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User's Manual

QB-78K0SKX1

In-Circuit Emulator

Target Devices

78K0S/KU1+

78K0S/KY1+

78K0S/KA1+

78K0S/KB1+

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- If power was turned on while connection to the AC adapter, USB interface cable, or target system was in an unsatisfactory state
- If the cable of the AC adapter, the USB interface cable, the target cable, the emulation probe, or the like was bent or pulled excessively
- If an AC adapter other than the supplied product was used
- If the product got wet
- If this product is connected to the target system when there is a potential difference between the GND of this product and GND of the target system.
- If the connectors or cables are plugged/unplugged while this product is in the power-on state.
- If excessive load is applied to the connectors or sockets (As for handling, please see **2.6 Mounting and Connecting Connectors**).
- If a metal part of the power switch, cooling fan, or another such part comes in contact with an electrostatic charge.

2. Safety precautions

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- Be careful of electrical shock. There is a danger of electrical shock if the product is used as described above in **1. Circumstances not covered by product guarantee**.
- The AC adapter supplied with the product is exclusively for this product, so do not use it with other products.

INTRODUCTION

Readers	This manual is intended for users who wish to perform debugging using the QB-78K0SKX1. The readers of this manual are assumed to be familiar with the device functions and usage, and to have knowledge of debuggers.	
Purpose	This manual is intended to give users an understanding of the basic specifications and correct usage of the QB-78K0SKX1.	
Organization	This manual is divided into the following sections. <ul style="list-style-type: none">• General• Setup procedure• Settings at product shipment• Restrictions	
How to Read This Manual	<p>It is assumed that the readers of this manual have general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers. This manual describes the basic setup procedures and how to set switches.</p> <p>To understand the overall functions and usages of the QB-78K0SKX1 →Read this manual in the order of the CONTENTS. The mark “<R>” shows major revised points. The revised points can be easily searched by copying an “<R>” in the PDF file and specifying it in the “Find what:” field.</p> <p>To know the manipulations, command functions, and other software-related settings of the QB-78K0SKX1 →See the user’s manual of the debugger (supplied with the QB-78K0SKX1) to be used.</p>	
Conventions	Note:	Footnote for item marked with Note in the text
	Caution:	Information requiring particular attention
	Remark:	Supplementary information
	Numeric representation:	Binary ... xxxx or xxxxB Decimal ... xxxx Hexadecimal ... xxxxH
	Prefix indicating power of 2 (address space, memory capacity):	K (kilo): $2^{10} = 1,024$ M (mega): $2^{20} = 1,024^2$

Terminology

The meanings of the terms used in this manual are described in the table below.

Term	Meaning
Target device	This is the device to be emulated.
Target system	This is the system to be debugged. This includes the target program and the hardware provided by the user.
78K0S/Kx1+	Generic name indicating 78K0S/KU1+, 78K0S/KY1+, 78K0S/KA1+, and 78K0S/KB1+.
IECUBE™	Generic name for NEC Electronics' high-performance/compact in-circuit emulator.

Related Documents

Please use the following documents in conjunction with this manual.

The related documents listed below may include preliminary versions. However, preliminary versions are not marked as such.

Documents Related to Development Tools (User's Manuals)

Document Name		Document Number
QB-78K0SKX1 In-Circuit Emulator		This manual
RA78K0S Ver. 2.00 Assembler Package	Operation	U17391E
	Language	U17390E
	Structured Assembler Language	U17389E
CC78K0S Ver. 2.00 C Compiler	Operation	U17416E
	Language	U17415E
ID78K0S-QB Ver. 3.00 Integrated Debugger	Operation	U18493E
PM plus Ver. 6.30		U18416E

Caution The related documents listed above are subject to change without notice. Be sure to use the latest version of each document for designing, etc.

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CHAPTER 1 GENERAL

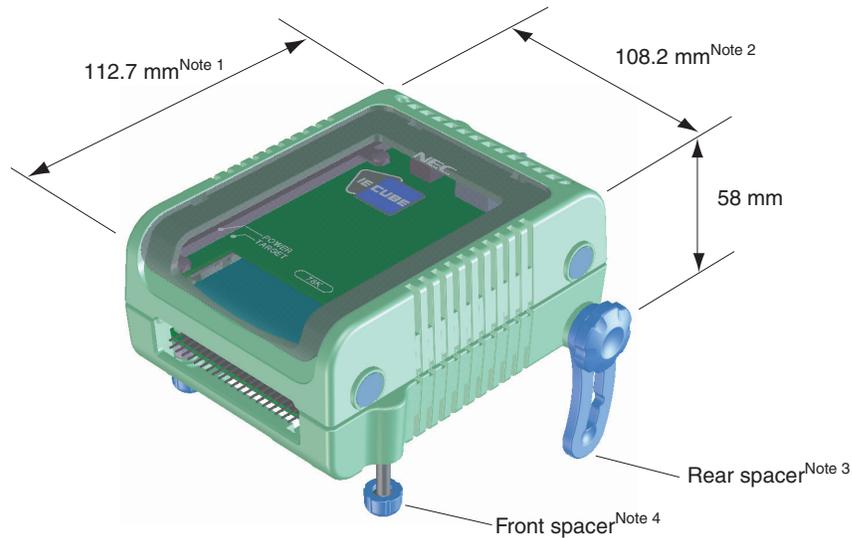
The QB-78K0SKX1 is an in-circuit emulator for emulating the 78K0S/Kx1+.

Hardware and software can be debugged efficiently in the development of systems in which the 78K0S/Kx1+ is used. This manual describes basic setup procedures, hardware specifications, system specifications, and how to set switches.

1.1 Hardware Specifications

Table 1-1. QB-78K0SKX1 Hardware Specifications

Parameter		Specification
Target device		78K0S/KU1+, 78K0S/KY1+, 78K0S/KA1+, 78K0S/KB1+
Operating voltage		2.0 to 5.5 V
Operating frequency	system clock	2.7 V ≤ V _{DD} ≤ 5.5 V: 1 to 10 MHz 2.0 V ≤ V _{DD} < 2.7 V: 1 to 5 MHz
	Internal high-speed oscillation clock	An 8 MHz clock (fixed) is supplied from the oscillation circuit in the QB-78K0SKX1
	Internal low-speed oscillation clock	A 250 kHz clock (fixed) is supplied from the oscillation circuit in the QB-78K0SKX1
Operating temperature range		0 to 40°C (No condensation)
Storage temperature range		-15 to +60°C (No condensation)
External dimensions		See figure below
Power consumption	AC adapter for QB-78K0SKX1	Output: DC15 V, 1 A Input: AC100 to 240 V
	Target system power supply	Voltage: 2.0 to 5.5 V Current: approx. 17 mA MAX.
Weight		Approx. 300 g
Host interface		USB interface (1.1, 2.0)



- Notes**
- Does not include projection of power switch
 - Includes projection of screw that fixes rear spacer
 - Rear spacer can adjust the height from 30 mm (longest) to 0 mm (shortest)
 - Front spacer can adjust the height from 20 mm (longest) to 5 mm (shortest)

1.2 System Specifications

This section shows the QB-78K0SKX1 system specifications.

Table 1-2. QB-78K0SKX1 System Specifications

Parameter		Specification
Emulation memory capacity	Internal ROM	8 KB (MAX.)
	Internal RAM	256 KB (MAX.)
Program execution functions	Real-time execution function	Go, Start from Here, Come Here, Restart, Return Out, Ignore break points and Go
	Non-real-time execution function	Step In, Next Over, Slowmotion, Go & Go
Memory manipulation		Available (initialize, copy, compare)
Register manipulation		Available (general-purpose registers, control registers, SFRs)
Disassemble function		Available
Local variable view		Local variables
Watch data view		Local variables, global variables, or else
Stack trace view		Available
Break functions	Event break	Access: 1 point
	Software break	2000 points
	Other	Forcible break
Trace functions	Trace data types	Program address, program data
	Trace modes	Unconditional instruction branch trace
	Trace functions	Non-stop
	Memory capacity	1 K frames
Pseudo-real-time RAM monitoring function		All internal RAM spaces (16 bytes)
Time measurement functions	Measurement clock	8 MHz
	Measurement objects	Start through end of program execution
	Maximum measurement time	Approx. 1 hour and 12 minutes (Resolution: 125 ns)
	Number of timers for measurement	Start through end of program execution: 1
	Measurement results	Execution time (start through end of execution)
Other functions		Command functions set in the console
		Event function, power-off emulation function, pin mask function, flash self programming emulation function

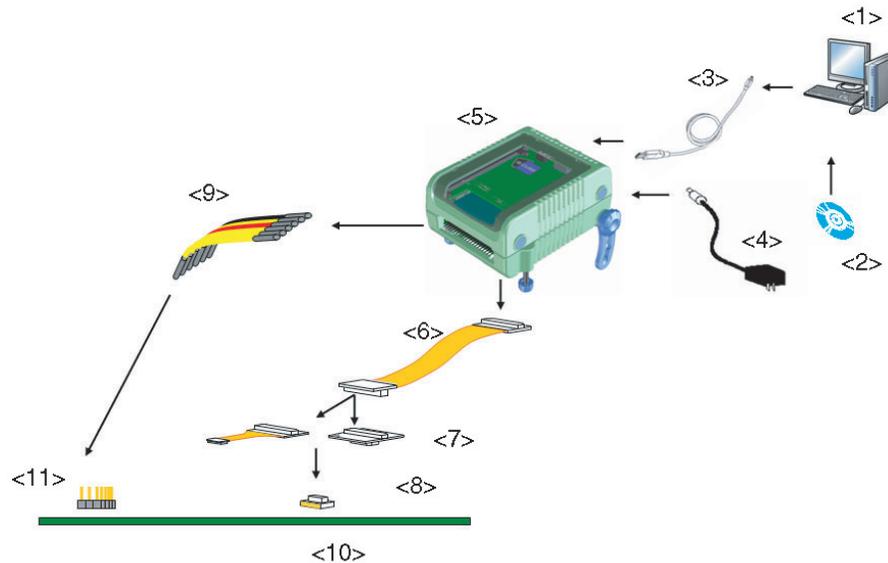
Table 1-3. List of QB-78K0SKX1 Peripheral Break Functions

Parameter	Target Peripheral Function Name
Peripheral Break: Peripheral function which stops when Break is set	16-bit timer/event counter 00
	8-bit timer 80
	8-bit timer H1

1.3 System Configuration

This section shows the system configuration when using the QB-78K0SKX1 connected to a PC (Windows™ PC (Windows 98 SE or later), PC/AT™ compatible). Connection is possible even without optional products.

Figure 1-1. System Configuration



- | | |
|---|---|
| <1> Host machine | : Windows PC (Windows 98 SE or later), IBM PC/AT compatible can be used |
| <2> ID78K0S-QB Disk/Accessory Disk | : Debugger, USB drivers, manual, etc. |
| <3> USB interface cable | : Cable connecting QB-78K0SKX1 to host machine |
| <4> AC adapter | : Support input AC100 to 240 V |
| <5> QB-78K0SKX1 | : This product |
| <6> Emulation probe | : Flexible type emulation probe |
| <7> Exchange adapter | : Adapter that performs pin conversion
flexible type for 10-pin and 16-pin
board type for 20-pin and 30-pin |
| <8> Target connector | : Connector soldered to target system |
| <9> Target cables (30 single-wire cables) | |
| <10> Target system (device foot pattern) | |
| <11> Target system (pin header) | : Recommended specification
vertical 0.635 mm, horizontal 0.635 mm, height 6 mm |

- Remarks 1.** Obtain device files from the NEC Electronics Microcontrollers and Microprocessors website.
<http://www.necel.com/micro/ods/eng/index.html>
- 2.** Refer to **1.5 Package Contents** for the purchase forms of the above products.
- 3.** As for handling of connectors, refer to **2.6 Mounting and Connecting Connectors**.

1.4 System Configuration for Each Target Device

The following table lists the system configuration for each target device of the QB-78K0SKX1.

Table 1-4. Adapters and Connectors for Each Target Device

Target Device	Package	Exchange Adaptor	Target Connector
78K0S/KU1+	10-pin MA	QB-10MA-EA-01T (sold separately) ^{Note 2}	QB-10MA-NQ-01T (sold separately) ^{Note 2}
78K0S/KY1+ ^{Note 1}	16-pin GR	QB-16GR-EA-01T (sold separately) ^{Note 2}	QB-16GR-NQ-01T (sold separately) ^{Note 2}
78K0S/KA1+ ^{Note 1}	20-pin MC	QB-20MC-EA-01T (sold separately) ^{Note 2}	QB-20MC-NQ-01T (sold separately) ^{Note 2}
78K0S/KB1+ ^{Note 1}	30-pin MC	QB-30MC-EA-04T (sold separately) ^{Note 2}	QB-30MC-NQ-02T (sold separately) ^{Note 2}

<R>

Table 1-5. Common Probe

Name	Part Number
Emulation probe	QB-50-EP-01T (sold separately) ^{Note 2}

<R> **Notes 1.** To develop WLPGA or SDIP, use the attached target cable (single-wire). Refer to **2.7.2 When using the single-wire target cables.**

2. These items are included with the QB-78K0SKX1, depending on the ordering code.

- If QB-78K0SKX1-ZZZ is ordered
The emulation probe, exchange adapter, and target connector are not included.
- If QB-78K0SKX1-T10MA is ordered
The QB-50-EP-01T, QB-10MA-EA-01T, and QB-10MA-NQ-01T are included.
- If QB-78K0SKX1-T16GR is ordered
The QB-50-EP-01T, QB-16GR-EA-01T, and QB-16GR-NQ-01T are included.
- If QB-78K0SKX1-T20MC is ordered
The QB-50-EP-01T, QB-20MC-EA-01T, and QB-20MC-NQ-01T are included.
- If QB-78K0SKX1-T30MC is ordered
The QB-50-EP-01T, QB-30MC-EA-04T, and QB-30MC-NQ-02T are included.

Remark For notes on target system design and package drawings, refer to **[Related Information]** on the following URL.

<http://www.necel.com/micro/english/iecube/index.html>

1.5 Package Contents

The following items have been placed in the QB-78K0SKX1 packing box. Please check the contents.

Products supplied with QB-78K0SKX1-ZZZ

- 1: QB-78K0SKX1
- 2: AC adapter
- 3: USB interface cable (2 meters)
- 4: Target cable (30 single-wire cables)
- 5: Online user registration card (warranty card and software contract in one)
- 6: ID78K0S-QB Disk (CD-ROM)
- 7: Accessory Disk (CD-ROM)
- 8: IECUBE Setup Manual (Japanese/English)
- 9: Pin header cover for QB-78K0SKX1 (Japanese/English)
- 10: Packing list
- 11: Simple programmer (QB-MINI2)

Products supplied with QB-78K0SKX1-T10MA

- 1 to 11
- 12: Emulation probe QB-50-EP-01T
 - 13: Exchange adapter QB-10MA-EA-01T
 - 14: Target connector QB-10MA-NQ-01T

Products supplied with QB-78K0SKX1-T16GR

- 1 to 11
- 12: Emulation probe QB-50-EP-01T
 - 13: Exchange adapter QB-16GR-EA-01T
 - 14: Target connector QB-16GR-NQ-01T

Products supplied with QB-78K0SKX1-T20MC

- 1 to 11
- 12: Emulation probe QB-50-EP-01T
 - 13: Exchange adapter QB-20MC-EA-01T
 - 14: Target connector QB-20MC-NQ-01T

Products supplied with QB-78K0SKX1-T30MC

- 1 to 11
- 12: Emulation probe QB-50-EP-01T
 - 13: Exchange adapter QB-30MC-EA-04T
 - 14: Target connector QB-30MC-NQ-02T

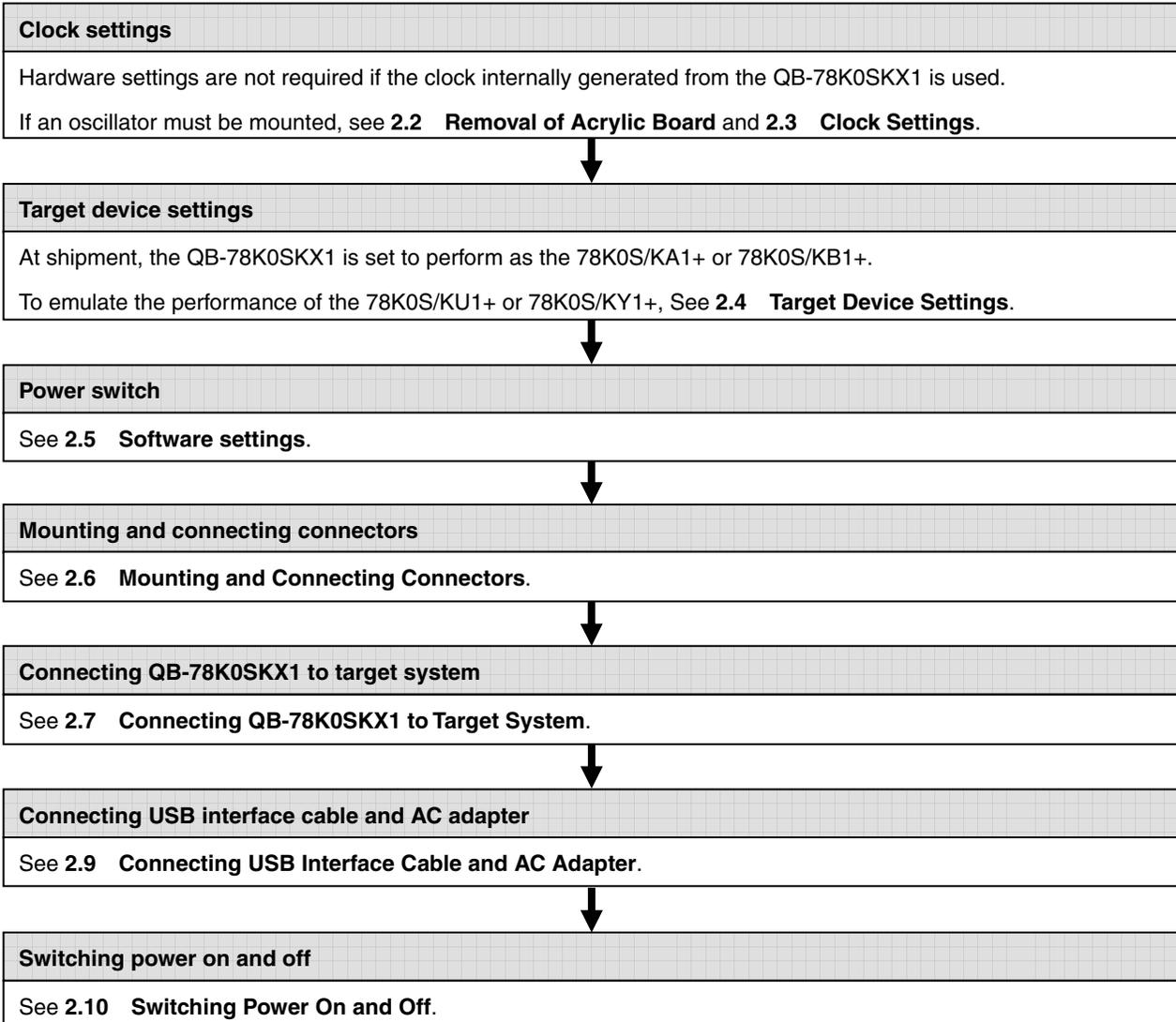
CHAPTER 2 SETUP PROCEDURE

This chapter explains the QB-78K0SKX1 setup procedure.

Setup can be completed by performing installation setup in the order in which it appears in this chapter.

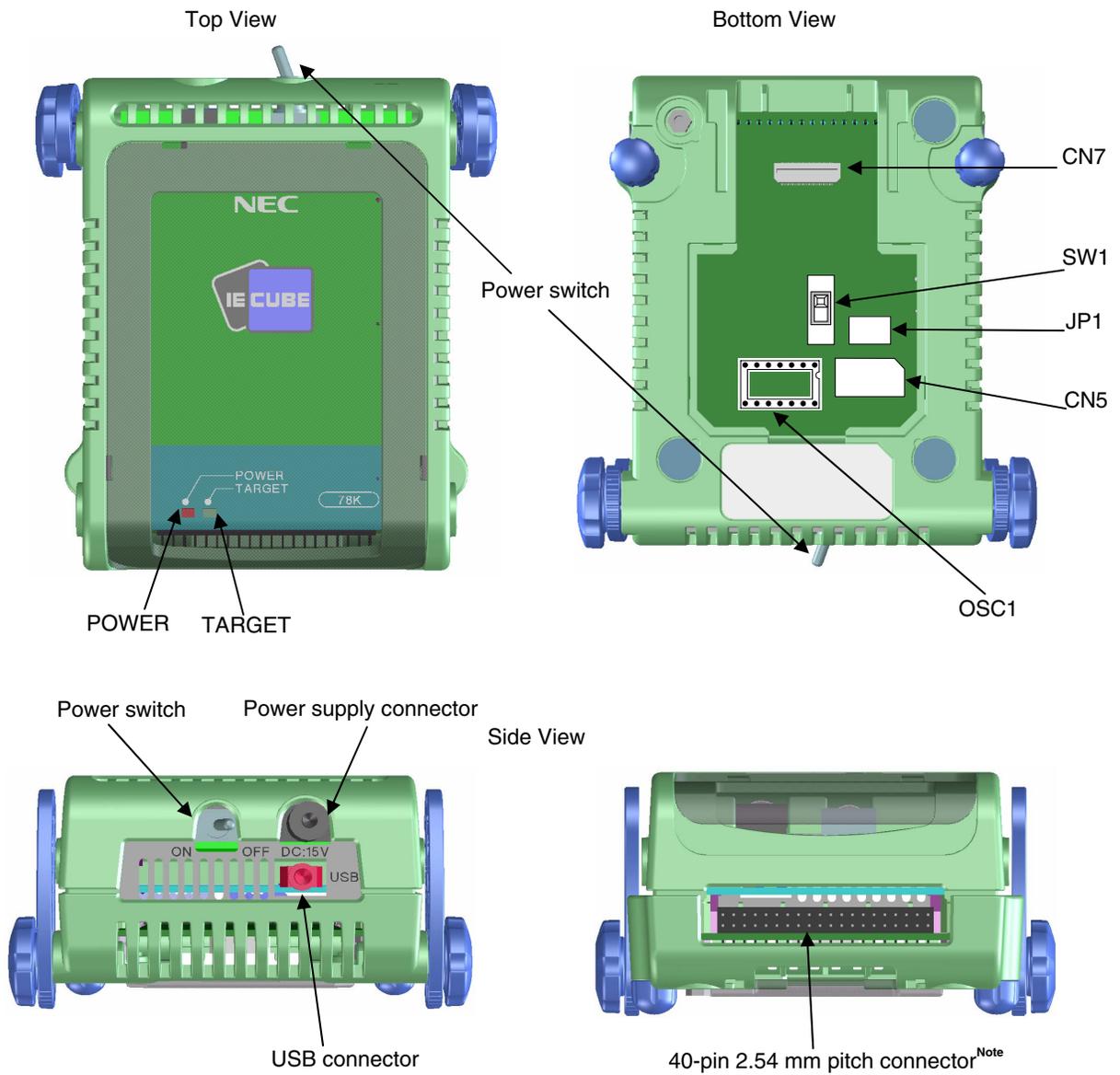
Perform setup along the lines of the following procedure.

See **2.1 Names and Functions of Hardware** for clock positions.



2.1 Names and Functions of Hardware

Figure 2-1. Names of Parts of QB-78K0SKX1



Note Pin 20 (N.C.) is a disconnected pin by default (at shipment).

(1) CN7

This is a connector for connecting an emulation probe.

(2) 40-pin 2.54 mm pitch connector

This is a connector for connecting target cables (30 single-wire cables).

(3) SW1

This is a target device selection switch. The switch is set to use the 78K0S/KA1+ or 78K0S/KB1+ at shipment.

(4) OSC1

This is a socket for mounting the oscillator.

(5) CN5

This is a connector for the shipment inspection. It is not intended for users to use.

(6) POWER (Red LED)

This is an LED that shows whether the power supply of the QB-78K0SKX1 is switched on.

LED State	QB-78K0SKX1 State
Lit	Power switch ON
Not lit	Power switch OFF or AC adapter not connected to QB-78K0SKX1
Blinking	Internal error occurred (Contact an NEC Electronics sales representative or distributor)

(7) TARGET (Green LED)

This is an LED that shows whether the power supply of the target system is switched on.

LED State	Target System State
Lit	Target system power supply ON
Not lit	Target system power supply OFF or target system not connected

(8) Power switch

This is the power switch of the QB-78K0SKX1.
It is OFF at shipment.

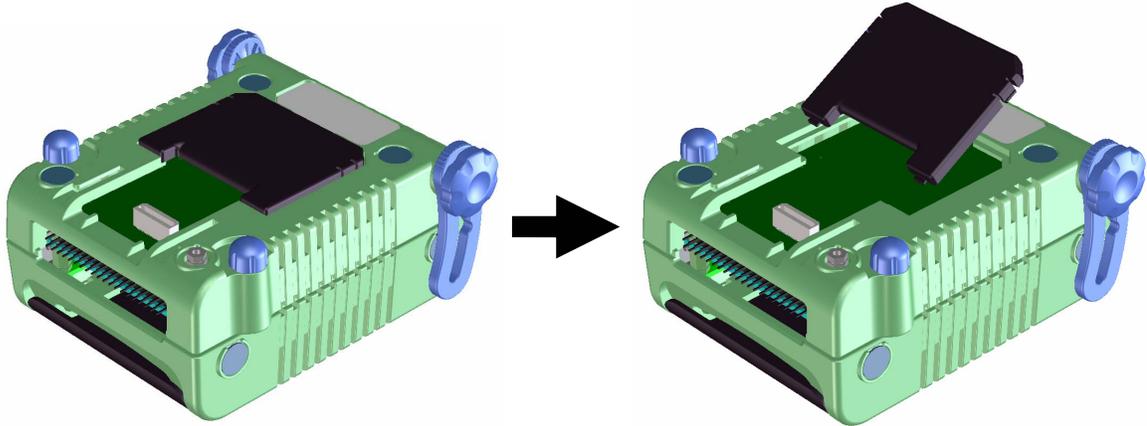
(9) JP1

This is a jumper for the shipment inspection.
At shipment, it is set as 1-2, 3-4 and 5-6 short. The settings other than this are prohibited.

2.2 Removal of Acrylic Board

To modify the clock setting, the acrylic board on the bottom of the QB-78K0SKX1 must be removed. The acrylic board can be removed by lifting it up.

Figure 2-2. Acrylic Board Removal Method



2.3 Clock Settings

2.3.1 Overview of clock settings

The following four types of clock settings are available. Each clock setting is listed below.

<R>

Table 2-1. Clock Settings

Clock Used	Clock Supply	Debugger Setting (in Configuration Dialog Box)
System clock	Uses the clock internally generated from the QB-78K0SKX1	System (5.00, 8.00, 10.00 [MHz])
	Uses the clock generated from the oscillator (OSC1) mounted on the QB-78K0SKX1	Clock Socket
Internal high-speed oscillation clock	Uses the clock internally generated from the QB-78K0SKX1	System (None)
Internal low-speed oscillation clock		—

The clock to be used is selected depending on the setting of the option byte.

To select crystal/ceramic oscillation circuit or external clock input circuit, see **2.3.2 How to set system clock**.

<R>

When the internal high-speed oscillation clock is selected, see **2.3.3 How to set internal high-speed oscillation clock**.

Oscillation with the resonator on the target system and an external input clock are not supported.

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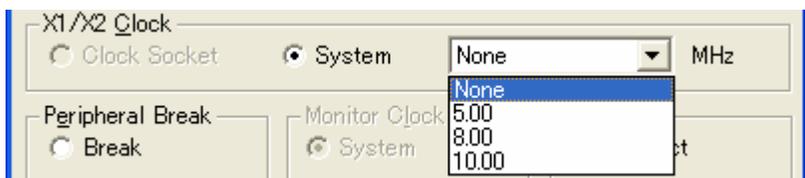
Remark If an oscillation circuit having an oscillator or resonator is mounted in OSC1, “Clock Socket” is automatically selected, thus “System” is not available.

2.3.2 How to set system clock

The clock settings are listed below.

Table 2-2. Settings for System Clock

Type of Clock to Be Used	OSC1	Debugger Setting
(1) Using the clock internally generated from the QB-78K0SKX1	Nothing is mounted	System (5.00, 8.00, 10.00 [MHz])
(2) Using the oscillation circuit (OSC1), having an oscillator or resonator, mounted on the QB-78K0SKX1	The oscillation circuit having an oscillator or resonator is mounted	Clock Socket



<R> **Remarks 1.** If “None” is selected without the internal high-speed oscillation clock being selected by the option byte setting, the CPU operates at 8.00 MHz.

<R> **2.** If an oscillation circuit having an oscillator or resonator is mounted in OSC1, “Clock Socket” is automatically selected.

(1) Using the clock internally generated from the QB-78K0SKX1

Select the “System” in the debugger and select the desired frequency from the drop-down list. The following frequencies are selectable.
5.00, 8.00, 10.00 [MHz]

(2) Using the oscillation circuit (OSC1), having an oscillator or resonator, mounted on the QB-78K0SKX1

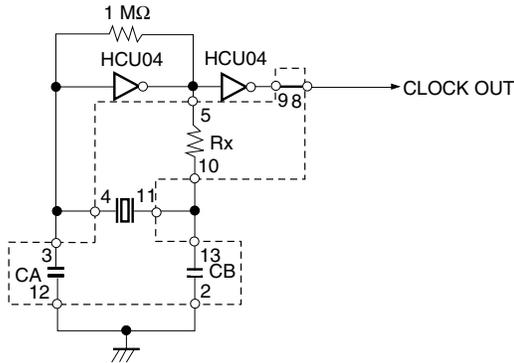
OSC1 of the QB-78K0SMINI does not mount an oscillator or an oscillation circuit at shipment. OSC1 specifications are shown in (a) to (d) of Figure 2-3.

Note that an oscillation circuit can also be configured by mounting a parts board such as the 160-90-314 (product of PRECI-DIP) in OSC1. The capacitors and resistors mounted on the parts board should be used at the constants recommended by the resonator manufacturer. A diagram of the parts board mounted in OSC1 is shown in (e) of Figure 2-3.

Caution Be sure to mount the clock on and remove it from OSC1 with the power supply of the QB-78K0SKX1 switched off.

Figure 2-3. Using Oscillator

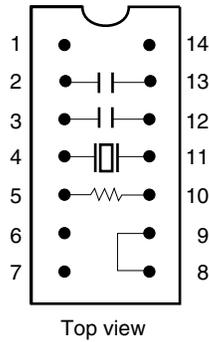
(a) Equivalent circuit



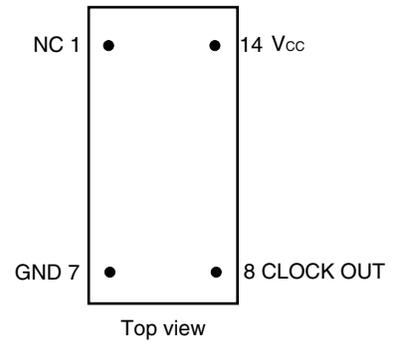
(b) Mounted parts

Pin Number	Connected Part
2-13	Capacitor CB
3-12	Capacitor CA
4-11	Ceramic resonator/crystal resonator
5-10	Resistor Rx
8-9	Shorted

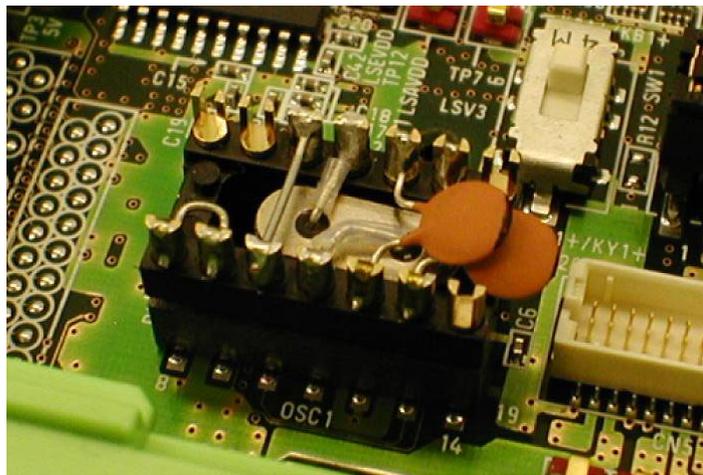
(c) Example of mounting parts board (oscillator circuit parts)



(d) Supported oscillator pin assignment



(e) Parts board mounted in OSC1



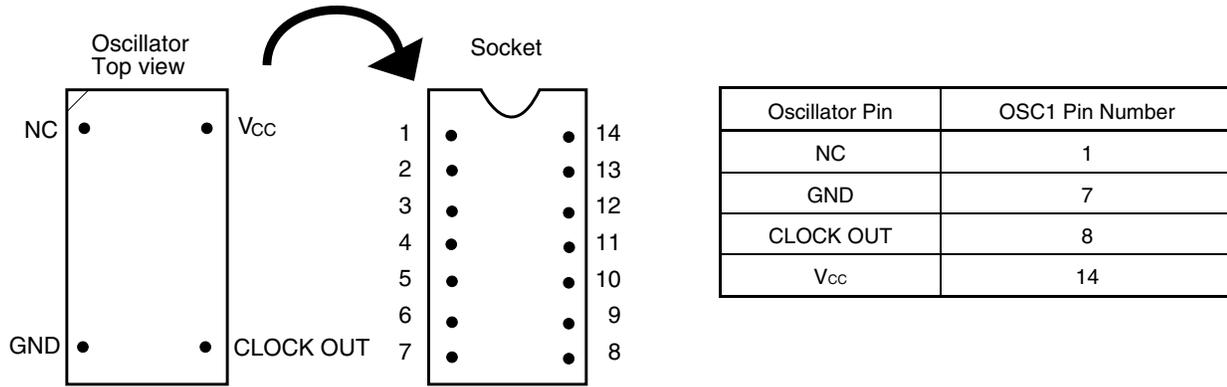
Mount an oscillator in OSC1 in the QB-78K0SKX1 and then select the “Clock socket” in the debugger. The clock generated from the oscillator mounted on the QB-78K0SKX1 is used.

The selectable frequencies are same as those of the target device.

As an oscillator to be mounted in OSC1 in the QB-78K0SKX1, use the one that satisfies the following specifications.

- Supply voltage: 5 V
- Output level: CMOS

Figure 2-4. Mapping of Oscillator to OSC1



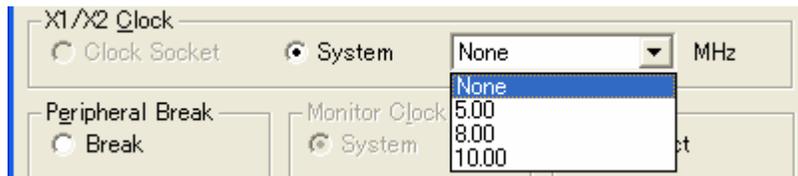
Remark Watch out for the pin 1 position and insert the oscillator into the socket.

<R> **2.3.3 How to set internal high-speed oscillation clock**

Select "System" in the debugger and select "None" from the drop-down list.

By the setting of the option byte, 8 MHz from the oscillation circuit in the QB-78K0SKX1 is used.

Figure 2-5. Debugger Configuration Dialog Box Setting



Remark If the internal high-speed oscillation clock is selected by the option byte setting without selecting "None", the CPU operates at 8.00 MHz after reset.

2.3.4 Internal low-speed oscillation clock

The debugger setting is not necessary.

250 MHz from the oscillation circuit in the QB-78K0SKX1 is used.

2.4 Target Device Settings

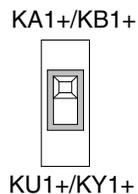
The target device is set by using SW1 on the QB-78K0SKX1.

When emulating the 78K0S/KA1+ or 78K0S/KB1+: Set to KA1+/KB1+ side

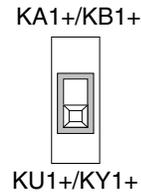
When emulating the 78K0S/KU1+ or 78K0S/KY1+: Set to KU1+/KY1+ side

Figure 2-6. SW1 Setting

When using the 78K0S/KA1+
or 78K0S/KB1+



When using the 78K0S/KU1+
or 78K0S/KY1+



Caution Be sure to switch off the power supply of the QB-78K0SKX1 before changing the setting.

2.5 Software Settings

For details, see the **ID78K0S-QB Ver. 3.00 Integrated Debugger Operation User's Manual (U18493E)**.

2.6 Mounting and Connecting Connectors

This section describes the methods of connecting the target connector and exchange adapter to target system. Make connections with both the power supplies of the QB-78K0SKX1 and target system switched off.

The following abbreviations are used in this section:

- TC: Target connector
- EA: Exchange adapter

2.6.1 Mounting TC to target system

- (1) Thinly apply an adhesive to the back of the TC and adhere the TC to the target system. In addition, be sure to clean the back of the TC as well as the surface of the target system using alcohol or the like. Align the TC leads along the target system pads.
- (2) Preserve the soldering conditions (use Sn-3.5Ag-0.5Cu) and solder carefully to prevent troubles such as flux or solder splashing and adhering to the contact pins.

Solder reflow:

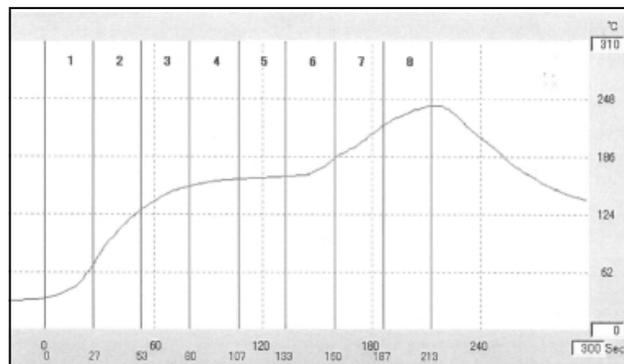
Preheating: 150 to 170°C

120 seconds or less

Heating: 220°C

60 seconds or less

Maximum temperature: 240°C or below



The above profile represents the temperature around the soldering pins.

Manual soldering:

350°C × 5 seconds or less (1 pin)

2.6.2 Plugging EA into TC

Check the pin 1 position of the EA and the pin 1 mark (silk) of the pin 1 position of the TC and plug in.

2.6.3 Precautions for handling TC

- (1) Do not perform cleaning by flux immersion or vapor.
- (2) Prying at insertion/removal might break the connector, therefore be sure to insert/remove vertically.
- (3) This system cannot be used in an environment of vibrations or shocks.
- (4) It is assumed that this product will be used in system development and evaluation. Moreover, when used in Japan, Electrical Appliance and Material Control Law and electromagnetic disturbance countermeasures have not been applied.
- (5) Since there are cases of shape change if the packing case is left for a long time in a place where it is 50°C or higher, for safekeeping, store it in a place where it is no higher than 40°C and direct sunlight does not hit it.

2.7 Connecting QB-78K0SKX1 to Target System

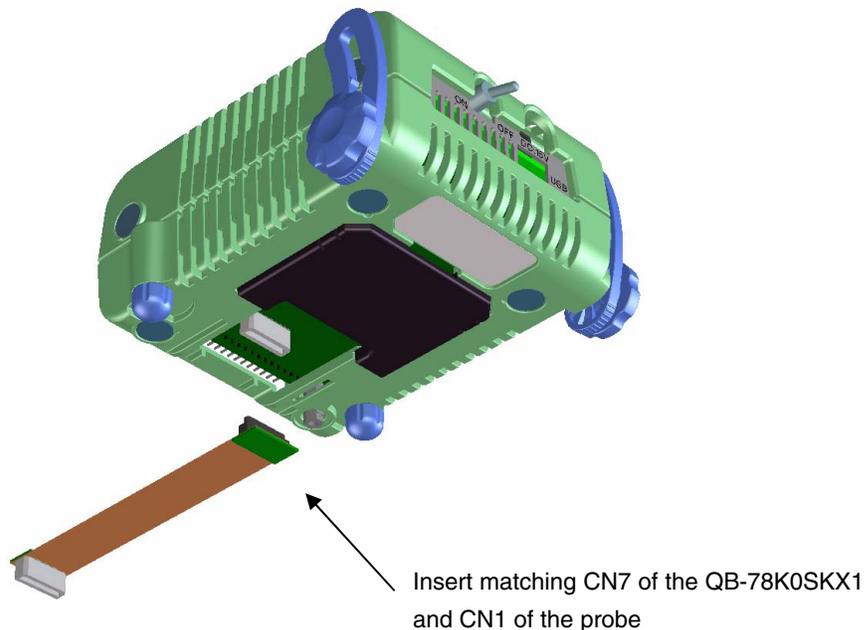
2.7.1 When using the emulation probe

If connecting the emulation probe (QB-50-EP-01T), connect it to the QB-78K0SKX1 and the target system by the following procedure.

(a) Connecting the emulation probe

Connect the emulation probe to the QB-78K0SKX1.

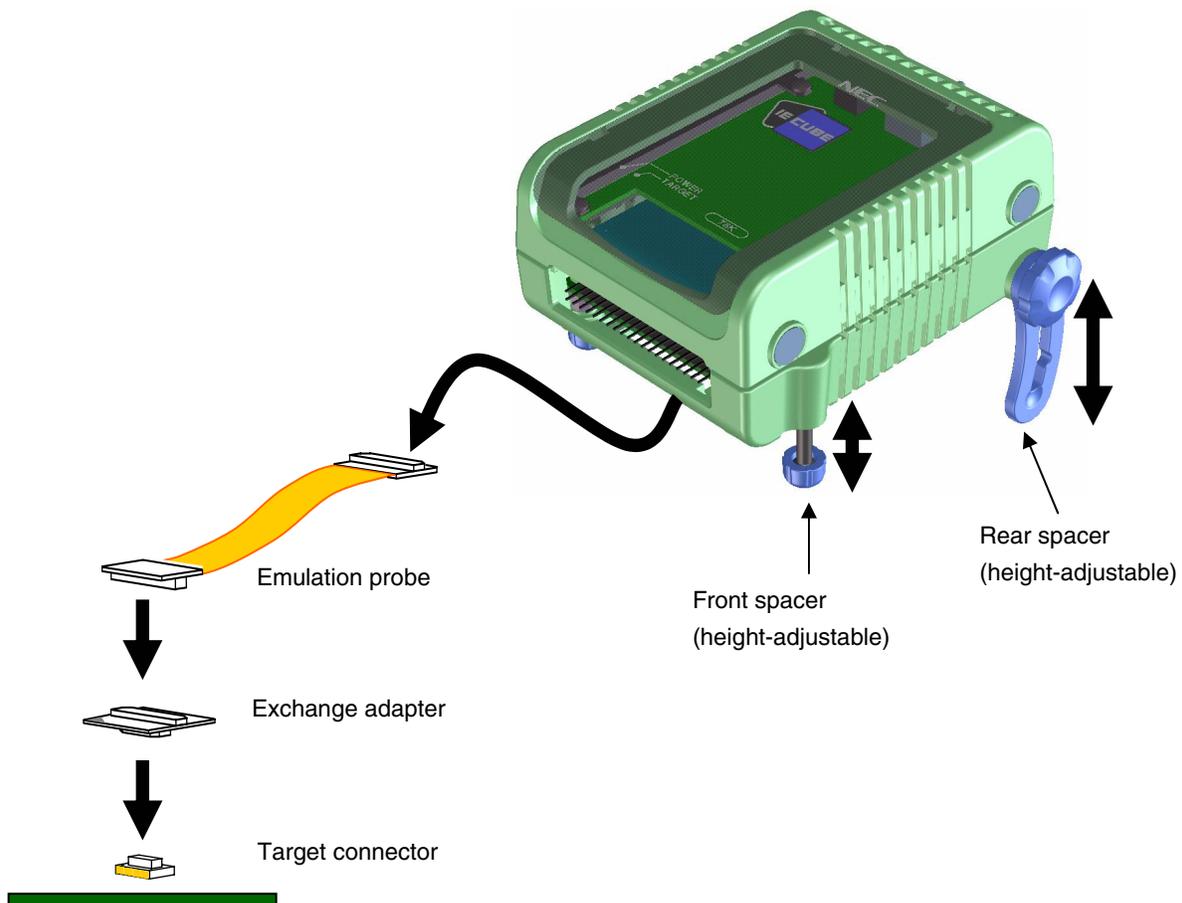
Figure 2-7. Using the Emulation Probe



(b) Ensuring isolation

When connecting the target system to the QB-78K0SKX1 using the emulation probe, perform height regulation using the front spacer or rear spacer of the QB-78K0SKX1 and ensure isolation from the target system.

Figure 2-8. Connection Using the Emulation Probe



(c) Precautions related to emulation probe

Be careful that stress of the emulation probe is not placed on the target connector. Moreover, when removing the emulation probe, remove it slowly while pressing down on the exchange adapter with a finger so that there is no stress on the target connector.

2.7.2 When using the single-wire target cables

Connect the QB-78K0SKX1 to the target system using the target cable (supplied), etc.

The 40-pin 2.54 mm pitch connector of the QB-78K0SKX1 incorporates a male pin header, so be sure to mount a male pin header on the target system connector. Connect corresponding pins to each other using a target cable with female connectors on each end.

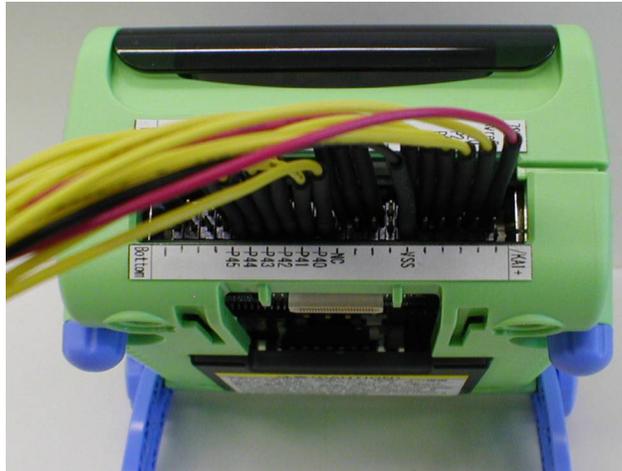
- Specifications of target cables (single-wire cables)
 - Red: 250 mm cable for power supply line (connected to V_{DD} and AV_{REF} pins) \times 2
 - Black: 250 mm cable for GND line (connected to V_{SS} and AV_{SS} pins) \times 2
 - Yellow: 250 mm cable for general signals \times 26
- Specifications of target system pin header:
 - 0.635 mm \times 0.635 mm (height: 6 mm)
 - When mounting the pin header, ensure that the pin pitch is at least 2.54 mm.

The 40-pin 2.54 mm pitch connector of the QB-78K0SKX1 incorporates a 40-pin pin header, so by mounting an IDE connector on the target system, the QB-78K0SKX1 can also be connected to the target system using a commercial IDE cable (ATA33 standard).

The pins in the 40-pin 2.54 mm pitch connector correspond functionally to the pins of the target device (pins 10, 16, 20, and 30). The functions of the target device pins can be switched using the target device selection switch (SW1). The attached product “Pin header cover for QB-78K0SKX1” that indicates the signal name of the target device pins is provided.

Use the appropriate cover by cutting it off from the product along the lines with scissors or a cutter, and cover the side of the QB-78K0SKX1 with it.

- Cautions**
1. **Be careful not to hurt yourself with scissors or a cutter when cutting off the “Pin header cover for QB-78K0SKX1”.**
 2. **When emulating products other than the 78K0S/KB1+, do not connect anything to the target I/F (pin header) pins that have not been assigned any pin functions (unused pins).**

Figure 2-9. Connection of QB-78K0SKX1 (40-pin 2.54 mm pitch connector) to Target System

Connect the 40-pin 2.54 mm pitch connector on the QB-78K0SKX1 to the target board connector using the target cables in accordance with the pin assignment of the target device. Be sure that both the power supplies of the target system and QB-78K0SKX1 are switched off.

Table 2-3. Pin Correspondence

Pin No.	Target Device Setting			
	KU1+/KY1+ Mode		KA1+/KB1+ Mode	
	78K0S/KU1+ (10 Pins)	78K0S/KY1+ (16 Pins)	78K0S/KA1+ (20 Pins)	78K0S/KB1+ (30 Pins)
1	–	–	AVREF(20)	AVREF(28)
2	–	–	–	AVSS(29)
3	P20/ANI0/TI000/TOH1(1)	P20/ANI0/TI000/TOH1(1)	P20/ANI0(19)	P20/ANI0(27)
4	GND	GND	GND	GND
5	P21/ANI1/TI010/TO/INTP0(10)	P21/ANI1/TI010/TO/INTP0(16)	P21/ANI1(18)	P21/ANI1(26)
6	GND	GND	GND	GND
7	P22/X2/ANI2(6)	P22/X2/ANI2(9)	P22/ANI2(17)	P22/ANI2(25)
8	GND	GND	GND	GND
9	P23/X1/ANI3(5)	P23/X1/ANI3(8)	P23/ANI3(16)	P23/ANI3(24)
10	GND	GND	GND	GND
11	VDD(4)	VDD(5)	VDD(5)	VDD(7)
12	VSS(3)	VSS(4)	VSS(1)	VSS(6)
13	–	–	–	P120(30)
14	GND	GND	GND	GND
15	–	–	P121/X1(2)	P121/X1(8)
16	GND	GND	GND	GND
17	–	–	P122/X2(3)	P122/X2(9)
18	GND	GND	GND	GND
19	–	–	P123(4)	P123(5)
20	N.C.	N.C.	N.C.	N.C.
21	–	–	–	P00(4)
22	P40(2)	P40(3)	P40(9)	P40(15)
23	–	–	–	P01(3)
24	–	P41(2)	P41/INTP3(10)	P41/INTP3(16)
25	–	–	–	P02(2)
26	–	P42(15)	P42/TOH1(11)	P42/TOH1(17)
27	–	–	–	P03(1)
28	P43(9)	P43(14)	P43/TxD6/INTP1(12)	P43/TxD6/INTP1(18)
29	–	–	P130(15)	P130(23)
30	–	P44(11)	P44/RxD6(13)	P44/RxD6(19)
31	–	–	P30/TI000/INTP0(8)	P30/TI000/INTP0(14)
32	–	P45(10)	P45(14)	P45(20)
33	–	–	P31/TI010/TO00/INTP2(7)	P31/TI010/TO00/INTP2(13)
34	–	P46(7)	–	P46(21)
35	P32/INTP1(8)	P32/INTP1(13)	–	P32(12)
36	–	P47(6)	–	P47(22)
37	–	–	–	P33(11)
38	GND	GND	GND	GND
39	P34/RESET(7)	P34/RESET(12)	P34/RESET(6)	P34/RESET(10)
40	GND	GND	GND	GND

Remark –: Pins not required in target device GND: Connected to Vss (pin 12) on the QB-78K0SKX1
(): The number in the parentheses indicates the pin number in the target device.

2.8 Notes on Power Supply and GND Pin Connection

Be sure to connect all the power supplies and GND pins of the target device to each power supply or GND of the QB-78K0SKX1.

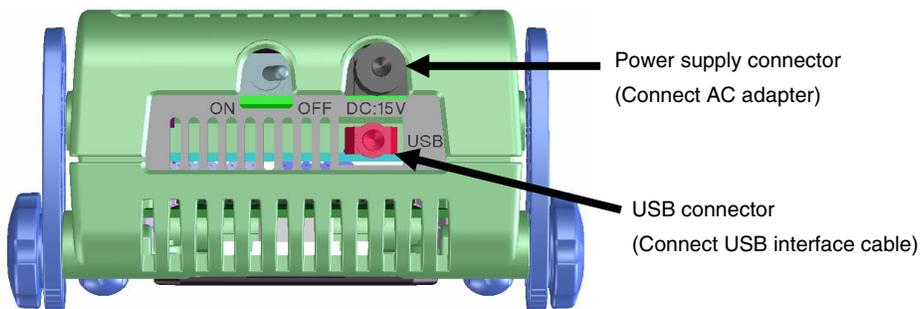
2.9 Connecting USB Interface Cable and AC Adapter

Plug the USB interface cable supplied with the QB-78K0SKX1 into the USB connector of the host machine, and plug the other side into the USB connector on the rear of the QB-78K0SKX1.

Plug the AC adapter supplied with the QB-78K0SKX1 into a receptacle and plug the other side into the power supply connector on the rear of the QB-78K0SKX1.

For QB-78K0SKX1 connector positions, see **Figure 2-10**.

Figure 2-10. Connector Positions



2.10 Switching Power On and Off

Be sure to switch the power on and off according to the following procedures.

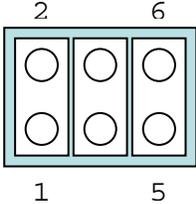
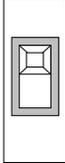
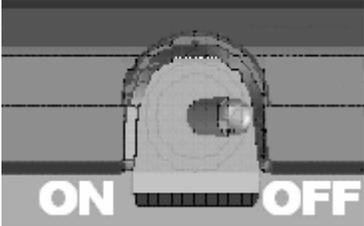
- | | |
|---|--|
| - Switching power on | - Switching power off |
| <1> QB-78K0SKX1 power switch ON | <1> Debugger termination |
| <2> Target system power switch ON ^{Note} | <2> Target system power switch OFF ^{Note} |
| <3> Debugger startup | <3> QB-78K0SKX1 power switch OFF |

Note <2> is unnecessary if the target system is not connected.

Caution If the wrong sequence was used for the operation, the target system or the QB-78K0SKX1 may fail.

CHAPTER 3 SETTINGS AT PRODUCT SHIPMENT

Table 3-1. Settings at Shipment

Item	Setting	Remarks
JP1		<p>Set as 1-2, 3-4 and 5-6 short. Do not change the settings.</p>
OSC1	Not mounted	Oscillation circuit using an oscillator or resonator can be mounted.
SW1	<p style="text-align: center;">KA1+/KB1+</p>  <p style="text-align: center;">KU1+/KY1+</p>	<p>Target device selection switch. Set to use the 78K0S/KA1+ or 78K0S/KB1+ at shipment.</p>
Power switch		Set to OFF at shipment.

CHAPTER 4 RESTRICTIONS

The following restrictions apply to the QB-78K0SKX1.

- Clock oscillation or clock input via a resonator on the target system is not supported. The clock differs between the device and the tool (QB-78K0SKX1) according to the option byte (OSCSEL1, OSCSEL0) setting as follows.

When the target device is other than the μ PD78F950x

Option Byte		Device	Tool
OSCSEL1	OSCSEL0		
0	0	Crystal/ceramic oscillation clock	System clock on QB-78K0SKX1
0	1	External clock input	System clock on QB-78K0SKX1
1	x	Internal high-speed oscillation clock	Internal high-speed oscillation clock of QB-78K0SKX1

When the target device is the μ PD78F950x

Option Byte		Device	Tool
OSCSEL1	OSCSEL0		
0	0	Internal high-speed oscillation clock	System clock on QB-78K0SKX1 ^{Note}
0	1	External clock input	System clock on QB-78K0SKX1
1	x	Internal high-speed oscillation clock	Internal high-speed oscillation clock of QB-78K0SKX1

Note If OSCSEL1 and 0 are set to 0 and 0, set the setting in the Configuration dialog box of the debugger to “None” or “8 MHz”.

- The oscillation circuit on the QB-78K0SKX1 generates a 250 kHz clock as the internal low-speed oscillation clock, and an 8 MHz clock as the internal high-speed oscillation clock. Note that the clock characteristics differ from those of the target device.
- The QB-78K0SKX1 has 256 KB of RAM. However, unfortunately the 256 KB RAM area can be accessed normally from the user program even when a 128 KB device is being emulated, so be aware that problems such as stack overflow may occur unnoticed.
- The characteristics of the A/D converter, LVI, and ports are not fully equivalent to those of the device. Moreover, pull-down resistors have also been inserted at the port signals to protect the target interface. See **APPENDIX A CHARACTERISTICS OF TARGET INTERFACE** for details.
- AV_{SS} and V_{SS} are equivalent on the QB-78K0SKX1.
- When using the QB-78K0SKX1, a correct A/D conversion result can be obtained even without waiting for 1 μ s to elapse after setting bit 0 (ADCE) of the A/D converter mode register (ADM) to 1. When using the actual device, however, be sure to execute processing such as reading and discarding this result.
- The internal functions (registers, peripheral macro, multiplier, etc.) of the QB-78K0SKX1 always operate for the 78K0S/KB1+. Therefore, while the emulation is performed for the 78K0S/KA1+, KU1+, or KY1+, if the bit of the register which exists only in the 78K0S/KB1+ is accessed from the program, it can be read or written even if access to the bit is disabled under normal conditions. In addition, the multiplication instruction execution can also be enabled while the emulation is performed for the 78K0S/KA1+, KU1+, or KY1+.

○ Device file versions

Use the combinations that satisfy the table below.

The device files can be downloaded from the following page on NEC Electronics Microcontrollers and Microprocessors website.

URL: <http://www.necel.com/micro/ods/eng/index.html> → Version-up Service

Target Device	Control Code	Usable Device File
78K0S/KA1+: μ PD78F9221, 78F9222	A or later	DF789222 V2.00 or DF789234 V2.00 or later
78K0S/KU1+: μ PD78F9200, 78F9201, 78F9202	A or later	DF789234 V2.11 or later

APPENDIX A CHARACTERISTICS OF TARGET INTERFACE

This chapter explains the differences between the signal lines of the target interface circuit of the QB-78K0SKX1 and the signal lines of the target device.

Although the target device is a CMOS circuit, the target interface circuit of the QB-78K0SKX1 consists of an emulation circuit that depends on the emulation CPU, TTL, CMOS-IC, etc.

When the target system is debugged by connecting it to the QB-78K0SKX1, the QB-78K0SKX1 emulates just as if the actual target device were operating on the target system.

However, small differences arise because the QB-78K0SKX1 actually is emulating.

The target interface equivalent circuit of the QB-78K0SKX1 is shown in Figure A-1.

Figure A-1. Equivalent Circuit (1/2)

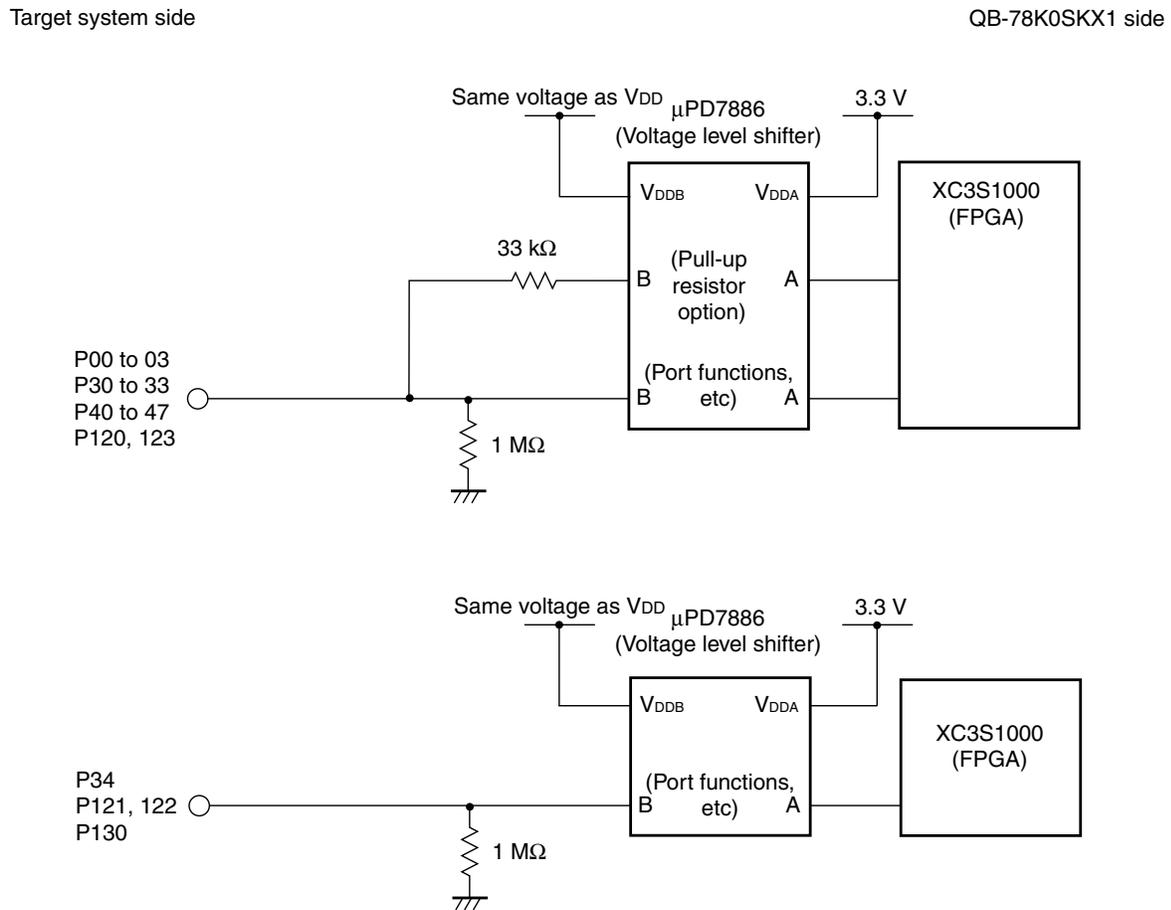
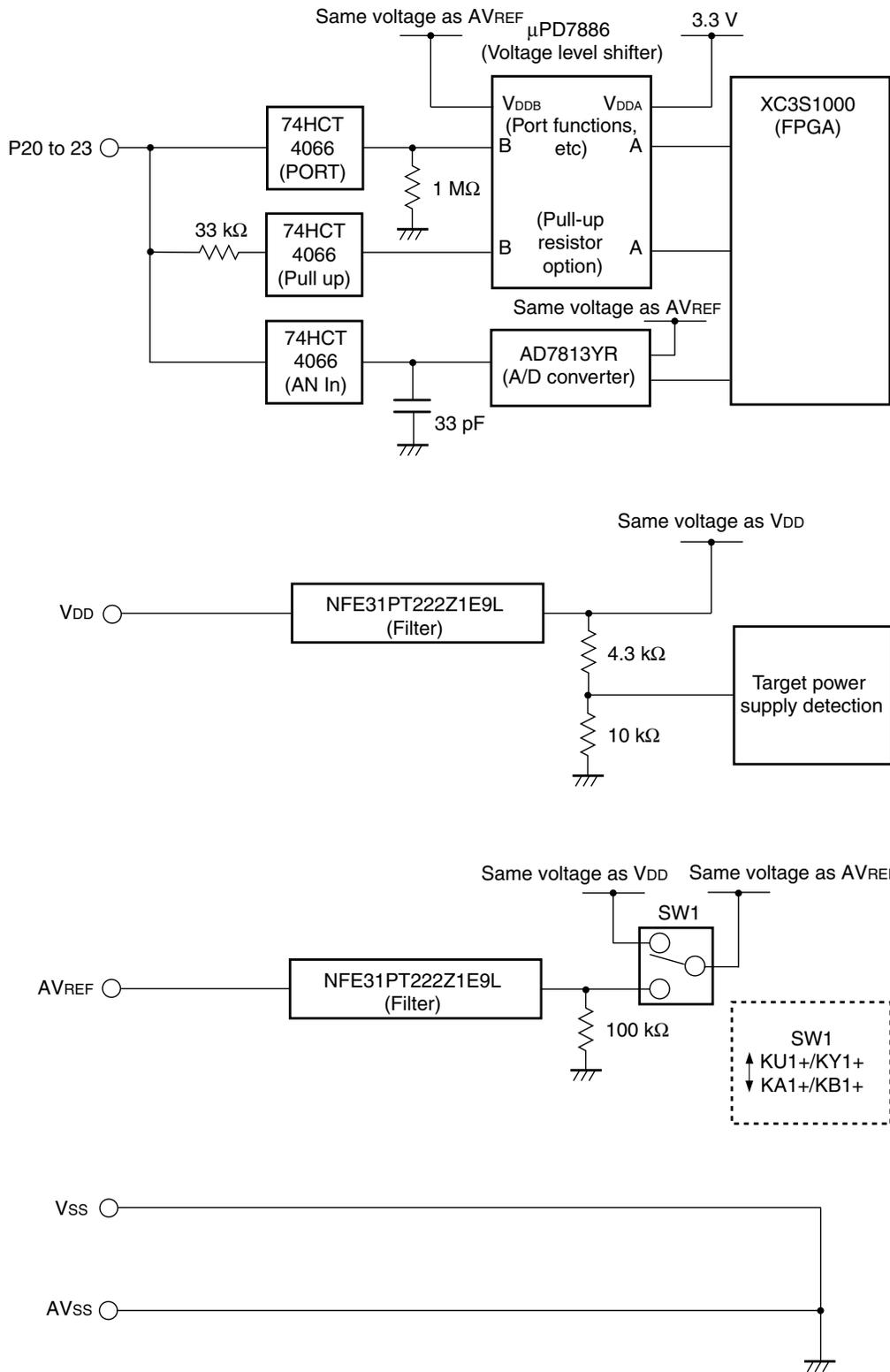


Figure A-1. Equivalent Circuit (2/2)

Target system side

QB-78K0SKX1 side



APPENDIX B REVISION HISTORY

B.1 Major Revisions in This Edition

Page	Description
CHAPTER 1 GENERAL	
p.12	Change of Table 1-4. Adapters and Connectors for Each Target Device

B.2 Revision History of Preceding Editions

Edition	Description	Chapter
2nd	Addition of Note 1 to "78K0S/KA1+" in Table 1-4. Adapters and Connectors for Each Target Device	CHAPTER 1 GENERAL
	Change of Remark of 1.4 System Configuration for Each Target Device	
	Change of Table 2-1. Clock Settings	CHAPTER 2 SETUP PROCEDURE
	Change of description of and addition of Remark to 2.3.1 Overview of clock settings	
	Change of Table 2-2. Settings for System Clock, figure, and Remarks 1 and 2	
	Change of description of and addition of Figure 2-5 and Remark to 2.3.3 How to set internal high-speed oscillation clock	
	Change and addition of description	CHAPTER 4 RESTRICTIONS
	Deletion of chapter	APPENDIX B PACKAGE DRAWINGS in 1st edition
	Addition of APPENDIX B REVISION HISTORY	APPENDIX B REVISION HISTORY

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