**NEC**

**User's Manual**

# IE-780701-NS-EM1

## Emulation Board

## Target Devices
### μPD780701Y Subseries

**[MEMO]**

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

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- 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.

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**Major Revisions in This Edition**

| Pages | Description |
|---|---|
| pp.36, 37 | Modification of the size on the adapter block in figures **B-2 Connection Conditions of Target System (When NP-80GC-TQ Is Used), B-3 Connection Conditions of Target System (When NP-H80GC-TQ Is Used)**. |

**The Mark ★ shows major revised points.**

# INTRODUCTION

**Product Overview**    The IE-780701-NS-EM1 is designed to be used with the 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.

- $\mu$PD780701Y Subseries:    $\mu$PD780701Y, 780702Y, 78F0701Y

**Target Readers**    This manual is intended for engineers who will use the IE-780701-NS-EM1 with the 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-780701-NS-EM1, refer to not only this manual (supplied with the IE-780701-NS-EM1) but also the manual that is supplied with 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 | IE-780701-NS-EM1 User's Manual |
|---|---|
| • Basic specifications | • General |
| • System configuration | • Part names |
| • External interface functions | • Installation |
|  | • Differences between target devices and target interface circuits |

**Purpose**    This manual's purpose is to explain various debugging functions that can be performed when using the IE-780701-NS-EM1.

**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 the IE-78K0-NS or IE-78K0-NS-A and the IE-780701-NS-EM1. |

**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-780701-NS-EM1  Emulation Board | This manual |
| ID78K Series Integrated Debugger  Ver. 2.30 or Later Operation Windows™ Based | U15185E |
| $\mu$PD780701Y Subseries | U13781E |

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

# CONTENTS

**LIST OF FIGURES**

# LIST OF TABLES

# CHAPTER 1 GENERAL

The IE-780701-NS-EM1 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-780701-NS-EM1's system configuration and basic specifications.

- Target devices
  - $\mu$PD780701Y Subseries

## 1.1  System Configuration

Figure 1-1 illustrates the IE-780701-NS-EM1's system configuration.

**Figure 1-1.  System Configuration**



Debugger
ID78K0-NS
(sold separately)

Device file[Note 1]
(available separately)

Control software

Host machine
PC-9800 Series,
IBM PC/AT™
or compatibles

Interface board
IE-70000-98-IF-C
(sold separately)

Interface board
IE-70000-PC-IF-C
(sold separately)

Interface board
IE-70000-PCI-IF-A
(sold separately)

or

Interface card

Interface cable
(NS IF Cable)

Interface cable

IE-78K0-NS
(sold separately)
or
IE-78K0-NS-A
(sold separately)

In-circuit emulator

FG Cable

NS CARD
Cable

MC CARD
Cable

IE-70000-CD-IF-A
(sold separately)

IE-780701-NS-EM1
(This product)

AC adapter
IE-70000-MC-PS-B
(sold separately)

Emulation probe[Note 2]
(sold separately)

☒ Conversion socket/conversion adapter[Note 3]
(sold separately)

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

$\mu$S××××DF780701Y: $\mu$PD780701Y 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 Densei Machida Mfg. Co., Ltd

For further information, contact Naito Densei 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)<br>NP-H80GC-TQ (probe length: 400 mm) | TGC-080SBP |

## 1.2 Hardware Configuration

Figures 1-2 and 1-3 show the IE-780701-NS-EM1's position in the basic hardware configuration.

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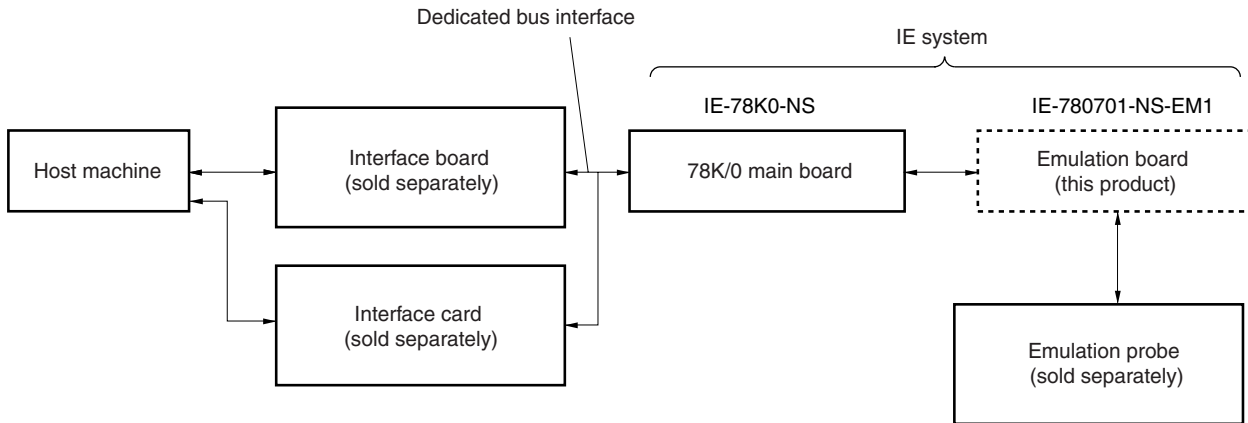


**Figure 1-3. Basic Hardware Configuration (Using IE-78K0-NS-A)**
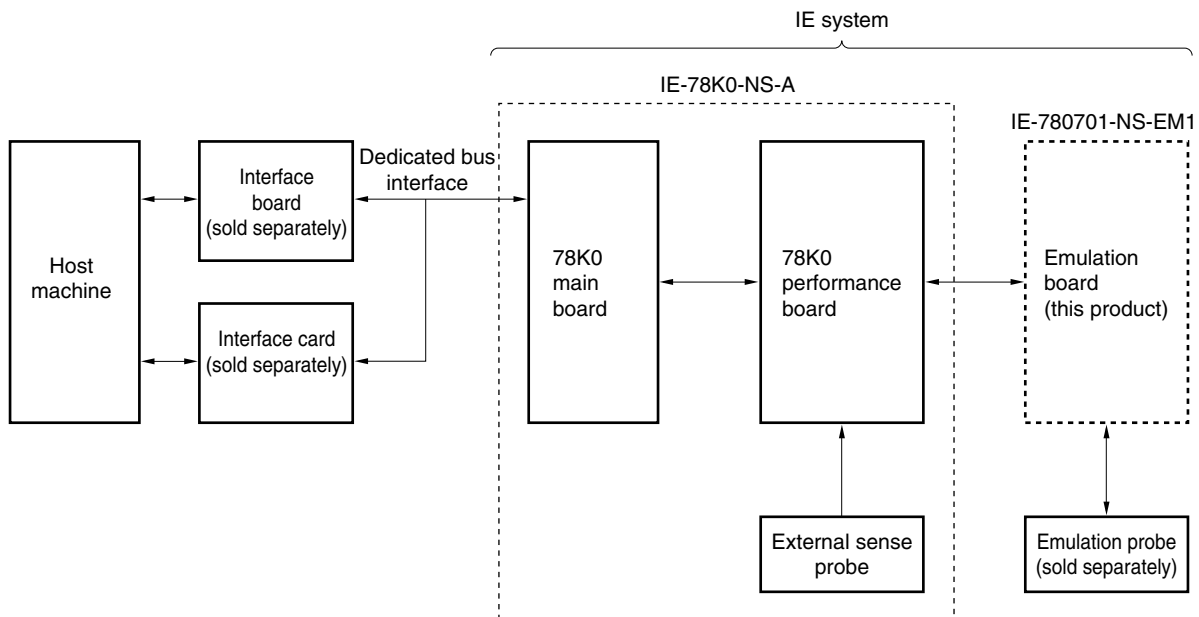
## 1.3 Basic Specifications

The IE-780701-NS-EM1's basic specifications are listed in Table 1-2.

**Table 1-2.  Basic Specifications**

| Parameter | Description |
|---|---|
| Target device | $\mu$PD780701Y Subseries |
| Clock | 6.2914  MHz |
| Main system clock supply | External:  Input via an emulation probe from the target system<br>Internal:   Mounted on the emulation board (6.2914 MHz) or mounted on the board by the user |
| Low voltage support | $V_{DD}$ = 3.5 to 5.5 V (same as the target device) |

# CHAPTER 2   PART NAMES

This chapter introduces the parts of the IE-780701-NS-EM1 main unit.

The packing box contains the emulation board (IE-780701-NS-EM1), 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-780701-NS-EM1 Part Names**
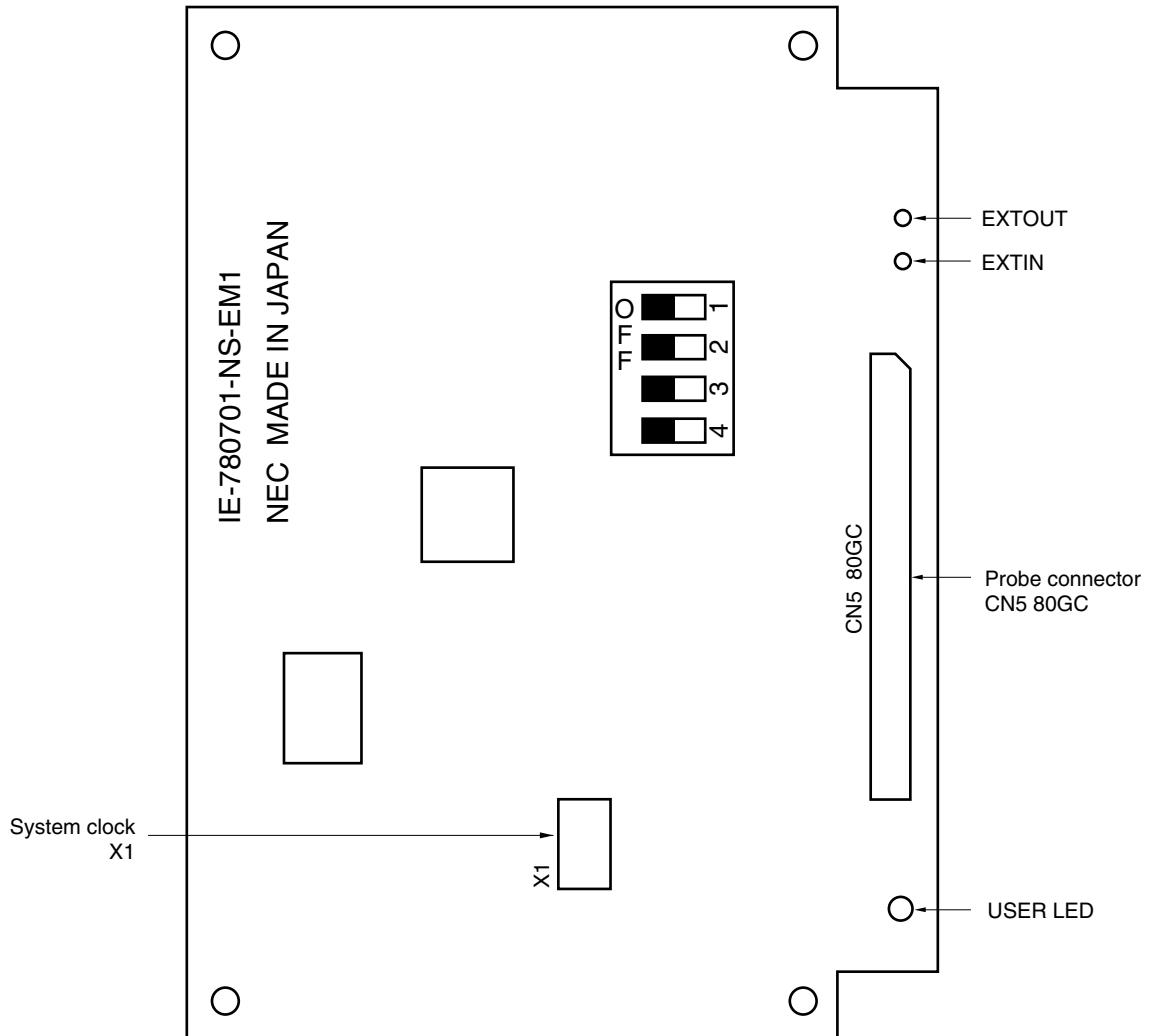
# CHAPTER 3  INSTALLATION

This chapter describes methods for connecting the IE-780701-NS-EM1 to the in-circuit emulator (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 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-780701-NS-EM1 to the IE-78K0-NS.

See the **IE-78K0-NS-A User's Manual (U14889E)** for a description of how to connect the IE-780701-NS-EM1 to the 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-780701-NS-EM1.

When using NP-80GC, NP-80GC-TQ, or NP-H80GC-TQ, connect it to CN5.

**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**



Emulation probe (sold separately)

CN5 80GC

IE-780701-NS-EM1

Main board (sold separately)
IE-78K0-NS or IE-78K0-NS-A
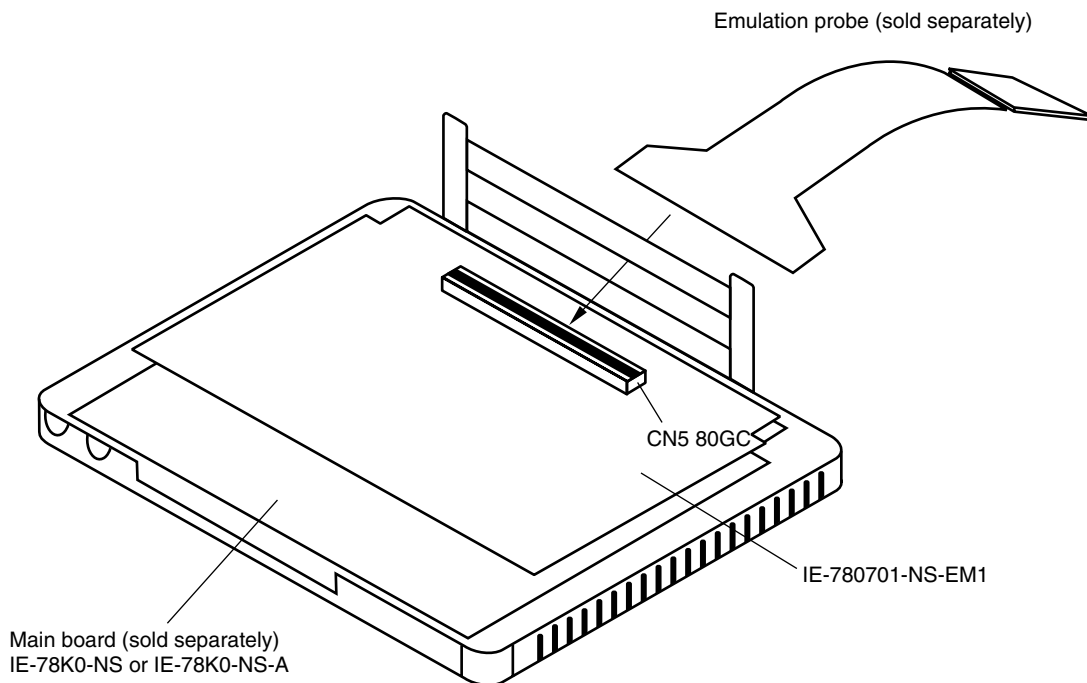
## 3.2 Clock Settings

### 3.2.1 Overview of clock settings

The system clock to be used during debugging can be selected from (1) to (3) below.

**(1) Clock that is already mounted on emulation board**
**(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 emulation board** 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 emulation board connected to the IE-78K0-NS or IE-78K0-NS-A 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 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.**

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

(a) Internal clock                    (b) External clock
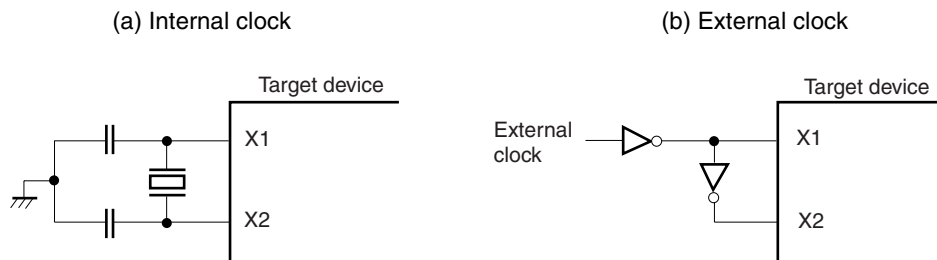
**(1) Clock that is already mounted on emulation board**

A crystal oscillator (X1) is already mounted on the emulation board.  Its frequency is 6.2914 MHz.

**Figure 3-3.  When Using Clock That Is Already Mounted on Emulation Board**
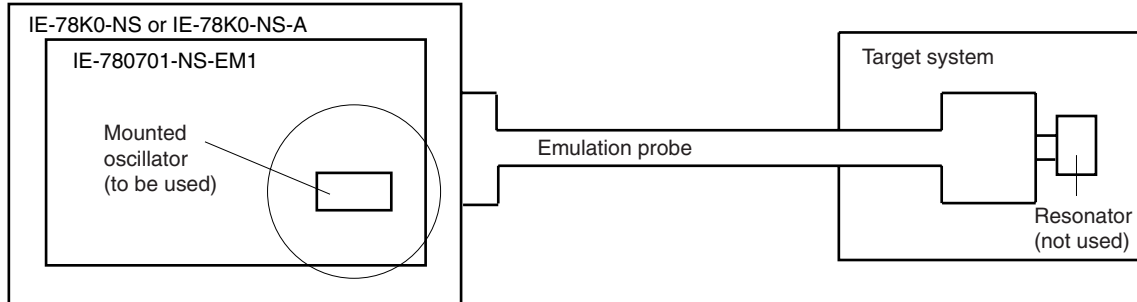


> **Remark**  The clock that is supplied by the IE-780701-NS-EM1's oscillator (encircled in the figure) is used.

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

The user is able to mount any clock supported by the set specifications on the IE-780701-NS-EM1.

Remove the crystal oscillator (X1) that is already mounted on the emulation board, 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**
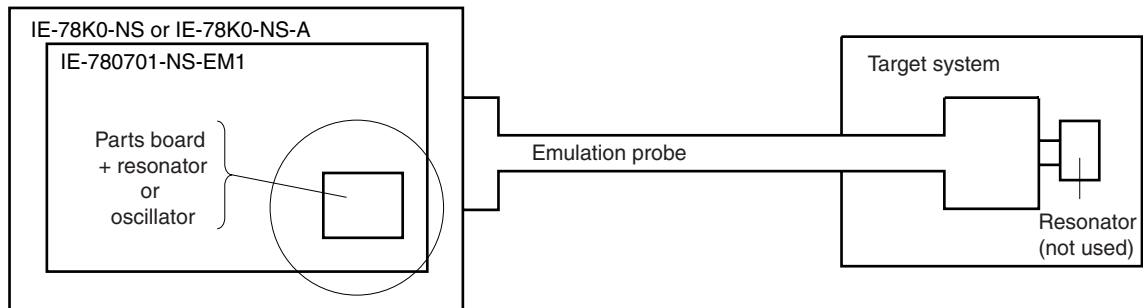


> **Remark**  The clock that is supplied by the IE-780701-NS-EM1's resonator or oscillator (encircled in the figure) is used.

**(3) External clock**

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

**Figure 3-5. When Using External Clock**
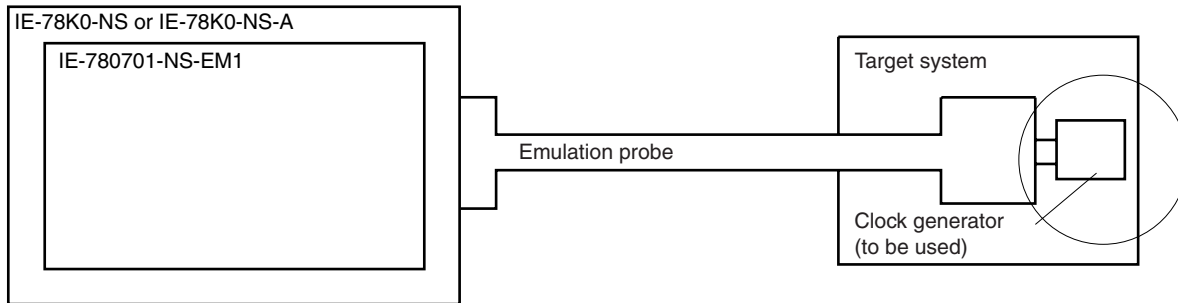


> **Remark** The clock supplied by the target system's clock generator (encircled in the figure) is used.

### 3.2.2 System clock settings

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

| Frequency of System Clock | | IE-780701-NS-EM1 | CPU Clock Source Selection (ID78K0-NS) |
|---|---|---|---|
| | | X1 Socket | |
| When using clock that is already mounted on emulation board | 6.2914 MHz | Oscillator used | Internal |
| When using clock mounted by user | Other than 6.2914 MHz | Oscillator assembled by user | |
| When using external clock | | Oscillator (not used) | External |

> **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).**

> **Remark** When the IE-780701-NS-EM1 is shipped, the settings for "when using clock that is already mounted on emulation board" are preset.

**(1) When using clock that is already mounted on emulation board**

When the IE-780701-NS-EM1 is shipped, a 6.2914 MHz crystal oscillator is already mounted in the IE-780701-NS-EM1's X1 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 3-6.  Connections on Parts Board (When Using User-Mounted Clock)**

Parts board (X1)
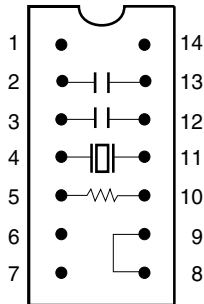


| Pin No. | Connection |
|---------|------------|
| 2-13 | Capacitor CA |
| 3-12 | Capacitor CB |
| 4-11 | Ceramic resonator or crystal resonator |
| 5-10 | Resistor Rx |
| 8-9 | Shorted |

Circuit diagram
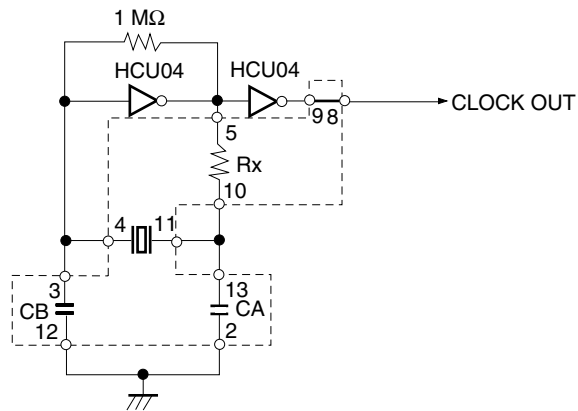


**Remark**  The sections enclosed in broken lines indicate parts that are attached to the parts board.

<2> Prepare the IE-780701-NS-EM1.

<3> Remove the crystal oscillator that is mounted in the IE-780701-NS-EM1's X1 socket.

<4> Connect the parts board (from <1> above) to the X1 socket from which the crystal oscillator 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 3-6 above.

<6> Connect the IE-780701-NS-EM1 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)**
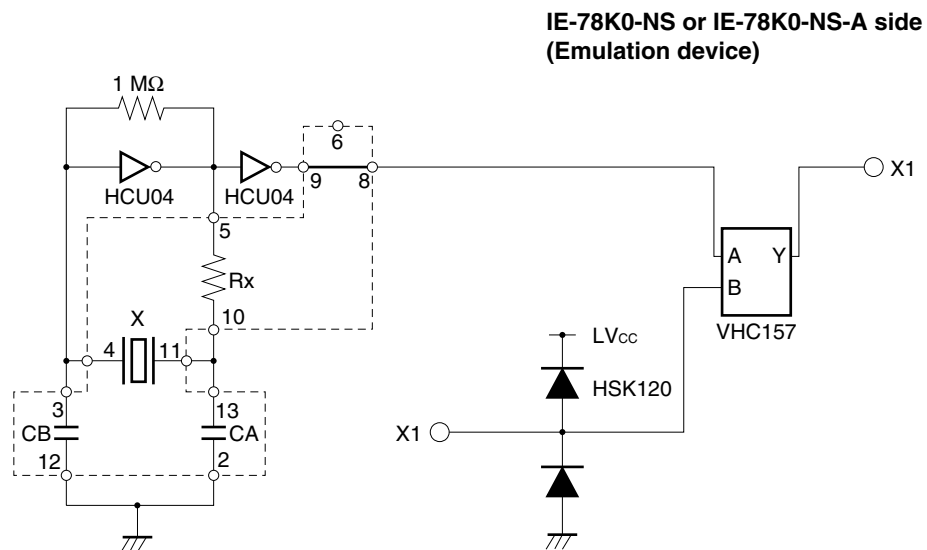


**Remark** The sections enclosed in broken lines indicate parts that are attached to the parts board.

**(b) When using a crystal oscillator**

- Items to be prepared
  - Crystal oscillator (see pins shown in Figure 3-7)

**Figure 3-7. Crystal Oscillator (When Using User-Mounted Clock)**
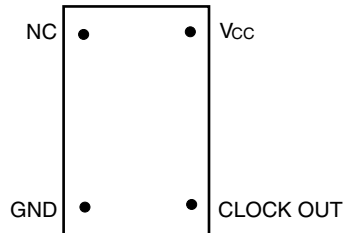


<Steps>
<1> Prepare the IE-780701-NS-EM1.
<2> Remove the crystal oscillator that is mounted in the IE-780701-NS-EM1's X1 socket.
<3> Mount the crystal oscillator prepared by the user in the X1 socket from which the crystal oscillator was removed in <2> above. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

**Figure 3-8. Pin Alignment of Crystal Oscillator and Socket**
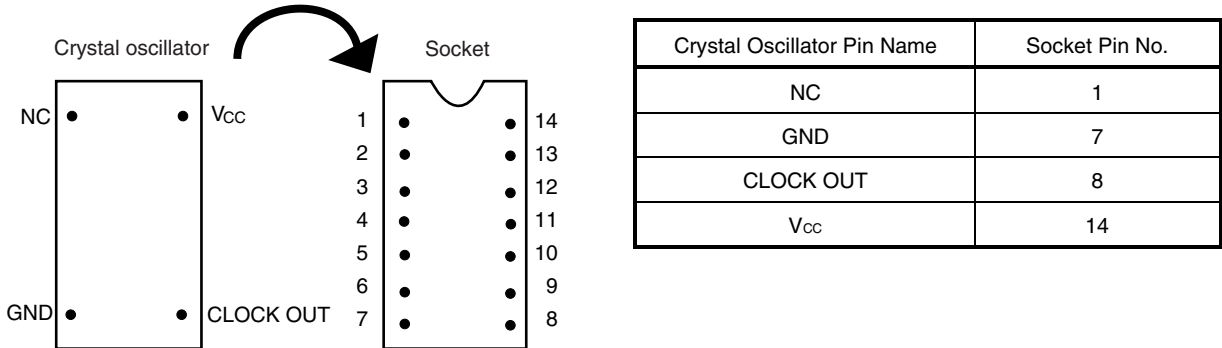


| Crystal Oscillator Pin Name | Socket Pin No. |
|---|---|
| NC | 1 |
| GND | 7 |
| CLOCK OUT | 8 |
| V$_{CC}$ | 14 |

<4> Connect the IE-780701-NS-EM1 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)**
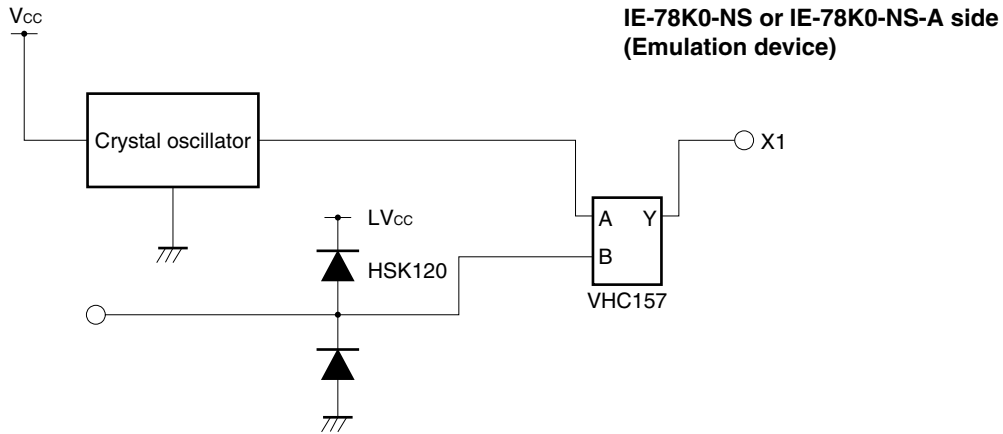
**(3) When using external clock**

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).

## 3.3 Mask Option Setting

### 3.3.1 Pull-up resistor

By setting the DIP switch (SW3) in the IE-780701-NS-EM1, a 30 kΩ pull-up resistor can be connected to P33, P71, and P72 as specified by the mask option.

All the switches of SW3 are initially set to OFF.

For ports that do not exist in the IE-780701-NS-EM1, set the DIP switch to OFF.

The pull-up resistor is pulled up by the $V_{DD}$ pin of the target socket.

**Figure 3-9.  Pull-up Resistor**
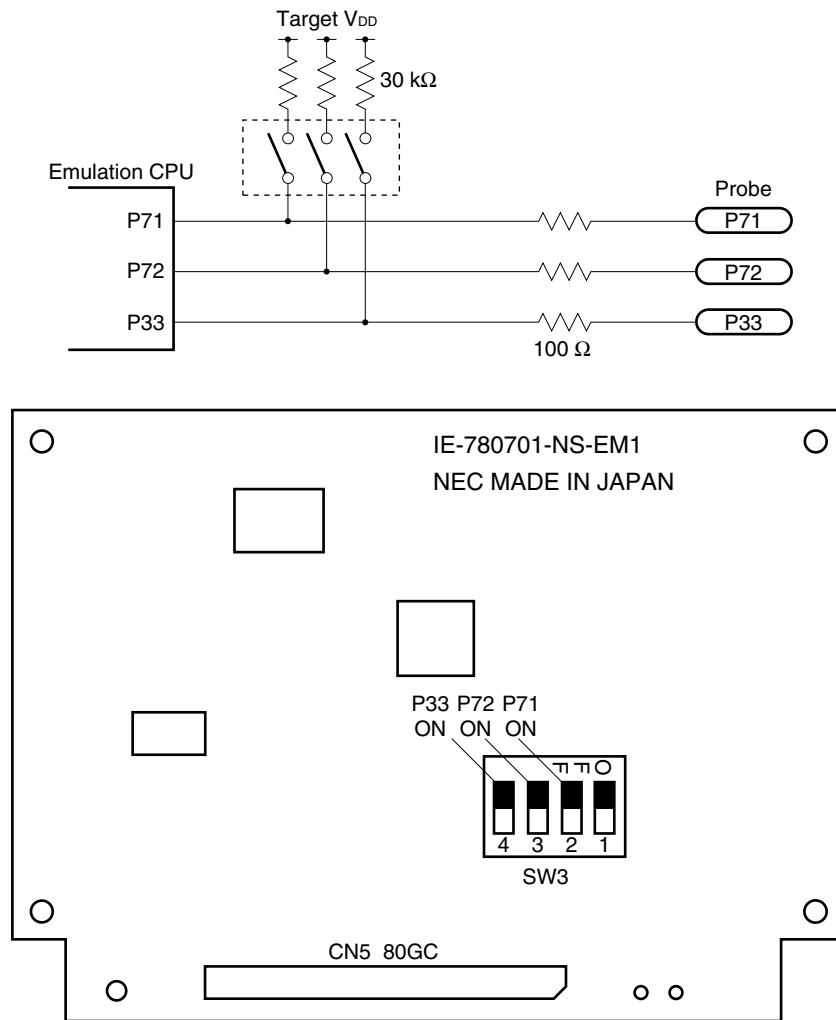
## 3.4 External Trigger

Connect the external trigger to the IE-780701-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **ID78K Series Integrated Debugger Ver. 2.30 or Later 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 3-10. External Trigger Input Position**
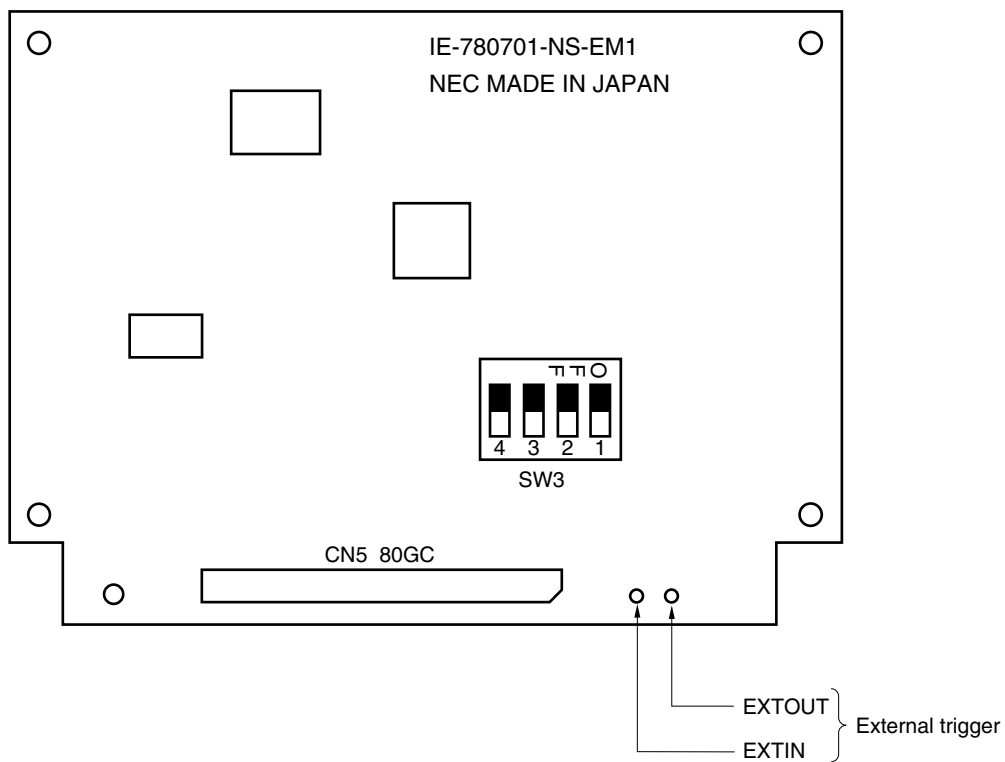
### 3.5  Jumper Settings on IE-78K0-NS

When using the IE-780701-NS-EM1 in combination with the IE-78K0-NS, set the jumpers on the IE-78K0-NS as shown below.

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

**Table 3-2.  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 | 1 and 2 shorted |

**Caution   Incorrect jumper settings may damage the IE-78K0-NS.**

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

When using the IE-780701-NS-EM1 in combination with the IE-78K0-NS-A, set the jumpers 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)**.

**Table 3-3.  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 | 1 and 2 shorted |

**Caution   Incorrect jumper settings may damage the IE-78K0-NS-A.**

**Table 3-4.  Jumper Settings on IE-78K0-NS-A G-78K0H Option Board**

|  | JP2 |
|---|---|
| Setting | 2 and 3 shorted |

# 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-780701-NS-EM1's target interface circuit.

Although the target device is a CMOS circuit, the IE-780701-NS-EM1'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 ($\mu$PD780009)
(2)  Signals input or output from the emulation CPU ($\mu$PD78F0701Y)
(3)  Other signals

The IE-780701-NS-EM1's circuit is used as follows for signals listed in (1) to (3) above.

**(1)  Signals input or output from the emulation CPU ($\mu$PD780009)**
See **Figure 4-1  Equivalent Circuit of Emulation Circuit (1)**.

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

**(2)  Signals input or output from the emulation CPU ($\mu$PD78F0701Y)**
See **Figure 4-2  Equivalent Circuit of Emulation Circuit (2)**.

- P07 to P00
- P27 to P20
- P36 to P30
- P77 to P70
- P87 to P80
- P97 to P90
- $AV_{REF}$, $AV_{SS}$
- CTXD, CRXD

**(3)  Other signals**
See **Figure 4-3  Equivalent Circuit of Emulation Circuit (3)**.

- $V_{DD0}$, $V_{DD1}$, $V_{SS0}$, $V_{SS1}$, X1, X2, $\overline{RESET}$, CPUREG, $V_{PP}$, IC

The handling is the same for alternate-function pins, for which circuits are not provided in the IE system.
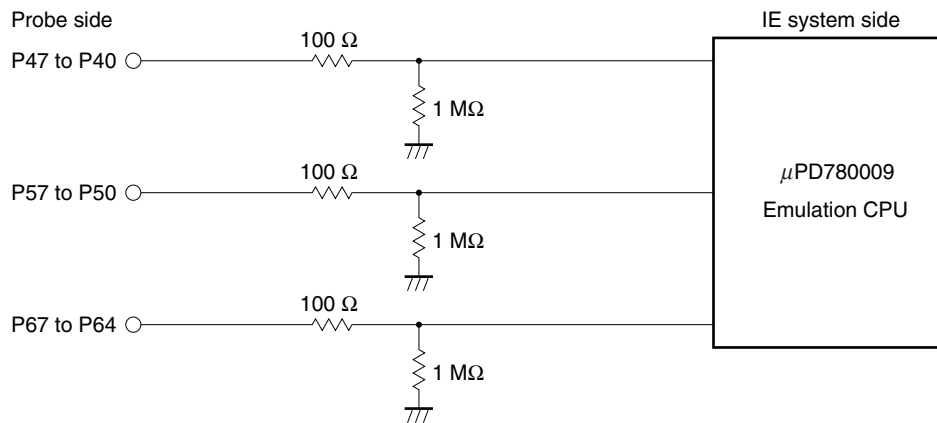
**Figure 4-1. Equivalent Circuit of Emulation Circuit (1)**



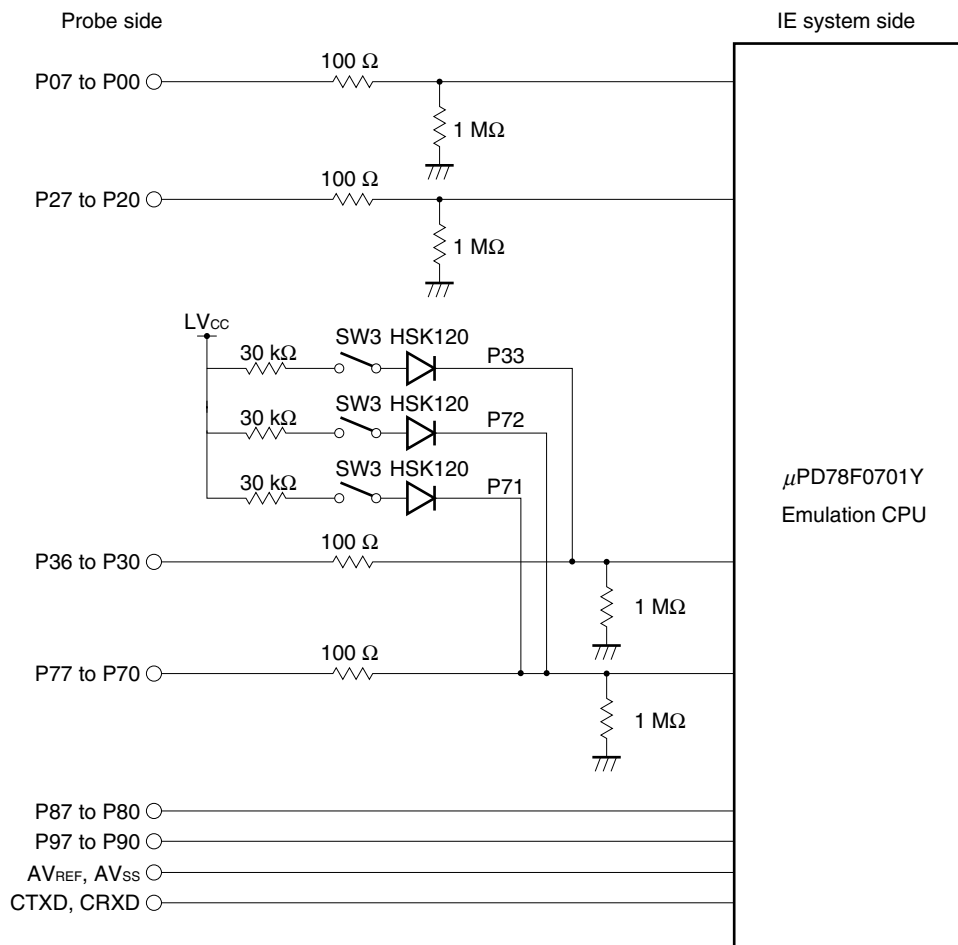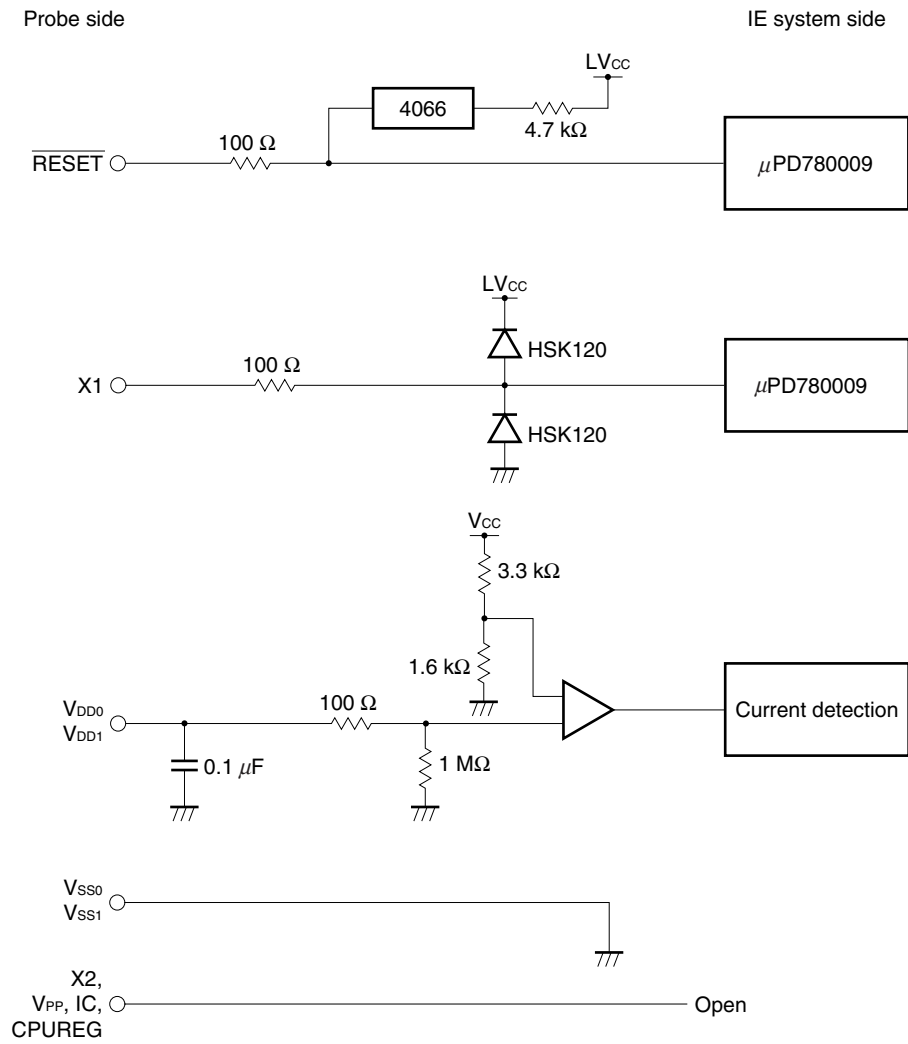**Figure 4-2. Equivalent Circuit of Emulation Circuit (2)**

**Figure 4-3.  Equivalent Circuit of Emulation Circuit (3)**

# APPENDIX A  EMULATION PROBE PIN ASSIGNMENT TABLE

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

| Emulation Probe | CN5 Pin No. | Emulation Probe | CN5 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 Densei Machida Mfg. Co., Ltd.

**2.** The numbers in the "Emulation Probe" column indicate the corresponding pin number on the emulation probe tip.

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

| Emulation Probe | CN5 Pin No. | Emulation Probe | CN5 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 Densei 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 Densei Machida Mfg. Co., Ltd. and TGC-080SBP is a product of TOKYO ELETECH CORPORATION.

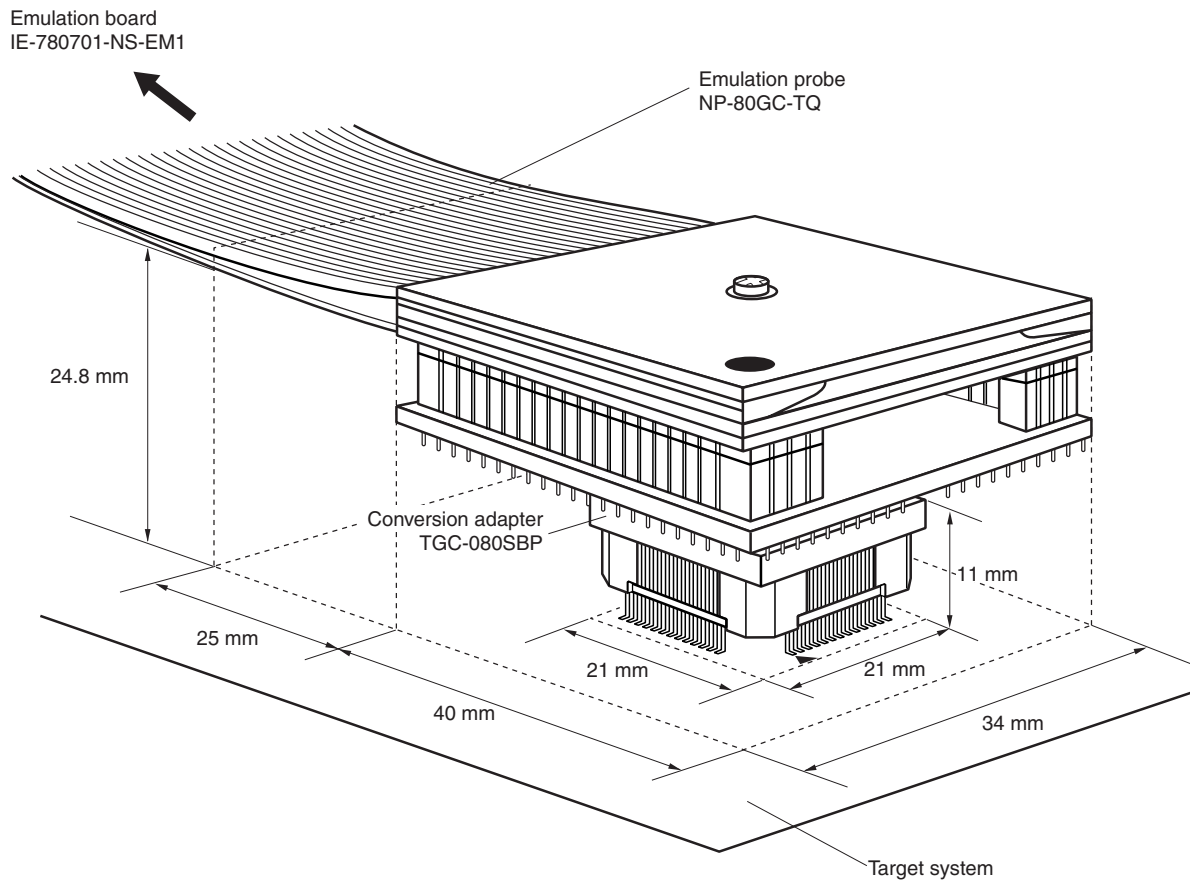**Table B-1.  Distance Between IE System and Conversion Adapter**

| 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 In-Circuit Emulator and Conversion Adapter**
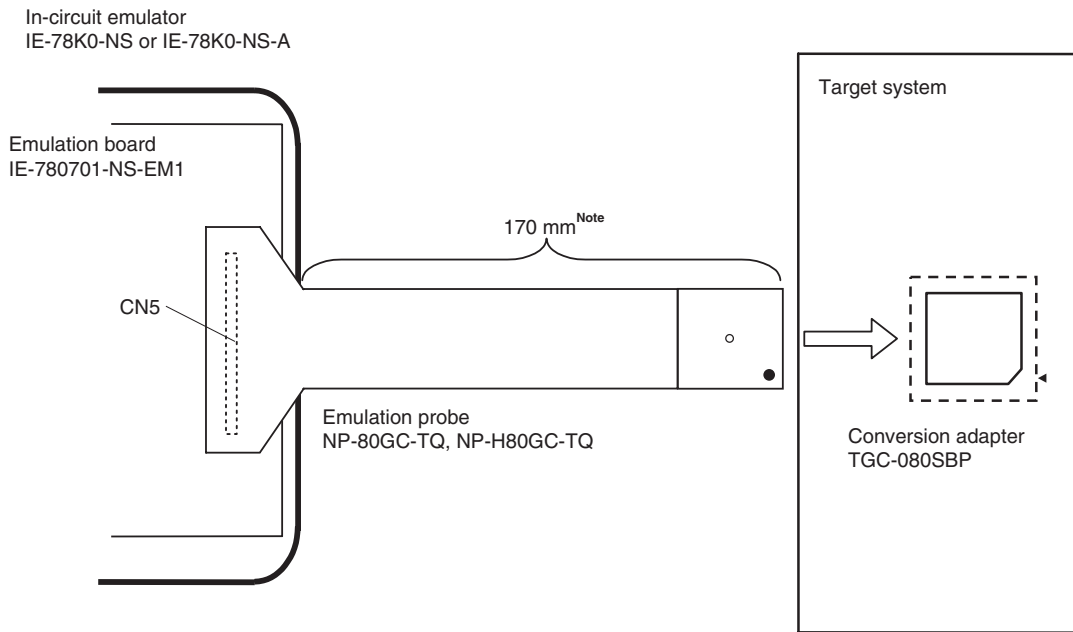


**Note**  The above shows the distance when the NP-80GC-TQ is used.  When the NP-H80GC-TQ is used, the distance is 370 mm.

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

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

Emulation board
IE-780701-NS-EM1

Extention probe
NP-H80GC-TQ

25.3 mm

Conversion adapter
TGC-080SBP

11 mm

25 mm

21 mm

21 mm

42 mm

45 mm

Target system

**[MEMO]**

# NEC
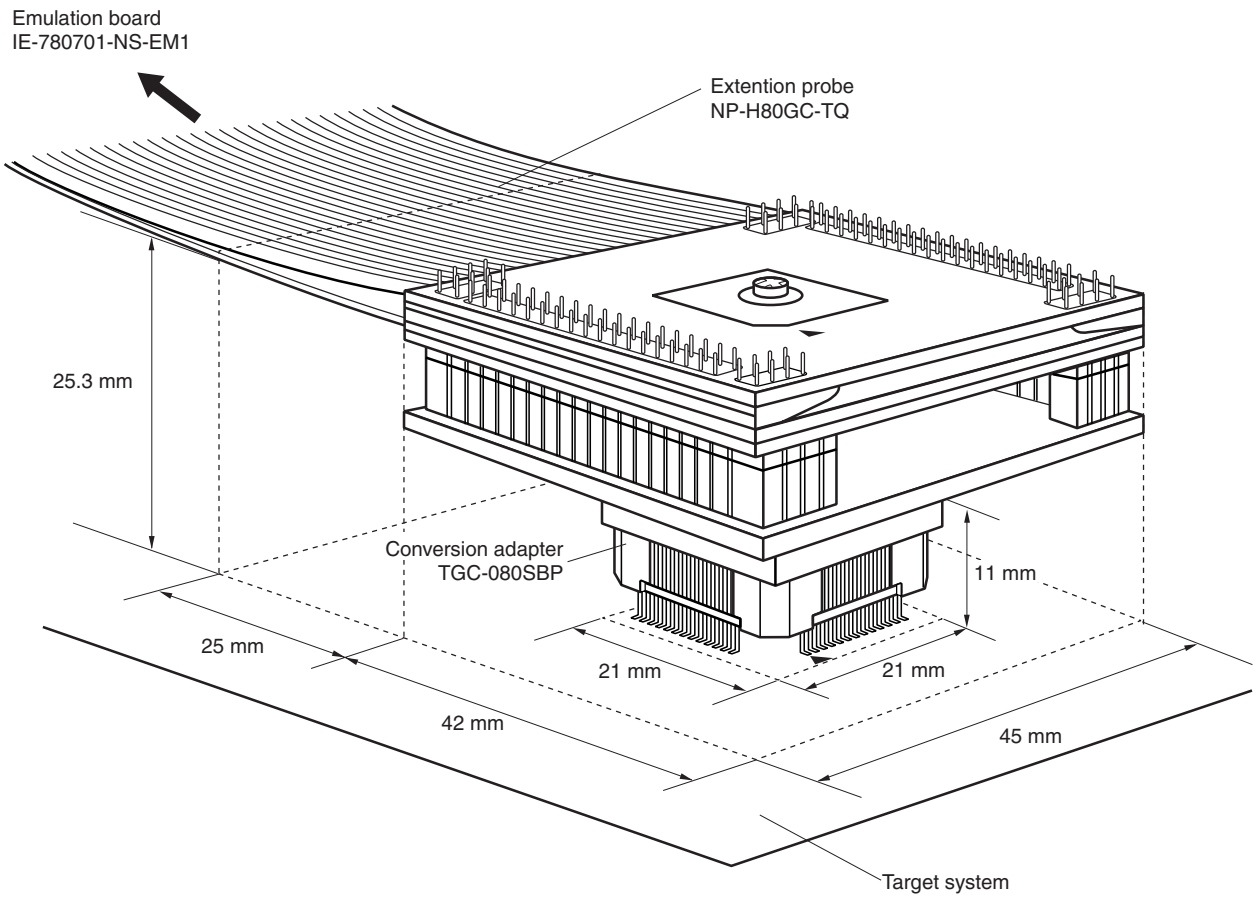
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