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User's Manual

IE-780208-NS-EM1

Emulation Board

Target device
μPD780208 Subseries

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INTRODUCTION

Product Overview

The IE-780208-NS-EM1, when combined with the IE-78K0-NS, is used to debug the following target devices that belong to the 78K/0 Series of 8-bit single-chip microcontrollers.

- μ PD780208 Subseries : μ PD780204, 780205, 780206, 780208, 78P0208

Target Readers

This manual is intended for engineers who will use the IE-780208-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-780208-NS-EM1, refer to not only this manual (supplied with the IE-780208-NS-EM1) but also the manual that is supplied with the IE-78K0-NS.

IE-78K0-NS User's Manual

- Basic specifications
- System configuration
- External interface functions

IE-780208-NS-EM1 User's Manual

- General
- Parts 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-780208-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 a device (a μ PD780208 Subseries 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-780208-NS-EM1.

Conventions

Data significance weight : 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 indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document Number	
	English	Japanese
IE-78K0-NS	To be prepared	U13731J
IE-780208-NS-EM1	To be prepared	This manual
ID78K0-NS Integrated Debugger Reference Windows™ Based	U12900E	U12900J
μ PD780208 Subseries	U11302E	U11302J

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-780208-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.

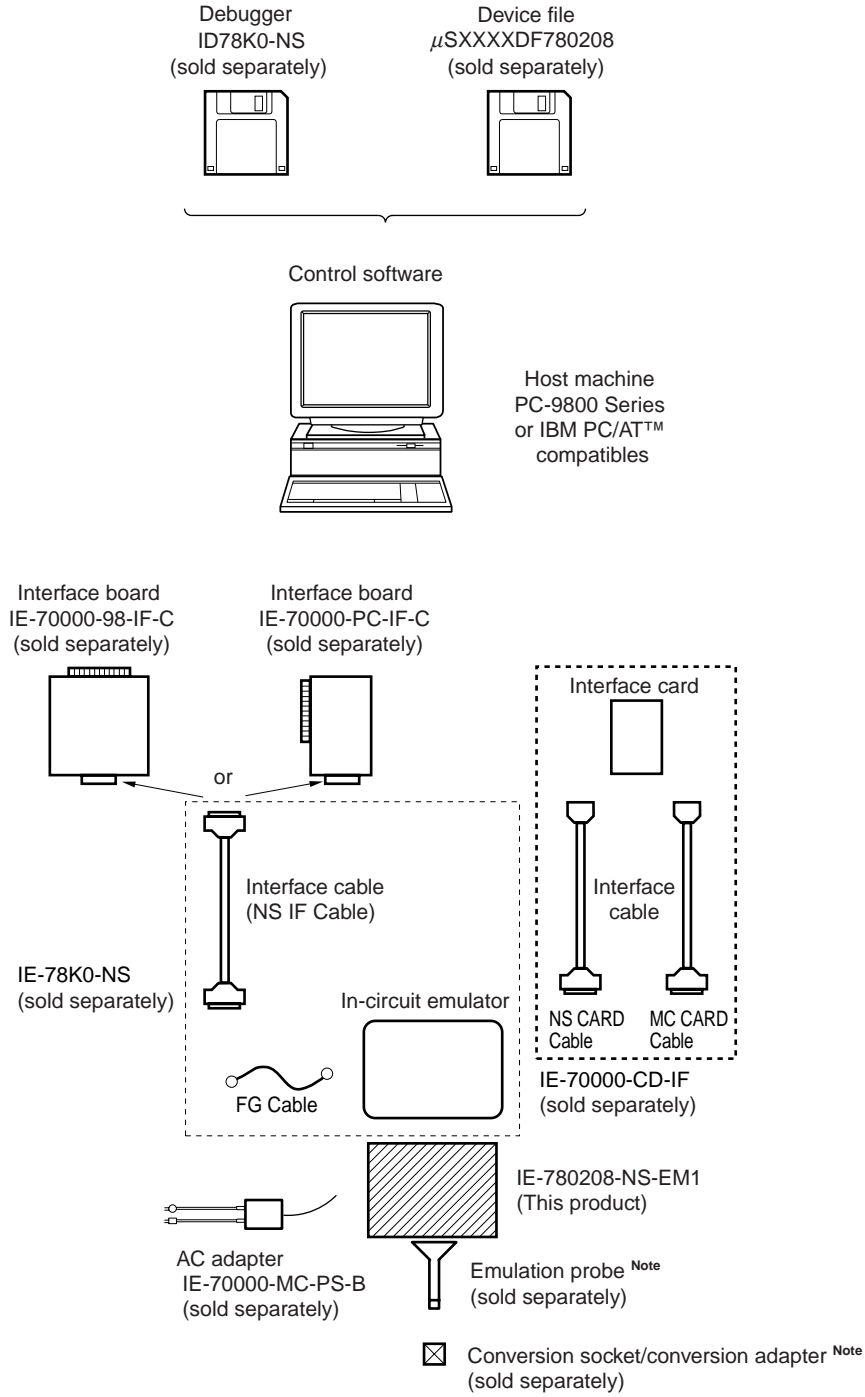
This chapter describes the IE-780208-NS-EM1's system configuration and basic specifications.

- Target device
 - μ PD780208 Subseries

1.1 System Configuration

Figure 1-1 illustrates the IE-780208-NS-EM1's system configuration.

Figure 1-1. System Configuration



Note The packages, emulation probes, and conversion sockets/conversion adapters are listed below.

Package	Emulation Probe	Conversion Socket/Conversion Adapter
100-pin plastic QFP (GF-3BA type)	NP-100GF (compatible with EV-9200GF-100)	EV-9200GF-100
	NP-100GF-TQ (compatible with TGF-100RBP)	TGF-100RBP

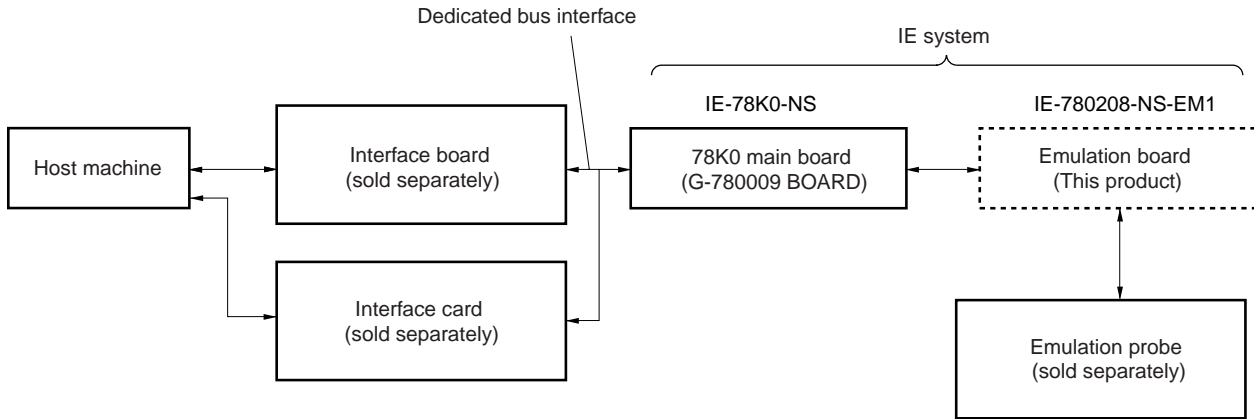
The NP-100GF and NP-100GF-TQ are products of Naito Densei Machidaseisakusho Co., Ltd.
 For further information, contact Naito Densei Machidaseisakusho Co., Ltd. (TEL: +81-44-822-3813)

The TGF-100RBP is a product of TOKYO ELETECH CORPORATION.
 For further information, contact: Daimaru Kogyo, Ltd.
 Tokyo Electronic Components Division (TEL: +81-3-3820-7112)
 Osaka Electronic Components Division (TEL: +81-6-244-6672)

1.2 Hardware Configuration

Figure 1-2 shows the IE-780208-NS-EM1's position in the basic hardware configuration.

Figure 1-2. Basic Hardware Configuration



1.3 Basic Specifications

The IE-780208-NS-EM1's basic specifications are listed in Table 1-1.

Table 1-1. Basic Specifications

Parameter	Description
Target device	μ PD780208 Subseries
System clock	Main system clock: 5 MHz Subsystem clock: 32.768 kHz
Clock supply	External: Pulse input Internal: Mounted on emulation board
Low-voltage support	3 to 5.5 V (same as target device)

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CHAPTER 2 PART NAMES

This chapter introduces the parts of the IE-780208-NS-EM1 main unit.

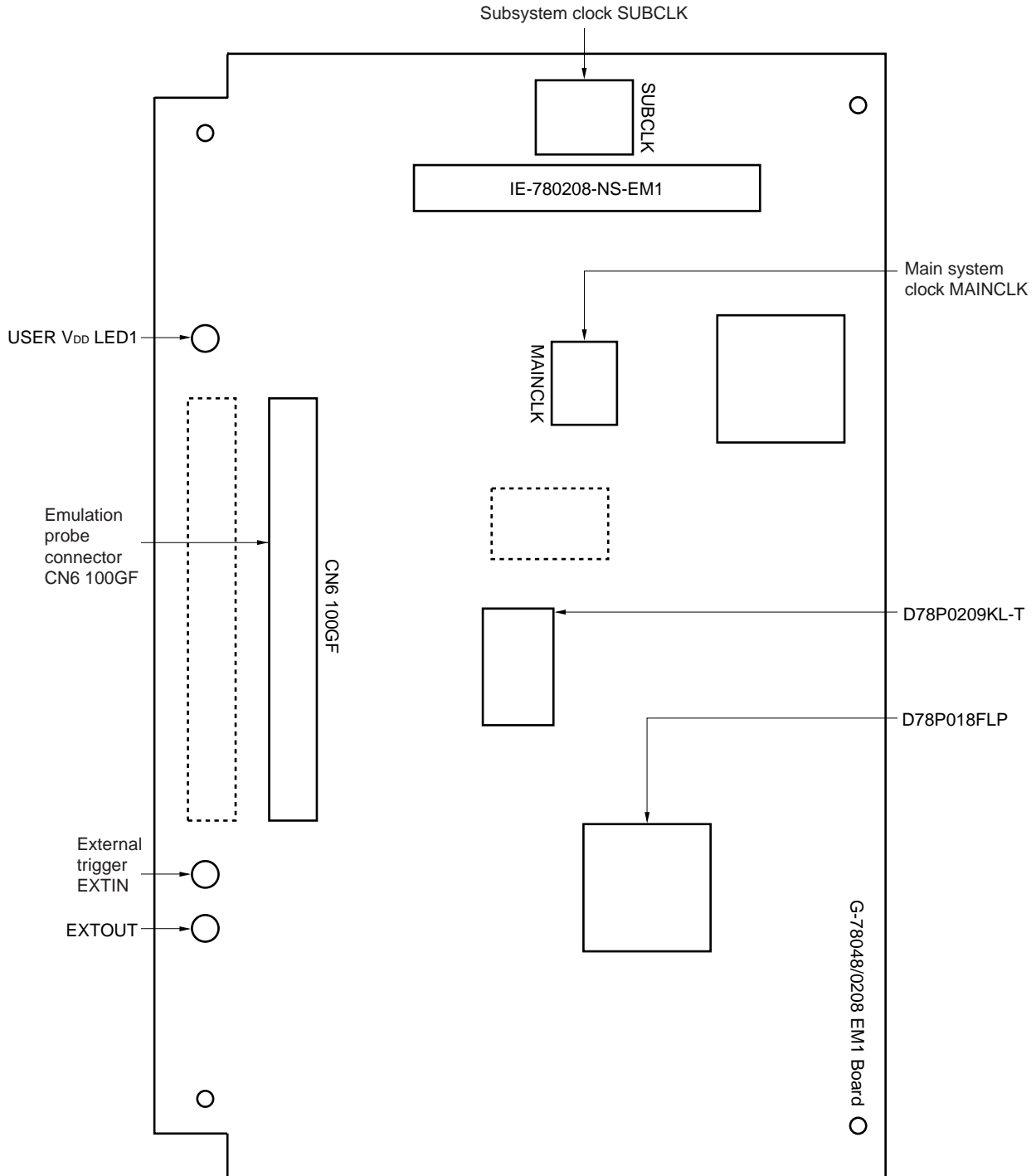
The packing box contains the emulation board (IE-780208-NS-EM1).

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

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

2.1 Parts of Main Unit

Figure 2-1. IE-780208-NS-EM1 Part Names



CHAPTER 3 INSTALLATION

This chapter describes methods for connecting the IE-780208-NS-EM1 to the IE-78K0-NS, emulation probe, etc. Mode setting methods are also described.

3.1 Connection

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

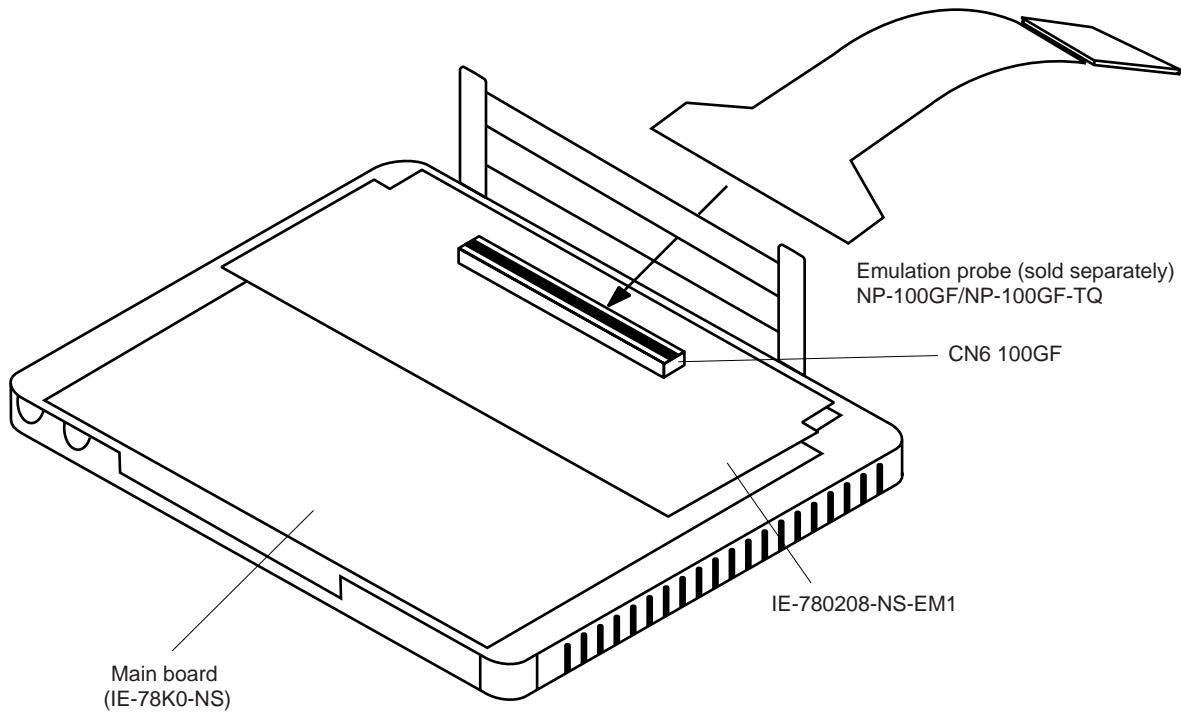
See the IE-78K0-NS User's Manual for a description of how to connect the IE-780208-NS-EM1 to the IE-78K0-NS.

(2) Connection with emulation probe

See the IE-78K0-NS User's Manual for a description of how to connect an emulation probe to the IE-780208-NS-EM1.

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

Figure 3-1. Connection of Emulation Probe



3.2 Clock Settings

3.2.1 Overview of clock settings

Select from (1) to (3) below as the main system clock and subsystem clock to be used during debugging.

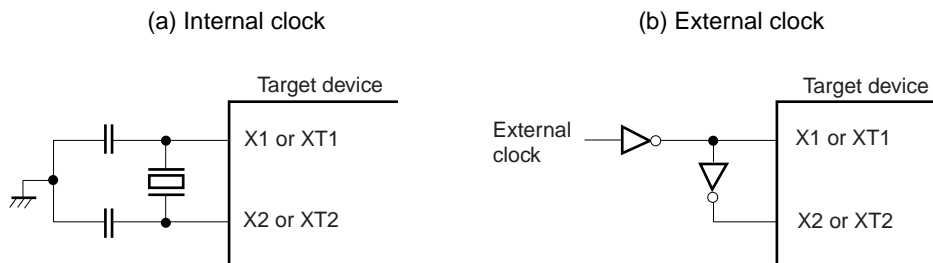
- (1) Clock that is already mounted on emulation board
- (2) Clock that is mounted by user
- (3) External clock

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”. An internal clock connects the target device to an oscillator and uses the target device’s internal oscillation circuit. An example of an external circuit is shown in part (a) of Figure 3-2. During emulation, the oscillator that is mounted on the target system is not used. Instead, it uses the clock that is mounted on the emulation board which is installed for the IE-78K0-NS.

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

An external clock supplies a clock signal from outside of the target device and does not use the target device’s internal oscillation circuit. An example of an external circuit is shown in part (b) of Figure 3-2.

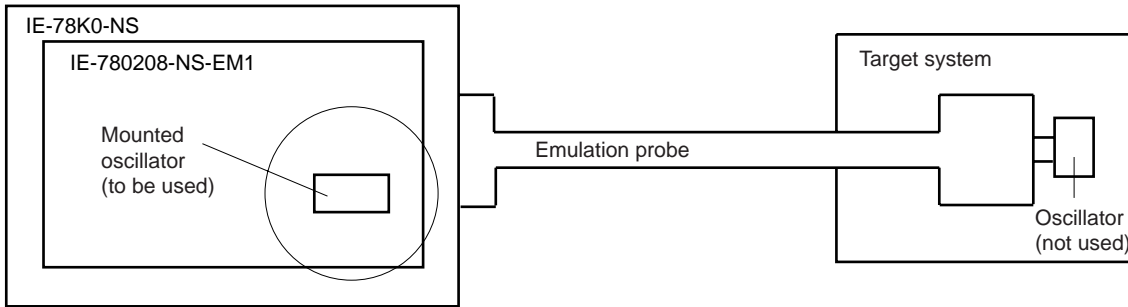
Figure 3-2. External Circuits Used as System Clock Oscillation Circuit



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

A crystal resonator is already mounted on the emulation board. Its frequency is 5.0000 MHz.

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

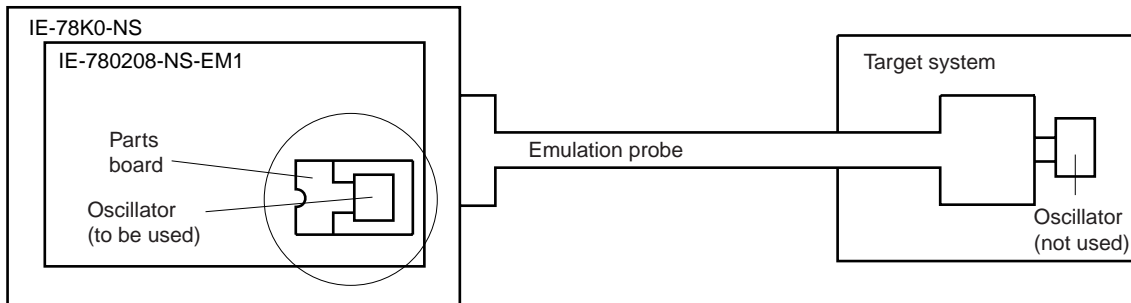


Remark The clock that is supplied by the IE-780208-NS-EM1's oscillator (encircled in the figure) is used.

- (2) Clock that is mounted by user

The user is able to mount any clock supported by the set specifications on the IE-780208-NS-EM1. First mount the oscillator on the parts board, then attach the parts board to the IE-780208-NS-EM1. This method is useful when using a different frequency from that of the pre-mounted clock.

Figure 3-4. When Using User-mounted Clock

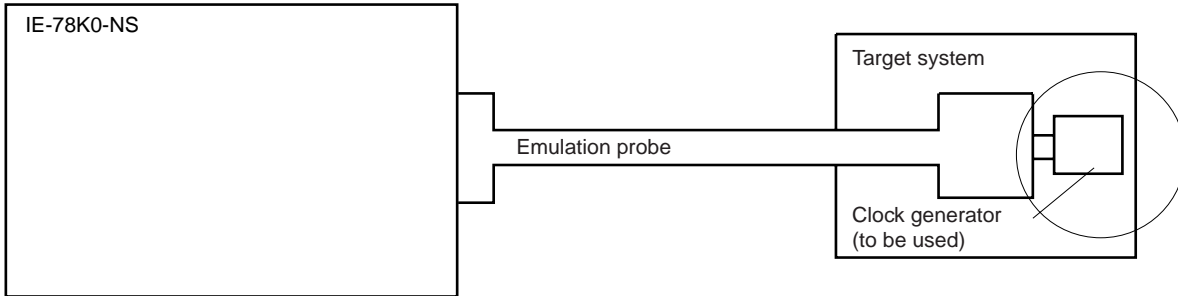


Remark The clock that is supplied by the IE-780208-NS-EM1's oscillator (encircled in the figure) is used.

(3) External clock

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

Figure 3-5. 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-780208-NS-EM1	CPU Clock Source Selection (ID)
		Parts board (MAINCLK)	
When using clock that is already mounted on emulation board	5.0000 MHz	Oscillator	Internal
When using clock mounted by user	Other than 5.0000 MHz	Includes oscillation circuit	
When using external clock		Oscillator (not used)	External

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

Remark The IE-780208-NS-EM1’s factory settings are those listed above under “when using clock that is already mounted on emulation board”.

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

When the IE-780208-NS-EM1 is shipped, a 5.0000-MHz crystal resonator is already mounted in the IE-780208-NS-EM1’s MAINCLK 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 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 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 oscillator or crystal resonator

● Items to be prepared

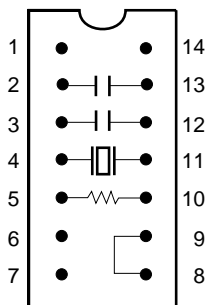
- Parts board (supplied with IE-78K0-NS)
- Ceramic oscillator or crystal resonator
- Resistor Rx
- Capacitor CA
- Capacitor CB
- Solder kit

<Steps>

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

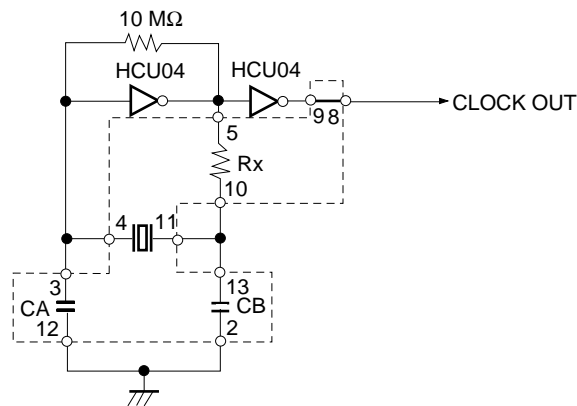
Figure 3-6. Connections on Parts Board (When Using Main System Clock or User-Mounted Clock)

Parts board (MAINCLK)



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

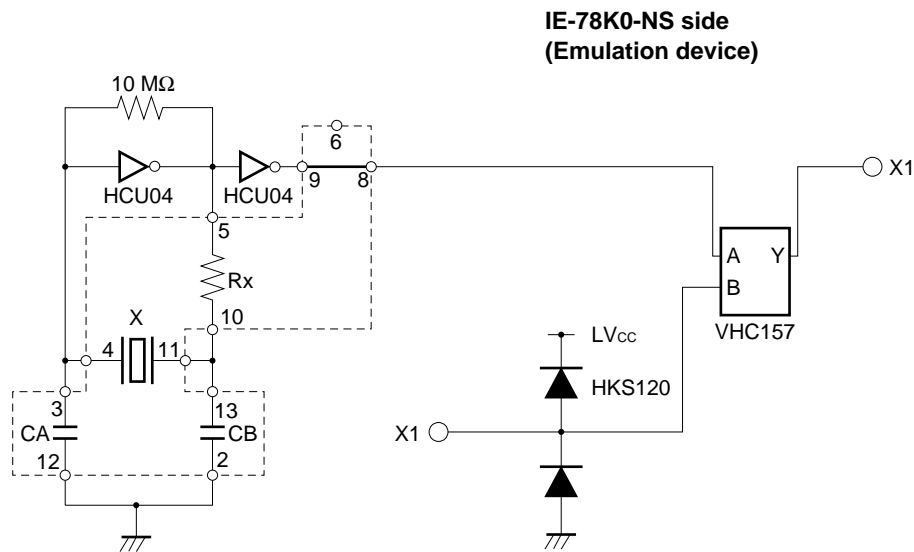
Circuit diagram



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

- <2> Prepare the IE-780208-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-780208-NS-EM1's socket (the socket marked as "MAINCLK").
- <4> Connect the parts board (from <1> above) to the socket (MAINCLK) from which the crystal oscillator was removed. Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Make sure that the parts board mounted in the MAINCLK socket on the emulation board is wired as shown in Figure 3-6 above.
- <6> Install the IE-780208-NS-EM1 in the IE-78K0-NS.

The above steps configure a circuit and enable clock output to be supplied from the mounted oscillator to the emulation device.

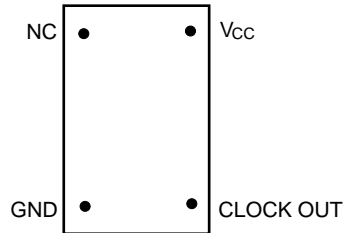


Remark The sections enclosed in broken lines indicate parts that are attached to the parts board.

(b) When using a crystal oscillator

- Items to be prepared
 - Crystal oscillator (see pinouts shown in Figure 3-7)

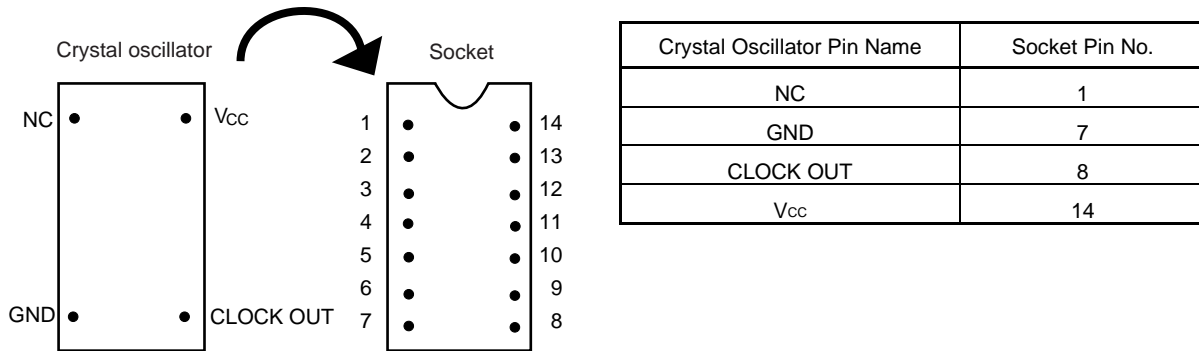
Figure 3-7. Crystal Oscillator (When Using Main System Clock or User-mounted Clock)



<Steps>

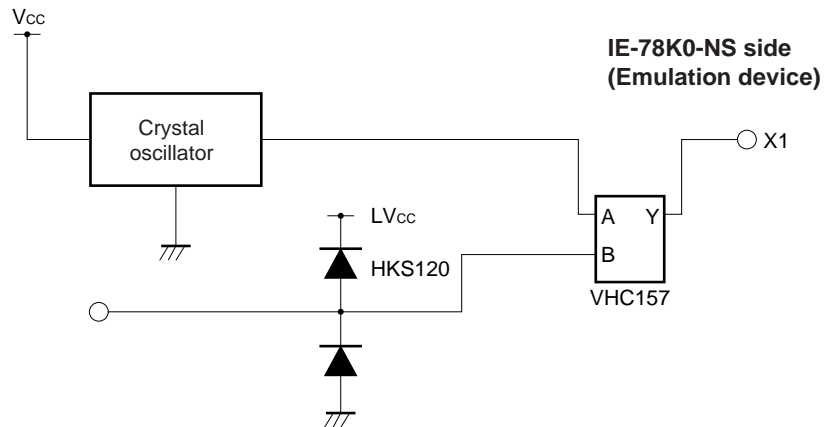
- <1> Prepare the IE-780208-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-780208-NS-EM1's socket (the socket marked as "MAINCLK").
- <3> Connect the parts board (from <2> above) to the socket (MAINCLK) from which the crystal oscillator was removed. Insert the crystal oscillator into the socket so as to align the pins as shown in the figure below.

Figure 3-8. Pin Alignment of Crystal Oscillator and Socket



- <4> Install the IE-780208-NS-EM1 in the IE-78K0-NS.

The above steps configure a circuit and enable clock output to be supplied from the mounted oscillator to the emulation device.



(3) When using an external clock

No hardware settings are required for this situation.

When starting the integrated debugger (ID78K0-NS), open the configuration dialog 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

Subsystem Clock Frequency to be Used		IE-780208-NS-EM1	IE-78K0-NS
		Parts board (SUBCLK)	JP8
When using clock that is already mounted on emulation board	32.768 kHz	Short 6 and 8	Short 1 and 2
When using user-mounted clock	Other than 32.768 kHz	Includes oscillator	
When using external clock		Not used	Short 3 and 4

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-780208-NS-EM1 is shipped, the settings for “when using clock that is already mounted on emulation board” are pre-set.

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

When the IE-780208-NS-EM1 is shipped, a 32.768-kHz crystal oscillator is already mounted in the IE-780208-NS-EM1. Pins 6 and 8 on the parts board (SUBCLK) are shorted. Short pins 1 and 2 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 user-mounted clock

The settings described under either (a) or (b) are required, depending on the type of clock to be used. Short pins 1 and 2 on the IE-78K0-NS’s jumper (JP8).

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

(a) When using a ceramic oscillator or crystal resonator

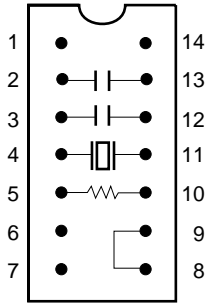
- Items to be prepared
 - Parts board (supplied with IE-78K0-NS)
 - Ceramic oscillator or crystal resonator
 - Resistor Rx
 - Capacitor CA
 - Capacitor CB
 - Solder kit

<Steps>

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

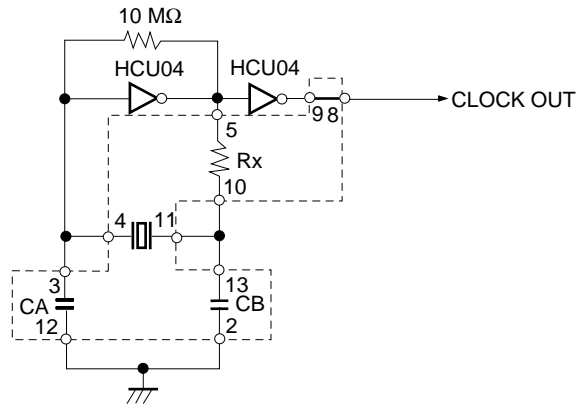
Figure 3-9. Connections on Parts Board (When Using Subsystem Clock or User-Mounted Clock)

Parts board (SUBCLK)



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

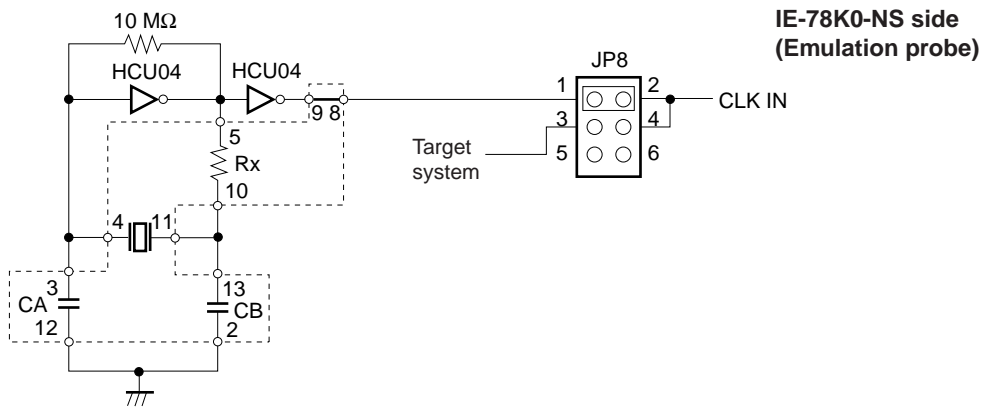
Circuit diagram



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

- <2> Prepare the IE-780208-NS-EM1.
- <3> Remove the crystal oscillator that is mounted in the IE-780208-NS-EM1's socket (the socket marked as "SUBCLK").
- <4> Connect the parts board (from <1> above) to the socket (SUBCLK) from which the crystal oscillator was removed (see <3> above). Check the pin 1 mark to make sure the board is mounted in the correct direction.
- <5> Install the IE-780208-NS-EM1 in the IE-78K0-NS.

The above steps configure a circuit and enable clock output to be supplied from the mounted oscillator to the emulation device.

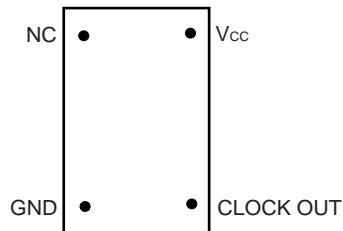


Remark The section enclosed in broken lines indicates parts that are attached to the parts board.

(b) When using a crystal oscillator

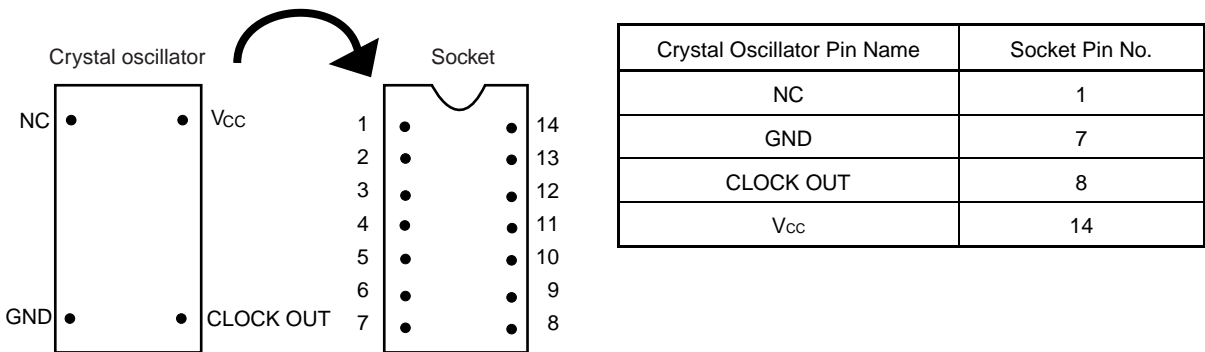
- Items to be prepared
 - Crystal oscillator (see pinouts shown in Figure 3-10)

Figure 3-10. Crystal Oscillator (When Using Subsystem Clock or User-mounted Clock)



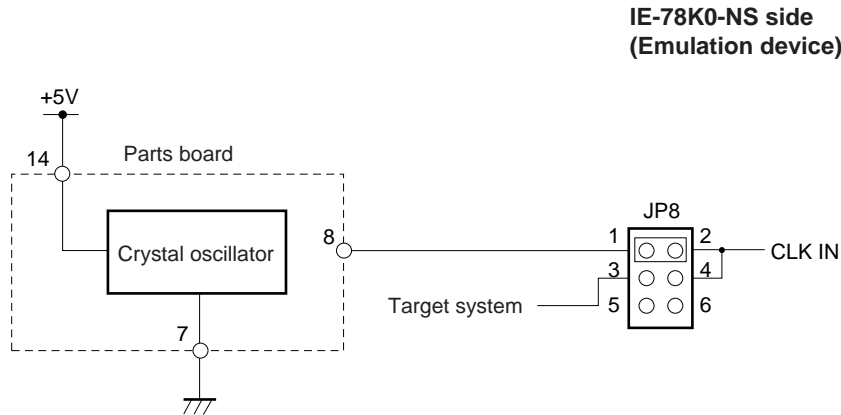
<Steps>

- <1> Prepare the IE-780208-NS-EM1.
- <2> Remove the crystal oscillator that is mounted in the IE-780208-NS-EM1's socket (the socket marked as "SUBCLK").
- <3> Connect the parts board (from <2> above) to the socket (SUBCLK) from which the crystal oscillator was removed. Insert the crystal oscillator into the socket so as to align the pins as shown below.



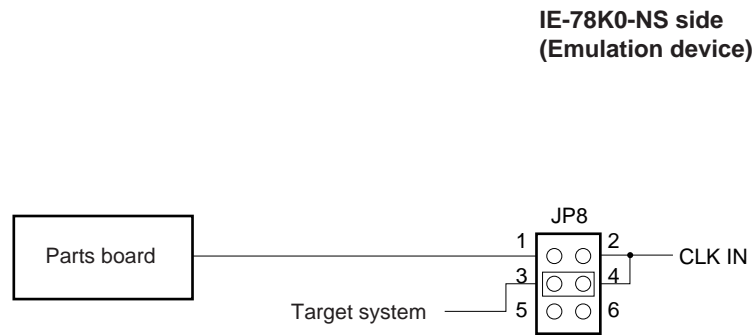
<4> Install the IE-780208-NS-EM1 in the IE-78K0-NS.

The above steps configure a circuit and enable clock output to be supplied from the mounted oscillator to the emulation device.



(3) When using an external clock

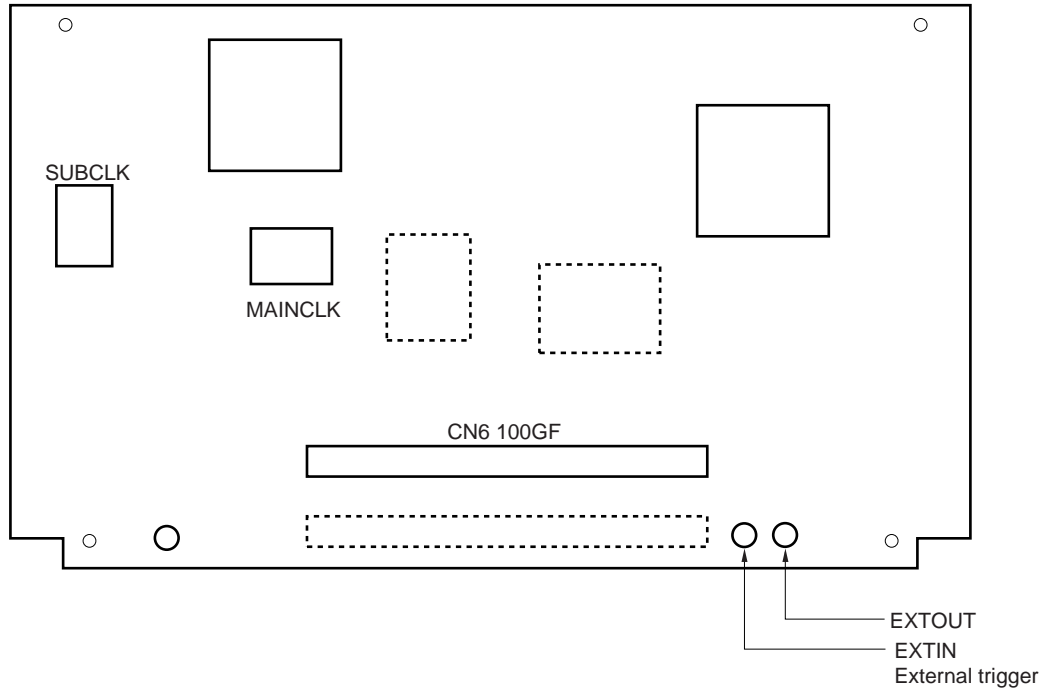
Short pins 3 and 4 on the IE-78K0-NS's jumper (JP8). There is no need to make any settings via the integrated debugger (ID78K0-NS).



3.3 External Trigger

To set up an external trigger, connect the IE-780208-NS-EM1's check pin, EXTOUT, and EXTIN as shown below. See the in-circuit emulator (IE-78K0-NS) User's Manual for description of related use methods and pin characteristics.

Figure 3-11. External Trigger Input Position



3.4 Mask Option Settings

Ports 1, 3, 7 to 12 ,and FIP0 to FIP12 pins are used for the mask option function. The mask option resistance can be set via the integrated debugger (ID78K0-NS) or via debug-related switch settings on the IE-780208-NS-EM1.

3.4.1 Setting mask options via the integrated debugger (ID78K0-NS)

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

P7 is an N-ch open-drain pin that is able to include a pull-up resistor. P7 is a +15V medium voltage port. The ON/OFF status can be switched via the ID78K0-NS.

P3's mask option resistance can also be set via the ID78K0-NS.

(2) Port 4

The P04/XT1 pin is shared as a port and as a subsystem clock pin. Its mode can be switched via the ID78K0-NS.

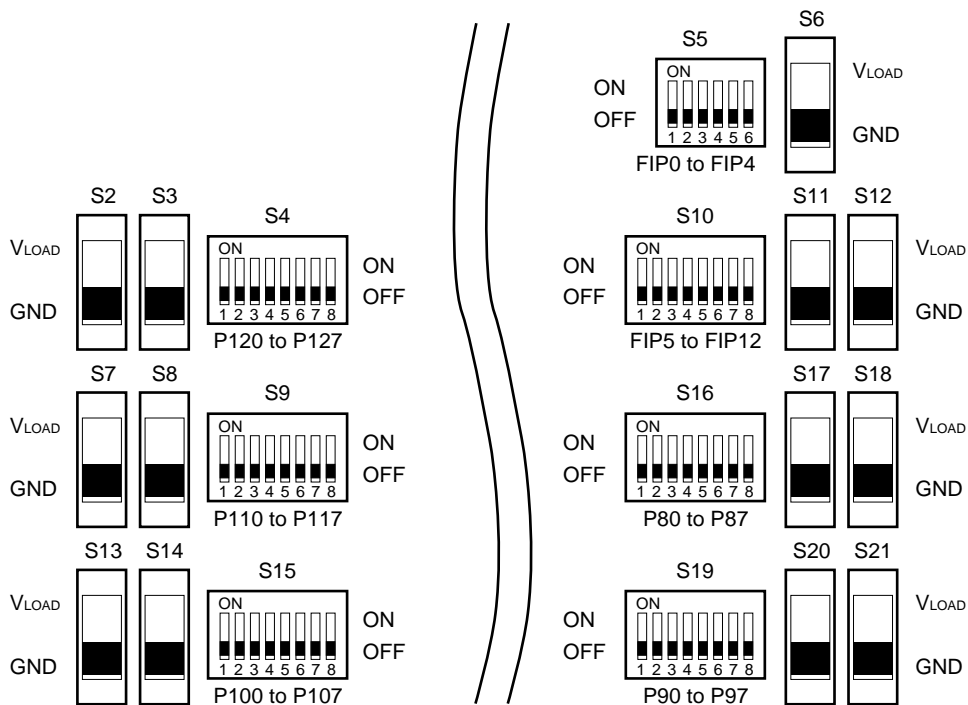
3.4.2 Setting mask options via DIP switches

In view of the large number of pins (ports 8 to 12 and FIP0 to FIP12), users may choose to set the mask option resistance via the DIP switches on the IE-780208-NS-EM1 (these switches enable bit-wise switching).

The connection target (V_{SS} or V_{LOAD}) can also be switched via the slide switches that appear next to the DIP switches (these switches enable 4-bit switching).

Caution The sixth bit switch on S5 is not used.

Figure 3-12. Mask Option Settings (Factory Settings)



Remark The factory settings do not connect pull-down resistors to ports 8 to 12 and FIP0 to FIP12 pins.

3.5 Jumper Settings on IE-78K0-NS

When using the IE-780208-NS-EM1, set the jumpers on the IE-78K0-NS as shown below. For details of these jumper settings, see the IE-78K0-NS's User's Manual.

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

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

[MEMO]

CHAPTER 4 DIFFERENCES AMONG TARGET DEVICES AND TARGET INTERFACE CIRCUITS

This chapter describes differences between the target device's signal lines and the signal lines of the IE-780208-NS-EM1's target interface circuit.

Although the target device is a CMOS circuit, the IE-780208-NS-EM1's target interface circuit consists of an emulation chip, TTL, CMOS-IC, and other components.

When connected the IE system with the target system for debugging, the IE system performs emulation so as to operate as the actual target device would operate on 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 μ PD78018 emulation CPU
- (2) Signals input to or output from the μ PD780208 emulation CPU
- (3) Signals input to and output from both the μ PD78018 and the μ PD780208
- (4) Signals input to or output from the μ PD780009 emulation CPU
- (5) Other signals

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

- (1) Signals input to or output from the μ PD78018 emulation CPU
 - Signals related to port 0
 - Signals related to port 1 (P15 to P17)
 - Signals related to port 1 (P10 to P14)
 - Signals related to port 2
 - Signals related to port 3
- (2) Signals input to or output from the μ PD780208 emulation CPU
 - P03
 - Signals related to port 7
 - V_{LOAD}
 - Signals related to port 12
 - Signals related to port 11
 - Signals related to port 10
 - Signals related to port 9
 - Signals related to port 8
 - FIP0 to FIP12
- (3) Signals input to and output from both the μ PD78018 and the μ PD780208
 - AV_{DD}
 - AV_{REF}
- (4) Signals input to or output from the emulation CPU and the μ PD780009
 - \overline{RESET}
 - X1
- (5) Other signals
 - $USERV_{DD}$
 - P04

Figure 4-1. Equivalent Circuit 1 from Emulation Circuit

Probe side

IE-78K0-NS side

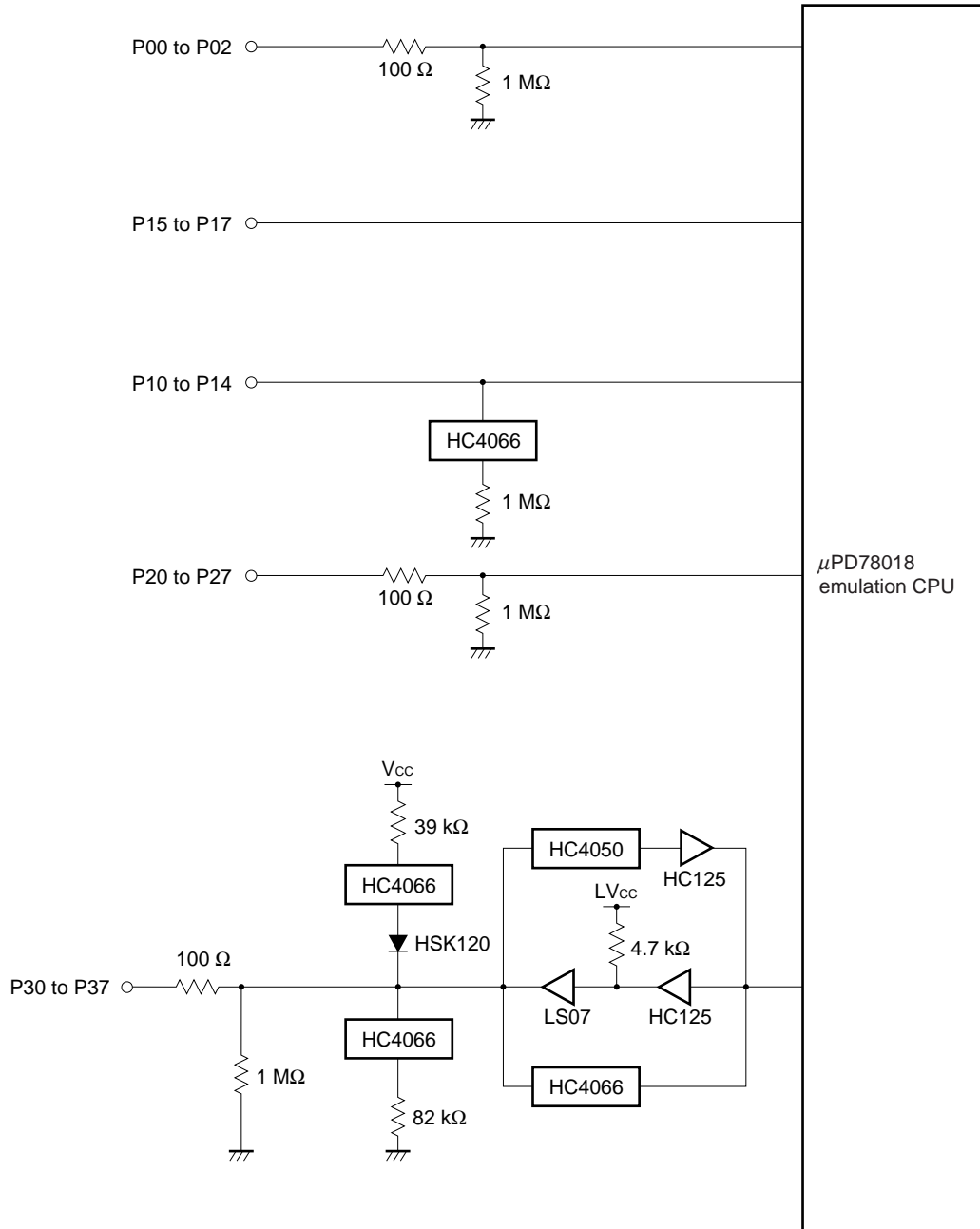


Figure 4-2. Equivalent Circuit 2 from Emulation Circuit

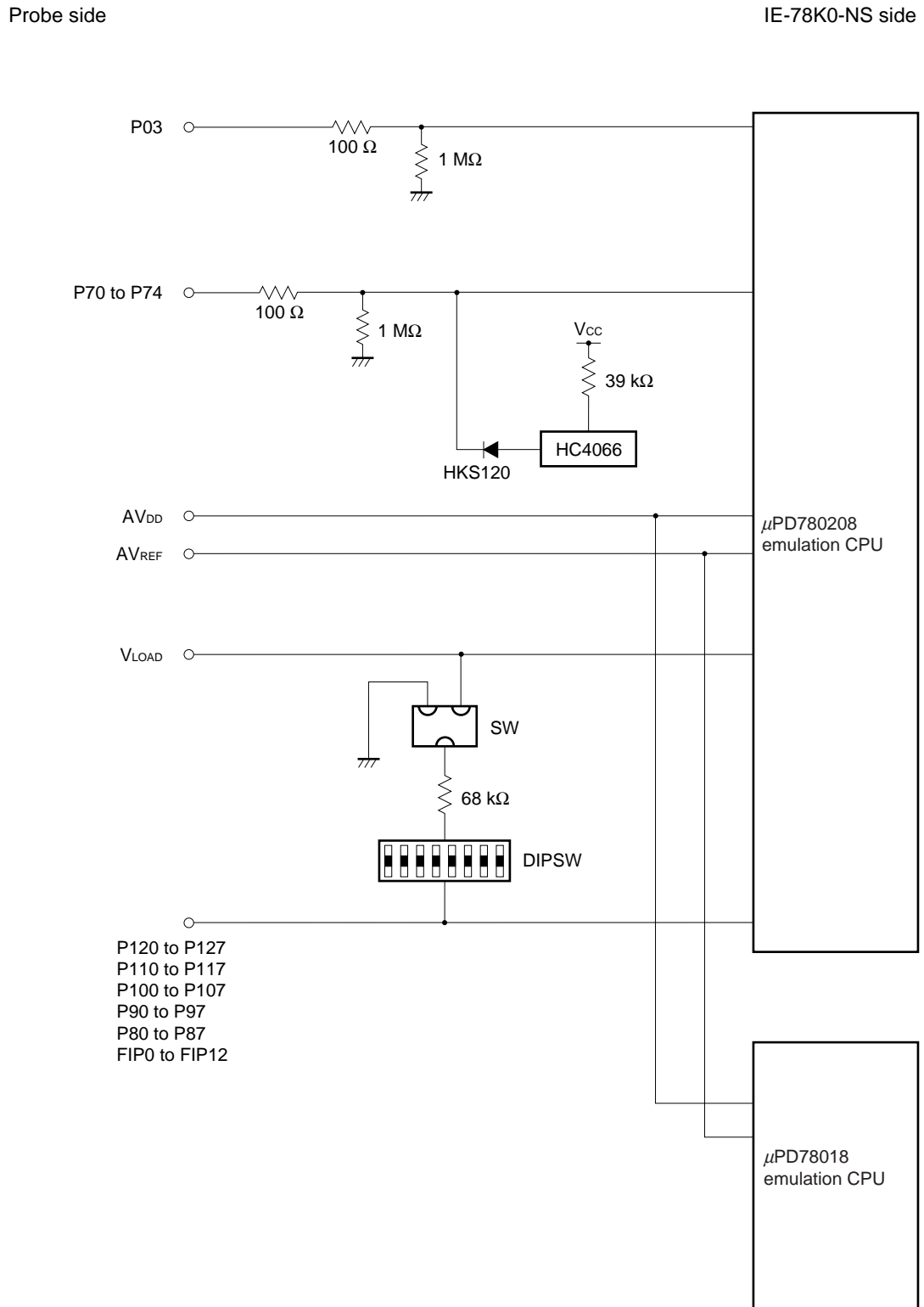
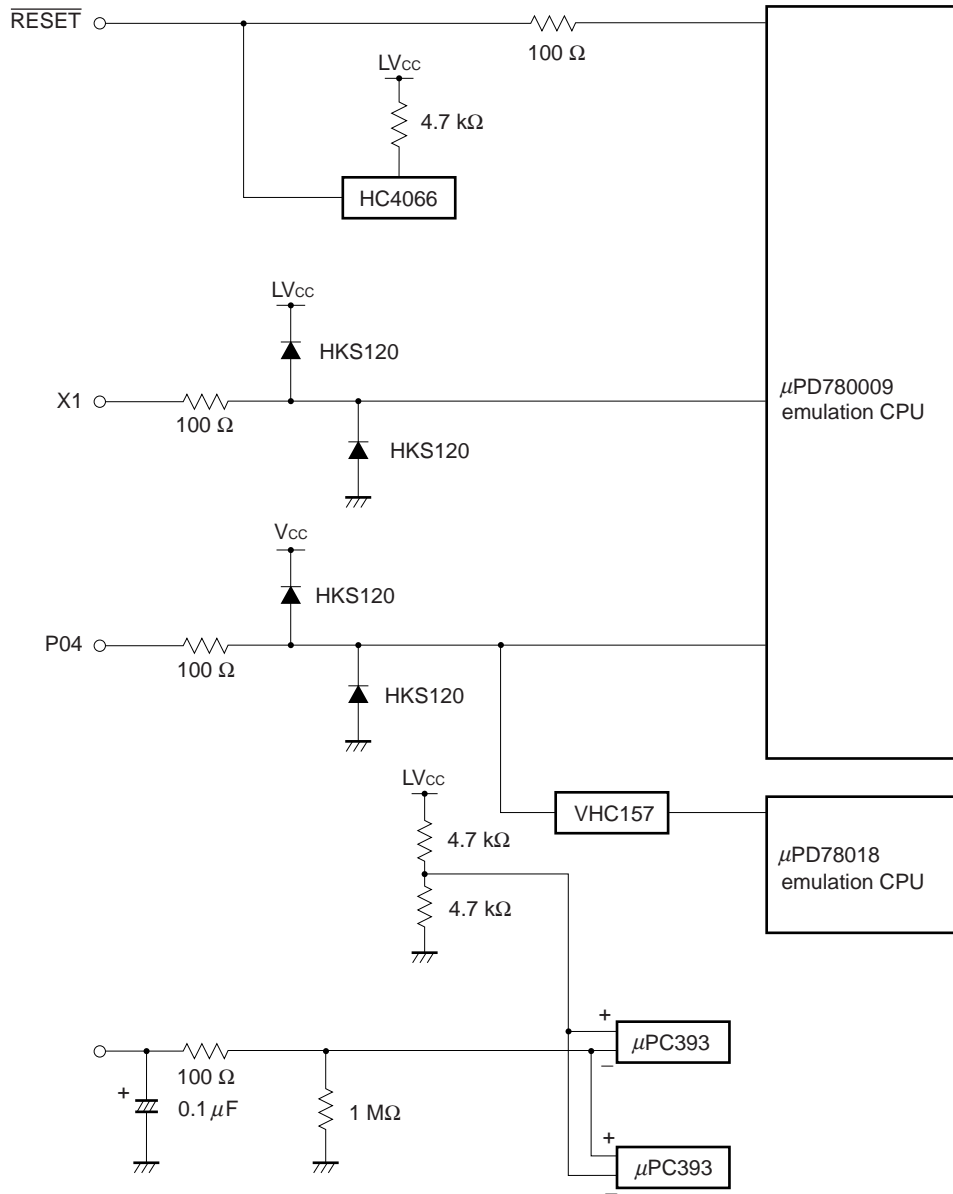


Figure 4-3. Equivalent Circuit 3 from Emulation Circuit

Probe side

IE-78K0-NS side



APPENDIX EMULATION PROBE PIN ASSIGNMENT TABLE

Table A-1. NP-100GF/GF-TQ Pin Assignments (1 of 2)

Emulation Probe	CN6 Pin No.	Emulation Probe	CN6 Pin No.
1	116	35	104
2	115	36	103
3	87	37	100
4	88	38	99
5	83	39	94
6	84	40	93
7	77	41	30
8	78	42	29
9	73	43	24
10	74	44	23
11	69	45	20
12	70	46	19
13	63	47	16
14	64	48	15
15	61	49	10
16	62	50	9
17	65	51	6
18	66	52	5
19	71	53	33
20	72	54	34
21	75	55	37
22	76	56	38
23	79	57	43
24	80	58	44
25	85	59	47
26	86	60	48
27	89	61	51
28	90	62	52
29	118	63	57
30	117	64	58
31	114	65	59
32	113	66	60
33	108	67	55
34	107	68	56

- Remarks**
1. The NP-100GF/GF-TQ is a product of Naito Densai Machidaseisakusho Co., Ltd.
 2. The numbers in the “Emulation probe” column indicate the corresponding pin number on the emulation probe tip.

Table A-1. NP-100GF/GF-TQ Pin Assignments (2 of 2)

Emulation Probe	CN6 Pin No.	Emulation Probe	CN6 Pin No.
69	49	85	18
70	50	86	17
71	45	87	22
72	46	88	21
73	41	89	28
74	42	90	27
75	35	91	92
76	36	92	91
77	31	93	98
78	32	94	97
79	4	95	102
80	3	96	101
81	8	97	106
82	7	98	105
83	14	99	112
84	13	100	111

- Remarks**
1. The NP-100GF/GF-TQ is a product of Naito Densai Machidaseisakusho Co., Ltd.
 2. The numbers in the "Emulation probe" column indicate the corresponding pin number on the emulation probe tip.

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