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User's Manual

IE-703002-MC

In-Circuit Emulator

Target Devices
V852™
V853™
V850/Sxx products

Document No. U11595EJ5V0UM00 (5th edition)
Date Published March 2003 N CP(K)

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[MEMO]

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Fax: 408-588-6130
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Hong Kong
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MAJOR REVISIONS IN THIS EDITION

Page	Contents
Throughout	• Deletion of V851™ from target devices • Addition of V853 and V850/Sxx products to target devices • Change from evaluation chip to emulation CPU • Deletion of description of PC interface boards IF-70000-98-IF-B and IF-70000-PC-IF-B • Change of description about how to connect IE-703002-MC to target system; from rear side of pod to connection tab of option board • Addition of description about referring to user's manual of option board
p.14	**1.1 Hardware Configuration** • Addition of description of option board to extension probe explanation • Change of part numbers of some PC interface boards
p.15	**1.2 Features** • Addition of description of maskable pins
p.16	Modification of **1.3 Function Specifications**
p.17	Addition of option board to **Figure 1-1 Basic Hardware Configuration**
p.18	**Figure 1-2 System Configuration** • Addition of IE-7000-PCI-IF-A and IE-70000-CD-IF-A to Remark <3> PC interface board • Addition of option board
pp.21, 22	**1.7.1 When using IE-703002-MC on stand-alone basis for performing software debugging, 1.7.2 When performing hardware debugging with target system** Addition of section (2)
p.29	Addition of **2.2.3 When IE-703002-MC is used connected to option board**
p.37	**3.2 Connection to Target System** Change of description of (2) (a) and (b) Modification of **Figure 3-10 Connection to Target System**

The mark ★ shows major revised points.

INTRODUCTION

Target Readers

This manual is intended for users who design and develop application systems using the V852, V853 or V850/Sxx products.

Purpose

To enable efficient debugging with the IE-703002-MC or a combination of the IE-703002-MC and an option board (IE-7030xx-MC-EM1) when designing and developing application systems using the V852, V853 or V850/Sxx. This manual describes the proper operation of the IE-703002-MC and its basic specifications.

Organization

This manual is broadly divided into the following parts.

- Overview
- Names and functions of parts
- Connections of parts
- Factory settings
- Option board
- Cautions

How to Use This Manual

It is assumed that the readers of this manual have a general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.

To learn the basic specifications and operations

→ Read this manual in the order of the **CONTENTS**.

To learn in detail about the connectors for target connection

→ Read **APPENDIX C CONNECTORS FOR TARGET CONNECTION.**

To learn the operation methods, command functions, etc., of the IE-703002-MC

→ Read the user's manual of the debugger that is used (sold separately).

Conventions

Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numeric notation:	Binary… ×××× or ××××B
	Decimal… ××××
	Hexadecimal…××××H

Prefixes indicating power of 2 (address space, memory capacity):

K (kilo): $2^{10} = 1,024$

M (mega): $2^{20} = 1,024^2$

Terminology

The meanings of terms used in this manual are listed below.

Target device	This is the device to be emulated.
Target system	The system (user-built system) to be debugged. This includes the target program and hardware provided by the user.
Evaluation chip	This is the device that performs emulation of the target device in the IE-703002-MC.

RELATED DOCUMENTS

The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

○ **Documents related to V852, V853, V850/SA1™, V850/SB1™, V850/SC1™, V850/SC2™, V850/SC3™, V850/SF1™, and V850/SV1™**

Device	Document Name	Document Number
V850 Series™	V850 Family Architecture User's Manual	U10243E
	V850 Series Flash Memory Self Programming User's Manual	U15673E
V852	μPD703002 Data Sheet	U11826E
	μPD70P3002 Data Sheet	U11827E
	V852 Hardware User's Manual	U10038E
	V852 Register List	U10513E
V853	μPD703003A, 703004A, 703025A, 703003A(A), 703025A(A) Data Sheet	U13188E
	μPD70P3002 Data Sheet	U13189E
	V853 Hardware User's Manual	U10913E
V850/SA1	V850/SA1 Application Note	U13851E
	V850/SA1 Hardware User's Manual	U12768E
V850/SB1, SB2	μPD703031A, 703031AY, 703033AY, 70F3033A, 70F3033AY Data Sheet	U14734E
	μPD703032A, 703032AY, 70F3032A, 70F3032AY Data Sheet	U14893E
	μPD703034A, 703034AY, 703035A, 703035AY, 70F3035A, 70F3035AY Data Sheet	U14780E
	μPD703037A, 703037AY, 70F3037A, 70F3037AY Data Sheet	U14894E
	V850/SB1, V850/SB2 Hardware User's Manual	U13850E
V850/SC1, SC2, SC3	V850/SC1, V850/SC2, V850/SC3 Hardware User's Manual	U15109E
V850/SF1	μPD703078Y, 703079Y, 70F3079Y Data Sheet	U15183E
	V850/SF1 Hardware User's Manual	U14665E
V850/SV1	μPD703039, 703039Y, 703040, 703040Y, 703041 Data Sheet	To be prepared
	μPD70F3040, 70F3040Y Data Sheet	To be prepared
	V850/SV1 Hardware User's Manual	U14462E

○ **Documents related to development tools (user's manual)**

Document Name		Document Number
IE-703002-MC (In-circuit emulator)		This manual
IE-703003-MC-EM1 (In-circuit emulator option board for V853)		U11596E
IE-703017-MC-EM1 (In-circuit emulator option board for V850/SA1)		U12898E
IE-703037-MC-EM1 (In-circuit emulator option board for V850/SB1, V850/SB2)		U14151E
IE-703079-MC-EM1 (In-circuit emulator option board for V850/SF1)		U15447E
IE-703040-MC-EM1 (In-circuit emulator option board for V850/SV1)		U14337E
CA850 Ver. 2.50 or later (C compiler package)	Operation	U16053E
	C Language	U16054E
	PM plus	U16055E
	Assembly Language	U16042E
ID850 Ver. 2.50 (Integrated debugger)	Operation Windows®-based	U15181E
SM850 Ver. 2.50 (System simulator)	Operation Windows-based	U15182E
SM850 Ver. 2.00 or later (System simulator)	External Part User Open Interface Specifications	U14873E
RX850 Ver. 3.13 or later (Real-time OS)	Basics	U13430E
	Installation	U13410E
	Technical	U13431E
RX850 Pro Ver. 3.13 (Real-time OS)	Basics	U13773E
	Installation	U13774E
	Technical	U13772E
RD850 Ver. 3.01 (Task debugger)		U13737E
RD850 Pro Ver. 3.01 (Task debugger)		U13916E
AZ850 Ver. 3.10 (System performance analyzer)		U14410E
PG-FP4 (Flash memory programmer)		U15260E

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CHAPTER 1 OVERVIEW

The IE-703002-MC is an in-circuit emulator that efficiently debugs hardware and software of systems being developed using V852, V853 and V850/Sxx products.

It incorporates functions such as a break/trace function using events, a coverage function for program performance evaluation, and a timer/counter function.

The IE-703002-MC can also be used as an in-circuit emulator for developing systems that use V853 and V850/Sxx products (but not the V852) by connecting an option board.

1.1 Hardware Configuration

In-circuit emulator (IE-703002-MC)

Separately sold hardware

Option board (IE-7030xx-MC-EM1)	The IE-703002-MC can be used as an in-circuit emulator of V853 and V850/Sxx products (not V852) by connecting this board.
★ Extension probe (SC-×××SDA[Note 1])	General-purpose extension probe. Product of TOKYO ELETECH CORPORATION. This varies depending on the option board to be used.
★ PC interface board (IE-70000-××-IF-C IE-70000-PCI-IF-A IE-70000-CD-IF-A)	These boards are used to connect the IE-703002-MC to a personal computer. These boards are added into the expansion slot of a personal computer. ××: 98 (for PC-9800 series C bus)[Note 2] PC (for IBM PC/AT™ compatible ISA bus)[Note 2] IE-70000-PCI-IF-A: For PCI bus IE-70000-CD-IF-A: For PCMCIA socket
Network module (IE-70000-MC-SV3)	This module is used when a workstation controls the IE-703002-MC via Ethernet™.
Power adapter (IE-70000-MC-PS-B)	An AC adapter dedicated to the NEC Electronics in-circuit emulator.

Notes 1. For further information, contact Daimaru Kogyo., Ltd.
Tokyo Electronic Division (TEL +81-3-3820-7112)
Osaka Electronic Division (TEL +81-6-6244-6672)

2. These interface boards cannot be used for the PC98-NX series.

1.2 Features

- Maximum operating frequency: 33 MHz (at 3.0 to 5.5 V operation)
- Higher equivalence with target device can be achieved by omitting buffer between signal cables.
- ★ Following pins can be masked.
  $\overline{\text{RESET}}$, NMI, $\overline{\text{WAIT}}$, $\overline{\text{HLDRQ}}$
  Maskable pins vary depending on the option board to be used.
- Two methods of connection to target system.
  - Directly connect to the connection tab of the option board.
  - Attach an extension probe (sold separately) to the connection tab of the option board for connection.
- Dimensions and environmental conditions for operation are as follows.

Parameter		Value
Maximum operating frequency		33 MHz
Supply voltage (DC)		5 V
Operating voltage (DC)		3.0 to 5.5 V
Power dissipation		10 W (Operating frequency: 33 MHz)[Note]
Outer dimensions (Refer to **Appendix A Package Drawings**)	Height	56 mm
	Length	403 mm
	Width	90 mm
Weight		475 g
Operating temperature range		0 to 40°C
Storage temperature range		0 to 45°C
Ambient humidity range		10 to 80%RH

Note To enable operation under the maximum operating frequency of 33 MHz, a factory-set 6.667 MHz crystal oscillator is included in the IE-703002-MC. If this emulator is used connected to the option board, refer to the user's manual of the option board used.

★ 1.3 Function Specifications

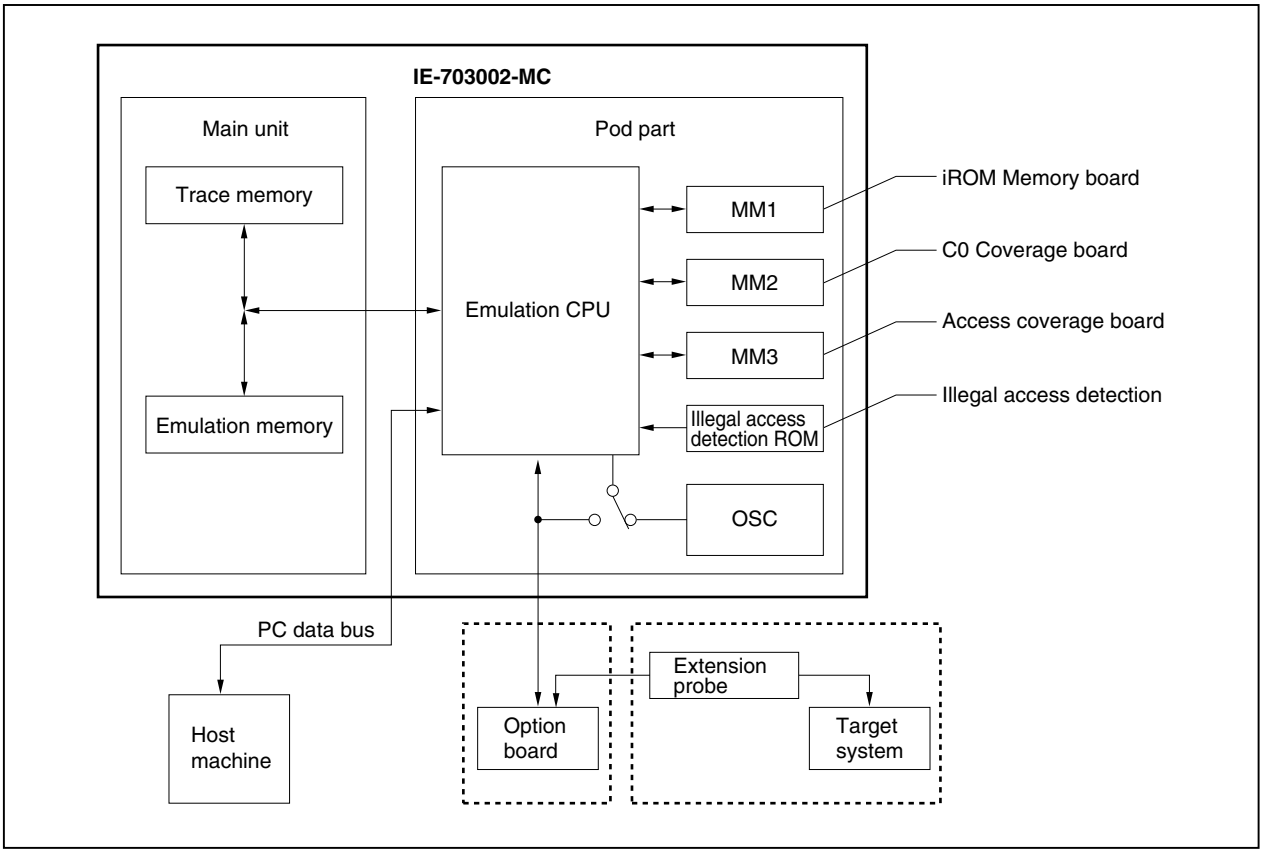
Item			Specification
Emulation memory capacity	Internal ROM		1 MB
	External Memory	In ROMless mode	2 MB
		When using iROM	1 MB
Execution/pass detection coverage memory capacity	Internal ROM		1 MB
	External memory	In ROMless mode	2 MB
		When using iROM	1 MB
Memory access detection coverage memory capacity	External memory		1 MB
Branch destination entry number counting coverage memory capacity	Internal ROM		1 MB
	External Memory	In ROMless Mode	2 MB
		When using iROM	1 MB
Trace memory capacity			150 bits × 32 Kframes
Time measurement function			Measurement enabled with time tag or three timers
External logic probe			4-bit external trace possible
			Trace/break event setting possible
Break function			Event break
			Step execution break
			Forced break
			Fail-safe break • Illegal access to peripheral I/O • Access to guard space • Write to ROM space

Caution Some of the functions may not be supported depending on the debugger used.

1.4 Hardware Configuration

The basic hardware configuration of the IE-703002 is as follows.

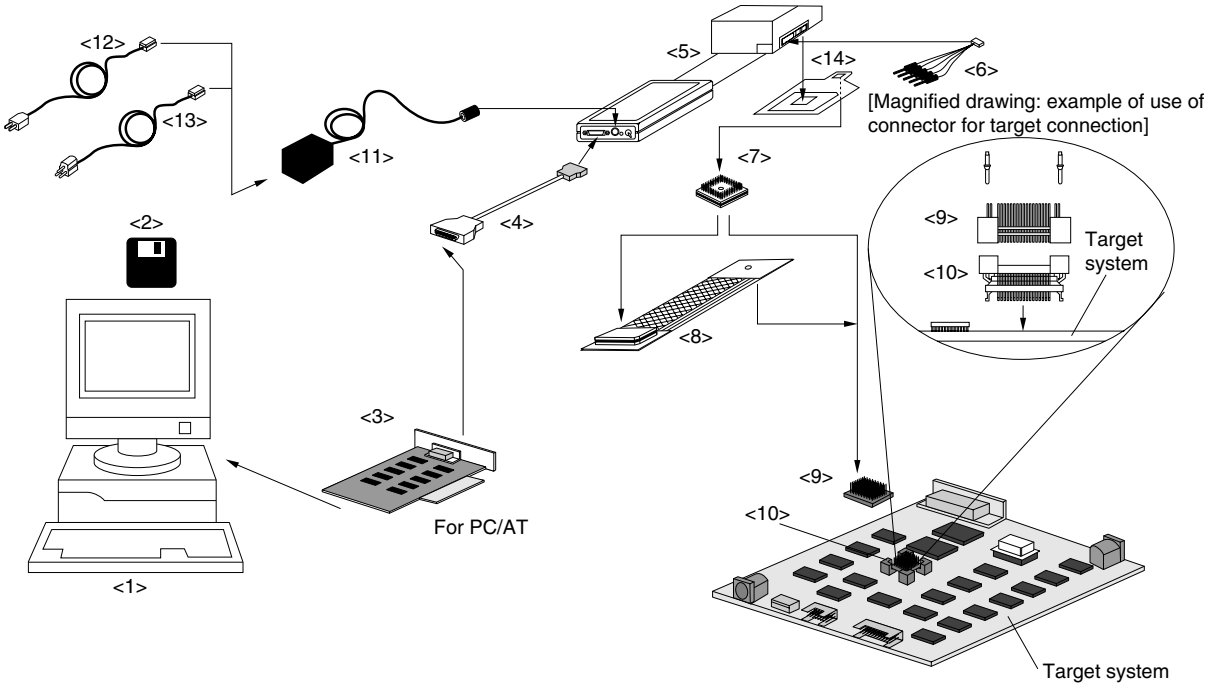
★ **Figure 1-1. Basic Hardware Configuration**



1.5 System Configuration

The system configuration when connecting the IE-703002-MC to a personal computer is illustrated below (PC-9800 Series or PC/AT™ (or compatible machines)).

★ **Figure 1-2. System Configuration**



Remark

<1> Personal computer (PC-9800 Series or PC/AT)
<2> Debugger (sold separately)
<3> PC interface board (IE-70000-98-IF-C, IE-70000-PC-IF-C, IE-70000-PCI-IF-A, IE-70000-CD-IF-A: Sold separately)
<4> PC Interface cable (included)
<5> IE-703002-MC (In-circuit emulator)
<6> External logic probe (included)
<7> Socket for target connection
<8> Extension probe (SC-100SD: Sold separately)[Note]
<9> Connector for emulator connection (YQPACK100SD: Included)
<10> Connector for target connection (NQPACK100SD: Included)
<11> Power adapter (IE-70000-MC-PS-B: Sold separately)
<12> 100-VAC power cable (sold separately: Included with IE-70000-MC-PS-B)
<13> 220-VAC power cable (sold separately: Included with IE-70000-MC-PS-B)
<14> Option board (sold separately)

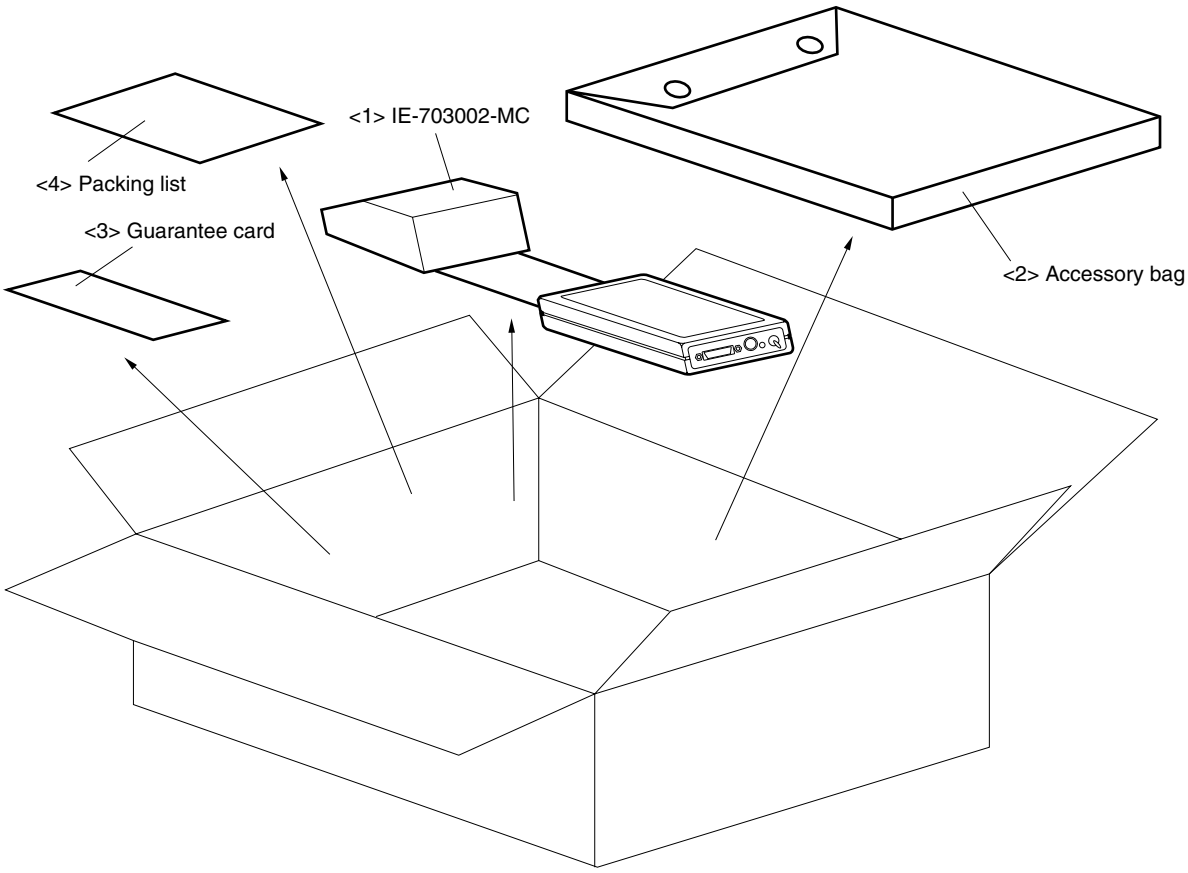
Note Product of TOKYO ELETECH CORPORATION.

1.6 Contents in Carton

The carton of the IE-703002-MC contains the main unit, guarantee card, packing list, and accessory bag.

Make sure that the accessory bag includes this manual and cables. In the case of missing or damaged contents, please contact an NEC Electronics sales representative or distributor.

Figure 1-3. Contents in IE-703002-MC Carton

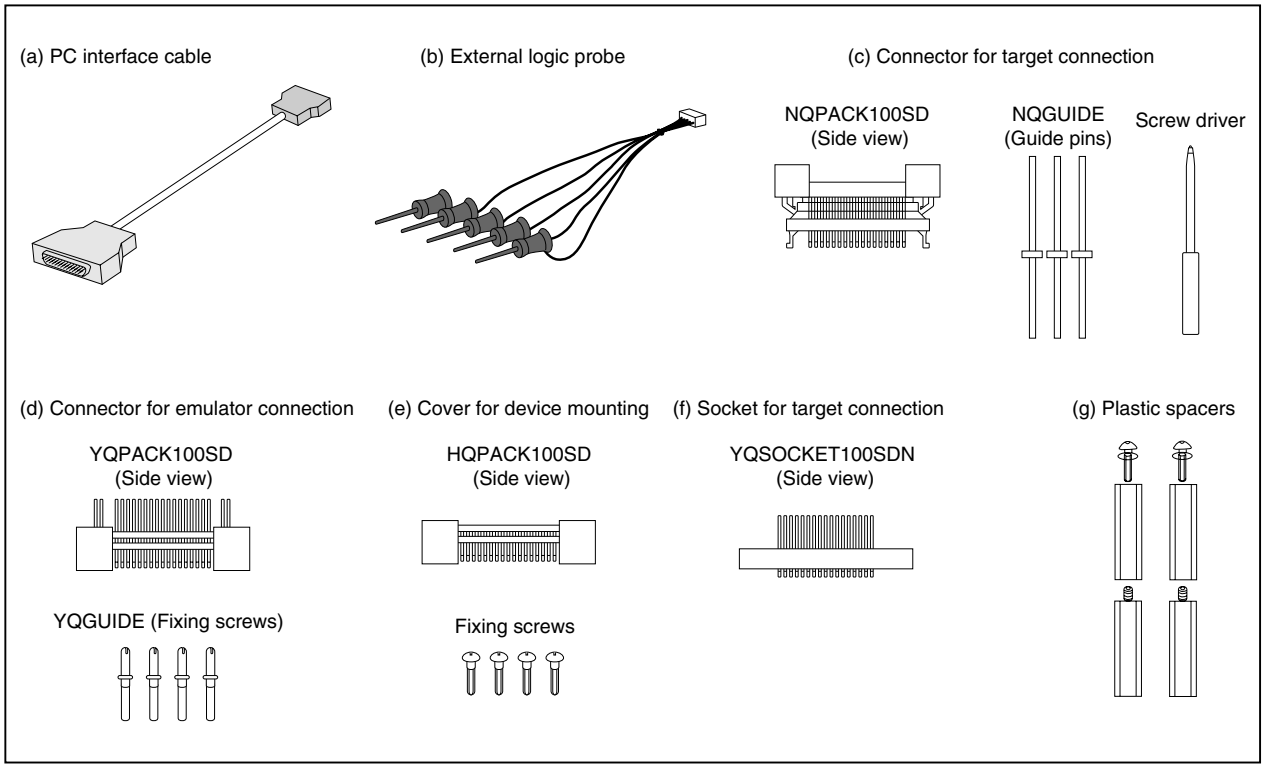


<1> IE-703002-MC × 1 pc.
<2> Accessory bag × 1 pc.
<3> Guarantee card × 1 pc.
<4> Packing list × 1 sheet

Check that the accessory bag contains this manual, an accessory list, and the following accessories.

(a) PC interface cable × 1
(b) External logic probe × 1
(c) Connector for target connection (NQPACK100SD) × 1 set (including NQGUIDE × 3, screw driver × 1)
(d) Connector for emulator connection (YQPACK100SD) × 1 set (including YQGUIDE × 4)
(e) Cover for device mounting (HQPACK100SD) × 1 set (including fixing screws × 4)
(f) Socket for target connection (YQSOCKET100SDN) × 1
(g) Plastic spacer × 2 sets (including plastic screw × 2)

Figure 1-4. Accessories



1.7 Setup

The following two system configurations for the IE-703002-MC are possible, depending on the purpose.
This section describes the setup procedure according to each purpose as follows.

Step	Reference section

1.7.1 When using IE-703002-MC on stand-alone basis for performing software debugging

(1) Connect interface board to PC — **3.1 Connection to Personal Computer**

Before connecting, make sure that the power of the PC is off.

★ (2) Set clock operation mode of IE-703002-MC — **2.2 Clock Setting**

The IE-703002-MC is provided with a 6.667 MHz crystal oscillator when shipped from the factory.
The clock setting differs depending on the option board used.
For details, refer to the user's manual of the option board used.

(3) Set illegal access detection ROM — **2.3 Setting of Illegal Access Detection ROM**

Switch the illegal access detection ROM.
(For details, refer to the user's manual of the option board used.)

(4) Set jumpers to adapt to voltage range of CPU and target system — **2.4 Operating Voltage Setting**

Set jumpers to adapt to voltage range of CPU and target system
(For details, refer to the user's manual of the option board used.)

(5) Connect cables — **3.3 Cable Connections**

Connect power source adapter and interface cable.

(6) Power up IE-703002-MC, then PC — **3.4 System Power-on and Power-off**

1.7.2 When performing hardware debugging with target system

Caution Before turning on the power of the target system, make sure that the power of the IE-703002-MC is turned on.
If the target system is turned on while the IE-703002-MC is off, the target system or the IE-703002-MC may be damaged.

(1) Connect interface board to PC — **3.1 Connection to Personal Computer**

Before connecting, make sure that the power of the PC is off.

★ (2) Set clock operation mode of IE-703002-MC — **2.2 Clock Setting**

The IE-703002-MC is provided with a 6.667 MHz crystal oscillator at factory shipping.
The clock setting differs depending on the option board used.
For details, refer to the user's manual of the option board used.

(3) Set illegal access detection ROM — **2.3 Setting of Illegal Access Detection ROM**

Switch the illegal access detection ROM.
(For details, refer to the user's manual of the option board used.)

(4) Set jumpers to adapt to voltage range of CPU and target system — **2.4 Operating Voltage Setting**

Set jumpers to adapt to voltage range of CPU and target system
(For details, refer to the user's manual of the option board used.)

(5) Connect cables — **3.3 Cable Connections**

Connect power source adapter and interface cable.

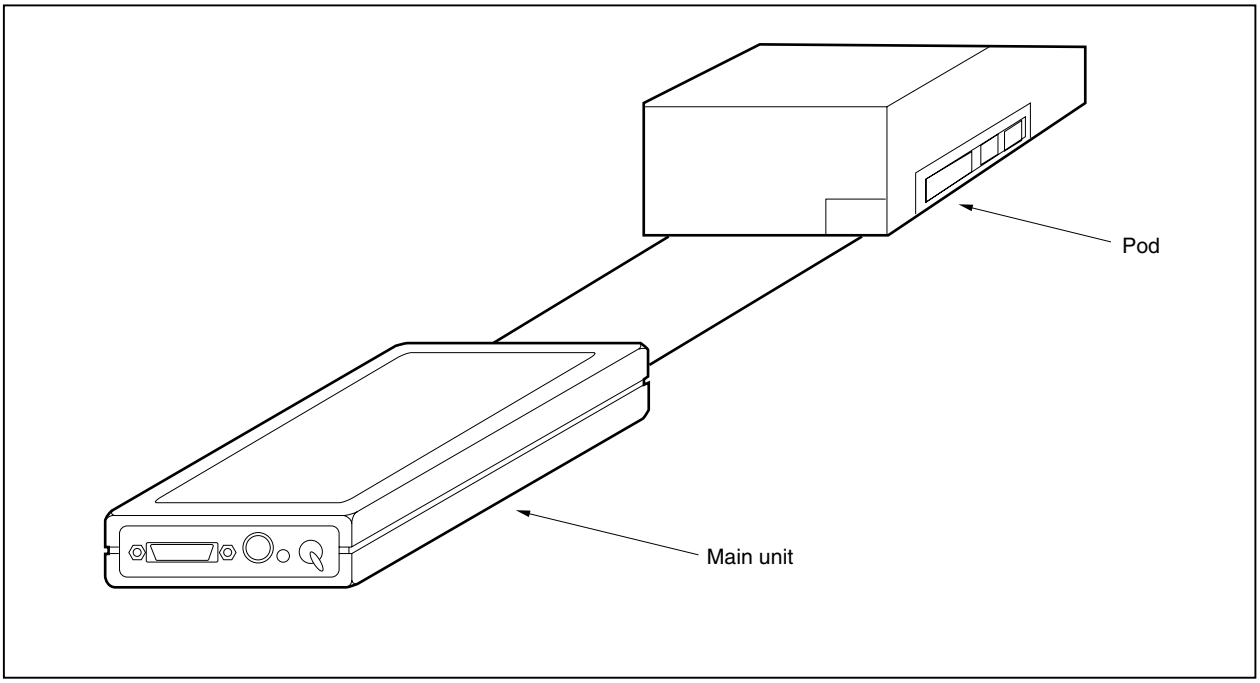
(6) Connect IE-703002-MC to target system — **3.2 Connection to Target System**

(7) Power up IE-703002-MC, then PC, then target system — **3.4 System Power-on and Power-off**

CHAPTER 2 NAMES AND FUNCTIONS OF PARTS

This chapter describes the name and function of each part of the IE-703002-MC, as well as switch settings.

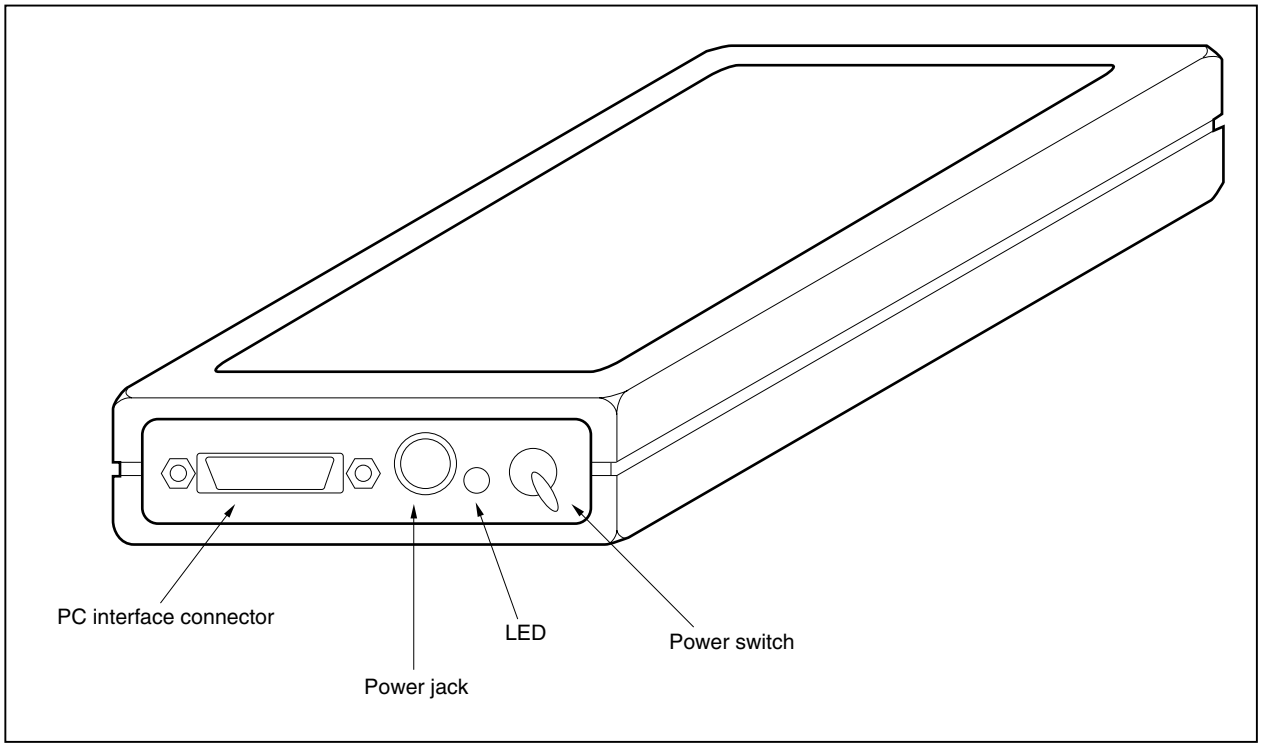
Figure 2-1. IE-703002-MC



2.1 Names and Functions

2.1.1 Names and functions of main unit

Figure 2-2. Main Unit



(1) Power switch

This is the main power ON/OFF switch of the IE-703002-MC. ON/OFF is printed on the chassis of the main unit.

(2) Power jack

The power adapter (IE-70000-MC-PS-B: Sold separately) is connected here.

(3) PC interface connector

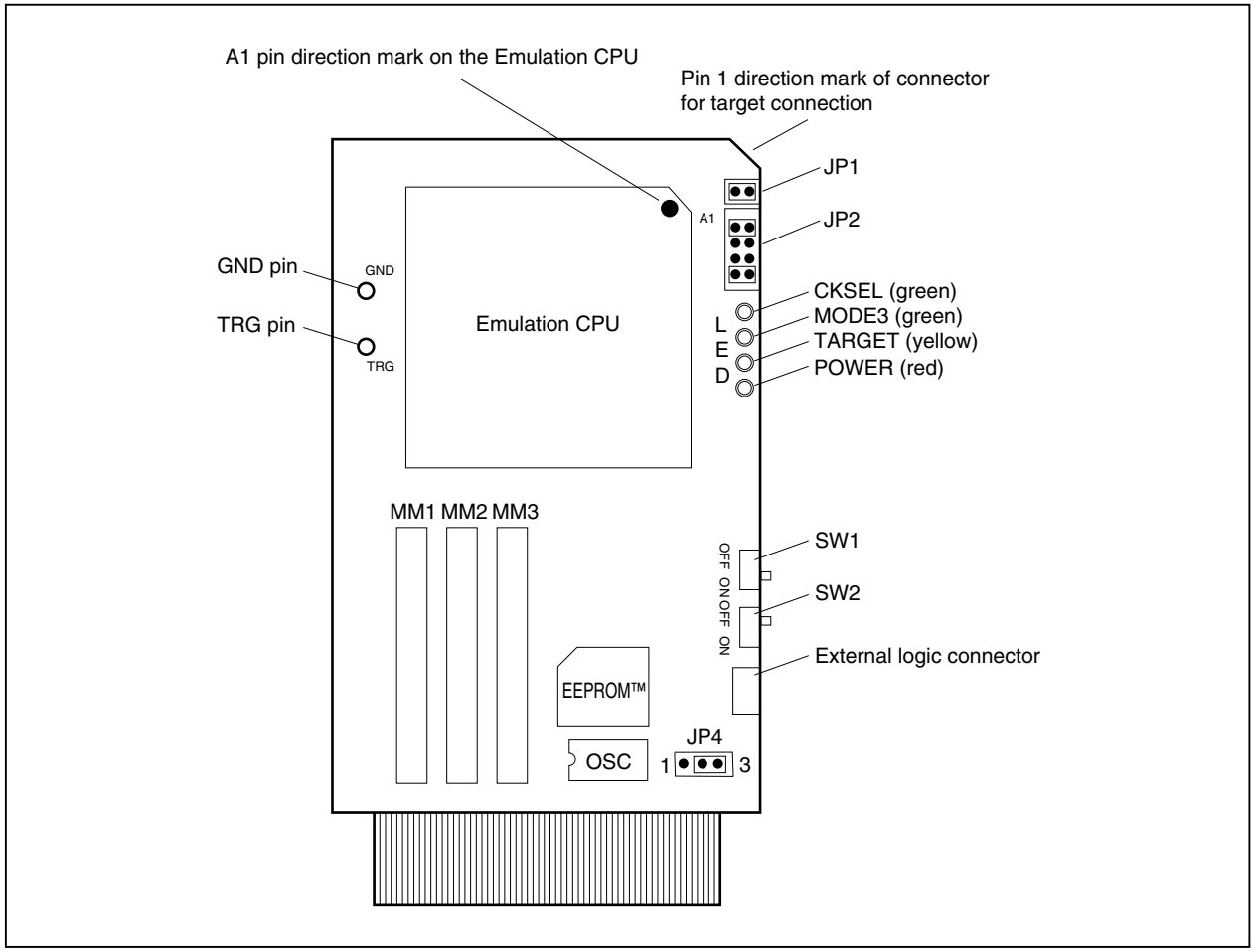
The PC interface cable (included) is connected here.

(4) LED

Lit when the power is on, extinguished when the power is off.

2.1.2 Names and functions of pod part

Figure 2-3. Pod (Top View)



(1) TRG pin

The trigger signal output pin

(2) GND pin

The GND pin used during trigger signal output

(3) External logic connector

Connects the external logic probe (included).

(4) Crystal oscillator (OSC)

A 6.667 MHz crystal oscillator is installed when shipped from the factory. This socket-mounted oscillator can easily be replaced. Clock supply using the crystal resonator of the target board is not supported, so be sure to use a clock oscillator to supply the clock to the X1 pin. (For details, refer to the user's manual of the option board used.)

(5) SW1, SW2

Switches for clock mode switching. (Refer to **2.2 Clock Setting**)

(6) JP1

The jumper switch for switching illegal access detection ROM. (Refer to **2.3 Setting of Illegal Access Detection ROM**)

(7) JP2

The jumper switch for switching the clock supply source. (Refer to **2.2 Clock Setting**)

(8) JP3, JP4

The jumper switch for making the voltage range of the CPU and that of the target system correspond. (Refer to **2.4 Operating Voltage Setting**)

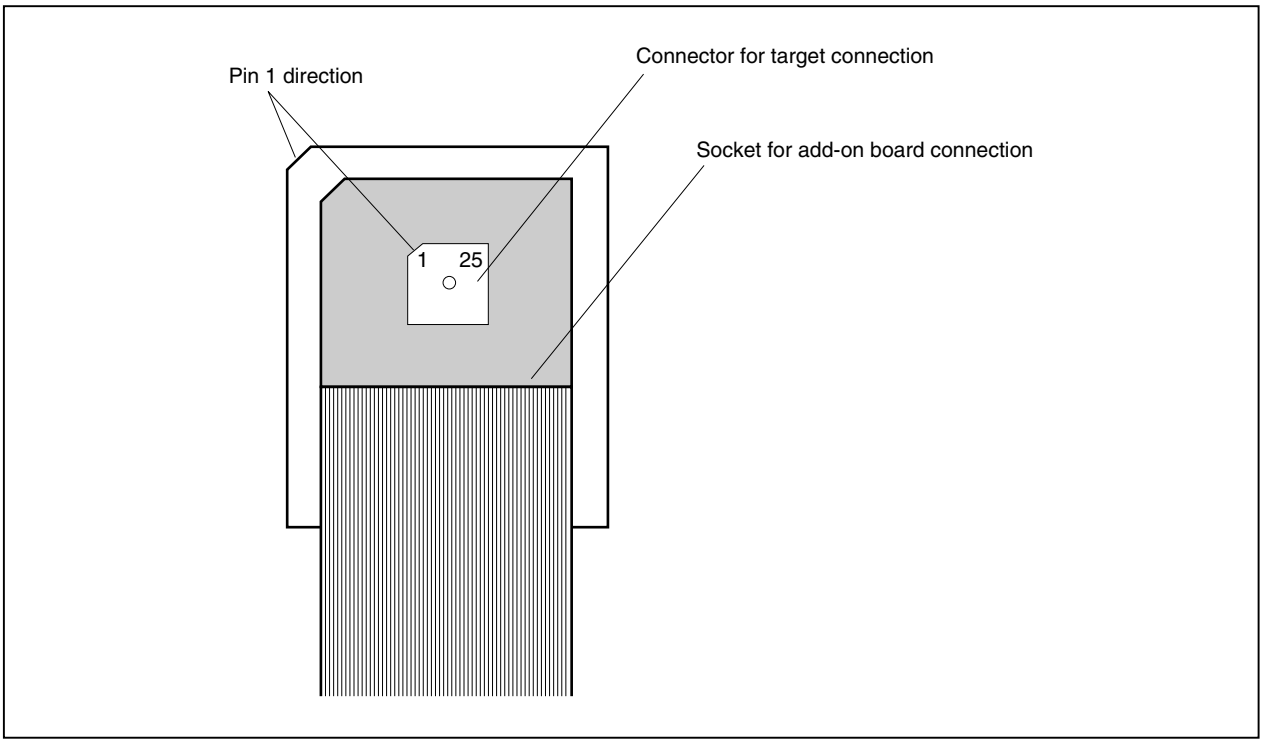
(9) LED

Name	Target[Note]	LED State	When Using Only IE-703002-MC	When Using IE-703002-MC Connected to Target System
CKSEL (green)	V852	Lit	SW 2 = ON	CKSEL signal from target system is high level
		Extinguished	SW 2 = OFF	CKSEL signal from target system is low level
MODE3 (green)	V852	Lit	SW 1 = ON	PLLSEL signal from target system is high level
		Extinguished	SW 2 = OFF	PLLSEL signal from target system is low level
TARGET (yellow)	V852	Lit	—	Power of target system = ON
		Extinguished	(Always extinguished)	Power of target system = OFF
POWER (red)	V852	Lit	Power switch of main unit = ON	
		Extinguished	Power switch of main unit = OFF	

Note V852: V852 application system

When the IE-703002-MC is used connected an option board, apply the setting for SW1, SW2 and each jumper as specified in the user's manual of the option board used.

Figure 2-4. Pod (Bottom View)



(1) Connector for target connection

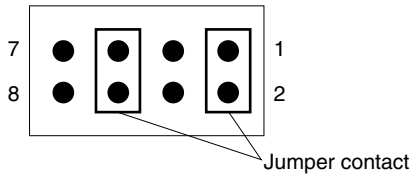
The connector to connect the target system or extension probe (sold separately).

(2) Socket for option board connection

The PGA socket to connect the option board (sold separately).

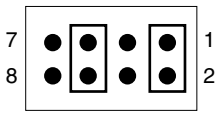
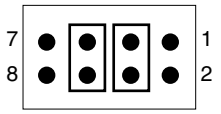
2.2 Clock Setting

Remark JP2 in the pod is factory-set as shown on the right (The numbers 1, 2, 7, 8 are the jumper pin numbers printed on the board).



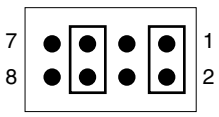
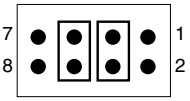
2.2.1 When IE-703002-MC is used alone

When IE-703002-MC is used to develop V852 application system

Clock Supply Source Setting				Clock Mode Setting	
Clock Supply Method			Pod JP2 Setting	Pod SW1 Setting (PLLSEL Setting)	Pod SW2 Setting (CKSEL Setting)
Internal clock	PLL mode	×5 multiplication (input clock × 5)		ON	OFF
		×1 multiplication (input clock × 1)		OFF	
	Direct mode (input clock × 1/2)			don't care	ON
Target clock	PLL mode	×5 multiplication (input clock × 5)		ON	OFF
		×1 multiplication (input clock × 1)		OFF	
	Direct mode (input clock × 1/2)			don't care	ON

2.2.2 When IE-703002-MC is used connected to target system

When IE-703002-MC is used to develop V852 application system

Clock Supply Source Setting				Clock Mode Setting			
Clock Supply Method			Pod JP2 Setting	Pod SW1 Setting (PLLSEL Setting)	Pod SW2 Setting (CKSEL Setting)	Pod SW2 Setting (CKSEL Setting)	CKSEL Setting of Target System
Internal clock	PLL mode	×5 multiplication (input clock × 5)		ON	High level	OFF	Low level
		×1 multiplication (input clock × 1)		OFF	Low level	OFF	Low level
	Direct mode (Input clock × 1/2)			don't care	don't care	ON	High level
Target clock	PLL mode	×5 multiplication (input clock × 5)		ON	High level	OFF	Low level
		×1 multiplication (input clock × 1)		OFF	Low level	OFF	Low level
	Direct mode (Input clock ×1/2)			don't care	don't care	ON	High level

★ **2.2.3 When IE-703002-MC is used connected to option board**

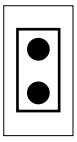
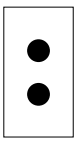
When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

2.3 Setting of Illegal Access Detection ROM

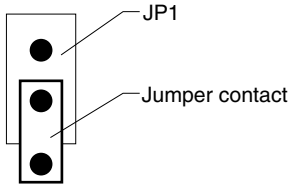
The JP1 setting contents in the pod differ depending on whether the IE-703002-MC is used for developing V852 application systems, or the IE-703002-MC is used for developing application systems using V853 and V850/Sxx products by connecting the option board (sold separately). (For the position of JP1, refer to **Figure 2-3 Pod (Top View)**.)

When the IE-703002-MC is used for developing V852 application systems, keep the JP1 in its factory-set position (shorted).

Remark The JP1 settings are as follows.

JP1		Description
Shorted (factory-set)		Set during V852 application system development
		Accesses illegal access detection ROM (Pod ROM) for V852
Open[Note]		Setting prohibited during V852 application system development
		Accesses illegal access detection ROM (ROM on option board) for V853 and V850/Sxx products (not V852)

Note When JP1 is set open, keep the removed jumper contact attached to one pin as shown in the drawing on the right.



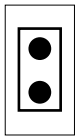
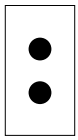
When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

2.4 Operating Voltage Setting

(1) JP3

The operating voltage range of the IE-703002-MC is set using JP3 in the pod. When the IE-703002-MC is used for developing application systems using the V852, V853 and V850/Sxx products keep JP3 as its factory-set position.

Remark The JP3 settings are as follows.

JP3		Description
Shorted (factory-set)		Set when developing V852 application system.
		Operating voltage range of IE-703002-MC is 3.0 to 5.5 V.
Open		Setting prohibited when developing V852 application system.
		Operating voltage range of IE-703002-MC is 3.0 to 3.6 V.

When the power of the target system is off or the IE-703002-MC is operated on a stand-alone basis, the operating voltage of the IE-703002-MC differs depending on the JP3 setting. (2-3 of JP4 shorted.)

Status of JP3	Operating Voltage of IE-703002-MC
Shorted	4.7 V
Open	3.3 V

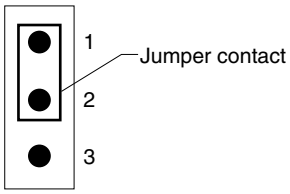
Therefore, if the IE-703002-MC is operated with an option board connected while JP3 is shorted, the option board, which should operate at 3.3 V will be damaged because 4.7 V, which is above the absolute maximum rating, is applied. It is therefore important to pay attention to the JP3 settings.

When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

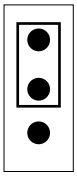
(2) JP4

Set JP4 of the pod in accordance with the input signal voltage from the target system.

Caution When the IE-703002-MC is used for developing application systems using the V852, make sure to change the JP4 setting as follows (1 to 3 indicate the pin number printed on the board.). Pay attention to the setting because it differs from the factory-set setting.



Remark The JP4 settings are as follows.

JP4		Description
1-2 shorted		Set when developing V852 application system.
		Power-supply voltage of target system is 4.5 V or higher. The IE-703002-MC operates at 5 V regardless of the target system supply voltage.

When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

CHAPTER 3 CONNECTION OF PARTS

The IE-703002-MC enables debugging and programming of target devices by connecting several parts and configuring the desired system.

This chapter describes the various parts and their connections. Read this chapter when connecting system parts. For the sequence of system configuration, refer to **1.7 Setup**. For details of software startup, refer to the user's manual of the debugger that is used.

3.1 Connection to Personal Computer

3.1.1 Overview of connection

The IE-703002-MC can use a personal computer (PC-9800 series or PC/AT compatible) as the host machine. The connection to each type of personal computer is described below.

(1) PC-9800 series

When using a PC-9800 series computer, insert the PC interface board (IE-70000-98-IF-C: Sold separately) in the external expansion slot in the PC-9800 series and connect the computer to the IE-703002-MC.

(2) PC/AT compatible

When using a PC/AT compatible, insert the following PC interface board in the external expansion slot of the PC/AT compatible and connect the computer to the IE-703002-MC.

- IE-70000-PC-IF-C: For ISA bus
- IE-70000-PCI-IF-A: For PCI bus (can also be used in PC98-NX series)

(3) Notebook-type personal computer

When using a notebook-type personal computer, insert the PC card interface (IE-70000-CD-IF-A: Sold separately) in the PC card slot of the computer and connect the computer to the IE-703002-MC.

3.1.2 Connection procedure

(1) Powering off

Perform connection while the power of each unit is off.

If the power of the IE-703002-MC or the PC is on, turn off the power first.

(2) PC interface board setting

Be sure to read the following section because the board settings differ depending on the board that is used.

(a) IE-70000-98-IF-C

The I/O addresses are set with DIP switch 1 (SW1) and DIP switch 2 (SW2) on the PC interface board. SW1 and SW2 are the handshake bus address setting switches. Set switches No. 1 to No. 8 of SW1 as shown in Figure 3-1 and switches No. 5 to No. 8 of SW2 as shown in Figure 3-2 (set to address 00D×H). Set INT JP to NO_USE and WAIT JP to the short between 2 and 3.

Figure 3-1. Setting of DIP Switch 1 (SW1) (IE-70000-98-IF-C)

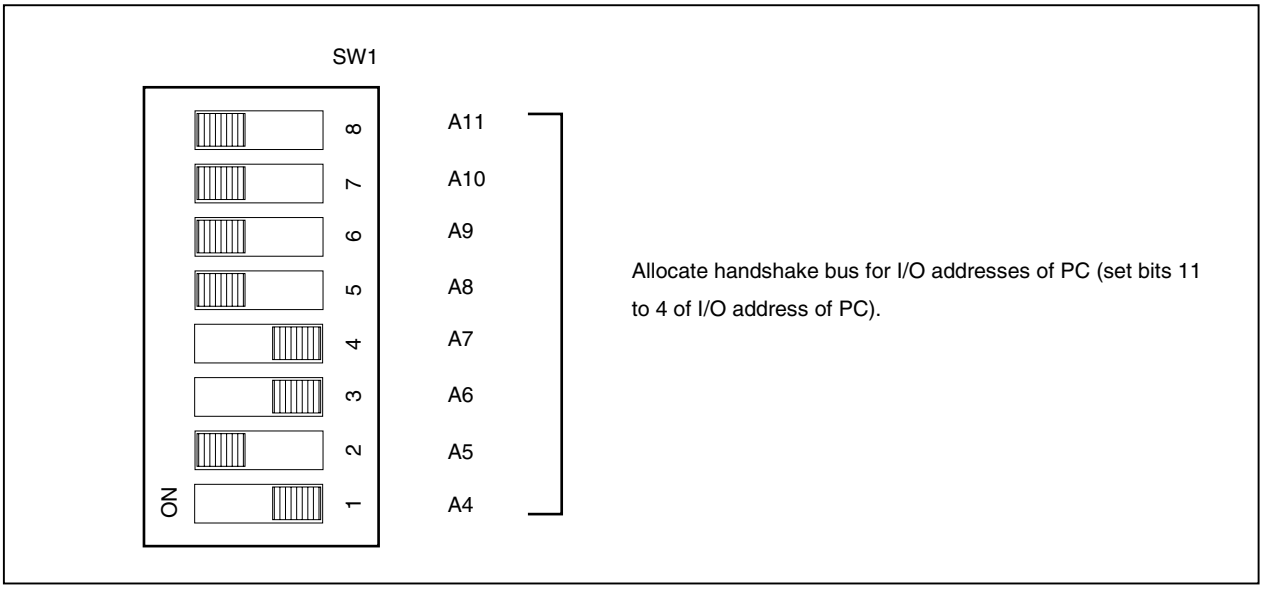
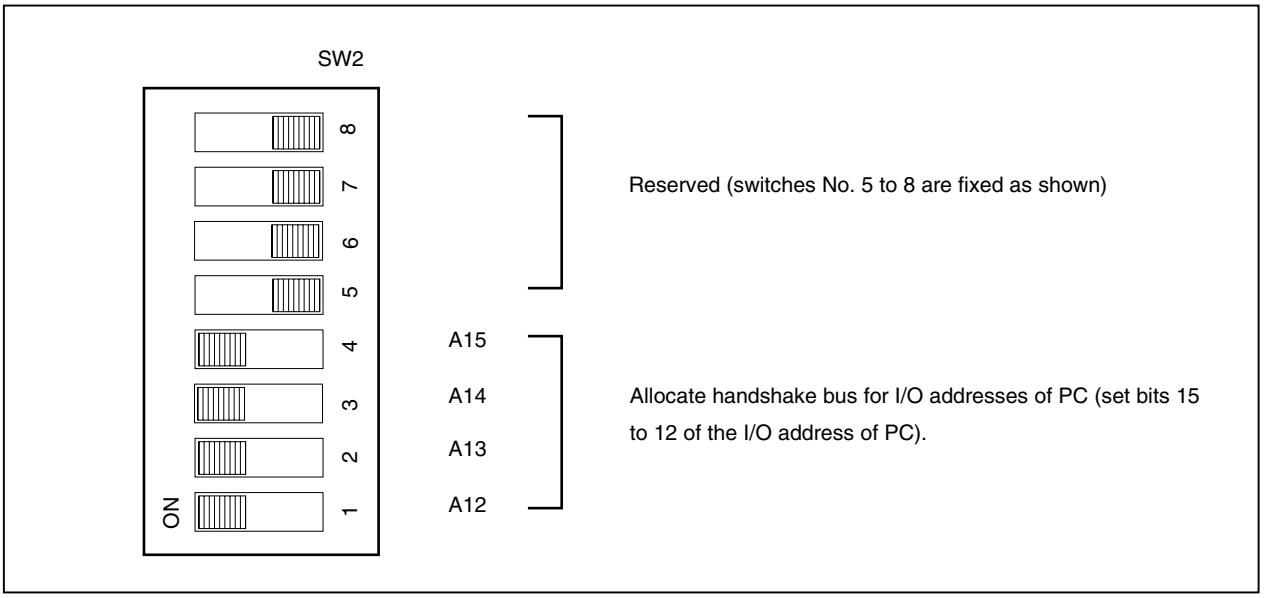


Figure 3-2. Setting of DIP Switch 2 (SW2) (IE-70000-98-IF-C)



(b) IE-70000-PC-IF-C

The I/O addresses are set with DIP switch 1 (SW1) and DIP switch 2 (SW2) on the PC interface board. SW1 and SW2 are setting switches of the handshake bus address. Set switches No. 1 to No. 8 of SW1 as shown in Figure 3-3 and switches No. 1 to No. 4 of SW2 as shown in Figure 3-4 (set to address 022×H). Set INT JP to NO_USE and WAIT JP to the short between 2 and 3.

Figure 3-3. Setting of DIP Switch 1 (SW1) (IE-70000-PC-IF-C)

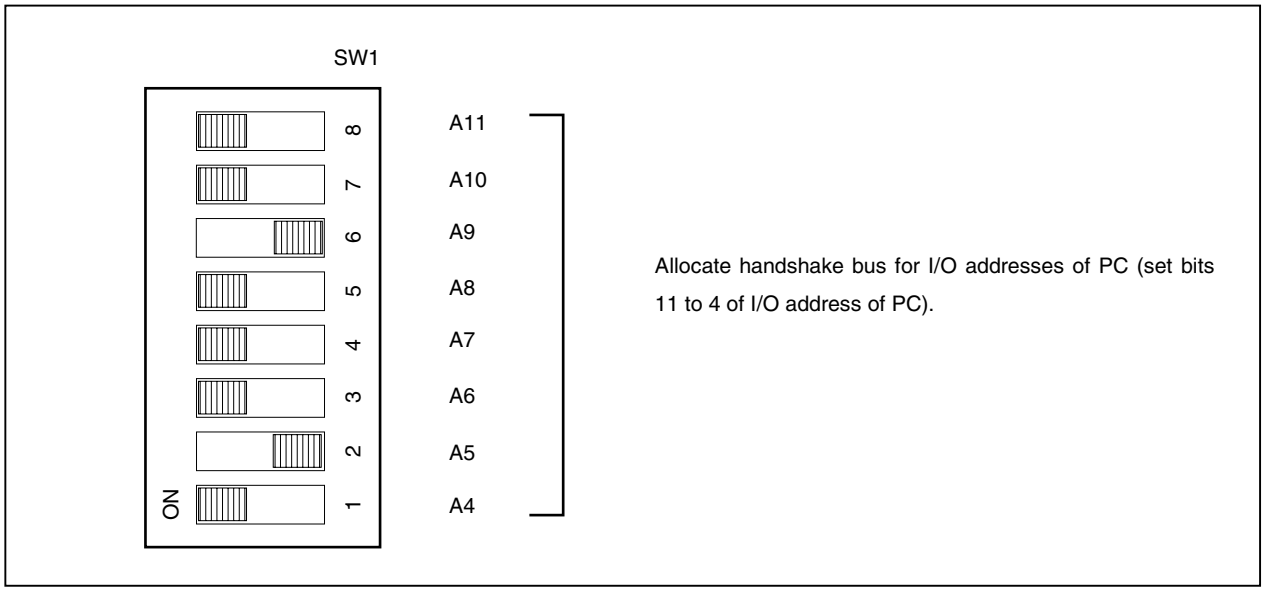
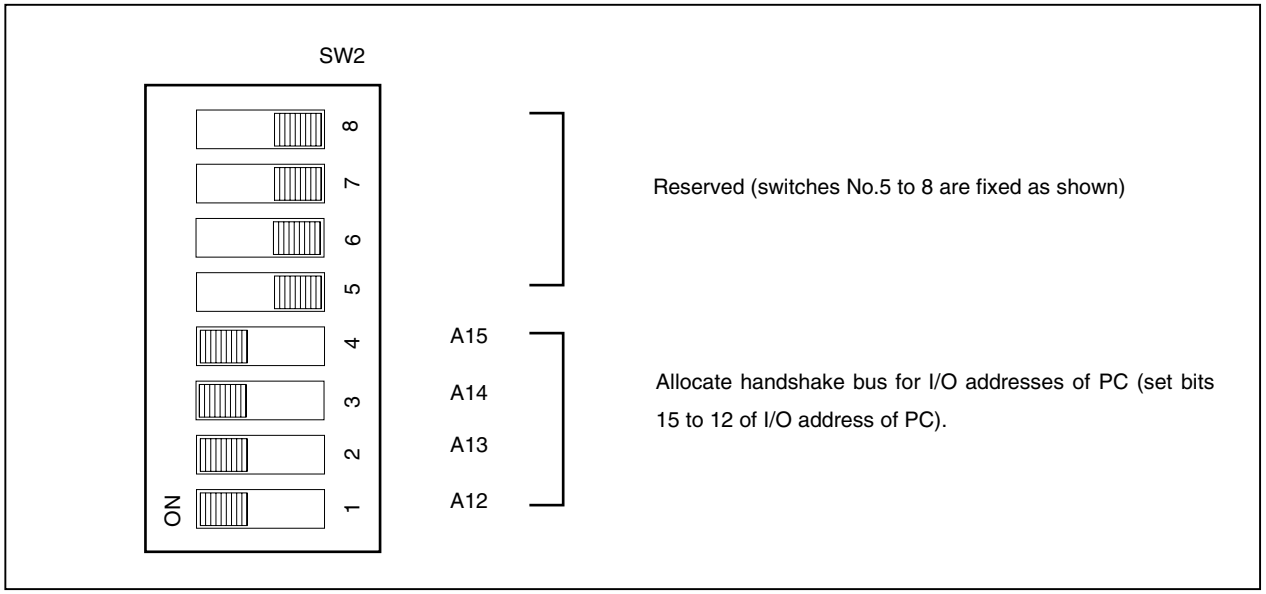


Figure 3-4. Setting of DIP Switch 2 (SW2) (IE-70000-PC-IF-C)

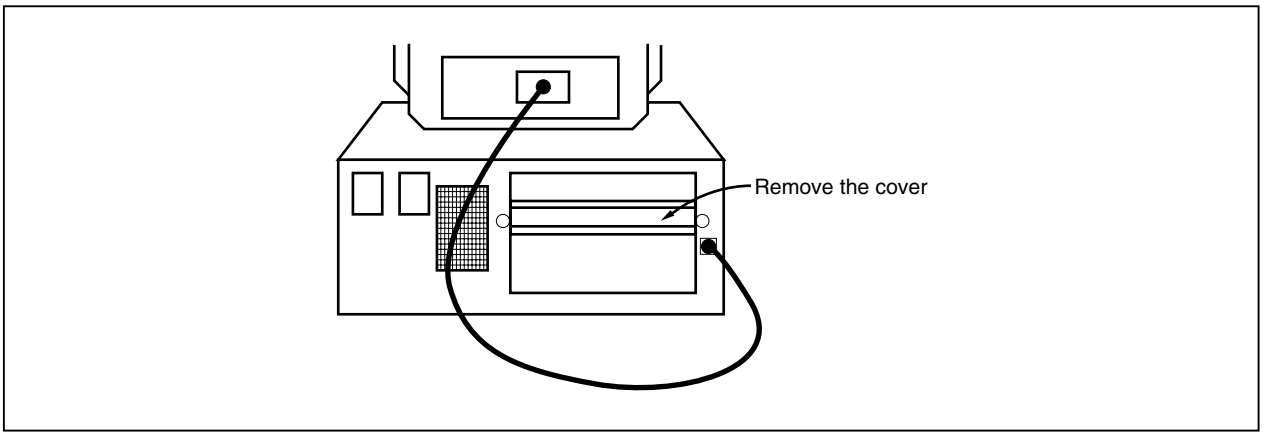


3.1.3 Personal computer setting

This section describes how to set and connect the interface board to the PC-9800 series computer add-on slot. Also refer to this section when connecting a PC/AT compatible.

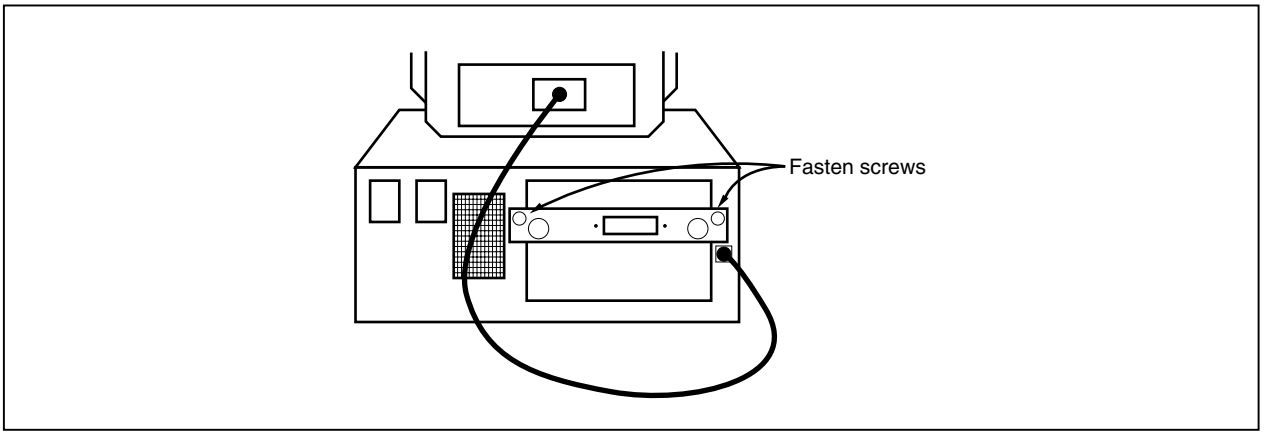
(a) Make sure that the PC-9800 series power is off before starting installation.
(b) Remove the cover of the add-on slot bus on the rear panel of the PC.

Figure 3-5. Rear Panel of PC-9800 Series



(c) Insert the PC interface board.
(d) Fasten the PC interface board with screws.

Figure 3-6. Insertion of PC Interface Board



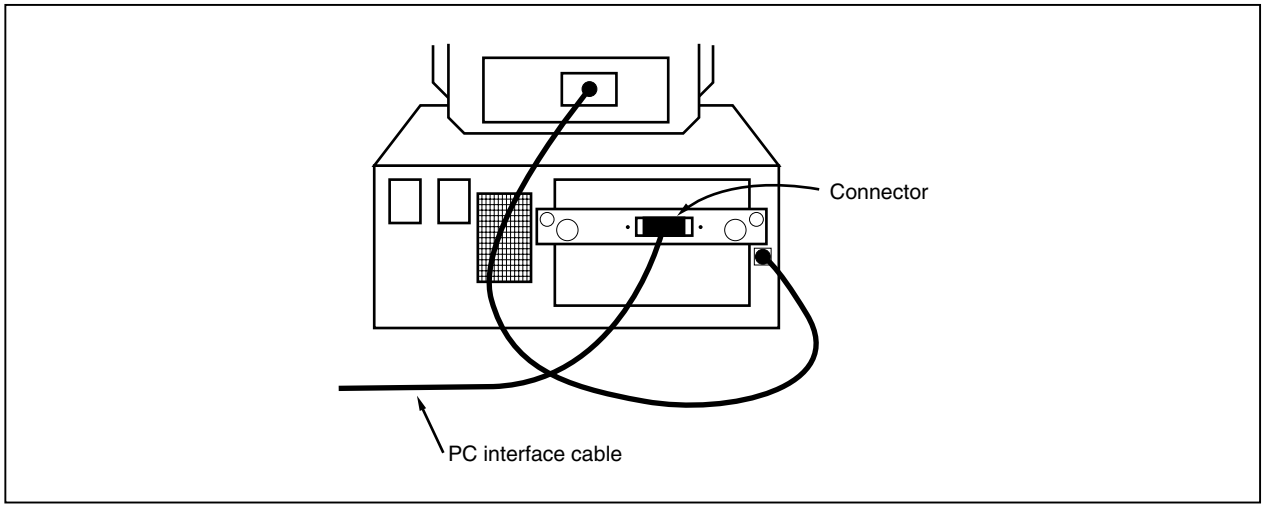
3.1.4 Connection of PC interface cable

Connect the PC interface cable to the interface board connector.

Figure 3-7 illustrates how to connect the PC interface cable.

Caution Connect to the CH1 connector when using the IE-70000-xx-IF-C.

Figure 3-7. Connection of Cable to PC Interface Board



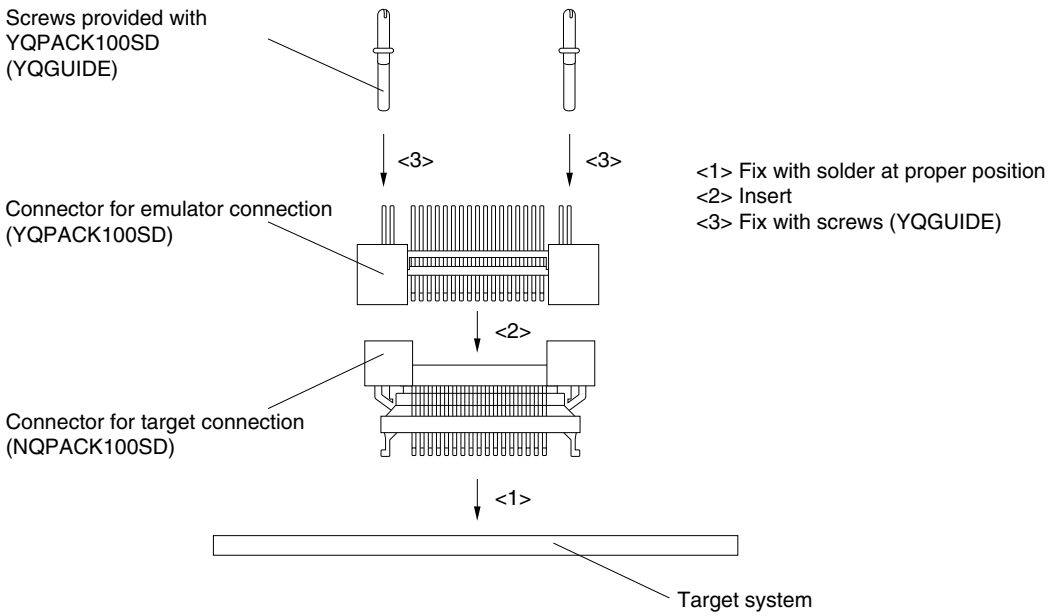
3.2 Connection to Target System

There are two connection methods: connecting the connection tab of the optional board to the target system directly and connecting the connection tab of the option board to the target system via an extension probe (sold separately).

When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

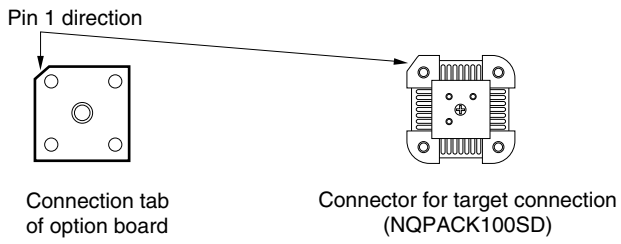
(1) Attach the connector for target connection (NQPACK100SD) and the connector for emulator connection (YQPACK100SD) to the target system.

Figure 3-8. Connection of Connector for Target Connection and Connector for Emulator Connection



Caution The connector for target connection (NQPACK100SD) has a pin 1 direction marking. Refer to Figure 3-9.

Figure 3-9. Pin 1 Direction Marking of Connector (Top View)



(2) Connect the connection tab of the option board to the target system directly or via the extension probe.
In either case, make sure that the pin 1 position (cutout corner of connector) is aligned.
The connection procedure is as follows.

Caution Be careful not to break or bend the pins of connector, socket, and extension probe when connecting.

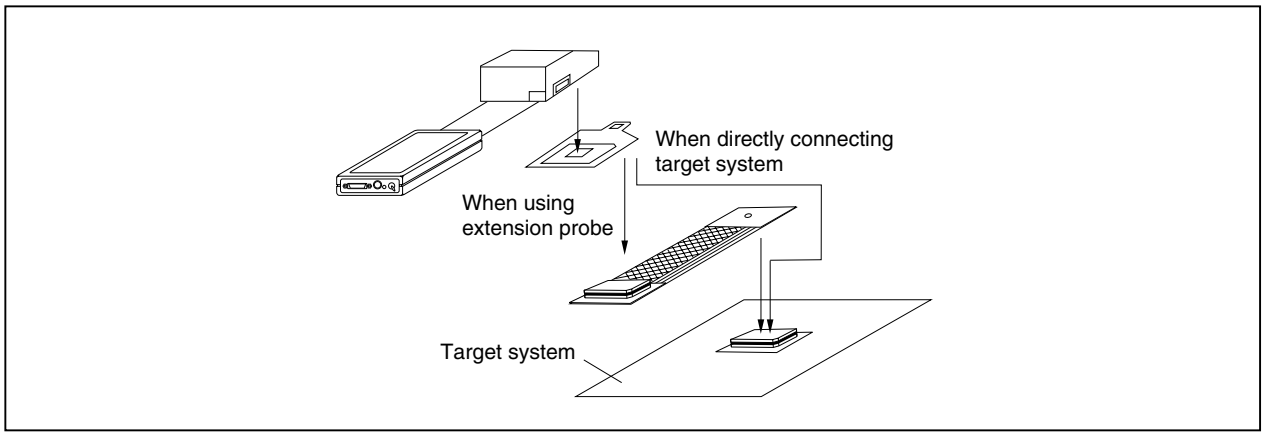
★ **(a) When connecting to target system directly**

<1> Turn off the power of the IE-703002-MC (power switch OFF).
<2> Connect the IE-703002-MC to the option board.
<3> Connect the connection tab of the option board to the target system.

★ **(b) When connecting to target system via extension probe**

<1> Turn off the power of the IE-703002-MC (power switch OFF).
<2> Connect the IE-703002-MC to the option board.
<3> Connect the extension probe to the option board.
<4> Connect the top of the extension probe to the target system.

★ **Figure 3-10. Connection of IE-703002-MC to Target System**



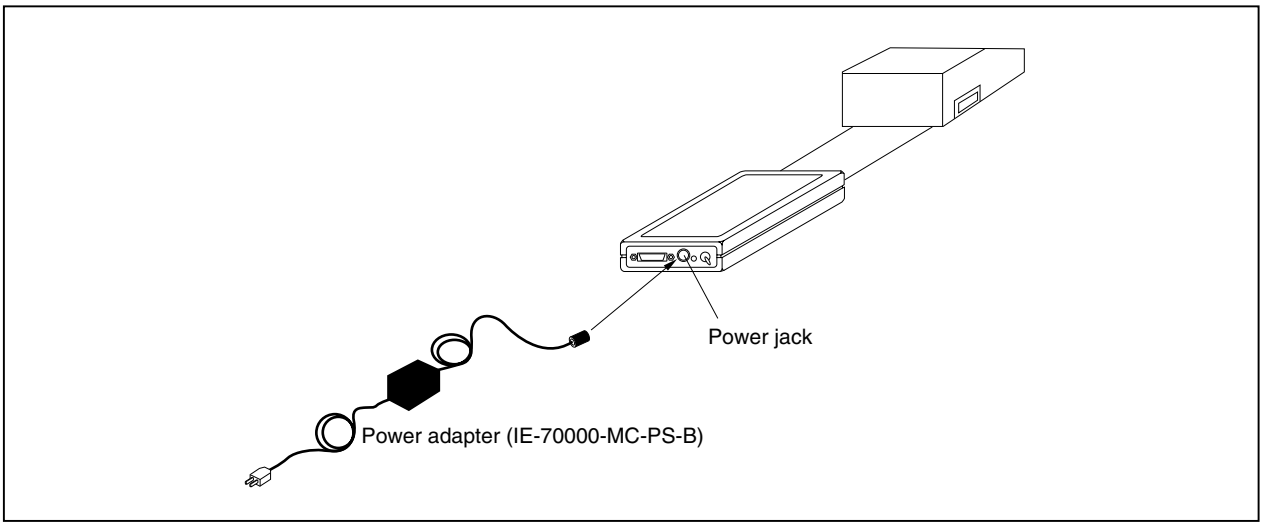
3.3 Cable Connections

3.3.1 Connection of power adapter

Insert the cable of the power supply adapter (IE-70000-MC-PS-B: Sold separately) to the power jack of the IE-703002-MC main part.

Caution Use only the IE-70000-MC-PS-B for power supply. Use of other power supplies may damage the IE-703002-MC due to different power jack polarity and voltage.

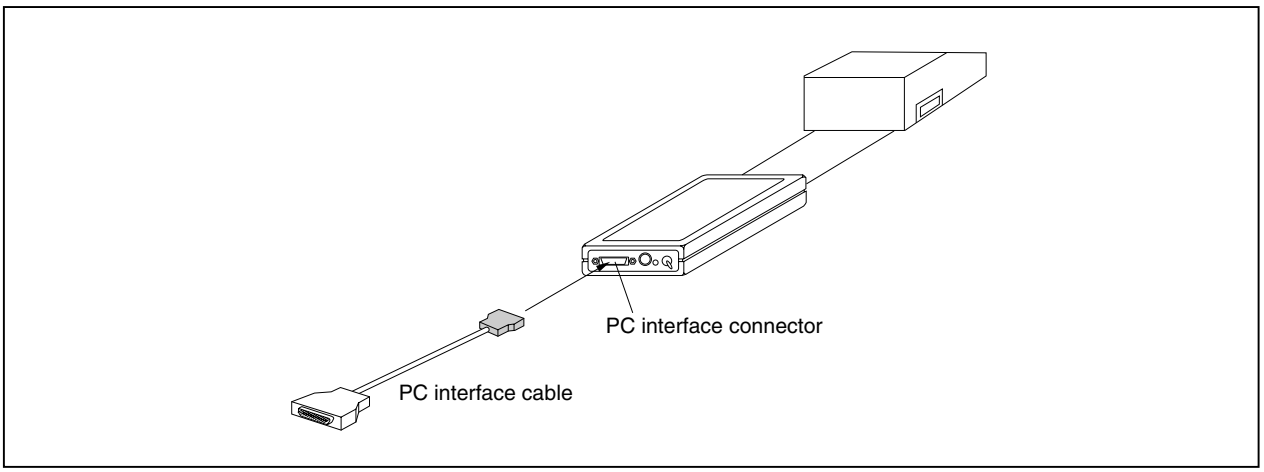
Figure 3-11. Power Adapter Connection



3.3.2 PC interface cable connection

Connect the PC interface cable to the PC interface connector of the IE-703002-MC.

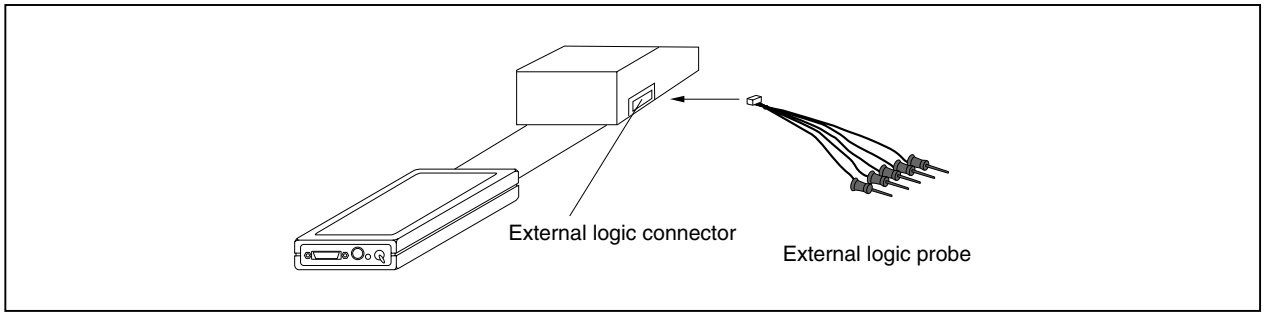
Figure 3-12. PC Interface Cable Connection



3.3.3 External logic probe connection

When using the external logic probe, connect to the 5-pin connector in the IE-703002-MC main unit.

Figure 3-13. External Logic Probe Connection



3.3.4 Additional information

The IE-703002-MC can perform real-time tracing of the emulation CPU bus cycle. In addition, an external logic probe is provided for the following three functions.
For details of their use, refer to the debugger user's manual.

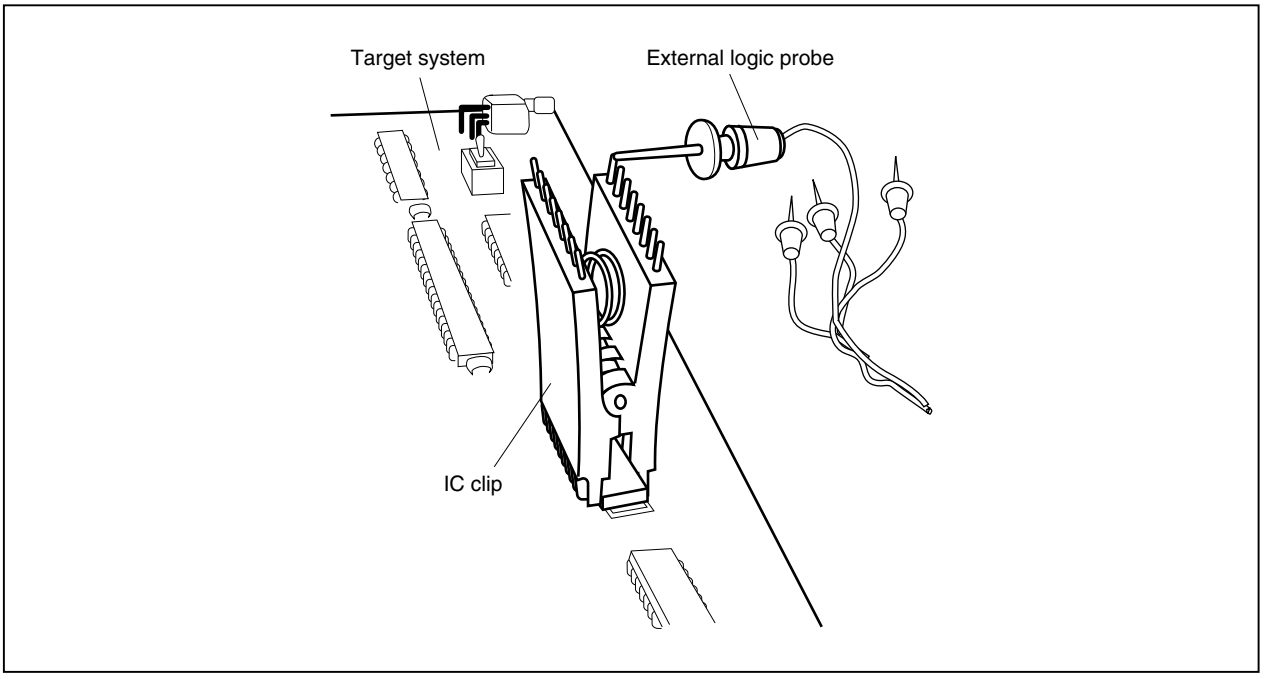
(1) Any four signals can be traced in real time.
(2) Tracer start/stop is enabled using any four signals.
(3) Break setting is enabled using any four signals.

Cautions 1. Connect the external logic probe only to a TTL-level signal line. The high level and low level cannot be detected correctly if connected to lines other than TTL-level signal lines. Note that the sensor of the IE-703002-MC may be damaged by an excessive voltage level.
2. When connecting the external logic probe, use commercially available IC clips.

Procedure

(1) Turn off the power of the target system.
(2) Turn off the power of the IE-703002-MC.
(3) Attach IC clips to a device on the target system.
(4) Connect the external logic probe to the included IC clips.
(5) Connect the GND of the external logic probe to the GND of the target system.

Figure 3-14. External Logic Probe Connection (Using IC Clip)



3.4 System Power-on and Power-off

After connecting the emulator and each system component (PC, target system, etc.), start up and shut down the system using the following procedure.

3.4.1 Power-on procedure

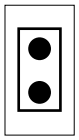
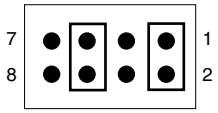
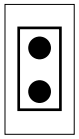
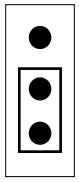
Cautions 1. Make sure that the IE-703002-MC is correctly connected to the PC.
2. If the IE-703002-MC is powered on using a procedure other than the following one, the emulator or the target system may be damaged.

(1) Turn on the power switch of the IE-703002-MC.
Set the power switch to “ON” after connecting the power adapter to the power jack of the IE-703002-MC and the plug to the power outlet.
(2) Turn on the power of the PC.
(3) Turn on the power of the target system.
(4) Start the debugger.

3.4.2 Power-off procedure

(1) Terminate the debugger.
(2) Turn off the power of the target system.
(3) Turn off the power of the PC.
(4) Turn off the power switch of the IE-703002-MC.

CHAPTER 4 FACTORY SETTINGS

Item		Setting	Description
IE-703002-MC	Power switch	OFF	Power off
Pod	SW1	ON	PLL mode (×5 multiplication: input clock × 5)
	SW2	OFF	
	JP1	 (Shorted)	Using illegal access detection ROM for V852
	JP2	 (1 to 2, 5 to 6 shorted)	Internal clock supply
	JP3	 (Shorted)	Operating voltage of IE-703002-MC is 3.0 to 5.5 V.
	JP4	 (2, 3 shorted)	Target system power voltage is 2 V or higher and lower than 4.5 V.

Remark The IE-703002-MC is provided with a 6.667 MHz crystal oscillator when shipped from the factory. When the factory setting of the pod is used, the emulation CPU of the IE-703002-MC operates at 33 MHz.

CHAPTER 5 OPTION BOARD

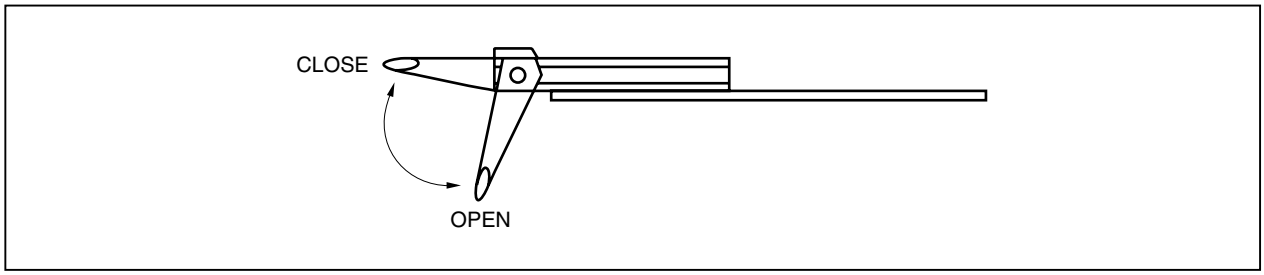
The IE-703002-MC can be used as an in-circuit emulator for developing systems using V853 and V850/Sxx products (but not the V852) by connecting an option board (sold separately).

Execute the following sequence if the IE-703002-MC is used as an in-circuit emulator for V853 and V850/Sxx products (not V852).

(1) Remove the covers (upper side and lower side) of the pod of the IE-703002-MC.
(2) Set the option board PGA socket lever to the OPEN position as shown in Figure 5-1.
(3) Connect the option board to the PGA socket at the back of the pod. When connecting, position the IE-703002-MC and the option board horizontally.
(4) Set the option board PGA socket lever to the CLOSE position as shown in Figure 5-1.
(5) Set the jumpers (JP1 to JP4) and switches (SW1 and SW2). Open JP1 (remove jumper contact. Attach the removed jumper contact to one of the jumper pins to avoid losing it). Set JP2 to JP4, and SW1 and SW2 depending on the use.
(6) Secure the pod covers (upper and lower) to the option board with the provided plastic screws.
(7) Secure the end of the pod cover (upper) with nylon rivets.

Remark For details, refer to the in-circuit emulator user's manual for the V853 or V850/Sxx product used.

Figure 5-1. Option Board PGA Socket Lever



CHAPTER 6 CAUTIONS

This chapter describes specification differences between the IE-703002-MC and the devices of the V850 Series. Keep these differences in mind when using the IE-703002-MC.

6.1 LED Display

Under the following conditions, the LED of the IE-703002-MC lights weakly even when the power is off.

The power of the personal computer is on while the personal computer and the IE-703002-MC are connected via the PC interface cable.

Caution Disconnect the PC interface cable after turning off all system parts.

6.2 Operating Voltage

There are the following differences between the target system supply voltage and the IE-703002-MC operating voltage.

Table 6-1. Differences Between Target System Supply Voltage and IE-703002-MC Operating Voltage

Target System Supply Voltage	IE-703002-MC Operating Voltage		
	JP4: 2-3 Shorted		JP4: 1-2 Shorted
	JP3: Shorted	JP3: Open	
5.0 V	(4.7 V)[Note 1]	(4.7 V)[Note 1]	5.0 V
4.5 V	4.5 V	(4.5 V)[Note 1]	(5.0 V)[Note 1]
4.0 V	4.0 V	(4.0 V)[Note 1]	
3.5 V	3.5 V	3.5 V	
3.0 V	3.0 V	3.0 V	
Less than 1.2 V	(4.7 V)[Note 1]	(3.3 V)[Note 1]	
No target system	4.7 V[Note 2]	3.3 V[Note 3]	5.0 V

Notes 1. In the actual operation, this combination between the setting and the target system voltage does not exist.

2. The IE-703002-MC assumes that the target system is off, or that is not connected.
As a result, the IE-703002-MC operates at 4.7 V, which provides the highest speed of operation on a stand-alone basis.

3. Setting that debugs a CPU with a voltage range of 3.0 to 3.6 V.
The IE-703002 operates at 3.3 V when operating on a stand-alone basis.

6.3 Internal RAM and ROM

Because the internal RAM (iRAM) and internal ROM (iROM) capacities of the IE-703002-MC are set in steps, the memory capacity differs from that of the target device. If addresses that exceed the target device capacity are accessed, the memory of the IE-703002-MC is accessed. The memory capacities are as follows.

Table 6-2. Memory Capacity Limitation List

(a) iRAM capacity (Unit: Bytes)

Target Device	IE-703002-MC
1 K	1 K
2 K	2 K
3 K (V852)	3 K
4 K	4 K
5 K to 6 K	6 K
7 K to 8 K	8 K
9 K to 10 K	10 K
11 K to 12 K	12 K
13 K to 16 K	16 K
17 K to 20 K	20 K
21 K to 24 K	24 K
25 K to 28 K	28 K

(b) iROM capacity (Unit: Bytes)

Target Device	IE-703002-MC (Emulation Memory)
1 K to 32 K	32 K
33 K to 64 K	64 K
65 K to 128 K (V852)	128 K
129 K to 256 K	256 K
257 K to 512 K	512 K
513 K to 1024 K	512 K

Remark The IE-703002-MC incorporates 512 KB of iROM emulation memory.

6.4 Target System V_{DD}

The target system V_{DD} is not connected to the IE-703002-MC V_{DD}. The IE-703002-MC uses the target system V_{DD} for the following purposes.

- Power ON/OFF detection of the target system
- Supply voltage emulation of the target system

6.5 Pin Handling

(1) MODE0 and MODE1 pins

When the IE-703002-MC is operated on a stand-alone basis, the MODE0 and MODE1 pins are set to operate in single mode as follows.

- MODE0: Pull down via 33 kΩ resistor
- MODE1: Pull up via 5.1 kΩ resistor

(2) $\overline{\text{RESET}}$ pin

Pull up via 5.1 kΩ resistor

(3) $\overline{\text{WAIT}}$ pin

Pull up via 5.1 kΩ resistor

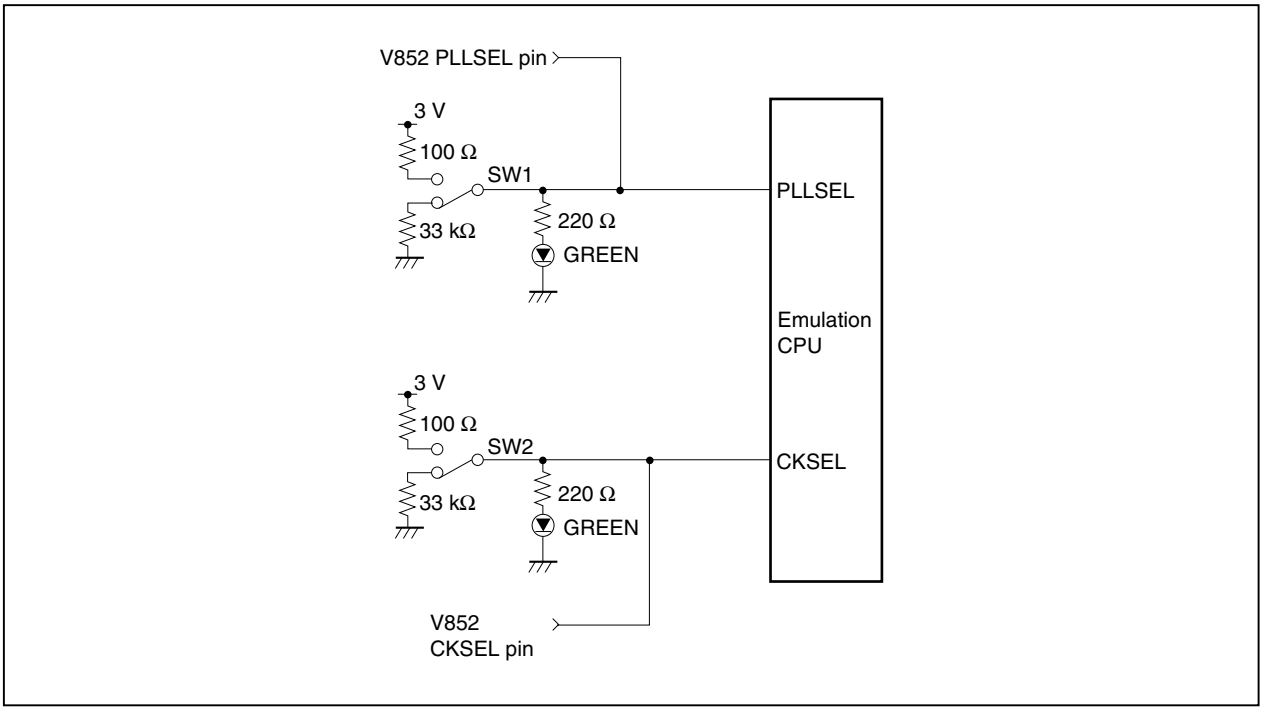
(4) CKSEL pin

SW1 in the pod can switch the CKSEL pin between a pull-up/pull-down resistor.

(5) PLLSEL pin (V852)

SW2 in the pod can switch the PLLSEL pin between a pull-up/pull-down resistor.

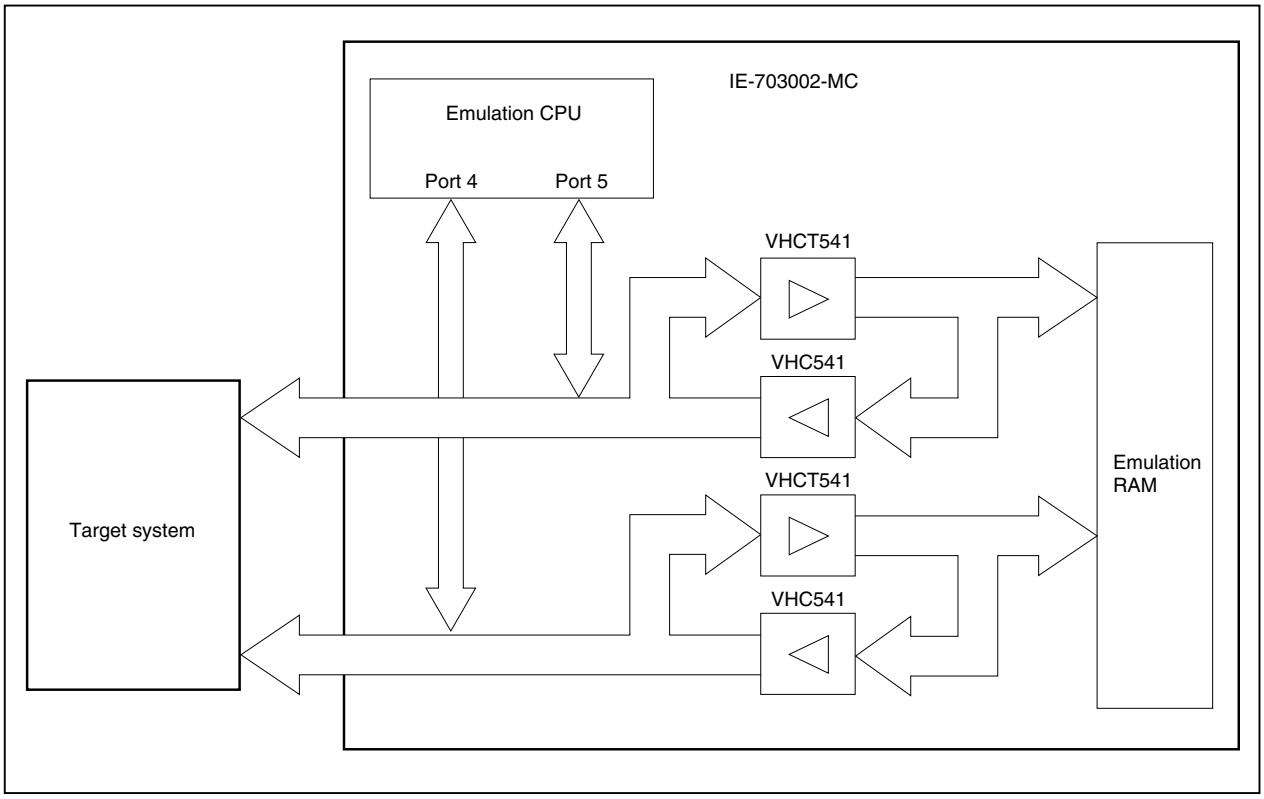
Figure 6-1. Circuit Diagram of PLLSEL Pin and CKSEL Pin



6.6 Port 4, Port 5

The connection of VHCT541 and VHC541 to Port 4 and Port 5 is as shown below.

Figure 6-2. Circuit Diagram of Port 4, Port 5



When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

6.7 Bus Interface Pins

There are the following differences in the operation of bus interface pins between the IE-703002-MC and the target device.

Table 6-3. Bus Interface Pin Operation List (1/2)

(a) During break

Pin Name	Internal Memory								External Memory			
	Memory Used by IE-703002-MC			Internal ROM	Internal RAM		Internal I/O		Emulation RAM (IE-703002-MC)		Target System	
	F	R	W	R	R	W	R	W	R	W	R	W
A16 to A19	Retains the address accessed last								Active		Active	
AD0 to AD15	Hi-Z											
ASTB	H											
R/$\overline{W}$	H											
$\overline{DSTB}$	H								H			
$\overline{LBEN}$	H								Active			
$\overline{UBEN}$	H											
$\overline{WAIT}$	Invalid								Valid		Valid	
$\overline{HLDRQ}$	Valid											
$\overline{HLDAK}$	H or L								H or L		H or L	
ST0	H								L		L	
ST1	H								H		H	

Remarks 1. F: Fetch
R: Read
W: Write

2. H: High-level output
L: Low-level output
Hi-Z: High impedance

When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

Table 6-3. Bus Interface Pin Operation List (2/2)

(b) During run

Pin Name	Internal Memory							External Memory					
	Internal ROM		Internal RAM			Internal I/O		Emulation RAM (IE-703002-MC)			Target System		
	F	R	F	R	W	R	W	F	R	W	F	R	W
A16 to A19	Retains the address accessed last							Active			Active		
AD0 to AD15	Hi-Z												
ASTB	H												
R/$\overline{W}$	H												
$\overline{DSTB}$	H							H					
$\overline{LBEN}$	H							Active					
$\overline{UBEN}$	H												
$\overline{WAIT}$	Invalid							Valid			Valid		
$\overline{HLDRQ}$	Valid												
$\overline{HLDAK}$	H or L							H or L			H or L		
ST0	L							**Note**	L		**Note**	L	
ST1	L								H			H	

Note ST0, ST1 = H, L or ST0, ST1 = L, H

Remarks 1. F: Fetch
R: Read
W: Write
2. H: High-level output
L: Low-level output
Hi-Z: High impedance

6.8 Operating Frequency of IE-703002-MC

The IE-703002-MC is provided with a 6.667 MHz crystal oscillator when shipped from the factory (maximum frequency: 33 MHz).

If this emulator is used to develop application systems using the V852, replace the oscillator with an oscillator of following frequency in accordance with the clock mode setting (refer to **2.2 Clock Setting**).

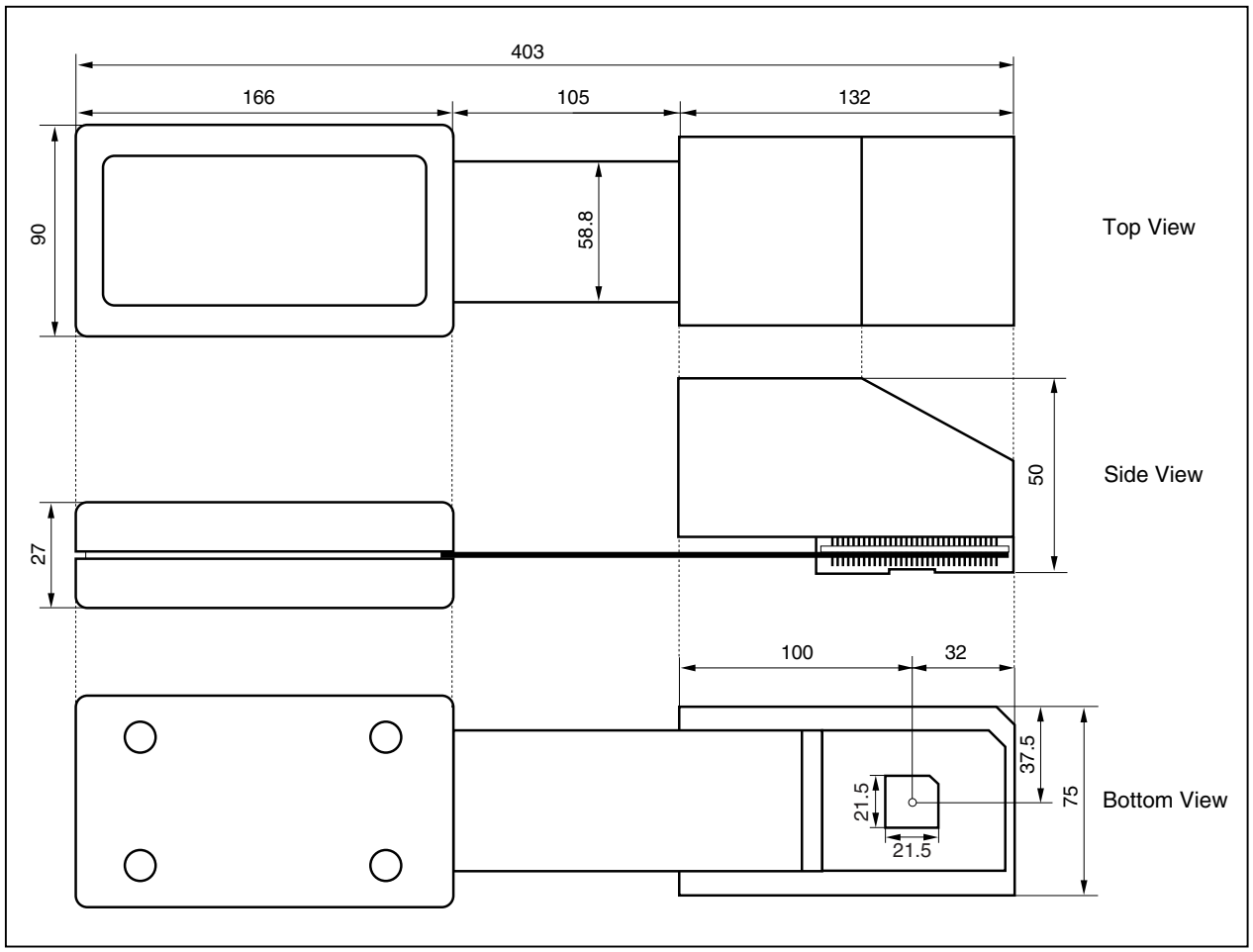
Table 6-4. List of Oscillator Frequencies for Clock Modes

Clock Mode		Crystal Oscillator Frequency
PLL mode	×5 multiplication	5 MHz
	×1 multiplication	25 MHz
Direct mode		50 MHz

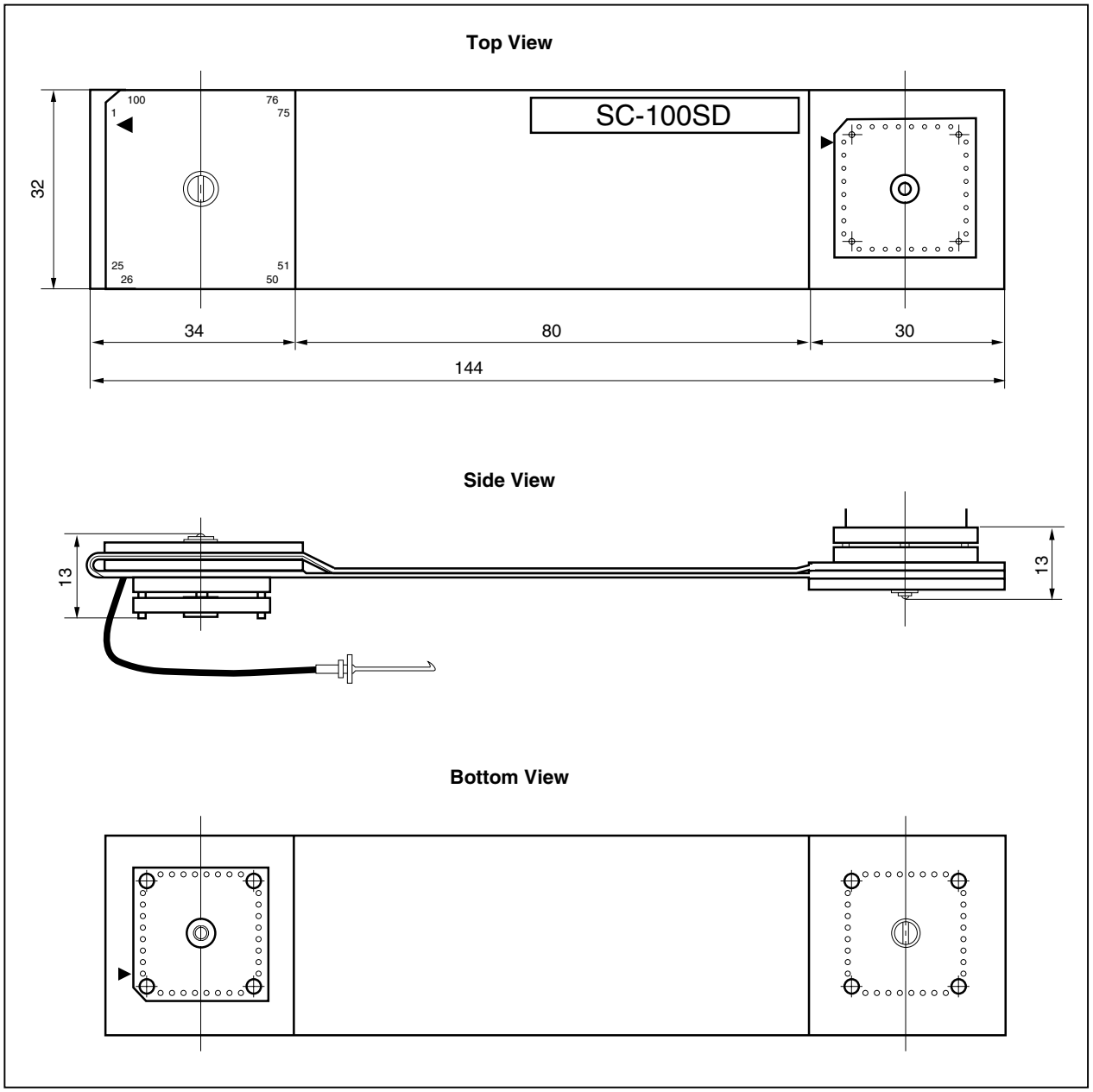
When the IE-703002-MC is used for developing application systems using V850/Sxx products by connecting an option board, apply the settings specified in the user's manual of the option board used.

APPENDIX A PACKAGE DRAWINGS

(1) IE-703002-MC (Unit: mm)

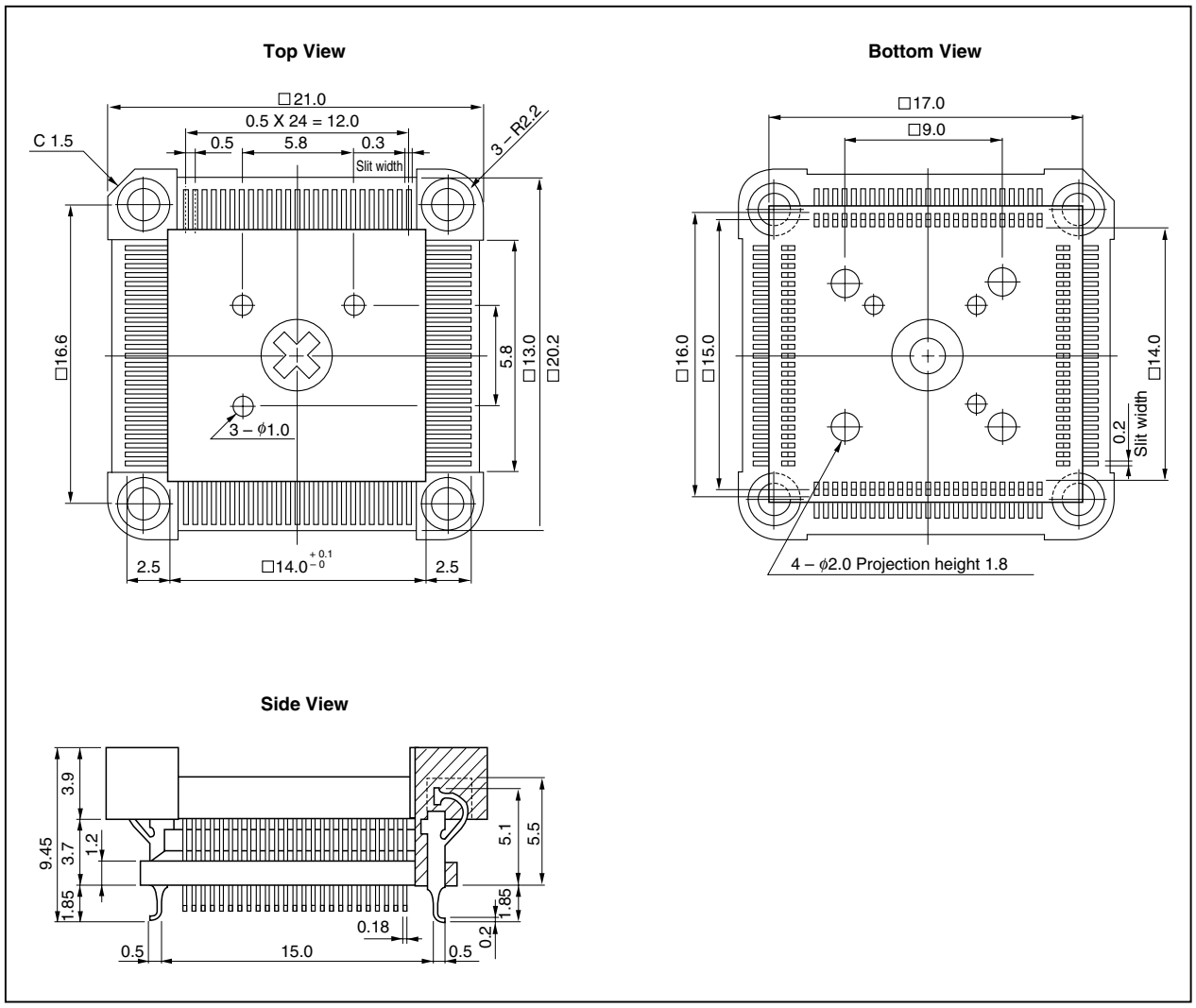


(2) SC-100SD (Unit: mm)



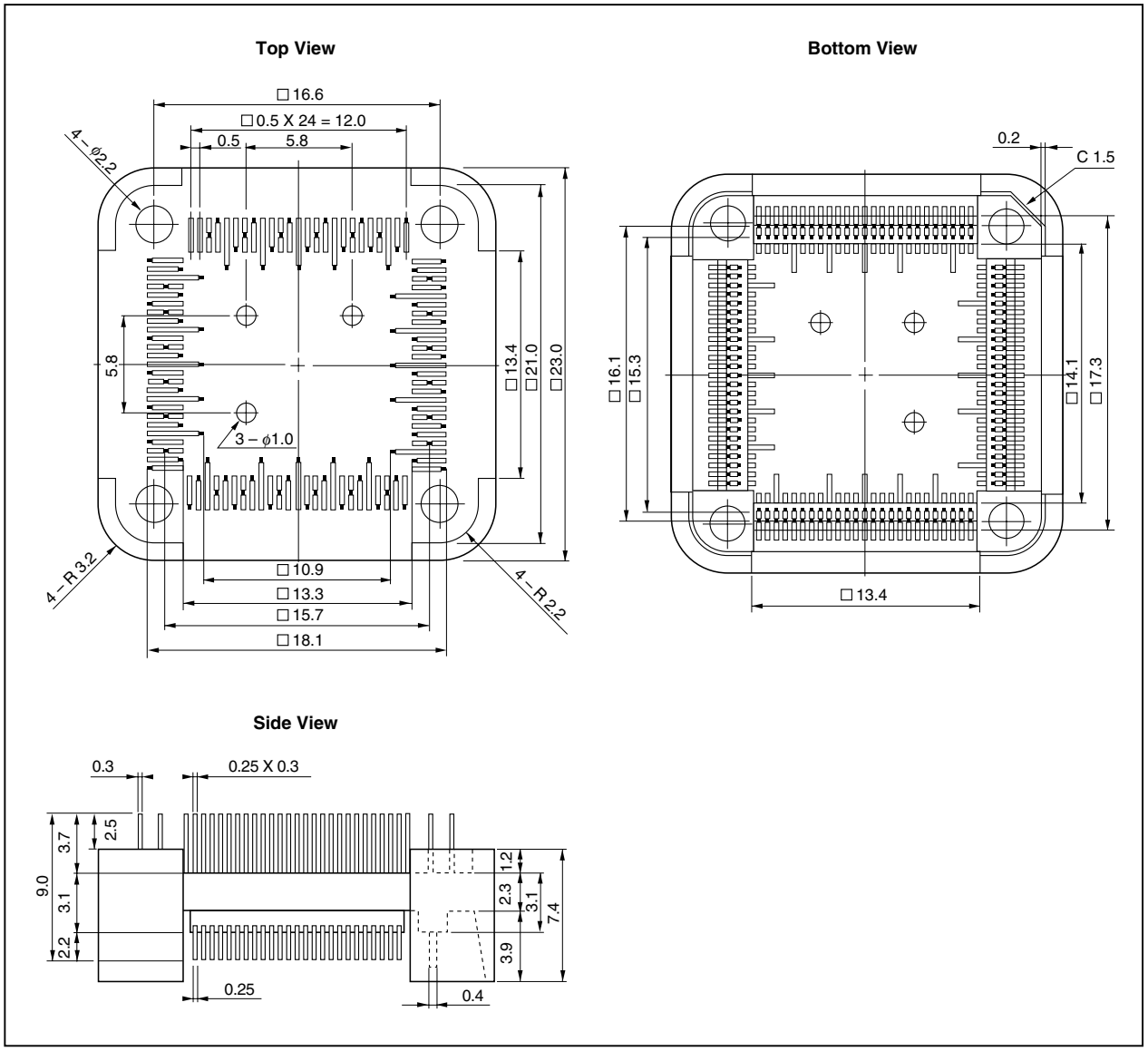
Remark SC-100SD is a product of TOKYO ELETECH CORPORATION.

(3) NQPACK100SD (Unit: mm)



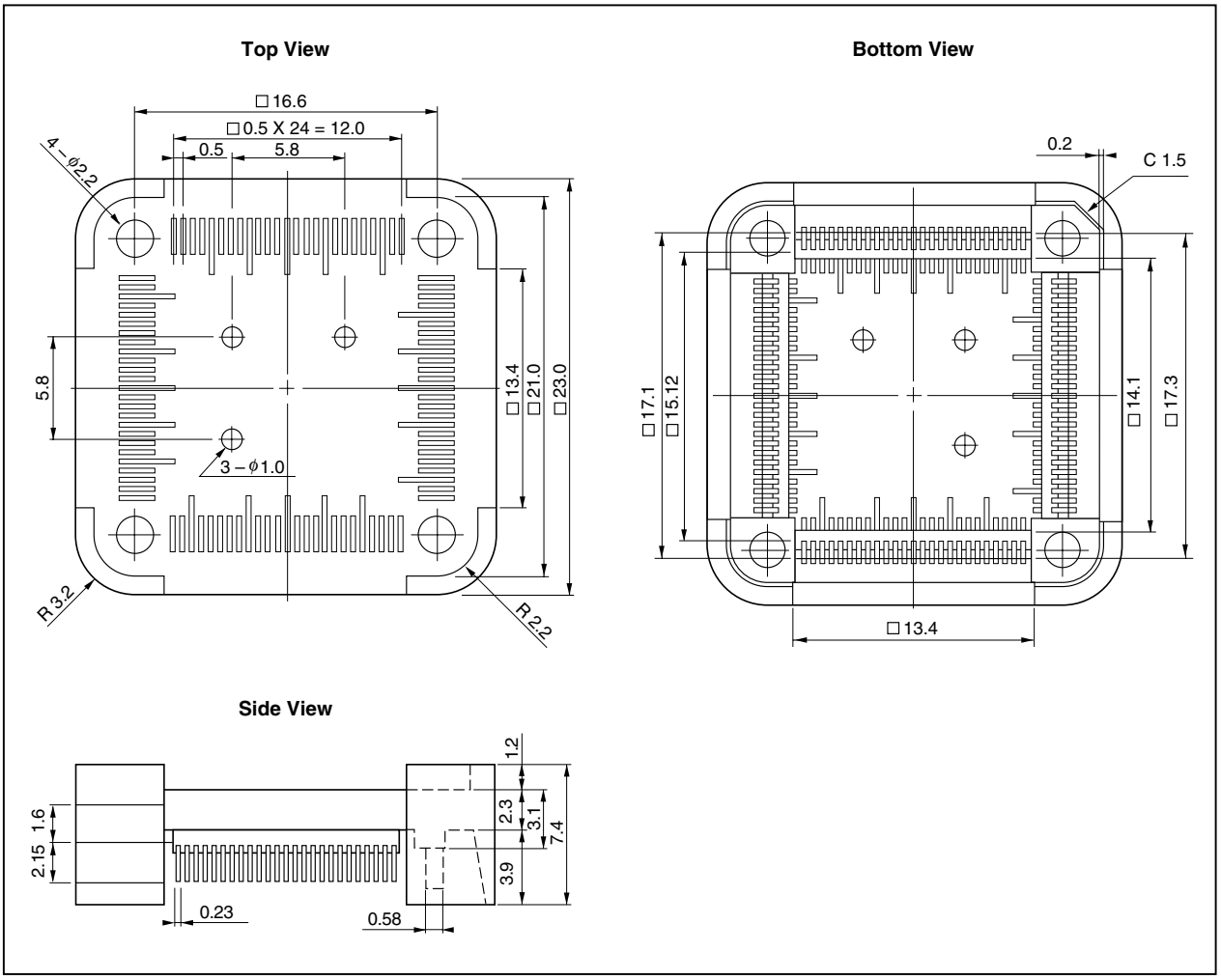
Remark NQPACK100SD is a product of TOKYO ELETECH CORPORATION.

(4) YQPACK100SD (Unit: mm)



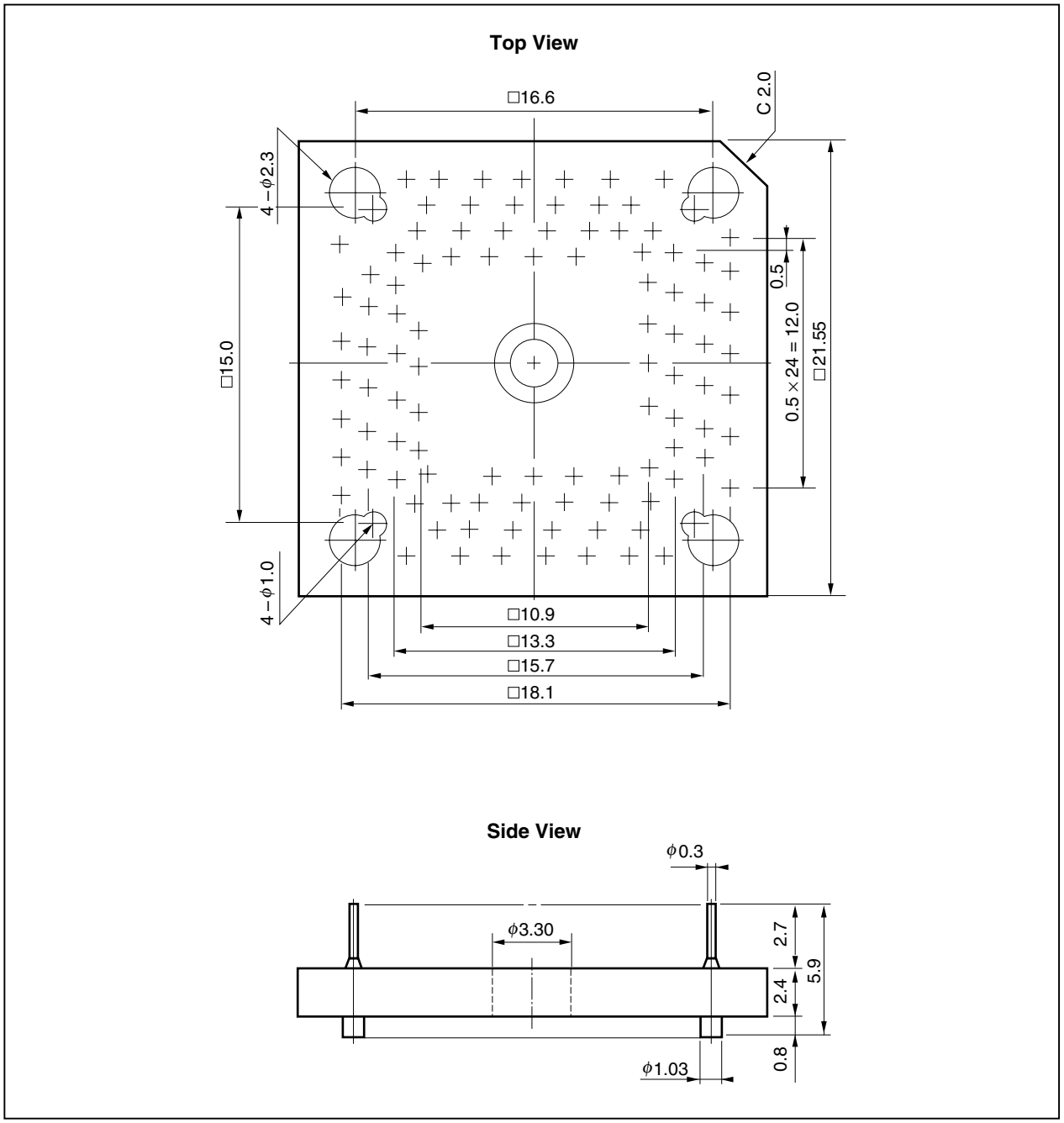
Remark YQPACK100SD is a product of TOKYO ELETECH CORPORATION.

(5) HQPACK100SD (Unit: mm)



Remark HQPACK100SD is a product of TOKYO ELETECH CORPORATION.

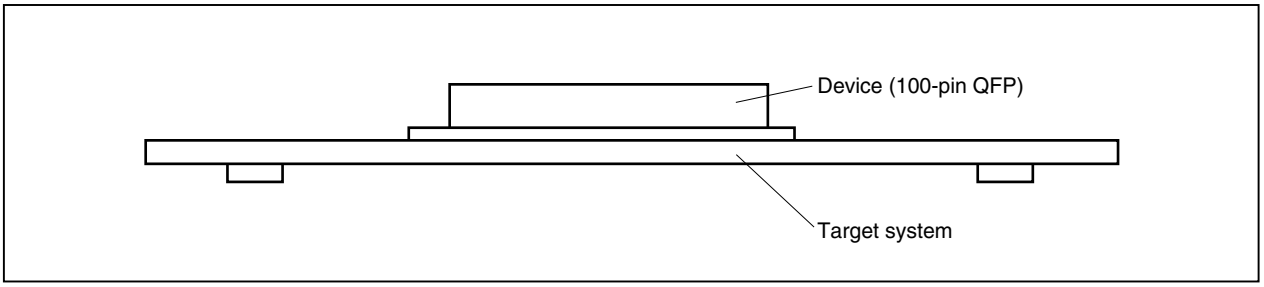
(6) YQSOCKET100SDN (Unit: mm)



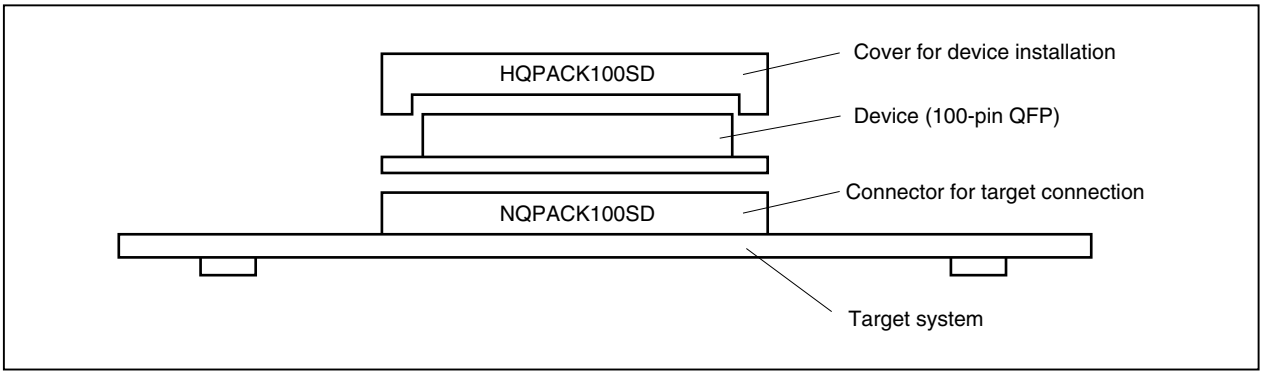
Remark YQSOCKET100SDN is a product of TOKYO ELETECH CORPORATION.

APPENDIX B APPLICATION EXAMPLES OF CONNECTOR FOR TARGET CONNECTION

(1) When attaching device directly to target system

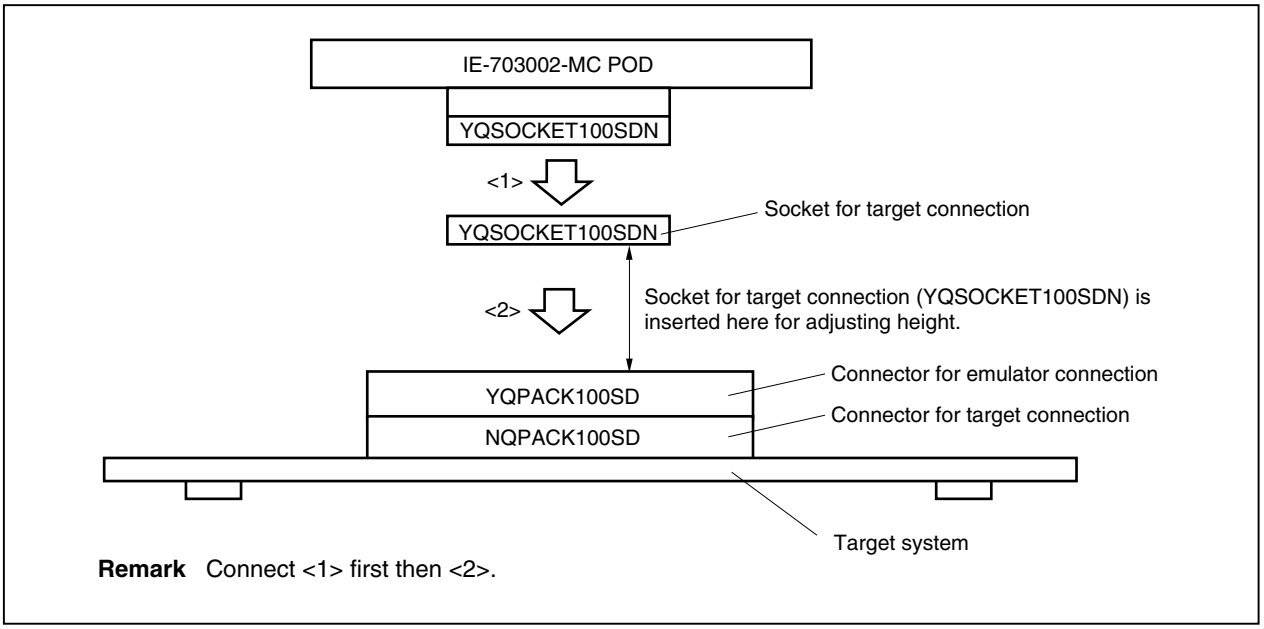


(2) When using device with connector for target connection



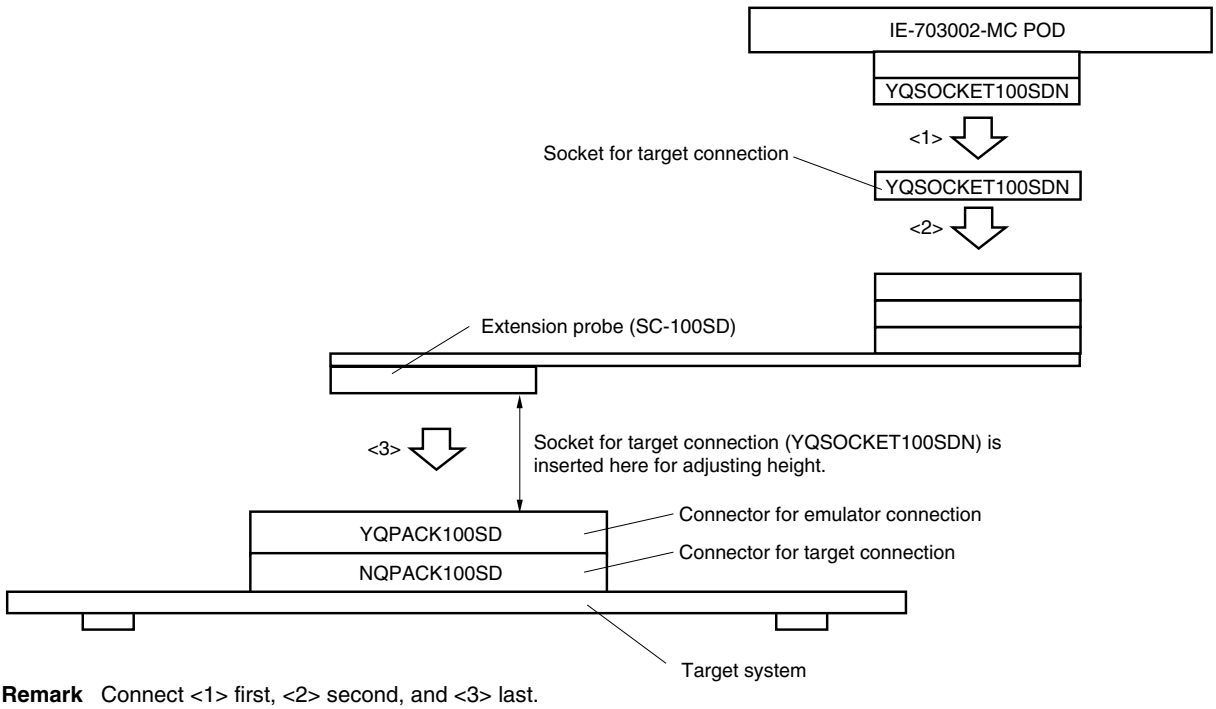
(3) Connection between IE-703002-MC and target system

(a) When extension probe is not used



Remark Connect <1> first then <2>.

(b) When using extension probe



Remark Connect <1> first, <2> second, and <3> last.

APPENDIX C CONNECTORS FOR TARGET CONNECTION

C.1 Use

(1) When mounting the NQPACK100SD in target system

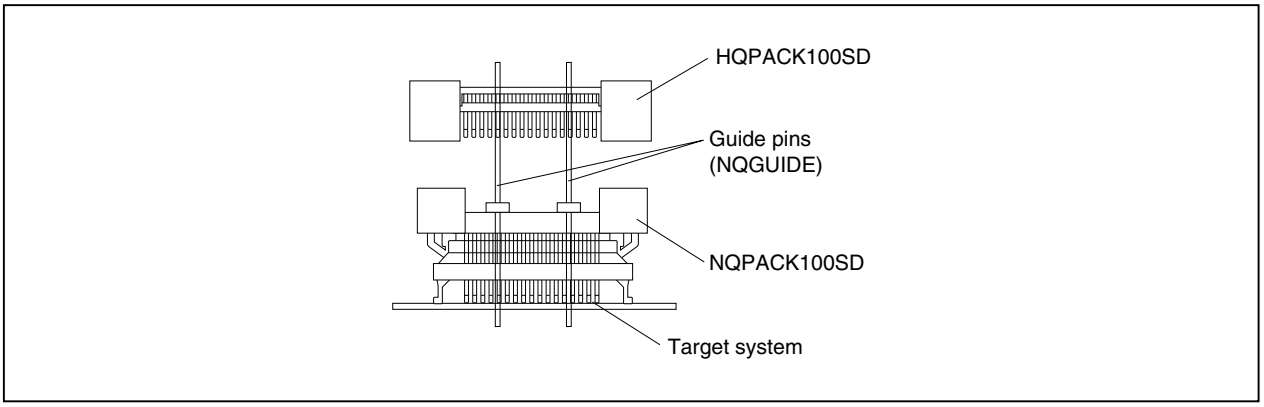
<1> Coat the tips of the four projections at the bottom of the NQPACK100SD with a two-component type epoxy adhesive (cure time longer than 30 minutes), and bond the NQPACK100SD to the target system. If not bonded correctly, the pad of the print board may peel off when removing the IE-703002-MC.
If the lead of the NQPACK100SD does not match the pad of the target system easily, perform step <2> to adjust the position.

<2> Insert the guide pins provided with the NQPACK100SD into the pin holes at the upper side of the NQPACK100SD to adjust the position (refer to **Figure C-1**).
There are three 1.0 mm diameter non-through holes (refer to **APPENDIX A PACKAGE DRAWINGS**).

<3> After setting the HQPACK100SD, solder the NQPACK100SD onto the target system. By following this sequence, flux or solder sputtering and adhering to contact pins of the NQPACK100SD can be avoided.
Recommended soldering conditions Reflow: 240°C, 20 sec. max.
Partial heating: 240°C, 10 sec. max. (per pin)

<4> Remove the guide pins.

Figure C-1. Mounting of NQPACK100SD



Remark NQPACK100SD: Connector for target connection
HQPACK100SD: Cover for device installation

(2) When setting device

Caution Check for abnormal conditions such as resin burrs or bent pins before setting a device on the NQPACK100SD. Moreover, check that the hold pins of the HQPACK100SD are not broken or bent before setting the HQPACK100SD. If there are broken or bent pins, fix them with a thin, flat plate such as a blade.

<1> Make sure that the NQPACK100SD is clean and the device pins are parallel (flat) before setting a device on the NQPACK100SD. Then, after mounting the NQPACK100SD on the target board, set the device and HQPACK100SD (refer to **Figure C-2**).

<2> Using the screws provided with the HQPACK100SD (four locations: M2 × 6 mm), secure the HQPACK100SD, device, and NQPACK100SD.
Tighten the screws in a crisscross pattern with the provided screwdriver or a screwdriver with a torque gauge (avoid tightening only one screw strongly). Tighten the screws with 0.55 kg·f·cm (0.054 N•m) max. torque. Excessive tightening may disminish conductivity.
At this time, each pin is fixed inside the plastic wall dividers by the contact pin of the NQPACK100SD and the hold pin of the HQPACK100SD (refer to **Figure C-3**). Thus, pins cannot cause shorting with pins of neighboring devices.

Figure C-2. Mouting Device

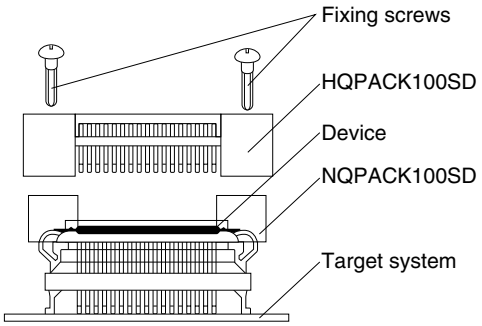
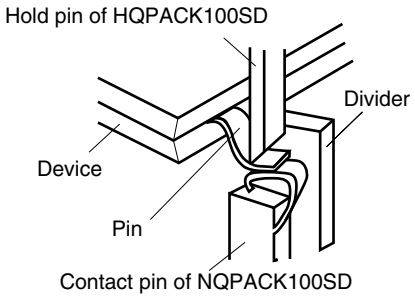


Figure C-3. NQPACK100SD and Device Pin



C.2 Cautions on Handling Connectors

(1) When unpacking connectors, first remove the sponge while holding the connector.

(2) When soldering the NQPACK100SD to the target system, cover it with the HQPACK100SD to avoid flux sputtering.
Recommended soldering conditions ··· Reflow: 240°C, 20 sec. max.
Partial heating: 240°C, 10 sec. max. (per pin)

(3) Check for abnormal conditions such as resin burrs or bent pins before setting a device on the NQPACK100SD. Moreover, check that the hold pins of the HQPACK100SD are not broken or bent before setting the HQPACK100SD. If there are broken or bent pins, fix them with a thin, flat plate such as a blade.

(4) When securing the YHQPACK100SD (connector for emulator connection) or the HQPACK100SD to the NQPACK100SD, gently tighten the four screws by using the provided screwdriver or a screwdriver with a torque gauge, and then tighten them in a crisscross pattern (0.054 N·m max. torque).
Excessive tightening of one screw only may diminish conductivity.
If conductivity is lowered after tightening the screws, avoid tightening them any more. Remove the screws and check again that the NQPACK100SD is clean and that the device pins are parallel (flat).

(5) Device pins are fragile and may bend if the device is set on and removed from the NQPACK100SD several times. When setting the device on the NQPACK100SD, check for bent pins and make adjustments as necessary.

APPENDIX D MOUNTING OF PLASTIC SPACERS

This chapter describes the mounting method for the plastic spacers supplied with the IE-703002-MC.

When using the emulator connected to the target system, mount the plastic spacers as shown in Figures D-1 to D-3 to fix the pod horizontally.

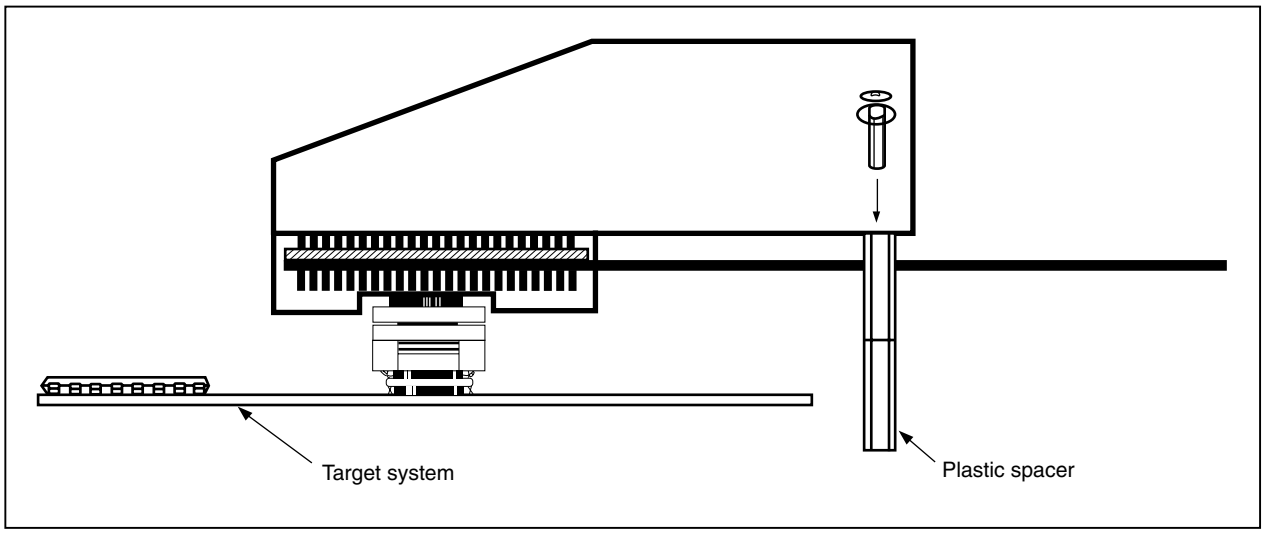
(1) When using the IE-703002-MC alone

<1> Remove the nylon rivet from the rear part of the pod.

<2> Fix the plastic spacer with the supplied plastic screw.

<3> To adjust the hight, use your own spacer or a stand.

Figure D-1. Mounting Method (When Using IE-703002-MC Alone)



(2) When using the IE-703002-MC + option board

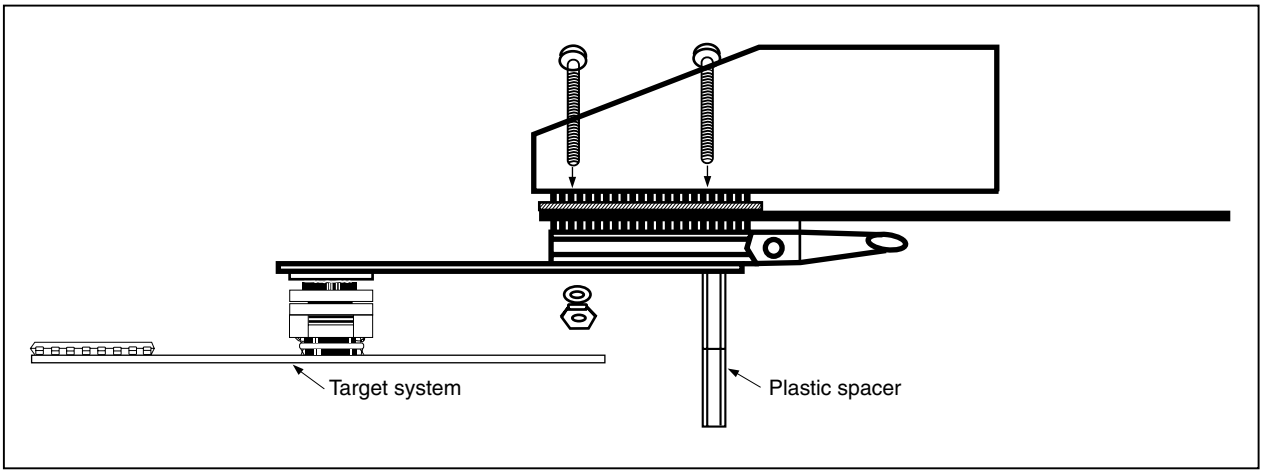
(a) When using the IE-703002-MC + option board

<1> Remove the nylon rivet from the rear part of the pod.

<2> Fix the plastic spacer with the supplied plastic screw.

<3> To adjust the hight, use your own spacer or a stand.

Figure D-2. Mounting Method (When Using IE-703002-MC + Option Board)



(b) When mounting plastic spacer on option board

<1> Remove the nylon rivets from the front and middle parts of the pod.

<2> After connecting the option board with the PGA socket in the back of the pod, secure with plastic screw supplied with the option board.

<3> To adjust the hight, use your own spacer or a stand.

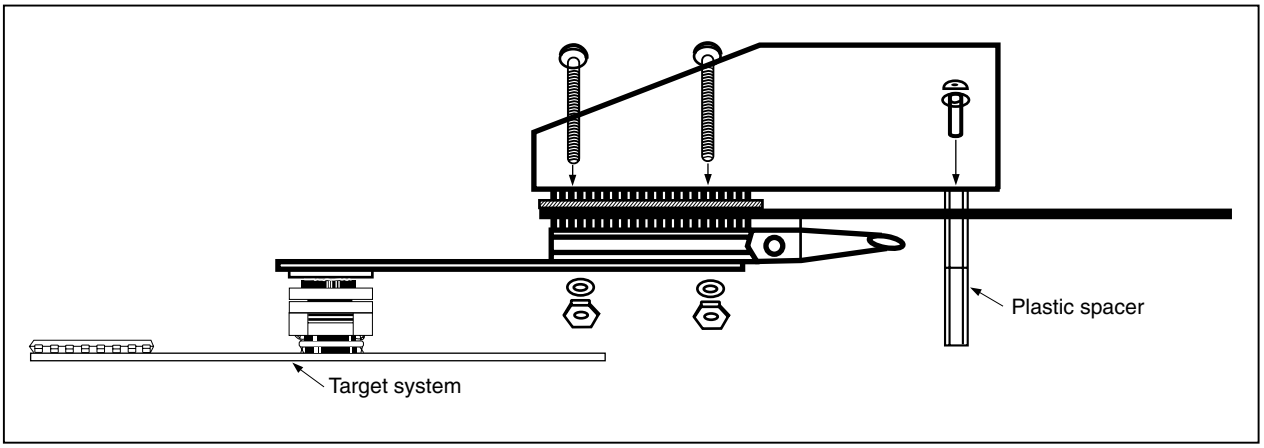



Figure D-3. Mounting Method (When Mounting Plastic Spacer on Option Board)