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User's Manual

QB-78K0SKX1MINI

In-Circuit Emulator

Target Devices

78K0S/KU1+
78K0S/KY1+
78K0S/KA1+
78K0S/KB1+

Document No. U17272EJ4V0UM00 (4th edition)
Date Published June 2007 NS

Printed in Japan

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1. Circumstances not covered by product guarantee

- If the product was disassembled, altered, or repaired by the customer
- If it was dropped, broken, or given another strong shock
- Use at overvoltage, use outside guaranteed temperature range, storing outside guaranteed temperature range
- If power was turned on while the AC adapter, USB interface cable, or target system connection was in an unsatisfactory state
- If the AC adapter cable, USB interface cable, target cable, 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 the product and target system were connected while a potential difference existed between the GND of the product and the GND of the target system
- If a connector or cable was removed while the power was being supplied to the product
- If an excessive load was placed on a connector or socket

2. Safety precautions

- If used for a long time, the product may become hot (50°C to 60°C). Be careful of low temperature burns and other dangers due to the product becoming hot.
- 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-78K0SKX1MINI. 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-78K0SKX1MINI.

Organization

This manual is divided into following parts.

- General
- Setup procedure
- Settings at product shipment
- Restrictions

How to Read This Manual

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.

To understand the overall functions and usages of the QB-78K0SKX1MINI

→ 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.

To know the manipulations, command functions, and other software-related settings of the QB-78K0SKX1MINI

→ See the user's manual of the debugger (supplied with the QB-78K0SKX1MINI) to be used.

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 following terms are used in this manual.

Target device	This is the device to be emulated.
Target system	This is the system to be debugged (user-specified system). It includes the target program and the user-specified hardware.
Emulation CPU	This is the CPU that executes the user program in the emulator.
On-chip debugging	On-chip debugging is a method by which a microcontroller is debugged while it is mounted in the target system so as to realize a debugging environment that is the same as the actual environment.

Related Documents

When using this manual, also refer to the following manuals.
The related documents indicated in this publication may include preliminary versions.
However, preliminary versions are not marked as such.

Documents related to development tools (user's manuals)

Document Name		Document No.
QB-78K0SKX1MINI In-Circuit Emulator		This manual
RA78K0S Ver. 2.00 Assembler Package	Operation	U17391E
	Language	U17390E
	Structured Assembly	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
PG-FPL2		U17307E
78K0S/KU1+		U18172E
78K0S/KY1+		U16994E
78K0S/KA1+		U16898E
78K0S/KB1+		U17446E

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

CONTENTS

CHAPTER 1 GENERAL

The QB-78K0SKX1MINI is an in-circuit emulator that incorporates the QB-78K0SMINI and QB-78K0SKX1-DA and is used to efficiently debug the hardware and software of the target device (78K0S/KU1+, 78K0S/KY1+, 78K0S/KA1+, or 78K0S/KB1+).

1.1 Features

- ○ Emulation using background monitoring method
  - • No user resources are used
- ○ Debug functions equivalent to on-chip debug emulator
  - • Access break function: Provided
  - • Pseudo real-time RAM monitor function (Break When Readout): Provided
- ○ Host interface is USB 2.0 compliant
- ○ USB power supply is used for QB-78K0SMINI
- ○ Power supply for QB-78K0SKX1-DA (AC adapter) supplied
  - • ACIN: 100 to 240 V supported
- ○ Target cable supplied
  - • Single-wire cables: Target interface of up to 30 pins supported
- ○ Includes integrated debugger (ID78K0S-QB)
- ○ Includes flash memory programmer (PG-FPL2)
- ○ Compact and lightweight
  - • The dimensions of the QB-78K0SMINI and the QB-78K0SKX1-DA are shown below.

Table 1-1. Dimensions of QB-78K0SKX1MINI

Item		QB-78K0SMINI	QB-78K0SKX1-DA
External dimensions	Height	26.1 mm	36.6 mm (spacer height: 25 mm)
	Width	56.5 mm	120 mm
	Depth	84.5 mm (88.5 mm including screws)	120 mm
Weight		Approximately 60 g	Approximately 100 g

- ○ Commercial IDE cable can be used as target interface cable

Figure 1-1. External Dimensions of QB-78K0SKX1MINI

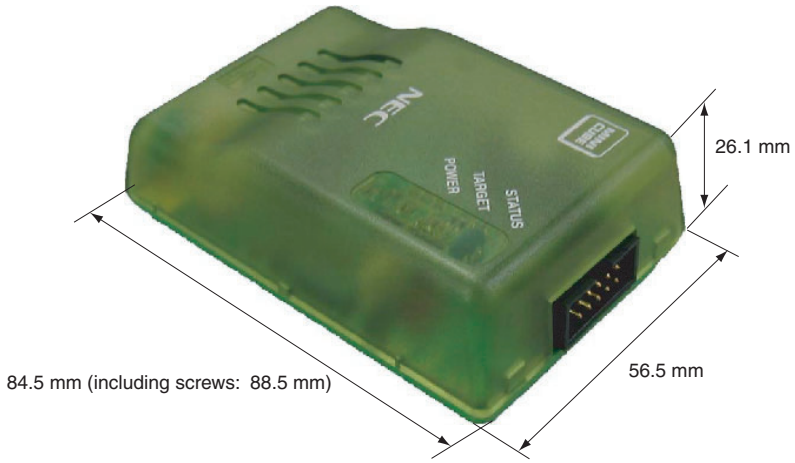
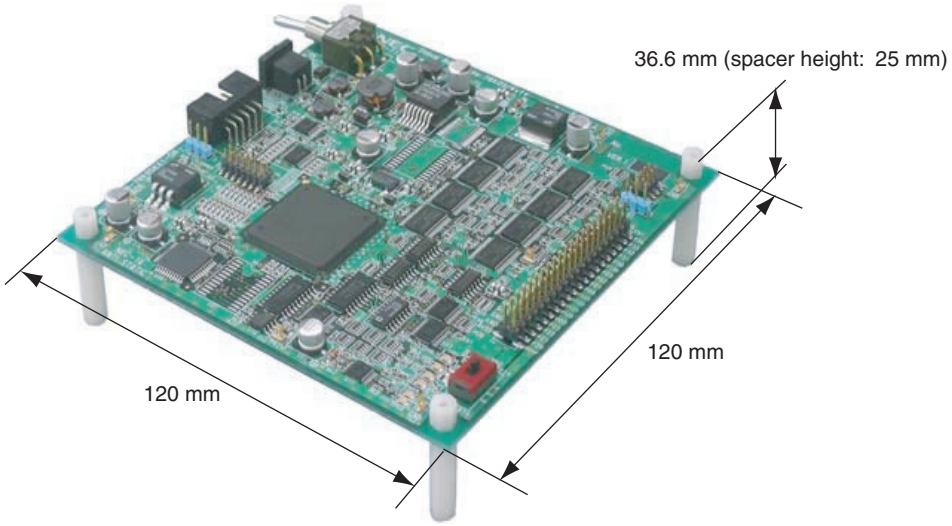


Figure 1-2. External Dimensions of QB-78K0SKX1-DA



1.2 Functional Specifications

Table 1-2. Product Specifications

Item	Specification
Target device	78K0S/KU1+: μPD78F9200, 78F9201, 78F9202, 78F9500, 78F9501, 78F9502 78K0S/KY1+: μPD78F9210, 78F9211, 78F9212, 78F9510, 78F9511, 78F9512 78K0S/KA1+: μPD78F9221, 78F9222 78K0S/KB1+: μPD78F9232, 78F9234
Operating power supply	QB-78K0SMINI: 5 V power supply via USB cable Maximum current consumption: 500 mA Since the maximum current consumption is 500 mA, be sure to use a self-powered hub when using a USB hub. QB-78K0SKX1-DA: 15 V power supply via AC adapter (supplied; supports 100 to 240 V) Internal voltage: 1.8 to 5.5 V Current consumption: 150 mA
Target interface power supply voltage (EV_{DD})	Power is supplied from target device 2.0 to 5.5 V (same level as target device)
System clock	Main clock 5 MHz is supplied internally. Oscillator or oscillator circuit can be mounted in QB-78K0SMINI Internal oscillation clock Internal high-speed oscillation clock: 8 MHz is supplied from oscillator circuit on QB-78K0SKX1-DA Internal low-speed oscillation: 250 kHz is supplied from oscillator circuit on QB-78K0SKX1-DA
System clock operating range	Same level as target device
Target host machine	PC-98NX Series, IBM PC/AT™ compatible
Host interface	Mini B connector for USB 2.0 (USB 1.1 compatible)
Supervisor	V850ES/KG1+, 20 MHz operation
Temperature characteristics	0 to 40°C
Storage temperature	−15 to +60°C (no condensation)

Table 1-3. List of Debug Functions

Item	Specification
Event-triggered break functions	No breaks before execution (if using software breaks) One access break
Software break functions	2000 points
Forced break functions	Included
Peripheral break functions	Included
Execution functions	Step execution, execution from cursor position, etc.
Slow motion	Included
RRM function	Enabled (16 bytes/implemented as instantaneous break.)
Register manipulation functions	Included
Forced reset functions	Included
Mask functions	Reset
SP setting overlook protection function	Included
Execution time measurement	Not included
Trace functions	Not included

Table 1-4. List of Peripheral Break Functions

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

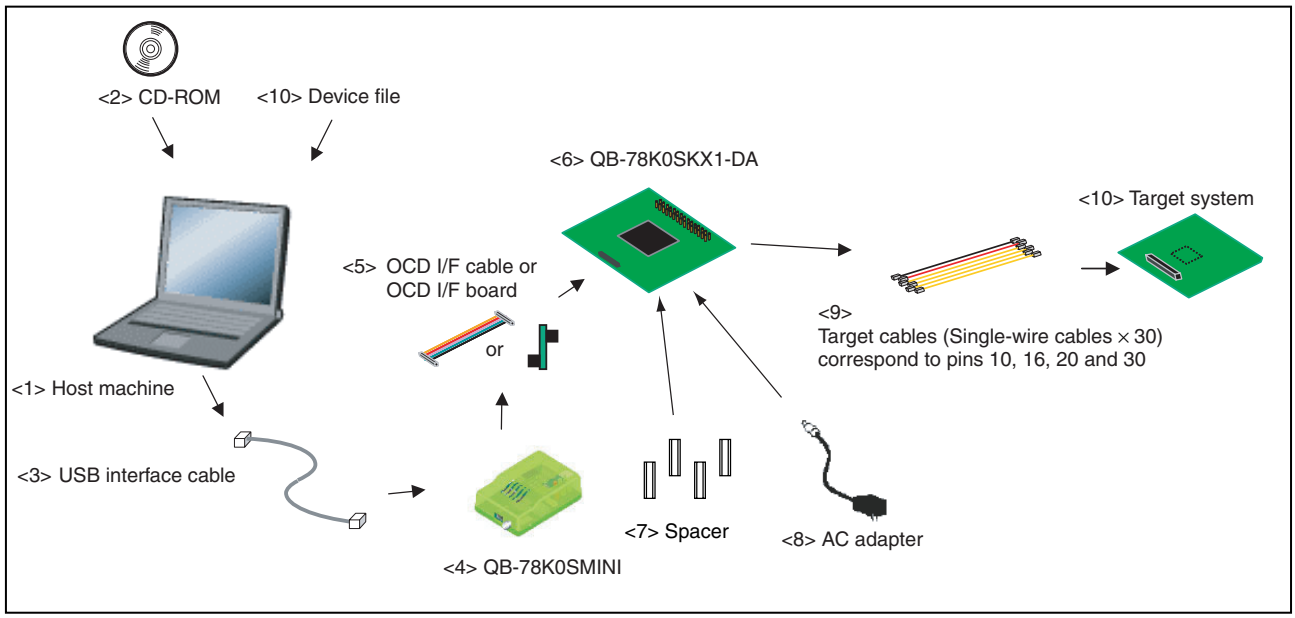
1.3 System Configuration

The system configuration when using the QB-78K0SKX1MINI is shown below.

When executing debugging by connecting the QB-78K0SMINI and QB-78K0SKX1-DA, do not connect the device to the target system. However, be sure to connect the device when writing to the flash memory using the PG-FPL2.

See the **PG-FPL2 User's Manual (U17307E)** to confirm the system configuration when writing to the flash memory.

Figure 1-3. System Configuration (For Emulation)



<1> Host machine (sold separately): Includes USB port. PC-98NX series, PC/AT compatible can be used
<2> CD-ROM (supplied): Integrated debugger ID-78K0S-QB, USB drivers, and user's manual
<3> USB interface cable (supplied): Cable connecting QB-78K0SKX1MINI to host machine
<4> QB-78K0SMINI: This product
<5> OCD I/F cable, OCD I/F board (supplied):
I/F cable, I/F board connecting QB-78K0SMINI and QB-78K0SKX1-DA
<6> QB-78K0SKX1-DA: This product
<7> Spacer (supplied): 25 mm in height
<8> AC adapter (supplied): Can support 100 to 240 V by replacing AC plug
<9> Target cable (supplied): I/F cable connecting QB-78K0SKX1-DA and target system.
<10> Device file: Download from the NEC Electronics Website.
(URL: http://www.necel.com/micro/ods/eng/index.html)
<11> Target system (sold separately): Target board based on user's specifications.
When using the QB-78K0SKX1MINI connected to the target system, do not connect the device.

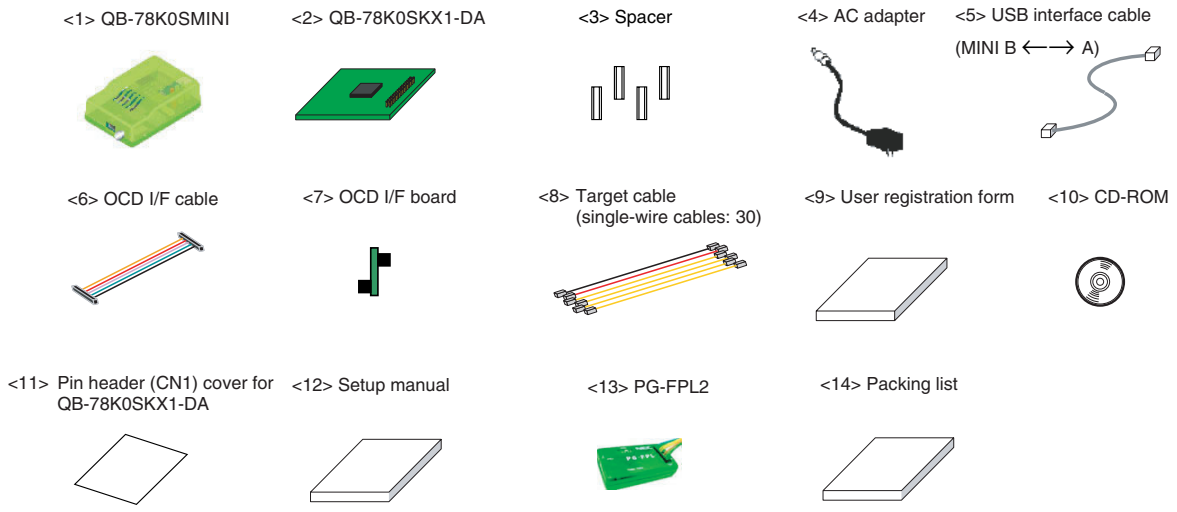
1.4 Package Contents

The following packaging is used with the QB-78K0SKX1MINI.

Make sure all of these items are included. If any items are missing or damaged, please contact an NEC Electronics sales representative or distributor.

Also, be sure to fill out and return the enclosed user registration form.

Figure 1-4. Package Contents



<1>	QB-78K0SMINI:	1
<2>	QB-78K0SKX1-DA:	1
<3>	Spacer for QB-78K0SKX1-DA:	4
<4>	AC adapter:	1
<5>	USB interface cable (MINI B ⟷ A) (length: 2m):	1
<6>	OCD I/F cable (length:20 cm):	1
<7>	OCD I/F board:	1
<8>	Target cable:	1 set (single-wire cables: 30)
<9>	User registration form:	1
<10>	CD-ROM:	2 (ID78K0S-QB Disk/Accessory Disk)
<11>	Pin header (CN1) cover for QB-78K0SKX1-DA:	1
<12>	Setup manual:	1
<13>	PG-FPL2:	1
<14>	Packing list:	1

CHAPTER 2 SETUP PROCEDURE

This chapter explains the QB-78K0SKX1MINI hardware setting and function setup procedure.

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

Perform setup according to the following procedure.

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

See **2.5 Connecting QB-78K0SKX1-DA to Target System** for how to connect the QB-78K0SKX1-DA to the target system.

Clock settings

The QB-78K0KX1MINI operates on the QB-78K0SMINI internal clock of 5 MHz.
If modification of the frequency is necessary, see **2.2 Clock Settings**.
Internal high-speed oscillation clock: 8 MHz (fixed)
Internal low-speed oscillation clock: 250 kHz (fixed)

↓

Target device selection

The target device is set as the 78K0S/KA1+ or 78K0S/KB1+ at shipment.
To emulate the 78K0S/KU1+ or 78K0S/KY1+, see **2.3 Target Device Selection**.

↓

Software settings

See **2.4 Software Settings**.

↓

Connection and Startup Procedures

See **2.6 Connection and Startup Procedure**.

2.1 Names and Functions of Hardware

2.1.1 Names of parts in QB-78K0SMINI

Figure 2-1. Main Unit (Top View)

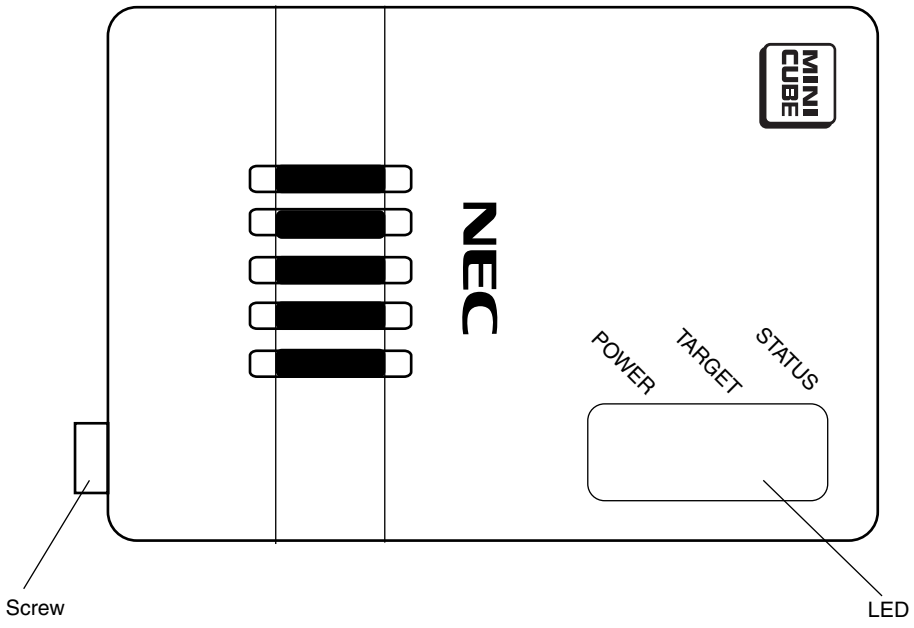


Figure 2-2. Main Unit (Side Views)

(a) Left side

(b) Right side

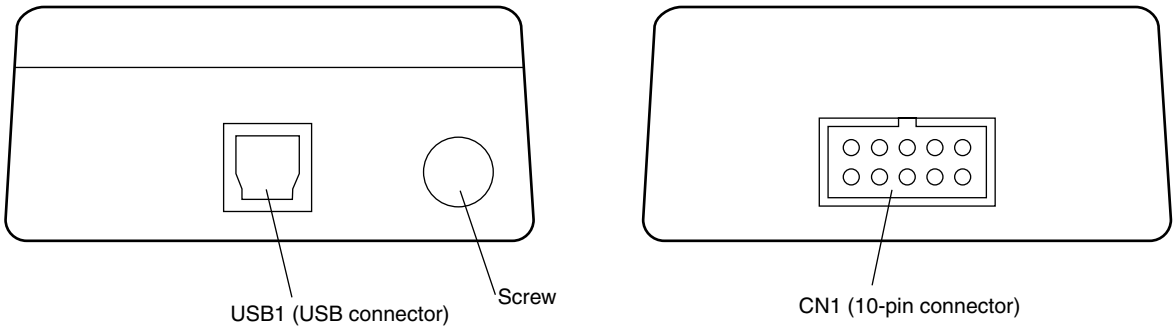
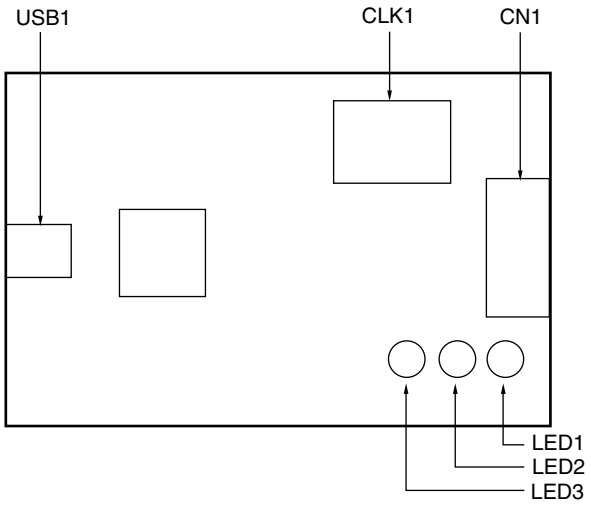


Figure 2-3. External View of Board



(1) USB1

This is a MINI B-compatible connector supporting USB 2.0. This connector is used to connect the QB-78K0SMINI to the host machine via a USB cable.

(2) CN1

This is a double-row 2.54 pitch type 10-pin connector with a groove for preventing reverse insertion. This connector is used to connect the QB-78K0SKX1-DA via an OCD I/F cable or using an OCD I/F board.

(3) LEDs

Three LEDs are included as status display devices.

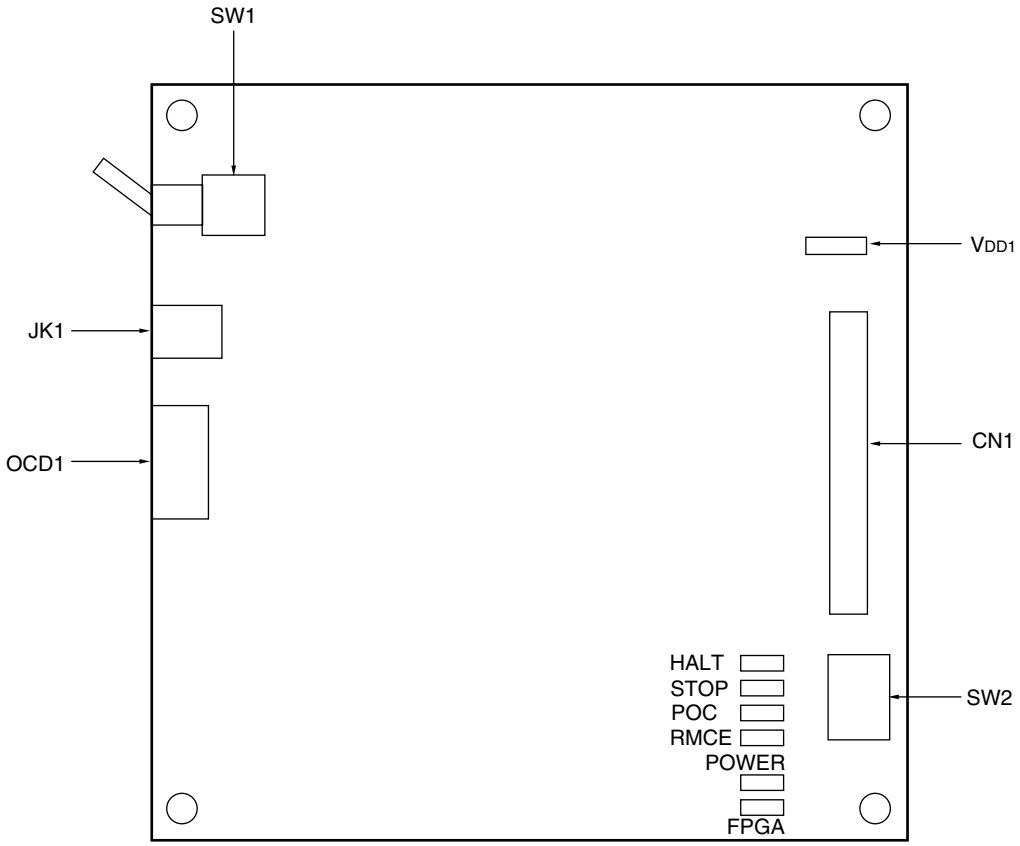
Name	Display Function		Remark
LED1	STATUS (RUN, BREAK, DOWNLOAD)		RUN: Blinking (slow) After break or debugger start: ON DOWNLOAD: Blinking (fast) Before starting debugger: OFF
LED2	TARGET	Before starting debugger	When target voltage is 1.8 V or higher: ON When target voltage is lower than 1.8 V: OFF
		After starting debugger	When target voltage = POC voltage or higher: ON When target voltage is lower than POC voltage: OFF
LED3	POWER		With power supplied from host machine: ON Without power supplied from host machine: OFF

(4) CLK1

A 14-pin DIP socket is mounted here. This socket can be used for a 14-pin type oscillator (5 V) or to configure an oscillator circuit.

2.1.2 Names of parts in QB-78K0SKX1-DA

Figure 2-4. Diagram of QB-78K0SKX1-DA Main Unit



(1) OCD1

This is a double-row 2.54 pitch type 10-pin connector with a groove for preventing reverse insertion.

This connector is used to connect the QB-78K0SKX1-DA to the QB-78K0SMINI via an OCD I/F cable or OCD I/F board.

(2) LEDs

These LEDs indicate the status of the QB-78K0SKX1-DA.

Name	Function When ON	Function When OFF
POWER	Power supply of QB-78K0SKX1-DA is ON	Power supply of QB-78K0SKX1-DA is OFF
FPGA	Configuration of FPGA for emulation is complete	Configuration of FPGA for emulation is not complete
HALT	System is in HALT mode	Normal operation
STOP	System is in STOP mode	Normal operation
POC	When the target system is connected: Internal reset due to POC has occurred When the target system is not connected: V_{DD} = 0 V is detected	When the target system is connected: Normal operation When the target system is not connected: Does not turn off
RMCE	During the RMCE bit is being used as P34 pin, reset is masked	RMCE bit of option byte is being used as RESET pin

(3) Switch settings

SW1: Power supply switch. Set to OFF at shipment.

SW2: Target device selection switch. Set to 78K0S/KA1+, 78K0S/KB1+ at shipment.

(4) V_{DD1}

V_{DD1} is a service pin. It outputs 3.3 V.

(5) CN1

This is a male 40-pin pin header.

- Pin header specifications:
  0.64 mm × 0.64 mm (height: 5.84 mm)

This header supports an IDE connector and is used to connect the QB-78K0SKX1-DA to the target system via the target cable.

2.2 Clock Settings

The setting of the clock to be used differs depending on whether an oscillator or oscillator circuit (clock) is mounted in CLK1 of the QB-78K0SMINI.

Clock Setting	QB-78K0SKX1MINI	
	Clock Is Not Mounted in CLK1 of QB-78K0SMINI (Setting at Shipment)	Clock Is Mounted in CLK1 of QB-78K0SMINI
Selection of system clock source	"System" is automatically selected as Main Clock in the Configuration dialog box of the debugger	"Clock Board" is automatically selected as Main Clock in the Configuration dialog box of the debugger
Crystal/ceramic oscillation clock	Internal clock of QB-78K0SMINI (5 MHz)	Clock on CLK1 (500 kHz to 10 MHz)
External clock input		
Internal high-speed oscillation clock	Internal high-speed oscillation clock (8 MHz fixed)	
Internal low-speed oscillation clock	Internal low-speed oscillation clock (250 kHz fixed)	

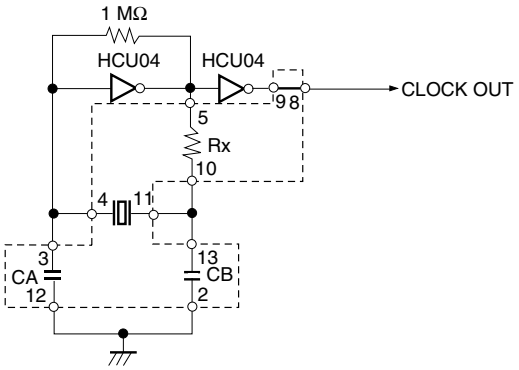
2.2.1 Clock settings on QB-78K0SMINI side

The clock socket (CLK1) of the QB-78K0SMINI does not mount an oscillator or an oscillator circuit at shipment. The socket specifications are shown in (a) to (d) below.

Note that an oscillator circuit can also be configured by mounting a parts board such as the 160-90-314 (product of PRECI-DIP) in the socket. 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 CLK1 is shown in (e).

Caution Be sure to mount the clock in and remove it from the socket with the power supply to the emulator switched off.

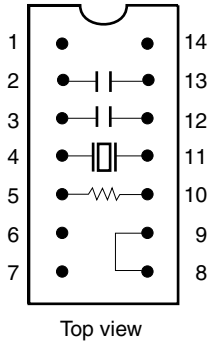
(a) Equivalent circuit



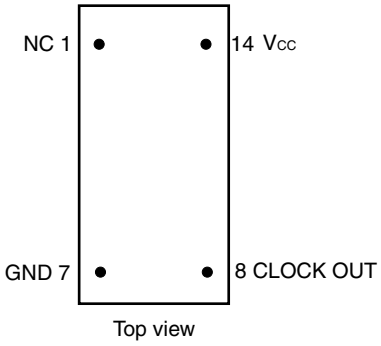
(b) Mounted parts

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

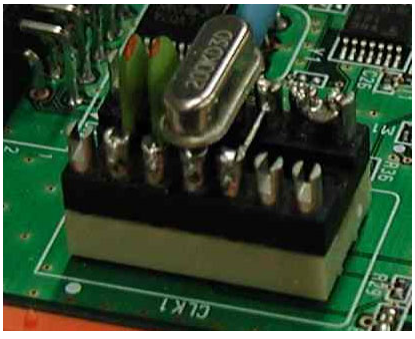
(c) Example of mounting parts board (oscillator circuit parts)



(d) Supported clock module pin assignment



(e) Parts board mounted in CLK1



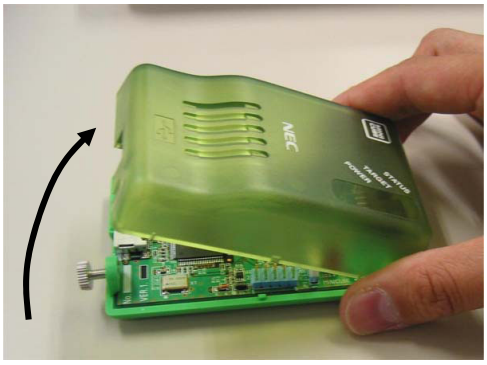
2.2.2 Mounting a clock

Mount an oscillator or oscillator circuit in the clock socket of the QB-78K0SMINI according to the procedure shown below.

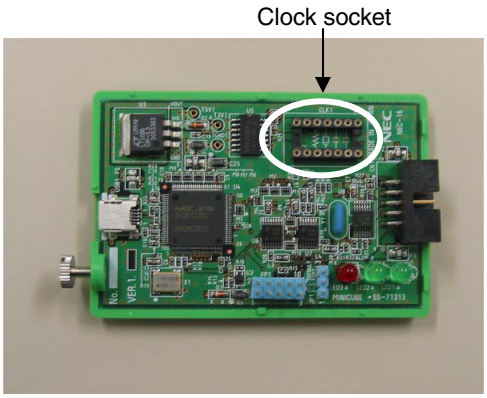
Caution Be sure to mount the clock in and remove it from the socket with the power supply to the emulator switched off.

(1) Loosen the QB-78K0SMINI's screw.

(2) Remove the cover.

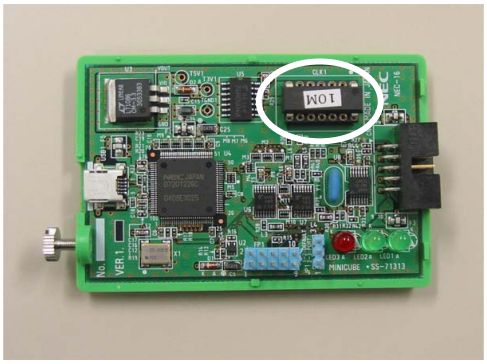


Use the interface connector side as a reference point when lifting the USB connector side.
The product appears as shown below when the cover has been removed.



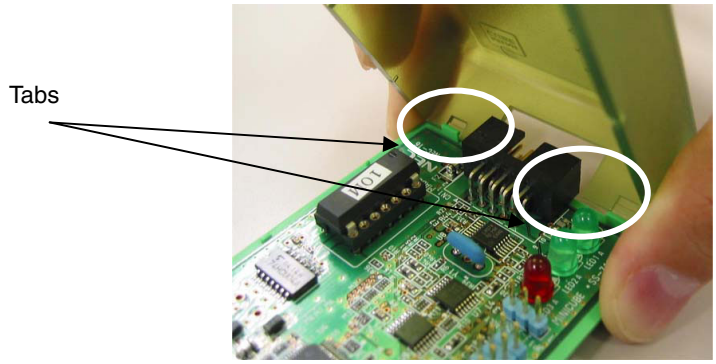
(3) Insert an oscillator or oscillator circuit.

Insert the oscillator or oscillator circuit to be used into the clock socket (the figure shows an oscillator).

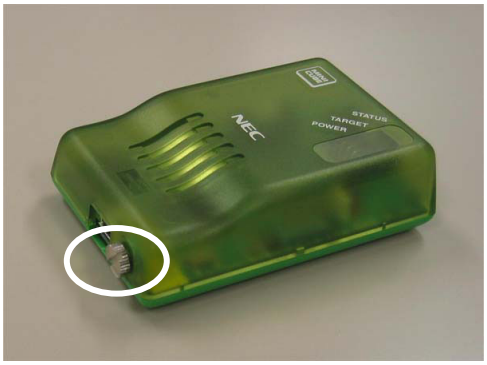


(4) Replace the cover.

Make sure that the cover is aligned with the two tabs on the interface connector side.



(5) Close the cover and tighten the screw.



This completes the clock mounting procedure.

2.2.3 Clock settings on QB-78K0SKX1-DA side

(1) Internal high-speed oscillation clock operation

An 8 MHz clock supplied from the oscillator circuit on the QB-78K0SKX1-DA is used for internal high-speed oscillation clock emulation.

(2) Internal low-speed oscillation clock operation

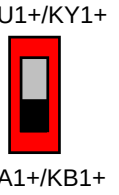
A 250 kHz clock supplied from the oscillator circuit on the QB-78K0SKX1-DA is used for internal low-speed oscillation clock emulation.

2.3 Target Device Selection

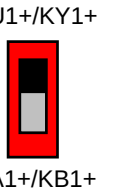
The target device is set by using SW2 on the QB-78K0SKX1-DA.
When emulating the 78K0S/KA1+ or 78K0S/KB1+: Set to KA1+/KB1+ side (3-6 pin side)
When emulating the 78K0S/KU1+ or 78K0S/KY1+: Set to KU1+/KY1+ side (1-4 pin side)

Figure 2-5. SW2 Setting

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



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



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

2.4 Software Settings

See the document **ID78K0S-QB Operating Precautions** supplied with the debugger (ID78K0S-QB) for details.

2.5 Connecting QB-78K0SKX1-DA to Target System

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

CN1 of the QB-78K0SKX1-DA 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 cable (single-wire cables)
  Red: 250 mm cable for power supply line (connected to V_{DD} and AV_{REF} pins) × 2
  Black: 250 mm cable for GND line (connected to V_{SS} and AV_{SS} pins) × 2
  Yellow: 250 mm cable for general signals × 26

- Specifications of target system pin header:
  0.635 mm × 0.635 mm (height: 6 mm)
  When mounting the pin header, ensure that the pin pitch is at least 2.54 mm.

CN1 of the QB-78K0SKX1-DA incorporates a 40-pin pin header, so by mounting an IDE connector on the target system, the QB-78K0SKX1-DA can also be connected to the target system using a commercial IDE cable (ATA33 standard).

The pins in CN1 correspond functionally to the pins of the target device (pins 8, 16, 20, and 30). The functions of the target device pins can be switched using the target device selection switch (SW2). The attached document **QB-78K0SKX1-DA Pin Header (CN1) Covers** that indicates the signal name of the target device pins is provided. Use the appropriate cover by cutting it off from the document along the lines with scissors or a cutter, and cover the CN1 on the QB-78K0SKX1-DA with it.

Cautions 1. Be careful not to hurt yourself with scissors or a cutter when cutting off the QB-78K0SKX1-DA pin header (CN1) covers.

2. When emulating other than the 78K0S/KB1+, do not connect target I/F (pin header) pins that have not been assigned pin functions (unused pins) to anything.

Figure 2-6. Connection of QB-78K0SKX1-DA to Target System

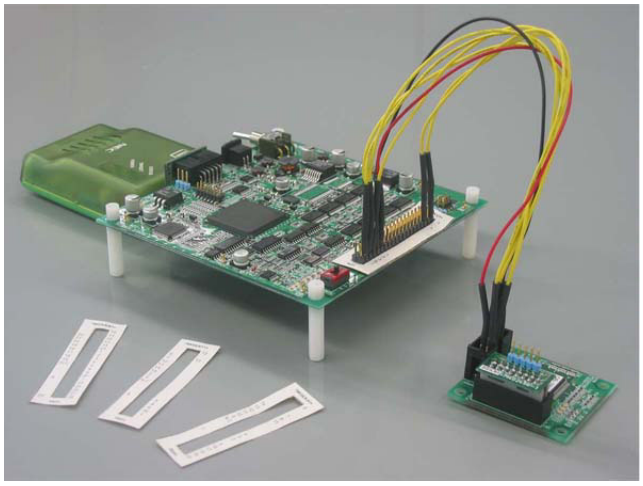


Table 2-1. Pin Correspondence

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	–	–	AV_{REF} (20)	AV_{REF} (28)
2	–	–	–	AV_{SS} (29)
3	P20/ANI0/TI000/TOH1(1)	P20/ANI0/TI000/TOH1(1)	P20/ANI0 (19)	P20/ANI0 (27)
4	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
7	P22/X2/ANI2 (6)	P22/X2/ANI2 (9)	P22/ANI2 (17)	P22/ANI2 (25)
8	GND		GND	GND
9	P23/X1/ANI3 (5)	P23/X1/ANI3 (8)	P23/ANI3 (16)	P23/ANI3 (24)
10	GND		GND	GND
11	V_{DD} (4)	V_{DD} (5)	V_{DD} (5)	V_{DD} (7)
12	V_{SS} (3)	V_{SS} (4)	V_{SS} (1)	V_{SS} (6)
13	–	–	–	P120 (30)
14	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/$\overline{\text{RESET}}$ (7)	P34/$\overline{\text{RESET}}$ (12)	P34/$\overline{\text{RESET}}$ (6)	P34/$\overline{\text{RESET}}$ (10)
40	GND	GND	GND	GND

Remark –: Pins not required in target device GND: Connected to V_{SS} (pin 12) on the QB-78K0SKX1-DA

( ): The number in the parentheses indicates the pin number in the target device.

2.6 Connection and Startup Procedures

2.6.1 Connecting QB-78K0SMINI to related devices

Follow the steps described below when connecting the QB-78K0SMINI to other related devices.

Caution Before connecting to any related device, be sure to install the integrated debugger (ID78K0S-QB) and USB driver in the host machine.
Download the device file from NEC Electronics Website.
(URL: http://www.necel.com/micro/ods/eng/index.html)

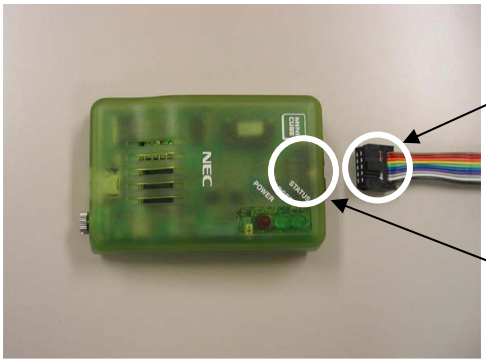
(1) Connecting the QB-78K0SMINI to the QB-78K0SKX1-DA

Insert the spacer supplied with the QB-78K0SKX1-DA.

(a) Connecting the QB-78K0SMINI to the QB-78K0SKX1-DA using the supplied OCD I/F probe

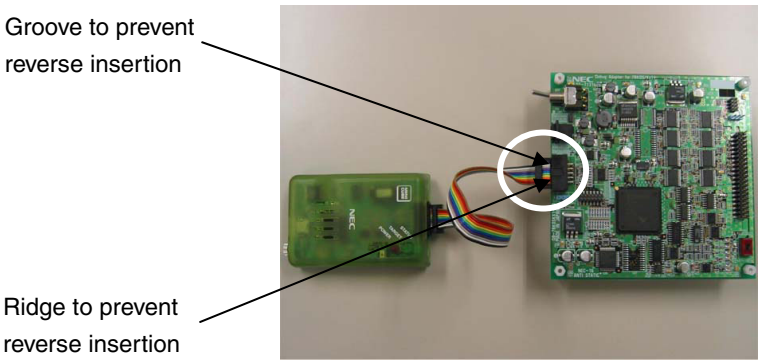
<1> QB-78K0SMINI side

Align the ridge in the OCD I/F probe socket with the groove in the QB-78K0SMINI's interface connector for preventing reverse insertion and insert the socket into the connector.



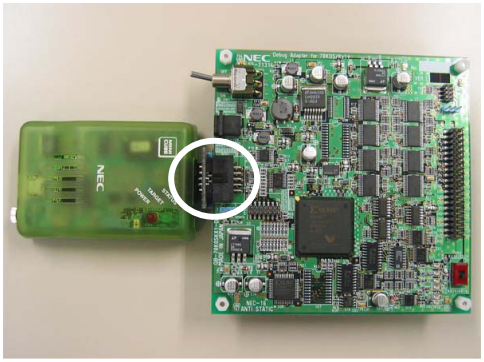
<2> QB-78K0SKX1-DA side

Align the ridge in the OCD I/F probe socket with the groove in the target connector on the QB-78K0SKX1-DA side for preventing reverse insertion and insert the socket into the connector.



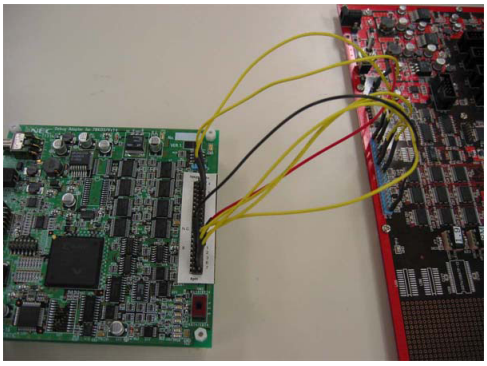
(b) Connecting the QB-78K0SMINI to the QB-78K0SKX1-DA using the supplied OCD I/F board

The OCD I/F board is made to handle differences in height between the QB-78K0SMINI and QB-78K0SKX1-DA connectors. Connect the QB-78K0SMINI connector to the connector (CN1) on the OCD I/F board, and connect the QB-78K0SKX1-DA connector to the connector (CN2) on the OCD I/F board.



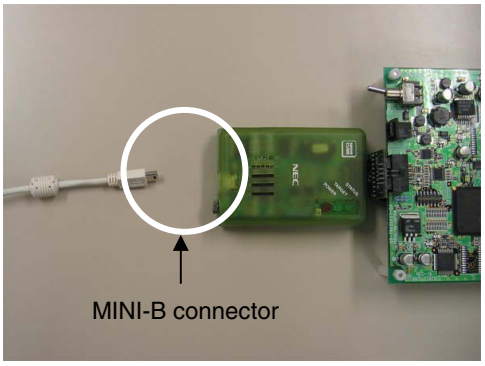
(2) Connecting the QB-78K0SKX1-DA to the target system

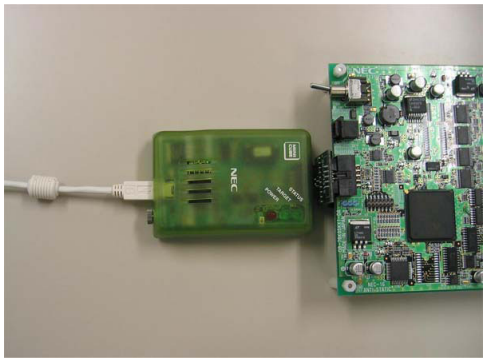
Connect the CN1 connector on the QB-78K0SKX1-DA to the target board connector in accordance with the pin assignment of the target device. See **2.5 Connecting QB-78K0SKX1-DA to Target System** for details. Be sure that the power supply to the target system is turned off.



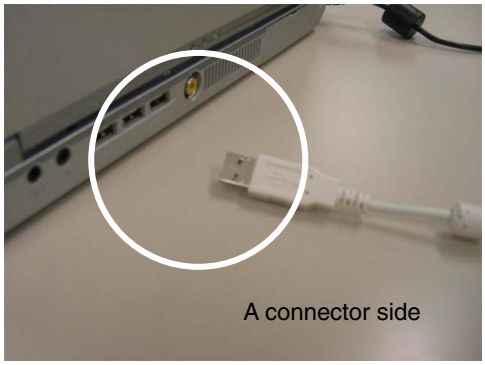
(3) Connecting the USB interface cable (QB-78K0SMINI side)

Connect the USB interface cable's MINI-B connector to the QB-78K0MINI's USB connector.

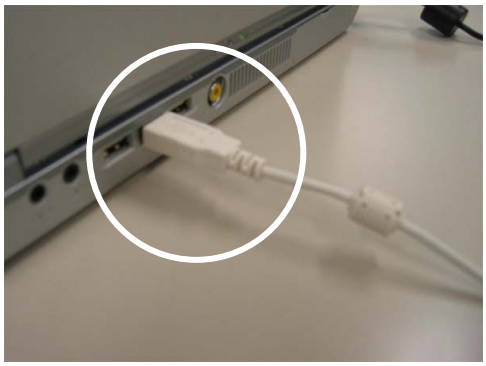




(4) Connecting the USB interface cable (host machine side)



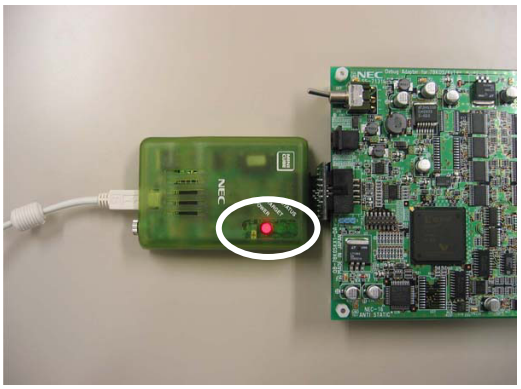
Connect the supplied USB interface cable's A connector to the host machine's USB port.



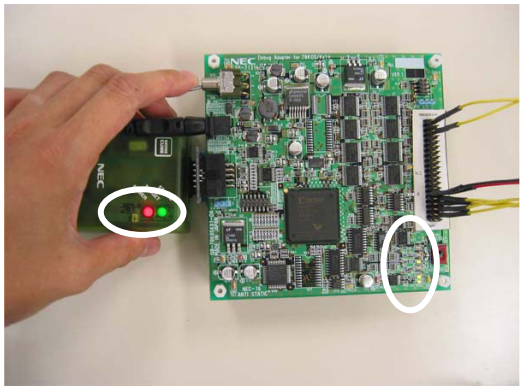
(5) Applying power

The procedure for applying power is described below using the case where a target system is connected as an example.

When the USB interface cable is connected to the host machine, only the QB-78K0MINI's POWER LED is ON (the QB-78K0SMINI's power is ON, the QB-78K0SKX1-DA's power is OFF, and the target system's power is OFF).



When turning on the power with the QB-78K0SKX1-DA connected via the AC adapter, the QB-78K0SKX1-DA's POWER LED is ON and when applying power to the target system, the QB-78K0SKX1-DA's POC is OFF (the QB-78K0SMINI's power is ON, the QB-78K0SKX1-DA's power is ON, and the target system's power is ON).



(6) Starting up ID78K0S-QB

After making sure the power is supplied to the QB-78K0SMINI, QB-78K0SKX1-DA, and the target system, start up the ID78K0S-QB.

When the target system is not connected, select the "Not Permit" on the Target Power Off setting on the ID78K0S-QB configuration dialog box.

2.6.2 Disconnecting QB-78K0SMINI from related devices

Follow the steps described below when disconnecting the QB-78K0SKX1MINI from other related devices.

(1) Exit the ID78K0S-QB.

(2) Turn off the power to the target system.

(3) Turn off the power to the QB-78K0SKX1-DA.

(4) Remove the AC adapter from the QB-78K0SKX1-DA.

(5) Remove the USB interface cable from the QB-78K0SMINI and the host machine.

(6) Remove the QB-78K0SMINI and QB-78K0SKX1-DA from the target system.

Table 3-1. Settings of QB-78K0SMINI at Shipment

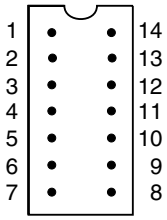
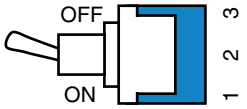
Item	Setting	Remarks
CLK1		Socket for mounting an oscillator or oscillator circuit. See **2.2 Clock Settings** for details.

Table 3-2. Settings of QB-78K0SKX1-DA at Shipment

Item	Setting	Remarks
SW1		This is the power supply switch. This switch is set to OFF at shipment.
SW2	KU1+/KY1+  KA1+/KB1+	This is the target device selection switch. This switch is set to 78K0S/KA1+, 78K0S/KB1+ at shipment.

CHAPTER 4 RESTRICTIONS

The following restrictions apply to the QB-78K0SKX1MINI.

- When the μPD78F950x is selected as the target device, the P34/$\overline{\text{RESET}}$ pin is subject to the following restrictions.
  The QB-78K0SKX1MINI is not pulled up even if bit 4 (PU34) of the pull-up resistor option register (PU3) is set to “Connect internal pull-up resistor”. Neither is it pulled up if bit 4 (RPRCE) of the option byte is set to “Connect internal pull-up resistor”.
- 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-78K0SKX1MINI) according to the option byte (OSCSEL1, OSCSEL0) setting as follows.

When the target device is other than the μPD78F950x

Option Byte		Device	Tool
OSCSEL1	OSCSEL0		
0	0	Crystal/ceramic oscillation clock	System clock on QB-78K0SMINI
0	1	External clock input	System clock on QB-78K0SMINI
1	x	Internal high-speed oscillation clock	Internal high-speed oscillation clock of QB-78K0SMINI

When the target device is the μPD78F950x

Option Byte		Device	Tool
OSCSEL1	OSCSEL0		
0	0	Internal high-speed oscillation clock	Setting prohibited
0	1	External clock input	System clock on QB-78K0SMINI
1	x	Internal high-speed oscillation clock	Internal high-speed oscillation clock of QB-78K0SMINI

- As the internal low-speed oscillation clock, the QB-78K0SKX1MINI uses a 250 kHz clock that is supplied from oscillator circuit. As the internal high-speed oscillation clock, the QB-78K0SKX1MINI uses a 8 MHz clock that is supplied from oscillator circuit. Note that the clock characteristics differ from those of the target device.
- The QB-78K0SKX1MINI has 256 KB of RAM. However, 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 without your knowledge.
- The characteristics of the AD converter, LVI, and ports are not fully equivalent to those of the device.
  Pull-down resistors have also been inserted at the port signals to protect the target I/F. See **APPENDIX A TARGET INTERFACE EQUIVALENT CIRCUIT** for details.
- AV_{SS} and V_{SS} are equivalent on the QB-78K0SKX1MINI.
- When using the QB-78K0SKX1MINI, a correct AD conversion result can be obtained even without waiting for 1 μs 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-DA always operate for the 78K0S/KB1+. Therefore, while the emulation is performed for 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. The multiplication instruction execution is enabled while the emulation is performed for 78K0S/KA1+, KU1+, and KY1+.
- The target interface circuit of the QB-78K0SKX1MINI does not use Schmitt-triggered I/O with hysteresis characteristics. Note that the I/O characteristics of the QB-78K0SKX1MINI differ from those of the target device.
- Device file version

  Use the combinations that satisfy the table below.

  The device file can be downloaded from the NEC Electronics Microcontrollers and Microprocessors website.

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

Target Device	Control Code	Device File
78K0S/KA1+: μPD78F9221, 78F9222	A or later	DF789222 V2.00 or DF789234 V2.00 or later
78K0S/KU1+: μPD78F9200, 78F9201, 78F9202	A or later	DF789234 V2.11 or later

APPENDIX A TARGET INTERFACE EQUIVALENT CIRCUIT

This chapter explains the differences between the signal lines of the target interface circuit of the QB-78K0SKX1MINI and the signal lines of the target device.

Although the target device is a CMOS circuit, the target interface circuit of the QB-78K0SKX1MINI 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-78K0SKX1MINI, the QB-78K0SKX1MINI emulates just as if the actual target device were operating on the target system.

However, small differences arise because the QB-78K0SKX1MINI actually is emulating.

The target interface equivalent circuit of the QB-78K0SKX1MINI is shown in Figure A-1 below.

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

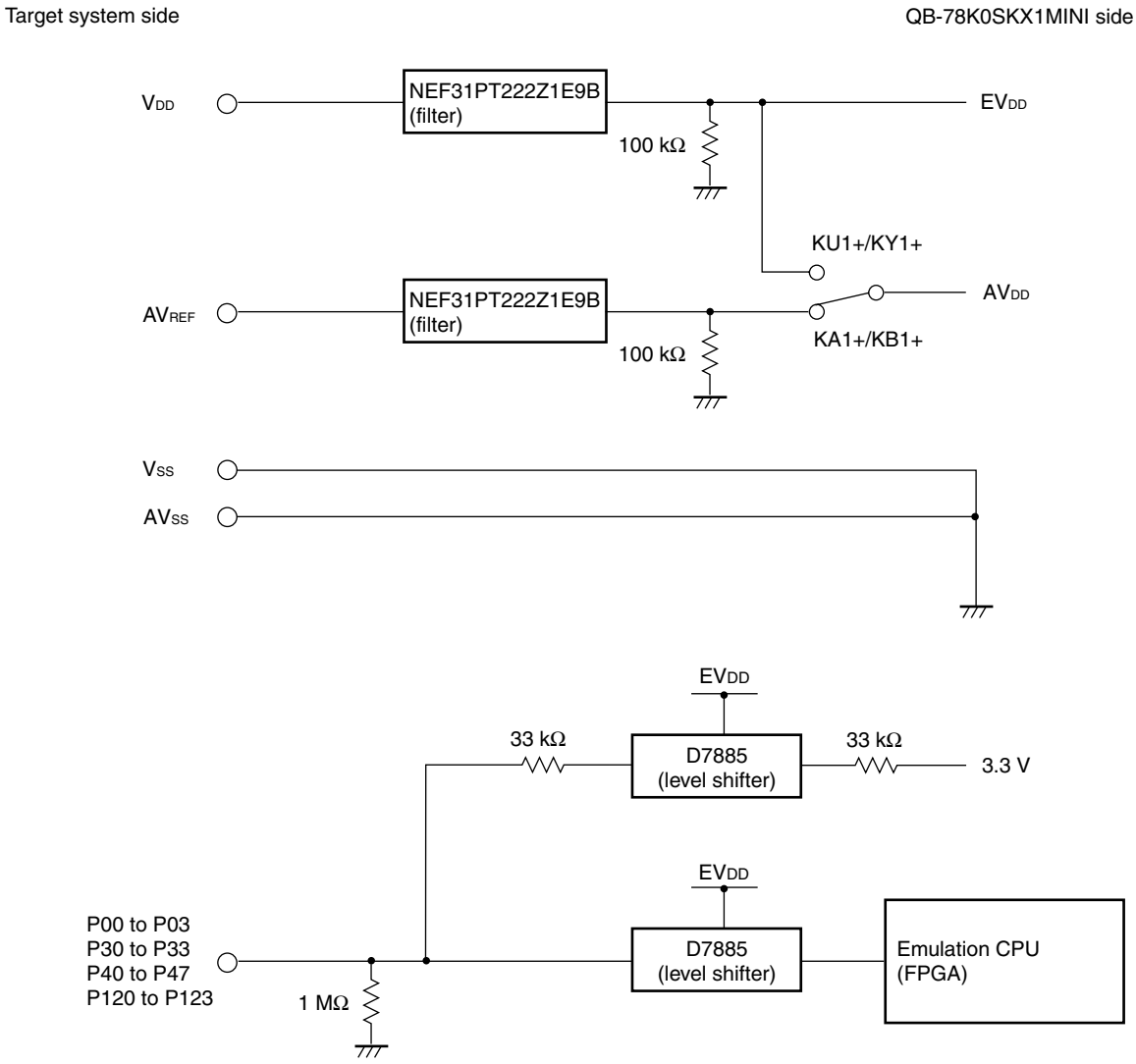
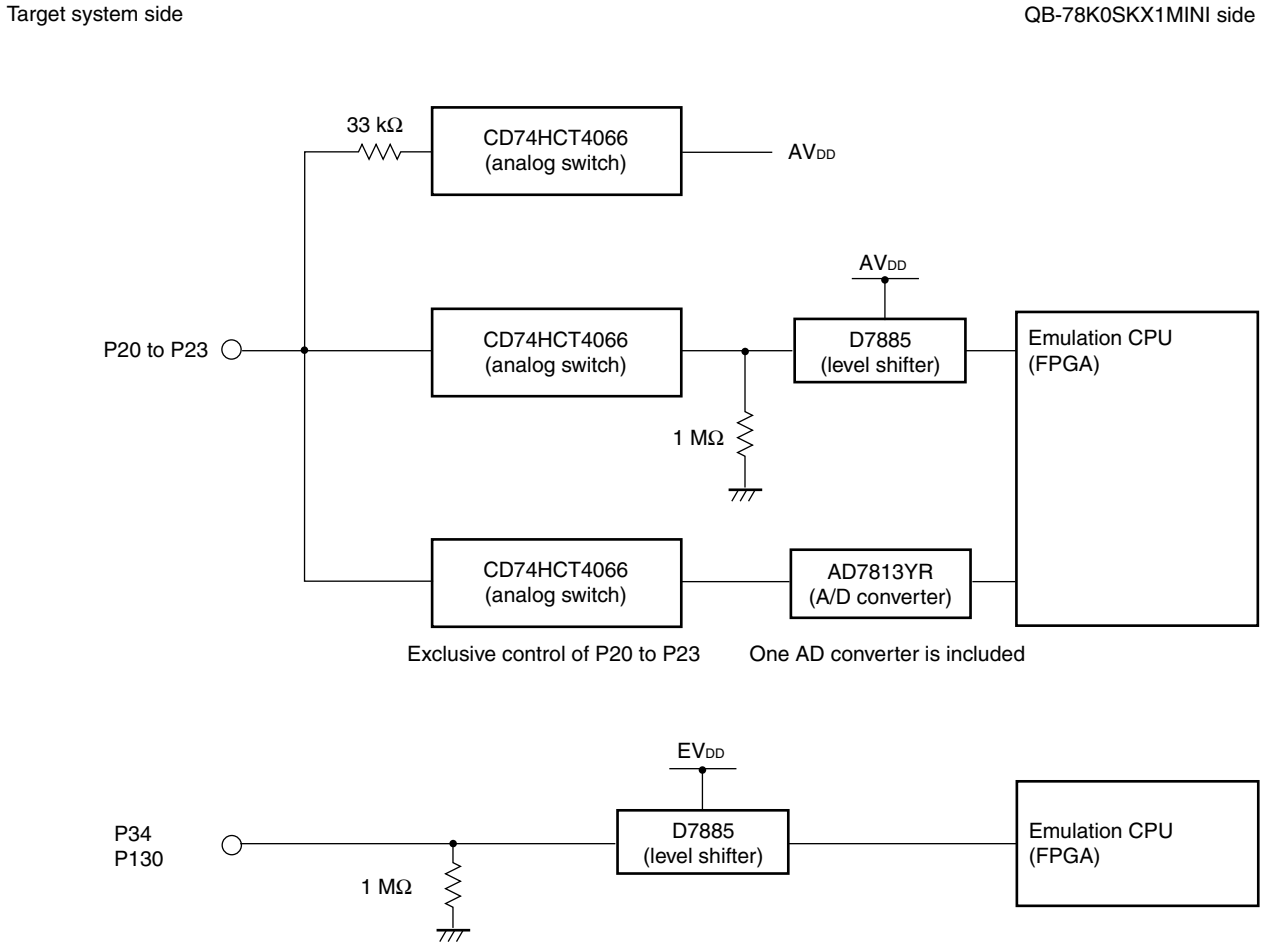


Figure A-1. Equivalent Circuit (2/2)



APPENDIX B REVISION HISTORY

B.1 Major Revisions in This Edition

Page	Description
CHAPTER 1 GENERAL	
p.11	**1.3 System Configuration** Deletion of **1.3.1 AC adapter**

B.2 Revision History of Preceding Editions

Edition	Description	Chapter
2nd	**1.1 Features** Deletion of the following description " ○ Can operate as an on-chip debug emulator just by using QB-78K0SMINI (under study)"	**CHAPTER 1 GENERAL**
	Table 1-2. Product Specifications Change of each part Number in 78K0S/KU1+	
	Figure 1-3. System Configuration (For Emulation) Change of description in <9>	
	Change of **Table 2-1. Pin Correspondence**	**CHAPTER 2 SETUP PROCEDURE**
	Addition of description	**CHAPTER 4 RESTRICTIONS**
	Addition of **APPENDIX B REVISION HISTORY**	**APPENDIX B REVISION HISTORY**
3rd	**Table 1-2. Product Specifications** Change of “Target device”	**CHAPTER 1 GENERAL**
	Table 1-4. List of Peripheral Break Functions Change of description and deletion of **Remark**	
	1.3 System Configuration Change of description in <10>	
	Figure 1-4. Package Contents Change of description in <10>	
	2.6.1 Connecting QB-78K0SMINI to related devices Change of **Caution**	**CHAPTER 2 SETUP PROCEDURE**
	Change and addition of description	**CHAPTER 4 RESTRICTIONS**
	Addition of **B.2 Revision History of Preceding Editions**	**APPENDIX B REVISION HISTORY**

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