User's Manual

NEC

IE-789842-NS-EM1

Emulation Board

Target Devices
μPD789842 Subseries

[MEMO]

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

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

Regional Information

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

- Device availability

- Ordering information

- Product release schedule

- Availability of related technical literature

- Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)

- Network requirements

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

NEC Electronics America, Inc. (U.S.)
Santa Clara, California
Tel: 408-588-6000
     800-366-9782
Fax: 408-588-6130
     800-729-9288

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

- **Tyskland Filial**
  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: 6253-8311
Fax: 6250-3583

J02.11

Major Revisions in This Edition

Page	Description
Throughout	• Addition of IE-78K0S-NS-A as supported in-circuit emulator • Addition of NP-44GB-TQ and NP-H44GB-TQ as supported emulation probes • Addition of TGB-044SAP as supported conversion adapter
pp. 12, 13	**Figure 1-1 System Configuration** • Modification of supply medium of debugger ID78K0S-NS to CD-ROM • Modification of the shape of interface cable • Modification of Notes 1 to 3 • Addition of **Table 1-1 Correspondence Between Emulation Probe and Conversion Socket/Conversion Adapter**
p. 15	Partial modification of **Table 1-2 Basic Specifications**
p. 20	**3.2 Switch and Jumper Settings on Main Unit** • Addition of **(2) Settings on the IE-78K0S-NS-A**
p. 28 of previous edition	Deletion of **3.3 Low-Voltage Emulation Setting**
p. 21	Addition of **3.3 Setting Power Supply Voltage of Target Interface**

pp. 22 to 24	**3.4.1 Overview of clock settings**
	• Change from "internal clock" in previous edition to "clock oscillator"
	• **Figure 3-3 External Circuits Used as System Clock Oscillator**
	  Addition of V_{SS} pin in figure of **(a) Clock oscillator**
	• **Figure 3-4 When Using Clock That Is Already Mounted on Emulation Board, Figure 3-5 When Using User-Mounted Clock**
	  Change from "resonator" in previous revision to "clock oscillator or external clock" on target system
	• Change from "clock generator" in previous edition to "external clock" in **Figure 3-6 When Supplying Pulse from Target System**

pp. 24 to 27	**3.4.2 System clock settings** • Change from "main system clock" in the previous edition to "system clock"
pp. 34, 35	Addition of **APPENDIX B NOTES ON DESIGNING TARGET SYSTEM**

The mark ★ shows major revised points.

Product Overview   The IE-789842-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.

- μPD789842 Subseries: μPD789841, 789842, 78F9842

Target Readers   This manual is intended for engineers who will use the IE-789842-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-789842-NS-EM1, refer to not only this manual (supplied with the IE-789842-NS-EM1) but also the manual that is supplied with the IE-78K0S-NS or IE-78K0S-NS-A.

IE-78K0-NS
User's Manual

- Basic specifications
- System configuration
- External interface functions

IE-789842-NS-EM1
User's Manual

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

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

- Basic specifications
- System configuration
- External interface functions

Purpose   This manual's purpose is to explain various debugging functions that can be performed when using the IE-789842-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.
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-78K0S-NS or IE-78K0S-NS-A) and emulation board (IE-789842-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 In-Circuit Emulator	U13549E
IE-78K0S-NS-A In-Circuit Emulator	U15207E
IE-789842-NS-EM1 Emulation Board	This manual
ID78K Series Integrated Debugger Ver. 2.30 or Later Operation Windows™ Based	U15185E
μPD789842 Subseries	U13776E

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-789842-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-789842-NS-EM1's system configuration and basic specifications.

- Target devices
  - μPD789842 Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-789842-NS-EM1's system configuration.

★ **Figure 1-1. System Configuration**

Debugger
ID78K0S-NS
(sold separately)

Device file[Note 1]
(obtain 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-78K0S-NS
or
IE-78K0S-NS-A
(sold separately)

In-circuit emulator

NS CARD
Cable

MC CARD
Cable

FG Cable

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

IE-789842-NS-EM1
(This product)

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

Emulation probe[Note 2]
(sold separately)

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

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

μS××××DF789842: μPD789842 Subseries

The device file can be downloaded from the web site of NEC Electronics

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

2. The emulation probes NP-44GB, NP-44GB-TQ, and NP-H44GB-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

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

3. The conversion adapter 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)

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
44-pin plastic QFP (GB type)	NP-44GB (probe length: 200 mm)	EV-9200G-44
	NP-44GB-TQ (probe length: 200 mm)	TGB-044SAP
	NP-H44GB-TQ (probe length: 400 mm)	

1.2 Hardware Configuration

Figure 1-2 shows the IE-789842-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration

User's Manual U14545EJ2V0UM
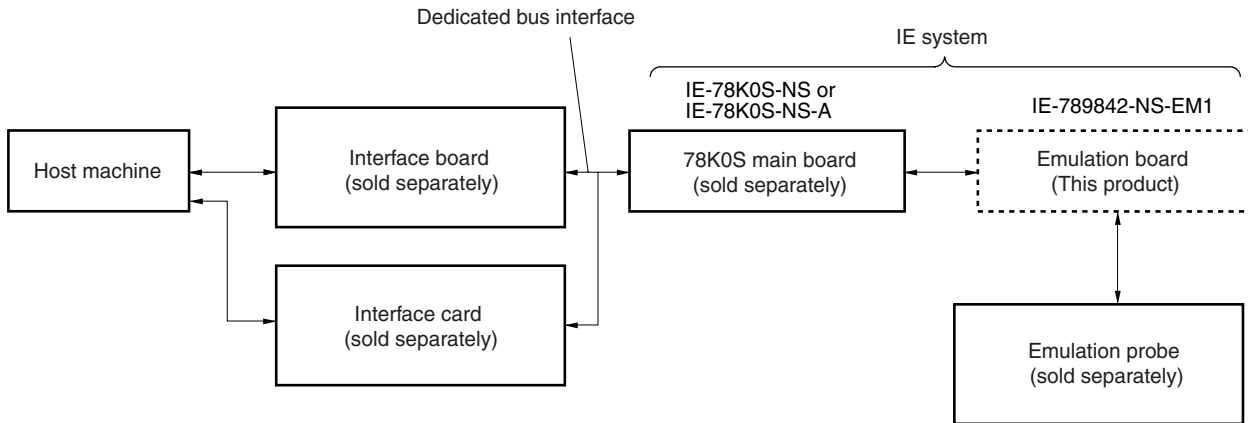
1.3 Basic Specifications

The basic specifications of the IE-789842-NS-EM1 are listed in Table 1-2.

★

Table 1-2. Basic Specifications

Parameter	Description
Target device	μPD789842 Subseries
System clock	8.38 MHz
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 parts board by the user
Target interface voltage	V_{DD} = 4.0 to 5.5 V (same as that of target device) Operates on internal power supply (5 V) when target system is not connected

CHAPTER 2   PART NAMES

This chapter introduces the parts of the IE-789842-NS-EM1 main unit.

The packing box contains the emulation board (IE-789842-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 shows the part names of the IE-789842-NS-EM1.

Figure 2-1. IE-789842-NS-EM1 Part Names
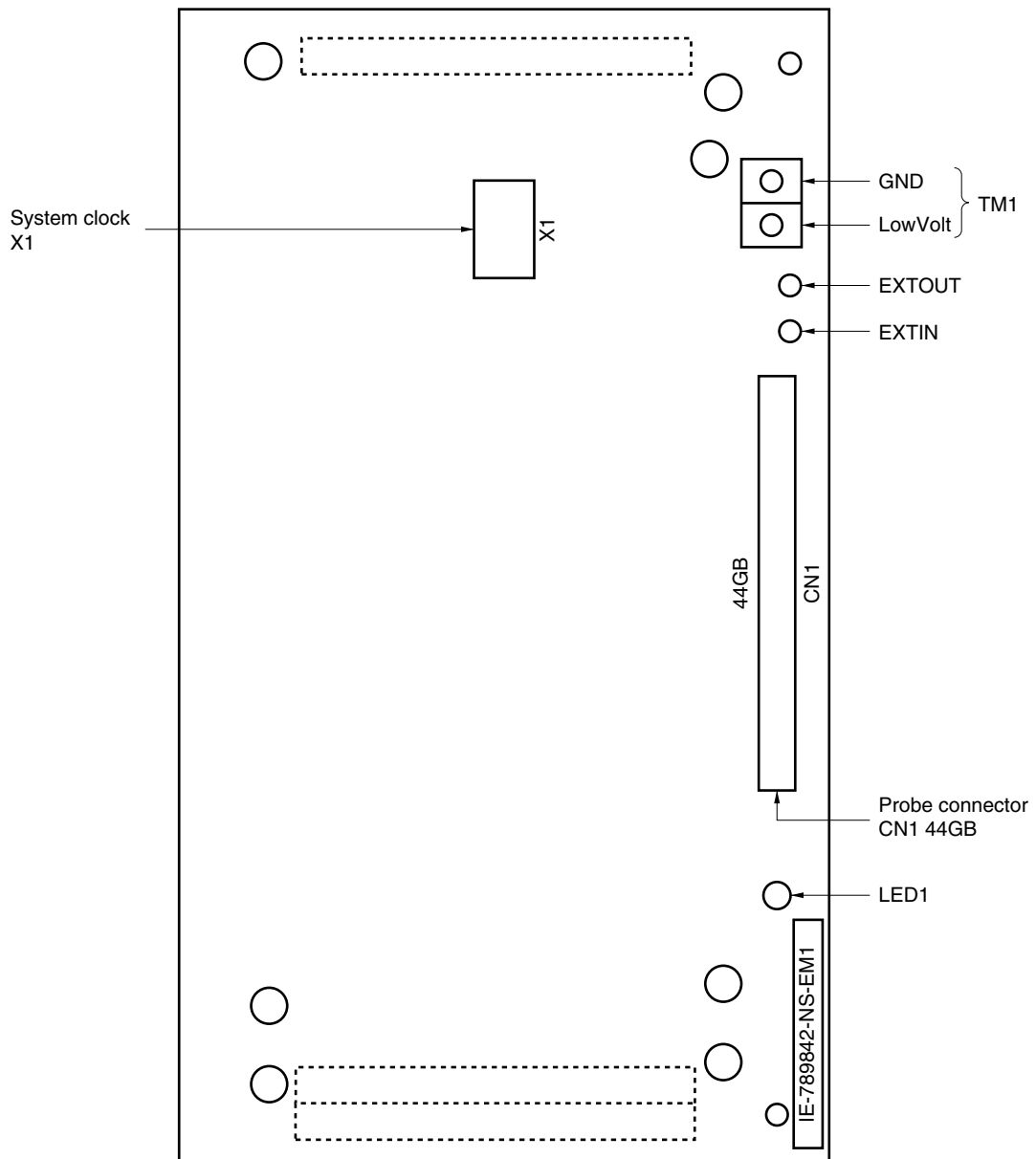
CHAPTER 3   INSTALLATION

This chapter describes methods for connecting the IE-789842-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)** for a description of how to connect the IE-789842-NS-EM1 to the IE-78K0S-NS[Note].

    Note When using the IE-78K0S-NS-A, see the **IE-78K0S-NS-A User's Manual (U15207E)**.

(2) Connection with emulation probe
See the **IE-78K0S-NS User's Manual (U13549E)** for a description of how to connect an emulation probe to the IE-789842-NS-EM1[Note].
On this board, connect the emulation probe to CN1.

    Note When using the IE-78K0S-NS-A, see the **IE-78K0S-NS-A User's Manual (U15207E)**.

    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)

CN1 44GB

IE-789842-NS-EM1

Main board of
IE-78K0S-NS (sold separately) or
IE-78K0S-NS-A (sold separately)
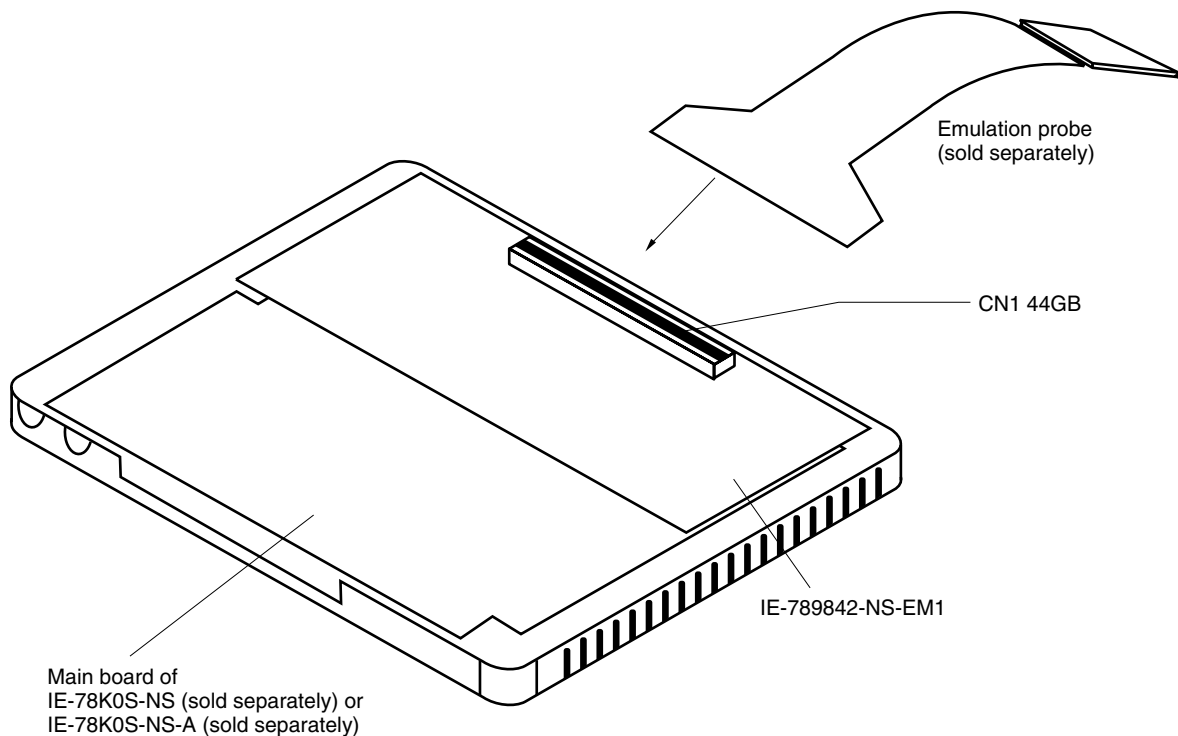
3.2   Switch and Jumper Settings on Main Unit

(1)   Settings on the IE-78K0S-NS

When using the IE-789842-NS-EM1, set the switches and jumpers on the IE-78K0S-NS as shown in Table 3-1.
For details of these switch and jumper settings, refer to the **IE-78K0S-NS User's Manual (U13549E)**.

Table 3-1. Switch and Jumper Settings on IE-78K0S-NS

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

Caution   Incorrect connection may damage the IE-789842-NS-EM1.

★ (2)   Settings on the IE-78K0S-NS-A

When using the IE-789842-NS-EM1, set the switches and jumpers on the IE-78K0S-NS-A as shown in Table 3-2. For details of these switch and jumper settings, refer to the **IE-78K0S-NS-A User's Manual (U15207E)**.

Table 3-2. Switch and Jumper Settings on IE-78K0S-NS-A

	SW1	JP1	JP3
Setting	OFF	1 and 2 shorted (fixed)	Shorted (fixed)

Caution   Incorrect connection may damage the IE-789842-NS-EM1.

★   ## 3.3   Setting 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 TM1 terminal pin of the IE-789842-NS-EM1 (the same applies when the voltage is 5 V).

Set the target voltage to between 4.0 and 5.0 V.

For how to select the operating power supply, refer to the **ID78K Series Ver.2.30 or Later Operation Windows-Based User's Manual (U15185E)**.

- Maximum current consumption of TM1
    4.0 to 5.0 V: Approximately 125 mA

Table 3-3. Setting Power Supply of Target Interface

Power Supply of Target Interface (LV$_{CC}$)		Integrated Debugger (ID78K0S-NS)
		Operating Power Supply Selection
When connecting target system	4.0 to 5.0 V	Target
When not connecting target system	5 V	Internal

Figure 3-2. Connecting TM1 and Target System Power Supply Voltage
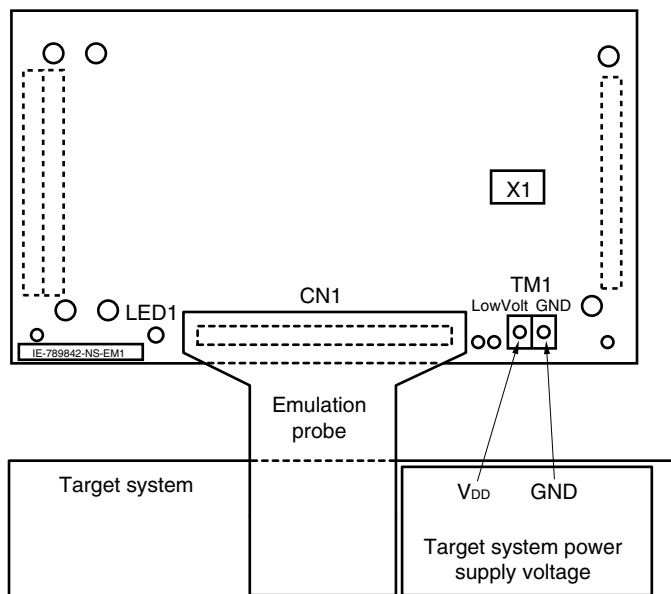
Caution   **Before connecting TM1 on the board and the target system power supply voltage, turn off the power to the IE-78K0S-NS or IE-78K0S-NS-A.**

Remark   The V$_{DD}$ pin on the target system is exclusively used to control LED1, which monitors whether the power supply of the target system is connected in the IE-789842-NS-EM1.

3.4   Clock Settings

3.4.1   Overview of clock settings

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

(1)   Clock that is already mounted on emulation board
(2)   Clock that is mounted by user
(3)   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 installed in the IE-78K0S-NS or IE-78K0S-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) 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 pulse from the target system. There is no need to supply a clock to the X2 pin. Also, even if a crystal resonator is connected directly to X1, the target device will not operate.**

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

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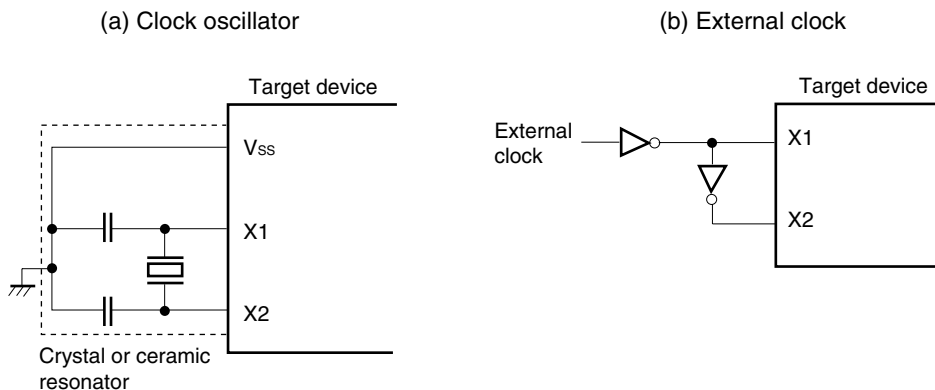
(1) Clock that is already mounted on emulation board

The crystal oscillator mounted on the IE-789842-NS-EM1 can be used.

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**
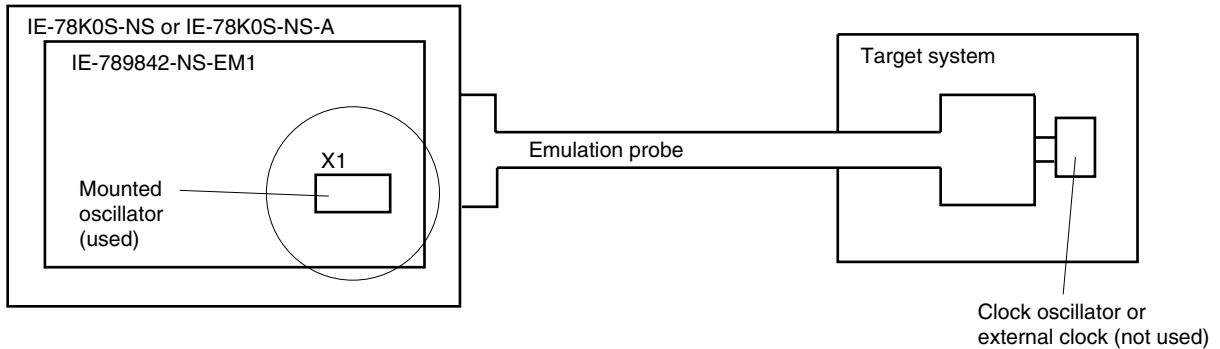
> **Remark**   The clock that is supplied by the oscillator of the IE-789842-NS-EM1 (encircled in the figure) is used.

(2) Clock that is mounted by user

The user can mount any clock supported by the set specifications on the IE-789842-NS-EM1. This feature is effective when debugging at a different frequency than the clock already mounted.

Remove the crystal oscillator (X1) that is already mounted on the emulation board, and mount the parts board on which the resonator to be used is mounted or mount the oscillator to be used.

★   **Figure 3-5. When Using User-Mounted Clock**
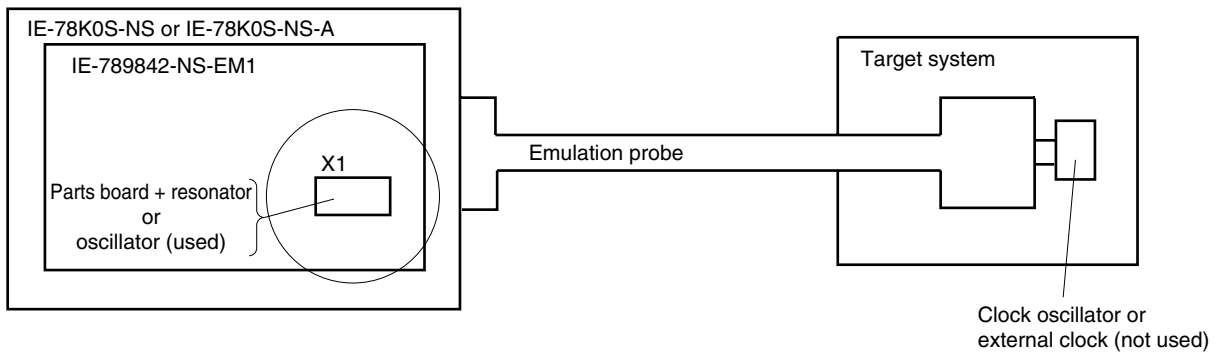
> **Remark**   The clock that is supplied by the resonator of the IE-789842-NS-EM1 (encircled in the figure) or the oscillator is used.

(3) Pulse input from target system

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

★ **Figure 3-6. When Supplying Pulse from Target System**
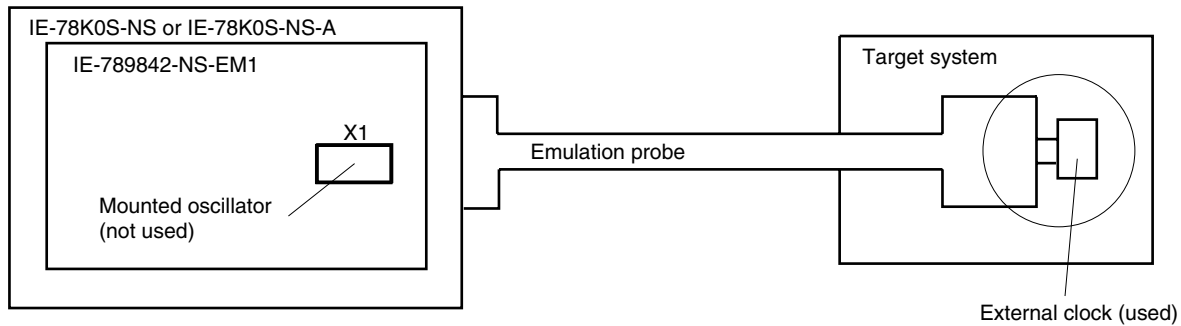
> **Remark** The pulse that is supplied by the external clock on the target system (encircled in the figure) or the oscillator is used.

★ **3.4.2 System clock settings**

Table 3-4 shows the settings of the IE-789842-NS-EM1 when the system clocks in (1) to (3) are used.

Table 3-4. System Clock Settings

Frequency of System Clock		IE-789842-NS-EM1	CPU Clock Source Selection (ID78K0S-NS)
		X1 Socket	
(1) When using clock that is already mounted on emulation board	8.38 MHz	Oscillator	Internal
(2) When using clock mounted by user	Other than 8.38 MHz	Oscillator configured by user	
(3) When inputting pulse from target system		Oscillator (not used)	External

> **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 factory settings of the IE-789842-NS-EM1 are those listed above under "when using clock that is already mounted on emulation board".

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

When the IE-789842-NS-EM1 is shipped, an 8.38 MHz crystal oscillator is already mounted in the IE-789842-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 (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

Perform the settings described under either (a) or (b), 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

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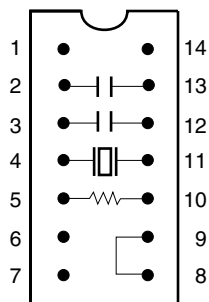
Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Ceramic resonator or crystal resonator
5-10	Resistor Rx
8-9	Shorted

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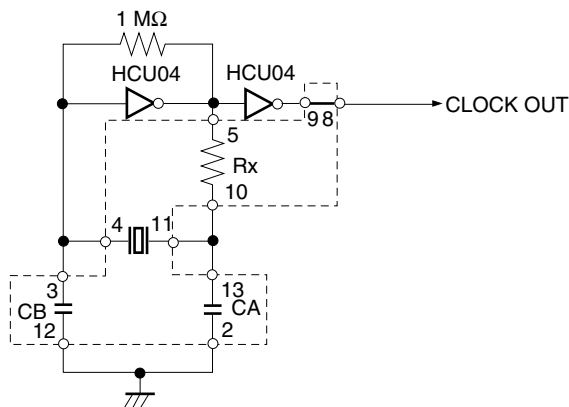
Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

<2> Prepare the IE-789842-NS-EM1.

<3> Remove the crystal oscillator that is mounted in the IE-789842-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 3-7 above.

<6> Install the IE-789842-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.

(b) When using a crystal oscillator

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

Figure 3-8. Crystal Oscillator
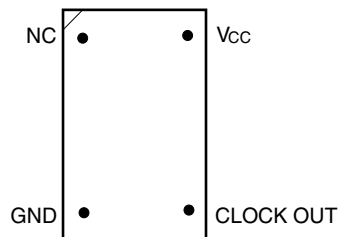

<Steps>

<1> Prepare the IE-789842-NS-EM1.

<2> Remove the crystal oscillator that is mounted in the IE-789842-NS-EM1's X1 socket.

<3> Connect a crystal oscillator to the X1 socket from which the crystal oscillator was removed (in <2> above). Insert the pins of the crystal oscillator into the socket aligning the pins as shown in the figure below.

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

Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
V_{CC}	14
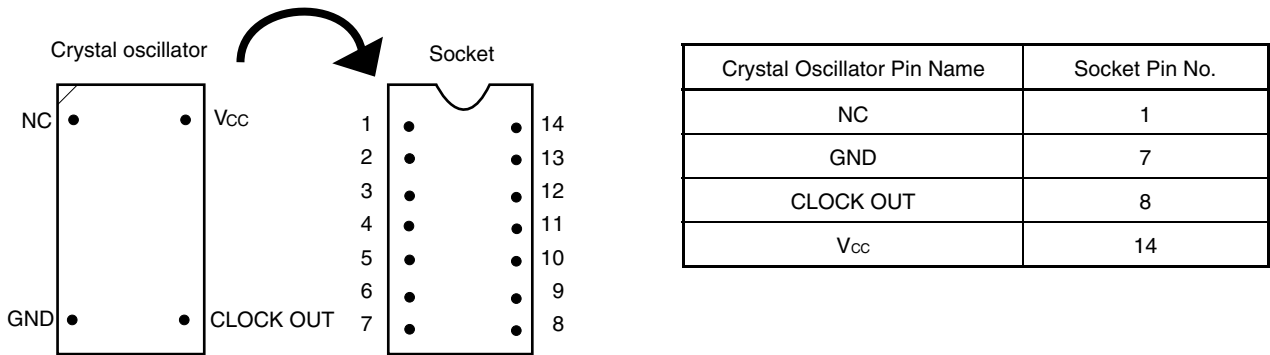
<4> Install the IE-789842-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(3) When inputting pulse from target system

Short pins 6 and 8 of the X1 socket.

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).

3.5   External Trigger

To set an external trigger, connect the IE-789842-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 (U15207E)** for pin characteristics.

For the use methods, see the **ID78K Series Ver.2.30 or Later Operation Windows Based User's Manual (U15185E)**.

(1) EXTOUT

The EXTOUT pin on the IE-789842-NS-EM1 outputs a low level for 1.3 μs 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-789842-NS-EM1. Input a high-level pulse signal for 2 CPU operation clocks or more.

Figure 3-10. External Trigger Input Position
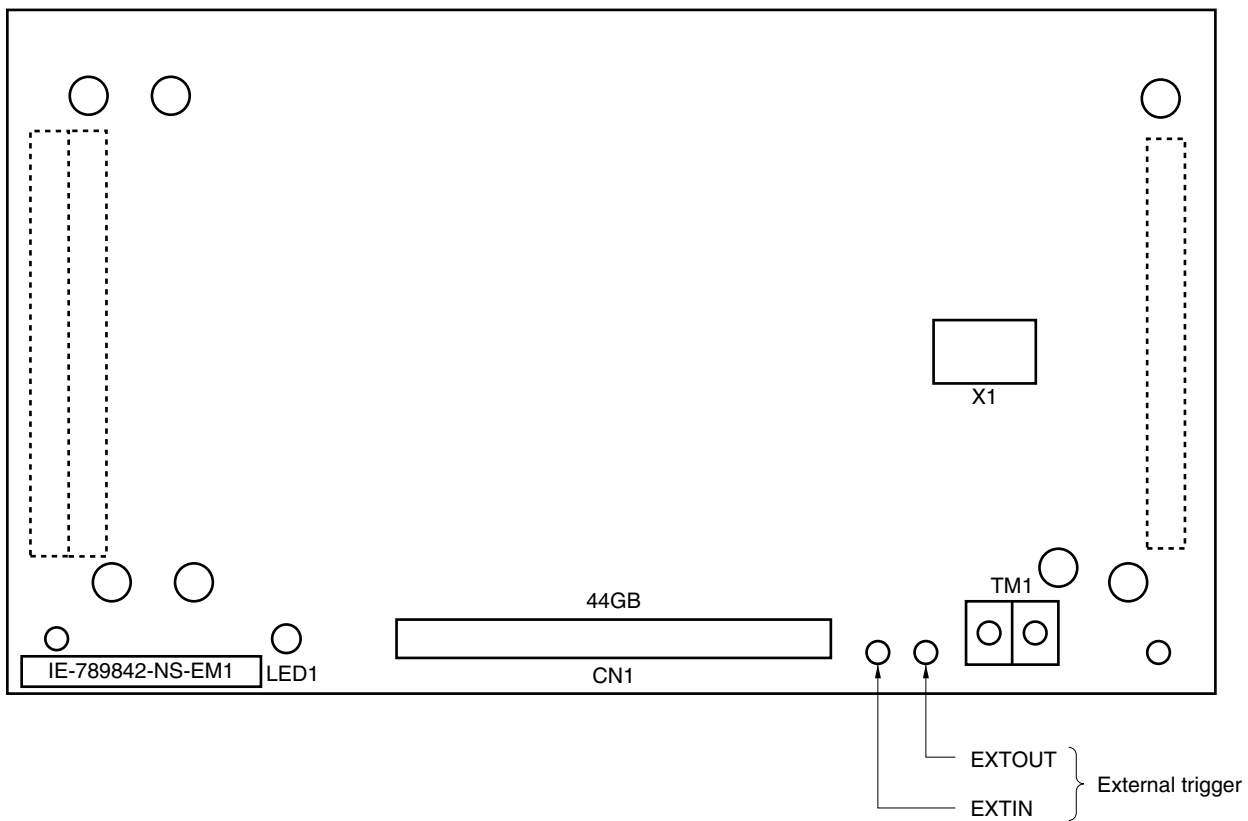
CHAPTER 4   DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT

This chapter describes differences between the target device's signal lines and the signal lines of the target interface circuit of the IE system.

The target interface circuit of the IE system realizes emulation via an emulation circuit configured by an emulation CPU, TTL, CMOS-IC, and other components. The electrical characteristics are different from those of the target device because a protector and other circuits are provided.

(1)   Signals input to or output from the emulation CPU
(2)   Signals input from the target system via a gate
(3)   Analog signals
(4)   Other signals

The IE-789842-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

The following signals perform the same operations as in the μPD789841, 789842, and 78F9842. However, a 1 MΩ 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 10-bit inverter control timer (TO70 to TO75)

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

Since the following signals are input via a gate, their timing shows a delay compared to the μPD789841, 789842, and 78F9842. Their AC characteristics and DC characteristics are therefore different from the μPD789841, 789842, and 78F9842 making it necessary to observe a stricter timing design than in the μPD789841, 789842, and 78F9842.

- $\overline{\text{RESET}}$ signal
- Signals related to clock input

From all the signals input from the target system, the $\overline{\text{RESET}}$ signal and signals related to clock input are input to the emulation CPU via a logic IC. The DC characteristics are therefore different from the μPD789841, 789842, and 78F9842.

(3) Analog signals

Because the following signals input/output analog signals, special processing is not performed in the IE-789842-NS-EM1.

- AV_{DD} pin
- Port 6

(4) Other signals

- V_{DD} pin

  When the emulation CPU is operating at 5 V, its power is supplied from the IE-789842-NS-EM1, but when operating at low voltage, its power is supplied from the low-voltage pin (TP1). The V_{DD} pin of the target system is only used to control the LED (TV$_{CC}$) in the IE-789842-NS-EM1 that monitors the input of the target system's power supply.

- V_{SS} and AV_{SS} pins

  The V_{SS} and AV_{SS} pins are connected to GND in the IE-789842-NS-EM1

- TEST/V_{PP} pin

  The TEST/V_{PP} pin is not used in the IE-789842-NS-EM1.

- X2 pin

  The X2 pin is not used in the IE-789842-NS-EM1.

Figure 4-1. Equivalent Circuit of Emulation Circuit
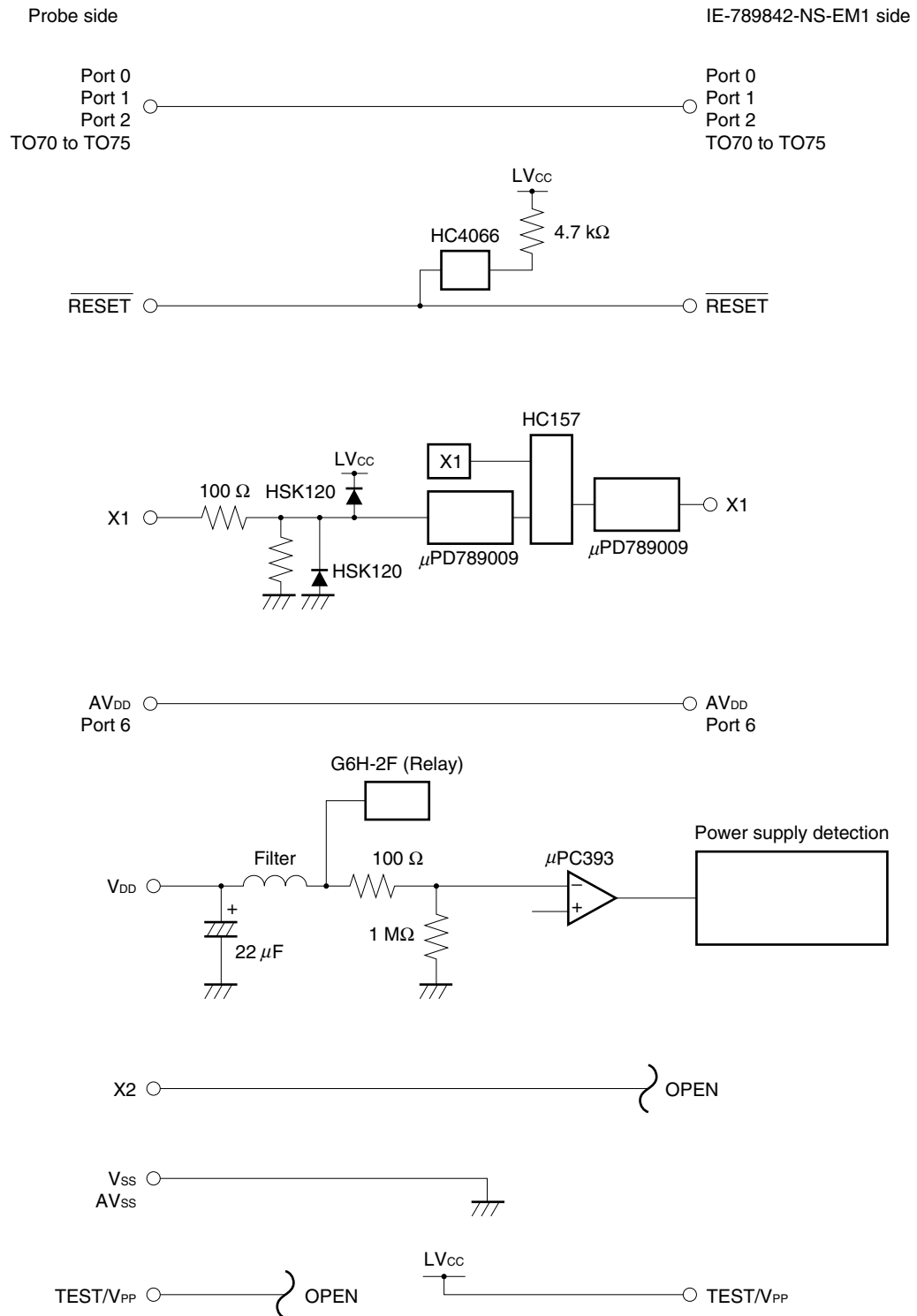
CHAPTER 5   CAUTIONS

This chapter describes points that require special attention when using the IE-789842-NS-EM1.
The target device and the emulation function of the IE-789842-NS-EM1 differ with regard to the following.

(1) Emulation of an RC oscillator is not possible with the IE-789842-NS-EM1.
Only those functions specified by the clock settings in **3.4 Clock Settings** can be emulated.

(2) Pin handling is not performed for the port pins on the emulation board. Consequently, an undefined value will be read out if an attempt is made to read the value of a port in input mode when an emulation probe is not connected.

(3) Emulation of the low voltage circuit (LVI) is possible with the IE-789842-NS-EM1.
Note, however, that the operation-guaranteed voltage is the same as that of the target device (4.0 to 5.5 V); that is, operation is not guaranteed if a voltage lower than this is applied.

APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

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

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. NP-44GB, NP-44GB-TQ, and NP-H44GB-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the "Emulation probe" column indicate the corresponding pin number on the emulation probe tip.
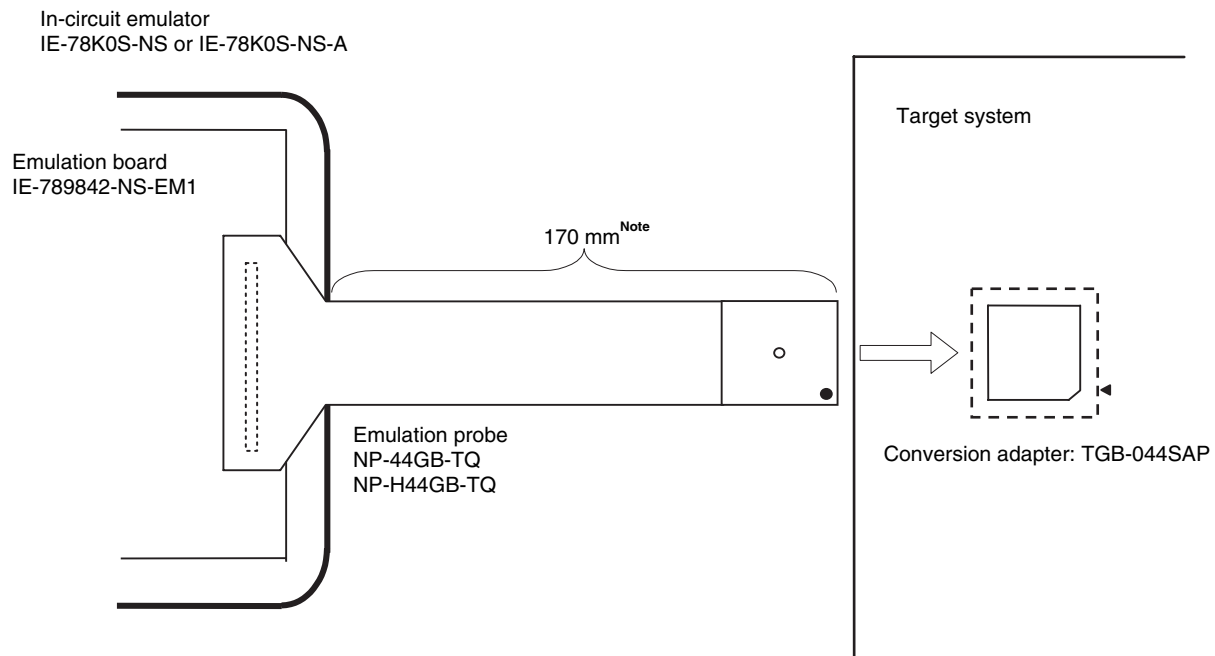
APPENDIX B NOTES ON DESIGNING TARGET SYSTEM

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

Among the products described in this appendix, NP-44GB-TQ and NP-H44GB-TQ are products of Naito Densei Machida Mfg. Co., Ltd. and TGB-044SAP is a product of TOKYO ELETECH CORPORATION.

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

Emulation Probe	Conversion Adapter	Distance Between IE System and Conversion Adapter
NP-44GB-TQ	TGB-044SAP	170 mm
NP-H44GB-TQ		370 mm

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

In-circuit emulator
IE-78K0S-NS or IE-78K0S-NS-A

Target system

Emulation board
IE-789842-NS-EM1

170 mm^{Note}

Emulation probe
NP-44GB-TQ
NP-H44GB-TQ

Conversion adapter: TGB-044SAP

Note The above distance shows when the NP-44GB-TQ is used. When the NP-H44GB-TQ is used, the distance is 370 mm.

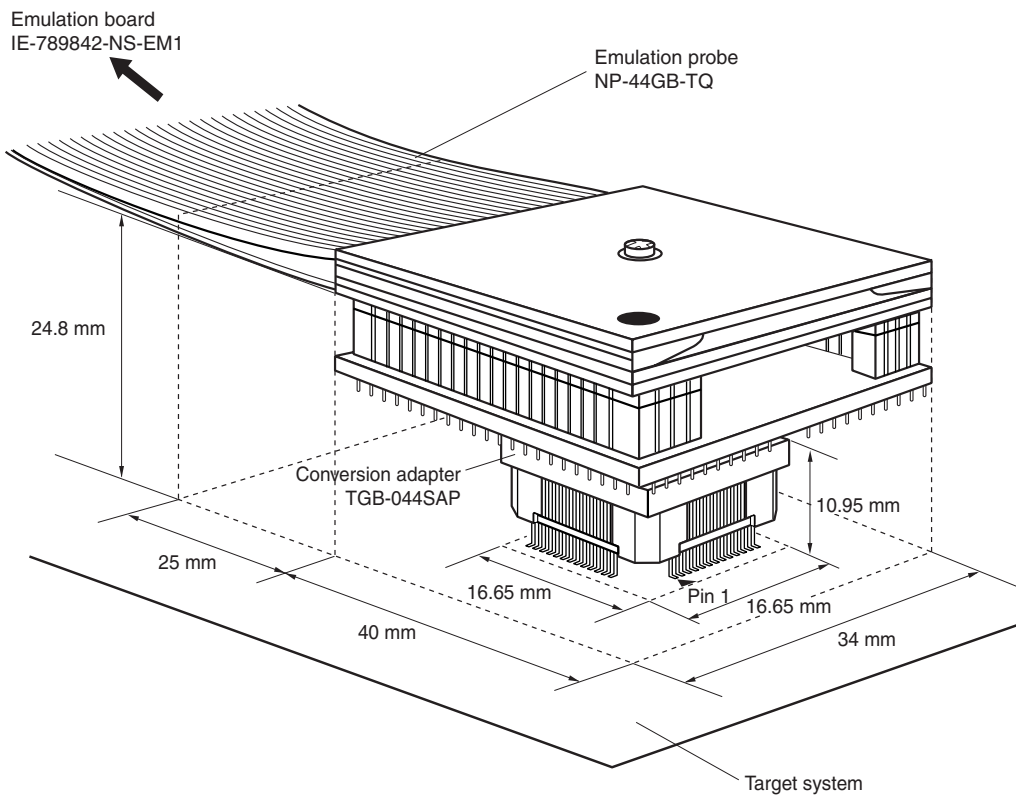**Figure B-2. Connection Conditions of Target System (NP-44GB-TQ)**

Figure B-3. Connection Conditions of Target System (NP-H44GB-TQ)