

**NEC**

**User's Manual**

# **IE-780066-NS-EM4**

**Emulation Board**

---

**Target Devices**  
**μPD780065 Subseries**

Document No. U16233EJ2V0UM00 (2nd edition)  
Date Published October 2002 N CP(K)

© NEC Corporation 2002  
Printed in Japan

[MEMO]

**Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and/or other countries.**

**PC/AT is a trademark of International Business Machines Corporation.**

- **The information in this document is current as of August, 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**

- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.

- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.

- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.

- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.

- NEC semiconductor products are classified into the following three quality grades:  
"Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

(Note)

(1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.

(2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4

# Regional Information

Some information contained in this document may vary from country to country. Before using any NEC product in your application, please contact the NEC office in your country to obtain a list of authorized representatives and distributors. They will verify:

- Device availability
- Ordering information
- Product release schedule
- Availability of related technical literature
- Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)
- Network requirements

In addition, trademarks, registered trademarks, export restrictions, and other legal issues may also vary from country to country.

## **NEC Electronics Inc. (U.S.)**

Santa Clara, California  
Tel: 408-588-6000  
800-366-9782  
Fax: 408-588-6130  
800-729-9288

## **NEC do Brasil S.A.**

Electron Devices Division  
Guarulhos-SP, Brasil  
Tel: 11-6462-6810  
Fax: 11-6462-6829

## **NEC Electronics (Europe) GmbH**

Duesseldorf, Germany  
Tel: 0211-65 03 01  
Fax: 0211-65 03 327

### **• Sucursal en España**

Madrid, Spain  
Tel: 091-504 27 87  
Fax: 091-504 28 60

### **• Succursale Française**

Vélizy-Villacoublay, France  
Tel: 01-30-67 58 00  
Fax: 01-30-67 58 99

### **• Filiale Italiana**

Milano, Italy  
Tel: 02-66 75 41  
Fax: 02-66 75 42 99

### **• Branch The Netherlands**

Eindhoven, The Netherlands  
Tel: 040-244 58 45  
Fax: 040-244 45 80

### **• Branch Sweden**

Taeby, Sweden  
Tel: 08-63 80 820  
Fax: 08-63 80 388

### **• United Kingdom Branch**

Milton Keynes, UK  
Tel: 01908-691-133  
Fax: 01908-670-290

## **NEC Electronics Hong Kong Ltd.**

Hong Kong  
Tel: 2886-9318  
Fax: 2886-9022/9044

## **NEC Electronics Hong Kong Ltd.**

Seoul Branch  
Seoul, Korea  
Tel: 02-528-0303  
Fax: 02-528-4411

## **NEC Electronics Shanghai, Ltd.**

Shanghai, P.R. China  
Tel: 021-6841-1138  
Fax: 021-6841-1137

## **NEC Electronics Taiwan Ltd.**

Taipei, Taiwan  
Tel: 02-2719-2377  
Fax: 02-2719-5951

## **NEC Electronics Singapore Pte. Ltd.**

Novena Square, Singapore  
Tel: 253-8311  
Fax: 250-3583

### Major Revisions in This Edition

Page	Description
p. 42	Modification of the size on the adapter block in <b>Figure B-2. Connection Conditions of Target System (NP-80GC-TQ)</b> , and <b>Figure B-3. Connection Conditions of Target System (NP-H80GC-TQ)</b>

The mark ★ shows major revised points.

## INTRODUCTION

### Product Overview

The IE-780066-NS-EM4 is designed to be used with the IE-78K0-NS-P01 and IE-78K0-NS or IE-78K0-NS-A to debug the following target devices that belong to the 78K/0 Series of 8-bit single-chip microcontrollers.

- $\mu$ PD780065 Subseries:  $\mu$ PD780065, 78F0066

### Target Readers

This manual is intended for engineers who will use the IE-780066-NS-EM4 with the IE-78K0-NS-P01 and IE-78K0-NS or IE-78K0-NS-A to perform system debugging.

Engineers who use this manual are expected to be thoroughly familiar with the target device's functions and use methods and to be knowledgeable about debugging.

### Organization

When using the IE-780066-NS-EM4, refer to not only this manual (supplied with the IE-780066-NS-EM4) but also the manuals that are supplied with the IE-78K0-NS-P01 and the IE-78K0-NS or IE-78K0-NS-A.

The IE-78K0-NS used in combination with the IE-78K0-NS-PA is functionally equivalent to the IE-78K0-NS-A. Therefore, as necessary, read IE-78K0-NS + IE-78K0-NS-PA for IE-78K0-NS-A in this document.

IE-78K0-NS or IE-78K0-NS-A User's Manual
---

- Basic specifications
- System configuration
- External interface functions

IE-780066-NS-EM4 User's Manual
-----------------------------------

- General
- Part names
- Installation
- Differences between target devices and target interface circuits

IE-78K0-NS-P01 User's Manual
---------------------------------

- General
- Part names
- Installation

### Purpose

This manual's purpose is to explain various debugging functions that can be performed when using the IE-780066-NS-EM4.

## Terminology

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

Term	Meaning
Emulation device	This is a general term that refers to the device in the emulator that is used to emulate the target device. It includes the emulation CPU.
Emulation CPU	This is the CPU block in the emulator that is used to execute user-generated programs.
Target device	This is the device that is the target for emulation.
Target system	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 or IE-78K0-NS-A), I/O board (IE-78K0-NS-P01), and emulation board (IE-780066-NS-EM4).

## 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-A In-Circuit Emulator	U14889E
IE-78K0-NS-P01 I/O Board	U16106E
IE-780066-NS-EM4 Emulation Board	This manual
ID78K Series Integrated Debugger Ver.2.30 or Later Operation Windows™ Based	U15185E
μPD780065 Subseries	U13420E

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

# CONTENTS

<b>CHAPTER 1 GENERAL</b> .....	<b>11</b>
<b>1.1 System Configuration</b> .....	<b>12</b>
<b>1.2 Hardware Configuration</b> .....	<b>14</b>
<b>1.3 Basic Specifications</b> .....	<b>15</b>
<b>CHAPTER 2 PART NAMES</b> .....	<b>16</b>
<b>2.1 Parts of Main Unit</b> .....	<b>17</b>
<b>CHAPTER 3 INSTALLATION</b> .....	<b>18</b>
<b>3.1 Connection</b> .....	<b>19</b>
<b>3.2 Clock Settings</b> .....	<b>20</b>
3.2.1 Overview of clock settings.....	20
3.2.2 Main system clock settings.....	23
3.2.3 Subsystem clock settings.....	28
<b>3.3 External Trigger</b> .....	<b>33</b>
<b>3.4 Jumper Settings on IE-78K0-NS</b> .....	<b>34</b>
<b>3.5 Jumper Settings on IE-78K0-NS-A</b> .....	<b>34</b>
<b>3.6 Low-Voltage Emulation Setting</b> .....	<b>35</b>
<b>CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS</b> .....	<b>36</b>
<b>CHAPTER 5 RESTRICTIONS</b> .....	<b>38</b>
<b>APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE</b> .....	<b>39</b>
<b>APPENDIX B NOTES ON DESIGNING TARGET SYSTEM</b> .....	<b>41</b>



## LIST OF FIGURES

Figure No.	Title	Page
1-1	System Configuration .....	12
1-2	Basic Hardware Configuration (Using IE-78K0-NS) .....	14
1-3	Basic Hardware Configuration (Using IE-78K0-NS-A).....	14
2-1	IE-780066-NS-EM4 Part Names .....	17
3-1	Connection of Emulation Probe .....	19
3-2	External Circuits Used as System Clock Oscillator .....	20
3-3	When Using Clock That Is Already Mounted on IE-78K0-NS-P01 (Main System Clock) .....	21
3-4	When Using User-Mounted Clock (Main System Clock) .....	22
3-5	When Using User-Mounted Clock (Subsystem Clock) .....	22
3-6	When Using External Clock.....	23
3-7	Connections on Parts Board (When Using Main System Clock or User-Mounted Clock) .....	24
3-8	Crystal Oscillator (When Using Main System Clock or User-Mounted Clock).....	26
3-9	Pin Alignment of Crystal Oscillator and Socket .....	26
3-10	Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock) .....	29
3-11	Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock).....	31
3-12	Pin Alignment of Crystal Oscillator and Socket .....	31
3-13	External Trigger Input Position .....	33
3-14	Main Board of IE-78K0-NS or IE-78K0-NS-A (G-780009 Board) .....	35
4-1	Equivalent Circuit of Emulation Circuit 1 .....	37
4-2	Equivalent Circuit of Emulation Circuit 2 .....	37
4-3	Equivalent Circuit of Emulation Circuit 3 .....	37
B-1	Distance Between IE System and Conversion Adapter .....	41
B-2	Connection Conditions of Target System (NP-80GC-TQ) .....	42
B-3	Connection Conditions of Target System (NP-H80GC-TQ) .....	42

## LIST OF TABLES

Table No.	Title	Page
1-1	Correspondence Between Emulation Probe and Conversion Socket/Conversion Adapter.....	13
1-2	Basic Specifications.....	15
3-1	Main System Clock Settings .....	23
3-2	Subsystem Clock Settings .....	28
3-3	Jumper Settings on IE-78K0-NS.....	34
3-4	Jumper Settings on IE-78K0-NS-A G-780009 Board.....	34
3-5	Jumper Settings on IE-78K0-NS-A G-78K0H Option Board .....	34
3-6	Power Supply Voltage and Maximum Current Consumption During Low-Voltage Emulation .....	35
5-1	Initial Value of Port When IE System Started Without Target System Connected .....	38
A-1	NP-80GC, NP-80GC-TQ, NP-H80GC-TQ Pin Assignments.....	39
B-1	Distance Between IE System and Conversion Adapter.....	41

## CHAPTER 1 GENERAL

The IE-780066-NS-EM4 is a development tool for efficient debugging of hardware or software when using one of the following target devices that belong to the 78K/0 Series of 8-bit single-chip microcontrollers.

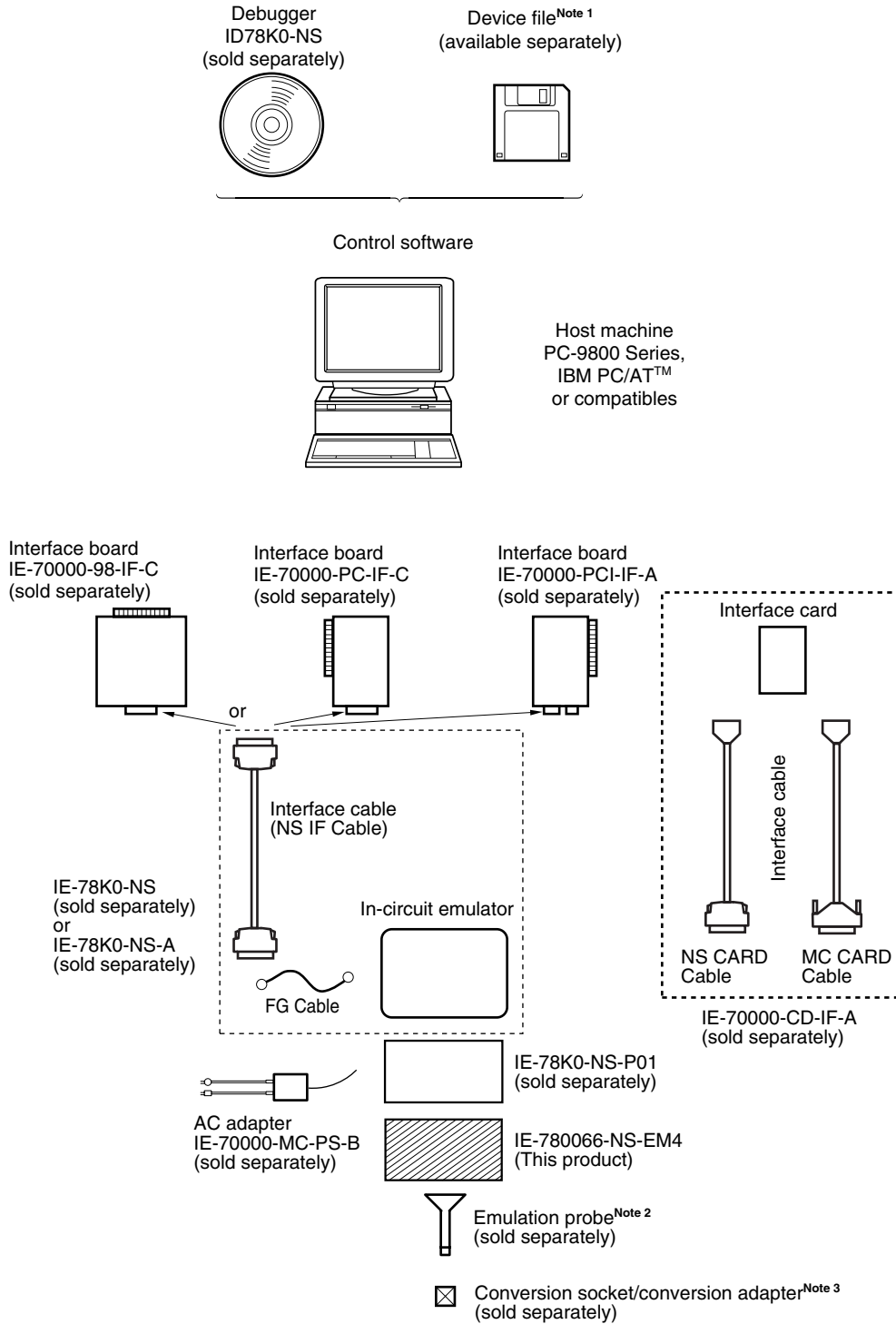
This chapter describes the IE-780066-NS-EM4's system configuration and basic specifications.

- Target devices
  - $\mu$ PD780065 Subseries

## 1.1 System Configuration

Figure 1-1 illustrates the IE-780066-NS-EM4's system configuration.

**Figure 1-1. System Configuration**



**Notes** 1. The device file is as follows, in accordance with the subseries.

$\mu$ SxxxxDF780066:  $\mu$ PD780065 Subseries

The device file can be downloaded from the web site of NEC Electron Devices  
(<http://www.ic.nec.co.jp/micro/>)

2. The emulation probes, NP-80GC, NP-80GC-TQ, and NP-H80GC-TQ are products of Naito Densai Machida Mfg. Co., Ltd.

For further information, contact Naito Densai Machida Mfg. Co., Ltd. (TEL: +81-45-475-4191)

3. The conversion socket/conversion adapter, TGC-080SBP is a product of TOKYO ELETECH CORPORATION.

For further information, contact Daimaru Kogyo Co., Ltd.

Tokyo Electronics Department (TEL: +81-3-3820-7112)

Osaka Electronics Department (TEL: +81-6-6244-6672)

Table 1-1 shows the correspondence between the emulation probes and conversion sockets/conversion adapters that are sold separately.

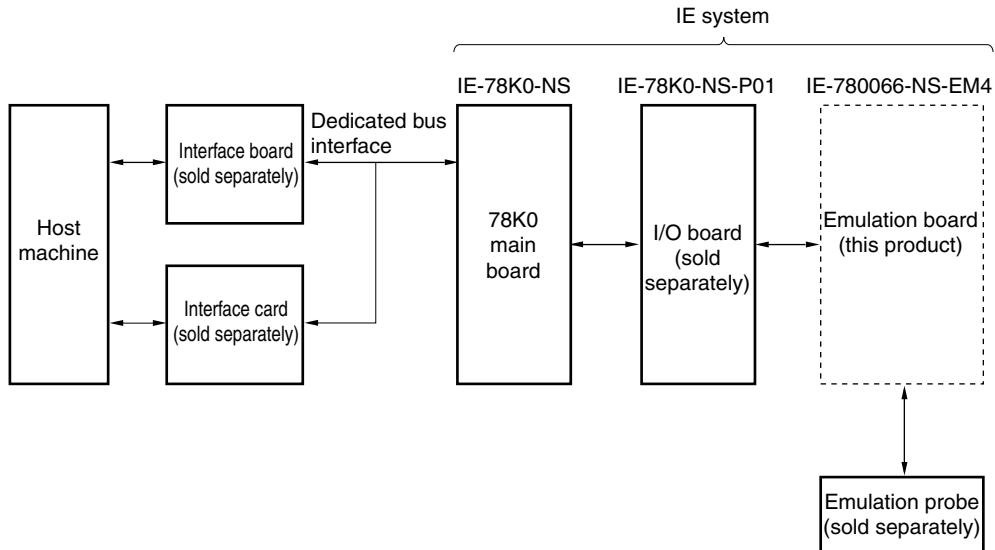
**Table 1-1. Correspondence Between Emulation Probe and Conversion Socket/Conversion Adapter**

Package	Emulation Probe	Conversion Socket/Conversion Adapter
80-pin plastic QFP (GC type)	NP-80GC (probe length: 200 mm)	EV-9200GC-80
	NP-80GC-TQ (probe length: 200 mm)	TGC-080SBP
	NP-H80GC-TQ (probe length: 400 mm)	

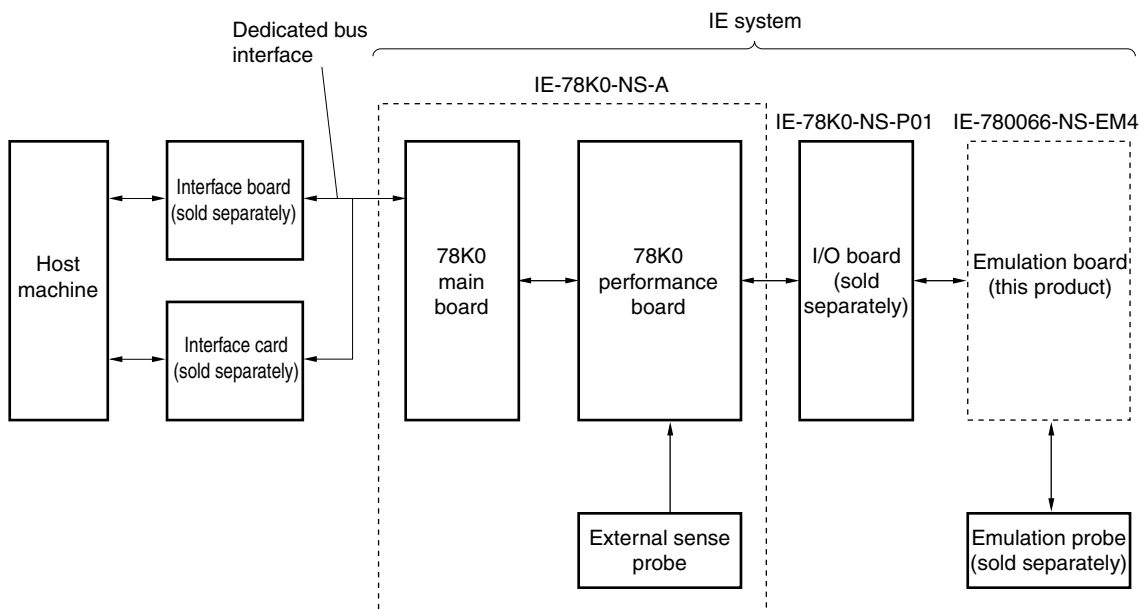
## 1.2 Hardware Configuration

Figures 1-2 and 1-3 show the IE-780066-NS-EM4's position in the basic hardware configuration.

**Figure 1-2. Basic Hardware Configuration (Using IE-78K0-NS)**



**Figure 1-3. Basic Hardware Configuration (Using IE-78K0-NS-A)**



### 1.3 Basic Specifications

The IE-780066-NS-EM4's basic specifications are listed in Table 1-2.

**Table 1-2. Basic Specifications**

Parameter	Description
Target device	$\mu$ PD780065 Subseries
System clock	8.38 MHz
Main system clock supply	External: Input via an emulation probe from the target system Internal: Mounted on the I/O board (8.38 MHz) or mounted on the board by the user
Subsystem clock supply	External: Input via an emulation probe from the target system
Low voltage support	$V_{DD} = 2.7$ to 5.5 V (same as the target device)

## CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-780066-NS-EM4 main unit.

The packing box contains the emulation board (IE-780066-NS-EM4), packing list, user's manual, and guarantee card.

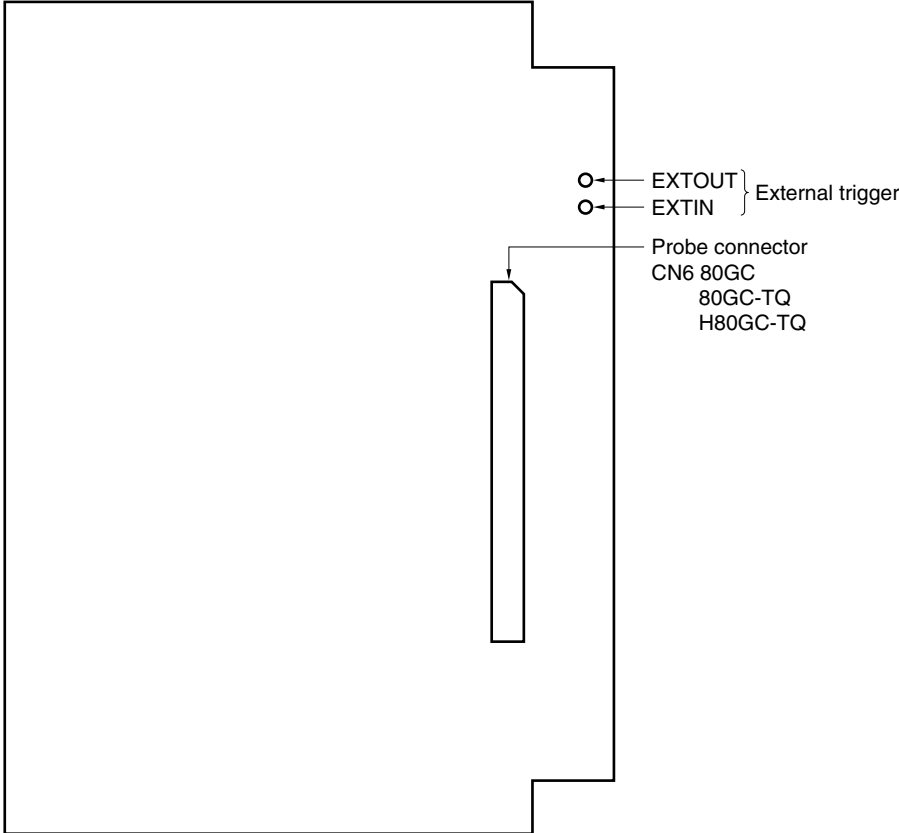
If there are any missing or damaged items, please contact an NEC sales representative.

Fill out and return the guarantee card that comes with the main unit.



2.1 Parts of Main Unit

Figure 2-1. IE-780066-NS-EM4 Part Names



## CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-780066-NS-EM4 to the IE-78K0-NS-P01 and IE-78K0-NS or IE-78K0-NS-A, emulation probe, etc. Mode setting methods are also described.

**Caution**    **Connecting or removing components to or from the target system, or making switch or other setting changes must be carried out after the power supply to both the IE system and the target system has been switched OFF.**

### 3.1 Connection

#### (1) Connection with IE-78K0-NS-P01 and IE-78K0-NS or IE-78K0-NS-A main unit

See the **IE-78K0-NS User's Manual (U13731E)** for a description of how to connect the IE-780066-NS-EM4 to the IE-78K0-NS-P01 and IE-78K0-NS.

See the **IE-78K0-NS-A User's Manual (U14889E)** for a description of how to connect the IE-780066-NS-EM4 to the IE-78K0-NS-P01 and IE-78K0-NS-A.

#### (2) Connection with emulation probe

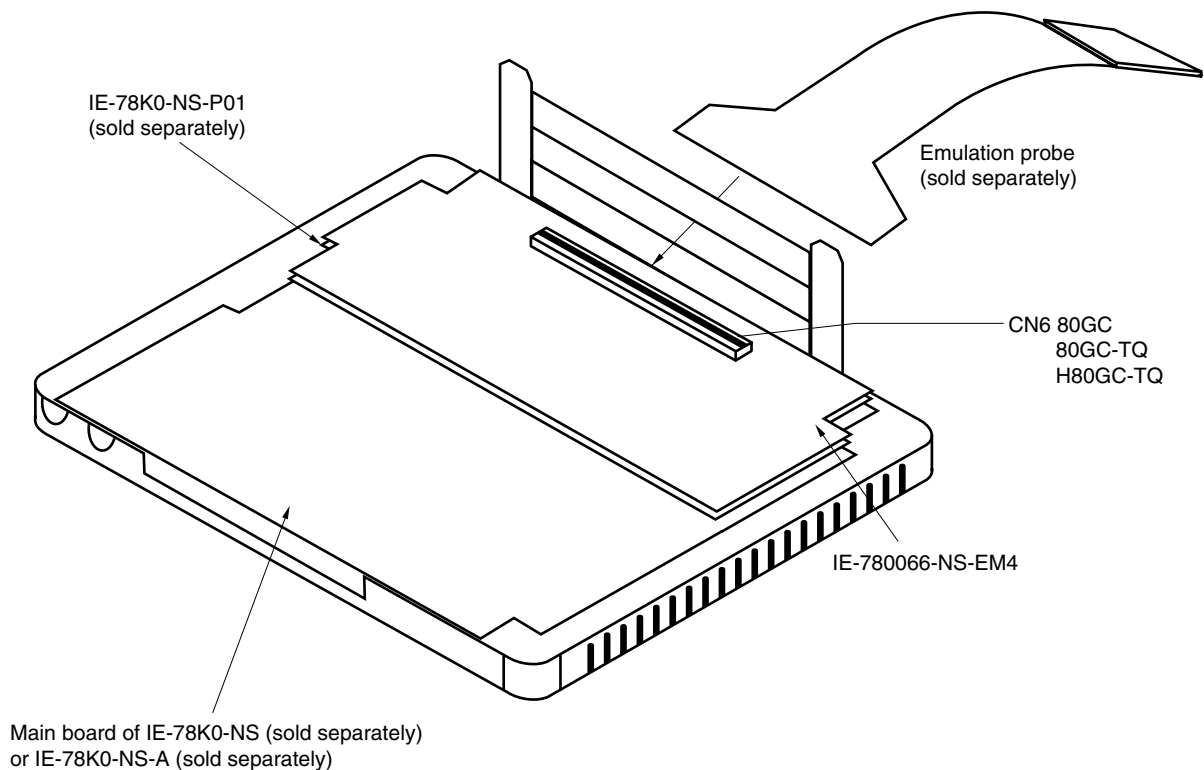
See the **IE-78K0-NS User's Manual (U13731E)** or **IE-78K0-NS-A User's Manual (U14889E)** for a description of how to connect an emulation probe to the IE-780066-NS-EM4.

On this board, connect the emulation probe to CN6.

**Caution** Incorrect connection may damage the IE system.

**Be sure to read the emulation probe's user's manual for a detailed description of the connection method.**

Figure 3-1. Connection of Emulation Probe



## 3.2 Clock Settings

### 3.2.1 Overview of clock settings

The main system clock to be used during debugging can be selected from (1) to (3) below and the subsystem clock from (2) and (3).

- (1) Clock that is already mounted on IE-78K0-NS-P01
- (2) Clock that is mounted by user
- (3) External clock

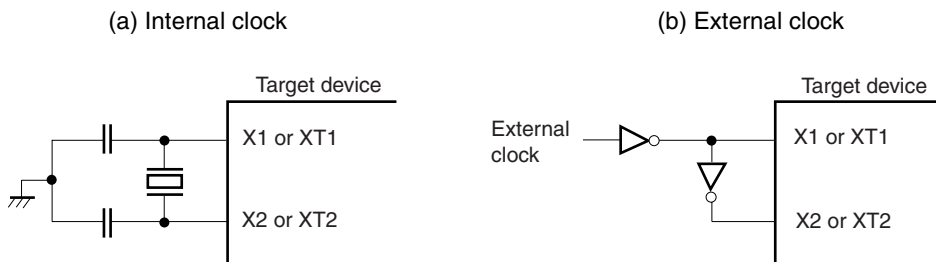
If the target system includes an internal clock, select either **(1) Clock that is already mounted on IE-78K0-NS-P01** or **(2) Clock that is mounted by user**. For an internal clock, a resonator is connected to the target device and the target device's internal oscillator is used. An example of the external circuit is shown in part (a) of Figure 3-2. During emulation, the resonator that is mounted on the target system is not used. Instead, the clock that is mounted on the IE-78K0-NS-P01 is used.

If the target system includes an external clock, select **(3) External clock**.

For an external clock, a clock signal is supplied from outside the target device and the target device's internal oscillator is not used. An example of the external circuit is shown in part (b) of Figure 3-2.

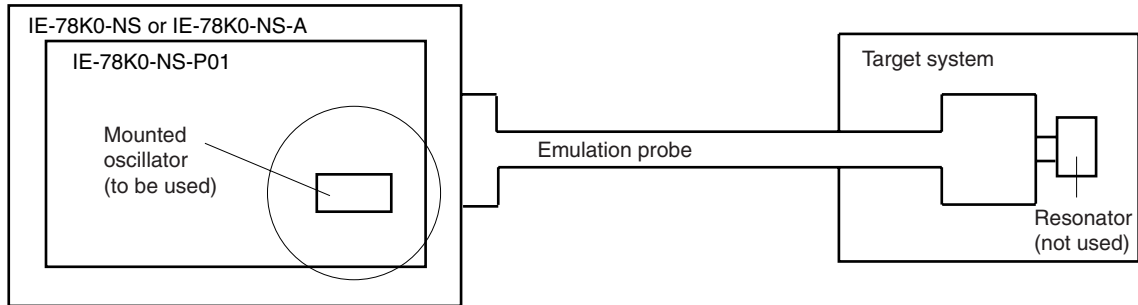
**Caution** The IE system will be hung-up if the main system clock is not supplied normally. Moreover, be sure to input a rectangular wave as the clock from the target. The IE system does not operate if the crystal resonator is connected to X1 (main system clock) and XT1 (subsystem clock).

Figure 3-2. External Circuits Used as System Clock Oscillator



**(1) Clock that is already mounted on IE-78K0-NS-P01**

A crystal oscillator (OSC1) is already mounted as a main system clock on the IE-78K0-NS-P01. Its frequency is 8.38 MHz.

**Figure 3-3. When Using Clock That Is Already Mounted on IE-78K0-NS-P01 (Main System Clock)**

**Remark** The clock that is supplied by the IE-78K0-NS-P01's oscillator (encircled in the figure) is used.

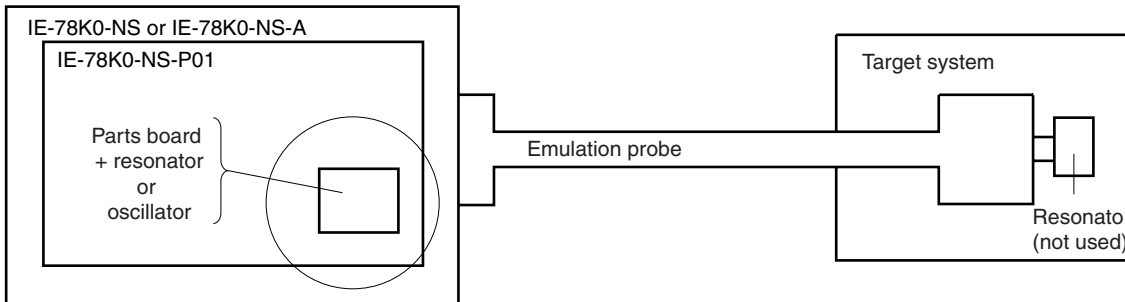
**(2) Clock that is mounted by user**

The user is able to mount any clock supported by the set specifications on the IE-78K0-NS-P01.

**(a) For main system clock**

Remove the parts board (X1) that is already mounted on the IE-78K0-NS-P01, and mount either the parts board on which the resonator to be used is mounted or an oscillator. This method is useful when using a different frequency from that of the pre-mounted clock.

**Figure 3-4. When Using User-Mounted Clock (Main System Clock)**

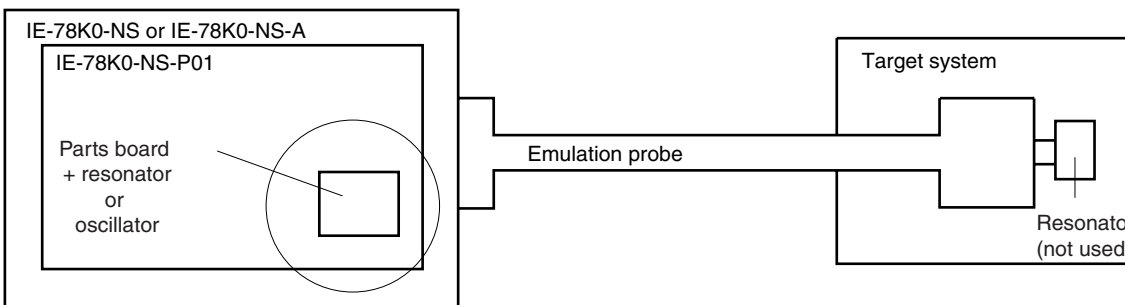


**Remark** The clock that is supplied by the IE-78K0-NS-P01’s resonator or oscillator (encircled in the figure) is used.

**(b) For subsystem clock**

Mount the resonator to be used on the parts board (X2) that is already mounted on the IE-78K0-NS-P01. Alternatively, remove the parts board and mount an oscillator.

**Figure 3-5. When Using User-Mounted Clock (Subsystem Clock)**

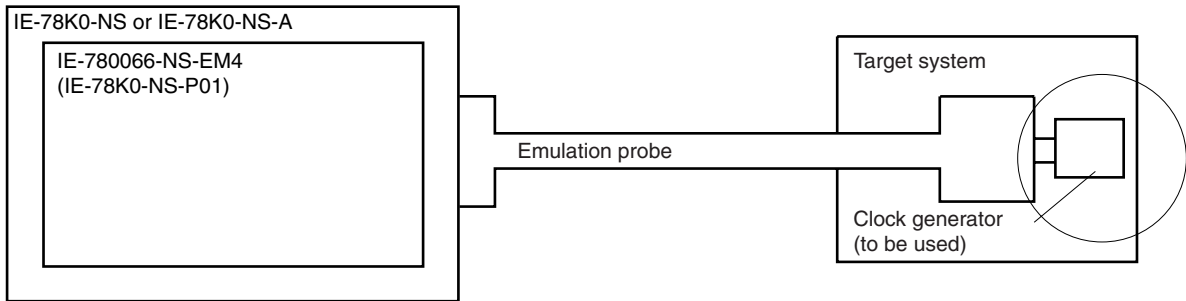


**Remark** The clock that is supplied by the IE-78K0-NS-P01’s resonator or oscillator (encircled in the figure) is used.

**(3) External clock**

An external clock connected to the target system can be used via an emulation probe.

**Figure 3-6. When Using External Clock**



**Remark** The clock supplied by the target system's clock generator (encircled in the figure) is used.

**3.2.2 Main system clock settings**

**Table 3-1. Main System Clock Settings**

Frequency of Main System Clock		IE-78K0-NS-P01	CPU Clock Source Selection (ID78K0-NS)
When using clock that is already mounted on IE-78K0-NS-P01	8.38 MHz	Oscillator (OSC1)	Internal
When using clock mounted by user	Other than 8.38 MHz	Oscillator assembled by user (X1)	External
When using external clock		Oscillator (target system)	

**Caution** When using an external clock, open the configuration dialog box when starting the integrated debugger (ID78K0-NS) and select "External" in the area (Clock) for selecting the CPU's clock source (this selects the user's clock).

**(1) When using clock that is already mounted on IE-78K0-NS-P01**

When the IE-78K0-NS-P01 is shipped, an 8.38 MHz crystal oscillator is already mounted in the IE-78K0-NS-P01's OSC1 socket. When using the factory-set mode settings, there is no need to make any other hardware settings.

When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select "Internal" in the area (Clock) for selecting the CPU's clock source (this selects the emulator's internal clock).

**(2) When using clock mounted by user**

Perform the settings described under either (a) or (b), depending on the type of clock to be used. When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select "Internal" in the area (Clock) for selecting the CPU's clock source (this selects the emulator's internal clock).

**(a) When using a ceramic resonator or crystal resonator**

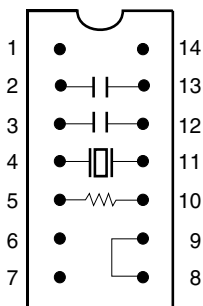
- Items to be prepared
  - Parts board
  - Ceramic resonator or crystal resonator
  - Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<Steps>

<1> Solder the target ceramic resonator or crystal resonator and resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequency) as shown below.

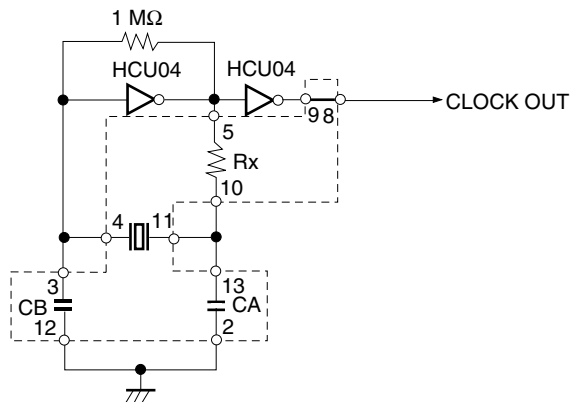
**Figure 3-7. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)**

IE-78K0-NS-P01  
parts board (X1)



Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Ceramic resonator or crystal resonator
5-10	Resistor Rx
8-9	Shorted

Circuit diagram



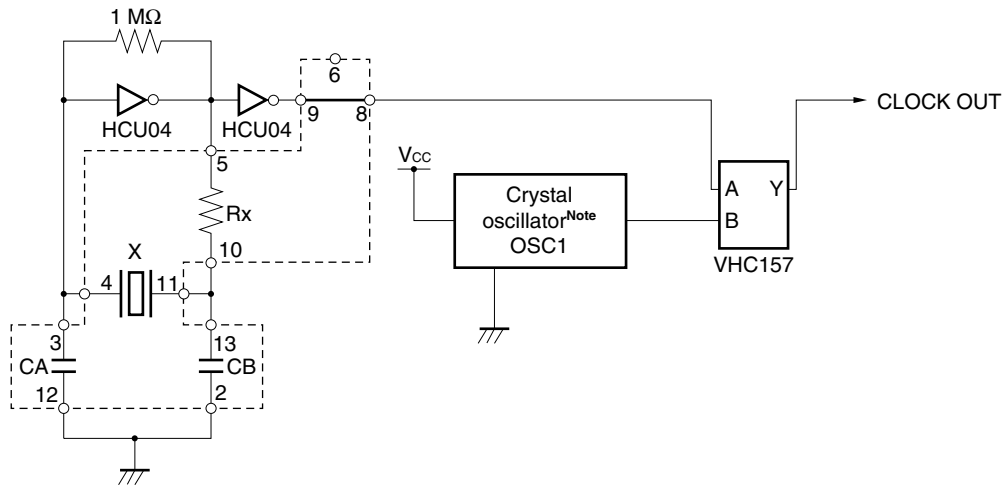
**Remark** The sections enclosed in broken lines indicate parts that are attached to the parts board.



- <2> Prepare the IE-78K0-NS-P01.
- <3> Remove the parts board that is mounted in the IE-78K0-NS-P01's X1 socket.
- <4> Connect the parts board (from <1> above) to the X1 socket from which the parts board was removed.  
Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Make sure that the parts board is wired as shown in Figure 3-7 above.
- <6> Connect the IE-780066-NS-EM4 and IE-78K0-NS-P01 to the IE-78K0-NS or IE-78K0-NS-A.

The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.

**IE-78K0-NS or IE-78K0-NS-A side  
(Emulation device)**



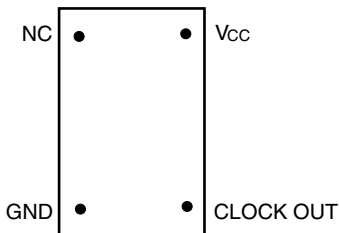
**Note** OSC1 of IE-78K0-NS-P01

**Remark** The sections enclosed in broken lines indicate parts that are attached to the parts board.

(b) When using a crystal oscillator

- Items to be prepared
  - Crystal oscillator (see pins shown in Figure 3-8)

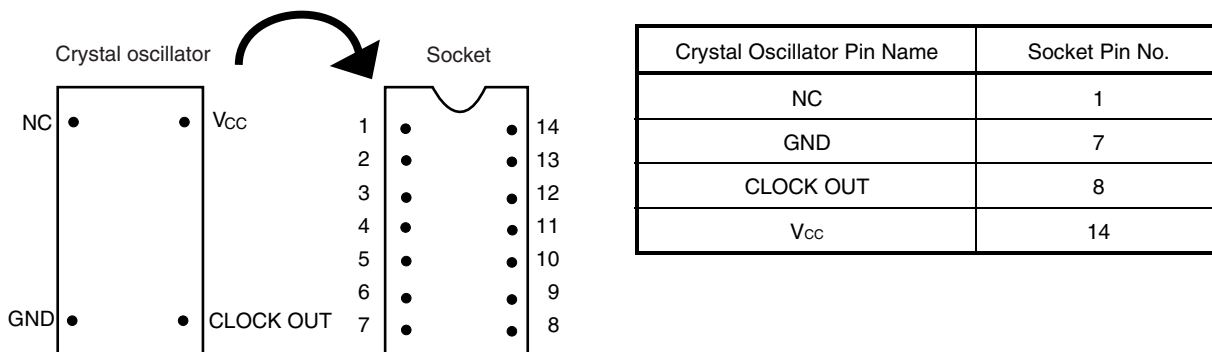
Figure 3-8. Crystal Oscillator (When Using Main System Clock or User-Mounted Clock)



<Steps>

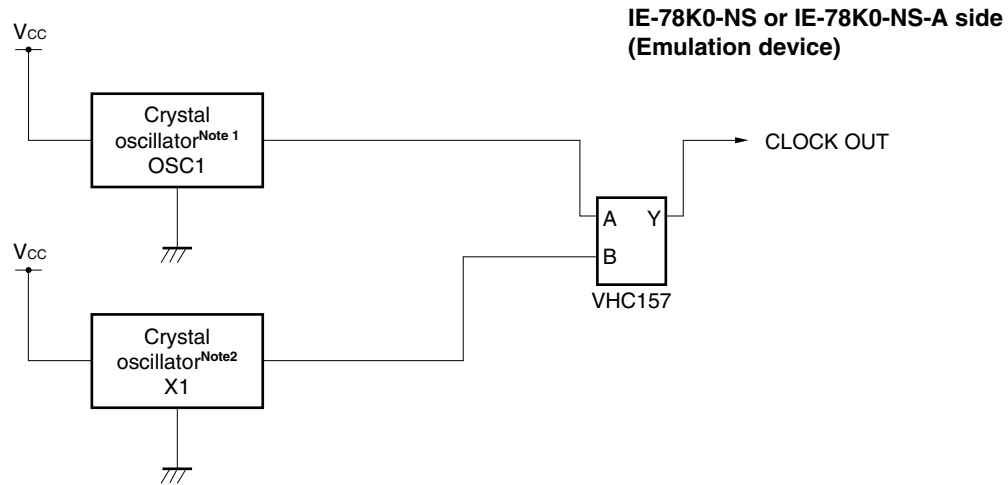
- <1> Prepare the IE-78K0-NS-P01.
- <2> Remove the parts board that is mounted in the IE-78K0-NS-P01's X1 socket.
- <3> Mount the crystal oscillator prepared by the user in the X1 socket from which the parts board was removed in <2> above. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

Figure 3-9. Pin Alignment of Crystal Oscillator and Socket



- <4> Connect the IE-780066-NS-EM4 and IE-78K0-NS-P01 to the IE-78K0-NS or IE-78K0-NS-A.

The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.



- Notes**
1. OSC1 of IE-78K0-NS-P01
  2. X1 of IE-78K0-NS-P01

### (3) When using external clock

No hardware settings are required for this situation.

When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select "External" in the area (Clock) for selecting the CPU's clock source (this selects the user's clock).

## 3.2.3 Subsystem clock settings

Table 3-2. Subsystem Clock Settings

Frequency of Subsystem Clock to Be Used	IE-78K0-NS-P01	IE-78K0-NS or IE-78K0-NS-A
	X2 Socket	JP8
When using clock mounted by user	Oscillator assembled by user	3 and 4 shorted
When using external clock	6 and 8 shorted	

**Caution** Jumper JP8, which is used to select the board's clock or an external clock, should be set only after turning off the power of the IE-78K0-NS or IE-78K0-NS-A.

## (1) When using the clock mounted by user

Perform the settings described under either (a) or (b), depending on the type of clock to be used. Short 3 and 4 on the jumper (JP8) of the IE-78K0-NS or IE-78K0-NS-A.

For the jumper position, refer to the **IE-78K0-NS User's Manual (U13731E)** when using the IE-78K0-NS, and refer to the **IE-78K0-NS-A User's Manual (U14889E)** when using the IE-78K0-NS-A.

There is no need to make any other settings via the integrated debugger (ID78K0-NS).

## (a) When using a ceramic resonator or crystal resonator

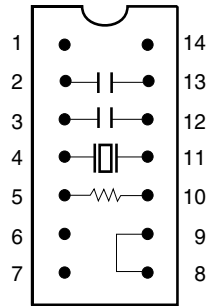
- Items to be prepared
  - Parts board
  - Ceramic resonator or crystal resonator
  - Resistor Rx
  - Capacitor CA
  - Capacitor CB
  - Solder kit

<Steps>

- <1> Solder the ceramic resonator or crystal resonator, resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequency) onto the parts board (X2) (as shown below).

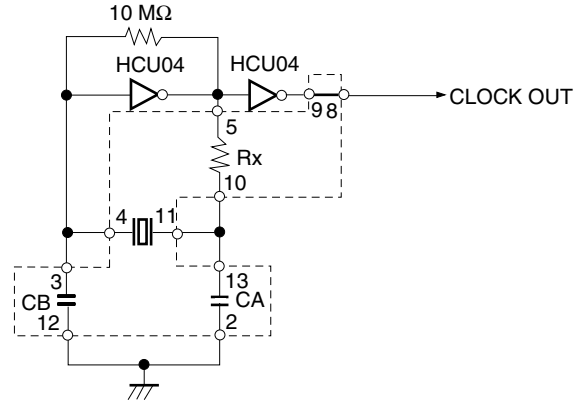
Figure 3-10. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

IE-78K0-NS-P01  
Parts board (X2)



Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Ceramic resonator or crystal resonator
5-10	Resistor Rx
8-9	Short

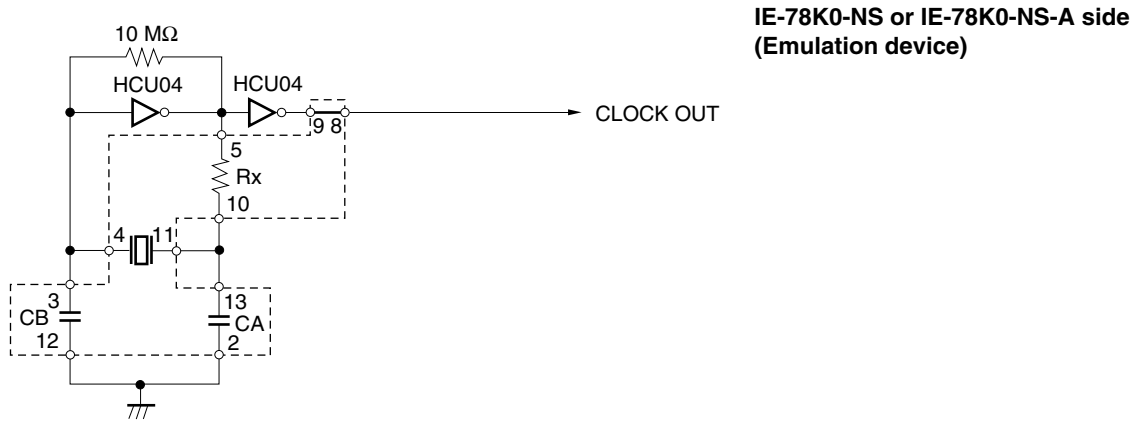
Circuit diagram



**Remark** The sections enclosed in broken lines indicate parts that are attached to the parts board.

- <2> Prepare the IE-78K0-NS-P01.
- <3> Remove the parts board mounted in the X2 socket on the IE-78K0-NS-P01.
- <4> Mount the parts board (<1>) in the X2 socket from which the parts board was removed in <3>. Insert the parts board, checking that the direction of the pin 1 mark is correct.
- <5> Make sure that the pins on the parts board are correctly connected as shown in Figure 3-10.
- <6> Connect the IE-780066-NS-EM4 and IE-78K0-NS-P01 with the IE-78K0-NS or IE-78K0-NS-A.

The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.

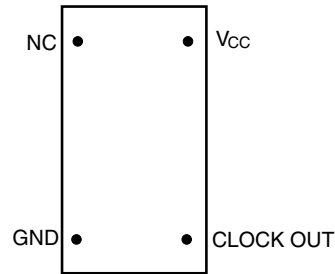


- Remarks**
- 1. The sections enclosed in broken lines indicate parts that are attached to the parts board.
  - 2. There is JP8 on the IE-78K0-NS or IE-78K0-NS-A.

(b) When using a crystal oscillator

- Items to be prepared
  - Crystal oscillator (see pinouts shown in Figure 3-11)

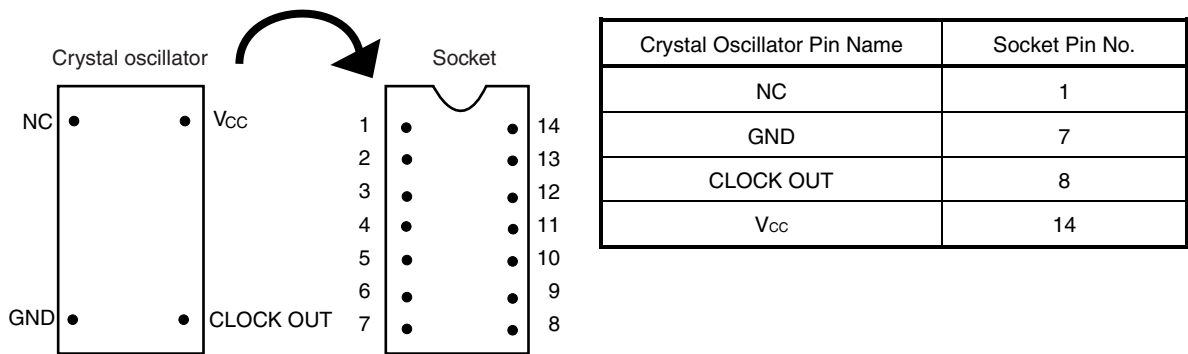
**Figure 3-11. Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock)**



<Steps>

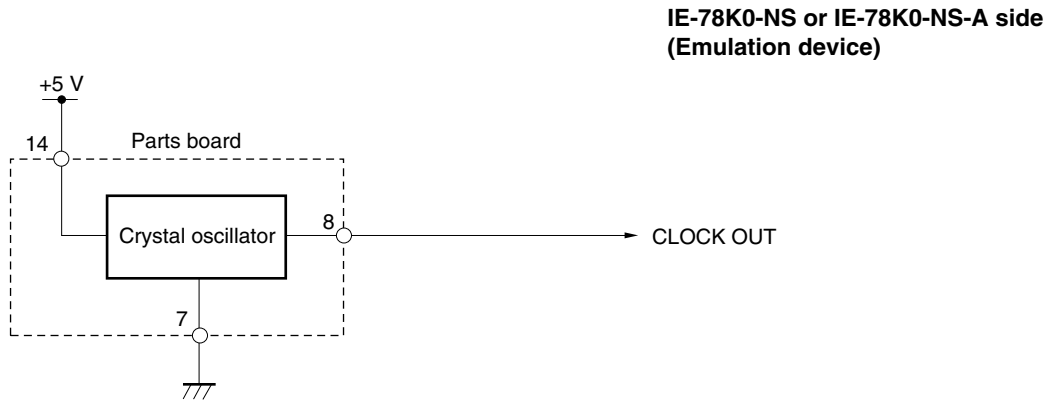
- <1> Prepare the IE-78K0-NS-P01.
- <2> Remove the parts board that is mounted in the IE-78K0-NS-P01's X2 socket.
- <3> Mount the crystal oscillator prepared by the user in the X2 socket from which the parts board was removed in <2> above. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

**Figure 3-12. Pin Alignment of Crystal Oscillator and Socket**



- <4> Connect the IE-780066-NS-EM4 and IE-78K0-NS-P01 to the IE-78K0-NS or IE-78K0-NS-A.

The above steps configure the following circuit and enable supply of the clock from the mounted oscillator to the emulation device.



- Remarks**
1. The sections enclosed in broken lines indicate the parts that are attached to the parts board.
  2. There is JP8 on the IE-78K0-NS or IE-78K0-NS-A.

### (3) When using an external clock

Short 3 and 4 on the jumper (JP8) of the IE-78K0-NS or IE-78K0-NS-A. There is no need to make any settings via the integrated debugger (ID78K0-NS).

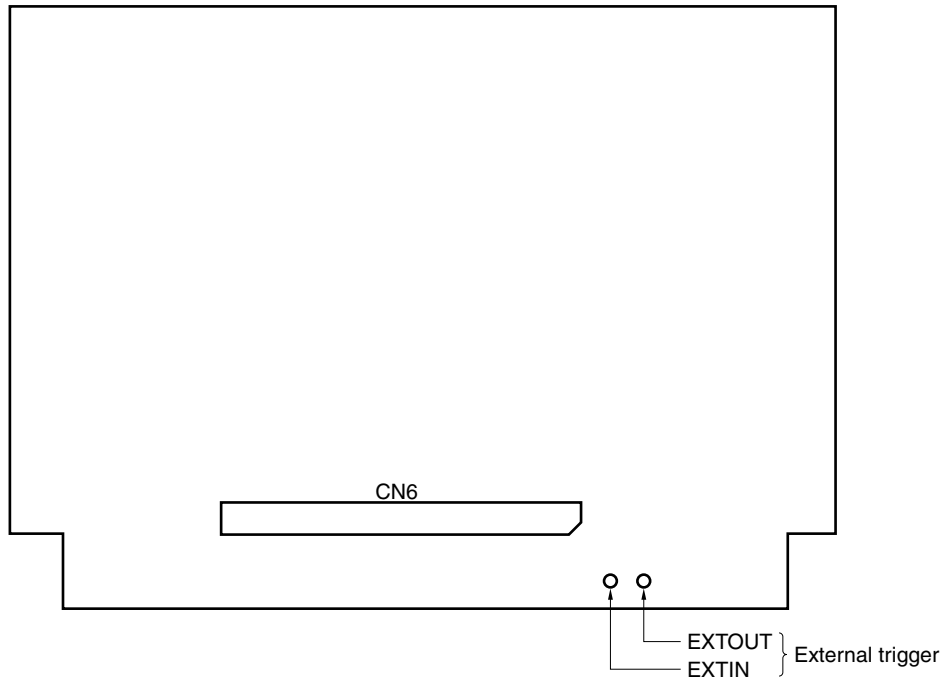


### 3.3 External Trigger

Connect the external trigger to the IE-780066-NS-EM4's check pins EXTOUT and EXTIN as shown below.

See the **ID78K Series Operation Windows Based User's Manual (U15185E)** for descriptions of related use methods, and see the **IE-78K0-NS User's Manual (U13731E)** or **IE-78K0-NS-A User's Manual (U14889E)** for pin characteristics.

Figure 3-13. External Trigger Input Position



### 3.4 Jumper Settings on IE-78K0-NS

When using the IE-780066-NS-EM4 in combination with the IE-78K0-NS, set the jumper on the IE-78K0-NS as shown below.

For details of these jumper positions, refer to the **IE-78K0-NS User's Manual (U13731E)**.

**Caution** Incorrect jumper settings may damage the devices.

**Table 3-3. Jumper Settings on IE-78K0-NS**

	JP2	JP3	JP4	JP6	JP7	JP8
Setting	2 and 3 shorted	1 and 2 shorted	1 and 2 shorted	3 and 4 shorted	1 and 2 shorted	3 and 4 shorted

### 3.5 Jumper Settings on IE-78K0-NS-A

When using the IE-780066-NS-EM4 in combination with the IE-78K0-NS-A, set the jumper on the IE-78K0-NS-A as shown below.

For details of these jumper positions, refer to the **IE-78K0-NS-A User's Manual (U14889E)**.

**Caution** Incorrect jumper settings may damage the devices.

**Table 3-4. Jumper Settings on IE-78K0-NS-A G-780009 Board**

	JP2	JP3	JP4	JP6	JP7	JP8
Setting	2 and 3 shorted	1 and 2 shorted	1 and 2 shorted	3 and 4 shorted	1 and 2 shorted	3 and 4 shorted

**Table 3-5. Jumper Settings on IE-78K0-NS-A G-78K0H Option Board**

	JP2
Setting	2 and 3 shorted

### 3.6 Low-Voltage Emulation Setting

When the target system operates with a low voltage, apply the same power supply voltage as the target system to the TP1 terminal pin on the main board (G-780009 board) of the IE-78K0-NS or IE78K0-NS-A (this is not required when the target system operates at 5 V).

In this case, apply a power supply voltage of 2.7 to 5.5 V to the target system.

**Table 3-6. Power Supply Voltage and Maximum Current Consumption During Low-Voltage Emulation**

Voltage Supplied to TP1	Maximum Current Consumption of TP1
2.7 to 5.5 V	300 mA

**Figure 3-14. Main Board of IE-78K0-NS or IE-78K0-NS-A (G-780009 Board)**



## CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes differences between the target device's signal lines and the signal lines of the IE-780066-NS-EM4's target interface circuit.

Although the target device is a CMOS circuit, the IE-780066-NS-EM4's target interface circuit consists of emulation circuits such as an emulation CPU, TTL, and CMOS-IC.

When the IE system is connected with the target system for debugging, the IE system performs emulation so as to operate as the actual target device would operate in the target system.

However, some minor differences exist since the operations are performed via the IE system's emulation.

- (1) Signals input or output from the emulation CPU ( $\mu$ PD7880)
- (2) Signals input or output from the emulation CPU ( $\mu$ PD7881)
- (3) Other signals

The IE-780066-NS-EM4's circuit is used as follows for signals listed in (1) to (3) above.

### (1) Signals output from the emulation CPU ( $\mu$ PD7880)

See **Figure 4-1 Equivalent Circuit of Emulation Circuit 1.**

- ANI7 to ANI0
- P27 to P20
- P37 to P30
- P77 to P70
- P84 to P80
- P92 to P90
- AV<sub>SS</sub>
- AV<sub>REF</sub>
- $\overline{\text{RESET}}$
- X1, XT1

### (2) Signals output from the emulation CPU ( $\mu$ PD7881)

See **Figure 4-2 Equivalent Circuit of Emulation Circuit 2.**

- P07 to P00
- P47 to P40
- P57 to P50
- P67 to P64

### (3) Other signals

See **Figure 4-2 Equivalent Circuit of Emulation Circuit 3.**

- V<sub>DD0</sub>, V<sub>DD1</sub>
- V<sub>SS0</sub>, V<sub>SS1</sub>
- V<sub>PP/IC</sub>
- X2, XT2

Figure 4-1. Equivalent Circuit of Emulation Circuit 1

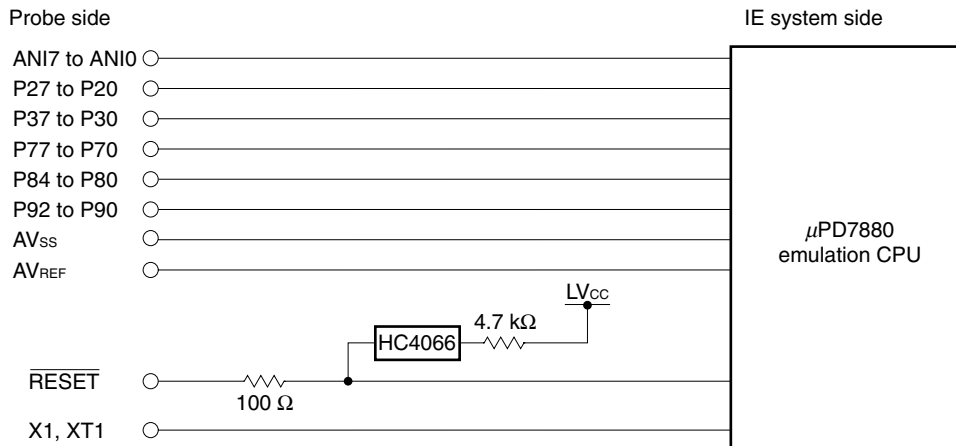


Figure 4-2. Equivalent Circuit of Emulation Circuit 2

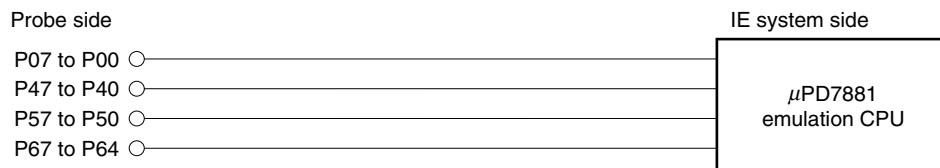
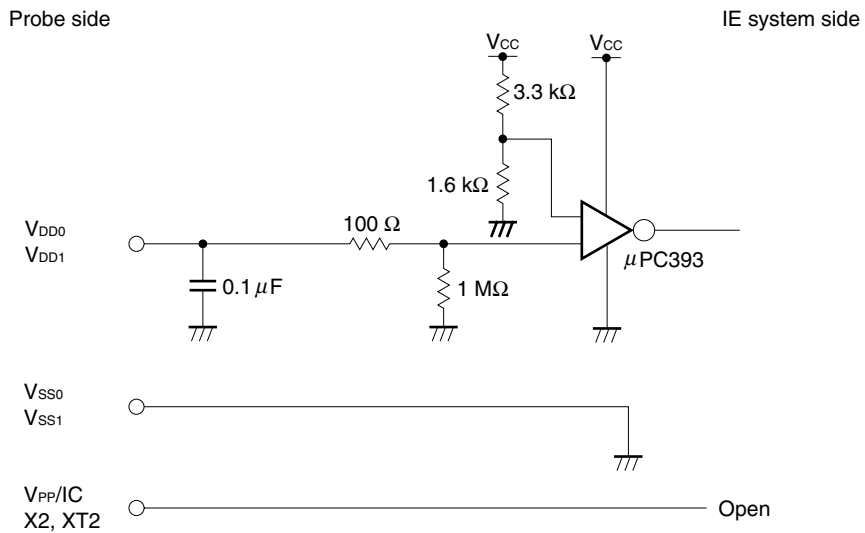


Figure 4-3. Equivalent Circuit of Emulation Circuit 3



## CHAPTER 5 RESTRICTIONS

The following are the restrictions of the IE-780066-NS-EM4.

- (1) When the IE system is started without the target system connected, the initial value of each port is undefined.

**Table 5-1. Initial Value of Port When IE System Started Without Target System Connected**

	Emulator	Target Device
Initial value of each port	Undefined	00H

- (2) When emulating the  $\mu$ PD78F0066, functions concerning flash memory including SFR self writing are not supported.

## APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

**Table A-1. NP-80GC, NP-80GC-TQ, NP-H80GC-TQ Pin Assignments (1/2)**

Emulation Probe	CN6 Pin No.	Emulation Probe	CN6 Pin No.
1	114	34	49
2	113	35	50
3	108	36	45
4	107	37	46
5	104	38	41
6	103	39	42
7	100	40	35
8	99	41	8
9	94	42	7
10	93	43	14
11	30	44	13
12	29	45	18
13	24	46	17
14	23	47	22
15	20	48	21
16	19	49	28
17	16	50	27
18	15	51	92
19	10	52	91
20	9	53	98
21	37	54	97
22	43	55	102
23	44	56	101
24	47	57	106
25	48	58	105
26	51	59	112
27	52	60	111
28	57	61	83
29	58	62	77
30	59	63	78
31	60	64	73
32	55	65	74
33	56	66	69

- Remarks**
1. The NP-80GC, NP-80GC-TQ, and NP-H80GC-TQ are products of Naito Densai Machida Mfg. Co., Ltd.
  2. The numbers in the “Emulation Probe” column indicate the corresponding pin number on the emulation probe tip.

**Table A-2. NP-80GC, NP-80GC-TQ, NP-H80GC-TQ Pin Assignments (2/2)**

Emulation Probe	CN6 Pin No.	Emulation Probe	CN6 Pin No.
67	70	74	71
68	63	75	72
69	64	76	75
70	61	77	76
71	62	78	79
72	65	79	80
73	66	80	85

- Remarks 1.** The NP-80GC, NP-80GC-TQ, and NP-H80GC-TQ are products of Naito Densai Machida Mfg. Co., Ltd.
- 2.** The numbers in the “Emulation Probe” column indicate the corresponding pin number on the emulation probe tip.



## APPENDIX B NOTES ON DESIGNING TARGET SYSTEM

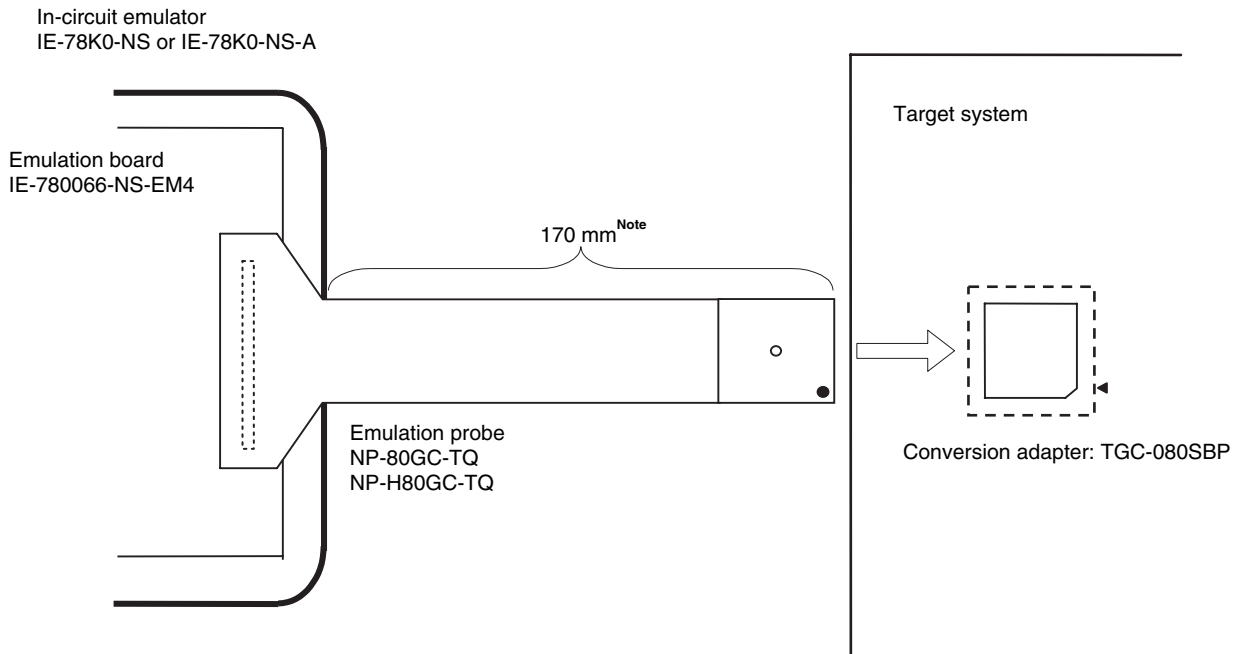
The following shows the conditions when connecting the emulation probe and conversion adapter. Consider the shape of the components to be mounted on the target system and follow the configurations below when designing the system.

Among the products described in this appendix, NP-80GC-TQ and NP-H80GC-TQ are products of Naito Densai Machida Mfg. Co., Ltd. and TGC-080SBP is a product of TOKYO ELETECH CORPORATION.

**Table B-1. Distance Between IE System and Conversion Adapter**

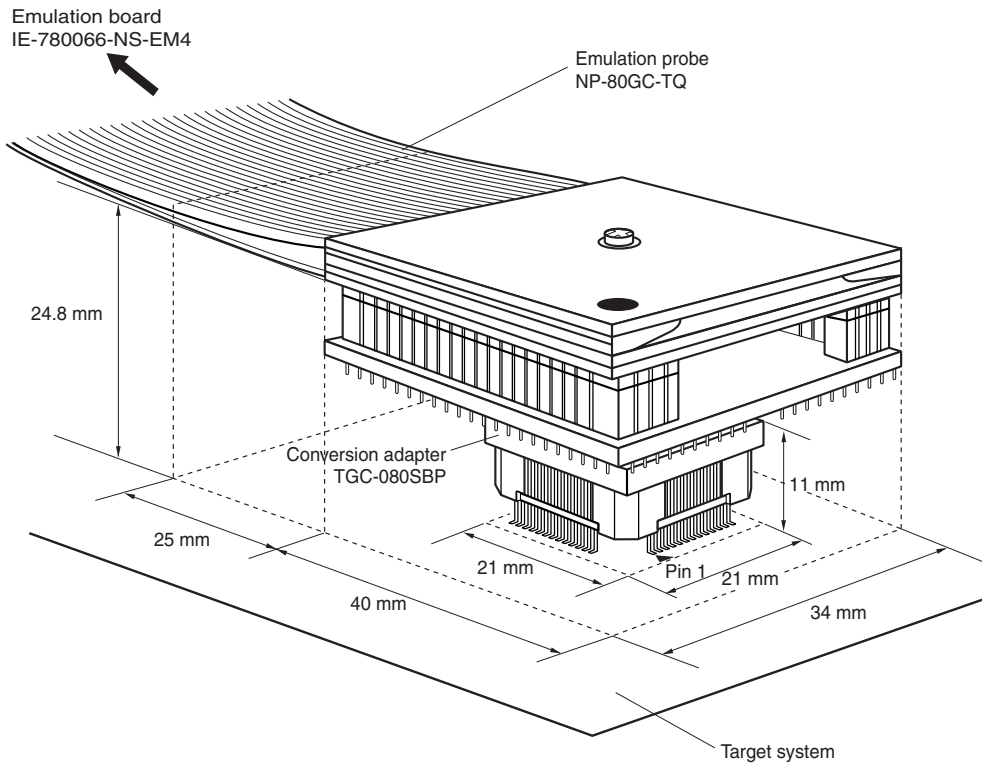
Emulation Probe	Conversion Adapter	Distance Between IE System and Conversion Adapter
NP-80GC-TQ	TGC-080SBP	170 mm
NP-H80GC-TQ		370 mm

**Figure B-1. Distance Between IE System and Conversion Adapter**

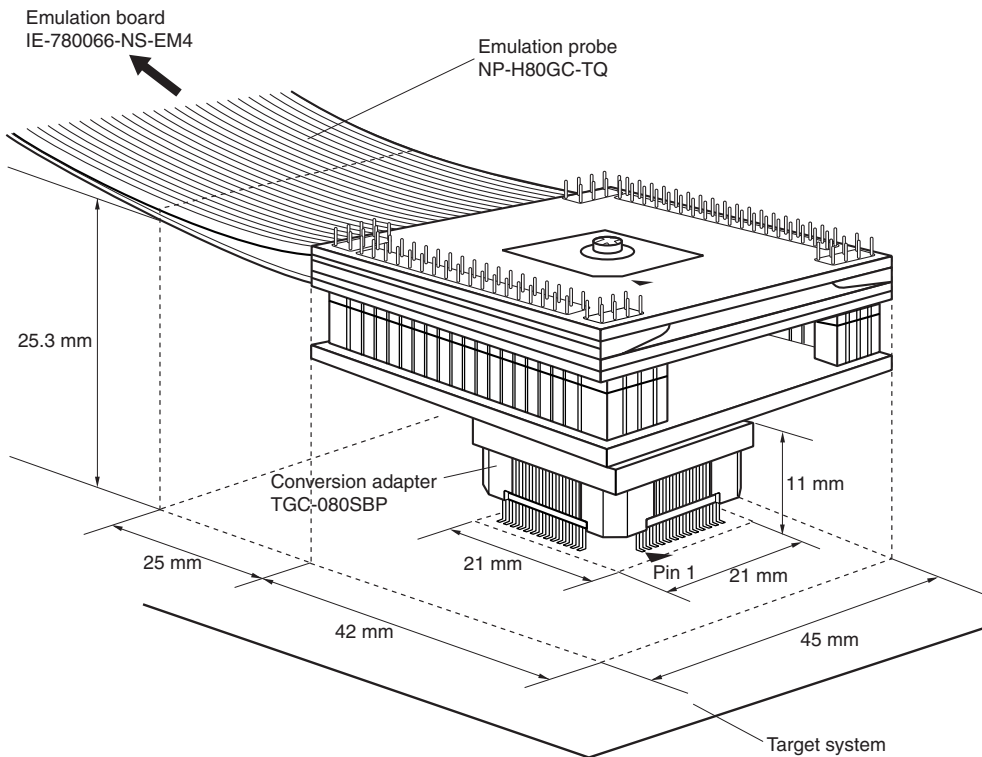


**Note** The above distance shows when the NP-80GC-TQ is used. When the NP-H80GC-TQ is used, the distance is 370 mm.

★ **Figure B-2. Connection Conditions of Target System (NP-80GC-TQ)**



★ **Figure B-3. Connection Conditions of Target System (NP-H80GC-TQ)**



## Facsimile Message

Although NEC has taken all possible steps to ensure that the documentation supplied to our customers is complete, bug free and up-to-date, we readily accept that errors may occur. Despite all the care and precautions we've taken, you may encounter problems in the documentation. Please complete this form whenever you'd like to report errors or suggest improvements to us.

From:

Name

Company

Tel.

FAX

Address

*Thank you for your kind support.*

**North America**

NEC Electronics Inc.  
Corporate Communications Dept.  
Fax: +1-800-729-9288  
+1-408-588-6130

**Hong Kong, Philippines, Oceania**

NEC Electronics Hong Kong Ltd.  
Fax: +852-2886-9022/9044

**Taiwan**

NEC Electronics Taiwan Ltd.  
Fax: +886-2-2719-5951

**Europe**

NEC Electronics (Europe) GmbH  
Market Communication Dept.  
Fax: +49-211-6503-274

**Korea**

NEC Electronics Hong Kong Ltd.  
Seoul Branch  
Fax: +82-2-528-4411

**Asian Nations except Philippines**

NEC Electronics Singapore Pte. Ltd.  
Fax: +65-250-3583

**South America**

NEC do Brasil S.A.  
Fax: +55-11-6462-6829

**P.R. China**

NEC Electronics Shanghai, Ltd.  
Fax: +86-21-6841-1137

**Japan**

NEC Semiconductor Technical Hotline  
Fax: +81- 44-435-9608

I would like to report the following error/make the following suggestion:

Document title: \_\_\_\_\_

Document number: \_\_\_\_\_ Page number: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If possible, please fax the referenced page or drawing.

Document Rating	Excellent	Good	Acceptable	Poor
Clarity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technical Accuracy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>