NEC

User's Manual

IE-78048-NS-EM1

Emulation Board

Target Device

μPD78044F Subseries

μPD78044H Subseries

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- Product release schedule
- Availability of related technical literature
- Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)
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INTRODUCTION

Product Overview

The IE-78048-NS-EM1 is designed to be used with the IE-78K0-NS to debug the following target devices that belong to the 78K/0 Series of 8-bit single-chip microcontrollers.

- μPD78044F Subseries: μPD78042F, 78043F, 78044F, 78045F
- μPD78044H Subseries: μPD78044H, 78045H, 78046H

Target Readers

This manual is intended for engineers who will use the IE-78048-NS-EM1 with the IE-78K0-NS to perform system debugging.
Engineers who use this manual are expected to be thoroughly familiar with the target device's functions and use methods and to be knowledgeable about debugging.

Organization

When using the IE-78048-NS-EM1, refer to not only this manual (supplied with the IE-78048-NS-EM1) but also the manual that is supplied with the IE-78K0-NS.

IE-78K0-NS User's Manual	IE-78048-NS-EM1 User's Manual
• Basic specifications • System configuration • External interface functions	• General • Part names • Installation • Differences between target devices and target interface circuits

Purpose

This manual's purpose is to explain various debugging functions that can be performed when using the IE-78048-NS-EM1.

Terminology The meanings of certain terms used in this manual are listed below.

Term	Meaning
Emulation device	This is a general term that refers to the device in the emulator that is used to emulate the target device. It includes the emulation CPU.
Emulation CPU	This is the CPU block in the emulator that is used to execute user-generated programs.
Target device	This is the device (real chip) that is the target for emulation.
Target system	This includes the target program and the hardware provided by the user. When defined narrowly, it includes only the hardware.
IE system	This refers to the combination of the IE-78K0-NS and the IE-78048-NS-EM1.

Conventions

Data significance: Higher digits on the left and lower digits on the right
Note: Footnote for item marked with **Note** in the text
Caution: Information requiring particular attention
Remark: Supplementary information

Related Documents The related documents (user's manuals) indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document Number
IE-78K0-NS	U13731E
IE-78048-NS-EM1	This manual
ID78K0-NS Integrated Debugger Reference Windows™ Based	U12900E
μPD78044F Subseries	U10908E
μPD78044H Subseries	U11756E

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

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CHAPTER 1 GENERAL

The IE-78048-NS-EM1 is a development tool for efficient debugging of hardware or software when using one of the following target devices that belong to the 78K/0 Series of 8-bit single-chip microcontrollers.

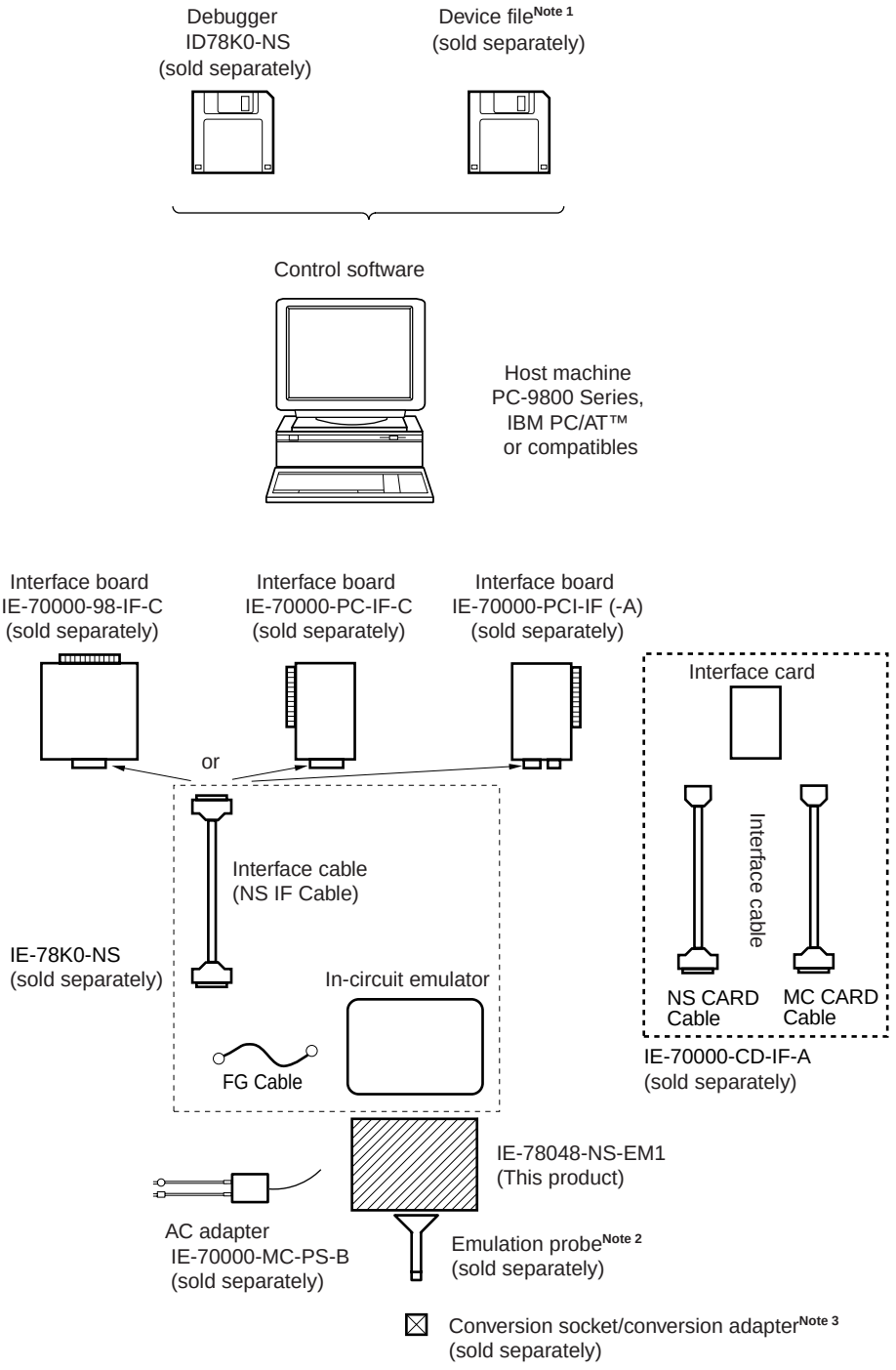
This chapter describes the IE-78048-NS-EM1's system configuration and basic specifications.

- Target device
  - μPD78044F Subseries
  - μPD78044H Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-78048-NS-EM1's system configuration.

Figure 1-1. System Configuration



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

μS××××DF78044: μPD78044F, 78044H Subseries

2. The emulation probe is as follows.

NP-80GF: 80-pin plastic QFP (GF type)

The NP-80GF is a product of Naito Densei Machida Mfg. Co., Ltd.

For further information, contact Naito Densei Machida Mfg. Co., Ltd. (TEL: +81-44-822-3813)

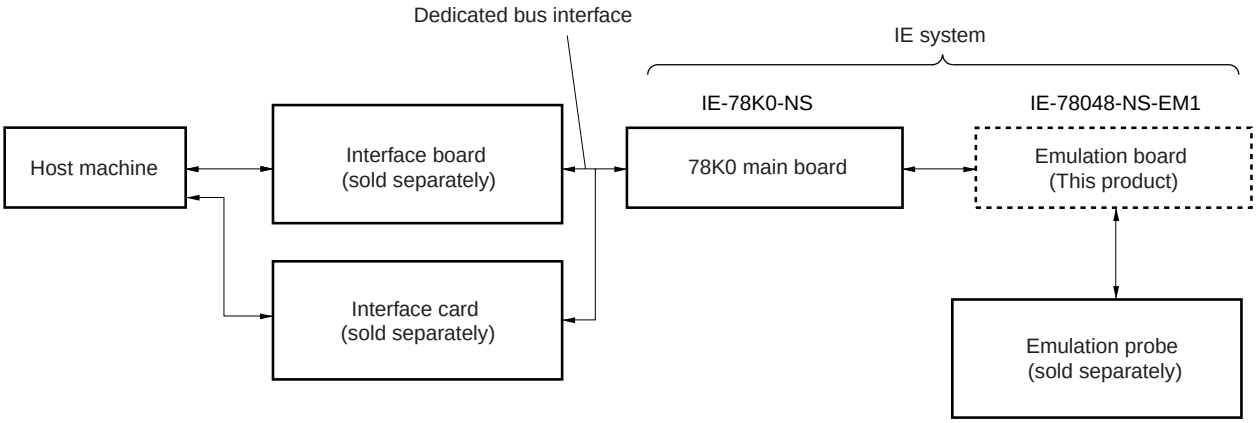
3. The conversion socket/conversion adapter are as follows, in accordance with the package.

EV-9200G-80: 80-pin plastic QFP (GF type)

1.2 Hardware Configuration

Figure 1-2 shows the IE-78048-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The IE-78048-NS-EM1's basic specifications are listed in Table 1-1.

Table 1-1. Basic Specifications

Parameter	Description
Target device	μPD78044F, 78044H Subseries
System clock	Main system clock: 5 MHz Subsystem clock: 32.768 kHz
Clock supply	External: Pulse input Internal: Mounted on the emulation board
Low voltage support	3 to 5.5 V (same as the target device)

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CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-78048-NS-EM1 main unit.

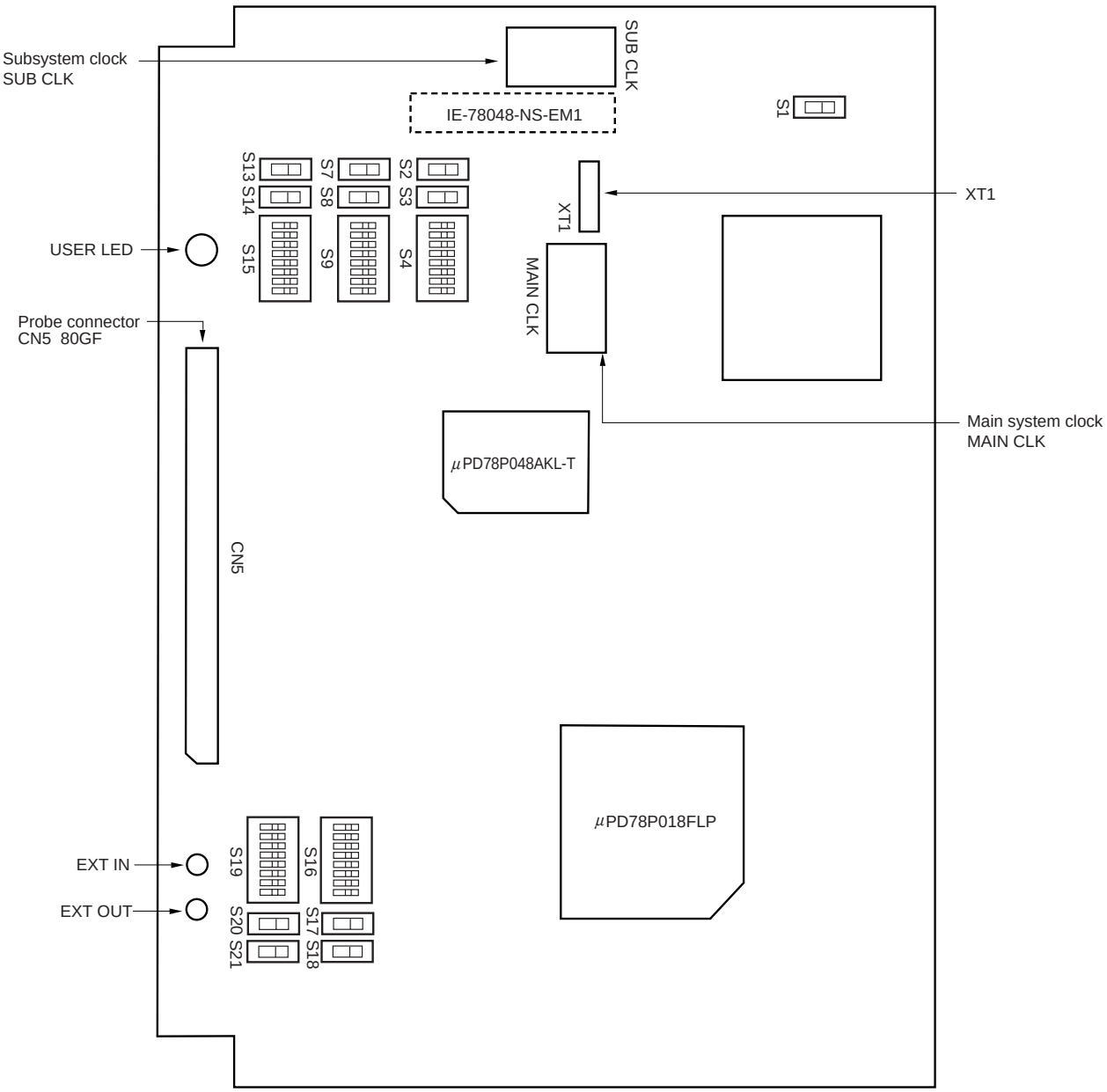
The packing box contains the emulation board (IE-78048-NS-EM1), packing list, user's manual, and guarantee card.

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

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

2.1 Parts of Main Unit

Figure 2-1. IE-78048-NS-EM1 Part Names



CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-78048-NS-EM1 to the IE-78K0-NS, emulation probe, etc. Mode setting methods are also described.

Caution Connecting or removing components to or from the target system, or making switch or other setting changes must be carried out after the power supply to both the IE system and the target system has been switched OFF.

3.1 Connection

(1) Connection with IE-78K0-NS main unit

See the **IE-78K0-NS User's Manual (U13731E)** for a description of how to connect the IE-78048-NS-EM1 to the IE-78K0-NS.

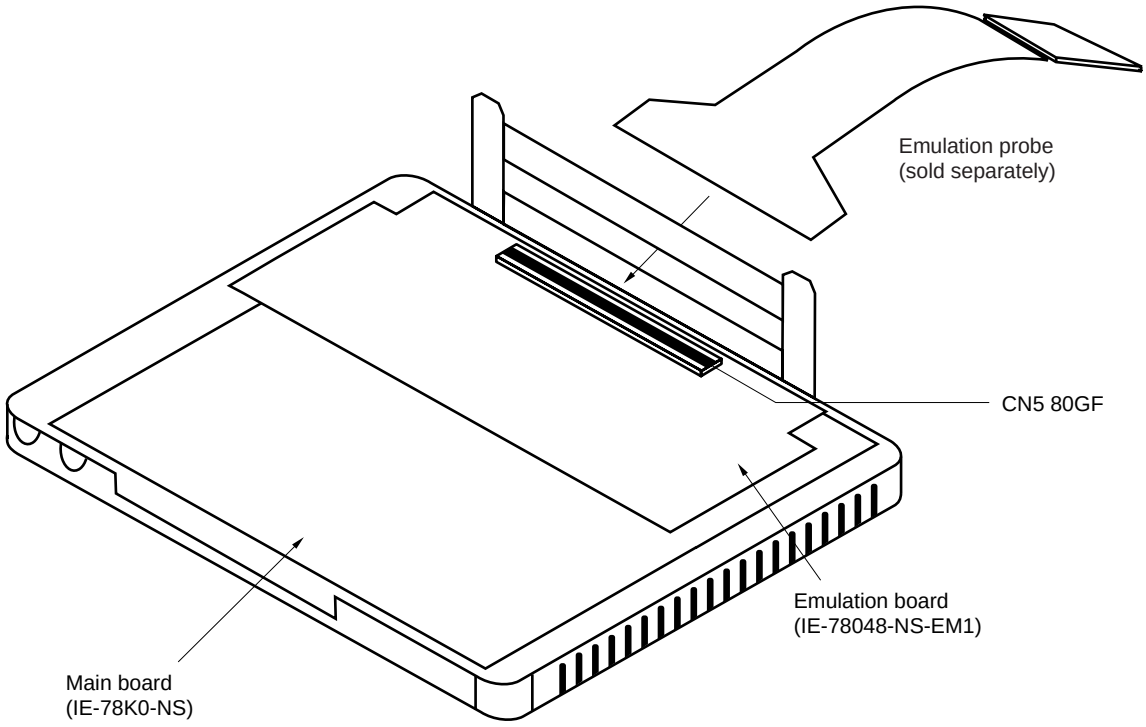
(2) Connection with emulation probe

See the **IE-78K0-NS User's Manual (U13731E)** for a description of how to connect an emulation probe to the IE-78048-NS-EM1.

On this board, connect the emulation probe to CN5.

Caution Incorrect connection may damage the IE system.
Be sure to read the emulation probe's user's manual for a detailed description of the connection method.

Figure 3-1. Connection of Emulation Probe



3.2 Clock Settings

3.2.1 Overview of clock settings

The main system and subsystem clocks to be used during debugging can be selected from (1) to (3) below.

(1) Clock that is already mounted on emulation board
(2) Clock that is mounted by user
(3) External clock

If the target system includes an internal clock, select either “(1) Clock that is already mounted on emulation board” or “(2) Clock that is mounted by user”. For an internal clock, a resonator is connected to the target device and the target device’s internal oscillator is used. An example of the external circuit is shown in part (a) of Figure 3-2. During emulation, the resonator that is mounted on the target system is not used. Instead, the clock that is mounted on the emulation board installed for the IE-78K0-NS is used.

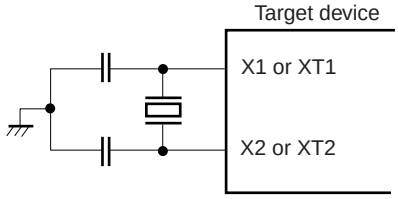
If the target system includes an external clock, select “(3) External clock”.

For an external clock, a clock signal is supplied from outside the target device and the target device’s internal oscillator is not used. An example of the external circuit is shown in part (b) of Figure 3-2.

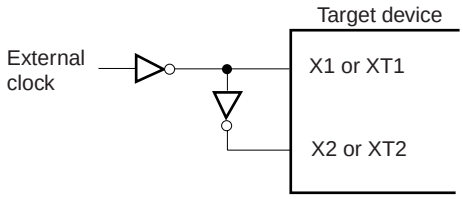
Caution The IE system will be hung-up if the main system clock is not supplied normally. Moreover, be sure to input a rectangular wave as the clock from the target. The IE system does not operate if the crystal resonator is connected to X1 (main system clock) and XT1 (subsystem clock).

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

(a) Internal clock



(b) External clock

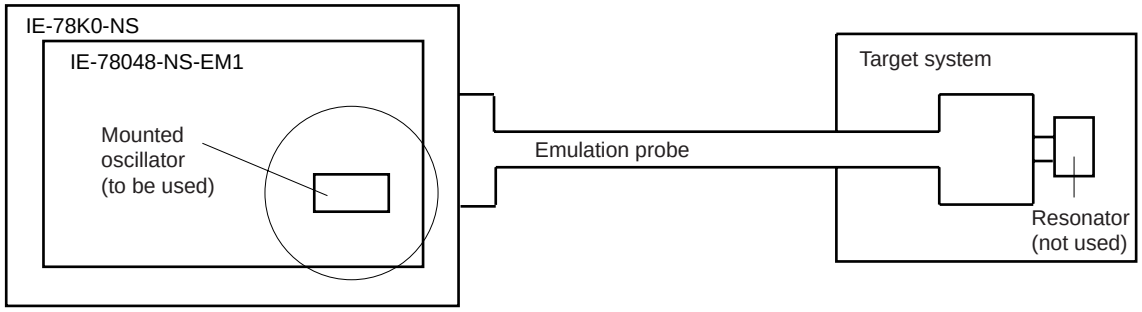


(1) Clock that is already mounted on emulation board

(a) For main system clock

A crystal oscillator (MAIN CLK) is already mounted on the emulation board. Its frequency is 5.0 MHz.

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

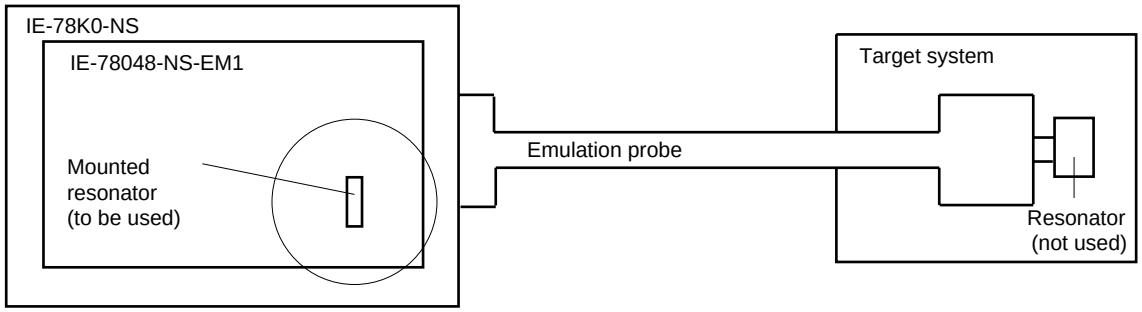


Remark The clock that is supplied by the IE-78048-NS-EM1's oscillator (encircled in the figure) is used.

(b) For subsystem clock

A crystal resonator (XT1) is already mounted on the emulation board. Its frequency is 32.768 kHz.

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



Remark The clock that is supplied by the IE-78048-NS-EM1's resonator (encircled in the figure) is used.

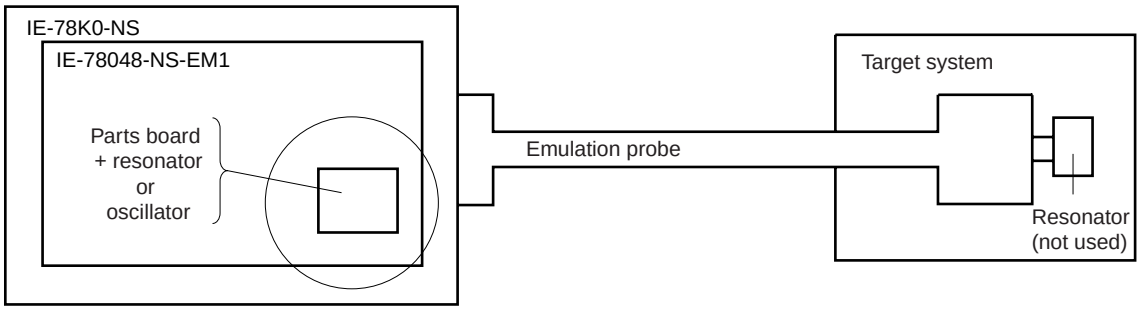
(2) Clock that is mounted by user

The user is able to mount any clock supported by the set specifications on the IE-78048-NS-EM1.

(a) For main system clock

Remove the crystal oscillator (MAIN CLK) that is already mounted on the emulation board, and mount either the parts board on which the resonator to be used is mounted or an oscillator. This method is useful when using a different frequency from that of the pre-mounted clock.

Figure 3-5. When Using User-Mounted Clock (Main System Clock)

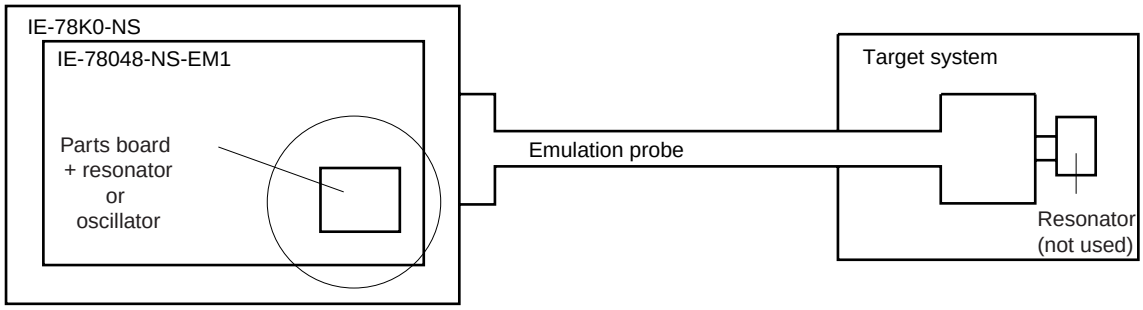


Remark The clock that is supplied by the IE-78048-NS-EM1's resonator or oscillator (encircled in the figure) is used.

(b) For subsystem clock

Mount the resonator to be used on the parts board (SUB CLK) that is already mounted on the emulation board. Alternatively, remove the parts board and mount an oscillator.

Figure 3-6. When Using User-Mounted Clock (Subsystem Clock)

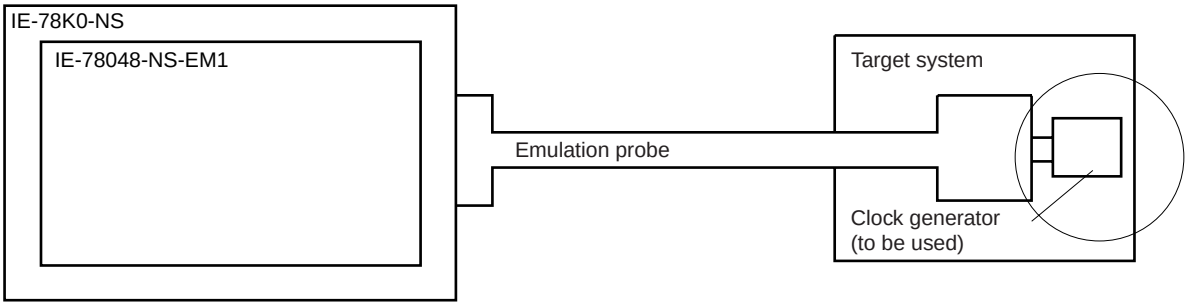


Remark The clock that is supplied by the IE-78048-NS-EM1's resonator or oscillator (encircled in the figure) is used.

(3) External clock

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

Figure 3-7. When Using an External Clock



Remark The clock supplied by the target system's clock generator (encircled in the figure) is used.

3.2.2 Main system clock settings

Table 3-1. Main System Clock Settings

Frequency of Main System Clock		IE-78048-NS-EM1 MAIN CLK Socket	CPU Clock Source Selection (ID)
When using clock that is already mounted on emulation board	5.0 MHz	Oscillator used	Internal
When using clock mounted by user	Other than 5.0 MHz	Oscillator assembled by user	
When using external clock		Oscillator (not used)	External

Caution When using an external clock, open the configuration dialog box when starting the integrated debugger (ID78K0-NS) and select "External" in the area (Clock) for selecting the CPU's clock source (this selects the user's clock).

Remark When the IE-78048-NS-EM1 is shipped, the settings for "when using clock that is already mounted on emulation board" are preset.

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

When the IE-78048-NS-EM1 is shipped, a 5.0 MHz crystal oscillator is already mounted in the IE-78048-NS-EM1's MAIN CLK socket. When using the factory-set mode settings, there is no need to make any other hardware settings.

When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select "Internal" in the area (Clock) for selecting the CPU's clock source (this selects the emulator's internal clock).

(2) When using clock mounted by user

The settings described under either (a) or (b) are required, depending on the type of clock to be used.

When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select “Internal” in the area (Clock) for selecting the CPU’s clock source (this selects the emulator’s internal clock).

(a) When using a ceramic resonator or crystal resonator

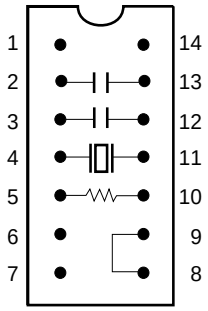
- Items to be prepared
  - Parts board (supplied with IE-78K0-NS)
  - Ceramic resonator or crystal resonator
  - Resistor Rx
  - Capacitor CA
  - Capacitor CB
  - Solder kit

<Steps>

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

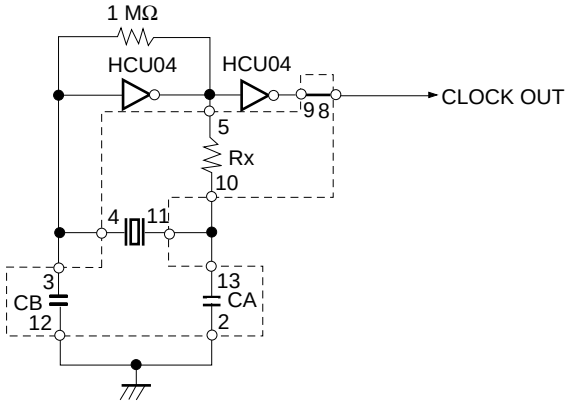
Figure 3-8. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)

Parts board (MAIN CLK)



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

Circuit diagram



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

<2> Prepare the IE-78048-NS-EM1.

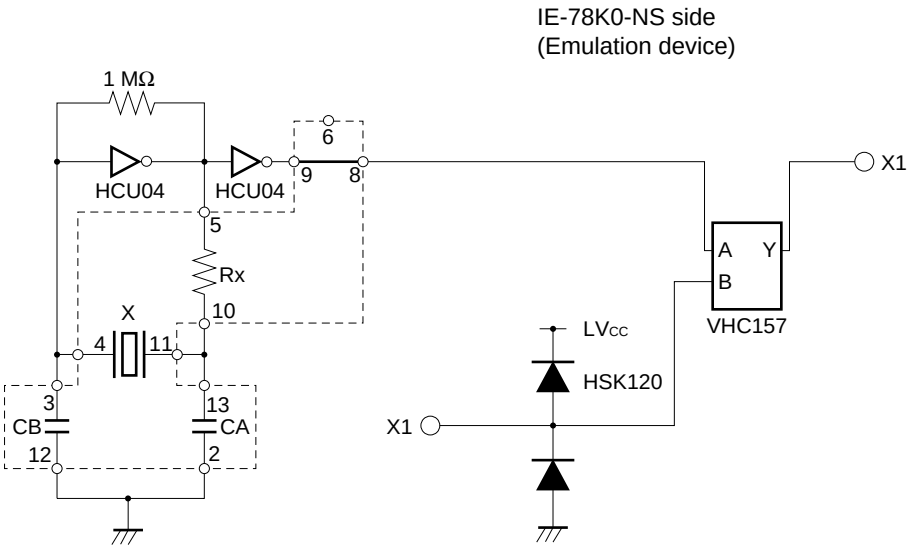
<3> Remove the crystal oscillator that is mounted in the IE-78048-NS-EM1's socket (the socket marked as MAIN CLK).

<4> Connect the parts board (from <1> above) to the socket (MAIN CLK) from which the crystal oscillator was removed. Check the pin 1 mark to make sure the board is mounted in the correct direction.

<5> Make sure that the parts board is wired as shown in Figure 3-8 above.

<6> Install the IE-78048-NS-EM1 in the IE-78K0-NS.

The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.

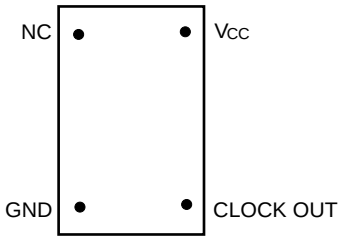


Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

(b) When using a crystal oscillator

- Items to be prepared
  - Crystal oscillator (see pinouts shown in Figure 3-9)

Figure 3-9. Crystal Oscillator (When Using Main System Clock or User-Mounted Clock)



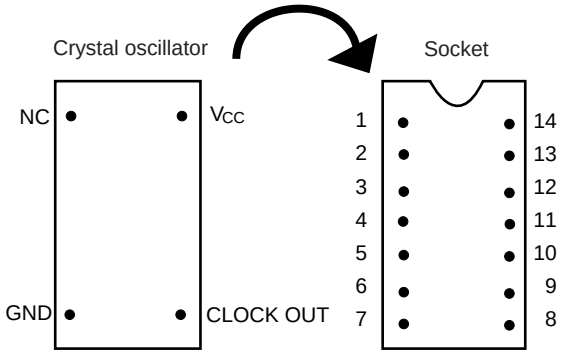
<Steps>

<1> Prepare the IE-78048-NS-EM1.

<2> Remove the crystal oscillator that is mounted in the IE-78048-NS-EM1's MAIN CLK socket.

<3> Mount the crystal oscillator prepared by the user in the MAIN CLK socket from which the crystal oscillator was removed in <2> above. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

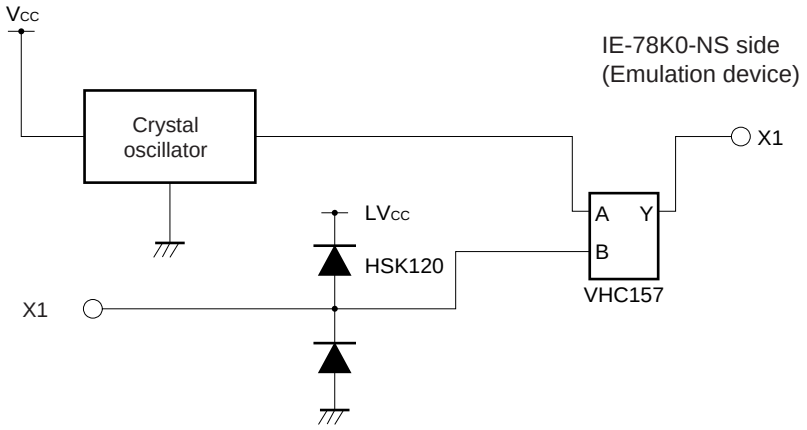
Figure 3-10. Pin Alignment of Crystal Oscillator and Socket



Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
VCC	14

<4> Install the IE-78048-NS-EM1 in the IE-78K0-NS.

The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.



(3) When using external clock

No hardware settings are required for this situation.

When starting the integrated debugger (ID78K0-NS), open the configuration dialog box and select “External” in the area (Clock) for selecting the CPU’s clock source (this selects the user’s clock).

3.2.3 Subsystem clock settings

Table 3-2. Subsystem Clock Settings

Frequency of Subsystem Clock to Be Used		IE-78048-NS-EM1	IE-78K0-NS
		SUB CLK Socket	JP8
When using clock (XT1) that is already mounted on emulation board	32.768 kHz	6 and 8 shorted	Short 1 to 2 side
When using clock mounted by user	Other than 32.768 kHz	Oscillator assembled by user	
When using external clock		Not used	Short 3 to 4 side

Caution Jumper JP8, which is used to select the board's clock or an external clock, should be set only after turning off the IE-78K0-NS's power.

Remark When the IE-78048-NS-EM1 is shipped, the settings for "when using clock that is already mounted on emulation board" are preset.

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

When the IE-78048-NS-EM1 is shipped, a 32.768 kHz crystal resonator (XT1) and the parts board (SUB CLK) on which pins 6 and 8 are shorted are already mounted on the IE-78048-NS-EM1. Short the 1 to 2 side on the IE-78K0-NS's jumper (JP8). There is no need to make any other settings via the integrated debugger (ID78K0-NS).

(2) When using the clock mounted by user

The settings described under either (a) or (b) are required, depending on the type of clock to be used. Short the 1 to 2 side on the IE-78K0-NS's jumper (JP8). Refer to **IE-78K0-NS User's Manual (U13731E)** for jumper position.

There is no need to make any other settings via the integrated debugger (ID78K0-NS).

(a) When using a ceramic resonator or crystal resonator

- Items to be prepared
  - Parts board (supplied with IE-78K0-NS)
  - Ceramic resonator or crystal resonator
  - Resistor Rx
  - Capacitor CA
  - Capacitor CB
  - Solder kit

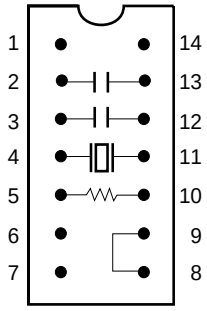
<Steps>

<1> Prepare the IE-78048-NS-EM1.

<2> Solder the ceramic resonator or crystal resonator, resistor Rx, capacitor CA, and capacitor CB (all with suitable oscillation frequency) onto the supplied parts board (SUB CLK) (as shown below).

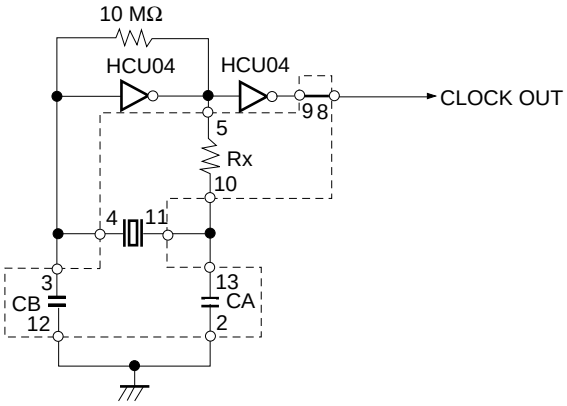
Figure 3-11. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

Parts board (SUB CLK)



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

Circuit diagram



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

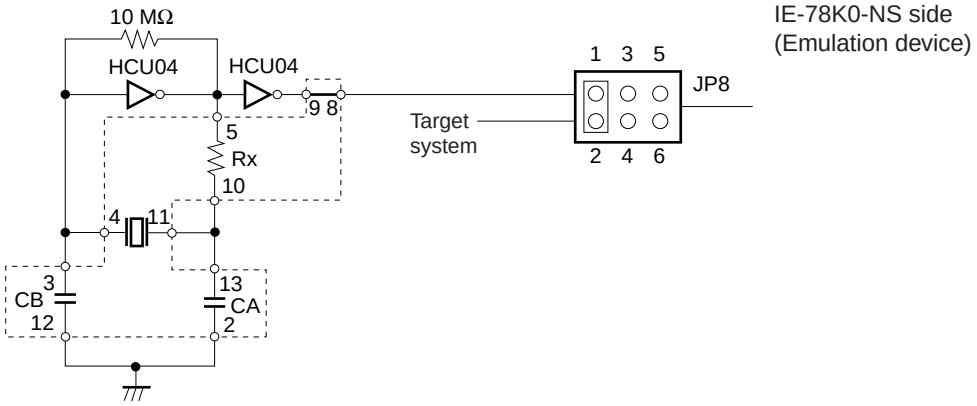
<3> Make sure that the parts board (SUB CLK) is wired as shown in Figure 3-11.

<4> Remove the parts board that is mounted in the IE-78048-NS-EM1's SUB CLK socket.

<5> Connect the parts board (from <2> above) to the SUB CLK socket from which the parts board was removed in <4> above. Check the pin 1 mark to make sure the board is mounted in the correct direction.

<6> Install the IE-78048-NS-EM1 in the IE-78K0-NS.

The above steps configure the following circuit and enable supply of the clock from the mounted resonator to the emulation device.



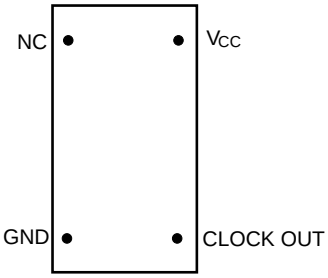
Remarks 1. The section enclosed in broken lines indicates parts that are attached to the parts board.

2. JP8 is on the IE-78K0-NS.

(b) When using a crystal oscillator

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

Figure 3-12. Crystal Oscillator (When Using Subsystem Clock or User-Mounted Clock)



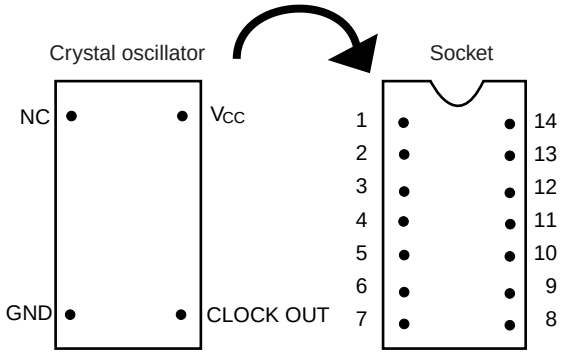
<Steps>

<1> Prepare the IE-78048-NS-EM1.

<2> Remove the parts board that is mounted in the IE-78048-NS-EM1's SUB CLK socket.

<3> Mount the crystal oscillator prepared by the user in the SUB CLK socket from which the parts board was removed in <2> above. Insert the crystal oscillator pin into the socket aligning the pins as shown in the figure below.

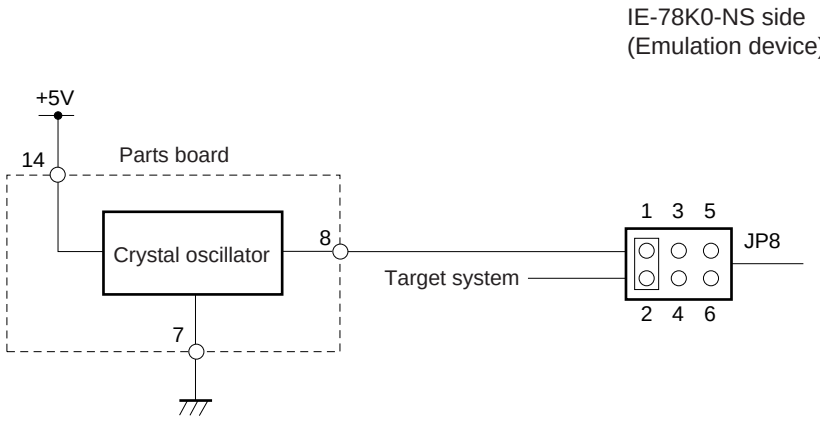
Figure 3-13. Pin Alignment of Crystal Oscillator and Socket



Crystal Oscillator Pin Name	Socket Pin No.
NC	1
GND	7
CLOCK OUT	8
VCC	14

<4> Install the IE-78048-NS-EM1 in the IE-78K0-NS.

The above steps configure the following circuit and enable supply of the clock from the mounted oscillator to the emulation device.



Remarks 1. The section enclosed in broken lines indicates parts that are attached to the parts board.

2. JP8 is on the IE-78K0-NS.

(3) When using an external clock

Short the 3 to 4 on the IE-78K0-NS's jumper (JP8). There is no need to make any settings via the integrated debugger (ID78K0-NS).

3.3 Mask Option Settings

The mask option function is available for ports 1, 3, 7, 8, 9, 10, 11, and 12.

A mask option resistor can be switched by the debugger (ID78K0-NS) or the DIP switch in the IE-78048-NS-EM1.

3.3.1 Mask option setting by debugger (ID78K0-NS)

(1) Port 3 (P3) and Port 7 (P7)

Port 7 is an N-ch open-drain pin to which a pull-up resistor can be connected. Port 7 has a middle-voltage structure. ON or OFF can be switched by the ID78K0-NS.

A pull-up resistor is specified for port 3 on the 04XH side, and a pull-down resistor is specified on the 04XF side using switch S1. ON or OFF can be switched by the ID78K0-NS.

(2) Port 0 bit 4

P04/XT1 pin is an alternate function pin for port and subsystem clock functions. These functions can be switched via the ID78K0-NS.

3.3.2 Mask option setting by DIP switch

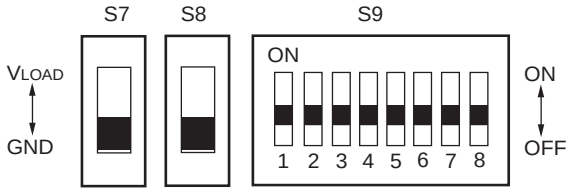
Since ports 8 to 12 (P8 to P12) are FIP alternate function pins and there are large number of these pins, the mask option resistors are switched using the DIP switch in the IE-78048-NS-EM1 (switched in 1-bit units).

The connection destination (V_{SS} or V_{LOAD}) can be switched using the slide switch beside the DIP switch (switched in 4-bit units). Figures 3-14 to 3-18 show the settings of the DIP switch at shipment.

Figure 3-14. Port 12 Mask Option Setting (At Shipment)

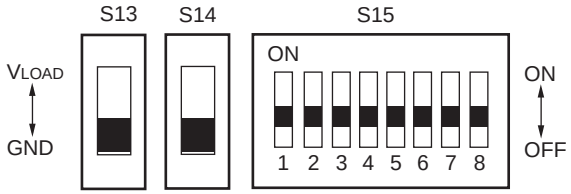
Switch		Port	Setting	Meaning	Setting at Shipment
S2		P127 to P124	V_{LOAD}/GND	Either V_{LOAD} or GND is specified as the connection destination (switched in 4-bit units).	GND
S3		P123 to P120			GND
S4	1	P127	ON/OFF	Either ON or OFF of the mask option pull-down resistor is specified (switched in 1-bit units).	OFF
	2	P126			OFF
	3	P125			OFF
	4	P124			OFF
	5	P123			OFF
	6	P122			OFF
	7	P121			OFF
	8	P120			OFF

Figure 3-15. Port 11 Mask Option Setting (At Shipment)



Switch		Port	Setting	Meaning	Setting at Shipment
S7		P117 to P114	V_{LOAD}/GND	Either V_{LOAD} or GND is specified as the connection destination (switched in 4-bit units).	GND
S8		P113 to P110			GND
S9	1	P117	ON/OFF	Either ON or OFF of the mask option pull-down resistor is specified (switched in 1-bit units).	OFF
	2	P116			OFF
	3	P115			OFF
	4	P114			OFF
	5	P113			OFF
	6	P112			OFF
	7	P111			OFF
	8	P110			OFF

Figure 3-16. Port 10 Mask Option Setting (At Shipment)

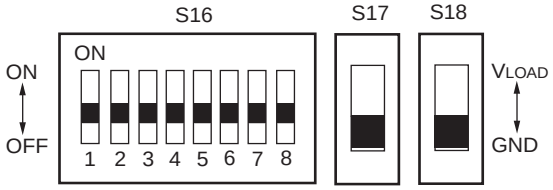


Switch		Port	Setting	Meaning	Setting at Shipment
S13		P107 to P104	V_{LOAD}/GND	Either V_{LOAD} or GND is specified as the connection destination (switched in 4-bit units).	GND
S14		P103 to P100			GND
S15	1	P107	ON/OFF	Either ON or OFF of the mask option pull-down resistor is specified (switched in 1-bit units).	OFF
	2	P106			OFF
	3	P105			OFF
	4	P104			OFF
	5	P103			OFF
	6	P102			OFF
	7	P101			OFF
	8	P100			OFF

Figure 3-17. Port 9 Mask Option Setting (At Shipment)

Switch		Port	Setting	Meaning	Setting at Shipment
S20		P97 to P94	V_{LOAD}/GND	Either V_{LOAD} or GND is specified as the connection destination (switched in 4-bit units).	GND
S21		P93 to P90			GND
S19	1	P97	ON/OFF	Either ON or OFF of the mask option pull-down resistor is specified (switched in 1-bit units).	OFF
	2	P96			OFF
	3	P95			OFF
	4	P94			OFF
	5	P93			OFF
	6	P92			OFF
	7	P91			OFF
	8	P90			OFF

Figure 3-18. Port 8 Mask Option Setting (At Shipment)



Switch		Port	Setting	Meaning	Setting at Shipment
S18		P81, P80	V_{LOAD}/GND	Either V_{LOAD} or GND is specified as the connection destination (switched in 2-bit units).	GND
S16	7	P81	ON/OFF	Either ON or OFF of the mask option pull-down resistor is specified (switched in 1-bit units).	OFF
	8	P80			OFF

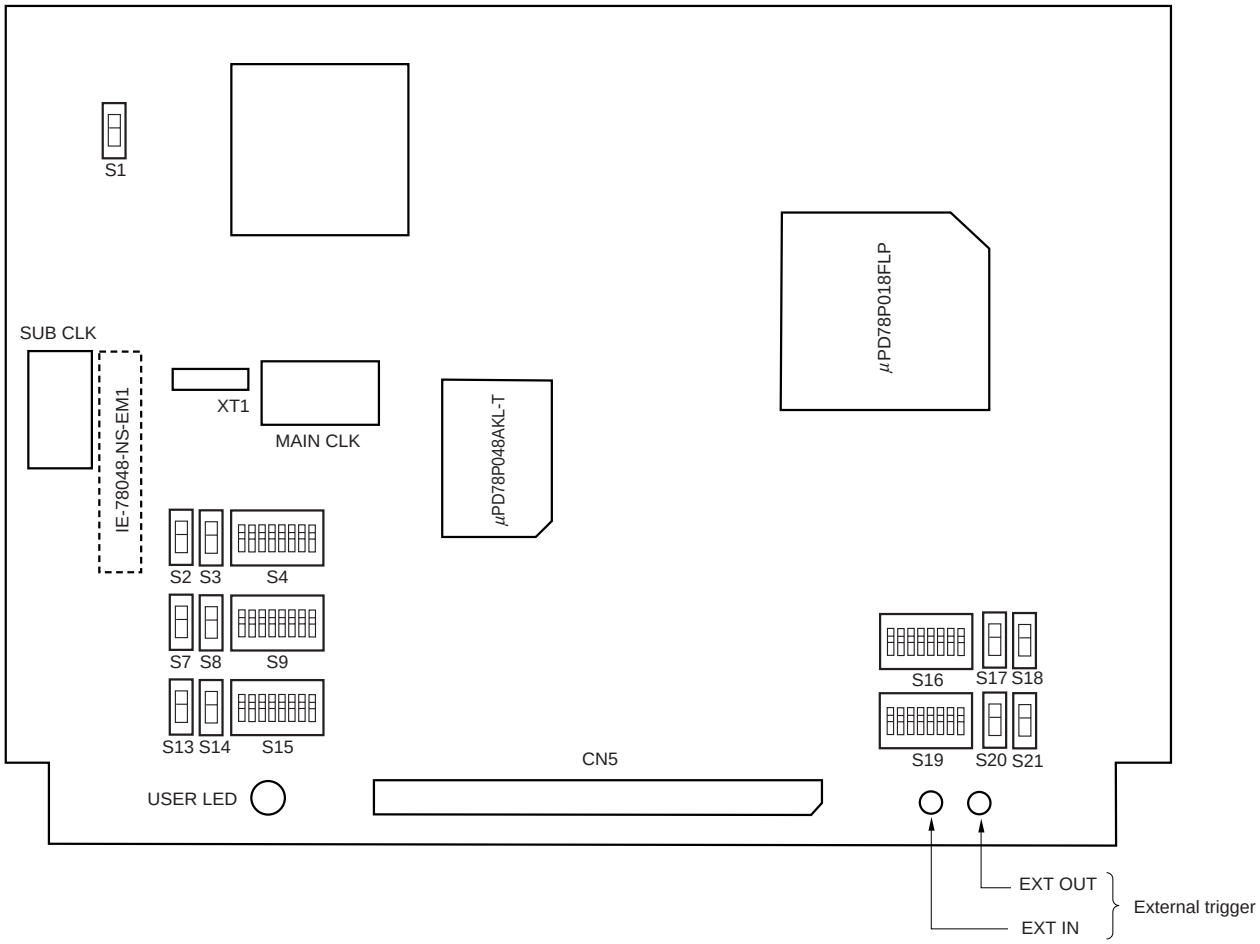
Caution Do not change the shipment settings of 1 to 6 of S16 (OFF).
Leave S17 set to GND (default).

3.4 External Trigger

To set up an external trigger, connect it to the IE-78048-NS-EM1's check pins EXTOUT and EXTIN as shown below.

See the **IE-78K0-NS User's Manual (U13731E)** for descriptions of related use methods and pin characteristics.

Figure 3-19. External Trigger Input Position



3.5 Switch and Jumper Settings

(1) Jumper settings on the IE-78K0-NS

When using the IE-78048-NS-EM1, set the jumpers on the IE-78K0-NS as follows.

For the jumper positions, refer to the **IE-78K0-NS User's Manual (U13731E)**.

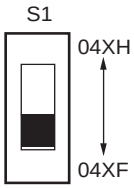
Table 3-3. Jumper Settings on IE-78K0-NS

	JP2	JP3	JP4	JP6	JP7	JP8
Short	2 to 3	1 to 2	1 to 2	3 to 4	1 to 2	1 to 2

(2) Switch settings on the IE-78048-NS-EM1

The mask option resistor for port 3 can be switched between pull-up resistor and pull-down resistor via the setting of switch S1. When emulating the μPD78044H Subseries, set S1 to the 04XH side. When emulating the μPD78044F Subseries, set S1 to the 04XF side.

Figure 3-20. S1 Setting



Switch	Setting	Meaning
S1	04XH	The mask option resistor connected to port 3 is a pull-up resistor. (Port 3 outputs N-ch open-drain output.)
	04XF	The mask option resistor connected to port 3 is a pull-down resistor. (Port 3 outputs CMOS output.)

Remark Port 3 of the μPD78044H Subseries is an N-ch open-drain pin.
Port 3 of the μPD78044F Subseries is a CMOS input pin.

CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes differences between the target device's signal lines and the signal lines of the IE-78048-NS-EM1's target interface circuit.

Although the target device is a CMOS circuit, the IE-78048-NS-EM1's target interface circuit consists of emulation circuits such as an emulation CPU, TTL, and CMOS-IC.

When the IE system is connected with the target system for debugging, the IE system performs emulation so as to operate as the actual target device would operate in the target system.

However, some minor differences exist since the operations are performed via the IE system's emulation.

(1) Signals input to or output from the emulation CPU μPD78P018
(2) Signals input to or output from the emulation CPU μPD78P048
(3) Signals input to or output from the emulation CPUs μPD78P018 and μPD78P048
(4) Signals input to or output from the emulation CPU μPD780009
(5) Other signals

The IE-78048-NS-EM1's circuit is used as follows for signals listed in (1) to (5) above.

(1) Signals input to or output from the emulation CPU μPD78P018 (refer to Figure 4-1 Equivalent Circuit for Emulation Circuit (1/5))

- P02 to P00
- Signals related to port 1
- Signals related to port 2
- Signals related to port 3

(2) Signals input to or output from the emulation CPU μPD78P048 (refer to Figure 4-1 Equivalent Circuit for Emulation Circuit (2/5))

- P03
- P74 to P70
- P81, P80
- Signals related to port 9
- Signals related to port 10
- Signals related to port 11
- Signals related to port 12
- V_{LOAD}

(3) Signals input to or output from the emulation CPUs μPD78P018 and μPD78P048 (refer to Figure 4-1 Equivalent Circuit of Emulation Circuit (3/5))

- AV_{DD}
- AV_{REF}

(4) Signals input to or output from the emulation CPU μPD780009 (refer to Figure 4-1 Equivalent Circuit of Emulation Circuit (4/5))

- $\overline{RESET}$
- X1

(5) Other signals (refer to Figure 4-1 Equivalent Circuit of Emulation Circuit (5/5)).

- P04
- $USERV_{DD}$

Figure 4-1. Equivalent Circuit of Emulation Circuit (1/5)

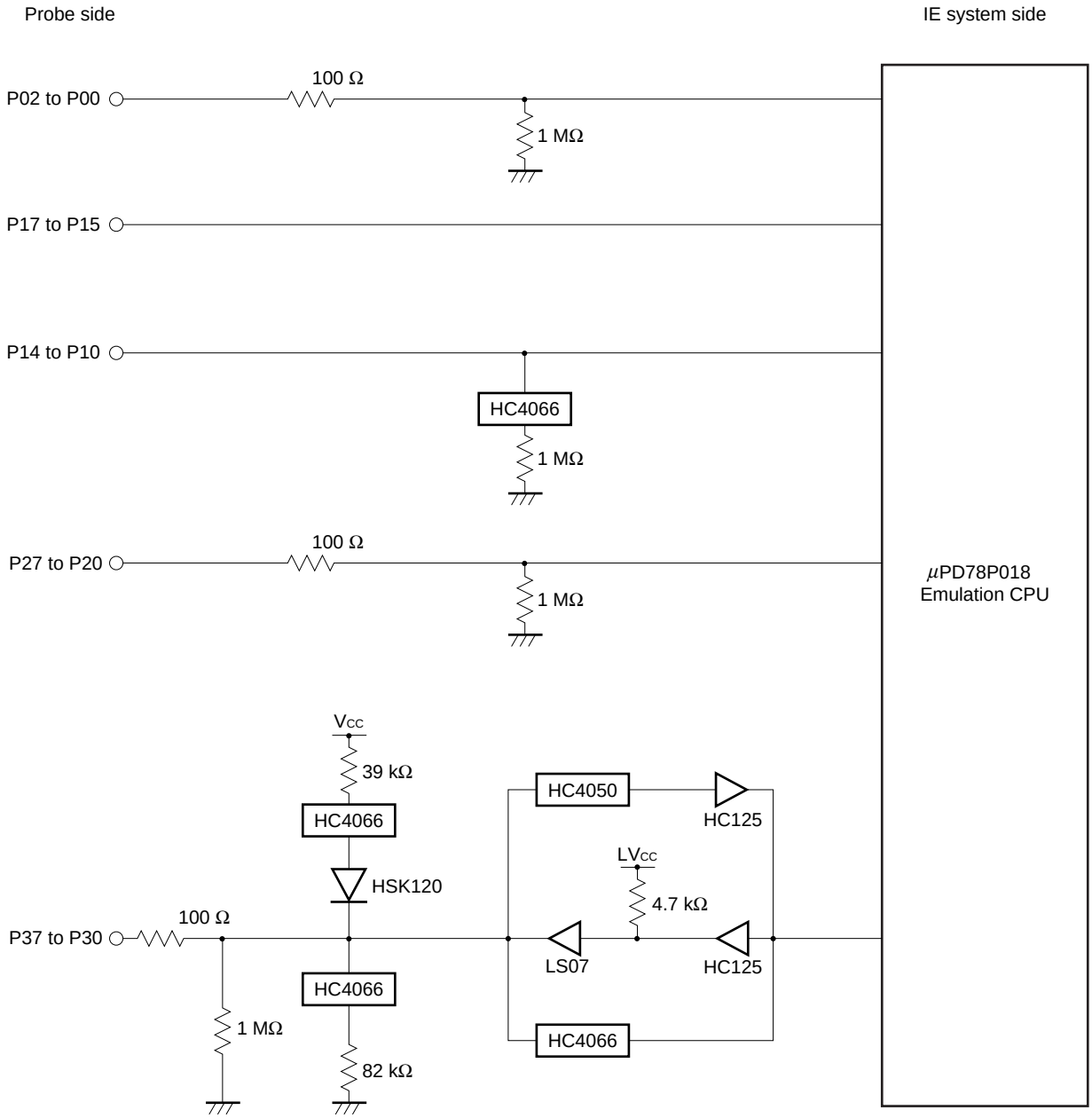


Figure 4-1. Equivalent Circuit of Emulation Circuit (2/5)

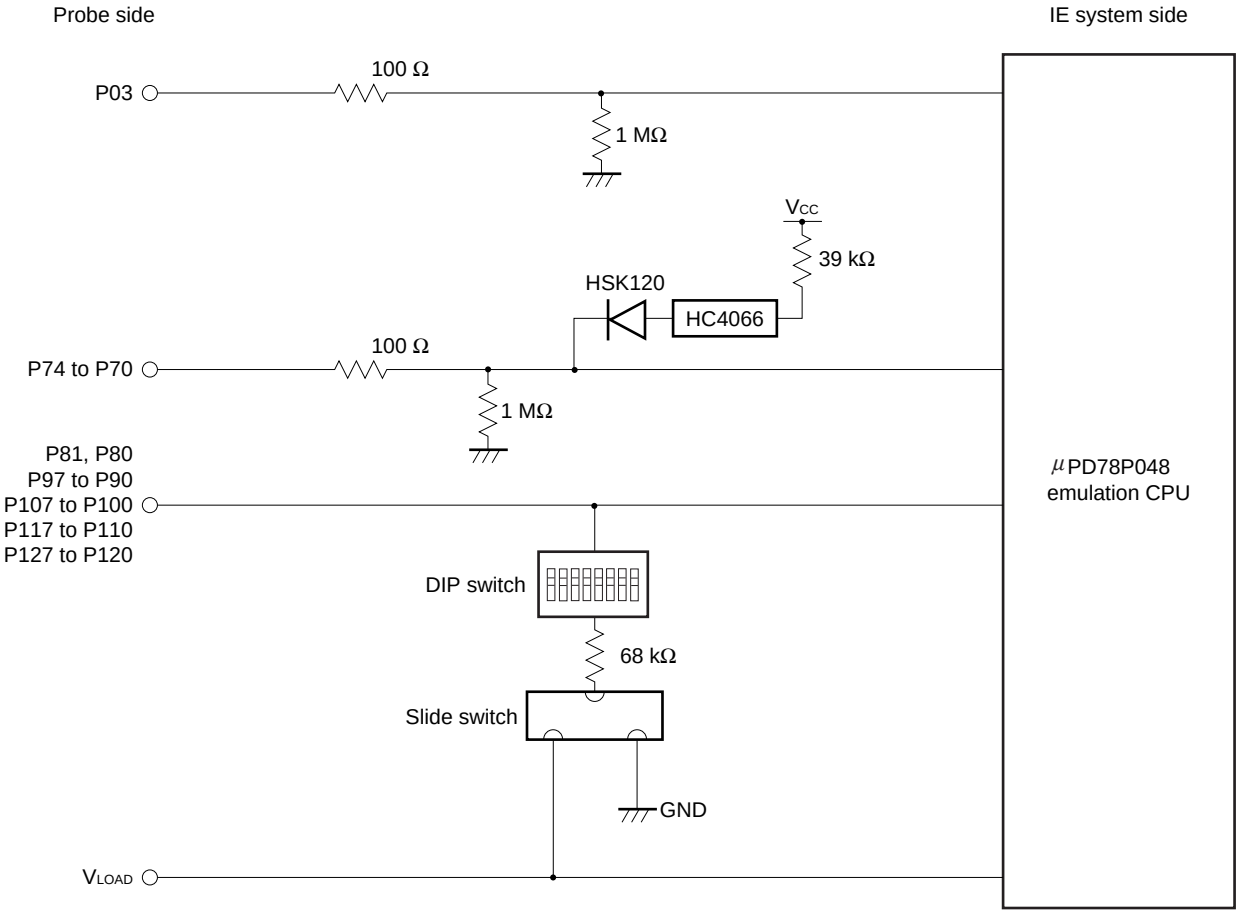


Figure 4-1. Equivalent Circuit of Emulation Circuit (3/5)

Figure 4-1. Equivalent Circuit of Emulation Circuit (4/5)

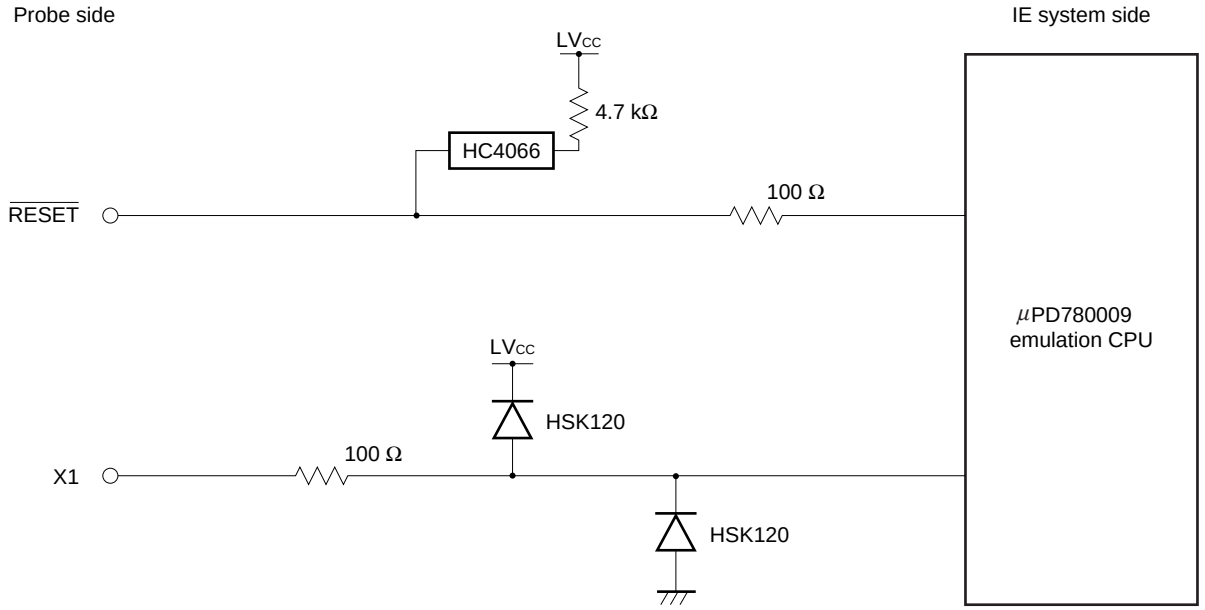
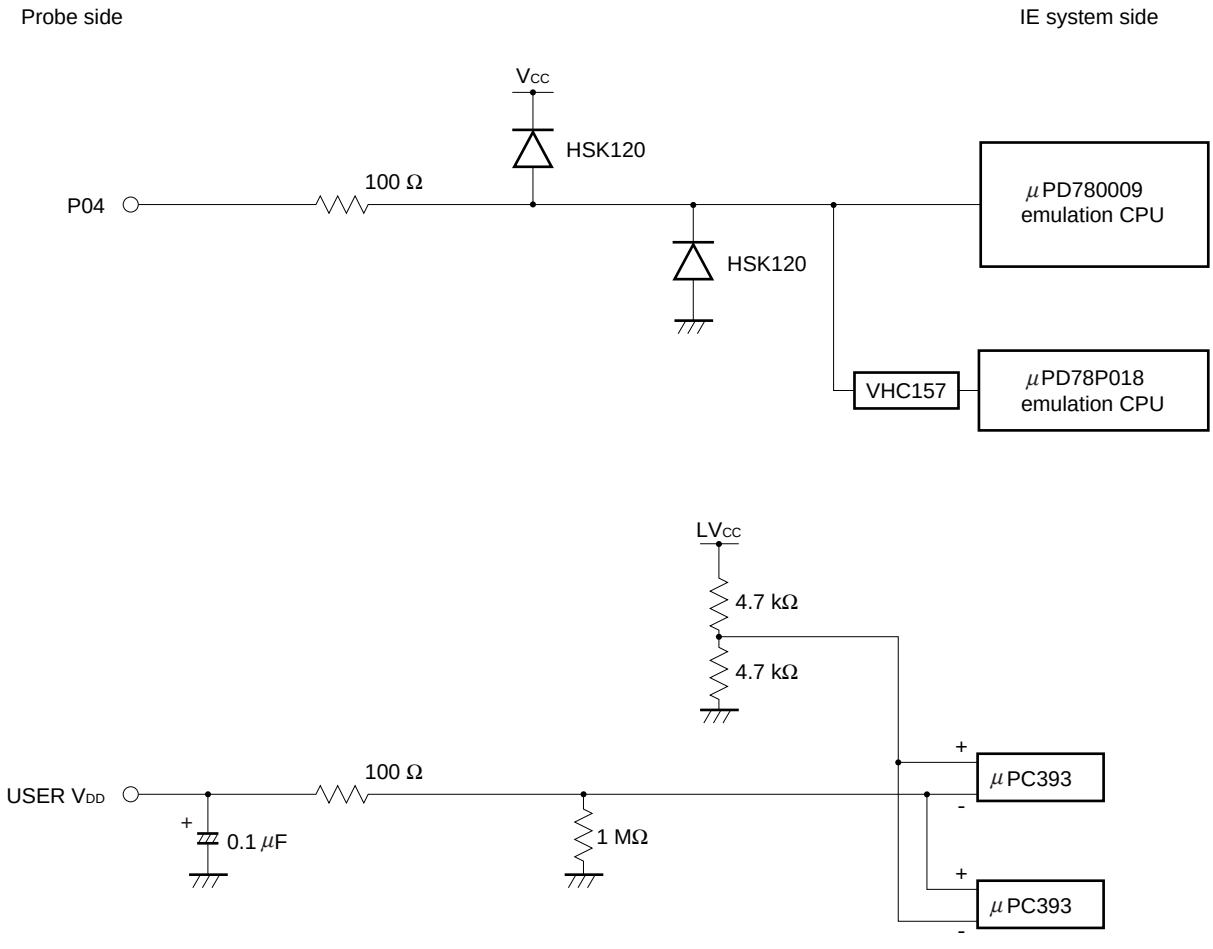


Figure 4-1. Equivalent Circuit of Emulation Circuit (5/5)



[MEMO]

APPENDIX EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. NP-80GF Pin Assignments (1/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
1	114	33	56
2	113	34	49
3	108	35	50
4	107	36	45
5	104	37	46
6	103	38	41
7	100	39	42
8	99	40	35
9	94	41	8
10	93	42	7
11	30	43	14
12	29	44	13
13	24	45	18
14	23	46	17
15	20	47	22
16	19	48	21
17	16	49	28
18	15	50	27
19	10	51	92
20	9	52	91
21	37	53	98
22	43	54	97
23	44	55	102
24	47	56	101
25	48	57	106
26	51	58	105
27	52	59	112
28	57	60	111
29	58	61	83
30	59	62	77
31	60	63	78
32	55	64	73

Remarks 1. The NP-80GF is a product of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the “Emulation probe” column indicate the corresponding pin number on the emulation probe tip.

Table A-1. NP-80GF Pin Assignments (2/2)

Emulation Probe	CN5 Pin No.	Emulation Probe	CN5 Pin No.
65	74	73	66
66	69	74	71
67	70	75	72
68	63	76	75
69	64	77	76
70	61	78	79
71	62	79	80
72	65	80	85

Remarks 1. The NP-80GF is a product of Naito Densei Machida Mfg. Co., Ltd.

2. The numbers in the “Emulation probe” column indicate the corresponding pin number on the emulation probe tip.

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