To our customers,

Old Company Name in Catalogs and Other Documents

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

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

April 1st, 2010
Renesas Electronics Corporation

RENESAS

RENESAS

M30245T3-RPD-E

User's Manual

Emulation Pod for M16C/24 Group M30245

Renesas Electronics
www.renesas.com

Rev.2.00   2004.01

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

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

Precautions to be taken when using this product
- This product is a development supporting unit for use in your program development and evaluation stages. In mass-producing your • This product is a development supporting unit for use in your program development and evaluation stages. In mass-producing your program you have finished developing, be sure to make a judgment on your own risk that it can be put to practical use by performing integration test, evaluation, or some experiment else.
- In no event shall Renesas Solutions Corporation be liable for any consequence arising from the use of this product.
- Renesas Solutions Corporation strives to renovate or provide a workaround for product malfunction at some charge or without charge. However, this does not necessarily mean that Renesas Solutions Corporation guarantees the renovation or the provision under any circumstances.
- This product has been developed by assuming its use for program development and evaluation in laboratories. Therefore, it does not fall under the application of Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.

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 M30245T3-RPD-E is an emulation pod for the M16C/24 Group M30245 of 16-bit MCUs. It is used with a PC4701 emulator.

This user's manual mainly describes specifications of the M30245T3-RPD-E emulation pod and how to setup it. For details on the following products, which are used with M30245T3-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 this product is used with the PC4700H emulator.

Contents

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 M30245T3-RPD-E (this product) does not support the PC4701L and PC4700L emulators. For details on specific models of PC4701, visit the Renesas Tools Homepage at http://www.renesas.com/en/tools

Emulation pod

This means M30245T3-RPD-E (this product). This emulation pod is for the M16C/24 Group M30245. It is used with the emulator main unit PC4701.

Emulator debugger

This means a software tool M3T-PD30 for 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.

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 unrepairable damage.

Warnings for Use Environment:

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

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

⚠ CAUTION

Caution to Be Taken for Modifying This Product:

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

Cautions to Be Taken for Handling This Product:

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

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

- Do not pull the emulation pod main unit by the flexible cable (FLX120-RPD) for connecting to the emulator main unit or the flexible cable (FLX64, FLX100, 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 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.

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 46). 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" (page 47).

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:

- Pin Vcc of the emulator is 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.

- The voltage of the target system should be within the MCU's specified range.

- 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 execution (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.

Notes on HOLD* Input:

- Be sure to input HOLD* of the target system during user program execution (only while the RUN status LED on the PC4701's front panel is lit). If "L" is input to pin HOLD*, the emulator will not work normally.

- When inputting "L" to pin HOLD* to run into the HOLD state, P00 to P52 will be in the HOLD state delaying by 2.5 cycles than the actual MCU (see Table 5.3 and Figure 5.3).

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) 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 10000h, the emulator uses 32-byte area of 10000h to 1001Fh.

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) or resources on the target system are used.

- Be sure to set the SFR 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 0FFF8h to 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 8 byte area of 0FFF8h to 0FFFFh set to EXT.

  (2) With the system which starts up in microprocessor mode, using the 8 byte area of 0FFF8h to 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 8 byte area of 0FFF8h to 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 #0480H, SP --> Set the stack pointer
                                                   (Stop the program after executing this instruction)

  (4) Set the 8 byte area 0FFF8h 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 an MCU file:

- To debug an MCU which has any other size of memory (SFR, ROM, RAM), be sure to make an MCU file for it. For details on making an MCU file, see "2.4 (1) Making an MCU File" (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 pod. 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, DMA1, DMA2, DMA3 transfer counter registers: TCR0, TCR1, TCR2, TCR3

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 network resistor (51 kΩ) to the inside of the emulator. How to apply it, refer to "3.5 Installing and Removing Network Resistors for Pullup" (page 36).

  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, 2, 3	SAR0, SAR1, SAR2, SAR3
DMA destination pointers 0, 1, 2, 3	DAR0, DAR1, DAR2, DAR3
DMA transfer counters 0, 1, 2, 3	TCR0, TCR1, TCR2, TCR3
DMA control registers 0, 1, 2, 3	DM0CON, DM1CON, DM2CON, DM3CON

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) Execution from the instruction setting "1" to PRC2 where a software breakpoint is set

    (3) 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.

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

Note on Accessing Address 00000h:

- With M16C Family MCUs, 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 Vcc to 0.8 Vcc) 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 can be read and written into.
  - (4) Characteristics of ports P0 to P5
    - Ports P0 to P5 are connected via emulation circuits. The device used for the port emulation circuit is the IC2 (RENESAS M60081L-0142FP).
  - (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) Hold control
    - When an 'L' level signal is input to pin HOLD* and the pin enters the hold state, in actuality, ports P00 to P52 enter the hold state 2.5 cycles later than the actual MCU (see Figure 5.3).
  - (7) 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.
  - (8) 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

  - (9) 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.
  - (10) 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.
  - (11) 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.

MEMO

Chapter 2. Preparation

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

Chapter 2. Preparation

2.1 Package Components

The M30245T3-RPD-E package consists of the following items. When unpacking, check to see if your M30245T3-RPD-E contains all of these items.

Table 2.1 Package components

Item	Quantity
M30245T3-RPD-E emulation pod main unit	1
FLX120-RPD flexible cable for connecting PC4701	1
M3T-FLX-100NSD converter board for 100-pin 0.5-mm-pitch LQFP	1
OSC-3 16MHz oscillator circuit board for main clock (preinstalled)	1
OSC-2 oscillator circuit board (bare board)	1
Network resistors for pulling up ports P0 to P5 (51 kΩ)	12
Hardware tool user registration FAX sheet	1
Hardware tool user registration FAX sheet (Japanese)	1
M30245T3-RPD-E User's Manual (This manual)	1
M30245T3-RPD-E User's Manual (Japanese)	1

* Please keep the M30245T3-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.

2.2 Other Tool Products Required for Development

To bring forward programs development on an M16C/24 Group M30245, 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

* To purchase these products, contact your local distributor.

2.3 Name of Each Part

(1) System Configuration
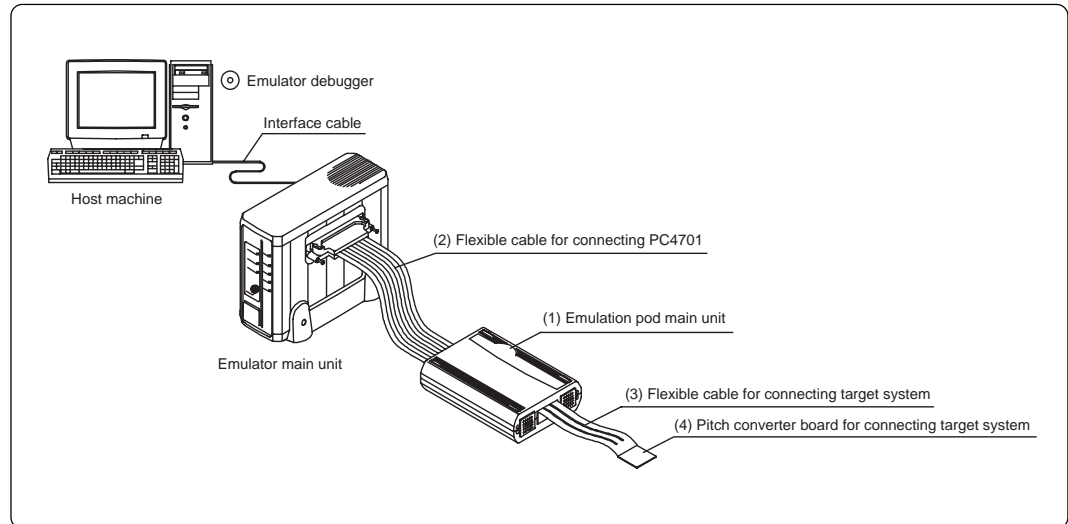
Figure 2.1 System configuration

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

(1) Emulation pod main unit M30245T3-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 FLX100

This is a 100-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 40).

(2) Inside of the Emulation Pod
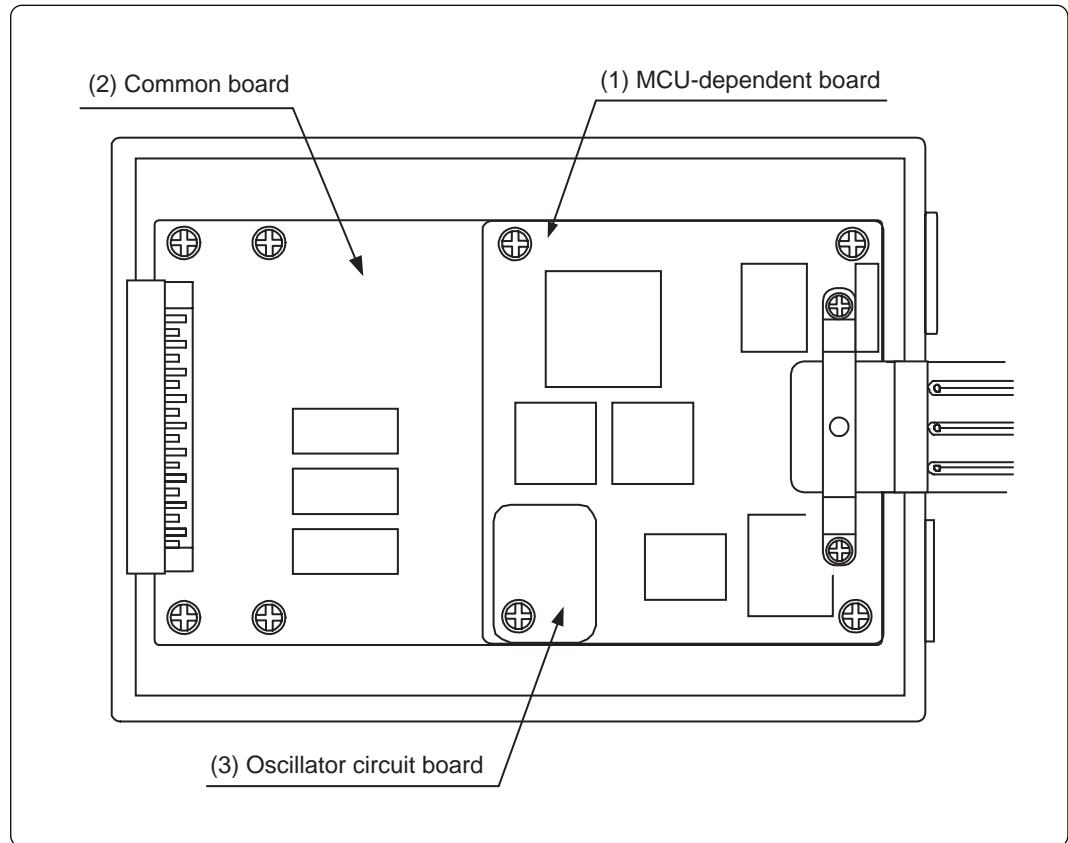
Figure 2.2 Internal view of the emulation pod

(1) MCU-dependent board

This is a board with an evaluation MCU for port emulation.

(2) Common board

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

(3) Oscillator circuit board

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

2.4 When Using This Product for the First Time

(1) Making an 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 an MCU file. Make an 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.

An 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 M30245FCGP (10KB RAM, 128KB ROM) are as follows:

0	: SFR area	Start address
3FF	:	End address
400	: Internal RAM	Start address
2BFF	:	End address
E0000	: Internal ROM	Start address
FFFFF	:	End address
M30620P	: Name of firmware (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) 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.

Connect the PC4701 and this product.	See "3.7 Connecting the PC4701" (page 38).
Within 2 seconds of turning the power ON, press the system reset switch of the PC4701 and check it is in maintenance mode.	See "4.2 Downloading Firmware" (page 46).
Download the firmware using the emulator debugger.	Init dialog box settings: - MCU file - Work are, etc.
End the emulator debugger and shut the power of the PC4701 OFF.	

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.

Within 2 seconds of turning the power ON, press the system reset switch of the PC4701 and check it is in maintenance mode.	
Push the system reset switch of the PC4701 again to start the self-check.	See "4.3 Self-check" (page 47).
After about 40 seconds, check that the self-check is complete normally and shut off the PC4701.	
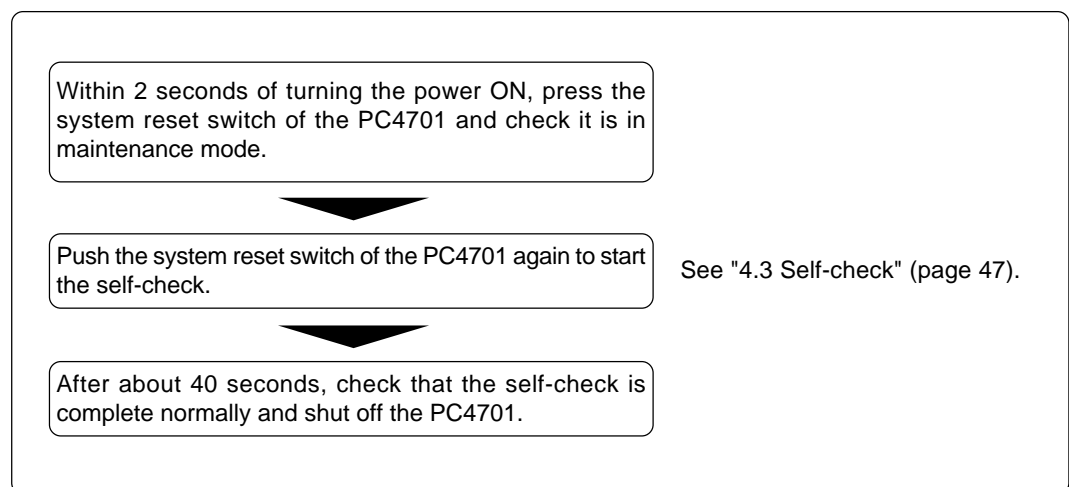
Figure 2.4 Self-check procedure

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.

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.

- Input frequency
- Switches
- Network resistors for pullup
- USB circuit, connector and others

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.
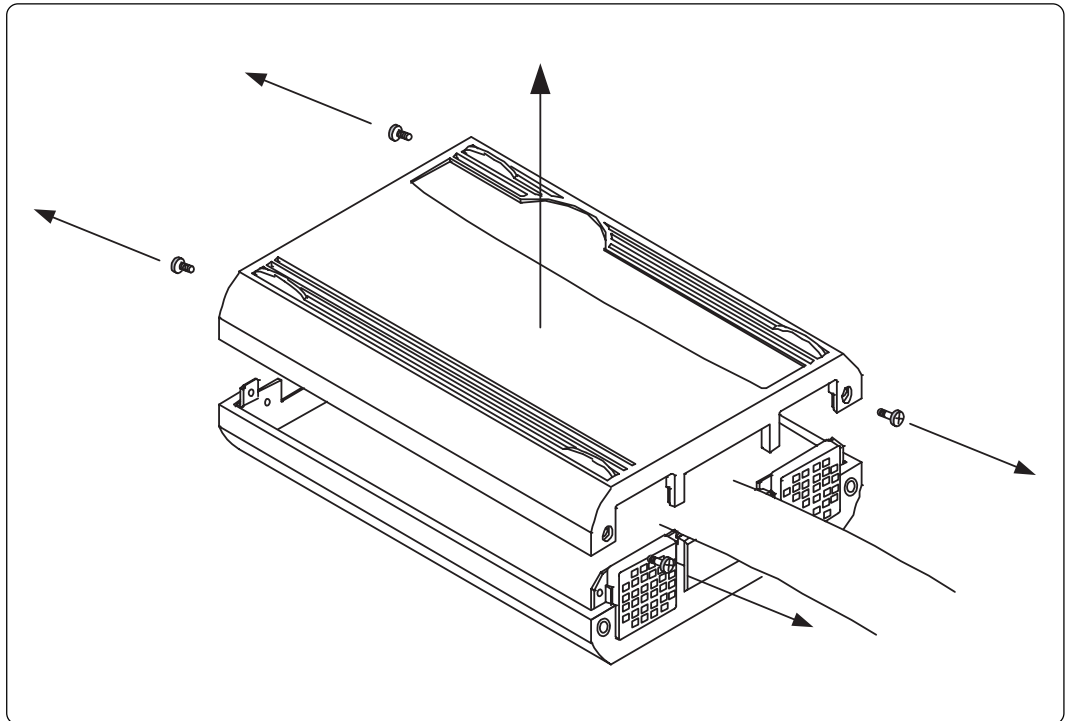
Figure 3.1 Removing the upper cover

⚠ 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) Socket for installing network resistors for pullup
(4) USB-related parts
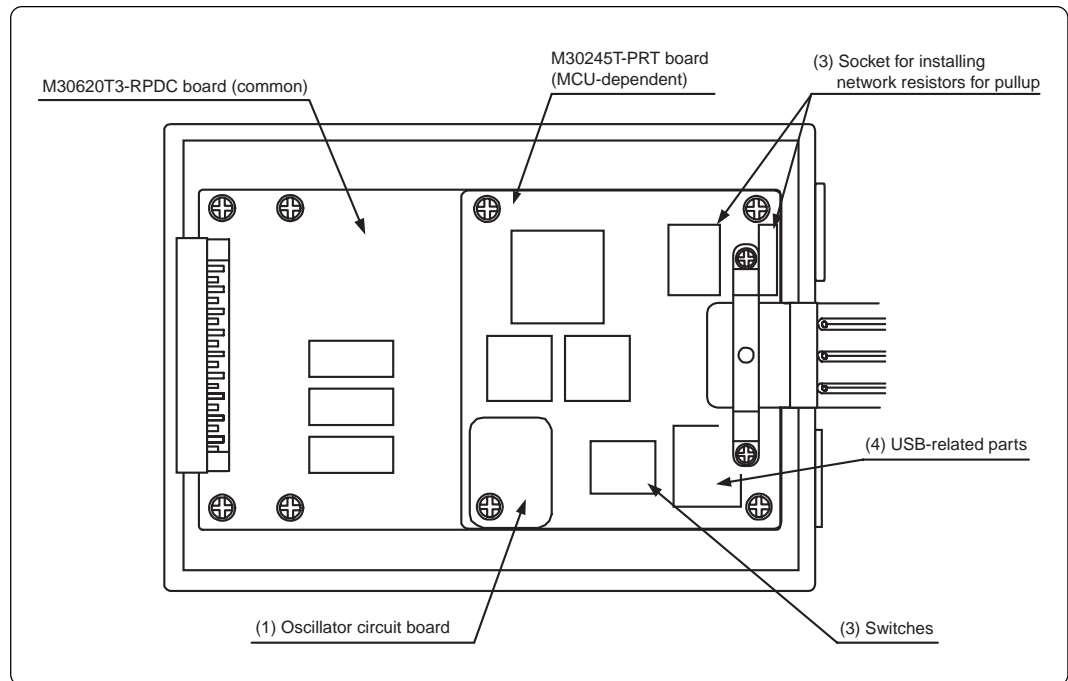
Figure 3.2 Positions of each part

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_{COUT}	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_{COUT}, 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.)
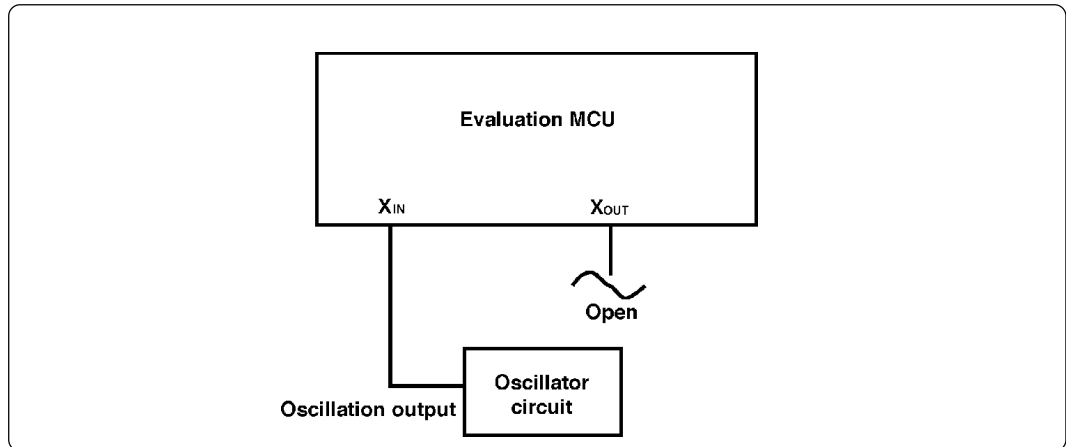
Figure 3.3 External oscillator circuit

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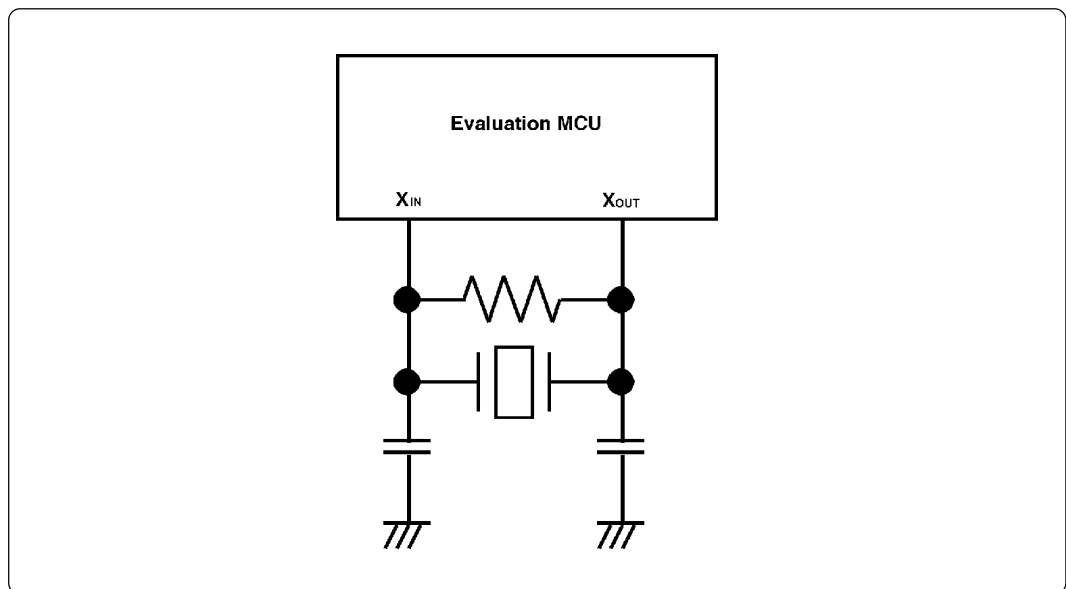
Figure 3.4 Circuit in which oscillation does not occur (same for X_{CIN}-X_{COUT})

(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.

J1-4: GND
J1-3: Oscillator output
J1-2: GND
J1-1: Vcc
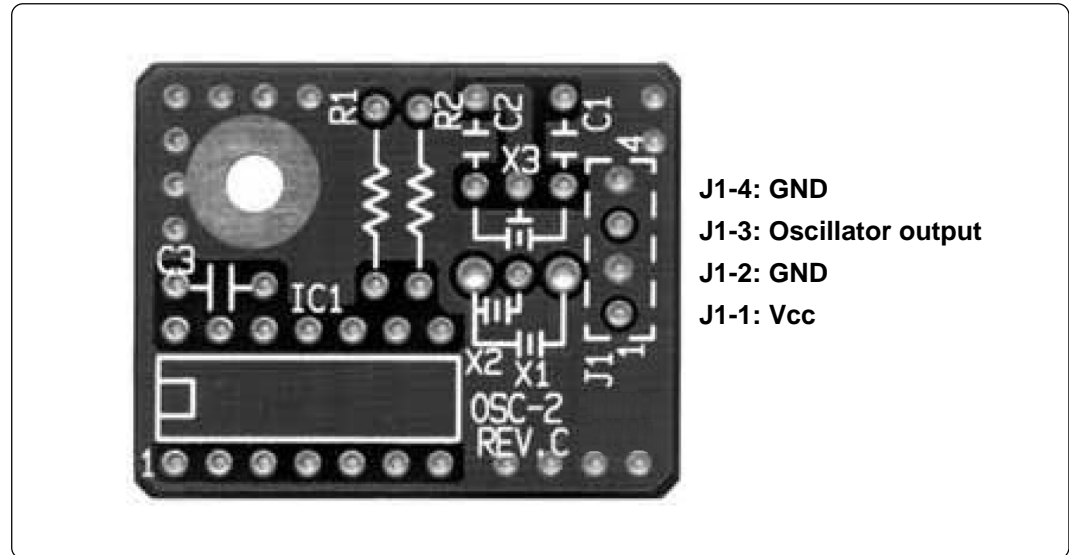
Figure 3.5 External view of the OSC-2 oscillator circuit board and its connector pin positions

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

IC1: Inverter (Unbuffer)
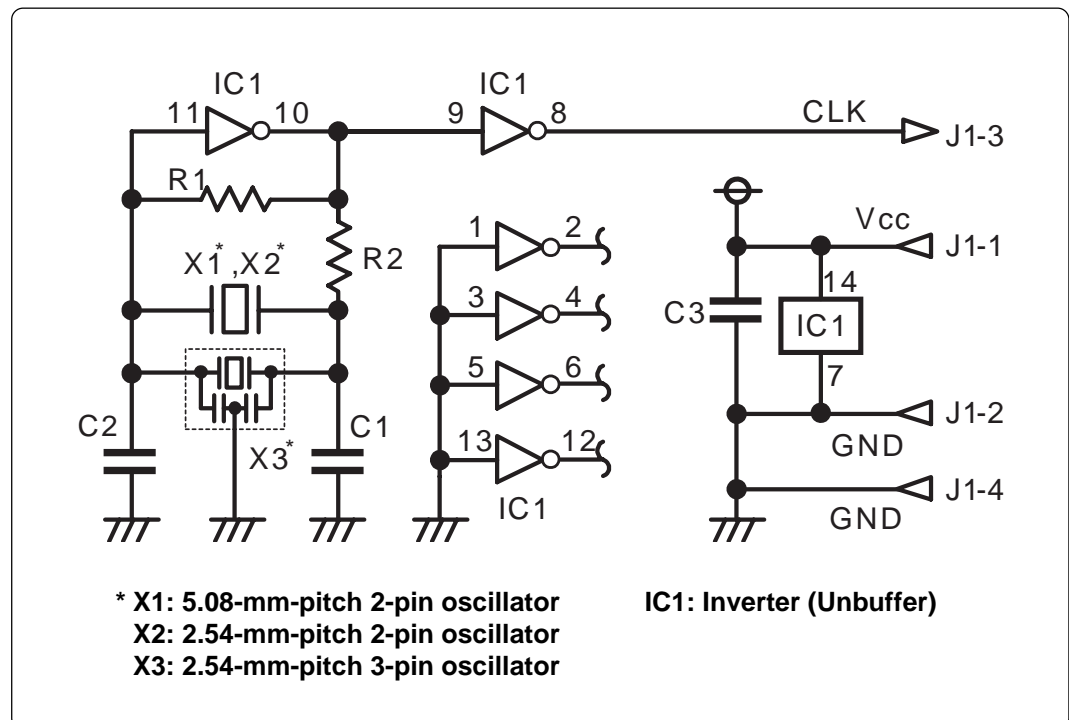
Figure 3.6 Circuits of the OSC-2 oscillator circuit bare board

(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.

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

(2) Lift off the oscillator circuit board.

(3) Insert the J1 connector of a new oscillator circuit board to the connector of the main board.

(4) Secure the new oscillator circuit board with the screw.
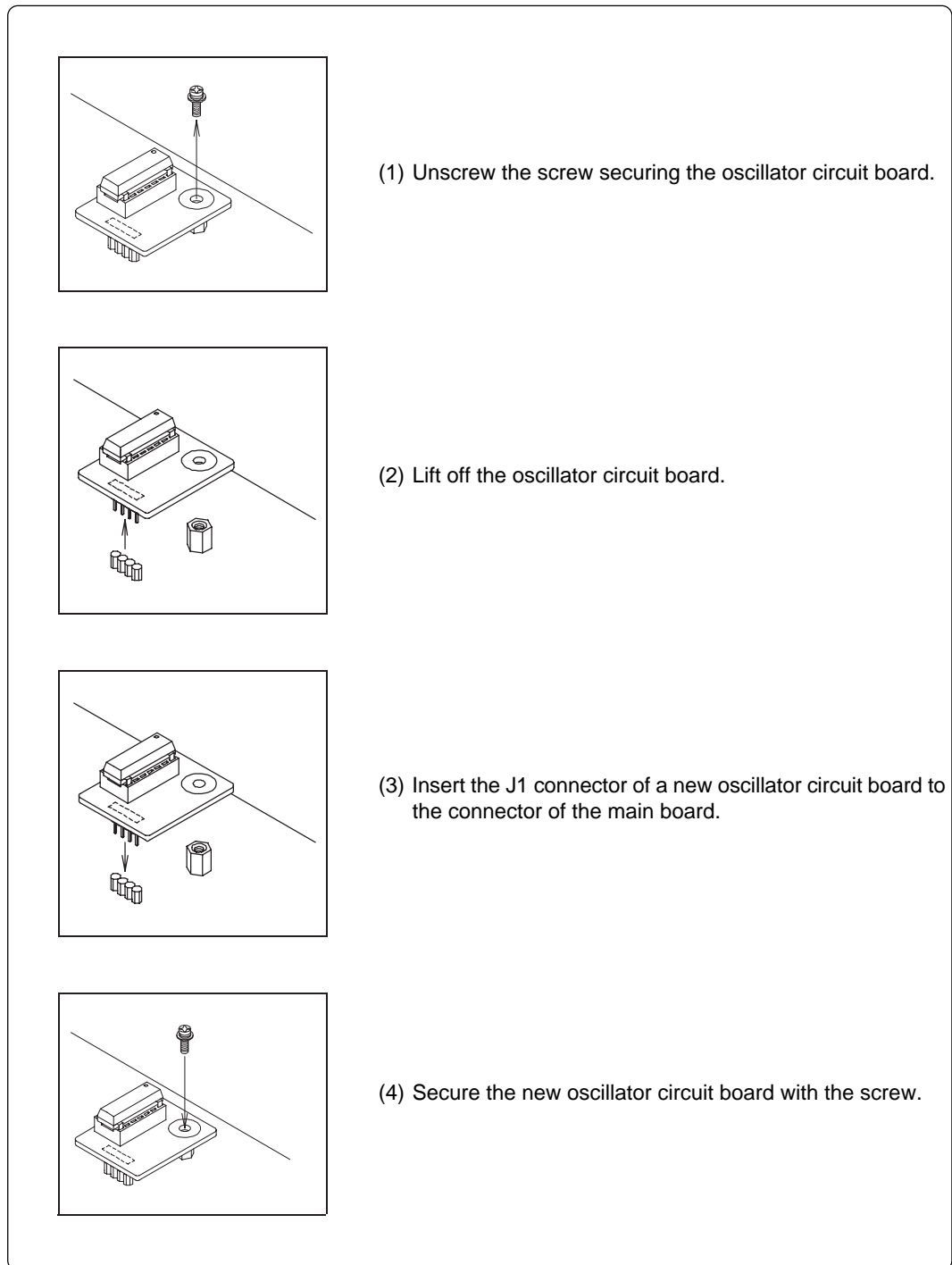
Figure 3.7 Replacing oscillator circuit boards

3.4 Switch Settings

Here follows explanations of the switches of the M30245T3-RPD-E.

Tables 3.2 and 3.3 list how to set toggle switches SW1 to SW6 of the M30245T-PRT board (MCU-dependent).

(1) Toggle Switches SW1 to SW6 on the M30245T-PRT Board (MCU-dependent)

Table 3.2 Switch settings of the M30245T3-RPD-E (1/2)
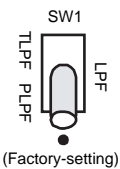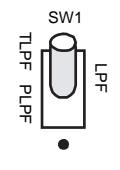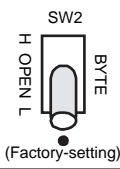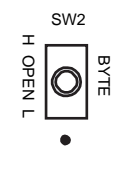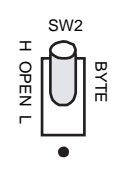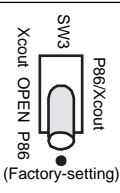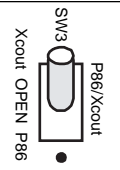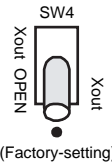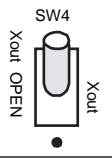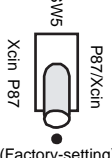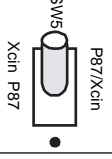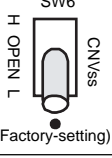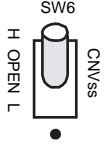
Signal	Switch	Setting	Description
LPF	SW1	SW1 TLPF PLPF / LPF (Factory-setting)	Uses LPF in the emulation pod.
		SW1 TLPF PLPF / LPF	Uses LPF on the target system.
BYTE	SW2	SW2 H OPEN L / BYTE (Factory-setting)	Sets pin BYTE of the MCU to "L" when the target system is unconnected. Pulls down pin BYTE of the MCU with a resistance of 33 kΩ.
		SW2 H OPEN L / 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.)
		SW2 H OPEN L / 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.
P86/Xcout	SW3	SW3 Xcout OPEN P86 / P86/Xcout (Factory-setting)	Connect the target system to use pin P86/Xcout of the MCU as port P86.
		SW3 Xcout OPEN P86 / P86/Xcout	Does not connect pin P86/Xcout of the MCU to the target system.
		SW3 Xcout OPEN P86 / P86/Xcout	Connect the target system to use pin P86/Xcout of the MCU as Xcout.

Table 3.3 Switch settings of the M30245T3-RPD-E (2/2)

Signal	Switch	Setting	Description
Xout	SW4	SW4 / Xout OPEN / Xout (Factory-setting)	Does not connect pin Xout of the MCU to the target system.
		SW4 / Xout OPEN / Xout	Connects pin Xout of the MCU to the target system.
P87/Xcin	SW5	SW5 / Xcin P87 / P87/Xcin (Factory-setting)	Uses pin P87/Xcin of the MCU as port P87.
		SW5 / Xcin P87 / P87/Xcin	Uses pin P87/Xcin of the MCU as Xcin.
CNVss	SW6	SW6 / H OPEN L / CNVss (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 33 kΩ.
		SW6 / H OPEN L / CNVss	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.)
		SW6 / H OPEN L / CNVss	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 33 kΩ.

⚠ 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.

3.5 Installing and Removing Network Resistors for Pullup

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

Therefore, this product has sockets for installing network resistors for pullup. Mount a 51kΩ network resistor supplied with this product to a port for which pullup control is required. For mounting positions, refer to Figure 3.8 below.
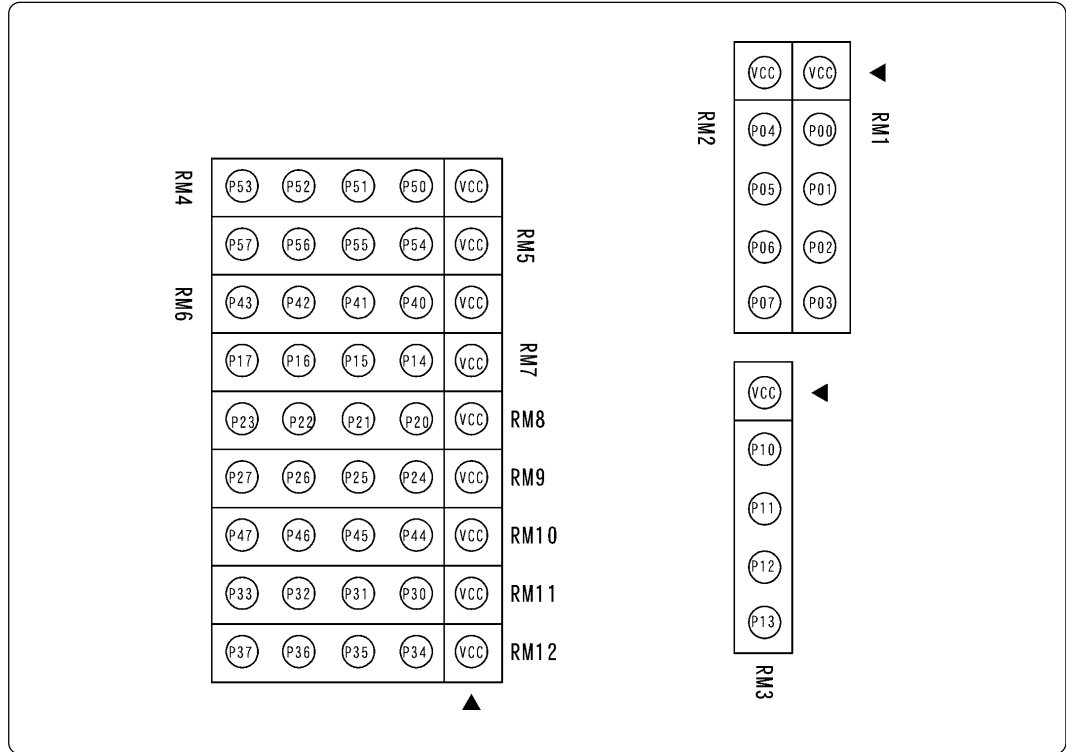
Figure 3.8 Position for mounting network resistors for pullup

⚠CAUTION

Note on Installing and Removing Pullup Resistors:

- Always shut OFF power before installing or removing network resistors for pullup. Otherwise, the internal circuits may be damaged.

- Install network resistors for pullup properly. Otherwise, the emulation pod will be damaged.

3.6 USB Circuit, Connector and Others

The M30245T3-RPD-E has a USB receptacle internally for USB communications. The positions for installing capacitors and resistors are shown in Figure 3.9. The circuit around the USB receptacle (JP2) is shown in Figure 3.10. And, settings of JP1 is described in Table 3.5.
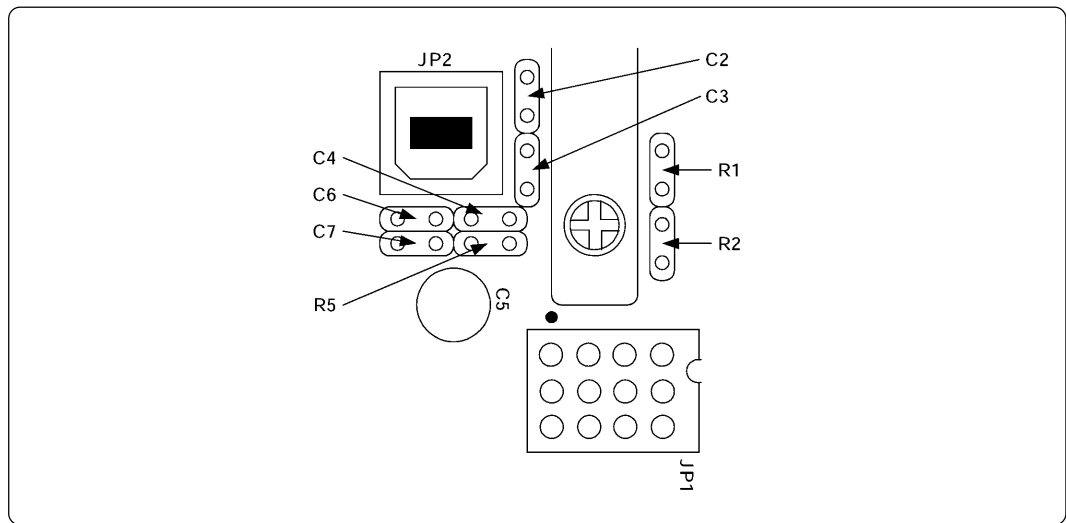
Figure 3.9 Positions for installing capacitors and resistors

Resistors and capacitors (Factory settings)	
R1	33 Ω
R2	1.5 kΩ
R5	33 Ω
C2	22 pF
C3	33 pF
C4	22 pF
C6	2.2 μF
C7	0.1 μF
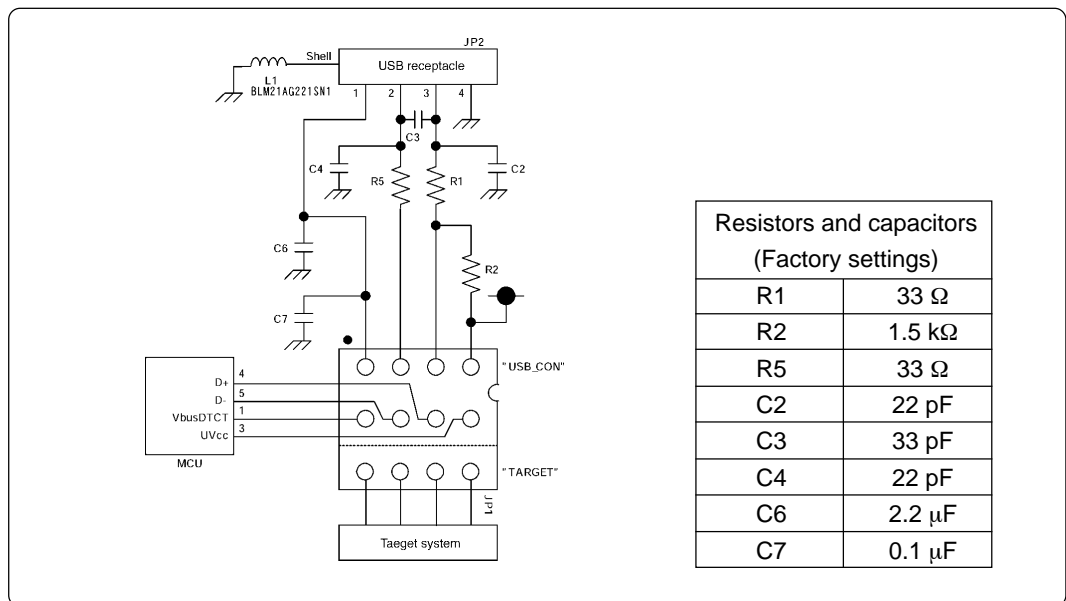
Figure 3.10 Circuit around the USB receptacle

Table 3.5 Settings of JP1

Settings for USB	JP1	(Factory setting)	Uses the USB receptacle in the emulation pod.
			Uses USB signals of the target system.

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 the FLX120-RPD to the cable connector of the PC4701, then secure with screws the FLX120-RPD.

(1) Connecting the Cable to the PC4701

Figure 3.11 shows how to connect the PC4701 and FLX120-RPD

Emulator main unit

PC4701 side connector of FLX120-RPD

"UPSIDE" should face up.

Secure this screw.

Secure this screw.
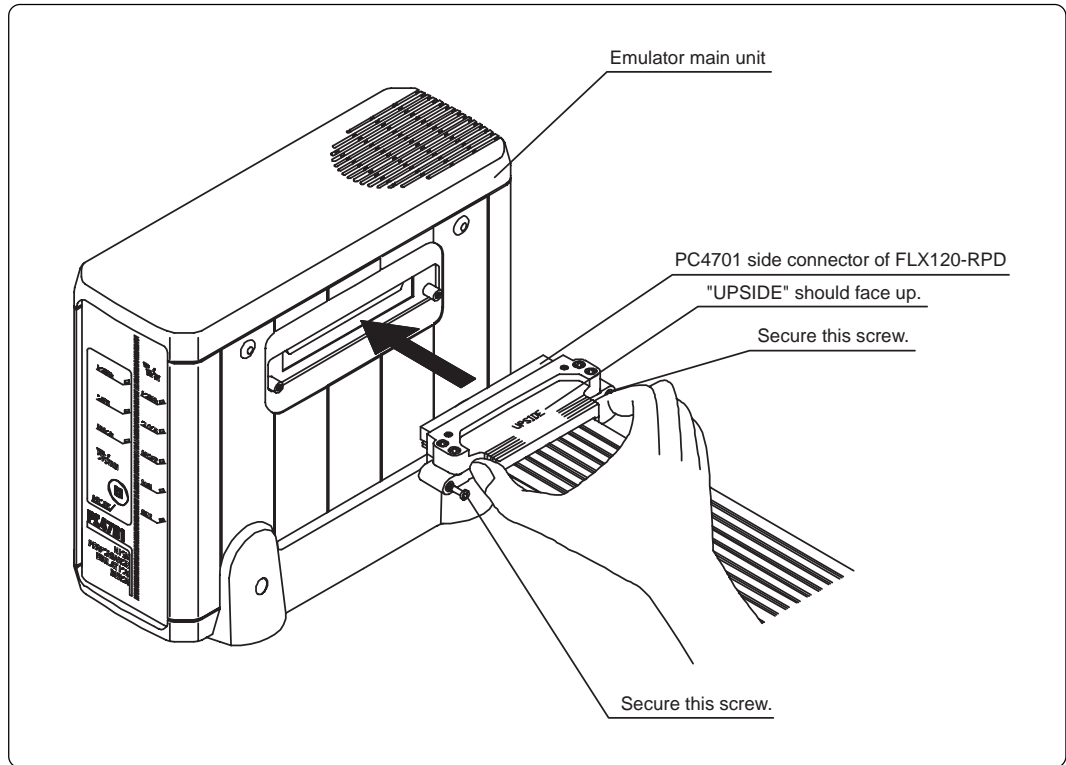
Figure 3.11 Connecting the cable to the PC4701

⚠ CAUTION

Notes 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 3.12 shows how to connect the FLX120-RPD and the emulation pod.
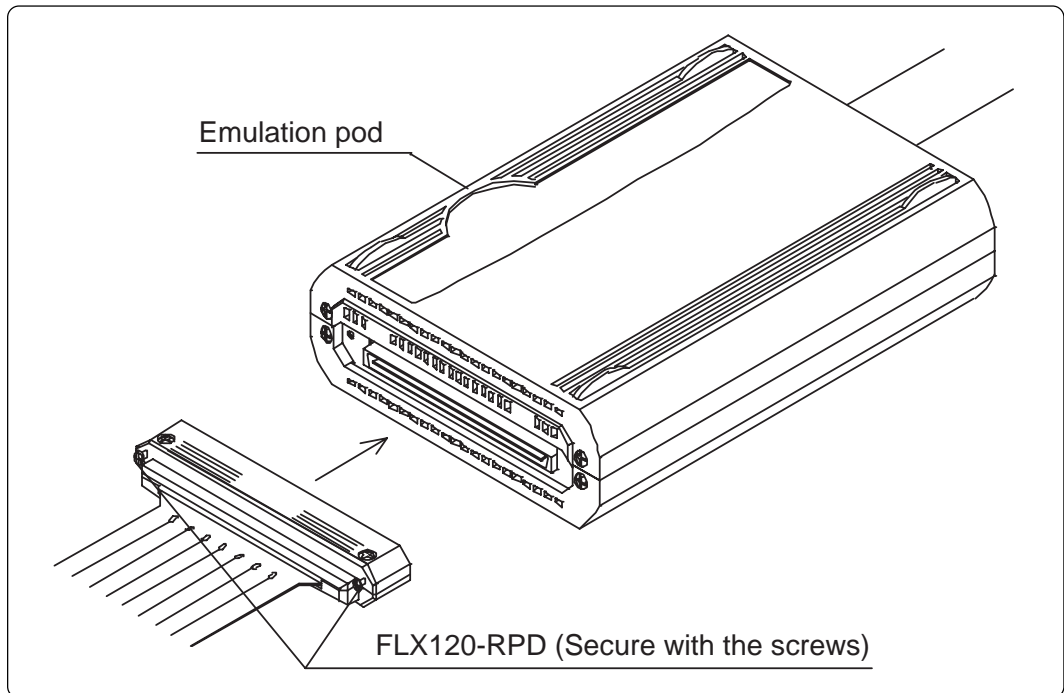
Figure 3.12 Connecting the cable to the emulation pod

⚠ 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 cover.

3.8 Connecting the Target System

There are several ways available to connect the emulation pod to target systems as shown in Figure 3.13.
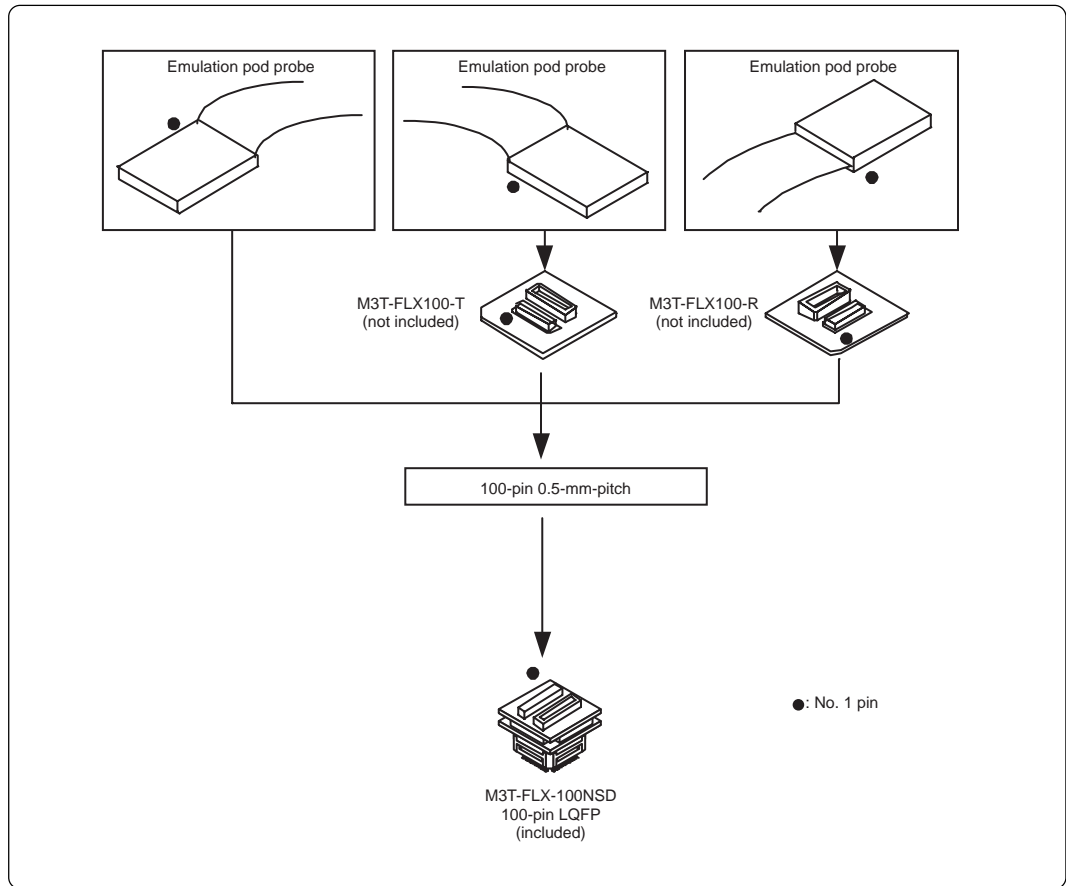
Figure 3.13 Connecting the target system

⚠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 0.5-mm-pitch Foot Pattern

Here follows how to connect the emulation pod probe to a 100-pin 0.5-mm-pitch foot pattern on the target system with the M3T-FLX-100NSD.

(1) Mount the NQPACK100SD to a foot pattern on the target system.
(2) Attach the YQPACK100SD to the NQPACK100SD.
(3) Secure it with YQ-GUIDE's.
(4) Attach the M3T-FLX-100NSD to the YQPACK100SD.
(5) Attach the probe (FLX100) of the emulation pod to the M3T-FLX-100NSD.
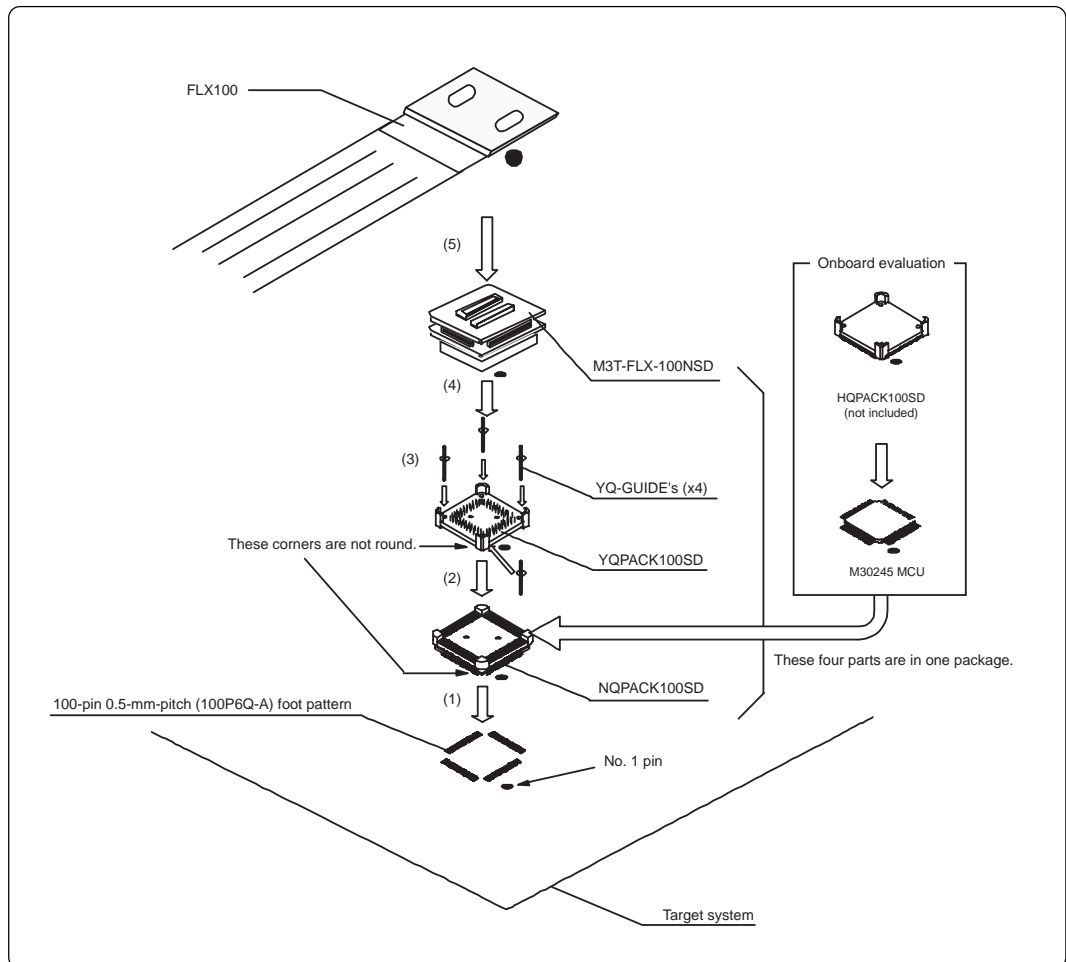
Figure 3.14 Connection to a 100-pin 0.5-mm-pitch foot pattern using the M3T-FLX-100NSD

⚠ 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 connector of the M3T-FLX-100NSD is 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.

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/OFF 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:

• Pin Vcc of the emulator is 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.

• The voltage of the target system should be within the MCU's specified range.

• 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.

STATUS OF **TARGET**

- When this does not light, check the power supply of the target system
- Check that power is supplied to all the power is supplied to all the terminals.
- This does not light when the target system is not connected.

POWER

SAFE

ERROR

POWER

CLOCK

- When this lights, check the reset pin of the target system.

RESET

RUN

HALT

STATUS OF **SYSTEM**

RESET

PC4701U

⟋ : **On**

⟍ : **Off**

HIGH PERFORMANCE EMULATION BENCH

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 emulation pod 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 pod 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
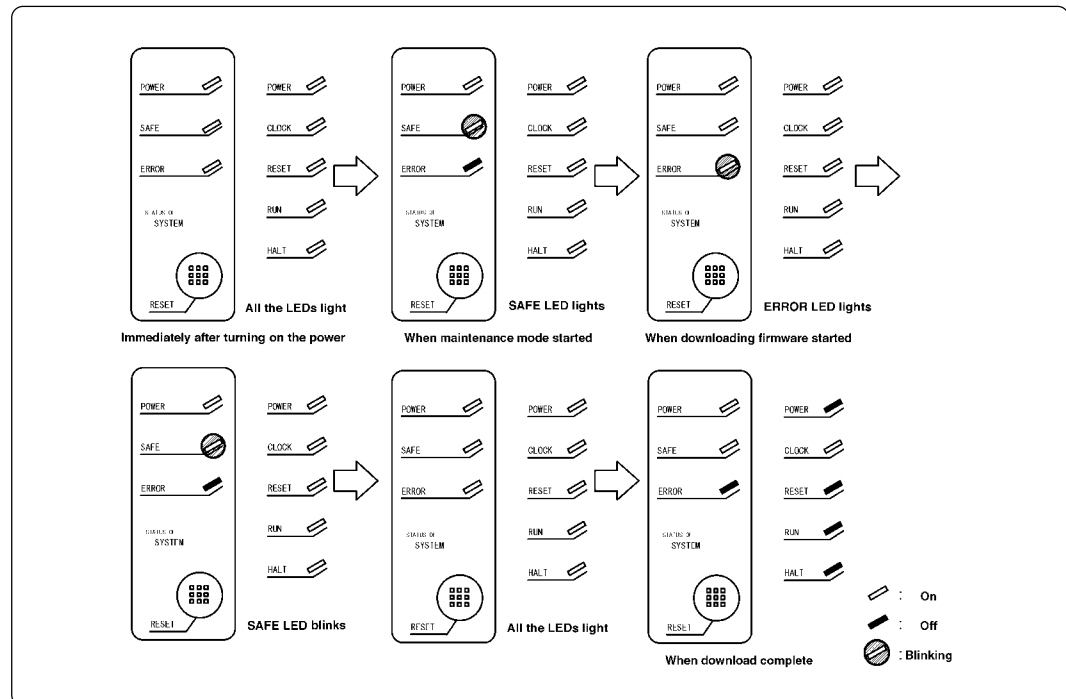
Figure 4.2 Downloading firmware in maintenance mode

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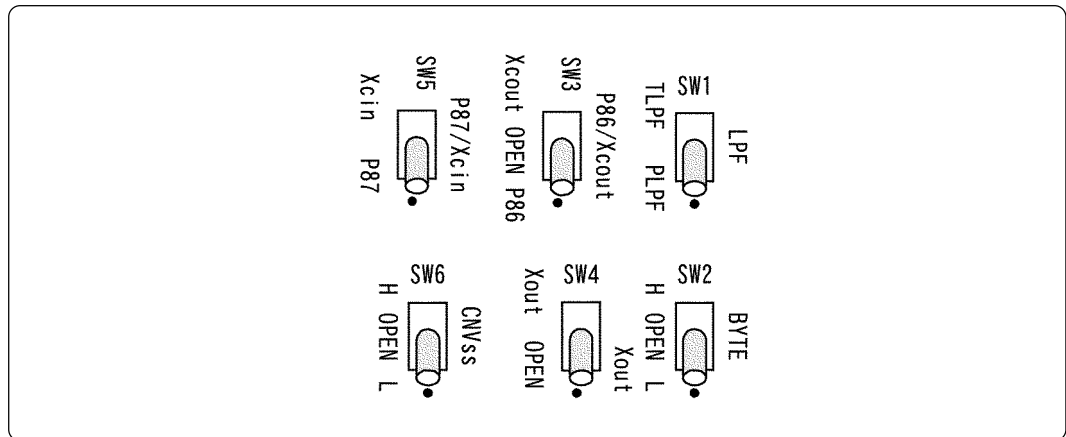
Figure 4.3 Switch settings (factory-settings) for the self-check

(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 the 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.
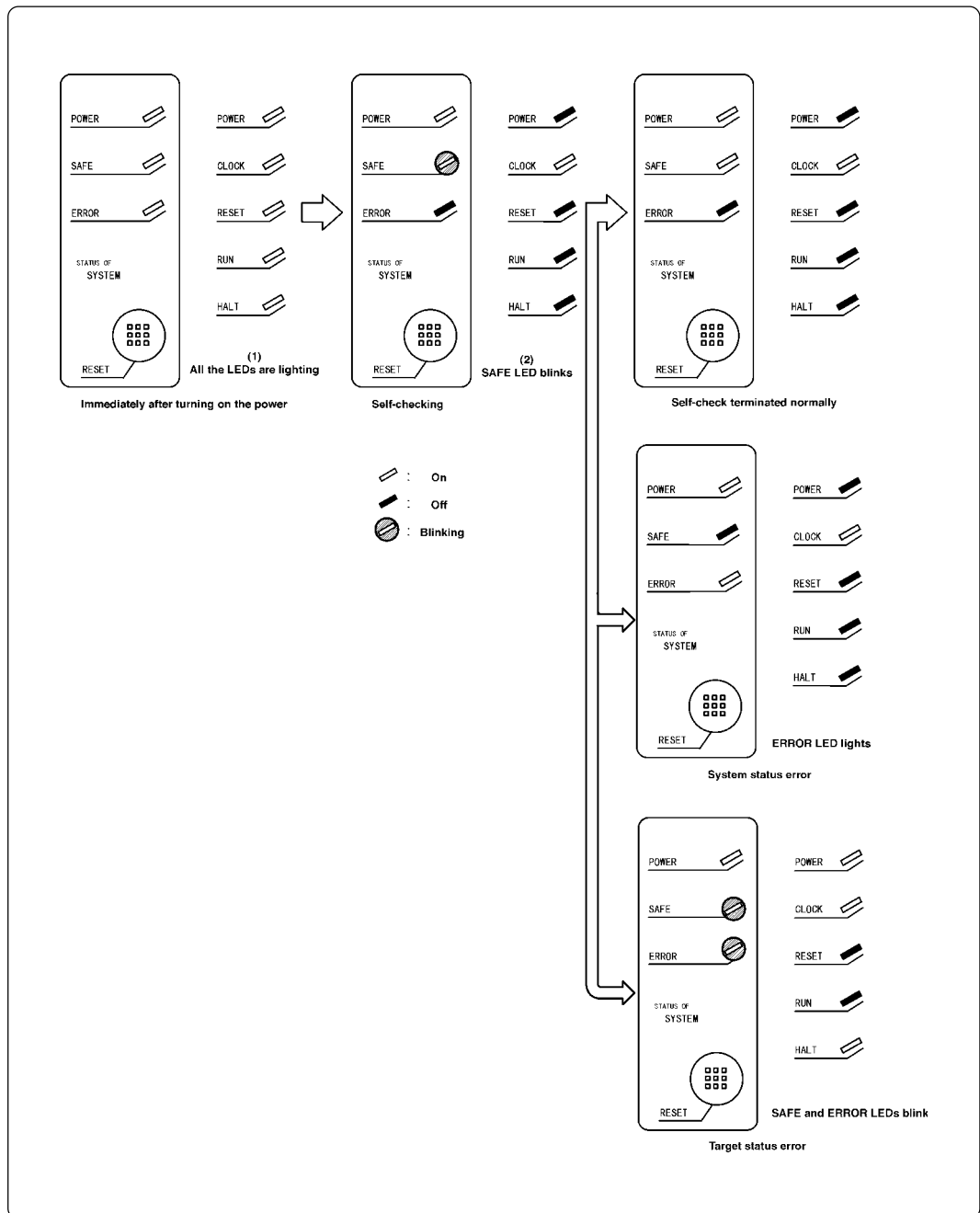
Figure 4.4 Self-check procedure

Chapter 5. Specifications

This chapter describes specifications of this product.

Chapter 5. Specifications

5.1 Specifications

Table 5.1 lists the specifications of the M30245T3-RPD-E.

Table 5.1 Specifications of the M30245T3-RPD-E

Emulator	PC4701 (excluding PC4701L and PC4700L)		
Applicable MCU	M16C/24 Group M30245		
Evaluation MCU	M30245MC-XXXGP x2		
Usable mode	- Single-chip mode - Memory expansion mode (16-bit bus, 8-bit bus) - Microprocessor mode (16-bit bus, 8-bit bus)		
Emulation memory	1 MB	Internal ROM, RAM	0 wait, 16 MHz (max.)
		External	0 wait, 8 MHz (max.) 1 wait, 16 MHz (max.)
Maximum operating frequency	16 MHz (No division)		
Clock supply	X_{IN}-X_{OUT}	Internal oscillator circuit board (OSC-3) Switchable to external oscillator input	
	X_{CIN}-X_{COUT}	Internal oscillator circuit (fixed 32.768 kHz) Switchable to external oscillator input	
Operating voltage	3.0 to 3.6 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".	100-pin 0.5-mm-pitch LQFP (100P6Q-A): M3T-FLX-100NSD (included)		
Overseas standard	- U.S. EMI standards (FCC part 15 Class A) - CE marking (EN55022, EN55024)		

5.2 Operation Timing in Memory Expansion and Microprocessor Modes

Table 5.2 and Figures 5.1 and 5.2 show the bus timing in memory expansion and microprocessor modes.

Table 5.2 Memory expansion and microprocessor modes

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

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

PM16 = 0: $\dfrac{(n - 0.5) \times 10^9}{f(BCLK)} - 40$ [ns]   n (number of wait) = 0 to 3

PM16 = 1: $\dfrac{n \times 10^9}{f(BCLK)} - 40$ [ns]   n (number of wait) = 0 to 3

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

$\dfrac{(n - 0.5) \times 10^9}{f(BCLK)}$ [ns]

(1) No-Wait

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

(2) With Wait, Accessing External Memory Area

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

Read

Write

Conditions:
• VCC = 3.3 V
• Input timing voltage: VIL = 0.66 V, VIH = 2.64 V
• Output timing voltage: VOL = 1.65 V, VOH = 1.65 V

Figure 5.2 Memory expansion and microprocessor modes (one wait, accessing external area)

(3) Timing Requirements

Table 5.3 and Figure 5.3 show the timing requirements.

Table 5.3 Timing requirements

Symbol	Item	Actual MCU [ns]		This product [ns]	
		Min.	Max.	Min.	Max.
tsu(DB-RD)	Data input setup time	50		65	
tsu(RDY-BCLK)	RDY* input setup time	40		55	
tsu(HOLD-BCLK)	HOLD* input setup time	105		115	
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

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

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

Note 1. P00 to P52 will be high-impedance status regardless of the input level of pin BYTE and ports P40 to P43 function selection bit (PM06) of the processor mode register 0.

Note 2. Compared with the actual MCU, this product enters high-impedance state after a 0.5 cycle delay.

Conditions:
• VCC = 3.3 V
• Input timing voltage: VIL = 0.66 V, VIH = 2.64 V
• Output timing voltage: VOL = 1.65 V, VOH = 1.65 V

Figure 5.3 Timing requirements

5.3 Connection Diagram

Figure 5.4 shows a connection diagram of the M30245T3-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 5.5 connect the evaluation MCU and the target system directly.
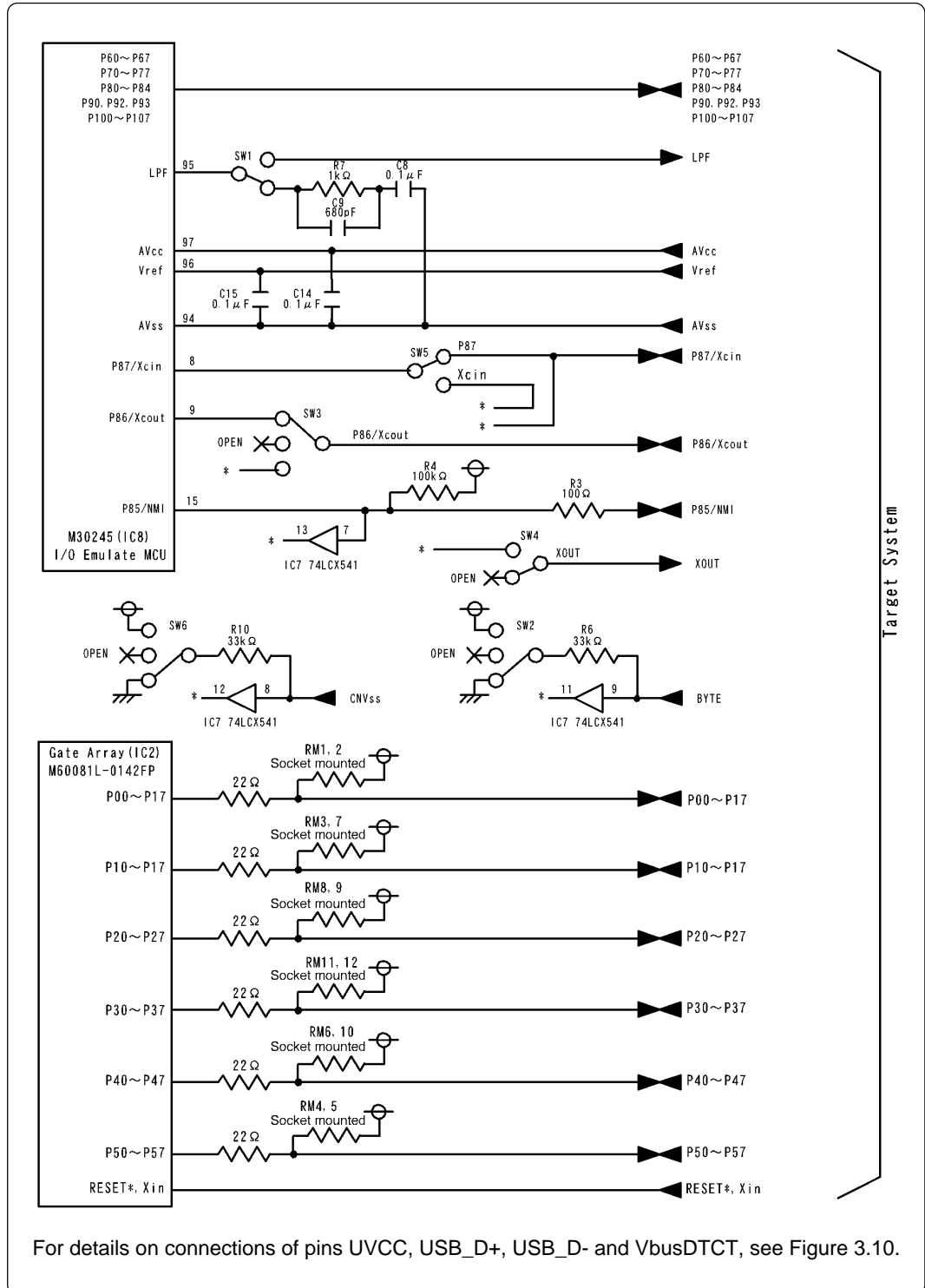
Figure 5.4 Connection diagram

5.4 External Dimensions

(1) External Dimensions of the Emulation Pod

Figure 5.5 shows external dimensions of the M30245T3-RPD-E.
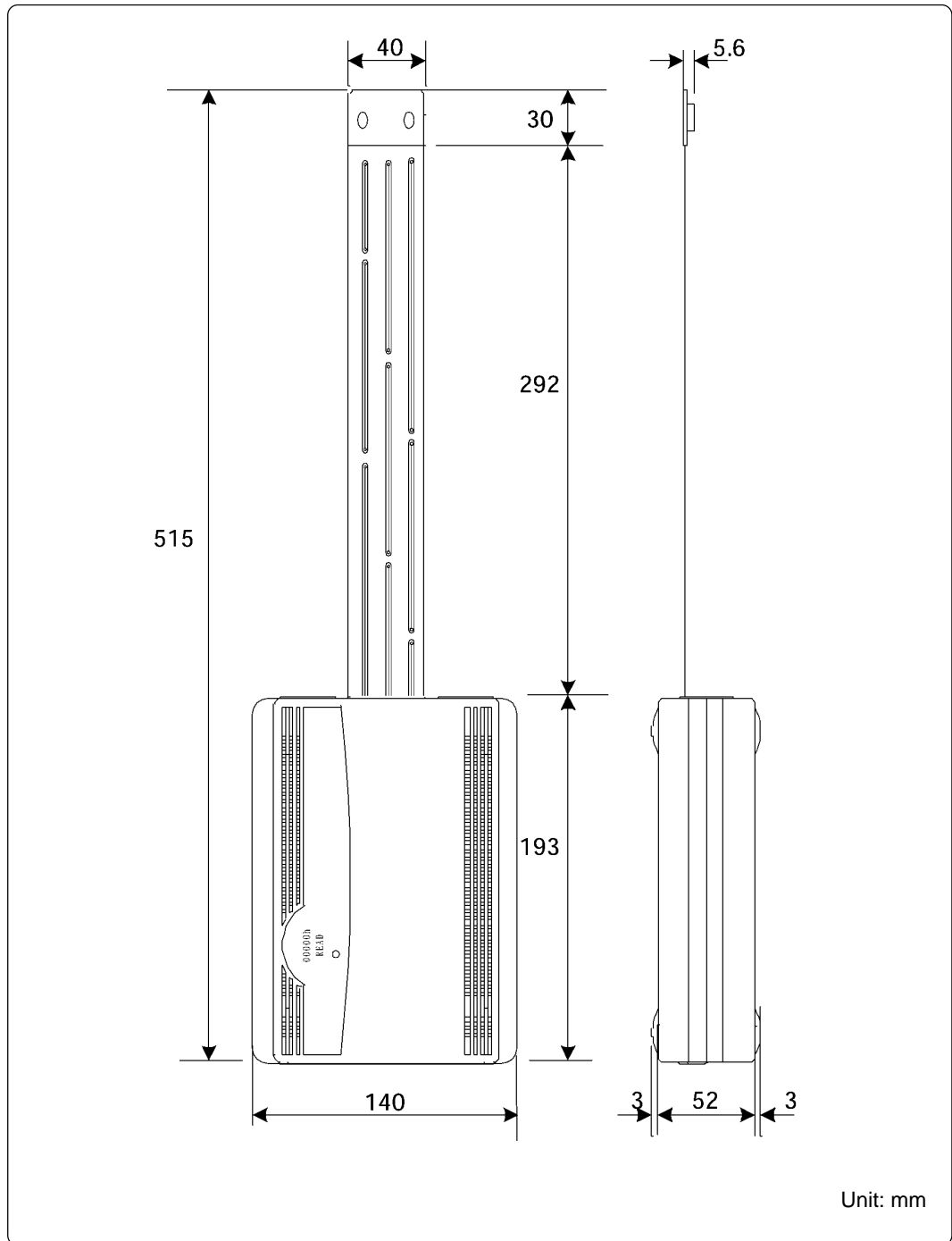
Figure 5.5 External dimensions of the emulation pod

(2) External Dimensions of the Converter Board M3T-FLX-100NSD

Figure 5.6 shows external dimensions and a sample foot pattern of the converter board M3T-FLX-100NSD (included) for a 100-pin 0.5-mm-pitch LQFP.
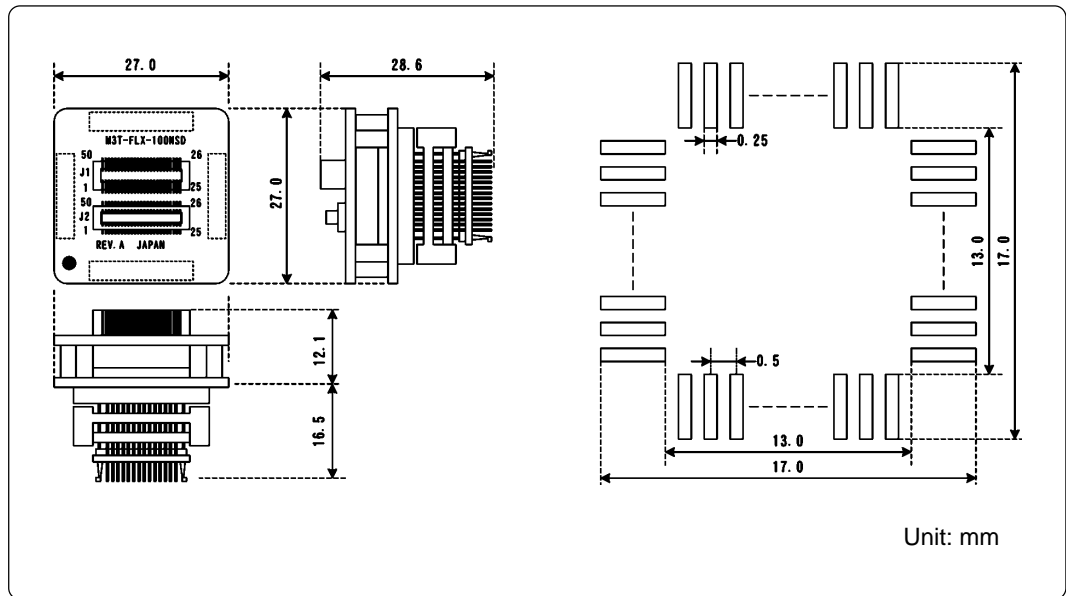
Figure 5.6 External dimensions and a sample foot pattern of the converter board M3T-FLX-100NSD

MEMO

Chapter 6. Troubleshooting

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

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 Tools Homepage.

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

```
┌──────────────────────────────────────┐
│  Turning on the power of PC4701       │
└──────────────────────────────────────┘
                    │
                    ▼
        ╱─────────────────────╲      Not normal
       ╱  PC4701 Front panel    ╲ ──────────────────┐
       ╲       LEDs             ╱                    │
        ╲─────────────────────╱                     ▼
                    │              ┌──────────────────────────────────────┐
                 Normal            │ 1. Check emulator system connections. │
                    │              │     See "3.7 Connecting the PC4701"   │
                    ▼              │     (page 38)                         │
        ╱─────────────────────╲   │ 2. Redownload the firmware.           │
       ╱  Init dialog box of    ╲  │     See "4.2 Downloading Firmware"    │
       ╲  emulator debugger      ╱ │     (page 46).                        │
        ╲  displayed            ╱  │ 3. Restart the PC4701 system.         │
         ╲───────────────────╱     └──────────────────────────────────────┘
                    │         Not normal or error displayed
                 Normal       ┌──────────────────────────────────────────┐
                    │         │ 1. Check the operating environment etc.   │
                    │         │    of the emulator debugger.               │
                    │         │    See the emulator debugger user's manual.│
                    │         │ 2. Reinstall the emulator debugger.        │
                    │         └──────────────────────────────────────────┘
         Error displayed
                    │         ┌──────────────────────────────────────────┐
                    │         │ See "6.2 (2) Program Window is Not         │
                    │         │ Displayed at Debugger Startup (Target      │
                    │         │ Connected)" (page 62).                     │
                    │         │ See "6.2 (3) Program Window is Not         │
                    │         │ Displayed at Debugger Startup (Target Not  │
                    │         │ Connected)" (page 63).                     │
                    ▼         └──────────────────────────────────────────┘
┌──────────────────────────────────────────────────┐
│ Program window of emulator debugger displayed     │
└──────────────────────────────────────────────────┘
```

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. *See the PC4701 user's manual.*
All LEDs remain lit.	-	Check the connection between the PC4701 and this product. *See "3.7 Connecting the PC4701" (page 38).*
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. *See "3.2 Each Setting" (page 29).* (2) Check that the oscillation circuit in the emulation pod is oscillating. *See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).*
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.	(1) Check the connection between the PC4701 and host machine. *See the PC4701 User's Manual.* (2) Check that the PC4701 is powered on. *See the PC4701 User's Manual.* (3) Check that all emulator debugger settings, interface cable connection and switches on the rear of the PC4701 match. *See the PC4701 User's Manual and the emulator debugger online manual.*
ERROR 16211: The version of PD30 and the firmware on the target are not same.	(1) Download the proper firmware. *See "4.2 Downloading Firmware" (page 46).* (2) Choose a proper MCU file in the Init dialog box. *See the emulator debugger online manual.* (3) Check that the descriptions in the MCU file are correct. *See "2.4 (1) Making an MCU File" (page 25).*
ERROR 16215: Cannot communicate with the debugging monitor.	(1) Check the connection between the PC4701 and this product. *See "3.7 Connecting the PC4701" (page 38).* (2) Check the reset pin of the target system is held high. *See the MCU specifications.* (3) If the CNVss is held high at startup, check that pins HOLD* and RDY* are held high, too. *See the MCU specifications.* (4) Check that the oscillation circuit of the emulation pod is oscillating properly. *See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).*
ERROR 16014: Communication ERROR. Can't accept data.	(1) Check that the oscillation circuit of the target system is oscillating properly. *See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).* (2) Check that the PC4701 LEDs at startup show normal operation. *See "4.1 (3) LED Display When the PC4701 Starts Up Normally" (page 45).*
ERROR 16231: There was sent undefined data from PC4700.	Check that the emulator debugger has not been started up without shutting down the PC4701. *See "IMPORTANT: Note on Quitting the Emulator Debugger" (page 12).*

(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. *See the PC4701 User's Manual.* (2) Check that the PC4701 is powered on. *See the PC4701 User's Manual.* (3) Check that all emulator debugger settings, interface cable connection and switches on the rear of the PC4701 match. *See the PC4701 User's Manual and the emulator debugger online manual.*
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. *See "3.7 Connecting the PC4701" (page 38).* (2) Download the proper firmware. *See "4.2 Downloading Firmware" (page 46).* (3) Choose a proper MCU file in the Init dialog box. *See the emulator debugger online manual.* (4) Check that the descriptions in the MCU file are correct. *See "2.4 (1) Making an MCU File" (page 25).*
ERROR 16215: Cannot communicate with the debugging monitor.	(1) Check that switch settings in the emulation pod are correct. *See "3.4 Switch Settings" (page 34).* (2) Check that the oscillation circuit of the emulation pod is oscillating properly. *See "3.3 Selecting Clock Supply and Replacing Oscillator Circuit Boards" (page 30).*
ERROR 16014: Communication ERROR. Can't accept data.	Check that the PC4701 LEDs at startup show normal operation. *See "4.1 (3) LED Display When the PC4701 Starts Up Normally" (page 45).*
ERROR 16231: There was sent undefined data from PC4700.	Check that the emulator debugger has not been started up without shutting down the PC4701. *See "IMPORTANT: Note on Quitting the Emulator Debugger" (page 12).*

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.

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
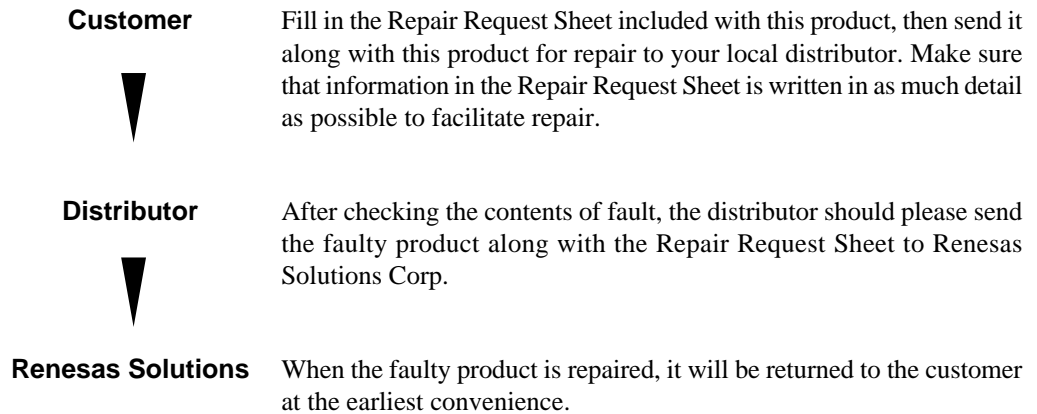
(3) Expiration of the repair period

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

(4) Transportation fees at sending your product for repair

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

7.4 How to Request for Repair

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

Customer

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

Distributor

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

Renesas Solutions

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

⚠ CAUTION

Note on Transporting the Product:

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

MEMO

M30245T3-RPD-E User's Manual

Rev.2.00
January 16, 2004
REJ10J0322-0200Z

M30245T3-RPD-E
User's Manual