

**NEC**

**User's Manual**

# **IE-780862-NS-EM1**

**Emulation Board**

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**Target Devices**  
 **$\mu$ PD780862 Subseries**

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# INTRODUCTION

## Product Overview

The IE-780862-NS-EM1 is designed to be used with the IE-78K0-NS or IE-78K0-NS-A to debug the following target devices that belong to the 78K/0 Series of 8-bit single-chip microcontrollers.

- $\mu$ PD780862 Subseries:  $\mu$ PD780861, 780862, 78F0862

## Target Readers

This manual is intended for engineers who will use the IE-780862-NS-EM1 with the IE-78K0-NS or IE-78K0-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-780862-NS-EM1, refer to not only this manual (supplied with the IE-780862-NS-EM1) but also the manual that is supplied with the IE-78K0-NS or IE-78K0-NS-A.

IE-78K0-NS  
User's Manual

- Basic specifications
- System configuration
- External interface functions

IE-780862-NS-EM1  
User's Manual

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

IE-78K0-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-780862-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-78K0-NS or IE-78K0-NS-A) and the emulation board (IE-780862-NS-EM1).
Emulation board	This refers to the IE-780862-NS-EM1 (this product).

## 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-78K0-NS In-Circuit Emulator	U13731E
IE-78K0-NS-A In-Circuit Emulator	U14889E
IE-780862-NS-EM1 Emulation Board	This manual
ID78K Series Integrated Debugger Ver. 2.30 or Later Operation (Windows™ Based)	U15185E
μPD780862 Subseries	U16418E

**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

This chapter describes the IE-780862-NS-EM1's system configuration and basic specifications.

The IE-780862-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/0 Series of 8-bit single-chip microcontrollers.

- Target devices
  - $\mu$ PD780862 Subseries

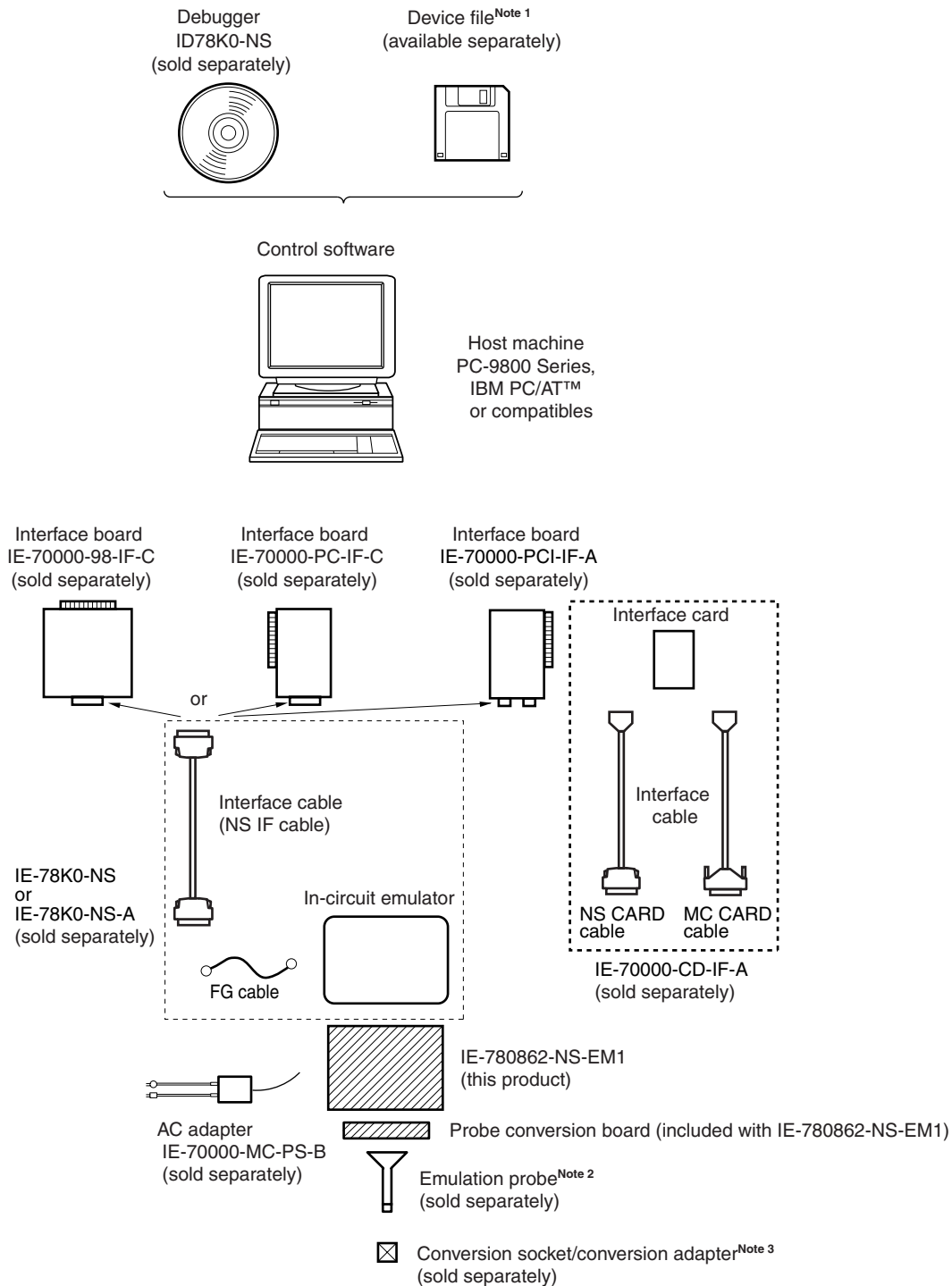


### 1.1 System Configuration

Figure 1-1 illustrates the IE-780862-NS-EM1's system configuration.

For the suitable probe conversion board, emulation probe, and conversion socket/conversion adapter, refer to Table 1-1.

**Figure 1-1. System Configuration**



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

$\mu$ SxxxxDF780862:  $\mu$ PD780862 Subseries

The device file can be downloaded from the website of NEC Electronics (<http://www.necel.com/micro/>)

2. Emulation probes NP-30MC and NP-20GS are products of Naito Densai Machida Mfg. Co., Ltd.  
For further information, contact Naito Densai Machida Mfg. Co., Ltd. (TEL: +81-45-475-4191)
3. Conversion adapters YSPACK30BK, NSPACK20BK, and guide screw YQGUIDE 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 Adapters**

Package	Probe Conversion Board	Emulation Probe	Conversion Socket/ Conversion Adapter
20-pin SSOP (300 mil)	IE-780862-NS-EM1 PROBE Board (20MC)	NP-30MC	YSPACK30BK + NSPACK20BK + YQGUIDE
20-pin SOP (300 mil)	IE-780862-NS-EM1 PROBE Board (20GS)	NP-20GS	EV-9500GS-20
			EV-9501GS-20

1.2 Hardware Configuration

Figures 1-2 and 1-3 show the IE-780862-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration (When IE-78K0-NS Is Used)

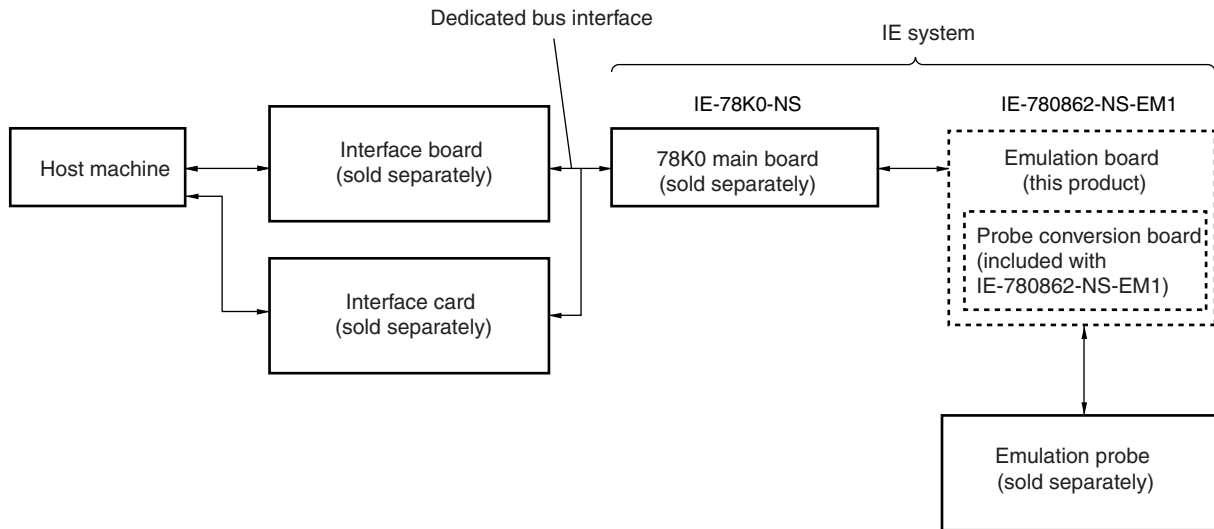
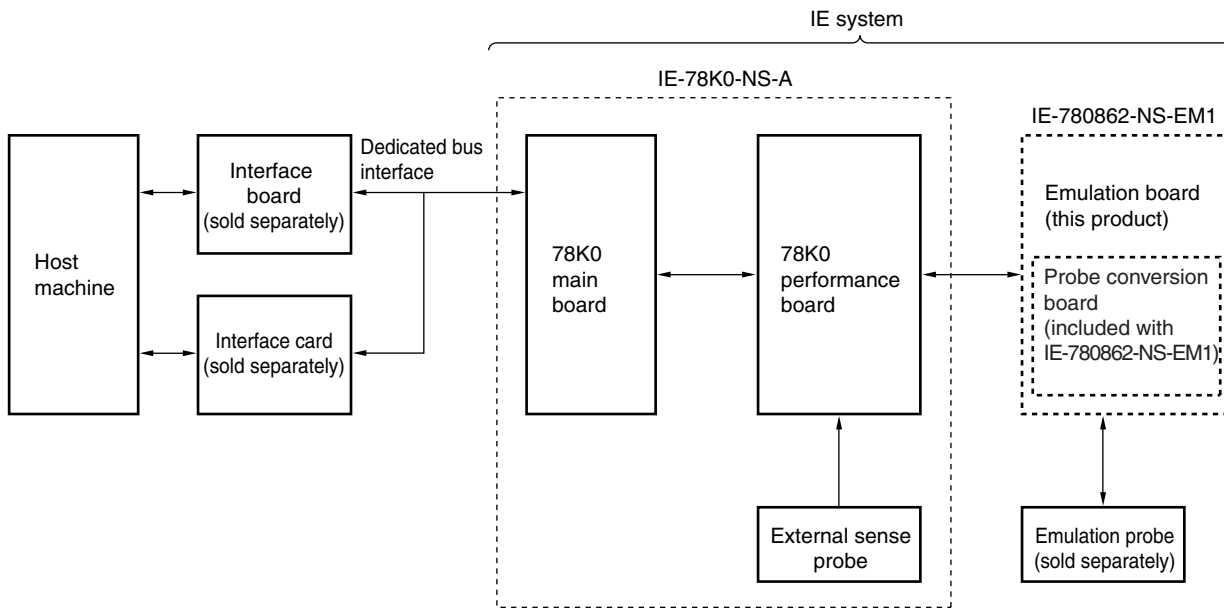


Figure 1-3. Basic Hardware Configuration (When IE-78K0-NS-A Is Used)



### 1.3 Basic Specifications

The basic specifications of the IE-780862-NS-EM1 are listed in Table 1-2.

**Table 1-2. Basic Specifications**

Parameter	Description
Target device	$\mu$ PD780862 Subseries
System clock	On-chip low-speed Ring-OSC: 240 kHz On-chip high-speed Ring-OSC: 8.0 MHz
System clock supply	External: Pulse input Internal: Mounted on the emulation board (10.0 MHz)
Low-voltage support <sup>Note</sup>	V <sub>DD</sub> = 2.7 to 5.5 V (same as target device)

**Note** See the **IE-78K0-NS User's Manual (U13731E)** or **IE-78K0-NS-A User's Manual (U14889E)** for details of the low-voltage operation of this IE system.

## CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-780862-NS-EM1 main unit.

The packing box contains the emulation board (IE-780862-NS-EM1), probe conversion board, packing list, user's manual, and guarantee card.

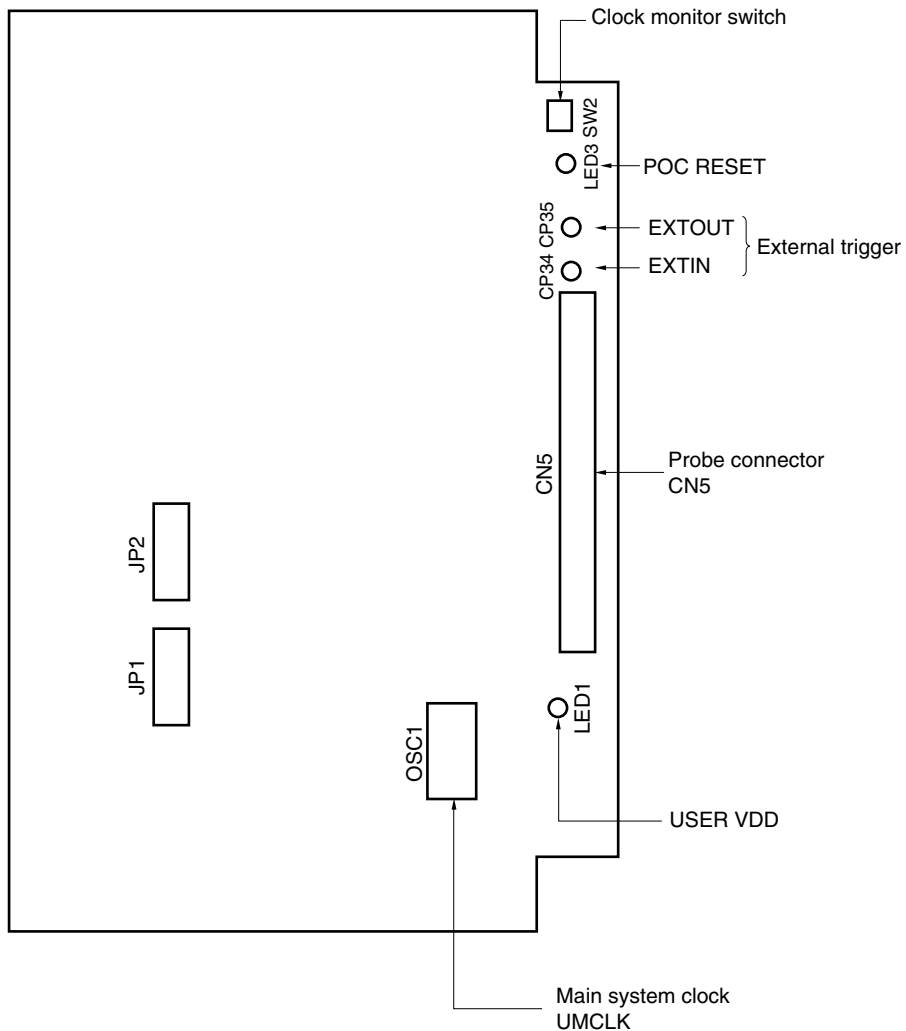
If there are any missing or damaged items, please contact an NEC Electronics sales representative.

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

2.1 Parts of Main Unit

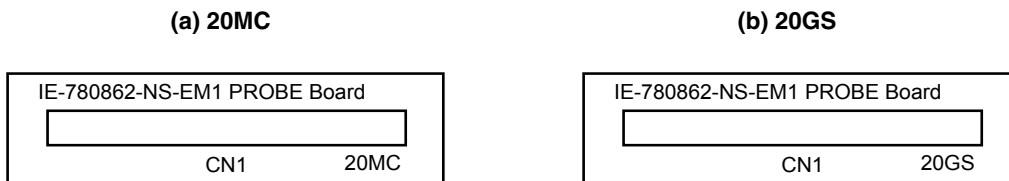
(1) IE-780862-NS-EM1 Part Names

Figure 2-1. IE-780862-NS-EM1 Part Names



(2) Probe conversion boards (two boards)

Figure 2-2. Probe Conversion Boards



## CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-780862-NS-EM1 to the IE-78K0-NS or IE-78K0-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-78K0-NS or IE-78K0-NS-A main unit

See the **IE-78K0-NS User's Manual (U13731E)** for a description of how to connect the IE-780862-NS-EM1 to the IE-78K0-NS<sup>Note</sup>.

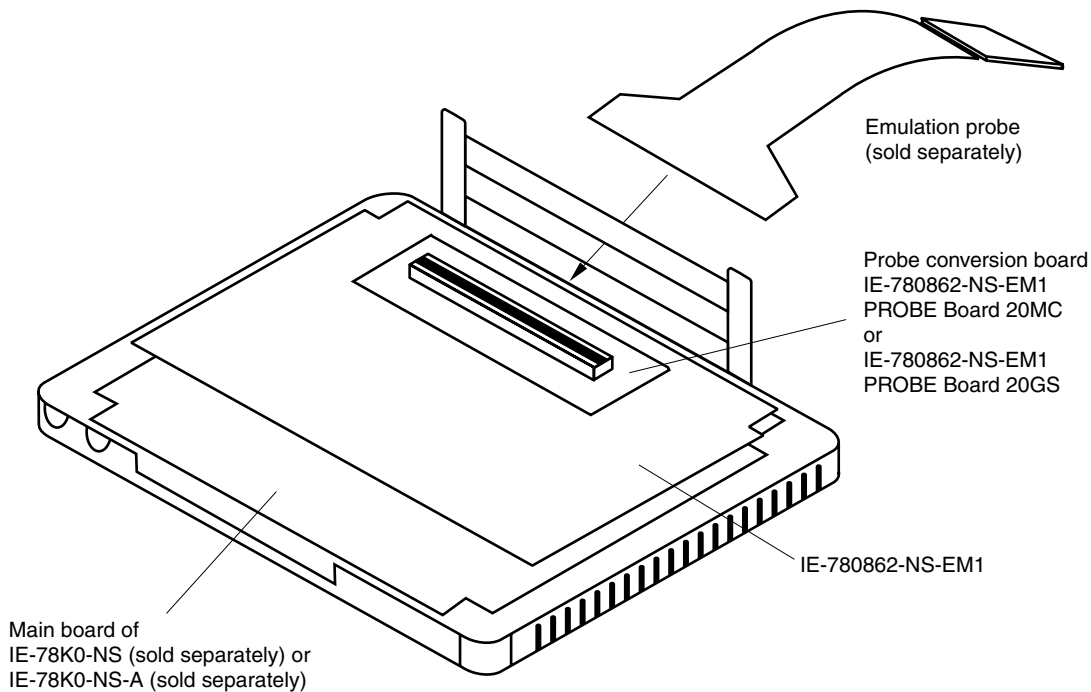
**Note** When using the IE-78K0-NS-A, see the **IE-78K0-NS-A User's Manual (U14889E)**.

#### (2) Connection with emulation probe

Use the probe conversion board corresponding to the used emulation probe.  
Connect CN2 of the probe conversion board to CN5 of the IE-780862-NS-EM1.  
Connect CN1 of the probe conversion board to the emulation probe.

**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 clock to be used during debugging can be selected from (1) to (4) below.

- (1) Clock that is already mounted on emulation board
- (2) Clock that is mounted by user
- (3) Pulse input from target system
- (4) On-chip Ring-OSC

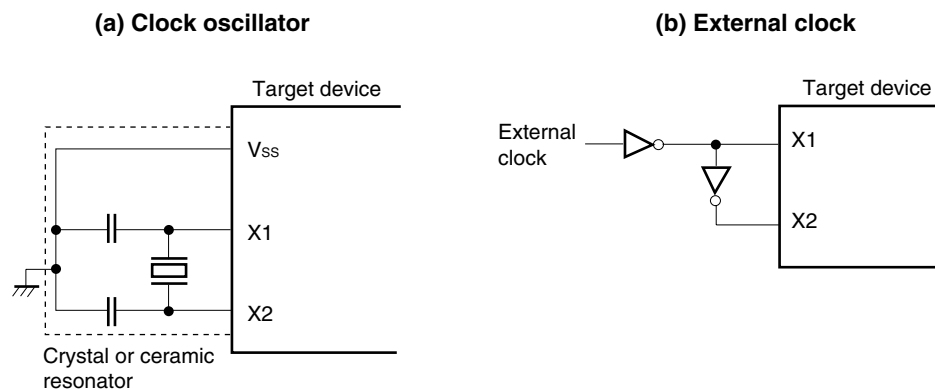
If the target system includes a clock oscillator, select either **(1) Clock that is already mounted on emulation board**, **(2) Clock that is mounted by user**, or **(4) On-chip Ring-OSC**. For the clock oscillator, a resonator is connected to the target device and the target device's internal oscillator is used. An example of the external circuit is shown in part (a) of Figure 3-2. 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-78K0-NS or IE-78K0-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**, **(3) Pulse input from target system**, or **(4) On-chip Ring-OSC**.

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 3-2.

**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 pin. Also, even if a crystal resonator is connected directly to X1 (for the main system clock), the target device will not operate.

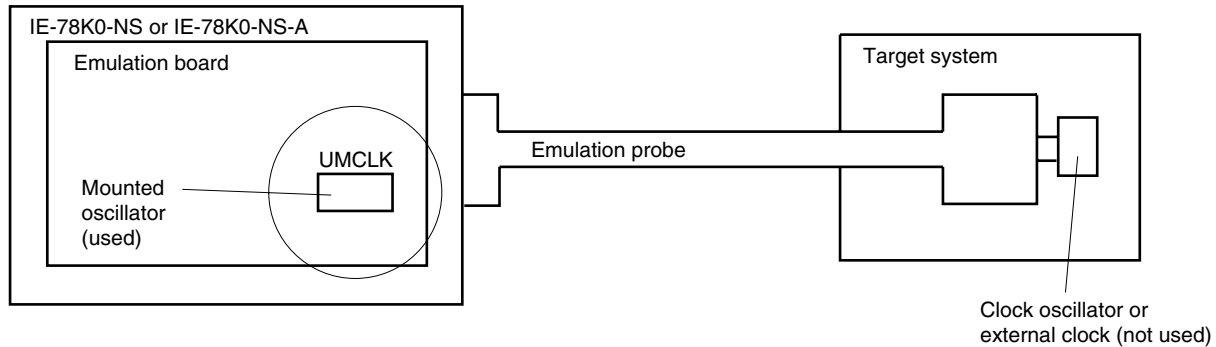
Figure 3-2. External Circuits Used as System Clock Oscillator



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

A 10.0 MHz crystal oscillator mounted on the IE-780862-NS-EM1 can be used.

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



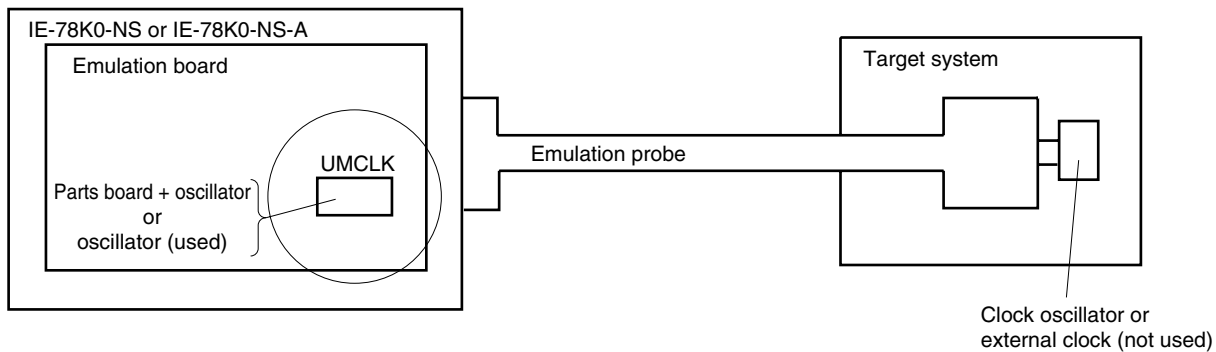
**Remark** The clock that is supplied by the oscillator of the IE-780862-NS-EM1 (encircled in the figure) is used.

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

The user can mount any clock supported by the set specifications on the IE-780862-NS-EM1. This feature is effective when debugging at a different frequency than the clock already mounted.

Remove the crystal oscillator (UMCLK) 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 3-4. When Using User-Mounted Clock (Main System Clock)**

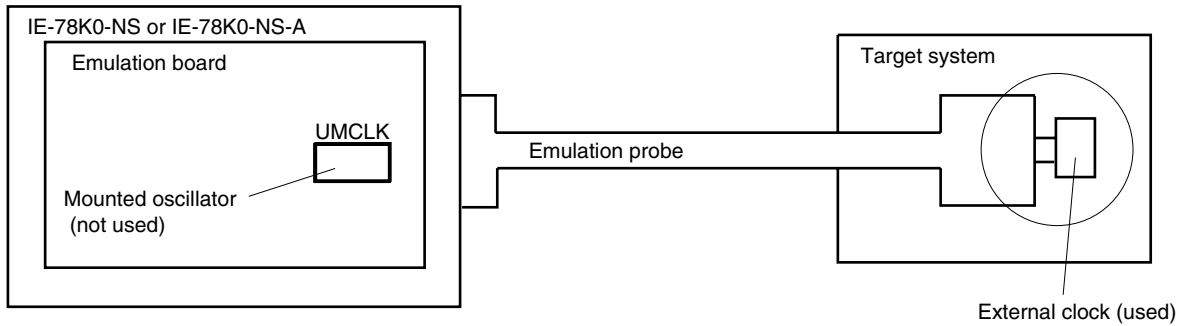


**Remark** The clock that is supplied by the resonator of the IE-780862-NS-EM1 (encircled in the figure) or the oscillator is used.

**(3) Pulse input from target system**

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

**Figure 3-5. 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.

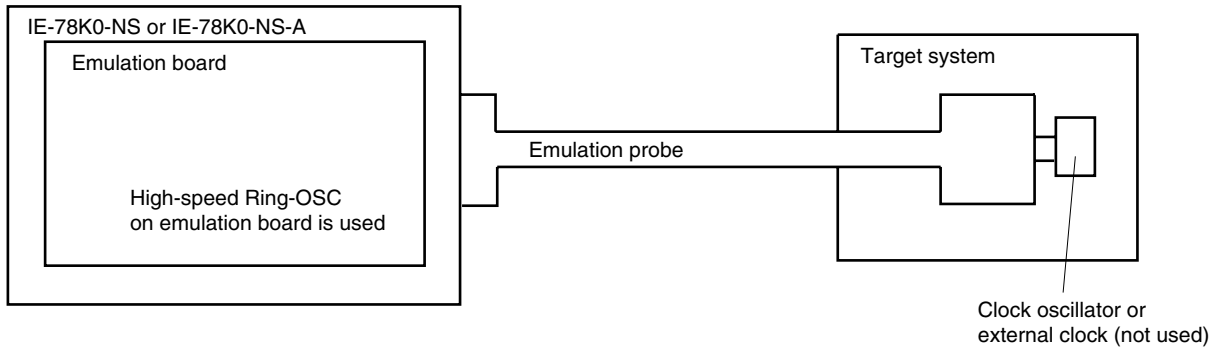
**(4) On-chip Ring-OSC**

The Ring-OSC on the emulation board can be used.

**(a) When using high-speed Ring-OSC**

The high-speed Ring-OSC on the emulation board can be used.

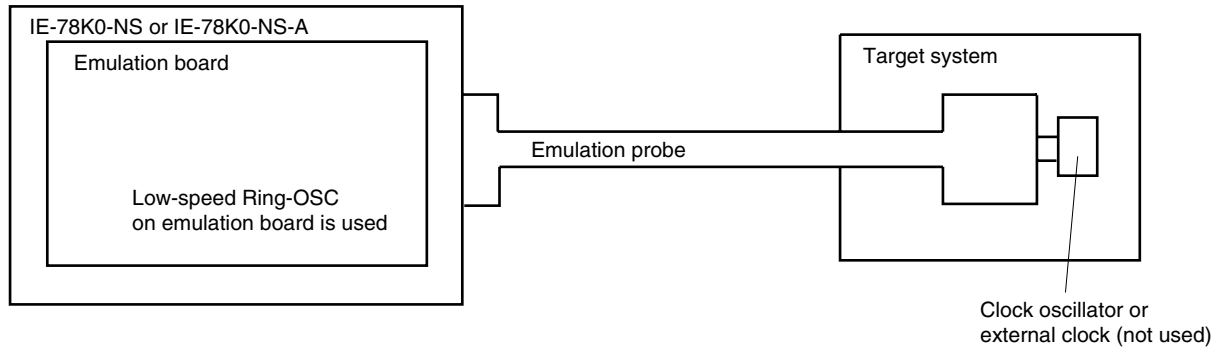
**Figure 3-6. When Using High-Speed Ring-OSC**



**(b) When using low-speed Ring-OSC**

The low-speed Ring-OSC on the emulation board can be used.

**Figure 3-7. When Using Low-Speed Ring-OSC**



**3.2.2 Main system clock settings**

Table 3-1 shows the settings of the IE-780862-NS-EM1 when the main system clocks in (1) to (4) are used.

**Table 3-1. Main System Clock Settings**

Frequency of Main System Clock		Mask Options (SystemClock)	SFR (MCM0)	IE-780862-NS-EM1 UMCLK	CPU Clock Source Selection <sup>Note 2</sup> (ID78K0-NS)
(1) When using clock that is already mounted on emulation board	10.0 MHz	X1orRC	1	Oscillator	Internal
(2) When using clock mounted by user	Other than 10.0 MHz			Oscillator assembled or prepared by user	
(3) When inputting pulse from target system				Oscillator (not used)	External
(4) When using on-chip Ring-OSC	High-speed Ring-OSC	HighspeedRing	0		Internal or external
	Low-speed Ring-OSC <sup>Note 1</sup>	X1orRC or HighspeedRing			

- Notes**
1. The IE-780862-NS-EM1 operates with the low-speed Ring-OSC clock when the integrated debugger is activated and immediately after reset.
  2. Select the source clock for the main system clock when the integrated debugger is started. After that, do not change the setting.

**Remark** SFR MCM0 is set to 0 under the factory setting of the IE-780862-NS-EM1.

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

When the IE-780862-NS-EM1 is shipped, a 10.0 MHz crystal oscillator is already mounted in the IE-780862-NS-EM1's socket (UMCLK). When using the factory-set mode settings, there is no need to make any other hardware settings.

When starting the integrated debugger (ID78K0-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).

After the debugger is activated, if "X1orRC" is selected for the mask option SystemClock in the Mask Option dialog box and the SFR MCM0 is changed to 1, the CPU operating clock is switched from the low-speed Ring-OSC to the clock already mounted on the emulation board.

**(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 (ID78K0-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).

After the debugger is activated, if "X1orRC" is selected for the mask option SystemClock in the Mask Option dialog box and the SFR MCM0 is changed to 1, the CPU operating clock is switched from the low-speed Ring-OSC to the clock mounted by user.

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

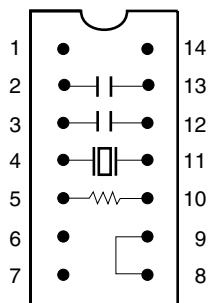
- Items to be prepared
  - Parts board
  - Ceramic resonator or crystal resonator
  - Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<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).

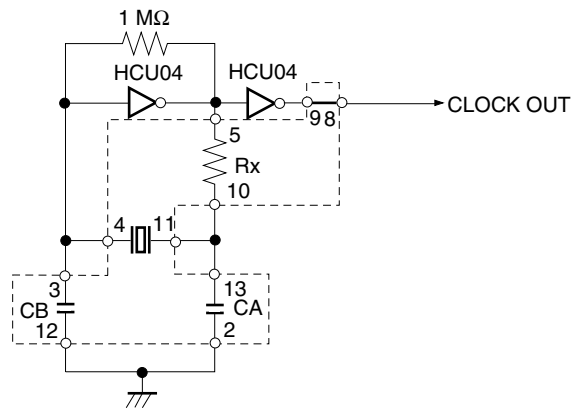
**Figure 3-8. Connections on Parts Board (Main System Clock)**

Parts board (UMCLK)



Pin No.	Connection
2-13	Capacitor CA
3-12	Capacitor CB
4-11	Ceramic resonator or crystal resonator
5-10	Resistor Rx
6-9	Shorted
8-9	Shorted

Circuit diagram



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

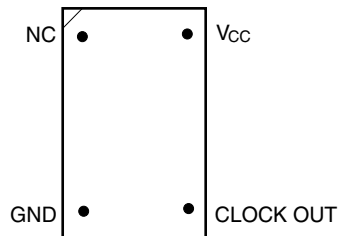
- <2> Prepare the IE-780862-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-780862-NS-EM1's socket (UMCLK).
- <4> Connect the parts board (from <1> above) to the socket (UMCLK) from which the crystal oscillator was removed (in <3> above). Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Make sure that the parts board is wired as shown in Figure 3-8 above.
- <6> Install the IE-780862-NS-EM1 in the IE-78K0-NS or IE-78K0-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 pin layout shown in Figure 3-9)

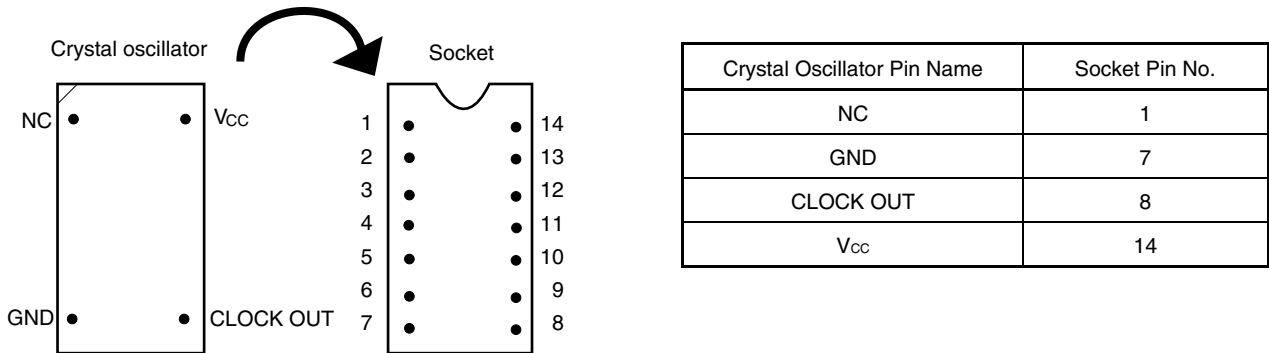
**Figure 3-9. Crystal Oscillator (Main System Clock)**



<Steps>

- <1> Prepare the IE-780862-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-780862-NS-EM1's socket (UMCLK).
- <3> Connect a crystal oscillator to the socket (UMCLK) 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 3-10. Pin Alignment of Crystal Oscillator and Socket (Main System Clock)



<4> Install the IE-780862-NS-EM1 in the IE-78K0-NS or IE-78K0-NS-A.

### (3) When inputting pulse from target system

No hardware settings are required for this situation.

When starting the integrated debugger (ID78K0-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).

After the debugger is activated, if “X1orRC” is selected for the mask option SystemClock in the Mask Option dialog box and the SFR MCM0 is changed to 1, the CPU operating clock is switched from the low-speed Ring-OSC to the clock input from the target system.

### (4) When using on-chip Ring-OSC

#### (a) When using high-speed Ring-OSC

No hardware settings are required for this situation. After the integrated debugger (ID78K0-NS) is activated, if “HighspeedRing” is selected for the mask option SystemClock in the Mask Option dialog box and the SFR MCM0 is changed to 1, the CPU operating clock is switched from the low-speed Ring-OSC to the high-speed Ring-OSC on the emulation board.

#### (b) When using low-speed Ring-OSC

The low-speed Ring-OSC (240 kHz) is selected as the CPU operating clock when the IE system is activated. See 3.2.2 (1) to (4) when changing the setting.

**Caution** Use of the peripheral functions, except for the following cases, is prohibited when the low-speed Ring-OSC is selected as the CPU operating clock (MCM0 = 0).

- When watchdog timer is used
- When clock monitor is used
- TMH1 (When  $f_{osc}/2^7$  is selected for the count clock (CKS12 = 1, CKS11 = 0, CKS10 = 1))
- When peripheral function that uses an external clock as the operating clock is used

### 3.3 Mask Option Settings

The following mask options are provided in the IE-780862-NS-EM1.

- (1) LowspeedRing  
On-chip low-speed Ring-OSC clock oscillation
- (2) SystemClock  
High-speed system clock oscillation selection

Open the Mask Option dialog box in the integrated debugger by selecting [Mask Option] on the [Option] menu to set the mask options.

See the **ID78K Series Integrated Debugger Ver.2.30 or Later Operation User's Manual (U15185E)** for details of the settings.

(1) LowspeedRing (initial value: SoftwareStop)

- SoftwareStop: Ring-OSC can be stopped.  
Source clock of watchdog timer can be selected
- Nonstop: Ring-OSC cannot be stopped.  
Source clock of watchdog timer cannot be selected

(2) SystemClock (initial value: X1orRC)

- X1orRC<sup>Note</sup>: The pulse input from the UMCLK socket on the emulation board and the target system are used when the SFR MCM0 is set to 1.  
P02 cannot be used.
- HighspeedRing: The high-speed Ring-OSC is used when the SFR MCM0 is set to 1.  
P02 can be used.

**Note** The RC clock is supported in the target device, but not in this IE system.  
When using the RC clock in the target device, use an oscillator equivalent to the RC clock in the IE system. See **3.2 Clock Settings** for how to use the oscillator.



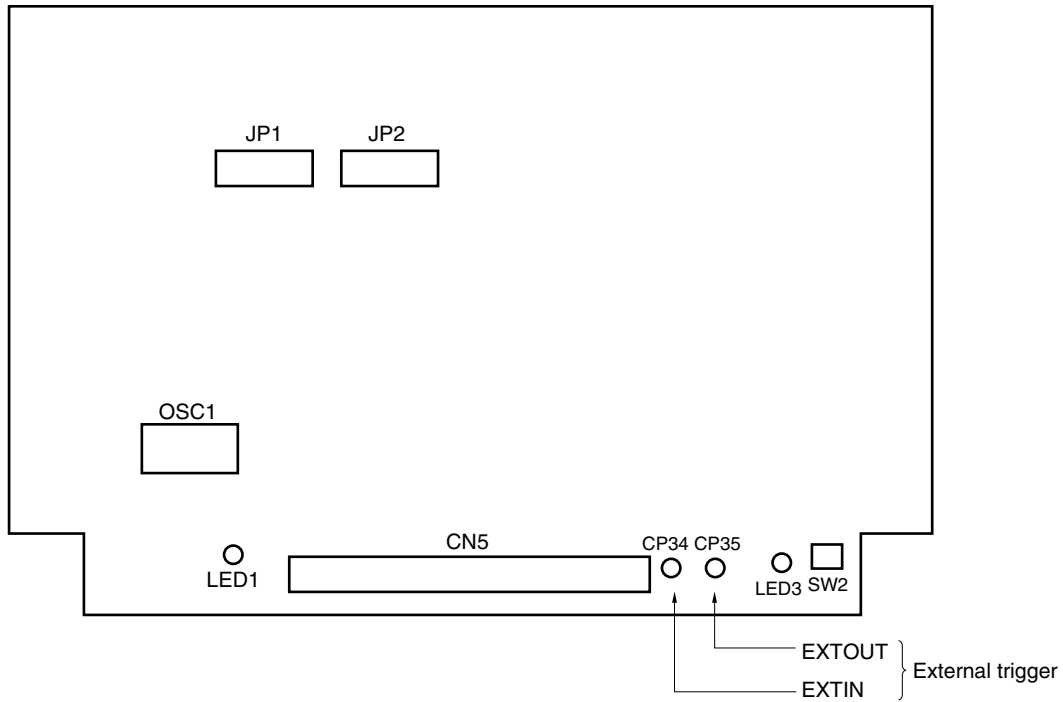
### 3.4 External Trigger

To set an external trigger, connect the IE-780862-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **IE-78K0-NS User's Manual (U13731E)** or **IE-78K0-NS-A User's Manual (U14889E)** for pin characteristics.

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

Figure 3-11. External Trigger Input Position



### 3.5 Jumper Setting of IE-78K0-NS

When using the IE-780862-NS-EM1 combined with the IE-78K0-NS, set the jumpers on the IE-78K0-NS as follows. For the locations of jumpers, refer to the **IE-78K0-NS User's Manual (U13731E)**.

**Caution** Incorrect jumper setting may damage the IE-780862-NS-EM1.

**Table 3-2. Jumper Setting of IE-78K0-NS**

	JP2	JP3	JP4	JP6	JP7	JP8
Setting	2 and 3 shorted	1 and 2 shorted	1 and 2 shorted	3 and 4 shorted	3 and 4 shorted	3 and 4 shorted

### 3.6 Jumper Setting of IE-78K0-NS-A

When using the IE-780862-NS-EM1 combined with the IE-78K0-NS-A, set the jumpers on the IE-78K0-NS-A as follows.

For the locations of jumpers, refer to the **IE-78K0-NS-A User's Manual (U14889E)**.

**Caution** Incorrect jumper setting may damage the IE-780862-NS-EM1.

**Table 3-3. Jumper Setting of IE-78K0-NS-A**

	JP2	JP3	JP4	JP6	JP7	JP8
Setting	2 and 3 shorted	1 and 2 shorted	1 and 2 shorted	3 and 4 shorted	3 and 4 shorted	3 and 4 shorted

**Table 3-4. Jumper Setting on G-78K0H Option Board of IE-78K0-NS-A**

	JP2
Setting	2 and 3 shorted

### 3.7 Jumper Settings of IE-780862-NS-EM1

Set the IE-780862-NS-EM1 jumpers as shown in the table below.

#### Setting of multiplication circuit

Change the settings of the multiplication circuit as shown in Table 3-5 according to the operating frequency of the main system clock.

**Table 3-5. Settings of Multiplication Circuit**

Main System Clock Frequency	JP1	JP2
2.0 MHz to less than 2.5 MHz	1-2 shorted	1-2 shorted
2.5 MHz to less than 3.5 MHz	3-4 shorted	3-4 shorted
3.5 MHz to less than 5.0 MHz	5-6 shorted	5-6 shorted
5.0 MHz to less than 6.5 MHz	7-8 shorted	7-8 shorted
6.5 MHz to less than 9 MHz	9-10 shorted	9-10 shorted
9 MHz to 10.0 MHz	11-12 shorted	11-12 shorted

### 3.8 Switch for Clock Monitor

A switch for clock monitor emulation (SW2) is mounted on the IE-780862-NS-EM1 board. Emulation for when the clock is stopped can be performed by pressing SW2.

### 3.9 Emulation of POC and LVI Functions

When emulating the POC and LVI using the IE-780862-NS-EM1, supply a voltage of the same potential as the  $V_{DD}$  pin of the emulation device to TP1, because POC and LVI supply voltage detection is performed via input from TP1 on the G-780009 BOARD of the IE-78K0-NS or IE-78K0-NS-A, not from the  $V_{DD}$  pin of the target device.

See the **IE-78K0-NS User's Manual (U13731E)** or **IE-78K0-NS-A User's Manual (U14889E)** for details of the connection with TP1.

In addition, LED3 is provided for confirming a POC reset.

LED3 is lit during the reset shown below. Do not set a break when LED3 is lit; otherwise the integrated debugger ID78K0-NS will hang up.

- Internal reset by comparing the power supply voltage and detection voltage of the POC circuit
- Internal reset by comparing the power supply voltage and detection voltage of the low-voltage detector (LVI)

## 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 input/output from the emulation CPU ( $\mu$ PD7880)**
- (2) Signals input/output from the emulation CPU ( $\mu$ PD7883)**
- (3) Other signals**

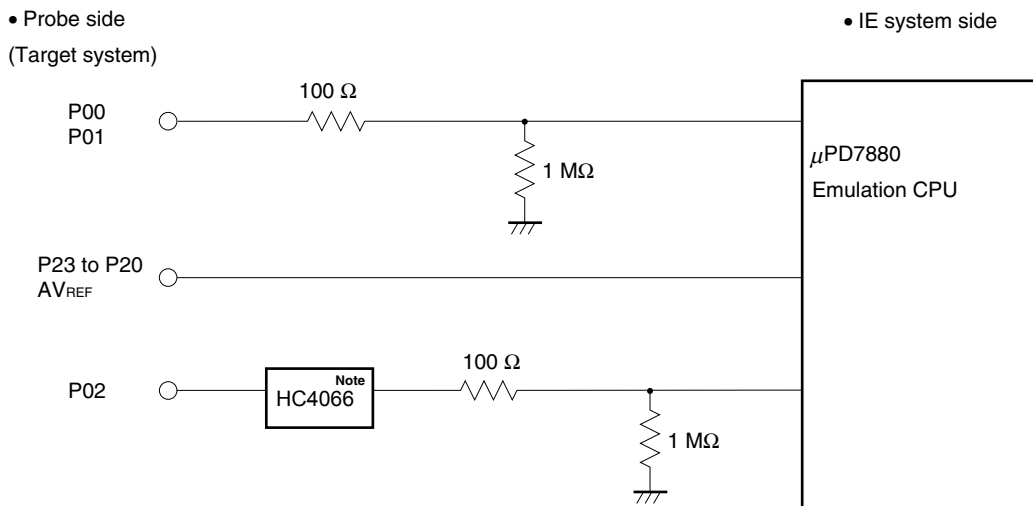
The circuits of the IE system are used as follows for signals listed in (1) to (3) above. The same applies to handling alternate-function pins of (1) and (2) above, for which no circuit is provided in the IE system.

**(1) Signals input/output from the emulation CPU ( $\mu$ PD7880)**

The IE system circuit for the following signals is shown in Figure 4-1.

- P02 to P00
- P23 to P20
- AV<sub>REF</sub>

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



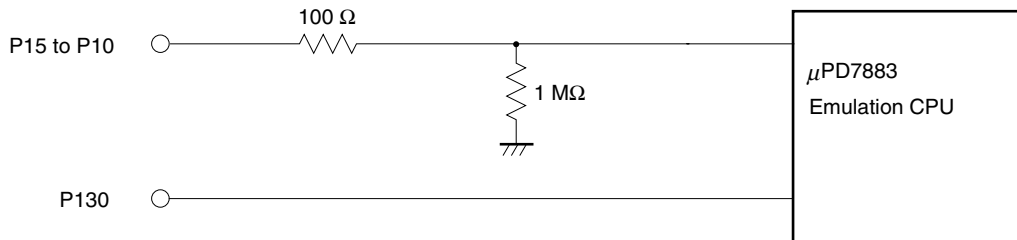
**Note** This circuit becomes valid and is connected when "HighspeedRing" is selected for the mask option SystemClock. This circuit becomes invalid and is disconnected when "X1orRC" is selected.

**(2) Signals input/output from the emulation CPU ( $\mu$ PD7883)**

The IE system circuit for the following signals is shown in Figure 4-2.

- P15 to P10
- P130

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



(3) Other signals

The IE system circuits for the following signals are shown in Figures 4-3 and 4-4.

- X1, X2,  $\overline{\text{RESET}}$ ,  $V_{DD}$ ,  $V_{SS}$ , IC

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

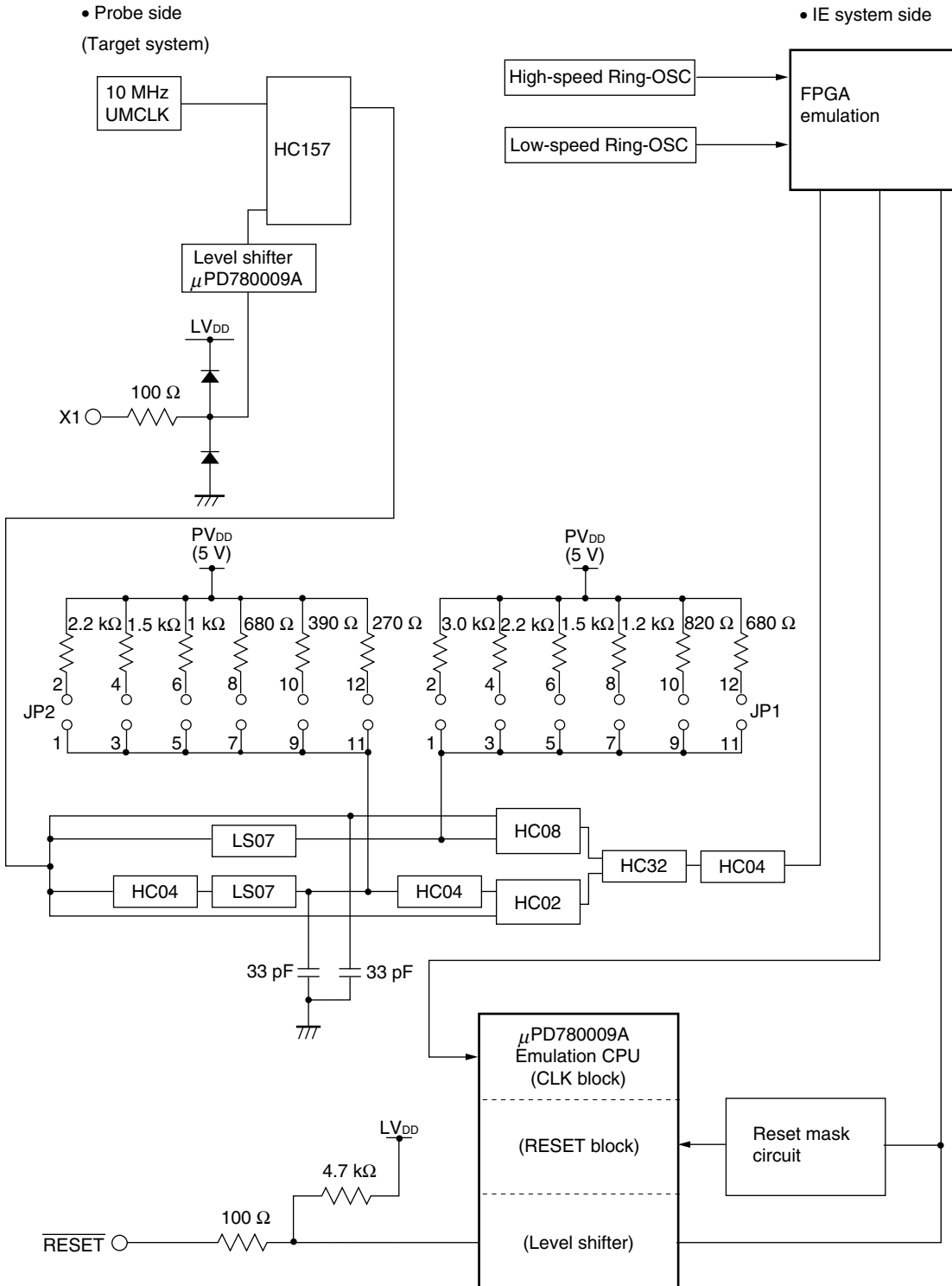
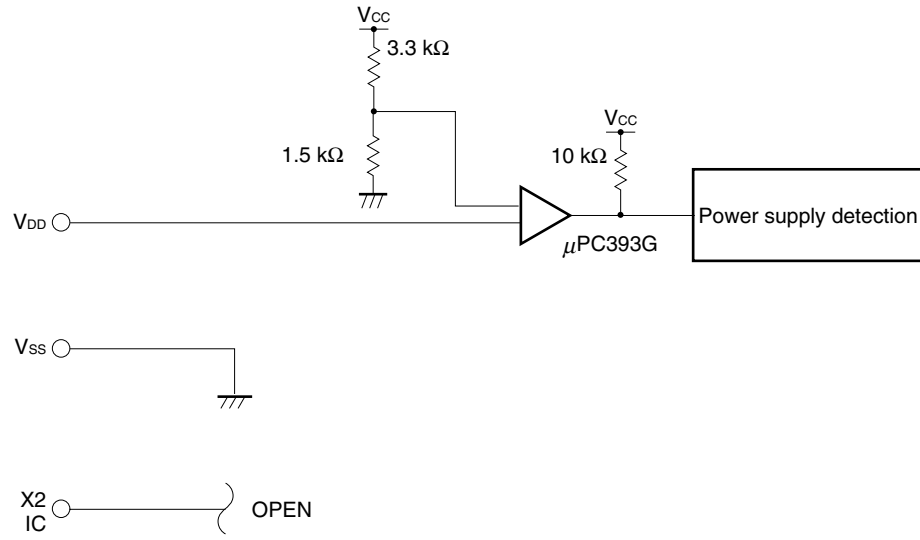


Figure 4-4. Equivalent Circuit of Emulation Circuit (4)

• Probe side  
(Target system)

• IE system side



## APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

**Table A-1. Pin Assignment of IE-780862-NS-EM1 PROBE Board (20GS) + NP-20GS**

Emulation Probe	IE-780862-NS-EM1 PROBE Board (20GS) CN1	IE-780862-NS-EM1 CN5
1	33	18
2	32	62
3	74	91
4	31	19
5	75	22
6	34	66
7	7	98
8	8	97
9	9	21
10	10	99
11	16	63
12	15	64
13	14	70
14	13	69
15	6	71
16	5	94
17	4	93
18	3	30
19	17	29
20	73	24

- Remarks**
1. NP-20GS 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.
  3. The numbers in the IE-780862-NS-EM1 PROBE Board (20GS) CN1 column refer to the IE-780862-NS-EM1 PROBE Board (20GS) pin to be connected to the NP-20GS.
  4. The numbers in the IE-780862-NS-EM1 CN5 column refer to the IE-780862-NS-EM1 pin to be connected to the IE-780862-NS-EM1 PROBE Board (20GS).



**Table A-2. Pin Assignment of IE-780862-NS-EM1 PROBE Board (20MC) + NP-30MC**

Emulation Probe	IE-780862-NS-EM1 PROBE Board (20MC) CN1	IE-780862-NS-EM1 CN5
1	49	18
2	55	62
3	19	91
4	18	19
5	22	22
6	62	66
7	65	98
8	66	97
9	92	21
10	91	99
11	70	63
12	69	64
13	72	70
14	102	69
15	71	71
16	94	94
17	93	93
18	30	30
19	29	29
20	24	24

- Remarks**
1. NP-30MC 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.
  3. The numbers in the IE-780862-NS-EM1 PROBE Board (20MC) CN1 column refer to the IE-780862-NS-EM1 PROBE Board (20MC) pin to be connected to the NP-30MC.
  4. The numbers in the IE-780862-NS-EM1 CN5 column refer to the IE-780862-NS-EM1 pin to be connected to the IE-780862-NS-EM1 PROBE Board (20MC).

## 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-30MC is a product of Naito Densai Machida Mfg. Co., Ltd, and YSPACK30BK, NSPACK20BK, and YQGUIDE 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-30MC	YSPACK30BK NSPACK20BK YQGUIDE	150 mm

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

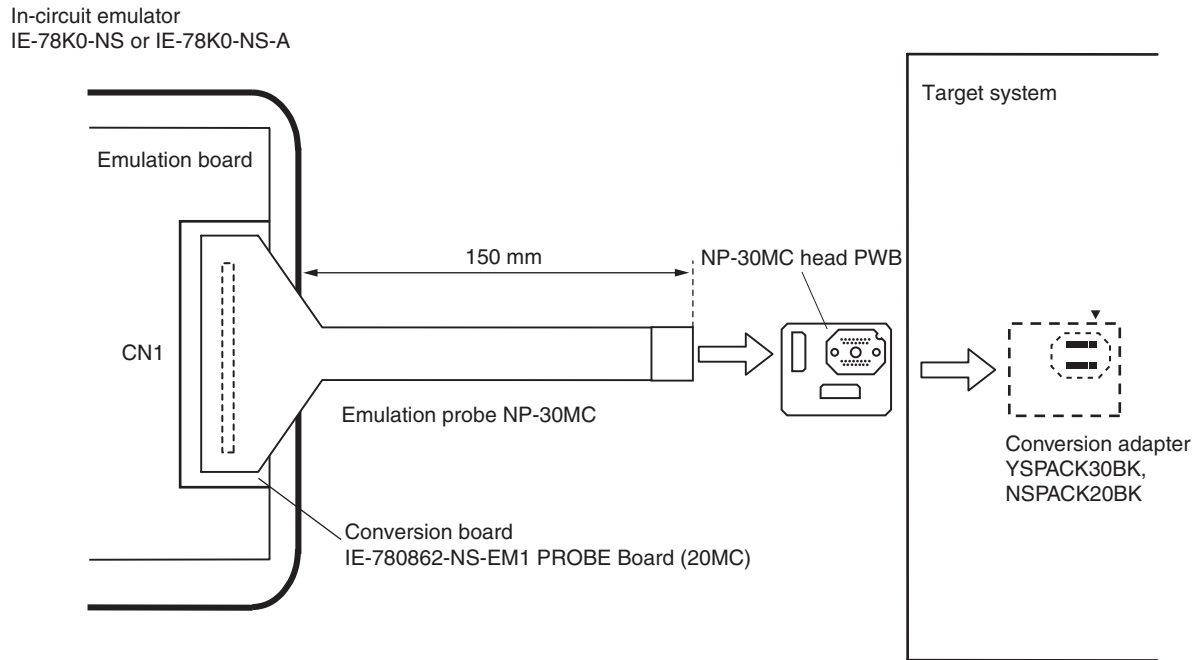


Figure B-2. Connection Conditions of Target System

