User's Manual

Main unit for IE850 In-circuit Emulator

QB-V850E2

User's Manual

Target Devices:
V850E2M Microcontroller
RH850 Family Microcontroller

NOTICE:
There are corrections on page 14 in this document.

Renesas Electronics
www.renesas.com

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Important

Before using this product, be sure to read this user's manual carefully.
Keep this user's manual, and refer to it when you have questions about this product.

Emulator:
"Emulator" in this document collectively refers to the following products manufactured by Renesas Electronics Corp.
(1) IE850 emulator main unit
(2) Pod

"Emulator" herein encompasses neither the customer's user system nor the host machine.

Purpose of use of the emulator:
This emulator is a device to support the development of systems that use Renesas microcontrollers. It provides support for system development in both software and hardware.
Be sure to use this emulator correctly according to said purpose of use. Please avoid using this emulator other than for its intended purpose of use.

For those who use this emulator:
This emulator can only be used by those who have carefully read the user's manual and know how to use it.
Use of this emulator requires basic knowledge of electric circuits, logical circuits, and MCUs.

When using the emulator:
(1) This product is a development-support unit for use in your program development and evaluation stages. When a program you have finished developing is to be incorporated in a mass-produced product, the judgment as to whether it can be put to practical use is entirely your own responsibility, and should be based on evaluation of the device on which it is installed and other experiments.
(2) In no event shall Renesas Electronics Corp. be liable for any consequence arising from the use of this product.
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(4) The product covered by this document has been developed on the assumption that it will be used for program development and evaluation in laboratories. Therefore, it does not fall within the scope of applicability of the Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.
(5) Renesas Electronics Corp. cannot predict all possible situations and possible cases of misuse that carry a potential for danger. Therefore, the warnings in this user's manual and the warning labels attached to the emulator do not necessarily cover all such possible situations and cases. The customer is responsible for correctly and safely using this emulator.
(6) The product covered by this document has not been through the process of checking conformance with UL or other safety standards and IEC or other industry standards in countries other than Japan. This fact must be taken into account when the product is taken from Japan to another country.
(7) Renesas Electronics Corp. will not assume responsibility for direct or indirect damage caused by an accidental failure or malfunction of this emulator.

When disposing of the emulator:
Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

Usage restrictions:
The emulator has been developed as a means of supporting system development by users. Therefore, do not use it as an embedded device in other equipment. Also, do not use it to develop systems or equipment for use in the following fields.

(1) Transportation and vehicular

(2) Medical (equipment that has an involvement in human life)

(3) Aerospace

(4) Nuclear power control

(5) Undersea repeaters

If you are considering the use of the emulator for one of the above purposes, please be sure to consult your local distributor.

About product changes:
We are constantly making efforts to improve the design and performance of this emulator. Therefore, the specification or design of this emulator, or this user's manual, may be changed without prior notice.

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About diagrams:
Some diagrams in this user’s manual may differ from the objects they represent.

Precautions for Safety

This chapter, by showing the relevant diagrammatic symbols and their meanings, describes the precautions which should be taken in order to use this product safely and properly. Be sure to read and understand this chapter before using this product. Contact us if you have any questions about the precautions described here.

⚠ WARNING **WARNING** indicates a potentially dangerous situation that will cause death or heavy wound unless it is avoided.

⚠ CAUTION **CAUTION** indicates a potentially dangerous situation that will cause a slight injury or a medium-degree injury unless it is avoided.

In addition to the two above, the following are also used as appropriate.

△means WARNING or CAUTION.

Example:  CAUTION AGAINST AN ELECTRIC SHOCK

⃠means PROHIBITION.

Example:  DISASSEMBLY PROHIBITED

●means A FORCIBLE ACTION.

Example:  UNPLUG THE POWER CABLE FROM THE RECEPTACLE.

⚠ WARNING

Warnings for AC Power Supply:

If the separately sold AC power cable for the power adaptor does not fit the receptacle, do not alter the AC power cable and do not plug it in forcibly. Failure to comply may cause electric shock and/or fire.

Use an AC power cable which complies with the safety standard of the country.

Do not touch the plug of the AC power cable when your hands are wet. This may cause electric shock.

This product is connected signal ground with frame ground. If your developing product is transformless (not having isolation transformer of AC power), this may cause electric shock. Also, this may give an unrepairable damage to this product and your developing one.
While developing, connect AC power of the product to commercial power through isolation transformer in order to avoid these dangers.

Connect the plug of the AC power cable to the outlet when connecting this emulator and the user system in order to eliminate differences in potential between the grounds of the emulator and of the user's system.

If other equipment is connected to the same branch circuit, care should be taken not to overload the circuit.

When installing this equipment, insure that a reliable ground connection is maintained.

If you smell a strange odor, hear an unusual sound, or see smoke coming from this product, then disconnect power immediately by unplugging the AC power cable from the outlet.
Do not use this as it is because of the danger of electric shock and/or fire. In this case, contact your local distributor.

Before setting up this emulator and connecting it to other devices, turn off power or remove a power cable to prevent injury or product damage.

⚠ WARNING

Warnings to Be Taken for This Product:

Do not disassemble or modify this product. Personal injury due to electric shock may occur if this product is disassembled and modified. Disassembling and modifying the product will void your warranty.

Make sure nothing falls into the cooling fan on the top panel, especially liquids, metal objects, or anything combustible.

Note the following point on products which have a cooling fan.

When the fan does not operate due to, for example, a fault, the temperature of the emulator may be high enough to potentially cause injuries (such as burns) on contact. Accordingly, if the fan does not operate after the emulator is turned on, turn the emulator off immediately and send it to be repaired.

Warning for Installation:

Do not set this product in water or areas of high humidity. Make sure that the product does not get wet. Spilling water or some other liquid into the product may cause unrepairable damage.

Warning for Use Environment:

Care should be taken to ensure that the emulator is not used at temperatures exceeding the maximum ambient temperature.

⚠ CAUTION

Point for Caution Regarding the Power Adaptor:

Use only the dedicated power adaptor which is separately sold. Also, do not use the power adaptor for other equipment.

Cautions to Be Taken for Turning On the Power:

Take the steps below to turn the power to the emulator ON or OFF. Not following the order might cause damage to the user system or emulator.

When turning on the power: (1) Turn on the emulator; (2) turn on the user system; (3) connect the debugger (emulator software)

When turning off the power: (1) Disconnect the debugging session (emulator software); (2) turn off the user system; (3) turn off the emulator

Cautions to Be Taken for Handling This Product:

Use caution when handling the emulator. Be careful not to apply a mechanical shock.

Do not touch the connector pins of the emulator and the user system directly. Doing so may lead to the discharge of static electricity and so damage the internal circuits.

When attaching and removing the pod cable, hold a fixture (such as a connector) to avoid pulling the pod cable. Do not pull the emulator and board by the communications interface cable or the cable for connecting the user system since this might lead to the breaking of wires in the pod cable. Also, do not flex the pod cable excessively when installing the cable since this might lead to the breaking of wires in the cable.

Do not use inch-size screws for this equipment. The screws used in this equipment are all ISO (meter-size) type screws.

Caution to Be Taken for System Malfunctions:

If the emulator malfunctions because of interference like external noise, do the following to remedy the trouble.

(1) Exit the debugger (emulator software), and shut OFF the emulator and the user system.

(2) After a lapse of 10 seconds, turn ON the power of the emulator and the user system again, then launch the debugger (emulator software).

⚠ CAUTION

Note on Heat Generation While the Product is in Use:

Using this product for a long time might cause the product to have a high temperature. If this is the case, care must be taken to avoid injuries due to the heat such as low temperature burns.

Note on Transporting the Product:

When sending your product for repair, use the packing box and cushioning material supplied with the product when it was delivered to you and specify caution in handling (handling as precision equipment). If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use the conductive plastic bag supplied with the product. If you use a different bag, it may lead to further trouble with your product due to static electricity.

Caution to Be Taken for Disposal:

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

European Union Regulatory Notices:

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the European Union only. This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner.
Renesas Electronics Europe GmbH can take back end of life equipment, register for this service at “http://www.renesas.eu/weee”.

How to Use This Manual

Readers

This manual is intended for users who wish to perform debugging using the QB-V850E2 (generic name: IE850 main unit). 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 IE850.

Organization

This manual is divided into the following sections.

- Overview
- Names and Functions of Hardware
- Notes
- Optional Product
- Maintenance and Warranty

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 IE850

→ Read this manual in the order of Contents.

To know the manipulations, command functions, and other software-related settings of the IE850

→ 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 hardware and software provided by the user.
IE850	Name for IE850 emulator systems in general.
IE850 main unit	QB-V850E2
Pod	The pod is a peripheral of the IE850 main unit and serves as the interface with the target system.
Emulator	This is the product to emulate the target device. Refers to the IE850 main unit and pod in this document.

Table of Contents

1. Overview

The IE850 is an in-circuit emulator for V850E2M microcontroller and RH850 Family microcontroller. Hardware and software can be debugged efficiently in the development of systems in which the target device is used. This manual describes general information of the IE850 main unit. Please refer to user's manual of each pod for detail usage.

This product supports multiple microcontrollers, but you will need to rewrite the control programs and FPGA data when you use a microcontroller of a different family. For more information on rewriting, refer to http://www.renesas.com/ie850.

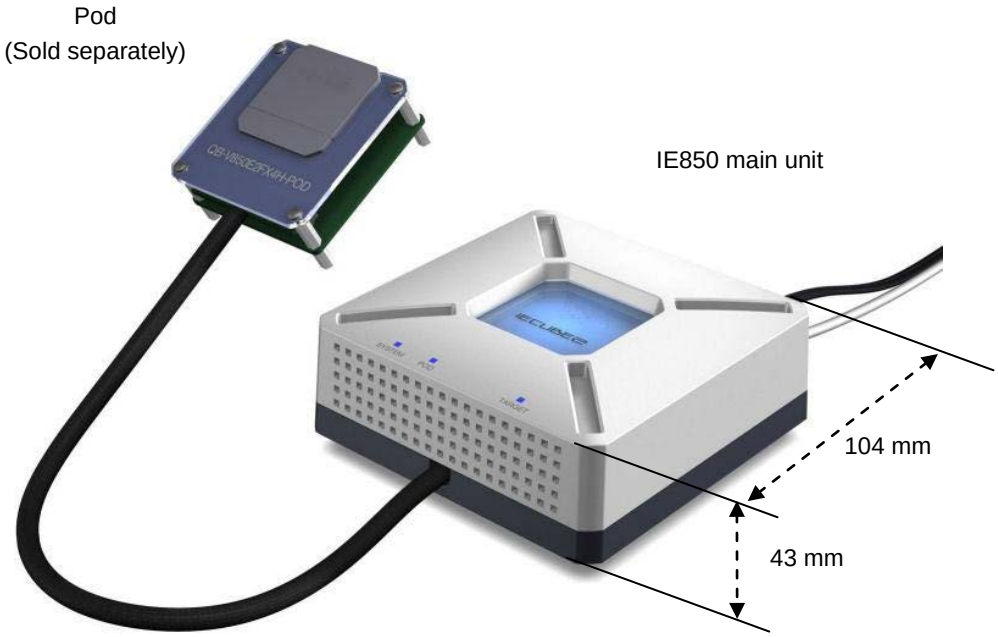


Figure 1-1 External Appearance

1.1 Hardware specification

The following table describes hardware specifications of the IE850 main unit.

Table 1-1 IE850 Main Unit Hardware Specifications

Parameter	Specification
Operating temperature range	0 to 40°C (No condensation)
Storage temperature range	–15 to 60°C (No condensation)
AC adaptor power consumption	15 V, 4 A
Weight	Approx. ~~500 g~~ 300 g
Host interface	USB interface (1.1, 2.0)
Trace memory	9 Mbytes (Approx. 512 K frames)
	2.25 Gbytes (Approx. 128 M frames) (When using long term trace option)

1.2 System overview

The system configuration is described below. The IE850 cannot be used on its own. The pod, an AC adaptor, and sockets are also required. These are sold separately.

To use the IE850, refer to the user's manual of each pod.

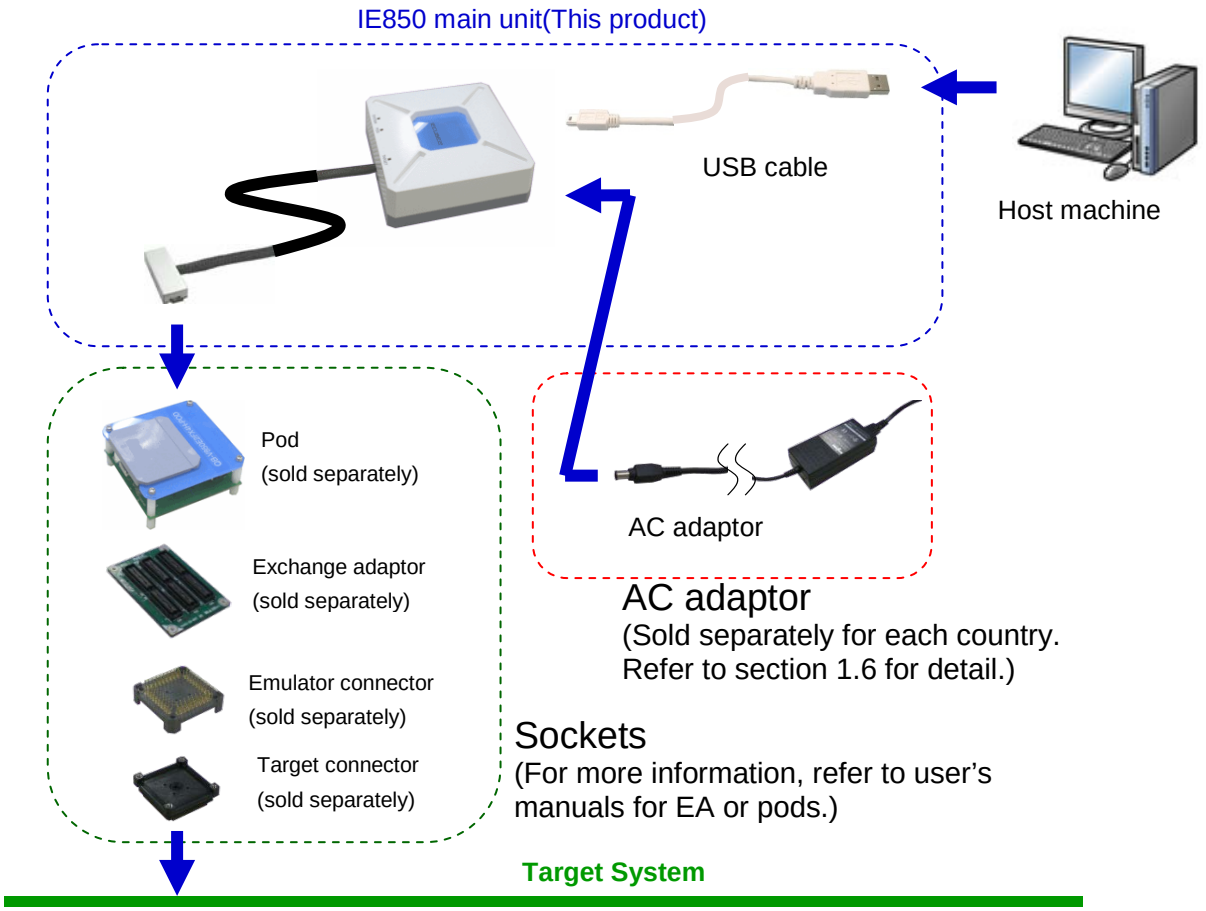


Figure 1-2 System Configuration

1.3 Functional overview

IE850 is provided with a wealth of debugging 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. Please refer to user's manual of each pod for detail usage.

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

1.4 Regulatory notices

●European Union regulatory notices

This product complies with the following EU Directives. (These directives are only valid in the European Union.)

CE Certifications:

This product complies with the following European EMC standards.

- EMC Directive (2004/108/EC)

EN 55022 Class A

WARNING: This is a Class A product. This equipment can cause radio frequency noise when used in the residential area. In such cases, the user/operator of the equipment may be required to take appropriate countermeasures under his responsibility.

EN 55024

Information for traceability:

- Authorised representative

Name: Renesas Electronics Corporation
Address: 1753, Shimonumabe, Nakahara-ku, Kawasaki, Kanagawa, 211-8668, Japan

- Manufacturer

Name: Renesas Solutions Corp.
Address: Nippon Bldg., 2-6-2, Ote-machi, Chiyoda-ku, Tokyo 100-0004, Japan

- Person responsible for placing on the market

Name: Renesas Electronics Europe GmbH
Address: Arcadiastrasse 10, 40472 Dusseldorf, Germany

- Trademark and Type name

Trademark: Renesas
Product name: IE850 Emulator
Type name: QB-V850E2

Environmental Compliance and Certifications:

- Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EC

●United States Regulatory notices on Electromagnetic compatibility

This product complies with the following EMC regulation. (This is only valid in the United States.)

FCC Certifications:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.5 Block overview

An internal block overview of the functions is described below.

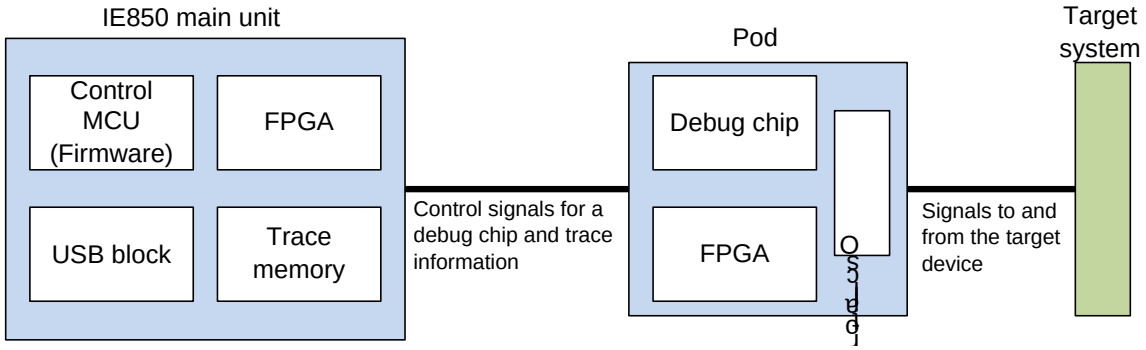


Figure 1-3 Overview of Internal Blocks

1.6 Package contents

QB-V850E2 package includes the items below. The list only includes items which are delivered in common to all regions and thus, more items may be included depending on the region. Therefore, confirm that the items in the attached contents of the package.

Products supplied with QB-V850E2:

- IE850 main unit
- USB interface cable
- Stick for unplugging EA from the pod
- Table of Toxic and Hazardous Substance and Elements

1.7 AC adaptor

The specifications of the AC adaptor for IE850 differ depending on the region of use.
Be sure to use an AC adaptor corresponding to the region of use.

The IE850 is not provided with an AC adaptor. It must be purchased separately.
Note: In European region, AC adaptor is included and need not to be purchased separately.

Table 1-9. Part Numbers of AC Adaptor for IE850 Classified by Region

Product	Destination (Region)*1, 2	Part Number*3
AC adaptor (sold separately)	Japan	QB-V850E2-PW-JP
	USA	QB-V850E2-PW-EA
	China	QB-V850E2-PW-CN
	Hong Kong	QB-V850E2-PW-HK
	Taiwan	QB-V850E2-PW-TW
	Korea	QB-V850E2-PW-KR
	Singapore	QB-V850E2-PW-SG
—	Europe	(AC adaptor is included in the IE850)

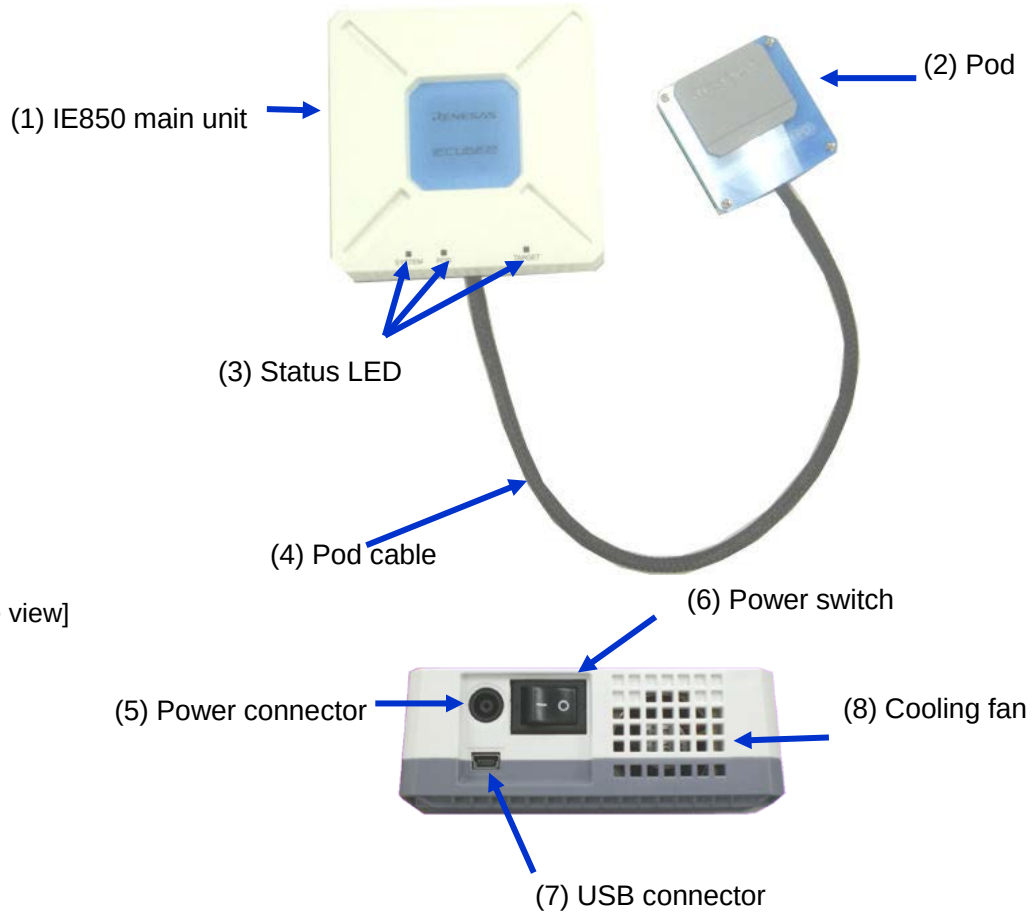
Notes 1. Products are shipped only on order from each region.
2. Contact a distributor for information on regions other than the above.
3. Only the AC adaptor usable in each region can be ordered.

2. Names and Functions of Hardware

The following shows the names of IE850 hardware units and their features.

2.1 IE850 main unit

[Top view]



[Side view]

Figure 2-1 Names of Parts of IE850

(1) IE850 main unit

IE850 main unit mainly controls debugging. The control program (firmware) and FPGA data will need to be rewritten in accord with the pod to be connected. For more information on rewriting, refer to http://www.renesas.com/ie850.

(2) Pod

The pod for use in combination with the IE850 main unit is sold separately. The pod is equipped with the major features for emulating the actual device. For details, please refer to the user's manual for the pod.

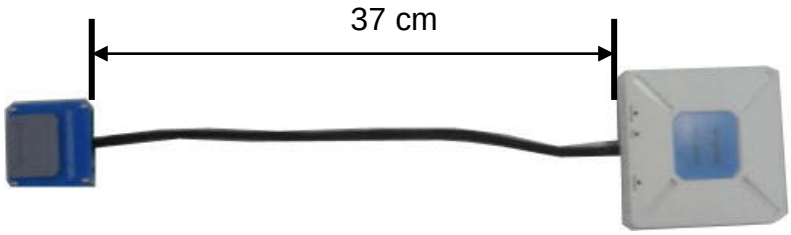
(3) Status LED

The status LEDs turn on or blink according to specific causes as described in the table below. If any LED does not turn on or not blink, IE850 might be broken. In this case, contact a 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 the IE850 is not running correctly. In this case, the IE850 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 IE850 main unit and emulation pod. The cable length is shown below. Be careful not to excessively bend this cable because doing so might break wires in 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

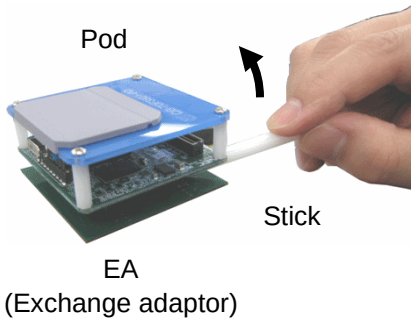
This fan cools down the IE850 internal units. Be careful not to obstruct the vents.

2.2 Stick for unplugging EA from pod

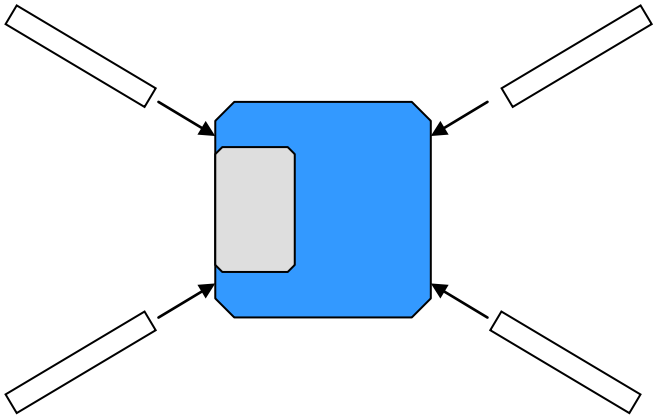
The stick as following figure is used to unplug an exchange adaptor (EA) from the pod.

Figure 2-2 Stick for Unplugging EA from Pod

To unplug the EA from the pod, insert the stick in a corner of the pod and slightly push up the pod.



Do the same thing in other corners as below.



3. Notes

This chapter explains the common notes of IE850.

3.1 Note for time stamp of trace function

Time stamps in the trace function do not necessarily indicate the time or number of cycles instruction execution takes. A time stamp indicates the time the IE850 main unit received the trace data from the debug chip in the pod. The output timing of the trace data is a little different from the time or number of cycles instruction execution by the CPU takes. In cases where a trace includes more than one datum per executed instruction, such as an accessed address and the data in the access, some errors may be seen because of queuing in the FIFO buffer.

*This applies only when the V850E2M microcontroller is in use.

4. Optional Product

4.1 Long term trace option

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

4.1.1 General

The QB-V850E2-SP is an option product that can expand trace memory for the IE850. Please confirm the supported versions of debuggers.

Figure 4-1 QB-V850E2-SP

4.1.2 Setup procedure

This section describes how to connect the QB-V850E2-SP to the IE850 main unit.

1. Remove the cover from the connector on the top side of the QB-V850E2-SP module. A screwdriver will be necessary to remove the cover.	
2. Remove the USB cable and power supply adaptor from the IE850 main unit, then remove the cover on the bottom side of the IE850 main unit.	
3. Mount the IE8502 main unit on the QB-V850E2-SP as shown in the picture. Now connect the USB cable and power supply adaptor to the IE850 main unit.	

The IE850 automatically detects the expanded trace memory when the QB-V850E2-SP is connected. Please set the capacity of the trace memory in the debugger.

4.1.3 Cautionary note when using the QB-V850E2-SP

(1) Support of QB-V850E2-SP and debugger

The QB-V850E2-SP can only be used in the Multi integrated environment provided by Green Hills Software, a U.S. company. It cannot be used in the integrated environments produced by Renesas for developing microcontroller software.

(2) Break when QBV850E2-SP is in use

When the QB-V850E2-SP is in use, the trace-full break function is not available.

5. Maintenance and Warranty

This chapter covers basic maintenance, warranty information, provisions for repair and the procedures for requesting a repair.

5.1 Maintenance

(1) If dust or dirt collects on this product, wipe it off with a dry soft cloth. Do not use thinner or other solvents because these chemicals can cause the surface coating to separate.

(2) When you do not use this product for a long period, disconnect it from the power supply, host machine, and user system.

5.2 Warranty

(3) This product comes with a one-year warranty after purchase.

Should the product break down or be damaged while you're using it under normal conditions in accord with its user's manual, it will be repaired or replaced free of cost.

(4) However, if the following types of failure or damage to the product occur during the term of the warranty, repairing or replacing the product will incur a cost.

a) Failure or damage attributable to the misuse or abuse of the product or its use under other abnormal conditions.

b) Failure or damage attributable to improper handling of the product after purchase, such as dropping the product while it is being transported or otherwise moved.

c) Failure or damage to the product caused by other pieces of equipment connected to it.

d) Failure or damage attributable to fire, earthquakes, thunderbolts, floods, or other natural disasters, or to abnormal voltages, etc.

e) Failure or damage attributable to modifications, repairs, adjustments, or other acts in relation to the product by parties other than Renesas Electronics Corp.

(5) Consumables (e.g., sockets and adaptors) are beyond the scope of repair and replacement.

In the above cases, contact your local distributor. If you are renting the product, consult the company you are renting it from or the owner.

5.3 Repair provisions

(1) Repairs not covered by warranty

Problems arising in products for which more than one year has elapsed since purchase are not covered by warranty.

(2) Replacement not covered by warranty

If your product's fault falls into any of the following categories, the fault will be corrected by replacing the entire product instead of repairing it, or you will be advised to purchase a new product, depending on the severity of the fault.

- Faulty or broken mechanical portions
- Flaws, separation, or rust in coated or plated portions
- Flaws or cracks in plastic portions
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- A wide range of faults that make replacement less expensive than repair
- Faults that are not locatable or identifiable

(3) Expiration of the repair period

When a period of one year has elapsed after production of a given model ceased, repairing products of that model may become impossible.

(4) Carriage fees for sending your product to be repaired

Carriage fees for sending your product to us for repair are at your own expense.

5.4 How to request repairs

If your product is found faulty, fill in a Repair Request Sheet downloadable from the following URL and email the sheet and send the product to your local distributor.

http://www.renesas.com/repair

⚠ CAUTION

Note on Transporting the Product:

- When sending your product for repair, use the packing box and cushioning material supplied with the MCU unit when it was delivered to you and specify caution in handling (handling as precision equipment). If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use the conductive plastic bag supplied with the MCU unit (usually a blue bag). If you use a different bag, it may lead to further trouble with your product due to static electricity.

Revision History	Main unit for IE850 In-circuit Emulator QB-V850E2 User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Sep. 12, 2011	—	First Edition issued
1.01	Jan. 08, 2013	22	**4.1.1 General** ・This option product cannot be used by the Integrated Development Environment for RENESAS microcontrollers.
2.00	Sep. 05, 2014	—	RH850 Family microcontroller support addition.

Main unit for IE850 In-circuit Emulator
QB-V850E2 User's Manual

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Colophon 3.0

Main unit for IE850 In-circuit Emulator

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