NEC

User's Manual

IE-70000-MC-NW-A

In-Circuit Emulator

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INTRODUCTION

Target Readers

This manual is intended for users who design and develop application systems using the IE-70000-MC-NW-A. It is assumed that the target readers are familiar with the functions and usage methods of the devices and have knowledge of debuggers.

Purpose

The purpose of this manual is to describe the proper operation of the IE-70000-MC-NW-A and its basic specifications.

Organization

This manual is divided into the following parts.

- Overview
- Names and functions of components
- Cautions on designing target system

How to Read This Manual

It is assumed that the reader of this manual has general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.
This manual explains the basic setup procedure and switch settings.

To learn about the basic specifications and operation methods
→ Read this manual in the order of the **CONTENTS**.

To learn the operation methods and command functions, etc., of the IE-70000-MC-NW-A
→ Read the user's manual of the debugger (sold separately) that is used.

Conventions

Note: Footnote for item marked with **Note** in the text
Caution: Information requiring particular attention
Remark: Supplementary information
Numeral representation: Binary ··· xxxx or xxxxB
Decimal ··· xxxx
Hexadecimal ··· xxxxH
Prefix indicating the power of 2 (address space, memory capacity):
K (kilo): $2^{10} = 1024$
M (mega): $2^{20} = 1024^2$

Terminology

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

Target device	The device that is targeted for emulation.
Target system	The system (user-built system) that is targeted for debugging. This includes the target program and user-configured hardware.

Related Documents

When using this manual, refer to the following manuals.
The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

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

Document Name		Document Number
IE-70000-MC-NW-A In-Circuit Emulator		This manual
CA850 C Compiler Package Ver. 2.40	Operation	To be prepared
	C Language	U16054E
	PM Plus	To be prepared
	Assembly Language	U16042E
ID850NW Integrated Debugger Ver.1.10 or Later	Operation (Windows™ Based)	U14891E

Caution The documents listed above are subject to change without notice. Be sure to use the latest documents when designing.

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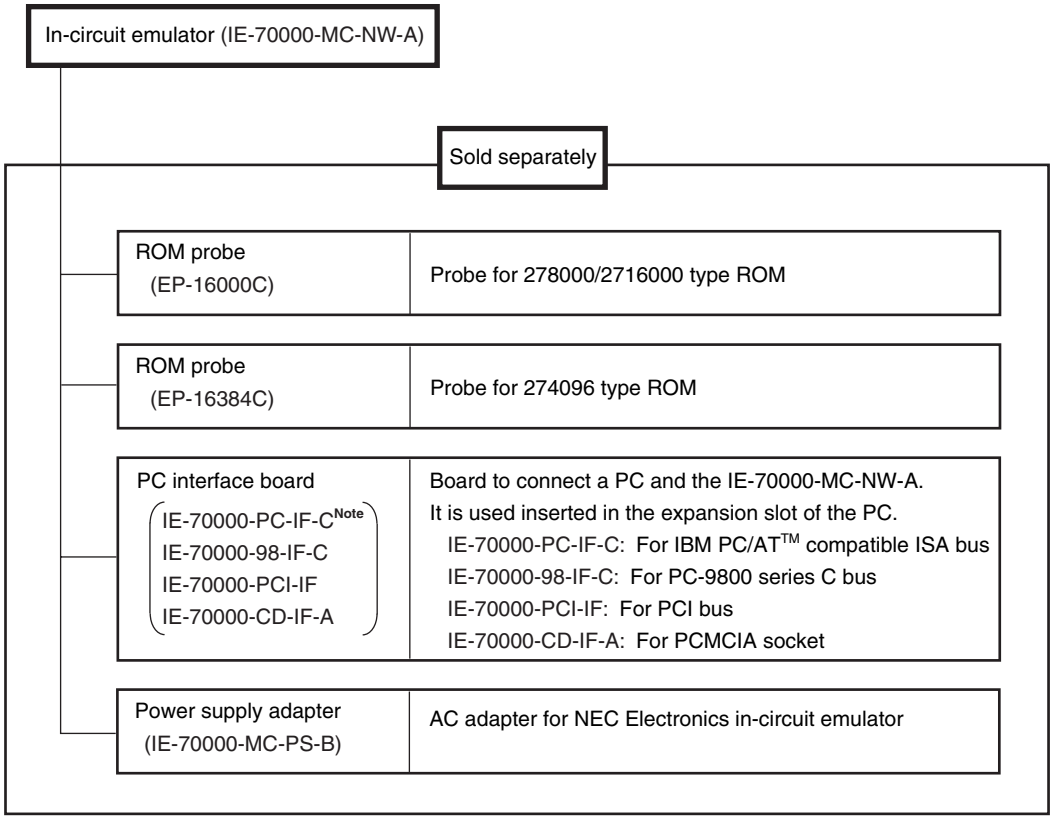
CHAPTER 1 OVERVIEW

The IE-70000-MC-NW-A is an external in-circuit emulator to be connected to a target device in which a debug control unit is mounted to efficiently debug hardware and software.

1.1 Hardware Configuration



Note Cannot be used for PC98-NX series

1.2 Features

- ○ General-purpose usage available in V850E series products in which a debug control unit is mounted
- ○ Debug control unit control interface mounted
- ○ Branch PC trace via the trace packet data method (including on-chip cache execution)
- ○ Data access trace via the trace packet data method
- ○ ROM emulation function
- ○ The dimensions of the IE-70000-MC-NW-A are as follows.

Parameter		Value
Operating voltage		5 V±5%
Current consumption		500 mA (TYP.)
External dimensions (refer to **APPENDIX PACKAGE DRAWINGS**)	Height	26 mm
	Width	160 mm
	Depth	162 mm
Weight		250 g

1.3 Function Specifications

Table 1-1. Function Specifications (1/2)

Parameter	Specification	
Target device	Device in which a debug control unit is mounted Operating voltage of target device: 3.0 to 3.6 V	
Debug control unit interface (execution control block)	Interface clock (DCK)	25 MHz
	Number of interface signal pins	5
	Functions of interface signal pins	• DCK: Interface clock input • DMS: Interface mode select output • DDI: Interface data input • DDO: Interface data output • DRST(–): Debug control unit reset output
Debug control unit interface (trace control block)	Trace clock (TRCLK)	100 MHz (max.)
	Number of trace signal pins	6
	Functions of trace signal pins	• TRCCLK: Trace clock input • TRCDATA[3:0]: Trace data input • TRCEND: Trace data end point indication input
	Trace packet data length	8 to 256 bits (in 8-bit units)
	Trace memory capacity	• 3 MB (including 1 MB of time stamp storage memory) Number of trace packet data … Approximately 200 K (min.) to 2 M (max.) • Any size between 24 and 3 MB specifiable in 24-byte units
	Trace start	• Trace event (Incorporated in debug control unit) • Trace forcible start (Incorporated in debug control unit)

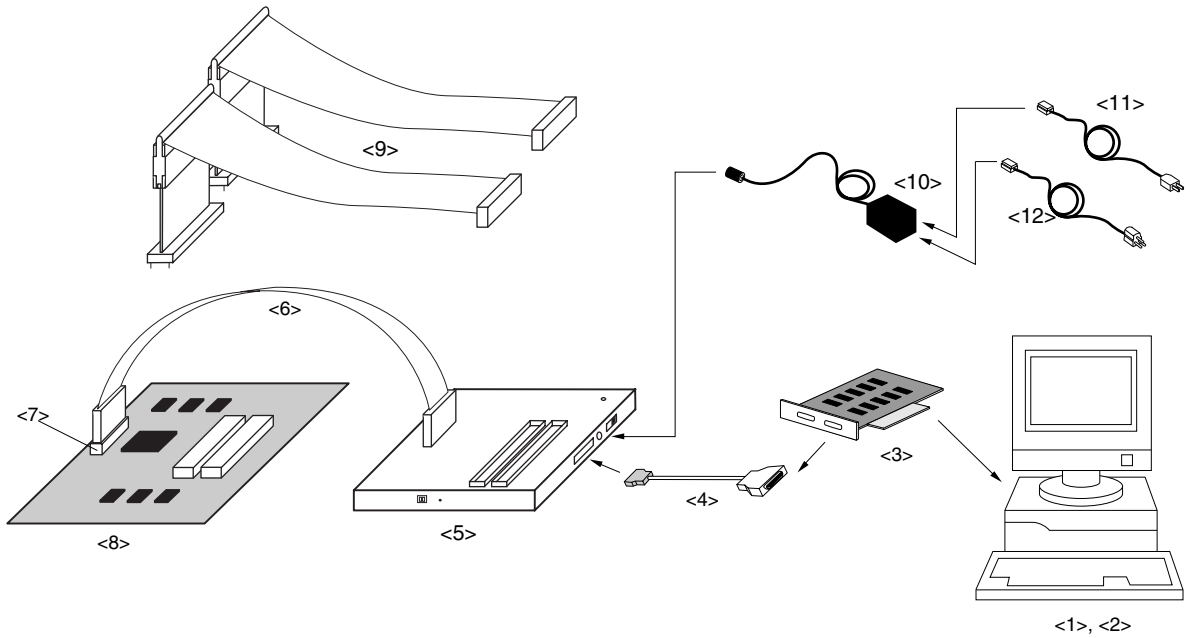
Table 1-1. Function Specifications (2/2)

Parameter	Specification	
Debug control unit interface (trace control block)	Trace end	• Trace memory full • Trace end status of debug control unit detected
	Trace mode	• 3 types <1> Trace from trace event to trace end <2> Trace around match event (delay trace) Delay counter: Any value between 0 and 32 K counts specifiable (1 count equals 24 bytes of trace memory) <3> Trace termination by trace event (incorporated in debug control unit)
ROM emulation function	ROM emulation memory capacity	2 MB × 2 banks (access time: 60 ns (min.))
	Supported ROM	• 4 /8/16 Mb ROM • 3 V/5 V • 16-bit bus mode only • Page access supported
	ROM probe	• Up to 2 probes connectable (sold separately) • 40-pin/42-pin DIP package type
Break function	Incorporated in debug control unit of target device	
Pin mask function	Incorporated in debug control unit of target device	
Connector for mounting target system (recommended)	• 26-pin straight type: 8830E-026-170S (by KEL Corporation) • 26-pin right-angle type: 8830E-026-170L (by KEL Corporation)	
Operating environment	Temperature	10 to 40°C
	Humidity	10 to 80%RH (no condensation)
Storage environment	Temperature	−15 to +40°C
	Humidity	10 to 80%RH (no condensation)

1.4 System Configuration

The following shows the system configuration when connecting the IE-70000-MC-NW-A.

Figure 1-1. System Configuration



Remark

<1> Personal computer (PC-9800 series, IBM PC/AT compatible)

<2> Debugger (ID850NW: 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> Host interface cable (included with this product)

<5> In-circuit emulator (IE-70000-MC-NW-A: This product)

<6> IE connection cable (included with this product)

<7> IE connector (Sold separately: made by KEL Corporation)
8830E-026-170S: Straignt
8830E-026-170L: Right angle

<8> Target system

<9> ROM probe (Sold separately)
EP-16000C: For 278000/2716000 type ROM
EP-16384C: For 274096 type ROM

<10> Power adapter (IE-70000-MC-PS-B: Sold separately)

<11> AC100V power cable (sold separately: Included with IE-70000-MC-PS-B)

<12> AC220V power cable (sold separately: Included with IE-70000-MC-PS-B)

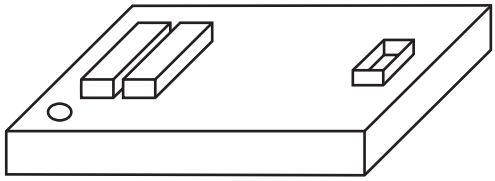
1.5 Contents in Carton

The carton of the IE-70000-MC-NW-A contains the following. Check for any missing items. If there are missing or damaged items, please contact an NEC Electronics sales representative or an NEC Electronics distributor.

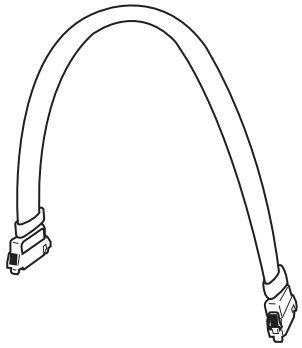
Return the guarantee card included in the carton after filling in all the items.

Figure 1-2. Contents in Carton

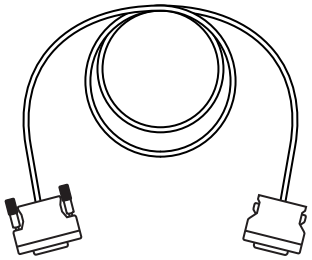
<1> IE-70000-MC-NW-A



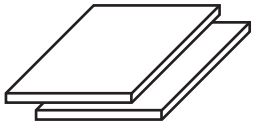
<2> IE connection cable (26-pin)



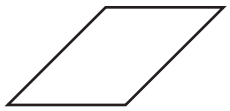
<3> Host interface cable (36-pin)



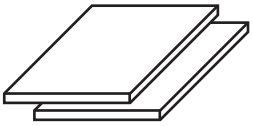
<4> Users' Manual (J/E)



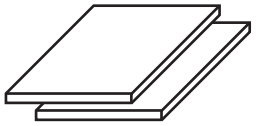
<5> Guarantee card



<6> Data Sheet (J/E)



<7> Cautions on Use (J/E)



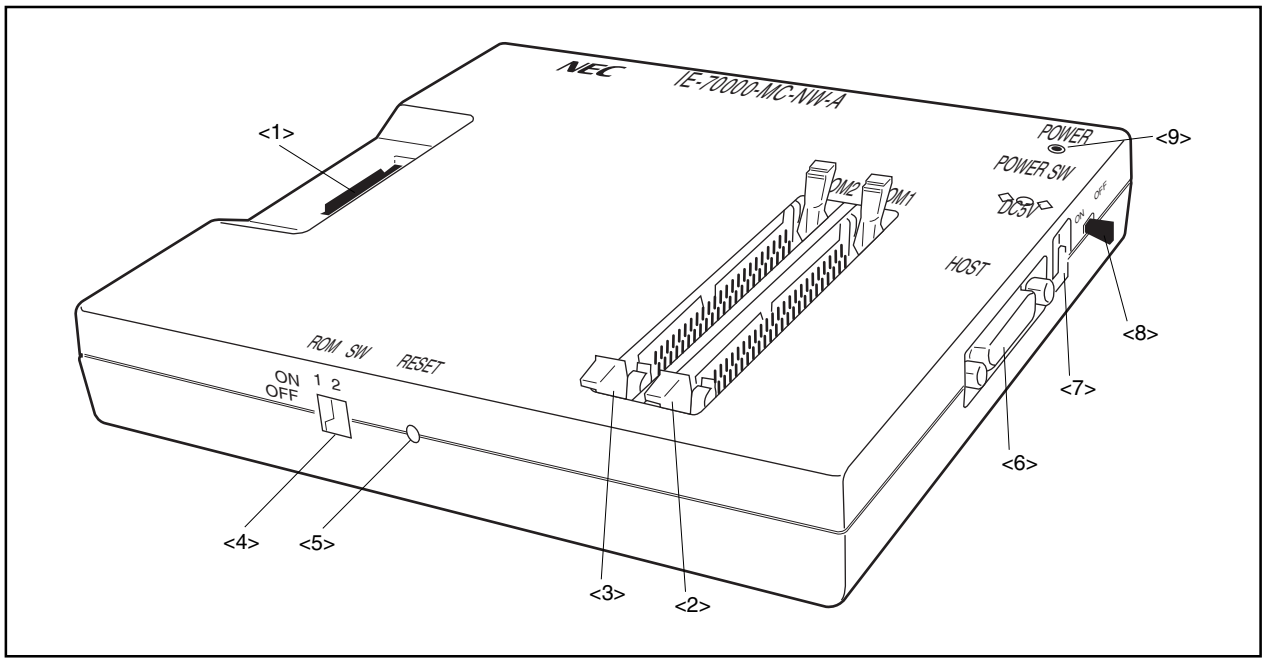
<1>	IE-70000-MC-NW-A	… 1
<2>	IE connection cable	… 1
<3>	Host interface cable	… 1
<4>	Users' Manual (Japanese version, English version)	… One each (this manual)
<5>	Guarantee card	… 1
<6>	Data Sheet (Japanese version, English version)	… One each
<7>	Cautions on Use (Japanese version, English version)	… One each

CHAPTER 2 NAMES AND FUNCTIONS OF COMPONENTS

This chapter describes the names and functions of components, switch settings, and connections with related devices of the IE-70000-MC-NW-A.

2.1 Names and Functions of Components

Figure 2-1. Names of Components



<1> IE connector

This is a connector for connecting the IE connection cable.

<2> ROM1 probe connector

This is a connector for connecting the ROM probe EP-16000C (sold separately) or EP-16384C (sold separately).

When configuring a 32-bit bus using two ROMs, connect the ROM corresponding to the lower 16 bits and this connector using the ROM probe. When emulating one ROM, connect the ROM to this connector.

<3> ROM2 probe connector (42-pin DIP package supported)

This is a connector for connecting the ROM probe EP-16000C (sold separately) or EP-16384C (sold separately).

When configuring a 32-bit bus using two ROMs, connect the ROM corresponding to the higher 16 bits and this connector using the ROM probe.

<4> DIP switch for ROM mode

This is a DIP switch for setting whether or not to use the ROM1 probe connector and ROM2 probe connector.

The factory setting of the ROM1 probe connector and ROM2 probe connector is “not use”.

<5> Reset switch

This is a switch for testing the product itself.

Do not use this switch. When this switch is pressed during debugging, the debugger will malfunction.

<6> Host interface connector

Connect the attached host interface cable to this connector.

However, when connecting the IE-70000-CD-IF-A, use the cable that is supplied with the IE-70000-CD-IF-A.

<7> Power supply jack

Connect the plug of the power supply adapter IE-70000-MC-PS-B (sold separately) to this jack.

<8> Power switch

Use this switch to turn on/off the power of the IE-70000-MC-NW-A.

<9> Power LED

This LED is lit while the IE-70000-MC-NW-A is on.

2.2 Connection

The following describes the connection between the IE-70000-MC-NW-A and related devices.

(1) Connection to the interface board

Use the host interface cable (supplied) to connect the host interface connector of the IE-70000-MC-NW-A to the "CH0" connector[Note] of the interface board.

When connecting the interface board to the IE-70000-CD-IF-A, use the cable supplied with the IE-70000-CD-IF-A (sold separately).

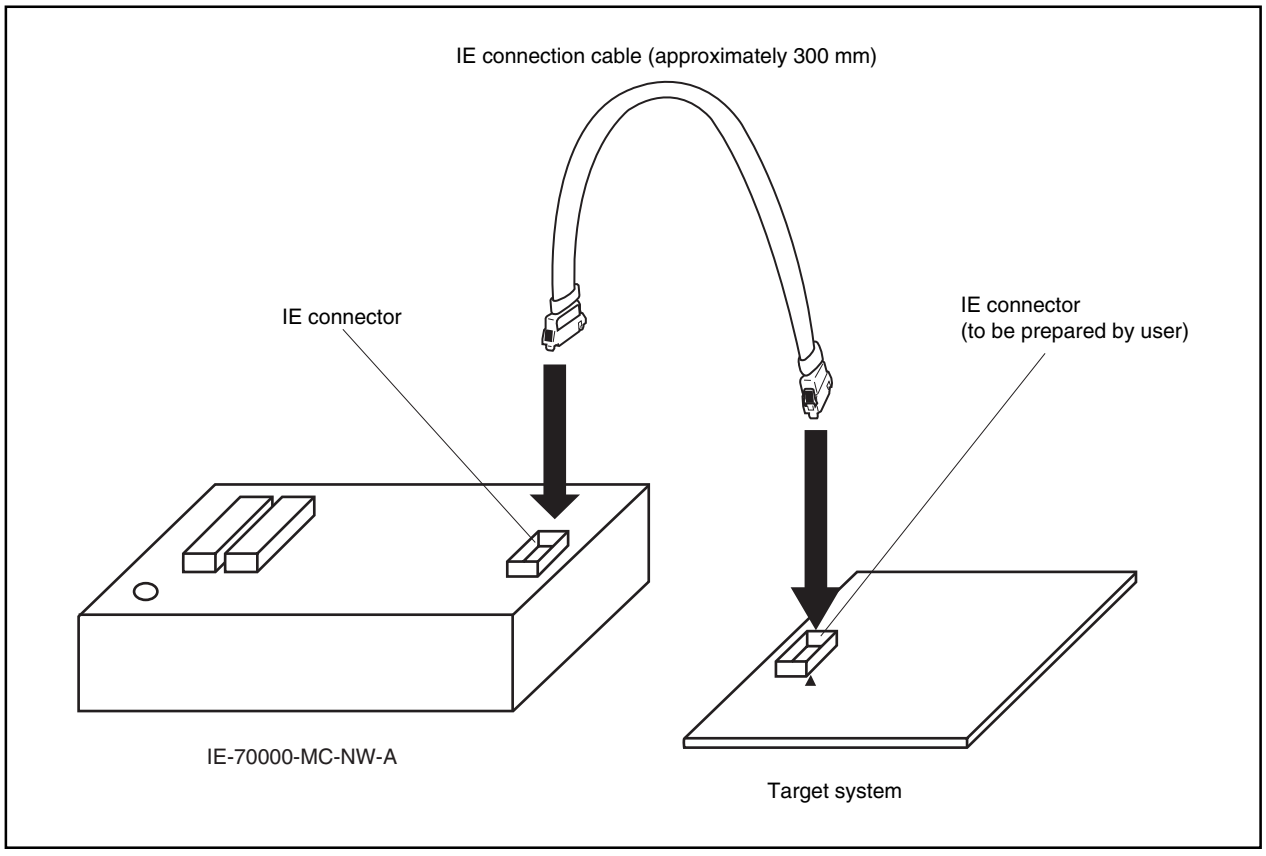
Note IE-70000-PCI-IF-A (sold separately), IE-70000-PC-IF-C (sold separately), or IE-70000-98-IF-C (sold separately)

(2) Connection to the target system

Use the IE connection cable (supplied) to connect the IE connector of the IE-70000-MC-NW-A to the IE connector[Note] on the target system.

Note IE connector (recommended)
8830E-026-170S (manufactured by KEL corporation): 26-pin straight type
8830E-026-170L (manufactured by KEL corporation): 26-pin right-angle type

Figure 2-2. Connection to Target System



(3) Connection to the ROM on the target system

Use the ROM probe[Note] to connect the ROM1 or ROM2 probe connector of the IE-70000-MC-NW-A to the ROM socket on the target system and set the switch. For how to set the switch, refer to **2.3 Switch Settings**.

Note EP-16000C (sold separately) or EP-16384C (sold separately)

Figure 2-3. Connection to ROM on Target System (1 ROM)

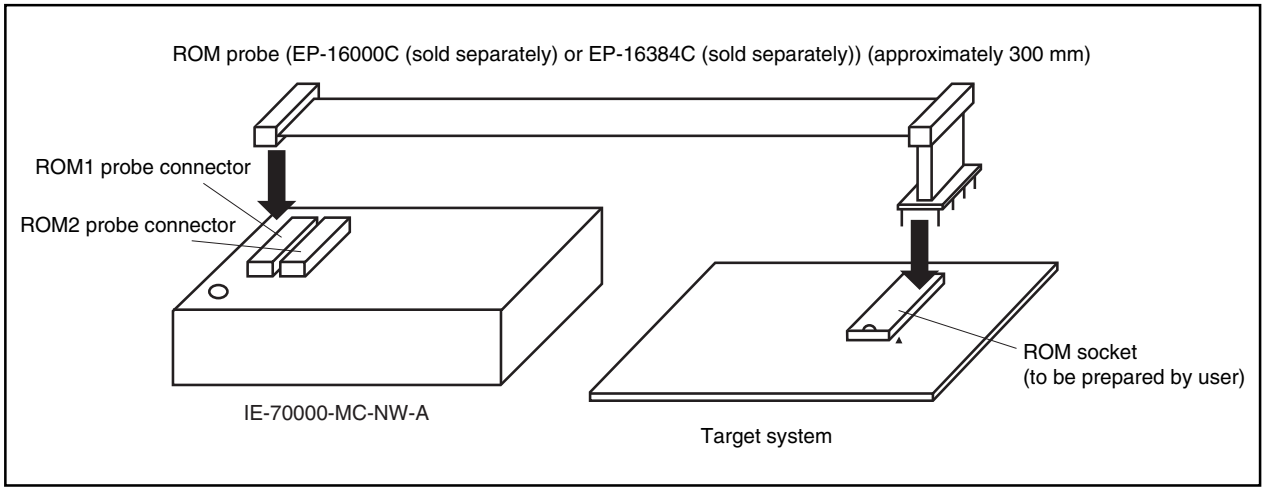
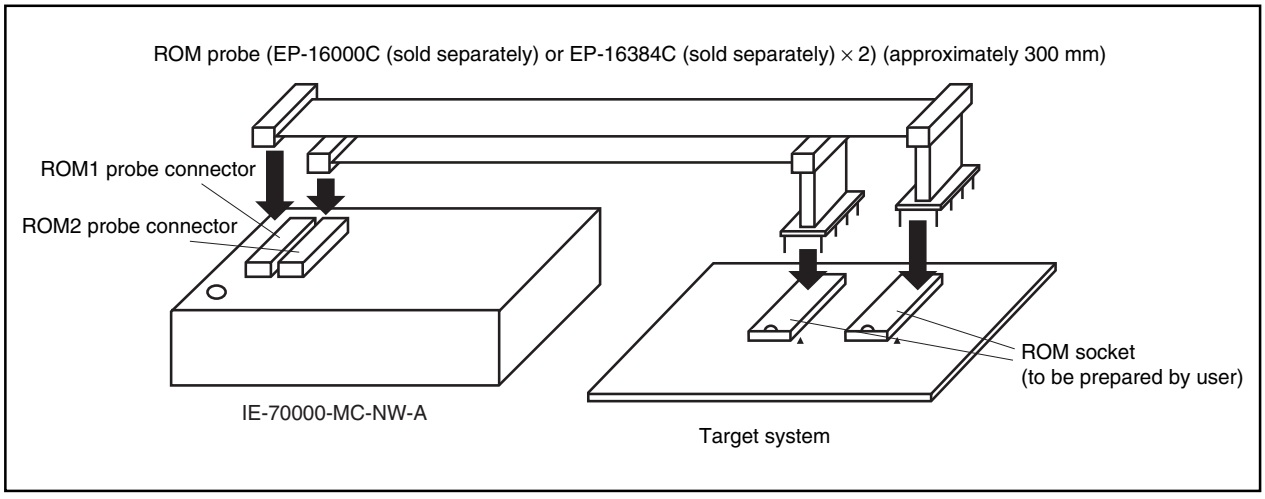


Figure 2-4. Connection to ROM on Target System (2 ROMs)



(4) Connection to power supply adapter

Connect the IE-70000-MC-PS-B plug to the power supply jack of the IE-70000-MC-NW-A.

2.3 Switch Settings

The following describes the switch settings of the DIP switches for ROM mode.
Set these switches when using the ROM emulation function via the ROM probe.

Table 2-1. Setting DIP Switches for ROM Mode

Purpose	Setting of DIP Switch for ROM Mode		
	SW1	SW2	Status
Not using ROM emulation function (factory setting)	OFF	OFF	
To enable only ROM1 probe connector	ON	OFF	
To enable ROM1 probe connector and ROM2 probe connector	ON	ON	

Caution The combination of SW1 OFF and SW2 ON is prohibited.

2.4 Startup/Termination

The following describes the procedures for startup and termination.

To operate the IE-70000-MC-NW-A, a dedicated debugger is required. For details, refer to the **ID850NW Integrated Debugger Ver.1.10 or Later Operation (Windows Based) User's Manual (U14891E)**.

(1) Startup procedure

<1> Turn on the host machine.

<2> Turn on the IE-70000-MC-NW-A.

<3> Turn on the target system.

<4> Start the debugger.

(2) Termination procedure

<1> Terminate the debugger.

<2> Shut down the power to the target system.

<3> Shut down the power to the IE-70000-MC-NW-A.

<4> Terminate the host machine (power off).

CHAPTER 3 CAUTIONS ON DESIGNING TARGET SYSTEM

To debug the target system with the IE-70000-MC-NW-A connected, a circuit to connect the IE-70000-MC-NW-A is required on the target system.

This chapter describes the circuit to connect the IE-70000-MC-NW-A and cautions.

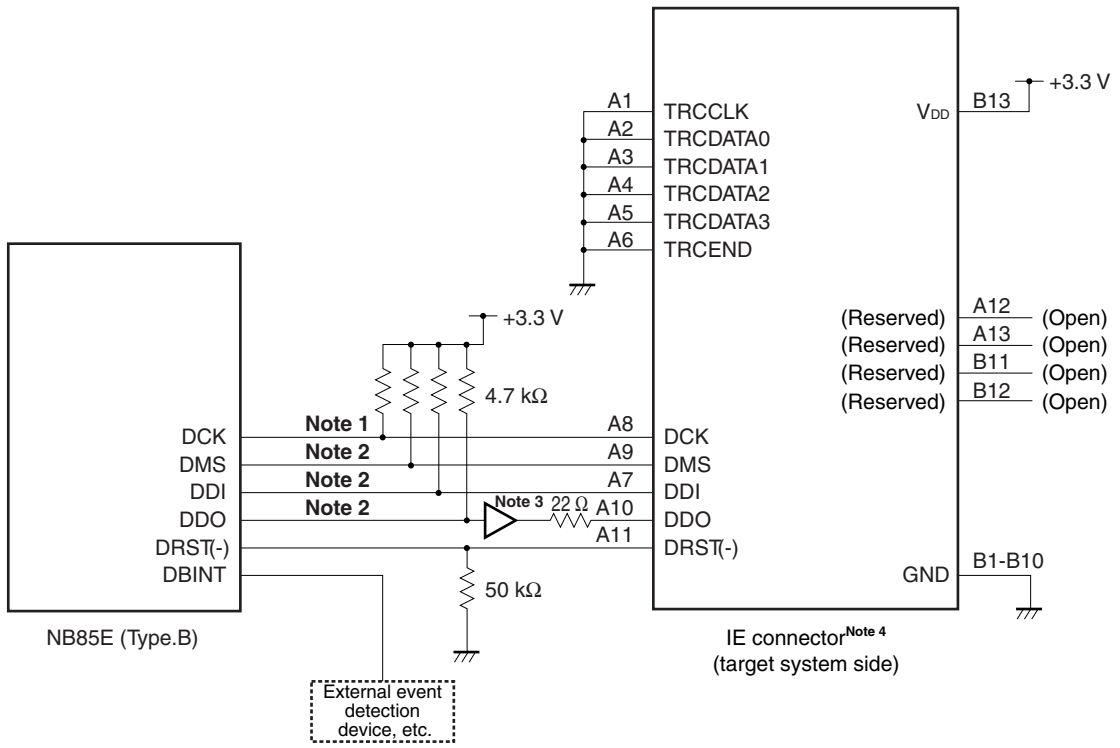
3.1 IE Connector (Target System Side)

The following shows the recommended circuit example of the target system required when connecting the IE-70000-MC-NW-A and the pin assignment of the IE connector (on the target system side).

3.1.1 Recommended circuit example when NB85E Type.B core is used

Figure 3-1 shows the recommended circuit example of the IE connector (on the target system side).

Figure 3-1. Recommended Connection Circuit Example (NB85E Type.B)



Notes 1. The clock pattern length must be as short as possible and shielded by GND. The pattern length should be 100 mm or less.

2. The pattern length must be as short as possible. The pattern length should be 100 mm or less.

3. Recommended 3.3 V buffer products: SN74LVC541A (manufactured by TI) or TC74LCX541F (manufactured by Toshiba)

4. Recommended products: 8830E-026-170S, 8830E-026-170L manufactured by KEL Corporation

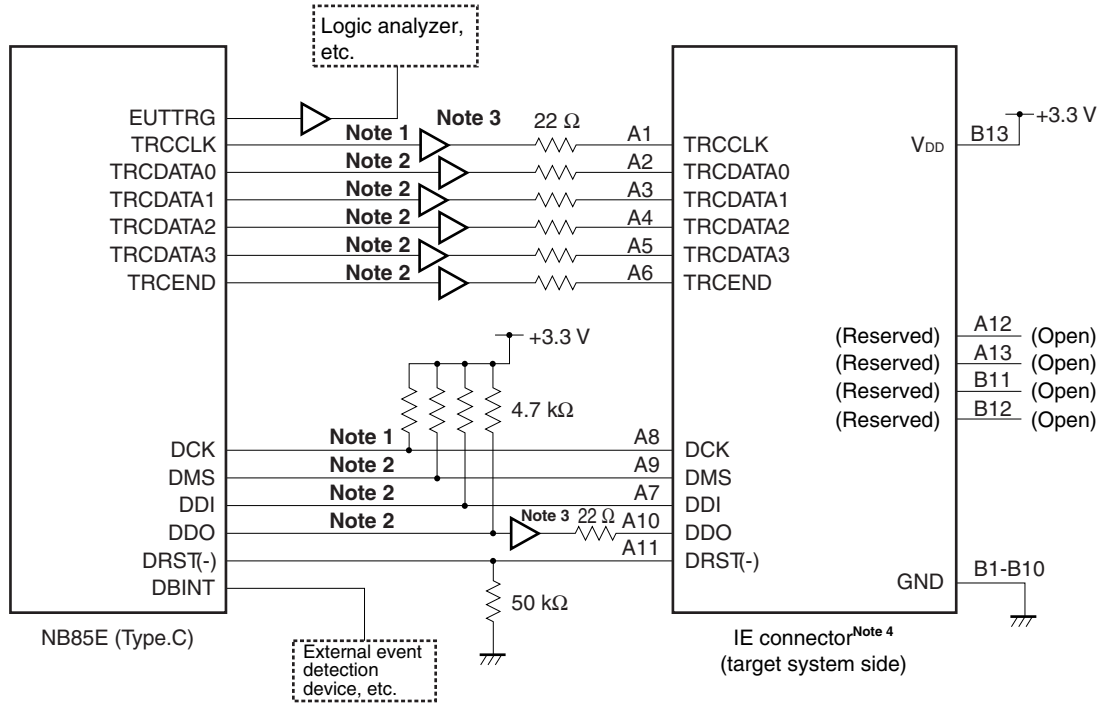
Remarks 1. V_{DD} (pin B13) of the IE connector (on the target system side) is used to detect whether the power of the target system is on.

2. The DBINT pin is optional. It is not required to be prepared as an external pin unless a debug interrupt has to be externally input.

3.1.2 Recommended circuit example when NB85E Type.C core is used

Figure 3-2 shows the recommended circuit example of the IE connector (on the target system side).

Figure 3-2. Recommended Connection Circuit Example (NB85E Type.C)



Notes 1. The clock pattern length must be as short as possible and shield by GND. The pattern length should be 100 mm or less.

2. The pattern length must be as short as possible. The pattern length should be 100 mm or less.

3. Recommended 3.3 V buffer products: SN74LVC541A (made by TI) or TC74LCX541F (made by Toshiba)

4. Recommended products: 8830E-026-170S, 8830E-026-170L made by KEL Corporation

Remarks 1. V_{DD} (pin B13) of the IE connector (on the target system side) is used to detect whether the power of the target system is on.

2. The DBINT pin is optional. It is not required to be prepared as an external pin unless a debug interrupt has to be externally input.

3. The EVTTRG pin is optional. It can be mainly used as a trigger output to a measuring device such as a logic analyzer. It is not required to be prepared as an external pin unless a trigger output is required.

3.1.3 IE connector (target system side)

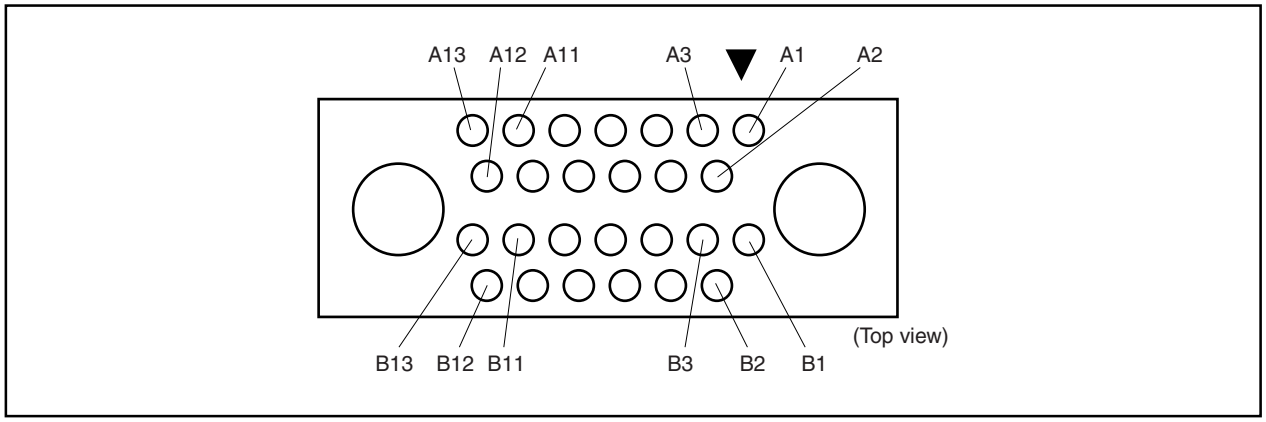
Table 3-1 and Figure 3-3 show the function list and pin assignment of the IE connector (on the target system side).

Recommended connectors: KEL Corporation 8830E-026-170S: 26-pin straight type
KEL Corporation 8830E-026-170L: 26-pin right-angle type

Table 3-1. Pin Functions of IE Connector (Target System Side)

Pin No.	Pin Name	I/O	Description
A1	TRCCLK	O	Trace clock output
A2	TRCDATA[0]	O	Trace data 0 output
A3	TRCDATA[1]	O	Trace data 1 output
A4	TRCDATA[2]	O	Trace data 2 output
A5	TRCDATA[3]	O	Trace data 3 output
A6	TRCEND	O	Trace data end output
A7	DDI	I	Data input for debug serial interface
A8	DCK	I	Clock input for debug serial interface
A9	DMS	I	Transfer mode selection input for debug serial interface
A10	DDO	O	Data output for debug serial interface
A11	DRST(-)	I	Debug control unit (DCU) reset input
A12	(Reserved)	–	(Leave open)
A13	(Reserved)	–	(Leave open)
B1	GND	–	–
B2	GND	–	–
B3	GND	–	–
B4	GND	–	–
B5	GND	–	–
B6	GND	–	–
B7	GND	–	–
B8	GND	–	–
B9	GND	–	–
B10	GND	–	–
B11	(Reserved)	–	(Leave open)
B12	(Reserved)	–	(Leave open)
B13	V_{DD}	–	+3.3 V input (for monitoring target power)

Figure 3-3. Pin Assignment of IE Connector (Target System Side)



3.2 ROM on Target System

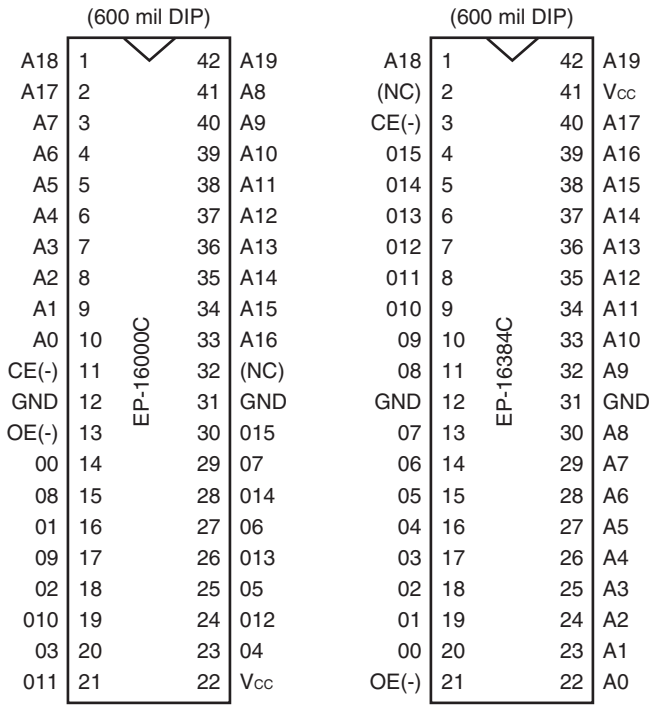
The following describes the pin assignment of the ROM probe (sold separately) and cautions when connecting the target system using the ROM probe.

3.2.1 ROM connector

Figure 3-4 shows the pin assignment of the ROM probe (sold separately).

The ROM probe (sold separately) supports ROM with two types of pin layouts.

Figure 3-4. Pin Assignment of ROM Probe (EP-16000C (Sold Separately) and EP-16384C (Sold Separately))



Remarks 1. The pin assignment of the EP-16000C (sold separately) is equivalent to that of the 27C4000/27C8000/27C16000, except for pin 32, which is an NC pin.

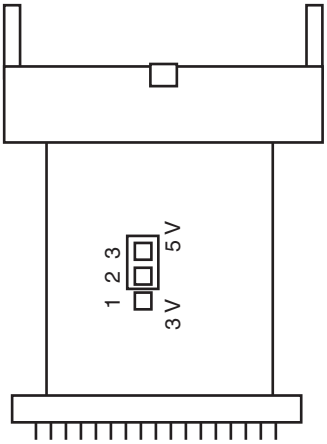
2. The pin assignment of the EP-16384C (sold separately) is equivalent to that of the 27C4096 for pins from 2 to 41, but pin 2 is an NC pin. Note that the pin assignments of pins 1 and 42 are exclusive to the EP-16384C (sold separately).

3.2.2 ROM probe setting

Figure 3-5 shows the jumper setting of the ROM probe.

The ROM probe supports 3.3 V ROM and 5 V ROM, so set the jumper in accordance with the voltage of the ROM to be mounted on the target system.

Figure 3-5. Voltage Setting of ROM Probe (EP-16000C (Sold Separately) and EP-16384C (Sold Separately))



1 and 2 shorted: When the voltage of the ROM on the target system is 3.3 V

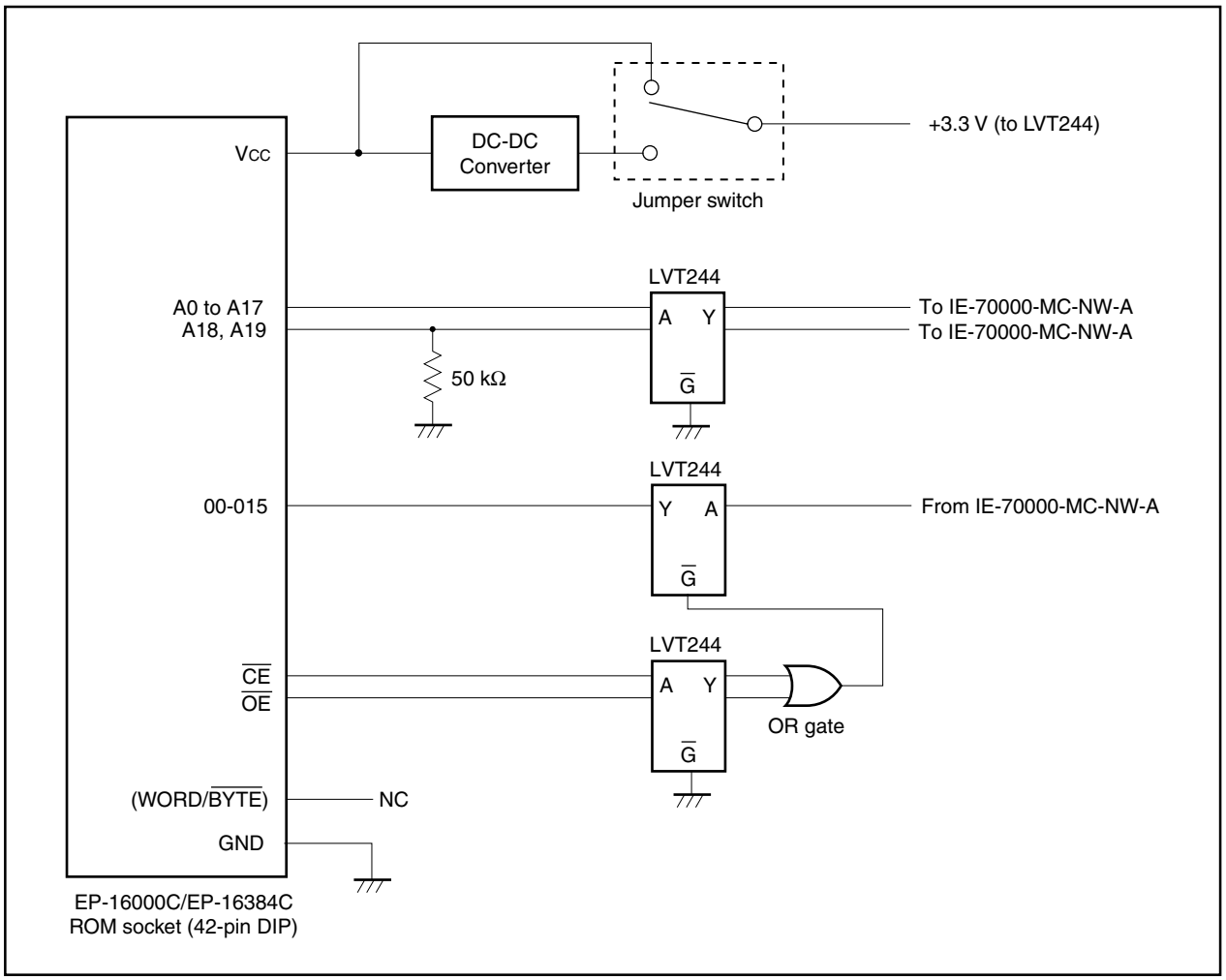
2 and 3 shorted: When the voltage of the ROM on the target system is 5 V (factory setting)

3.2.3 Interface Circuit and Cautions for ROM Probe

The interface circuit of the ROM probe is shown in Figure 3-6.

When using the ROM probe, note the cautions on designing the target system.

Figure 3-6. Interface Circuit Outline of ROM Probe



Cautions 1. The bus load of the target system when the ROM probe is connected may be higher than that when an actual ROM is connected. Caution must be paid when designing the bus of the target system. It is recommended to mount a bus buffer in the ROM of the target system.

2. A18 and A19 are pulled down (50 kΩ) inside the ROM probe, so they must be NC (no connection) on the target system when they are not used on the target system.

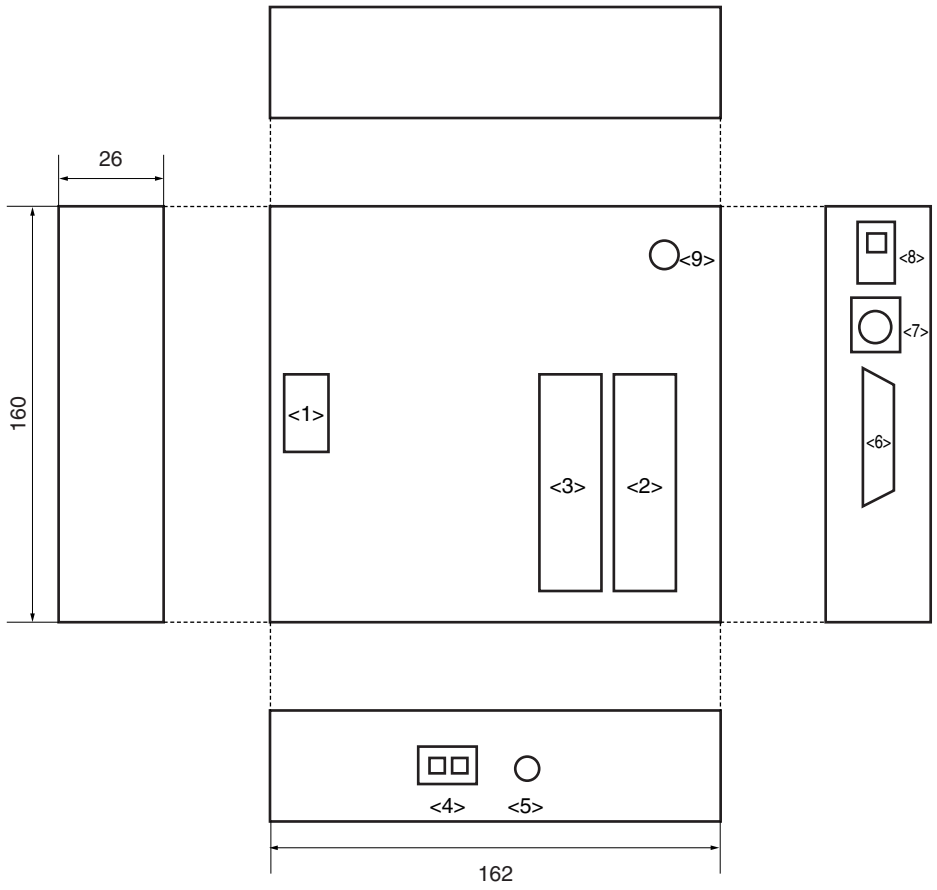
3. When using the ROM emulation function, set the size of the ROM area set by the mapping command of the debugger to the same size as the size of the ROM on the target system. If these settings are different, the ROM emulation memory cannot be read with a correct address from the target device.

4. Data cannot be written to the ROM emulation memory form the target device.

5. The access time of the ROM emulation memory is 60 ns. Set the wait count of the target device to an appropriate value when using the ROM emulation memory.

APPENDIX PACKAGE DRAWINGS

IE-70000-MC-NW-A (Unit: mm)



<1> IE connector
<2> ROM1 probe connector
<3> ROM2 probe connector
<4> DIP switch for ROM mode
<5> Reset switch
<6> Host interface connector
<7> Power supply jack
<8> Power switch
<9> Power LED