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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]

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.

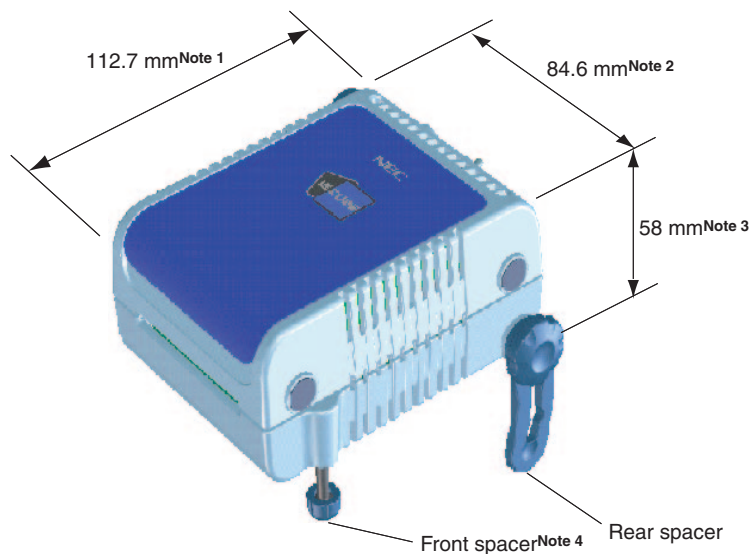
Hardware and software can be debugged efficiently in the development of systems in which the μ PD78F0714 is used. This manual describes basic setup procedures, hardware specifications, system specifications, and how to set switches.

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.

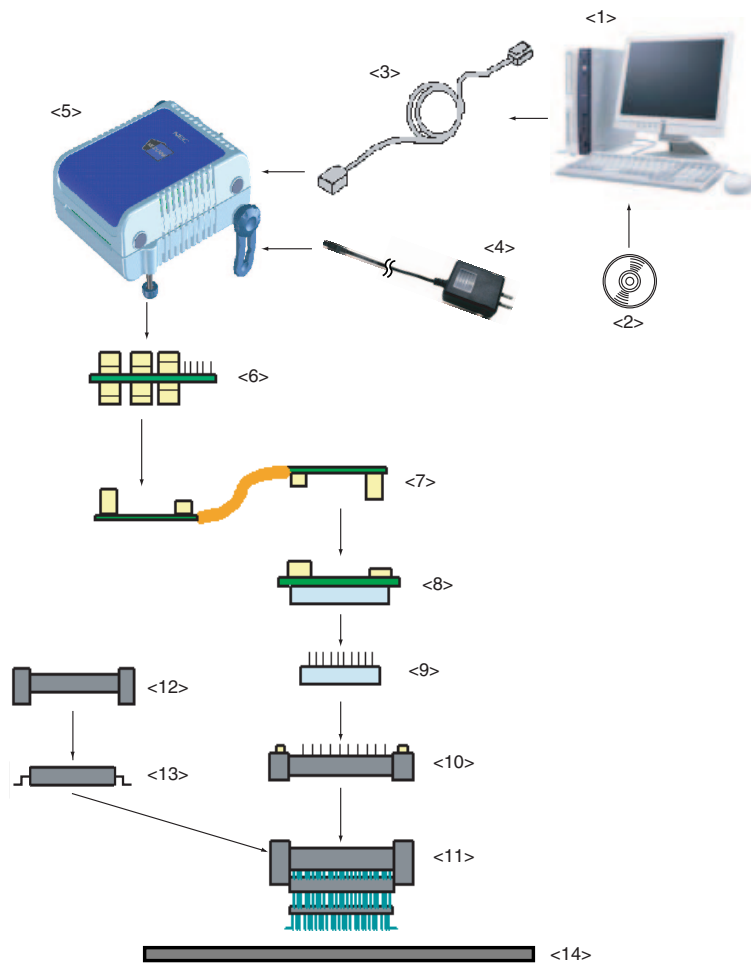
<R>

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**.

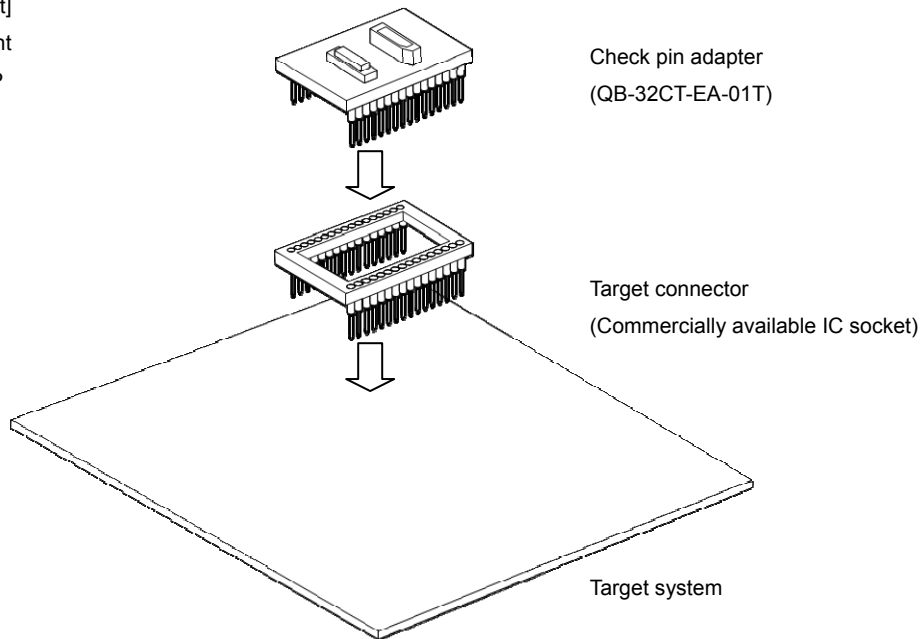
Remark For notes on target system design and package drawings, refer to [Related Information] on the following URL.

<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.

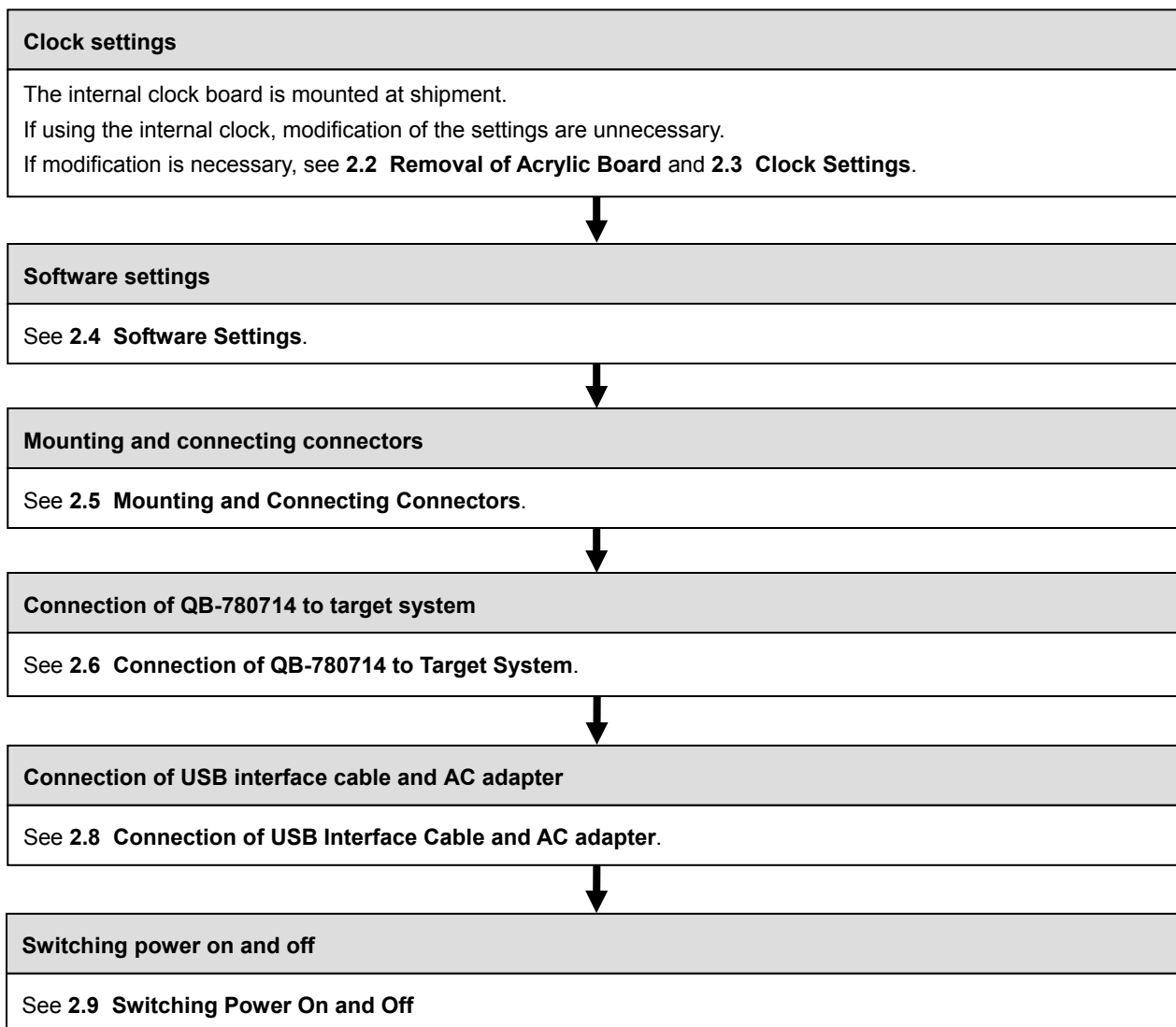
CHAPTER 2 SETUP PROCEDURE

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

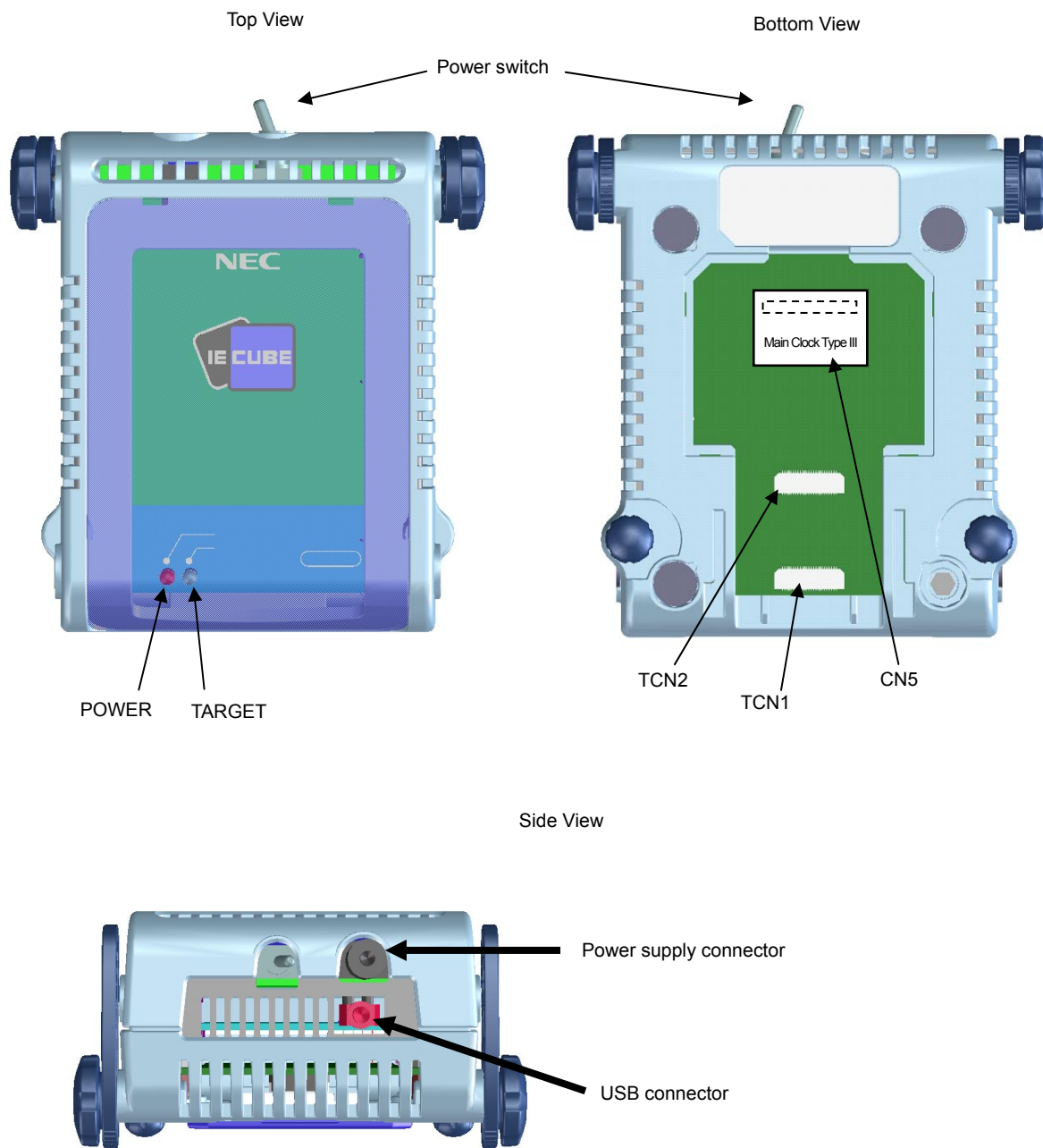
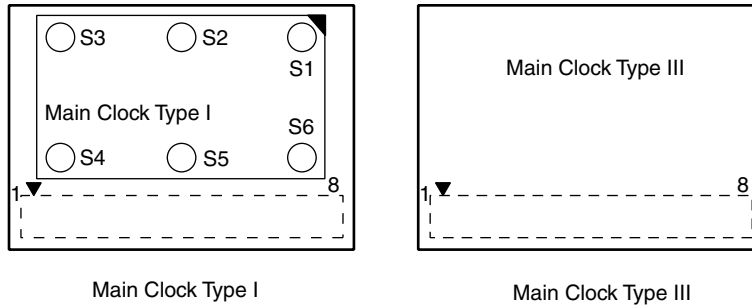


Figure 2-2. Clock Board



(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

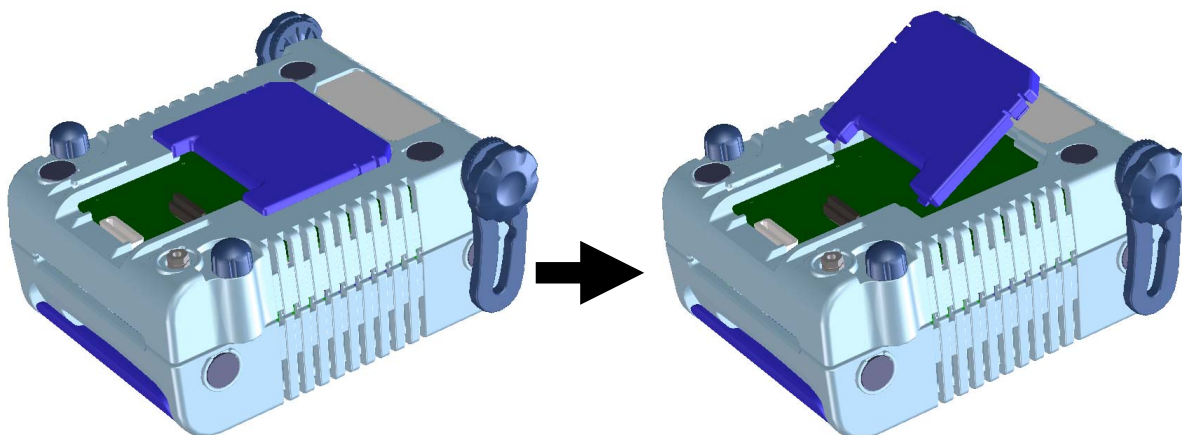
(5) **Power switch**

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.

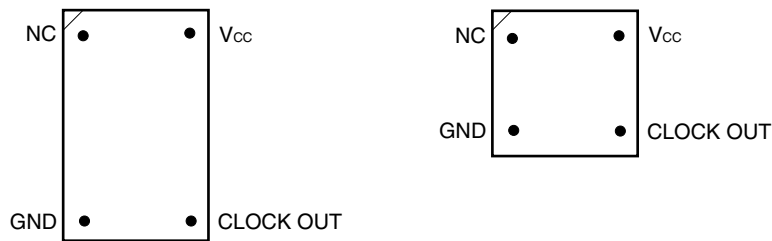
2.3.3 High-speed system clock

(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

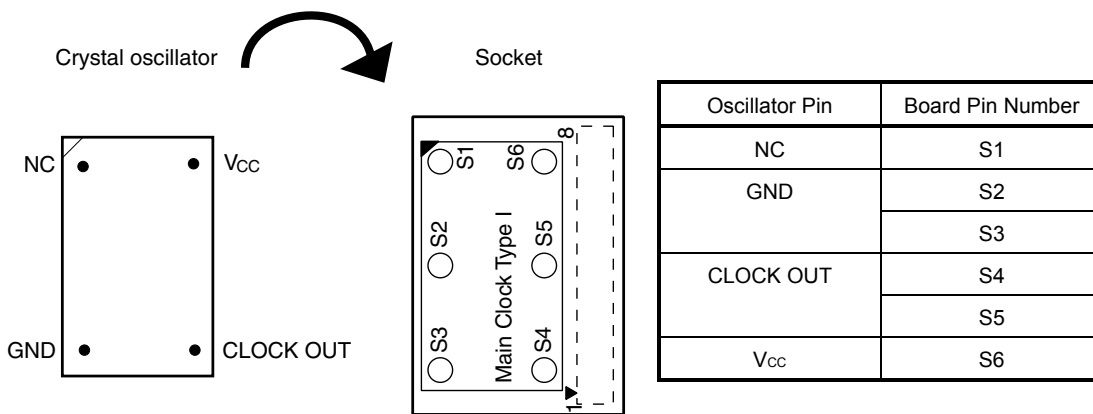
<Procedure>

<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).