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E30A Emulator

R0E00030AKCT00
User's Manual

On-chip Debugging Emulator for R32C/100 Series

User's Manual

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Renesas Technology
www.renesas.com

Preface

The E30A Emulator (R0E00030AKCT00) is an on-chip debugging emulator that makes use of the debugging circuit NSD (New Single-wire Debugger), that is built in the R32C/100 Series MCUs. NSD is Renesas original OCD (On Chip Debugger).

All the components of this product are shown in "1.4 Package Components" (page 13). If there is any question or doubt about this product, contact your local distributor.

This user's manual mainly describes specifications of the E30A Emulator and how to setup it. For details on the related product such as an emulator debugger, refer to each product's user's manual.
The related manuals for using this product are listed below. You can download the latest manuals from the Renesas Tools homepage (http://www.renesas.com/tools).

Related manuals

Item	Manual
Integrated development environment	High-performance Embedded Workshop online help
Emulator debugger	R32C/100 E30A emulator debugger online help
C compiler	NC100 C Compiler User's Manual
Assembler	AS100 Assembler User's Manual

Important

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

Emulator:
The emulator in this document refers to the E30A emulator manufactured by Renesas Technology Corp.
The emulator herein does not include the customer's user system and host machine.

Purpose of use of the emulator:
This emulator is a device to support the development of a system that uses the M16C Family R32C/100 Series of Renesas 32-bit single-chip MCUs. It provides support for system development in both software and hardware.
This emulator is not guaranteed for use on production lines.
Be sure to use this emulator correctly according to said purpose of use. Please avoid using this emulator for other than its intended purpose of use.

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

When using the emulator:
(1) This product 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 Corp. be liable for any consequence arising from the use of this product.
(3) Renesas Solutions Corp. 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 Corp. guarantees the renovation or the provision under any circumstances.
(4) This product 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) Renesas Solutions Corp. cannot predict all possible situations or possible cases of misuse where a potential danger exists. Therefore, the warnings written in this user's manual and the warning labels attached to this emulator do not necessarily cover all of such possible situations or cases. Please be sure to use this emulator correctly and safely on your own responsibility.
(6) This product is not qualified under UL or other safety standards and IEC or other industry standards. This fact must be taken into account when taking this product from Japan to some other country.

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Usage restrictions:

This emulator has been developed as a means of supporting system development by users. Therefore, do not use it as a device used for equipment-embedded applications. Also, do not use it for developing the systems or equipment used for the following purposes either:

(1) Transportation and vehicular
(2) Medical (equipment where human life is concerned)
(3) Aerospace
(4) Nuclear power control
(5) Undersea repeater

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

About product changes:

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

About the rights:

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

(2) The information or data in this user's manual does not implicitly or otherwise grant a license for patent rights or any other rights belonging to us or third parties.

(3) This user's manual and this emulator are copyrighted, with all rights reserved by us. This user's manual may not be copied, duplicated or reproduced, in whole or part, without prior written consent of us.

About diagrams:

The diagrams in this user's manual may not all represent exactly the actual object.

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Precautions for Safety

Definitions of Signal Words

In both the user's manual and on the product itself, 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.

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read this chapter before using this product.

⚠	This symbol represents a warning about safety. It is used to arouse caution about a potential danger that will possibly inflict an injury on persons. To avoid a possible injury or death, please be sure to observe the safety message that follows this symbol.
⚠ **DANGER**	**DANGER** indicates an imminently dangerous situation that will cause death or heavy wound unless it is avoided. However, there are no instances of such danger for the product presented in this user's manual.
⚠ **WARNING**	**WARNING** indicates a potentially dangerous situation that will cause death or heavy wound unless it is avoided.
⚠ **CAUTION**	**CAUTION** indicates a potentially dangerous situation that will cause a slight injury or a medium-degree injury unless it is avoided.
CAUTION	**CAUTION** with no safety warning symbols attached indicates a potentially dangerous situation that will cause property damage unless it is avoided.
IMPORTANT	This is used in operation procedures or explanatory descriptions to convey exceptional conditions or cautions to the user.

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

△means WARNING or CAUTION.
　Example: ⚠ CAUTION AGAINST AN ELECTRIC SHOCK

○means PROHIBITION.
　Example: 🚫 DISASSEMBLY PROHIBITED

●means A FORCIBLE ACTION.
　Example: 🔌 UNPLUG THE POWER CABLE FROM THE RECEPTACLE.

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⚠ WARNING

Warnings for AC Power Supply:

● If the included AC power cable does not fit the outlet, do not alter the AC power cable and do not plug it forcibly. Failure to comply may cause electric shock and/or fire.

● The included AC power cable complies with Japanese Electrical Appliance and Material Safety Law and American UL Standard. Use an AC power cable which complies with the safety standard of the country.

● The rated voltage for this cable is 125 volts. When you connect to a power supply of more than 125V, use an appropriate cable for the voltage.

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

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

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

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

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

Warning for Modification:

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

Warning for Installation:

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

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

Warning for Use Environment:

● This equipment is to be used in an environment with a maximum ambient temperature of 35°C. Care should be taken that this temperature is not exceeded.

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⚠ CAUTION

Cautions to Be Taken for the AC Adapter:

● Use only the AC adapter included in this product.

● The DC plug of the included AC adapter has the below polarity.

⊕—●—⊖

Cautions to Be Taken for Turning On the Power:

● Turn ON/OFF the power of the emulator and user system as simultaneously as possible. If you cannot turn on the powers simultaneously, turn on the emulator first, then the user system.

● Before turning on the power again after shutting off the power, wait about 10 seconds.

Cautions to Be Taken for Handling This Product:

● Use caution when handling the main unit. Be careful not to apply a mechanical shock.

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

● Do not pull this emulator by the communications interface cable or the flexible cable for connecting the user system. And, excessive flexing or force may break conductors.

Caution to Be Taken for System Malfunctions:

● If the emulator malfunctions because of interference like external noise, do the following to remedy the trouble.
(1) Exit the emulator debugger, and shut OFF the emulator main unit and user system.
(2) When turning the power ON again, wait more than 10 seconds. Then start up the emulator debugger.

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Contents

User Registration

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

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

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

Terminology

Some specific words used in this user's manual are defined as follows:

E30A Emulator (R0E00030AKCT00)

This means the on-chip debugging emulator (this product) for the R32C/100 Series MCUs.

Emulator system

This means an emulator system built around the E30A emulator. The E30A emulator system is configured with an E30A emulator main unit, the R32C/100 E30A emulator debugger, host machine and user system.

R32C/100 E30A emulator debugger

This means an emulator software which you can control the emulator from a host machine through the USB interface.

Firmware

This means a program stored in the flash ROM of the emulator. It analyzes contents of communication with the emulator debugger and controls the emulator hardware. This program is downloadable from the emulator debugger to upgrade the debugger.

Host machine

This means a personal computer used to control the emulator system.

Target MCU

This means the microcomputer you are going to debug.

User system

This means a user's application system using the MCU to be debugged.

User program

This means a user's application program to be debugged.

#

In this user's manual, this symbol is used to show LOW active. (e.g. RESET#)

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1. Outline

1.1 Applicable MCU

- M16C Family R32C/100 Series

1.2 Product Outline

The E30A Emulator (R0E00030AKCT00) is an on-chip debugging emulator that makes use of the debugging circuit NSD (New Single-wire Debugger), that is built in the R32C/100 Series MCUs. NSD is Renesas original OCD (On-chip Debugger). You can easily perform software verification such as on-chip debug or data tuning in the actual operating environment.

1.3 System Configuration

The E30A emulator is used connecting the target MCU that mounted on the user system. This emulator cannot supply the power to the user system. Prepare a power supply separately.

Figure 1.1 shows a configuration of the E30A emulator.
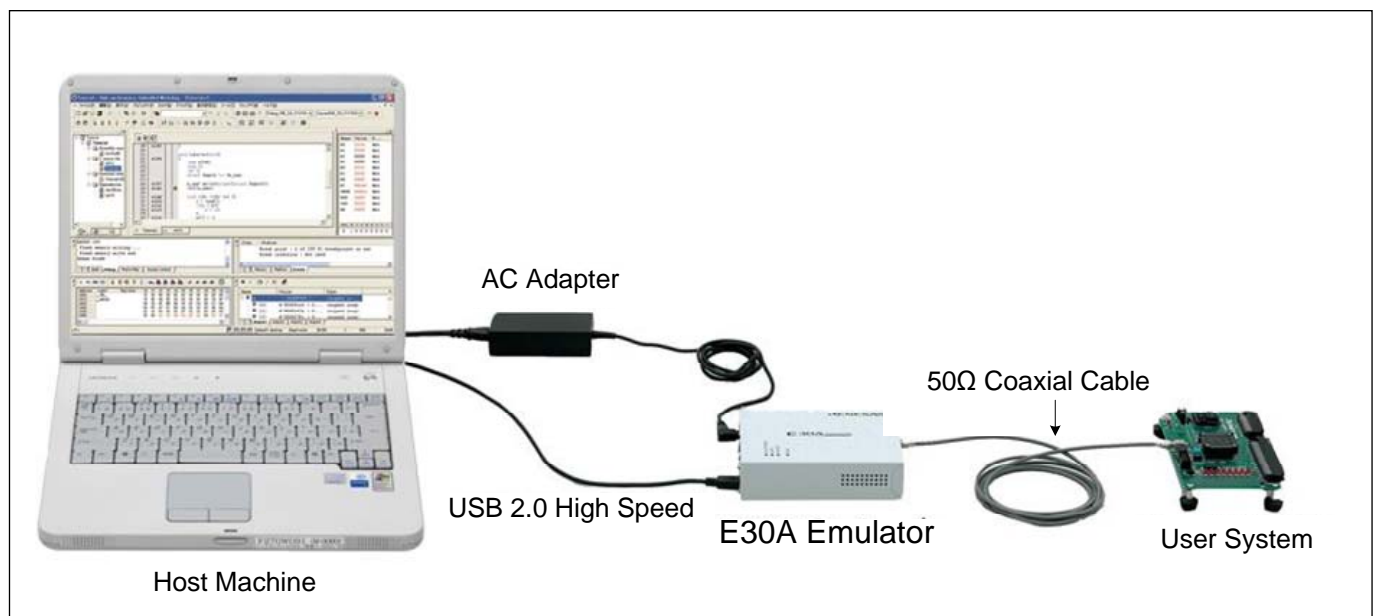
Figure 1.1 E30A emulator system configuration

1.4 Package Components
Table 1.1 lists the package components of the E30A emulator.

Table 1.1 Package components

Item	Description	Quantity
E30A emulator main unit	R0E00030AKCT00	1
AC adapter	AC input 100 - 240 V, 50/60Hz, DC output 12V 3A	1
AC power cable	1.5m, UL/PSE qualified	1
USB I/F cable	A plug -- mini-B plug, 1.8 m long, compliant with high-speed standard	1
Target I/F cable	50Ω coaxial cable (gray), 1.8 m long	1
Coaxial connector	HRM-300-126B(40) (Hirose Electric)	1
Coaxial converter board	R0E00030ACKZ00, coaxial connector and 3-pin connector (premounted)	1
Connector for coaxial converter board	PIC-FS03-G+R (Honda Tsushin Kogyo), 2.54mm pitch 3-pin socket	1
Option I/F cable	10-pin flat cable, 20cm long	1
Option board	R0E00030ACKZ10, 10-pin connector and 3-pin socket (premounted)	1
Option board connector	FFC-8LAMEP1B (Honda Tsushin Kogyo), 2.54mm pitch 8-pin right angle	1
	PIC-MSA08-2G (Honda Tsushin Kogyo), 2.54mm pitch 8-pin straight	1
	PIC-FS08-G+R (Honda Tsushin Kogyo), 2.54mm pitch 8-pin socket	1
CD-ROM	- Integrated development environment High-performance Embedded Workshop - R32C/100 E30A emulator debugger - E30A emulator user's manual	1

1.5 Operating Environment
- IBM PC/AT compatibles (Windows XP and Windows 2000)

1.6 PC Interface
- USB interface (USB 2.0, high speed)

  Also connectable to host computers that support USB 1.1.

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1.7 Specifications

1.7.1 External specifications of E30A emulator

Table 1.2 lists the external specifications of the E30A emulator.

Table 1.2 External specifications of E30A emulator

Item	Description						
Applicable MCU	M16C Family R32C/100 Series						
Available MCU mode	Single-chip mode Memory expansion mode						
Maximum operating frequency	100MHz (CPU clock)						
Emulation memory	Not available (internal flash ROM used as emulation memory)						
Software break	Maximum 64 points (implemented by instruction replacement)						
Execution address break	Maximum 8 points (execution address/data access)						
Hardware break	- Shared with trace event/time measurement event - Only address and R/W attribute specifiable for data access break - One data comparison breakpoint specifiable in software						
Combinatorial break point	OR/status transition (in forward direction)						
Trace mode	Trace priority/MCU execution priority specifiable						
Trace capacity	8M events (Trace priority) /512 events (MCU execution priority)						
Trace contents	Branch source and branch destination/conditional branch/data access						
Trace event	Maximum 8 points/4 area (prefetch address/data access) - Shared with break event/time measurement event - Start/end/extraction event specifiable						
Time measurement	Execution time (between Go-Stop, 32-bit CPU clock counter in MCU) Interval time, 3 points (between data access, 40-bit counter in E30A)						
RAM monitor	Specifiable in byte or word units - pseudo-RAM monitor realized by software (one event used)						
Coverage	Not available						

Simultaneously usable functions by operation mode	Break				Trace	Time Measurement	RAM Monitor
	Execution Address	Data Access	Address Range	Data Comparison			
Trace: Trace priority	Yes	Yes	-	-	Yes	-	-
Trace: MCU execution priority	Yes	Yes	-	Yes	Yes	-	-
Time Measurement	Yes	Yes	-	-	-	Yes	-
RAM Monitor	Yes	Yes	Yes	-	-	-	Yes
Writer	-	-	-	-	-	-	-

Item	Description
Host machine I/F	USB 2.0 (High Speed)
Target I/F	2-pin (50Ω coaxial cable) 3-pin (via coaxial converter board) 8-pin (via option board)
Target I/F signal	NSDport, GND (When using coaxial cable/coaxial converter board) NSDport, GND, Vcc1, Vcc2, RESET# (When using option board)
Targetless debugging	Not available
Emulator power supply	Supplied from the included AC adapter
Target MCU power supply	Supplied from a user system
Outside dimension (except the protruding part)	Width: 136.3 mm, depth: 104.0 mm, height: 36.8 mm
Weight	Approx. 300g
Operating environment	Temperature: 5°C to 35°C (no condensation)
Storage environment	Temperature: -10°C to 60°C (no condensation)
Overseas standard	European EN Standard (EN55022 Class A, EN55024) American FCC Standard (FCC part 15 Class A)

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1.7.2 Specifications of the AC Adapter

Table 1.3 lists the specifications of the included AC adapter.

Table 1.3 Specifications of the included AC adapter

Item	Description
AC input voltage range	AC 100 - 240 V, 50/60Hz single phase
Output power	36 W
DC output voltage, current	12.0 V, 3.0 A
DC output polarity	EIAJ TYPE IV, inner side plus/outer side minus
Outside dimension (except the protruding part)	Width: 99.5 mm, depth: 49.5 mm, height: 25.5 mm
Weight	Approx. 200g

1.8 Names and Functions of Each Part of the Emulator

Figure 1.2 shows the names and functions of each part of the emulator. The connector followed by "*" (the differential connector) is prepared for future expansion. It cannot be used because of not working now.
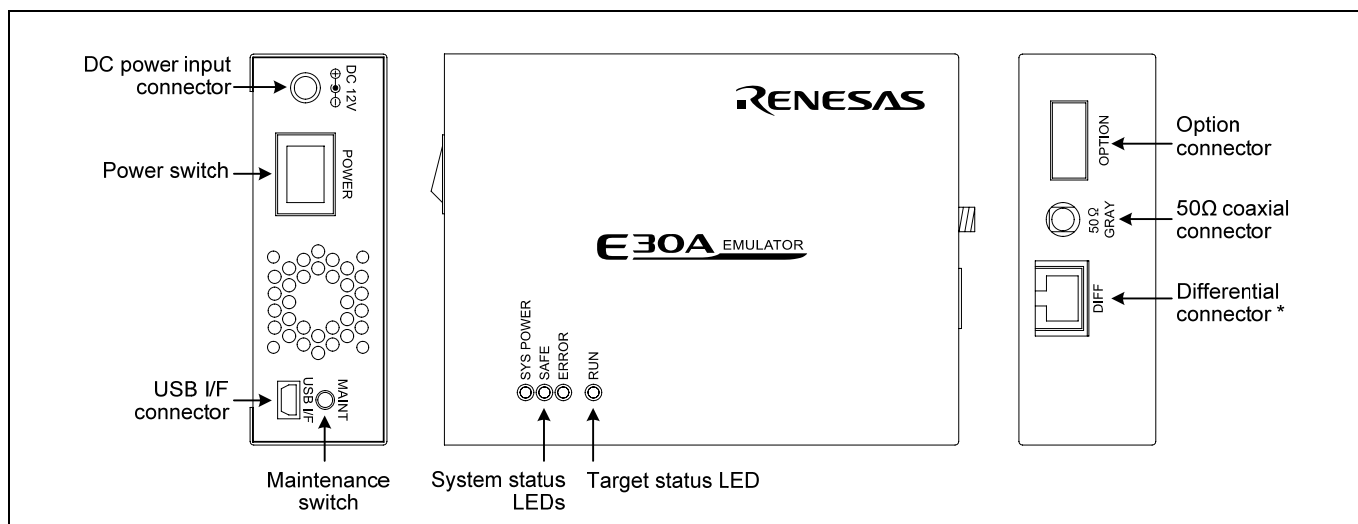
Figure 1.2 Names and functions of each part of the emulator

1.8.1 System Status LEDs

The system status LEDs indicate the emulator main unit's operating status. Tables 1.4 and 1.5 list the definition of the system status LEDs.

Table 1.4 Definitions of the system status LEDs (SYS POWER)

Name/Status		Meaning
SYS POWER	ON	Power is supplied to the emulator.
(Orange)	OFF	Power is not supplied to the emulator.

Table 1.5 Definitions of the system status LEDs (SAFE and ERROR)

Name/Status		Meaning
SAFE (Green)	ERROR (Red)	
ON	OFF	Emulator system has started normally.
ON	Blinking	Firmware is being downloaded.
Blinking	OFF	Emulator is in maintenance mode.
OFF	ON	Emulator system is not operating normally.
OFF	Blinking	Firmware download is not operating normally.

1.8.2 Target Status LED

The target status LED indicates the target MCU's operating status. Table 1.6 lists the definition of the target status LED.

Table 1.6 Definitions of the target status LED

Name/Status		Meaning
RUN	ON	User program is being executed.
(Green)	OFF	User program is not being executed.

1.8.3 DC Power Input Connector

This connector connects the included AC adapter DC output cable to supply DC 12.0 V.

1.8.4 Power Switch

This is a power switch of the E30A emulator. Before turning on the power again after shutting off the power, wait about 10 seconds.

1.8.5 USB I/F Connector

This is a USB interface connector for connecting the host machine to this emulator. For details on connecting the emulator and host machine, refer to "2.5 Connecting the E30A Emulator and the Host Machine" on page 22.

1.8.6 Maintenance Switch

If this switch is pressed within 2 seconds after turning on the power, the SAFE LED blinks and the emulator switches to maintenance mode for downloading firmware. In maintenance mode you can download firmware forcibly. For details, refer to "2.10 Downloading Firmware" on page 29.

1.8.7 50Ω Coaxial Connector

This included 50Ω coaxial cable (gray) connects this emulator to the user system. For details on connecting the emulator and user system, refer to "2.6 Connecting E30A Emulator and the User System" on page 23.

1.8.8 Option Connector

This connector is provided for connecting to the user system via an option board using the 10-pin flat cable included with the product. For details on connecting to the user system, refer to "2.6 Connecting E30A Emulator and the User System" on page 23.

1.9 Operating Environment

Be sure to use this emulator with the operating environment of the emulator and host machine listed in Table 1.7.

Table 1.7 Operating environmental conditions

Item	Description
Operating temperature	5 to 35°C (no condensation)
Storage temperature	-10 to 60°C (no condensation)

2. Setup

2.1 Flowchart of Starting Debugging

The procedure for starting the debugging is shown in Figure 2.1. For details, refer to each section hereafter.

Check the package components.	First time only	Refer to "1.4 Package Components (page 13).
↓		
Install the emulator debugger.	First time only	Install the emulator debugger to the host machine.
↓		
Change the settings of the hardware.	First time only	Change the settings of the E30A emulator when necessary.
↓		
Connect the AC adapter to the E30A emulator.	First time only	Connect the AC adapter to the E30A emulator.
↓		
Connect the host machine to the E30A emulator.	First time only	Connect the host machine to the E30A emulator with the USB interface cable.
↓		
Connect the E30A emulator to the user system.	First time only	Connect the E30A emulator to the user system with the 50Ω coaxial cable (gray).
↓		
Turn on the emulator.		Turn on the E30A emulator and user system.
↓		
Install the USB device driver.	First time only	The USB device driver will be installed automatically.
↓		
Check the LED display of the emulator.		Check that the SYS POWER LED and SAFE LED of the system status LEDs are lighting.
↓		
Download the firmware.	First time only	The firmware will be automatically installed as needed.
↓		
Start up the emulator debugger and set the Init dialog.		Start up the emulator debugger and set the Init dialog.
↓		
Reset the user system.		After a message dialog is displayed, reset the user system.
↓		
Enter the ID code.		If the target MCU has had its ID code set, enter the ID code.
↓		
Set the operating environment of the emulator debugger.		Set the Emem dialog.
↓		
Start debugging.		For details, refer to the emulator debugger's online help.

Figure 2.1 Flowchart of starting the debug

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2.2 Installing the Emulator Debugger

Install the R32C/100 E30A emulator debugger from the included CD-ROM as follows.

If the OS used in your host machine is Windows XP or 2000, this installation must be executed by a user with administrator rights. Be aware that users without administrator rights cannot complete the installation.

(1) When inserting the included CD-ROM, the Readme Web page will be displayed. Click "Install" to open the folder where the Installation program is stored. Execute "R32cE30ADebuggerV100R00.exe".

(2) The install manager starts. Click "Standard Install (Recommended)".

(3) In the page to select an installation product, click "Install" to start installing.

(4) When the installation finishes, a dialog box will be displayed indicating that the setup has been completed.

2.3 Changing Hardware Settings

2.3.1 Selecting Clock Supply

You need to choose the X_{IN} clock supplied to the target MCU on the user system. Table 2.1 shows the clock supply to the MCU.

For normal use, select "Generated" in the Emulator tab of the Init dialog box of the emulator debugger and specify a frequency you like to use for this clock supplied to an MCU.

You can change a frequency between 2.0 and 32.0 MHz by 0.1 MHz.

Table 2.1 Clock supply to the MCU

Clock	Emulator debugger display	Description
X_{IN}-X_{OUT}	Generated	Internal generator circuit (2.0 to 32.0 MHz)
	Internal	Oscillator circuit board (OSC-3 or OSC-2)

2.3.2 Using the Oscillator Circuit Board

Even when you have selected "Internal" on the Emulator tab of the emulator debugger's Init dialog box to specify an oscillator circuit board, you need to enter a clock frequency.

With this emulator, no oscillator circuit board has been mounted when shipped from the factory. If you use a special frequency, attach the oscillator circuit board following the procedure described below.

(1) Unscrew the five screws securing the E30A emulator, and remove the upper cover.
(2) The connector J1 for connecting an oscillator circuit board is in the corner of the board (around the DC power input connector).
(3) Unscrew the screw which is used for securing an oscillator circuit board.
(4) Attach the oscillator circuit board you like to use, and secure the oscillator circuit board with the screw.
(5) Attach the upper cover and secure it with the five screws.

⚠ CAUTION

Note on Replacing the Oscillator Circuit Board:

● When removing the upper cover or replacing the oscillator circuit boards, be sure to shut OFF the power supply. Otherwise the internal circuit may cause a break.

Note on Using the Oscillator Circuit Board:

● This product was inspected for the qualification of CE marking under factory shipment conditions (with no oscillator circuit boards mounted in place). When using an oscillator circuit board for this product, please be aware that depending on the oscillation frequency of the oscillator circuit board used, radiation EMI standards (EN55022 Class A and FCC part 15 Class A) may be exceeded.

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2.3.3 Using the Internal Oscillator Circuit Bare Board

To use this product at a frequency you like, build a desired oscillator circuit on the OSC-2 oscillator circuit bare board (not included). Figure 2.2 shows an external view of the OSC-2 oscillator circuit bare board and the connector pin locations. Figure 2.3 shows the circuitry of the oscillator circuit bare board OSC-2. Use the number of oscillator circuits recommended by the oscillator manufacturer.
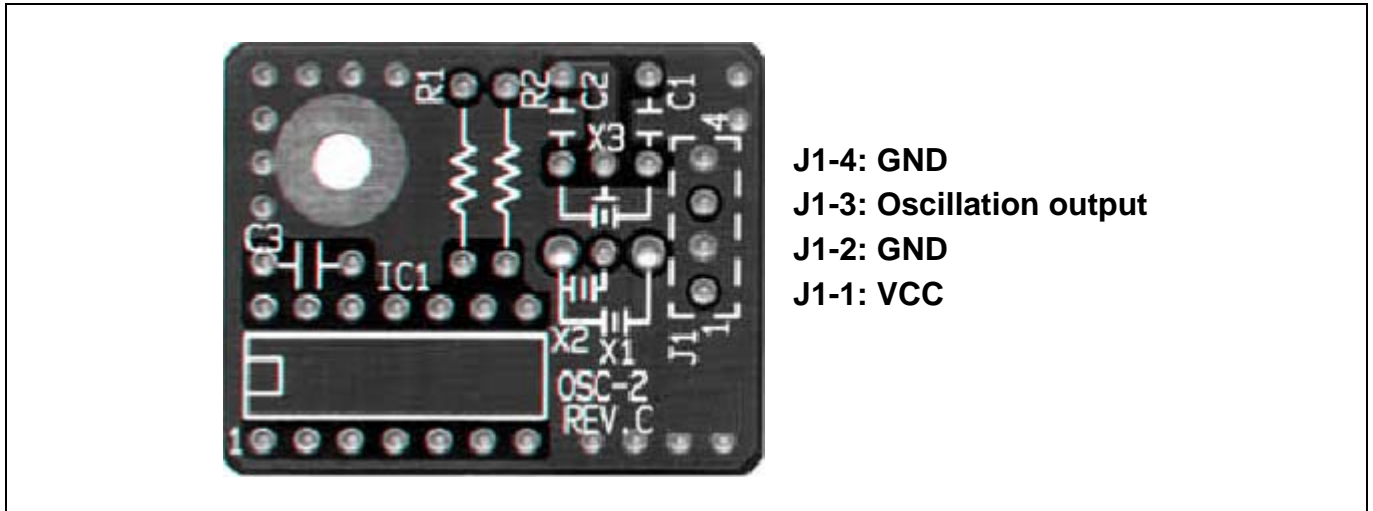
Figure 2.2 External view of the oscillator circuit board OSC-2 and its connector pin locations
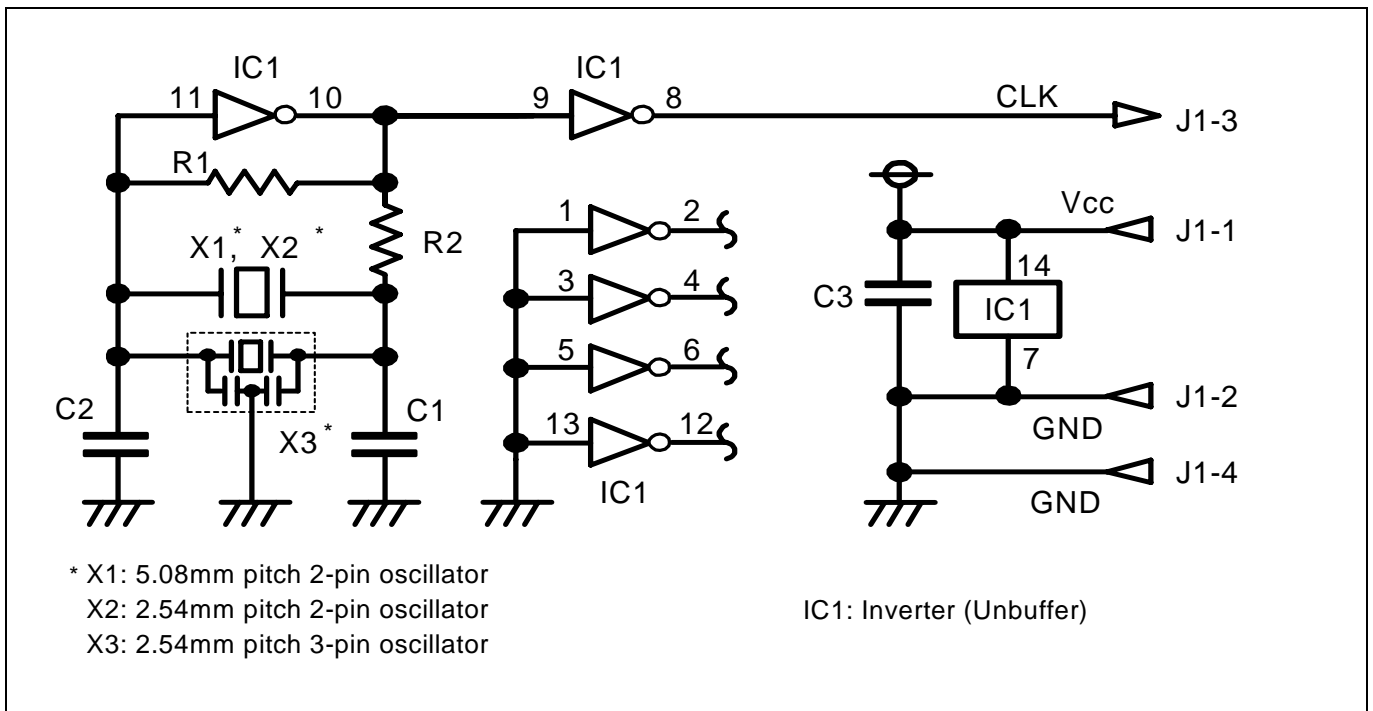
Figure 2.3 Circuits of the oscillator circuit bare board OSC-2

2.4 Connecting the AC Adapter to the E30A Emulator

Connect the included AC adapter to the E30A emulator.

(1) Check to see if the E30A emulator power switch is OFF.

(2) Connect the DC output cable of the AC adapter to the DC power input connector of the E30A emulator.

(3) Connect the AC power cable to the AC power input connector of the AC adapter.

(4) Connect the AC power cable to the outlet.

⚠ WARNING

Warning for the AC Power Cable:

- If the included AC power cable does not fit the outlet, do not alter the AC power cable and do not plug it forcibly. Failure to comply may cause electric shock and/or fire.

- The included AC power cable complies with Japanese Electrical Appliance and Material Safety Law and American UL Standard. Use an AC power cable which complies with the safety standard of the country.

- The rated voltage for this cable is 125 volts. When you connect to a power supply of more than 125V, use an appropriate cable for the voltage.

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

2.5 Connecting the E30A Emulator and the Host Machine

Connect the E30A emulator to the host machine with the included USB I/F cable.

(1)   Connect the A-plug of the USB I/F cable to the USB I/F connector of the host machine.

(2)   Connect the mini-B plug of the USB I/F cable to the USB I/F connector of the E30A emulator.

IMPORTANT

Note on USB I/F Cable:

- The USB I/F cable included with the product is compliant with USB 2.0 High Speed standard. Be sure to use the included USB I/F cable for the E30A emulator.

2.6 Connecting the E30A Emulator and the User System

2.6.1 Using the Coaxial Connector

(1) Processing NSDport

   Pull up NSDport of the target MCU to Vcc1 with a 4.7kΩ resistor. (It cannot be connected directly to Vcc1 and Vcc2.) Furthermore, be sure that the wiring from NSDport to the connector is shortest possible.

(2) Mounting part in place

   Mount the coaxial connector included with the product (HRM-300-126B(40) made by Hirose Electric) on designated position of the user system.

(3) Connection procedure

   Plug the 50Ω coaxial cable (gray) included with the product into the E30A emulator and the coaxial connector on the user system.

Although the cable can be connected over a distance, the power supply condition of the user system cannot be monitored. Furthermore, since only a software reset is possible from the E30A emulator, a hardware reset is required when the emulator debugger is started or when a communication error occurs. Figure 2.4 is a connection diagram showing how to connect the E30A emulator and user system using the coaxial connector.

Figure 2.4 Connection diagram when using the coaxial connector

⚠ CAUTION

Caution for Insertion/Removal of the Coaxial Cable:

● When inserting or removing the coaxial cable, be aware not to rotate it. The center core of the coaxial cable may be broken.

2.6.2 Using the Coaxial Converter Board R0E00030ACKZ00

(1) Processing NSDport

Pull up NSDport of the target MCU to Vcc1 with a 4.7kΩ resistor. (It cannot be connected directly to Vcc1 and Vcc2.) Furthermore, be sure that the wiring from NSDport to the connector is shortest possible.

(2) Mounting part in place

Mount the 2.54mm pitch 3-pin socket included with the product (PIC-FS03-G+R made by Honda Tsushin Kogyo) on designated position of the user system.

(3) Connection procedure

Plug the 50Ω coaxial cable included with the product (gray) into the E30A emulator and CN1 on coaxial converter board. Fit CN2 on coaxial converter board into the 3-pin socket on user system. It can be turned 180 degrees as it is fitted into place.

Although the cable can be easily removed/inserted and can be connected over a distance, the power supply condition of the user system cannot be monitored. Furthermore, since only a software reset is possible from the E30A emulator, a hardware reset is required when the emulator debugger is started or when a communication error occurs. Figure 2.5 is a connection diagram showing how to connect the E30A emulator and user system using the coaxial converter board.
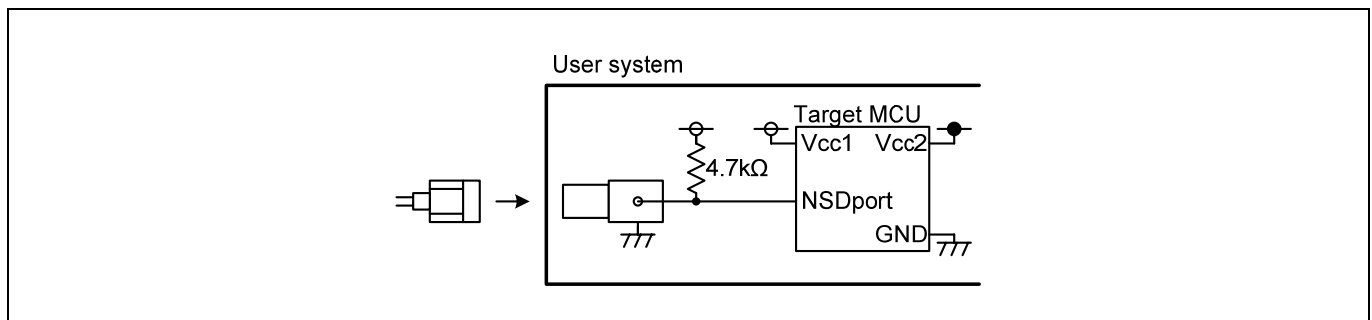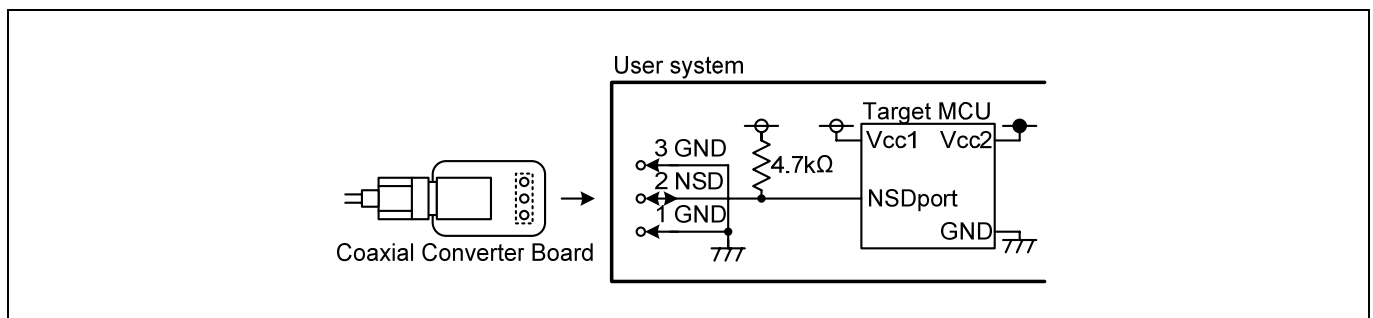

Figure 2.5 Connection diagram when using the coaxial converter board

2.6.3 Using the Option Board R0E00030ACKZ10

(1) Processing NSDport

Pull up NSDport of the target MCU to Vcc1 with a 4.7kΩ resistor. (It cannot be connected directly to Vcc1 and Vcc2.) Furthermore, be sure that the wiring from NSDport to the connector (pin 4) is shortest possible.

(2) Mounting part in place

Mount the 2.54mm pitch 8-pin socket included with the product (PIC-FS08-G+R made by Honda Tsushin Kogyo) on designated position of the user system. Furthermore, mount the 2.54mm pitch 8-pin straight pin included with the product (PIC-MSA08-2G made by Honda Tsushin Kogyo) on CN4 (solder side) of the option board.

(3) Wiring of Vcc1 and Vcc2

Vcc1 (pin 1) is used to monitor the power supply condition of the user system and as power supply for the RST# and RSTMSK output buffers.

Vcc2 (pin 2) monitors the power supply condition of the user system.

(4) Wiring of RST# and RSTMSK

Since the target MCU is reset in hardware from the E30A emulator, connect RST# signal (pin 6) to the RESET# terminal of the target MCU.

If the reset circuit of the user system uses an open-drain output, pull it up to Vcc1 with a 4.7k–22kΩ resistor. The same applies for the power-on reset case making use of a CR circuit.

If the reset signal is generated as CMOS output from other logic devices, the user system may have a RSTMSK signal connected to disable the output. Since RSTMSK input is indeterminate when the E30A emulator is not connected, it requires a pulldown resistor.

(5) Connection procedure

Plug the 10-pin flat cable included with the product into CN3 on the option board.

Plug the 50Ω coaxial cable (gray) included with the product into CN1 on the coaxial converter board.

Fit CN2 on the coaxial converter board into CN2 on the option board. It can be turned 180 degrees as it is fitted into place.

Fit CN4 on the option board into the 8-pin socket on the user system.

Alternatively, the coaxial converter board can be attached to pins 3-5 of the 8-pin socket on the user system without using the option board.

(6) Compatibility with the E30 emulator (old product)

If you have hitherto been using the 8-pin flat cable of the E30 emulator, you can attach the 2.54mm pitch 8-pin right angle connector included with the product (FFC-8LAMEP1B made by Honda Tsushin Kogyo) to CN4 (component side) of the option board, for connection to the user system. However, since the non-coaxial NSDport wiring becomes longer, it is recommended that the connector on the user system be replaced with the 8-pin socket, and that the 8-pin straight pin be used for connection.

Since a hardware reset can be generated from the E30A emulator, the target MCU does not need to be reset. Figure 2.6 is a connection diagram showing how to connect the E30A emulator and user system using the option board.
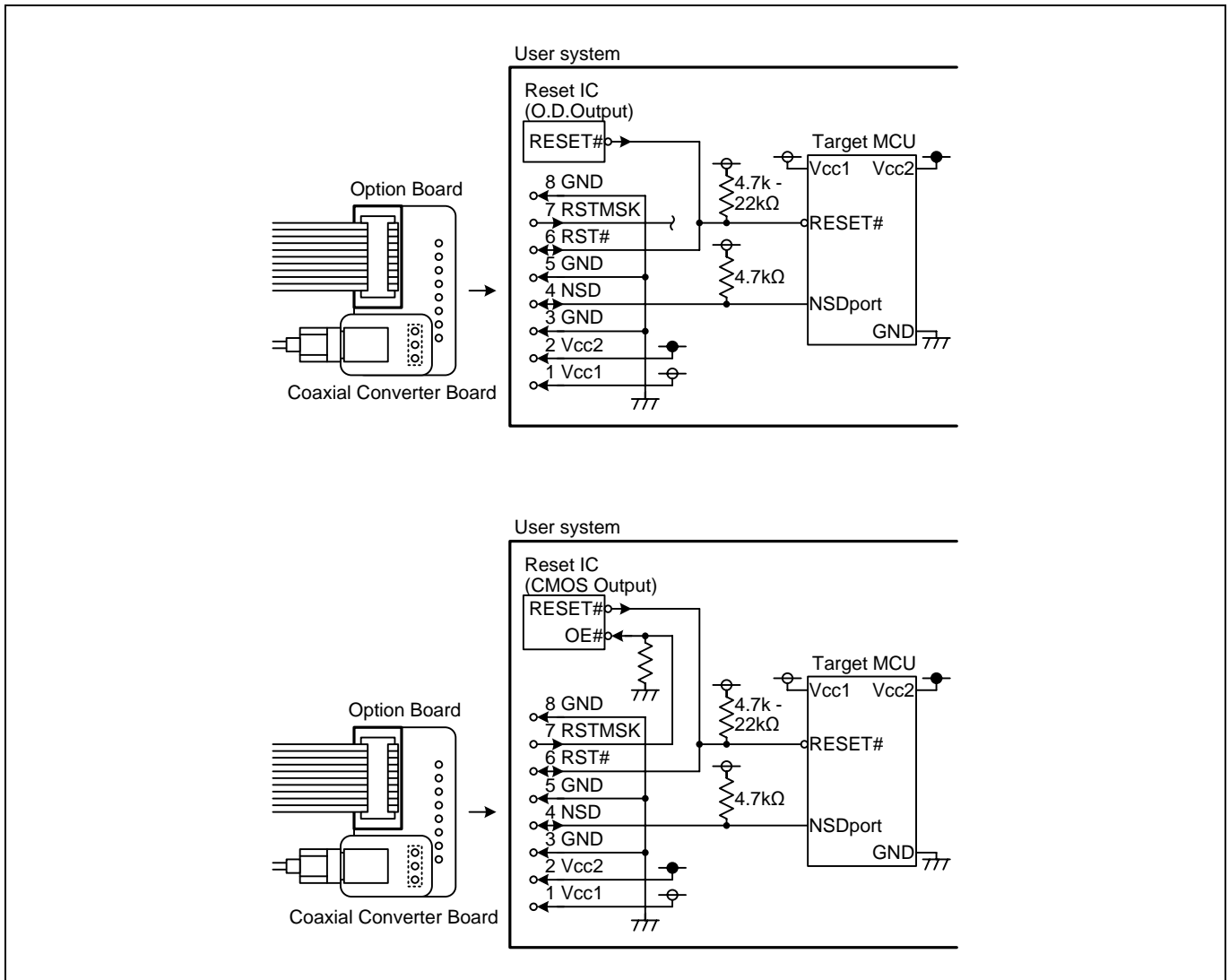
Figure 2.6 Connection diagram when using the option board

2.7 Turning ON the Power

2.7.1 Checking the Connections of the Emulator System

Verify the connection of the emulator with the AC adapter, host machine and user system.

2.7.2 Turning ON/OFF the Power

Turn ON/OFF the power of the emulator and user system as simultaneously as possible. If you cannot turn on the powers simultaneously, turn on the emulator first, then the user system.

Before turning on the power again after shutting off the power, wait about 10 seconds.

IMPORTANT

Notes on Power Supply to the User System:
- The emulator does not supply power to the user system. Provide power to the user system separately.
- Do not change the voltage of the user system after turning on the power.

2.8 Installing the USB Device Driver

The installation wizard for USB device drivers starts after the device had been detected by the host machine.

Figure 2.7 shows the procedure for installing the USB device drivers for Window XP. For other OS, the driver will be installed automatically.

	Select "No, not this time" and click "Next".
	Click "Next".
	The USB driver will be installed automatically. Click "Finish" to exit.
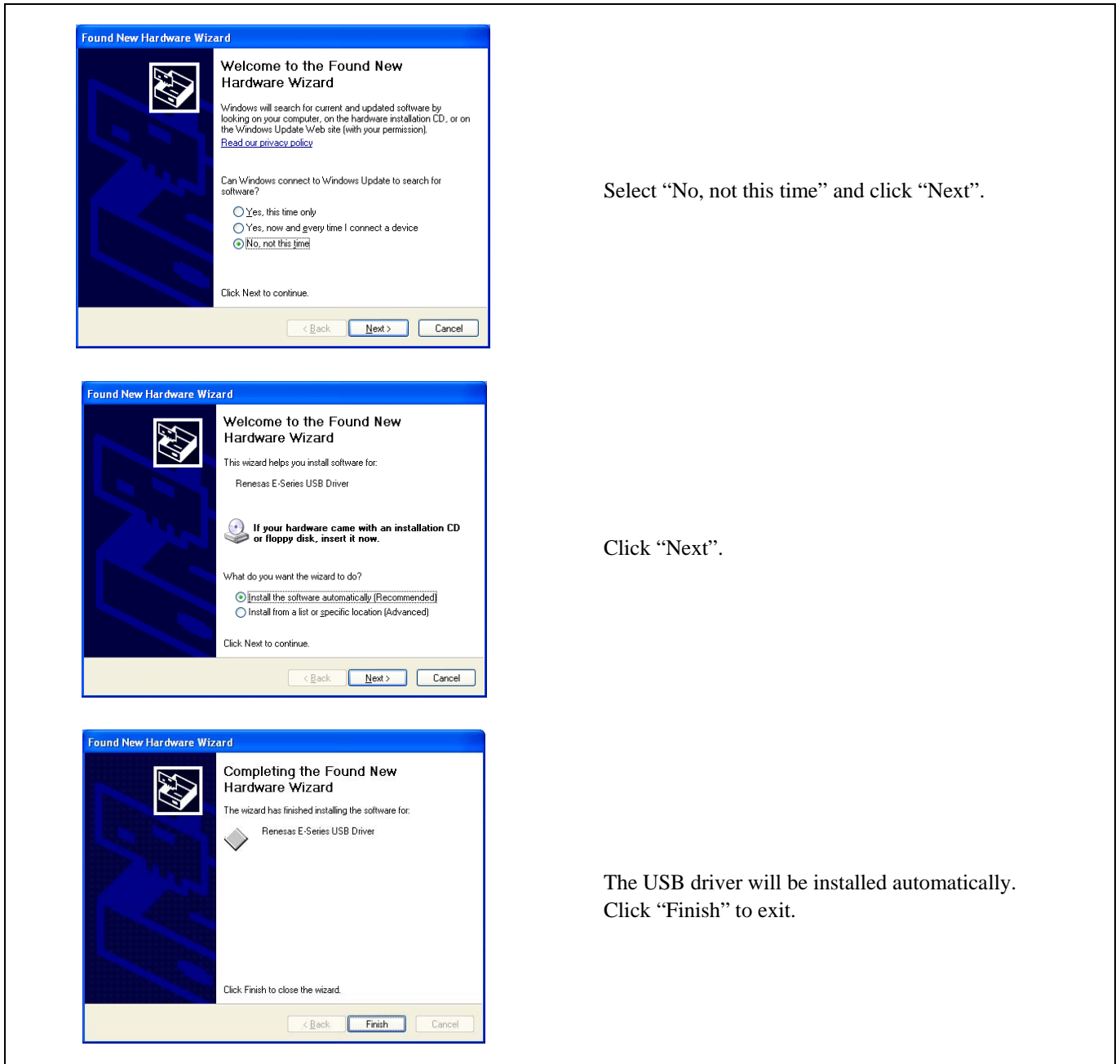
Figure 2.7 Installation of USB device driver for Windows XP

IMPORTANT

Note on USB Port Change:
- If you change the port to connect USB, the device driver is installed over again.

Note on Found New Hardware Wizard:
- For Windows XP, the amount of time needed for the wizard to appear depends on the CPU usage rate of the host machine. For example, approximately 9 seconds of time is needed when the CPU usage rate is 0%, whereas approximately 30 seconds is needed when the CPU usage rate is 100%.

2.9 Checking the Status LEDs Display

Check that the SYS POWER LED and SAFE LED are lighting.

If the SAFE LED is off and the ERROR LED is on, it means that the E30A emulator hardware is not operating normally. When the SAFE LED is off and the ERROR LED blinks, it means the internal firmware of the E30A emulator is not running normally. When the status LED indicates abnormal, perform the forced download as follows.

2.10 Downloading Firmware

It is necessary to upgrade the firmware in the cases listed below. Normally, the following are automatically detected when the emulator debugger is started up, and the firmware is downloaded.

- When you use this product for the first time
- When the firmware has been upgraded
- When the emulator debugger has been upgraded

If downloading firmware is not completed when the power is unexpectedly shut down during a download from the emulator debugger, the status LEDs show abnormal and the emulator debugger may not start up normally. Download firmware in the special mode called maintenance mode as explained here following.

(1) Within 2 seconds of activating power to the emulator, press the maintenance switch on it to start maintenance mode. The System Status SAFE LED begins to blink.

(2) Start up the emulator debugger in maintenance mode. When settings in the Init dialog box are complete, the dialog which urges to download the firmware will appear. Download firmware following messages. Required time for downloading the firmware is about 15 seconds.

2.11 Starting Up and Initializing the Emulator Debugger

2.11.1 Switching the Session
When you finish creating a program and start debugging, switch the session of the High-performance Embedded Workshop. Select "SessionR32C_100_E30A_Emulator" from the dropdown list in [Standard] toolbar.

R32C/100 E30A emulator debugger starts up and the Init dialog box appears. When you finished setting of each tab, click "OK".

2.11.2 MCU Tab

This tab permits you to select an MCU file and the connected emulator, and specify whether to debug a program in CPU rewrite mode, whether to use ECC for E2 data flash and a work area for the monitor program.
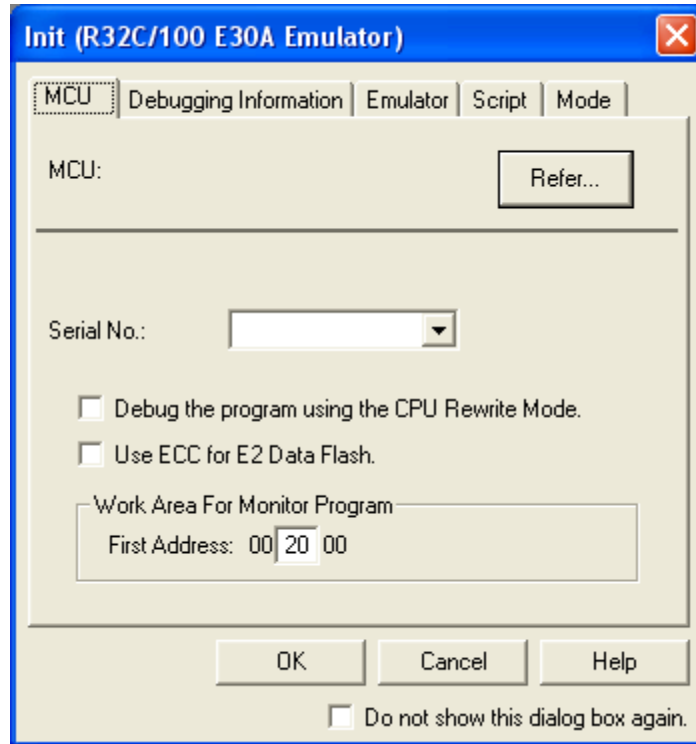
(1) MCU

An MCU file (MCU type name_E30A.mcu) contains the information specific to the target MCU. Select the MCU file applicable to the target MCU.
- Click the "Refer…" button to open the Select MCU File dialog box.
- Select the desired MCU file.

(2) Serial No.

Select the serial number of the emulator to be used from the connected emulator list.

(3) Debug the program using the CPU Rewrite Mode.

Select this check box when you want to debug a program in CPU rewrite mode. In this mode, software breaks in the internal ROM area of the MCU cannot be used.

(4) Use ECC for E2 Data Flash

Select this check box when you want to use ECC for E2 data flash.

(5) Work Area For Monitor Program

Specify the start address of the internal RAM area of the MCU that is used by the debug monitor program.

Approximately 1 KB of the internal RAM will be used as needed, for example, to download a user program. Since the memory contents are saved before debugging starts, you do not need to be specifically concerned, except that the following cannot be specified.
- Areas overlapping the stack
- Areas to or from which DMA-transferred

IMPORTANT

Note on MCU file:
- When you cannot select the MCU to be used, add the MCU file to the folder below. For details on getting the MCU file, contact your local distributor.

  Install folder of the High-performance Embedded Workshop\Tools\Renesas\DebugComp\Platform \PDTarget\PD100E30A\McuFiles

RENESAS

2.11.3 Debugging Information Tab

This tab permits you to select a compiler, select an object format, and choose to specify On Demand for debug information.
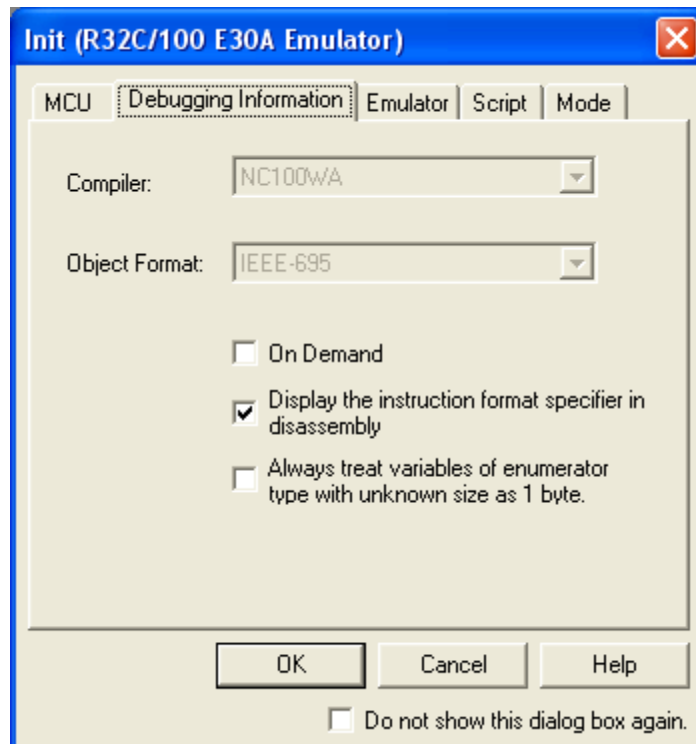
(1) Compiler

Select the compiler you are using.

(2) Object Format

Select the format of the object file that is output by the compiler you are using.

(3) On Demand

Select this check box when you want to hold debug information in a temporary file in order to reduce the amount of memory used by the host machine.

(4) Display the instruction format specifier in disassembly

Specify whether or not to show the instruction format specifier in disassemble display.

(5) Always treat variables of enumerator type with unknown size as 1 byte

If the debug information contains information on an enumerator type that does not have size information, it is possible to specify whether to handle it always as being 1 byte in size.

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2.11.4 Emulator Tab

This tab permits you to specify the clock supplied to the target MCU and RAM monitor data acquisition interval.

(1) Clock

Specify the X_{IN} clock and the frequency that supplied to the target MCU.

- Xin: Enter the frequency of the X_{IN} clock, and select Generated (Internal generator circuit) or Internal (Oscillator circuit board).
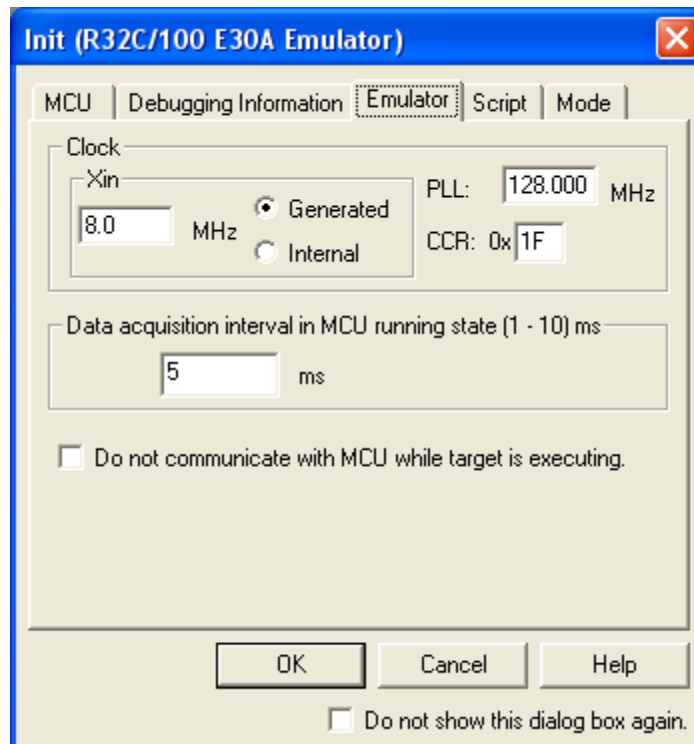- PLL: Enter the frequency of the internal PLL of the target MCU.
- CCR: Enter the value for the internal clock control register of the target MCU.

(2) Data acquisition interval in MCU running state (1 - 10) ms

Specify the data acquisition interval (byte or word data) during a program execution by the RAM monitor function. 1 - 10 ms can be specified.

(3) Do not communicate with MCU while target is executing.

Specify whether or not to communicate with the MCU when executing the user program. Select this check box when executing the STOP or WAIT instruction or when temporarily switching to OCO. Although the debug function cannot be used when executing the user program, it is possible to press the stop button after restored to the base clock specified in the Clock column.

IMPORTANT

Notes on Clock Setting:

● The emulator sets the PLL-related settings before starting up in order to secure a communication path. In a user program, be sure to set the same value of the PLL-related settings specified by the emulator debugger. Otherwise, the emulator will be out of control.

● According to the MCU specifications, the base clock is used for communication with the emulator. For this reason, the PLL frequency and the base clock frequency dividing ratio cannot be changed when executing the user program. To change the base clock temporarily for OCO, etc., select the Do not communicate with MCU while target is executing check box. Once the base clock specified at startup is restored, it is possible to press the stop button or perform other operations.

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2.11.5 Script Tab

This tab permits you to specify a script file.
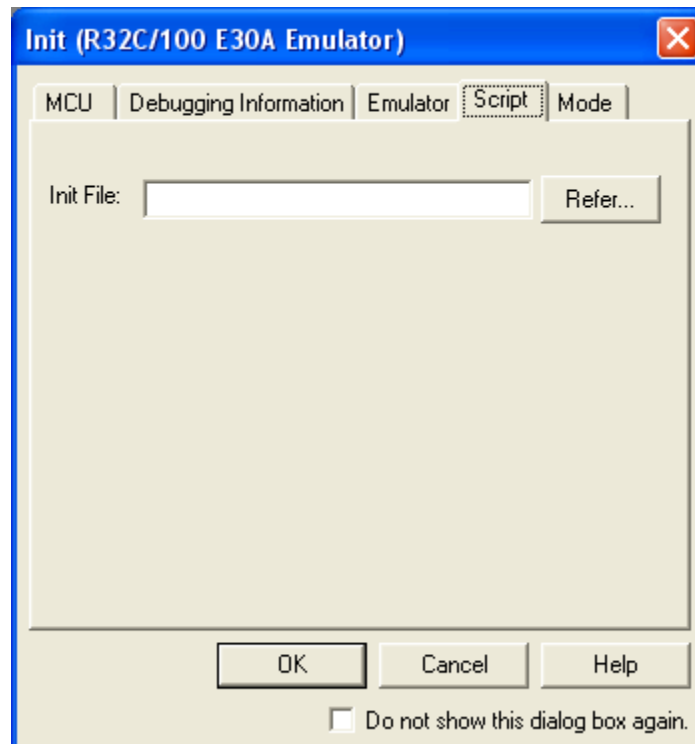
(1) Init File

   If you have any script that is automatically executed at startup, specify that file.

   - Click the "Refer…" button to open the Select Script File dialog box.
   - Select the desired script file.

2.11.6 Mode tab

This tab permits you to select an operating mode and specify the download to flash ROM area and the writer mode. Table 2.2 lists the debug functions depending on the operating mode.

Table 2.2 Debug functions depending on the operating mode

Mode	Break				Trace	Time Measurement	RAM Monitor
	Execution Address	Data Access	Address Range	Data Comparison			
Trace: Trace priority	Yes	Yes	-	-	Yes	-	-
Trace: MCU execution priority	Yes	Yes	-	Yes	Yes	-	-
Time Measurement	Yes	Yes	-	-	-	Yes	-
RAM Monitor	Yes	Yes	Yes	-	-	-	Yes
Writer	-	-	-	-	-	-	-

(1) Mode

Select an operating mode from "Trace", "Time measurement", "RAM monitor" or "Writer".

(2) Download to Flash ROM Area

If you want to verify the flash ROM area when downloading the user program, select the check box.

(3) Writer Mode

This function is valid when "Writer" is selected. This mode is used when using the E30A emulator as the flash ROM writer. Select a load module file to be downloaded.

- Click "Add…" to open a dialog box to select a load module file. Multiple files can be selected.
- To cancel the selection, select the file and click "Remove…".

If you want to enable the verification and checksum functions, select the check box.

You cannot debug the program in writer mode. Restart or terminate the emulator debugger after writing the program.

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2.12 Resetting the User System

When using the coaxial connector or the coaxial converter board for connecting the E30A emulator and user system, by clicking "OK" in the Init dialog box, the dialog box shown below will be displayed. When using the option board, the dialog is not displayed because the target MCU is reset in hardware from the emulator.
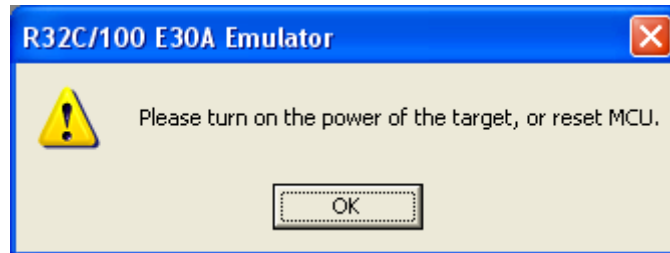
- If the user system has already been powered on, reset the user system. If the power for the user system is turned off, turn the power on.
- Click "OK".

IMPORTANT

Notes on Power Supply to the User System:
- The emulator does not supply power to the user system. Provide power to the user system separately.
- Do not change the voltage of the user system after turning on the power.

2.13 Entering ID Code

If the target MCU has ID code set in it, the ID Code verification dialog box shown below is displayed. Enter the 7-byte ID code written to the internal flash ROM into the dialog box successively. Table 2.3 shows the ID code storage area.

ID Code verification

Please input ID

11223344556677

[OK]   [Cancel]

- Enter ID1 -- ID7 successively in that order and then click "OK". Unless all IDs match, the emulator debugger will not start.

Table 2.3 ID Code Storage Area

| Address	Description
FFFF_FFE8h	First byte of ID code
FFFF_FFE9h	Second byte of ID code
FFFF_FFEAh	Third byte of ID code
FFFF_FFEBh	Fourth byte of ID code
FFFF_FFECh	Fifth byte of ID code
FFFF_FFEDh	Sixth byte of ID code
FFFF_FFEEh	Seventh byte of ID code

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2.14 Setting the Emulator Debugger Operating Environment

When a communication path between the E30A Emulator and target MCU is established, the Emem dialog box shown below is displayed. Set each tab described below and click "OK".

2.14.1 Flash ROM Clear Tab

This tab permits you to specify whether or not to overwrite each block of the internal flash ROM in the MCU.
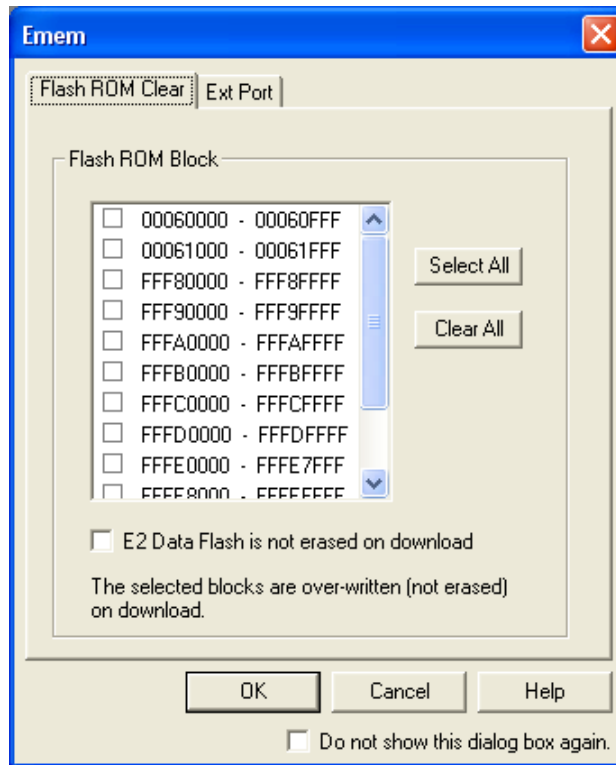
(1) Flash ROM Block

If you want to keep the data when you download a user program or data table, check the blocks of contents you want to keep intact. The address list is expressed in units of internal flash ROM blocks of the MCU. The selected blocks, those flagged by a check mark, require extra time because their contents need to be read out before being programmed. Therefore, we recommend leaving blocks unselected.

- When you select the check box for any block, the content of that block is read out into the host machine and the data to be downloaded is written over it inside the PC before the block is erased and programmed.
- When you deselect the check box for any block, the data to be downloaded is written to the block after being erased.
- Click the Select All button, and all blocks will be selected.
- Click the Clear All button, and all blocks will be deselected.

(2) E2 Data Flash is not erased on download

If you want to keep the data in the E2 data flash when you download a user program or data table, select this check box.

- When you select the check box, the data in the E2 data flash is read out into the host machine and the data to be downloaded is written over it inside the PC before the block is erased and programmed.
- When you deselect the check box, the data to be downloaded is written to the block after being erased.
- When E2 data flash is not embedded in the MCU, this setting is invalid.

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2.14.2 Ext Port Tab

This tab permits you to set the extension port function to connect an option connector.

(1) Setting Extension Port

Specify whether to disable the reset signal for the user system. Unless the option board is connected, this setting is not available to use. When this check box is selected, a high output to RSTMSK is generated to disable reset of the user system. For details, refer to "2.6.3 Using the Option Board R0E00030ACKZ10" on page 25.
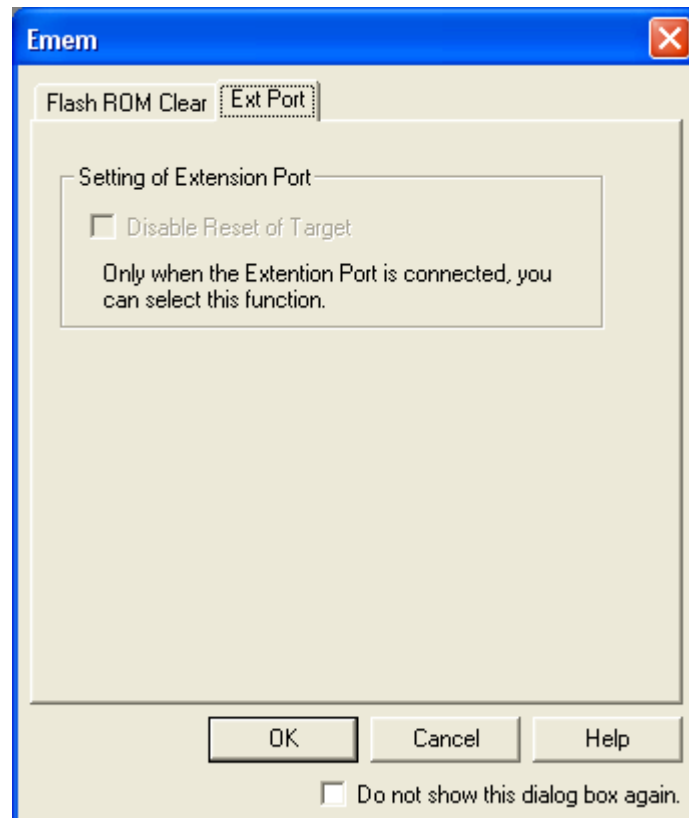
3. Functional Description

3.1 Break Function

3.1.1 Software Break

If the breakpoint you set is a software breakpoint, the program stops before executing the instruction at the set breakpoint

- Up to 64 break points can be set.
- You can specify breakpoints in the internal RAM of the MCU, the internal flash ROM of the MCU, and the RAM on the user system.
- If breakpoints in the internal flash ROM of the MCU are specified, the need arises for instruction rewrite/writeback processing in block units.

3.1.2 Execution Address Break

This is a kind of event break by the internal debug circuit of the MCU. It specifically is a pre-execution break that causes execution of the user program to stop at a specified address.

- Up to 8 break points can be set (used for hardware breaks, trace points, and time measurement events in common).
- There are no limitations on specifiable areas.
- Since there is no need for instruction rewrite/writeback processing, the response speed is fast.
- Internal address match interrupts of the MCU are unused.

3.1.3 Hardware Break

This is a kind of event break by the internal debug circuit of the MCU. It specifically is a post-execution break that causes execution of the user program to stop upon detecting data access at a specified address.

- Up to 8 break points can be set (used for execution address breaks, trace points, and time measurement events in common).
- You can set a specified address range (using 2 events).
- You can set three conditions, e.g., read, write, and read/write.
- Only one instance of data comparison break can be specified (event E5 only). Several bytes from the beginning of the MCU's internal RAM (8 bytes at the addresses 0400h -- 0407h) are used for data comparison by the debug monitor.

IMPORTANT

Note on Overhead for Data Comparison Break:
- Data comparison break is executed by that the debug monitor compares the data after the specified address is accessed and determines to cause a break or not.
  In the case of X_{IN} 8MHz, PLL 128MHz (16 times), BASE 64MHz and CPU 64MHz, for example, it takes 6μs to return to the user program after data comparison.

3.1.4 Break Combination

Event breaks by the internal debug circuit of the MCU can be cascaded to constitute a state transition break at up to 8 points in the forward direction. If all of the events are used for a state transition break, program execution will break when the events E7, E6, ..., and E0 all have occurred in that order.

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3.2 Trace Function

3.2.1 Trace Capacity

The following can be selected depending on the trace mode chosen in the event setting window.

- Trace priority

  8M events can be traced. The trace data is output from the MCU and recorded to the emulator trace memory. The user program execution may be delayed because the MCU processes the trace data output prior to others.
- MCU execution priority

  512 events can be traced. The trace data is recorded to the trace RAM of the MCU debug circuit. This mode does not affect the execution speed of the user program.

3.2.2 Trace Contents

You can select information on branch sources and destinations, information on conditional branches, information on data accesses, or mixed information of branch sources and destinations, and data accesses.

- Information on branch sources and destinations

  Branch source address and branch destination address are recorded as an event.
- Conditional branch information

  This is a compressed branch information which records whether a conditional branch is effected or not. To record conditional branch information, cancel all event settings in the event setting window. For tracing 512 evens with MCU execution priority, branch information can be acquired up to 24, 576 times.
- Data access information

  Address, data, data size and read/write information are recorded as an event.

IMPORTANT

Note on Jump in Queue:
- R32C/100 series has a function that branches to the instructions fetched into the prefetch queue, to improve the processing performance, but the branch source and destination information is not output.

3.2.3 Extraction Trace

An extraction trace with the start event E0 and the end event E4 specified is possible.

The events E1 -- E3 or E5 -- E7 that occurred during an interval between E0 to E4 are recorded in the trace RAM.

3.3 Time Measument Function

3.3.1 Execution Time Measurement

You can measure a program execution time between Go and Stop. The 32-bit CPU clock counter allows you to measure a program execution time of up to 67.1 s when operating at 64MHz.

3.3.2 Interval Time Measurement

You can measure a program execution time between data access by trace information. Data access trace information (address, data, data size and read/write) is detected as the measurement start event and measurement end event inside the emulator. The 40-bit asynchronous clock counter inside the emulator enables the interval time measurement of more than 24 hours.

IMPORTANT

Note on Interval Time Measurement Event:
- Interval time measurement compares the data access trace information output by an MCU in the emulator and detects start/end event. If the number of the specified data access is large, it takes a long time for the trace output, and affects the time measurement error and MCU execution.
  In the case of X_{IN} 8MHz, PLL 128MHz (16 times), BASE 64MHz, for example, it takes 5μs to output the data access trace information. When data access of less than 5μs occurs, an inaccuracy depending on the output time occurs. If this occurs often, MCU execution will be delayed. A write-only setting with the fewest number of event points possible is recommended.

3.4 RAM Monitor Function

Pseudo-RAM monitor, which is realized by the software with using event E5, can be used. Data is acquired in byte/word unit by the interval specified in Data acquisition interval in MCU running state in the Init dialog box. This function results in the realtime capability becoming impaired because the debug monitor program intervenes.

IMPORTANT

Note on Overhead for RAM Monitor Function:
- When using RAM monitor function, it returns to the user program when the debug monitor sends data after debug interrupt occurs.
  In the case of X_{IN} 8MHz, PLL 128MHz (16 times), BASE 64MHz and CPU 64MHz, for example, it takes 6μs to return to the user program after debug interrupt occurs.

4. Hardware Specifications

4.1 Target MCU Specifications

Table 4.1 lists the specifications of target MCUs which can be debugged with this product.

Table 4.1 Specifications of the applicable target MCU

Item	Description
Applicable MCU	M16C Family R32C/100 Series
Usable MCU mode	Single-chip mode
	Memory expansion mode
Maximum operating frequency	100MHz (CPU clock)
Supported ROM/RAM capacity	Internal ROM/RAM capacity of the MCU

4.2 Differences between the Actual MCU and Emulator

Differences between the actual MCU and emulator are shown below. When debugging the MCU using this product, be careful about the following precautions.

IMPORTANT

Note on the Internal PLL of the MCU
- The emulator sets PLL-related settings which you have selected in the Emulator tab of the emulator debugger's Init dialog box before it starts up in order to secure a communication path. In a user program, make sure to set the same value of the PLL-related settings specified by the emulator debugger. Otherwise, the emulator will be out of control.

Notes on Interrupt Stack:
- The E30A Emulator uses an interrupt stack of up to 52 bytes. Make sure sufficient space is reserved for the interrupt stack area, with the maximum stack size used by a user program added. If the reserved interrupt stack area is exceeded, the user program may go wild or the emulator may be out of control.
- The E30A Emulator sets the interrupt stack pointer (ISP) at the beginning address of RAM + 0100h after being reset, and uses that location as a stack area at deassertion of reset.

Note on Interrupts That Cannot Used by the User Program:
- The BRK2 interrupt, single-step interrupt, and DBC interrupt are used by the emulator program. Therefore, make sure the user program does not use these interrupts.

Note on Interrupt Request:
- Even if a user program is not being executed (including when run-time debugging is being performed), the evaluation MCU keeps running so as to control the emulator. The interrupt request cannot be accepted, because the emulator disables interrupts. The interrupt request is accepted immediately after the user program execution is started.

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IMPORTANT

Note on Low Voltage Detection Interrupt:
- With this product, as the power voltage cannot be change after powering on the user system, the low voltage detection interrupt cannot be used with this product.

Notes on Using the Watchdog Timer:
- A user program can be debugged by using the MCU's internal watchdog timer if so desired. When the watchdog timer is active, the debug monitor program refreshes it as necessary.
- Watchdog timers connected external to the MCU cannot be used. Make sure those watchdog timers are disabled while the emulator is in use.

Note on the Lock Bits for the MCU Internal Flash ROM:
- The lock bits for the blocks whose contents have been altered by downloading a user program or setting software breakpoints are in an unlocked state.

Note on Protect Bit 2 (PRC2):
- Protect bit 2 (PRC2) behaves in such a way that when the bit is set to 1 to remove write protect and then a write to any address is executed, the bit is write protected again. Note that the bit cannot be cleared by a software operation while single-stepping a program or manipulating the memory window.

Note on RDY# Input:
- Be sure to input "L" to pin RDY# of the user system during the user program executing (when the RUN status LED is lit). Inputting "L" to pin RDY# during the user program stopping may cause a malfunction of the emulator.

Note on HOLD# Input:
- Be sure to input "L" to pin HOLD# of the user system during the user program executing (when the RUN status LED is lit). Inputting "L" to pin HOLD# during the user program stopping may cause a malfunction of the emulator.

Note on the MCU Used in Debugging:
- During debugging, the MCU's internal flash ROM is frequently rewritten as a user program is downloaded or software breakpoints are set or cleared. Do not use any MCU in product once it was used in debugging.

Note on Final Evaluation:
- Be sure to evaluate your system with an evaluation MCU. Before starting mask production, evaluate your system and make final confirmation with a CS (Commercial Sample) version MCU.

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4.3 Notes on Using This Product

Notes on using this product are listed below. When debugging the MCU using this product, be careful about the following precautions.

IMPORTANT

Notes on the Resources of the MCU Used by the Emulator

- When you are using a data comparison break (event E5 only), the E30A Emulator uses several bytes from the beginning of the MCU's internal RAM (8 bytes at the addresses 0400h -- 0407h) for data comparison by the debug monitor. These bytes cannot be used in a user program.
- The E30A Emulator uses approximately 1 Kbyte of the internal RAM as needed, for example, to download a user program. Since the memory contents are saved in advance, you do not need to be specifically concerned, except that you cannot specify any area that overlaps the stack and an area on which DMA operates.

Notes on Power Supply to the User System:

- The emulator does not supply power to the user system. Provide power to the user system separately.
- Do not change the voltage of the user system after turning on the power.

Note on Downloading Firmware:

- Do not shut off the power while downloading the firmware. If this happens, the product will not start up properly. If the power is shut off unexpectedly, startup the emulator in maintenance mode and redownload the firmware.

Note on Quitting the Emulator Debugger:

- To restart the emulator debugger, always shut power to the emulator and user system off once and then on again.

Note on Event Settings:

- Events are used for breaks, trace, and time measurement in common. For breakpoint settings in the source window, events are given priority in order to reduce the number of times the flash ROM is rewritten. Note that the unused events are used in order of followings.
  (Extraction start event E0, end of range event E4, and data comparison event E5 are assigned lower priorities.)
  E7 -> E6 -> E3 -> E2 -> E1 -> E5 -> E4 -> E0

Notes on the Software Breaks:

- Software breaks execute the tool-only BRK2 command instead of instruction code to generate a BRK interrupt. Be aware that when trace results are referred to in bus display, you will see "BFh" displayed for instruction fetches performed at the addresses that have software breakpoints set.
- If a user program is altered before being downloaded, the software breakpoints that have been set may be displaced depending on the content of alteration. After downloading a user program, be sure to check the contents of software breakpoints set.

Notes on the Data Access Trace:

- 16-bit word data starting from an odd address and 32-bit long word data assigned differently from the 4-byte alignment cannot be traced properly.
- Data access event by DMA is excluded from the subject of detection.

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IMPORTANT

Notes on Debug Monitor Program Intervention
- The following functions result in the realtime capability becoming impaired because the debug monitor program intervenes.
  - Run-time debugging (Referring and modifying the memory during the user program execution)
  - RAM monitor
  - Data comparison break (when a break for data access is set in event E5)
- The RAM monitor function should be adjusted for sampling intervals (byte/word data acquisition intervals in ms units). Since the updating time is extended if a wide area is displayed in bytes, we recommend displaying only the necessary area in word size.

Note on Trace Mode
- When selecting Trace priority, the user program execution may be delayed because the MCU processes the trace data output prior to others.
  When selecting MCU execution priority, the execution speed of the user program is not affected.

Notes on the Simultaneous Use of Multiple Functions:
- Data comparison breaks and RAM monitor cannot be used at the same time. If event E5 is set for a data access break, the RAM monitor functions cannot be specified. If the RAM monitor function needs to be used, event E5 cannot be specified for a data access break.
- Be aware that if a run-time debug, RAM monitor, or data comparison break is used during a branch trace in which branch addresses are recorded, the recorded information will include branch information (debug monitor program processing address) which the user program does not generate.

Note on Debugging in the Stop Mode or Wait Mode:
- Do not shift the target MCU to stop mode or wait mode when using the emulator. Otherwise, emulation operation cannot be guaranteed.

Note on MCU Reset:
- Software reset and hardware reset cannot be used during the user program execution. If the MCU is reset during the user program execution, the emulator recovers communication with the MCU and the user program stops in a reset state.

Notes on Debugging in CPU Rewrite Mode:
- To debug a program in CPU rewrite mode, check the box "Debug the program using the CPU Rewrite Mode" in the MCU tab of the Init dialog box. When the debugging in CPU rewrite mode is enabled, software breakpoint to the internal ROM area cannot be used.
- Do not stop the user program during debugging in CPU rewrite mode. Otherwise, the emulator will be out of control. Furthermore, before executing a user program, be sure to disable automatic updating of the windows to ensure that no memory accesses will occur during execution of the user program. To inspect data after CPU rewrite operation, stop the program after exiting CPU rewrite mode and inspect the data in the memory window or another appropriate window.

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4.4 Connection Diagram

Figure 4.1 shows a connection diagram of the E30A emulator. This connection diagram shows the interface section.
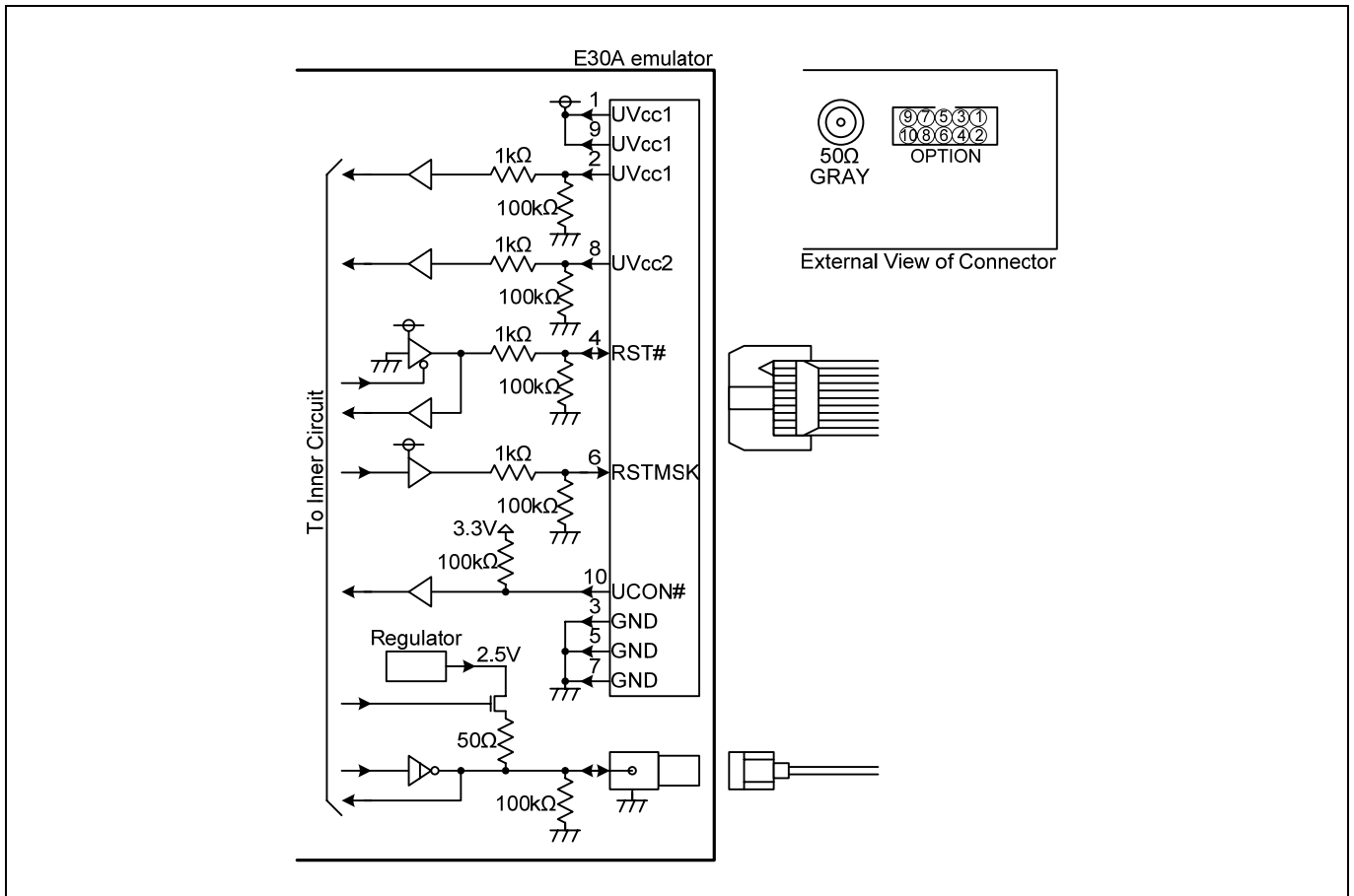

Figure 4.1 Connection diagram of the E30A emulator's interface section

4.5 Signal Assignments of the Connectors

4.5.1 USB I/F Connector

Table 4.2 lists the signal assignments of the USB I/F connector.

Table 4.2 Signal assignments of the USB I/F connector

No.	Signal	Description
1	VBUS	5.0 V power supply, unused
2	D-	
3	D+	
4	NC	Unused
5	GND	

4.5.2 Oscillator Circuit Board Connector

Table 4.3 lists the signal assignments of the oscillator circuit board connector.

Table 4.3 Signal assignments of the oscillator circuit board connector

No.	Signal	Description
J1-1	V50	5.0 V power supply
J1-2	GND	
J1-3	OSCCLK	Oscillator circuit input (amplitude: 5.0 V)
J1-4	GND	

4.5.3 Option Connector

Table 4.4 lists the signal assignments of the option connector.

Table 4.4 Signal assignments of the option connector

No.	Signal	Description
1	UVcc1	Vcc1 power supply
2	UVcc1	Vcc1 power supply
3	GND	
4	RST#	Reset signal
5	GND	
6	RSTMSK	Reset mask signal
7	GND	
8	UVcc2	Vcc2 power supply
9	UVcc1	Vcc1 power supply
10	UCON#	

4.6 External Dimensions

4.6.1 E30A Emulator

Figure 4.2 shows external dimensions of the E30A emulator.
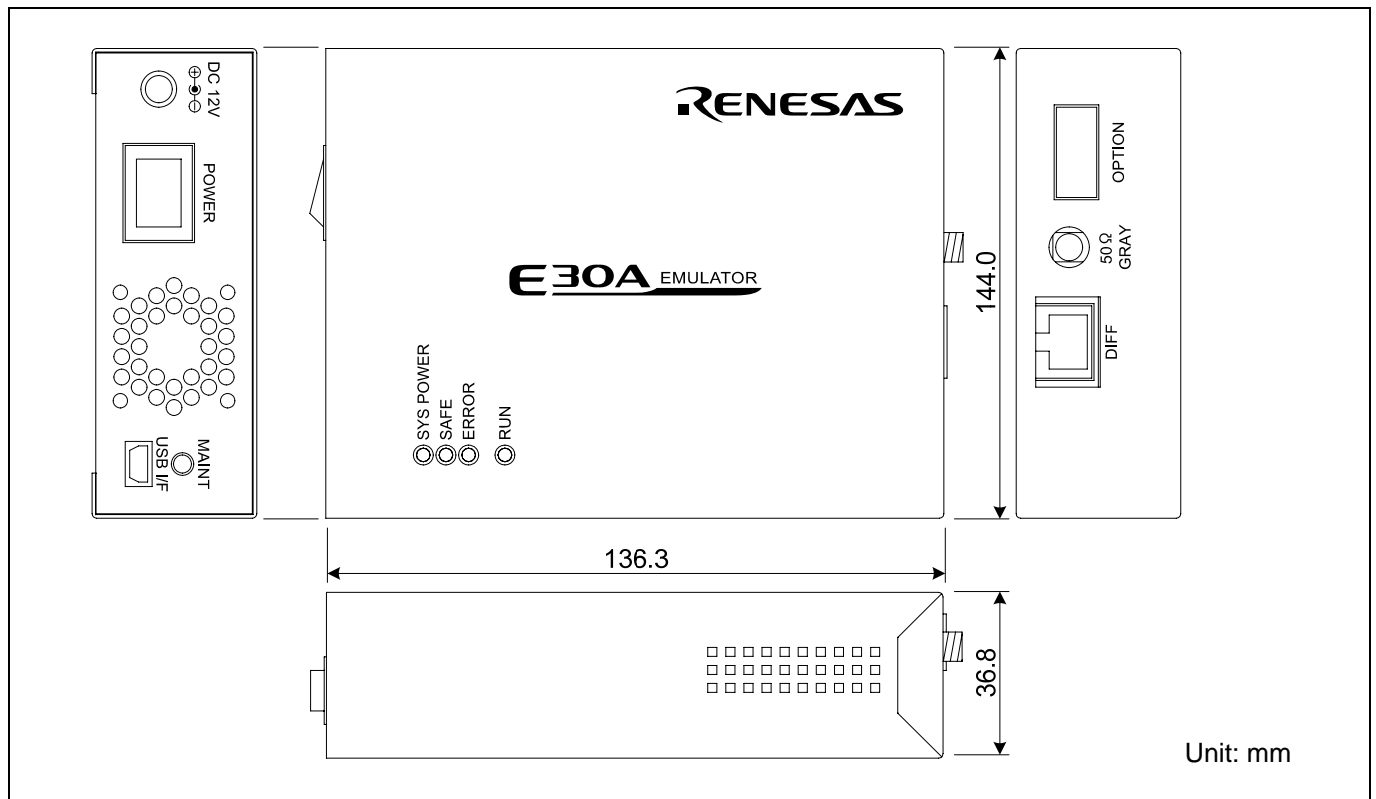

Figure 4.2 External dimensions of the E30A emulator

4.6.2 Coaxial Converter Board

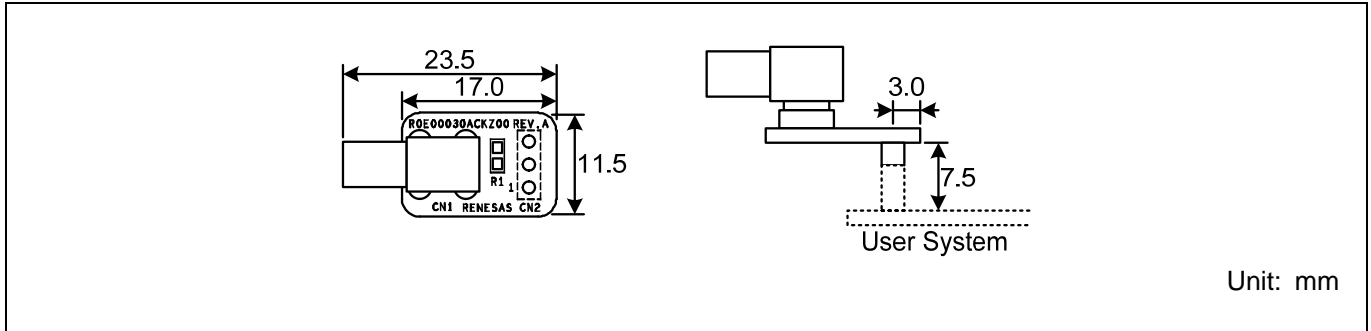Figure 4.3 shows external dimensions of the coaxial converter board.

Figure 4.3 External dimensions of the coaxial converter board

4.6.3 Option Board

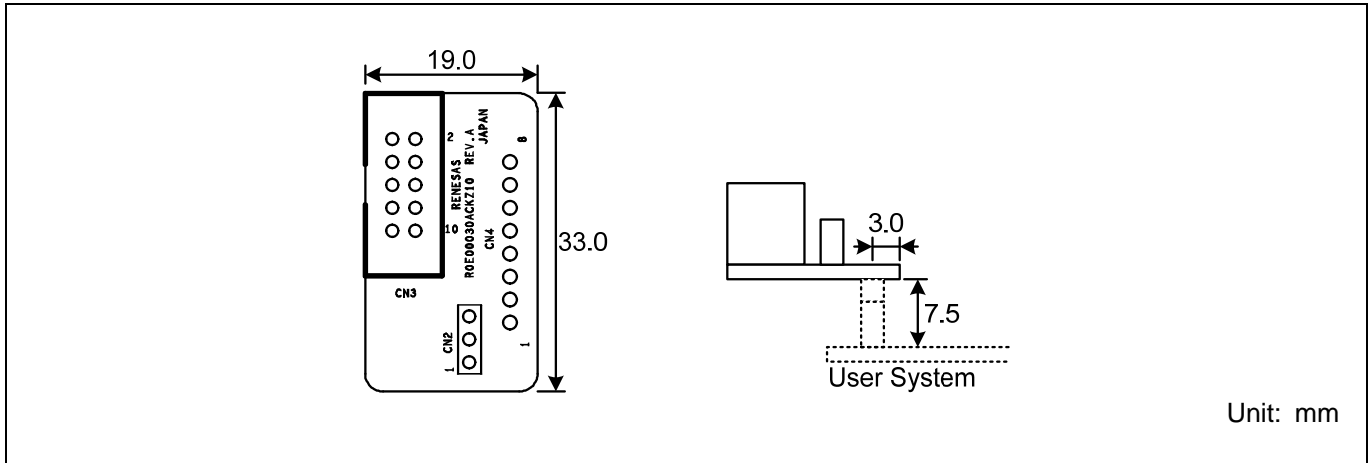Figure 4.4 shows external dimensions of the option board.

Figure 4.4 External dimensions of the option board

5. Maintenance and Guarantee

5.1 User Registration

When you purchase our product, be sure to register as a user. For user registration, refer to "User Registration" (page 10) of this user's manual.

5.2 Maintenance

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

5.3 Guarantee

If your product becomes faulty within one year after its purchase while being used under good conditions by observing "IMPORTANT" and "Precautions for Safety" 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.

5.4 Repair Provisions

(1) Repairs not covered by warranty

The products elapsed more than one year after purchase are not covered by warranty.

(2) Replacement not covered by warranty

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

(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) Transportation fees at sending your product for repair

Please send your product to us for repair at your expense.

5.5 How to Make Request for Repair

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

http://www.renesas.com/repair

⚠ CAUTION

Note on Transporting the Product:
- When sending your product for repair, use the packing box and 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.
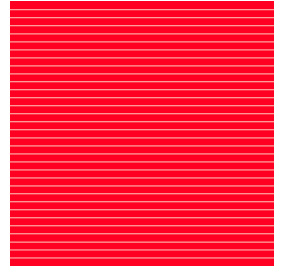

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