User's Manual (Preliminary)

NEC

IE-78K0K1-ET

In-Circuit Emulator

Target Devices

μPD780103 Subseries (78K0/KB1)
μPD780114 Subseries (78K0/KC1)
μPD780124 Subseries (78K0/KD1)
μPD780138 Subseries (78K0/KE1)
μPD780148 Subseries (78K0/KF1)

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INTRODUCTION

Product Overview

The IE-78K0K1-ET is designed to be used to debug the following target devices that belong to the 78K0 Series of 8-bit single-chip microcontrollers.

- 78K0/KB1 (μPD780103 Subseries): μPD780101, 780102, 780103, 78F0103
- 78K0/KC1 (μPD780114 Subseries): μPD780111, 780112, 780113, 780114, 78F0114
- 78K0/KD1 (μPD780124 Subseries): μPD780121, 780122, 780123, 780124, 78F0124
- 78K0/KE1 (μPD780138 Subseries): μPD780131, 780132, 780133, 780134, 780136, 780138, 78F0134, 78F0138
- 78K0/KF1 (μPD780148 Subseries): μPD780143, 780144, 780146, 780148, 78F0148

Target Readers

This manual is intended for engineers who will use the IE-78K0K1-ET 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.

Purpose

This manual's purpose is to explain various debugging functions that can be performed when using the IE-78K0K1-ET.

Organization

When using the IE-78K0K1-ET, refer to the manual supplied with the IE-78K0K1-ET (this manual).

This manual is organized as follows.

IE-78K0K1-ET User's Manual

- Basic specifications
- General
- System configuration
- Part names
- External interface functions
- Installation
- Differences between target devices and target interface circuits

How to Use This Manual

To understand the functions in general:

→ Read this manual in the order of the contents.

To understand the basic specifications:

→ Read **CHAPTER 1 GENERAL** and **CHAPTER 2 PART NAMES**.

To learn the settings when debugging the target device of the IE-78K0K1-ET:

→ Read **CHAPTER 3 INSTALLATION**.

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 (the real chip) that is the target of 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 IE-78K0K1-ET.

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

Caution When referring the ID78K0-NS User's Manual, read IE-78K0-NS as IE-78K0K1-ET.

CONTENTS

CHAPTER 1 GENERAL

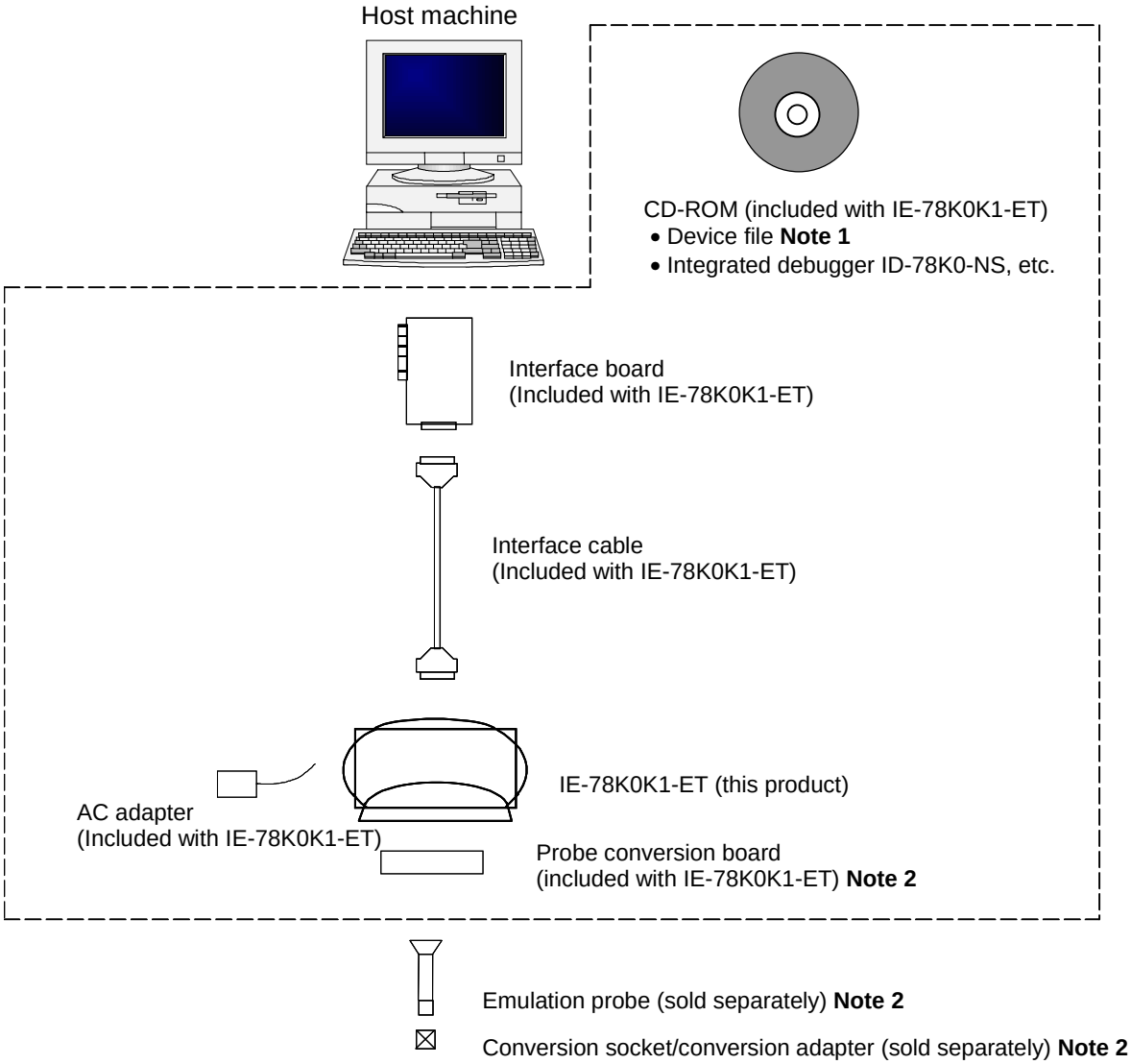
The IE-78K0K1-ET is a development tool for efficient debugging of hardware or software when using one of the following target devices that belong to the 78K0 Series 8-bit of single-chip microcontrollers.
This chapter describes the IE-78K0K1-ET system configuration and basic specifications.

- Target devices
  - 78K0/KB1 (μPD780103 Subseries): μPD780101, 780102, 780103, 78F0103
  - 78K0/KC1 (μPD780114 Subseries): μPD780111, 780112, 780113, 780114, 78F0114
  - 78K0/KD1 (μPD780124 Subseries): μPD780121, 780122, 780123, 780124, 78F0124
  - 78K0/KE1 (μPD780138 Subseries): μPD780131, 780132, 780133, 780134, 780136, 780138, 78F0134, 78F0138
  - 78K0/KF1 (μPD780148 Subseries): μPD780143, 780144, 780146, 780148, 78F0148

1.1 System Configuration

Figure 1-1 illustrates the IE-78K0K1-ET system configuration.

Figure 1-1. System Configuration



Notes 1. The device file is as follows.

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

μSxxxxDF780103: 78K0/KB1
μSxxxxDF780114: 78K0/KC1
μSxxxxDF780124: 78K0/KD1
μSxxxxDF780138: 78K0/KE1
μSxxxxDF780148: 78K0/KF1

2. Refer to Table 1-1 for details of the probe conversion board, emulation probe and conversion socket/conversion adapter.

Table 1-1. List of Emulation Probes, Conversion Sockets, and Conversion Adapters

Package	Probe Conversion Board	Emulation Probe	Conversion Socket/ Conversion Adapter
80-pin QFP (14 x 14 mm)	78014X PROBE Board	NP-80GC *1 *4	EV-9200GC-80 *3
		NP-80GC-TQ *1	TGC-080SBP *2 *5
		NP-H80GC-TQ *1	
80-pin TQFP (12 x 12 mm)		NP-80GK *1	TGK-080SDP *2 *6
		NP-H80GK-TQ *1	
64-pin TQFP (12 x 12 mm)	78013X PROBE Board	NP-64GK *1	TGK-064SBP *2 *5
		NP-H64GK-TQ *1	
64-pin LQFP (14 x 14 mm)		NP-64GC *1	EV-9200GC-64 *3
		NP-64GC-TQ *1	TGC-064SAP *2 *5
		NP-H64GC-TQ *1	
64-pin LQFP (10 x 10 mm)		NP-H64GB-TQ *1	TGB-064SDP *2 *5
52-pin LQFP (10 x 10 mm)	78012X PROBE Board	NP-H52GB-TQ *1	TGB-052SBP *2 *5
44-pin LQFP (10 x 10 mm)	78011X PROBE Board	NP-44GB *1 *4	EV-9200G-44 *3
		NP-44GB-TQ *1	TGB-44SAP *2 *5
		NP-H44GB-TQ *1	
30-pin SSOP (300 mil)	78010X PROBE Board	NP-30MC *1	YSPACK30BK + NSPACK30BK + YQ-Guide *2

*1 Made by Naito Densei Machida Mfg. Co., Ltd.

*2 Made by Tokyo Eletech Corp.

*3 Made by NEC Electronics

*4 OEM product

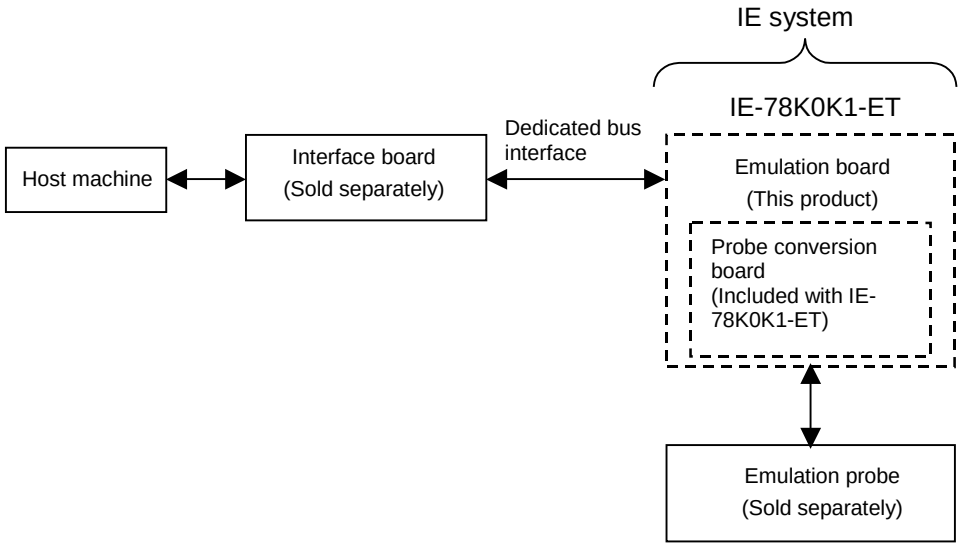
*5 Tokyo Eletech's NQPACK series socket can also be used.

*6 Tokyo Eletech's NQPACK series socket cannot be used.

1.2 Hardware Configuration

The IE-78K0K1-ET's position is shown below.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

Table 1-2. Basic Specifications (1/2)

Parameter		Description
Supervisor CPU		V40™ (operating frequency: 16.0 MHz)
Target device		• 78K0/KB1 (μPD780103 Subseries): μPD780101, 780102, 780103, 78F0103 • 78K0/KC1 (μPD780114 Subseries): μPD780111, 780112, 780113, 780114, 78F0114 • 78K0/KD1 (μPD780124 Subseries): μPD780121, 780122, 780123, 780124, 78F0124 • 78K0/KE1 (μPD780138 Subseries): μPD780131, 780132, 780133, 780134, 780136, 780138, 78F0134, 78F0138 • 78K0/KF1 (μPD780148 Subseries): μPD780143, 780144, 780146, 780148, 78F0148
System clock		• Main system clock: 10 MHz • Ring-OSC: 240 kHz • Subsystem clock: 32.768 kHz (not provided for the μPD78010x and 78F0103)
Clock supply	External	Pulse input
	Internal	Mounted on the emulation board
Emulation memory capacity		64 KB
Mapping unit	Internal ROM	4 KB
	Internal high-speed RAM	64 bytes
	Internal low-speed RAM	128 bytes
	External expansion memory	8 KB
Emulation functions		• Real-time execution • Break execution • Step execution
Real-time internal RAM monitor		2 KB among all data memory spaces
Event detection		• Program execution detection • Bus event detection • External trigger detection • Trigger output (open-drain output)
Event integration		• Bus condition • Trace qualify condition • Delay condition • Trigger condition
Break trigger		• Event break • Manual break • Command break • Fail-safe break
Real-time trace	Trace source	• All trace • Qualify trace
	Trace capacity	32 bits × 8 KB
	Trace target	Address, data, status
Execution time measurement		4 min. 28 sec. Max., resolution: 62.5 ns
Target interface		Emulation board (sold separately) available for each device shape

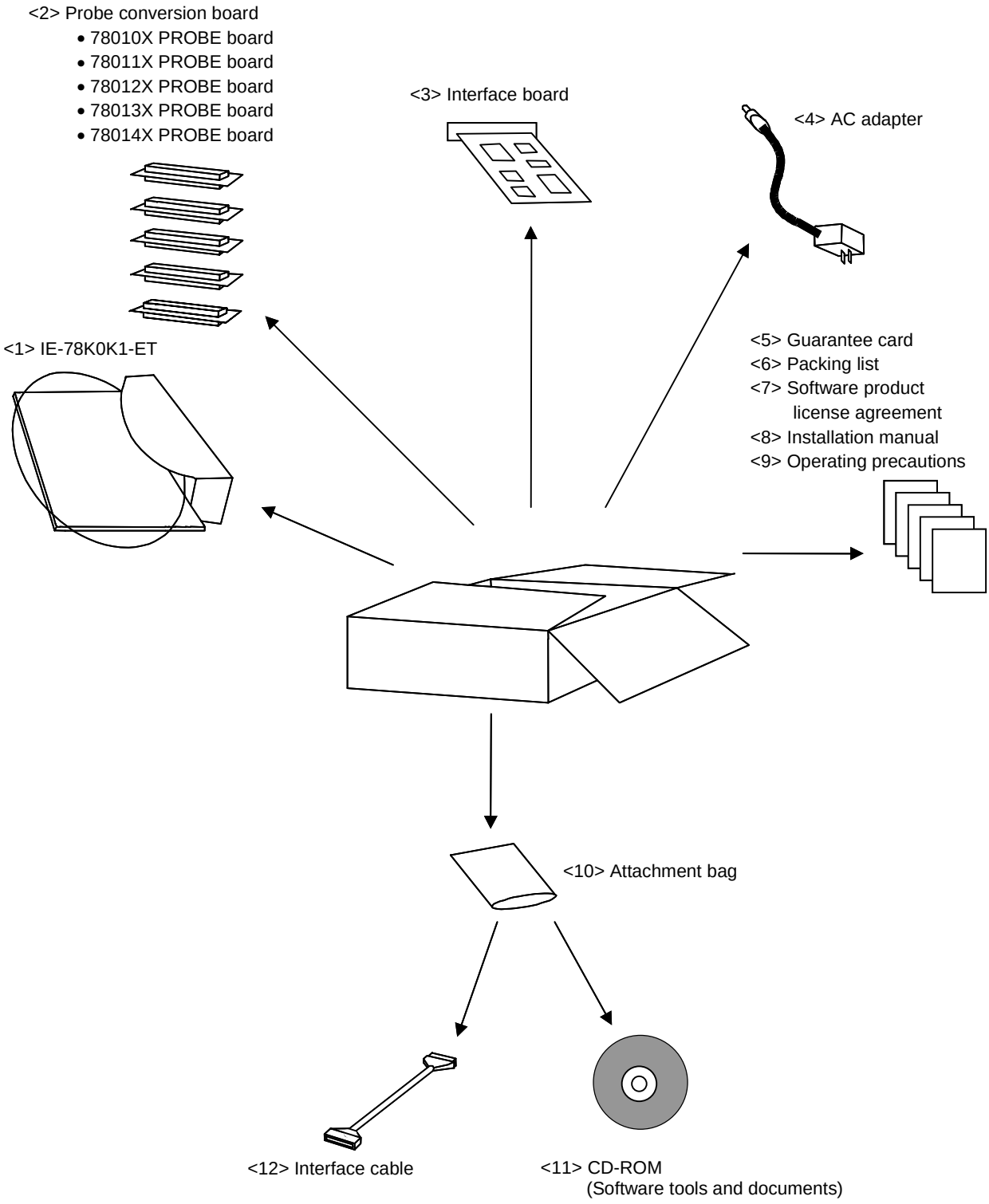
Table 1-2. Basic Specifications (2/2)

Parameter	Description
Host interface	Dedicated bus interface
Low voltage support	2.7 to 5.5 V (same as target device)
Host machine	IBM PC/AT compatible machines
Power supply	DC 9V
Operating ambient temperature	10 to 40°C
External dimensions (not including projection)	Height: 193 mm, width: 265 mm, length: 72 mm

1.4 Package Contents

The packing box contains the IE-78K0K1-ET, probe conversion board, attachment bag, guarantee card, AC adapter, interface board, and packing list. The documentation bag contains the user's manual (this document), CD-ROM, and interface cable. 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.

Figure 1-3. Package Contents



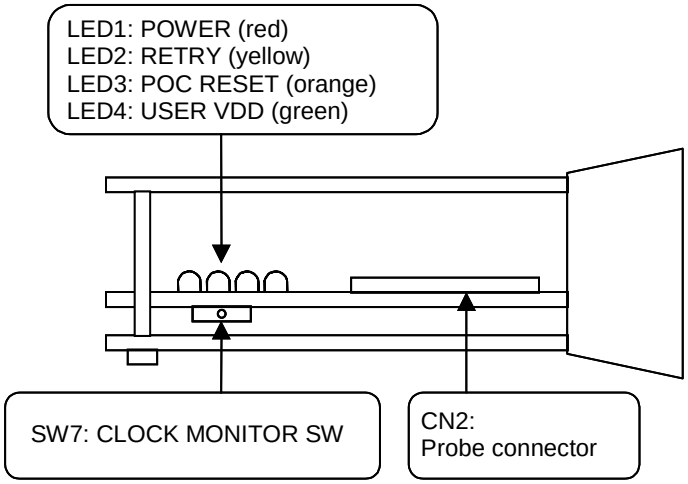
CHAPTER 2 PART NAMES

This chapter introduces the part names of the IE-78K0K1-ET main unit.

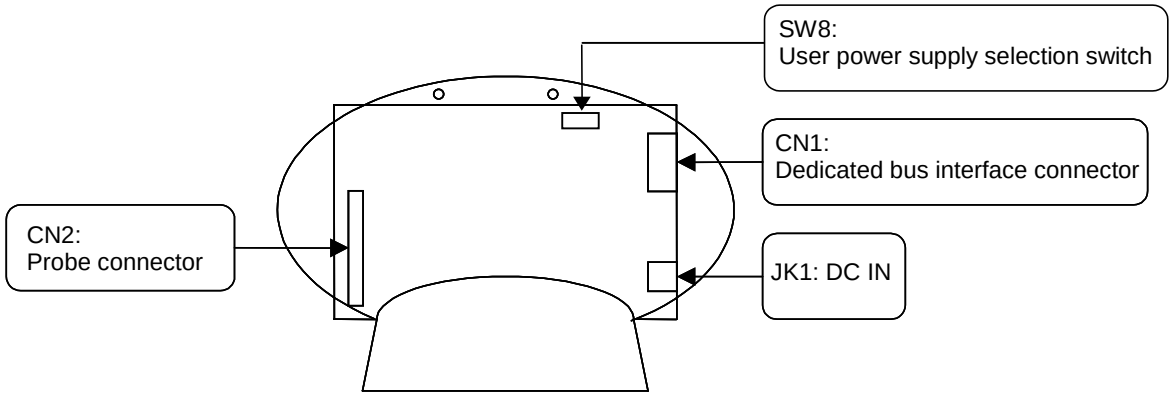
2.1 Names of Main Unit

Figure 2-1. Names of Parts on Main Unit

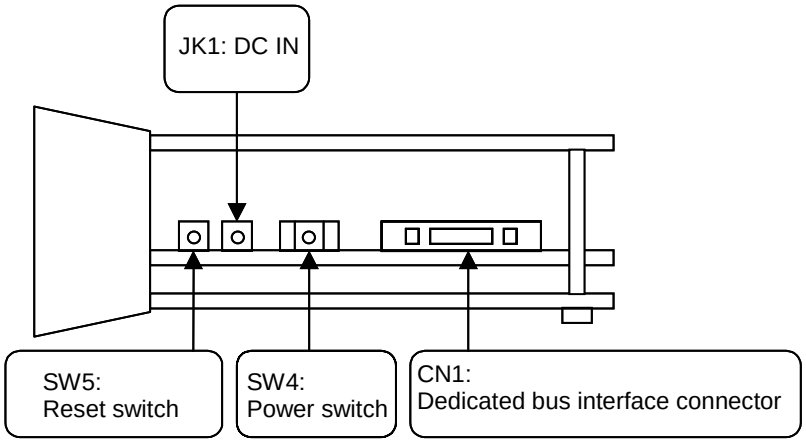
(1) Probe side



(2) Top



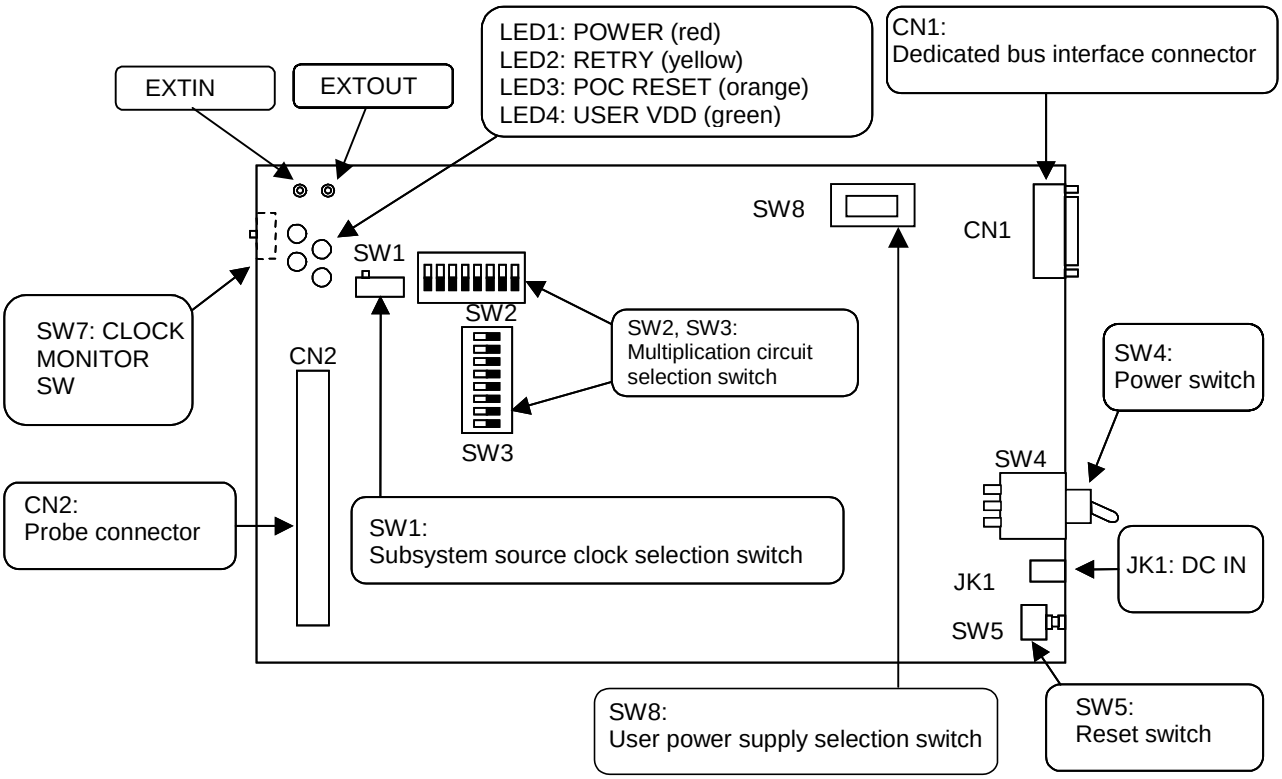
(3) Interface side



2.2 Names of Parts on Board

(1) Emulation board (S-780148 Board) × 1

Figure 2-2. Package Drawing of Emulation board (S-780148 Board)



(2) Probe conversion boards (five boards)

78010X PROBE Board × 1

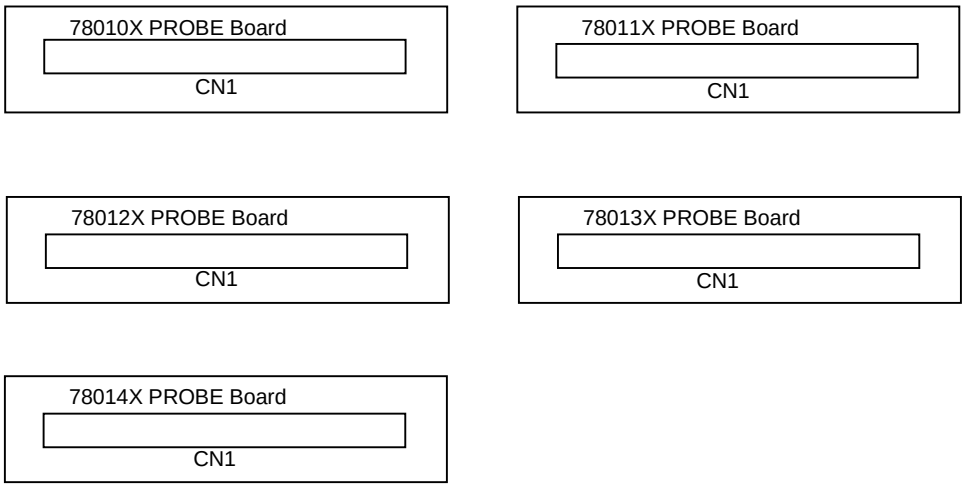
78011X PROBE Board × 1

78012X PROBE Board × 1

78013X PROBE Board × 1

78014X PROBE Board × 1

Figure 2-3. Package Drawings of Probe Conversion Boards (Four Boards)



CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-78K0K1-ET to the cables, etc. Mode setting methods are also described.

The following components are connected. Refer to **1.1 System Configuration** for details of the IE-78K0K1-ET system configuration.

- Emulation probe: NP-XXXXX (Sold separately)
- Probe conversion board (Included)
- AC adapter (Included)
- Interface cable (Included)
- Interface board (Included)

Caution Connecting or removing parts 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 emulation probe

With the IE-78K0K1-ET, the connection method differs according to the emulation probe used.

Use the probe conversion board corresponding to the target device shown in Table 3-1.

Caution Incorrect connection may damage the IE system. For more details on connection, see the user's manual for each emulation probe.

- When using the probe conversion board

<1> Connect CN2 of the probe conversion board to CN2 of the IE-78K0K1-ET (Figure 3-1).

<2> Connect CN1 of the probe conversion board to the emulation probe (Figure 3-2).

Figure 3-1. When Using Probe Conversion Board

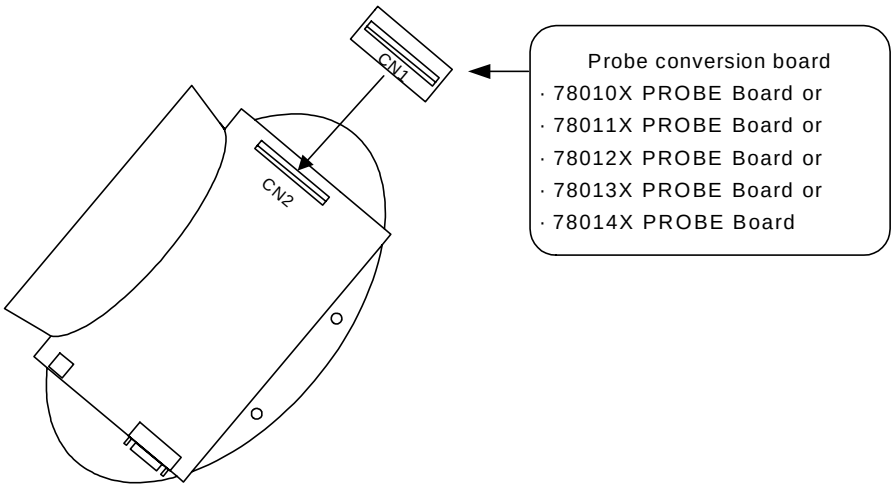


Figure 3-2. When Not Using Probe Conversion Board

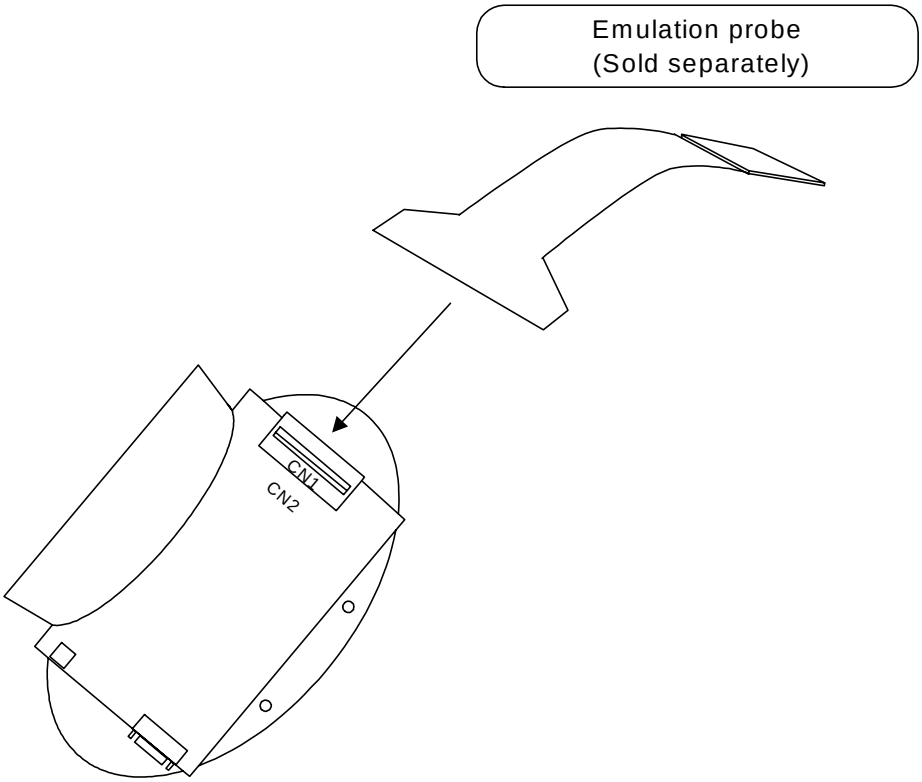


Table 3-1. Target Device and Corresponding Probe Conversion Board

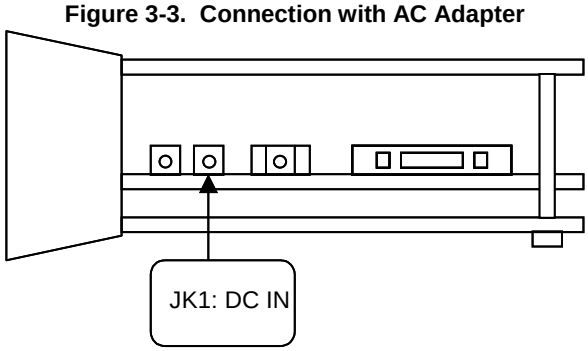
Target Device	Probe Conversion Board to Be Used
μPD780101, 780102, 780103, 78F0103	78010X PROBE Board
μPD780111, 780112, 780113, 780114, 78F0114	78011X PROBE Board
μPD780121, 780122, 780123, 780124, 78F0124	78012X PROBE Board
μPD780131, 780132, 780133, 780134, 780136, 780138, 78F0134, 78F0138	78013X PROBE Board
μPD780143, 780144, 780146, 780148, 78F0148	78014X PROBE Board

(2) Connection with AC adapter

Use the AC adapter supplied with the IE-78K0K1-ET.

<1> Insert the AC adapter in “JK1” on the interface panel of the IE-78K0K1-ET.

Figure 3-3. Connection with AC Adapter

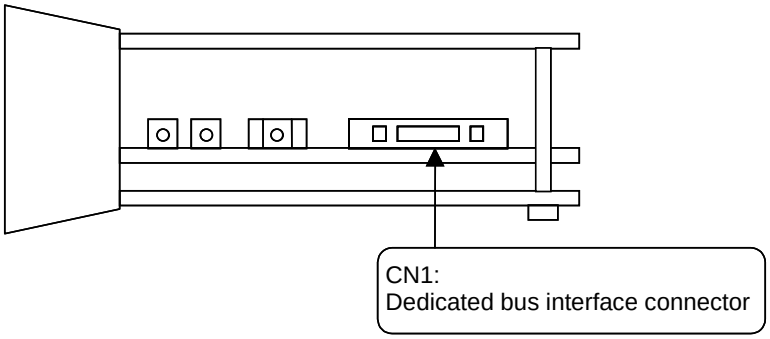


(3) Connection with interface cable

Use the interface cable supplied with the IE-78K0K1-ET.

<1> Insert the interface cable in the dedicated bus interface connector on the interface panel of the IE-78K0K1-ET.

Figure 3-4. Connection with Interface Cable



3.2 Clock Settings

3.2.1 Outline of clock settings

The main system clock and subsystem clock to be used can be selected from (1) to (4) below.

(1) Clock already mounted on emulation board

(2) Clock mounted by user

(3) Clock input from the target system

(4) Clock generated using Ring-OSC[Note]

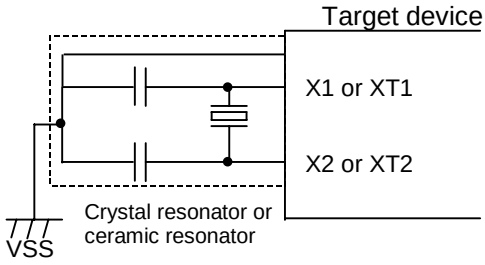
Note (4) can be selected only for the main system clock.

When the target system includes a clock oscillator, refer to **3.2.2 (1) Clock already mounted on emulation board** or **3.2.2 (2) Clock mounted by user**.

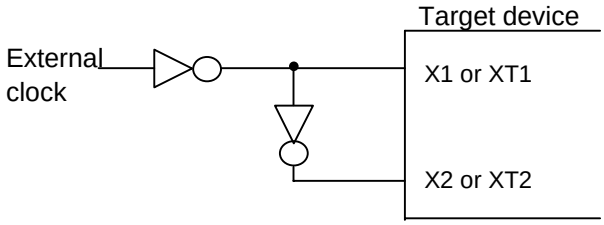
Caution An abnormal main system clock supply will cause the IE system to hang up.

Figure 3-5. Target System Clock Oscillator

(a) Clock oscillator



(b) External clock



- When the target system includes a clock oscillator:

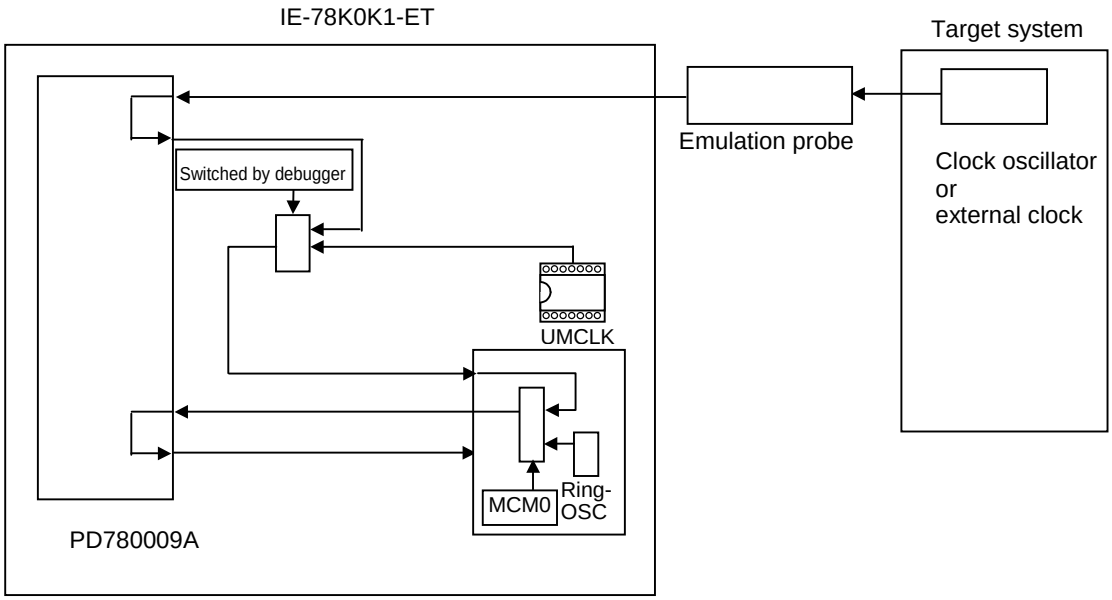
  Select clock (1), (2), or (4) for **Figure 3-5 (a)**. (3) cannot be selected.

- When the target system includes an external clock:

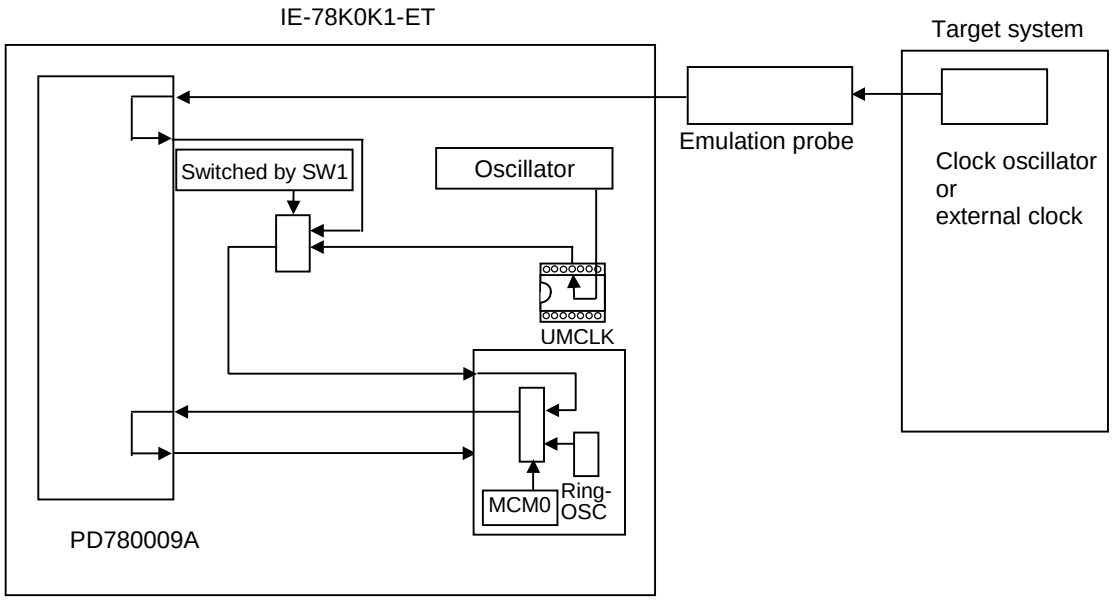
  Clock (1), (2), (3), or (4) can be selected for **Figure 3-5 (b)**.

Figure 3-6. Outline of System Clock

● **Main system clock**



● **Subsystem clock**



3.2.2 Main system/subsystem clock settings

The settings of the main system clock are shown in Table 3-2.

Table 3-2. Settings of Main System Clock

Frequency of Main System Clock Used		SFR (MCM0)	IE-78K0K1-ET	Integrated Debugger (ID78K0-NS)
			Parts Board (UMCLK)	CPU Clock Source Selection Note 2
(1) Clock already mounted on emulation board	10.0 MHz	1	Oscillator	Internal
(2) Clock mounted by user	Other than 10.0 MHz		Oscillator assembled or prepared by user	
(3) Clock input from the target system			Oscillator (not used)	External
(4) Ring-OSC Note 1	240 kHz	0	Oscillator (not used)	Internal or external

Notes 1. The IE-78K0K1-ET operates with the Ring-OSC clock when the debugger is activated and immediately after reset.

2. Select the source clock for the main system clock when the debugger is started. After that, do not change the setting.

The settings of the subsystem clock are shown in Table 3-3.

Table 3-3. Settings of Subsystem Clock

Frequency of Subsystem Clock Used		IE-78K0K1-ET Parts Board (USCLK)	IE-78K0K1-ET SW1
(1) Clock that is already mounted on emulation board	32.768 kHz	6-8 shorted	I side (Internal)
(2) Clock that is mounted by user	Other than 32.768 kHz	Oscillator assembled or prepared by user	
(3) Clock input from the target system		Oscillator (not used)	E side (External)

A 32.768 kHz clock is supplied from the oscillator on the IE-78K0K1-ET according to the factory settings.

The main system/subsystem clock settings of (1) to (4) are individually described in the following pages.

(1) When using clock already mounted on emulation board

When the IE-78K0K1-ET is shipped, a 10.0 MHz crystal oscillator and a parts board with 6-8 shorted are already mounted on the UMCLK socket and USCLK socket, respectively, and a clock is supplied from the 32.768 kHz oscillator on the board.

When using the factory-set mode settings, there is no need to make any other hardware settings.

A setting outline is shown in Figure 3-7.

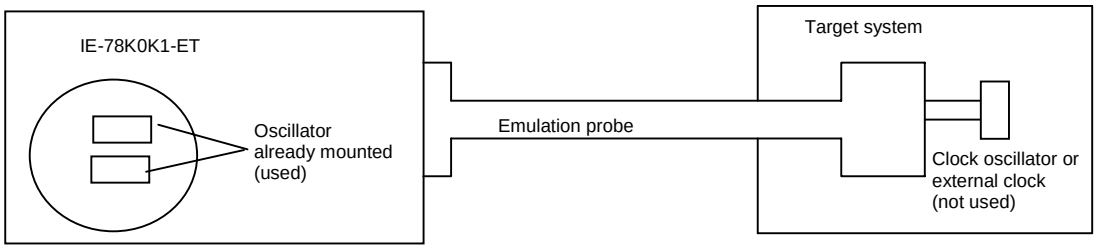
Set the main system clock in the following steps.

<1> When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select “Internal” in the area (Clock) for selecting the CPU clock source.

<2> After the debugger is activated, set the special-function register MCM0 to 1 to switch the CPU operating clock from Ring-OSC (default) to the clock already mounted on the emulation board.

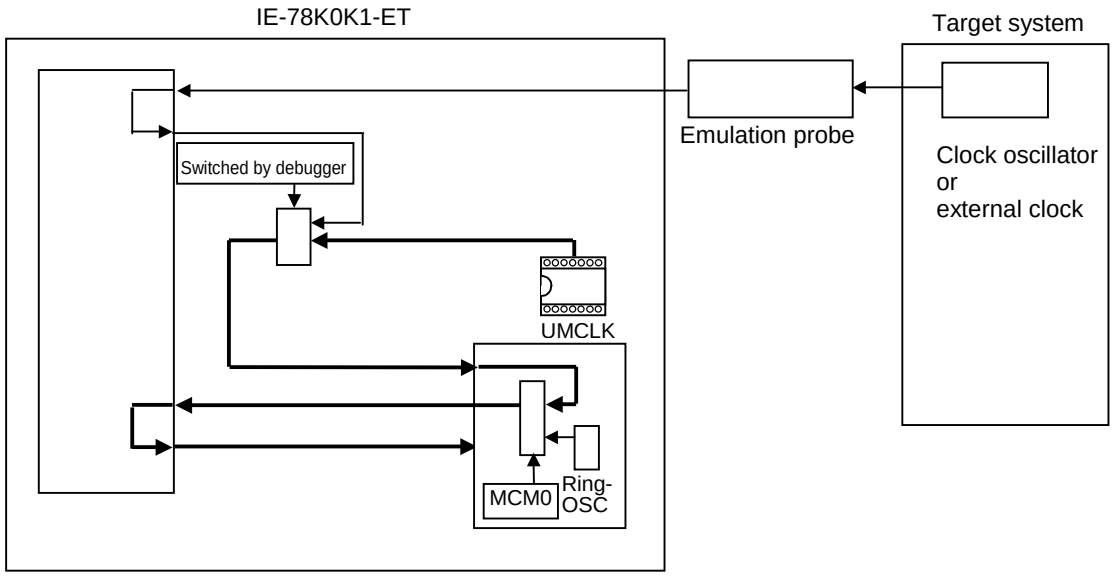
Set SW1 to the I side for the subsystem clock to set the clock already mounted on the emulation board.

Figure 3-7. When Using Clock Already Mounted on Emulation Board



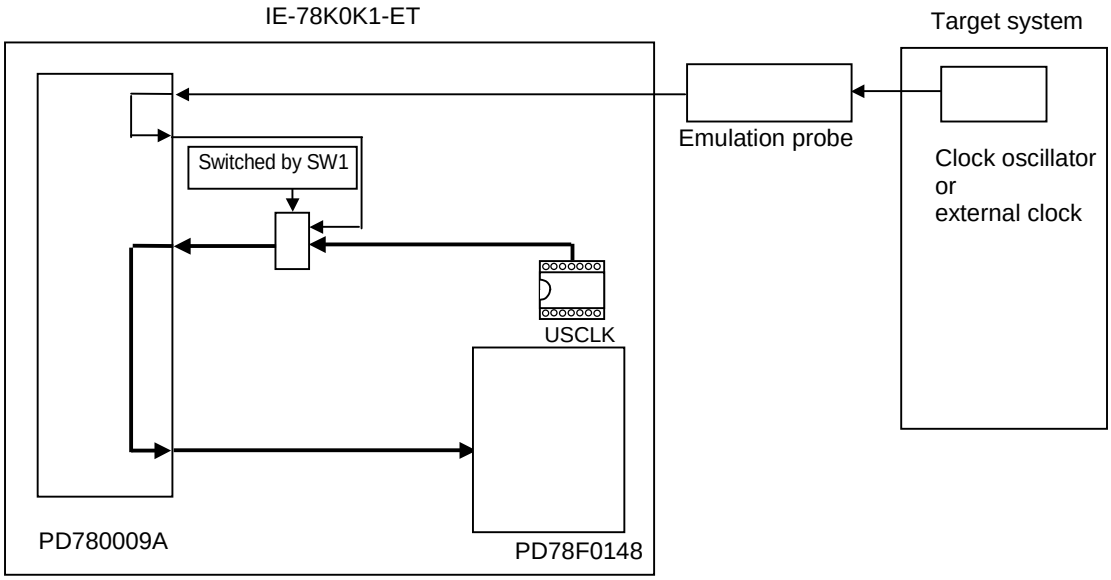
Remark The clock that is supplied by the IE-78K0K1-ET’s oscillator (encircled in the figure) is used.

Figure 3-8. Flow of Clock (Main System Clock)



Remark The flow of the clock is indicated by the bold line.

Figure 3-9. Flow of Clock (Subsystem Clock)



Remark The flow of the clock is indicated by the bold line.

(2) When using clock mounted by user

Remove the crystal oscillator already mounted on the emulation board (UMCLK: 10.0 MHz) or parts board (USCLK: 6-8 shorted) and mount the parts board (oscillator) that includes the oscillator or resonator to be used. This is effective when debugging with a clock with a different frequency from the clock already mounted (main system clock: 2.0 MHz to 10.0 MHz, subsystem clock: 32 kHz to 38.5 kHz).

A setting outline is shown in Figure 3-10. The settings of either (a) or (b) described in the following pages are required, depending on the type of clock to be used.

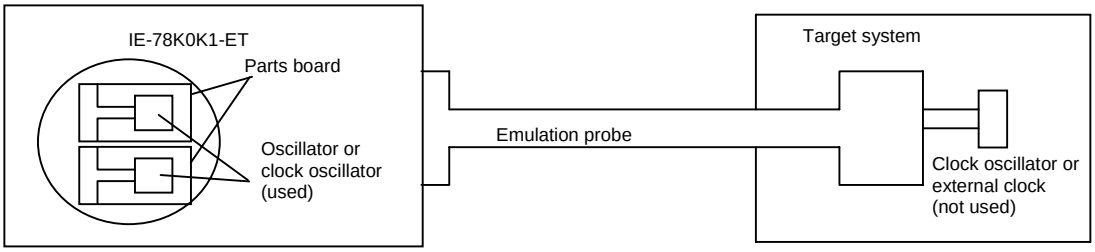
Set the main system clock in the following steps.

<1> When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select "Internal" in the area (Clock) for selecting the CPU clock source.

<2> After the debugger is activated, set the special-function register MCM0 to 1 to switch the CPU operating clock from Ring-OSC (default) to the clock mounted by user.

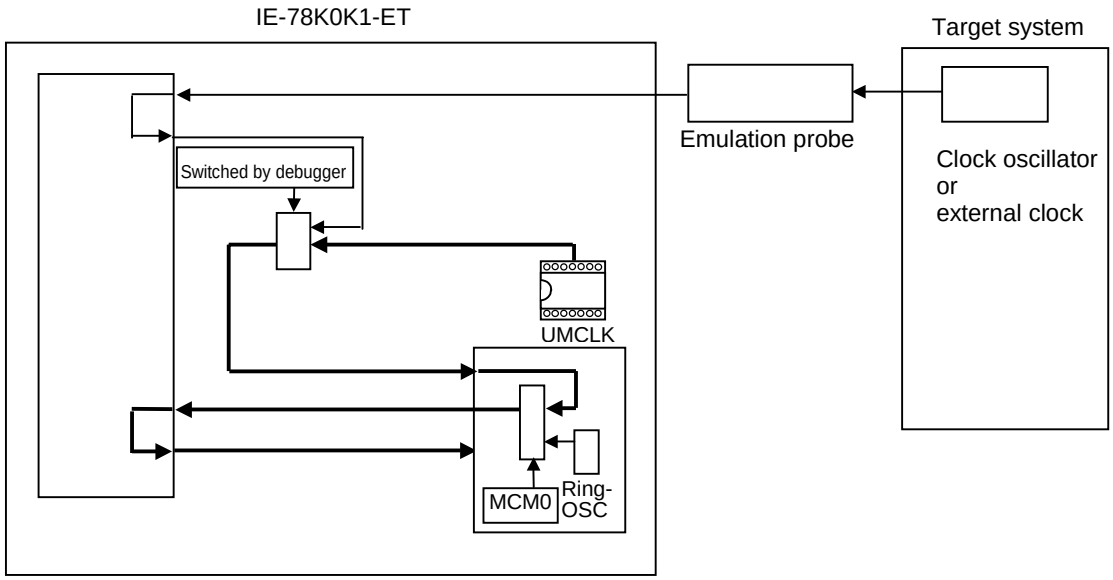
Set SW1 to the I side for the subsystem clock to set the clock mounted by user.

Figure 3-10. When Using Clock Mounted by User



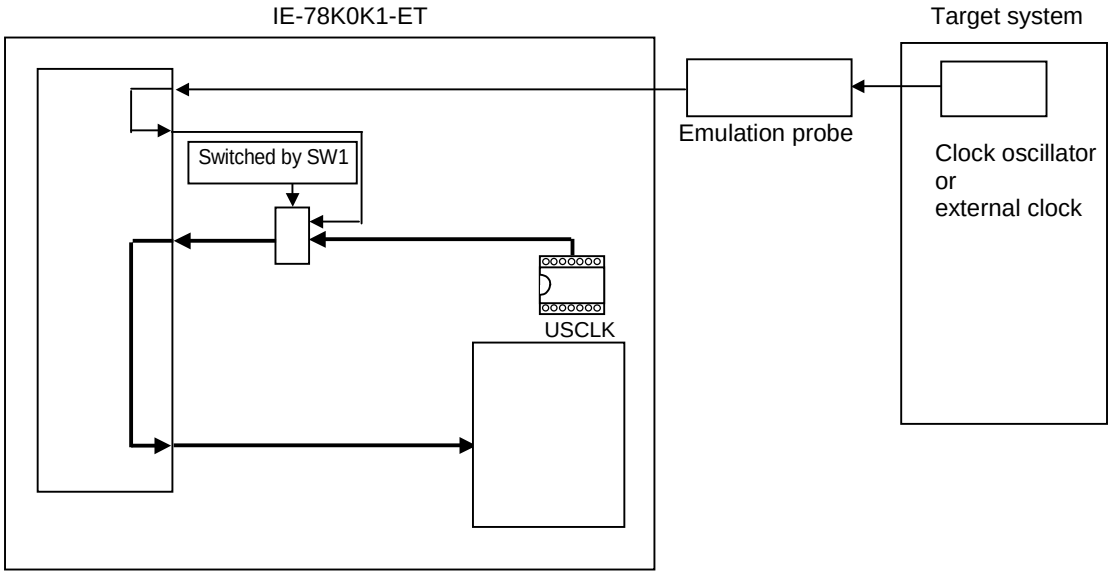
Remark The clock that is supplied by the IE-78K0K1-ET's oscillator (encircled in the figure) is used.

Figure 3-11. Flow of Clock (Main System Clock)



Remark The flow of the clock is indicated by the bold line.

Figure 3-12. Flow of Clock (Subsystem Clock)



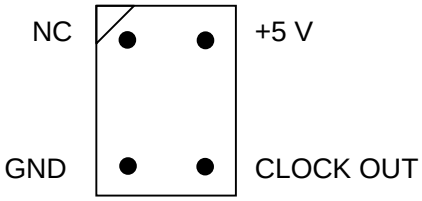
Remark The flow of the clock is indicated by the bold line.

(a) When using a crystal oscillator

♦ Necessary items

• Crystal oscillator (with pin configuration as shown in Figure 3-13)

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



<Procedure>

<1> Prepare the IE-78K0K1-ET.

<2> Remove the crystal oscillator or parts board from the socket (marked UMCLK or USCLK) on the IE-78K0K1-ET.

<3> Mount the new crystal oscillator in the socket from which the oscillator was removed in <2> above (UMCLK or USCLK). At this time, insert the oscillator into the socket aligning the pins as indicated below.

Figure 3-14. Crystal Oscillator and Socket Pins

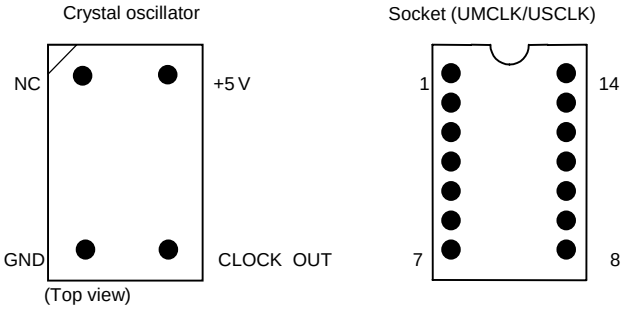


Table 3-4. Crystal Oscillator Pins and Socket Pin Numbers

Crystal Oscillator Pin	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
+5 V	14

(b) When using a ceramic or crystal resonator

♦ Necessary items

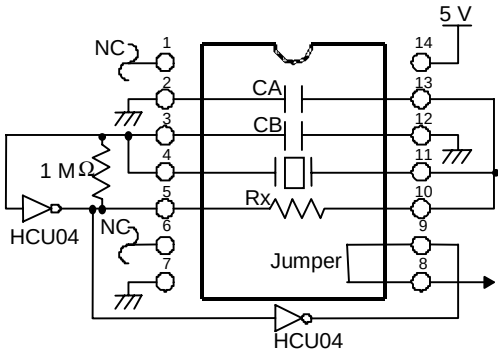
- Parts board
- Ceramic or crystal resonator
- Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<Procedure>

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

Figure 3-15. Connections on Parts Board

Parts board (UMCLK/USCLK)



Remark NC: No Connection

Table 3-5. Connection Pins and Parts Board

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

<2> Prepare the IE-78K0K1-ET.

<3> Remove the crystal oscillator that is mounted in the IE-78K0K1-ET's UMCLK socket.

<4> Connect the parts board (<1> above) to the socket (UMCLK or USCLK) 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 or USCLK socket is wired as shown in Figure 3-15 above.

(3) Input a clock from the target system

The external clock pulse signal on the target system is used via an emulation probe. Therefore this clock can be used only when an external clock is connected on the target system

A setting outline is shown in Figure 3-16.

Set the main system clock in the following steps.

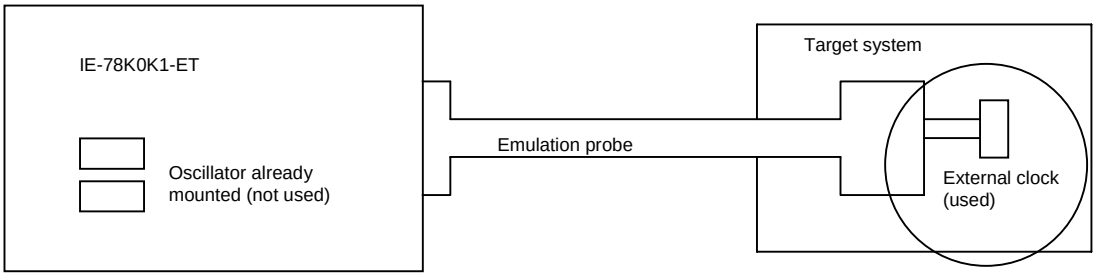
<1> When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select "External" in the area (Clock) for selecting the CPU clock source.

<2> After the debugger is activated, set the special-function register MCM0 to 1 to switch the CPU operating clock from Ring-OSC (default) to the clock input from the target system.

Set SW1 to the E side for the subsystem clock to set the clock from the target system.

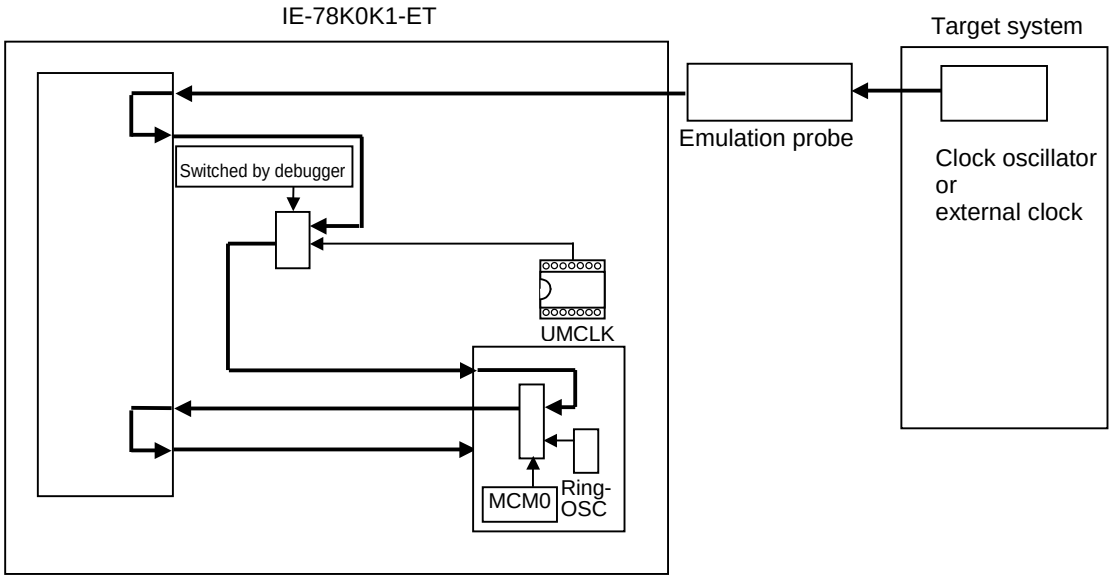
Caution The clock input from the target should be a rectangular wave.

Figure 3-16. When Using Clock Input from Target System (Main System Clock)



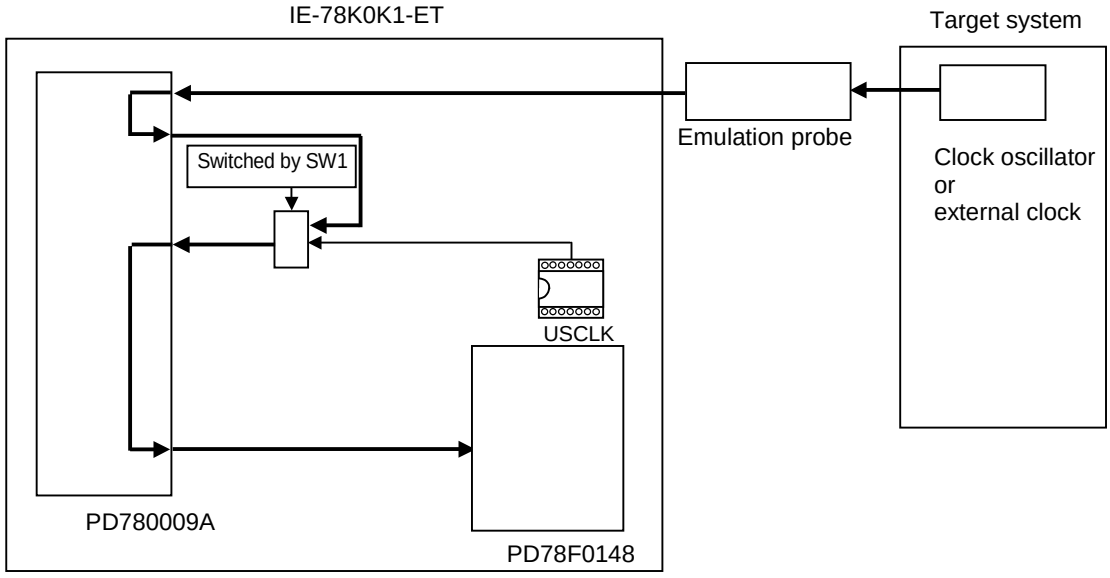
Remark The external clock that is supplied by the target system (encircled in the figure) is used.

Figure 3-17. Flow of Clock (Main System Clock)



Remark The flow of the clock is indicated by the bold line.

Figure 3-18. Flow of Clock (Subsystem Clock)



Remark The flow of the clock is indicated by the bold line.

(4) When using Ring-OSC

This clock can be selected only for the main system clock.

When the IE system is activated, Ring-OSC (240 kHz) is selected as the CPU operating clock.

A setting outline is shown in Figure 3-19.

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

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

Figure 3-19. When Using Ring-OSC (Main System Clock)

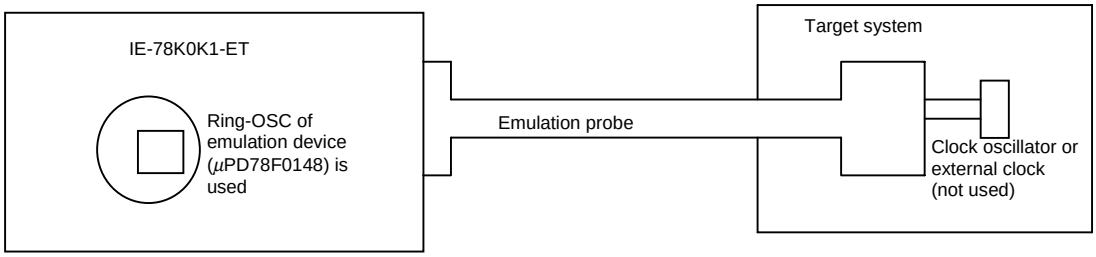
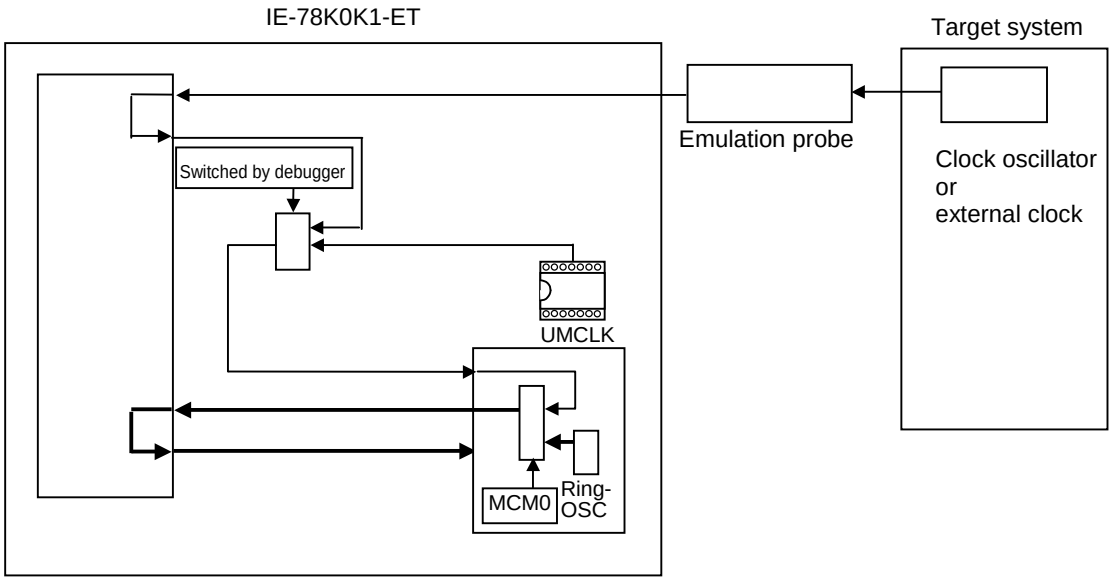


Figure 3-20. Flow of Clock (Main System Clock)



Remark The flow of the clock is indicated by the bold line.

3.3 External Trigger Settings

(1) EXTOUT

A low-level pulse is output from the EXTOUT pin on the emulation board for 1.3 μs upon the occurrence of a break event.

Caution Because this is an open-drain output, a pull-up resistor should be connected on the target system.

(2) EXTIN

An event signal can be input from the EXTIN pin on the emulation board. Input a high-level pulse signal for 2 CPU operating clocks or longer.

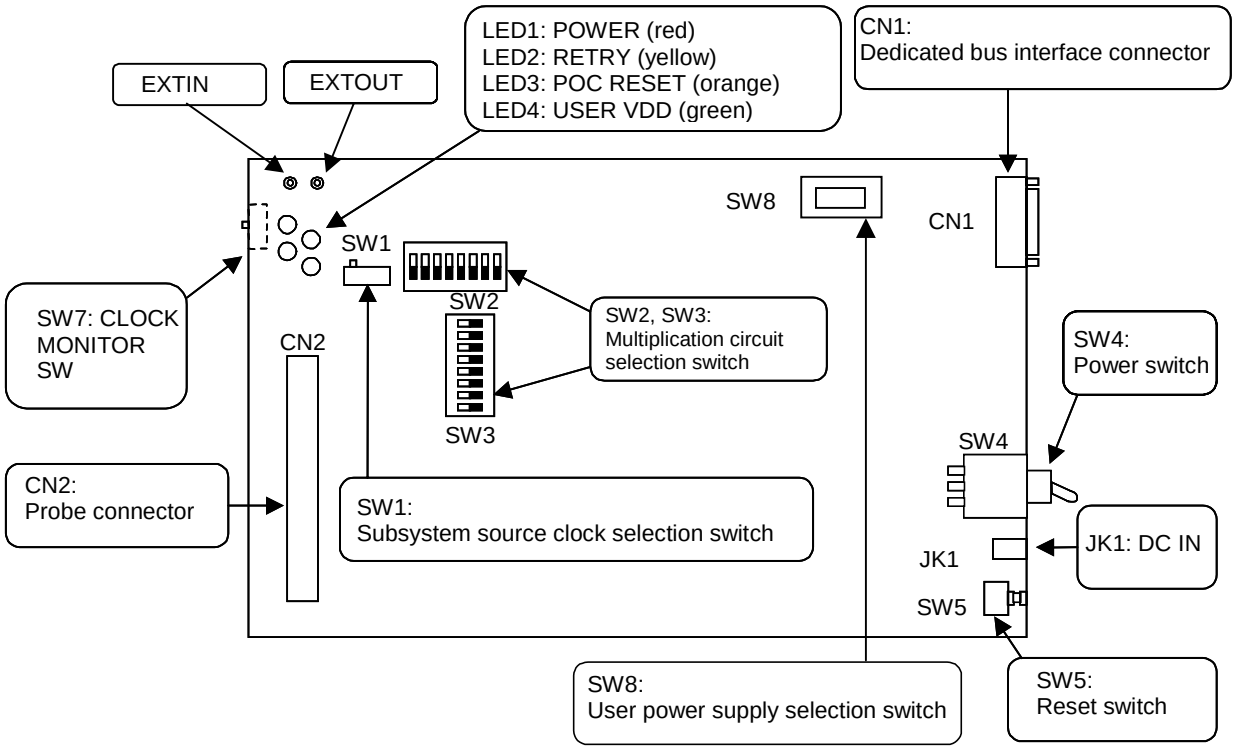
Caution Satisfy the following electrical specifications.

Table 3-6. Electrical Specifications

Parameter	MIN. [V]	MAX. [V]
Input voltage, high	Target voltage × 0.7	Target voltage
Input voltage, low	0	Target voltage × 0.3

See the ID78K Series Integrated Debugger Ver.2.30 or Later Operation User's Manual (U15181E) for descriptions of usage.

Figure 3-21. Package Drawing of Emulation board (S-780148 Board)



3.4 Multiplication Circuit Selection Switches (SW2, SW3) Settings

Change the settings of the multiplication circuit as shown in Table 3-7 according to the operating frequency of the main system clock.

Table 3-7. Settings of Multiplication Circuit

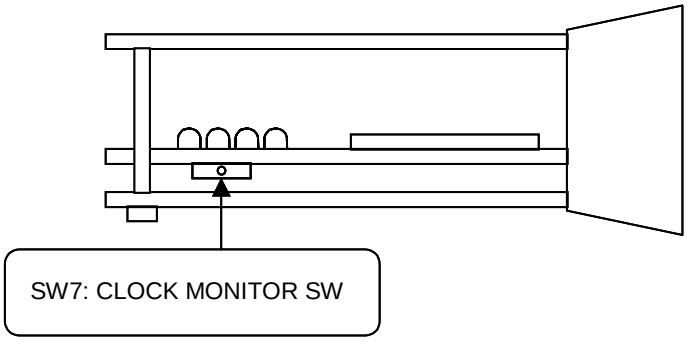
Main System Clock Frequency	SW2	SW3
2.0 MHz to less than 2.5 MHz	1 ON (Other: OFF)	1 ON (Other: OFF)
2.5 MHz to less than 3.5 MHz	2 ON (Other: OFF)	2 ON (Other: OFF)
3.5 MHz to less than 5.0 MHz	3 ON (Other: OFF)	3 ON (Other: OFF)
5.0 MHz to less than 6.5 MHz	4 ON (Other: OFF)	4 ON (Other: OFF)
6.5 MHz to less than 9 MHz	5 ON (Other: OFF)	5 ON (Other: OFF)
9 MHz to 10 MHz (factory setting)	6 ON (Other: OFF)	6 ON (Other: OFF)

3.5 Switch for Clock Monitor (SW7)

A switch for clock monitor emulation (SW7) is mounted on the IE-78K0K1-ET board.

Emulation for when the clock is stopped can be performed by pressing SW7.

Figure 3-22. Switch for Clock Monitor



3.6 Settings of Mask Options

The following mask options are provided in the IE-78K0K1-ET.

- Ring-OSC
- POC ON/OFF and detection voltage 2.85 V, 3.5 V
- P60 to P63 (these ports are not provided in the μPD780101, 780102, 780103 and 78F0103)

Set the mask options in the integrated debugger.
Open the mask option window from [Option] → [Mask Option] and set the mask options.
Refer to the ID78K Series Integrated Debugger Ver.2.30 or Later Operation User's Manual (U15185E) for details of the settings.

• RINGMSK	NONMSK:	Ring-OSC stop by software enabled Watchdog timer stop enabled
	MSK:	Ring-OSC by software disabled Watchdog timer stop disabled
• POC	ON:	POC function ON
	OFF:	POC function OFF
• POCV	2.85 V:	POC detection voltage 2.85 V
	3.5 V:	POC detection voltage 3.5 V
• P60 to P63	ON:	Pulled up by mask option resistor
	OFF:	No mask option resistor

3.7 Emulation of POC and LVI Functions

Emulation of the POC (power-on clear) and LVI (low-voltage detection) functions is implemented by detecting a voltage input from the VDD pin of the target device.
Apply VDD (target voltage) from the target system via the emulation probe (apply in the same manner when operated at 5 V).

3.8 Low-Voltage Emulation Settings

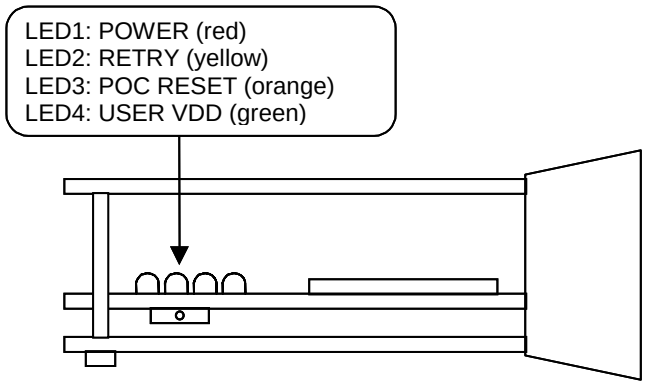
Low-voltage emulation is implemented by detecting the voltage input from the VDD pin of the target device.
Apply VDD (target voltage) from the target system via the emulation probe (apply in the same manner when operated at 5 V).

3.9 LED Specifications

The LED lighting specifications are as follows.

- LED1: POWER (red): Power is being applied to the IE-78K0K1-ET
- LED2: RETRY (yellow): A retry is being performed
- LED3: POC RESET (orange): POC is being reset
- LED4: USER VDD (green): Power for the target system is being detected

Figure 3-23. LED Specifications



3.10 User Power Supply Selection Switch (SW8) Settings

Set SW8 according to the power supply voltage of the target system.

Table 3-8. Settings of User Power Supply Selection Switch (SW8)

Target System Voltage	SW8
2.7 V to less than 4 V	1 side
4 V to 5.5 V	3 side (factory setting)

CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes the differences between the signal lines of the target device and those of the IE-78K0K1-ET's target interface circuit.

The target device consists of CMOS circuits, whereas the IE-78K0K1-ET's target interface circuit consists of emulation circuits such as the emulation CPU, TTL, and CMOS-IC.

At the time of debugging by connecting the IE system and the target system, the IE system performs emulation as if the actual target device is operating on the target system, however, in reality, it is the IE system that performs the emulation, thus producing slight differences.

(a) Signals that are input/output from emulation CPU μPD78F0148
(b) Signals that are input/output from emulation CPU μPD780009A
(c) Other signals

Regarding the signals in (a) to (c) above, the circuits of the IE system are shown below.

(1) When μPD780101, 780102, 780103, and 78F0103 are emulated

(a) Signals that are input/output from emulation CPU μPD78F0148

- P03 to P00
- P17 to P10
- P23 to P20
- P33 to P30
- P120
- P130
- AVREF

(b) Signals that are input/output from emulation CPU μPD780009A

None

(c) Other signals

- X1, X2, $\overline{\text{RESET}}$, VDD, IC/VPP, VSS, AVSS

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

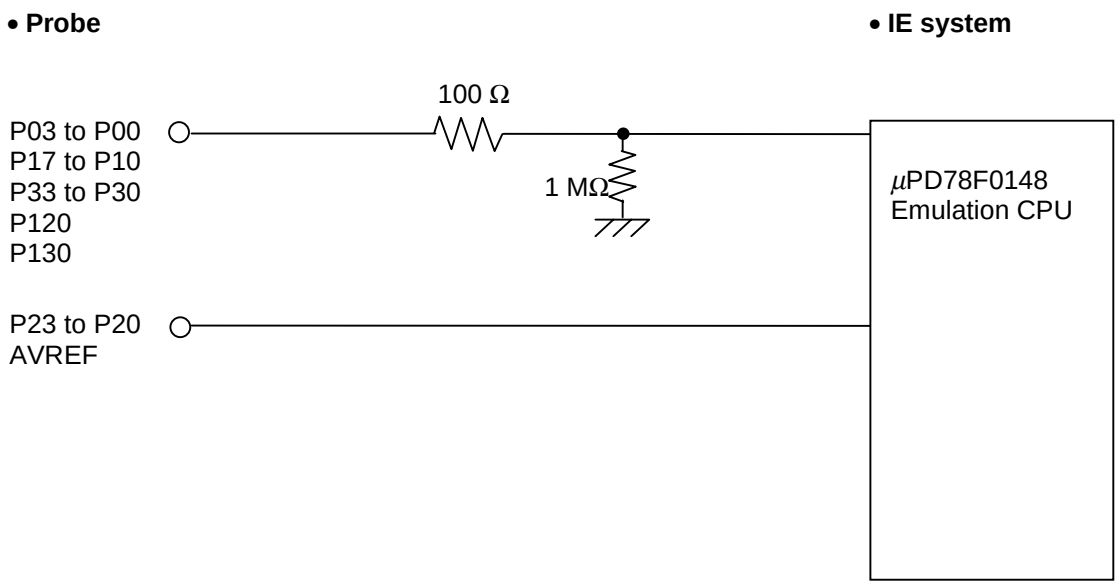


Figure 4-2. Equivalent Circuit of Emulation Circuit (c)

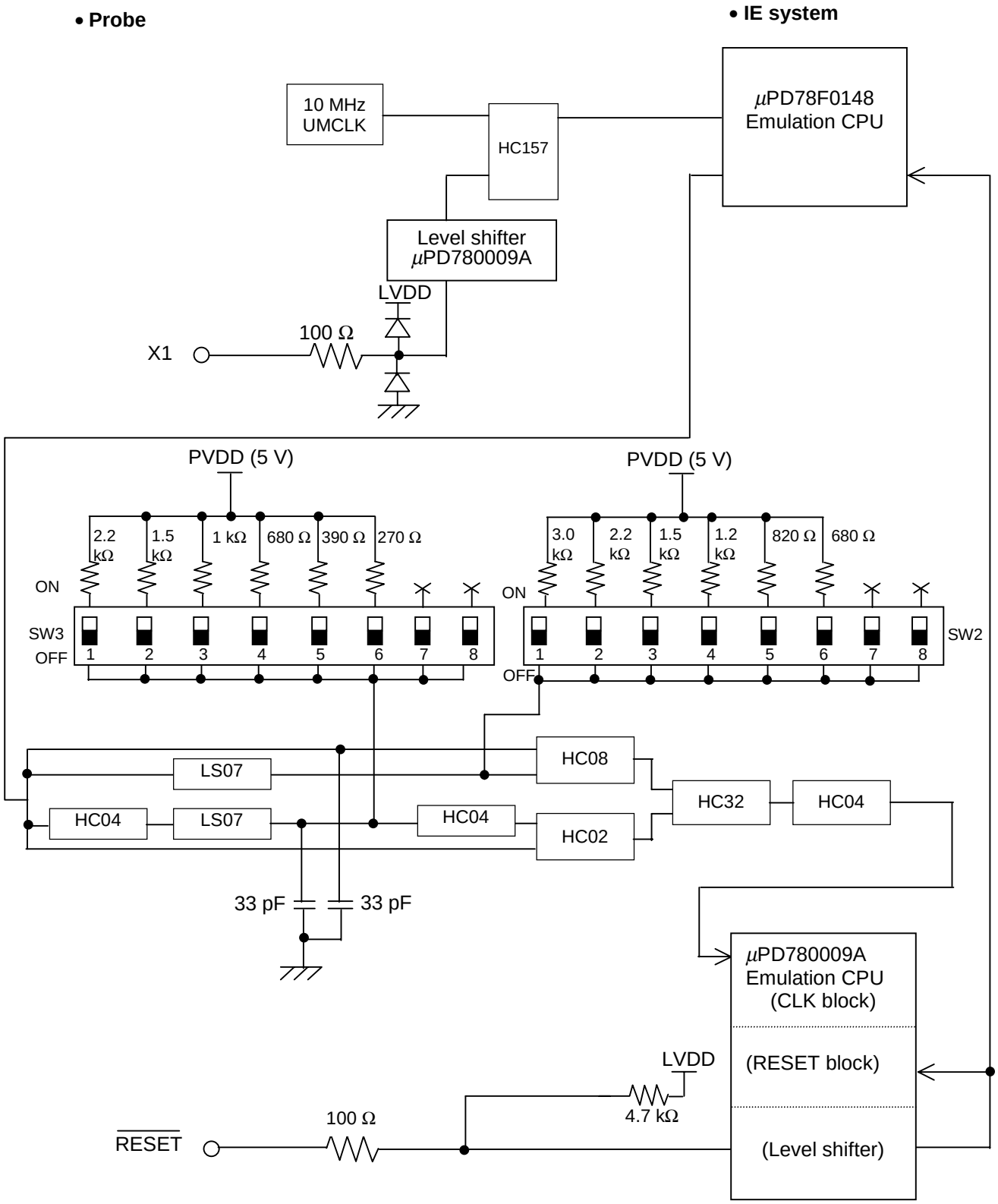
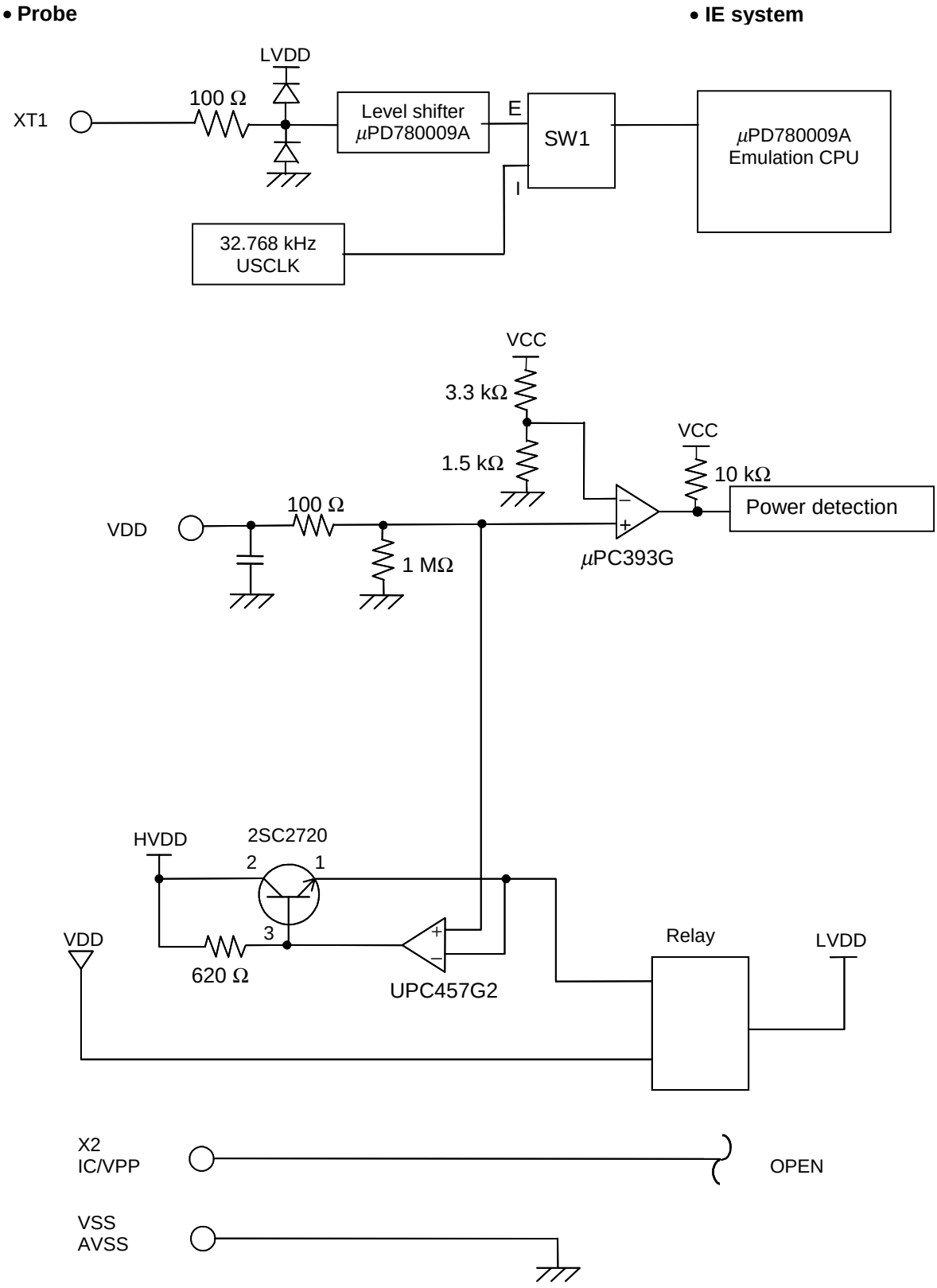


Figure 4-3. Equivalent Circuit of Emulation Circuit (c)



(2) When μPD780111, 780112, 780113, and 78F0114 are emulated

(a) Signals that are input/output from emulation CPU μPD78F0148

- P01 to P00
- P17 to P10
- P27 to P20
- P33 to P30
- P73 to P70
- P120
- P130
- AVREF

(b) Signals that are input/output from emulation CPU μPD780009A

- P63 to P60

(c) Other signals

- X1, X2, XT1, XT2, $\overline{\text{RESET}}$, IC/VPP, VDD, VSS, EVDD, EVSS, AVSS

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

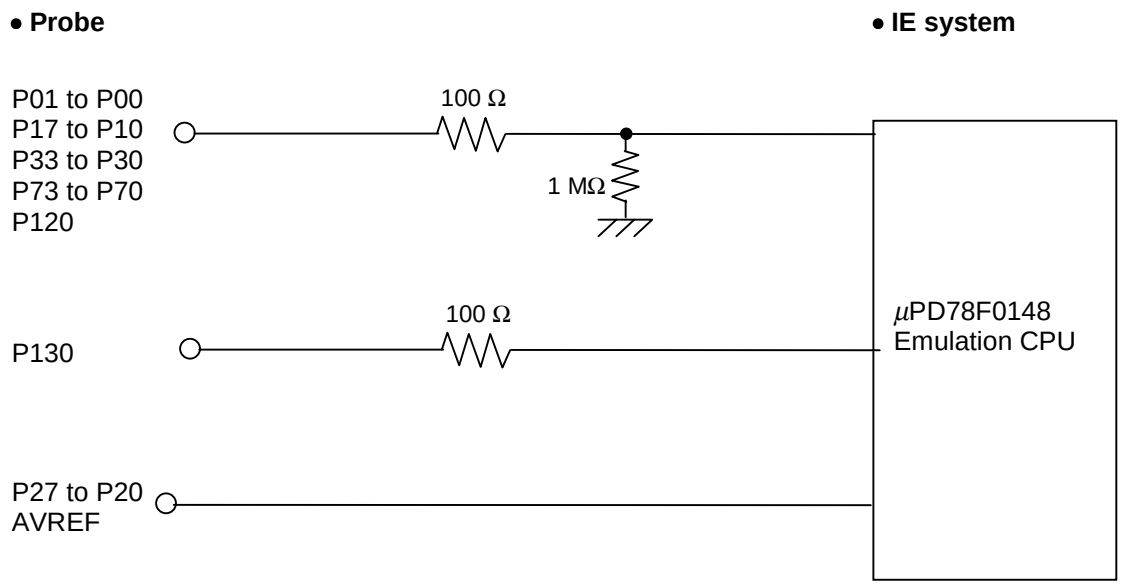


Figure 4-5. Equivalent Circuit of Emulation Circuit (b)

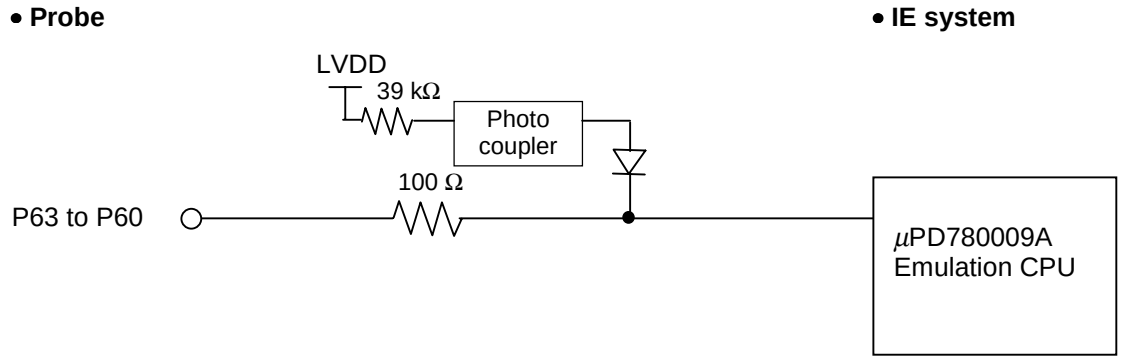


Figure 4-6. Equivalent Circuit of Emulation Circuit (c)

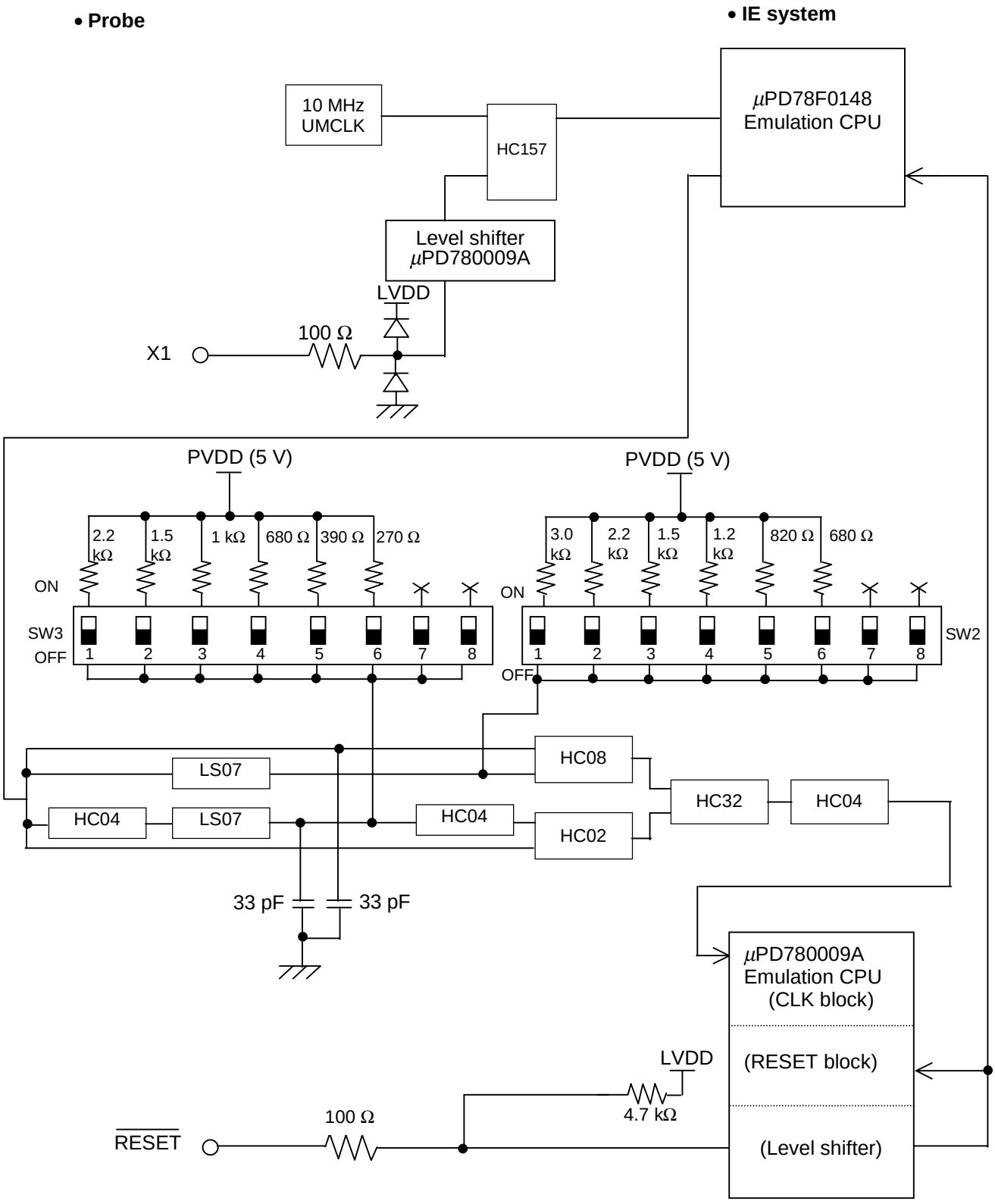
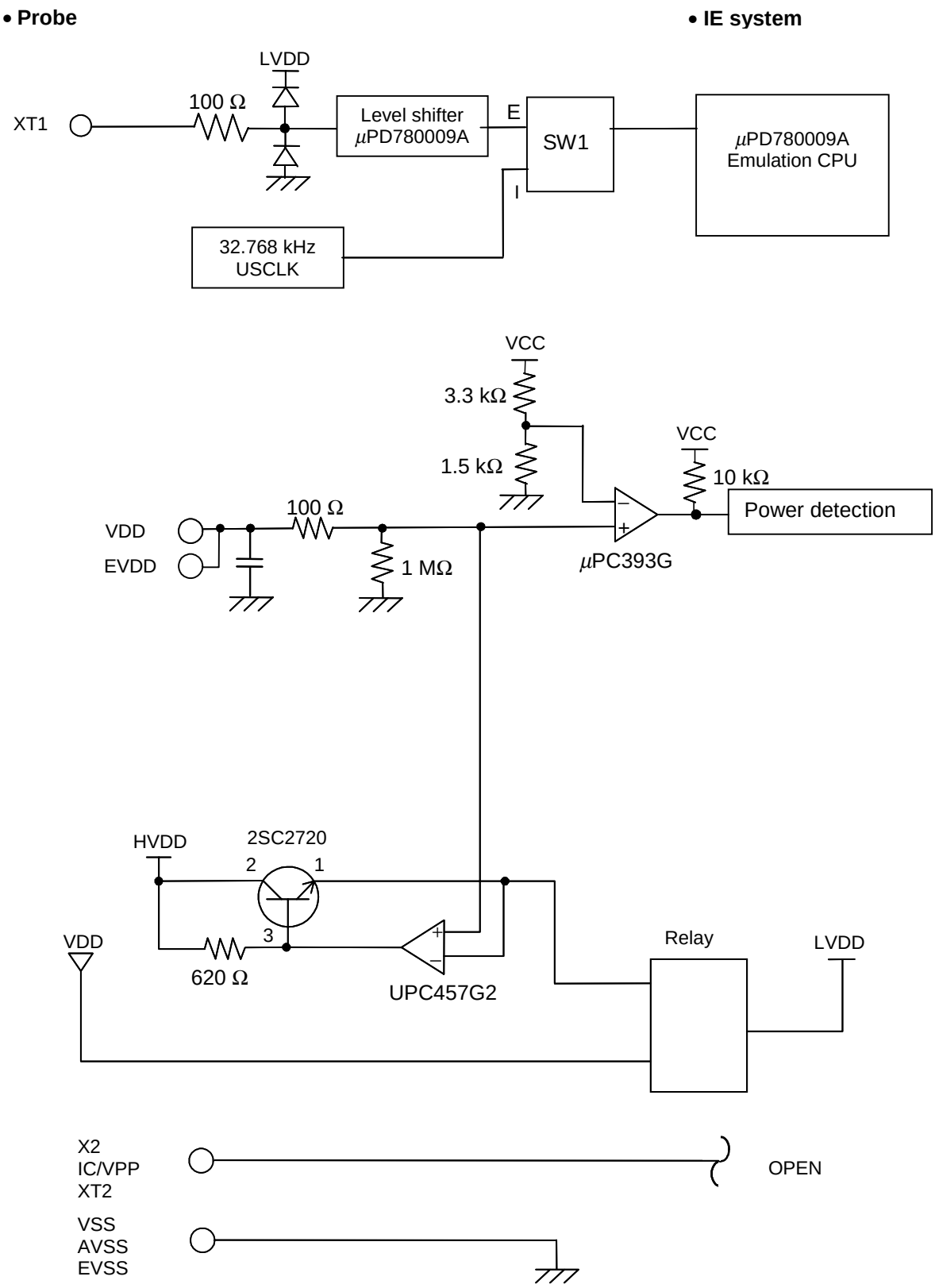


Figure 4-7. Equivalent Circuit of Emulation Circuit (c)



(3) When μPD780120, 780121, 780123, 780124, and 78F0124 are emulated

(a) Signals that are input/output from emulation CPU μPD78F0148

- P03 to P00
- P17 to P10
- P27 to P20
- P33 to P30
- P77 to P70
- P120
- P130
- P140
- AVREF

(b) Signals that are input/output from emulation CPU μPD780009A

- P63 to P60

(c) Other signals

- X1, X2, XT1, XT2, $\overline{\text{RESET}}$, IC/VPP, VDD, VSS, EVDD, EVSS, REGC, AVSS

Figure 4-8. Equivalent Circuit of Emulation Circuit (a)

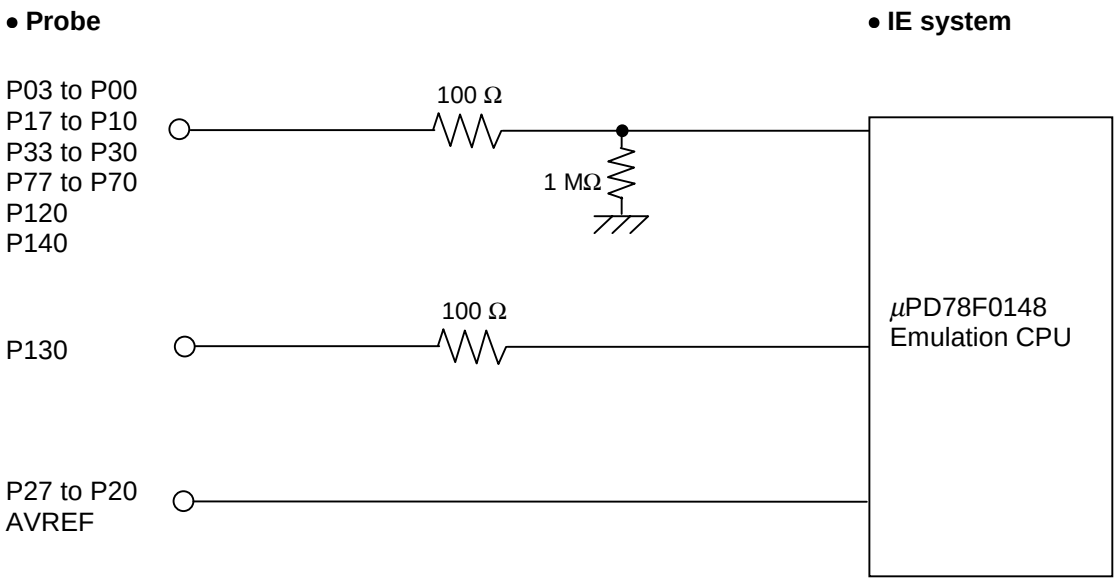


Figure 4-9. Equivalent Circuit of Emulation Circuit (b)

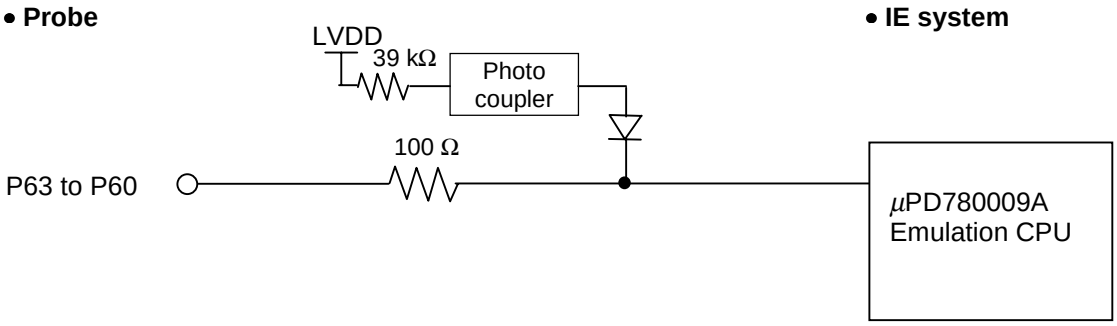


Figure 4-10. Equivalent Circuit of Emulation Circuit (c)

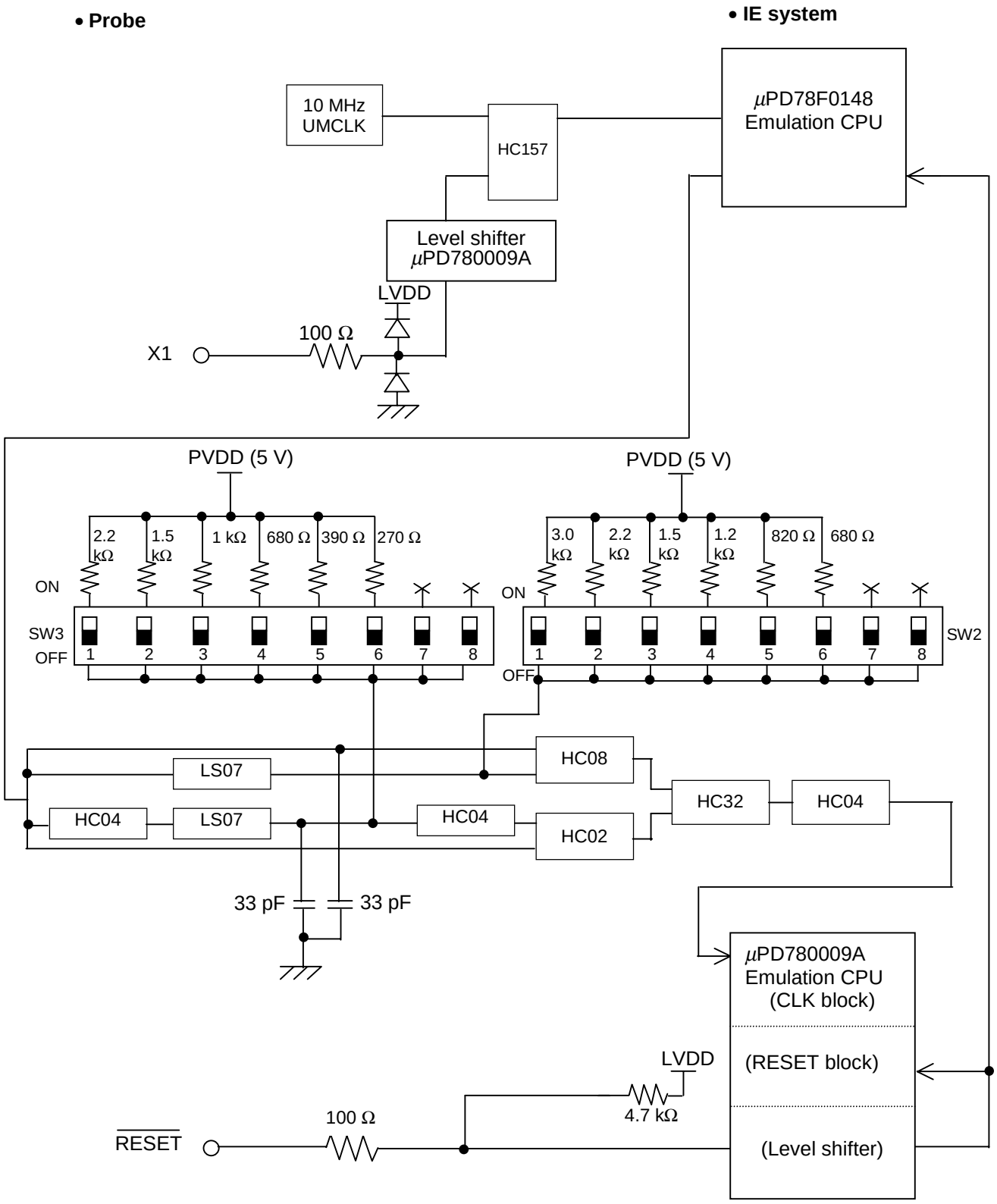
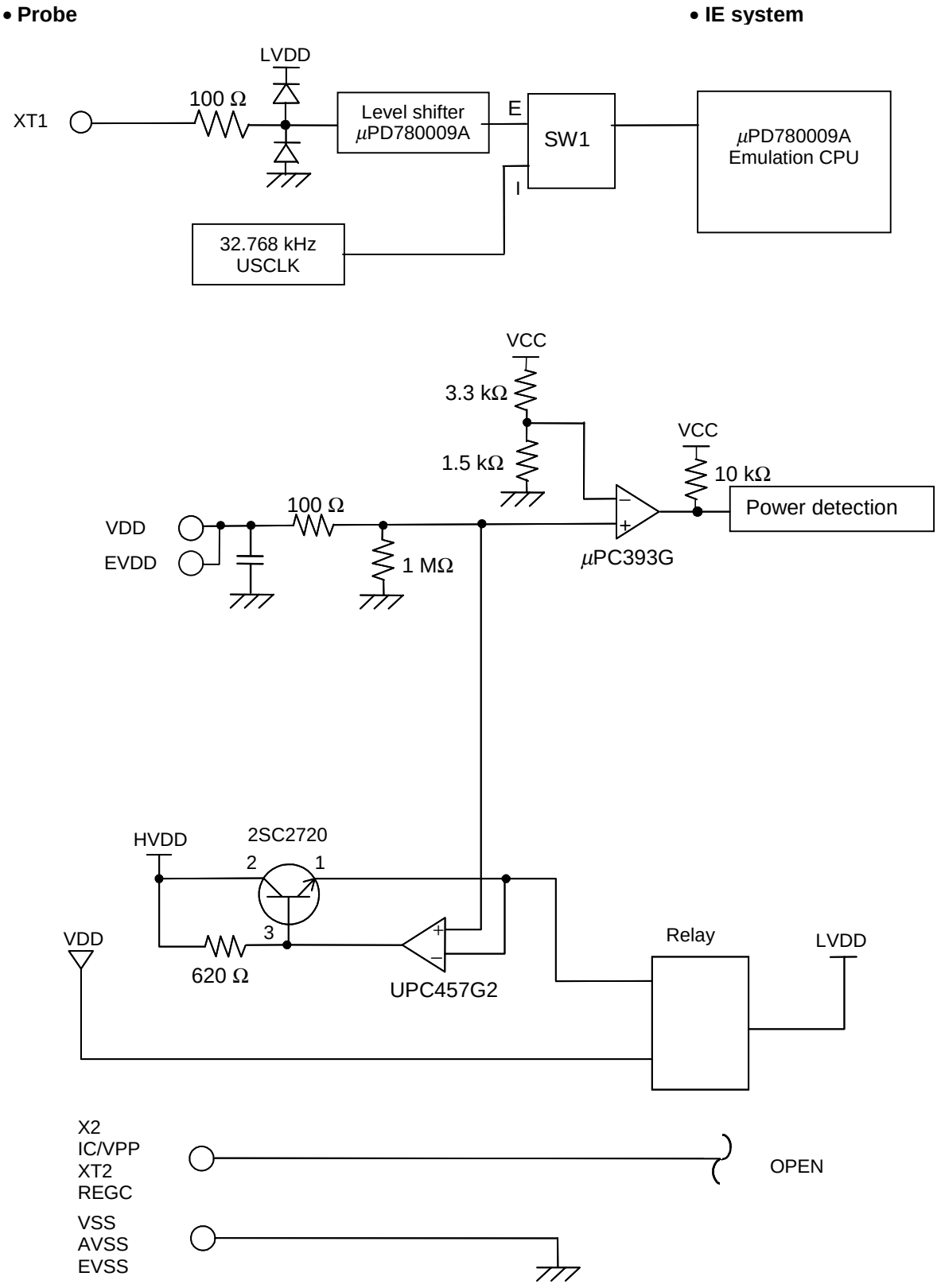


Figure 4-11. Equivalent Circuit of Emulation Circuit (c)



(4) When μPD780131, 780132, 780133, 780134, 780136, 780138, 78F0134, and 78F0138 are emulated

(a) Signals that are input/output from emulation CPU μPD78F0148

- P06 to P00
- P17 to P10
- P27 to P20
- P33 to P30
- P77 to P70
- P120
- P130
- P141 and P140
- AVREF

(b) Signals that are input/output from emulation CPU μPD780009A

- P43 to P40
- P53 to P50
- P63 to P60

(c) Other signals

- X1, X2, XT1, XT2, $\overline{\text{RESET}}$, IC/VPP, VDD, VSS, EVDD, EVSS, REGC, AVSS

Figure 4-12. Equivalent Circuit of Emulation Circuit (a)

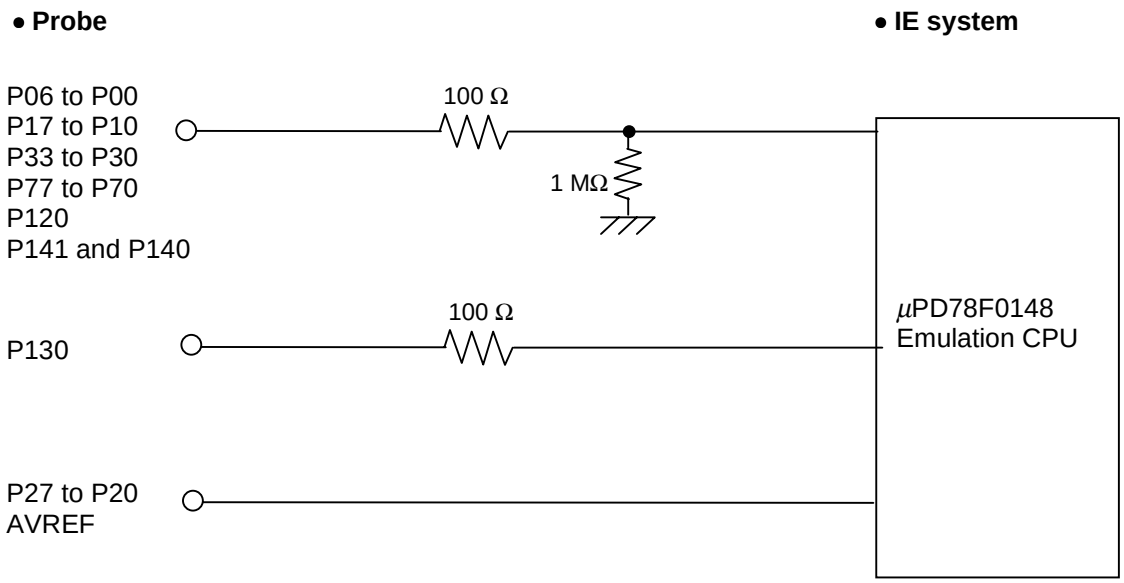


Figure 4-13. Equivalent Circuit of Emulation Circuit (b)

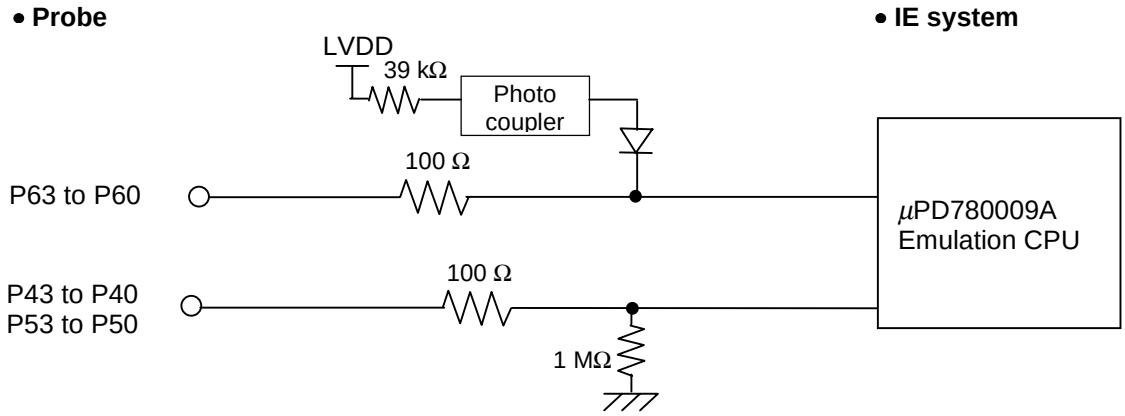


Figure 4-14. Equivalent Circuit of Emulation Circuit (c)

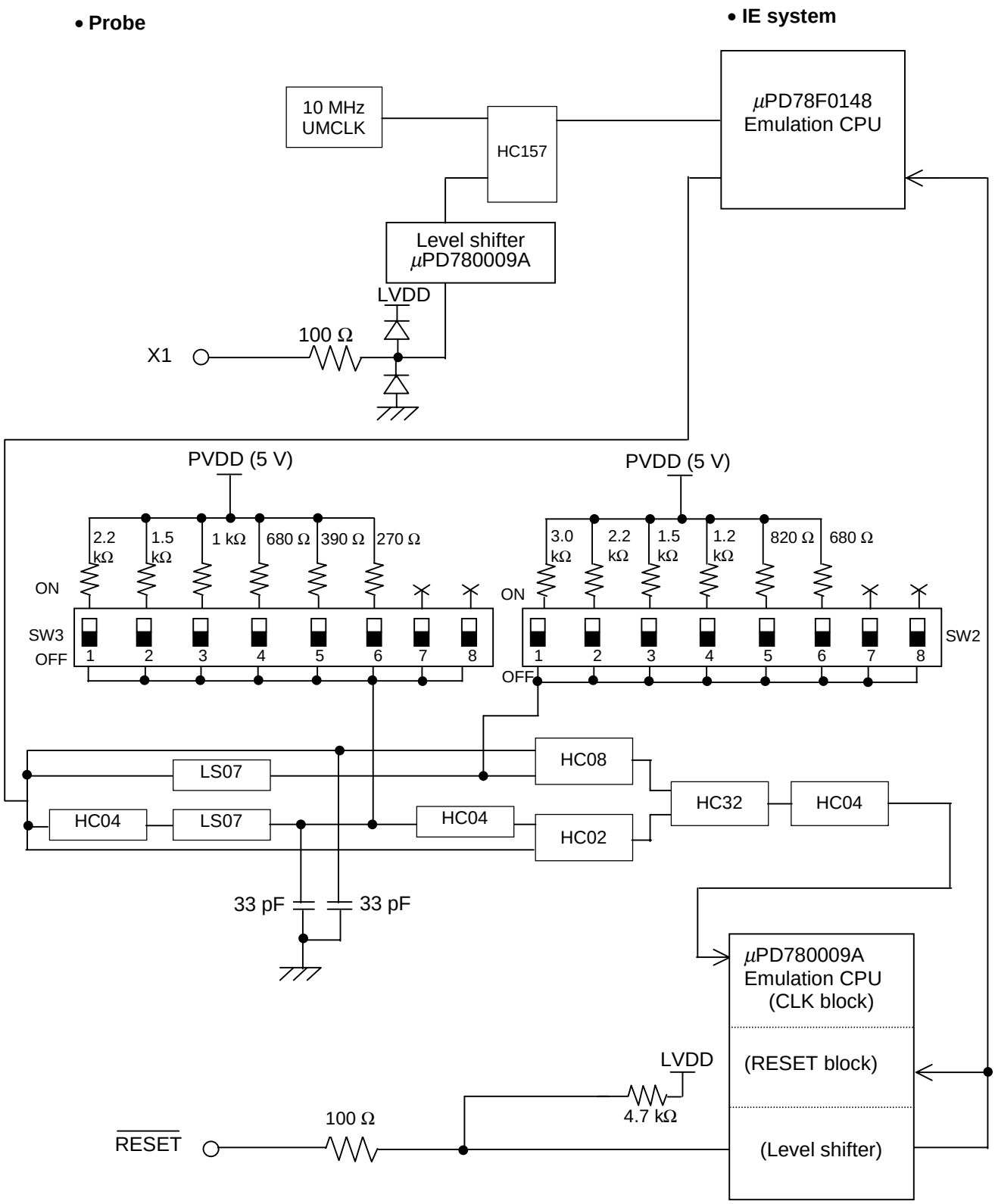
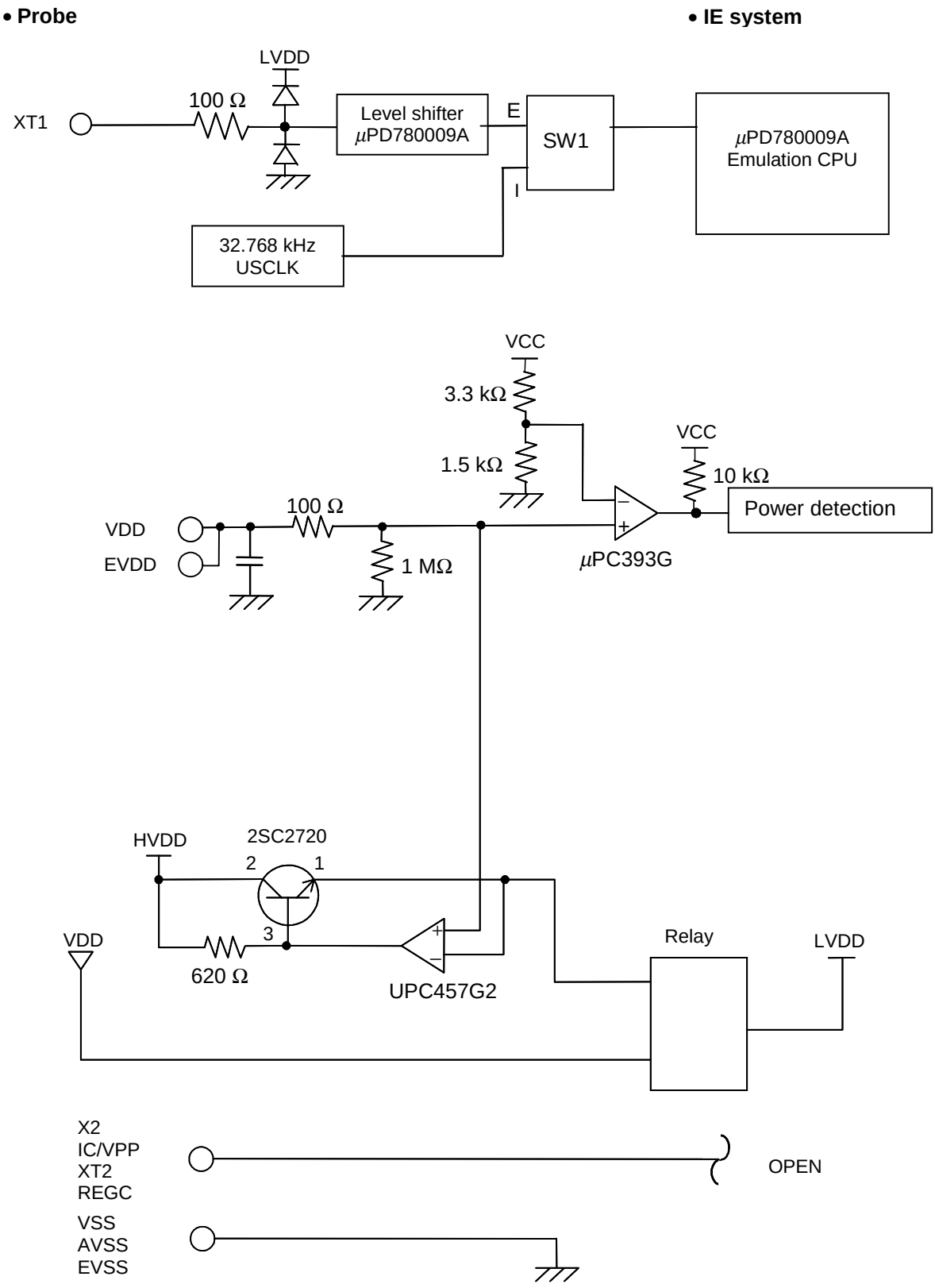


Figure 4-15. Equivalent Circuit of Emulation Circuit (c)



(5) When μPD780143, 780144, 780146, 780148, and 78F0148 are emulated

(a) Signals that are input/output from emulation CPU μPD78F0148

- P06 to P00
- P17 to P10
- P27 to P20
- P33 to P30
- P77 to P70
- P120
- P130
- P145 to P140
- AVREF

(b) Signals that are input/output from emulation CPU μPD780009A

- P47 to P40
- P57 to P50
- P67 to P60

(c) Other signals

- X1, X2, XT1, XT2, $\overline{\text{RESET}}$, IC/VPP, VDD, VSS, EVDD, EVSS, REGC, AVSS

Figure 4-16. Equivalent Circuit of Emulation Circuit (a)

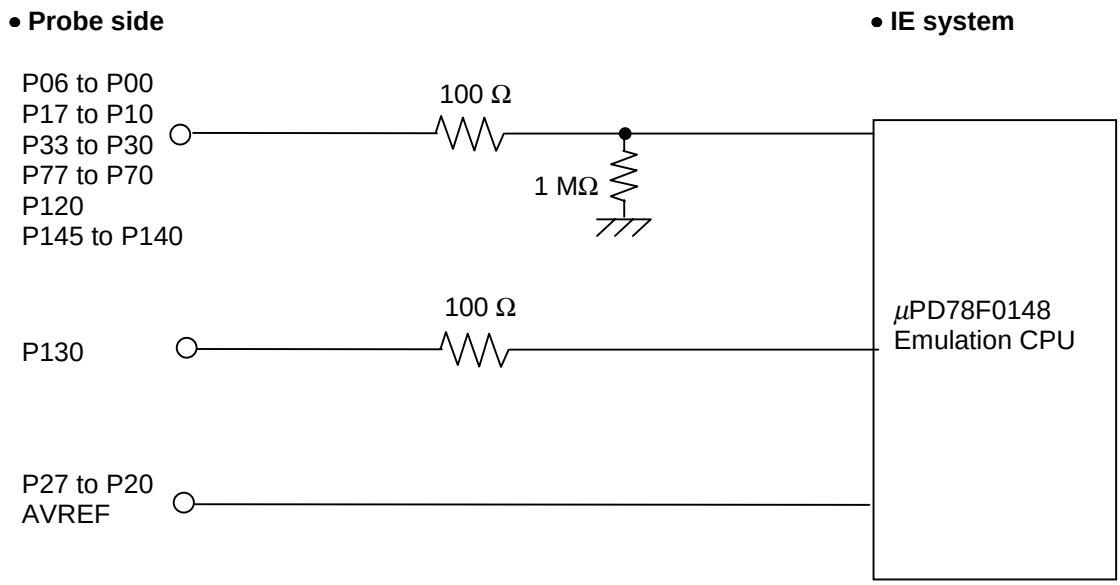


Figure 4-17. Equivalent Circuit of Emulation Circuit (b)

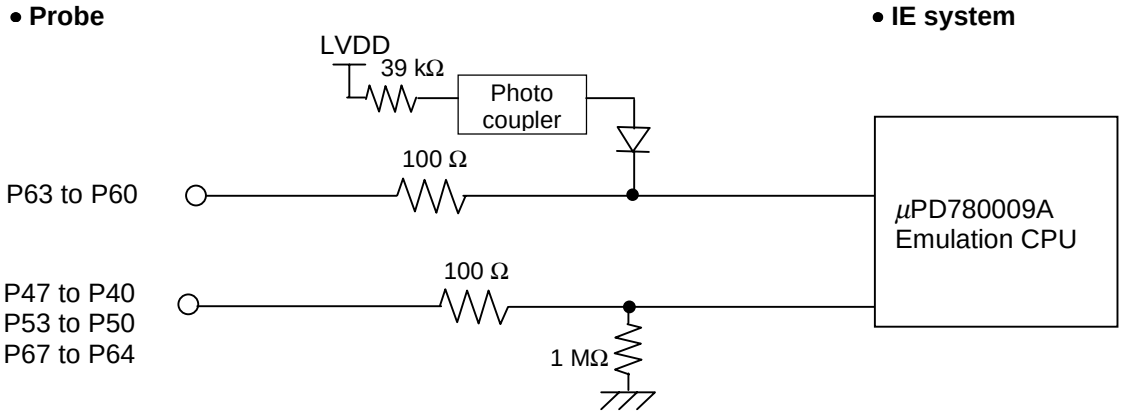


Figure 4-18. Equivalent Circuit of Emulation Circuit (c)

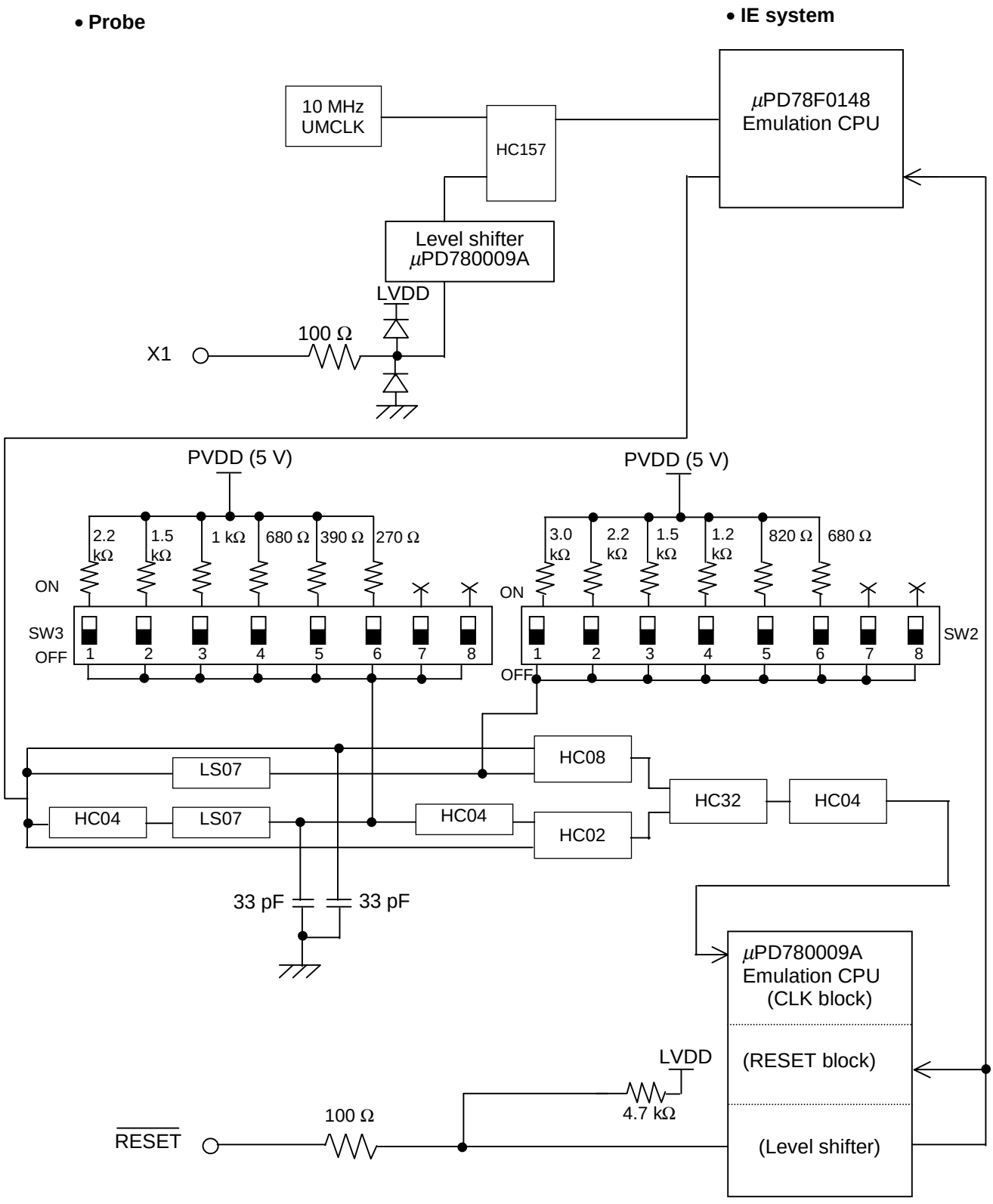
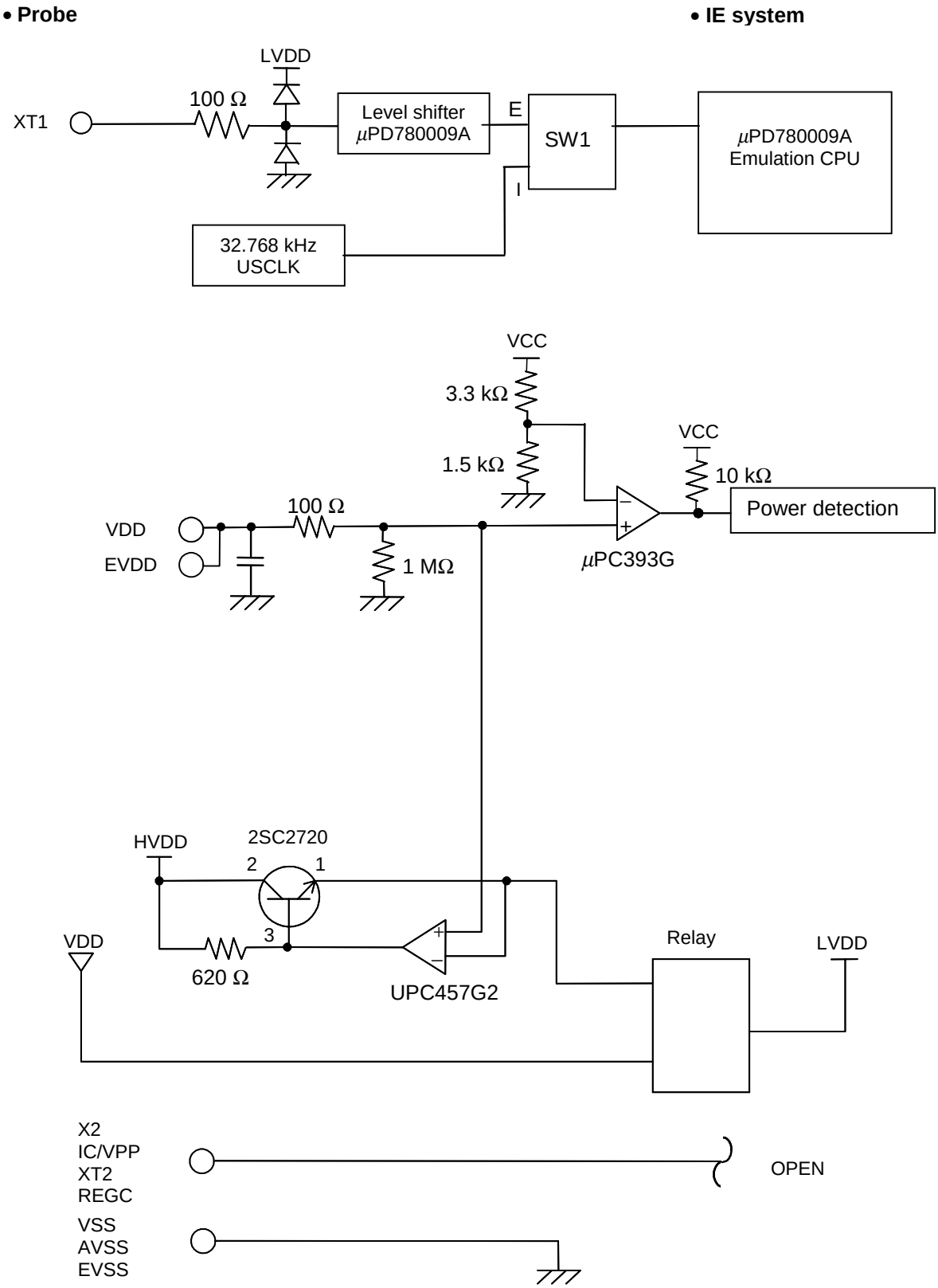


Figure 4-19. Equivalent Circuit of Emulation Circuit (c)



CHAPTER 5 CAUTIONS ON USE

Observe the following cautions on use to avoid damaging the emulator.

- Do not place heavy objects on the emulator, or apply pressure to it.
- Do not drop the emulator, or subject it to physical shock or vibration.
- Do not use the emulator in a hot, humid or dusty environment. Avoid using or storing the emulator in a location where it is exposed to direct sunlight.
- Avoid subjecting the emulator to sudden environmental changes (in temperature or humidity)
- Do not spill liquids on the emulator.
- Do not use the connectors or cables of a different product.

APPENDIX A EMULATION PROBE PIN CORRESPONDENCE TABLE

Table A-1. Pin Correspondence of 78010X PROBE Board + Emulation Probe

Emulation Probe Device Side	78010x PROBE Board CN1	IE-78K0K1-ET CN2
1	58	107
2	56	104
3	49	103
4	55	100
5	19	99
6	18	30
7	22	94
8	62	29
9	65	24
10	66	23
11	92	8
12	91	7
13	98	14
14	97	13
15	21	15
16	99	10
17	63	9
18	64	37
19	70	43
20	69	44
21	72	47
22	102	48
23	71	16
24	94	76
25	93	79
26	30	80
27	29	85
28	24	114
29	23	113
30	20	108

Remarks 1. The emulation probe is the NP-30MC.

The NP-30MC is a product of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the Emulation Probe Device Side column refer to the pin number of the target system.

3. The numbers in the 78010X PROBE Board CN1 column refer to the 78010X PROBE Board pin to be connected to the emulation probe.

4. The numbers in the IE-78K0K1-ET CN2 column refer to the IE-78K0K1-ET pin to be connected to the 78010X PROBE Board.

Table A-2. Pin Correspondence of 78011X PROBE Board + Emulation Probe

Emulation Probe Device Side	78011X PROBE Board CN1	IE-78K0K1-ET CN2
1	104	114
2	103	113
3	100	99
4	99	94
5	94	30
6	93	29
7	30	24
8	29	23
9	24	20
10	23	19
11	20	16
12	47	108
13	48	107
14	51	104
15	52	103
16	57	100
17	58	48
18	59	56
19	60	55
20	55	58
21	56	57
22	49	59
23	18	60
24	17	47
25	22	44
26	21	43
27	28	37
28	27	9
29	92	10
30	91	15
31	98	14
32	97	13
33	102	64
34	73	61
35	72	62
36	69	65
37	70	66
38	63	71
39	64	72
40	61	75
41	62	76
42	65	79
43	66	80
44	71	85

Remarks 1. The emulation probe is the NP-44GB, NP-44GB-TQ, or H44GB-TQ.

The NP-44GB, NP-44GB-TQ, and H44GB-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the Emulation Probe Device Side column refer to the pin number of the target system.

3. The numbers in the 78011X PROBE Board CN1 column refer to the 78011X PROBE Board pin to be connected to the emulation probe.

4. The numbers in the IE-78K0K1-ET CN2 column refer to the IE-78K0K1-ET pin to be connected to the 78011X PROBE Board.

Table A-3. Pin Correspondence of 78012X PROBE Board + Emulation Probe

Emulation Probe Device Side	78012X PROBE Board CN1	IE-78K0K1-ET CN2
1	118	114
2	114	113
3	108	99
4	104	94
5	100	93
6	94	30
7	30	29
8	29	24
9	24	23
10	20	20
11	16	19
12	10	16
13	6	108
14	33	107
15	37	104
16	43	103
17	47	100
18	51	51
19	57	48
20	59	47
21	55	44
22	49	56
23	45	55
24	41	58
25	35	57
26	31	59
27	4	60
28	8	43
29	14	37
30	18	9
31	22	10
32	28	15
33	92	8
34	91	7
35	98	14
36	102	13
37	106	74
38	112	69
39	116	70
40	87	63
41	83	64
42	77	61
43	73	62
44	69	65
45	63	66
46	61	71

47	65	72
48	71	75
49	75	76
50	79	79
51	85	80
52	89	85

Remarks 1. The emulation probe is the NP-H52GB-TQ.

The NP-H52GB-TQ is a product of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the Emulation Probe Device Side column refer to the pin number of the target system.

3. The numbers in the 78012X PROBE Board CN1 column refer to the 78012X PROBE Board pin to be connected to the emulation probe.

4. The numbers in the IE-78K0K1-ET CN2 column refer to the IE-78K0K1-ET pin to be connected to the 78012X PROBE Board.

Table A-4. Pin Correspondence of 78013X PROBE Board + Emulation Probe (1/2)

Emulation Probe Device Side	78013X PROBE Board CN1	IE-78K0K1-ET CN2
1	108	114
2	107	113
3	104	99
4	103	94
5	100	93
6	99	30
7	94	29
8	93	24
9	30	23
10	29	20
11	24	19
12	23	16
13	20	108
14	19	107
15	16	104
16	15	103
17	43	100
18	44	51
19	47	52
20	48	48
21	51	47
22	52	44
23	57	43
24	58	37
25	59	9
26	60	10
27	55	15
28	56	56
29	49	55
30	50	58
31	45	57
32	46	59

Remarks 1. The emulation probe is the NP-64GB-TQ, H64GB-TQ, H64GK, H64GK-TQ, H64GC, H64GC-TQ, or H64GC-TQ.

The NP-64GB-TQ, H64GB-TQ, H64GK, H64GK-TQ, H64GC, H64GC-TQ, and H64GC-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the Emulation Probe Device Side column refer to the pin number of the target system.

3. The numbers in the 78013X PROBE Board CN1 column refer to the 78013X PROBE Board pin to be connected to the emulation probe.

4. The numbers in the IE-78K0K1-ET CN2 column refer to the IE-78K0K1-ET pin to be connected to the 78013X PROBE Board.

Table A-4. Pin Correspondence of 78013X PROBE Board + Emulation Probe (2/2)

Emulation Probe Device Side	78013X PROBE Board CN1	IE-78K0K1-ET CN2
33	14	60
34	13	41
35	18	42
36	17	35
37	22	8
38	21	7
39	28	14
40	27	13
41	92	98
42	91	97
43	98	102
44	97	101
45	102	83
46	101	77
47	106	78
48	105	73
49	77	74
50	78	69
51	73	70
52	74	63
53	69	64
54	70	61
55	63	62
56	64	65
57	61	66
58	62	71
59	65	72
60	66	75
61	71	76
62	72	79
63	75	80
64	76	85

Remarks 1. The emulation probe is the NP-64GB-TQ, H64GB-TQ, H64GK, H64GK-TQ, H64GC, H64GC-TQ, or H64GC-TQ.

The NP-64GB-TQ, H64GB-TQ, H64GK, H64GK-TQ, H64GC, H64GC-TQ, and H64GC-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the Emulation Probe Device Side column refer to the pin number of the target system.

3. The numbers in the 78013X PROBE Board CN1 column refer to the 78013X PROBE Board pin to be connected to the emulation probe.

4. The numbers in the IE-78K0K1-ET CN2 column refer to the IE-78K0K1-ET pin to be connected to the 78013X PROBE Board.

Table A-5. Pin Correspondence of Emulation Probe

Emulation Probe Device Side	78014X PROBE Board CN1	IE-78K0K1-ET CN2	Emulation Probe Device Side	78014X PROBE Board CN1	IE-78K0K1-ET CN2
1	114	114	41	8	8
2	113	113	42	7	7
3	108	108	43	14	14
4	107	107	44	13	13
5	104	104	45	18	18
6	103	103	46	17	17
7	100	100	47	22	22
8	99	99	48	21	21
9	94	94	49	28	28
10	93	93	50	27	27
11	30	30	51	92	92
12	29	29	52	91	91
13	24	24	53	98	98
14	23	23	54	97	97
15	20	20	55	102	102
16	19	19	56	101	101
17	16	16	57	106	106
18	15	15	58	105	105
19	10	10	59	112	112
20	9	9	60	111	111
21	37	37	61	83	83
22	43	43	62	77	77
23	44	44	63	78	78
24	47	47	64	73	73
25	48	48	65	74	74
26	51	51	66	69	69
27	52	52	67	70	70
28	57	57	68	63	63
29	58	58	69	64	64
30	59	59	70	61	61
31	60	60	71	62	62
32	55	55	72	65	65
33	56	56	73	66	66
34	49	49	74	71	71
35	50	50	75	72	72
36	45	45	76	75	75
37	46	46	77	76	76
38	41	41	78	79	79
39	42	42	79	80	80
40	35	35	80	85	85

Remarks 1. The emulation probe is the NP-80GC, NP-80GC-TQ, H80GC-TQ, H80GK, or H80GK-TQ. The NP-80GC, NP-80GC-TQ, H80GC-TQ, H80GK, and H80GK-TQ are products of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the Emulation Probe Device Side column refer to the pin number of the target system.

3. The numbers in the 78014X PROBE Board CN1 column refer to the 78014X PROBE Board pin to be connected to the emulation probe.

4. The numbers in the IE-78K0K1-ET CN2 column refer to the IE-78K0K1-ET pin to be connected to the emulation probe.

APPENDIX B INTERFACE BOARD

This chapter explains the settings when connecting the interface board to the IE-78K0K1-ET.

B.1 General

The interface board included with the IE-78K0K1-ET is used mounted in the PCI slot the host machine.
Although this interface board supports PCI Rev.2.2, operation with PCI Rev.2.1 causes no problem.

Hardware resources used:

I/O address	0000H to FFFFH
Interrupt	Not used
Memory	80H bytes used
Power consumption	+5V, 300 mA max.

B.2 Installation

This section explains the overall flow of installation.

Be sure to refer to the document in the CD-ROM for details of other OSs and descriptions.

(1) Board setting

This interface board does not have jumpers and DIP switches.

(2) Mounting on the host machine

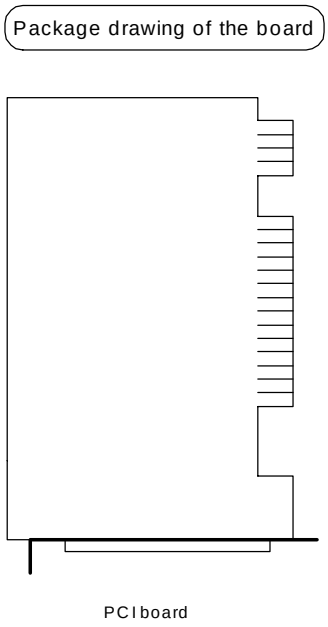
Confirm that the power supply to the host machine is disconnected, then mount the interface board in the PCI bus slot, in accordance with the directions in the user's manual of the host machine.

When mounting, fix the host machine and interface board tightly with screws.

(3) Installation of driver

Install the driver by Plug&Play.

Figure B-1. Package Drawing of Interface Board



B.2.1 Installing in Windows 98

This section explains the installation procedure when using Windows 98 with a PC/AT compatible machine or PC-9800 series computer as the host machine.

The procedure explained is applicable to any host machine model.

<Installation procedure>

Remark The CD-ROM drive is assumed as E: in the explanation below. If the NEC PC-9800 series is used, read E as C.

Step 1 Shutdown Windows 98 and turn off the power of the computer.

Shutdown Windows 98 and turn off the power of the host machine.

Furthermore, disconnect the power supply cable of the host machine to assure safety.

Step 2 Connect the interface board to an open PCI card slot.

Remove the cover of the host machine in accordance with the user's manual of the host machine, and connect the interface board to an open PCI card slot. At this time, be sure to fix them with screws tightly. In addition, check the connection again before mounting the cover.

Step 3 Turn on the power to the host machine and activate Windows 98.

Apply the power to the host machine and activate Windows 98.

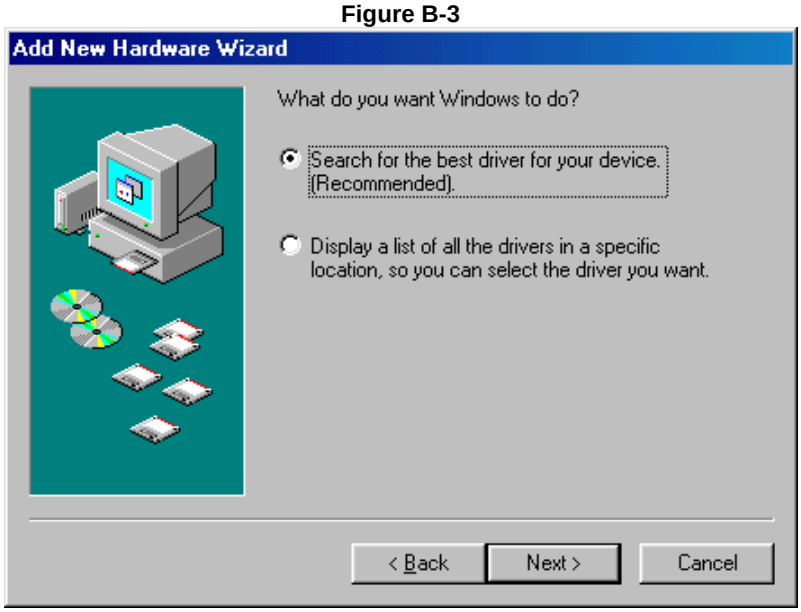
Step 4 Install the driver by Plug&Play of Windows 98.

(1) While Windows 98 is being activated, the [Add New Hardware Wizard] window appears. Click [Next].

Figure B-2

(2) Select “Search for the best driver for your device. (Recommended)” and click [Next].

Figure B-3



(3) Insert the attached CD-ROM in the CD-ROM drive.

(4) Select “Specify a location:” and input “E:\ID78K0NS\driver\WIN9X\PCI-IF”.

Alternately, click [Browse], select “E:\ID78K0NS\ driver \WIN9X\PCI-IF” from the drop-down list, and click [Next].

Figure B-4

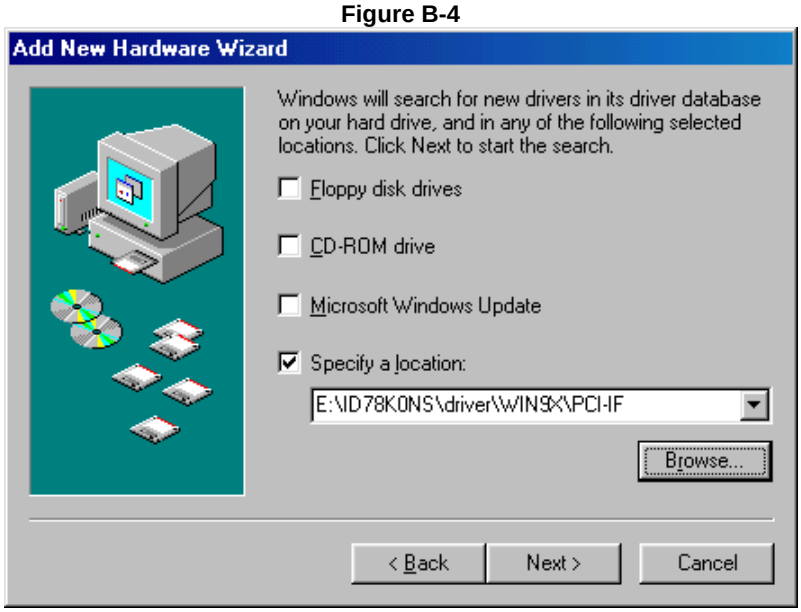
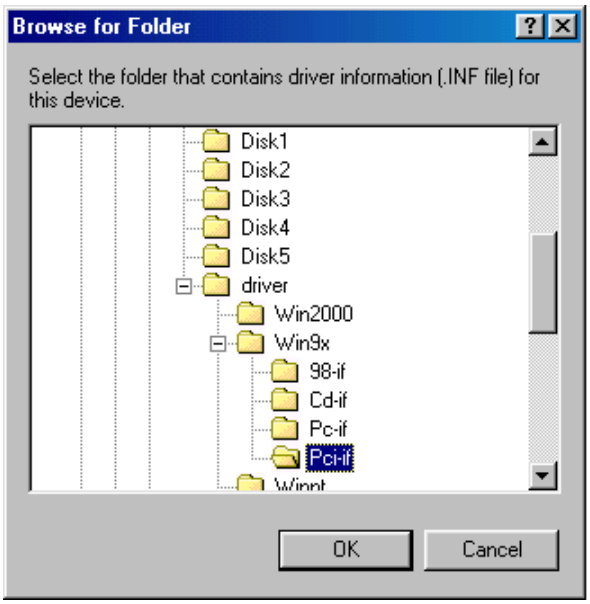


Figure B-5



(5) Click [OK].

(6) “NEC IE-PC Interface Card [PCI IF Card]” is displayed. Click [Next]. The necessary files are then automatically copied.

Figure B-6

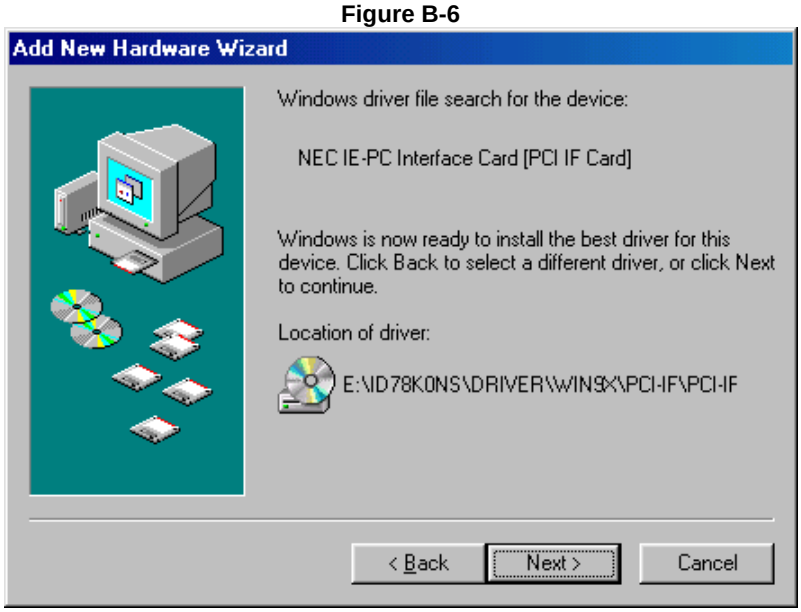
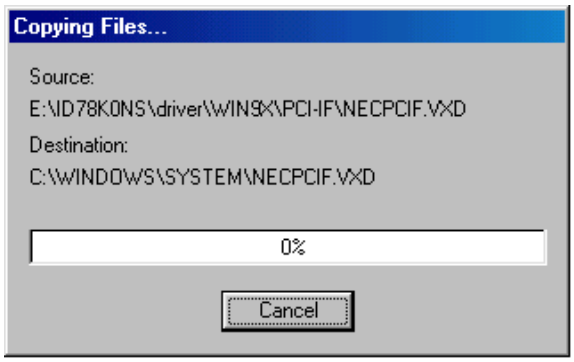
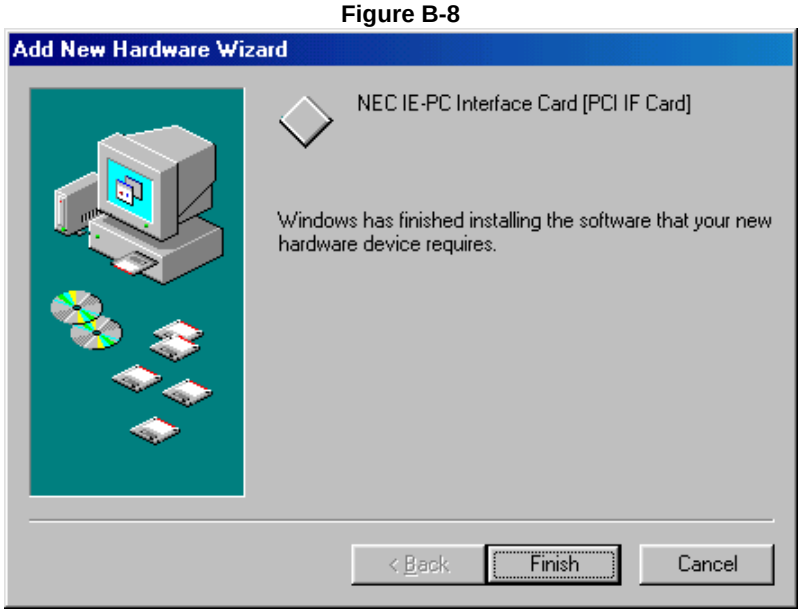


Figure B-7



(7) Installation is complete. Click [Finish]. Activation of Windows 98 then continues.

Figure B-8



Step 5 Completion of installing the IE-PC Driver.

Installation of the driver is complete.

B.2.2 Installing in Windows 2000

This section explains the installation procedure when using Windows 2000 with a PC/AT compatible machine or PC-9800 series computer as the host machine.

The procedure explained is applicable to any host machine model.

<Installation procedure>

Remark The CD-ROM drive is assumed as E: in the explanation below. If the NEC PC-9800 series is used, read E as C.

Step 1 Shutdown Windows 2000 and turn off the power of the computer.

Shutdown Windows 2000 and turn off the power of the host machine.

Furthermore, disconnect the power supply cable of the host machine to assure safety.

Step 2 Connect the interface board to an open PCI card slot.

Remove the cover of the host machine in accordance with the user's manual of the host machine, and connect the interface board to an open PCI card slot. At this time, be sure to fix them with screws tightly. In addition, check the connection again before mounting the cover.

Step 3 Turn on the power to the host machine and activate Windows 2000.

Apply the power to the host machine and activate Windows 2000.

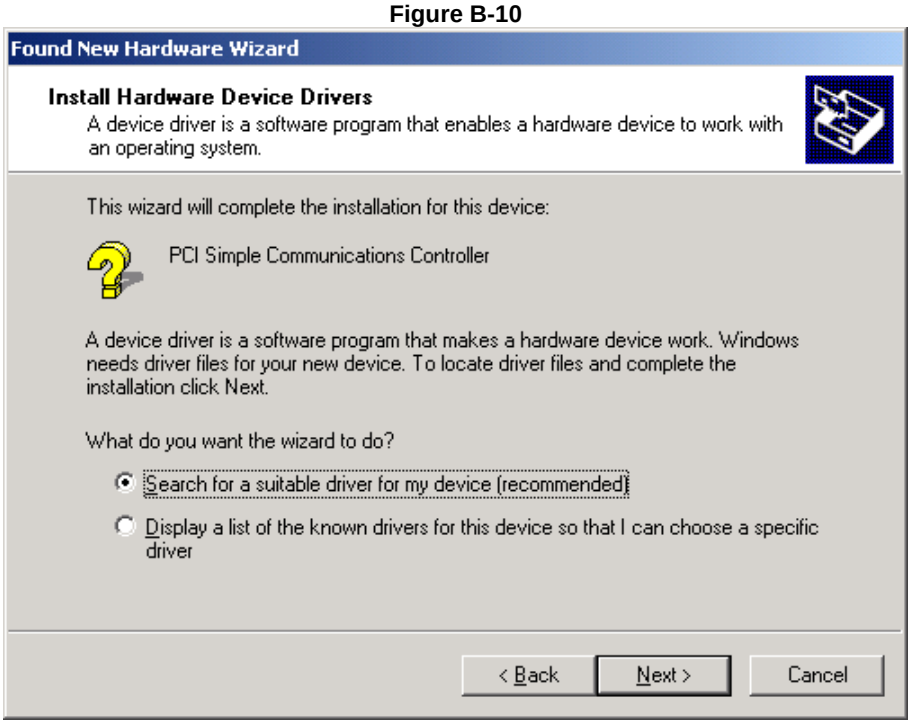
Step 4 Install the driver by Plug&Play of Windows 2000.

(1) While Windows 2000 is being activated, the [Found New Hardware Wizard] window appears. Click [Next].

Figure B-9

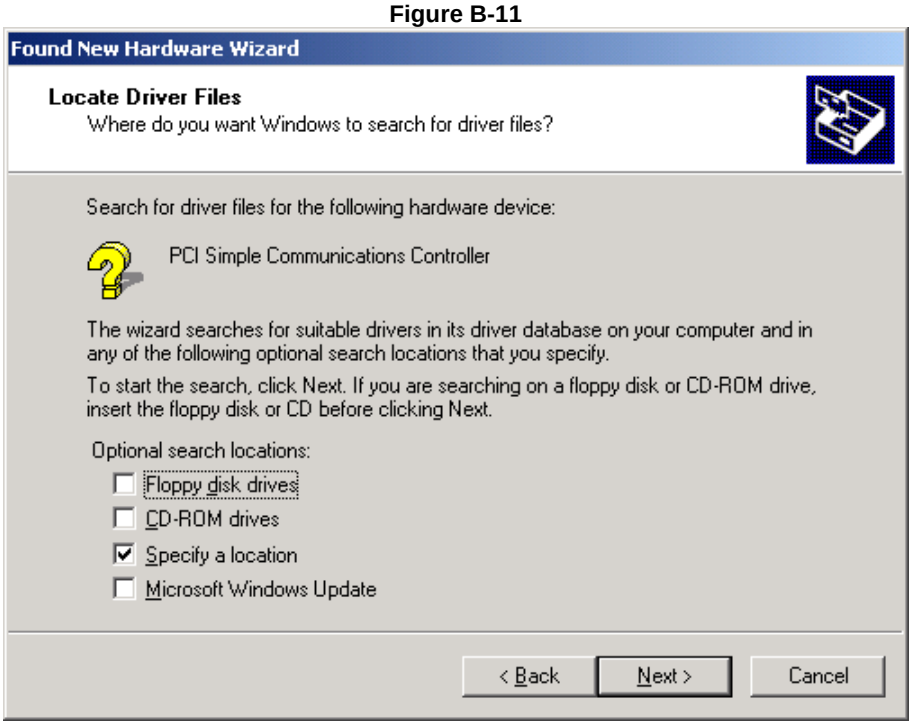
(2) Select “Search for a suitable driver for my device (recommended)” and click [Next].

Figure B-10



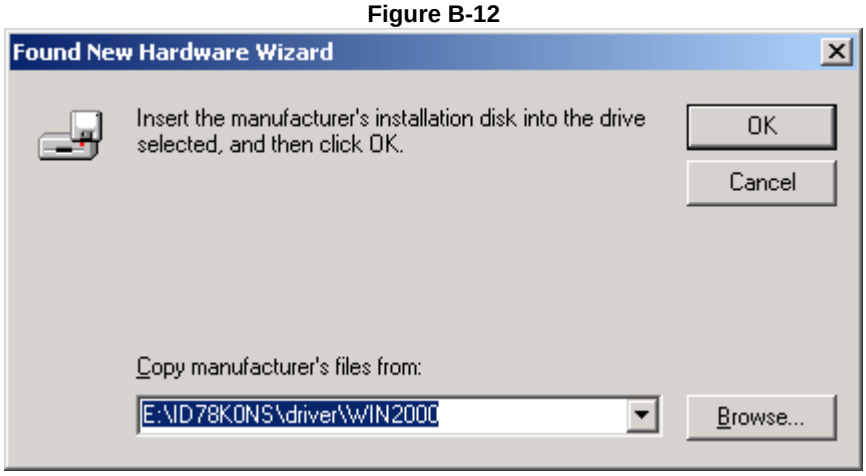
(3) Select “Specify a location” and click [Next].

Figure B-11



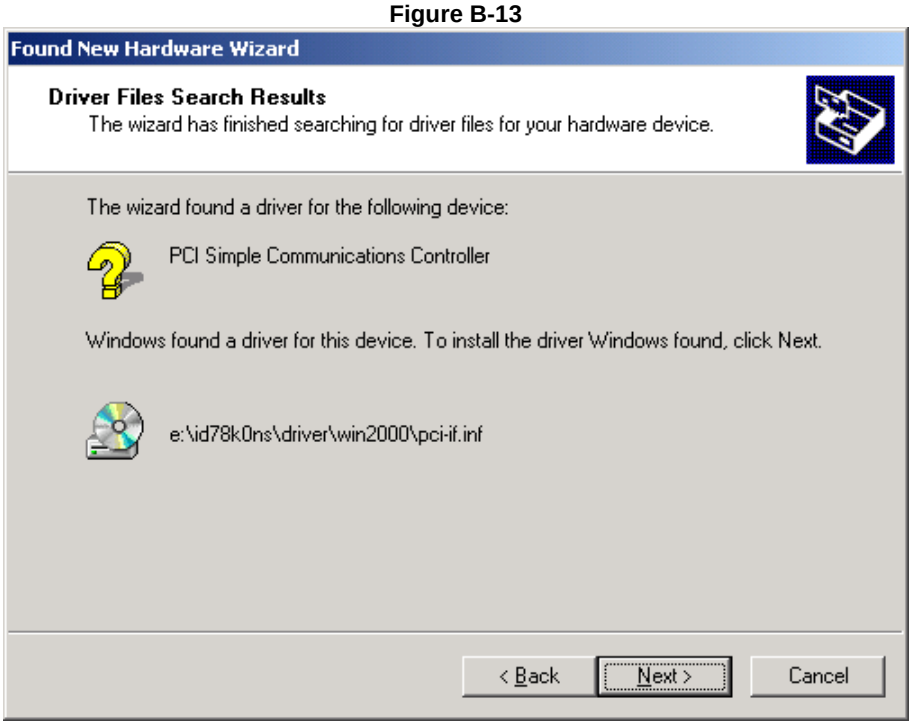
(4) Insert the attached CD-ROM in the CD-ROM drive and input “E:\ID78K0NS\driver\WIN2000” in the “Copy manufacturer’s files from:” field and click [OK].

Figure B-12



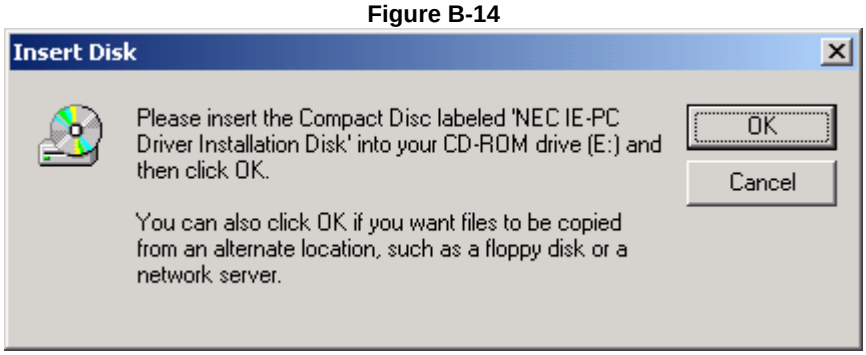
(5) Click [Next].

Figure B-13



(6) The [Insert Disk] window is displayed. Click [OK].

Figure B-14



(7) The [Files Needed] window is displayed. Click [Browse] to open the [Locate File] window. Specify NECPCIF.SYS and click [Open].

Figure B-15

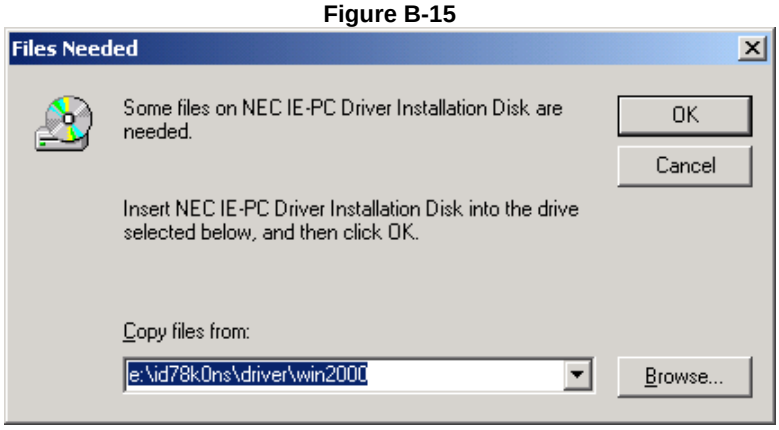
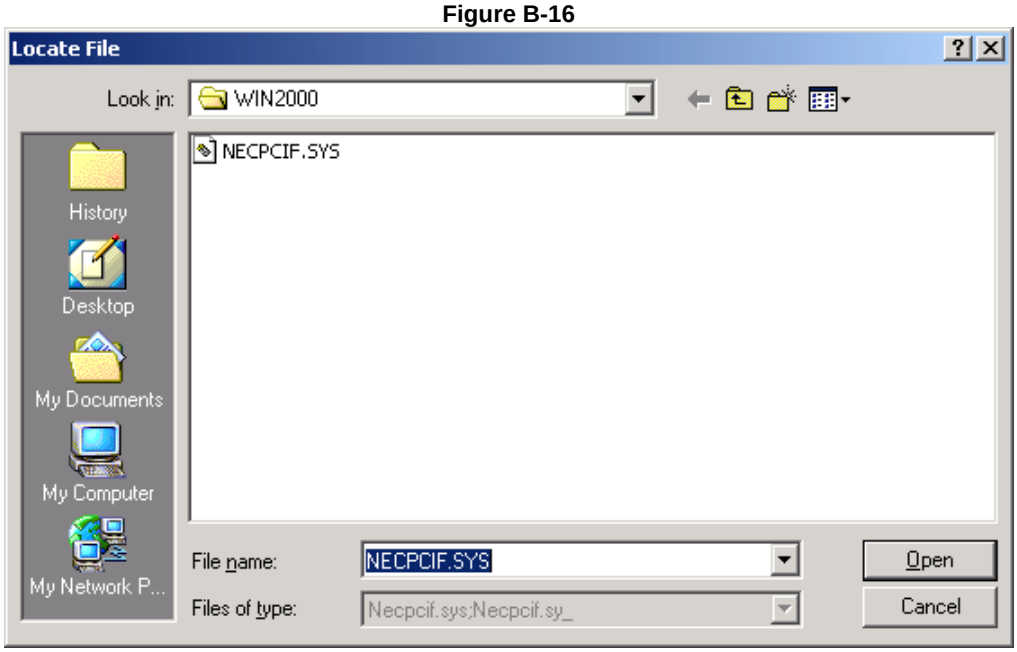
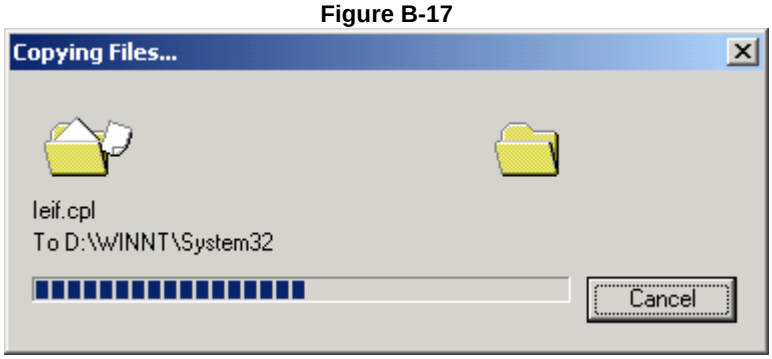


Figure B-16



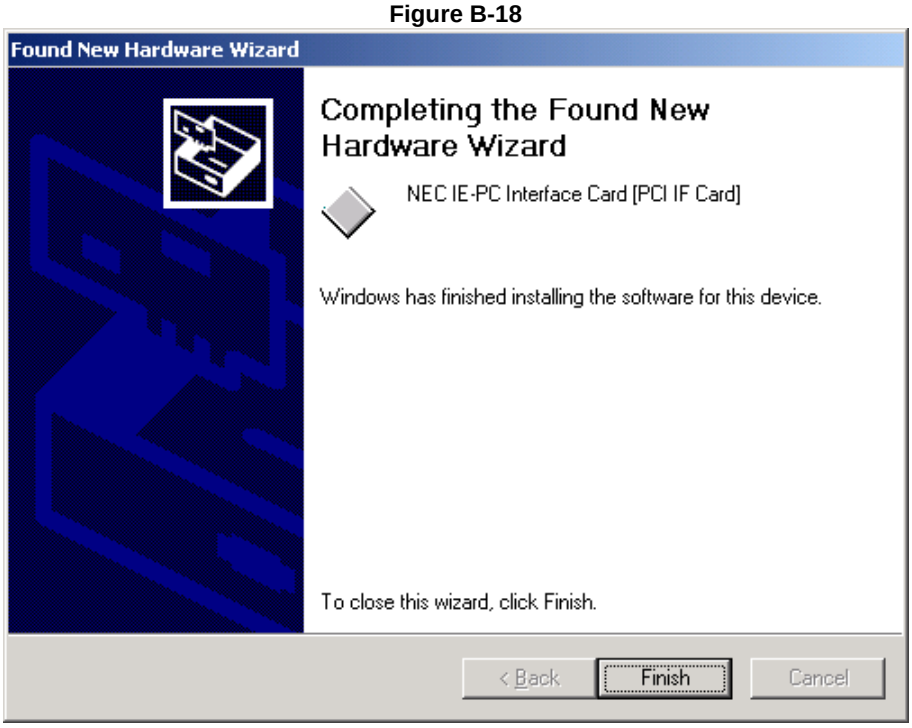
(8) The necessary files are automatically copied.

Figure B-17



(9) The message “Completing the Found New Hardware Wizard” is displayed. Click [Finish]. Activation of Windows 2000 then continues.

Figure B-18



Step 5 Completion of installing the IE-PC Driver.

Installation of the driver is complete.

Revision History

Version	Page	Description
1st	–	Newly created (SUD-TT-0228-1-E)
2nd	8, 9, 12, 14, 16, 17, 63	Addition of probe conversion board 78014X PROBE Board
	13, 14, 31, 34	Addition of SW8
	2, 15, 32, 33, 37, 41, 45, 49, 52, 65	Correction of description

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- 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.

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