

**NEC**

**User's Manual**

# **IE-789862-NS-EM1**

**Emulation Board**

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**Target Devices**  
 **$\mu$ PD789862 Subseries**

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[MEMO]

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- 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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## INTRODUCTION

### Product Overview

The IE-789862-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.

- $\mu$ PD789862 Subseries:  $\mu$ PD789862,  $\mu$ PD78E9862

### Target Readers

This manual is intended for engineers who will use the IE-789862-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 usage methods and to be knowledgeable about debugging.

### Organization

When using the IE-789862-NS-EM1, refer to not only this manual (supplied with the IE-789862-NS-EM1) but also the manual that is supplied with the IE-78K0S-NS or IE78K0S-NS-A.

IE-78K0S-NS  
User's Manual

- Basic specifications
- System configuration
- External interface functions

IE-789862-NS-EM1  
User's Manual

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

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

- Basic specifications
- System configuration
- External interface functions

### Purpose

This manual is intended to give users an understanding of the various debugging functions that can be performed when using the IE-789862-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 (real chip) 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-78K0S-NS or IE-78K0S-NS-A) and the emulation board (IE-789862-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

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-78K0S-NS In-Circuit Emulator	U13549E
IE-78K0S-NS-A In-Circuit Emulator	U15207E
IE-789862-NS-EM1 Emulation Board	This manual
ID78K0S-NS Ver. 2.52 Integrated Debugger Operation	U16584E
μPD789862 Subseries	U15852E

**Caution** The related 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-789862-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-789862-NS-EM1's system configuration and basic specifications.

- Target devices
  - $\mu$ PD789862 Subseries

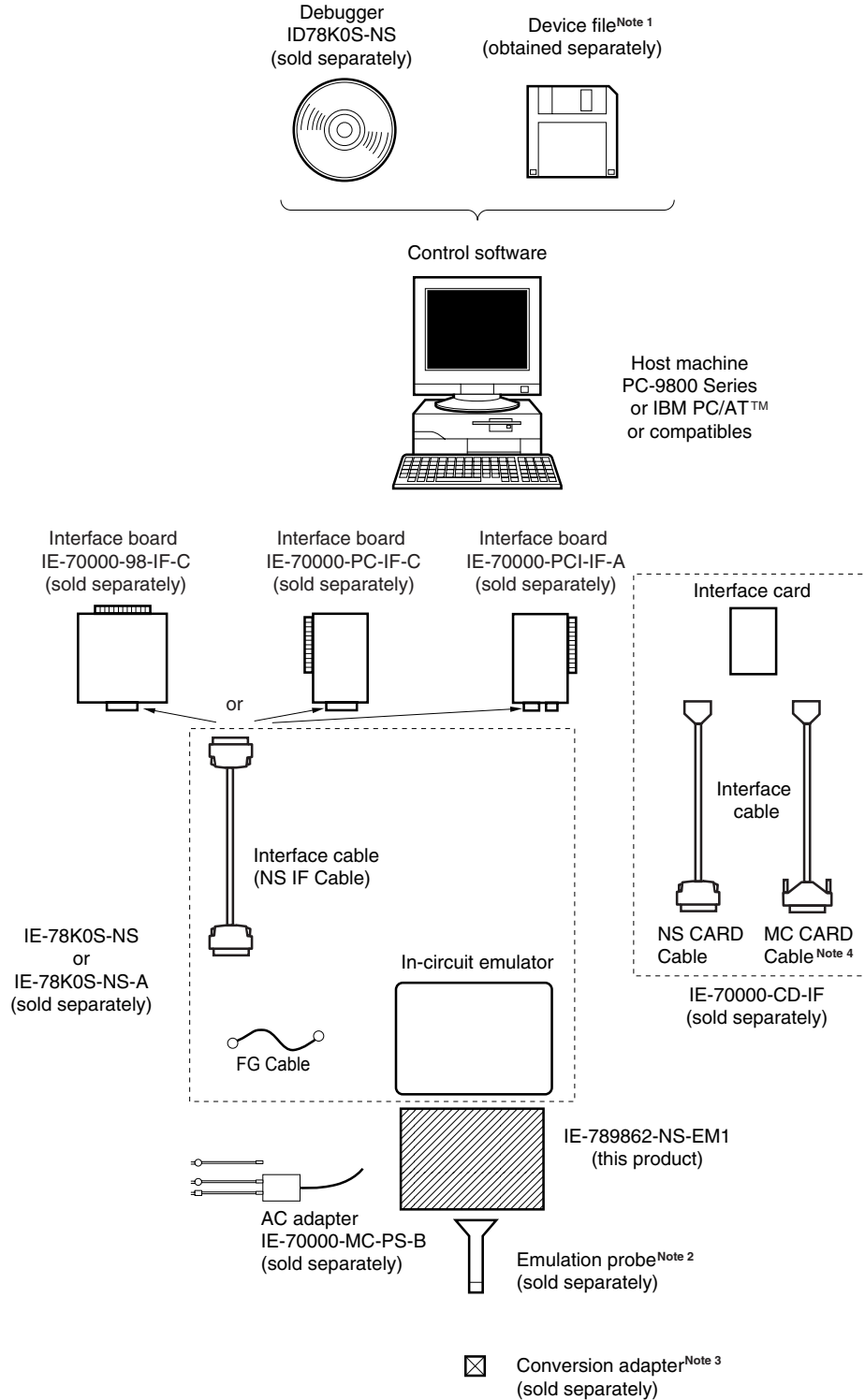


## 1.1 System Configuration

Figure 1-1 illustrates the IE-789862-NS-EM1's system configuration.

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**Figure 1-1. System Configuration**



**Notes** 1. The device file is as follows.

$\mu$ SxxxxDF789862:  $\mu$ PD789862 Subseries

The device file can be downloaded from the NEC Electronics website  
(URL: [http://www.necel.com/micro/index\\_e.html](http://www.necel.com/micro/index_e.html)).

2. The emulation probe NP-30MC is a product 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 NSPACK30BK, YSPACK30BK, and YSGUIDE are products of TOKYO ELETECH CORPORATION.

For further information, contact Daimaru Kogyo, Ltd.

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

Osaka Electronics Department (TEL: +81-6-6244-6672)

Table 1-1 shows the correspondence between the emulation probe and conversion adapters that are separately available.

**Table 1-1. Correspondence Between Emulation Probe and Conversion Adapters**

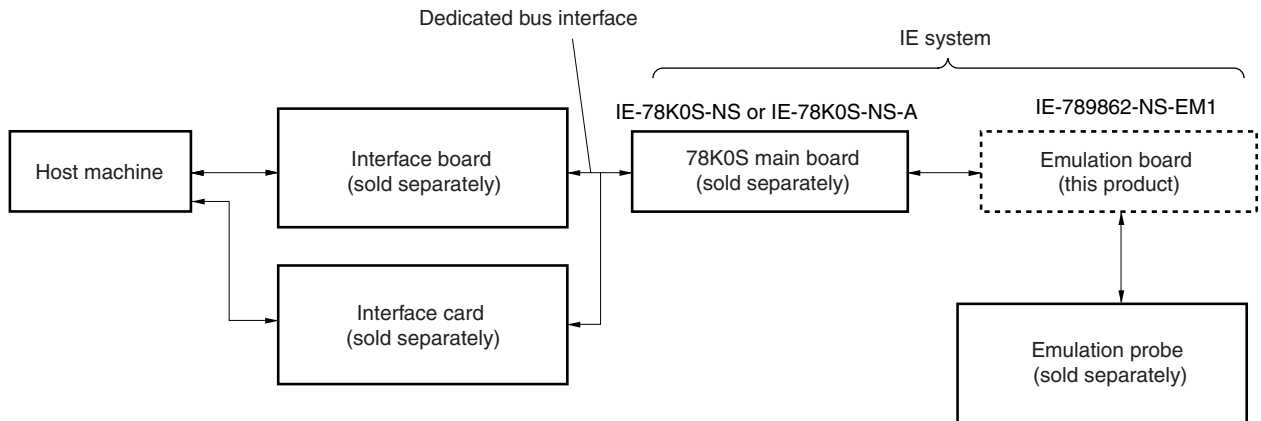
Package	Emulation Probe	Conversion Adapter
30-pin plastic SSOP (MC type)	NP-30MC (probe length: 200 mm)	NSPACK30BK YSPACK30BK YSGUIDE (screw for fixing NSPACK30BK and YSPACK30BK)

4. The MC CARD Cable is not used in this product.

## 1.2 Hardware Configuration

Figure 1-2 shows the IE-789862-NS-EM1's position in the basic hardware configuration.

**Figure 1-2. Basic Hardware Configuration**



### 1.3 Basic Specifications

The IE-789862-NS-EM1's basic specifications are listed in Table 1-2.

**Table 1-2. Basic Specifications**

Parameter	Description
Target device	$\mu$ PD789862 Subseries
System clock	1.0 MHz to 5.0 MHz
System clock supply	External: Pulse input from the target system via an emulation probe Internal: Clock mounted on emulation board (5 MHz), or clock mounted on parts board by user
Target interface voltage	$V_{DD} = 1.8$ to 5.5 V (same as the target device) Operates with internal power supply (5 V) when not connected to the target system.

## CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-789862-NS-EM1 main unit.

The packing box contains the emulation board (IE-789862-NS-EM1) packing list, user's manual, and guarantee card.

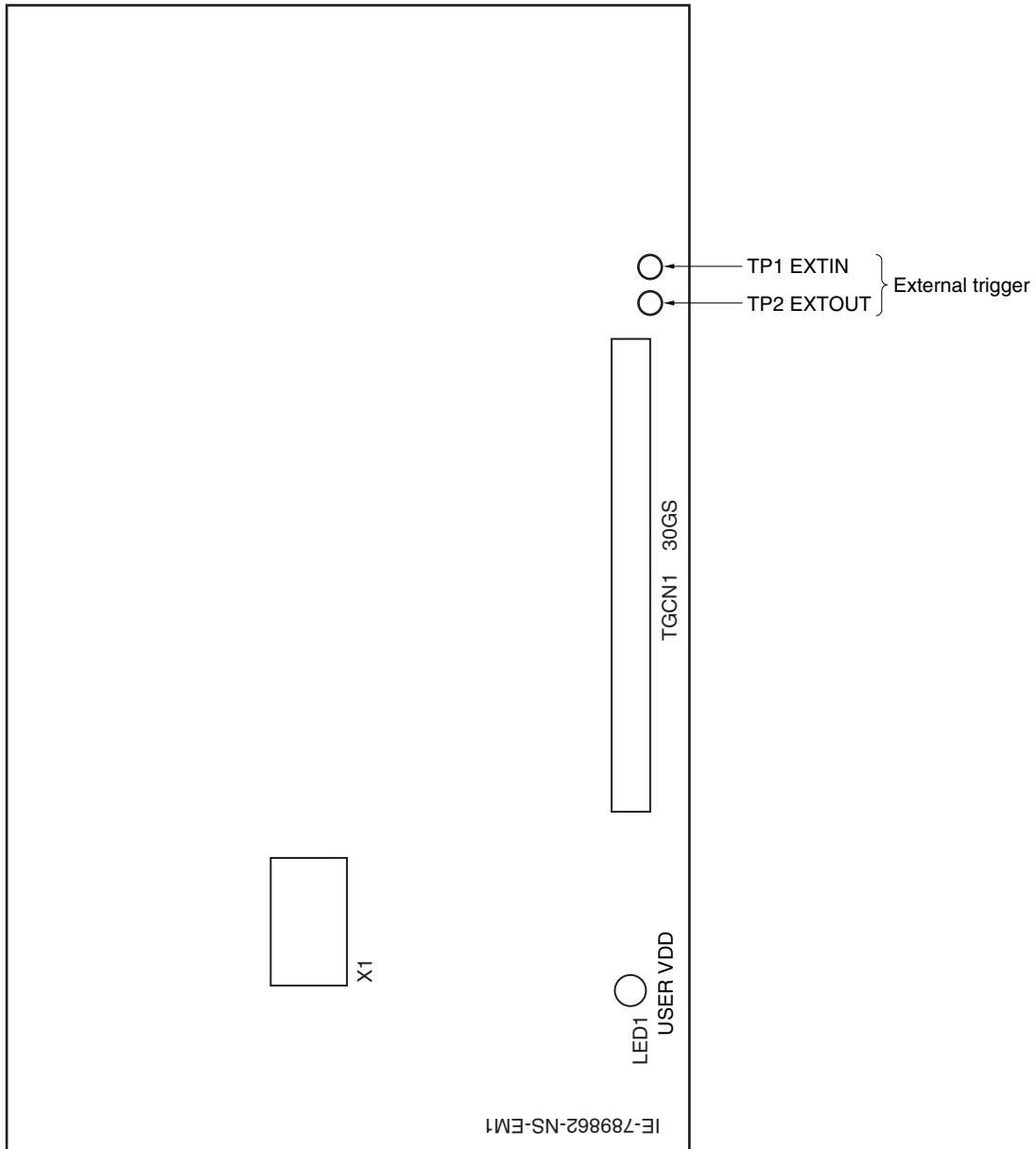
If there are any missing or damaged items, please contact an NEC Electronics sales representative.

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-789862-NS-EM1.

Figure 2-1. IE-789862-NS-EM1 Part Names



## 2.2 Initial Settings of Switch and Jumper

Switches and jumpers requiring manual switching are not provided on the IE-789862-NS-EM1.

## CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-789862-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-789862-NS-EM1 to the IE-78K0S-NS or IE-78K0S-NS-A<sup>Note</sup>.

**Note** When using the IE-78K0S-NS-A, refer to 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-789862-NS-EM1<sup>Note</sup>.

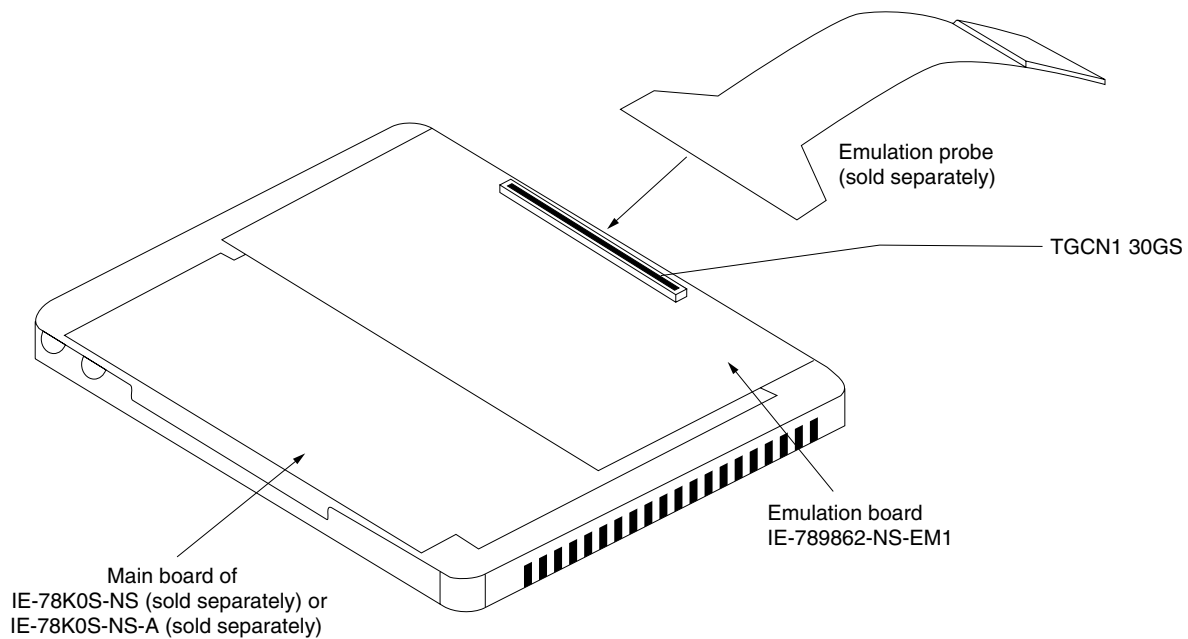
On this board, connect the emulation probe to TGCN1.

**Note** When using the IE-78K0S-NS-A, refer to 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**





### 3.2 Switch and Jumper Settings on Main Unit

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

When using the IE-789862-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)**.

**Caution** Incorrect connection may damage the IE-789862-NS-EM1.

**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

#### (2) Settings on the IE-78K0S-NS-A

When using the IE-789862-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)**.

**Caution** Incorrect connection may damage the IE-789862-NS-EM1.

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

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

### 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, the same voltage as that of the target system is supplied to the IE-789862-NS-EM1 from the V<sub>DD</sub> pin and the supplied voltage is used as a reference voltage for the target interface power supply generation.

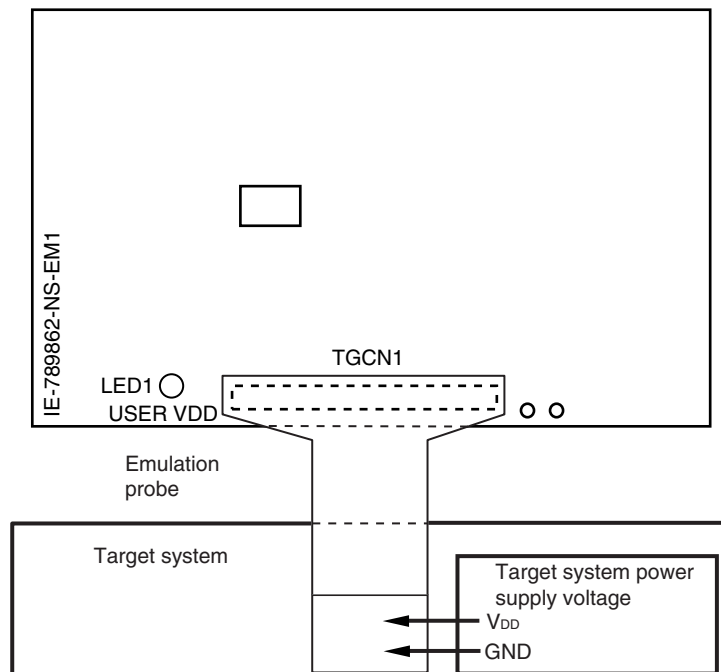
Set the target voltage to between 1.8 and 5.5 V. For how to select the operating power supply, refer to the **ID78K0S-NS Ver. 2.52 Integrated Debugger Operation User's Manual (U16584E)**.

- Maximum current consumption of V<sub>DD</sub>  
1.8 to 5.5 V: 20 mA

**Table 3-3. Setting Power Supply of Target Interface**

Power Supply of Target Interface (LVcc)		Integrated Debugger (ID78K0S-NS)
		Operating Power Supply Selection
When connecting target system	1.8 to 5.5 V	Target
When not connecting target system	5 V	Internal

**Figure 3-2. Connecting Target System Power Supply Voltage**



**Caution** Before connecting and disconnecting the target system, turn off the power to the IE-78K0S-NS or IE system and target system.

## 3.4 Clock Settings

### 3.4.1 Overview of clock settings

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

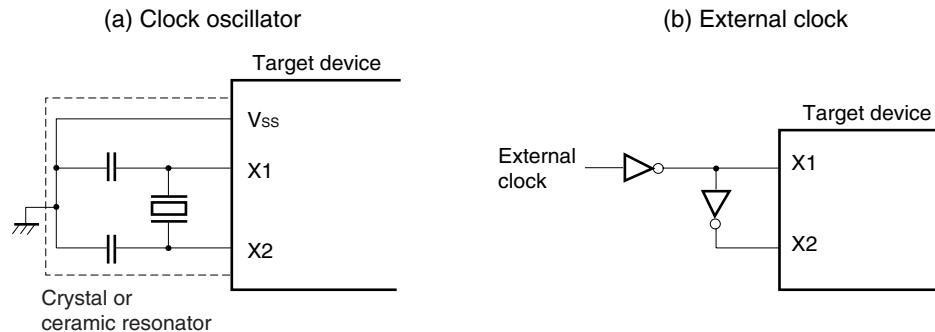
- (1) Clock that is already mounted on emulation board
- (2) Clock that is mounted by user
- (3) Pulse input from target system

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 a clock oscillator, the target device is connected to a resonator 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 an 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 hang up if the system clock is not supplied normally. Moreover, be sure to input a rectangular wave as the pulse from the target system. However, it is not necessary to supply a clock to the X2 pin. The IE system does not operate if the crystal resonator or ceramic resonator is directly connected to the X1 pin.

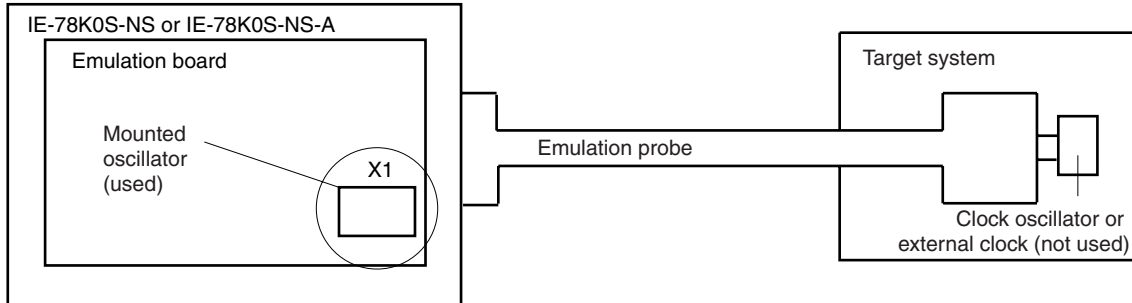
Figure 3-3. External Circuits Used as System Clock Oscillator



**(1) Clock that is already mounted on emulation board**

The oscillator mounted on the IE-789862-NS-EM1 can be used. A crystal oscillator is already mounted in the socket of X1 on the emulation board. Its frequency is 5 MHz.

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

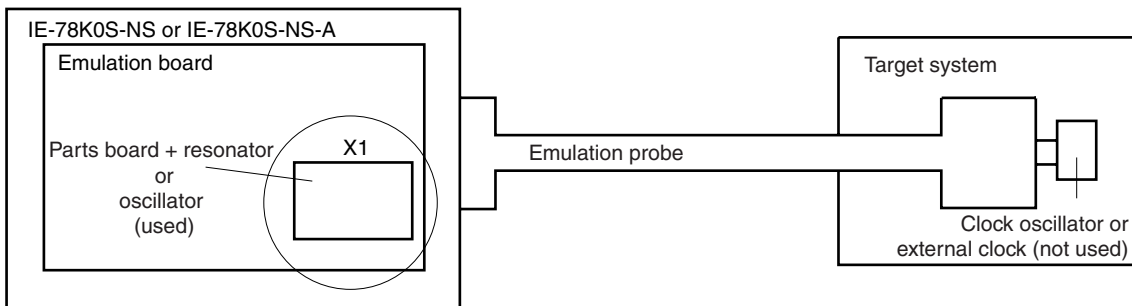


**Remark** The clock that is supplied by the IE-789862-NS-EM1's oscillator (encircled in the figure) is used.

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

The user is able to mount any clock supported by the set specifications on the IE-789862-NS-EM1. This method is useful when using a different frequency from that of the pre-mounted clock. Remove the crystal resonator (X1) mounted on the emulation board and mount the resonator to be used.

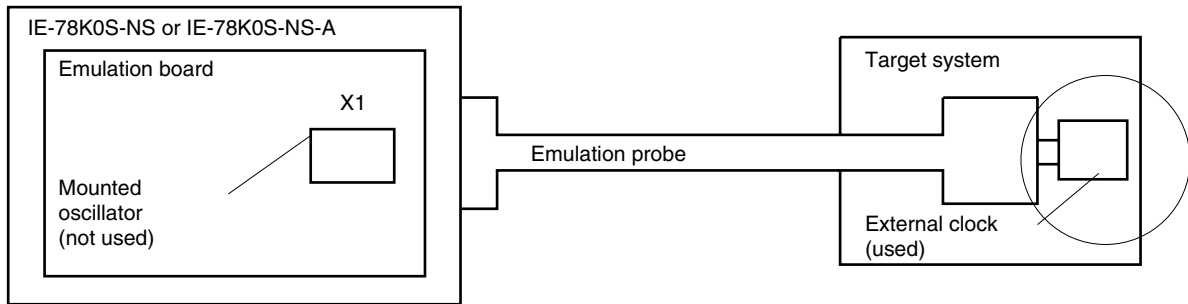
**Figure 3-5. When Using User-Mounted Clock**



**Remark** The clock that is supplied by the parts board with the IE-789862-NS-EM1's resonator (encircled in the figure) or the oscillator is used.

**(3) Pulse input from target system**

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

**Figure 3-6. When Supplying Pulse from Target System**

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

### 3.4.2 System clock settings

Table 3-4 shows the system clock settings of the IE-789862-NS-EM1.

**Table 3-4. System Clock Settings**

Frequency of System Clock		IE-789862-NS-EM1	ID78K0S-NS
		Socket (X1)	CPU Clock Source Selection
(1) When using clock that is already mounted on emulation board	5.0 MHz	Oscillator used	Internal
(2) When using clock mounted by user	Other than 5.0 MHz	Oscillator assembled by user	
(3) When pulse is input from target system			Oscillator not used

**Caution** When using an external clock, open the configuration dialog box when starting the integrated debugger (ID78K0S-NS) and select “External” in the area (Clock) for selecting the CPU clock source (this selects the user’s clock). Emulation using the RC oscillator is not possible.

**Remark** The IE-789862-NS-EM1’s factory settings 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-789862-NS-EM1 is shipped, a 5.0 MHz crystal oscillator is already mounted in the socket (X1) on the IE-789862-NS-EM1. If the IE-789862-NS-EM1 is in the same state as when shipped, no hardware settings are required.

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

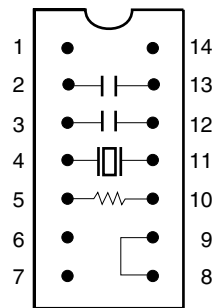
- Parts board
- Ceramic resonator or crystal resonator
- Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<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**

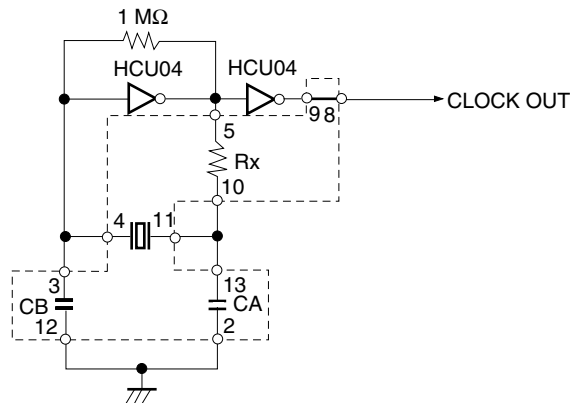
Parts board (X1)



(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



**Remarks 1.** The sections enclosed in broken lines indicate parts that are attached to the parts board.

★

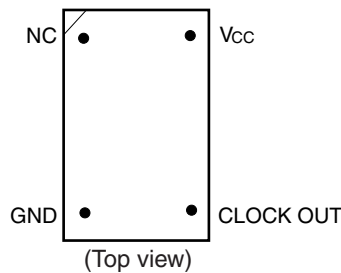
- 2. Refer to the data sheet of the resonator used (data sheet provided by the manufacturer) for the resistance of Rx and capacitance of CA and CB.

- <2> Prepare the IE-789862-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-789862-NS-EM1's socket (the socket marked as X1).
- <4> Connect the parts board (from <1> above) to the socket (X1) 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-789862-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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

- Items to be prepared
- ★ ● Crystal oscillator (see pinouts shown in Figure 3-8, +5 V power supply voltage, and CMOS-level output level)

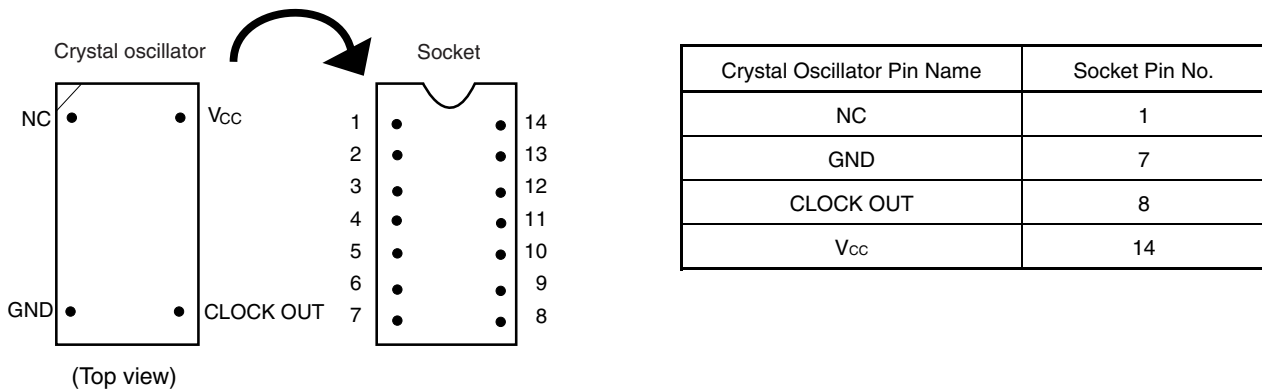
**Figure 3-8. Crystal Oscillator (When Using User-Mounted Clock)**



<Steps>

- <1> Prepare the IE-789862-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-789862-NS-EM1's socket (the socket marked as X1).
- <3> Connect a crystal oscillator to the socket (X1) from which the crystal oscillator for external clock 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-789862-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.



**(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).

**3.5 Mask Option Settings**

The IE-789862-NS-EM1 features a “POC switching circuit” that performs POC control of the power-on-clear functions by software. Turn on/off this function via an SFR. When emulating the detection voltage of the low voltage detection circuit and power-on-clear circuit, the power supply change and noise may effect the results. The detection voltage must be confirmed with EEPROM products.

### 3.6 External Trigger

To set up an external trigger, connect it to the IE-789862-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, and the **ID78K0S-NS Ver. 2.52 Integrated Debugger Operation User's Manual (U16584E)** for usage methods.

#### (1) EXTOUT

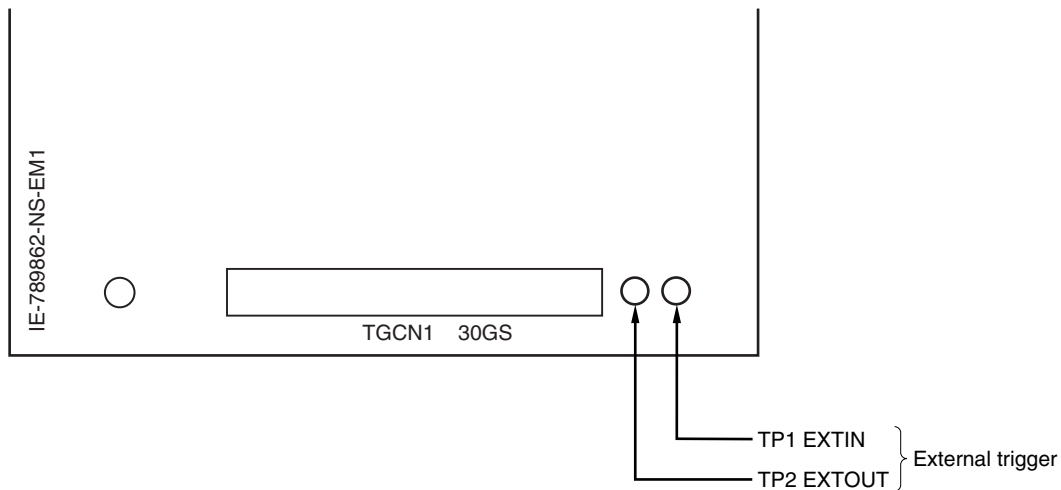
Output a low level from the EXTOUT pin on the IE-789862-NS-EM1 for 1.3  $\mu$ s upon the occurrence of a break event.

**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-789862-NS-EM1. Input a high-level pulse signal of 2 CPU operation clocks or more for the event signal.

**Figure 3-10. External Trigger Input Position**



★ **CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT**

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

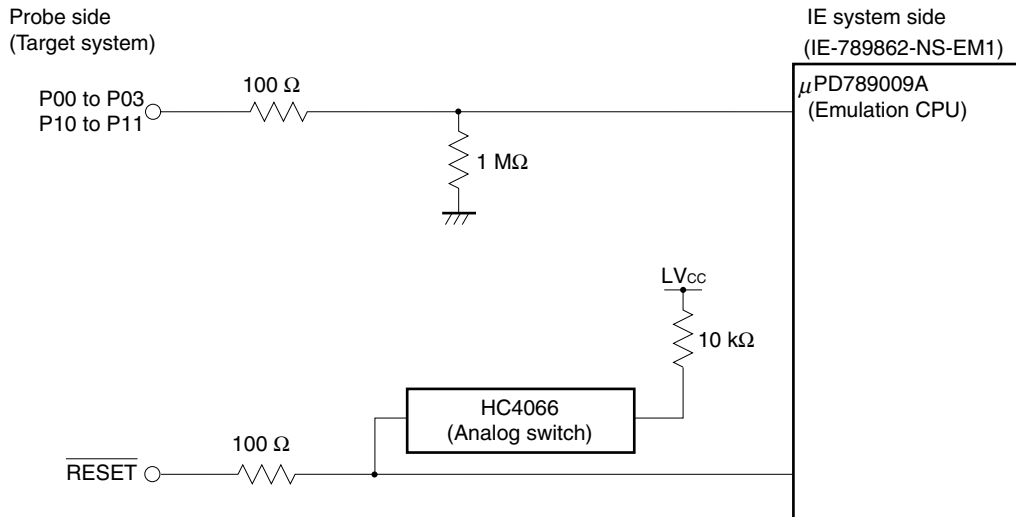
The target interface circuit of the IE system realizes emulation via an emulation circuit configured by an emulation CPU, TTL, CMOS-IC, and other components. The electrical characteristics are different from those of the target device because a protector and other circuits are provided.

- (1) Signals input to or output from the emulation CPU ( $\mu$ PD789009A)**
- (2) Signals input to or output from the pin emulator ( $\mu$ PD7880)**
- (3) Signals input to or output from the pin emulator ( $\mu$ PD7883)**
- (4) Other signals**

The circuits of the IE-789862-NS-EM1 are used as follows for signals listed in (1) to (4) above. The same applies to handling alternate-function pins, for which no circuit is provided in the IE system.

**(1) Signals input to or output from the emulation CPU ( $\mu$ PD789009A)**Refer to **Figure 4-1 Emulation Circuit Equivalent Circuit 1**.

- Signals related to port 0 (P00 to P03)
- Signals related to port 1 (P10 to P11)
- $\overline{\text{RESET}}$

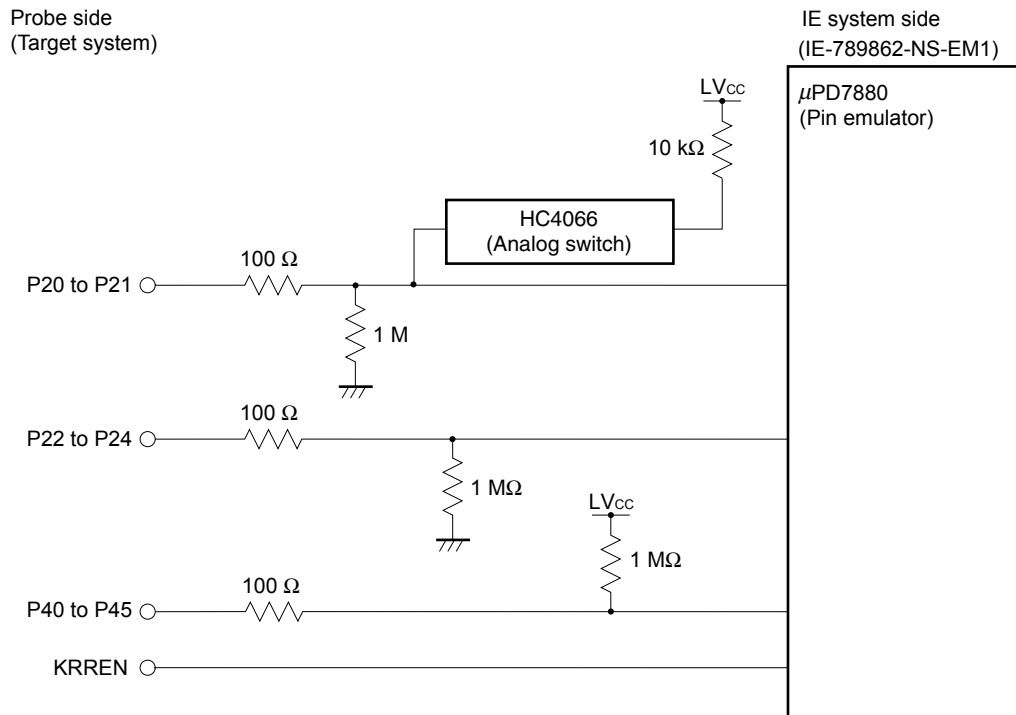
**Figure 4-1. Emulation Circuit Equivalent Circuit 1**

**(2) Signals input to or output from the pin emulator ( $\mu$ PD7880)**

Refer to **Figure 4-2 Emulation Circuit Equivalent Circuit 2**.

- Signals related to port 2 (P20 to P24)
- Signals related to port 4 (P40 to P45)
- KRREN

**Figure 4-2. Emulation Circuit Equivalent Circuit 2**

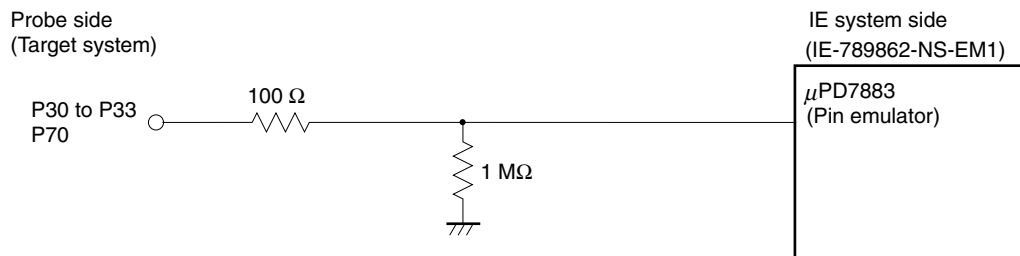


**(3) Signals input to or output from the pin emulator ( $\mu$ PD7883)**

Refer to **Figure 4-3 Emulation Circuit Equivalent Circuit 3**.

- Signals related to port 3 (P30 to P33)
- Signals related to port 7 (P70)

**Figure 4-3. Emulation Circuit Equivalent Circuit 3**

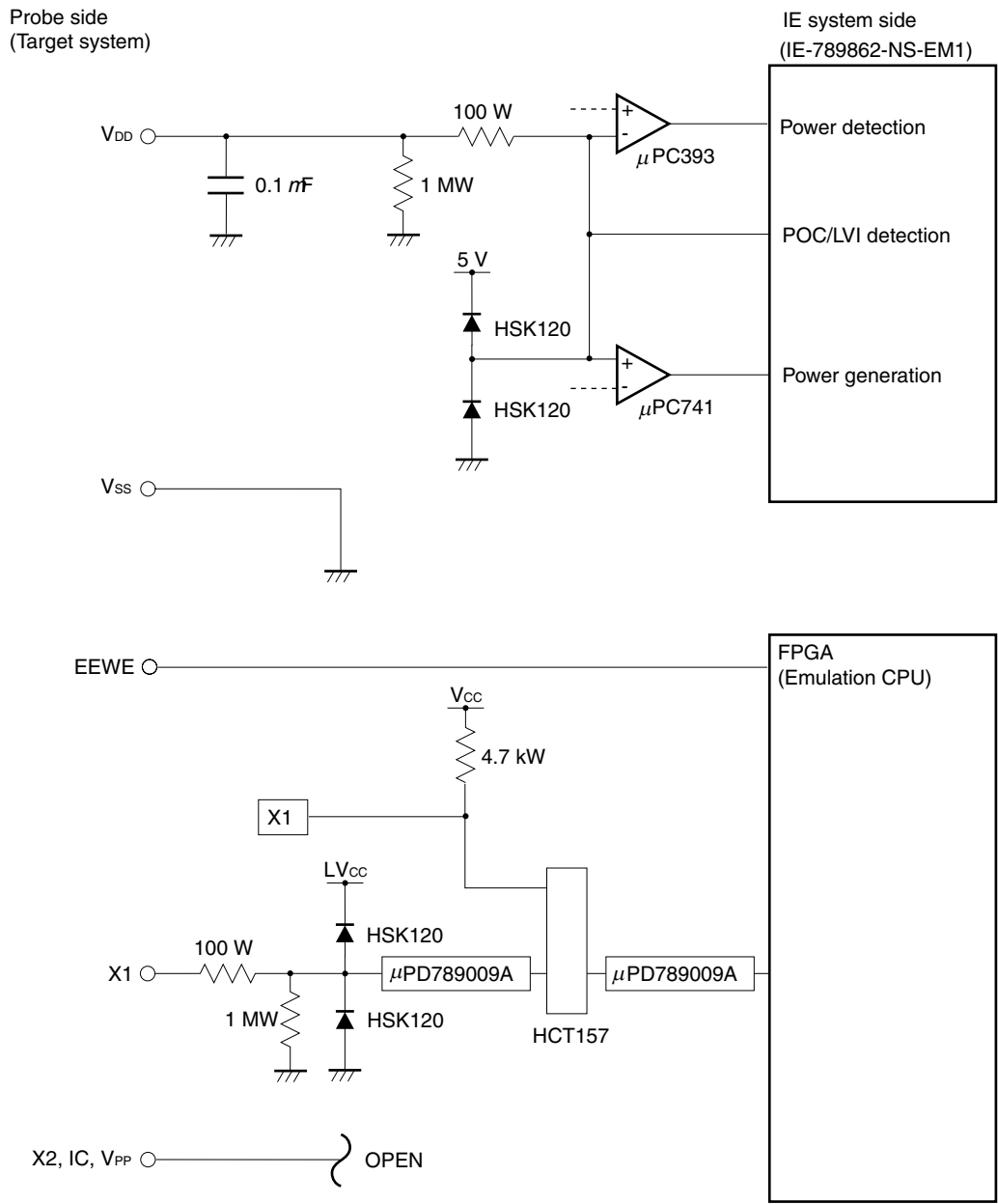


(4) Other signals

Refer to **Figure 4-4 Emulation Circuit Equivalent Circuit 4**.

- VDD (target voltage input from the probe)
- VSS
- EEWE
- X1
- X2
- IC
- VPP

**Figure 4-4. Emulation Circuit Equivalent Circuit 4**



## CHAPTER 5 CAUTIONS

This chapter describes the differences between the target device and the IE system specifications. The emulation circuit of the IE system realizes emulation by configuring an emulation CPU, TTL, CMOS-IC, and other components. Therefore, there are differences between the target device and IE system specifications.

- (1) Emulating the detection voltage of the lower voltage detection circuit and power-on clear circuit in the IE-789862-NS-EM1 may be affected by power supply change and noise. Confirm the detection voltage with EEPROM products.
- (2) When a program that tries to perform illegal access to EEPROM is executed in the IE-789862-NS-EM1, an error message appears and the program breaks. The following shows the EEPROM illegal access conditions and the error message to be displayed.

**Table 5-1. Illegal Access Conditions**

Error Message: Unspecified illegal	
EEPROM illegal access conditions	
1	Write instruction to EEPROM is executed when EWE10 = 0
2	Write instruction to EEPROM is executed while the clock (8-bit timer 80) selected in the EEPROM is stopped
3	Write instruction to EEPROM is executed while writing to EEPROM
4	Read instruction from EEPROM is executed while writing to EEPROM
5	Instruction fetch is executed from EEPROM while writing to EEPROM
6	EWE10 is changed to 0 while writing to EEPROM
7	ERE10 is changed to 0 while writing to EEPROM
8	The main clock is stopped (STOP instruction is executed) while writing to EEPROM
9	Count clock selection of write time setting timer is changed while writing to EEPROM
10	RESET signal is input while writing to EEPROM
11	Instruction fetch from EEPROM is performed when EWE10 = 1
12	Writing to EEPROM area 2 is performed when EEWE pin is at low level
13	Read instruction from EEPROM is executed when ERE10 = 0
14	Writing to EEPROM is performed when EWST = 1

- (3) A 1 MΩ pull-up resistor is connected to each signal related to port 4 in the IE-789862-NS-EM1. The initial value of port 4 is read as 3FH in the following environment.
  - a) The target system is not connected
  - b) All the P4 pins are open in the target system
- (4) The POCOF bit (bit 2) of the power-on clear register (POCOF) is set to 1 when the emulator is started up in the IE-789862-NS-EM1. Therefore, clear the POCOF bit (bit 2) to 0 in the startup routine.
- (5) Even if the writing time to EEPROM is set outside a range of 3.3 to 6.6 ms, no error occurs in the IE-789862-NS-EM1.

(6) Set ERE10 and EWE10 as follows when writing to EEPROM.

<1> Set ERE10 = 1.

<2> Set EWE10 = 1.

<3> Make the wait period 1 ms or longer by software.

<4> Shift to the EEPROM writing state.

If the wait period is shorter than 1 ms in step <3>, no error occurs in the IE-789862-NS-EM1.



## APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. Emulation Probe Pin Assignments

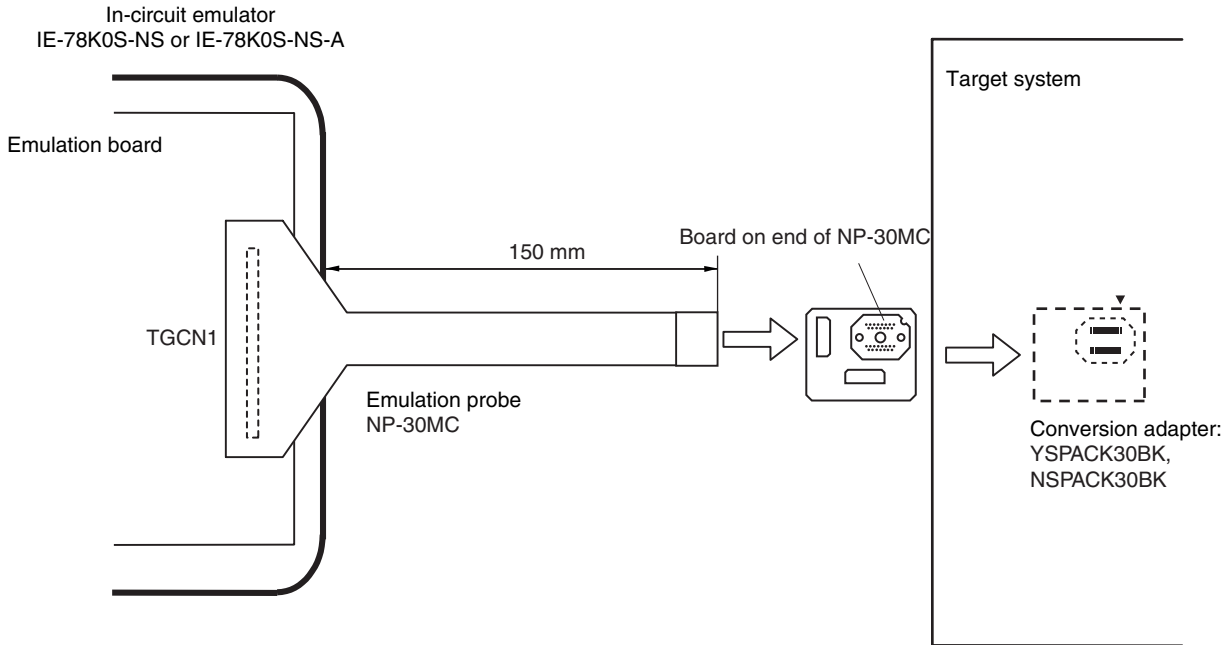
Emulation Probe	CN1 Pin No.	Emulation Probe	CN1 Pin No.
1	58	16	99
2	56	17	63
3	49	18	64
4	55	19	70
5	19	20	69
6	18	21	72
7	22	22	102
8	62	23	71
9	65	24	94
10	66	25	93
11	92	26	30
12	91	27	29
13	98	28	24
14	97	29	23
15	21	30	20

- Remarks**
1. The NP-30MC is a product 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.

## APPENDIX B NOTES ON TARGET SYSTEM DESIGN

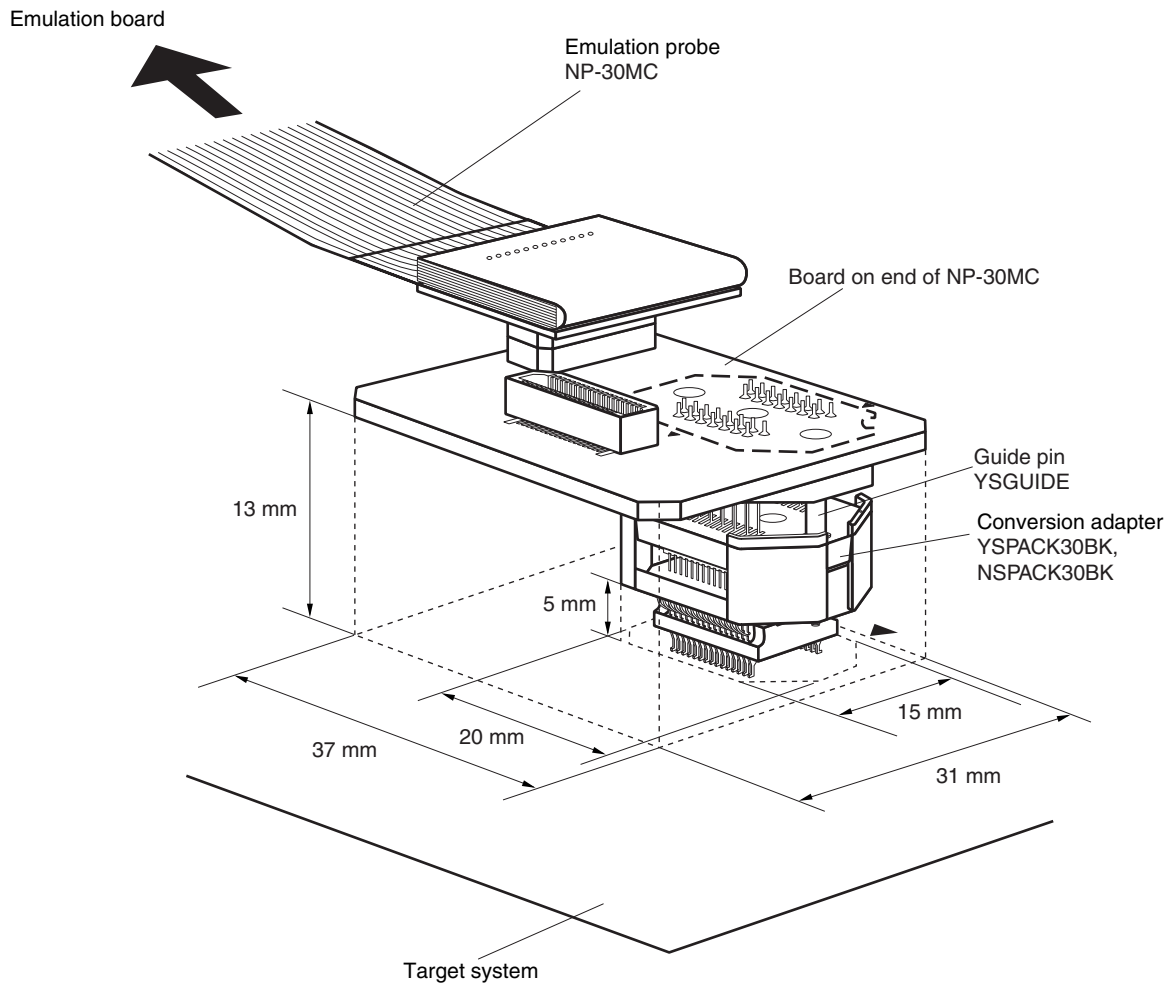
The following show the conditions when connecting the emulation probe to the conversion adapter. Follow the configuration below and consider the shape of parts to be mounted on the target system when designing a system.

**Figure B-1. Distance Between In-Circuit Emulator and Conversion Adapter**



- Remarks**
1. The NP-30MC product of Naito Densai Machida Mfg. Co., Ltd.
  2. The YSPACK30BK and NSPACK30BK are products of TOKYO ELETECH CORPORATION.

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



- Remarks**
1. NP-30MC is a product of Naito Densai Machida Mfg. Co., Ltd.
  2. YSPACK30BK, NSPACK30BK, and YSGUIDE are products of TOKYO ELETECH CORPORATION.

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## APPENDIX C REVISION HISTORY

The following table shows the revision history up to this edition. The “Applied to:” column indicates the chapters of each edition in which the revision was applied.

Edition	Major Revision from Previous Edition	Applied to:
2nd	Change from YQPACK to YSPACK	Throughout
	Modification of <b>Figure 1-1 System Configuration</b>	<b>CHAPTER 1 INTRODUCTION</b>
	Addition of <b>Remark 2 to 3.4.2 (2) (a)</b>	<b>CHAPTER 3 INSTALLATION</b>
	Addition of description to <b>3.4.2 (2) (b)</b>	
	Change of <b>CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT</b>	<b>CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT</b>
Change of <b>CHAPTER 5 CAUTIONS</b>	<b>CHAPTER 5 CAUTIONS</b>	