User's Manual

NEC

IE-780034-NS-EM1

Emulation Board

Target Devices
μPD780024A Subseries
μPD780034A Subseries
μPD780024AY Subseries
μPD780034AY Subseries
μPD780024AS Subseries
μPD780034AS Subseries

[MEMO]

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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

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Major Revisions in This Edition

Pages	Description
Throughout	• Addition of μPD780024AS, 780034AS Subseries as target devices • NP-H64CW, NP-H64GK-TQ, NP-H64GB-TQ, NP-H52GB-TQ, and NP-73F1-CN3 are added as supported emulation probes • Addition of description regarding probe conversion board (used when 52-pin GB type is used)
p.12	Modification of shape of interface cable in **Figure 1-1 System Configuration**
p.15	Modification of system clock in **Table 1-2 Basic Specifications**
p.17	Addition of **Figure 2-2 Probe Conversion Board (780034AS 52pin Board)**
p.19	Addition of **3.1 (2) Connection with 780034AS 52pin Board**
p.20	Addition of **Figure 3-2 Connection of Emulation Probe (When Using NP-H52GB-TQ)**
p.37	Addition of **3.7 Low-Voltage Emulation Setting**
p.41	Addition of **CHAPTER 5 NOTES ON USAGE**
pp.44, 45	Addition of **Table A-3 NP-H52GB-TQ Pin Assignment** and **Table A-4 NP-73F1-CN3 Pin Assignment**
p.41 in previous edition	Deletion of **APPENDIX B REVISION HISTORY**
pp.46 to 56	Addition of **APPENDIX B NOTES ON TARGET SYSTEM DESIGN**

The mark ★ shows major revised points.

INTRODUCTION

Product Overview The IE-780034-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.

- μPD780024A Subseries: μPD780021A, 780022A, 780023A, 780024A
- μPD780034A Subseries: μPD780031A, 780032A, 780033A, 780034A, 78F0034A
- μPD780024AY Subseries: μPD780021AY, 780022AY, 780023AY, 780024AY
- μPD780034AY Subseries: μPD780031AY, 780032AY, 780033AY, 780034AY, 78F0034AY
- μPD780024AS Subseries: μPD780021AS, 780022AS, 780023AS, 780024AS,
- μPD780034AS Subseries: μPD780031AS, 780032AS, 780033AS, 780034AS, 78F0034AS

Target Readers This manual is intended for engineers who will use the IE-780034-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-780034-NS-EM1, refer to not only this manual (supplied with the IE-780034-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-780034-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-780034-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 in-circuit emulator (IE-78K0-NS or IE-78K0-NS-A) and emulation board (IE-780034-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-780034-NS-EM1 Emulation Board	This manual
ID78K Series Integrated Debugger Ver. 2.30 or Later Operation Windows™ Based	U15185E
μPD780024A, 780034A, 780024AY, 780034AY Subseries	U14046E
μPD780024AS, 780034AS Subseries	U16035E

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-780034-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-780034-NS-EM1's system configuration and basic specifications.

- Target devices
  - μPD780024A Subseries
  - μPD780034A Subseries
  - μPD780024AY Subseries
  - μPD780034AY Subseries
  - μPD780024AS Subseries
  - μPD780034AS Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-780034-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)

Interface card

or

Interface cable
(NS IF Cable)

Interface cable

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

In-circuit emulator

NS CARD
Cable

MC CARD
Cable

FG Cable

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

IE-780034-NS-EM1
(this product)

Probe conversion board
(connected when 52-pin GB type is used)

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.

μS$\times\times\times$DF780034: μPD780024A, 780034A, 7800024AY, 780034AY, 7800024AS, 780034AS
Subseries

The device file can be downloaded from the web site of NEC Electronics
(http://www.necel.com/micro/)

2. The emulation probes NP-64CW, NP-H64CW, NP-64GC, NP-64GC-TQ, NP-H64GC-TQ, NP-64GK, NP-H64GK-TQ, NP-64GB-TQ, NP-H64GB-TQ, NP-H52GB-TQ, and NP-73F1-CN3 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 adapters TGC-064SAP, TGK-064SBW, TGB-064SDP, TGB-052SBP, CSSOCKET73A0909NO1, and LSPACK73A0909NO1 are products 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 probe and conversion socket/conversion adapter, which are sold separately.

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

Package	Emulation Probe	Conversion Socket/Conversion Adapter
64-pin plastic SDIP (CW type)	NP-64CW (Probe length: 200 mm) NP-H64CW (Probe length: 400 mm)	–
64-pin plastic QFP (GC type)	NP-64GC (Probe length: 200 mm)	EV-9200GC-64
	NP-64GC-TQ (Probe length: 200 mm) NP-H64GC-TQ (Probe length: 400 mm)	TGC-064SAP
64-pin plastic LQFP (GK type)	NP-64GK (Probe length: 200 mm) NP-H64GK-TQ (Probe length: 400 mm)	TGK-064SBW
64-pin plastic LQFP (GB type)	NP-64GB-TQ (Probe length: 200 mm) NP-H64GB-TQ (Probe length: 400 mm)	TGB-064SDP
52-pin plastic LQFP (GB type)	NP-H52GB-TQ (Probe length: 400 mm)	TGB-052SBP
73-pin plastic FBGA	NP-73F1-CN3 (Probe length: 253 mm)	LSPACK73A0909NO1+ CSSOCKET73A0909NO1

1.2 Hardware Configuration

Figures 1-2 and 1-3 show the IE-780034-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration (Using IE-78K0-NS)
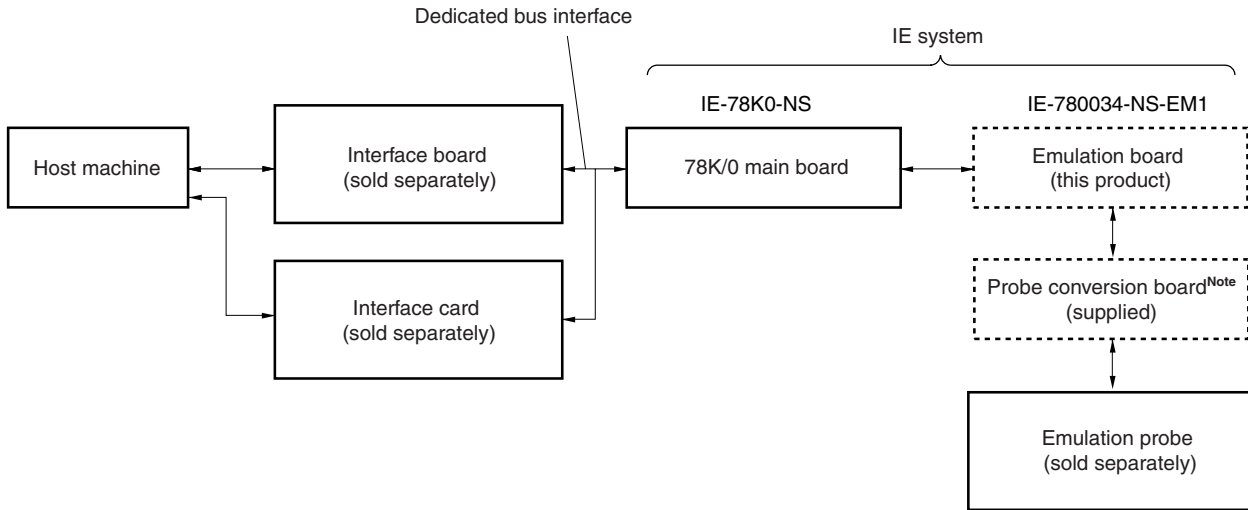
Note Connected when 52-pin GB type is used

Figure 1-3. Basic Hardware Configuration (Using IE-78K0-NS-A)
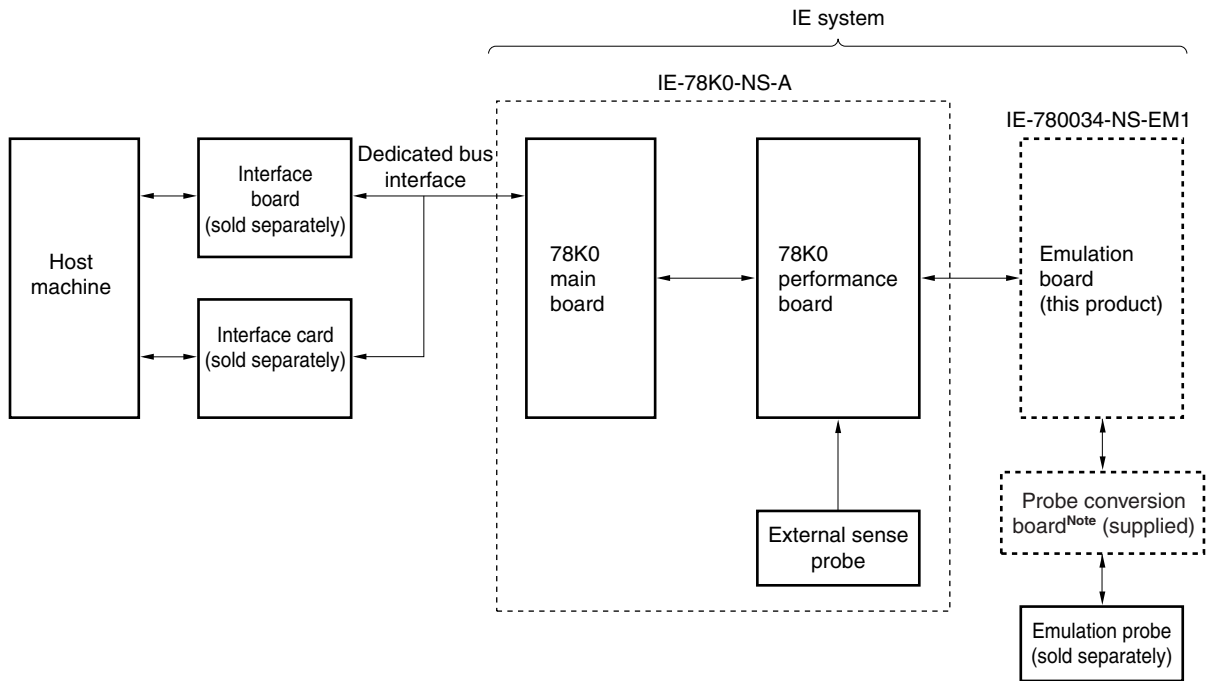
Note Connected when 52-pin GB type is used

1.3 Basic Specifications

The IE-780034-NS-EM1's basic specifications are listed in Table 1-2.

★

Table 1-2. Basic Specifications

Parameter	Description
Target device	μPD780024A, 780034A, 780024AY, 780034AY, 780024AS, 780034AS Subseries
System clock	12.0 MHz
Main system clock supply	External: Input via an emulation probe from the target system Internal: Mounted on the emulation 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 Internal: Mounted on the emulation board (32.768 kHz) or mounted on the board by the user
Low voltage support	V_{DD} = 1.8 to 5.5 V (same as the target device)

CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-780034-NS-EM1 main unit.

The packing box contains the emulation board (IE-780034-NS-EM1), probe conversion board (780034AS 52pin Board), packing list, user's manual, and guarantee card.

If there are any missing or damaged items, please contact an NEC Electronics 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-780034-NS-EM1 Part Names

Main system clock X1

Subsystem clock X2

SW1

IC7

Mask option

EXTOUT

EXTIN

Probe connector CN6

CN6 64GC/64GC-TQ/H64GC-TQ/GK

CN5 64CW

Probe connector CN5

LED1

IE-780034-NS-EM1

★ **Figure 2-2. Probe Conversion Board (780034AS 52pin Board)**

NO

CN2 (52GB)

VER.1.
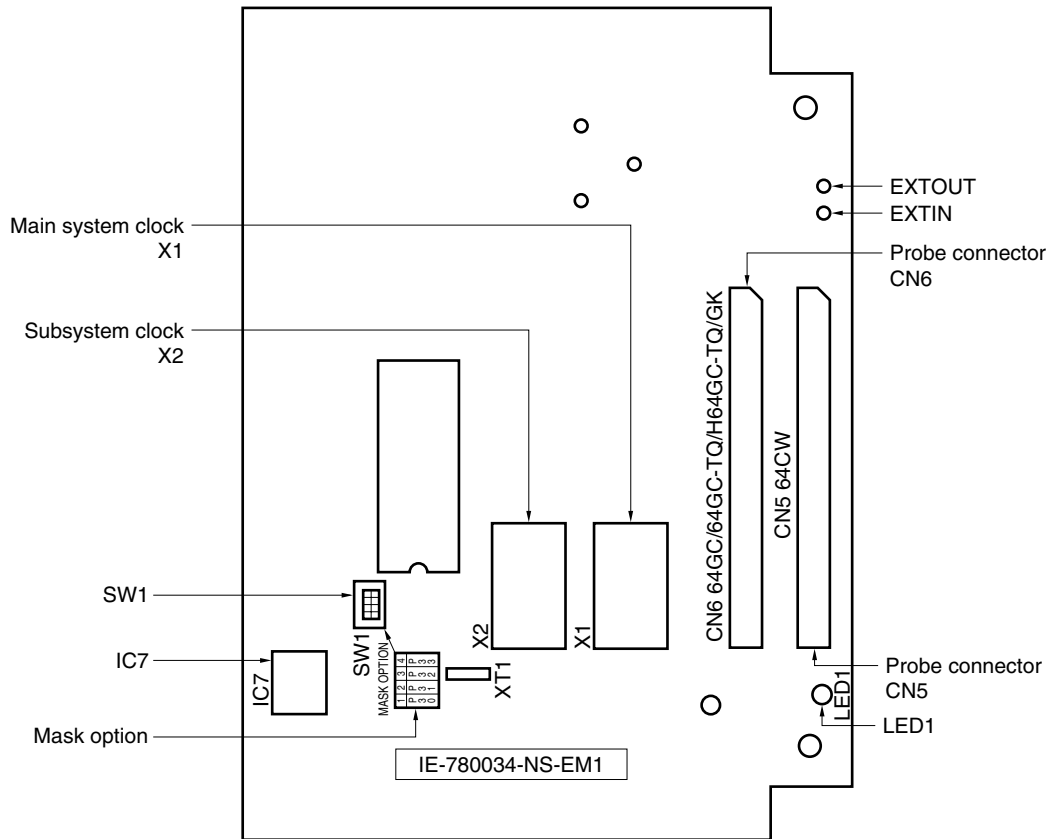
780034AS 52pin Board
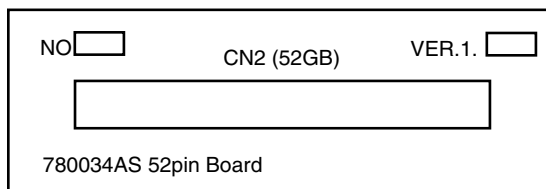
CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-780034-NS-EM1 to the 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-780034-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-780034-NS-EM1 to the IE-78K0-NS-A.

★   **(2) Connection with 780034AS 52pin Board**
Connect the 780034AS 52pin Board only when the emulation probe NP-H52GB-TQ is used (when the target device is a 52-pin GB package). Connect CN5 of the IE-780034-NS-EM1 and CN1 of the 780034AS 52pin Board, aligning pin 1 of each connector.

(3) 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-780034-NS-EM1.
On this board, the probe connector differs depending on the emulation probe used.
- When using NP-64GC, NP-64GC-TQ, NP-H64GC-TQ, NP-64GK, NP-H64GK-TQ, NP-64GB-TQ, NP-H64GB-TQ, or NP-73F1-CN3 connect it to CN6.
- When using NP-64CW or NP-H64CW, connect it to CN5.
- When using NP-H52GB-TQ, connect it to CN2 of the 780034AS 52pin Board.

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)

CN6

CN5

IE-780034-NS-EM1

Main board of
IE-78K0-NS (sold separately) or
IE-78K0-NS-A (sold separately)

★ **Figure 3-2. Connection of Emulation Probe (When Using NP-H52GB-TQ)**

Emulation probe (sold separately)
NP-H52GB-TQ

780034AS 52pin Board
(supplied)

CN6

CN5

IE-780034-NS-EM1

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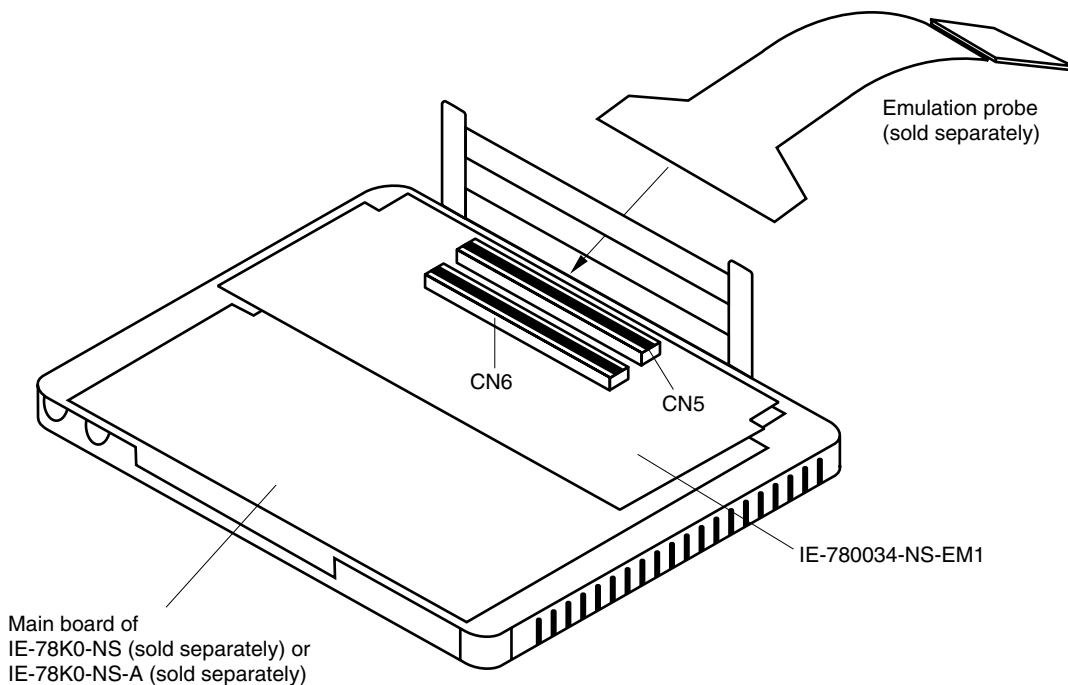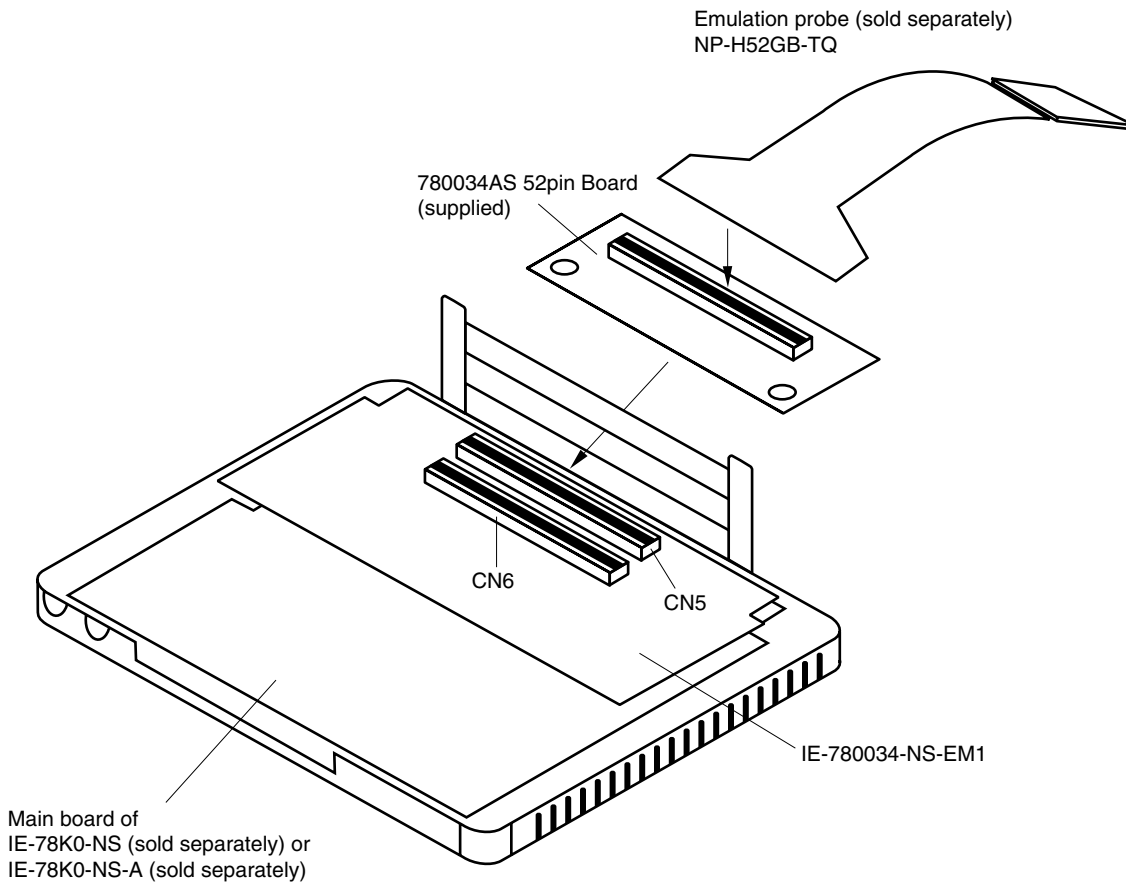
3.2   Clock Settings

3.2.1   Overview of clock settings

The main system and subsystem clocks 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 3-3. 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 3-3.

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 a crystal resonator is connected to X1 (main system clock) and XT1 (subsystem clock).**

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

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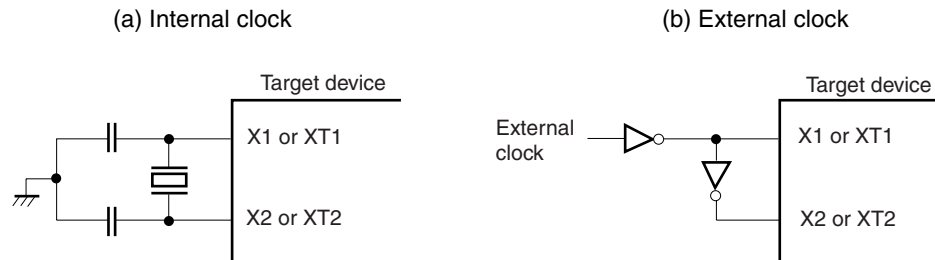
(1) Clock that is already mounted on emulation board

(a) For main system clock

A crystal oscillator (X1) is already mounted on the emulation board. Its frequency is 8.38 MHz.

Figure 3-4. When Using Clock That Is Already Mounted on Emulation Board (Main System Clock)
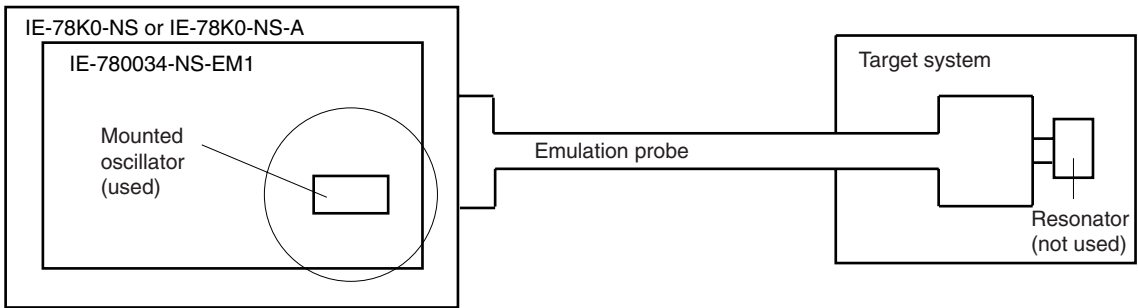
> **Remark** The clock that is supplied by the IE-780034-NS-EM1's oscillator (encircled in the figure) is used.

(b) For subsystem clock

A crystal resonator (XT1) is already mounted on the emulation board. Its frequency is 32.768 kHz.

Figure 3-5. When Using Clock That Is Already Mounted on Emulation Board (Subsystem Clock)
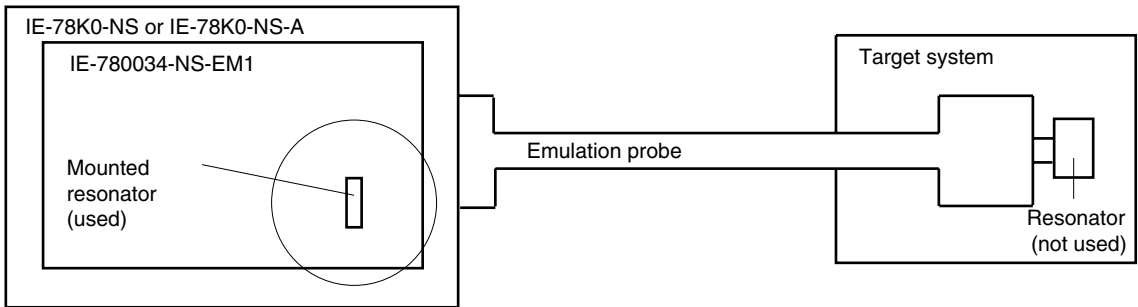
> **Remark** The clock that is supplied by the IE-780034-NS-EM1's resonator (encircled in the figure) is used.

(2) Clock that is mounted by user

The user is able to mount any clock supported by the set specifications on the IE-780034-NS-EM1.

(a) For main system clock

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 3-6. When Using User-Mounted Clock (Main System Clock)
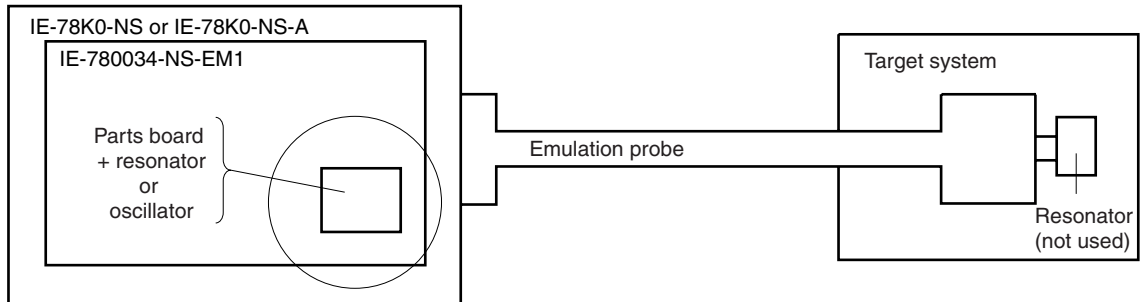
Remark The clock that is supplied by the IE-780034-NS-EM1's resonator or oscillator (encircled in the figure) is used.

(b) For subsystem clock

Mount the resonator to be used on the parts board (X2) that is already mounted on the emulation board. Alternatively, remove the parts board and mount an oscillator.

Figure 3-7. When Using User-Mounted Clock (Subsystem Clock)
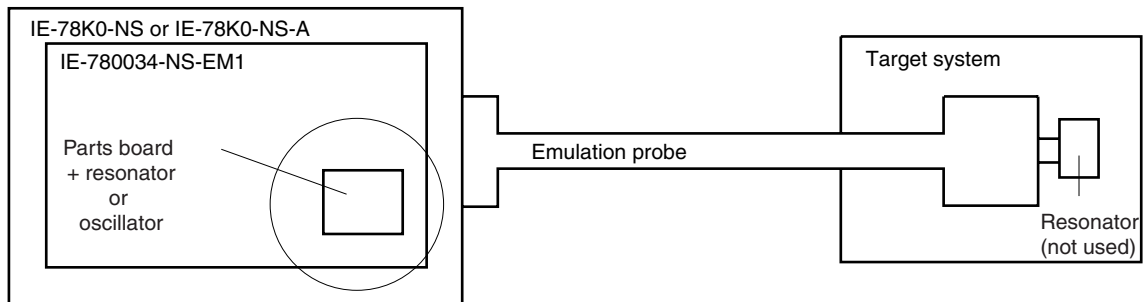
Remark The clock that is supplied by the IE-780034-NS-EM1's resonator or oscillator (encircled in the figure) is used.

(3) External clock

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

Figure 3-8. When Using an External Clock
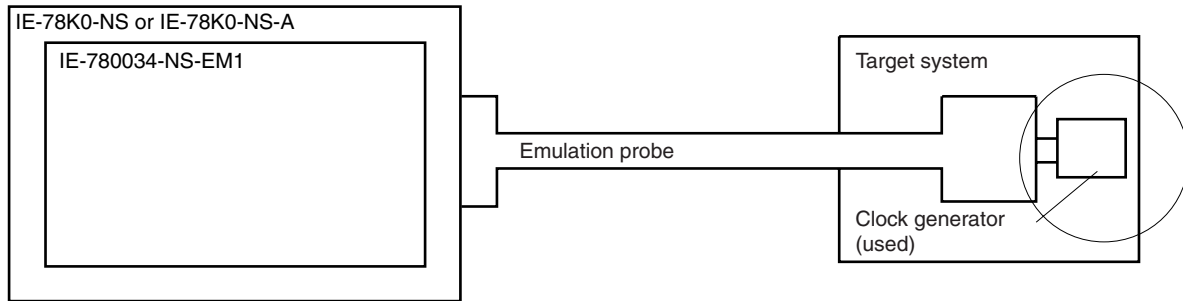
> **Remark** The clock supplied by the target system's clock generator (encircled in the figure) is used.

3.2.2 Main system clock settings

Table 3-1. Main System Clock Settings

Frequency of Main System Clock		IE-780034-NS-EM1	CPU Clock Source Selection (ID78K0-NS)
		X1 Socket	
When using clock that is already mounted on emulation board	8.38 MHz	Oscillator used	Internal
When using clock mounted by user	Other than 8.38 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-780034-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-780034-NS-EM1 is shipped, an 8.38 MHz crystal oscillator is already mounted in the IE-780034-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 frequencies) as shown below.

Figure 3-9. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)

Parts board (X1)
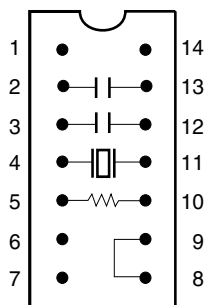
Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Ceramic resonator or crystal resonator
5-10	Resistor Rx
8-9	Shorted

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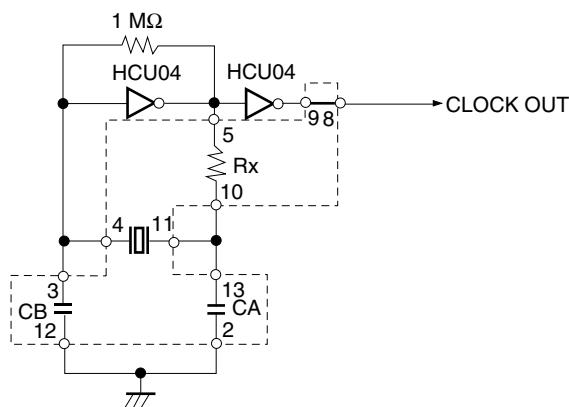
Remark   The sections enclosed in broken lines indicate parts that are attached to the parts board.

<2> Prepare the IE-780034-NS-EM1.

<3> Remove the crystal oscillator that is mounted in the IE-780034-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 3-9 above.

<6> Connect the IE-780034-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)**
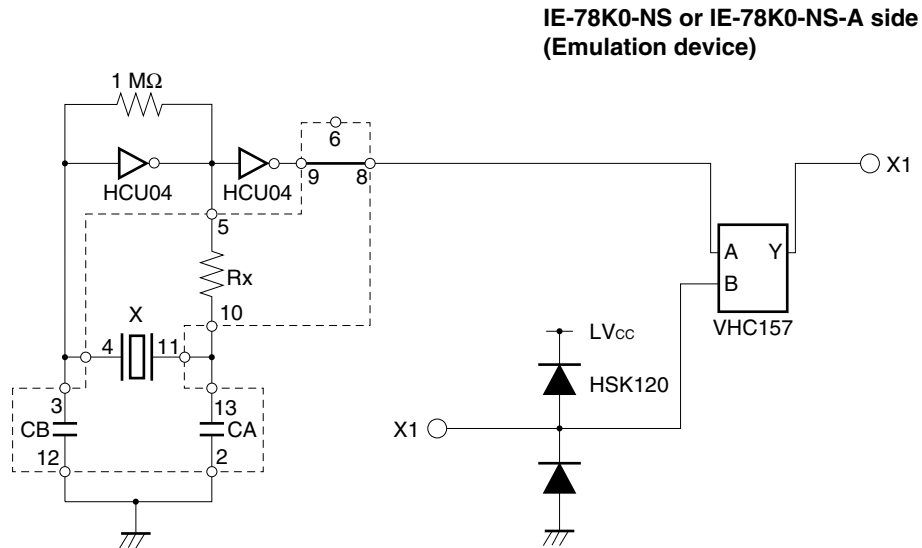
Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

(b) When using a crystal oscillator

- Items to be prepared
  - Crystal oscillator (see pins shown in Figure 3-10)

Figure 3-10. Crystal Oscillator (When Using Main System Clock or User-Mounted Clock)
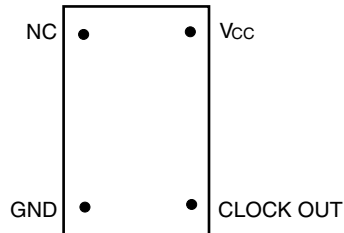
<Steps>
<1> Prepare the IE-780034-NS-EM1.
<2> Remove the crystal oscillator that is mounted in the IE-780034-NS-EM1's X1 socket.
<3> Mount the crystal oscillator prepared by the user in the X1 socket from which the crystal oscillator was removed in <2> above. Insert the crystal oscillator into the socket aligning the pins as shown in the figure below.

Figure 3-11. Pin Alignment of Crystal Oscillator and Socket
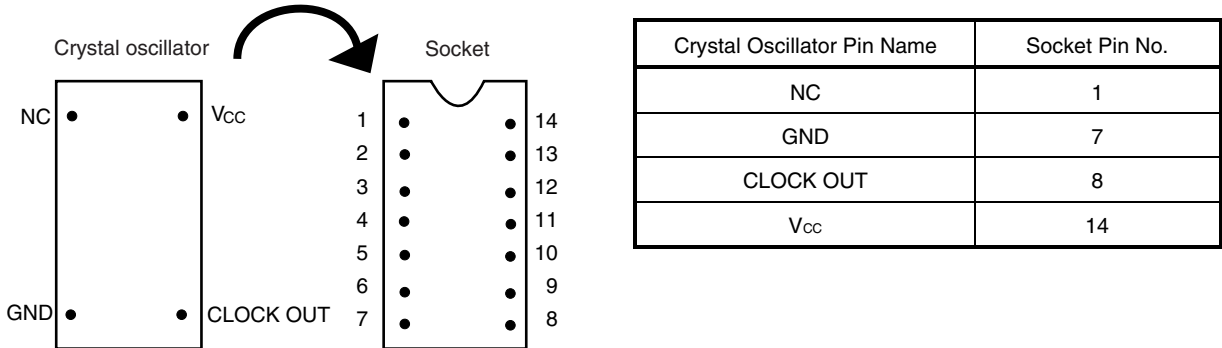
Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
V_CC	14

<4> Connect the IE-780034-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)
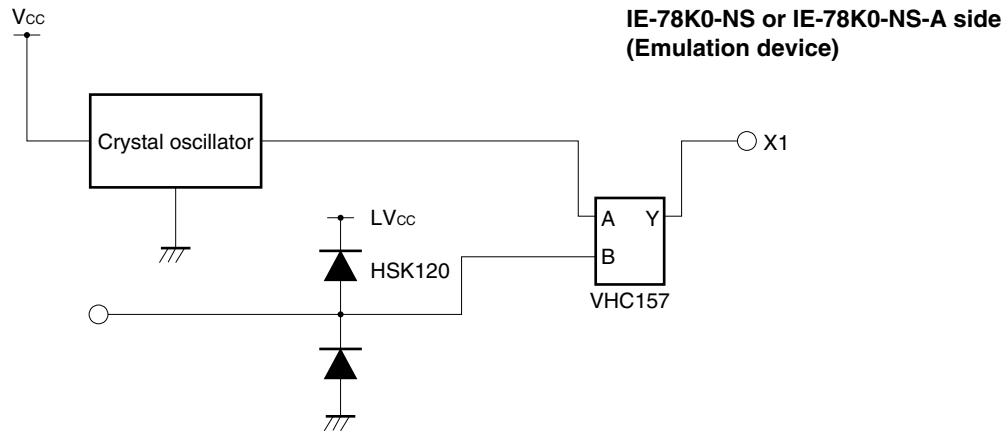
(3) When using external clock

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).

3.2.3 Subsystem clock settings

Table 3-2. Subsystem Clock Settings

Frequency of Subsystem Clock to Be Used		IE-780034-NS-EM1	IE-78K0-NS or IE-78K0-NS-A
		X2 Socket	JP8
When using clock (XT1) that is already mounted on emulation board	32.768 kHz	6 and 8 shorted	Short 1 and 2 side
When using clock mounted by user	Other than 32.768 kHz	Oscillator assembled by user	
When using external clock		Not used	Short 3 and 4 side

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.**

Remark When the IE-780034-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-780034-NS-EM1 is shipped, a 32.768 kHz crystal resonator (XT1) and the parts board (X2) on which pins 6 and 8 are shorted are already mounted on the IE-780034-NS-EM1. Short the 1 and 2 side of the jumper (JP8) on the IE-78K0-NS or IE-78K0-NS-A. There is no need to make any other settings via the integrated debugger (ID78K0-NS).

(2) 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 the 1 and 2 side 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> Prepare the IE-780034-NS-EM1.
<2> Solder the ceramic resonator or crystal resonator, resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequencies) onto the parts board (X2) (as shown below).

Figure 3-12. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

Parts board (X2)
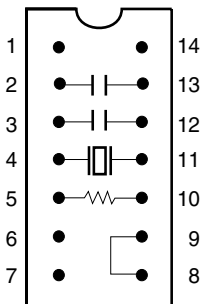
| Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Ceramic resonator or crystal resonator
5-10	Resistor Rx
8-9	Short

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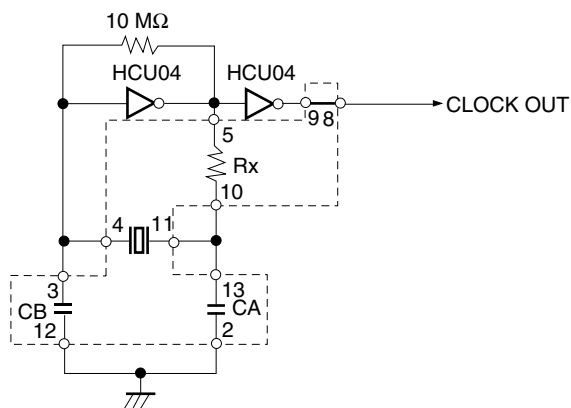
Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

<3> Make sure that the parts board (X2) is wired as shown in Figure 3-12.

<4> Remove the parts board that is mounted in the IE-780034-NS-EM1's X2 socket.

<5> Connect the parts board from <2> above to the socket from which the parts board (from <4> above) was removed. Check the pin 1 mark to make sure the board is mounted in the correct direction.

<6> Connect the IE-780034-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.
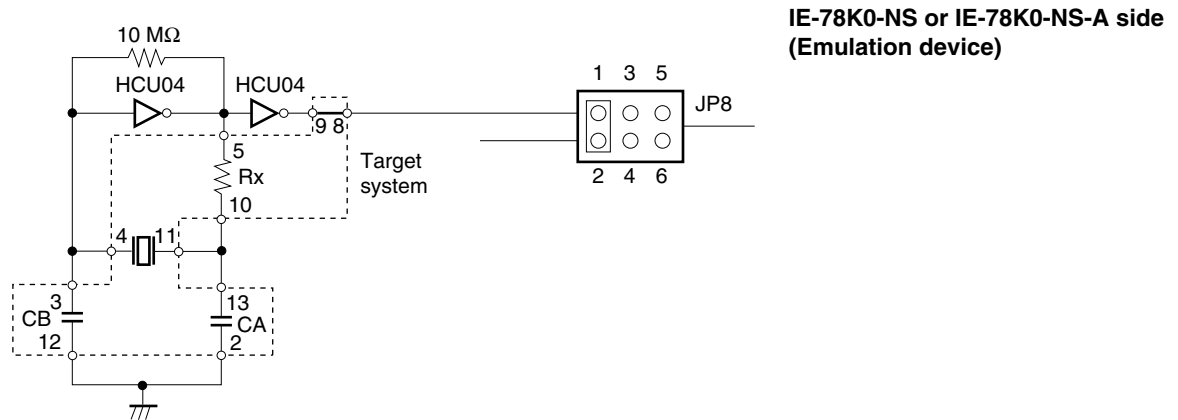
Remarks 1. The sections enclosed in broken lines indicate parts that are attached to the parts board.

2. JP8 is 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 3-13)

Figure 3-13. Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock)

<Steps>
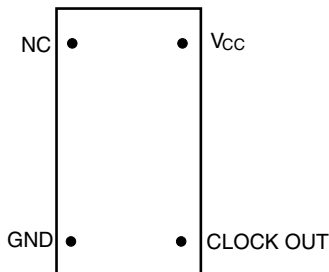
<1> Prepare the IE-780034-NS-EM1.

<2> Remove the parts board that is mounted in the IE-780034-NS-EM1'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 into the socket aligning the pins as shown in the figure below.

Figure 3-14. Pin Alignment of Crystal Oscillator and Socket
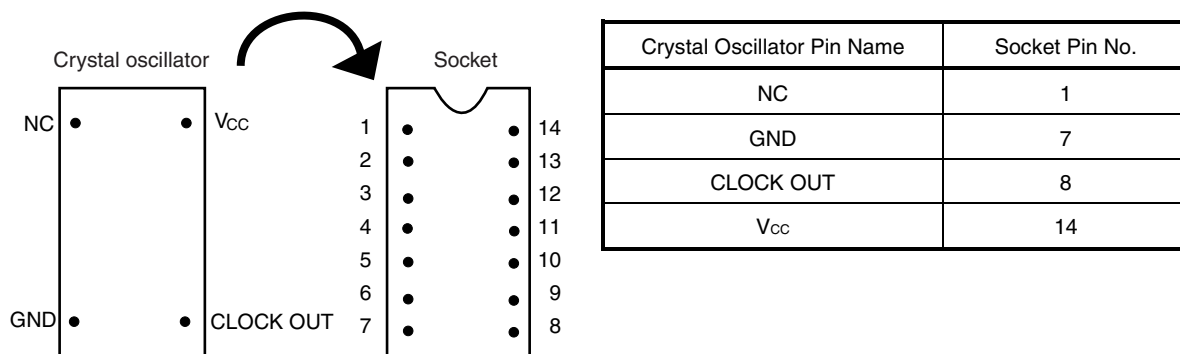
Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
V_CC	14

<4> Connect the IE-780034-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 oscillator to the emulation device.

IE-78K0-NS or IE-78K0-NS-A side (Emulation device)
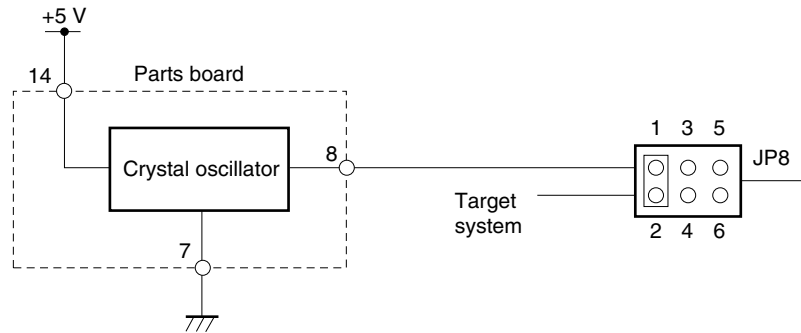
Remarks 1. The sections enclosed in broken lines indicate the parts that are attached to the parts board.

2. JP8 is on the IE-78K0-NS or IE-78K0-NS-A.

(3) When using an external clock

Short the 3 and 4 side 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 Mask Option Setting

3.3.1 Pull-up resistor

By setting the DIP switch (SW1) in the IE-780034-NS-EM1, a 30 kΩ pull-up resistor can be connected to P30 to P33 as specified by the mask option.

For ports that do not exist in the IE-780034-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 3-15. Pull-up Resistor

Initial setting is OFF
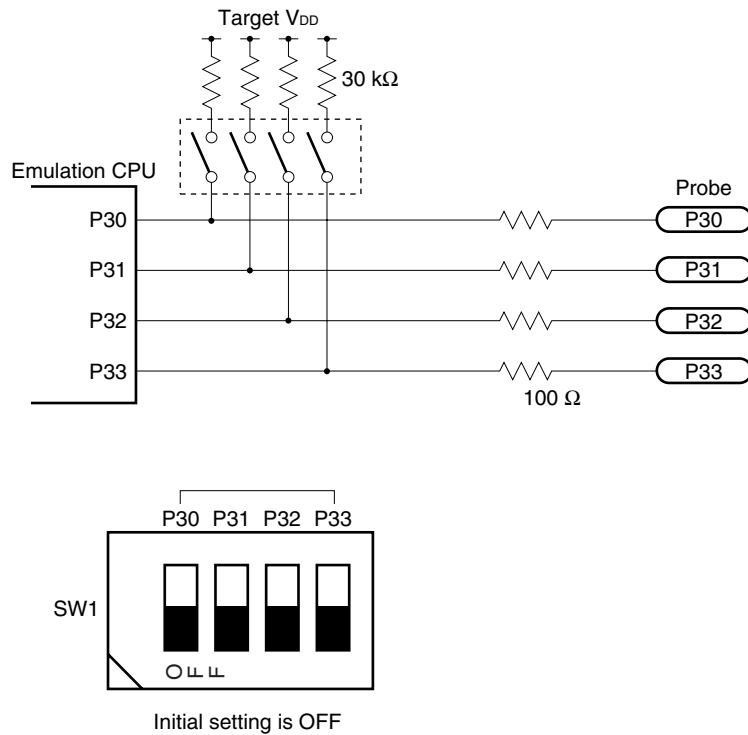
3.4   External Trigger

Connect the external trigger to the IE-780034-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **ID78K0-NS User's Manual (U14379E)** 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 3-16. External Trigger Input Position
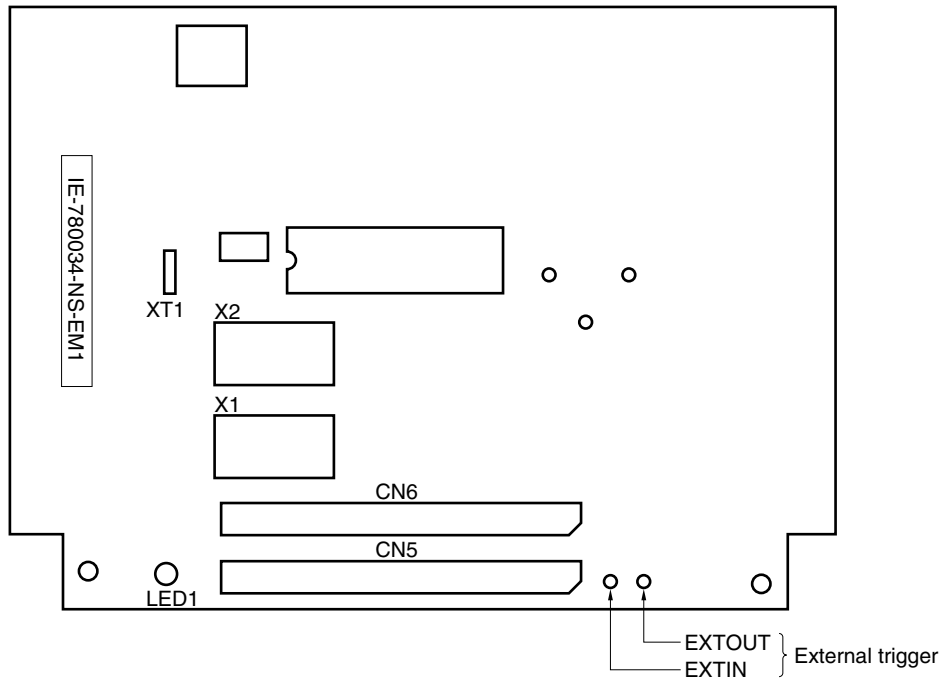
3.5 Jumper Settings on IE-78K0-NS

When using the IE-780034-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)**.

Caution   An incorrect jumper setting may damage the device.

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	1 and 2 shorted

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

When using the IE-780034-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)**.

Caution   An incorrect jumper setting may damage the device.

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	1 and 2 shorted

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

	JP2
Setting	2 and 3 shorted

★ **3.7 Low-Voltage Emulation Setting**

When the target system is operating on low voltage, supply the same voltage as the target system to the TP1 terminal pin on the main board (G-780009 board) of the IE-78K0-NS or IE-78K0-NS-A (this is unnecessary when target system is operating on 5 V).

Set the supply voltage of the target system to between 1.8 to 5.5 V.

Caution   To emulate at 4.5 V or lower, first start at 5 V, and then lower the target system voltage.

Table 3-6. Supply Voltage and Maximum Current Consumption

Supply Voltage to TP1	Maximum Current Consumption of TP1
1.8 to 5.5 V	300 mA

Figure 3-17. Main Board (G-780009 Board) of IE-78K0-NS or IE-78K0-NS-A

TP1

GND Vcc

Dedicated bus interface connector
(HOST-I/F)
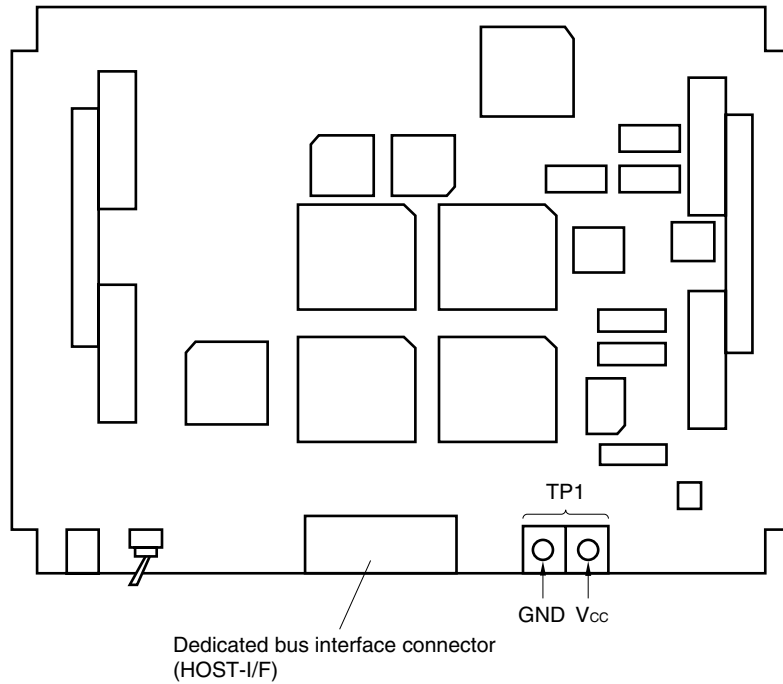
CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes differences between the target device's signal lines and the signal lines of the IE-780034-NS-EM1's target interface circuit.

Although the target device is a CMOS circuit, the IE-780034-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 (μPD780009)
(2) Signals input or output from the emulation CPU (μPD78F0034)
(3) Other signals

The IE-780034-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 (μPD780009)
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 (μPD78F0034)
See **Figure 4-2 Equivalent Circuit of Emulation Circuit (2)**.

- P03 to P00
- P25 to P20
- P36 to P30
- P75 to P70
- P17 to P10
- AV_{DD}, AV_{REF}, AV_{SS}

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

- V_{DD0}, V_{DD1}, V_{SS0}, V_{SS1}, X1, X2, XT1, XT2, $\overline{RESET}$, IC

Figure 4-1. Equivalent Circuit of Emulation Circuit (1)
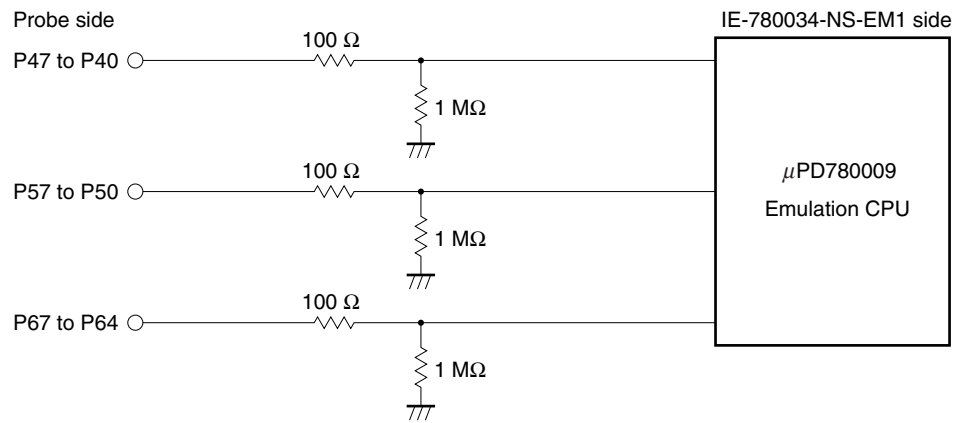
Figure 4-2. Equivalent Circuit of Emulation Circuit (2)
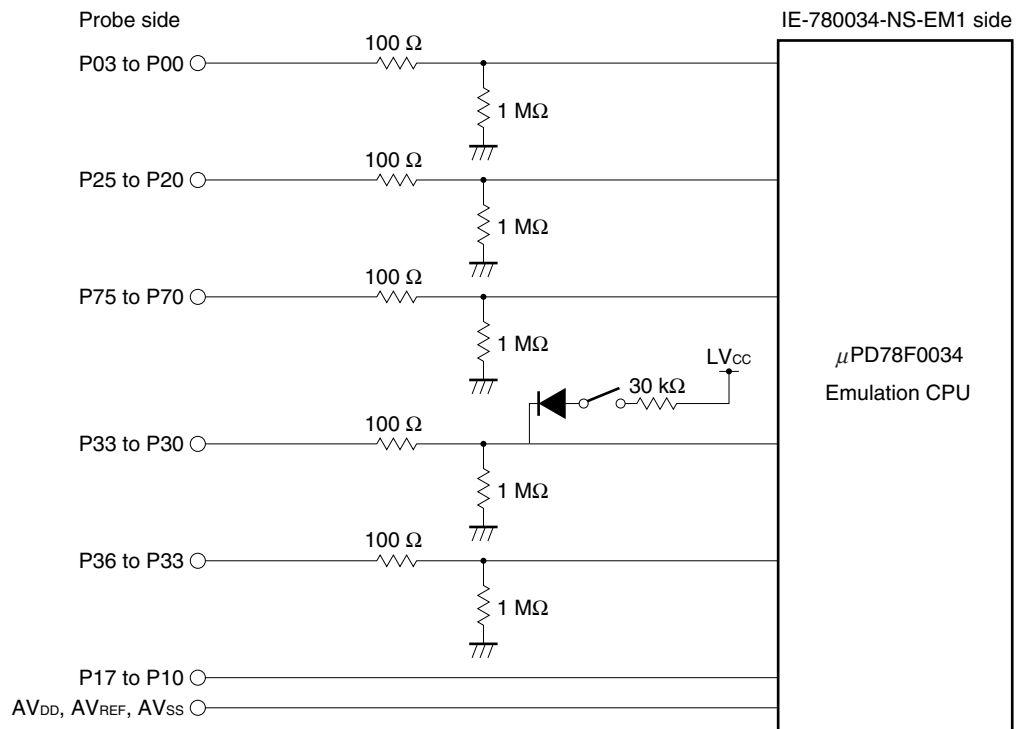
Figure 4-3. Equivalent Circuit of Emulation Circuit (3)
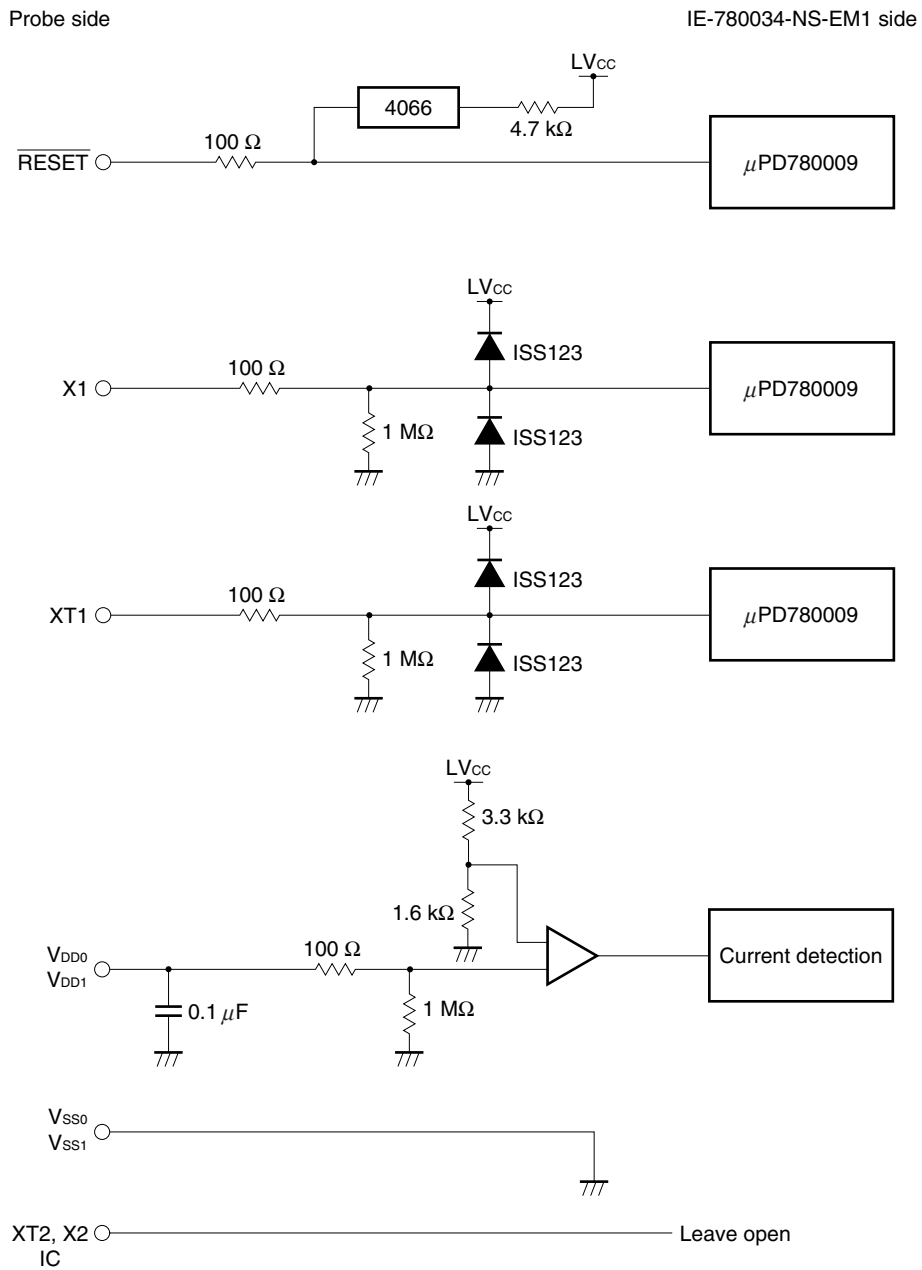
The following must be noted when using the IE-780034-NS-EM1.

• In external diffusion mode, the data read from area xx24H of the external memory is undefined.

Preventive measures: Use an IE-78K0-NS with control code L or later, or IE-78K0-NS-A with control code E or later.

When using an IE-78K0-NS with a control code earlier than L or IE-78K0-NS-A with a control code earlier than E, set the PM4 register to 00H (set port 4 to output mode).

APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. NP-64GC, NP-64GC-TQ, NP-H64GC-TQ, NP-64GK, NP-H64GK-TQ, NP-64GB-TQ, NP-H64GB-TQ Pin Assignments

Emulation Probe	CN6 Pin No.	Emulation Probe	CN6 Pin No.
1	108	33	14
2	107	34	13
3	104	35	18
4	103	36	17
5	100	37	22
6	99	38	21
7	94	39	28
8	93	40	27
9	30	41	92
10	29	42	91
11	24	43	98
12	23	44	97
13	20	45	102
14	19	46	101
15	16	47	106
16	15	48	105
17	43	49	77
18	44	50	78
19	47	51	73
20	48	52	74
21	51	53	69
22	52	54	70
23	57	55	63
24	58	56	64
25	59	57	61
26	60	58	62
27	55	59	65
28	56	60	66
29	49	61	71
30	50	62	72
31	45	63	75
32	46	64	76

Remarks 1. The NP-64GC, NP-64GC-TQ, NP-H64GC-TQ, NP-64GK, NP-H64GK-TQ, NP-64GB-TQ, NP-H64GB-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.

User's Manual U14642EJ3V0UM

Table A-2. NP-64CW, NP-H64CW Pin Assignments

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
1	29	33	91
2	24	34	98
3	23	35	97
4	20	36	102
5	19	37	101
6	16	38	106
7	15	39	105
8	43	40	77
9	44	41	78
10	47	42	73
11	48	43	74
12	51	44	69
13	52	45	70
14	57	46	63
15	58	47	64
16	59	48	61
17	60	49	62
18	55	50	65
19	56	51	66
20	49	52	71
21	50	53	72
22	45	54	75
23	46	55	76
24	14	56	108
25	13	57	107
26	18	58	104
27	17	59	103
28	22	60	100
29	21	61	99
30	28	62	94
31	27	63	93
32	92	64	30

Remarks 1. The NP-64CW and NP-H64CW 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.

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Table A-3. NP-H52GB-TQ Pin Assignment

Emulation Probe	CN2 Pin No.	Emulation Probe	CN2 Pin No.
1	118	27	4
2	114	28	8
3	108	29	14
4	104	30	18
5	100	31	22
6	94	32	28
7	30	33	92
8	29	34	91
9	24	35	98
10	20	36	102
11	16	37	106
12	10	38	112
13	6	39	116
14	33	40	87
15	37	41	83
16	43	42	77
17	47	43	73
18	51	44	69
19	57	45	63
20	59	46	61
21	55	47	65
22	49	48	71
23	45	49	75
24	41	50	79
25	35	51	85
26	31	52	89

Remarks 1. NP-H52GB-TQ is a product 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.

3. The numbers in the CN2 Pin No. column indicate the pin number of CN2 on the 780034AS 52pin Board.

★

Table A-4. NP-73F1-CN3 Pin Assignment

Emulation Probe	CN6 Pin No.	Emulation Probe	CN6 Pin No.
A1	–	G5	52
B1	107	H5	59
C1	104	J5	–
D1	99	A6	70
E1	93	B6	74
F1	24	C6	78
G1	19	G6	58
H1	16	H6	56
J1	–	J6	60
A2	75	A7	73
B2	76	B7	77
C2	103	C7	101
D2	94	D7	102
E2	29	E7	98
F2	23	F7	49
G2	20	G7	55
H2	15	H7	46
J2	43	J7	45
A3	71	A8	–
B3	66	B8	105
C3	72	C8	97
D3	108	D8	28
E3	100	E8	21
F3	30	F8	17
G3	44	G8	18
H3	51	H8	14
J3	–	J8	50
A4	62	A9	–
B4	61	B9	106
C4	65	C9	91
D4	–	D9	92
G4	47	E9	27
H4	48	F9	22
J4	57	G9	–
A5	64	H9	13
B5	63	J9	–
C5	69		

Remarks 1. NP-73F1-CN3 is a product 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 TARGET SYSTEM DESIGN

The following shows a diagram of the connection conditions between the emulation probe and conversion adapter. Design your system making allowances for conditions such as the shape of parts mounted on the target system, as shown below.

Of the products described in this chapter, all the emulation probes are products of Naito Densei Machida Mfg. Co., Ltd., and all the conversion adapters are products 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-64GC-TQ	TGC-064SAP	155 mm
NP-H64GC-TQ		355 mm
NP-64GK	TGK-064SBW	155 mm
NP-H64GK-TQ		355 mm
NP-64GB-TQ	TGB-064SDP	155 mm
NP-H64GB-TQ		355 mm
NP-64CW	–	170 mm
NP-H64CW		370 mm
NP-H52GB-TQ	TGB-052SBP	370 mm
NP-73F1-CN3	LSPACK73A0909NO1, CSSOCKET73A0909NO1	213 mm

Figure B-1. Distance Between In-Circuit Emulator and Conversion Adapter (When Using 64GC)
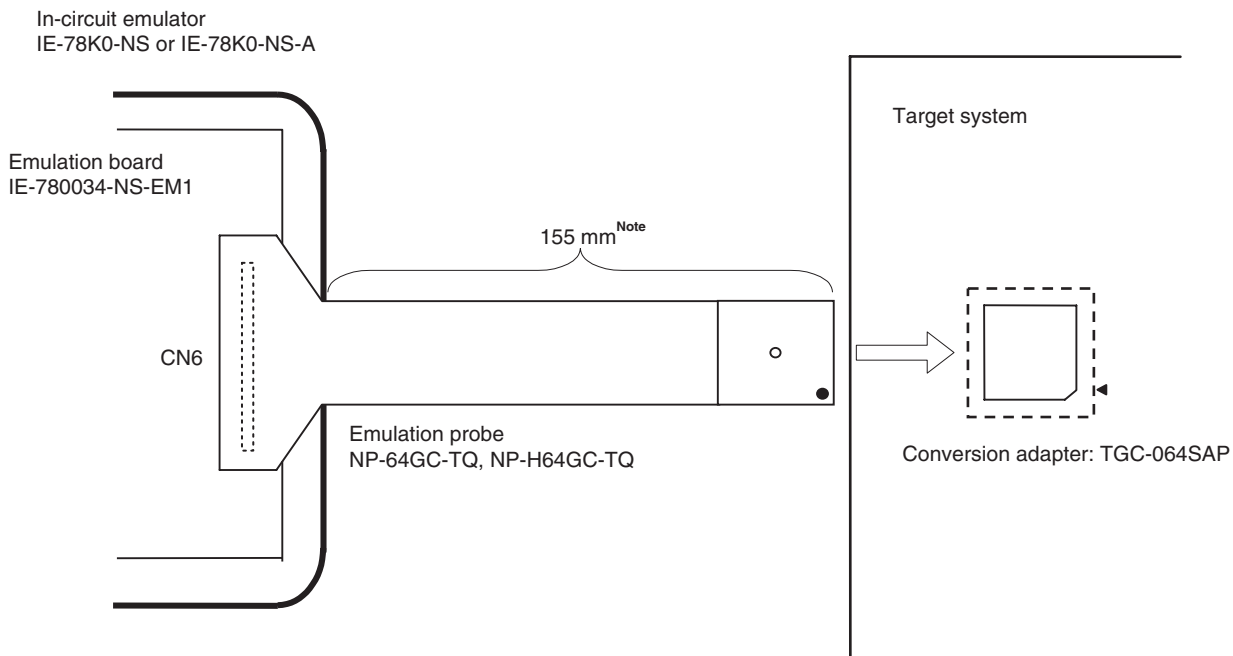
Note   Distance when using NP-64GC-TQ. This is 355 mm when using NP-H64GC-TQ.

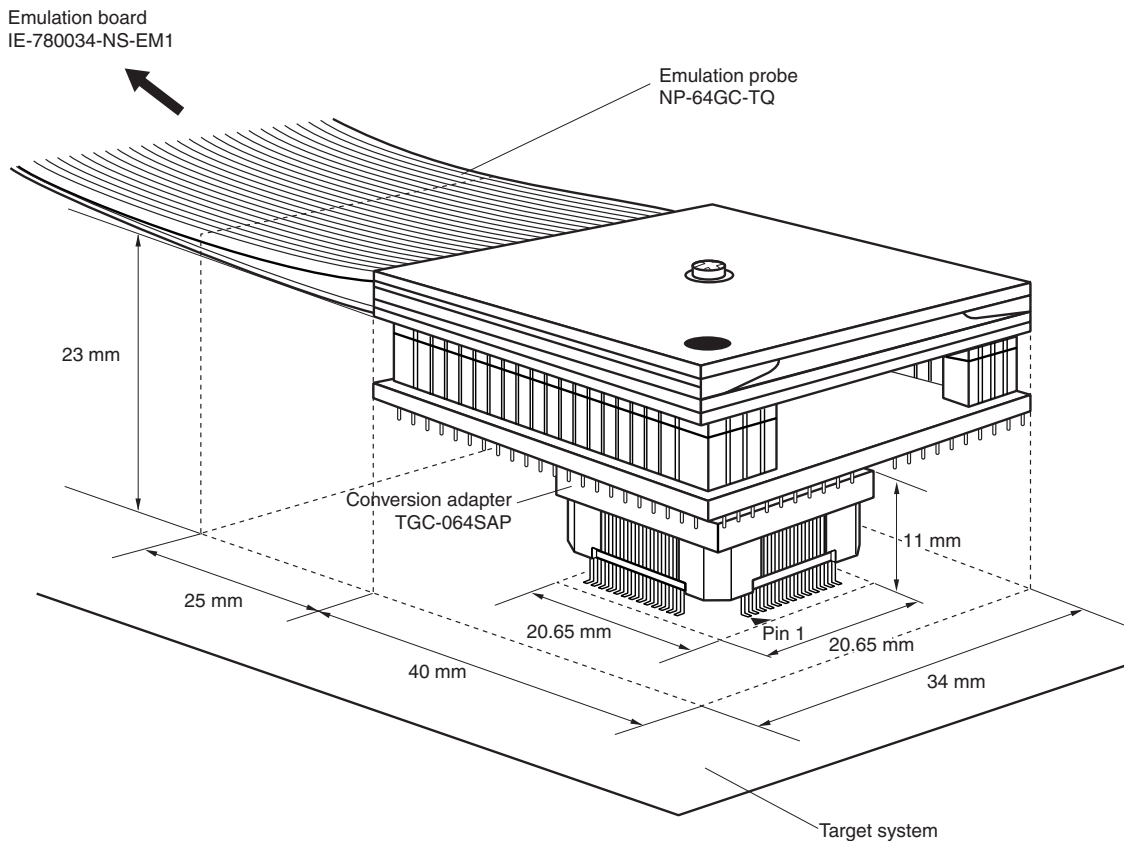**Figure B-2. Connection Conditions of Target System (When Using NP-64GC-TQ)**

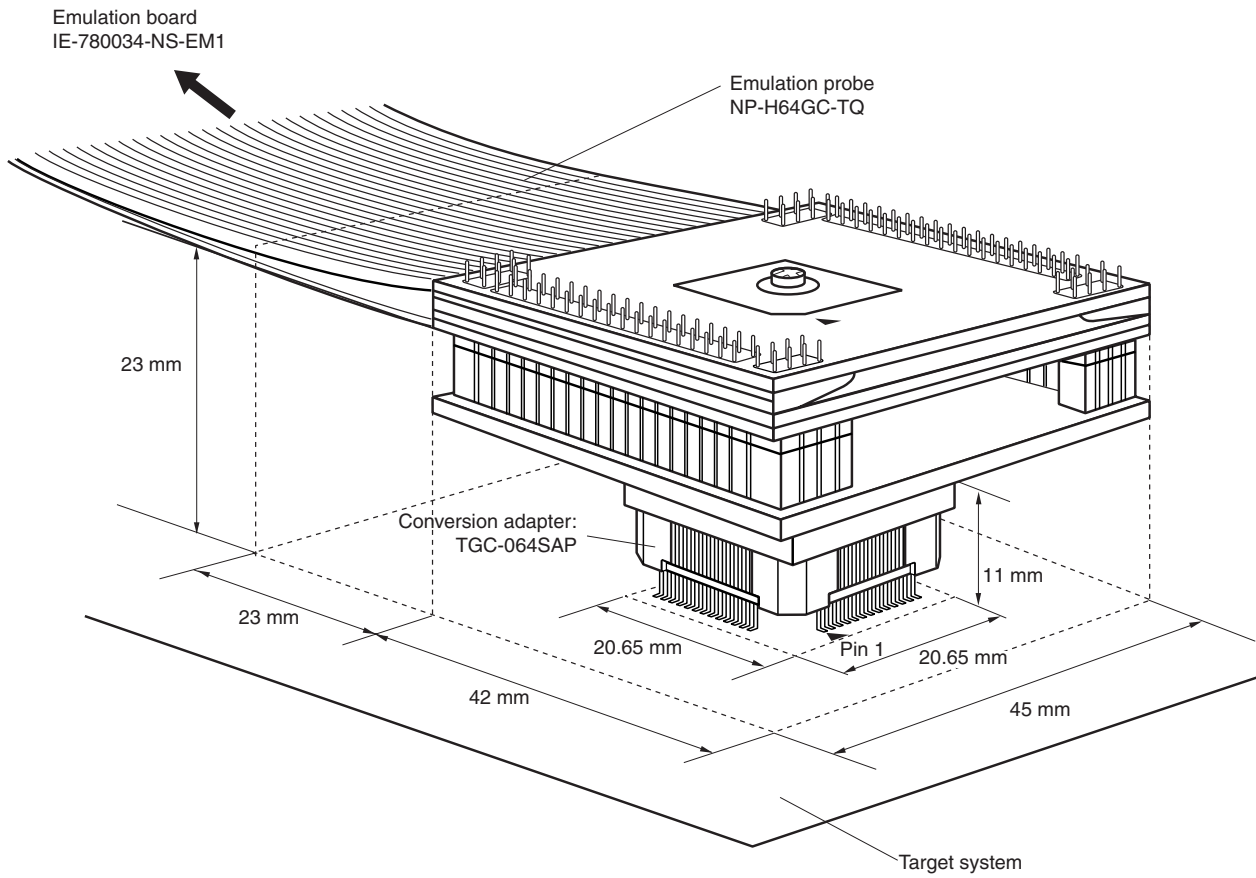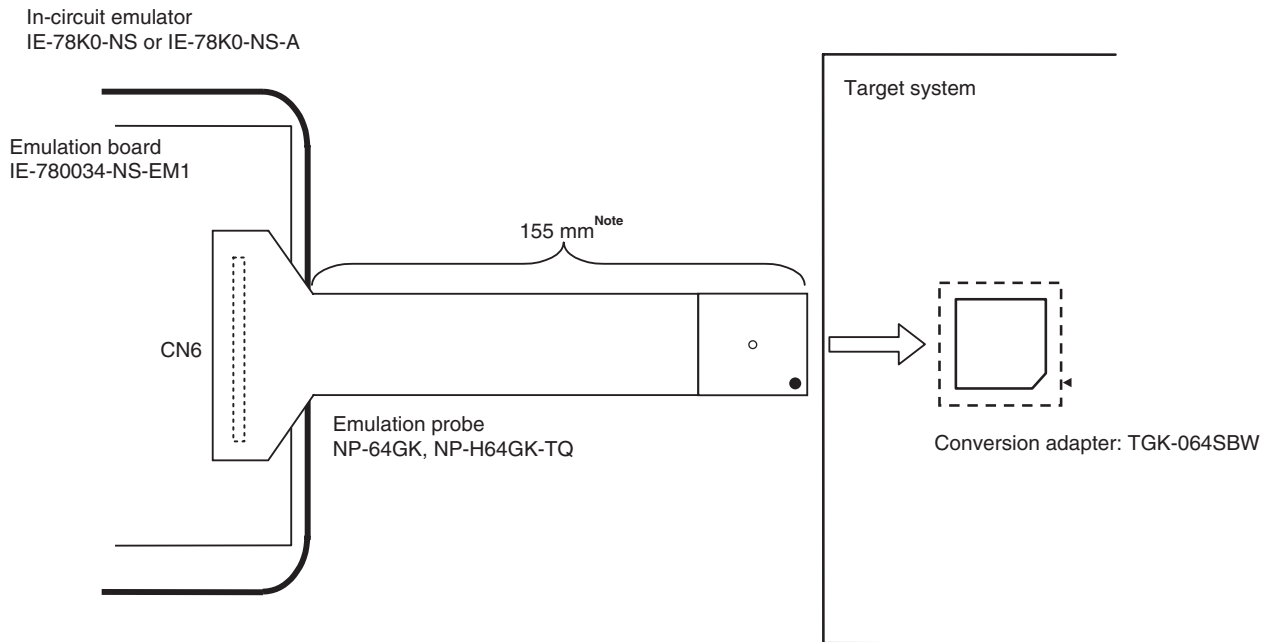**Figure B-3. Connection Conditions of Target System (When Using NP-H64GC-TQ)**

Emulation board
IE-780034-NS-EM1

Emulation probe
NP-H64GC-TQ

23 mm

Conversion adapter:
TGC-064SAP

11 mm

23 mm

20.65 mm

Pin 1

20.65 mm

42 mm

45 mm

Target system

Figure B-4. Distance Between In-Circuit Emulator and Conversion Adapter (When Using 64GK)

Note Distance when using NP-64GK. This is 355 mm when using NP-H64GK-TQ.

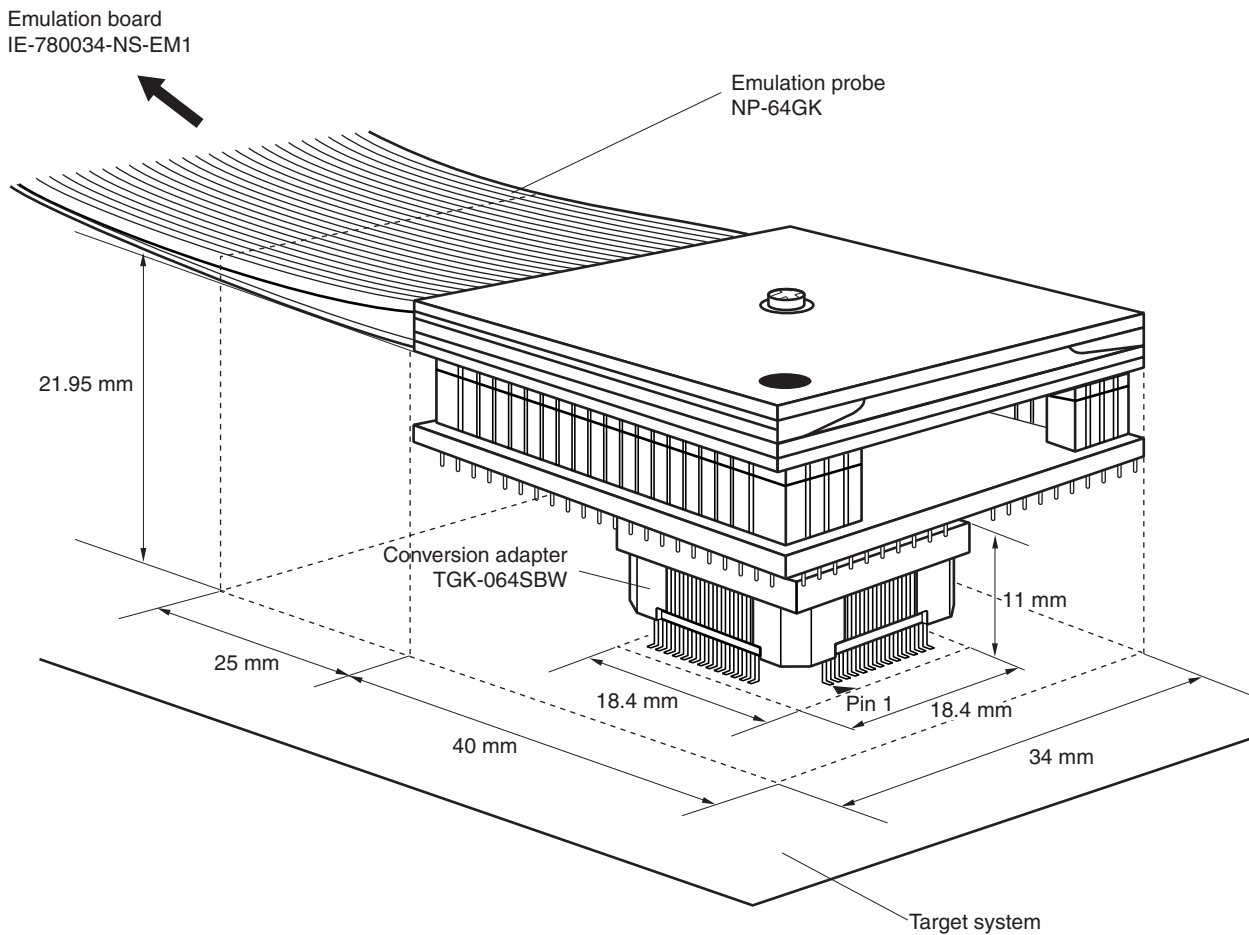**Figure B-5. Connection Conditions of Target System (When Using NP-64GK)**

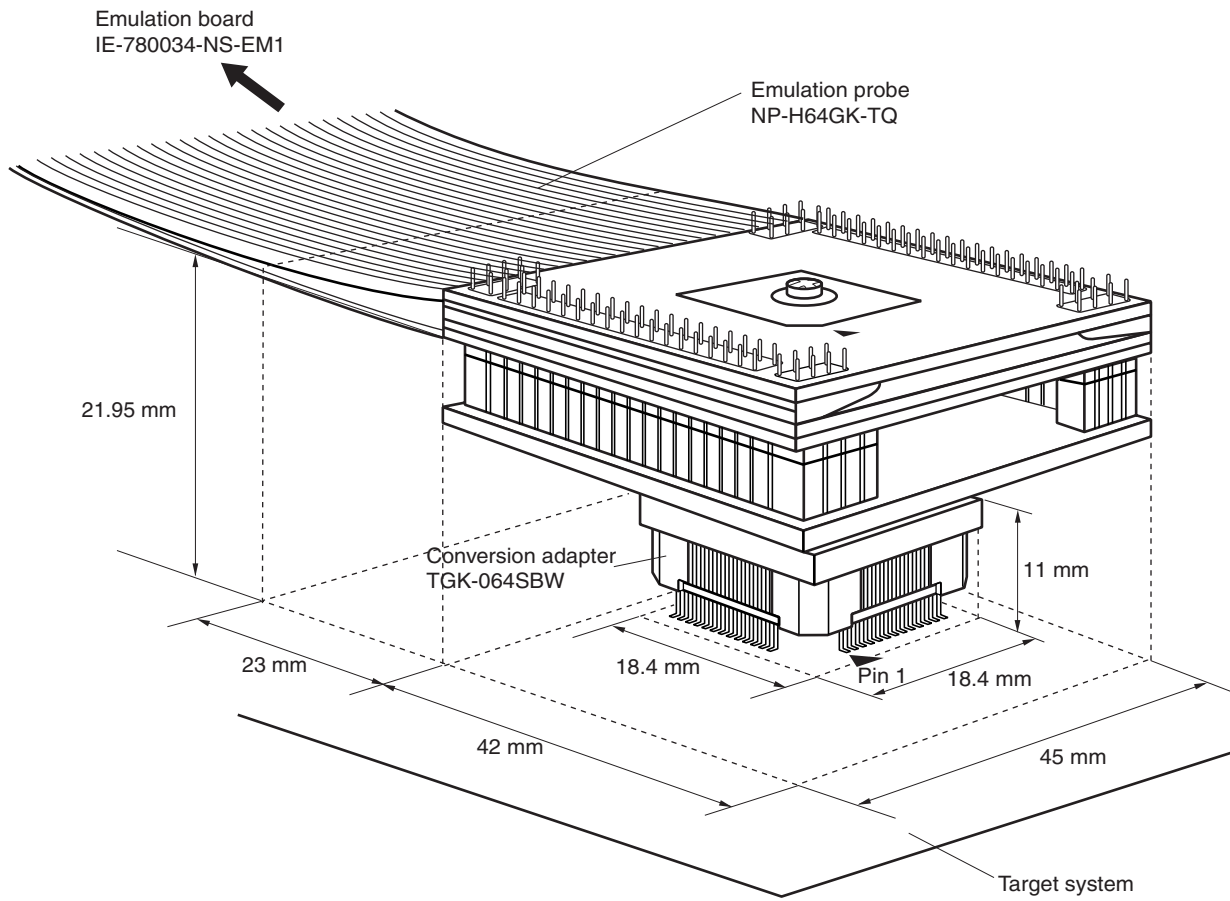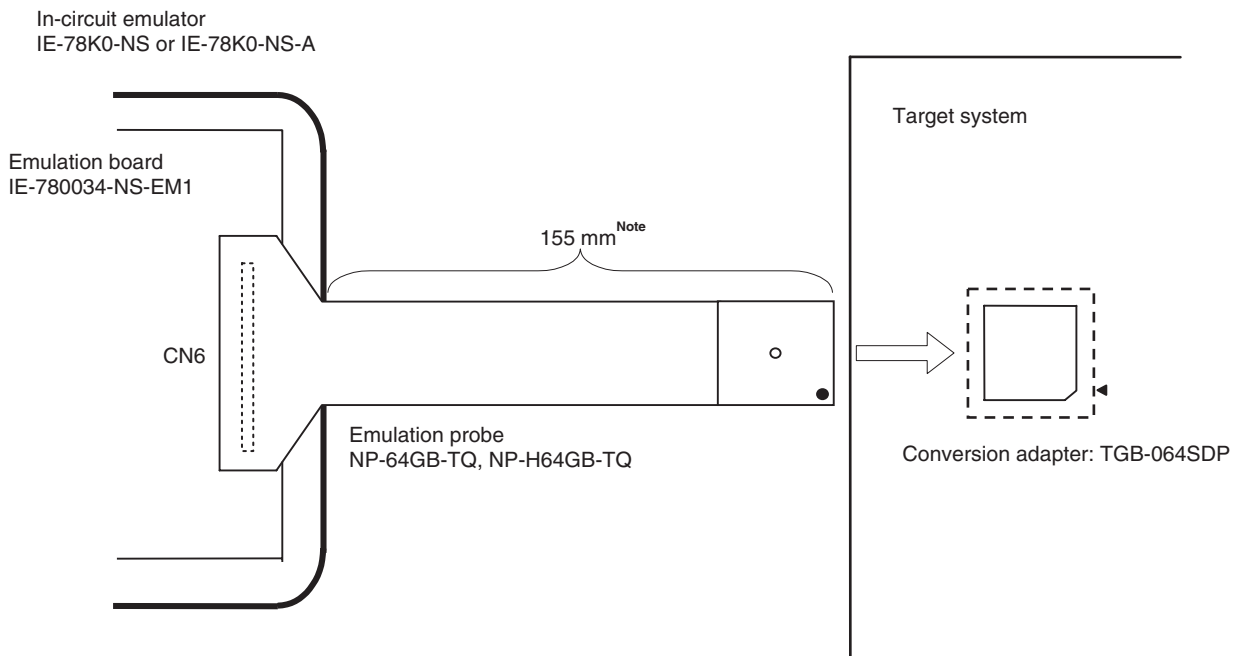**Figure B-6. Connection Conditions of Target System (When Using NP-H64GK-TQ)**

Emulation board
IE-780034-NS-EM1

Emulation probe
NP-H64GK-TQ

21.95 mm

Conversion adapter
TGK-064SBW

11 mm

23 mm

18.4 mm

Pin 1

18.4 mm

42 mm

45 mm

Target system

Figure B-7. Distance Between In-Circuit Emulator and Conversion Adapter (When Using 64GB)

In-circuit emulator
IE-78K0-NS or IE-78K0-NS-A

Emulation board
IE-780034-NS-EM1

CN6

155 mm**Note**

Emulation probe
NP-64GB-TQ, NP-H64GB-TQ

Target system

Conversion adapter: TGB-064SDP

Note   Distance when using NP-64GB-TQ. This is 355 mm when using NP-H64GB-TQ.

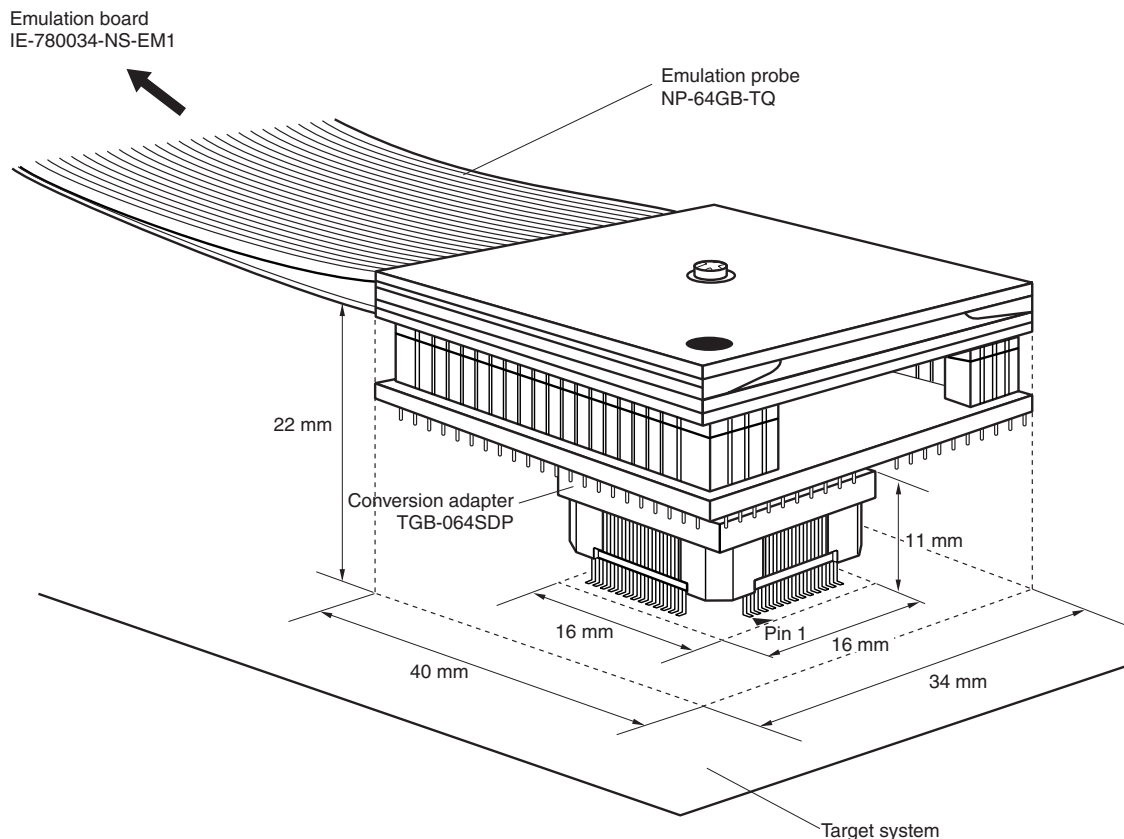**Figure B-8. Connection Conditions of Target System (When Using NP-64GB-TQ)**

Emulation board
IE-780034-NS-EM1

Emulation probe
NP-64GB-TQ

22 mm

Conversion adapter
TGB-064SDP

11 mm

16 mm

Pin 1

16 mm

40 mm

34 mm

Target system

Figure B-9. Connection Conditions of Target System (When Using NP-H64GB-TQ)

Emulation board
IE-780034-NS-EM1

Emulation probe
NP-H64GB-TQ

21.4 mm

Conversion adapter
TGB-064SDP

11 mm

16 mm

Pin 1

16 mm

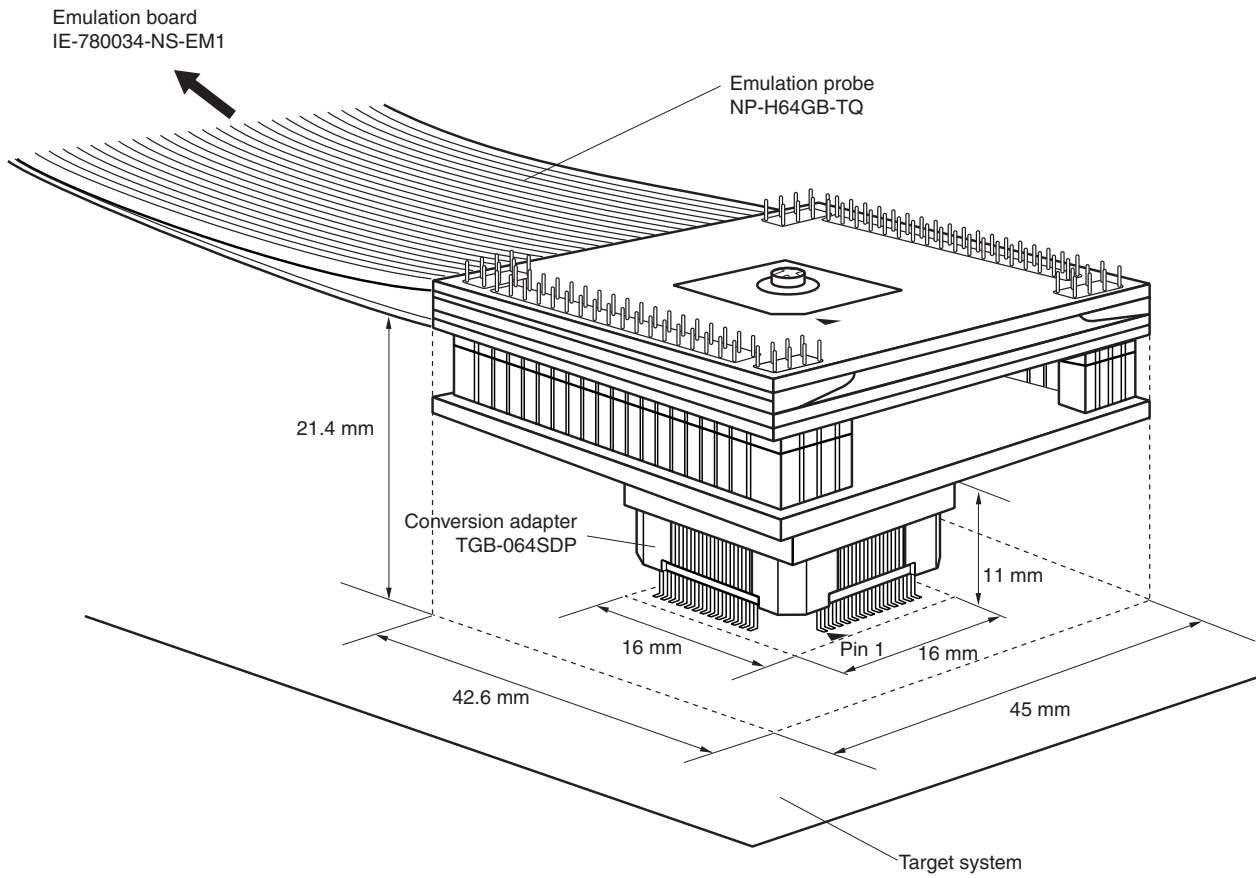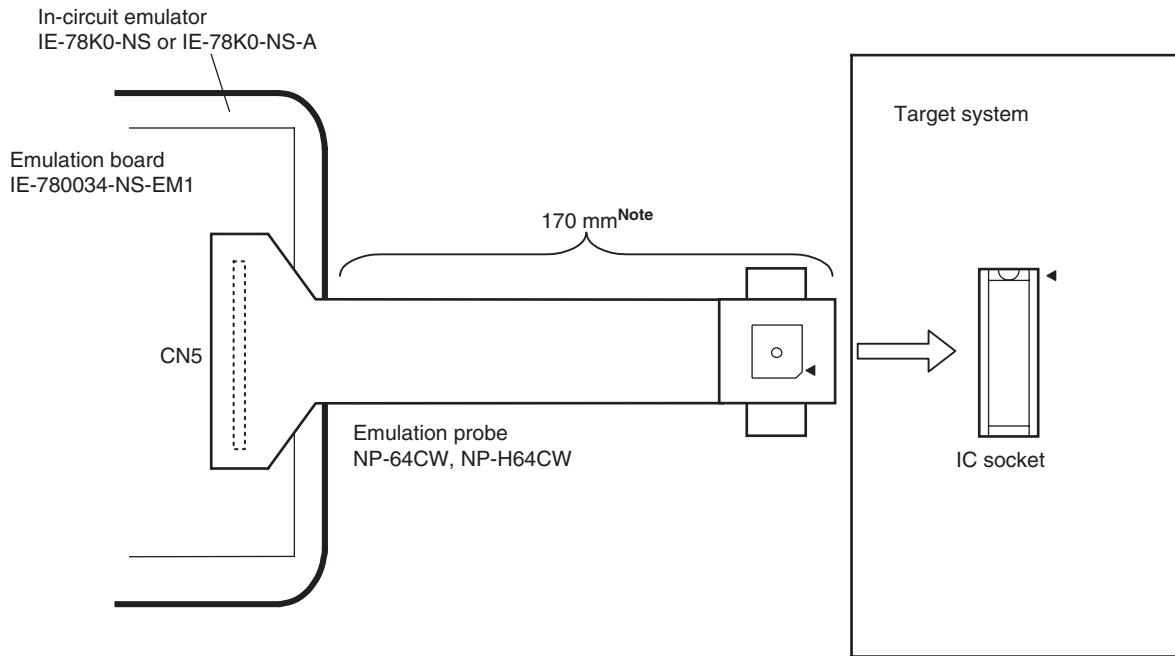42.6 mm

45 mm

Target system

Figure B-10. Distance Between In-Circuit Emulator and Conversion Adapter (When Using 64CW)

Note   Distance when using NP-64CW. This is 370 mm when using NP-H64CW.

Figure B-11. Connection Conditions of Target System (When Using NP-64CW)
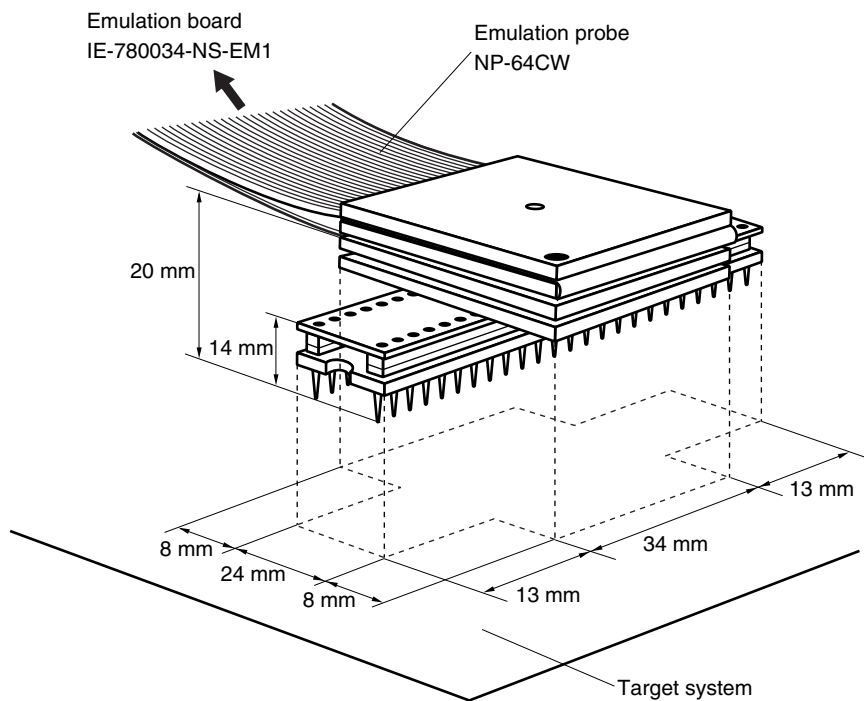
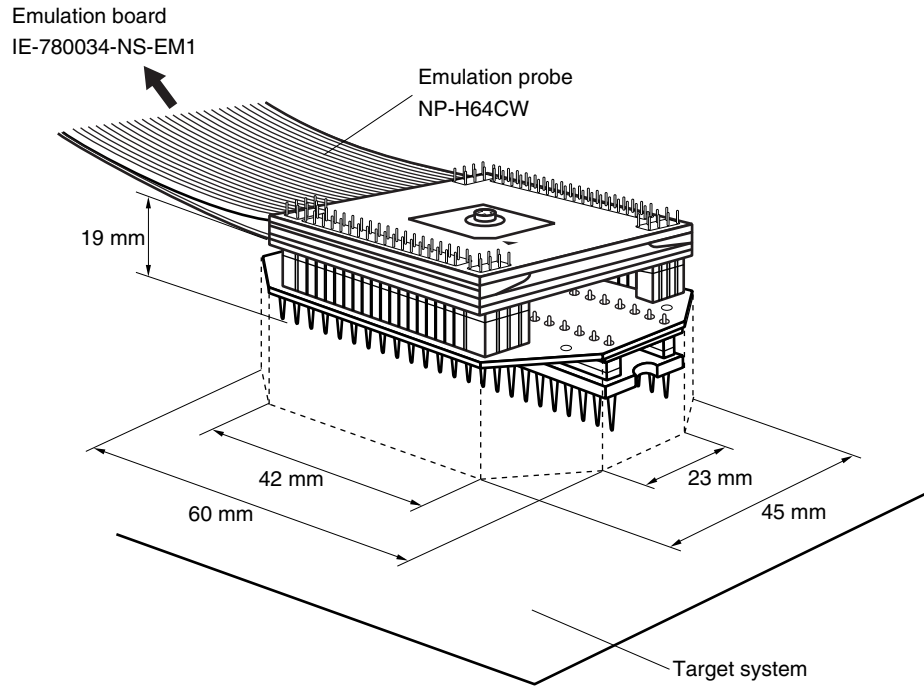**Figure B-12. Connection Conditions of Target System (When Using NP-H64CW)**

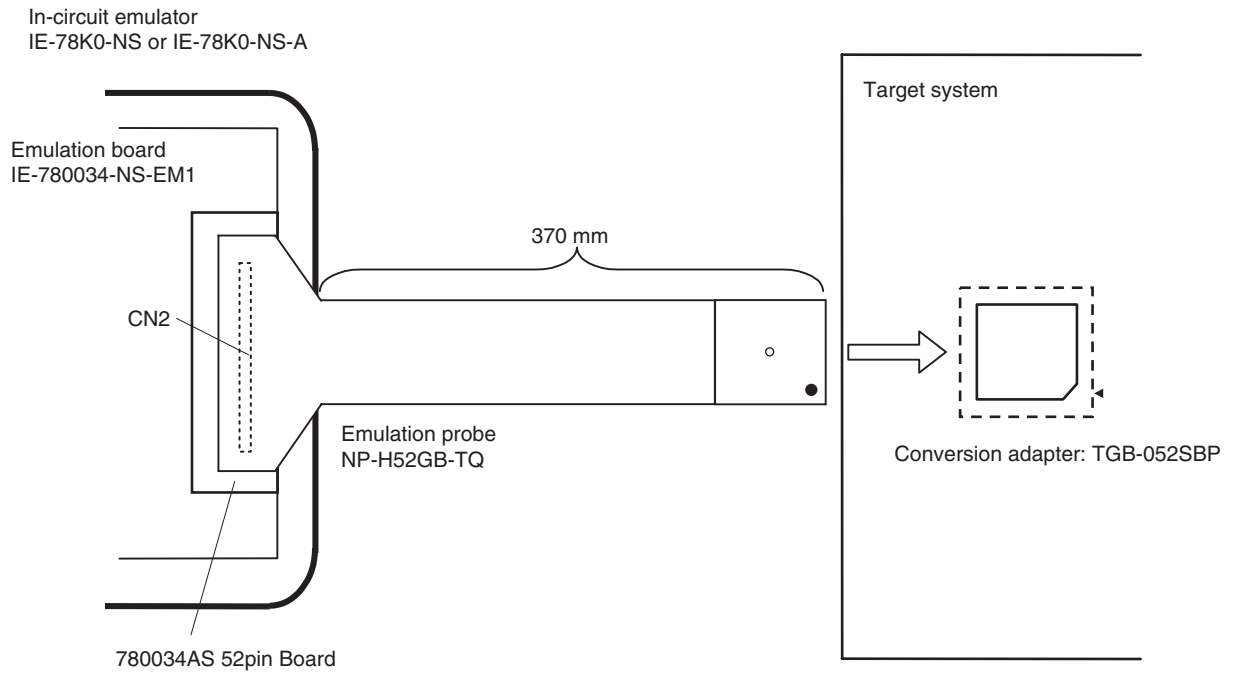**Figure B-13. Distance Between In-Circuit Emulator and Conversion Adapter (When Using NP-H52GB-TQ)**

Figure B-14. Connection Conditions of Target System (When Using NP-H52GB-TQ)
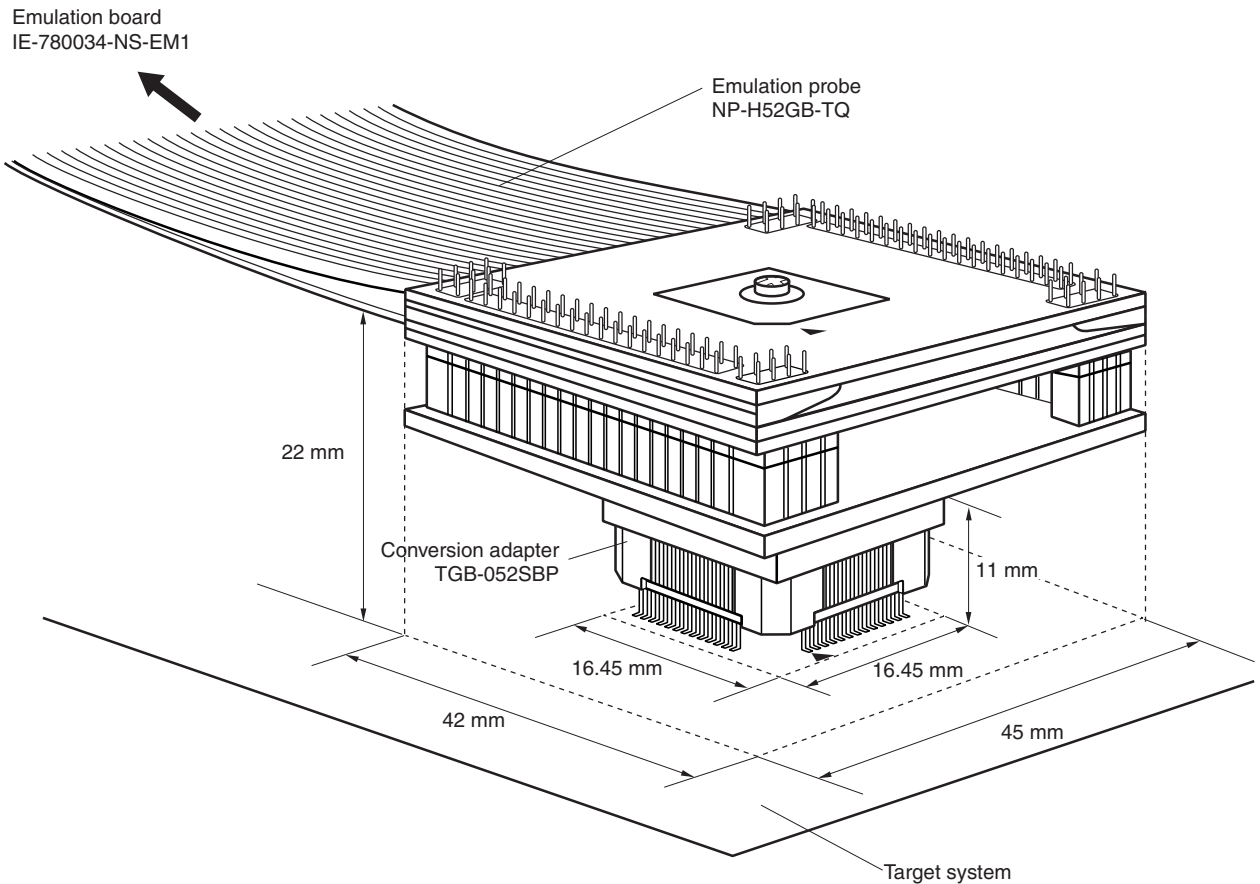
Figure B-15. Distance Between In-Circuit Emulator and Conversion Adapter (When Using NP-73F1-CN3)

Emulation board
IE-78K0-NS or IE-78K0-NS-A

Emulation board
IE-780034-NS-EM1

Target system

213 mm

CN6

Emulation probe
NP-73F1-CN3

Conversion adapter: LSPACK73A0909NO1,
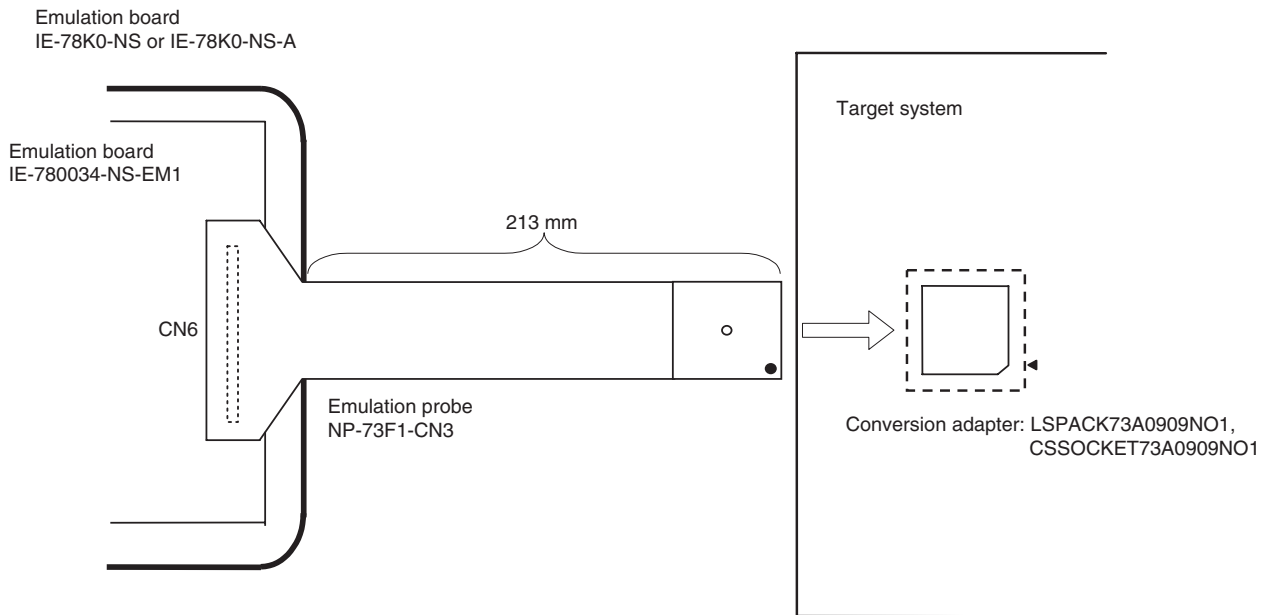CSSOCKET73A0909NO1

Figure B-16. Connection Conditions of Target System (When Using NP-73F1-CN3)

Emulation board
IE-780034-NS-EM1

Emulation probe
NP-73F1-CN3

Conversion adapter
LSPACK73A0909NO1,
CSSOCKET73A0909NO1

21 mm

20 mm

23 mm

23 mm

27 mm

33 mm

Target system