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User's Manual

IE-78K0-NS-PA

Performance Board

Target Devices
78K/0 Series

Document No. U16109EJ1V0UM00 (1st edition)
Date Published June 2002 N CP(K)

Printed in Japan

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- Availability of related technical literature
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INTRODUCTION

Product overview

The IE-78K0-NS-PA is used in combination with an in-circuit emulator (IE-78K0-NS), emulation board (IE-780×××-NS-EM1, IE-780×××-NS-EM4), and I/O board (IE-78K0-NS-P0×) to debug products of the 78K/0 Series of 8-bit single-chip microcontrollers.

Target readers

This manual is intended for engineers who perform debugging of systems that employ the 78K/0 Series of 8-bit single-chip microcontrollers using the IE-78K0-NS-PA and an in-circuit emulator (IE-78K0-NS), emulation board (IE-780×××-NS-EM1, IE-780×××-NS-EM4), and I/O board (IE-78K0-NS-P0×) together.

Purpose

The purpose of this manual is to help the user understand the debugging functions that are available by using the IE-78K0-NS-PA and the in-circuit emulator (IE-78K0-NS), emulation board (IE-780×××-NS-EM1, IE-780×××-NS-EM4), and I/O board (IE-78K0-NS-P0×) together.

Organization

When using the IE-78K0-NS-PA, please refer to the manual (this manual) that comes with the IE-78K0-NS-PA as well as the manual that comes with the in-circuit emulator (IE-78K0-NS), emulation board (IE-780×××-NS-EM1, IE-780×××-NS-EM4), and I/O board (IE-78K0-NS-P0×).

IE-78K0-NS User's Manual	IE-78K0-NS-PA User's Manual (This manual)
• General • Part names • Installation • External interface	• General • Part names • Installation • External sense specifications • Cautions

IE-78K0-NS-P0× User's Manual	IE-780×××-NS-EM1 IE-780×××-NS-EM4 User's Manual
• General • Part names • Installation	• General • Part names • Installation • Differences between target devices and target interface circuits

How to read this manual

To understand the overall functions of the IE-78K0-NS-PA:
→ Read this manual in the order of the contents.

To understand the basic specifications:
→ Refer to **CHAPTER 1 GENERAL** and **CHAPTER 2 PART NAMES**.

For how to connect the IE-78K0-NS, IE-780×××-NS-EM1, IE-780×××-NS-EM4, and IE-78K0-NS-P0× and make settings to debug 78K/0 Series products:
→ Refer to **CHAPTER 3 INSTALLATION**.

Terminology

The meanings of the terms used in this manual are described in the table below.

Term	Meaning
Target device	This is the device to be emulated.
Target system	This is the system to be debugged. This includes the target program and the hardware provided by the user. When defined narrowly, it includes only the hardware.
IE system	This refers to the combination of an in-circuit emulator (IE-78K0-NS), emulation board (IE-780×××-NS-EM×), and I/O board (IE-78K0-NS-P0×).

Conventions

Data significance:	Higher digits on the left and lower digits on the right
Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information

Related documents

The related documents (user's manuals) indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document No.
IE-78K0-NS In-Circuit Emulator	U13731E
IE-78K0-NS-PA Performance Board	This manual
ID78K Series Integrated Debugger Ver. 2.30 or Later Operation (Windows™ Based)	U15185E

Caution The related documents listed above are subject to change without notice. Be sure to use the latest version of each document for designing.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 GENERAL

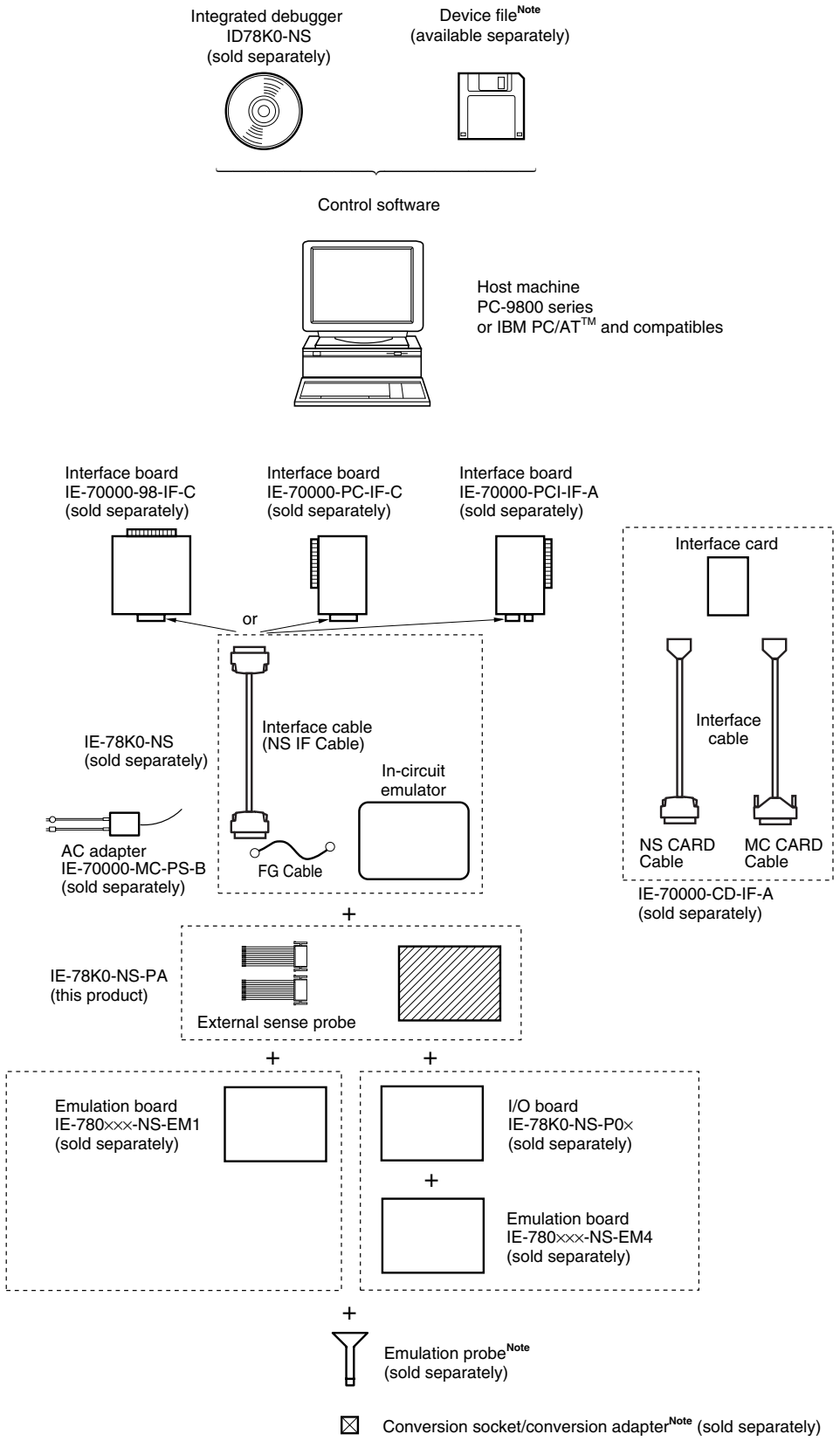
The IE-78K0-NS-PA is a development tool for effectively debugging hardware and software in which a 78K/0 Series 8-bit single-chip microcontroller is used as the target device.

This chapter describes the system configuration and basic specifications of the IE-78K0-NS-PA.

1.1 System Configuration

Figure 1-1 shows the system configuration of the IE-78K0-NS-PA.

Figure 1-1. IE-78K0-NS-PA System Configuration

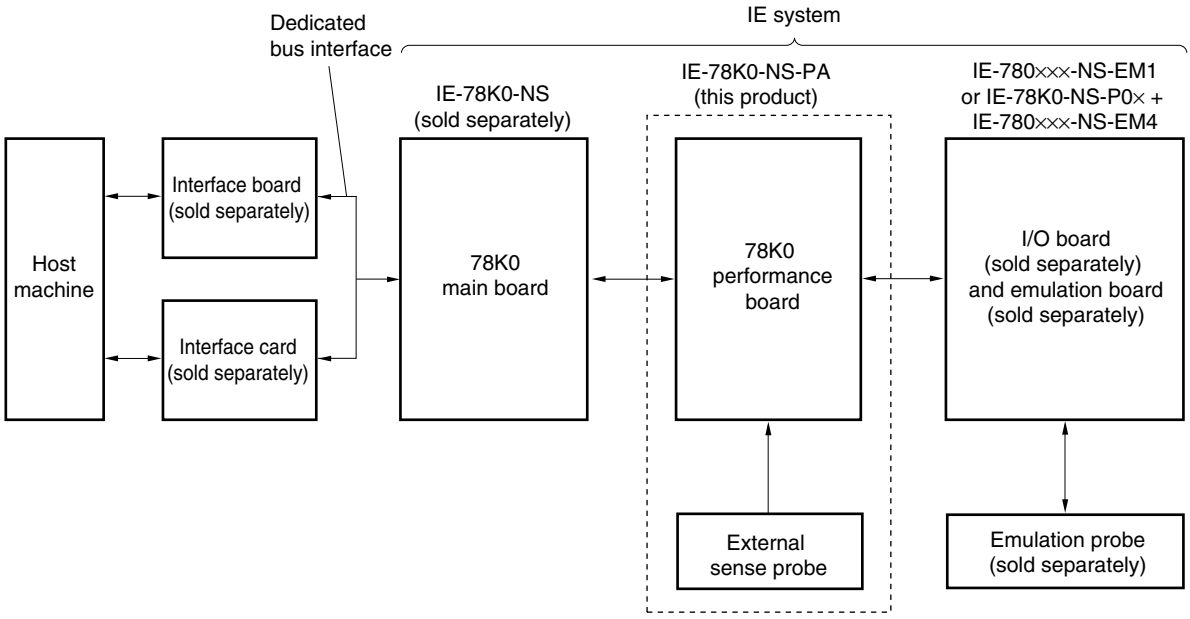


Note For the device file, emulation probe, and conversion socket/conversion adapter, refer to the IE-780×××-NS-EM1 or IE-780×××-NS-EM4 User's Manual.

1.2 Hardware Configuration

The position of the IE-78K0-NS-PA is shown in Figure 1-2.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

Table 1-1. List of Functions (MAX. Specifications) (1/2)

Parameter		IE-78K0-NS Single Unit Functions	Functions Added by Combining IE-78K0-NS with IE-78K0-NS-PA
Supervisor		V40™ (operating frequency: 16.0 MHz)	
Target device		78K/0 Series (μPD780×××)	
System clock		According to specification of emulation board (sold separately)	
Clock supply	External	Pulse input	
	Internal	Mounted on emulation board (sold separately)	
Substitute memory capacity		64 KB	
Mapping unit	Internal ROM	4 KB	
	Internal high-speed RAM	64 bytes	
	Internal low-speed RAM	128 bytes	
	External expansion memory	8 KB	
Emulation function		• Real-time execution • Break execution • Step execution	
Real-time internal RAM monitor		2 KB of entire data memory space	
Event detection		• Program execution detection: 2 (fetch) (BRS1, BRS2) • Bus event detection: 4 (access) (BRA1 to BRA4)	• Program execution detection: 8 (fetch) (BRS3 to BRS10) • Bus event detection: 8 (access) (BRA5 to BRA12)
Event integration		• Trigger condition • Path condition • Delay condition • Trace qualify condition	
Break factors		• External trigger detection (EXTIN: 1) • Trigger output OUT (open-drain output: 1) • Event break • Manual break • Command break • Fail-safe break	• External event inputs (EXTCN1: 8) • Timeout break
Real-time trace	Trace factors	• All traces • Qualify trace (access only)	• Section trace (both fetch and access) (inter-event trace)[Note]
	Trace capacity	32 bits × 8 KB	48 bits × 8 KB
	Trace contents	• Address • Data • Status	• External sense traces: 16 (8 of which (EXTCN1) can be used as external single event inputs) • Time stamp • Snap shot

Note Events use BRS3 to BRS10 and BRA5 to BRA12 added by the IE-78K0-NS-PA.

Table 1-1. List of Functions (MAX. Specifications) (2/2)

Parameter	IE-78K0-NS Single Unit Functions	Functions Added by Combining IE-78K0-NS with IE-78K0-NS-PA
Execution time measurement	Up to 4 min 28 s, resolution: 62.5 ns	
Inter-event time measurement	–	• Resolution: Changeable between 160 ns and 20.56 μs • Maximum measurement time When resolution is set to 160 ns: Approximately 11 minutes When resolution is set to 20.56 μs: Approximately 24 hours[Note]
Coverage	–	64 KB space (read, write, fetch)
DMM	–	16 events[Note]
Target interface	Emulation probe (sold separately) provided for each target device shape	
Host interface	Dedicated bus interface	
Low-voltage support	According to specification of emulation board (sold separately)	
Host machine	PC-9800 series, or IBM PC/AT and compatibles	
Power supply	DC 5 V	
Dimensions	W240 × D197 × H73 (mm)	

Note Events use BRS3 to BRS10 and BRA5 to BRA12 added by the IE-78K0-NS-PA.

CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-78K0-NS-PA main unit.

The packing box contains the performance board, 2 external sense probes, 20 external sense clips, a packing list, the user's manual, and a guarantee card.

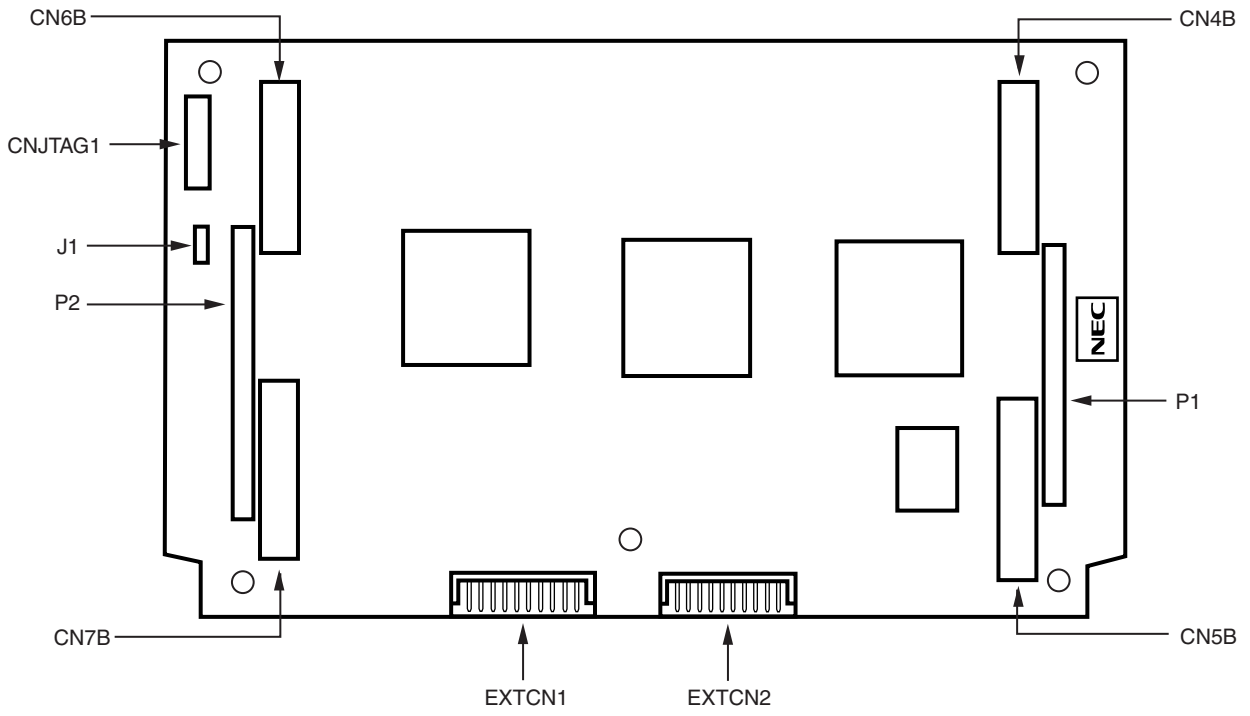
If there are any missing or damaged items, please contact an NEC sales representative.

Please make sure to fill out and return the guarantee card that comes with the main unit.

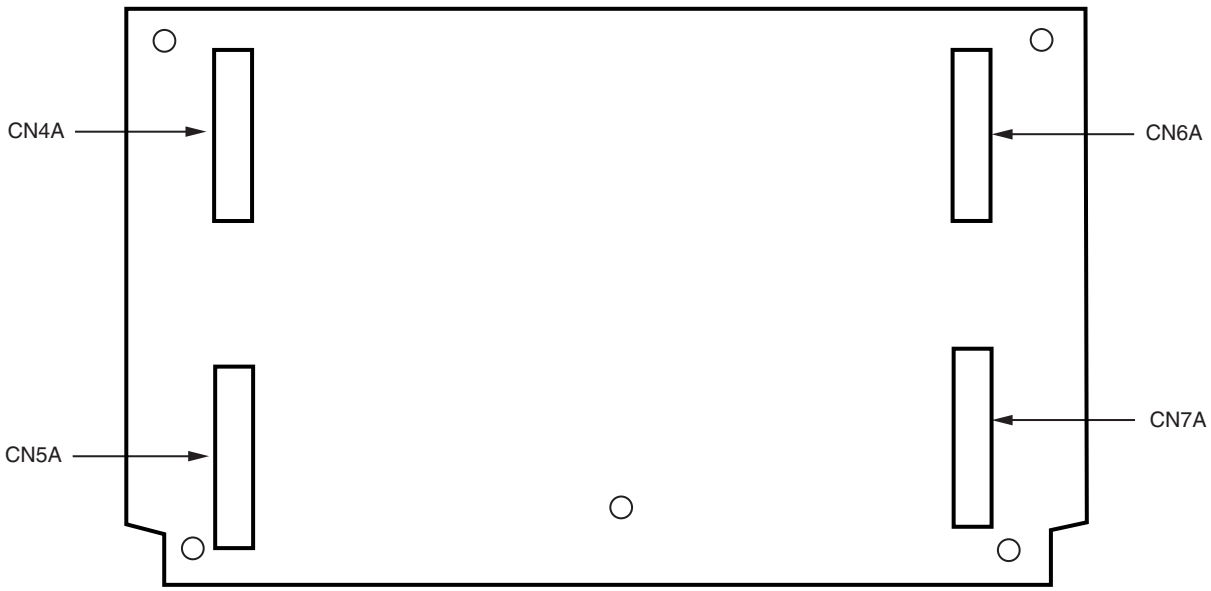
2.1 Parts of Main Unit

Figure 2-1. Performance Board

< Part side >



< Soldering side >



2.2 External Sense Probe Names

The IE-78K0-NS-PA includes external sense probes and external sense clips.

(1) External sense probes: 2

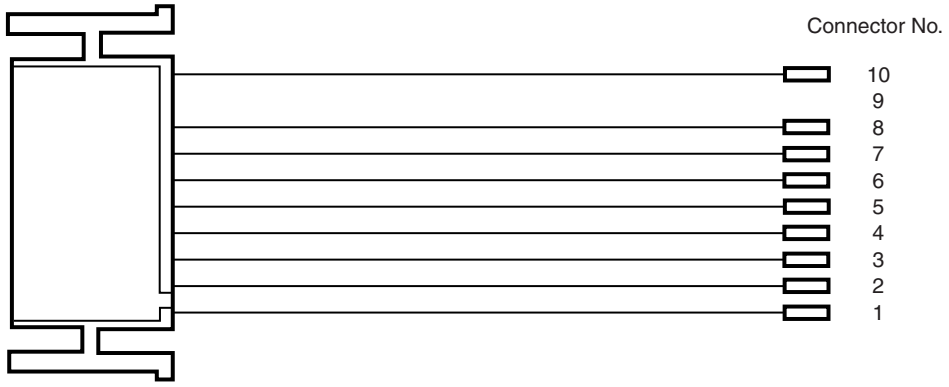


Table 2-1. Correspondence Between Connector No. and Color of Cable

Connector No.	1	2	3	4	5	6	7	8	9	10
Color of cable	Brown	Red	Orange	Yellow	Green	Blue	Purple	Gray	N.C.	Black

The names of the external sense probes when they are connected to EXTCN1 and EXTCN2 are as follows.

Table 2-2. Bit Configuration When Connecting External Sense Probe to EXTCN1

Connector No.	1	2	3	4	5	6	7	8	9	10
External sense	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	EXT7	EXT8	N.C.	GND

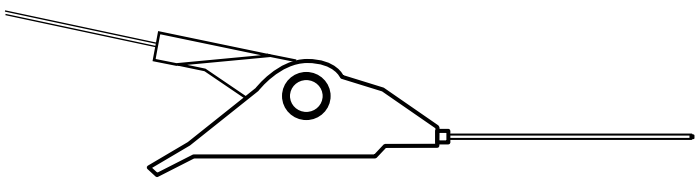
Table 2-3. Bit Configuration When Connecting External Sense Probe to EXTCN2

Connector No.	1	2	3	4	5	6	7	8	9	10
External sense	EXT9	EXT10	EXT11	EXT12	EXT13	EXT14	EXT15	EXT16	N.C.	GND

Remark N.C.: No connection

(2) External sense clips: 20 (16 for external sense probes, 2 for GND, and 2 spares)

- Made by Sunhayato Corporation (2 sets of 10)



CHAPTER 3 INSTALLATION

This chapter describes how to connect the IE-78K0-NS-PA to the IE-78K0-NS, emulation board, etc.

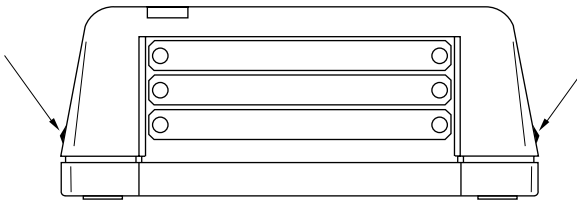
Caution Connecting and removing cables or components from the target system and changing the settings of switches, etc. should be carried out after turning off the power supply of the IE system and the target system.

(1) Connecting emulation board (IE-780×××-NS-EM1)

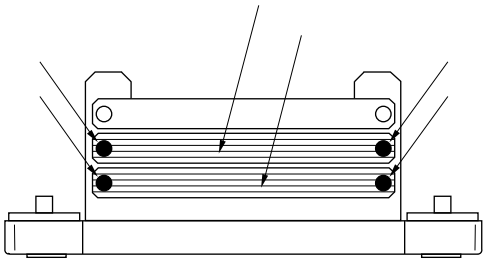
The IE-780×××-NS-EM1 is sold separately.

Figure 3-1. Connecting Emulation Board (IE-780×××-NS-EM1) (1/2)

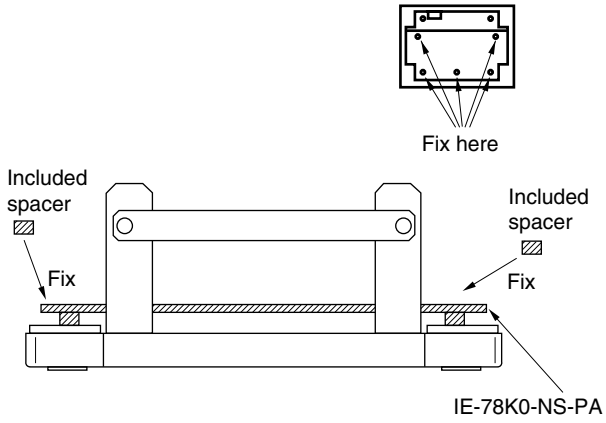
<1> Remove the screws from the sides of the main unit, and then remove the top cover.



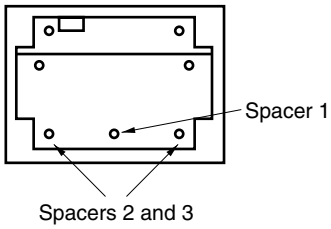
<2> Remove the first and second plates from the bottom by removing the screws.



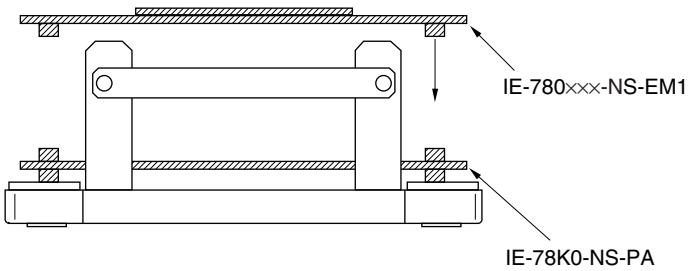
<3> Connect the IE-78K0-NS-PA and fix the spacers (metal) included with this product at five points on the board.



Caution Only when connecting the IE-78018-NS-EM1 on the IE-78K0-NS-PA, remove spacer 1 (metal) of the following figure and replace spacers 2 and 3 (metal) with spacers (plastic) included with this product.



<4> Connect the IE-780×××-NS-EM1 to the IE-78K0-NS-PA and fasten the two screws.



<5> When using an emulation probe, connect the corresponding emulation probe.

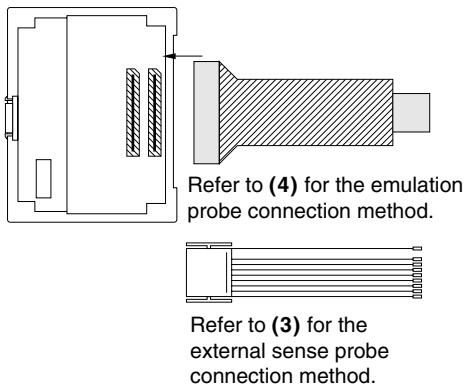
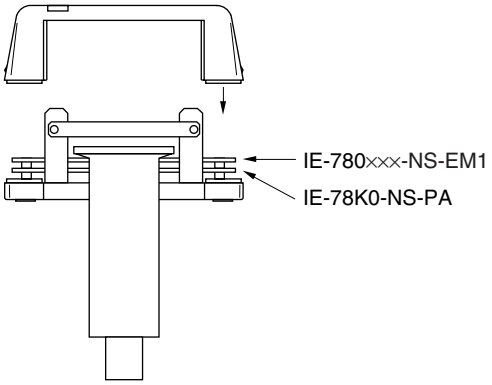


Figure 3-1. Connecting Emulation Board (IE-780×××-NS-EM1) (2/2)

<6> Replace the top cover and fasten the four screws on the sides.



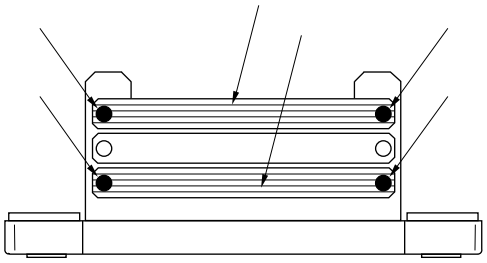
(2) Connecting I/O board (IE-78K0-NS-P0×) and emulation board (IE-780×××-NS-EM4)

The IE-78K0-NS-P0× and IE-780×××-NS-EM4 are sold separately.

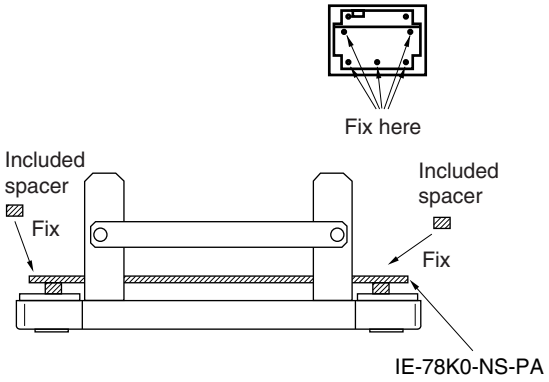
Figure 3-2. Connecting I/O Board (IE-78K0-NS-P0×) and Emulation Board (IE-780×××-NS-EM4) (1/2)

<1> Remove the screws from the sides of the main unit, and then remove the top cover.

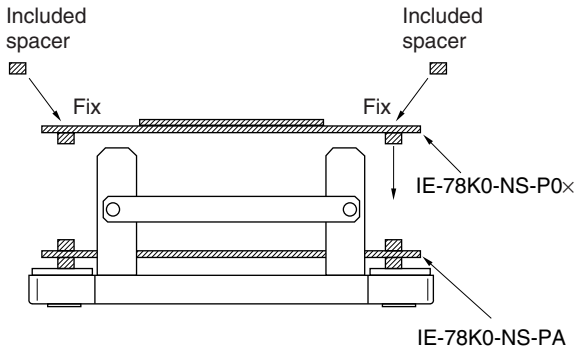
<2> Remove the first and third plates from the bottom by removing the screws.



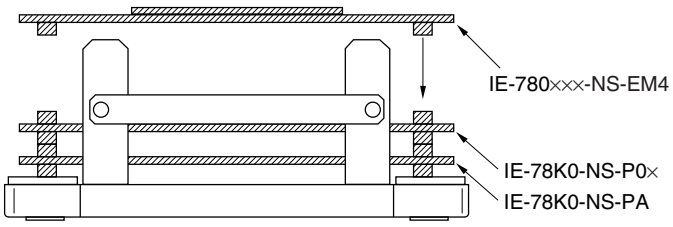
<3> Connect the IE-78K0-NS-PA and fix the spacers (metal) included with this product at five points on the board.



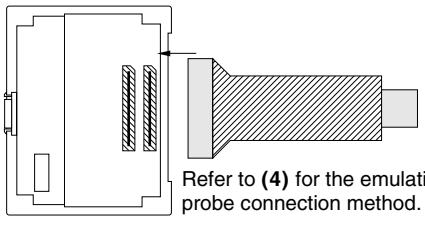
<4> Connect the IE-78K0-NS-P0× on the IE-78K0-NS-PA and fix the spacers included with the IE-78K0-NS-P0× at the four corners.



<5> Connect the IE-780×××-NS-EM4 on the IE-78K0-NS-P0×, and fasten the screws at the four corners.



<6> When using an emulation probe, connect the corresponding emulation probe.



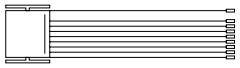
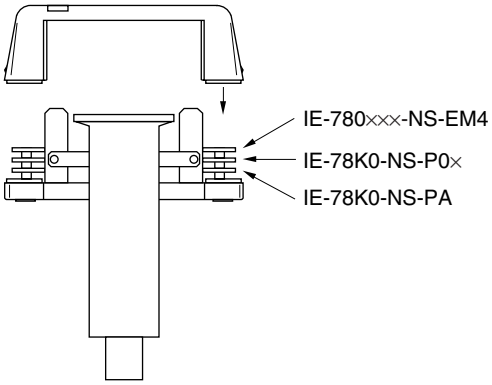


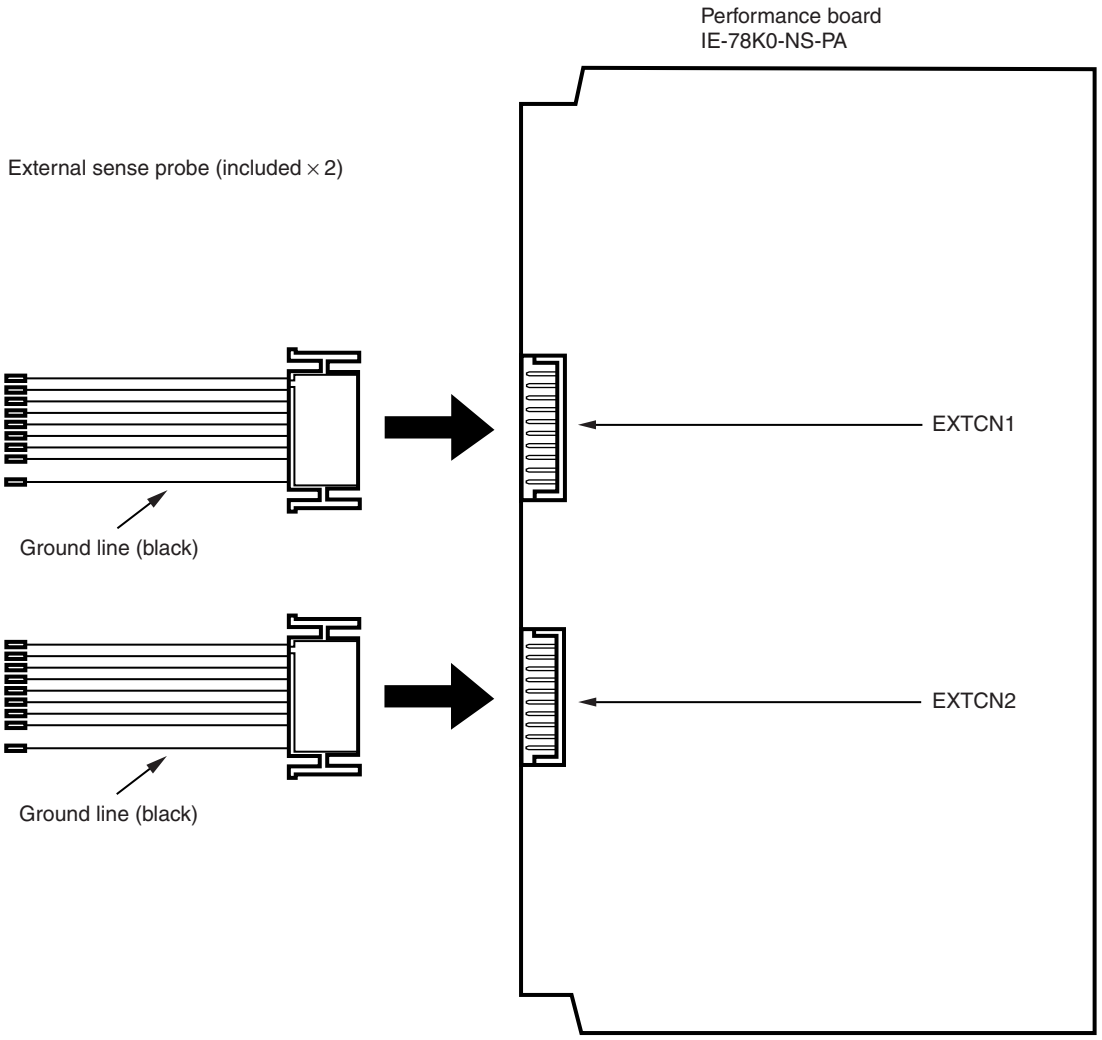
Figure 3-2. Connecting I/O Board (IE-78K0-NS-P0×) and Emulation Board (IE-780×××-NS-EM4) (2/2)

<7> Replace the top cover and fasten the four screws on the sides.



(3) Connecting external sense probe

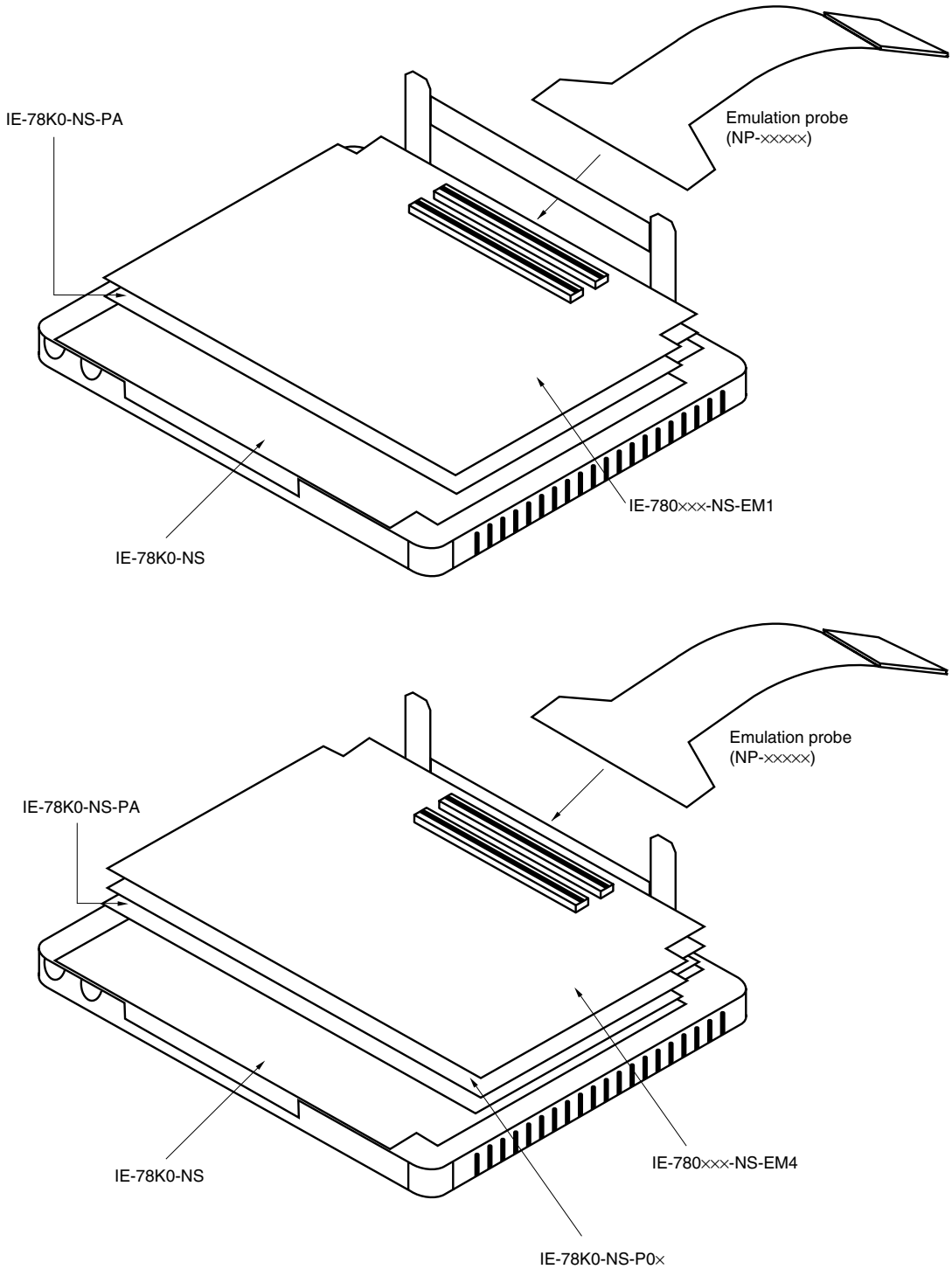
Figure 3-3. Connecting External Sense Probe



(4) Connecting emulation probe (NP-××××)

NP-××××× is sold separately.

Figure 3-4. Connecting Emulation Probe



Caution The emulation probe (NP-××××) mounting location varies depending on the emulation board in use. For details, refer to the user's manual of the corresponding emulation board.

CHAPTER 4 EXTERNAL SENSE SPECIFICATIONS

Up to 16-bit data can be input to the IE-78K0-NS-PA from the target system via an external sense probe. Also, when using an external event input, input a level of at least 2 CPU clocks.

Table 4-1. Electrical Specifications of External Sense

Parameter	MIN. [V]	MAX. [V]
Input voltage, high	Target voltage[Note] × 0.7	Target voltage[Note]
Input voltage, low	0	Target voltage[Note] × 0.3

Note 2.0 V when the target voltage is less than 2.0 V.

CHAPTER 5 CAUTIONS

(1) When debugging is performed by connecting the performance board IE-78K0-NS-PA to the in-circuit emulator IE-78K0-NS and the corresponding emulation board, use an in-circuit emulator or an integrated debugger that satisfies the following conditions.

- Use an in-circuit emulator IE-78K0-NS with control code D or later.
- Use version 2.00 or later of the integrated debugger ID78K0-NS.

(2) If it is set that DMM or snap shot occurs during the measurement section of the execution time, the execution time measurement value becomes larger than the actual value.

○ Countermeasure: Do not specify DMM or snap shot during the measurement section of the execution time.

(3) When section trace is specified and then DMM or snap shot is specified, the trace data may not appear correctly.

○ Countermeasure: Do not set a DMM or snap shot event when performing a section trace.
Do not set a section trace when performing a DMM or snap shot event.

[MEMO]

[MEMO]

[MEMO]

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