User's Manual

On-Chip Debug Emulator

QB-V850MINIL, QB-V850MINI

User's Manual

Renesas Electronics
www.renesas.com

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(2012.4)

Preface

QB-V850MINIL and QB-V850MINI are designed for use with the MCU's made by Renesas Electronics.

All components of QB-V850MINIL and QB-V850MINI are listed under "1.2 Before Using QB-V850MINIL or QB-V850MINI". If you have any questions about QB-V850MINIL or QB-V850MINI, contact your local distributor.

This user's manual describes mainly the hardware specifications of QB-V850MINIL or QB-V850MINI. For information on emulator debuggers and other related products, please see the additional document for user's manuals included with each product.
You can download the latest manuals from the Renesas Tools homepage.

http://www.renesas.com/

Important

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

Emulator:

"Emulator" in this user's manual collectively refers to the QB-V850MINIL and QB-V850MINI emulators manufactured by Renesas Electronics Corporation.
"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 uses the Renesas microcomputers. It provides support for system development in both software and hardware. The emulator is not guaranteed for use in the production line.
Be sure to use the emulator correctly according to said purpose of use. Please avoid using the emulator other than for its intended purpose of use.

For those who use the emulator:

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

When using the emulator:

(1) The emulator 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 Corporation be liable for any consequence arising from the use of the emulator.

(3) Renesas Electronics Corporation strives to provide workarounds for and correct trouble with products malfunctions, with some free and some incurring charges. However, this does not necessarily mean that Renesas Electronics Corporation guarantees the provision of a workaround or correction under any circumstances.

(4) The emulator 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 Corporation 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 the emulator.

(6) The emulator 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. This fact must be taken into account when the emulator is taken from Japan to some other country.

(7) Renesas Electronics Corporation will not assume responsibility of direct or indirect damage caused by an accidental failure or malfunction in the 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 our product. Therefore, the specification or design of the emulator, or this user's manual, may be changed without prior notice.

About rights:

(1) We assume no responsibility for any damage or infringement on patent rights or any other rights arising from the use of any information, products or circuits presented in this user's manual.

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About diagrams:

Some diagrams in this user's manual may differ from the objects they represent.

Safety Precautions

The Safety Precautions which should be taken in order to use QB-V850MINIL or QB-V850MINI safely and properly.
Be sure to read and understand this document before using QB-V850MINIL or QB-V850MINI.
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 or property damage 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:

Do not repair or remodel the emulator product by yourself in order to prevent danger such as an electric shock or fire and for the sake of quality assurance. For after-sale services in case of a mechanical or electrical fault, please contact your local distributor.

Always switch off the host computer and user system before connecting or disconnecting any cables or parts. Neglect of this precaution will result in getting an electric shock or will result in the emulator product or user system emitting smoke or catching fire. Also, the user program under debug will be destroyed.

Make sure that the connectors on both ends of the user-system interface cable are facing the right way relative to the user-side connector on the emulator and the connector on the user system, respectively. Neglect of this precaution will result in getting an electric shock or will result in the emulator product or user system emitting smoke or catching fire.

Warnings to Be Taken for Handling:

Do not modify this product. Personal injury due to electric shock may occur if this product is modified. Modifying the product will void your warranty.

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 un-repairable damage.

Warning for Use temperature:

Care should be taken that a maximum ambient temperature is not exceeded when this emulator is to be used.

⚠CAUTION

Cautions to Be Taken for Turning On the Power:

Observe the following specified order for the power-on and power-off procedures of the user system and the emulator. Doing otherwise may cause the user system or the emulator to fail.

Power ON: (1) Emulator power ON, (2) User system power ON, (3) Start emulator debugger

Power OFF: (1) Exit emulator debugger, (2) User system power OFF, (3) Emulator power OFF

Cautions to Be Taken for Handling This Product:

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

Do not touch the connector pins of the emulator and the target MCU connector pins directly. Static electricity may damage the internal circuits.

When attaching and removing the cable, hold the plug of the cable and do not touch the cable. Do not pull the emulator by the communications interface cable or the flexible cable. And, excessive flexing or force may break conductors.

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 (usually a blue bag). If you use a different bag, it may lead to further trouble with your product due to static electricity.

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 emulator debugger, 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 emulator debugger.

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”.

Contents

User Registration

When you install debugger software, a text file for user registration is created on your PC. Fill it in and email it to your local distributor. If you have replaced an emulator main unit or emulation probe, rewrite an emulator name and serial number in the text file you filled in earlier to register your new hardware products.

Your registered information is used for only after-sale services, and not for any other purposes. Without user registration, you will not be able to receive maintenance services such as a notification of field changes or trouble information. So be sure to carry out the user registration.

For more information about user registration, please contact your local distributor.

Terminology

Some specific words used in this user's manual are defined below.

Integrated development environment

This tool provides powerful support for the development of embedded applications for Renesas microcomputers. It has an emulator debugger function allowing the emulator to be controlled from the host machine via an interface. Furthermore, it permits a range of operations from editing a project to building and debugging it to be performed within the same application. In addition, it supports version management.

Emulator debugger

This means a software tool that is started up from IDE, and controls the emulator and enables debugging.

Host machine

This means a personal computer used to control the emulator.

Target MCU

This means the MCU to be debugged.

Target system

This means a user's application system in which the MCU to be debugged is used.

User program

This means the program to be debugged.

On-chip debug unit

This is a circuit in the device that is used for on-chip debugging.

OCD

An acronym that stands for on-chip debug.

This is the debugging that is performed with the real device mounted on the target system.

DCU

An acronym that stands for debug control unit.

This is a unit in the microcontroller that is used for on-chip debugging.

V850MINI self-check board

This means the self-check board included with the QB-V850MINI.

V850MINIL self-check board

This means the self-check board included with the QB-V850MINIL.

Self-check board

General term used for both the V850MINI self-check board and the V850MINIL self-check board.

The symbol (#) means that the signal is active-low in this document.

1. Outline

QB-V850MINIL or QB-V850MINI is an emulator to be connected to a target device with an on-chip debug unit to efficiently debug hardware and software.

1.1 Features

○ USB connection

QB-V850MINIL or QB-V850MINI can be connected to the host machine via the USB interface (1.1/2.0).
Since it operates on power supplied via USB, an external power supply is unnecessary.

○ On-chip debugging

Debugging is possible with the target microcontroller mounted on the target system.
Programs can be downloaded (programming) to the flash memory by using the flash self programming function of the microcontroller.

<R> ○ JTAG interface, Nexus interface

Using a JTAG or Nexus compliant interface, the QB-V850MINI can be used generally for V850E2S, V850E2M, V850E2, V850E1 and V850ES microcontrollers with the on-chip debug unit.
QB-V850MINIL or QB-V850MINI is a successor of the IE-V850E1-CD-NW (PCMCIA type), so that the debugging environment for the IE-V850E1-CD-NW can be ported as is to the QB-V850MINI.

Note that the IE-V850E1-CD-NW cannot be used with V850E2S andV850E2M microcontrollers.

○ Inclusion of self-check board

Using the self-check board that is supplied with QB-V850MINIL or QB-V850MINI can perform self-testing for faults.
The self-check board comes with QB-V850MINI can also be used as the debug adapter for the V850ES/KJ1(+), V850ES/KG1(+), V850ES/KF1(+), and V850ES/KE1(+).

1.2 Before Using QB-V850MINIL or QB-V850MINI

Be sure to confirm the package contents listed in this chapter before using QB-V850MINIL or QB-V850MINI.
To utilize this document effectively, familiarize yourself with the usage purposes of QB-V850MINIL or QB-V850MINI described in this chapter.

1.2.1 Package contents

When purchasing QB-V850MINIL or QB-V850MINI, be sure to check that all the items listed in the packing specifications are included. QB-V850MINIL or QB-V850MINI package contains the items shown below. If there are missing or damaged items, contact your local distributor. Note that the items in the QB-V850MINI package differ from those in the QB-V850MINIL package.

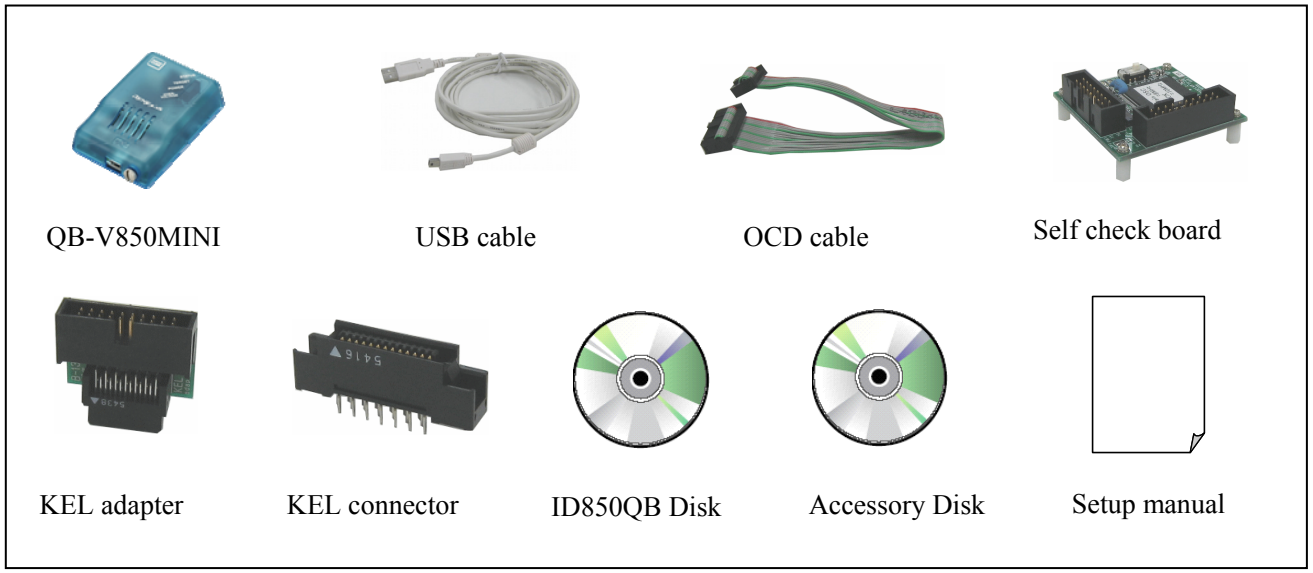


Figure 1-1. Package Contents of QB-V850MINI

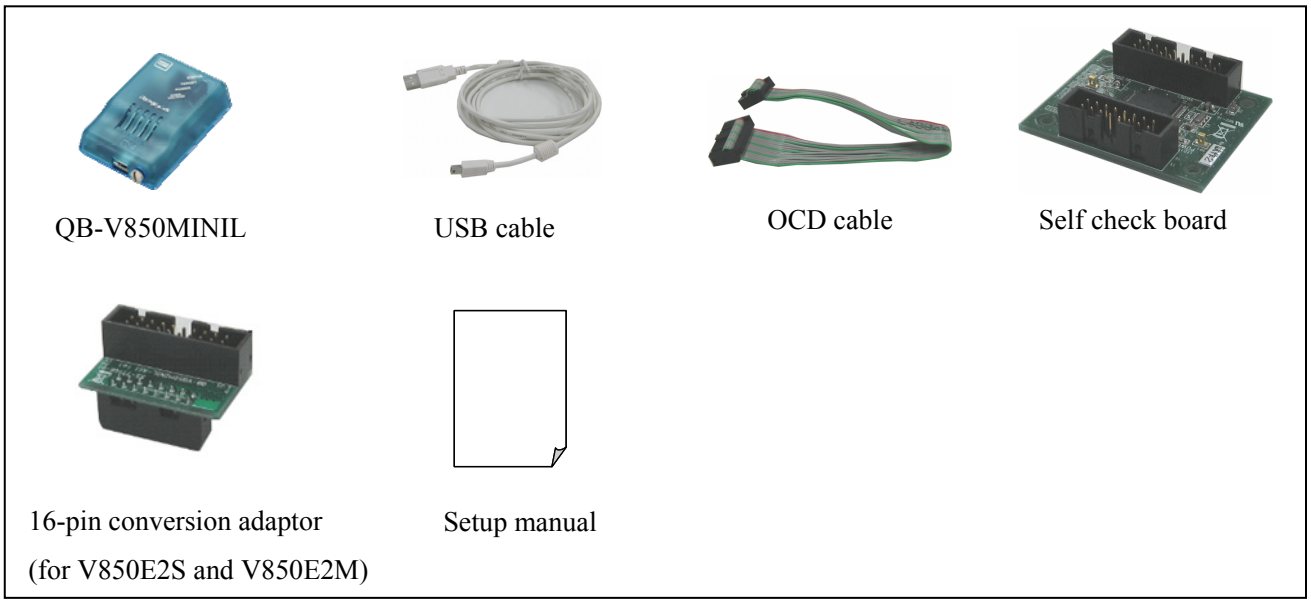


Figure 1-2. Package Contents of QB-V850MINIL

1.2.2 Checking purpose for using QB-V850MINIL or QB-V850MINI

There are mainly three purposes for using QB-V850MINIL or QB-V850MINI.
The system must be configured appropriately according to each usage purpose of QB-V850MINIL or QB-V850MINI, so check the following and refer to the relevant chapter.

- To debug the target device mounted on the target system
  See **3. On-Chip Debugging**.

- To debug V850ES/Kx1+ with in-circuit method
  See **4. Debugging with In-Circuit method**.

- To perform self-testing for faults in QB-V850MINIL or QB-V850MINI
  See **5. Self-Testing**.

<R> 1.3 Supported Devices

The following describes the devices that are supported by QB-V850MINIL or QB-V850MINI, as of June 2013

1.3.1 On-Chip Debug

Microcontrollers supported by QB-V850MINIL or QB-V850MINI are listed in the following table.

Be sure to use the latest software tools such as debuggers.

CPU core	Supported devices
V850E1	V850E/IA3, V850E/IF3, V850E/IG3, V850E/IG4, V850E/IH4, V850E/IG4-H V850E/IH4-H, V850E/IA4, V850E/SJ3-H, V850E/SK3-H V850E/MA3, V850E/ME2, V850E/RS1, V850E/SV2 V850E/DJ3, V850E/DL3, V850E/PHJ1, V850E/PHO3, V850E/PHC3
V850ES	V850ES/FE2, V850ES/FF2, V850ES/FG2, V850ES/FJ2 V850ES/FE3, V850ES/FF3, V850ES/FG3, V850ES/FJ3, V850ES/FK3 V850ES/FE3-L, V850ES/FF3-L, V850ES/FG3-L V850ES/HE2, V850ES/HF2, V850ES/HG2, V850ES/HJ2 V850ES/HE3, V850ES/HF3, V850ES/HG3, V850ES/HJ3 V850ES/IK1, V850ES/IE2 V850ES/JG2, V850ES/JJ2, V850ES/JG3, V850ES/JJ3 V850ES/JC3-L, V850ES/JE3-L, V850ES/JF3-L, V850ES/JG3-L V850ES/JC3-H, V850ES/JE3-H, V850ES/JG3-H, V850ES/JH3-H, V850ES/JG3-U, V850ES/JH3-U V850ES/JH3-E, V850ES/JG3-E, V850ES/JJ3-E V850ES/KJ1, V850ES/KJ1+, V850ES/KE2, V850ES/KF2, V850ES/KG2, V850ES/KJ2 V850ES/SG2, V850ES/SJ2, V850ES/SG3, V850ES/SJ3 V850ES/SG2-H, V850ES/SJ2-H, V850ES/ST3
V850E2	V850E2/ME3
V850E2M	V850E2/DJ4, V850E2/DK4-H, V850E2/DN4-H, V850E2/DP4-H, V850E2/FK4, V850E2/FG4, V850E2/FJ4, V850E2/FL4, V850E2/FF4-M, V850E2/FK4-H, V850E2/FL4-H, V850E2/FK4-G, V850E2/PG4, V850E2/PJ4, V850E2/PG4- L, V850E2/PJ4-E, V850E2/PG4-S V850E2/MN4, V850E2/ML4, V850E2/SG4-H, V850E2/SJ4-H, V850E2/SK4-H
V850E2S	V850E2/FE4-L, V850E2/FF4-L, V850E2/FG4-L, V850E2/FJ4-L, V850E2/FF4-G V850E2/FG4-G

Remark If your target device is not listed in the above table, contact your local distributor.

1.3.2 On-chip debugging with in-circuit method

For the following devices, on-chip debugging with the in-circuit method is possible by using QB-V850MINIL or QB-V850MINI in combination with V850MINI self-check board or debug adapter (separately available). V850MINIL self-check board is not supported to this method.

Be sure to use the latest software tools such as debuggers and device files.

Supported Device	Debug Adapter
V850ES/KE1, V850ES/KF1 V850ES/KG1, V850ES/KJ1	QB-V850ESKX1-DA or V850MINI self-check board[Note 1]
V850ES/KE1+, V850ES/KF1+ V850ES/KG1+, V850ES/KJ1+	QB-V850ESKX1H-DA or V850MINI self-check board
V850ES/KE2, V850ES/KF2 V850ES/KG2, V850ES/KJ2	QB-V850ESKX1H-DA[Note 2] or V850MINI self-check board[Note 2]

Notes 1. Note that the P00 pin outputs a low level during reset. Should this cause a problem, the problem can be avoided by using the QB-V850ESKX1-DA (separately available).

2. The following operations differ from those of the device.
   - The P00 pin outputs a low level during reset.
   - The subclock cannot be selected as the count clock for timer H1. If the subclock is specified as the count clock for timer H1 using TMHMD1 register, the operation is not guaranteed.

1.4 Specifications

This section describes QB-V850MINIL or QB-V850MINI hardware specifications and specifications for the debug function when using the Integrated debugger.

Table 1-1. Hardware Specifications

Classification	Item	Specifications
<R> QB-V850MINIL/ QB-V850MINI main unit	Operating power supply	5 V (USB-bus powered type) 500 mA (Max.) Note
	Operating clock	Clock mounted in QB-V850MINIL or QB-V850MINI
	Operating environment	Temperature: 0 to +40°C Humidity: 10 to 80% RH (no condensation)
	Storage environment	Temperature: −15 to +40°C Humidity: 10 to 80% RH (no condensation)
	External dimensions	88.5 × 56.5 × 26.1 mm (see **Appendix B External Dimensions** for details)
	Weight	Approximately 90 g
<R> Host machine interface	Target host machine	IBM PC/AT™ compatibles
	Target OS	Windows XP, Windows 7
	USB	1.1, 2.0
	USB cable length	2,000 mm max.
	Current consumption	Approximately 350 mm
<R> Target interface	Target device	Microcontroller with V850E2S, V850E2M, V850E2, V850E1, V850ES Series on-chip debug unit and microcontroller with Nx85ET core
	OCD cable length	200 mm
	Clock frequency	Equivalent to specifications supported by the target device
	Voltage range	2.0 to 5.5 V
<R>	Number of signals occupied for debugging	V850E2, V850E1, V850ES: 5 V850E2S, V850E2M: 6
	V850E2/V850E1/ V850ES signals / V850E2S/V850E2M signals	
	DCK / TCK	Clock for DCU
	DMS / TMS	DCU state transition control signal
	DDI / TDI	Data signal transmitted to DCU
	DDO / TDO	Data signal transmitted from DCU
	DRST# / TRST#	DCU reset signal
	- / RDY#	Synchronous signals
	Number of signals used for flash memory writing / FLMD0	1 Flash programming mode setting signal
	Number of signals for target power supply detection / V_{DD}	1 Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)
	Number of GND signal lines / GND	– (depends on the target connector for OCD) GND signal
	Number of signals for reset interface / RESET#	1 System reset input signal

Note Not all hardware combinations of host machine, USB device, and USB hub are guaranteed to work.

2. Names and functions of hardware

This chapter describes the part names and functions of QB-V850MINIL or QB-V850MINI and the self-check board. The part names described in this chapter are used throughout this document. This chapter provides an overview of the various functions. Reading it through, the reader will gain a basic grasp of QB-V850MINIL or QB-V850MINI and the self-check board that will facilitate reading of subsequent chapters. Also check the hardware while reading this chapter: This way you may detect damage, if any, and this prevents adverse effects on the system.

2.1 Names of Parts in Main Unit

The part names and functions of QB-V850MINIL or QB-V850MINI are described below.

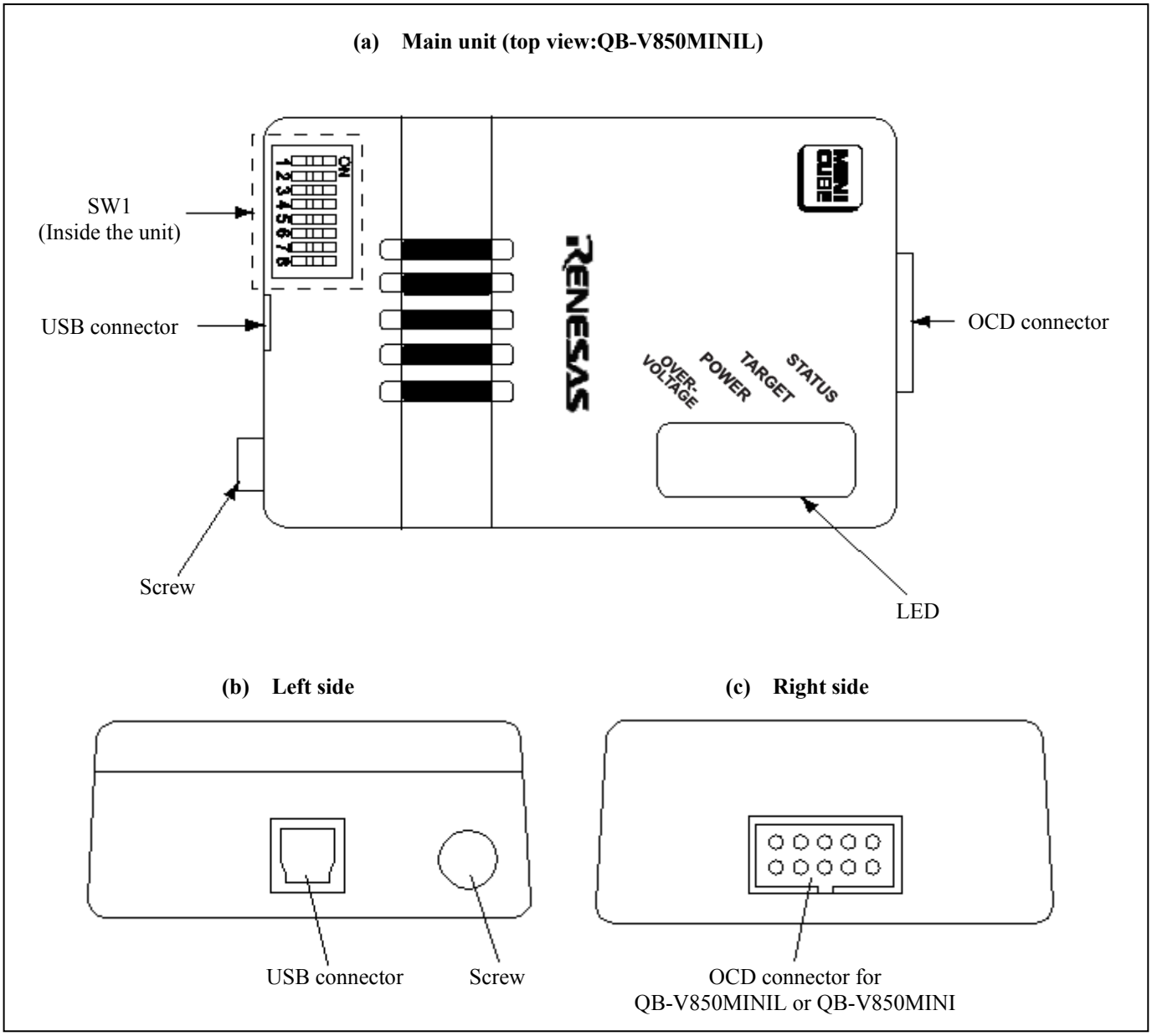


Figure 2-1. Names of Parts in QB-V850MINIL or QB-V850MINI

(1) SW1

Switches used for performing the initial settings for QB-V850MINIL/QB-V850MINI. They are set to OFF by default.

Refer to **3.2.2 Switch settings** for details on the settings.

(2) USB connector

A connector used for connecting the USB interface cable.

(3) OCD connector

A connector used for connecting the OCD cable.

(4) Screw

A screw used for fixing QB-V850MINIL or QB-V850MINI main unit.

(5) LED

The meanings of each LED are listed below.

Display Name	Lit/Extinguished	Meaning
POWER	Lit	The power supply to QB-V850MINIL or QB-V850MINI is on.
	Extinguished	The power supply to QB-V850MINIL or QB-V850MINI is off.
TARGET	Lit	The power supply to the target system is on.
	Extinguished	The power supply to the target system is off, or the target system is not connected to QB-V850MINI.
STATUS	Lit	The QB-V850MINI is running.
	Extinguished	The QB-V850MINI is in the break state, or the debugger is not active.
OVER VOLTAGE (QB-V850MINIL only)	Lit	Overvoltage of 6.5 V or higher is being applied from the target system.
	Extinguished	Voltage is being applied normally from the target system.

2.2 Self-Check Board

The part names and functions of the self-check board are described below.

The self-check board included with the QB-V850MINI differs from the self-check board included with the QB-V850MINIL.

For details, see the following sections.

- Self-check board included with QB-V850MINI: See **2.2.1 QB-V850MINI self-check board**.
- Self-check board included with QB-V850MINIL: See **2.2.2 QB-V850MINIL self-check board**.

2.2.1 V850MINI self-check board

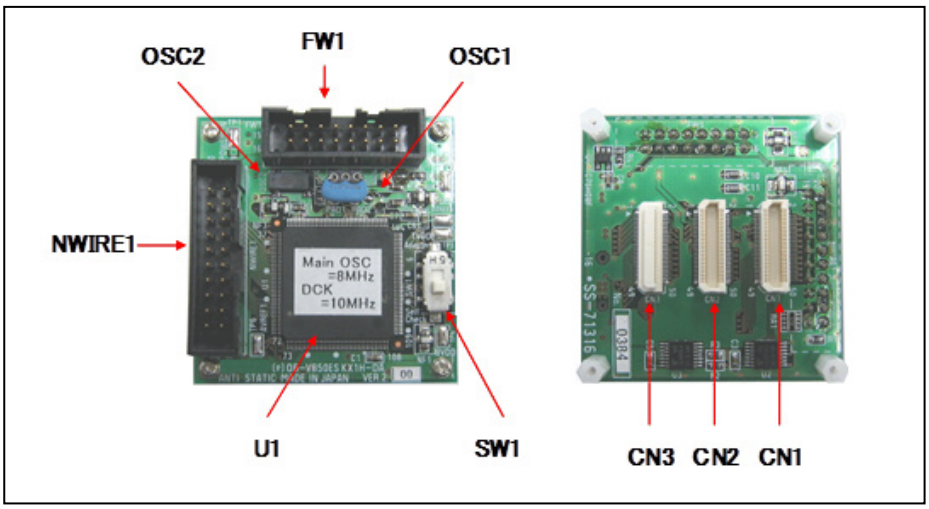


Figure 2-2. Part Names of V850MINI Self-Check Board

(1) NWIRE1

A connector used for connecting QB-V850MINIL or QB-V850MINI (HIF3FC-20PA-2.54DSA: made by Hirose Electric Co., Ltd).

(2) FW1

A connector used for connecting the flash memory programmer.

(3) SW1

A switch used to set connection or disconnection of the target system.

For in-circuit debugging: Set to “Adapter”.

For self-testing: Set to “Self Check”. (Default setting)

Refer to **4.3.4 Switch settings** for details on the settings.

(4) OSC1

A resonator board for the ceramic resonator that is used for the main clock. An 8 MHz resonator is mounted in a socket at shipment.

Refer to **4.3.3 Clock settings** when changing the main clock frequency.

(5) OSC2

A resonator for the subclock. A 32.768 kHz resonator is mounted at shipment.

The frequency cannot be changed.

(6) U1

V850ES/KJ1+ (The μPD70F3318YGJ) is mounted.

(7) CN1, CN2, CN3

Connectors used for connecting QB-V850MINIL or QB-V850MINI to the target system.
An exchange adapter and a target connector are required separately.

2.2.2 V850MINIL self-check board

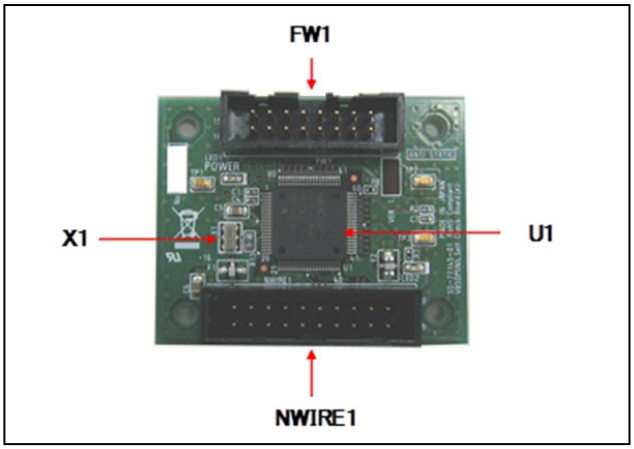


Figure 2-2. Part Names of V850MINIL Self-Check Board

(1) NWIRE1

A connector used for connecting QB-V850MINIL or QB-V850MINI.

(2) FW1

A connector used for connecting the flash memory programmer.

(3) X1

The main clock. A 5 kHz resonator is mounted at shipment.

(6) U1

V850ES/JF3-L (The μPD70F3736GK) is mounted.

3. On-Chip Debugging

This chapter describes how to use QB-V850MINIL or QB-V850MINI when performing on-chip debugging (OCD).
On-chip debugging is a method to debug a microcontroller mounted on the target system. Since debugging is performed with the real device operating on the board, this method is suitable for field debugging.
On the other hand, on-chip debugging takes up five or six function pins for communication with the host machine. Moreover, communication circuits must be mounted on the target system.
Refer to **3.4 Designing Target System Circuits when using V850E2S or V850E2M**, and for the latter, refer to **3.5 Designing Target System Circuits when using V850E2, V850E1, or V850ES** for information on designing target system circuits. Also refer to the user's manual for the target device.
Refer to **3.6 Target Connectors for OCD** for the target connectors for OCD that can be mounted on the target board.

3.1 System Configuration

This section describes the system configuration for performing on-chip debugging.

The system configurations differ between V850E2S/V850E2M environment and V850E2/V850E1/V850ES environment. For the former, see **3.1.1 System configuration in V850E2S or V850E2M environment**, and for the latter, see **3.1.2 System configuration in V850E2, V850E1, or V850ES environment**.

3.1.1 System configuration in V850E2S or V850E2M environment

The system configuration when using the V850E2S or V850E2M is shown below. The components used for connection can be selected to suit the features of the system being used.

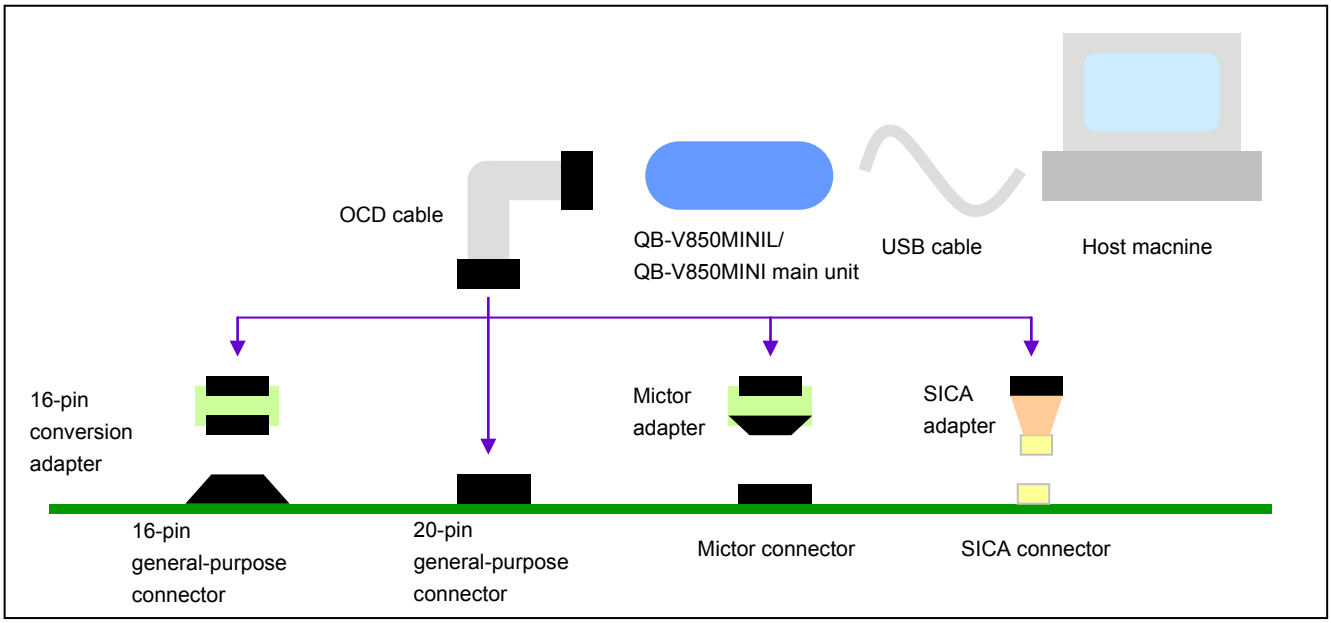


Figure 3-1. System Configuration When Using V850E2S or V850E2M

Common parts

- Host machine: For software tool operation
- USB cable: Connects the host machine to QB-V850MINIL or QB-V850MINI main unit.
- QB-V850MINIL or QB-V850MINI main unit: On-chip debug emulator main unit.
- OCD cable: Connects QB-V850MINIL or QB-V850MINI to the target system.

Connection parts

- 16-pin conversion adapter: Used to connect the OCD cable to a 16-pin general-purpose connector.
  Included with the QB-V850MINIL but not with the QB-V850MINI.
- 16-pin general-purpose connector: A 16-pin male connector with a pitch of 2.54 mm. Sold separately.
- 20-pin general-purpose connector: A 20-pin male connector with a pitch of 2.54 mm. Sold separately.
- Mictor adapter: Used to connect the OCD cable to a Mictor connector. Sold separately.
- Mictor connector: A connector that supports a high-speed interface. Sold separately.
  A debugging tool with tracing capability sold by an Renesas Electronics partner company can also be connected to this connector.
- SICA adapter: Used to connect the OCD cable to an SICA connector. Sold separately.
- SICA connector: A small, space-saving connector. Sold separately.

3.1.2 System configuration in V850E2, V850E1, or V850ES environment

The system configuration when using the V850E2, V850E1, or V850ES is shown below. The components used for connection can be selected to suit the features of the system being used.

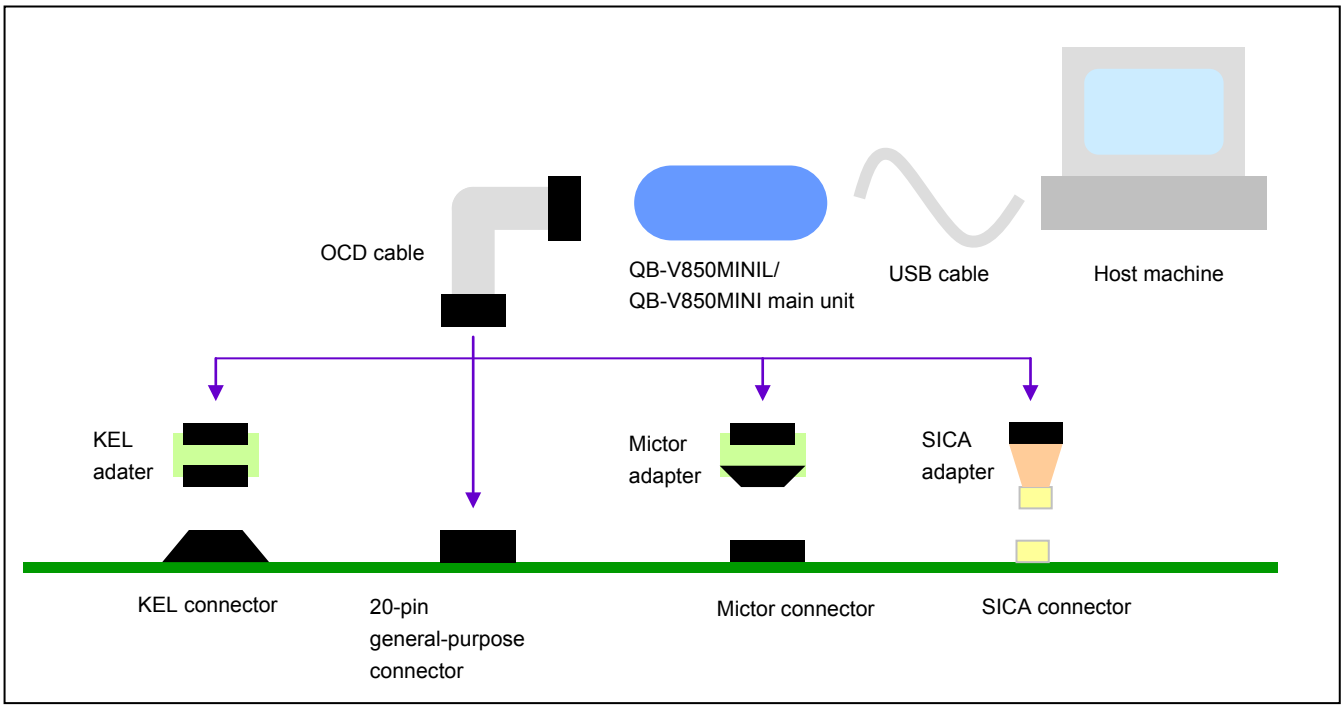


Figure 3-2. System Configuration When Using V850E2, V850E1, or V850ES

Common parts

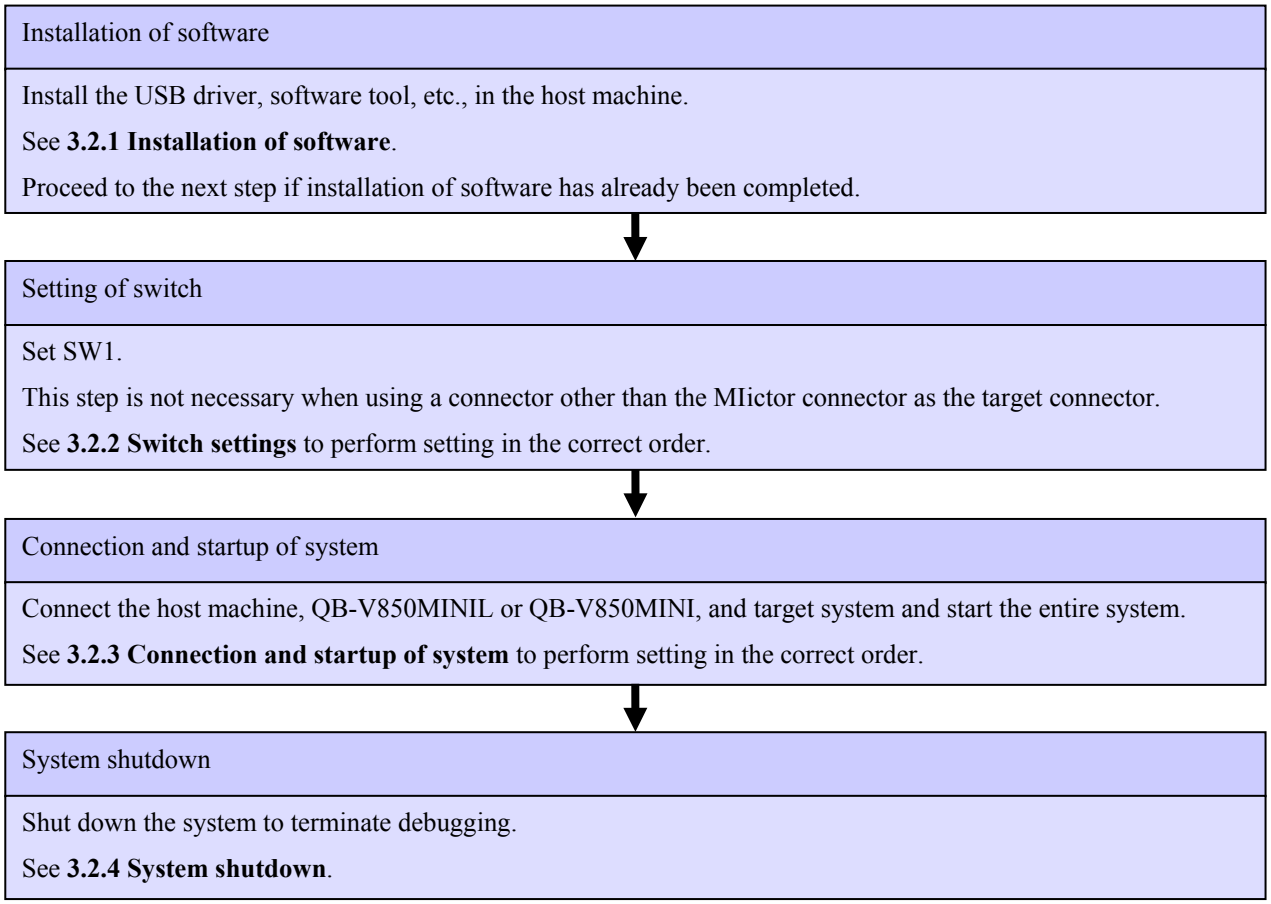
- Host machine: For software tool operation
- USB cable: Connects the host machine to QB-V850MINIL or QB-V850MINI main unit.
- QB-V850MINIL or QB-V850MINI main unit: On-chip debug emulator main unit.
- OCD cable: Connects QB-V850MINIL or QB-V850MINI to the target system.

Connection parts

- KEL adapter: Used to connect the OCD cable to a KEL connector.
  Included with the QB-V850MINI but not with the QB-V850MINIL.
- KEL connector: Standard connector for V850E2, V850E1, or V850ES. Sold separately.
  Included with the QB-V850MINI but not with the QB-V850MINIL.
- 20-pin general-purpose connector: A 20-pin male connector with a pitch of 2.54 mm. Sold separately.
- Mictor adapter: Used to connect the OCD cable to a Mictor connector. Sold separately.
- Mictor connector: A connector that supports a high-speed interface. Sold separately.
  A debugging tool with tracing capability sold by an Renesas Electronics partner company can also be connected to this connector.
- SICA adapter: Used to connect the OCD cable to an SICA connector. Sold separately.
- SICA connector: A small, space-saving connector. Sold separately.

3.2 Setup Procedure

This section describes QB-V850MINIL or QB-V850MINI setup procedure to operate QB-V850MINIL or QB-V850MINI normally. Perform setup using the following procedure.



3.2.1 Installation of software

Install the following software tool in the host machine before setting up the hardware. Refer to the “Setup manual” supplied with QB-V850MINIL or QB-V850MINI for the procedures.

- USB driver
- Debugger
- Device file

3.2.2 Switch settings

Set SW1. SW1 is mounted inside QB-V850MINIL or QB-V850MINI main unit. Loosen the screw, open the cover, and then set SW1.
Change the SW1 setting only when all the following conditions are satisfied; otherwise, use QB-V850MINIL or QB-V850MINI with the default setting (all “OFF”).

- A Mictor connector is used as the target connector.
- Renesas Electronics partner company’s emulator that supports the trace interface is used together with QB-V850MINIL or QB-V850MINI.
- Pin 20 of the Mictor connector is used as TRCCE (trace compression enable input).

When all the above conditions are satisfied, set SW1 as follows.

Table 3-1. SW1 Setting (When Conditions Are Satisfied)

SW1 Number	Setting	Remark
1 to 7	OFF	Default setting. Any other settings are prohibited.
8	ON	Setting to turn off the power supply to the self-check board

3.2.3 Connection and startup of system

Connect and start the system in the following order.

(1) Connecting QB-V850MINIL or QB-V850MINI to target system

Connect QB-V850MINIL or QB-V850MINI to the target system using the adapter and target connector. Refer to the system configuration diagrams shown in Figure 3-1 and Figure 3-2 for the adapter and target connector to be used.

Caution Perform connection while the power to the target system is off.

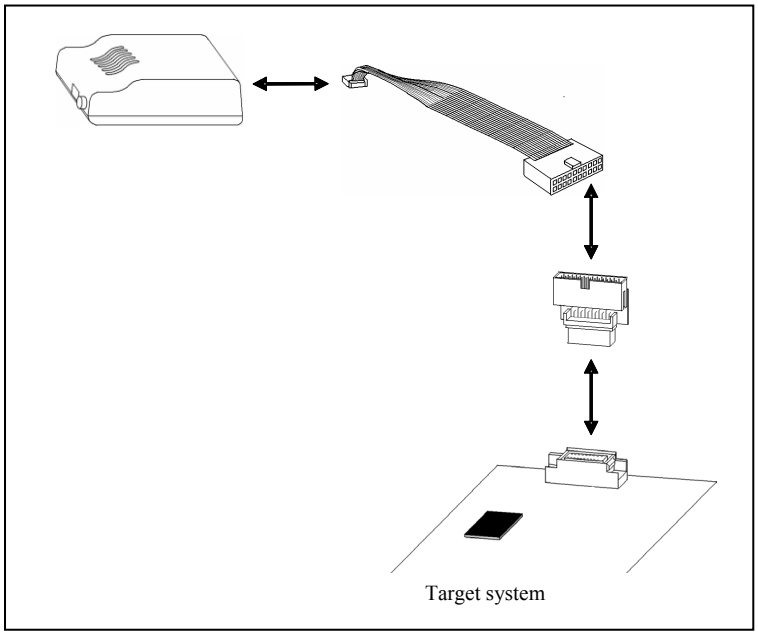


Figure 3-3. Connecting QB-V850MINIL or QB-V850MINI to Target System

(2) Connecting QB-V850MINIL or QB-V850MINI to host machine

Connect QB-V850MINIL or QB-V850MINI to the host machine using a USB interface cable. After performing this connection, confirm that the POWER LED on QB-V850MINIL or QB-V850MINI is lit.

Caution Perform connection while the power to the target system is off.

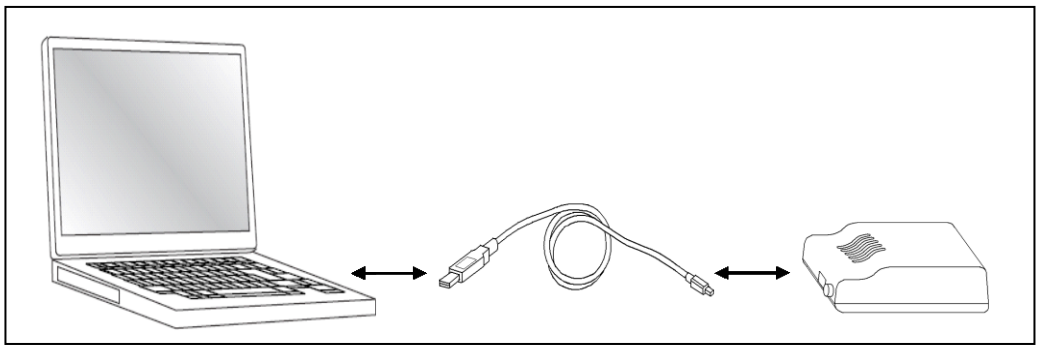


Figure 3-4. Connecting QB-V850MINIL or QB-V850MINI to Host Machine

(3) Power application to target system

Apply the power to the target system. After power application, confirm that the TARGET LED on QB-V850MINIL or QB-V850MINI is lit.

When using the QB-V850MINIL, if the yellow LED is on, it means that an overvoltage may be being applied. Check the target system's power supply and make sure that an appropriate voltage is being applied.

(4) Running the software

Start up and run the software as described in the supplied user's manual.

3.2.4 System shutdown

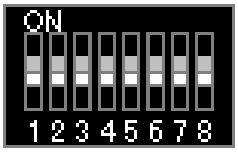
Terminate debugging and shutdown the system in the following order.

(1) Terminate the the software tool.

(2) Turn off the power to the target system.

(3) Disconnect the USB cable from the host machine.

3.3 Default Setting

Item	Setting	Description
SW1		All of switches 1 to 8 are set to OFF by default. Refer to **3.2.2 Switch settings** for how to set the switches.

3.4 Designing Target System Circuits when Using V850E2S or V850E2M

To debug the target system with QB-V850MINIL or QB-V850MINI connected, a circuit to connect QB-V850MINIL or QB-V850MINI is required on the target system.

This section presents information required for circuit design. Read this information together with the information described in the user's manual of the target device.

Note that circuit design information when the target device is the V850E2, V850E1, or V850ES is described in **3.5 Designing Target System Circuits When Using V850E2, V850E1, or V850ES**.

3.4.1 Example of circuit design (for V850E2S or V850E2M)

Figure 3-5 illustrates an example of the design of a target system circuit that is used to connect QB-V850MINIL or QB-V850MINI.

<R> To determine the resistance value in the circuit, see the user's manual of the target device.

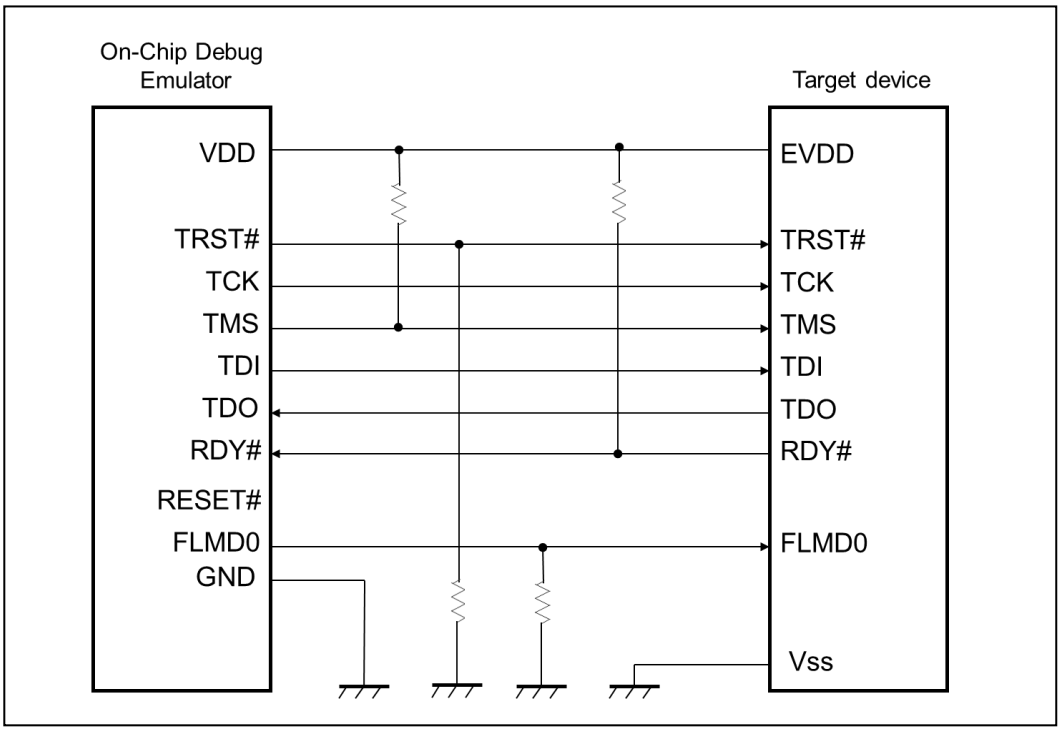


Figure 3-5. Circuit Connection Example

Signal Name	Outline of Signal
TCK	Clock for DCU
TMS	DCU state transition control signal
TDI	Data signal transmitted to DCU
TDO	Data signal transmitted from DCU
TRST#	DCU reset signal
RDY#	Synchronous signals
FLMD0	Flash programming mode setting signal
RESET#	System reset input signal
V_{DD}	Power supply (The power supply for buffers of debugging interface, or for power supply detection of target system)
GND	GND

3.4.2 Cautions on target system design (for V850E2S or V850E2M)

Note the following points when designing the target system circuits and the board.

(1) Keep the pattern length as short as possible.

(2) If V_{DD} is between 2.0 and 5.5 V, it is judged that target system power is being supplied, and the signals switch to being used as debug signals. If V_{DD} is not between 2.0 and 5.5 V, it is judged that the system has not been configured correctly, regardless of whether target system power is being supplied or not. In this case, the DRST#, DCK, DMS, DDI, FLMD0, and RESET# pins become high impedance, regardless of the operating status of the debugger. To avoid this, be sure to input the voltage from the power supply pin on the target device directly to V_{DD}.

(3) The circuit for connecting FLMD0 varies when using flash self programming. See 3.4.3 Connecting the FLMD0 signal (for V850E2S or V850E2M) for details.

(4) To reset the target device while the target system power supply is on, connect the RESET# signal. See 3. 4. 4 Connecting RESET# (for V850E2S or V850E2M) for details.

3.4.3 Connecting the FLMD0 signal (for V850E2S or V850E2M)

FLMD0 is the signal used to switch the system to flash programming mode. Control the status of FLMD0 on QB-V850MINIL or QB-V850MINI as follows in accordance with the status of the debugger.

Table 3-2. Status of FLMD0 Signal on QB-V850MINIL or QB-V850MINI

Debugger Status		Status of FLMD0
During a break	When writing to the flash memory[Note]	High-level (CMOS output)
	When not writing to the flash memory	High impedance
While the user-created program is executing		
Terminated		

Note When downloading a program or when writing in the Assemble or Memory window.

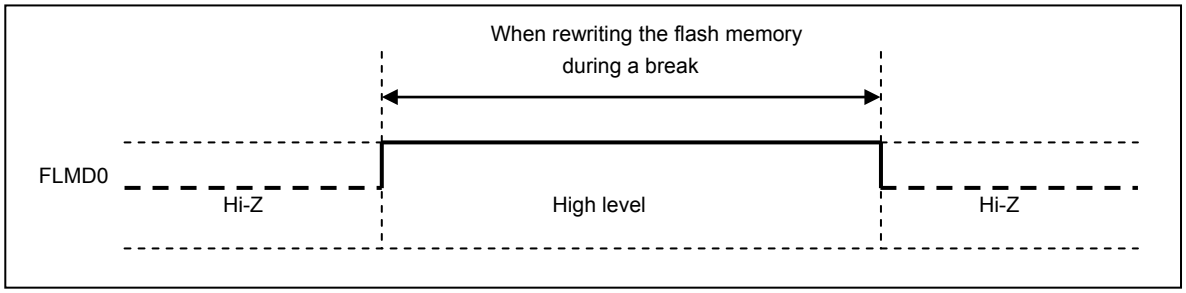


Figure 3-6. Timing of FLMD0 on QB-V850MINIL or QB-V850MINI

Handle the FLMD0 signal as shown in either (a) or (b) below. Whether the FLMD0 signal needs to be connected or not depends on the specifications of the target device.

(a) When not performing flash self programming

Connect the FLMD0 signal output from QB-V850MINIL or QB-V850MINI to the FLMD0 pin on the target device.

As long as there are no problems arising from the specifications of the target device, pull the signal down to low level. Determine the resistance value of the pull-down resistor by referring to the user's manual of the target device.

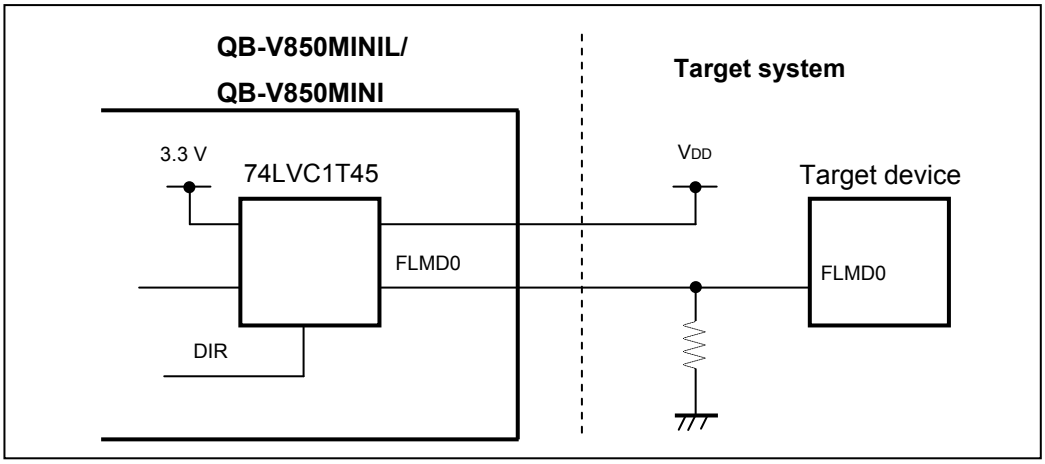


Figure 3-7. Example Connection of FLMD0 Pin When Used by QB-V850MINIL or QB-V850MINI

（ b） When performing flash self programming

To use the FLMD0 pin as a port pin when performing flash self programming by using a user-created program, connect the FLMD0 signal as shown in Figure 3-8.

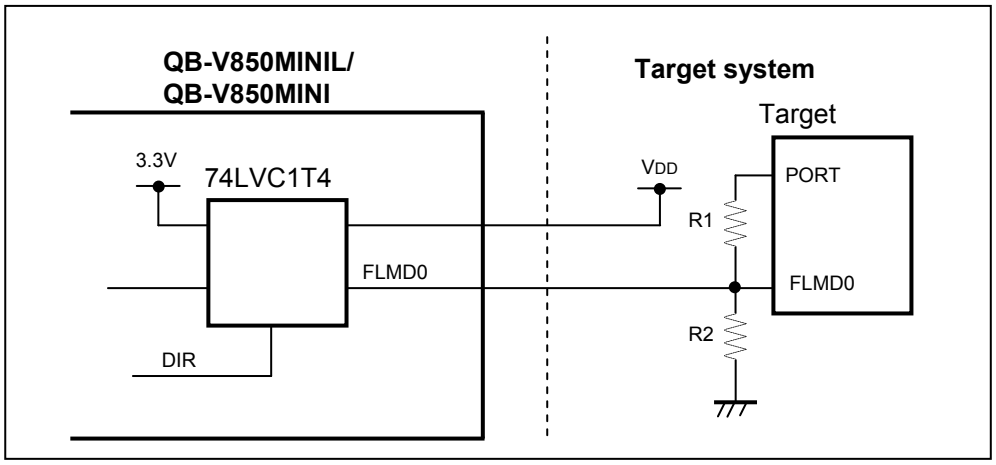


Figure 3-8. Example Connection of FLMD0 Pin When Performing Flash Self Programming

Remark The resistance of R2 must be at least 10 times the resistance of R1.

When leaving the FLMD0 signal output from QB-V850MINIL or QB-V850MINI open and connecting a port signal to FLMD0 on the target device, set the output of the port to high level in the SFR or other debugger window when writing to the flash memory during a break. When not writing to the flash memory, set the port output to low level or set the port to input mode.

3.4.4 Connecting the RESET# signal (for V850E2S or V850E2M)

To reset the target device while the target system power supply is on, connect the reset signal output from QB-V850MINIL or QB-V850MINI to the RESET# pin on the target device. The RESET# signal timing and an example connection circuit are shown below.

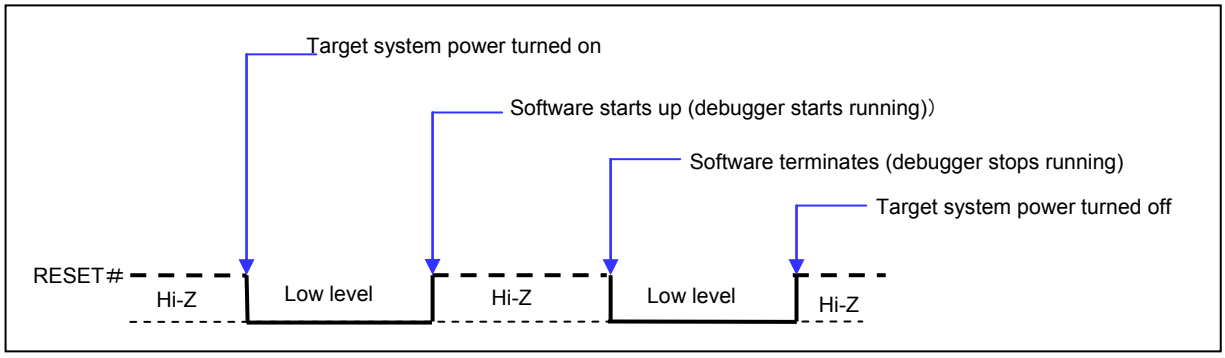


Figure 3-9. Timing of RESET# on QB-V850MINIL or QB-V850MINI

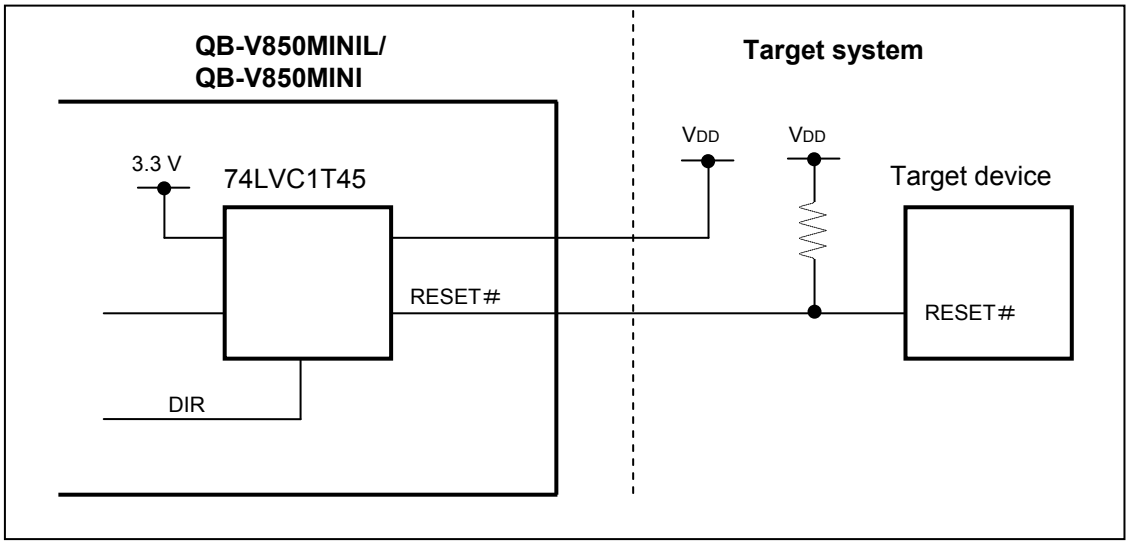


Figure 3-10. RESET# Pin Connection Example

3.5 Designing Target System Circuits When Using V850E2, V850E1, or V850ES

To debug the target system with QB-V850MINIL or QB-V850MINI connected, a circuit to connect QB-V850MINIL or QB-V850MINI is required on the target system.

This section presents information required for circuit design. Read this information together with the information described in the user's manual of the target device.

Note that circuit design information when the target device is the V850E2S or V850E2M is described in **3.4 Designing Target System Circuits When Using V850E2S or V850E2M.**

3.5.1 Example of circuit design (for V850E2, V850E1, or V850ES)

Figure 3-11 illustrates an example of the design of a target system circuit that is used to connect QB-V850MINIL or QB-V850MINI.

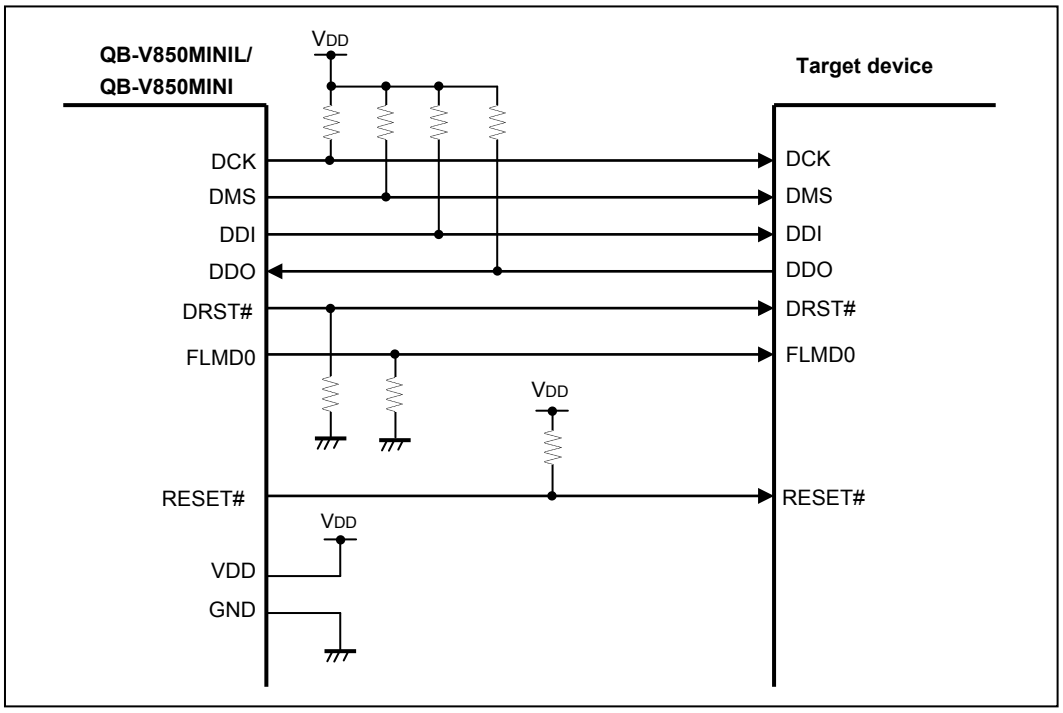


Figure 3-11. Circuit Connection Example

Signal Name	Outline of Signal
DCK	Clock for DCU
DMS	DCU state transition control signal
DDI	Data signal transmitted to DCU
DDO	Data signal transmitted from DCU
DRST#	DCU reset signal
FLMD0	Flash programming mode setting signal
RESET#	System reset input signal
V_{DD}	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)
GND	GND

3.5.2 Cautions on target system design (for V850E2, V850E1, or V850ES)

Note the following points when designing the target system circuits and the board.

(1) Keep the pattern length as short as possible.

(2) If V_{DD} is between 2.0 and 5.5 V, it is judged that target system power is being supplied, and the signals switch to being used as debug signals. If V_{DD} is not between 2.0 and 5.5 V, it is judged that the system has not been configured correctly, regardless of whether target system power is being supplied or not. In this case, the DRST#, DCK, DMS, DDI, FLMD0, and RESET# pins become high impedance, regardless of the operating status of the debugger. To avoid this, be sure to input the voltage from the power supply pin on the target device directly to V_{DD}.

(3) The circuit for connecting FLMD0 varies when using flash self programming or using microcontrollers that do not have an on-chip flash memory. See 3.5.3 Connecting the FLMD0 signal (for V850E2, V850E1, or V850ES) for details.

(4) To reset the target device while the target system power supply is on, connect the RESET# signal. See 3. 5. 4 Connecting RESET# signal (for V850E2, V850E1, or V850ES) for details.

3.5.3 Connecting the FLMD0 signal (for V850E2, V850E1, or V850ES)

FLMD0 is the signal used to switch the system to flash programming mode. Control the status of FLMD0 on QB-V850MINIL or QB-V850MINI as follows in accordance with the status of the debugger.

Table 3-3. Status of FLMD0 Signal on QB-V850MINIL or QB-V850MINI

Debugger Status		Status of FLMD0
During a break	When writing to the flash memory[Note]	High-level (CMOS output)
	When not writing to the flash memory	High impedance
While the user-created program is executing		
Terminated		

Note When downloading a program or when writing in the Assemble or Memory window.

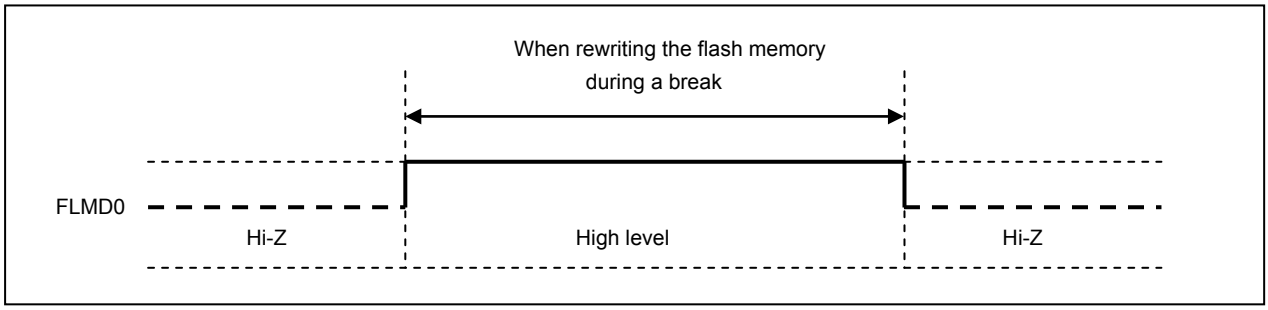


Figure 3-12. Timing of FLMD0 on QB-V850MINIL or QB-V850MINI

Handle the FLMD0 signal as shown in one of below (a) or (b) or (C). Whether the FLMD0 signal needs to be connected or not depends on the specifications of the target device.

(a) When not performing flash self programming

Connect the FLMD0 signal output from QB-V850MINIL or QB-V850MINI to the FLMD0 pin on the target device.

As long as there are no problems arising from the specifications of the target device, pull the signal down to low level. Determine the resistance value of the pull-down resistor by referring to the user's manual of the target device.

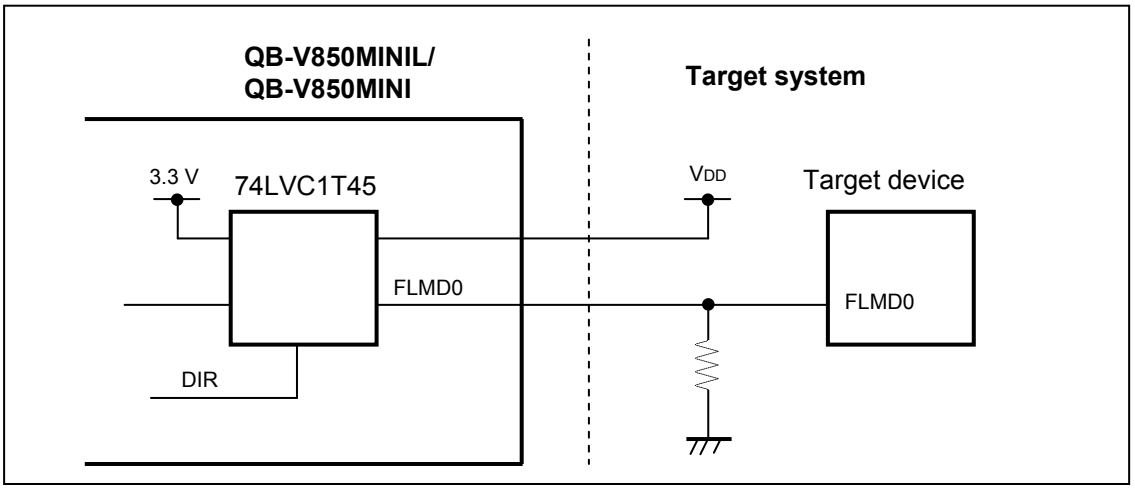


Figure 3-13. Example Connection of FLMD0 Pin When Used by QB-V850MINIL or QB-V850MINI

（ b） When performing flash self programming

To use the FLMD0 pin as a port pin when performing flash self programming by using a user-created program, connect the FLMD0 signal as shown in Figure 3-14.

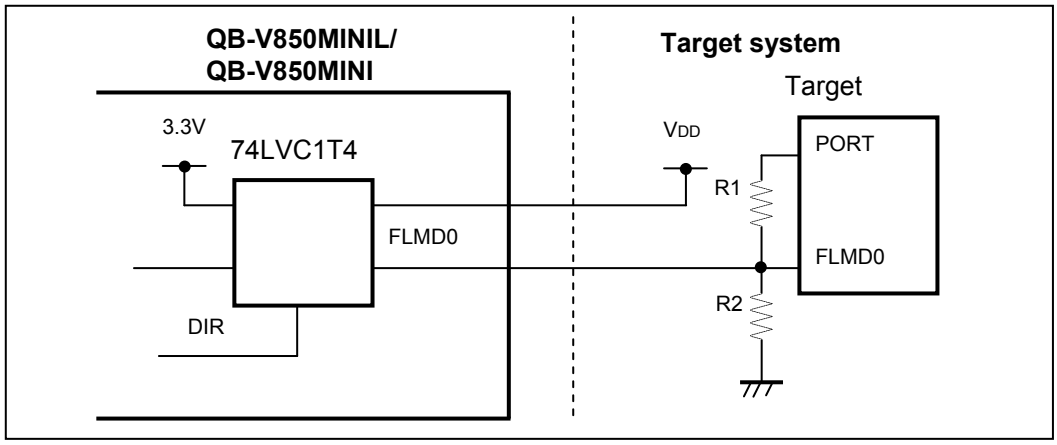


Figure 3-14. Example Connection of FLMD0 Pin When Performing Flash Self Programming

Remark The resistance of R2 must be at least 10 times the resistance of R1.

When leaving the FLMD0 signal output from QB-V850MINIL or QB-V850MINI open and connecting a port signal to FLMD0 on the target device, set the output of the port to high level in the SFR or other debugger window when writing to the flash memory during a break. When not writing to the flash memory, set the port output to low level or set the port to input mode.

（ c） When target device not having an internal flash memory

The FLMD0 pin is not required to be connected.

3.5.4 Connecting the RESET# signal (for V850E2, V850E1, or V850ES)

This is the system reset input signal. QB-V850MINIL or QB-V850MINI controls the RESET# signal as follows.

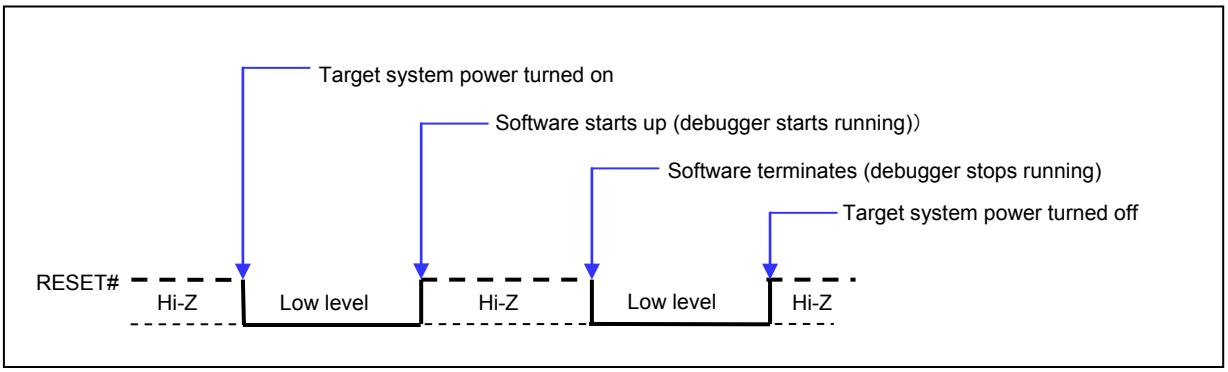


Figure 3-15. Timing of RESET# on QB-V850MINIL or QB-V850MINI

Connect the RESET# signal as shown in Figure 3-16 if any of the conditions listed below is satisfied. At this time, make sure that the RESET# signal does not conflict with the RESET# signal generated on the target system. When none of the following conditions are satisfied, leave open the pin for the RESET# signal that is output from QB-V850MINIL or QB-V850MINI.

- The target device should be kept in the reset state before debugger startup or after debugger termination.
- The OCD signal pins (DCK, DDI, DDO, DMS, and DRST#) are alternate-function pins in the specifications of the target device, the OCD signal becomes inactive due to a reset by other than the RESET# pin, and the OCD signals are not set to active in the startup routine.
  For example, when using a device in which the pins that alternately function as the OCD signal pins are controlled by the OCDM0 register as shown below, the OCDM0 register is cleared to 0 upon reset by POC, so the OCD signals are not specified and as a result, on-chip debugging cannot be performed normally.

	7	6	5	4	3	2	1	0
OCDM	0	0	0	0	0	0	0	OCDM0

OCDM0	Specification of alternate-function pin for on-chip debug function
0	Use as port/peripheral function pin
1	Use as on-chip debug function pin

Remark Initial value At RESET# pin input: OCDM0 = 1
After reset by POC: OCDM0 = 0
After internal reset (other than POC): The OCDM register holds the value before reset

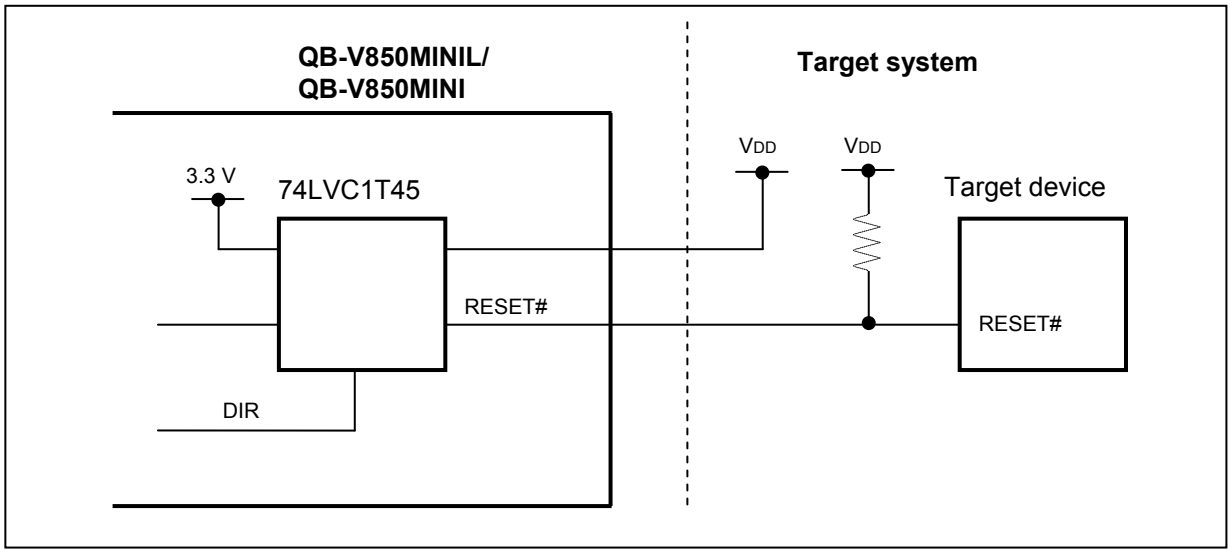


Figure 3-16. RESET# Pin Connection Example

3.6 Target Connectors for OCD

A target connector for OCD must be mounted on the target system in order to connect QB-V850MINIL or QB-V850MINI to the target system. The target connector for OCD can be selected from the target connectors listed in the table below. The features of each target connector are described in the following sections.

Table 3-4. List of Target Connectors for OCD (Part Number and Manufacturer)

Target Connector Name		Part Number	Manufacturer
KEL connector (cannot be used when using V850E2S or V850E2M)		8830E-026-170S (included with QB-V850MINI) 8830E-026-170L	KEL Corporation
	Adapter	QB-V850MINIL-AK1 (included with QB-V850MINI)	Renesas Electronics Corporation
Mictor connector		2-767004-2	Tyco Electronics AMP K.K.
	Adapter	QB-V850MINIL-AM1	Renesas Electronics Corporation
SICA connector		SICA2P20S05 (5 set)	Tokyo Eletech Corporation
	Adapter	SICA2012P (included with SICA2P20S)	Tokyo Eletech Corporation
2.54 mm pitch 16-pin general-purpose connector (cannot be used when using V850E2, V850E1, or V850ES)		HIF3FC-16PA-2.54DS HIF3FC-16PA-2.54DSA	Hirose Electronic Co., Ltd. (for example)
	Adapter	QB-V850MINIL-AG1 (inclued with QB-V850MINIL)	Renesas Electronics Corporation
2.54 mm pitch 20-pin general-purpose connector		HIF3FC-20PA-2.54DS HIF3FC-20PA-2.54DSA	Hirose Electronic Co., Ltd. (for example)
	Adapter	Not required	–

3.6.1 KEL connector (for V850E2, V850E1, or V850ES)

A KEL connector is a target connector included with the QB-V850MINI but not with the QB-V850MINIL.

Note that the KEL connector cannot be used when using the V850E2S or V850E2M.

When using the KEL connector as the target connector for OCD, mount either of the following connectors on the target system.

- 8830E-026-170S: 26-pin straight type (included with QB-V850MINI)
- 8830E-026-170L: 26-pin right-angle type (sold separately)

Remark 8830E-026-170S and 8830E-026-170L are products of KEL Corporation. A conversion adapter is included with the QB-V850MINI.

Figure 3-17 and Table 3-5 show the pin assignment and the pin functions of the KEL connector, respectively.

Input/output is indicated as seen from the target device.

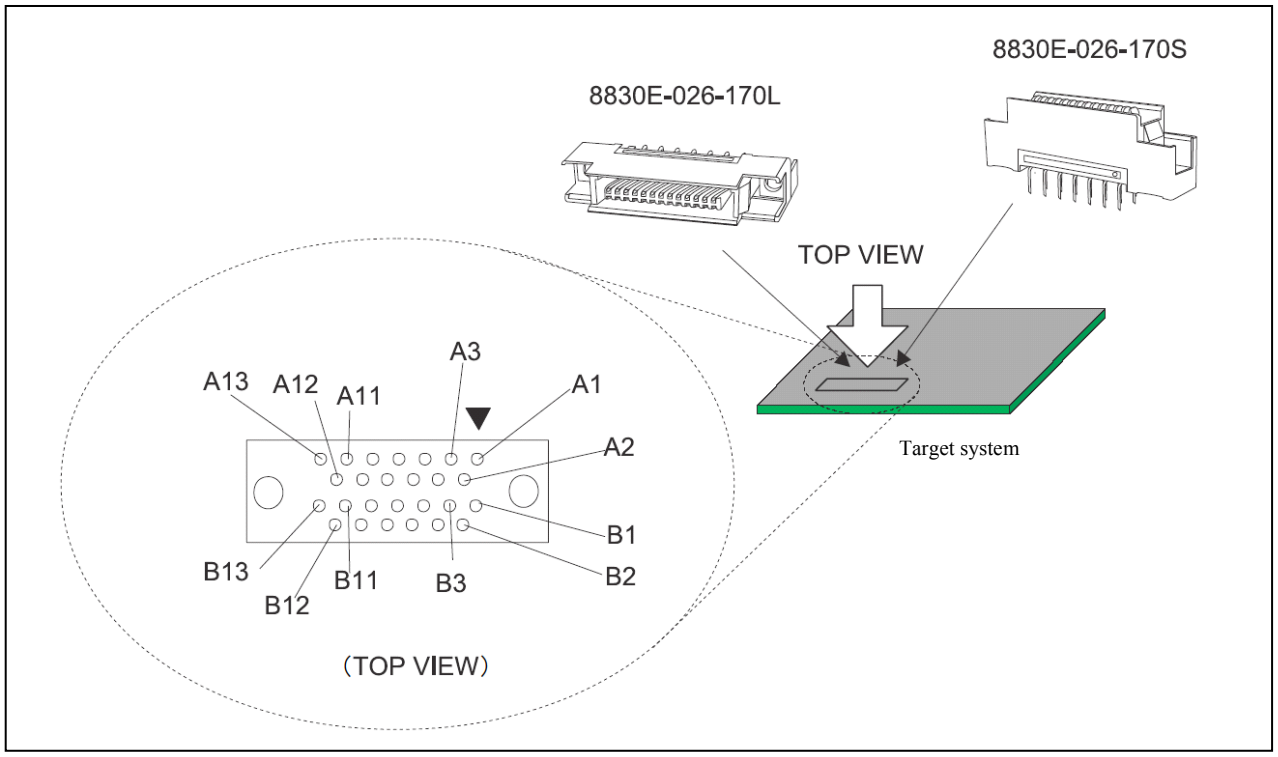


Figure 3-17. KEL Connector Pin Assignment Diagram

Table 3-5. KEL Connector Pin Functions (for V850E2, V850E1, or V850ES)

Pin No.	Signal Name	I/O[Note 1]	Description
A1 to A6	GND	–	Connect to GND
A7	DDI	IN	Data signal transmitted to DCU
A8	DCK	IN	Clock for DCU
A9	DMS	IN	DCU state transition control signal
A10	DDO	OUT	Data signal transmitted from DCU
A11	DRST#	IN	DCU reset signal
A12	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
A13	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
B1 to B10	GND	–	Connect to GND
B11	PORT0_IN	–	Connect to GND
B12	PORT1_IN	–	Connect to GND
B13	V_{DD}	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)

Notes 1. As seen from the target device

2. Refer to **3.5.4 Connecting the RESET# signal (for V850E2, V850E1, or V850ES)**.

3. Refer to **3.5.3 Connecting the FLMD0 signal (for V850E2, V850E1, or V850ES)**.

3.6.2 Mictor connector

The Mictor connector is conventionally supported as a target connector for OCD that supports the high-speed trace interface. When combining use of QB-V850MINIL or QB-V850MINI and an emulator with tracing capability sold by Renesas Eloctronics partner company, use the Mictor connector.
When using the Mictor connector as the target connector for OCD, mount the following connector on the target system.

- 2-767004-2: 38-pin type (sold separately)

Remark 2-767004-2 is a product of Tyco Electronics AMP K.K.

The following adapter is required for connection with the emulator.

- QB-V850MINIL-AM1 (sold separately)

Remark QB-V850MINIL-AM1 is products of Renesas Electronics Corporation

Figure 3-18, Table 3-6 and Table 3-7 show the pin assignment and the pin functions of a target connector for OCD, respectively. Input/output is indicated as seen from the target device.

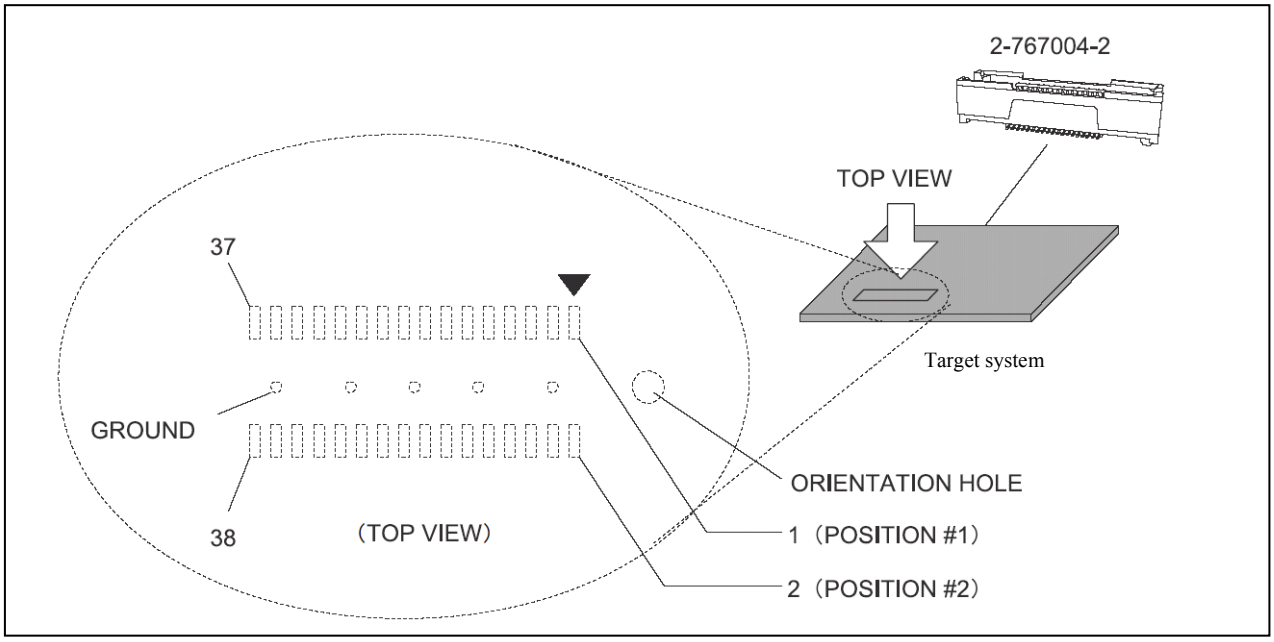


Figure 3-18. Mictor Connector Pin Assignment Diagram

Table 3-6. Mictor Connector Pin Functions (for V850E2S or V850E2M)

Pin No.	Signal Name	I/O[Note 1]	Description
1 and 2	GND	–	Connect to GND
3	TCK	IN	Clock for DCU
4	V_{DD}	–	Power supply (The power supply for buffers of debugging interface, or for power supply detection of target system)
5	TMS	IN	DCU state transition control signal
6	TRST#	IN	DCU reset signal
7	TDI	IN	Data signal transmitted to DCU
8	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
9	TDO	OUT	Data signal transmitted from DCU
10	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
11	RESERVE	–	Open
12	RDY#	OUT	Synchronous signals
13	RESERVE	–	Open
14	RESERVE	–	Open
15	RESERVE	–	Open
16	RESERVE	–	Open
17	RESERVE	–	Open
18	RESERVE	–	Open
19	RESERVE	–	Open
20	RESERVE	–	Open
21 to 36	RESERVE	–	Open
37, 38	GND	–	Connect to GND

Notes 1. As seen from the target device.

2. Refer to **3.4.4 Connecting the RESET# signal (for V850E2S or V850E2M)**.

3. Refer to **3.4.3 Connecting the FLMD0 signal (for V850E2S or V850E2M)**.

Table 3-7. Mictor Connector Pin Functions (for V850E2, V850E1, or V850ES)

Pin No.	Signal Name	I/O[Note 1]	Description
1 and 2	GND	–	Connect to GND
3	DCK	IN	Clock for DCU
4	V_{DD}	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)
5	DMS	IN	DCU state transition control signal
6	DRST#	IN	DCU reset signal
7	DDI	IN	Data signal transmitted to DCU
8	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
9	DDO	OUT	Data signal transmitted from DCU
10	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
11	N.C	–	Open (not connected)
12	RESERVE	–	Open
13	N.C	–	Open (not connected)
14	PORT0_IN	–	Connect to GND
15	N.C	–	Open (not connected)
16	PORT1_IN	–	Connect to GND
17	GND	–	Connect to GND
18	PORT2_IN	–	Connect to GND
19	GND	–	Connect to GND
20	POWER	–	Open[Note 4]
21 to 38	GND	–	Connect to GND

Notes 1. As seen from the target device.

2. Refer to **3.5.4 Connecting the RESET# signal (for V850E2, V850E1, or V850ES)**.

3. Refer to **3.5.3 Connecting the FLMD0 signal (for V850E2, V850E1, or V850ES)**.

4. When the TRCCE signal (trace compression enable input) is connected as the trace interface for Renesas Electronics partner company's emulator, the SW1 settings in QB-V850MINIL or QB-V850MINI must be changed. Refer to **3.2.2 Switch settings** for details.

3.6.3 SICA connector

The SICA connector is a compact target connector. Use of this connector is effective in cases such as when a mounting area cannot be secured on the target system. Note that the SICA connector may not support Renesas Electronics partner company's emulators.

When using the SICA connector as the target connector for OCD, mount the following connector on the target system.

- SICA2P20S: 20-pin type (sold separately)

Remark SICA2P20S is a product of Tokyo Eletech Corporation. The ordering code is "SICA2P20S05", which is for a set of five units. Contact Tokyo Eletech Corporation to purchase this product.

The following adapter is required for connection with the emulator.

- SICA20I2P (sold separately)

Remark SICA20I2P is a product of Tokyo Eletech Corporation.

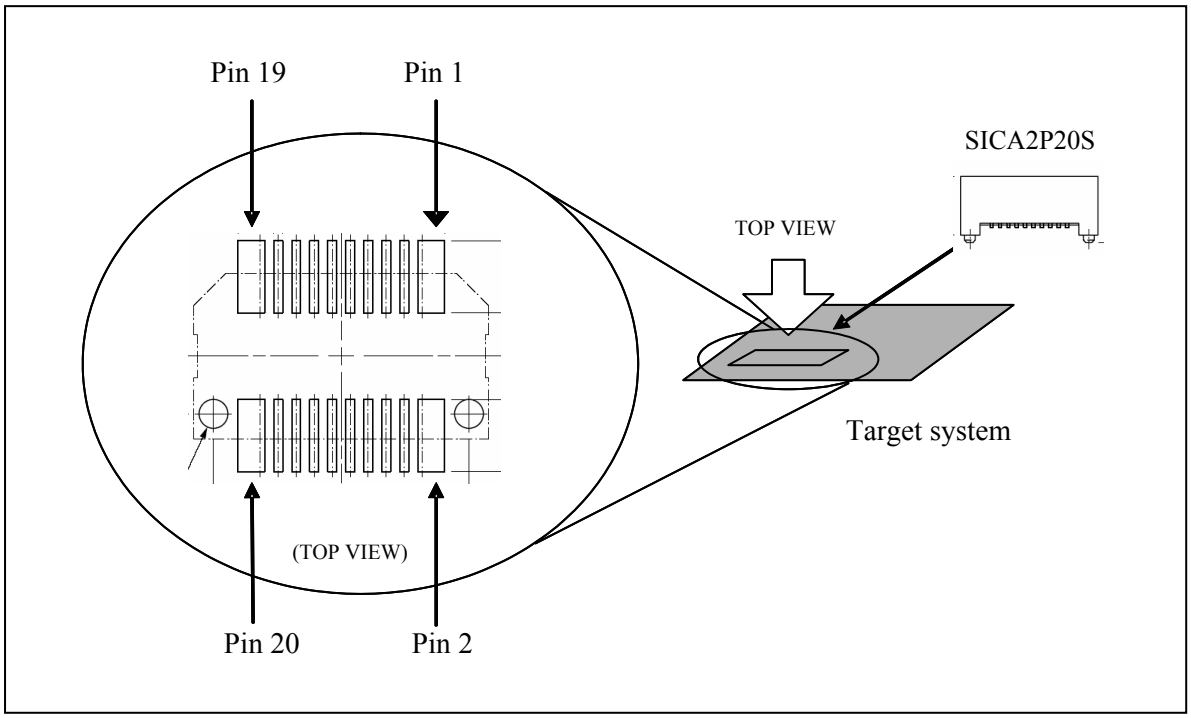


Figure 3-19. SICA Connector Pin Assignment Diagram

Table 3-8. SICA Connector Pin Functions (for V850E2S or V850E2M)

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	TCK	IN	Clock for DCU
3	GND	–	Connect to GND
4	TMS	IN	DCU state transition control signal
5	GND	–	GND
6	TDI	IN	Data signal transmitted to DCU
7	GND	–	Connect to GND
8	TRST#	IN	DCU reset signal
9	GND	–	Connect to GND
10	POWER	–	Open
11	GND	–	Connect to GND
12	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
13	GND	–	Connect to GND
14	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
15	GND	–	Connect to GND
16	RDY#	–	Synchronous signals
17	GND	–	Connect to GND
18	DDO	OUT	Data signal transmitted from DCU
19	GND	–	Connect to GND
20	V_{DD}	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)

Notes 1. As seen from the target device.

2. Refer to **3.4.4 Connecting the RESET# signal (for V850E2S or V850E2M)**.

3. Refer to **3.4.3 Connecting the FLMD0 signal (for V850E2S or V850E2M)**.

Table 3-9. SICA Connector Pin Functions (for V850E2, V850E1, or V850ES).

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	DCK	IN	Clock for DCU
3	GND	–	Connect to GND
4	DMS	IN	DCU state transition control signal
5	GND	–	GND
6	DDI	IN	Data signal transmitted to DCU
7	GND	–	Connect to GND
8	DRST#	IN	DCU reset signal
9	GND	–	Connect to GND
10	RESERVE	–	Open
11	GND	–	Connect to GND
12	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
13	GND	–	Connect to GND
14	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
15	GND	–	Connect to GND
16	RESERVE	–	Open
17	GND	–	Connect to GND
18	DDO	OUT	Data signal transmitted from DCU
19	GND	–	Connect to GND
20	V_{DD}	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)

Notes 1. As seen from the target device.

2. Refer to **3.5.4 Connecting the RESET# signal (for V850E2, V850E1, or V850ES)**.

3. Refer to **3.5.3 Connecting the FLMD0 signal (for V850E2, V850E1, or V850ES)**.

3.6.4 2.54 mm pitch 16-pin general-purpose connector (for V850E2S or V850E2M)

After attaching the 2.54 mm pitch 16-pin general-purpose connector, it can also be used to connect a separately sold flash memory programming tool. Note that the 2.54 mm pitch 16-pin general-purpose connector cannot be used when using the V850E2, V850E1, or V850ES.

Note that the 2.54 mm pitch 16-pin general-purpose connector may not support Renesas Electronics partner company's emulators.

The followings are examples of the 2.54 mm pitch 16-pin general-purpose connector.

- HIF3FC-16PA-2.54DS (sold separately)
- HIF3FC-16PA-2.54DSA (sold separately)

Remark HIF3FC-16PA-2.54DS and HIF3FC-16PA-2.54DSA are products of Hirose Electronic Co., Ltd.

The following adapter is required when connecting an emulator:

- QB-V850MINIL-AG1 (included with the QB-V850MINIL but not with the QB-V850MINI)

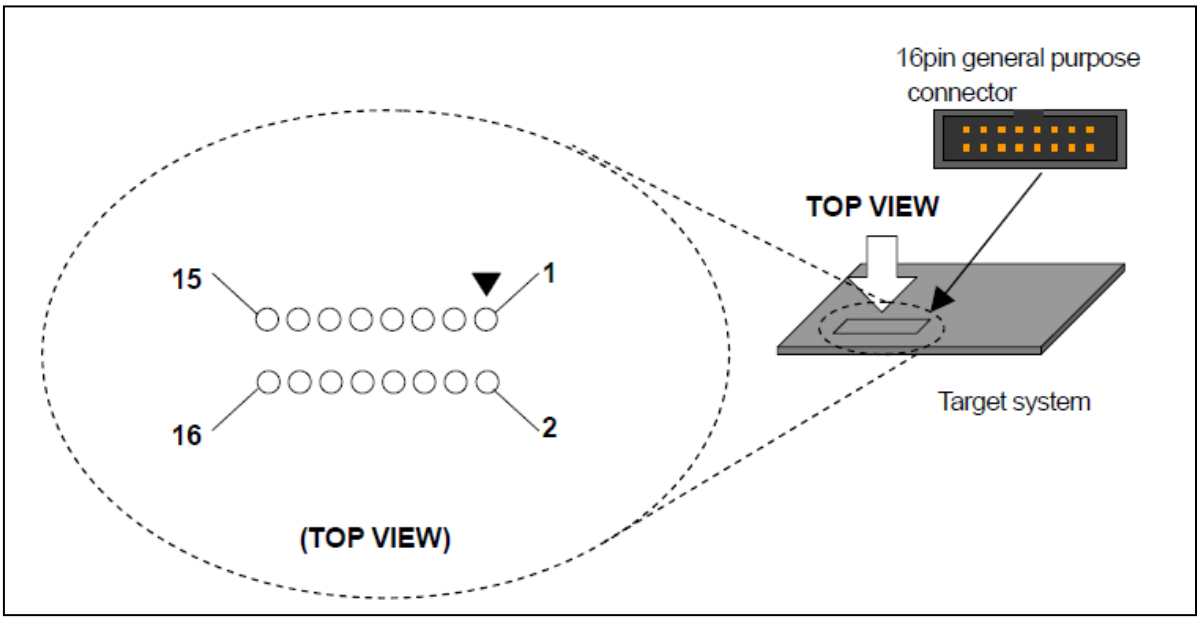


Figure 3-20. 2.54 mm Pitch 16-pin General-Purpose Connector Pin Assignment Diagram

Table 3-10. 2.54 mm Pitch 16-pin General-Purpose Connector Pin Functions (for V850E2S or V850E2M)

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
3	TDO	OUT	Data signal transmitted from DCU
4	VDD	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)
5	TDI	IN	Data signal transmitted to DCU
6	RESERVE	–	Open
7	TCK	IN	Clock for DCU
8	RDY#	OUT	Synchronous signals
9	TRST#	IN	DCU reset signal
10	RESERVE	–	Open
11	RESERVE	–	Open
12	TMS	IN	DCU state transition control signal
13	RESERVE	–	Open
14	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
15	For QB-MINI2	OUT	Signal of a separately sold QB-MINI2 [Note 4]
16	POWER	–	Open

Notes 1. As seen from the target device.

2. Refer to **3.4.4 Connecting the RESET# signal (for V850E2S or V850E2M)**.

3. Refer to **3.4.3 Connecting the FLMD0 signal (for V850E2S or V850E2M)**.

4. When using a separately sold QB-MINI2 as the debug tool, connect this signal to QB-MINI2. Refer to QB-MINI2 User's Manual for detail on the connection. When using a QB-MINI2 as the programming tool, this signal is not required to be connected.

3.6.5 2.54 mm pitch 20-pin general-purpose connector

A 2.54 mm pitch general-purpose connector do not need connection of adaptor. Note that 2.54 mm pitch 20-pin general-purpose connectors may not support Renesas Electronics partner company's emulators.

The followings are examples of the 2.54 mm pitch 20-pin general-purpose connector.

- HIF3FC-20PA-2.54DS (sold separately, right-angle type)
- HIF3FC-20PA-2.54DSA (sold separately, straight type)

Remark HIF3FC-20PA-2.54DS and HIF3FC-20PA-2.54DSA are products of Hirose Electronic Co., Ltd.

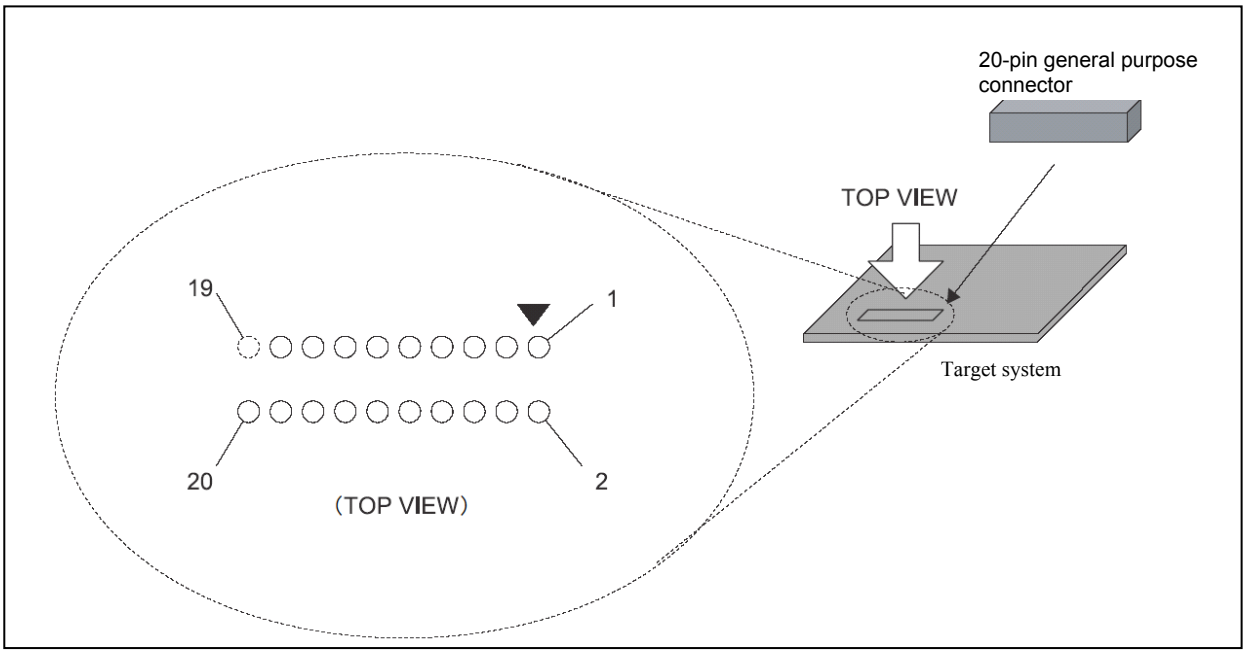


Figure 3-21. 2.54 mm Pitch General-Purpose Connector Pin Assignment Diagram

Table 3-11. 2.54 mm Pitch General-Purpose Connector Pin Functions (for V850E2S or V850E2M)

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	TCK	IN	Clock for DCU
3	GND	–	Connect to GND
4	TMS	IN	DCU state transition control signal
5	GND	–	GND
6	TDI	IN	Data signal transmitted to DCU
7	GND	–	Connect to GND
8	TRST#	IN	DCU reset signal
9	GND	–	Connect to GND
10	POWER	–	Open
11	GND	–	Connect to GND
12	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
13	GND	–	Connect to GND
14	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
15	GND	–	Connect to GND
16	RDY#	–	Synchronous signal
17	GND	–	Connect to GND
18	TDO	OUT	Data signal transmitted from DCU
19	GND	–	Connect to GND
20	V_{DD}	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)

Notes 1. As seen from the target device.

2. Refer to **3.4.4 Connecting the RESET# signal (for V850E2S or V850E2M)**.

3. Refer to **3.4.3 Connecting the FLMD0 signal (for V850E2S or V850E2M)**.

Table 3-12. 2.54 mm Pitch General-Purpose Connector Pin Functions (for V850E2, V850E1, V850ES)

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	DCK	IN	Clock for DCU
3	GND	–	Connect to GND
4	DMS	IN	DCU state transition control signal
5	GND	–	GND
6	DDI	IN	Data signal transmitted to DCU
7	GND	–	Connect to GND
8	DRST#	IN	DCU reset signal
9	GND	–	Connect to GND
10	RESERVE	–	Open
11	GND	–	Connect to GND
12	RESET#	IN	System reset input signal (leave open when not used)[Note 2]
13	GND	–	Connect to GND
14	FLMD0	IN	Flash programming mode setting signal (leave open when not used)[Note 3]
15	GND	–	Connect to GND
16	RESERVE	–	Open
17	GND	–	Connect to GND
18	DDO	OUT	Data signal transmitted from DCU
19	GND	–	Connect to GND
20	V_{DD}	–	Power supply (The power supply for buffers of a debugging interface, or for power supply detection of a target system)

Notes 1. As seen from the target device.

2. Refer to **3.5.4 Connecting the RESET# signal (for V850E2, V850E1, or V850ES)**.

3. Refer to **3.5.3 Connecting the FLMD0 signal (for V850E2, V850E1, or V850ES)**.

4. Debugging with in-circuit method

This chapter describes how to use QB-V850MINIL or QB-V850MINI for debugging with the in-circuit method.
In the in-circuit method, an emulator is connected in the position where the device is to be mounted.
By using the V850MINI self-check board included with the QB-V850MINI or the separately sold QB-V850ESKX1H-DA, QB-V850MINIL or QB-V850MINI can be used to debug the target devices shown in 4.1 below. Note that the V850MINIL self-check board included with the QB-V850MINIL cannot be used for in-circuit emulation.

4.1 Target Devices

Debugging with the in-circuit method can be performed using QB-V850MINIL or QB-V850MINI for the following target devices.

V850ES/KE1+, V850ES/KF1+, V850ES/KG1+, V850ES/KJ1+
V850ES/KE1[Note], V850ES/KF1[Note], V850ES/KG1[Note], V850ES/KJ1[Note]

Note One caution applies to debugging using the V850MINI self-check board included with the QB-V850MINI. See No. 23 in Table 6-1 for details.
This caution item is not applicable when using the QB-V850ESKX1-DA (sold separately).
Refer to the technical document for the QB-V850ESKX1-DA (ZUD-CD-04-0120) for details.
Contact your local distributor for how to obtain this document.

4.2 System Configuration

This section describes the system configuration for debugging with the in-circuit method.

4.2.1 Minimum system configuration

The system configuration shown in the following figure illustrates the minimum system configuration required for debugging with the in-circuit method. Note that items <6> and <7> in Figure 4-1 are not included with the QB-V850MINI or QB-V850MINIL. Note also that item <5> is included with the QB-V850MINI but not with the QB-V850MINIL.

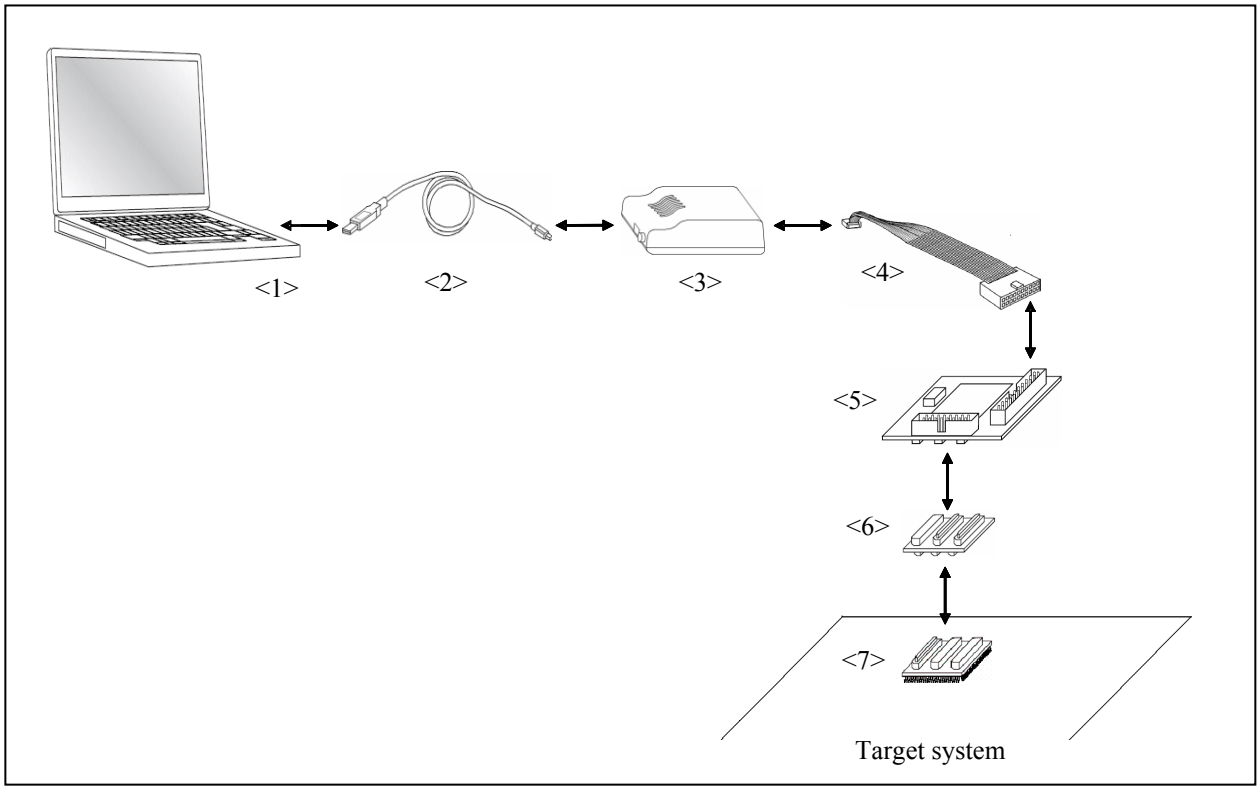


Figure 4-1. Minimum System Configuration for Debugging with In-Circuit Method

<1> Host machine: With USB ports
<2> USB cable (accessory)
<3> QB-V850MINIL or QB-V850MINI (this product)
<4> OCD cable (accessory)
<5> V850MINI Self-check board (included with the QB-V850MINI) or QB-V850ESKX1H-DA
<6> Exchange adapter (sold separately)
<7> Target connector (sold separately): A connector mounted on the target system.

4.2.2 System configuration when using optional products

The figure shown below illustrates the system configuration when using optional products. The items enclosed by dotted lines are the optional products. Applications of the optional products are described on this page. Refer to **4.2.3 List of optional product names** for the corresponding product names.

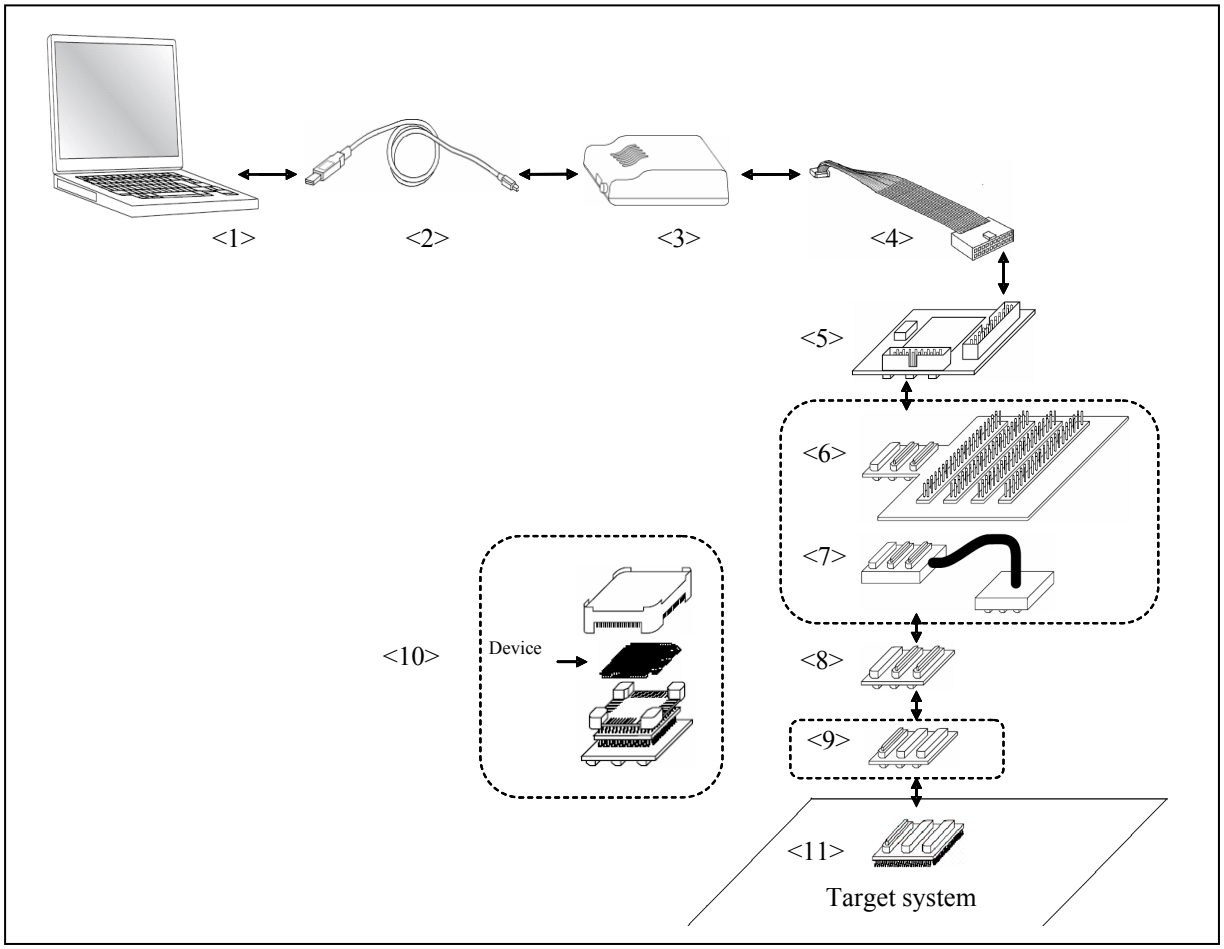


Figure 4-2. System Configuration with Optional Products

<1> Host machine: With USB ports
<2> USB (accessory)
<3> QB-V850MINIL or QB-V850MINI (this product)
<4> OCD cable (accessory)
<5> V850MINI Self-check board (accessory) (included with the QB-V850MINI) or QB-V850ESKX1H-DA
<6> Check pin adapter (sold separately): An adapter used for monitoring waveforms with an oscilloscope, etc.
<7> Coaxial type extension probe (sold separately): A cable used to extend the distance between the emulator and target system.
<8> Exchange adapter (sold separately)
<9> Space adapter (sold separately): An adapter used to adjust the height.
<10> Mount adapter (sold separately): An adapter used to mount the device in the socket.
<11> Target connector (sold separately): A connector mounted on the target system.

4.2.3 List of optional product names

The tables below list the optional product names. On-chip debugging is also possible for the V850ES/KJ1 or V850ES/KJ1+.

The external dimensions of optional products are posted on the following Renesas Electronics webpage.

URL: http://www.renesas.com/iecube/v850

Table 4-1. List of Optional Product Names (1/2)

No.	Name	Target Device to Be Emulated			
		V850ES/KE1, V850ES/KE1+		V850ES/KF1, V850ES/KF1+	
		64-pin GB	64-pin GK	80-pin GC	80-pin GK
<6>	Check pin adapter	QB-144-CA-01			
<7>	Extension probe (coaxial type)	QB-144-EP-01S			
<8>	Exchange adapter	QB-64-EA-01S		QB-80GC-EA-02S	QB-80GK-EA-01S
<9>	Space adapter	QB-64-SA-01S		QB-80-SA-01S	
<10>	Mount adapter	QB-64GB-MA-01S	QB-64GK-MA-01S	QB-80GC-MA-01S	QB-80GK-MA-01S
<11>	Target connector	QB-64GB-TC-01S	QB-64GK-TC-01S	QB-80GC-TC-01S	QB-80GK-TC-01S

Table 4-1. List of Optional Product Names (2/2)

No.	Name	Target Device to Be Emulated		
		V850ES/KG1, V850ES/KG1+		V850ES/KJ1, V850ES/KJ1+
		100-pin GC	100-pin GF	144-pin GJ
<6>	Check pin adapter	QB-144-CA-01		
<7>	Extension probe (coaxial type)	QB-144-EP-01S		
<8>	Exchange adapter	QB-100GC-EA-01S	QB-100GF-EA-01S	QB-144GJ-EA-02S
<9>	Space adapter	QB-100-SA-01S		QB-144-SA-01S
<10>	Mount adapter	QB-100GC-MA-01S	QB-100GF-MA-01S	QB-144GJ-MA-01S
<11>	Target connector	QB-100GC-TC-01S	QB-100GF-TC-01S	QB-144GJ-TC-01S

4.3 Setup Procedure

This section describes QB-V850MINIL or QB-V850MINI setup procedure to operate QB-V850MINIL or QB-V850MINI normally. Perform setup using the following procedure.

Installation of software
Install the USB driver, software tool, etc., in the host machine. See **4.3.1 Installation of software**. Proceed to the next step if installation of software has already been completed.

↓

Setting of QB-V850MINIL or QB-V850MINI
Set QB-V850MINIL or QB-V850MINI SW1 to the default setting. See **3.3 Default Setting** for the default settings of QB-V850MINIL or QB-V850MINI.

↓

Setting of clock
At shipment, an 8 MHz resonator (ceramic resonator) is mounted as the main clock in OSC1 on the V850MINI self-check board. A 32.768 kHz resonator is also mounted as the subclock. See **4.3.3 clock settings** for details.

↓

Setting of switch
The SW1 settings vary depending on the purpose of use of the V850MINI self-check board. At shipment, SW1 is set to perform self-testing (self-check mode). See **4.3.4 Switch settings** for details.

↓

Mounting of target connector
Mount the target connector on the target system. See **4.3.5 Mounting of target connector**. Proceed to the next step if the target connector is already mounted.

↓

Connection and startup of system
Connect the host machine, QB-V850MINIL or QB-V850MINI, V850MINI self-check board, and target system and start the entire system. See **4.3.6 Connection and startup of system** to perform setting in the correct order.

↓

System shutdown
Shut down the system to terminate debugging. See **4.3.7 System shutdown** to shut down the system in the correct order.

4.3.1 Installation of software

Install the software tool in the host machine before setting up the hardware. Refer to the Setup Manual supplied with this product for the procedures.

4.3.2 Setting of QB-V850MINIL or QB-V850MINI

Set QB-V850MINIL or QB-V850MINI to the default setting.

See **3.3 Default Setting** for the default settings of QB-V850MINIL or QB-V850MINI.

4.3.3 Clock settings

The oscillation clock of the target device is set by the clock settings for the V850MINI self-check board.

Main clock oscillation frequency: The frequency can be changed by replacing the resonator mounted in OSC1.

Subclock oscillation frequency: The frequency is fixed to 32.768 kHz. Do not change the frequency.

This chapter explains how to set the main clock.

The main clock oscillation frequency is determined by the clock mounted in OSC1.

An 8 MHz ceramic resonator is mounted at shipment.

There is no need to change the setting when using an 8 MHz resonator.

When changing the setting, remove the 8 MHz resonator from the parts board of OSC1, and insert the relevant resonator, as shown in Figure 4-3.

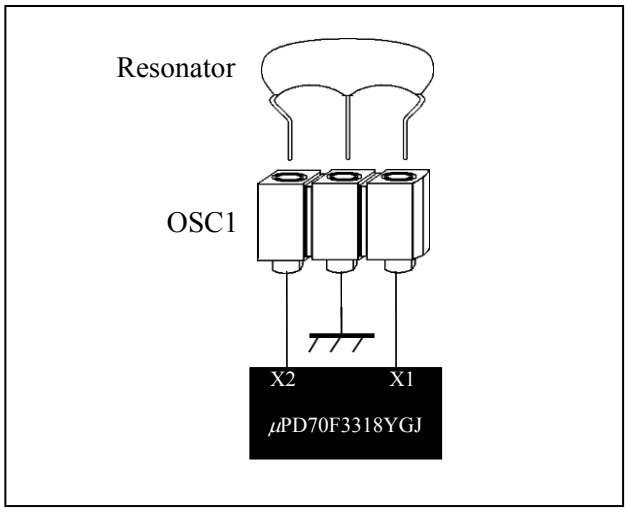


Figure 4-3. OSC1 Setting

A 3-pin resonator with the capacitor can be inserted easily.

When using a resonator other than the 3-pin resonator, a resonator without the capacitor, or the oscillator, the oscillator must be configured in OSC1.

Refer to the user's manual of the target device for details on the oscillator.

4.3.4 Switch settings

For the V850MINI self-check board, two types of mode can be selected by setting SW1.

Set SW1 to “Adapter” when performing emulation with the in-circuit method to set the adapter mode.

Table 4-2. SW1 Setting (Self-Check Board)

SW1 Setting	Mode	Description
Adapter	Adapter mode	A setting to set the mode for performing debugging with in-circuit method.
Self Check	Self-check mode	This is the default setting of SW1. A setting to set the mode for performing self-testing. This setting is also used to set the mode for writing to the μPD70F3318YGJ on the V850MINI self-check board using a flash memory programmer. This mode is used to erase the on-chip flash memory when the debugger cannot be activated because the user has skipped setting of the security ID code.

4.3.5 Mounting target connector

Mount the target connector on the target system in the following order.

(1) Apply cream solder to the foot pattern for mounting the IC on the target system.

(2) The target connector has a cylindrical projection in the center of the underside (Figure 4-4). Apply a two-component hardening type epoxy adhesive agent (a type that hardens in 15 to 30 minutes) sparingly to the underside of the projection to temporarily secure the connector at the specified location on the target system. Make sure that the position of pin 1 of the connector (where the corner is cut) matches the position of pin 1 on the target board.

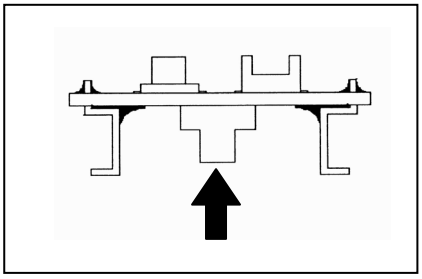


Figure 4-4. Target Connector Projection Diagram

(3) Mount the target connector under the following conditions.

a. To mount the target connector by reflow: 245°C within 20 seconds (heating)

b. To mount the target connector by manual soldering: 320°C within 5 seconds (per pin)

Caution The flux splashing that takes place while the connector is being mounted often results in defective conduction. Be sure to cover the upper part of the connector with aluminum foil. Avoid flux cleaning since the connector has a structure in which flux solvent is likely to remain.

4.3.6 Connection and startup of system

Connect and start the system in the following order.

(1) Connecting QB-V850MINIL or QB-V850MINI to target system

Connect QB-V850MINIL or QB-V850MINI to the target system using the exchange adapter and target connector. Refer to the system configuration diagrams shown in Figures 4-1 and 4-2 for the connection of other optional products.

Caution Perform connection while the power to the target system is off.

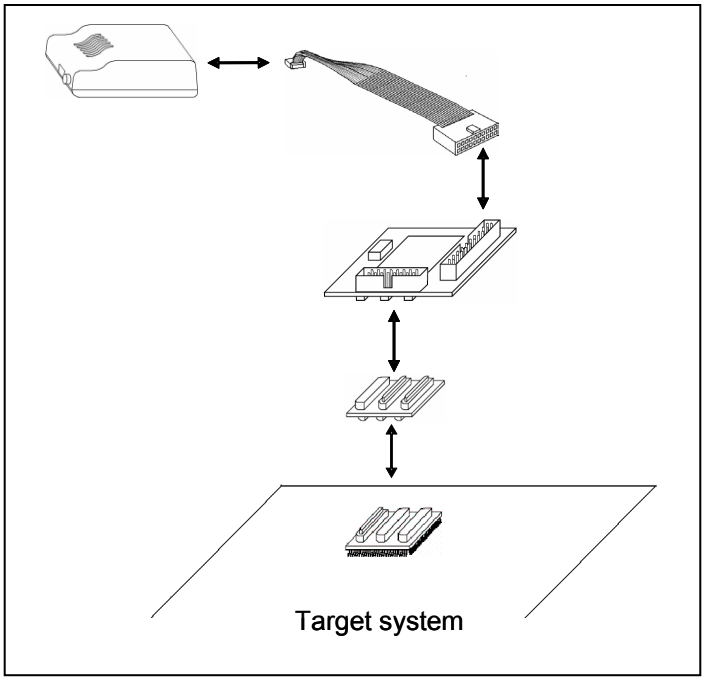


Figure 4-5. Connecting QB-V850MINIL or QB-V850MINI to Target System

(2) Connecting QB-V850MINIL or QB-V850MINI to host machine

Connect QB-V850MINIL or QB-V850MINI to the host machine using the USB interface cable. After performing this connection, confirm that the POWER LED on QB-V850MINIL or QB-V850MINI is lit.

Caution Perform connection while the power to the target system is off.

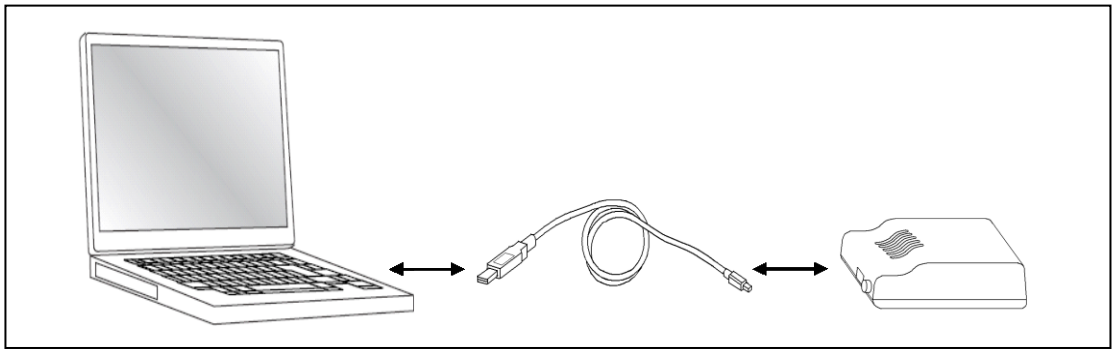


Figure 4-6. Connecting QB-V850MINIL or QB-V850MINI to Host Machine

(3) Power application to target system

Apply the power to the target system. After power application, confirm that the TARGET LED on QB-V850MINIL or QB-V850MINI is lit.

(4) Running the software

Start up and run the software as described in the supplied user's manual.

4.3.7 System shutdown

Terminate debugging and shutdown the system in the following order.

(1) Terminate the software.

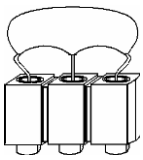
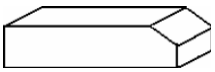
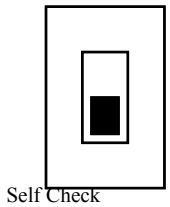
(2) Turn off the power to the target system.

(3) Disconnect the USB cable from the host machine.

Caution If the above order is not observed, QB-V850MINIL or QB-V850MINI or the self-check board may be damaged.

4.4 Default Settings (V850MINI Self-check board)

Table 4-3. Default Settings of Self-Check Board

Item	Setting	Description
OSC1		An 8 MHz resonator is mounted at shipment. There is no need to change the setting when using an 8 MHz resonator as is. When changing the setting, refer to **4.3.3 Clock settings** for details.
OSC2		A 32.768 kHz resonator is mounted at shipment. Do not change the frequency.
SW1		SW1 is set to “Self Check” by default. Refer to **4.3.4 Switch settings** for how to set the switches.

4.5 Cautions on Using Sockets

This section describes cautions on using sockets such as the target connector and exchange adapter.

The following symbols are used in this section.

- TC: Target connector
- EA: Exchange adapter
- MA: Mount adapter
- CA: Check pin adapter
- SA: Space adapter
- EP: Extension probe

4.5.1 Cautions on inserting/removing sockets

- When inserting an adapter such as EA, MA, or SA in TC, insert it so that the position of pin 1 (where the corner is cut) on each adapter matches. Be sure to insert the connectors in the correct direction (so that the positions match).
- Remove or insert the sockets in the correct direction (see **Figure 4-7**).
- Be sure to hold the lower (mating) connector or board with your fingers when inserting or removing a socket.
- Use a bamboo spit or similar object as a tool to remove the connector. Insert the tool between TC and EA and remove TC in the correction direction as shown in Figure 4-7. If force is applied to the connector in the wrong direction, the connector will be damaged. If only a metallic object such as a screwdriver is available as leverage, wrap its tip in a soft cloth.

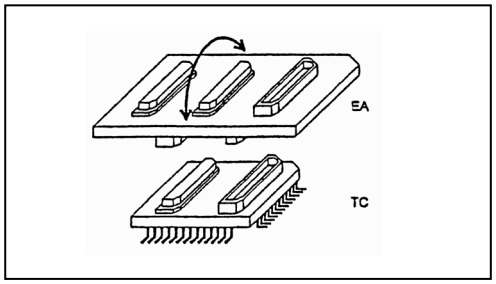


Figure 4-7. How to Insert/Remove a Socket

4.5.2 Causes of faulty contact of connectors and countermeasures for them

Possible causes of faulty connector contact and countermeasures are listed below.

- If flux gets inside TC when it is mounted

  Thoroughly clean the flux with a solvent such as alcohol. Cleaning must be performed at least 5 to 6 times. If conduction is still not stable, repeat cleaning.
- If dirt gets inside the connector

  If dirt, such as threads, gets inside the connector, defective conduction occurs. Remove any dirt with a brush.
- Cautions on using CA, SA, and EP

  When CA, SA, or EP is inserted, a very small amount of delay in the signal propagation and capacitance occur. Thoroughly evaluate these points after CA, SA, or EP is connected to the target system.

4.6 Recovery of Security ID

This section describes how to recover from the case where the software tool cannot be activated because the user forgot the ID code or has skipped setting of the ID code, when using the V850MINI self-check board.

Perform the following steps to recover from the above cases.

(1) Remove the V850MINI self-check board from the target system.

(2) Set SW1 on the V850MINI self-check board to “Self Check”.

(3) Connect the flash memory programmer to the FW1 connector on the self-check board.

Caution To avoid signal conflicts, do not connect QB-V850MINIL or QB-V850MINI to the self-check board when the flash memory programmer is connected.
Do not supply the clock from the flash memory programmer during writing/erasure.
(Use OSC1 on the self-check board as a clock for writing.)

(4) Enter the settings for the flash memory programmer.

Figure 4-8 shows setting examples when using the QB-Programmer as the flash memory programmer.

(5) Perform a chip erase operation.

After the chip erasure, the security ID is set to “0xFFFFFFFFFFFFFFFFFFFF”.

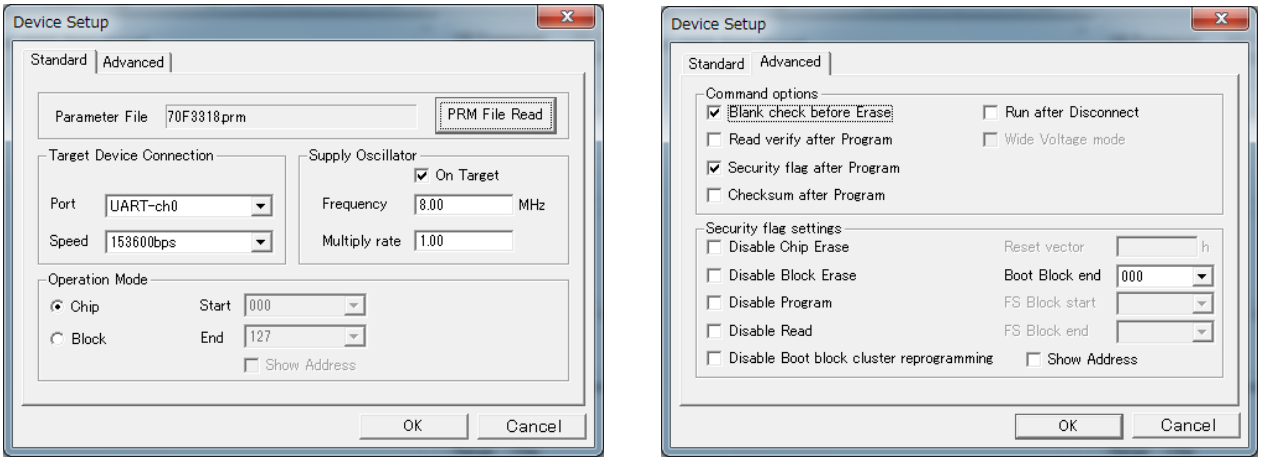


Figure 4-8. Example of Settings for QB-Programmer

5. Self-Testing

This chapter describes how to perform self-testing of QB-V850MINIL or QB-V850MINI.
When the debugger does not operate normally, this function can be used to determine whether the cause lies in QB-V850MINIL or QB-V850MINI, or in other hardware.

5.1 System Configuration

Figure 5-1 illustrates the system configuration for performing self-testing.

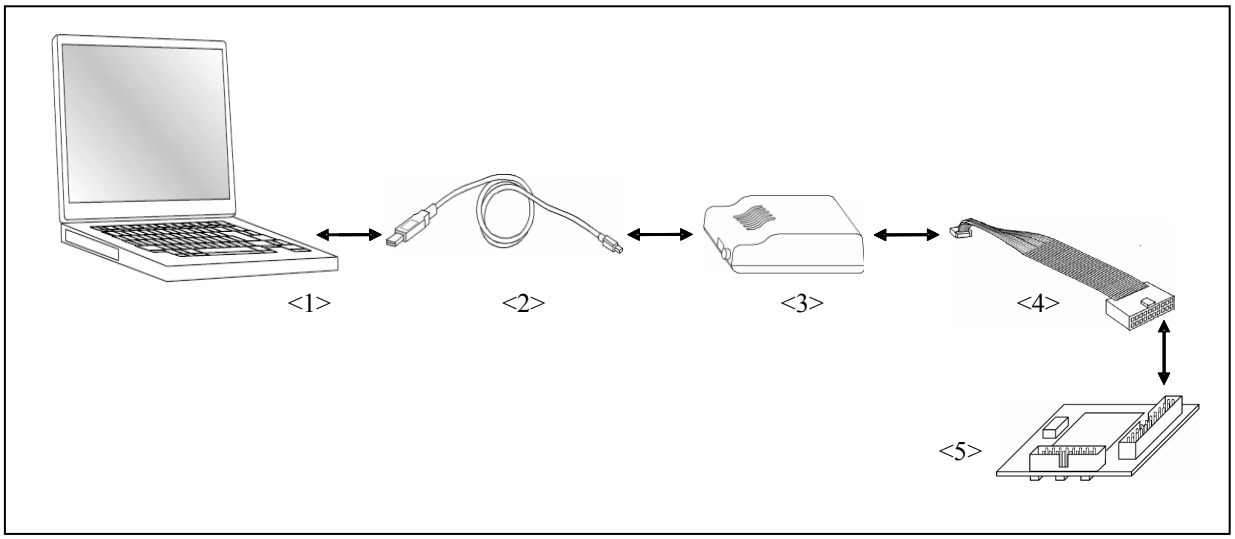
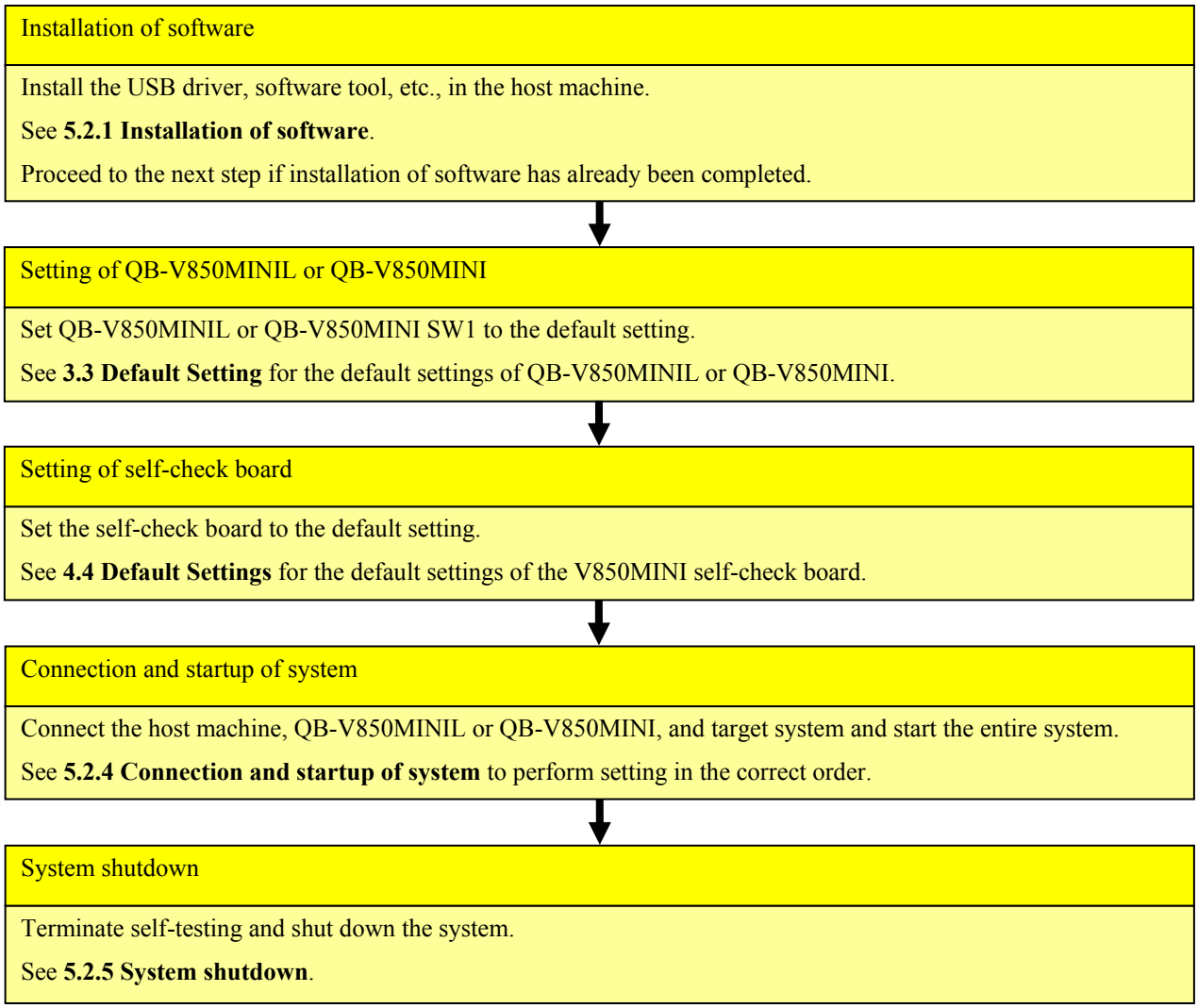


Figure 5-1. System Configuration for Self-Testing

<1> Host machine: With USB ports
<2> USB interface cable (accessory)
<3> QB-V850MINIL or QB-V850MINI (this product)
<4> OCD cable (accessory)
<5> Self-check board (accessory)

5.2 Setup Procedure

This section describes QB-V850MINIL or QB-V850MINI setup procedure to operate QB-V850MINIL or QB-V850MINI normally. Perform setup using the following procedure.



5.2.1 Installation of software

Install the following software in the host machine before setting up the hardware. Refer to the “Setup manual” supplied with the QB-V850MINI for the procedures.

When using the ID850QB,MULTI(made by Green hills software Co., Ltd).,

The required device file is shown below. This file differs depending on which self-check board is being used. A device file does not have to be installed when using CubeSuite+.

- V850MINIL self-check board: DF703736
- V850MINI self-check board: DF703318

The device file can be downloaded from the following website:

http://www.renesas.com/ghs_debug_if

5.2.2 Setting of QB-V850MINIL or QB-V850MINI

Set QB-V850MINIL or QB-V850MINI to the default setting when performing self-testing.

See **3.3 Default Setting** for the default settings of QB-V850MINIL or QB-V850MINI.

5.2.3 Setting of self-check board

Set the self-check board to the default setting when performing self-testing.

See **4.4 Default Settings (V850MINI Self-check board)** for the default settings.

5.2.4 Connection and startup of system

Connect and start the system in the following order.

(1) Connecting QB-V850MINIL or QB-V850MINI to self-check board

Connect QB-V850MINIL or QB-V850MINI to the V850MINI self-check board using the OCD cable.

Caution Do not connect QB-V850MINIL or QB-V850MINI to the host machine at this time.

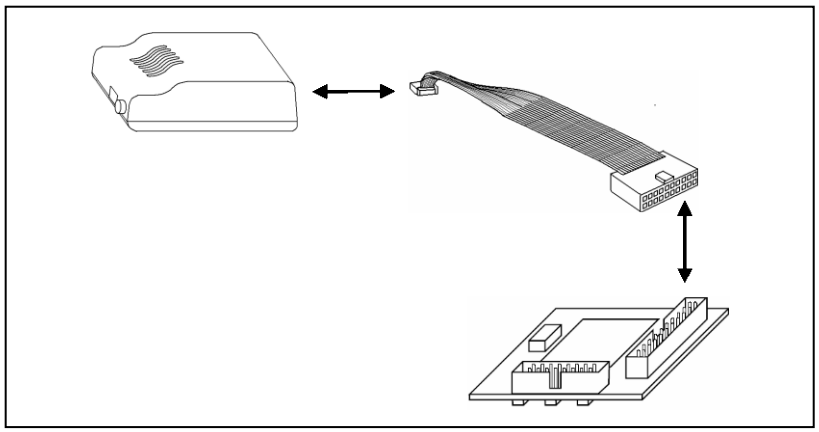


Figure 5-2. Connecting QB-V850MINIL or QB-V850MINI to Self-Check Board

(2) Connecting QB-V850MINIL or QB-V850MINI to host machine

Connect QB-V850MINIL or QB-V850MINI to the host machine using the USB interface cable. After performing this connection, confirm that LEDs (POWER and TARGET) on QB-V850MINIL or QB-V850MINI are lit.

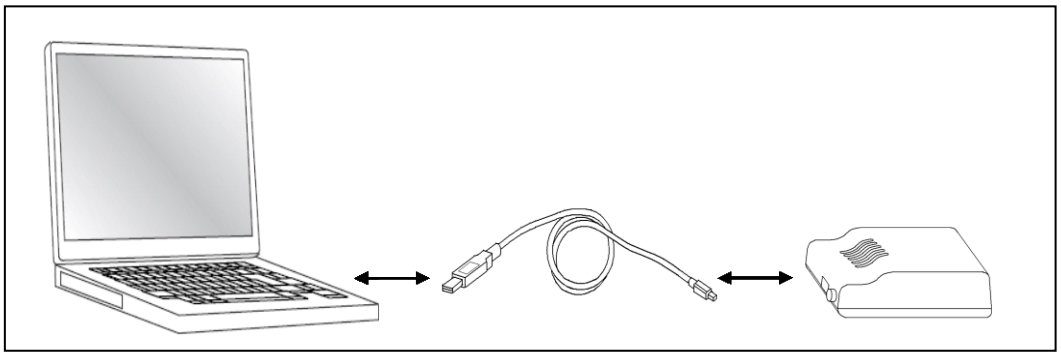


Figure 5-3. Connecting QB-V850MINIL or QB-V850MINI to Host Machine

<R> (3) Startup of V850 JTAG OCD Checker

V850 JTAG OCD Checker can be started up by clicking Start menu.

Refer to the following table for the settings to be specified in the main dialog box.

After specifying these settings, proceed according to the instructions in the V850 JTAG OCD Checker user's manual.

When using V850MINIL self-check board	Device file: Specify **DF3736.800** Clock: Select **5.000** for **Main OSC**. Internal ROM Sequrity: Select the **ID code** check box and input the security code specified at addresses 0x70 to 0x79. Emulator: Select **IE-V850E1-CD-NW/QB-V850MINI (DCK=20 MHz)**.
When using V850MINI self-check board	Device file: Specify **DF3318Y.800** Clock: Select **8.000** for **Main OSC**. Internal ROM Sequrity: Select the **ID code** check box and input the security code specified at addresses 0x70 to 0x79. Emulator: At shipment, the debugger can be activated by inputting "FFFFFFFFFFFFFFFFFFFF".Select **IE-V850E1-CD-NW/QB-V850MINI (DCK=10 MHz)**.

5.2.5 System shutdown

Terminate self-testing and shutdown the system in the following order.

(1) Terminate the V850 JTAG OCD Checker.

(2) Disconnect the USB cable from the host machine.

Caution If the above order is not observed, QB-V850MINIL or QB-V850MINI or the self-check board may be damaged.

6. Cautions

This chapter lists cautions on using QB-V850MINIL or QB-V850MINI.

Caution items are classified in the following three categories, so refer to the relevant items.

[OCD] Cautions for performing on-chip debugging

[IE] Cautions for performing debugging with in-circuit method

[SC] Cautions for performing self-testing

Table 6-1. List of Cautions (1/2)

No.	Classification	Caution
1	**[OCD]**	Use of target devices used for on-chip debugging as mass production products is not guaranteed. Guarantee for the case where only downloading of a program is performed but debugging is not performed is planned.
2	**[OCD]**	In a target device that incorporates an OCD unit, some of the target interface signal pins for OCD may have alternate functions. The alternate functions of these pins cannot be used during on-chip debugging.
3	**[OCD]**, **[IE]**	When erasure and write are prohibited by setting the security flag for the flash memory, programs cannot be downloaded via the debugger.
4	**[OCD]**, **[IE]**	If DMA transfer to the internal RAM is performed while a program is being downloaded to the flash memory, downloading of the program may not be performed normally because the integrated debugger uses the internal RAM during program downloading.
5	**[OCD]**, **[IE]**	Do not use the ROM correction function or else unexpected breaks will occur.
6	**[OCD]**	Since the initial value of the ASID register in the V850E1 Series is undefined, set the ASID register to 00H via the reset routine. Initialization of the V850ES Series is not required.
7	**[OCD]**	The current consumption in the target device increases during debugging compared with that in normal operation mode, because the OCD unit of the target device operates during debugging.
8	**[OCD]**	The break function may malfunctions when a reset occurs during RUN (program execution), depending on the target device. See the documents of the target device (user's manual, restriction notification, etc.).
9	**[OCD]**	The I/O buffer (port pin) may enter the reset status depending on the target device when a reset is input from the pin, even if reset is masked by the mask function. See the documents of the target device (user's manual, restriction notification, etc.).
10	**[OCD]**	No break occurs in an interrupt service routine for an interrupt acknowledged during self programming, even if an event breakpoint has been set.
11	**[OCD]**, **[IE]**	When using the self programming function, set the debugger so that the clock for the peripheral macros does not stop during breaks; otherwise, the flash memory may be damaged.
12	**[OCD]**, **[IE]**	When using the self programming function, do not set software breaks to the ROM area; otherwise, an unexpected break may occur.
13	**[OCD]**	With the V850E1 Series, a forced break may be executed via the debugger operation during flash self writing. After a forced break, reexecute the program via the debugger or reset the CPU.

Table 6-1. List of Cautions (2/2)

No.	Classification	Caution
14	**[IE]**	V_{DD} and EV_{DD} are shorted on the self-check board. Therefore, be sure to input the same voltage level to V_{DD} and EV_{DD}.
15	**[IE]**	The P05, P52, P53, P54, and P55 pins are used for connecting the on-chip debug emulator, so these ports cannot be used.
16	**[IE]**	The X1, X2, XT1, and XT2 pins are not connected to the target system. Consequently, the oscillation circuit in the target system cannot be used.
17	**[IE]**	Do not apply a high voltage (5.5 V or higher) to the V_{PP} pin; otherwise, QB-V850MINIL or QB-V850MINI may be damaged.
18	**[IE]**	The REGC pin is not connected to the target system. The REGC pin is connected to V_{DD} inside the emulator.
19	**[IE]**	QB-V850MINIL or QB-V850MINI and the flash memory programmer cannot be connected at the same time.
20	**[IE]**	QB-V850MINIL or QB-V850MINI outputs a high-level signal to the FLMD0 pin while a program is being downloaded. (QB-V850MINIL or QB-V850MINI output becomes the high-impedance state when no program is being downloaded.) Note the FLMD0 pin connection on the target system side.
21	**[IE]**	When the flash memory programmer is connected, no clock can be supplied from the programmer. Use a clock on the self-check board (8 MHz at shipment) for writing or erasing data from the flash memory programmer.
22	**[IE]**	Note the following points concerning the settings in the Configuration screen when the debugger is activated. • “Chip” area Select the device to be used. • “Clock” area Set as follows. - Main OSC: Input a frequency of the resonator mounted in OSC1 with the socket (Input “8” when using OSC1 with the default setting). - Multiply rate: Input the maximum multiplication rate of the frequency used for the resonator mounted in OSC1 with the socket. - Sub OSC: Input “32.768”. • “ID Code” area Input the security code that has been set at addresses 0x70 to 0x79. At shipment, the debugger can be activated by inputting “FFFFFFFFFFFFFFFFFFFF”. • “N-Wire I/F” area Be sure to select “DCK=10MHz”. The debugger may not operate if “DCK=20MHz” is selected.
23	**[IE]**	The P00 pin outputs a low-level signal during a reset. Exercise care when performing emulation of the V850ES/KE1, V850ES/KF1, V850ES/KG1, or V850ES/KJ1.
24	**[SC]**	Do not connect the target system when performing self-testing.

7. Maintenance and Warranty

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

7.1 User Registration

When you purchase our product, be sure to register as a user. For user registration, refer to “User Registration” (page 12) of this user's manual.

7.2 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.

7.3 Warranty

(1) This product comes with a one-year limited warranty after purchase.
Should the product break down or be damaged while you’re using it under normal condition based on its user’s manual, it will be repaired or replaced free of cost.

(2) However, if the following failure or damage occurs to the product under warranty, the product will be repaired or replaced at 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 of the product when it is transported or 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 abnormal voltages, etc.

(e) Failure or damage attributable to modifications, repairs, adjustments, or other acts made to the product by other than Renesas Electronics Corporation.

(3) Consumables (e.g., sockets and adapters) are not covered by the aforementioned repair.

In the above cases, contact your local distributor. If your product is being leased, consult the leasing company or the owner.

7.4 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.

(a) - Faulty or broken mechanical portions

(b) - Flaws, separation, or rust in coated or plated portions

(c) - Flaws or cracks in plastic portions

(d) - Faults or breakage caused by improper use or unauthorized repair or modification

(e) - Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply

(f) - Cracks in the printed circuit board or burnt-down patterns

(g) - A wide range of faults that make replacement less expensive than repair

(h) - 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.

7.5 How to Make Request for Repair

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.

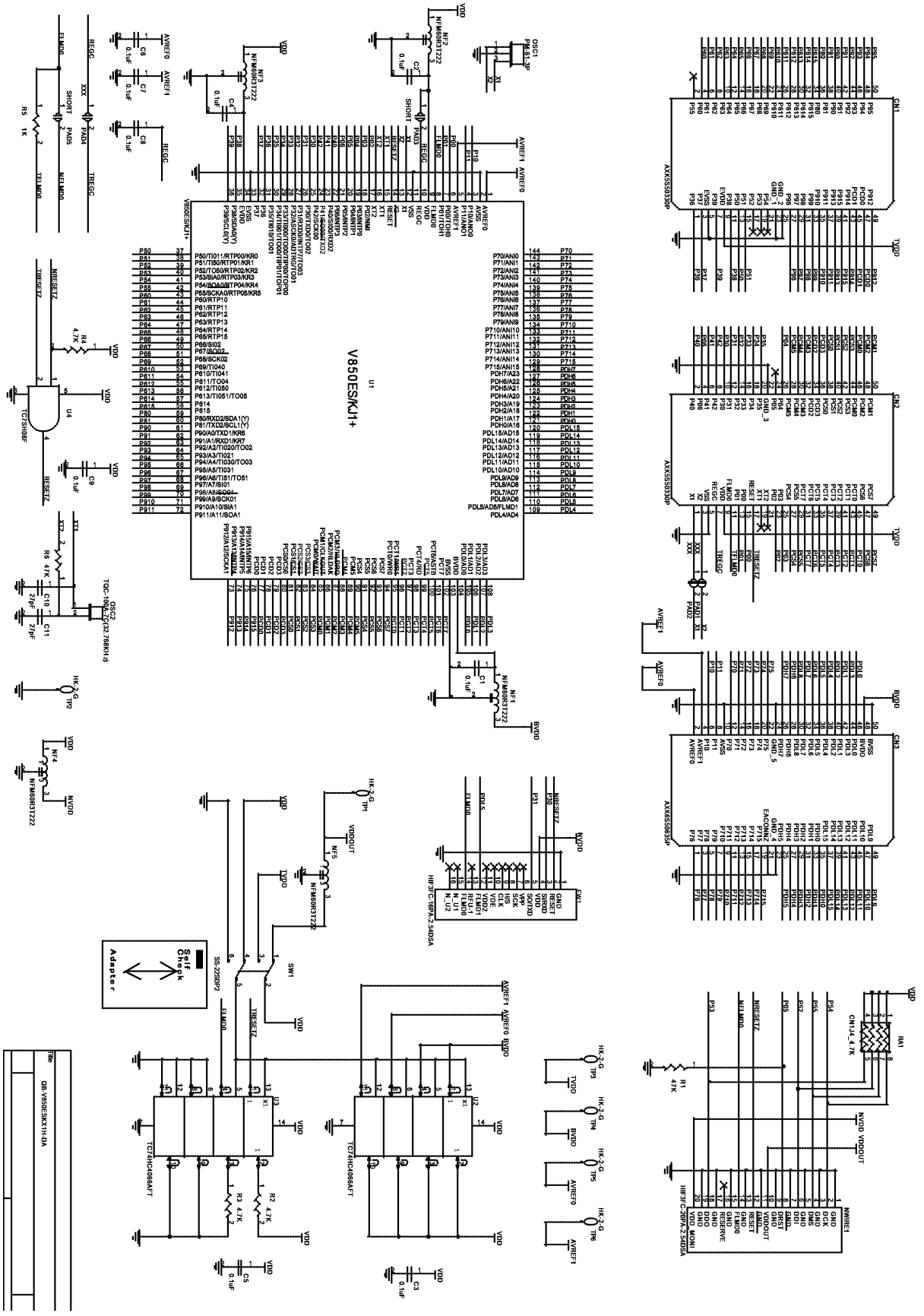
http://www.renesas.com/repair

⚠CAUTION

Note on Transporting the Product:

When sending your product for repair, use the packing box and cushioning material supplied with the 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 (usually a blue bag). If you use a different bag, it may lead to further trouble with your product due to static electricity.

Appendix A. V850MINI Self-Check Board Circuit Diagrams



Appendix B. External Dimensions

B.1 QB-V850MINIL, QB-V850MINI

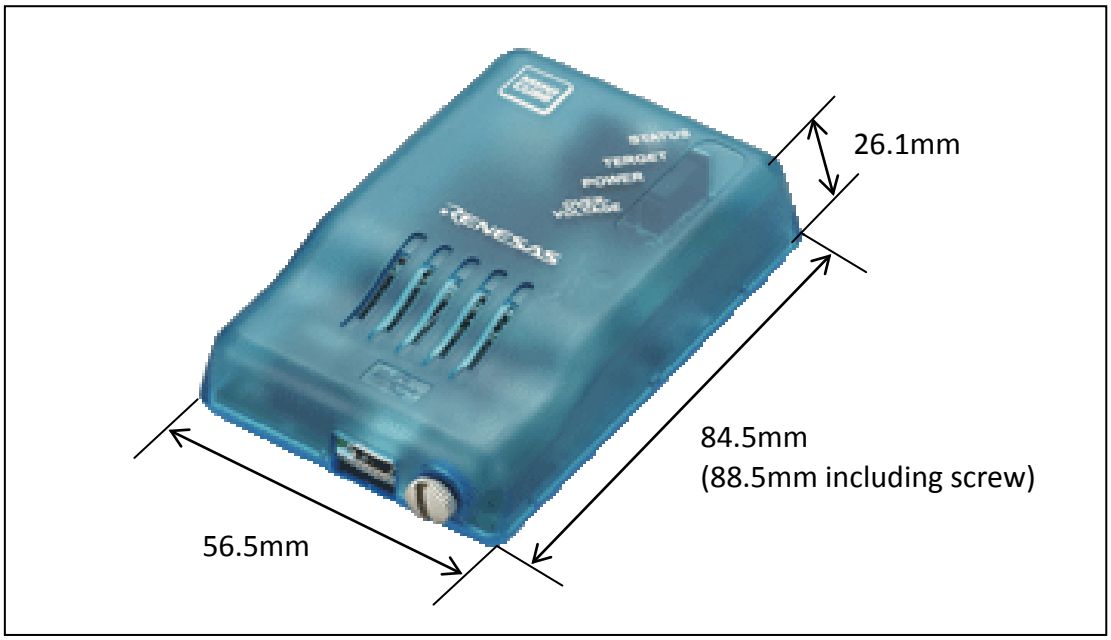


Figure B-1. QB-V850MINIL or QB-V850MINI

B.2 V850MINI Self-Check Board

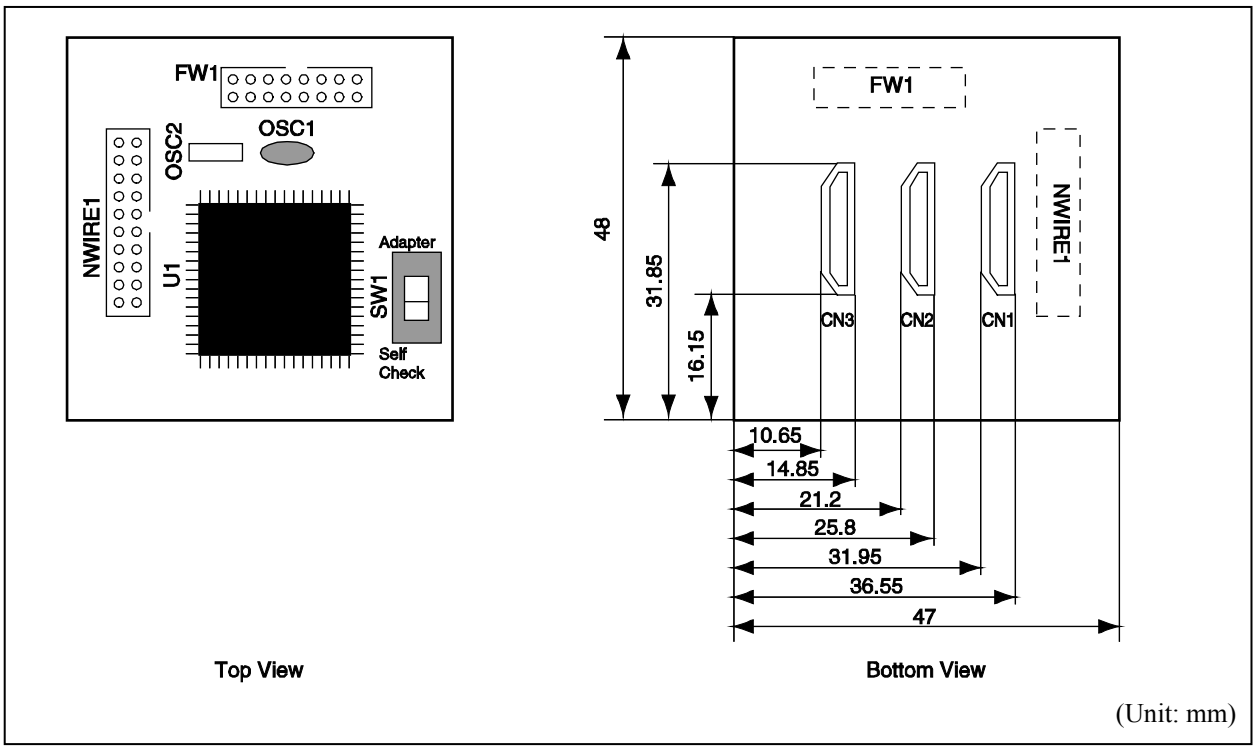


Figure B-2. V850MINI Self-Check Board

B.3 Target Connectors (for OCD)

The external dimensions described in this section are the dimensions required for the target connector (for OCD) (unit: mm). Refer to the dimension diagrams supplied by each connector manufacturer when designing boards.

The external dimension diagrams of optional products to be used for emulation with the in-circuit method are posted on the following Renesas Electronics webpage.

URL: http://www.renesas.com/iecube/v850

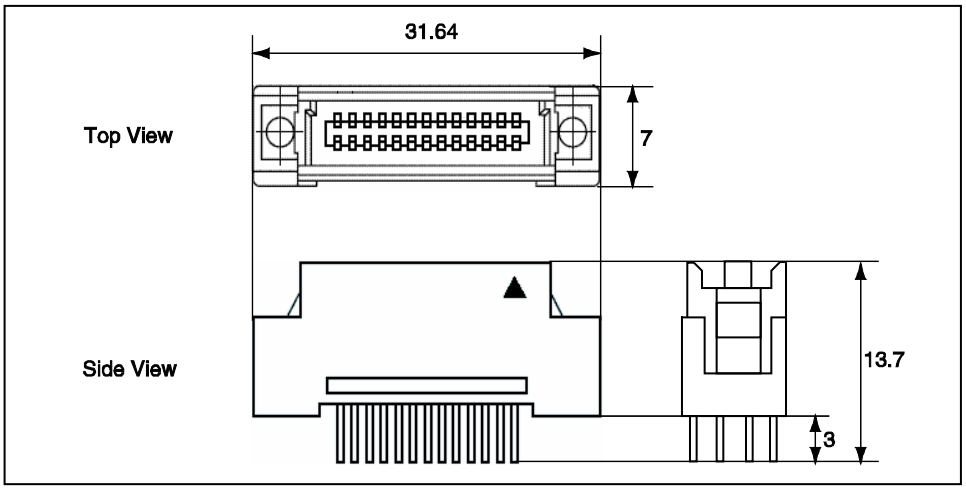


Figure B-3. KEL Connector (8830E-026-170S)

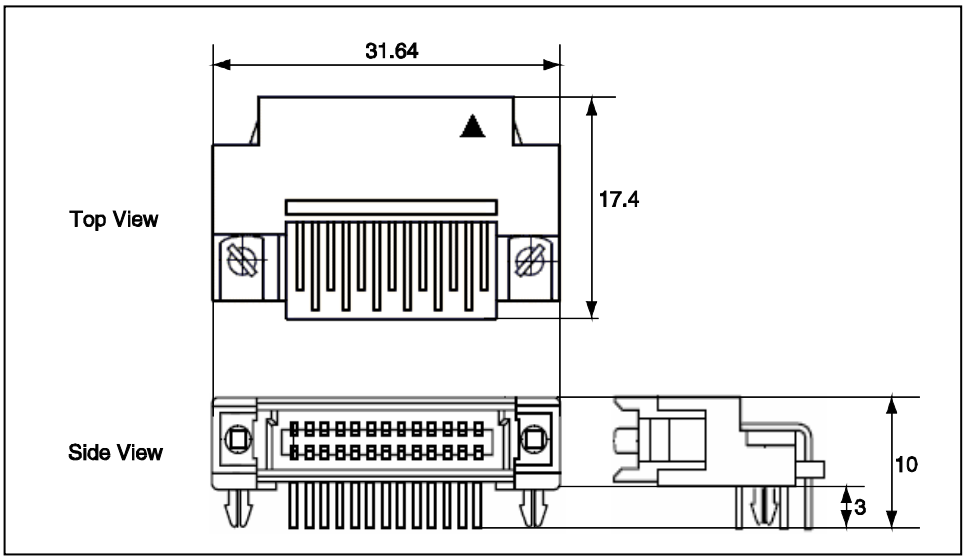


Figure B-4. KEL Connector (8830E-026-170L)

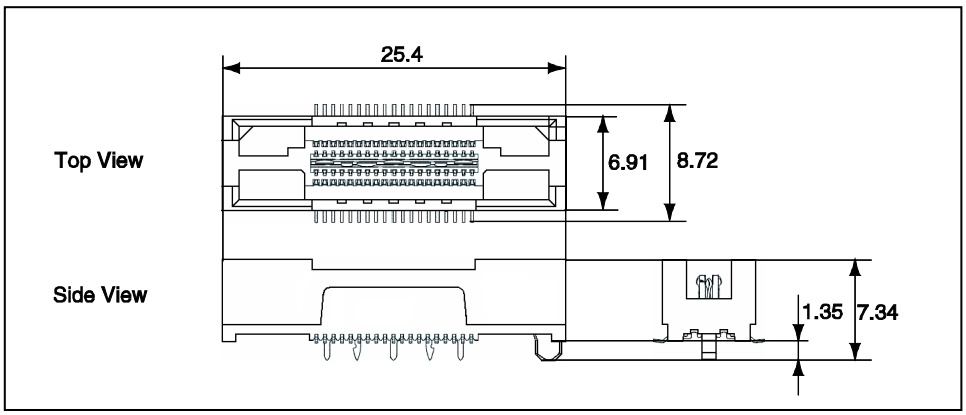


Figure B-5. Mictor Connector (2-767004-2)

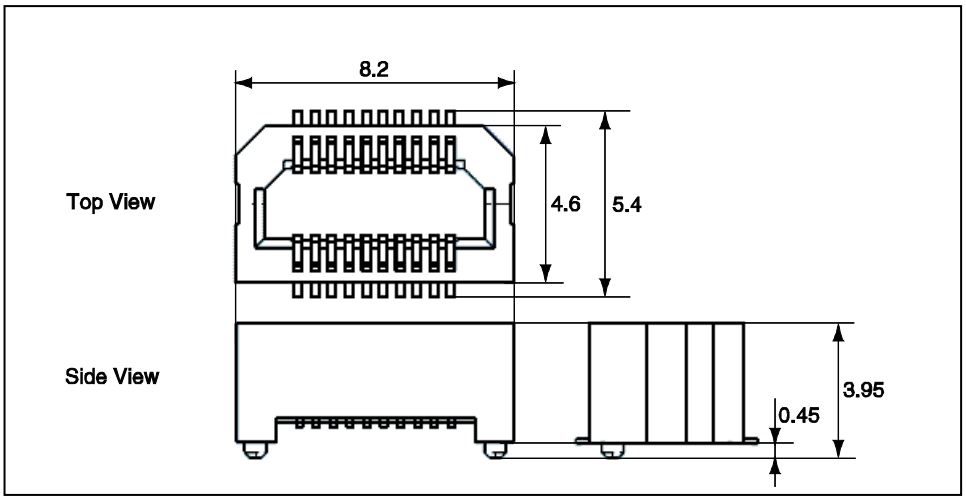


Figure B-6. SICA Connector (SICA2P20S)

Appendix C. Revision History

Revisions up to the previous edition are shown below. The “Applied to” column indicates the chapter in each edition to which the revision was applied.

Edition	Description	Applied to
2nd edition	Change of **Documents Related to Development Tools (User's Manuals)** in **INTRODUCTION**	**INTRODUCTION**
	Addition of **1.3 Supported Devices**	**CHAPTER 1 OVERVIEW**
	Change of **Table 1-2 Debug Function Specifications** in **1.4 Specifications**	
	Change of **3.4.2 Cautions on target system design**	**CHAPTER 3 ON-CHIP DEBUGGING**
	Change of **3.4.3 (1) DCK**	
	Change of **3.4.3 (7) (a) When not performing flash self programming**	
	Change of **3.4.3 (7) (b) When performing flash self programming**	
	Addition of **3.4.3 (7) (c) When the target device is not provided with an on-chip flash memory**	
	Change of **Table 3-3. List of Target Connectors for OCD (Part Number and Manufacturer)** in **3.5 Target Connectors for OCD**	
	Addition of **APPENDIX D REVISION HISTORY**	**APPENDIX D REVISION HISTORY**
3rd edition	Addition of **1.1 Features**	**CHAPTER 1 OVERVIEW**
	Change of **1.4 Specifications**	
	Change of **2.1 Names of Parts in Main Unit**	**CHAPTER 2 NAMES AND FUNCTIONS OF HARDWARE**
	Change of **2.2 Self-Check Board**	
	Addition of **2.2.2 V850MINIL self-check board**	
	Change of **CHAPTER 3 ON-CHIP DEBUGGING**	**CHAPTER 3 ON-CHIP DEBUGGING**
	Change of **3.1 System Configuration**	
	Change of **3.2 Setup Procedure**	
	Addition of **3.4 Designing Target System Circuits when Using V850E2M**	
	Change of **3.5 Designing Target System Circuits When Using V850E2, V850E1, or V850ES**	
	Change of **3.6 Target Connectors for OCD**	
	Change of **CHAPTER 4 DEBUGGING WITH IN-CIRCUIT METHOD**	**CHAPTER 4 DEBUGGING WITH IN-CIRCUIT METHOD**
	Change of **4.2 System Configuration**	
	Change of **4.3.6 Connection and startup of system**	
	Change of **5.1 System Configuration**	**CHAPTER 5 SELF-TESTING**
	Change of **5.2 Setup Procedure**	
	Change of **CHAPTER 6 CAUTIONS** (Deletion of No.25)	**CHAPTER 6 CAUTIONS**
	Deletion **APPENDIX C INTERNAL ROM/FLASH MEMORY SECURITY FUNCTION** of the previous edition	**APPENDIX C INTERNAL ROM/FLASH MEMORY SECURITY FUNCTION** of the previous edition
3rd edition (Modified version)	Change of **Figure 3-5. Circuit Connection Example**	**CHAPTER 3 On-Chip Degugging**

Edition	Description	Applied to
4th edition	Addition of V850E2S core	**Document whole**
	Change of **5.2.4** **Connection and startup of system**	**CHAPTER 5 SELF-TESTING**

On-Chip Debugger
QB-V850NIMIL, QB-V850MINI User's Manual

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Colophon 1.3

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