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April 1st, 2010
Renesas Electronics Corporation

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ZUD-F35-10-0097 (1/32)

December 2, 2010

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MCU Software Division
MCU Business Unit
Renesas Electronics Corporation

User's Manual（Preliminary）

QB-V850E2FX4H-PD

In-Circuit Emulator

Target Devices

V850E2/FG4
V850E2/FJ4
V850E2/FK4
V850E2/FL4

Contents

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 POD probe, or the like was bent or pulled excessively
- When using an AC adapter not supported in the region of use
- 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.
- 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 it may likely be exposed to electrostatic discharge or electrical noise

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-V850E2FX4H-PD (generic name: POD). 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 POD.

Organization

This manual is divided into the following sections.

- General
- Names and functions of Hardware
- Notes
- Optional function

How to Read This Manual

It is assumed that the readers of this manual have general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.
This manual describes the basic setup procedures and how to set switches.

To understand the overall functions and usages of the IECUBE2
→Read this manual in the order of the CONTENTS.

To know the manipulations, command functions, and other software-related settings of the IECUBE2
→See the user's manual of the debugger 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.

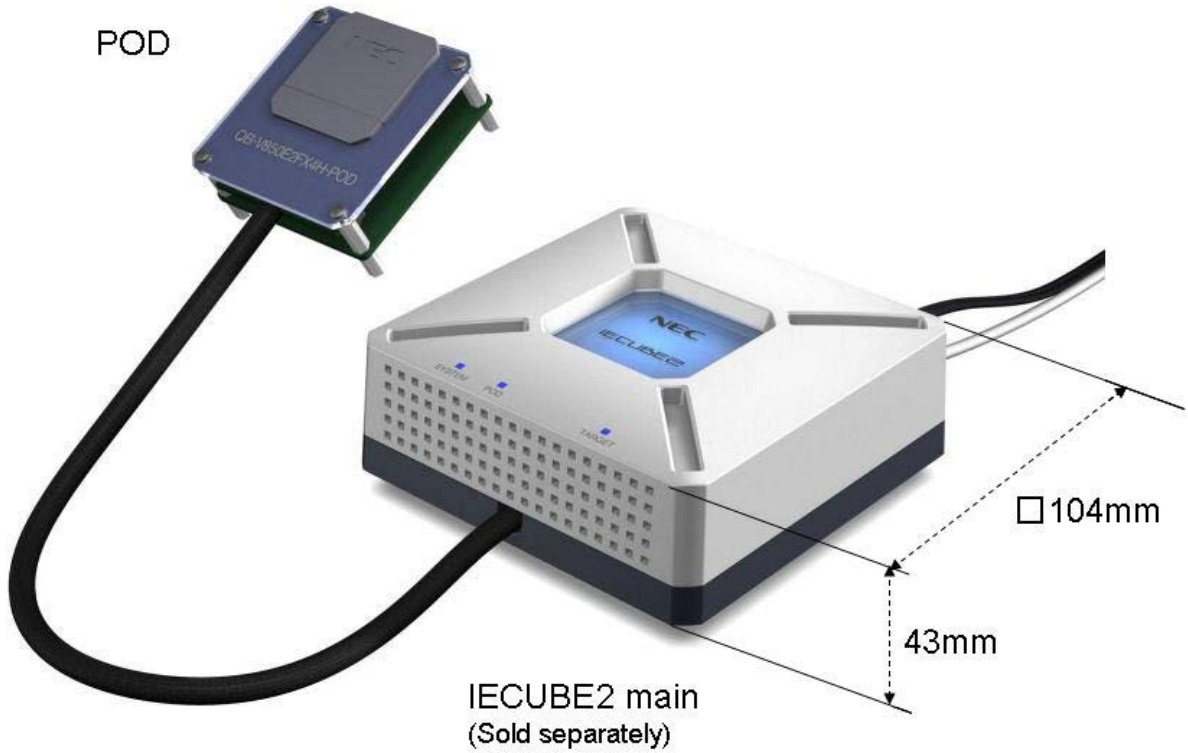
Term	Meaning
Target device	This is the device to be emulated.
Target system	This is the system to be debugged (system provided by the user). This includes the target program and the hardware provided by the user.
IECUBE®2	Generic name for Renesas Electronics' high-performance, compact in-circuit emulator.
POD	This is IECUBE2 peripheral to interface with the target system.
Emulator	This is the product to emulate the target device.

CHAPTER 1 GENERAL

The QB-V850E2FX4H-PD ("POD") is used together with the QB-V850E2 (IECUBE2 main unit) in order to emulate the V850E2/Fx4 microcontroller.

The IECUBE2 can be used to debug hardware and software efficiently when developing systems using the target device.

Figure 1-1. Description of external dimension



1.1 Hardware Specifications

The following table describes hardware specifications of POD.

Table 1-1. IECUBE2 Hardware Specifications

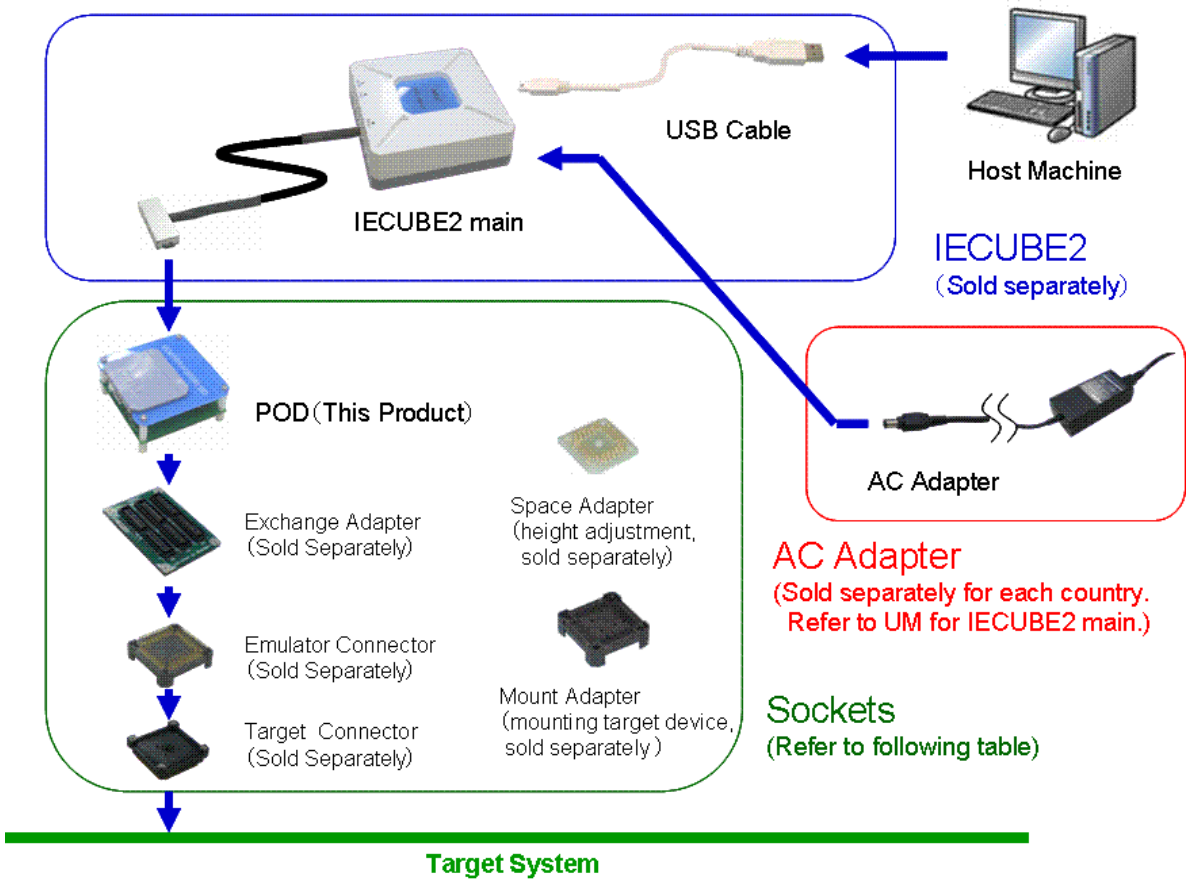
Parameter		Specification
Target device		V850E2/FG4, V850E2/FJ4, V850E2/FK4, V850E2/FL4
Target system interface voltage[note]	REGxVDD, FVDD0, ExVDD, B0VDD, AxVDD, AVREFPx	3.3V, or 5.0V
Maximum operating frequency		80 MHz
Capability of main clock oscillator		4 to 20MHz (The oscillator on POD is used)
Low-speed internal oscillator		240kHz (typ.)
High-speed internal oscillator		8MHz (typ.)
Operating temperature range		0 to 40°C (No condensation)
Storage temperature range		−15 to 60°C (No condensation)

Note: The other terminals are connected to the internal power of IECUBE2.

1.2 System Overview

The system configuration is described as below. POD can not be used alone. IECUBE2, AC adapter and sockets are needed to use. These are sold separately.

Figure 1-2. System Configuration



The following table describes the corresponding sockets for the target device.

Table 1-2. Sockets for the target device

Socket	Target Device			
	V850E2/FG4	V850E2/FJ4	V850E2/FK4	V850E2/FL4
Exchange Adapter	QB-100GC-EA-60T	QB-144GJ-EA-62T	QB-176GM-EA-61T	QB-208GD-EA-61T
Emulator Connector	QB-100GC-YQ-01T	QB-144GJ-YQ-01T	QB-176GM-YQ-01T	QB-208GD-YQ-01T
Target Connector	QB-100GC-NQ-01T	QB-144GJ-NQ-01T	QB-176GM-NQ-01T	QB-208GD-NQ-01T
Space Adapter	QB-100GC-YS-01T	QB-144GJ-YS-01T	QB-176GM-YS-01T	QB-208GD-YS-01T
Mount Adapter	QB-100GC-HQ-01T	QB-144GJ-HQ-01T	QB-176GM-HQ-01T	QB-208GD-HQ-02T

1.3 Functional Overview

IECUBE2 is provided with a wealth of debug functions to enable efficient program debugging, in addition to being used to emulate the operation of a target device. An overview of the functions is provided in this section.

Some functions are not supported, depending on the debugger to be used. See also the manual of the debugger to be used to confirm.

1.3.1 Program execution function (real-time execution function)

The program execution function enables program execution equivalent to that of the target device. The executed program can be stopped under various conditions by using the break functions. The operation of only a function can be checked by executing a program, because a program can be executed from any address.

1.3.2 Step execution function (non-real-time execution function)

The step execution function can be used to execute instructions one by one, in assemble instruction units. Only instructions to be executed purely in steps can be executed, because interrupts are not acknowledged during step execution.

Caution Step execution to be performed at the C language level is performed by a debugger using the break function. In this case, interrupts are acknowledged in step execution. Consequently, if processing at the interrupt destination cannot be completed, step execution may not be completed. For handling such a case, see the manual of the debugger.

1.3.3 Break functions (program execution stop)

The break functions are used to stop program execution. With IECUBE2, program execution can be stopped under the following various conditions. See (1) to (5) for an overview of each break function.

- An address has been executed → Hardware break function, software break function
- A variable has been accessed → Hardware break function
- A specific time has elapsed → Timer overflow break function

Variable values can be checked during a break and a program can be executed again by changing register values, because the CPU operates even during a break (while the program is stopped). Interrupts generated during the break are suspended, because basically peripheral functions also operate during the break. Use the peripheral break function to stop peripheral functions during the break.

(1) Hardware break function

The hardware break function is used to observe the CPU bus cycles and set a break for a specific fetch or access operation. For example, a break can be set by detecting a state where an address has been executed or a variable has been accessed. For states that can be set, see **"Event function"**.

Caution The address for which a break has been set is at a position ahead of the address where an actual access has occurred, because the break set for the access (write, read) is detected at an MEM stage or a WB stage on the CPU pipeline.

(2) Software break function

The software break function is used to set a break when a specific address has been executed (fetched).

(3) Timer overflow break function

This function is used to set a break when a time set by using the time measurement function has elapsed. For example, if the execution time of a function must be 2 ms, a break can be set when at least 2 ms have elapsed between starting and ending the function. This function and the trace function can be used together to find the source that has taken time.

(4) Forced break function

This function is used to forcibly stop a program when it is desired to be stopped.

(5) Trace full break function

This function is used to stop a program when the trace memory is full.

1.3.4 Trace function (program execution history)

The trace function can be used to check the CPU execution history (trace). Items (1) to (7) can be recorded in the execution history.

(1) Program counter (PC) of branch source and branch destination

The PCs of a branch source and a branch destination can be recorded in the history.

Consequently, practically all executed programs can be checked, because programs executed between branch points also will be clarified. The amount of trace memory used can be saved and more history items can be traced by that amount, by recording only branch information. (The amount of traces that can be traced back depends on the number of branches.)

(2) Access data/access address

Access addresses for memories and peripheral I/O registers, and access data can be recorded in the history. Read and write operations can also be recorded in the history.

Caution Accesses to CPU program registers (such as r1 and r2) and system registers (such as PSW and EIPC) cannot be recorded in the history.

(3) Time stamp

The time elapsed from the trace start point can be added to each trace information. The timer performance for time stamps is the same as that of the time measurement function.

(4) DMA access address, data, status, channel number, transfer count

When the DMA function of the target microcontroller is being used, the DMA access can be recorded in the history.

- Access address
- Access data
- Access status (R/W)
- DMA channel number
- Transfer count

(5) History of specific sections (section trace)

Only specific sections can be recorded in the history by using the event function in combination. For example, the execution history of from the start to the end of a function can be recorded.

(6) History of specific phenomenon occurred (qualify trace)

Only the occurrence of specific phenomena can be recorded in the history by using the event function in combination.

For example, a history of having accessed to only a variable can be recorded.

(7) Recording histories before and after specific phenomenon has occurred (delay trigger trace)

The history after a specific phenomenon has occurred can be recorded by using the event function in combination. This is similar to being able to observe a signal waveform by assuming an edge as a trigger, when using an oscilloscope to observe a signal.

For example, the program execution histories before and after a write access has been performed for a variable can be viewed.

1.3.5 Time measurement function

This function is used to measure the execution time of a specific section. The measurement start and end points can be set by using the event function.

In addition, the maximum, minimum, and average execution time and the number by which the measurement section has been passed can be measured.

1.3.6 Event function (specific CPU operation detection)

The event function is used to detect specific fetch and access operations by observing the CPU bus cycle. CPU operations, such as of an address being executed and a variable being accessed can be detected. Such specific CPU operations are called events. Use the event function together with the following functions.

- Hardware break function
- Trace function
- Time measurement function

The events that can be registered by using the event function are as follows.

(1) Pre-execution event

A pre-execution event is detected when execution of an address is attempted. It can be used only with the hardware break function. Four pre-execution event points can be specified.

[Detection conditions that can be specified]

- Execution address

(2) Post-execution event

A post-execution event is detected when an address has been executed. The address of a post-execution event can be specified as a range. Up to eight post-execution event points can be specified, but if the execution address has been specified as a range, two points will be consumed. When the execution address has been specified as a range for all events, four event points can be specified.

[Detection conditions that can be specified]

- Execution address (can be specified as a range)

(3) Access event

An access event is detected when an address has been accessed (read or written). The following detection conditions can be specified for an access event.

Up to six access event points can be specified, but if the access address has been specified as a range, two points will be consumed. When the access address has been specified as a range for all events, three event points can be specified.

[Detection conditions that can be specified]

- Access address (can be specified as a range)
- Access data
- Access size
- Access status (read, write, both read and write)

1.3.7 Event link function (event combinations)

The event link function is used to combine into one event, events that have been registered by using the event function. It is used to detect a specific sequence, such as when an address has been executed after a variable was accessed.

1.3.8 Peripheral break function

When the break function has been used to stop program execution, peripheral functions other than the watchdog timer continue to operate in general, but some peripheral functions can be stopped by using the peripheral break function. The following peripheral functions can be stopped.

• Following functions always stopped upon a breakpoint hit
- Watch dog timer (WDTA)

• Following functions can be stopped or continue upon a breakpoint hit by user option
- Timers (TAUA, TAUB, TAUC, TAUJ, ENCA, RTCA, CNTA, OSTM, TAPA)
- Serial interfaces (UARTE, CSIH, CSIG, I2CB)
- A/D converter (ADC)

1.3.9 Mask function

The mask function can be used to mask the following sources.

- _RESET terminal
- internal reset (For example, watch dog timer)

1.4 System Specifications

This section shows the IECUBE2 system specifications. For the usage of the debugging function, refer to the documentation of the debugger.

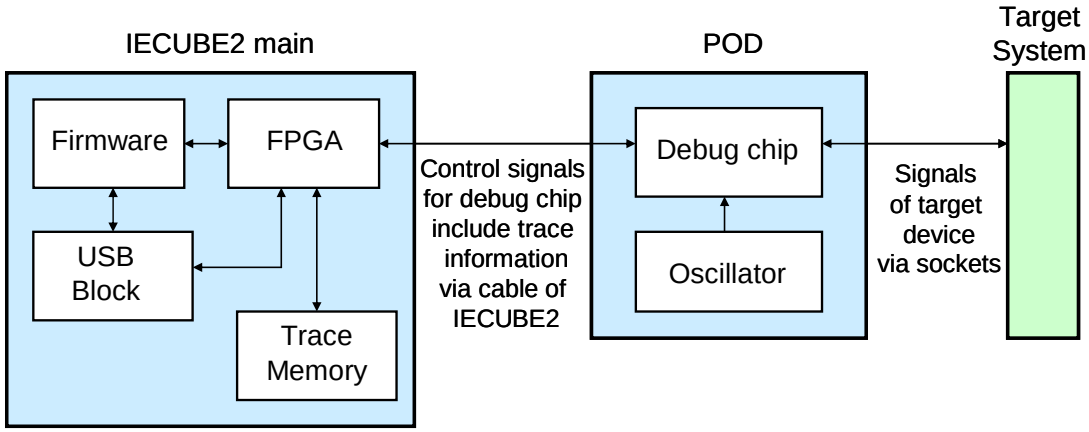
Table 1-3. IECUBE2 System Specifications

Parameter		Specification
Emulation memory capacity	Internal ROM	Same as target devices.
	Internal RAM	Same as target devices.
	External memory	None
Program execution functions	Real-time execution function	Available
	Non-real-time execution function (Step execution)	Available (Step execution in source level depends on debugger)
Event functions	Detection of execution	Pre-execution: 4 points (only for break function) Post-execution: 8 points
	Detection of access	6 points
	Pass counter	12 bits
	Sequential	4 steps
	Modification when running	Available
Break functions	Hardware break	Available
	Software break	Depends on debugger
	Other	Trace full break, forced break, timer overflow break, delay trigger break
Trace functions	Trace data types	Branch-source PC, branch-destination PC, access data, access address, R/W status, time stamp, DMA access data, DMA access address, DMA R/W status, DMA transfer count, DMA channel number
	Trace events	Delay trigger, section, qualify
	Memory capacity	9M bytes (512K frames)
		2.25G bytes (Approx. 128M frames) (When using the long term trace option)
	Other	Trace full stop, delay trigger stop
Time measurement functions (IECUBE2 main supports)	Measurement clock	200 MHz
	Measurement objects	Beginning through end of program execution Start event through end event (6 sections)
	Maximum measurement time	Approximately 195 hours (When using measurement-dedicated clock divided by 16384)
	Minimum resolution	5 ns
	Measurement results	Execution time (Start through end of execution) Maximum, minimum, average, pass count (between events)
	Other	Timer overflow break function (1 point)
Time measurement functions (Debug chip supports)	Measurement clock	CPU clock
	Measurement objects	Beginning through end of program execution Start event through end event (1 sections)
	Maximum measurement time	Approximately 1 minutes (When CPU clock is 80MHz)
	Minimum resolution	Depends on CPU clock
	Measurement results	Execution time (Start through end of execution) Maximum, minimum, average, pass count (between events)
	Other	Timer overflow break function (1 point)
Other functions		Peripheral break function, mask function(_RESET, internal reset)

1.5 Block Overview

An internal block overview of the functions is described as below.

Figure 1-3. System Configuration



1.6 Package Contents

QB-V850E2FX4H-PD package includes the items below. The list contains only items which are delivered commonly to all regions and that depending on region more items may be available. Therefore, confirm that the items in the attached packing list.

Products supplied with QB-V850E2FX4H-PD

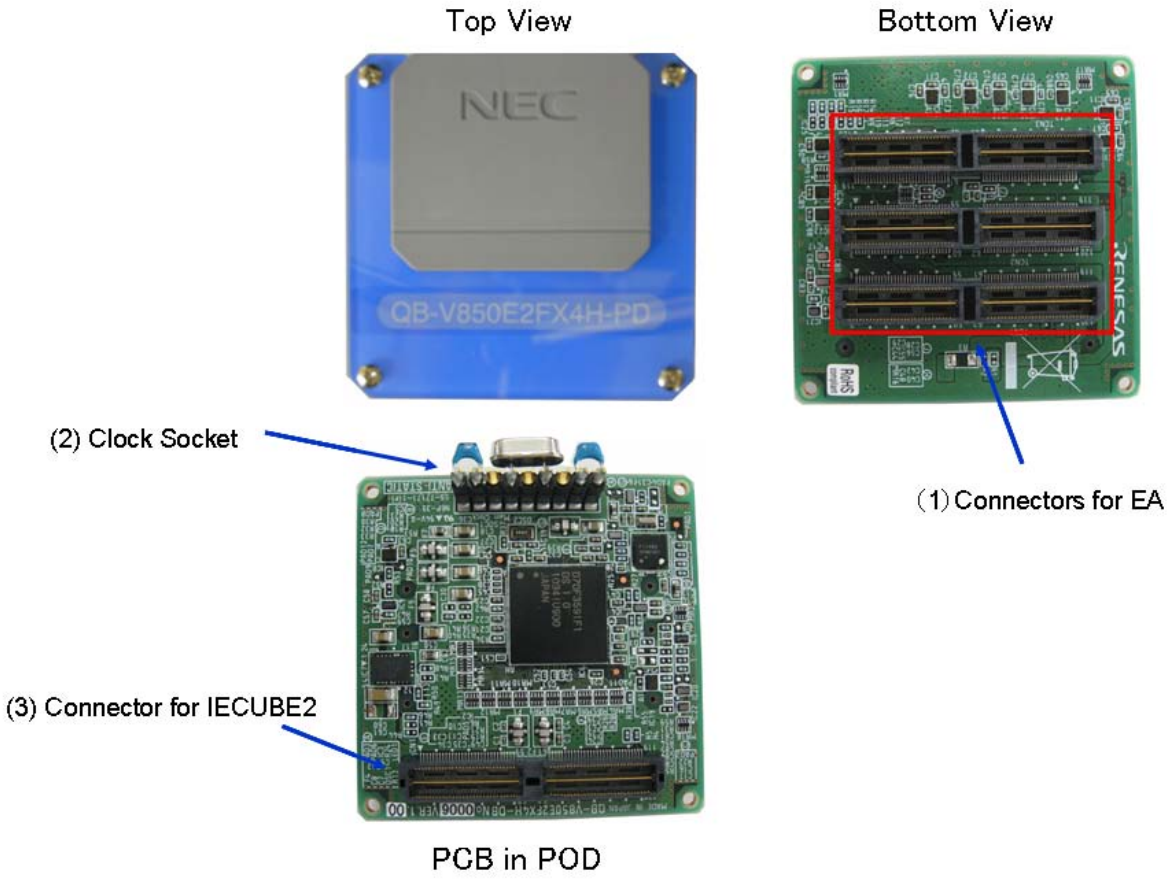
- POD
- Table of Toxic and Hazardous Substance and Elements

CHAPTER 2 Names and Functions of Hardware

The following shows the names of POD and IECUBE2 hardware units and their features.

2.1 POD

Figure 1-3. Names of parts of POD



(1) Connectors for EA

This is the connector for connecting to the exchange adapter (EA).

(2) Clock Socket

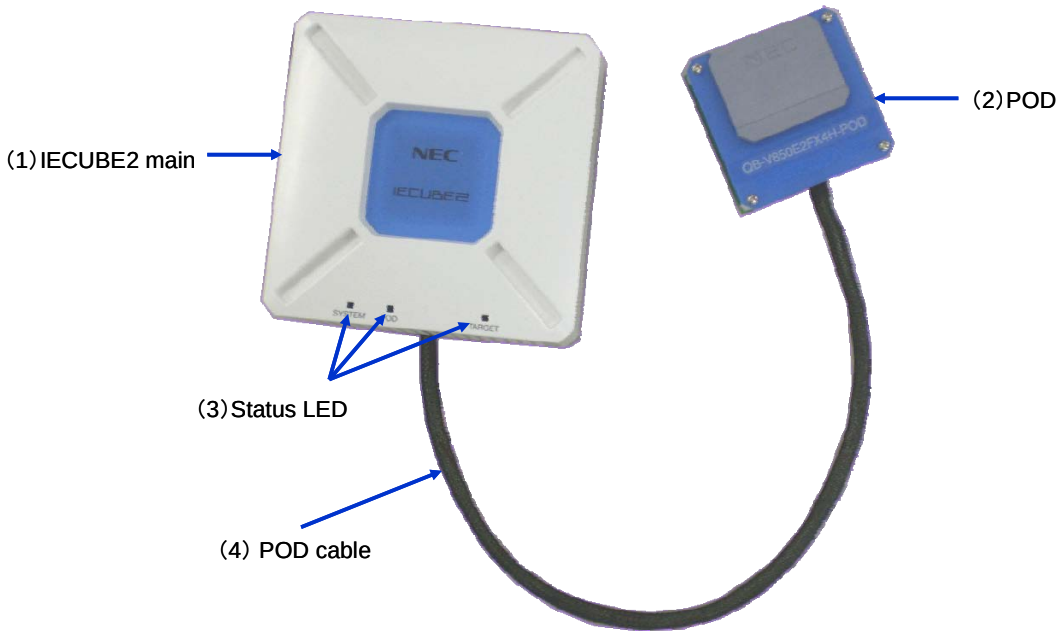
This is the socket for the main clock setting. A 4 MHz resonator is mounted upon shipment.

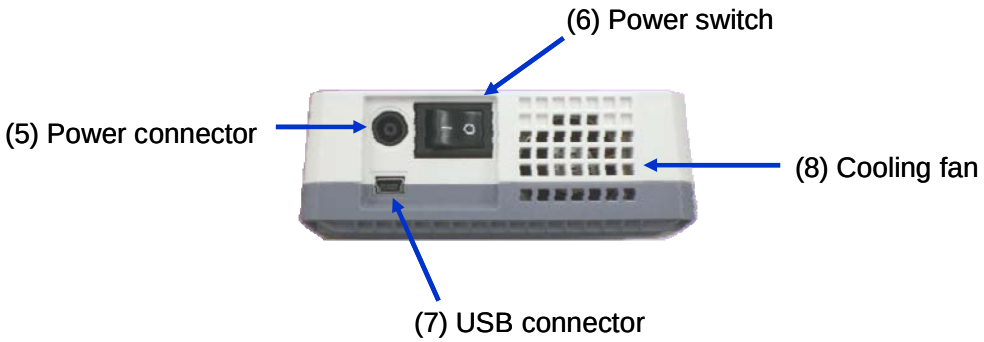
(3) Connectors for IECUBE2

This is the connector for connecting to the IECUBE2 main.

2.2 IECUBE2 main

Figure 2-2. Names of parts of IECUBE2





(1) IECUBE2 main

IECUBE2 main is unit that controls debugging. IECUBE2 main is sold separately.

(2) POD

Please refer to 2.1.

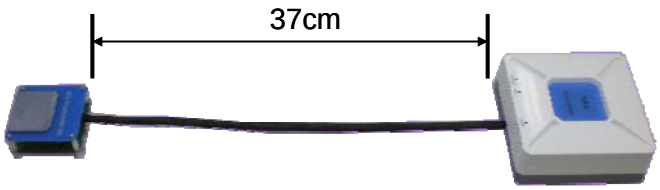
(3) Status LED

The status LEDs turn on or blink according to specific causes as described in the table below. If any LED does not turn on, IECUBE2 might be broken. In this case, contact an RENESAS Electronics sales representative or distributor.

LED name	Description
SYSTEM	This LED turns on when the power switch is turned on. This LED blinks if the FPGA in IECUBE2 is not running correctly. In this case, IECUBE2 might be broken.
POD	This LED turns on when communication with the emulation POD is established.
TARGET	This LED turns on when the target system is turned on.

(4) POD cable

This coaxial cable is used to connect the IECUBE2 main unit and emulation POD. The cable length is shown below. Be careful not to excessively bend this cable because doing so might break the cable.



(5) Power connector

This connector is for the power supply cable.

(6) Power switch

This switch turns the power on and off. Press the "|" side to turn on the power or the "O" side to turn off the power.

(7) USB connector

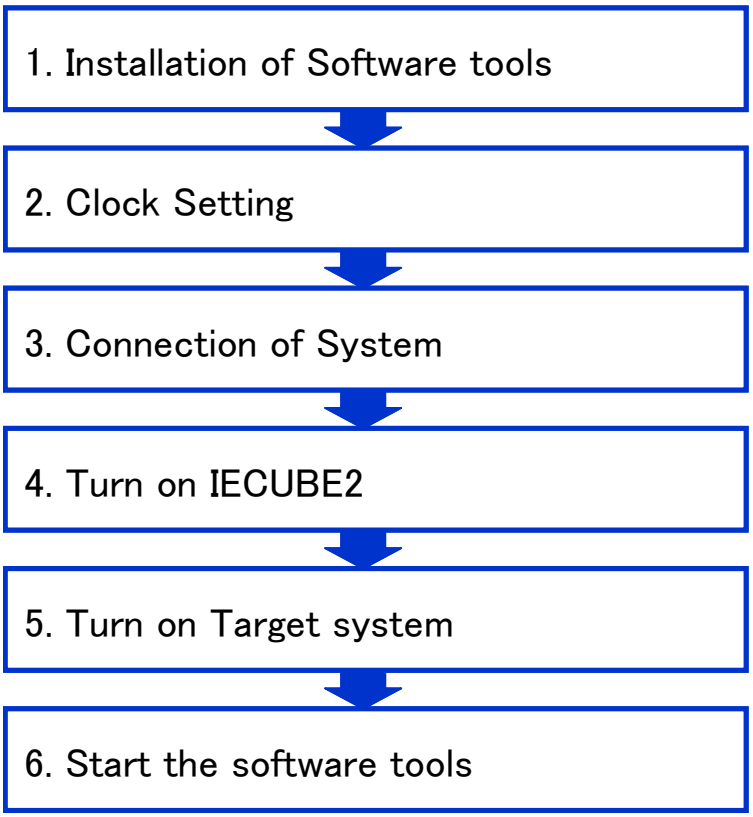
This connector is for a USB cable.

(8) Cooling fan

This fan cools down the IECUBE2 internal units. Be careful not to obstruct the vents.

CHAPTER 3 SETUP PROCEDURE

This chapter explains the IECUBE2 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.
To shut down the system, refer to 3.7 Shut Down Procedure



3.1 Installation of Software Tools

Install the necessary software tools before setting up the hardware.

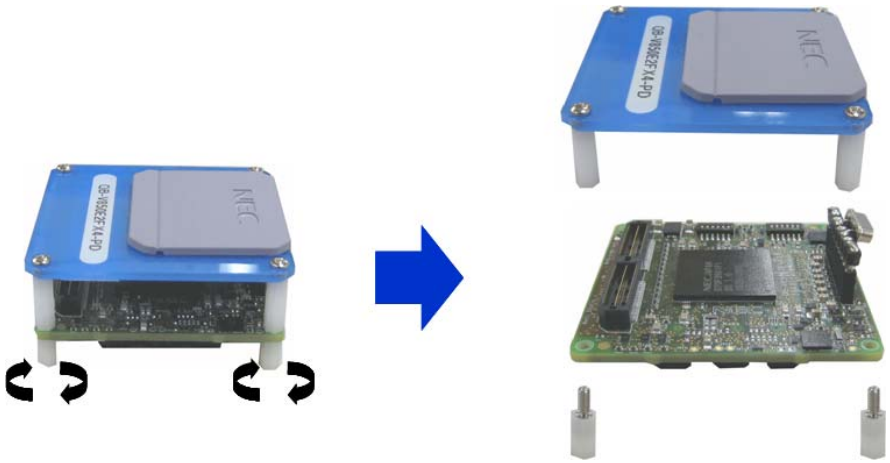
See the documentation of the software tools for installation instructions.

3.2 Setting up POD and Connecting IECUBE2

Set up the clock on POD, and connect IECUBE2.

3.2.1 Removing POD Cover

Remove the POD cover as shown below.

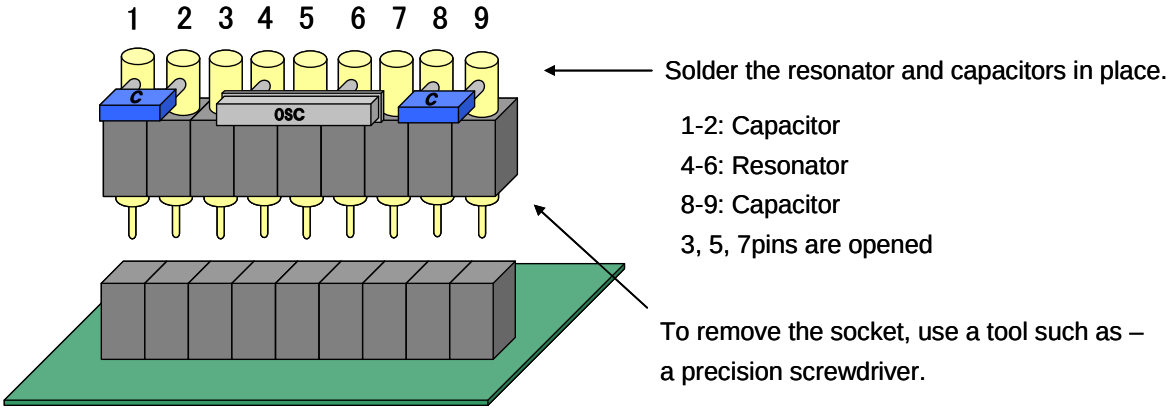


3.2.2 Clock Settings

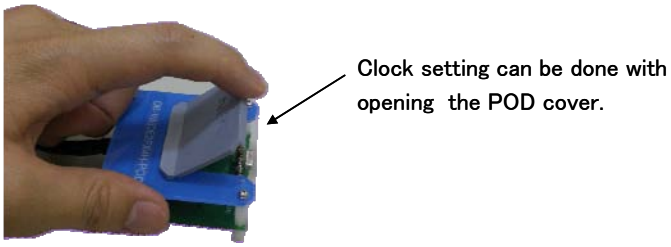
The main-oscillator clock is generated by the oscillator on the POD, as shown in the figure below.

The POD ships with an oscillation frequency of 4 MHz. To generate an oscillation clock with a frequency other than 16 MHz, replace the parts on the clock socket as shown below.

Caution This product does not support clock input from an oscillator on the target system. A 32.768 kHz sub-oscillator clock is generated on the POD.

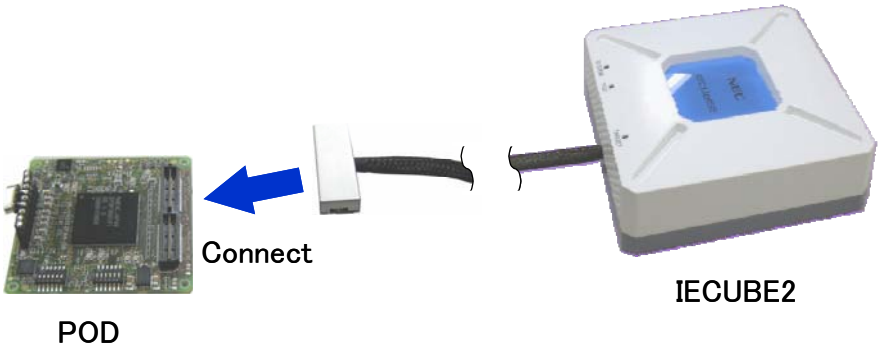


Additional information: If the POD cover is screwed shut, you can open the lid on the top of the POD, as shown in the figure below, to set the clock.

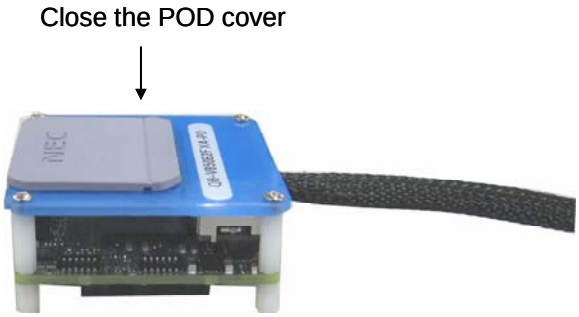


3.2.3 Connection to IECUBE2

Connect IECUBE2 to POD as shown in the figure below.



Next, close the POD cover. This completes the clock setting.



3.3 Connection of System

This section describes the connection of the system as a whole. The following abbreviations are used for socket names.

EA: Exchange Adapter
EC: Emulator Connector
TC: Target Connector
SA: Space Adapter
MA : Mount Adaptor

3.3.1 Connection of Target Connector (TC)

This section describes the procedure for mounting the TC.

(1) Coat the tips of the four protrusions on the bottom of the TC with a two-part epoxy adhesive (hardening time of 30 minutes or more), and fix the TC to the target system (clean the surface of the target system with alcohol or other cleaner first). If you have difficulty aligning the TC lead with the pad of the user board, position the components in accordance with the instructions in (2).

(2) Push the positioning guide pin included with the TC (NQGUIDE) through the pin hole at the top of the TC, and then position it relative to the unit. There are two or three 1.0-mm diameter non-through component holes. See the drawings for the individual TC for the hole locations.

(3) Solder the TC to the POD. If there is a mount adapter (MA), solder the TC after attaching the MA. This will prevent problems from flux, solder, or other material spattering and adhering to the TC's contact pins during soldering.

● Soldering conditions Reflow 260oC x 10 seconds or less
Manual 350oC x 5 seconds or less (1 pin)

Caution Do not clean off flux by immersion, steaming, etc.

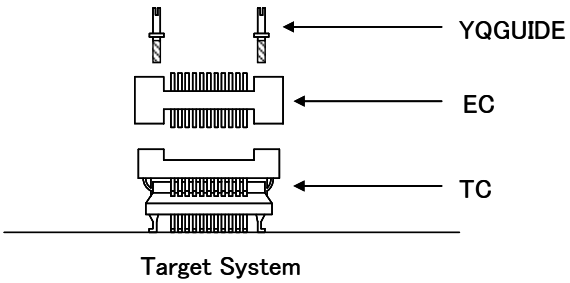
(4) If you used a guide pin or MA, remove it.

3.3.2 Connection of Emulator Connector (EC)

This section describes the procedure for connecting the emulator connector (EC).

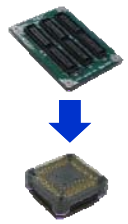
(1) Make sure that the EC's connector pins are not bent or broken, then connect the EC to the TC, and lock it in place with the included YQGUIDE (see (2) for instructions on locking the EC in place). If you will be connecting and disconnecting the EC repeatedly, be sure to inspect the EC connector pins before connection. If a pin is bent, straighten it with a knife blade or other thin, flat object.

(2) Lock the EC to the TC on the target system using the included YQGUIDE. When doing so, use the included flat-head screwdriver or a torque wrench to tighten each of the four corners evenly in turn. The tightening torque for the YQGUIDE is 0.054 Nm (MAX). If it is too tight, it could cause a bad connection.



3.3.3 Connection of Exchange Adater (EA)

Align the positions of the EA's #1 pin (location of triangle (▲) mark) and the EC's #1 pin (location of "C" cut), then press in the EA. When pressing in the EA, hold down the EC with your finger so that force is not applied to the TC. When removing the EA, insert a precision screwdriver or other tool between the EC and EA, and pry them apart slowly, while rocking the screwdriver. Take care with the step, as rocking the screwdriver in the wrong direction could damage the connector.



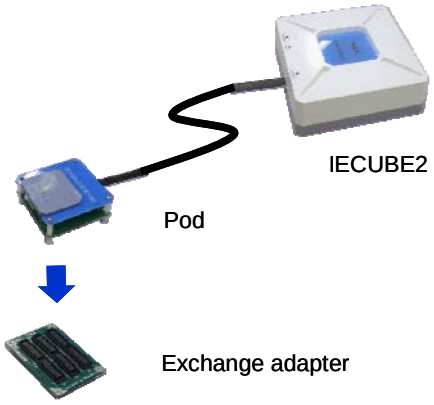
3.3.4 Handling Precautions for Sockets

This completes the socket connections. Please follow the precautions below when handling the sockets.

- When removing a socket from the case, pull out the cushion first, holding down the unit.
- Handle the EC and SA pins with care, as they are thin and bend easily. Make sure that the pins are not bent before connecting to the TC.
- When screwing down an EC soldered to a TC and board, screw in each of the four screws partway, and then tighten each of the screws in turn, using a #0 or #1 Phillips-head (cross-head) precision screwdriver or torque screwdriver. Lock the torque at 0.054 Nm (MAX). If only one screw is too tight, then it could cause a bad contact. The board that the EC is connected to must have component holes at the prescribed locations (four locations, with diameter of 2.3 or 3.3 mm). Wiring is not permitted in the area of the screw heads (3.8/4.3 mm diam.).
- When pulling out or pressing in the EC, do not twist or wiggle the EC, as this could cause the EC's pins to bend or fall out. Instead, use a flat-head screwdriver to pry off the EC from each of the four sides, a little at a time. Before connecting the EC and SA, first screw together the TC and EC with the YQGUIDE (included with EC), using a flat-head screwdriver. Lock the torque at 0.054 Nm (MAX). If only one screw is too tight, then it could cause a bad contact.
- Do not clean with solvents, as residue of the cleaning solution could remain in the contact.
- Do not mount a combined TC and EC on a microcontroller. Use the MA to do so.
- Do not use sockets in environments subject to shocks or vibration.

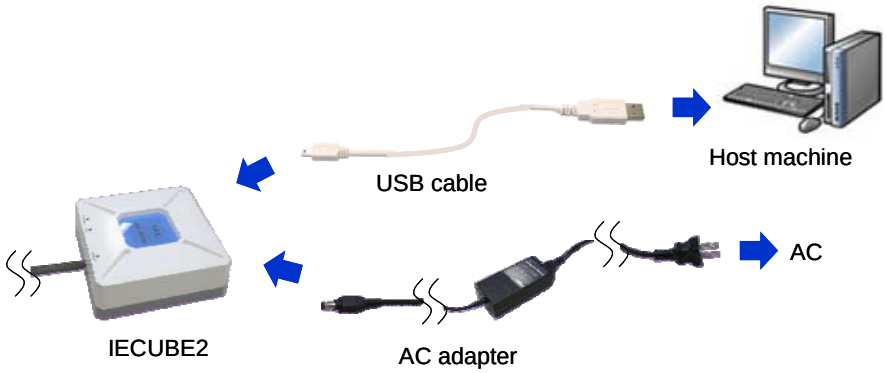
3.3.5 Connecting Pod and Target System

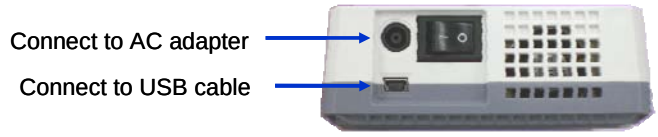
Connect the emulation Pod to the exchange adapter. Be careful not to excessively bend the emulation Pod cable.



3.3.6 Connecting USB cable, AC adapter

Connect the USB cable and power supply adapter as shown below. At this time, make sure that IECUBE2 and the target system are not on.



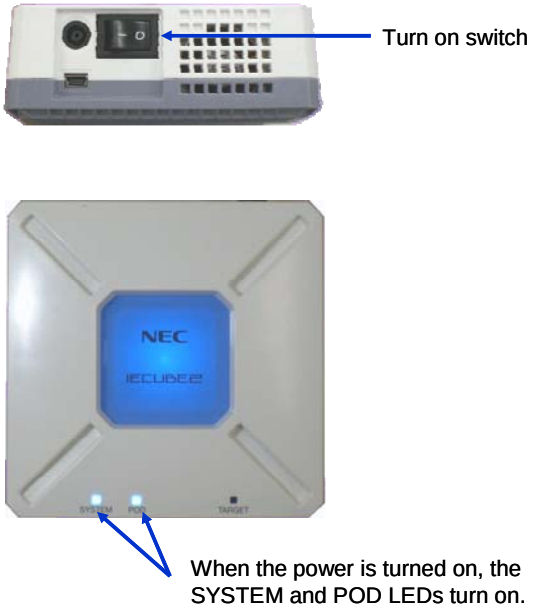


3.4 Turn on IECUBE2

Turn on IECUBE2. At this time, make sure that the target system is not on.

When the power is turned on, the SYSTEM and POD LEDs turn on. If these LEDs blink or remain off, IECUBE2 might be broken.

Remark: When the power is turned on for the first time, Plug and Play starts and sets up the USB driver. Continue setup according to the wizard.

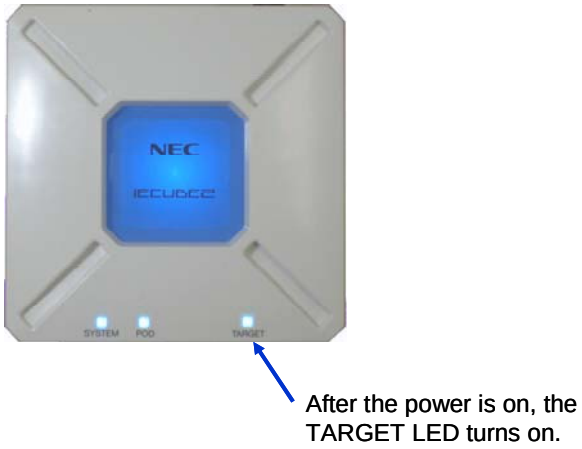


3.5 Turn on Target system

Turn on the target system.

After the power is on, the TARGET LED turns on. If the LED remains off, connectors might be connected poorly, the emulation Pod cable might be broken, or voltage might not be correctly applied to the power supply pins of the microcontroller (such as VDD).

Figure 3-5. Description of turning on target system

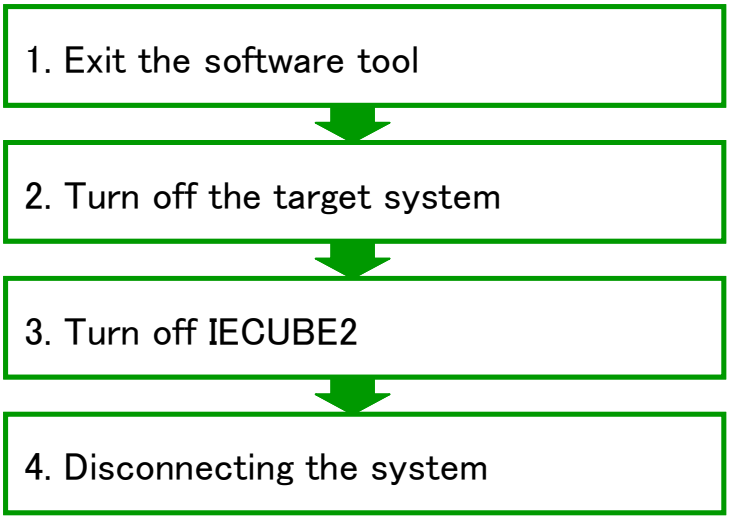


3.6 Start the software tool

After the above procedure, the system starts up. Start the software tool to perform debugging.
For details about debugging procedures, see the document supplied with the software tool.

3.7 Shut down procedure

Shut down the system according to the procedure below. Note that shutting down the system incorrectly might damage IECUBE2.



CHAPTER 4 NOTES

This chapter explains the common notes of IECUBE2.

4.1 Notes for Differences between Actual Device and Emulator

When connecting the emulator and target system for debugging, the emulation duplicates the behavior of an actual device on the target system to the greatest extent possible, but the following differences do exist between the behavior of the emulation and actual device. We therefore urge you to perform an evaluation on the actual device as the final evaluation step before mass production. It is your responsibility to ensure that the target system is suitable.

4.1.1 Behavior after Target System Is Powered On

After powering on the device on which the target system is implemented, the program runs once the reset has been cleared. The emulator, however, will not start the program until the debugger has downloaded the program and performed a start-execution operation.

Also, although the emulator is able to download and run an object before the initial variable values and other information have been ROMized, the actual device will not function normally if the object is not ROMized.

4.1.2 DBTRAP Instruction

The DBTRAP instruction is not available in user programs, because it is used for software breakpoints.

4.1.3 On-chip Debugging

The on-chip debugging function is not available in emulations.

4.1.4 Downloaded Programs

User programs are downloaded to the Flash memory of a debugging chip mounted on POD (the program is generally saved when the power is turned off). In order to run the program successfully, however, you should always download the program before starting debugging.

4.1.5 Power Save Mode

When a break occurs, HALT mode, STOP mode, and DEEPSTOP mode are all cleared. STOP mode and DEEPSTOP mode may also be cleared during program execution when the following operations are performed.

(1) When the trace function emits a full stop or delay stop

(2) When the settings of an event are changed during program execution

(3) When the real-time RAM monitoring function is used

4.1.6 Oscillator

The emulator does not support clock input from an oscillator on the target system. The oscillator runs on POD. For this reason, the operation clock frequency may differ depending on whether the system is implemented on the target device or connected to the emulator.

4.1.7 Current Consumption

The current consumption of the emulator differs from that of the actual device.

4.1.8 Pin Characteristics and Pin States

Unlike when the target system is implemented on the target device, the emulator acts as an intermediary between the connectors, adapters, and circuit board. For this reason, the pin characteristics are slightly different. Note that the conversions results of the A/D converter are particularly susceptible to impact from this.

The table below shows the differences in pin states from when the actual device is used. Please take note of these differences.

Pin	State when IECUBE2 is used	Connection of target system and POD
WAKE	High level during external reset input	Connected
REGC	Connection of 4.7uF capacitor on POD	Not connected
CVDD	Connection to IECUBE2 internal power	Not connected
CVSS	Connection to IECUBE2 internal GND	Not connected
PTCTL1	Pin processing on POD	Connected, Low level

4.1.9 PWGD Pin

When the PWGD pin is not used, lock it to H.

Even if option byte PWGDEN is 0, the PWGD pin is treated as H at all times when not in use.

4.1.10 Reset Period of Power-on Clear Circuit (POC)

When the POC causes a reset, the internal registers on the debugging chip are reset, which causes the reset period to be slightly longer than on the actual device.

4.1.11 ECC Errors

When a program is downloaded and executed, IECUBE2 uses Flash self programming, and it initializes the onboard RAM area to that an ECC error does not occur. For this reason, ECC errors cannot be emulated after downloading a program.

4.1.12 Standby Mode Settings

When settting isolated area 0 (Iso0) to power-save mode, mask all wake-up triggers if Isolated area 1 (Iso1) (WUFMSKL1/WUFMSKM1/WUFMSKH1) are masked, and then mask the Iso0 wake-up triggers (WUFMSKH0-WUFMSKH015).

When setting only Iso1 to power-save mode, clear the wake-up triggers (WUPMSKH1-WUPMSKH115) before setting power-save mode.

4.2 Notes for Debugging

When connecting the emulator and target system for debugging, the emulation duplicates the behavior of an actual device on the target system to the greatest extent possible, but the following differences do exist between the behavior of the emulation and actual device. We therefore urge you to perform an evaluation on the actual device as the final evaluation step before mass production. It is your responsibility to ensure that the target system is suitable.

4.2.1 Dropping of Trace Results by Trace Function

The trace function may drop some trace results. Although dropped information cannot be recovered, it is possible to detect that the drop has occurred. Drops may occur during successive and frequent CPU data accesses.

4.2.2 Hardware Breaks in Embedded RAM Area

If a hardware break is set in the embedded RAM area, the break occurs on a match with the low-order address. As shown in the example below, the break may occur at an unintended location.

Example: When a break is set at 0x0FED_C000H, breaks will occur at the following addresses.

0x01ED_C000H, 0x03ED_C000H, 0x05ED_C000H, 0x07ED_C000H, 0x09ED_C000H, 0x0BED_C000H, 0x0DED_C000H

4.2.3 Dropping of Traces When Power-on Clear Circuit (POC) Is Reset

When the POC causes a reset, trace data from before the POC reset may be dropped.

4.2.4 When High-speed Internal Oscillator (High-speed IntOsc) Is Stopped

If a break occurs while the high-speed IntOsc is stopped, the debugger may hang. A reset must be performed in order to recover.

4.2.5 Mask Function

If Flash self-programming is performed or a program is downloaded while resets are masked, the debugger may hang. Do not generate resets when performing these actions.

4.2.6 During Breaks

Do not generate a reset via a pin reset while the program is stopped (during a break). Doing so may cause the debugger to hang.

CHAPTER 4 LONG TERM TRACE OPTION

This chapter explains an optional product QB-V850E2-SP for extending the trace memory.

4.1 General

The QB-V850E2-SP is a trace memory extension for IECUBE2. Please make sure the supported version of debugger software.

Figure 4-1. QB-V850E2-SP

4.2 SETUP PROCEDURE

This section describes how to connect the QB-V850E2-SP to the IECUBE2 main.

1. Remove the cover from the connector on the top side of the QB-V850E2-SP module. It might be necessary to loose the screw a little bit.

2. Make sure that the IECUBE2 is switched off and the USB cable and power supply adapter is not connected to the IECUBE2 main module. Then Remove the cover on the bottom side of the IECUBE2 main module.

3. Mount the IECUBE2 main module on the QB-V850E2-SP as shown in the picture. Now connect the USB cable and power supply adapter to the IECUBE2 and turn the IECUBE2 on.

IECUBE2 detects trace memory extension automatically when QB-V850E2-SP is connected. Configuration in hardware or debugger software is not necessary.