



M306N4T3-RPD-E

Emulation Pod for M16C/6N Group M16C/6N4, 6N5

User's Manual

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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 M306N4T3-RPD-E is an emulation pod for the M16C/6N Group M16C/6N4, 6N5 of 16-bit MCUs. It is used with a PC4701 emulator.

This user's manual mainly describes specifications of the M306N4T3-RPD-E emulation pod and how to setup it. For details on the following products, which are used with the M306N4T3-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 "2.1 Package Components" (page 22) 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". 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 M306N4T3-RPD-E is used with the PC4700H emulator.

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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 M16C, 7700, 740 Families. Take note of the fact that the M306N4T3-RPD-E (this product) does not support the PC4701L and PC4700L emulators. For details on specific models of PC4701, visit the Renesas Tool Homepage at <http://www.renesas.com/en/tools>

Emulation pod

This means M306N4T3-RPD-E (this product). This emulation pod is for the M16C/6N Group M16C/6N4, 6N5 MCUs. It is used with the emulator main unit PC4701.

Emulator debugger

This means a software tool M3T-PD30 for the M16C/60, M16C/30, M16C/20 and M16C/10 Series MCUs. The M3T-PD30 controls the emulator from the host machine through various interfaces.

Host machine

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

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.

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.

User program

This means an application program to be debugged.

Evaluation MCU

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

*

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

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

	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. Make sure that the main unit does not get wet. 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, FLX160 or M3T-FLX160C) 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, FLX160 or M3T-FLX160C) 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.

Cautions to Be Taken for Turning On the Power:



- Turn on the power of the emulator and target system as simultaneously as possible.
- Turn off the power of the emulator and target system as simultaneously as possible.
- Do not leave either the emulator or target system powered on, because of leakage current the internal circuits may be damaged.
- When turning on the power again after shutting off the power, wait about 10 seconds.

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 system 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.

Notes on Downloading Firmware:

- Before using this product for the first time, it is necessary to download the dedicated firmware. Please note that, to do this, it is necessary to start up the emulator main unit in maintenance mode. For firmware download procedures, see "4.2 Downloading Firmware" (page 50). 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 in maintenance mode.
- Be sure to disconnect the target system before downloading the firmware.

Notes on the Self-check:

- If the self-check does not result normally (except target status errors), the product may be damaged. Then, contact your local distributor.
- Be sure to disconnect the target system before executing the self-check. For details on the self-check, see "4.3 Self-check" on page 51.

Note on Quitting the Emulator Debugger:

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

Note on Final Evaluation:

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

Notes on Power Supply to the Target System:

- Pins Vcc1 and Vcc2 of the emulator are connected to the target system to observe the voltage of the target system. Therefore design your system so that the target system is powered by an external power supply.
- Do not change the voltage of the target system after turning on the power.

IMPORTANT

Note on Clock Supply to the MCU:

- Clock can be supplied to the evaluation MCU in one of the following two ways. This is determined by emulator debugger clock selection.
 - (1) When Internal is selected:

A clock generated by the oscillation circuit in the emulation pod is supplied to the evaluation MCU. The clock is continually supplied to the evaluation MCU regardless of "target system clock status" and "user program execution status".
 - (2) When External is selected:

Clock supply to the evaluation MCU depends on oscillation status (oscillate/off) of the target system.

Note on RESET* Input:

- "L" input from the target system to pin RESET* 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 NMI* Input:

- "L" input from the target system to pin NMI* 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 RDY* Input:

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

Note on HOLD* Input:

- You cannot use the hold function with this product. Be sure to input "H" to pin HOLD* of the target system when you use a processor mode other than single-chip mode. If "L" is input to pin HOLD*, this product will not work normally.

Notes on Setting the Work Area When Starting Up the Emulator Debugger:

- With this product, the emulator uses 32 bytes as a work area in emulation memory. In single-chip mode, set the work area address at 10000h. In memory expansion or microprocessor mode, set the work area address in an area other than SFR area (0000h--003FFh), external area of multiplex bus setting, reserved area of 27000h--27FFFh and stack area used by the emulator for reset command execution (0FFF9h--0FFFFh). For more details, see "2.4 (2) Setting the Work Area" (page 25).
- The top address of the work area should be an even-numbered address.
- Set the work area as MAP=INT.

For example, if the work area is set at 02C00h, the emulator uses 32-byte area of 02C00h--02C1Fh.

IMPORTANT

Note on Stack Area:

- With this product, a maximum 7 bytes of the user stack is consumed. Therefore, ensure the +7 bytes maximum capacity used by the user program as the user stack area.

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 a work area. Using areas like this is a cause of user program crashes and destabilized emulator control.

Notes on MAP References and Settings:

- For details on referencing and setting MAP information, see the emulator debugger M3T-PD30 user's manual.

Make settings as follows:

(1) MAP = INT

The emulation memory inside this product becomes effective.
Set this at MCU internal ROM debugging.

(2) MAP = EXT

The emulation memory inside this product is not used.
Set this where the MCU internal resource (SFR, RAM) or resources on the target system are used.

- Be sure to set the SFR area and RAM area of the MCU to EXT, and the reserved area of the MCU to INT.
- Be sure to set mappings in word units.
- When setting 0FFF9h--0FFFFh to EXT:

This product uses the 7 byte area 0FFF9h through 0FFFFh as the stack area. If this 7 byte 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 memory expansion (or microprocessor) mode, using the 7 byte area of 0FFF9h--0FFFFh set to EXT.

(2) With the system which starts up in microprocessor mode, using the 7 byte area of 0FFF9h--0FFFFh set to EXT 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.

(1) Set the 7 byte area of 0FFF9h--0FFFFh to INT.

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

(3) Set the stack pointer.

(Example)

RESET: FCLR I

LDC #4000H, SP --> Set the stack pointer

(Stop the program after executing this instruction)

(4) Set the 7 byte area 0FFF9h through 0FFFFh to EXT.

IMPORTANT

Note on Operation When Not Executing the User Program:

- With this product, bit 7 of processor mode register 1 (wait bit PM17) is forcibly set to "1" (with wait) when the user program is not executed (e.g. when the program is stopped or when run-time debugging is being performed). Therefore, if the external area set to 0 wait is accessed by other than the user program (such as debugging operation), one wait is inserted. However, when wait bit PM17 is referenced by the dump window etc. the value set during user program execution is displayed.

Note on Making the MCU file:

- To debug an MCU which has any other size of memory (ROM, RAM), be sure to make an MCU file for it. For details on making the MCU file, see "2.4 (1) Making the MCU File" on page 25. For memory maps of each MCU, refer to the datasheet of the MCU.

Notes on Maskable Interrupts:

- Even if a user program is not being executed (including when run-time debugging is being performed), the evaluation MCU keeps running so as to control the emulation probe. Therefore, timers and other components do not stop running.

If a maskable interrupt is requested when the user program is not being executed (including when run-time debugging is being performed), the maskable interrupt request cannot be accepted, because the emulator disables interrupts. The interrupt request is accepted immediately after the user program execution is started.

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

Notes on Address-Match Interrupt:

- To debug address-match interrupts, set a software breaks or hardware break at the top address of the address-match interrupt process. If you set a software breaks or hardware break at an address where an address-match interrupt occurs, 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 BRK Instruction and BRK Interrupt:

- With this emulator system, a BRK interrupt by a BRK instruction is exclusively used for software break functions. Therefore, you can not use them for your program.

IMPORTANT

Notes on Software and Hardware Breaks:

- The software break is a debugging function which breaks a program immediately before the system executes an instruction at a specified address. The instruction at the preset address will not be executed.
- The hardware break is a debugging function which breaks a program by setting the detection of an execution of an instruction at a specified address as a break event. The program will break after the instruction at the specified address is executed.
- The software break generates BRK interrupts by substituting the proper instruction to the BRK instruction. Therefore, when referencing the result of a trace in bus mode, "00h" is displayed for the instruction fetch address where a software break is set, and when referencing in disassemble mode, "BRK" instruction is displayed.
- It is not possible to use a software break and a hardware break at the same time. If doing so, it may not operate normally.
- In the area where the MAP setting is EXTERNAL, software breaks cannot be used.

Note on Stop and Wait Modes:

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

Note on Watchdog Function:

- The MCU's watchdog timer can be used only while programs are being executed. To use it otherwise, disable the watchdog timer.

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, a DMA transfer is executed. However, make note of the fact that a DMA transfer while the program is stopped may not be performed correctly. Also note that the below registers have been changed to generate a DMA transfer as explained here even when the program is stopped.

DMA0 and DMA1 transfer counter registers TCR0 and TCR1

Note on Pullup Control:

- With this product, ports P0 to P5 are not pulled up by the pullup control register.

To pull up the ports P0 to P5, apply a resistance to the inside of the emulator. How to apply it, refer to "3.5 Installing and Removing Pullup Resistors" (page 37).

Note: Ports P6 to P10 are pulled up by the pullup control registers.

Note: Pullup control registers themselves can be read and written into properly.

IMPORTANT

Note on Reading Internal Resources of the MCU:

- When the registers that are listed in Table 1.1 are read with an emulator, those results will be the following (the data in the MCU are not effected).

- (1) Results of real-time trace
The data values of the cycles read are not displayed correctly.
- (2) Real-time RAM monitor
The data values read are not displayed correctly.

Table 1.1 Registers and symbols not displayed normally

Register	Symbol
DMA source pointers 0, 1	SAR0, SAR1
DMA destination pointers 0, 1	DAR0, DAR1
DMA transfer counters 0, 1	TCR0, TCR1
DMA control registers 0, 1	DM0CON, DM1CON

Note on Protect Register (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/Oi control register, 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 port P9 direction register and SI/Oi control register are set.
- (3) Setting ("1") PRC2" from the dump window or script window

Note on Accessing Address 00000h:

- When a maskable interrupt is generated, the interrupt data (interrupt No. and interrupt request level) stored in address 00000h is read out. Also, the interrupt request bit is cleared when address 00000h is read out. Consequently, when the address 00000h readout instruction is executed or when address 00000h 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 00000h 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 00000h, therefore check the program. This LED is turned off by the system reset switch of the emulator main unit.

IMPORTANT

Note on Differences Between the Actual MCU and Emulator:

- Operation of the emulator differs from that of the actual MCU as listed below.

(1) Reset condition

Set the time for starting up (0.2 V_{CC} to 0.8 V_{CC}) 1 μs or less.

(2) Initial values of MCU's internal resources at power-on

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

With this emulator system, regardless of ROM and RAM of the MCU you use, all the areas other than the SFR area and a reserved area (addresses 27000h--27FFFh) can be read and written into.

(4) Characteristics of ports P0 to P5 and P10

- Ports P0 to P5 are connected via emulation circuits. The device used for the port emulation circuit is the IC21 (ALTERA EPF6016QC208-2).
- Output of port P10 is connected via the CMOS output buffer (TC7WH125FU). Input of that is connected via the IC21 (ALTERA EPF6016QC208-2).

(5) Oscillator circuit

- Make note that in the oscillator circuit where a resonator is connected between pins X_{IN} and X_{OUT}, 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 oscillators (X_{CIN} and X_{COUT}).
- For notes on when using the oscillator circuit on the target system, refer to "3.3 (2) Using the Oscillator Circuit on the Target System" (page 31).

(6) A-D conversion function

As a flexible cable and other devices are used between the evaluation MCU and the target system, some characteristics are slightly different from those of the actual MCU.

(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 1.2).

Table 1.2 Vector table addresses for the emulator

Factor of interruption	Vector table addresses	Data read
DBC*1	FFFF4h--FFFF7h	Indefinite
Single-step*1	FFFECh--FFFEFh	Indefinite
BRK instruction	FFFE4h--FFFE7h	Indefinite

*1 Interruption for the emulator only

(8) Address and status of BHE*

When the internal RAM or ROM area of the MCU is accessed during user program execution, the actual MCU retains a preceding address and status of BHE*, while this product does not.

(9) Status of a data bus

In stop or wait mode, the actual MCU retains a preceding status of a data bus, while with this product a data bus is floating.

(10) ALE signal

When the internal RAM or SFR area of the MCU is accessed during user program execution, with the actual MCU, ALE output is fixed to Low, while this product outputs ALE signal.

IMPORTANT

Note on Debugging Operations After Releasing a Reset from the Target:

- Do not execute debugging operations such as setting a software or hardware break, runtime debugging after releasing a reset from the target system until an interrupt stack pointer (ISP) is set in the user program.

Note on Emulating External Area:

- To emulate the external area using emulation memory in this product, set 0 wait (8 MHz) or less, or 1 wait or more.

MEMO

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 Package Components

The M306N4T3-RPD-E package consists of the following items. When unpacking, check to see if your M306N4T3-RPD-E contains all of these items.

Table 2.1 Package components

Item	Quantity
M306N4T3-RPD-E emulation pod main unit	1
FLX120-RPD flexible cable for connecting PC4701	1
M3T-F160T3-PRB converter board for M3T-FLX160C (preinstalled)	1
M30800T-PTC converter board for 100-pin 0.65-mm-pitch LCC	1
IC61-1004-051 100-pin 0.65-mm-pitch LCC socket (made by Yamaichi Electronics Co., Ltd.)	1
OSC-3 16MHz oscillator circuit board for main clock (preinstalled)	1
OSC-2 oscillator circuit board (bare board)	1
Resistor arrays for pulling up ports P0 to P5 (51 kΩ)	6
Hardware tool user registration FAX sheet (English/Japanese)	1 each
Repair request sheet (English/Japanese)	1 each
M306N4T3-RPD-E User's Manual (This manual)	1
M306N4T3-RPD-E User's Manual (Japanese)	1

- * Please keep the M306N4T3-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.
- * If there is any question or doubt about the packaged product, contact your local distributor.
- * For purchasing the IC61-1004-051 or for technical information, contact Yamaichi Electronics Co., Ltd.

2.2 Other Tool Products Required for Development

To bring forward programs development on M16C/6N4, 6N5 MCUs of the M16C/6N Group , the products listed below are necessary in addition to those contained package above. Get them separately.

Table 2.2 Other tool products

Emulator main unit	PC4701 (excluding PC4701L and PC4700L)
Emulator debugger	M3T-PD30
Converter board	For 100-pin 0.65-mm-pitch QFP (100P6S-A): M3T-100LCC-DMS + M3T-DIRECT100S M3T-100LCC-DMS + M3T-DUMMY100S M3T-100LCC-DMS + M3T-FLX-100NRB Required according to the foot pattern of the target system (see "3.8 Connecting the Target System" on page 41)

- * To purchase these products, contact your local distributor.

2.3 Name of Each Part

(1) System Configuration

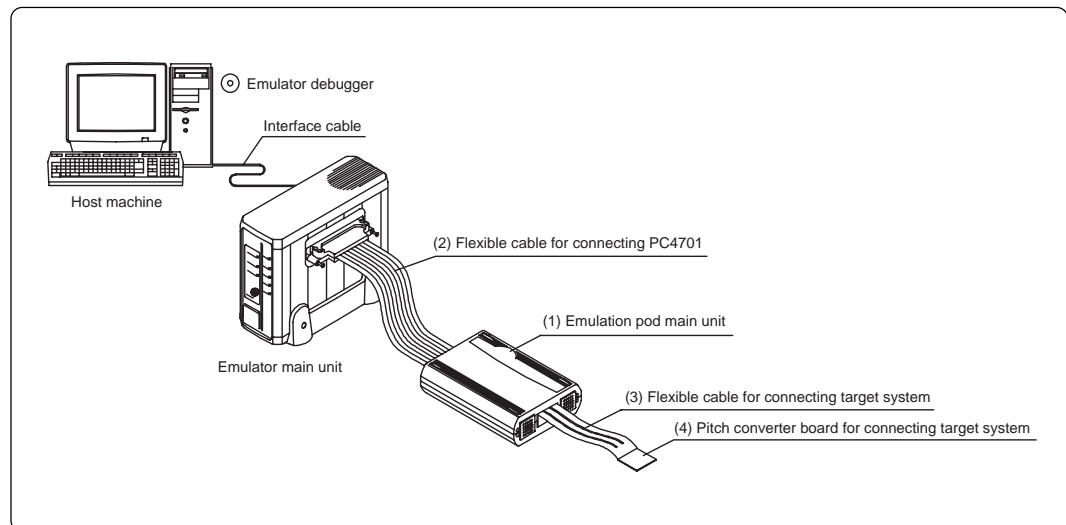


Figure 2.1 System configuration

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

(1) Emulation pod main unit M306N4T3-RPD-E

This emulation pod contains an evaluation MCU, emulation memory and circuits to feature the debug functions.

(2) Flexible cable FLX120-RPD

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

(3) Flexible cable M3T-FLX160C

This is a 160-conductor flexible cable for connecting the emulation pod and the target system.

(4) Pitch converter board

This is a pitch converter board for connecting to the target system. For details, refer to "3.8 Connecting the Target System" (page 41).

(2) Inside of the Emulation Pod

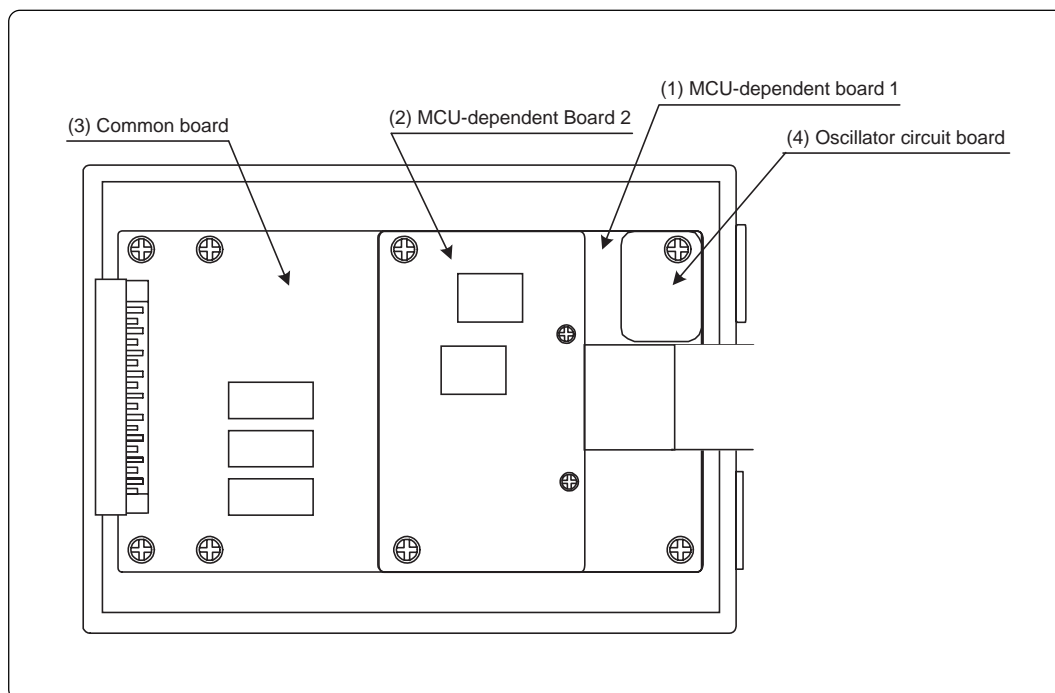


Figure 2.2 Internal view of the emulation pod

(1) MCU-dependent board 1

This is a board for port emulation.

(2) MCU-dependent board 2

This is a board with the evaluation MCU.

(3) Common board

This is a board controlling the interface with the PC4701 and evaluation MCU.

(4) Oscillator circuit board

This is a board with an oscillator module. You can change the operating frequency by replacing it with other oscillator circuit board included with this product package.

2.4 When Using This Product for the First Time

(1) Making the MCU File

It is necessary to make an MCU file to use this product with the emulator debugger M3T-PD30. According to the MCU you use, change the contents of the MCU file. Make the MCU file following the description below using a text editor and store it in the "mcufiles" folder in the directory where the emulator debugger is installed.

The MCU file contains information such as, SFR area, internal RAM area, internal ROM area, firmware file name. The contents of the MCU file when using the M306N4FGTFP (10KB RAM, 256KB ROM) are as follows:

0	:	SFR area	Start address
3FF	:		End address
400	:	Internal RAM	Start address
2BFF	:		End address
C0000	:	Internal ROM	Start address
FFFFF	:		End address
M30620P	:	Firmware name (Do not change.)	
0	:	Expansion No.	M3T-PD30 V.4.00 or later required (Do not change.)

When using this product in microprocessor mode, set the internal ROM area as follows.

00000	:	Internal ROM	Start address
00001	:		End address

(2) Setting the Work Area

With this product, the emulator uses 32 bytes as a work area in emulation memory. Therefore, according to the memory mapping of the MCU you use, specify the work area addresses.

In single-chip mode, set the work area address at 10000h.

In memory expansion or microprocessor mode, the areas listed below cannot be used as a work area, specify a work area other than the areas listed below. And the top address of the work area should be an even-numbered address.

- (1) SFR area (0000h--003FFh)
- (2) External area of multiplex bus setting
- (3) Reserved area of 27000h--27FFFh
- (4) Stack area used by the emulator for reset command execution (0FFF9h--0FFFFh)

The area used as a work area (32 bytes) is specified in the F/W and Work Area tab of the INIT dialog box of the emulator debugger M3T-PD30. And set the work area as MAP=INT.

(3) Downloading Firmware

The download procedure is given in Figure 2.3. Before attempting to download the firmware, check that the emulator is connected to the host machine.

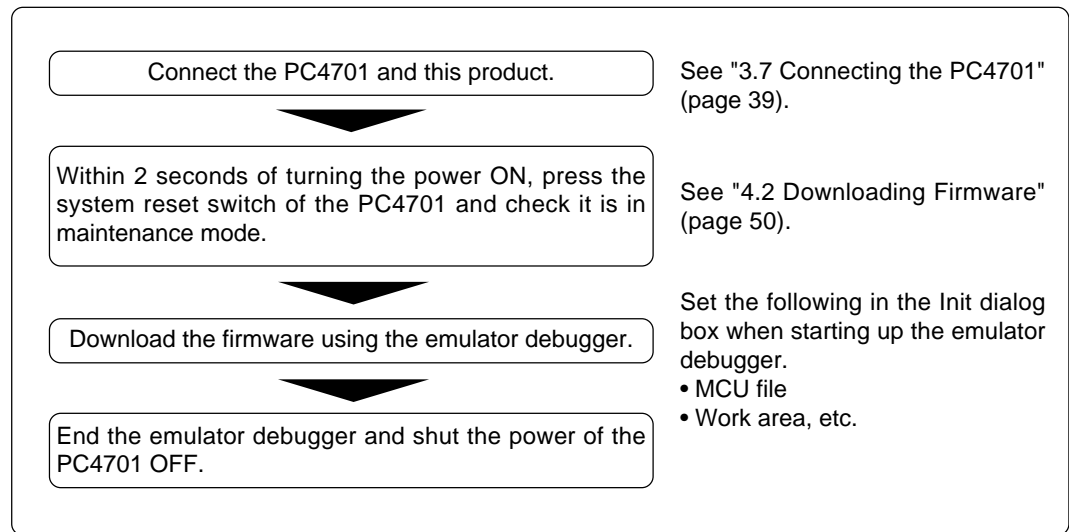


Figure 2.3 Firmware download procedure

(4) Self-check

To confirm that your emulation pod works properly, execute the self-check after downloading the firmware. The self-check procedure is given in Figure 2.4.

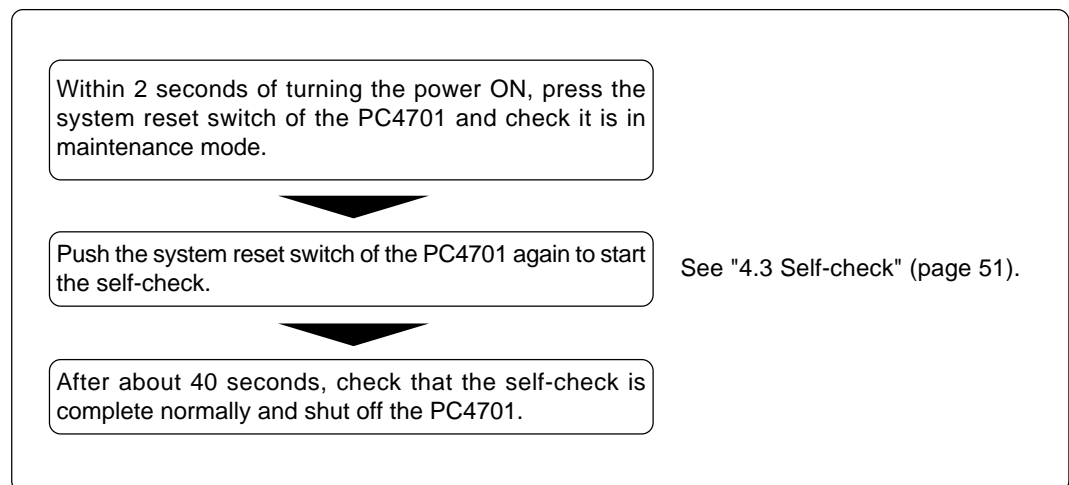


Figure 2.4 Self-check procedure

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.

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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.

- Oscillation frequency
- Switches
- Pullup resistors
- A-D conversion bypass capacitor

3.1 Removing and Closing the Upper Cover

- (1) To open the upper cover, remove the four screws of both sides of this product and lift off the upper cover (see Figure 3.1).
- (2) To close the upper cover, attach the upper cover and secure the four screws of both sides of this product.

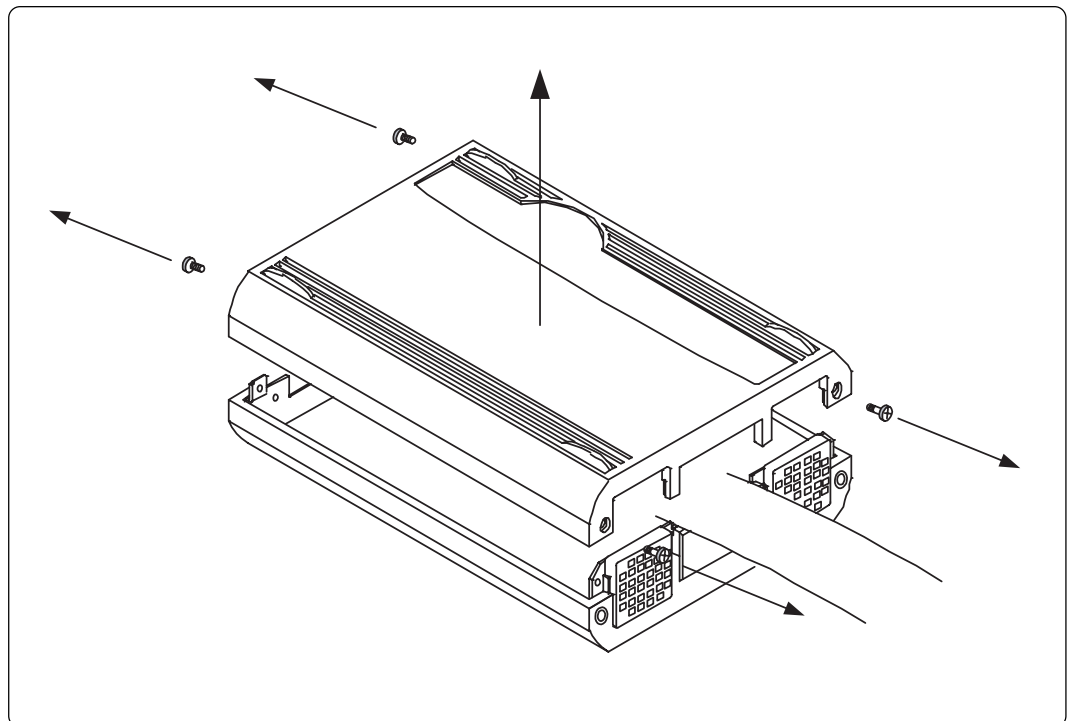


Figure 3.1 Removing the upper cover

CAUTION

When Removing and Closing the Upper Cover:



- Always shut OFF power before opening the upper cover to change the switch settings.
- Do not touch the connector pins of the PC4701 and the target MCU connector pins. Static electricity may damage the internal circuits.

3.2 Each Setting

Figure 3.2 shows the positions of the following parts.

- (1) Oscillator circuit board
- (2) Switches
- (3) Pullup resistors
- (4) A-D conversion bypass capacitor

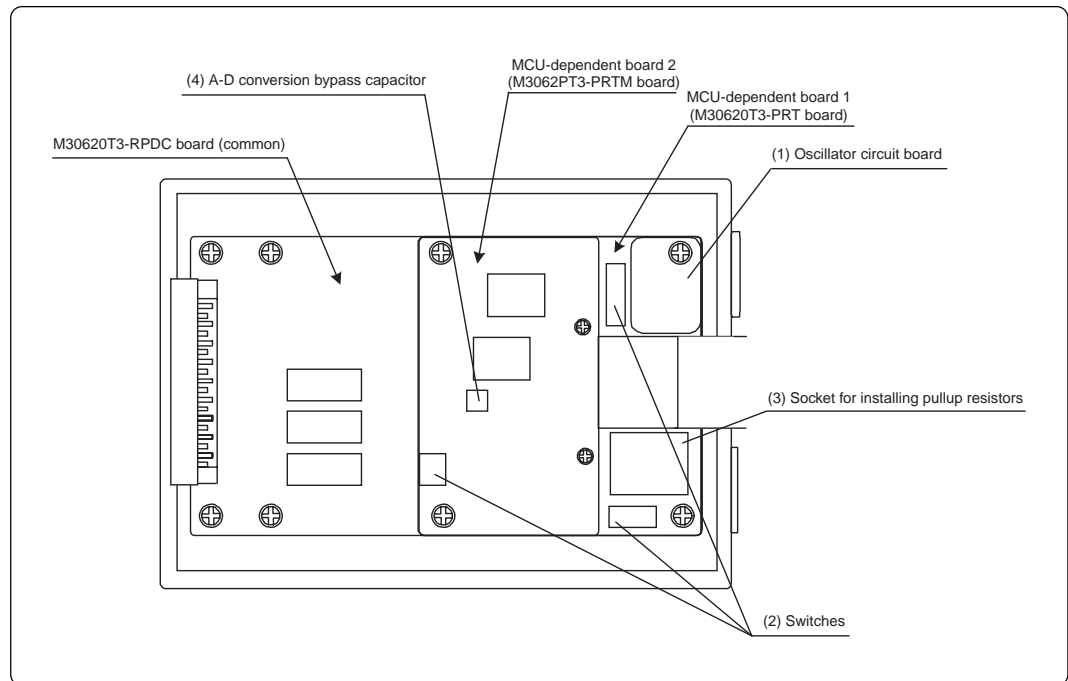


Figure 3.2 Positions of each part

3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards

(1) Clock Supply to the MCU

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 3.1 lists the factory-settings of each clock supply. The clock supply can be set in the Init dialog box when starting up the emulator debugger or inputting CLK command on the script window.

Table 3.1 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: 16.0 MHz)	Internal	Yes
	Target system	External	-
X _{CIN} -X _{COU} T	Internal oscillator circuit of emulation pod (32.768 kHz)	Internal	-
	Target system	External	Yes

IMPORTANT

Note on Changing the Clock Supply:

- For pins X_{CIN}-X_{COU}T, it is necessary to set the switches in the emulation pod. For details, refer to "3.4 Switch Settings" (page 34).

(2) Using the Oscillator Circuit on the Target System

To operate this product with an external clock, construct the oscillator circuit as shown in Figure 3.3 in the target system and input the oscillator output at 50% duty (within the operating range of the evaluation MCU) into pin X_{IN} . And pin X_{OUT} should be open.

To use the external clock on the target system, set in the Init dialog box of the emulator debugger or by the CLK command on the script window. (For details, refer to the emulator debugger user's manual.)

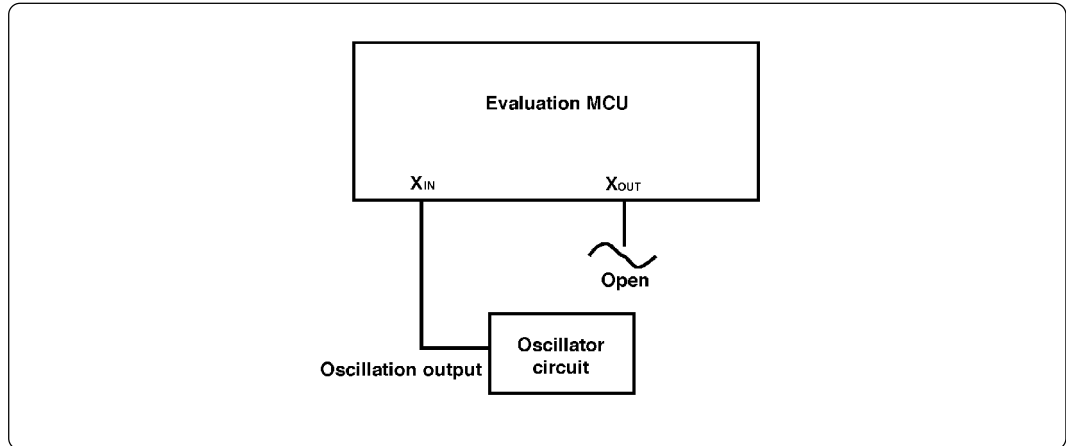


Figure 3.3 External oscillator circuit

Make note that in the oscillator circuit shown in Figure 3.4 where a resonator is connected between pins X_{IN} and X_{OUT} , oscillation does not occur because a 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}).

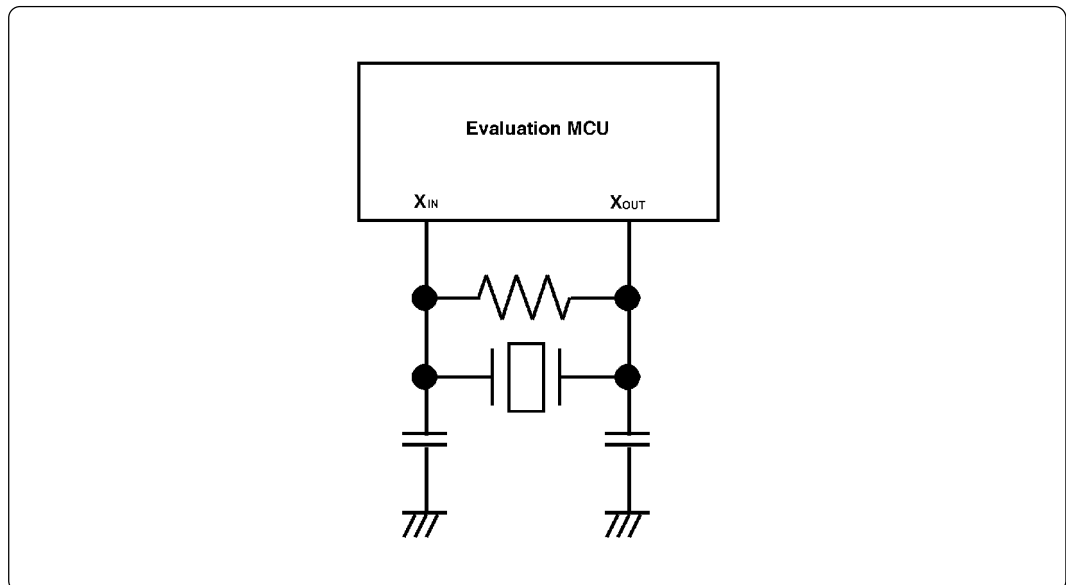


Figure 3.4 Circuit in which oscillation does not occur (same for X_{CIN} - X_{COUT})

(3) Changing the Internal Oscillator Circuit of the Emulation Pod

An oscillator circuit board for 16.0 MHz (OSC-3) is mounted on this product. To use the emulation pod at a frequency other than 16.0 MHz, 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 3.5 shows a view of the OSC-2 oscillator circuit board (bare board) and where connector pins are located. Figure 3.6 shows the circuitry of the OSC-2 oscillator circuit board (bare board). Use the number of oscillator circuits recommended by the oscillator manufacturer.

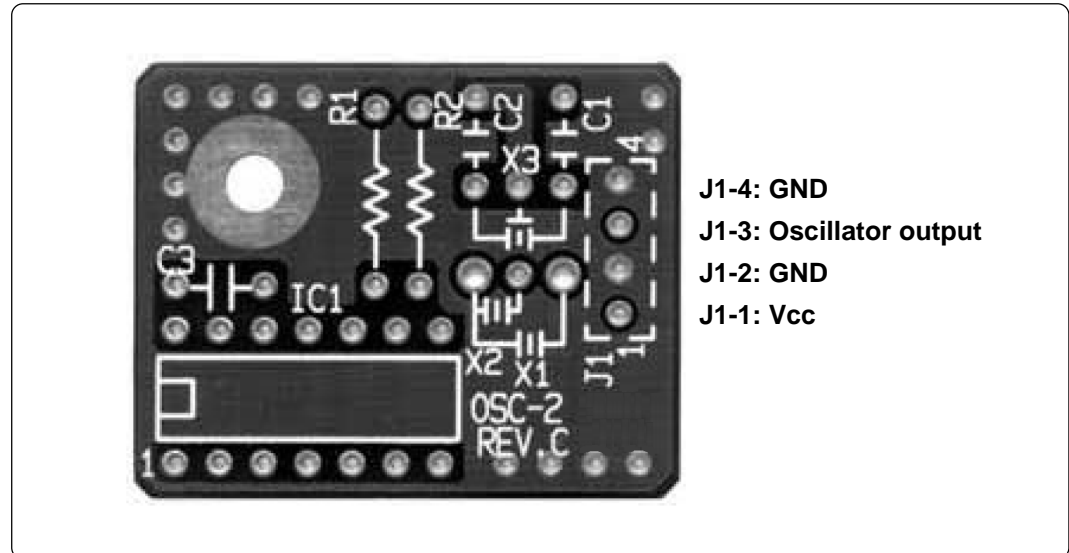


Figure 3.5 External view of the OSC-2 oscillator circuit board and its connector pin positions

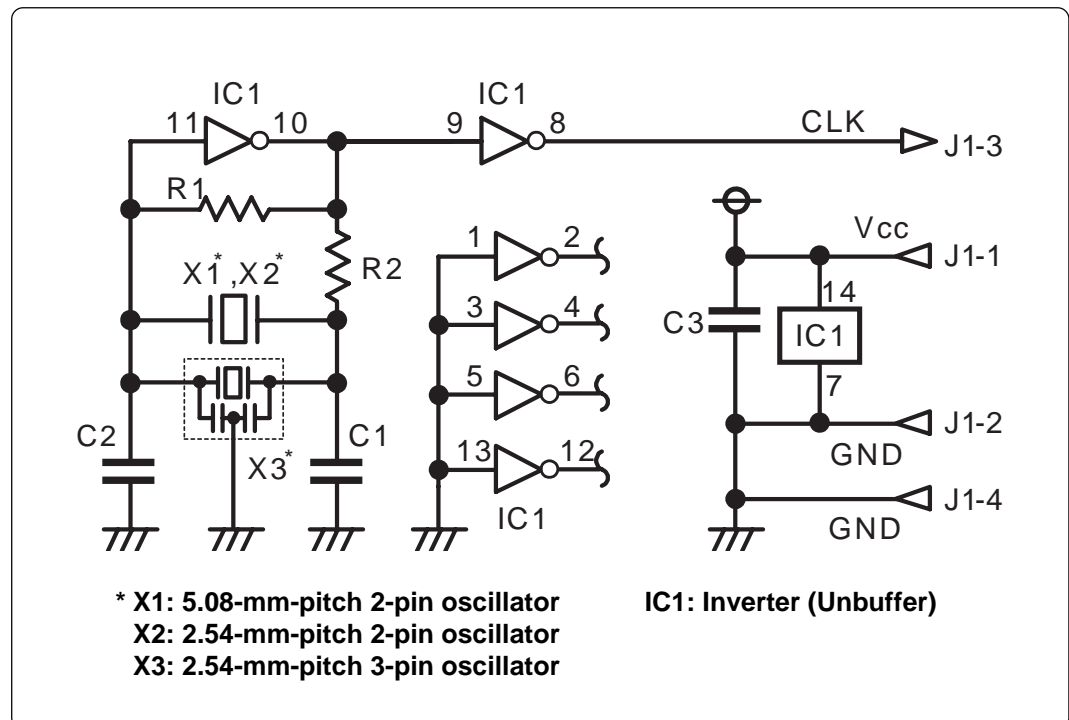


Figure 3.6 Circuits of the OSC-2 oscillator circuit bare board

(4) Replacing Oscillator Circuit Boards

Figure 3.7 shows how to replace the oscillator circuit boards. For the position of the oscillator circuit board, see Figure 3.2.

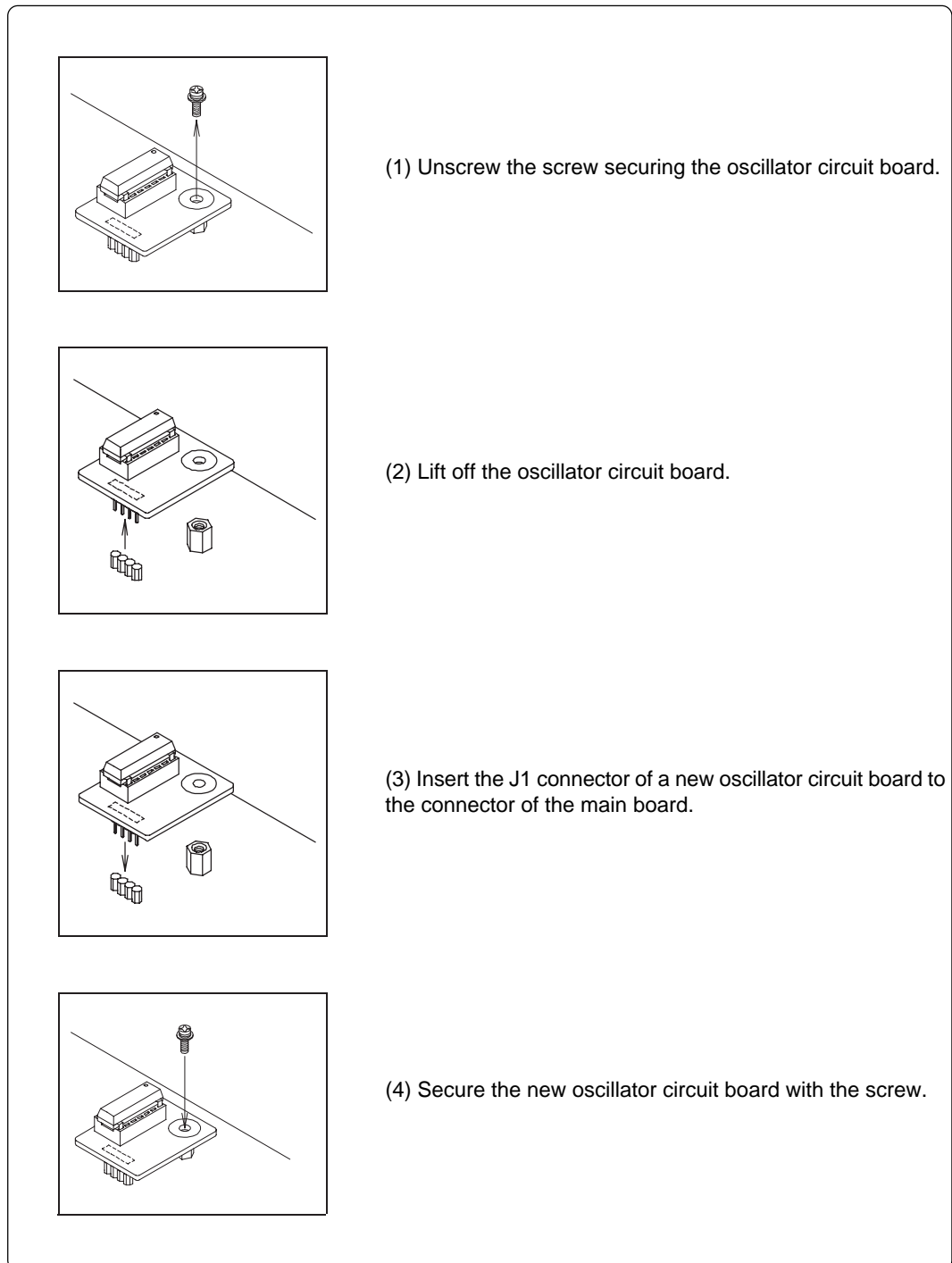


Figure 3.7 Replacing oscillator circuit boards

3.4 Switch Settings

Here follows explanations of the switches of the M306N4T3-RPD-E.

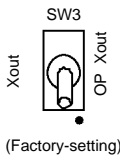
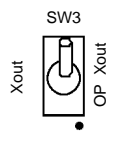
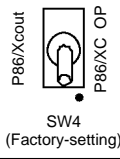
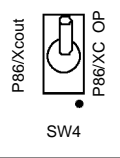
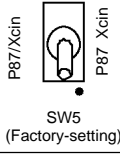
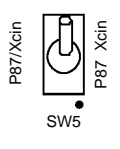
Tables 3.2 and 3.3 list how to set toggle switches SW1 to SW5 of the M30620T3-PRT board (MCU-dependent), Table 3.4 lists how to set jumper switches JP1 and JP2, and Table 3.5 lists how to set jumper switch JP1 on the M3062PT3-PRTM (MCU-dependent board 2).

(1) Toggle Switches SW1 to SW5 on the M30620T3-PRT Board (MCU-dependent 1)

Table 3.2 Switch settings of the M306N4T3-RPD-E (1/4)

Signal	Switch	Setting	Description
BYTE	SW1	SW1 BYTE (Factory-setting)	Sets pin BYTE of the MCU to "L" when the target system is unconnected. Pulls down pin BYTE of the MCU with a resistance of 33 kΩ.
		SW1 BYTE 	Use this setting when the target system is connected. Does not pull up/down pin BYTE of the MCU. (Inputs the level of the target system to pin BYTE of the MCU.)
		SW1 BYTE 	Sets pin BYTE of the MCU to "H" when the target system is unconnected. Pulls up pin BYTE of the MCU with a resistance of 33 kΩ.
CNVss	SW2	CNVss SW2 (Factory-setting)	Sets pin CNVss of the MCU to "L" when the target system is unconnected. Pulls down pin CNVss of the MCU with a resistance of 1 kΩ.
		CNVss SW2 	Use this setting when the target system is connected. Does not pull up/down pin CNVss of the MCU. (Inputs the level of the target system to pin CNVss of the MCU.)
		CNVss SW2 	Sets pin CNVss of the MCU to "H" when the target system is unconnected. Pulls up pin CNVss of the MCU with a resistance of 1 kΩ.

Table 3.3 Switch settings of the M306N4T3-RPD-E (2/4)

Signal	Switch	Setting	Description
Xout	SW3	 <p>(Factory-setting)</p>	Does not connect pin Xout of the MCU to the target system.
			Connects pin Xout of the MCU to the target system.
P86/Xcout	SW4	 <p>(Factory-setting)</p>	Connects pin P86/Xcout of the MCU to the target system to use it as port P86 or Xcout.
		 <p>SW4</p>	Does not connect pin P86/Xcout of the MCU to the target system.
P87/Xcin	SW5	 <p>(Factory-setting)</p>	Uses pin P87/Xcin of the MCU as port P87.
		 <p>SW5</p>	Uses pin P87/Xcin of the MCU as Xcin.

⚠ CAUTION

Note on Switch Settings:



- Always shut OFF power before changing switch settings.

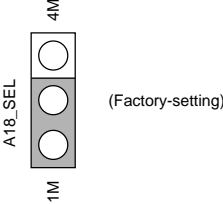
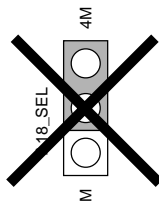
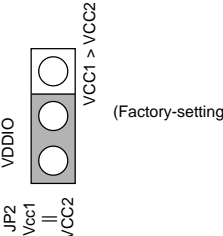
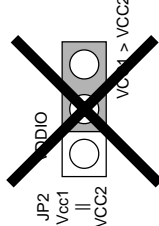
IMPORTANT

Note on BYTE and CNVss Switch Settings:

- Switch settings of the BYTE and CNVss are for debugging without the target system connected.

(2) Jumper Switches JP1 and JP2 on the M30620T3-PRT Board (MCU-dependent 1)

Table 3.4 Switch settings of the M306N4T3-RPD-E (3/4)

Signal	Switch	Setting	Description
A18_SEL	JP1		Use this setting.
			Do not use this setting.
VDDIO	JP2		Use this setting.
			Do not use this setting.

⚠ CAUTION

Note on Switch Settings:



- Always shut OFF power before changing switch settings.

3.5 Installing and Removing Pullup Resistors

In this product, you cannot control pullup for ports P0 to P5 by pullup control registers (pullup control register read/write are possible).

Mounting a pullup resistor inside this product allows pullup control. Mount the 51kΩ resistor array supplied with this product to the port for which pullup control is required. For the mounting location, refer to Figure 3.8 below.

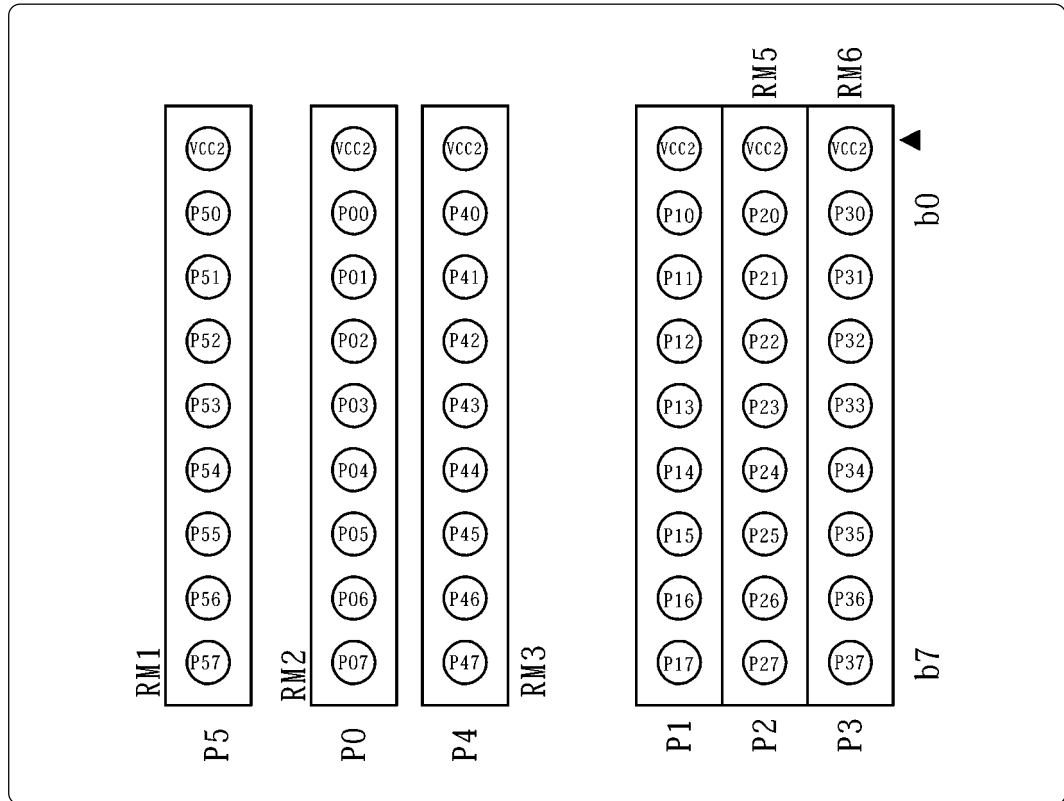


Figure 3.8 Position for mounting pullup resistors

CAUTION

Note on Installing and Removing Pullup Resistors:



- Always shut OFF power before installing or removing pullup resistors. Otherwise, the internal circuits may be damaged.
- Install pullup resistors properly. Otherwise, the emulation pod will be damaged.

3.6 A-D Conversion Bypass Capacitors

The M306N4T3-RPD-E has the M3062PT3-PRTM board which has a foot pattern for installing A-D conversion bypass capacitors near the MCU and premounted 0.1 μ F capacitors. Mount suitable bypass capacitors as occasion demands. Figure 3.2 shows where they are installed and Figure 3.9 shows their connection diagrams.

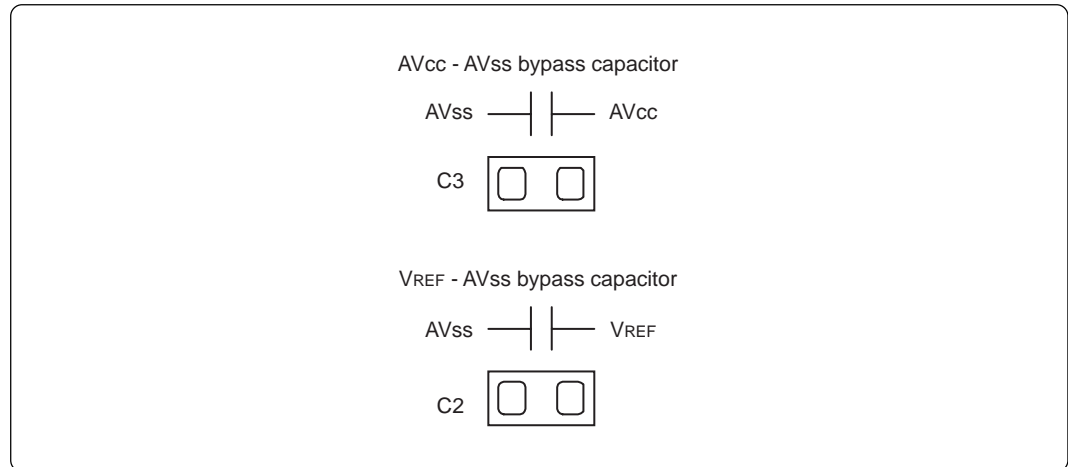


Figure 3.9 Foot patterns of A-D conversion bypass capacitor

IMPORTANT

Note on the A-D Converter Function:

- Because a flexible cable and other devices are used between the evaluation MCU and the target system, the A-D converter operates differently from that of the actual MCU. Make the final evaluation of the A-D converter with the actual MCU.

3.7 Connecting the PC4701

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

(1) Connecting the Cable to the PC4701

Figure 3.10 shows how to connect the PC4701 and FLX120-RPD

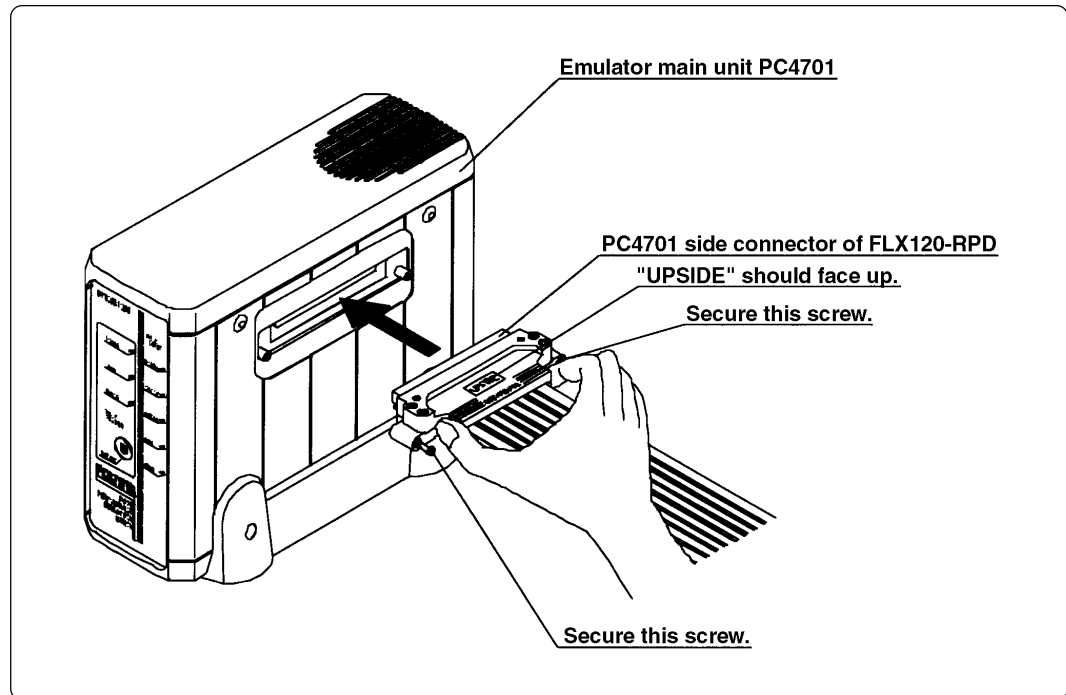


Figure 3.10 Connecting the Cable to the PC4701

CAUTION

Note on Connecting the Cable:



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

IMPORTANT

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

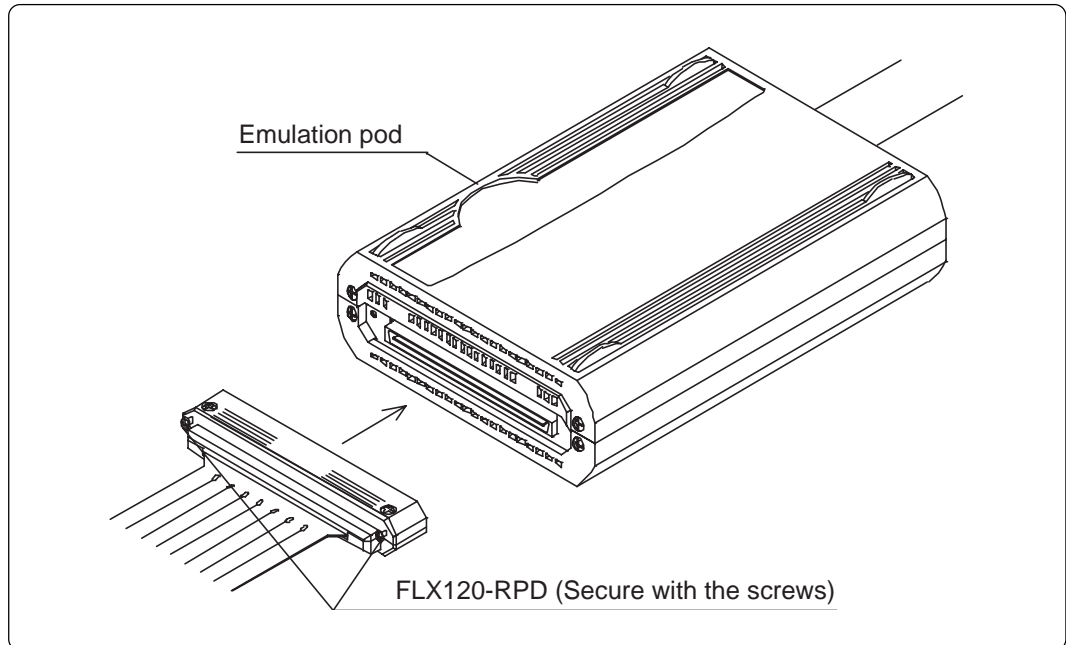


Figure 3.11 Connecting the Cable to the Emulation Pod

CAUTION

When Connecting the Cable:



- Always shut OFF power before connecting the cable. Otherwise, the internal circuits may be damaged.

IMPORTANT

Note on Securing the Screws:

- After connecting the emulation pod and the FLX120-RPD, be sure to secure the screws mounted in both sides of the connector.

3.8 Connecting the Target System

There are several ways available to connect the emulation pod to target systems as shown in Figure 3.12.

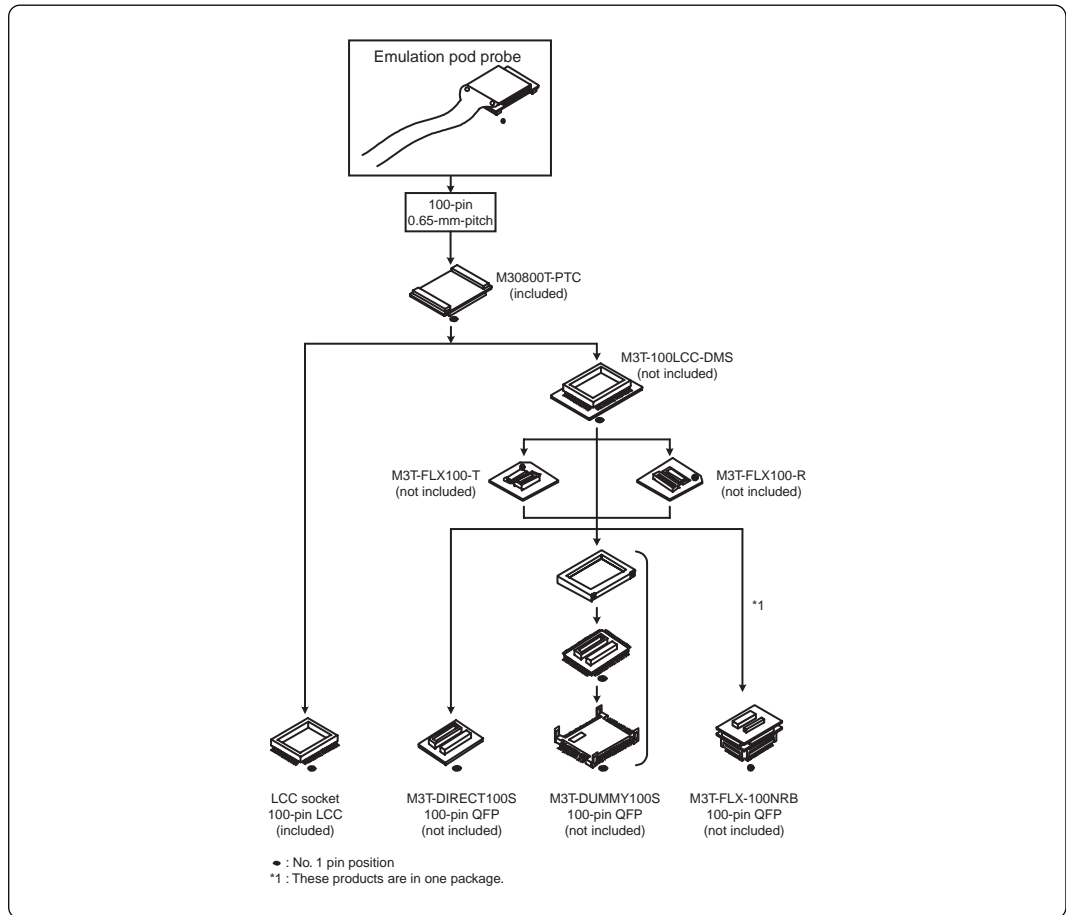


Figure 3.12 Connecting the target system

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.

(1) Connecting to a 100-pin LCC Socket

To connect the M30800T-PTC (included) to the 100-pin LCC socket (IC61-1004-051 by Yamaichi Electronics Co., Ltd.) on the target system, following the procedure below.

- (1) Attach the CN2 side of the M30800T-PTC to the tip (CN2 side) of the pitch converter board connected to the emulation pod probe.
- (2) Attach the M30800T-PTC to the 100-pin LCC socket.

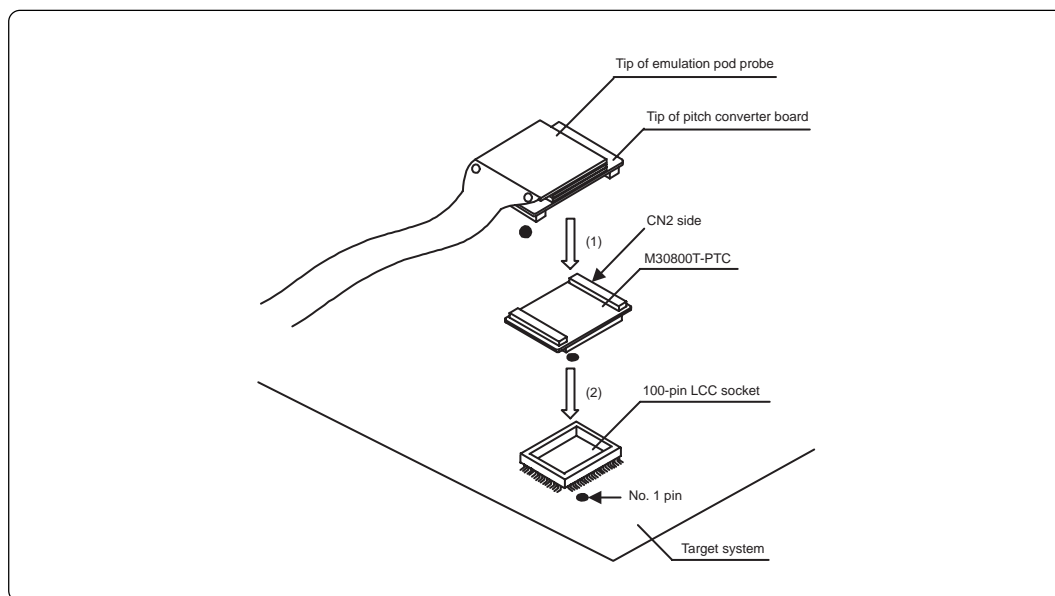


Figure 3.13 Connecting to a 100-pin LCC socket

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 connectors of the M30800T-PTC are guaranteed for only 50 insertion/removal iterations.
- The IC61-1004-51 included with this product is guaranteed for only 20 insertion/removal iterations.
- For purchasing the IC61-1004-51 or for technical information, contact Yamaichi Electronics Co., Ltd. (<http://www.yamaichi.co.jp/e/index.shtml>)

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

Here follows how to connect the emulation pod probe to a 100-pin 0.65-mm-pitch foot pattern on the target system with the M3T-DIRECT100S (not included). For details on the M3T-100LCC-DMS (not included) and M30800T-PTC (not included), refer to each user's manual.

- (1) Mount the M3T-DIRECT100S to the target system.
- (2) Attach the M3T-100LCC-DMS to the M3T-DIRECT100S.
- (3) Attach the CN2 side of the M30800T-PTC to the tip (CN2 side) of the pitch converter board connected to the emulation pod probe.
- (4) Attach the M30800T-PTC to the M3T-100LCC-DMS.

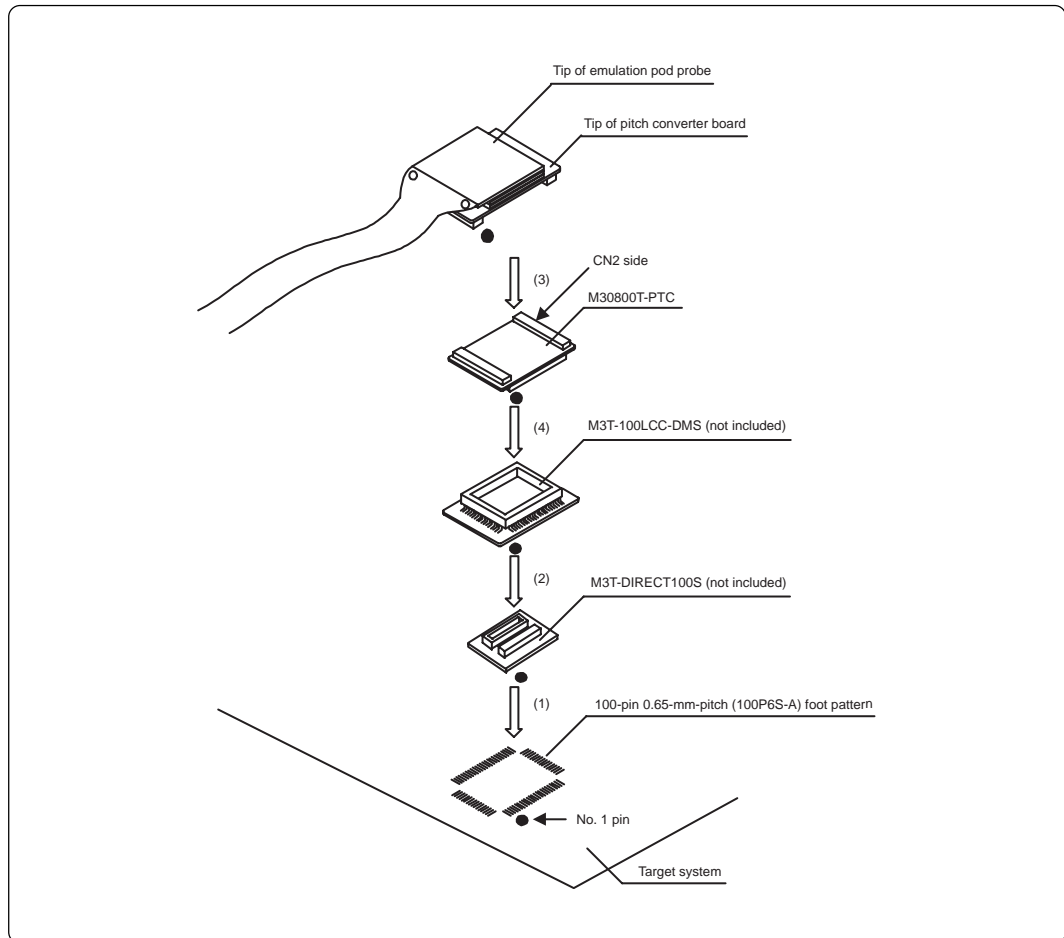


Figure 3.14 Connecting to a 100-pin 0.65-mm-pitch foot pattern (part 1)

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

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

Here follows how to connect the emulation pod probe to a 100-pin 0.65-mm-pitch foot pattern on the target system with the M3T-DUMMY100S (not included). For details on the M3T-100LCC-DMS (not included) and M3T-DUMMY100S (not included), refer to each user's manual.

- (1) Mount the M3T-DUMMY100S to the target system.
- (2) Attach the M3T-100LCC-DMS to the M3T-DUMMY100S.
- (3) Attach the CN2 side of the M30800T-PTC to the tip (CN2 side) of the pitch converter board connected to the emulation pod probe.
- (4) Attach the M30800T-PTC to the M3T-100LCC-DMS.

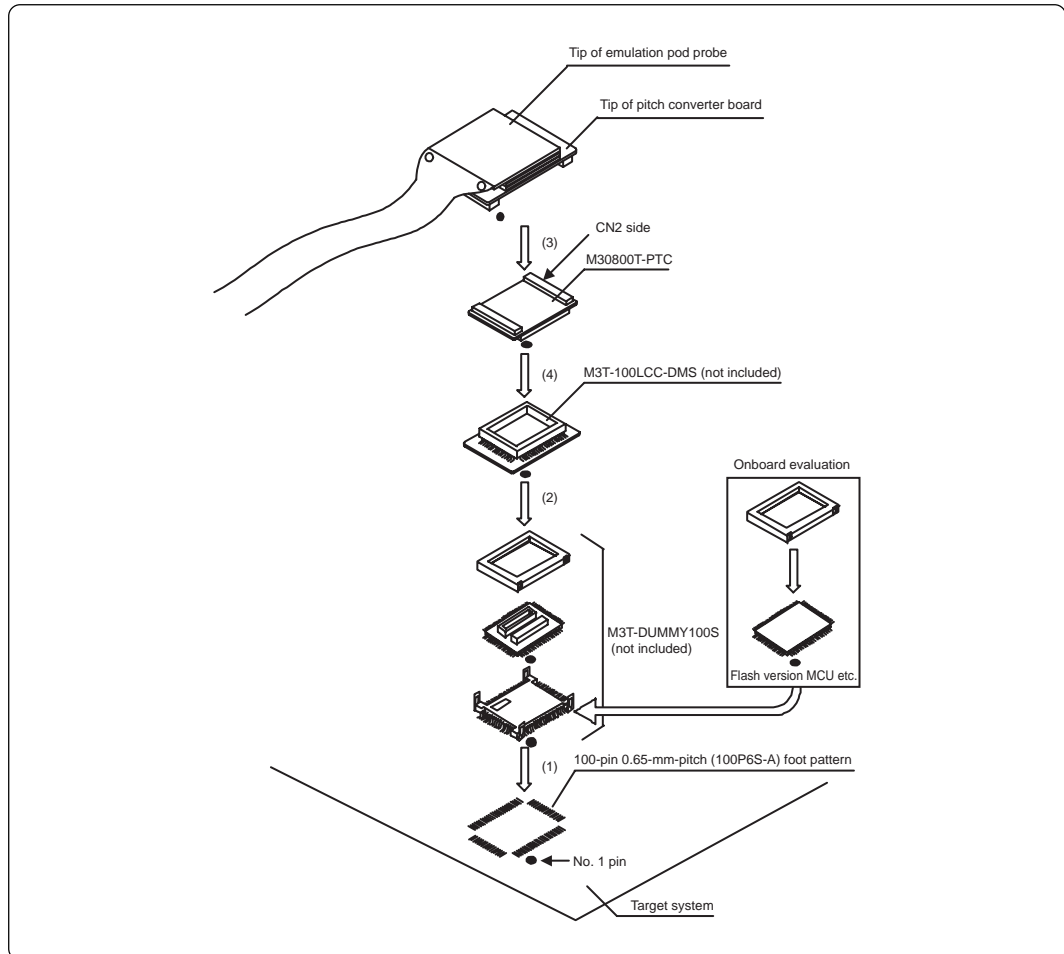


Figure 3.15 Connecting to a 100-pin 0.65-mm-pitch foot pattern (part 2)

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

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

Here follows how to connect the emulation pod probe to a 100-pin 0.65-mm-pitch foot pattern on the target system with the M3T-FLX-100NRB (not included). For details on the M3T-100LCC-DMS (not included) and M3T-FLX-100NRB (not included), refer to each user's manual.

- (1) Mount the NQPACK100RB to the target system.
- (2) Attach the YQPACK100RB to the NQPACK100RB and secure it with the included YQ-GUIDE's.
- (3) Attach the M3T-FLX-100NRB to the YQPACK100RB.
- (4) Attach the M3T-100LCC-DMS to the M3T-FLX-100NRB.
- (5) Attach the CN2 side of the M30800T-PTC to the tip (CN2 side) of the pitch converter board connected to the emulation pod probe.
- (6) Attach the M30800T-PTC to the M3T-100LCC-DMS.

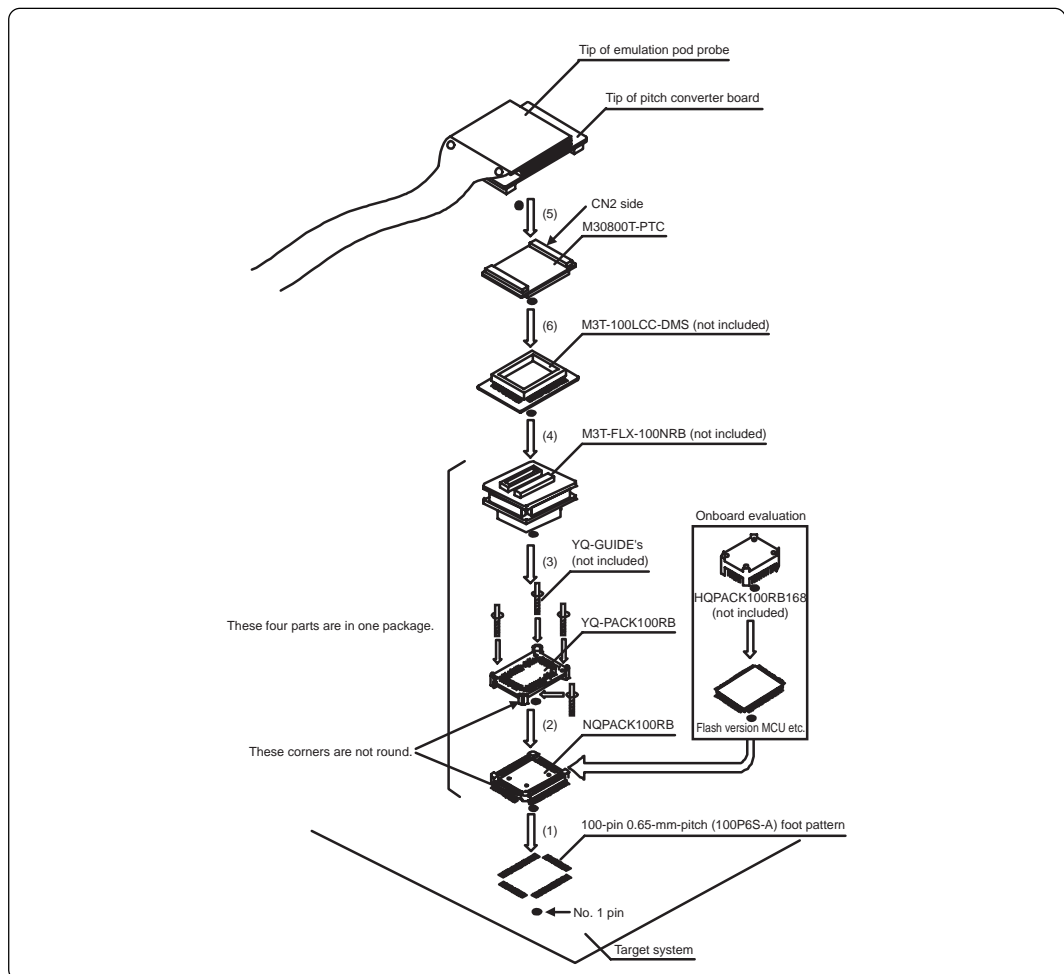


Figure 3.16 Connecting to a 100-pin 0.65-mm-pitch foot pattern (part 3)

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

MEMO

Chapter 4. Usage

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

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Chapter 4. Usage

4.1 Turning On the Power

(1) Checking Connections of the Emulator System

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

(2) Turning On the Power

- Turn on the power of the emulator and target system as simultaneously as possible.
- Turn off the power of the emulator and target system as simultaneously as possible.
- Do not leave either the emulator or target system powered on, because of leakage current the internal circuits may be damaged.
- When turning on the power again after shutting off the power, wait about 10 seconds.

CAUTION

Notes on Power Supply:



- Pins Vcc1 and Vcc2 of the emulator are connected to the target system to observe the voltage of the target system. Therefore design your system so that the target system is powered by an external power supply.
- Do not change target system power supply voltage after power has been activated.

(3) LED Display When the 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.

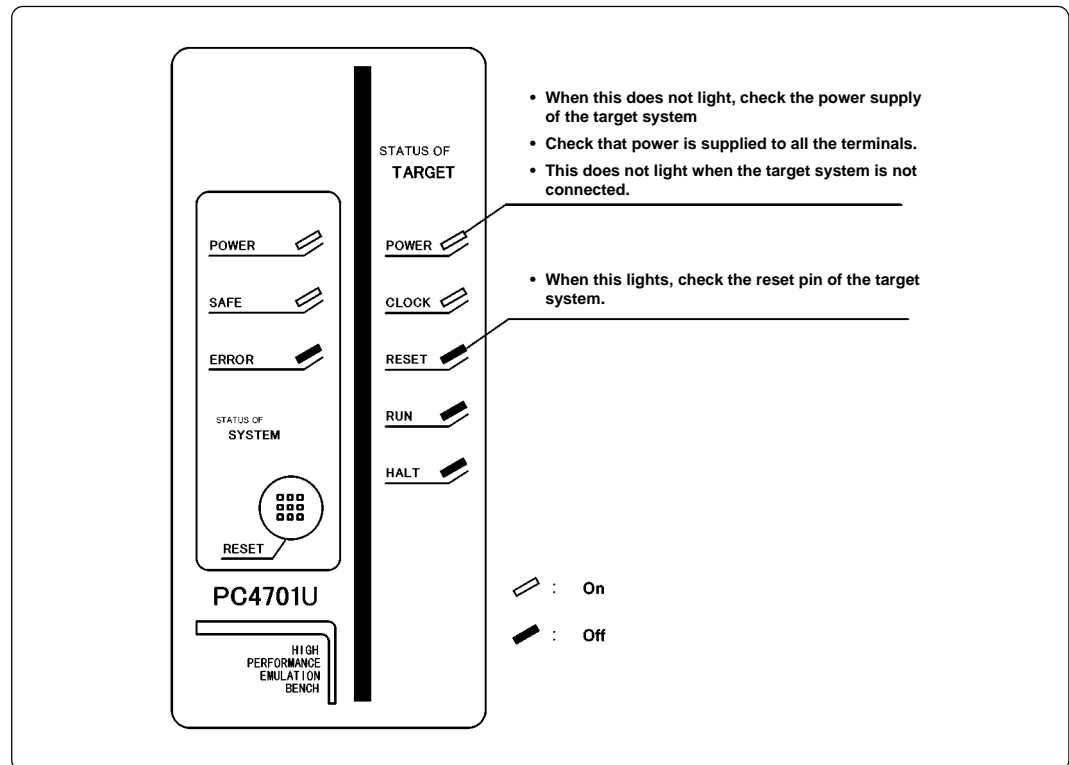


Figure 4.1 LED display when the power turned on

IMPORTANT

Note on Memory Expansion and Microprocessor Modes:

- To use memory expansion or microprocessor mode, be sure to set pins RDY* and HOLD* so that they are not active at startup. Otherwise the emulator system will not start up correctly.

Note on the Target Status POWER LED:

- If the MCU has two or more Vcc terminals, the LED does not light unless power is supplied to all the terminals.

Note on the Target Status CLOCK LED:

- If the LED is not turned on, check the following.
 - (1) After powering on the PC4701 (before starting up the emulator debugger):

Make sure that the oscillator circuit board is properly installed in the PC4701 and it is oscillating normally.
 - (2) After the emulator debugger is started up (after the Init dialog box settings are complete):

Make sure that the oscillator selected in the Init dialog box is oscillating normally.

4.2 Downloading Firmware

(1) When It is Necessary to Download Firmware

It is necessary to download the firmware in the cases listed below. Normally, the following are automatically detected when the emulator debugger is started up, and the firmware is downloaded.

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

If you use this product for the first time or have accidentally failed to download the firmware, redownload the firmware in maintenance mode.

(2) Downloading Firmware in Maintenance Mode

Download the firmware in maintenance mode as explained here following. Figure 4.2 shows LED display during firmware download. **The target system must not be connected when downloading the firmware.**

- (1) Within 2 seconds of activating power to the emulator, press the system reset switch on the emulator front panel to switch the emulator to maintenance mode. Then the system status SAFE LED will start blinking.
- (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.
 - USB and LPT interface about 20 seconds
 - Dedicated parallel interface about 30 seconds
 - Serial interface about 5 minutes

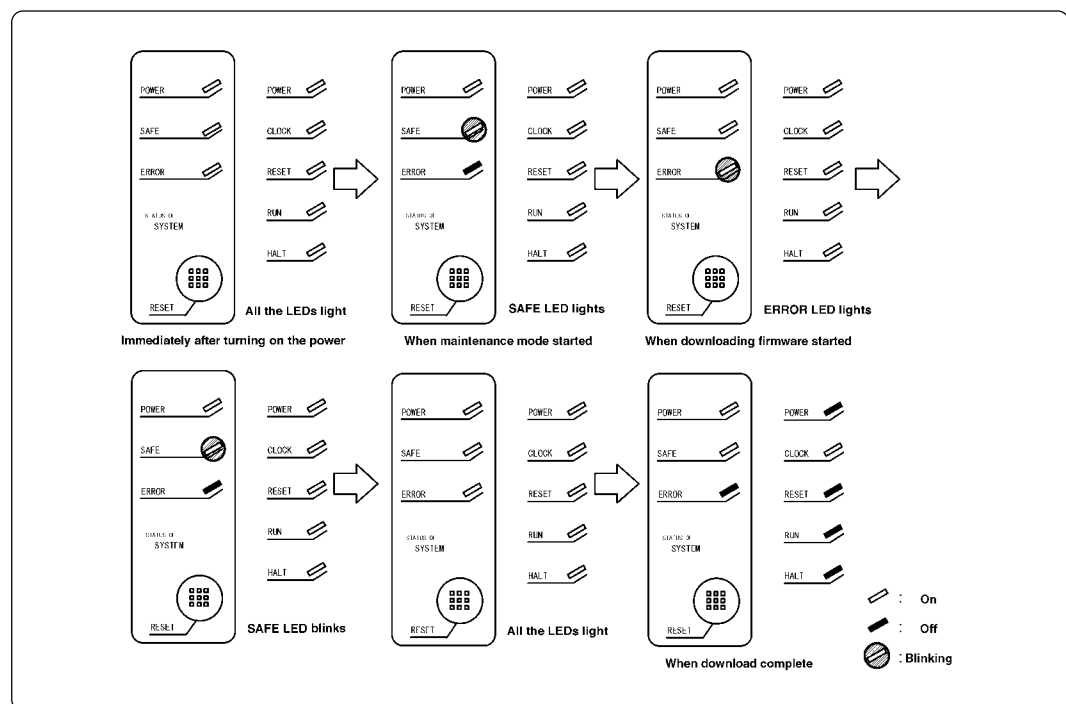


Figure 4.2 Downloading firmware in maintenance mode

IMPORTANT

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 maintenance mode.

4.3 Self-check

(1) Self-check Procedure

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

- (1) Set the switches in the emulation pod to the factory settings as shown in Figure 4.3.
- (2) If the target system is connected, disconnect it.
- (3) Within 2 seconds of activating power to the emulator, press the system reset switch on the emulator front panel to switch the emulator to maintenance mode.
- (4) Check the SAFE LED starts blinking and then press the system reset switch again.
- (5) The self-check will start. If the normal result is displayed in about 40 seconds, the self-check has terminated normally.

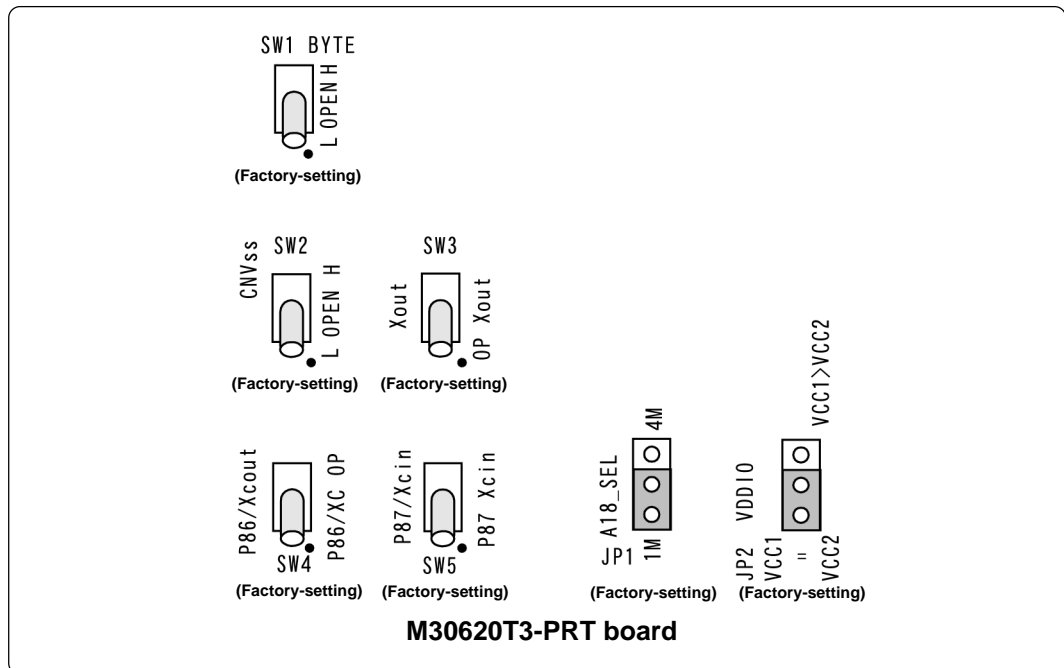


Figure 4.3 Switch settings (factory-settings) for the self-check

(2) If an Error is Detected in the Self-check

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

- Whether the emulation pod and PC4701 are connected properly
- Whether the proper firmware has been downloaded
- Whether the switch settings of this product are the factory settings (Figure 4.3)

IMPORTANT

Note on Self-check:

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

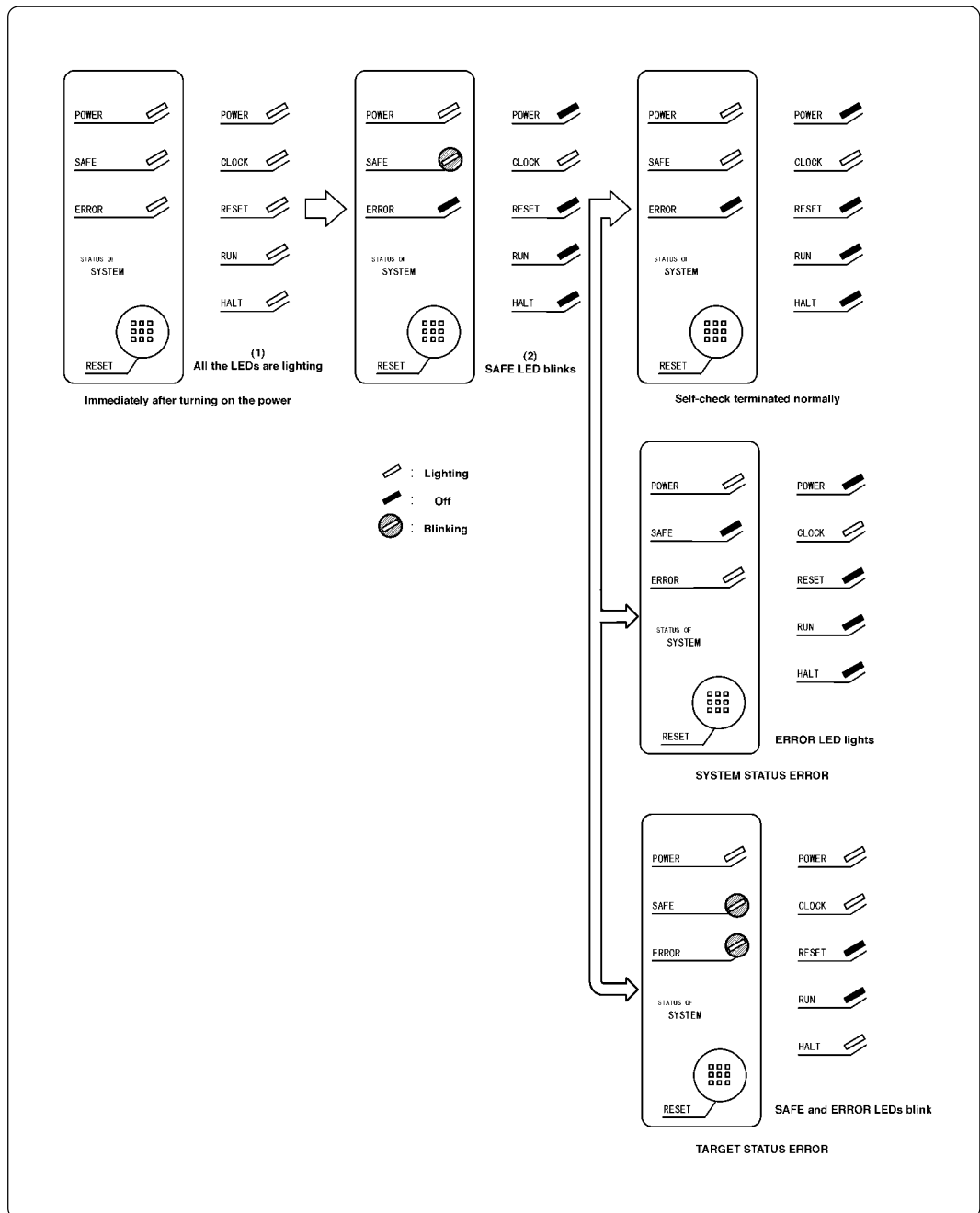


Figure 4.4 Self-check procedure

Chapter 5. Specifications

This chapter describes specifications of this product.

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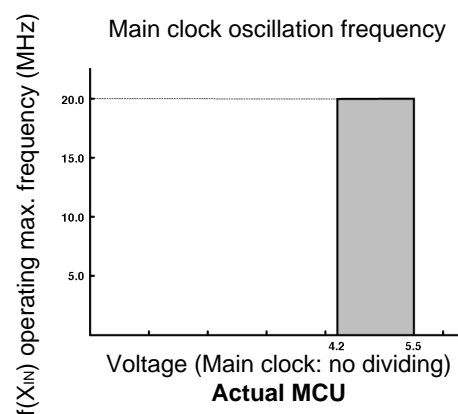
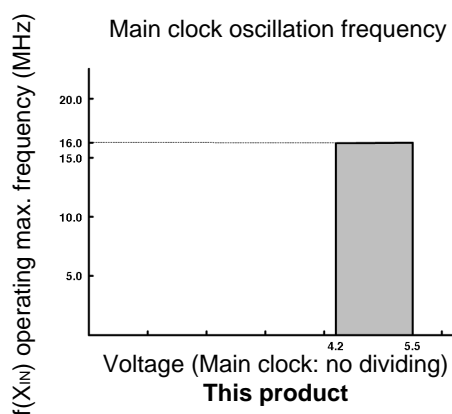
Chapter 5. Specifications

5.1 Specifications

Table 5.1 lists the specifications of the M306N4T3-RPD-E.

Table 5.1 Specifications of the M306N4T3-RPD-E

Emulators	PC4701 (excluding PC4701L and PC4700L)	
Applicable MCU	M16C/6N Group M16C/6N4, 6N5	
Evaluation MCU	M306N4FGTKP (dedicated package), M30627MHP-xxxGP (one each)	
Usable mode	Single-chip mode, Memory expansion mode, Microprocessor mode	
Emulation memory	1 MB	Internal ROM, RAM area: 0 wait, 16 MHz (max.)
		External area: 0 wait, 8 MHz (max.) 1 wait, 16 MHz (max.)
Maximum operating frequency	16 MHz (no-dividing) at 4.2 to 5.0 V (see the figures below)	
Clock supply	X _{IN} -X _{OUT}	Internal oscillator circuit board (OSC-3) Switchable to external oscillator input
	X _{CIN} -X _{COU} T	Internal oscillator circuit board (fixed 32.768 kHz) Switchable to external oscillator input
Operating voltage	4.2 to 5.5 V	
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 "3.8 Connecting the Target System" (page 41).	100-pin 0.65-mm-pitch LCC socket: (1) M30800T-PTC (included) + IC61-1004-051 (included)	
	100-pin 0.65-mm-pitch QFP (100P6S-A): (1) M30800T-PTC (included) + M3T-100LCC-DMS (not included) + M3T-DIRECT100S (not included) (2) M30800T-PTC (included) + M3T-100LCC-DMS (not included) + M3T-DUMMY100S (not included) (3) M30800T-PTC (included) + M3T-100LCC-DMS (not included) + M3T-FLX-100NRB (not included)	



5.2 Operation Timing in Memory Expansion and Microprocessor Modes (5 V)

(1) Separate Bus Timing

Table 5.2 and Figure 5.1 show the bus timing in memory expansion and microprocessor modes (3-wait, accessing external area).

Table 5.2 Memory expansion and microprocessor modes (3-wait, accessing external area)

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

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

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

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

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

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

$$\frac{0.5 \times 10^9}{f(BCLK)} - 4 \text{ [ns]}$$

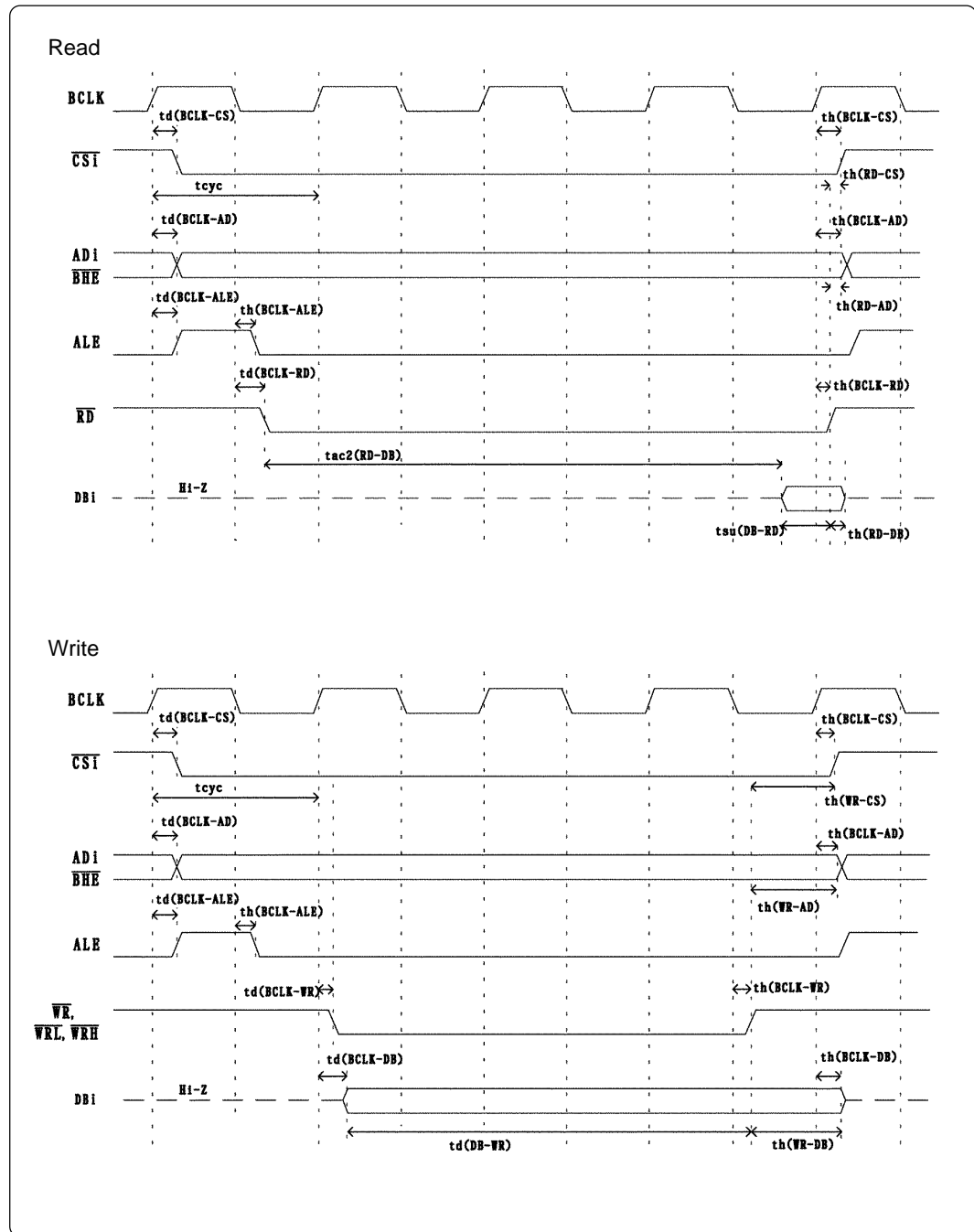


Figure 5.1 Memory expansion and microprocessor modes (3-wait, accessing external area)

(2) Multiplex Bus Timing

Table 5.3 and Figure 5.2 show the bus timing in memory expansion and microprocessor modes (2-wait, accessing external area, using multiplex bus).

Table 5.3 Memory expansion and microprocessor modes (2-wait, accessing external area, using multiplex bus)

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
td(BCLK-AD)	Address output delay time		25		26
th(BCLK-AD)	Address output hold time (BCLK standard)	4		See left	
th(RD-AD)	Address output hold time (RD standard)	(*1)		(*4)	
th(WR-AD)	Address output hold time (WR standard)	(*1)		(*5)	
td(BCLK-CS)	Chip-select output delay time		25		See left
th(BCLK-CS)	Chip-select output hold time (BCLK standard)	4		See left	
th(RD-CS)	Chip-select output hold time (RD standard)	(*1)		(*4)	
th(WR-CS)	Chip-select output hold time (WR standard)	(*1)		(*5)	
td(BCLK-RD)	RD signal output delay time		25		See left
th(BCLK-RD)	RD signal output hold time	0		-1	
td(BCLK-WR)	WR signal output delay time		25		See left
th(BCLK-WR)	WR signal output hold time	0		-4	
td(BCLK-DB)	Data output delay time (BCLK standard)		40		See left
th(BCLK-DB)	Data output hold time (BCLK standard)	4		See left	
td(DB-WR)	Data output delay time (WR standard)	(*2)		See left	
th(WR-DB)	Data output hold time (WR standard)	(*1)		(*6)	
td(BCLK-ALE)	ALE output delay time (BCLK standard)		25		See left
th(BCLK-ALE)	ALE output hold time (BCLK standard)	-4		See left	
td(AD-ALE)	ALE output delay time (Address standard)	(*3)		See left	
th(ALE-AD)	ALE output hold time (Address standard)	30		See left	
td(AD-RD)	After address RD signal output delay time	0		-4	
td(AD-WR)	After address WR signal output delay time	0		-3	
tdz(RD-AD)	Address output floating start time		8		17

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

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

$$\frac{0.5 \times 10^9}{f(BCLK)} - 1 \text{ [ns]}$$

*2 Calculated by the following formula according to the frequency of BCLK. *5 Calculated by the following formula according to the frequency of BCLK.

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

$$\frac{0.5 \times 10^9}{f(BCLK)} - 4 \text{ [ns]}$$

*3 Calculated by the following formula according to the frequency of BCLK. *6 Calculated by the following formula according to the frequency of BCLK.

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

$$\frac{0.5 \times 10^9}{f(BCLK)} - 6 \text{ [ns]}$$

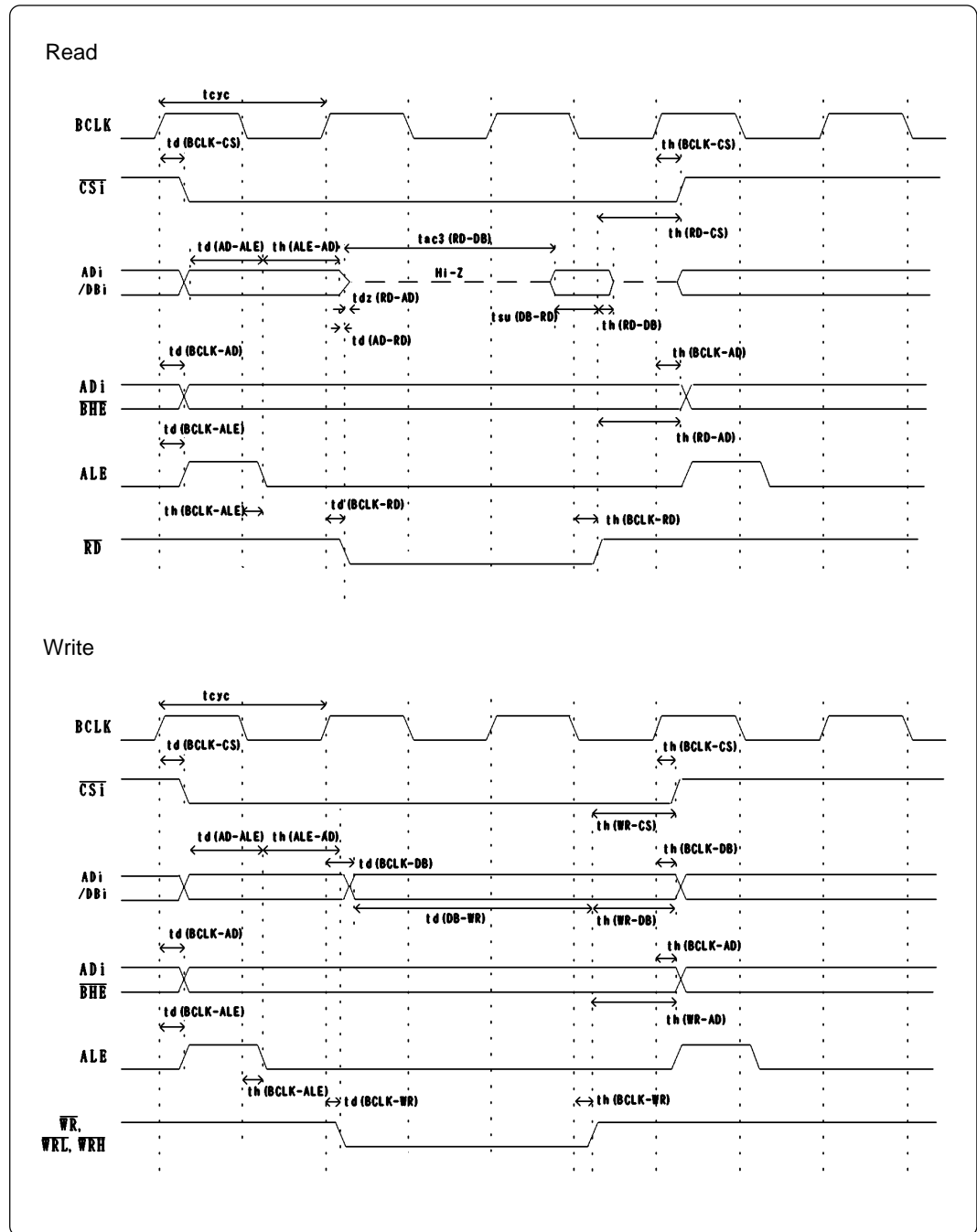


Figure 5.2 Memory expansion and microprocessor modes (2-wait, accessing external area, using multiplex bus)

(3) Timing Requirements

Table 5.4 and Figure 5.3 show the timing requirements.

Table 5.4 Timing requirements

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

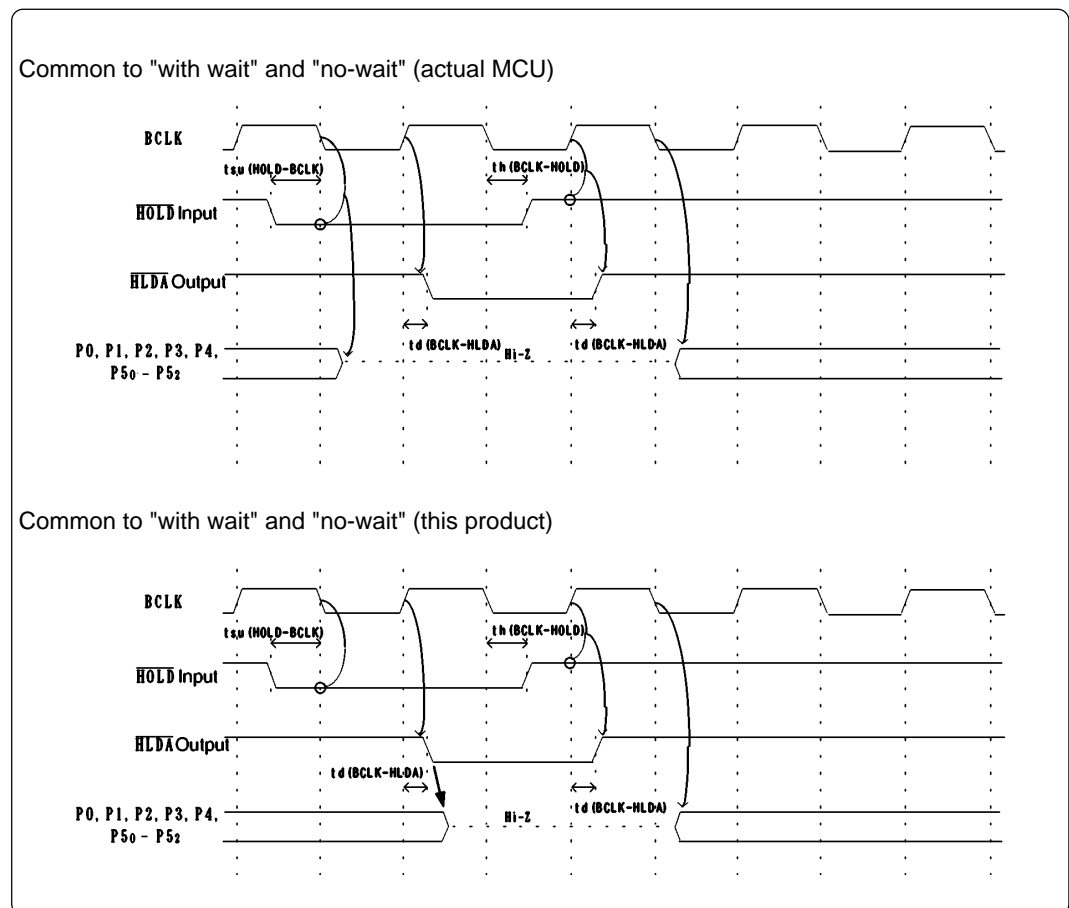


Figure 5.3 Timing requirements

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

5.3 Connection Diagram

Figure 5.4 shows a connection diagram of the M306N4T3-RPD-E. This connection diagram mainly shows the interface section. The circuits not connected to the target system such as the emulator's control system are omitted. The signals not shown in Figure 5.4 connect the evaluation MCU and the target system directly.

Tables 5.5 to 5.7 show IC electric characteristics of this product for reference purposes.

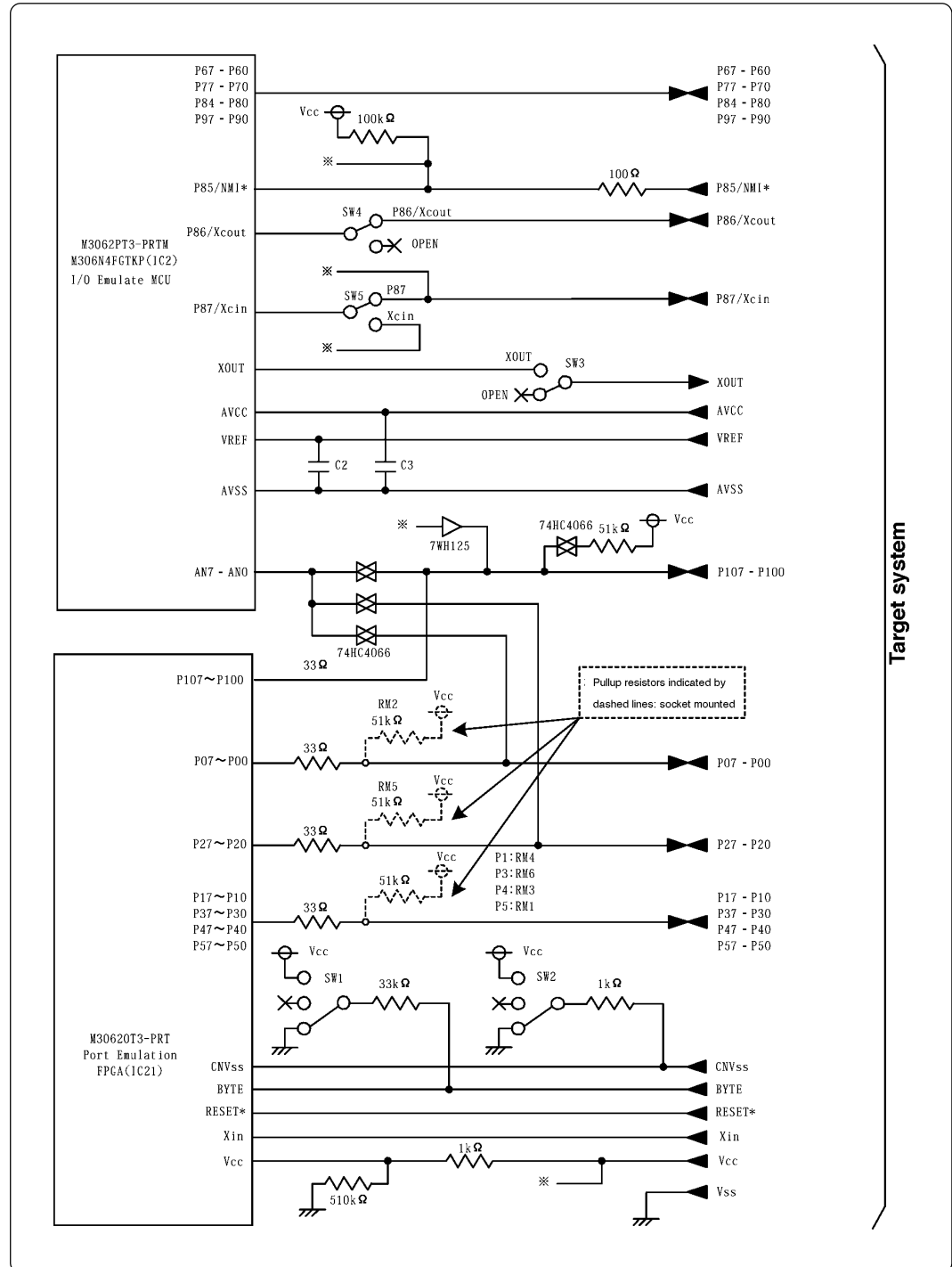


Figure 5.4 Connection diagram

Table 5.5 Electrical characteristics of the 74HC4066

Symbol	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
R _{ON}	ON resistor	V _{CC} = 4.5 V	-	96	200	Ω
Δ R _{ON}	ON resistor difference	V _{CC} = 4.5 V	-	10	-	
I _{OFF}	Leak current (Off)	V _{CC} = 12.0 V	-	-	±1	μA
I _{IZ}	Leak current (On, output: open)	V _{CC} = 12.0 V	-	-	±1	

Table 5.6 Electrical characteristics of the 7WH125

Symbol	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
V _{IH}	"H" level input voltage	V _{CC} = 3.0 to 5.5 V	V _{CC} × 0.7	-	-	V
V _{IL}	"L" level input voltage	V _{CC} = 3.0 to 5.5 V	-	-	V _{CC} × 0.3	
V _{OH}	"H" level output voltage	I _{OH} = -4 mA, V _{CC} = 3.0 V	2.48	-	-	
		I _{OH} = -8 mA, V _{CC} = 4.5 V	3.80	-	-	
V _{OL}	"L" level output voltage	I _{OH} = 8 mA, V _{CC} = 3.0 V	-	-	0.44	
		I _{OH} = 8 mA, V _{CC} = 4.5 V	-	-	0.44	
I _{OZ}	Leak current (Tristate)	V _{IN} = V _{IH} or V _{IL} , V _O = V _{CC} or GND, V _{CC} = 5.5 V	-2.5	-	2.5	μA
C _{IN}	I/O pin input capacitance	V _{IN} = 0 V, f = 1.0 MHz	-	-	10	pF

Table 5.7 Electrical characteristics of the port emulation FPGA

Symbol	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
V _{IH}	"H" level input voltage		2.0	-	5.5	V
V _{IL}	"L" level input voltage		-0.5	-	0.8	
V _{OH}	"H" level output voltage	I _{OH} = -8 mA DC, V _{CC} = 4.75 V	2.4	-	-	
		I _{OH} = -8 mA DC, V _{CC} = 3.00 V	2.4	-	-	
V _{OL}	"L" level output voltage	I _{OL} = 8 mA DC, V _{CC} = 4.75 V	-	-	0.45	
		I _{OL} = 8 mA DC, V _{CC} = 3.00 V	-	-	0.45	
I _{OZ}	Leak current (Tristate)	V _O = V _{CC} or GND	-40	-	40	μA
C _{IN}	I/O pin input capacitance	V _{IN} = 0 V, f = 1.0 MHz	-	-	8	pF

5.4 External Dimensions

(1) External Dimensions of the Emulation Pod

Figure 5.5 shows external dimensions of the M306N4T3-RPD-E.

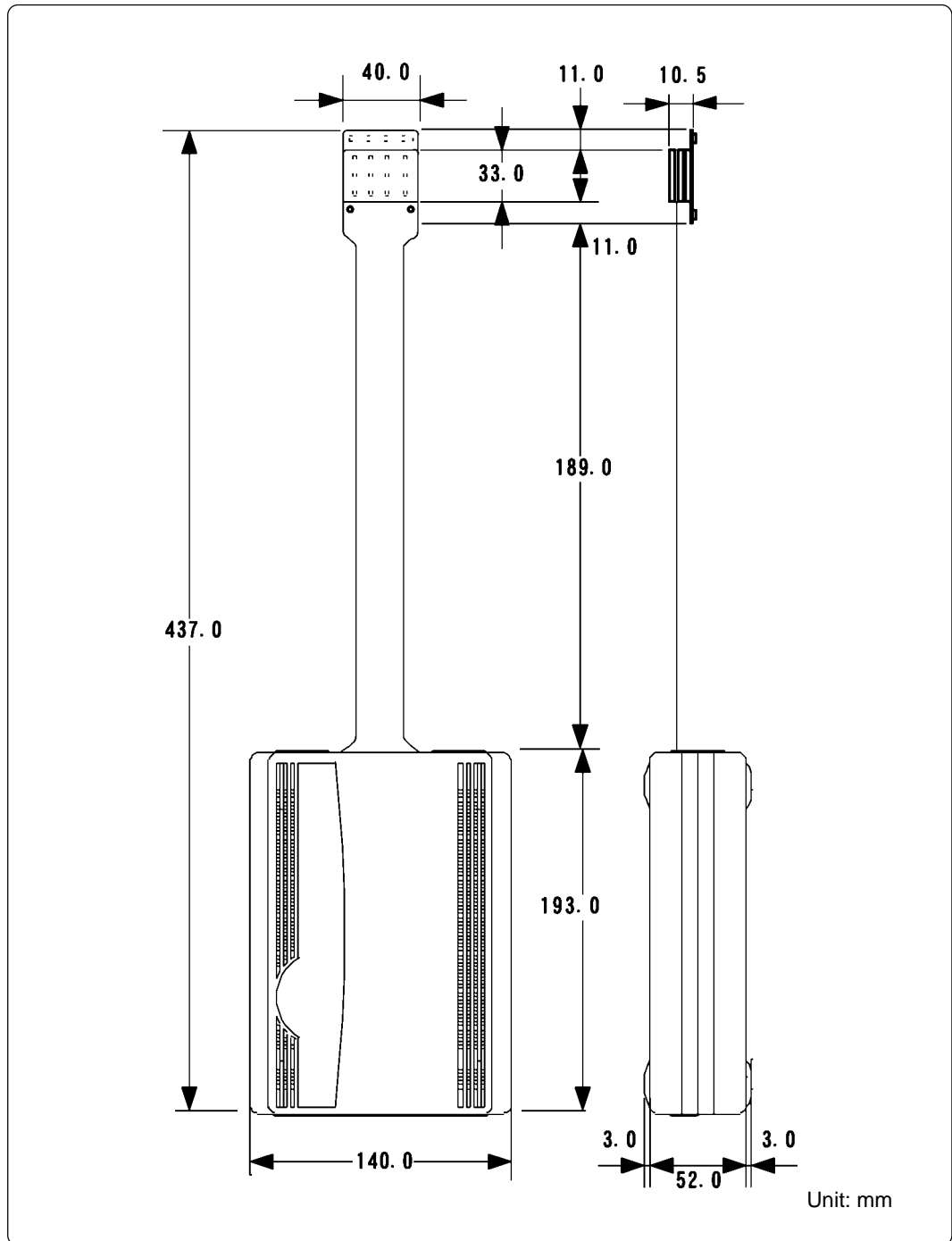


Figure 5.5 External dimensions of the emulation pod

(2) External Dimensions of the Converter Board M30800T-PTC

Figure 5.6 shows external dimensions of the converter board M30800T-PTC (included) for a 100-pin LCC and a sample foot pattern for 100-pin 0.65-mm-pitch (100P6S-A).

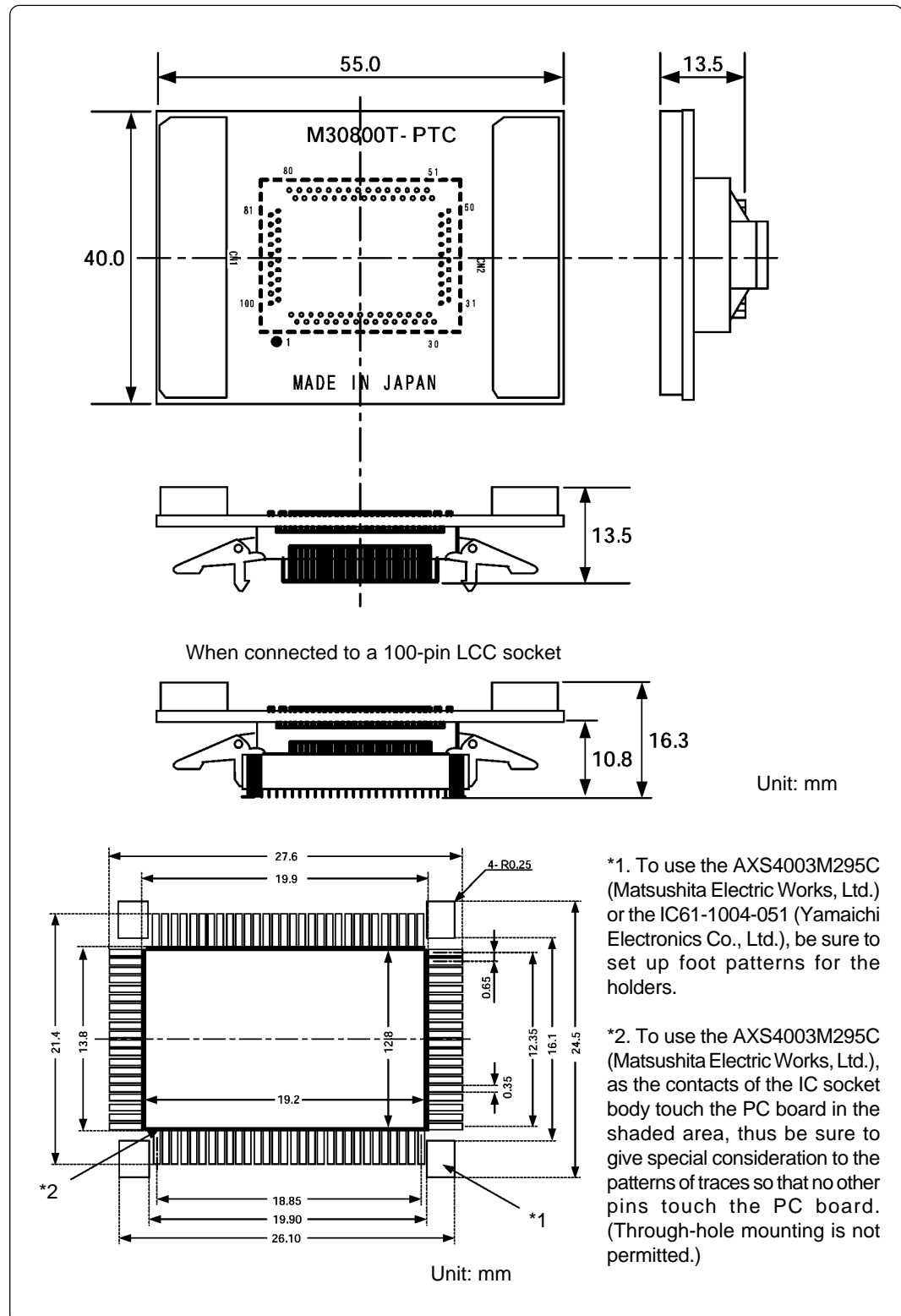


Figure 5.6 External dimensions of the converter board M30800T-PTC and a sample foot pattern

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 troubles from when power to the emulator is activated until the emulator debugger starts up. Check this while the target system is disconnected. For the latest FAQs visit the Renesas Tool Homepage.

http://www.renesas.com/eng/products/mpumcu/toolhp/faq/m16c/m16c_e.htm

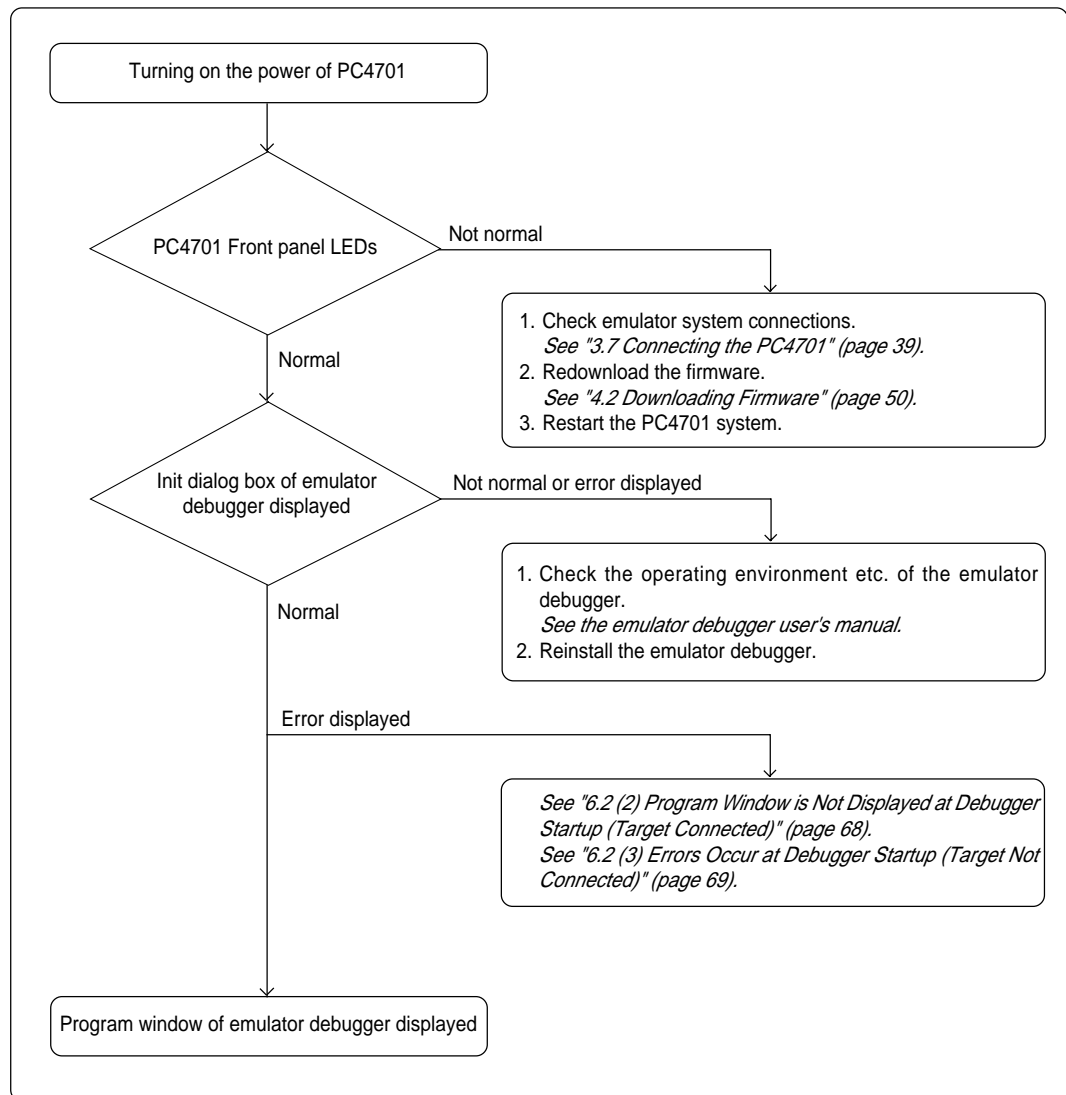


Figure 6.1 Flowchart to remedy troubles

6.2 When the Emulator Debugger Does Not Start Up Properly

(1) When the LED Display of the 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.	-	Check that the power cable is connected to the PC4701. <i>See the PC4701 user's manual.</i>
All LEDs remain lit.	-	Check the connection between the PC4701 and this product. <i>See "3.7 Connecting the PC4701" (page 39).</i>
The "POWER" LED of "STATUS OF TARGET" does not light up.	Connected	Check that power (Vcc and GND) is properly supplied to the target system.
The "CLOCK" LED of "STATUS OF TARGET" does not light up.	-	(1) Check that an oscillator circuit board is installed in the emulation pod. <i>See "3.2 Each Setting" (page 29).</i> (2) Check that the oscillation circuit in the emulation pod is oscillating. <i>See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).</i>
The RESET LED of "STATUS OF TARGET" does not go out.	Connected	Check the reset pin of the target system is held high.

(2) Program Window is Not Displayed at Debugger Startup (Target Connected)

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

Error	Checkpoint
ERROR 16005: Can't connect with the target.	<ol style="list-style-type: none">(1) Check the connection between the PC4701 and host machine. <i>See the PC4701 User's Manual.</i>(2) Check that the PC4701 is powered on. <i>See the PC4701 User's Manual.</i>(3) Check that all emulator debugger settings, interface cable connection and switches on the rear of the PC4701 match. <i>See the PC4701 User's Manual and the emulator debugger online manual.</i>
ERROR 16211: The version of PD30 and the firmware on the target are not same.	<ol style="list-style-type: none">(1) Download the proper firmware. <i>See "4.2 Downloading Firmware" (page 50).</i>(2) Choose the proper MCU file in the Init dialog box. <i>See the emulator debugger online manual.</i>(3) Check that the descriptions in the MCU file are correct. <i>See "2.4 (1) Making the MCU File" (page 25).</i>
ERROR 16215: Cannot communicate with the debugging monitor.	<ol style="list-style-type: none">(1) Check the connection between the PC4701 and this product. <i>See "3.7 Connecting the PC4701" (page 39).</i>(2) Check the reset pin of the target system is held high. <i>See the MCU specifications.</i>(3) If the CNVss is held high at startup, check that pins HOLD* and RDY* are held high, too. <i>See the MCU specifications.</i>(4) Check that the oscillation circuit of the emulation pod is oscillating properly. <i>See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).</i>
ERROR 16014: Communication ERROR. Can't accept data.	<ol style="list-style-type: none">(1) Check that the oscillation circuit of the target system is oscillating properly. <i>See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).</i>(2) Check that the PC4701 LEDs at startup show normal operation. <i>See "4.1 (3) LED Display When the PC4701 Starts Up Normally" (page 49).</i>
ERROR 16231: There was sent undefined data from PC4700.	Check that the emulator debugger has not been started up without shutting down the PC4701. <i>See "IMPORTANT: Note on Quitting the Emulator Debugger" (page 12).</i>

(3) Program Window is Not Displayed at Debugger Startup (Target Not Connected)

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

Error	Checkpoint
ERROR 16005: Can't connect with the target.	(1) Check the connection between the PC4701 and host machine. <i>See the PC4701 User's Manual.</i> (2) Check that the PC4701 is powered on. <i>See the PC4701 User's Manual.</i> (3) Check that all emulator debugger settings, interface cable connection and switches on the rear of the PC4701 match. <i>See the PC4701 User's Manual and the emulator debugger online manual.</i>
ERROR 16211: The version of PD30 and the firmware on the target are not same.	(1) Check the connection between the PC4701 and this product. <i>See "3.7 Connecting the PC4701" (page 39).</i> (2) Download the proper firmware. <i>See "4.2 Downloading Firmware" (page 50).</i> (3) Choose the proper MCU file in the Init dialog box. <i>See the emulator debugger online manual.</i> (4) Check that the descriptions in the MCU file are correct. <i>See "2.4 (1) Making the MCU File" (page 25).</i>
ERROR 16215: Cannot communicate with the debugging monitor.	(1) Check that switch settings in the emulation pod are correct. <i>See "3.4 Switch Settings" (page 34).</i> (2) Check that the oscillation circuit of the emulation pod is oscillating properly. <i>See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).</i>
ERROR 16014: Communication ERROR. Can't accept data.	Check that the PC4701 LEDs at startup show normal operation. <i>See "4.1 (3) LED Display When the PC4701 Starts Up Normally" (page 49).</i>
ERROR 16231: There was sent undefined data from PC4700.	Check that the emulator debugger has not been started up without shutting down the PC4701. <i>See "IMPORTANT: Note on Quitting the Emulator Debugger" (page 12).</i>

6.3 How to Request for Support

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

For prompt response, please specify the following information:

(1) Operating environment

- Operating voltage: X.X [V]
- Operating frequency: XX.X [MHz]
- Operating mode: Single-chip, memory expansion, or microprocessor mode

(2) Problem

MEMO

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 one year 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 one year after purchase can be repaired with extra-charge.

(2) Replacement with extra-charge

If your product's fault falls in any of the following categories, the fault will be corrected by replacing the entire product instead of repair, or you will be advised to purchase new one, depending on the severity of the fault.

- Faulty or broken mechanical portions
- Flaw, separation, or rust in coated or plated portions
- Flaw or cracks in plastic portions
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- Wide range of faults that makes replacement less expensive than repair
- Unlocatable or unidentified faults

(3) Expiration of the repair period

When a period of 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 M306N4T3-RPD-E 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 M306N4T3-RPD-E for repair, use the packing box and cushion material supplied with the M306N4T3-RPD-E 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 the M306N4T3-RPD-E (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

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M306N4T3-RPD-E User's Manual

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