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User's Manual

IE-789468-NS-EM1

Emulation Board

Target Devices

μ PD789327 Subseries

μ PD789467 Subseries

μ PD179327 Subseries

Document No. U16482EJ1V0UM00 (1st edition)

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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 78K/0S Series of 8-bit single-chip microcontrollers.

- μ PD789327 Subseries: μ PD789322, 789324, 789326, 789327, 78F9328
- μ PD789467 Subseries: μ PD789462, 789464, 789466, 789467, 78F9468
- μ PD179327 Subseries: μ PD179322, 179324, 179326, 179327, 78F9328

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

- Basic specifications
- System configuration
- External interface functions

IE-789468-NS-EM1
User's Manual

- General
- Part names
- Installation
- Differences between target device and target interface circuit
- Notes

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

- Basic specifications
- System configuration
- External interface functions

Purpose

This manual's purpose is to explain various debugging functions that can be performed when using the IE-789468-NS-EM1.

Notes

This manual describes the following two board configurations. The setting method differs depending on the board configuration. Check the board configuration before use.

- IE-789468-NS-EM1 with sub-board: Product with a sub-board (IE-789468-NS-EM1 CN Board) connected
- IE-789468-NS-EM1 without sub-board: Product with a socket mounted at the location of IC1

Terminology

The meanings of certain terms used in this manual are listed below.

Term	Meaning
Emulation device	This is a general term that refers to the device in the emulator that is used to emulate the target device. It includes the emulation CPU.
Emulation CPU	This is the CPU block in the emulator that is used to execute user-generated programs.
Target device	This is the device to be emulated.
Target system	This includes the target program and the hardware provided by the user. When defined narrowly, it includes only the hardware.
IE system	This refers to the combination of the in-circuit emulator (IE-78K0S-NS or IE-78K0S-NS-A) and the emulation board (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 Documents

The related documents (user's manuals) indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document Number
IE-78K0S-NS In-Circuit Emulator	U13549E
IE-78K0S-NS-A In-Circuit Emulator	U15207E
IE-789468-NS-EM1 Emulation Board	This manual
ID78K0S-NS Ver. 2.52 Integrated Debugger Operation	U16584E
μPD789327 Subseries	U15043E
μPD789467 Subseries	U15552E
μPD179327 Subseries	U16995E

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

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CHAPTER 1 GENERAL

The IE-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 78K/0S Series of 8-bit single-chip microcontrollers.

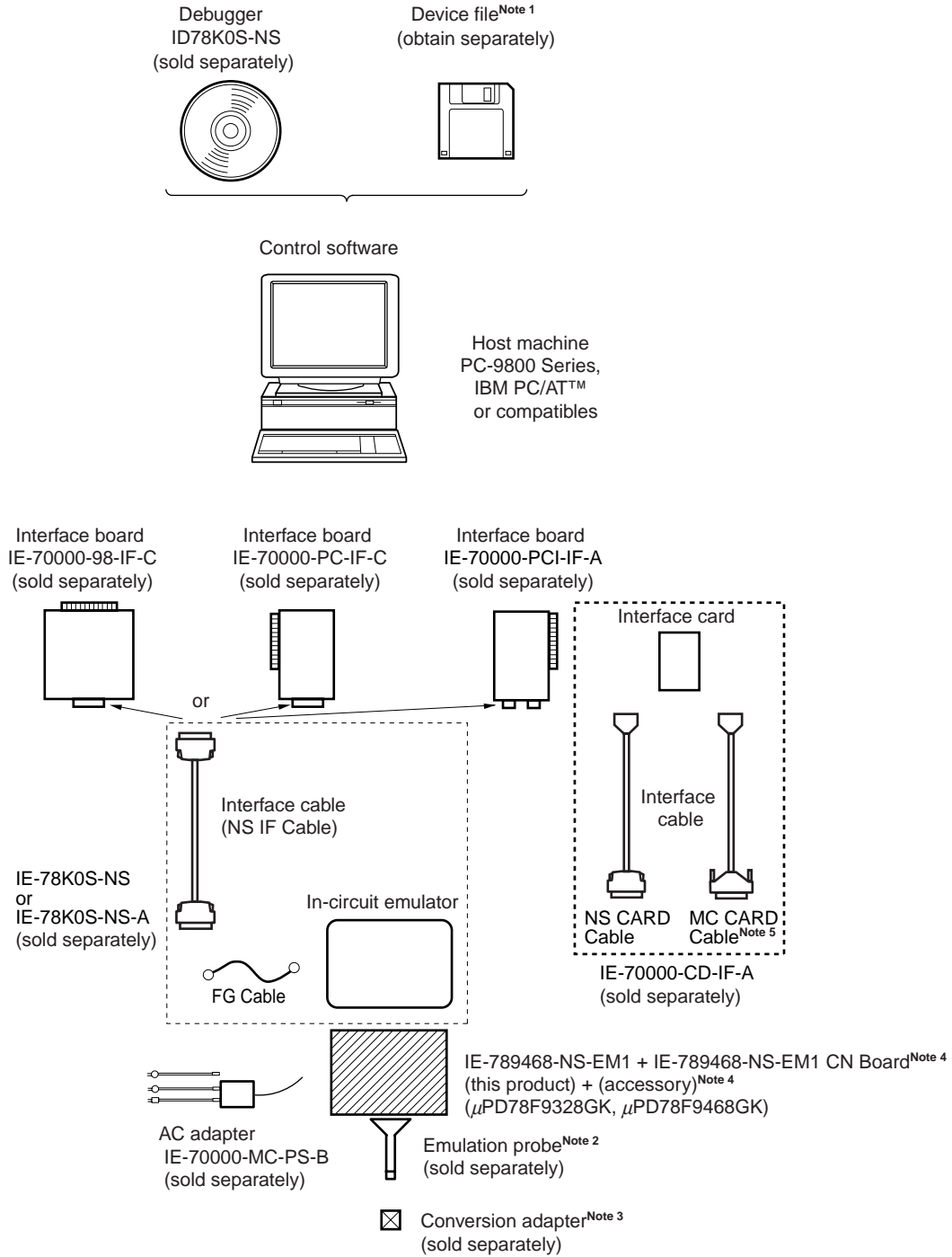
This chapter describes the IE-789468-NS-EM1's system configuration and basic specifications.

- Target devices
 - μ PD789327 Subseries
 - μ PD789467 Subseries
 - μ PD179327 Subseries

1.1 System Configuration

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

Figure 1-1. System Configuration



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

μ SxxxxDF789328: μ PD789327 Subseries

μ SxxxxDF789468: μ PD789467 Subseries

μ SxxxxDF179327: μ PD179327 Subseries

The device file can be downloaded from the website of NEC Electronics Corporation.

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

2. The emulation probe NP-H52GB-TQ is a product of Naito Densei Machida Mfg. Co., Ltd.
For further information, contact Naito Densei Machida Mfg. Co., Ltd. (TEL: +81-45-475-4191)
3. The conversion adapter TGB-052SBP is a product of TOKYO ELETECH CORPORATION.
For further information, contact Daimaru Kogyo Co., Ltd.
Tokyo Electronics Department (TEL: +81-3-3820-7112)
Osaka Electronics Department (TEL: +81-6-6244-6672)

Table 1-1. Correspondence Between Emulation Probe and Conversion Adapter

Package	Emulation Probe	Conversion Adapter
52-pin plastic LQFP (GB type)	NP-H52GB-TQ (probe length: 400 mm)	TGB-052SBP

4. Supplied with the IE-789468-NS-EM1 with sub-board only.
5. Not used in this product.

1.2 Hardware Configuration

Figures 1-2 and 1-3 show the IE-789468-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration (for IE-789468-NS-EM1 with Sub-Board)

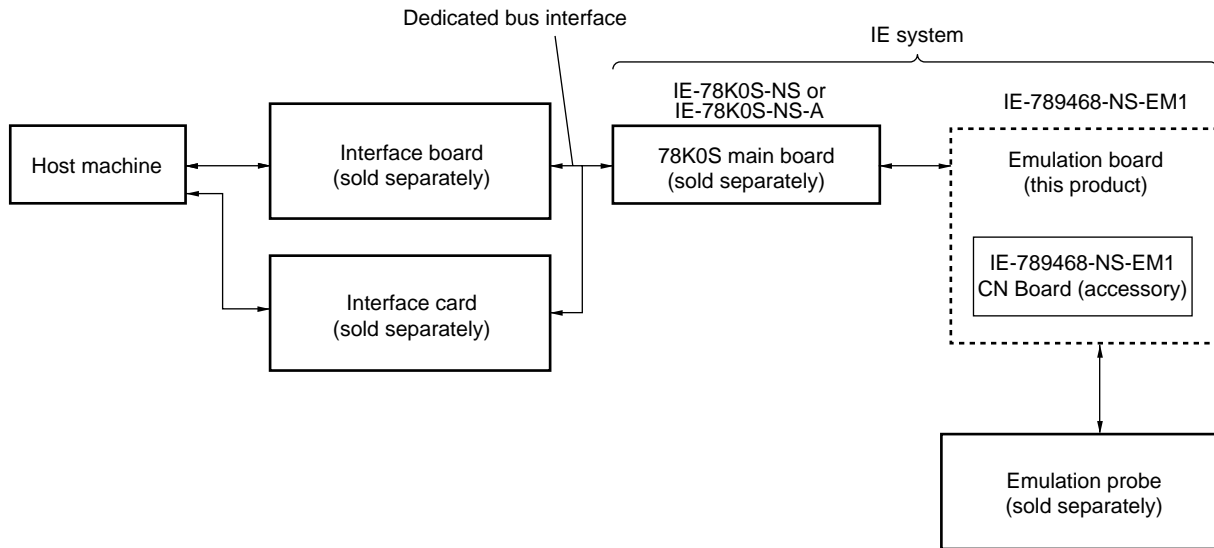
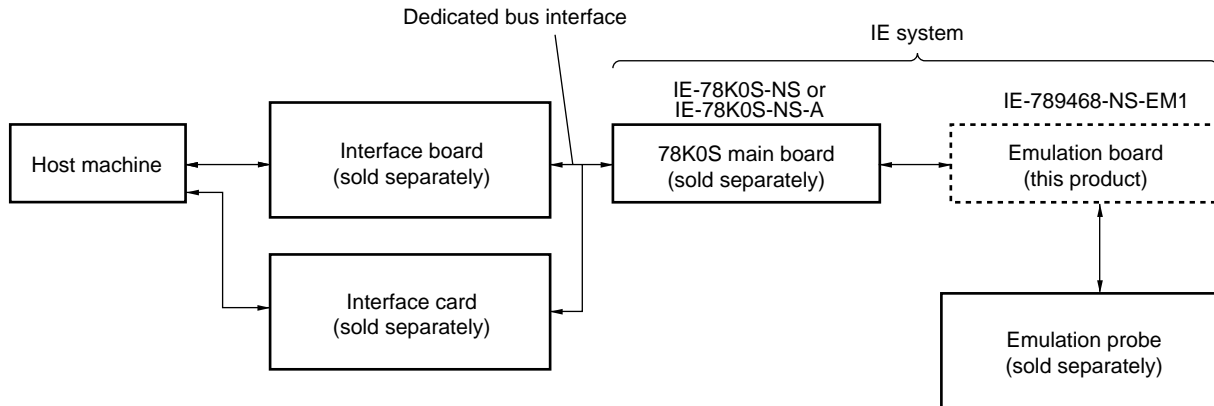


Figure 1-3. Basic Hardware Configuration (for IE-789468-NS-EM1 Without Sub-Board)



1.3 Basic Specifications

The basic specifications of the IE-789468-NS-EM1 are listed in Table 1-2.

Table 1-2. Basic Specifications

Parameter	Description
Target device	μ PD789327, 789467, 179327 Subseries
System clock	Main system clock: 1.0 to 5.0 MHz Subsystem clock: 32.768 kHz
Main system clock supply	External: Input via an emulation probe from the target system Internal: Mounted on emulation board (5.0 MHz), or mounted on the parts board by the user
Subsystem clock supply	External: Input via an emulation probe from the target system Internal: Mounted on the emulation board (32.768 kHz), or mounted on the parts board by the user
Target interface voltage	$V_{DD} = 1.8$ to 5.5 V (same as that of target device) Operates on internal power supply (5 V) when target system is not connected

1.4 Emulation CPU

For the emulation CPU, the device to be used (emulation CPU (I/O EVA chip)) differs depending on the target Subseries device.

(1) IE-789468-NS-EM1 with sub-board

Connecting the IE-789468-NS-EM1 CN Board supplied with the product changes the target emulation CPU. The IE-789468-NS-EM1 CN Board is connected between CN101 and CN102 at shipment.

Refer to **3.1.1 Emulation CPU settings** for details of the emulation CPU settings.

Table 1-3. Emulation CPU Settings at Shipment (for IE-789468-NS-EM1 with Sub-Board)

Target Subseries	Emulation CPU (I/O EVA Chip)	Settings at Shipment (IE-789468-NS-EM1 CN Board)
μ PD789327 Subseries, μ PD179327 Subseries	μ PD78F9328GK	Connected between CN101 and CN102.
μ PD789467 Subseries	μ PD78F9468GK	The area between CN102 and CN103 is left open.

(2) IE-789468-NS-EM1 without sub-board

Refer to **2.1 Parts of Main Unit** for the IC1 position. Refer to **3.1.1 Emulation CPU settings** for details of the settings.

The μ PD78F9468GK E1.3, which is the emulation CPU (I/O EVA chip) used for debugging a μ PD789467 Subseries device, is included in the packing box as an accessory.

Table 1-4. Emulation CPU Settings at Shipment (for IE-789468-NS-EM1 Without Sub-Board)

Target Subseries	Emulation CPU (I/O EVA Chip)	Settings at Shipment
μ PD789327 Subseries, μ PD179327 Subseries	μ PD78F9328GK V1.31	Mounted on the socket (IC1) on the emulation board.
μ PD789467 Subseries	μ PD78F9468GK E1.3	Included in the packing box as an accessory.

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), a case^{Note 1} containing the emulation CPU^{Note 2} and a screwdriver^{Note 3}, the packing list, the user's manual, and the 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.

- Notes**
1. Supplied with the IE-789468-NS-EM1 without sub-board only.
 2. The emulation CPU to be used differs depending on the target subseries device as follows:

μ PD789327, 179327 Subseries:	I/O EVA chip μ PD78F9328GK V1.31 (Mounted on IC1 on the emulation board at shipment)
μ PD789467 Subseries:	I/O EVA chip μ PD78F9468GK E1.3 (Included in the packing box as an accessory at shipment)
 3. This screwdriver is provided for exclusive use in removing/attaching the screws that fix the socket (IC1) on which the emulation CPU is mounted. Be careful not to lose it.

2.1 Parts of Main Unit

Figure 2-1 shows the part names of the IE-789468-NS-EM1.

Figure 2-1. Part Names of IE-789468-NS-EM1 with Sub-Board

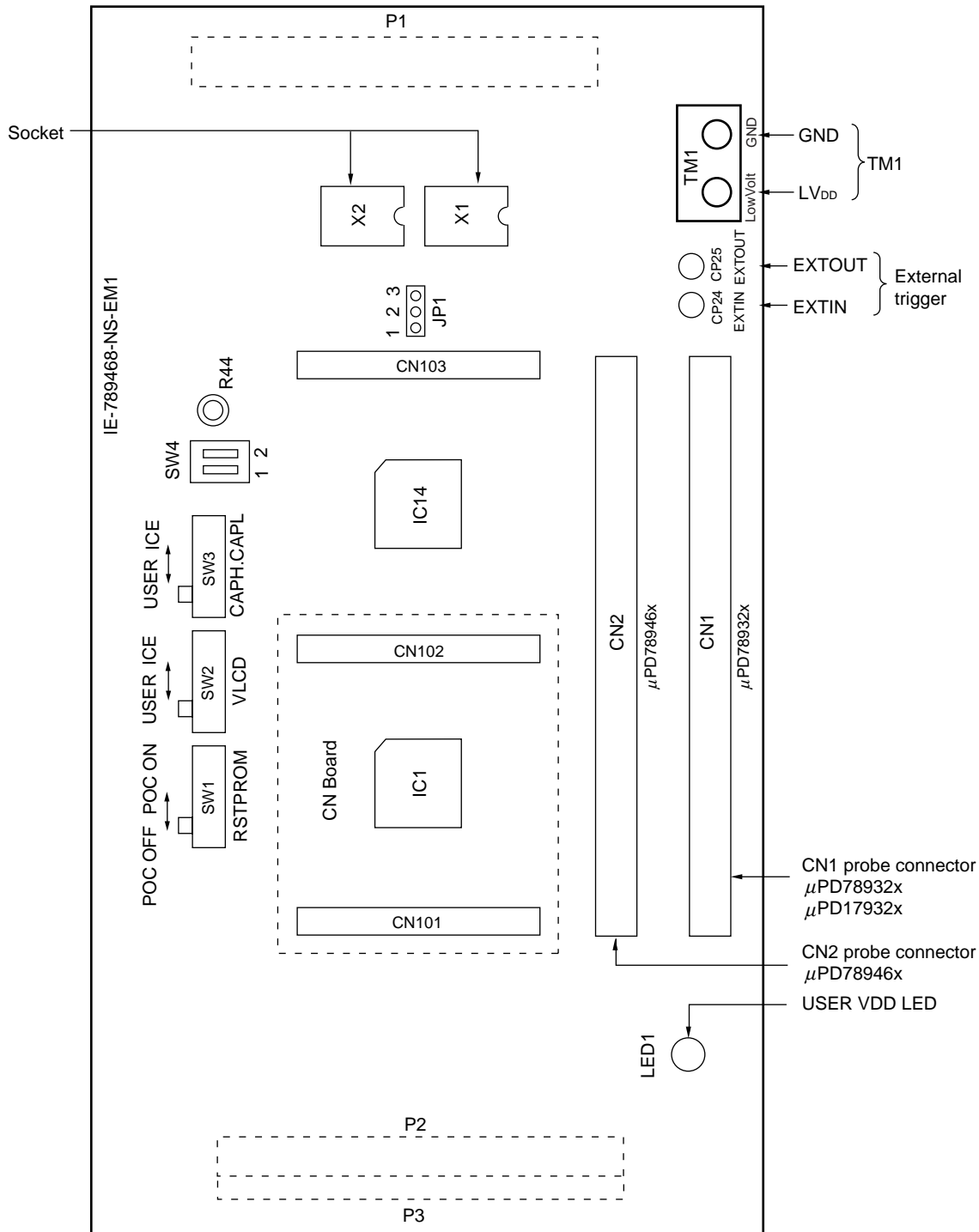
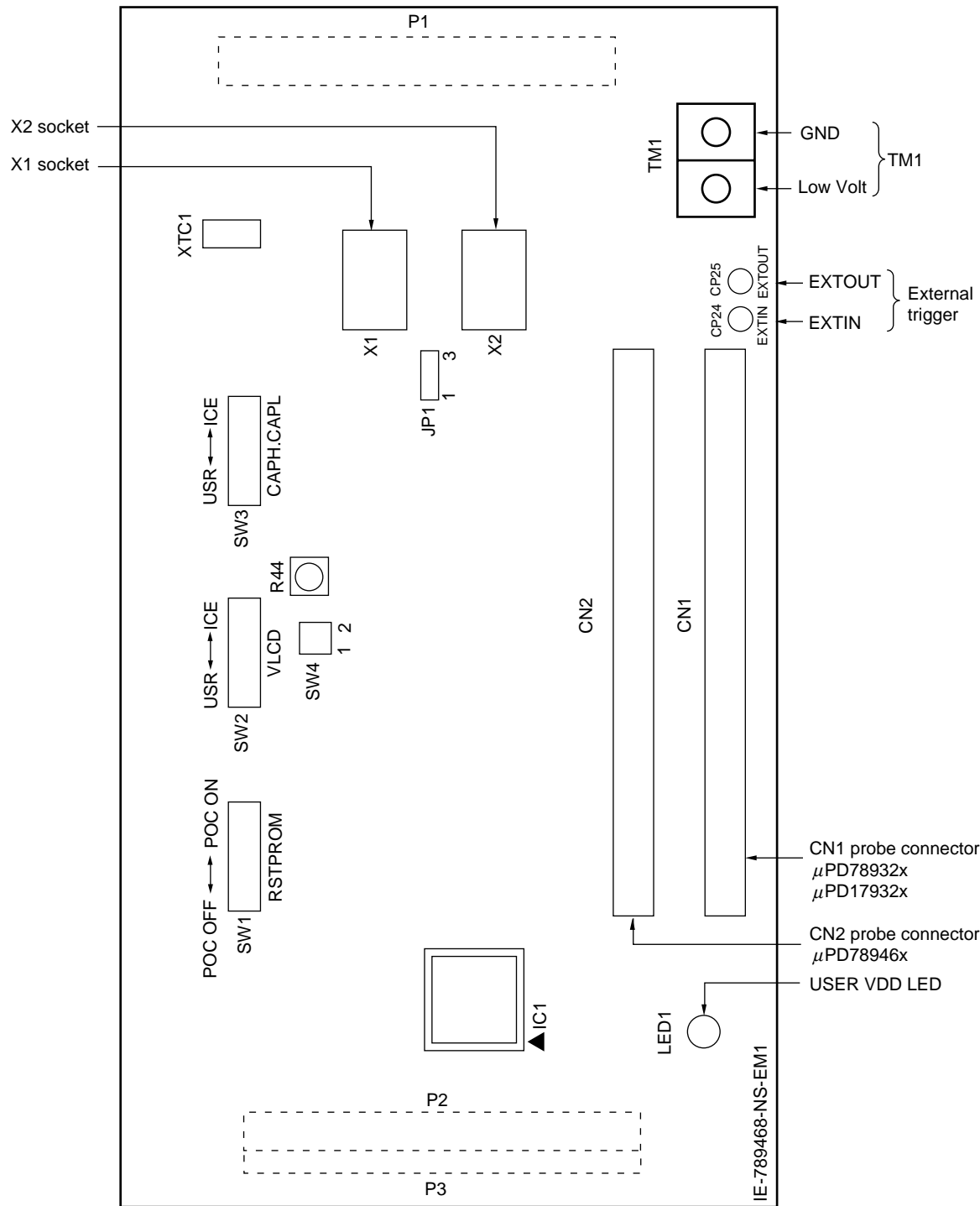


Figure 2-2. Part Names of IE-789468-NS-EM1 Without Sub-Board



2.2 Initial Settings of Switches and Jumper

Table 2-1 shows the initial settings of the switches and jumper on the IE-789468-NS-EM1.
Refer to **3.5.4 Switch settings** for the setting of the switches and jumper.

Table 2-1. Initial Settings of Switches and Jumper

	SW1	SW2	SW3	SW4-1	SW4-2	JP1
Initial setting	POC ON	USER (USR)	USER (USR)	OFF (Fixed)	OFF (Fixed)	2 and 3 shorted

Remark R44 is not used.

CHAPTER 3 INSTALLATION

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

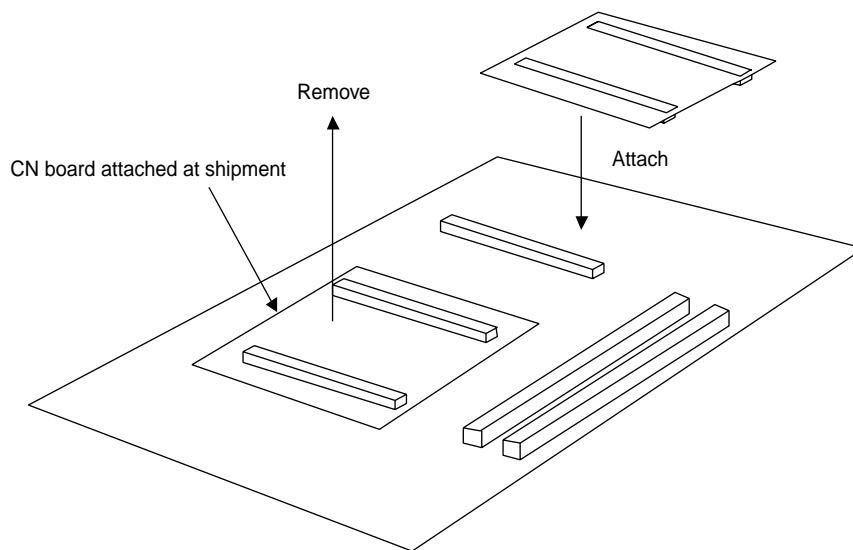
3.1.1 Emulation CPU settings

(1) Settings for the IE-789468-NS-EM1 with sub-board

The emulation CPU of the IE-789468-NS-EM1 to be used differs depending on the target subseries device. The μ PD78F9328GK, which is the emulation CPU (I/O EVA chip) used for debugging a μ PD789327/179327 Subseries device, is set at shipment. There is no need to change any hardware settings when using the factory settings.

When debugging a μ PD789467 Subseries device, remove the CN Board mounted between CN101 and CN102, and attach it between CN102 and CN103. This changes the target emulation CPU to the μ PD78F9468GK, which is the emulation CPU (I/O EVA chip) for debugging a μ PD789467 Subseries device.

Figure 3-1. Changing Emulation CPU for IE-789468-NS-EM1 with Sub-Board



- Cautions**
1. Be sure to align the pin number (position of pin 1) when attaching the CN Board.
 2. Changing of the emulation CPU must be carried out after the power supply to the IE-78K0-NS or IE-78K0S-NS-A has been switched OFF. Changing the emulation CPU during power-on may damage the IE system.

(2) Settings for the IE-789468-NS-EM1 without sub-board

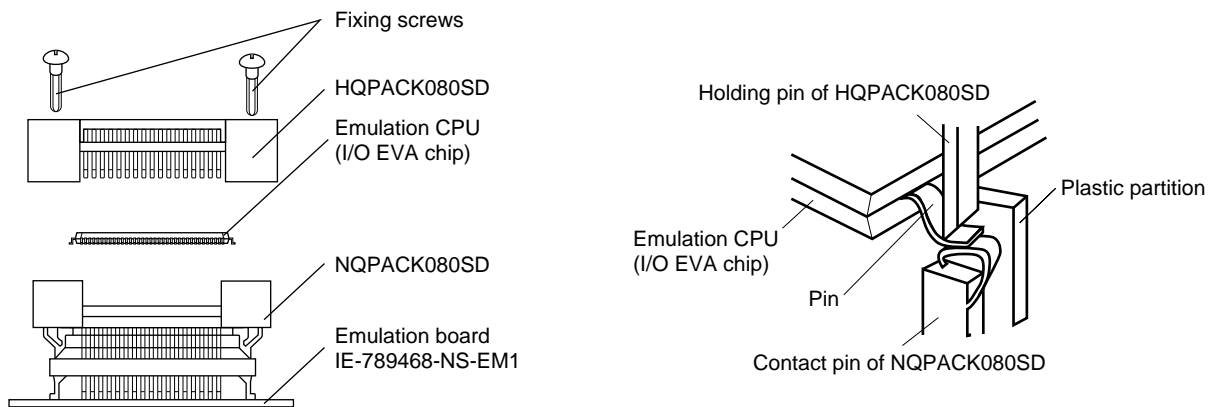
The emulation CPU of the IE-789468-NS-EM1 to be used differs depending on the target subseries device.

The μ PD78F9328GK V1.31, which is the emulation CPU (I/O EVA chip) used for debugging a μ PD789327/179327 Subseries device, is mounted on the socket (IC1) at shipment. There is no need to change any hardware settings when using the factory settings.

When debugging a μ PD789467 Subseries device, remove the μ PD78F9328GK V1.31 from the socket (IC1), and mount the μ PD78F9468GK E1.3, which is the emulation CPU used for debugging a μ PD789467 Subseries device and which is included in the packing box as an accessory, on the socket (IC1).

When the emulation CPU (I/O EVA chip) is mounted, each emulation CPU pin is fixed by a contact pin of the NQPACK080SD and a holding pin of the HQPACK080SD, being separated by a plastic partition. This prevents each emulation CPU pin from being shorted with an adjacent pin.

Figure 3-2. Replacing Emulation CPU for IE-789468-NS-EM1 Without Sub-Board



<Steps>

- <1> Remove the four screws (M2 × 6 mm) that fix the HQPACK080SD on each corner using the supplied screwdriver.
- <2> Remove the mounted emulation CPU (I/O EVA chip).
- <3> Mount the emulation CPU (I/O EVA chip) for the Subseries device to be debugged, aligning pin 1 of the emulation CPU (I/O EVA chip) to the position of pin 1 of the NQPACK080SD.
- <4> Place the HQPACK080SD on the NQPACK080SD with the emulation CPU (I/O EVA chip) mounted, and fix them with four screws (M2 × 6 mm), one at each corner. Tighten the four screws equally in opposite angle order using the supplied screwdriver or a screwdriver with a torque gauge. Be careful not to tighten one screw harder than the others. The target torque for tightening screws is 0.55 kg•f•cm (0.054 N•m) max. Tightening screws too hard may obstruct smooth conduction.

- Cautions**
1. Replacement of the emulation CPU must be carried out after the power supply to the IE-78K0S-NS or IE-78K0S-NS-A has been switched OFF. Replacing the emulation CPU during power-on may damage the IE system.
 2. Be sure to align pin 1 of the emulation CPU (I/O EVA chip) to the position of pin 1 of the socket (IC1) when mounting the emulation CPU. Mounting the emulation CPU (I/O EVA chip) misaligning the pin 1 position may damage the emulation CPU.
 3. The emulation CPU (I/O EVA chip) may not operate normally if it is mounted with its pin leads bent.
 4. Check that the emulation CPU (I/O EVA chip) does not have resin flash, broken or bent pins, or other problems before mounting it on the NQPACK080SB.
When mounting the HQPACK080SD on the NQPACK080SB on which the emulation CPU is mounted, check that all holding pins of the HQPACK080SD are not broken or bent. If the HQPACK080SD has a bent pin, straighten it using a thin plate or a knife-like blade.

3.2 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-789468-NS-EM1 to the IE-78K0S-NS^{Note}.

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

(2) Connection with emulation probe

See the **IE-78K0S-NS User's Manual (U13549E)** for a description of how to connect an emulation probe to the IE-789468-NS-EM1^{Note}.

Connect an emulation probe to CN1 when debugging a μ PD789327 or 179327 Subseries product.

Connect an emulation probe to CN2 when debugging a μ PD789467 Subseries product.

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

Caution Incorrect connection may damage the IE system.

Be sure to read the emulation probe's user's manual for a detailed description of the connection method.

Figure 3-3. Connection of Emulation Probe to IE-789468-NS-EM1 with Sub-Board

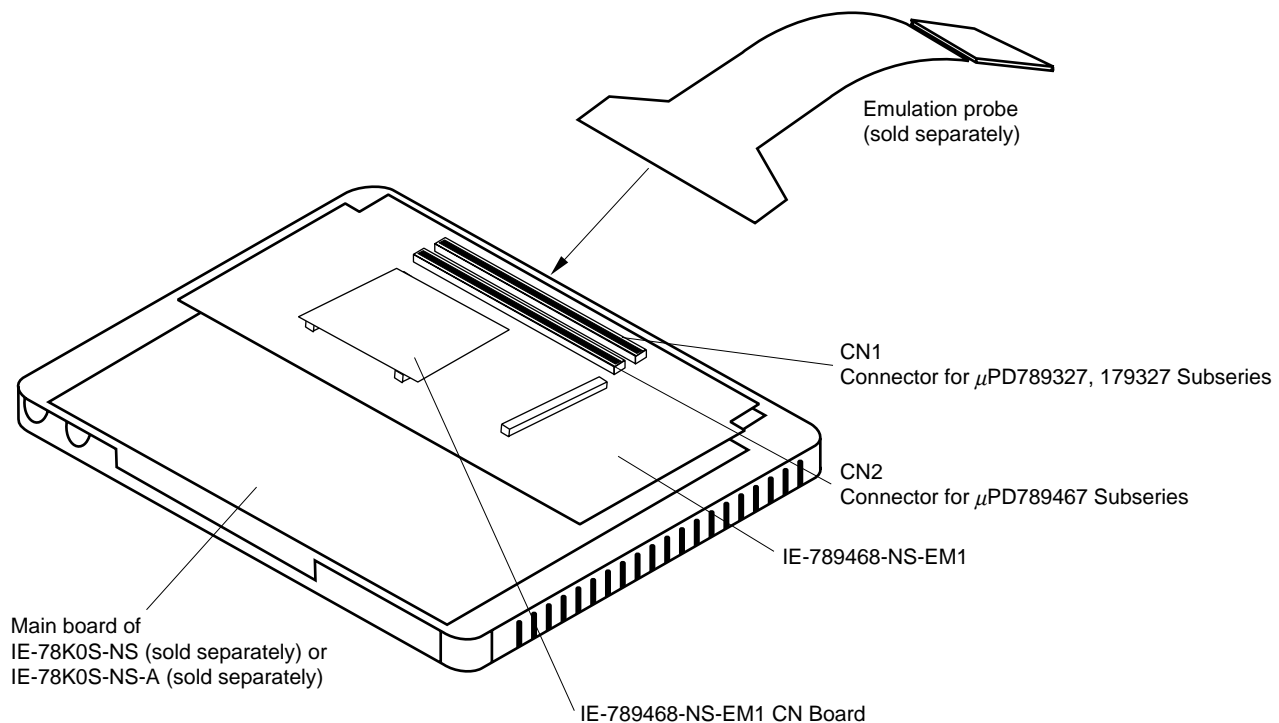
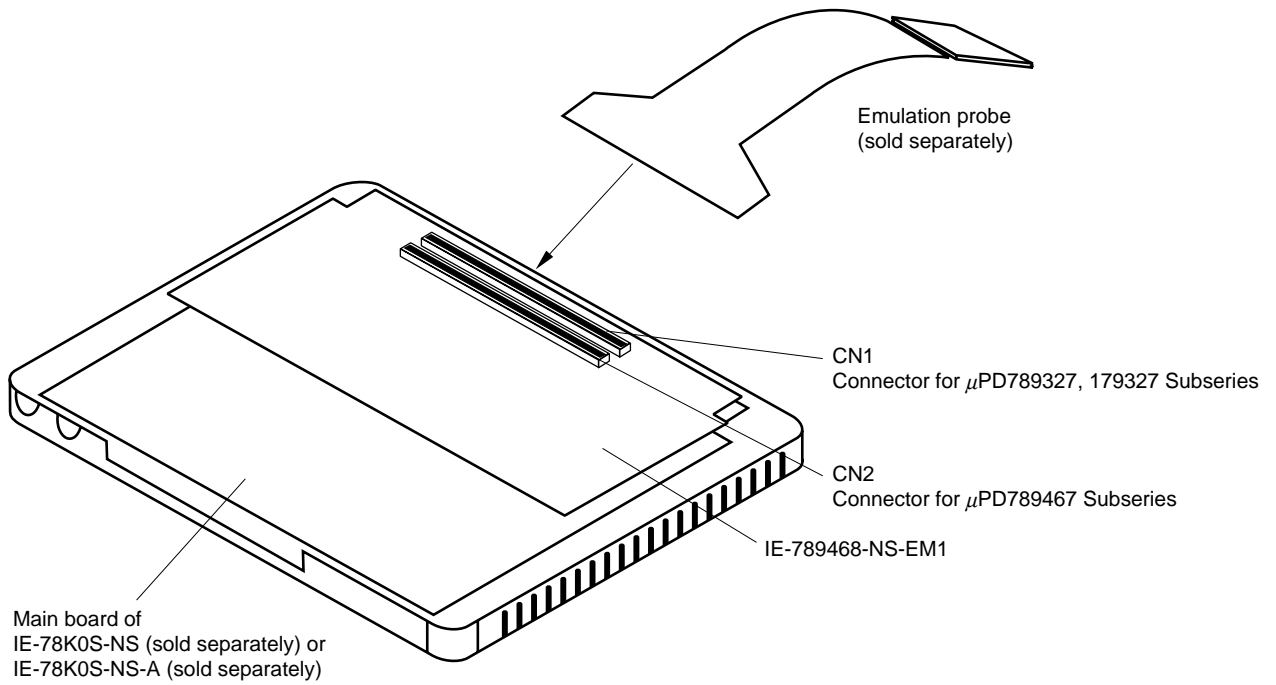


Figure 3-4. Connection of Emulation Probe to IE-789468-NS-EM1 Without Sub-Board



3.3 Switch and Jumper Settings on Main Unit

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

When using the IE-789468-NS-EM1, set the switches and jumpers on the IE-78K0S-NS as shown in Table 3-1. For details of these switch and jumper settings, refer to the **IE-78K0S-NS User's Manual (U13549E)**.

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

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

Caution Incorrect connection may damage the IE-789468-NS-EM1.

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

When using the IE-789468-NS-EM1, set the switches and jumpers on the IE-78K0S-NS-A as shown in Table 3-2. For details of these switch and jumper settings, refer to the **IE-78K0S-NS-A User's Manual (U15207E)**.

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

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

Caution Incorrect connection may damage the IE-789468-NS-EM1.

3.4 Setting Power Supply Voltage of Target Interface

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

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

When debugging with a voltage that is the same level as that of the target system, supply the same voltage as that of the target system to the TM1 terminal pin of the IE-789468-NS-EM1 (the same applies when the voltage is 5 V).

Set the target voltage to between 1.8 and 5.5 V.

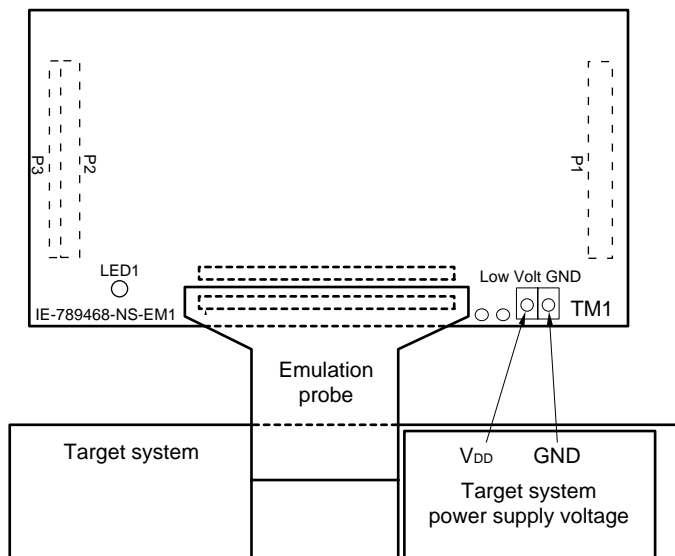
For how to select the operating power supply, refer to the **ID78K0S-NS Ver. 2.52 Operation User's Manual (U16584E)**.

- Maximum current consumption of TM1
1.8 to 5.5 V: Approximately 100 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 3-5. Connecting TM1 and Target System Power Supply Voltage (for μ PD789327 Subseries)



Caution Before connecting TM1 on the board and the target system power supply voltage, turn off the power to the IE-78K0S-NS or IE-78K0S-NS-A.

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

3.5 Clock Settings

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

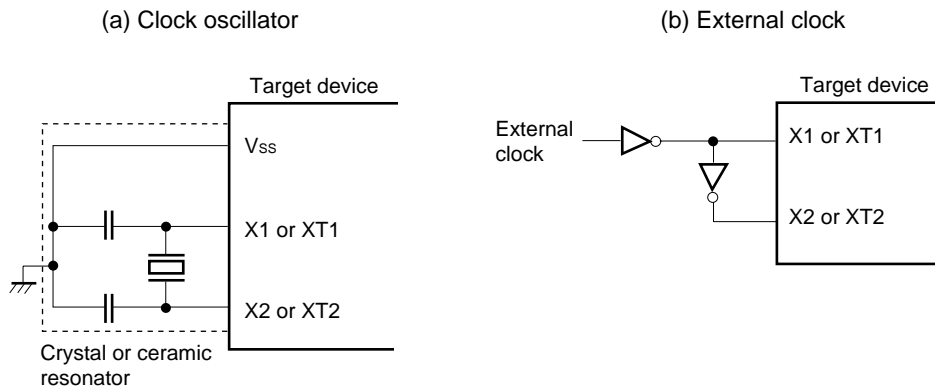
If the target system includes a clock oscillator, select either **(1) Clock that is already mounted on emulation board** or **(2) Clock that is mounted by user**. For the clock oscillator, a resonator is connected to the target device and the target device's internal oscillator is used. An example of the external circuit is shown in part (a) of Figure 3-6. During emulation, the oscillator that is mounted on the target system is not used. Instead, the clock that is mounted on the emulation board installed in the IE-78K0S-NS or IE-78K0S-NS-A is used.

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

For the external clock, a clock signal is supplied from outside of the target device and the target device's internal oscillator is not used. An example of the external circuit is shown in part (b) of Figure 3-6.

Caution The IE system will hang up if the main system clock is not supplied normally. Moreover, be sure to input a rectangular wave as the pulse from the target system. There is no need to supply a clock to the X2 and XT2 pins. Also, even if a crystal resonator is connected directly to X1 (for the main system clock) or XT1 (for the subsystem clock), the target device will not operate.

Figure 3-6. External Circuits Used as System Clock Oscillator



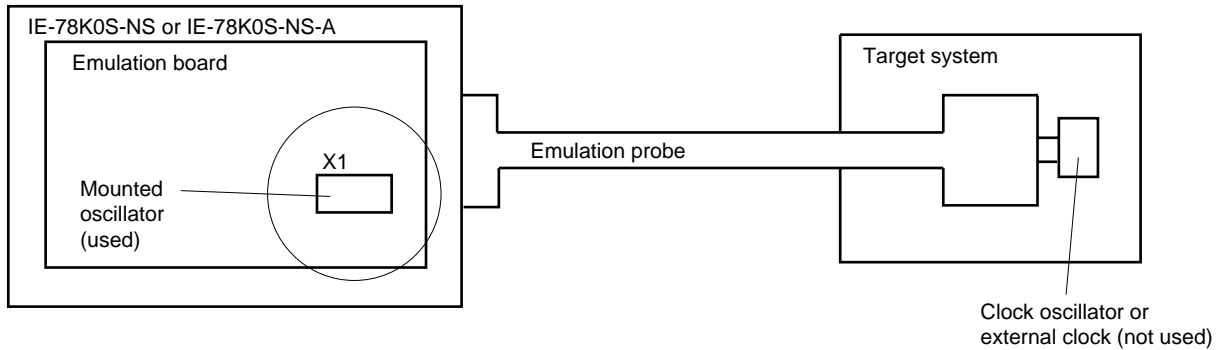
(1) Clock that is already mounted on emulation board

The crystal oscillator mounted on the IE-789468-NS-EM1 can be used.

(a) Main system clock

A crystal oscillator (X1) is already mounted on the emulation board. Its frequency is 5.0 MHz.

Figure 3-7. When Using Clock That Is Already Mounted on Emulation Board (Main System Clock)

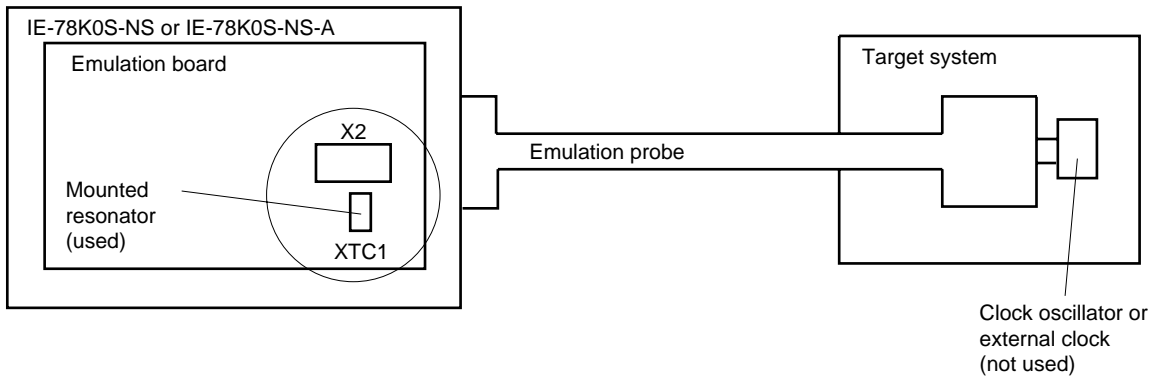


Remark The clock that is supplied by the oscillator of the IE-789468-NS-EM1 (encircled in the figure) is used.

(b) Subsystem clock

A crystal resonator (XTC1) is already mounted on the emulation board. Its frequency is 32.768 kHz

Figure 3-8. When Using Clock That Is Already Mounted on Emulation Board (Subsystem Clock)



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

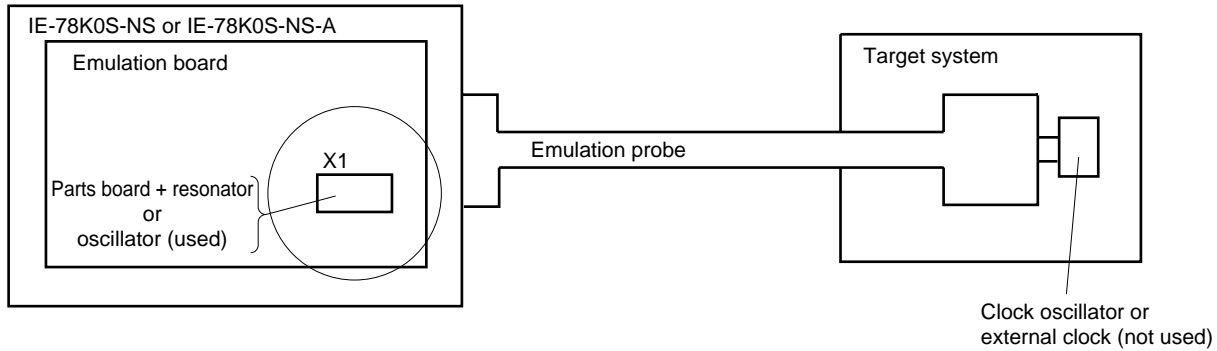
(2) Clock that is mounted by user

The user can mount any clock supported by the set specifications on the IE-789468-NS-EM1. This feature is effective when debugging at a different frequency from that of the clock already mounted.

(a) Main system clock

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

Figure 3-9. When Using User-Mounted Clock (Main System Clock)

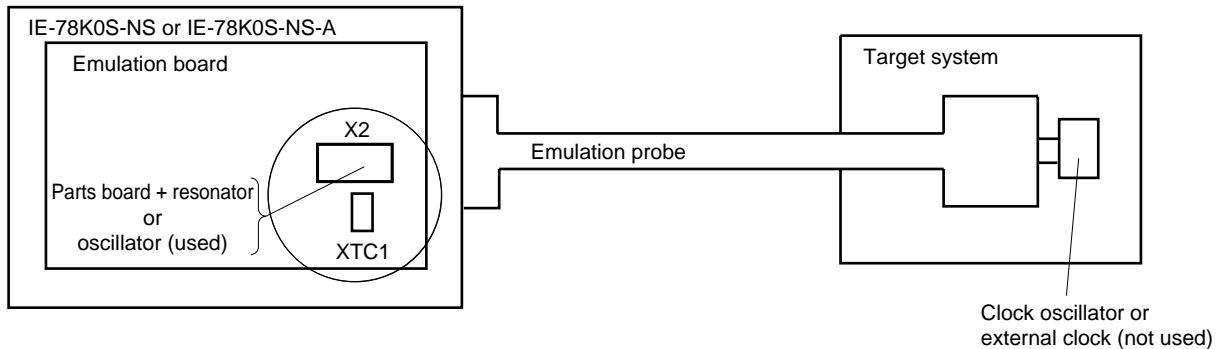


Remark The clock that is supplied by the resonator or the oscillator of the IE-789468-NS-EM1 (encircled in the figure) is used.

(b) Subsystem clock

Remove the parts board (X2) that is already mounted on the emulation board, and mount the parts board on which the resonator to be used is mounted or mount the oscillator to be used.

Figure 3-10. When Using User-Mounted Clock (Subsystem Clock)

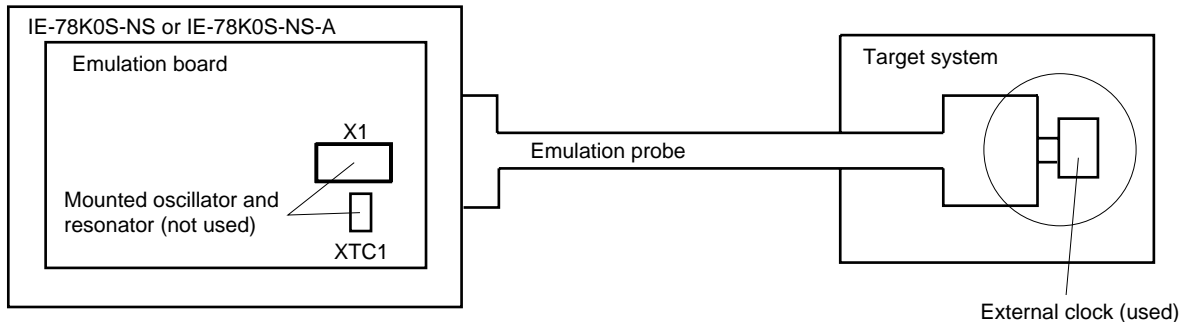


Remark The clock that is supplied by the resonator or the oscillator of the IE-789468-NS-EM1 (encircled in the figure) is used.

(3) Pulse input from target system

An external clock on the target system can be used as both the main system clock and subsystem clock via an emulation probe.

Figure 3-11. When Supplying Pulse from Target System



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

3.5.2 Main system clock settings

Table 3-4 shows the settings of the IE-789468-NS-EM1 when the main system clocks in (1) to (3) are used.

Table 3-4. Main System Clock Settings

Frequency of Main System Clock		IE-789468-NS-EM1	CPU Clock Source Selection (ID78K0S-NS)
		X1 Socket	
(1) When using clock that is already mounted on emulation board	5.0 MHz	Oscillator	Internal
(2) When using clock mounted by user	Other than 5.0 MHz	Oscillator configured by user	
(3) When inputting pulse from target system		Oscillator (not used)	External

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

Remark The factory settings of the IE-789468-NS-EM1 are those listed above under “when using clock that is already mounted on emulation board”.

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

When the IE-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 other hardware settings.

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

(a) When using a ceramic resonator or crystal resonator

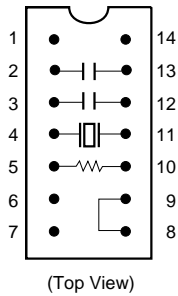
- Items to be prepared
 - Parts board
 - Ceramic resonator or crystal resonator
 - Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<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).

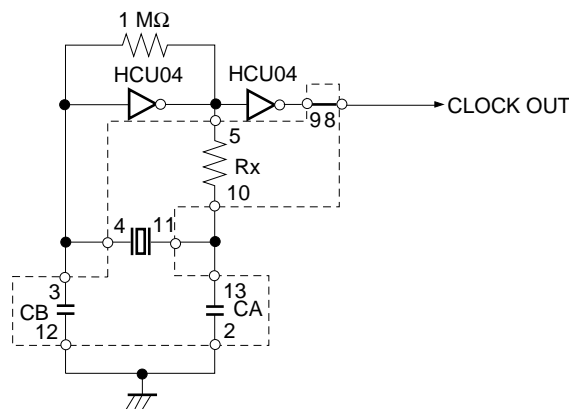
Figure 3-12. Connections on Parts Board (Main System Clock)

Parts board (X1)



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

Circuit diagram



- Remarks**
1. The sections enclosed in broken lines indicate the 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.

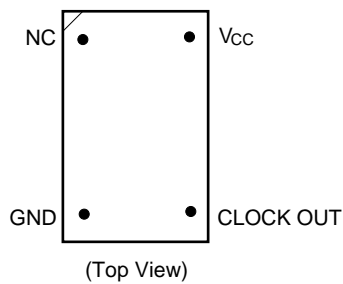
- <2> Prepare the IE-789468-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-789468-NS-EM1's X1 socket.
- <4> Connect the parts board (from <1> above) to the X1 socket from which the crystal oscillator was removed (in <3> above). Check the pin 1 mark to make sure the parts board is mounted in the correct direction.
- <5> Make sure that the parts board is wired as shown in Figure 3-12 above.
- <6> Install the IE-789468-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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

(b) When using a crystal oscillator

- Items to be prepared
 - Crystal oscillator (with pinouts shown in Figure 3-13, +5 V power supply voltage, and CMOS-level output level)

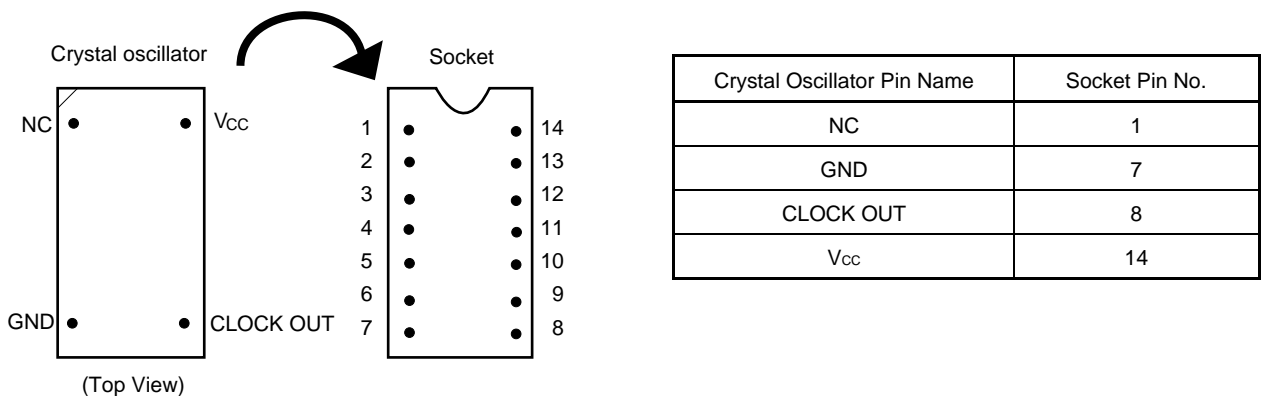
Figure 3-13. Crystal Oscillator (Main System Clock)



<Steps>

- <1> Prepare the IE-789468-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-789468-NS-EM1's X1 socket.
- <3> Connect a crystal oscillator to the X1 socket from which the crystal oscillator was removed (in <2> above). Insert the pins of the crystal oscillator into the socket aligning the pins as shown in the figure below.

Figure 3-14. Pin Alignment of Crystal Oscillator and Socket (Main System Clock)



- <4> Install the IE-789468-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 clock source (this selects the user's clock).

3.5.3 Subsystem clock settings

Table 3-5 shows the settings of the IE-789468-NS-EM1 when the subsystem clocks in (1) to (3) are used.

Table 3-5. Subsystem Clock Settings

Frequency of Subsystem Clock		IE-789468-NS-EM1	
		X2 Socket	JP1
(1) When using clock (XTC1) that is already mounted on emulation board	32.768 kHz	6 and 8 shorted	2 and 3 shorted
(2) When using clock mounted by user	Other than 32.768 kHz	Oscillator configured by user	
(3) When inputting pulse from target system			Not used

Caution Before setting JP1 to switch between the clock on the board and external clock, turn off the power of the IE-78K0S-NS or IE-78K0S-NS-A.

Remark The factory settings of the IE-789468-NS-EM1 are those listed above under “when using clock that is already mounted on emulation board”.

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

When the IE-789468-NS-EM1 is shipped, a 32.768 kHz crystal resonator (XTC1) and a parts board (X2) on which pins 6 and 8 are shorted are already mounted on the IE-789468-NS-EM1. Short 2 and 3 of the jumper (JP1) on the IE-789468-NS-EM1. No settings are required on the integrated debugger (ID78K0S-NS).

(2) When using clock mounted by user

Perform the settings in (a) or (b) below according to the type of clock to be used. Short 2 and 3 of the jumper (JP1) on the IE-789468-NS-EM1.

No settings are required on the integrated debugger (ID78K0S-NS).

(a) When using a ceramic resonator or crystal resonator

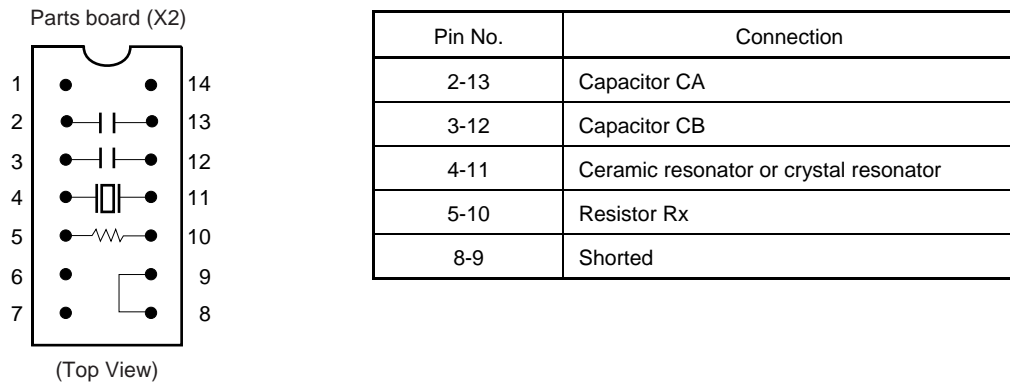
- Items to be prepared
 - Ceramic resonator or crystal resonator
 - Resistor Rx
 - Capacitor CA
 - Capacitor CB
 - Solder kit

<Steps>

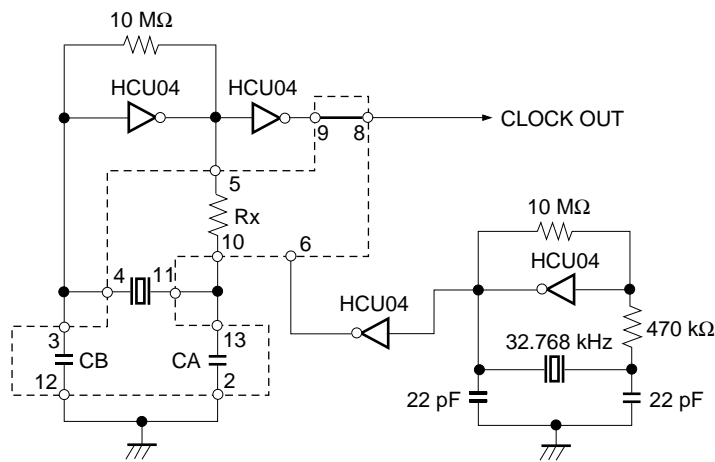
<1> Prepare the IE-789468-NS-EM1.

<2> Solder the target ceramic resonator or crystal resonator, resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequencies) onto the parts board (X2).

Figure 3-15. Connections on Parts Board (Subsystem Clock)



Circuit Diagram



- Remarks**
1. The sections enclosed in broken lines indicate the 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.

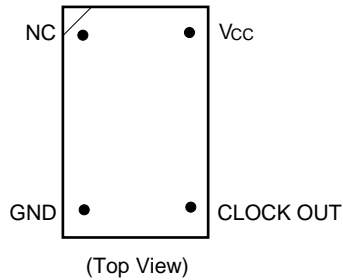
<3> Make sure that the parts board (X2) is wired as shown in Figure 3-15 above.

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

(b) When using a crystal oscillator

- Items to be prepared
 - Crystal oscillator (with pinouts shown in Figure 3-16, +5 V power supply voltage, and CMOS-level output level)

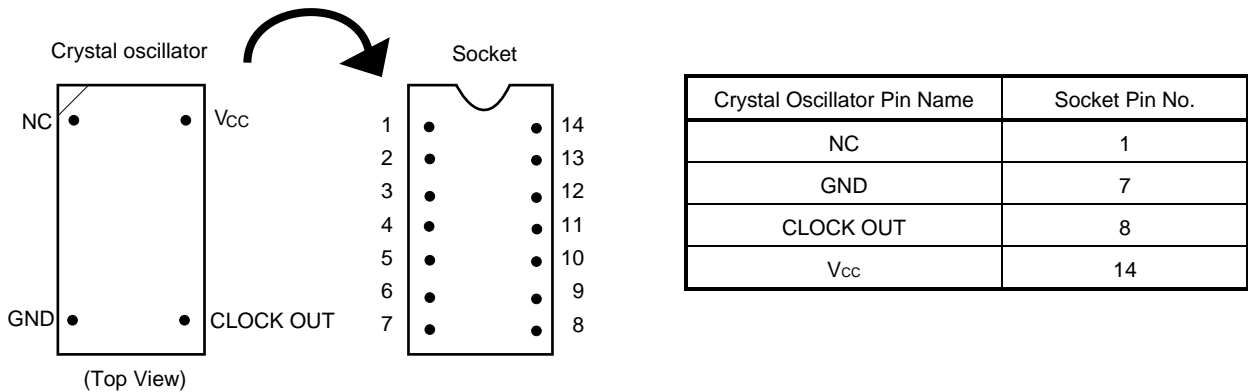
Figure 3-16. Crystal Oscillator (Subsystem Clock)



<Steps>

- <1> Prepare the IE-789468-NS-EM1.
- <2> Remove the parts board that is mounted in the X2 socket of the IE-789468-NS-EM1.
- <3> Connect a crystal oscillator to the X2 socket from which the parts board was removed (in <2> above). Insert the crystal oscillator pins into the socket aligning the pins as shown in the figure below.

Figure 3-17. Pin Alignment of Crystal Oscillator and Socket (Subsystem Clock)



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

(3) When inputting pulse from target system

Short 1 and 2 of the jumper (JP1) on the IE-789468-NS-EM1.
 No settings are required on the integrated debugger (ID78K0S-NS).

3.5.4 Switch settings

The settings of the IE-789468-NS-EM1's switches and jumper differ depending on the target subseries device as shown in Table 3-6 below.

Table 3-6. Settings of IE-789468-NS-EM1's Switches and Jumper

For μ PD789327 and 179327 Subseries

	SW1	SW2	SW3	SW4-1	SW4-2	JP1
Setting	POC ON or POC OFF	USER (USR) (Fixed)	USER (USR) (Fixed)	OFF (Fixed)	OFF (Fixed)	2 and 3 shorted or 1 and 2 shorted

For μ PD789467 Subseries

	SW1	SW2	SW3	SW4-1	SW4-2	JP1
Setting	POC ON or POC OFF	ICE or USER (USR)	ICE or USER (USR)	OFF (Fixed)	OFF (Fixed)	2 and 3 shorted or 1 and 2 shorted

- Remark** SW1: Selects whether to use the power-on-clear (POC) circuit.
 POC ON: When using the POC circuit.
 POC OFF: When not using the POC circuit.
- SW2: Selects the capacitor to be connected to VCL0 to VCL2 pins.
 ICE: When using the capacitor on the emulation board.
 USER (USR): When using the capacitor on the target system.
- SW3: Selects the capacitor to be connected between CAPL and CAPH pins.
 ICE: When using the capacitor on the emulation board.
 USER (USR): When using the capacitor on the target system.
- SW4-1 and SW4-2:
 Fixed to OFF.
- JP1: Selects the subsystem clock source.
 2 and 3 shorted: When using the clock mounted on the emulation board.
 1 and 2 shorted: When inputting pulses from the target system.

Cautions 1. Setting of the switches and jumper must be carried out after the power supply to the IE-78K0S-NS or IE-78K0S-NS-A has been switched OFF.

2. R44 is not used.

3.6 Mask Option Settings

3.6.1 Mask option when debugging μ PD789327, 179327 Subseries

With the IE-789468-NS-EM1, selection of the oscillation stabilization wait time, which is a mask option of the μ PD789327 and 179327 Subseries, is disabled. The oscillation stabilization wait time is fixed to the same value as that of the flash memory version μ PD78F9328.

- $2^{15}/fx$ (Fixed)

3.6.2 Mask option when debugging μ PD789327, 789467, 179327 Subseries

With the IE-789468-NS-EM1, selection of whether to use the power-on-clear (POC) circuit, which is a mask option of the μ PD789327, 789467, and 179327 Subseries, is possible. Table 3-7 shows the SW1 switch setting for POC circuit usage.

Table 3-7. SW1 Setting for POC Circuit Usage

POC Circuit Usage	SW1 Setting
When using POC circuit	POC ON
When not using POC circuit	POC OFF

- Cautions**
1. SW1 is set to POC ON (using POC circuit) as the initial setting.
 2. Setting of SW1 must be carried out after the power supply to the IE-78K0S-NS or IE-78K0S-NS-A has been switched OFF.

3.7 External Trigger

To set an external trigger, connect to the IE-789468-NS-EM1's check pins EXTOUT and EXTIN as shown below.

Refer to the **IE-78K0S-NS User's Manual (U13549E)** or **IE-78K0S-NS-A User's Manual (U15207E)** for pin characteristics.

For the use methods, refer to the **ID78K0S-NS Ver. 2.52 Operation User's Manual (U16584E)**.

(1) EXTOUT

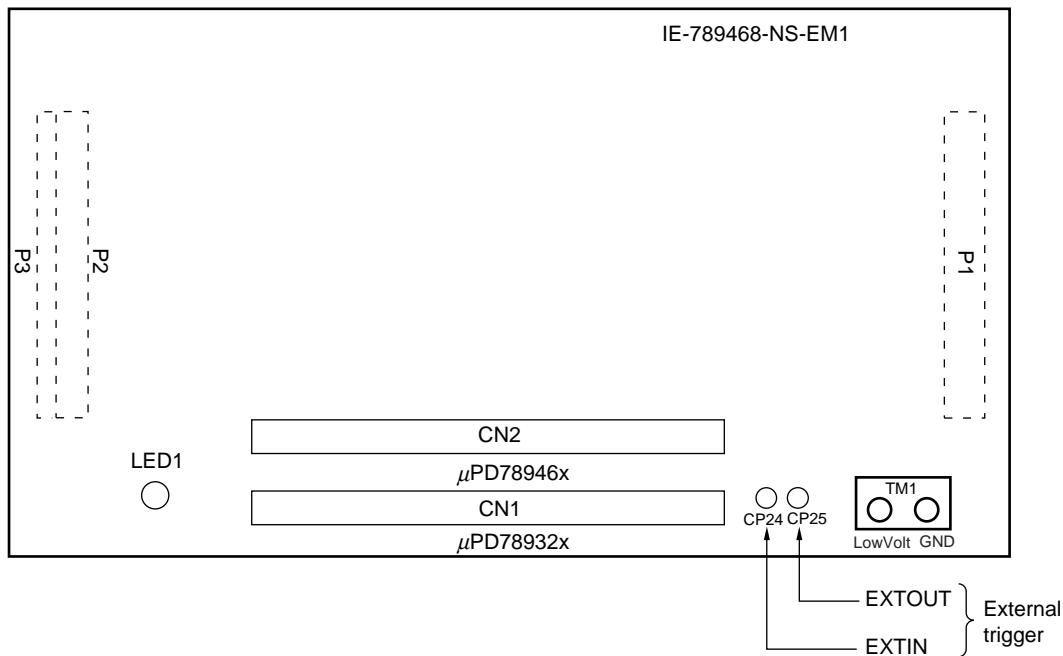
The EXTOUT pin on the IE-789468-NS-EM1 outputs a low level for 1.3 μ s when a break event occurs.

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

(2) EXTIN

An event signal can be input from the EXTIN pin on the IE-789468-NS-EM1. Input a high-level pulse signal for 2 CPU operation clocks or more.

Figure 3-18. External Trigger Input Position



CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT

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

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

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

The circuits of the IE-789468-NS-EM1 are used as follows for signals listed in (1) to (3) above. The same applies to connection of alternate-function pins, for which no circuit is provided in the IE system.

(1) Signals directly input to or output from the emulation CPU

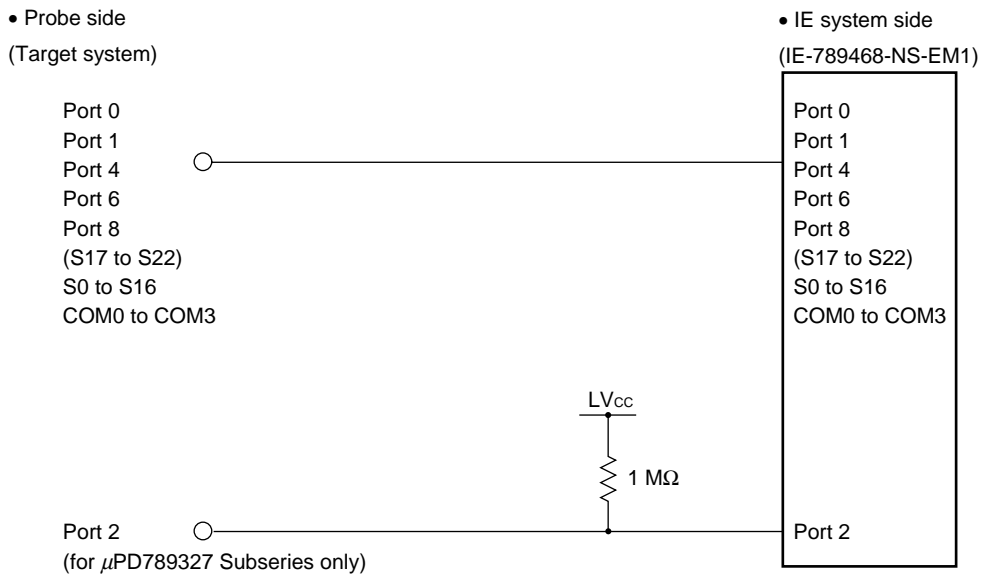
Refer to **Figure 4-1 Emulation Circuit Equivalent Circuit 1**. The following signals operate the same as in the μ PD789327, 789467, and 179327 Subseries.

- 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

A 1 M Ω pull-up resistor is connected to the following signals.

- Signals related to port 2 (available for μ PD789327 Subseries only)

Figure 4-1. Emulation Circuit Equivalent Circuit 1

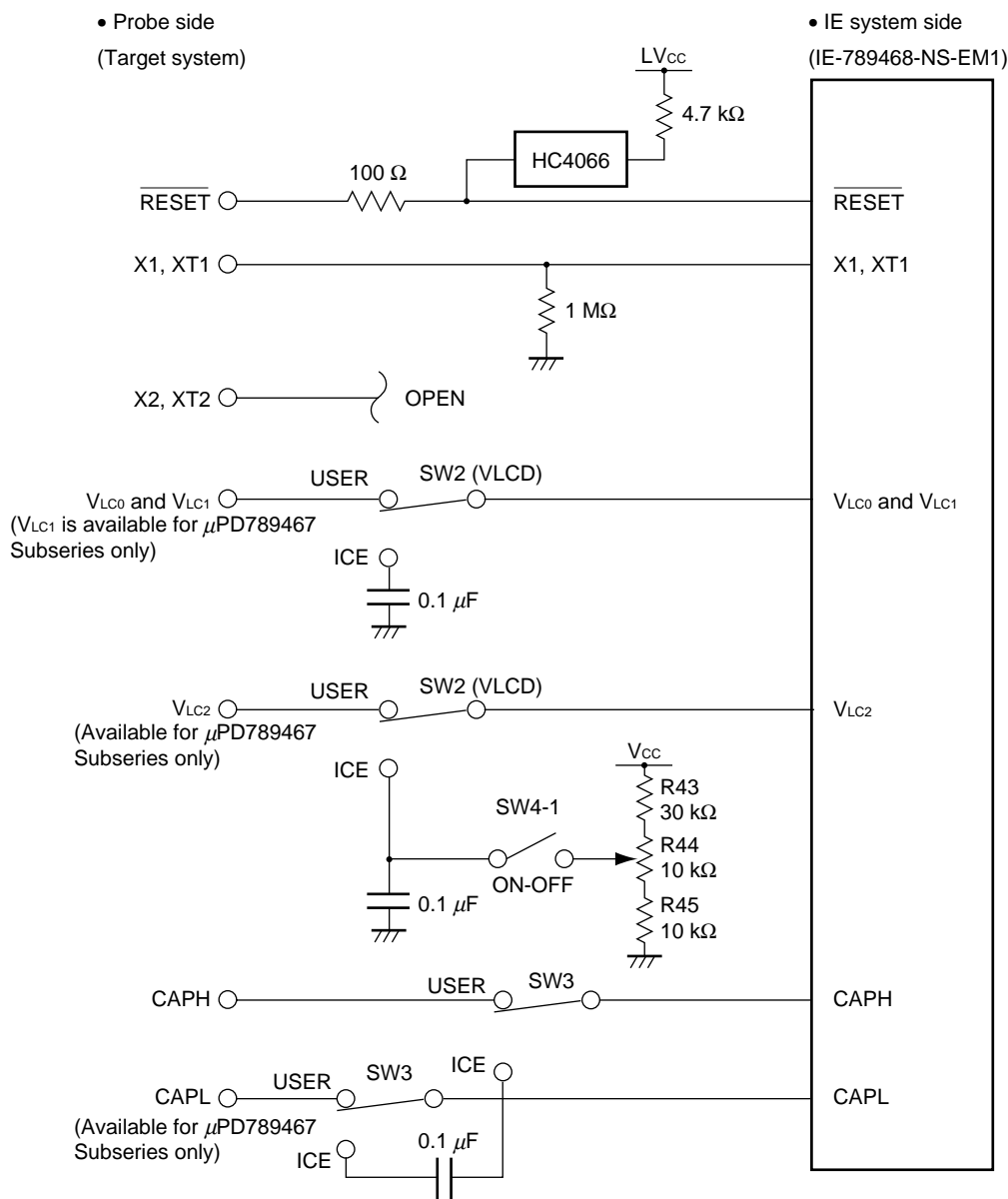


(2) Signals input from the target system via a gate

Since the following signals are input via a gate, their timing shows a delay compared to the μ PD789327, 789467, and 179327 Subseries. Refer to **Figure 4-2 Emulation Circuit Equivalent Circuit 2**.

- $\overline{\text{RESET}}$ signal
- Signals related to clock input
 The X2 and XT2 pins are not used in the IE-789468-NS-EM1.
- CAPH and CAPL signals (available for μ PD789467 Subseries only)
- V_{LC0} to V_{LC2} signals (V_{LC1} and V_{LC2} are available for μ PD789467 Subseries only)

Figure 4-2. Emulation Circuit Equivalent Circuit 2

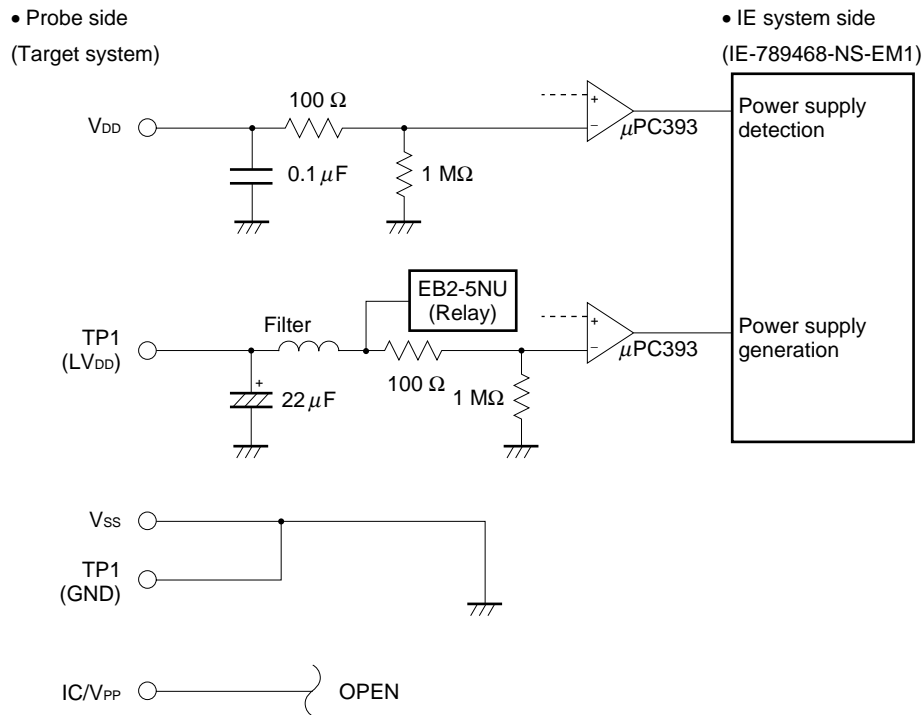


(3) Other signals

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

- VDD pin
The power supply of the emulation CPU operates on the internal power supply voltage (5 V) when the target system is not connected, and on the voltage supplied from the low voltage supply pin (TM1) (LVcc) when the target system is connected. In the IE-789468-NS-EM1, the VDD pin of the target system is exclusively used for controlling LED1 (USER VDD), which monitors whether the power of the target system is on.
- VSS pin
The Vss pin is connected to GND in the IE-789468-NS-EM1.
- IC/VPP pin
The IC/VPP pin is not used in the IE-789468-NS-EM1.

Figure 4-3. Emulation Circuit Equivalent Circuit 3



CHAPTER 5 NOTES

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

The emulation circuit in the IE system enables emulation with a configuration that includes the emulation CPU, TTL, CMOS-IC, and other components, resulting in specification differences between the target device and IE system.

(1) Port 2 read value when the target system is not connected

When using a μ PD789327 Subseries device, a 1 M Ω pull-up resistor is directly connected to Port 2. When Port 2 is read out in the input mode while the target system is not connected, the read value is 07H.

(2) Oscillation stabilization wait time cannot be changed

When using a μ PD789327 or μ PD179327 Subseries mask ROM version device, the oscillation stabilization wait time after releasing the stop mode by reset or POC is fixed to the same value as that of the flash memory version μ PD78F9328.

- $2^{15}/f_x$ (Fixed)

APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. NP-H52GB-TQ Pin Assignments

Emulation Probe	CN1, CN2 Pin No.	Emulation Probe	CN1, CN2 Pin No.
1	118	27	4
2	114	28	8
3	108	29	14
4	104	30	18
5	100	31	22
6	94	32	28
7	30	33	92
8	29	34	91
9	24	35	98
10	20	36	102
11	16	37	106
12	10	38	112
13	6	39	116
14	33	40	87
15	37	41	83
16	43	42	77
17	47	43	73
18	51	44	69
19	57	45	63
20	59	46	61
21	55	47	65
22	49	48	71
23	45	49	75
24	41	50	79
25	35	51	85
26	31	52	89

- Remarks**
1. NP-H52GB-TQ is a product of Naito Densai Machida Mfg. Co., Ltd.
 2. The numbers in the “Emulation Probe” column indicate the corresponding pin number on the emulation probe tip.

APPENDIX B NOTES ON TARGET SYSTEM DESIGN

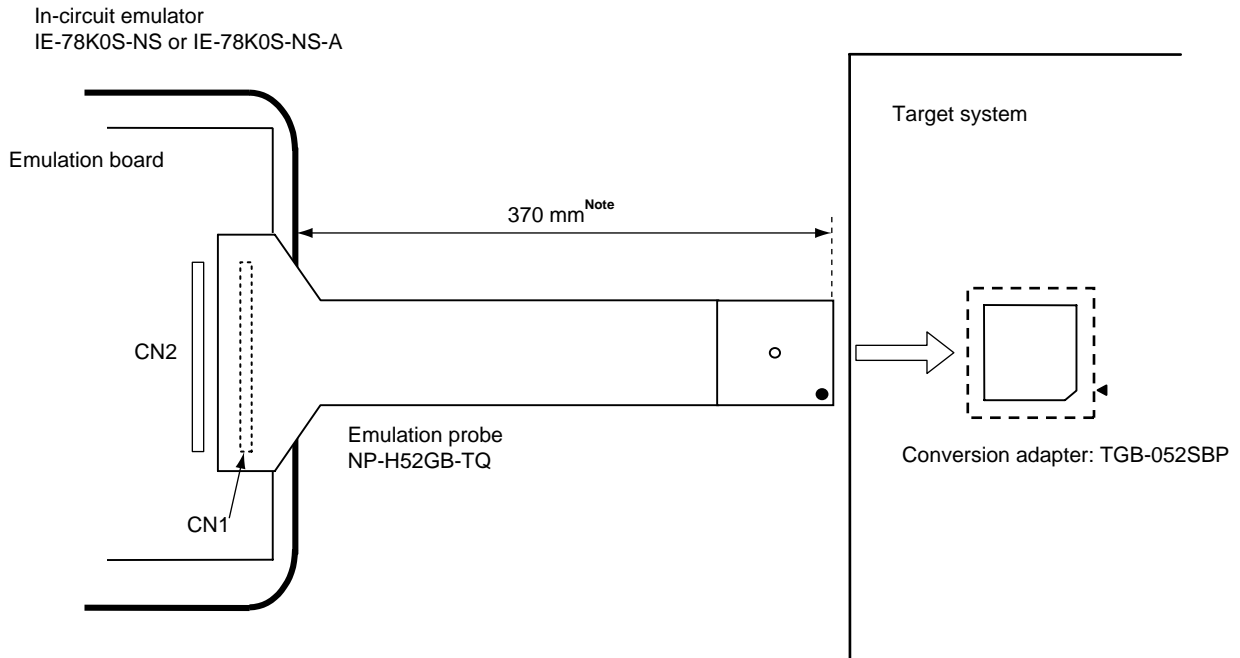
The following shows the conditions when connecting the emulation probe to the conversion adapter. Follow the configuration below and consider the shape of parts to be mounted on the target system when designing a system.

Among the products described in this appendix, NP-H52GB-TQ is a product of Naito Densetsu Machida Mfg. Co., Ltd, and TGB-052SBP is a product of TOKYO ELETECH CORPORATION.

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

Emulation Probe	Conversion Adapter	Distance Between IE System and Conversion Adapter
NP-H52GB-TQ	TGB-052SBP	370 mm (for μ PD789327, 179327 Subseries)
		350 mm (for μ PD789467 Subseries)

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



Note Distance when using a μ PD789327, 179327 Subseries device (connecting NP-H52GB-TQ to CN1). When using a μ PD789467 Subseries device (connecting to CN2), the distance is 350 mm.

Figure B-2. Connection Conditions of Target System

