User's Manual

SH7450 Series Debugging MCU Board

R0E574504PBZ00, R0E574504CBF10, R0E574552CBG00 User's Manual

Renesas Microcomputer Development Environment System
SuperH™ Family / SH7450 Series

R0E574504PBZ00E

Renesas Electronics
www.renesas.com

Rev.1.00 2010.05

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- EMC Directive (2004/108/EC)

  EN 55022 Class A

WARNING:	This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

  EN 55024

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Information for Traceability:

- Authorized representative

  Name: Renesas Electronics Corp.

  Address: 1753, Shimonumabe, Nakahara-ku, Kawasaki-shi, Kanagawa, 211-8668, Japan
- Manufacturer

  Name: Renesas Solutions Corp.

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

- Person responsible for placing on the market

  Name: Renesas Electronics Europe Ltd.

  Address: Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
- Trademark and Type name

Trademark	Renesas
Product name	Debug MCU Board
Type name	R0E574504PBZ00

United States Regulatory Notices on Electromagnetic Compatibility

FCC Certifications:

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

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

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

IMPORTANT INFORMATION

READ FIRST

• READ this user's manual before using this emulator product.

• KEEP the user's manual handy for future reference.

Do not attempt to use the emulator product until you fully understand its mechanism.

Emulator Product:

Throughout this document, the term "emulator product" shall be defined as the following products produced only by Renesas Electronics Corp. and Renesas Solutions Corp. excluding all subsidiary products.

- E10A-USB emulator main unit
- Debugging MCU board

The user system or a host computer is not included in this definition.

Purpose of the Debugging MCU Board:

This debugging MCU board is used to connect the E10A-USB emulator to the user system. This debugging MCU board must only be used for the above purpose.

Limited Applications:

This emulator product is not authorized for use in transportation, vehicular, medical (where human life is potentially at stake), aerospace, nuclear, or undersea repeater applications. Buyers of this emulator product must notify Renesas Electronics Corporation, Renesas Solutions Corporation or an authorized Renesas Electronics product distributor before planning to use the product in such applications.

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Target User of the Emulator Product:

This emulator product should only be used by those who have carefully read and thoroughly understood the information and restrictions contained in the user's manual. Do not attempt to use the emulator product until you fully understand its mechanism.

It is highly recommended that first-time users be instructed by users that are well versed in the operation of the emulator product.

Users are required to be familiar with the basic knowledge for the electric circuits, logic circuits, and microcomputers.

Precautions to be Taken when Using This Product:

1. This emulator is a development supporting unit for use in your program development and evaluation stages. In mass-producing your program you have finished developing, be sure to make a judgment on your own risk that it can be put to practical use by performing integration test, evaluation, or some experiment else.

2. In no event shall Renesas Solutions Corporation be liable for any consequence arising from the use of this emulator.

3. Renesas Solutions Corporation strives to renovate or provide a workaround for product malfunction at some charge or without charge. However, this does not necessarily mean that Renesas Solutions Corporation guarantees the renovation or the provision under any circumstances.

4. This emulator has been developed by assuming its use for program development and evaluation in laboratories. Therefore, it does not fall under the application of Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.

5. This emulator does not conform to safety standards such as UL or IEC. Be careful when you take this emulator overseas.

6. Renesas cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this user's manual and on the emulator product are therefore not all inclusive. Therefore, you must use the emulator product safely at your own risk.

LIMITED WARRANTY

Renesas warrants its emulator products to be manufactured in accordance with published specifications and free from defects in material and/or workmanship. Renesas, at its option, will replace any emulator products returned intact to the factory, transportation charges prepaid, which Renesas, upon inspection, shall determine to be defective in material and/or workmanship. The foregoing shall constitute the sole remedy for any breach of Renesas' warranty. See the Renesas warranty booklet for details on the warranty period. This warranty extends only to you, the original Purchaser. It is not transferable to anyone who subsequently purchases the emulator product from you. Renesas is not liable for any claim made by a third party or made by you for a third party.

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Figures:

Some figures in this user's manual may show items different from your actual system.

SAFETY PAGE

READ FIRST

• READ this user's manual before using this emulator product.

• KEEP the user's manual handy for future reference.

Do not attempt to use the emulator product until you fully understand its mechanism.

DEFINITION OF SIGNAL WORDS

Either in the user's manual or on the product, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties. Their graphic images and meanings are given in this safety page. Be sure to read this chapter before using the product.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION **CAUTION** used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE emphasizes essential information.

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

⚠ WARNING

Observe the precautions listed below. Failure to do so will result in a FIRE HAZARD and will damage the user system and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

1. **Do not repair or remodel the emulator product by yourself for electric shock prevention and quality assurance.**
2. **Always switch OFF the emulator and user system before connecting or disconnecting any CABLES or PARTS.**
3. **Always before connecting any CABLES, make sure that pin 1 on both sides are correctly aligned.**

4. If cables are connected incorrectly in the case of the SH7450 and SH7451 groups, the power-supply pins will be shorted as shown below:

90° Rotation		
A8(Vss)	–	H20(PVcc)
A14(Vss)	–	P20(AVcc)
B8(Vss)	–	H19(PVcc)
B20(Vss(N.C.))	–	Y19(AVcc(N.C.))
D16(Vdd)	–	T17(AVcc(N.C.))
G1(PLLVcc)	–	A14(Vss)
H9(Vdd)	–	J13(Vss)
H10(Vdd)	–	K13(Vss)
H11(Vdd)	–	L13(Vss)
H12(Vdd)	–	M13(Vss)
J8(Vss)	–	H12(Vdd)
J11(Vdd)	–	L12(Vss)
J12(Vdd)	–	M12(Vss)
K8(Vss)	–	H11(Vdd)
K12(Vdd)	–	M11(Vss)
L8(Vss)	–	H10(Vdd)
L9(Vss)	–	J10(Vdd)
M8(Vss)	–	H9(Vdd)
M9(Vss)	–	J9(Vdd)
M10(Vss)	–	K9(Vdd)
N20(AVss)	–	Y8(Vcc)
W20(AVss(N.C.))	–	Y2(Vcc(N.C.))
Y1(Vcc(N.C.))	–	A1(Vss(N.C.))
Y2(Vcc(N.C.))	–	B1(Vss(N.C.))
Y8(Vcc)	–	H1(PLLVss)
Y19(AVcc(N.C.))	–	W1(Vss(N.C.))
Y20(AVss(N.C.))	–	Y1(Vcc(N.C.))

180° Rotation		
A2(Vss(N.C.))	–	Y19(AVcc(N.C.))
A19(Vss(N.C.))	–	Y2(Vcc(N.C.))
A20(Vss(N.C.))	–	Y1(Vcc(N.C.))
B18(Vdd)	–	W3(Vcc)
E1(Vss)	–	T20(AVcc)
G1(PLLVcc)	–	P20(AVcc)
H9(Vdd)	–	N12(Vss)
H10(Vdd)	–	N11(Vss)
H11(Vdd)	–	N10(Vss)
H12(Vdd)	–	N9(Vss)
J9(Vdd)	–	M12(Vss)
J10(Vdd)	–	M11(Vss)
J11(Vdd)	–	M10(Vss)
J12(Vdd)	–	M9(Vss)
K9(Vdd)	–	L12(Vss)
K12(Vdd)	–	L9(Vss)

270° Rotation		
A1(Vss(N.C.))	–	Y1(Vcc(N.C.))
A14(Vss)	–	G1(PLLVcc)
B1(Vss(N.C.))	–	Y2(Vcc(N.C.))
H1(PLLVss)	–	Y8(Vcc)
H9(Vdd)	–	M8(Vss)
H10(Vdd)	–	L8(Vss)
H11(Vdd)	–	K8(Vss)
H12(Vdd)	–	J8(Vss)
H19(PVcc)	–	B8(Vss)
H20(PVcc)	–	A8(Vss)
J9(Vdd)	–	M9(Vss)
J10(Vdd)	–	L9(Vss)
J13(Vss)	–	H9(Vdd)
K9(Vdd)	–	M10(Vss)
K13(Vss)	–	H10(Vdd)
L12(Vss)	–	J11(Vdd)
L13(Vss)	–	H11(Vdd)
M11(Vss)	–	K12(Vdd)
M12(Vss)	–	J12(Vdd)
M13(Vss)	–	H12(Vdd)
P20(AVcc)	–	A14(Vss)
T17(AVcc(N.C.))	–	D16(Vdd)
W1(Vss(N.C.))	–	Y19(AVcc(N.C.))
Y1(Vcc(N.C.))	–	Y20(AVss(N.C.))
Y2(Vcc(N.C.))	–	W20(AVss(N.C.))
Y8(Vcc)	–	N20(AVss)
Y19(AVcc(N.C.))	–	B20(Vss(N.C.))

If cables are connected incorrectly in the case of the SH7455 and SH7456 groups, power-supply pins will be shorted as listed below.

90° Rotation		
L3(Vcc)	—	C5(Vdd)
K3(Vss)	—	C6(Vdd)
L4(Vcc)	—	D5(Vdd)
K4(Vss)	—	D6(Vdd)
D5(Vdd)	—	E12(Vss)
D6(Vdd)	—	F12(Vcc)
N10(Vcc)	—	K3(Vss)
M10(Vcc)	—	K4(Vss)
N11(Vss)	—	L3(Vcc)
M11(Vss)	—	L4(Vcc)
R15(AVcc(N.C.))	—	R1(Vss(N.C.))
A15(Vss(N.C.))	—	R15(AVcc(N.C.))

180° Rotation		
A1(Vss(N.C.))	—	R15(AVcc(N.C.))
L4(Vcc)	—	E12(Vss)
K4(Vss)	—	F12(Vcc)
D5(Vdd)	—	M11(Vss)
C5(Vdd)	—	N11(Vss)
D6(Vdd)	—	M10(Vcc)
C6(Vdd)	—	N10(Vcc)
N7(Vdd)	—	C9(Vcc)
M7(Vdd)	—	D9(Vcc)
N8(Vdd)	—	C8(Vss)
M8(Vdd)	—	D8(Vss)

270° Rotation		
R1(Vss(N.C.))	—	R15(AVcc(N.C.))
K3(Vss)	—	N10(Vcc)
L3(Vcc)	—	N11(Vss)
K4(Vss)	—	M10(Vcc)
L4(Vcc)	—	M11(Vss)
C5(Vdd)	—	L3(Vcc)
D5(Vdd)	—	L4(Vcc)
C6(Vdd)	—	K3(Vss)
D6(Vdd)	—	K4(Vss)
E12(Vss)	—	D5(Vdd)
F12(Vcc)	—	D6(Vdd)
R15(AVcc(N.C.))	—	A15(Vss(N.C.))

User Registration

When you have purchased the emulator represented in this user's manual, be sure to register it. As the H/W Tool Customer Registration Sheet is included with this product, fill it in and send the same contents to the following address by an email. 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, send an email to the following address.

regist_tool@renesas.com

Contents

Section 1 Product Overview

1.1 Introduction

The High-performance Embedded Workshop is a graphical user interface intended to ease the development and debugging of applications written in C/C++ programming language and assembly language for Renesas microcomputers. Its aim is to provide a powerful yet intuitive way of accessing, measuring, and modifying the debugging platform in which the application is running.

This system is a software and hardware development support tool for application systems using the Renesas original microcomputer.

The debugging MCU board is connected to the user system through the IC socket on the user system. The user system can be debugged under the conditions similar to the actual application conditions. The debugging MCU board enables debugging anywhere indoors or out with the E10A-USB emulator. The host computer for controlling the debugging MCU board must be an IBM PC compatible machine with USB 1.1/2.0 (Full-Speed).

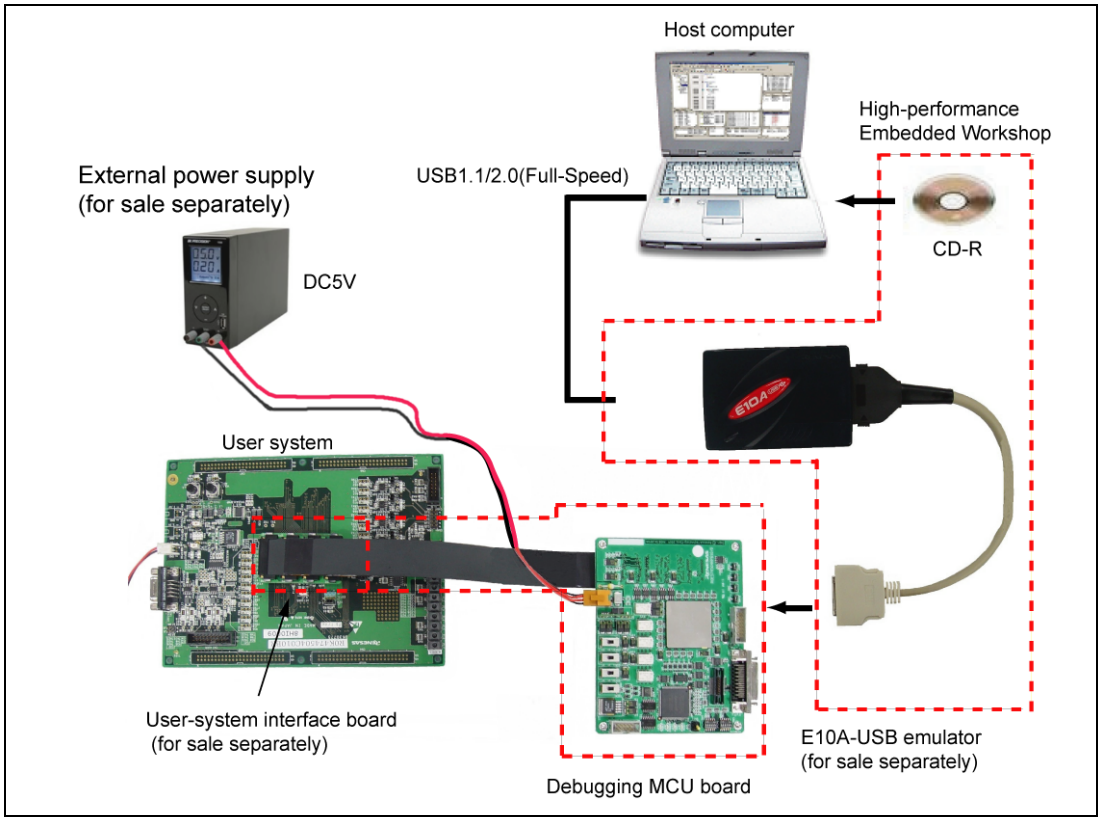


Figure 1.1 System Configuration with the Debugging MCU Board

The user-system interface board is for separate purchase. Note that it is not the same as the target MCU.

The debugging MCU board provides the following features:

- Excellent cost-performance in-circuit emulator

  Using the debugging MCU board with the E10A-USB emulator implements low-cost debugging of the user system without the user pins being occupied by the debugging interface (H-UDI).

  When the AUD function on the debugging MCU board is used, the debugging MCU board supports the window trace function for trace acquisition of a large-capacity realtime trace or a memory access (memory access address or memory access data) within the specified ranges.
- Realtime emulation

  Realtime emulation of the user system is enabled at the maximum operating frequency of the CPU.
- Excellent operability

  Using the High-performance Embedded Workshop on the Microsoft® Windows® 2000, Microsoft® Windows® XP, and Windows Vista® operating systems enables user program debugging using a pointing device such as a mouse. The High-performance Embedded Workshop enables high-speed downloading of load module files.
- Debugging of the user system in the final development stage

  The user system can be debugged under conditions similar to the actual application conditions.
- Compact debugging environment

  When the emulator is used, a laptop computer can be used as a host computer, creating a debugging environment in any place.

⚠ CAUTION

READ the following warnings before using the debugging MCU board. Incorrect operation will damage the user system and the debugging MCU board. The USER PROGRAM will be LOST.

1. Check all components against the component list after unpacking the emulator.
2. Never place heavy objects on the casing.
3. Protect the emulator from excessive impacts and stresses. For details, refer to section 1.5, Environmental Conditions.
4. Only supply the power of the specified voltages or power-supply frequencies to the debugging MCU board.
5. When moving the host computer or user system, take care not to vibrate or damage it.

6 After connecting the cable, check that it is connected correctly. For details, refer to section 2, Setting Up the Debugging MCU Board.

7. Supply power to the connected equipment after connecting all cables. Cables must not be connected or removed while the power is on.

1.2 Components

After removing the product from its packaging, confirm that you have all of the components. For details on the components of the debugging MCU board, refer to section 1.3, Components in the Package for the Debugging MCU Board. If any component is not present, contact your nearest Renesas Electronics sales office.

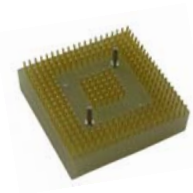
1.3 Components in the Package for the Debugging MCU Board

The debugging MCU board supports the SH7450 series (SH7450, SH7451, SH7455, or SH7456 group). Table 1.1 lists the components supplied in the package for the debugging MCU board.

Table 1.1 Components in the Package for the Debugging MCU Board

Classi-fication	Component	Appearance	Qty	Remarks
Hard-ware	Debugging MCU board main unit		1	Depth: 105.0 mm, width: 135.0 mm, height: 13.0 mm, mass: 120.0 g.
	Common-user system interface cable		4	Length: 267.0 mm, mass: 8.0 g
	User-system interface board (for sale separately: R0E574504CBF10)		1	Depth: 35.0 mm, width: 58.5 mm, height: 7.2 mm, mass: 17.0 g For the SH7450 and SH7451 groups
	User-system interface board (for sale separately: R0E574552CBG00)		1	Depth: 35.0 mm, width: 58.5 mm, height: 7.2 mm, mass: 17.0 g For the SH7455 and SH7456 groups
	Power cable		1	Length: 0.5 m

Table 1.1 Components in the Package for the Debugging MCU Board (cont.)

Classi-fication	Component	Appearance	Qty	Remarks
Hard-ware (cont.)	IC socket plug (for sale separately)		1	For connecting the user-system interface board and IC socket *The attached socket plug will differ according to the target MCU for debugging. This will be attached to the user-system interface board.
	User's manual		1	SH7450 series Debugging MCU Board User's Manual (this manual)

CAUTION

1. Use the following IC sockets and IC socket plugs to connect the user sytem, user-system interface board, and debugging MCU board. An IC socket is not provided with the user-system interface board and debugging MCU board, so must be separately purchased before use.

- **For SH7450/7451 groups (package code: PRBG0292GB-A):**
  IC socket: BSSOCKET292A2017RE21N
  (manufactured by Tokyo Eletech Corporation)
  IC socket plug: CSPLUG/W292A2017RE01
  (manufactured by Tokyo Eletech Corporation)
- **For SH7455/7456 groups (package code: PRBG0176GA-A):**
  IC socket: BSSOCKET176A1513RE21N
  (manufactured by Tokyo Eletech Corporation)
  IC socket plug: CSPLUG/W176A1513RE01
  (manufactured by Tokyo Eletech Corporation)

2. Use the following IC sockets and IC socket cover for installing an MCU on the user system without using the user-system interface board and debugging MCU board. An IC socket is not provided with the user-system interface board and debugging MCU board, so must be separately purchased before use.

- **For SH7450/7451 group (package code: PRBG0292GB-A):**
  IC socket: BSSOCKET292A2017RE21N
  (manufactured by Tokyo Eletech Corporation)
  IC socket cover: LSPACK292A2017RE02
  (manufactured by Tokyo Eletech Corporation)
- **For SH7455/7456 group (package code: PRBG0176GA-A):**
  IC socket: BSSOCKET176A1513RE21N
  (manufactured by Tokyo Eletech Corporation)
  IC socket cover: LSPACK176A1513RE01
  (manufactured by Tokyo Eletech Corporation)

1.4 Hardware Configuration

As shown in figure 1.2, the usable configuration of the debugging MCU board consists of the main unit, common user-system interface cable, and power cable. The debugging MCU board is connected, via the user-system interface board, to the user system, and is also connected, via the E10A-USB emulator, to the host computer over a USB 1.1/2.0 (Full-Speed) link.
The user-system interface board is not the same as the target MCU for debugging, so must be purchased separately.

The host computer, E10A-USB emulator, and external power supply must be separately obtained by the user.

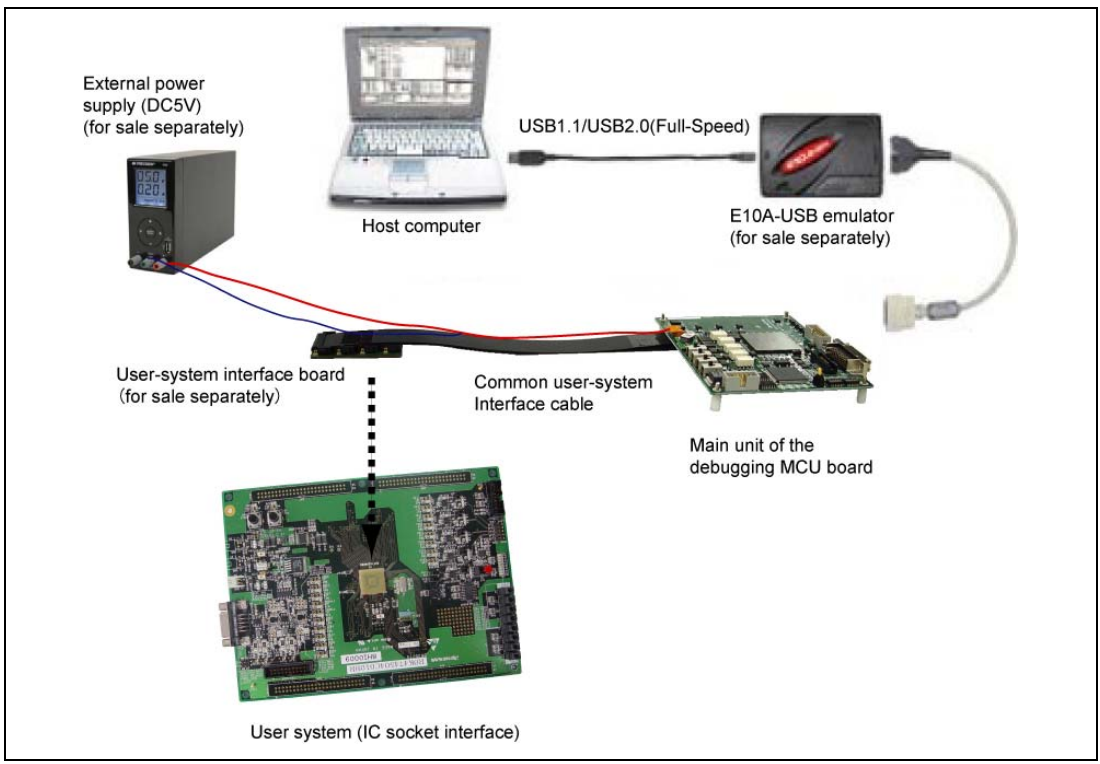


Figure 1.2 Hardware Configuration of the Debugging MCU Board

1.4.1 Configuration of the Main Unit of the Debugging MCU Board

The names of each section of the debugging MCU board are explained below.

Top of the Main Unit of the Debugging MCU Board (1)

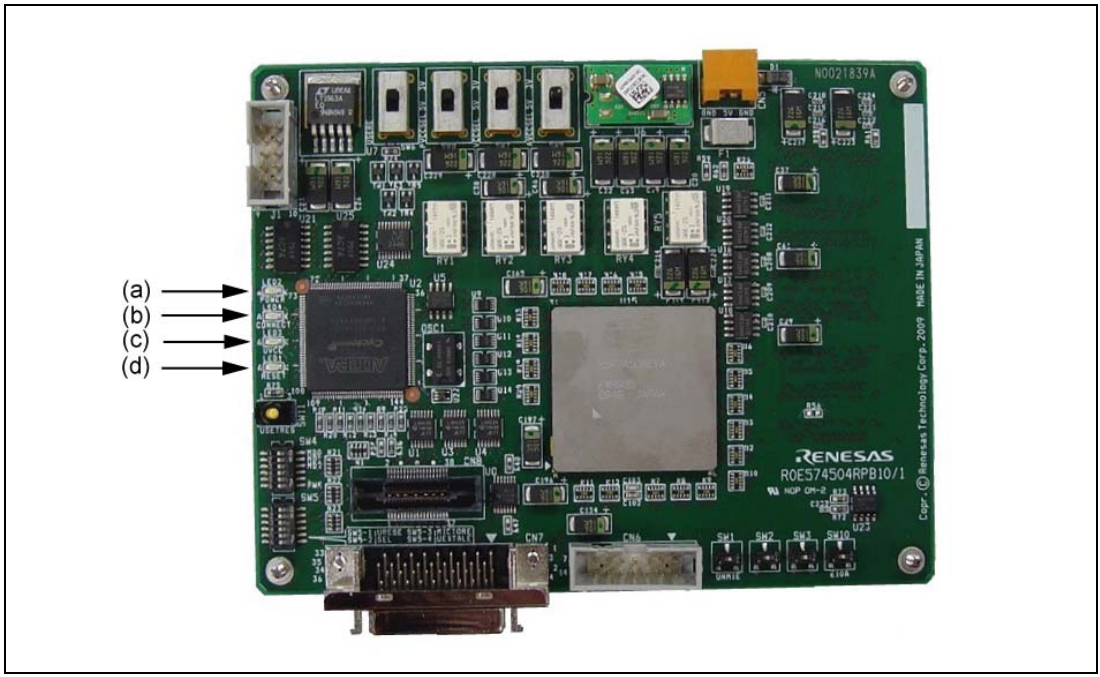


Figure 1.3 Top of the Main Unit of the Debugging MCU Board (1)

(a) External power LED:	Marked 'POWER'. This LED is lit while external power is being supplied from the power cable.
(b) User Cable Connection:	Marked 'Connect'. This LED is lit while the debugging MCU board is connected to the user system.
(c) User VCC LED:	Marked 'UVCC'. This LED is lit while power is being supplied from the VCC power-supply of the user system to the MCU board.
(d) Reset LED:	Marked 'RESET'. This LED is lit while the reset signal is being input to the MCU.

Top of the Main Unit of the Debugging MCU Board (2)

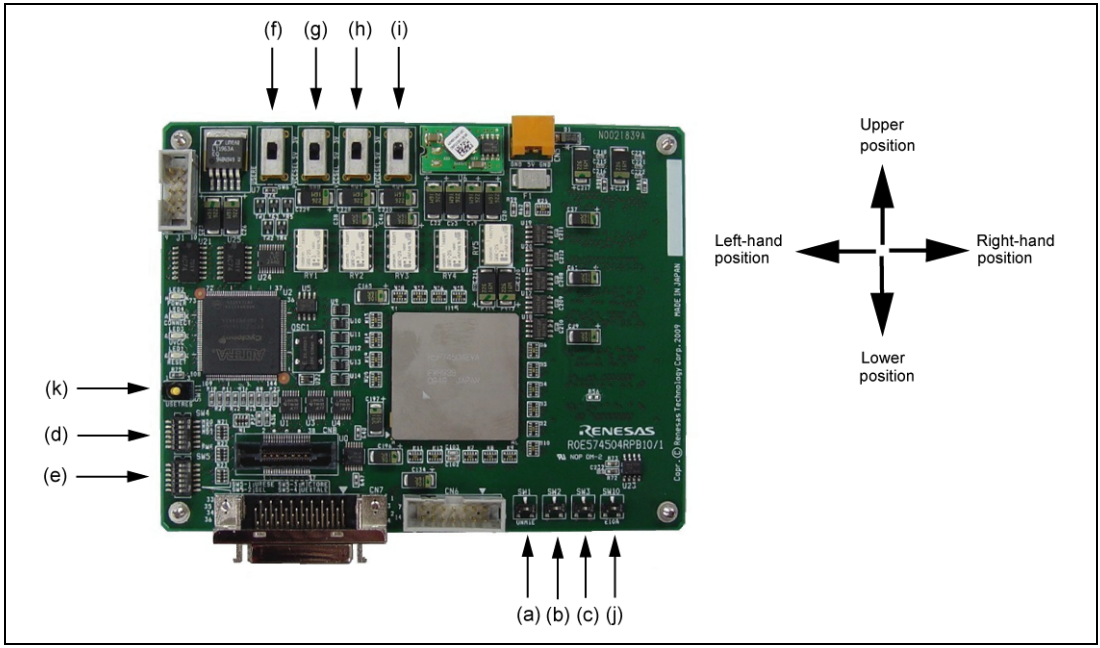


Figure 1.4 Top of the Main Unit of the Debugging MCU Board (2)

(a) User-system NMI input signal enabling/disabling switch:	This switch is indicated by "SW1 (UNMIE)" and enables or disables the input of the user NMI input signal from the user system. Placing the switch in the left-hand position enables the input of user NMI signals. Placing the switch in the right-hand position disables the input of user NMI signals (the NMI signal is always 'H').
(b) User DET3OR5 signal enabling/disabling switch:	This switch is indicated by "SW2" and enables or disables the input of user DET3OR5 input signals from the user system. Placing the switch in the left-hand position enables the input of user DET3OR5 signals. Placing the switch in the right-hand position disables the input of user DET3OR5 signals. In this case, the input signal level of the DET3OR5 is adjusted to the level corresponding to the setting of switch block (c), described below.
(c) User DET3OR5 signal level setting switch:	This switch is indicated by "SW3" and is for setting the level of the user DET3OR5 signal. For VCC = 5 V and 3.3 V, Place this switch in the left- and right-hand positions, respectively. The setting is only valid when switch (b) is in the right-hand position. Note: The setting of this switch must correspond to that of switch block (h), described below.
(d) Control signal setting switches 1:	This switch is indicated by "SW4" and is used to select input of the MD2 to MD0 and FWE signals to the MCU. When switch (f) below is in the upper position, the settings of this switch block will be all invalid.
(e) Control signal setting switches 2:	This switch block is indicated by "SW5" and enables or disables the input of /RES and the clock signal from the user system and the target MCU for debugging.
(f) Control signal and voltage pin enabling/disabling switch:	This switch is indicated by "SW6 (USERE)" and enables or disables the input of voltage and control signals input from the user system. When the switch is in the upper position, the signal levels are those input from the user system, regardless of the settings of switch block (d). Also, operation is at the user voltages regardless of the settings of the voltage setting switches (g) to (i) listed below. When the switch is in the lower position, control signals and voltages are in accord with the settings of switch block (d) and the voltage setting switches (g) to (i).
(g) PVCC voltage setting switch:	This switch is indicated by "SW8 (PVCCSEL)" and is used to select the PVCC voltage to be input to the MCU. When the switch is in the upper position (3 V), operation is with PVCC = 3.3 V. When the switch is in the lower position (5 V), operation is with PVCC = 5.0 V. The setting of this switch is only valid when switch (f) described above is in the lower positions.

(h) VCC voltage setting switch:	This switch is indicated by "SW7 (VCCSEL)" and is used to select the VCC voltage to be input to the MCU. When the switch is in the upper position (3 V), operation is with VCC = 3.3 V. When the switch is in the lower position (5 V), operation is with VCC = 5.0 V. Note: The setting of this switch must correspond to that of switch block (c), described above. The setting of this switch is only valid when switch (f) described above is in the lower position.
(i) AVCC voltage setting switch:	This switch is indicated by "SW9 (AVCCSEL)" and is used to select the AVCC voltage to be input to the MCU. When the switch is in the upper position (3 V), operation is with AVCC = 3.3 V. When the switch is in the lower position (5 V), operation is with AVCC = 5.0 V. The setting of this switch block is only valid when switch (f) described above is in the lower position.
(j) Future expansion switch	This switch is indicated by "SW10 (E10A)". Currently unused, this switch is for use in future expansion (leave this switch in the left-hand position).
(k) Reset switch	This switch is indicated by "SW11 (USETRES)" and is used for manual input of the reset signal.

Top of the Main Unit of the Debugging MCU Board (3)

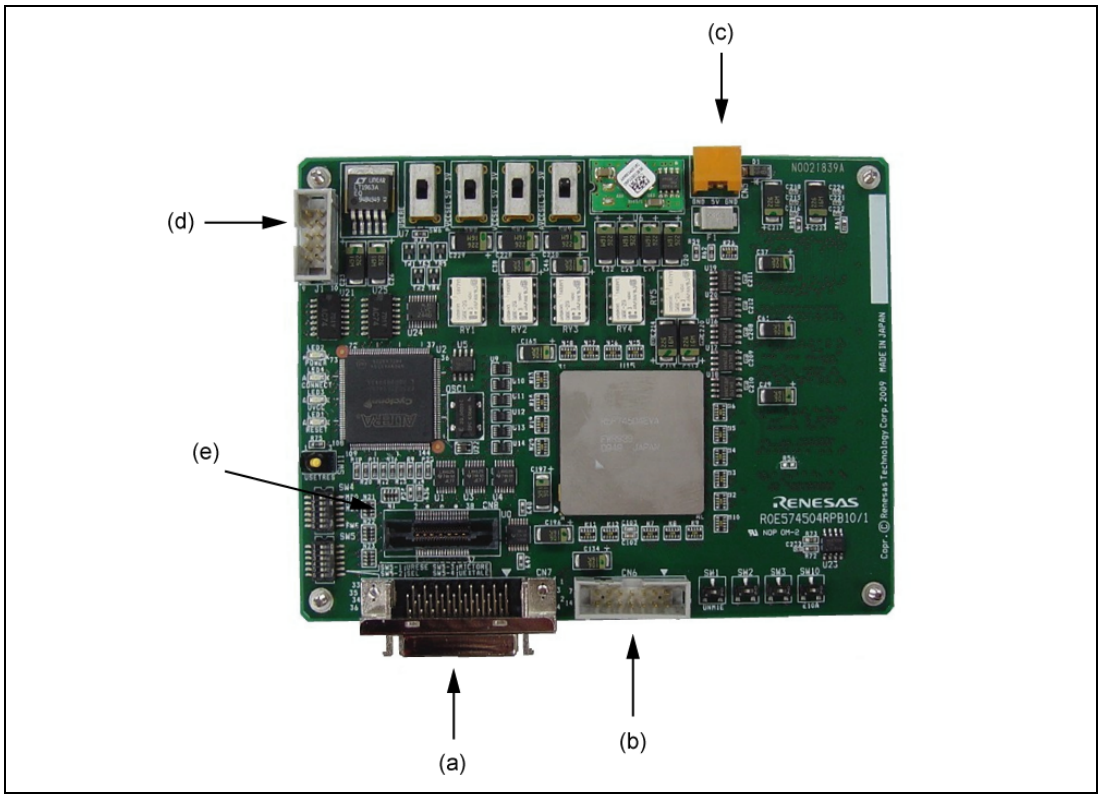


Figure 1.5 Top of the Main Unit of the Debugging MCU Board (3)

(a) H-UDI interface connector (36 pins):	This connector is indicated by "CN7" and is used to connect the debugging MCU board to the 36-pin cable of the E10A-USB emulator.
(b) H-UDI interface connector (14 pins):	This connector is indicated by "CN6" and is used to connect the debugging MCU board to the 14-pin cable of the E10A-USB emulator.
(c) Power-cable connector:	This connector is indicated by "CN5" and is used to connect the debugging MCU board to the power cable for the external power supply.
(d) Unused connector 1:	This connector is indicated by "J1" and is currently not used. Do not connect anything to it.
(e) Future expansion connector:	This connector is indicated by "CN8" and is currently not used but is for use in future expansion.

Bottom of the Main Unit of the Debugging MCU Board

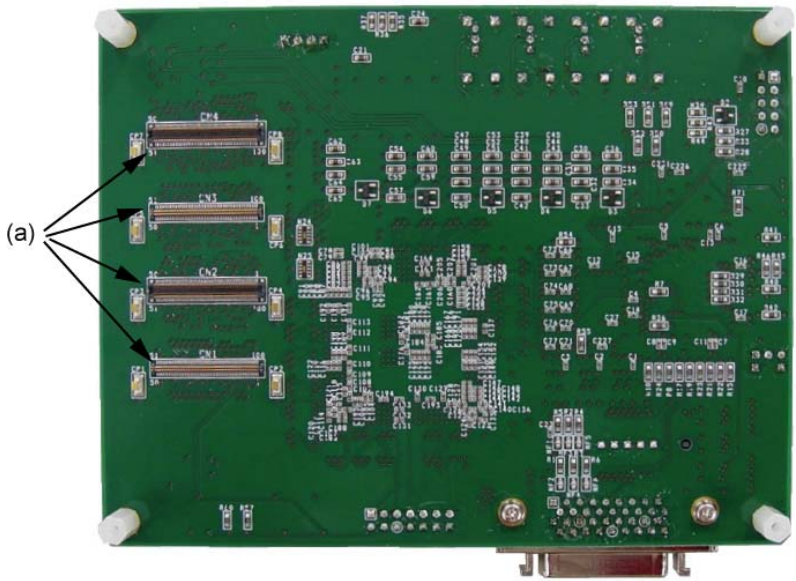


Figure 1.6 Bottom of the Main Unit of the Debugging MCU Board

(a) User system interface connector:	This connector indicated by "CN1, CN2, CN3, CN4" and is used to connect the main unit of the debugging MCU board to the common user-system interface cable.

1.4.2 Configuration of the User System Interface Board

The names of each section of the user-system interface board are explained below.
The user-system interface board is not provided with the MCU board (i.e. is for sale separately).The interface board to be used is not the same as the target MCU for debugging. Use the R0E574504CBF10 and R0E574552CBG00 boards for debugging MCU in the SH7450 and SH7451 groups and the SH7455 and SH7456 groups, respectively.

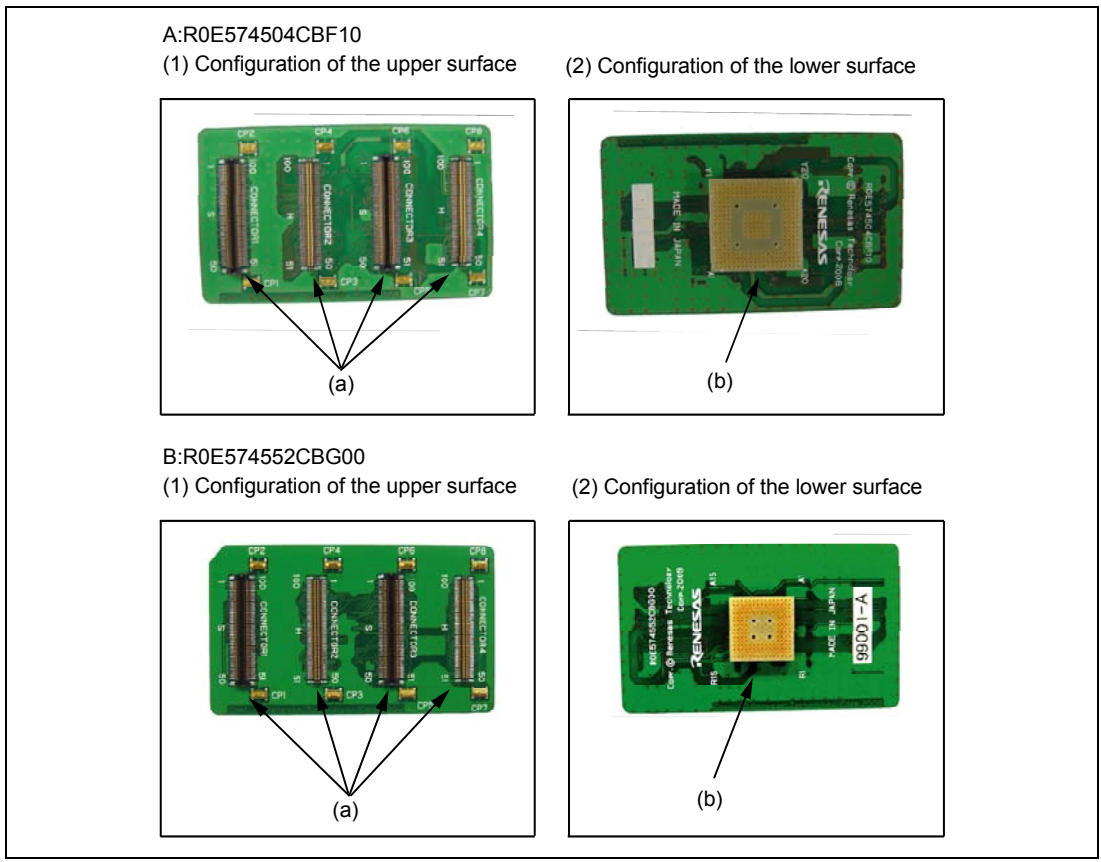


Figure 1.7 User-System Interface Board

(a) User system interface connector: This connector is indicated by "CONNECTOR1, CONNECTOR2, CONNECTOR3, CONNECTOR4" and is used to connect the user-system interface board to the common user-system interface cable.

(b) User system connector: This connector is for connection to the user system via an IC socket plug.

1.5 Environmental Conditions

⚠ CAUTION

Observe the conditions listed in tables 1.2 and 1.3 when using the debugging MCU board. Failure to do so can lead to abnormal operation of the user system, the debugging MCU board, and the user program.

Table 1.2 Environmental Conditions

Item	Specifications
Temperature	Operating: +10°C to +35°C Storage: –10°C to +50°C
Humidity	Operating: 35% RH to 80% RH, no condensation Storage: 35% RH to 80% RH, no condensation
Vibration	Operating: 2.45 m/s^2 max. Storage: 4.9 m/s^2 max. Transportation: 14.7 m/s^2 max.
Ambient gases	No corrosive gases may be present

Table 1.3 Operating Environment

Item	Description
Host computer	IBM PC or compatible machine that satisfies the operating-environment conditions of the E10A-USB emulator
Emulator	Renesas microcomputer development tool: E10A-USB emulator (HS0005KCU01H or HS0005KCU02H)
Power supply	DC 5 V ± 10%
Supply current	300 mA (max.)

Section 2 Setting Up the Debugging MCU Board

2.1 Flow Chart before Using the Debugging MCU Board

Unpack the debugging MCU board and prepare it for use as follows:

⚠ WARNING

READ the reference sections shaded in figure 2.1 before using the debugging MCU board. Incorrect operation will damage the user system and the debugging MCU board uct. The USER PROGRAM will be LOST.

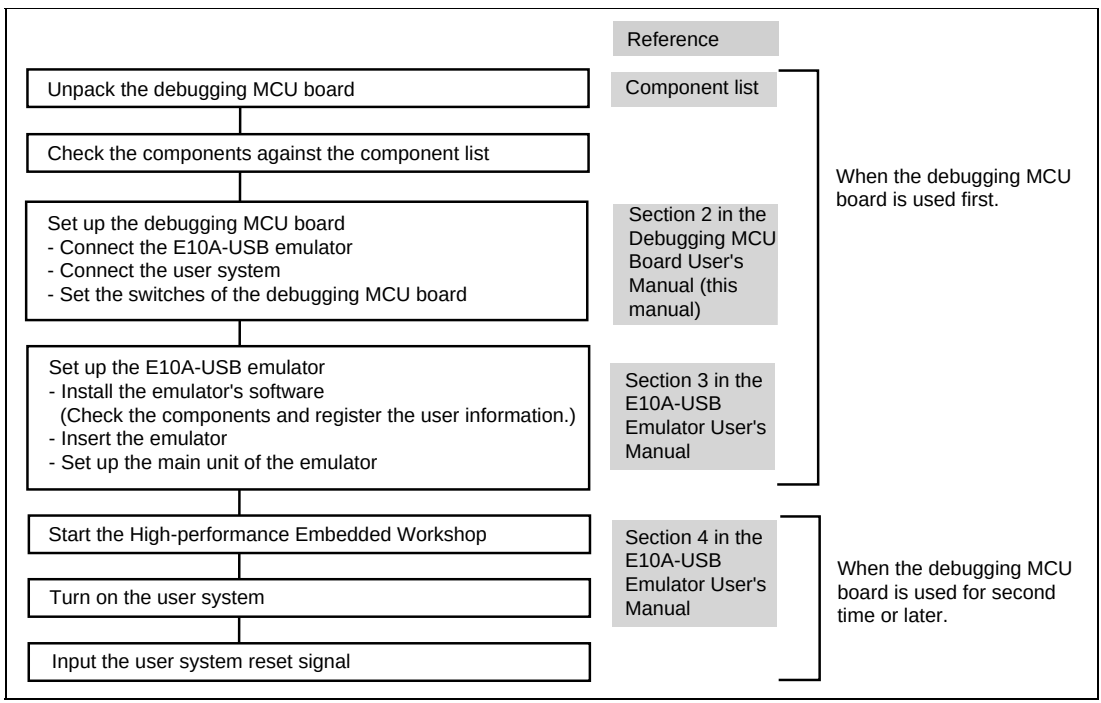


Figure 2.1 Preparation Flow Chart for the Debugging MCU Board

2.2 Setting Up the Debugging MCU Board

To apply the debugging MCU board, you must obtain an E10A-USB emulator. This section describes how to connect the debugging MCU board, the E10A-USB emulator, the user-system interface board, and the user system.

Before making the connections, check that the host computer is turned off, the E10A-USB emulator is not connected to the host computer via the USB cable, and power is being supplied to neither the debugging MCU board nor the user system.

2.2.1 Connecting the Debugging MCU Board to the E10A-USB Emulator

Follow the below procedure to connect the debugging MCU board to the E10A-USB emulator.

1. Connect the user system interface cable (14 or 36 pins) provided with the E10A-USB emulator to the side connector of the E10A-USB emulator as shown in figure 2.2.

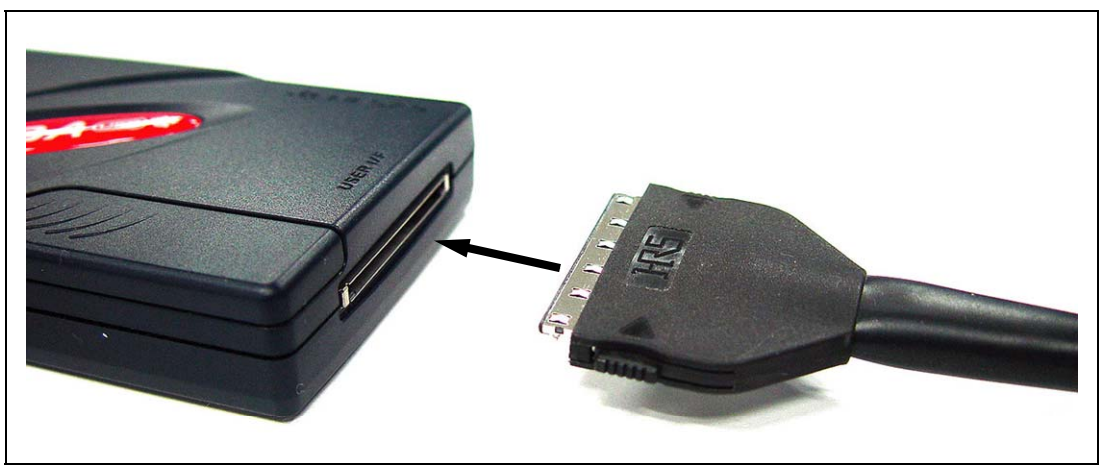


Figure 2.2 Connecting the E10A-USB Emulator to the User System Interface Cable

2. Connect the 14-pin or 36-pin connector of the user system interface cable to the H-UDI interface connector on the debugging MCU board as shown in figures 2.3 and 2.4. Connect the 36-pin or 14-pin connector to CN7 or CN6, respectively.

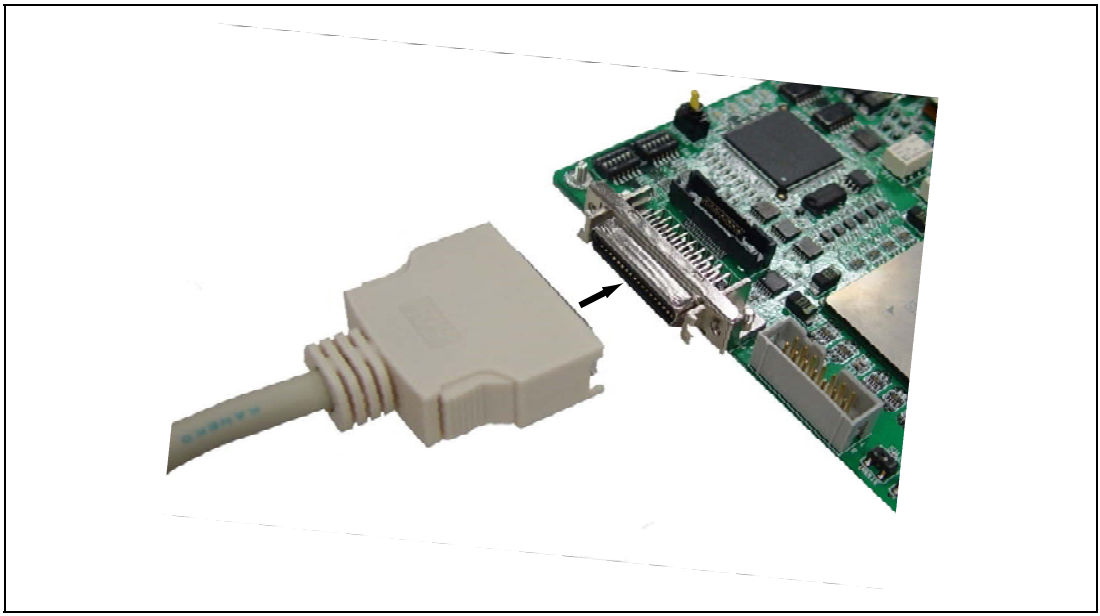


Figure 2.3 Connecting the User System Interface Cable (36 Pins) to the Debugging MCU Board

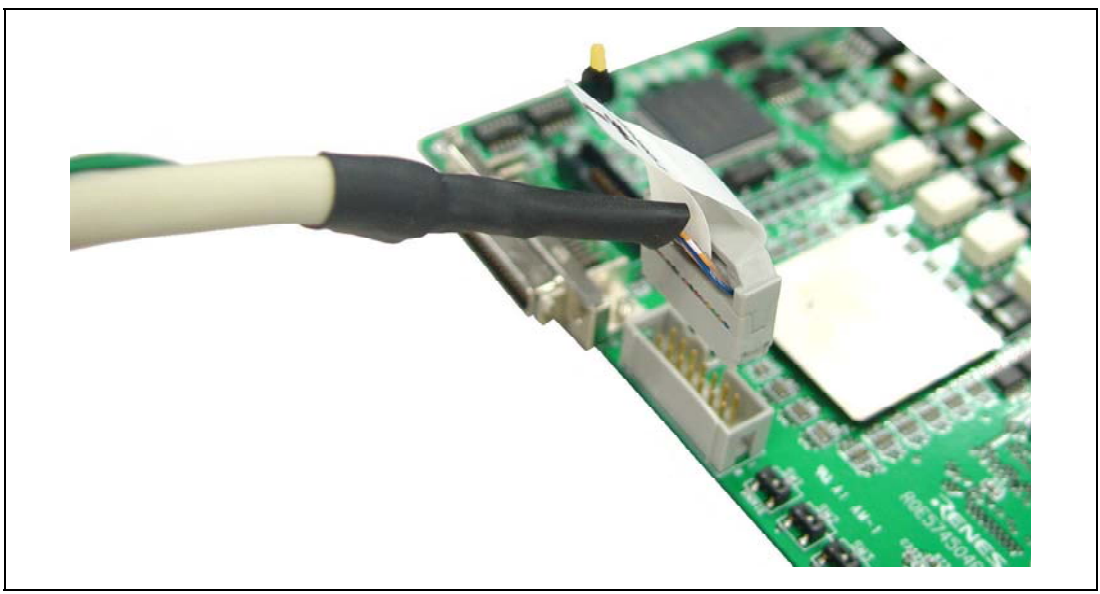


Figure 2.4 Connecting the User System Interface Cable (14 Pins) to the Debugging MCU Board

2.2.2 Connecting the Debugging MCU Board to the User System

To connect the debugging MCU board, the user-system interface board, and the user system, follow the instructions below.
However, debugging can proceed on the debugging MCU board without connection to the user system.

⚠ WARNING

Always switch OFF the emulator product, the debugging MCU board, and the user system before any connection or removal of the USER SYSTEM INTERFACE BOARD. Furthermore, make sure that the pin 1 positions on both sides are correctly aligned. Failure to do so will create a FIRE HAZARD that can damage the emulator product, the debugging MCU board, the user-system interface board, or the user system, or produce PERSONAL INJURY.

1. Solder the IC socket to the user system.

CAUTION

After applying solder, use epoxy resin adhesive to affix the IC socket to the user system.

2. Confirm the location of pin CN4-1 on the debug MCU main unit before plugging the common user-system interface cable into the main MCU unit, as shown in figure 2.5. In the listed order, plug the four pins indicated by the following silk-screened labels on the debug MCU board, into the main unit: CN4, CN3, CN2, and CN1.
3. Plug the IC socket plug into the user-system interface board as shown in figure 2.6.
4. Confirm the location of pin CONNECTOR1-1 on the user-system interface board before plugging in the common user-system interface cable as shown in figure 2.7. In the listed order, plug in the four connectors indicated by the following silk-screened labels on the user-system interface board: CONNECTOR1, CONNECTOR2, CONNECTOR3, and CONNECTOR4.

Doing so completes the connection between the debug MCU board main unit and the user-system interface board via the common user-system interface cable.

5. Align pin A1 on the IC socket on the user system with pin 1 on the user-system interface board, and plug the user system connector of the interface board into the IC socket on the user system, as is shown in figure 2.8.

Note: Although figures 2.6 to 2.8 illustrate settings for the SH7450 and SH 7451 groups, the same settings are applicable for connecting the debug MCU board, user-system interface board, and user system in the case of products of the SH7455 and SH 7456 groups.

CAUTION

Ensure that the locations of pin A1 on the socket and connector are aligned before inserting the connector. If this is not done in the case of the SH7450 and SH7451 groups, power-supply pins will be shorted listed below.

90° Rotation			180° Rotation			270° Rotation		
A8(Vss)	—	H20(PVcc)	A2(Vss(N.C.))	—	Y19(AVcc(N.C.))	A1(Vss(N.C.))	—	Y1(Vcc(N.C.))
A14(Vss)	—	P20(AVcc)	A19(Vss(N.C.))	—	Y2(Vcc(N.C.))	A14(Vss)	—	G1(PLLVcc)
B8(Vss)	—	H19(PVcc)	A20(Vss(N.C.))	—	Y1(Vcc(N.C.))	B1(Vss(N.C.))	—	Y2(Vcc(N.C.))
B20(Vss(N.C.))	—	Y19(AVcc(N.C.))	B18(Vdd)	—	W3(Vcc)	H1(PLLVss)	—	Y8(Vcc)
D16(Vdd)	—	T17(AVcc(N.C.))	E1(Vss)	—	T20(AVcc)	H9(Vdd)	—	M8(Vss)
G1(PLLVcc)	—	A14(Vss)	G1(PLLVcc)	—	P20(AVcc)	H10(Vdd)	—	L8(Vss)
H9(Vdd)	—	J13(Vss)	H9(Vdd)	—	N12(Vss)	H11(Vdd)	—	K8(Vss)
H10(Vdd)	—	K13(Vss)	H10(Vdd)	—	N11(Vss)	H12(Vdd)	—	J8(Vss)
H11(Vdd)	—	L13(Vss)	H11(Vdd)	—	N10(Vss)	H19(PVcc)	—	B8(Vss)
H12(Vdd)	—	M13(Vss)	H12(Vdd)	—	N9(Vss)	H20(PVcc)	—	A8(Vss)
J8(Vss)	—	H12(Vdd)	J9(Vdd)	—	M12(Vss)	J9(Vdd)	—	M9(Vss)
J11(Vdd)	—	L12(Vss)	J10(Vdd)	—	M11(Vss)	J10(Vdd)	—	L9(Vss)
J12(Vdd)	—	M12(Vss)	J11(Vdd)	—	M10(Vss)	J13(Vss)	—	H9(Vdd)
K8(Vss)	—	H11(Vdd)	J12(Vdd)	—	M9(Vss)	K9(Vdd)	—	M10(Vss)
K12(Vdd)	—	M11(Vss)	K9(Vdd)	—	L12(Vss)	K13(Vss)	—	H10(Vdd)
L8(Vss)	—	H10(Vdd)	K12(Vdd)	—	L9(Vss)	L12(Vss)	—	J11(Vdd)
L9(Vss)	—	J10(Vdd)				L13(Vss)	—	H11(Vdd)
M8(Vss)	—	H9(Vdd)				M11(Vss)	—	K12(Vdd)
M9(Vss)	—	J9(Vdd)				M12(Vss)	—	J12(Vdd)
M10(Vss)	—	K9(Vdd)				M13(Vss)	—	H12(Vdd)
N20(AVss)	—	Y8(Vcc)				P20(AVcc)	—	A14(Vss)
W20(AVss(N.C.))	—	Y2(Vcc(N.C.))				T17(AVcc(N.C.))	—	D16(Vdd)
Y1(Vcc(N.C.))	—	A1(Vss(N.C.))				W1(Vss(N.C.))	—	Y19(AVcc(N.C.))
Y2(Vcc(N.C.))	—	B1(Vss(N.C.))				Y1(Vcc(N.C.))	—	Y20(AVss(N.C.))
Y8(Vcc)	—	H1(PLLVss)				Y2(Vcc(N.C.))	—	W20(AVss(N.C.))
Y19(AVcc(N.C.))	—	W1(Vss(N.C.))				Y8(Vcc)	—	N20(AVss)
Y20(AVss(N.C.))	—	Y1(Vcc(N.C.))				Y19(AVcc(N.C.))	—	B20(Vss(N.C.))

CAUTION

If this is not done in the case of the SH7455 and SH7456 groups, power-supply pins will be shorted as listed below.

90° Rotation		
L3(Vcc)	—	C5(Vdd)
K3(Vss)	—	C6(Vdd)
L4(Vcc)	—	D5(Vdd)
K4(Vss)	—	D6(Vdd)
D5(Vdd)	—	E12(Vss)
D6(Vdd)	—	F12(Vcc)
N10(Vcc)	—	K3(Vss)
M10(Vcc)	—	K4(Vss)
N11(Vss)	—	L3(Vcc)
M11(Vss)	—	L4(Vcc)
R15(AVcc(N.C.))	—	R1(Vss(N.C.))
A15(Vss(N.C.))	—	R15(AVcc(N.C.))

180° Rotation		
A1(Vss(N.C.))	—	R15(AVcc(N.C.))
L4(Vcc)	—	E12(Vss)
K4(Vss)	—	F12(Vcc)
D5(Vdd)	—	M11(Vss)
C5(Vdd)	—	N11(Vss)
D6(Vdd)	—	M10(Vcc)
C6(Vdd)	—	N10(Vcc)
N7(Vdd)	—	C9(Vcc)
M7(Vdd)	—	D9(Vcc)
N8(Vdd)	—	C8(Vss)
M8(Vdd)	—	D8(Vss)

270° Rotation		
R1(Vss(N.C.))	—	R15(AVcc(N.C.))
K3(Vss)	—	N10(Vcc)
L3(Vcc)	—	N11(Vss)
K4(Vss)	—	M10(Vcc)
L4(Vcc)	—	M11(Vss)
C5(Vdd)	—	L3(Vcc)
D5(Vdd)	—	L4(Vcc)
C6(Vdd)	—	K3(Vss)
D6(Vdd)	—	K4(Vss)
E12(Vss)	—	D5(Vdd)
F12(Vcc)	—	D6(Vdd)
R15(AVcc(N.C.))	—	A15(Vss(N.C.))

CAUTION

1. **If the emulator does not operate correctly, cracks may have been produced in the solder. Check conduction with a tester and re-solder the IC socket if necessary.**

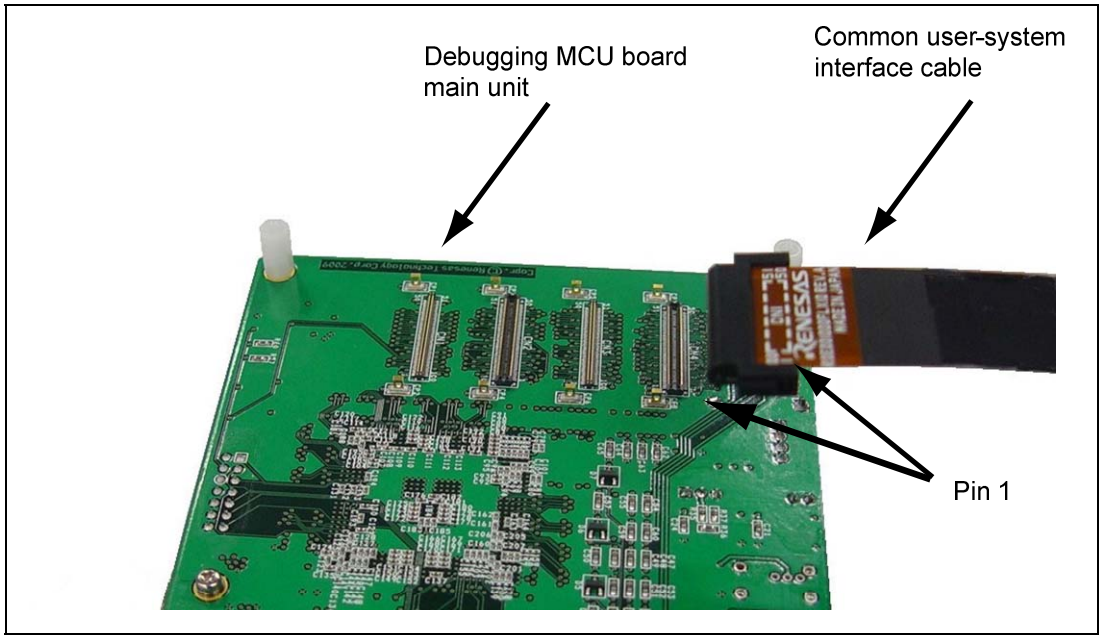


Figure 2.5 Connecting the Debug MCU Board Main Unit and the Common User-System Interface Cable

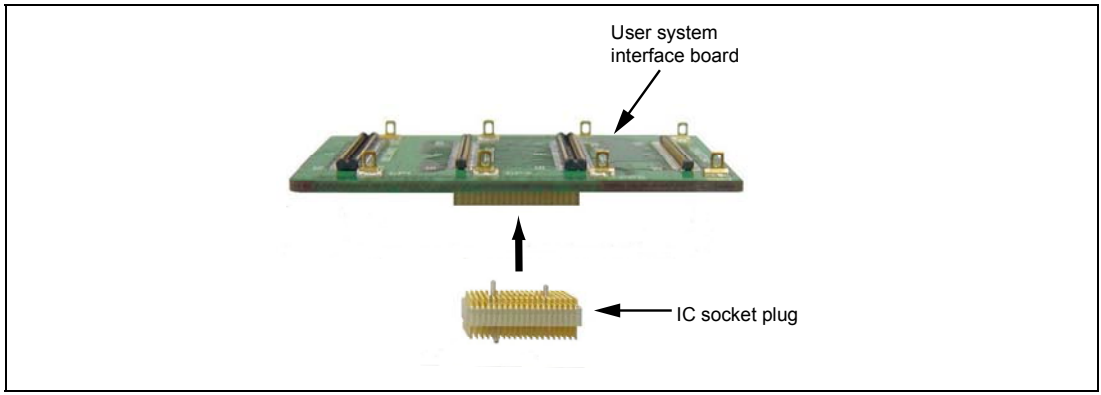


Figure 2.6 Connecting the User-System Interface Board and IC Socket Plug

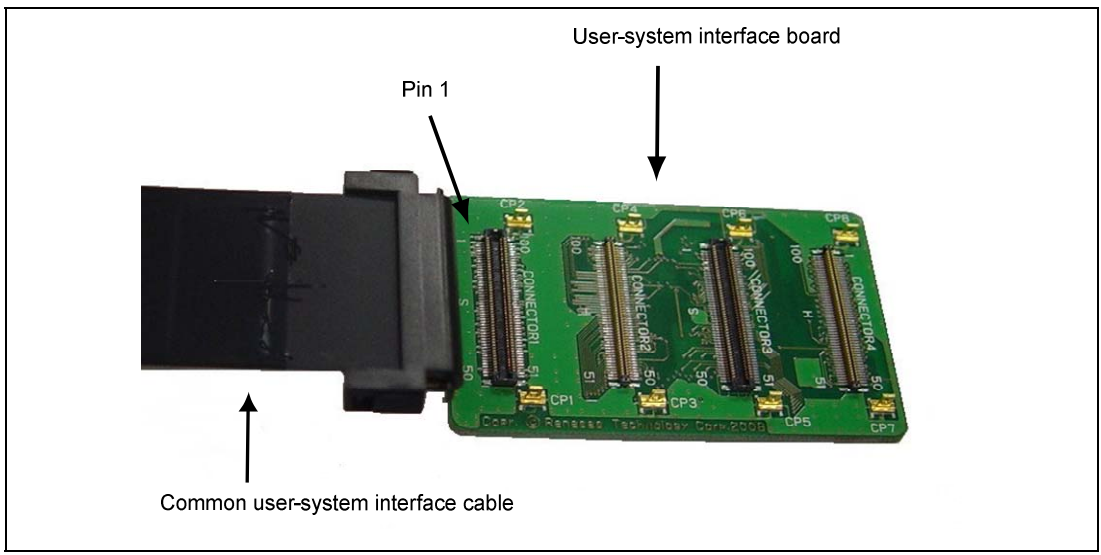


Figure 2.7 Connecting the User-System Interface Board and the Common User-System Interface Cable

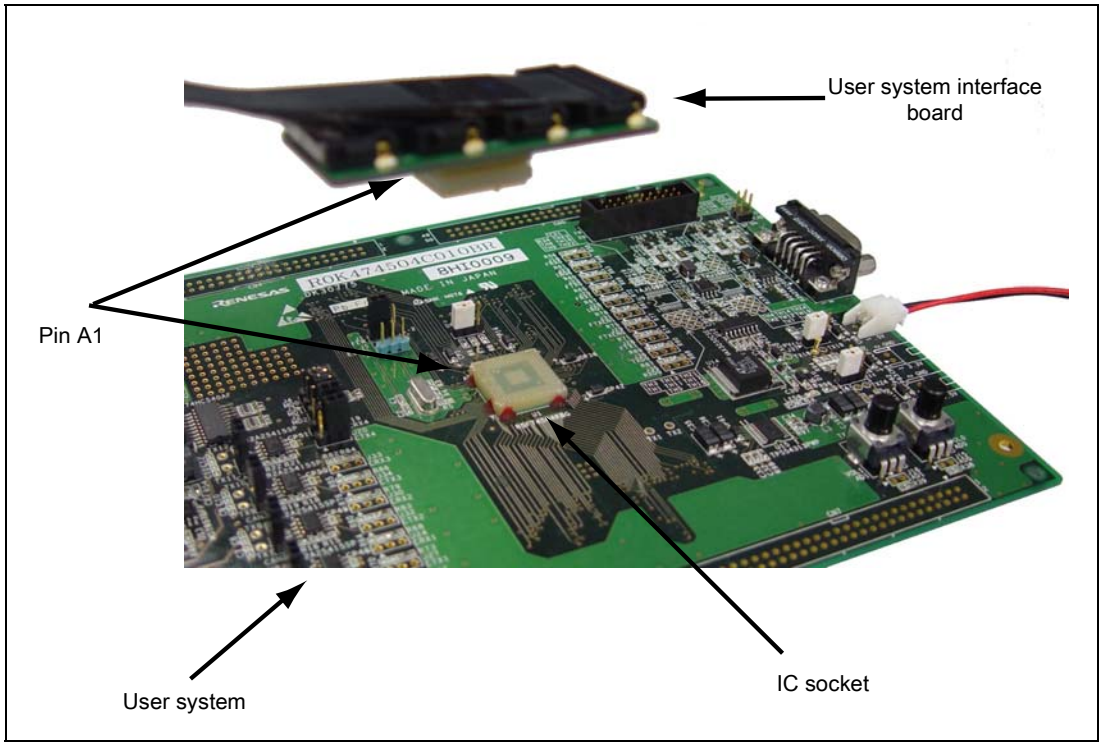


Figure 2.8 Connecting the User-System Interface Board to the User System

2.2.3 Setting the Power-Selection Switch

An external power supply or the VCC power supply on the user system can be selected as the source of power for the debugging MCU board. However, even if supply of power from the user system is selected, external power must be supplied by the power cable for the debugging MCU board.
Refer to table 2.1 when selecting the power supply for the MCU.

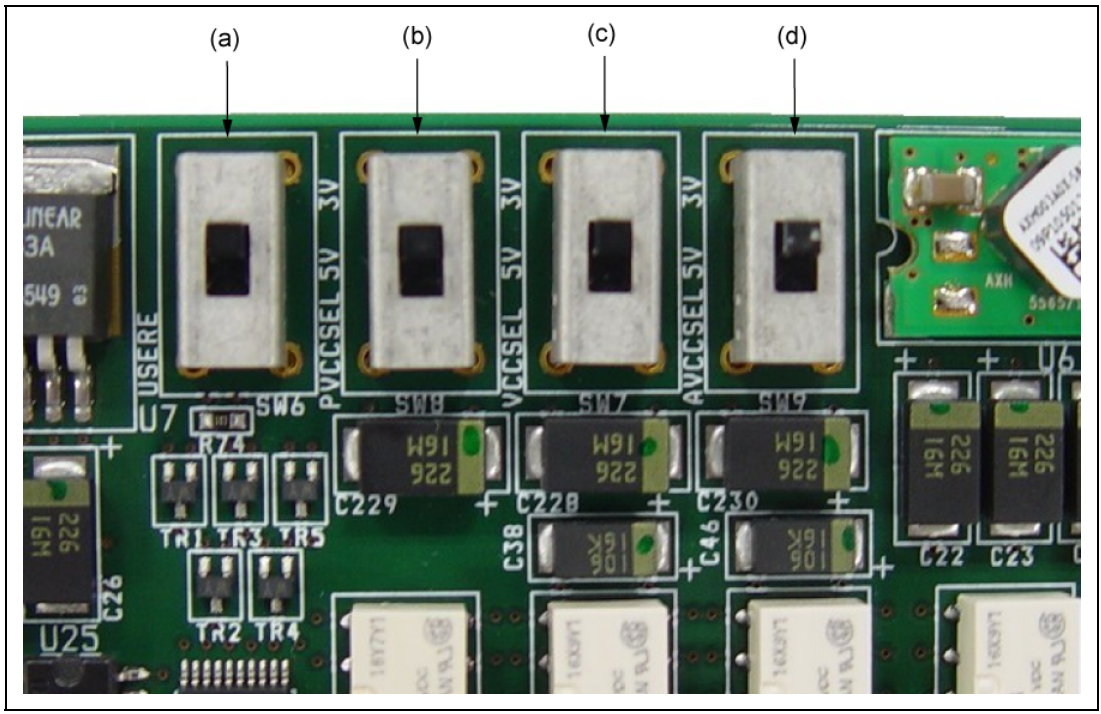


Figure 2.9 Power-Selection Switch

Table 2.1 Correspondence of Power-Selection Switch Settings

No.	SW No.	Silk-Screened Label	Power Supply to be Used
(a)	SW6	USERE (upper position)	VCC, PVCC, and AVCC on the user system (factory setting) are used for the power supply of the MCU.
		USERE (lower position)	External power supply connected to the power cable
(b)	SW8	PVCCSEL (3 V)	Operation is with PVCC at 3.3 V*
		PVCCSEL (5 V)	Operates is with PVCC at 5.0 V (factory setting)*
(c)	SW7	VCCSEL (3 V)	Operates is with VCC at 3.3 V*
		VCCSEL (5 V)	Operates is with VCC at 5.0 V (factory setting)*
(d)	SW9	AVCCSEL (3 V)	Operates is with AVCC at 3.3 V*
		AVCCSEL (5 V)	Operates is with AVCC at 5.0 V (factory setting)*

Note: * This is only valid when the USERE switch (a) is in the lower position. When USERE is in the upper position, the board will operate from the user power supply regardless of this setting.

2.2.4 Connecting the Power Cable

The power cable must be connected to the debugging MCU board so that power can be supplied from beyond the board. Connect the power cable to the power-cable connector (CN5) on the debugging MCU board as shown in figure 2.10.

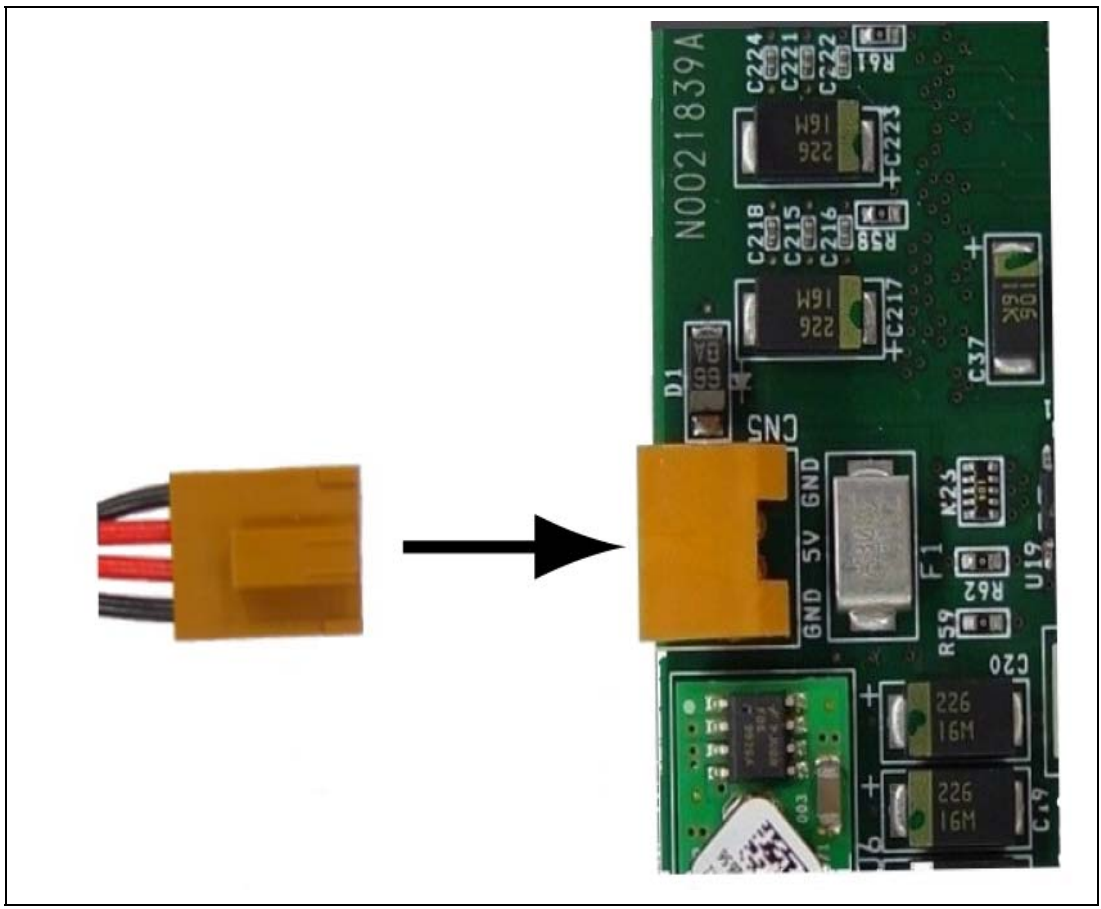


Figure 2.10 Connecting the Power Cable to the Debugging MCU Board

2.2.5 Setting the User-System Input Control Signal Setting Switches

To support debugging without connection to the user system, settings are available to select control signals (MD2 to MD0 and FWE) for input to the MCU on this MCU board and to enable or disable input of the NMI, DET3OR5, RES and clock signal from the user system. Settings are also made to select the target MCU for debugging. Table 2.2, 2.3, and 2.4 list the signals and settings.

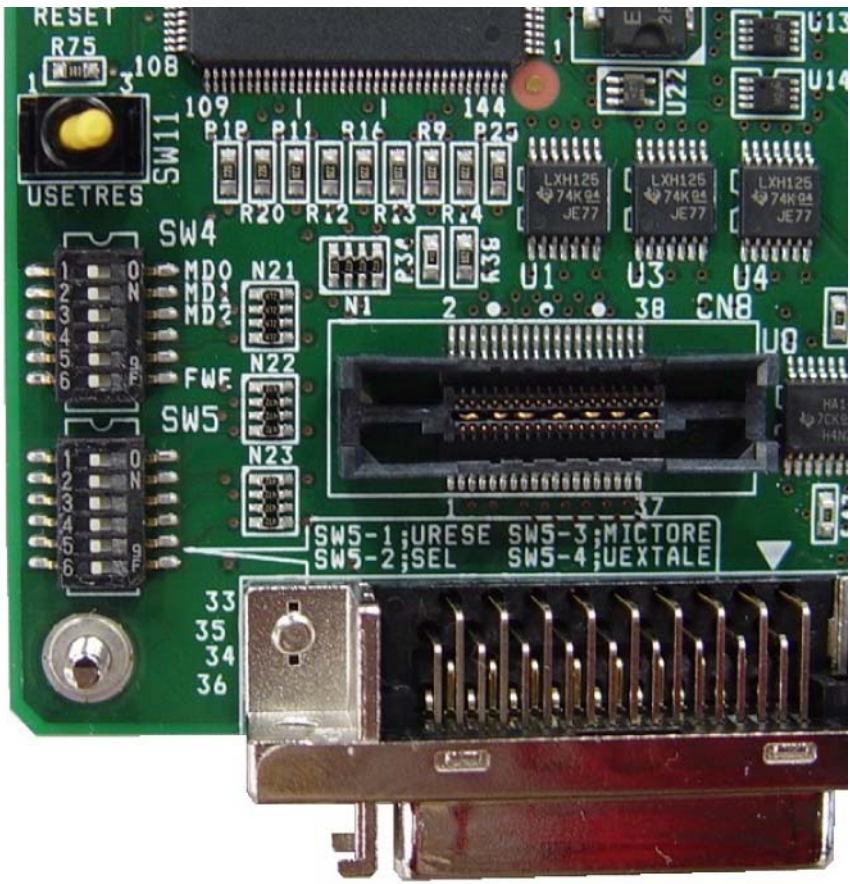


Figure 2.11 Control Signal Enabling/Disabling Switches

Table 2.2 Correspondence of Control Signal Setting Switches

Number on the Block	Left-hand Position	Right-hand Position
SW4-1 (MD0) *1	Input MODE0 = H	Input MODE0 = L (factory setting)
SW4-2 (MD1) *1	Input MODE1 = H	Input MODE1 = L (factory setting)
SW4-3 (MD2) *1	Input MODE2 = H	Input MODE2 = L (factory setting)
SW4-4	Do not change the setting.	Do not change the setting (factory setting).
SW4-5	Do not change the setting.	Do not change the setting (factory setting).
SW4-6 (FWE)*1	Input FWE = H	Input FWE = L (factory setting)
SW5-1 (URESE)	Enables input of the RESET signal from the user system	Disables input of the RESET signal from the user system (factory setting)
SW5-2 (SEL)	When debugging MCUs of the SH7455 and SH7456 groups.	When debugging MCUs of the SH7450 and SH7451 groups.
SW5-3 (MICTORE) *2	When using the 38-pin connector (CN8).	When debugging with the E10A-USB (factory setting).
SW5-4 (UEXTALE)	Use the clock input from the user system.*3	Use the oscillator module (20 MHz) on the debugging MCU board (factory setting)
SW5-5	Do not change the setting.	Do not change the setting (factory setting).
SW5-6	Do not change the setting (factory setting).	Do not change the setting.

Notes: 1. When SW6 (USERE) (described in section 2.2.3, Setting the Power-Selection Switches) is in the upper position, the input signal level from the user system is input to the MCU, therefore this setting will be invalid. This setting is valid only when the SW6 (USERE) is in the lower position.

2. This setting is only applicable with the 38-pin connector which is for use in future expansion. In normal operation (debugging with the E10A-USB), place this switch in the right-hand position. If this switch is placed in the left-hand position, also place SW10 (E10A) in the right-hand position.

3. As the operating clock, this debugging MCU board supports neither the crystal oscillator nor the clock oscillator from the user system.

4. This debugging MCU board is capable of operating without connection to the user system. Refer to section 2.4, Setting Up the Debugging MCU Board for Single Operation, for the use of simple evaluation before designing the user system.

5. Refer to section 2.3.6, Selecting the Target MCU, for setting up the E10A-USB emulator.

Table 2.3 List of Pin Settings by Operating Mode (Reference)

No.	Mode		Pin Setting			
			MD2	MD1	MD0	FWE
Mode 0	Single chip mode	User mode	"L"	"L"	"L"	"L" or "H"
Mode 1		Boot mode	"L"	"H"	"L"	"H"
Mode 2		User boot mode	"H"	"L"	"L"	"H"
Mode 3	ROM-enabled expansion mode	User mode	"L"	"L"	"H"	"L" or "H"
Mode 4		Boot mode	"L"	"H"	"H"	"H"
Mode 5		User boot mode	"H"	"L"	"H"	"H"

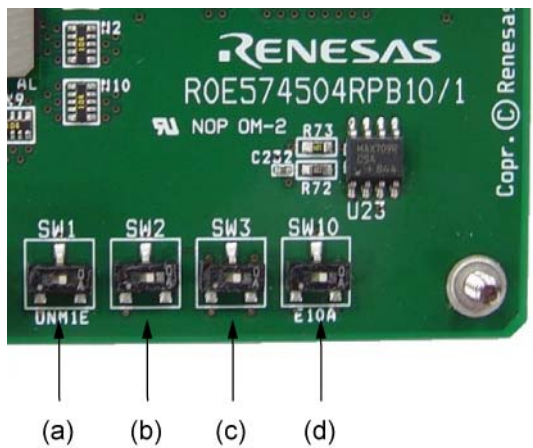


Figure 2.12 Setting Switches for the NMI and DET3OR5 Signals

Table 2.4 List of the Switch Settings for the NMI and DET3OR5 Signals

No.	Number on the Block	Left-hand side	Right-hand side
(a)	SW1(UNMIE)	Enables input of the NMI signal from the user system (factory setting)	Disables input of the NMI signal from the user system (high level is always input as the NMI signal)
(b)	SW2	Enables input of the DET3OR5 signal from the user system (factory setting)	Disables input of the DET3OR5 signal from the user system (the DET3OR5 signal level for input to the MCU is specified by the setting of SW3 as listed below.)
(c)	SW3	Operation is with VCC at 5.0 V (factory setting)	Operation is with VCC at 3.3 V
(d)	SW10(E10A) *	When debugging by using the E10A-USB (factory setting)	When using the 38-pin connector (CN8)

Note: This setting is only applicable with the 38-pin connector which is for use in future expansion. In normal operation (debugging with the E10A-USB), place this switch in the left-hand position. If this switch is placed in the right-hand position, also place SW5-3 (MICTORE) in the left-hand position.

2.2.6 Connecting the System Ground

⚠ WARNING

Separate the frame ground and signal ground of the user system. Failure to do so will create a FIRE HAZARD that can damage the user system and emulator product, or produce PERSONAL INJURY.

The signal grounds of the E10A-USB emulator and the debugging MCU board are connected to the user system's signal ground. In the emulator, the signal ground and frame ground are connected. In the user system, only connect the frame ground to earth; do not connect the signal ground to the frame ground (figure 2.13).

If it is difficult to separate the frame ground from the signal ground in the user system, tie the frame ground of the user system to the same potential as the GND level of the DC power input (AC adapter) of the host computer. This is because differences in GND potential between the host computer and target system will lead to excessive flows of current in the low-impedance GND lines, and thin lines might burn out.

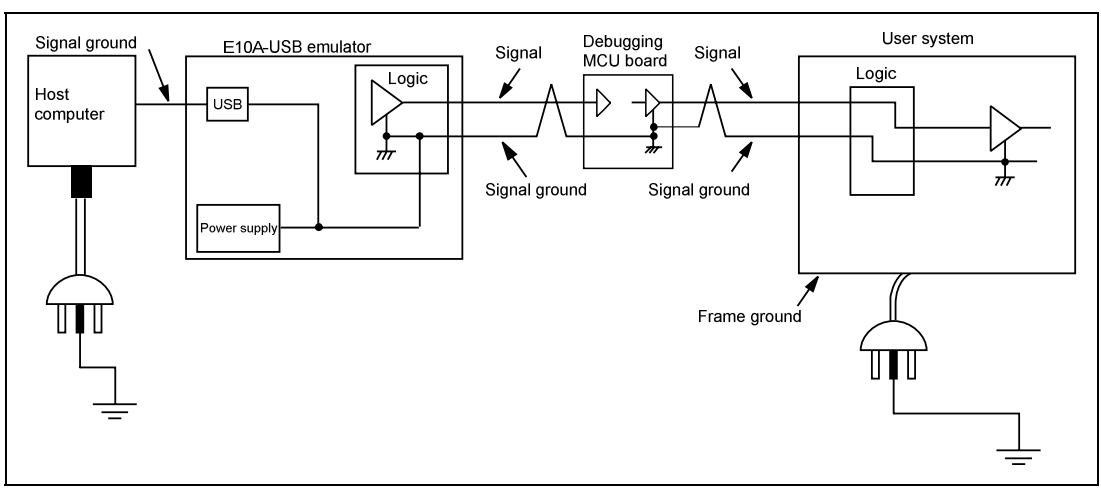


Figure 2.13 Connecting System Ground

2.3 Setting the E10A-USB Emulator

2.3.1 Setting the DIP Switches of the E10A-USB Emulator

Set the DIP switches of the E10A-USB emulator as follows.

1. Open the sliding switch cover in the lower right portion of the upper side of the E10A-USB emulator by sliding it to the right as shown in figure 2.14.
2. Turn all of the DIP switches (SW1, SW2, and SW3) on (‘1’ side).

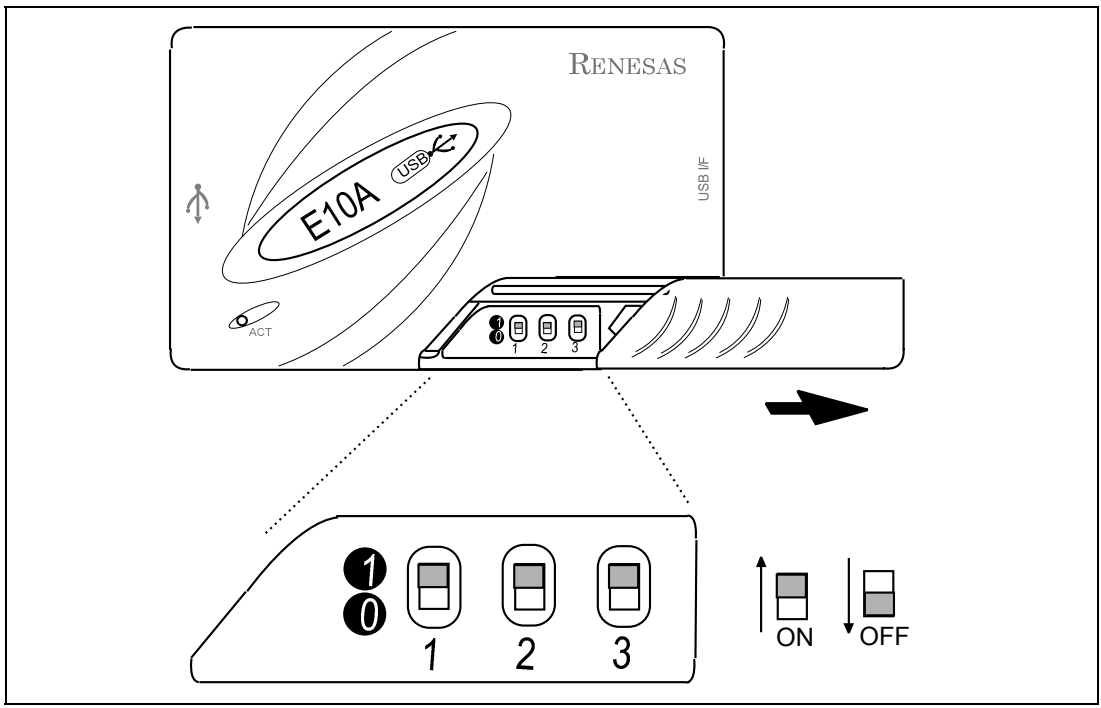


Figure 2.14 Setting the DIP Switches of the E10A-USB Emulator

2.3.2 CD-R

The emulator's software for the debugging MCU board is included in the CD-R provided with the E10A-USB emulator.

The root directory of the CD-R contains a setup program for installing the emulator's software for the debugging MCU board. The folders contain the files and programs listed below.

Table 2.5 Contents of the CD-R Directories

Directory Name	Contents	Description
Dlls	Microsoft® runtime library	A runtime library for the High-performance Embedded Workshop. The version is checked at installation and this library is copied to the hard disk as part of the installation process.
Drivers	E10A-USB emulator driver	USB drivers for the E10A-USB emulator.
Help	Online help for the E10A-USB emulator	An online help file. This is copied to the hard disk as part of the installation process.
Manual	E10A-USB emulator manuals	E10A-USB emulator user's manuals. They are provided as PDF files.

Execute HewInstMan.exe from the root directory of the CD-R and follow the cues shown on screen to install the software.

Follow the cues given by the installation wizard to install the software.

Note: When a driver is installed in Windows® XP, a warning message on the Windows® logo test may be displayed, but it is not a problem. Select [Continue Anyway] to proceed with driver installation.

2.3.3 Connecting the E10A-USB Emulator to the Host Computer

This section describes how to connect the E10A-USB emulator to the host computer. For the position of each connector of the emulator, refer to the SuperH™ Family E10A-USB Emulator User's Manual.

Notes: 1. When [Add New Hardware Wizard] is displayed, select the [Search for the best driver for your device. (Recommended)] radio button and then the [Specify a location] check box to select the path to be searched for drivers. The location must be specified as <Drive>:\DRIVERS. (<Drive> is the CD drive letter.)

2. When a driver is installed in Windows® XP, a warning message on the Windows® logo test may be displayed, but it is not a problem. Select [Continue Anyway] to proceed with driver installation.

3. Be sure to install the software for the E10A-USB emulator before putting the emulator in place.

⚠ WARNING

Always switch OFF the emulator product and the user system before connecting or disconnecting any CABLES except for the USB interface cable. Failure to do so will result in a FIRE HAZARD and will damage the user system and the emulator product or will result in PERSONAL INJURY.
The USER PROGRAM will be LOST.

The E10A-USB emulator is connected to the host computer via the USB 1.1, and also to the USB port conforming to USB 2.0. Figure 2.15 shows the system configuration.

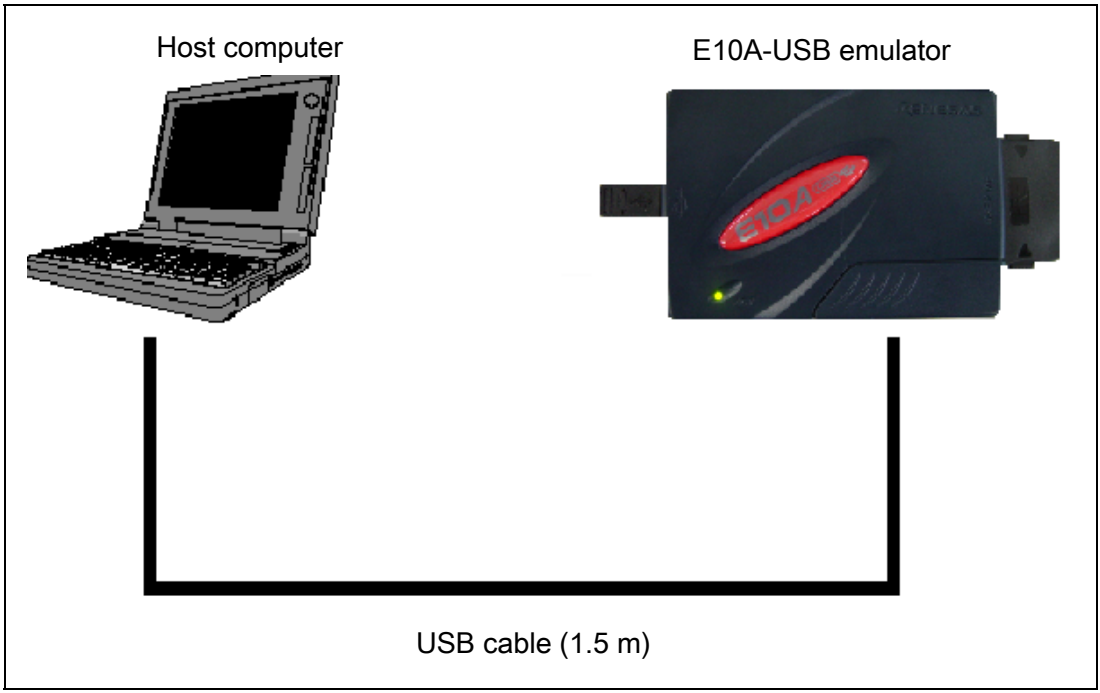


Figure 2.15 System Configuration when Connecting the E10A-USB Emulator to the Host Computer

2.3.4 Setting Up the E10A-USB Emulator

Set up the E10A-USB emulator's firmware referring to section 3.10, Setting Up the Emulator, and section 3.11, System Check, in the SuperH™ Family E10A-USB Emulator User's Manual.

2.3.5 Activating the High-performance Embedded Workshop

Activate the High-performance Embedded Workshop referring to section 4, Preparations for Debugging, in the SuperH™ Family E10A-USB Emulator User's Manual, which describes the activation procedure.

2.3.6 Selecting the Target MCU

Select the target MCU for the emulator according to that in use. For details, refer to section 4, Preparations for Debugging, in the SuperH™ Family E10A-USB Emulator User's Manual.

For debugging the SH7450 series debugging MCU board, select the following (refer to table 2.6) in the [Debugger Target] and [Select Emulator mode] dialog boxes.

Table 2.6 Selection of the Target Device

Device Group	SW5-2 (SEL)	[Debugger Target]	[Select Emulator Mode]
SH7450 and SH7451Groups	Right	SH-4A E10A-USB SYSTEM (CPU SH-4A)	SH74504 Debug MCU BOARD
SH7455 and SH7456 Groups	Left		SH74552 Debug MCU BOARD

2.4 Setting Up the Debugging MCU Board for Single Operation

Since the debugging MCU board can be initiated even if the user system has not been connected, it is available for simple evaluation before designing the user system.

⚠ WARNING

1. **Always disconnect the E10A-USB emulator from the host computer and switch OFF the debugging MCU board before setting switches on the debugging MCU board. Failure to do so will create a FIRE HAZARD that can damage the E10A-USB emulator product, the debugging MCU board, or the user-system interface board.**
2. **For the single operation of the debugging MCU board, connector pins on the bottom of the user system interface board, which are used for connecting the user system, are disconnected. To prevent connector pins from being shorted, be sure to put an insulator under the user-system interface board or pull out the common user-system interface cable from the main debugging MCU board.**

2.4.1 Setting Switches on the Debugging MCU Board

For the single operation of the debugging MCU board, set the switches on the debugging MCU board as described below and activate the High-performance Embedded Workshop.

1. Only the oscillator module installed on the debugging MCU board is supported as the source of the clock signal.
   Set the clock-selection jumper (SW5-4: UEXTALE) to the right-hand position.
2. For stand-alone operation of the debugging MCU board, make the switch settings listed below.
   - Set the user NMI signal disabling/enabling switch (SW: UNMIE) to the “disabled” setting.
   - Set the user DET3OR5 signal disabling/enabling signal switch (SW2) to the “disabled” setting.
   - Set the user DET3OR5 signal setting switch (SW3) to match the operating voltage.
   - Set control signal setting switches 1 (SW4) to select the operating mode.
   - Set SW5-1 on control signal setting switch block 2 (SW5) to the “disabled” setting.
   - Set the voltage setting switches (SW7: VCCSEL, SW8: PVCC, and SW9: AVCC) to match the operating voltages.
   - Set the selection switch (SW5-2: SEL) for MCUs to match the target MCU for debugging.
3. Only the external power supply is supported at the stand-alone emulator operation. Set the power-selection switch (SW6: USERE) to the lower position and supply the external power from the power-cable connector.

Table 2.7 lists the switch setting for operation without connection to the user system.

Table 2.7 Switch Settings for Stand-Alone Emulator Operation

No.	Remarks	Setting for Stand-Alone Emulator Operation
SW1 (UNMIE)	Enables or disables the input of NMI signals from the user system.	Right-hand position (disabled)
SW2	Enables or disables the input of DET3OR5 signals from the user system.	Right-hand position (disabled)
SW3	Specifies the value of the DET3OR5 signal (left-hand position: operation with VCC at 5.0 V, right-hand position: operation with VCC at 3.3 V).	Side for operation at desired VCC
SW4-1 (MD0)	Specifies the value of the MODE 0 signal (left-hand position: "H" input, right-hand position : "L" input).	Desired mode of operation
SW4-2 (MD1)	Specifies the value of the MODE1 signal (left-hand position: "H" input, right-hand position : "L" input).	
SW4-3 (MD2)	Specifies the signal value of the MODE2 (left-hand position: "H" input, right-hand position : "L" input).	
SW4-4	Not used	Right-hand position (factory setting)
SW4-5	Not used	Right-hand position (factory setting)
SW4-6 (FWE)	Specifies the value of the FWE signal (left-hand position: "H" input, right-hand position : "L" input).	Desired FWE signal for input

Table 2.7 Switch Settings for Stand-Alone Emulator Operation (cont.)

No.	Remarks	Setting for Stand-Alone Emulator Operation
SW5-1 (URESE)	Enables or disables the input of RESET signals from the user system.	Right-hand position (disabled)
SW5-2 (SEL)	Selects the target MCU for debugging (left-hand position : SH7455 and SH7456 groups, right-hand position: SH7450 and SH7451 groups).	Target MCU for debugging
SW5-3 (MICTORE)	Enables or disables the expansion connector.	Right-hand position (factory setting)
SW5-4 (UEXTALE)	Enables or disables input of a clock signal from the user system.	Right-hand position (disabled) The oscillator module on the debugging MCU board is used.
SW5-5	Not used	Right-hand position (factory setting)
SW5-6	Not used	Left-hand position (factory setting)
SW6 (USERE)	Selects the power-supply for input to the MCU.	Lower position The power supply from the power cable is used.
SW7 (VCCSEL)	Specifies VCC voltage (lower position: VCC is 5.0 V, upper position: VCC is 3.3 V).	Side for operation at desired VCC
SW8 (PVCCSEL)	Specifies PVCC voltage (lower position: PVCC is 5.0 V, upper position: PVCC is 3.3 V).	Side for operation at desired PVCC
SW9 (AVCCSEL)	Specifies AVCC voltage (lower position: AVCC is 5.0 V, upper position: AVCC is 3.3 V)	Side for operation at desired AVCC
SW10 (E10A)	For use in future expansion	Left-hand position
SW11 (USETRES)	RESET input to the MCU on the debugging MCU board.	Left-hand position ("1" side): RESET is input. Right-hand position ("3" side): RESET is not input.

2.4.2 Inputting Reset Signals to the Debugging MCU Board

When reset signals must be input, such as the case when activating the High-performance Embedded Workshop or debugging, they can be manually input from the reset switch on the debugging MCU board. For details on inputting reset signals, see table 2.8.

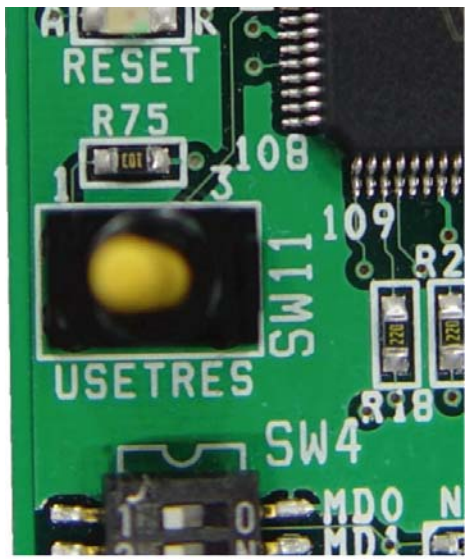


Figure 2.16 Reset Switch

Table 2.8 Correspondence of Reset Switch Settings

Setting of SW11	Reset Signal Input to the MCU on the Debugging MCU Board
Turned towards silk-screened label '3'	Reset signal from this reset switch (SW11) is input to the MCU (factory setting).
Turned towards silk-screened label '1'	Reset signal from the reset switch (SW11) is input to the MCU.

Note: This reset switch is used for the manual input of a reset signal to the MCU. This reset switch can input a reset signal to the MCU even if SW5-1 (URESE) has been set to invalidate the input of RESET signals from the user system. When the user system is connected, however, note that this switch does not produce a reset signal for the user system.

Section 3 Hardware Specifications

3.1 External Dimensions of the Debugging MCU Board

Figures 3.1 and 3.2 show the external dimensions of the debugging MCU board. Figures 3.3 and 3.4 show the external dimensions of the user-system interface board.

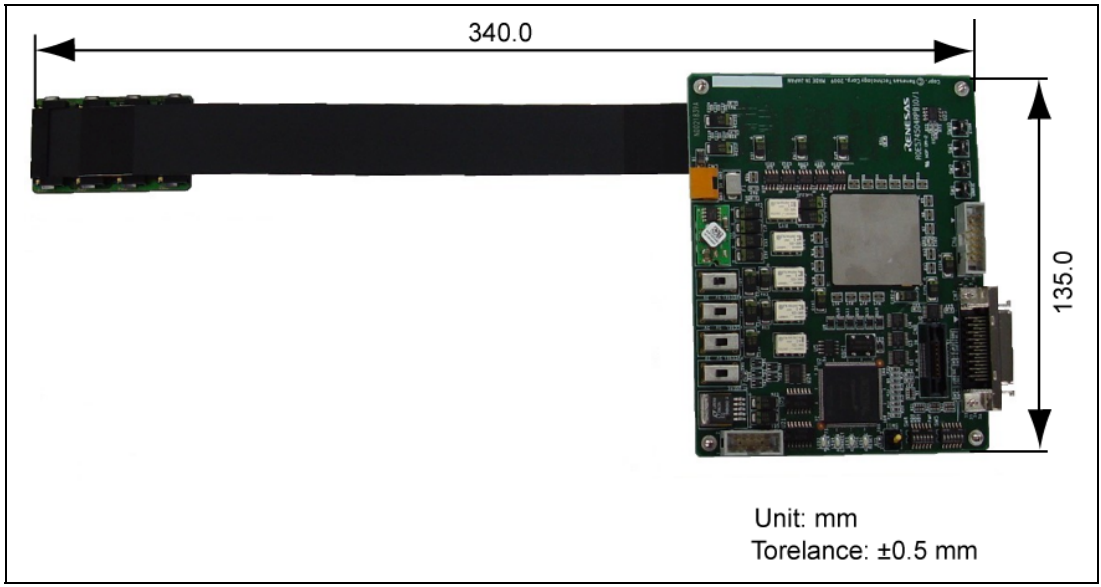


Figure 3.1 External Dimensions of the Debugging MCU Board

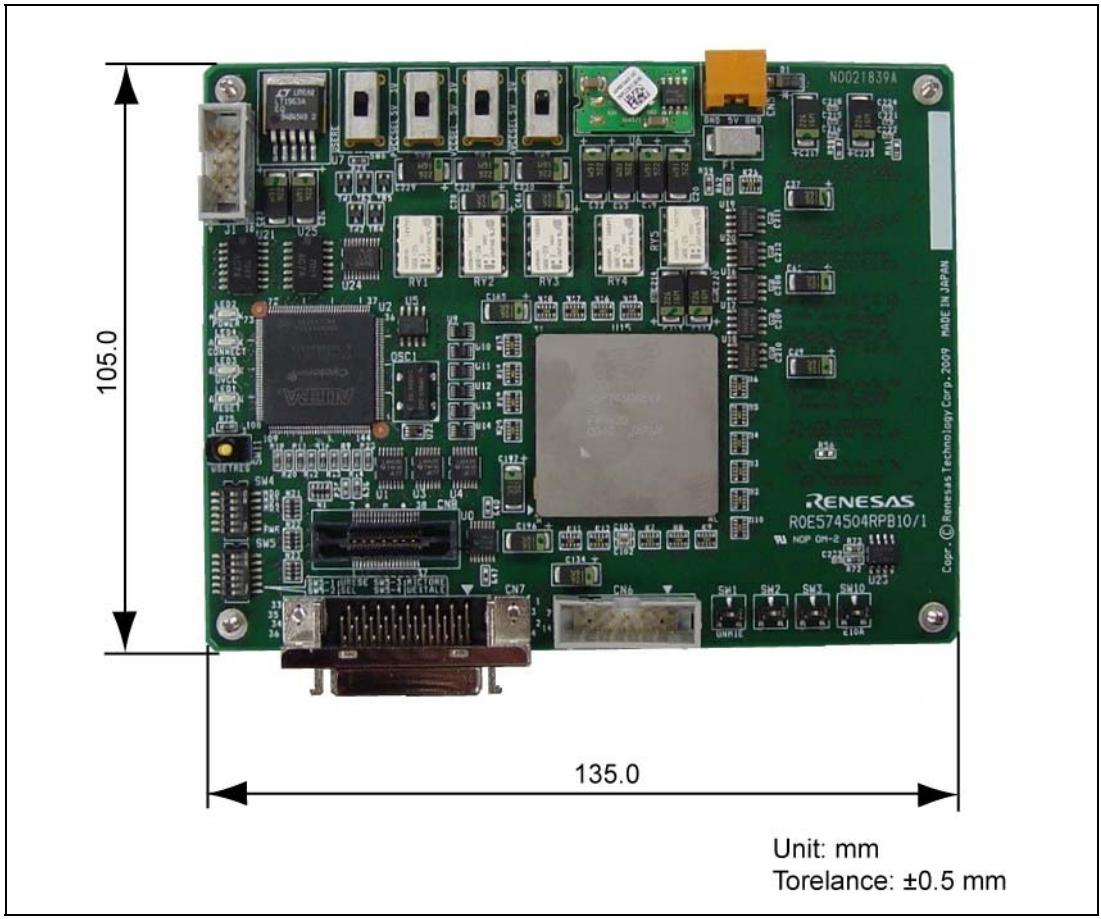


Figure 3.2 External Dimensions of the Main Unit of the Debugging MCU Board

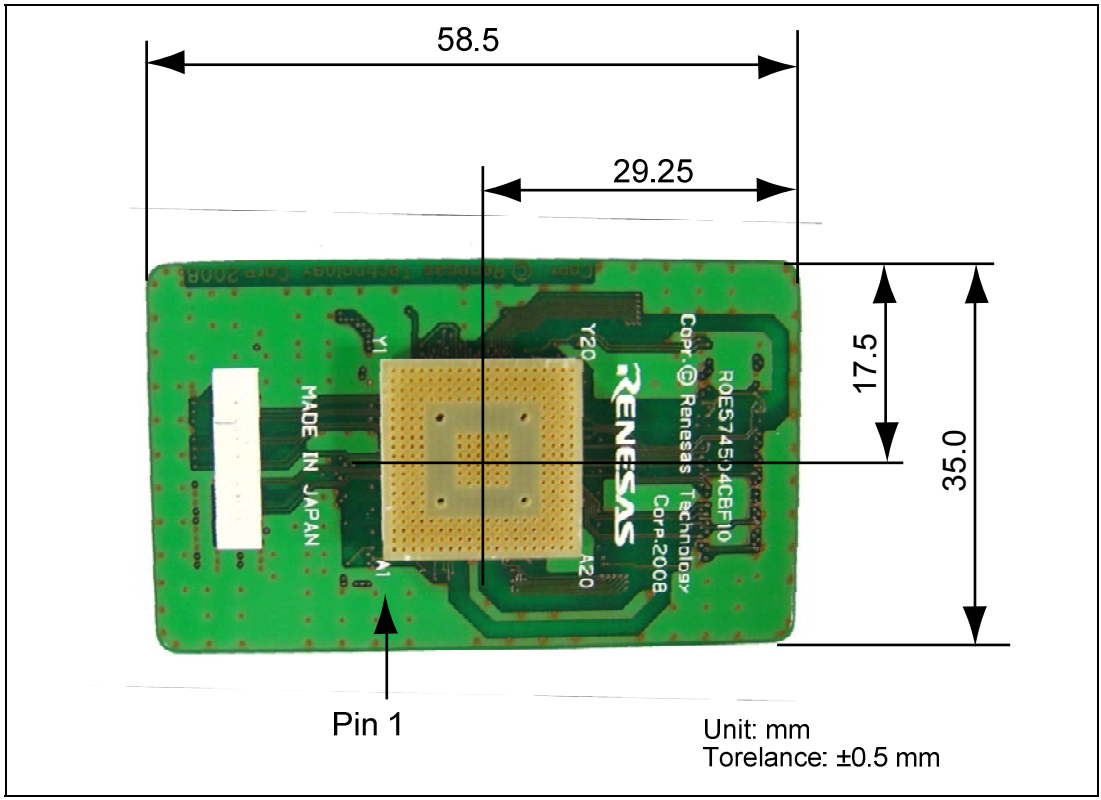


Figure 3.3 External Dimensions of the User-System Interface Board (R0E574504CBF10)

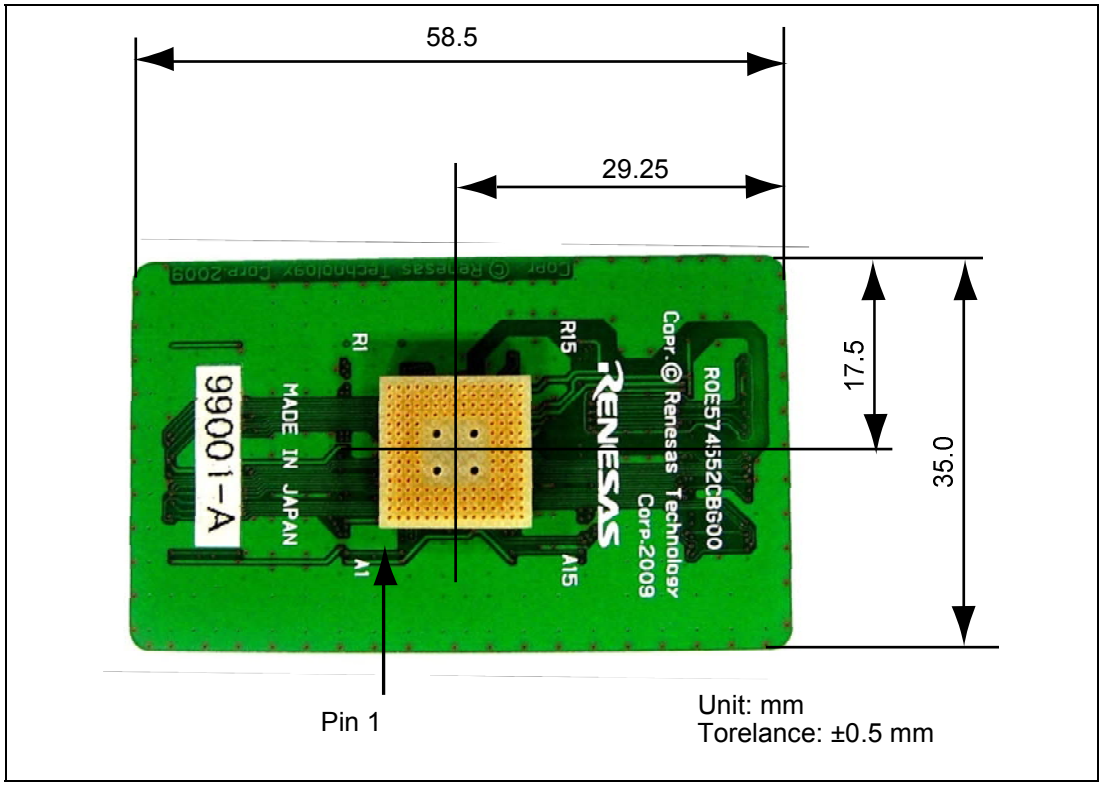


Figure 3.4 External Dimensions of the User-System Interface Board (R0E574552CBG00)

3.2 Resulting Dimensions after Connecting User System Interface Board

Figures 3.5 and 3.7 show the dimensions after the user-system interface board is connected to the user system. Figures 3.6 and 3.8 show the limitations on height in the design of user systems for the SH7450 and SH7451 groups and for the SH7455 and SH7456 groups, respectively. When designing the user system, make sure to keep this limitations on height.

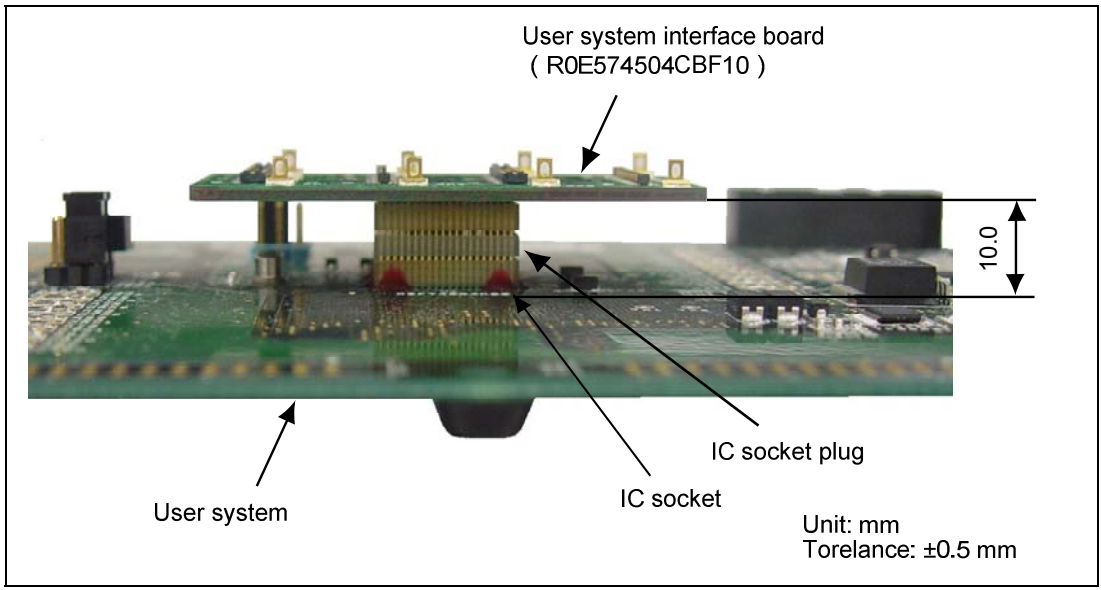


Figure 3.5 Dimensions after Connecting the User-System Interface Board (R0E574504CBF10)

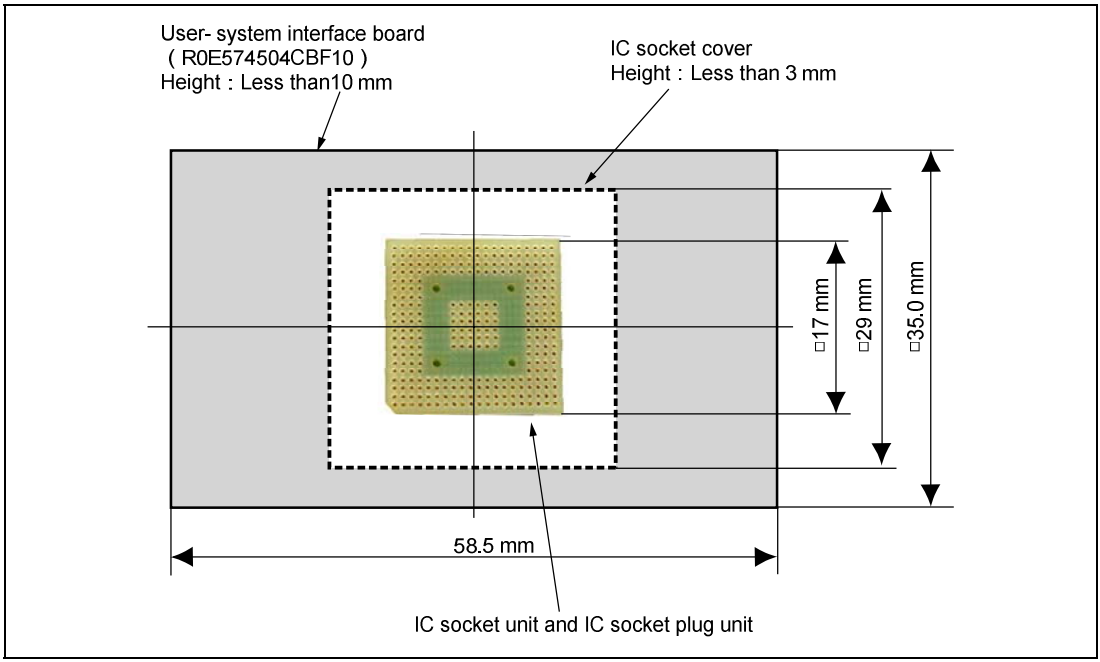


Figure 3.6 Limitations on Height in the Design of User Systems for the SH7450 and SH7451 Groups

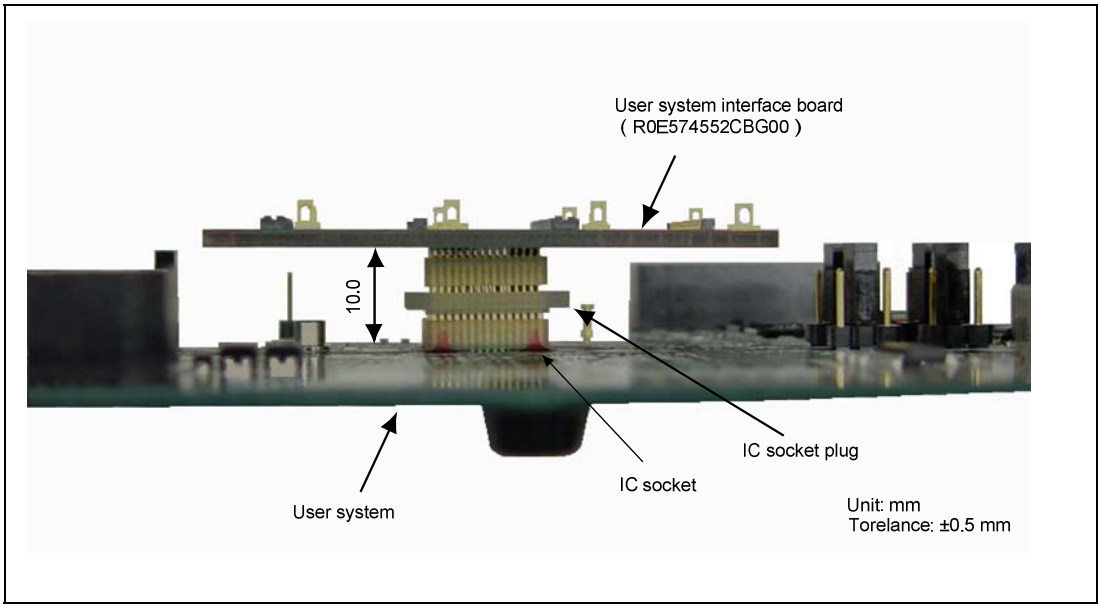


Figure 3.7 Dimensions after Connecting the User-System Interface Board (R0E574552CBG00)

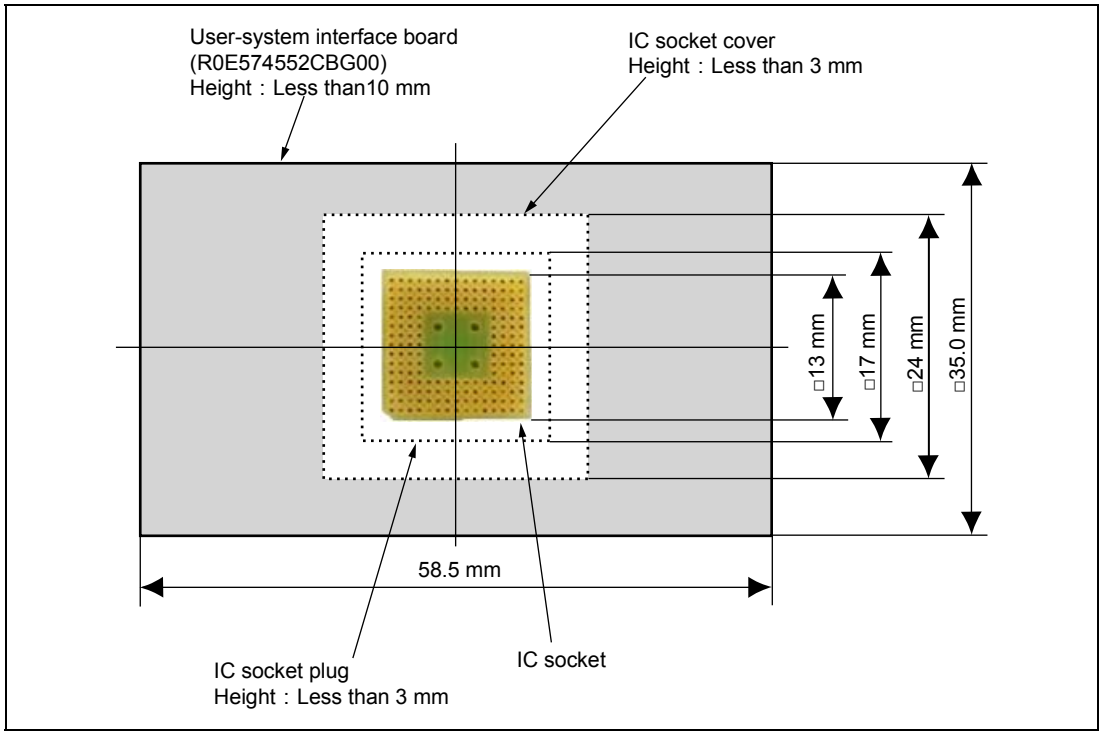


Figure 3.8 Limitations on Height in the Design of User Systems for the SH7455 and SH7456 Groups

3.3 Recommended Dimensions for User System Mount Pad (Footprint)

Figures 3.9 and 3.10 show the recommended dimensions for the mount pad (footprint) for the user system with an IC socket.

3.3.1 Using the SH7450 and SH7451 Groups (PRBG0292GB-A Package)

Figure 3.9 shows the recommended dimensions for the mounting pads on the user system.

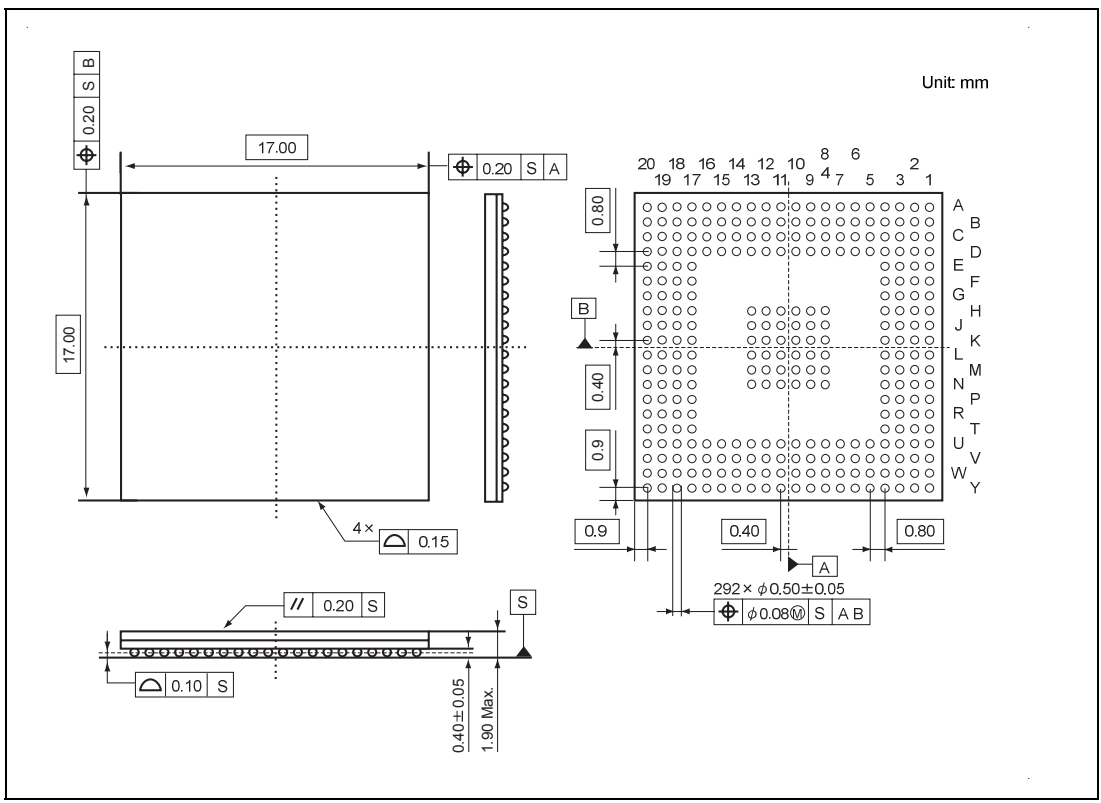


Figure 3.9 Recommended Dimensions of Mounting Pads for the PRBG0292GB-A

3.3.2 Using the SH7455 and SH7456 Groups (PRBG0176GA-A Package)

Figure 3.10 shows the recommended dimensions for the mounting pads on the user system.

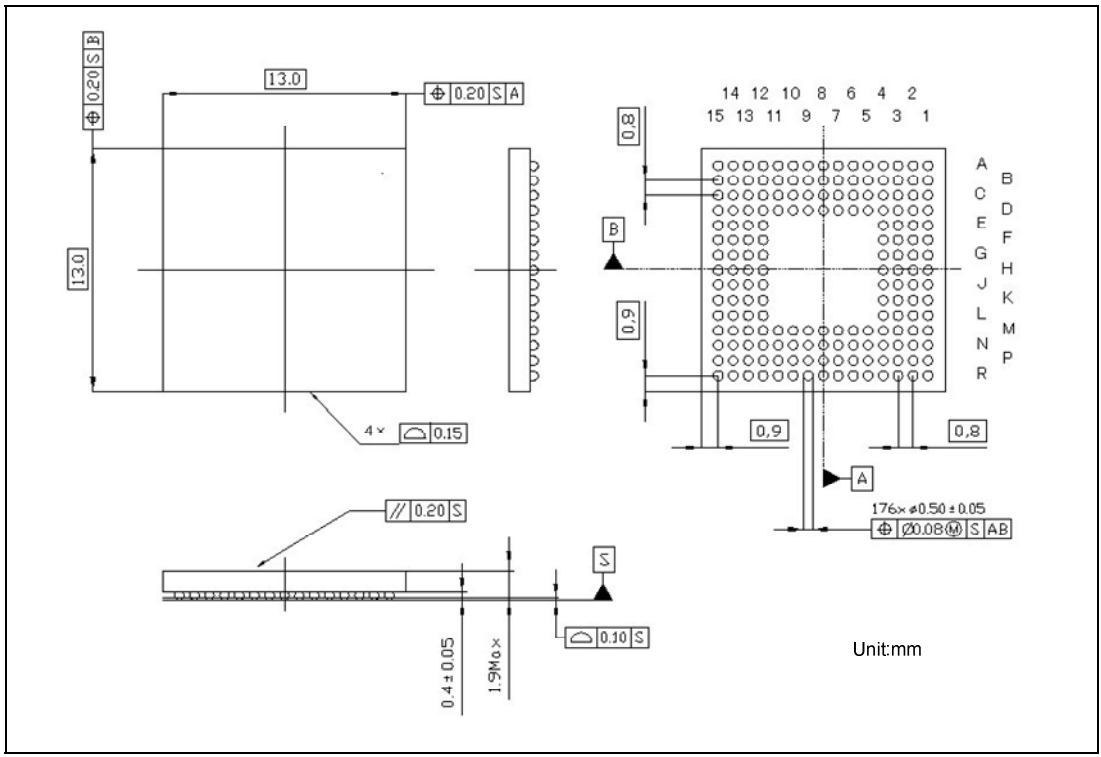


Figure 3.10 Recommended Dimensions of Mount Pad for the PRBG0176GA-A

3.4 Installing the MCU to the User System

CAUTION

1. **Check the location of pin A1 before inserting.**
2. **Use a Philips-type screwdriver whose head matches the screw head.**
3. **The tightening torque must be 0.054 N•m or less. If the applied torque cannot be accurately measured, stop tightening when the force required to turn the screw becomes significantly greater than that needed when first tightening. If a screw is tightened too much, the screw head may break or an IC socket contact error may be caused by a crack in the IC socket solder.**
4. **If the MCU does not operate correctly, cracks might have occurred in the solder. Check conduction with a tester and re-solder the IC socket if necessary.**

Check the location of pin A1 before inserting the MCU into the IC socket on the user system, as shown in figure 3.11. After inserting the MCU, fasten the socket cover with the provided four screws (M2.0 x 10 mm). Take special care, such as manually securing the IC socket soldered area, to prevent the IC socket from being damaged by overtightening the screws or twisting the components.

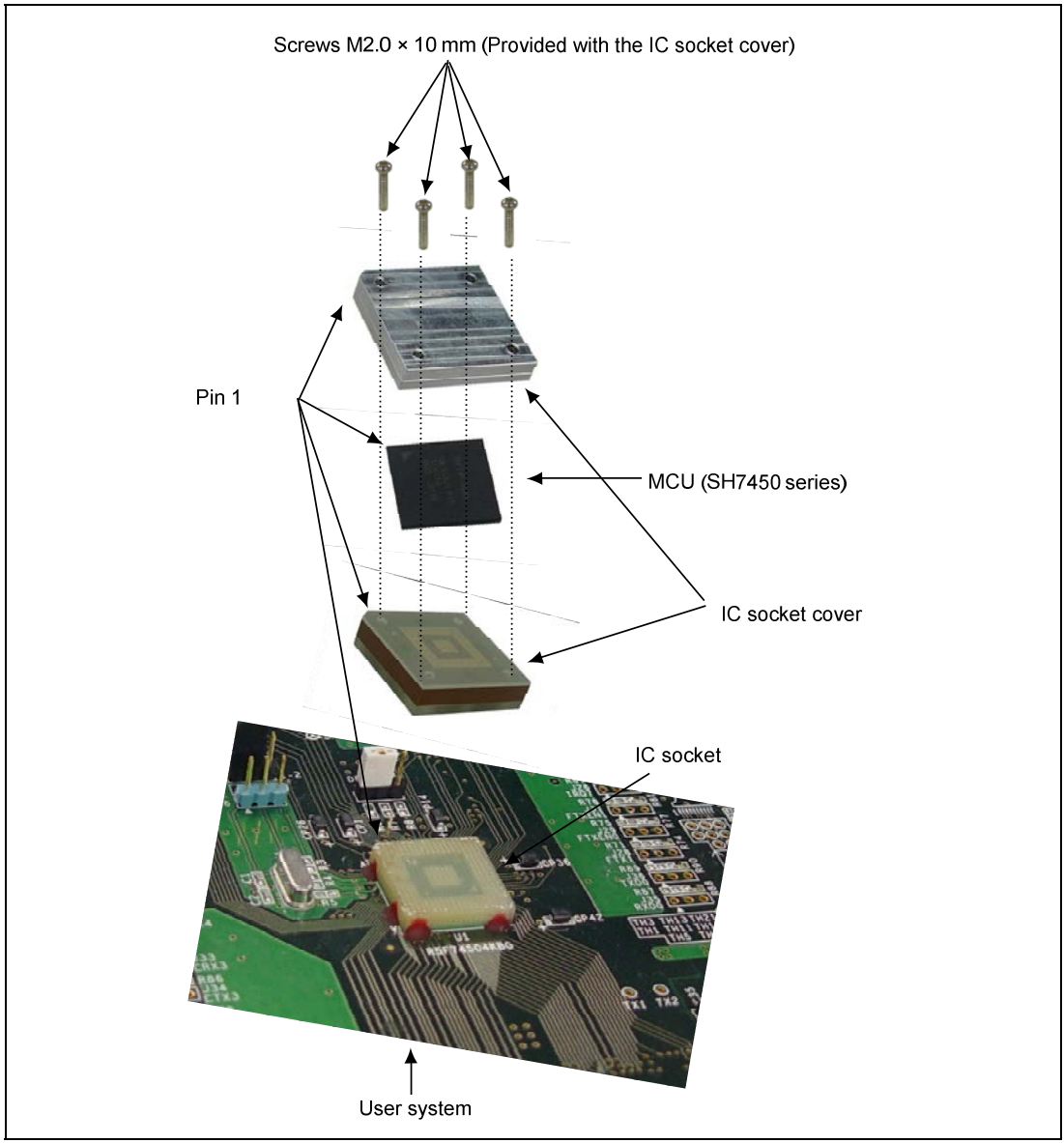


Figure 3.11 Installing MCU to User System

Note: Note that the IC socket and IC socket cover is differ according to the supported MCU. Although figure 3.11 shows an example of the installation for the SH7450 or SH7451, follow the same procedure in installation for the SH7455 and SH7456.

3.5 User System Interface Circuits

Figures 3.12 through 3.17 show user system interface circuits. Use them as a reference to determine the value of the pull-up resistance.

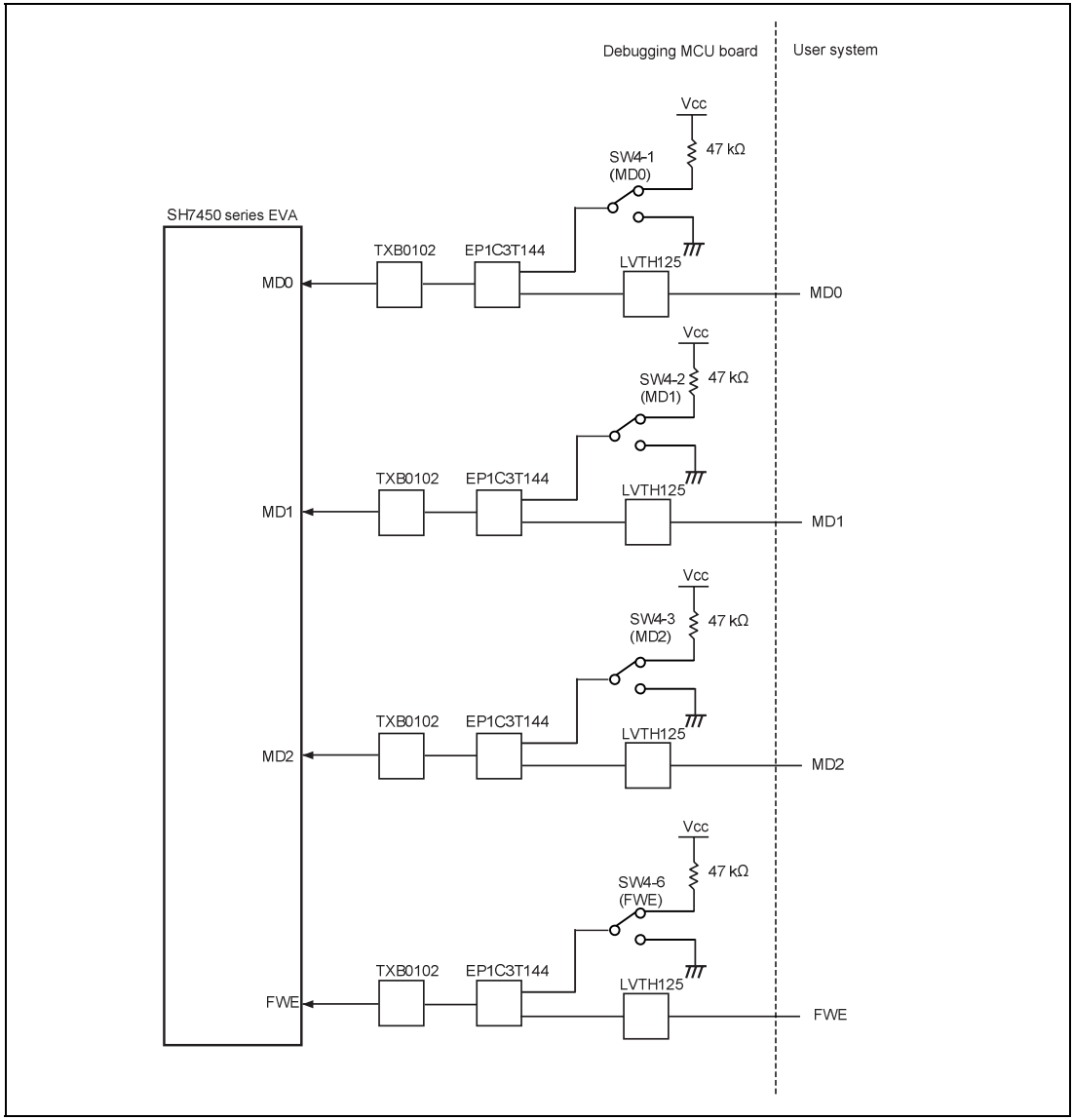


Figure 3.12 User System Interface Circuits

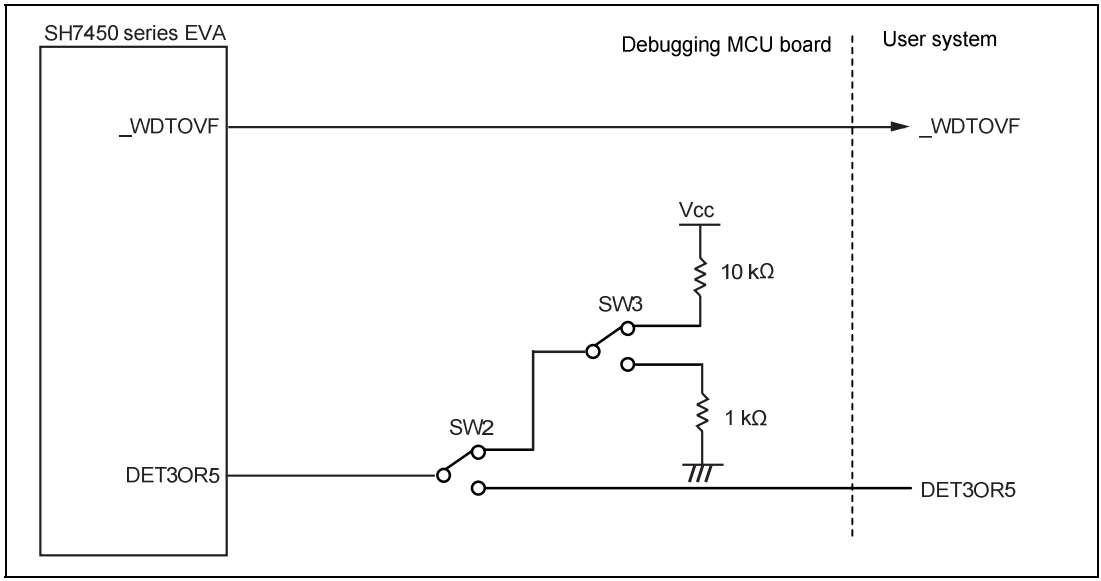


Figure 3.13 User System Interface Circuits

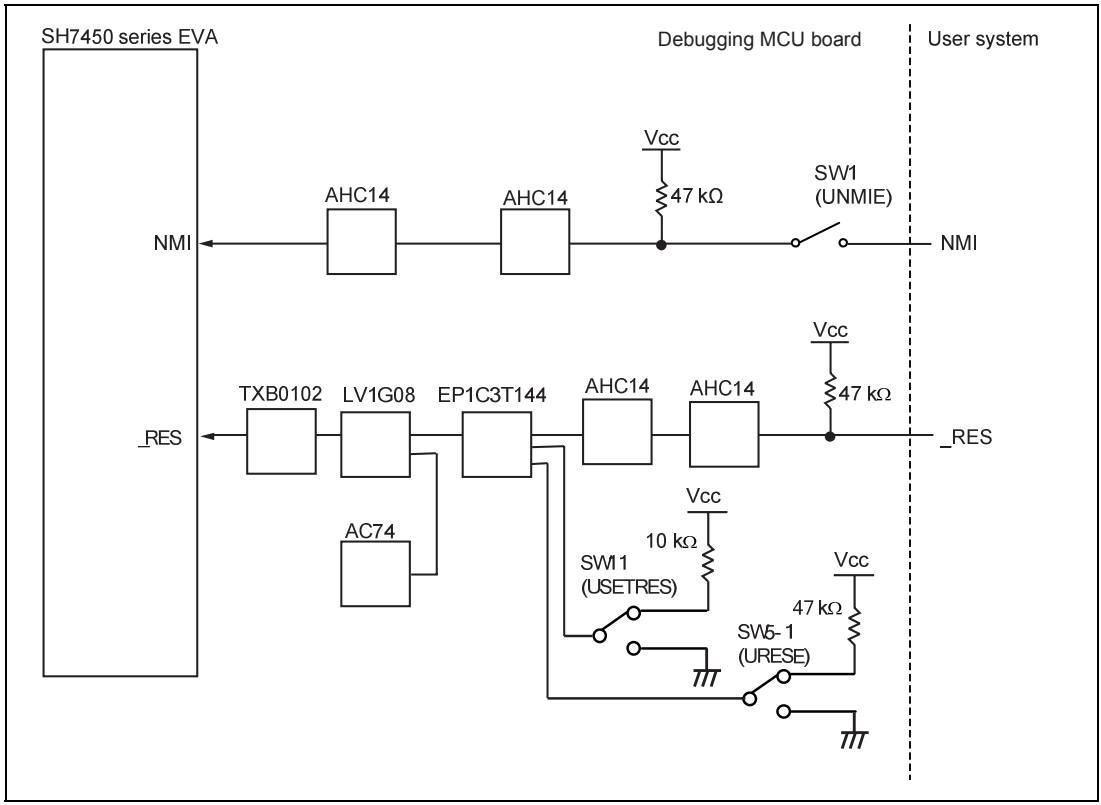


Figure 3.14 User System Interface Circuits

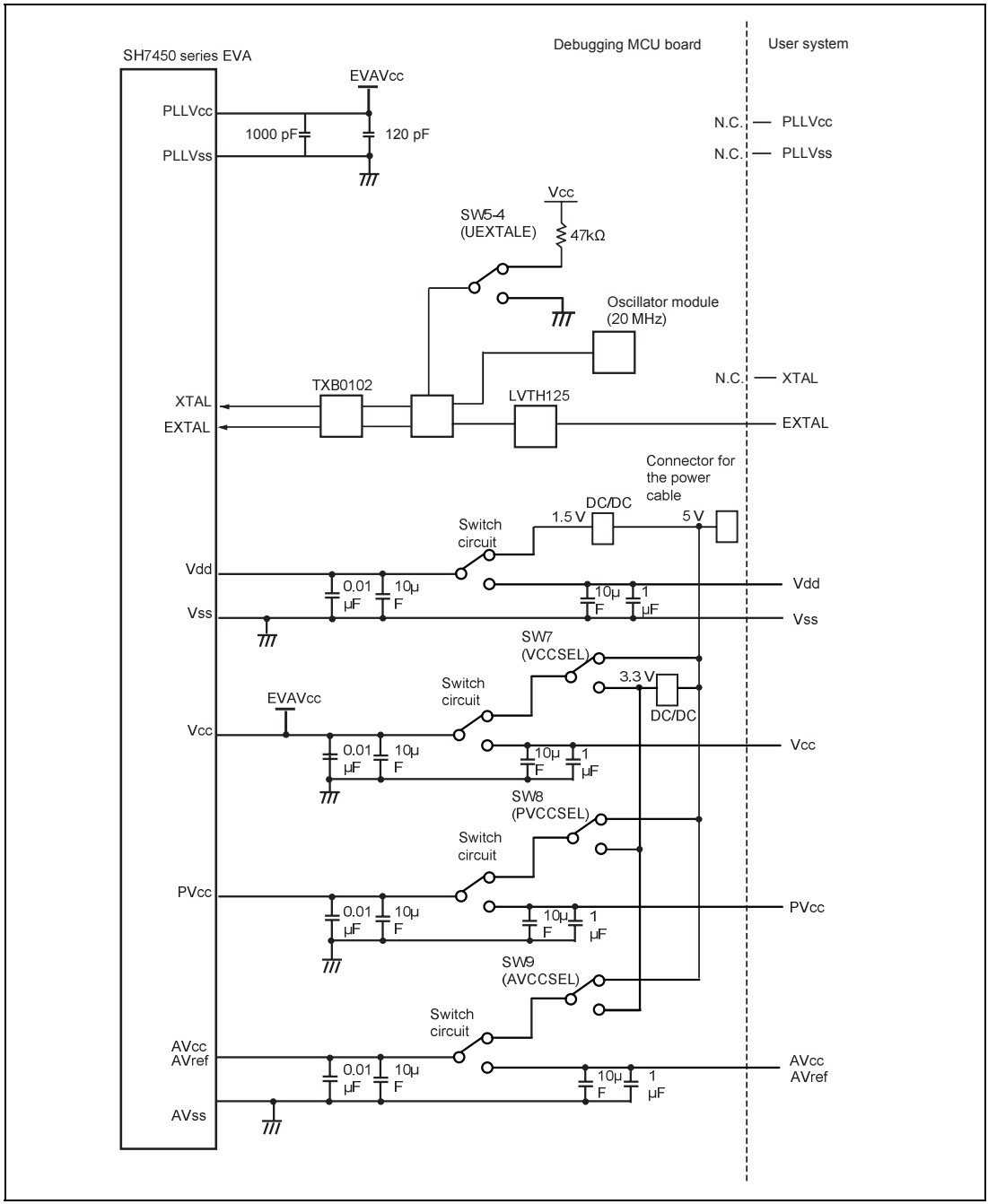


Figure 3.15 User System Interface Circuits

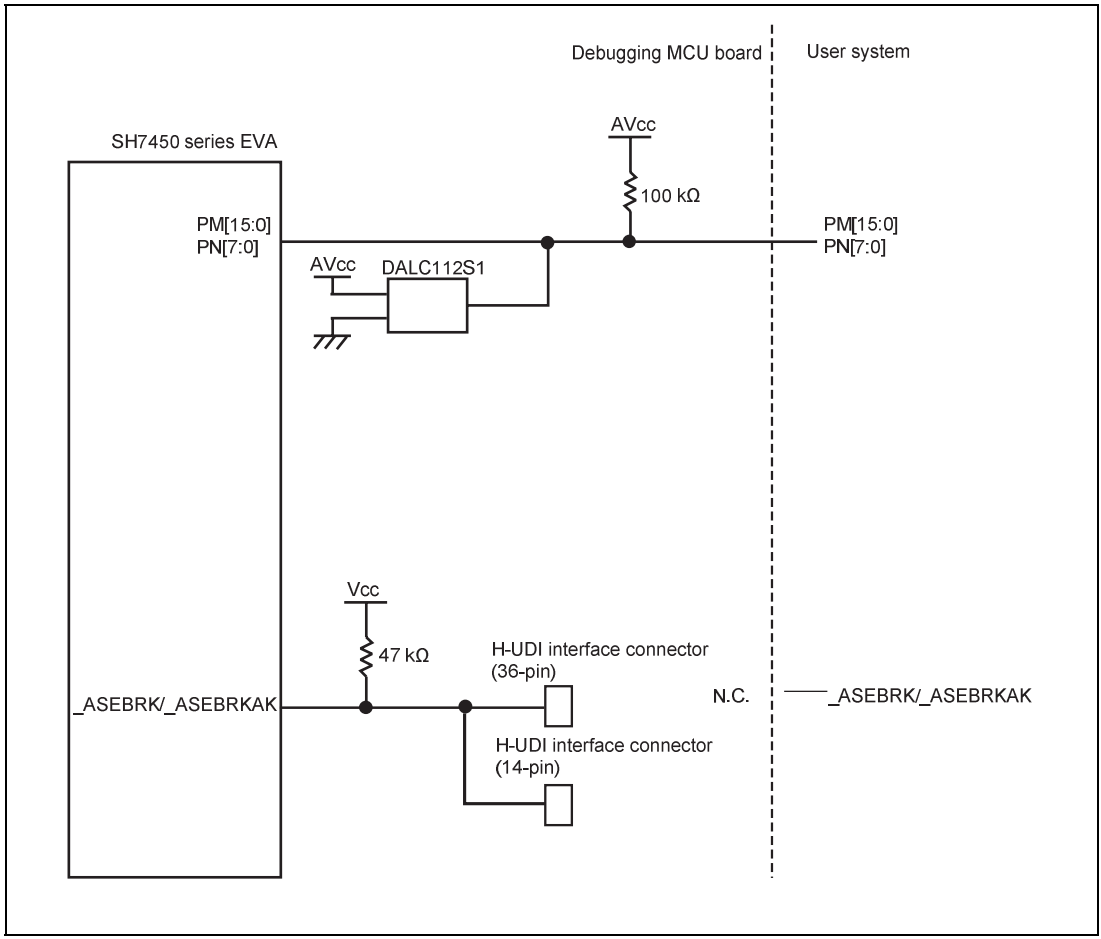


Figure 3.16 User System Interface Circuits

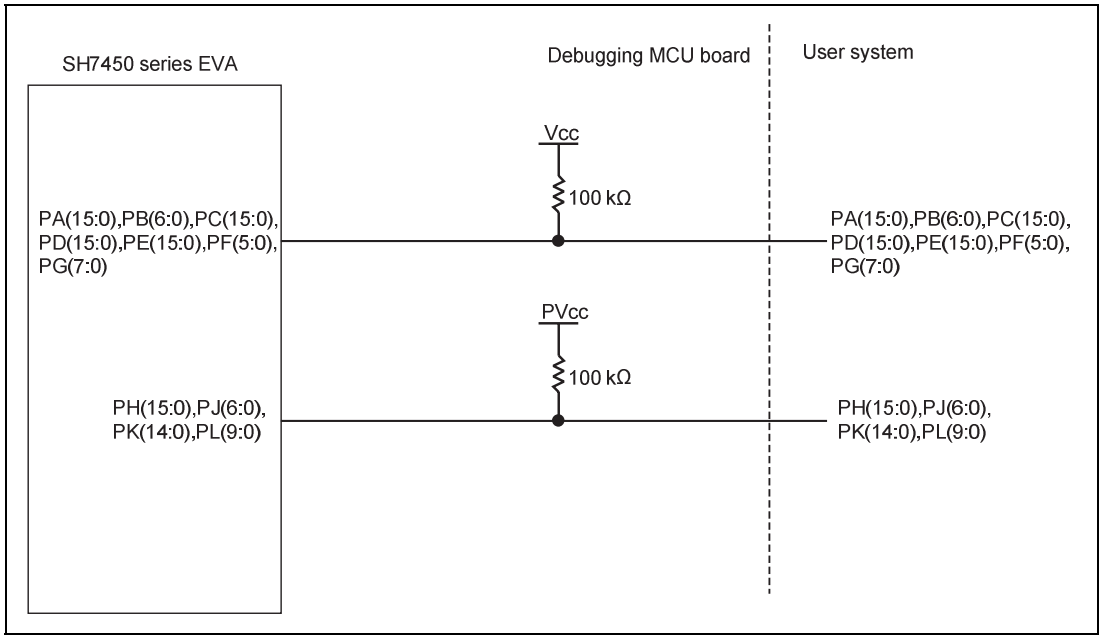


Figure 3.17 User System Interface Circuits

3.6 Delay Time for the User System Interface

Since the _RES and NMI signals are connected to the MCU via logic on the debugging MCU board, input of the signals from the user system to the MCU will be after the delay times shown in table 3.1.

Table 3.1 Delay Time for Signals via the Debugging MCU Board

No.	Signal Name	Delay Time (ns)
1	_RES	13
2	NMI	5

Section 4 Maintenance and Guarantee

This section describes maintenance, guarantee, repair provisions, and how to request for repair of the emulator.

4.1 User Registration

When you purchase our product, be sure to register as a user. For user registration, refer to the section of ‘User Registration’ (p. i) of this user's manual.

4.2 Maintenance

1. If dust or dirt collects on any equipment of this product, wipe the board dry with a soft cloth. Do not use thinner or other solvents because these chemicals can cause the equipment's surface coating to separate.
2. When you do not use this product for a long period, for safety purposes, disconnect the power cable from the power supply.

4.3 Guarantee

If your product becomes faulty within one year after its purchase while being used under good conditions by observing ‘IMPORTANT INFORMATION’ described in this user's manual, we will repair or replace your faulty product free of charge. Note, however, that if your product's fault is raised by any one of the following causes, we will repair it or replace it with new one with extra-charge:

- Misuse, abuse, or use under extraordinary conditions
- Unauthorized repair, remodeling, maintenance, and so on
- Inadequate user's system or misuse of it
- Fires, earthquakes, and other unexpected disasters

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

4.4 Repair Provisions

4.4.1 Repair with Extra-Charge

The products elapsed more than one year after purchase can be repaired with extra-charge.

4.4.2 Replacement with Extra-Charge

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

- Faulty or broken mechanical parts
- Flaw, separation, or rust in coated or plated parts
- Flaw or cracks in plastic parts
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- Wide range of faults that makes replacement less expensive than repair
- Unlocatable or unidentified faults

4.4.3 Expiration of the Repair Period

When a period of one year elapses after the model was dropped from production, repairing products of the model may become impossible.

4.4.4 Transportation Fees at Sending Your Product for Repair

Send your product to us for repair at your expense.

4.5 How to Make a Request for Repair

If your product is found faulty, follow the procedure below to send your product for repair.

Fill in the Repair Request Sheet included with this product, then send it along with this product for repair to your local distributor. Make sure that information in the Repair Request Sheet is written in as much detail as possible to facilitate repair.

⚠ CAUTION

Note on Transporting the Product:

When sending your product for repair, use the packing box and cushion material supplied with this product when delivered to you and specify handling caution for it to be handled 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 conductive polyvinyl supplied with this product (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

Appendix A Repair Request Sheet

Thank you for purchasing the SH7450 series debugging MCU board (R0E574504PBZ00).

In the event of a malfunction, fill in the repair request sheet on the following pages and send it to your distributor.

Repair Request Sheet

To Distributor

Your company name:

Person in charge:

Tel.:

Item	Symptom
1. Date and time when the malfunction occurred	Month/Day/Year {at system initiation, in system operation} *Circle either of items in the braces { }.
2. Frequency of generation of the malfunction	( ) times in ( ) {day(s), week(s), or month(s)} *Enter the appropriate numbers in the parentheses ( ) and circle one of the three items in the braces { }.
3. System configuration when the malfunction occurred	Enter the system configuration in use when the malfunction occurred. • E10A-USB emulator (HS0005KCU01H or HS0005KCU02H): Serial No.: Revision: The above items are written on the label for product management at the bottom of the emulator unit; the serial no. is the five-digit number and the revision is the string of letters following the number. • Provided CD-R (HS0005KCU01SR): Version: V. Shown as 'V.x.xx release' on the CD-R (x: numeral). • SH7450 series debugging MCU board (R0E574504PBZ00). Serial No.: Revision: These are impressed on the circuit board. • User-system interface board (R0E574504CBF10, R0E574552CBG00, or not connected). Serial No.: Revision: These are impressed on the circuit board.

Item	Symptom
3. System configuration when the malfunction occurred	• Host computer in use: Manufacturer: Type number: OS:
4. Settings when the malfunction occurred	Enter the operational settings of the debugging MCU board. (1) Power-selection switch (USERE(SW6)): lower or upper (circle either item). (2) Clock-selection jumper (UEXTALE(SW5-4)): left or right (circle either item). Input clock: MHz (3) User-system input signal enabling/disabling switches: UNMIE (SW1): left or right (circle either item). URESE (SW5-1): left or right (circle either item). (4) Operating voltage: Vdd: V, VCC: V, PVCC: V, AVCC V
5. Failure phenomenon	
6. Error in debugging	
7. The High-performance Embedded Workshop does not link-up with the debugging MCU board.	Content of the error message

For errors other than the above, fill in the box below.

SH7450 Series Debugging MCU Board
R0E574504PBZ00, R0E574504CBF10, R0E574552CBG00
User's Manual

Publication Date: Rev.1.00, May 25, 2010
Published by: Renesas Electronics Corporation
1753, Shimonumabe, Nakahara-ku, Kawasaki-shi,
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Colophon 1.0

SH7450 Series Debugging MCU Board
R0E574504PBZ00, R0E574504CBF10, R0E574552CBG00
User's Manual

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REJ10J2166-0100