

User's Manual

IE-789046-NS-EM1

Emulation Board

Target Devices

μ PD789046 Subseries

μ PD789074 Subseries

[MEMO]

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NEC Electronics Inc. (U.S.)

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

NEC do Brasil S.A.

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

NEC Electronics (Europe) GmbH

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

• Sucursal en España

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

• Succursale Française

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

• Filiale Italiana

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

• Branch The Netherlands

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

• Branch Sweden

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

• United Kingdom Branch

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

NEC Electronics Hong Kong Ltd.

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

NEC Electronics Hong Kong Ltd.

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

NEC Electronics Shanghai, Ltd.

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

NEC Electronics Taiwan Ltd.

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

NEC Electronics Singapore Pte. Ltd.

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

Major Revisions in This Edition

Page	Description
Throughout	<ul style="list-style-type: none"> • Addition of μPD789074 Subseries to the target devices • Addition of description for IE-78K0S-NS-A
p. 12	Addition of URL where device files can be obtained, and names of related products in Figure 1-1 System Configuration
pp. 21 to 32	3.2 Clock Settings <ul style="list-style-type: none"> • Modification of description • Addition of V_{SS} to (a) Internal clock in Figure 3-3 External Circuits Used as System Clock Oscillator
p. 33	Addition of 3.3 Power Supply Voltage of Target Interface
p. 36	Modification of descriptions in 4.1 μPD789046 Subseries
p. 40	Addition of 4.2 μPD789074 Subseries
p. 43	Addition of corresponding product names to Table A-1 Pin Assignments of NP-44GB, NP-44GB-TQ, and NP-H44GB-TQ
p. 44	Addition of Table A-2 Pin Assignments of NGS-30, NP-36GS, NP-H36GS, and NP-K907
p. 45	Addition of APPENDIX B CAUTIONS ON DESIGNING TARGET SYSTEM

The mark ★ shows major revised points.

INTRODUCTION

Product Overview

The IE-789046-NS-EM1 is designed to be used with the IE-78K0S-NS or IE-78K0S-NS-A to debug the following target devices that belong to the 78K/0S Series of 8-bit single-chip microcontrollers.

- μ PD789046 Subseries: μ PD789046, 78F9046
- μ PD789074 Subseries: μ PD789071, 789072, 789074, 78F9046

Target Readers

This manual is intended for engineers who will use the IE-789046-NS-EM1 with the IE-78K0S-NS or IE-78K0S-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-789046-NS-EM1, refer to not only this manual (supplied with the IE-789046-NS-EM1) but also the manual that is supplied with the IE-78K0S-NS or IE-78K0S-NS-A.

IE-78K0S-NS
User's Manual

- Basic specifications
- System configuration
- External interface functions

IE-78K0S-NS-A
User's Manual

- Basic specifications
- System configuration
- External interface functions

IE-789046-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-789046-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 to be emulated (a real chip).
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-78K0S-NS or IE-78K0S-NS-A and the IE-789046-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 Number
IE-78K0S-NS	U13549E
IE-78K0S-NS-A	U15207E
IE-789046-NS-EM1	This manual
ID78K0-NS, ID78K0S-NS Integrated Debugger Ver. 2.20 or Later Operation (Windows™ Based)	U14910E
μPD789046 Subseries	U13600E
μPD789074 Subseries	U14801E

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

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CHAPTER 1 GENERAL

The IE-789046-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/0S Series of 8-bit single-chip microcontrollers.

This chapter describes the IE-789046-NS-EM1's system configuration and basic specifications.

- Target devices
 - μ PD789046 Subseries
 - μ PD789074 Subseries

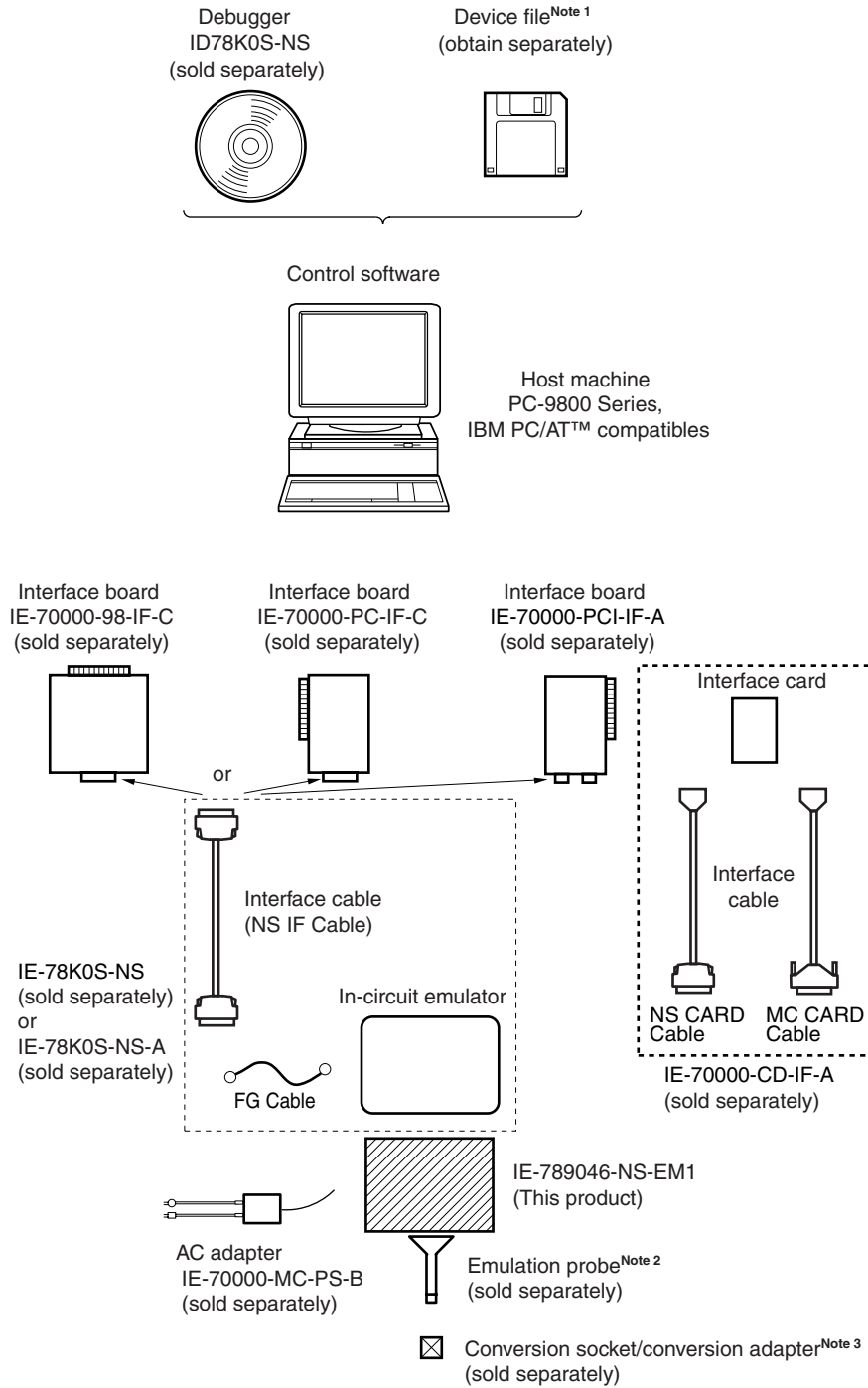
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1.1 System Configuration

Figure 1-1 illustrates the IE-789046-NS-EM1's system configuration.

★

Figure 1-1. System Configuration



Notes 1. The device files are as follows.

μ SxxxxDF789046: μ PD789046 Subseries

μ SxxxxDF789074: μ PD789074 Subseries

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

2. The emulation probes are as follows.

(1) For μ PD789046 Subseries

NP-44GB: For 44-pin plastic QFP (GB-8ES type)

NP-44GB-TQ: For 44-pin plastic QFP (GB-8ES type)

NP-H44GB-TQ: Long type for 44-pin plastic QFP (GB-8ES type)

(2) For μ PD789074 Subseries

NP-K907: Probe conversion board

NP-36GS: For 30-pin plastic shrink SOP (MA type)

NP-H36GS: Long type for 30-pin plastic shrink SOP (MA type)

3. The conversion socket/conversion adapter is as follows.

(1) For μ PD789046 Subseries

EV-9200G-44: For 44-pin plastic QFP (GB-8ES type)

TGB-044SAP: For 44-pin plastic QFP (GB-8ES type)

(2) For μ PD789074 Subseries

NGS-30: For 30-pin plastic shrink SOP (MA type)

Remarks 1. NP-44GB, NP-44GB-TQ, NP-H44GB-TQ, NP-K907, NP-36GS, NP-H36GS, and NGS-30 are products of Naito Densai Machida Mfg. Co., Ltd.

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

2. TGB-044SAP is a product of TOKYO ELETECH CORPORATION.

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

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

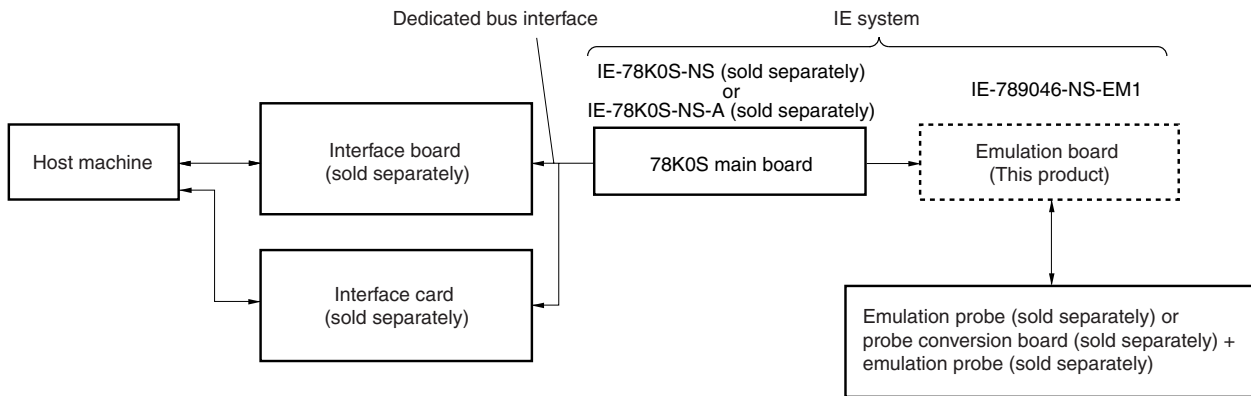
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1.2 Hardware Configuration

Figure 1-2 shows the IE-789046-NS-EM1's position in the basic hardware configuration.

★

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The IE-789046-NS-EM1's basic specifications are listed in Table 1-1.

★

Table 1-1. Basic Specifications

Parameter	Description
Target device	μ PD789046 Subseries, μ PD789074 Subseries
System clock	1.0 MHz to 10.0 MHz
Main clock supply	External: Input via an emulation probe from the target system Internal: Mounted on emulation board (5.0 MHz), or mounted on the board by the user
Subsystem clock supply (μ PD789046 Subseries only)	Internal: Mounted on 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 target device)

CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-789046-NS-EM1 main unit.

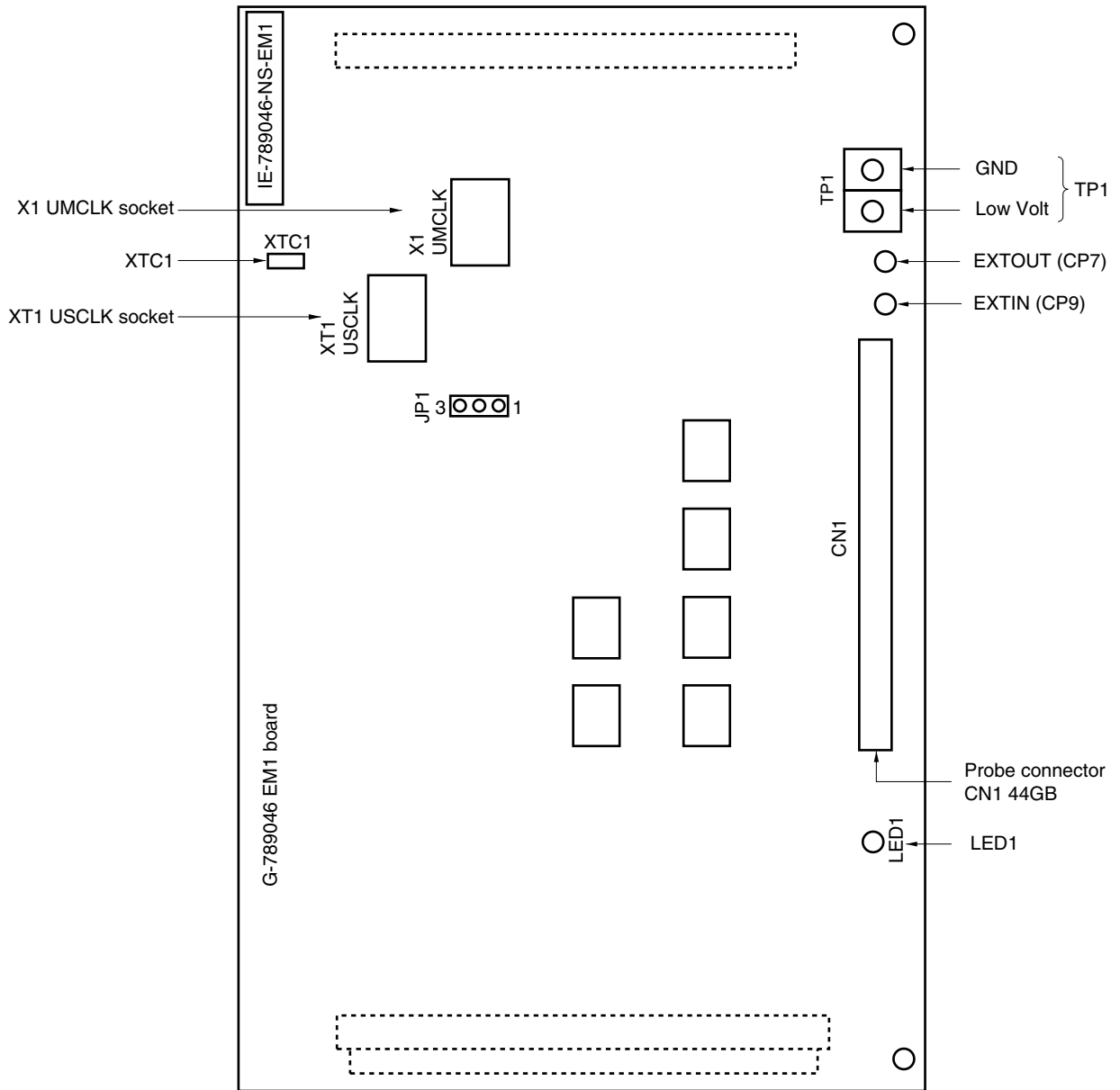
The packing box contains the emulation board (IE-789046-NS-EM1), packing list, user's manual, and guarantee card.

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-789046-NS-EM1 Part Names



CHAPTER 3 INSTALLATION

- ★ This chapter describes methods for connecting the IE-789046-NS-EM1 to the IE-78K0S-NS or IE-78K0S-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-78K0S-NS or IE-78K0S-NS-A main unit

See the **IE-78K0S-NS User's Manual (U13549E)** or **IE-78K0S-NS-A User's Manual (U15207E)** for a description of how to connect the IE-789046-NS-EM1 to the IE-78K0S-NS or IE-78K0S-NS-A.

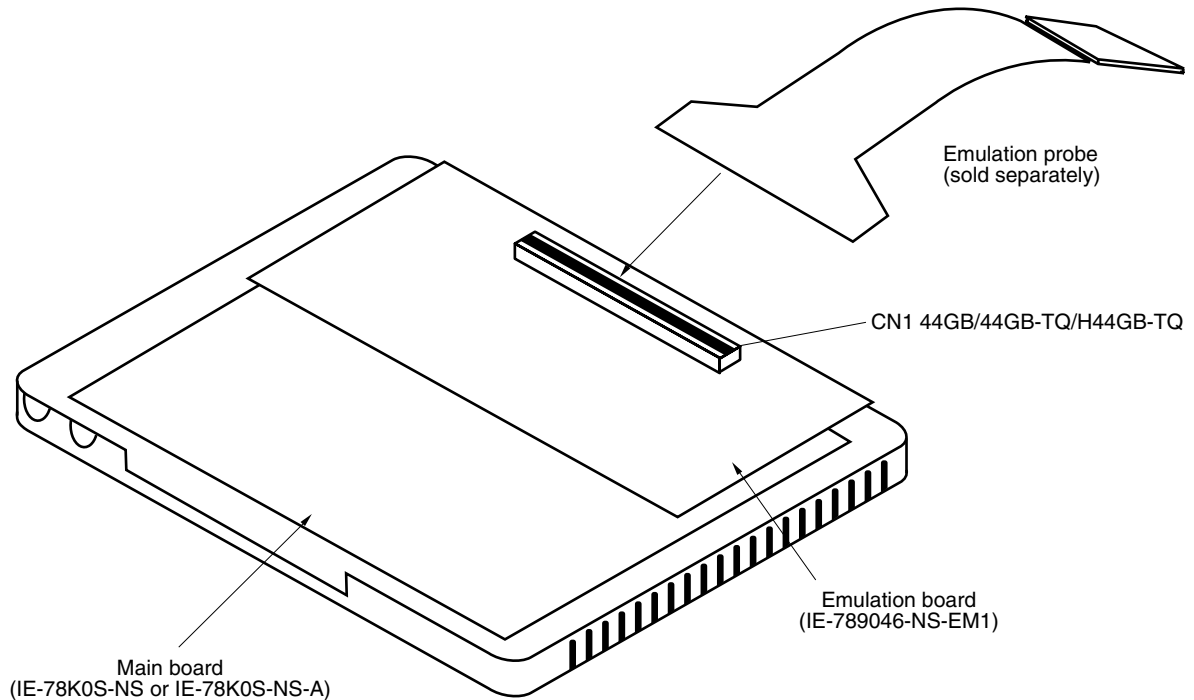
(2) Connection with emulation probe (when debugging μ PD789046 Subseries)

See the **IE-78K0S-NS User's Manual (U13549E)** or **IE-78K0S-NS-A User's Manual (U15207E)** for a description of how to connect an emulation probe to the IE-789046-NS-EM1 when debugging the μ PD789046 Subseries. On this board, connect the emulation probe to CN1.

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 (When Debugging μ PD789046 Subseries)



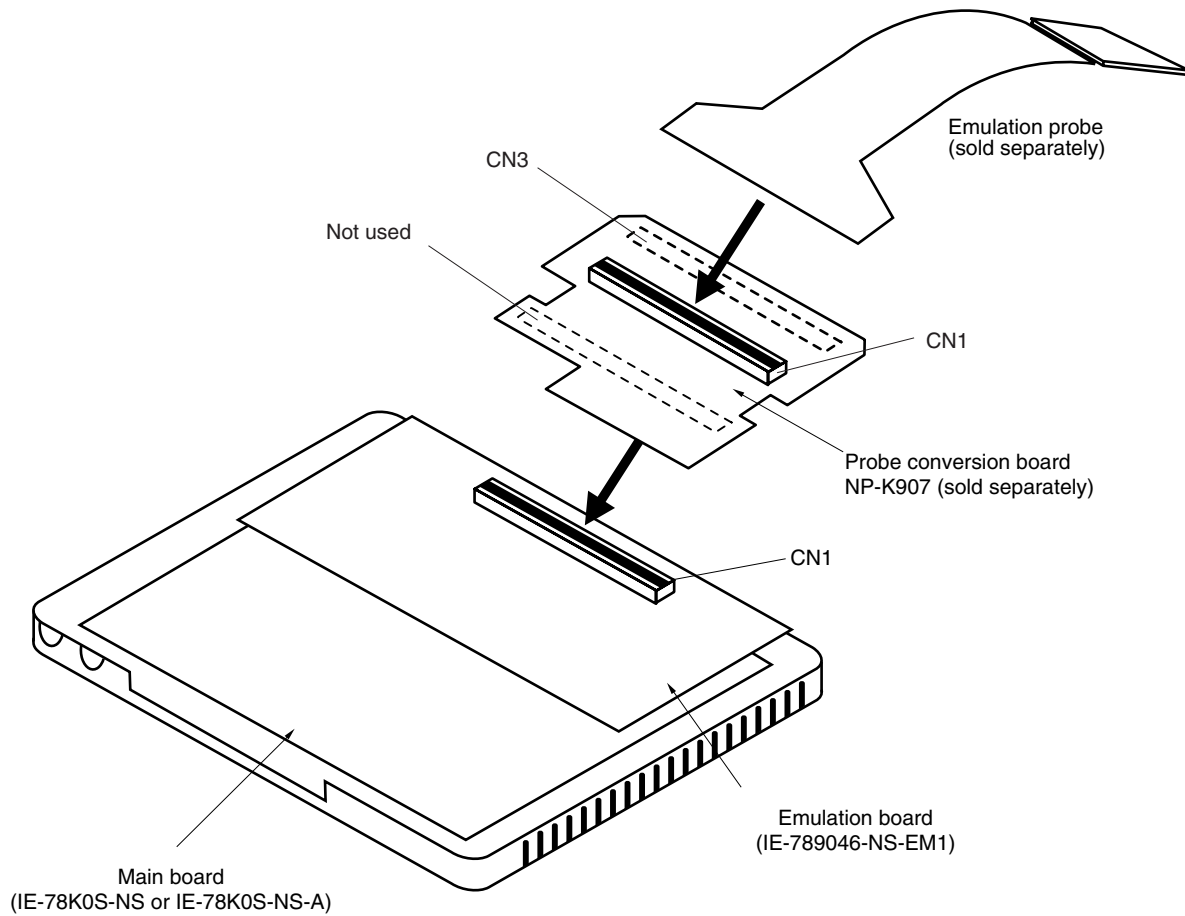
(3) Connection with emulation probe (when debugging μ PD789074 Subseries)

When debugging the μ PD789074 Subseries, connect CN3 (connector for NEC-IE(NS)) of the probe conversion board to CN1 of IE789046-NS-EM1, and the emulation probe to CN1 of the probe conversion 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 3-2. Connection of Emulation Probe (When Debugging μ PD789074 Subseries)



★ 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) Pulse input from target system

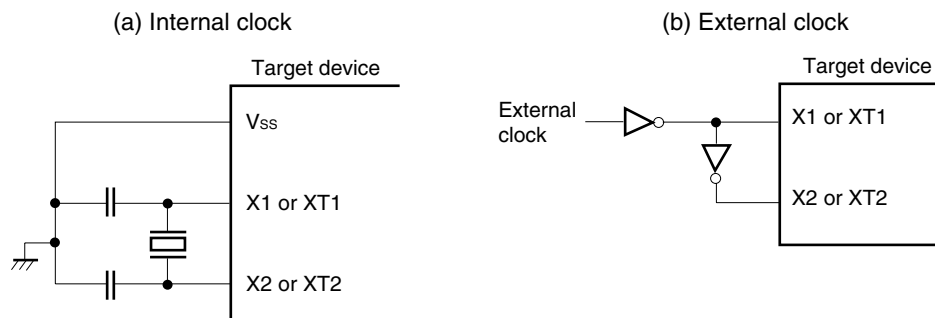
If the target system includes a clock oscillator, select either “(1) Clock that is already mounted on emulation board” or “(2) Clock that is mounted by user”. For the clock oscillator, a resonator is connected to the target device and the target device’s internal oscillator is used. An example of the external circuit is shown in part (a) of Figure 3-3. During emulation, the oscillator that is mounted on the target system is not used. Instead, the clock that is mounted on the emulation board, which is installed in the IE-78K0S-NS or IE-78K0S-NS-A is used.

If the target system includes an external clock, select (1) clock that is already mounted on emulation board, (2) clock that is mounted by user, or (3) pulse input from target system.

For the external clock, a clock signal is supplied from outside of 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. There is no need to supply a clock to X2 or XT2 pin.

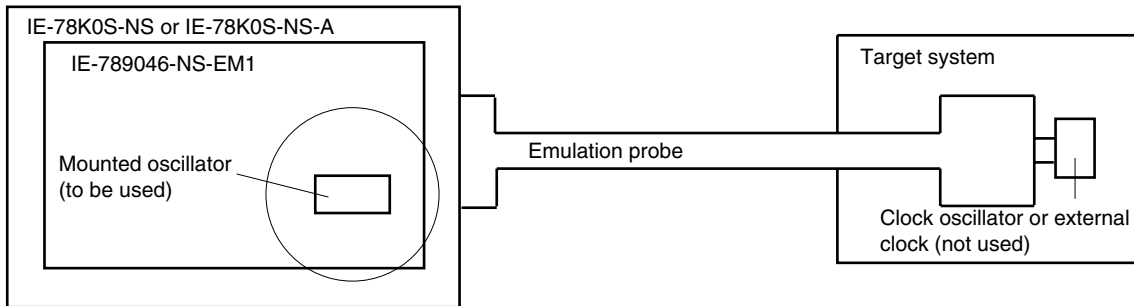
Figure 3-3. External Circuits Used as System Clock Oscillator



(1) Clock that is already mounted on emulation board

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

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

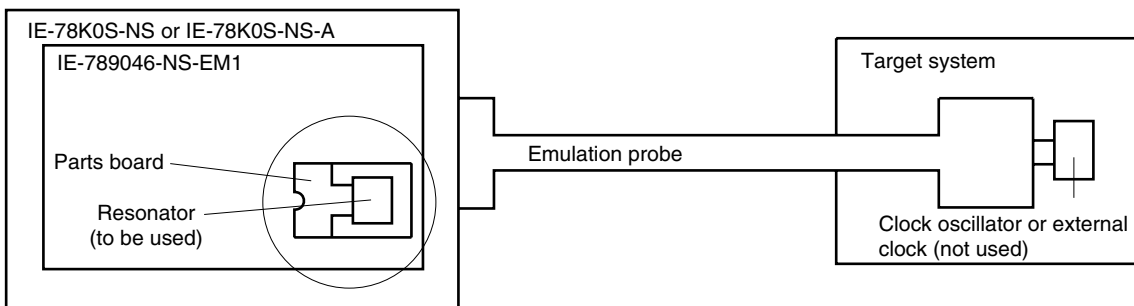


Remark The clock that is supplied by the IE-789046-NS-EM1's oscillator (encircled in the figure) is used.

(2) Clock that is mounted by user

The user is able to mount any clock supported by the set specifications on the IE-789046-NS-EM1. Mount either the parts board on which the resonator to be used is mounted or an oscillator on the IE-789046-NS-EM1. This method is useful when using a different frequency from that of the premounted clock.

Figure 3-5. When Using User-Mounted Clock

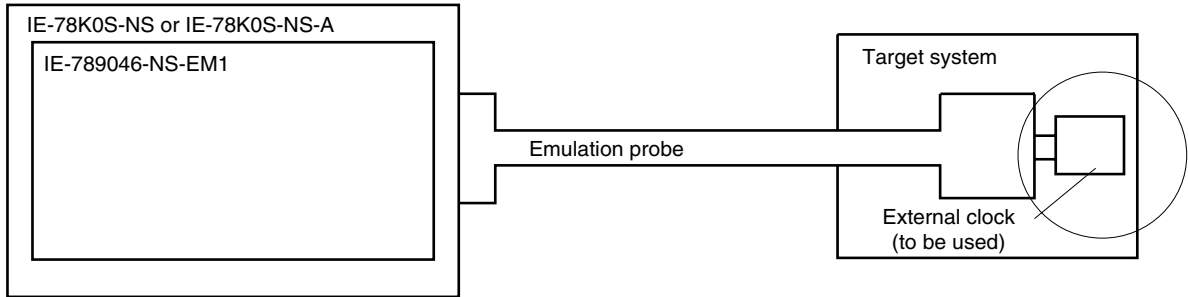


Remark The clock that is supplied by the parts board on which the IE-789046-NS-EM1's resonator is mounted or the oscillator (encircled in the figure) is used.

(3) Pulse input from target system

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

Figure 3-6. When Using an 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-789046-NS-EM1	CPU Clock Source Selection (ID)
		X1 UMCLK	
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	Oscillator assembled by user	
When inputting pulse from target system			Oscillator not used

Caution When inputting a pulse from the target system, open the configuration dialog box when starting the integrated debugger (ID78K0S-NS) and select “External” in the area (Clock) for selecting the CPU’s clock source (this selects the user’s clock).

Remark The IE-789046-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-789046-NS-EM1 is shipped, a 5.0 MHz crystal oscillator is already mounted in the IE-789046-NS-EM1’s X1 UMCLK socket. When using the factory-set mode settings, there is no need to make any other hardware settings.

When starting the integrated debugger (ID78K0S-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

The settings described under either (a) or (b) are required, depending on the type of clock to be used. When starting the integrated debugger (ID78K0S-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

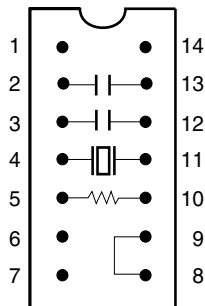
 - Capacitor CA
 - Capacitor CB
 - Solder kit

<Steps>

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

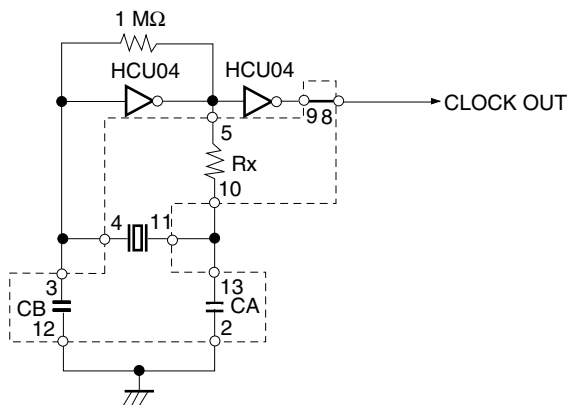
Figure 3-7. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)

Parts board (X1 UMCLK)



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

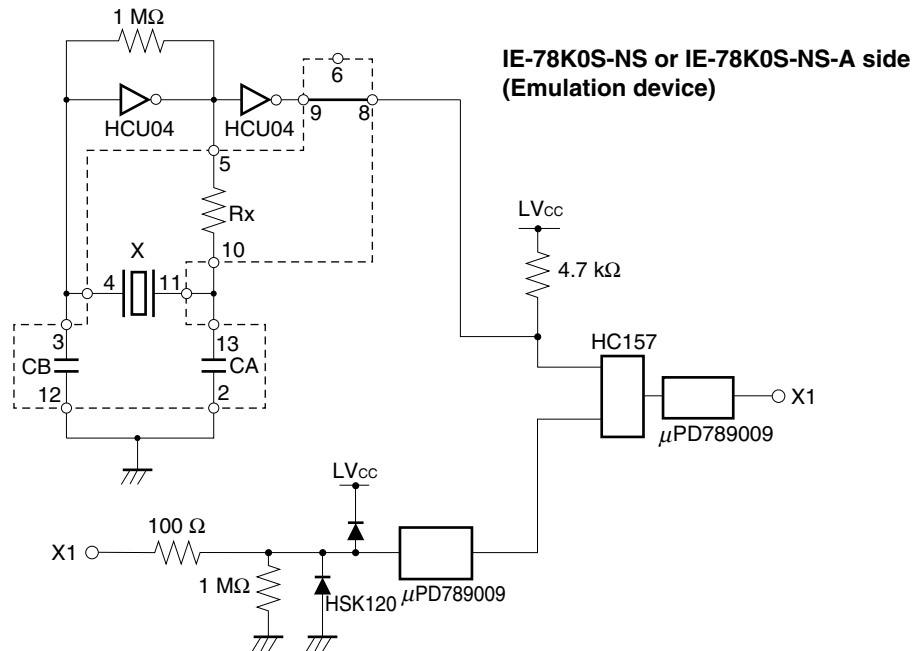
Circuit diagram



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

- <2> Prepare the IE-789046-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-789046-NS-EM1's X1 UMCLK socket.
- <4> Connect the parts board (from <1> above) to the X1 UMCLK 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 mounted in the X1 UMCLK socket on the emulation board is wired as shown in Figure 3-7 above.
- <6> Install the IE-789046-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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

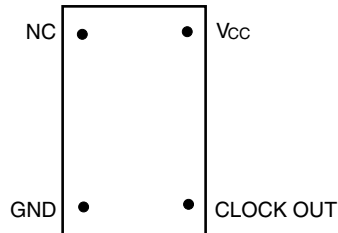


Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

(b) When using a crystal oscillator

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

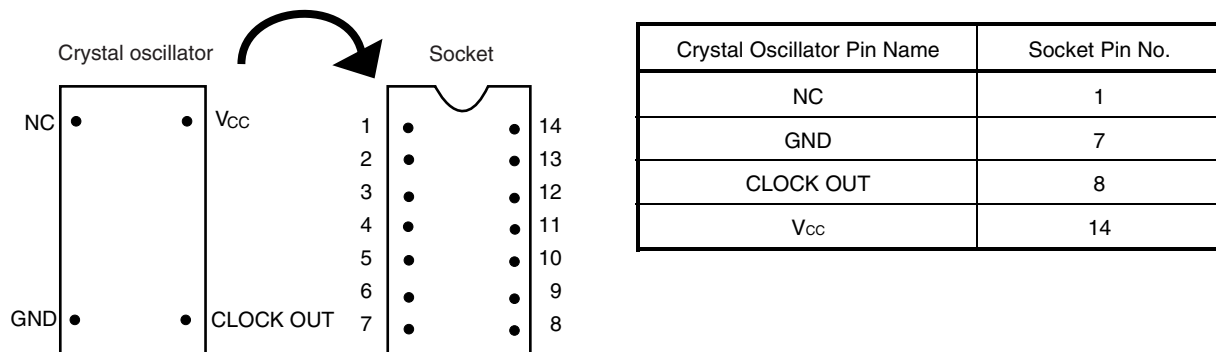
Figure 3-8. Crystal Oscillator (When Using Main System Clock or User-Mounted Clock)



<Steps>

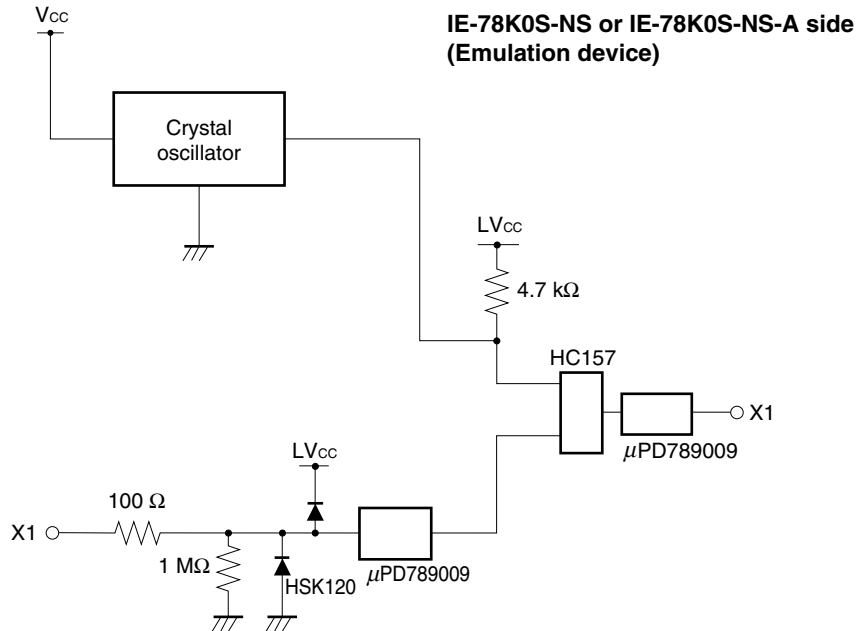
- <1> Prepare the IE-789046-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-789046-NS-EM1's X1 UMCLK socket.
- <3> Mount the crystal oscillator prepared by the user in the X1 UMCLK socket from which the crystal oscillator was removed in <2> above. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

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



- <4> Install the IE-789046-NS-EM1 in the IE-78K0S-NS or IE-78K0S-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 inputting pulse from target system

No hardware settings are required for this situation.

When starting the integrated debugger (ID78K0S-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		IE-789046-NS-EM1	
		XT1 USCLK	JP1
When using clock that is already mounted on emulation board	32.768 kHz	6 and 8 shorted	Short 2 and 3
When using clock mounted by user	Other than 32.768 kHz	Oscillator assembled by user	Short 1 and 2
When inputting pulse from target system		Not used	

Caution Jumper JP1, which is used to select the board's clock or an external clock, should be set only after turning power of the IE-78K0S-NS or IE-78K0S-NS-A off.

Remark When the IE-789046-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-789046-NS-EM1 is shipped, a 32.768 kHz crystal resonator (XTC1) and the parts board (XT1 USCLK) on which pins 6 and 8 are shortened are already mounted on the IE-789046-NS-EM1. Short pins 2 and 3 on the IE-789046-NS-EM1's jumper (JP1). There is no need to make any other settings via the integrated debugger (ID78K0S-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 pins 2 and 3 on the IE-789046-NS-EM1's jumper (JP1).

There is no need to make any other settings via the integrated debugger (ID78K0S-NS).

(a) When using a ceramic resonator or crystal resonator

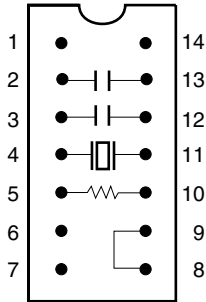
- Items to be prepared
 - Parts board
 - Ceramic resonator or crystal resonator
 - Resistor Rx
 - Capacitor CA
 - Capacitor CB
 - Solder kit

<Steps>

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

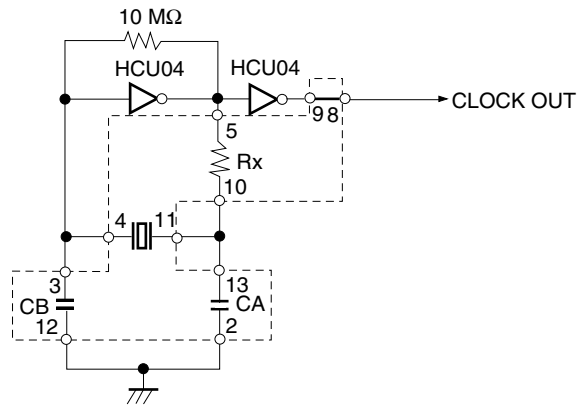
Figure 3-10. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

Parts board (XT1 USCLK)



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

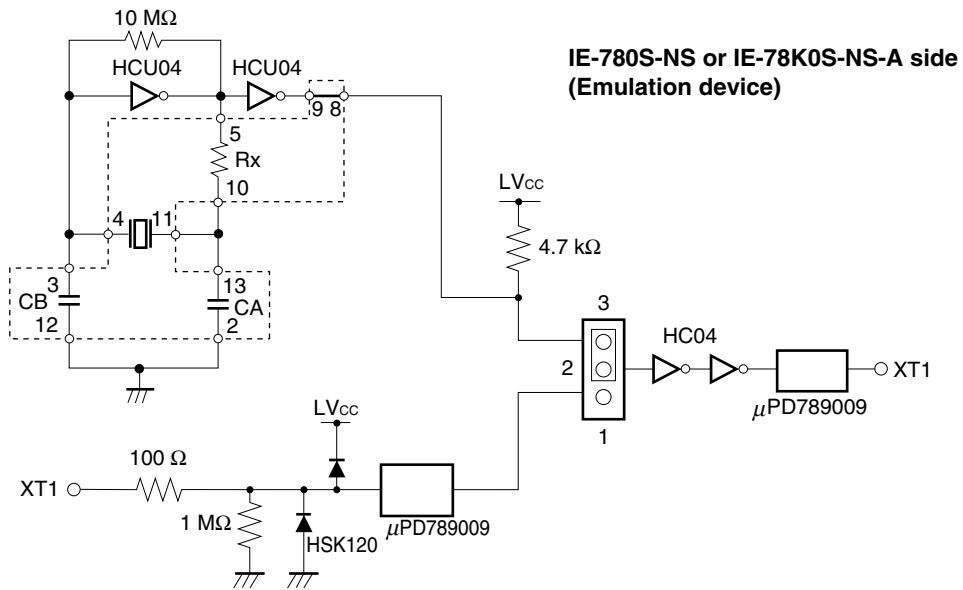
Circuit diagram



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

- <2> Prepare the IE-789046-NS-EM1.
- <3> Remove the parts board that is mounted in the IE-789046-NS-EM1's XT1 USCLK socket.
- <4> Connect the parts board (from <1> above) to the XT1 USCLK socket from which the parts board was removed (see <3> above). Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Install the IE-789046-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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

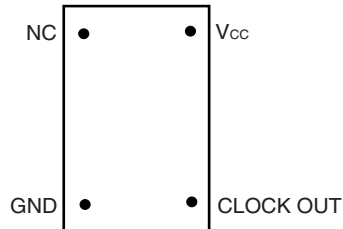


Remark The section enclosed in broken lines indicates parts that are attached to the parts board.

(b) When using a crystal oscillator

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

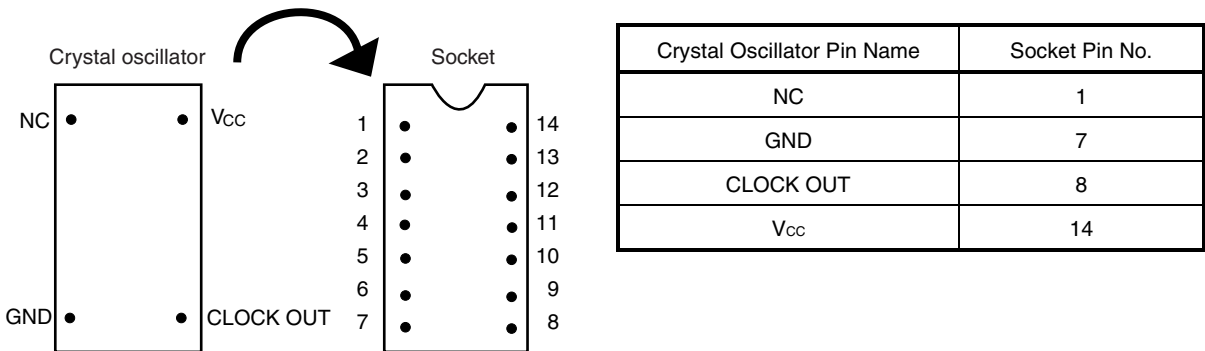
Figure 3-11. Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock)



<Steps>

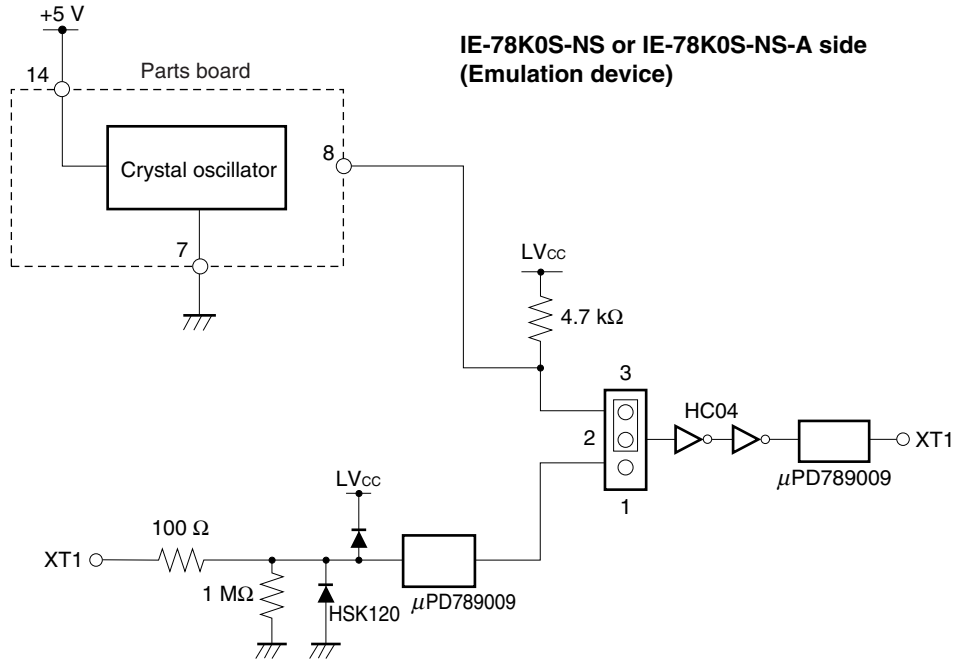
- <1> Prepare the IE-789046-NS-EM1.
- <2> Remove the parts board that is mounted in the IE-789046-NS-EM1's XT1 USCLK socket.
- <3> Mount the crystal oscillator prepared by the user in the XT1 USCLK socket from which the parts board was removed in <2> above. Insert the crystal oscillator into the socket aligning the pins as shown below.

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



- <4> Install the IE-789046-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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



(3) When using an external clock

Short pins 1 and 2 on the IE-789046-NS-EM1's jumper (JP1). There is no need to make any settings via the integrated debugger (ID78K0S-NS).

★ 3.3 Power Supply Voltage of Target Interface

In the IE system, emulation is possible with a voltage of the same level as the power supply voltage of the target system.

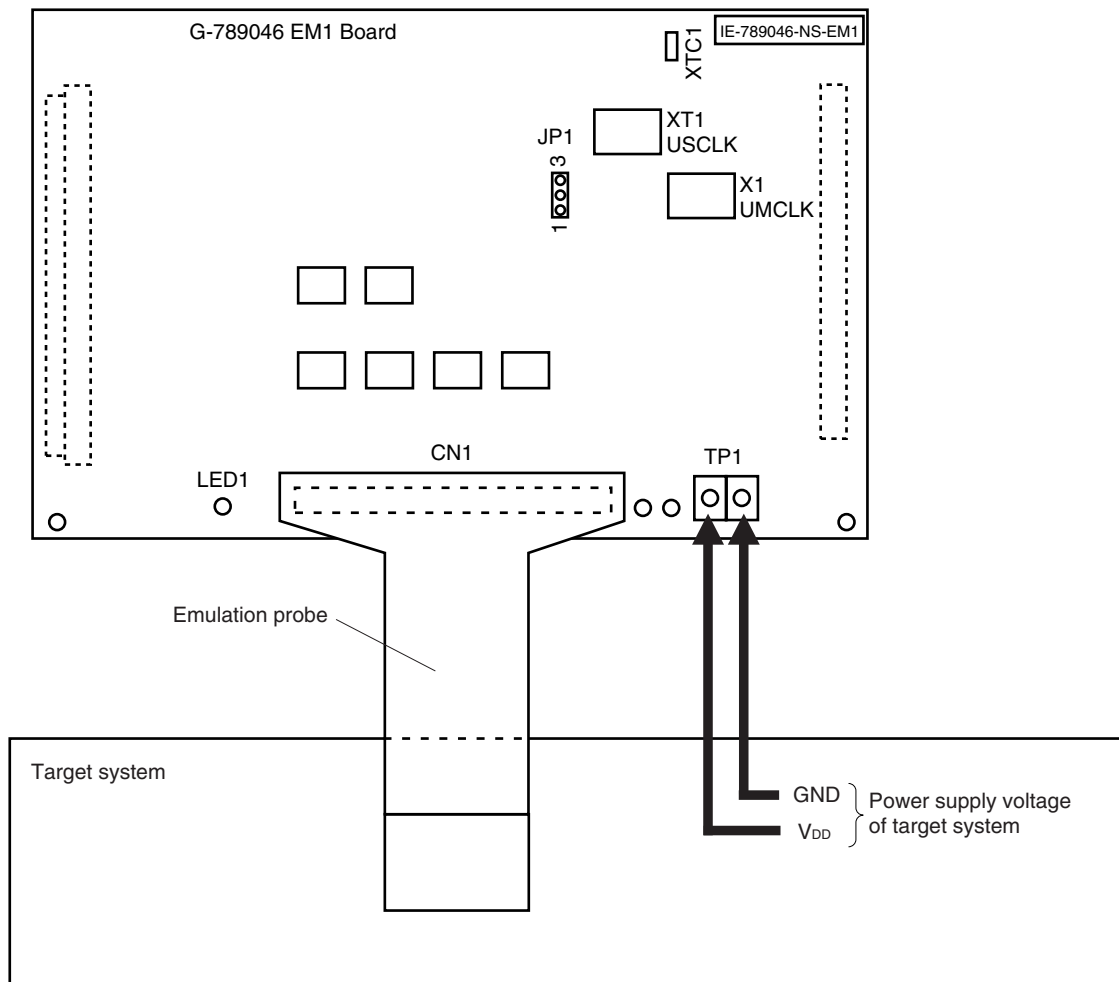
When the target system is not connected, the IE system automatically operates with the emulator's internal power supply (5 V).

When debugging with a voltage that is the same level as that of the target system, supply the same voltage as that of the target system to the TP1 terminal pin of the IE-789046-NS-EM1 (the same applies when the voltage is 5 V).

Set the target voltage to between 1.8 and 5.0 V.

- Maximum current consumption of TP1
1.8 to 5.0 V: Approximately 100 mA

Figure 3-13. Connection of TP1 and Power Supply Voltage of Target System



Caution Connect TP1 on the board and the power supply voltage of the target system after turning off the power of the IE-78K0S-NS or IE-78K0S-NS-A.

Remark The V_{DD} pin of the target system is only used for controlling LED1 (TV_{CC}), which monitors whether the power supply of the target system is connected in the IE-789046-NS-EM1.

3.4 External Trigger

To set up an external trigger, connect it to the IE-789046-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **IE-78K0S-NS User's Manual (U13549E)** or **IE-78K0S-NS-A User's Manual (15207E)** for pin characteristics. See the **ID78K0-NS, ID78K0S-NS Integrated Debugger Ver. 2.20 or Later Operation User's Manual (U14910E)** for use methods.

(1) EXTOUT

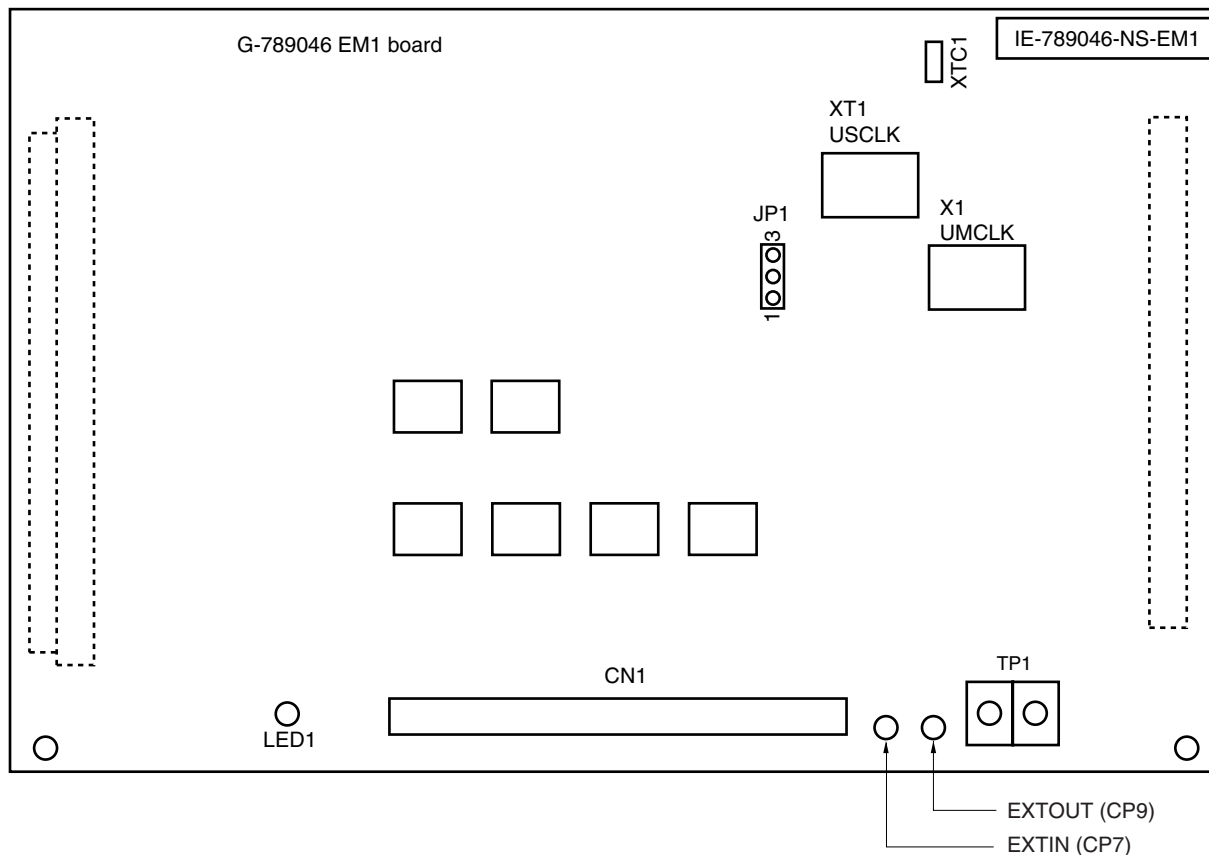
Output a low level from the EXTOUT pin on the IE-789046-NS-EM1 for 1.3 μ s upon the occurrence of a break event.

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

(2) EXTIN

An event signal can be input from the EXTIN pin on the IE-789046-NS-EM1. Use a high-level pulse signal for 2 CPU operation clocks or more for the event signal.

Figure 3-14. External Trigger Input Position



3.5 Switch and Jumper Settings

(1) Switch and jumper settings on the IE-78K0S-NS

When using the IE-789046-NS-EM1, set the switches and jumpers on the IE-78K0S-NS as shown in Table 3-3. For details of these switch and jumper settings, refer to the **IE-78K0S-NS User's Manual (U13549E)**.

Table 3-3. Switch and Jumper Settings on IE-78K0S-NS

	SW1	SW3	SW4	JP1	JP4
Setting	OFF	All switches ON	All switches ON	2 and 3 shorted	1 and 2 shorted

Caution Incorrect settings may damage the IE-78K0S-NS.

★ (2) Switch and jumper settings on the IE-78K0S-NS-A

When using the IE-789046-NS-EM1, set the switches and jumpers on the IE-78K0S-NS-A as shown in Table 3-4. For details of these switch and jumper settings, refer to the **IE-78K0S-NS-A User's Manual (U15207E)**.

Table 3-4. Switch and Jumper Settings on IE-78K0S-NS-A

	SW1	JP1	JP3
Setting	OFF	1 and 2 shorted	Shorted

Caution Incorrect settings may damage the IE-78K0S-NS-A.

CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes the differences in electrical specifications between the target device and the target interface circuit.

Unlike the target device, the target interface circuit of the IE system comprises emulation circuits such as the emulation CPU, TTL, and CMOS-IC and other circuits. Also, because the target interface circuit includes protection and other circuits, its electrical specifications differ from those of the target device.

★ 4.1 μ PD789046 Subseries

When debugging the μ PD789046 Subseries, connect the target system to IE-789046-NS-EM1 via the emulation probe.

- (1) Signals directly input/output to/from the emulation CPU
- (2) Signals input from the target system via a gate
- (3) Other signals

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

(1) Signals input to or output from the evaluation chip and peripheral evaluation chip

The following signals perform the same operations as in the μ PD789046 Subseries. However, a 1 M Ω pull-down resistor and 100 Ω resistor are inserted in series.

- Signals related to port 0
- Signals related to port 1
- Signals related to port 2
- Signals related to port 3
- Signals related to port 4

(2) Signals input from the target system via a gate

Since the following signals are input via a gate, their signals show a delay compared to the μ PD789046 Subseries.

- $\overline{\text{RESET}}$ signal
- X1, XT1 signal

(3) Other signals

- V_{DD0} and V_{DD1} pins

The emulation CPU operates on the internal power supply voltage (5 V) when the target system is not connected. When the target system is connected, power is supplied via the power supply pin (TP1). The V_{DD0} and V_{DD1} pins of the target system are only used to control the LED1 in the IE-789046-NS-EM1 that monitors the input of the target system's power supply (TV_{CC}).

- V_{SS0} and V_{SS1} pins

The V_{SS0} and V_{SS1} pins are connected to GND in the IE-789046-NS-EM1.

- TEST/ V_{PP} pin

The TEST/ V_{PP} pin is not used in the IE-789046-NS-EM1.

- X2 and XT2 pins

The X2 and XT2 pins are not used in the IE-789046-NS-EM1.

Figure 4-1. Equivalent Circuit 1 of Emulation Circuit

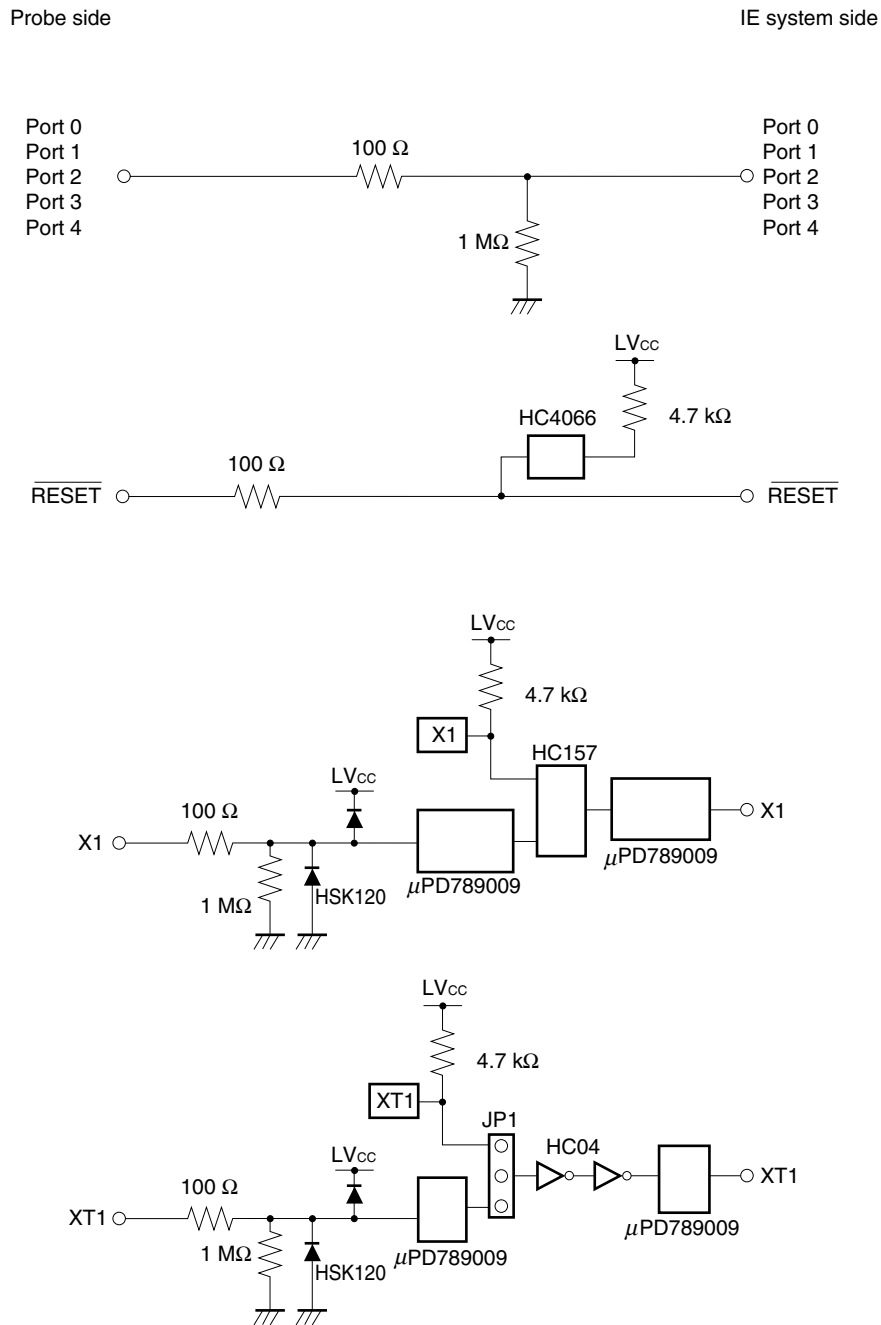
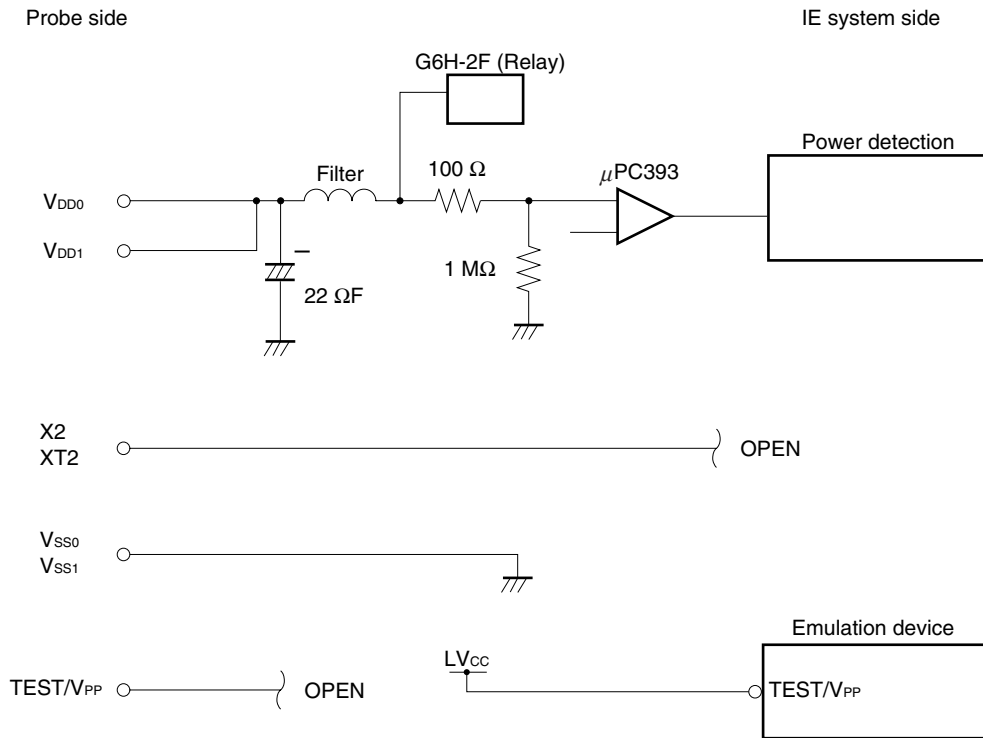


Figure 4-2. Equivalent Circuit 2 of Emulation Circuit



★ 4.2 μ PD789074 Subseries

When debugging the μ PD789074 Subseries, connect the emulation probe and target system to IE-789046-NS-EM1 via the probe conversion board.

- (1) Signals directly input/output to/from the emulation CPU
- (2) Signals input from the target system via a gate
- (3) Other signals

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

(1) Signals input to or output from the evaluation chip and peripheral evaluation chip

The following signals perform the same operations as in the μ PD789074 Subseries. However, a 1 M Ω pull-down resistor and 100 Ω resistor are inserted in series.

- Signals related to port 0
- Signals related to port 1
- Signals related to port 2
- Signals related to port 3

(2) Signals input from the target system via a gate

Since the following signals are input via a gate, their signals show a delay compared to the μ PD789074 Subseries.

- $\overline{\text{RESET}}$ signal
- X1 signal

(3) Other signals

- V_{DD} pin
The emulation CPU operates on the internal power supply voltage (5 V) when the target system is not connected. When the target system is connected, power is supplied via the power supply pin (TP1). The V_{DD} pin of the target system is only used to control LED1 in the IE-789046-NS-EM1, which monitors the input of the target system's power supply (TV_{CC}).
- V_{SS} pin
The V_{SS} pin is connected to GND in the IE-789046-NS-EM1.
- TEST/V_{PP} pin
The TEST/V_{PP} pin is not used in the IE-789046-NS-EM1.
- X2 pin
The X2 pin is not used in the IE-789046-NS-EM1.

Figure 4-3. Equivalent Circuit 3 of Emulation Circuit

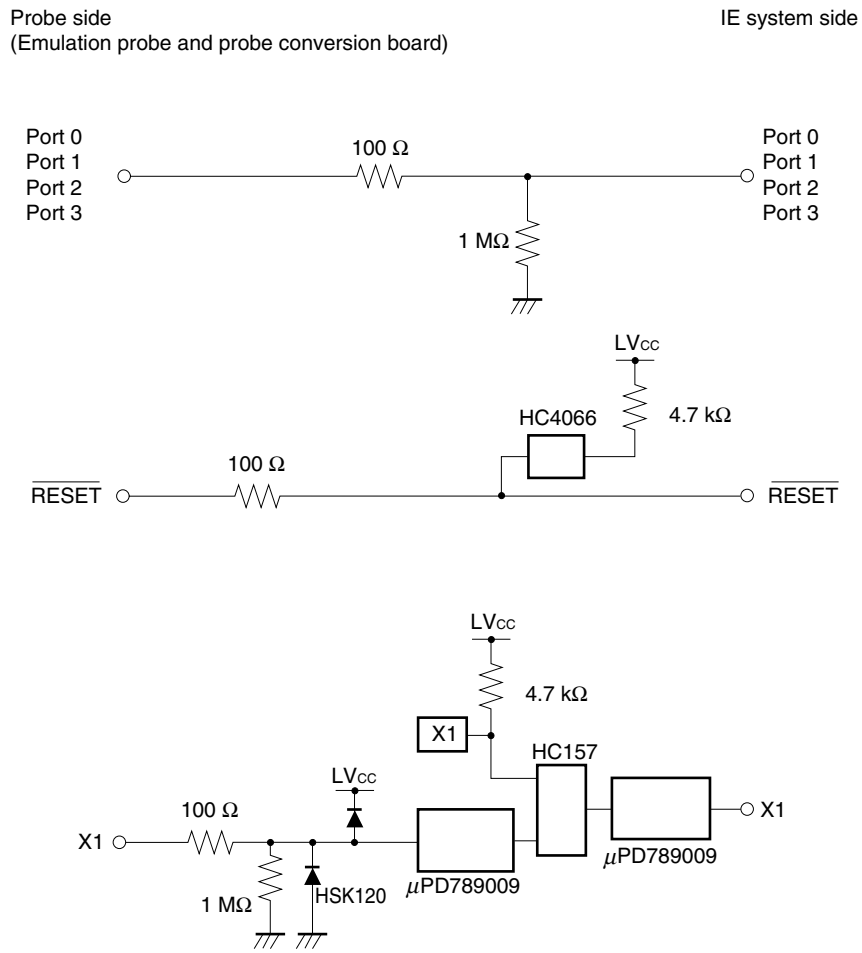
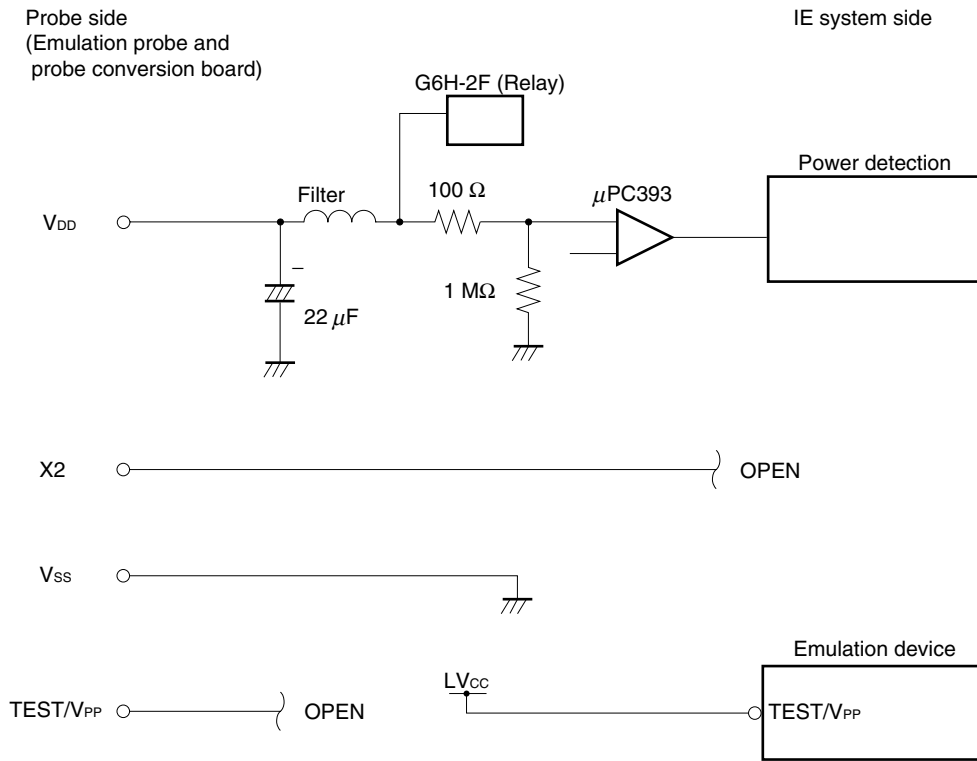


Figure 4-4. Equivalent Circuit 4 of Emulation Circuit



APPENDIX A. EMULATION PROBE PIN ASSIGNMENT TABLE

★

Table A-1. Pin Assignments of NP-44GB, NP-44GB-TQ, and NP-H44GB-TQ

Emulation Probe	CN1 Pin No.	Emulation Probe	CN1 Pin No.
1	104	23	18
2	103	24	17
3	100	25	22
4	99	26	21
5	94	27	28
6	93	28	27
7	30	29	92
8	29	30	91
9	24	31	98
10	23	32	97
11	20	33	102
12	47	34	73
13	48	35	72
14	51	36	69
15	52	37	70
16	57	38	63
17	58	39	64
18	59	40	61
19	60	41	62
20	55	42	65
21	56	43	66
22	49	44	71

- Remarks**
1. The NP-44GB, NP-44GB-TQ, and NP-H44GB-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. Pin Assignments of NGS-30, NP-36GS, NP-H36GS, and NP-K907

Device Side of NGS-30	CN5 Pin No. of NP-36GS, NP-H36GS	CN1 Pin No. of NP-K907	CN1 Pin No. of IE-789046-NS-EM1
1	19	58	100
2	20	56	47
3	21	49	48
4	22	55	55
5	23	19	51
6	24	18	52
7	25	22	57, 64
8	33	62	58, 63
9	32	65	56
10	31	66	49
11	30	92	18
12	29	91	17
13	28	98	22
14	27	97	21
15	26	21	28
16	11	99	27
17	10	63	92
18	9	64	91
19	8	70	98
20	7	69	97
21	6	72	102
22	5	102	73
23	4	71	72
24	12	94	69
25	13	93	70
26	14	30	65
27	15	29	66
28	16	24	71
29	17	23	104
30	18	20	103

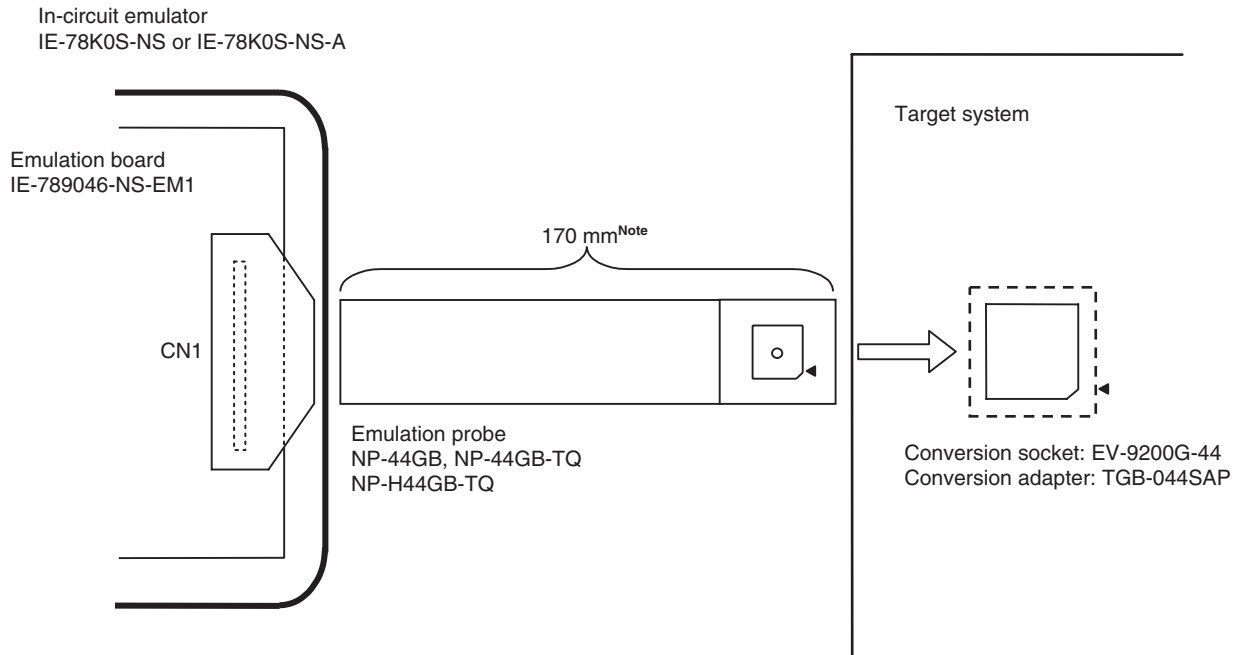
Remark The NGS-30, NP-36GS, NP-H36GS, and NP-K907 are products of Naito Densetsu Machida Mfg. Co., Ltd.

APPENDIX B. CAUTIONS ON DESIGNING TARGET SYSTEM

B.1 Cautions on Designing Target System When Debugging μ PD789046 Subseries

The following shows the conditions when connecting the emulation probe to the conversion connector or conversion socket. Follow the configuration below and consider the shape of parts to be mounted on the target system when designing a system.

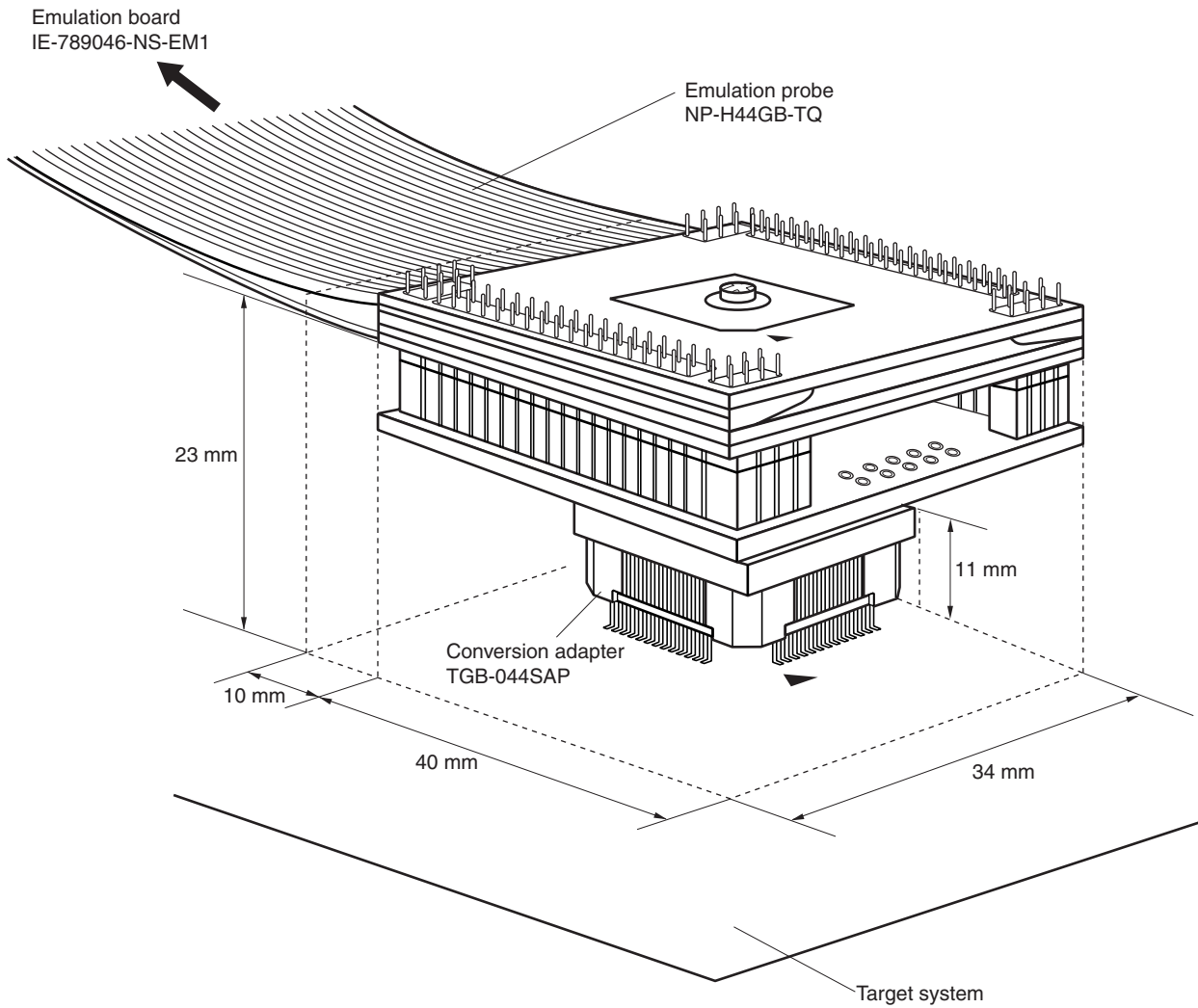
Figure B-1. Distance Between In-Circuit Emulator and Conversion Socket (1)



Note Distance when NP-44GB and NP-44GB-TQ are used. When NP-H44GB-TQ is used, the distance is 370 mm.

Remarks 1. NP-44GB, NP-44GB-TQ, and NP-H44GB-TQ are products of Naito Densai Machida Mfg. Co., Ltd.
2. TGB-044SAP is a product of TOKYO ELETECH CORPORATION.

Figure B-2. Connection Condition of Target System (NP-H44GB-TQ)

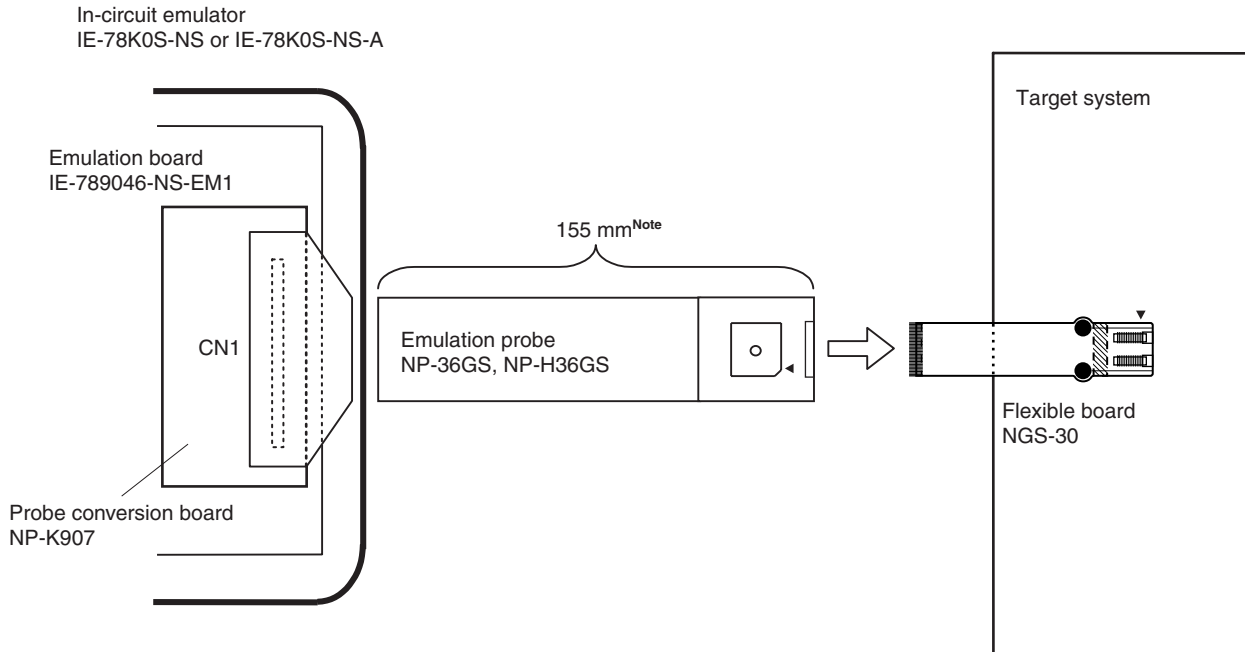


- Remarks**
1. NP-H44GB-TQ is a product of Naito Densai Machida Mfg. Co., Ltd.
 2. TGB-044SAP is a product of TOKYO ELETECH CORPORATION.

B.2 Cautions on Designing Target System When Debugging μ PD789074 Subseries

The following shows the conditions when connecting the probe conversion board and emulation probe to the conversion connector or conversion socket. Follow the configuration below and consider the shape of parts to be mounted on the target system when designing a system.

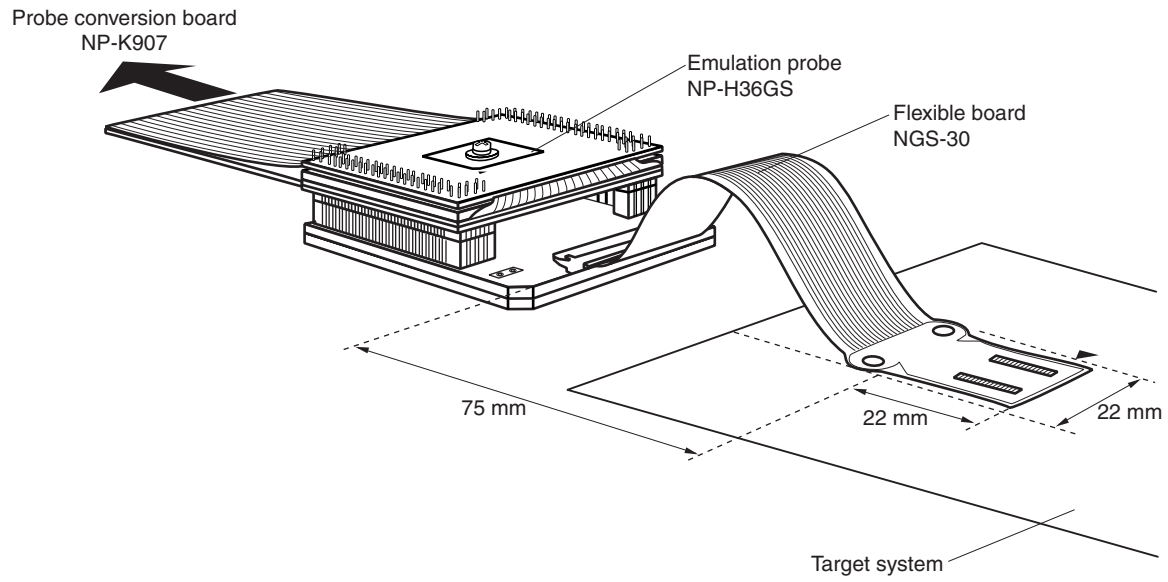
Figure B-3. Distance Between In-Circuit Emulator and Conversion Socket (2)



Note Distance when NP-36GS is used. When NP-H36GS is used, the distance is 355 mm.

Remark NP-36GS, NP-H36GS, and NGS-30 are products of Naito Densai Machida Mfg. Co., Ltd.

Figure B-4. Connection Condition of Target System (NP-H36GS)



Remark NP-H36GS and NGS-30 are products of Naito Densai Machida Mfg. Co., Ltd.

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