NEC

User's Manual

IE-75300-R-EM

75X Series Emulation Board
75XL Series Emulation Board
Version 1.47

For

IE-75001-R

IE-75000-R

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Major Revisions in This Edition

Page	Description
General	Upgraded the IE-75300-R-EM to Ver.1.47
	Added μPD753304 to target devices
	Upgraded information ROM (IC79, IC80) and system setting data ROM (IC3)
p.41	Added **3.4 Differences in Clock Generation Circuit**
p.43	Added **3.7 Restrictions**
p.46	**4.1 Differences among Target Devices** Added **(5) Serial interface**, and **(6) A/D converter**
p.47	Change in **4.2 Handling of Pins of IE-75300-R-EM (μPD75308, 316, 328, and 336 Subseries)**
p.50	Change in **5.2 Handling of Pins of IE-75300-R-EM (μPD750008, 0108 Subseries)**
p.52	Change in **6.2 Handling of Pins of IE-75300-R-EM (μPD750068 Subseries)**
p.54	Change in **7.2 Handling of Pins of IE-75300-R-EM (μPD753017 Subseries)**
p.56	Change in **8.2 Handling of Pins of IE-75300-R-EM (μPD753036 Subseries)**
p.58	Change in **9.2 Handling of Pins of IE-75300-R-EM (μPD753108 Subseries)**
p.60	Change in **10.2 Handling of Pins of IE-75300-R-EM (μPD753208 Subseries)**
p.63	**12.1 Differences among Target Devices** Added **(2) EEPROM™**
p.66	Change in **13.2 Handling of Pins of IE-75300-R-EM (μPD754304 Subseries)**

The mark ★ shows major revised points.

INTRODUCTION

Product description

The IE-75300-R-EM, when connected to the separately sold IE-75001-R[Note], is used for debugging of 4-bit single-chip microcomputers of the 75X or 75XL Series. This device cannot be used with the EVAKIT-75X.

Note The IE-75001-R comes as an IE-75000-R-EM taken from the IE-75000-R (maintenance part). The IE-75000-R can be used in place of the IE-75001-R.

Readers

This manual is intended for system debugging engineers who are using the 75X or 75XL Series and who connect the IE-75300-R-EM to the IE-75001-R.

Purpose

This manual's purpose is to explain methods for connecting the IE-75300-R-EM to the IE-75001-R and settings to be made when debugging various devices in the 75X or 75XL Series.

Organization

This manual generally contains the following sections.

- System configuration
- IE-75001-R connection methods and settings

How to read this manual

Engineers who read this manual are assumed to be acquainted with the functions and use methods for devices to be debugged and knowledgeable about debugging.

> When using the IE-75000-R, you can consider all of this manual's references to the IE-75001-R as applicable to the IE-75000-R (see the setting procedures described in **CHAPTER 2 INSTALLATION PROCEDURE**).
> The shape and connecting methods of versions less than and above the IE-75300-R-EM Ver.1.32 differ.
> When using an IE-75300-R-EM earlier than Ver.1.32, read the user's manual provided for that IE-75300-R-EM.

For a brief description of the IE-75300-R-EM's functions and operation methods:
-> See the table of contents

For description of basic specifications:
-> See the overview description in **CHAPTER 1 OVERVIEW**.

For information on setting methods when debugging various devices connected to the IE-75001-R:
-> See **CHAPTERS 2** to **13**.

Legends

Main system clock : this manual assumes that the main system clock has been set to 4.19 MHz.

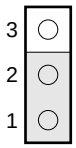
Significance of data notation : left side is most significant, right side is least significant.

Symbols inside of boxes : contents of monitor screen or input command.

Input key description
: xxxxx indicates key input.
: The ↵ symbol indicates the return (ENTER) key.
: The Δ symbol indicates a space.

JP settings : JP (Jumper Pin) settings are indicated as shown below.

Example

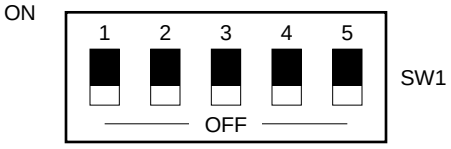


JP3

Indicates short between pins 1 and 2 in JP3.

Switch settings : switch (DIP switch) settings are indicated as shown below.

Example



(1 to 5 are ON)

Indicates bits 1 to 5 in SW1 are ON.

Note : refers to notes explaining contents of text.

Caution : refers to contents that warrant special attention when reading.

Numerical notation
: binary numbers ... xxxxB
: hexadecimal numbers ... xxxxH

Related document **IE-75000-R/IE-75001-R USER'S MANUAL** (ref. No. EEU-846).

[MEMO]

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[MEMO]

CHAPTER 1 OVERVIEW

1.1 What is the IE-75300-R-EM?

The IE-75300-R-EM is an emulation board for the (separately sold) IE-75001-R development system for 4-bit single-chip microcomputers of the 75X or 75XL Series. When the IE-75001-R is combined with the IE-75300-R-EM and the EP-75xxxzz-R[Note 1] (separately sold adapter board and emulation probe described (refer to **Table 1-1**)), efficient debugging and operation checking of the system using various devices[Note 2] can be performed.

This emulation board can execute emulation in the power supply voltage V_{DD} range of 2.7 to 5.0 V.

Notes 1. The EP-75xxxzz-R is an adapter board and emulation probe for various devices used with the 75X or 75XL Series.

Example EP-75328GC-R: probe set for μPD75328GC and P328.

2. Refer to **1.5 List of Target Devices.**

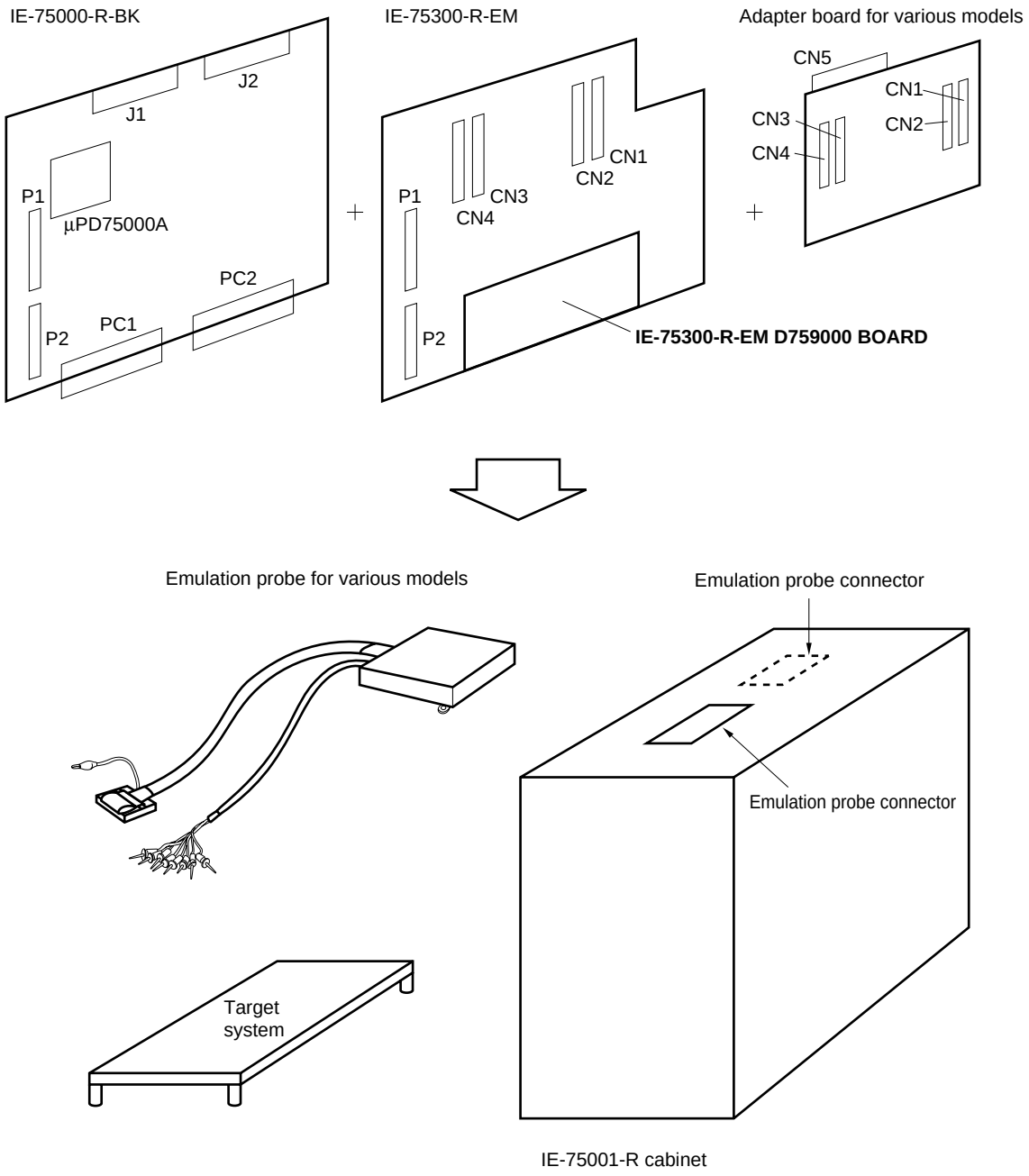
Table 1-1. Adapter Boards and Emulation Probes for Various Models

No. of Pins	Package	Target Device	Adapter Board/Emulation Probe
80	QFP (GF) (0.8 mm pitch) WQFN (K)	μPD75304, 304B, 306, 306B, 308, 308B, P308, 312, 316, P316, P316A	EP-75308GF-R
	QFP (GC) (0.65 mm pitch)	μPD75304B, 306B, 308B, 312B, 316B, P316B	EP-75308BGC-R
		μPD753012, 3012A, 3016, 3016A, 3017, 3017A, P3018, P3018A	EP-753017GC-R
		μPD75328, P328	EP-75328GC-R
		μPD75336, P336, 3036, P3036	EP-75336GC-R
	TQFP (GK) (0.5 mm pitch)	μPD75304B, 306B, 308B, 312B, 316B, P316B	EP-75308BGK-R
		μPD753012, 3012A, 3016, 3016A, 3017, 3017A, P3018, P3018A	EP-753017GK-R
		μPD75336, P336, 3036, P3036	EP-75336GK-R
64	QFP (GC) (0.8 mm pitch)	μPD753104, 3106, 3108, P3116	EP-753108GC-R
	QFP (GK) (0.65 mm pitch)	μPD753104, 3106, 3108, P3116	EP-753108GK-R
48	Shrink SOP (GT)	μPD753204, 3206, 3208, P3216	EP-753208GT-R
44	QFP (GB) (0.8 mm pitch)	μPD750004, 0006, 0008, P0016, 0104, 0106, 0108, P0116	EP-75008GB-R
42	Shrink DIP (CU)	μPD750004, 0006, 0008, P0016, 0104, 0106, 0108, P0116	EP-75008CU-R
		μPD750064, 0066, 0068, P0076	EP-750068CU-R
★	Shrink DIP (DU)	μPD753304[Notes 1, 2]	EP-753304DU-R
	Shrink SOP (GT)	μPD750064, 0066, 0068, P0076	EP-750068GT-R
36	Shrink SOP (GS)	μPD754302, 4304, 4308	EP-754304GS-R
20	SOP (GS) (1.27 mm pitch)	μPD754202, 4144, 4244, 4264, F4264[Note 2]	EP-754144GS-R
	Shrink SOP (GS) (0.65 mm pitch)	μPD754202, 4144, 4244	

Notes **1.** Supports only ES products (shrink DIP (DU)), but not mass produced products (bare chip).

2. Under development

Figure 1-1. Connection with IE-75001-R



1.2 IE-75300-R-EM Features

The IE-75300-R-EM has the following features when connected to the IE-75000-R-BK.

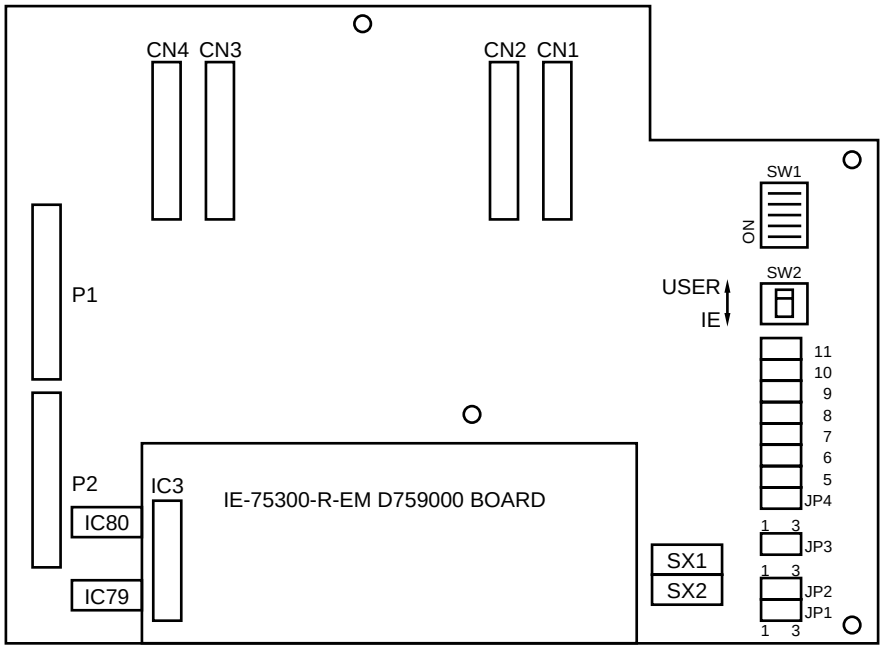
(1) Emulation can be performed in real time or in one step for various target devices[Note 1].
(2) If the target program has accessed a stack area, data memory, a register, or a peripheral I/O which is not incorporated in the target devices, forced termination of the program's execution will be performed (guard break function).
(3) When using the IE-75001-R's on-line assembler function (ASM command), you can use target device peripheral hardware reserved words[Note 2] for operand input addresses.
(4) The I/O port status can be traced during emulation.
(5) The command set that can be assembled and disassembled using the ASM and DAS commands is attached to the target device[Note 1].

Notes 1. Refer to **1.5 List of Target Devices.**
2. A reserved word is a symbol value that has been reserved to indicate the address assigned to a target device's peripheral hardware by memory mapped I/O.

1.3 IE-75300-R-EM Product Configuration

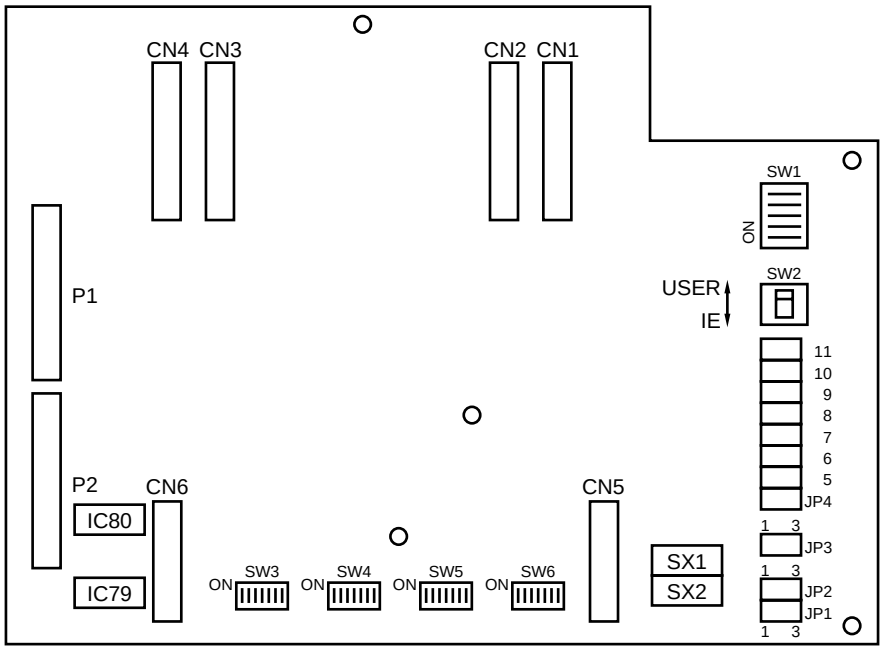
The IE-75300-R-EM consists of the products shown in Figure 1-2.

Figure 1-2. IE-75300-R-EM and Its Product Configuration (1/3)

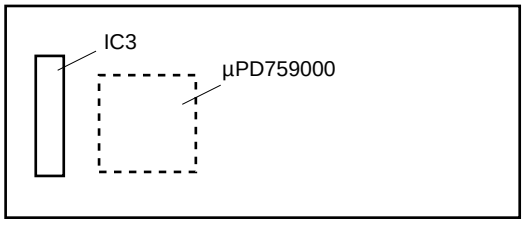


IE-75300-R-EM

Figure 1-2. IE-75300-R-EM and Its Product Configuration (2/3)



IE-75300-R-EM (With the IE-75300-R-EM D759000 BOARD removed)

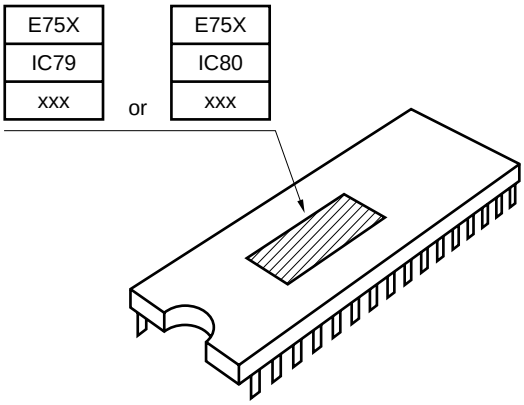


IE-75300-R-EM D759000 BOARD

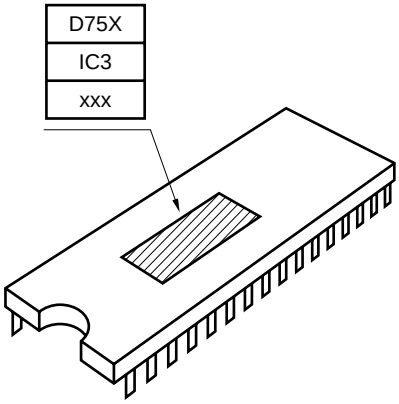
Remark IE-75300-R-EMs later than Ver.1.32 do not have SW3 to SW6 and JP4 to JP11. Settings performed by users using SW3 to SW6 and JP4 to JP11 in versions earlier than Ver.1.32 are performed automatically by the IE-75300-R-EM D759000 BOARD with versions later than Ver.1.32, thus eliminating the need for users to perform the settings.

IE-75300-R-EM boards later than Ver.1.32 also have labels SW3 to SW6 and JP4 to JP11 because the same board as versions earlier than Ver.1.32 are used.

Figure 1-2. IE-75300-R-EM and Its Product Configuration (3/3)



Information ROM (µPD27C1001A)
(Mounted on IE-75300-R-EM's IC79 and IC80 when shipped)



System setting data ROM (µPD27C1001A)
(Mounted on IC3 IE-75300-R-EM D759000 BOARD when shipped)

Caution The IE-75300-R-EM includes dedicated devices for emulation of each target devices' peripheral function (I/O port, etc.).

1.4 IE-75300-R-EM Part Names

Table 1-2. IE-75300-R-EM Part Names

Name	Function
SW1	DIP switch for selecting target device when starting up system
SW2	Power supply switch
JP1	Internal clock and user clock switch for subsystem clock
P1, P2	Connector for IE-75000-R-BK connection
CN1 to CN4	Connector for adapter board connection
SX1, SX2	Socket for mounting user clock
★ IC79[Note], IC80[Note]	Information ROM Ver.3.3
★ IC3[Note]	System setting data ROM Ver.3.3 (Mounted on IE-75300-R-EM D759000 BOARD)

Note Mounted on IE-75300-R-EM prior to shipment.

Other than the above, the IE-75300-R-EM is provided with IC86 (firmware ROM Ver.1.6), IC79,
★ IC80 (information ROM Ver.4.3), and IC3 (system setting data ROM Ver.4.3).

1.5 List of Target Devices

In this manual, the term “target device” is used to refer to microcontrollers such as the μPD75308 that are targeted for emulation.

Also, the term “target system” is used to refer to user systems composed of target devices.

The following are target devices that can be emulated using the IE-75001-R.

μPD75304, 304B, 306, 306B, 308, 308B, P308,
75312, 312B, 316, 316B, P316, P316A, P316B,
75328, P328, 336, P336,
750004, 0006, 0008, P0016,
750104, 0106, 0108, P0116,
750064, 0066, 0068, P0076,
753012, 3012A, 3016, 3016A, 3017, 3017A, P3018, P3018A,
753036, P3036,
753104, 3106, 3108, P3116,
753204, 3206, 3208, P3216,
★ 753304[Notes 1, 2],
754202, 4144, 4244, 4264, F4264[Note 2],
754302, 4304, P4308

Notes **1.** Supports only ES products (shrink DIP (DU)), but not mass produced products (bare chip).

2. Under development

1.6 Cautions Concerning Use of IE-75300-R-EM

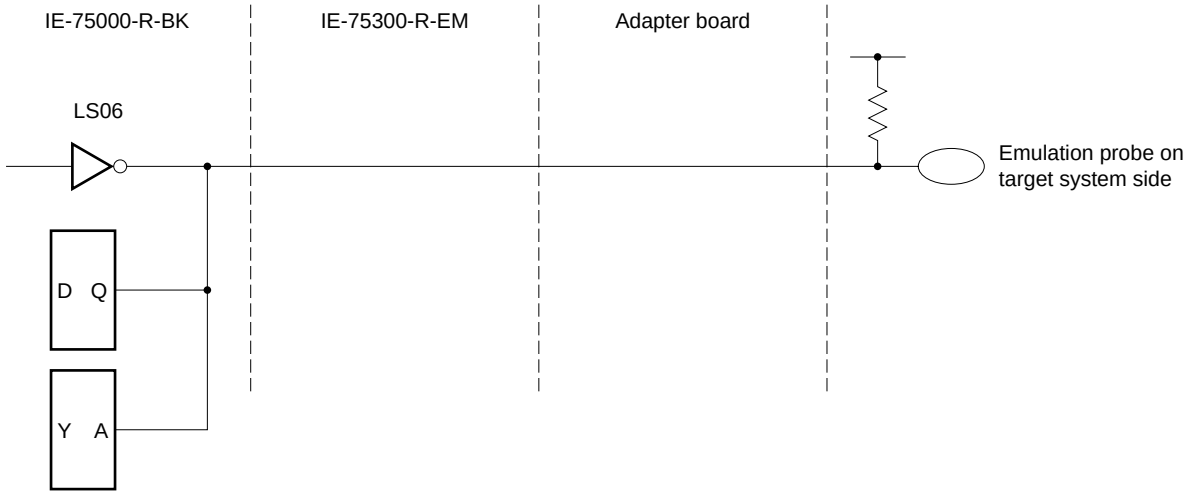
The following shows common precautions not specifically related to the target device used.
Refer to **CHAPTERS 3** to **13** for precautions for each target device used.

(1) Turn off the power supply to the IE-75001-R and target system before connecting or removing the IE-75300-R-EM and adapter board or target system, or changing the switch settings on these devices.
(2) When connecting the IE-75300-R-EM with the IE-75001-R to emulate a target device, the operation will vary in some respects from that of an actual device.
(3) If the connection between the IE-75300-R-EM and the IE-75001-R has not been made correctly, a “No Connect” message is output and the devices will not operate correctly.
(4) If the target program attempts to access a memory area, peripheral I/O, stack pointer, or register which is not incorporated in the target devices, forced termination of the program’s execution will be performed and one of the following messages will be displayed on the IE-75001-R.

Memory area	“GDM” break terminated
Peripheral I/O	“GDIO” break terminated
Stack pointer	“GDSP” break terminated
Register	“GDR” break terminated

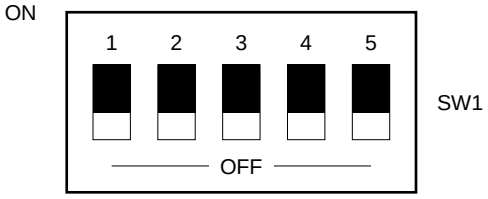
(5) When performing mnemonic input using ASM commands, note that the data memory R/W attributes have not been checked.
(6) Bit 0 (EXT0) on the external sense clip used for the external trigger sets up open drain output and therefore a pull-up resistor should be attached.
External sense interface should be used in output mode. Do not use it in input mode.
Figure 1-3 shows the interface circuit for the external sense clip.

Figure 1-3. Interface Circuit for External Sense Clip



(7) The DIP switch (SW1) on the IE-75300-R-EM is set as follows prior to shipment. When connecting to the IE-75001-R, use the STS command or SW1 to select the target device. (Refer to **2.3 Selection of Target Device**)

Figure 1-4. SW1 Setting (for shipment of IE-75300-R-EM)



(Bits 1 to 5 are ON.)

1.7 ROMs Provided with IE-75300-R-EM

IE-75300-R-EMs later than Ver.1.32 are provided with the following four ROMs.

- Firmware ROM (IC86 Ver.1.6)
- ★ • Information ROM (IC79, IC80 Ver.4.3)
- ★ • System setting data ROM (IC3 Ver.4.3)

These ROMs are used when replacing ROMs mounted on the IE-75001-R and IE-75300-R-EM prior to shipment to the version of the IE-75300-R-EM and target device.

1.7.1 Firmware ROM

The firmware ROM (IC86 Ver.1.6) is used when connecting IE-75300-R-EMs above Ver.1.32 to the IE-75001-R.

Replace the firmware ROM mounted on the IE-75001-R prior to shipment with the firmware ROM (IC86 Ver.1.6) provided with the IE-75300-R-EM.

For details, refer to **2.1.3 When exchanging firmware ROM**.

Cautions 1. The IE-75001-R provided with a firmware ROM earlier than Ver.1.6 cannot be used for IE-75300-R-EMs Ver.1.32 or later. If used, the message “NO CONNECT” will be displayed.

2. Always replace the firmware ROM before turning on the power.

1.7.2 Information ROM and system setting data ROM

★ The information ROM and system setting data ROM (Ver.3.3) mounted on the IE-75300-R-EM prior to shipment needs to be replaced with the ROM (Ver.4.3) provided with the IE-75300-R-EM according to the target device used.

For details, refer to **2.4 ROM Checking and Replacement**.

Table 1-3. Information ROM and System Setting Data ROM

IE-75300-R-EM Version	Applications	ROM Label	Mounting Site	Device
Less than Ver.1.32	Information ROM	E75x IC79 xxx	IC79 socket (On IE-75300-R-EM)	μPD27C1001A
Ver.1.32 or later	Information ROM[Note]	E75x IC79 xxx	IC79 socket (On IE-75300-R-EM)	
		E75x IC80 xxx	IC80 socket (On IE-75300-R-EM)	
	System setting data ROM[Note]	D75x IC3 xxx	IC3 socket (On IE-75300-R-EM D759000 BOARD)	

★ **Note** Uses ROM Ver.3.1 with IE-75300-R-EM Ver.1.32 and ROM Ver.4.3 with IE-75300-R-EM Ver.1.47.

1.8 IE-75300-R-EM D759000 BOARD

IE-75300-R-EMs Ver.1.32 or later are provided with an IE-75300-R-EM D75900 BOARD mounted to CN5 and CN6 (Refer to **Figure 1-2. IE-75300-R-EM and Its Product Configuration**).

The IE-75300-R-EM D759000 BOARD is mounted with an emulation device μPD759000, which automatically performs settings of detailed parts required during the emulation of the target device. This means that settings performed by SW3 to SW6 and JP4 to JP11 for IE-75300-R-EMs less than Ver.1.32 are unnecessary.

The IE-75300-R-EM D759000 BOARD has an EEPROM control section, which performs the emulation of target devices incorporating the EEPROM™.

Table 1-4 shows the differences made by whether the device is provided with the IE-75300-R-EM D759000 BOARD.

Table 1-4. Provision of IE-75300-R-EM D759000 BOARD

Item	No IE-75300-R-EM D759000 BOARD	With IE-75300-R-EM D759000 BOARD
IE-75300-R-EM version	Less than Ver.1.32	Ver.1.32 or later
Emulation device	μPD75000AL, μPD75390R, FPGA	μPD75000AL, μPD759000
EEPROM control section	No (Emulation of devices incorporating EEPROM not possible)	Yes (Emulation of devices incorporating EEPROM possible)
SW3 to SW6	Yes (Mounted on IE-75300-R-EM, and requires user settings for use.)	No (IE-75300-R-EM D759000 BOARD performs settings automatically. User settings unnecessary.)
JP4 to JP11		
Other	The shape, weight, CN2 pin connection, etc. differ.	

Functions other than those in Table 1-4 and IE-75300-R-EM operations are the same.

Remark IE-75300-R-EMs later than Ver.1.32 do not have SW3 to SW6 and JP4 to JP11. Settings performed by users using SW3 to SW6 and JP4 to JP11 in versions earlier than Ver.1.32 are performed automatically by the IE-75300-R-EM D759000 BOARD with versions above Ver.1.32, thus eliminating the need for users to perform the settings.

IE-75300-R-EM boards above Ver.1.32 also have labels SW3 to SW6 and JP4 to JP11 because the same board as versions earlier than Ver.1.32 are used.

CHAPTER 2 INSTALLATION PROCEDURE

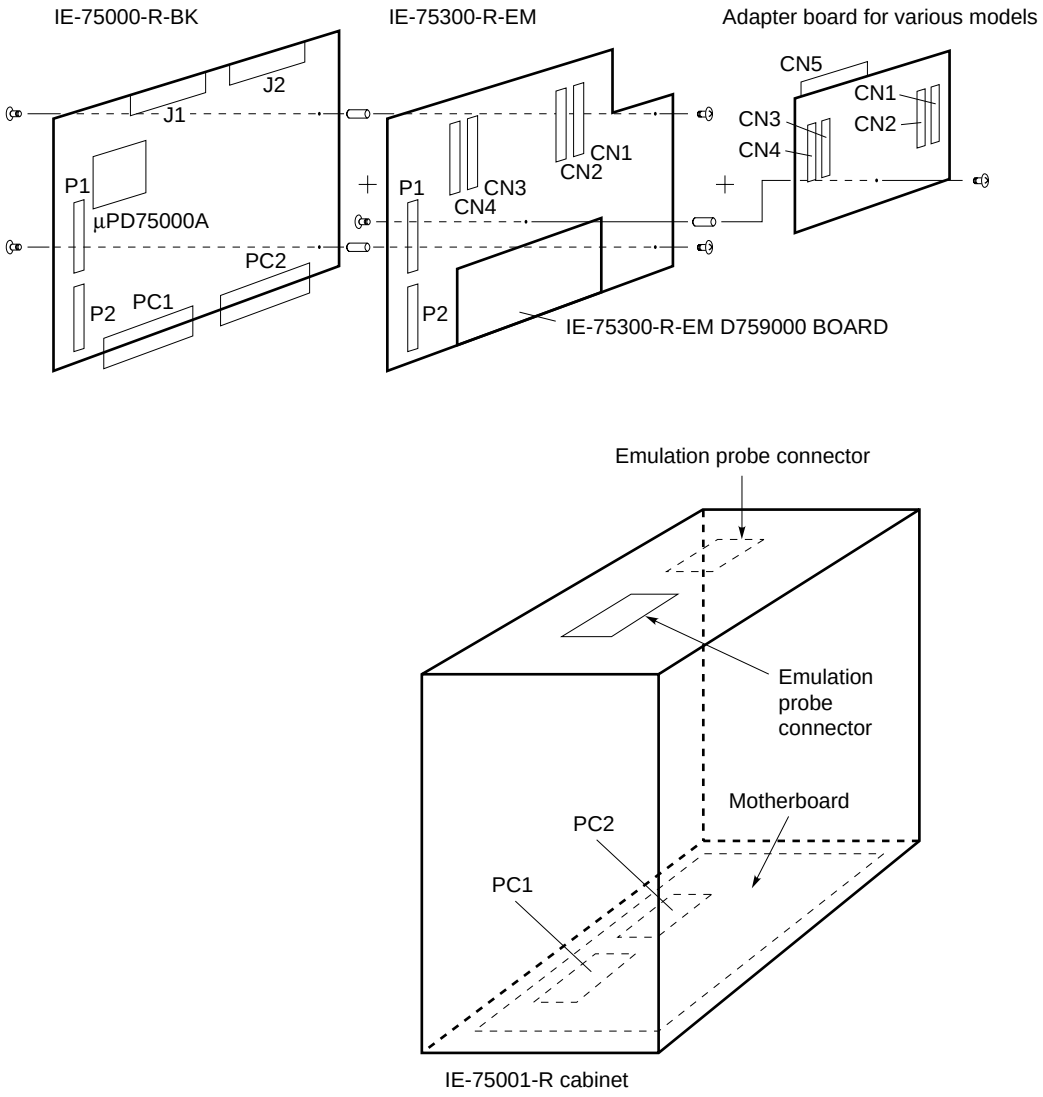
2.1 Method for Connection with Target System

2.1.1 When connecting with target system

When using the IE-75001-R for emulation of a target device, use an EP-75xxxzz-R (emulation probe and adapter board).

Follow the connection procedure described below.

Figure 2-1. Connection between IE-75001-R and Target System



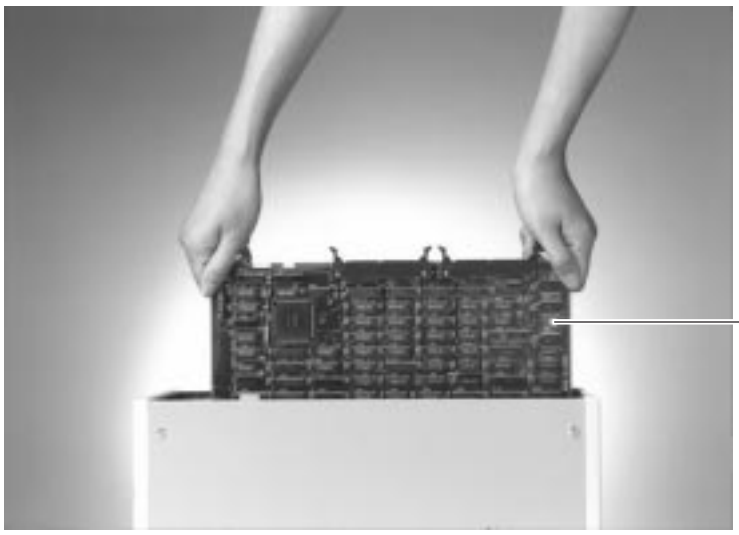
(1) Remove screws from six locations on the IE-75001-R unit to open the lid of the case.

Figure 2-2. Opening Lid of IE-75001-R

(2) The IE-75000-R-BK is connected inside the IE-75001-R. If using the IE-75000-R instead of the IE-75001-R, the IE-75000-R-EM fits into the case when the IE-75000-R is screw-fastened to the IE-75000-R-BK. Remove the two boards once and remove the screws.

(3) Remove the cable (J1 or J2 cable) connecting the IE-75000-R-BK to the control/trace board, then pull forward the two card pullers on either side of the IE-75000-R-BK to completely remove the IE-75000-R-BK from its slot.

Figure 2-3. Removal of IE-75000-R-BK



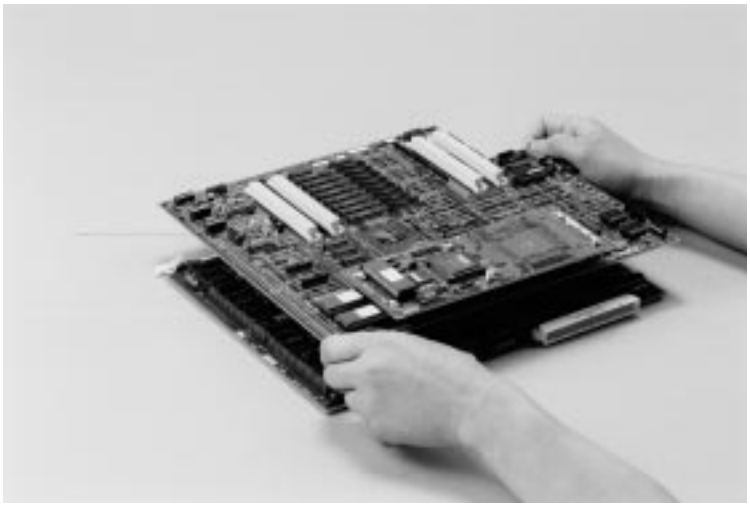
(4) Connect the IE-75300-R-EM to the IE-75000-R-BK.

<1> Remove the screws from the two spacers on the IE-75000-R-BK.

<2> Connect connectors P1 and P2 on the IE-75000-R-BK to connectors P1 and P2 on the IE-75300-R-EM.

<3> Use the screws removed at step <1> to fasten the IE-75300-R-EM.

Figure 2-4. Connection between IE-75300-R-EM and IE-75000-R-BK



(5) Connect the emulation probe's adapter board to the boards fastened at step (4) above.

<1> Connect connectors CN1 to CN4 on the IE-75300-R-EM to connectors CN1 to CN4 on the adapter board.

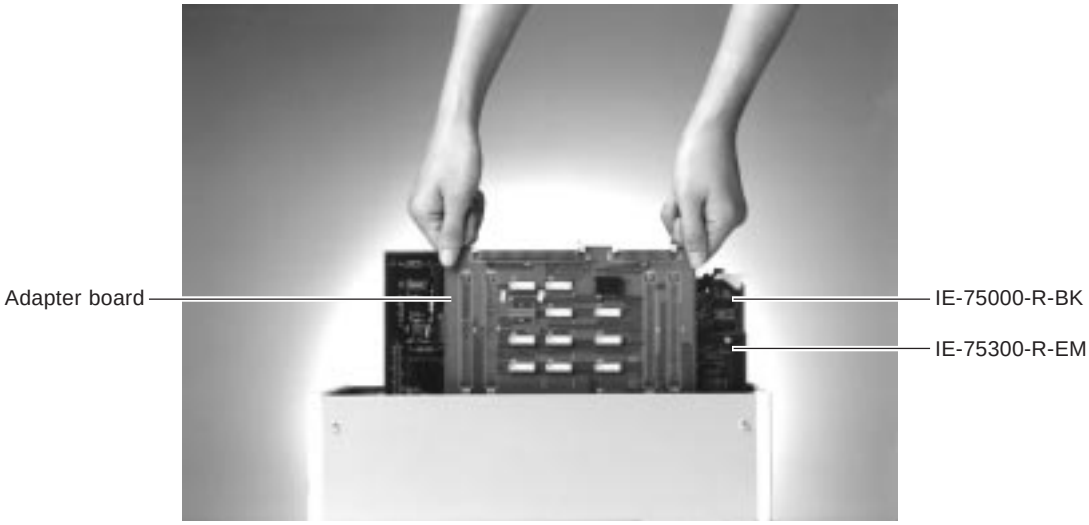
Figure 2-5. Connection of IE-75300-R-EM, IE-75000-R-BK, and Adapter Board

<2> Insert a flat-head screw, spring, washer, and flat washer to attach one spacer between the IE-75300-R-EM and adapter board.

Figure 2-6. Screw Fastening of IE-75300-R-EM, IE-75000-R-BK, and Adapter Board

(6) Install the boards connected at step (5) inside the IE-75001-R's case.

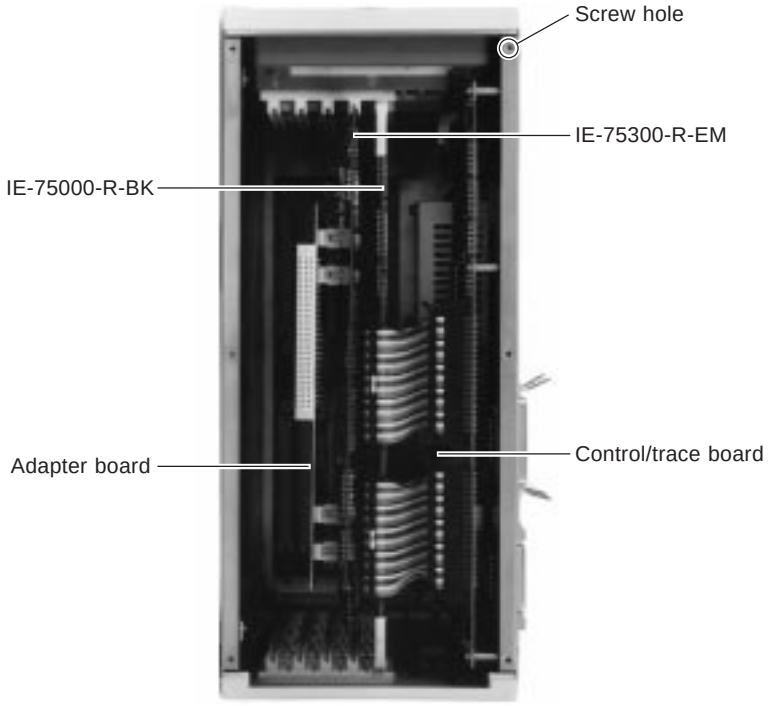
Figure 2-7. Board Installation



(7) Insert the IE-75000-R-BK's connectors PC1 and PC2 to connectors PC1 and PC2 inside the case.

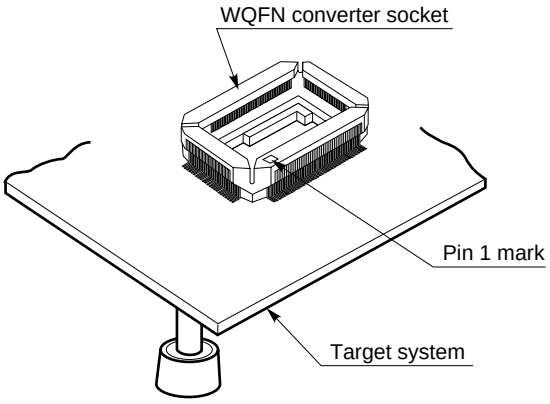
(8) Connect the cables from J1 and J2 to the IE-75000-R-BK. Check the position of the board.

Figure 2-8. Board Position



(9) Solder an appropriate converter socket, etc.[Note] suiting with shape of the top of the probe at the mounting site on the target system's target device.

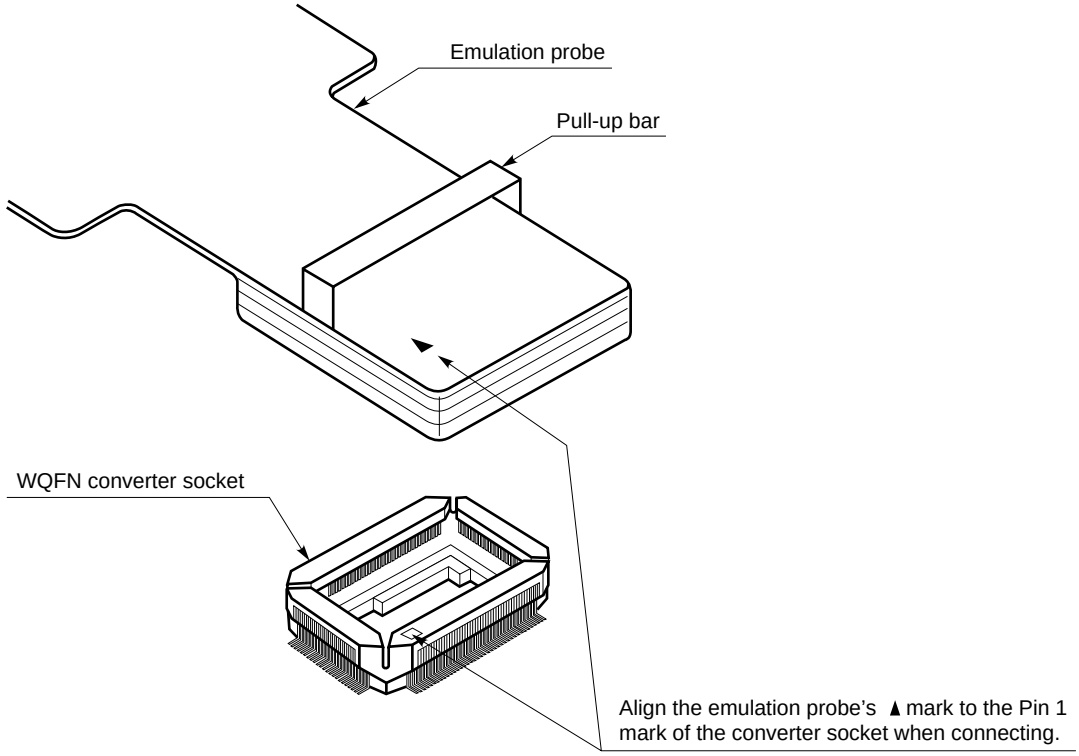
Figure 2-9. Mounting on Converter Socket



Note Depending on the probe used, the converter socket, converter adapter, or flexible board may be required. Use the items provided with the probe intended for the target device. The above shows a case using the WQFN converter socket.
For details of the converter adapter and flexible board, refer to the User's Manual of the respective probe.

(10) Connect the emulation probe's plug to the converter socket that was soldered at step (9).

Figure 2-10. Connection between Emulation Probe and Converter Socket



Caution Use the pull-up bar to remove the emulation probe's plug from the converter socket.

2.1.2 When not connecting with target system

Among the pins left open for connectors CN1 to CN4 on the IE-75300-R-EM, the input and input/output ports have 1 MΩ pull-down resistors. Accordingly, when not connecting with a target system, the connection pins can be used in open condition.

2.1.3 When replacing firmware ROM

When using IE-75300-R-EMs Ver.1.32 or later to perform the emulation of a target device, replace the IE-75001-R firmware ROM with the ROM IC86 Ver.1.6 provided with the IE-75300-R-EM.

Follow the replacement procedure described below.

(1) Remove the firmware ROM mounted on the IE-75001-R at shipment from the socket.
The firmware ROM is located next to the “RTS SELECT” switch in the RS-232C setting section at the side of the IE-75001-R.

Figure 2-11. Location of Firmware ROM

(2) Insert the firmware ROM IC86 Ver.1.6 provided with the IE-75300-R-EM in the socket.

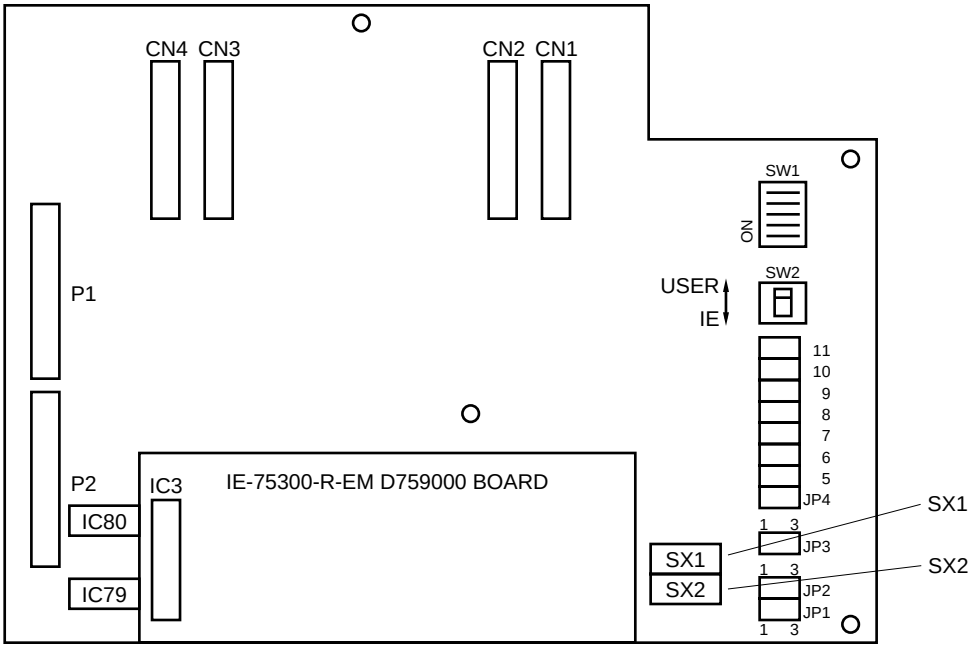
Cautions 1. IE-75001-Rs provided with a firmware ROM earlier than Ver.1.6 cannot be used for IE-75300-R-EMs Ver.1.32 or later. If used, the message “NO CONNECT” will be displayed.
2. Always replace the firmware ROM before turning on the power.

2.2 User Clock Settings

When the IE-75001-R is activated, the main system clock and subsystem clock are set to the status selecting the internal clock.

When using only the user clock from the main system clock and subsystem clock, you must change the settings. When using the user clock, the mounting positions for the parts boards (SX1, SX2) are as follows.

Figure 2-12. Positions of SX1 and SX2



(1) Switching between internal clock and user clock in main system clock

The main system clock can be switched between internal clock and user clock.

The settings for using the user clock are as follows.

<1> Setting of SX1 (parts board) on IE-75300-R-EM

<2> Use of CLK command to select “U”

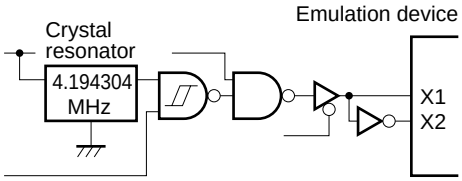
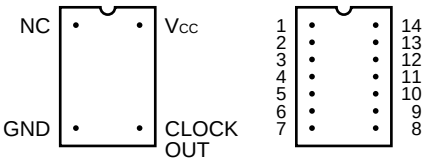
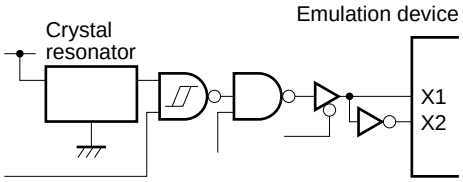
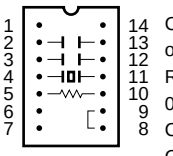
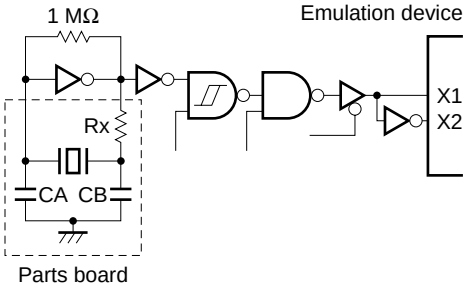
Table 2-1. Switching between Internal Clock and User Clock in Main System Clock

Main System Clock Selection	Internal Clock	User Clock
Set using CLK command[Note]	CLKΔI ↵ Select internal clock CLK ↵ If the operand is omitted, the current setting is displayed. IE Display when internal clock has been selected	CLKΔU ↵ Select user clock (clock in target system) CLK ↵ If the operand is omitted, the current setting is displayed. User Display when user clock has been selected

Note After selecting the clock source, be sure to use the RES command to reset the emulation device. If the operand has been omitted, the currently selected clock source name will be displayed.
When the IE-75001-R is activated, the internal clock is automatically selected.

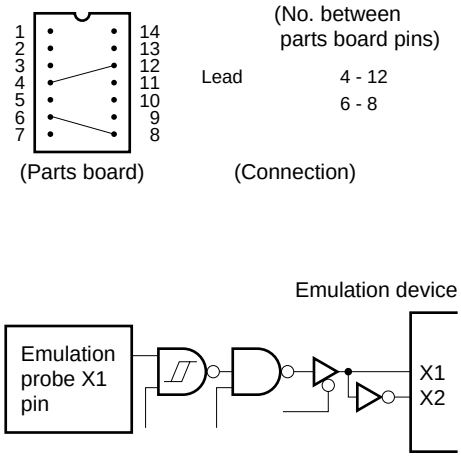
Caution If you execute the “CLKΔU” command without first setting SX1, the error message “E-CPU ERROR” will be output. This occurs because the clock is not being supplied to the emulation device.

Table 2-2. Main System Clock Connection Circuit and SX1 Setting (1/2)

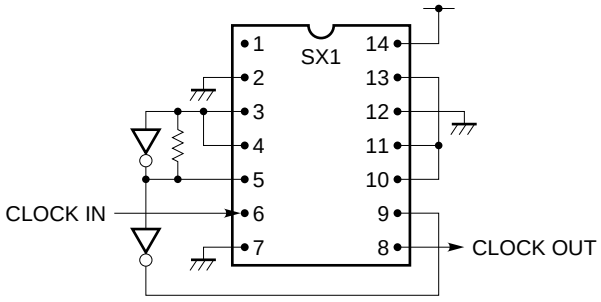
Main System Clock Selection	Internal Clock	User Clock
Connection circuit during setting		**SX1 setting** **(1) When using an oscillator**  (Crystal oscillator) (Socket) Crystal oscillator pin — Socket No. NC - 1 GND - 7 CLOCK OUT - 8 Vcc - 14 (Connection)  **(2) When using resonator**  (Parts board) (No. between parts board pins) Ceramic resonator or crystal resonator: 4 - 11 Resistor Rx (normally 0 Ω[Note]): 5 - 10 Capacitor CA: 3 - 12 Capacitor CB: 2 - 13 Lead: 8 - 9 (Connection) 

Note If using a low frequency such as 1 MHz, connect a limiting resistance.

Table 2-2. Main System Clock Connection Circuit and SX1 Setting (2/2)

Main System Clock Selection	Internal Clock	User Clock
Connection circuit during setting		**(3) When using external clock**  Use oscillation circuit output for external clock. Leave the X2 pin open.

Remark The SX1 peripheral circuits are shown below. This should be used as a reference when mounting a ceramic oscillator with internal capacitor to SX1 and selecting the user clock.



(2) Switching between internal clock and user clock in subsystem clock

Use JP1 to switch between internal clock and user clock in the subsystem clock. When using the user clock, be sure to set SX2 (parts board) on the IE-75300-R-EM.

If the target device does not have a subsystem clock, the subsystem user clock cannot be used. In addition, if using something other than f_{XT} = 32.768 kHz, connect an (4.19 x f_{XT}/32.768) MHz resonator to SX2.

f_{XT}: clock to be used

Table 2-3. Switching between Internal Clock and User Clock in Subsystem Clock (1/2)

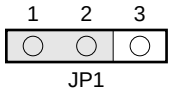
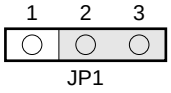
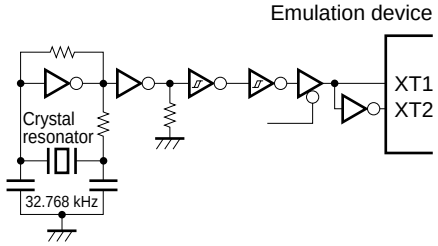
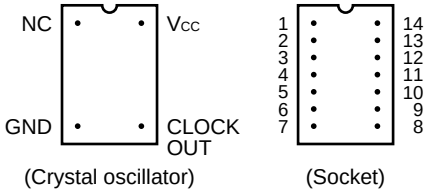
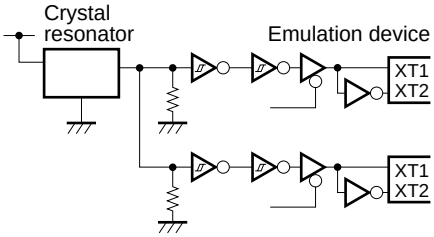
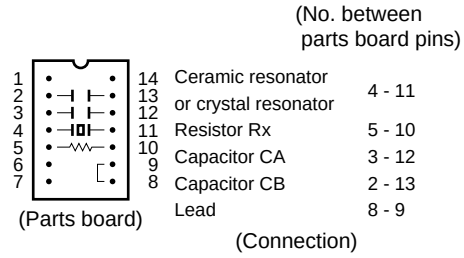
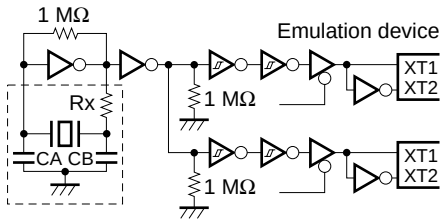
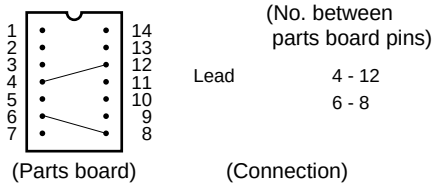
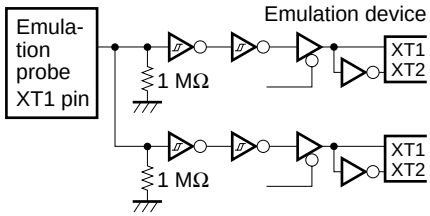
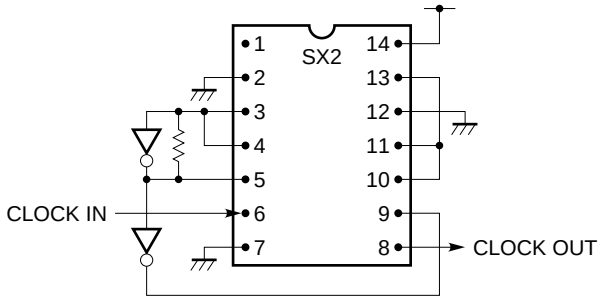
Subsystem Clock Selection	Internal Clock	User Clock
JP1 and JP2 connection positions	 (1 and 2 shorted) (Shipped setting)	 (2 and 3 shorted) **Caution To select the user clock, the CLK∆U command is effective only in the main system clock.**
Connection circuit for setting		**SX2 setting** **(1) When using an oscillator**  (Crystal oscillator) (Socket) Crystal oscillator pin - Socket No. NC - 1 GND - 7 CLOCK OUT - 8 Vcc - 14 (Connection) 

Table 2-3. Switching between Internal Clock and User Clock in Subsystem Clock (2/2)

Subsystem Clock Selection	Internal Clock	User Clock
Connection circuit for setting		**(2) When using resonator**   **(3) When using external clock**   Use oscillation circuit output for external clock. Leave the XT2 pin open.

Remark The SX2 peripheral circuits are shown below. This should be used as a reference when using a frequency other than 32.768 kHz.



2.3 Selection of Target Device

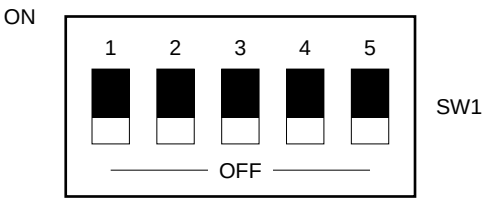
When connecting to the IE-75001-R, you can select the target device either by using the DIP switch (SW1) on the IE-75300-R-EM or by using the IE-75001-R's STS command. These two methods are described below.

2.3.1 Selection of target device using SW1

If you use SW1 on the IE-75300-R-EM to set the target device in advance, the selected target device will always be set whenever the IE-75001-R's power is turned on. You can change the target device setting by using the IE-75001-R's STS command.

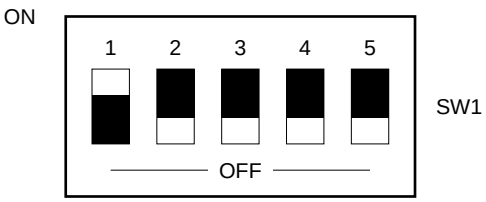
Figure 2-13. SW1 Setting (1/4)

μPD75304, 306, 308, P308, 312, 316, P316, 304B, 306B, 308B



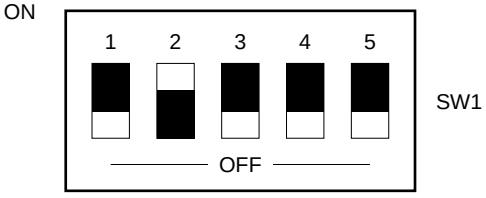
(Bits 1 to 5 are ON.)

μPD75312B, 316B, P316A, P316B



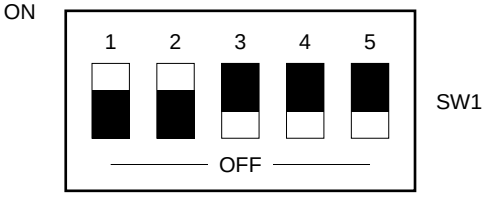
(Bits 2 to 5 are ON.)

μPD75328, P328



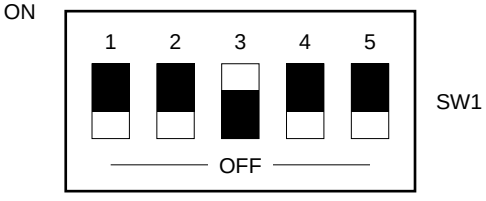
(Bits 1 and 3 to 5 are ON.)

μPD75336, P336



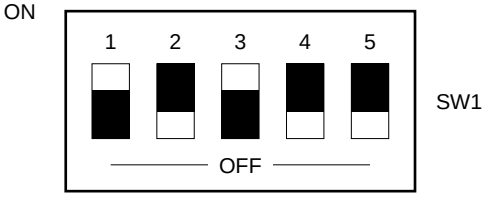
(Bits 3 to 5 are ON.)

μPD750004, 0006, 0008, P0016 (Mk I)



(Bits 1, 2, 4, and 5 are ON.)

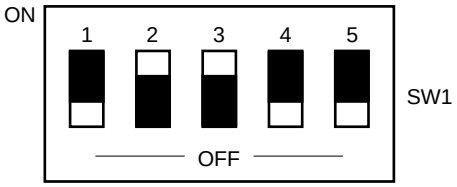
μPD750004, 0006, 0008, P0016 (Mk II)



(Bits 2, 4, and 5 are ON.)

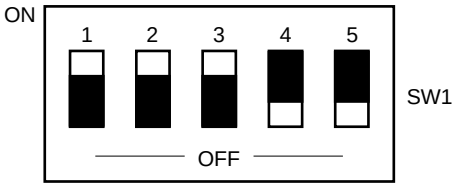
Figure 2-13. SW1 Setting (2/4)

μPD750104, 0106, 0108, P0116 (Mk I)



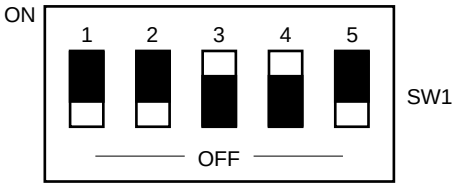
(Bits 1, 4, and 5 are ON.)

μPD750104, 0106, 0108, P0116 (Mk II)



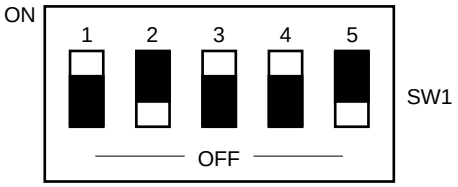
(Bits 4 and 5 are ON.)

μPD750064, 0066, 0068, P0076 (Mk I)



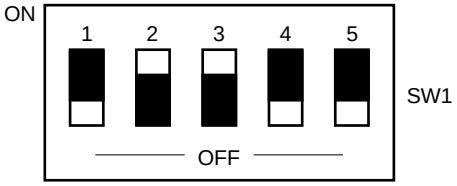
(Bits 1, 2, and 5 are ON.)

μPD750064, 0066, 0068, P0076 (Mk II)



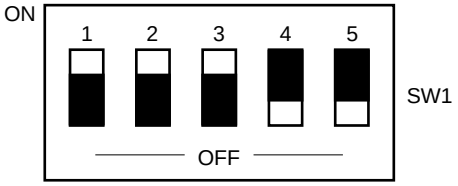
(Bits 2 and 5 are ON.)

μPD753012, 3016, 3017, P3018 (Mk I)
μPD753012A, 3016A, 3017A, P3018A (Mk I)



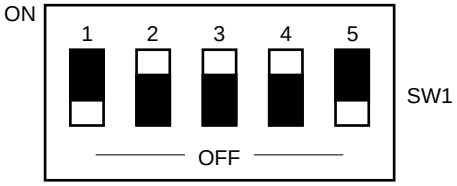
(Bits 1, 4, and 5 are ON.)

μPD753012, 3016, 3017, P3018 (Mk II)
μPD753012A, 3016A, 3017A, P3018A (Mk II)



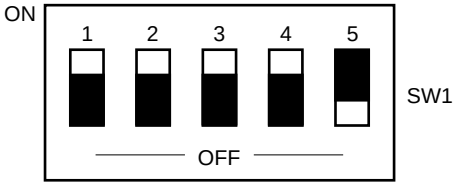
(Bits 4 and 5 are ON.)

μPD753036, P3036 (Mk I)



(Bits 1 and 5 are ON.)

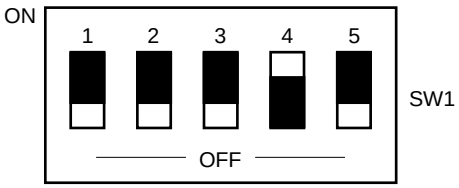
μPD753036, P3036 (Mk II)



(Bits 5 is ON.)

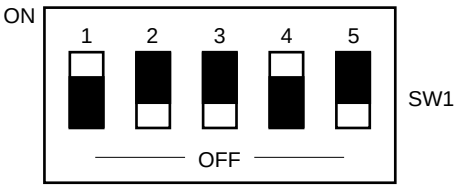
Figure 2-13. SW1 Setting (3/4)

μPD753104, 3106, 3108, P3116 (Mk I)



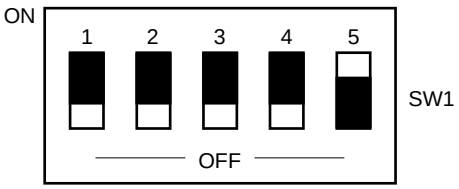
(Bits 1 to 3 and 5 are ON.)

μPD753104, 3106, 3108, P3116 (Mk II)



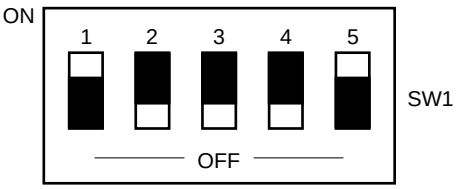
(Bits 2, 3, and 5 are ON.)

μPD753204, 3206, 3208, P3216 (Mk I)



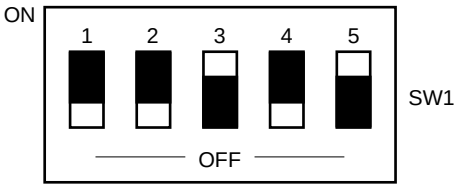
(Bits 1 to 4 are ON.)

μPD753204, 3206, 3208, P3216 (Mk II)



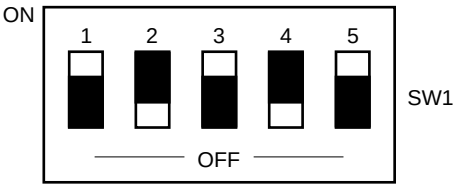
(Bits 2 to 4 are ON.)

★ **μPD753304 (Mk I)**



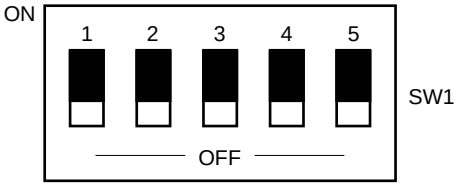
(Bits 1, 2, and 4 are ON.)

μPD753304 (Mk II)



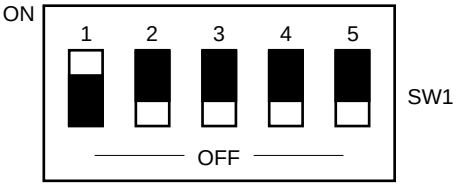
(Bits 2 and 4 are ON.)

μPD754202 (Mk I)



(Bits 1 to 5 are ON.)

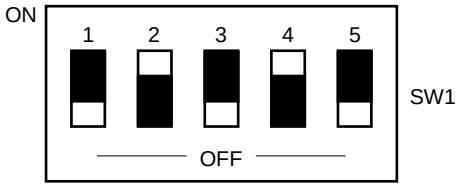
μPD754202 (Mk II)



(Bits 2 to 5 are ON.)

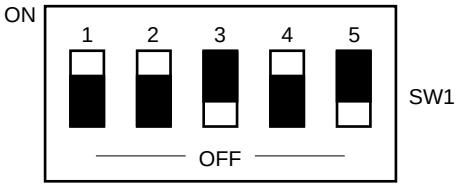
Figure 2-13. SW1 Setting (4/4)

μPD754144, 4244 (Mk I)



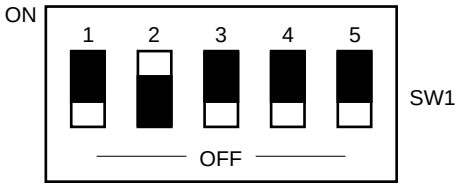
(Bits 1, 3, and 5 are ON.)

μPD754144, 4244 (Mk II)



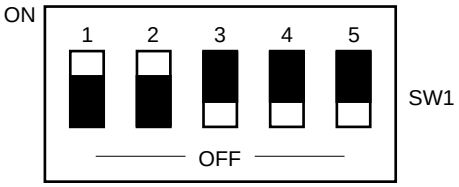
(Bits 3 and 5 are ON.)

μPD754264 (Mk I)



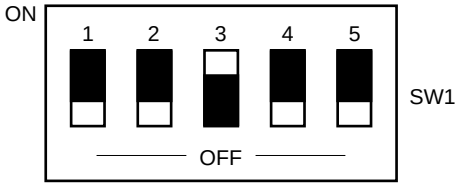
(Bits 1 and 3 to 5 are ON.)

μPD754264 (Mk II)



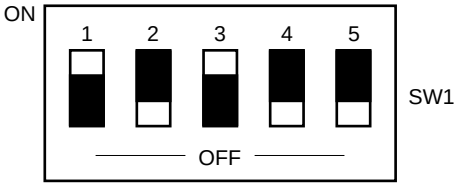
(Bits 3 to 5 are ON.)

μPD75F4264 (Mk I)



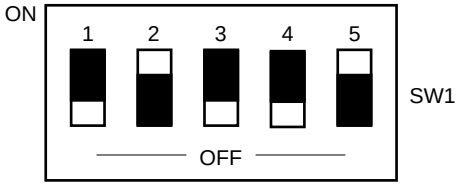
(Bits 1, 2, 4, and 5 are ON.)

μPD75F4264 (Mk II)



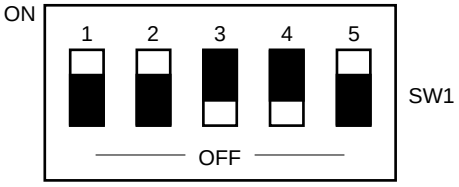
(Bits 2, 4, and 5 are ON.)

μPD754302, 4304, P4308 (Mk I)



(Bits 1, 3, and 4 are ON.)

μPD754302, 4304, P4308 (Mk II)



(Bits 3 and 4 are ON.)

2.3.2 Selection of target device using STS command

The IE-75001-R's STS command (STSΔC) can be used to change the target device setting regardless of the SW1 setting on the IE-75300-R-EM.

After entering the command, select the number for the target device from the menu screens to select a new target device.

The list of target devices is divided into two screens. After executing the STSΔC command, press the RETURN key to switch screens.

When the power is switched on, the target device will be that selected via SW1 on the IE-75300-R-EM.

Enter STSΔD to display the selected target device. In addition to the target device name, this display shows the program memory area address and other device-related information.

Example of display following STSΔC command:

(a) When information ROM and system setting data ROM are Ver.3.3

```
brk:0>stsΔc ↵                                                    <1>

(1)  Target CPU   uPD75304/304B/306/306B/308/308B/P308/312/316/P316
(2)  Target CPU   uPD75312B/316B/P316A/P316B
(3)  Target CPU   uPD75328/P328
(4)  Target CPU   uPD75336/P336
(5)  Target CPU   uPD750004/0006/0008/P0016(MkI)
(6)  Target CPU   uPD750004/0006/0008/P0016(MkII)
★(7)  Target CPU   uPD753017/3017A/3016/3016A/3012/3012A/P3018/P3018A(MkI)
★(8)  Target CPU   uPD753017/3017A/3016/3016A/3012/3012A/P3018/P3018A(MkII)
(9)  Target CPU   uPD753108/3106/3104/P3116(MkI)
(10) Target CPU   uPD753108/3106/3104/P3116(MkII)
(11) Target CPU   uPD754144/4244(MkI)                            <2>
(12) Target CPU   uPD754144/4244(MkII)
(13) Target CPU   uPD750064/0066/0068/P0076(MkI)
(14) Target CPU   uPD750064/0066/0068/P0076(MkII)
(15) Target CPU   uPD753036/P3036(MkI)
(16) Target CPU   uPD753036/P3036(MkII)
(17) Target CPU   uPD753208/3206/3204/P3216(MkI)
(18) Target CPU   uPD753208/3206/3204/P3216(MkII)
(19) Target CPU   uPD754304/4302/P4308(MkI)
(20) Target CPU   uPD754304/4302/P4308(MkII)
★(21) Target CPU   uPD753304(MkI)
★(22) Target CPU   uPD753304(MkII)

 Target CPU No. 11(cr:next page / .:end)=                        <3>
```

<1> Change target device

<2> Selectable target device

Select the target device used according to the number in parentheses. The device name displayed differs according to the version of the information ROM and system setting data ROM.

<3> Select target device

(b) When information ROM and system setting data ROM are Ver.4.3

```
brk:0>stsΔc ↵                                                    <1>

(1)  Target CPU    uPD754102/4202(MkI)
(2)  Target CPU    uPD754102/4202(MkII)
(3)  Target CPU    uPD754264(MkI)
(4)  Target CPU    uPD754264(MkII)                               <2>
(5)  Target CPU    uPD75F4264(MkI)
(6)  Target CPU    uPD75F4264(MkII)
(7)  Target CPU    uPD750104/0106/0108/P0116(MkI)
(8)  Target CPU    uPD750104/0106/0108/P0116(MkII)

 Target CPU No. 1(cr:next page / .:end)=                         <3>
```

<1> Change target device

<2> Selectable target device

Select the target device used according to the number in parentheses. The device name displayed differs according to the version of the information ROM and system setting data ROM.

<3> Select target device

Example of display following STSΔD command:

```
brk:0>stsΔd ↵                                                    <1>
Target CPU       uPD75304/304B/306/306B/308/308B/P308/312/316/P316
Program Memory   0-FFFFH
Data Memory      00H-1FFH, F80H-FFFH
Memory Bank      0-1, 15
Register Bank    0-0
```

<1> Display target device for debugging

Caution On the target device, the SBS.3 setting can be used to select between Mk I (2-byte stack operation) and Mk II (3-byte stack operation), but note that the selection made using the STS command is in effect.

2.4 ROM Checking and Replacement

2.4.1 ROM checking

With the Ver.1.47 IE-75300-R-EM, it is necessary to replace the information ROM and system setting data ROM ★ mounted at shipment (Ver.3.3) with the ROM (Ver.4.3) provided according to the target device used.

Table 2-4 shows the target device and corresponding ROM.

Table 2-4. Target Device and Corresponding ROM

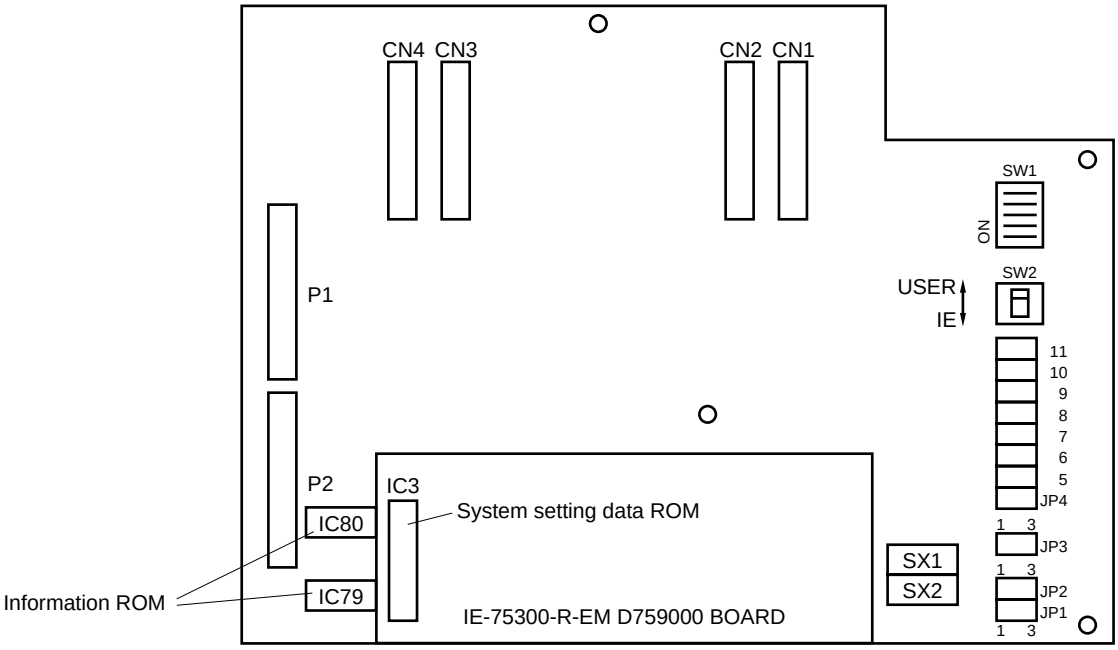
Target Device	Corresponding ROM
μPD75304, 304B, 306, 306B, 308, 308B, P308, 75312, 312B, 316, 316B, P316, P316A, P316B, 75328, P328, 336, P336, 750004, 0006, 0008, P0016, 750064, 0066, 0068, P0076, 753012, 3012A, 3016, 3016A, 3017, 3017A, P3018, P3018A, 753036, P3036, 753104, 3106, 3108, P3116, 753204, 3206, 3208, P3216, ★ 753304[Notes 1, 2], 754144, 4244, 754302, 4304, P4308	ROMs mounted at shipment • Information ROM IC79, IC80 (Ver.3.3) • System setting data ROM IC3 (Ver.3.3)
μPD750104, 0106, 0108, P0116, 754202, 4264, F4264[Note 2]	ROMs provided with IE-75300-R-EM • Information ROM IC79, IC80 (Ver.4.3) • System setting data ROM IC3 (Ver.4.3)

Notes 1. Supports only ES products (shrink DIP (DU)), but not mass produced products (bare chip).

2. Under development

Before use, check that the versions of the information ROM and system setting data ROM mounted on the IE-75300-R-EM correspond to the target device used.

Figure 2-14. Positions of Information ROM and System Setting Data ROM



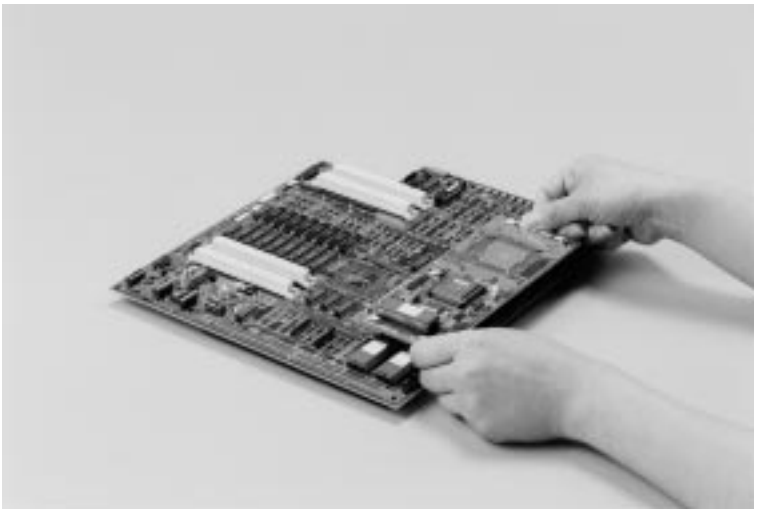
IE-75300-R-EM

2.4.2 Information ROM replacement

Replace the information ROM as follows.

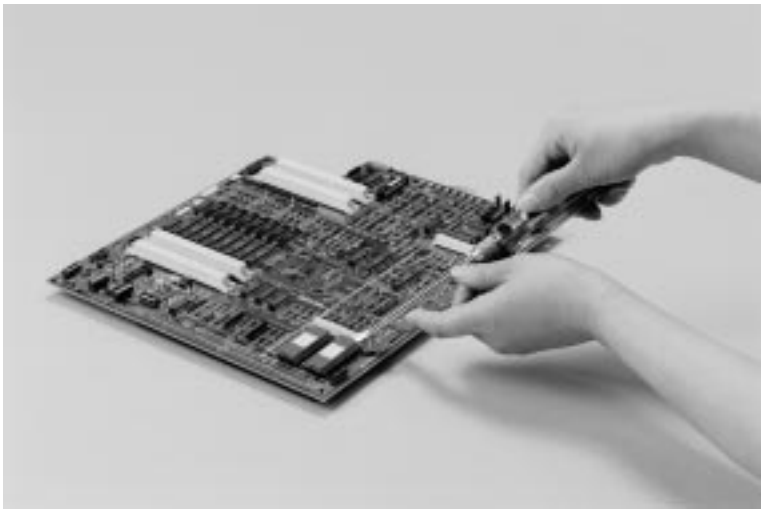
(1) Remove the IE-75300-R-EM D759000 BOARD from the IE-75300-R-EM.
The IE-75300-R-EM D759000 BOARD is inserted into CN5 and CN6 of the IE-75300-R-EM.

Figure 2-15. Removal of IE-75300-R-EM D759000 BOARD



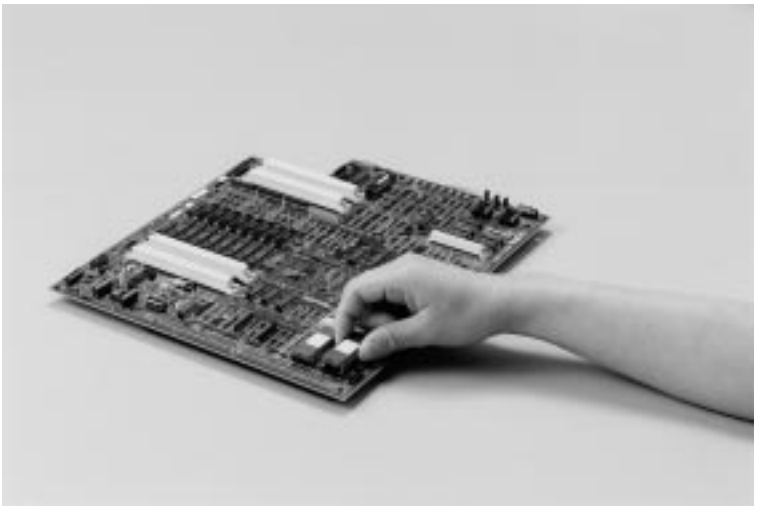
(2) Remove the information ROMs IC79 and IC80 from the IC79 and IC80 sockets on the IE-75300-R-EM.

Figure 2-16. Removal of Information ROM



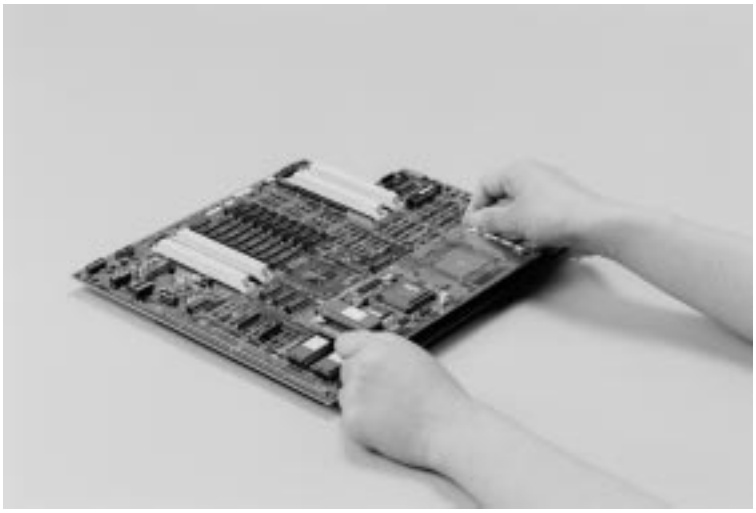
(3) Insert the information ROMs IC79 and IC80 for replacement into the IC79 and IC80 sockets.

Figure 2-17. Mounting of Information ROM



(4) Insert the IE-75300-R-EM D759000 BOARD into CN5 and CN6 of the IE-75300-R-EM.

Figure 2-18. Connection of IE-75300-R-EM D759000 BOARD

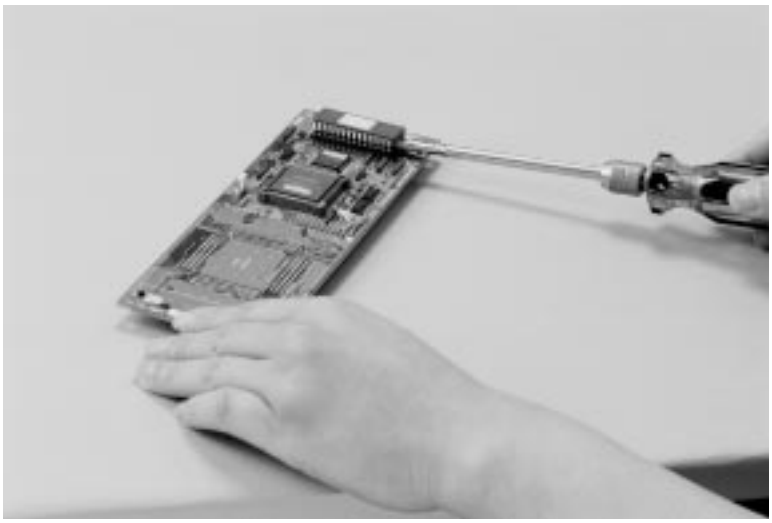


2.4.3 System setting data ROM replacement

Replace the system setting data ROM as follows.

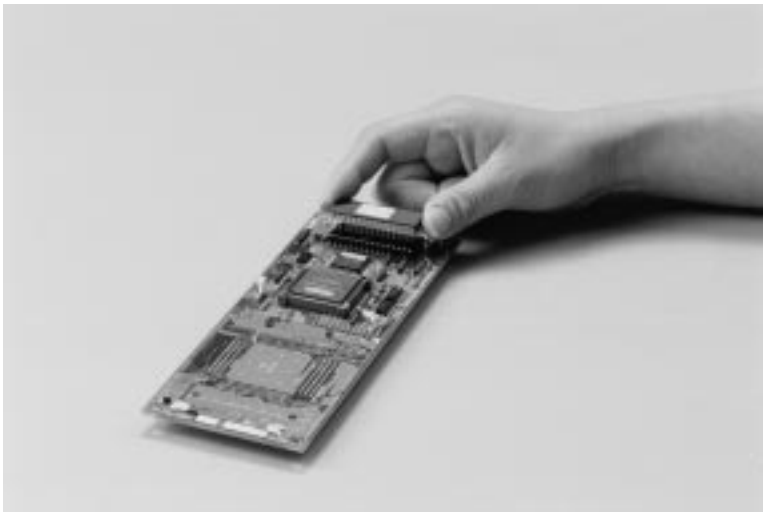
(1) Remove the system setting data ROM from the IC3 socket on the IE-75300-R-EM D759000 BOARD.

Figure 2-19. Removal of System Setting Data ROM



(2) Insert the system setting data ROM IC3 for replacement into the IC3 socket.

Figure 2-20. Mounting of System Setting Data ROM



2.5 Mask Options

For details of mask options, see the user's manual for the target emulation probe.

2.6 Power Supply Setting

Two types of power supply can be set for emulation using the IE-75300-R-EM: the IE-75001-R's internal power supply or a user power supply.

Use SW2 to make the power supply setting.

SW2's shipped setting is for use of the IE-75001-R's internal power supply.

Figure 2-21. SW2 Setting

IE: sets IE-75001-R's internal power supply

USER: sets user power supply

If you use SW2 to set user power supply, emulation can be performed in the power supply voltage V_{DD} range of 2.7 to 5.0 V. However, if you use the IE-75001-R's internal power supply, emulation can only be performed at V_{DD} = 5.0 V.

Cautions 1. When performing low-voltage emulation, make sure that the power supply is applied to V_{DD}.

2. When performing emulation with a user power supply, make sure that the $\overline{\text{RESET}}$ pin is pulled-up.

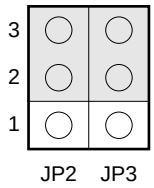
Remark IE-75300-R-EMs Ver.1.32 or later do not have SW3 to SW5 and JP4 to JP11, therefore settings are not necessary.

IE-75300-R-EM D759000 BOARD has the functions of SW3 to SW5 and JP4 to JP11, and automatically performs the settings.

2.7 JP2 and JP3 Settings

JP2 and JP3 are jumper pins (JP) to select IE-75300-R-EM D759000 BOARD. Therefore, their settings do not need to be changed. The factory-shipped jumpers are installed between 2 and 3 on both JP2 and JP3.

Figure 2-22. JP2 and JP3 Settings

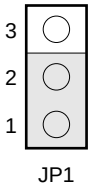


2.8 JP1 of IE-75300-R-EM D759000 BOARD Setting

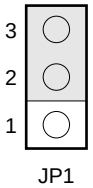
JP1 of IE-75300-R-EM D759000 BOARD is a jumper pin to select the version of μPD759000 which is the emulation device of IE-75300-R-EM D759000 BOARD. Therefore, its setting does not need to be changed. The factory-shipped jumpers are installed as shown below depending on the version.

★ **Figure 2-23. JP1 of IE-75300-R-EM D759000 BOARD Setting**

(1) When version of IE-75300-R-EM is 1.32 to 1.35



(2) When version of IE-75300-R-EM is 1.46 or later



CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)

When combining the IE-75300-R-EM with the IE-75000-R-BK to emulate various target devices, the executable commands, program memory area, pin treatment, and other factors vary in some respects from the operation of an actual device.

These differences should be noted, and are described below.

3.1 Differences in Executable Commands

The emulation CPU (μPD75000A[Note 1]) for the IE-75000-R-BK can execute the entire command sets of the 75X and 75XL Series even when it is connected to the IE-75300-R-EM. Accordingly, this includes commands that are not supported by the target device or that have different use ranges from the target device's commands. This should be noted when developing programs[Note 2].

Notes 1. The IE-75000-R-BK uses a μPD75000A as a dedicated device for executing emulation of common functions of the 75X and 75XL Series.

2. The target device can be specified using the relocatable assembler (RA75X) for the 75X Series to enable program development within the target device's instruction set.

3.2 Differences in Program Memory Area

The IE-75000-R-BK has 64 Kbytes of program memory area, all of which can be used even when the IE-75000-R-BK is connected to the IE-75300-R-EM. When using this area, be sure to note the internal ROM capacity of the target device.

3.3 Differences in Power Supply Voltage

Although actual devices operate with power supply voltages V_{DD} = 2.7 V to 6.0 V, 2.0 V to 6.0 V, or 1.8 V to 6.0 V, the IE-75300-R-EM can perform emulation with a power supply voltage V_{DD} = 2.7 V to 5.0 V.

★ 3.4 Differences in Clock Generation Circuit

When emulating a device which has RC oscillation, use the internal clock (4.19 MHz) or the user clock. Oscillaion with an external resistor (R) and a capacitor (C) is not possible.

3.5 Operation Using Main System Clock or Subsystem Clock

- Main system clock oscillation stop (SCC.3 = 1)

  The following are differences when the main system clock's oscillation is stopped.

	Emulation	Target Device
Main system clock	Does not stop	Stops
Basic interval timer operation	Operable via divided clock of X1 input (32 kHz x1, x2, x16)	Stops

After switching to subsystem clock oscillation, the clock supplied to the peripheral hardware differs until the main system clock's oscillation is stopped.

	Emulation	Target Device
Supplied clock	32 kHz x1, x2, x16	4.19 MHz divided clock

As shown above, the emulation operates differently from the target device, and the following caution points should be noted.

(1) Basic interval timer operation

Before switching to 32 kHz (SCC.0 = 1), set the BT interrupt to disabled mode. When the clock returns to the main system clock (SCC.0 = 0), be sure to use the start command to clear the interrupt request flag and counter before using the BT.

(2) Peripheral hardware operation

Before switching to 32 kHz (SCC.0 = 1), set the peripheral hardware for internal clock operation to interrupt disabled mode or operation stop mode.

(3) When using a target device subsystem clock with a frequency other than f_{XT} = 32.768 kHz, connect a (4.19 x f_{XT}/32.768) MHz resonator to SX2.

f_{XT}: clock to be used

3.6 Differences between IE-75300-R-EM Version's Earlier than Ver. 1.32 and Target Devices

While IE-75300-R-EMs earlier than Ver.1.32 have the following differences with the target device, the Ver.1.47 do not have such restrictions and can carry out the same operations as the device.

• Restrictions of IE-75300-R-EMs earlier than Ver.1.32

	Emulation	Target Device
Operation when using the P02/SO/SB0 and P03/SB7/SI pins as serial interface I/O port	Low-voltage emulation is possible only with some devices	Operates regardless of the power voltage
Buzzer output frequency	2 kHz only	Selectable 2 kHz, 4 kHz, and 32 kHz

★ 3.7 Restrictions

When using SPR command of the control program, the manipulation of the system clock control register (SCC) is made illegal. Do not manipulate SCC, SCC.0, and SCC.3 with SPR command.

The following methods are taken to bypass the problem.

- When reading (checking the value)
  Check the trace result and make sure the manipulation instruction has been executed.
- When writing
  Describe the manipulation instruction on the program.

[MEMO]

CHAPTER 4 INSTALLATION (μPD75308, 316, 328, AND 336 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD75304, 304B, 306, 306B, 308, 308B, and P308 (μPD75308 Subseries)
μPD75312, 312B, 316, 316B, P316, P316A, and P316B (μPD75316 Subseries)
μPD75328 and P328 (μPD75328 Subseries)
μPD75336 and P336 (μPD75336 Subseries)

4.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD75308, 316, 328, and 336 Subseries.

(1) Clock timer

The following shows the restrictions when using the clock timer.

<1> Always write bits 4 and 5 of the clock mode register (WM) as “0”.

<2> As bits 0, 1, and 2 of the clock mode register (WM) can be read by IE, but not with the device, do not read these bits.

(2) LCD display

Always write bit 1 of the LCD display mode register (LCDC) as “0”.

(3) Interrupt function

Always write bit 2 of the INT0 edge detection mode register (IM0) as “0”.

(4) Timer/event counter

★ **• μPD75308, 316, and 328 Subseries only**

<1> Always write “0” to the bits 0 and 1 of the timer/event counter mode register (TM0, TM1).

<2> The bits 0 and 1 of the timer/event counter mode register (TM0, TM1) and timer/event counter output enable flag (TOE0, TOE1) can be read with IE, but not with a device. Therefore, do not perform reading.

• μPD75336 Subseries only

(a) When using PTO0 and PTO1

<1> Output 0H to PORT2 and clear the output latch.

<2> Do not connect a pull-up resistor with POGA bit 2 = 0.

<3> Set the input port mode with PMGB bit 2 = 1.

(b) When using TI1

Set the input port mode with PMGC bit 0 = 0.

★ **(5) Serial interface**

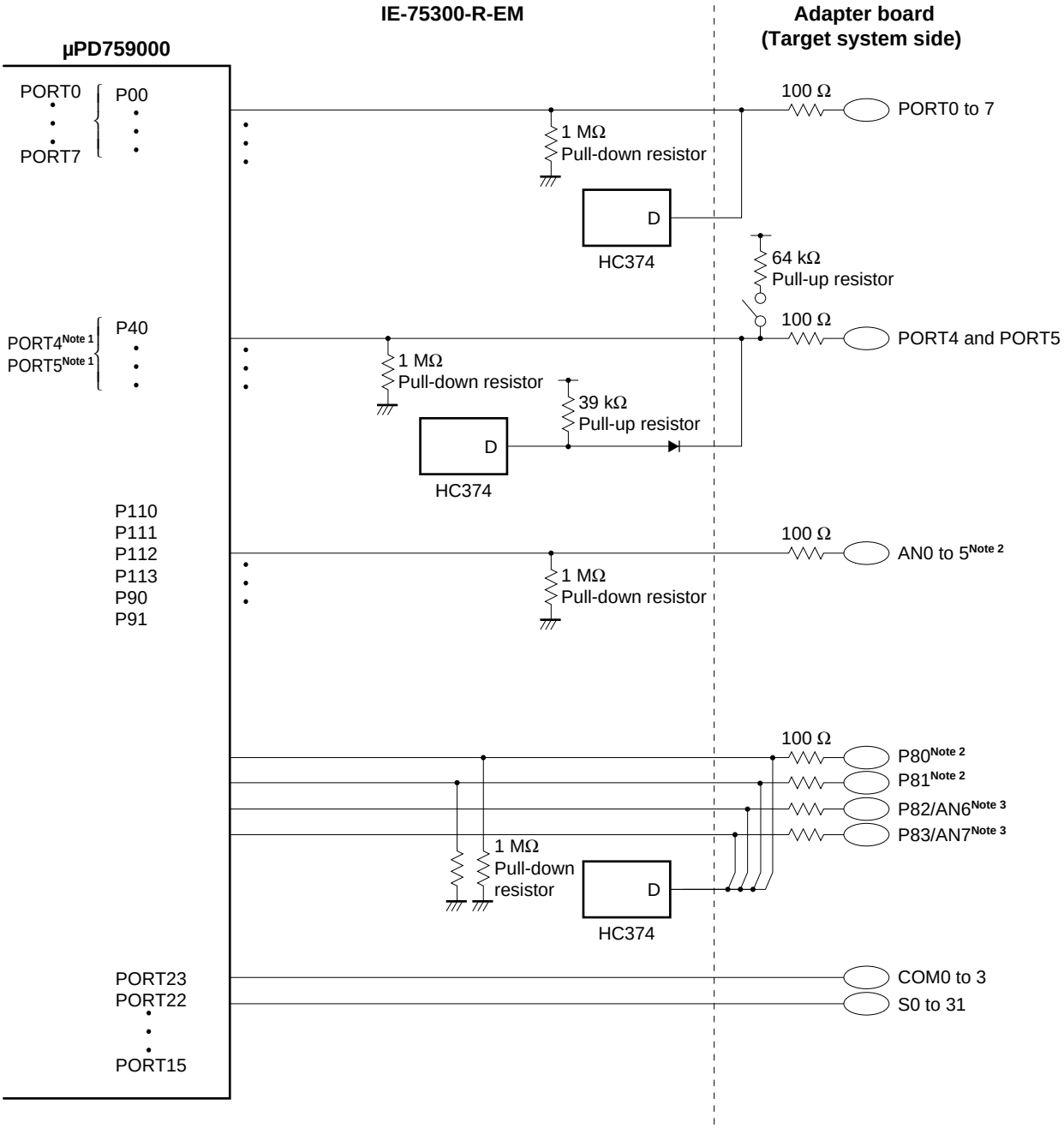
If reading is performed to the higher four bits of the serial operation mode register (CSIM), the bit 4 can be read with IE, but not with a device. Therefore, do not perform reading to the higher four bits.

★ **(6) A/D converter (μPD75328 and 336 Subseries only)**

Always write “0” to the bits 0 and 1, and “1” to the bit 7 of the A/D conversion mode register (ADM).

4.2 Handling of Pins of IE-75300-R-EM (μPD75308, 316, 328, and 336 Subseries)

★ **Figure 4-1. Handling of Pins of μPD75304, 304B, 306, 306B, 308, 308B, P308, 312, 312B, 316, 316B, P316, P316A, P316B, 328, P328, 336, and P336**



Notes **1.** N-ch open drain output

2. Only for μPD75328, P328, 336, and P336

3. Only for μPD75336 and P336

[MEMO]

CHAPTER 5 INSTALLATION (μPD750008 AND 0108 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD750004, 0006, 0008, and P0016 (μPD750008 Subseries)
μPD750104, 0106, 0108, and P0116 (μPD750108 Subseries)

5.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION**).

Described below are the differences between actual devices and target devices belonging to the μPD750008 and 0108 Subseries.

(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

(2) Oscillation wait time when reset (μPD750108 Subseries only)

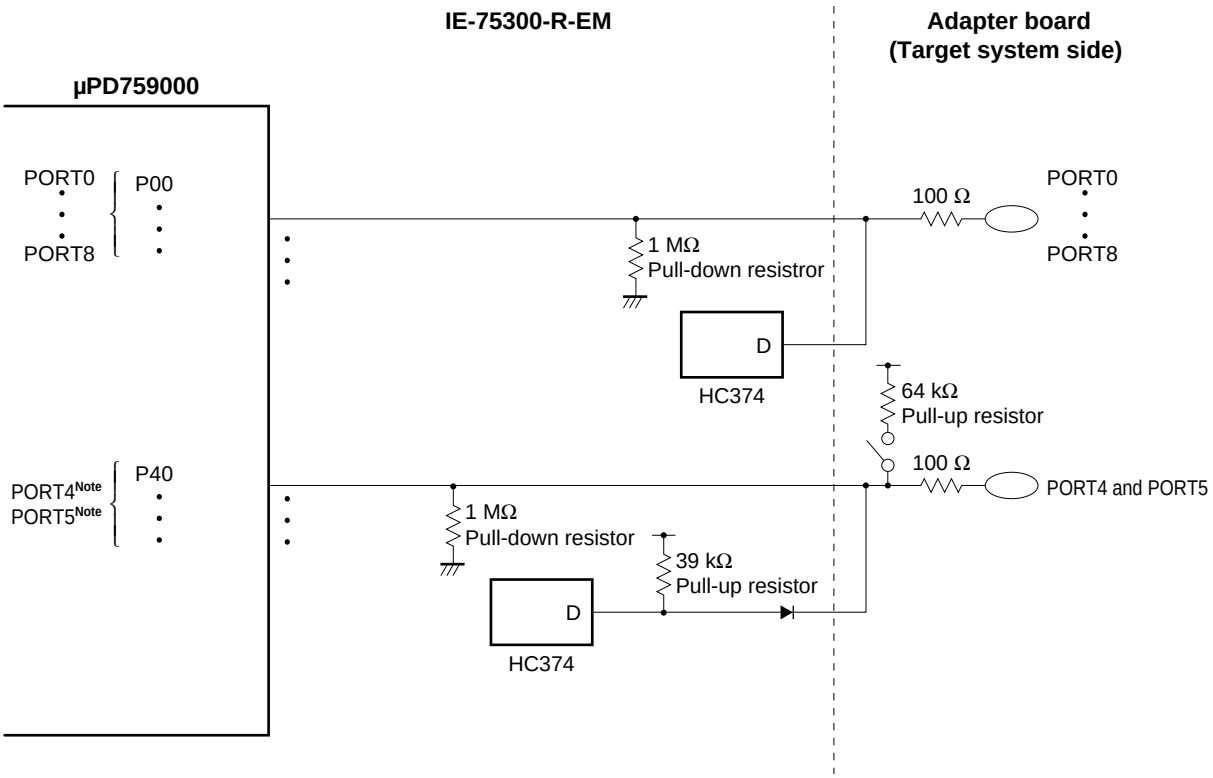
The oscillation wait time when reset is fixed at $2^{17}/f_{CC}$ (131.1 ms: f_{CC} = at 1.0 MHz operation) with the IE.

(3) Subsystem clock oscillation circuit

Read/write of the sub-oscillation circuit control register (SOS) cannot be performed.

5.2 Handling of Pins of IE-75300-R-EM (μPD750008 and 0108 Subseries)

★ **Figure 5-1. Handling of Pins of μPD750004, 0006, 0008, P0016, 0104, 0106, 0108, and P0116**



Note N-ch open drain output

CHAPTER 6 INSTALLATION (μPD750068 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD750064, 0066, 0068, and P0076 (μPD750068 Subseries)

6.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD750068 Subseries.

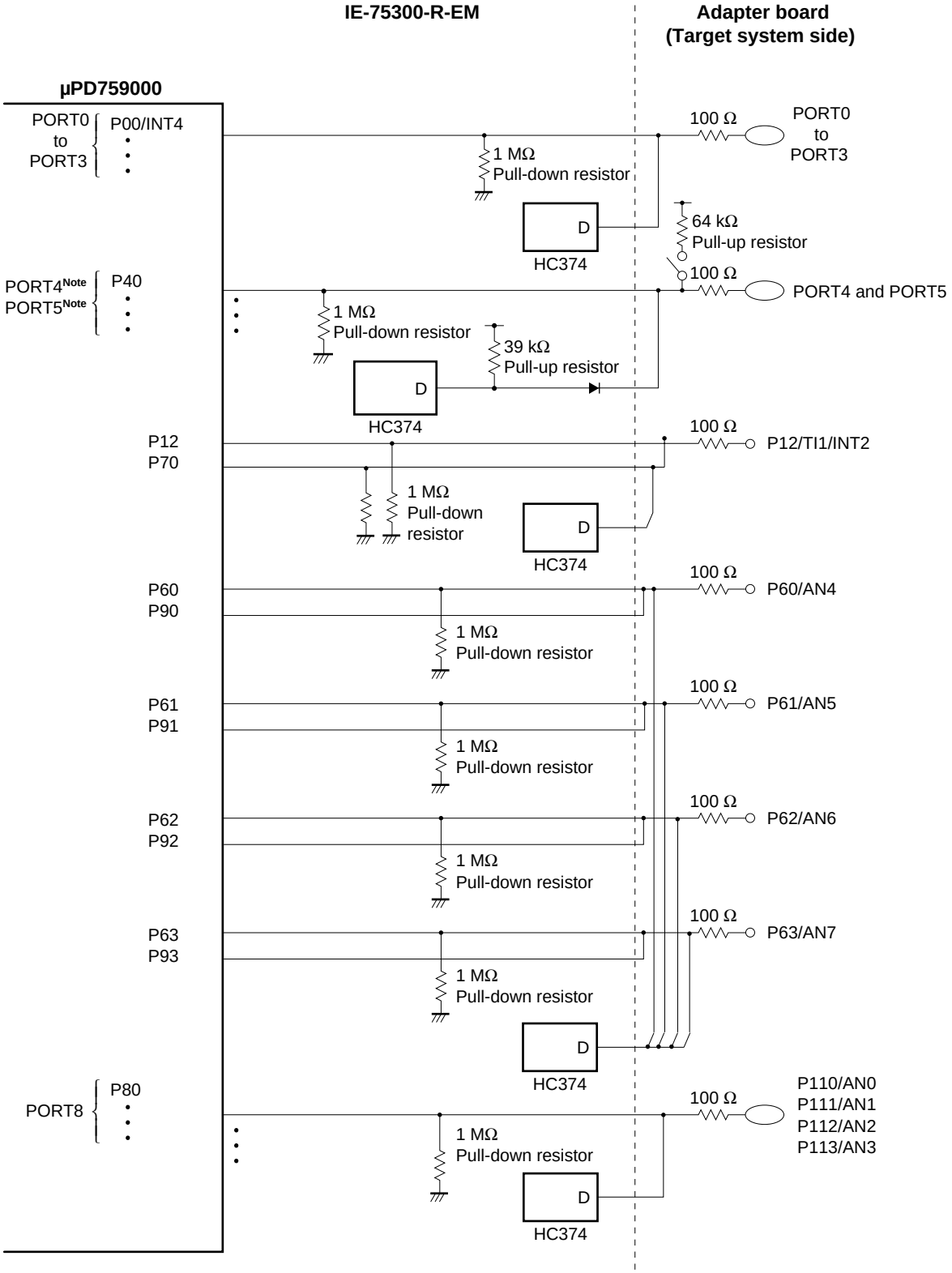
(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

6.2 Handling of Pins of IE-75300-R-EM (μPD750068 Subseries)

★ **Figure 6-1. Handling of Pins of μPD750064, 0066, 0068, and P0076**



Note N-ch open drain output

CHAPTER 7 INSTALLATION (μPD753017 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD753012, 3012A, 3016, 3016A, 3017, 3017A, P3018, and P3018A (μPD753017 Subseries)

7.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD753017 Subseries.

(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

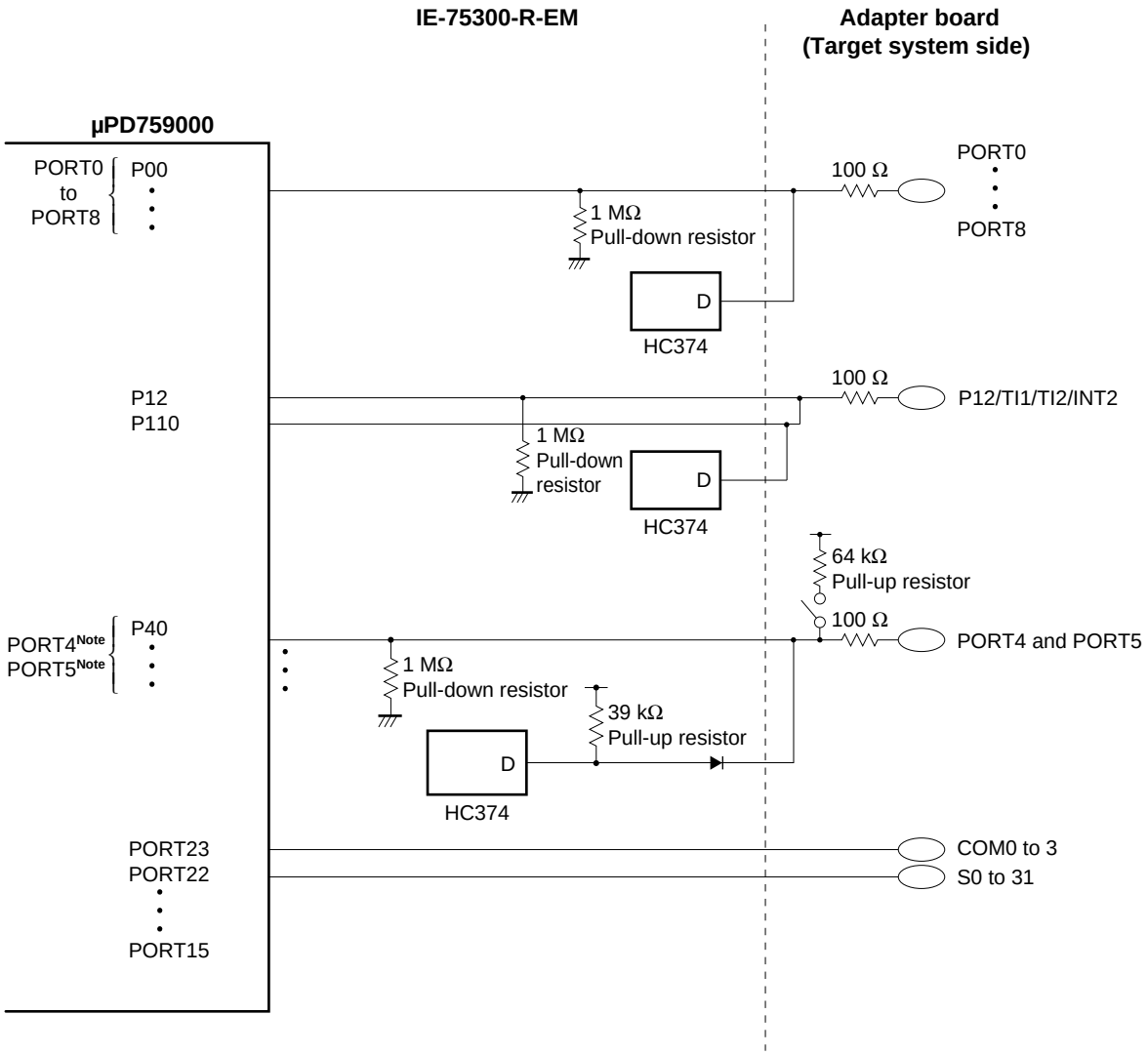
When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

(2) Subsystem clock oscillation circuit

Read/write of the sub-oscillation circuit control register (SOS) cannot be performed.

7.2 Handling of Pins of IE-75300-R-EM (μPD753017 Subseries)

★ **Figure 7-1. Handling of Pins of μPD753012, 3012A, 3016, 3016A, 3017, 3017A, P3018, and P3018A**



Note N-ch open drain output

CHAPTER 8 INSTALLATION (μPD753036 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD753036 and P3036 (μPD753036 Subseries)

8.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD753036 Subseries.

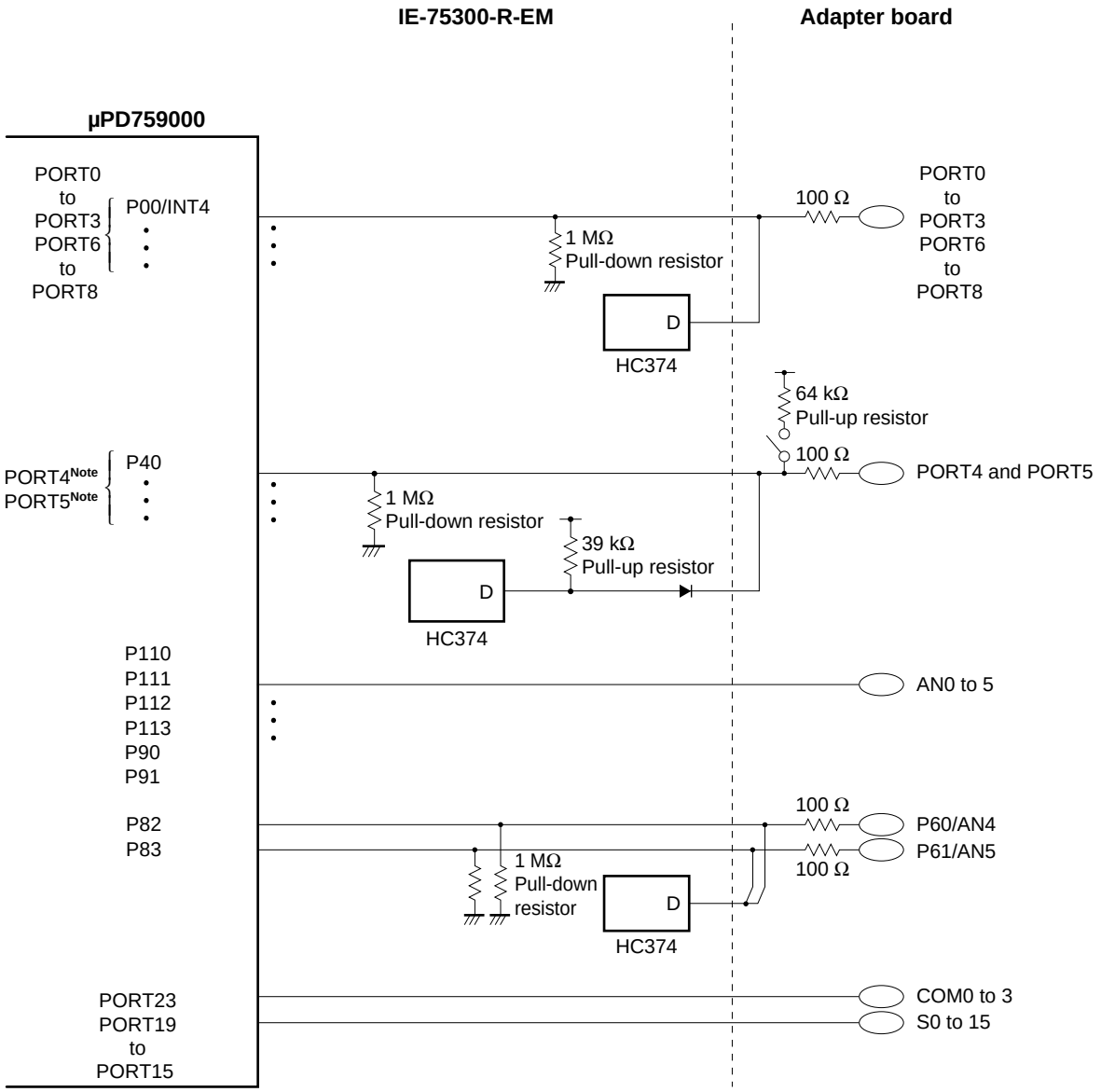
(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

8.2 Handling of Pins of IE-75300-R-EM (μPD753036 Subseries)

★ **Figure 8-1. Handling of Pins of μPD753036 and P3036**



Note N-ch open drain output

CHAPTER 9 INSTALLATION (μPD753108 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD753104, 3106, 3108, and P3116 (μPD753108 Subseries)

9.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD753108 Subseries.

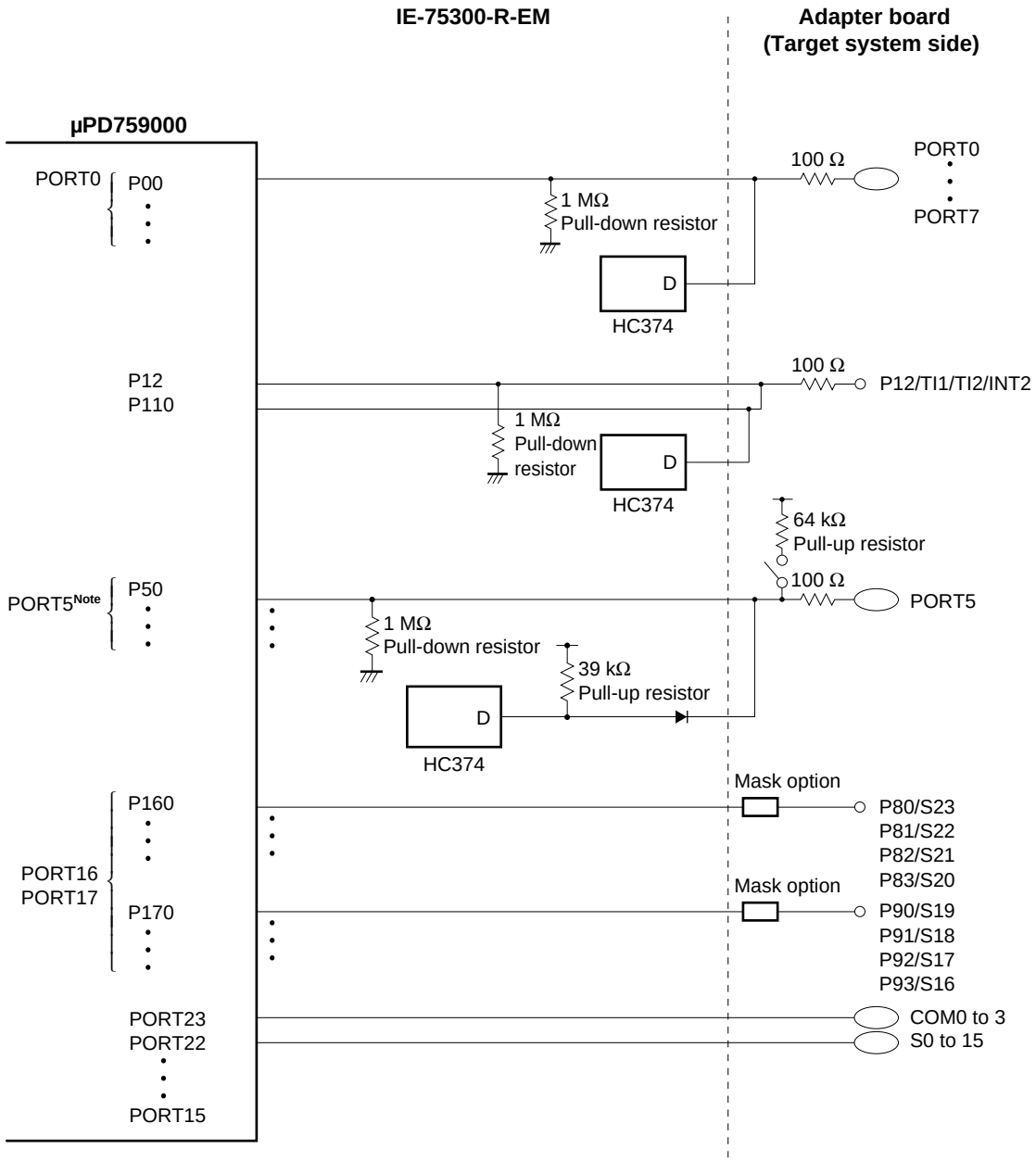
(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

9.2 Handling of Pins of IE-75300-R-EM (μPD753108 Subseries)

★ **Figure 9-1. Handling of Pins of μPD753104, 3106, 3108, and P3116**



Note N-ch open drain output

CHAPTER 10 INSTALLATION (μPD753208 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD753204, 3206, 3208, and P3216 (μPD753208 Subseries)

10.1 Differences Among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD753208 Subseries.

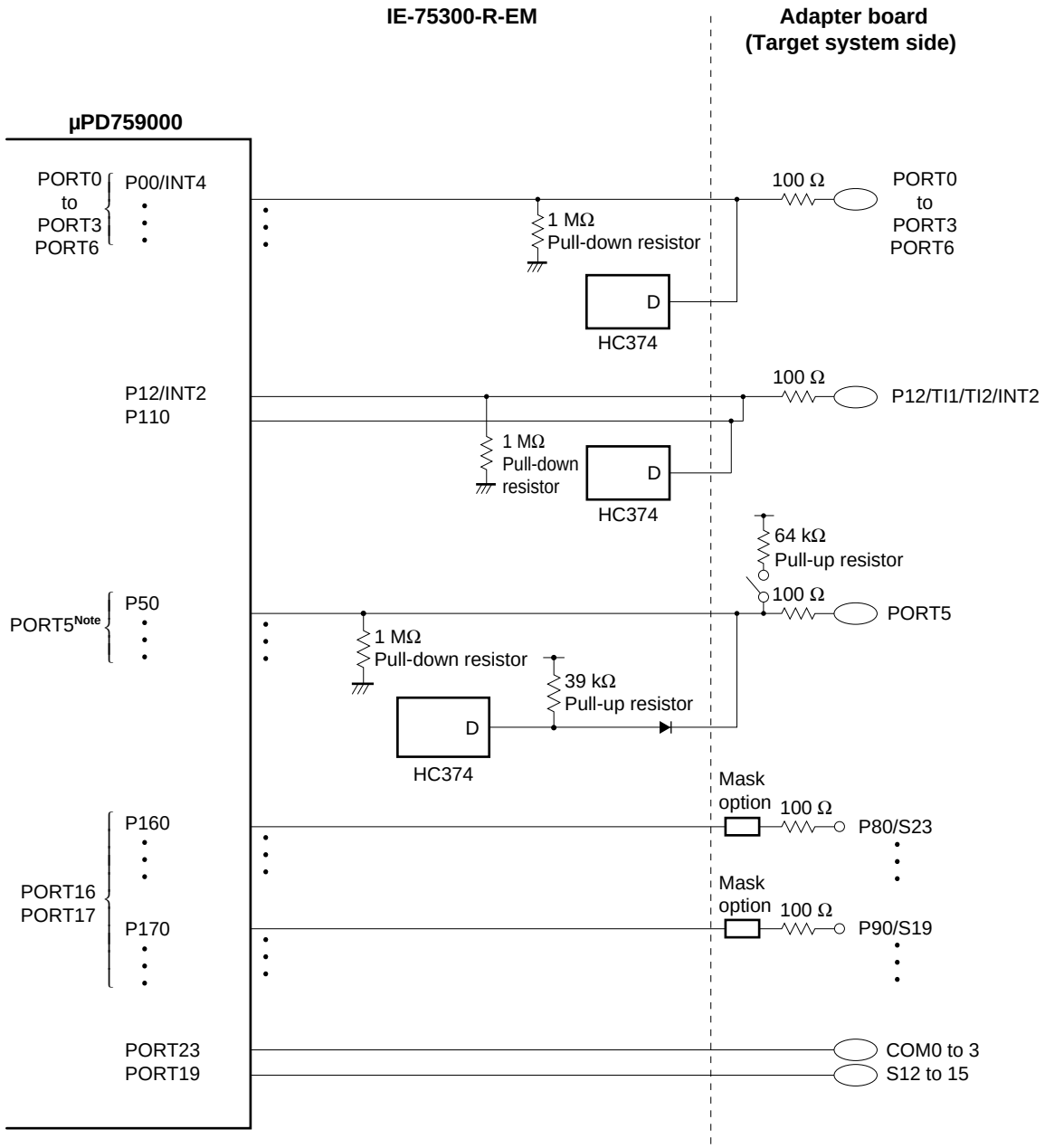
(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

10.2 Handling of Pins of IE-75300-R-EM (μPD753208 Subseries)

★ **Figure 10-1. Handling of Pins of μPD753204, 3206, 3208, and P3216**



Note N-ch open drain output

★ CHAPTER 11 INSTALLATION (μPD753304) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of the product shown below.

Target devices: μPD753304

11.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**.

Described below are the differences between actual devices and target devices belonging to the μPD753304.

(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

(2) Interrupt function

The bits 3 and 4 of the INTA register (INTA) can be read/written with IE, but not with a device. Always write “0” to the bits 3 and 4.

(3) P30 to P33, P100 to P103

When using IE, P30 to P33 and P100 to P103 become low-level input mode after reset. However, when using a device, P30 to P32 become low-level output mode, P33 becomes high-level output mode, P100 to P103 become input mode with a pull-up resistor after reset.

Performs the following processings after reset.

<1> Write “8H” to the address FF3H.

<2> Write “0FH” to the address FE8H.

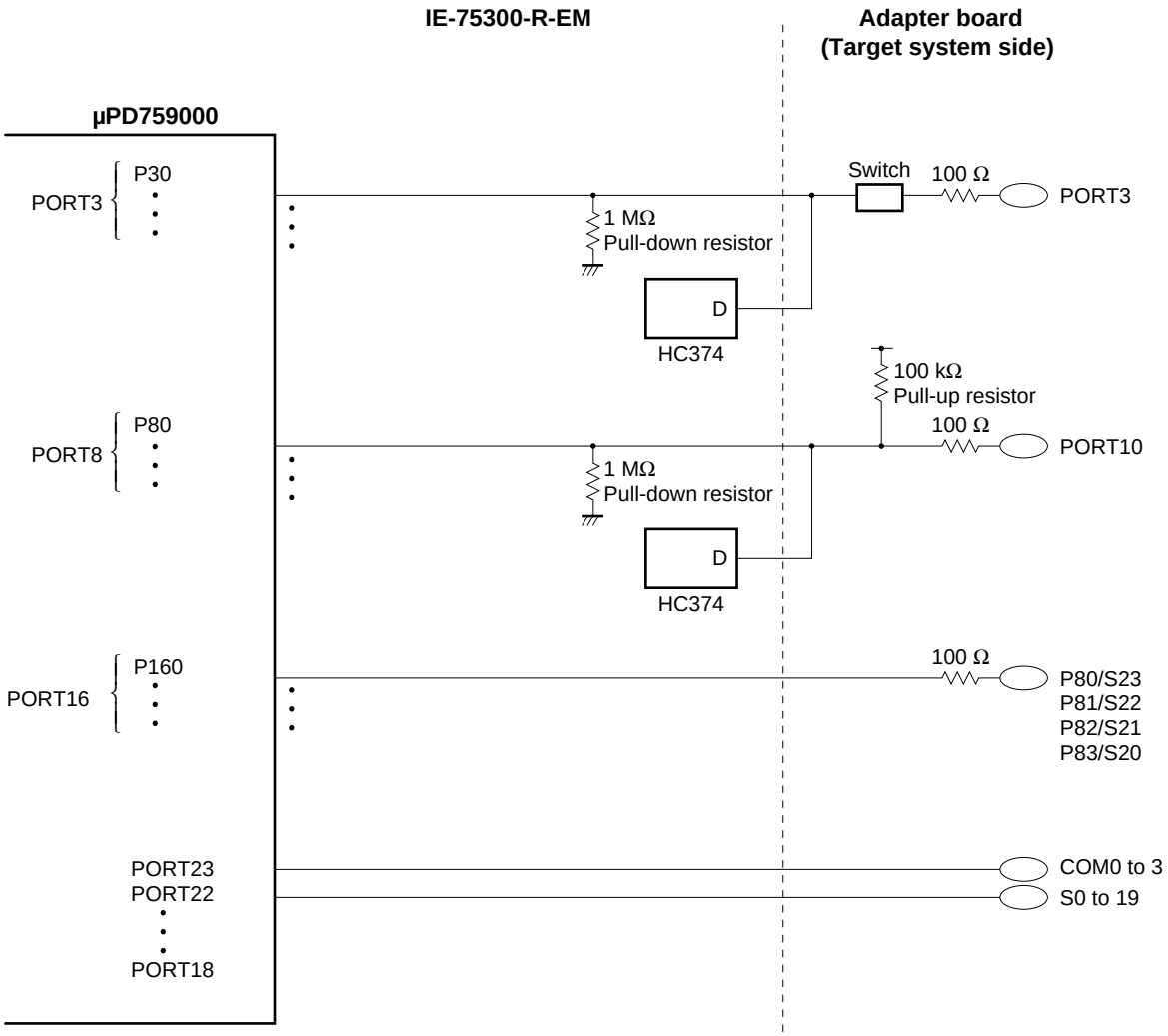
<3> Write “01H” to the address FDEH.

(4) Sub-oscillation circuit control register (SOS)

When using a device, the oscillation of the subsystem clock can be stopped in the STOP mode. However, when using IE, the oscillation cannot be stopped. Always write “0” to the bit 3 of SOS.

11.2 Handling of Pins of IE-75300-R-EM (μPD753304)

Figure 11-1. Handling of Pins of μPD753304



CHAPTER 12 INSTALLATION (μPD754244 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD754202, 4144, 4244, 4264, and F4264 (μPD754244 Subseries)

12.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION**).

Described below are the differences between actual devices and target devices belonging to the μPD754244 Subseries.

(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

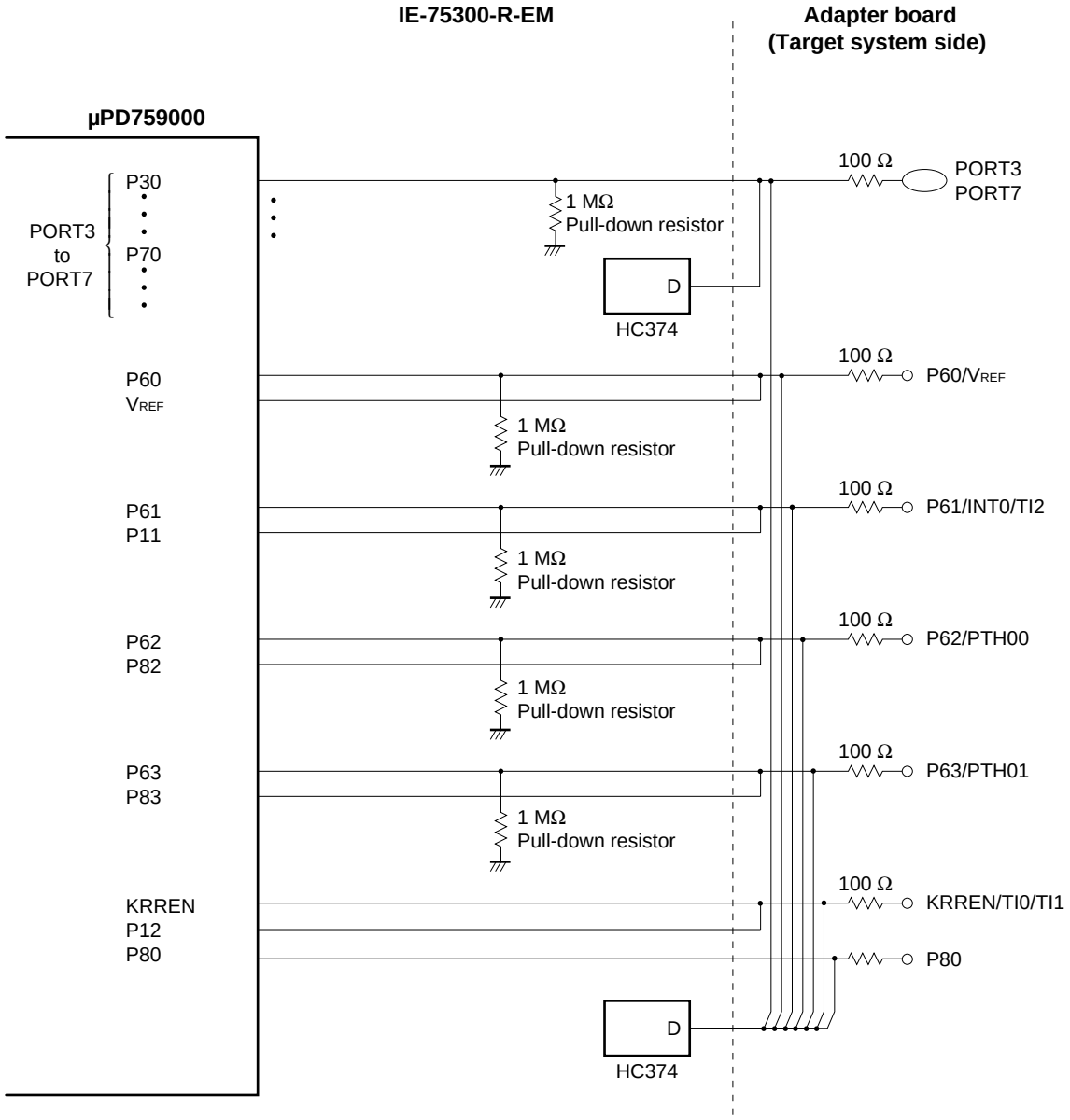
When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

★ **(2) EEPROM (μPD754144, 4244, 4264, and F4264 only)**

IE simulatively performs writing to EEPROM using a RAM, so it seems as if the writing is properly performed even when sufficient writing time is not secured. However, a device cannot perform proper writing unless sufficient writing time is secured.

12.2 Handling of Pins of IE-75300-R-EM (μPD754244 Subseries)

Figure 12-1. Handling of Pins of μPD754202, 4144, 4244, 4264, and F4264



Remark Alternate-function pin can be used only for the μPD754144 and 4244. Alternate functions differ according to the device used.

CHAPTER 13 INSTALLATION (μPD754304 SUBSERIES) FOR IE-75001-R

This chapter describes use of the IE-75001-R for emulation of products of the subseries shown below.

Target devices: μPD754302, 4304, and P4308 (μPD754304 Subseries)

13.1 Differences among Target Devices

When combining the IE-75300-R-EM with the IE-75001-R to emulate various target devices, some factors vary in certain respects from the operation of an actual device. For details concerning operation factors such as the executable commands, program memory area, and system clock, see **CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION**).

Described below are the differences between actual devices and target devices belonging to the μPD754304 Subseries.

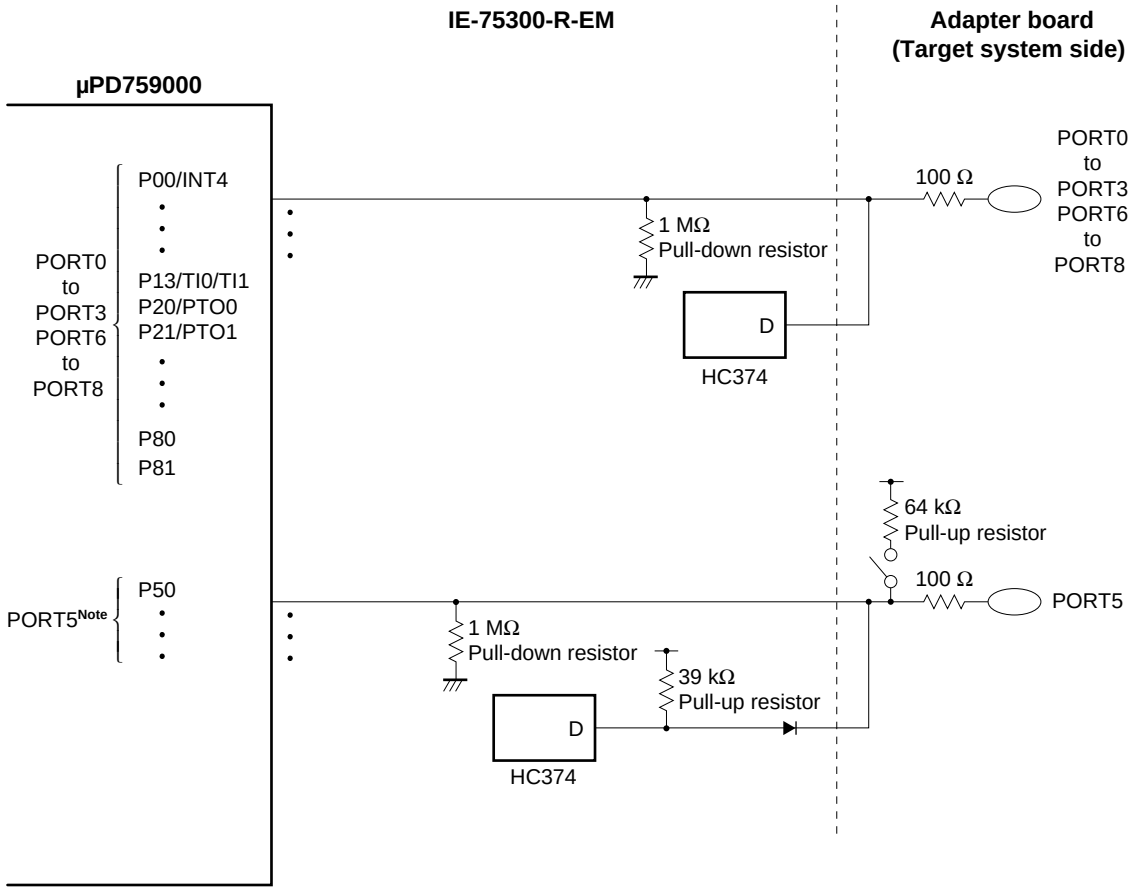
(1) Watchdog timer (WDT) mode

The IE-75001-R cannot perform emulation in the WDT mode.

When the software comes to the WDT setting, the basic interval timer (BT) is activated and a BT interrupt flag is set.

13.2 Handling of Pins of IE-75300-R-EM (μPD754304 Subseries)

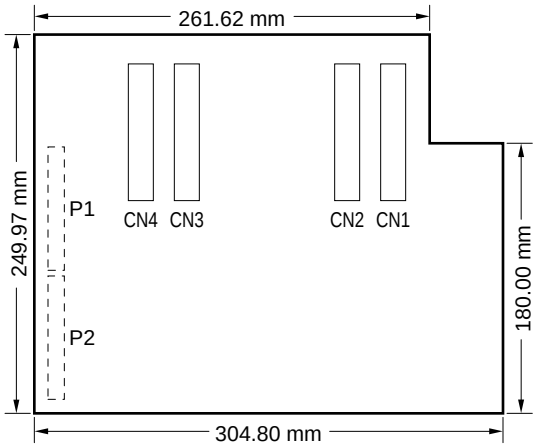
★ **Figure 13-1. Handling of Pins of μPD754302, 4304, and P4308**



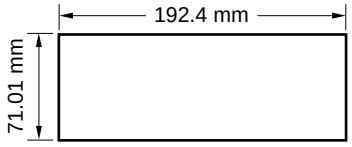
Note N-ch open drain output

APPENDIX A IE-75300-R-EM SPECIFICATIONS

	Part number	: IE-75300-R-EM
	Emulation device	: μPD75000AL and μPD759000
	Operating ambient temperature	: 0 to 50 ˚C (must be free of condensation)
	Humidity	: 10 to 80 % (must be free of condensation)
★	Storage temperature	: –15 to +60 ˚C (must be free of condensation)
	Power supply	: 5 V ± 5 %
	PCB dimensions	: **IE-75300-R-EM**



IE-75300-R-EM D759000 BOARD



[MEMO]

APPENDIX B IE-75300-R-EM BLOCK DIAGRAM

Figure B-1. IE-75300-R-EM Block Diagram

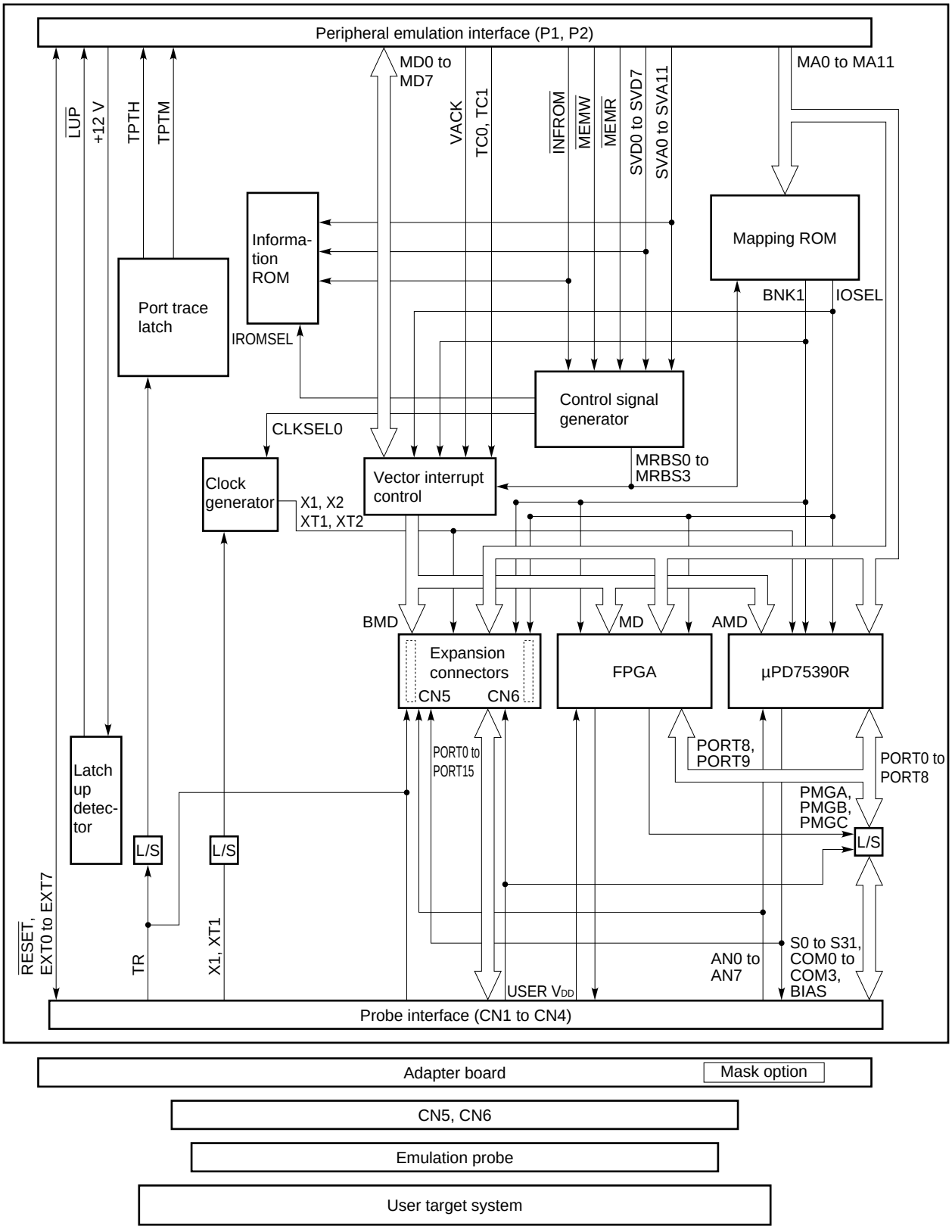
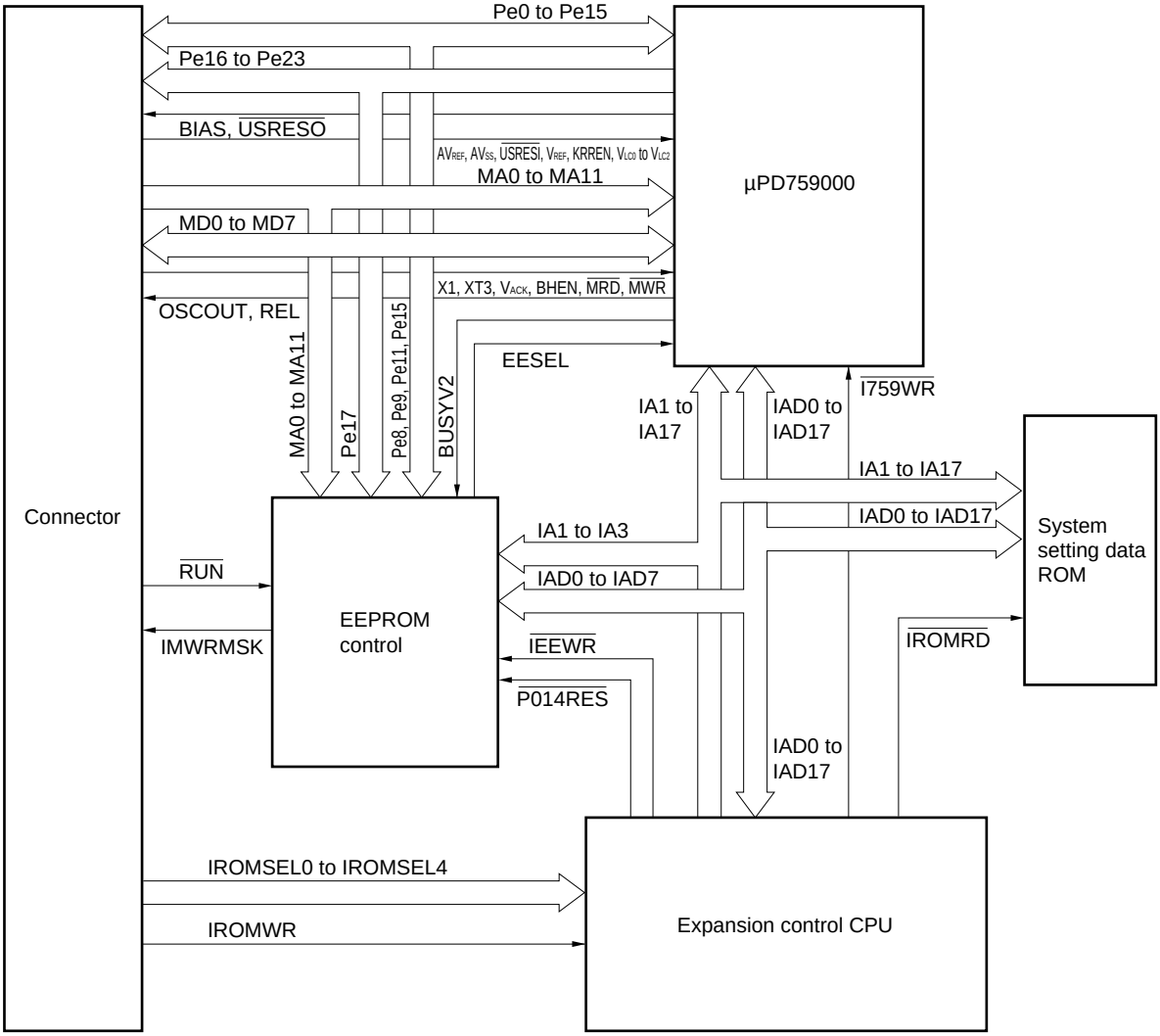


Figure B-2. IE-75300-R-EM D759000 BOARD Block Diagram



APPENDIX C PIN TABLES FOR CN1 TO CN4

CN1 pin table

No.	Pin Name	No.	Pin Name	No.	Pin Name
1	GND	33	NC	65	P92
2	GND	34	P41 a	66	P93
3	GND	35	NC	67	P100
4	GND	36	P42 a	68	NC
5	P00a/INT4	37	NC	69	P101
6	P01 a	38	P43 a	70	NC
7	NC	39	NC	71	P102
8	P02 a	40	P50 a	72	NC
9	NC	41	NC	73	P103
10	P03 a	42	P51 a	74	NC
11	NC	43	NC	75	AV_{SS}
12	P10 a	44	P52 a	76	NC
13	NC	45	NC	77	NC
14	P11 a	46	P53 a	78	NC
15	NC	47	P60 a	79	NC
16	P12 a	48	P61 a	80	AN0
17	NC	49	P62 a	81	AN1
18	P13 a	50	P63 a	82	AN2
19	NC	51	P70 a	83	AN3
20	NC	52	P71 a	84	AN4
21	TI1 a	53	P72 a	85	NC
22	P20 a	54	P73 a	86	AN5
23	P21 c	55	NC	87	NC
24	NC	56	NC	88	AN6
25	P22 c	57	NC	89	NC
26	P23 a	58	NC	90	AN7
27	P30 a	59	P80 a	91	NC
28	P31 a	60	P81 a	92	AV_{DD}
29	P32 a	61	P82 a	93	NC
30	P33 a	62	P83 a	94	AV_{REF}
31	NC	63	P90	95	NC
32	P40 a	64	P91	96	NC

CN2 pin table

No.	Pin Name
97	GND
98	GND
99	GND
100	GND
101	P110
102	P111
103	P112
104	P113
105	P120
106	P121
107	P122
108	P123
109	P130
110	P131
111	P132
112	P133
113	P140
114	P141
115	P142
116	P143
117	P150
118	P151
119	P152
120	P153
121	P21 a
122	P22 a
123	NC
124	NC
125	NC
126	NC
★ 127	V_{REF}
★ 128	KRREN

No.	Pin Name
129	V_{LC0}
130	V_{LC1}
131	V_{LC2}
132	TRG2
133	$\overline{\text{RESET}}$ u
134	IROMSEL0
135	IROMSEL1
136	IROMSEL2
137	IROMSEL3
138	IROMSEL4
139	pe12
140	NC
141	NC
142	NC
143	NC
144	NC
145	NC
146	NC
147	NC
148	NC
149	NC
150	NC
151	NC
152	NC
153	NC
154	NC
155	NC
156	NC
157	NC
158	NC
159	X1 a
160	NC

No.	Pin Name
161	XT1 a
162	NC
163	NC
164	NC
165	NC
166	$\overline{\text{RUN}}$/BRK
167	TI2
168	TI3
169	NC
170	NC
171	NC
172	NC
173	NC
174	NC
175	NC
176	NC
177	NC
178	NC
179	NC
180	NC
181	NC
182	NC
183	EXT0
184	EXT1
185	EXT2
186	EXT3
187	EXT4
188	EXT5
189	EXT6
190	EXT7
191	P82 d
192	P83 d

CN3 pin table

No.	Pin Name
193	$\overline{\text{RESETU}}$ a
194	NC
195	NC
196	NC
197	NC
198	NC
199	NC
200	NC
201	EVCMOSPW
202	EVCMOSPW
203	EVCMOSPW
204	TR153 a
205	TR152 a
206	TR151 a
207	TR150 a
208	NC
209	NC
210	NC
211	NC
212	TR143 a
213	TR142 a
214	TR141 a
215	TR140 a
216	NC
217	NC
218	NC
219	NC
220	TR133 a
221	TR132 a
222	TR131 a
223	TR130 a
224	NC

No.	Pin Name
225	NC
226	NC
227	NC
228	TR123 a
229	TR122 a
230	TR121 a
231	TR120 a
232	TR113 a
233	TR112 a
234	TR111 a
235	TR110 a
236	TR103 a
237	TR102 a
238	TR101 a
239	TR100 a
240	TR93 a
241	TR92 a
242	TR91 a
243	TR90 a
244	TR83 a
245	TR82 a
246	TR81 a
247	TR80 a
248	TR73 a
249	TR72 a
250	TR71 a
251	TR70 a
252	TR63 a
253	TR62 a
254	TR61 a
255	TR60 a
256	TR53 a

No.	Pin Name
257	TR52 a
258	TR51 a
259	TR50 a
260	TR43 a
261	TR42 a
262	TR41 a
263	TR40 a
264	TR33 a
265	TR32 a
266	TR31 a
267	TR30 a
268	TR23 a
269	TR22 a
270	TR21 a
271	TR20 a
272	TR13 a
273	TR12 a
274	TR11 a
275	TR10 a
276	TR03 a
277	TR02 a
278	TR01 a
279	TR00 a
280	V_{DD} (+3 V)
281	V_{DD} (+3 V)
282	V_{DD} (+3 V)
283	V_{DD} (+5 V)
284	V_{DD} (+5 V)
285	V_{DD} (+5 V)
286	$USRV_{DD}$
287	$USRV_{DD}$
288	$USRV_{DD}$

CN4 pin table

No.	Pin Name
289	S31/BP7
290	S30/BP6
291	S29/BP5
292	S28/BP4
293	S27/BP3
294	S26/BP2
295	S25/BP1
296	S24/BP0
297	S23
298	S22
299	S21
300	S20
301	S19
302	S18
303	S17
304	S16
305	S15
306	S14
307	S13
308	S12
309	S11
310	S10
311	S9
312	S8
313	S7
314	S6
315	S5
316	S4
317	S3
318	S2
319	S1
320	S0

No.	Pin Name
321	COM0
322	COM1
323	COM2
324	COM3
325	VLC0
326	VLC1
327	VLC2
328	BIAS
329	NC
330	NC
331	NC
332	NC
333	NC
334	NC
335	NC
336	NC
337	NC
338	NC
339	NC
340	NC
341	NC
342	NC
343	NC
344	NC
345	NC
346	NC
347	NC
348	NC
349	NC
350	NC
351	NC
352	NC

No.	Pin Name
353	NC
354	NC
355	OSCOUT
356	CPUCL
357	MA0
358	MA1
359	MA2
360	MA3
361	MA4
362	MA5
363	MA6
364	MA7
365	MA8
366	MA9
367	MA10
368	MA11
369	MD0
370	MD1
371	MD2
372	MD3
373	MD4
374	MD5
375	MD6
376	MD7
377	$\overline{\text{MRD}}$
378	$\overline{\text{MWR}}$
379	TC0
380	TC1
381	BHEN
382	VACK
383	SADREL
384	$\overline{\text{RESET}}$

APPENDIX D REVISION HISTORY

The history of revisions hitherto made until now is shown below.

(1/2)

Edition	Major Revisions	Chapter
Second	Upgraded the IE-75300-R-EM to Ver.1.34	**General**
	Added the following products to target devices: μPD750068 subseries, μPD750108 Subseries, μPD753036 subseries, μPD753208 Subseries, μPD754244 subseries, μPD754304 Subseries, μPD753012A, 3016A, 3017A, and P3018A	
	Added the items about ROMs provided at shipment and IE-75300-R-EM D759000 BOARD mounted on	**CHAPTER 1 OVERVIEW**
	Added explanation of procedure when replacing firmware ROM	**CHAPTER 2 INSTALLATION PROCEDURE**
	Change in figures when connecting with target system	
	Added the item about check and replacement of information ROM and system setting data ROM. Addition of the item about JP1 of IE-75300-R-EM D759000 BOARD setting	
	Added caution for $\overline{\text{RESET}}$ pin when performing emulation with user power supply	
	Added the figure of JP2 and JP3 settings	
	Added differences between less than Ver.1.32 and above Ver.1.32 of IE-75300-R-EM when connecting with IE-75001-R	**CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**
	Added differences among target devices when using watch timer, LCD display, and interrupt function	**CHAPTER 4 INSTALLATION (μPD75308, 316, 328, AND 336 SUBSERIES) FOR IE-75001-R**
	Change of the figure of pin treatment of IE-75300-R-EM	
	Added differences among target devices of oscillation wait time when reset and subsystem clock oscillation circuit	**CHAPTER 5 INSTALLATION (μPD750008 AND 0108 SUBSERIES) FOR IE-75001-R**
	Change in the figure of pin treatment of IE-75300-R-EM	
	Added differences among target devices of subsystem clock oscillation circuit	**CHAPTER 7 INSTALLATION (μPD753017 SUBSERIES) FOR IE-75001-R**
	Change of the figure of pin treatment of IE-75300-R-EM	
	Change of the figure of pin treatment of IE-75300-R-EM	**CHAPTER 9 INSTALLATION (μPD753108 SUBSERIES) FOR IE-75001-R**
	Added IE-75300-R-EM D759000 BOARD block diagram	**APPENDIX B IE-75300-R-EM BLOCK DIAGRAM**
	Change of CN2 pin table	**APPENDIX C PIN TABLES FOR CN1 TO CN4**

(2/2)

Edition	Major Revisions	Chapter
Third	Upgraded the IE-75300-R-EM to Ver.1.47	**General**
	Added μPD753304 to target devices	
	Upgrading of information ROM (IC79, IC80) and system setting data ROM (IC3)	
	Added the differences in clock generation circuit	**CHAPTER 3 DIFFERENCES BETWEEN IE-75001-R AND TARGET DEVICES WHEN CONNECTING THE IE-75001-R (ALL TARGET DEVICES COMMON VERSION)**
	Added the restrictions	
	Added serial interface and A/D converter to the differences among target devices	**CHAPTER 4 INSTALLATION (μPD75308, 316, 328, AND 336 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 5 INSTALLATION (μPD750008 AND 0108 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 6 INSTALLATION (μPD750068 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 7 INSTALLATION (μPD753017 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 8 INSTALLATION (μPD753036 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 9 INSTALLATION (μPD753108 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 10 INSTALLATION (μPD753208 SUBSERIES) FOR IE-75001-R**
	Added the differences between EEPROM and target devices	**CHAPTER 12 INSTALLATION (μPD754244 SUBSERIES) FOR IE-75001-R**
	Change the figure of handling of pins of IE-75300-R-EM	
	Change the figure of handling of pins of IE-75300-R-EM	**CHAPTER 13 INSTALLATION (μPD754304 SUBSERIES) FOR IE-75001-R**

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