NEC

User's Manual

QB-V850MINI

On-Chip Debug Emulator

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[MEMO]

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1. **Circumstances not covered by product guarantee**
   - If the product was disassembled, altered, or repaired by the customer.
   - If it was dropped, broken, or given another strong shock.
   - Use at overvoltage, use outside guaranteed temperature range, storing outside guaranteed temperature range.
   - If power was turned on while connection to the USB interface cable or target system was in an unsatisfactory state.
   - If the USB interface cable, the connection cable, or the like was bent or pulled excessively.
   - If the product got wet.
   - If this product is connected to the target system when there is a potential difference between the GND of this product and GND of the target system.
   - If the connectors or cables are plugged/unplugged while this product is in the power-on state.
   - If excessive load is applied to the connectors or sockets.

2. **Safety precautions**
   - If used for a long time, the product may become hot (50°C to 60°C). Be careful of low temperature burns and other dangers due to the product becoming hot.
   - Be careful of electrical shock. There is a danger of electrical shock if the product is used as described above in **1. Circumstances not covered by product guarantee**.

INTRODUCTION

Readers

This manual is intended for users who wish to perform debugging using the QB-V850MINI. The readers of this manual are assumed to be familiar with the device functions and usage, and to have knowledge of debuggers.

Purpose

This manual is intended to give users an understanding of the basic specifications and correct usage of the QB-V850MINI.

Organization

This manual is divided into the following sections.

- Overview
- Names and functions of hardware
- On-chip debugging
- Debugging with in-circuit method
- Self-testing
- Cautions

How to Read This Manual

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

To understand the overall functions and usages of the QB-V850MINI
→Read this manual according to the **CONTENTS**. The mark <R> shows major revised points. The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

To know the manipulations, command functions, and other software-related settings of the QB-V850MINI
→See the user's manual of the debugger (supplied with the QB-V850MINI) to be used.

Conventions

Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numeric representation:	Binary ... xxxx or xxxxB
	Decimal ... xxxx
	Hexadecimal ... xxxxH
Prefix indicating power of 2 (address space, memory capacity):	K (kilo): 2^{10} = 1,024
	M (mega): 2^{20} = $1,024^2$

Terminology

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

Term	Meaning
Target device	This is the device to be emulated.
Target system	This is the system to be debugged (system provided by the user). This includes the target program and the hardware provided by the user.
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.
MINICUBE®	Generic name for NEC Electronics' high-performance/compact in-circuit emulator.

Related Documents

Please use the following documents in combination with this manual**.**
The related documents listed below may include preliminary versions. However, preliminary versions are not marked as such.

<R>

○ **Documents Related to Development Tools (User's Manuals)**

Document Name		Document Number
QB-V850MINI On-Chip Debug Emulator		This manual
CA850 Ver. 3.20 C Compiler Package	Operation	U18512E
	C Language	U18513E
	Assembly Language	U18514E
	Link Directives	U18515E
ID850QB Ver. 3.40 Integrated Debugger	Operation	U18604E
SM+ System Simulator	Operation	U18601E
	User Open Interface	U18212E
RX850 Ver. 3.20 Real-Time OS	Basics	U13430E
	Installation	U17419E
	Technical	U13431E
	Task Debugger	U17420E
RX850 Pro Ver. 3.20 Real-Time OS	Basics	U13773E
	Installation	U17421E
	Technical	U13772E
	Task Debugger	U17422E
AZ850 Ver. 3.30 System Performance Analyzer		U17423E
PM+ Ver. 6.00 Project Manager		U17178E

Caution The related documents listed above are subject to change without notice. Be sure to use the latest version of each document for designing, etc.

CONTENTS

CHAPTER 1 OVERVIEW

The 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

The 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.

○ N-Wire interface

Using JTA-compliant N-Wire interface, the QB-V850MINI can be used generally for V850E1 and V850ES Series microcontrollers with the on-chip debug unit.
The 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.

○ Inclusion of self-check board

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

1.2 Before Using QB-V850MINI

Be sure to confirm the package contents listed in this chapter before using the QB-V850MINI.

To utilize this document effectively, familiarize yourself with the usage purposes of the QB-V850MINI described in this chapter.

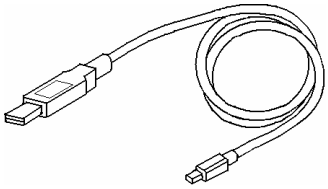
1.2.1 Package contents

The QB-V850MINI package contains the following items. Make sure they are all included. If there are missing or damaged items, please contact an NEC Electronics sales representative or an NEC Electronics distributor.

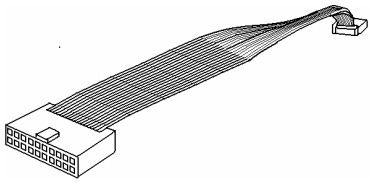
The online user registration card serves both as a warranty and a license arrangement card, so be careful not to misplace. Be sure to perform user registration or else the one-year warranty following purchase may be invalid.

Figure 1-1. Package Contents

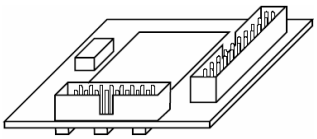
(1) QB-V850MINI



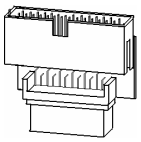
(2) USB interface cable



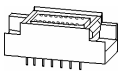
(3) OCD cable



(4) Self check board



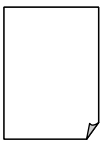
(5) KEL adapter



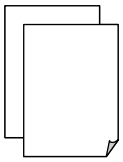
(6) KEL connector

(7) ID850QB Disk

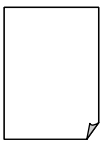
(8) Accessory Disk



(9) Online user registration card



(10) Setup manual (J/E)



(11) Details of package

Remark "AccessoryDisk" contains the hardware user's manual (this document). In addition to the above items, usage cautions that are not covered by this document or additional information on supported devices may be included depending on the time of purchase, so also check for such items.

1.2.2 Checking purpose for using QB-V850MINI

There are mainly three purposes for using the QB-V850MINI.

The system must be configured appropriately according to each usage purpose of the QB-V850MINI, so check the following and refer to the relevant chapter.

- To debug the target device mounted on the target system
  See **CHAPTER 3 ON-CHIP DEBUGGING**.

- To debug V850ES/Kx1+ with in-circuit method
  See **CHAPTER 4 DEBUGGING WITH IN-CIRCUIT METHOD**.

- To perform self-testing for faults in QB-V850MINI
  See **CHAPTER 5 SELF-TESTING**.

<R>

1.3 Supported Devices

See the following MINICUBE Web site or document for the devices supported by the QB-V850MINI.

QB-V850MINI Web site:

http://www.necel.com/micro/en/development/asia/v850/minicube.html#support

Document:

Document name: Notes on Using QB-V850MINI

Remark The above-mentioned document is posted on the QB-V850MINI Web site.

1.4 Specifications

This section describes QB-V850MINI's hardware specifications and specifications for the debug function when using the ID850QB integrated debugger.

Table 1-1. Hardware Specifications

Classification	Item		Specifications
QB-V850MINI main unit	Operating power supply		Supplied via USB interface (5 V)
	Operating clock		Clock mounted in 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
Host machine interface	Target host machine		PC98-NX Series, IBM PC/AT™ compatibles
	Target OS		Windows™ 98, Windows Me, Windows 2000, Windows XP
	USB		1.1, 2.0
	USB cable length		2,000 mm max.
	Current consumption		Approximately 350 mm
Target interface	Target device		Microcontroller with 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
	Number of signals occupied for debugging		5
		DCK	Clock input
		DMS	Mode select input signal
		DDI	Data input signal
		DDO	Data output signal
		$\overline{\text{DRST}}$	On-chip debug mode setting signal
	Number of signals used for flash memory writing		1
		FLMD0	Signal for writing to the flash memory Used when writing to the flash memory from the ID850QB
	Number of signals for target power supply detection		1
		V_{DD}	Power supply to the target system Used for monitoring power supplied to the target system
	Number of GND signal lines		– (depends on the target connector for OCD)
		GND	GND signal
	Number of signals for reset interface		1
		$\overline{\text{RESET}}$	Used for system reset

<R> **Table 1-2. Debug Function Specifications**

Debug Function	Specifications		
Target Microcontroller	Microcontrollers other than those listed to the right[Note 1]		V850E/ME2 V850E2/ME3
Internal ROM/flash memory security function	10-byte ID code authentication		Not available
Event detection break function	Break before execution or access break × 2 (selectable)		Break before execution × 2, Break after execution × 2, Access break × 4
Software break function	2,000 points Among these points, 0 to 8 points can be set to the internal ROM/flash memory area at one time[Note 2]		
Forced break function	Available		
Execution function	Go (free-run), Start from Here, Come Here, Restart, step execution, Slow Motion		
Pseudo RRM, DMM functions[Note 3]	Available		
Mask function	Reset, non-maskable interrupt, hardware STOP request, external bus hold request		
Register manipulation function	Available		
Execution time measurement function	Available[Note 4]	• When DCK = 10 MHz Resolution: 200 nsec Max. measurement time: 7 min. • When DCK = 20 MHz Resolution: 100 nsec Max. measurement time: 3 min. 30 sec.	Not available
Trace function	Not available		

Notes 1. The following devices can be emulated only with the in-circuit method.
V850ES/KE1, V850ES/KF1, V850ES/KG1,V850ES/KE1+, V850ES/KF1+, V850ES/KG1+, V850ES/KE2, V850ES/KF2, V850ES/KG2

2. The number of points is equal to that used for the ROM correction function of the target device. This function cannot be used when the flash self programming function is used.

3. Pseudo RRM (Real-time RAM Monitor): Function that reads the contents of the memory during program execution
DMM (Dynamic Memory Modification): Function that rewrites the contents of the RAM during program execution

4. Not provided in the V850E/SV2.

CHAPTER 2 NAMES AND FUNCTIONS OF HARDWARE

This chapter describes the part names and functions of the QB-V850MINI and the self-check board.

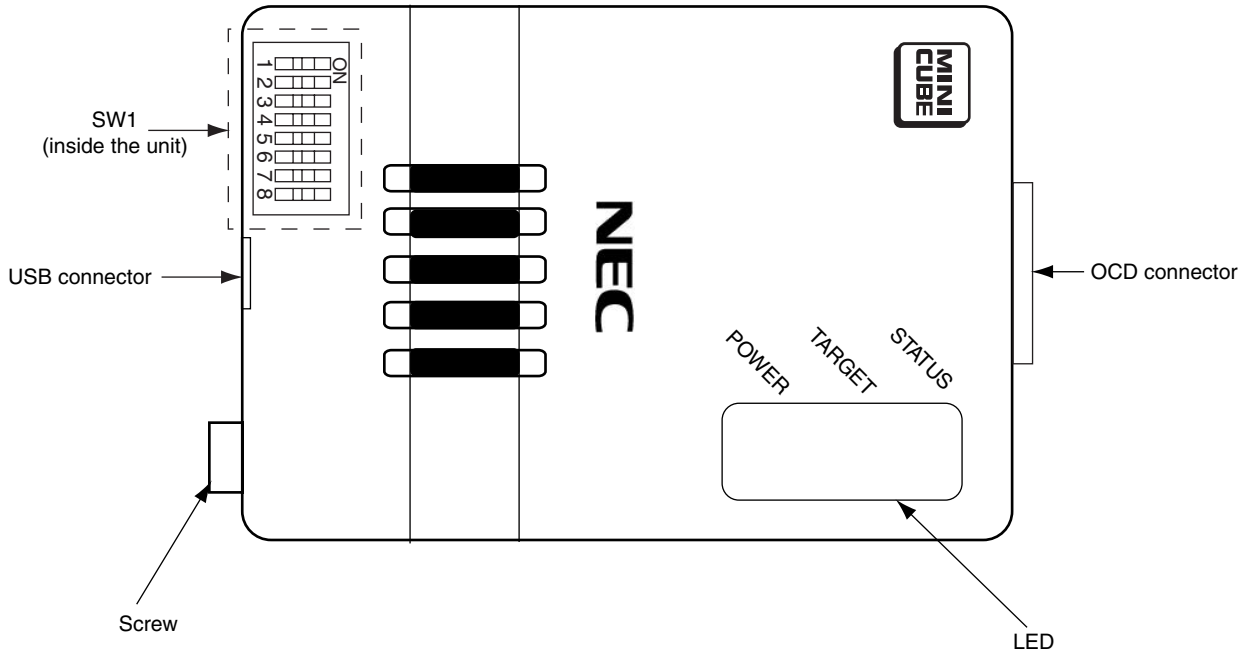
The part names described in this chapter are used throughout this document. This chapter provides an overview of the various functions. Reading it through, the reader will gain a basic grasp of the QB-V850MINI and the self-check board that will facilitate reading of subsequent chapters. Also check the 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

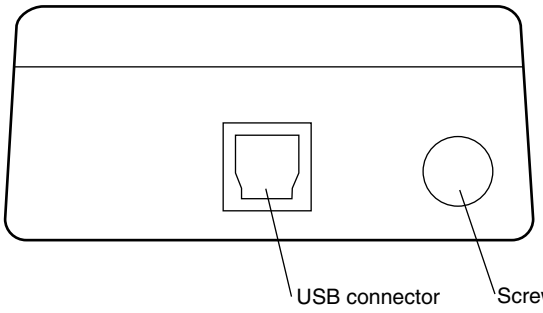
The part names and functions of the QB-V850MINI are described below.

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

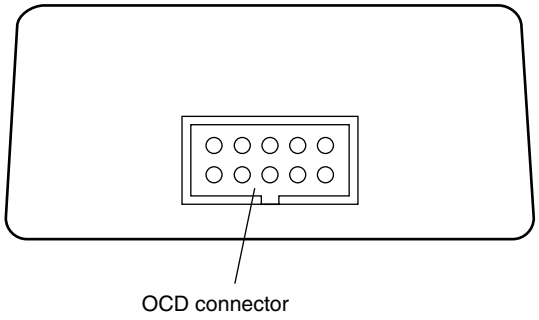
(a) Main unit (top view)



(b) Left side



(c) Right side



(1) SW1

Switches used for performing the initial settings for the 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 the QB-V850MINI main unit.

(5) LED

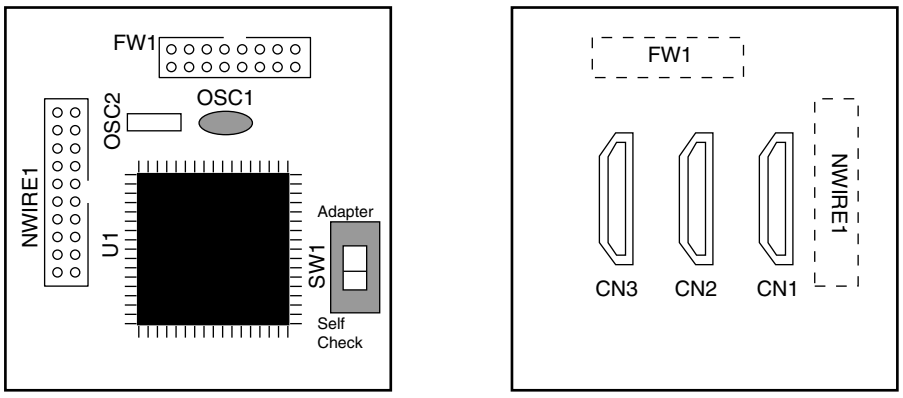
The meanings of each LED are listed below.

Display Name	Lit/Extinguished	Meaning
POWER	Lit	The power supply to the QB-V850MINI is on.
	Extinguished	The power supply to the 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.

2.2 Self-Check Board

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

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



Top View　　Bottom View

(1) NWIRE1

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

(2) FW1

A connector used for connecting the flash memory programmer (PG-FP4 or PG-FPL).

Connectable flash memory programmers:

- PG-FP4
- PG-FPL
- FL-PR4 (made by Naito Densei Machida Mfg. Co., Ltd.)
- FL-LITE (made by Naito Densei Machida Mfg. Co., Ltd.)

(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

The μPD70F3318YGJ is mounted.

(7) CN1, CN2, CN3

Connectors used for connecting the QB-V850MINI to the target system.

An exchange adapter and a target connector are required separately.

CHAPTER 3 ON-CHIP DEBUGGING

This chapter describes how to use the 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 alternate-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** for information on designing target system circuits. Also refer to the user's manual for the target device.

Refer to **3.5 Target Connectors for OCD** for the target connectors for OCD that can be mounted on the target board.

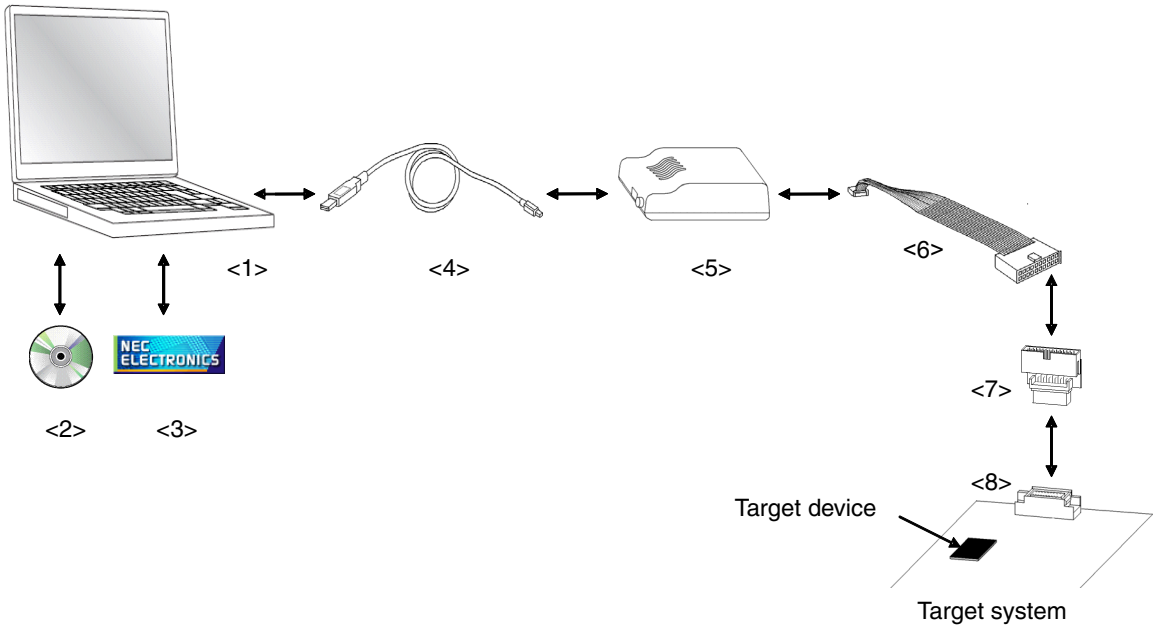
3.1 System Configuration

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

3.1.1 Standard system configuration

The system shown below is configured with the components included with the QB-V850MINI.

Figure 3-1. Standard System Configuration for On-Chip Debugging



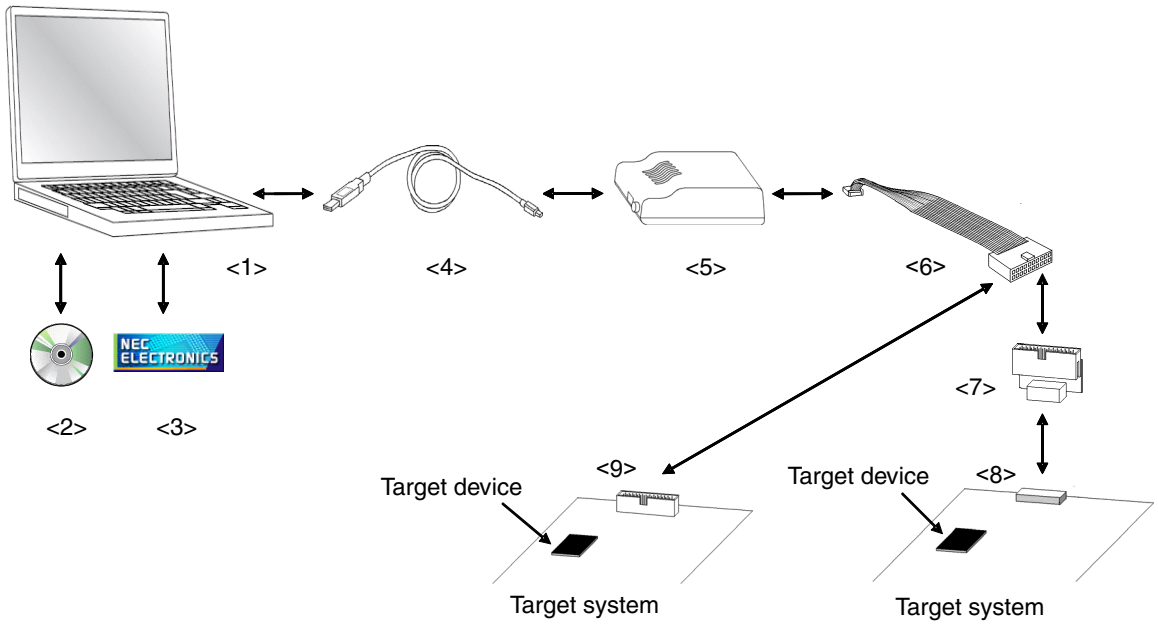
<1> Host machine: With USB ports
<2> ID850QB Disk (accessory): Software tools required for debugging are packaged.
<3> Device file: Download the device file from the following NEC Electronics webpage.
URL: http://www.necel.com/micro/ods/eng/index.html
<4> USB interface cable (accessory)
<5> QB-V850MINI (this product)
<6> OCD cable (accessory)
<7> KEL adapter (accessory)
<8> KEL connector (accessory): A connector mounted on the target system.

3.1.2 System configuration with non-supplied connector on target system

The system shown below is configured with some components not included with the QB-V850MINI.

Refer to this configuration when you want to use a non-supplied connector as the connector to be mounted on the target system.

Figure 3-2. System Configuration When Using Non-Supplied Connector

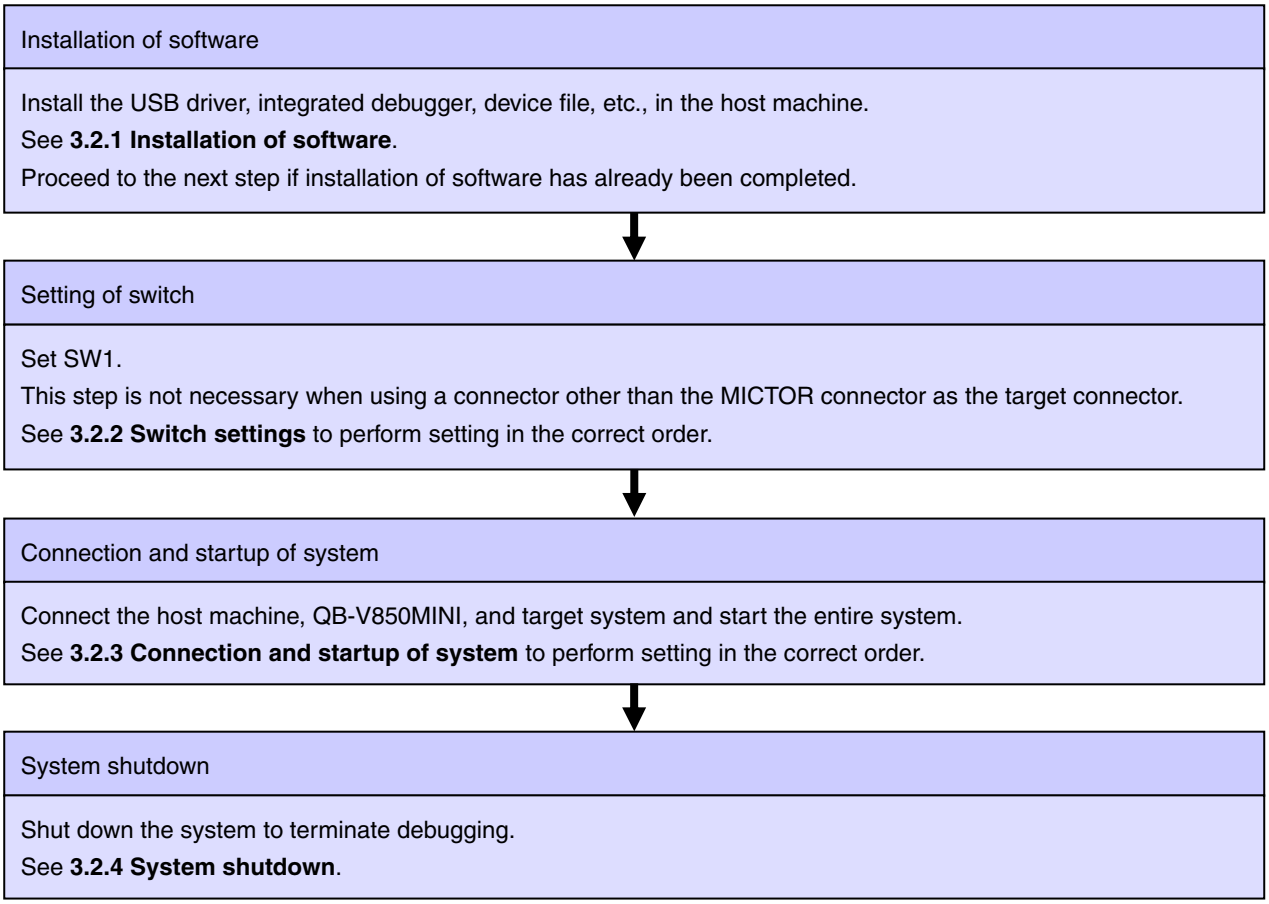


<1> Host machine: With USB ports
<2> ID850QB Disk (accessory): Software tools required for debugging are packaged.
<3> Device file: Download the device file from the following NEC Electronics webpage.
URL: http://www.necel.com/micro/ods/eng/index.html
<4> USB interface cable (accessory)
<5> QB-V850MINI (this product)
<6> OCD cable (accessory)
<7> Connection adapter (sold separately)[Note]
<8> Target connector (sold separately)[Note]
<9> 2.54 mm pitch 20-pin general-purpose connector (sold separately)[Note]

Note A connector other than KEL connectors can also be used as the target connector.
Refer to **3.5 Target Connectors for OCD** for details.

3.2 Setup Procedure

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



3.2.1 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.

- USB driver
- Debugger
- Device file

3.2.2 Switch settings

Set SW1. SW1 is mounted inside the 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 the QB-V850MINI with the default setting (all “OFF”).

- A MICTOR connector is used as the target connector.
- A third party’s emulator that supports the trace interface is used together with the 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

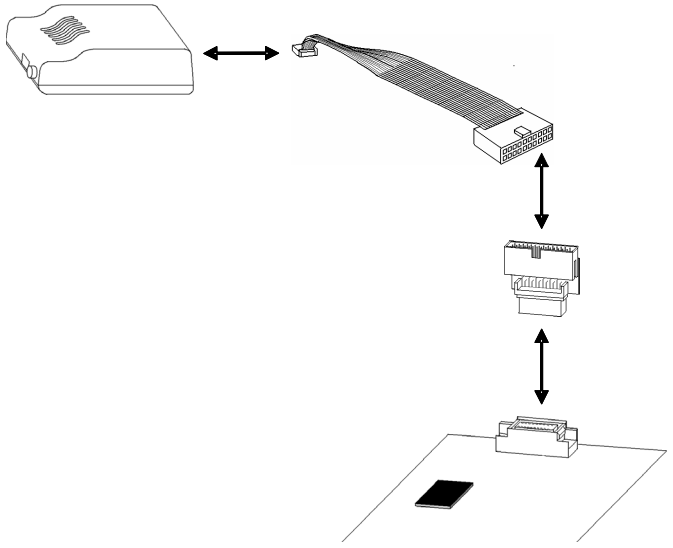
Connect and start the system in the following order.

(1) Connecting QB-V850MINI to target system

Connect the 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-V850MINI to Target System

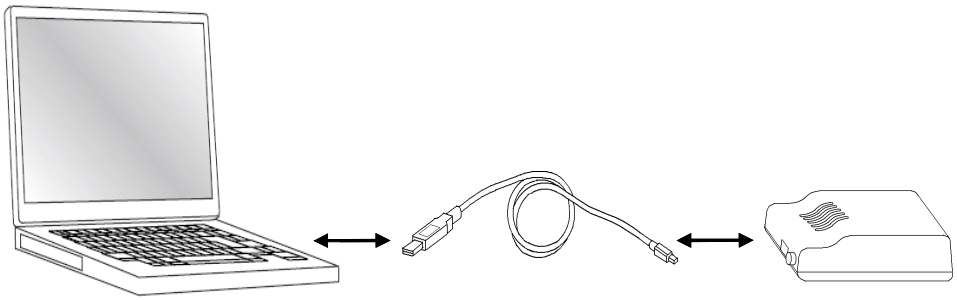


(2) Connecting QB-V850MINI to host machine

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

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

Figure 3-4. Connecting 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 the QB-V850MINI is lit.

(4) Startup of ID850QB

Start the ID850QB using the Start menu, shortcut icon, etc.

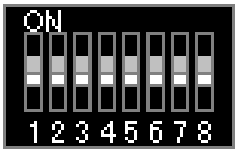
Refer to **ID850QB Ver. 3.40 Integrated Debugger Operation User's Manual (U18604E)** for operations after startup.

3.2.4 System shutdown

Terminate debugging and shutdown the system in the following order.

(1) Terminate the ID850QB.
(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

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

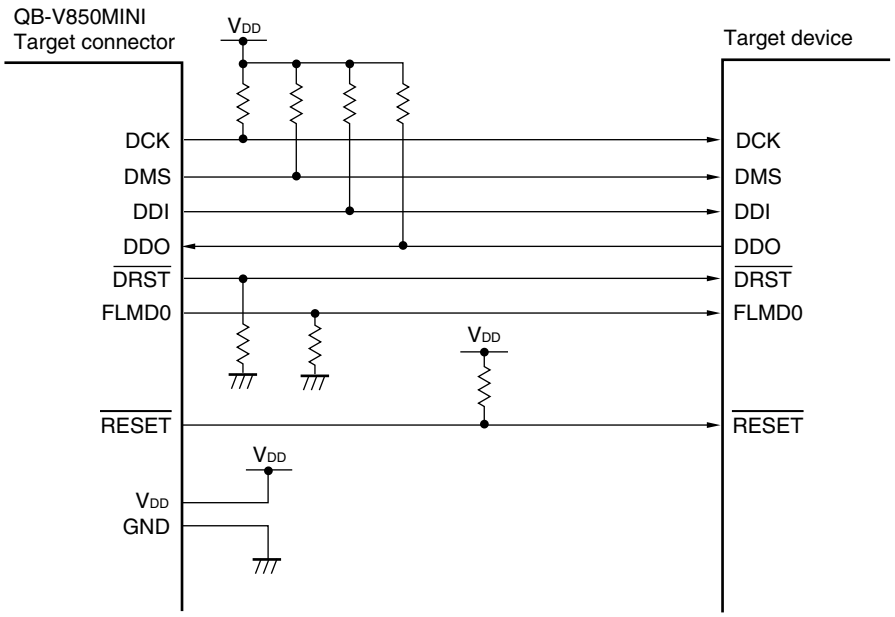
This section presents information required for circuit design. Read it along with the user's manual of the target device.

3.4.1 Example of circuit design

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

Details on each signal are described in **3.4.3 Target interface signals**. Figure 3-5 is just a connection example, so refer to the user's manual of the target device for circuit design.

Figure 3-5. Circuit Connection Example



Signal Name	Outline of Signal
DCK	Clock for the debug control unit (DCU) in the target device
DMS	DCU mode selection signal
DDI	Data signal transmitted to DCU
DDO	Data signal transmitted from DCU
$\overline{\text{DRST}}$	DCU reset signal
FLMD0	Flash programming mode setting signal
$\overline{\text{RESET}}$	System reset input signal
V_{DD}	Power supply (The QB-V850MINI uses this signal for detection of target system power supply)
GND	GND

<R> **3.4.2 Cautions on target system design**

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

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

(2) V_{DD} is used for detecting whether the target board is powered on, so supply the same voltage as the target device pins to V_{DD}. See 3.4.3 (6) V_{DD} for details.

(3) The DCK, DMS, DDI, DDO, and $\overline{\text{DRST}}$ pins may function alternately as general-purpose ports. Therefore connect these pins in accordance with the specifications of each target device. When on-chip pull-up/pull-down resistors are used, connection of external pull-up/pull-down resistors is not necessary. See the signals described in 3.4.3 (1) DCK to (5) $\overline{\text{DRST}}$ for details.

(4) Make sure that the signals driven from the QB-V850MINI and the signals generated on the target system do not conflict during debugging.

(5) The circuit for connecting FLMD0 varies when using flash self programming or using microcontrollers that do not have an on-chip flash memory. See 3.4.3 (7) FLMD0 for details.

(6) Connection of the $\overline{\text{RESET}}$ pin depends on the target device specifications and control when the debugger is started. See 3.4.3 (8) $\overline{\text{RESET}}$ for details.

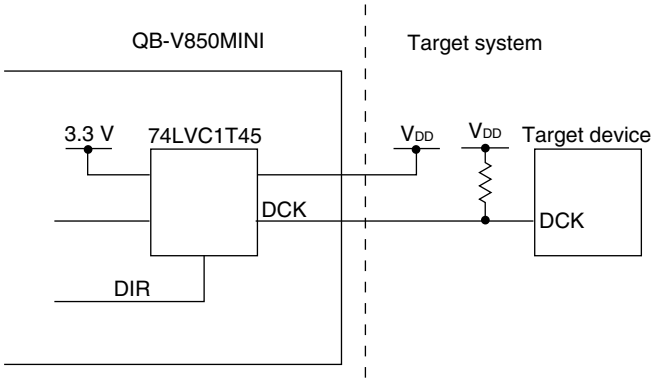
3.4.3 Target interface signals

This section describes the interface signals between the QB-V850MINI and the target system.

<R> **(1) DCK**

This is the clock signal for the on-chip debug unit (DCU) in the target system. A 10 or 20 MHz clocks is supplied from the QB-V850MINI, according to the setting of the debugger. The DMS and DDI signals are sampled in synchronization with the rising edge of the DCK signal in the DCU, and the data DDO signal is output in synchronization with the falling edge of the DCK signal. Barring a problem arising from the specifications of the target device, pull up this signal to high level as shown in Figure 3-6.

Figure 3-6. DCK Pin Connection Example



(2) DMS

This is the DCU mode selection signal. The state machine in the DCU changes according to the level of the DMS signal. This signal is sampled in synchronization with the rising edge of the DCK signal in the DCU.

Barring a problem arising from the specifications of the target device, pull up this signal to high level. The connection example for this signal is the same as that shown in Figure 3-6.

(3) DDI

This is the data signal transmitted to the DCU. This signal is sampled in synchronization with the rising edge of the DCK signal in the DCU.

Barring a problem arising from the specifications of the target device, pull up this signal to high level. The connection example for this signal is the same as that shown in Figure 3-6.

(4) DDO

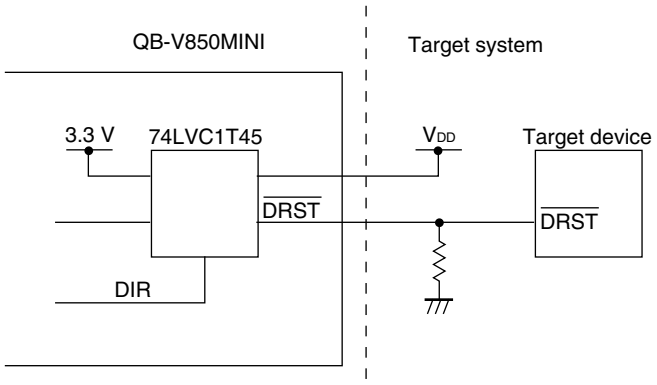
This is the data signal transmitted from the DCU. This signal is output from the DCU in synchronization with the falling edge of the DCK signal.

Barring a problem arising from the specifications of the target device, pull up this signal to high level. The connection example for this signal is the same as that shown in Figure 3-6.

(5) $\overline{\text{DRST}}$

This is the reset signal for the DCU. This is a negative logic signal for initializing the DCU asynchronously. Barring a problem arising from the specifications of the target device, pull down this signal to low level as shown in Figure 3-7.

Figure 3-7. $\overline{\text{DRST}}$ Pin Connection Example



When the debugger is started, the QB-V850MINI drives the $\overline{\text{DRST}}$ signal to high level to start the DCU in the target device. When the DCU is started, a reset occurs in the CPU of the target device. Therefore, when debugging is started by starting up the debugger, CPU reset always occurs.

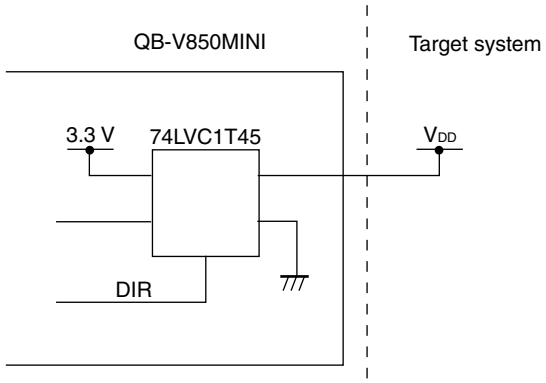
(6) V_{DD}

This signal is used for detecting V_{DD} supplied to the target system. When V_{DD} is within the range of 2.0 to 5.5 V, the QB-V850MINI judges that the power to the target system is being supplied and controls each signal for debugging.

If V_{DD} is outside the range of 2.0 to 5.5 V, the QB-V850MINI judges that the power to the target system has not been supplied and the entire system is not configured normally, and sets the $\overline{\text{DRST}}$, DCK, DMS, DDI, FLMD0, and $\overline{\text{RESET}}$ pins to the high-impedance state, regardless of the debugger's operating status.

Input V_{DD} directly, as shown in Figure 3-8.

Figure 3-8. V_{DD} Pin Connection Example



(7) FLMD0

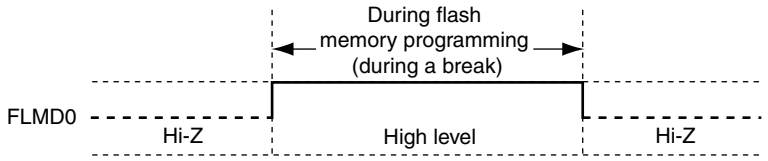
This is the flash programming mode setting signal. The QB-V850MIN controls the FLMD0 signal as follows.

Table 3-2. FLMD0 Status in QB-V850MINI

Debugger Status		FLMD0 Status
During break	During flash memory programming[Note]	High level
	Other than above	High-impedance
During user program execution		
At termination		

Note When a program is being downloaded, or during a write operation via the Assemble or Memory window.

Figure 3-9. Timing Chart of FLMD0 in QB-V850MINI

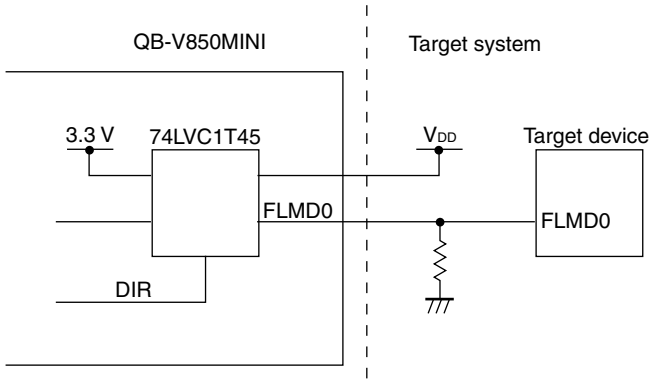


Connect the FLMD0 signal with either method (a) or (b) below. Whether or not the FLMD0 signal should be connected depends on the target device specifications.

<R> **(a) When not performing flash self programming**

Connect the FLMD0 signal that is output from the QB-V850MINI to the FLMD0 pin in the target device. Barring a problem arising from the specifications of the target device, pull down this signal to low level.

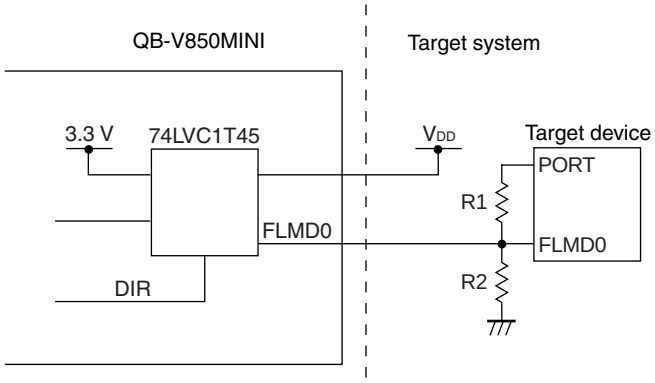
Figure 3-10. FLMD0 Pin Connection Example (When Controlled by QB-V850MINI)



<R> **(b) When performing flash self programming**

When the FLMD0 pin is controlled by port signals when performing flash memory self programming in the user program, connect the FLMD0 pin as shown in Figure 3-11.

Figure 3-11. FLMD0 Pin Connection Example (When performing flash self programming)



Remark Make R2 a resistance value that is at least ten times that of R1.

When writing to the flash memory during a break when the FLMD0 signal output from the QB-V850MINI is left open and the port signal is connected to the FLMD0 pin of the target device, set the port output to high level such as by using the I/O register window of the debugger. For an operation other than writing to the flash memory, set the port output to low level, or set the port mode to “input”.

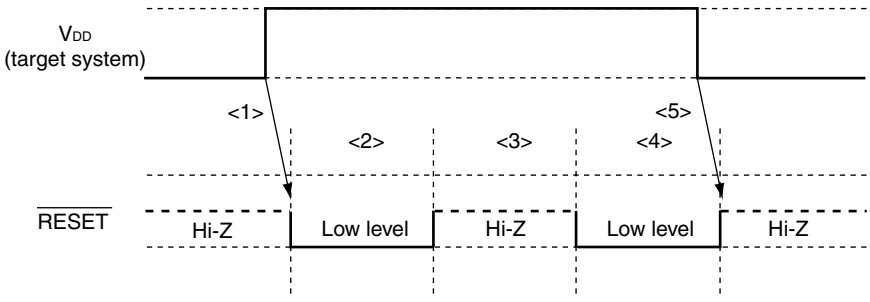
<R> **(c) When the target device is not provided with an on-chip flash memory**

The FLMD0 pin is not required to be connected.

(8) $\overline{\text{RESET}}$

This is the system reset input signal. The QB-V850MINI controls the $\overline{\text{RESET}}$ signal as follows.

Figure 3-12. Timing Chart of $\overline{\text{RESET}}$ in QB-V850MINI



<1> Power application to target system
<2> Before debugger startup
<3> Debugger is running
<4> After debugger termination
<5> Power shutdown to target system

Connect the $\overline{\text{RESET}}$ signal as shown in Figure 3-13 if any of the conditions listed below is satisfied. At this time, make sure that the $\overline{\text{RESET}}$ signal does not conflict with the $\overline{\text{RESET}}$ signal generated on the target system. When none of the following conditions are satisfied, leave open the pin for the $\overline{\text{RESET}}$ signal that is output from the 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 $\overline{\text{DRST}}$) are alternate-function pins in the specifications of the target device, the OCD signal becomes inactive due to a reset by other than the $\overline{\text{RESET}}$ pin, and the OCD signals are not set to active in the startup routine.

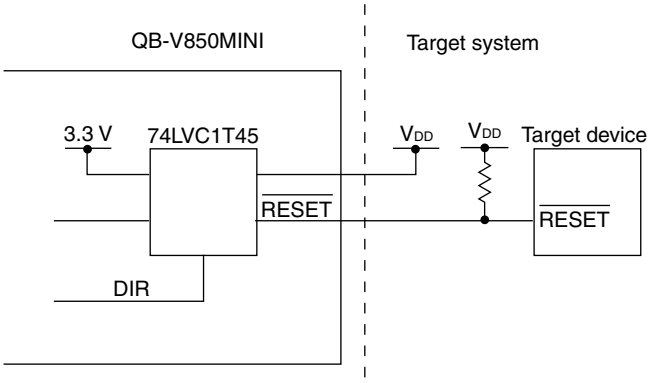
  For example, when using a device in which the pins that alternately function as the OCD signal pins are controlled by the OCDM0 register as shown below, the OCDM0 register is cleared to 0 upon reset by POC, so the OCD signals are not specified and as a result, on-chip debugging cannot be performed normally.

	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 $\overline{\text{RESET}}$ 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 3-13. $\overline{\text{RESET}}$ Pin Connection Example



3.5 Target Connectors for OCD

A target connector for OCD must be mounted on the target system in order to connect the 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.

<R> **Table 3-3. List of Target Connectors for OCD (Part Number and Manufacturer)**

Target Connector Name		Part Number	Manufacturer
KEL connector		8830E-026-170S (included with QB-V850MINI) 8830E-026-170L	KEL Corporation
	Adapter	B-136 (included with QB-V850MINI)	Sumitomo Heavy Industries Mechatronics, Ltd.
MICTOR connector		2-767004-2	Tyco Electronics AMP K.K.
	Adapter	B-137, B-137A	Sumitomo Heavy Industries Mechatronics, Ltd.
XF2E connector		XF2E-1515-1	OMRON Corporation
	Adapter	B-140 (XF2E-1515-1 included)	Sumitomo Heavy Industries Mechatronics, Ltd.
SICA connector		SICA2P20S05 (5 units as a set)	Tokyo Eletech Corporation
	Adapter	SICA20I2P (SICA2P20S x 1 included)	
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	–

3.5.1 KEL connector

A KEL connector is a target connector included with the QB-V850MINI.

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 3-14 and Table 3-4 show the pin assignment and the pin functions of the KEL connector, respectively. Input/output is indicated as seen from the target device.

Figure 3-14. KEL Connector Pin Assignment Diagram

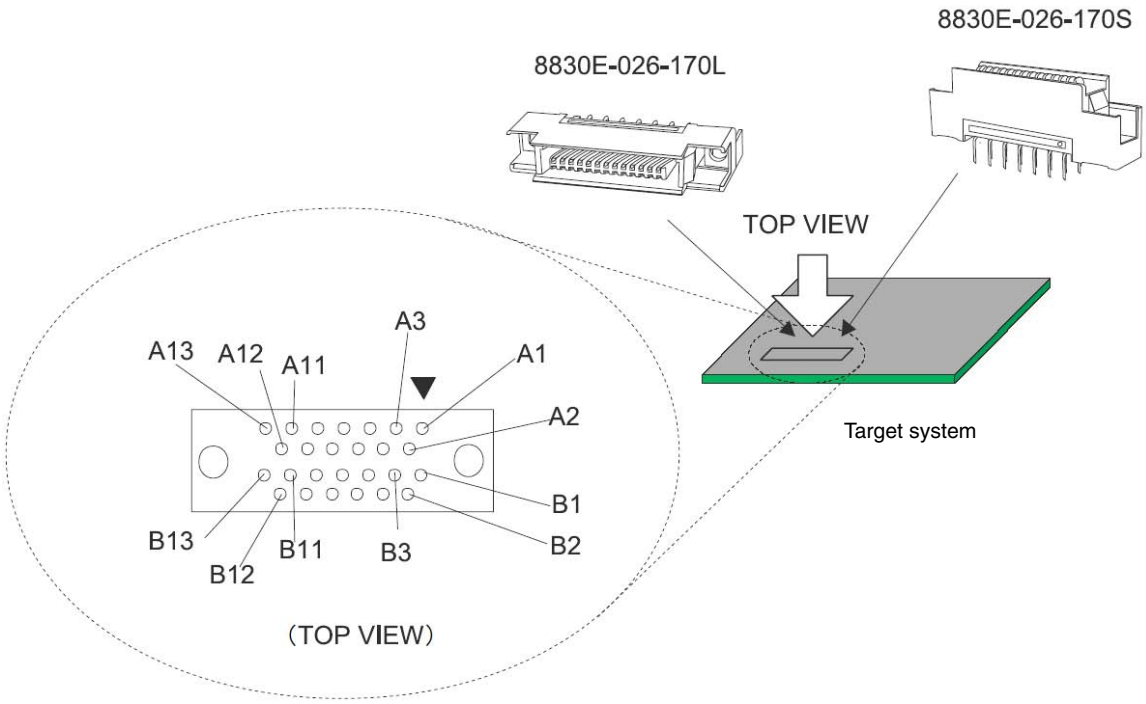


Table 3-4. KEL Connector Pin Functions

Pin No.	Signal Name	I/O[Note 1]	Description
A1 to A6	GND	–	Connect to GND
A7	DDI	IN	Data input
A8	DCK	IN	Clock input
A9	DMS	IN	Transfer mode selection input
A10	DDO	OUT	Data output
A11	$\overline{\text{DRST}}$	IN	Reset input to on-chip debug unit
A12	$\overline{\text{RESET}}$	IN	System reset input (leave open when not used)[Note 2]
A13	FLMD0	IN	Flash mode input (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}	–	Connect to V_{DD} for on-chip debugging (for target system power ON monitoring)

Notes 1. As seen from the target device

2. Refer to **3.4.3 (8) $\overline{\text{RESET}}$**.

3. Refer to **3.4.3 (7) FLMD0**.

3.5.2 MICTOR connector

The MICTOR connector is conventionally supported as a target connector for OCD that supports the high-speed trace interface. Since the QB-V850MINI does not support the high-speed trace interface, the MICTOR connector cannot be used unless combined with a third-party emulator.

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.

Either of the following adapters is required for connection with the emulator.

- B-137 (sold separately, right-angle type)
- B-137A (sold separately, straight type)

Remark B-137 and B-137A are products of Sumitomo Heavy Industries Mechatronics, Ltd.

Figure 3-15 and Table 3-5 show the pin assignment and the pin functions of the MICTOR connector, respectively. Input/output is indicated as seen from the target device.

Figure 3-15. MICTOR Connector Pin Assignment Diagram

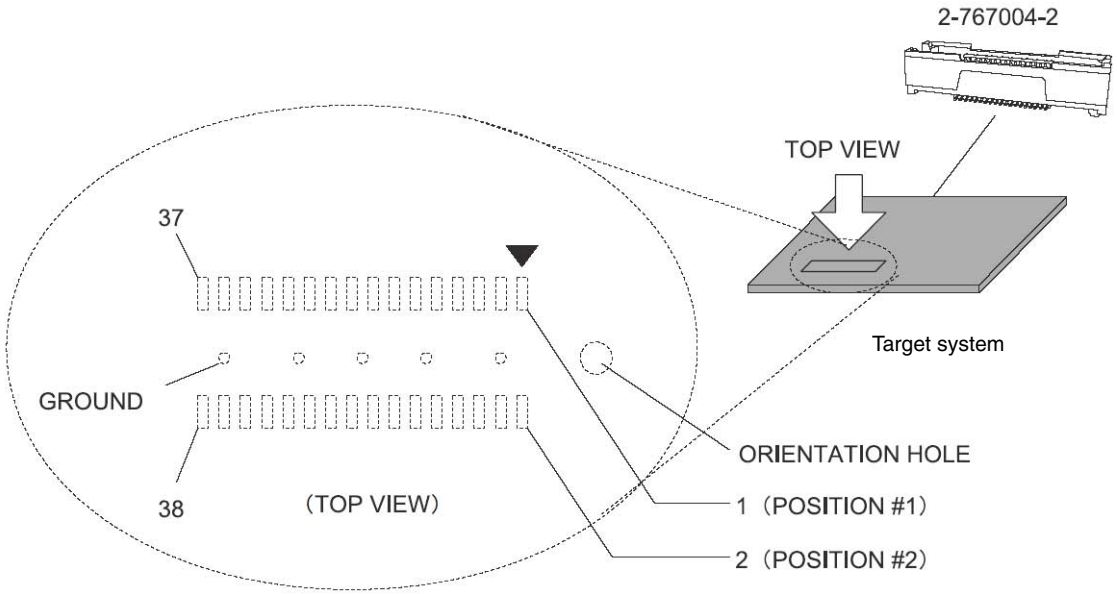


Table 3-5. MICTOR Connector Pin Functions

Pin No.	Signal Name	I/O[Note 1]	Description
1 and 2	GND	–	Connect to GND
3	DCK	IN	Clock input
4	V_{DD}	–	Connect to V_{DD} for on-chip debugging (for target system power ON monitoring)
5	DMS	IN	Transfer mode selection input
6	$\overline{\text{DRST}}$	IN	Reset input to on-chip debug unit
7	DDI	IN	Data input
8	$\overline{\text{RESET}}$	IN	System reset input (leave open when not used)[Note 2]
9	DDO	OUT	Data output
10	FLMD0	IN	Flash mode input (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 **3.4.3 (8) $\overline{\text{RESET}}$**.

3. Refer to **3.4.3 (7) FLMD0**.

4. When the TRCCE signal (trace compression enable input) is connected as the trace interface for a third-party emulator, the SW1 settings in the QB-V850MINI must be changed. Refer to **3.2.2 Switch settings** for details.

3.5.3 XF2E connector

The XF2E connector is a compact type 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 XF2E connector may not support third-party emulators.

When using the XF2E connector as the target connector for OCD, mount the following connector on the target system.

- XF2E-1515-1: 15-pin type (sold separately)

Remark XF2E-1515-1 is a product of OMRON Corporation.

The following adapter is required for connection with the emulator.

- B-140 (sold separately, XF2E-1515-1 is included.)

Remark B-140 is a product of Sumitomo Heavy Industries Mechatronics, Ltd.

Figure 3-16. XF2E Connector Pin Assignment Diagram

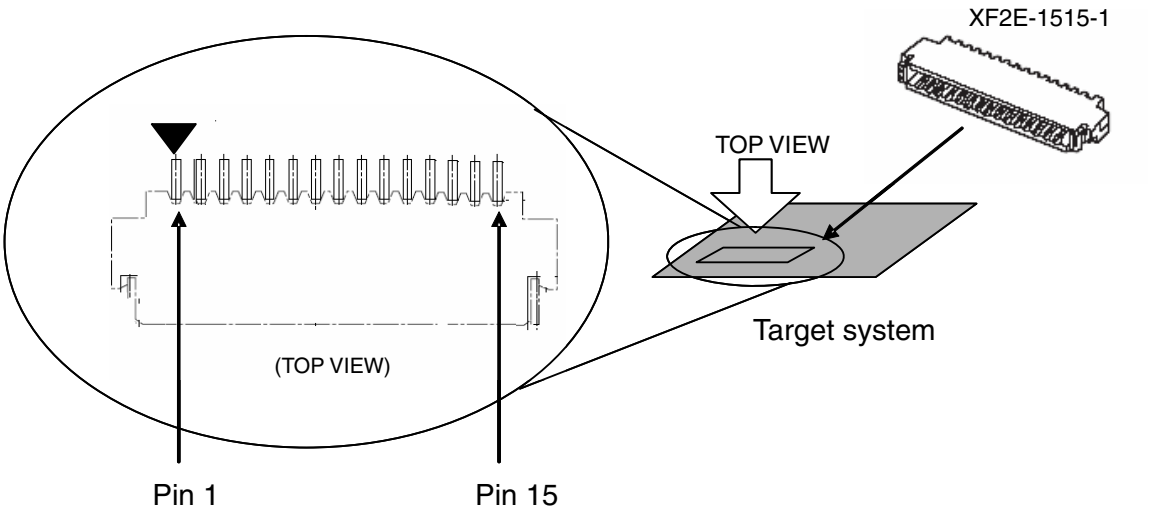


Table 3-6. XF2E Connector Pin Functions

Pin No.	Signal Name	I/O[Note 1]	Description
1	V_{DD}	–	Connect to V_{DD} for on-chip debugging (for target system power ON monitoring)
2	$\overline{\text{RESET}}$	IN	System reset input (leave open when not used)[Note 2]
3	FLMD0	IN	Flash mode input (leave open when not used)[Note 3]
4	N.C	–	Open (not connected)
5	N.C	–	Open (not connected)
6	N.C	–	Open (not connected)
7	N.C	–	Open (not connected)
8	N.C	–	Open (not connected)
9	DDO	OUT	Data output
10	DCK	IN	Clock input
11	DMS	IN	Transfer mode selection input
12	DDI	IN	Data input
13	$\overline{\text{DRST}}$	IN	Reset input to on-chip debug unit
14	GND	–	Connect to GND
15	GND	–	Connect to GND

Notes 1. As seen from the target device.

2. Refer to **3.4.3 (8) $\overline{\text{RESET}}$**.

3. Refer to **3.4.3 (7) FLMD0**.

3.5.4 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 third-party 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 3-17. SICA Connector Pin Assignment Diagram

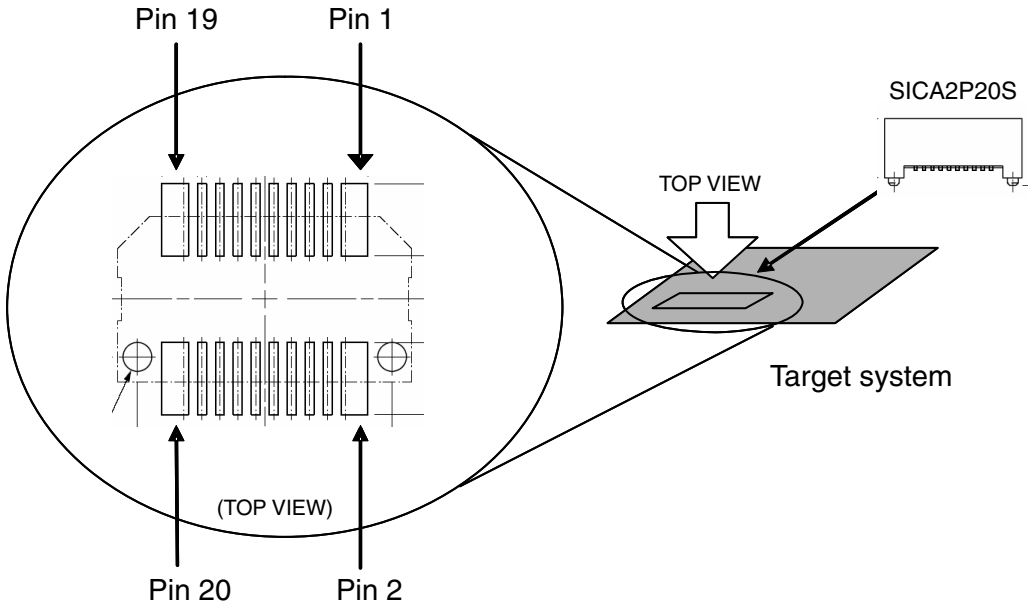


Table 3-7. SICA Connector Pin Functions

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	DCK	IN	Clock input
3	GND	–	Connect to GND
4	DMS	IN	Transfer mode selection input
5	GND	–	GND
6	DDI	IN	Data input
7	GND	–	Connect to GND
8	$\overline{\text{DRST}}$	IN	Reset input to on-chip debug unit
9	GND	–	Connect to GND
10	RESERVE	–	Open
11	GND	–	Connect to GND
12	$\overline{\text{RESET}}$	IN	System reset input (leave open when not used)[Note 2]
13	GND	–	Connect to GND
14	FLMD0	IN	Flash mode input (leave open when not used)[Note 3]
15	GND	–	Connect to GND
16	RESERVE	–	Open
17	GND	–	Connect to GND
18	DDO	OUT	Data output
19	GND	–	Connect to GND
20	V_{DD}	–	Connect to V_{DD} for on-chip debugging (for target system power ON monitoring)

Notes 1. As seen from the target device.

2. Refer to **3.4.3 (8) $\overline{\text{RESET}}$**.

3. Refer to **3.4.3 (7) FLMD0**.

3.5.5 2.54 mm pitch 20-pin general-purpose connector

When using a 2.54 mm pitch general-purpose connector as the target connector for OCD, mount a connector that can be connected to the OCD cable on the target system. Note that 2.54 mm pitch 20-pin general-purpose connectors may not support third-party 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 3-18. 2.54 mm Pitch General-Purpose Connector Pin Assignment Diagram

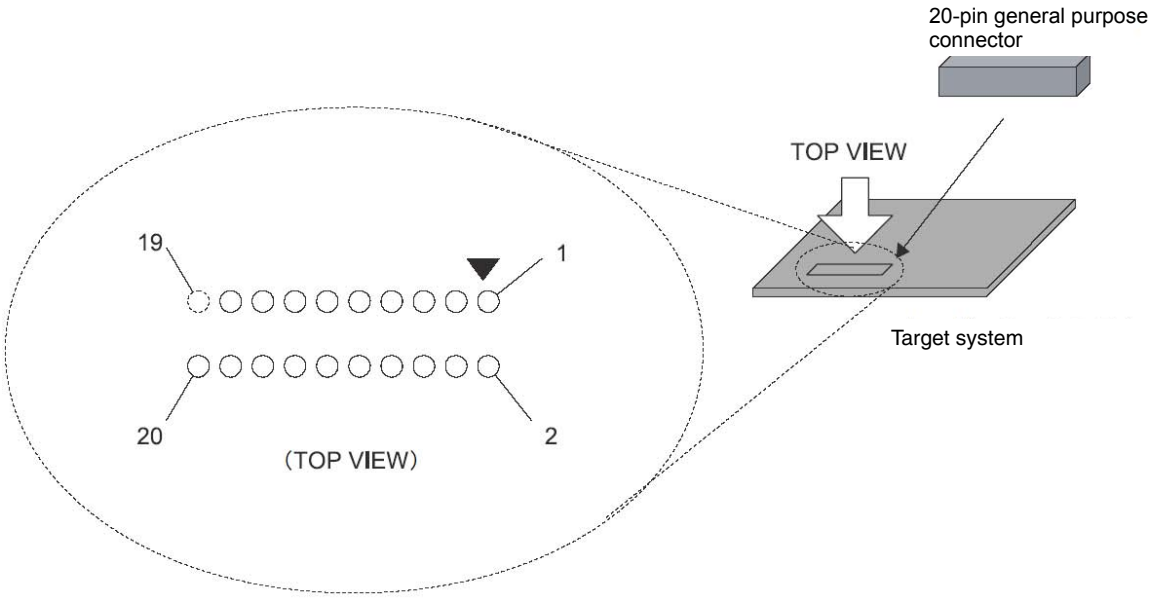


Table 3-8. 2.54 mm Pitch General-Purpose Connector Pin Functions

Pin No.	Signal Name	I/O[Note 1]	Description
1	GND	–	Connect to GND
2	DCK	IN	Clock input
3	GND	–	Connect to GND
4	DMS	IN	Transfer mode selection input
5	GND	–	GND
6	DDI	IN	Data input
7	GND	–	Connect to GND
8	$\overline{\text{DRST}}$	IN	Reset input to on-chip debug unit
9	GND	–	Connect to GND
10	RESERVE	–	Open
11	GND	–	Connect to GND
12	$\overline{\text{RESET}}$	IN	System reset input (leave open when not used)[Note 2]
13	GND	–	Connect to GND
14	FLMD0	IN	Flash mode input (leave open when not used)[Note 3]
15	GND	–	Connect to GND
16	RESERVE	–	Open
17	GND	–	Connect to GND
18	DDO	OUT	Data output
19	GND	–	Connect to GND
20	V_{DD}	–	Connect to V_{DD} for on-chip debugging (for target system power ON monitoring)

Notes 1. As seen from the target device.

2. Refer to **3.4.3 (8) $\overline{\text{RESET}}$**.

3. Refer to **3.4.3 (7) FLMD0**.

CHAPTER 4 DEBUGGING WITH IN-CIRCUIT METHOD

This chapter describes how to use the 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 self-check board included with the QB-V850MINI, devices in **4.1 Target Devices** can be debugged.

4.1 Target Devices

Debugging with the in-circuit method can be performed using the 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 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.
Consult an NEC Electronics sales representative or distributor for how to obtain this document.

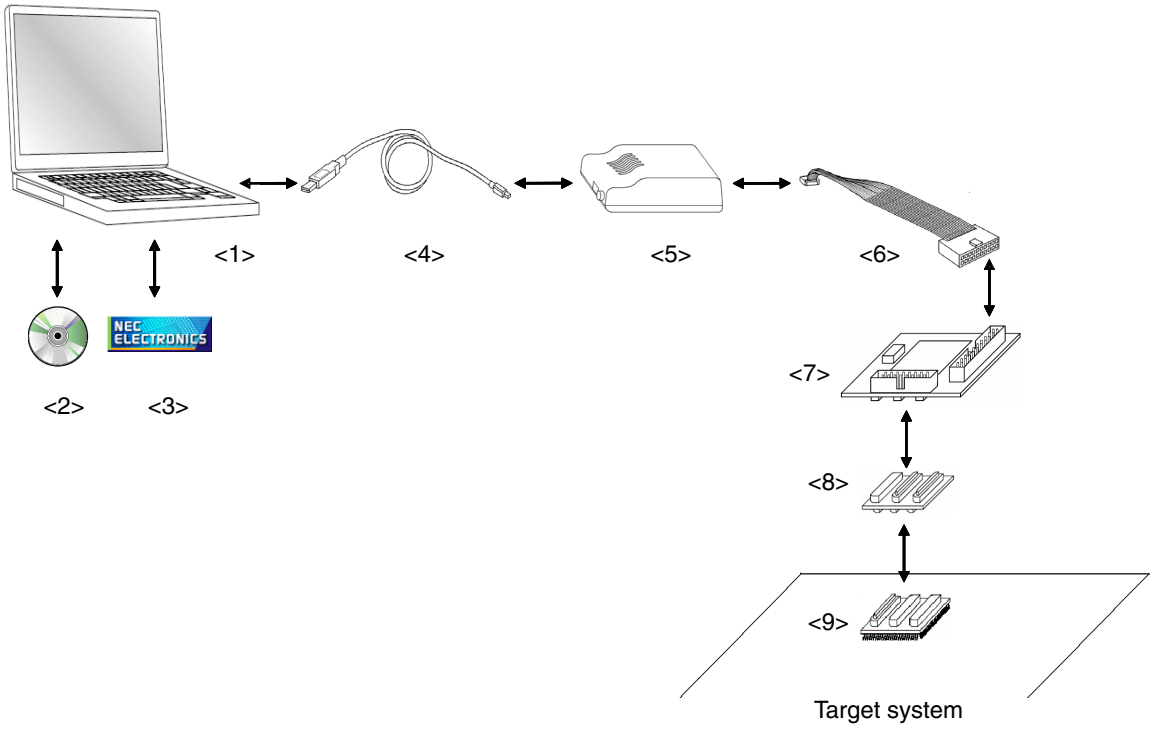
4.2 System Configuration

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 <8> and <9> in Figure 4-1 are not included with the QB-V850MINI.

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

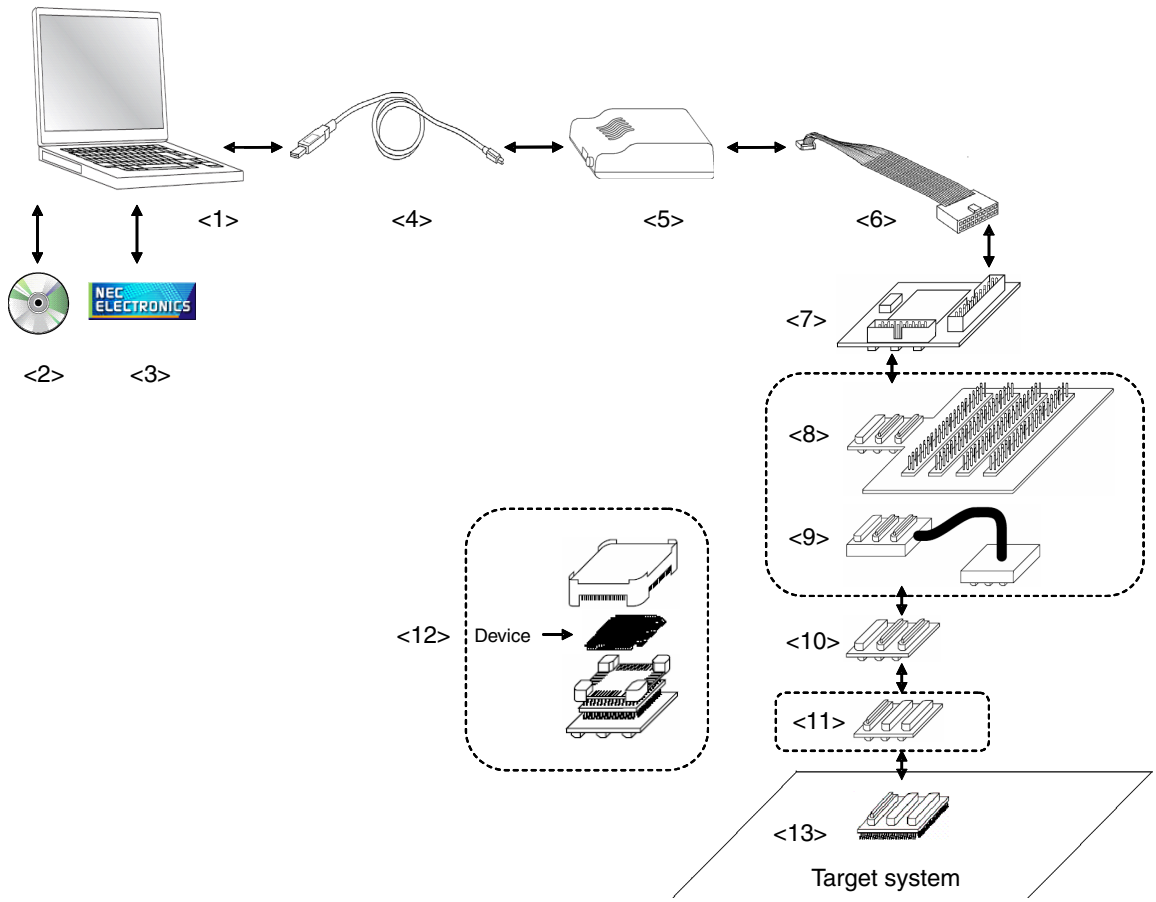


<1> Host machine: With USB ports
<2> ID850QB Disk (accessory): Software tools for debugging are packaged.
<3> Device file: Download the device file from the following NEC Electronics webpage.
URL: http://www.necel.com/micro/ods/eng/index.html
<4> USB interface cable (accessory)
<5> QB-V850MINI (this product)
<6> OCD cable (accessory)
<7> Self-check board (accessory)
<8> Exchange adapter (sold separately)
<9> 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> ID850QB Disk (accessory): Software tools for debugging are packaged.
<3> Device file: Download the device file from the following NEC Electronics webpage.
URL: http://www.necel.com/micro/ods/eng/index.html
<4> USB interface cable (accessory)
<5> QB-V850MINI (this product)
<6> OCD cable (accessory)
<7> Self-check board (accessory)
<8> Check pin adapter (sold separately): An adapter used for monitoring waveforms with an oscilloscope, etc.
<9> Coaxial type extension probe (sold separately): A cable used to extend the distance between the emulator and target system.
<10> Exchange adapter (sold separately)
<11> Space adapter (sold separately): An adapter used to adjust the height.
<12> Mount adapter (sold separately): An adapter used to mount the device in the socket.
<13> 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 NEC Electronics webpage.

URL: http://www.necel.com/micro/english/iecube/index.html

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
<8>	Check pin adapter	QB-144-CA-01			
<9>	Extension probe (coaxial type)	QB-144-EP-01S			
<10>	Exchange adapter	QB-64-EA-01S		QB-80GC-EA-02S	QB-80GK-EA-01S
<11>	Space adapter	QB-64-SA-01S		QB-80-SA-01S	
<12>	Mount adapter	QB-64GB-MA-01S	QB-64GK-MA-01S	QB-80GC-MA-01S	QB-80GK-MA-01S
<13>	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
<8>	Check pin adapter	QB-144-CA-01		
<9>	Extension probe (coaxial type)	QB-144-EP-01S		
<10>	Exchange adapter	QB-100GC-EA-01S	QB-100GF-EA-01S	QB-144GJ-EA-02S
<11>	Space adapter	QB-100-SA-01S		QB-144-SA-01S
<12>	Mount adapter	QB-100GC-MA-01S	QB-100GF-MA-01S	QB-144GJ-MA-01S
<13>	Target connector	QB-100GC-TC-01S	QB-100GF-TC-01S	QB-144GJ-TC-01S

4.3 Setup Procedure

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

Installation of software

Install the USB driver, integrated debugger, device file, 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-V850MINI

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

↓

Setting of clock

At shipment, an 8 MHz resonator (ceramic resonator) is mounted as the main clock in OSC1 on the self-check board.
A 32.768 kHz resonator is also mounted as the subclock.

↓

Setting of switch

The SW1 settings vary depending on the purpose of use of the 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-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 following software in the host machine before setting up the hardware. Refer to the Setup Manual supplied with the QB-V850MINI for the procedures.

- USB driver
- Debugger
- Device file

4.3.2 Setting of QB-V850MINI

Set the QB-V850MINI to the default setting.

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

4.3.3 Clock settings

The oscillation clock of the target device is set by the clock settings for the 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.

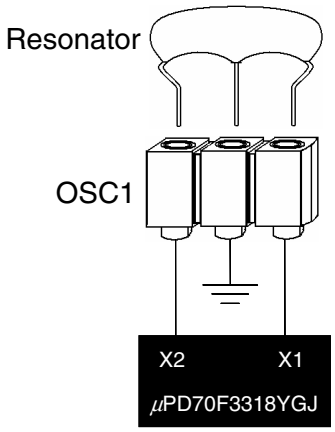
The main clock oscillation frequency is determined by the clock mounted in OSC1.

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 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. This is the default setting of SW1.
Self Check	Self-check mode	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 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.

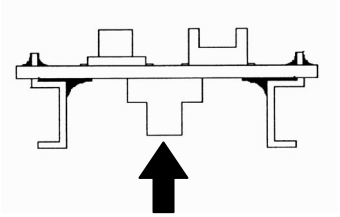
4.3.5 Mounting target connector

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

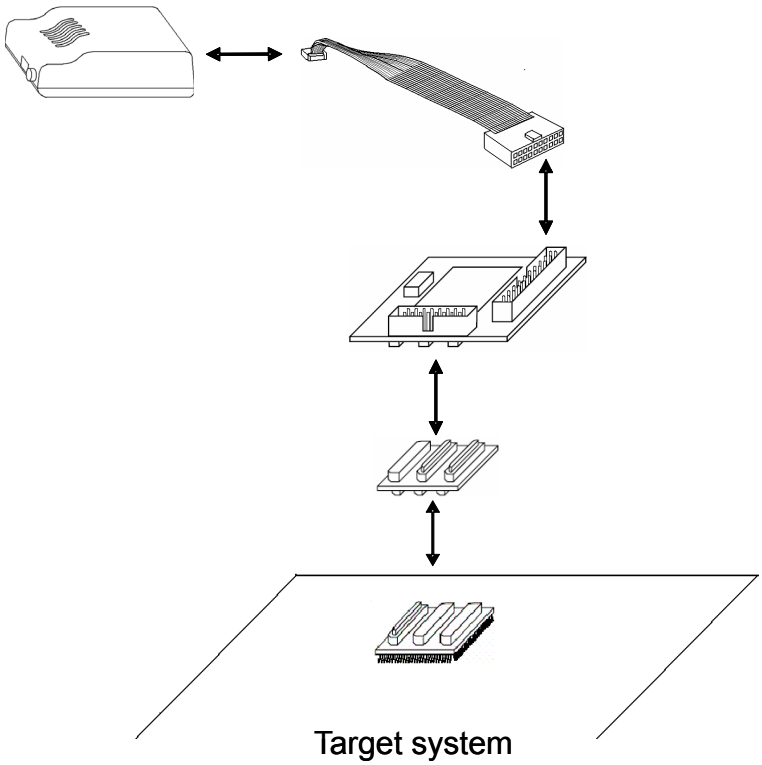
Connect and start the system in the following order.

(1) Connecting QB-V850MINI to target system

Connect the 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-V850MINI to Target System

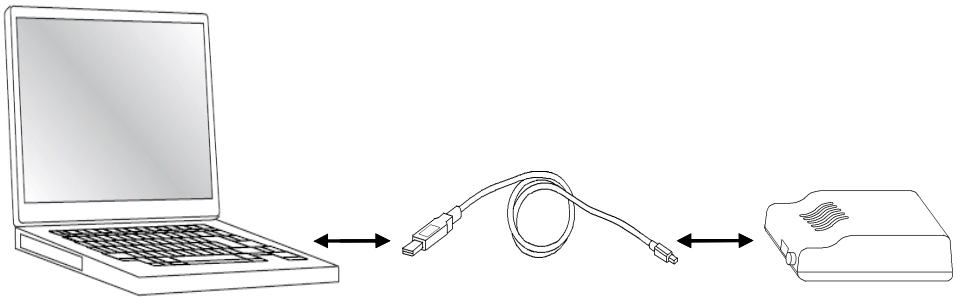


(2) Connecting QB-V850MINI to host machine

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

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

Figure 4-6. Connecting 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 the QB-V850MINI is lit.

(4) Startup of ID850QB

Start the ID850QB using the Start menu, shortcut icon, etc.

Refer to **CHAPTER 6 CAUTIONS** for the configuration settings.

Refer to **ID850QB Ver. 3.10 Integrated Debugger Operation User's Manual (U17435E)** for operations after startup.

4.3.7 System shutdown

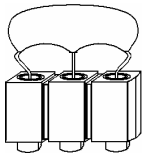
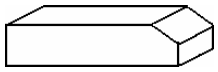
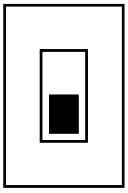
Terminate debugging and shutdown the system in the following order.

(1) Terminate the ID850QB.
(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, the QB-V850MINI or the self-check board may be damaged.

4.4 Default Settings

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	Adapter  Self Check	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.

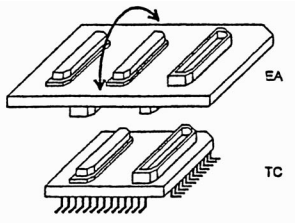
The following symbols are used in this section.

- 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 ID850QB cannot be activated because the user forgot the ID code or has skipped setting of the ID code, when using the self-check board.

Perform the following steps to recover from the above cases.

(1) Remove the self-check board from the target system.
(2) Set SW1 on the 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 the 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 PG-FPL 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 PG-FPL (1/2)

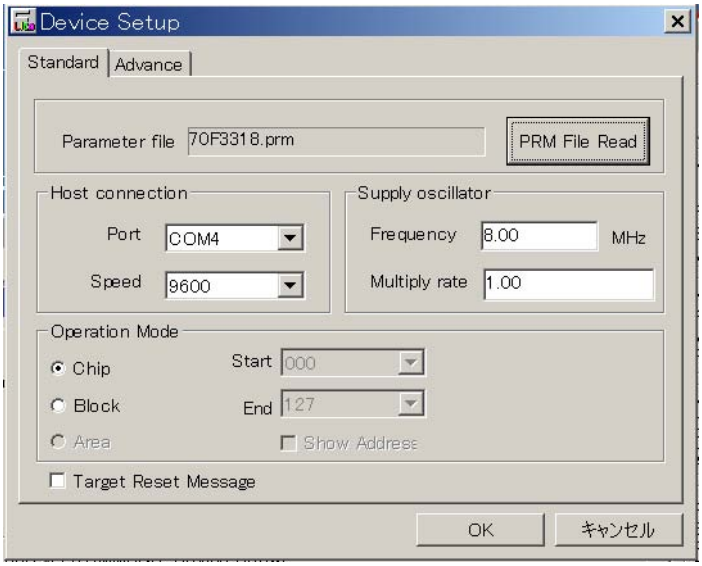
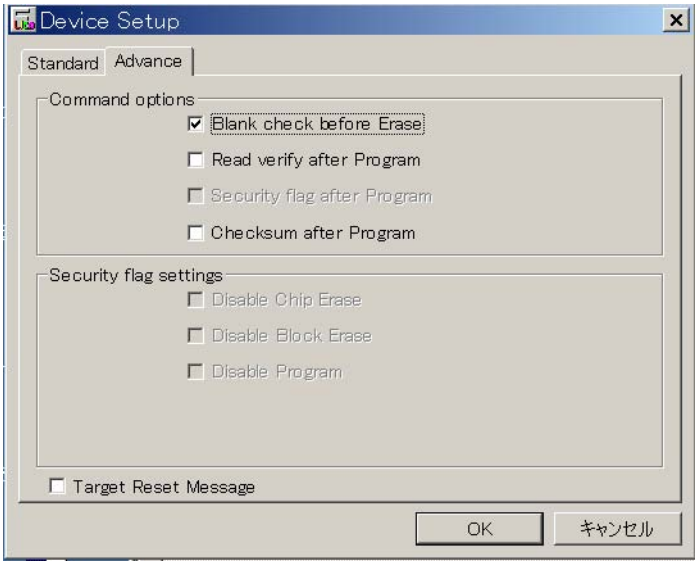


Figure 4-8. Example of Settings for PG-FPL (2/2)



CHAPTER 5 SELF-TESTING

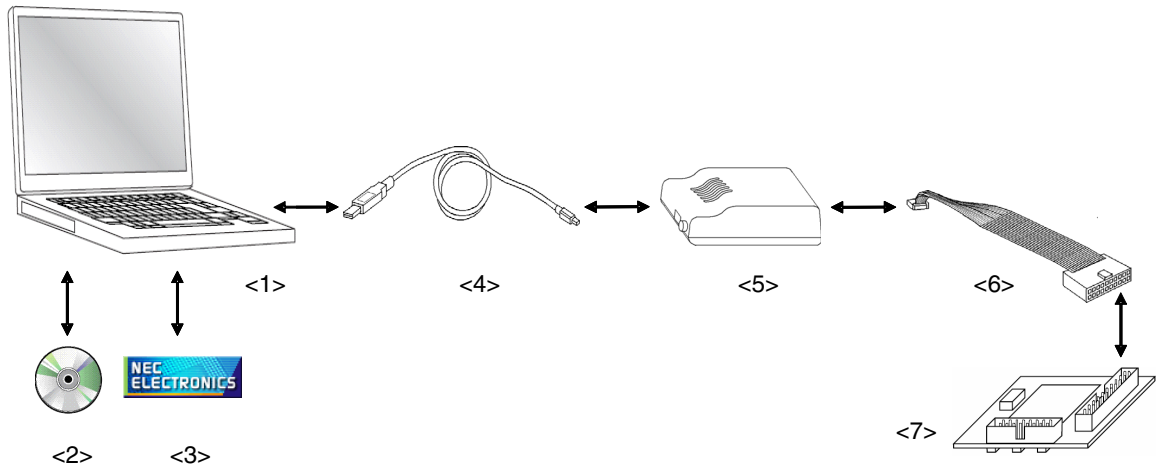
This chapter describes how to perform self-testing of the QB-V850MINI.

When the debugger does not operate normally, this function can be used to determine whether the cause lies in the 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> ID850QB Disk (accessory): Software tools required for debugging are packaged.

<3> Device file: Download the device file from the following NEC Electronics webpage.
URL: http://www.necel.com/micro/ods/eng/index.html

<4> USB interface cable (accessory)

<5> QB-V850MINI (this product)

<6> OCD cable (accessory)

<7> Self-check board (accessory)

5.2 Setup Procedure

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

Installation of software

Install the USB driver, self-testing tool, device file, etc., in the host machine.
See **5.2.1 Installation of software**.
Proceed to the next step if installation of software has already been completed.

↓

Setting of QB-V850MINI

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

↓

Setting of self-check board

Set the self-check board to the default setting.
See **4.4 Default Settings** for the default settings of the self-check board.

↓

Connection and startup of system

Connect the host machine, QB-V850MINI, and target system and start the entire system.
See **5.2.4 Connection and startup of system** to perform setting in the correct order.

↓

System shutdown

Terminate self-testing and shut down the system.
See **5.2.5 System shutdown**.

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.

- USB driver
- Self-testing tool “N-Wire Checker” Note 1
- Device file Note 2

Notes 1. The N-Wire Checker is automatically installed when the ID850QB is installed.

2. Download the DF703318 from the NEC Electronics website.

5.2.2 Setting of QB-V850MINI

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

See **3.3 Default Setting** for the default settings of the 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** for the default settings.

5.2.4 Connection and startup of system

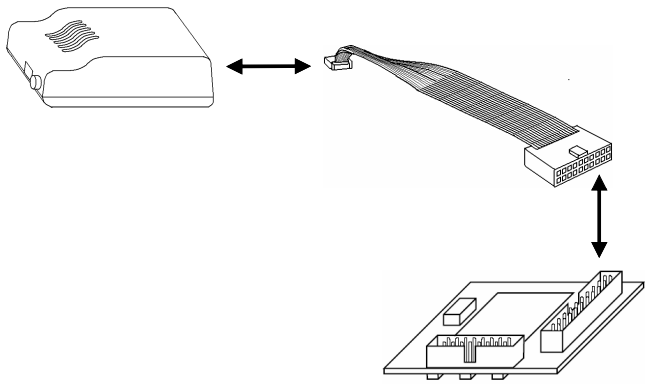
Connect and start the system in the following order.

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

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

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

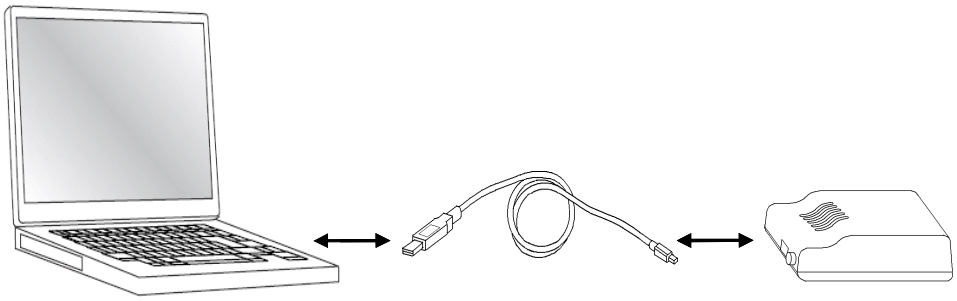
Figure 5-2. Connecting QB-V850MINI to Self-Check Board



(2) Connecting QB-V850MINI to host machine

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

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



(3) Startup of N-Wire Checker

Start the N-Wire Checker using the Start menu, etc.

Refer to **CHAPTER 6 CAUTIONS** for settings in the main dialog box.

Refer to the N-Wire Checker user's manual for operations after startup.

5.2.5 System shutdown

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

(1) Terminate the N-Wire Checker.

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

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

CHAPTER 6 CAUTIONS

This chapter lists cautions on using the 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 (1/3)

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 (2/3)

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, the 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]**	The QB-V850MINI and the flash memory programmer cannot be connected at the same time.
20	**[IE]**	The QB-V850MINI outputs a high-level signal to the FLMD0 pin while a program is being downloaded. (The 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. Figure 6-1 shows the screen image for the above settings.
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.

Table 6-1. List of Cautions (3/3)

No.	Classification	Caution
25	**[SC]**	Note the following points concerning the settings in the N-Wire Checker main dialog box. • “Device file” area Specify “DF3318Y.800”. • “Clock” area Set as follows. - Main OSC: Select “8.000”. • “Internal ROM Security” area Select “ID Code” and input the security code that has been set at addresses 0x70 to 0x79. At shipment, the debugger can be activated by inputting “FFFFFFFFFFFFFFFFFFFF”. • “Emulator” area Select “IE-V850E1-CD-NW/QB-V850MINI (DCK=10MHz)”. Figure 6-2 shows the screen image for the above settings.

Figure 6-1. Image of Configuration Screen for Caution No. 22

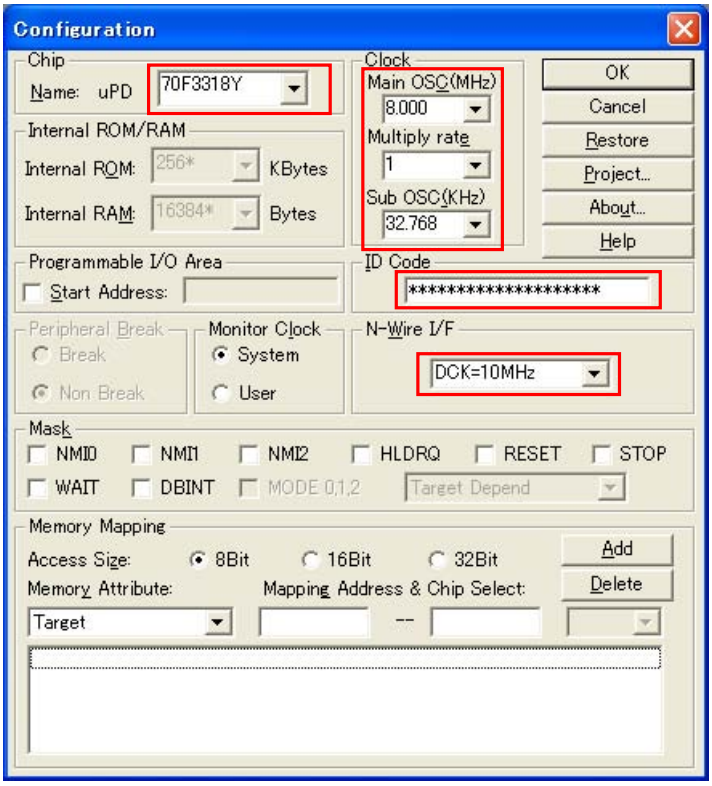
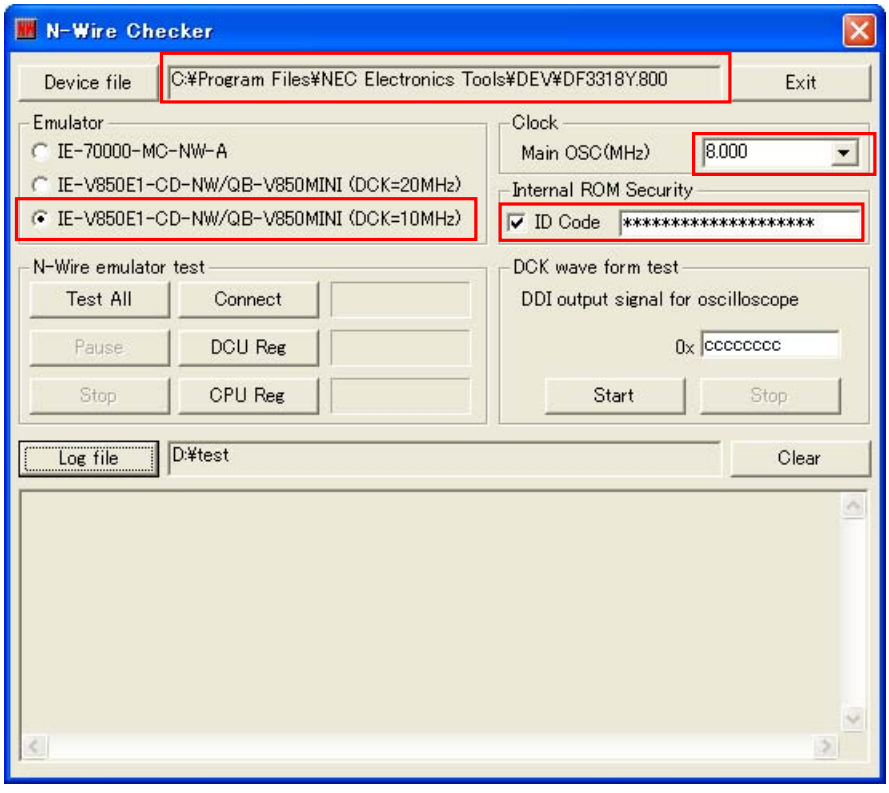
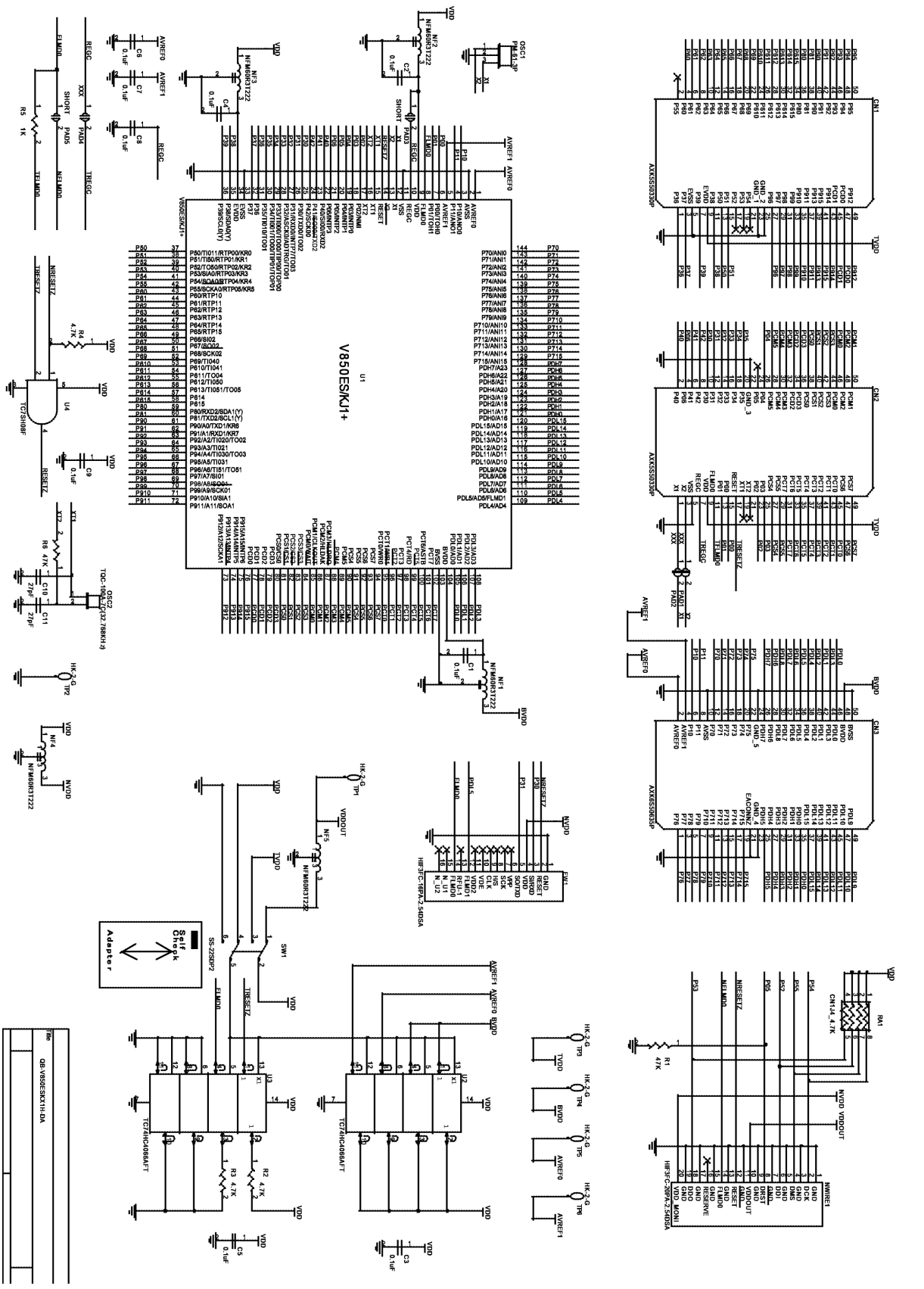


Figure 6-2. Image of Main Dialog Box for Caution No. 25



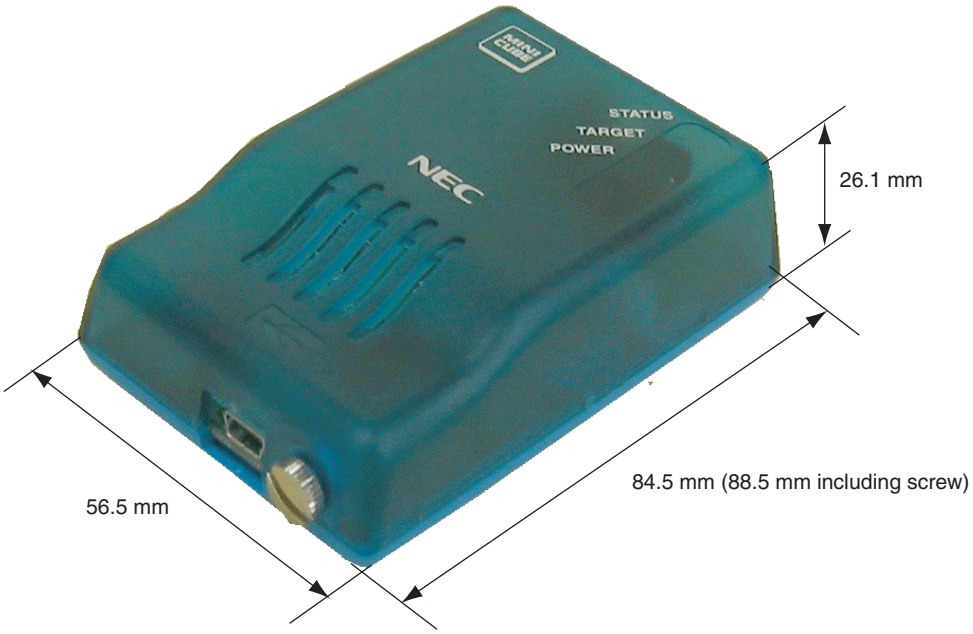
APPENDIX A SELF-CHECK BOARD CIRCUIT DIAGRAMS



APPENDIX B EXTERNAL DIMENSIONS

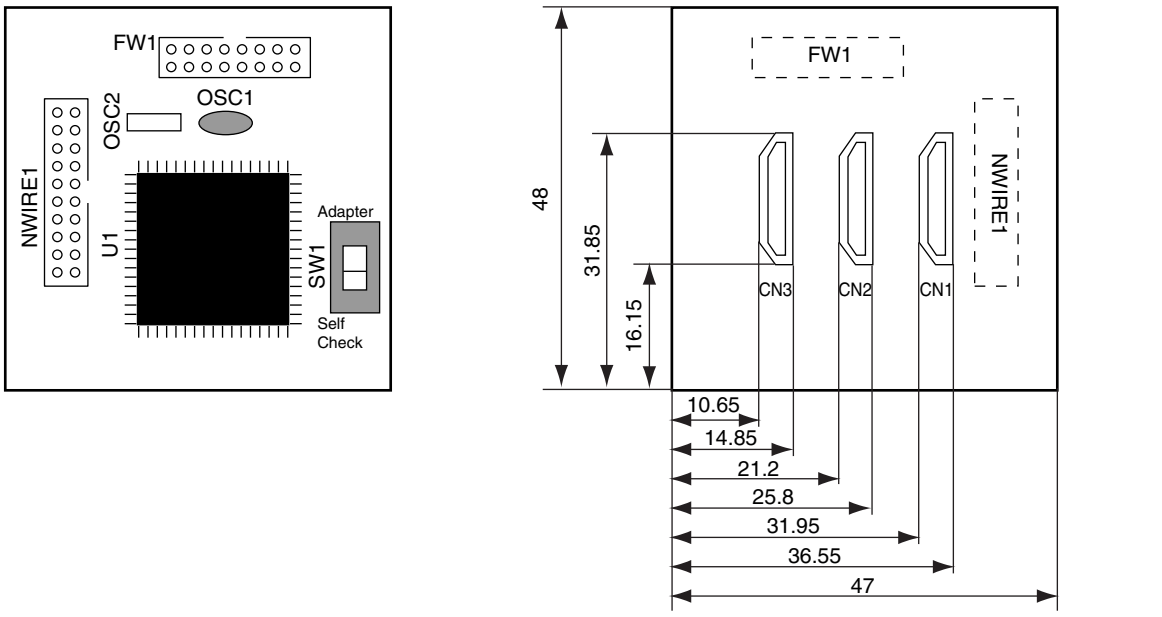
B.1 QB-V850MINI

Figure B-1. QB-V850MINI



B.2 Self-Check Board

Figure B-2. Self-Check Board



Top View

Bottom View

(Unit: mm)

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 NEC Electronics webpage.

URL: http://www.necel.com/micro/english/iecube/index.html

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

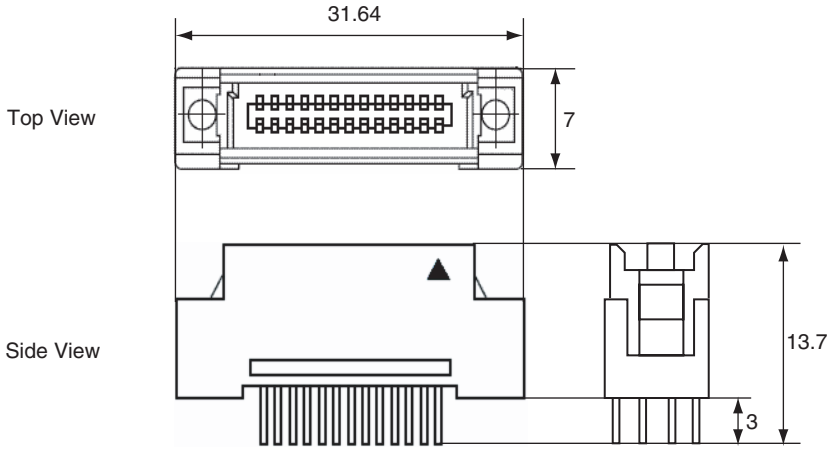


Figure B-4. KEL Connector (8830E-026-170L)

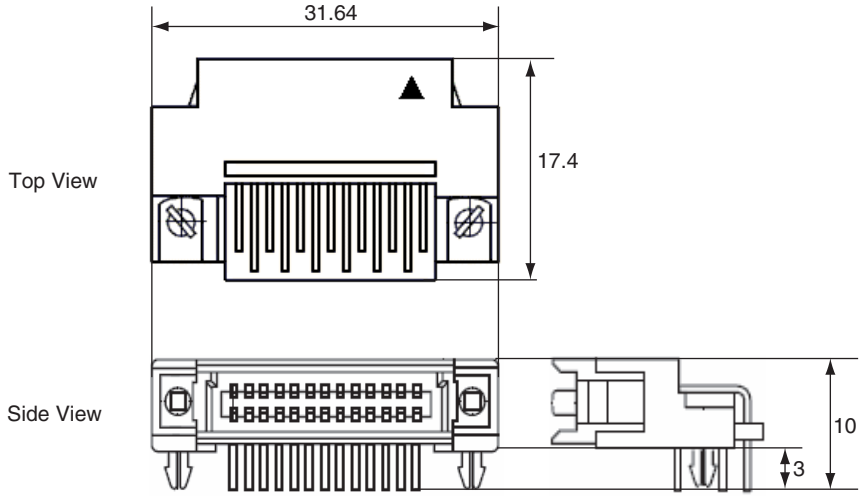


Figure B-5. MICTOR Connector (2-767004-2)

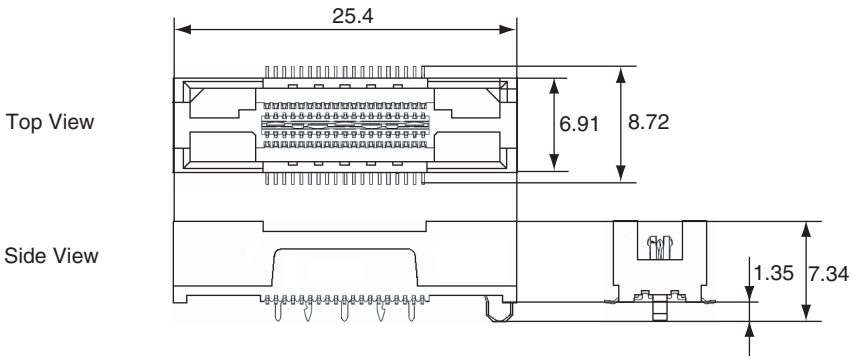


Figure B-6. XF2E Connector (XF2E-1515-1)

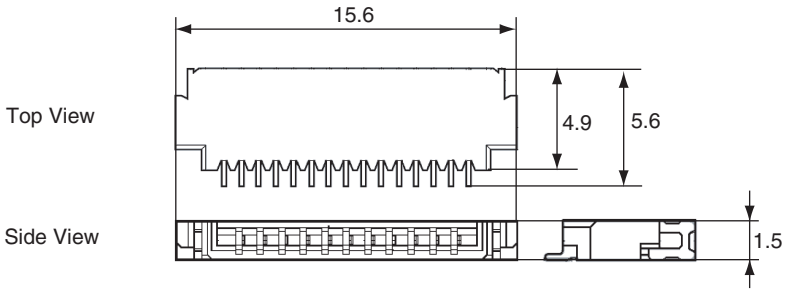
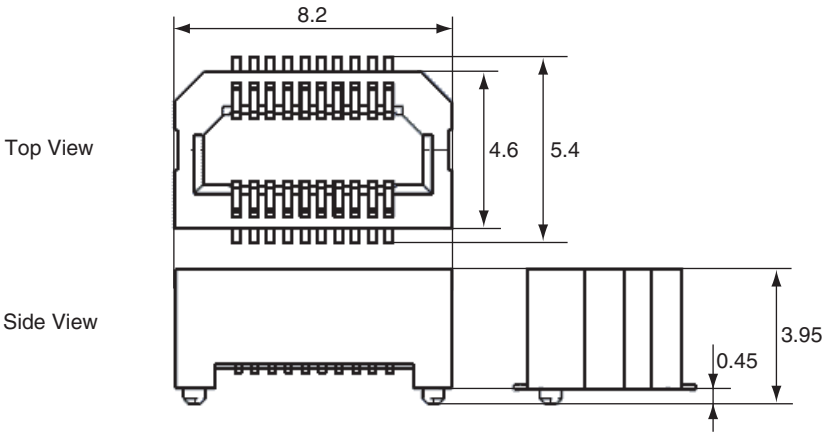


Figure B-7. SICA Connector (SICA2P20S)



APPENDIX C INTERNAL ROM/FLASH MEMORY SECURITY FUNCTION

A ten-byte ID code authentication function is provided in the microcontrollers with internal ROM/flash memory to prevent the memory contents from being read by an unauthorized person.

The ID code specifications are as follows. Embed the ID code in the internal ROM/flash memory in accordance with these specifications. Input the ID code in the Configuration dialog box of the integrated debugger to execute ID code authentication before starting debugging (reading the code of the internal ROM/flash memory of the target device) using the integrated debugger and the QB-V850MINI.

[ID code specifications]

- Addresses 0x70 to 0x79 are used as the 10-byte ID code.
- Bit 7 at address 0x79 is used as the N-Wire emulator use enable flag (use disabled if “0”, and enabled if “1”).
- Debugging can be started if the ID code input in the integrated debugger and the ID code embedded in the internal ROM/flash memory match.
- Even if the ID code matches, debugging cannot be performed if the N-Wire emulator use enable flag is “0”.
- When the flash memory is in the erased status, the ID code is 0xFFFFFFFFFFFFFFFFFFFF.

Examples 1 to 3 for setting the ID code as shown in the following table are described on the following page.

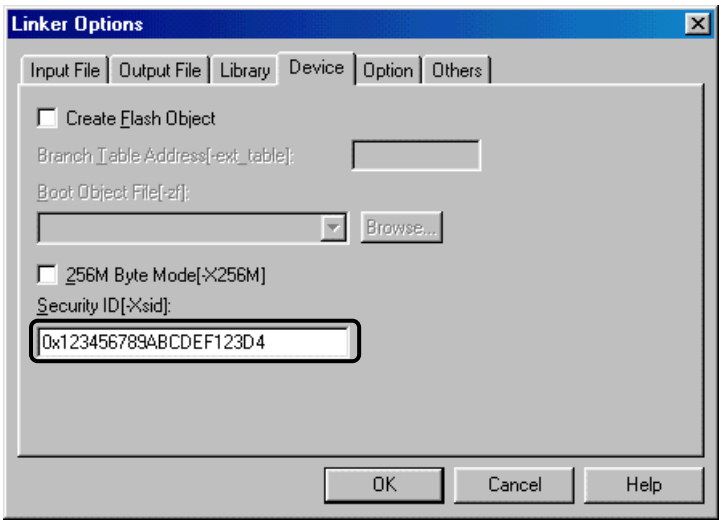
Address	Value [7:0]
0x70	0x12
0x71	0x34
0x72	0x56
0x73	0x78
0x74	0x9A
0x75	0xBC
0x76	0xDE
0x77	0xF1
0x78	0x23
0x79	0xD4

The ID code input in the Configuration dialog box of the integrated debugger ID850QB is 123456789ABCDEF123D4 or 123456789abcdef123d4.

If the QB-V850MINI cannot be activated because the user has forgotten the ID code or has skipped setting the ID code, erase the on-chip flash memory using the flash programmer. The ID code will be set to “0xFFFFFFFFFFFFFFFFFFFF”.

<Setting example 1>

The ID code can be specified in the Linker Options dialog box or the Compiler Common Options dialog box of the PM+ when a device file that supports CA850 Ver. 2.60 or later and the security ID is used.



<Setting example 2>

Example of assembler source description of device file that supports the security ID

[Add the following description in the startup file]

```
#-------------------------------------------------------------------------------
#   SECURITYID
#-------------------------------------------------------------------------------
            .section            "SECURITY_ID"       -- Interrupt handler address 0x70
            .word               0x78563412          -- 0 - 3 byte code
            .word               0xF1DEBC9A          -- 4 - 7 byte code
            .hword              0xD423              -- 8 - 9 byte code
```

<Setting example 3>

Example of assembler source description of device file that does not support the security ID

[Add the following description in the startup file]
(When the handler at address 0x60 is “ILGOP”)

```
#-------------------------------------------------------------------------------
#   ILGOP     handler
#-------------------------------------------------------------------------------
            .section            "ILGOP"             -- Interrupt handler address 0x60
                                                    -- Input ILGOP handler code
            .org                0x10                -- Skip handler address to 0x70
#-------------------------------------------------------------------------------
#           SECURITYID    (continue ILGOP  handler)
#-------------------------------------------------------------------------------
            .word               0x78563412          -- 0 - 3 byte code
            .word               0xF1DEBC9A          -- 4 - 7 byte code
            .hword              0xD423              -- 8 - 9 byte code
```

<R>

APPENDIX D 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**

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