

# **User's Manual**

# **IE-784000-R**

## **In-circuit Emulator**

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**IE-784000-R**

**IE-784000-R-BK**

**IE-784000-R-EM**

**IE-70000-98-IF-B**

**IE-70000-98N-IF**

**IE-70000-PC-IF-B**

**IE-78000-R-SV3**

Document No. U12903EJ1V0UM00 (1st edition)  
(Previous No. EEU-1534)  
Date Published May 1998 N CP(K)

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## INTRODUCTION

### Readers:

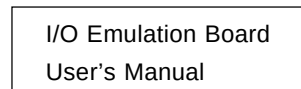
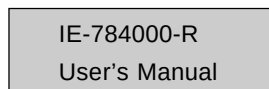
This manual is intended for engineers who wish to debug a system using NEC's 78K/IV series 16-/8-bit single-chip microcomputers with the IE-784000-R. It is also intended for engineers who upgrade other in-circuit emulators to have functions equivalent to those of the IE-784000-R. It is therefore assumed that engineers who read this manual are thoroughly familiar with the functions and usage of the target device and have knowledge of the debugger.

The target devices are as follows:

- $\mu$ PD784026 subseries:  $\mu$ PD784020, 784021, 784025, 784026, 78P4026

### Organization:

As manuals for the IE-784000-R, a manual supplied with the IE-784000-R (this manual) and a manual supplied with the I/O emulation board (IE-784026-R-EM1) are available.



(supplied with IE-784026-R-EM1)

Basic specifications  
System configuration  
External interface function

Functional outline  
Connecting I/O emulation board

### Purpose:

This manual is intended to describe the basic specifications of the IE-784000-R and how to connect the peripheral equipment correctly.

### How to Read This Manual:

- To understand the basic specifications,  
→ Refer to **CHAPTER 1 GENERAL** and **CHAPTER 2 NAMES AND FUNCTIONS OF RESPECTIVE PARTS**.
- To connect the IE-784000-R and peripheral equipment,  
→ Read **1.3 System Configuration**, **1.4 Setup Sequence**, **2.3 Connecting Accessory Cables**, **CHAPTER 6 CONNECTING PERIPHERAL EQUIPMENT**, and the User's Manual of the I/O emulation board.

**Terminology:**

The terms used in this manual and their meanings are listed below.

| Term             | Meaning                                                                                                                                                        |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Emulation device | Devices that emulate the target device in the emulator, including the emulation CPU                                                                            |
| Emulation CPU    | CPU in emulator that executes the program developed by the user                                                                                                |
| Target device    | The device (actual chip) that is emulated                                                                                                                      |
| Target program   | Program to be debugged (program developed by the user)                                                                                                         |
| Target system    | System to be debugged (system developed by the user). Includes the target program and the hardware developed by the user. In a narrow sense, only the hardware |

**Legend:**

**Note** : Footnote

**Caution** : Important information

**Remark** : Supplement

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[MEMO]

## **CHAPTER 1 GENERAL**

The IE-784000-R In-Circuit Emulator is a development tool that efficiently debugs the hardware and software of an application system using NEC's 78K/IV series microcomputer.

This in-circuit emulator is used in combination with the optional emulation board (IE-784000-R-EM), I/O emulation board (IE-784026-R-EM1, etc.), and emulation probe (EP-78230GC-R, etc.).

The in-circuit emulator is connected to a host machine with an optional interface board (IE-70000-98-IF-B, IE-70000-98N-IF, IE-70000-PC-IF-B, or IE-78000-R-SV3).

## 1.1 Features

Here are the features of the IE-784000-R:

- High-speed PC bus interface can be used.
- Network interface by Ethernet can be used (an optional network board is necessary).
- Real-time execution, real-time trace
- A wealth of event detection functions and real-time trace functions
- The contents of the real-time tracer can be checked without stopping execution of the emulation CPU.
- The contents of the real-time tracer can be searched.
- Data can be written to the real-time tracer or the user program can be executed in synchronization with events.
- Execution time and the number of time measurements can be measured at three locations.
- The specified data of the internal RAM can be displayed while the emulation CPU operates real-time.
- The execution area of the program area and data access area can be displayed.
- 8-bit trace by using an external sense clip.
- 1M-byte emulation memory.
- All packages can be supported by using optional I/O emulation board and emulation probe.

**Photo 1-1 IE-784000-R**

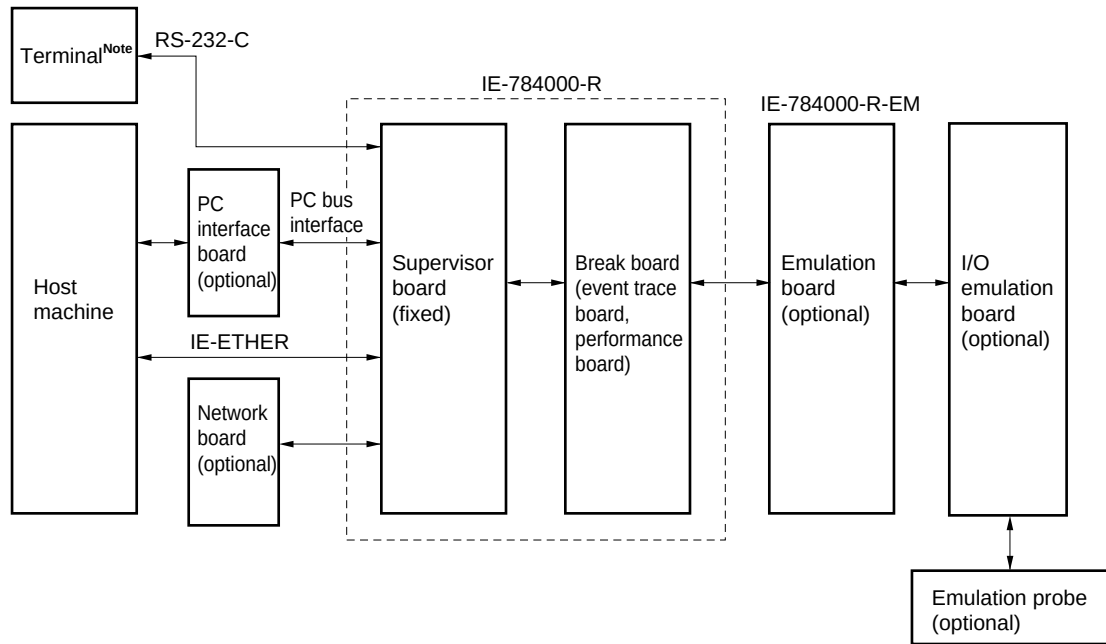


## 1.2 Hardware Configuration

The IE-784000-R consists of the following hardware (housing and boards):

- Housing
- Break board (event trace board + performance board)
- Supervisor board

**Fig. 1-1 Basic Hardware Configuration of IE-784000-R**

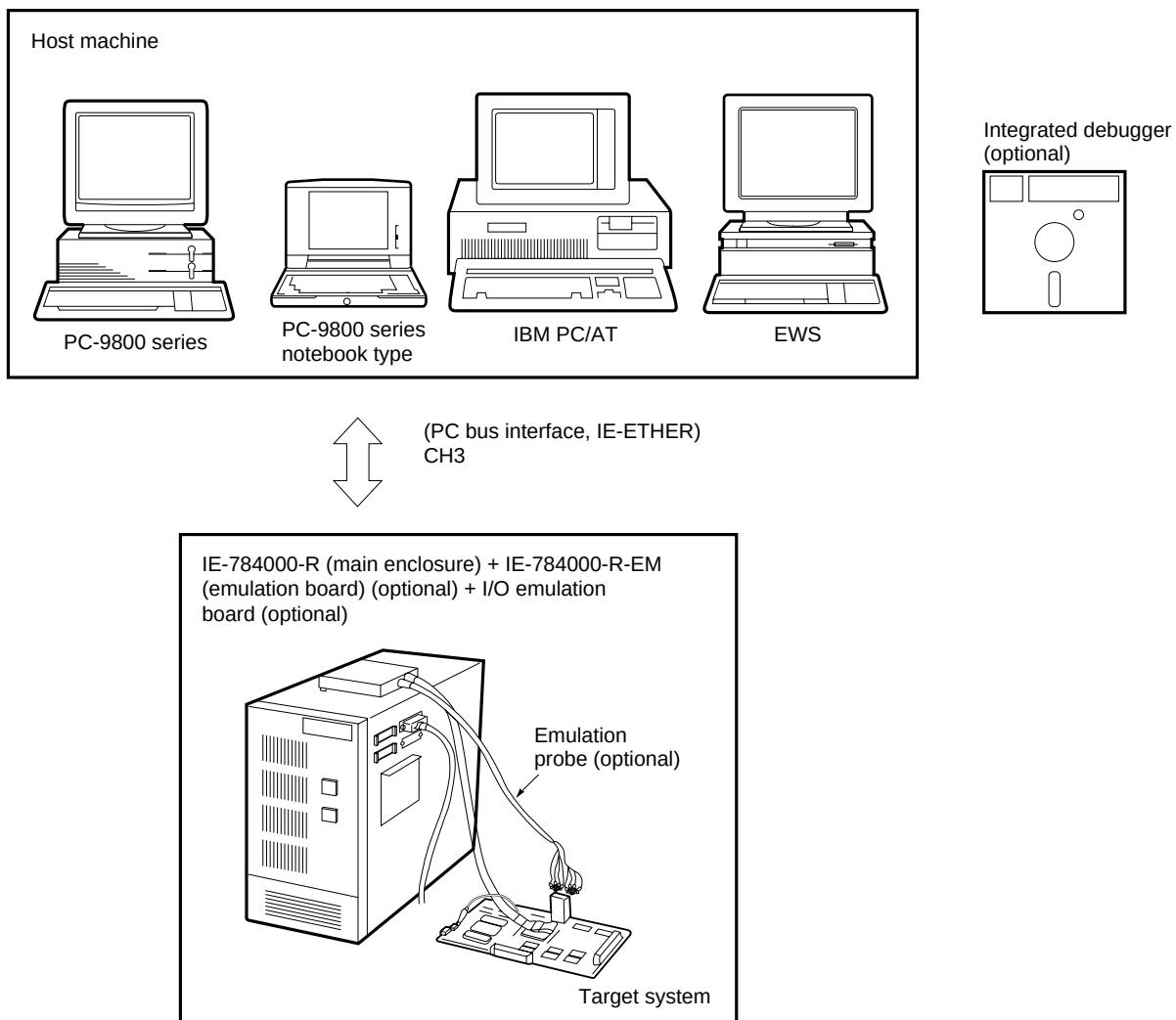


**Note** This terminal is used to set network addresses when Ethernet is used.

### 1.3 System Configuration

The IE-784000-R is used connected to a host machine (PC-9800 series, IBM PC/AT™, or work station).

**Fig. 1-2 System Configuration**





## 1.4 Setup Sequence

The setup sequence is as follows:

- <1> Connect the emulation board (IE-784000-R-EM).  
→ Refer to the User's Manual for the I/O emulation board.
  
- <2> Connect the I/O emulation board (to emulate the target device).  
→ Refer to the User's Manual for the I/O emulation board.
  
- <3> Set the user clock (when necessary).  
Change the operating clock on the I/O emulation board when necessary.  
→ Refer to the User's Manual for the I/O emulation board.
  
- <4> Connect the I/O emulation board and connector board.  
Connect the connector board (supplied with the optional emulation probe) to the I/O emulation board (optional).  
→ Refer to the User's Manual for the I/O emulation board or emulation probe.
  
- <5> Connect the accessory cables.  
Connect the power cable and interface cable.  
→ Refer to **CHAPTER 2 NAMES AND FUNCTIONS OF RESPECTIVE PARTS** in this manual.
  
- <6> Connect the IE-784000-R to peripheral equipment.  
Connect the host machine.  
→ Refer to **CHAPTER 6 CONNECTING PERIPHERAL EQUIPMENT** in this manual.
  
- <7> Connect the target system.  
Connect the emulation probe (optional) and target system.  
→ Refer to **CHAPTER 7 CONNECTING TARGET SYSTEM** in this manual and the User's Manual for the I/O emulation board or emulation probe.

**Remark** Connect the emulation board <1>, set the user clock <3>, and connect the I/O emulation board and connector board <4> at the same time to enhance the efficiency.

## 1.5 Target Device

The IE-784000-R can emulate the devices in the 78K/IV series when used in combination with the optional emulation board, optional I/O emulation board, and optional emulation probe. For details, refer to the User's Manuals for the respective emulation boards.

## 1.6 Emulation Board and I/O Emulation Board

The emulation board and I/O emulation board are optional.

If the target device is a 78K/IV series product, use the IE-784000-R-EM as the emulation board.

For the details of the I/O emulation board, refer to the User's Manual for the I/O emulation board.

## 1.7 Emulation Probe

The emulation probe is optional.

For details, refer to the User's Manual for the I/O emulation board or emulation probe.

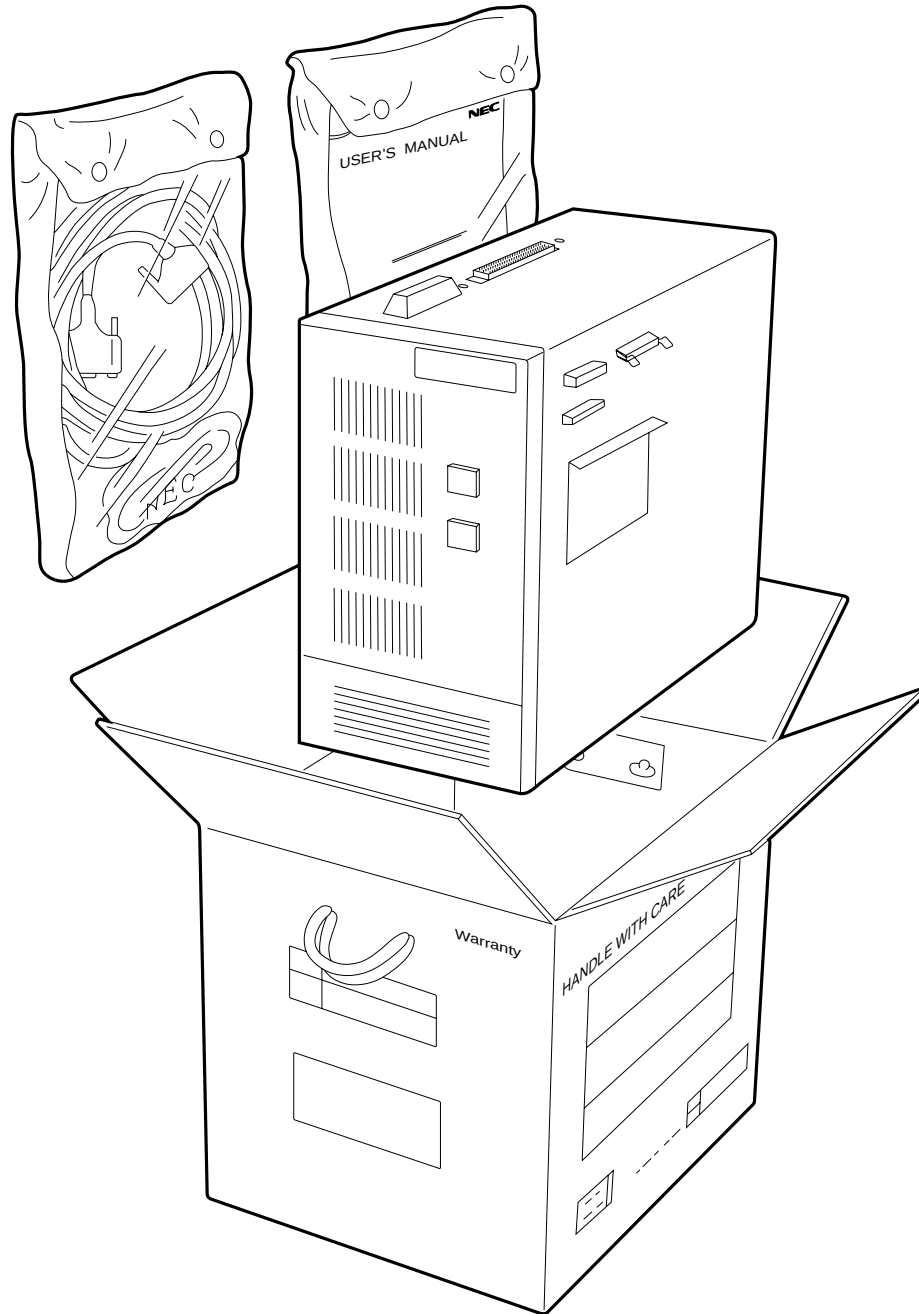
**Photo 1-2 Example of Connecting Emulation Probe**



## 1.8 Unpacking Carton Box

The carton box of the IE-784000-R contains the main enclosure of the in-circuit emulator and bags containing accessories. Three boards are installed in the in-circuit emulator. As accessories, cables are supplied in addition to this manual. Check to see if all the accessories are contained when unpacking the carton box. Also check to see if the in-circuit emulator and accessories are not damaged in any way. If you should find some accessories missing or damaged, consult NEC.

**Fig. 1-3 Unpacking**



**(1) Checking boards**

The following three boards are installed in the IE-784000-R. Remove the top lid from the in-circuit emulator as described on the following page and check to see if all the boards are correctly installed.

**(a) Break board**

This board consists of an event trace board and a performance board.

The event trace board and performance board are secured with screws.

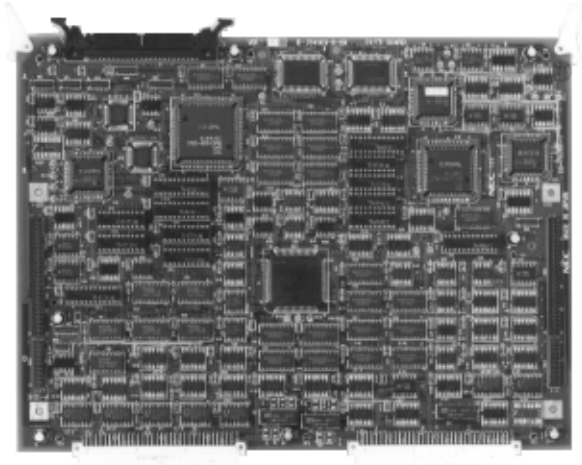
- Event trace board : ×1
- Performance board : ×1

**(b) Supervisor board (secured to IE-784000-R) : ×1**

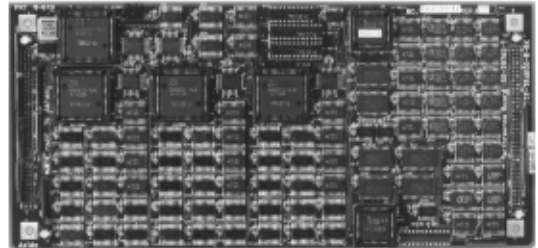
Photo 1-3 Boards

(a) Break board

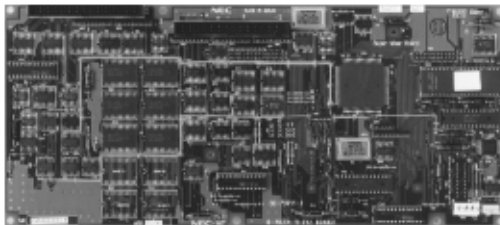
- Event trace board



- Performance board



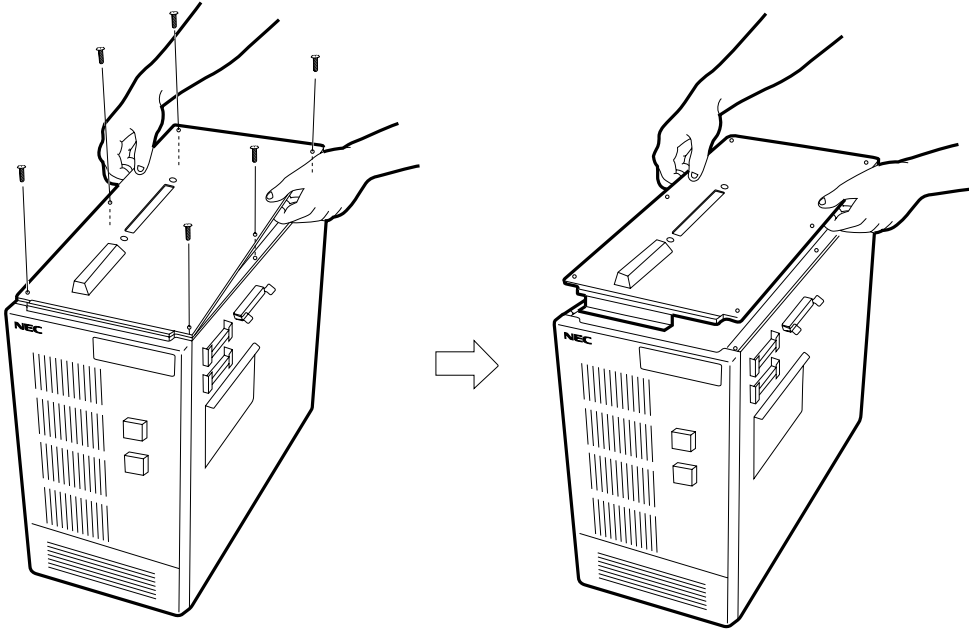
(b) Supervisor board



◇ Procedure

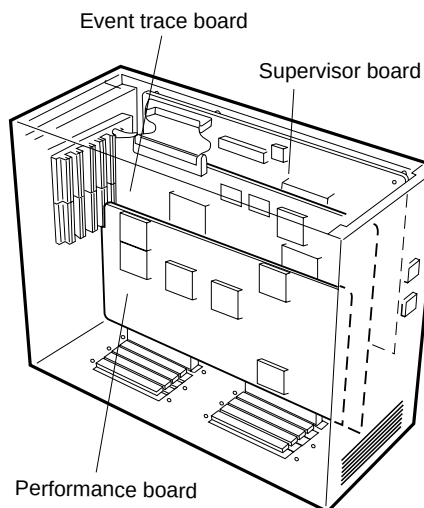
- <1> Remove the screws (six places) from the top lid of the in-circuit emulator and open the lid.

**Fig. 1-4 Top View of In-Circuit Emulator**



- <2> Confirm that all the boards are correctly installed as shown in Fig. 1-5.

**Fig. 1-5 Board Positions**



**(2) Checking accessories**

The carton box of the in-circuit emulator contains two bags of accessories. Check to see if these bags contain the following accessories (refer to Photo 1-4):

- (a) User's Manual (this manual) : ×1
- (b) AC 100 V power cable (with AC adapter) : ×1
- (c) AC 200 V power cable<sup>Note</sup> : ×1
- (d) RS-232C serial interface : ×1
- (e) Ground lead cable : ×1
- (f) Spare fuse : ×1
- (g) Accessory list : ×1
- (h) Warranty : ×1
- (i) Packing list : ×1
- (j) PC bus interface cable : ×1

**Note** The AC 200 V power cable is used when the IE-784000-R is used overseas.

Photo 1-4 Accessories

(b) AC 100 V power cable



(c) AC 200 V power cable



(d) RS-232C interface cable



(e) Ground lead cable



(f) Spare fuse



(j) PC bus interface cable





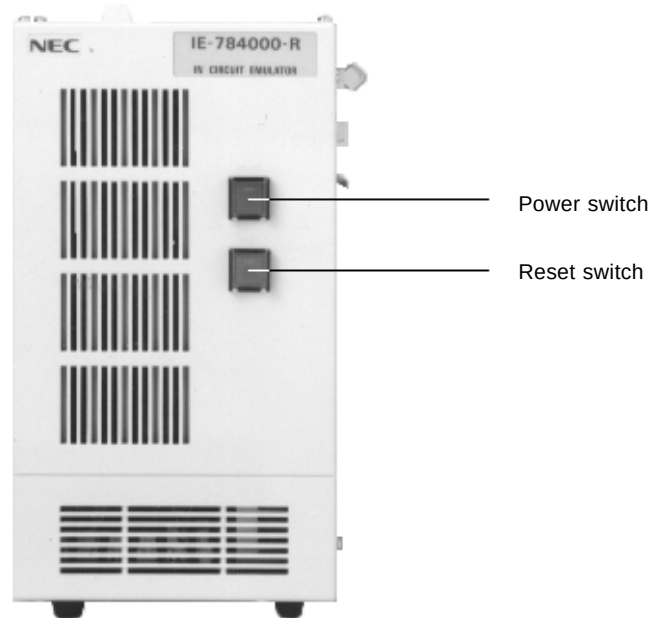
## **CHAPTER 2 NAMES AND FUNCTIONS OF RESPECTIVE PARTS**

This chapter describes the names and functions of the respective parts of the IE-784000-R, how to set switches, and how to connect the accessory cables.

## 2.1 Names and Functions of Respective Parts

### (1) Front view

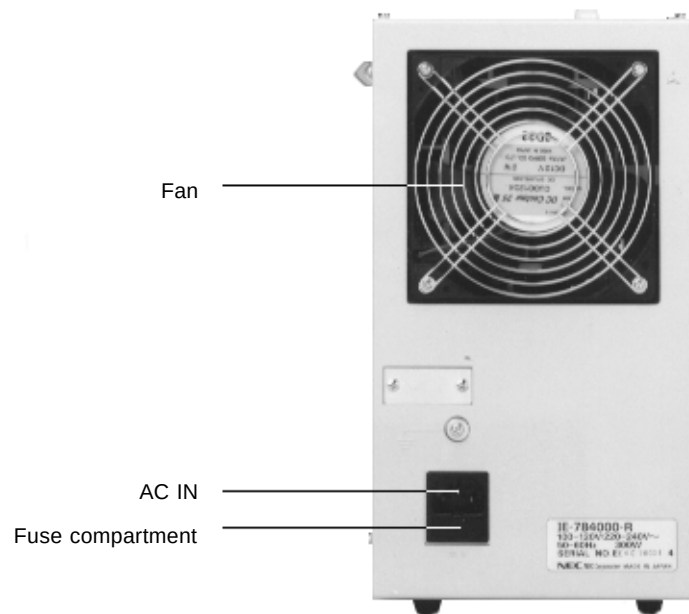
Photo 2-1 Front View of IE-784000-R



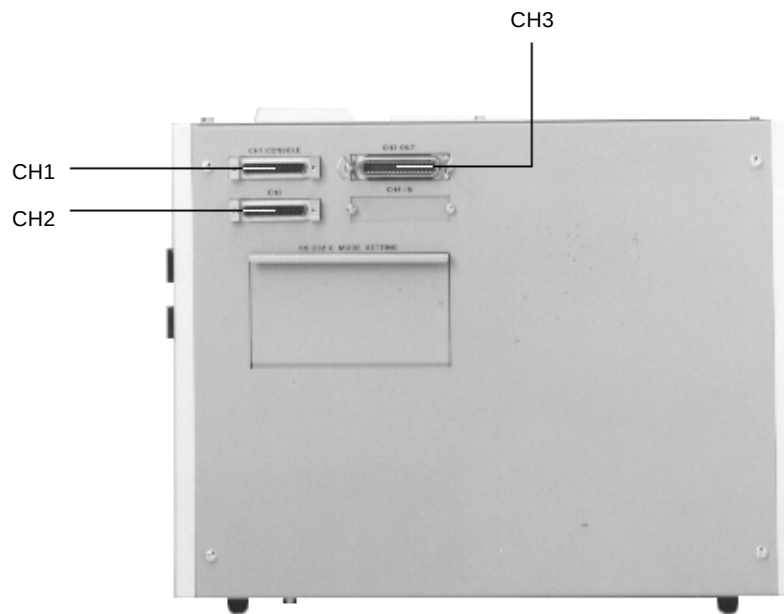
- **Power switch**  
Turns ON/OFF power to the IE-784000-R.
- **Reset switch**  
Resets the IE-784000-R.

(2) Rear view

Photo 2-2 Rear View of IE-784000-R

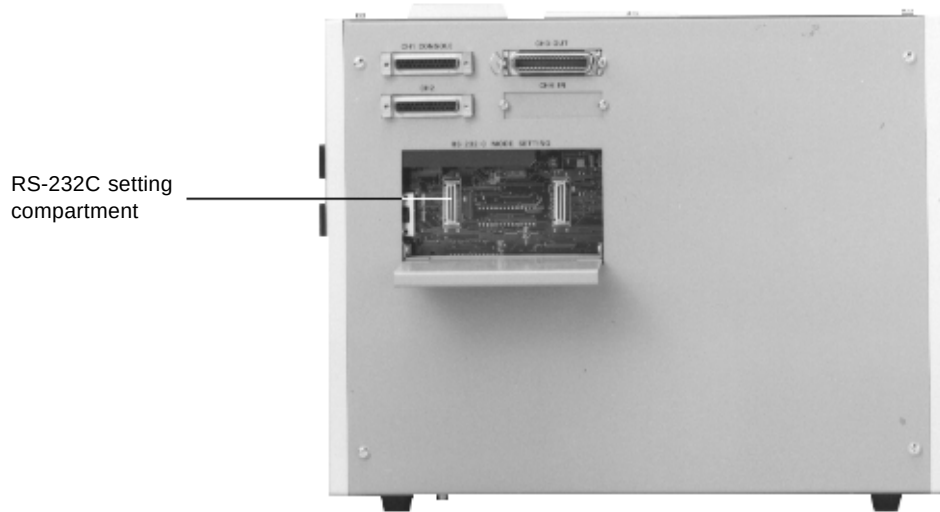


- **Fan**  
Cools inside the housing.
- **AC IN**  
Connects the power cable and supplies power to the IE-784000-R.

**(3) Side view****Photo 2-3 Side View of IE-784000-R (1)**

- **CH1 (I/O)**  
Connects a terminal with an RS-232C cable to set network information.  
Interfacing a host machine is not supported.
- **CH2 (I/O)**  
This channel is reserved and cannot be used.
- **CH3 (I/O)**  
Provided with a PC bus interface and a network interface which are respectively used to connect a host machine with a PC bus interface cable and an IE-ETHER cable.

Photo 2-4 Side View of IE-784000-R (2)

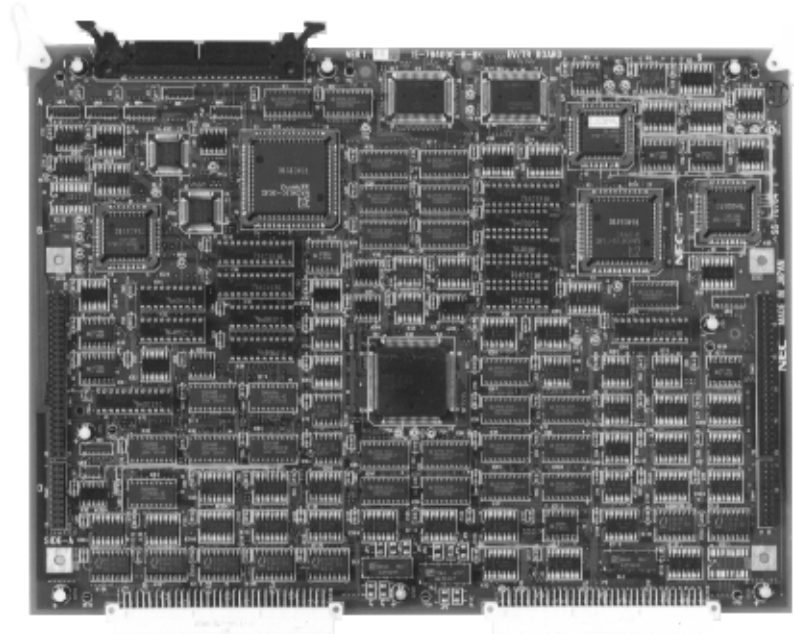


- **RS-232C setting compartment**  
Selects a modem or terminal mode, sets FG, and selects a baud rate.

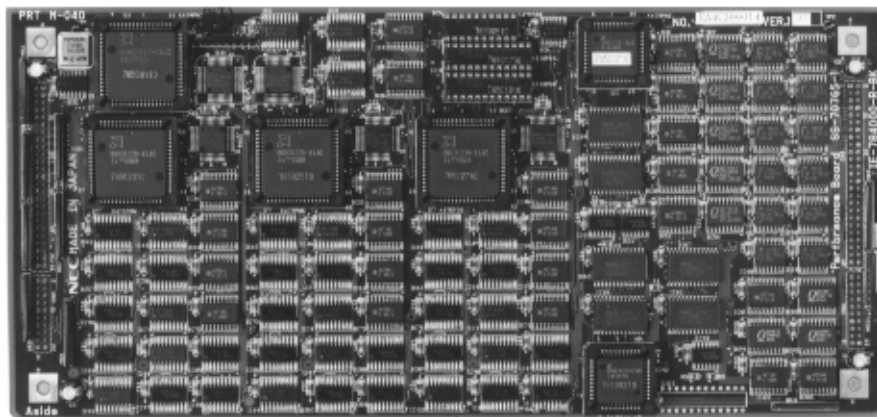
(4) Boards

– Break board (IE-784000-R-BK)

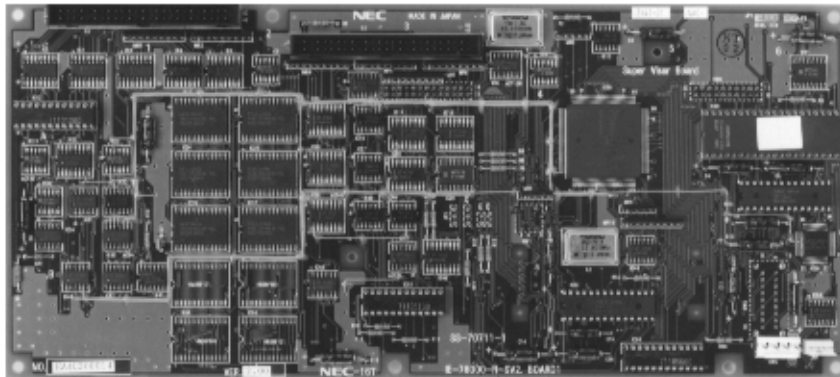
- Event trace board  
Controls event and trace.



- Performance board  
Controls performance measurement.



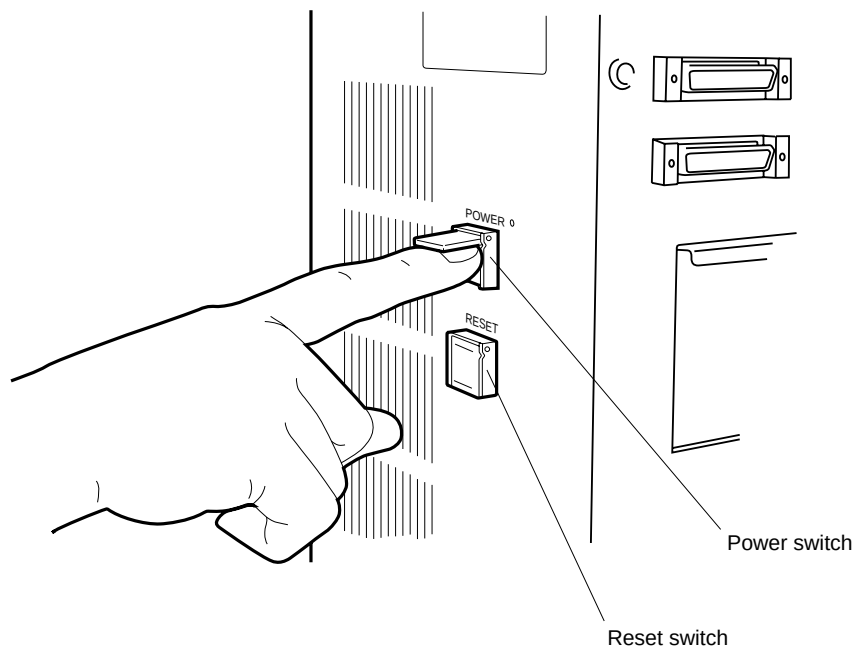
- **Supervisor board (IE-78000-R-SV2)**  
Controls the entire IE-784000-R.



## 2.2 Switch Setting

### (1) Power switch and reset switch

Fig. 2-1 Power Switch and Reset Switch



#### – Power switch

- The power switch is a pushbutton switch.
- Setting

**[Power ON]** Press the switch once. The switch LED will light.

**[Power OFF]** Press the switch once. The LED will extinguish.

#### – Reset switch

- The reset switch is a pushbutton switch.
- Setting

**[Reset]** Press the switch once. The IE-784000-R will be reset.



## 2.3 Connecting Accessory Cables

### – Installation location

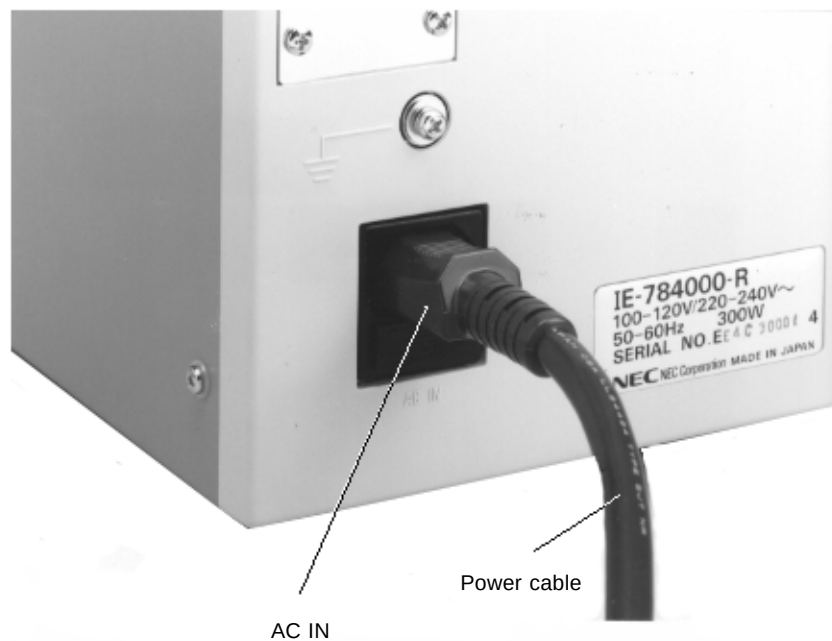
When installing the IE-784000-R, bear in mind the following points:

- Do not install the IE-784000-R where is subject to dust and dirt.
- Do not place any object in the vicinity of the air inlet of the IE-784000-R.

### (1) Power cable

Insert the power cable into the AC IN inlet on the rear panel of the IE-784000-R.

**Photo 2-5 Connecting Power Cable**



**(2) RS-232C interface cable**

Connect the RS-232C interface cable to the serial interface port CH1 on a side panel of the IE-784000-R.

**Photo 2-6 Connecting RS-232C Cable**



**(3) PC bus interface cable**

Connect the PC bus interface cable to the PC bus interface/network interface port CH3 on a side panel of the IE-784000-R.

**Photo 2-7 Connecting PC Bus Interface Cable**



[MEMO]

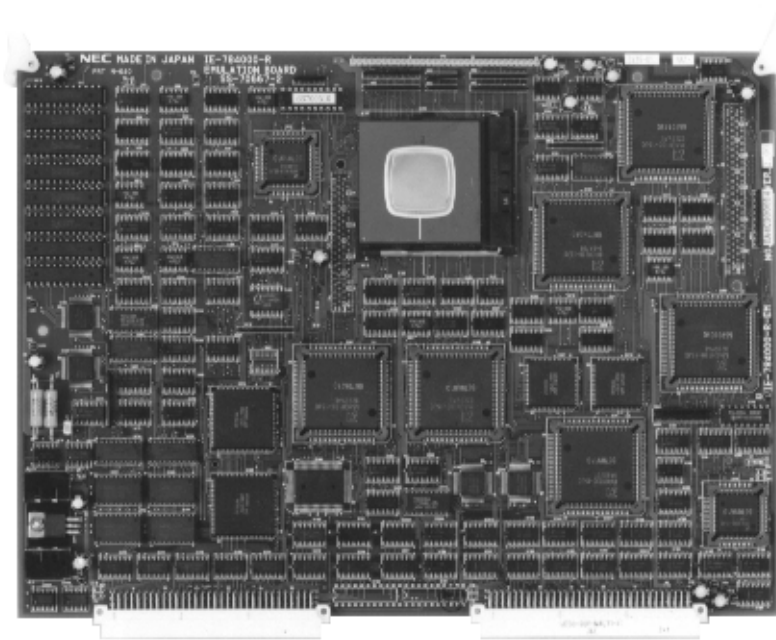
## CHAPTER 3 IE-784000-R-EM (EMULATION BOARD)

### 3.1 General

The IE-784000-R-EM is an emulation board for the 78K/IV series.

This board is used in combination with the IE-784000-R and a peripheral emulation board.

Photo 3-1 IE-784000-R-EM



### 3.2 Unpacking Carton Box of IE-784000-R-EM

The carton box containing the IE-784000-R-EM also contains the following accessories (a) through (d). Check to see that each accessory is not damaged or missing. If you find any abnormality, consult NEC.

- **Accessories**
  - (a) Installation manual: ×1
  - (b) Warranty : ×1
  - (c) Packing list : ×1
  - (d) Accessory list : ×1

[MEMO]

## CHAPTER 4 IE-784000-R-BK (BREAK BOARD)

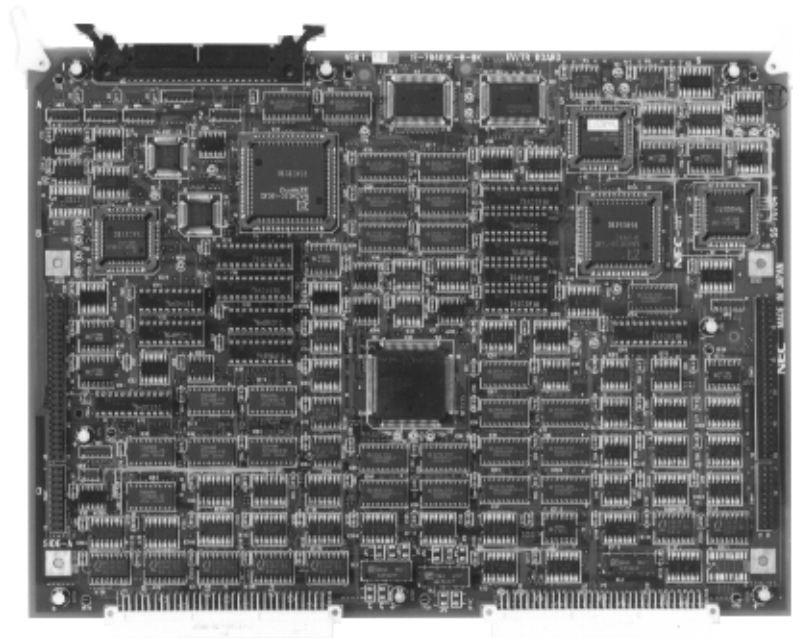
### 4.1 General

The IE-784000-R-BK is a break board for the 78K/IV series.

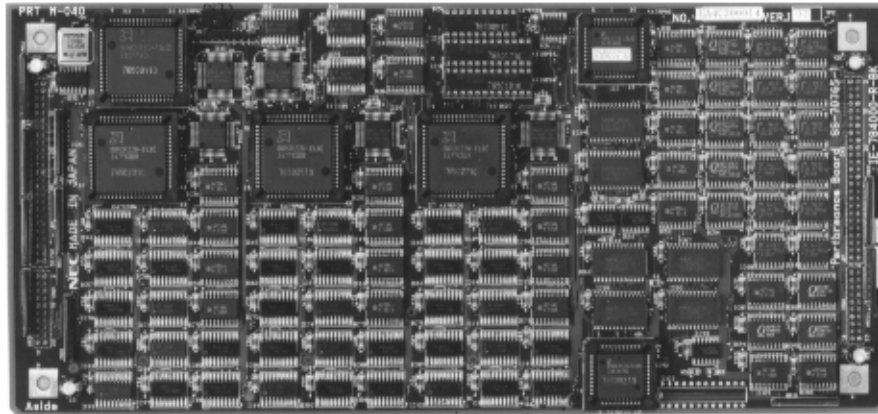
This board consists of an event trace board and a performance board. These two boards are secured with screws.

**Photo 4-1 Break Board**

**(1) Event trace board**



## (2) Performance board



## 4.2 Unpacking Carton Box of IE-784000-R-BK

The carton box containing the IE-784000-R-BK also contains the following accessories (a) through (d). Check to see that each accessory is not damaged or missing. If you find any abnormality, consult NEC.

- **Accessories**

- (a) Installation manual: ×1
- (b) Warranty : ×1
- (c) Packing list : ×1
- (d) Accessory list : ×1



## CHAPTER 5 HOST INTERFACE BOARDS

This chapter describes the following four boards for the 78K/IV series:

- IE-70000-98-IF-B
- IE-70000-98N-IF
- IE-70000-PC-IF-B
- IE-78000-R-SV3

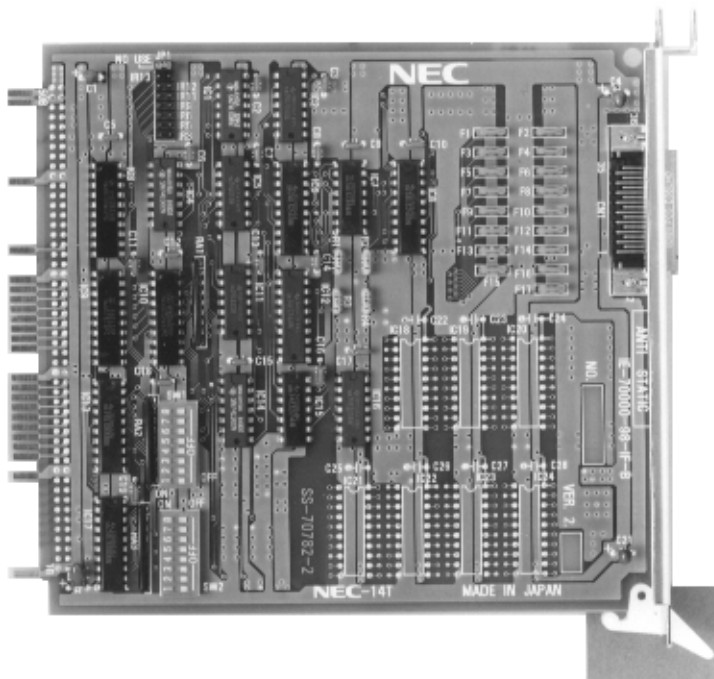
## 5.1 IE-70000-98-IF-B

### 5.1.1 General

The IE-70000-98-IF-B consists of an interface adapter and a cable that are used when an NEC's PC-9800 series personal computer is used as the host machine.

This board is inserted to an expansion slot of the PC-9800 series.

Photo 5-1 IE-70000-98-IF-B



### 5.1.2 Unpacking carton box of IE-70000-98-IF-B

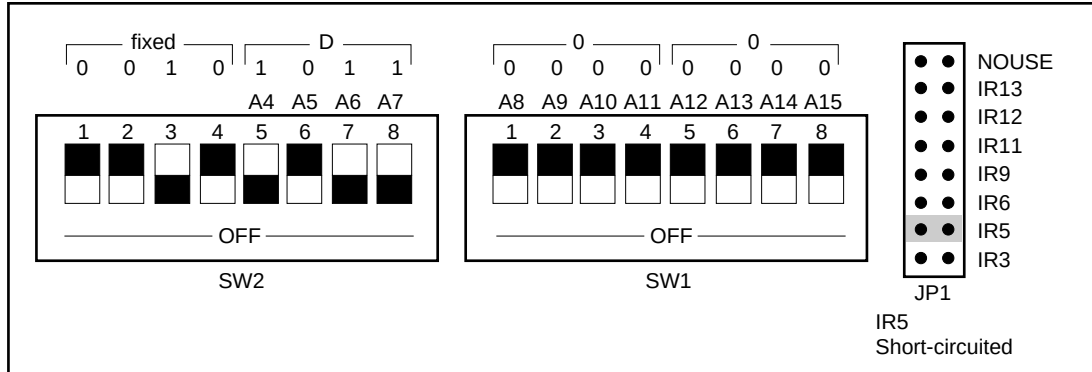
The carton box containing the IE-70000-98-IF-B also contains the following accessories (a) through (c). Check to see that each accessory is not damaged or missing. If you find any abnormality, consult NEC.

- **Accessories**
  - (a) Warranty : ×1
  - (b) Packing list : ×1
  - (c) Accessory list : ×1

### 5.1.3 Setting IE-70000-98-IF-B

Set the I/O address of the IE-70000-98-IF-B by using the DIP switches, and set the interrupt vector address by using the jumper, as illustrated below.

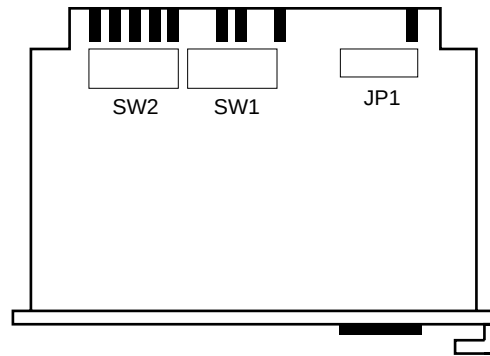
#### Example



I/O address = xxx0

SW2: 8-5  
SW1: 4-1  
SW1: 8-5

| Set Value of Jumper | Vector Number | IE-70000-98-IF-B |
|---------------------|---------------|------------------|
| IR3 (INT0)          | 0 × 0B        | O                |
| IR5 (INT1)          | 0 × 0D        | O                |
| IR6 (INT2)          | 0 × 0E        | O                |
| IR9 (INT3)          | 0 × 11        | O                |
| IR11 (INT4)         | 0 × 12        | O                |
| IR12 (INT5)         | 0 × 14        | O                |
| IR13 (INT6)         | 0 × 15        | O                |



**Caution** If the setting of the PC interface board has been changed, the setting of the EXPC.INI file must be changed accordingly.

## 5.2 IE-70000-98N-IF

### 5.2.1 General

The IE-70000-98N-IF consists of an interface adapter and a cable that are used when an NEC's PC-9800 series notebook type personal computer is used as the host machine.

**Photo 5-2 IE-70000-98N-IF**



### 5.2.2 Unpacking carton box of IE-70000-98N-IF

The carton box containing the IE-70000-98N-IF also contains the following accessories (a) through (c). Check to see that each accessory is not damaged or missing. If you find any abnormality, consult NEC.

- **Accessories**

- (a) Warranty : ×1
- (b) Packing list : ×1
- (c) Accessory list : ×1

### 5.2.3 Setting of IE-70000-98N-IF

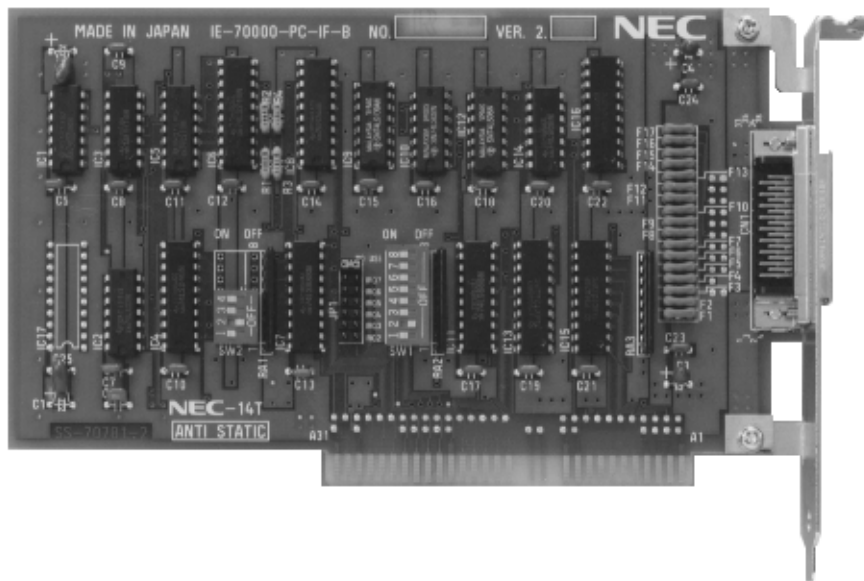
The IE-70000-98N-IF has no parts to be set.

### 5.3 IE-70000-PC-IF-B

#### 5.3.1 General

The IE-70000-PC-IF-B consists of an interface adapter and a cable that are used when an IBM PC/AT is used as the host machine. This board is inserted in a bus slot of the IBM PC/AT.

Photo 5-3 IE-70000-PC-IF-B



#### 5.3.2 Unpacking carton box of IE-70000-PC-IF-B

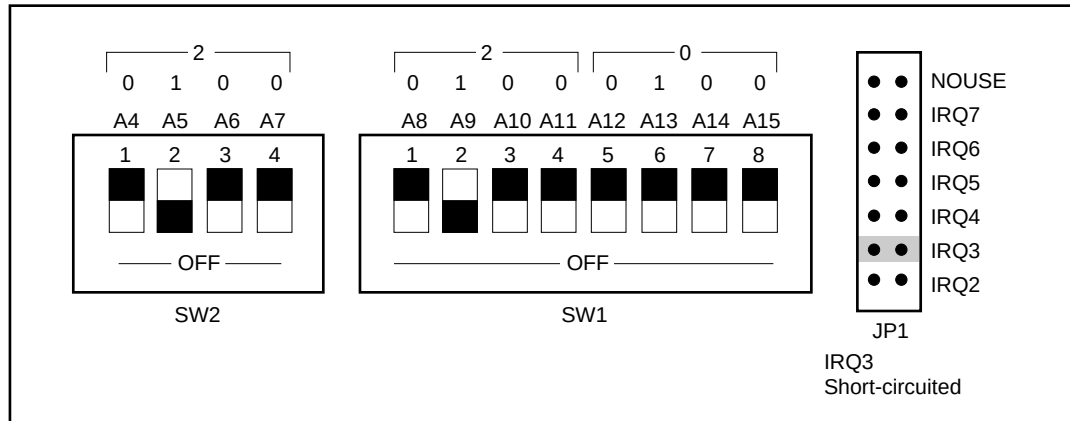
The carton box containing the IE-70000-PC-IF-B also contains the following accessories (a) through (c). Check to see that each accessory is not damaged or missing. If you find any abnormality, consult NEC.

- **Accessories**
  - (a) Warranty : ×1
  - (b) Packing list : ×1
  - (c) Accessory list : ×1

### 5.3.3 Setting IE-70000-PC-IF-B

Set the I/O address of the IE-70000-PC-IF-B by using the DIP switches, and set the interrupt vector address by using the jumper, as illustrated below.

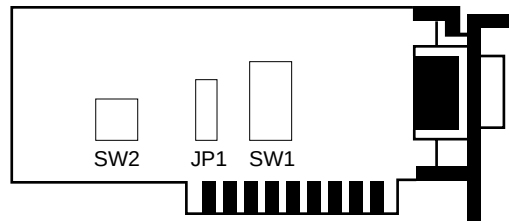
#### Example



I/O address = xxx0

SW2: 4-1  
SW1: 4-1  
SW1: 8-5

| Set Value of Jumper | Vector Number | IE-70000-98-IF-B |
|---------------------|---------------|------------------|
| IRQ2                | 0 × 0A        | O                |
| IRQ3                | 0 × 0B        | O                |
| IRQ4                | 0 × 0C        | O                |
| IRQ5                | 0 × 0D        | O                |
| IRQ6                | 0 × 0E        | O                |
| IRQ7                | 0 × 0F        | O                |



**Caution** If the setting of the PC interface board has been changed, the setting of the EXPC.INI file must be changed accordingly.



## 5.4 IE-78000-R-SV3

### 5.4.1 General

The IE-78000-R-SV3 is an interface board that is used when an EWS is used as the host machine, and is connected to an internal board of the IE-784000-R. As Ethernet, 10BASE5 is supported. For any other method, a commercially available conversion adapter is necessary.

**Photo 5-4 IE-78000-R-SV3**



### 5.4.2 Unpacking carton box of IE-78000-R-SV3

The carton box containing the IE-78000-SV3 also contains the following accessories (a) through (c). Check to see that each accessory is not damaged or missing. If you find any abnormality, consult NEC.

- **Accessories**
  - (a) Warranty : ×1
  - (b) Packing list : ×1
  - (c) Accessory list : ×1

### 5.4.3 Setting of IE-78000-R-SV3

For the setting of the IE-78000-R-SV3, refer to **CHAPTER 9 SETTING NETWORK INFORMATION**.

[MEMO]

## CHAPTER 6 CONNECTING PERIPHERAL EQUIPMENT

The IE-784000-R can debug or program the target device when it is connected to peripheral equipment, and thereby to organize a system. This chapter describes how to connect the peripheral equipment, and the set values and setting of each. Be sure to read this chapter when connecting peripheral equipment.

For the sequence of system configuration, refer to **1.4 Setup Sequence**. For the details on how to start the system, refer to the **User's Manual for the ID78K/IV Integrated Debugger**.

## 6.1 Peripheral Equipment

A "host machine" is connected to the IE-784000-R as peripheral equipment.

### <Host machine>

#### – PC-9800 series

The PC-9800 series can supply a consistent development environment where software development and total evaluation of hardware can be carried out, when an optional control program for the IE-784000-R is executed on Windows™.

#### – IBM PC/AT

The IBM PC/AT can supply a consistent development environment where software development and total evaluation of hardware can be carried out, when an optional control program for the IE-784000-R is executed on Windows.

#### – Work station

A work station can supply a consistent development environment where software development and total evaluation of hardware can be carried out, when an optional control program for the IE-784000-R is executed on OS.

## 6.2 Interface of IE-784000-R

To connect the IE-784000-R with peripheral equipment, a serial interface (channel 1), PC bus interface (channel 3), or network interface (channel 3) is used.

Note that channel 2 of the IE-784000-R is reserved and cannot be used.

### (1) Serial interface (channel 1)

| Serial Interface | Connected Peripheral Equipment |
|------------------|--------------------------------|
| Channel 1 (I/O)  | Terminal                       |
| Channel 2 (I/O)  | None                           |

Table 6-1 outlines the functions of channel 1. For further information on the functions of channel 1, refer to **CHAPTER 8 FUNCTIONS OF RESPECTIVE CHANNELS**.

**Table 6-1 Functional Outline of Channel 1**

| Set Item                |                  | Functional Outline of Channel 1                                                                                    | Setting |
|-------------------------|------------------|--------------------------------------------------------------------------------------------------------------------|---------|
| Mode                    |                  | Modem mode                                                                                                         | Fixed   |
| Baud rate               |                  | Internal : 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 78600, 153600 [bps] MAX.<br>External : 19200 [bps] MAX. | H       |
| Handshaking             |                  | Hardware: 1 character<br>Software : Flow control } Shared                                                          | Fixed   |
| Character specification | Character length | 8 bits                                                                                                             | Fixed   |
|                         | Parity bit       | None                                                                                                               | Fixed   |
|                         | Stop bit         | 2 bits                                                                                                             | Fixed   |

**Remark** H: selected by switch (hardware)

## (2) PC bus interface and network interface (channel 3)

Channel 3 is a PC bus interface/network interface port that is used to connect the host machine. As the network interface, Ethernet is employed.

For details, refer to **CHAPTER 5 HOST INTERFACE BOARDS**.

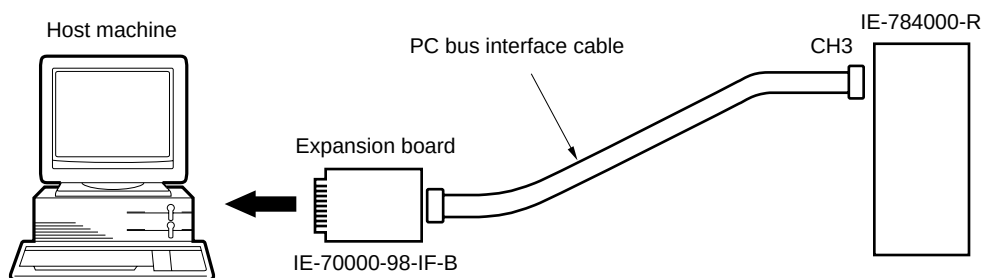
### 6.3 Connecting PC-9800 Series

To connect the PC-9800 series, use the PC bus interface.

#### 6.3.1 Connecting PC-9800 series as host machine

##### – General

- Turn off power.
- Connect channel 3 of the IE-784000-R and the PC-9800 series (hereafter referred to as the “host machine”) with the PC bus interface cable.
- Turn on power.



##### – Connecting

#### (1) Turn off power.

Before connection, turn off the power to each equipment. If power to the IE-784000-R and host machine is on, be sure to turn it off.

#### (2) Set the IE-70000-98-IF-B board.

#### (3) Insert the board to an expansion slot of the host machine.

#### (4) Connect the IE-784000-R with the host machine.

Table 6-2 Cable Connection

| IE-784000-R | Connecting Cable       | Host Machine     |
|-------------|------------------------|------------------|
| CH3         | PC bus interface cable | IE-70000-98-IF-B |

**(5) Turn on power**

Turn on power in the sequence described below. Turn off power in the reverse sequence. Usually, turn power on/off in the described sequence.

**◇ Procedure****– Power-on sequence**

- <1> Turn on the power switch of the host machine.
- <2> Turn on the power switch of the IE-784000-R.
- <3> Start Windows and then the integrated debugger. For details on how to start the debugger, refer to the **User's Manual for the ID78K/IV Integrated Debugger**.

**Caution** If communication with the IE-784000-R cannot be established after the integrated debugger has been started, check the following points:

- <1> Is the cable between the IE-784000-R and host machine connected correctly?
- <2> Is the PC interface board connected to the host machine correctly?
- <3> Is the setting of the PC interface board correct?
- <4> Does the setting of the PC interface board match the setting of the integrated debugger?
- <5> Is the jumper on the emulation board or supervisor board set as described in **APPENDIX C JUMPER SETTING**?
- <6> Are the break board, emulation board, I/O emulation board, and connector board correctly mounted to specified positions?
- <7> If the target system is connected, is the RESET pin of the target device fixed to the low level or not?

If the IE-784000-R still cannot be started, consult NEC.

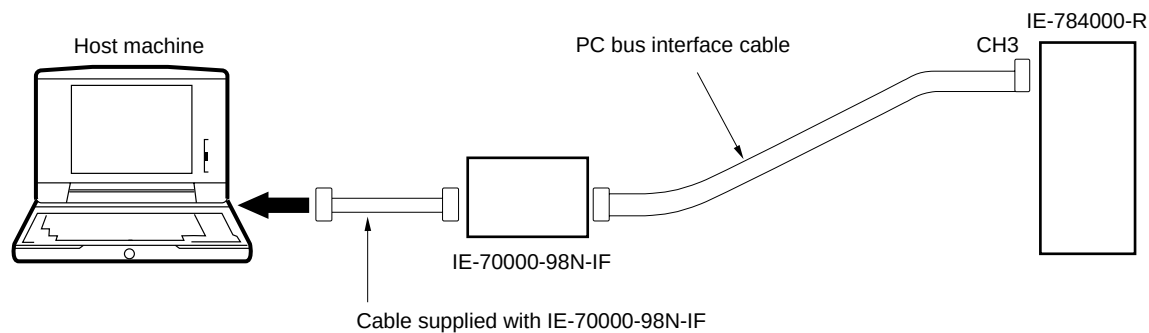
**– Power-off sequence**

- <1> Turn off the power switch of the IE-78400-R.
- <2> Turn off the power switch of the host machine.

### 6.3.2 When using PC-9800 series notebook type personal computer as host machine

#### – General

- Turn off power.
- Connect channel 3 of the IE-784000-R and the PC-9800 series notebook type personal computer (hereafter referred to as the “host machine”) with the PC bus interface cable.
- Turn on power.



#### – Connecting

##### (1) Turn off power.

Before starting connection, turn off power to each equipment. If power to the IE-784000-R and host machine is on, first turn it off.

##### (2) Connect the IE-70000-98N-IF to the expansion connector of the host machine.

##### (3) Connect the IE-784000-R and IE-70000-98N-IF.

**Table 6-3 Cable Connection**

| IE-784000-R | Connecting Cable       | Host Machine    |
|-------------|------------------------|-----------------|
| CH3         | PC bus interface cable | IE-70000-98N-IF |



**(5) Turn on power**

Turn on power in the sequence described below. Turn off power in the reverse sequence. Usually, turn power on/off in the described sequence.

**◇ Procedure****– Power-on sequence**

- <1> Turn on the power switch of the host machine.
- <2> Turn on the power switch of the IE-784000-R.
- <3> Start Windows and then the integrated debugger. For details on how to start the debugger, refer to the User's Manual for ID78K/IV Integrated Debugger.

**Caution** If communication with the IE-784000-R cannot be established after the integrated debugger has been started, check the following points:

- <1> Is the cable between the IE-784000-R and IE-70000-98N-IF connected correctly?
- <2> Is the connecting cable between the IE-70000-98N-IF and host machine connected correctly?
- <3> Is the setting of the integrated debugger for the IE-70000-98N-IF?
- <4> Is the jumper on the emulation board or supervisor board set as described in **APPENDIX C JUMPER SETTING**?
- <5> Are the break board, emulation board, I/O emulation board, and connector board correctly mounted to specified positions?
- <6> If the target system is connected, be sure that the RESET pin of the target device is not fixed to the low level.

If the IE-784000-R still cannot be started, consult NEC.

**– Power-off sequence**

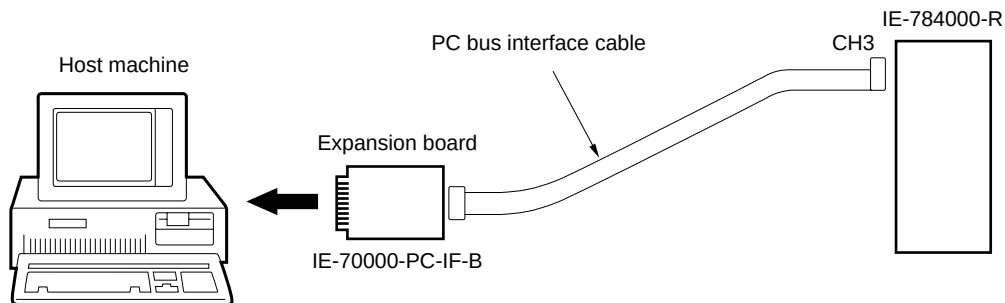
- <1> Turn off the power switch of the IE-784000-R.
- <2> Turn off the power switch of the host machine.

## 6.4 Connecting IBM PC/AT

To connect the IBM PC/AT, use the PC bus interface.

### – General

- Turn off power.
- Connect channel 3 of the IE-784000-R and the IBM PC/AT (hereafter referred to as the “host machine”) with the PC bus interface cable.
- Turn on power.



### – Connecting

#### (1) Turn off power.

Before connection, turn off the power to each equipment. If power to the IE-784000-R and host machine is on, be sure to turn it off.

#### (2) Set the IE-70000-PC-IF-B board.

#### (3) Insert the board to an expansion slot of the host machine.

#### (4) Connect the IE-784000-R with the host machine.

**Table 6-4 Cable Connection**

| IE-784000-R | Connecting Cable       | Host Machine     |
|-------------|------------------------|------------------|
| CH3         | PC bus interface cable | IE-70000-PC-IF-B |

**(5) Turn on power**

Turn on power in the sequence described below. Turn off power in the reverse sequence. Usually, turn power on/off in the described sequence.

**◇ Procedure****– Power-on sequence**

- <1> Turn on the power switch of the host machine.
- <2> Turn on the power switch of the IE-784000-R.
- <3> Start Windows and then the integrated debugger. For details on how to start the debugger, refer to the **User's Manual for the ID78K/IV Integrated Debugger**.

**Caution** If communication with the IE-784000-R cannot be established after the integrated debugger has been started, check the following points:

- <1> Is the cable between the IE-784000-R and host machine connected correctly?
- <2> Is the PC interface board connected to the host machine correctly?
- <3> Is the setting of the PC interface board correct?
- <4> Does the setting of the PC interface board match the setting of the integrated debugger?
- <5> Is the jumper on the emulation board or supervisor board set as described in **APPENDIX C JUMPER SETTING**?
- <6> Are the break board, emulation board, I/O emulation board, and connector board correctly mounted to specified positions?
- <7> If the target system is connected, be sure that the RESET pin of the target device is not fixed to the low level.

If the IE-784000-R still cannot be started, consult NEC.

**– Power-off sequence**

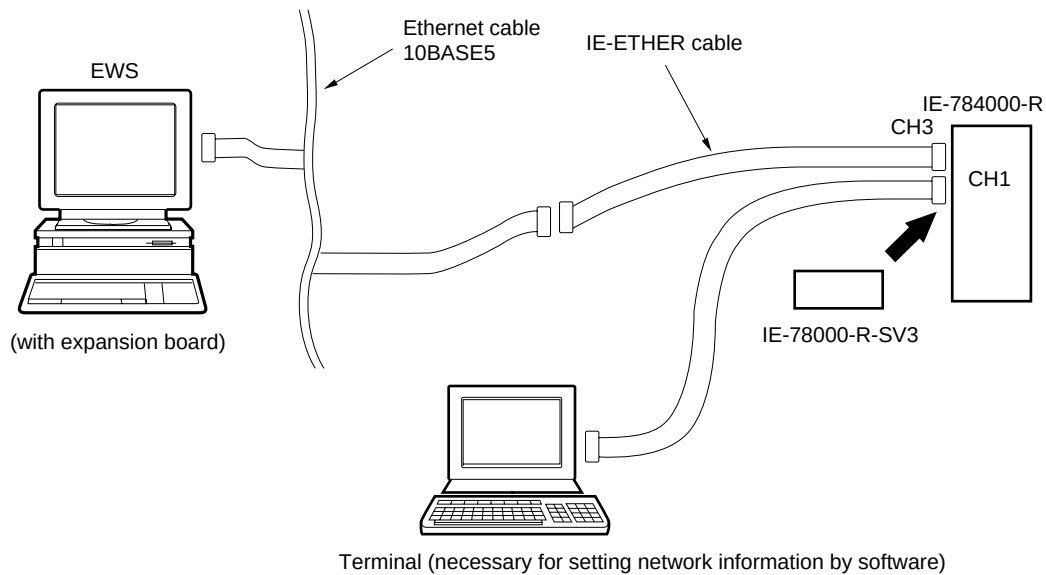
- <1> Turn off the power switch of the IE-784000-R.
- <2> Turn off the power switch of the host machine.

## 6.5 Connecting EWS

To connect an EWS, use the network interface.

### – General

- Turn off power.
- If the IE-784000-R is connected to Ethernet for the first time, or if the network information is changed, set the network information by referring to **CHAPTER 9 SETTING NETWORK INFORMATION**.
- Connect channel 3 of the IE-784000-R and Ethernet with the IE-ETHER cable.
- Turn on power.



### – Setting network information (by software)

- (1) Turn off power.
- (2) Connect the IE-78000-R-SV3 board to the RS-232C setting compartment on a side panel of the IE-784000-R.
- (3) Connect the IE-ETHER cable to CH3.

- (4) Connect the terminal to CH1 of the IE-784000-R.

**Table 6-5 Cable Connecting**

| IE-784000-R | Connecting Cable | Connected to:    |
|-------------|------------------|------------------|
| CH1         | RS-232C cable    | Terminal         |
| CH3         | IE-ETHER cable   | Ethernet or open |

- (5) **Turn on power**

Turn on power in the following sequence:

- <1> Terminal
- <2> IE-784000-R

- (6) **Set network information**

Set the necessary information from the terminal. For details, refer to **CHAPTER 9 SETTING NETWORK INFORMATION**.

- (7) **Turn off power**

Turn off power in the following sequence:

- <1> IE-784000-R
- <2> Terminal

– Setting network information (by hardware)

- (1) Turn off power.
- (2) Connect the IE-78000-R-SV3 board to the RS-232C setting compartment on a side panel of the IE-784000-R.
- (3) Connect the IE-ETHER cable to CH3.

**Table 6-6 Cable Connecting**

| IE-784000-R | Connecting Cable | Connected to:    |
|-------------|------------------|------------------|
| CH3         | IE-ETHER cable   | Ethernet or open |

- (4) Turn on power while pressing SW1 of the IE-784000-R-SV3.
- (5) **Set network information.**  
Set the necessary information by using the switches on the IE-78000-R-SV3. For details, refer to **CHAPTER 9 SETTING NETWORK INFORMATION**.
- (6) Turn off power.

– Connecting

(1) Turn off power.

Before starting connection, be sure to turn off power to the IE-784000-R first.

(2) Set network information.

(3) Connect the IE-ETHER cable to Ethernet.

Table 6-7 Cable Connection

| IE-784000-R | Connecting Cable | Connected to: |
|-------------|------------------|---------------|
| CH3         | IE-ETHER cable   | Ethernet      |

(4) Turn on power.

Turn on power in the sequence described below. Turn off power in the reverse sequence. Usually, turn power on/off in the described sequence.

◇ Procedure

– Power-on sequence

- <1> Turn on the power switch of EWS.
- <2> Turn on the power switch of the IE-784000-R.
- <3> Start the integrated debugger. For details on how to start the debugger, refer to the **User's Manual for the ID78K/IV Integrated Debugger**.

**Caution** If communication with the IE-784000-R cannot be established after the integrated debugger has been started, check the following points:

- <1> Is the cable between the IE-784000-R and EWS connected correctly?
- <2> Is the IE-78000-R-SV3 connected correctly to the IE-784000-R?
- <3> Is the setting of the network information correct?

If the IE-784000-R still cannot be started, consult NEC.

– Power-off sequence

- <1> Turn off the power switch of the IE-784000-R.
- <2> Turn off the power switch of the EWS.

[MEMO]



## **CHAPTER 7 CONNECTING TARGET SYSTEM**

This chapter describes how to connect the emulation probe connected to the IE-784000-R to the target system. Also described is the action to be taken in case a latchup occurs.

Be sure to read this chapter when you connect the IE-784000-R to the target system.

## 7.1 Connection

### – Before connection

- If the user clock has not yet been set (only when the user clock must be set)  
→ Refer to the User's Manual for the I/O emulation board.

### – General

- Connect the emulation probe to the target system.
- Connect the external sense clip to the target system.

**(1) Connect the target system and emulation probe**

Connect the emulation probe to the target system following the steps described below.

For the details of connection, refer to the User's Manual of the I/O emulation board or emulation probe.

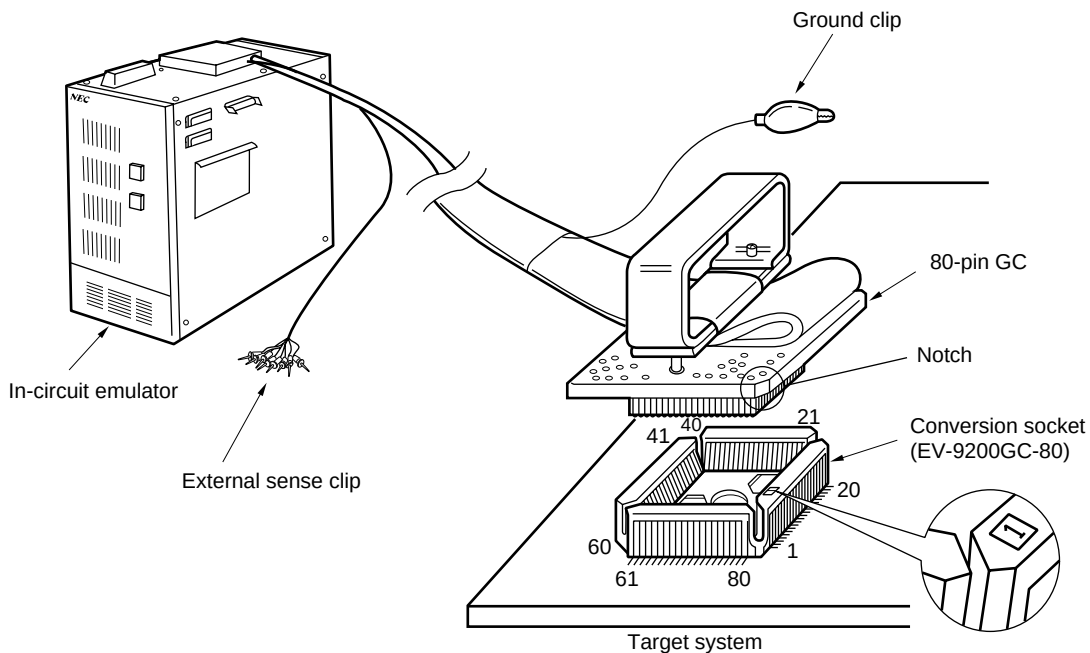
**◇ Procedure**

<1> Connect the ground clip of the emulation probe to GND (signal ground) of the CPU on the target system.

**Caution** Unless the ground clip is connected, the IE-784000-R may be damaged by static electricity.

<2> Insert the tip of the emulation probe to the CPU socket on the target system. At this time, match pin 1 of the CPU socket and pin 1 of the tip of the emulation probe.

**Fig. 7-1 Example of Connecting Target System with EP-78230GC-R**



**Caution** Do not bend the pins of the CPU and those of the emulation probe.

**(2) Connect the external sense clip to the target system**

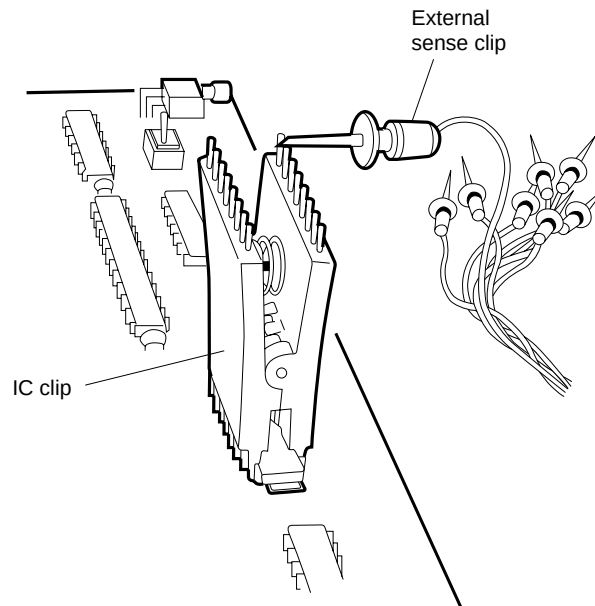
The IE-784000-R can trace the bus cycle of the emulation CPU real-time. Eight external sense clips are available for evaluating the five types of functions listed below. For details on how to use the external sense clips, refer to the **User's Manual for the ID78K/IV Integrated Debugger**.

- <1> External sense function to trace any eight signal lines real-time
- <2> External data detection condition
- <3> External data condition of bus event detection
- <4> External data condition of program execution event condition
- <5> External trigger output function

- Cautions**
1. Connect the external sense clip to a signal line of TTL or CMOS level. If the external sense clip is connected to any other signal line, the signal level cannot be accurately detected. Moreover, the sensor of the IE-784000-R may be damaged depending on the voltage level.
  2. Usually, the eight external sense clips are used as input signal lines. However, external sense clip 1 can be used to output a trigger signal to an external system when an event occurs if so set by using an external trigger output function (for details, refer to the User's Manual for the ID78K/IV Integrated Debugger). To use external sense clip 1 as an output signal line, do not connect it to a line that outputs a signal of the target system.
  3. To connect the external sense clip, use an IC clip.

**◆ Procedure**

- <1> First, turn off power to the IE-784000-R.
- <2> Next, turn off power to the target system.
- <3> Attach the IC clip to an IC on the target system to be traced.
- <4> Connect the external sense clip to the IC clip.

**Fig. 7-2 Connecting External Sense Clip**

## 7.2 Power-On/Off Sequence

After connecting the target system, turn on power in the sequence described below. For the details on how to start and end the IE-784000-R's operation, refer to the **User's Manual for the ID78K/IV Integrated Debugger**.

**Caution** Be sure to turn on/off power in the correct sequence; otherwise, the IE-784000-R may not operate correctly or, in the worst case, may be damaged.

### ◇ Procedure

#### – Power-on sequence

- <1> Turn on power to the IE-784000-R.
- <2> Start the integrated debugger.

#### – Power-off sequence

- <1> Turn off power to the target system.
- <2> Turn off power to the IE-784000-R.

### 7.3 Action to Be Taken in Case of Latchup

If a latchup occurs in the emulation CPU of the IE-784000-R or in the peripheral CMOS devices, immediately turn off power.

- The IE-784000-R automatically turns off power when it has detected a latchup.
  - Emulation CPU
  - Peripheral CMOS devices of emulation CPU
  - Other CMOS devices
- Turn off power to the target system.
- Turn off power to the IE-784000-R.

[MEMO]



## CHAPTER 8 FUNCTIONS OF RESPECTIVE CHANNELS

This chapter describes in detail the functions of channels 1 and 3 of the IE-784000-R.

Channel 1 is an interface for setting network information, and channel 3 is an interface for the host machine.

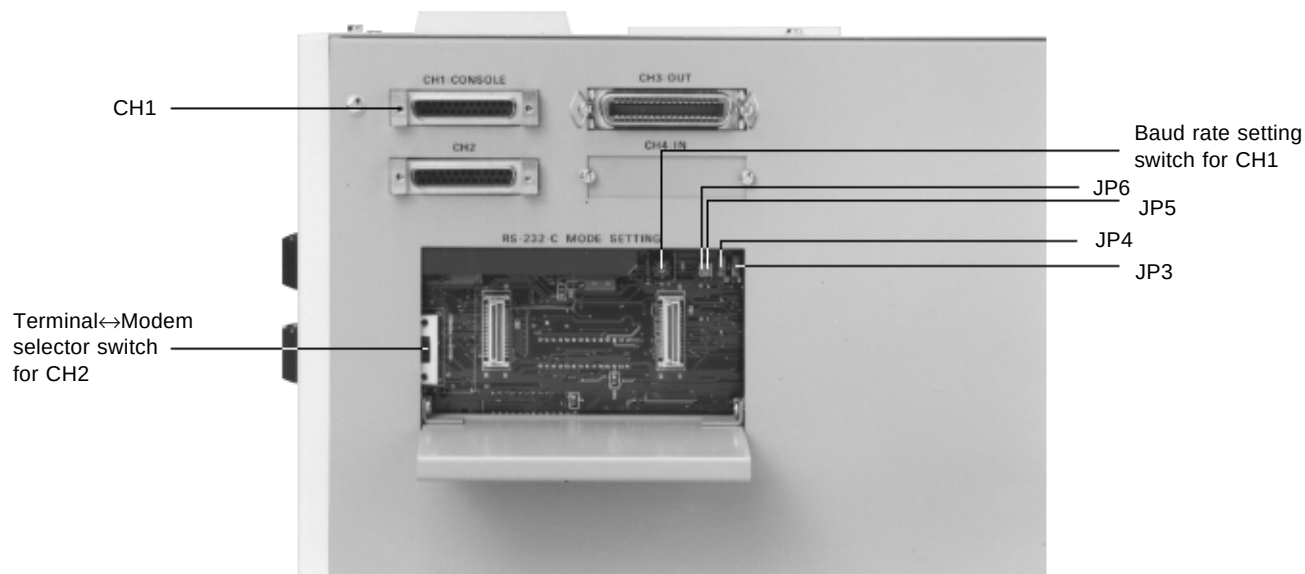
You do not have to read this chapter as long as the IE-784000-R is connected to the host machine by either of the following methods in accordance with **CHAPTER 6 CONNECTING PERIPHERAL EQUIPMENT**.

1. Connect the PC bus interface port (CH3) and host machine.
2. Connect the network interface port (CH1) and host machine.

## 8.1 Function of Channel 1

Channel 1 is a serial interface provided for setting network interface information when the network interface is used. This channel employs an RS-232C interface. The RS-232C setting compartment on a side panel of the IE-784000-R contains a switch that sets a mode of channel 1 (CHANNEL1). Located above this compartment is a serial interface port (CH1).

**Photo 8-1 Channel 1**



**Remark** JP3: Selects SG or FG of CH1  
JP4: Selects SG or FG of CH2  
JP3: Shorted  
JP6: Shorted

Channel 1 controls the RS-232C interface by setting the following five parameters (1) through (5) and sets network information necessary for using the network interface.

Parameters (2) and (3) can be set by using the setting switch or jumper of channel 1. The other parameters, (1), (4), and (5), are fixed and cannot be changed.

#### (1) Mode

| Parameter | Contents   | Setting |
|-----------|------------|---------|
| Mode      | Modem mode | Fixed   |

#### (2) Setting of FG

| Parameter     | Contents   | Setting                |
|---------------|------------|------------------------|
| Setting of FG | Open/short | JP3 shorted to FG side |

#### (3) Baud rate

| Parameter | Contents                                                                                                 | Setting                  |
|-----------|----------------------------------------------------------------------------------------------------------|--------------------------|
| Baud rate | Internal : 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 78600, 153600 [bps]<br>External : 19200 [bps] | Baud rate setting switch |

#### (4) Handshake mode

| Parameter      | Contents                 | Setting |
|----------------|--------------------------|---------|
| Handshake mode | Hardware/software shared | Fixed   |

#### (5) Character specification

| Parameter        | Contents  | Setting |
|------------------|-----------|---------|
| Character length | 8 bits    | Fixed   |
| Parity bit       | No parity |         |
| Stop bit length  | 2 bits    |         |

**(1) Mode**

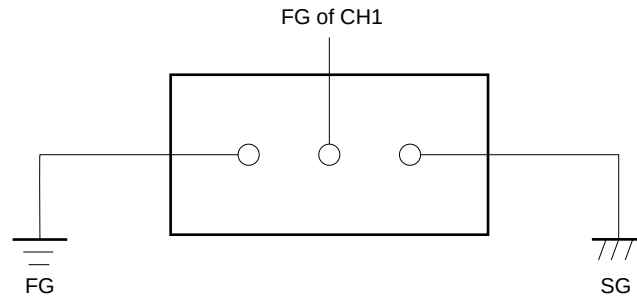
The mode is fixed to the modem mode.

**(2) Setting of FG**

The FG select jumper (JP3) is used for setting of FG. When this jumper is set to the FG (frame ground) side, FG is opened. When it is set to the SG (signal ground) side, FG and SG are shared.

Usually, set the jumper to the FG side (open).

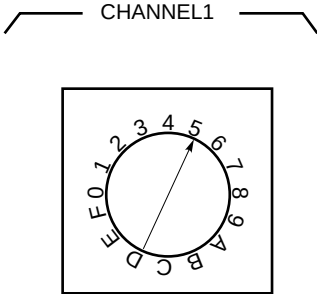
**Fig. 8-1 Circuit Diagram of FG Select Jumper (CH1)**



**(3) Baud rate**

It is necessary to set the baud rate of the terminal same as that of the IE-784000-R. To set a baud rate, use the baud rate setting rotary DIP switch.

**Fig. 8-2 Baud Rate Setting Switch**



**Table 8-1 Setting Baud Rate**

| Switch Position | Baud Rate [bps] | Switch Position | Baud Rate [bps]          |
|-----------------|-----------------|-----------------|--------------------------|
| 0               | 300             | 6               | 19200                    |
| 1               | 600             | 7               | 38400                    |
| 2               | 1200            | 8               | 76800                    |
| 3               | 2400            | 9               | 153600                   |
| 4               | 4800            | A to F          | External <sup>Note</sup> |
| 5               | 9600            |                 |                          |

**Note** This is the mode in which the baud rate of the terminal is used. If the setting of the baud rate is changed, the setting of the IE-784000-R is changed. However, the baud rate must be 19200 bps or less.

**(4) Handshake mode**

Hardware handshaking is established by connecting handshake signals RTS, CTS, DSR, and DTR. If these signals are not connected, software handshaking is executed. Usually, channel 1 executes both hardware handshaking and software handshaking simultaneously to transfer data.

Hardware handshaking is to transfer data 1 byte at a time by using a handshake signal. This is called character handshaking. Software handshaking cannot handshake on a byte-by-byte basis, but can handshake on a block basis. This is called flow control.

The IE-784000-R automatically adjusts its hardware by using the respective handshake signals so that no data overlap during handshaking. For example, if a buffer becomes full, the IE-784000-R controls the CTS signal and completely stops data transfer. Therefore, no data is skipped as long as the handshake signals are connected. If the handshake signals are not connected, however, only software handshaking is executed, and there is a possibility that some data are skipped.

**(5) Character specifications**

The character specifications for data transmission/reception are as follows:

- **Character length**

Fixed to 8 bits

- **Parity bit**

None

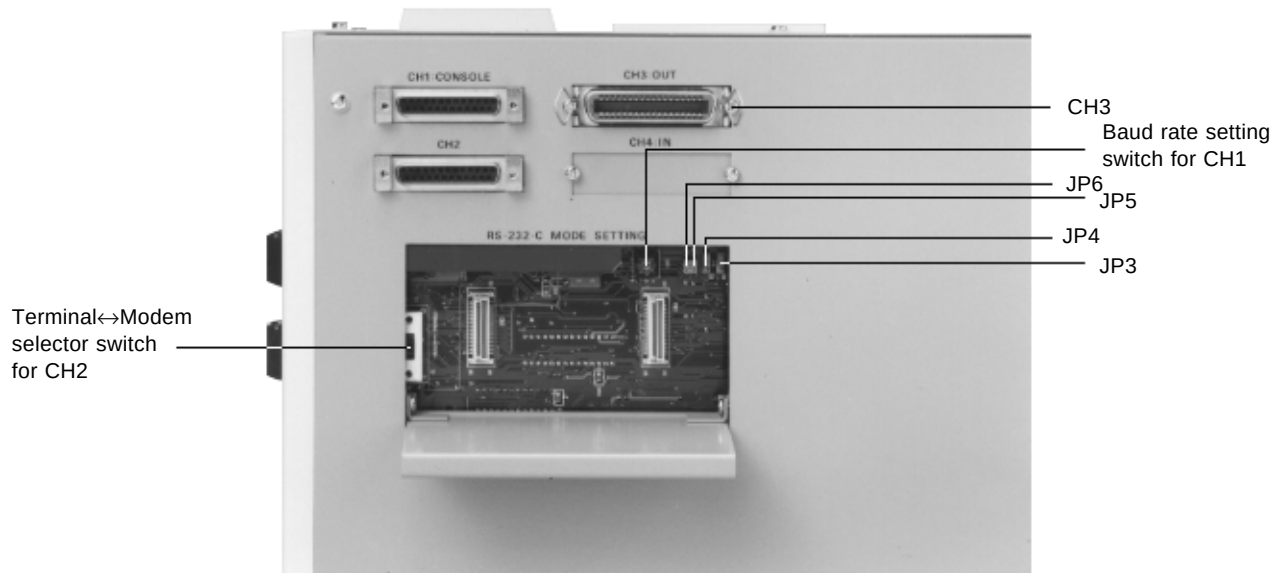
- **Stop bit length**

Fixed to 2 bits

## 8.2 Function of Channel 3

Channel 3 is a PC bus interface/network interface provided for the host machine. It transmits control data between the IE-784000-R and host machine, and loads object files.

Photo 8-2 Channel 3



**Remark** JP3: Selects SG or FG of CH1  
JP4: Selects SG or FG of CH2  
JP5: Shorted  
JP6: Shorted

[MEMO]



## **CHAPTER 9 SETTING NETWORK INFORMATION**

This chapter describes how to set network information necessary for implementing network interfacing. Be sure to set the network information because it is necessary for network interfacing.

The network information is written to the EEPROM on the IE-78000-R-SV3. Once set, therefore, the information is retained even if power has been turned off.

## 9.1 Setting Network Information

The network information can be set in the following two ways:

- <1> By connecting a terminal (by software)
- <2> By using hardware switches (by hardware)

### Features

|                     | Environment                              | Set Information             | Setting       | Merit/Demerit                                                |
|---------------------|------------------------------------------|-----------------------------|---------------|--------------------------------------------------------------|
| Setting by software | Terminal<br>(personal computer,<br>etc.) | All information             | Refer to 9.2. | All information can be set.<br>Terminal is necessary.        |
| Setting by hardware | Unnecessary                              | Only IP address<br>port No. | Refer to 9.5. | Terminal is not necessary.<br>All information cannot be set. |

## 9.2 Setting by Software

### 9.2.1 Connecting equipment

To set the network information by software, the equipment must be set as follows:

- <1> Confirm that the IE-78000-R-SV3 is connected to the setting window.
- <2> Connect channel 1 of the IE-784000-R and terminal with the RS-232C cable supplied as an accessory (for the setting of RS-232C, refer to Table 9-1).
- <3> Connect the IE-ETHER cable supplied as an accessory to channel 3 of the IE-784000-R (the other side of the cable may be left open).
- <4> When power is turned on, the menu shown in Fig. 9-1 will be displayed.

**Table 9-1 Setting of RS-232C (factory-set condition)**

|                |          |
|----------------|----------|
| Baud rate      | 9600 bps |
| Character      | 8 bits   |
| Parity bit     | None     |
| Stop bit       | 2 bits   |
| Modem/terminal | Modem    |

**Fig. 9-1 Menu Screen**

```

IE-SV VX.XX [XX/XX/XX]
--- SETUP NETWORK INFORMATION -----
  1.LOCAL  ETHERNET ADDRESS  XXXXXXXXXXXXX
  2.LOCAL  IP ADDRESS       XXXXXXXXX
  3.LOCAL  HOST NAME        XXXXXXXXXXXXXXXXX
  4.LOCAL  PORT NO.         XXXX
  5.REMOTE ETHERNET ADDRESS  XXXXXXXXXXXXX
  6.REMOTE IP ADDRESS       XXXXXXXXX
  7.REMOTE HOST NAME        XXXXXXXXXXXXXXXXX
  8.REMOTE PORT NO.         XXXX
  9.ROUTER ADDRESS         XXXXXXXXX
 10.SUBNET ADDRESS MASK    XXXXXXXXX
 11.EXIT
-----
FUNCTION NO. > XX

```

### 9.2.2 Operation

This section describes the operations to be performed after the menu screen has been displayed.

FUNCTION NO. > □□

On the menu screen, you can set 11 types of parameters.

Input a parameter number, 1 to 11, to the position of □□ and press the return key (↓).

Parameter “1” is to display only and the setting cannot be changed.

```
--- SETUP NETWORK INFORMATION -----
 1.LOCAL  ETHERNET ADDRESS  XXXXXXXXXXXX    ...  (1)
 2.LOCAL  IP ADDRESS       XXXXXXXX        ...  (2)
 3.LOCAL  HOST NAME        XXXXXXXXXXXXXXXX  ...  (3)
 4.LOCAL  PORT NO.         XXXX             ...  (4)
 5.REMOTE ETHERNET ADDRESS XXXXXXXXXXXX    ...  (5)
 6.REMOTE IP ADDRESS       XXXXXXXX        ...  (6)
 7.REMOTE HOST NAME        XXXXXXXXXXXXXXXX  ...  (7)
 8.REMOTE PORT NO.         XXXX             ...  (8)
 9.ROUTER ADDRESS         XXXXXXXX        ...  (9)
10.SUBNET ADDRESS MASK     XXXXXXXX        ... (10)
11.EXIT                    ...             ... (11)
-----
FUNCTION NO. > XX
```

Each of the 11 parameters is described in detail next.

**(1) LOCAL ETHERNET ADDRESS**

Indicates the Ethernet address of the station. This parameter is only displayed and cannot be set.

**(2) LOCAL IP ADDRESS**

Sets the IP address of the station. Input an 8-digit hexadecimal number.

|                          |            |                                          |
|--------------------------|------------|------------------------------------------|
| <1> LOCAL IP ADDRESS     | > XXXXXXXX |                                          |
|                          |            | XX is currently set.                     |
| <2> NEW LOCAL IP ADDRESS | > □□□□□□□↓ |                                          |
|                          |            | Set the new value to the position of □□. |

**(3) LOCAL HOST NAME**

Sets the host name of the station. Input up to 16 alphanumeric characters.

|                         |         |                                          |
|-------------------------|---------|------------------------------------------|
| <1> LOCAL HOST NAME     | > XXXX  | XX is currently set.                     |
| <2> NEW LOCAL HOST NAME | > □□□□↓ | Set the new value to the position of □□. |

**(4) LOCAL PORT NO.**

Sets the port number of the station. Input a 4-digit hexadecimal number except 0.

|                        |         |                                          |
|------------------------|---------|------------------------------------------|
| <1> LOCAL PORT NO.     | > XXXX  | XX is currently set.                     |
| <2> NEW LOCAL PORT NO. | > □□□□↓ | Set the new value to the position of □□. |

**(5) REMOTE ETHERNET ADDRESS**

Sets the Ethernet address of the other station. Input a 12-digit hexadecimal number.

|                                 |                 |                                                      |
|---------------------------------|-----------------|------------------------------------------------------|
| <1> REMOTE ETHERNET ADDRESS     | > XXXXXXXXXXXXX |                                                      |
|                                 |                 | XX is currently set.                                 |
| <2> NEW REMOTE ETHERNET ADDRESS | > □□□□□□□□□□□↓  |                                                      |
|                                 |                 | Set the new value to the position of □□.             |
|                                 |                 | If the current address is not changed, only input ↓. |

**(6) REMOTE IP ADDRESS**

Sets the IP address of the other station. Input an 8-digit hexadecimal number.

|                           |            |                                                      |
|---------------------------|------------|------------------------------------------------------|
| <1> REMOTE IP ADDRESS     | > XXXXXXXX |                                                      |
|                           |            | XX is currently set.                                 |
| <2> NEW REMOTE IP ADDRESS | > □□□□□□□↓ |                                                      |
|                           |            | Set the new value to the position of □□.             |
|                           |            | If the current address is not changed, only input ↓. |

**(7) REMOTE HOST NAME**

Sets the host name of the other station. Input up to 16 alphanumeric characters.

If the other station is not specified, input ↓.

|                          |         |                                           |
|--------------------------|---------|-------------------------------------------|
| <1> REMOTE HOST NAME     | > XXXX  | XX is currently set.                      |
| <2> NEW REMOTE HOST NAME | > □□□□↓ | Set the new number to the position of □□. |

**(8) REMOTE PORT NO.**

Sets the port number of the other station. Input a 4-digit hexadecimal number.

If the other station is not specified, input ↓.

|                         |         |                                           |
|-------------------------|---------|-------------------------------------------|
| <1> REMOTE PORT NO.     | > XXXX  | XX is currently set.                      |
| <2> NEW REMOTE PORT NO. | > □□□□↓ | Set the new number to the position of □□. |

**(9) ROUTER ADDRESS**

Sets the IP address of the router. Input an 8-digit hexadecimal number.

If the IP address of the router is not set, input 0.

|                        |            |                                           |
|------------------------|------------|-------------------------------------------|
| <1> ROUTER ADDRESS     | > XXXXXXXX | XX is currently set.                      |
| <2> NEW ROUTER ADDRESS | > □□□□□□□↓ | Sets the new value to the position of □□. |

**(10) SUBNET ADDRESS MASK**

Sets a subnet address mask field. Input an 8-digit hexadecimal number. When the subnet address mask is not set, input 0.

|                             |            |                                           |
|-----------------------------|------------|-------------------------------------------|
| <1> SUBNET ADDRESS MASK     | > XXXXXXXX | XX is currently set.                      |
| <2> NEW SUBNET ADDRESS MASK | > □□□□□□□↓ | Sets the new value to the position of □□. |

**(11) EXIT**

Finishes the setting of the network information.

<1> Save & quit/Quit/Continue

If S or s is input in response to this message, the set information is written to the EEPROM, and the setting will be completed.

If Q or q is input, the set information is not written to the EEPROM, and the setting will be completed.

If C or c is input, the menu screen is displayed again.

## 9.3 List of Network Set Values

| No. | Input Parameter         | Input Format | Number of Digits | Input Range    | Default Value |
|-----|-------------------------|--------------|------------------|----------------|---------------|
| 1   | LOCAL ETHERNET ADDRESS  | Hexadecimal  | 12               | 0-FFFFFFFFFFFF | 00004C80XXXX  |
| 2   | LOCAL IP ADDRESS        | Hexadecimal  | 8                | 0-FFFFFFF      | C00101FE      |
| 3   | LOCAL HOST NAME         | Alphanumeric | 16               | —              | IESV3         |
| 4   | LOCAL PORT NO.          | Hexadecimal  | 4                | 1-FFFF         | 1000          |
| 5   | REMOTE ETHERNET ADDRESS | Hexadecimal  | 12               | 0-FFFFFFFFFFFF | FFFFFFFFFFFF  |
| 6   | REMOTE IP ADDRESS       | Hexadecimal  | 8                | 0-FFFFFFF      | 00000000      |
| 7   | REMOTE HOST NAME        | Alphanumeric | 16               | —              | —             |
| 8   | REMOTE PORT NO.         | Hexadecimal  | 4                | 0-FFFF         | 0000          |
| 9   | ROUTER ADDRESS          | Hexadecimal  | 8                | 0-FFFFFFF      | 00000000      |
| 10  | SUBNET ADDRESS MASK     | Hexadecimal  | 8                | 0-FFFFFFF      | 00000000      |

| No. | Input Parameter         | Number of Digits                        |                         | In Case of Abnormal Data Input |
|-----|-------------------------|-----------------------------------------|-------------------------|--------------------------------|
|     |                         | Too few                                 | Too many                |                                |
| 1   | LOCAL ETHERNET ADDRESS  | Left-justified. 0 for remaining digits  | 12 digits from left     | 0                              |
| 2   | LOCAL IP ADDRESS        | Right-justified. 0 for remaining digits | 8 digits from right     | 0                              |
| 3   | LOCAL HOST NAME         | Left-justified                          | 16 characters from left | —                              |
| 4   | LOCAL PORT NO.          | Right-justified. 0 for remaining digits | 4 digits from right     | 0                              |
| 5   | REMOTE ETHERNET ADDRESS | Left-justified. 0 for remaining digits  | 12 digits from left     | 0                              |
| 6   | REMOTE IP ADDRESS       | Right-justified. 0 for remaining digits | 8 digits from right     | 0                              |
| 7   | REMOTE HOST NAME        | Left-justified                          | 16 characters from left | —                              |
| 8   | REMOTE PORT NO.         | Left-justified. 0 for remaining digits  | 4 digits from right     | 0                              |
| 9   | ROUTER ADDRESS          | Right-justified. 0 for remaining digits | 8 digits from right     | 0                              |
| 10  | SUBNET ADDRESS MASK     | Left-justified. 0 for remaining digits  | 8 digits from right     | 0                              |

## 9.4 Meaning of Network Set Values

### (1) LOCAL ETHERNET ADDRESS (station Ethernet address)

This value indicates the Ethernet address of the station. A different value is assigned to each station. The address cannot be changed.

### (2) LOCAL IP ADDRESS (station IP address)

This value indicates the IP address of the station. Usually, one IP address is assigned to each node. Be sure to set this address.

### (3) LOCAL HOST NAME (station host name)

This value indicates the host name of the station.

### (4) LOCAL PORT NO. (station port number)

This value indicates the port number of the station. Be sure to set a port number other than 0. Usually, one port number is assigned to one user application process.

### (5) REMOTE ETHERNET ADDRESS (other station Ethernet address)

This value indicates the Ethernet address of the other station. This address must be set to specify the other station. If the Ethernet address of the other station is not known, set FFFFFFFFFF.

### (6) REMOTE IP ADDRESS (other station IP address)

This value indicates the IP address of the other station. Set this address to specify the other station. Set 0 if the other station is not specified.

### (7) REMOTE HOST NAME (other station host name)

This value indicates the host name of the other station. Set this name to specify the other station. Input ↓ if the other station is not specified.

### (8) REMOTE PORT NO. (other station port number)

This value indicates the port number of the other station. Set this port number to specify the other station. Set 0 if the other station is not specified.

### (9) ROUTER ADDRESS (router IP address)

This value indicates the IP address of the router. It is used to communicate with a station having different net\_ID.

### (10) SUBNET ADDRESS MASK (subnet address mask)

This value indicates a subnet address mask field. net\_ID is determined by this value.

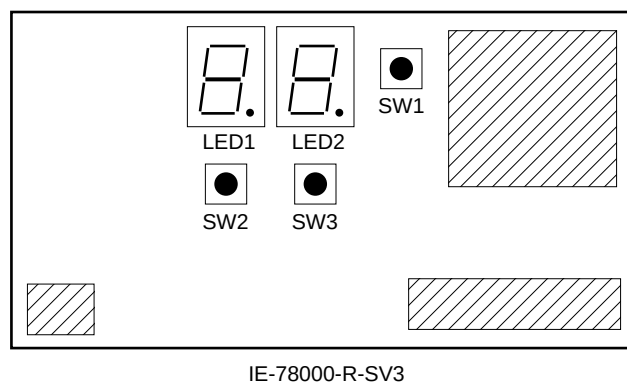


## 9.5 Setting by Hardware

Of the network information, the IP address (LOCAL IP ADDRESS) and port number (LOCAL PORT NO.) can be set by using hardware switches. In this case, no special equipment such as a terminal is necessary.

### <Setting procedure>

- <1> Confirm that the IE-78000-R-SV3 is connected to the setting window.
- <2> Connect the IE-ETHER cable to channel 3 of the IE-784000-R (the other side of the cable may be open).
- <3> Turn on power while holding SW1 (pushbutton switch) on the IE-78000-R-SV3. LED1 and LED2 will blink two times (the network information setting mode is set).



- <4> Perform setting according to the flowchart in Fig. 9-2.

### <Meanings of LEDs and switches>

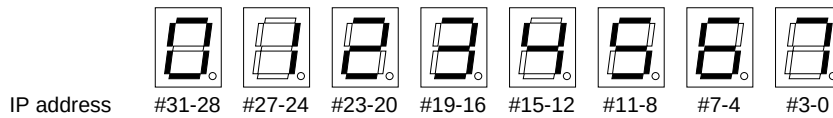
- **LED1**

Indicates the position (pointer) of the data displayed on LED2.

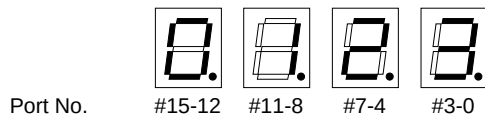
0 to 7 (decimal point remains dark) : IP address

0. to 3. (decimal point lights) : port No.

<1> Indication of LED1 (with decimal point remaining dark)



<2> Indication of LED1 (with decimal point lighting)



- **LED2**

Indicates the value of data indicated by LED1 (hexadecimal indication).

- **SW1**

<1> Sets the network information setting mode when power is turned ON while this switch is held down.

<2> Writes data to the buffer. (Press this switch once. The LED will blink once.)

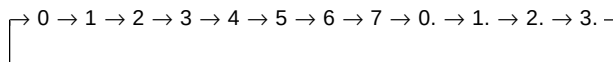
<3> Writes the buffer contents to the EEPROM (Hold down this switch for about 2 seconds. The LED will blink two times.)

- **SW2**

Increments the value indicated by LED1.

The value indicated by LED1 is successively incremented while this switch is held down.

(Incrementing value indicated by LED1)



- **SW3**

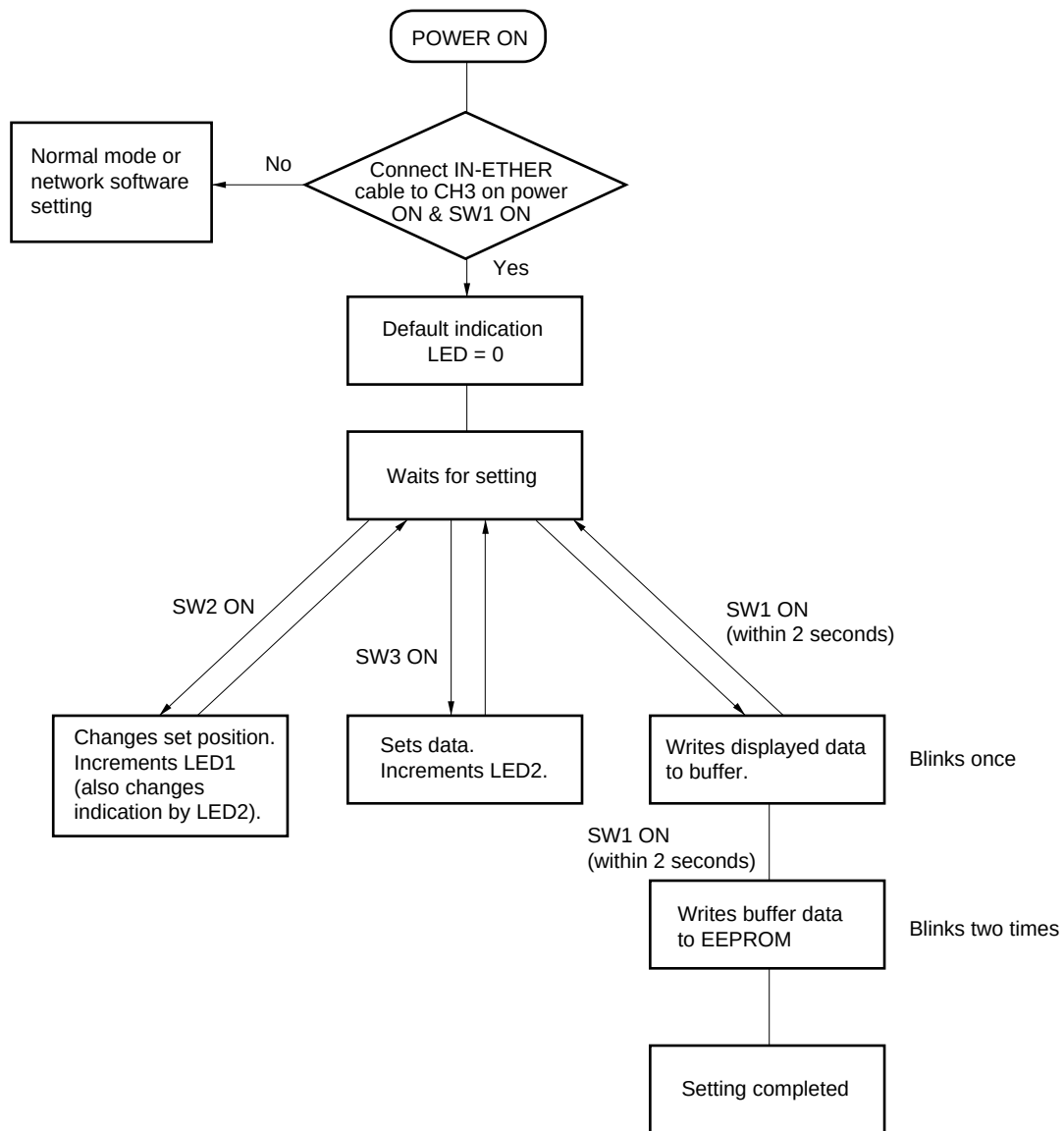
Increments the value indicated by LED2.

The value indicated by LED2 is successively incremented while this switch is held down.

(Incrementing value indicated by LED2)

→ 0 → 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → A → B → C → D → E → F ]

Fig. 9-2 Network Information Setting Flow



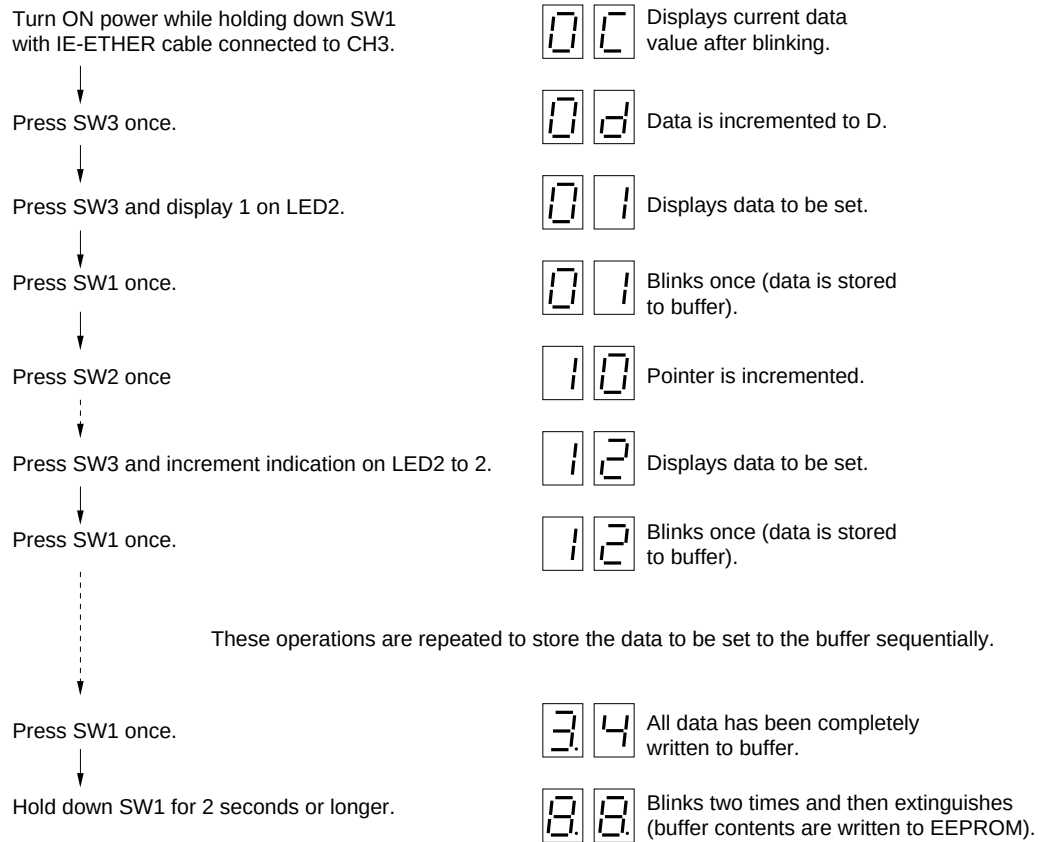
### <Example of setting>

Here is a setting example:

IP address = 12XXXXXXh

Port No. = XXX4h

Both the IP address and port No. are set in hexadecimal number.



The stored data can be checked by pressing SW2 successively.

[MEMO]

## APPENDIX A SPECIFICATIONS

This appendix describes the product specifications (dimensions and electrical specifications) of the IE-784000-R.

### A.1 Product Specifications

| Parameter                   | Specifications                                                                                                      |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------|
| Dimension                   | <ul style="list-style-type: none"><li>• Depth : 370 mm</li><li>• Width : 160 mm</li><li>• Height : 283 mm</li></ul> |
| Weight                      | 8.5 kg                                                                                                              |
| Power requirement           | AC100 – 120/220 – 240 V, 50/60 Hz                                                                                   |
| Power dissipation           | 300 W (MAX.)                                                                                                        |
| Operating temperature range | 10 to 40 °C                                                                                                         |
| Storage temperature range   | –15 to –45 °C                                                                                                       |
| Ambient humidity range      | 10 to 80 % RH                                                                                                       |

## A.2 Basic Specifications as an In-Circuit Emulator

### ◆ Target device

μPD784026 subseries: μPD784020, 784021, 784025, 784026, 78P4026

### ◆ Internal system clock

16 MHz MAX. (However, the clock may be less than 16 MHz depending on the target device.)

### ◆ Clock supply

The clock is supplied from the internal crystal oscillator of the IE-784026-R-EM1 and target system.

### ◆ Memory

- Alternate memory capacity

Internal ROM and alternate memory: 1M bytes (0 wait, except SFR internal RAM)

- Mapping units

Peripheral RAM : 32K bytes MAX.

Internal ROM : 8K-byte units

Alternate memory : 4K-byte units

Peripheral RAM : 256-byte units

### ◆ Event detection

- Bus event detection condition : Detects data read/write or program fetch operation. Can be set by mask data (address/data/status/external data signal).
- Program execution detection condition : Detects program execution at any address. Four points can be set (address/external data signal).
- External data detection condition : Detects that external sense clips 1 through 4 have reached predetermined levels.  
Can be set by mask data.
- External trigger output : High-level signal is output from TRGOUT pin when external trigger condition is satisfied.



◆ **Event integration**

- Break condition setting : Break condition can be set during real-time execution.
- Pass condition setting : Counts the specified number of times of event occurrence.
- Delay condition setting : Sets the number of trace frames until the real-time tracer stops.
- Enable condition setting/  
disable condition setting : Sequential point pulse becomes active in bus cycle in which four enable conditions are satisfied in the order of 1 to 4.  
When the disable condition is satisfied, all the enable conditions become invalid.  
Two sequential circuits are provided.
- Zone measurement condition setting : Performs “real-time trace in zone trace mode” measurement from when the start condition of the zone measurement conditions is satisfied, until the stop condition is satisfied.
- Trace qualify condition setting : Sets a qualify trace condition under which only a specified bus cycle is traced.
- Check point condition setting : Writes the following specified condition to the real-time tracer and re-executes writing when a check point condition is satisfied:  
<1> Register, memory, SFR  
<2> User check routine of target program

◆ **Performance measurement**

Measures time (mean, maximum, or minimum value) of a zone specified by three time measurement conditions.

- Maximum measurement time : 14 minutes 18 seconds
- Resolution : 200 nanoseconds
- Number of measurements : 65535 MAX.

◆ **Internal RAM real-time display**

The addresses of the specified internal RAM space can be displayed real-time.

◆ **C0 coverage**

Displays the accessed area of the program area and data area.

“Accessing” means fetching, reading, and writing.

◆ **Break source**

- Break by event detection
- Manual break
- Break by command
- Trace full break
- Fail-safe break : Non-map break  
Write-protect break  
SFR illegal access break  
Illegal relocation break

◆ **Real-time trace**

- Trace source : All trace  
Section trace  
Qualify trace
- Trace capacity : 32K bytes × 142 bits
- Traced contents : Main bus<sup>Note 1</sup> : Address : 24 bits  
Data : 16 bits  
Status : 5 bits  
CPU internal bus<sup>Note 2</sup> : Address : 10 bits  
Data : 32 bits  
Status : 7 bits  
Others : External sense data signal: 8 bits  
Time tag: 24 bits  
Others : 15 bits

} Selectable

**Notes** 1. Bus to fetch the program from or access data to the internal ROM or expansion memory, and to access SFR data

2. Bus to access the CPU's internal RAM and data

◆ **Target interface**

Emulation probe (optional)

**◆ External interface**

- RS-232C : CH1 ... for setting network information
- PC bus interface : CH3 ... for connecting host machine
- Network interface : CH3 ... for connecting host machine  
(Conforms to IEEE802.3, supports Ethernet: 10BASE5)

**◆ Host machine**

- PC-9800 series
- IBM PC/AT
- EWS

**◆ Control program**

- For Windows (optional)
- Others, supporting each software

**◆ Language processor program****◆ Others**

- Standby function supported
- Internal latchup protection circuit
- Changes event detection and displays trace result during emulation CPU operation

[MEMO]

## APPENDIX B BLOCK DIAGRAM

This appendix shows the block diagrams of the control board and driver module that implements the pivotal functions of the IE-784000-R.

### (1) Control board block

- ◆ **Driver control**

Interfaces the driver module.

- ◆ **Serial interface**

One channel of an RS-232C interface is provided.

This interface channel is used to set network information.

- ◆ **RAM**

768K-byte memory with symbol and program work areas

- ◆ **ROM**

512K-byte ROM storing the program that starts the IE-784000-R

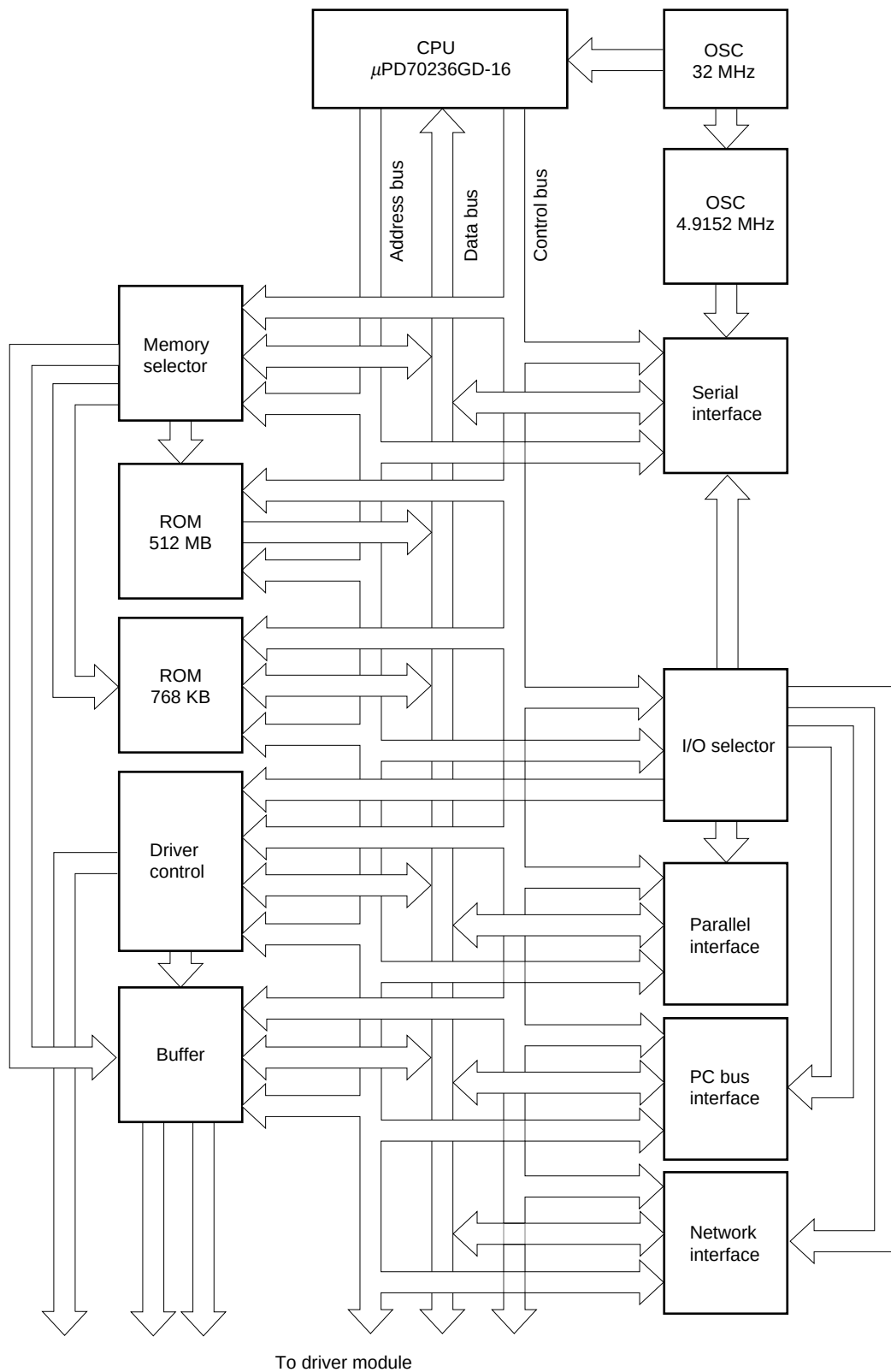
- ◆ **PC bus interface**

One dedicated parallel interface channel that can be used when a dedicated interface board is connected to a personal computer (PC-9800 series or IBM PC/AT) is provided (the connector is also used to connect the network interface).

- ◆ **Network interface**

One channel of network interface (supporting Ethernet) conforming to IEEE802.3 is provided (the connector is also used to connect the PC bus interface). To use the network interface, an optional network board is necessary.

**Fig. B-1 Block Diagram of Control Board**



**(2) Driver module block**

The driver module block consists of the following six:

- (a) I/O emulation board
- (b) Emulation board
- (c) Mother bus interface
- (d) Event trace board
- (e) Performance board
- (f) Control interface

Each of these is described next.

**(a) I/O emulation board****◆ I/O emulation**

Emulates the target device.

**◆ Target interface**

Interfaces the target system via the emulation probe.

**◆ Clock block**

The clock block selects the clock to be supplied to the evachip under direction by the supervisor.

<1> The internal clock of the IE is used.

<2> The user clock is used (supplied from the emulation probe or a user clock is mounted).

**(b) Emulation board****◆ Emulation CPU**

Provided with the CPU emulation function of the target device and special functions of the IE-784000-R.

**◆ Latchup warning block**

Turns off power to the emulation CPU, peripheral CMOS devices of the emulation CPU, and TTL at the stage preceding to the CMOS devices if a latchup occurs in the emulation CPU, peripheral CMOS devices, or TTL.

**◆ Program execution detection block**

Detects program execution at a set address.

**◆ 3-V emulation/5-V emulation selector block**

Allows emulation in accordance with the supply voltage of the target.

◆ **Emulation memory**

Alternate memory of 0-FFFFFH (except SFR, internal RAM, and peripheral RAM) that can be accessed by the target device in the  $\mu$ PD784026 subseries. Even if the target system has not been developed, software debugging can be implemented by using this memory. With a mapping function, 0 to 64K bytes can be allocated as an alternate memory in 4K-byte units, and an internal ROM can be allocated in 8K-byte units. Map a space of 64K to 12K in 64K-byte units.

◆ **Peripheral RAM**

Can be allocated as an internal expansion RAM in 256-byte units.

◆ **Break control block**

Controls break, manual break, and fail-safe break of the emulation CPU caused by detection of each event.

◆ **Internal RAM real-time display**

The value of the internal RAM can be displayed real-time.

◆ **Alternate memory**

Dual-port memory to establish alternate communication between the supervisor CPU and emulation CPU.

**(c) Mother bus interface**

Connector to establish communication among the emulation board, event board, and trace board.

**(d) Event trace board**

◆ **Bus event detection block**

Detects read/write access to memory and SFR and prefetch operation of the program.

◆ **External data detection block**

Detects that external sense clips 1 to 4 reach predetermined levels.

◆ **Event control block**

Integrates many types of event detection.

◆ **Trace control block**

Controls the trace condition and data. The IE-784000-R has a trace memory of 32K words x 142 bits that records the execution status of the emulation CPU. Various trace conditions can be set by combining event conditions.



**(e) Performance board****◆ Performance measurement block**

Measures the execution time of a zone specified as one of the three zone measurement conditions, and the number of executed instructions.

**◆ C0 coverage block**

Records the accessed area of the program area and data area.

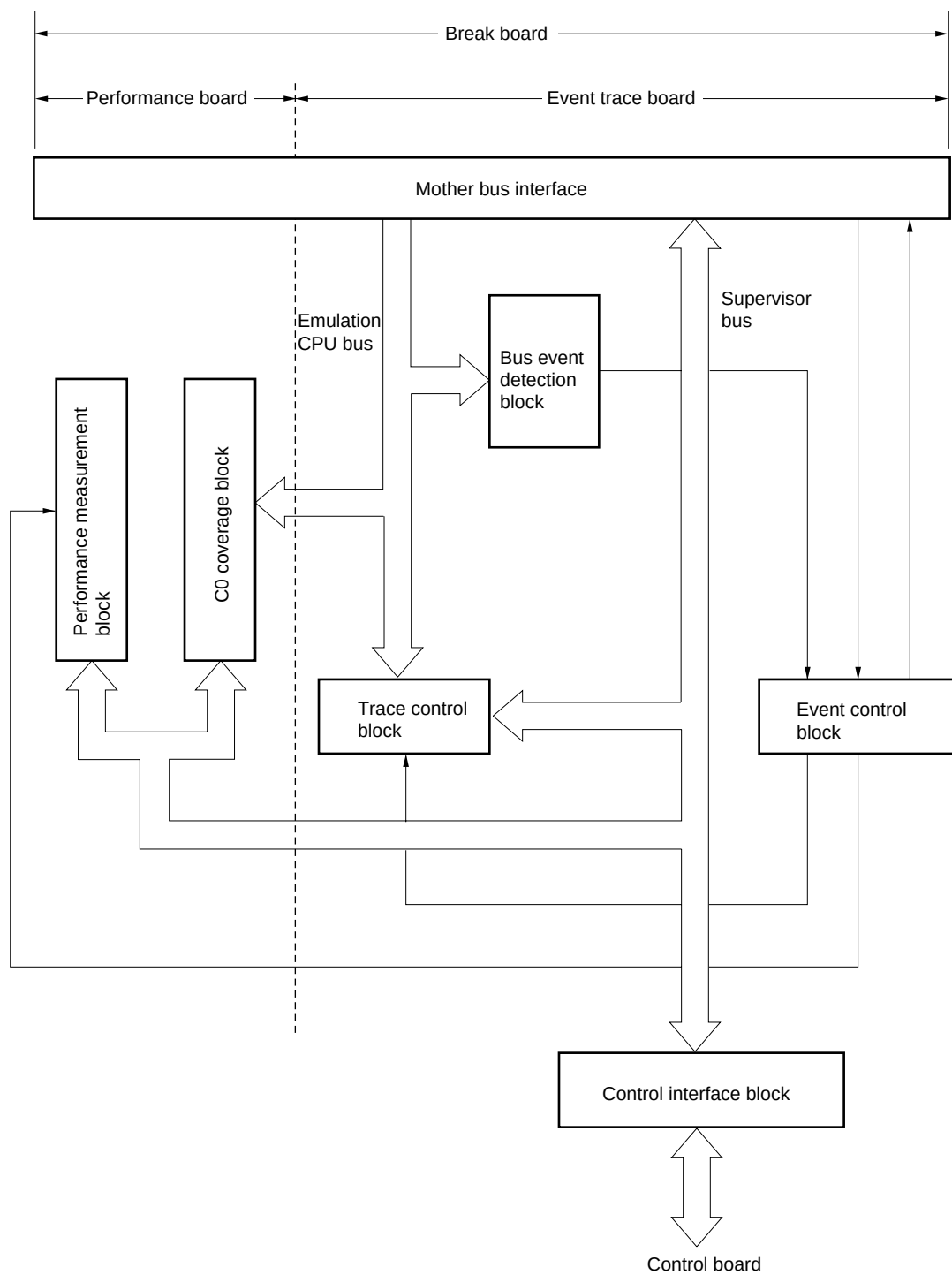
**(f) Control interface**

Used by the supervisor CPU to communicate with the driver module.

The diagram illustrates the architecture of an emulation system, organized into several hierarchical layers and functional blocks:

- Emulation probe:** The topmost layer, connected to the Target interface via a bidirectional arrow.
- Target interface:** A central layer that connects to the Emulation board interface and the Mother bus interface. It also connects to the I/O emulation CPU and the Clock.
- Emulation board interface:** A layer that connects to the Emulation CPU and the Mother bus interface.
- Emulation CPU:** The central processing unit, connected to the I/O emulation CPU, the Clock, the Program execution detection block, the Peripheral RAM, the Alternate memory, the Internal RAM real-time display, and the Break control block.
- I/O emulation CPU:** A block that interfaces with the Emulation CPU and the Clock.
- Clock:** A block that provides timing signals to the I/O emulation CPU and the Emulation CPU.
- Program execution detection:** A block that interfaces with the Emulation CPU, the Peripheral RAM, the Alternate memory, the Internal RAM real-time display, and the Break control block.
- Peripheral RAM:** A block that interfaces with the Emulation CPU and the Program execution detection block.
- Alternate memory:** A block that interfaces with the Emulation CPU, the Program execution detection block, the Internal RAM real-time display, and the Break control block.
- Internal RAM real-time display:** A block that interfaces with the Emulation CPU, the Program execution detection block, the Alternate memory, and the Break control block.
- Break control:** A block that interfaces with the Emulation CPU, the Program execution detection block, the Alternate memory, and the Internal RAM real-time display.
- 3-V/5-V selection:** A block that interfaces with the User power supply, the Internal power supply of IE, and the Program execution detection block.
- Latchup:** A block that interfaces with the User power supply and the Program execution detection block.
- User power supply:** A block that provides power to the Latchup and the 3-V/5-V selection block.
- Internal power supply of IE:** A block that provides power to the 3-V/5-V selection block.
- Supervisor bus:** A bus that connects the Program execution detection block to the Emulation CPU, the Peripheral RAM, the Alternate memory, the Internal RAM real-time display, and the Break control block.
- Emulation CPU bus:** A bus that connects the Emulation CPU to the Peripheral RAM, the Alternate memory, the Internal RAM real-time display, and the Break control block.
- Mother bus interface:** The bottommost layer, connected to the Target interface and the Emulation board interface.

Fig. B-3 Block Diagram of Driver Module (2)



[MEMO]

## APPENDIX C JUMPER SETTING

This appendix describes the factory-set conditions of the jumpers on the supervisor board (IE-78000-R-SV2) and emulation board (IE-784000-R-EM). Usually, the setting of the jumpers needs not to be changed.

### C.1 Setting of Jumpers on Supervisor Board

The factory-set conditions of the jumpers on the supervisor board (IE-78000-R-SV2) are as follows:

**Table C-1 Jumper Setting (factory-set conditions)**

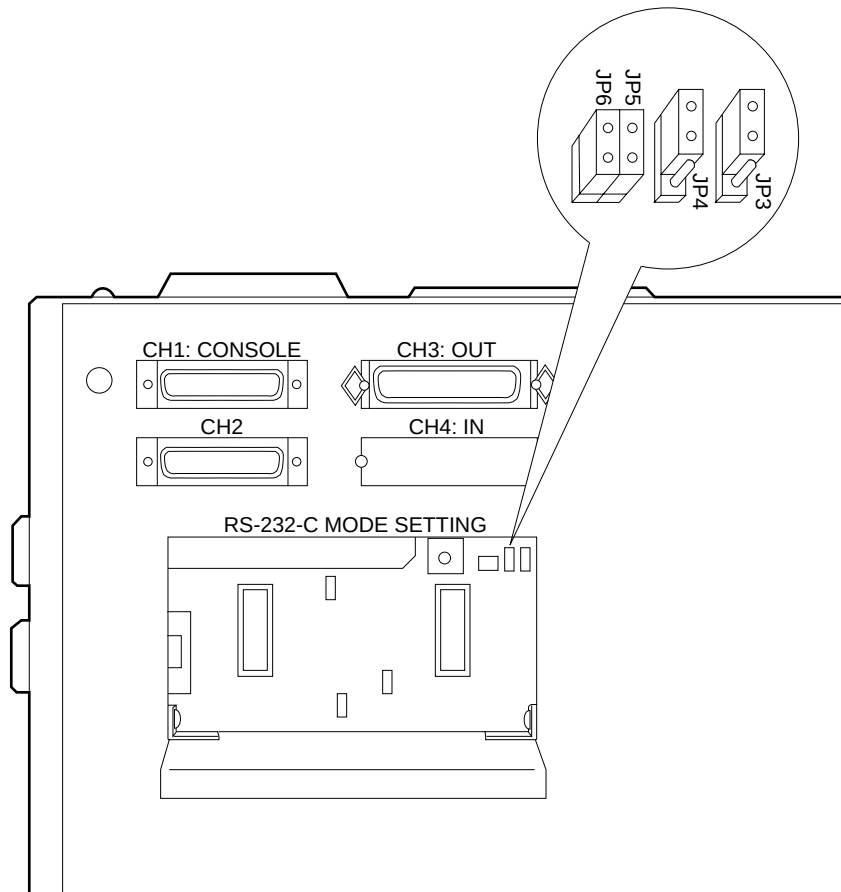
| Board                                | Jumper No. | Setting                                                   |
|--------------------------------------|------------|-----------------------------------------------------------|
| Supervisor board<br>(component side) | JP1        | Shorted to 1024 side/shorted to 4096 side <sup>Note</sup> |
|                                      | JP2        | Open                                                      |
| Supervisor board<br>(setting window) | JP3        | Shorted to FG side                                        |
|                                      | JP4        | Shorted to FG side                                        |
|                                      | JP5        | Shorted                                                   |
|                                      | JP6        | Shorted                                                   |

**Note** Set to either side depending on the type of the monitor ROM mounted (equivalent to  $\mu$ PD27C1024/ $\mu$ PD27C4096). The supervisor board does not operate correctly if the factory-set condition is changed.

**Caution** If the factory-set conditions of JP1, JP2, JP5, and JP6 are changed, the supervisor board does not operate correctly. Do not change the factory-set conditions of the jumpers, because they do not have to be changed for ordinary use.

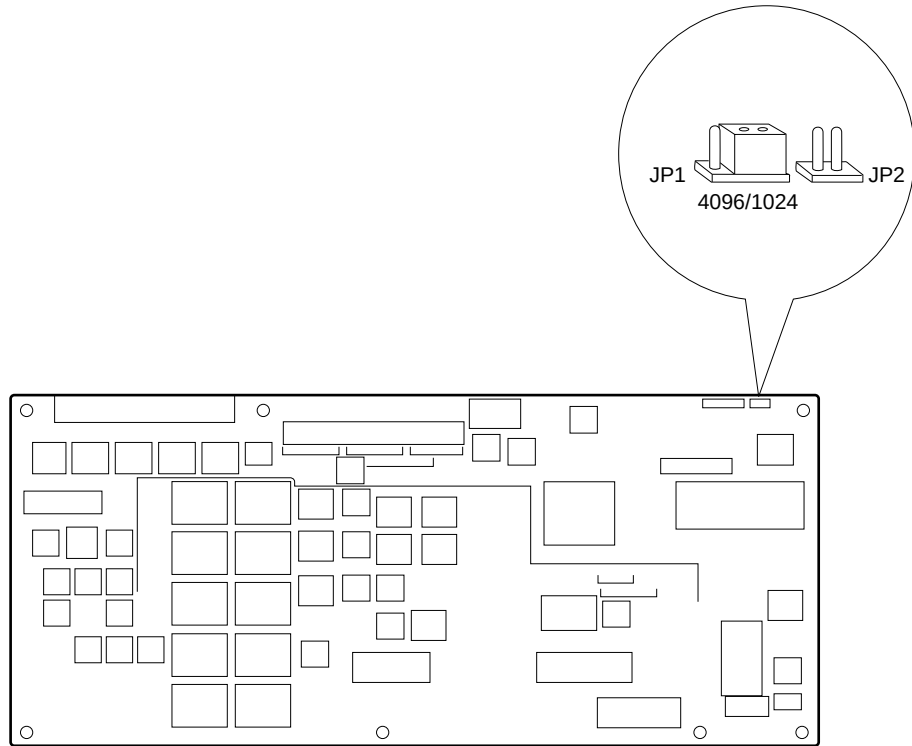
Fig. C-1 Locations of Jumpers on IE-78000-R-SV2 Board (1/2)

Setting window



**Fig. C-1 Locations of Jumpers on IE-78000-R-SV2 Board (2/2)**

**Component side**



## C.2 Setting Jumper on Emulation Board

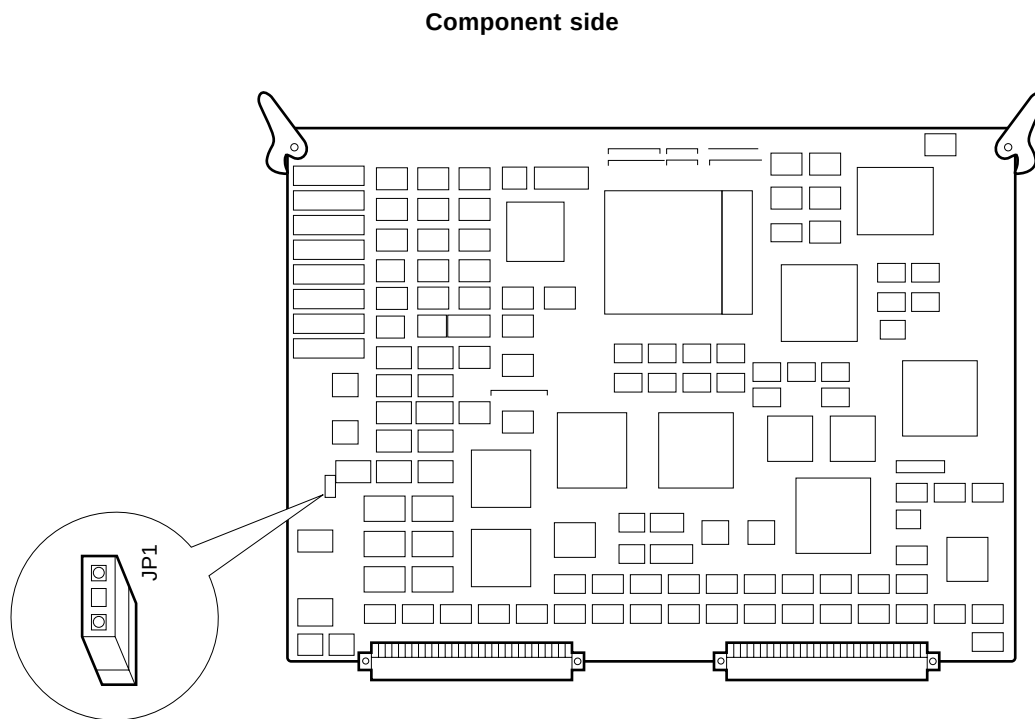
The factory-set conditions of the jumper on the emulation board (IE-784000-R-EM) are as follows:

**Table C-2 Jumper Setting (factory-set conditions)**

| Board           | Jumper No. | Setting |
|-----------------|------------|---------|
| Emulation board | JP1        | Shorted |

**Caution** If the factory-set condition of the jumper is changed, the emulation board does not operate correctly. Do not change the factory-set conditions of the jumper, because it does not have to be changed for ordinary use.

**Fig. C-2 Location of Jumper on Emulation Board**





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