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RENESAS

User's Manual

IE-789456-NS-EM1

Emulation Board

Target Devices

μPD789446 Subseries
μPD789456 Subseries

Document No. U16289EJ1V0UM00 (1st edition)
Date Published November 2002 N CP(K)

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- Availability of related technical literature
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INTRODUCTION

Product Overview

The IE-789456-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.

- μPD789446 Subseries: μPD789445, 789446, 78F9446
- μPD789456 Subseries: μPD789455, 789456, 78F9456

Target Readers

This manual is intended for engineers who will use the IE-789456-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-789456-NS-EM1, refer to not only this manual (supplied with the IE-789456-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-789456-NS-EM1
User's Manual

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

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-789456-NS-EM1.

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

Term	Meaning
Emulation device	This is a general term that refers to the device in the emulator that is used to emulate the target device. It includes the emulation CPU.
Emulation CPU	This is the CPU block in the emulator that is used to execute user-generated programs.
Target device	This is the device to be emulated.
Target system	This includes the target program and the hardware provided by the user. When defined narrowly, it includes only the hardware.
IE system	This refers to the combination of the in-circuit emulator (IE-78K0S-NS or IE-78K0S-NS-A) and the emulation board (IE-789456-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-789456-NS-EM1 Emulation Board	This manual
ID78K Series Integrated Debugger Ver. 2.30 or Later Operation Windows™ Based	U15185E
μPD789426, 789436, 789446, 789456 Subseries	U15075E

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

CONTENTS

CHAPTER 1 GENERAL 10

1.1 System Configuration 11
1.2 Hardware Configuration 13
1.3 Basic Specifications 14

CHAPTER 2 PART NAMES 15

2.1 Parts of Main Unit 16
2.2 Initial Settings of Switches and Jumpers 17

CHAPTER 3 INSTALLATION 18

3.1 Connection 19
3.2 Switch and Jumper Settings on Main Unit 20
3.3 Setting Power Supply Voltage of Target Interface 21
3.4 Clock Settings 22
3.4.1 Overview of clock settings 22
3.4.2 Main system clock settings 25
3.4.3 Subsystem clock setting 29
3.5 Mask Option Settings 32
3.6 External Trigger 33

CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT 34

APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE 38

APPENDIX B CAUTIONS ON DESIGNING TARGET SYSTEM 39

LIST OF FIGURES

Figure No.	Title	Page
1-1	System Configuration	11
1-2	Basic Hardware Configuration	13
2-1	IE-789456-NS-EM1 Part Names	16
3-1	Connection of Emulation Probe	19
3-2	Connecting TP1 and Target System Power Supply Voltage	21
3-3	External Circuits Used as System Clock Oscillator	22
3-4	When Using Clock That Is Already Mounted on Emulation Board (Main System Clock)	23
3-5	When Using Clock That Is Already Mounted on Emulation Board (Subsystem Clock)	23
3-6	When Using User-Mounted Clock (Main System Clock)	24
3-7	When Using User-Mounted Clock (Subsystem Clock)	24
3-8	When Supplying Pulse from Target System	25
3-9	Connections on Parts Board (Main System Clock)	26
3-10	Crystal Oscillator (Main System Clock)	27
3-11	Pin Alignment of Crystal Oscillator and Socket (Main System Clock)	28
3-12	Connections on Parts Board (Subsystem Clock)	30
3-13	Crystal Oscillator (Subsystem Clock)	31
3-14	Pin Alignment of Crystal Oscillator and Socket (Subsystem Clock)	31
3-15	Mask Option Setting	32
3-16	External Trigger Input Position	33
4-1	Equivalent Circuit 1 of Emulation Circuit	35
4-2	Equivalent Circuit 2 of Emulation Circuit	36
4-3	Equivalent Circuit 3 of Emulation Circuit	37
B-1	Distance Between In-Circuit Emulator and Conversion Adapter (When 64GB Is Used)	39
B-2	Connection Conditions of Target System (When NP-64GB-TQ Is Used)	40
B-3	Connection Conditions of Target System (When NP-H64GB-TQ Is Used)	40
B-4	Distance Between In-Circuit Emulator and Conversion Adapter (When 64GK Is Used)	41
B-5	Connection Conditions of Target System (When NP-64GK Is Used)	41
B-6	Connection Conditions of Target System (When NP-H64GK-TQ Is Used)	42

LIST OF TABLES

Table No	Title	Page
1-1	Correspondence Between Emulation Probes and Conversion Socket/Conversion Adapters	12
1-2	Basic Specifications	14
2-1	Initial Settings of Switches and Jumpers	17
3-1	Switch and Jumper Settings on IE-78K0S-NS	20
3-2	Switch and Jumper Settings on IE-78K0S-NS-A	20
3-3	Setting Power Supply of Target Interface	21
3-4	Main System Clock Settings	25
3-5	Subsystem Clock Settings	29
3-6	Mask Option Setting	32
A-1	NP-64GB-TQ, NP-H64GB-TQ, NP-64GK, NP-H64GK-TQ Pin Assignments	38
B-1	Distance Between IE System and Conversion Adapter	39

CHAPTER 1 GENERAL

The IE-789456-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.

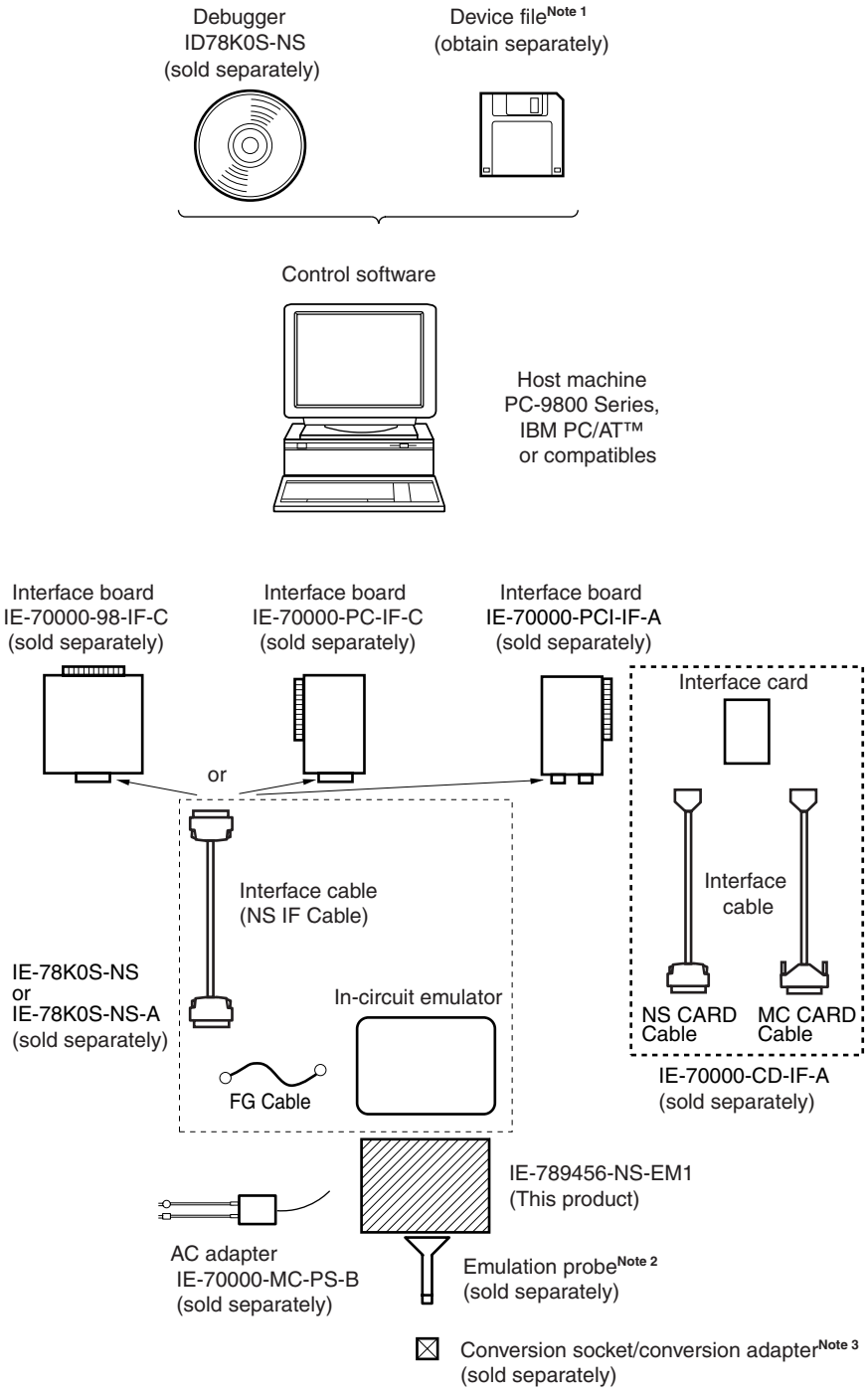
This chapter describes the IE-789456-NS-EM1's system configuration and basic specifications.

- Target devices
  - μPD789446 Subseries
  - μPD789456 Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-789456-NS-EM1's system configuration.

Figure 1-1. System Configuration



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

μS××××DF789456: μPD789426, 789436, 789446, 789456 Subseries

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

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

2. The emulation probes NP-64GB-TQ, NP-H64GB-TQ, NP-64GK, and NP-H64GK-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

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

3. The conversion adapters TGB-064SDP and TGK-064SBW are products 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)

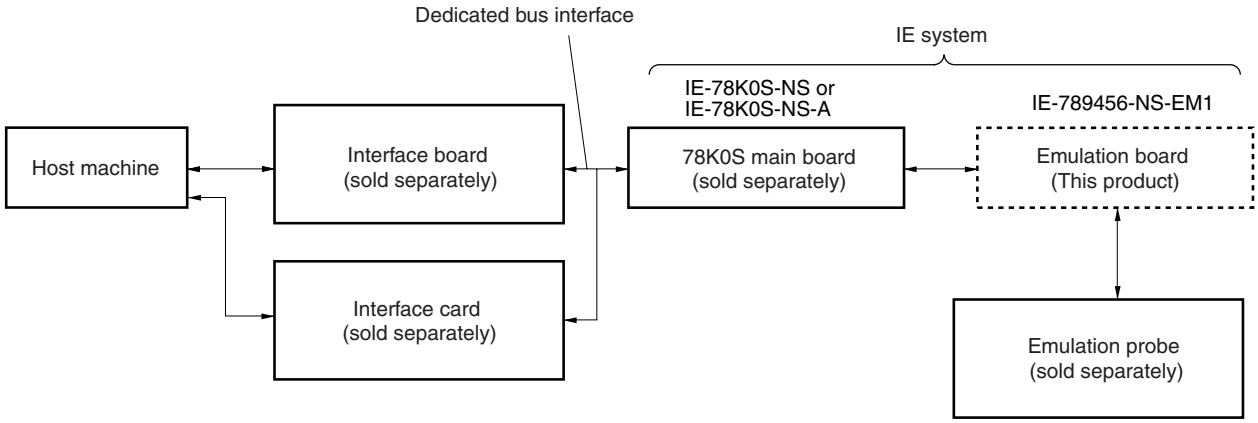
Table 1-1. Correspondence Between Emulation Probes and Conversion Socket/Conversion Adapters

Package	Emulation Probe	Conversion Socket/Conversion Adapter
64-pin plastic LQFP (GB type)	NP-64GB-TQ (probe length: 200 mm)	TGB-064SDP
	NP-H64GB-TQ (probe length: 400 mm)	
64-pin plastic TQFP (GK type)	NP-64GK (probe length: 200 mm)	TGK-064SBW
	NP-H64GK-TQ (probe length: 400 mm)	

1.2 Hardware Configuration

Figure 1-2 shows the IE-789456-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The basic specifications of the IE-789456-NS-EM1 are listed in Table 1-2.

Table 1-2. Basic Specifications

Parameter	Description
Target device	μPD789446, 789456 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

CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-789456-NS-EM1 main unit.

The packing box contains the emulation board (IE-789456-NS-EM1), packing list, user's manual, and guarantee card.

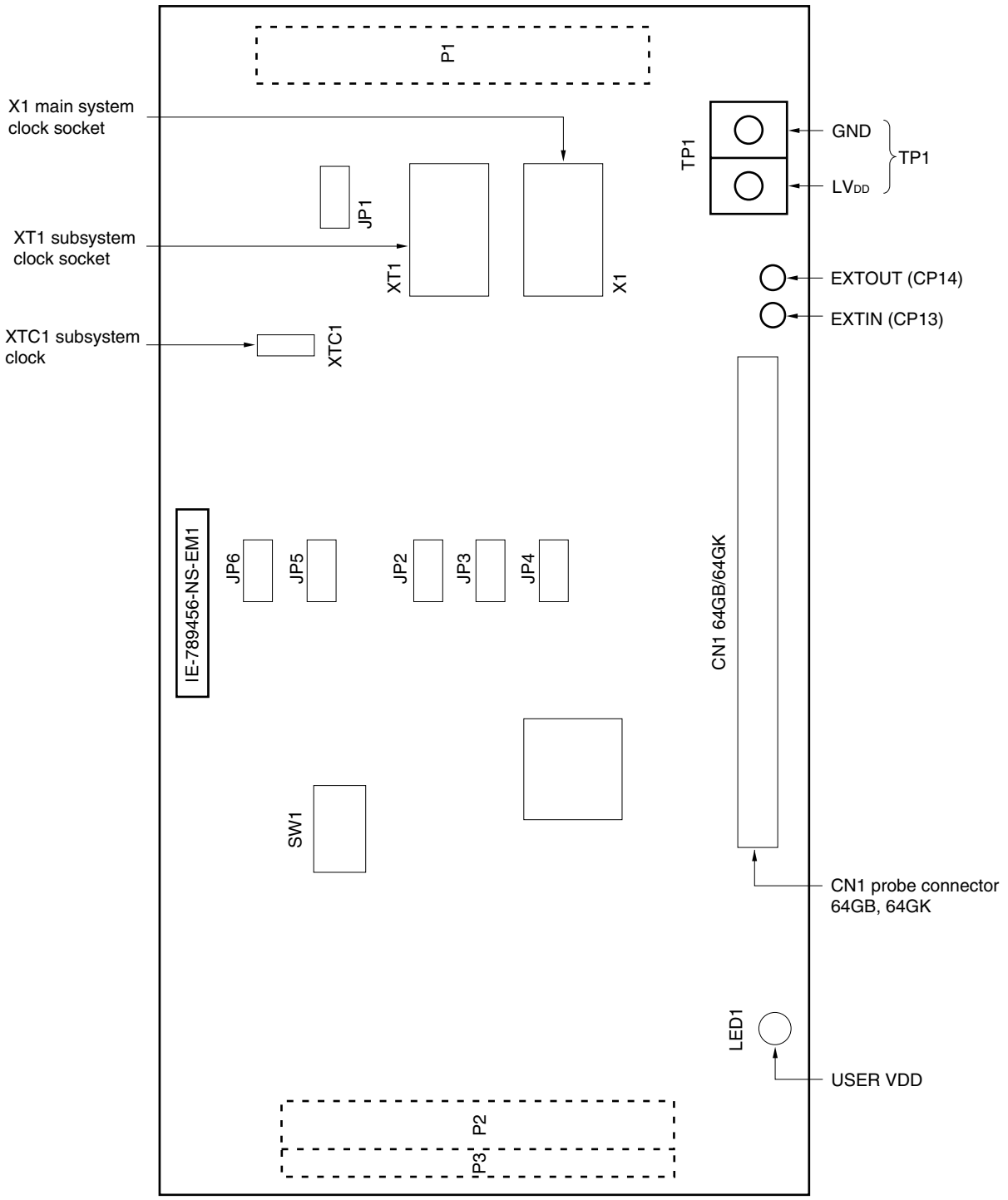
If there are any missing or damaged items, please contact an NEC Electronics sales representative.

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

2.1 Parts of Main Unit

Figure 2-1 shows the part names of the IE-789456-NS-EM1.

Figure 2-1. IE-789456-NS-EM1 Part Names



2.2 Initial Settings of Switches and Jumpers

Table 2-1 shows the initial settings of the switches and jumpers on the IE-789456-NS-EM1.

For the setting of JP1, refer to **3.4 Clock Settings**.

For the setting of SW1, refer to **3.5 Mask Option Settings**.

Use the IE-789456-NS-EM1 with jumpers JP2 to JP6 set to the initial settings.

Table 2-1. Initial Settings of Switches and Jumpers

	SW1			
	1	2	3	4
Initial setting	OFF	OFF	OFF	OFF

	JP1	JP2	JP3	JP4	JP5	JP6
Initial setting	2 and 3 shorted	1 and 2 shorted (Fixed)	1 and 2 shorted (Fixed)	1 and 2 shorted (Fixed)	1 and 2 shorted (Fixed)	1 and 2 shorted (Fixed)

CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-789456-NS-EM1 to the IE-78K0S-NS or IE-78K0S-NS-A, emulation probe, etc. Mode setting methods are also described.

Caution Connecting or removing components to or from the target system, or making switch or other setting changes must be carried out after the power supply to both the IE system and the target system has been switched OFF.

3.1 Connection

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

See the **IE-78K0S-NS User's Manual (U13549E)** for a description of how to connect the IE-789456-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

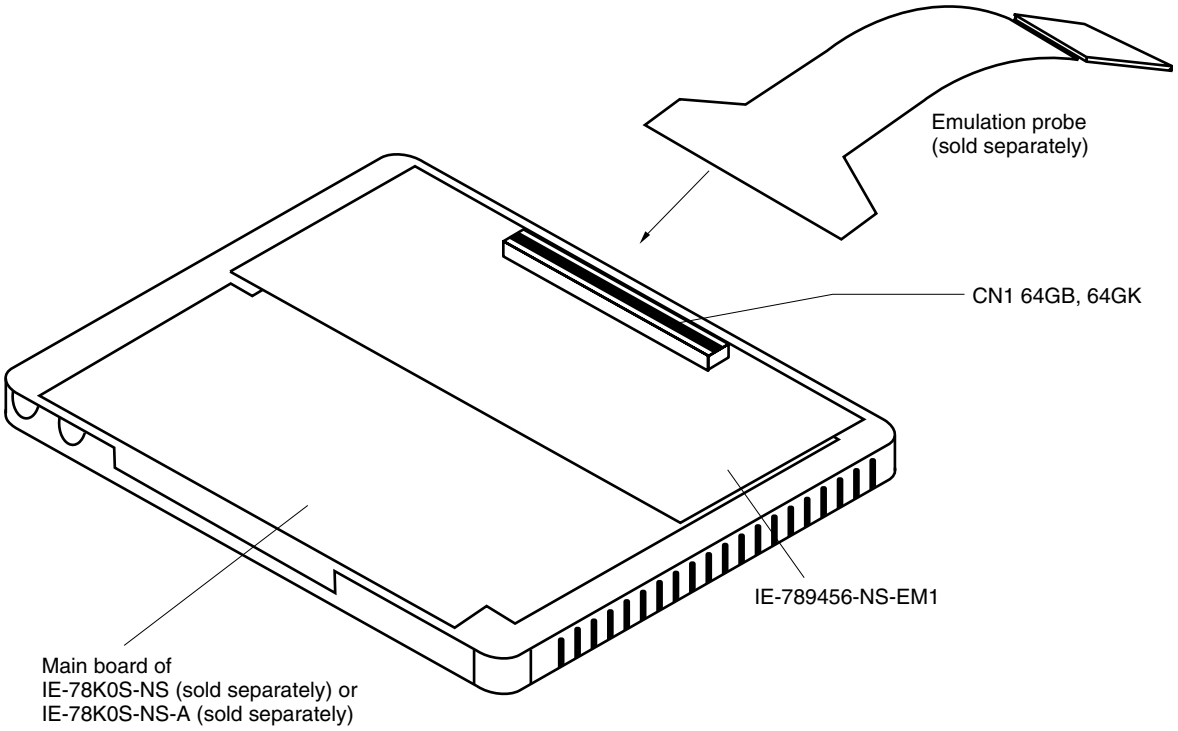
See the **IE-78K0S-NS User's Manual (U13549E)** for a description of how to connect an emulation probe to the IE-789456-NS-EM1[Note].

On this board, connect the emulation probe to CN1.

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

Caution Incorrect connection may damage the IE system.
Be sure to read the emulation probe's user's manual for a detailed description of the connection method.

Figure 3-1. Connection of Emulation Probe



3.2 Switch and Jumper Settings on Main Unit

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

When using the IE-789456-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-789456-NS-EM1.

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

When using the IE-789456-NS-EM1, set the switches and jumpers on the IE-78K0S-NS-A as shown in Table 3-2. For details of these switch and jumper settings, refer to the **IE-78K0S-NS-A User's Manual (U15207E)**.

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

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

Caution Incorrect connection may damage the IE-789456-NS-EM1.

3.3 Setting Power Supply Voltage of Target Interface

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

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

When debugging with a voltage that is the same level as that of the target system, supply the same voltage as that of the target system to the TP1 terminal pin of the IE-789456-NS-EM1 (the same applies when the voltage is 5 V).

Set the target voltage to between 1.8 and 5.0 V.

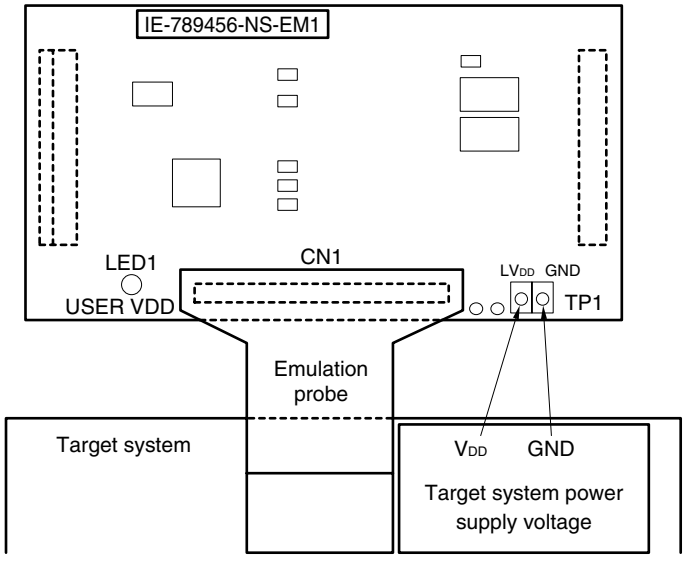
For how to select the operating power supply, refer to the **ID78K Series Ver.2.30 or Later Operation Windows-Based User's Manual (U15185E)**.

- Maximum current consumption of TP1
  1.8 to 5.0 V: Approximately 100 mA

Table 3-3. Setting Power Supply of Target Interface

Power Supply of Target Interface (LV_{CC})		Integrated Debugger (ID78K0S-NS)
		Operating Power Supply Selection
When connecting target system	1.8 to 5.0 V	Target
When not connecting target system	5 V	Internal

Figure 3-2. Connecting TP1 and Target System Power Supply Voltage



Caution Before connecting TP1 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-789456-NS-EM1.

3.4 Clock Settings

3.4.1 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 3-3. During emulation, the oscillator that is mounted on the target system is not used. Instead, the clock that is mounted on the emulation board installed in the IE-78K0S-NS or IE-78K0S-NS-A is used.

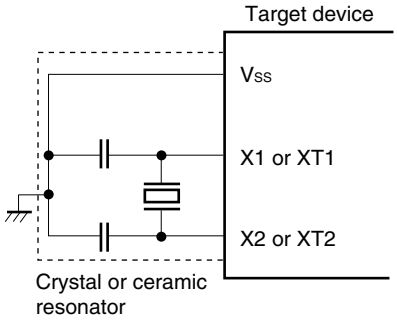
If the target system includes an external clock, select either **(1) Clock that is already mounted on emulation board**, **(2) Clock that is mounted by user**, or **(3) Pulse input from target system**.

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

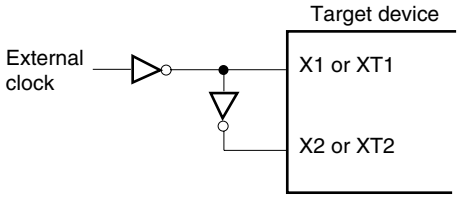
Caution The IE system will be hung-up if the main system clock is not supplied normally. Moreover, be sure to input a rectangular wave as the pulse from the target system. There is no need to supply a clock to the X2 and XT2 pins. Also, even if a crystal resonator is connected directly to X1 (for the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

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

(a) Clock oscillator



(b) External clock



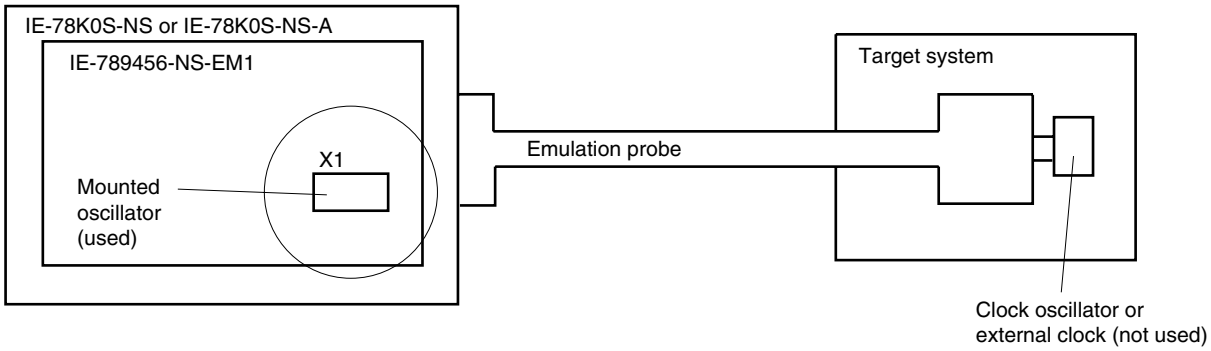
(1) Clock that is already mounted on emulation board

The crystal oscillator mounted on the IE-789456-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 3-4. When Using Clock That Is Already Mounted on Emulation Board (Main System Clock)

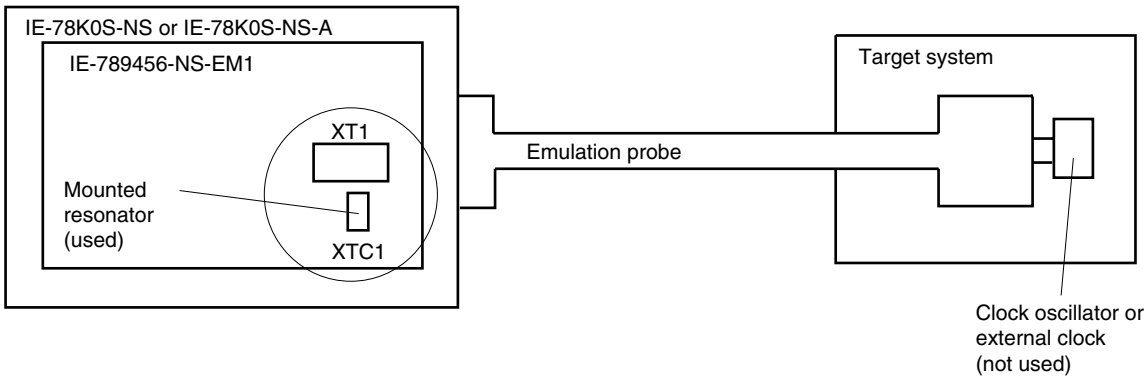


Remark The clock that is supplied by the oscillator of the IE-789456-NS-EM1 (encircled in the figure) is used.

(b) Subsystem clock

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

Figure 3-5. When Using Clock That Is Already Mounted on Emulation Board (Subsystem Clock)



Remark The clock that is supplied by the resonator of the IE-789456-NS-EM1 (encircled in the figure) is used.

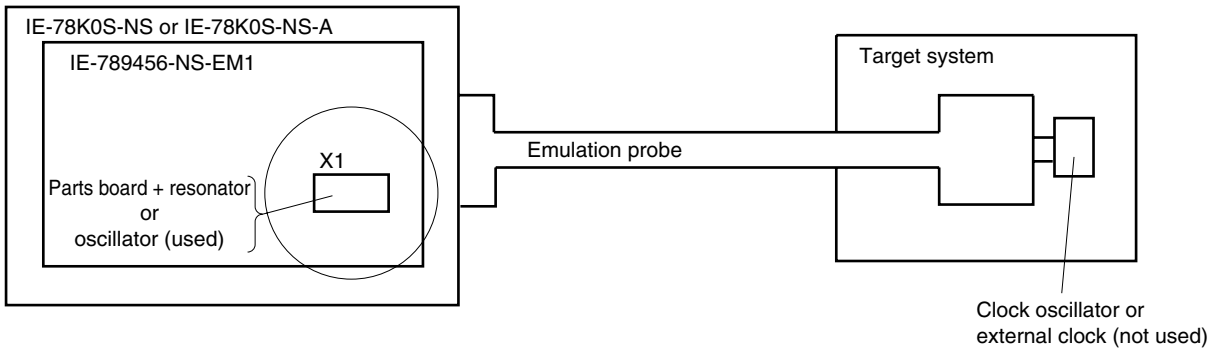
(2) Clock that is mounted by user

The user can mount any clock supported by the set specifications on the IE-789456-NS-EM1. This feature is effective when debugging at a different frequency than 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 3-6. When Using User-Mounted Clock (Main System Clock)

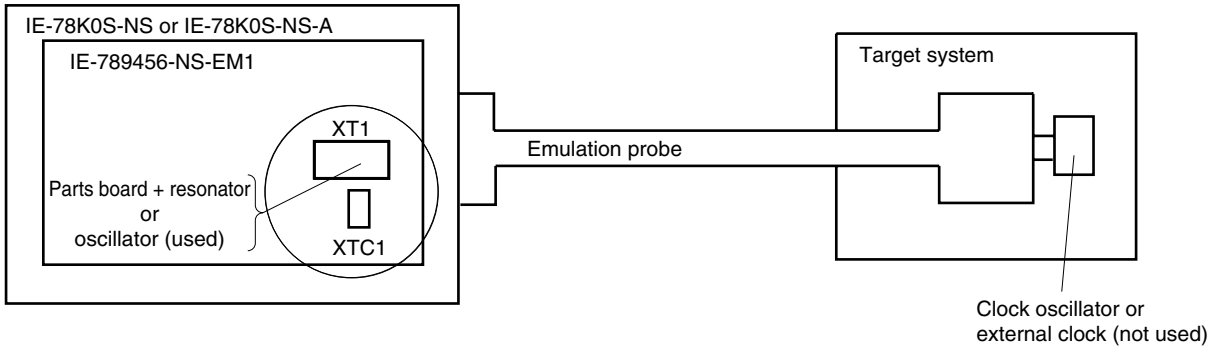


Remark The clock that is supplied by the resonator of the IE-789456-NS-EM1 (encircled in the figure) or the oscillator is used.

(b) Subsystem clock

Remove the parts board (XT1) 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 3-7. When Using User-Mounted Clock (Subsystem Clock)

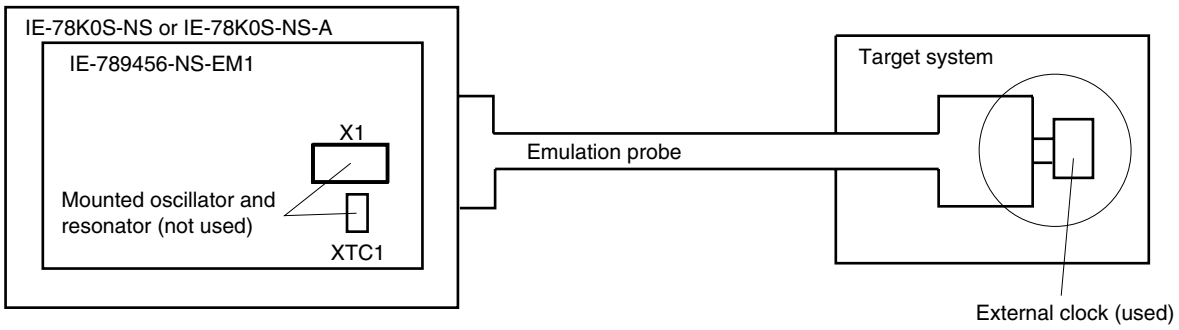


Remark The clock that is supplied by the resonator of the IE-789456-NS-EM1 (encircled in the figure) or the oscillator is used.

(3) Pulse input from target system

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

Figure 3-8. When Supplying Pulse from Target System



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

3.4.2 Main system clock settings

Table 3-4 shows the settings of the IE-789456-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-789456-NS-EM1 X1 Socket	CPU Clock Source Selection (ID78K0S-NS)
(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's clock source (this selects the user's clock).

Remark The factory settings of the IE-789456-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-789456-NS-EM1 is shipped, a 5.0 MHz crystal oscillator is already mounted in the IE-789456-NS-EM1's X1 socket. When using the factory-set mode settings, there is no need to make any other hardware settings.

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

(2) When using clock mounted by user

Perform the settings described under either (a) or (b), depending on the type of clock to be used.

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

(a) When using a ceramic resonator or crystal resonator

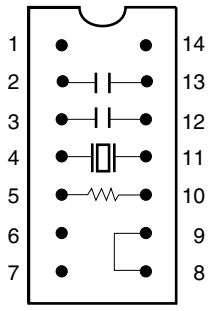
- Items to be prepared
  - Parts board
  - Ceramic resonator or crystal resonator
  - Resistor Rx
  - Capacitor CA
  - Capacitor CB
  - Solder kit

<Steps>

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

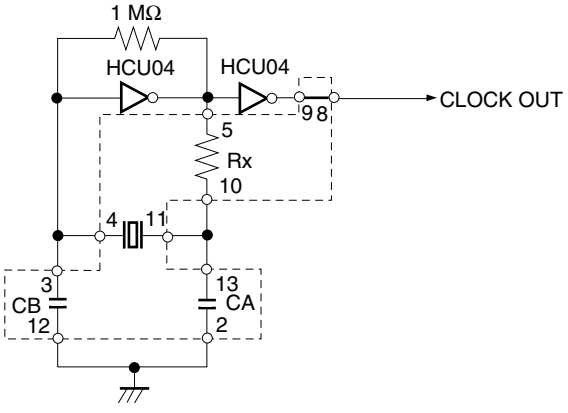
Figure 3-9. Connections on Parts Board (Main System Clock)

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



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

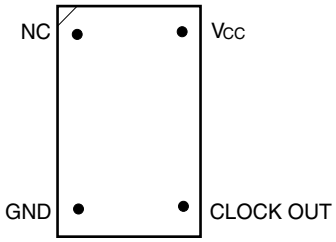
<2> Prepare the IE-789456-NS-EM1.
<3> Remove the crystal oscillator that is mounted in the IE-789456-NS-EM1's X1 socket.
<4> Connect the parts board (from <1> above) to the X1 socket from which the crystal oscillator was removed. Check the pin 1 mark to make sure the board is mounted in the correct direction.
<5> Make sure that the parts board is wired as shown in Figure 3-9 above.
<6> Install the IE-789456-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

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

(b) When using a crystal oscillator

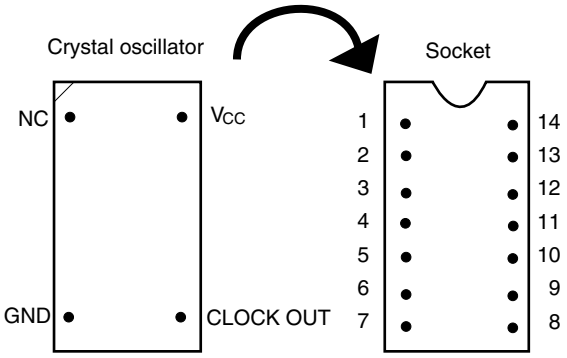
- Items to be prepared
  - Crystal oscillator (see pinouts shown in Figure 3-10)

Figure 3-10. Crystal Oscillator (Main System Clock)



<Steps>
<1> Prepare the IE-789456-NS-EM1.
<2> Remove the crystal oscillator that is mounted in the IE-789456-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 3-11. Pin Alignment of Crystal Oscillator and Socket (Main System Clock)



Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
V_{CC}	14

<4> Install the IE-789456-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(3) When inputting pulse from target system

No hardware settings are required for this situation.

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

3.4.3 Subsystem clock setting

Table 3-5 shows the settings of the IE-789456-NS-EM1 when the subsystem clocks in (1) to (3) are used.

Table 3-5. Subsystem Clock Settings

Frequency of Subsystem Clock		IE-789456-NS-EM1	
		XT1 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	1 and 2 shorted

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-789456-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-789456-NS-EM1 is shipped, a 32.768 kHz crystal resonator (XTC1) and a parts board on which pins 6 and 8 are shorted are already mounted on the IE-789456-NS-EM1. Short 2 and 3 of the jumper (JP1) on the IE-789456-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, depending on the type of clock to be used. Short 2 and 3 of the jumper (JP1) on the IE-789456-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

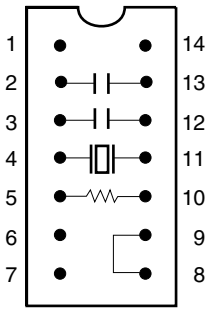
<Steps>

<1> Prepare the IE-789456-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 (XT1).

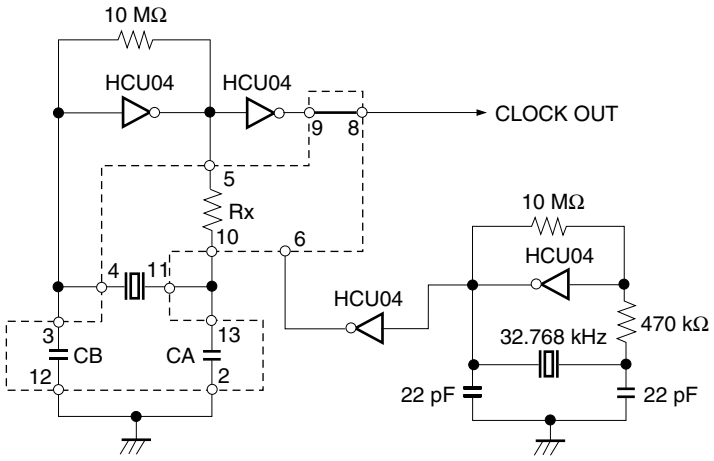
Figure 3-12. Connections on Parts Board (Subsystem Clock)

Parts board (XT1)



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

Circuit Diagram



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

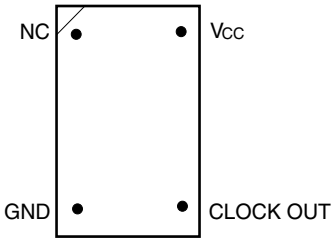
<3> Make sure that the parts board is wired as shown in Figure 3-12 above.

<4> Install the IE-789456-NS-EM1 in the IE-78K0S-NS or IE-78K0S-NS-A.

(b) When using a crystal oscillator

- Items to be prepared
  - Crystal oscillator (see pinouts shown in Figure 3-13)

Figure 3-13. Crystal Oscillator (Subsystem Clock)



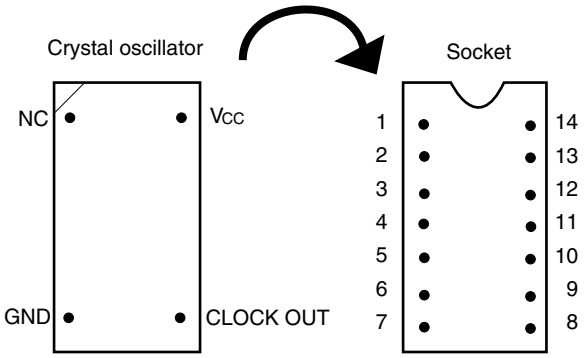
<Steps>

<1> Prepare the IE-789456-NS-EM1.

<2> Remove the parts board that is mounted in the XT1 socket of the IE-789456-NS-EM1.

<3> Connect a crystal oscillator to the XT1 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 3-14. Pin Alignment of Crystal Oscillator and Socket (Subsystem Clock)



Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
VCC	14

<4> Install the IE-789456-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-789456-NS-EM1.

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

3.5 Mask Option Settings

By setting the DIP switch (SW1) in the IE-789456-NS-EM1, a 33 kΩ pull-up resistor can be connected to P50 to P53 by mask option.

Use the mask option setting dialog box of the integrated debugger (ID78K0S-NS) to set the mask option. When reading a project file, however, setting is not required. The results of reading a project file are reflected in the mask option setting dialog box.

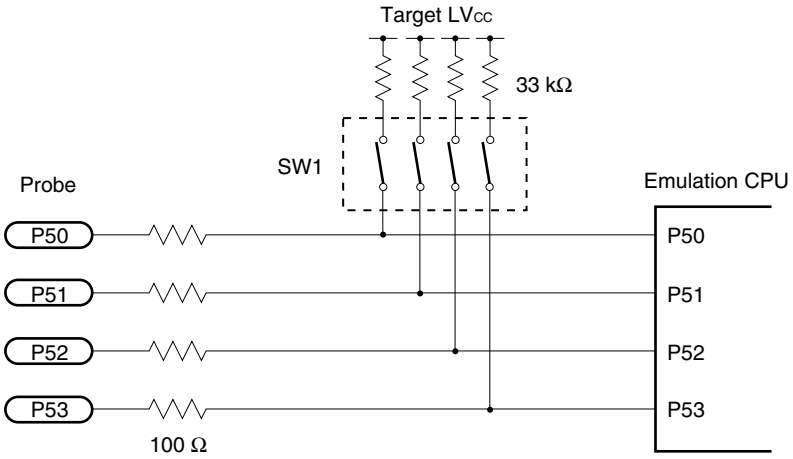
For the usage method, refer to the **ID78K Series Ver.2.30 or Later Operation Windows Based User's Manual (U15185E)**.

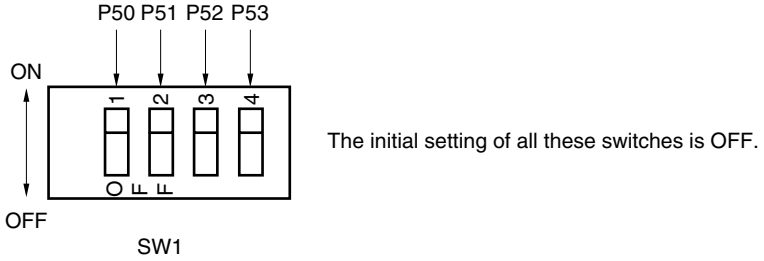
Table 3-6. Mask Option Setting

	SW1			
	1	2	3	4
Connected to:	P50	P51	P52	P53

When the DIP switch is ON, the corresponding pin is pulled-up by the target V_{DD} pin. When it is OFF, the corresponding pull-up resistor is disconnected. Set the DIP switch to OFF for ports that do not exist.

Figure 3-15. Mask Option Setting





The initial setting of all these switches is OFF.

3.6 External Trigger

To set an external trigger, connect the IE-789456-NS-EM1's check pins EXTOUT and EXTIN as shown below.

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

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

(1) EXTOUT

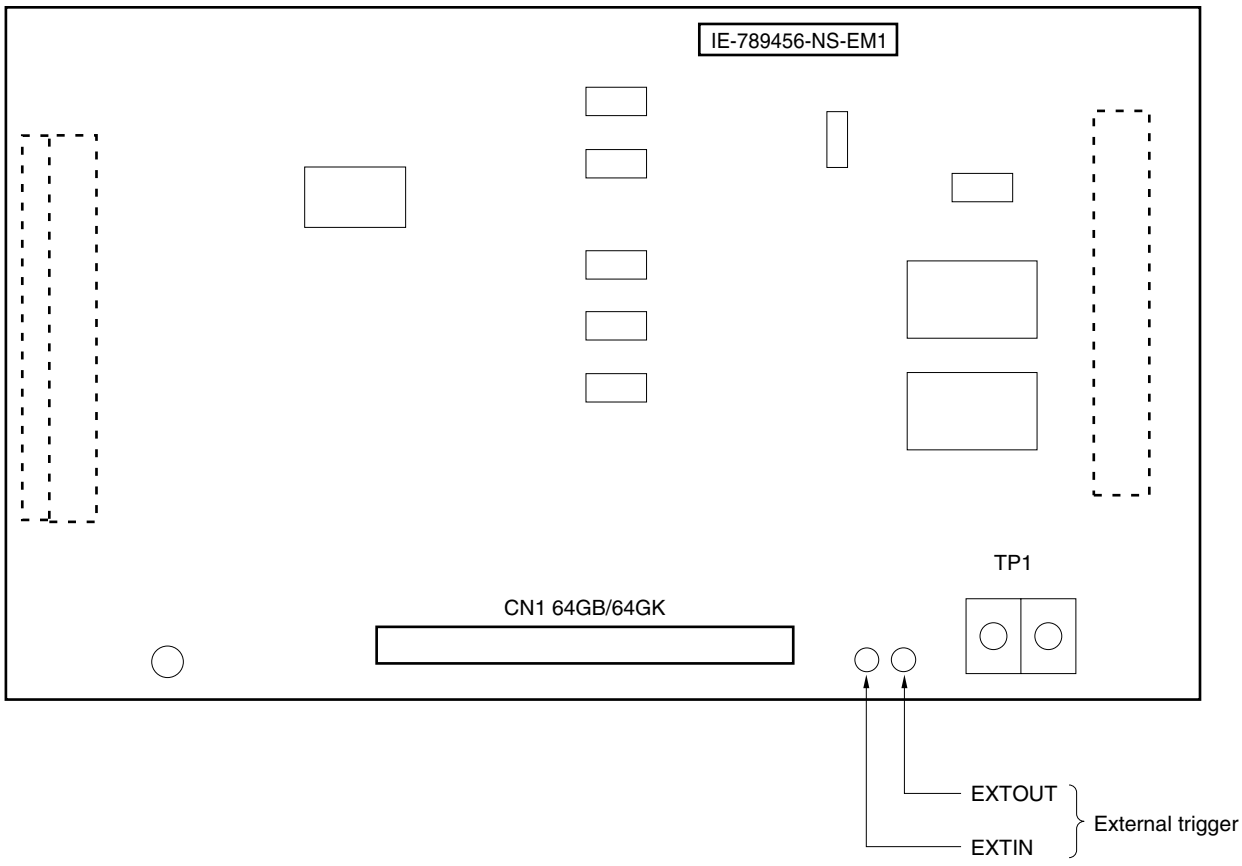
The EXTOUT pin on the IE-789456-NS-EM1 outputs a low level for 1.3 μs when a break event occurs.

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

(2) EXTIN

An event signal can be input from the EXTIN pin on the IE-789456-NS-EM1. Input a high-level pulse signal for 2 CPU operation clocks or more.

Figure 3-16. 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-789456-NS-EM1 are used as follows for signals listed in (1) to (3) above. The same applies to handling 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 Equivalent Circuit 1 of Emulation Circuit**. The following signals operate the same as in the μPD789446/789456 Subseries.

- S0 to S14
- COM0 to COM3
- CAPH, CAPL
- V_{LC0} to V_{LC2}
- Signals related to port 6, AV_{DD}, AV_{SS}

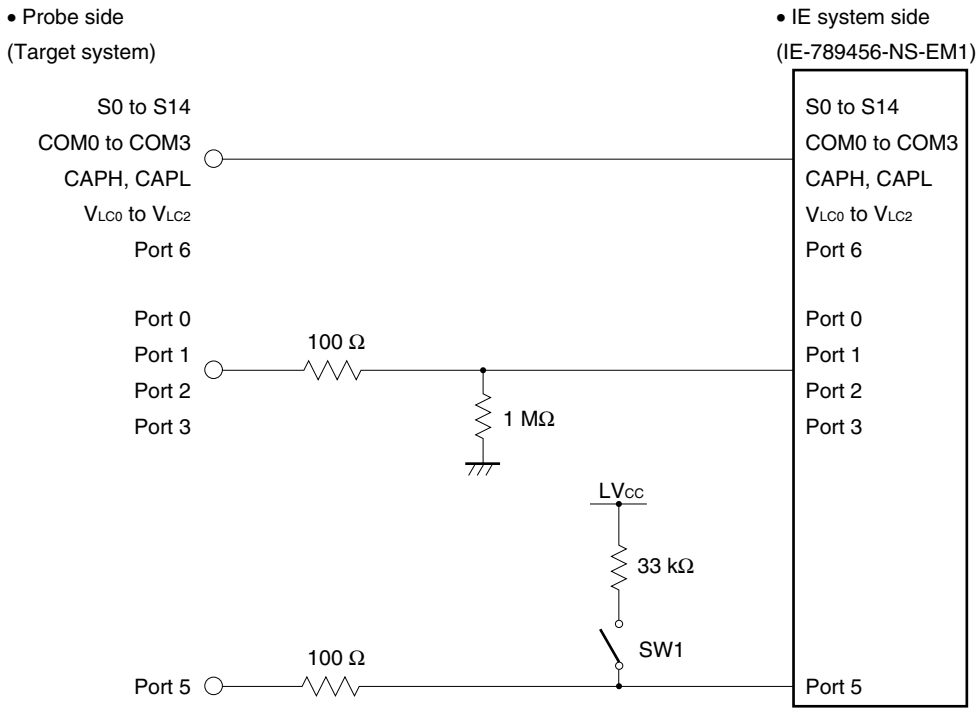
Note that for the following signals, a 1 MΩ pull-down resistor and a 100 Ω resistor are connected in series. Signals related to ports 0 and 1 are connected to a 1 MΩ pull-down resistor in the IE-78K0S-NS or IE-78K0S-NS-A.

- Signals related to port 0
- Signals related to port 1
- Signals related to port 2
- Signals related to port 3

A 33 kΩ pull-up resistor is connected to the following signals by setting the switch.

- Signals related to port 5

Figure 4-1. Equivalent Circuit 1 of Emulation Circuit

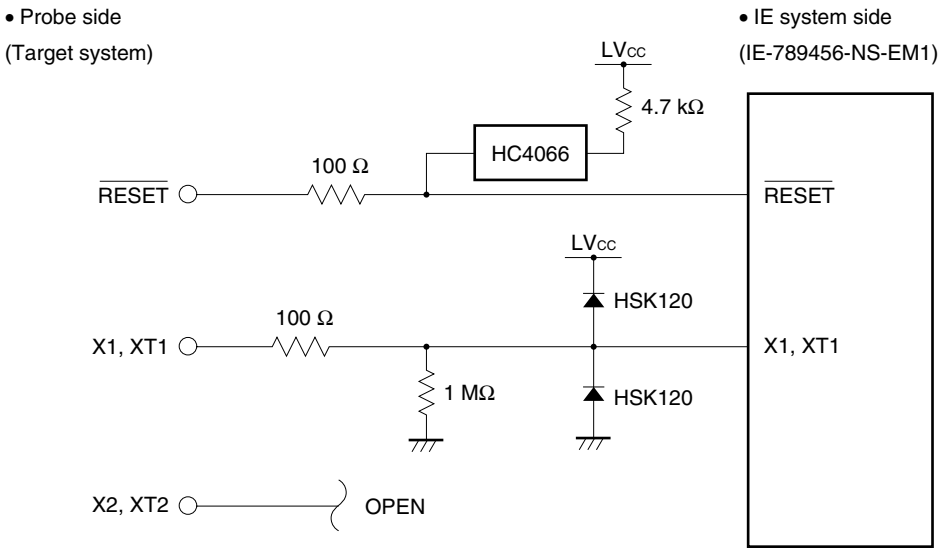


(2) Signals input from the target system via a gate

Since the following signals are input via a gate, their timing shows a delay compared to the μPD789446/789456 Subseries. Refer to **Figure 4-2 Equivalent Circuit 2 of Emulation Circuit**.

- $\overline{\text{RESET}}$ signal
- Signals related to clock input
  The X2 and XT2 pins are not used in the IE-789456-NS-EM1.

Figure 4-2. Equivalent Circuit 2 of Emulation Circuit



(3) Other signals

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

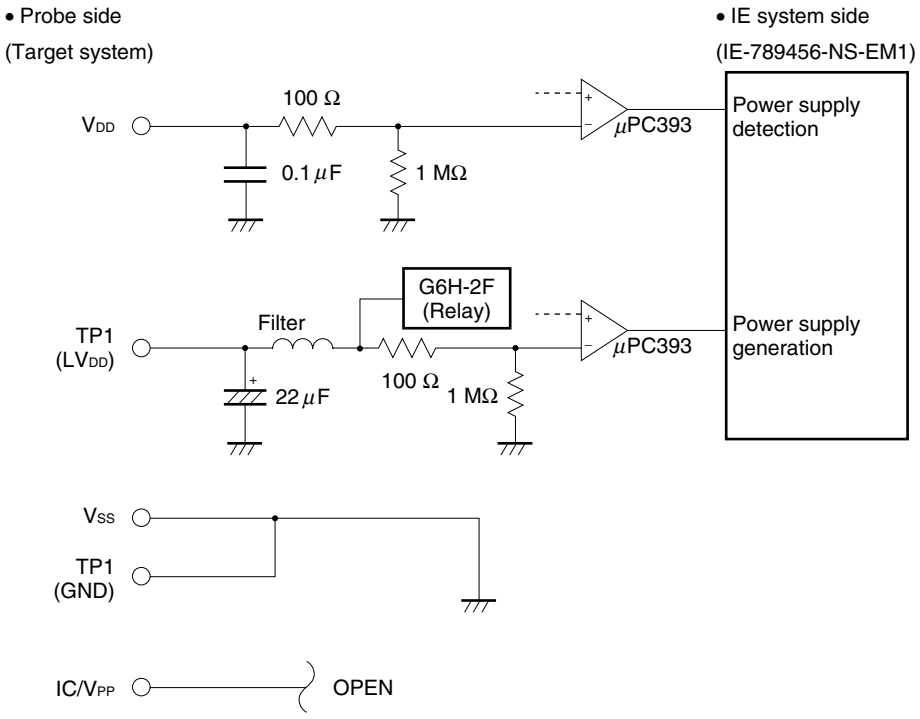
- V_{DD} pin

  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 power voltage supply pin (TP1) (LV_{CC}) when the target system is connected. In the IE-789456-NS-EM1, the V_{DD} pin of the target system is exclusively used for controlling LED1 (USER VDD), which monitors whether the power of the target system is on.
- V_{SS} pin

  The V_{SS} pin is connected to GND in the IE-789456-NS-EM1.
- IC/V_{PP} pin

  The IC/V_{PP} pin is not used in the IE-789456-NS-EM1.

Figure 4-3. Equivalent Circuit 3 of Emulation Circuit



APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. NP-64GB-TQ, NP-H64GB-TQ, NP-64GK, NP-H64GK-TQ Pin Assignments

Emulation Probe	CN1 Pin No.	Emulation Probe	CN1 Pin No.
1	108	33	14
2	107	34	13
3	104	35	18
4	103	36	17
5	100	37	22
6	99	38	21
7	94	39	28
8	93	40	27
9	30	41	92
10	29	42	91
11	24	43	98
12	23	44	97
13	20	45	102
14	19	46	101
15	16	47	106
16	15	48	105
17	43	49	77
18	44	50	78
19	47	51	73
20	48	52	74
21	51	53	69
22	52	54	70
23	57	55	63
24	58	56	64
25	59	57	61
26	60	58	62
27	55	59	65
28	56	60	66
29	49	61	71
30	50	62	72
31	45	63	75
32	46	64	76

Remarks 1. NP-64GB-TQ, NP-H64GB-TQ, NP-64GK, and NP-H64GK-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the “Emulation probe” column indicate the corresponding pin number on the emulation probe tip.

APPENDIX B CAUTIONS ON DESIGNING TARGET SYSTEM

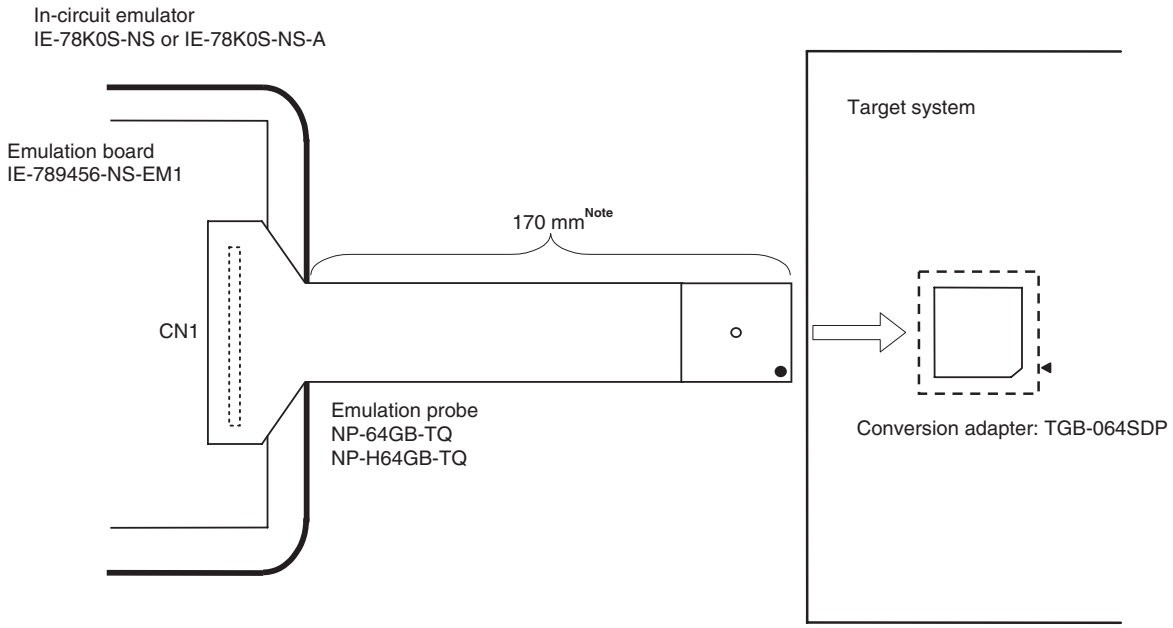
The following shows the conditions when connecting the emulation probe to the conversion adapter. Follow the configuration below and consider the shape of parts to be mounted on the target system when designing a system.

Among the products described in this appendix, NP-64GB-TQ, NP-H64GB-TQ, NP-64GK, and NP-H64GK-TQ are products of Naito Densei Machida Mfg. Co., Ltd, and TGB-064SDP and TGK-064SBW are products 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-64GB-TQ	TGB-064SDP	170 mm
NP-H64GB-TQ		370 mm
NP-64GK	TGK-064SBW	170 mm
NP-H64GK-TQ		370 mm

Figure B-1. Distance Between In-Circuit Emulator and Conversion Adapter (When 64GB Is Used)



Note Distance when NP-64GB-TQ is used. When NP-H64GB-TQ is used, the distance is 370 mm.

Figure B-2. Connection Conditions of Target System (When NP-64GB-TQ Is Used)

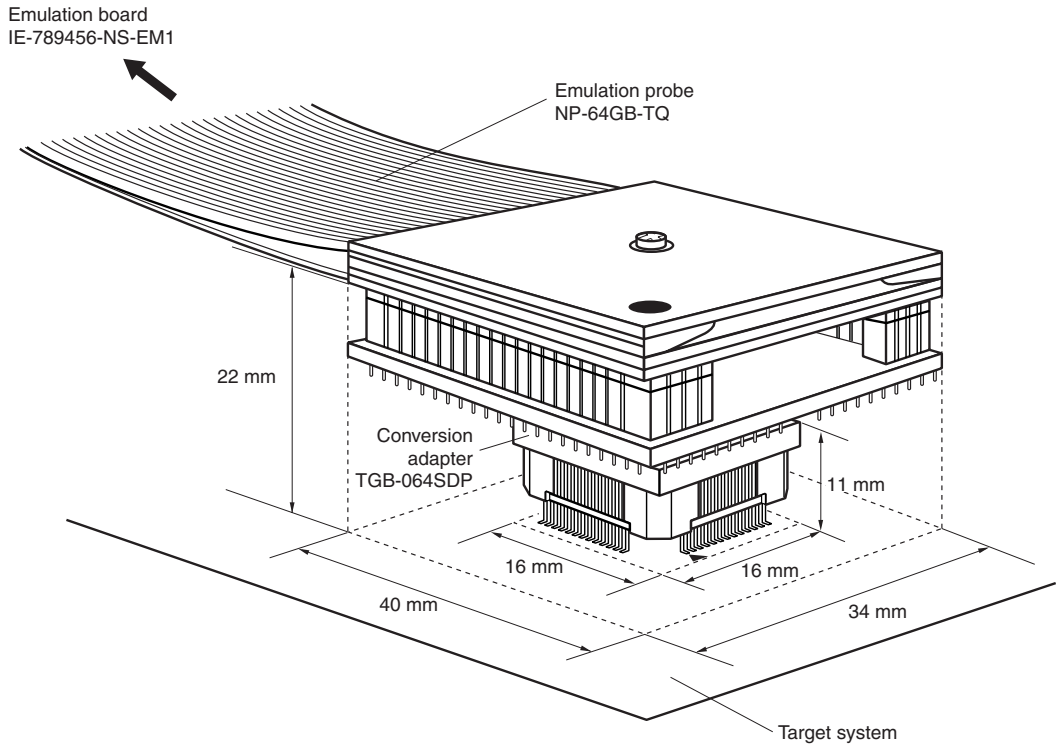


Figure B-3. Connection Conditions of Target System (When NP-H64GB-TQ Is Used)

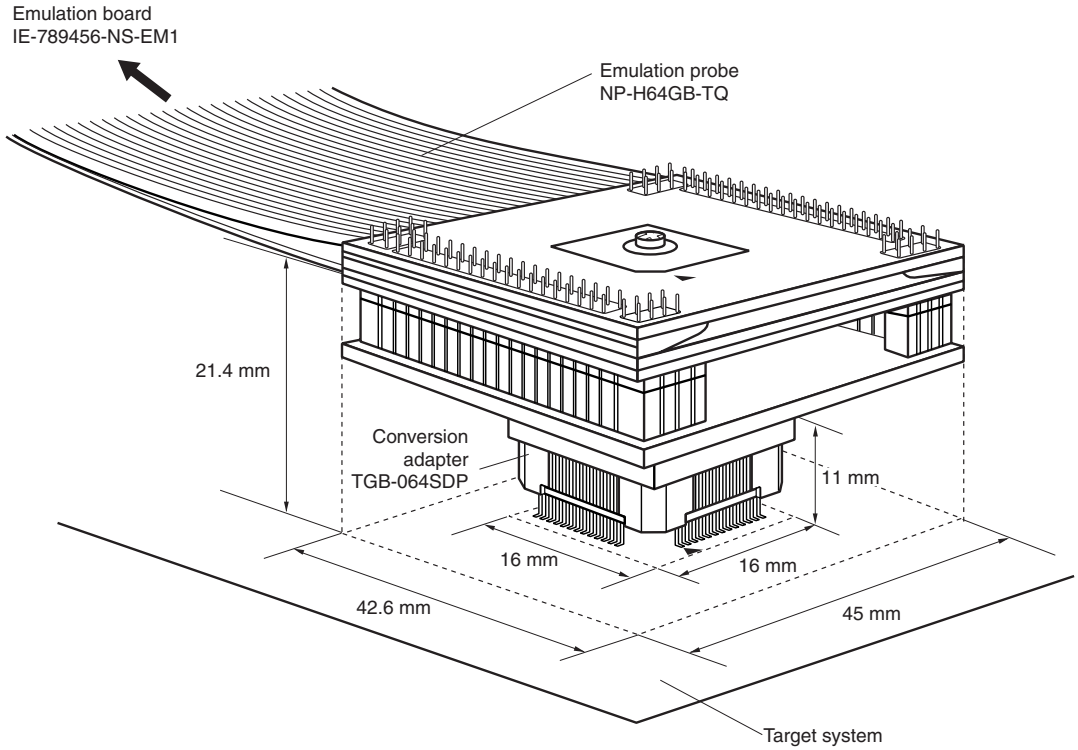
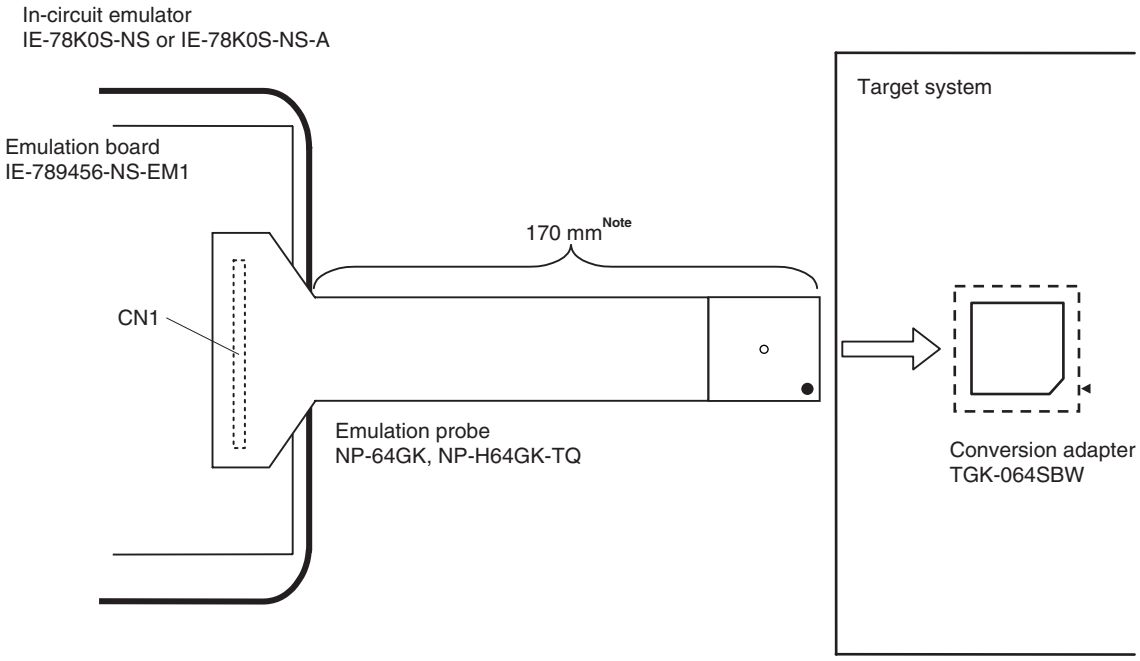


Figure B-4. Distance Between In-Circuit Emulator and Conversion Adapter (When 64GK Is Used)



Note Distance when NP-64GK is used. When NP-H64GK-TQ is used, the distance is 370 mm.

Figure B-5. Connection Conditions of Target System (When NP-64GK Is Used)

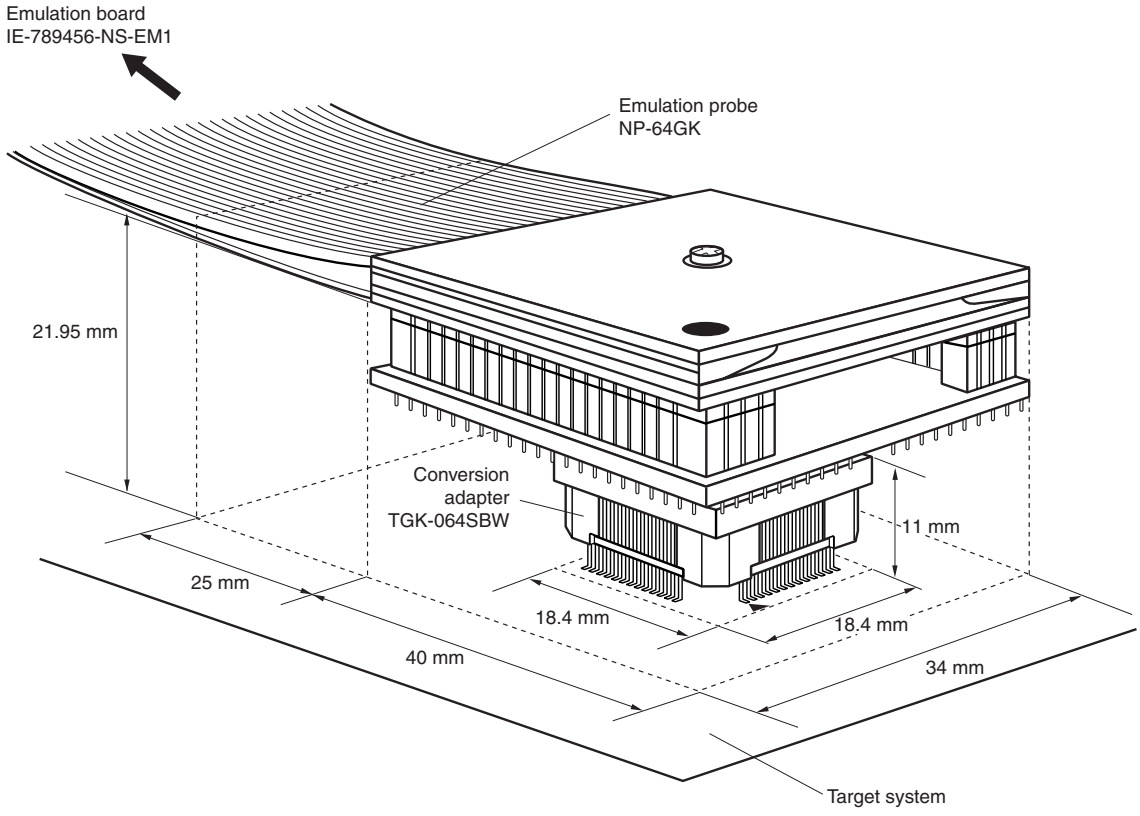
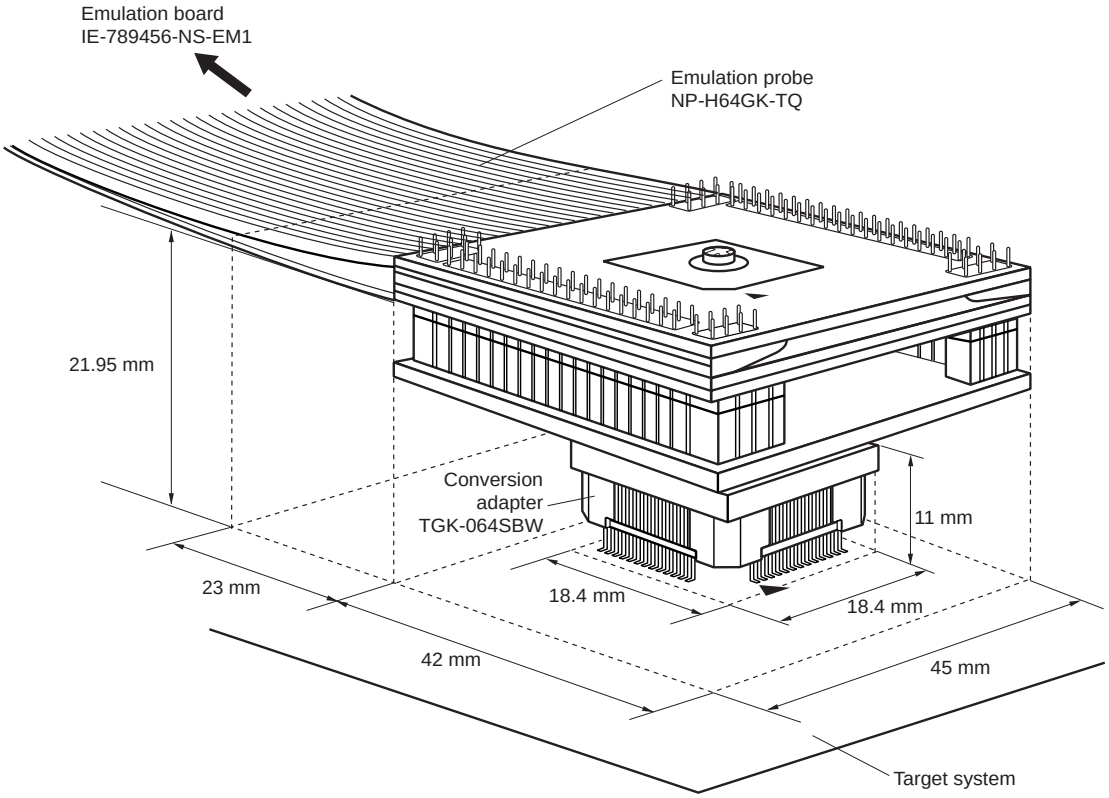



Figure B-6. Connection Conditions of Target System (When NP-H64GK-TQ Is Used)