



# **M30220T-PRB**

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Pod Probe for M30220 and M30221 Group MCUs

## **User's Manual**

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\\SUPPORT\Product-name\SUPPORT.TXT

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

# Preface

The M30220T-PRB is a pod probe for M30220 and M30221 Groups of Renesas 16-bit microcomputers. The M30220T-PRB is used by connecting to the PC4701 emulator main unit and the M30200T-RPD-E emulation pod main unit.

This manual mainly explains specifications and setting up of M30220T-PRB. For detail information about the emulator main unit, emulation pod main unit, and emulator debugger, refer to each user's manual.

Emulator main unit	: PC4701M, PC4701HS, PC4701L User's Manual
Emulation pod main unit	: M30200T-RPD-E User's Manual
Emulator debugger	: M3T-PD30 User's Manual

To check the components of this product, refer to "2.1 Package Components" in this manual. If there is any question or doubt about this product, contact your local distributor.

## To use the product properly

### Precautions for Safety:



- Both in 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.

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# Chapter 1. Precautions for Safety

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

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# Chapter 1. Precautions for Safety

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

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

## 1.1 Safety Symbols and Meanings

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

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

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

⊘ means PROHIBITION.  
Example:  **DISASSEMBLY PROHIBITED**

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

The following pages describe the symbol "IMPORTANT".

# IMPORTANT

## Note on Differences between Actual MCU and Emulator:

- The emulator operation differs from the mask MCU operation, as listed below:
  - (1) Reset condition
  - (2) Initial values of internal resource data at power-on
  - (3) Capacity of internal memory (ROM, RAM) etc.
  - (4) A-D converter  
The A-D converter characteristics differ from actual MCU characteristics because there are a converter board and other devices between the evaluation MCU and the target system. Make the final evaluation of the A-D converter with the actual MCU.
  - (5) D-A converter  
The D-A converter characteristics differ from actual MCU characteristics because there are a converter board and other devices between the evaluation MCU and the target system. Make the final evaluation of the D-A converter with the actual MCU.

## Note on DMA Transfer:

- With this product, the program is stopped with a loop program to a specific address. Therefore, if a DMA request is generated by a timer or other source while the program is stopped, DMA transfer is executed. However, make note of the fact that DMA transfer while the program is stopped may not be performed correctly. Also note that the below registers have been changed owing to DMA transfer as explained here even when the program is stopped.

DMA0 transfer counter register .... TCR0  
DMA1 transfer counter register .... TCR01  
DMA0 control register ..... DM0CON  
DMA1 control register ..... DM1CON

## Note on Referencing and Setting the Work Area:

- The work area given below is assigned as the initial setting at the time of starting up the emulator debugger. (Set by "F/W and Work Area" tab\*<sup>1</sup> in the Init dialog.)

When using the pod probe M30220T-PRB for M30220 and M30221 Group MCUs, use the initial setting value.

02C00<sub>16</sub> to 02C0F<sub>16</sub>: Work area

\*<sup>1</sup>: Supported by emulator debugger M3T-PD30 Ver.4.00 or later

## Notes on MAP References and Settings:

- When starting up the M30200T-RPD-E, the initial MAP settings are as follows.

00000<sub>16</sub> to 003FF<sub>16</sub>: EXT  
00400<sub>16</sub> to FFFFF<sub>16</sub>: INT

- Always set the SFR area to EXT (external).

# IMPORTANT

## Note on Reading Out SFR Area:

- When reading out the registers below, they are not read out properly. However, they can be written properly.

Pullup control register 2

Key input mode register

# 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

This product consists of the following items. When unpacking, check to see if your product package contains all of these items.

### *Package components*

Item	Quantity
M30220T-PRB pod probe for M30220 and M30221 Group MCUs	1
FLX-144NSD converter board for 144-pin LQFP (144P6Q-A)	1
Screws for securing pod probe	2
M30220T-PRB User's Manual (this manual)	1
M30220T-PRB User's Manual (Japanese)	1
M30220T-PRB Repair Request Sheet (English)	1
M30220T-PRB Repair Request Sheet (Japanese)	1

Please keep the M30220T-PRB'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 the M30220T-PRB.

If any of these items are missing or found faulty, please contact your local distributor. Also, if there is any question or doubt about the packaged product, contact your local distributor.

## 2.2 Other Tool Products Required for Development

To bring forward programs development on the M30220 and M30221 Group MCUs, the products listed below are necessary in addition to those contained package above. Get them separately.

### *Other tool products*

Emulator main unit	PC4701M, PC4701HS or PC4701L (essential)
Emulation pod main unit	M30200T-RPD-E (essential)
Emulator debugger	M3T-PD30 Ver.4.00 or later recommended (essential)
Converter board	For 144-pin TQFP (144PFB-A): FLX-144NSE (Converter board supporting the foot pattern of the target system)
	For 120-pin LQFP (120P6R-A): FLX-120NSE (Converter board supporting the foot pattern of the target system)

To purchase these products, contact your nearest distributor.

## 2.3 System Configuration

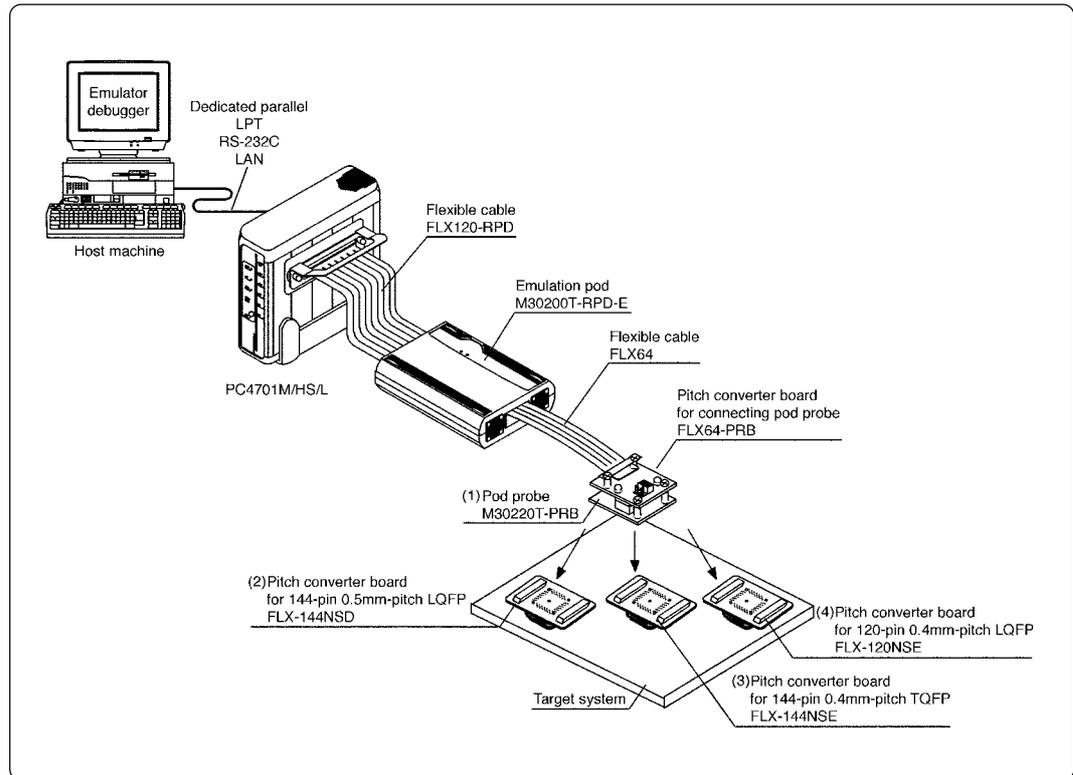


Figure 2.1 System configuration

Products (1) and (2) shown in Figure 2.1 are included with this product. Get (3) and (4) in Figure 2.1 separately.

(1) Pod probe (M30220T-PRB)

This pod probe is equipped with the evaluation MCUs M30220GP-EVA and M30220GP-PORT.

(2) Pitch converter board for 144-pin 0.5mm-pitch LQFP (FLX-144NSD)

Board for connecting the pod probe to the 144-pin 0.5mm-pitch LQFP foot pattern on the target system.

(3) Pitch converter board for 144-pin 0.4mm-pitch TQFP (FLX-144NSE)

Board for connecting the pod probe to the foot pattern for 144-pin 0.4mm-pitch TQFP on the target system.

(4) Pitch converter board for 120-pin 0.4mm-pitch LQFP (FLX-120NSE)

Board for connecting the pod probe to the foot pattern for 120-pin 0.4mm-pitch LQFP on the target system.

For details on the connection, refer to "3.4 Connecting the Target System" (page 17).

# MEMO

# 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

With this product, it is necessary to set the following according to your application system.

- X<sub>CIN</sub>/X<sub>COU</sub>T pins for the target system
- Mounting the A-D conversion bypass capacitor

## 3.1 Switch Settings

It is necessary to set the switches of the FLX64-PRB for debugging according to the target system.

Figure 3.1 shows the positions of the switches of the FLX64-PRB, and Table 3.1 shows the switch settings.

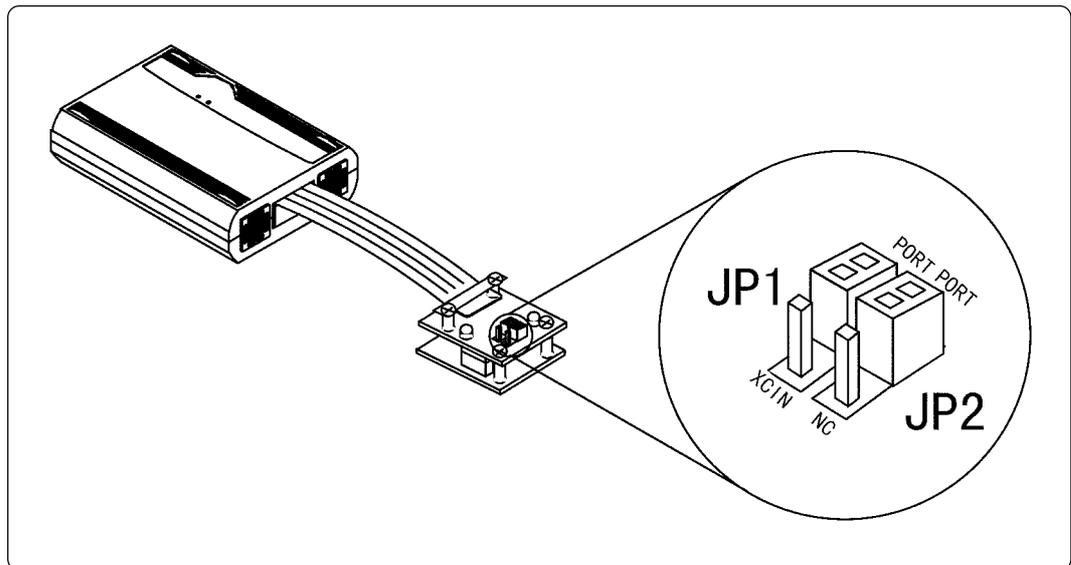


Figure 3.1 Positions of the switches and their factory-settings

Table 3.1 Switch settings of FLX64-PRB

Function	Switch No.	Switch setting	
Selecting X <sub>CIN</sub>	JP1	As this switch is not used for M30220T-PRB, X <sub>CIN</sub> is always selected.	
Selecting X <sub>COU</sub> T	JP2	<p>PORT</p> <p>NC</p> <p>Used when X<sub>COU</sub>T is connected to the target system (Factory-setting)</p>	<p>PORT</p> <p>NC</p> <p>Used when X<sub>COU</sub>T is not connected to the target system</p>

### 3.2 A-D Conversion Bypass Capacitor

This product has foot patterns on the board for mounting a bypass capacitor for the A-D converter circuit. Mount a suitable bypass capacitor as occasion demands.

Figure 3.2 shows the position of the bypass capacitor.

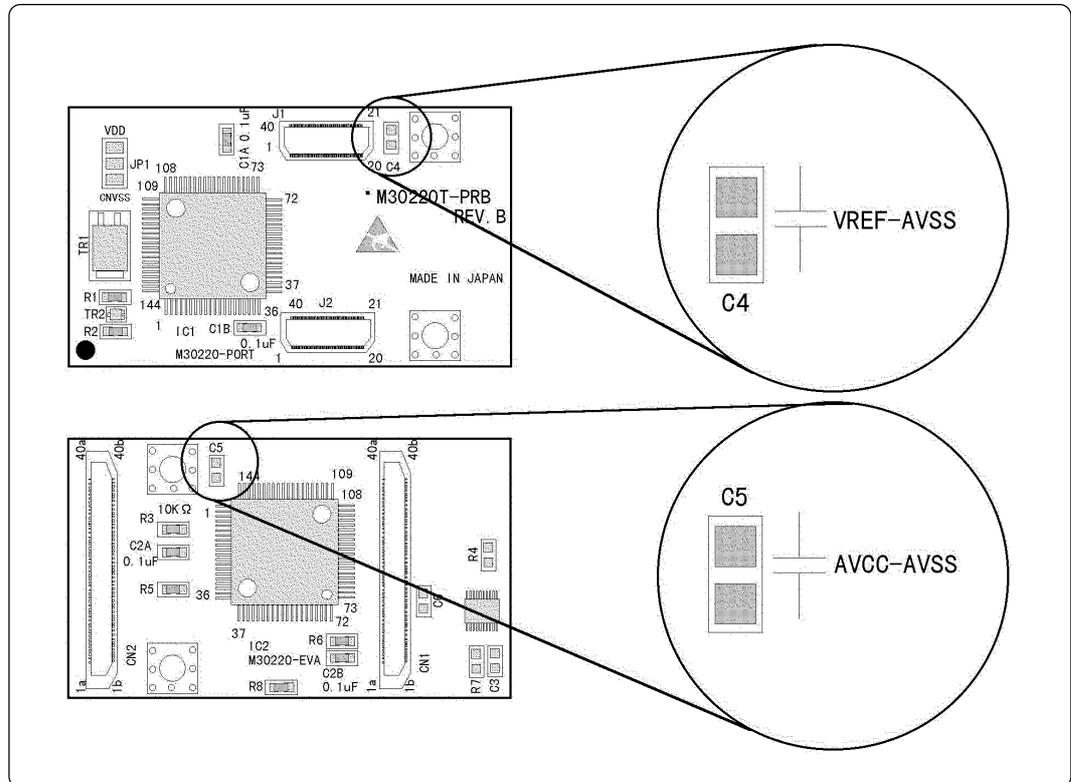


Figure 3.2 Foot patterns of A-D conversion bypass capacitor

## IMPORTANT

### Note on the Operation of A-D Converter:

- The A-D converter characteristics differ from actual MCU characteristics because there are a converter board and other devices between the evaluation MCU and the target system. Make the final evaluation of the A-D converter with the actual MCU.

### 3.3 Connecting M30200T-RPD-E

The emulation pod for M30220 and M30221 Group MCUs consists of the M30200T-RPD-E and the M30220T-PRB. Figures 3.3 and 3.4 show how to connect the M30220T-PRB pod probe, and how to remove it, respectively.

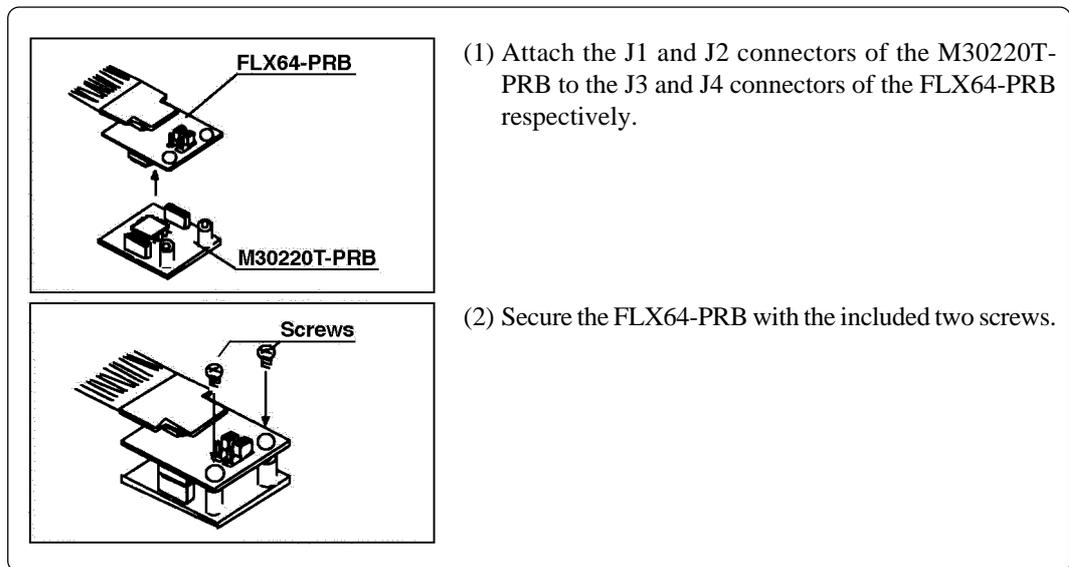


Figure 3.3 Connecting the M30220T-PRB pod probe

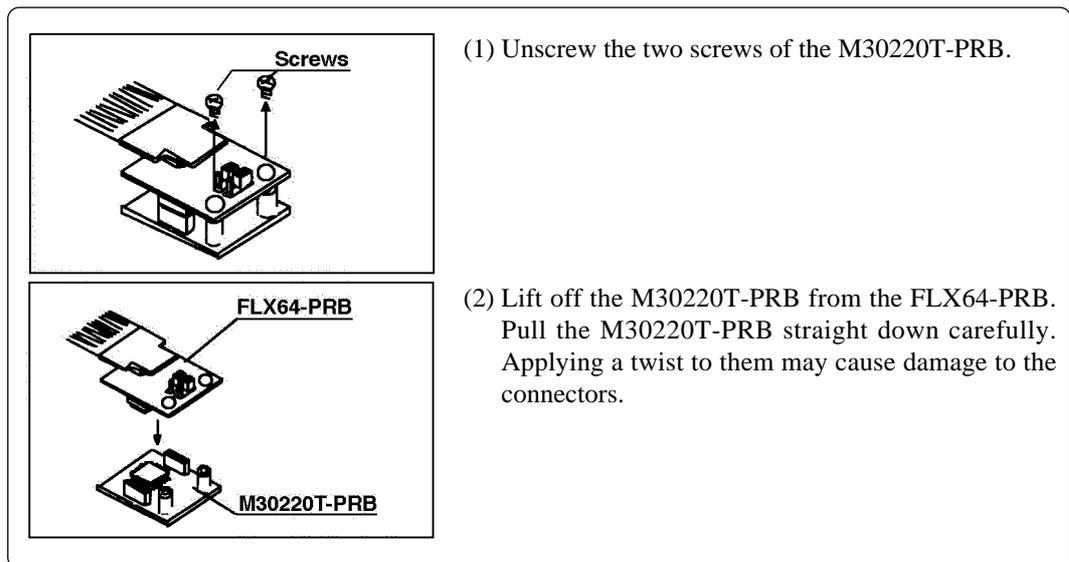


Figure 3.4 Removing the M30220T-PRB pod probe

## CAUTION

### Notes on Connecting the Pod Probe:

- Be sure to turn off the power before making connections. Otherwise, the internal circuits may be damaged.
- The small connectors (J3 and J4) of the M30220T-PRB are guaranteed for only 50 insertion/removal iterations.
- The small connectors (J3 and J4) of the FLX64-PRB and the small connectors (J1 and J2) of the M30220T-PRB are guaranteed for only 50 insertion/removal iterations.

### 3.4 Connecting the Target System

There are three ways available to connect the emulation pod to target systems as shown in Figure 3.5.

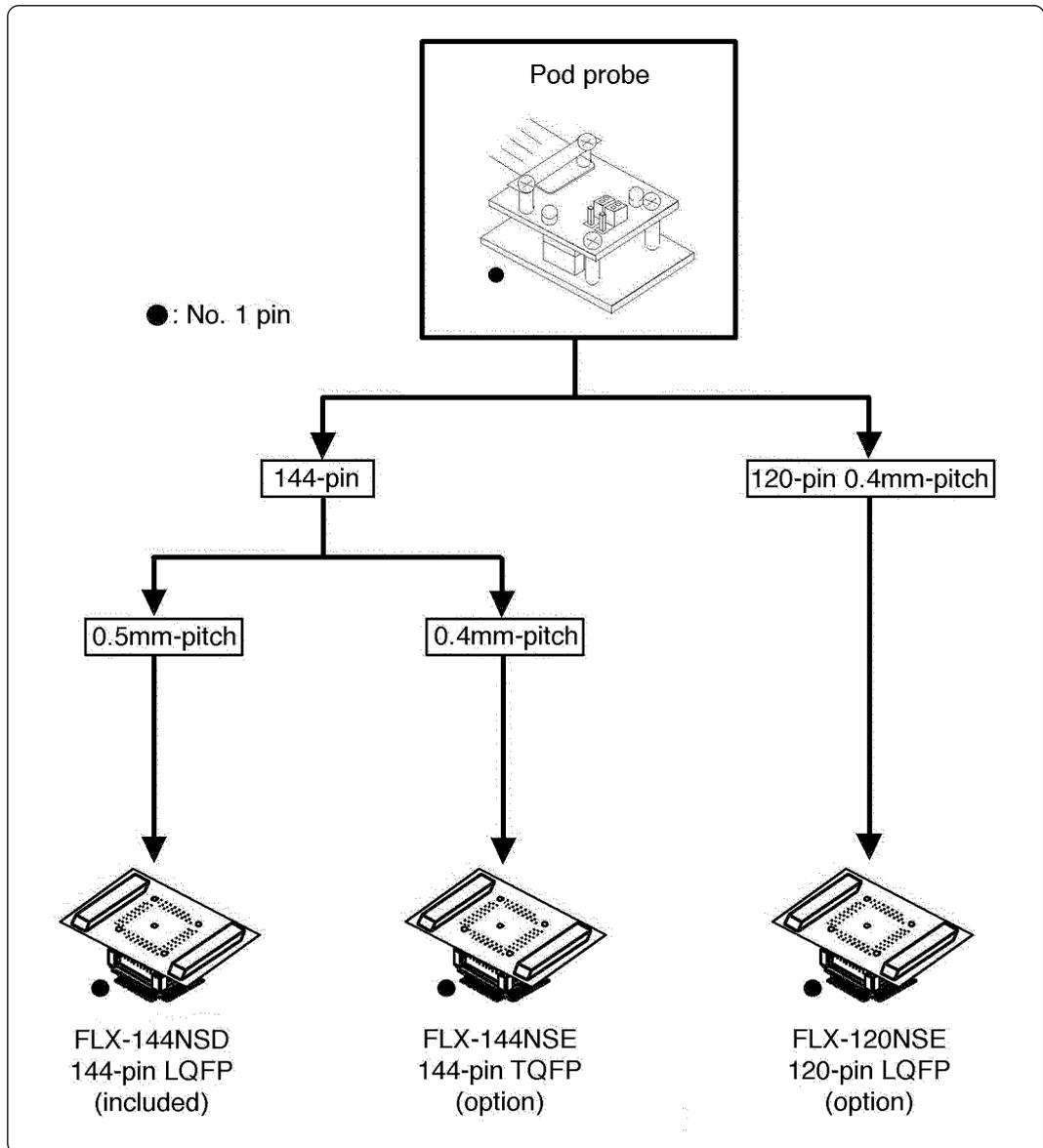


Figure 3.5 Connecting the target system

Figures 3.6, 3.7 and 3.8 show how to connect the pitch converter board FLX-144NSD for 144-pin 0.5mm-pitch LQFP, how to connect the pitch converter board FLX-144NSE for 144-pin 0.4mm-pitch TQFP, and how to connect the pitch converter board FLX-120NSE for 120-pin 0.4mm-pitch LQFP, respectively.

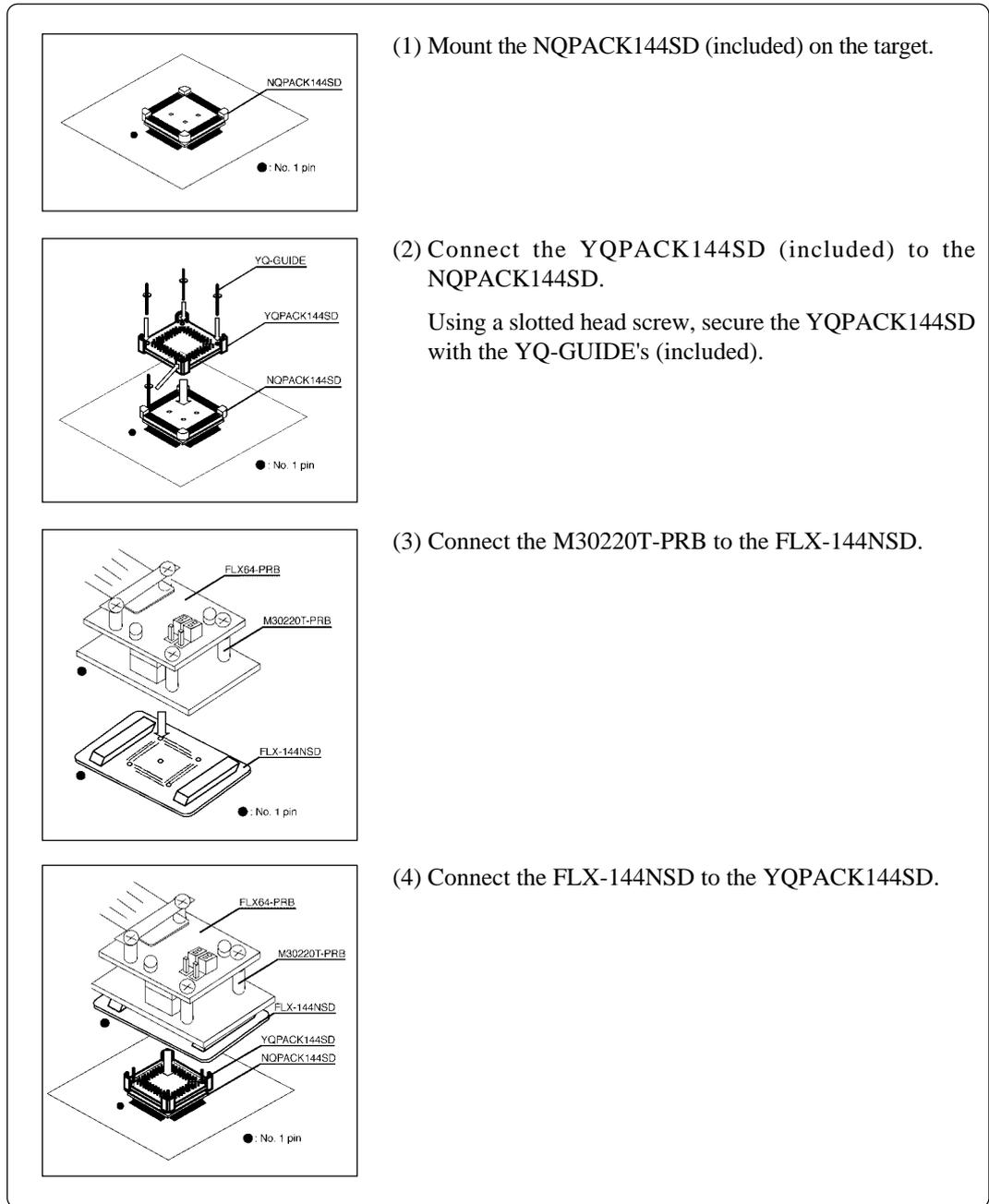


Figure 3.6 Connecting the pitch converter board FLX-144NSD for 144-pin 0.5mm-pitch LQFP

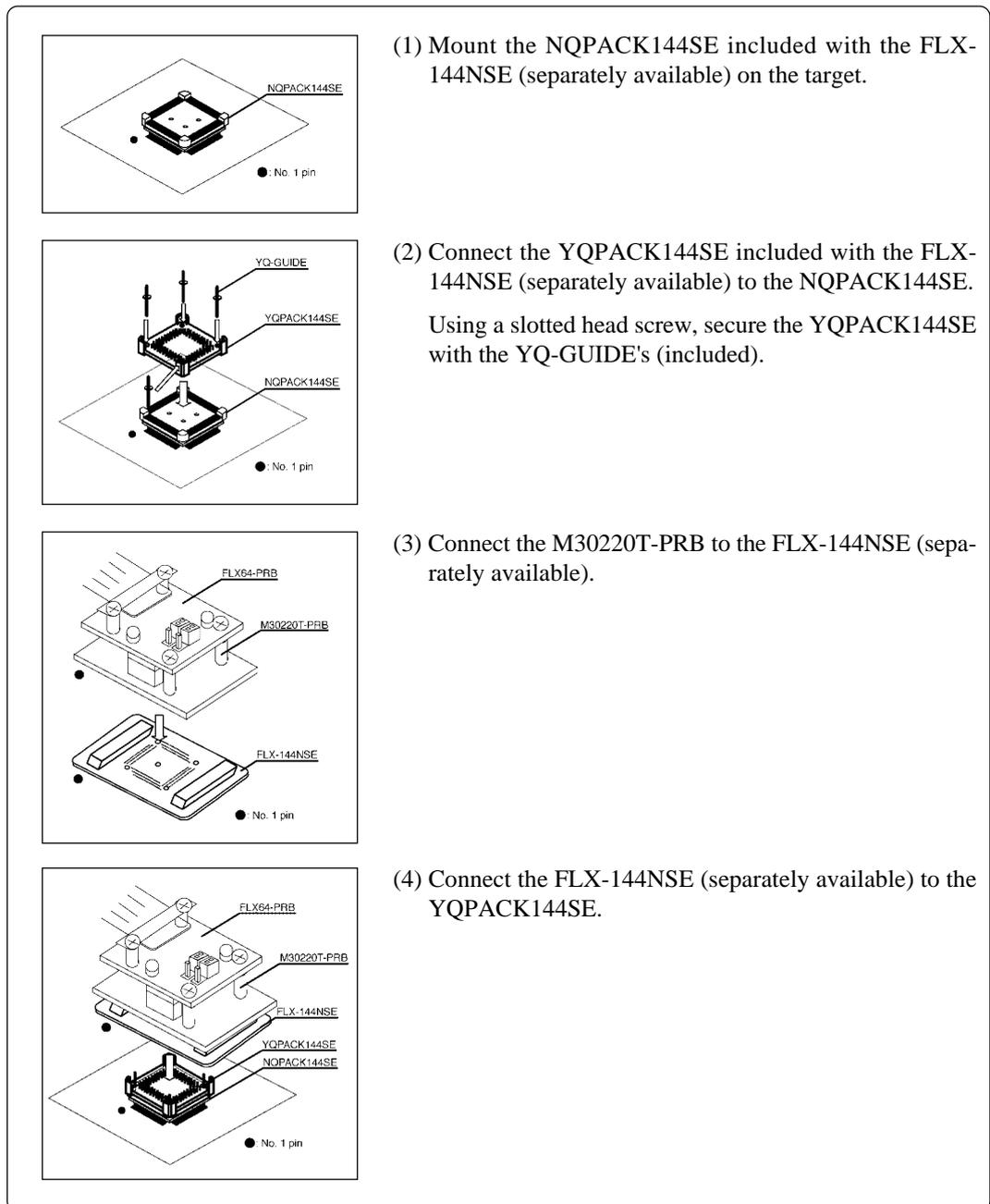


Figure 3.7 Connecting the pitch converter board FLX-144NSE for 144-pin 0.4mm-pitch TQFP

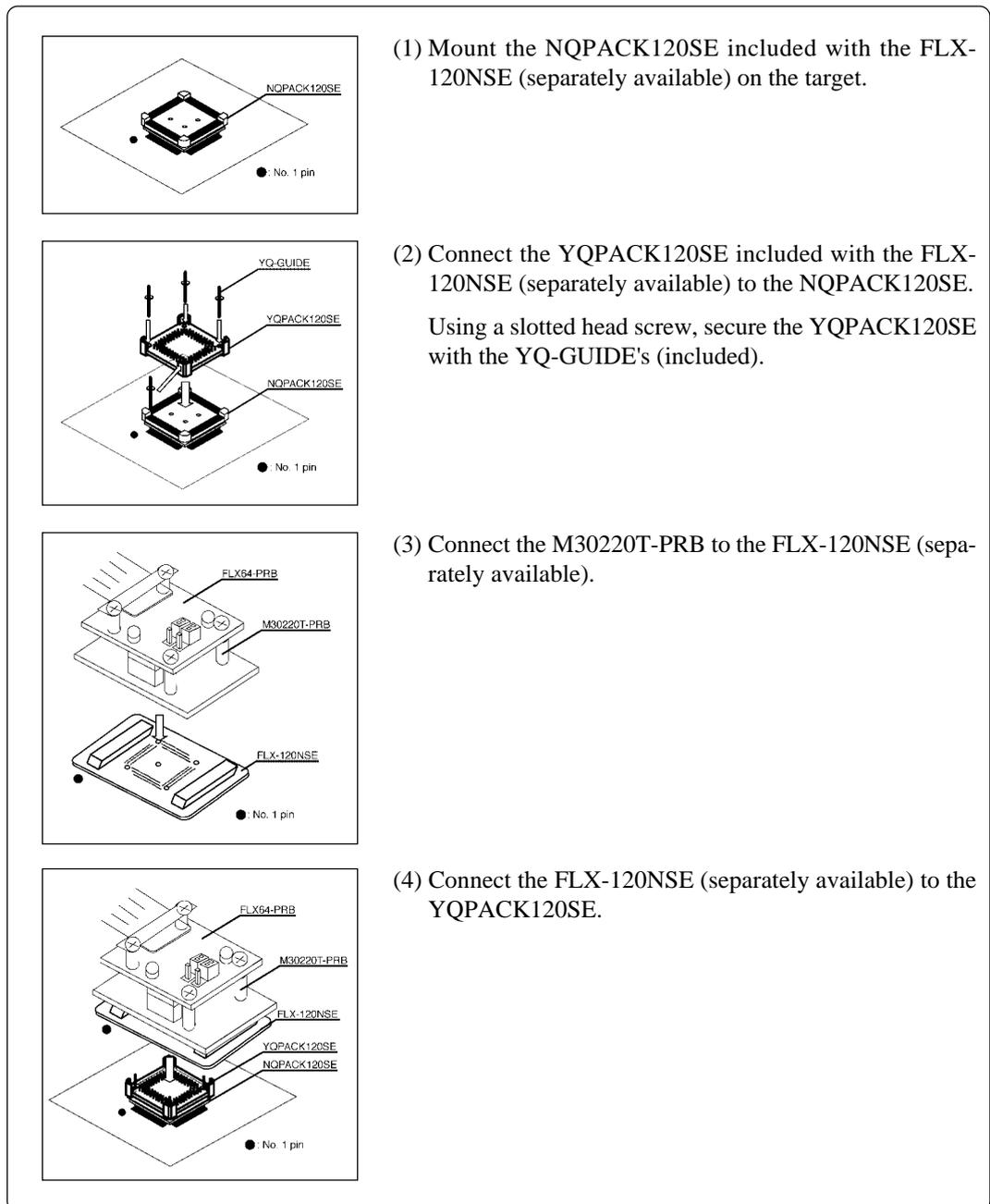


Figure 3.8 Connecting the pitch converter board FLX-120NSE for 120-pin 0.4mm-pitch LQFP

## ⚠ CAUTION

### Note on Connecting Target Systems:

- Take care not to attach the converter board in the wrong direction.

### 3.5 Making an MCU File for M3T-PD30

It is necessary to change the contents of the MCU file according to the MCU to be developed. Make the MCU file in the directory same as emulator debugger M3T-PD30 (M30220.MCU for M30220 Group MCU and M30221.MCU for M30221 Group MCU).

The contents of the MCU file (the SFR area, internal RAM area, internal ROM area, the name of firmware file) are shown below. Change the settings according to the MCU to be debugged. Use your editor for modifying the MCU file.

The contents of the MCU file are as follows:

(1) For M30220 Group (M30220.MCU)

0	: SFR area	Start address
3FF	:	End address
400	: Internal RAM	Start address
1BFF	:	End address
E8000	: Internal ROM	Start address
FFFFFF	:	End address
M30620B	: Name of firmware file (Do not change)	
0	: Expansion No.	M3T-PD30 V.4.00 or later required (Do not change)

(2) For M30221 Group (M30221.MCU)

0	: SFR area	Start address
3FF	:	End address
400	: Internal RAM	Start address
9FF	:	End address
FA000	: Internal ROM	Start address
FFFFFF	:	End address
M30620B	: Name of firmware file (Do not change)	
0	: Expansion No.	M3T-PD30 V.4.00 or later required (Do not change)

# MEMO

# Chapter 4. Specifications

This chapter describes specifications of this product.

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(4) External Dimensions of Converter Board (FLX-120NSE) .....	26

# Chapter 4. Specifications

## 4.1 Specifications

Table 4.1 lists the specifications of the M30220T-PRB.

Table 4.1 Specifications of M30220T-PRB

Emulators		PC4701M, PC4701HS or PC4701L		
Emulation pod main unit		M30200T-RPD-E		
Applicable MCUs		M30220 and M30221 Group MCUs		
Usable MCU mode		Single-chip mode		
Emulation memory		1MB		
Operating frequency	4.0 to 5.5V	X <sub>IN</sub> =10MHz		
	2.7 to 5.5V	X <sub>IN</sub> =7MHz, 1 wait		
Power supply range		+2.7 to 5.5V		
Stack capacity used for emulator		Max. 8 bytes		
Suspended cycles in run-time debug		16-byte dump: approx. 312 BCLK cycles 16-byte fill: approx. 283 BCLK cycles		
Power supply to emulation pod main unit		1. Supplied from an emulator main unit 2. The operating voltage of the emulation pod main unit is determined by detecting the supply voltage of the target system. When no target system is connected, or when the supply voltage of the target system is more than 5.0V, the operating voltage is 5.0V.		
Operating temperature range		5 to 35°C (no dew)		
Storage temperature range		-10 to 60°C (no dew)		
Connection to the target system (See "3.4 Connecting to the Target System", page 17)		M30220 Group	144-pin 0.5mm-pitch LQFP (144P6Q-A)	FLX-144NSD (included)
			144-pin 0.4mm-pitch TQFP (144PFB-A)	FLX-144NSE (option)
		M30221 Group	120-pin 0.4mm-pitch LQFP (120P6R-A)	FLX-120NSE (option)

## 4.2 External Dimensions

### (1) External Dimensions of Pod Probe

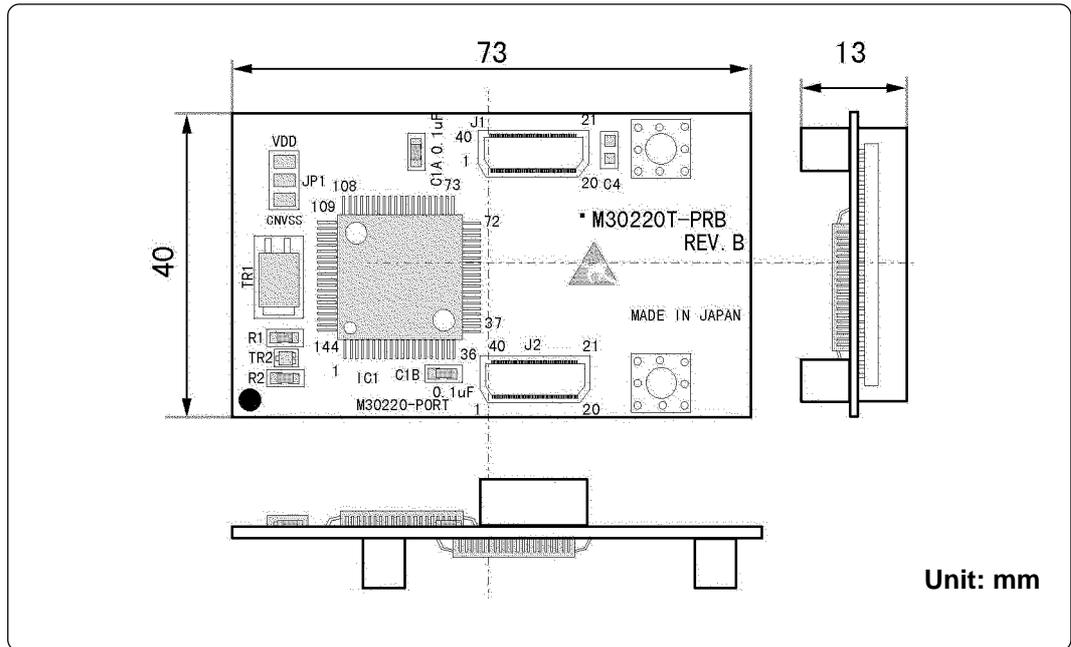


Figure 4.1 External dimensions of pod probe

### (2) External Dimensions of Converter Board (FLX-144NSD)

Figure 4.2 shows the external dimensions and a sample foot pattern of the pitch converter board FLX-144NSD for 144-pin 0.5mm-pitch LQFP.

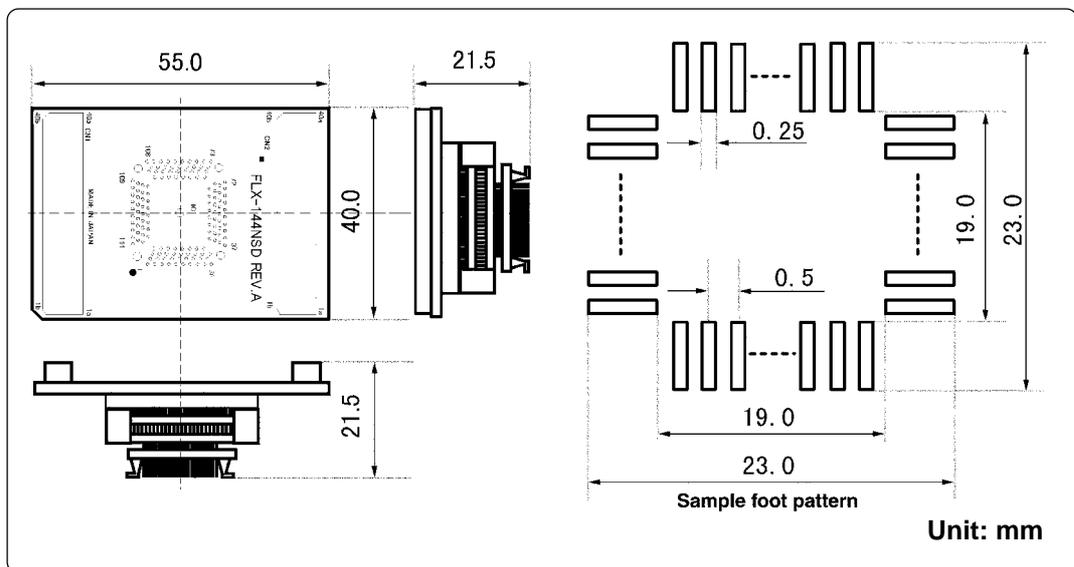


Figure 4.2 External dimensions of FLX-144NSD

### (3) External Dimensions of Converter Board (FLX-144NSE)

Figure 4.3 shows the external dimensions and a sample foot pattern of the pitch converter board FLX-144NSE for 144-pin 0.4mm-pitch TQFP.

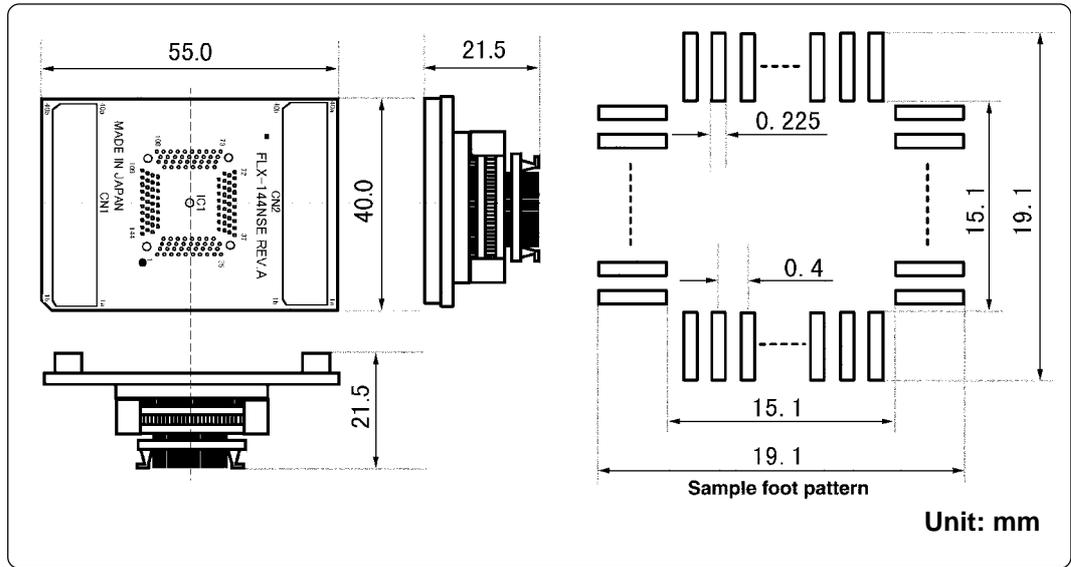


Figure 4.3 External dimensions of FLX-144NSE

### (4) External Dimensions of Converter Board (FLX-120NSE)

Figure 4.4 shows the external dimensions and a sample foot pattern of the pitch converter board FLX-120NSE for 120-pin 0.4mm-pitch LQFP.

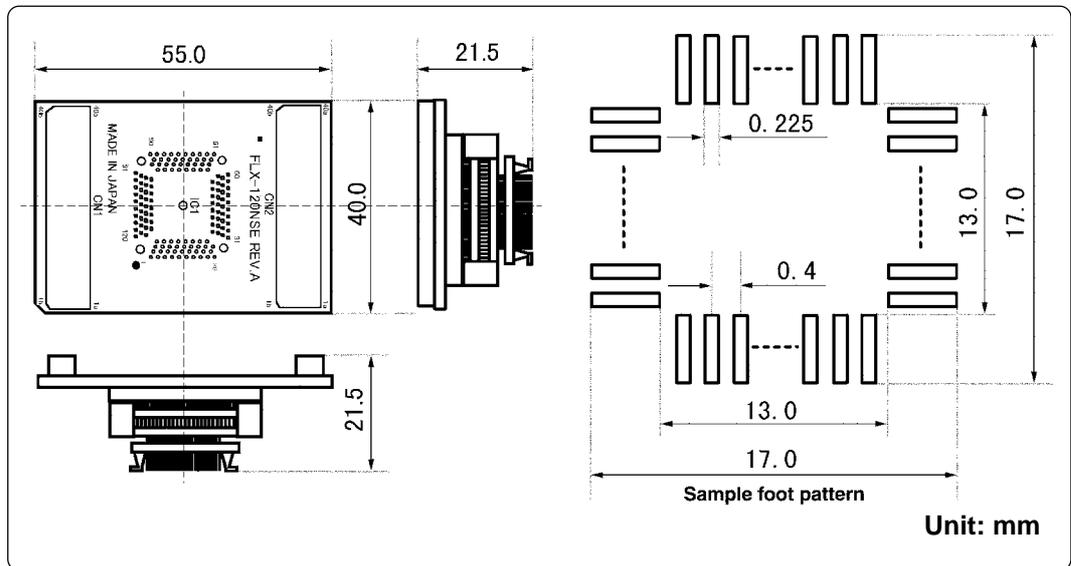


Figure 4.4 External dimensions of FLX-120NSE

# Chapter 5. Troubleshooting

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

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# Chapter 5. Troubleshooting

When this product does not work properly, check the following.

## 5.1 When the Emulator Debugger Does Not Start Up Properly

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

Table 5.1 LED's abnormal display and its checkpoints

Error	Connection to the target system	Checkpoint
LEDs do not light up.	-	Check the power cable is connected to the PC4701. <i>See the user's manual of the PC4701.</i>
All LEDs remain lit.	-	(1) Check the connection between the M30200T-RPD-E and this product. <i>See "3.3 Connecting M30200T-RPD-E" (page 16).</i> (2) Check the connection between the PC4701 and the M30200T-RPD-E. <i>See the user's manual of the M30200T-RPD-E.</i>
The "POWER LED" of "STATUS OF TARGET" does not light up.	Connected	Check power and GND are properly supplied to the target system.
The "CLOCK LED" of "STATUS OF TARGET" does not light up.	Not connected	(1) Check both the main and sub clocks are not set to "EXT" in the emulator debugger. <i>See the CLK command of the emulator debugger.</i> (2) Check the oscillator circuit in the M30200T-RPD-E is oscillating. <i>See the user's manual of the M30200T-RPD-E.</i>
	Connected	(1) Check the oscillator circuit on the target system is oscillating. (2) Check the switches of the FLX64-PRB are correctly set. <i>See "3.1 Switch Settings" (page 14).</i>
The "RESET LED" of "STATUS OF TARGET" does not go out.	Connected	Check the reset pin of the target system is pulled up.

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

*Table 5.2 Checkpoints of errors when starting up the emulator debugger (target is connected)*

Error	Checkpoint
Communication ERROR Data is not sent to the target	Check all emulator debugger settings, interface cable connections and switches on the rear of the PC4701 match. <i>See the user's manuals of the PC4701 and emulator debugger.</i>
Target system is not constructed properly	(1) Download the proper firmware. <i>See the user's manuals of the emulator debugger.</i> (2) Check the connection between the M30200T-RPD-E and this product. <i>See "3.3 Connecting M30200T-RPD-E" (page 16).</i> (3) Check the connection between the PC4701 and the M30200T-RPD-E. <i>See user's manual of the M30200T-RPD-E.</i>
The version of M3T-PD30 and the firmware on the target system are not same	Download the proper firmware. <i>See the user's manual of the emulator debugger.</i>
Target MCU is reset state	(1) Check the reset pin of the target system is pulled up. (2) Check the reset pin of the target system has changed from "L" to "H" level.
Target MCU is unable to reset	(1) Check the NMI* pin is "H" level. (2) If the reset circuit of the target system has a watchdog timer, disable the timer. (3) Check power and GND are properly supplied to the target system.
Target is "HOLD" state	The MCU is either in the stop mode or wait mode. Either reset the MCU or cancel the mode with an interrupt. <i>See MCU specifications.</i>
Target MCU is not given clock	(1) Check the oscillator circuit on the target system is oscillating properly. (2) Check the switches of the FLX64-PRB are correctly set. <i>See "3.1 Switch Settings" (page 14).</i>
Target MCU is not given power	Check power and GND are properly supplied to the target system.

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

*Table 5.3 Checkpoints of errors when starting up the emulator debugger (target is not connected)*

Error	Checkpoint
Communication ERROR Data is not sent to the target	Check all emulator debugger settings, interface cable connections and switches on the rear of the PC4701 match. <i>See the user's manuals of the PC4701 and emulator debugger.</i>
Target system is not constructed properly	(1) Download the proper firmware. <i>See the user's manual of the emulator debugger.</i> (2) Check the connection between the M30200T-RPD-E and this product. <i>See "3.3 Connecting M30200T-RPD-E" (page 16).</i> (3) Check the connection between the PC4701 and the M30200T-RPD-E. <i>See the user's manual of the M30200T-RPD-E.</i>
The version of M3T-PD30 and the firmware on the target are not same	Download the proper firmware. <i>See the user's manual of the emulator debugger.</i>
Target is "HOLD" state	The MCU is either in the stop mode or wait mode. Either reset the MCU or cancel the mode with an interrupt. <i>See MCU specifications.</i>
Target MCU is not given clock	Check the switches of the FLX64-PRB are correctly set. <i>See "3.1 Switch Settings" (page 14).</i>

**5.2 Operation Differs from That of MCUs with PROM**

**(1) When the A-D Conversion Values are Different from Expected Values**

The A-D converter characteristics differ from actual MCU characteristics because there are a converter board and other devices between the evaluation MCU and the target system. Make the final evaluation of the A-D converter with the actual MCU.

**(2) When the D-A Conversion Values are Different from Expected Values**

The D-A converter characteristics differ from actual MCU characteristics because there are a converter board and other devices between the evaluation MCU and the target system. Make the final evaluation of the D-A converter with the actual MCU.

# Chapter 6. Maintenance and Warranty

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

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# Chapter 6. Maintenance and Guarantee

## 6.1 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.

## 6.2 Guarantee

If your product becomes faulty within twelve months after its purchase while being used under good conditions by observing "Precautions for Safety" described in Chapter 1 of this user's manual, we will repair or replace your faulty product free of charge. Note, however, that if your product's fault is raised by any one of the following causes, we will repair it or replace it with new one with extra-charge:

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

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

## 6.3 Repair Provisions

### (1) Repair with extra-charge

The products elapsed more than twelve months after purchase can be repaired with extra-charge.

### (2) Replacement with extra-charge

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

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

### (3) Expiration of the repair period

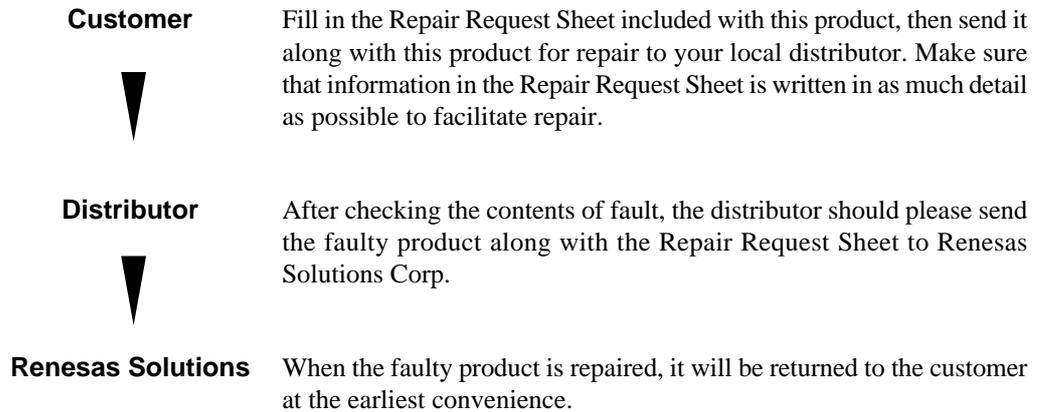
When a period of twelve months elapses after the model was dropped from production, repairing products of the model may become impossible.

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

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

## 6.4 How to Request for Repair

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



### CAUTION

#### Note on Transporting the Product:



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

# MEMO

# M30220T-PRB User's Manual

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