

CUSTOMER NOTIFICATION

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IE-789088-NS-EM1

Preliminary User's Manual

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INTRODUCTION

Product Overview

The IE-789088-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 78K0S Series of 8-bit single-chip microcontrollers.

- μ PD789088 Subseries: μ PD78F9088, 789088, 789086

Target Readers

This manual is intended for engineers who will use the IE-789088-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-789088-NS-EM1, refer to not only this manual (supplied with the IE-789088-NS-EM1) but also the manual that is supplied with the IE-78K0S-NS or IE-78K0S-NS-A.

Manual Name	IE-78K0S-NS User's Manual	IE-78K0S-NS-A User's Manual	IE-789088-NS-EM1 User's Manual
Contents	<ul style="list-style-type: none">• Basic specifications• System configuration• External interface functions	<ul style="list-style-type: none">• Basic specifications• System configuration• External interface functions	<ul style="list-style-type: none">• 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-789088-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 (a 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 IE-78K0S-NS or IE-78K0S-NS-A and the IE-789088-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

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CHAPTER 1 GENERAL

The IE-789088-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 78K0S Series of 8-bit single-chip microcontrollers.

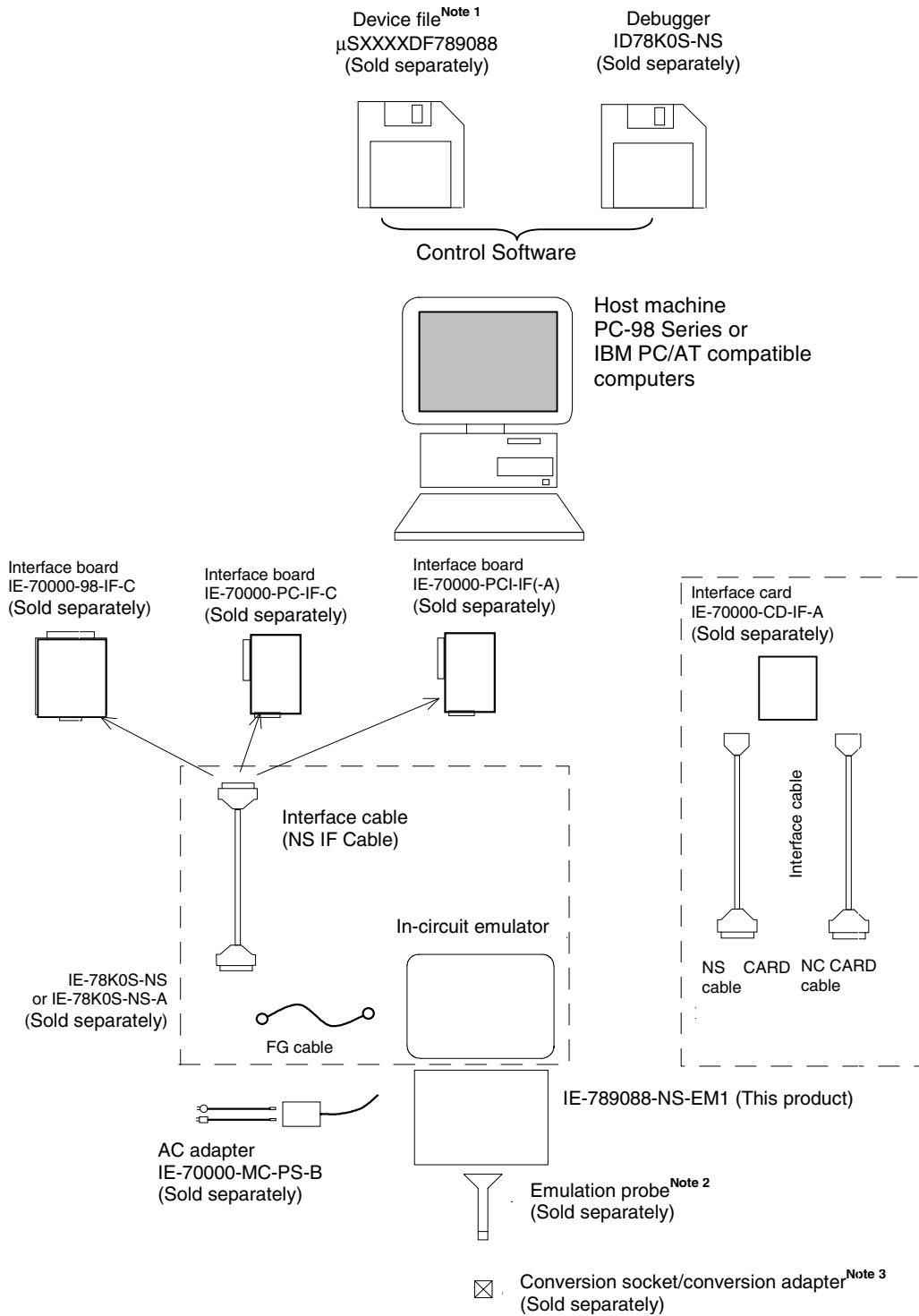
This chapter describes the IE-789088-NS-EM1 system configuration and basic specifications.

- Target device
 - μ PD789088 Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-789088-NS-EM1 system configuration.

Figure 1-1. System Configuration



Notes 1. The device file is as follows.

μSXXXXDF789088: μPD789088 Subseries

2. The emulation probe is as follows.

NP-H36GS: 30-pin plastic SSOP (probe length: 400 mm)

NP-36GS: 30-pin plastic SSOP (probe length: 200 mm)

NP-H36GS and NP-36GS are products of Naito Densei Machida Mfg. Co., Ltd.

Contact: Naito Densei Machida Mfg. Co., Ltd. (TEL: 044-822-3813)

3. The conversion socket and conversion adapter are as follows.

NGS-30: 30-pin plastic SSOP

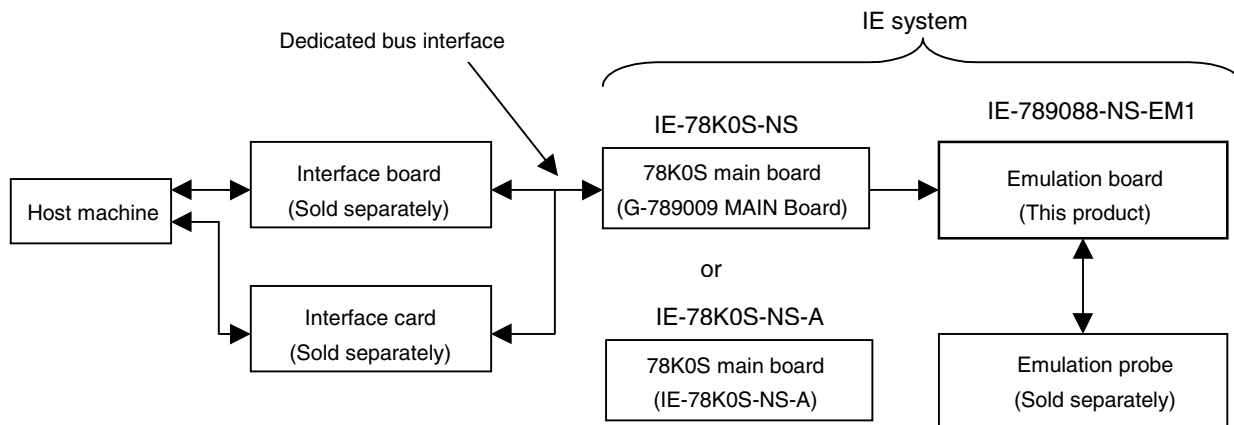
NGS-30 is a product of Naito Densei Machida Mfg. Co., Ltd.

Contact: Naito Densei Machida Mfg. Co., Ltd. (TEL: 044-822-3813)

1.2 Hardware Configuration

Figure 1-2 shows the IE-789088-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The IE-789088-NS-EM1's basic specifications are listed in Table 1-1.

Table 1-1. Basic Specifications

Parameter	Description
Target device	μ PD789088 Subseries
System clock	Main system clock: 1.000 to 5.000 MHz
Clock supply	Internal: Mounted on the emulation board (5.000 MHz) or mounted by user on the parts board External: Pulse input from the target system via an emulation probe
Target interface voltage	VDD = 1.8 V to 5.5 V: Same as the target device When target system not connected: Operates @ 5 V internal voltage

CHAPTER 2 COMPONENT NAMES

This chapter introduces the parts of the IE-789088-NS-EM1 main unit.

The packing box contains the emulation board (IE-789088-NS-EM1), package details, user's manual, and guarantee card.

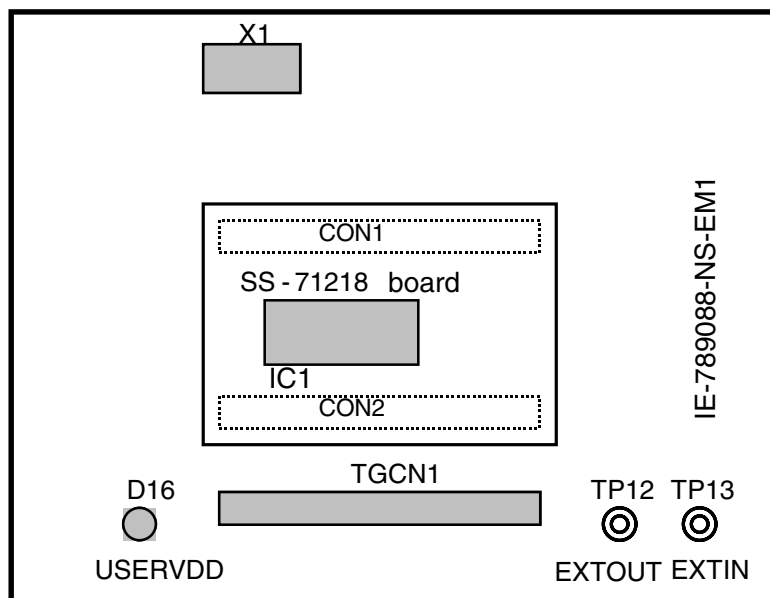
If there are any missing or damaged items, please contact an NEC sales representative.

Fill out and return the guarantee card that comes with the main unit.

2.1 Names of Components

Figure 2-1 shows the names of the IE-789088-NS-EM1 components.

Figure 2-1. Names of IE-789088-NS-EM1 Components



Caution Use the SS-71218 board mounted as is.

2.2 Initial Settings of Switches and Jumpers

It is not necessary to set switches and jumpers.

CHAPTER 3 INSTALLATION

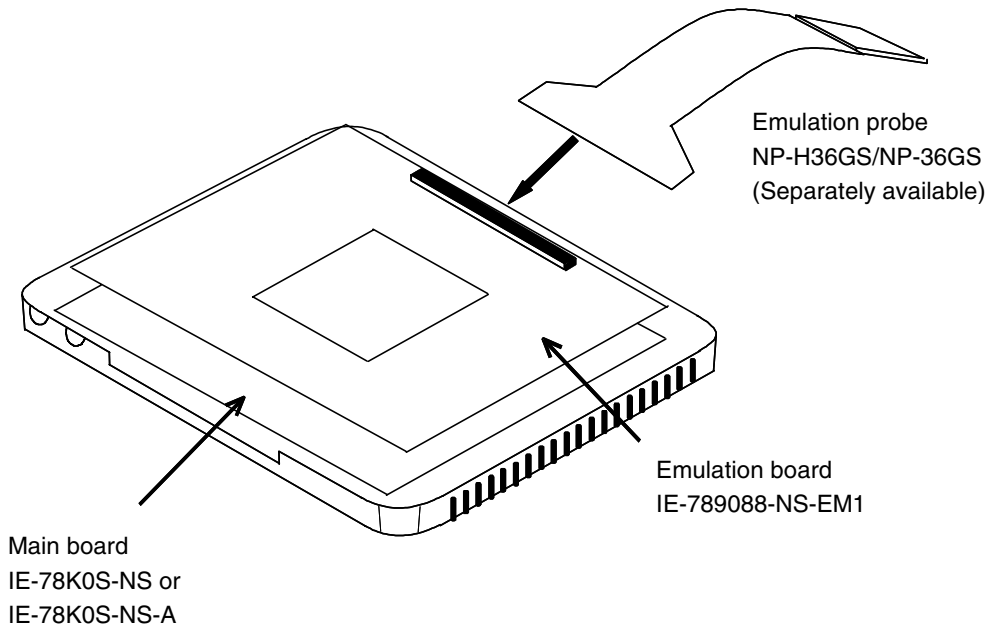
This chapter describes methods for connecting the IE-789088-NS-EM1 to the IE-78K0S-NS or IE-78K0S-NS-A and emulation probe. Mode setting methods are also described.

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

A connection diagram of the emulation probe and the main board is shown in Figure 3-1.

Figure 3-1. Mounting of Emulation Probe



(1) Connection with IE-78K0S-NS or IE-78K0S-NS-A main unit

See the IE-78K0S-NS or IE-78K0S-NS-A User's Manual for a description of how to connect the IE-789088-NS-EM1 to the IE-78K0S-NS or IE-78K0S-NS-A.

(2) Connection with emulation probe

See the IE-78K0S-NS or IE-78K0S-NS-A User's Manual for a description of how to connect an emulation probe to the IE-789088-NS-EM1.

On this board, connect the emulation probe to TGCN1.

Caution Incorrect connection may damage the IE system. For more details on connection, see the user's manual for each emulation probe.

3.2 Settings of Switches and Jumpers

(1) Setting of IE-78K0S-NS

Before using the IE-789088-NS-EM1, set each jumper and switch as described below. For the positions of the switches and jumpers, refer to the IE-78K0S-NS User's Manual.

Table 3-1. Setting of Switches and Jumpers on IE-78K0S-NS

	SW1	SW3	SW4	JP1	JP4
Setting	OFF	All "ON"	All "ON"	2-3	1-2

Note Be sure to set the switches and jumpers as described above; otherwise the IE-78K0S-NS may be damaged.

(2) Setting of IE-78K0S-NS-A

Before using the IE-789088-NS-EM1, set each jumper and switch as described below. For the positions of the switches and jumpers, refer to the IE-78K0S-NS-A User's Manual.

Table 3-2. Setting of Switches and Jumpers on IE-78K0S-NS-A

	SW1	JP1	JP3
Setting	OFF	1-2	Shorted (fixed)

Note Be sure to set the switches and jumpers as described above; otherwise the IE-78K0S-NS may be damaged.

3.3 Settings of Target Interface Voltage

Because the IE-789088-NS-EM1 internally generates the voltage for target interface (1.8 to 5.5 V: the same as the voltage to the device) supplied from the VDD pin of the emulation probe, no special setting is necessary.

When the target system is used, be sure to supply the same voltage as the target system to the VDD pin.

When the target system is not used (VDD = 0 V), the emulator is designed to automatically operate on the internal voltage (5 V).

The settings for the target interface voltage are shown in Table 3-3.

Table 3-3. Settings of Target Interface Voltage

Target Interface Voltage		Integrated Debugger (ID78K0S-NS)
		Operation Voltage Selection
When the target system is used	1.8 to 5.5 V	Target
When the target system is not used	5 V	Internal

Caution When using the target system, open the configuration dialog box when starting the integrated debugger and select “Target” in the operation voltage selection area (Voltage).

3.4 Clock Settings

3.4.1 Outline of clock settings

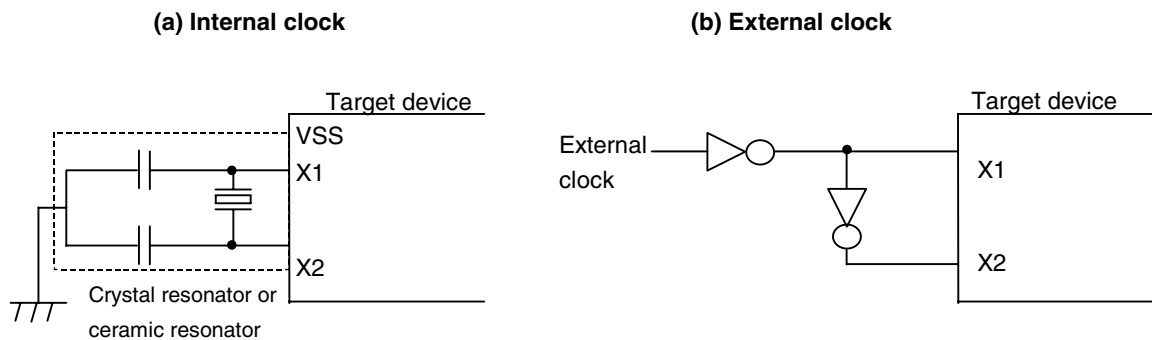
The system clock to be used during debugging can be selected from (1) to (3) below.

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

“(3) Pulse input from the target system” can be selected only when the target system shown in part (b) of Figure 3-2 includes an external clock.

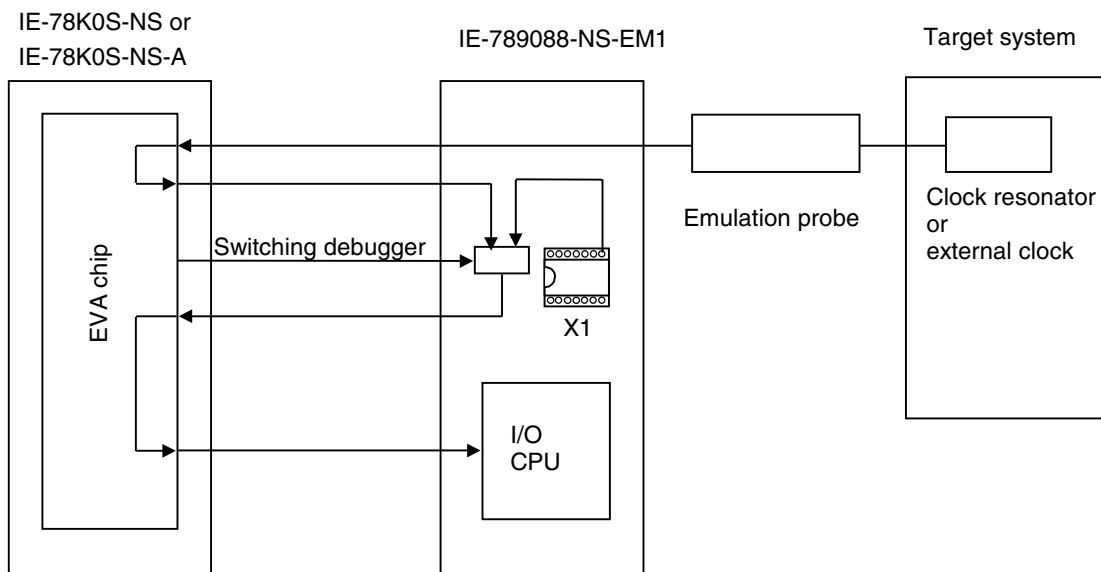
If the target system shown in part (a) of Figure 3-2 includes a clock oscillator, select “(1) Clock that is already mounted on emulation board” or “(2) Clock that is mounted by user”.

Figure 3-2. External Circuits Used as System Clock Oscillator



The outline of the system clock is shown in Figure 3-3.

Figure 3-3. Outline of System Clock



3.4.2 Main system clock settings

The settings of the main system clock are shown in Table 3-4.

Table 3-4. Settings of Main System Clock

Frequency of Main System Clock		IE-789088-NS-EM1	Integrated Debugger (ID78K0S-NS)
		Components Board (X2)	CPU Clock Source Selection
(1) Clock that is already mounted on emulation board	5.000 MHz	Oscillator	Internal
(2) Clock that is mounted by user	Other than 5.000 MHz	Oscillator assembled by user or oscillator	
(3) Pulse input from the target system		Oscillator not used	Internal

Remark The IE-789088-NS-EM1's factory settings are those listed above under "when using clock that is already mounted on emulation board".

The main system clock settings of (1) to (3) are individually described in the following pages.

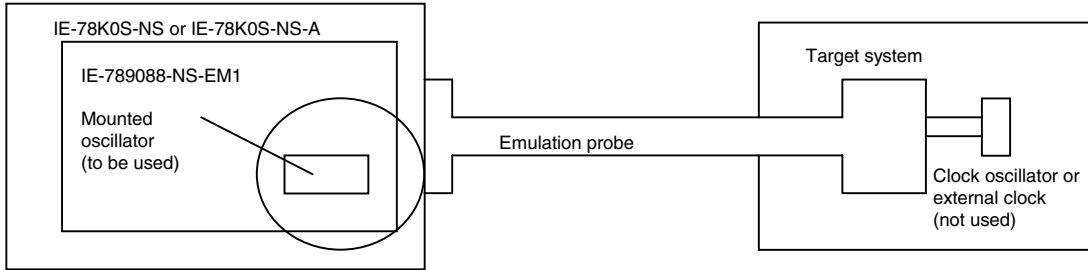
Caution The IE system will hang up if the main system clock is not supplied correctly.

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

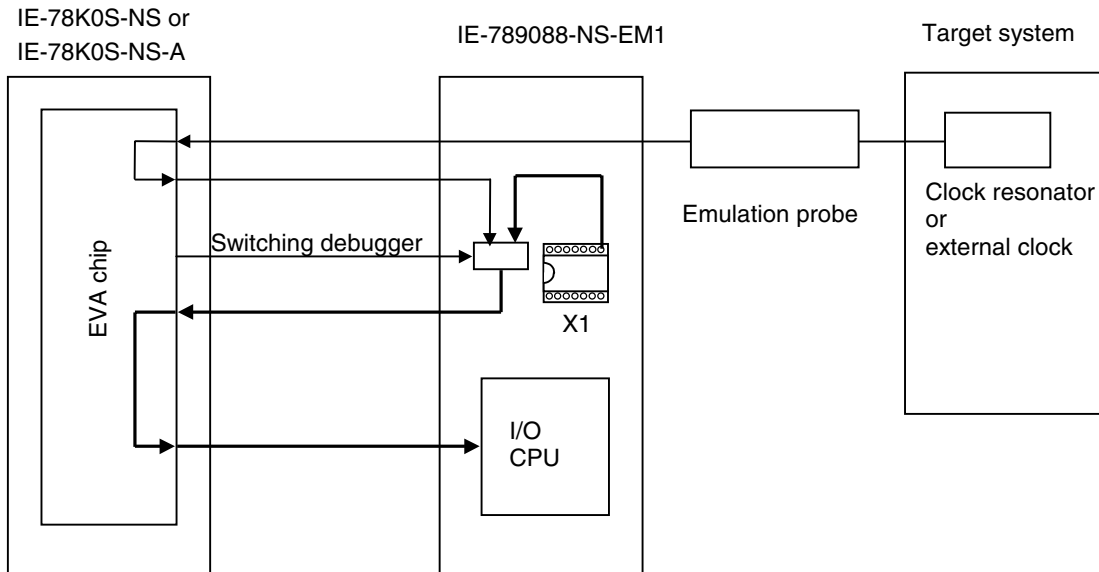
When the IE-789088-NS-EM1 is shipped, a 5.000 MHz crystal oscillator is already mounted in the IE-789088-NS-EM1's X1 socket. When using the factory-set mode settings, there is no need to make any other hardware settings.

A setting outline is shown in Figure 3-4. 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).

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



Remark The clock that is supplied by the IE-789088-NS-EM1's oscillator (encircled in the figure) is used.



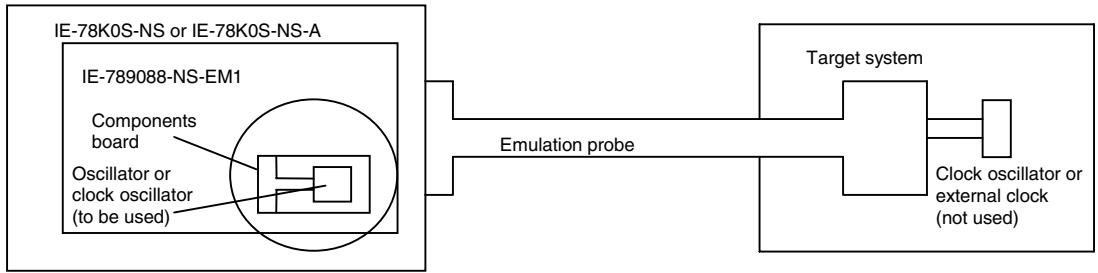
Remark The flow of the clock is indicated by the bold line.

(2) Clock that is mounted by user

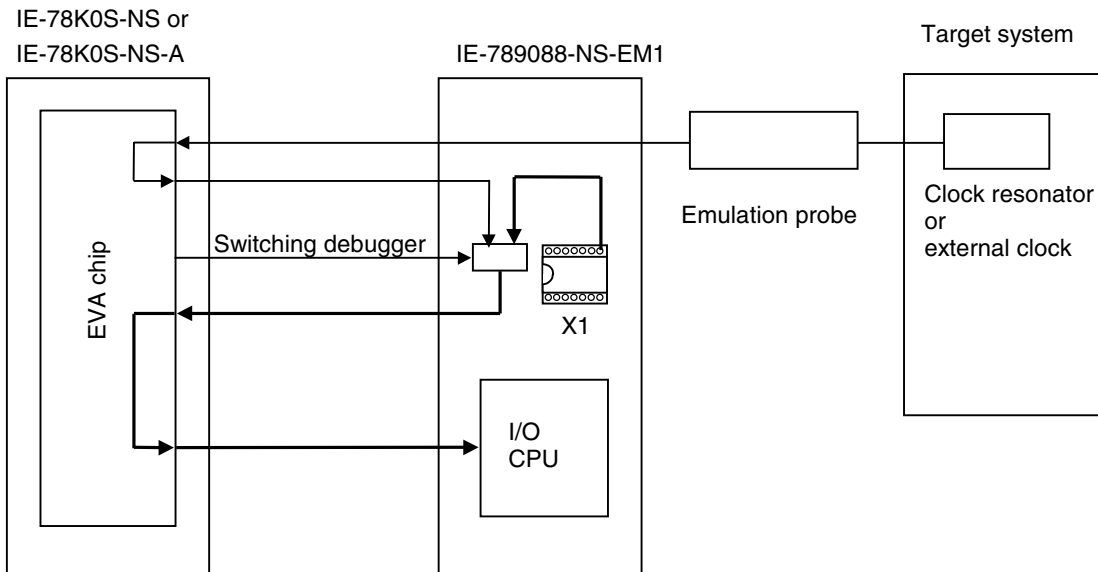
Remove the crystal oscillator already mounted on the emulation board (X1: 5.000 MHz) and mount the components board (oscillator) that includes the oscillator or resonator to be used. This is effective when debugging with a clock that is different from the clock already mounted (1.000 MHz to 5.000 MHz)

A setting outline is shown in Figure 3-5. The settings of either (a) or (b) that are described in the following pages 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).

Figure 3-5. When Using Clock That Is Mounted by User



Remark The clock that is supplied by the IE-789088-NS-EM1's oscillator (encircled in the figure) is used.

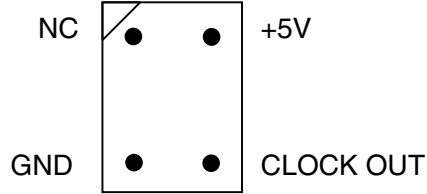


Remark The flow of the clock is indicated by the bold line.

(a) When using a crystal oscillator

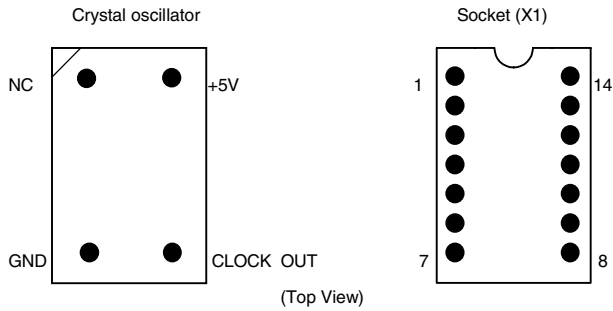
- ◆ Necessary items
 - Crystal oscillator (with pin configuration as shown in Figure 3-6)

Figure 3-6. Crystal Oscillator (Main System Clock)



<Procedure>

- <1> Prepare the IE-789088-NS-EM1.
- <2> Remove the crystal oscillator from the socket (marked X1) on the IE-789088-NS-EM1.
- <3> Mount the new crystal oscillator in the socket (X1) from which the oscillator was removed in <2>above. At this time, insert the oscillator into the socket aligning the pins as indicated below.



Crystal Oscillator Pin	Socket Pin No.
NC	1
GND	4
CLOCK OUT	8
+5 V	14

- <6> Install the IE-789088-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(b) When using a ceramic resonator or crystal resonator

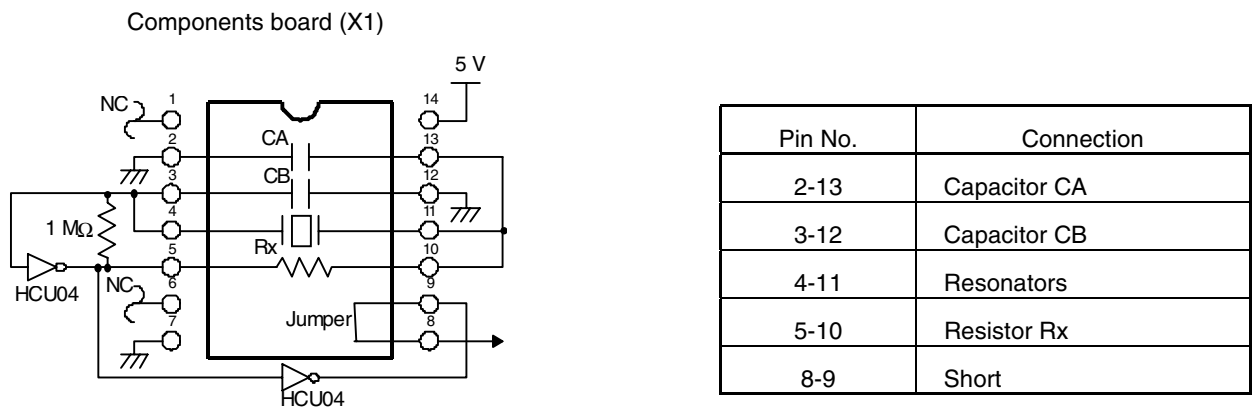
◆ Necessary items

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

<Procedure>

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

Figure 3-7. Connections on Components Board



Remark NC: No Connection.

<2> Prepare the IE-789088-NS-EM1.

<3> Remove the crystal oscillator that is mounted in the IE-789088-NS-EM1's socket (the socket marked as X1).

<4> Connect the components 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 mounted in the X1 socket on the emulation board is wired as shown in Figure 3-7 above.

<6> Install the IE-789088-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

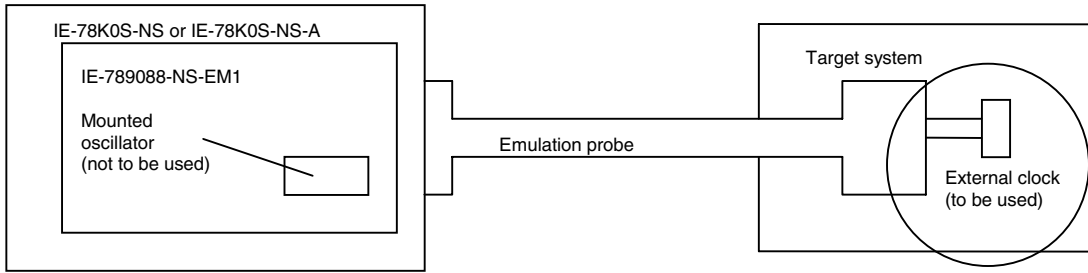
(3) When using a pulse input from the target system

The external clock pulse signal on the target system is used via an emulation probe. There is no need to make any other hardware settings.

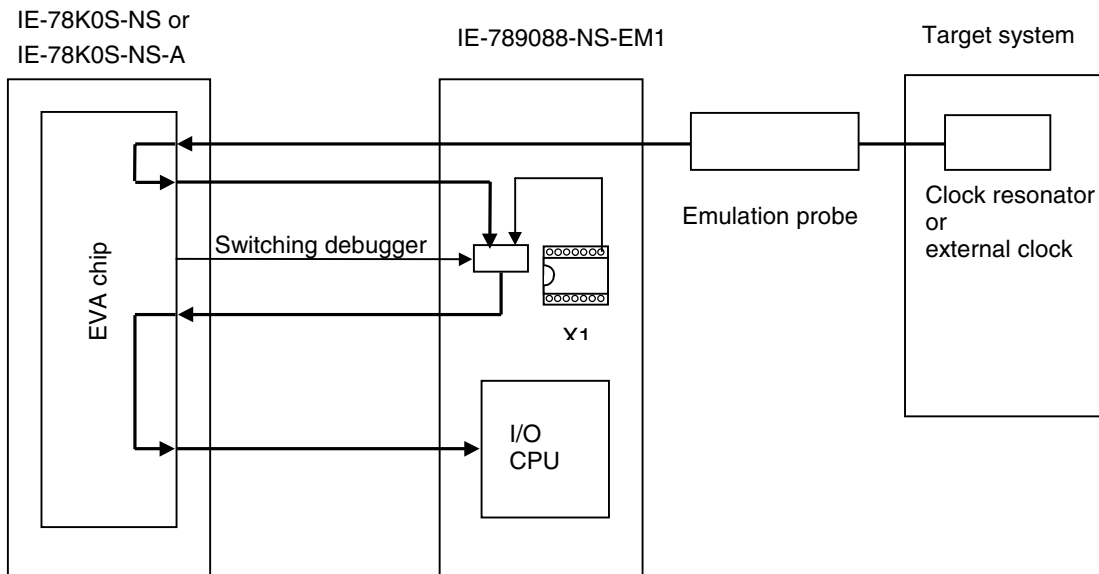
A setting outline is shown in Figure 3-8. When starting the integrated debugger (ID78K0S-NS), open the configuration dialog box and select “External” in the area (Clock) for selecting the CPU’s clock source (this selects the emulator’s internal clock).

Caution The clock input from the target should be a rectangular wave.

Figure 3-8. When Using Pulse Input from Target System



Remark The clock that is supplied by the IE-789088-NS-EM1’s oscillator (encircled in the figure) is used.



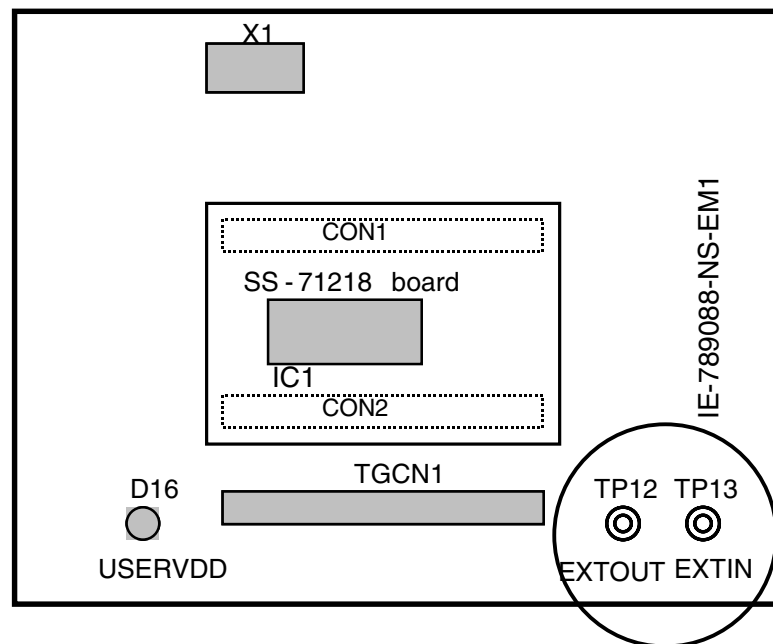
Remark The flow of the clock is indicated by the bold line.

3.5 External Trigger

To set up an external trigger, connect it to the IE-789088-NS-EM1's check pin, EXTIN pin (TP13), and EXTOUT pin (TP12) as shown below.

See the IE-78K0S-NS or IE-78K0S-NS-A User's Manual for descriptions of related use methods and pin characteristics.

Figure 3-9. External Trigger Input Position



CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

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

The target interface circuit of the IE system consists of an EVA chip, CPU, TTL, CMOS-IC, CMOS-IC and other emulation circuits. Differences in electrical characteristics between the target device and the target interface circuit occur due to the existence of a protection circuit.

The differences with the target device are classified into the following (1) to (3) and explained in the following pages.

- (1) Signals directly input/output to/from the EVA chip or peripheral EVA chip
- (2) Signals input from the target system via a gate
- (3) Other signals

(1) Signals directly input/output to/from the EVA chip or peripheral EVA chip

Refer to Figure 4-1 Equivalent Circuit of Emulation Circuit (1).

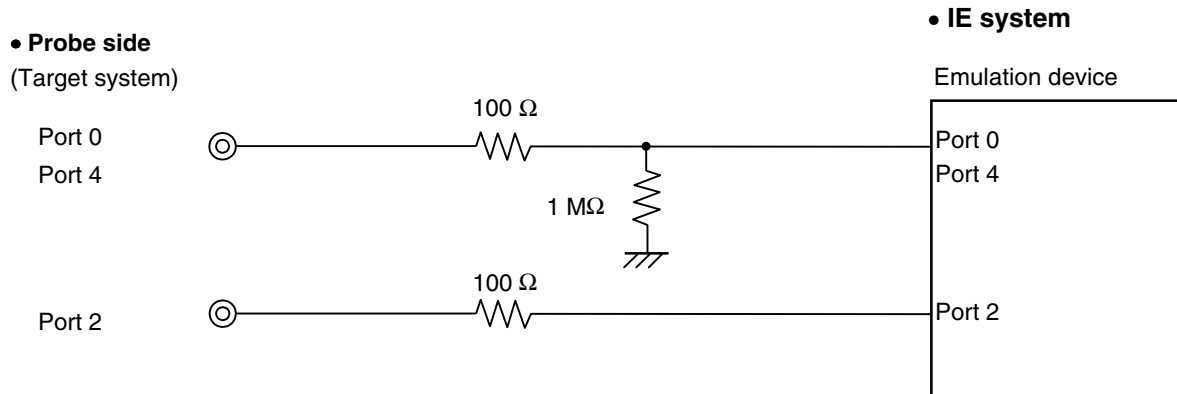
A 1 M Ω pull-down resistor and a 100 Ω resistor are inserted in series for the following signals.

- Signals related to port 0
- Signals related to port 4

A 100 Ω resistor is inserted in series for the following signals.

- Signals related to port 2

Figure 4-1. Equivalent Circuit of Emulation Circuit (1)



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

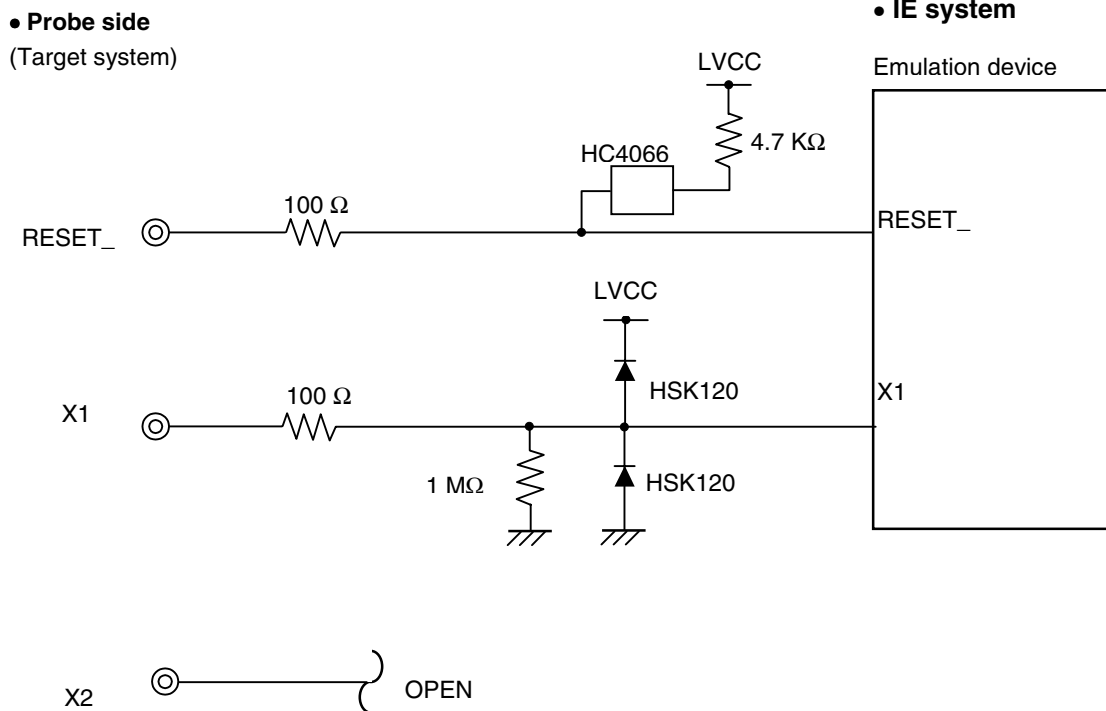
Refer to Figure 4-2 Equivalent Circuit of Emulation Circuit (2).

Since the following signals are input via a gate, their timing shows a delay compared to that of the μ PD789088 Subseries.

- Signals related to RESET
- Signals related to clock input

The IE-789088-NS-EM1 does not use the X2 pin.

Figure 4-2. Equivalent Circuit of Emulation Circuit (2)



(3) Other signals

Refer to Figure 4-3 Equivalent Circuit of Emulation Circuit (3).

- V_{DD} pin

The V_{DD} pin is used to control the LED (USERVDD) in the IE-789088-NS-EM1 that monitors the target system's power status (on/off) and is also used as a reference voltage to generate the target interface voltage power (LVCC).

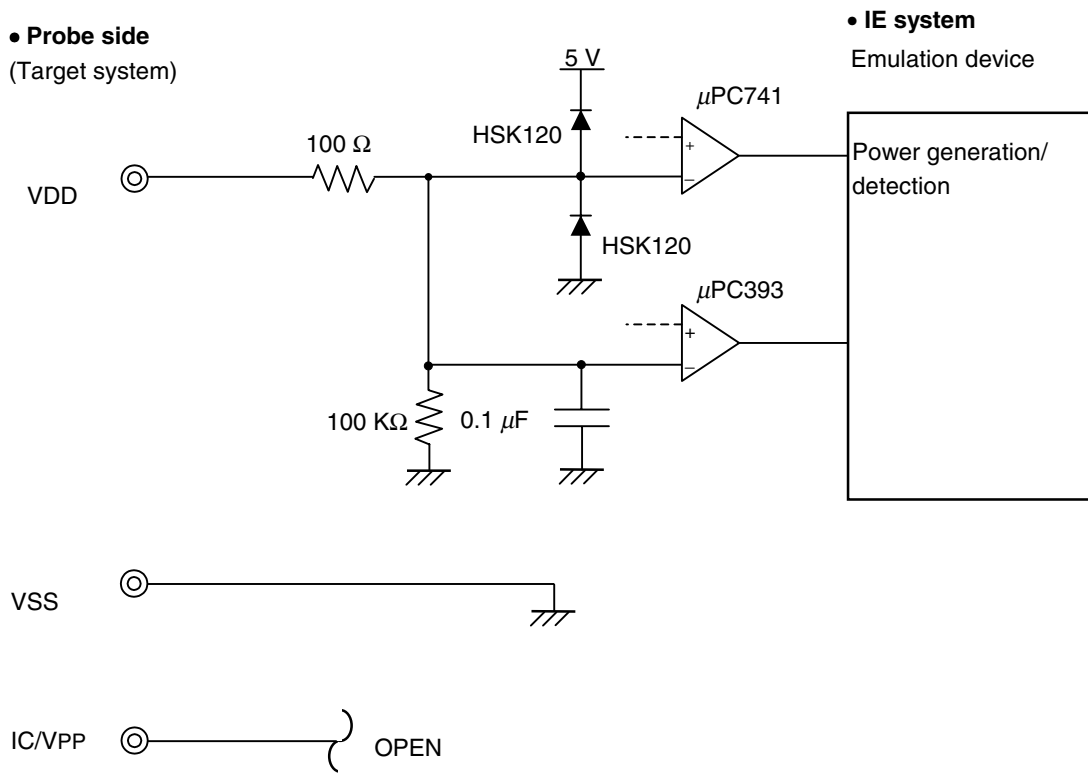
- V_{SS} pin

The V_{SS} pin is connected to GND inside the IE system.

- IC/VPP pin

The IE-789088-NS-EM1 does not use IC/VPP pin.

Figure 4-3. Equivalent Circuit of Emulation Circuit (3)



APPENDIX. EMULATION PROBE PIN CORRESPONDENCE TABLE

Table A-1. NP-H36GS/36GS + NGS-30 Pin Correspondence

Emulation Probe Pin No.	TGCN1 Pin No.
1	58
2	56
3	49
4	55
5	19
6	18
7	22
8	62
9	65
10	66
11	92
12	91
13	98
14	97
15	21
16	99
17	63
18	64
19	70
20	69
21	72
22	102
23	71
24	94
25	93
26	30
27	29
28	24
29	23
30	20

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