CUSTOMER NOTIFICATION

SUD-TT-0094-1-E (SUD-T-4865-2-E)
March 8, 2002
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IE-789468-NS-EM1

Preliminary User's Manual

1st edition, March 2002

Revision History

The control codes and revised points are listed below.

Control Code [Note]	Document No.	Description
A	SUD-T-4865-1-E (April 7, 2000)	Newly created
B	SUD-T-4865-2-E (July 17, 2001)	Addition of description on IE-78K0S-NS-A (main board), addition of APPENDIX B NOTES ON TARGET SYSTEM DESIGN, correction of erroneous description
C	SUD-TT-0094-1-E (March 8, 2002)	Addition of description on the emulation CPU setting, correction of erroneous description

Note The “control code” is the second digit from the left in the 10-digit serial number (if it has not been upgraded). If the in-circuit emulator has been upgraded, a label indicating the new version is attached to the in-circuit emulator and the x in V-UP LEVEL x on this label indicates the control code.

INTRODUCTION

Product Overview

The IE-789468-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.

- μPD789327 Subseries: μPD78F9327, 789322, 789324, 789326, 789327
- μPD789467 Subseries: μPD78F9468, 789462, 789464, 789466, 789467

Target Readers

This manual is intended for engineers who will use the IE-789468-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-789468-NS-EM1, refer to not only this manual (supplied with the IE-789468-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	IE-78K0S-NS-A User's Manual	IE-789468-NS-EM1 User's Manual
• Basic specifications • System configuration • External interface functions	• Basic specifications • System configuration • External interface functions	• 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-789468-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-789468-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 Document The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document Number	
	Japanese	English
IE-78K0S-NS	U13549J	U13549E
IE-78K0S-NS-A	U15207J	U15207E
IE-789468-NS-EM1	SUD-TT-0094-1	This manual
ID78K Series Integrated Debugger Ver.2.30 or Later Operation (Windows™ Based)	U15185J	U15185E
μPD789327 Subseries	U15043J	U15043E
μPD789468 Subseries	U15552J	U15552E

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

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 GENERAL

The IE-789468-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.

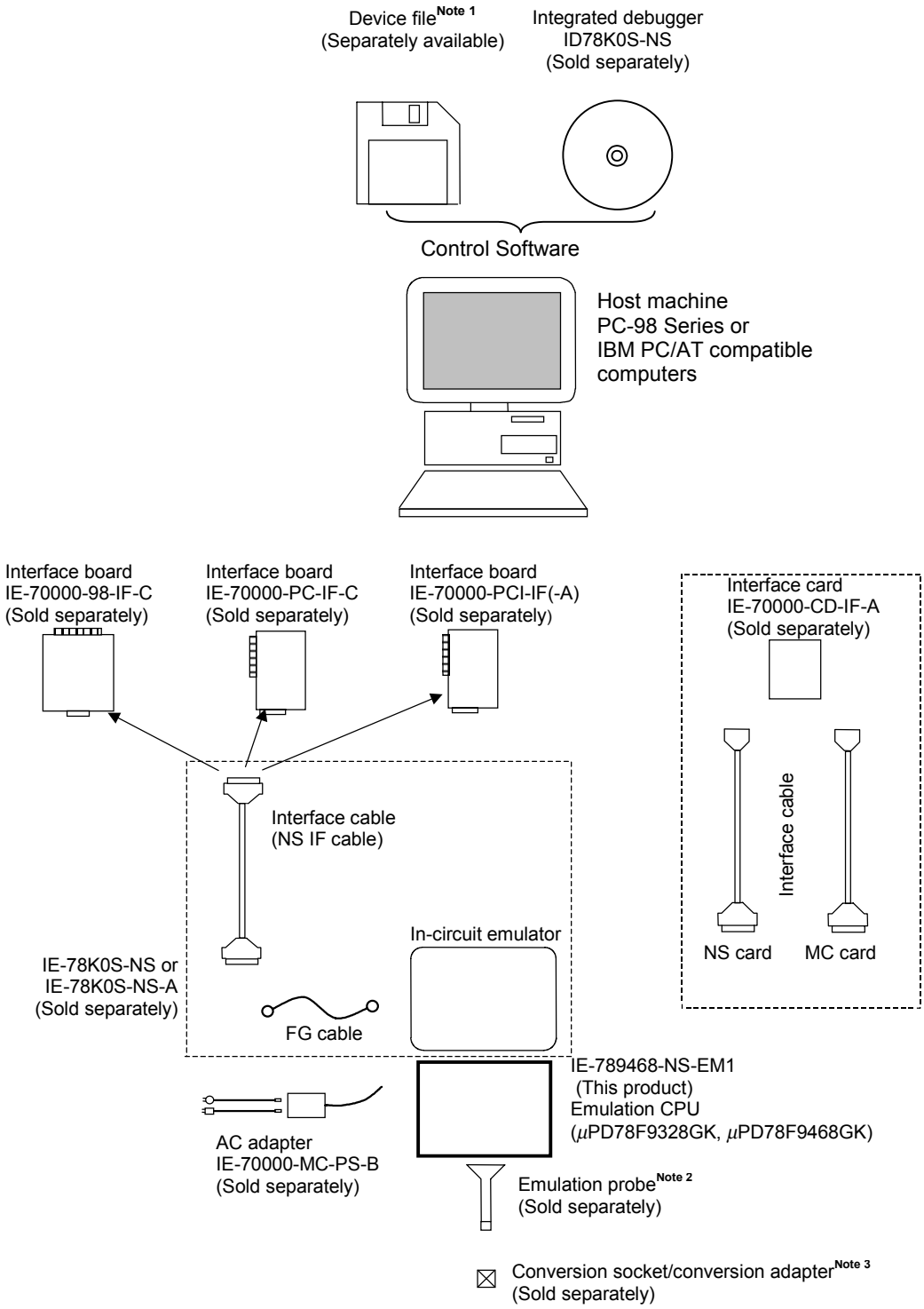
This chapter describes the IE-789468-NS-EM1 system configuration and basic specifications.

- Target device
  - μPD789327 Subseries
  - μPD789467 Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-789468-NS-EM1 system configuration.

Figure 1-1. System Configuration



Notes 1. The device files are as follows.

μSXXXXDF789327: μPD789327 Subseries

μSXXXXDF789468: μPD789467 Subseries

2. The emulation probe is as follows.

NP-H52GB-TQ: 52-pin plastic LQFP (probe length: 400 mm; GB type)

NP-H52GB-TQ is a product of Naito Densei Machida Mfg. Co., Ltd.

Contact: Naito Densei Machida Mfg. Co., Ltd. (TEL: 045-475-4191)

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

TBG-052SBP: For 52-pin plastic LQFP (GB type)

TBG-052SBP is a product of Tokyo Eletech Corporation.

For further information, contact: Daimaru Kogyo, Ltd.

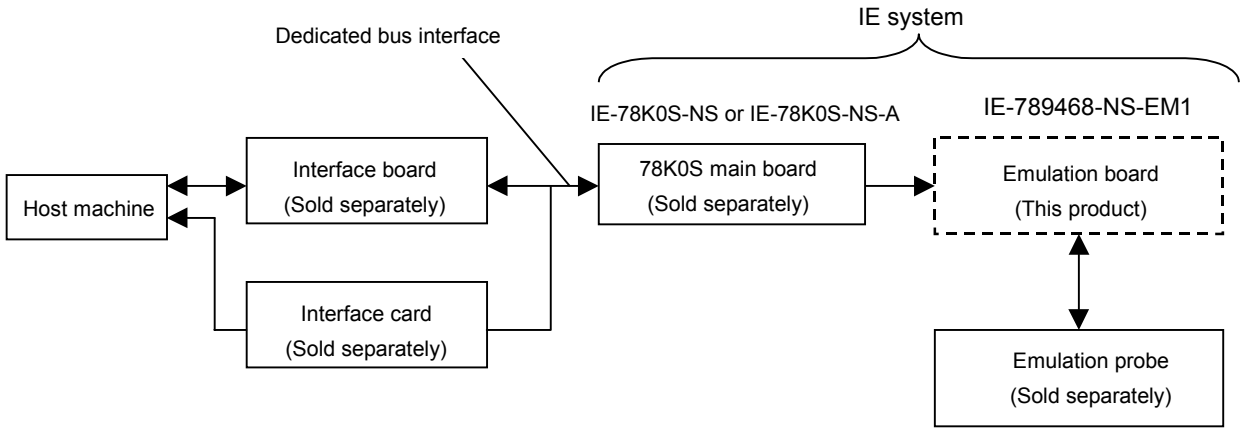
Tokyo Electronics Department (TEL +81-3-3820-7112)

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

1.2 Hardware Configuration

Figure 1-2 shows the IE-789468-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The IE-789468-NS-EM1's basic specifications are listed in Table 1-1.

Table 1-1. Basic Specifications

Parameter	Description
Target device	μPD789327, 789467 Subseries
System clock	Main system clock: 1.000 to 5.000 MHz Subsystem clock: 32.768 kHz
Main clock supply	Internal: Mounted on the emulation board (5 MHz) or mounted by user on the parts board External: Pulse input from the target system via an emulation probe
Subclock supply	Internal: Mounted on the emulation board (32.768 kHz) or mounted by user on the parts board External: Pulse input from the target system via an emulation probe
Target interface voltage	V_{DD} = 1.8 V to 5.5 V (Same as the target device) When target system not connected: Operates @ 5 V internal voltage

1.4 Emulation CPU

The device (I/O EVA chip) for the emulation CPU varies depending on the subseries as shown in Table 1-2.
Refer to **2.1 Names of Parts on Board** for details of the IC1 position. Refer to **3.1.1 Setting of emulation CPU** for details of the settings. The I/O EVA chip μPD78F9468GK E1.3 used for debugging the μPD789467 Subseries is supplied with the IE-789468-NS-EM1.

Table 1-2. Factory Setting of Emulation CPU

Target Subseries	Emulation CPU (I/O EVA Chip)	Factory Setting
μPD789327 Subseries	μPD78F9328GK V1.31	Mounted in the socket (IC1) on the board
μPD789467 Subseries	μPD78F9468GK E1.3	Included with the IE-789468-NS-EM1

CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-789468-NS-EM1 main unit.

The packing box contains the emulation board (IE-789468-NS-EM1), case (emulation CPU [Note 1]), screw driver [Note 2]), 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.

Notes 1. The emulation CPU is as follows.

μPD789327 Subseries: I/O EVA chip μPD78F9328GK V1.31

(Mounted in IC1 on the emulation board at shipment)

μPD789467 Subseries: I/O EVA chip μPD78F9468GK E1.3

(Included with the IE-789468-NS-EM1at shipment)

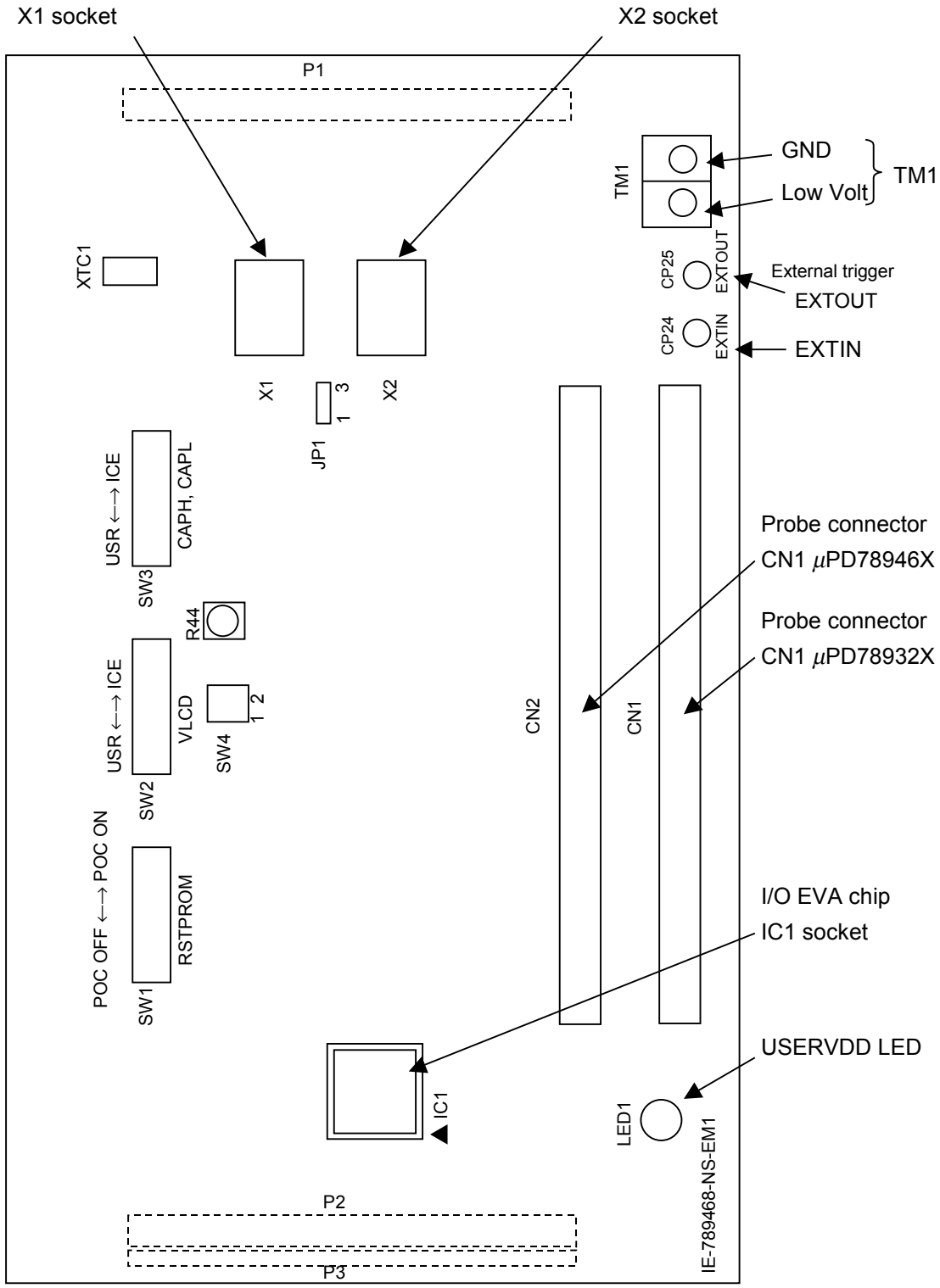
2. Screw driver

This is a screw driver used to remove/fix the screws used to fix the socket (IC1) that incorporates the emulation CPU.

2.1 Names of Parts on Board

Figure 2-1 shows the names of the parts on the probe board.

Figure 2-1. Names of Parts on IE-789468-NS-EM1 Board



2.2 Initial Settings of Switches and Jumpers

Table 2-1 shows the initial settings of jumpers and switches on the IE-789468-NS-EM1.

Refer to **3.1 Emulation Settings** and **3.6 Mask Option Settings** for the SW1 setting.

Use SW2 to SW4 with the default settings.

Refer to **3.5 Clock Settings** for the JP1 setting.

Table 2-1. Initial Settings of Switches and Jumpers

	SW1	SW2	SW3
Initial setting	POC ON side	USR side (fixed)	USR side (fixed)
	SW4 to SW1	SW4 to SW2	JP1
Initial setting	ON (fixed)	OFF (fixed)	2-3

CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-789468-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 parts 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 Emulation Settings

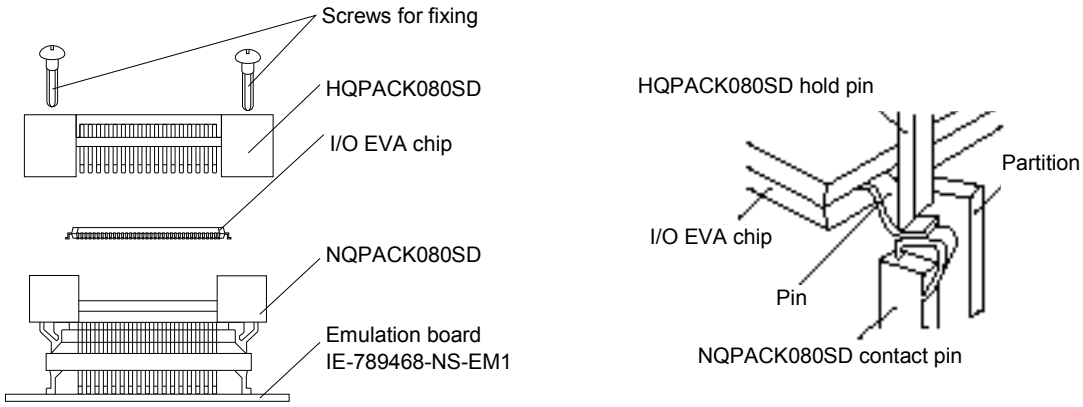
3.1.1 Setting of emulation CPU

The emulation CPU of the IE-789468-NS-EM1 varies depending on the subseries.

The I/O EVA chip μPD78F9328GK V1.31 for debugging the μPD789327 Subseries is mounted in the socket (IC1) at shipment. When using the factory-set mode settings, there is no need to make any hardware settings. When debugging the μPD789467 Subseries, remove the I/O EVA chip μPD78F9328GK V1.31 for debugging the μPD789327 Subseries from the socket (IC1) and mount the I/O EVA chip μPD78F9468GK E1.3 for debugging the μPD789467 Subseries which is included with the IE-789468-NS-EM1 in the socket (IC1).

Each pin of the I/O EVA chip is fixed within the plastic partition by the NQPACK080SD contact pin and the HQPACK080SD hold pin. Therefore, I/O EVA chip pins placed side by side will never be shorted.

Figure 3-1. Replacing the Emulation CPU



<Procedure>

(1) Remove the four screws (M2 × 6 mm) fixing the HQPACK080SD from the HQPACK080SD using the supplied screw driver.

(2) Remove the mounted I/O EVA chip.

(3) Mount the I/O EVA chip corresponding to the subseries to be debugged. (Set the I/O EVA chip so that the pin 1 position of the I/O EVA chip and NQPACK080SD match.)

(4) Set the HQPACK080SD and fix it to the I/O EVA chip and NQPACK080SD using the four screws (M2 × 6 mm). Fix the screws using the supplied screw driver or a screw driver with a torque gauge in the order of opposite diagonals and applying equal pressure to all four corners (be careful not to fix one screw too tightly). The torque for tightening a screw is 0.55 kg • f • cm (0.054 N • m) MAX. Fixing a screw too tightly may cause bad conduction.

Cautions 1. Replace the emulation CPU when the power of the IE-78K0S-NS or IE-78K0S-NS-A is off; otherwise the IE system will be damaged.

2. When mounting the emulation CPU, set it so that the pin 1 position of the I/O EVA chip and the socket (IC1) match; otherwise the emulation CPU will be damaged.

3. The emulation CPU does not operate correctly if the I/O EVA chip is mounted with bent leads.

Cautions 4. Before the I/O EVA chip is mounted on the NQPACK052SB, make sure that there are no abnormalities such as resin burr, bent pins, or crooked pins. When the I/O EVA chip is covered by the HQPACK080SD, make sure that there are no crooked or bent HQPACK080SD hold pins before mounting. If there are bent or crooked pins, straighten the pins by using a flat surface like an edge of a knife.

3.3 Settings of Switches and Jumpers

The switch setting of the IE-789468-NS-EM1 varies depending on the subseries as shown in Table 3-1.

When debugging the μPD789327 Subseries, set SW1 to "POC ON side (2-side)" as shown.

When debugging the μPD789467 Subseries, SW1 is used as the mask option setting switch. Refer to **3.6 Mask Option Settings**.

Table 3-1. Setting for Selecting Subseries

Target Subseries	SW1
μPD789327 Subseries	POC ON side (2-side)
μPD789468 Subseries	Switch to set mask option

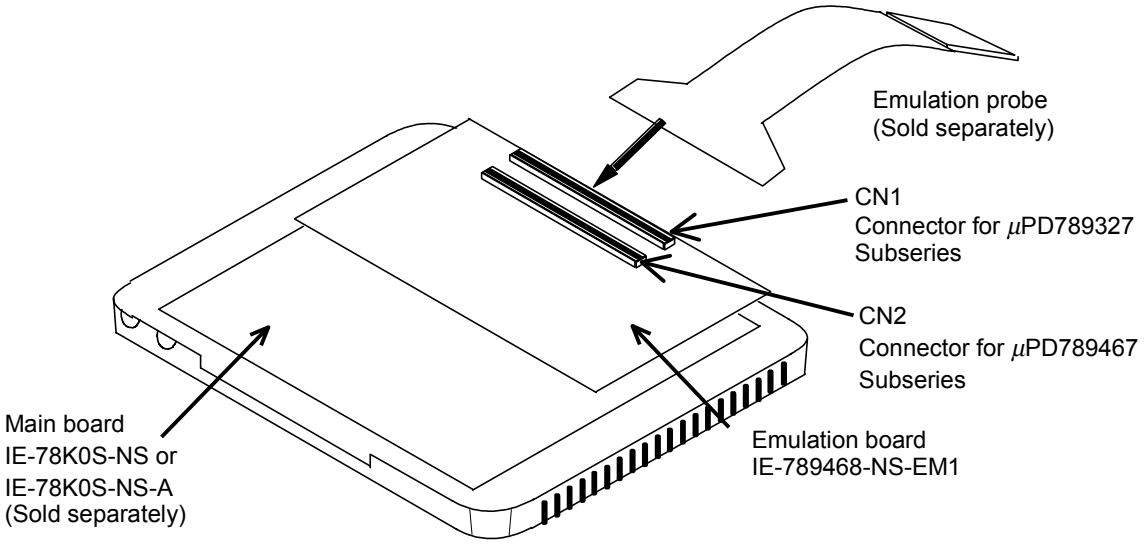
Cautions 1. POC ON side (2-side) is set in the μPD789327 Subseries by default.

2. Set the switch when the power of the IE-78K0S-NS or IE-78K0S-NS-A is off.

3.2 Connection

A connection diagram of the emulation probe and the main board is shown in Figure 3-2.

Figure 3-2. Connection of Emulation Probe



(1) Connection with IE-78K0S-NS-A 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-789468-NS-EM1 to the IE-78K0S-NS or IE-78K0S-NS-A.

(2) Connection with emulation probe

See the IE-78K0S-NS-A User's Manual (U15207E) or IE-78K0S-NS-A User's Manual (U15207E) for a description of how to connect an emulation probe to the IE-789468-NS-EM1.

Connect the emulation probe to CN1 when debugging the μPD789327 Subseries.

Connect the emulation probe to CN2 when debugging the μPD789467 Subseries.

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

3.3 Settings of Switches and Jumpers on Main Board

(1) Setting of IE-78K0S-NS

Before using the IE-789468-NS-EM1, set each jumper and switch of the IE-78K0S-NS as described below. For the positions of the switches and jumpers, refer to the IE-78K0S-NS User's Manual (U13549E).

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

	SW1	SW3	SW4	JP1	JP4
Setting	OFF	All "ON" (fixed)	All "ON" (fixed)	2-3 shorted	1-2 shorted

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

Before using the IE-789468-NS-EM1, set each jumper and switch of the IE-78K0S-NS-A as described below. For the positions of the switches and jumpers, refer to the IE-78K0S-NS-A User's Manual (U15207E).

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

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

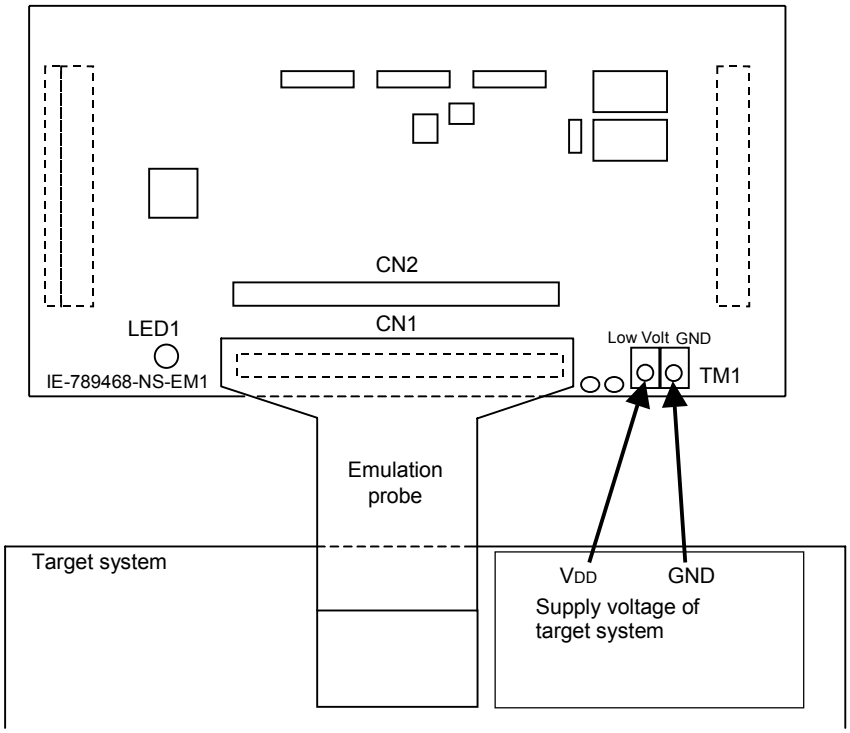
3.4 Settings of Target Interface Voltage

The IE system can be emulated at the same supply voltage level as that of the target system.
When the target system is not used, the emulator is designed to automatically operate on the internal voltage (5 V).
When debugging is performed at the voltage same level as the target system voltage, connect the voltage that is the same level as the target system voltage to the terminal pin (TM1) of the IE-789468-NS-EM1 (also applicable when debugging at 5 V). The status when the μPD789327 Subseries is debugged is shown in Figure 3-3. The emulation probe is connected to CN2 when debugging the μPD789467 Subseries.
Set the target voltage to 1.8 to 5.0 V. See ID78K0 Series Integrated Debugger User's Manual (U15185E) for details of how to select the supply voltage.
The maximum current that can be consumed by TM1 is 1.8 to 5.0 V: approx.125 mA

Table 3-4. Target Interface Voltage Settings

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

Figure 3-3. Connection of TM1 and Target System Voltage (When the μPD789327 Subseries Is Used)



Caution Connect TM1 on the board and the target system supply voltage when the power of the IE-78K0S-NS or IE-78K0S-NS-A is off.

Remark The V_{DD} pin of the target system is only used to control the LED1 that monitors the connection of the target system power supply in the IE-789468-NS-EM1.

3.5 Clock Settings

3.5.1 Outline of clock settings

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

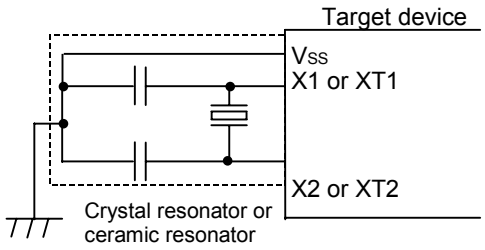
(1) Clock already mounted on emulation board
(2) Clock mounted by user
(3) Pulse input from the target system

If the target system includes a clock oscillator, select either “(1) Clock already mounted on emulation board” or “(2) Clock 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 Figure 3-4 (a). During emulation, the clock oscillator that is mounted on the target system is not used. Instead, the clock that is mounted on the emulation board, which is installed for the IE-78K0S-NS or IE-78K0S-NS-A, is used.
If the target system includes an external clock, select either “(1) Clock already mounted on emulation board”, “(2) Clock mounted by user”, or “(3) Pulse input from the 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 Figure 3-4 (b).

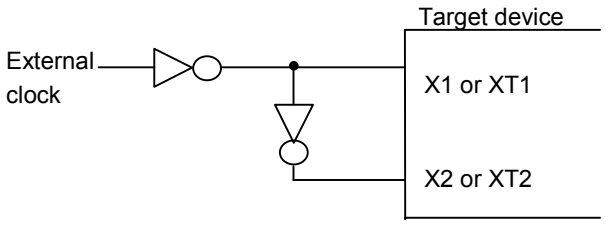
Caution The IE system will hang up if the main system clock is not supplied correctly. In addition, input a rectangular pulse from the target system. It is not necessary to input clock to X2 and XT2 pins. The program does not operate if a crystal or ceramic resonator is connected directly to X1 (in case of main system clock) or XT1 (in case of subsystem clock).

Figure 3-4. External Circuits Used as System Clock Oscillator

(a) Clock oscillator



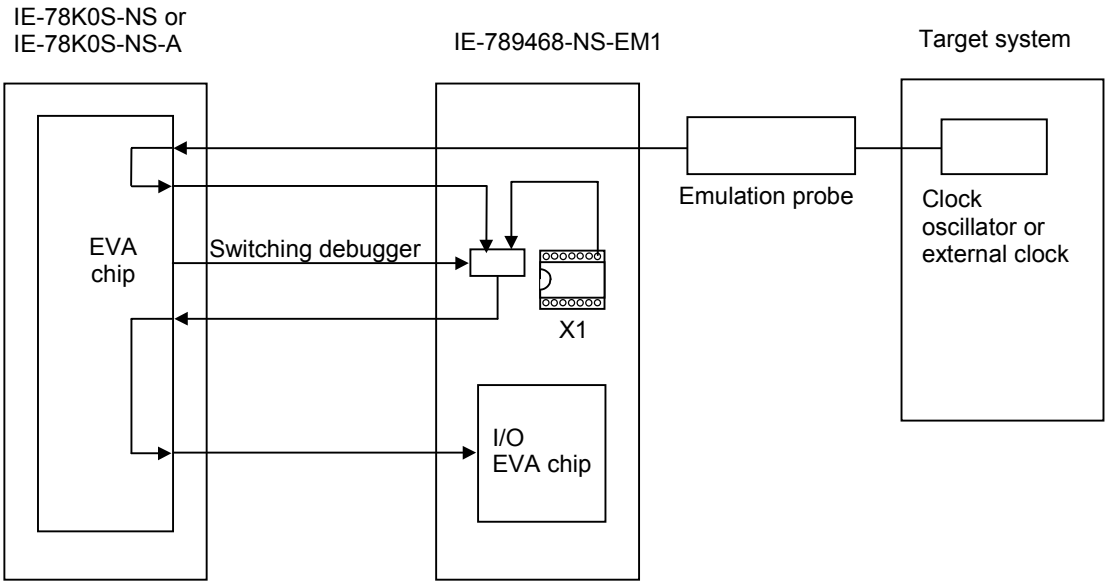
(b) External clock



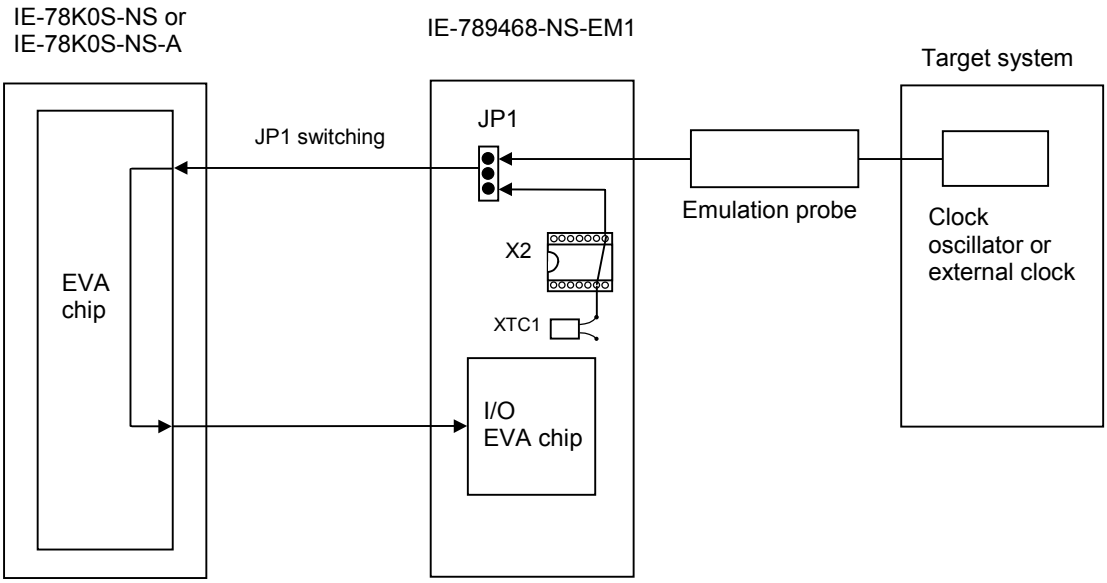
An outline of the system clock is shown in Figure 3-5.

Figure 3-5. Outline of System Clock

(a) Main system clock



(b) Subsystem clock



3.5.2 Main system clock settings

The settings of the IE-789468-NS-EM1's main system clock are shown in Table 3-5.

Table 3-5. Main System Clock Settings

Frequency of Main System Clock		IE-789468-NS-EM1	ID78K0S-NS
		Socket (X1)	CPU Clock Source Selection
(1) Clock already mounted on emulation board	5.0 MHz	Oscillator	Internal
(2) Clock mounted by user	Other than 5.0 MHz	Oscillator or oscillator circuit assembled	
(3) Pulse input from the target system		Oscillator (not used)	External

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's clock source (this selects the user's clock).

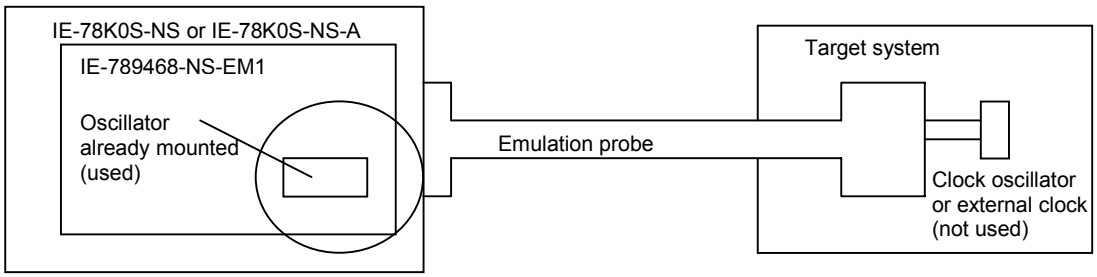
Remark The IE-789468-NS-EM1's factory settings are those listed above under "when using clock already mounted on emulation board".

(1) When using clock already mounted on emulation board

When the IE-789468-NS-EM1 is shipped, a 5.0 MHz crystal oscillator is already mounted in the IE-789468-NS-EM1's X1 socket. When using the factory-set mode settings, there is no need to make any hardware settings.

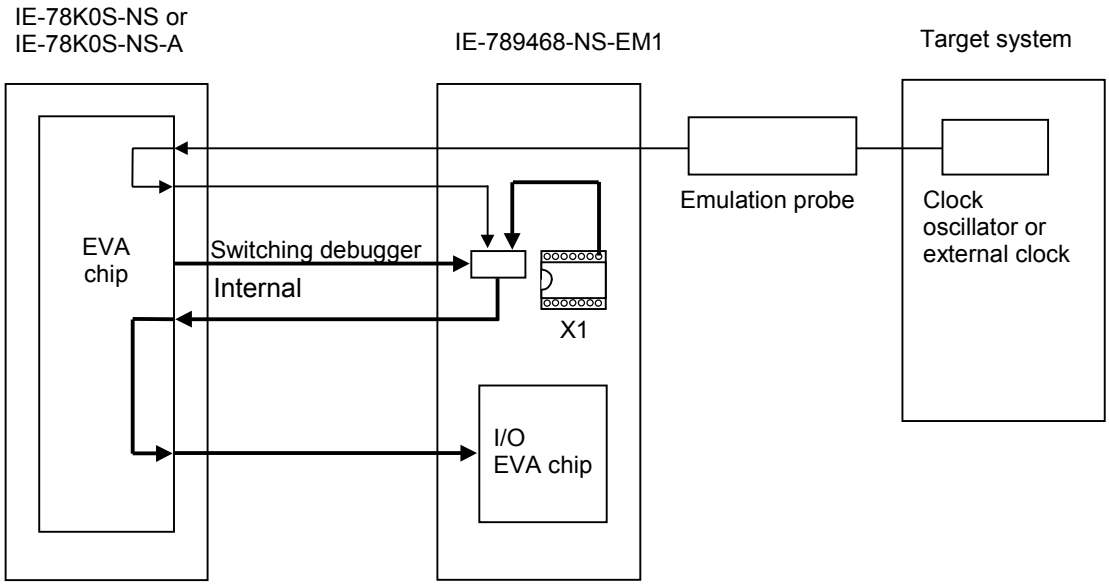
When starting the integrated debugger (ID78K0S-NS), open the configuration dialog box and select "Internal" in the area (Clock) for selecting the CPU's clock source (this selects the emulator's internal clock).

Figure 3-6. When Using Clock Already Mounted on Emulation Board (Main System Clock)



Remark The clock that is supplied by the IE-789468-NS-EM1's oscillator (encircled in the figure) is used.

Outline Diagram



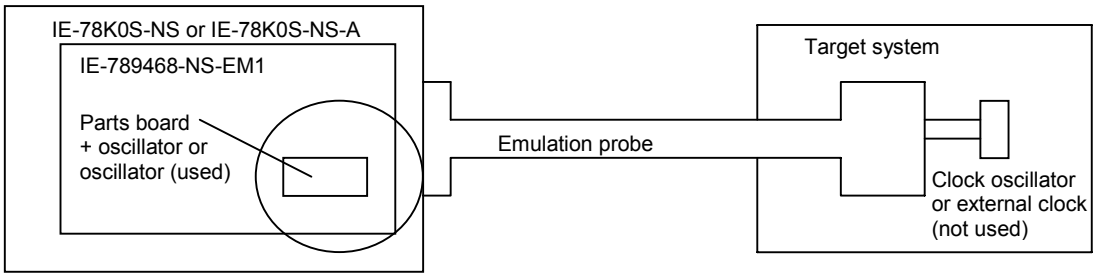
Remark The flow of the clock inside the IE-789468-NS-EM1 is indicated by the bold line.

(2) When using clock mounted by user

The settings of either (a) or (b) described in the following pages are required, depending on the type of clock to be used.

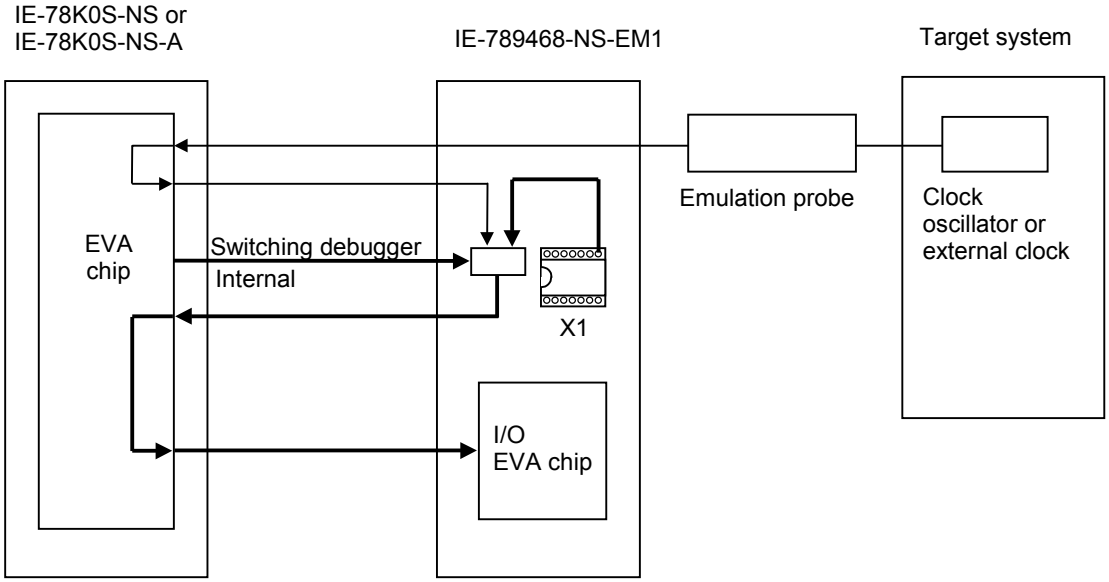
When starting the integrated debugger (ID78K0S-NS), open the configuration dialog box and select “Internal” in the area (Clock) for selecting the CPU’s clock source (this selects the emulator’s internal clock).

Figure 3-7. When Using Clock Mounted by User (Main System Clock)



Remark The clock that is supplied by the IE-789468-NS-EM1’s oscillator (encircled in the figure) is used.

Outline Diagram



Remark The flow of the clock inside the IE-789468-NS-EM1 is indicated by the bold line.

(a) When using a ceramic or crystal resonator

♦ Necessary items

- Crystal or ceramic resonator
- Resistor Rx
- Parts board
- Capacitor CA
- Capacitor CB
- Solder kit

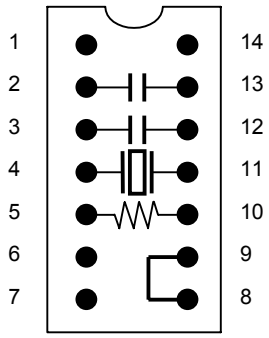
<Procedure>

<1> Prepare a parts board.

<2> Solder the target crystal or ceramic resonator, resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequencies) onto the supplied parts board as shown below.

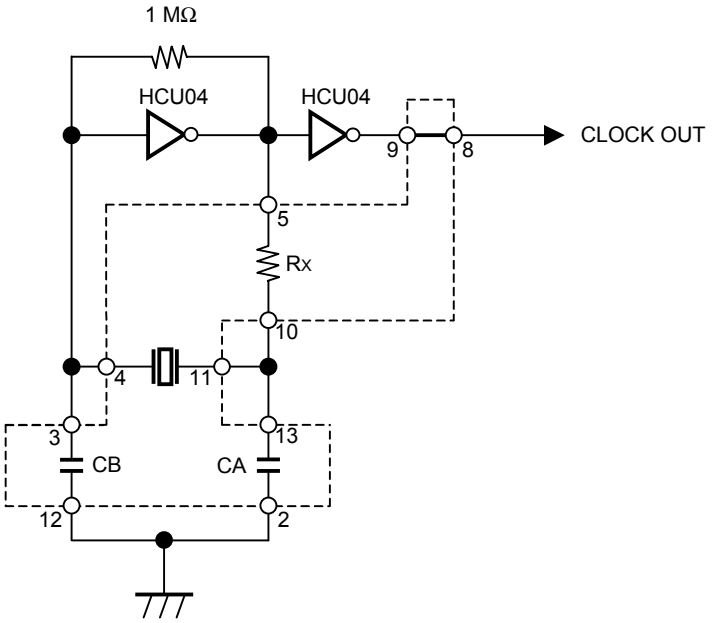
Figure 3-8. Connections on Parts Board (Main System Clock)

Parts board (X1)



Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Crystal or ceramic resonator
5-10	Resistor Rx
8-9	Shorted

Circuit Diagram



Remark The section enclosed by dotted lines indicates the section to be mounted on the parts board.

<3> Prepare the IE-789468-NS-EM1.

<4> Remove the crystal oscillator that is mounted in the IE-789468-NS-EM1's socket (X1).

<5> Make sure that the parts board is wired as shown in Figure 3-8 above.

<6> Connect the parts board (from <2> above) to the socket (X1) from which the crystal oscillator was removed in <4>. Check the pin 1 mark to make sure the board is mounted in the correct direction.

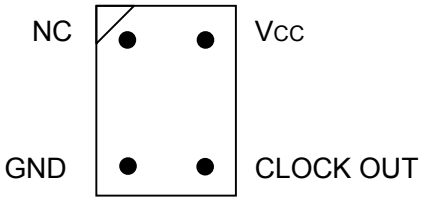
<7> Install the IE-789468-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(b) When using a crystal oscillator

♦ Necessary items

• Crystal oscillator (with pin configuration as shown in Figure 3-9)

Figure 3-9. Crystal Oscillator (Main System Clock)



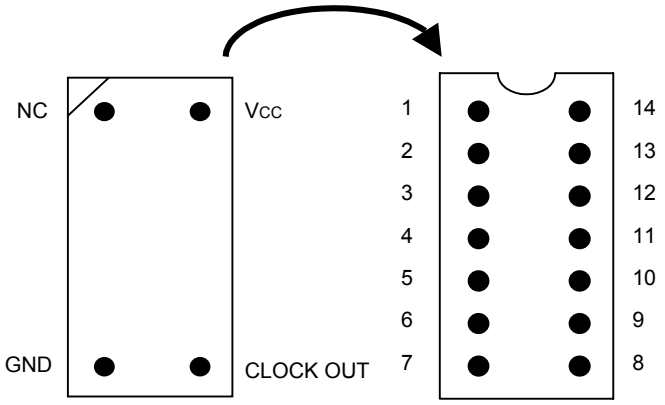
<Procedure>

<1> Prepare the IE-789468-NS-EM1.

<2> Remove the crystal oscillator from the socket (X1) on the IE-789468-NS-EM1.

<3> Mount the new crystal oscillator in the socket (X1) from which the crystal oscillator was removed in <2>. At this time, insert the crystal oscillator pin into the socket pin as indicated below.

Figure 3-10. Correspondence Between Crystal Oscillator and Socket (Main System Clock)



Crystal Oscillator Pin	Socket Pin No.
NC	1
GND	4
CLOCK OUT	8
VCC	14

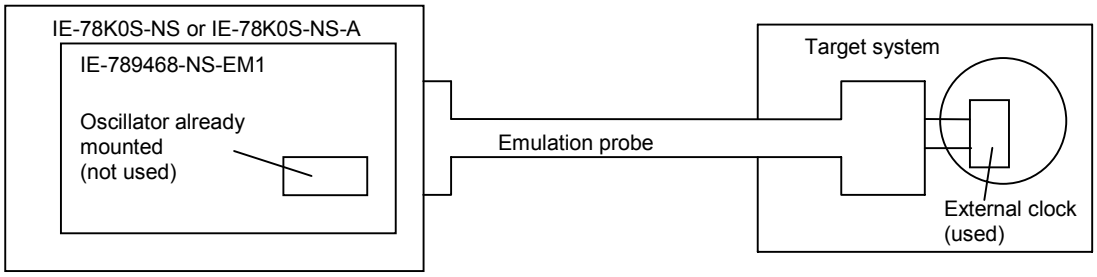
<4> Install the IE-789468-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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

There is no need to make any hardware settings.

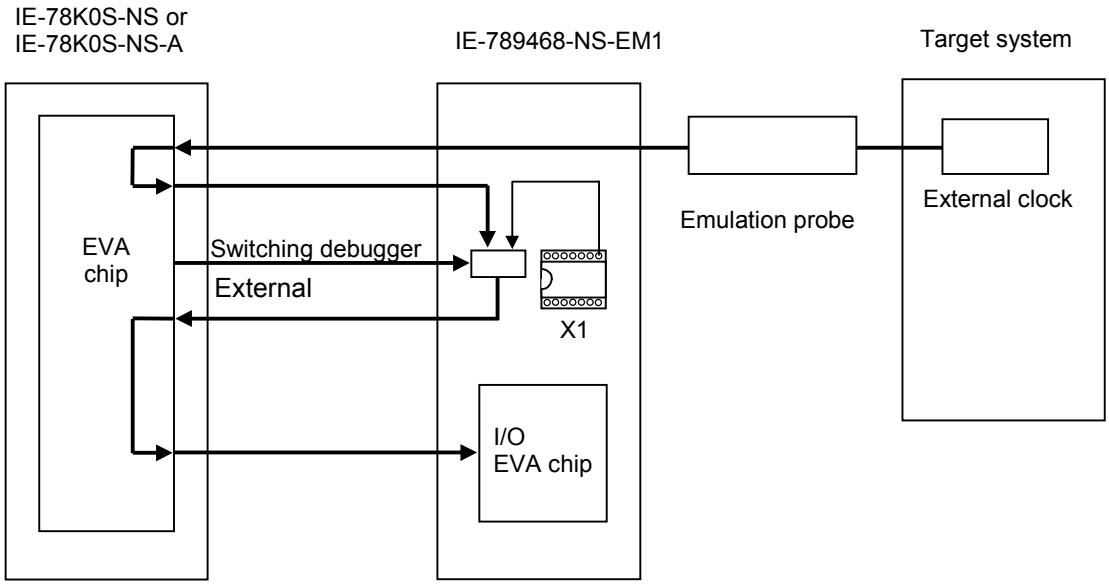
When starting the integrated debugger (ID78K0S-NS), open the configuration dialog box and select “External” in the area (Clock) for selecting the CPU’s clock source (this selects the user clock).

Figure 3-11. When Using Pulse Input from Target System (Main System Clock)



Remark The clock that is supplied by the external clock (encircled in the figure) is used.

Outline Diagram



Remark The flow of the clock inside the IE-789468-NS-EM1 is indicated by the bold line.

3.5.3 Subsystem clock settings

The settings of the IE-789468-NS-EM1's subsystem clock are shown in Table 3-6.

Table 3-6. Subsystem Clock Settings

Frequency of Subsystem Clock		IE-789468-NS-EM1	
		Socket (X2)	Jumper (JP1)
(1) Clock that is already mounted on emulation board (XTC1)	32.768 kHz	6-8 shorted	2-3 shorted
(2) Clock that is mounted by user	Other than 32.768 kHz	Oscillator assembled by user	
(3) Pulse input from the target system		Oscillator not used	1-2 shorted

Caution Set JP1 to switch between the clock on the board and external clock when the power of the IE-78K0S-NS or IE-78K0S-NS-A is off.

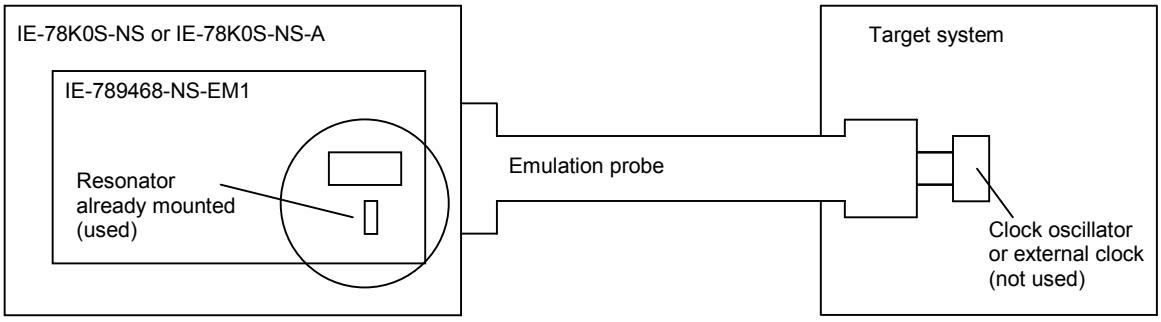
Remark The IE-789468-NS-EM1's factory settings are those listed above under "when using clock already mounted on emulation board".

(1) When using clock already mounted on emulation board

When the IE-789468-NS-EM1 is shipped, a crystal resonator (XTC1) is already mounted on the IE-789468-NS-EM1. When using the factory-set mode settings, there is no need to make any hardware settings. Pins 6 and 8 of the IE-789468-NS-EM1's socket (X2) on the parts board (X2) are shorted. Set the jumper (JP1) to 2-3 shorted.

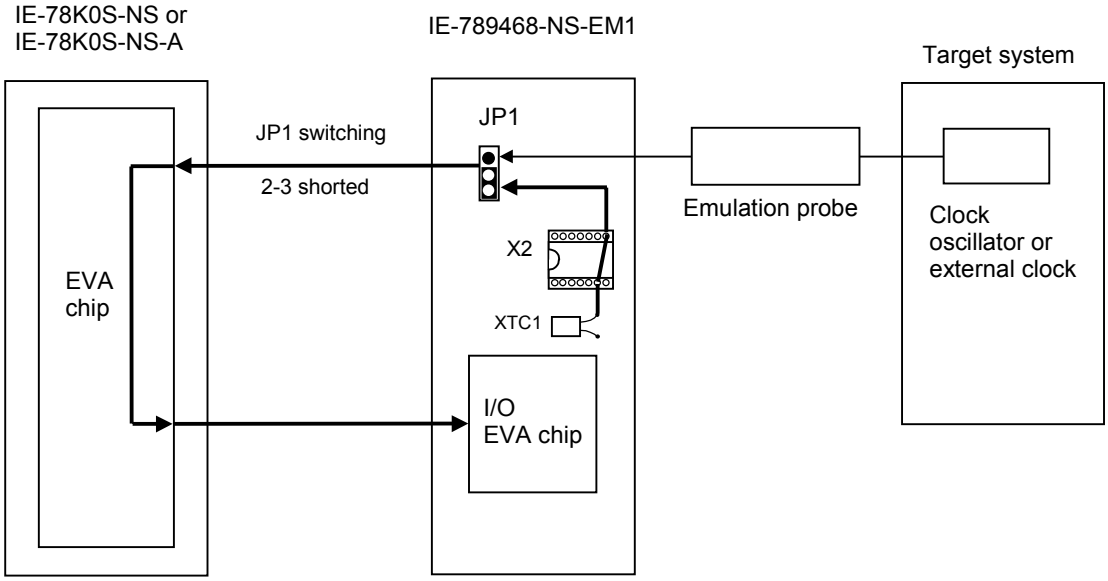
There is no need to make any settings in the integrated debugger (ID78K0S-NS).

Figure 3-12. When Using Clock Already Mounted on Emulation Board (Subsystem Clock)



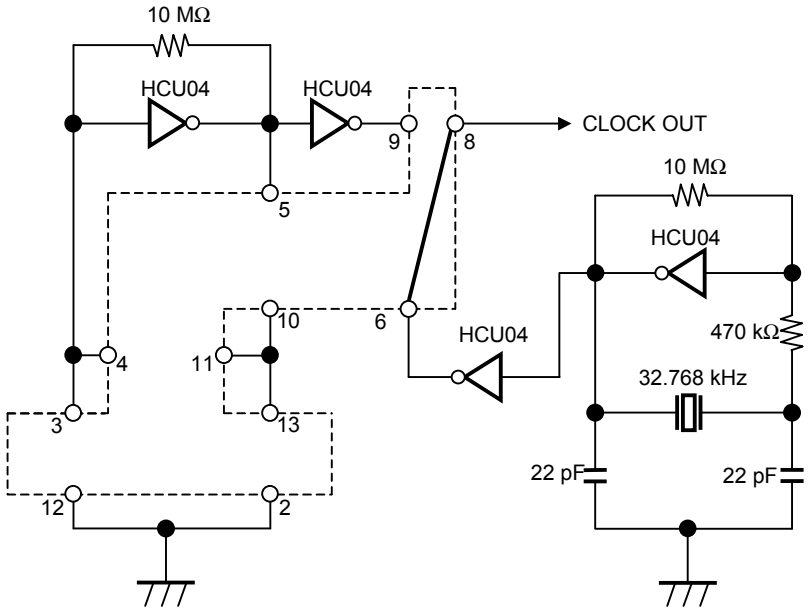
Remark The clock that is supplied by the IE-789468-NS-EM1's resonator (encircled in the figure) is used.

Outline Diagram



Remark The flow of the clock inside the IE-789468-NS-EM1 is indicated by the bold line.

Circuit Diagram



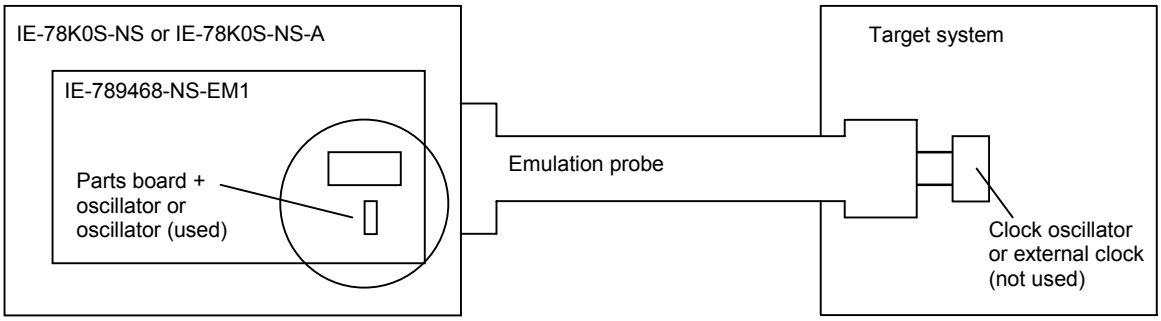
Remark The section enclosed by dotted lines indicates the section to be mounted on the socket (X2).

(2) When using clock mounted by user

The settings of either (a) or (b) described in the following pages are required, depending on the type of clock to be used. Set the jumper (JP1) on the IE-789468-NS-EM1 to 2-3 shorted.

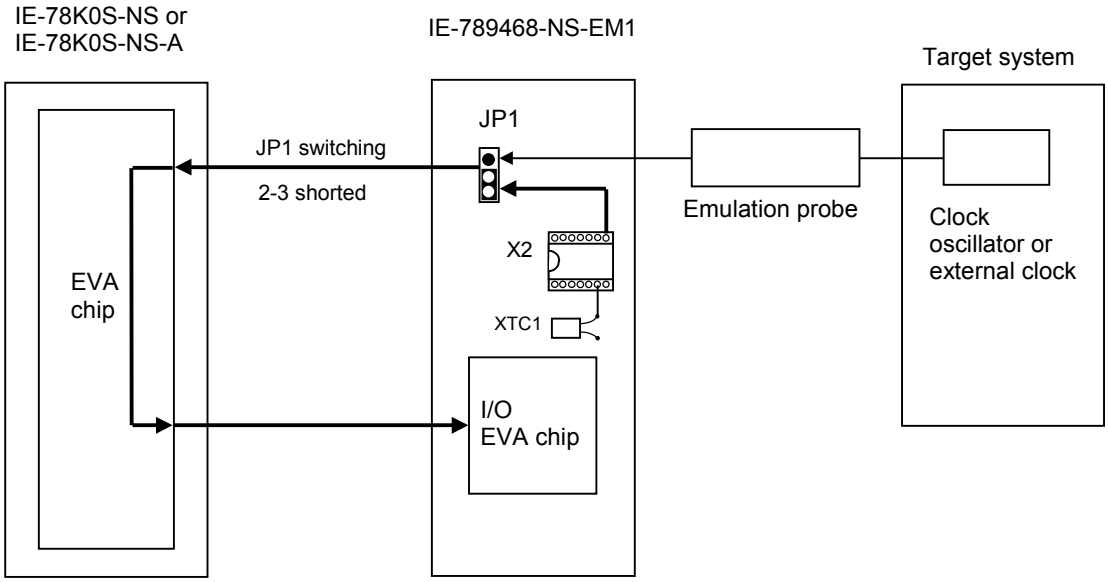
There is no need to make any settings in the integrated debugger (ID78K0S-NS).

Figure 3-13. When Using Clock Mounted by User (Subsystem Clock)



Remark The clock that is supplied by the IE-789468-NS-EM1's oscillator (encircled in the figure) is used.

Outline Diagram



Remark The flow of the clock inside the IE-789468-NS-EM1 is indicated by the bold line.

(a) When using a crystal resonator

♦ Necessary items

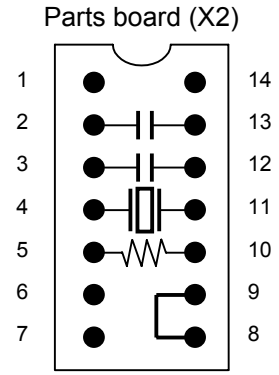
- Crystal resonator
- Resistor Rx
- Parts board
- Capacitor CA
- Capacitor CB
- Solder kit

<Procedure>

<1> Prepare a parts board.

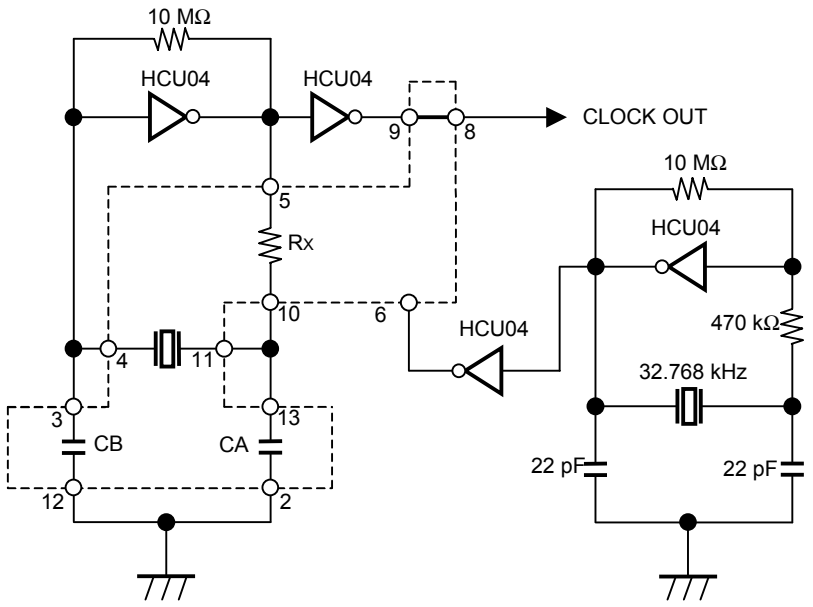
<2> Solder the target crystal resonator, resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequencies) onto the supplied parts board as shown below.

Figure 3-14. Connections on Parts Board (Subsystem Clock)



Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Crystal resonator
5-10	Resistor Rx
8-9	Shorted

Circuit Diagram



Remark The section enclosed by dotted lines indicates the section to be mounted on the parts board.

<3> Prepare the IE-789468-NS-EM1.

<4> Remove the jumper that is mounted in the IE-789468-NS-EM1's socket (X2).

<5> Make sure that the parts board is wired as shown in Figure 3-14 above.

<6> Connect the parts board (from <2> above) to the socket (X2) from which the jumper was removed in <4>. Check the pin 1 mark to make sure the board is mounted in the correct direction.

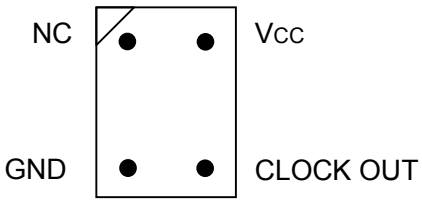
<7> Install the IE-789468-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(b) When using a crystal oscillator

♦ Necessary items

• Crystal oscillator (with pin configuration as shown in Figure 3-15)

Figure 3-15. Crystal Oscillator (Subsystem Clock)



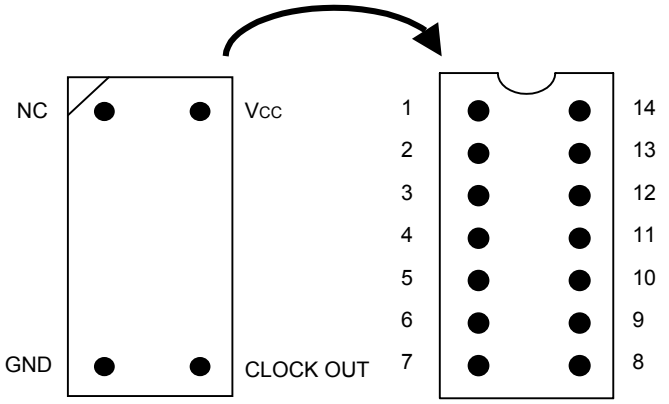
<Procedure>

<1> Prepare the IE-789468-NS-EM1.

<2> Remove the jumper from the socket (X2) on the IE-789468-NS-EM1.

<3> Mount the crystal oscillator in the socket (X2) from which the jumper was removed in <2>. At this time, insert the crystal oscillator pin into the socket pin as indicated below.

Figure 3-16. Correspondence Between Crystal Oscillator and Socket (Subsystem Clock)



Crystal Oscillator Pin	Socket Pin No.
NC	1
GND	4
CLOCK OUT	8
VCC	14

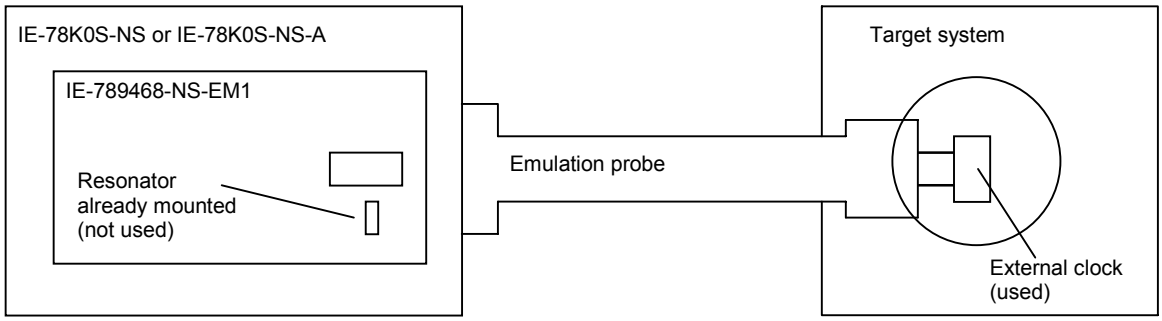
<4> Install the IE-789468-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(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. Set JP1 on the IE-789468-NS-EM1 to 1-2 shorted.

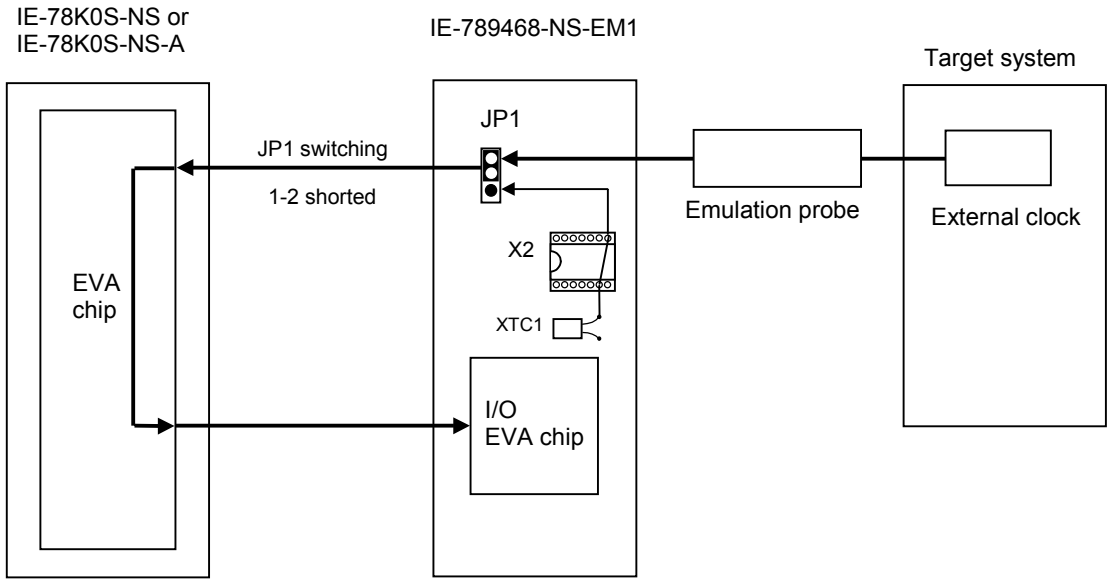
There is no need to make any settings in the integrated debugger (ID78K0S-NS).

Figure 3-17. When Using Pulse Input from Target System (Subsystem Clock)



Remark The external clock that is supplied by the target system (encircled in the figure) is used.

Outline Diagram



Remark The flow of the clock inside the IE-789468-NS-EM1 is indicated by the bold line.

3.6 Mask Option Settings

3.6.1 Mask option when μPD789327 Subseries is debugged

In the IE-789468-NS-EM1, the oscillation stabilization time, which is set by a mask option in the μPD789327 Subseries, cannot be selected. The oscillation stabilization wait time is the same as that of the flash memory version, μPD78F9327.

- 2^{15}/fx (fixed)

3.6.2 Mask option when μPD789467 Subseries is debugged

In the IE-789468-NS-EM1, whether to use the POC circuit, which is set by a mask option in the μPD789467 Subseries, can be selected. The switch settings are shown in Table 3-7.

Table 3-7. Selection of Use of POC Circuit

POC Circuit	SW1
POC circuit is used	POC ON side (2-side)
POC circuit is not used	POC OFF side (1-side)

Cautions 1. The POC circuit is selected to be used by default (POC ON side (2-side)).

2. Set the switch when the power of the IE-78K0S-NS or IE-78K0S-NS-A is off.

3.7 External Trigger

To set an external trigger, connect it to the IE-789468-NS-EM1's check pin, EXTOUT pin and EXTIN pin. The input pin position is shown in Figure 3-18.

See the IE-78K0S-NS User's Manual (U13549E) or IE-78K0S-NS-A User's Manual (U15207E) for descriptions of pin characteristics.

See the ID78K Series Integrated Debugger Ver.2.30 or Later Operation User's Manual (Windows™ Based) (U15185E) for descriptions of usage.

(1) EXTOUT

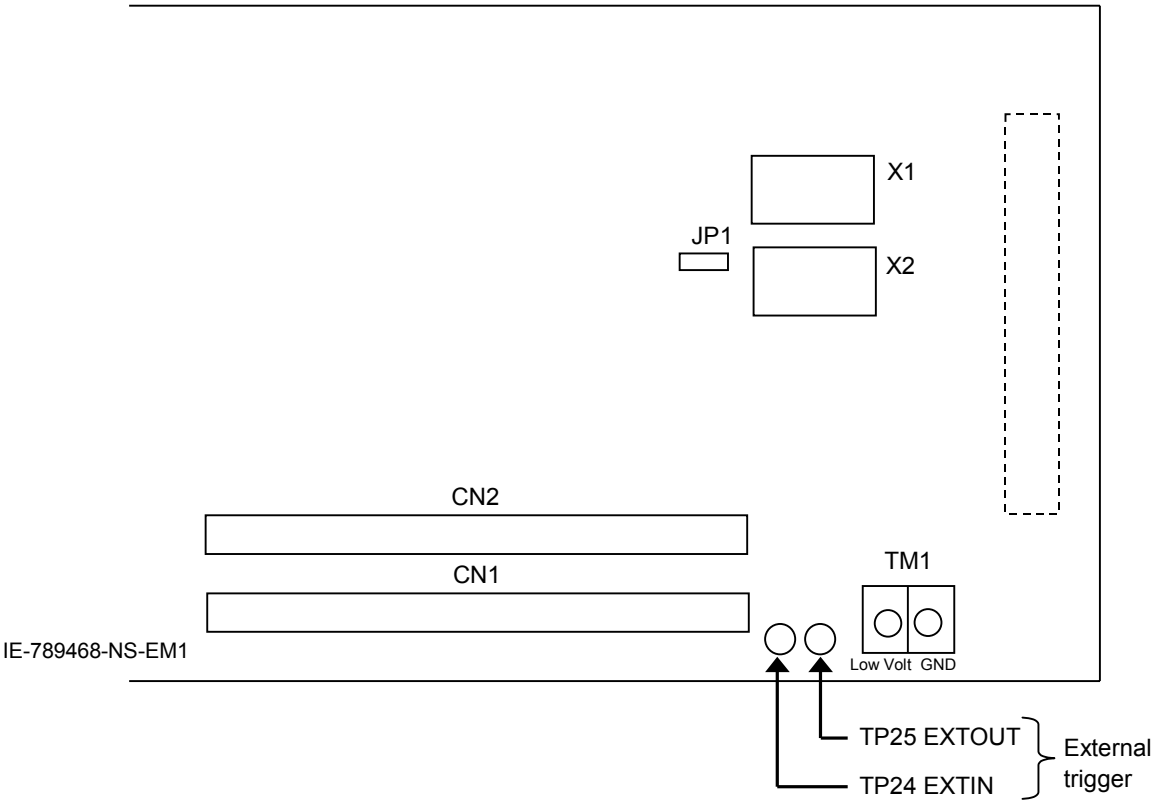
A low-level pulse is output from the IE-789468-NS-EM1's EXTOUT pin for 1.3 μs upon the occurrence of a break event.

Caution Because this is an open-drain output, a pull-up resistor should be connected on the target system.

(1) EXTIN

An event signal can be input from the IE-789468-NS-EM1's EXTIN pin. Input a high-level pulse signal for 2 CPU operating clocks or longer.

Figure 3-18. 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 emulation CPU, TTL, 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.

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

The circuits of the IE-789468-NS-EM1 for the signals in (1) to (3) above are shown below.

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

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

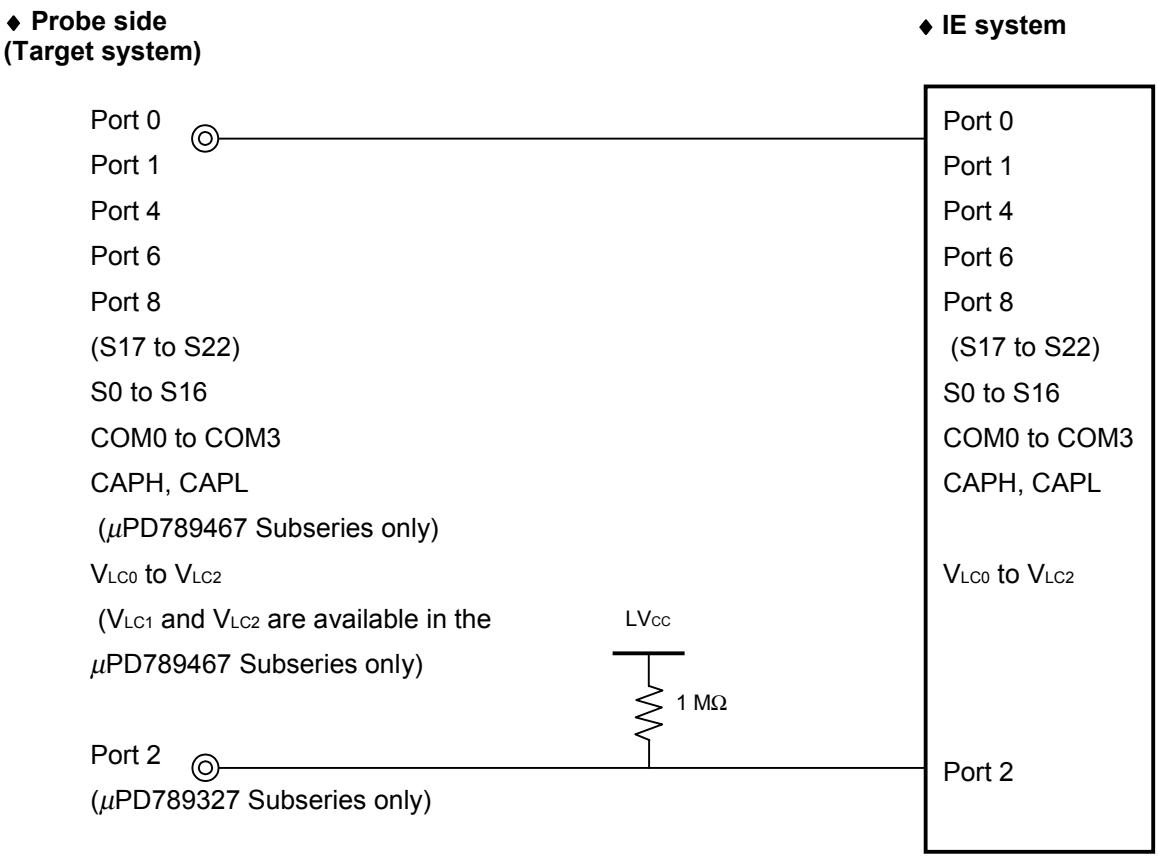
The following signals operate in the same manner as those in the μPD789327, 789467 Subseries.

- Signals related to port 0
- Signals related to port 1
- Signals related to port 4
- Signals related to port 6
- Signals related to port 8 (S17 to S22)
- S0 to S16
- COM0 to COM3
- CAPH, CAPL (μPD789467 Subseries only)
- V_{LC0} to V_{LC2} (V_{LC1} and V_{LC2} are available in the μPD789467 Subseries only)

A pull-up resistor of 1 MΩ is directly inserted in the following signal.

- Signals related to port 2 (μPD789327 Subseries only)

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



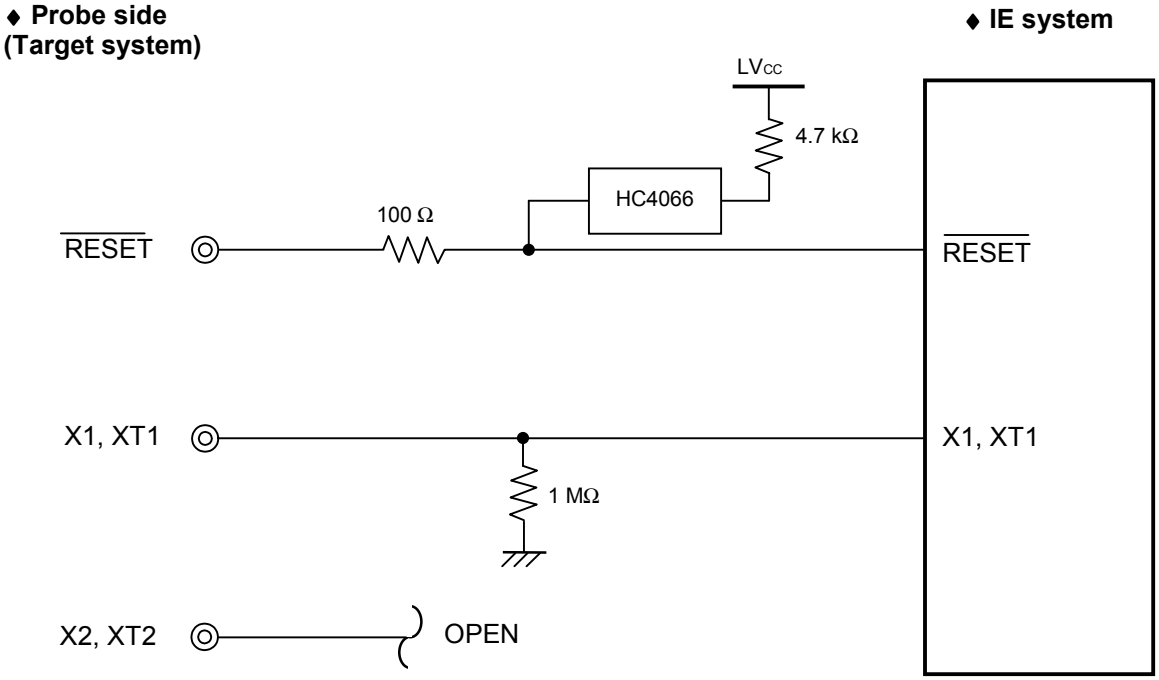
(2) Signals input from the target system via a gate

Since the following signals are input via a gate, their timing shows a delay compared to that of the μPD789327, 789467 Subseries. Refer to Figure 4-2 Equivalent Circuit of Emulation Circuit (2).

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

  The IE-789468-NS-EM1 does not use the X2 and XT2 pins.

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

When the target system is not connected, the power supply of the emulation CPU operates with the internal supply voltage (5 V). When the target system is connected, it operates with the power (LV_{CC}) supplied from the low-voltage supply pin (TM1).

The V_{DD} pin of the target system is only used to control the LED1 (USER VDD) that monitors the connection of the target system power supply in the IE-789468-NS-EM1.

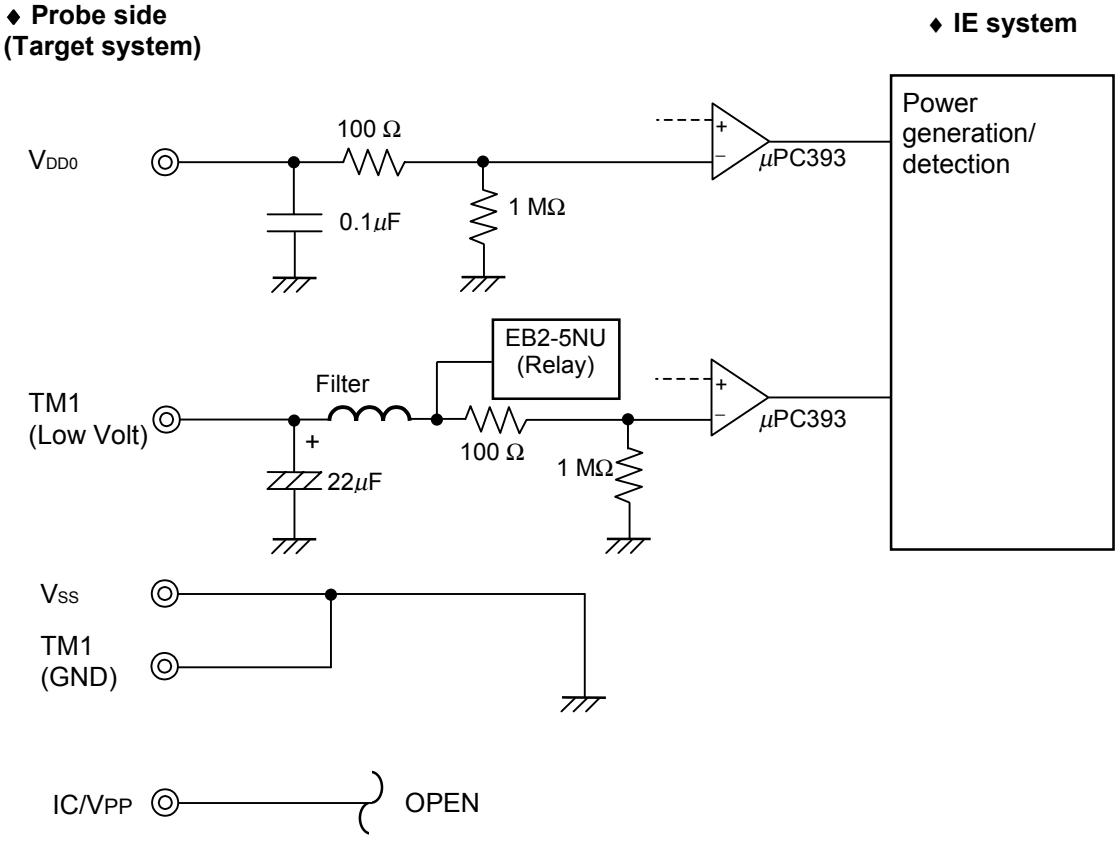
- V_{SS} pin

The V_{SS} pin is connected to GND inside the IE-789468-NS-EM1.

- IC/V_{PP} pin

The IE-789468-NS-EM1 does not use the IC/V_{PP} pin.

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



CHAPTER 5 CAUTIONS

This chapter describes differences between the target device and the IE system specifications.

The emulation circuit of the IE system consists of an EVA chip, TTL, CMOS-IC, and other circuits. Therefore, there are differences between the target device and the IE system specifications.

- Read value of port 2 when the target system is not connected

  Port 2 of the μPD789327 Subseries is directly connected to a 1 MΩ pull-up resistor. When the port value is read in input mode when the target system is not connected, the value read from port 2 is 07h.

- Oscillation stabilization wait time cannot be changed

  The oscillation stabilization wait time of the μPD789327 Subseries (mask ROM version) after STOP mode is released by $\overline{\text{RESET}}$ input or power-on clear is the same as that of the μPD78F9328 (flash memory version).

  - $2^{15}/f_X$ (fixed)

APPENDIX A EMULATION PROBE PIN CORRESPONDENCE TABLE

Table A-1. Pin Correspondence of NP-H52GB-TQ

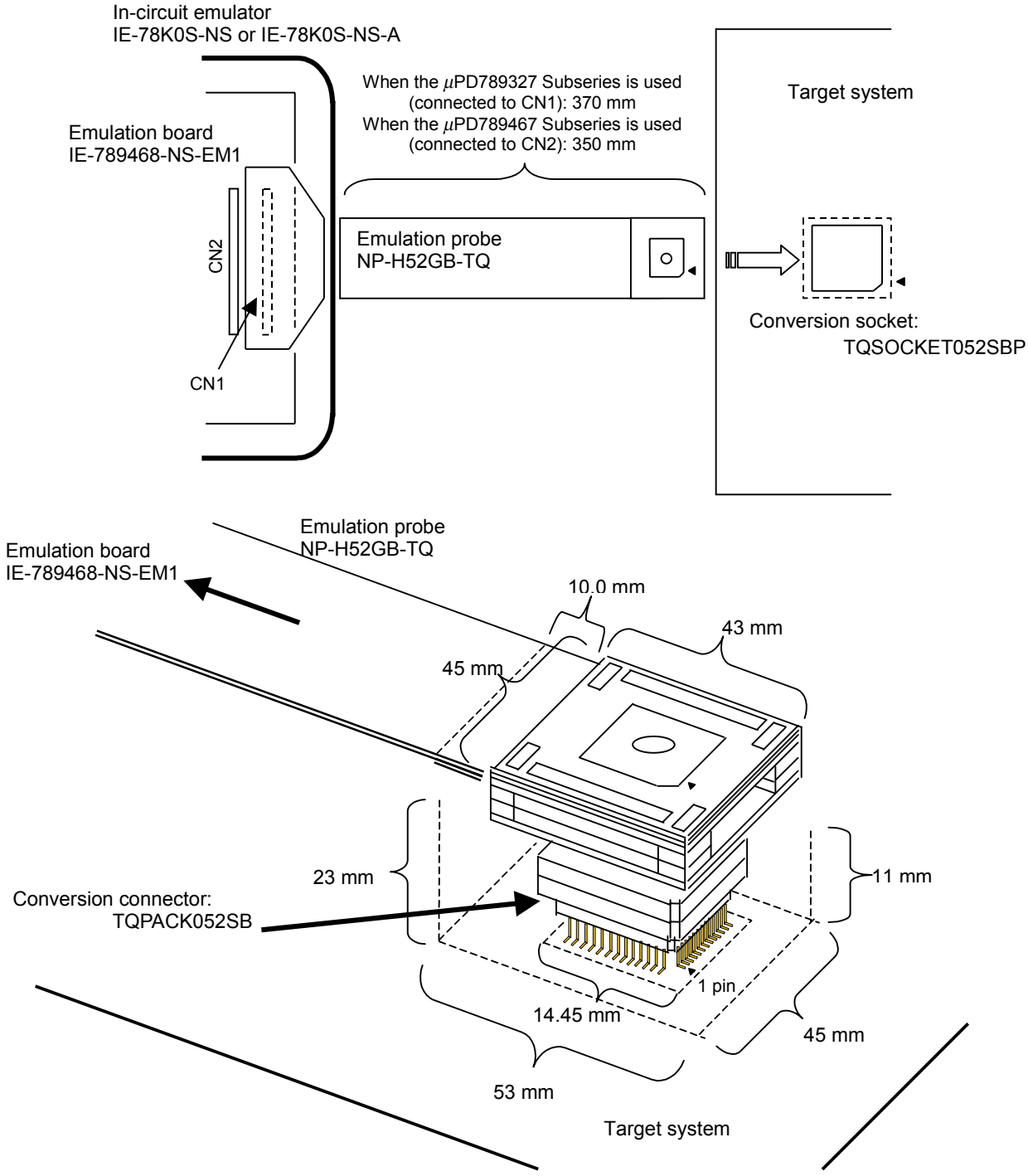
Emulation Probe Pin No.	CN1 Pin No.	Emulation Probe Pin No.	CN1 Pin No.
1	118	31	22
2	114	32	28
3	108	33	92
4	104	34	91
5	100	35	98
6	94	36	102
7	30	37	106
8	29	38	112
9	24	39	116
10	20	40	87
11	16	41	83
12	10	42	77
13	6	43	73
14	33	44	69
15	37	45	63
16	43	46	61
17	47	47	65
18	51	48	71
19	57	49	75
20	59	50	79
21	55	51	85
22	49	52	89
23	45		
24	41		
25	35		
26	31		
27	44		
28	47		
29	48		
30	35		

Remark NP-H52GB-TQ is a product of Naito Densei Machida Mfg. Co., Ltd.

APPENDIX B CAUTIONS ON TARGET SYSTEM DESIGN

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

Figure B-1. Conditions for Target System Connection



Remark NP-H52GB-TQ is a product of Naito Densei Machida Mfg. Co., Ltd.

TGB-052SBP is a product of Tokyo Eletech Corporation.