



# **M30620TL-RPD-E**

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Emulation Pod for M16C/62 Group M16C/62M

## **User's Manual**

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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

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# 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.

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# 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.



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# 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

	<b>WARNING</b>	If the requirements shown in the "WARNING" sentences are ignored, the equipment may cause serious personal injury or death.
	<b>CAUTION</b>	If the requirements shown in the "CAUTION" sentences are ignored, the equipment may malfunction.
	<b>IMPORTANT</b>	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 unreparable 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<sub>16</sub> to 0FFFF<sub>16</sub> to EXTERNAL:  
This product uses the 4 bytes area 0FFFC<sub>16</sub> to 0FFFF<sub>16</sub> 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<sub>16</sub> to 0FFFF<sub>16</sub> set to EXTERNAL.
  - (2) With the system which starts up in the microprocessor mode, using the 4 bytes area of 0FFFC<sub>16</sub> to 0FFFF<sub>16</sub> 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<sub>16</sub> to 0FFFF<sub>16</sub> 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<sub>16</sub> through 0FFFF<sub>16</sub> 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<sub>16</sub>" 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<sub>0</sub> to P5<sub>7</sub> are not pulled up by the pullup control resistor.

When pulling up the ports P0<sub>0</sub> to P5<sub>7</sub>, 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<sub>0</sub> to P10<sub>7</sub> are pulled up by the pullup control resistor.

Note: The pullup control resistor can read and write from P0<sub>0</sub> to P10<sub>7</sub> 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 (0.2V<sub>CC</sub> to 0.8V<sub>CC</sub>) 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<sub>IN</sub> and X<sub>OUT</sub> 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<sub>CIN</sub> and X<sub>COUT</sub>).
    - 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<sub>0</sub> to P5<sub>7</sub>
    - Ports P0<sub>0</sub> to P5<sub>7</sub> 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<sub>0</sub> to P5<sub>2</sub> 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* <sup>1</sup>	FFFF4 <sub>16</sub> to FFFF7 <sub>16</sub>	Forbidden to use usually
Single-step* <sup>1</sup>	FFFE4 <sub>16</sub> to FFFE7 <sub>16</sub>	Forbidden to use usually
BRK instruction	FFFE4 <sub>16</sub> to FFFE7 <sub>16</sub>	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.

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# 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 <sub>0</sub> to P5 <sub>7</sub> (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 <i>See Figure 3.11 Connecting emulation pod and target systems (page 35)</i>

To purchase these products, contact your nearest distributor.

## 2.4 Name of Each Part

### (1) System Configuration

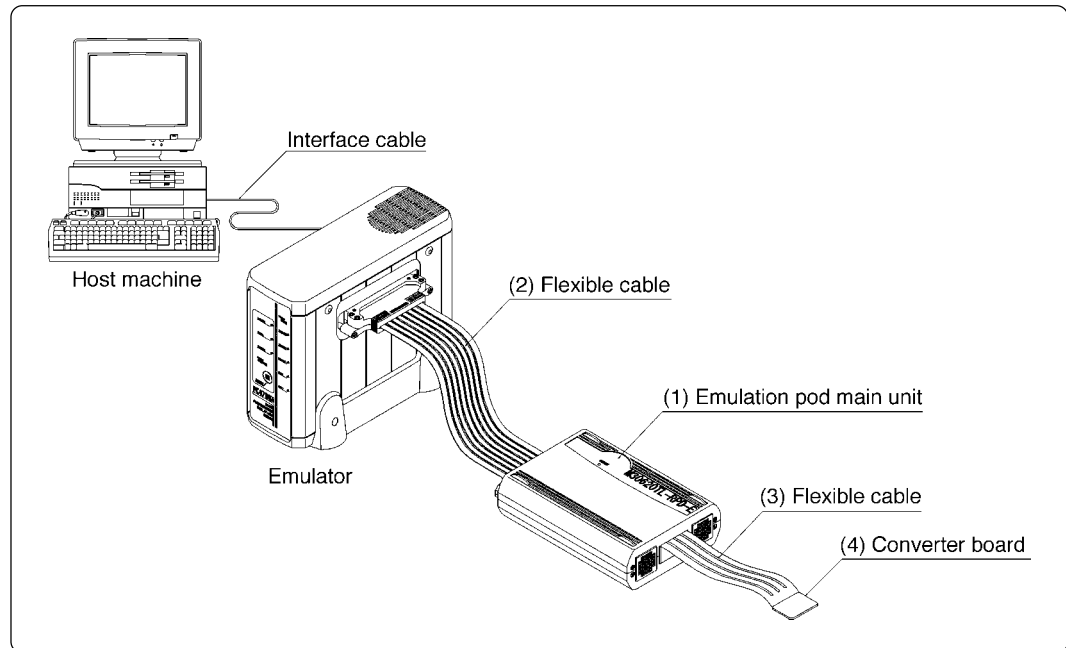


Figure 2.1 System configuration

(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

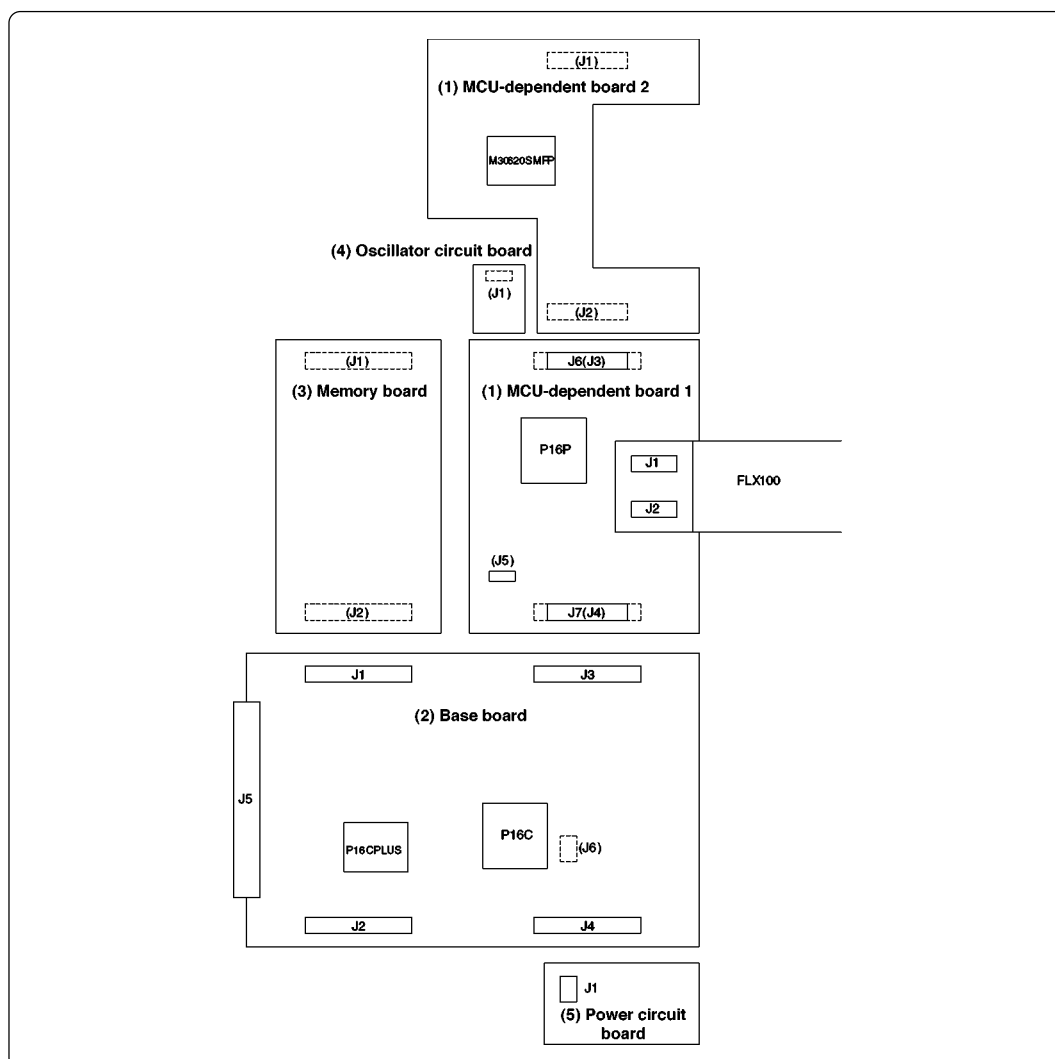


Figure 2.2 Internal view of emulation pod

### (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.

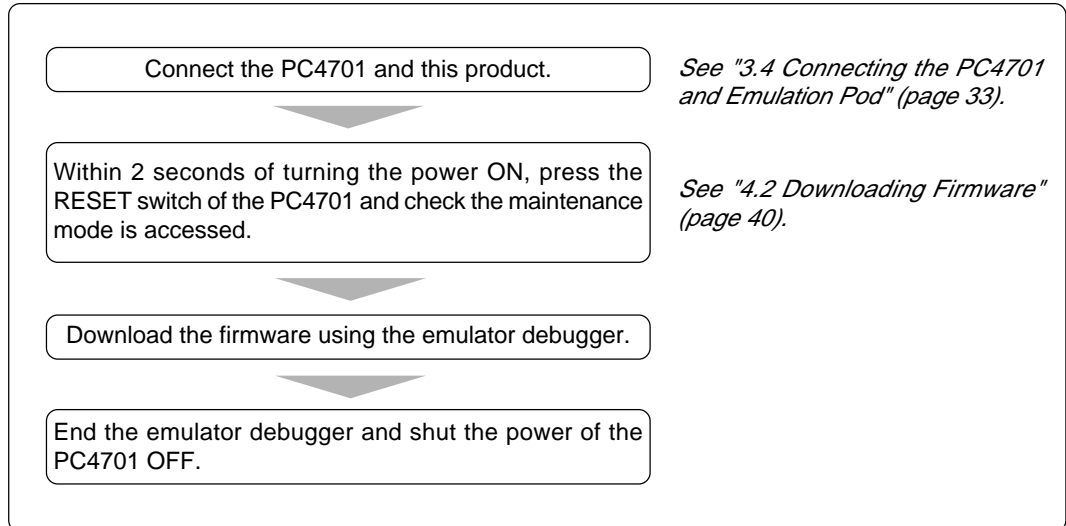


Figure 2.3 Firmware download procedure when emulator is used for the first time

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<sub>IN</sub>, X<sub>OUT</sub>, X<sub>CIN</sub> and X<sub>COU</sub>T pins for the target system.
- Set the switches for the operating voltage of the target system.
- Install a pullup resistor to ports P0<sub>0</sub> to P5<sub>7</sub>.

### 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.

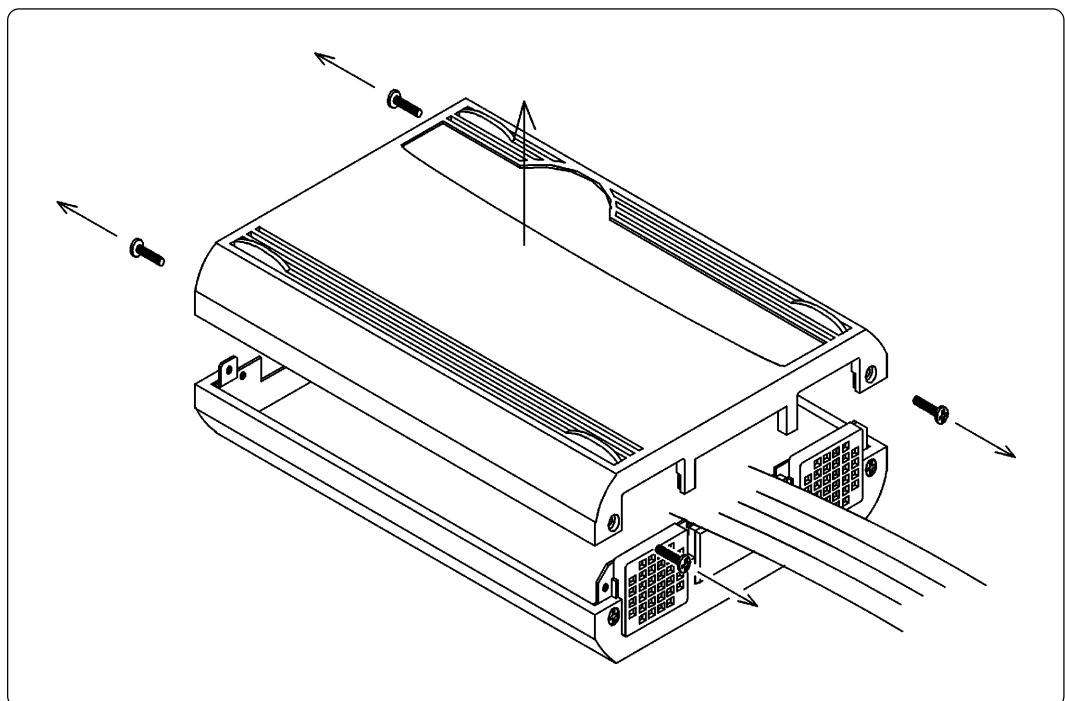


Figure 3.1 Removing the upper cover

### 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.

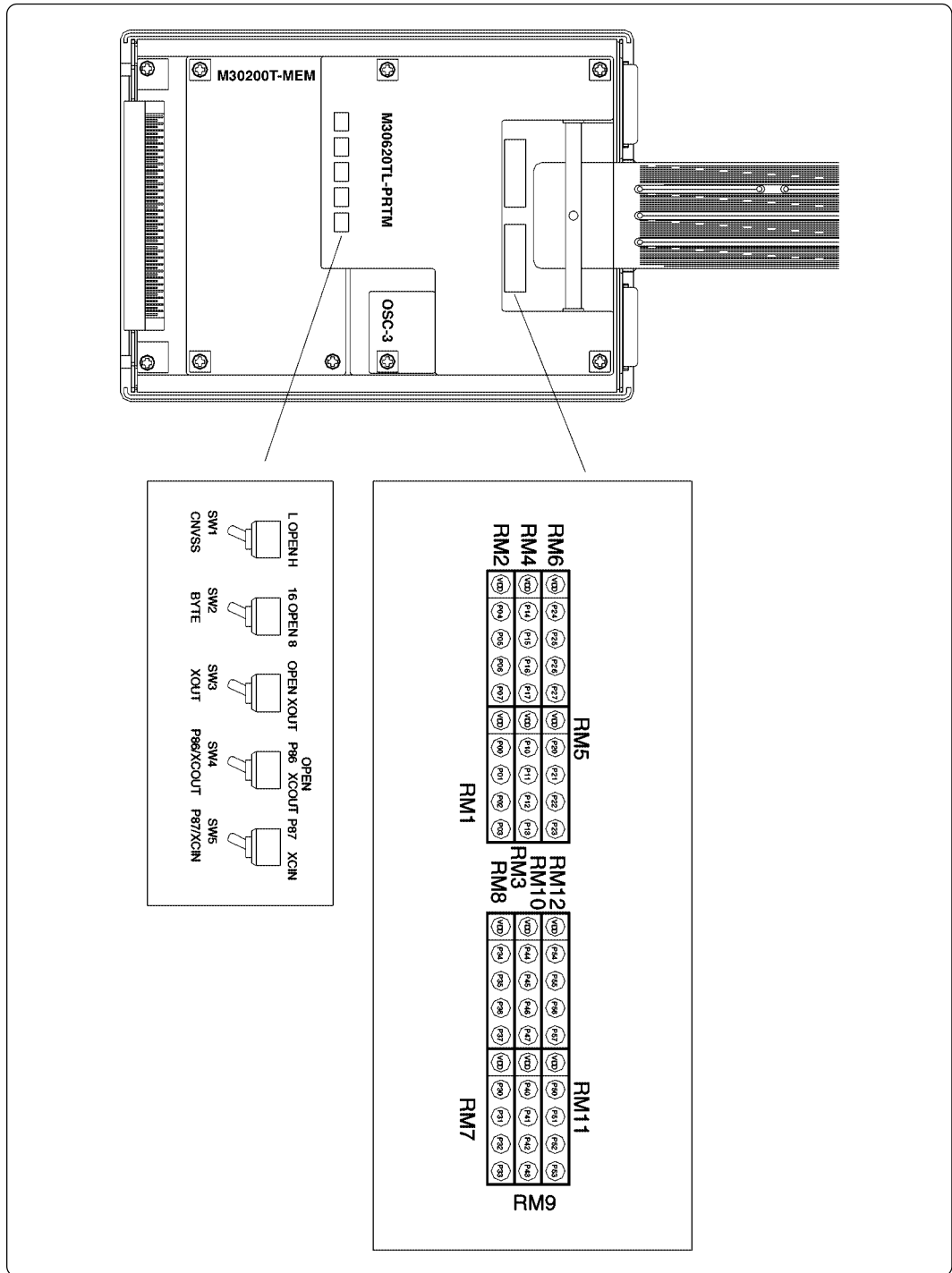


Figure 3.2 Positions of switches and their factory-settings

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

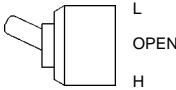
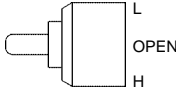
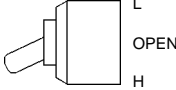
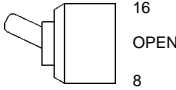
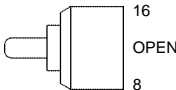
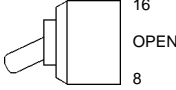
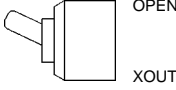
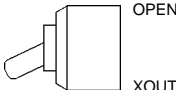
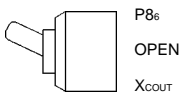
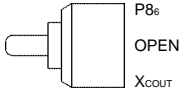

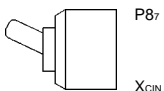
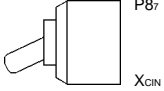
Switch	Signal	Setting	Description
SW1	CNV <sub>SS</sub>	 <p>SW1 CNV<sub>SS</sub> (Factory-setting)</p>	Pulls down the CNV <sub>SS</sub> pin of MCU with a resistance of 33kΩ.
		 <p>SW1 CNV<sub>SS</sub></p>	Does not pull down/up the CNV <sub>SS</sub> pin of MCU.
		 <p>SW1 CNV<sub>SS</sub></p>	Pulls up the CNV <sub>SS</sub> pin of MCU with a resistance of 33kΩ.
SW2	BYTE	 <p>SW2 BYTE (Factory-setting)</p>	Pulls down the BYTE pin of MCU with a resistance of 33kΩ.
		 <p>SW2 BYTE</p>	Does not pull down/up the BYTE pin of MCU.
		 <p>SW2 BYTE</p>	Pulls up the BYTE pin of MCU with a resistance of 33kΩ.
SW3	X <sub>OUT</sub>	 <p>SW3 X<sub>OUT</sub> (Factory-setting)</p>	Does not connect the X <sub>OUT</sub> pin of MCU to the target system.
		 <p>SW3 X<sub>OUT</sub></p>	Connects the X <sub>OUT</sub> pin of MCU to the target system.

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

Switch	Signal	Setting	Description
SW4	P8 <sub>6</sub> /X <sub>COU</sub> T	 <p>P8<sub>6</sub> OPEN X<sub>COU</sub>T SW4 P8<sub>6</sub>/X<sub>COU</sub>T (Factory-setting)</p>	Connects the P8 <sub>6</sub> /X <sub>COU</sub> T pin of MCU to the target system. (Uses P8 <sub>6</sub> /X <sub>COU</sub> T pin as port P8 <sub>6</sub> )
		 <p>P8<sub>6</sub> OPEN X<sub>COU</sub>T SW4 P8<sub>6</sub>/X<sub>COU</sub>T</p>	Does not connect the P8 <sub>6</sub> /X <sub>COU</sub> T pin of MCU. (Uses P8 <sub>6</sub> /X <sub>COU</sub> T pin as X <sub>COU</sub> T and opens X <sub>COU</sub> T.)
		 <p>P8<sub>6</sub> OPEN X<sub>COU</sub>T SW4 P8<sub>6</sub>/X<sub>COU</sub>T</p>	Connects the P8 <sub>6</sub> /X <sub>COU</sub> T pin of MCU to the target system. (Uses P8 <sub>6</sub> /X <sub>COU</sub> T pin as X <sub>COU</sub> T and connect X <sub>COU</sub> T to the target system.)
SW5	P8 <sub>7</sub> /X <sub>CIN</sub>	 <p>P8<sub>7</sub> X<sub>CIN</sub> SW5 P8<sub>7</sub>/X<sub>CIN</sub> (Factory-setting)</p>	Connects the P8 <sub>7</sub> /X <sub>CIN</sub> pin of MCU to the target system. (Uses P8 <sub>7</sub> /X <sub>CIN</sub> pin as port P8 <sub>7</sub> )
		 <p>P8<sub>7</sub> X<sub>CIN</sub> SW5 P8<sub>7</sub>/X<sub>CIN</sub></p>	Uses P8 <sub>7</sub> /X <sub>CIN</sub> pin as X <sub>CIN</sub> .

It is not possible to control the pullup by the pullup control resistor of ports P0<sub>0</sub> to P5<sub>7</sub> (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.

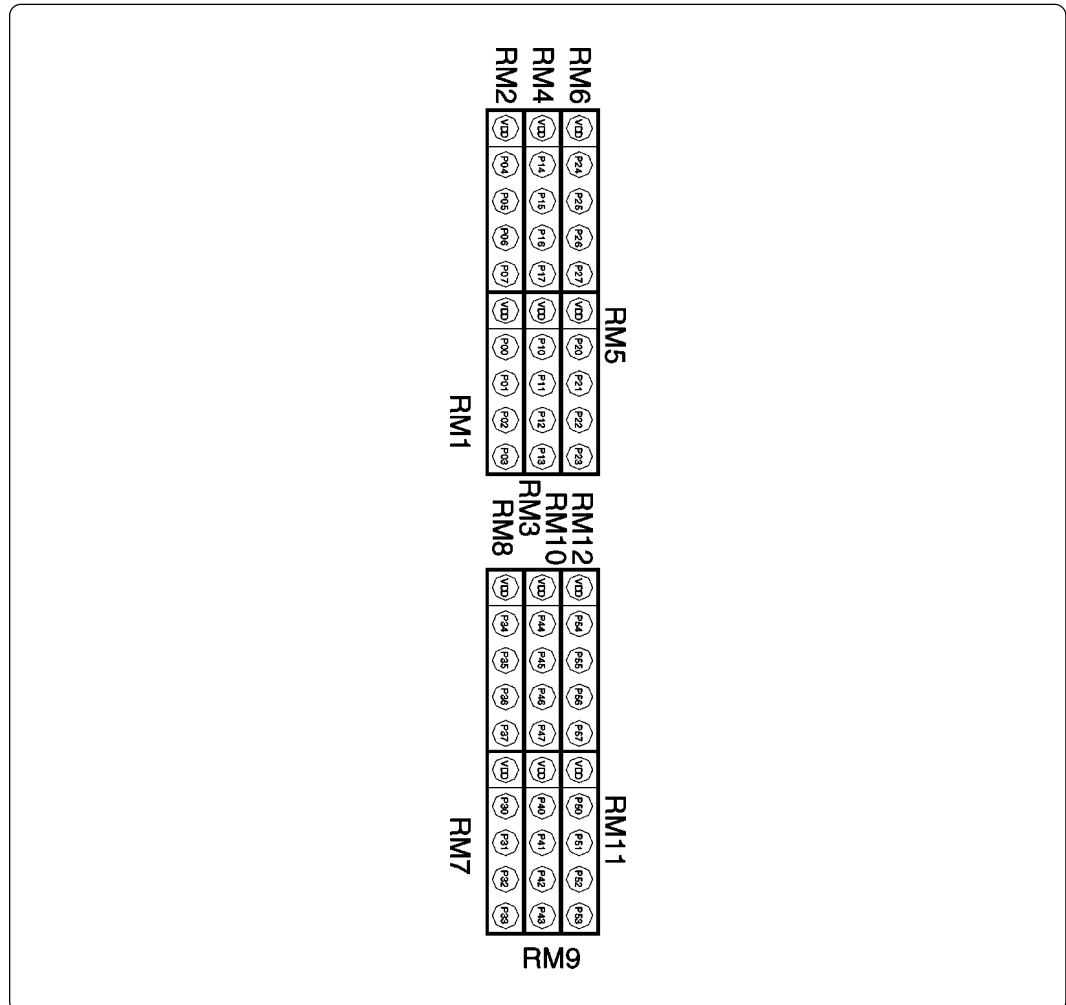


Figure 3.3 Positions for installing the pullup resistor

### 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 <sub>IN</sub> -X <sub>OUT</sub>	Internal oscillator circuit of emulation pod (OSC-3: 10.000MHz)	Internal	Yes
	Target System	External	-
X <sub>CIN</sub> -X <sub>COU</sub>	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<sub>CIN</sub>-X<sub>COU</sub> 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.)

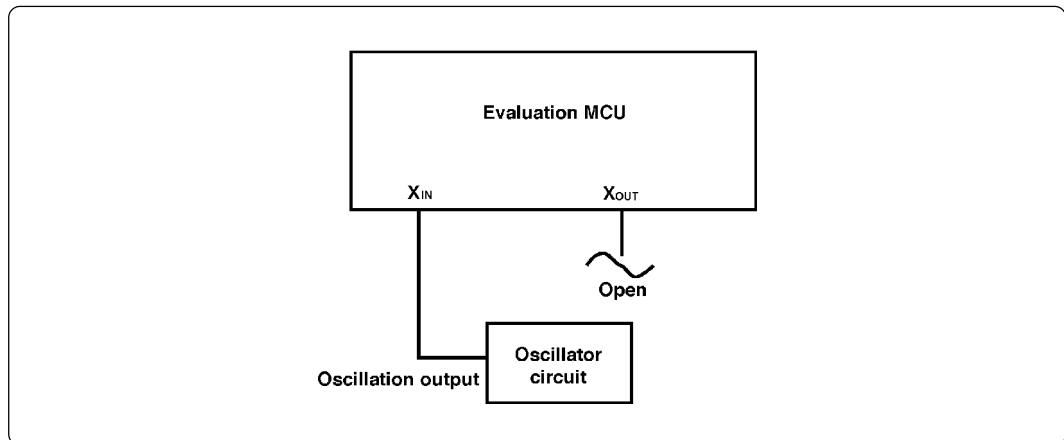


Figure 3.4 External oscillator circuit

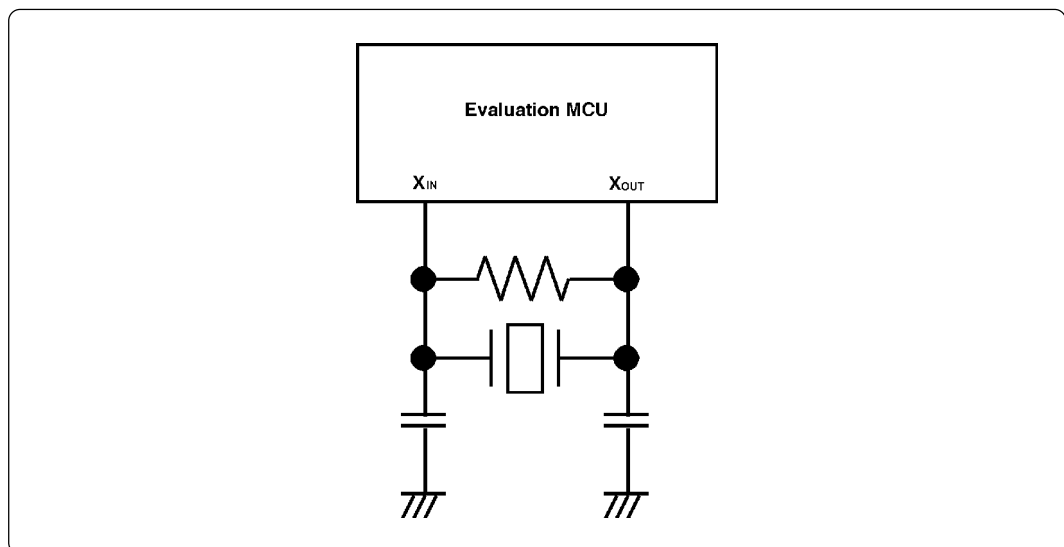


Figure 3.5 Circuit in which oscillation does not occur (same for  $X_{CIN}$ - $X_{COUT}$ )

## 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  $X_{IN}$  pin. And the  $X_{OUT}$  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  $X_{IN}$  and  $X_{OUT}$  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 ( $X_{CIN}$  and  $X_{COUT}$ ).

## (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.

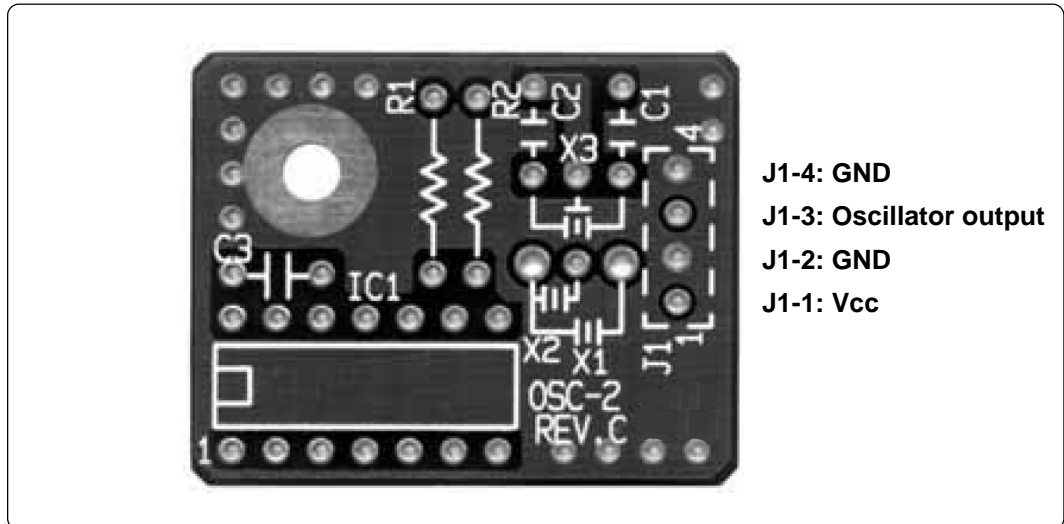


Figure 3.6 External view of oscillator board (OSC-2) and connector pin assignment

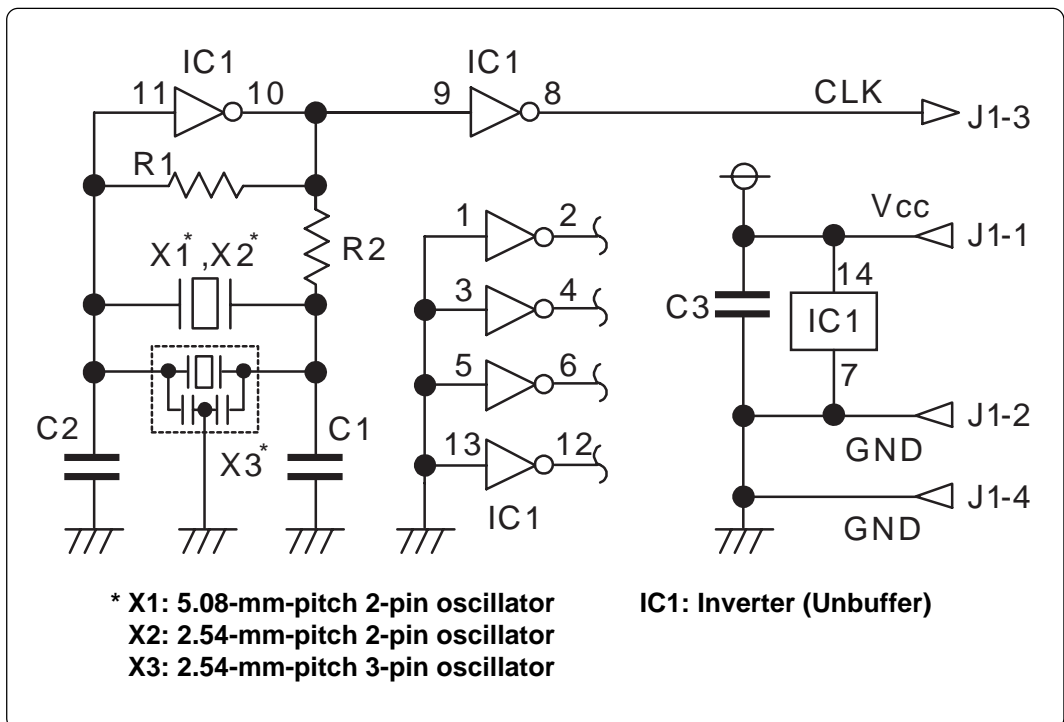


Figure 3.7 Circuit of oscillator board (OSC-2)

### (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.

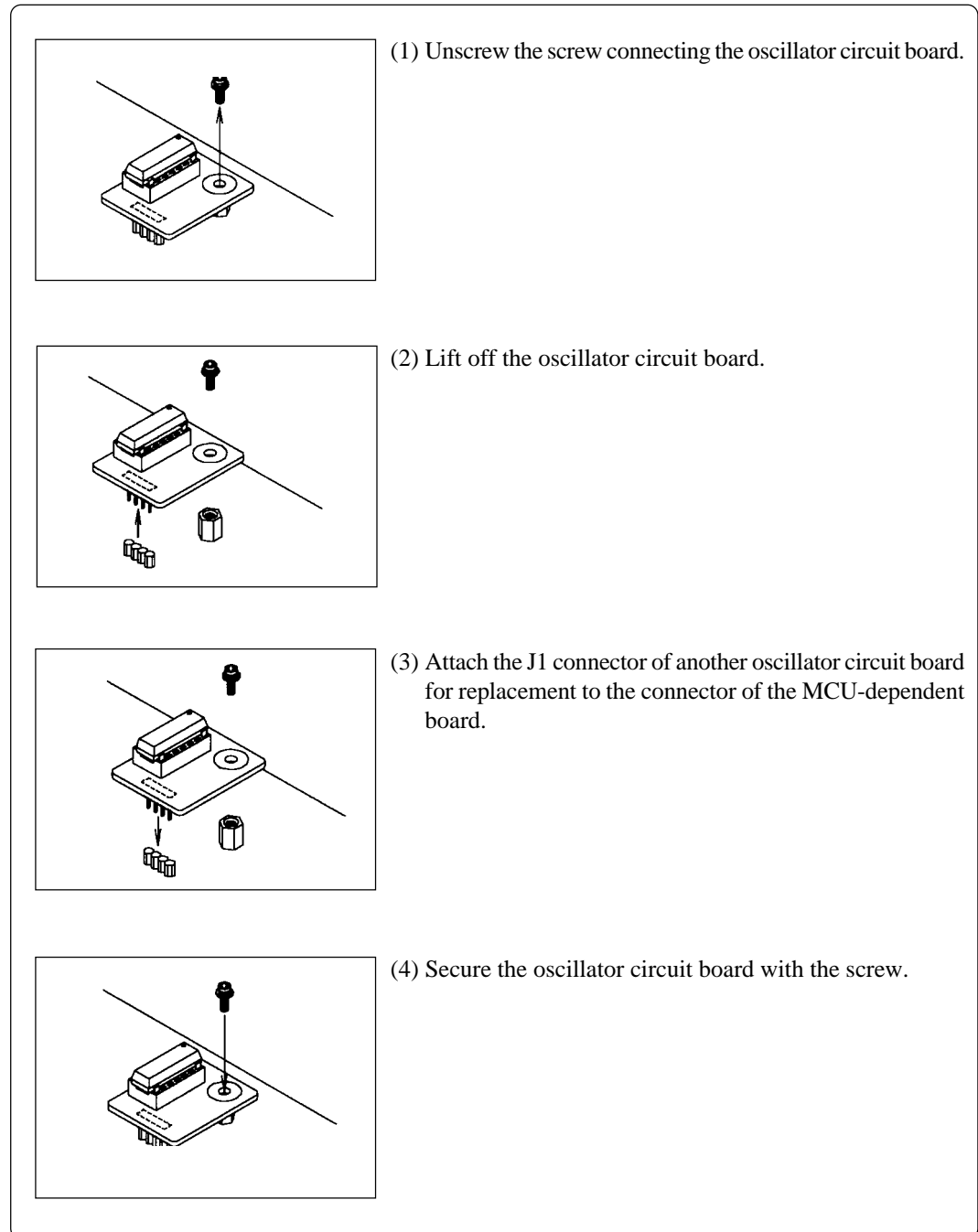


Figure 3.8 Replacing the oscillator circuit boards



### 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.

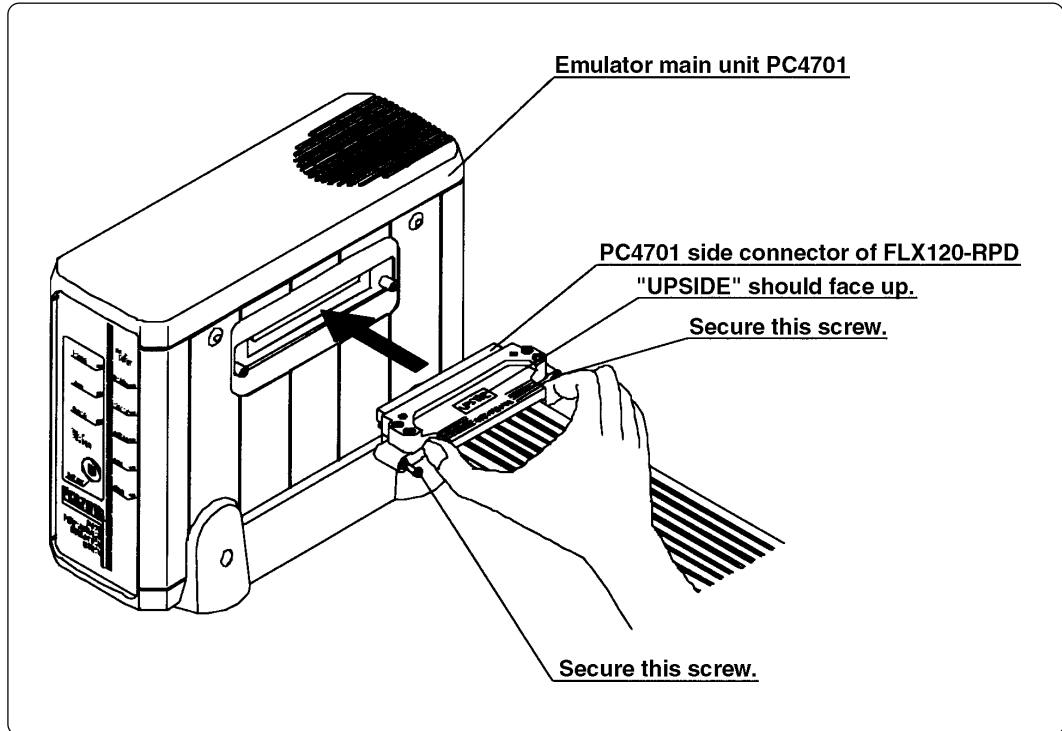


Figure 3.9 Connecting PC4701 and FLX120-RPD

## 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.

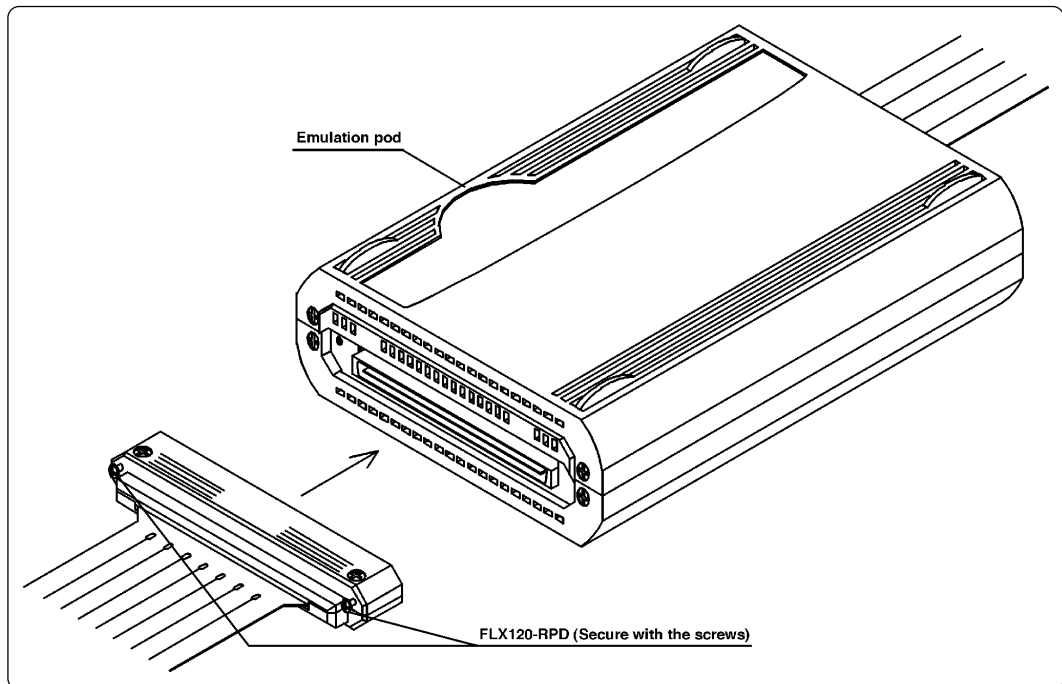


Figure 3.10 Connecting FLX120-RPD and emulation pod

### 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.

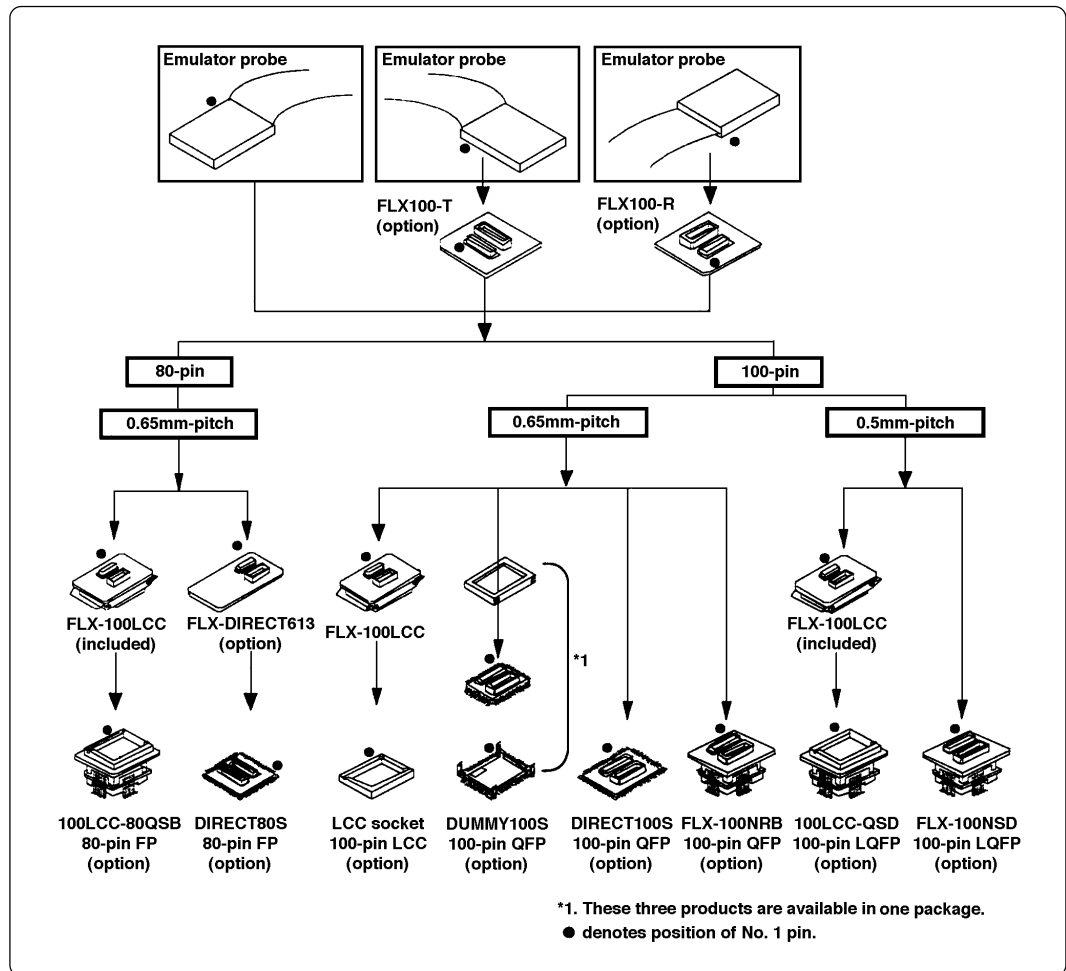


Figure 3.11 Connecting emulation pod and target systems

## ⚠ 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
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	(3) LED Display When PC4701 Starts Up Normally .....	39
4.2	Downloading Firmware .....	40
	(1) When It is Necessary to Download Firmware .....	40
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# 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.

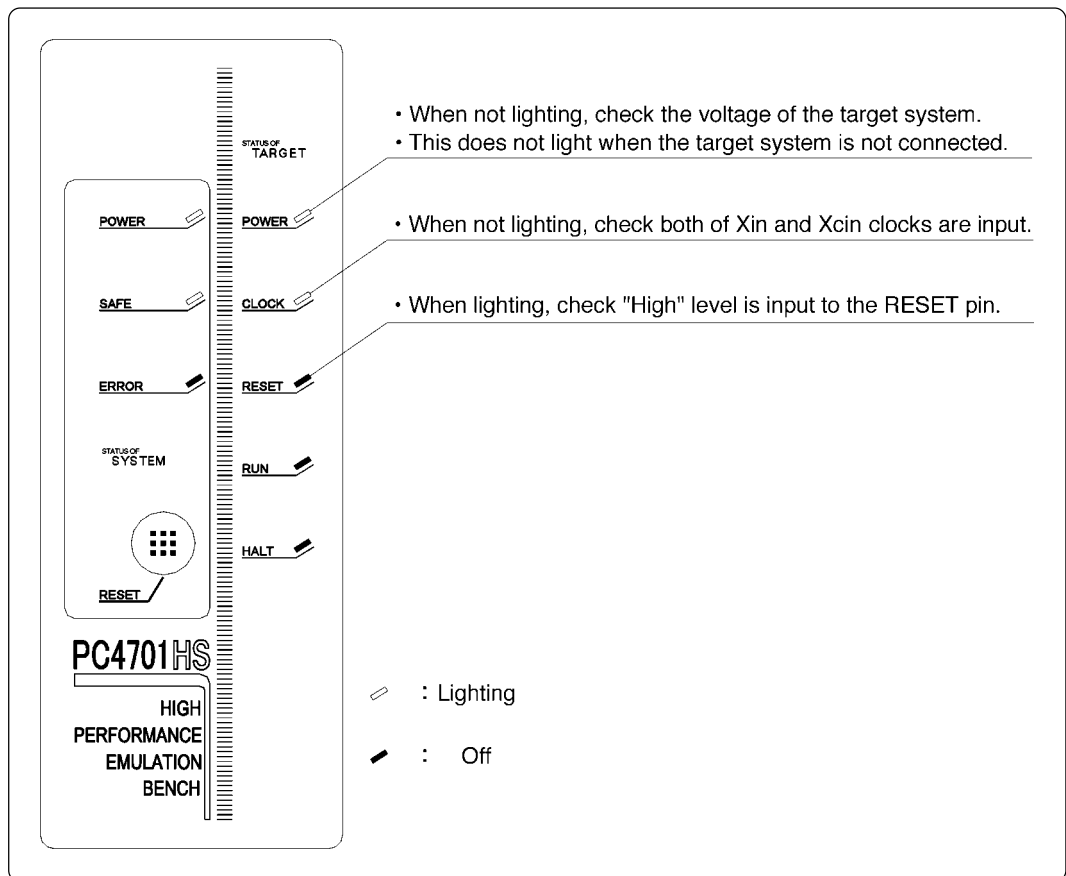


Figure 4.1 LED display when the power turned on

## 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

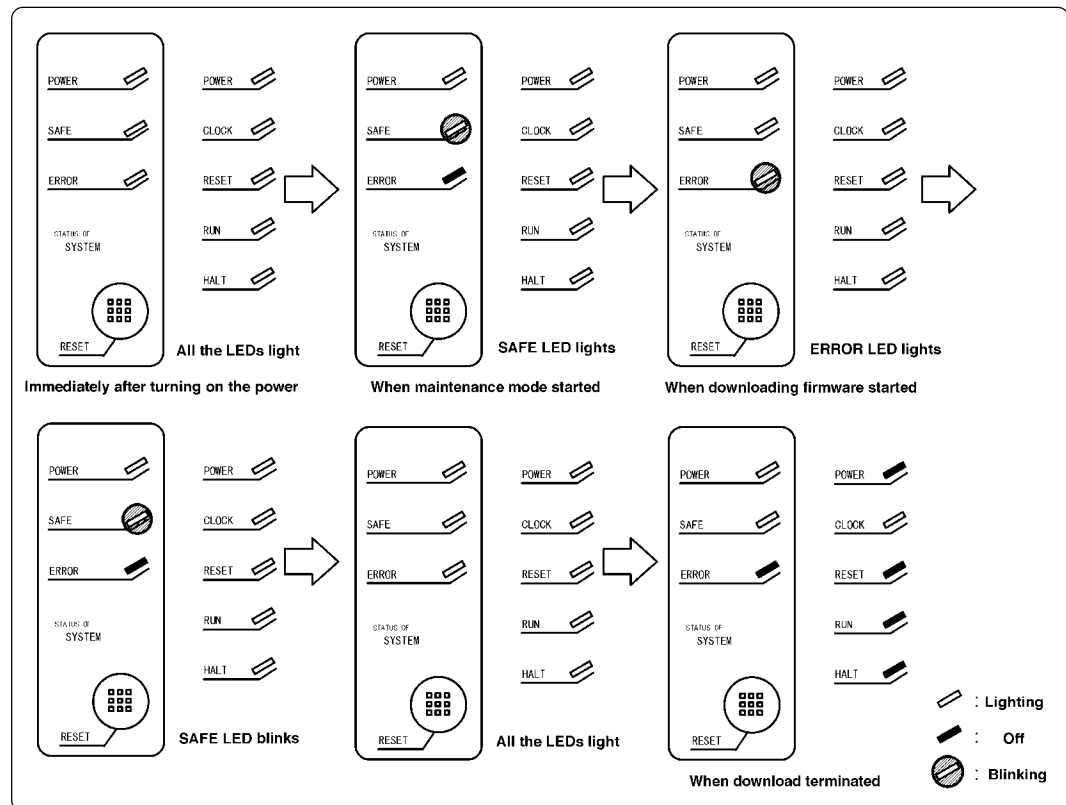


Figure 4.2 Downloading firmware in the maintenance mode

## ⚠ 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.

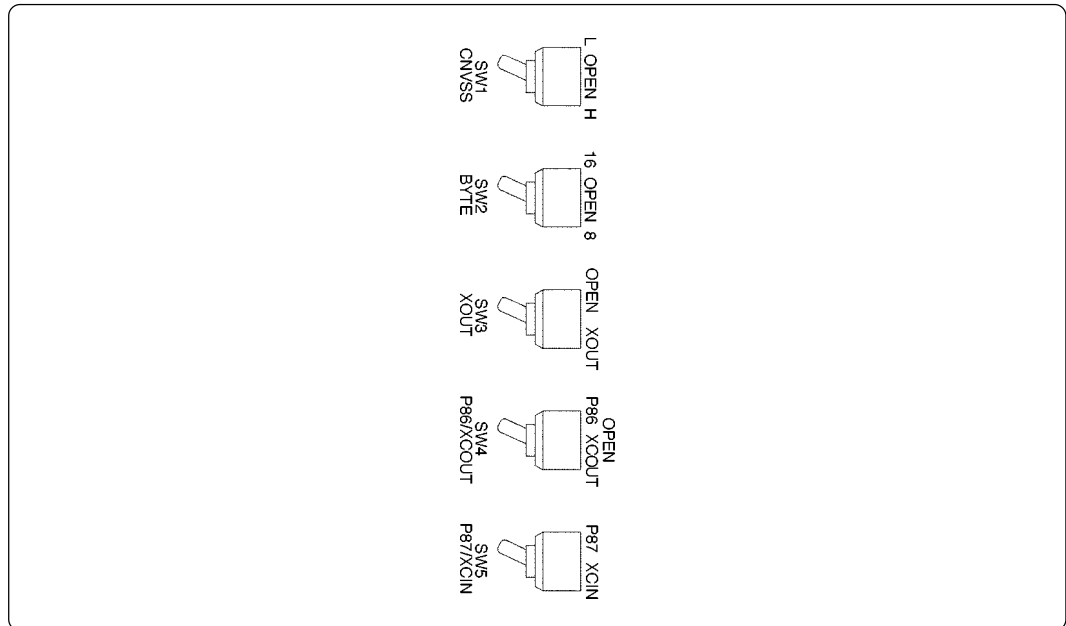


Figure 4.3 Switch settings when running self-checks (factory-settings)

### (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.

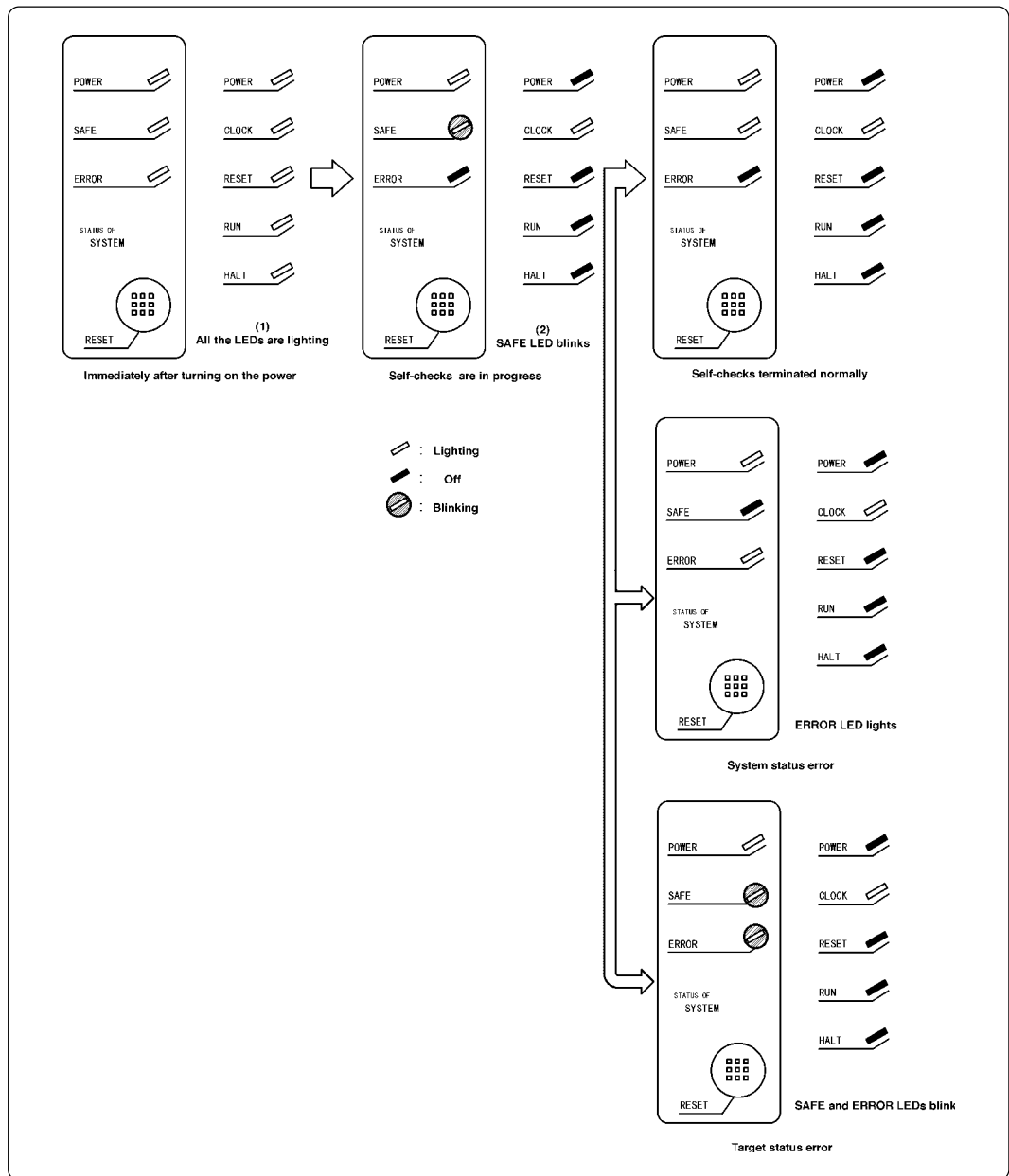


Figure 4.4 Self-check procedure

# Chapter 5. Specifications

This chapter describes specifications of this product.

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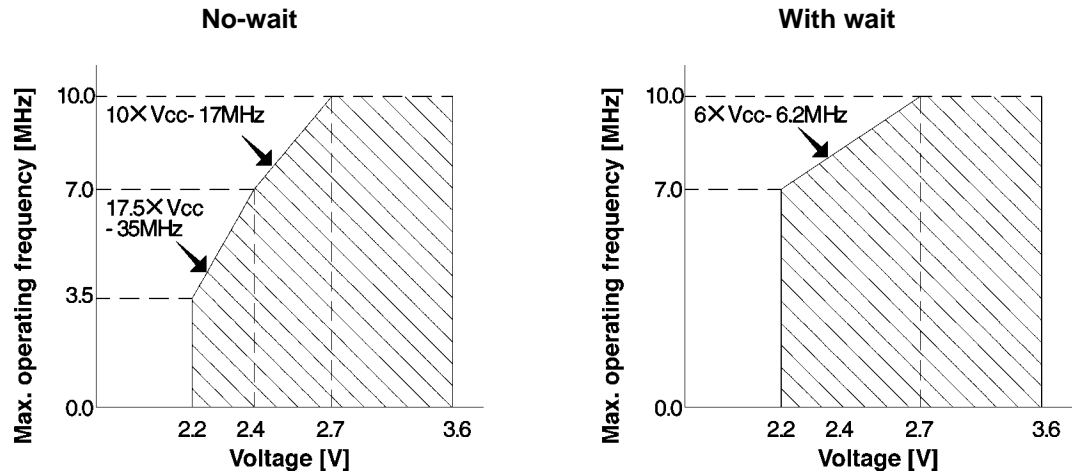
# Chapter 5. Specifications

## 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	<ul style="list-style-type: none"> <li>• U.S. EMI standards (FCC part 15 Class A)</li> <li>• CE marking (EN55022, EN50082-1)</li> </ul>	



## 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)

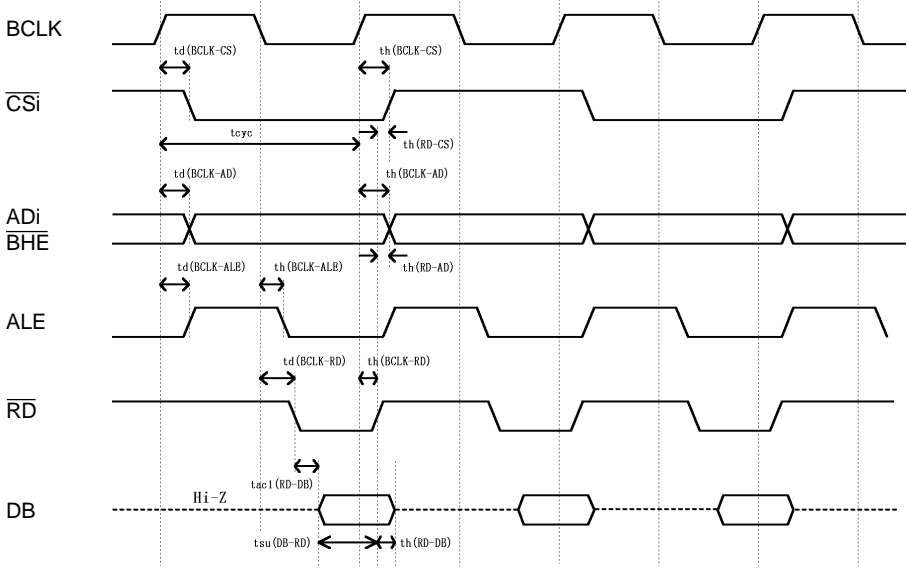
Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
Td (BCLK-AD)	Address output delay time		60		See left
Th (BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
Th (RD-AD)	Address output hold time (RD standard)	0		See left	
Th (WR-AD)	Address output hold time (WR standard)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

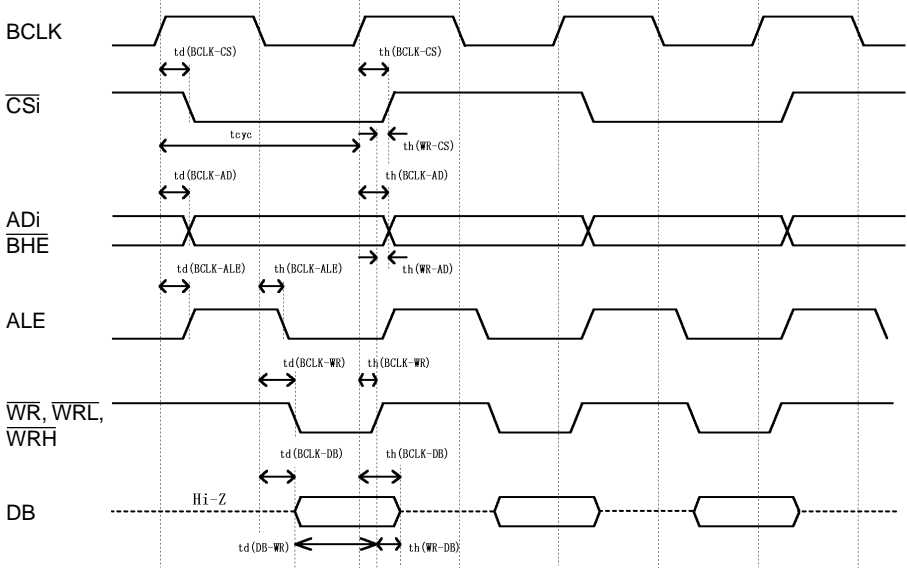
$$T_d(\text{DB-WR}) = \frac{10^9}{f(\text{BCLK}) \times 2} - 80 \text{ [ns]}$$

Memory expansion mode and microprocessor mode (no-wait)

Read timing



Write timing



Conditions:

- V<sub>CC</sub>=3V
- Input timing voltage: V<sub>IL</sub>=0.48V, V<sub>IH</sub>=1.5V
- Output timing voltage: V<sub>OL</sub>=1.5V, V<sub>OH</sub>=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	

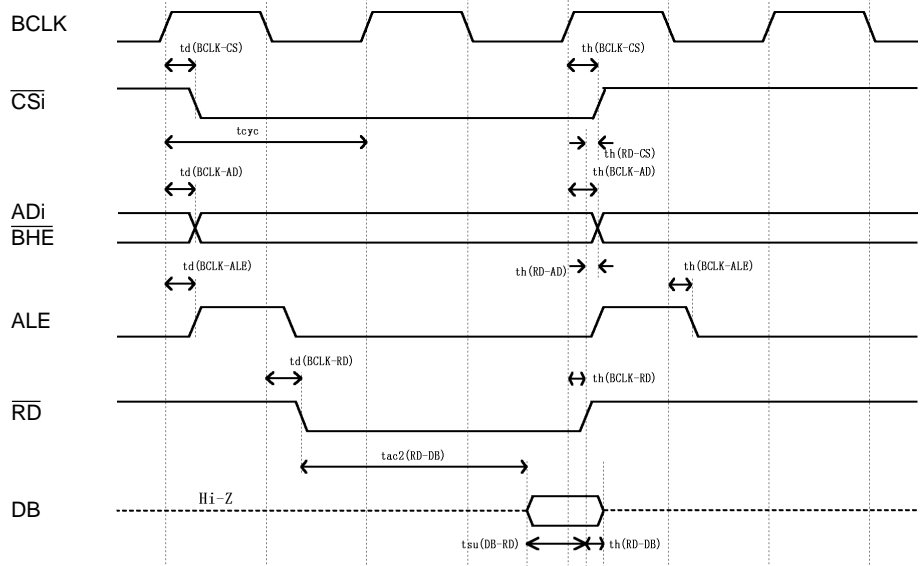
\*1 Calculated by the following formula according to the frequency of BCLK.

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

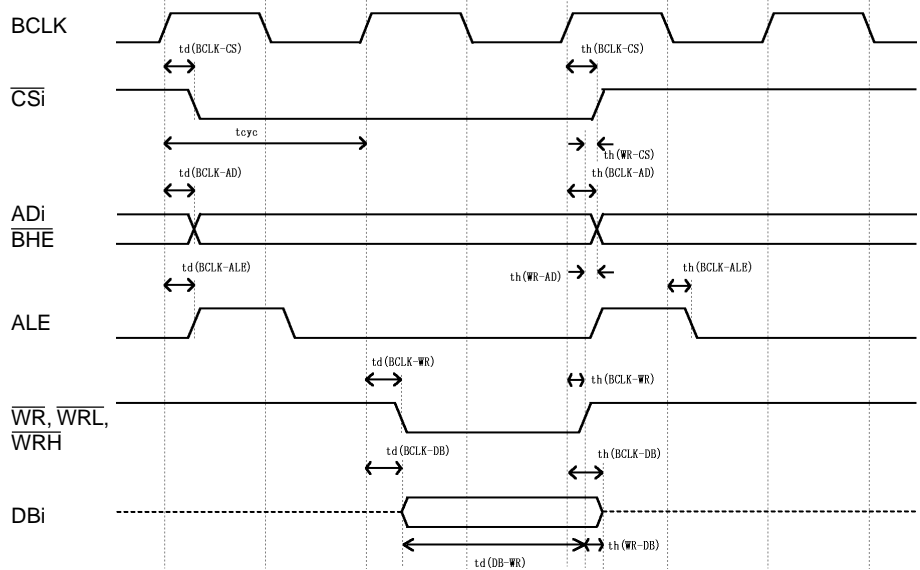
V<sub>CC</sub>=3V

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

Read timing



Write timing



Conditions:

- V<sub>CC</sub>=3V
- Input timing voltage: V<sub>IL</sub>=0.48V, V<sub>IH</sub>=1.5V
- Output timing voltage: V<sub>OL</sub>=1.5V, V<sub>OH</sub>=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.

$$\begin{aligned} \text{Th (RD-AD)} &= \frac{10^9}{f(\text{BCLK}) \times 2} \text{ [ns]} \\ \text{Th (WR-AD)} &= \frac{10^9}{f(\text{BCLK}) \times 2} \text{ [ns]} \\ \text{Th (RD-CS)} &= \frac{10^9}{f(\text{BCLK}) \times 2} \text{ [ns]} \\ \text{Th (WR-CS)} &= \frac{10^9}{f(\text{BCLK}) \times 2} \text{ [ns]} \\ \text{Td (DB-WR)} &= \frac{10^9 \times 3}{f(\text{BCLK}) \times 2} - 80 \text{ [ns]} \\ \text{Th (WR-DB)} &= \frac{10^9}{f(\text{BCLK}) \times 2} \text{ [ns]} \\ \text{Td (AD-ALE)} &= \frac{10^9}{f(\text{BCLK}) \times 2} - 45 \text{ [ns]} \end{aligned}$$

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

$$\begin{aligned} \text{Th (RD-AD)} &= \frac{10^9}{f(\text{BCLK}) \times 2} - 6 \text{ [ns]} \\ \text{Th (WR-AD)} &= \frac{10^9}{f(\text{BCLK}) \times 2} - 6 \text{ [ns]} \end{aligned}$$

V<sub>CC</sub>=3V

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

Read timing

The read timing diagram shows the relationship between several signals during a memory read cycle. BCLK is a periodic clock signal. CSi is the chip select, which goes active (low) at the start of the cycle. ADi and DBi are multiplexed: ADi carries the address and DBi carries the data input. ADi and BHI are also multiplexed: ADi carries the address and BHI carries the data input. ALE is active (high) during the address phase. RD is the read strobe, which goes active (low) during the data phase. Various timing parameters are indicated by arrows: t<sub>d</sub>(BCLK-CS) is the delay from BCLK to CSi; t<sub>cyc</sub> is the clock cycle time; t<sub>h</sub>(RD-CS) is the hold time from RD to CSi; t<sub>d</sub>(AD-ALE) and t<sub>h</sub>(ALE-AD) are setup and hold times for the address; t<sub>dz</sub>(RD-AD) is the delay from RD to AD; t<sub>ac3</sub>(RD-DB) is the access time from RD to DB; t<sub>su</sub>(DB-RD) and t<sub>h</sub>(RD-DB) are setup and hold times for the data; t<sub>d</sub>(BCLK-AD) and t<sub>h</sub>(BCLK-AD) are delay and hold times from BCLK to AD; t<sub>d</sub>(BCLK-ALE) and t<sub>h</sub>(BCLK-ALE) are delay and hold times from BCLK to ALE; t<sub>h</sub>(RD-AD) is the hold time from RD to AD; t<sub>d</sub>(BCLK-RD) and t<sub>h</sub>(BCLK-RD) are delay and hold times from BCLK to RD.

Write timing

The write timing diagram shows the relationship between several signals during a memory write cycle. BCLK is a periodic clock signal. CSi is the chip select, which goes active (low) at the start of the cycle. ADi and DBi are multiplexed: ADi carries the address and DBi carries the data output. ADi and BHI are also multiplexed: ADi carries the address and BHI carries the data output. ALE is active (high) during the address phase. WR, WRL, and WRH are the write strobes, which go active (low) during the data phase. Various timing parameters are indicated by arrows: t<sub>d</sub>(BCLK-CS) is the delay from BCLK to CSi; t<sub>cyc</sub> is the clock cycle time; t<sub>h</sub>(WR-CS) is the hold time from WR to CSi; t<sub>d</sub>(BCLK-DB) and t<sub>h</sub>(BCLK-DB) are delay and hold times from BCLK to DB; t<sub>d</sub>(AD-ALE) and t<sub>h</sub>(ALE-AD) are setup and hold times for the address; t<sub>d</sub>(BCLK-AD) and t<sub>h</sub>(BCLK-AD) are delay and hold times from BCLK to AD; t<sub>h</sub>(WR-DB) and t<sub>h</sub>(BCLK-AD) are hold times from WR to DB and BCLK to AD; t<sub>d</sub>(BCLK-ALE) and t<sub>h</sub>(BCLK-ALE) are delay and hold times from BCLK to ALE; t<sub>d</sub>(AD-WR) and t<sub>h</sub>(WR-AD) are setup and hold times for the address; t<sub>d</sub>(BCLK-WR) and t<sub>h</sub>(BCLK-WR) are delay and hold times from BCLK to WR.

Conditions:

- V<sub>CC</sub>=3V
- Input timing voltage: V<sub>IL</sub>=0.48V, V<sub>IH</sub>=1.5V
- Output timing voltage: V<sub>OL</sub>=1.5V, V<sub>OH</sub>=1.5V

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

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#### (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.)

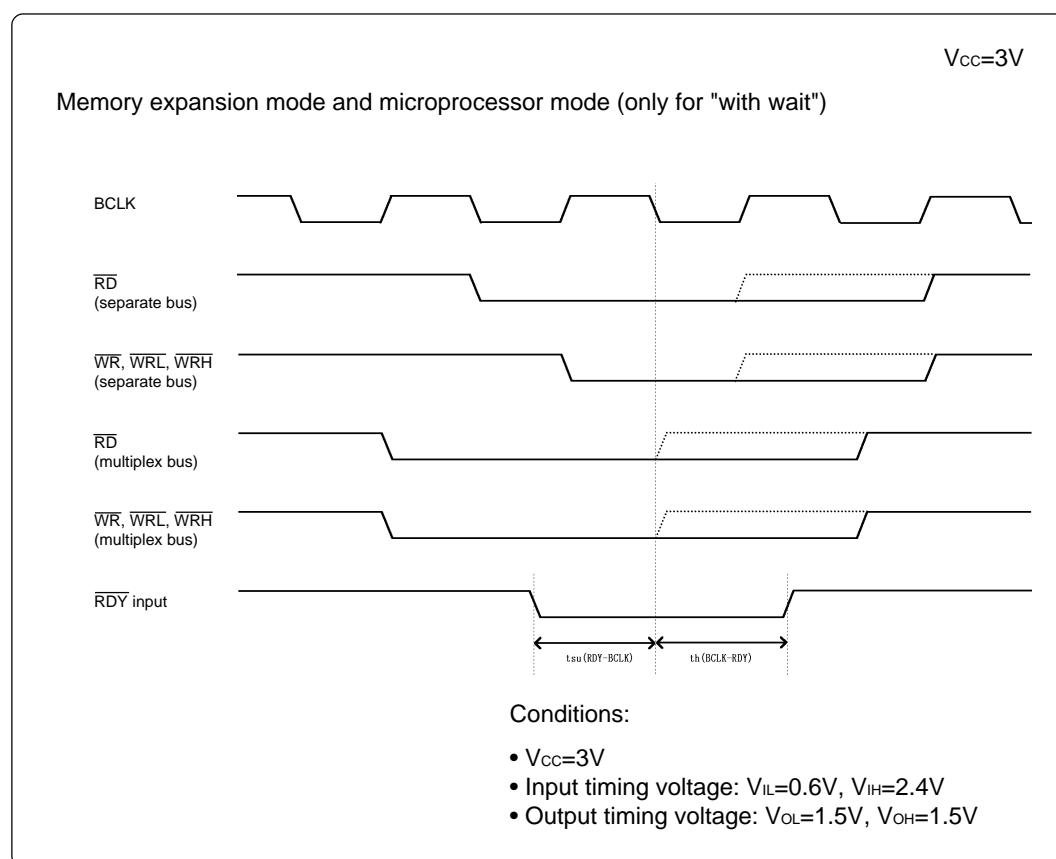
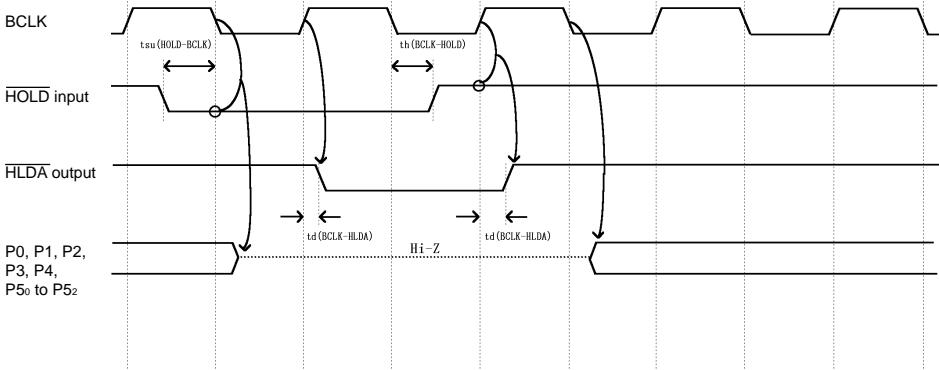


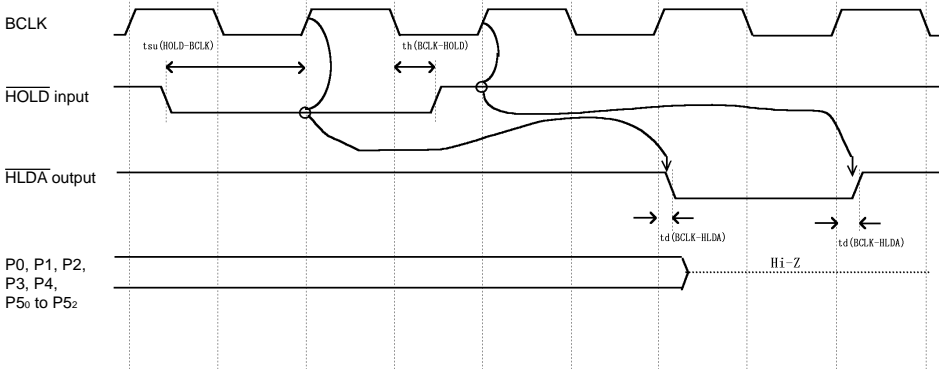
Figure 5.4 Timing requirements

V<sub>CC</sub>=3V

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



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



- Note 1. P0<sub>0</sub> to P5<sub>2</sub> will be high-impedance status regardless of the input level of BYTE pin and ports P4<sub>0</sub> to P4<sub>3</sub> 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<sub>CC</sub>=3V
- Input timing voltage: V<sub>IL</sub>=0.6V, V<sub>IH</sub>=2.4V
- Output timing voltage: V<sub>OL</sub>=1.5V, V<sub>OH</sub>=1.5V

Figure 5.5 Timing requirements

### 5.3 Connection Diagram

Figure 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.

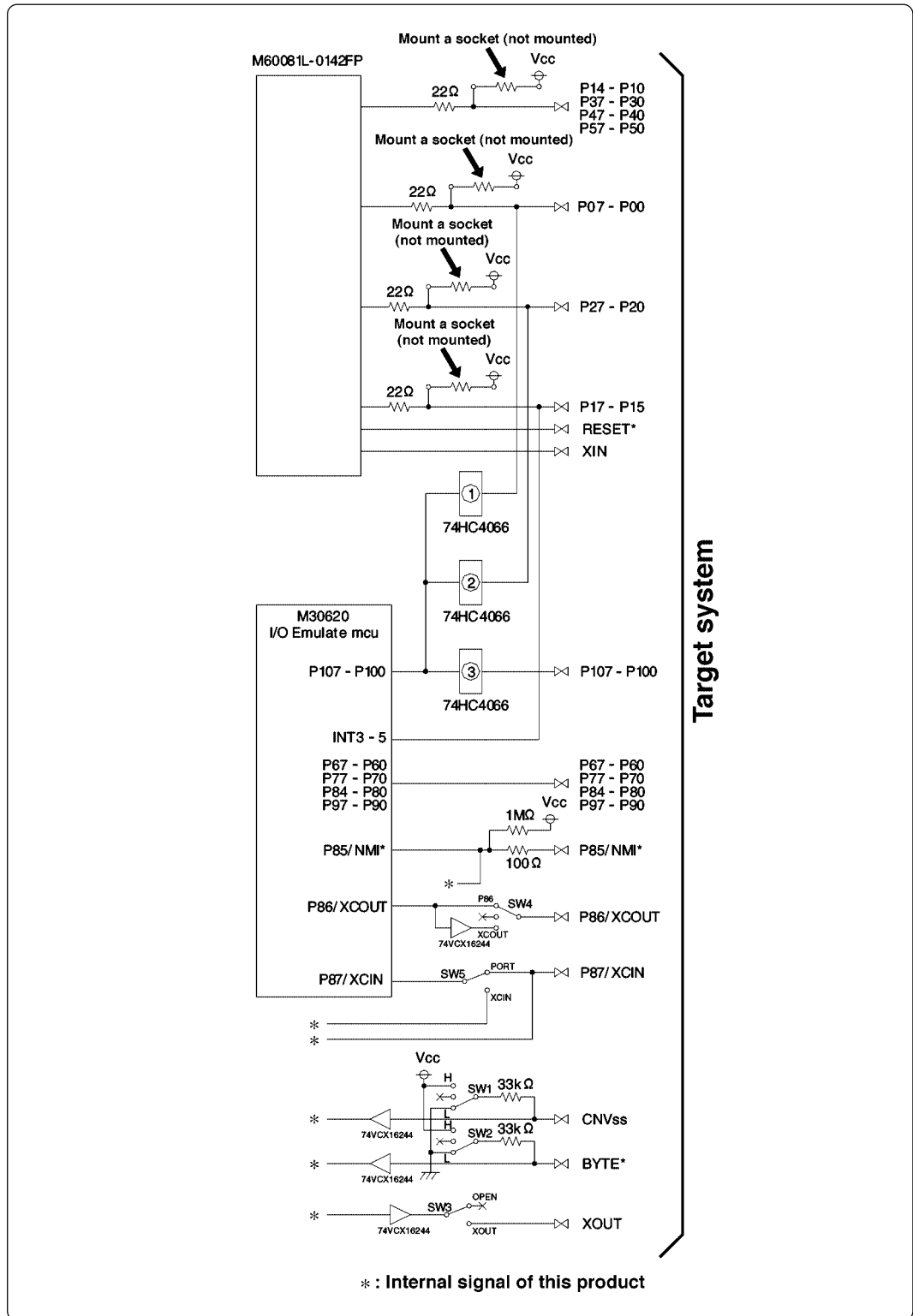


Figure 5.6 Connection diagram

## 5.4 External Dimensions

### (1) External Dimensions of Emulation Pod

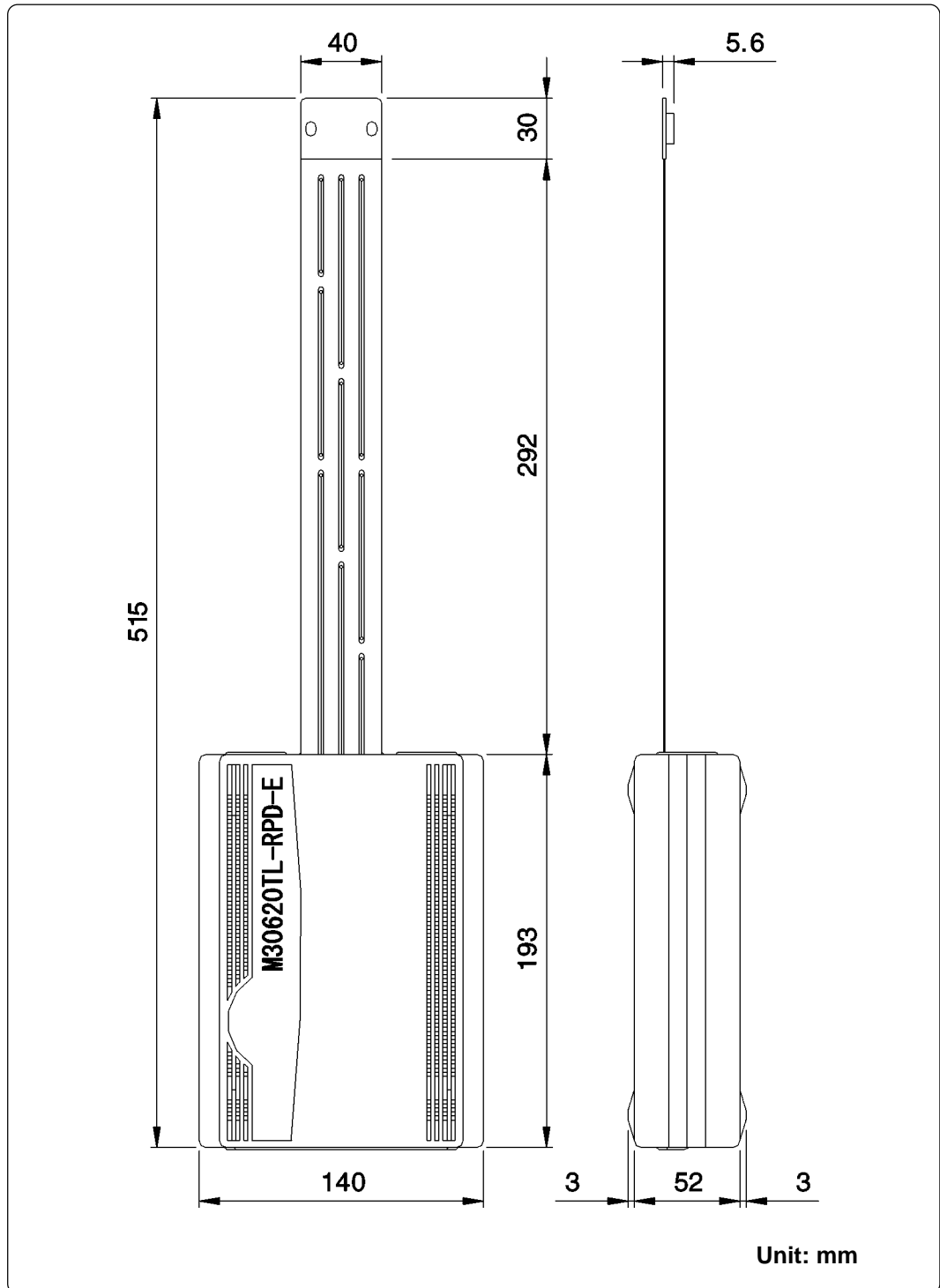


Figure 5.7 External dimensions of emulation pod

**(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).

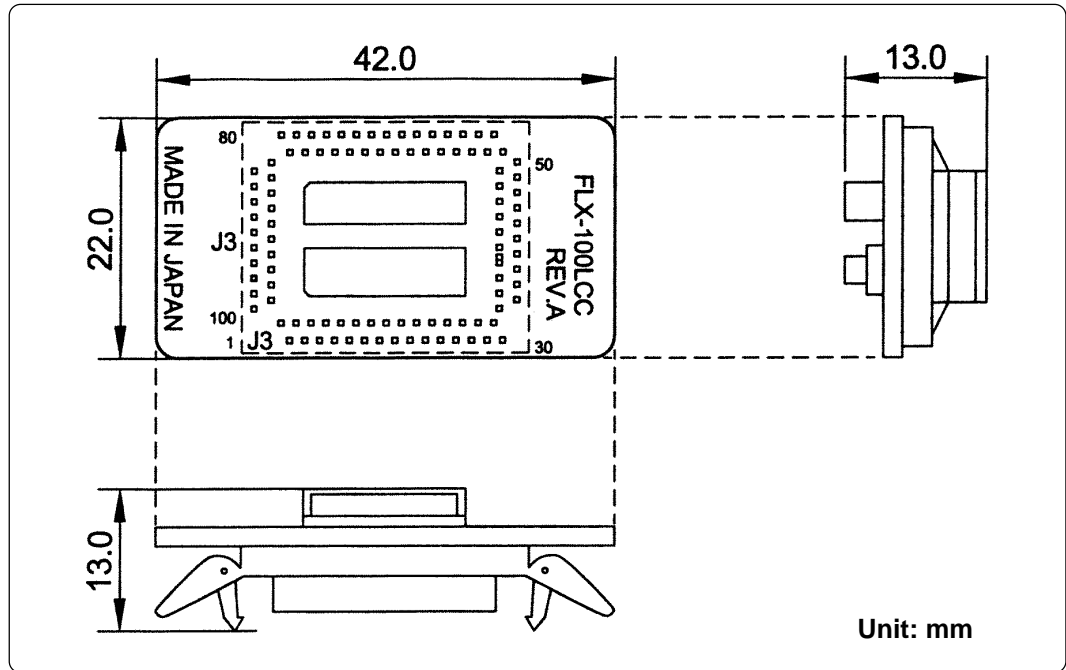


Figure 5.8 External dimensions of converter board (FLX-100LCC)

# MEMO



# Chapter 6. Troubleshooting

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

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# 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.

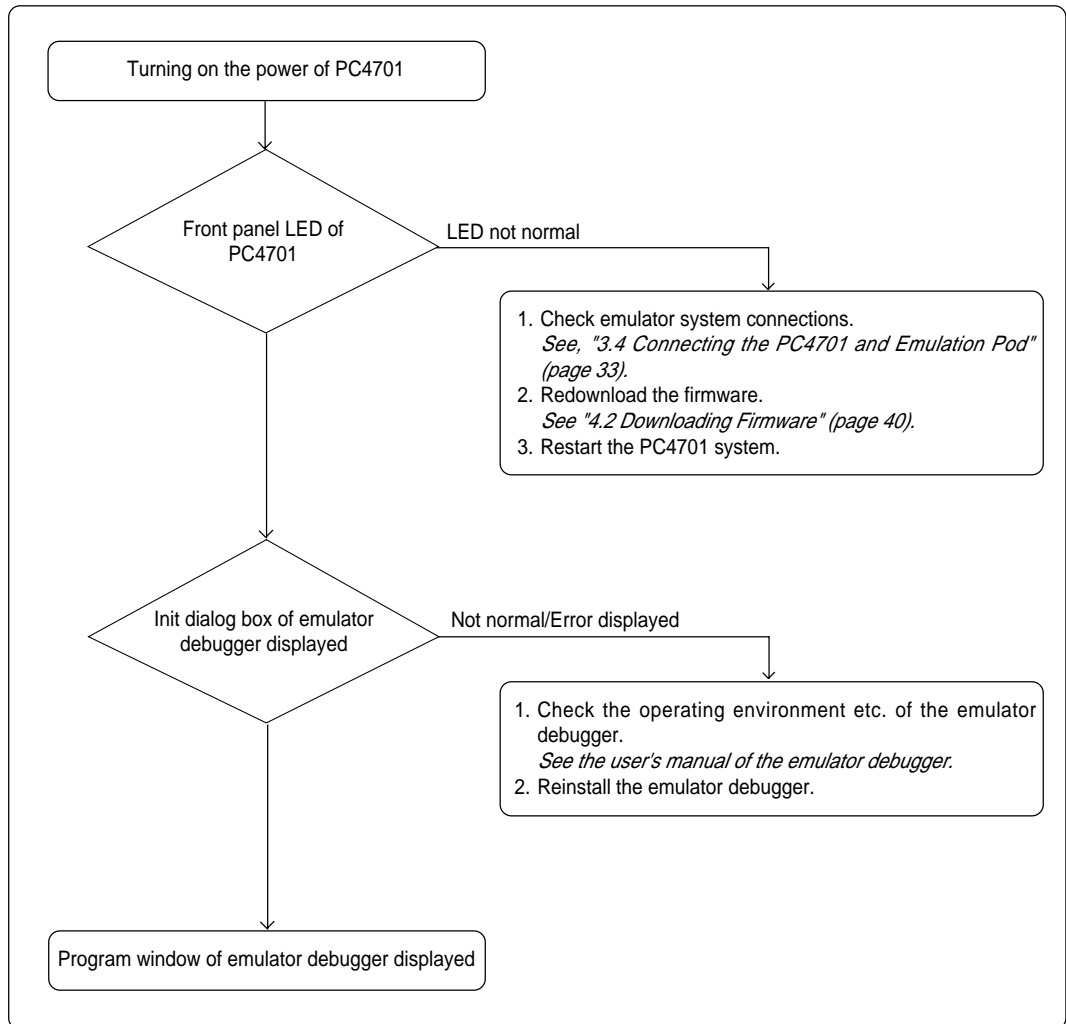


Figure 6.1 Flowchart to remedy the troubles

## 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. <i>See the instruction manual of the PC4701.</i>
All LEDs remain lit.	-	Recheck the connection between the PC4701 and this product. <i>See "3.4 Connecting the PC4701 and Emulation Pod" (page 33).</i>
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". <i>See the CLK command of the emulator debugger.</i> (2) Check the oscillation circuit in the emulation pod is oscillating. <i>See "3.3 Selecting Clock Supply" (page 29).</i>
	Connected	(1) Check the oscillation circuit in the target system is oscillating. (2) Check the switches in the emulation pod are correctly set. <i>See "3.2 Setting Switches and Pullup Resistor" (page 25).</i>

**(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. <i>See the instruction manuals of the PC4701 and the emulator debugger.</i>
Target system cannot be properly built	(1) Download the proper firmware. <i>See "4.2 Downloading Firmware" (page 40).</i> (2) Recheck the connection between the PC4701 and this product. <i>See "3.4 Connecting the PC4701 and Emulation Pod" (page 33).</i>
M3T-PD30 version is not the same version as the firmware in the target	Download the proper firmware. <i>See "4.2 Downloading Firmware" (page 40).</i>
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. <i>See the MCU specifications.</i> (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. <i>See "3.2 Setting Switches and Pullup Resistor" (page 25).</i>
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. <i>See the instruction manuals of the PC4701 and the emulator debugger.</i>
Target system cannot be properly built	(1) Download the proper firmware. <i>See "4.2 Downloading Firmware" (page 40).</i> (2) Recheck the connection between the PC4701 and this product. <i>See "3.4 Connecting the PC4701 and Emulation Pod" (page 33).</i>
M3T-PD30 version is not the same version as the firmware in the target	Download the proper firmware. <i>See "4.2 Downloading Firmware" (page 40).</i>
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. <i>See the MCU specifications.</i> (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. <i>See "3.2 Setting Switches and Pullup Resistor" (page 25).</i>

## 6.3 Operation Differs from That of Actual MCUs

### (1) Cannot Reset from the Target System

Set the time for starting up (0.2V<sub>cc</sub> to 0.8V<sub>cc</sub>) 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<sub>0</sub> to P5<sub>2</sub> 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.

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# 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.

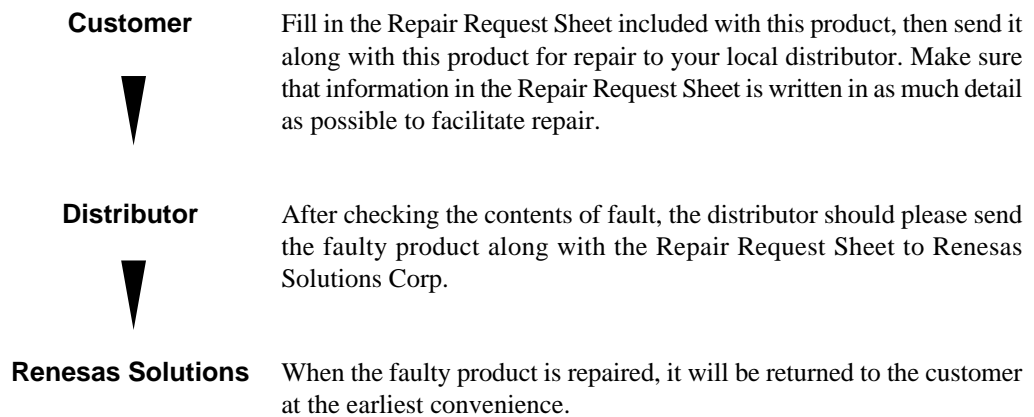
### (4) Transportation fees at sending your product for repair

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.



### 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

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