CUSTOMER NOTIFICATION

ZUD-CD-09-0139	1/31
August 3, 2009	

Preliminary User's Manual

QB-78K0RFX3

In-Circuit Emulator

Target Devices:

78K0R/FB3
78K0R/FC3
78K0R/FE3
78K0R/FF3
78K0R/FG3

[MEMO]

General Precautions for Handling This Product

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 connection to the target system was in an unsatisfactory state
   - If the cable of the AC adapter, the USB interface cable, the emulation probe, or the like was bent or pulled excessively
   - 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[Note]
   - If a metal part of the power switch, cooling fan, or another such part comes in contact with an electrostatic charge
   - If the product is used or stored in an environment where an electrostatic or electrical noise is likely to occur

Note For details on handling, see **2.5 Mounting and Connecting Connectors**.

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**.

INTRODUCTION

Readers

This manual is intended for users who wish to perform debugging using the QB-78K0RFX3. 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-78K0RFX3.

Organization

This manual is divided into the following sections.

- General
- Setup procedure
- Settings at product shipment
- Cautions
- Notes on target system design
- Optional functions

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
→ Read this manual according to the **CONTENTS**.

To know the manipulations, command functions, and other software-related settings of the QB-78K0RFX3
→ See the user's manual of the debugger (supplied with the QB-78K0RFX3) 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 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 (system provided by the user). This includes the target program and the hardware provided by the user.
IECUBE®	Generic name for NEC Electronics' high-performance, compact in-circuit emulator.

Related Documents

Please use the following documents in combination 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-78K0RFX3 In-Circuit Emulator		This document
RA78K0R Ver. 1.20 Assembler Package	Operation	U18547E
	Language	U18546E
CC78K0R Ver. 2.00 C Compiler	Operation	U18549E
	Language	U18548E
ID78K0R-QB Ver. 3.20 Integrated Debugger	Operation	U17839E
PM+ Ver. 6.30 Project Manager		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.

CONTENTS

CHAPTER 1 GENERAL

The QB-78K0RFX3 is an in-circuit emulator for emulating the 78K0R/FB3, 78K0R/FC3, 78K0R/FE3, 78K0R/FF3, or 78K0R/FG3.

Hardware and software can be debugged efficiently in the development of systems in which a device shown above is used. This manual descries basic setup procedures, hardware specifications, system specifications, and how to set switches.

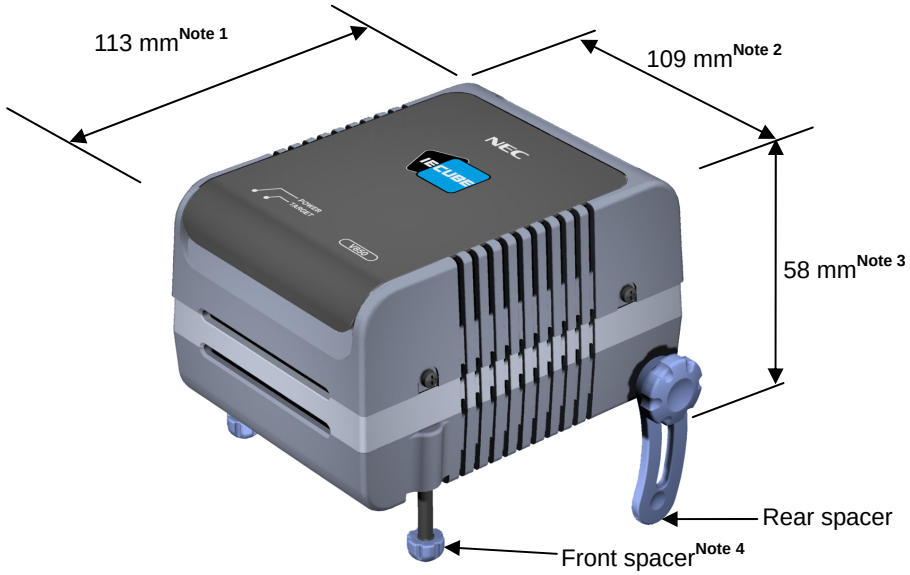
1.1 Hardware Specifications

Table 1-1. QB-78K0RFX3 Hardware Specifications

Parameter		Specification
Target device		78K0R/FB3, 78K0R/FC3, 78K0R/FE3, 78K0R/FF3, 78K0R/FG3
Operating voltage		2.7 to 5.5 V
Operating frequency[Note]	High-speed system clock	2.7 V ≤ V_{DD} ≤ 5.5 V: 2 to 24 MHz
	Internal high-speed oscillation clock	2.7 V ≤ V_{DD} ≤ 5.5 V: 4 MHz, 8 MHz
Operating temperature range		0 to 40°C (No condensation)
Storage temperature range		–15 to 60°C (No condensation)
External dimensions		See the figure below.
Power consumption	Target system power supply	Voltage: 2.7 to 5.5 V Current: Max approx. 3.3 mA
Weight		Approx. 300 g
Host interface		USB interface (1.1, 2.0)

Note The error is within ±0.5%. This, however, does not apply to errors with the oscillator and the clock system of the target board.

Figure 1-1. External Dimensions



Notes 1. Does not include projection of power switch

2. Includes projection of screw that fixes rear spacer

3. Front spacer can vary from 30 mm (longest) to 0 mm (shortest).

4. Front spacer can vary from 20 mm (longest) to 5 mm (shortest).

1.2 System Specifications

This section shows the QB-78K0RFX3 system specifications.

Table 1-2. QB-78K0RFX3 System Specifications

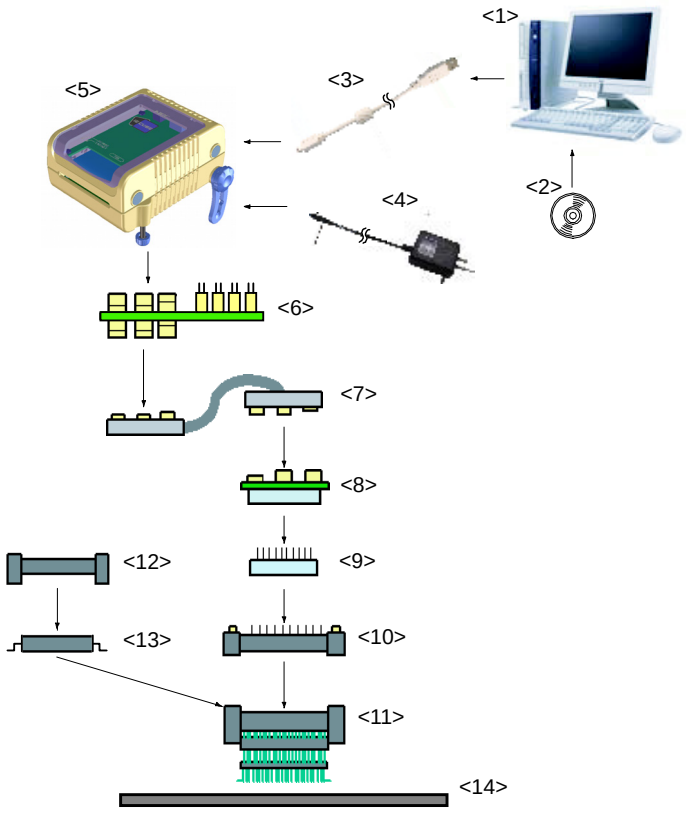
Parameter		Specification
Emulation memory capacity	Internal ROM	512 KB max.
	Internal RAM	60 KB max.
Program execution functions	Real-time execution function	Go, Start from Here, Come Here, Restart, Return Out, Ignore break points and Go
	Non-real-time execution function	Step In, Next Over, Slow motion, 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	Hardware break	Execution: 8 points Access: 8 points
	Software break	2000 points
	Pre-execution break	4 to 8 points[Note]
	Fail-safe break	Non-map, write protect, SFR illegal access, stack overflow, or else
	Other	Forced break, trace full break, trace delay break, timeout break, timer overflow break
Trace functions	Trace data types	Program address, program data, access address, access data, status, time lag
	Trace modes	Unconditional trace, section trace, qualify trace, delay trigger trace
	Trace functions	Non stop, full stop, full break, delay trigger stop, delay trigger break
	Memory capacity	128K frames
Real-time RAM monitoring function		All internal RAM spaces
Time measurement functions	Measurement clock	60 MHz
	Measurement objects	Beginning through end of program execution Start event through end event
	Maximum measurement time	Approx. 40 hours and 43 minutes (Resolution: 17 ns)
	Number of timers for measurement	Beginning through end of program execution : 1 Start event through end event: 2
	Measurement results	Execution time (Start through end of execution) Maximum, minimum, average, total, pass count (between events)
	Other	Timer overflow break function, timeout break function
Other functions		Command functions set in the console, mapping function, event function, coverage function, snapshot function, DMM function, power-off emulation function, pin mask function, flash self programming emulation function

Note The number of breaks that can be set varies depending on the location where the break is set.

1.3 System Configuration

This section shows the system configuration when using the QB-78K0RFX3 connected to a host machine. Connection is possible even without optional products.

Figure 1-2. System Configuration



<1>	Host machine:	Machine with USB ports
<2>	ID78K0R-QB Disk/Accessory Disk:	Debugger, USB drivers, manual, etc.
<3>	USB interface cable:	Cable used for connecting QB-78K0RFX3 to host machine
<4>	AC adapter:	AC adapter suitable for each country
<5>	QB-78K0RFX3:	This product
<6>	Check pin adapter (optional):	Adapter used for monitoring waveforms with oscilloscope
<7>	Emulation probe:	High-characteristic FPC type emulation probe
<8>	Exchange adapter:	Adapter that performs pin conversion
<9>	Space adapter (optional):	Adapter used for height adjustment
<10>	YQ connector:	Connector that connects exchange adapter to target connector
<11>	Target connector:	Connector to be soldered to target system
<12>	Mount adapter (optional):	Adapter used for mounting target device into socket
<13>	Device:	Target device
<14>	Target system	

Notes 1. Download the device file from the NEC Electronics website.
URL: http://www.necel.com/micro/en/ods/

2. Refer to **1.5 Package Contents** for the purchase forms of the above products.

3. As for handling of connectors, see **2.5 Mounting and Connecting Connectors**.

4. The part number of an AC adapter (<4>) differs depending on the country. For details, see **Table 1-5 AC Adapter for IECUBE Regional Model Names**. An AC adaptor must be used when using IECUBE.

1.4 System Configuration for Each Target Device

The following table lists the system configuration for each target device of the QB-78K0RFX3.

Table 1-3. Adapters and Connectors for Each Target Device

Target Device	Package	Exchange Adapter	Space Adapter	YQ Connector	Target Connector	Emulation Probe	Mount Adapter
78K0R/FB3	30MC	QB-30MC-EA-06T	QB-30MC-YS-01T	QB-30MC-YQ-01T	QB-30MC-NQ-01T	QB-80-EP-01T	QB-30MC-HQ-01T
78K0R/FC3	38MC	QB-38MC-EA-xxT (Under development)	QB-38MC-YS-xxT (Under development)	QB-38MC-YQ-xxT (Under development)	QB-38MC-NQ-xxT (Under development)	QB-80-EP-01T	QB-38MC-HQ-xxT (Under development)
	48GA	QB-48GA-EA-05T	QB-48GA-YS-01T	QB-48GA-YQ-01T	QB-48GA-NQ-01T	QB-80-EP-01T	QB-48GA-HQ-01T
78K0R/FE3	64GB	QB-64GB-EA-09T	QB-64GB-YS-01T	QB-64GB-YQ-01T	QB-64GB-NQ-01T	QB-80-EP-01T	QB-64GB-HQ-01T
78K0R/FF3	80GK	QB-80GK-EA-10T	QB-80GK-YS-01T	QB-80GK-YQ-01T	QB-80GK-NQ-01T	QB-80-EP-01T	QB-80GK-HQ-01T
78K0R/FG3	100GC	QB-100GC-EA-09T	QB-100GC-YS-01T	QB-100GC-YQ-01T	QB-100GC-NQ-01T	QB-144-EP-02S	QB-100GC-HQ-01T

Table 1-4. Common Adapter

Name	Part Number
Check pin adapter	QB-144-CA-01

The adapter and connector for each device are sold separately, but an exchange adapter, a YQ connector, a target connector, and an emulation probe may be included depending on the part number. For details, see **1.5 Package Contents**.

Remark For the package drawings of the connector, adapter, and probe, refer to the following URL.
http://www.necel.com/micro/en/development/asia/Emulator/IE/iecube.html

1.5 Package Contents

The following items have been placed in the QB-78K0RFX3 packing box. Please check the contents.

Products supplied with QB-78K0RFX3-ZZZ

<1>: QB-78K0RFX3
<2>: USB interface cable (2 m)
<3>: Online user registration card (warranty card and software contract in one)
<4>: ID78K0R-QB Disk (CD-ROM)
<5>: Accessory Disk (CD-ROM)
<6>: IECUBE Setup Manual (J/E)
<7>: Packing list
<8>: QB-MINI2

Products supplied with QB-78K0RFX3-T30MC

<1> to <8>

<9>:	Emulation probe	QB-80-EP-01T
<10>:	Exchange adapter	QB-30MC-EA-06T
<11>:	YQ connector	QB-30MC-YQ-01T
<12>:	Target connector	QB-30MC-NQ-01T

Products supplied with QB-78K0RFX3-T38MC

<1> to <8>

<9>:	Emulation probe	QB-80-EP-01T
<10>:	Exchange adapter	QB-38MC-EA-xxT (under development)
<11>:	YQ connector	QB-38MC-YQ-xxT (under development)
<12>:	Target connector	QB-38MC-NQ-xxT (under development)

Products supplied with QB-78K0RFX3-T48GA

<1> to <8>

<9>:	Emulation probe	QB-80-EP-01T
<10>:	Exchange adapter	QB-48GA-EA-05T
<11>:	YQ connector	QB-48GA-YQ-01T
<12>:	Target connector	QB-48GA-NQ-01T

Products supplied with QB-78K0RFX3-T64GB

<1> to <8>

<9>:	Emulation probe	QB-80-EP-01T
<10>:	Exchange adapter	QB-64GB-EA-09T
<11>:	YQ connector	QB-64GB-YQ-01T
<12>:	Target connector	QB-64GB-NQ-01T

Products supplied with QB-78K0RFX3-T80GK

<1> to <8>

<9>:	Emulation probe	QB-80-EP-01T
<10>:	Exchange adapter	QB-80GK-EA-10T
<11>:	YQ connector	QB-80GK-YQ-01T
<12>:	Target connector	QB-80GK-NQ-01T

Products supplied with QB-78K0RFX3-T100GC

<1> to <8>

<9>: Emulation probe QB-144-EP-02S

<10>: Exchange adapter QB-100GC-EA-09T

<11>: YQ connector QB-100GC-YQ-01T

<12>: Target connector QB-100GC-NQ-01T

1.6 AC Adapter for IECUBE

The specifications of AC adapters for IECUBE differ depending on the country. Be sure to use the AC adapter suitable for your country.

No AC adapter is supplied with IECUBE. An order must be placed for it separately.

Table 1-5. Regional Part Numbers of AC Adapter for IECUBE

Product	Country[Note 1, 2]	Part Number[Note 3]
AC adapter (sold separately)	Japan	QB-COMMON-PW-JP
	USA	QB-COMMON-PW-EA
	China	QB-COMMON-PW-CN
	Hong Kong	QB-COMMON-PW-HK
	Korea	QB-COMMON-PW-KR
	Singapore	QB-COMMON-PW-SG
	Taiwan	QB-COMMON-PW-TW

Notes 1. Only products for a particular country or region will be shipped for orders received from that country or region.

2. For orders from countries other than the above, contact an NEC Electronics sales representative or distributor.

3. Only the AC adapter that can be used in your country can be ordered.

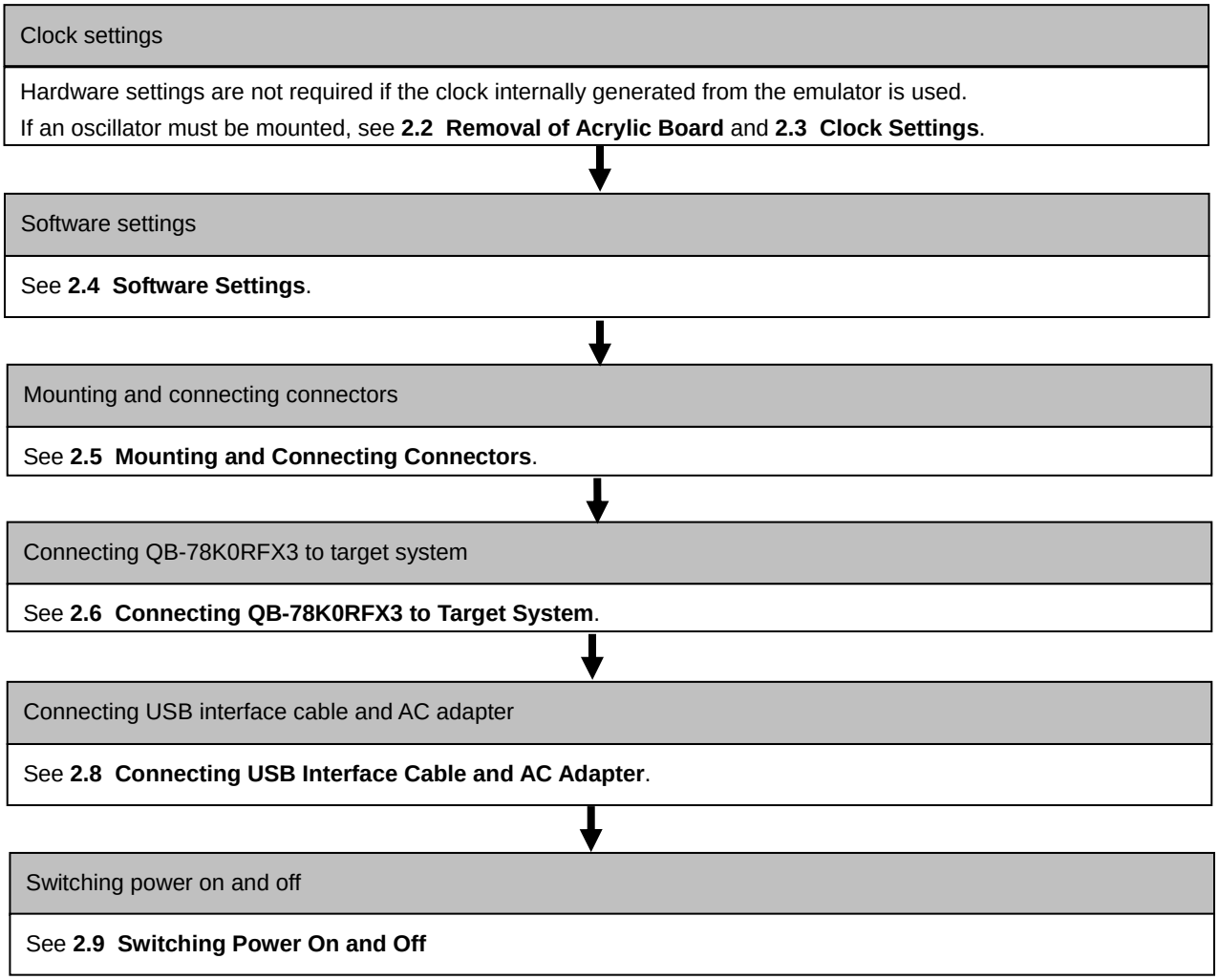
CHAPTER 2 SETUP PROCEDURE

This chapter explains the QB-78K0RFX3 setup procedure.

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

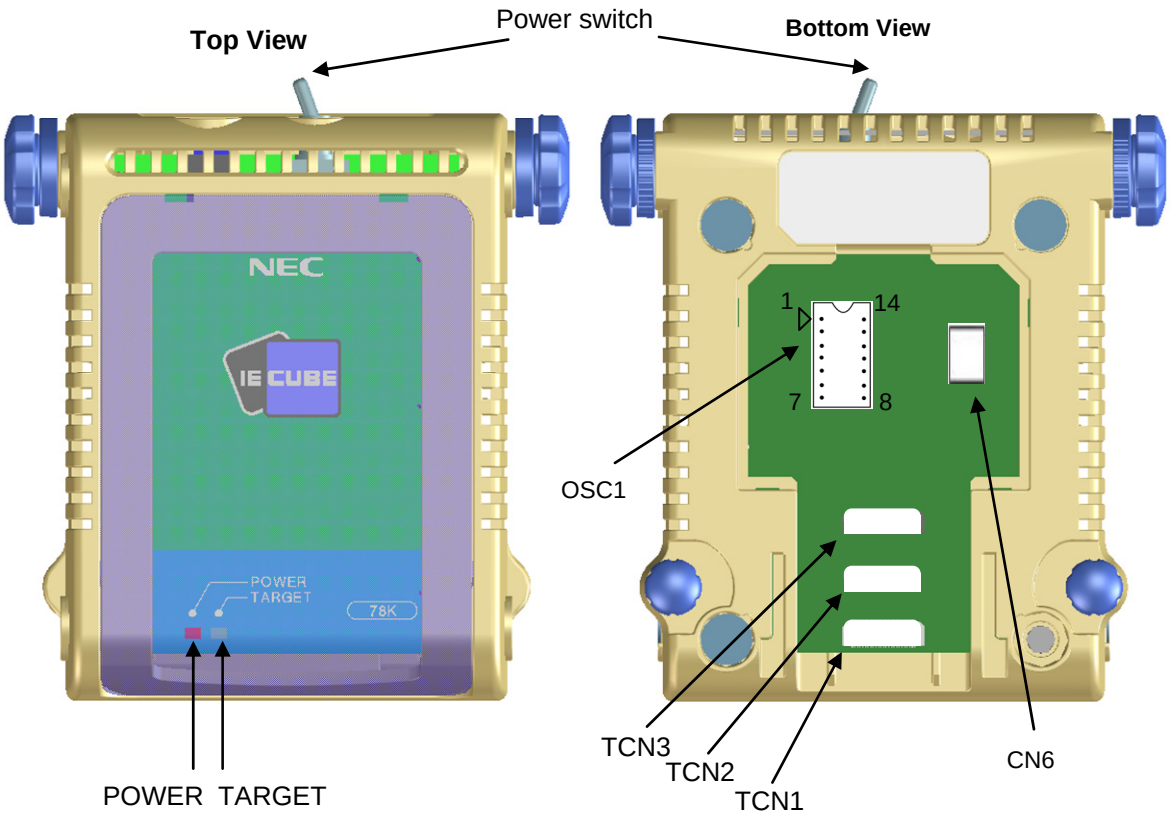
Perform setup along the lines of the following procedure.

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

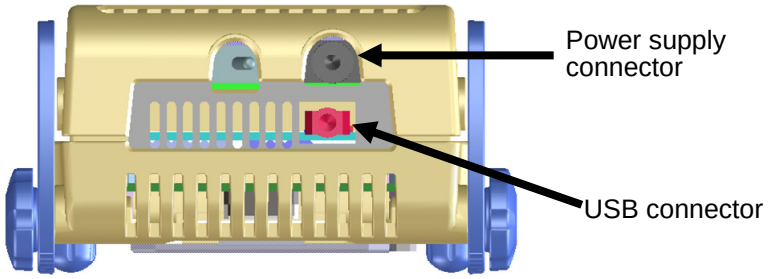


2.1 Names and Functions of Hardware

Figure 2-1. Names of Parts of QB-78K0RFX3



Side View



(1) TCN1, TCN2, TCN3

These connectors are used to connect the exchange adapter or extension probe.

(2) OSC1 (parts board connector)

This connector is used to mount an oscillator.

(For details, see **2.3 Clock Settings**.)

(3) CN6

This connector is used for delivery inspection.

All the pins of this connector are open at shipment. Other settings are prohibited.

(4) POWER (Red LED)

This is an LED that shows whether or not the power supply of the QB-78K0RFX3 is switched on.

LED Status	QB-78K0RFX3 Status
Lit	Power switch ON
Not lit	Power switch OFF or AC adapter not connected to QB-78K0RFX3
Blinking	Internal error occurred (Contact an NEC Electronics sales representative or distributor)

(5) TARGET (Green LED)

This is an LED that shows whether or not the power supply of the target system is switched on.

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

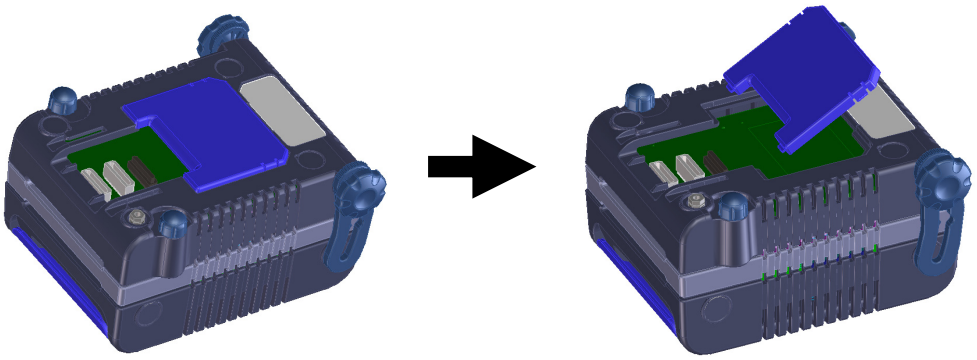
(6) Power switch

This is the power switch of the QB-78K0RFX3. It is OFF at shipment.

2.2 Removal of Acrylic Board

To change the clock setting, the acrylic board on the bottom of the QB-78K0RFX3 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 three types of clock settings are available.

Each clock setting is listed below.

Clock Used	Clock Supply	Debugger Setting (in Configuration Dialog Box)
(1) High-speed system clock[Note] (X1 oscillation circuit or external input)	(a) When the clock generated within the emulator is used	System
	(b) When the clock is supplied from the target system	External
	(c) When the oscillator (OSC1) mounted onto the emulator is used	Clock Socket
(2) Internal high-speed oscillation clock	Uses the clock internally generated from the emulator	–

Note First, select "System" in the debugger settings (see **(a) When the clock generated within the emulator is used** in **(1) High-speed system clock**).

If there is no clock that can be selected, follow the descriptions below.

- If the target system clock can supply a square wave for the emulator:

  Select "External" in the debugger settings (see **(b) When the clock is supplied from the target system** in **(1) High-speed system clock**).

- If the target system clock cannot supply a square wave for the emulator:

  Mount onto the emulator the oscillator of the clock to be used and select "Clock Socket" in the debugger settings (see **(c) When the oscillator (OSC1) mounted onto the emulator is used** in **(1) High-speed system clock**).

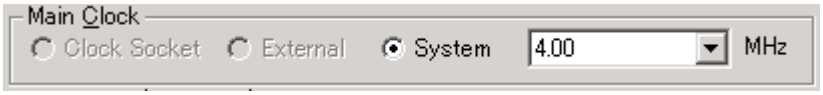
Oscillation with the resonator on the target system is not supported. Therefore, the in-circuit emulator cannot emulate the oscillation operation of the clock on the target system.

(1) High-speed system clock

The clock settings are listed below.

Table 2-1. Settings for High-Speed System Clock

Type of Clock To Be Used	OSC1	Debugger Setting
(a) When the clock generated within the emulator is used	–	System
(b) When the clock is supplied from the target system[Note].	–	External
(c) When the oscillator (OSC1) mounted onto the emulator is used	Oscillator mounted	Clock Socket



Note This setting is not possible when TARGET LED is not lit.

Remarks 1. Settings other than the above are prohibited.

2. Selection of (a) or (b) is possible regardless of whether the oscillator is mounted in the OSC1 socket.

(a) When the clock generated within the emulator is used

Select the "System" in the debugger and select the desired frequency from the drop-down list.

The following frequencies are selectable.

2.00, 3.00, 3.57, 4.00, 4.19, 4.91, 5.00, 6.00, 8.00, 8.38, 10.00, 12.00, 16.00, 20.00[MHz]

24 MHz (4 MHz input multiplied by 6, or 8 MHz input multiplied by 4)

(b) When the clock is supplied from the target system

Select the "External" in the debugger. The clock input from the target system is then used.

Oscillation with the resonator on the target system is not supported. To input a clock from the target system, input to the clock pin (X2) the square-wave signal with the same voltage potential as that of the target device supply voltage (V_{DD}). Inputting the inverted signal to X1 is not necessary.

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

(c) When the oscillator (OSC1) mounted onto the emulator is used

Mount an oscillator in the OSC1 socket in the emulator and then select the "Clock socket" in the debugger. The clock generated from the oscillator mounted on the emulator is used.

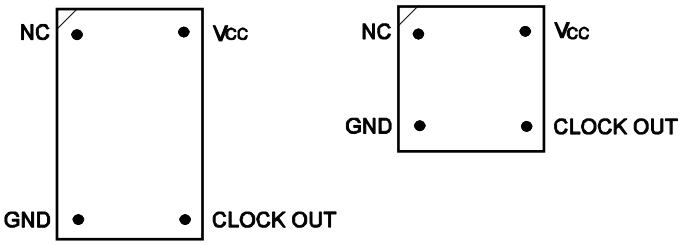
The selectable frequencies are same as those of the target device.

As an oscillator[Note] to be mounted in the OSC1 socket in the emulator, use the one that satisfies the following specifications.

- Supply voltage: 5 V
- Output level: CMOS

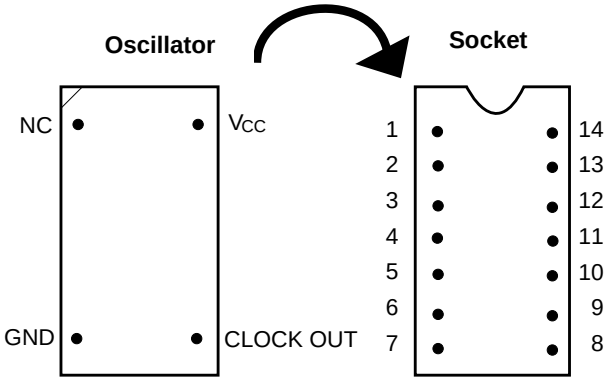
Note An oscillator that uses a resonator cannot be used.

Figure 2-3. Oscillator Shape



Top View

Figure 2-4. Mapping of Oscillator to Socket



Oscillator	OSC1 Pin Number
NC	1
GND	4
	7
CLOCK OUT	8
	11
Vcc	14

Remark Insert the oscillator into the socket, take care for the pin 1 position.

(2) Internal high-speed oscillation clock

The debugger setting is not necessary.

The use of the internal high-speed oscillation clock can be specified in the user program.

2.4 Software Settings

For details, see the **ID78K0R-QB Ver. 3.20 Integrated Debugger Operation User's Manual** (U17839E).

2.5 Mounting and Connecting Connectors

This section describes the methods for connecting the QB-78K0RFX3 to the target system.
Make connections with both the QB-78K0RFX3 and target system powered off.
The following abbreviations are used in this section.

- TC: Target connector
- YQ: YQ connector
- EA: Exchange adapter
- MA: Mount adapter
- CA: Check pin adapter
- SA: Space adapter

2.5.1 Mounting TC onto target system

(1) Thinly apply a two-component epoxy adhesive (hardening time at least 30 minutes) to the ends of the four projections on the base of the TC and adhere the TC to the user board (clean the surface of the user board using alcohol or the like). If alignment of user board pads to TC leads is difficult, align them as in (2).

(2) Align by inserting the guide pins for alignment for the TC (NQGUIDE) through the pin holes on the top of the TC. Accessory holes are ϕ1.0 mm non-through holes in two or three places.
(For hole positions, see the particular TC drawing.)

(3) Solder after fitting the MA to the TC. This is to prevent troubles such as flux or solder splatter and adhering to the TC contact pins when soldering.

- Soldering conditions
  - Solder reflow: At 260°C for a maximum of 10 seconds
  - Manual soldering: At 350°C for a maximum of 5 seconds (per pin)

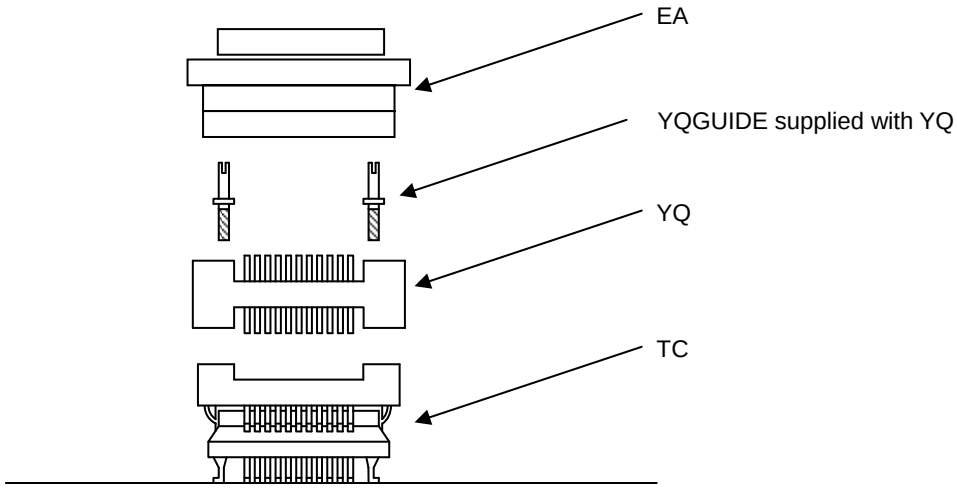
Caution Do not perform cleaning by flux immersion or vapor.

(4) Remove the guide pins.

2.5.2 Connecting YQ on TC

(1) After confirming that there are no broken or bent YQ contact pins, fit YQ in the TC and fasten it using the supplied YQGUIDE (for the fastening method, see the next step, (2)). If repeatedly inserting and removing, be sure to inspect the YQ pins before fitting. If pins are bent, correct them using something thin and flat such as the edge of a knife.

(2) Fasten YQ to the TC on the target system using the supplied YQGUIDE. Fasten the screws equally in the four corners using the supplied flat-blade screwdriver or a torque driver. The tightening torque of YQGUIDE is 0.054 Nm (MAX.). Too great tightening causes bad connections.
Four screws for fitting to the MA (M2 x 10 mm / 4 units) are included with YQ.



Target system

2.5.3 Inserting EA into YQ

Match the pin 1 position of the YQ or SA (corner cuts match in both) to the pin 1 position of the EA and insert it.

- When inserting or removing, press on the TC, YQ, and SA with a finger so that there is no force on the TC.
- When inserting or removing, be careful of the direction of wiggling.

As a tool when removing, insert some kind of thin non-conductive material such as a wooden stick between the YQ (SA) and EA and wiggle it while slowly removing. Be careful since the connector will be damaged if this is done in the wrong direction.

2.5.4 Precautions for handling TC, YQ, SA, and CA

(1) When taking the TC from the box, press down on the body and take out the sponge first.

(2) Since the pins of the YQ are thin and easily bent, be careful. When inserting it in the TC, confirm that there are no bent pins.

(3) When screwing a YQ soldered to a board to the TC, fasten the screws in four places in turn using a #0 or #1 Phillips precision screwdriver or torque driver after tentatively tightening them. Fix the torque at 0.054 Nm (MAX.). If just one place is overtightened, it may cause poor contact. Moreover, a board being connected to the YQ must have accessory holes in prescribed positions (4 places: ϕ2.3 mm or ϕ3.3 mm). The ϕ3.8 mm or ϕ4.3 mm that is the screw head size is an area where wiring is prohibited.

(4) In YQ and SA removal, since there is a danger of YQ pins being bent or broken when prying and wiggling, remove them gradually using a flatbladed screwdriver from four directions. Moreover, to connect and use the YQ and SA, screw the YQ to the TC according to the YQGUIDE (sold separately) using a 2.3 mm flatbladed screwdriver and then connect it to the SA. Fix the torque at 0.054 Nm (MAX.). If even one place is overtightened, it may cause poor contact.

(5) For the TC, YQ, and SA, since there is a danger that cleaning fluid on the structure will remain in the connector, do not perform cleaning.

(6) TC, IC, and YQ cannot be used in combination.

(7) A TC/YQ system cannot be used in an environment of vibrations or shocks.

(8) 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.

(9) Since there are rare cases of shape change if the box 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.

(10) For details about handling the TC, YQ, and SA, see the NQPACK series technical materials at the website of Tokyo Eletech Corporation.
Tokyo Eletech Corporation website: http://www.tetc.co.jp/

(11) Check pin adapter QB-144-CA-01
The check pin adapter QB-144-CA-01 is an optional product for IECUBE, and can be used to measure the waveform between IECUBE and the target system.
Since the pins on the QB-144-CA-01 do not correspond to the pin layout in each device, the pin header cover must be mounted according to the device to be used.
For mounting methods of the pin header cover, see **[Related Information]** on the following webpage.
URL: http://www.necel.com/micro/en/development/asia/Emulator/IE/iecube.html

2.5.5 Precautions for mounting IC using TC and MA

(1) Confirm that there is no weld flash in the resin (sealant part) of the IC. If there is weld flash, remove it using a knife or the like.

(2) Confirm that there is no weld flash breaking or bending of IC leads. In particular, confirm the planarity of IC leads. If there is abnormality in the planarity, correct that portion.

(3) Viewing the TC contact pins from the top, if there are foreign bodies on them, remove them using a brush or the like.
After confirming (1) to (3), fit the IC to the TC. Also fit the MA.

(4) Put the supplied M2 × 6 mm screws in the four accessory holes of the MA and fasten the screws in opposite corners. At that time, use either the dedicated screwdriver that is supplied or a torque driver to fasten them equally in turn with a tightening torque of 0.054 Nm (MAX.). Since the contact is poor if tightening is too great, once you have lightly fastened the MA screws, tighten them again.

(5) Depending on the use environment, when starting up a device that has been left for a long time, starting it may be difficult. In this case, loosen the screws slightly and then retighten them.

(6) If startup still is difficult after (5) above, check (1) to (3) again.

(7) Tightening the screws of the MA too much may give rise to cracks in the molded part of the MA (plastic part) and bend the mold into a bowed shape, making contact poor.

(8) After soldering the TC, do not perform cleaning by flux immersion or vapor.

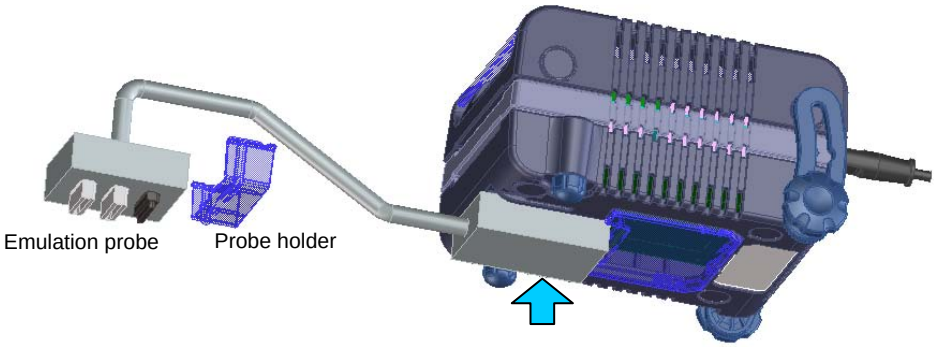
2.6 Connecting QB-78K0RFX3 to Target System

Connect the emulation probe (QB-80-EP-01T or QB-144-EP-02S) to the QB-78K0RFX3 and the target system by using the following procedure. The probe holder is not necessary when using the QB-80-EP-01T.

(1) Connecting QB-78K0RFX3 to emulation probe

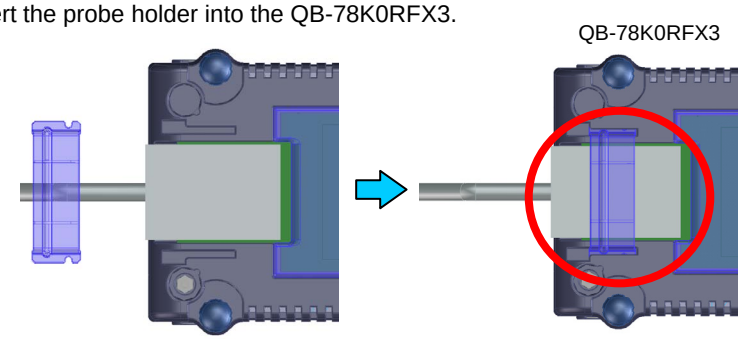
Figure 2-5. Connecting QB-78K0RFX3 to Emulation Probe

<1> Connect the QB-78K0RFX3 to the emulation probe.



Insert TCN1, TCN2, and TCN3 of the emulation probe into TCN1, TCN2, and TCN3 of the QB-78K0RFX3.

<2> Insert the probe holder into the QB-78K0RFX3.



Insert the probe holder into the QB-78K0RFX3 until you hear a click (note the direction).

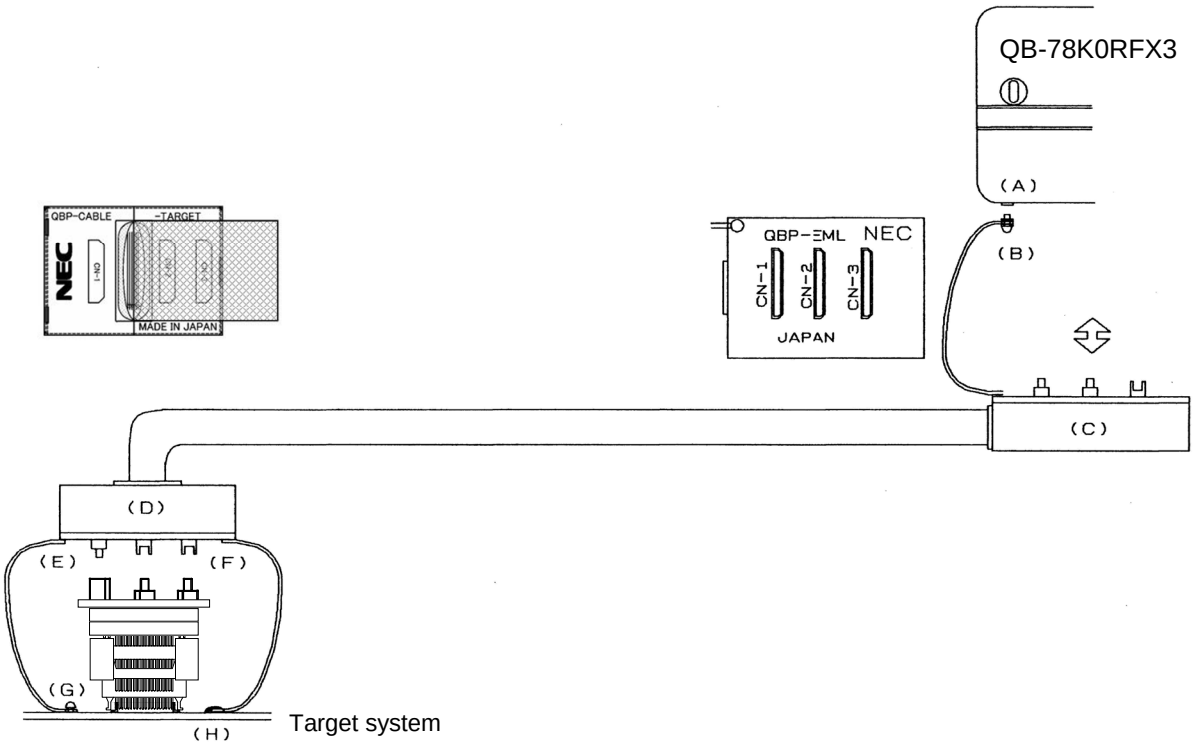
(2) Connection of emulation probe GND wire

There are two GND wires in the emulation probe. Connect them to the QB-78K0RFX3 and target system.

<1> Fasten the GND wire on the QB-78K0RFX3 side of the emulation probe to the nut on the bottom of the QB-78K0RFX3 using a #0 or #1 Phillips precision screwdriver (connection of B to A in **Figure 2-6**).

<2> Next insert the connector on the top of the emulation probe into the connector at the opening on the bottom of the QB-78K0RFX3 from below being careful of the insertion direction.

Figure 2-6. GND Wire

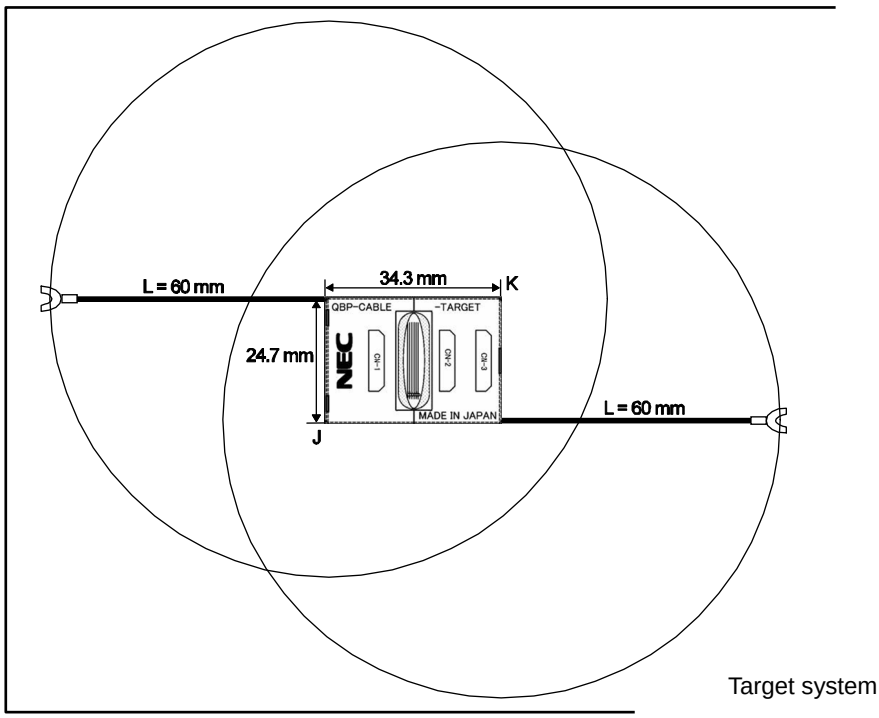


<3> Connect the exchange adapter and the emulation probe to the target connector.

<4> Connect wires on the target system side of the emulation probe to the target system GND. If a pin or screw is fastened to the target system GND, remove the transparent terminal cover on the end of the GND wire and fasten the Y type pin of the GND wire to the target system (C in **Figure 2-6**). If the GND on the target system is an exposed pad, likewise fasten the Y type pin to the pad on the target system by soldering (recommended soldering iron temperature setting: 300°C).

<5> Since the length of the GND wire below the head (insulated part) is approximately 60 mm, there must be one GND to which it can be connected to within the range of the two approximately 60 mm radius sections of the target system for connecting the emulation probe, as shown in **Figure 2-7**.

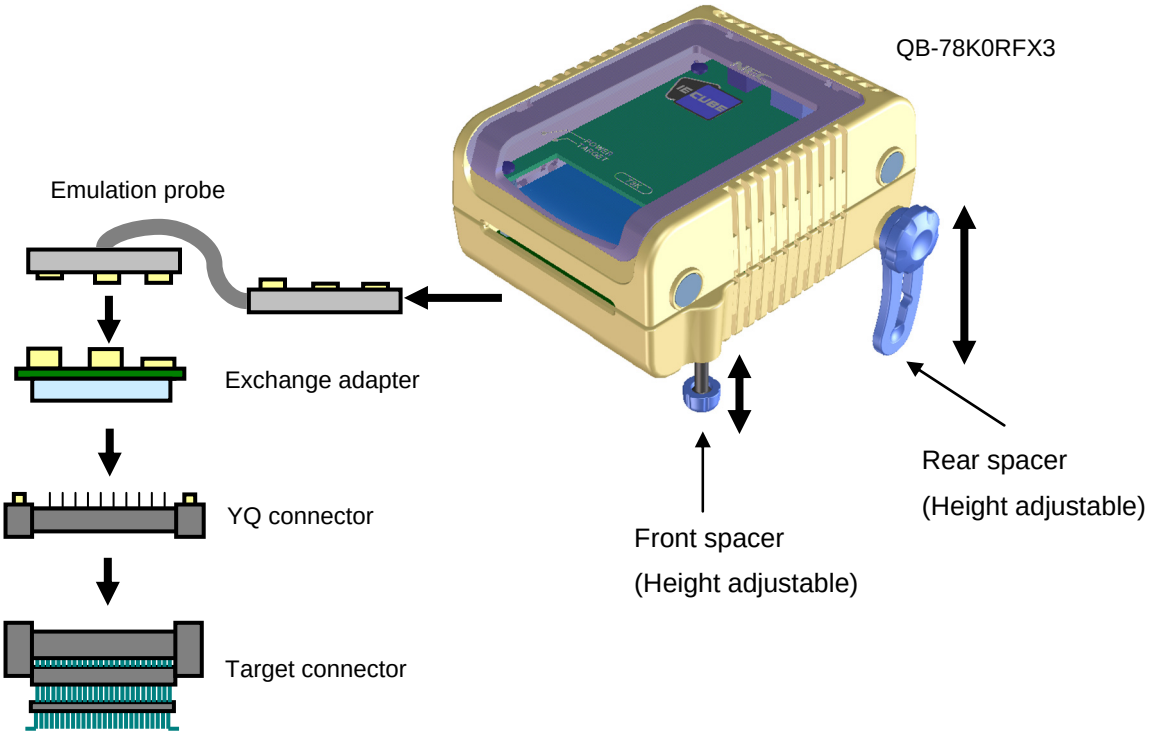
Figure 2-7. Where GND Wire Can Be Connected



(3) Ensuring isolation

When connecting the target system to the QB-78K0RFX3 using an emulation probe, adjust the height using the front spacer or rear spacer of the QB-78K0RFX3 to ensure isolation from the target system.

Figure 2-8. Connection Using Emulation Probe



(4) Cautions related to emulation probe

The following cautions pertain to using the emulation probe.

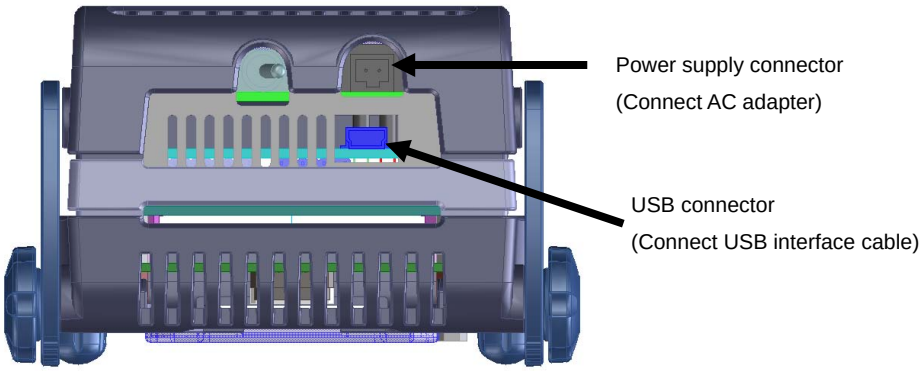
<1> Be careful that stress of the emulation probe is not placed on the target connector. Moreover, when removing the emulation probe, remove it slowly while holding down on the exchange adapter with a finger so that there is no stress on the target connector.

<2> Be sure to connect the GND wire of the emulation probe to the QB-78K0RFX3 and the target system. If not, the impedance of the cable might be unstable, resulting in the lowering of signal transmission characteristics or distortion of the output waveform for an input waveform.

2.7 Notes on Power Supply and GND Pin Connection

For power supplies and GND pins of the target device, be sure to connect all pins to each power supply or GND.

Figure 2-9. Connector Positions



2.8 Connecting USB Interface Cable and AC Adapter

Plug the USB interface cable supplied with the QB-78K0RFX3 into the USB connector of the host machine, and plug the other side into the USB connector on the rear of the QB-78K0RFX3.
Plug the AC adapter for QB-78K0RFX3 into a receptacle and plug the other side into the power supply connector on the rear of the QB-78K0RFX3.
See **Figure 2-9** for QB-78K0RFX3 connector positions.

2.9 Switching Power On and Off

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

- Switching power on

<1> QB-78K0RFX3 power on
<2> Target system power on[Note]
<3> Debugger startup

- Switching power off

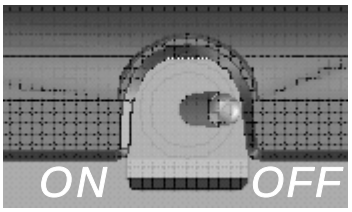
<1> Debugger termination
<2> Target system power off[Note]
<3> QB-78K0RFX3 power off

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

Caution If the wrong sequence was used for the operation, the target system or QB-78K0RFX3 may fail.

CHAPTER 3 SETTINGS AT PRODUCT SHIPMENT

Table 3-1. Settings at Shipment

Item	Setting	Remarks
OSC1	Not mounted	Oscillator can be mounted[Note]
Power switch		Set to OFF at shipment.

Note The oscillation circuit using an oscillation cannot be used.

CHAPTER 4 CAUTIONS

- Target system voltage during a break

  Do not decrease the voltage of the target system during a break.

  A reset that is generated by the low-voltage detector (LVI) or by power-on-clear (POC) during a break may cause an incorrect operation of the debugger or communication errors.

- FLMD0 pin

  Connection of the FLMD0 pin differs from that of the target device.

Table 4-1. FLMD0 Pin Connection

Item	FLMD0 Pin Connection
Target device	Protection resistance: 4.5 kΩ (TYP.) Pull-up/pull-down resistance: 10 kΩ (MIN.), 20 kΩ (TYP.), 100 kΩ (MAX.)
IECUBE	Protection resistance: 4.7 kΩ (TYP.) Pull-up/pull-down resistance: 27 kΩ (MIN.), 29 kΩ (TYP.), 32 kΩ (MAX.)

- Power-on-clear (POC) voltage values

  The power-on-clear (POC) voltage values differ from the voltage value of the target device.

Table 4-2. Power-on-Clear (POC) Voltage Values

Item		MIN.	TYP.	MAX.
Target device	VPOR	1.52 V	1.61 V	1.70 V
	VPDR	1.50 V	1.59 V	1.68 V
IECUBE	VPOR	–	1.65 V	–
	VPDR	–	1.55 V	–

- TTL input buffer characteristics

  When the port input mode register (PIM) is used to set the input to a pin that can set a TTL buffer to the TTL level, the high-level input voltage characteristics differ between the target device and emulator. For details, see **Table 4-3**.

  The following pins can be set as a TTL buffer.

  Target pins: P73, P75, P76, P77, P60 to P63

Table 4-3. High-Level Input Voltage Characteristics

Item	Conditions	MIN.
Target device	$4.0\ V \le V_{DD} \le 5.5\ V$	2.2 V
	$2.7\ V \le V_{DD} < 4.0\ V$	2.0 V
IECUBE[Note]	$2.7\ V \le V_{DD} \le 5.5\ V$	2.0 V

Note If V_{DD} is 2.0 V or less, use CMOS input.

- AD converter scan mode

  When a break is performed for the A/D converter in the scan mode, the A/D converter does not stop, even during the break. It therefore becomes unclear which value stored in the conversion result registers is the conversion result of which ANI pin.

  When a break is performed for the A/D converter in the scan mode, do not execute the program again. (Reset the CPU first.)

APPENDIX A REVISION HISTORY

Document Number	Issued on	Description
ZUD-CD-08-0148	December 1, 2008	Newly created.
ZUD-CD-09-0139	August 3, 2009	Document change 1.4 System Configuration for Each Target Device