

# User's Manual

# IE-780354-NS-EM1

## Emulation Board

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### Target Devices

**$\mu$ PD780344 Subseries**

**$\mu$ PD780354 Subseries**

**$\mu$ PD780344Y Subseries**

**$\mu$ PD780354Y Subseries**

[MEMO]

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# INTRODUCTION

## Product Overview

The IE-780354-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.

- $\mu$ PD780344 Subseries:  $\mu$ PD780343, 780344
- $\mu$ PD780354 Subseries:  $\mu$ PD780353, 780354, 78F0354
- $\mu$ PD780344Y Subseries:  $\mu$ PD780343Y, 780344Y
- $\mu$ PD780354Y Subseries:  $\mu$ PD780353Y, 780354Y, 78F0354Y

## Target Readers

This manual is intended for engineers who will use the IE-780354-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-780354-NS-EM1, refer to not only this manual (supplied with the IE-780354-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
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- Basic specifications
- System configuration
- External interface functions

IE-780354-NS-EM1 User's Manual
-----------------------------------

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

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-780354-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-780354-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-78K0-NS In-Circuit Emulator	U14379E
IE-78K0-NS-A In-Circuit Emulator	U14889E
IE-780354-NS-EM1 Emulation Board	This manual
ID78K Series Integrated Debugger Ver. 2.30 or Later Operation Windows™ Based	U15185E
μPD780344, 780354, 780344Y, 780354Y Subseries	U15798E

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

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## CHAPTER 1 GENERAL

The IE-780354-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.

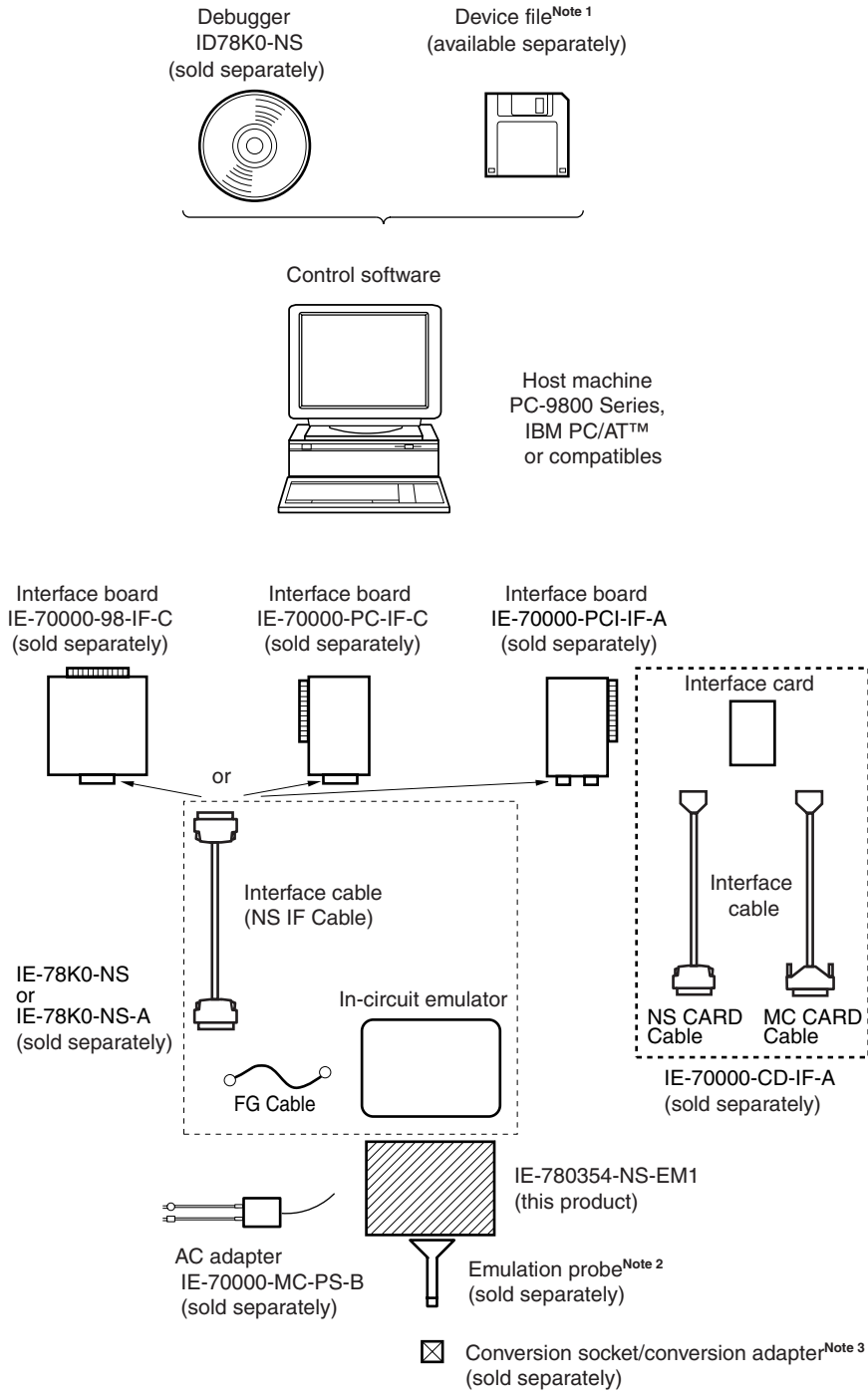
This chapter describes the IE-780354-NS-EM1's system configuration and basic specifications.

- Target devices
  - $\mu$ PD780344 Subseries
  - $\mu$ PD780354 Subseries
  - $\mu$ PD780344Y Subseries
  - $\mu$ PD780354Y Subseries

## 1.1 System Configuration

Figure 1-1 illustrates the IE-780354-NS-EM1's system configuration.

**Figure 1-1. System Configuration**



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

$\mu$ SxxxxDF780354:  $\mu$ PD780344, 780354, 780344Y, 780354Y Subseries

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

2. The emulation probes NP-100GC, NP-H100GC-TQ, and NP-113F1-DA3 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. The conversion adapters TGC-100SDW, LSPACK113A1110NO1, CSSOCKET113A1110NO1, and CSSOCKET113A1110NO1N 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	Emulation Probe	Conversion Adapter
100-pin plastic LQFP (GC type)	NP-100GC (probe length: 200 mm)	TGC-100SDW
	NP-H100GC-TQ (probe length: 400 mm)	
113-pin plastic FBGA	NP-113F1-DA3 (probe length: 253 mm)	LSPACK113A1110NO1 + CSSOCKET113A1110NO1 or CSSOCKET113A1110NO1N

1.2 Hardware Configuration

Figures 1-2 and 1-3 show the IE-780354-NS-EM1's position in the basic hardware configuration.

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

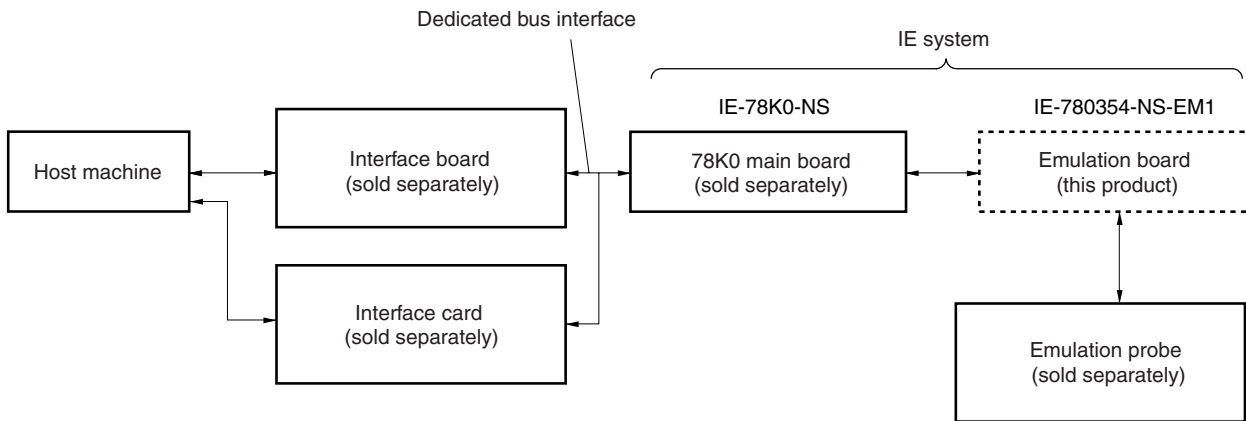
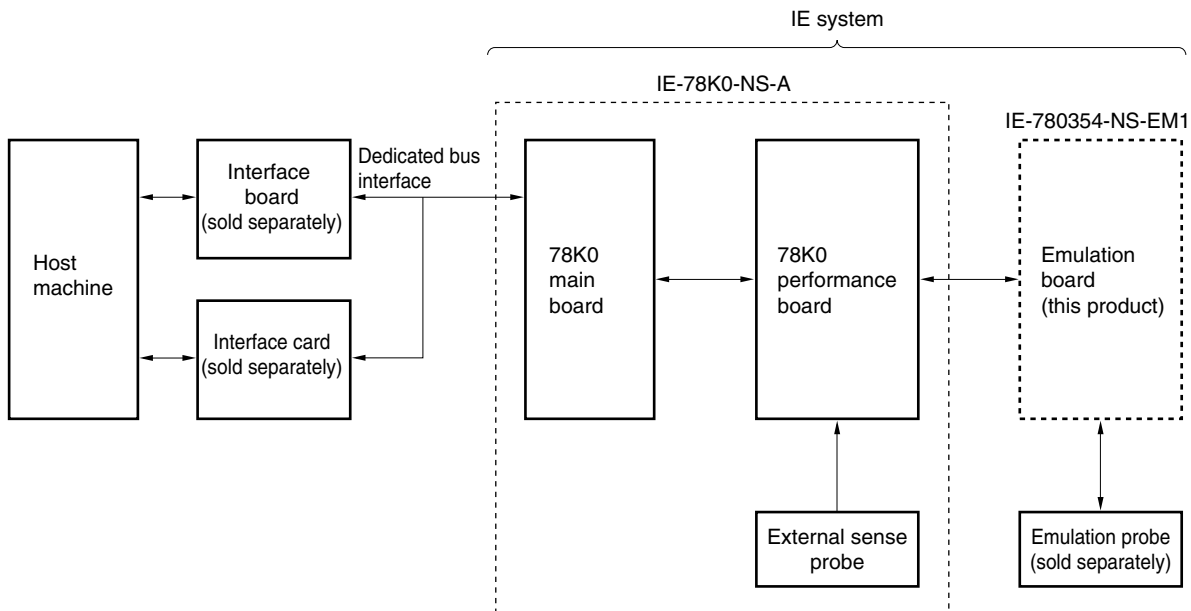


Figure 1-3. Basic Hardware Configuration (When IE-78K0-NS-A Is Used)



### 1.3 Basic Specifications

The basic specifications of the IE-780354-NS-EM1 are listed in Table 1-2.

**Table 1-2. Basic Specifications**

Parameter	Description
Target device	$\mu$ PD780344, 780354, 780344Y, 780354Y Subseries
System clock	Main system clock: 10.0 MHz Subsystem clock: 32.768 kHz
Main system clock supply	External: Input via an emulation probe from the target system Internal: Mounted on the emulation board (10.0 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 (1.048576 MHz), or mounted on the parts board by the user
Low-voltage support	$V_{DD} = 1.8$ to 5.5 V (same as target device)

## CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-780354-NS-EM1 main unit.

The packing box contains the emulation board (IE-780354-NS-EM1), packing list, user's manual, and guarantee card.

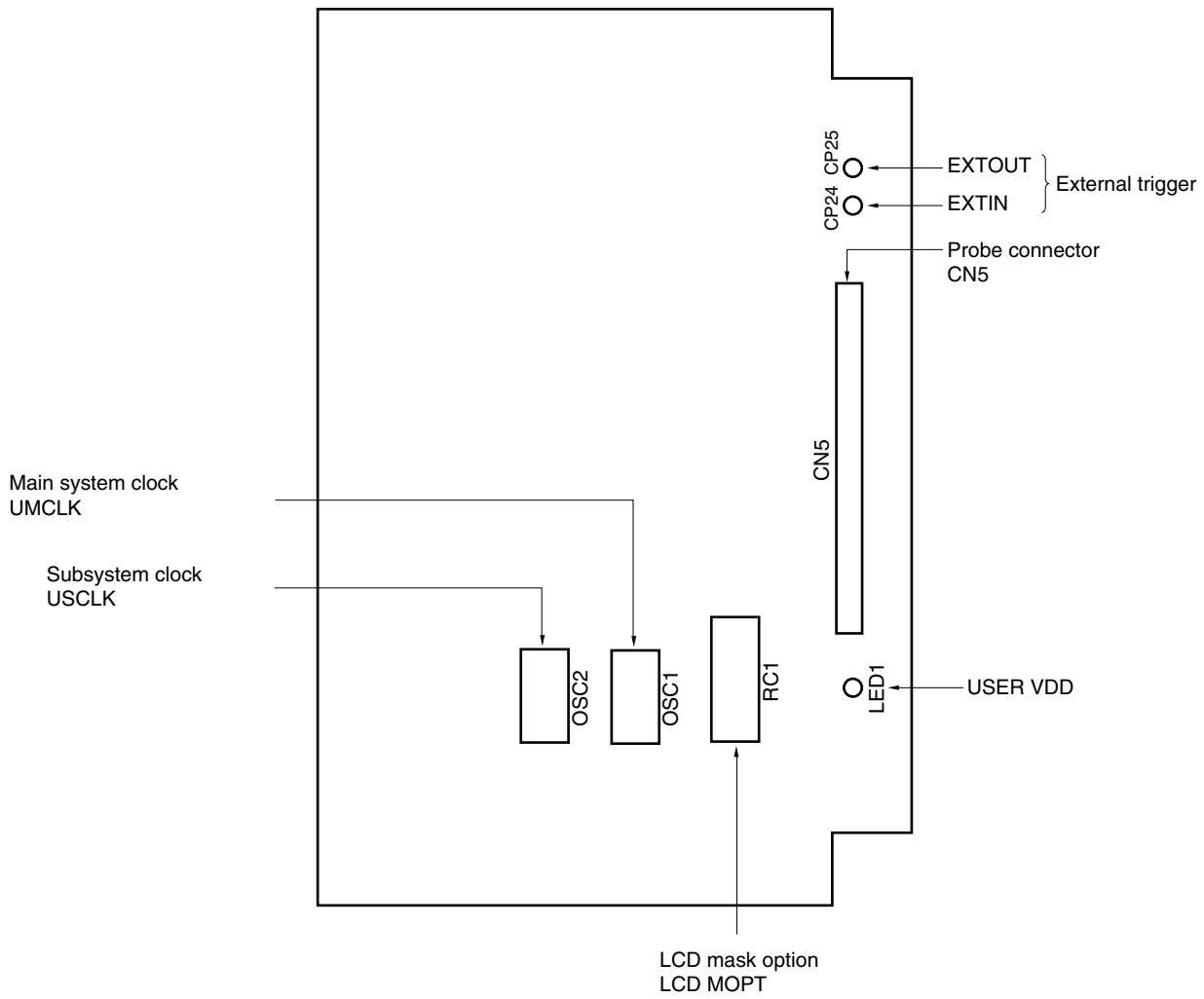
If there are any missing or damaged items, please contact an NEC Electronics sales representative.

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-780354-NS-EM1.

Figure 2-1. IE-780354-NS-EM1 Part Names





## CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-780354-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 (U14379E)** for a description of how to connect the IE-780354-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

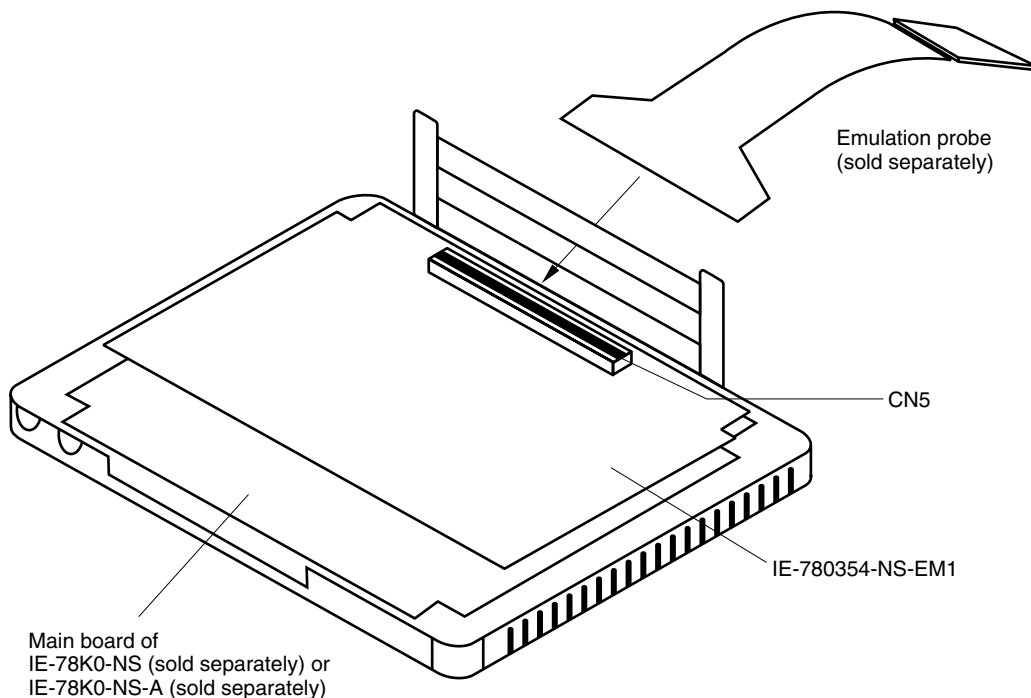
See the **IE-78K0-NS User's Manual (U14379E)** for a description of how to connect an emulation probe to the IE-780354-NS-EM1<sup>Note</sup>.

On this board, connect the emulation probe to CN5.

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

**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 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

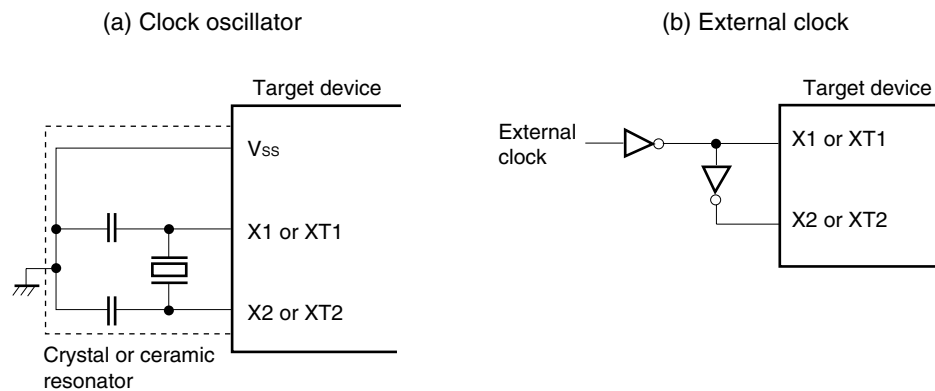
If the target system includes a clock oscillator, select either **(1) Clock that is already mounted on emulation board** or **(2) Clock that is mounted by user**. For the clock oscillator, a resonator is connected to the target device and the target device's internal oscillator is used. An example of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

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



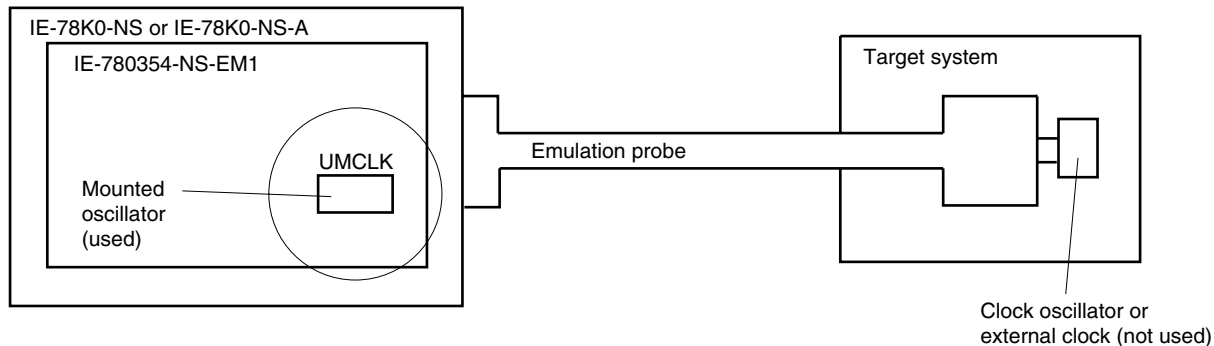
**(1) Clock that is already mounted on emulation board**

The crystal oscillator mounted on the IE-780354-NS-EM1 can be used.

**(a) Main system clock**

A crystal oscillator (UMCLK) is already mounted on the emulation board. Its frequency is 10.0 MHz.

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

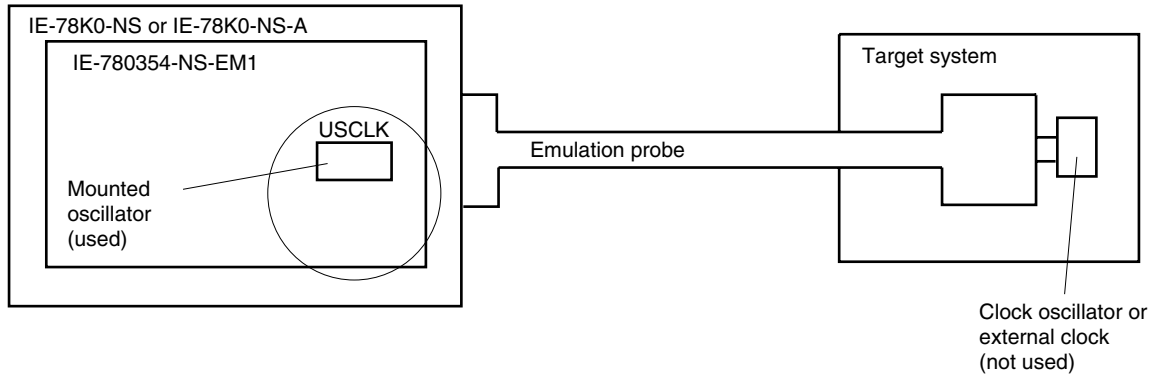


**Remark** The clock that is supplied by the oscillator of the IE-780354-NS-EM1 (encircled in the figure) is used.

**(b) Subsystem clock**

A crystal oscillator (USCLK) is already mounted on the emulation board. Its frequency is 1.048576 MHz

**Figure 3-4. When Using Clock That Is Already Mounted on Emulation Board (Subsystem Clock)**



**Remark** The clock that is supplied by the oscillator of the IE-780354-NS-EM1 (encircled in the figure) is used.

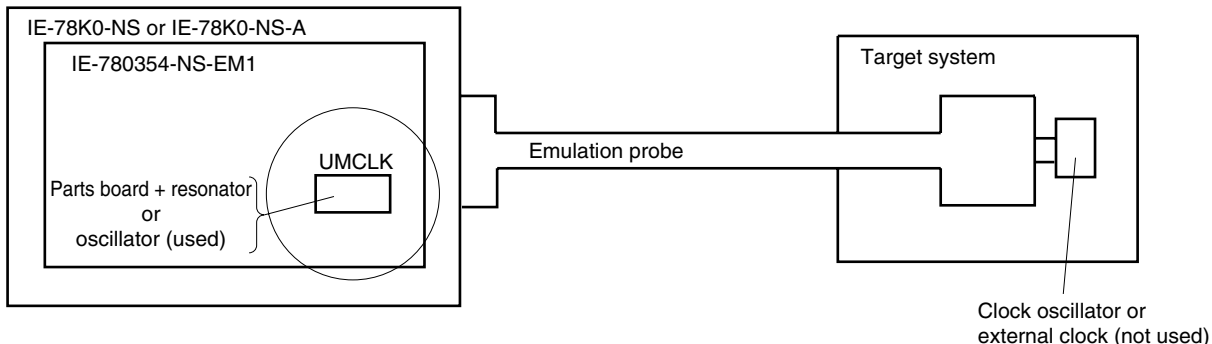
**(2) Clock that is mounted by user**

The user can mount any clock supported by the set specifications on the IE-780354-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 (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 3-5. When Using User-Mounted Clock (Main System Clock)**

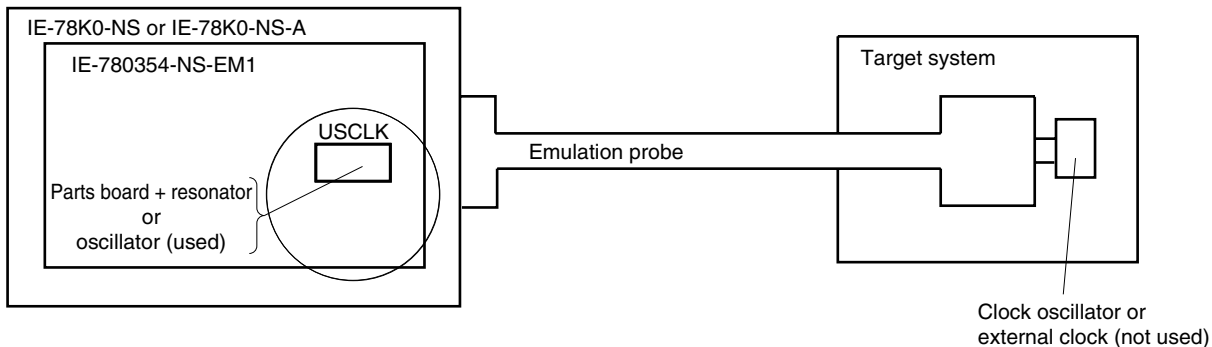


**Remark** The clock that is supplied by the resonator of the IE-780354-NS-EM1 (encircled in the figure) or the oscillator is used.

**(b) Subsystem clock**

Remove the crystal oscillator (USCLK) 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 (Subsystem Clock)**

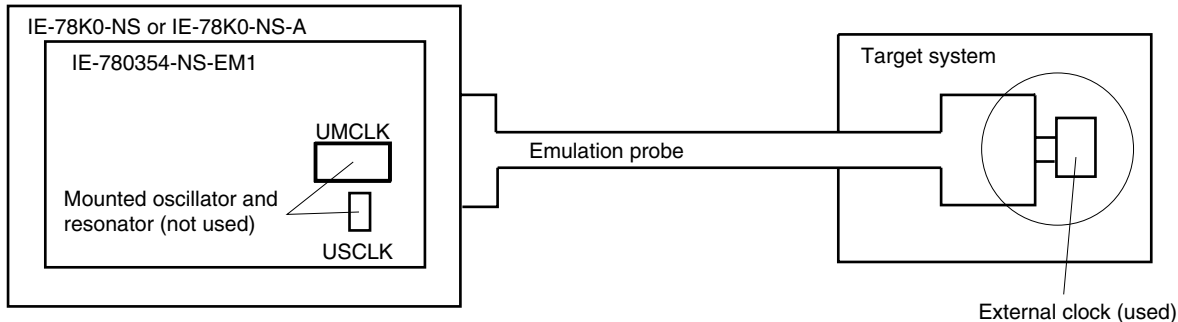


**Remark** The clock that is supplied by the resonator of the IE-780354-NS-EM1 (encircled in the figure) or the oscillator is used.

**(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 3-7. 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.

**3.2.2 Main system clock settings**

Table 3-1 shows the settings of the IE-780354-NS-EM1 when the main system clocks in (1) to (3) are used.

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

Frequency of Main System Clock		IE-780354-NS-EM1	CPU Clock Source Selection (ID78K0-NS)
		UMCLK	
(1) When using clock that is already mounted on emulation board	10.0 MHz	Oscillator	Internal
(2) When using clock mounted by user	Other than 10.0 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 (ID78K0-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-780354-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-780354-NS-EM1 is shipped, a 10.0 MHz crystal oscillator is already mounted in the IE-780354-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).

**(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).

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

● Items to be prepared

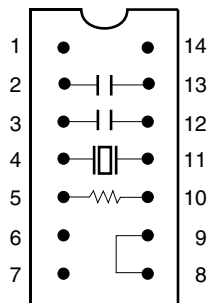
- Parts board
- Ceramic resonator or crystal resonator
- Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<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).

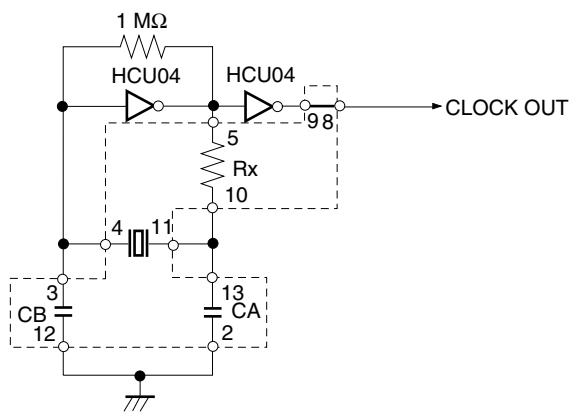
**Figure 3-8. Connections on Parts Board (Main System Clock)**

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
8-9	Shorted

Circuit diagram



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

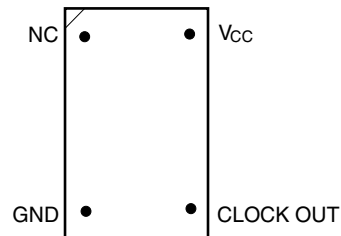
- <2> Prepare the IE-780354-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-780354-NS-EM1's socket (UMCLK).
- <4> Connect the parts board (from <1> above) to the socket (UMCLK) from which the crystal oscillator was removed. Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Make sure that the parts board is wired as shown in Figure 3-8 above.
- <6> Install the IE-780354-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 pinouts shown in Figure 3-9)

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

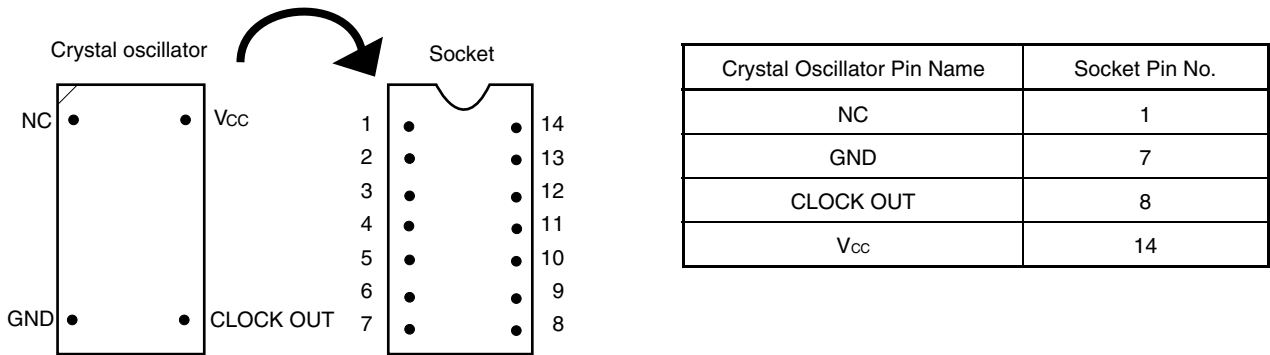


**<Steps>**

- <1> Prepare the IE-780354-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-780354-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-780354-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).

3.2.3 Subsystem clock settings

Table 3-2 shows the settings of the IE-780354-NS-EM1 when the subsystem clocks in (1) to (3) are used.

Table 3-2. Subsystem Clock Settings

Frequency of Subsystem Clock		IE-780354-NS-EM1	IE-78K0-NS or IE-78K0-NS-A
		USCLK	JP8
(1) When using clock (USCLK) that is already mounted on emulation board	32.768 kHz	Oscillator	1 and 2 shorted
(2) When using clock mounted by user	Other than 32.768 kHz	Oscillator configured by user	
(3) When inputting pulse from target system			Not used

**Caution** Before setting JP8 to switch between the clock on the board and external clock, turn off the power of the IE-78K0-NS or IE-78K0-NS-A.

**Remark** The factory settings of the IE-780354-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-780354-NS-EM1 is shipped, a 1.048576 MHz crystal oscillator (USCLK) is already mounted on the IE-780354-NS-EM1. Short 1 and 2 of the jumper (JP8) on the IE-78K0-NS or IE-78K0-NS-A. No settings are required on the integrated debugger (ID78K0-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 1 and 2 of the jumper (JP8) on the IE-78K0-NS or IE-78K0-NS-A.

No settings are required on the integrated debugger (ID78K0-NS).

Set the frequency for the socket (USCLK) to the value of the frequency to be used by the actual chip multiplied by 32.

(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

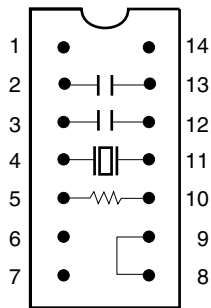
<Steps>

<1> Prepare the IE-780354-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 (USCLK).

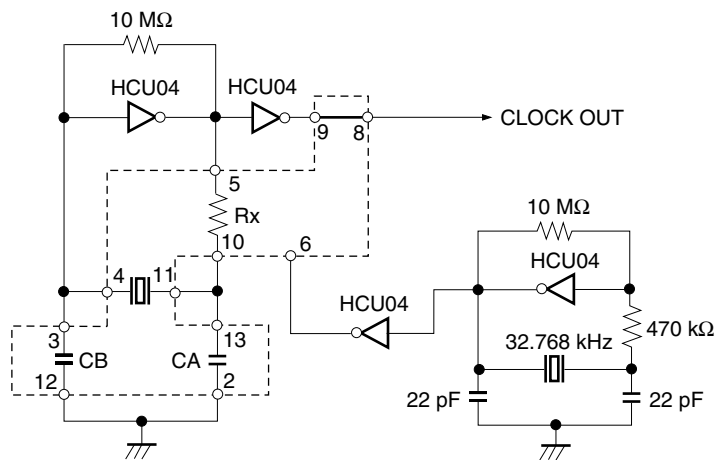
**Figure 3-11. Connections on Parts Board (Subsystem Clock)**

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



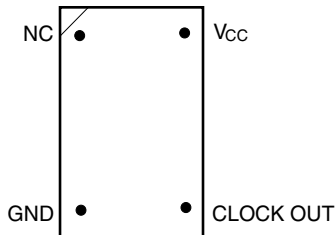
**Remark** The sections enclosed in broken lines indicate parts that are attached to the parts board.

- <3> Make sure that the parts board (USCLK) is wired as shown in Figure 3-11 above.
- <4> Install the IE-780354-NS-EM1 in the IE-78K0-NS or IE-78K0-NS-A.

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

- Items to be prepared
  - Crystal oscillator (see pinouts shown in Figure 3-12)

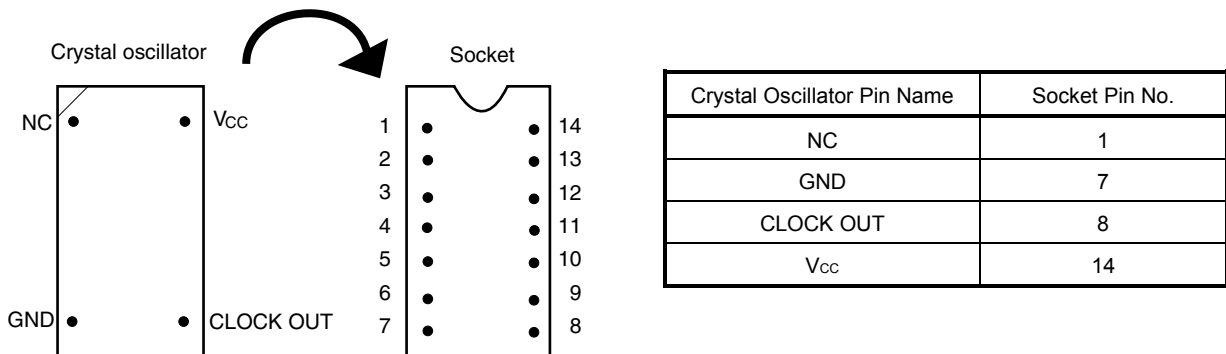
**Figure 3-12. Crystal Oscillator (Subsystem Clock)**



<Steps>

- <1> Prepare the IE-780354-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the socket (USCLK) of the IE-780354-NS-EM1.
- <3> Connect a crystal oscillator to the socket (USCLK) from which the crystal oscillator was removed (in <2> above). Insert the crystal oscillator pins into the socket aligning the pins as shown in the figure below.

**Figure 3-13. Pin Alignment of Crystal Oscillator and Socket (Subsystem Clock)**



- <4> Install the IE-780354-NS-EM1 in the IE-78K0-NS or IE-78K0-NS-A.

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

Short 3 and 4 of the jumper (JP8) on the IE-78K0-NS or IE-78K0-NS-A.  
 No settings are required on the integrated debugger (ID78K0-NS).  
 Set the frequency input by the target to the value of the frequency used by the target device multiplied by 4.

### 3.3 Mask Option Settings

#### 3.3.1 LCD step-up circuit

When the IE-780354-NS-EM1 is shipped, a step-up circuit for driving an LCD is mounted on the parts board of the LCD MOPT socket (RC1) of the IE-780354-NS-EM1.

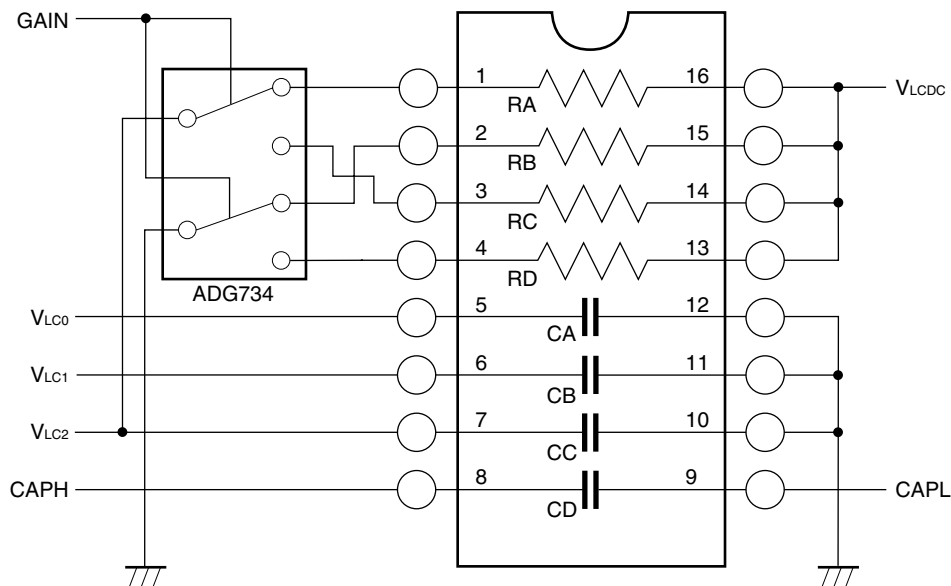
When modifying the step-up circuit for LCD driving, mount the resistors and capacitors required for the parts board and other parts that come with the IE-780354-NS-EM1 on the LCD MOPT socket.

When setting the gain adjustment to x1.0 (GAIN = 0) and x1.5 (GAIN = 1), change RA and RB, and RC and RD, respectively.

Figure 3-14 shows the step-up circuit for LCD driving.

**Caution** The step-up circuit on the target system cannot be used. Change RA and RB, or RC and RD so that the gain adjustment is between x1.0 and x1.5. Note that the IE system may be damaged if a value outside this range is set.

Figure 3-14. LCD MOPT Socket (RC1)



Connection Pin	Part Used	Parts Board After Shipment	Remark
1-16	Resistor RA	Shorted	Gain adjustment x1.0 supported
2-15	Resistor RB	3 MΩ	
3-14	Resistor RC	1 MΩ	Gain adjustment x1.5 supported
4-13	Resistor RD	2 MΩ	
5-12	Capacitor CA	0.47 μF (fixed)	-
6-11	Capacitor CB	0.47 μF (fixed)	-
7-10	Capacitor CC	0.47 μF (fixed)	-
8-9	Capacitor CD	0.47 μF (fixed)	-

### 3.4 External Trigger

To set an external trigger, connect the IE-780354-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **IE-78K0-NS User's Manual (U14379E)** 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)**.

#### (1) EXTOUT

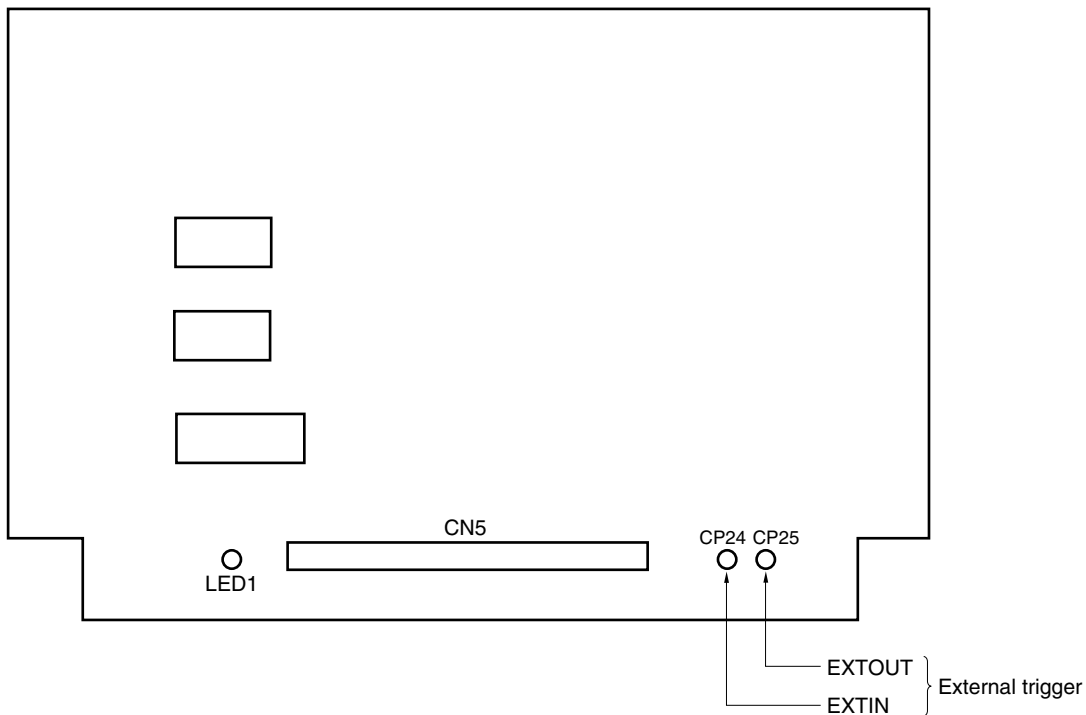
The EXTOUT pin on the IE-780354-NS-EM1 outputs a low level for 1.3  $\mu$ s when a break event occurs.

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

#### (2) EXTIN

An event signal can be input from the EXTIN pin on the IE-780354-NS-EM1. Input a high-level pulse signal for 2 CPU operation clocks or more.

**Figure 3-15. External Trigger Input Position**



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

When using the IE-780354-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-780354-NS-EM1.

**Table 3-3. 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	1 and 2 shorted	<b>Note</b>

**Note** The setting of JP8 is as follows.

1 and 2 shorted: (Internal selection of subsystem clock)

3 and 4 shorted: (External selection of subsystem clock)

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

When using the IE-780354-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-780354-NS-EM1.

**Table 3-4. 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	1 and 2 shorted	<b>Note</b>

**Note** The setting of JP8 is as follows.

1 and 2 shorted: (Internal selection of subsystem clock)

3 and 4 shorted: (External selection of subsystem clock)

**Table 3-5. Jumper Setting on G-78K0H Option Board of IE-78K0-NS-A**

	JP2
Setting	2 and 3 shorted

## 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 ( $\mu$ PD7880)**
- (2) Signals input/output from the emulation CPU ( $\mu$ PD78F0338)**
- (3) Signals input/output from the emulation CPU ( $\mu$ PD7880, 78F0338)**
- (4) Other signals**

The circuits of the IE-780354-NS-EM1 are used as follows for signals listed in (1) to (4) above. The same applies to handling alternate-function pins, for which no circuit is provided in the IE system.

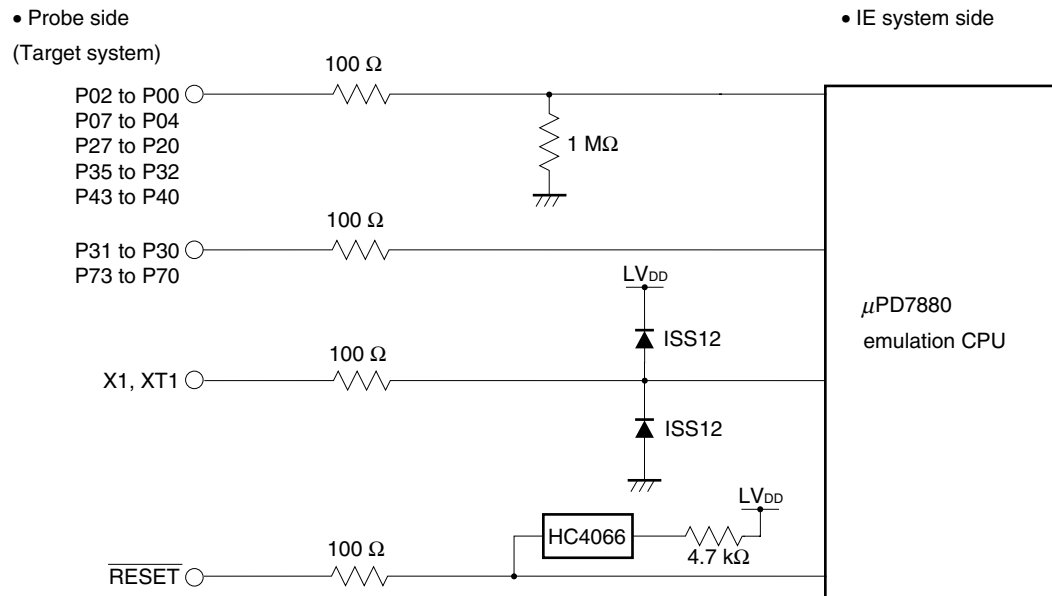


(1) Signals directly input to or output from the emulation CPU ( $\mu$ PD7880)

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

- P02 to P00
- P07 to P04
- P27 to P20
- P35 to P30
- P43 to P40
- P73 to P70
- X1
- XT1
- $\overline{\text{RESET}}$

Figure 4-1. Equivalent Circuit 1 of Emulation Circuit



**(2) Signals input/output from the emulation CPU ( $\mu$ PD78F0338)**

Refer to **Figure 4-2 Equivalent Circuit 2 of Emulation Circuit**.

- P17 to P10
- S11 to S0
- COM3 to COM0
- SCOM0
- AV<sub>REF</sub>
- AV<sub>SS</sub>

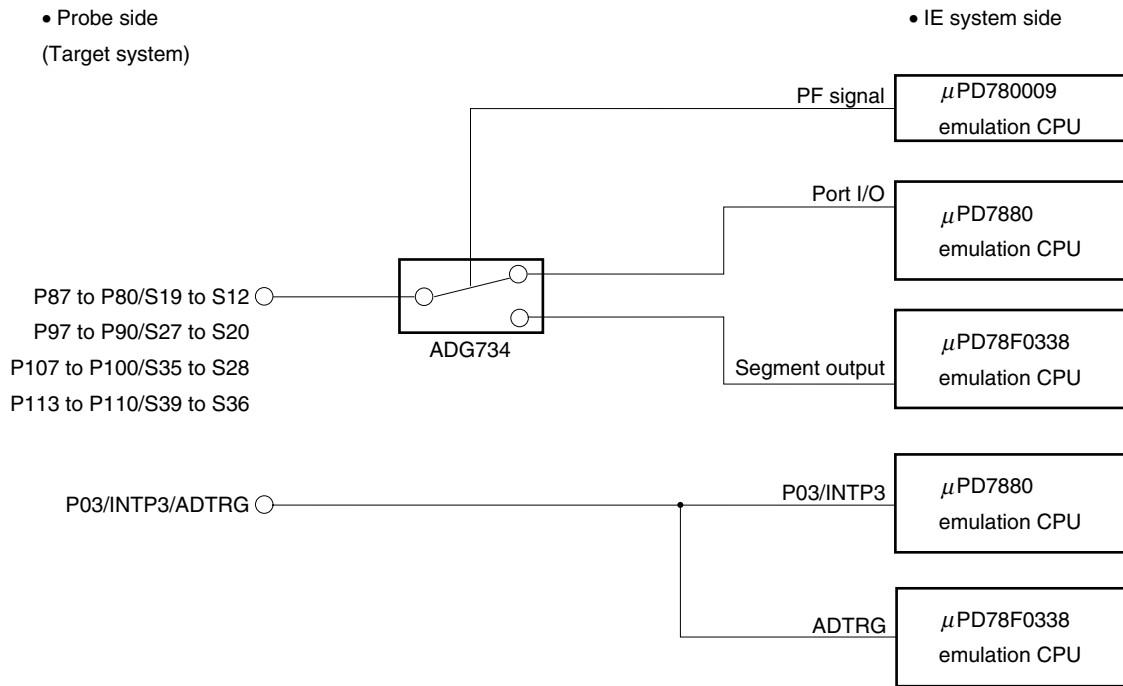
**Figure 4-2. Equivalent Circuit 2 of Emulation Circuit**

**(3) Signals directly input/output from the emulation CPU**

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

- P87 to P80/S19 to S12
- P97 to P90/S27 to S20
- P107 to P100/S35 to S28
- P113 to P110/S39 to S36
- P03/INTP3/ADTRG

Figure 4-3. Equivalent Circuit 3 of Emulation Circuit

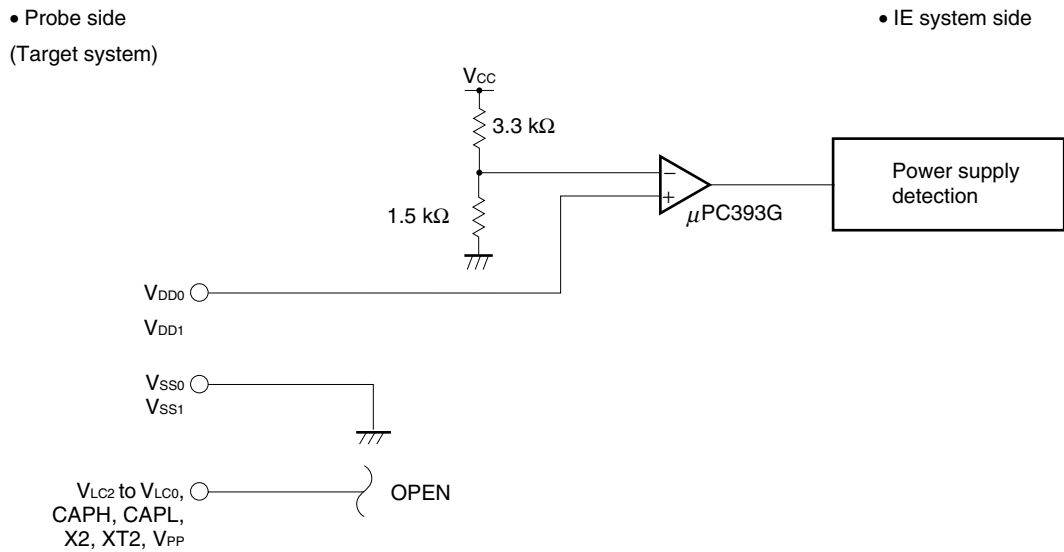


(4) Other signals

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

- $V_{LC2}$  to  $V_{LC0}$   
CAPH, CAPL, X2, XT2,  $V_{DD0}$ ,  $V_{DD1}$ ,  $V_{SS0}$ ,  $V_{SS1}$ ,  $V_{PP}$

Figure 4-4. Equivalent Circuit 4 of Emulation Circuit



## CHAPTER 5 CAUTIONS

The following must be noted when using the IE-780354-NS-EM1.

**(1) Connection with the IE-78001-R-A is not supported.**

(When connected with the IE-78001-R-A, port trace results will not be correctly indicated.)

**(2) Use a device file of version E1.00h or later.**

(With device files earlier than E1.00h, the mask option functions of P30, P31, and P70 to P73 cannot be used.)

## APPENDIX A EMULATION PROBE PIN ASSIGNMENT TABLE

**Table A-1. NP-100GC, NP-H100GC-TQ Pin Assignments (1/2)**

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
1	118	35	57
2	117	36	58
3	114	37	59
4	113	38	60
5	108	39	55
6	107	40	56
7	104	41	49
8	103	42	50
9	100	43	45
10	99	44	46
11	94	45	41
12	93	46	42
13	30	47	35
14	29	48	36
15	24	49	31
16	23	50	32
17	20	51	4
18	19	52	3
19	16	53	8
20	15	54	7
21	10	55	14
22	9	56	13
23	6	57	18
24	5	58	17
25	33	59	22
26	34	60	21
27	37	61	28
28	38	62	27
29	43	63	92
30	44	64	91
31	47	65	98
32	48	66	97
33	51	67	102
34	52	68	101

- Remarks**
1. NP-100GC and NP-H100GC-TQ are products 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.

**Table A-1. NP-100GC, NP-H100GC-TQ Pin Assignments (2/2)**

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
69	106	85	63
70	105	86	64
71	112	87	61
72	111	88	62
73	116	89	65
74	115	90	66
75	87	91	71
76	88	92	72
77	83	93	75
78	84	94	76
79	77	95	79
80	78	96	80
81	73	97	85
82	74	98	86
83	69	99	89
84	70	100	90

- Remarks**
1. NP-100GC and NP-H100GC-TQ are products 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.

Table A-2. NP-113F-DA3 Pin Assignments (1/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
A1	–	B4	79
B1	117	C4	85
C1	–	D4	108
D1	107	E4	30
E1	103	F4	29
F1	93	G4	19
G1	24	H4	44
H1	16	J4	52
J1	–	K4	43
K1	33	L4	47
L1	–	A5	66
A2	90	B5	71
B2	118	C5	80
C2	114	D5	75
D2	113	E5	–
E2	104	H5	60
F2	94	J5	57
G2	23	K5	48
H2	15	L5	51
J2	5	A6	61
K2	34	B6	64
L2	37	C6	72
A3	–	D6	65
B3	89	H6	55
C3	86	J6	50
D3	100	K6	58
E3	99	L6	59
F3	20	A7	69
G3	10	B7	74
H3	9	C7	63
J3	6	D7	62
K3	38	H7	45
L3	–	J7	42
A4	76	K7	49

- Remarks**
1. NP-113F1-DA3 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.

Table A-2. NP-113F-DA3 Pin Assignments (2/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
L7	56	A10	83
A8	73	B10	88
B8	77	C10	115
C8	70	D10	105
D8	78	E10	97
E8	101	F10	28
F8	91	G10	18
G8	92	H10	7
H8	14	J10	8
J8	35	K10	4
K8	41	L10	32
L8	46	A11	–
A9	–	B11	87
B9	84	C11	–
C9	116	D11	106
D9	111	E11	98
E9	112	F11	27
F9	102	G11	17
G9	21	H11	13
H9	22	J11	–
J9	36	K11	3
K9	31	L11	–
L9	–		

- Remarks**
1. NP-113F1-DA3 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.



## APPENDIX B NOTES ON TARGET SYSTEM DESIGN

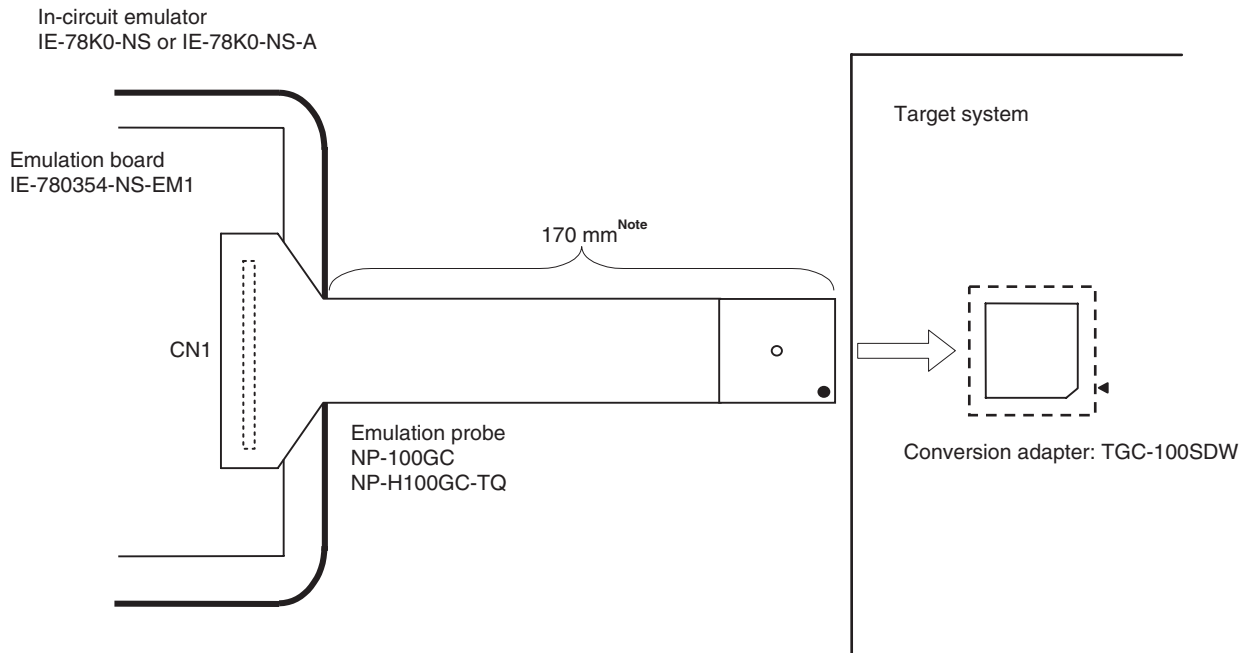
The following shows the conditions when connecting the emulation probe to the conversion adapter. Follow the configuration below and consider the shape of parts to be mounted on the target system when designing a system.

Among the products described in this appendix, NP-100GC, NP-H100GC-TQ, and NP-113F1-DA3 are products of Naito Densai Machida Mfg. Co., Ltd, and TGC-100SDW, LSPACK113A1110NO1, CSSOCKET113A1110NO1, and CSSOCKET113A1110NO1N 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-100GC	TGC-100SDW	170 mm
NP-H100GC-TQ		370 mm
NP-113F1-DA3	LSPACK113A1110NO1 + CSSOCKET113A1110NO1 or CSSOCKET113A1110NO1N	228.5 mm

**Figure B-1. Distance Between In-Circuit Emulator and Conversion Adapter  
(When 100GC Is Used)**



**Note** Distance when NP-100GC is used. When NP-H100GC-TQ is used, the distance is 370 mm.

Figure B-2. Connection Conditions of Target System (When NP-100GC Is Used)

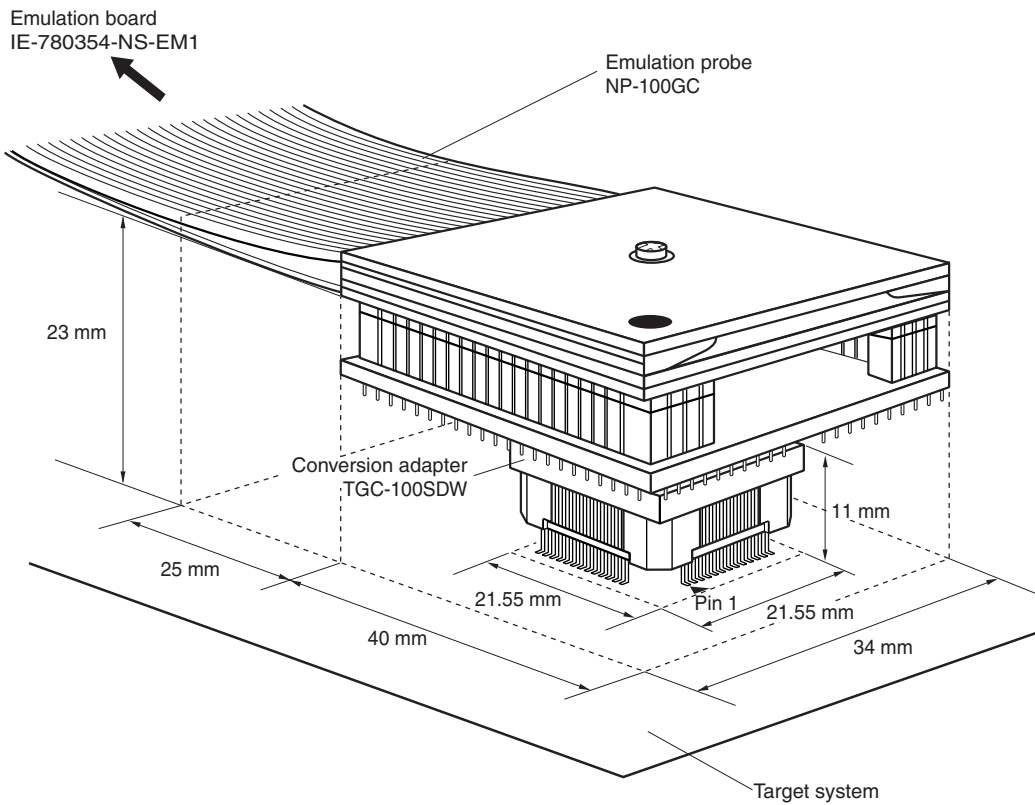
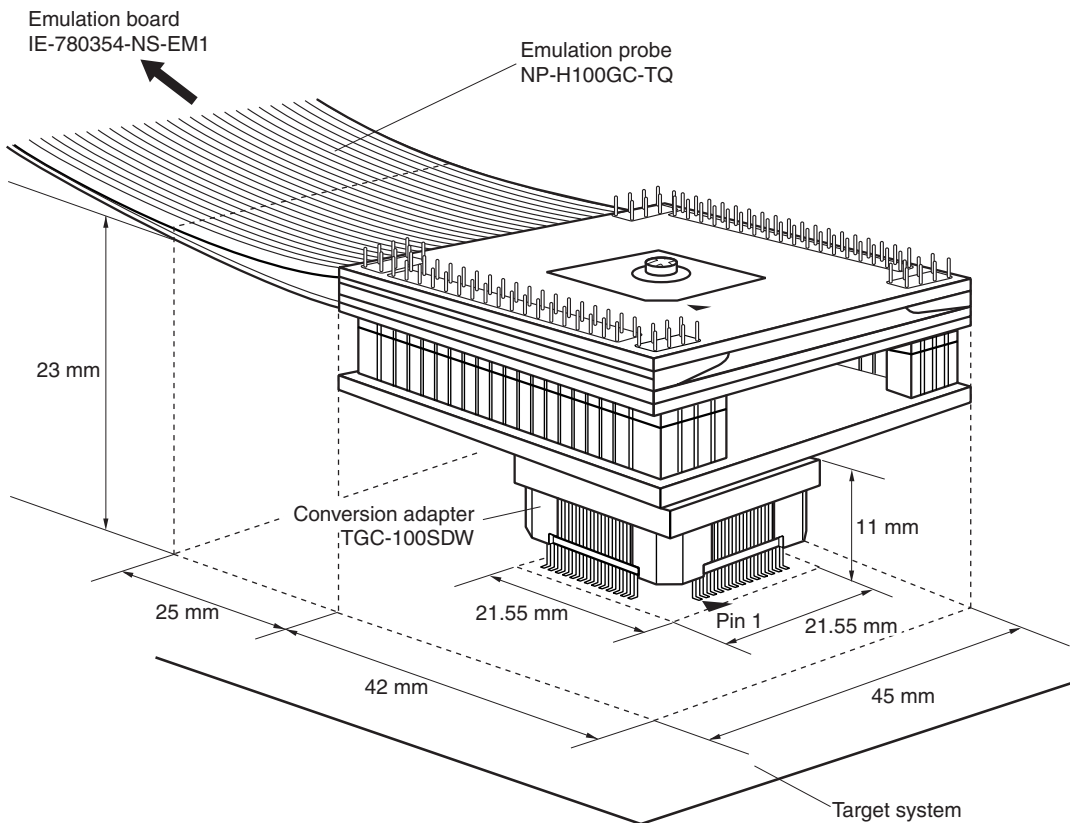
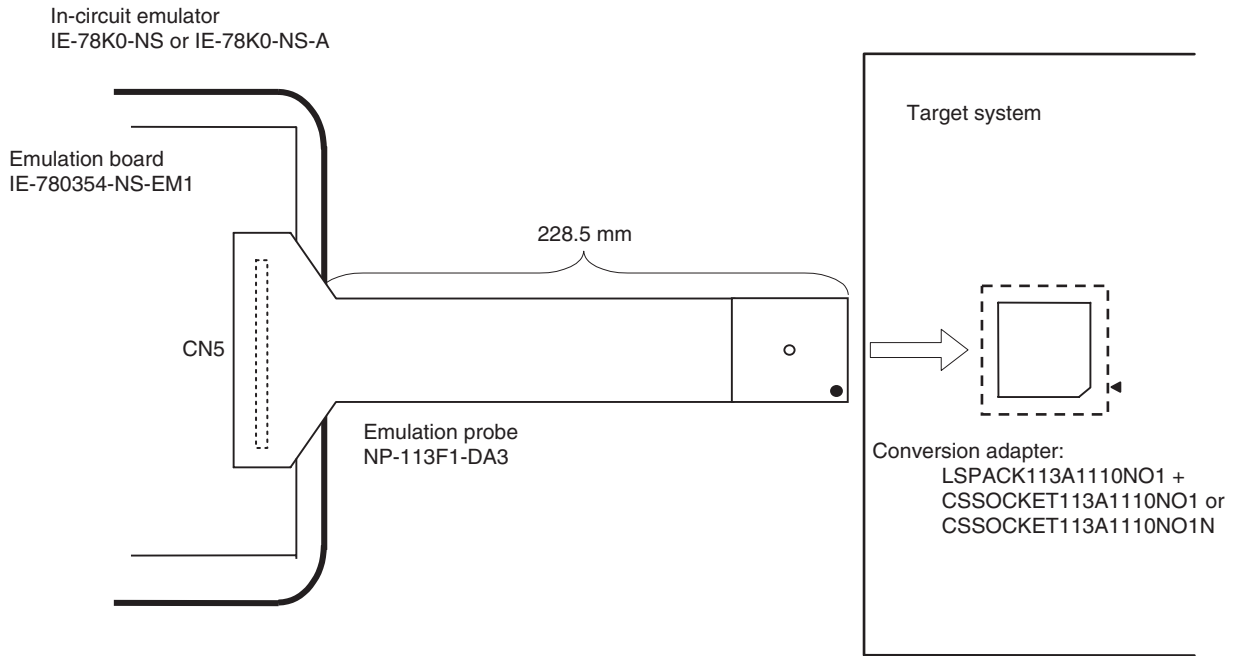


Figure B-3. Connection Conditions of Target System (When NP-H100GC-TQ Is Used)



**Figure B-4. Distance Between In-Circuit Emulator and Conversion Adapter  
(When NP-113F1-DA3 Is Used)**



**Figure B-5. Connection Conditions of Target System (When NP-113F1-DA3 Is Used)**

