

User's Manual**IE-780308-NS-EM1****Emulation Board**

Target Devices **μ PD78054 Subseries** **μ PD78054Y Subseries** **μ PD78058F Subseries** **μ PD78058FY Subseries** **μ PD78064 Subseries** **μ PD78064B Subseries** **μ PD78064Y Subseries** **μ PD780058 Subseries** **μ PD780058Y Subseries** **μ PD780308 Subseries** **μ PD780308Y Subseries**

[MEMO]

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- 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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J04.1

General Precautions for Handling This Product

1. Circumstances not covered by product guarantee

- If the product was disassembled, altered, or repaired by the customer
- If it was dropped, broken, or given another strong shock
- Use at overvoltage, use outside guaranteed temperature range, storing outside guaranteed temperature range
- If power was turned on while connection to the power supply, PC interface cable, or target system was in an unsatisfactory state
- If the cable of the power supply, the PC interface cable, the emulation probe, or the like was bent or pulled excessively
- If a power supply other than the product described in the system configuration was used
- If the product got wet
- If this product is connected to the target system when there is a potential difference between the GND of this product and GND of the target system.
- If the connectors or cables are plugged/unplugged while this product is in the power-on state.
- If excessive load is applied to the connectors or sockets.

2. Safety precautions

- If used for a long time, the product may become hot (50°C to 60°C). Be careful of low temperature burns and other dangers due to the product becoming hot.
- Be careful of electrical shock. There is a danger of electrical shock if the product is used as described above in **1 Circumstances not covered by product guarantee**.

INTRODUCTION

Product Overview

The IE-780308-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.

- μ PD78054 Subseries: μ PD78052, 78053, 78054, 78055, 78056, 78058
- μ PD78054Y Subseries: μ PD78052Y, 78053Y, 78054Y, 78055Y, 78056Y, 78058Y
- μ PD78058F Subseries: μ PD78056F, 78058F
- μ PD78058FY Subseries: μ PD78056FY, 78058FY
- μ PD78064 Subseries: μ PD78062, 78063, 78064, 78P064
- μ PD78064Y Subseries: μ PD78062Y, 78063Y, 78064Y
- μ PD78064B Subseries: μ PD78064B, 78P064B
- μ PD780058 Subseries: μ PD780053, 780054, 780055, 780056, 780058B, 78F0058
- μ PD780058Y Subseries: μ PD780053Y, 780054Y, 780055Y, 780056Y, 780058BY, 78F0058Y
- μ PD780308 Subseries: μ PD780306, 780308, 78P0308
- μ PD780308Y Subseries: μ PD780306Y, 780308Y, 78P0308Y

Target Readers

This manual is intended for engineers who will use the IE-780308-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-780308-NS-EM1, refer to not only this manual (supplied with the IE-780308-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

- General
- Part names
- Installation

IE-780308-NS-EM1 User's Manual

- General
- Part names
- 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-780308-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-780308-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

How to Read This Manual

It is assumed that the readers of this manual have general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.

To understand the overall functions of the IE-780308-NS-EM1

→ Read this manual according to the **CONTENTS**.

The mark ★ shows major revised points.

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-780308-NS-EM1 Emulation Board	This manual
ID78K0-NS Ver. 2.52 Integrated Debugger Operation	U16488E
μPD78054, 78054Y Subseries	U11747E
μPD78058F, 78058FY Subseries	U12068E
μPD78064, 78064Y Subseries	U10105E
μPD78064B Subseries	U10785E
μPD780058, 780058Y Subseries	U12013E
μPD780308, 780308Y Subseries	U11377E

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

CONTENTS

CHAPTER 1 GENERAL	9
1.1 System Configuration.....	10
1.2 Hardware Configuration	12
1.3 Basic Specifications	13
CHAPTER 2 PART NAMES	14
2.1 Parts of Main Unit	15
CHAPTER 3 INSTALLATION	16
3.1 Connection	17
3.2 Clock Settings.....	18
3.2.1 Overview of clock settings.....	18
3.2.2 Main system clock settings	21
3.2.3 Subsystem clock settings.....	26
3.3 Mask Option	31
3.4 External Trigger	32
3.5 Jumper Settings on IE-78K0-NS	33
★ 3.6 Jumper Settings on IE-78K0-NS-A	33
★ 3.7 Low-Voltage Emulation Setting	34
CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS	35
APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE	40
★ APPENDIX B NOTES ON TARGET SYSTEM DESIGN	46
★ APPENDIX C REVISION HISTORY	53

CHAPTER 1 GENERAL

The IE-780308-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-780308-NS-EM1's system configuration and basic specifications.

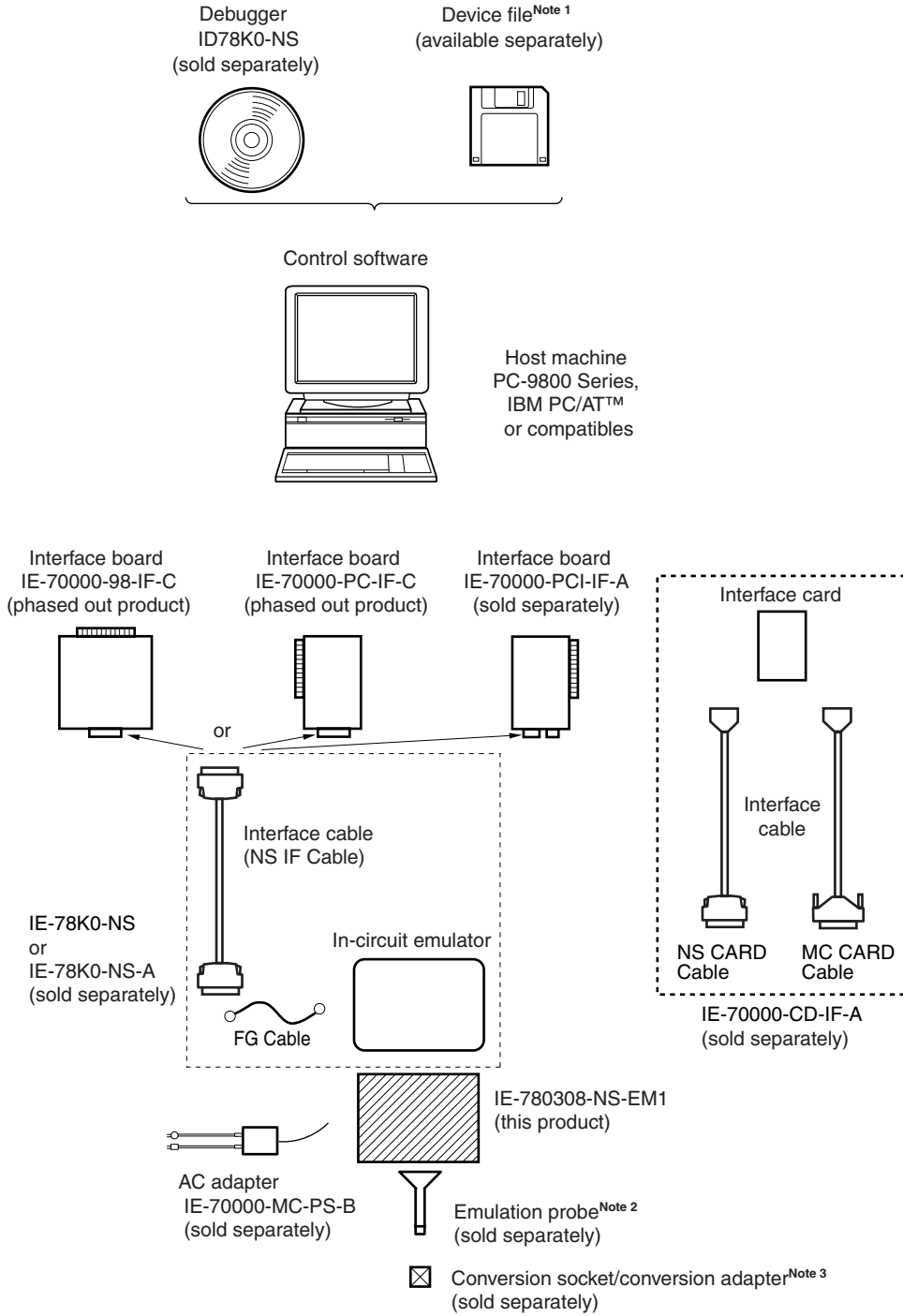
- Target devices
 - μ PD78054 Subseries
 - μ PD78054Y Subseries
 - μ PD78058F Subseries
 - μ PD78058FY Subseries
 - μ PD78064 Subseries
 - μ PD78064Y Subseries
 - μ PD78064B Subseries
 - μ PD780058 Subseries
 - μ PD780058Y Subseries
 - μ PD780308 Subseries
 - μ PD780308Y Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-780308-NS-EM1's system configuration.

★

Figure 1-1. System Configuration



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

μ SxxxxDF78054: μ PD78054, 78054Y, 78058F, 78058FY Subseries

μ SxxxxDF78064: μ PD78064, 78064Y, 78064B, 780308, 780308Y Subseries

μ SxxxxDF780058: μ PD780058, 780058Y Subseries

μ SxxxxDF780308: μ PD780308, 780308Y Subseries

Obtain the device files from the NEC Electronics website.

(http://www.necel.com/micro/index_e.html)

2. The emulation probes NP-80GC, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, NP-H80GK-TQ, NP-100GC, NP-H100GC-TQ, NP-100GF, NP-100GF-TQ, and NP-H100GF-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 adapters TGC-080SBP, TGK-080SDW, TGC-100SDW, and TGF-100RBP 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)

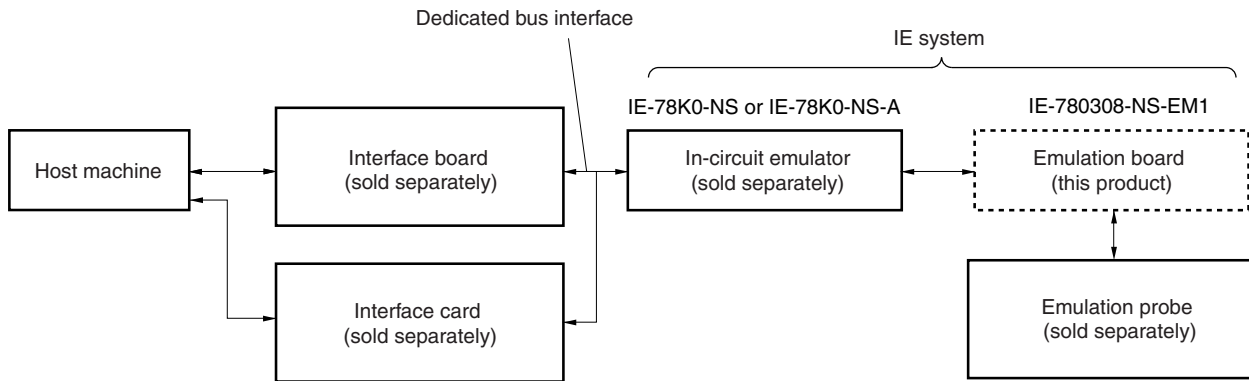
Table 1-1. Correspondence Between Emulation Probe and Conversion Socket/Conversion Adapter

Package	Emulation Probe	Conversion Socket/Conversion Adapter
80-pin plastic QFP (GC type)	NP-80GC	EV-9200GC-80
	NP-80GC-TQ	TGC-080SBP
	NP-H80GC-TQ	
80-pin plastic TQFP (GK type)	NP-80GK	TGK-080SDW
	NP-H80GK-TQ	
100-pin plastic LQFP (GC type)	NP-100GC	TGC-100SDW
	NP-H100GC-TQ	
100-pin plastic QFP (GF type)	NP-100GF	EV-9200GF-100
	NP-100GF-TQ	TGF-100RBP
	NP-H100GF-TQ	

1.2 Hardware Configuration

Figure 1-2 shows the IE-780308-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The IE-780308-NS-EM1's basic specifications are listed in Table 1-2.

Table 1-2. Basic Specifications

Item	Description
Target device	μPD78054, 78054Y, 78058F, 78058FY, 78064, 78064Y, 78064B, 780058, 780058Y, 780308, 780308Y Subseries
System clock	Main system clock: 5 MHz Subsystem clock: 32.768 kHz
Clock supply	External: Input via an emulation probe from the target system Internal: Mounted on the emulation board or mounted on the parts board by the user
Low voltage support	2.0 to 5.5 V (same as target device)

CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-780308-NS-EM1 main unit.

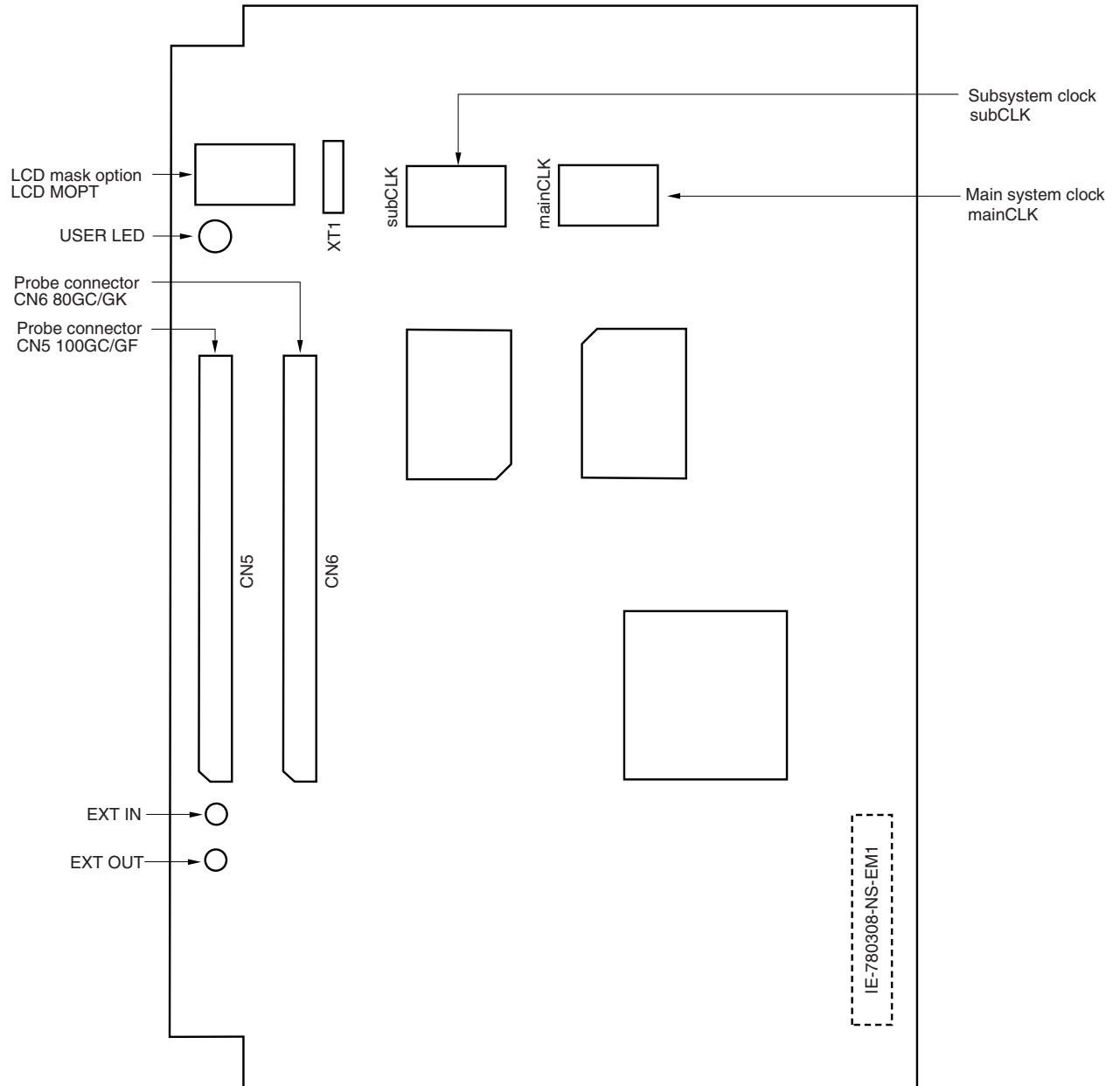
The packing box contains the emulation board (IE-780308-NS-EM1), packing list, user's manual, and guarantee card.

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-780308-NS-EM1 Part Names



CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-780308-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-780308-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-780308-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-780308-NS-EM1.

On this board, the emulation probe connection varies depending on the probe used.

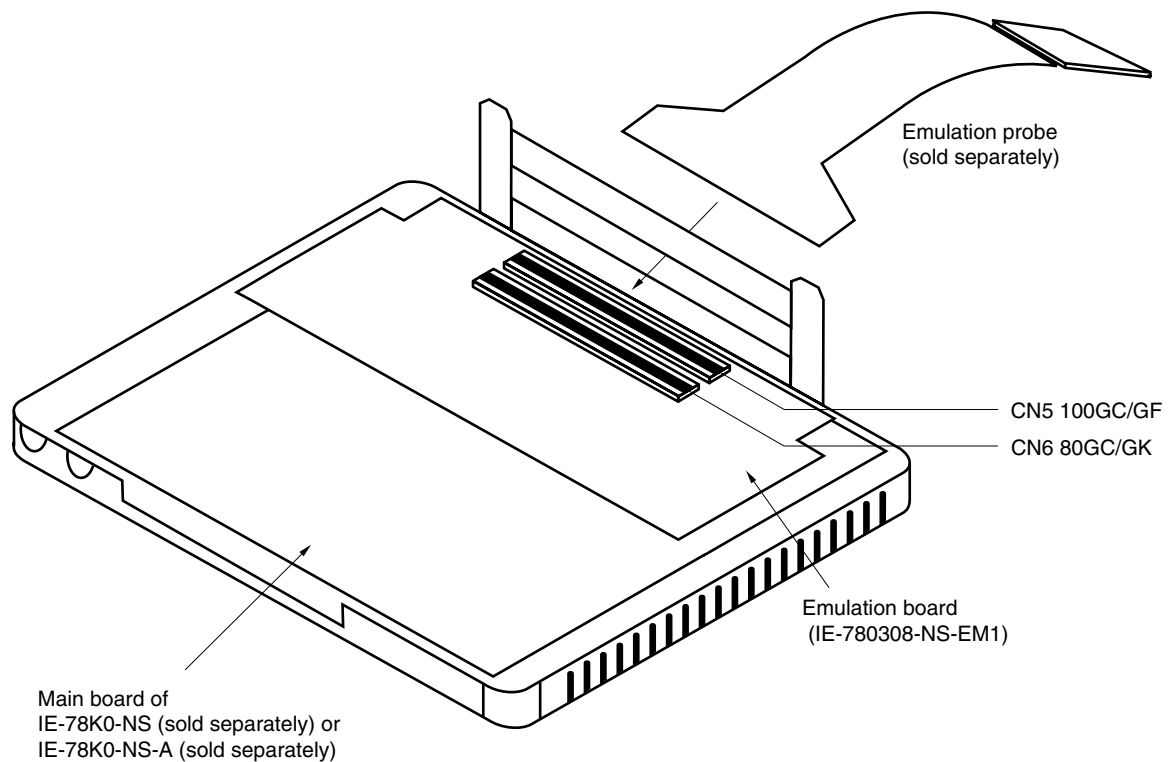
When the emulation probe to be used is the NP-80GC, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, or NP-H80GK-TQ, connect to CN6.

When the emulation probe to be used is the NP-100GC, NP-H100GC-TQ, NP-100GF, NP-100GF-TQ, or NP-H100GF-TQ, connect 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



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.

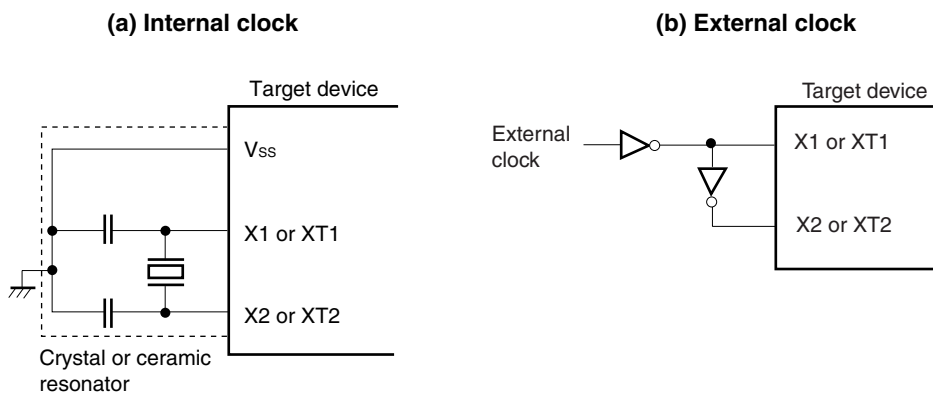
- (1) Clock that is already mounted on emulation board
- (2) Clock that is mounted by user
- (3) External clock

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 oscillation circuit 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 installed in the IE-78K0-NS or IE-78K0-NS-A is used.

If the target system includes an external clock, select either **(1) Clock that is already mounted on emulation board**, **(2) Clock that is mounted by user**, or **(3) External clock**. For an external clock, a clock signal is supplied from outside the target device and the target device's internal oscillation circuit is not used. An example of the external circuit is shown in part (b) of Figure 3-2.

Caution The IE system will hang up if the main system clock is not supplied normally. Moreover, be sure to input a rectangular wave as the clock from the target. There is no need to supply a clock to the X2 and XT2 pins. Also, even if a crystal resonator is connected directly to X1 (for the main system clock) or XT1 (for the subsystem clock), the target device will not operate.

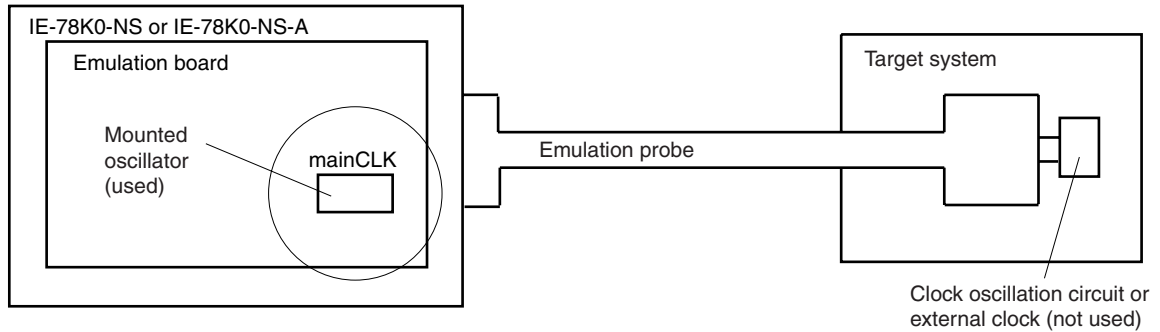
Figure 3-2. External Circuits Used as System Clock Oscillation Circuit



(1) Clock that is already mounted on emulation board**(a) For main system clock**

A crystal oscillator (mainCLK) is already mounted on the emulation board. Its frequency is 5.0 MHz.

Figure 3-3. When Using Clock That Is Already Mounted on Emulation Board (Main System Clock)

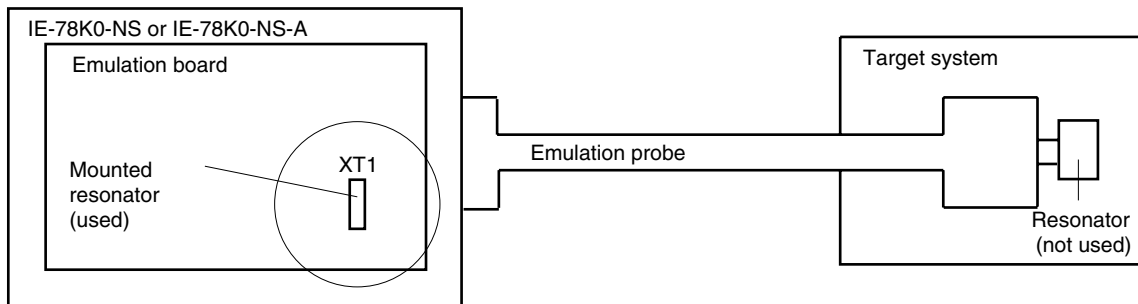


Remark The clock that is supplied by the IE-780308-NS-EM1's oscillator (encircled in the figure) is used.

(b) For subsystem clock

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

Figure 3-4. When Using Clock That Is Already Mounted on Emulation Board (Subsystem Clock)



Remark The clock that is supplied by the IE-780308-NS-EM1's resonator (encircled in the figure) is used.

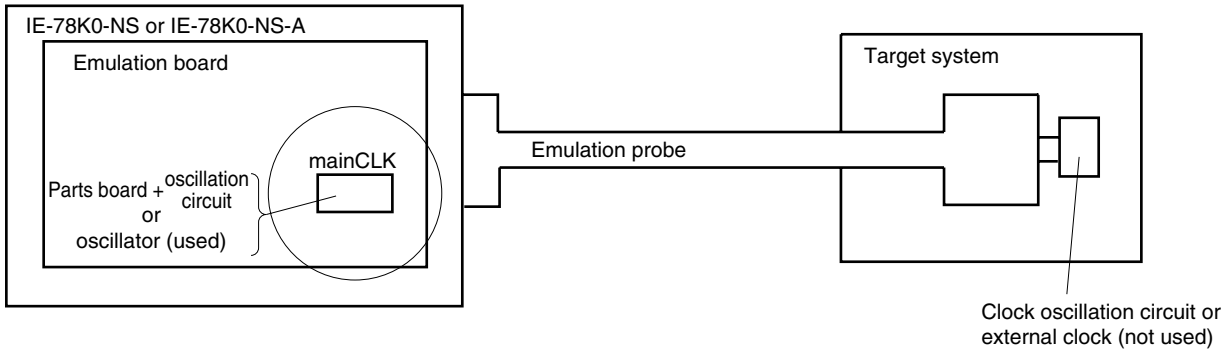
(2) Clock that is mounted by user

The user is able to mount any clock supported by the set specifications on the IE-780308-NS-EM1.

(a) For main system clock

Remove the crystal oscillator (mainCLK) 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 3-5. When Using User-Mounted Clock (Main System Clock)

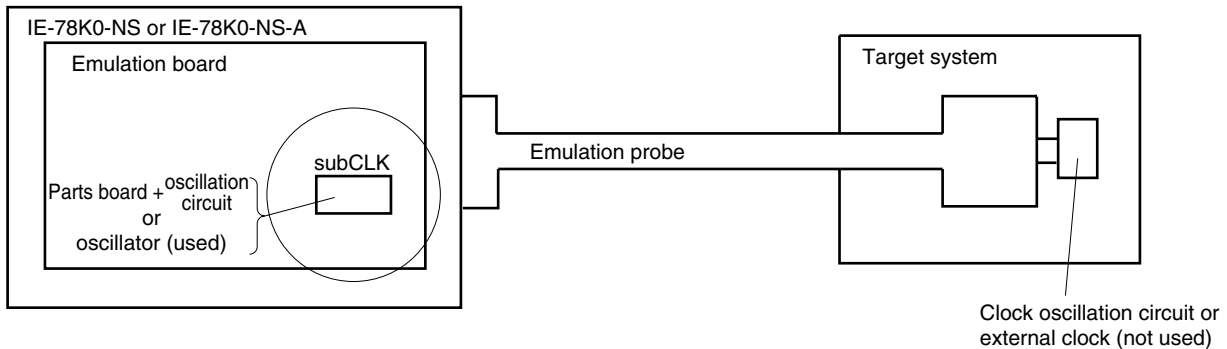


Remark The clock that is supplied by the IE-780308-NS-EM1’s resonator or oscillator (encircled in the figure) is used.

(b) For subsystem clock

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

Figure 3-6. When Using User-Mounted Clock (Subsystem Clock)

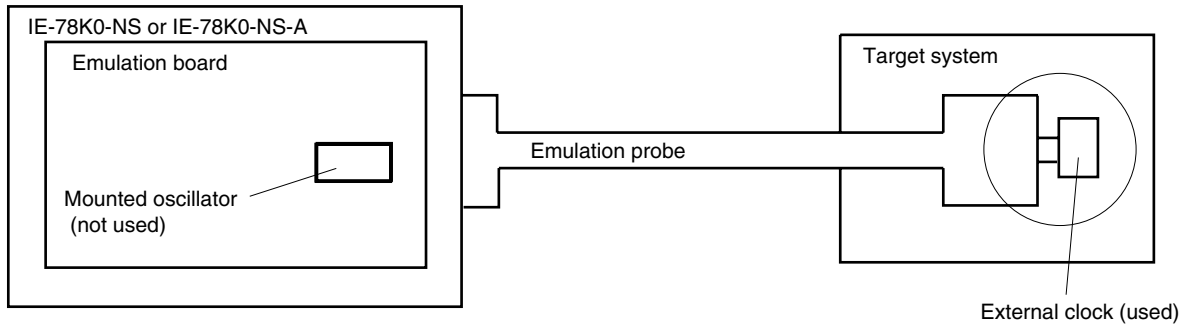


Remark The clock that is supplied by the IE-780308-NS-EM1’s resonator or oscillator (encircled in the figure) is used.

(3) External clock

The external clock on the target system can be used via an emulation probe.

Figure 3-7. When Using External Clock



Remark The clock supplied by the target system's external clock (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-780308-NS-EM1	CPU Clock Source Selection (ID78K0-NS)
		mainCLK Socket	
When using clock that is already mounted on emulation board	5.0 MHz	Oscillator used	Internal
When using clock mounted by user	Other than 5.0 MHz	Oscillation circuit assembled by user	
When using external clock			Oscillator (not used)

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-780308-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-780308-NS-EM1 is shipped, a 5.0 MHz crystal oscillator is already mounted in the IE-780308-NS-EM1’s mainCLK 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

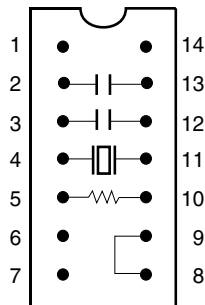
- Items to be prepared
 - Parts board
 - Ceramic resonator or crystal resonator
 - Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<Steps>

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

Figure 3-8. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)

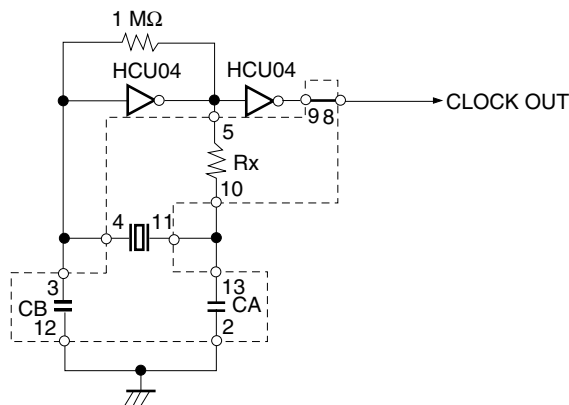
Parts board (mainCLK)



(Top view)

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

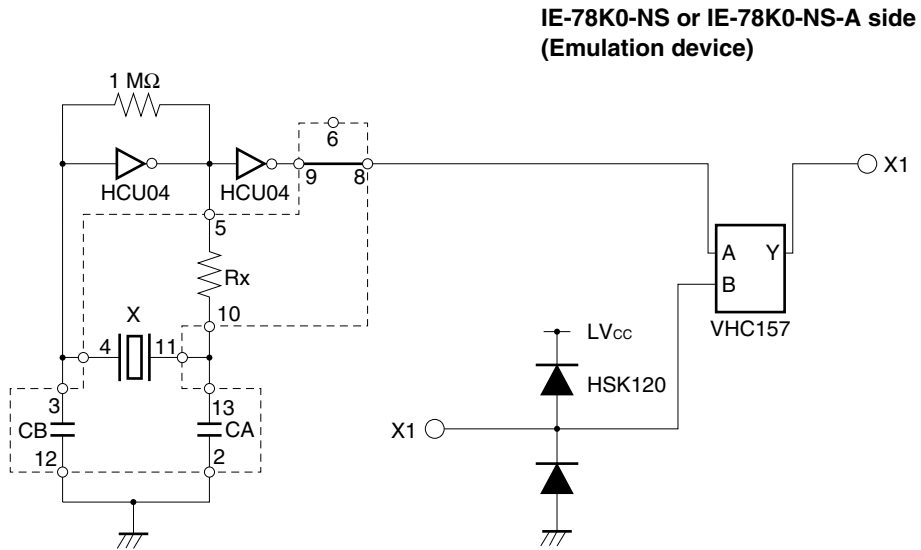
Circuit diagram



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

- <2> Prepare the IE-780308-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-780308-NS-EM1's mainCLK socket.
- <4> Connect the parts board (from <1> above) to the mainCLK 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 3-8 above.
- <6> Install the IE-780308-NS-EM1 in 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.

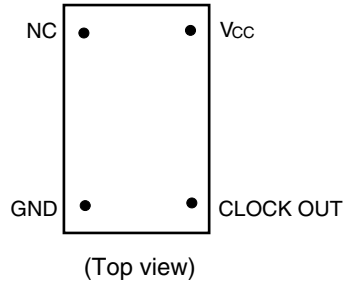


Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

(b) When using a crystal oscillator

- Items to be prepared
 - Crystal oscillator (pins are as shown in Figure 3-9, V_{cc}: +5 V, CLOCK OUT: CMOS level)

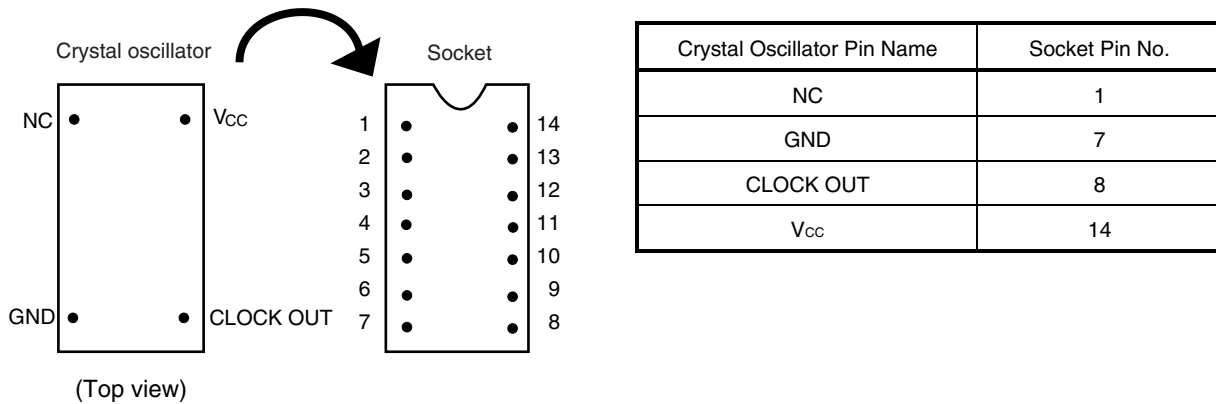
Figure 3-9. Crystal Oscillator (When Using Main System Clock or User-Mounted Clock)



<Steps>

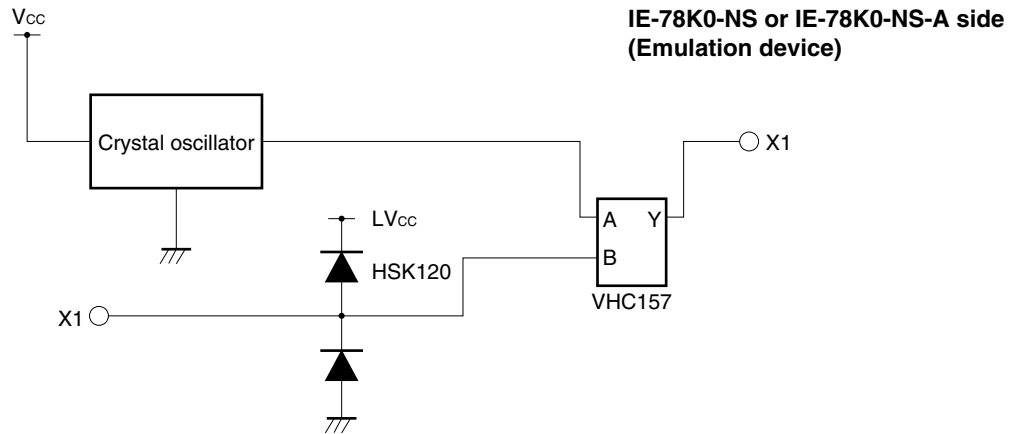
- <1> Prepare the IE-780308-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-780308-NS-EM1's mainCLK socket.
- <3> Mount the crystal oscillator prepared by the user in the mainCLK socket from which the crystal oscillator was removed in <2> above. Insert the crystal oscillator into the socket aligning the pins as shown in the figure below.

Figure 3-10. Pin Alignment of Crystal Oscillator and Socket



- <4> Install the IE-780308-NS-EM1 in 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.



(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-780308-NS-EM1	IE-78K0-NS or IE-78K0-NS-A
		subCLK 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	Oscillation circuit assembled by user	
When using external clock			Not used

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-780308-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-780308-NS-EM1 is shipped, a 32.768 kHz crystal resonator (XT1) and the parts board (subCLK) on which pins 6 and 8 are shorted are already mounted on the IE-780308-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

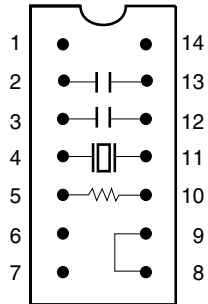
<Steps>

<1> Prepare the IE-780308-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 (subCLK) (as shown below).

Figure 3-11. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

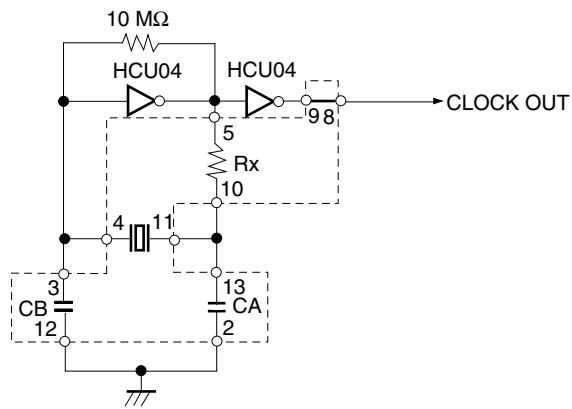
Parts board (subCLK)



(Top view)

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

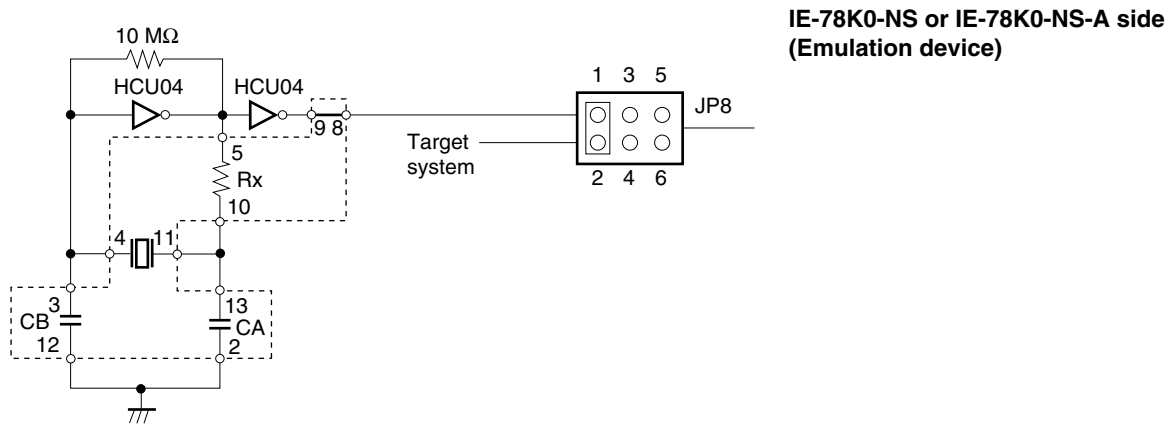
Circuit diagram



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

- <3> Make sure that the parts board (subCLK) is wired as shown in Figure 3-11.
- <4> Remove the parts board that is mounted in the IE-780308-NS-EM1's subCLK socket.
- <5> Connect the parts board from <2> above to the subCLK 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> Install the IE-780308-NS-EM1 in 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.

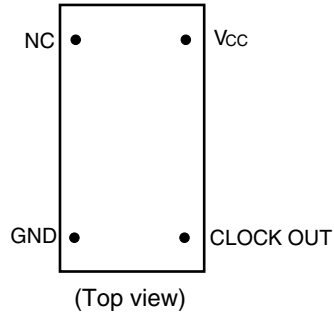


- Remarks**
- 1. The sections enclosed in broken lines indicate parts that are attached to the parts board.
 - 2. JP8 is on the IE-78K0-NS or IE-78K0-NS-A.

(b) When using a crystal oscillator

- Items to be prepared
 - Crystal oscillator (pins are as shown in Figure 3-12, V_{cc}: +5 V, CLOCK OUT: CMOS level)

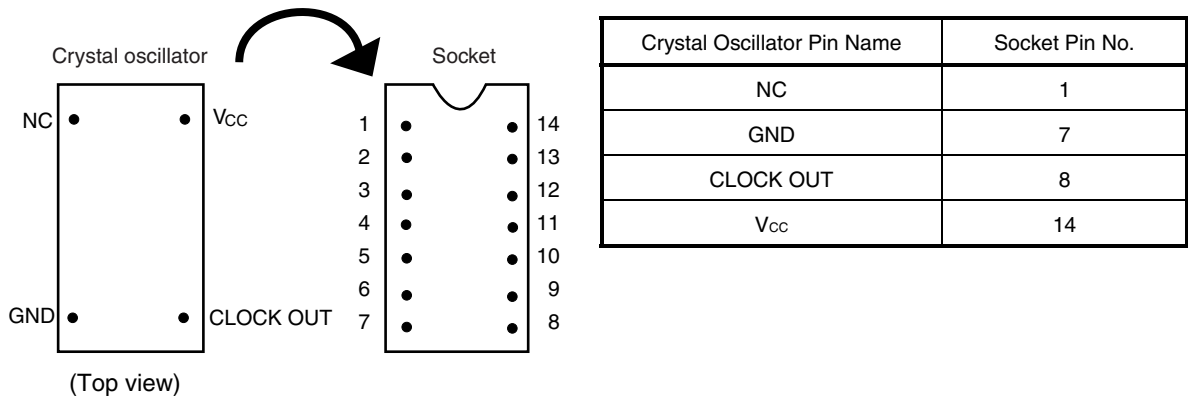
Figure 3-12. Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock)



<Steps>

- <1> Prepare the IE-780308-NS-EM1.
- <2> Remove the parts board that is mounted in the IE-780308-NS-EM1's subCLK socket.
- <3> Mount the crystal oscillator prepared by the user in the subCLK 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.

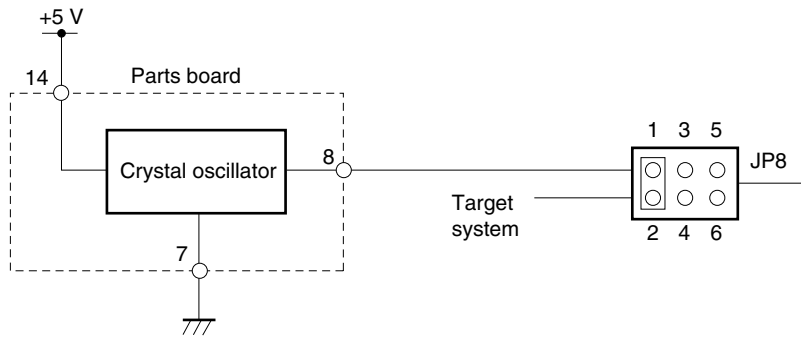
Figure 3-13. Pin Alignment of Crystal Oscillator and Socket



- <4> Install the IE-780308-NS-EM1 in 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.

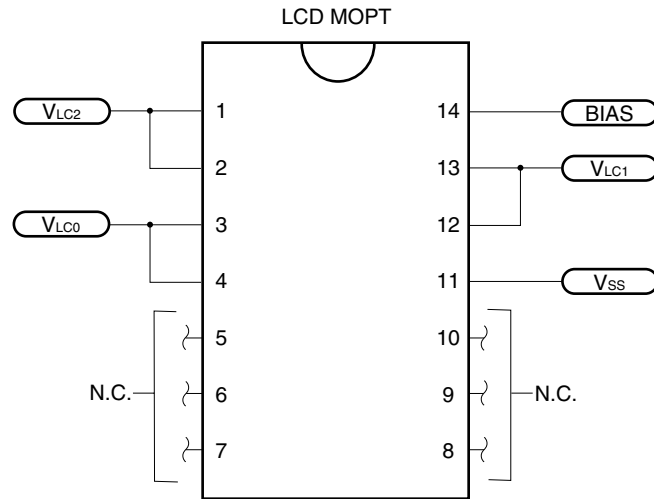
(3) When using an external clock

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

In the IE-780308-NS-EM1, a division resistor for the mask option LCD drive can be mounted on the parts board of LCD MOPT.

Figure 3-14. LCD MOPT Pin Configuration



Remark Pins 5 to 10 are no connection (N.C.) pins.

3.4 External Trigger

Connect the external trigger to the IE-780308-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **IE-78K0-NS User's Manual (U13731E)** or **IE-78K0-NS-A User's Manual (U14889E)** for pin characteristics. For the use methods, see the **ID78K0-NS Ver. 2.52 Operation User's Manual (U16488E)**.

(1) EXTOUT

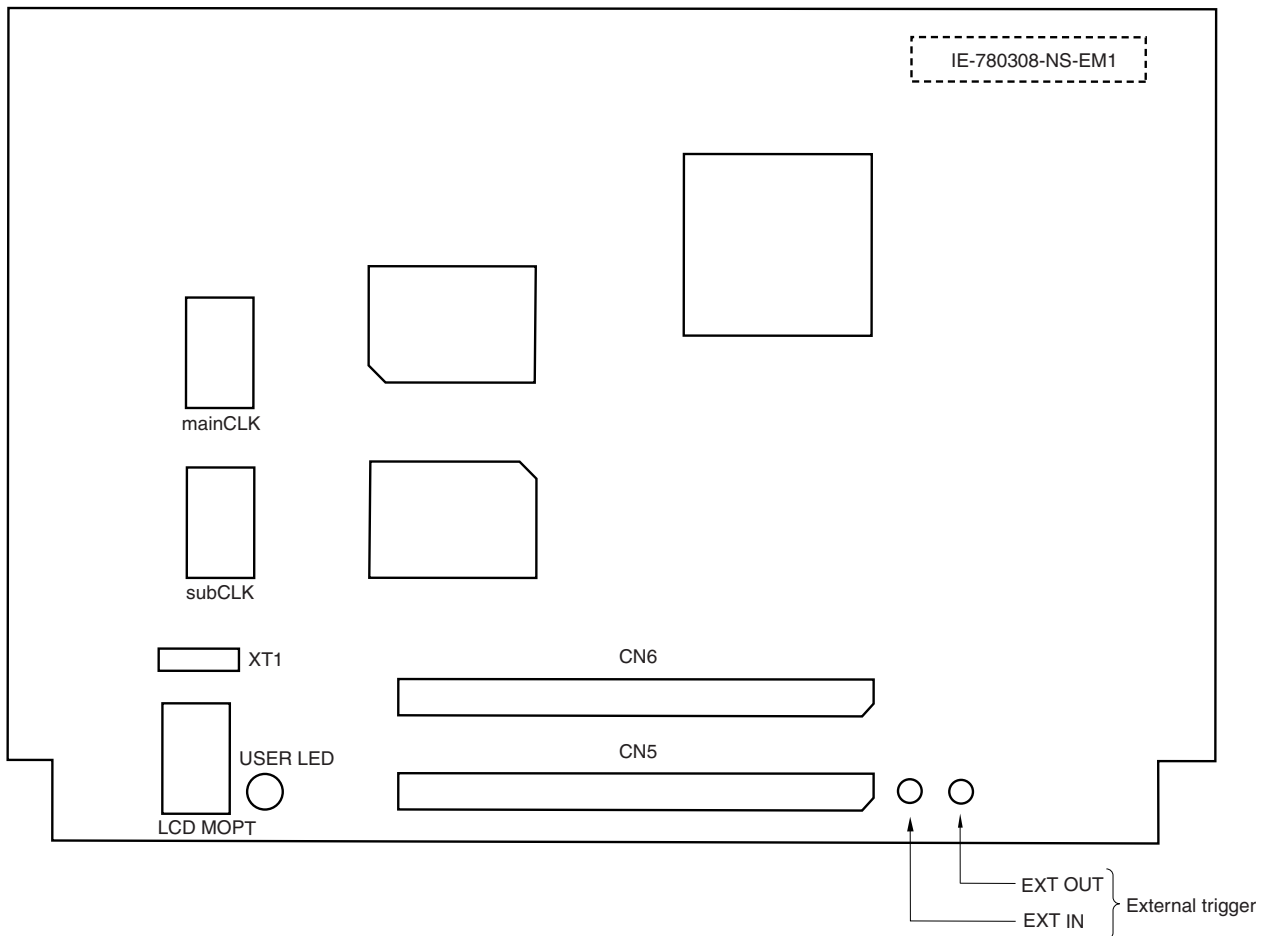
The EXTOUT pin on the IE-780308-NS-EM1 outputs a low level for 1.3 μ s when a break event occurs.

Caution Connect a pull-up resistor on the target system because this is an open drain output.

(2) EXTIN

An event signal can be input from the EXTIN pin on the IE-780308-NS-EM1. Input a high-level pulse signal for 2 CPU operation clocks or more.

Figure 3-15. External Trigger Input Position



3.5 Jumper Settings on IE-78K0-NS

When using the IE-780308-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 ^{Note}
Shorted	2 and 3 shorted	1 and 2 shorted	1 and 2 shorted	3 and 4 shorted	5 and 6 shorted	1 and 2 shorted

Note When using the P07/XT1 pin as P07, short 3 and 4 on JP8.

★ 3.6 Jumper Settings on IE-78K0-NS-A

When using the IE-780308-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	5 and 6 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

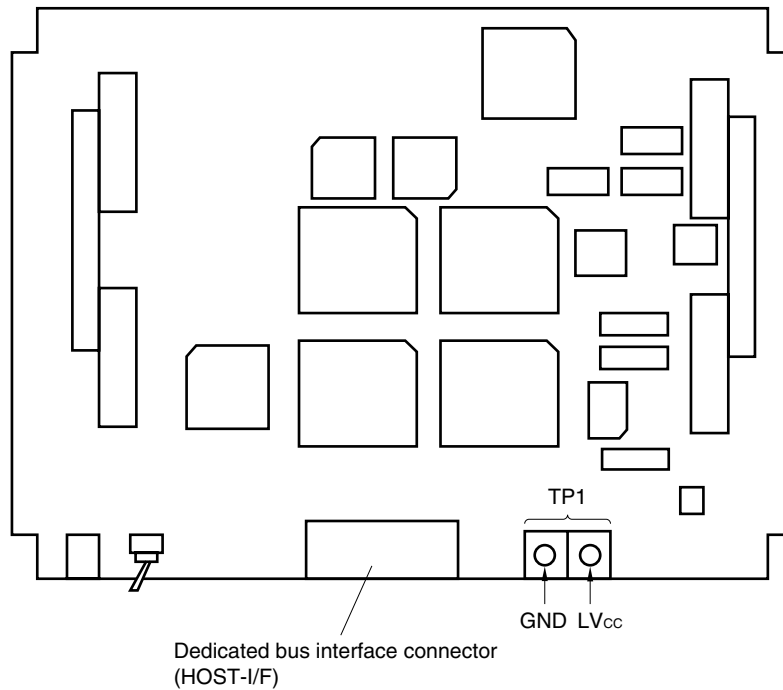
When the target system is operating on low voltage, supply the same voltage as the target system to the TP1 terminal pin on the main board (G-780009 board) of the IE-78K0-NS or IE-78K0-NS-A (this is also necessary when target system is operating on 5 V).

Set the supply voltage of the target system to between 2.0 to 5.5 V.

Table 3-6. Supply Voltage and Maximum Current Consumption

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

Figure 3-16. Main Board (G-780009 Board) of IE-78K0-NS or IE-78K0-NS-A



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-780308-NS-EM1's target interface circuit.

Although the target device is a CMOS circuit, the IE-780308-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 to or output from the emulation CPU (μ PD780009)
- (2) Signals input to or output from the emulation CPU (μ PD78P054)
- (3) Signals input to or output from the emulation CPU (μ PD78P0308)
- (4) Other signals

The IE-780308-NS-EM1's circuit is used as follows for signals listed in (1) to (4) above.

(1) Signals input to or output from the emulation CPU (μ PD780009) (Refer to Figure 4-1 Equivalent Circuit of Emulation Circuit 1)

- P47 to P40
- P57 to P50
- P67 to P60

(2) Signals input to or output from the emulation CPU (μ PD78P054) (Refer to Figure 4-2 Equivalent Circuit of Emulation Circuit 2)

- P06 to P00 (P05 to P00^{Note 1})
- P17 to P10
- P27 to P25
- P22 to P20
- P37 to P30
- P72
- P127 to P120
- P131, P130
- AV_{DD}
- AV_{REF1}
- AV_{REF0}
- AV_{SS}

(3) Signals input to or output from the emulation CPU (μ PD78P0308) (Refer to Figure 4-3 Equivalent Circuit of Emulation Circuit 3)

- P24, P23^{Note 2}
- P71, P70
- P87 to P80
- P97 to P90
- P103 to P100
- P117 to P110
- S23 to S0
- COM3 to COM0
- V_{LC2} to V_{LC0}
- BIAS

(4) Other signals (Refer to Figure 4-4 Equivalent Circuit of Emulation Circuit 4)

- V_{DD}
- V_{SS1}
- V_{SS0}
- X1
- X2
- XT1
- XT2
- $\overline{\text{RESET}}$

Notes 1. When emulating the μ PD780058 or 780058Y Subseries
 2. When emulating the μ PD78054, 78054Y, 78058F, 78058FY, 780058, or 780058Y Subseries

Figure 4-1. Equivalent Circuit of Emulation Circuit 1

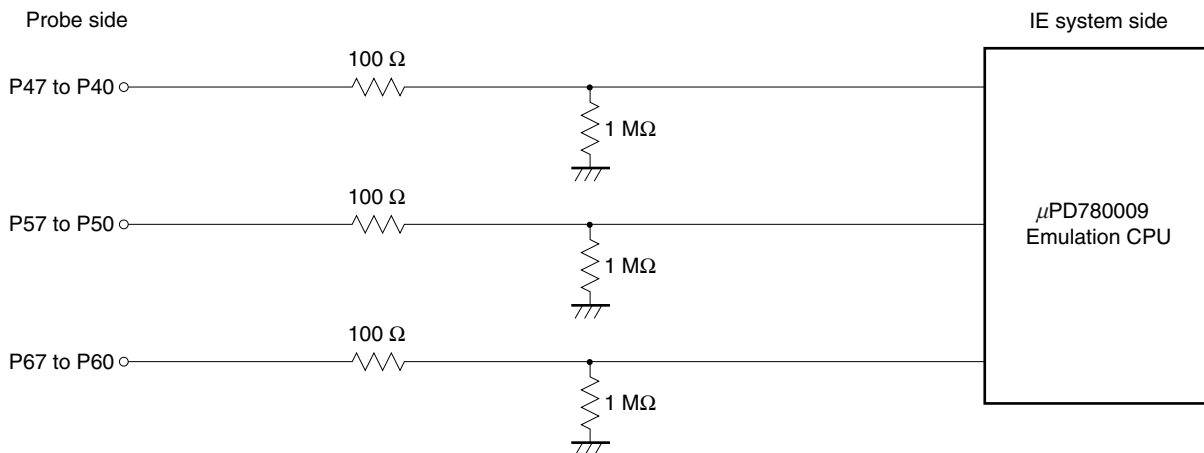
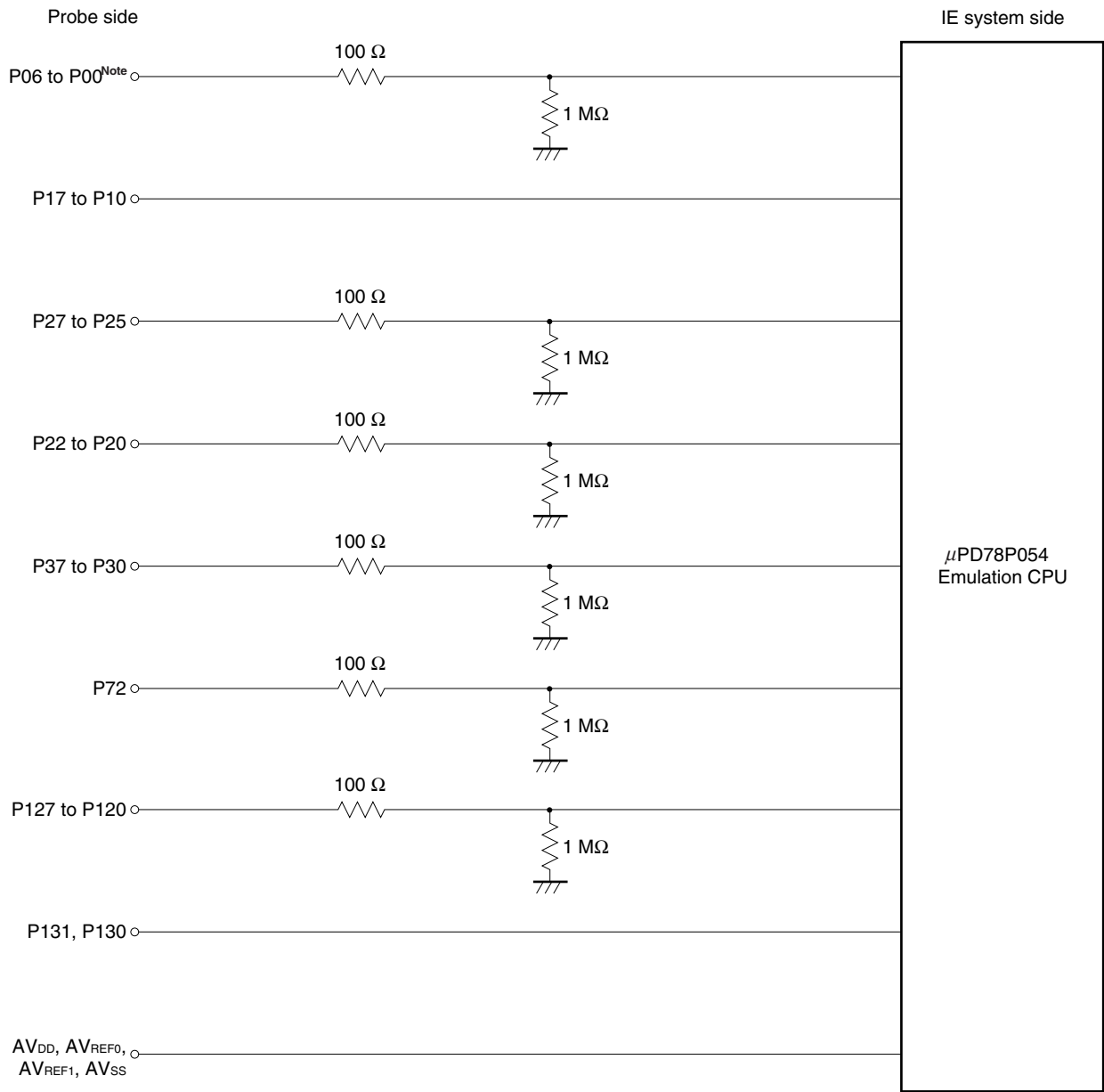


Figure 4-2. Equivalent Circuit of Emulation Circuit 2



Note P05 to P00 when emulating the μ PD780058 or 780058Y Subseries.

Figure 4-3. Equivalent Circuit of Emulation Circuit 3

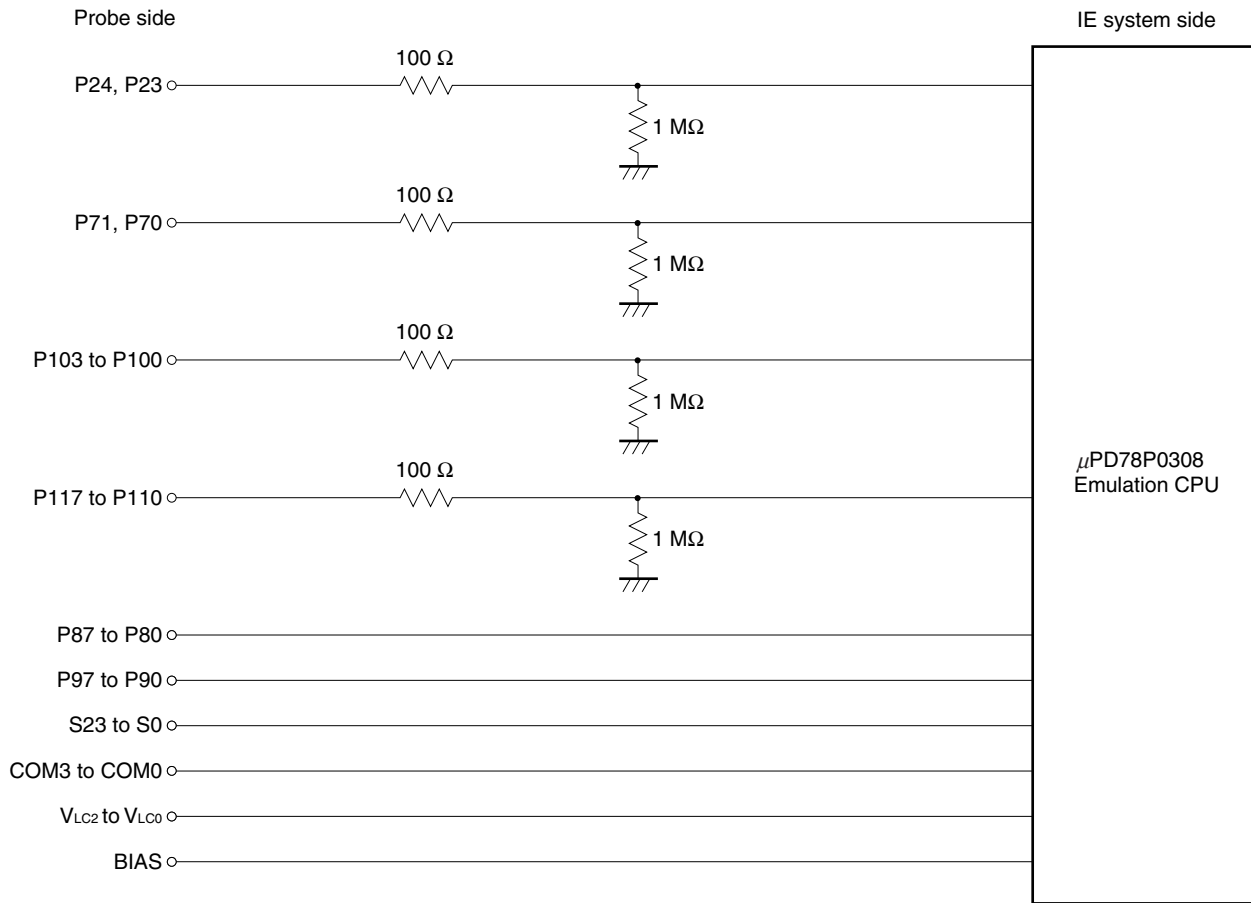
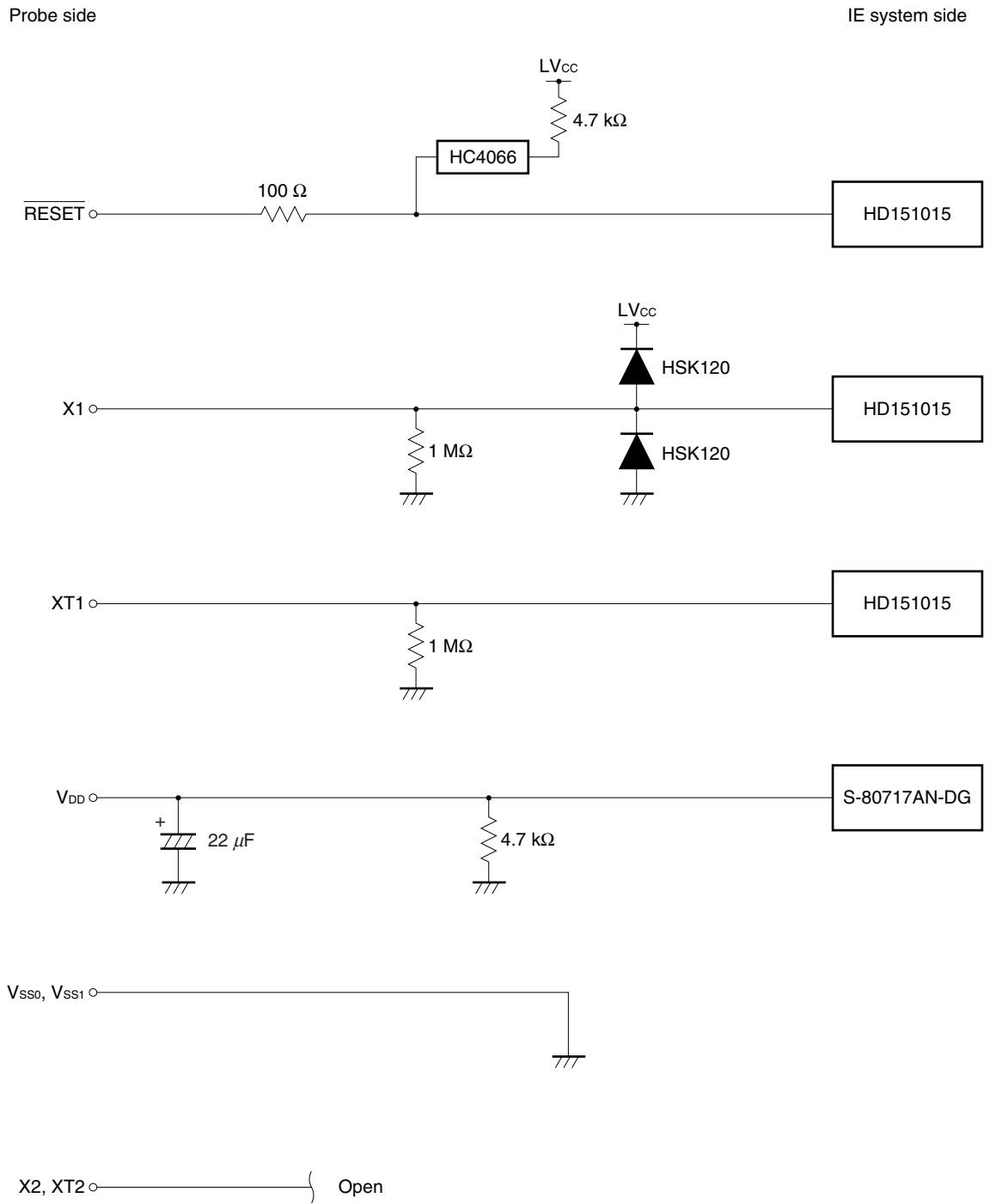


Figure 4-4. Equivalent Circuit of Emulation Circuit 4



APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. NP-80GC, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, NP-H80GK-TQ Pin Assignments (1/2)

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

- Remarks**
1. The NP-80GC, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, and NP-H80GK-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-1. NP-80GC, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, NP-H80GK-TQ Pin Assignments (2/2)

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

- Remarks**
1. The NP-80GC, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, and NP-H80GK-TQ are products of Naito Densetsu 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-100GC, NP-H100GC-TQ Pin Assignments (1/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
1	118	37	59
2	117	38	60
3	114	39	55
4	113	40	56
5	108	41	49
6	107	42	50
7	104	43	45
8	103	44	46
9	100	45	41
10	99	46	42
11	94	47	35
12	93	48	36
13	30	49	31
14	29	50	32
15	24	51	4
16	23	52	3
17	20	53	8
18	19	54	7
19	16	55	14
20	15	56	13
21	10	57	18
22	9	58	17
23	6	59	22
24	5	60	21
25	33	61	28
26	34	62	27
27	37	63	92
28	38	64	91
29	43	65	98
30	44	66	97
31	47	67	102
32	48	68	101
33	51	69	106
34	52	70	105
35	57	71	112
36	58	72	111

- Remarks**
1. The NP-100GC and NP-H100GC-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-100GC, NP-H100GC-TQ Pin Assignments (2/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
73	116	87	61
74	115	88	62
75	87	89	65
76	88	90	66
77	83	91	71
78	84	92	72
79	77	93	75
80	78	94	76
81	73	95	79
82	74	96	80
83	69	97	85
84	70	98	86
85	63	99	89
86	64	100	90

- Remarks**
1. The NP-100GC and NP-H100GC-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-3. NP-100GF, NP-100GF-TQ, NP-H100GF-TQ Pin Assignments (1/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
1	116	37	100
2	115	38	99
3	87	39	94
4	88	40	93
5	83	41	30
6	84	42	29
7	77	43	24
8	78	44	23
9	73	45	20
10	74	46	19
11	69	47	16
12	70	48	15
13	63	49	10
14	64	50	9
15	61	51	6
16	62	52	5
17	65	53	33
18	66	54	34
19	71	55	37
20	72	56	38
21	75	57	43
22	76	58	44
23	79	59	47
24	80	60	48
25	85	61	51
26	86	62	52
27	89	63	57
28	90	64	58
29	118	65	59
30	117	66	60
31	114	67	55
32	113	68	56
33	108	69	49
34	107	70	50
35	104	71	45
36	103	72	46

- Remarks**
1. The NP-100GF, NP-100GF-TQ, and NP-H100GF-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-3. NP-100GF, NP-100GF-TQ, NP-H100GF-TQ Pin Assignments (2/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
73	41	87	22
74	42	88	21
75	35	89	28
76	36	90	27
77	31	91	92
78	32	92	91
79	4	93	98
80	3	94	97
81	8	95	102
82	7	96	101
83	14	97	106
84	13	98	105
85	18	99	112
86	17	100	111

- Remarks**
1. The NP-100GF, NP-100GF-TQ, and NP-H100GF-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 TARGET SYSTEM DESIGN

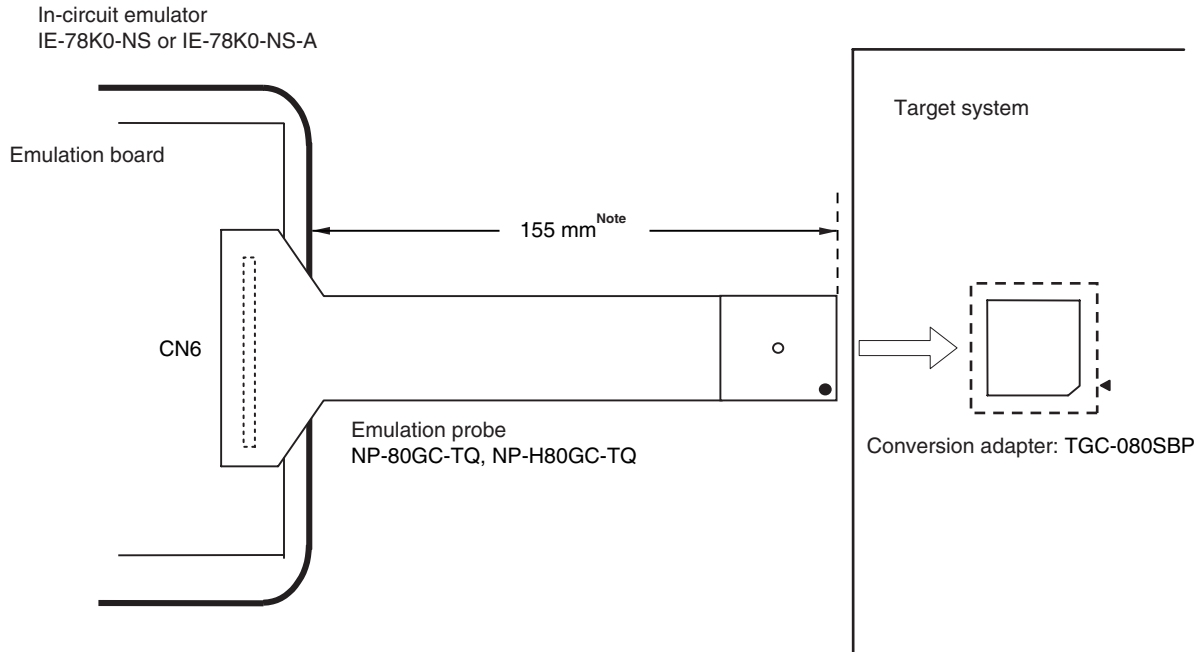
The following shows a diagram of the connection conditions between the emulation probe and conversion adapter. Design your system making allowances for conditions such as the shape of parts mounted on the target system, as shown below.

Among the products described in this appendix, NP-80GC-TQ, NP-H80GC-TQ, NP-80GK, NP-H80GK-TQ, NP-100GC, NP-H100GC-TQ, NP-100GF-TQ, and NP-H100GF-TQ are products of Naito Densetsu Machida Mfg. Co., Ltd., and TGC-080SBP, TGK-080SDW, TGC-100SDW, and TGF-100RBP 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-80GC-TQ	TGC-080SBP	155 mm
NP-H80GC-TQ		355 mm
NP-80GK	TGK-080SDW	155 mm
NP-H80GK-TQ		355 mm
NP-100GC	TGC-100SDW	170 mm
NP-H100GC-TQ		370 mm
NP-100GF-TQ	TGF-100RBP	170 mm
NP-H100GF-TQ		370 mm

Figure B-1. Distance Between IE System and Conversion Adapter (When Using 80GC)



Note Distance when using NP-80GC-TQ. This is 355 mm when using NP-H80GC-TQ.

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

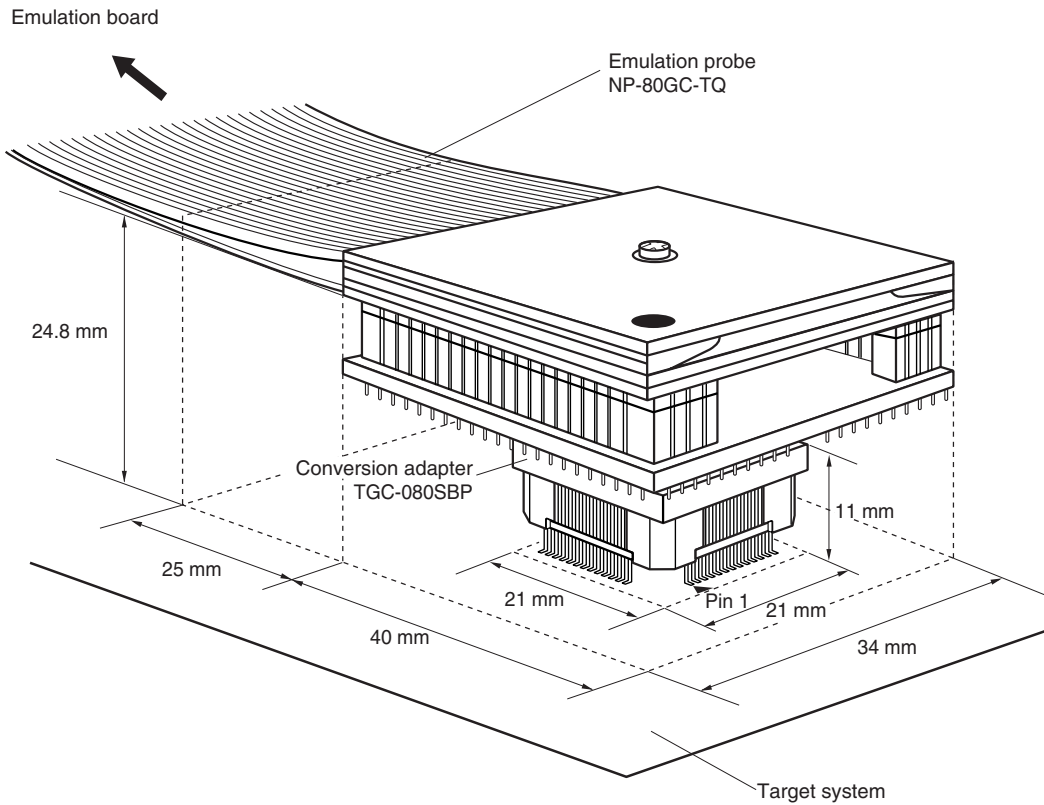


Figure B-3. Connection Conditions of Target System (When Using NP-H80GC-TQ)

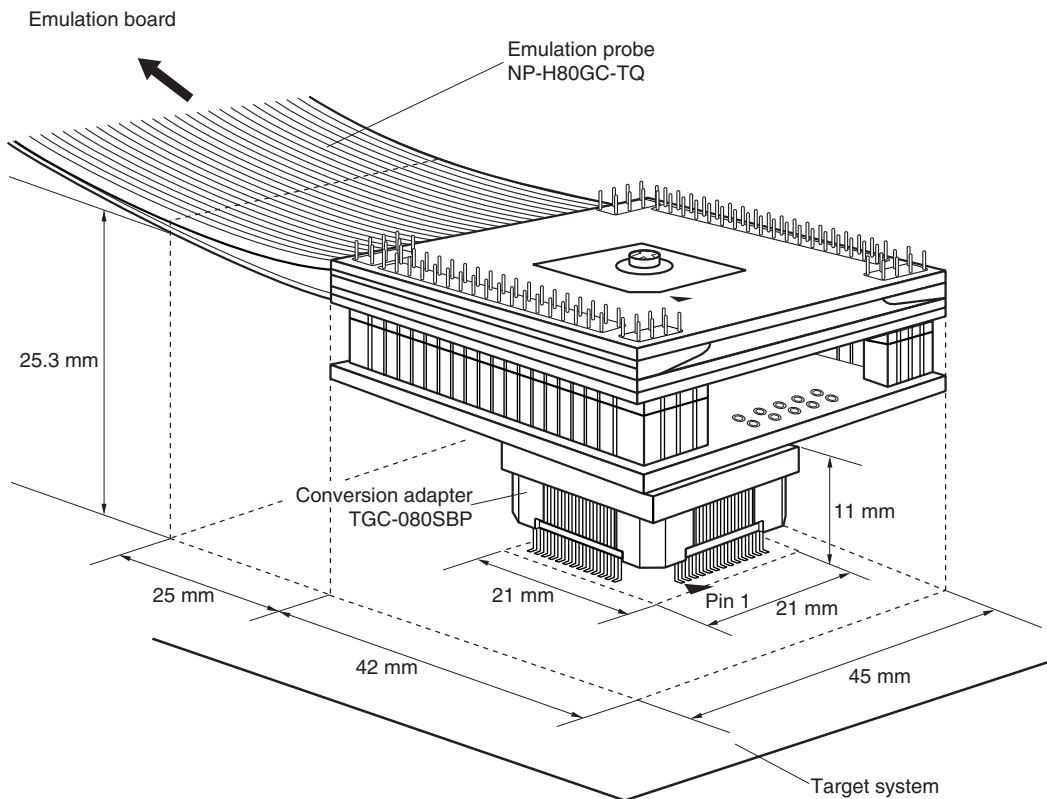
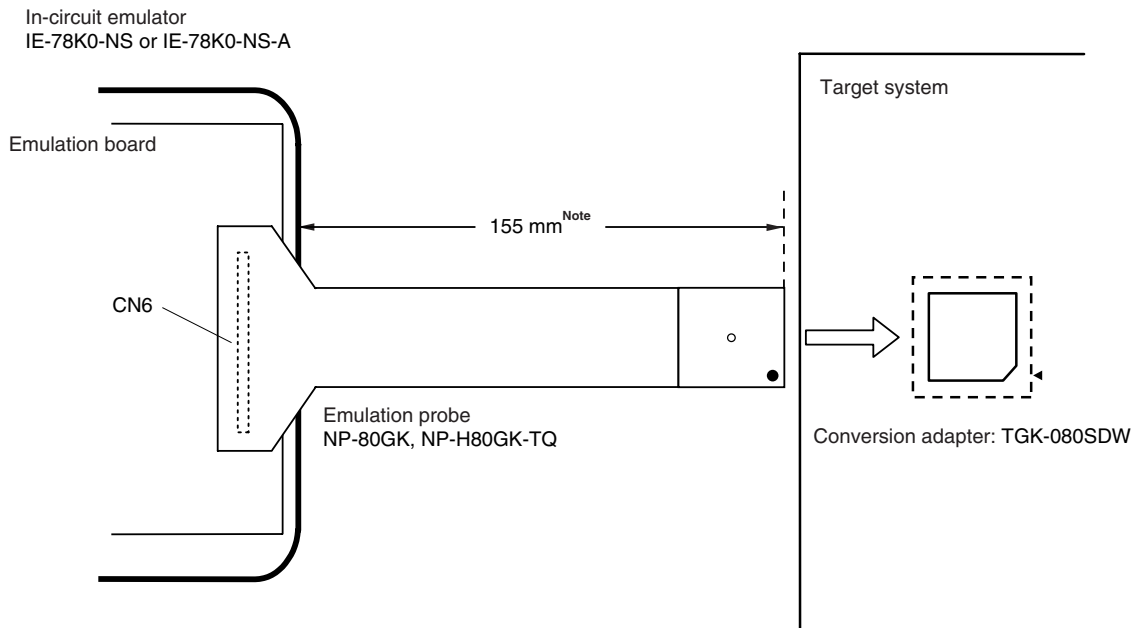


Figure B-4. Distance Between In-Circuit Emulator and Conversion Adapter (When Using 80GK)



Note Distance when using NP-80GK. This is 355 mm when using NP-H80GK-TQ.

Figure B-5. Connection Conditions of Target System (When Using NP-80GK)

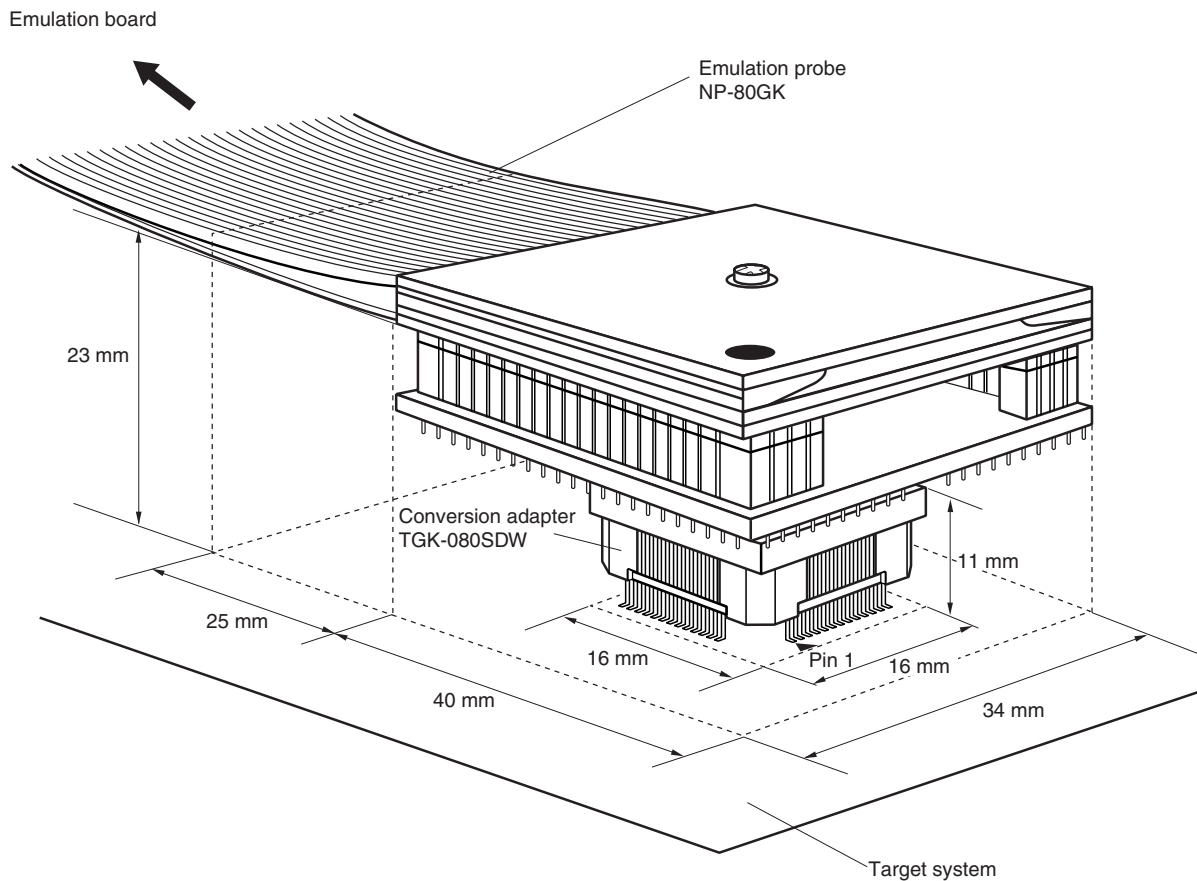


Figure B-6. Connection Conditions of Target System (When Using NP-H80GK-TQ)

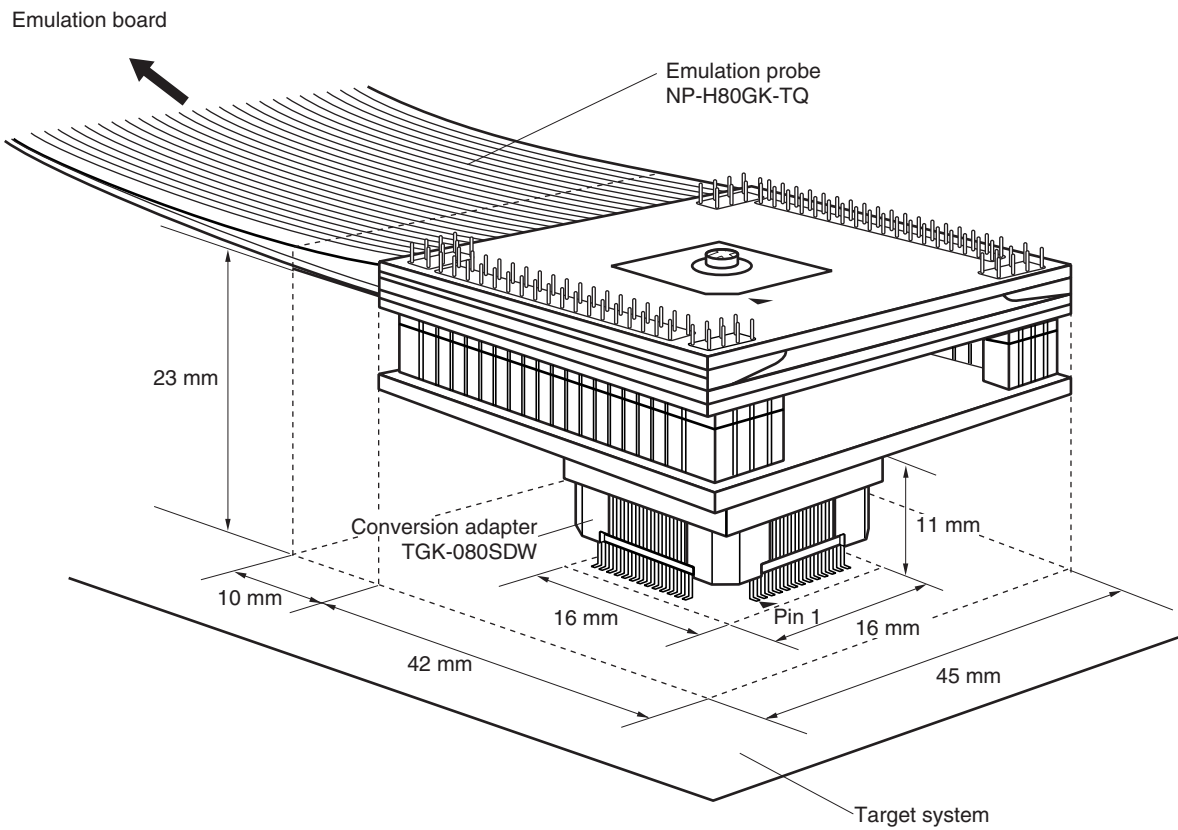
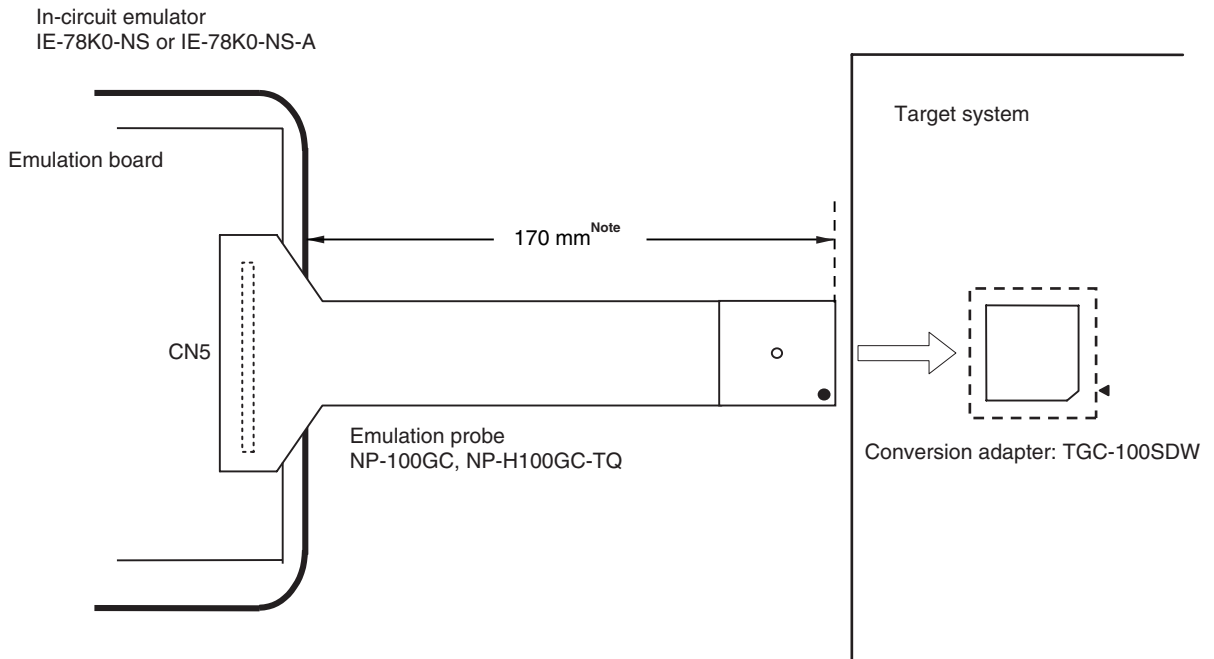


Figure B-7. Distance Between IE System and Conversion Adapter (When Using 100GC)



Note Distance when using NP-100GC. This is 370 mm when using NP-H100GC-TQ.

Figure B-8. Connection Conditions of Target System (When Using NP-100GC)

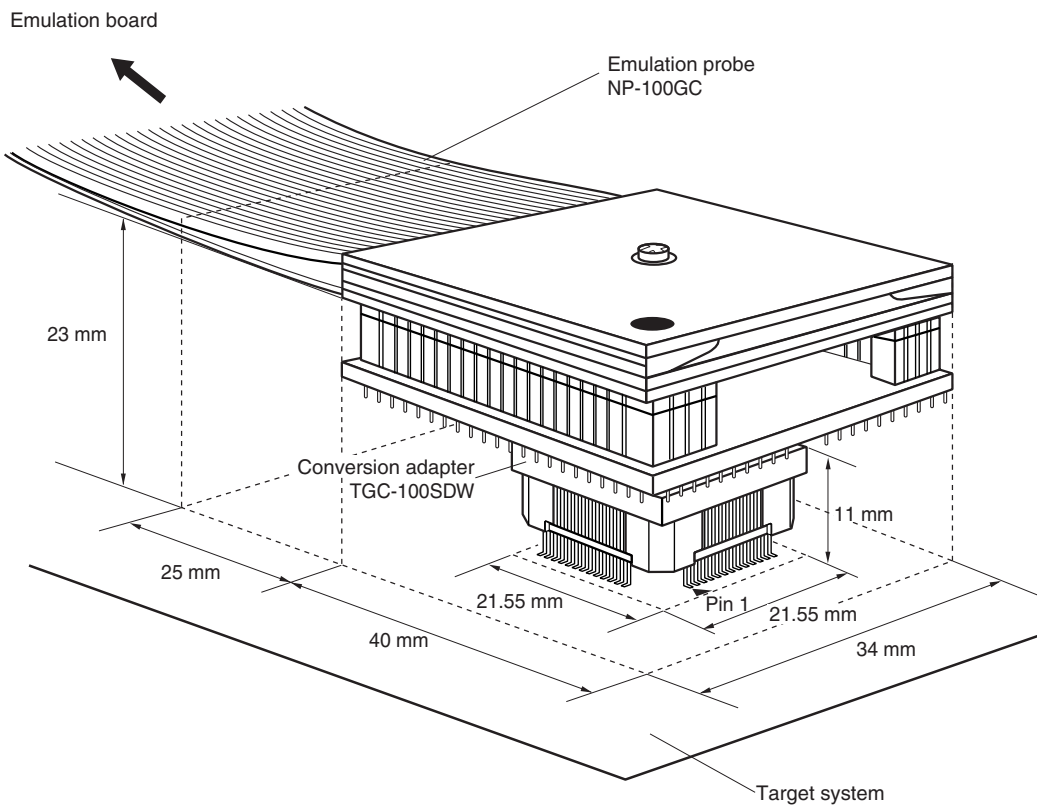


Figure B-9. Connection Conditions of Target System (When Using NP-H100GC-TQ)

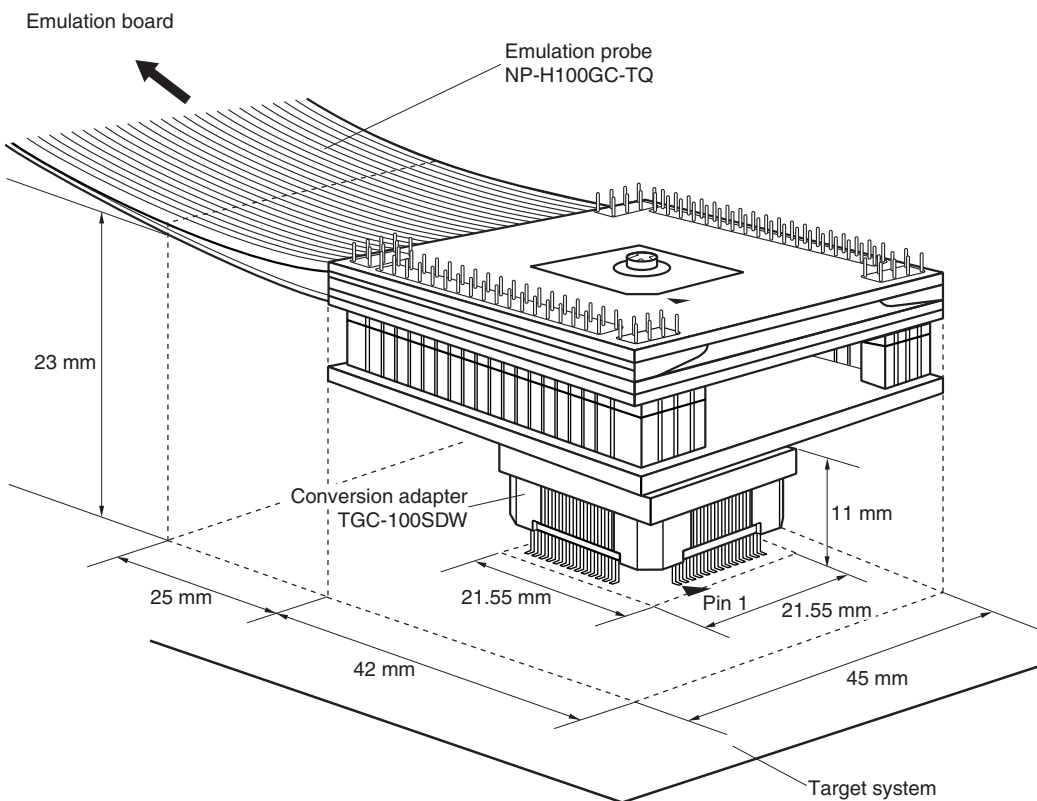
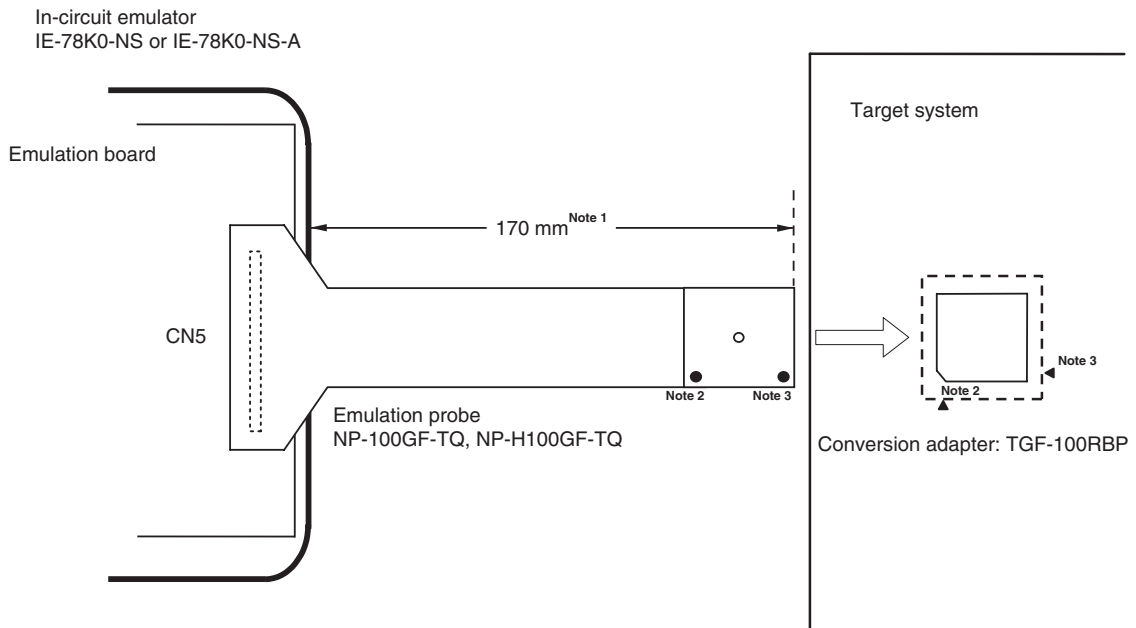


Figure B-10. Distance Between IE System and Conversion Adapter (When Using 100GF)



- Notes**
1. Distance when using NP-100GF-TQ. This is 370 mm when using NP-H100GF-TQ.
 2. This is the position of pin 1 when using NP-100GF-TQ.
 3. This is the position of pin 1 when using NP-H100GF-TQ.

Figure B-11. Connection Conditions of Target System (When Using NP-100GF-TQ)

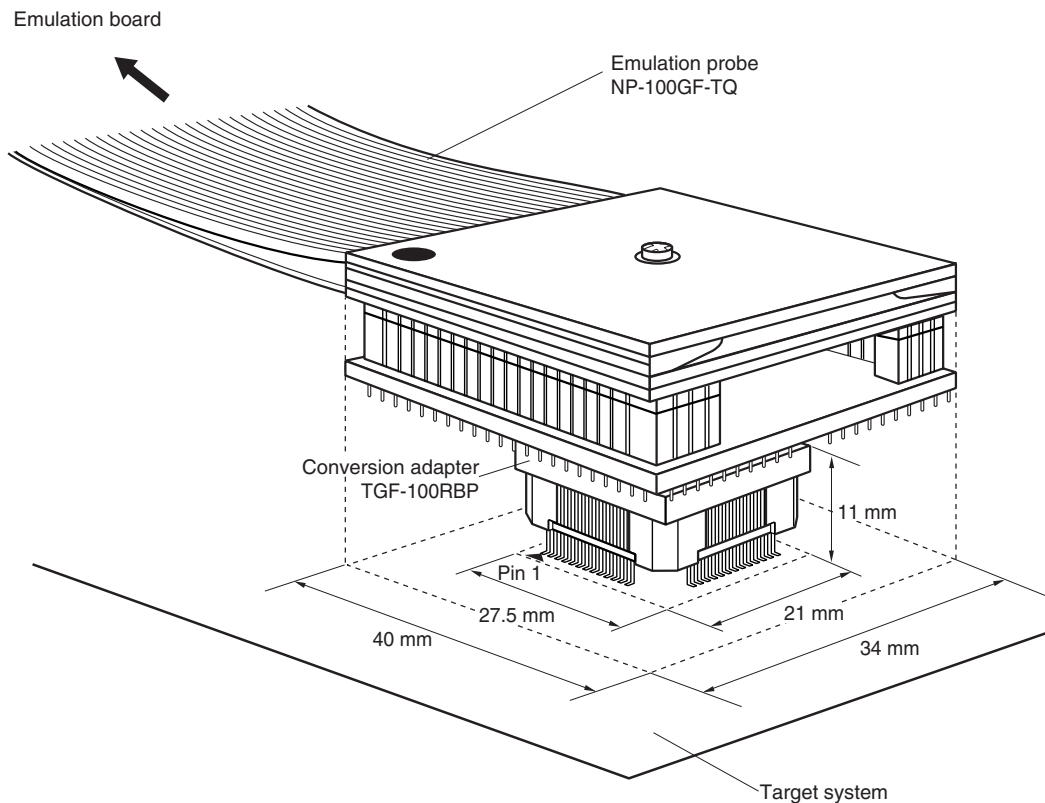
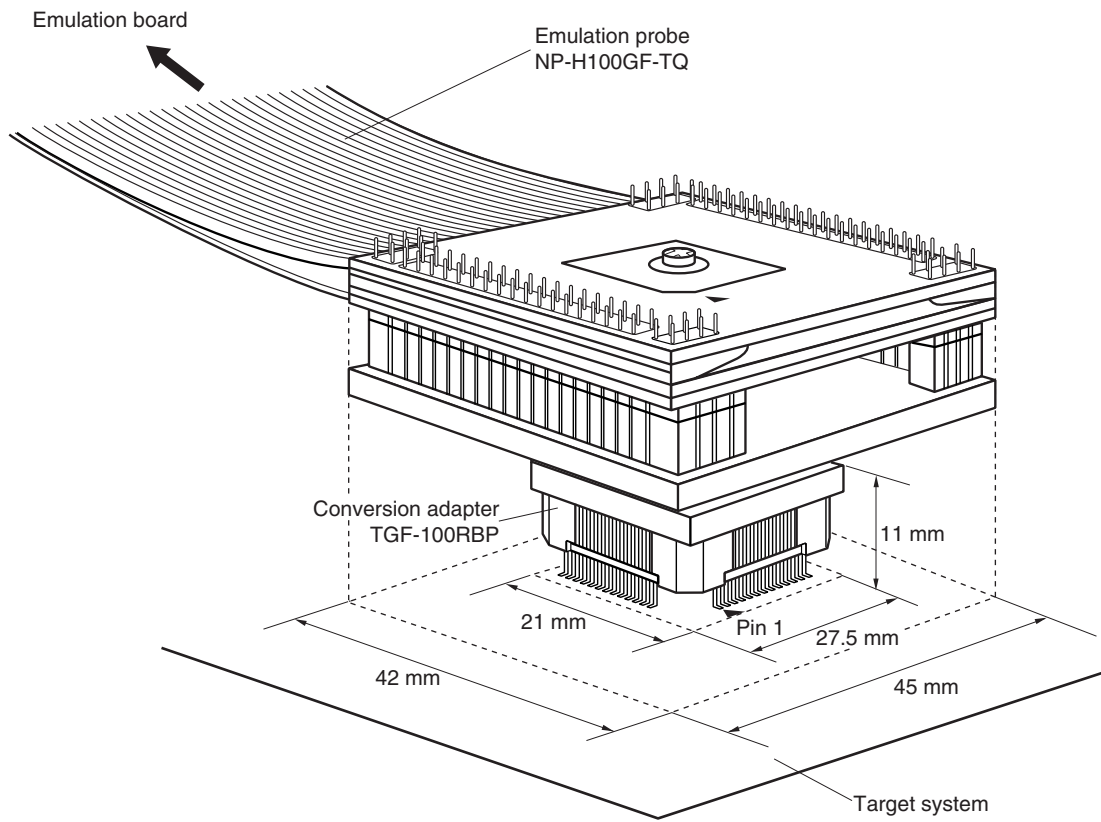


Figure B-12. Connection Conditions of Target System (When Using NP-H100GF-TQ)



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APPENDIX C REVISION HISTORY

Here is the revision history of this manual. The “Applied to:” column indicates the chapters of each edition in which the revision was applied.

Edition	Revisions from Previous Edition	Applied to:
Second	<ul style="list-style-type: none"> • Addition of description of IE-78K0-NS-A • Addition of NP-80GC-TQ, NP-H80GC-TQ, NP-H80GK-TQ, NP-H100GC-TQ, NP-100GF-TQ, and NP-H100GF-TQ to the supported emulation probes 	Throughout
	Modification of contents of Figure 1-1 System Configuration	CHAPTER 1 GENERAL
	Addition of 3.6 Jumper Settings on IE-78K0-NS-A	CHAPTER 3 INSTALLATION
	Table 3-4 Jumper Settings on IE-78K0-NS-A G-780009 Board <ul style="list-style-type: none"> • Correction of JP7 setting (in U13304EJ2V1UM00) 	
	Addition of 3.7 Low-Voltage Emulation Setting	
	Addition of APPENDIX B NOTES ON TARGET SYSTEM DESIGN	APPENDIX B
	Addition of APPENDIX C REVISION HISTORY	APPENDIX C