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User's Manual

QB-780714

In-Circuit Emulator

Target Devices

*μ*PD78F0711

*μ*PD78F0712

*μ*PD78F0714

Document No. U17366EJ5V0UM00 (5th edition)
Date Published October 2007 NS

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[MEMO]

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[MEMO]

INTRODUCTION

Readers	This manual is intended for users who wish to perform debugging using the QB-780714. 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-780714.	
Organization	This manual is divided into following parts. <ul style="list-style-type: none">• General• Setup procedure• Settings at product shipment• Differences between target device and target interface circuit• Differences Between Emulator and Device• Cautions	
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-780714 →Read this manual according to 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-780714 →See the user’s manual of the debugger (supplied with the QB-780714) 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 or 0x xxxx
	Prefix indicating power of 2 (address space, memory capacity):	K (kilo): $2^{10} = 1,024$ M (mega): $2^{20} = 1,024^2 = 1,048,576$ G (giga): $2^{30} = 1,024^3 = 1,073,741,824$

Terminology

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

Term	Meaning
Target system	This is the system to be debugged. This includes the target program and the hardware provided by the user.

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-780714 In-Circuit Emulator		This manual
RA78K0 Assembler Package Ver. 3.80	Operation	U17199E
	Language	U17198E
	Structured Assembly Language	U17197E
CC78K0 C Compiler Ver. 3.70	Operation	U17201E
	Language	U17200E
ID78K0-QB Ver. 2.90 Integrated Debugger	Operation	U17437E
PM plus Ver. 5.20		U16934E

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.

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 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 **2.5 Mounting and Connecting Connectors**).
- If the product is used or stored in an environment where an electrostatic or electrical noise is likely to occur

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**.

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CHAPTER 1 GENERAL

The QB-780714 is an in-circuit emulator for emulating the μ PD78F0711, μ PD78F0712 and μ PD78F0714.

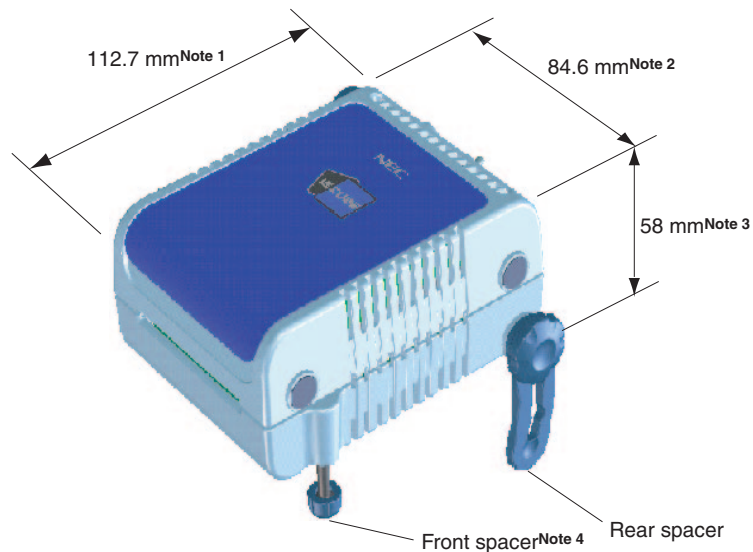
Hardware and software can be debugged efficiently in the development of systems in which the μ PD78F0714 is used. This manual describes basic setup procedures, hardware specifications, system specifications, and how to set switches.

1.1 Hardware Specifications

Table 1-1. QB-780714 Hardware Specifications

Parameter		Specification	
Target device		μ PD78F0711, μ PD78F0712	μ PD78F0714
Operating voltage		4.0 to 5.5 V	3.3 to 5.5 V
Operating frequency	Hi-speed system clock	5.0 to 20 MHz	
	Internal high-speed oscillator	8.0 MHz (Typ.)	-
	Internal low-speed oscillator	240 kHz (Typ.)	
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-780714	15 V, 1 A	
	Target system power supply	Same level as target device. Deviations based on emulation structure possible.	
Weight		382 g	
Host interface		USB interface (1.1, 2.0)	

Figure 1-1. QB-780714



- Notes**
- Does not include projection of power switch
 - Includes projection of screw that fixes rear spacer
 - Dimension when rear spacer is made shortest (88 mm when longest)
 - Front spacer can vary from 20 mm (longest) to 5 mm (shortest)

1.2 System Specifications

This section shows the QB-780714 system specifications.

Table 1-2. QB-780714 System Specifications

Parameter		Specification
Program execution functions	Real-time execution function	Go, Start from Here, Go & Go, Come Here, Restart, Return Out, Ignore break points and Go
	Non-real-time execution function	Step execution
Break functions	Event break	Execution: 8 points Access: Byte 8 points, word 2 points
	Software break	2000 points
	Pre-execution break	16 points
	Fail-safe break	Exists
	Other	Forcible 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
	Trace modes	Full trace, section trace, qualify trace
	Trace functions	Delay function, full stop function
	Memory capacity	128K frames
Real-time RAM monitoring function		All spaces
Time measurement functions	Measurement clock	50 MHz or CPU clock
	Measurement objects	Beginning through end of program execution Start event through end event
	Maximum measurement time	Approximately 24 hours (Resolution 41 μ s)
	Minimum resolution	20 ns (Measurement time: 85 seconds)
	Number of timers for measurement	Start through end of program execution: 1 Start event through end event: 2
	Measurement results	Maximum, minimum, average, cumulative, number of passes (between events)
	Other	Timer overflow break function, timeout break function
Other functions		Mapping function, event function, coverage function, snapshot function, DMM function, stub function, power-off emulation function, pin mask function

1.3 System Configuration

This section shows the system configuration when using the QB-780714 connected to a PC (PC-9821 series, PC/AT™ compatible). Connection is possible even without optional products.

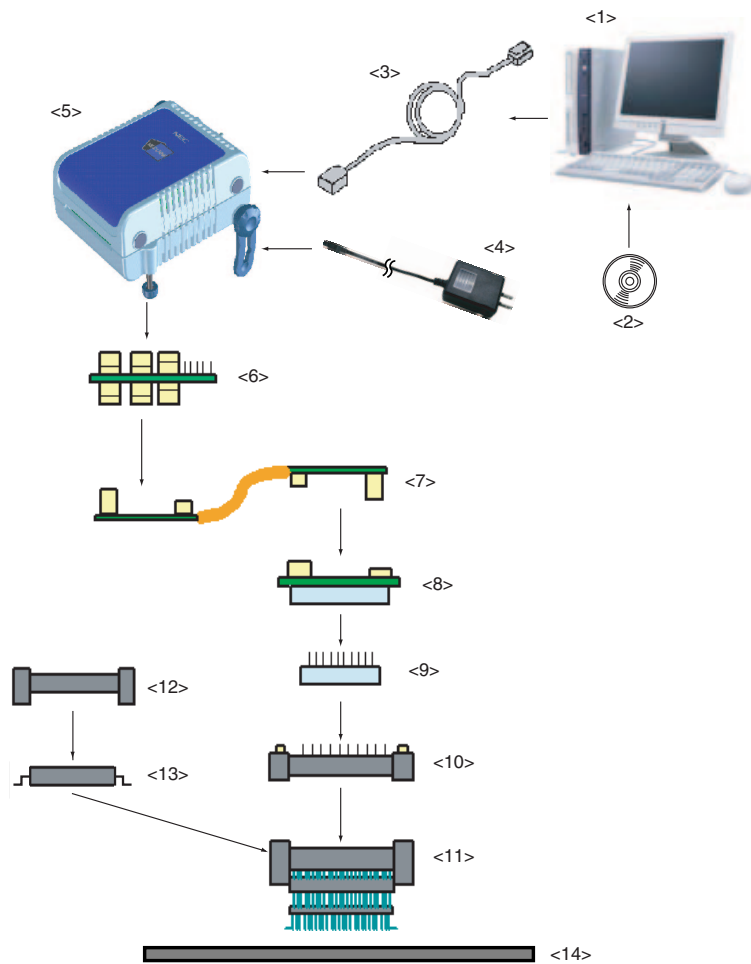
<R>

Table 1-3. Adapter/Connector List by Target Devices

Target Devices	Package	Exchange Adapter	Space Adapter	YQ Connector	Target Connector	Mount Adapter
μ PD78F0711	30MC	QB-30MC-EA-03T	QB-30MC-YS-01T	QB-30MC-YQ-01T	QB-30MC-NQ-01T	QB-30MC-HQ-01T
μ PD78F0712	32CT	QB-32CT-EA-01T	–	–	–	–
μ PD78F0714	64GK	QB-64GK-EA-01T	QB-64GK-YS-01T	QB-64GK-YQ-01T	QB-64GK-NQ-01T	QB-64GK-HQ-01T

<R>

Figure 1-2. System Configuration



- | | |
|------------------------------------|--|
| <1> Host machine: | PC-9821 series, PC/AT compatible can be used |
| <2> ID78K0-QB Disk/Accessory Disk: | Debugger, USB drivers, manual, etc. |
| <3> USB interface cable: | Cable connecting QB-780714 to host machine |
| <4> AC adapter: | Can support 100 to 240 V |
| <5> QB-780714: | This product |
| <6> Check pin adapter: | Adapter used when observing waveforms on oscilloscope |
| <7> Emulation probe: | Flexible type of emulation probe |
| <8> Exchange adapter: | Adapter that performs pin conversion |
| <9> Space adapter: | Adapter for height regulation |
| <10> YQ connector: | Connector that connects exchange adapter to target connector |
| <11> Target connector: | Connector soldered to target system |
| <12> Mount adapter: | Adapter for socket mounting target device |
| <13> Device | Target device |
| <14> Target system | |

Remarks 1. Obtain device files from the NEC Electronics website.

http://www.necel.com/micro/index_e.html

2. See 1.4 **Package Contents** for the purchase forms of the above products.

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

Table 1-4. Check Pin Adapters

Package	Check Pin Adapter
Common	QB-144-CA-01

Table 1-5. Emulation Probes

Package	Emulation Probe
Common	QB-80-EP-01T

Table 1-6. Exchange Adapters

Package	Exchange Adapter
30MC	QB-30MC-EA-03T
32CT	QB-32CT-EA-01T
64GK	QB-64GK-EA-01T

Table 1-7. Space Adapters

Package	Spacer Adapter
30MC	QB-30MC-YS-01T
32CT	_ Note 1
64GK	QB-64GK-YS-01T

Table 1-8. YQ Connectors

Package	YQ Connector
30MC	QB-30MC-YQ-01T
32CT	_ Note 1
64GK	QB-64GK-YQ-01T

Table 1-9. Target Connectors

Package	Target Connector
30MC	QB-30MC-NQ-01T
32CT	_ Note 2
64GK	QB-64GK-NQ-01T

Table 1-10. Mount Adapters

Package	Target Connector
30MC	QB-30MC-HQ-01T
32CT	_ Note 1
64GK	QB-64GK-HQ-01T

Notes 1. Space adapters, YQ connectors, target connectors, and mount adapters are not provided with the 32-pin SDIP.

2. Commercially available IC sockets can be used as a target connector for the 32-pin SDIP. For details, see **1.3.1 Target connector for 32-pin SDIP**.

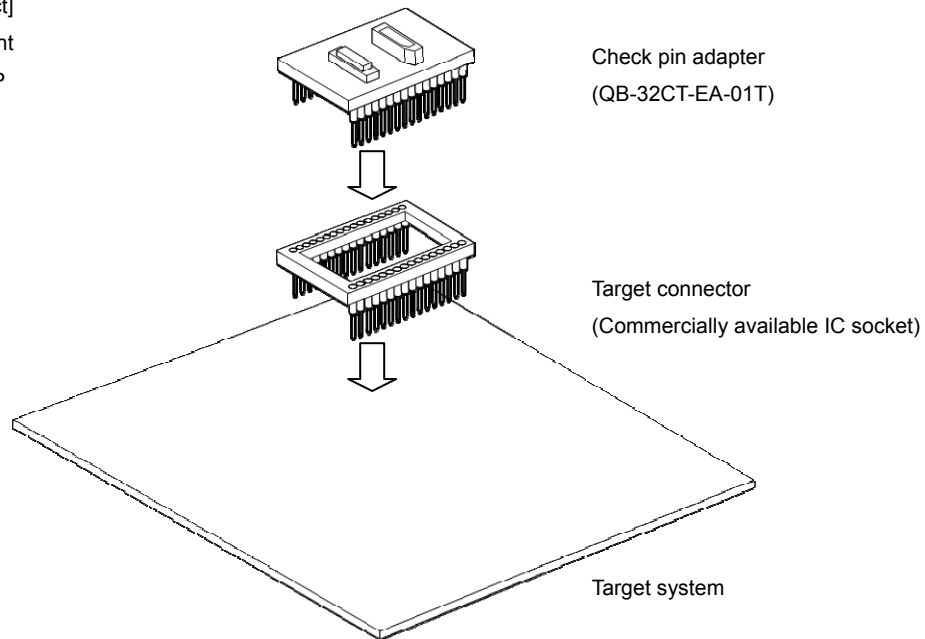
Remark For notes on target system design and package drawings, refer to [Related Information] on the following URL.

<R> <http://www.necel.com/micro/en/development/asia/Emulator/IE/iecube.html>

1.3.1 Target connector for 32-pin SDIP

Target connectors for the 32-pin SDIP manufactured by NEC Electronics are not available. Commercially available IC sockets can be used, so obtain the following recommended product or equivalent.

<R> [Recommended product]
 Manufacturer: Mac-Eight
 Part number: PM-6-16P



1.4 Package Contents

The following items have been placed in the QB-780714 packing box. Please check the contents.

Products supplied with QB-780714-ZZZ

- 1: QB-780714
- 2: AC adapter
- 3: USB interface cable
- 4: Clock board set
 - Main Clock Type I
 - Main Clock Type III (Mounted at shipment)
- 5: User registration
- 6: Simplified flash programmer (PG-FPL or QB-MINI2)
- 7: ID78K0-QB Disk (CD-ROM)
- 8: Accessory Disk (CD-ROM)
- 9: Setup Manual

Products supplied with QB-780714-T30MC

1 to 9

- 10: Emulation probe QB-80-EP-01T
- <R> 11: Exchange adapter QB-30MC-EA-03T
- <R> 12: YQ connector QB-30MC-YQ-01T
- <R> 13: Target connector QB-30MC-NQ-01T

Products supplied with QB-780714-T32CT

1 to 9

- 10: Emulation probe QB-80-EP-01T
- <R> 11: Exchange adapter QB-32CT-EA-01T

Products supplied with QB-780714-T64GK

1 to 9

- 10: Emulation probe QB-80-EP-01T
- 11: Exchange adapter QB-64GK-EA-01T
- 12: YQ connector QB-64GK-YQ-01T
- 13: Target connector QB-64GK-NQ-01T

The following products are sold as single items.

- Emulation probe
- Exchange adapter
- YQ connector
- Target connector
- Check pin adapter
- Space adapter
- Mount adapter

Note Space adapters, YQ connectors, target connectors, and mount adapters are not provided with the 32CT.

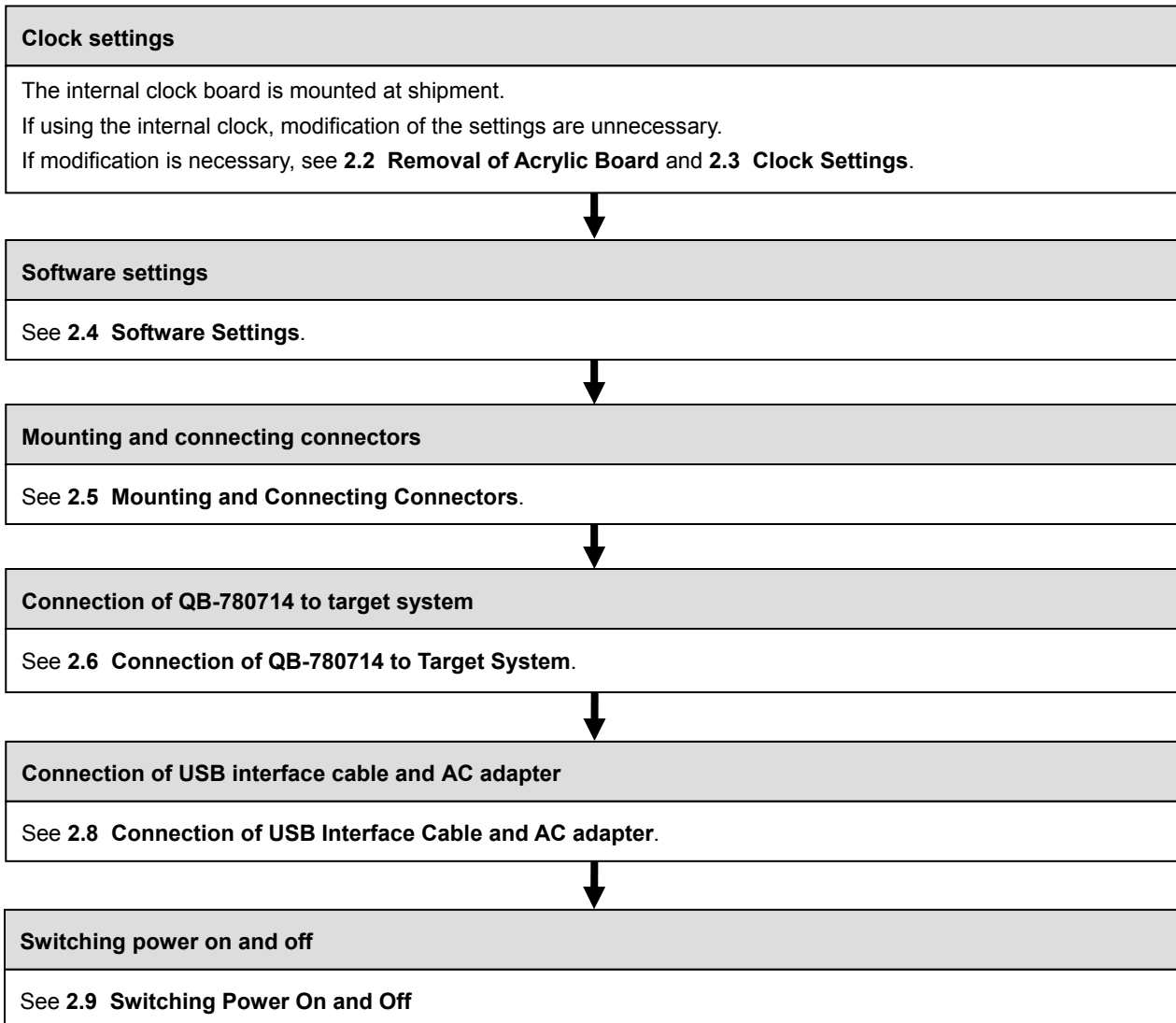
CHAPTER 2 SETUP PROCEDURE

This chapter explains the QB-780714 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 board positions.



2.1 Names and Functions of Hardware

Figure 2-1. Names of Parts of QB-780714

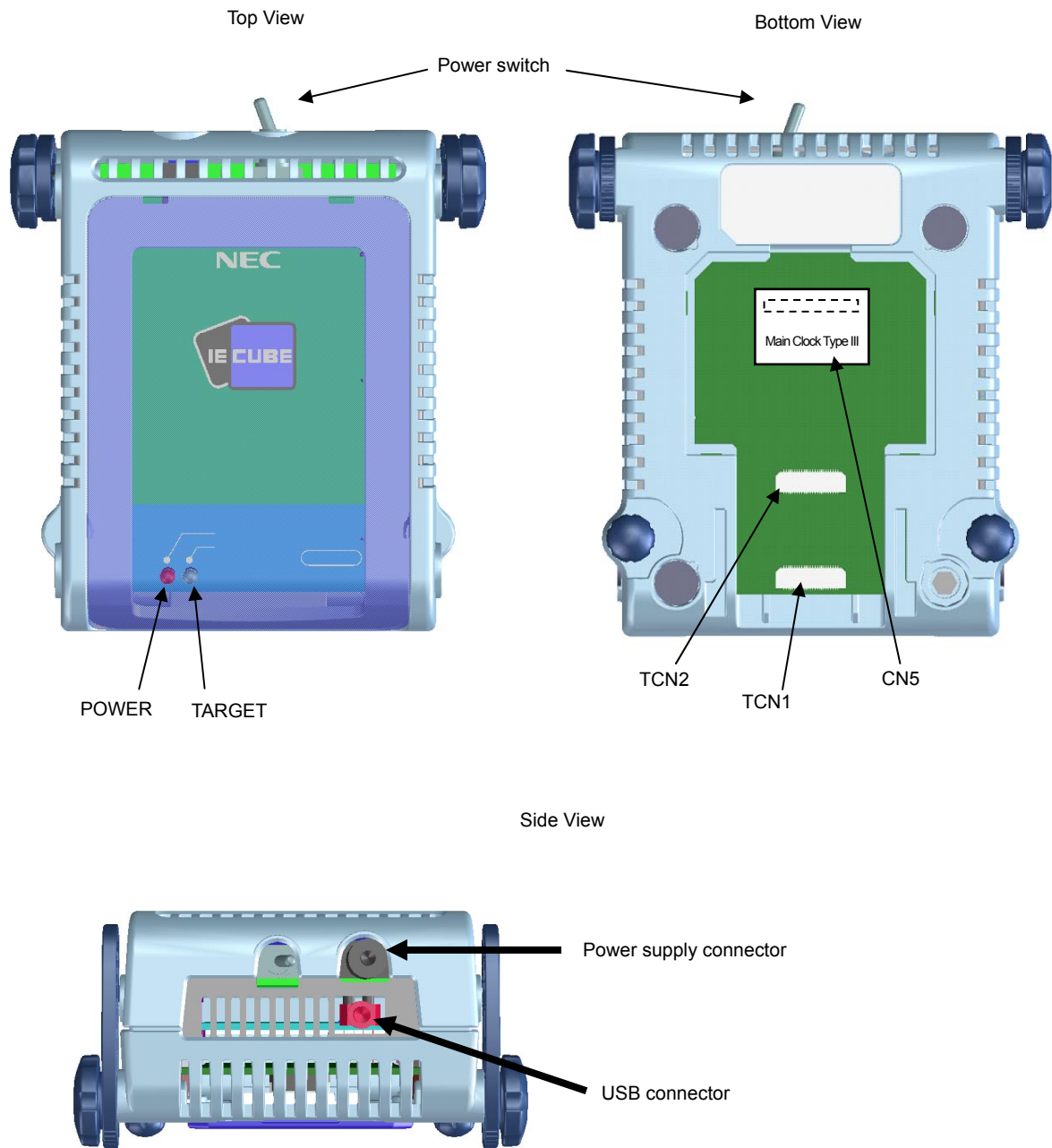
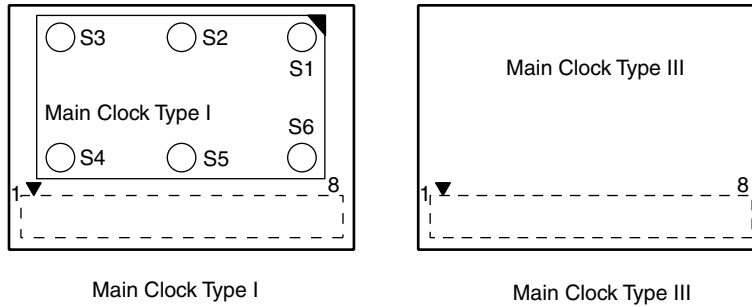


Figure 2-2. Clock Board



(1) **TCN1, TCN2**

These are connectors for connecting a check pin adapter or emulation probe.

(2) **CN5**

CN5 (Main clock board connector) is the connector for mounting the main clock board. Main Clock Type III is mounted at shipment.

(3) **POWER (Red LED)**

This is an LED that shows whether or not the power supply of the QB-780714 is switched on.

LED State	QB-780714 State
Lit	Power switch ON
Not lit	Power switch OFF or AC adapter not connected to QB-780714
Blinking	Internal error occurred (Contact an NEC Electronics sales representative or distributor)

(4) **TARGET (Green LED)**

This is an LED that shows whether or not 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

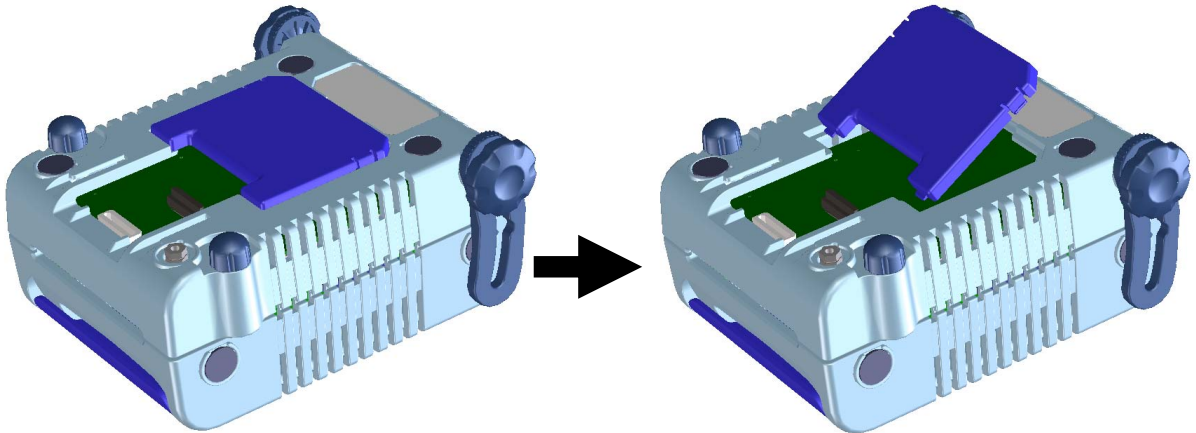
(5) **Power switch**

This is the power switch of the QB-780714.
It is OFF at shipment.

2.2 Removal of Acrylic Board

To modify the clock setup, the acrylic board on the bottom of the QB-780714 must be removed. The acrylic board can be removed by lifting it up.

Figure 2-3. Acrylic Board Removal Method



2.3 Clock Settings

2.3.1 Overview of clock settings

The following 3 types of clock settings are available.

For details, see **2.3.2 Clock setting methods**.

Main system clock

- (1) Mount the clock board in CN5 and use the internally generated clock
- (2) Mount the clock board in CN5 and use an externally input clock
- (3) Mount the oscillation circuit clock board in CN4 and generate the clock from the clock board

2.3.2 Clock setting methods

This section shows the hardware settings when setting the clock.

Table 2-1. Hardware Settings When Setting Hi-speed System Clock

Type of Clock to Use	CN5	Remarks
(1) Mount clock board in CN5 and use internally generated clock	Mount Main Clock Type III in CN5.	Mounted in CN5 at shipment
(2) Mount clock board in CN5 and use externally input clock	Mount Main Clock Type III in CN5.	Mounted in CN5 at shipment
(3) Mount oscillator clock board in CN5 and generate clock from clock board	Mount Main Clock Type I on CN5. Mount oscillator on Main Clock Type I board.	Oscillator is always supplied by 5 V

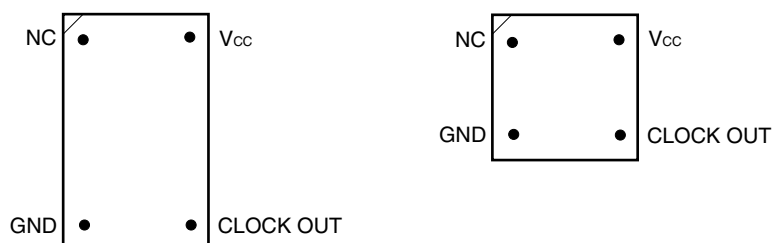
Remark Settings other than the above are prohibited.

2.3.3 High-speed system clock

(1) For mounting Main Clock Type I (for oscillator use)

- ◆ Things to prepare
 - Oscillator (with pins as shown in Figure 2-4 and 5 V power supply)

Figure 2-4. Oscillator (Main System Clock)



Top View

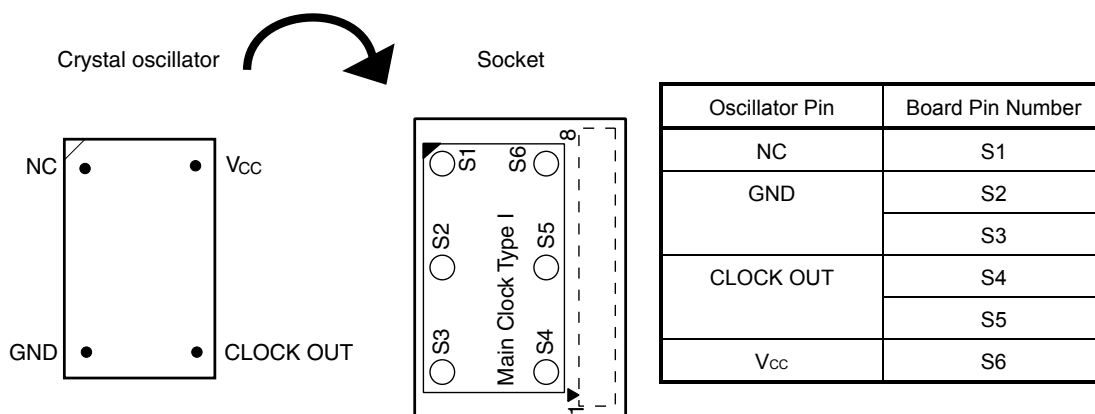
<Procedure>

<1> Prepare the QB-780714 and Main Clock Type I. Remove the clock board that is mounted in the CN5 socket on the QB-780714.

When removing the clock board, do so carefully, since the pins of the CN5 socket bend easily.

<2> Implement the prepared oscillator in Main Clock Type I. Carefully insert it in the direction of the number 1 pin mark.

Figure 2-5. Mapping of Oscillator to Main Clock Type I (Main System Clock)



<3> Fit Main Clock Type I prepared in <2> in the CN5 socket from which the clock board was removed in <1>.

In the configuration dialog box of the debugger, only the “Clock Board” button can be selected (others displayed in gray) at this time. For the frequency at this time, the clock of the oscillator that is mounted on the clock board is used.

(2) For mounting Main Clock Type III (for internally generated clock or externally input clock use)

Main Clock Type III is fitted in the CN5 socket at shipment. If in the same state as at shipment, hardware settings are unnecessary.

In the configuration dialog box of the debugger, only “External” or “System” can be selected at this time (“Clock Board” is displayed in gray). If “External” is selected, a clock that is input from the target system is used. If “System” is selected, select the desired frequency from the dialog menu.

If inputting an external clock, input a square wave^{Note} of the same potential as the target device in the clock pin (X1) (input of inverse waveform to X2 is unnecessary).

Note Square waves from oscillators using a resonator are not supported.

2.4 Software Settings

For details, see the **ID78K0-QB Ver. 2.90 Integrated Debugger Operation User’s Manual (U17437E)**.

2.5 Mounting and Connecting Connectors

This section describes the methods of connecting the QB-780714 and target system.

Make connections with both the QB-780714 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 in 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 (NQ-Guide) through the pin holes on the top of the TC. Accessory holes are $\phi 1.0$ mm non-through holes in 2 or 3 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 splashing and adhering to the MA contact pins when soldering.
 - Soldering conditions Solder reflow $240^{\circ}\text{C} \times 20$ seconds or less
 Manual soldering $240^{\circ}\text{C} \times 10$ seconds or less (1 pin)

Caution Do not perform washing by flux immersion or vapor.

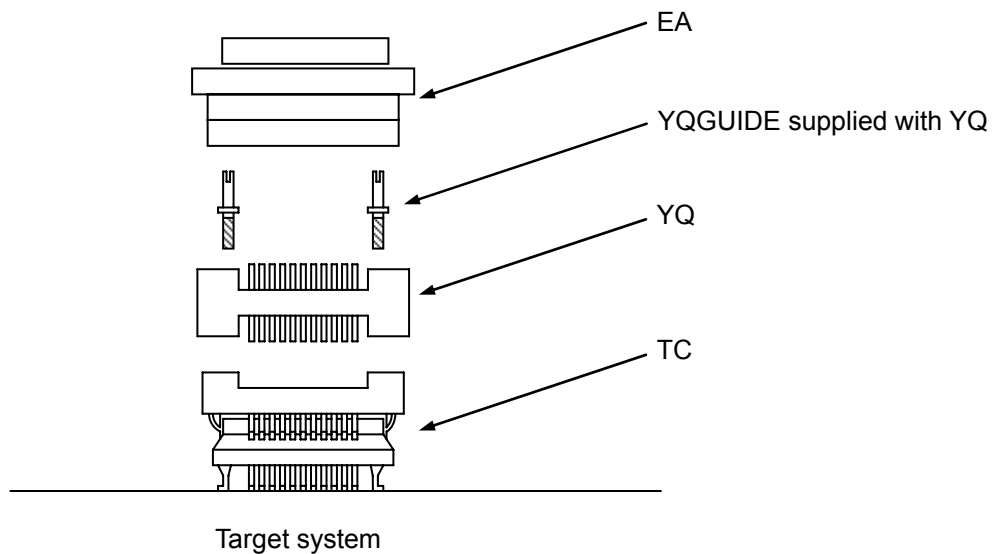
- (4) Take away the guide pins.

<R>

2.5.2 Mounting YQ on TC

- (1) After confirming that there are no broken or bent YQ contact pins, fit the YQ onto the TC and use the provided YQGUIDE screws to fix it into place. (See (2) for how to fix.) 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) Use the provided YQGUIDE screws to fix the YQ onto the TC on the target system. Use the provided slotted screwdriver or a torque driver to fasten the screws equally in the four corners. The tightening torque of the YQGUIDE screws should be no more than 0.55 kgf • cm (0.054 Nm). Too great tightening causes bad connections.

Screws for fitting to the MA (M2 × 10 mm/4) are included with the YQ.



2.5.3 Plugging EA into YQ

Match the No. 1 pin position of the YQ or YS (C cuts match in both) to the No. 1 pin position of the EA and plug in.

- When plugging or unplugging, press on the TC, YQ, and YS with a finger so that there is no force on the TC.
- When plugging or unplugging, be careful of the direction of rocking.

As a tool when unplugging, insert a bamboo skewer or the like between the YQ (SA) and EA and rock while slowly unplugging. 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

- (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 No. 0 or No. 1 (+) precision driver 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: $\phi 2.3$ mm or $\phi 3.3$ mm). The $\phi 3.8$ mm or $\phi 4.3$ 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 rocking, remove them gradually using a (-) driver 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 (-) driver 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 washing fluid on the structure will remain in the connector, do not perform washing.
- (6) TC, IC, and YQ cannot be used in combination.
- (7) An 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/>

2.5.5 Precautions on mounting TC and IC

- (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 4 accessory holes of the TC and fasten the screws in opposite corners. At that time, use either the dedicated screw driver that is supplied or a torque driver to fasten them equally in turn with a tightening torque of MAX. 0.55 kg • f (0.054 Nm). 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 washing by flux immersion or vapor.

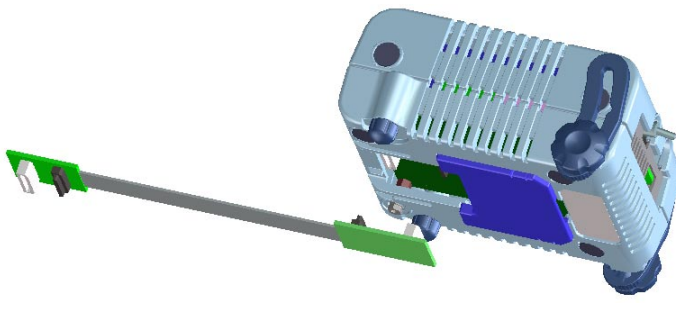
2.6 Connection of QB-780714 to Target System

If connecting the emulation probe (QB-80-EP-01T), connect it to the QB-780714 and the target system by the following procedure.

(a) Connection of emulation probe

Connect the emulation probe to the QB-780714.

Figure 2-6. Emulation Probe Connection Method



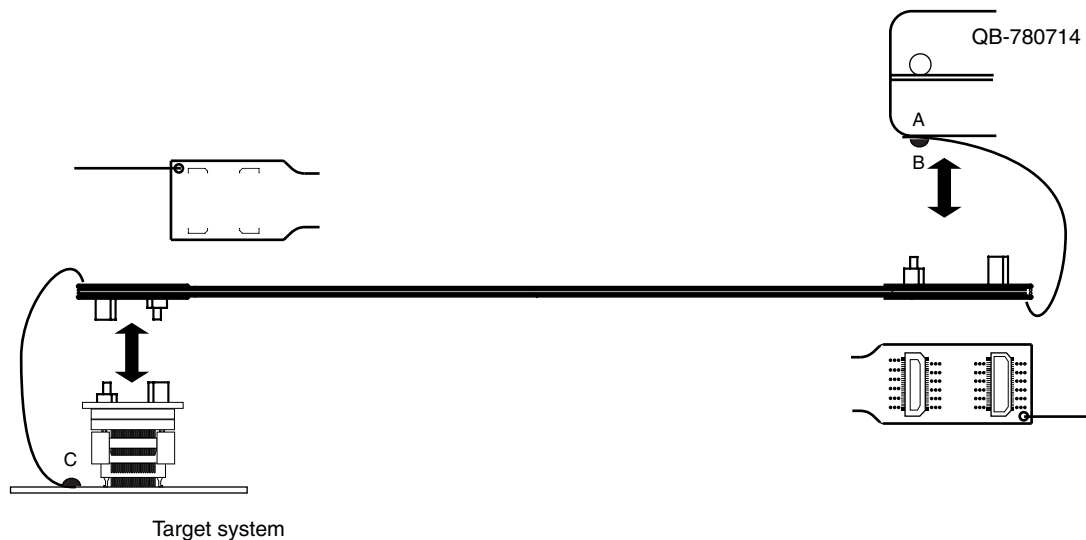
Insert CN1 and CN2 of the probe into TCN1 and TCN2 of the QB-780714.

(b) Connection of emulation probe GND wire

There are 2 GND wires in the emulation probe. Connect them to the QB-780714 and target system.

- <1> Fasten the GND wire on the QB-780714 side of the emulation probe to the nut on the bottom of the QB-780714 using a #0 or #1 (+) precision driver (connection of B to A in Figure 2-7).
- <2> Next plug the connector on top of the emulation probe into the connector in the opening in the bottom of the QB-780714 from below being careful of the insertion direction.

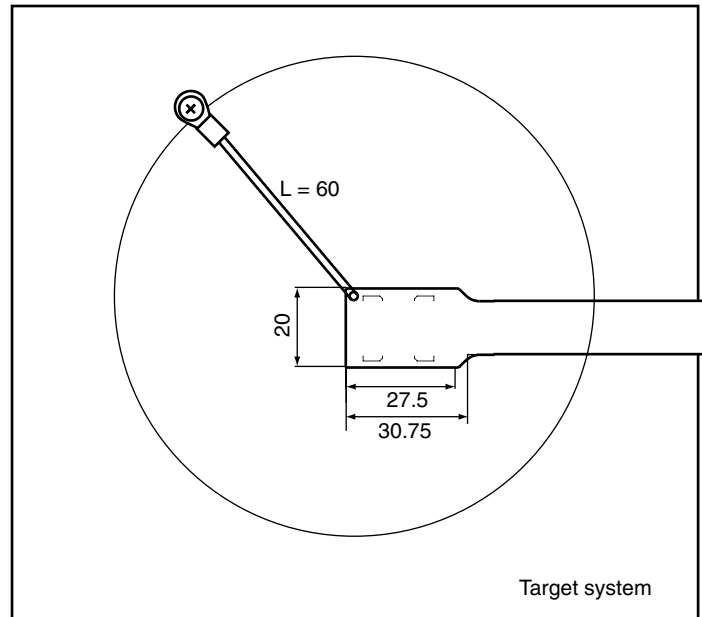
Figure 2-7. GND Wire



- <3> Connect the exchange adapter and emulation probe to the target connector.
- <4> Connect the GND wire 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 terminal of the GND wire to the target system (C in Figure 2-7). If the GND on the target system is an exposed pad, likewise fasten the Y terminal 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 a GND to which it can be connected in the range of an approximately 60 mm radius of the section of the target system for connecting the emulation probe, as shown in Figure 2-8.

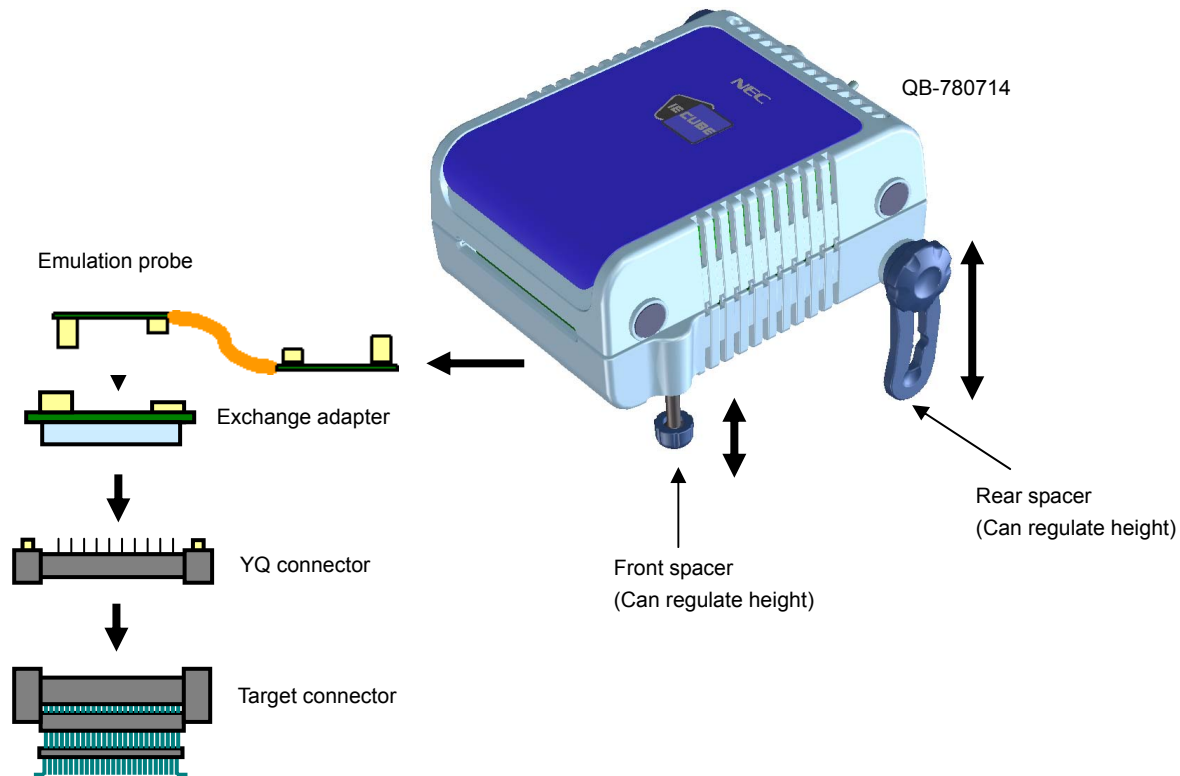
Figure 2-8. Where GND Wire Can Be Connected



(c) Ensuring isolation

When connecting the target system to the QB-780714 using an emulation probe, perform height regulation using the front spacer or rear spacer of the QB-780714 and ensure isolation from the target system.

Figure 2-9. Connection Using Emulation Probe

**(d) Precautions related to emulation probe**

The following precautions 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 pressing 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-780714 and the target system. If it cannot be connected, the impedance of the cable is unstable and could bring about lowering of signal transmission characteristics or distortion of the output waveform for an input waveform.

2.7 Power Supply and GND Pin Connection Precautions

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

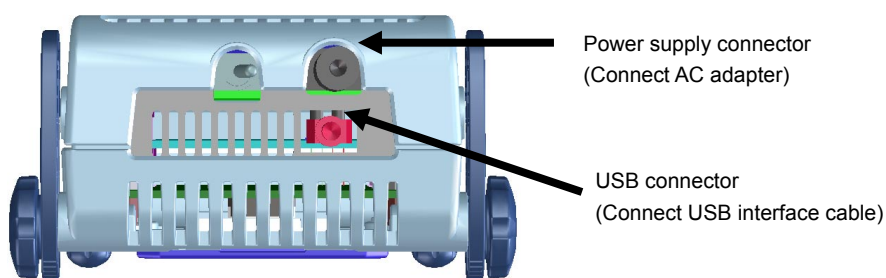
2.8 Connection of USB Interface Cable and AC Adapter

Plug the USB interface cable supplied with the QB-780714 into the USB connector of the host machine and also plug it into the USB connector on the rear of the QB-780714.

Plug the AC adapter supplied with the QB-780714 into a receptacle and plug it into the power supply connector on the rear of the QB-780714.

For QB-780714 connector positions, see **Figure 2-10**.

Figure 2-10. Connector Positions



2.9 Switching Power On and Off

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

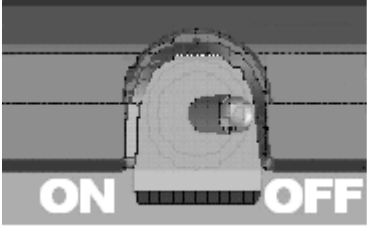
- | | |
|--|---|
| • Switching power on | • Switching power off |
| <1> QB-780714 power on | <1> Debugger termination |
| <2> Target system power on ^{Note} | <2> Target system power off ^{Note} |
| <3> Debugger startup | <3> QB-780714 power off |

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

Caution If there is a mistake in the order, the target system or QB-780714 may fail.

CHAPTER 3 SETTINGS AT PRODUCT SHIPMENT

Table 3-1. Settings at Shipment

Item	Setting	Remarks
CN5	Main Clock Type III is mounted	
Power switch		Set to OFF at shipment.

CHAPTER 4 DIFFERENCES BETWEEN TARGET DEVICE AND TARGET INTERFACE CIRCUIT

This chapter explains the differences between the signal lines of a target interface circuit of the QB-780714 and the signal lines of a target device

Although the target device is a CMOS circuit, the target interface circuit of the QB-780714 consists of an emulation circuit that depends on the emulation CPU, TTL, CMOS-IC, or other.

When the target system is debugged by connecting it to the QB-780714, the QB-780714 emulates just as if the actual target device were operating on the target system.

However, small differences arise because the QB-780714 actually is emulating.

- (1) Signals input and output by emulation CPU (μ PD78F0714)
- (2) Signals input and output by emulation CPU (FPGA)
- (3) Other signals

The circuits of the QB-780714 for the signals in (1) to (3) above are shown below by target device.

4.1 For μ PD78F0714 Emulation

For the signals in (1) to (3) below, see **Figure 4-1 Emulation Circuit Equivalent Circuit**.

(1) Signals input and output by emulation CPU (μ PD78F0714)

- P27 to P20
- AVREF, VDD, EVDD

(2) Signals input and output by emulation CPU (FPGA)

- P03 to P00
- P17 to P10
- P33 to P30
- P73 to P70
- P47 to P40
- P57 to P50
- P67 to P64
- X1, RESET, Vss, IC/FLMD0
- TWOTO5 to TWOTO0

(3) Other signals

- X2, XT2, EVss, REGC, AVss

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

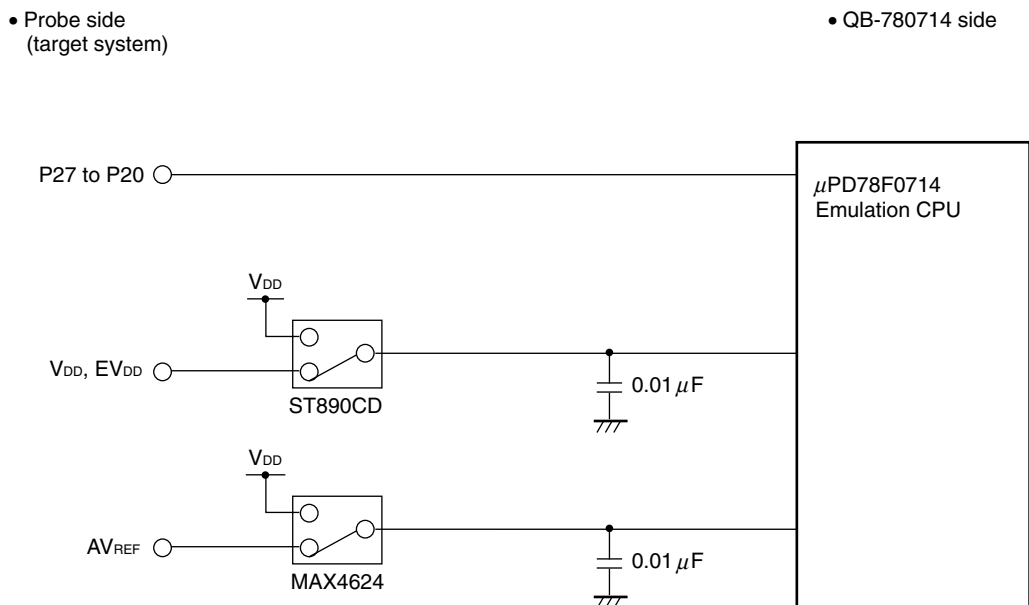
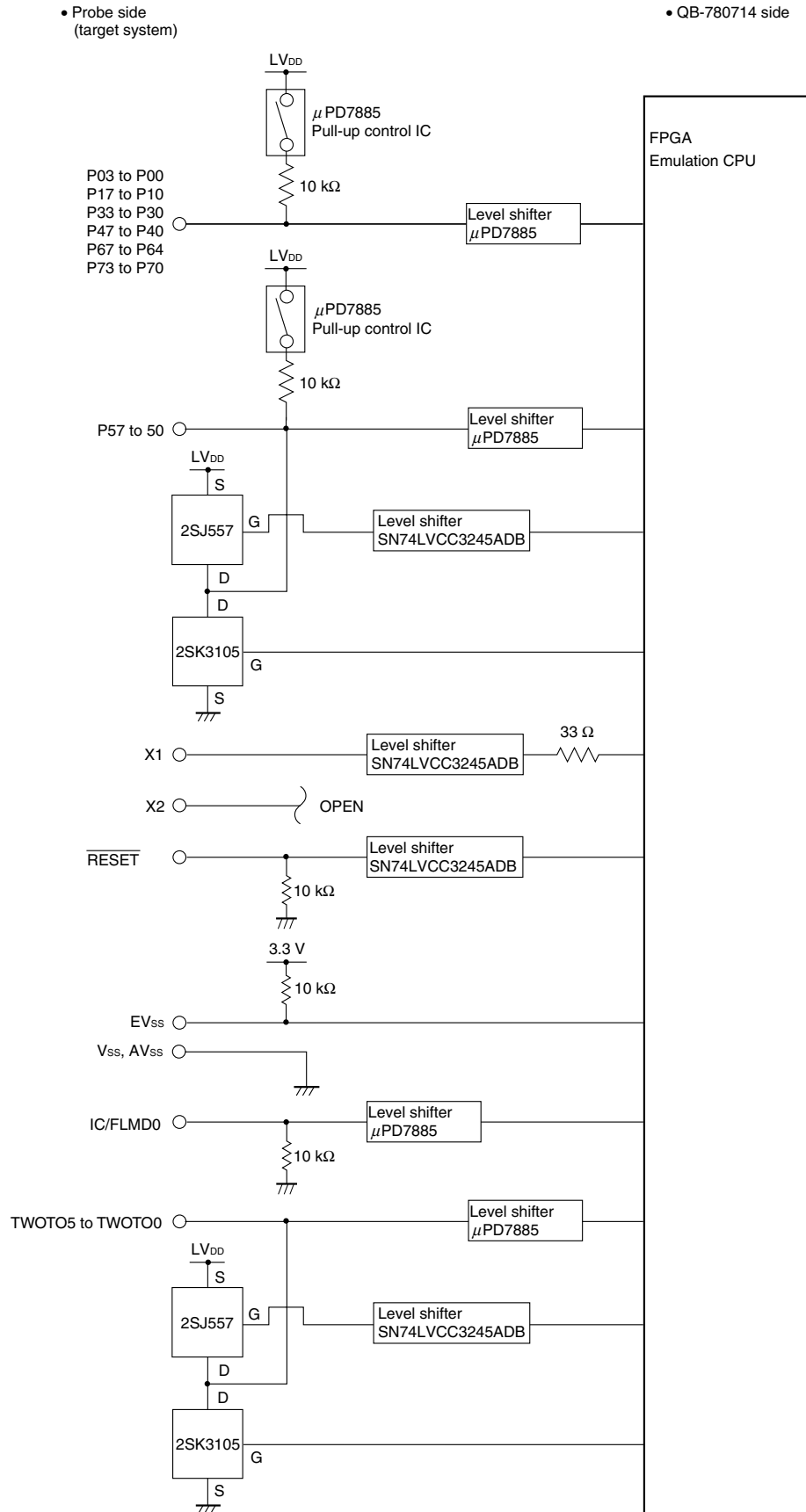


Figure 4-1. Emulation Circuit Equivalent Circuit (2/2)



CHAPTER 5 DIFFERENCES BETWEEN EMULATOR AND DEVICE

This chapter explains the differences in behavior between the QB-780714 emulator and the μ PD78F0714 device.

5.1 Mask options

5.1.1 Internal low-speed oscillator

The device has a mask option setting for internal low-speed oscillator (and WDT).

This mask option can be set to three possible configurations.

Use ROM byte at 0x0080	Uses the byte stored at 0x0080 to determine the setting (same as device)
Can be stopped by software	(0) ignores the byte at 0x0080 and allows internal low-speed oscillator to be stopped
Can not be stopped	(1) ignores the byte at 0x0080 and forbids internal low-speed oscillator to be stopped

5.1.2 POC level

Note that this is not a mask option of the device.

The device has a fixed POC level of 3.5 V \pm 200 mV.

This setting selects the POC level at which the emulator will generate a reset. To test all possible conditions, it is possible to set the POC level to 3.3 V, 3.5 V and 3.7 V on the tool.

Note Do not turn off the target power supply during a break. The target power should only be removed during RUN.

5.1.3 V_{DD} source for LVI function

Note that this is not a mask option of the device.

This setting selects what source to use for the LVI function of the emulator. By default V_{DD} is taken from the target application (V_{DD} from target).

To test all possible conditions without physically applying the voltage to the tool, it is possible to configure the emulator as if V_{DD} were below or above the threshold voltage (V_{DD} above 4.3 V/V_{DD} below 4.3 V).

Note Do not turn off or reduce the target power supply during a break. The target power should only be removed or reduced during RUN.

5.2 Difference in Electrical Behavior of Pins

The electrical characteristics of the pins may differ between device and emulator, because the emulator is an FPGA based design.

5.2.1 Port pins

(1) Regular port pins

The standard port pins have similar, yet not identical input and output buffers as the device. The electrical characteristics such as driver strength, slew rate and programmable pull-up resistor may differ from those of the device. The ports affected are P0[3:0], P1[7:0], P3[3:0], P4[7:0], P6[7:4], and P7[3:0].

Port P2[7:0] has the same characteristics as the device.

(2) High current port pins

The ports with increased current output capabilities, P5[7:0] and TWOTO[5:0], are implemented using discrete FET driver stages. The electrical characteristics such as driver strength and slew rate are different to those of the device.

5.2.2 Dedicated pins

(1) X1/X2

X1 uses a different input buffer as the device.

X2 is not connected.

(2) Control pins

$\overline{\text{RESET}}$ has a different input buffer as the device. It has an internal pull-down resistor of 10 k Ω . Be sure that the target applies a valid level to this pin. If it does not, the emulator will refuse to operate.

IC/FLMD0 has a different input buffer as the device. As flash programming is not supported by the emulator, this pin should always be held at a logic low level.

(3) Power pins

The supply power pins V_{DD} , EV_{DD} and AV_{REF} are connected to the target, if a target is connected. If no target is connected, they will be supplied by an internal supply voltage of approx. 5.0 V. Although the current load on these pins will be close to that of the device, it may differ from that of the device.

V_{DD} and EV_{DD} are connected internally inside the emulator.

V_{SS} and AV_{SS} are connected internally inside the emulator.

EV_{SS} is used to detect the connection of a target application. This pin is not connected to V_{SS} in the emulator. It is connected to a 10 k Ω pull-up to 3.3 V. This pin must be connected to V_{SS} on the target application (same as the device).

5.3 Peripheral Break

5.3.1 Peripheral macros will operate during peripheral break when retry registers are accessed

The peripheral clock will run for a few cycles when peripheral break is enabled and an SFR requiring RETRY is accessed in break mode.

Because of this, all peripheral macros will operate for these few cycles.

Access to SFRs can occur in the SFR window, watch window or the TCL console.

5.3.2 WDT always stops during break

During break mode the WDT is always stopped, even if peripheral break is disabled.

5.4 Reset Behavior

5.4.1 iRAM content after reset

The iRAM content will remain unchanged after reset on the emulator. However on the device, the iRAM content may have changed after a reset.

5.4.2 Execution after reset release

The time between when the reset (external or peripheral reset) is released and when the first instruction of code is executed may differ between device and emulator.

5.5 Internal Low-speed Oscillator

The internal oscillation clock source can vary in its frequency from 120 kHz to 480 kHz on the device. The emulator will always supply a stable clock of 240 kHz.

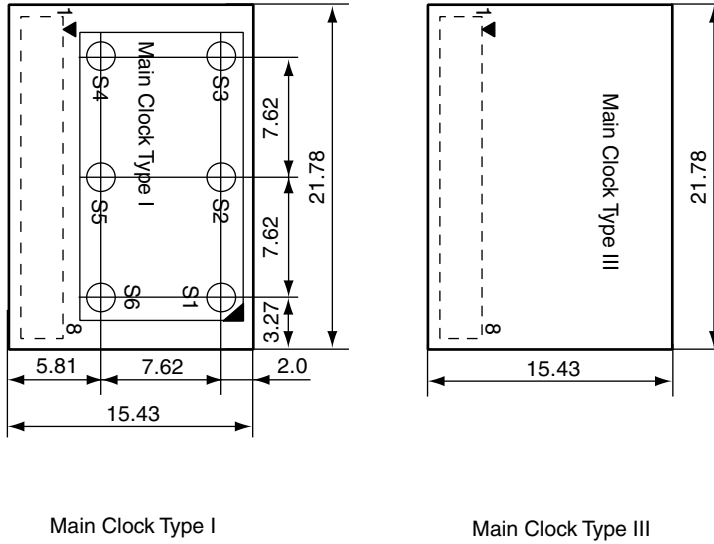
Observe the following cautions.

- Do not decrease the voltage of the target system during a break.
A reset generated by LVI or POC during a break may cause an incorrect operation of the debugger or communication errors.
- Even when using the product without connecting a target system, connect and use the emulation probe and exchange adapter.
If the product is used without connecting the emulation probe and exchange adapter, a warning window is displayed but use is possible.
- The function that sets the option byte to address 0x0080 cannot be emulated when a microcontroller that has an internal flash memory and an option byte function is used.
Set the option byte function in the mask option setting dialog of the debugger.

APPENDIX A PACKAGE DRAWINGS

A.1 Clock Board

Figure A-1. Clock Board



APPENDIX B REVISION HISTORY

B.1 Major Revisions in This Edition

Page	Description
CHAPTER 1 GENERAL	
p.13	1.3 System Configuration <ul style="list-style-type: none">• Change of Table 1-3. Adapter/Connector List by Target Devices
p.14	<ul style="list-style-type: none">• Change AC plug of Figure 1-2 System Configuration
p.16	<ul style="list-style-type: none">• Change URL of Remark
p.16	1.3.1 Target connector for 32-pin SDIP <ul style="list-style-type: none">• Change of Recommended product
p.17	1.4 Package Contents <ul style="list-style-type: none">• Change of Products supplied with QB-780714-T30MC• Change of Products supplied with QB-780714-T32CT
CHAPTER 2 SETUP PROCEDURE	
p.25	2.5.2 Mounting YQ on TC <ul style="list-style-type: none">• Change of description
p.31	2.8 Connection of USB Interface Cable and AC Adapter <ul style="list-style-type: none">• Deletion of types of AC adapter plug
CHAPTER 6 CAUTIONS	
p.39	Change of CHAPTER 6 CAUTIONS

B.2 Revision History up to Previous Edition

The following table shows the revision history up to this edition. The “Applied to:” column indicates the chapters of each edition in which the revision was applied.

Edition	Description	Applied to:
2nd edition	Deletion of 1.3.1 AC adapter	CHAPTER 1 GENERAL
3rd edition	Addition of μ PD78F0711, 78F0712 to the target device	throughout
	Modification of Table 1-1. QB-780714 Hardware Specifications	CHAPTER 1 GENERAL
	Modification of Table 1-3. Devices Subject to Emulation by QB-780714	
	Modification of Figure 1-2. System Configuration	
	Addition of the supported socket in Table 1-6. Exchange Adapters to Table 1-10. Mount Adapters	
	Addition of 1.3.1 Target connector for 32-pin SDIP	APPENDIX A NOTES ON TARGET SYSTEM DESIGN
	Addition of Figure A-1. For μ PD78F0711 (30-Pin MC Package) and Figure A-2. For μ PD78F0712 (32-Pin CT Package)	
	Addition of Figure B-1. Target Connector for μ PD78F0711 (QB-30MC-NQ-01T) , Figure B-3. YQ Connector for μ PD78F0711 (QB-30MC-YQ-01T) , Figure B-5. Exchange Adapter for μ PD78F0711 (QB-30MC-EA-03T) , Figure B-8. Space Adapter for μ PD78F0711 (QB-30MC-YS-01T) , and Figure B-10. Mount Adapter for μ PD78F0711 (QB-30MC-HQ-01T)	APPENDIX B PACKAGE DRAWINGS
Addition of APPENDIX C REVISION HISTORY	APPENDIX C REVISION HISTORY	
4th edition	1.3 System Configuration • Addition of Remark	CHAPTER 1 GENERAL
	1.4 Package Contents • Change of Products supplied with QB-780714-ZZZ	
	2.3.3 High-speed system clock • Change of description	CHAPTER 2 SETUP PROCEDURE
	Deletion of APPENDIX A NOTES ON TARGET SYSTEM DESIGN	APPENDIX A NOTES ON TARGET SYSTEM DESIGN in previous edition
	Deletion of B.1 Target Connectors to B.7 Emulation Probe from a previous edition	APPENDIX A PACKAGE DRAWINGS

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