

# User's Manual

# IE-784908-NS-EM1

## Emulation Board

---

### Target device

**μPD784908 Subseries**

[MEMO]

**IEBus is a trademark of NEC Corporation.**

**Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and/or other countries.**

**PC/AT is a trademark of International Business Machines Corporation.**

**The information in this document is subject to change without notice.**

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or of others.

# Regional Information

Some information contained in this document may vary from country to country. Before using any NEC product in your application, please contact the NEC office in your country to obtain a list of authorized representatives and distributors. They will verify:

- Device availability
- Ordering information
- Product release schedule
- Availability of related technical literature
- Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)
- Network requirements

In addition, trademarks, registered trademarks, export restrictions, and other legal issues may also vary from country to country.

## **NEC Electronics Inc. (U.S.)**

Santa Clara, California  
Tel: 408-588-6000  
800-366-9782  
Fax: 408-588-6130  
800-729-9288

## **NEC Electronics (Germany) GmbH**

Duesseldorf, Germany  
Tel: 0211-65 03 02  
Fax: 0211-65 03 490

## **NEC Electronics (UK) Ltd.**

Milton Keynes, UK  
Tel: 01908-691-133  
Fax: 01908-670-290

## **NEC Electronics Italiana s.r.l.**

Milano, Italy  
Tel: 02-66 75 41  
Fax: 02-66 75 42 99

## **NEC Electronics (Germany) GmbH**

Benelux Office  
Eindhoven, The Netherlands  
Tel: 040-2445845  
Fax: 040-2444580

## **NEC Electronics (France) S.A.**

Velizy-Villacoublay, France  
Tel: 01-30-67 58 00  
Fax: 01-30-67 58 99

## **NEC Electronics (France) S.A.**

Spain Office  
Madrid, Spain  
Tel: 91-504-2787  
Fax: 91-504-2860

## **NEC Electronics (Germany) GmbH**

Scandinavia Office  
Taeby, Sweden  
Tel: 08-63 80 820  
Fax: 08-63 80 388

## **NEC Electronics Hong Kong Ltd.**

Hong Kong  
Tel: 2886-9318  
Fax: 2886-9022/9044

## **NEC Electronics Hong Kong Ltd.**

Seoul Branch  
Seoul, Korea  
Tel: 02-528-0303  
Fax: 02-528-4411

## **NEC Electronics Singapore Pte. Ltd.**

United Square, Singapore 1130  
Tel: 65-253-8311  
Fax: 65-250-3583

## **NEC Electronics Taiwan Ltd.**

Taipei, Taiwan  
Tel: 02-2719-2377  
Fax: 02-2719-5951

## **NEC do Brasil S.A.**

Electron Devices Division  
Rodovia Presidente Dutra, Km 214  
07210-902-Guarulhos-SP Brasil  
Tel: 55-11-6465-6810  
Fax: 55-11-6465-6829

J99.1

## INTRODUCTION

### Product Overview

The IE-784908-NS-EM1 is designed to be used with the IE-78K4-NS to debug the following target devices that belong to the 78K/IV Series of 16-bit single-chip microcontrollers.

- $\mu$ PD784908 Subseries:  $\mu$ PD784907, 784908, 78P4908

### Target Readers

This manual is intended for engineers who will use the IE-784908-NS-EM1 with the IE-78K4-NS 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-784908-NS-EM1, refer to not only this manual (supplied with the IE-784908-NS-EM1) but also the manual that is supplied with the IE-78K4-NS.

|                             |
|-----------------------------|
| IE-78K4-NS<br>User's Manual |
|-----------------------------|

- Basic specifications
- System configuration
- External interface functions

|                                   |
|-----------------------------------|
| IE-784908-NS-EM1<br>User's Manual |
|-----------------------------------|

- 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-784908-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-78K4-NS and the IE-784908-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 |          |
|--------------------------------------------------------|-----------------|----------|
|                                                        | English         | Japanese |
| IE-78K4-NS                                             | U13356E         | U13356J  |
| IE-784908-NS-EM1                                       | This manual     | U13743J  |
| ID78K4-NS Integrated Debugger Reference Windows™ Based | U12796E         | U12796J  |
| μPD784908 Subseries Hardware                           | U11787E         | U11787J  |

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

## CONTENTS

|                                                                                            |               |
|--------------------------------------------------------------------------------------------|---------------|
| <b>CHAPTER 1 GENERAL .....</b>                                                             | <b>11</b>     |
| <b>1.1 System Configuration .....</b>                                                      | <b>12</b>     |
| <b>1.2 Hardware Configuration.....</b>                                                     | <b>14</b>     |
| <b>1.3 Basic Specifications.....</b>                                                       | <b>15</b>     |
| <br><b>CHAPTER 2 PART NAMES.....</b>                                                       | <br><b>17</b> |
| <b>2.1 Parts of Main Unit .....</b>                                                        | <b>18</b>     |
| <br><b>CHAPTER 3 INSTALLATION .....</b>                                                    | <br><b>19</b> |
| <b>3.1 Connection.....</b>                                                                 | <b>20</b>     |
| <b>3.2 Clock Settings.....</b>                                                             | <b>21</b>     |
| 3.2.1 Overview of clock settings.....                                                      | 21            |
| 3.2.2 Main system clock settings.....                                                      | 23            |
| 3.2.3 Subsystem clock settings .....                                                       | 28            |
| <b>3.3 Pin Mask Function Settings.....</b>                                                 | <b>33</b>     |
| 3.3.1 Wait (WAIT) mask function.....                                                       | 33            |
| 3.3.2 Wait display function setting .....                                                  | 33            |
| 3.3.3 NMI interrupt mask setting.....                                                      | 33            |
| <b>3.4 Low-Voltage Emulation Setting.....</b>                                              | <b>34</b>     |
| <b>3.5 External Trigger .....</b>                                                          | <b>35</b>     |
| <br><b>CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS.....</b> | <br><b>37</b> |
| <br><b>APPENDIX EMULATION PROBE PIN ASSIGNMENT TABLE .....</b>                             | <br><b>41</b> |

## LIST OF FIGURES

| Figure No. | Title                                                                                 | Page |
|------------|---------------------------------------------------------------------------------------|------|
| 1-1.       | System Configuration .....                                                            | 12   |
| 1-2.       | Basic Hardware Configuration .....                                                    | 14   |
| 2-1.       | IE-784908-NS-EM1 Part Names .....                                                     | 18   |
| 3-1.       | Connection of Emulation Probe .....                                                   | 20   |
| 3-2.       | External Circuits Used as System Clock Oscillator .....                               | 21   |
| 3-3.       | When Using Clock That Is Already Mounted on Emulation Board .....                     | 22   |
| 3-4.       | When Using User-Mounted Clock .....                                                   | 22   |
| 3-5.       | When Using an External Clock .....                                                    | 23   |
| 3-6.       | Connections on Parts Board (When Using Main System Clock or User-Mounted Clock) ..... | 24   |
| 3-7.       | Crystal Oscillator (When Using Main System Clock or User-Mounted Clock) .....         | 26   |
| 3-8.       | Pin Alignment of Crystal Oscillator and Socket .....                                  | 26   |
| 3-9.       | Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock) .....   | 29   |
| 3-10.      | Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock) .....           | 31   |
| 3-11.      | Pin Alignment of Crystal Oscillator and Socket .....                                  | 31   |
| 3-12.      | External Trigger Input Position .....                                                 | 35   |
| 4-1.       | Equivalent Circuit 1 of Emulation Circuit .....                                       | 38   |
| 4-2.       | Equivalent Circuit 2 of Emulation Circuit .....                                       | 39   |

## LIST OF TABLES

| Table No. | Title                                                 | Page |
|-----------|-------------------------------------------------------|------|
| 1-1.      | Basic Specifications .....                            | 15   |
| 3-1.      | Main System Clock Settings.....                       | 23   |
| 3-2.      | Subsystem Clock Settings .....                        | 28   |
| 3-3.      | DIP Switch Setting for Wait (WAIT) Mask Function..... | 33   |
| 3-4.      | DIP Switch Setting for Wait Display Function .....    | 33   |
| 3-5.      | DIP Switch Setting for NMI Interrupt Mask .....       | 33   |
| A-1.      | NP-100GF Pin Assignments .....                        | 41   |

[MEMO]

## CHAPTER 1 GENERAL

The IE-784908-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/IV Series of 16-bit single-chip microcontrollers.

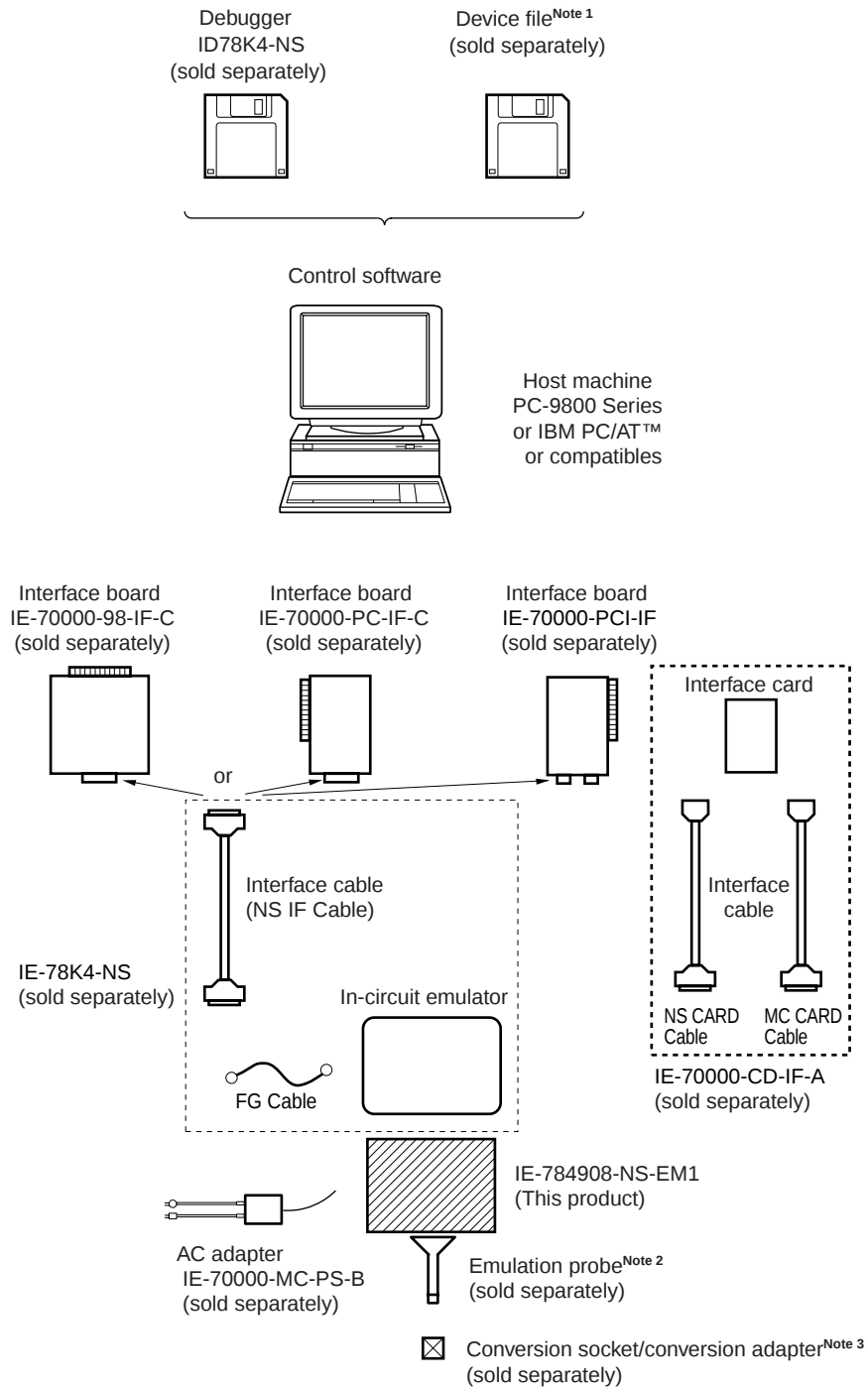
This chapter describes the IE-784908-NS-EM1's system configuration and basic specifications.

- Target device
  - $\mu$ PD784908 Subseries products

## 1.1 System Configuration

Figure 1-1 illustrates the IE-784908-NS-EM1's system configuration.

**Figure 1-1. System Configuration**



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

$\mu$ SxxxxDF784908:  $\mu$ PD784908 Subseries

**2.** The emulation probe is as follows.

NP-100GF: 100-pin plastic QFP (GF-3BA type)

The NP-100-GF is a product of Naito Densai Machida Mfg. Co., Ltd.

For further information, contact Naito Densai Machida Mfg. Co., Ltd. (TEL: +81-44-822-3813)

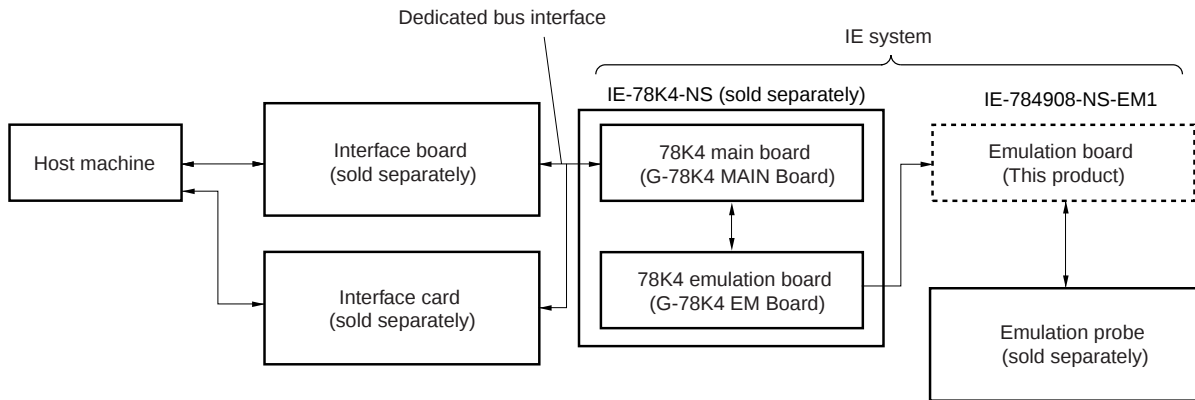
**3.** The conversion socket/conversion adapter is as follows.

EV-9200GF-100: 100-pin plastic QFP (GF-3BA type)

## 1.2 Hardware Configuration

Figure 1-2 shows the IE-784908-NS-EM1's position in the basic hardware configuration.

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



### 1.3 Basic Specifications

The IE-784908-NS-EM1's basic specifications are listed in Table 1-1.

**Table 1-1. Basic Specifications**

| Parameter           | Description                                                                                                                                            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Target device       | $\mu$ PD784908 Subseries                                                                                                                               |
| System clock        | Maximum 12.58 MHz                                                                                                                                      |
| Main clock supply   | External: Input via an emulation probe from the target system<br>Internal: Mounted on emulation board (12.58 MHz), or mounted on the board by the user |
| Subclock supply     | Internal: Mounted on emulation board (32.768 kHz), or mounted on the board by the user                                                                 |
| Low-voltage support | 3 V or higher (@ 6.29-MHz operation)<br>4.5 V or higher (@ 12.58-MHz operation)                                                                        |

[MEMO]

## CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-784908-NS-EM1 main unit.

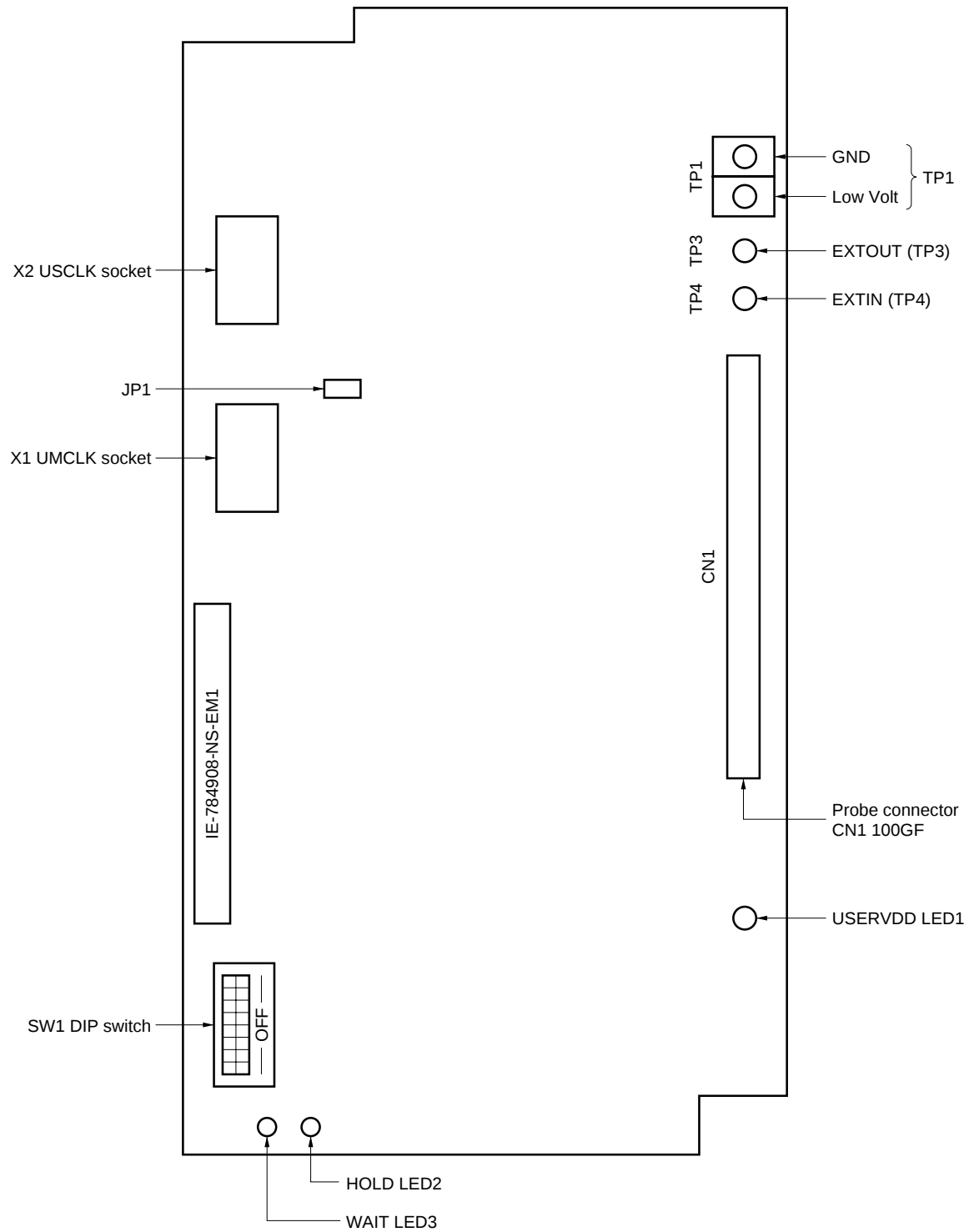
The packing box contains the emulation board (IE-784908-NS-EM1).

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

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

## 2.1 Parts of Main Unit

Figure 2-1. IE-784908-NS-EM1 Part Names



## CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-784908-NS-EM1 to the IE-78K4-NS, 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-78K4-NS main unit

See the IE-78K4-NS User's Manual (U13356E) for a description of how to connect the IE-784908-NS-EM1 to the IE-78K4-NS.

#### (2) Connection with emulation probe

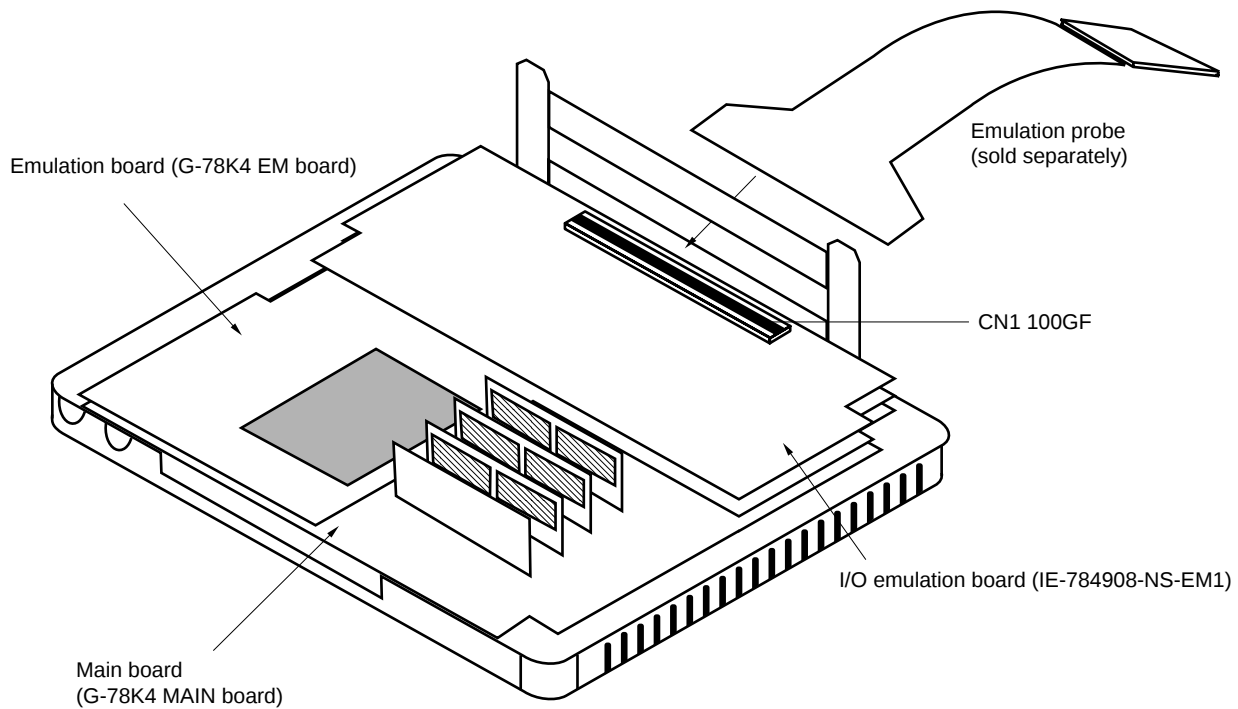
See the IE-78K4-NS User's Manual for a description of how to connect an emulation probe to the IE-784908-NS-EM1.

On this board, connect the emulation probe to CN1.

**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 Clock Settings

### 3.2.1 Overview of clock settings

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

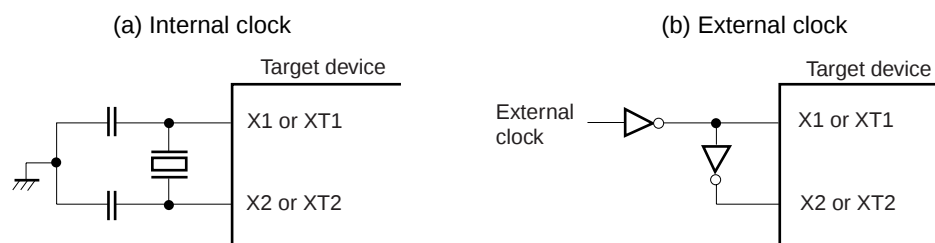
- (1) Clock that is already mounted on emulation board
- (2) Clock that is mounted by user
- (3) External clock

If the target system includes an internal clock, select either “(1) Clock that is already mounted on emulation board” or “(2) Clock that is mounted by user”. For an internal clock, the target device is connected to a resonator and the target device's internal oscillator is used. An example of the external circuit is shown in part (a) of Figure 3-2. During emulation, the resonator that is mounted on the target system is not used. Instead, it uses the clock that is mounted on the emulation board, which is installed for the IE-78K4-NS.

If the target system includes an external clock, select “(3) External clock”.

For an external clock, a clock signal is supplied from outside of the target device and the target device's internal oscillator is not used. An example of the external circuit is shown in part (b) of Figure 3-2.

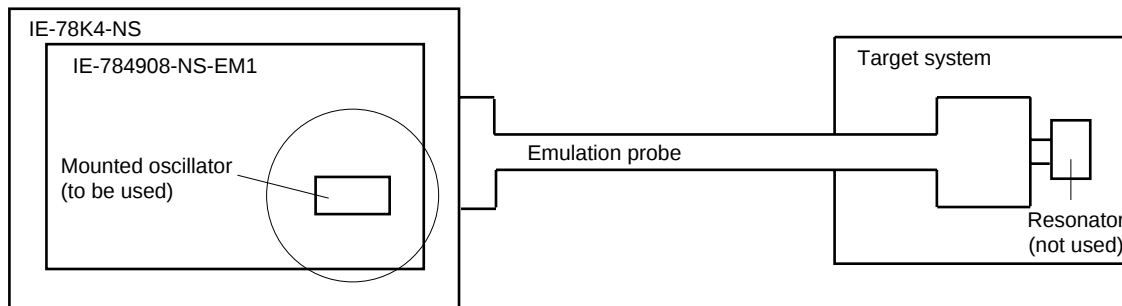
**Figure 3-2. External Circuits Used as System Clock Oscillator**



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

A crystal oscillator is already mounted on the emulation board. Its frequency is 12.58 MHz.

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

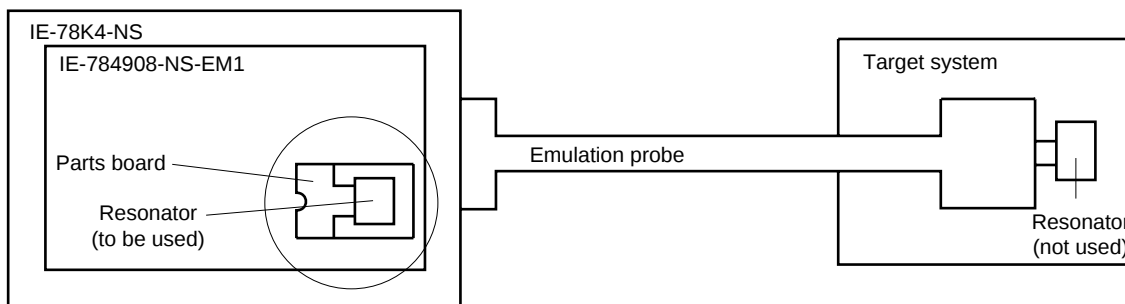


**Remark** The clock that is supplied by the IE-784908-NS-EM1's oscillator (encircled in the figure) is used.

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

The user is able to mount any clock supported by the set specifications on the IE-784908-NS-EM1. First mount the resonator on the parts board, then attach the parts board to the IE-784908-NS-EM1. This method is useful when using a different frequency from that of the pre-mounted clock.

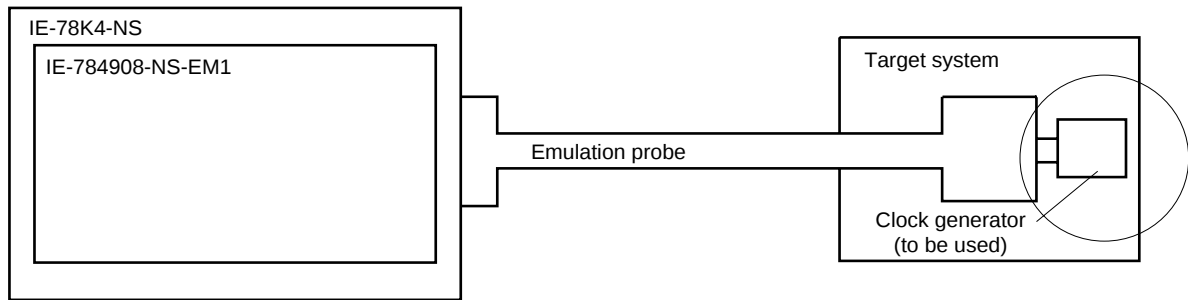
**Figure 3-4. When Using User-Mounted Clock**



**Remark** The clock that is supplied by the IE-784908-NS-EM1's resonator (encircled in the figure) is used.

**(3) External clock**

An external clock connected to the target system can be used via an emulation probe.

**Figure 3-5. When Using an External Clock**

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

**3.2.2 Main system clock settings****Table 3-1. Main System Clock Settings**

| Frequency of Main System Clock                              |                      | IE-784908-NS-EM1             | CPU Clock Source Selection (ID) |
|-------------------------------------------------------------|----------------------|------------------------------|---------------------------------|
|                                                             |                      | Parts Board (UMCLK)          |                                 |
| When using clock that is already mounted on emulation board | 12.58 MHz            | Oscillator used              | Internal                        |
| When using clock mounted by user                            | Other than 12.58 MHz | Oscillator assembled by user |                                 |
| When using external clock                                   |                      | Oscillator not used          | External                        |

**Caution** When using an external clock, open the configuration dialog box when starting the integrated debugger (ID78K4-NS) and select “External” in the area (Clock) for selecting the CPU’s clock source (this selects the user’s clock).

**Remark** The IE-784908-NS-EM1’s factory settings are those listed above under “when using clock that is already mounted on emulation board”.

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

When the IE-784908-NS-EM1 is shipped, a 12.58-MHz crystal oscillator is already mounted in the IE-784908-NS-EM1’s UMCLK socket. When using the factory-set mode settings, there is no need to make any other hardware settings.

When starting the integrated debugger (ID78K4-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**

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

When starting the integrated debugger (ID78K4-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**

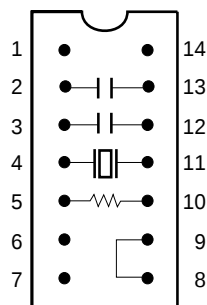
- Items to be prepared
  - Parts board (supplied with IE-78K4-NS)
  - Ceramic resonator or crystal resonator
  - Resistor Rx
  - Capacitor CA
  - Capacitor CB
  - Solder kit

### <Steps>

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

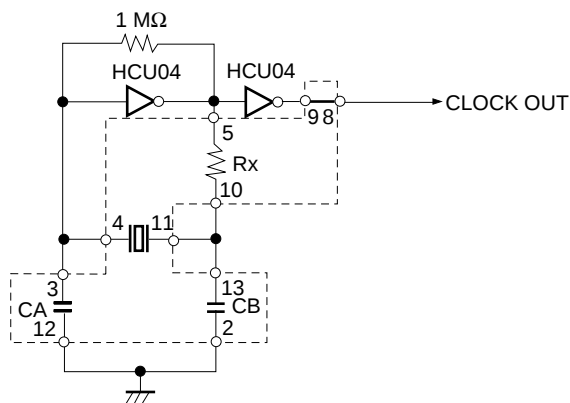
**Figure 3-6. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)**

Parts board (UMCLK)



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

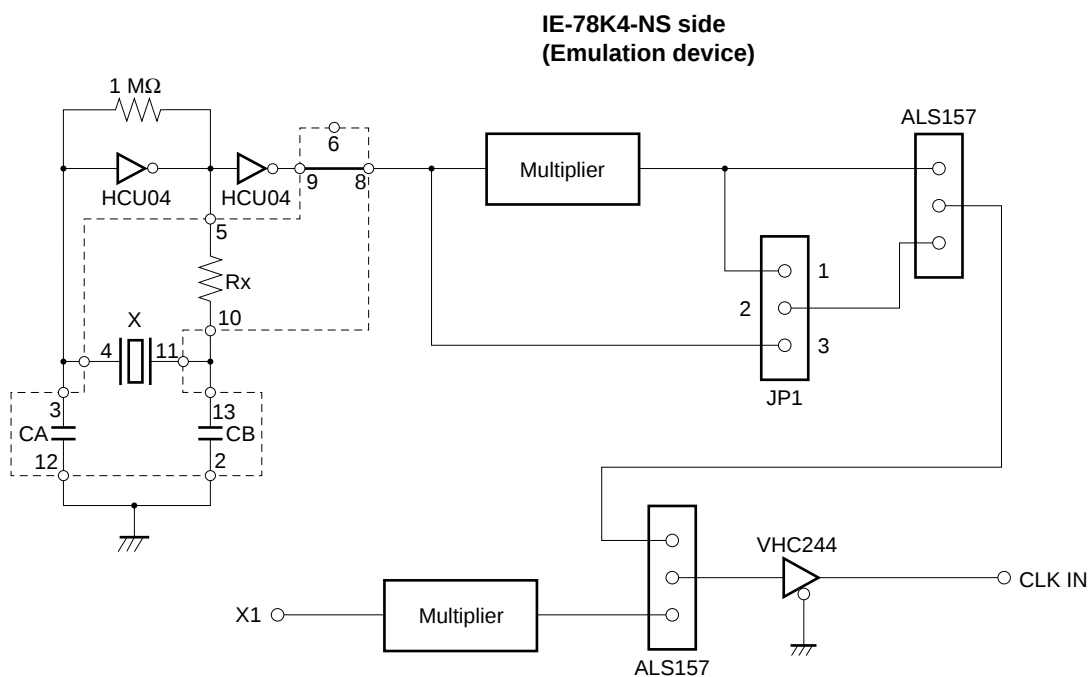
### Circuit diagram



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

- <2> Prepare the IE-784908-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-784908-NS-EM1's socket (the socket marked as UMCLK).
- <4> Connect the parts board (from <1> above) to the socket (UMCLK) from which the crystal oscillator was removed. Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Make sure that the parts board mounted in the UMCLK socket on the emulation board is wired as shown in Figure 3-6 above.
- <6> Install the IE-784908-NS-EM1 in the IE-78K4-NS.

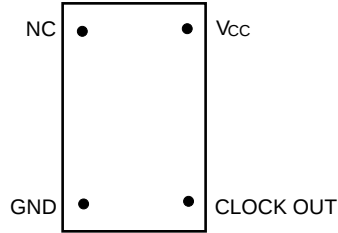
The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.



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

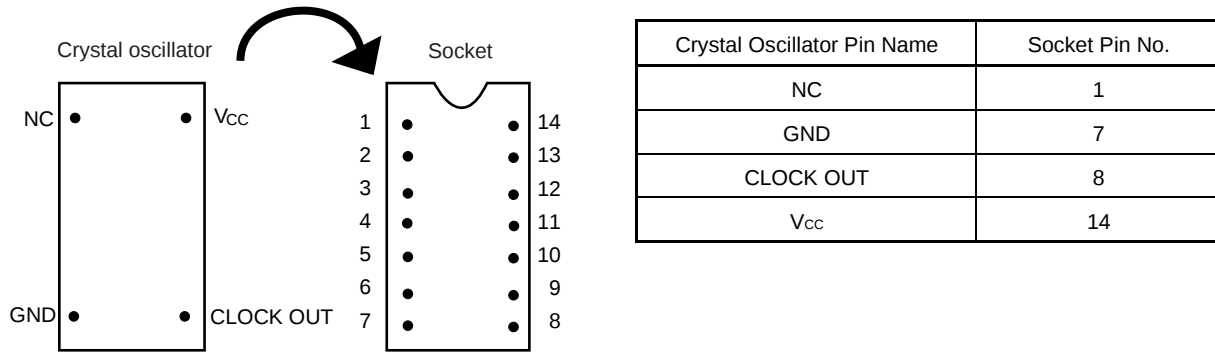
**(b) When using a crystal oscillator**

- Items to be prepared
  - Crystal oscillator (see pinouts shown in Figure 3-7)

**Figure 3-7. Crystal Oscillator (When Using Main System Clock or User-Mounted Clock)**

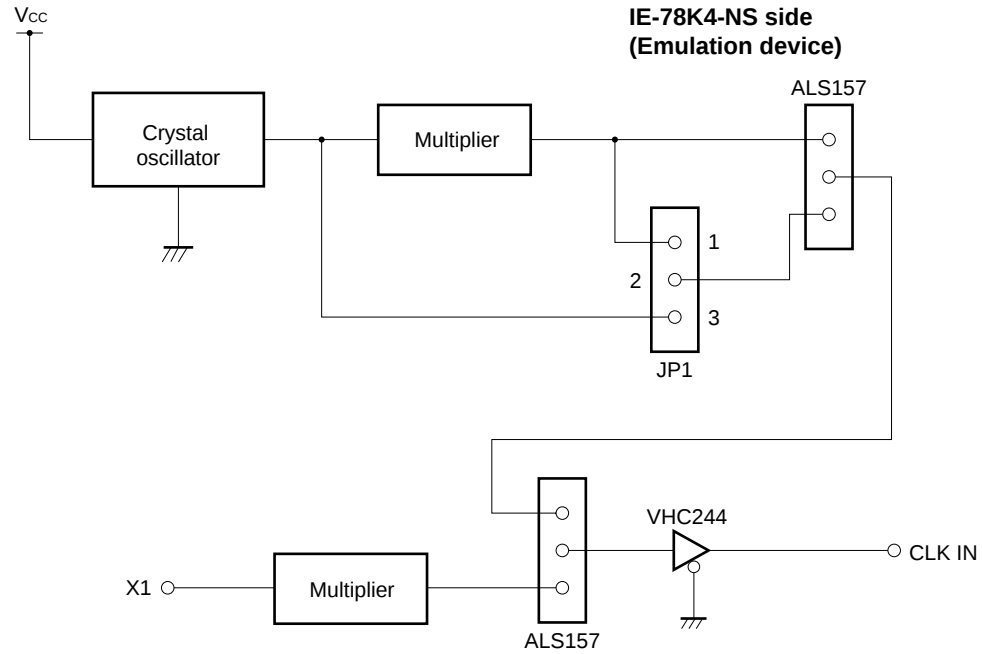
## &lt;Steps&gt;

- <1> Prepare the IE-784908-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-784908-NS-EM1's socket (the socket marked as UMCLK).
- <3> Connect the crystal oscillator (from <2> above) to the socket (UMCLK) from which the crystal oscillator was removed. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

**Figure 3-8. Pin Alignment of Crystal Oscillator and Socket**

- <4> Install the IE-784908-NS-EM1 in the IE-78K4-NS.

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



### (3) When using external clock

No hardware settings are required for this situation.

When starting the integrated debugger (ID78K4-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).

### 3.2.3 Subsystem clock settings

**Table 3-2. Subsystem Clock Settings**

| Frequency of Subsystem Clock                                |                       | IE-784908-NS-EM1             |               |
|-------------------------------------------------------------|-----------------------|------------------------------|---------------|
|                                                             |                       | Parts board (USCLK)          | JP1           |
| When using clock that is already mounted on emulation board | 32.768 kHz            | 6 and 8 shorted              | Short 1 and 2 |
| When using clock mounted by user                            | Other than 32.768 kHz | Oscillator assembled by user |               |
| When using external clock                                   |                       | Not used                     | Short 2 and 3 |

**Caution** Jumper JP1, which is used to select the board's clock or an external clock, should be set only after turning off the IE-78K4-NS's power.

**Remark** When the IE-784908-NS-EM1 is shipped, the settings for "when using clock that is already mounted on emulation board" are pre-set.

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

When the IE-784908-NS-EM1 is shipped, a 32.768-kHz crystal resonator is already mounted on the IE-784908-NS-EM1. Pins 6 and 8 on the parts board (USCLK) are shorted. Short pins 1 and 2 on the IE-784908-NS-EM1's jumper (JP1). There is no need to make any other settings via the integrated debugger (ID78K4-NS).

#### (2) When using the clock mounted by user

The settings described under either (a) or (b) are required, depending on the type of clock to be used. Short pins 1 and 2 on the IE-784908-NS-EM1's jumper (JP1).

There is no need to make any other settings via the integrated debugger (ID78K4-NS).

##### (a) When using a ceramic resonator or crystal resonator

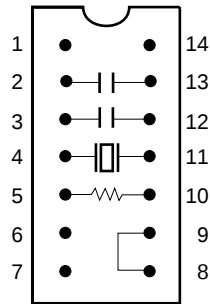
- Items to be prepared
  - Parts board (supplied with IE-78K4-NS)
  - Ceramic resonator or crystal resonator
  - Resistor Rx
  - Capacitor CA
  - Capacitor CB
  - Solder kit

<Steps>

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

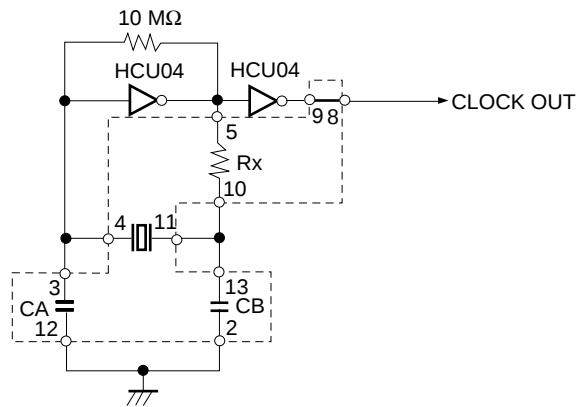
Figure 3-9. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

Parts board (USCLK)



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

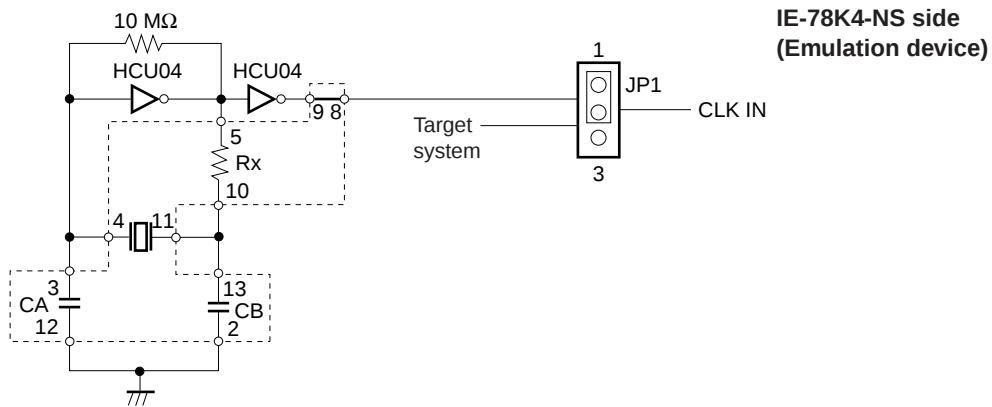
Circuit diagram



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

- <2> Prepare the IE-784908-NS-EM1.
- <3> Remove the parts board that is mounted in the IE-784908-NS-EM1's socket (the socket marked as USCLK).
- <4> Connect the parts board (from <1> above) to the socket (USCLK) from which the parts board was removed (see <3> above). Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Install the IE-784908-NS-EM1 in the IE-78K4-NS.

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

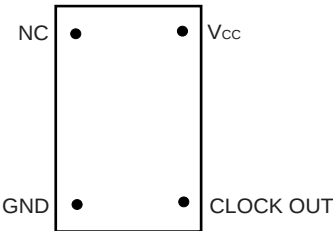


**Remark** The section enclosed in broken lines indicates parts that are attached to the parts board.

(b) When using a crystal oscillator

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

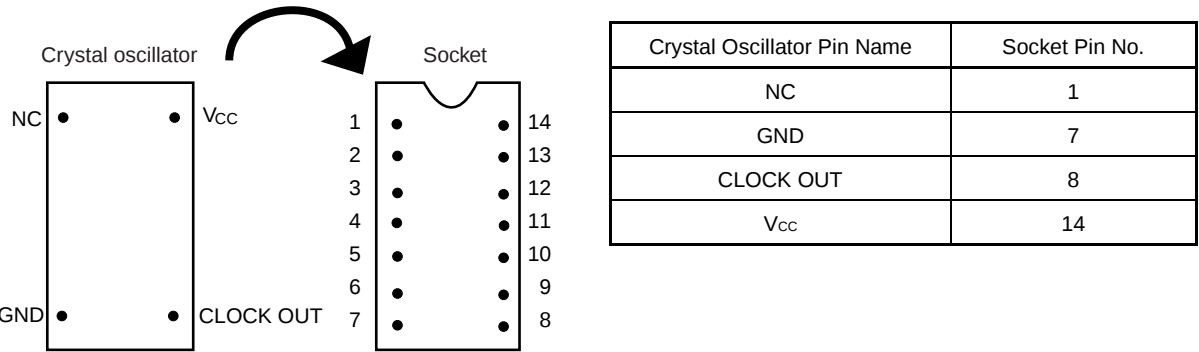
Figure 3-10. Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock)



<Steps>

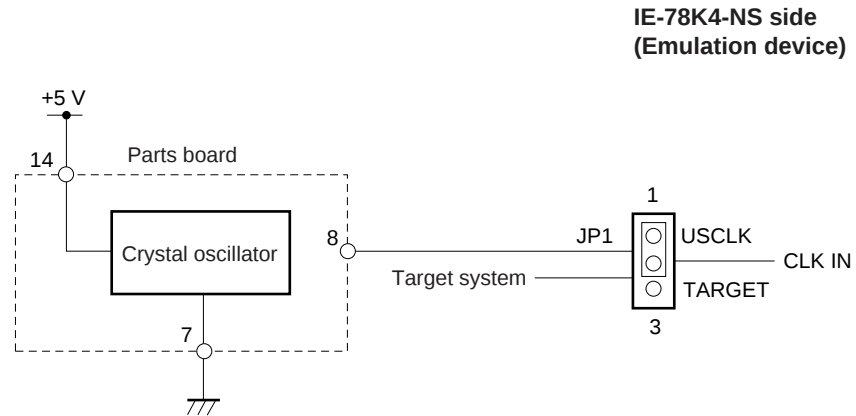
- <1> Prepare the IE-784908-NS-EM1.
- <2> Remove the parts board that is mounted in the IE-784908-NS-EM1's socket (the socket marked as USCLK).
- <3> Connect the crystal oscillator (from <2> above) to the socket (USCLK) from which the parts board was removed. Insert the crystal oscillator into the socket aligning the pins as shown below.

Figure 3-11. Pin Alignment of Crystal Oscillator and Socket



- <4> Install the IE-784908-NS-EM1 in the IE-78K4-NS.

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



### (3) When using an external clock

Short pins 2 and 3 on the IE-784908-NS-EM1's jumper (JP1). There is no need to make any settings via the integrated debugger (ID78K4-NS).

### 3.3 Pin Mask Function Settings

#### 3.3.1 Wait (WAIT) mask function

By setting the DIP switch (SW1) in the IE-784908-NS-EM1, it is possible to mask the alternate function (WAIT) and HOLD of pin P66 in the  $\mu$ PD784908 Subseries.

**Table 3-3. DIP Switch Setting for Wait (WAIT) Mask Function**

| Status                    | DIP Switch Setting |             |           |
|---------------------------|--------------------|-------------|-----------|
|                           | 2 (WAITMSK)        | 3 (HOLDMSK) | 4 (P66ON) |
| No mask (initial setting) | OFF                | OFF         | ON        |
| Hold mask status          | OFF                | ON          | OFF       |
| Wait mask status          | ON                 | OFF         | OFF       |

**Caution** Do not set the DIP switch to settings other than those above.

#### 3.3.2 Wait display function setting

By setting the DIP switch (SW1) in the IE-784908-NS-EM1, it is possible to display the statuses of “waiting” and “holding” with an LED light.

**Table 3-4. DIP Switch Setting for Wait Display Function**

| Status                                                                         | DIP Switch Setting |             |
|--------------------------------------------------------------------------------|--------------------|-------------|
|                                                                                | 5 (HOLDLED)        | 6 (WAITLED) |
| HOLD status is displayed,<br>WAIT status is not displayed<br>(initial setting) | ON                 | OFF         |
| HOLD status is not displayed,<br>WAIT status is displayed                      | OFF                | ON          |

**Caution** When pin P66 is used as a port pin, unless the DIP switch is turned OFF the LED may light up.

#### 3.3.3 NMI interrupt mask setting

By setting switch 1 of the DIP switch (SW1) in the IE-784908-NS-EM1, it is possible to mask the NMI interrupt, which is the alternate function of the port 20.

**Table 3-5. DIP Switch Setting for NMI Interrupt Mask**

| Status                        | DIP Switch Setting |  |
|-------------------------------|--------------------|--|
|                               | 1 (NMIMSK)         |  |
| No NMI mask (initial setting) | ON                 |  |
| NMI mask status               | OFF                |  |

**Caution** Because the NMI interrupt is the alternate function of the P20 pin, this pin cannot operate as the P20 pin when the NMI mask status has been set.

### 3.4 Low-Voltage Emulation Setting

Low-voltage emulation is possible in the IE system.

When the target system is operating on low voltage, supply the same voltage as the target system to the TP1 terminal pin of the IE-784908-NS-EM1 (this is unnecessary when the TP1 is 5 V). Set the target voltage between 3 and 5 V.

- Maximum current consumption of TP1

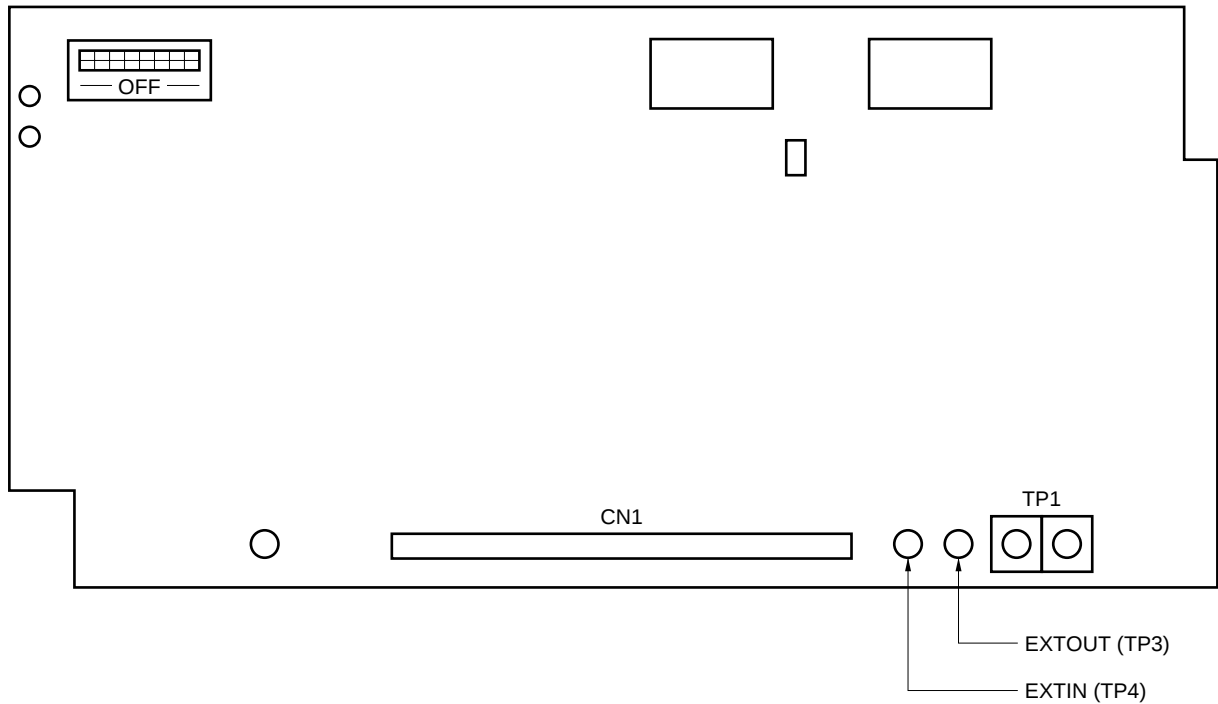
|     |        |
|-----|--------|
| 5 V | 300 mA |
| ⋮   | ⋮      |
| 3 V | 250 mA |

### 3.5 External Trigger

To set up an external trigger, connect it to the IE-784908-NS-EM1's check pin, EXTOUT pin, and EXTIN pin as shown below.

See the integrated debugger (ID-78K4-NS) User's Manual (U12796E) for descriptions of related use methods and pin characteristics.

**Figure 3-12. External Trigger Input Position**



[MEMO]

## CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes differences between the target device's signal lines and the signal lines of the IE-784908-NS-EM1's target interface circuit.

Although the target device is a CMOS circuit, the IE-784908-NS-EM1's target interface circuit consists of an emulation CPU, TTL, CMOS-IC, and other emulation circuits.

When the IE system is connected with the target system for debugging, the IE system performs emulation so as to operate as the actual target device would operate in the target system.

However, some minor differences exist since the operations are performed via the IE system's emulation.

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

The IE system's circuit is used as follows for signals listed in (1) to (3) above.

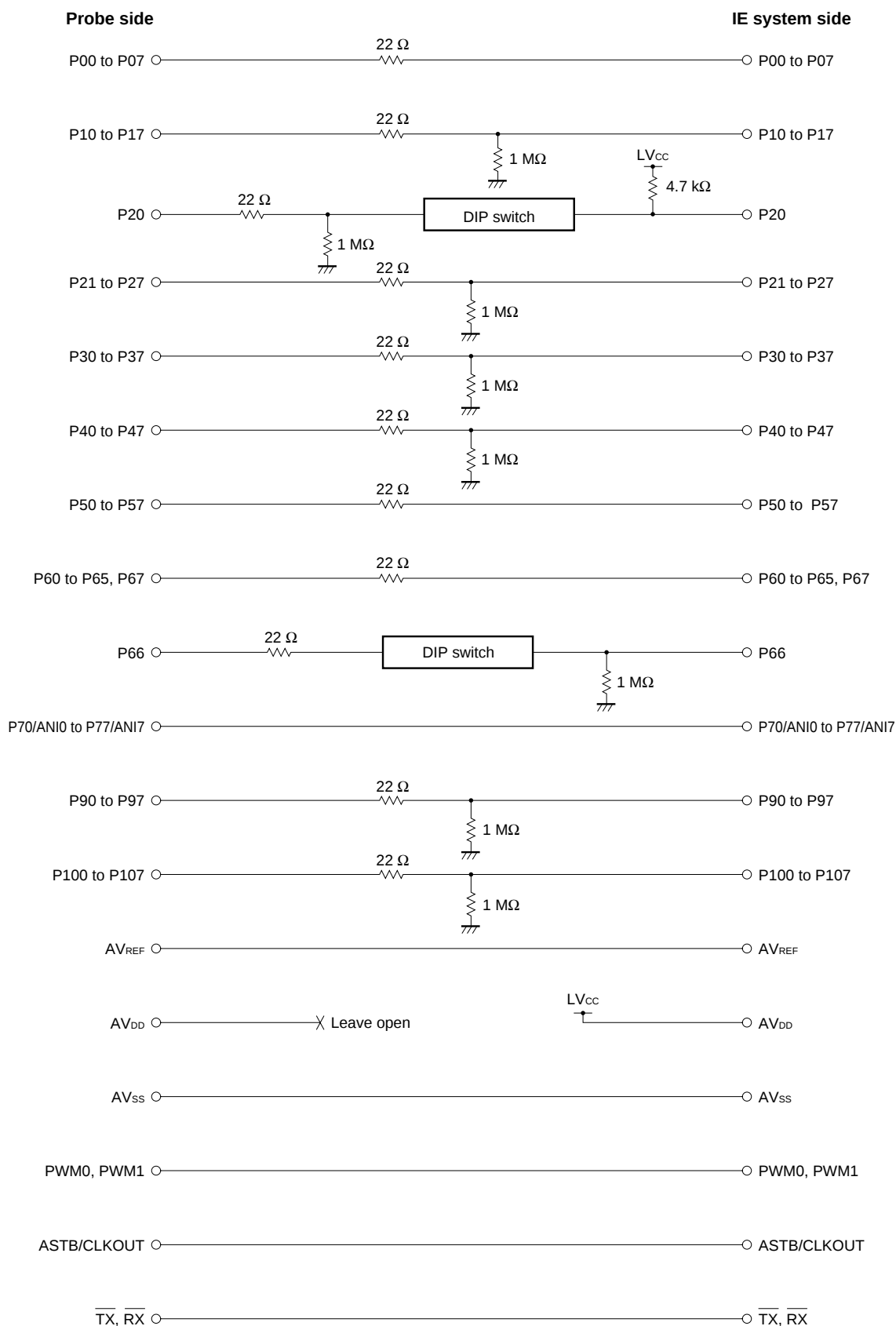
### (1) Signals directly input/output to/from the emulation CPU

The following signals perform the same operations as in the  $\mu$ PD784908 Subseries. For the signals related to ports excluding port 7 (having alternate functions as pins for A/D converter), however, a 1-M $\Omega$  pull-down resistor and 22- $\Omega$  resistor are inserted in series.

- Signals related to port 0
- Signals related to port 1
- Signals related to port 2
- Signals related to port 3
- Signals related to port 4
- Signals related to port 5
- Signals related to port 6
- Signals related to port 7 (A/D converter input)
- Signals related to port 9
- Signals related to port 10
- Signals related to A/D converter
  - AV<sub>REF</sub>
  - AV<sub>SS</sub>
- Signals related to PWM
- ASTB/CLKOUT
- IEBus™ interface signal  $\overline{\text{TX}}$ ,  $\overline{\text{RX}}$

**Remark** The AV<sub>DD</sub> pin on the target system is not connected to the IE system. Either the power supply of the IE system or the power supply supplied to TP1 is supplied to the AV<sub>DD</sub> pin of the emulation CPU.

Figure 4-1. Equivalent Circuit 1 of Emulation Circuit

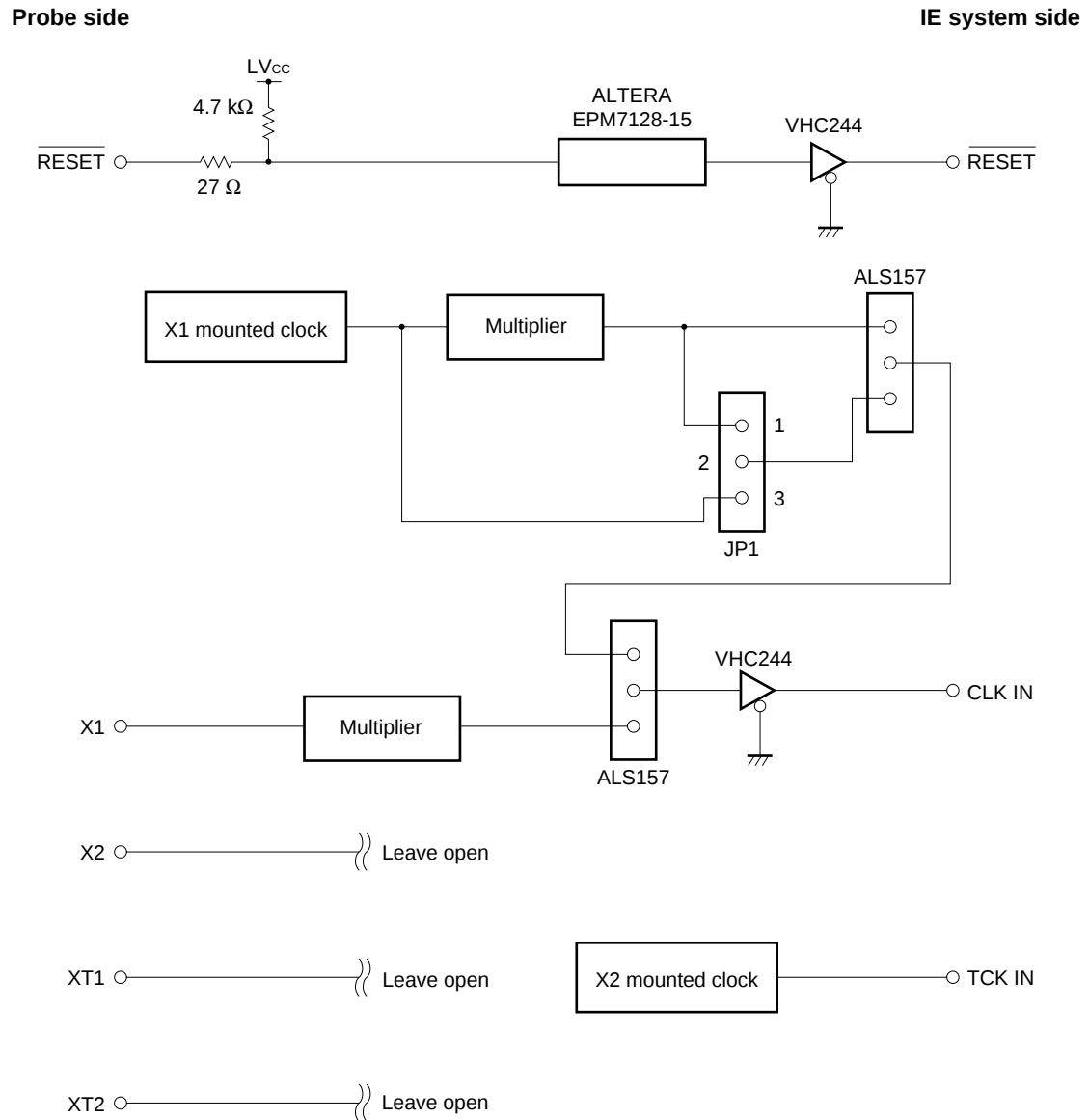


## (2) Signals input from the target system via a gate

Since the following signals are input via a gate, their timing shows a delay compared to that of the  $\mu$ PD784908 Subseries. Their AC characteristics and DC characteristics are therefore different from  $\mu$ PD784908 Subseries, making it necessary to observe a stricter timing design than in the case of  $\mu$ PD784908 Subseries.

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

Figure 4-2. Equivalent Circuit 2 of Emulation Circuit



**Caution** Set JP1 to 1 and 2 shorted.

**(3) Other signals**

- **V<sub>DD</sub> pin**

When the emulation CPU is operating at 5 V, its power is supplied from the internal IE system, but when operating at low voltage, its power is supplied from the low-voltage pin (TP1). The V<sub>DD</sub> pin of the target system is only used to control the LED (USERV<sub>DD</sub>) in the IE system that monitors the input of the target system's power supply.

- **V<sub>SS</sub> pin**

The V<sub>SS</sub> pin is connected to GND inside the IE system.

## APPENDIX EMULATION PROBE PIN ASSIGNMENT TABLE

**Table A-1. NP-100GF Pin Assignments (1/2)**

| Emulation Probe | CN1 Pin No. | Emulation Probe | CN1 Pin No. |
|-----------------|-------------|-----------------|-------------|
| 1               | 116         | 34              | 107         |
| 2               | 115         | 35              | 104         |
| 3               | 87          | 36              | 103         |
| 4               | 88          | 37              | 100         |
| 5               | 83          | 38              | 99          |
| 6               | 84          | 39              | 94          |
| 7               | 77          | 40              | 93          |
| 8               | 78          | 41              | 30          |
| 9               | 73          | 42              | 29          |
| 10              | 74          | 43              | 24          |
| 11              | 69          | 44              | 23          |
| 12              | 70          | 45              | 20          |
| 13              | 63          | 46              | 19          |
| 14              | 64          | 47              | 16          |
| 15              | 61          | 48              | 15          |
| 16              | 62          | 49              | 10          |
| 17              | 65          | 50              | 9           |
| 18              | 66          | 51              | 6           |
| 19              | 71          | 52              | 5           |
| 20              | 72          | 53              | 33          |
| 21              | 75          | 54              | 34          |
| 22              | 76          | 55              | 37          |
| 23              | 79          | 56              | 38          |
| 24              | 80          | 57              | 43          |
| 25              | 85          | 58              | 44          |
| 26              | 86          | 59              | 47          |
| 27              | 89          | 60              | 48          |
| 28              | 90          | 61              | 51          |
| 29              | 118         | 62              | 52          |
| 30              | 117         | 63              | 57          |
| 31              | 114         | 64              | 58          |
| 32              | 113         | 65              | 59          |
| 33              | 108         | 66              | 60          |

- Remarks**
1. The NP-100GF is a product 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.

Table A-1. NP-100GF Pin Assignments (2/2)

| Emulation Probe | CN1 Pin No. | Emulation Probe | CN1 Pin No. |
|-----------------|-------------|-----------------|-------------|
| 67              | 55          | 84              | 13          |
| 68              | 56          | 85              | 18          |
| 69              | 49          | 86              | 17          |
| 70              | 50          | 87              | 22          |
| 71              | 45          | 88              | 21          |
| 72              | 46          | 89              | 28          |
| 73              | 41          | 90              | 27          |
| 74              | 42          | 91              | 92          |
| 75              | 35          | 92              | 91          |
| 76              | 36          | 93              | 98          |
| 77              | 31          | 94              | 97          |
| 78              | 32          | 95              | 102         |
| 79              | 4           | 96              | 101         |
| 80              | 3           | 97              | 106         |
| 81              | 8           | 98              | 105         |
| 82              | 7           | 99              | 112         |
| 83              | 14          | 100             | 111         |

- Remarks**
1. The NP-100GF is a product of Naito Densetsu Machida Mfg. Co., Ltd.
  2. The numbers in the "Emulation probe" column indicate the corresponding pin number on the emulation probe tip.

## Facsimile Message

From:

Name

Company

Tel.

FAX

Address

Although NEC has taken all possible steps to ensure that the documentation supplied to our customers is complete, bug free and up-to-date, we readily accept that errors may occur. Despite all the care and precautions we've taken, you may encounter problems in the documentation. Please complete this form whenever you'd like to report errors or suggest improvements to us.

*Thank you for your kind support.*

### North America

NEC Electronics Inc.  
Corporate Communications Dept.  
Fax: 1-800-729-9288  
1-408-588-6130

### Hong Kong, Philippines, Oceania

NEC Electronics Hong Kong Ltd.  
Fax: +852-2886-9022/9044

### Asian Nations except Philippines

NEC Electronics Singapore Pte. Ltd.  
Fax: +65-250-3583

### Europe

NEC Electronics (Europe) GmbH  
Technical Documentation Dept.  
Fax: +49-211-6503-274

### Korea

NEC Electronics Hong Kong Ltd.  
Seoul Branch  
Fax: 02-528-4411

### Japan

NEC Semiconductor Technical Hotline  
Fax: 044-548-7900

### South America

NEC do Brasil S.A.  
Fax: +55-11-6465-6829

### Taiwan

NEC Electronics Taiwan Ltd.  
Fax: 02-2719-5951

I would like to report the following error/make the following suggestion:

Document title: \_\_\_\_\_

Document number: \_\_\_\_\_ Page number: \_\_\_\_\_

If possible, please fax the referenced page or drawing.

| Document Rating    | Excellent                | Good                     | Acceptable               | Poor                     |
|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Clarity            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Technical Accuracy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Organization       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |