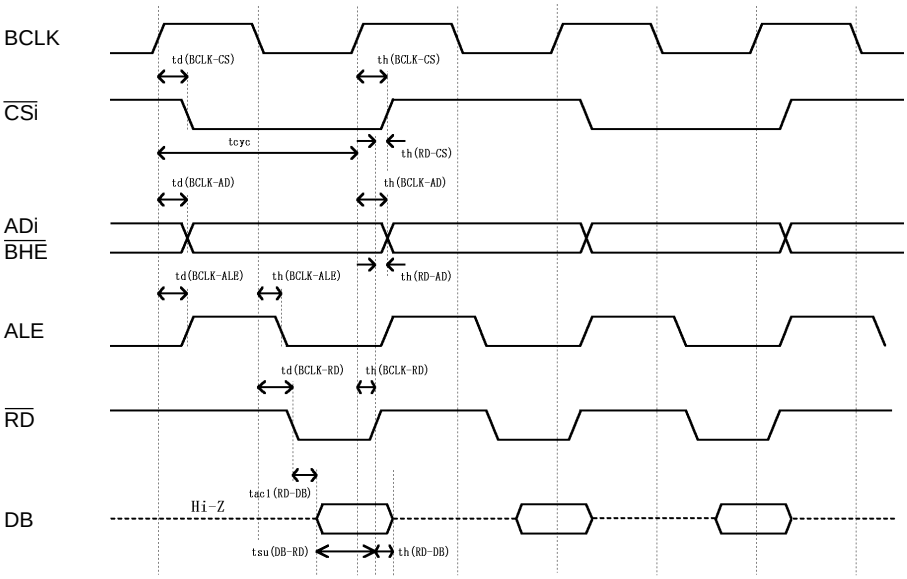
*1 Calculated by the following formula according to the frequency of BCLK.

$$\text{Td (DB-WR)} = \frac{10^9}{\text{f(BCLK)x2}} - 80 \text{ [ns]}$$

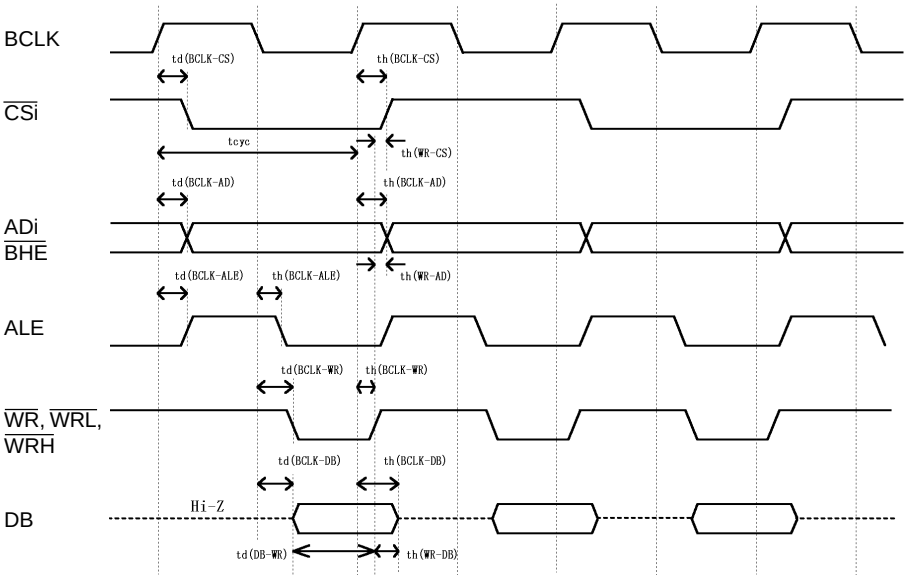
V_{CC}=3V

Memory expansion mode and microprocessor mode (no-wait)

Read timing



Write timing



Conditions:

- V_{CC}=3V
- Input timing voltage: V_{IL}=0.48V, V_{IH}=1.5V
- Output timing voltage: V_{OL}=1.5V, V_{OH}=1.5V

Figure 5.1 Memory expansion mode and microprocessor mode (no-wait)

(2) Separate Bus, With Wait, Accessing External Memory Area

Table 5.3 and Figure 5.2 show the bus timing in the memory expansion mode and the microprocessor mode (with wait, accessing external memory area).

Table 5.3 Memory expansion mode and microprocessor mode (with wait, external memory area)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
Td (BCLK-AD)	Address output delay time		60		See left
Th (BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
Th (RD-AD)	Address output hold time (RD standard)	0		See left	
Th (WR-AD)	Address output hold time (WR standard)	0		See left	
Td (BCLK-CS)	Chip-select output delay time		60		See left
Th (BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
Td (BCLK-ALE)	ALE signal output delay time		60		See left
Th (BCLK-ALE)	ALE signal output hold time	-4		See left	
Td (BCLK-RD)	RD signal output delay time		60		See left
Th (BCLK-RD)	RD signal output hold time	0		See left	
Td (BCLK-WR)	WR signal output delay time		60		See left
Th (BCLK-WR)	WR signal output hold time	0		See left	
Td (BCLK-DB)	Data output delay time (BCLK standard)		80		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)	0		See left	

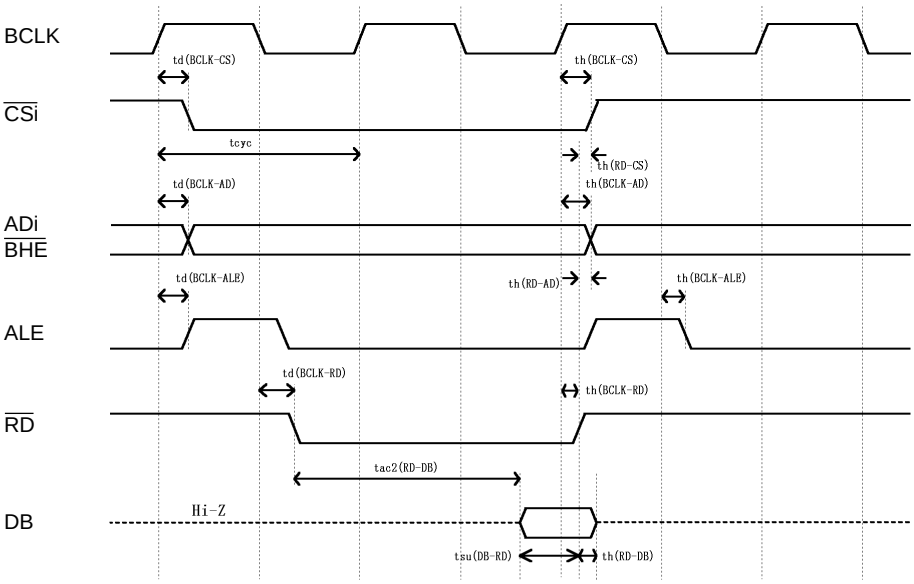
*1 Calculated by the following formula according to the frequency of BCLK.

$$\text{Td (DB-WR)} = \frac{10^9}{\text{f(BCLK)}} - 80 \text{ [ns]}$$

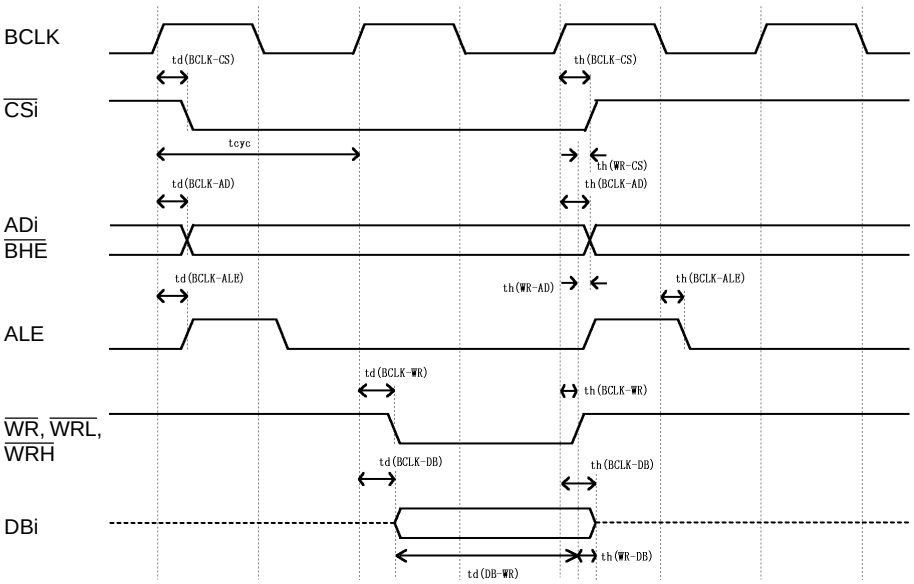
V_{CC}=3V

Memory expansion mode and microprocessor mode (with wait, accessing external memory area)

Read timing



Write timing



Conditions:

- V_{CC}=3V
- Input timing voltage: V_{IL}=0.48V, V_{IH}=1.5V
- Output timing voltage: V_{OL}=1.5V, V_{OH}=1.5V

Figure 5.2 Memory expansion mode and microprocessor mode (with wait)

(3) Multiplex Bus, With Wait, Accessing External Memory Area

Table 5.4 and Figure 5.3 show the bus timing in the memory expansion mode and the microprocessor mode (with wait, accessing external memory area and using multiplex bus).

Table 5.4 Memory expansion mode and microprocessor mode (with wait, multiplex bus)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
Td (BCLK-AD)	Address output delay time		60		See left
Th (BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
Th (RD-AD)	Address output hold time (RD standard)	(*1)		(*2)	
Th (WR-AD)	Address output hold time (WR standard)	(*1)		(*2)	
Td (BCLK-CS)	Chip-select output delay time		60		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)		See left	
Th (WR-CS)	Chip-select output hold time (WR standard)	(*1)		See left	
Td (BCLK-RD)	RD signal output delay time		60		See left
Th (BCLK-RD)	RD signal output hold time	0		See left	
Td (BCLK-WR)	WR signal output delay time		60		See left
Th (BCLK-WR)	WR signal output hold time	0		See left	
Td (BCLK-DB)	Data output delay time (BCLK standard)		80		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)	(*1)		See left	
Td (BCLK-ALE)	ALE output delay time (BCLK standard)		60		See left
Th (BCLK-ALE)	ALE output hold time (BCLK standard)	-4		See left	
Td (AD-ALE)	ALE output delay time (Address standard)	(*1)		See left	
Th (ALE-AD)	ALE output hold time (Address standard)	40		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		See left

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

$$\text{Th (RD-AD)} = \frac{10^9}{f(BCLK)x2} \text{ [ns]}$$

$$\text{Th (WR-AD)} = \frac{10^9}{f(BCLK)x2} \text{ [ns]}$$

$$\text{Th (RD-CS)} = \frac{10^9}{f(BCLK)x2} \text{ [ns]}$$

$$\text{Th (WR-CS)} = \frac{10^9}{f(BCLK)x2} \text{ [ns]}$$

$$\text{Td (DB-WR)} = \frac{10^9 x3}{f(BCLK)x2} - 80 \text{ [ns]}$$

$$\text{Th (WR-DB)} = \frac{10^9}{f(BCLK)x2} \text{ [ns]}$$

$$\text{Td (AD-ALE)} = \frac{10^9}{f(BCLK)x2} - 45 \text{ [ns]}$$

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

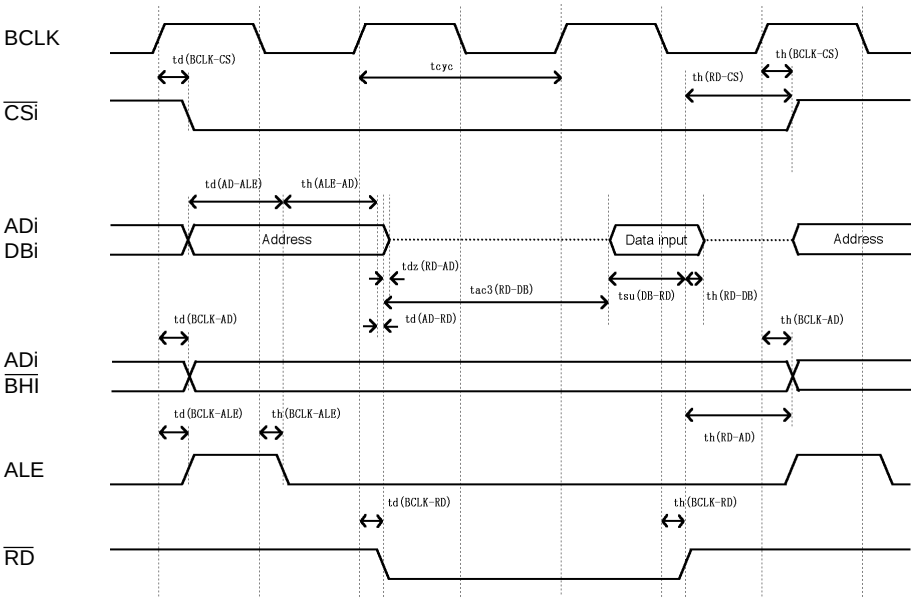
$$\text{Th (RD-AD)} = \frac{10^9}{f(BCLK)x2} - 6 \text{ [ns]}$$

$$\text{Th (WR-AD)} = \frac{10^9}{f(BCLK)x2} - 6 \text{ [ns]}$$

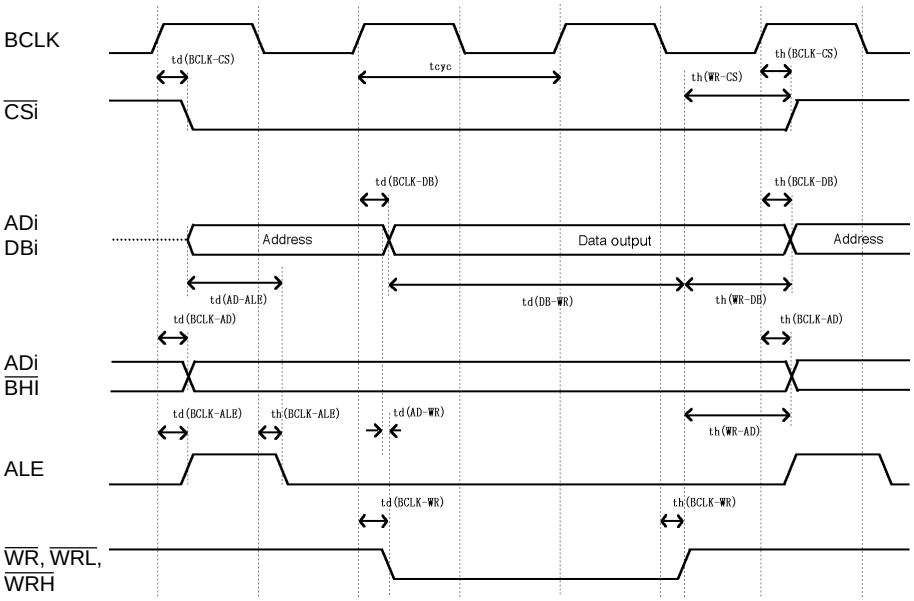
V_{CC}=3V

Memory expansion mode and microprocessor mode (with wait, accessing external memory area and using multiplex bus)

Read timing



Write timing



Conditions:

- V_{CC}=3V
- Input timing voltage: V_{IL}=0.48V, V_{IH}=1.5V
- Output timing voltage: V_{OL}=1.5V, V_{OH}=1.5V

Figure 5.3 Memory expansion mode and microprocessor mode (with wait, multiplex bus)

(4) Timing Requirements

Table 5.5, Figures 5.4 and 5.5 show timing requirements in the memory expansion mode and the microprocessor mode.

Table 5.5 Timing requirements (V_{CC}=3V)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
Tsu (DB-RD)	Data input setup time	80		See left	
Tsu (RDY-BCLK)	RDY* input setup time	60		See left	
Tsu (HOLD-BCLK)	HOLD* input setup time	80		(*1)	
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		100		See left

*1 Minimum 7ns (The definition is different from that of actual MCUs. For details, see Figure 5.5.)

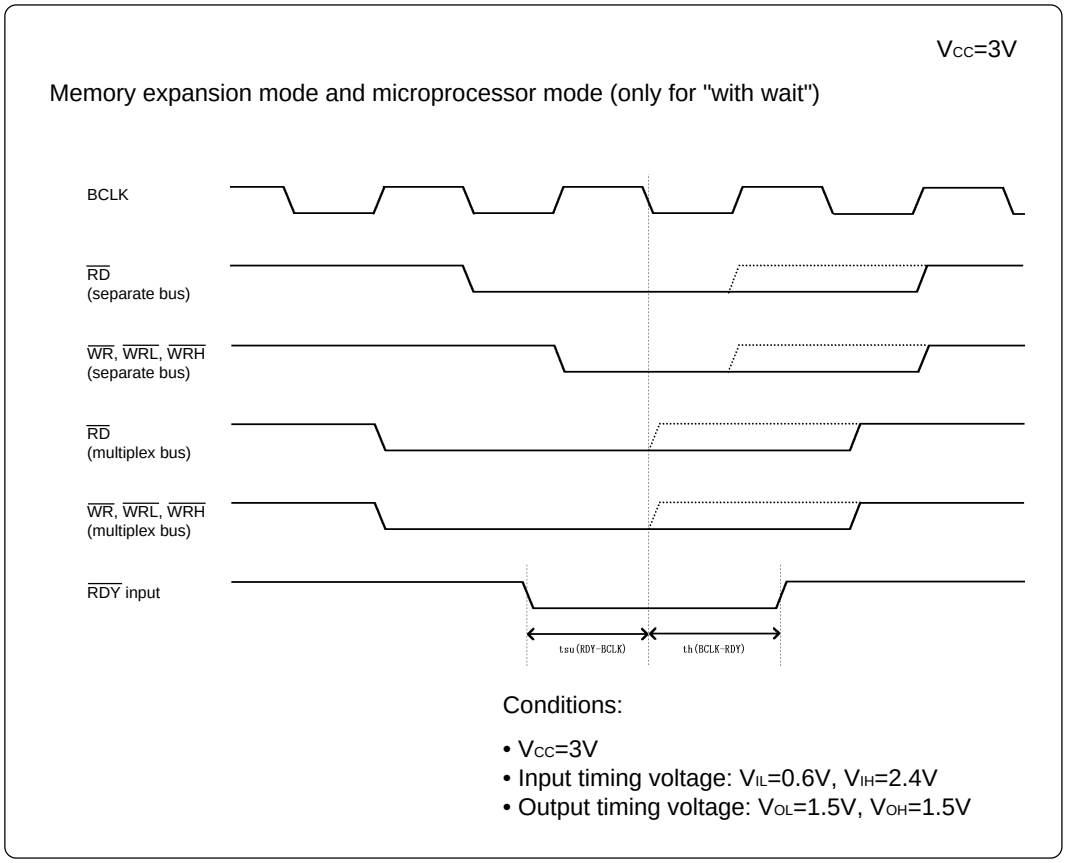
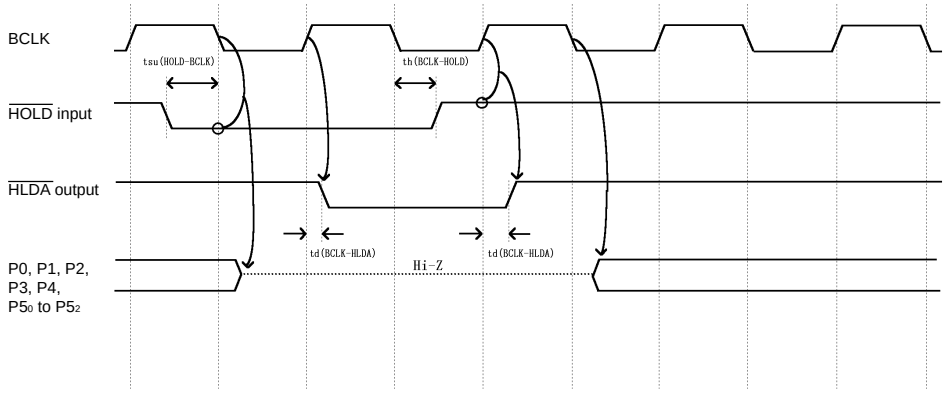


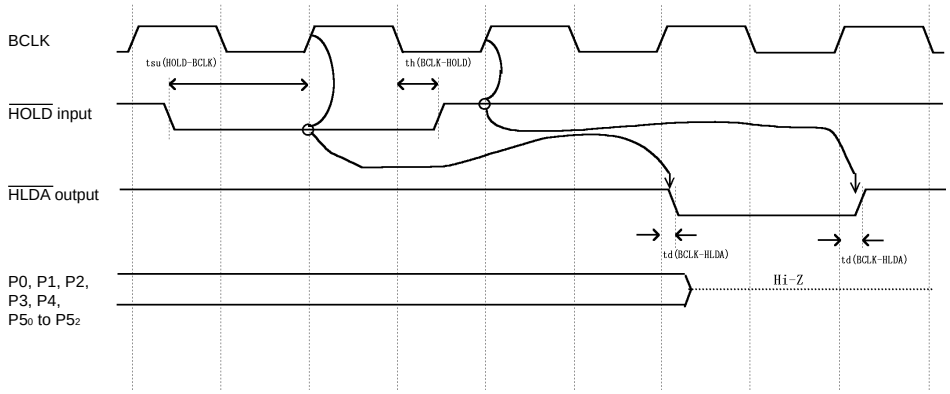
Figure 5.4 Timing requirements

V_{CC}=3V

Common to "with wait" and "no-wait" (actual MCU)



Common to "with wait" and "no-wait" (This product)



Note 1. $P0_0$ to $P5_2$ will be high-impedance status regardless of the input level of BYTE pin and ports $P4_0$ to $P4_3$ function selection bit (PM06) of the processor mode register 0.

Note 2. This product will be high-impedance delaying by 2.5 cycles than an actual MCU.

Note 3. The setup time of HOLD is defined by the startup of BCLK, differently from that of actual MCUs.

Conditions:

- V_{CC}=3V
- Input timing voltage: V_{IL}=0.6V, V_{IH}=2.4V
- Output timing voltage: V_{OL}=1.5V, V_{OH}=1.5V

Figure 5.5 Timing requirements

5.3 Connection Diagram

Figures 5.6 shows the connection diagram of M30620TL-RPD-E. This connection diagram mainly shows the interface section, and the circuits which are not connected to the target system such as the emulator's control system are omitted.

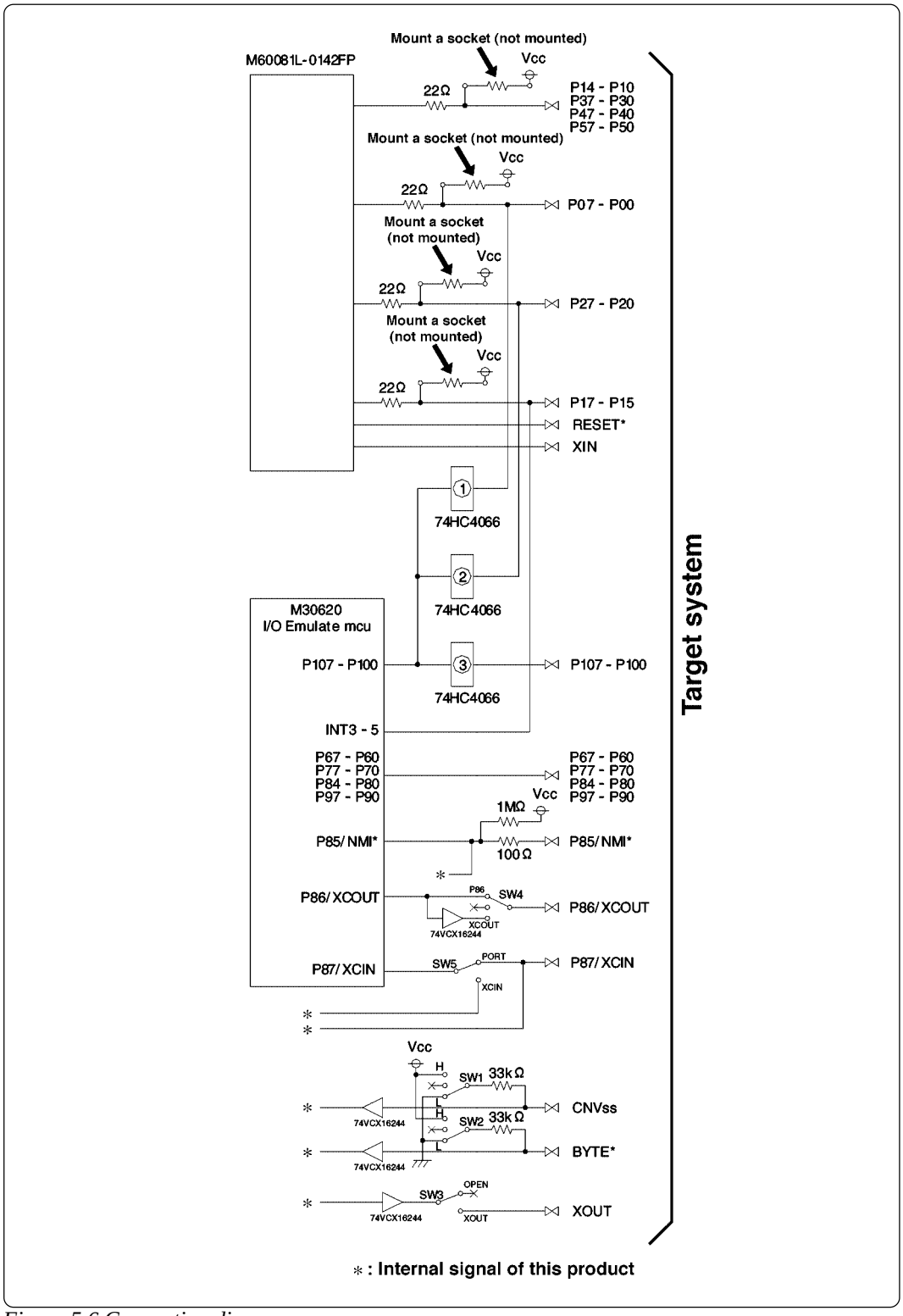


Figure 5.6 Connection diagram

5.4 External Dimensions

(1) External Dimensions of Emulation Pod

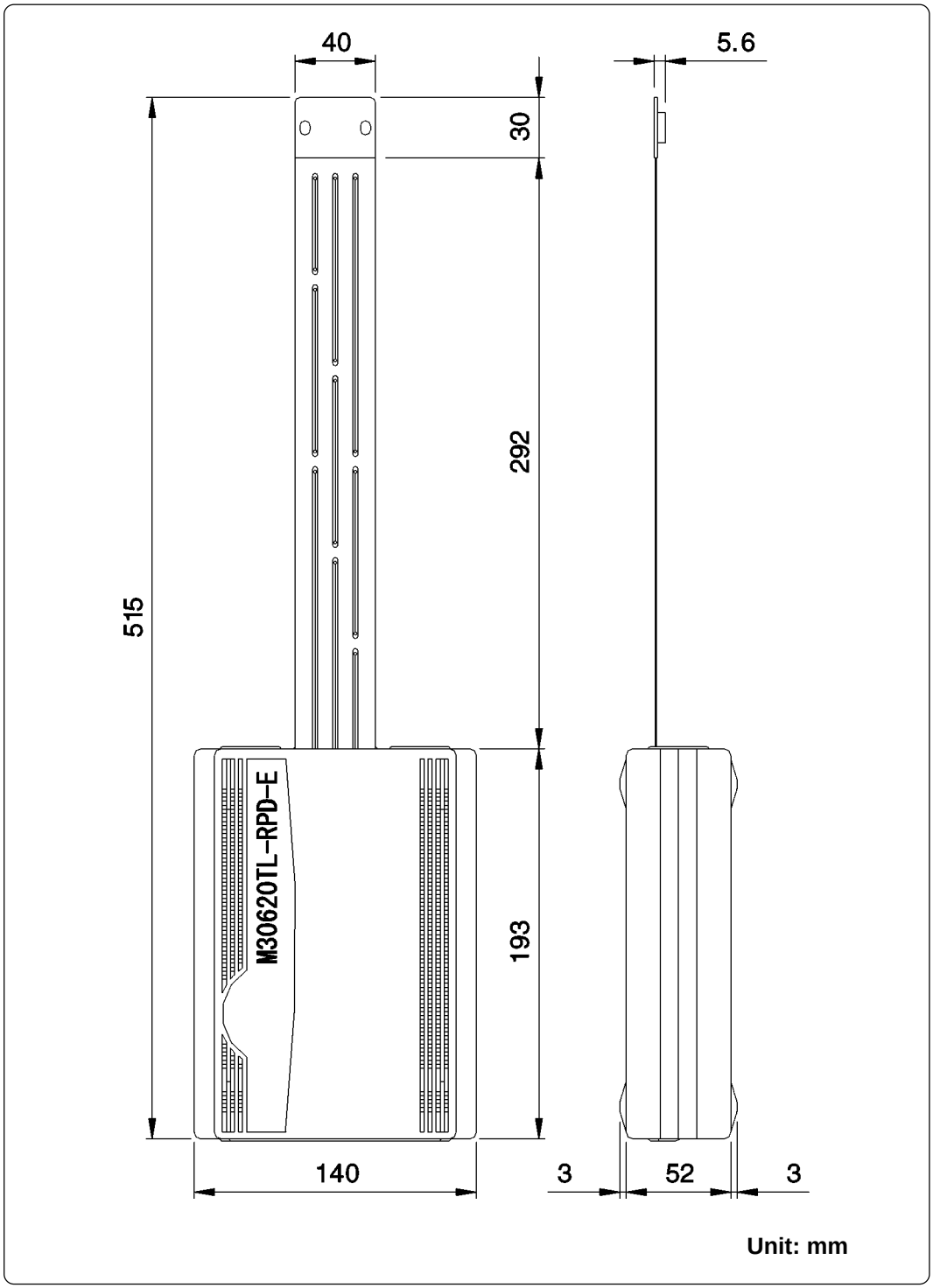


Figure 5.7 External dimensions of emulation pod

(2) External Dimensions of Converter Board (FLX-100LCC)

Figure 5.8 shows the external dimensions of the converter board FLX-100LCC for 100-pin LQFP (100D0).

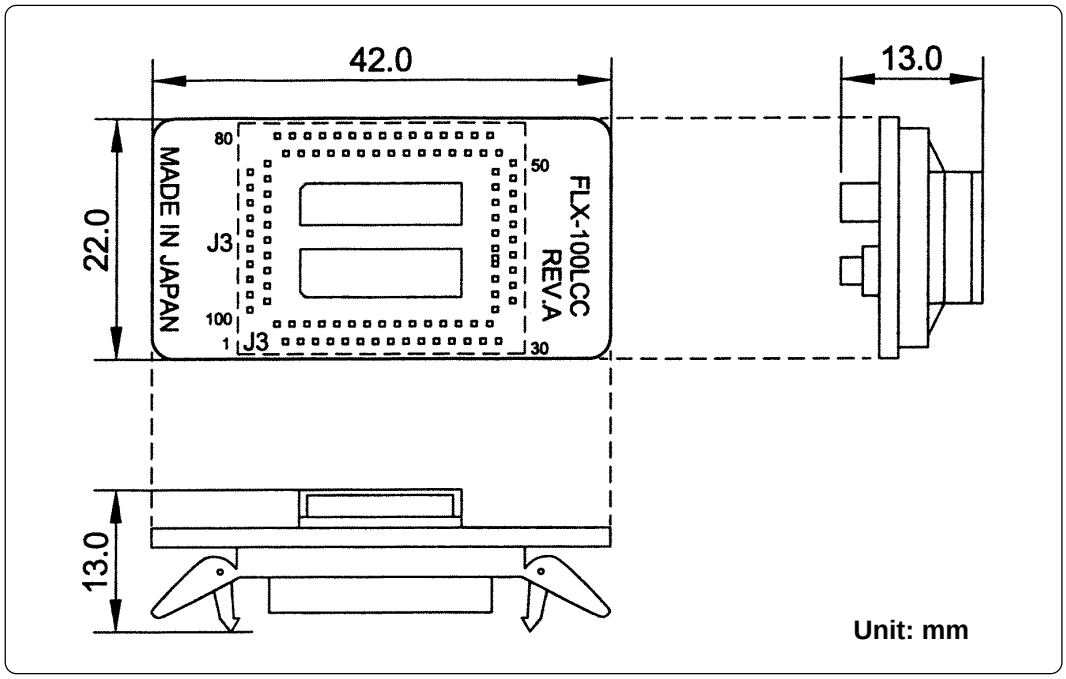


Figure 5.8 External dimensions of converter board (FLX-100LCC)

MEMO

Chapter 6. Troubleshooting

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

6.1 Flowchart to Remedy the Troubles 58

6.2 When the Emulator Debugger Does Not Start Up Properly 59

(1) When the LED Display of PC4701 is Abnormal 59

(2) Errors Occur When the Emulator Debugger Starts Up (When the target system is connected) 60

(3) Errors Occur When the Emulator Debugger Starts Up (When the target system is not connected) 61

6.3 Operation Differs from That of Actual MCUs 62

(1) Cannot Reset from the Target System 62

(2) Data Values of ROM Area at Power-on Are Different 62

(3) HOLD* Control 62

(4) A-D Conversion Values are Different from Expected Values 62

(5) Outputs of ALE, Address and Others are Different from Those of Actual MCUs 62

Chapter 6. Troubleshooting

6.1 Flowchart to Remedy the Troubles

Figure 6.1 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 target system is disconnected.

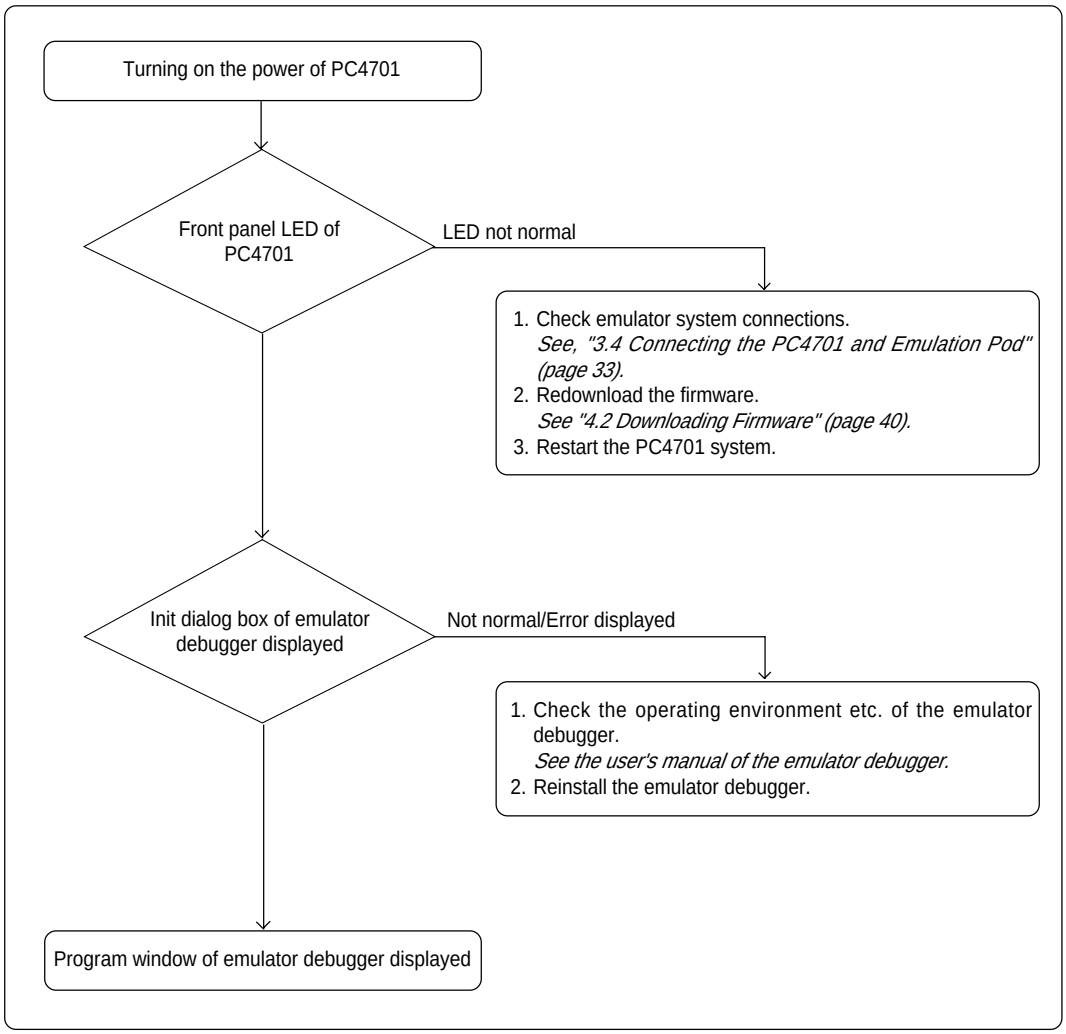


Figure 6.1 Flowchart to remedy the troubles

6.2 When the Emulator Debugger Does Not Start Up Properly

(1) When the LED Display of PC4701 is Abnormal

Table 6.1 LED's abnormal display and its checkpoints

Error	Connection to the target system	Checkpoint
LEDs do not light up.	-	Recheck the power cable is connected to the PC4701. *See the instruction manual of the PC4701.*
All LEDs remain lit.	-	Recheck the connection between the PC4701 and this product. *See "3.4 Connecting the PC4701 and Emulation Pod" (page 33).*
The "POWER" LED of "STATUS OF TARGET" does not light up.	Connected	Check power is properly supplied to the target system and that the target system is properly grounded.
The "CLOCK" LED of "STATUS OF TARGET" does not light up.	Disconnected	(1) Check 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 the oscillation circuit in the emulation pod is oscillating. *See "3.3 Selecting Clock Supply" (page 29).*
	Connected	(1) Check the oscillation circuit in the target system is oscillating. (2) Check the switches in the emulation pod are correctly set. *See "3.2 Setting Switches and Pullup Resistor" (page 25).*

(2) Errors Occur When the Emulator Debugger Starts Up (When the target system is connected)

Table 6.2 Checkpoints of errors when starting up the emulator debugger (target is connected)

Error	Checkpoint
Communication error occurred Data was not sent to the target	Check all emulator debugger settings, interface cable connection and switches on the rear of the PC4701 match. *See the instruction manuals of the PC4701 and the emulator debugger.*
Target system cannot be properly built	(1) Download the proper firmware. *See "4.2 Downloading Firmware" (page 40).* (2) Recheck the connection between the PC4701 and this product. *See "3.4 Connecting the PC4701 and Emulation Pod" (page 33).*
M3T-PD30 version is not the same version as the firmware in the target	Download the proper firmware. *See "4.2 Downloading Firmware" (page 40).*
Target MCU is in the reset state	Check the reset pin of the target system has changed from "Low" to "High" level.
Target MCU cannot be reset	(1) If the reset circuit of the target system has a watchdog timer, disable the timer. (2) Check power is properly supplied to the target system and that the target system is properly grounded. (3) The program may be uncontrollable in areas where memory not allocated. Recheck the map setting.
Target is in HOLD state	(1) The MCU is either in the stop mode or wait mode. Either reset the MCU or cancel the mode with an interrupt. *See the MCU specifications.* (2) The program may be uncontrollable in areas where memory not allocated. Recheck the map setting.
Target clock is stopped	(1) Check the oscillation circuit of the target system is oscillating properly. (2) Check the switches in the emulation pod are correctly set. *See "3.2 Setting Switches and Pullup Resistor" (page 25).*
Target MCU is not receiving power	Check power is properly supplied to the target system and the target system is properly grounded.

(3) Errors Occur When the Emulator Debugger Starts Up (When the target system is not connected)

Table 6.3 Checkpoints of errors when starting up the emulator debugger (target is not connected)

Error	Checkpoint
Communication error occurred Data was not sent to the target	Check all emulator debugger settings, interface cable connection and switches on the rear of the PC4701 match. *See the instruction manuals of the PC4701 and the emulator debugger.*
Target system cannot be properly built	(1) Download the proper firmware. *See "4.2 Downloading Firmware" (page 40).* (2) Recheck the connection between the PC4701 and this product. *See "3.4 Connecting the PC4701 and Emulation Pod" (page 33).*
M3T-PD30 version is not the same version as the firmware in the target	Download the proper firmware. *See "4.2 Downloading Firmware" (page 40).*
Target MCU cannot be reset	The program may be uncontrollable in areas where memory not allocated. Recheck the map setting.
Target is in HOLD state	(1) The MCU is either in the stop mode or wait mode. Either reset the MCU or cancel the mode with an interrupt. *See the MCU specifications.* (2) The program may be uncontrollable in areas where memory not allocated. Recheck the map setting.
Target clock is stopped	Check the switches in the emulation pod are correctly set. *See "3.2 Setting Switches and Pullup Resistor" (page 25).*

6.3 Operation Differs from That of Actual MCUs

(1) Cannot Reset from the Target System

Set the time for starting up (0.2Vcc to 0.8Vcc) 1μs or less.

(2) Data Values of ROM Area at Power-on Are Different

For this product, 04h is written into the ROM area at power-on. Therefore, the data values are different from those of an actual MCU.

(3) HOLD* Control

When inputting "Low" to the HOLD* pin to run into the HOLD state, $P0_0$ to $P5_2$ will be in the HOLD state delaying by 2.5 cycles than the actual MCU (see Figure 5.5 and Table 5.5).

(4) A-D Conversion Values are Different from Expected Values

As a flexible cable, a pitch converter board and other devices are used between the evaluation MCU and the target system, some characteristics are slightly different from those of the actual MCU. Therefore, be sure to evaluate your system with an evaluation MCU. Before starting mask production, evaluate your system and make final confirmation with an ES (Engineering Sample) version MCU.

(5) Outputs of ALE, Address and Others are Different from Those of Actual MCUs

This product has some output signals which are different from those of actual MCU as following.

1) ALE signal output in accessing the SFR area
2) Address, BHE* and ALE signal outputs in accessing the internal RAM and ROM
3) State of the data bus in the stop mode and wait mode

For details, see Chapter 1 "Note on Differences between Actual MCU and Emulator" (page 14).

Chapter 7. Maintenance and Guarantee

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

7.1 Maintenance 64
7.2 Guarantee 64
7.3 Repair Provisions 64
7.4 How to Request for Repair 65

Chapter 7. Maintenance and Guarantee

7.1 Maintenance

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.

7.2 Guarantee

If your product becomes faulty within twelve months after its purchase while being used under good conditions by observing "Precautions for Safety" described in Chapter 1 of 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.

7.3 Repair Provisions

(1) Repair with extra-charge

The products elapsed more than twelve months 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 twelve months 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.

7.4 How to Request for Repair

If your product is found faulty, follow the procedure below to send your product for repair.

Customer

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.

Distributor

After checking the contents of fault, the distributor should please send the faulty product along with the Repair Request Sheet to Renesas Solutions Corp.

Renesas Solutions

When the faulty product is repaired, it will be returned to the customer at the earliest convenience.

⚠ 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.

MEMO

M30620TL-RPD-E User's Manual

Rev.1.00
September 1, 2003
REJ10J0265-0100Z

COPYRIGHT ©2003 RENESAS TECHNOLOGY CORPORATION
AND RENESAS SOLUTIONS CORPORATION ALL RIGHTS RESERVED

M30620TL-RPD-E
User's Manual

Renesas Electronics Corporation
1753, Shimonumabe, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8668 Japan

REJ10J0265-0100Z