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Application Notes

Renesas E8a On-Chip Debugging Emulator

Introductory Guide for R8C Family Application Notes

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R8C Family

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Introduction

Notes

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Glossary

CPU	Central Processing Unit	PC	Program Counter
HEW	High-performance Embedded Workshop	RSK	Renesas Starter Kit
LED	Light Emitting Diode		

1. Overview

1.1. Overview of This Guide

This introductory guide is intended for first-time users of the E8a emulator. It provides simple descriptions regarding the E8a emulator to help the user easily follow a straight path from unpacking of the emulator to running and stopping a program without getting lost on the way.

This guide assumes that the user who purchased E8a emulator uses the CPU board contained in Renesas Starter Kit for R8C/1B as the user system; however, the E8a emulator can also be used for systems which incorporate other R8C family products with the same operating procedures.

The operating procedures are described in sections 4 through 6. Section 7 gives the procedure for using the E8a as a programmer of the on-chip flash memory rather than as a debugger. By proceeding along the steps in the flowchart below, you can get some practical experience with the E8a, starting with installation of the program and simple examples of usage to programming the on-chip flash memory of a microcomputer.

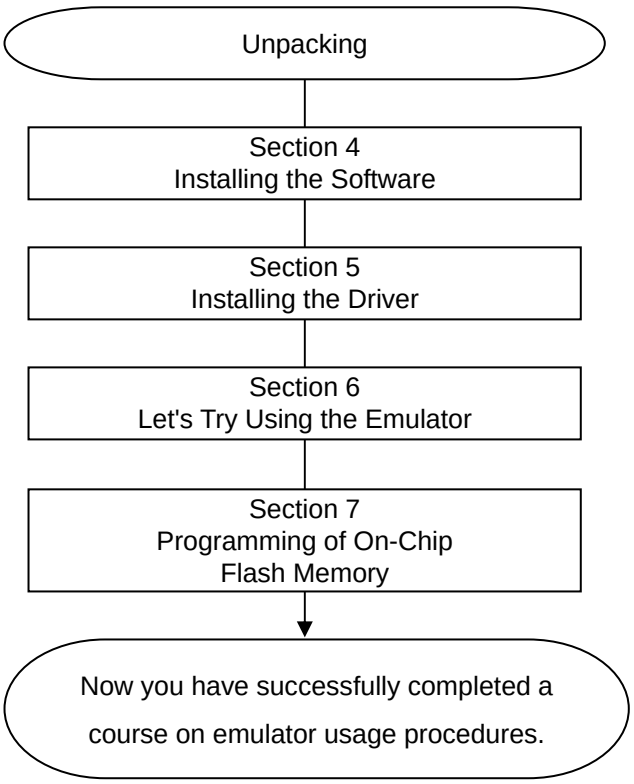


Figure 1.1 Flowchart of Procedure Descriptions

This guide assumes the use of the following machines and tools.

(1) Host computer

(2) E8a emulator

(3) CPU board (Renesas Starter Kit for R8C/1B)

2. Components and Environment

This section shows the components of the E8a emulator and the devices and environment needed to use the E8a emulator. Unpack the E8a emulator package and check the components against the component list.

2.1. Components

Table 2.1 is a list of the E8a emulator components.

Table 2.1 Components of the E8a emulator

Product Name	Quantity
R0E00008AKCE00 (E8a emulator)	1
USB cable	1
User system interface cable	1
CD-ROM	1

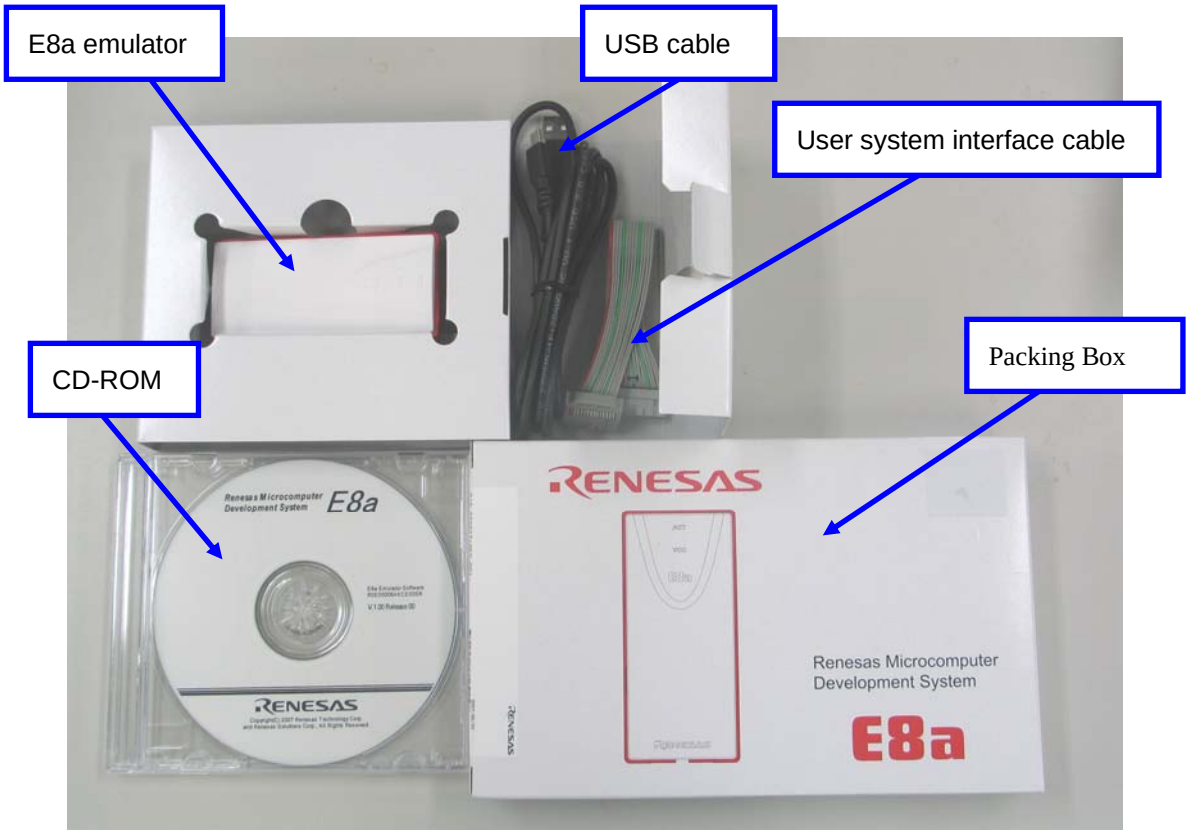


Figure 2.1 E8a Emulator Product Package

Note: The above picture shows the product taken out of the electrically conductive bag.

2.2. Operating Environment

The software products provided together with the E8a emulator operate on the host computer and OS version shown in table 2.2.

Table 2.2 Operating Environment

Host computer	IBM PC/AT with the USB1.1 interface
OS	Microsoft Windows 2000 or XP
CPU	PentiumIII 600 MHz or higher-performance CPU
Memory	128 Mbytes or more
HDD	Installation disc capacity: 100 Mbytes or more

2.3. CPU Board (Renesas Starter Kit for R8C/1B)

This guide uses the CPU board contained in Renesas Starter Kit instead of the user system. The RSK contains both of the CPU board and the E8a emulator; however, this guide assumes that the user will purchase the single unit of the E8a emulator and use the RSK's CPU board only.

The CPU board of Renesas Starter Kit for R8C/1B has the Renesas Technology 16-bit single-chip microcomputer R8C/1B (product code: R5F211B4).

The Renesas Starter Kit for R8C/1B is also available from Digi-Key Corporation (URL: http://digikey.com/).

2.4. CD-ROM

The CD-ROM provided together with the E8a emulator includes the software products necessary for program development and the online manual. The following shows the contents of the CD-ROM.

```
CD-ROM
    |- E8a Emulator Debugger
    |     E8a Emulator Software                                  V.1.00 Release 00
    |     - High-performance Embedded Workshop                   V.4.02.00
    |     - R8C E8a Emulator Debugger                            V.1.00.00
    |     - H8 Tiny/Super Low Power E8a Debugger                 V.1.00.00
    |     - M16C E8a Emulator Debugger                           V.1.00.00
    |     - M32C E8a Emulator Debugger                           V.1.00.00
    |     - 740 E8a Emulator Debugger                            V.1.00.00
    |     - Free evaluation-version M3T-NC30WA                   V.5.43 Release 00
    |     - Free evaluation-version M3T-NC308WA                  V.5.41 Release 01
    |     - Free evaluation-version C/C++ compiler package
    |       for H8SX, H8S, and H8 family                         V.6.01 Release 03
    |     - Free evaluation-version M3T-SRA74                    V.4.10 Release 02
    |     - E8a Self Check Program                               V.1.00.01
    |- ICC740
    |     - Free evaluation-version M3T-ICC740                   V.1.01 Release 02
    |- Flash Development Toolkit
    |     Free evaluation-version Flash Development Toolkit      V.4.00 Release 00
    |- AutoUpdate
        AutoUpdate Utility                                       V.1.03.00
```

Figure 2.2 Contents of E8a Emulator CD-ROM

Note: Versions of each product differ according to the timing of the E8a emulator shipment. This guide assumes that the E8a emulator software V.1.00 Release 00 will be used. For the software, download the latest version from the Renesas website or update the software provided in this product using the AutoUpdate Utility after it has been installed.

2.5. Machine to be Prepared by the User

Please prepare the following machine.

- Host computer

After the software in the CD-ROM has been installed, the latest versions can be easily found through the installed AutoUpdate Utility.

3. Product Specifications

3.1. C Compiler

The free evaluation-version C compiler package for the M16C series is provided in the CD-ROM. This C compiler package creates a debugging information file from the C or assembly-language source programs. Note that the free evaluation version has limitations in comparison with the production-version C compiler. For the limitations, refer to section 8.1, Limitations on Free Evaluation-Version C Compiler.

3.2. High-performance Embedded Workshop

The High-performance Embedded Workshop integrates software development tools, such as the C compiler, assembler, emulator software, and editor, into a common graphical user interface (GUI) to make software development more efficient.

3.3. Emulator Software

The emulator software operates on the host computer and communicates with the firmware that is stored in the flash memory in the target microcomputer on the user system board to provide high-level debugging functions. This emulator software has the following features.

1) Source-line debugging is available in assembly language, structured assembly language, and C language.
2) Event breakpoints with four address conditions or with two address conditions and one data condition are available. Software breaks can be set for up to 255 points.
3) The branch-trace function of the microcomputer shows the trace information of last four branch instructions (address, instruction, label, and source code).
4) The user program can be debugged in realtime at the maximum operating frequency by writing it to the flash memory in the target microcomputer.

4. Installing the Software

4.1. Installing the Provided Software

4.1.1. Before Starting Installation

1) Do not connect the E8a emulator to the host computer before the provided software is installed.
   - Installing the provided software transfers the E8a emulator driver to the host computer, and the [Found New Hardware] processing will automatically start.
   - If you connect the E8a emulator body to the host computer before installing the provided software, the host computer will not recognize the E8a because no driver for the E8a is found. In such a case, use the Windows device manager to delete the unknown USB device. Then install the provided software and connect the E8a to the host computer.

2) When you have both the free evaluation version and the production version of the compiler, use the production version.
   - If you have installed the production-version C compiler package for the M16C series, or if you purchased a production-version compiler package and E8a emulator together, you do not need to install the free-evaluation version included in the E8a emulator CD-ROM; only install the E8a emulator debugger through the [Select Features] dialog box described in section 4.1.2 (13).
   - For the limitations on the free evaluation-version C compiler package for the M16C series, refer to section 8.1, Limitations on Free Evaluation-Version C Compiler.

3) Dialog Boxes for Installation
   - If you have installed the High-performance Embedded Workshop in the target host computer, some dialog boxes may be skipped during the provided software installation.

4.1.2. How to Install the Software

(1) The following shows the procedure for installing the software necessary for the E8a emulator. Insert the E8a emulator CD-ROM in the host computer and the installation program will automatically start through the automatic play function of the drive.
If the installation program does not start, execute HewInstMan.exe from the CD-ROM.

(2) The [High-performance Embedded Workshop Install Manager] dialog box will appear. For the first-time installation, [Install Manager Help] will also appear for confirmation. Click on the [Close] button on the window title to close [Install Manager Help].

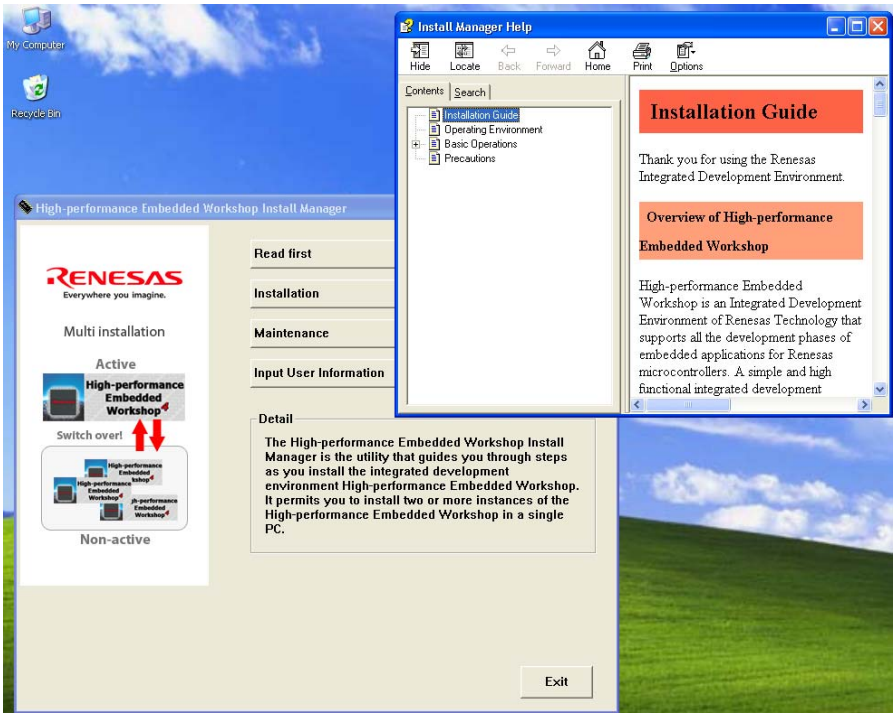


Figure 4.1 High-performance Embedded Workshop Install Manager

After confirming [Install Manager Help], enter user information by selecting the [Input User Information] button in the [High-performance Embedded Workshop Install Manager] dialog box. Entering user information can be omitted from the second time.

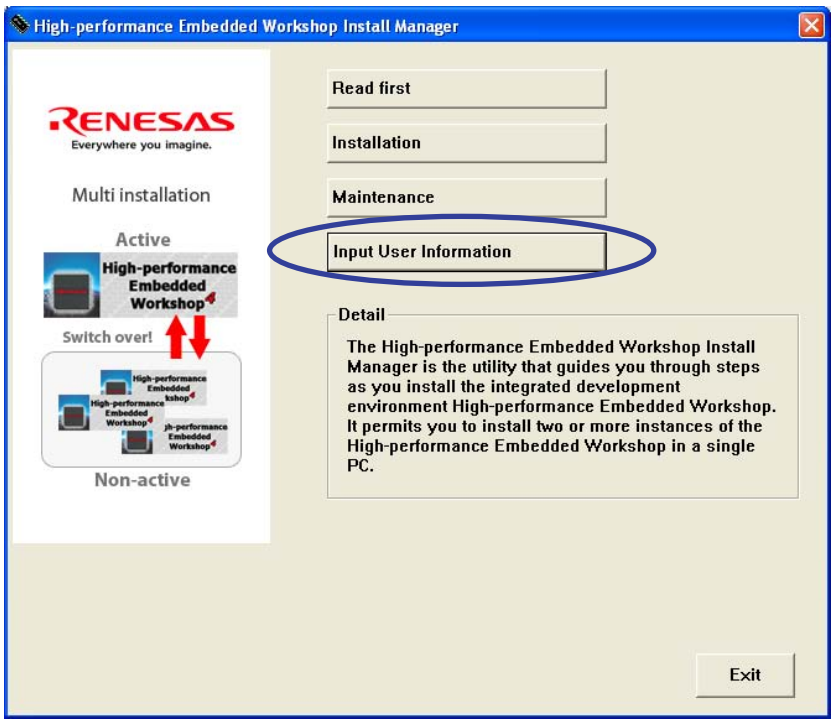


Figure 4.2 Top Menu of the High-performance Embedded Workshop Install Manager

(3) The [Input User Information] dialog box will appear. Enter each item and click on the [Save] button.

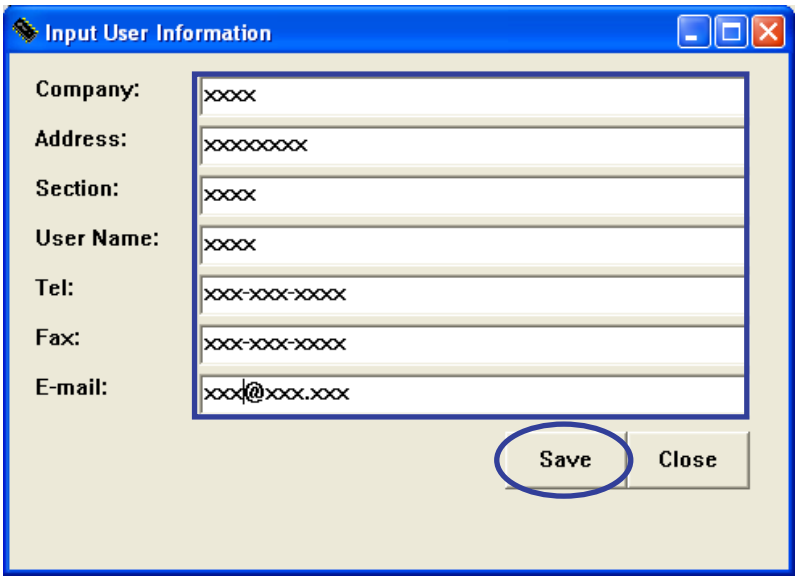


Figure 4.3 Entering User Information

(4) After entering user information, click on the [Installation] button.

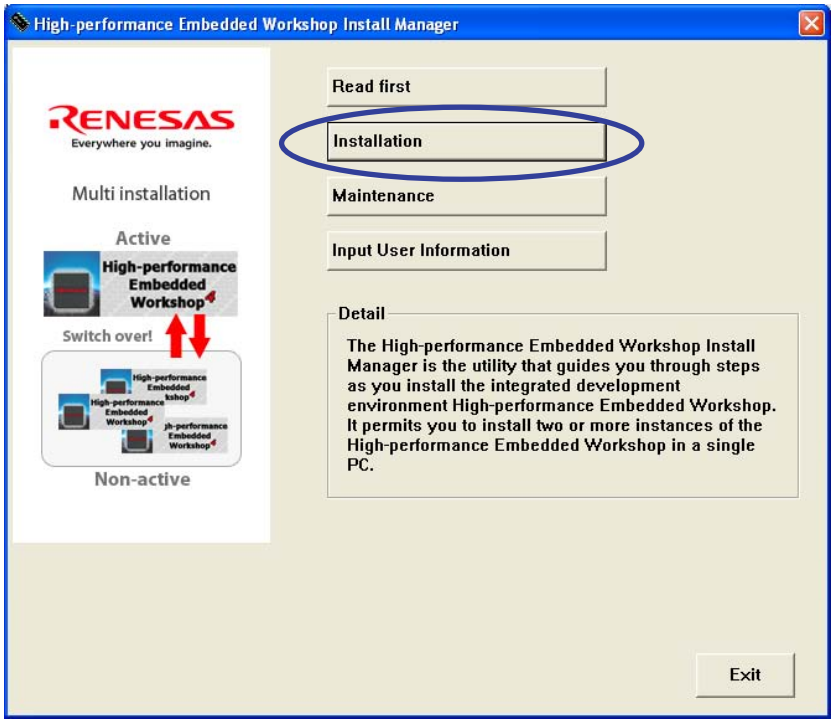


Figure 4.4 Starting Installation

(5) The [Choice of an installation mode] dialog box will appear. Select the [Install a High-performance Embedded Workshop for the first time.] radio button at the top of the installation methods and click on the [Next] button.

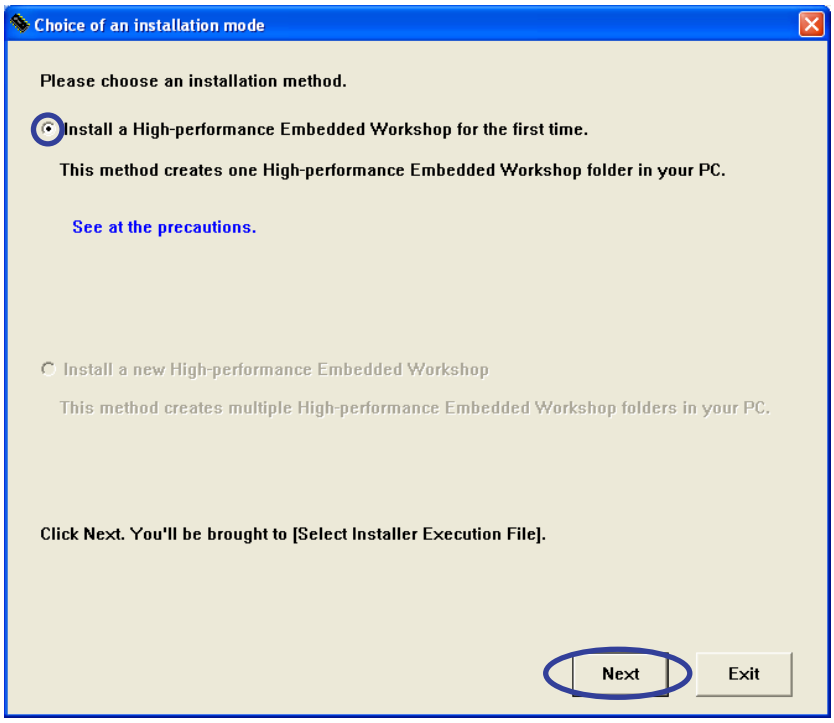


Figure 4.5 Selecting the Installation Method

(6) The [Choice of an installation] dialog box will appear. To change [Folder of an installation], click on the [Change] button and select the target folder. Check the folder for installing the file, and click on the [Next] button. This guide shows an example of using the default installation folder.

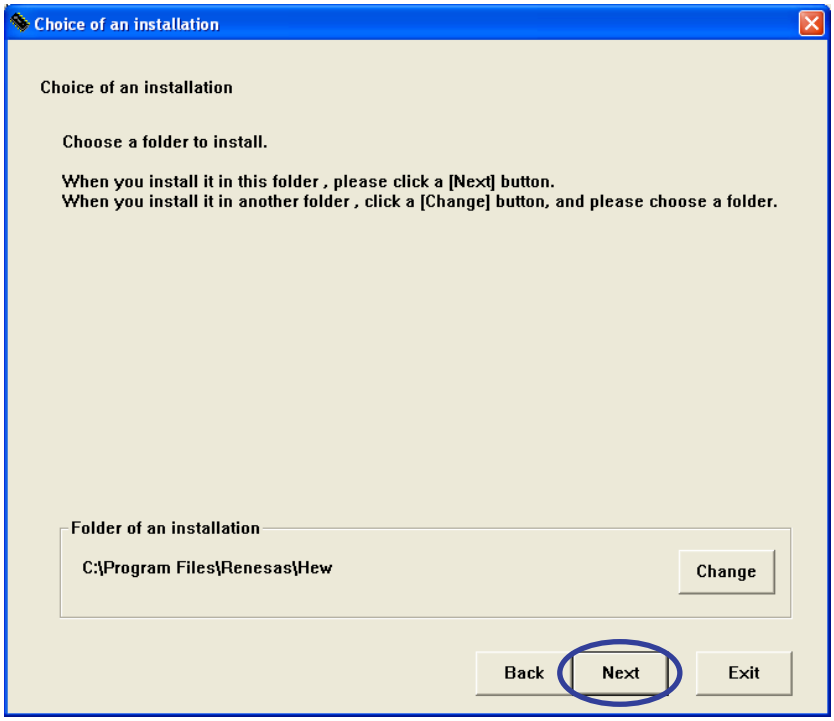


Figure 4.6 Selecting the Installation Folder

The installation folder may differ depending on the version of the High-performance Embedded Workshop earlier installed.

(a) The emulator software is installed in the same folder as the High-performance Embedded Workshop Ver.2.
When the High-performance Embedded Workshop Ver.2 was installed first and then updated (Ver.2->Ver.3, Ver.2->Ver.4, or Ver.2->Ver.3->Ver.4).

(b) The emulator software is installed in the same folder as the High-performance Embedded Workshop Ver.3.
When the High-performance Embedded Workshop Ver.3 was installed first.

(7) The [Choice of an installation product] dialog box will appear. Select the software products to install and click on the [Install] button.

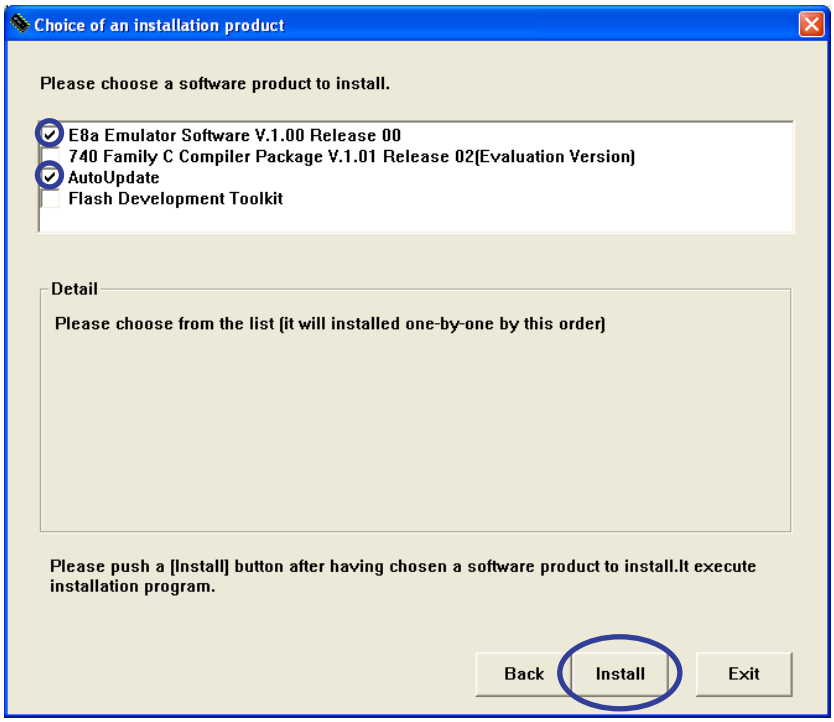


Figure 4.7 Selecting Software Products to Install from the E8a Emulator CD-ROM

In this guide, the E8a emulator software and AutoUpdate Utility have been selected.
A check box for the free-evaluation version flash development toolkit is only selectable in the CD-ROM version.

(8) The [Confirm] dialog box will appear to inquire installation of the High-performance Embedded Workshop. Click on the [Yes] button.

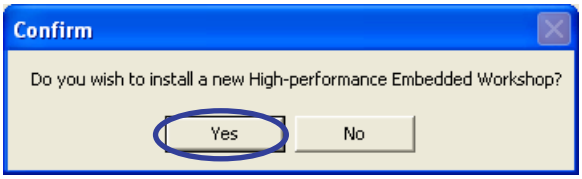


Figure 4.8 Confirming Installation of the High-performance Embedded Workshop

(9) Installation of the High-performance Embedded Workshop starts and the [Choose Setup Language] dialog box will appear. Select [English] and click on the [Next] button.

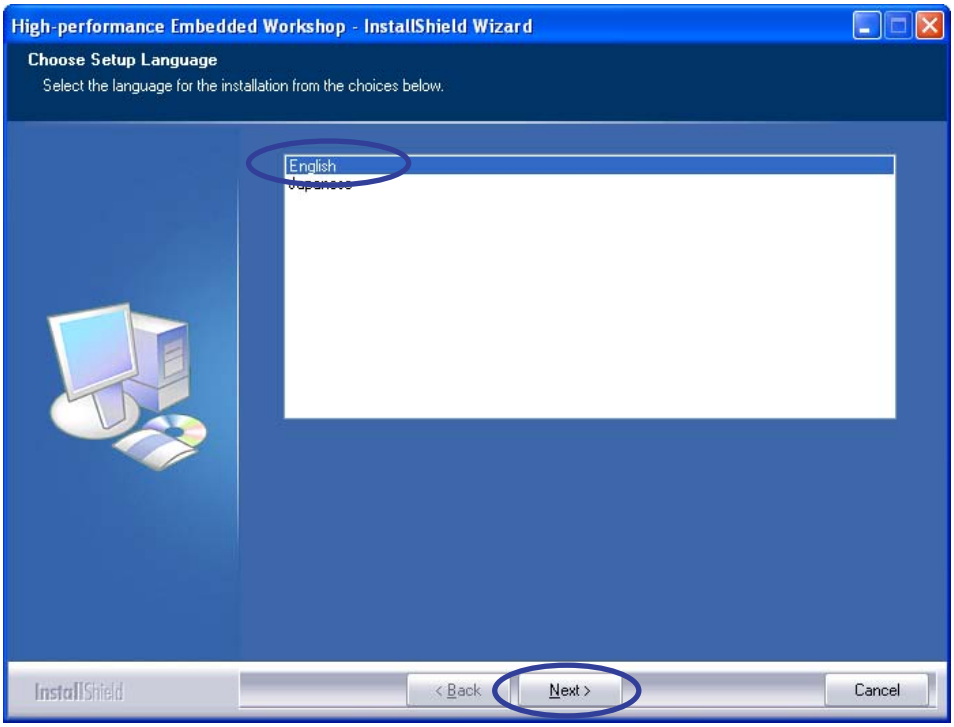


Figure 4.9 Selecting the Language for Installation

(10) Installation of the E8a emulator software starts. Click on the [Next] button.

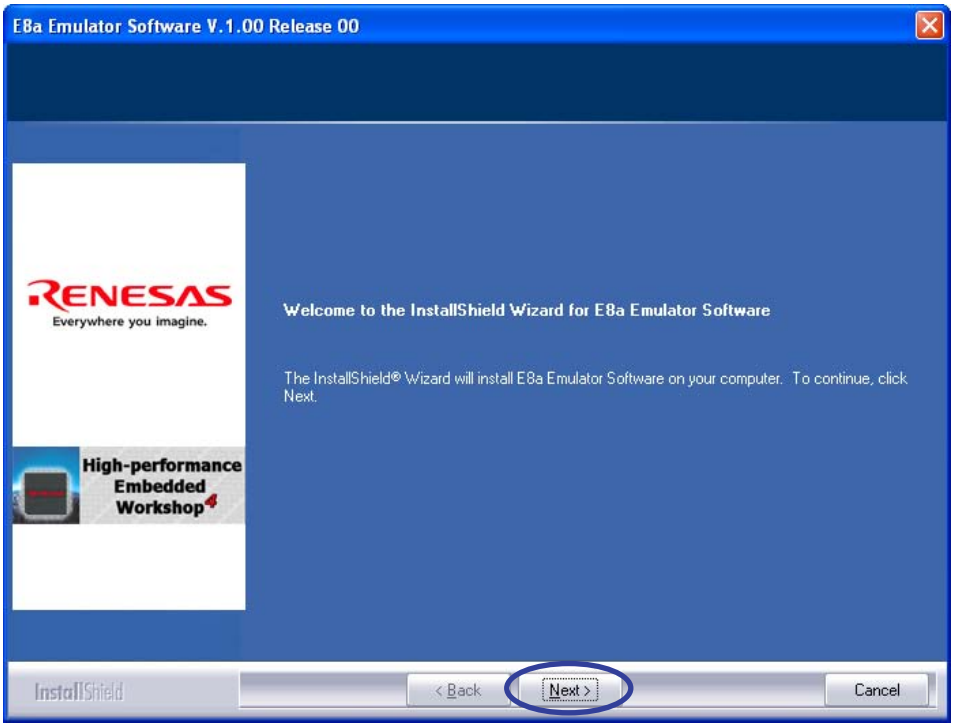


Figure 4.10 Starting the E8a Emulator Software Installation

(11) The [License Agreement] dialog box will appear. Read the contents and click on the [Yes] button.

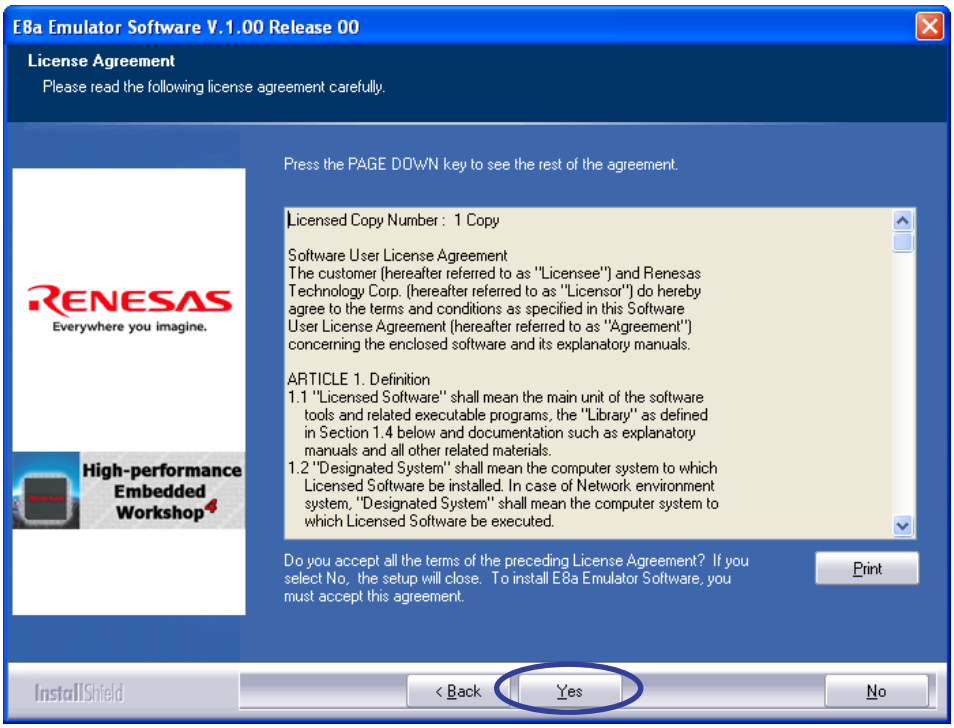


Figure 4.11 License Agreement for the E8a Emulator Software

(12) The [Region Selection] dialog box will appear. Select the [Europe or United States of America] radio button when you live in Europe or in the United States. Select the [Other region (Japan, Asia etc.)] radio button when you live in other countries. After selecting the region, click on the [Next] button.

Figure 4.12 Selecting the Region

In this example, [Europe or United States of America] has been selected.

(13) The [Select Features] dialog box will appear. Deselect the functions that will not be used, and click on the [Next] button. This guide shows an example of deselecting the H8SX, H8S, H8 family, M32C/90/80, M16C/80/70 series, and 740 family.

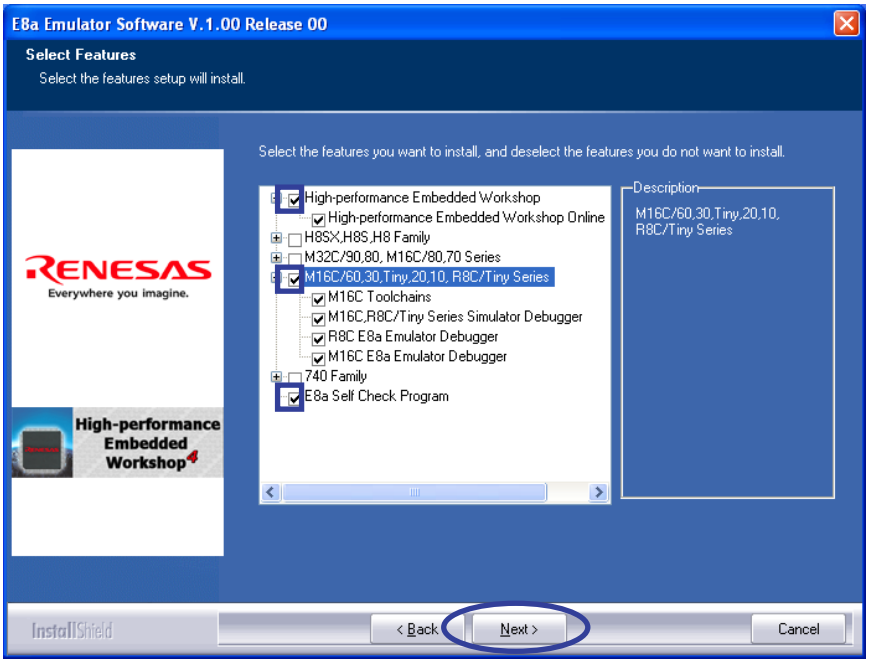


Figure 4.13 Selecting the Functions to Install

If you have installed the production-version C compiler package for the M16C series, or if you purchased a production-version compiler package and E8a emulator together, you do not need to install the free evaluation version included in the E8a emulator CD-ROM; deselect [M16C Toolchains] from [M16C Series] in the [Select Features] dialog box.

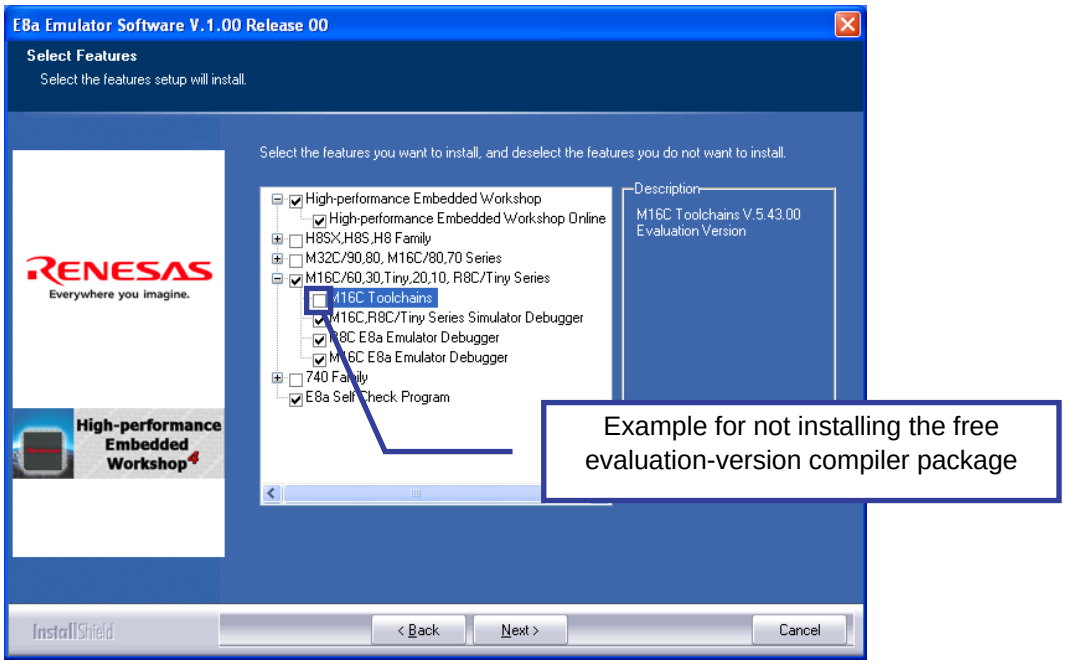


Figure 4.14 Selecting the Functions to Install - Example for Not Installing the Free Evaluation-Version Compiler Package

(14) The [Start Copying Files] dialog box will appear. Check the current setting and click on the [Next] button.

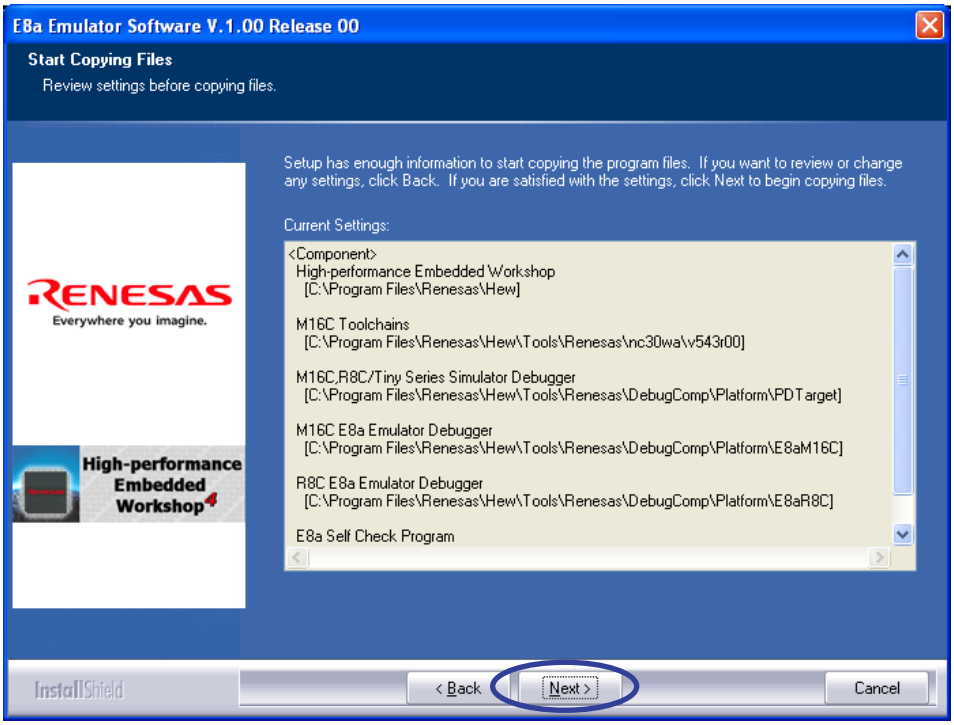


Figure 4.15 E8a Emulator Software Components to Be Installed

(15) The following progress bar will be displayed while the program files are being copied.

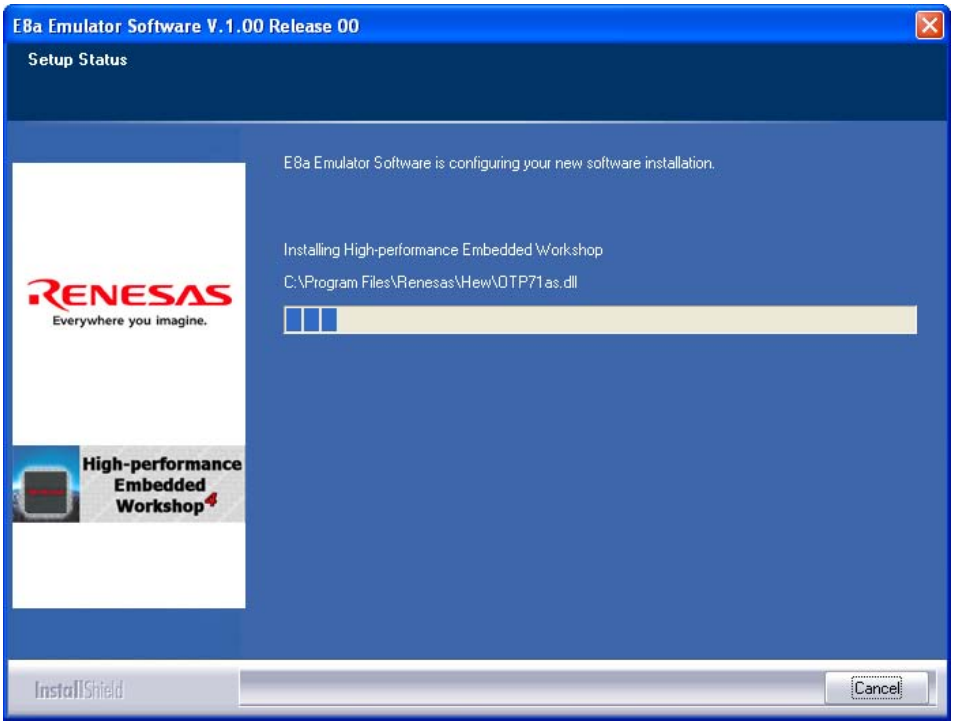


Figure 4.16 Progress Bar for E8a Emulator Software Installation

(16) The [InstallShield Wizard Complete] dialog box will appear. Click on the [Finish] button.

Figure 4.17 Screen Showing Completion of E8a Emulator Software Installation

When [Executes a Support Information Tool.] is selected, user information which is required for user registration is checked. If a serial number of the emulator product has not been entered, a message box will appear to enter that number. Click on the [OK] button to show the screen for entering the serial number.

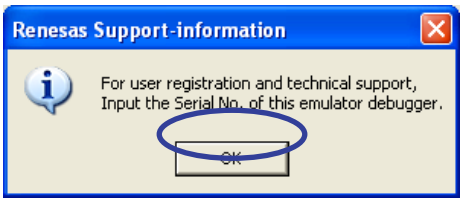


Figure 4.18 Request for Entering the Serial Number of the Emulator Product

Enter the serial number in the input space for [Emulator Serial No.] and click on the [Save] button.

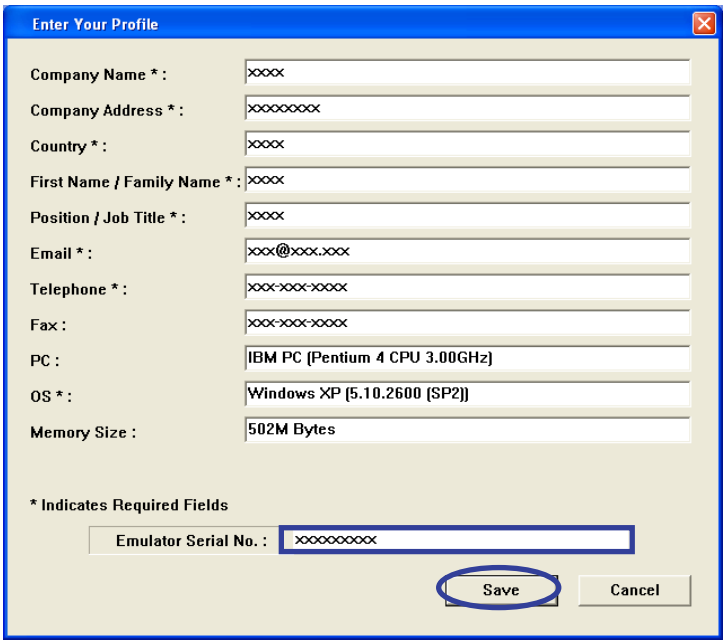


Figure 4.19 Entering the Serial Number of the Emulator Product

Use the [Renesas Tools Support-information] dialog box to confirm user registration. Click on the [OK] button to close the window.

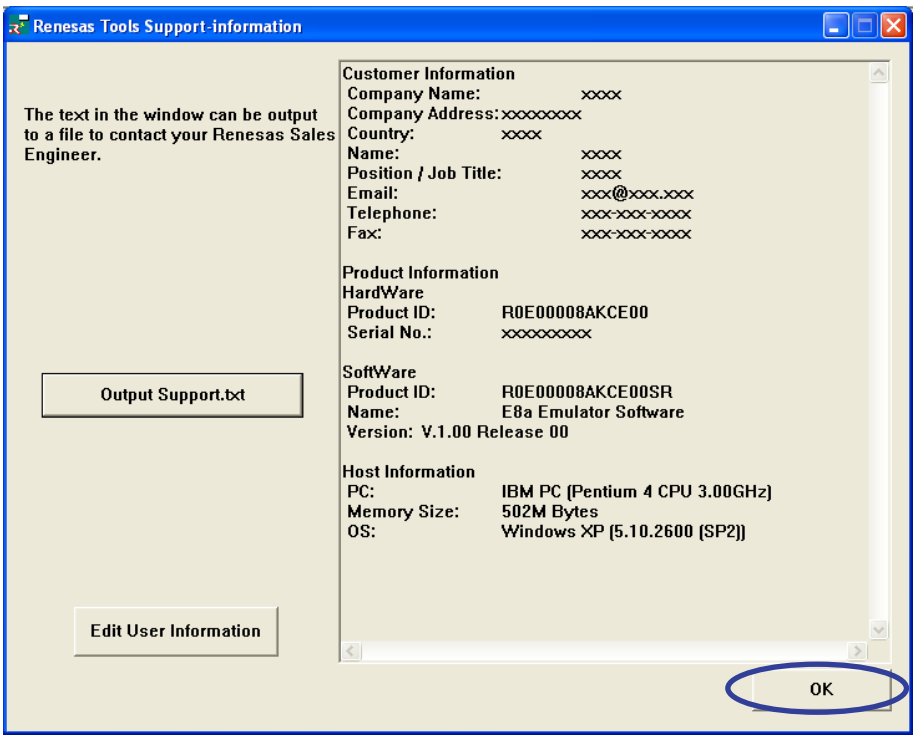


Figure 4.20 [Renesas Tools Support-information] Dialog Box

(17) When [Open a precaution file.] is selected on the screen showing completion of E8a emulator software, the [Supplementary and Precautions for Emulator E8a] window will be displayed in html form.

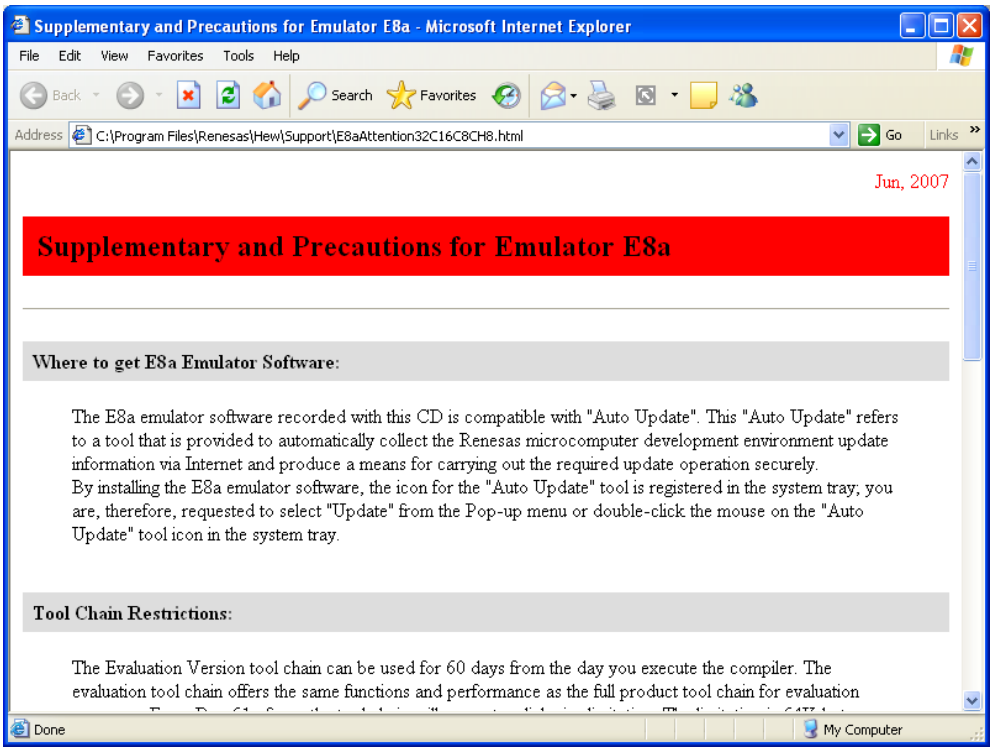


Figure 4.21 [Supplementary and Precautions for Emulator E8a] Window

Be sure to read the supplementary information and precautions on the E8a emulator. This also includes the website address where the latest-version software for the E8a emulator is available. For more information about the latest version and other supplementary information, refer to the descriptions at the website.

To close the [Supplementary and Precautions for Emulator E8a] window, select [Close] from the [File] menu on the window. To read the supplementary information and precautions on the E8a emulator later, access the following file. For the folder name, refer to the description in step (6).

"C:¥Program Files¥Renesas¥Hew¥Support¥ E8aAttention32C16C8CH8.html"

(18) Next, installation of the [AutoUpdate Utility] component will start. The [Choose Setup Language] dialog box will appear. Select [English] and click on the [OK] button.

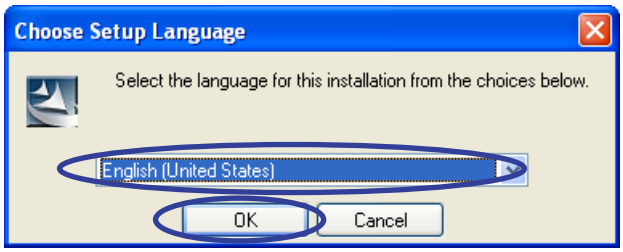


Figure 4.22 Starting AutoUpdate Utility Installation

(19) The [Welcome to the InstallShield Wizard for Renesas AutoUpdate Utility V.*.**.**] dialog box will appear. Click on the [Next] button. 'V.*.**.**' means the version of the AutoUpdate Utility.

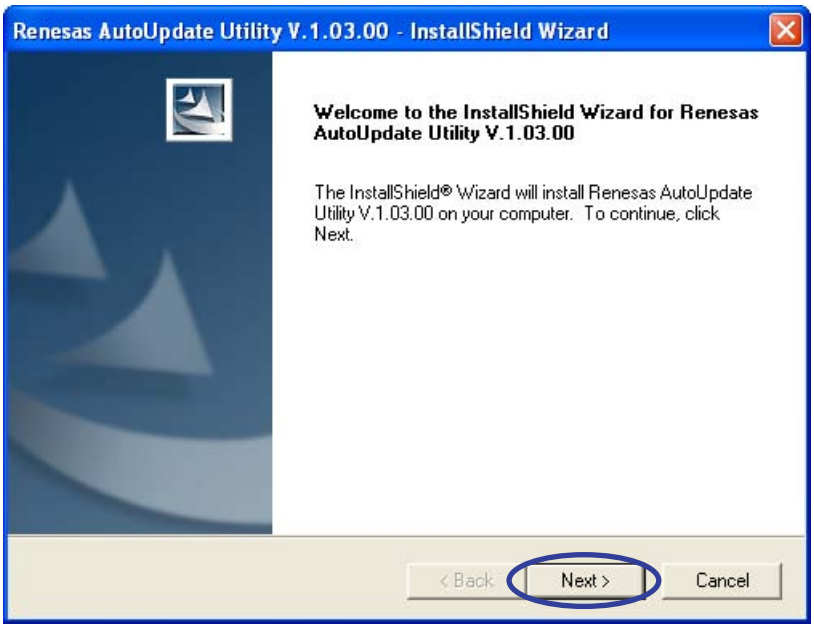


Figure 4.23 Dialog Box for Starting AutoUpdate Utility Installation

(20) The [Installation options] dialog box will appear.

Selecting [I want to register the AutoUpdate utility to the startup folder.] enables the product update information to be automatically monitored. Select the installation option if necessary and click on the [Next] button.

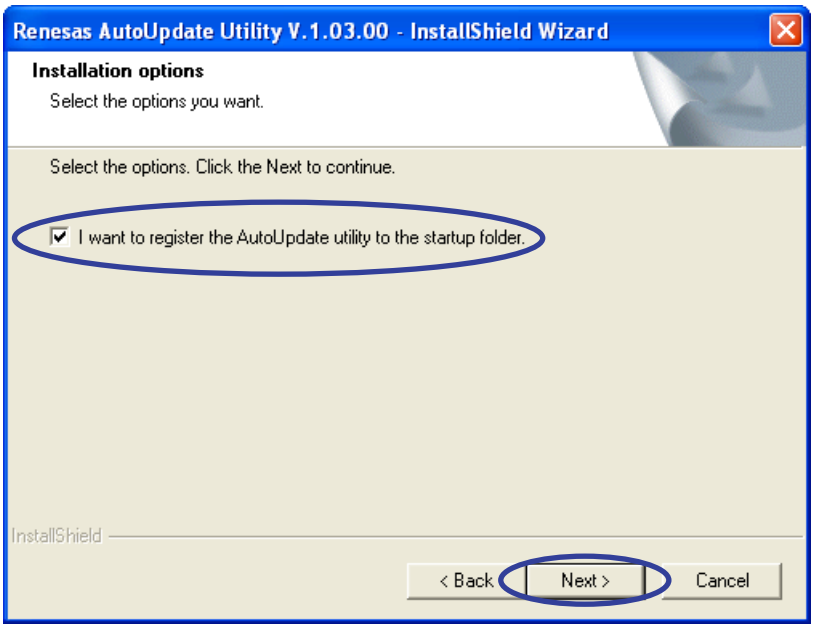


Figure 4.24 Option for AutoUpdate Utility Installation

(21) The [Ready to Install the Program] dialog box will appear. Click on the [Install] button.

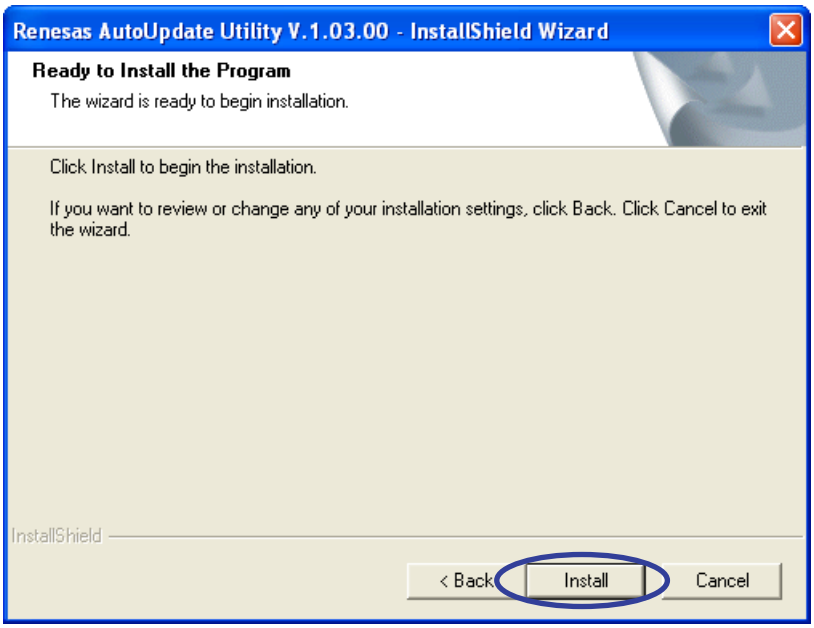


Figure 4.25 AutoUpdate Utility Component to be Installed

(22) After file copying finishes, notes on the Renesas AutoUpdate Utility installation will be displayed in html form. Read the notes and close the window.

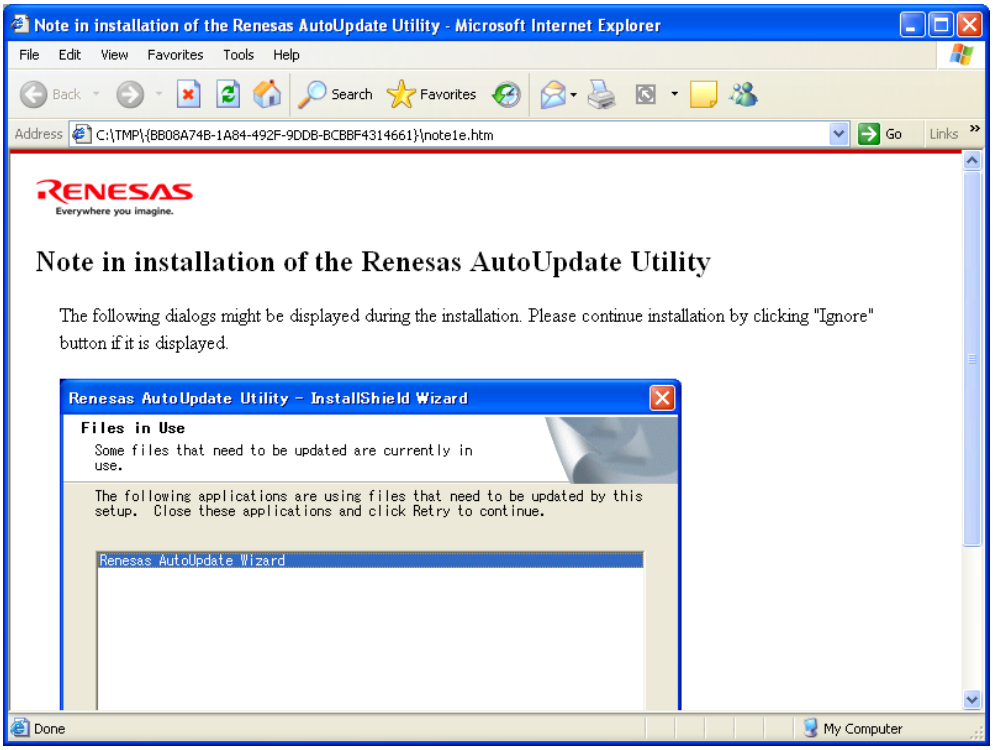


Figure 4.26 Notes on AutoUpdate Utility Installation

(23) After the [AutoUpdate Utility] component has been installed, the [InstallShield Wizard Complete] dialog box will appear. Click on the [Finish] button.

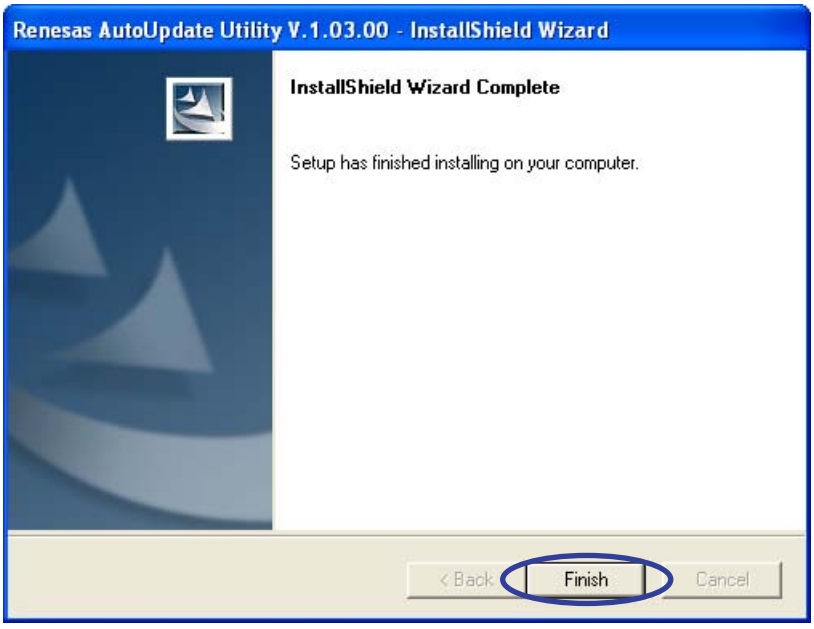


Figure 4.27 Completing AutoUpdate Utility Installation

(24) If the [Restart Windows] dialog box appears, select the [No, I will restart my computer later.] radio button and click on the [OK] button. Restart the computer manually after completing the installation of all components.

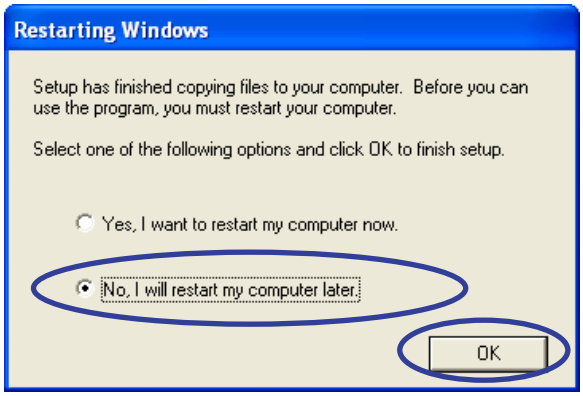


Figure 4.28 Dialog Box for Confirming Windows Restart

(25) The [High-performance Embedded Workshop Install Manager] dialog box will appear. Click on the [Exit] button. This completes installation of all selected components.

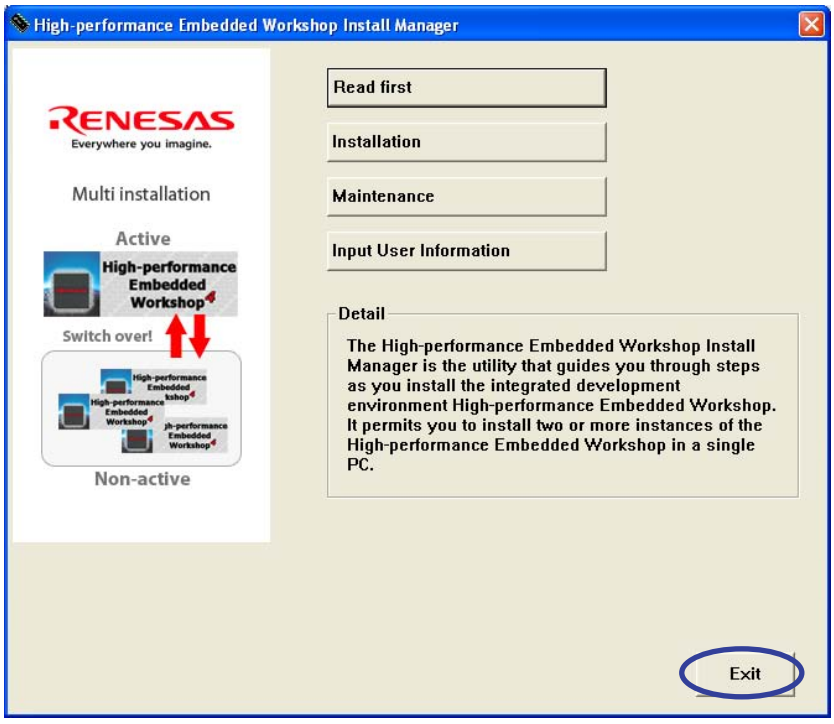


Figure 4.29 Completing Installation of Software Provided for the E8a Emulator

Installation of the software is completed through these steps. If you were prompted to restart the computer in step (24), restart Windows.

(26) If you deselected installation of the free evaluation-version compiler in the [Select Features] dialog box in step (13) and want to install the production version, you can install it now. For the installation procedure, refer to the document supplied together with the production-version compiler package.

(27) If you obtain the latest version of the installed software, download and update the software by using Renesas AutoUpdate Utility.

5. Installing the Driver

5.1. Wizard for Adding Hardware

(1) Connect the E8a emulator body to the host computer through the USB cable.

(2) The [Welcome to the Found New Hardware Wizard] dialog box will appear. Select the [No, not this time] radio button and click [Next].

Figure 5.1 [Found New Hardware Wizard] Dialog Box

This guide shows an example of the wizard in Windows XP Service Pack 2 (SP2).

(3) The [Found New Hardware Wizard] dialog box will appear. Select the [Install the software automatically (Recommended)] radio button and click [Next].

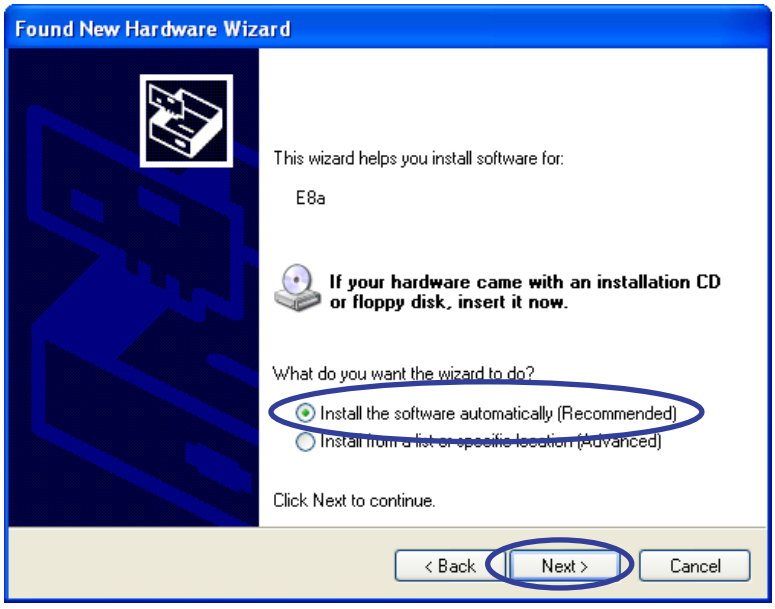


Figure 5.2 Selecting the Driver Software Installation Method

(4) Windows automatically detects and installs the driver. To enable automatic driver detection, the E8a emulator software should be installed in advance. For the E8a emulator software installation, refer to section 4, Installing the Software.

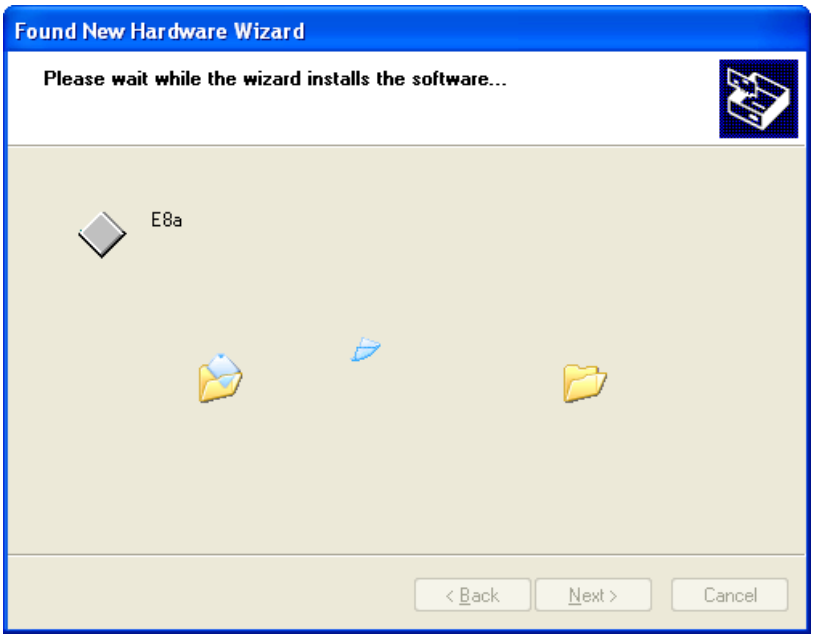


Figure 5.3 Dialog Box Shown during Driver Installation

(5) The [Completing the Found New Hardware Wizard] dialog box will appear. Click on the [Finish] button.

Figure 5.4 [Completing the Found New Hardware Wizard] Dialog Box

Driver installation is completed through these steps.

6. Let's Try Using the E8a Emulator

This section describes the basic usage of the E8a emulator with regard to the sample program that is to be installed in the host computer when the E8a emulator software is installed

6.1. Before Starting

6.1.1. Checking the Software

This example uses the C compiler, High-performance Embedded Workshop, and the E8a emulator software supplied with the emulator. Be sure to check that the software is installed in the computer before using the emulator. If any software is not installed, install it as described in section 4, Installing the Software.

6.1.2. Checking the Connections

Before using the E8a emulator, be sure to check that the host computer, USB cable, E8a emulator, user system interface cable, and user system (i.e. CPU board included in the Renesas Starter Kit for R8C/1B) are connected as shown in figure 6.1. If the connections are not complete, connect them as shown in the figure.

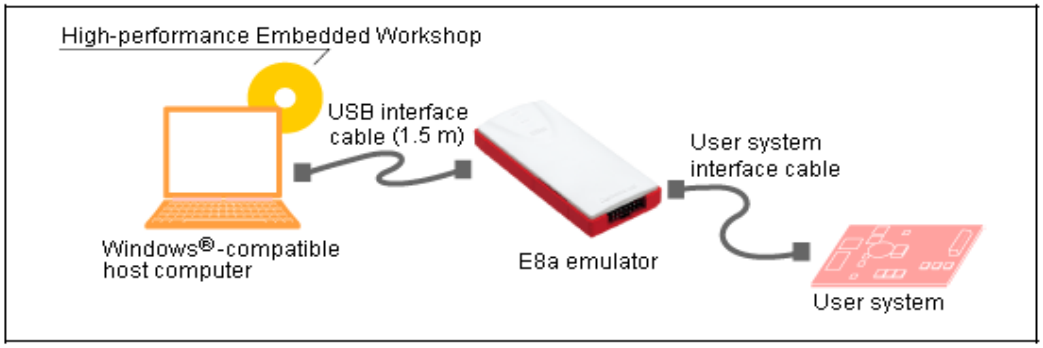


Figure 6.1 System Configuration of the E8a Emulator

6.2. Activating the High-performance Embedded Workshop

6.2.1. Activating the High-performance Embedded Workshop

Activate the High-performance Embedded Workshop by opening the [Start] menu and selecting [All Programs], [Renesas], [High-performance Embedded Workshop], and [High-performance Embedded Workshop] in that order.

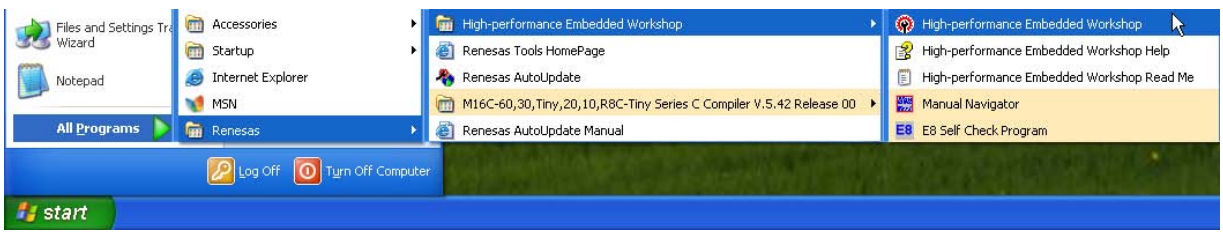


Figure 6.2 Activating the High-Performance Embedded Workshop

6.3. Sample Program Execution Procedures

This section guides you through the procedures for loading the sample program in memory, executing it, and checking the resultant value of a variable through the following steps.

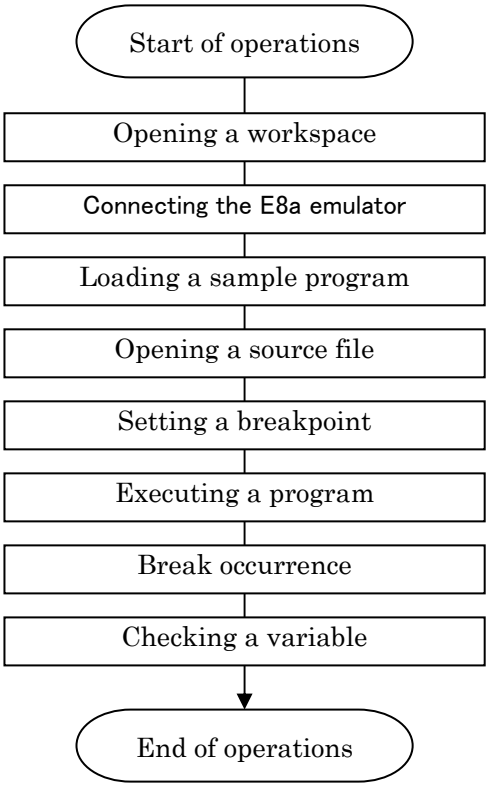


Figure 6.3 Procedure for Sample Program Execution

6.3.1. Opening a Workspace

(1) The [Welcome!] dialog box will appear on the High-performance Embedded Workshop window.

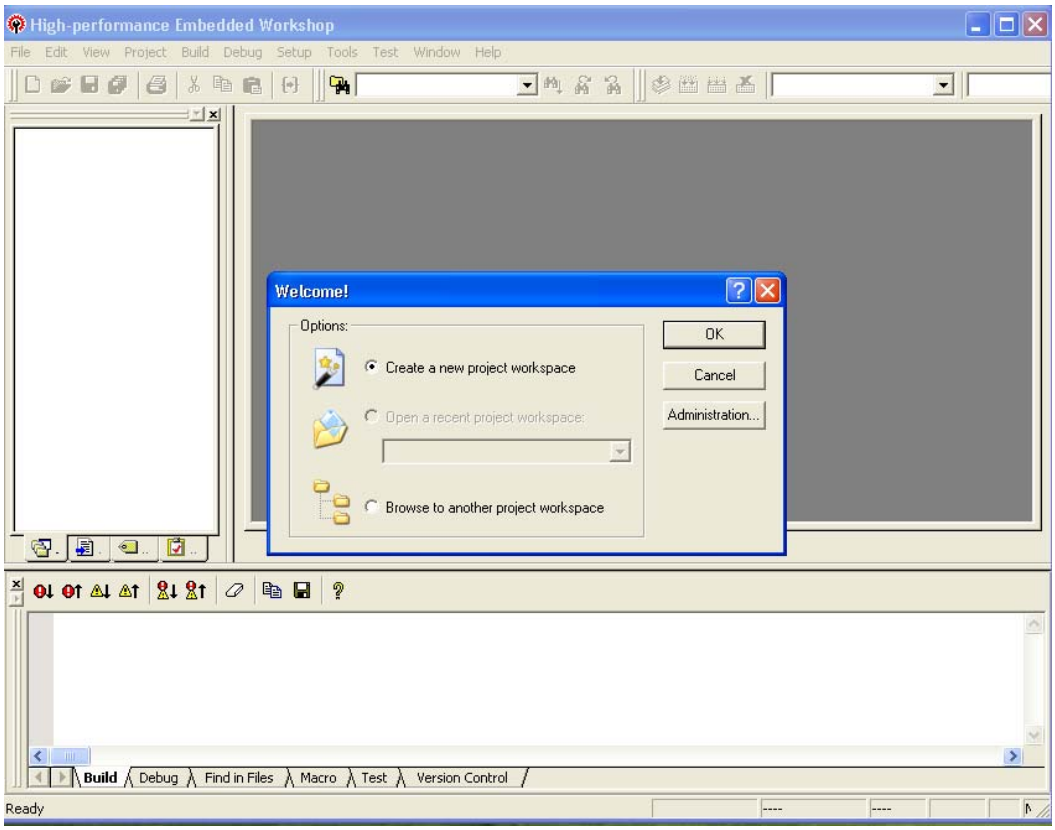


Figure 6.4 Startup Screen of the High-Performance Embedded Workshop

Select the [Browse to another project workspace] radio button in the [Welcome!] dialog box and click on the [OK] button.

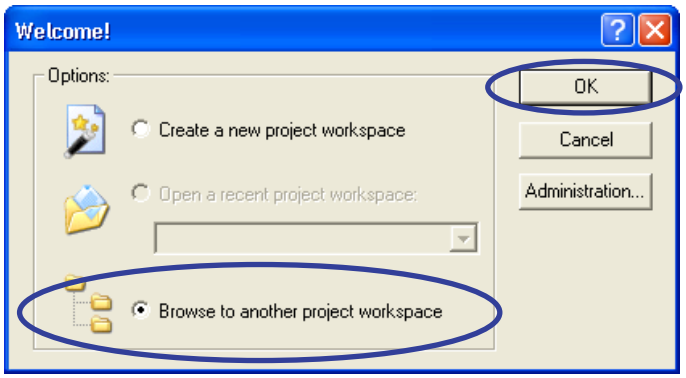


Figure 6.5 Selecting the Workspace Processing

(2) The [Open Workspace] dialog box will appear.

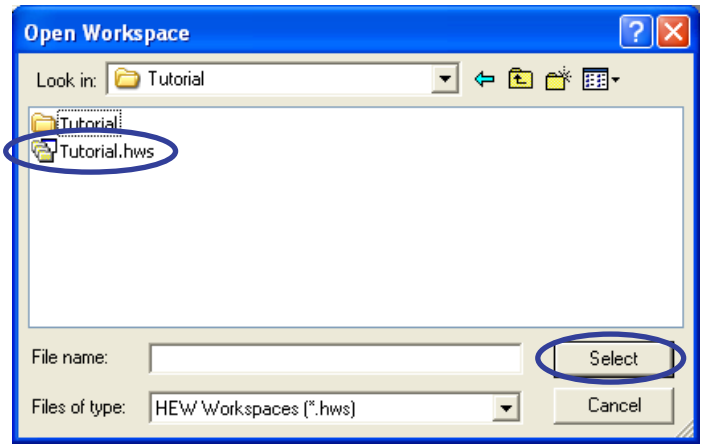


Figure 6.6 Selecting a Workspace File

If the software for the emulator has been installed, the workspace "Tutorial.hws" will be in the folder shown below (standard location). Specify the correct location by opening the folders in order. Select the workspace "Tutorial.hws" and click on the [Select] button.

C:¥WorkSpace¥Tutorial¥E8a¥R8C¥Tutorial¥Tutorial.hws
C:\WorkSpace └Tutorial └E8a └R8C └Tutorial └Tutorial.hws

Figure 6.7 Folder Including the Workspace File

The above folder will not be specifiable depending on the user environment. In this case, select the folder indicated below.

C:¥hew3¥Tools¥Renesas¥DebugComp¥Platform¥E8a¥R8C¥Tutorial

C:¥hew2¥Tools¥Renesas¥DebugComp¥Platform¥ E8a¥R8C¥Tutorial

Note: The drive name C: should be read as the name of the drive where the OS is installed in your computer.

(3) If the workspace was made with an old version of the High-performance Embedded Workshop, the following dialog box will appear.

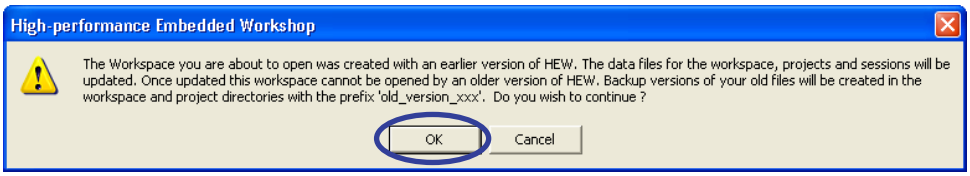


Figure 6.8 Dialog Box Shown for Old-Version Workspace

To update it to the new version, click on the [OK] button.

6.3.2. Connecting the E8a Emulator

(1) Select [SessionR8C_E8a_SYSTEM] from the sessions drop-down list box on the toolbar.

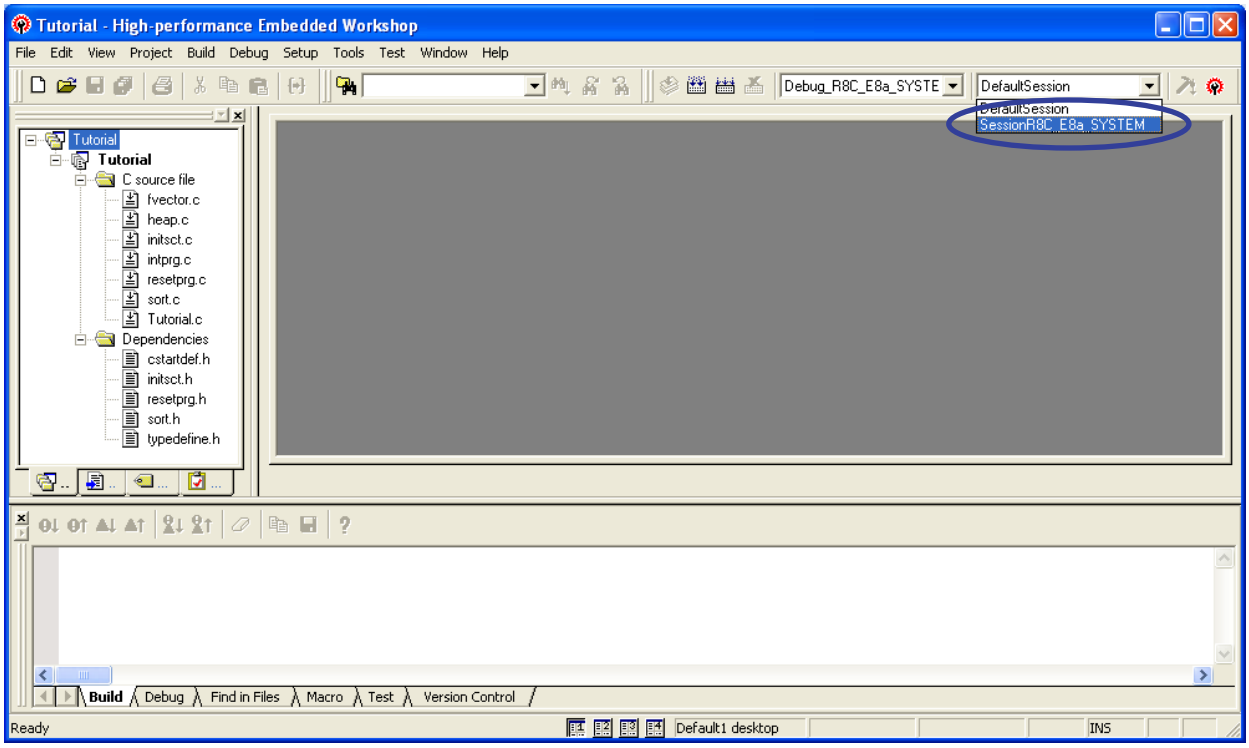


Figure 6.9 Switching Debug Session

If a dialog box appears to save the change of the previous session, click on the [Yes] button.

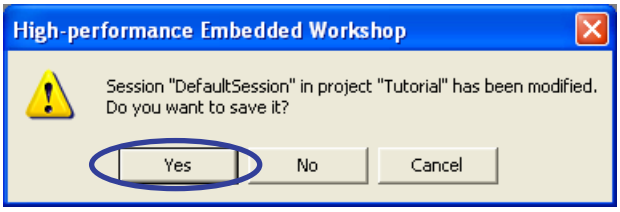


Figure 6.10 Saving Previous Debug Session

(2) The [Emulator mode] dialog box will appear.

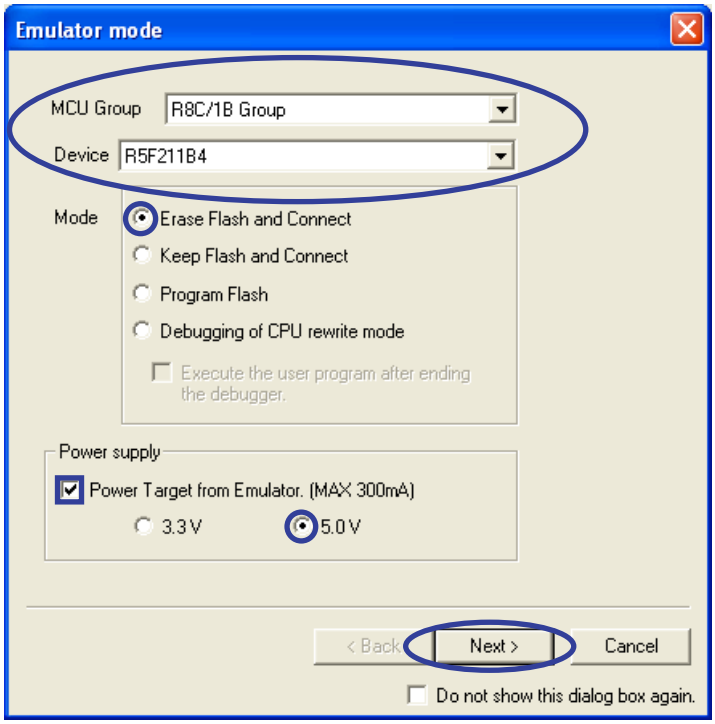


Figure 6.11 [Emulator mode] Dialog Box

In the [MCU Group] menu, the type of the device mounted on the user system should be selected.

Here, select [R8C/1B Group].

In the [Device] menu, the name of the device should be specified.

Select [R5F211B4] which is installed on the CPU board.

Select the [Erase Flash and Connect] radio button for [Mode].

Click [Power Target from Emulator. (MAX 300mA)] for [Power supply] and select 5.0 V required for the CPU board.

Then, click on the [Next] button.

Emulator modes:

- [Erase Flash and Connect]:
  This mode is used to erase data of the on-chip flash memory before launching the debugger. A program for the E8a is also written to the flash memory at the same time.
- [Keep Flash and Connect]:
  This mode is used to launch the debugger while retaining data of the on-chip flash memory. However, areas for the E8a emulator program and vector areas used by the emulator will be changed.
- [Program Flash]:
  This mode is used to launch the emulator as a simple programmer. Only the user program is written to at downloading (not the E8a emulator program). Accordingly, in this mode, debugging of the program is not available.
- [Debugging of CPU rewrite mode]:
  This mode is used to debug the program that rewrites the CPU. Debugging of the program is not available in this mode.

(3) The [Firmware Location] dialog box will appear. Specify the assignment area for the E8a firmware as the area that is not used in the user system. In this example, the E8a firmware has been assigned to the data-flash area. With some types of devices, however, selecting the location for the E8a firmware is not necessary (i.e. no user resources will be used).

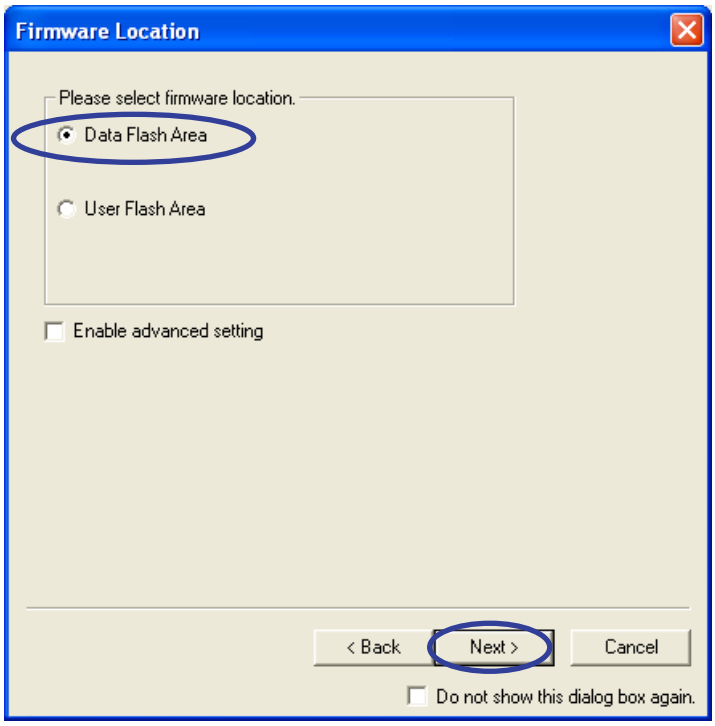


Figure 6.12 Selecting the Location for the E8a Firmware

When the [Enable advanced setting] check box is selected, a specific address in the user-flash area can be selected. The E8a firmware will be assigned to the 2-Kbyte area shown in the [Specify the address] section in the [Firmware Location] dialog box.

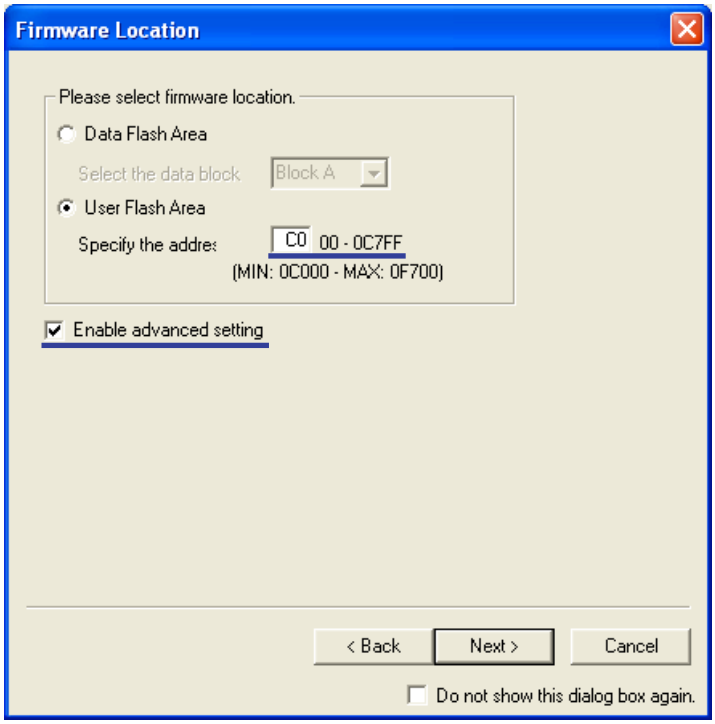


Figure 6.13 Selecting the Location for the E8a Firmware (with [Enable advanced setting] Selected)

(4) The [Communication Baud Rate] dialog box opens. Select a desired baud rate for communication between the E8a and the device. In this example, [500000 bps] is selected. Normally it is not necessary to change the default value.

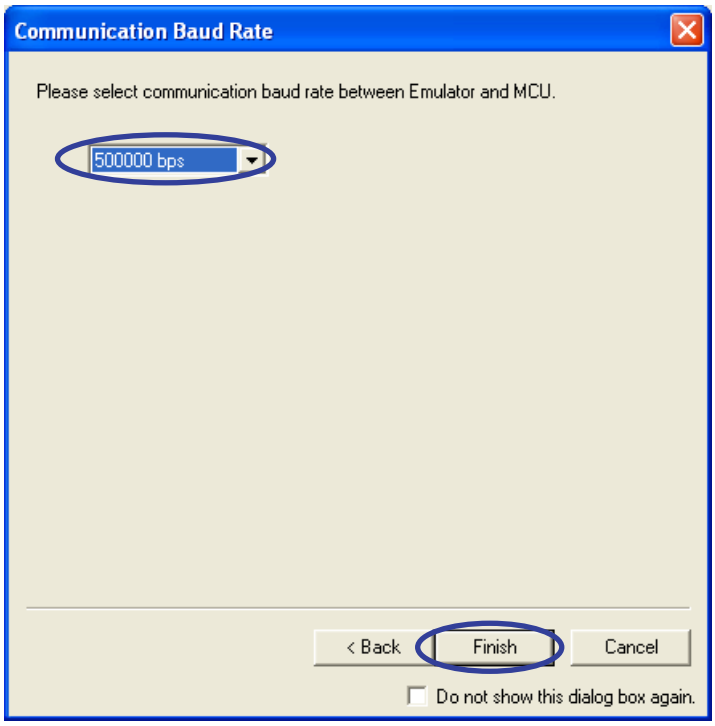


Figure 6.14 Selecting the Baud Rate

The [ID Code verification] dialog box may appear. In such cases, enter the ID code written in the on-chip flash memory.

(5) While the connection with the E8a emulator is being made, the [Connecting] information box shown below is displayed.

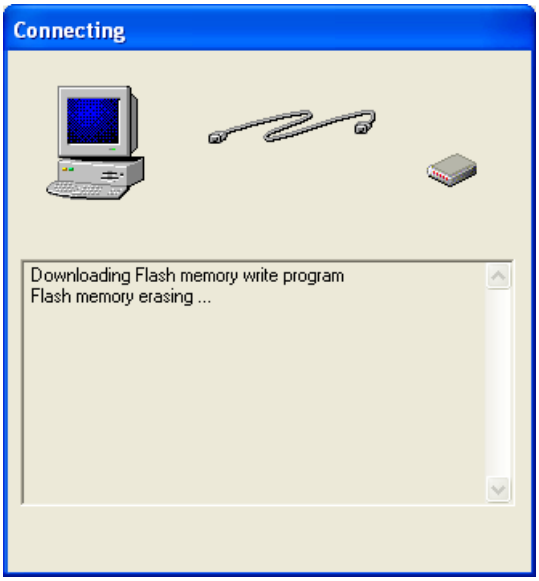


Figure 6.15 [Connecting] Dialog Box

(6) Now that the E8a emulator has been successfully connected, “Connected” appears in the [Debug] tabbed page in the [Output] pane.

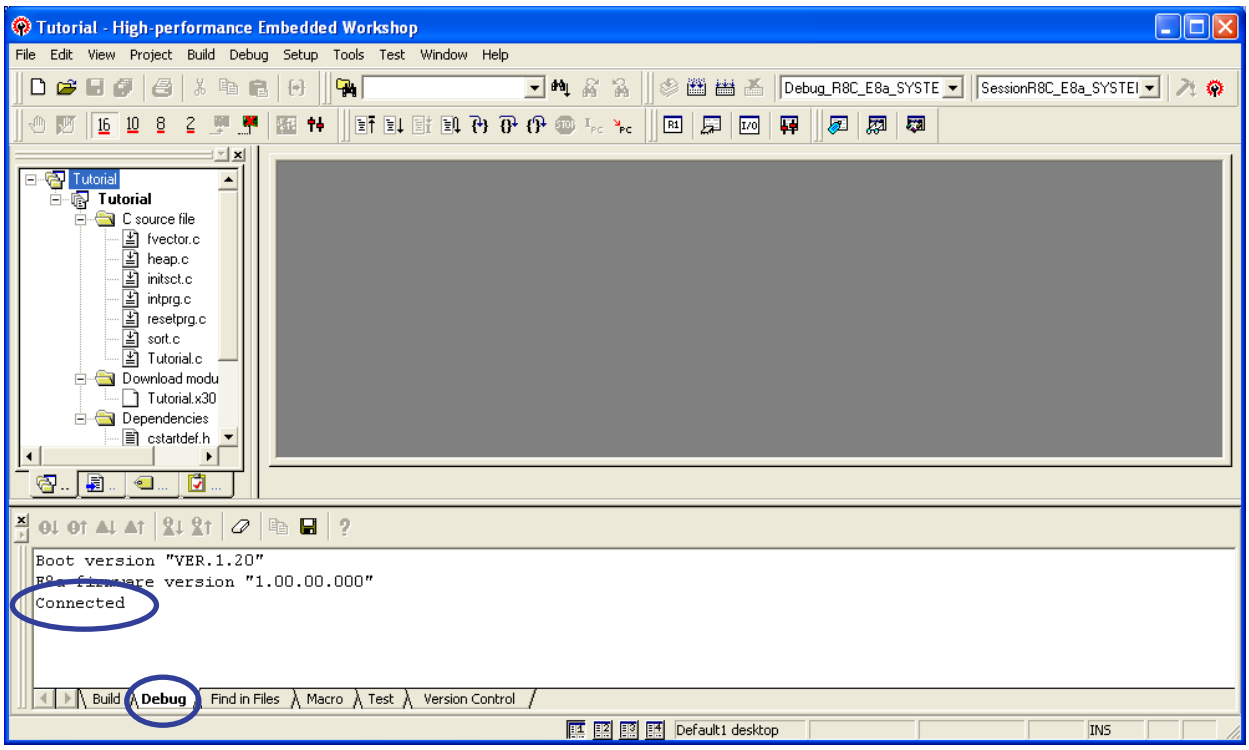


Figure 6.16 E8a Emulator Successfully Connected

6.3.3. Loading a Sample Program

(1) Double-click on the file name (“Tutorial.x30” in this example) that has been expanded under [Download modules] in the workspace to load the sample program.

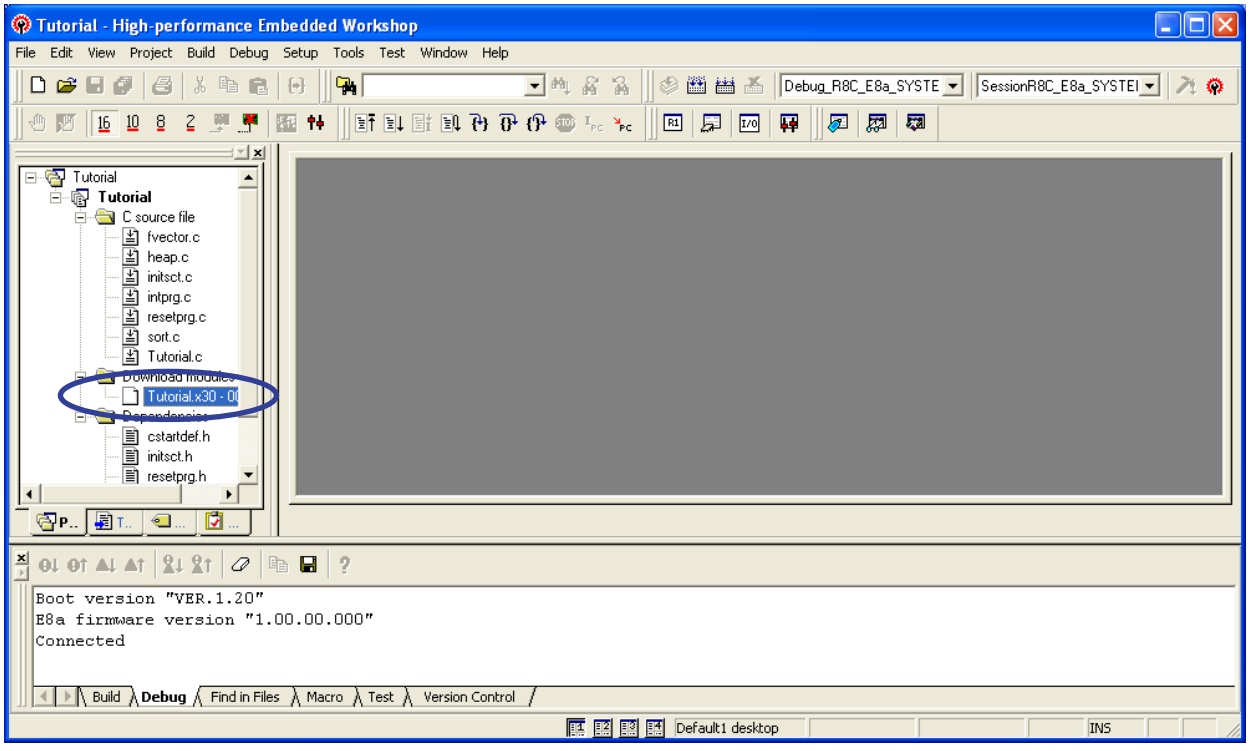


Figure 6.17 Downloading the Sample Program

After downloading of the program has been completed, a downward-pointing arrow appears on the icon which indicates a file, as shown below.

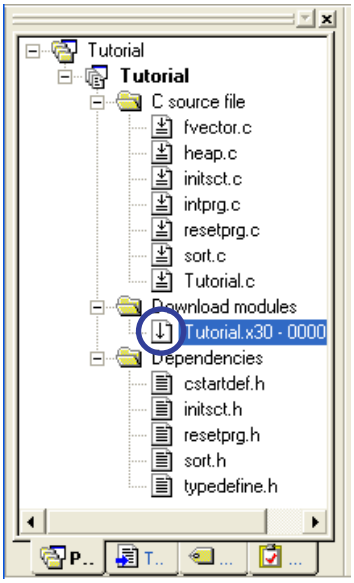


Figure 6.18 Completing Program Download

6.3.4. Opening a Source File

(1) Double-click on the target source file name in the workspace to open the source code.

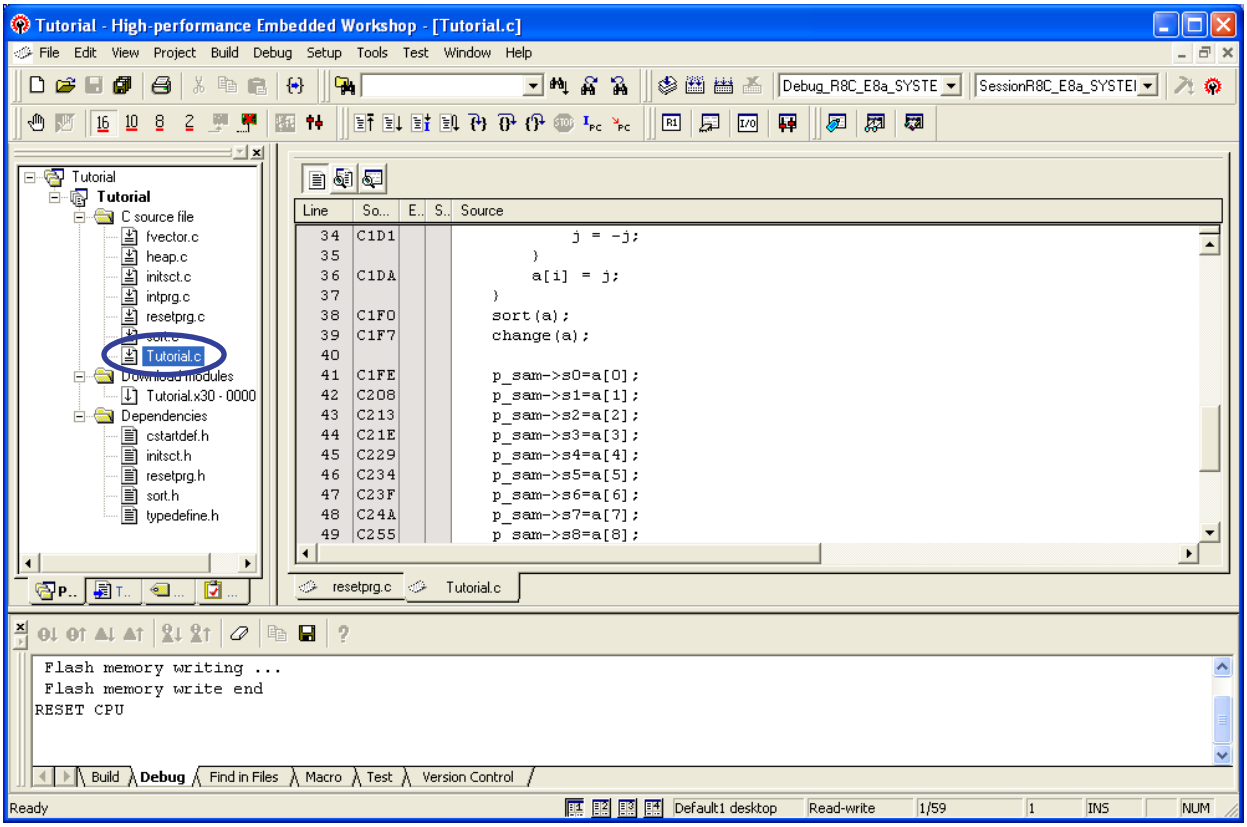


Figure 6.19 Opening a Source File

Select "Tutorial.c" here.

6.3.5. Setting a Breakpoint

(1) Scroll the source code display to show line 41 by using the scroll bar.

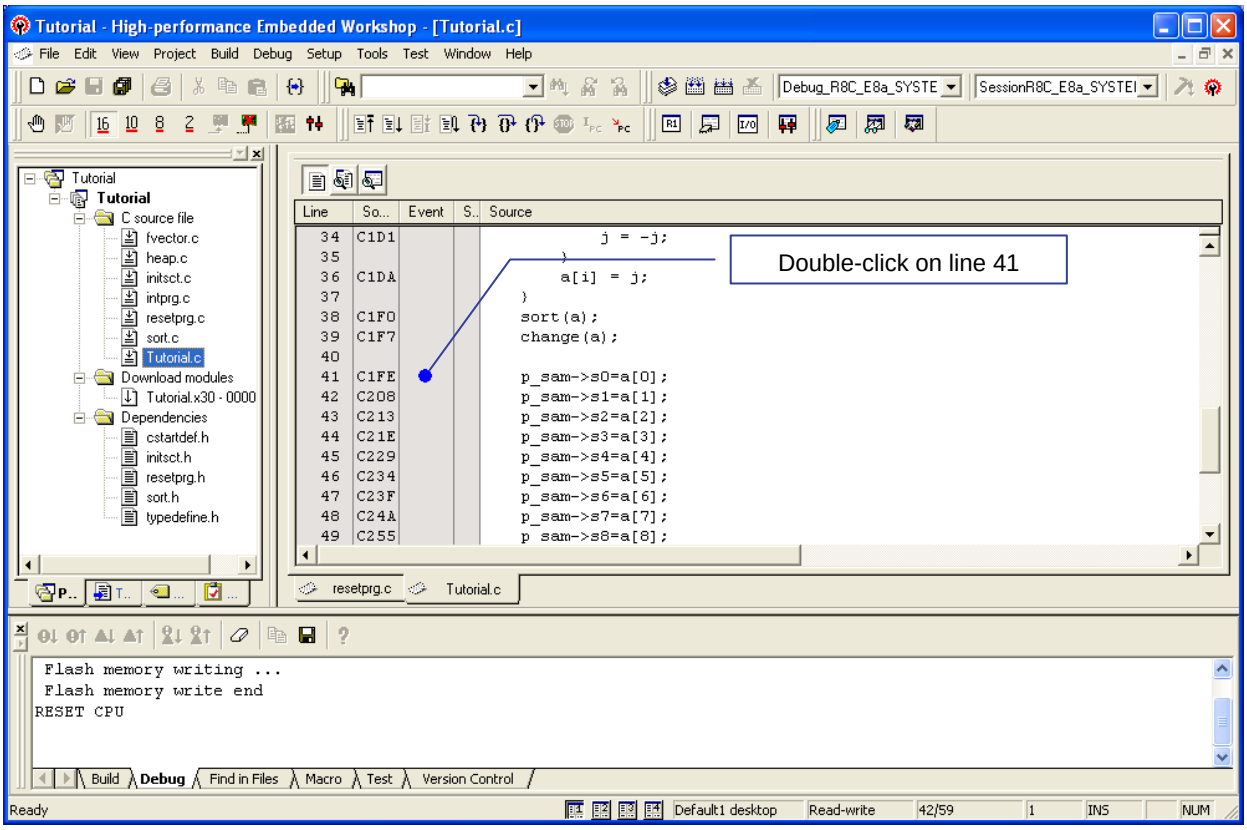


Figure 6.20 Setting an Event Break

Here, double-click on the [Event] column on line 41 to set a break condition.

A blue dot indicates that a break condition has been set.

To clear a break condition previously set, double-click on the blue dot.

During debugging of the R8C/1B program through the E8a emulator, up to four breakpoints can be set as an [Event]-type break. This type of break is advantageous because it does not require write access to the on-chip flash memory to set or clear a break condition, since it is implemented by the debug circuit of the R8C/1B, and thus does not lower the write-access speed of the flash memory.

In contrast, software break conditions can be set for up to 255 points, but the flash memory is written to every time a condition is set or cleared.

6.3.6. Executing a Program

(1) Pull down the [Debug] menu and click on [Reset Go] to execute a program.

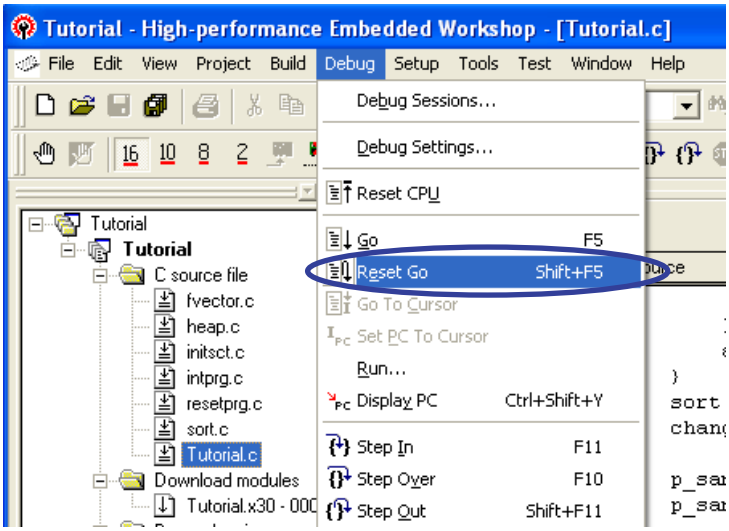


Figure 6.21 Executing a Program after a Reset

6.3.7. Break Occurrence

(1) When a break condition is satisfied, the source window shows the program stop position.

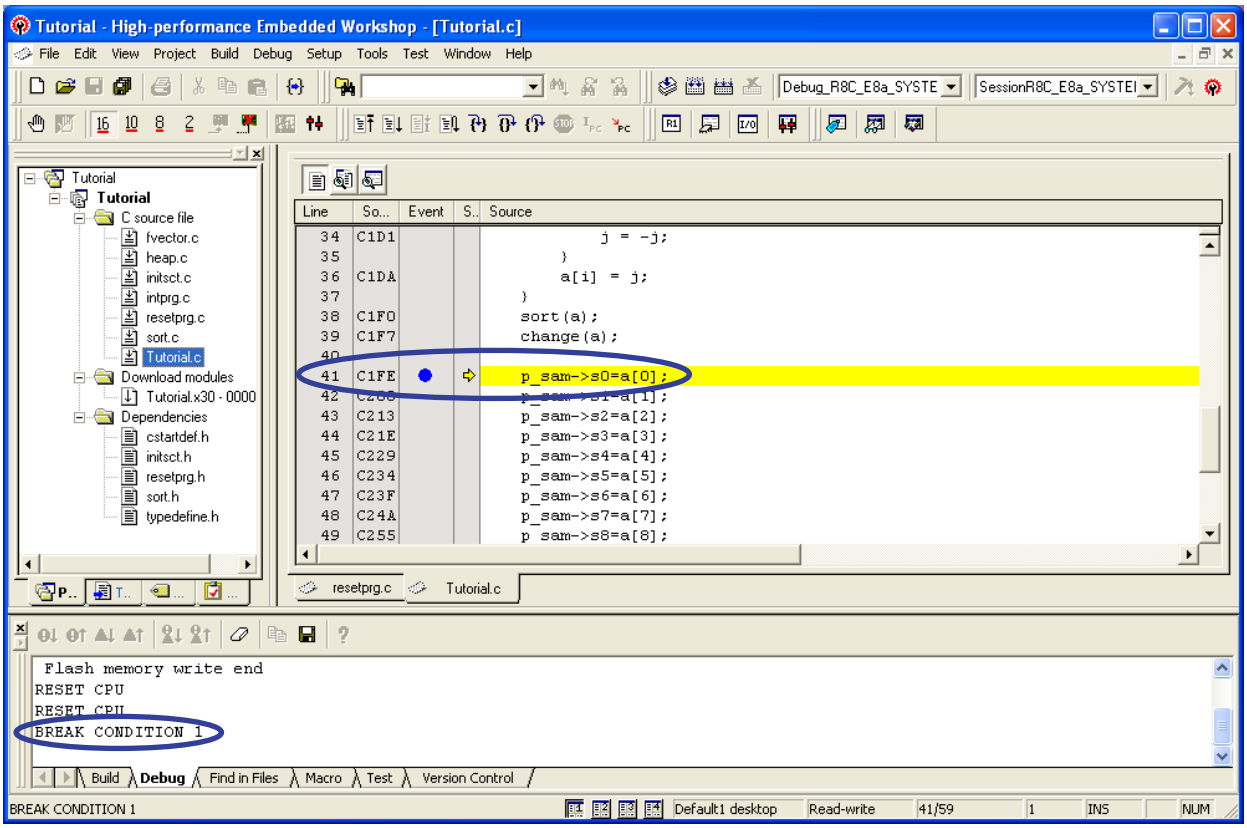


Figure 6.22 Screen Showing Break Condition Satisfaction

The yellow arrow points to the program counter location and the corresponding source line is highlighted in yellow.
"BREAK CONDITION 1" is displayed as the program stop cause in the [Debug] tabbed page.

6.3.8. Checking Variable Contents

(1) To show the contents of a variable, select [Symbol] from the [View] menu and select [Watch].

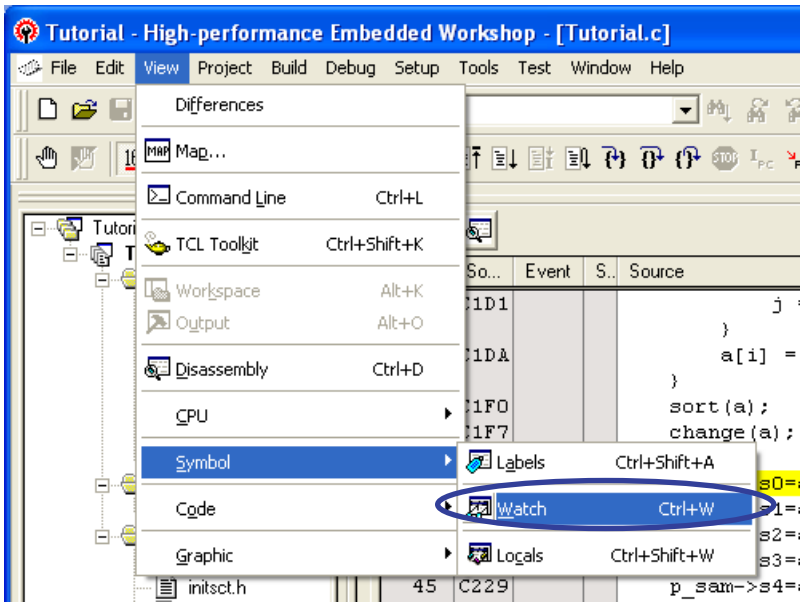


Figure 6.23 Selecting the Memory Watch Function

The R8C family E8a emulator incorporates the memory watch function and another function available for debugging, such as the trace function which shows the trace information of branch instructions and the data break function which uses a break condition of the eventpoint. The trace and eventpoint functions can be displayed and set from [Code] of the [View] menu.

(2) Select [Add Watch...] from the popup menu opened by right-clicking on the Watch window.

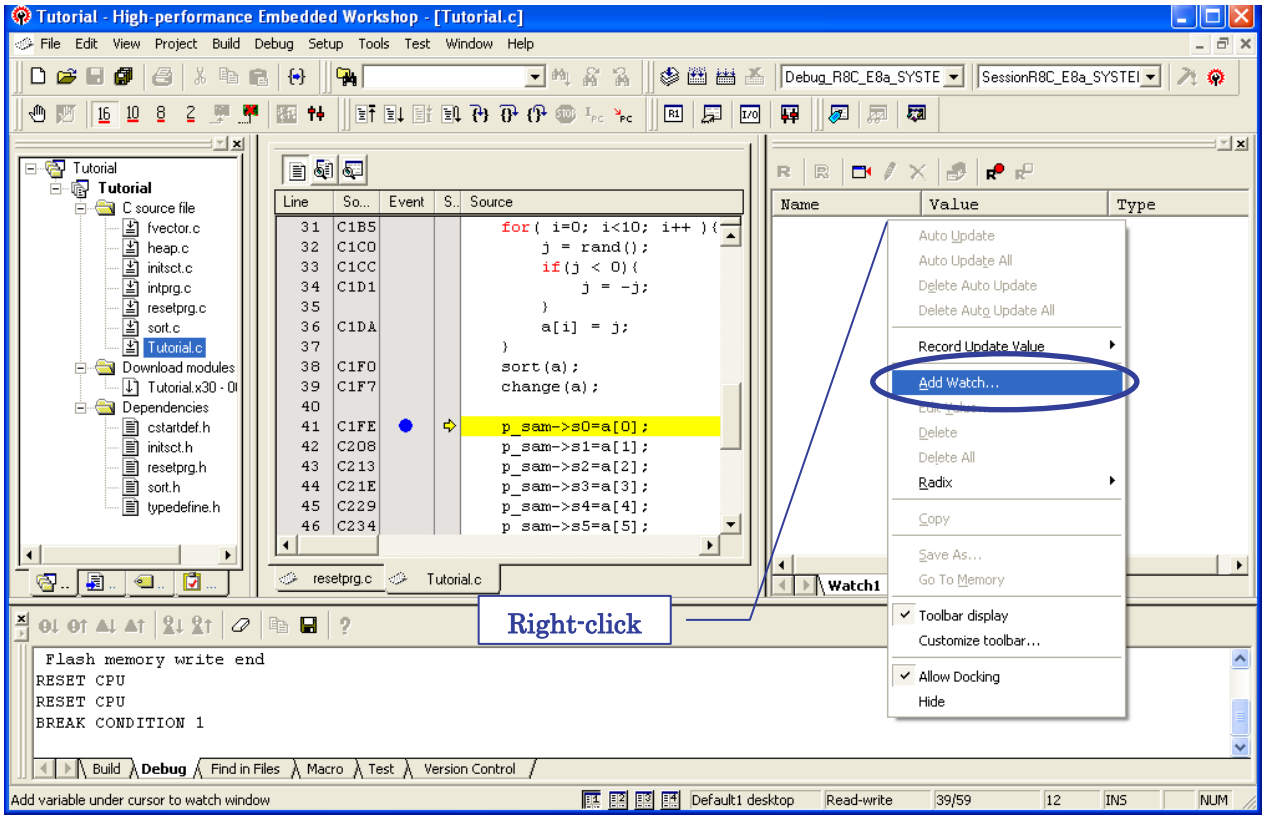


Figure 6.24 Adding a Symbol in the Watch Window

(3) The [Add Watch] dialog box will appear. Enter "a" (symbol name) in the [Variable or expression:] edit box and click on the [OK] button.

Figure 6.25 Specifying a Symbol Name

When specifying a local variable in C language as a watch symbol, note that the variable has a scope (a valid range).

A local variable is only valid while the program counter (PC) points to a location in the function that declared the local variable.

The symbol "a" specified in this example is also a local variable and cannot be watched when a break occurs in another function.

(4) The Watch window shows the contents of symbol "a".

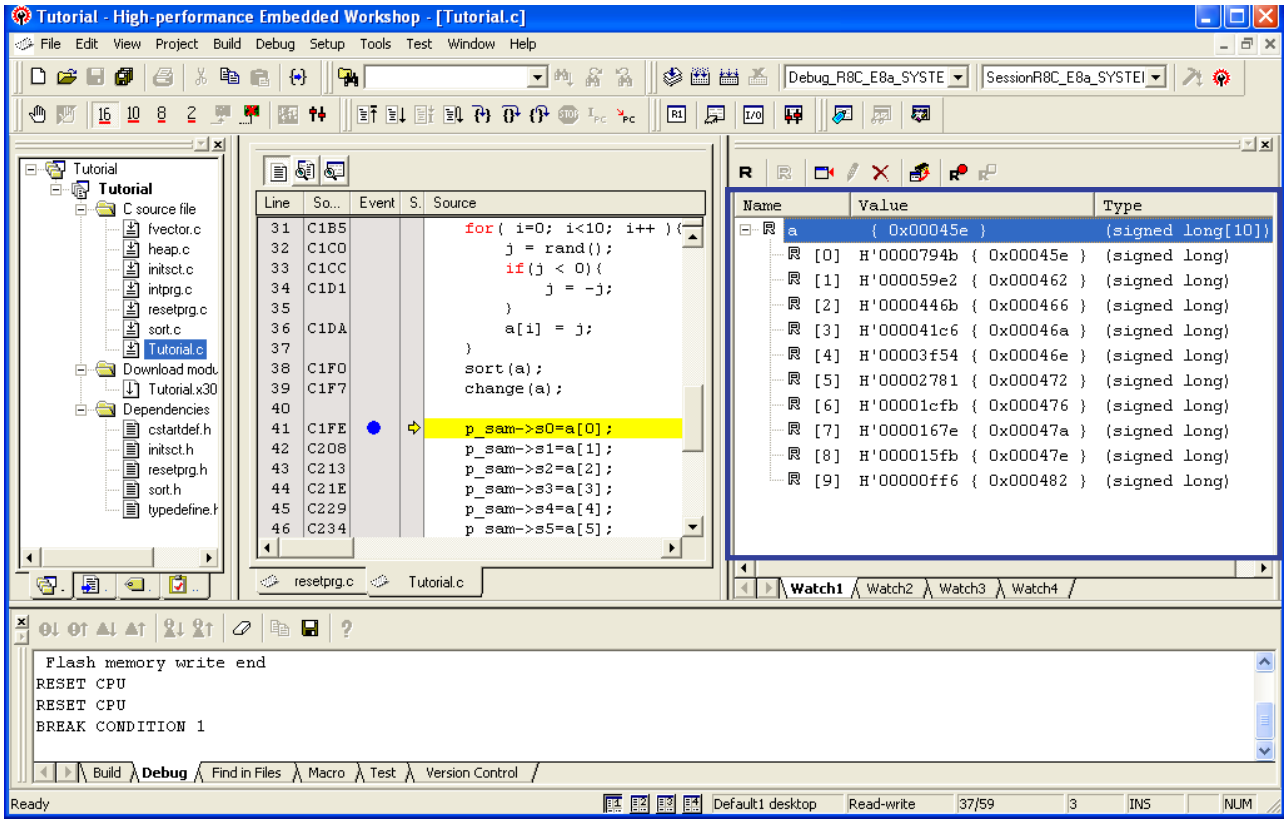


Figure 6.26 Contents of the Symbol Specified in the Watch Window

The Type column in the Watch window shows that symbol "a" is a signed long-type array (signed long[10]).

For memory allocation, a[0] is allocated to address H'45e, a[1] is allocated to address H'462, and the last element a[9] is allocated to address H'482.

The [Value] column (the value of each array element) shows that the elements are arranged in descending order as a result of program execution; that is, the array elements have been created at random (line 32), sorted in ascending order (line 38), and then sorted in the opposite order (line 39).

7. Programming of On-Chip Flash Memory

This section describes how to activate the High-performance Embedded Workshop (HEW) and how to use the flash-memory programming function. When the E8a is launched as a debugger, the user program and E8a emulator firmware are written to the on-chip flash memory. To check the operation of the microcomputer operating independently of the E8a after debugging has been completed, however, the E8a must be operating in the programmer mode ([Program Flash]) to write only the user program to the flash memory. The procedure for programming the on-chip flash memory consists of the following steps.

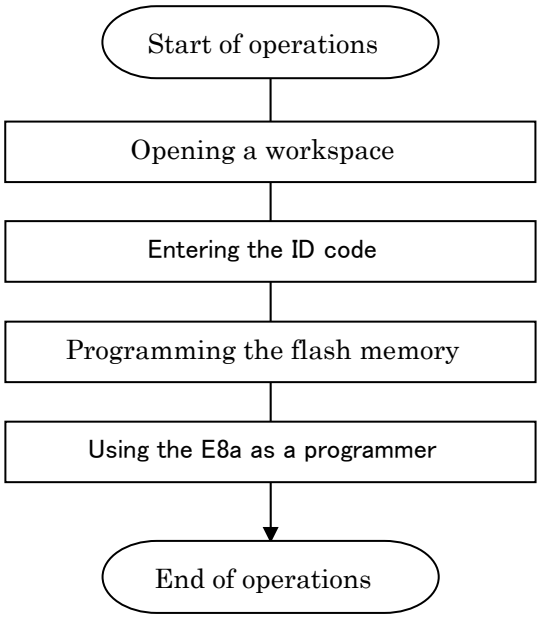


Figure 7.1 Procedure for Programming On-Chip Flash Memory

7.1. Opening a Workspace

(1) After connection of the E8a has been started, the [Emulator Setting] dialog box opens. For [Mode], select [Program Flash]. In this example, [R8C/1B Group] is selected for [MCU Group] and [R5F211B4] is selected for [Device]. Then, make settings for [Power supply] that fit your system. In this example, [Power Target from Emulator.] and [5.0V] are selected. Click on the [OK] button.

Notes:

*1 If the [Emulator Setting] dialog box does not appear after a workspace has been opened, select [SessionR8C_E8a_SYSTEM] from the sessions drop-down list box on the toolbar. For details, refer to section 6.3.1, Opening a Workspace.

*2 If an emulator mode other than [Program Flash] is selected, the user program and E8a emulator program are written to the flash memory. To evaluate the operation of the microcomputer independently of the E8a, be sure to select [Program Flash].

*3 If you require the reliability of flash-memory programming to be particularly high (e.g. if you intend to program flash memory on a mass-production scale), do not use the E8a function of supplying power to the user system. The user system itself must supply power that fits the voltage for programming of the microcomputer. Since the power voltage from the E8a depends on the performance of the USB power-voltage supply from the host computer, its accuracy cannot be guaranteed.

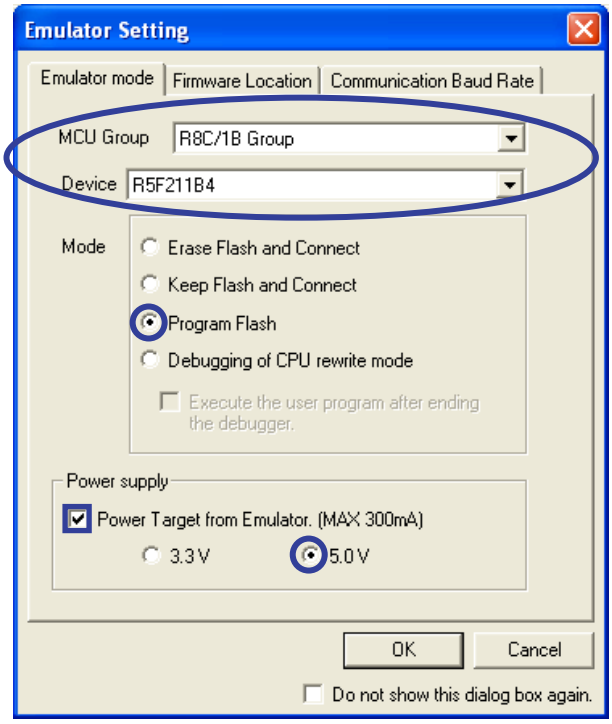


Figure 7.2 [Emulator Setting] Dialog Box

(2) Since the current emulator mode is [Program Flash], no setting is required on the [Firmware Location] tab.

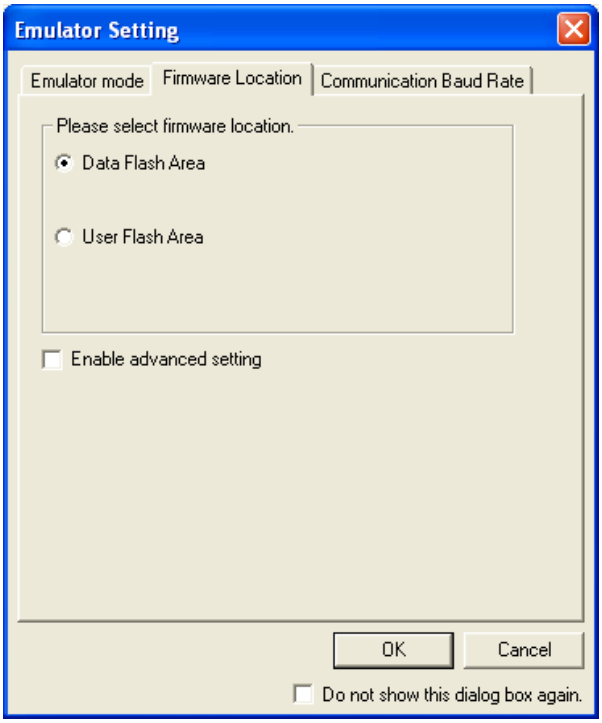


Figure 7.3 Selecting the Location for the E8a Firmware

(3) Click on the [Communication Baud Rate] tab and select [500000 bps] as the baud rate.

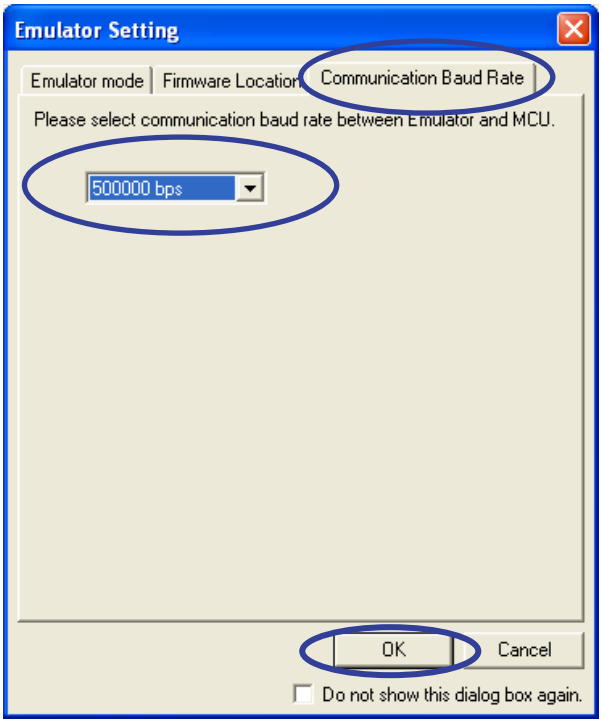


Figure 7.4 Selecting the Baud Rate

The [ID Code verification] dialog box may appear. In such cases, enter the ID code written in the on-chip flash memory.

(4) While the connection with the E8a emulator is being made, the [Connecting] information box shown below is displayed.

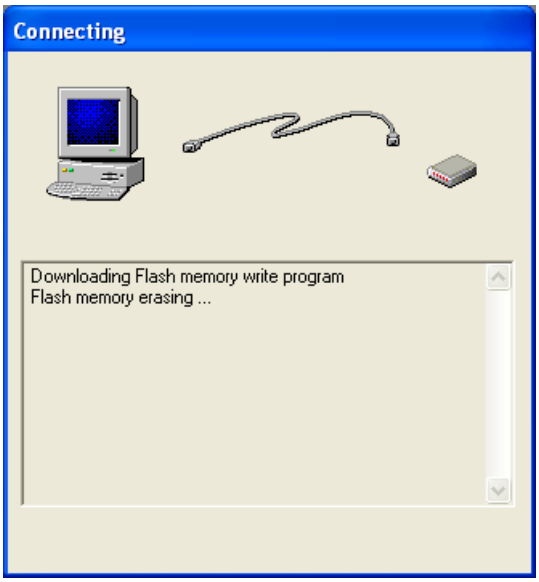


Figure 7.5 [Connecting] Dialog Box

Notes:

*1 On completion of the connection, the entire on-chip flash memory will be in the erased state (blank) in readiness for programming.

*2 Microcomputers of the R8C family have two special functions to prevent easy reading or programming of the on-chip flash memory: ID code verification in the standard serial I/O mode and ROM-code protection in the parallel I/O mode.

*3 The ID-code verification function is used in connecting the E8a emulator. If the flash memory is not blank, the E8a checks if the ID code sent by the programmer matches the 7-byte ID code written in the flash memory. If the two ID codes do not match, the E8a does not accept any commands from the programmer. The ID code consists of 8-bit data units stored in addresses 00FFDFh, 00FFE3h, 00FFEBh, 00FFEFh, 00FFF3h, 00FFF7h, and 00FFFBh, respectively. A program to be written to the flash memory must include an ID code assigned to these addresses beforehand.

*4 If any of the addresses for storage of the ID code contains a value other than FF, the [ID Code verification] dialog box will appear when the connection of the E8a emulator is started. Further operations cannot proceed until the correct ID code has been entered. For this reason, after you have set your own ID code, control it with care. Examples in this document assume that the microcomputer in use has blank flash memory, i.e. the value of each ID code byte is FF, when the E8a emulator is first connected.

(5) Now that the E8a emulator has been successfully connected, "Connected" appears in the [Debug] tabbed page in the [Output] pane.

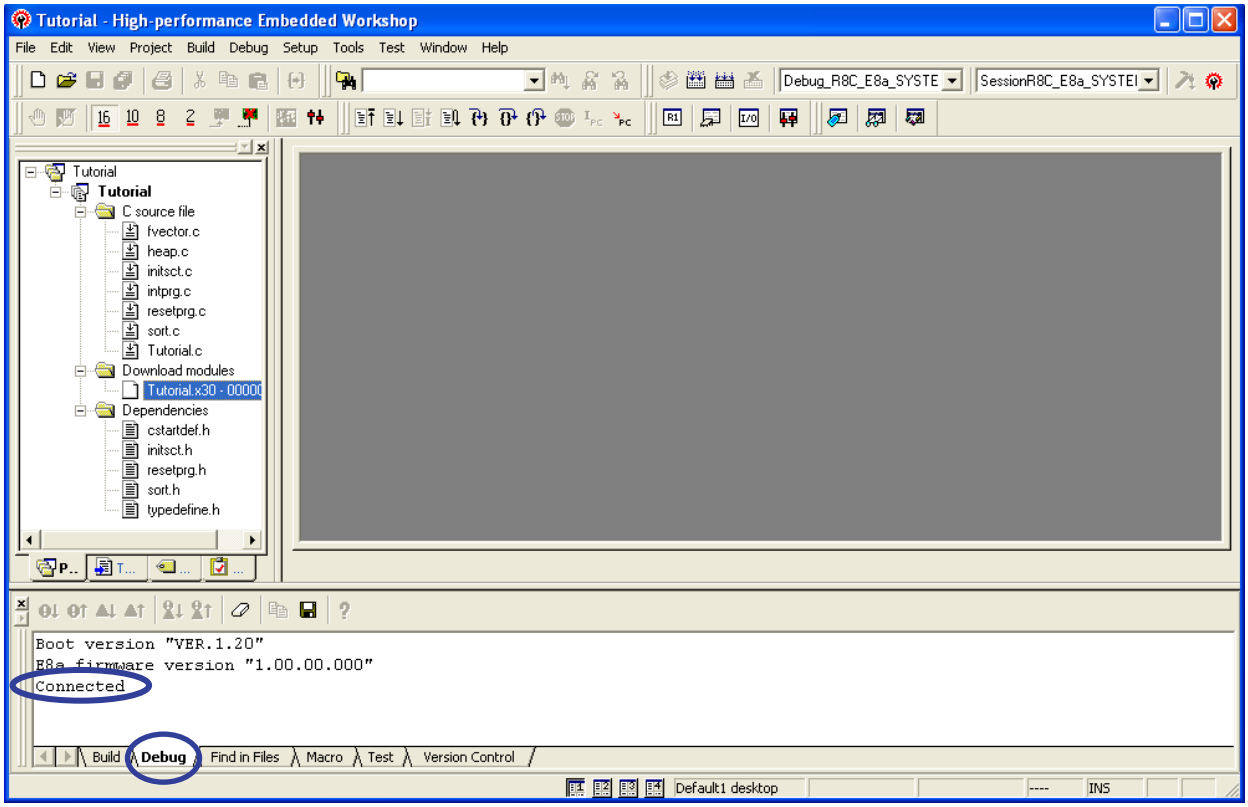


Figure 7.6 Message after Successful Connection of the E8a Emulator

7.2. Setting the ID Code

After an ID code has been set, anyone who does not know the correct ID code cannot read the contents of the flash memory even if they use a serial programmer.

(1) Double-click on the file name "fvector.c" in the [Workspace] pane.

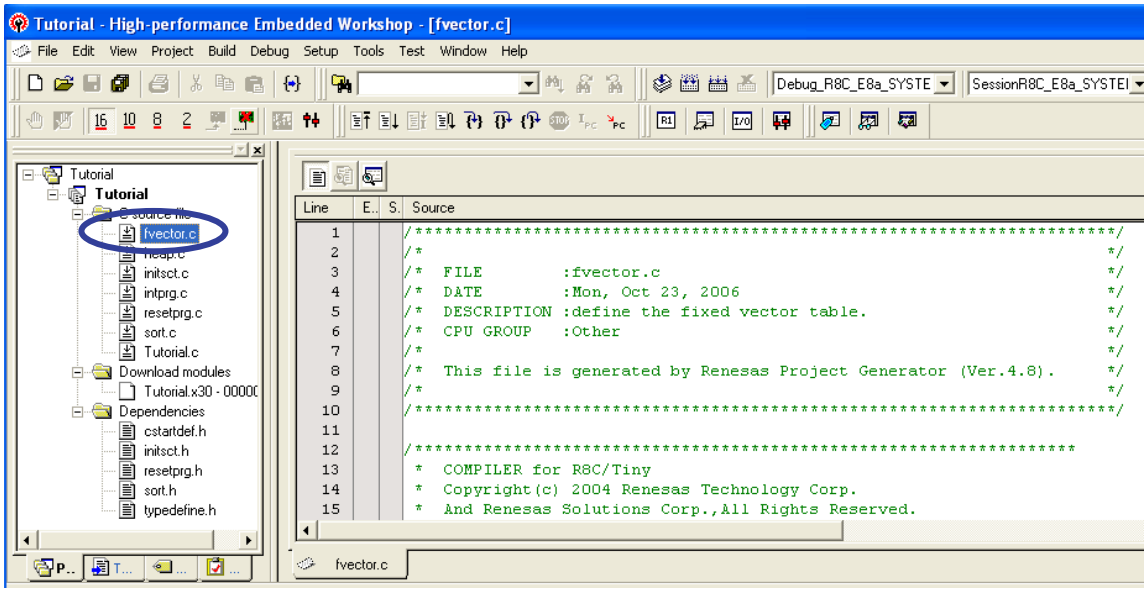


Figure 7.7 Source File "fvector.c"

Since the source files listed in the [Workspace] pane have been automatically generated by the project generator, an assembler directive ".ID" to set the ID code will have been written to the file "fvector.c".

(2) Scroll down through the contents of the source file "fvector.c" until you see line 46, which contains the assembler directive ".ID".

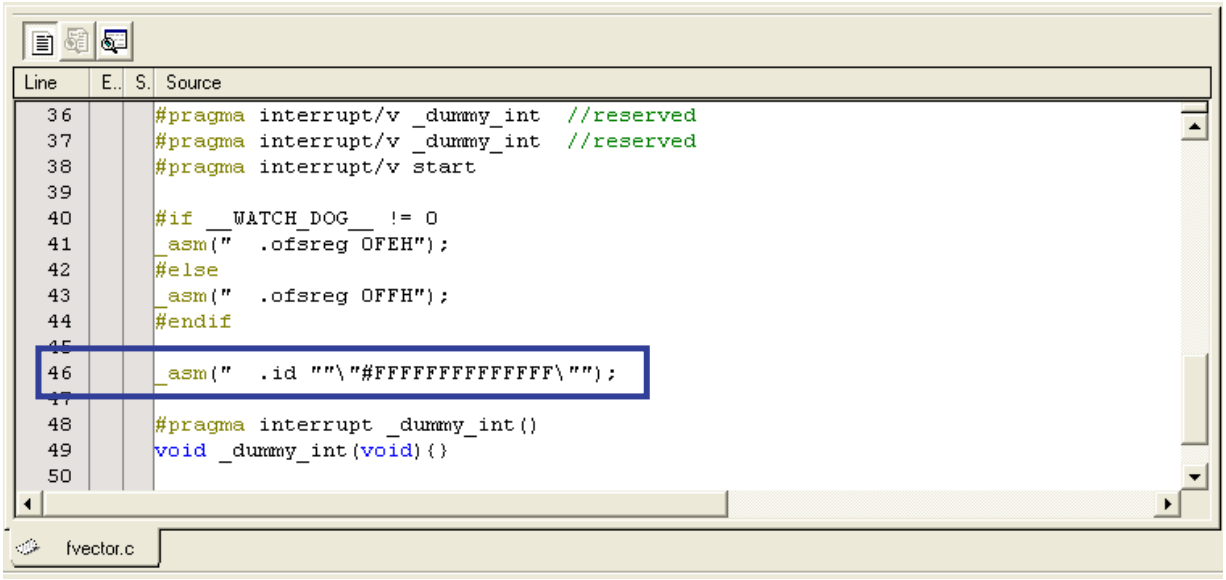


Figure 7.8 ID Code Statement

The initial value is preceded by "#" and is a 14-digit hexadecimal number "FFFFFFFFFFFFFF".

(3) Modify the value to set your own ID code.

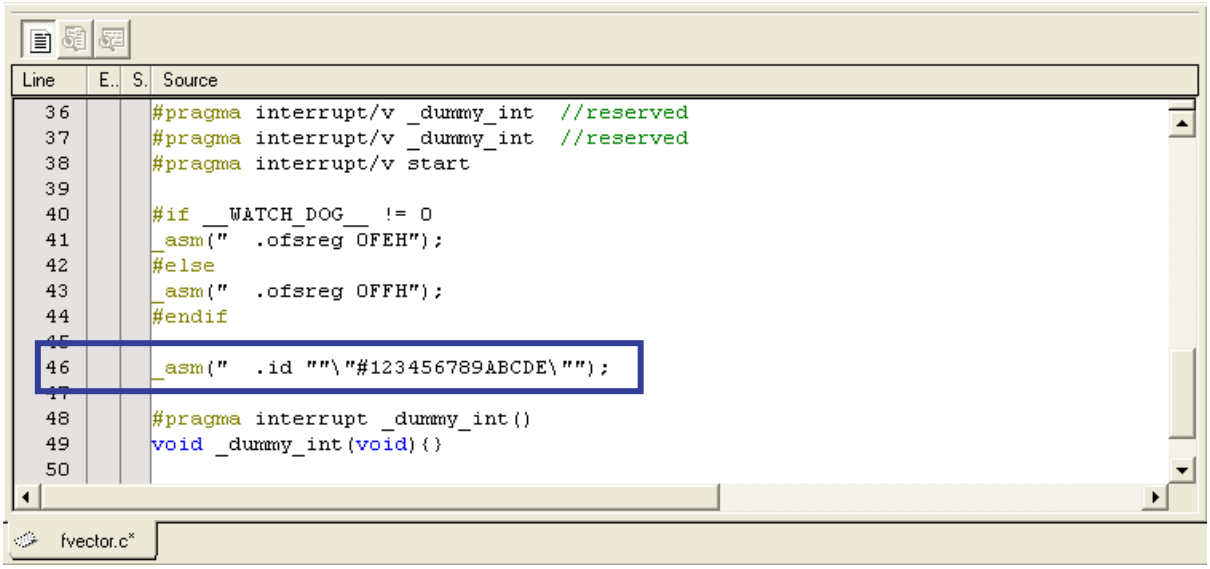


Figure 7.9 New ID Code

In this example, the ID code is a hexadecimal value "123456789ABCDE".

For further information on how to set the ID code, refer to the descriptions of "ln30", "lmc30", and directives in the C Compiler Package Assembler User's Manual.

(4) Select [Build] from the [Build] menu.

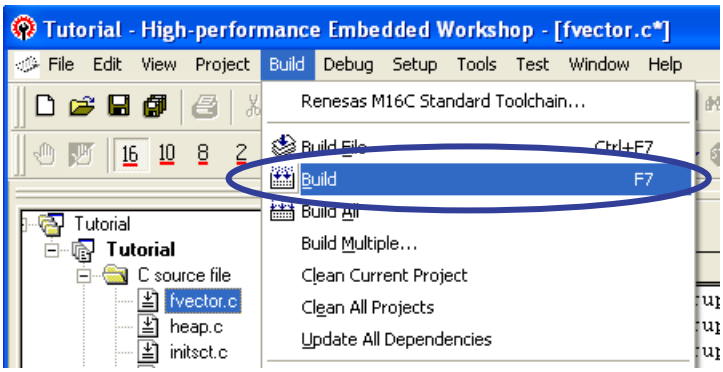


Figure 7.10 Executing the Build

(5) Upon completion of the build, the [Confirmation Request] dialog box appears to request confirmation that data is to be downloaded to the flash memory. At this stage, select [No] or [No to All].

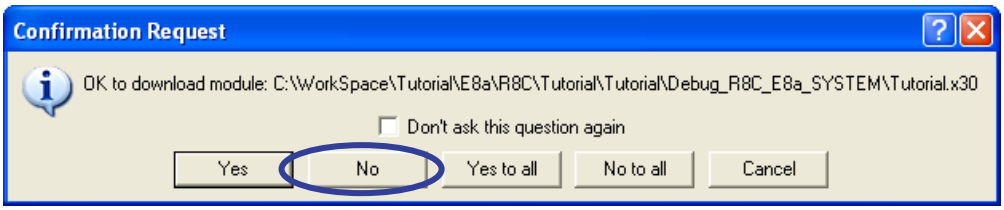


Figure 7.11 [Confirmation Request] Dialog Box

In this example, automatic downloading has been canceled because the example of programming is to be introduced after the map information has been confirmed. If you are already sure that the data will be programmed correctly, you can select [Yes] or [Yes to All] to download the data to the flash memory.

(6) Select [Map] from the [View] menu.

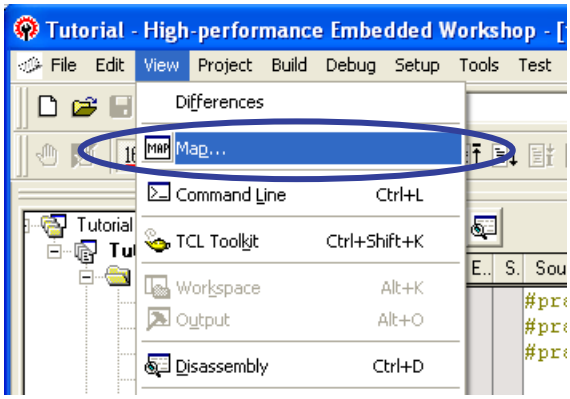


Figure 7.12 Viewing the Memory Map

(7) The [Select Map Window Type] dialog box opens. Select [Map Section Information] and click on the [OK] button.

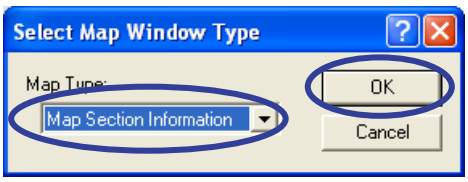


Figure 7.13 Selecting the Map Window Type

(8) The [Map Section Information] tabbed page shows information on the sections.

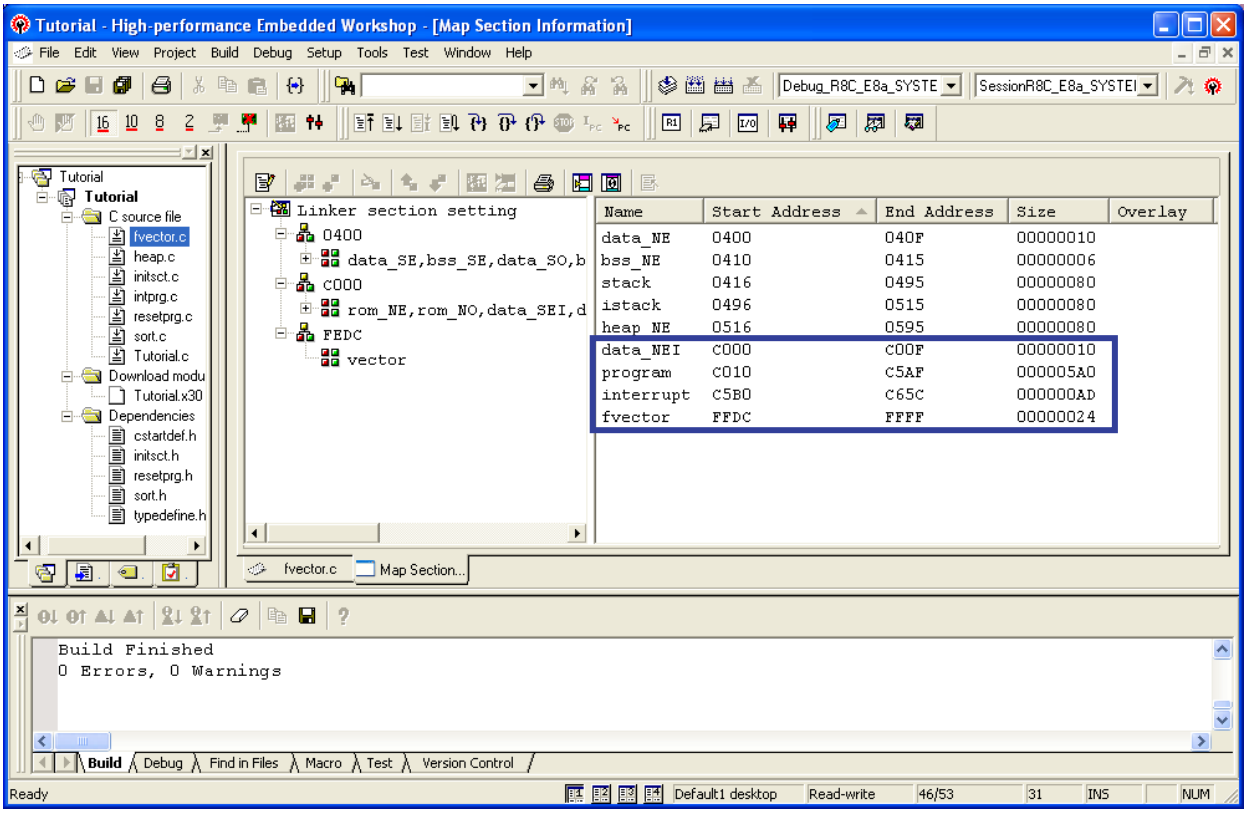


Figure 7.14 Contents of the [Map] Pane

Sort the [Start Address] values in ascending order; we can see that the area of flash memory where the ROM-attributes data are to be stored starts at C000 and ends at FFFF.

In the picture above, the [Map] pane has been undocked.

7.3. Programming the Flash Memory

(1) Select the [Debug] tab. Right-click on the name of the load module under [Download modules] in the workspace tree and select [Download] from the popup menu. Downloading can also be initiated by double-clicking on the file name.

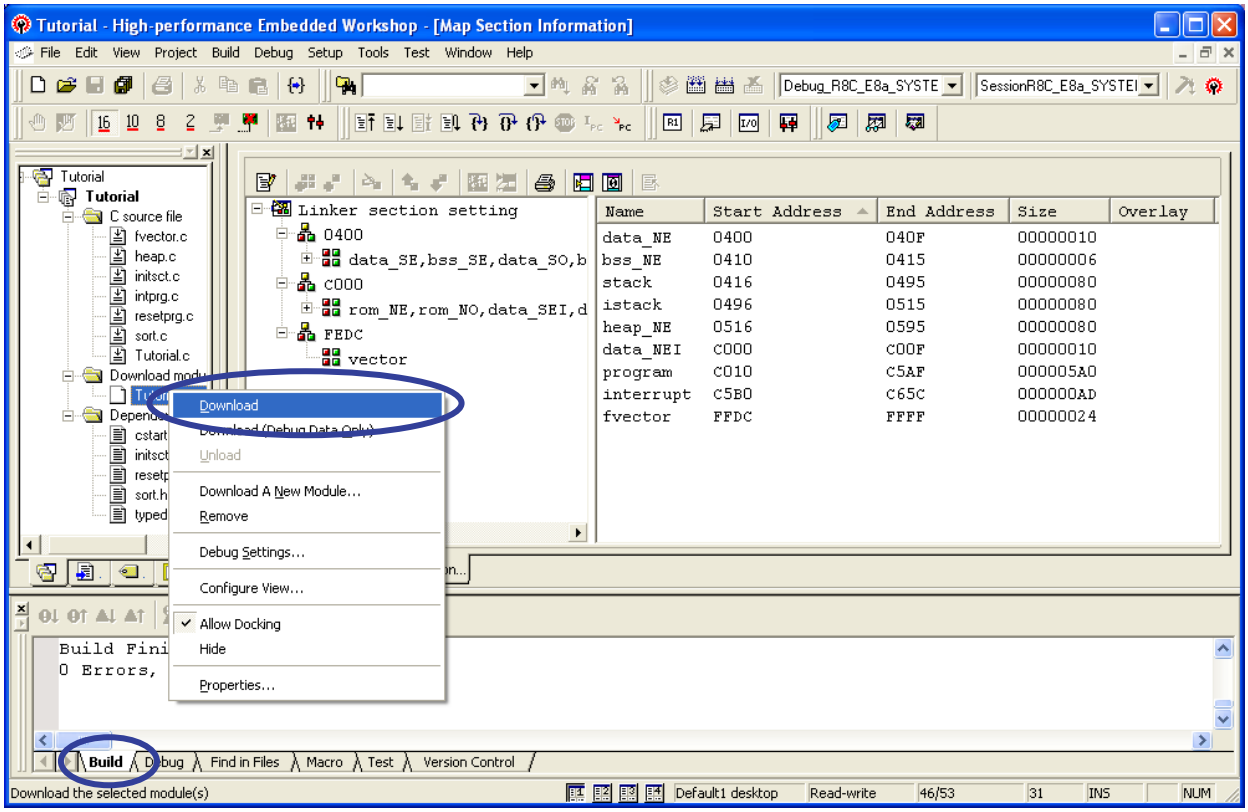


Figure 7.15 Programming the Flash Memory

(2) Upon completion of downloading, a message box containing the text "Sum data" and "ID code" appears. Read the messages and click on the [OK] button.

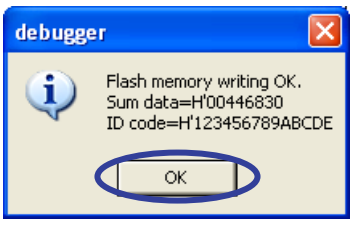


Figure 7.16 Programming Completed

The message box displays the value you have set as [ID code] in the source file.

Programming of the flash memory is now complete. Click on the [OK] button.

Figure 7.17 [Please Restart or Exit] Message Box

(3) While the flash memory is being programmed, the [Debug] tabbed page in the [Output] pane shows the message "Flash memory writing ...". When programming is completed, the [Debug] tabbed page shows the message "Flash memory write end" and a downward-pointing arrow appears on the icon of the load-module file in the workspace.

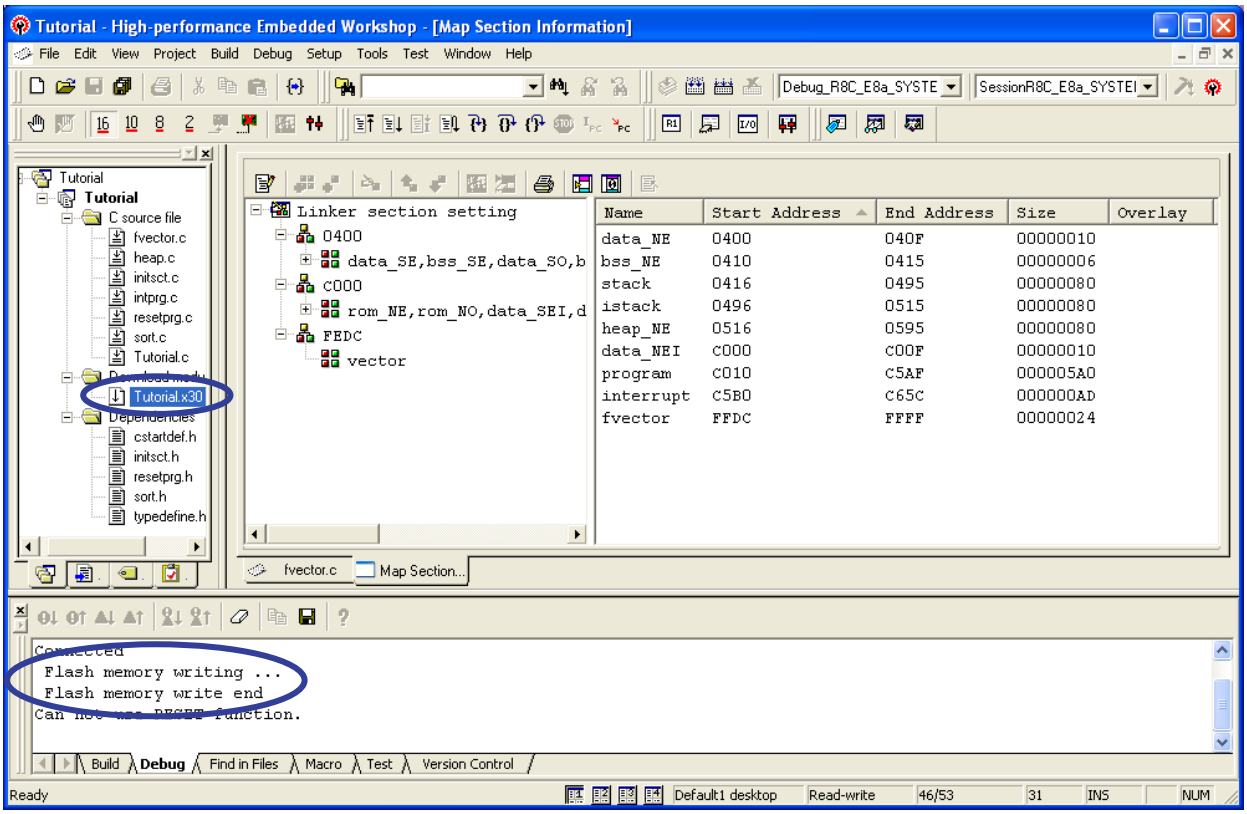


Figure 7.18 Messages to Confirm Programming of Flash Memory

Since the on-chip flash memory does not contain a program for the E8a, debugging is not possible. Values shown in the [Memory] pane etc. are dummy values.

If debugging is attempted, an error message is displayed on the [Debug] tabbed page in the [Output] pane.

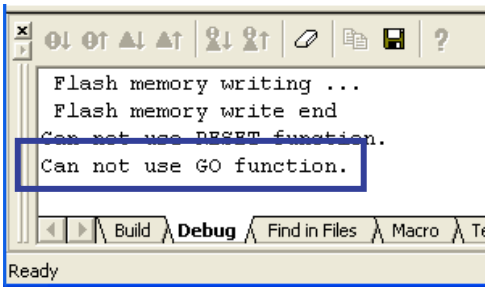


Figure 7.19 Error Message Shown When Debugging is Attempted in the Programmer Mode

The figure above shows an example where the user has used the debugger to specify program execution.

Shut down the E8a emulator. The next section describes the procedure for using the E8a as a programmer to write existing data to the flash memory.

7.4. Using the E8a as a Programmer

(1) Select the [Create a new project workspace] radio button in the [Welcome!] dialog box that is opened when the High-performance Embedded Workshop starts up. If you have already created a project for development, load the project, change the session, and go to step (6).

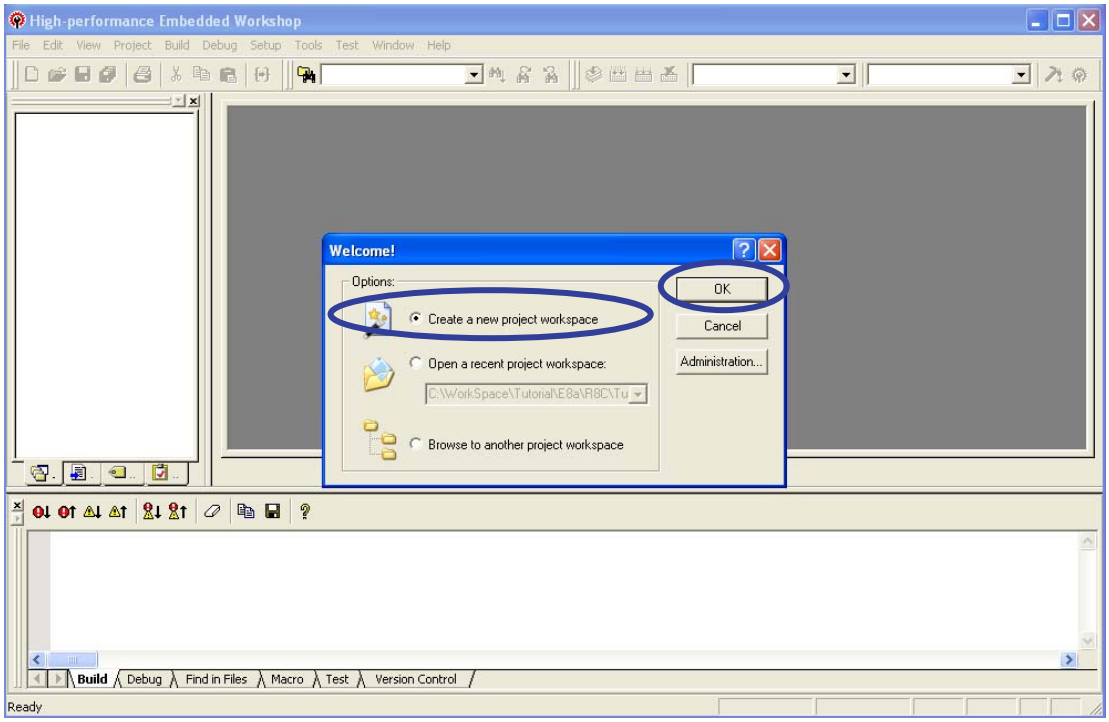


Figure 7.20 Selecting the Workspace Type

(2) The [New Project Workspace] dialog box opens. Select [M16C] for [CPU family] and [None] for [Tool chain]. Then select [R8C E8a SYSTEM] in the [Project Types] column and enter the workspace name in the [Workspace Name] field. Click on the [OK] button.

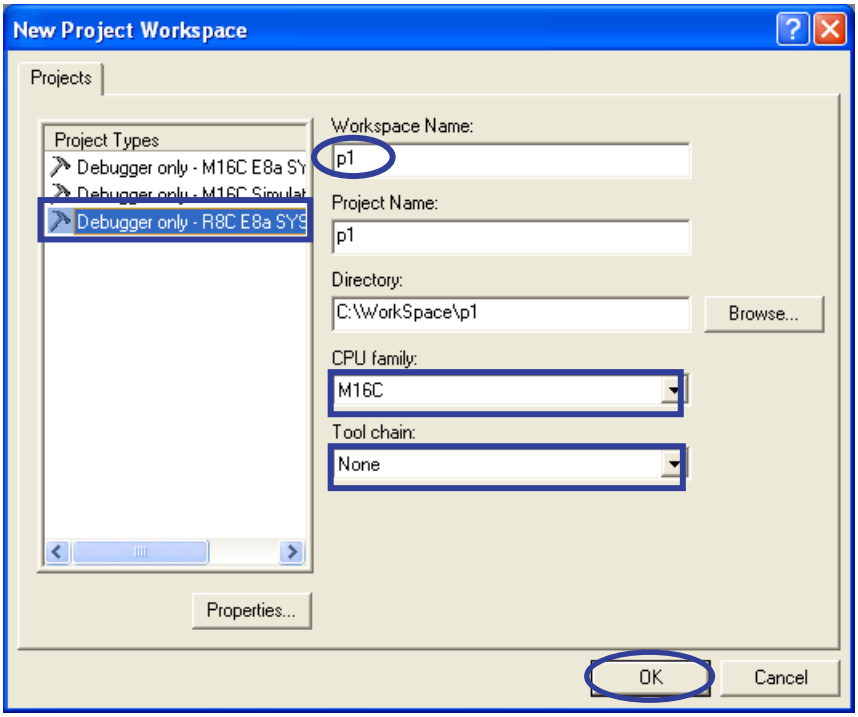


Figure 7.21 Settings for a New Project Workspace

In this example, the workspace name is "p1".

(3) Select the target and click on the [Next] button.

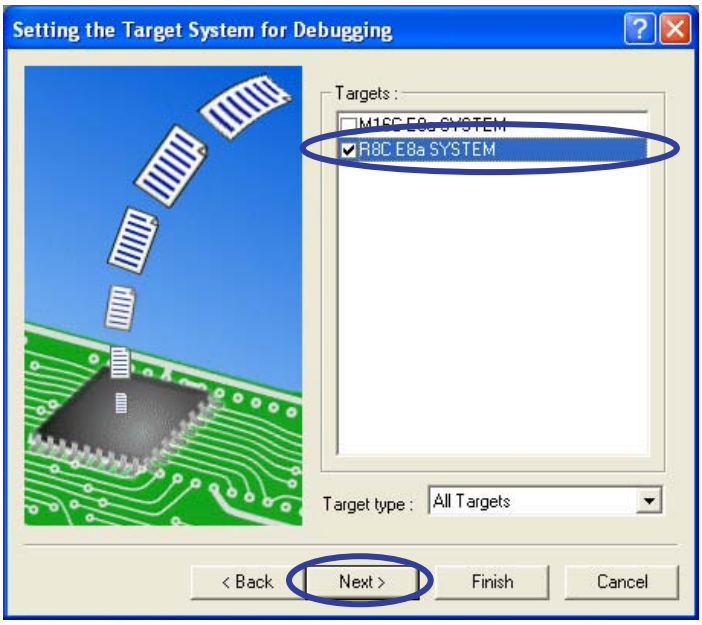


Figure 7.22 Selecting the Debugger Target

In this example, "R8C E8a SYSTEM" has been selected.

(4) The [Setting the Debugger Options] dialog box opens. Click on the [Finish] button to leave the default settings.

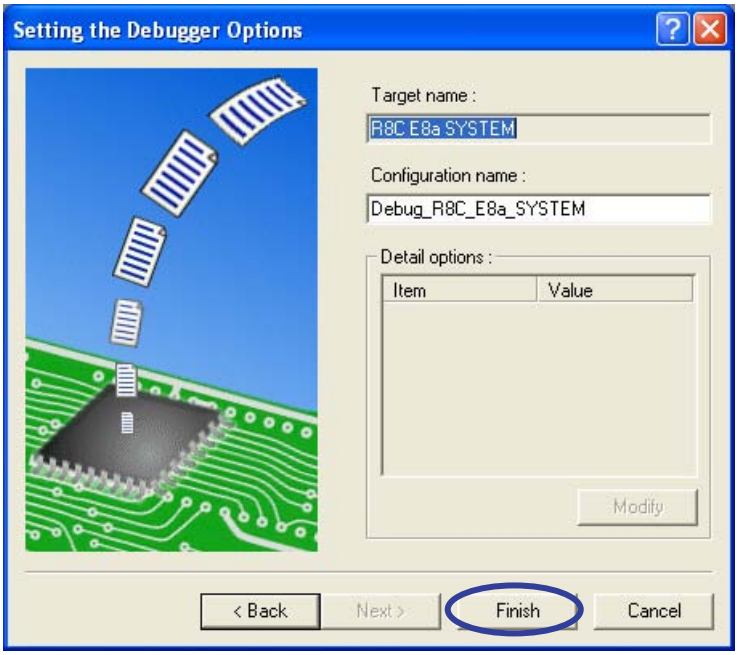


Figure 7.23 [Setting the Debugger Options] Dialog Box

(5) The [Summary] dialog box appears. Click on the [OK] button.

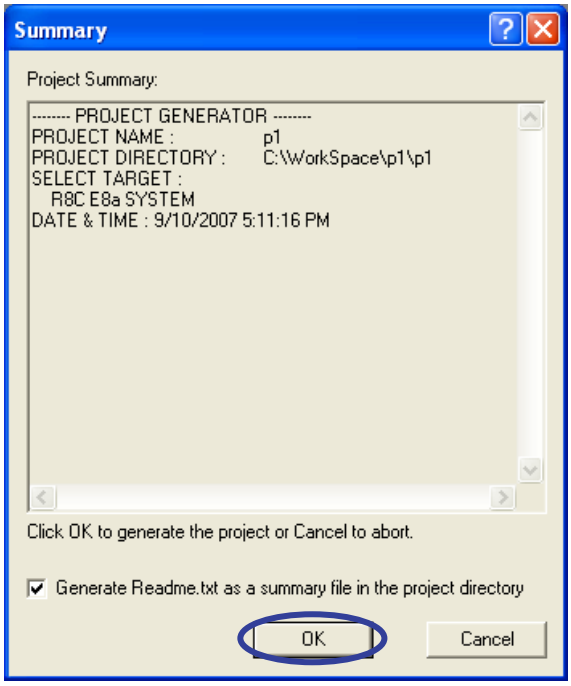


Figure 7.24 [Summary] Dialog Box

(6) The [Emulator mode] dialog box opens. Select the target device from [Device]. For [Mode], select [Program Flash]. Then, make settings for [Power supply] that fit your system and click on the [OK] button. The E8a must have been connected with the user system beforehand.

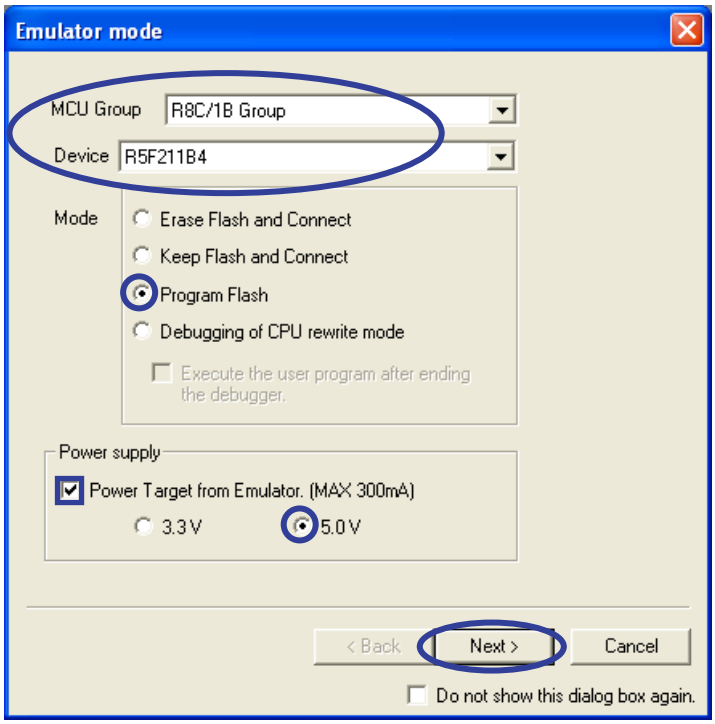


Figure 7.25 [Emulator mode] Dialog Box

Notes:

*1 If the [Emulator mode] dialog box does not appear after a workspace has been opened, select [SessionR8C_E8a_SYSTEM] from the sessions drop-down list box on the toolbar. For details, refer to section 6.3.1, Opening a Workspace.

*2 If an emulator mode other than [Program Flash] is selected, the user program and E8a emulator program will be written to the flash memory. To evaluate the operation of the microcomputer independently of the E8a, be sure to select [Program Flash].

*3 If you require the reliability of flash-memory programming to be particularly high (e.g. if you intend to program flash memory on a mass-production scale), do not use the E8a function of supplying power to the user system. The user system itself must supply power that fits the voltage for programming of the microcomputer. Since the power voltage from the E8a depends on the performance of the USB power-voltage supply from the host computer, its accuracy cannot be guaranteed.

(7) Since the current emulator mode is [Program Flash], no setting is required on the [Firmware Location] tab.

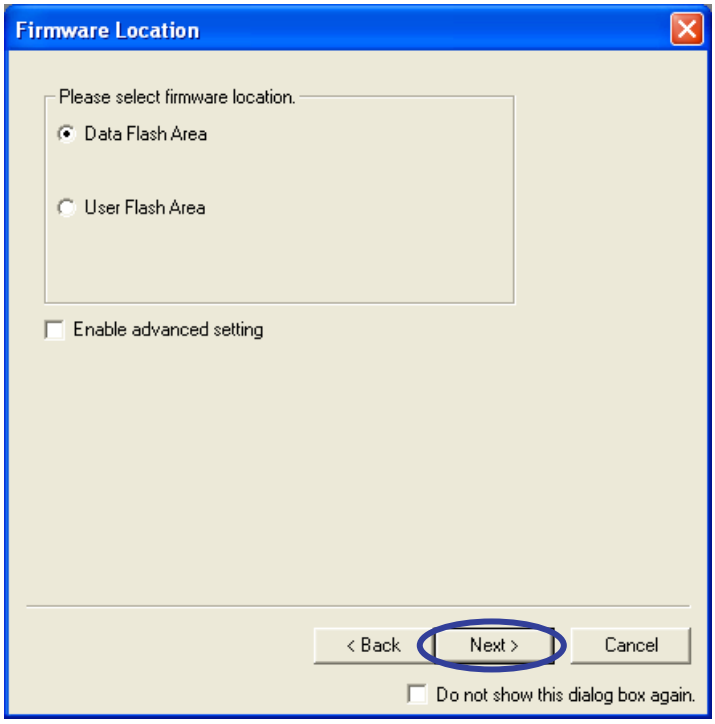


Figure 7.26 Selecting the Location for the E8a Firmware

(8) The [Communication Baud Rate] dialog box opens. Click on the [Finish] button to leave the default settings.

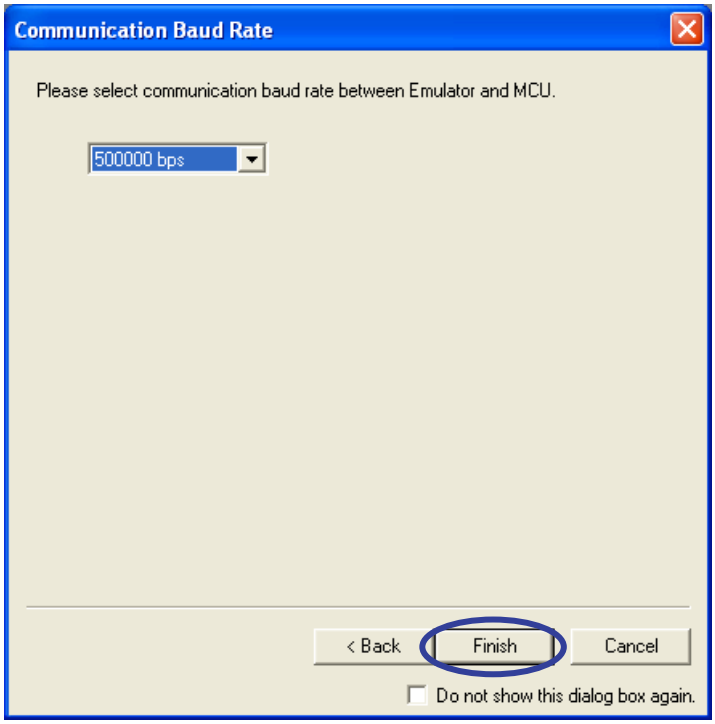


Figure 7.27 Selecting the Baud Rate

(9) The [ID Code verification] dialog box appears because, in this example, the ID code "123456789ABCDE" has already been written to the on-chip flash memory. Enter the ID code and click on the [OK] button.

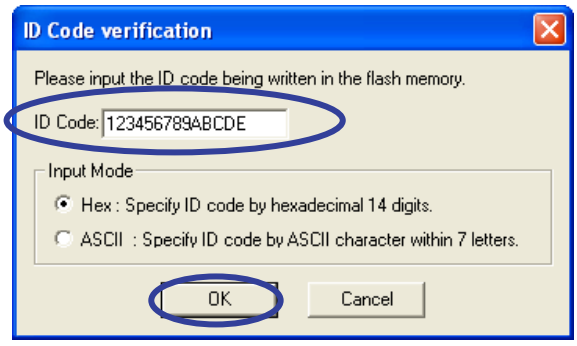


Figure 7.28 ID Code Verification

- The picture shown above is an example of ID code verification where the E8a is to be connected to a microcomputer to which an ID code has been written according to the procedure given in section 7.2 in this document.
- Further operations cannot proceed until the correct ID code has been entered. After you have set your own ID code, control it with care.
- If the ID code in the flash memory is the hexadecimal "FFFFFFFFFFFFFF", the next screen will appear without the [ID Code verification] dialog box being shown.

(10) Now that the E8a emulator has been successfully connected, “Connected” appears in the [Debug] tabbed page in the [Output] pane.

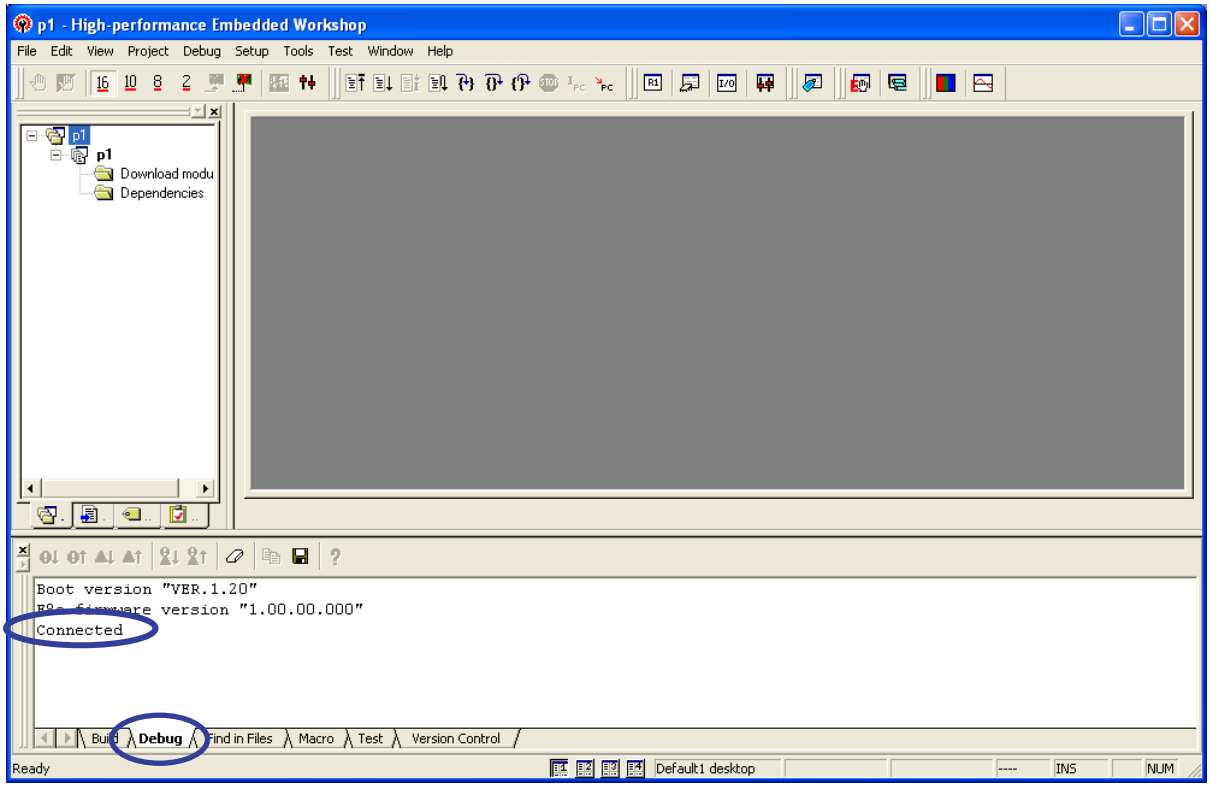


Figure 7.29 Message after Successful Connection of the E8a Emulator

(11) Select [Debug Settings…] from the [Debug] menu.

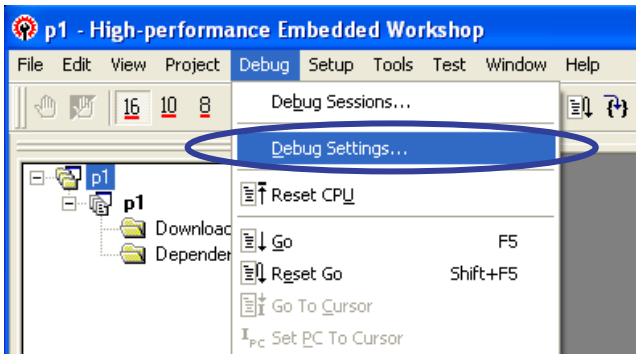


Figure 7.30 Selecting [Debug Settings…]

(12) The [Debug Settings] dialog box appears. Select the desired file format from [Default debug format] and click on the [Add…] button. Since this setting is saved in the project, you will not need to make it again.

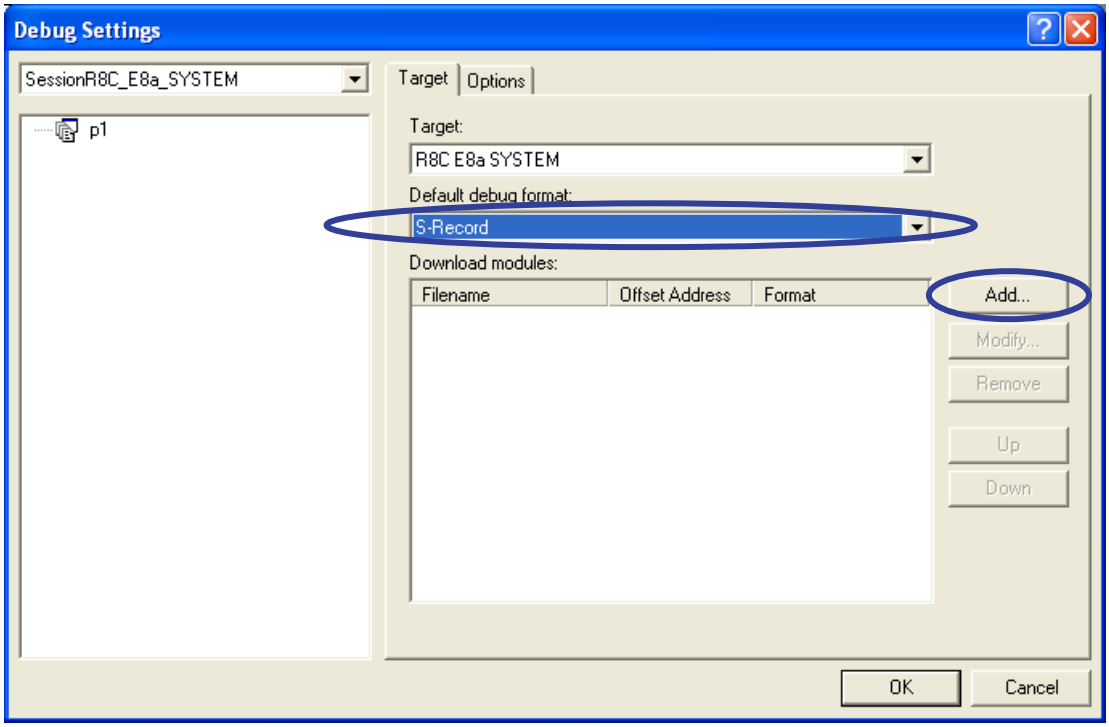


Figure 7.31 [Debug Settings] Dialog Box

The following formats are selectable.

- IEEE-695 RENESAS: Renesas object format (.x30)
- Intel Hex: Intel HEX format (.hex)
- S-Record: Motorola S format (.mot or .s)

In the example shown in figure 7.31, the Motorola S format is selected.

(13) The [Download Module] dialog box opens. Click on the [Browse…] button to select the file you wish to download.

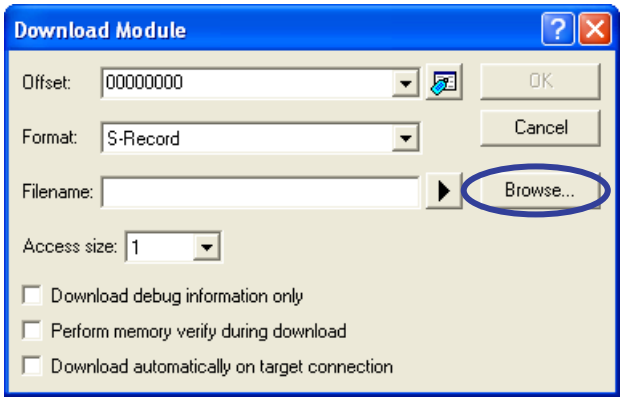


Figure 7.32 Selecting a Download-Module File (1)

(14) Click on the [OK] button. Normally the offset should be the default value.

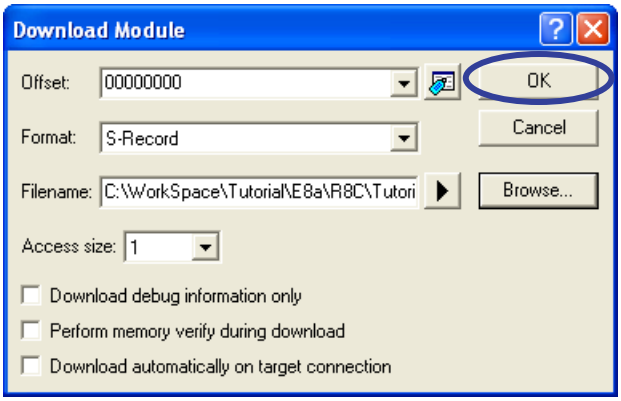


Figure 7.33 Selecting a Download-Module File (2)

(15) The [Download modules] list box in the [Debug Settings] dialog box shows the file you have selected. Check that the information is correct and click on the [OK] button.

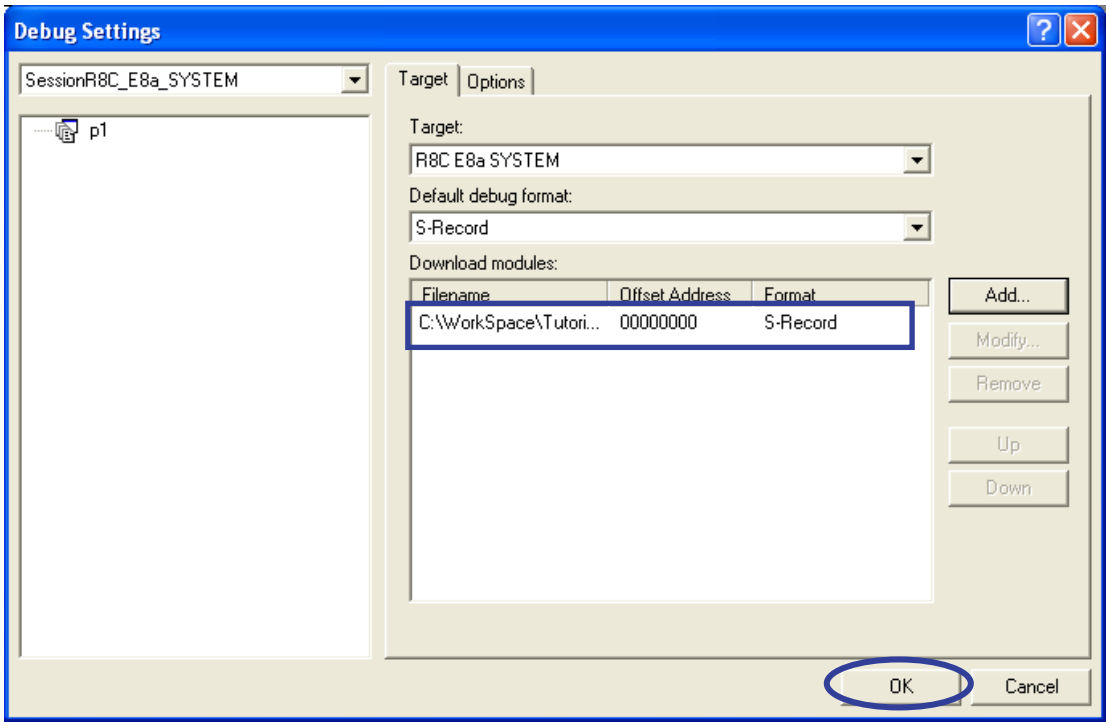


Figure 7.34 [Debug Settings] Dialog Box after Selection of the Download Module

In this example, the Motorola S format is selected as the format for the file to be output from the sample program (tutorial workspace).

(16) The file to be downloaded has been added to the [Workspace] pane.

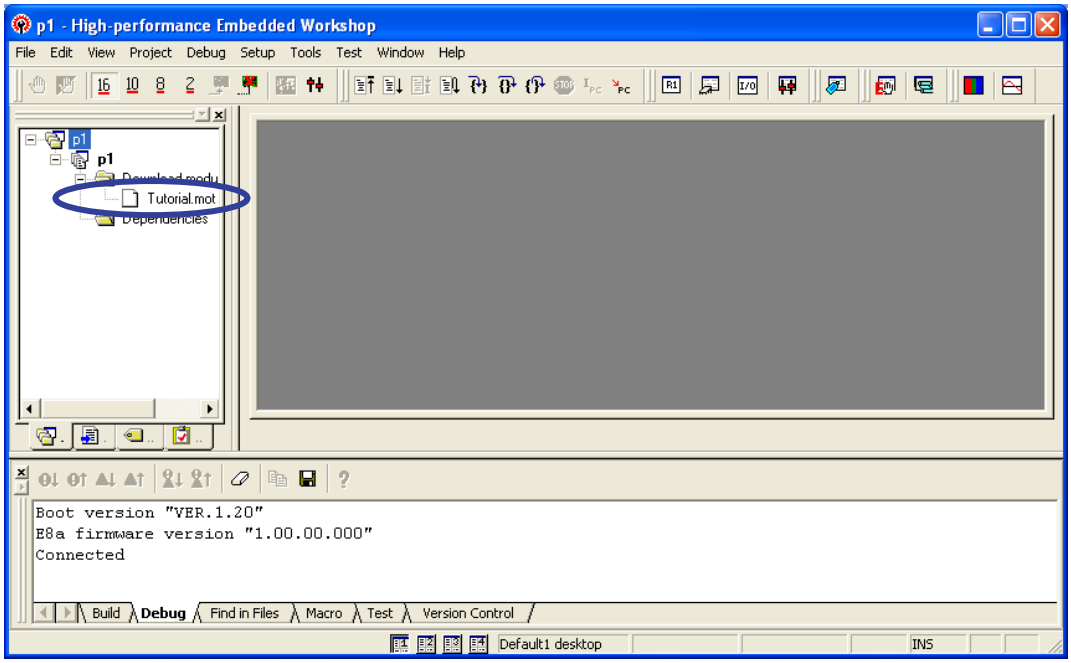


Figure 7.35 Download-Module File Added

(17) Select the filename and right-click to open the popup menu. Select [Download] to start downloading of the file. Downloading can also be initiated by double-clicking on the file name.

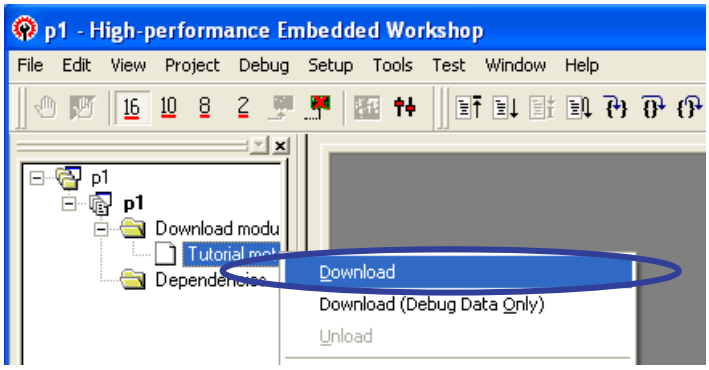


Figure 7.36 Downloading to the Flash Memory

While the emulator mode is [Program Flash], only downloading is possible. If you attempt to use other functions such as viewing the contents of memory, the values displayed will not be correct.

(18) Upon completion of downloading, a message box containing the text “Sum data”, “ID code”, and “Flash memory writing OK.” appears. Read the messages and click on the [OK] button.

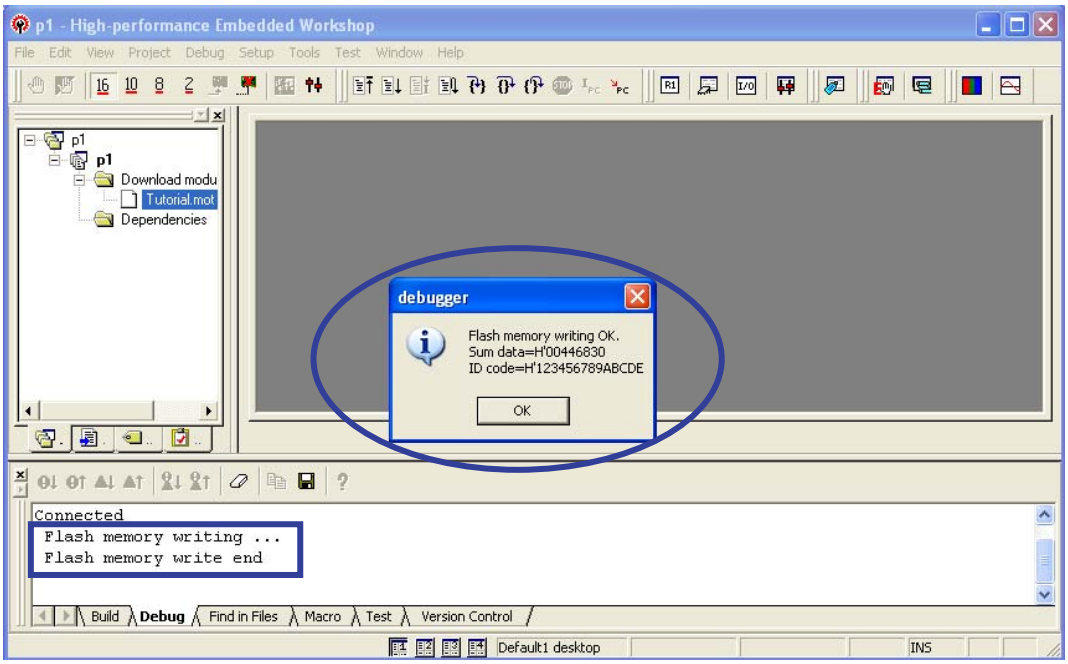


Figure 7.37 Programming Completed

While the flash memory is being programmed, the [Debug] tabbed page in the [Output] pane shows the message “Flash memory writing …”. When programming is completed, the [Debug] tabbed page shows the message “Flash memory write end”.

(19) The [Please Restart or Exit] message box appears. Click on the [OK] button.

Figure 7.38 [Please Restart or Exit] Message Box

Programming of the flash memory is now complete. Debugging with the E8a emulator is not possible in the [Program Flash] mode. Restart or close the E8a emulator.

(20) Click on the [Disconnect] toolbar button of the HEW to disconnect the E8a and then detach the E8a from the user system. If you have finished programming, also close the HEW. If you wish to continue programming, on the other hand, go to the next step. The E8a must be disconnected whether or not programming is to be continued.

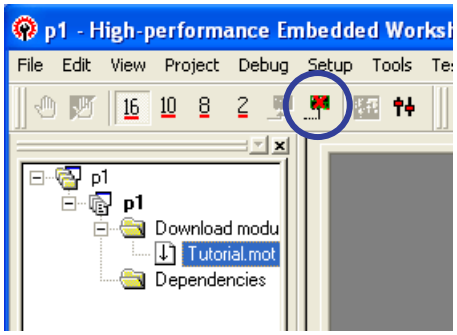


Figure 7.39 Disconnecting the E8a

If you wish to check the operation of the microcomputer independently of the E8a, detach the E8a from the user system.

(21) To continue programming, click on the [Connect] toolbar button and repeat the steps (6), (9), and (17) to (20).

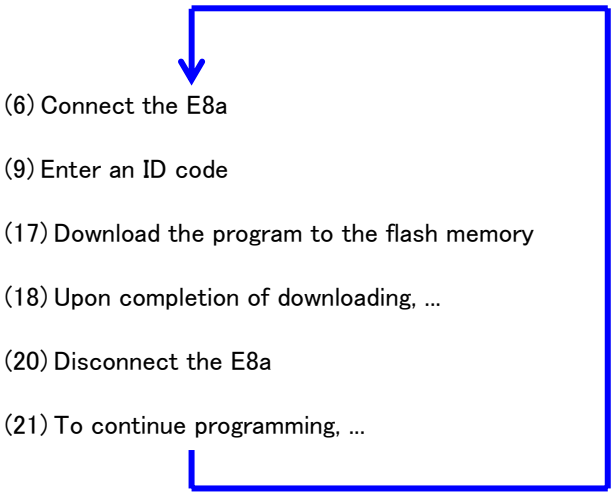


Figure 7.40 Procedure for Programming On-Chip Flash Memory

(22) If you wish to download the same file again, reopen the workspace you have created in this session the next time you start up the HEW.

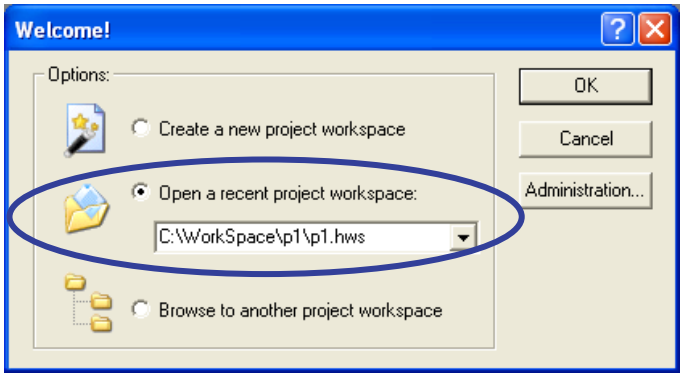


Figure 7.41 Selecting the Workspace Type

The subsequent steps of the procedure are the same as those given in section 7.4 (6) onwards.

The HEW can also be started up by double-clicking on a HEW workspace file (with extension ".hws") in Windows Explorer, etc.

(23) If you wish to select one from among multiple workspace files, add the files to the [Debug Settings] dialog box beforehand.

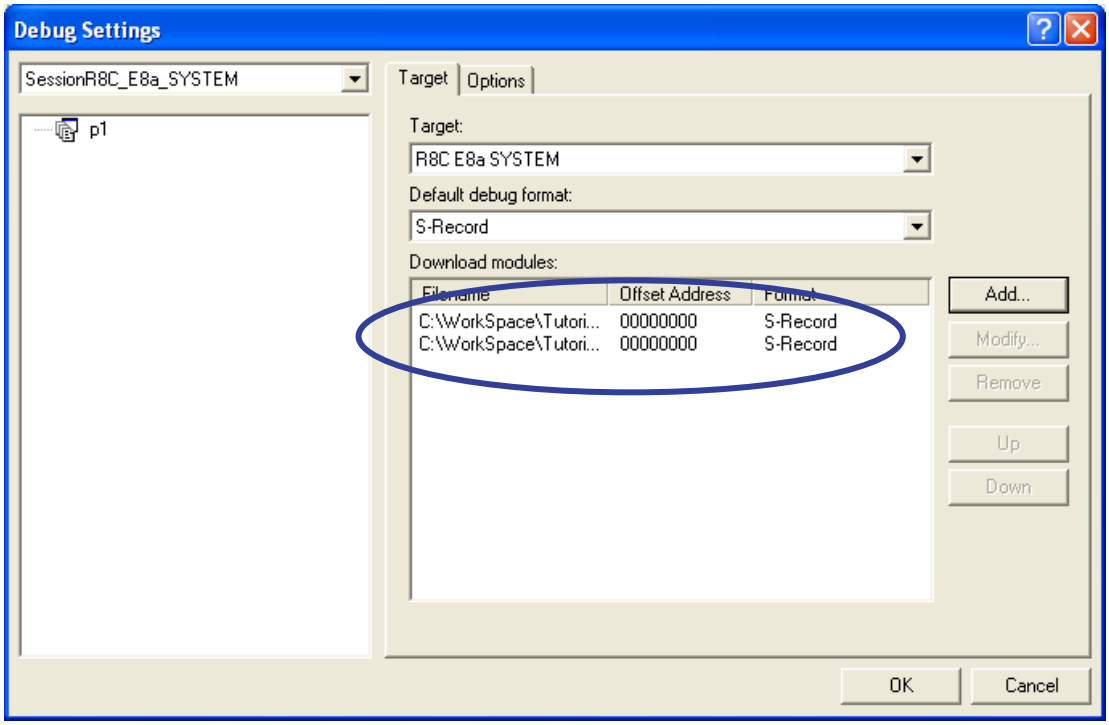


Figure 7.42 Adding Multiple Download-Module Files

This allows the user to select a desired file in the [Workspace] pane.

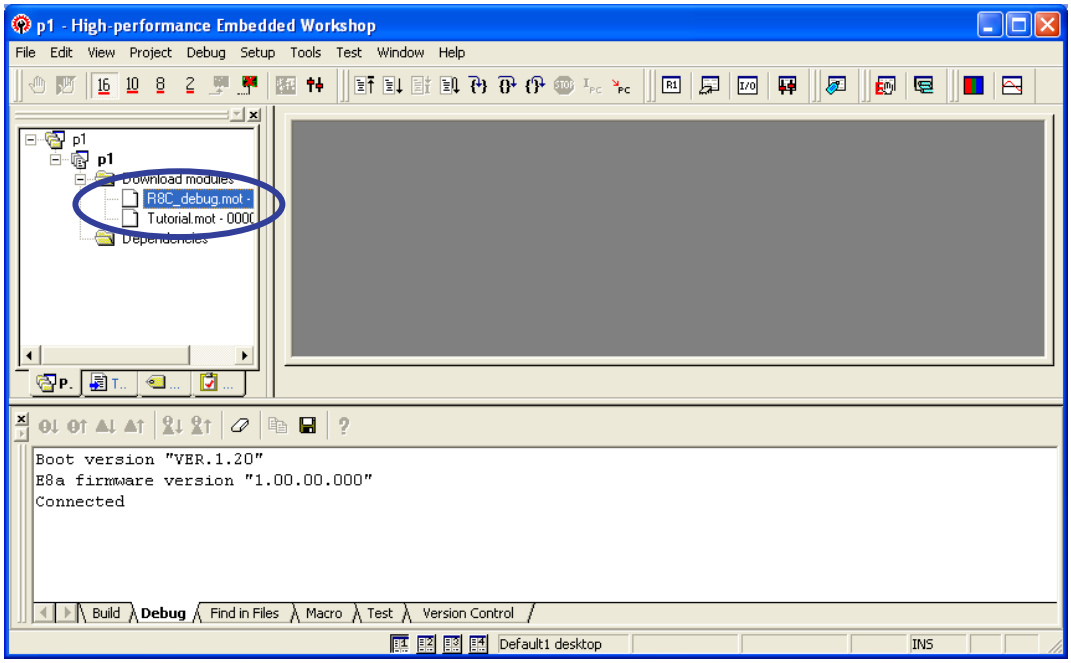


Figure 7.43 Downloading One of Multiple Download-Module Files

Note, however, that only one file is selectable for downloading while the E8a is operating in the [Program Flash] mode.

8. Limitations

8.1. Limitations on Free Evaluation-Version C Compiler

1) After the evaluation-version software has been initially installed, the free evaluation-version compiler has no limitations in usage for 60 days after it is built for the first time.
2) From the 61st day on, the linkage size is limited to within 64 Kbytes.

8.2. Limitations on Emulator Software

These limitations apply to Ver. 1.00R00; they may be changed in accordance with a software upgrade.

There are two types of documents related to the E8a emulator: common documents and additional documents.

The common documents include the E8a Emulator User's Manual and the Precautions on Using the E8a Emulator.

An additional document is prepared for each device type. For example, for the R8C/1B used in this guide, Notes on Connecting the R8C/18, R8C/19, R8C/1A and R8C/1B (REJ10J1646-0100) is available.

Please refer to the latest additional document for important information required when using the E8a emulator. A part of limitations is described in this guide.

8.2.1. Areas Occupied by the Emulator Program

Parts of the flash memory and vector areas are used by the E8a emulator program; do not change the allocation of these areas. Table 8.1 shows the areas occupied by the E8a emulator program for each device. If such an area is overwritten, the emulator will not work correctly.

Table 8.1 Areas Occupied by the E8a Emulator Program

Group	Part No.	ROM Size		Program Area for E8a Emulator	
		Programming Area	Data Area	Vector Area	ROM Area (Default Area)
R8C/18	R5F21181	4 KB	-	FFE4h - FFE7h, FFE8h - FFEBh, FFECh - FFEFh, FFF4h - FFF7h, FFF8h - FFFBh, FFFCh - FFFEh	-
	R5F21182	8 KB	-		-
	R5F21183	12 KB	-		-
	R5F21184	16 KB	-		2 KB of the ROM area [*1] (User Flash Area C000h - C7FFh)
R8C/19	R5F21191	4 KB	2 KB		-
	R5F21192	8 KB	2 KB		-
	R5F21193	12 KB	2 KB		-
	R5F21194	16 KB	2 KB		2 KB of the ROM area [*1] (Data Flash Area 2400h - 2700h) or (User Flash Area C000h - C7FFh)
R8C/1A	R5F211A1	4 KB	-		-
	R5F211A2	8 KB	-		-
	R5F211A3	12 KB	-		-
	R5F211A4	16 KB	-		2 KB of the ROM area [*1] (User Flash Area C000h - C7FFh)
R8C/1B	R5F211B1	4 KB	2 KB		-
	R5F211B2	8 KB	2 KB		-
	R5F211B3	12 KB	2 KB		-
	R5F211B4	16 KB	2 KB		2 KB of the ROM area [*1] (Data Flash Area 2400h - 2700h) or (User Flash Area C000h - C7FFh)

Note:

*1 When the device you are using is an R5F21184, R5F21194, R5F211A4, or R5F211B4, the [Firmware Location] dialog box, which is described in (3) of section 6.3.2 in this document, will appear; specify an area that will not be used for the user system. When the [Enable advanced setting] check box is selected, the area for use by the emulator can be specified as an address.

8.2.2. SFRs Used by the Emulator Program

Although the SFRs (special function registers) listed in table 8.2 are available to the user program, they can also be used by the E8a emulator program. Do not change values of these SFRs by any means (e.g. via the [Memory] pane) other than the user program. Although the values are changeable during execution of the user program, the changed values cannot be viewed during a break.

The SFRs in table 8.3 are only available to the E8a emulator program; they cannot be used by the user program. Do not change the values of these SFRs; if they are changed, the E8a emulator will become incapable of controlling them. Note that values read out from UART1 transmit interrupt control register S1TIC and UART1 receive interrupt control register S1RIC are always the values in use by the emulator.

Table 8.2 SFRs Used by the E8a Emulator Program (1)

Address	Register	Symbol	Bit
000Ah	Protect register	PRCR	Bit 0
0020h	High-speed on-chip oscillator control register 0	HRA0	Bit 0
0021h	High-speed on-chip oscillator control register 1	HRA1	All bits
0022h	High-speed on-chip oscillator control register 2	HRA2	All bits
01B3h	Flash memory control register 4	FMR4	Bit 7

Table 8.3 SFRs Used by the E8a Emulator Program (2)

Address	Register	Symbol	Bit	Notes on using the E8a emulator
0009h	Address match interrupt enable register	AIER	All bits	[*1]
0010h - 0012h	Address match interrupt register 0	RMAD0	All bits	[*1]
0014h - 0016h	Address match interrupt register 1	RMAD1	All bits	[*1]
00A8h	UART1 transmit/receive mode register	U1MR	All bits	[*1]
00A9h	UART1 bit rate register	U1BRG	All bits	[*1]
00AAh, 00ABh	UART1 transmit buffer register	U1TB	All bits	[*1]
00ACh	UART1 transmit/receive control register 0	U1C0	All bits	[*1]
00ADh	UART1 transmit/receive control register 1	U1C1	All bits	[*1]
00AEh, 00AFh	UART1 receive buffer register	U1RB	All bits	[*1]
00B0h	UART transmit/receive control register 2	UCON	Bits 1, 4 and 5	[*2]

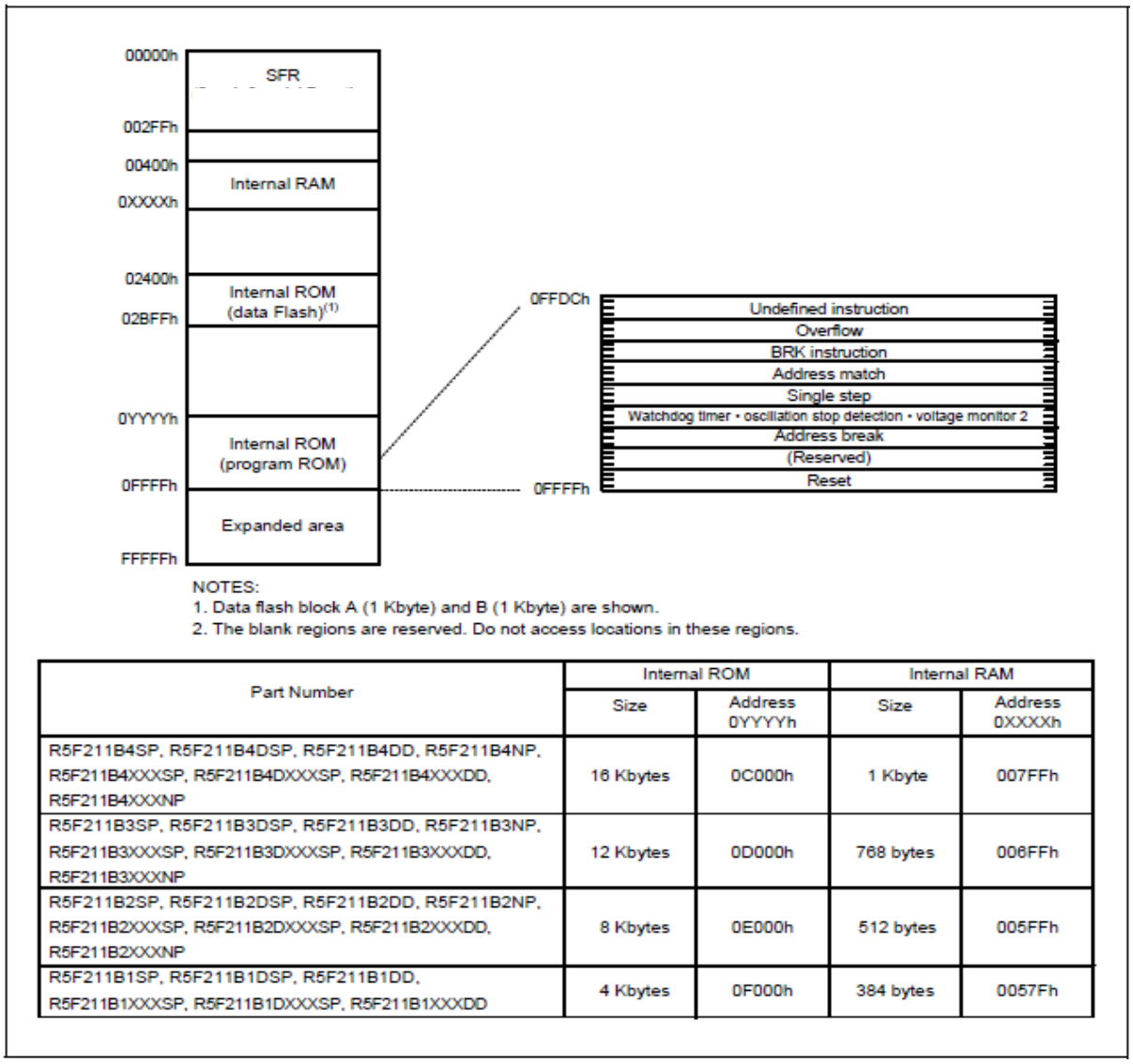
Notes:

*1 Do not change these values.

*2 Do not change the values of bits listed at left. If another bit is to be changed, it must be done by a bit-manipulation instruction or some other means that leaves the values of the listed bits unchanged.

8.3. Memory Map

Figure 8.1 shows the memory map of the R8C/1B. The R5F211B4, which is mounted on the CPU board of the Renesas Starter Kit for the R8C/1B, has 16 Kbytes of internal ROM as a program area, 2 Kbytes of internal ROM as a data area, and 1 Kbyte of internal RAM.



NOTES:
1. Data flash block A (1 Kbyte) and B (1 Kbyte) are shown.
2. The blank regions are reserved. Do not access locations in these regions.

Part Number	Internal ROM		Internal RAM	
	Size	Address 0YYYYh	Size	Address 0XXXXh
R5F211B4SP, R5F211B4DSP, R5F211B4DD, R5F211B4NP, R5F211B4XXXSP, R5F211B4DXXXSP, R5F211B4XXXDD, R5F211B4XXXNP	16 Kbytes	0C000h	1 Kbyte	007FFh
R5F211B3SP, R5F211B3DSP, R5F211B3DD, R5F211B3NP, R5F211B3XXXSP, R5F211B3DXXXSP, R5F211B3XXXDD, R5F211B3XXXNP	12 Kbytes	0D000h	768 bytes	006FFh
R5F211B2SP, R5F211B2DSP, R5F211B2DD, R5F211B2NP, R5F211B2XXXSP, R5F211B2DXXXSP, R5F211B2XXXDD, R5F211B2XXXNP	8 Kbytes	0E000h	512 bytes	005FFh
R5F211B1SP, R5F211B1DSP, R5F211B1DD, R5F211B1XXXSP, R5F211B1DXXXSP, R5F211B1XXXDD	4 Kbytes	0F000h	384 bytes	0057Fh

Figure 8.1 Memory Map of R8C/1B

9. Frequently Asked Questions

9.1. A communication error has occurred at startup.

If a communication error has occurred at startup, confirm the following.

1) The USB cable and user system interface cable are correctly connected.
2) The power is supplied to the CPU board when an external power source is used.
   Turn on the power after the message, 'Turn on the target device and press the <Enter> key.' appears.
3) The selected device corresponds to the microcomputer in use.

9.2. A communication error has occurred during debugging.

If a communication error has occurred during debugging, confirm the following.

1) The firmware may have gone out of control due to user program execution (going out of control or accessing to the monitor area). Disconnect the USB cable of the E8a emulator from the host computer, connect it again, and then restart the emulator software.
2) The user program does not access the area or the resource used by the firmware.

9.3. Do the on-chip peripheral modules work after a break occurs?

While the program is stopped due to a break, the CPU does not accept interrupts but the peripheral modules continue operation. For example, when the user program stops due to a break after a timer has started counting, the timer continues counting but the CPU does not accept timer interrupts.

9.4. Is there any method to check if the emulator fails?

The diagnostic hardware program (self-check program) is available. For the procedure, refer to the section 'Diagnostic Hardware Program' in the E8a Emulator User's Manual.

9.5. What should be entered in the [ID Code verification] dialog box?

When the E8a emulator is being started up, the E8a reads the ID-code section within the on-chip flash memory and requires user verification. The ID code that should be entered in the [ID Code verification] dialog box varies depending on whether or not the user has specified .ID or -ID in source files or as options*1, and whether or not fixed interrupt vectors have been set. Set the correct ID code according to the following table.

Table 9.1 ID Code Values

.ID or –ID Specified?		**ID Code**
Yes *2		Value specified by the user
No *3	Fixed interrupt vectors are set	Hexadecimal “00000000000000”
	No fixed interrupt vector is set	Hexadecimal “FFFFFFFFFFFFFF”

Notes:

*1 There are the following two ways of setting an ID code.

- Use the assembler directive “.ID” (recommended)

  [Example] To set the hexadecimal value “123456789ABCDE” as the ID code:

  (1) In an assembler program

  .id “#123456789ABCDE”

  (2) In a C program

  _asm(“.id””¥”#123456789ABCDE””);

- Use the “-ID” option of the LMC30 load module converter

  “-ID” is an optional feature of the LMC30. If an “.ID”, “.OFSREG”, or “.PROTECT” assembler directive has already been specified, the “-ID” option is ignored.

*2 Reflection of the ID code value in .x30 and .mot files depends on whether “.ID” or “-ID” has been used. Use of the “.ID” assembler directive is thus recommended.

When “.ID” is used: The ID code value is reflected in both .x30 and .mot files

When “-ID” is used: The ID code value is only reflected in .mot files

Due to this difference, if the “-ID” option has been used and an .x30 file has been downloaded to the flash memory, you may encounter a problem since an ID code setting in the user program will not be reflected in the contents of memory on the actual device.

*3 If the user has not set any ID code, the value is normally “00000000000000” because the ID is assigned to the highest-order address range of the fixed interrupt vectors. If the vectors where the ID code is to be stored were not included in the user program, each byte of the ID code has the default value for the flash memory: i.e. the code is the hexadecimal number “FFFFFFFFFFFFFF”.

*4 While the E8a is used as a debugger (i.e. the emulator mode is not [Program Flash]), the ID code will always be the hexadecimal number “FFFFFFFFFFFFFF” regardless of the contents of the user program.

*5 At the time of the purchase of any device (blank), the ID code will be the hexadecimal number “FFFFFFFFFFFFFF”.

9.6. Other Questions

Questions and answers for Renesas products, including E8a emulator, are released on the website as 'FAQs'.

http://www.renesas.com/e8a (Global site)

Access the above website and click 'FAQs' on the left link side.

10. Typical Error Messages and Resolution

(1) Driver Error:Illegal driver inter face select

Communication with the E8a is not available.

Disconnect the USB cable from the host computer and re-connect it.

(2) Driver Error:No available communication devices found.

The E8a is not connected. Check the state of the USB connector.

(3) Connector disconnected. Please, connect and press <Enter> key.

The user board and the E8a are not connected. Connect them and press the Enter key.

This error message will also be reported when pin connector 14 on the E8a is not connected to GND.

(4) Flash memory erase error ! Change device

Erasing of the flash memory has failed. Exchange the device.

(5) Flash memory write error

Programming of the flash memory has failed.

In many cases, this will be because the voltage on the user board was 3.0 V or lower while the E8a was operating in the programmer mode.

(6) Communication timeout error

The device does not respond.

Refer to the Frequently Asked Questions regarding the E8a on the Renesas website.

11. Related Documents

The E8a emulator and HEW provide many other useful functions not mentioned in this document. Please refer to the following related documents for important information about our products such as detailed specifications, technical information, or restrictions.

Documents Related to the E8a Emulator:

- E8a Emulator User's Manual
- Additional Document for User's Manual: Notes on Connecting the R8C/18, R8C/19, R8C/1A and R8C/1B

Document Related to High-Performance Embedded Workshop:

- High-performance Embedded Workshop User's Manual

Documents Related to CPU:

- R8C/1A, R8C/1B Group Hardware Manual
- M16C/60, M16C/20, M16C/Tiny Series Software Manual

Documents Related to M16C/60 Series C Compiler Package:

- M3T-NC30WA C Compiler User's Manual (C Compiler Package for M16C Series)
- M3T-NC30WA C Compiler Release Notes (C Compiler Package for M16C Series)

12. For More Information

Access the following addresses for information on this product.

USA:	techsupport.rta@renesas.com
Europe:	tools.support.eu@renesas.com
Japan:	csc@renesas.com

Information on the E8a emulator is available at the following Renesas websites:

http://www.renesas.com/e8a (Global site)

http://japan.renesas.com/e8a (Japan site)

Information on the Renesas microcomputers is available at the following Renesas websites:

http://www.renesas.com/ (Global site)

http://japan.renesas.com/ (Japan site)

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Application Notes

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