Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

User's Manual

R0E535M00MCU00

User's Manual

Supported Devices:
M16C Family / M16C/50 Series
M16C/5M,5L,56,5LD and 56D Groups

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Electronics Corporation without notice. Please review the latest information published by Renesas Electronics Corporation through various means, including the Renesas Electronics Corporation website (http://www.renesas.com).

Renesas Electronics
www.renesas.com

Rev.6.01 Dec 2015

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.

   “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.

   Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(2012.4)

Preface

The R0E535M00MCU00 is a full-spec emulator for MCUs of the M16C/5M, M16C/5L, M16C/56, M16C/5LD and M16C/56D Groups. This user's manual mainly describes specifications of the R0E535M00MCU00 and how to setup it.

All components of the R0E535M00MCU00 are listed under "1.1 Package Components" (page 16). If you have any questions about the R0E535M00MCU00, contact your local distributor.

The manuals relevant to usage of the R0E535M00MCU00 are listed below. You can download the latest manuals from the Renesas Tools homepage (http://www.renesas.com/tools).

Related manuals

Item	Manual
Accessory	R0E0100TNPFK00 User's Manual
	R0E535M00CFK30 User's Manual
	R0E535M00CFK40 User's Manual
Integrated development environment	High-performance Embedded Workshop User's Manual
C compiler	C/C++ Compiler Package for M16C Series, R8C Family C/C++ Compiler User's Manual
Assembler	C/ C++ Compiler Package for M16C Series, R8C Family 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 it when you have questions about this product.

Emulator:

"Emulator" in this document collectively refers to the following products manufactured by Renesas Electronics Corporation.

(1) E100 emulator main unit
(2) MCU unit
(3) Pitch converter board for connecting the user system

"Emulator" herein encompasses neither the customer's user system nor the host machine.

Purpose of use of the emulator:

This emulator is a device to support the development of systems that use the M16C Family M16C/5M, M16C/5L, M16C/56, M16C/5LD and M16C/56D Groups of Renesas 16-bit single-chip MCUs. It provides support for system development in both software and hardware.
Be sure to use this emulator correctly according to said purpose of use. Please avoid using this emulator other than for 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 basic knowledge of electric circuits, logical circuits, and MCUs.

When using the emulator:

(1) This product is a development-support unit for use in your program development and evaluation stages. When a program you have finished developing is to be incorporated in a mass-produced product, the judgment as to whether it can be put to practical use is entirely your own responsibility, and should be based on evaluation of the device on which it is installed and other experiments.
(2) In no event shall Renesas Electronics Corporation be liable for any consequence arising from the use of this product.
(3) Renesas Electronics Corporation strives to provide workarounds for and correct trouble with products malfunctions, with some free and some incurring charges. However, this does not necessarily mean that Renesas Electronics Corporation guarantees the provision of a workaround or correction under any circumstances.
(4) The product covered by this document has been developed on the assumption that it will be used for program development and evaluation in laboratories. Therefore, it does not fall within the scope of applicability of the Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.
(5) Renesas Electronics Corporation cannot predict all possible situations and possible cases of misuse that carry a potential for danger. Therefore, the warnings in this user's manual and the warning labels attached to the emulator do not necessarily cover all such possible situations and cases. The customer is responsible for correctly and safely using this emulator.
(6) The product covered by this document has not been through the process of checking conformance with UL or other safety standards and IEC or other industry standards. This fact must be taken into account when the product is taken from Japan to some other country.
(7) Renesas Electronics Corporation will not assume responsibility of direct or indirect damage caused by an accidental failure or malfunction in this product.

When disposing of the emulator:

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

Usage restrictions:

The emulator has been developed as a means of supporting system development by users. Therefore, do not use it as an embedded device in other equipment. Also, do not use it to develop systems or equipment for use in the following fields.

(1) Transportation and vehicular
(2) Medical (equipment that has an involvement in human life)
(3) Aerospace
(4) Nuclear power control
(5) Undersea repeaters

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

About product changes:

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

About rights:

(1) We assume no responsibility for any damage or infringement on patent rights or any other rights arising from the use of any information, products or circuits presented in this user's manual.
(2) The information or data in this user's manual does not implicitly or otherwise grant a license to patent rights or any other rights belonging to Renesas or to a third party.
(3) This user's manual and this emulator are copyrighted, with all rights reserved by Renesas. This user's manual may not be copied, duplicated or reproduced, in whole or part, without prior written consent from Renesas.

About diagrams:

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

Precautions for Safety

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read and understand this chapter before using this product.
Contact us if you have any questions about the precautions described here.
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.

⚠ WARNING	WARNING indicates a potentially dangerous situation that will cause death or heavy wound unless it is avoided.
⚠ CAUTION	CAUTION indicates a potentially dangerous situation that will cause a slight injury or a medium-degree injury or property damage unless it is avoided.

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

△ means WARNING or CAUTION.
Example:

CAUTION AGAINST AN ELECTRIC SHOCK

⃠ means PROHIBITION.
Example:

DISASSEMBLY PROHIBITED

● means A FORCIBLE ACTION.
Example:

UNPLUG THE POWER CABLE FROM THE RECEPTACLE.

⚠ WARNING

Warnings for AC Power Supply:

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

Use an AC power cable which complies with the safety standard of the country.

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

This product is connected signal ground with frame ground. If yours developing product is transform-less (not having isolation transformer of AC power), this may cause electric shock. Also, this may give an un-repairable damage to this product and yours developing product. 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.

When installing this equipment, insure that a reliable ground connection is maintained.

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 product and connecting it to other devices, turn off power or remove a power cable to prevent injury or product damage.

Warnings to Be Taken for Handling:

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

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

Warning for Installation:

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

Warning for Use temperature:

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.

⚠CAUTION

Cautions to Be Taken for the AC Adapter:

Use only the AC adapter included in this product.
Do not use the AC adapter for other equipment.

Cautions to Be Taken for Turning On the Power:

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

When 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 product. Be careful not to apply a mechanical shock.

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

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

Do not flex the flexible cable excessively. The cable may cause a break.

Do not use inch-size screws for this equipment. The screws used in this equipment are all ISO (meter-size) type screws. When replacing screws, use same type screws as equipped before.

Do not tape the flexible cable or apply adhesives to secure the cable. The shielding material on the surface of the cable may come off.

Note on Transporting the Product:

When sending your product for repair, use the packing box and cushioning material supplied with the product when it was delivered to you and specify caution in handling (handling as precision equipment). If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use the conductive plastic bag supplied with the product (usually a blue bag). If you use a different bag, it may lead to further trouble with your product due to static electricity.

Caution to Be Taken for System Malfunctions:

If the emulator malfunctions because of interference like external noise, do the following to remedy the trouble.

(1) Exit the emulator debugger, and shut OFF the emulator and the user system.
(2) After a lapse of 10 seconds, turn ON the power of the emulator and the user system again, then launch the emulator debugger.

Caution to Be Taken for Disposal:

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

European Union regulatory notices:

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the European Union only. This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner.
Renesas Electronics Europe GmbH can take back end of life equipment, register for this service at "http://www.renesas.eu/weee".

Contents

Page
Preface....3
Important....4
Precautions for Safety....6
Contents....9
User Registration....14
Terminology....15
1. Outline....16
1.1 Package Components....16
1.2 Other Tool Products Required for Development....16
1.3 System Configuration....17
1.3.1 System Configuration....17
1.3.2 Names and Functions of each part of the emulator....18
1.4 Specifications....20
1.4.1 Product Specifications....20
1.4.2 Regulatory Compliance Notices....21
1.4.3 Operating Environment....22
2. Setup....23
2.1 Flowchart of Starting Up the Emulator....23
2.2 Installing the Included Software....25
2.3 Connecting the MCU Unit to and Disconnecting it from the E100 Emulator Main Unit....26
2.4 Connecting the Host Machine....27
2.5 Connecting the Emulator Power Supply....28
2.6 Turning ON the Power....29
2.6.1 Checking the Connections of the Emulator System....29
2.6.2 Turning the Power ON and OFF....29
2.7 Self-checking....30
2.8 Selecting the Clock Supply....31
2.8.1 Clock Source....31
2.8.2 Using an Internal Oscillator Circuit Board....32
2.8.3 Using the Oscillator Circuit on the User System....33
2.8.4 Using the Internal Generator Circuit....33
2.9 Connecting the User System....34
2.9.1 Connecting to a 100-pin 0.5mm Pitch Foot Pattern....35
2.9.2 Connecting to an 80-pin 0.5mm Pitch Foot Pattern....36
2.9.3 Connecting to a 64-pin 0.5mm Pitch Foot Pattern....37
3. Tutorial....38
3.1 Introduction....38
3.2 Starting the High-performance Embedded Workshop....39
3.3 Connecting the Emulator....39
3.4 Downloading the Tutorial Program....40
3.4.1 Downloading the Tutorial Program....40
3.4.2 Displaying the Source Program....41
3.5 Setting Software Breakpoints....42
3.6 Executing the Program....43
3.6.1 Resetting the CPU....43
3.6.2 Executing the Program....43
3.7 Checking Breakpoints....44
3.7.1 Checking Breakpoints....44
3.8 Altering Register Contents....45
3.9 Referencing Symbols....46
3.10 Checking Memory Contents....47
3.11 Referencing Variables....48
3.12 Showing Local Variables....50
3.13 Single-Stepping a Program....50
3.13.1 Executing Step In Command....51
3.13.2 Executing the Step Out Command....52
3.13.3 Executing the Step Over Command....53

3.14 Forcibly Breaking a Program 54
3.15 Hardware Break Facility 55
3.15.1 Stopping a Program when It Executes a Specified Address 55
3.16 Stopping a Program when It Accesses Memory 56
3.17 Trace Facility 57
3.17.1 Showing the Trace Information Acquired by Fill Until Stop 58
3.17.2 Showing the Trace Information Acquired by Fill around TP 61
3.17.3 Showing a Function Execution History 63
3.17.4 Filter Facility 65
3.18 Stack Trace Facility 67
3.19 What Next? 68
4. Preparing to Debug 69
4.1 Starting the High-performance Embedded Workshop 69
4.2 Creating a New Workspace (Toolchain Unused) 70
4.3 Creating a New Workspace (Toolchain Used) 72
4.4 Opening an Existing Workspace 75
4.5 Connecting the Emulator 76
4.5.1 Connecting the Emulator 76
4.5.2 Reconnecting the Emulator 76
4.6 Disconnecting the Emulator 77
4.6.1 Disconnecting the Emulator 77
4.7 Quitting the High-performance Embedded Workshop 77
4.8 Setting Up the Debug 78
4.8.1 Specifying a Download Module 78
4.8.2 Setting Up Automatic Execution of Command Line Batch Files 79
5. Debugging Functions 80
5.1 Setting Up the Emulation Environment 81
5.1.1 Setting Up the Emulator at Startup 81
5.1.2 Setting Up the Target MCU 82
5.1.3 Setting Up the System 84
5.1.4 Setting Up Flash ROM Overwrite 86
5.1.5 Setting the Warning of Exceptional Events 87
5.1.6 Showing Progress in Boot-up Processing 88
5.2 Downloading a Program 90
5.2.1 Downloading a Program 90
5.2.2 Showing the Source Code 90
5.2.3 Turning columns in all source files off 92
5.2.4 Turning columns in one source file off 92
5.2.5 Showing Assembly Language Code 93
5.2.6 Correcting Assembly Language Codes 94
5.3 Displaying Memory Contents in Real Time 95
5.3.1 Displaying Memory Contents in Real Time 95
5.3.2 Setting RAM Monitor Update Intervals 96
5.3.3 Clearing RAM Monitor Access History 96
5.3.4 Clearing RAM Monitor Error Detection Data 96
5.4 Showing the Current Status 97
5.4.1 Showing the Emulator Status 97
5.4.2 Showing the Emulator Status in the Status Bar 98
5.5 Periodically Reading Out and Showing the Emulator Status 99
5.5.1 Periodically Reading Out and Showing the Emulator Information 99
5.5.2 Selecting the Items to Be Displayed 100
5.6 Using Software Breakpoints 101
5.6.1 Using Software Breakpoints 101
5.6.2 Adding/Removing Software Breakpoints 102
5.6.3 Enabling/Disabling Software Breakpoints 103
5.7 Using Events 105
5.7.1 Using Events 105
5.7.2 Adding Events 106
5.7.3 Removing Events 111
5.7.4 Registering Events 113
5.7.5 Entering Events Each Time or Reusing Events 115
5.7.6 Applying Events 116

5.8 Setting Hardware Break Conditions 117
5.8.1 Setting Hardware Break Conditions 117
5.8.2 Setting Hardware Breakpoints 117
5.8.3 Saving/Loading the Set Contents of Hardware Breaks 120
5.9 Looking at Trace Information 121
5.9.1 Looking at Trace Information 121
5.9.2 Acquiring Trace Information 121
5.9.3 Setting Trace Information Acquisition Conditions 123
5.9.4 Setting Trace Modes 126
5.9.5 Setting Trace Points 128
5.9.6 Setting Capture/Do not Capture Conditions 132
5.9.7 Selecting the Content of Trace Acquisition 134
5.9.8 Showing Trace Results 135
5.9.9 Filtering Trace Information 137
5.9.10 Searching for Trace Records 138
5.9.11 Saving Trace Information to Files 139
5.9.12 Loading Trace Information from Files 140
5.9.13 Temporarily Stopping Trace Information Acquisition 140
5.9.14 Restarting Trace Information Acquisition 140
5.9.15 Switching Timestamp Display 140
5.9.16 Showing the History of Function Execution 141
5.9.17 Showing the History of Task Execution 142
5.10 Measuring Performance 143
5.10.1 Measuring Performance 143
5.10.2 Showing the Result of Performance Measurement 143
5.10.3 Setting Performance Measurement Conditions 144
5.10.4 Starting Performance Measurement 146
5.10.5 Clearing Performance Measurement Conditions 147
5.10.6 Clearing the Performance Measurement Result 147
5.10.7 About the Maximum Measurement Time of Performance 147
5.11 Acquiring Code Coverage 148
5.11.1 Acquiring Code Coverage 148
5.11.2 Opening the Code Coverage Window 148
5.11.3 Allocating Code Coverage Memory (Hardware Resource) 149
5.11.4 Code Coverage in an Address Range 151
5.11.5 Adding Address Ranges 152
5.11.6 Changing Address Ranges 153
5.11.7 Removing Address Ranges 154
5.11.8 Code Coverage in a Source File 156
5.11.9 Adding Source Files 157
5.11.10 Removing Source Files 158
5.11.11 Showing Percentages and Graphs 160
5.11.12 Using the Sort Function 161
5.11.13 Searching for Unexecuted Lines 162
5.11.14 Clearing Code Coverage Information 163
5.11.15 Updating Coverage Information 163
5.11.16 Preventing Update of Coverage Information 163
5.11.17 Saving the Code Coverage Information to a File 164
5.11.18 Loading Code Coverage Information from a File 164
5.11.19 Coverage Information File Load Modes 165
5.11.20 Displaying Code Coverage Information in the Editor Window 167
5.12 Acquiring Data Coverage 168
5.12.1 Acquiring Data Coverage 168
5.12.2 Opening the Data Coverage Window 168
5.12.3 Allocating Data Coverage Memory (Hardware Resource) 169
5.12.4 Data Coverage in an Address Range 171
5.12.5 Adding Address Ranges 172
5.12.6 Changing Address Ranges 173
5.12.7 Removing Address Ranges 174
5.12.8 Data Coverage in a Section 175
5.12.9 Adding Sections 176
5.12.10 Removing Sections 177

5.12.11 Data Coverage in a Task Stack 178
5.12.12 Clearing Data Coverage Information 179
5.12.13 Updating Coverage Information 179
5.12.14 Preventing Update of Coverage Information 179
5.12.15 Saving the Data Coverage Information to a File 180
5.12.16 Loading Data Coverage Information from a File 180
5.13 Viewing Realtime Profile Information 182
5.13.1 Viewing Realtime Profile Information 182
5.13.2 Setting Realtime Profile Measurement Modes 184
5.13.3 Measuring Function Profiles 184
5.13.4 Setting Function Profile Measurement Ranges 185
5.13.5 Saving Function Profile Measurement Ranges 186
5.13.6 Loading Function Profile Measurement Ranges 186
5.13.7 Measuring Task Profiles 187
5.13.8 Setting Task Profile Measurement Ranges 188
5.13.9 Saving Task Profile Measurement Tasks 189
5.13.10 Loading Task Profile Measurement Tasks 189
5.13.11 Clearing Realtime Profile Measurement Results 190
5.13.12 Saving Realtime Profile Measurement Results 190
5.13.13 Setting the Measurement Interval 190
5.13.14 Maximum Measurement Time of the Realtime Profile 191
5.14 Detecting Exceptional Events 192
5.14.1 Detecting Exceptional Events 192
5.14.2 Detecting an Access Protect Violation 192
5.14.3 Setting an Access Protected Area 194
5.14.4 Detecting Initialization-Omitted 198
5.14.5 Detecting Stack Access Violation 199
5.14.6 Detecting a Performance Overflow 200
5.14.7 Detecting a Realtime Profile Overflow 200
5.14.8 Detecting a Trace Memory Overflow 201
5.14.9 Detecting a Task Stack Access Violation 201
5.14.10 Setting a Task Stack Area 202
5.14.11 Detecting an OS Dispatch 205
5.15 Using the Start/Stop Function 206
5.15.1 Opening the Start/Stop Function Setting Dialog Box 206
5.15.2 Specifying the Work Address 206
5.15.3 Specifying the Routine to be executed 206
5.15.4 Limitations of the Start/Stop Function 207
5.15.5 Limitations to the Statements written in a Specified Routine 207
5.16 Using the Trigger Output Function 208
5.16.1 Using the External Trigger Cable for Output 208
5.16.2 Opening the Trigger Output Conditions Dialog Box 209
5.16.3 Manual Setting for Output through Trigger Pins 31 to 24 210
5.16.4 Setting for Output through Trigger Pins 20 to 16 211
5.16.5 Events 212
6. Troubleshooting (Action in Case of an Error) 213
6.1 Flowchart for Remediation of Trouble 213
6.2 Error in Self-checking 214
6.3 Errors Reported in Booting-up of the Emulator 215
6.4 How to Request Support 217
7. Hardware Specifications 218
7.1 Target MCU Specifications 218
7.2 Differences between the Actual MCU and Emulator 219
7.3 Connection Diagram 220
7.3.1 Connection Diagram for the R0E535M00MCU00 220
7.4 External Dimensions 221
7.4.1 External Dimensions of the E100 Emulator 221
7.4.2 External Dimensions of the Converter Board R0E0100TNPFK00 222
7.4.3 External Dimensions of the Converter Board R0E535M00CFK30 223
7.4.4 External Dimensions of the Converter Board R0E535M00CFK40 224
7.5 Notes on Using the MCU Unit 225
8. Maintenance and Warranty 229

8.1 User Registration 229
8.2 Maintenance 229
8.3 Warranty 229
8.4 Repair Provisions 230
8.5 How to Make Request for Repair 230
Revision History 1

User Registration

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

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

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

Terminology

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

MCU unit (R0E535M00MCU00)
This means the E100 emulator for the M16C/5M, M16C/5L, M16C/56, M16C/5LD and M16C/56D Groups.

Emulator system
This means an emulator system built around the MCU unit (R0E535M00MCU00). The emulator system is configured with an emulator main unit (R0E001000EMU00), MCU unit (R0E535M00MCU00), emulator power supply, USB cable, emulator debugger and host machine.

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

Emulator debugger
This means a software tool that is started up from the High-performance Embedded Workshop, and controls the MCU unit and enables debugging.

Firmware
This means a control program stored in the emulator. This analyzes the contents of communications with the emulator debugger and controls the emulator hardware. To upgrade the firmware, download the program from the emulator debugger.

Host machine
This means a personal computer used to control the emulator.

Target MCU
This means the MCU to be debugged.

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

User program
This means the program to be debugged.

Evaluation MCU
This means the MCU mounted on the emulator which is operated in a dedicated mode for use with tools.

#
This symbol indicates that a signal is active-low (e.g. RESET#).

1. Outline

This chapter describes the package components, the system configuration, and the specifications of the emulator functions and operating environment.

1.1 Package Components

The R0E535M00MCU00 package consists of the following items. After you have unpacked the box, check if your R0E535M00MCU00 contains all of these items.

Table 1.1 Package components

Item	Description	Quantity
R0E535M00MCU00	MCU board	1
Oscillator module (20MHz)	Mounted on the IC17 socket	1
R0E001000FLX10	Flexible cable	2
R0E535M00MCU00 Release Notes	English	1
R0E535M00MCU00 Release Notes	Japanese	1
Repair Request Sheet	English	1
Repair Request Sheet	Japanese	1
CD-ROM	- M16C R8C E100 Emulator Software (M16C R8C E100 Emulator Debugger Included) - User's Manual	1

* Please keep the R0E535M00MCU00's packing box and cushioning materials at hand for later reuse in sending the product for repairs or for other purposes. Always use the original packing box and cushioning material when transporting the MCU unit.
* If you have any questions or are in doubt about any point regarding the packaged product, contact your local distributor.

1.2 Other Tool Products Required for Development

To proceed with the development of a program for M16C/50 Series M16C/5M, M16C/5L, M16C/56, M16C/5LD and M16C/56D Groups MCUs, the products listed below are necessary in addition to those contained in the package and listed above. Procure them separately.

Table 1.2 Other tool products required for development

Product	Part No.
Emulator main unit E100	R0E001000EMU00
100-pin 0.5mm pitch LQFP (PLQP0100KB-A Previous code: 100P6Q-A)	R0E0100TNPFK00
80-pin 0.5mm pitch LQFP (PLQP0080KB-A Previous code: 80P6Q–A)	R0E535M00CFK30
64-pin 0.5mm pitch LQFP (PLQP0064KB-A Previous code: 64P6Q–A)	R0E535M00CFK40

* To purchase the product, contact your local distributor.

1.3 System Configuration

1.3.1 System Configuration

Figure 1.1 shows the configuration of the emulator system.

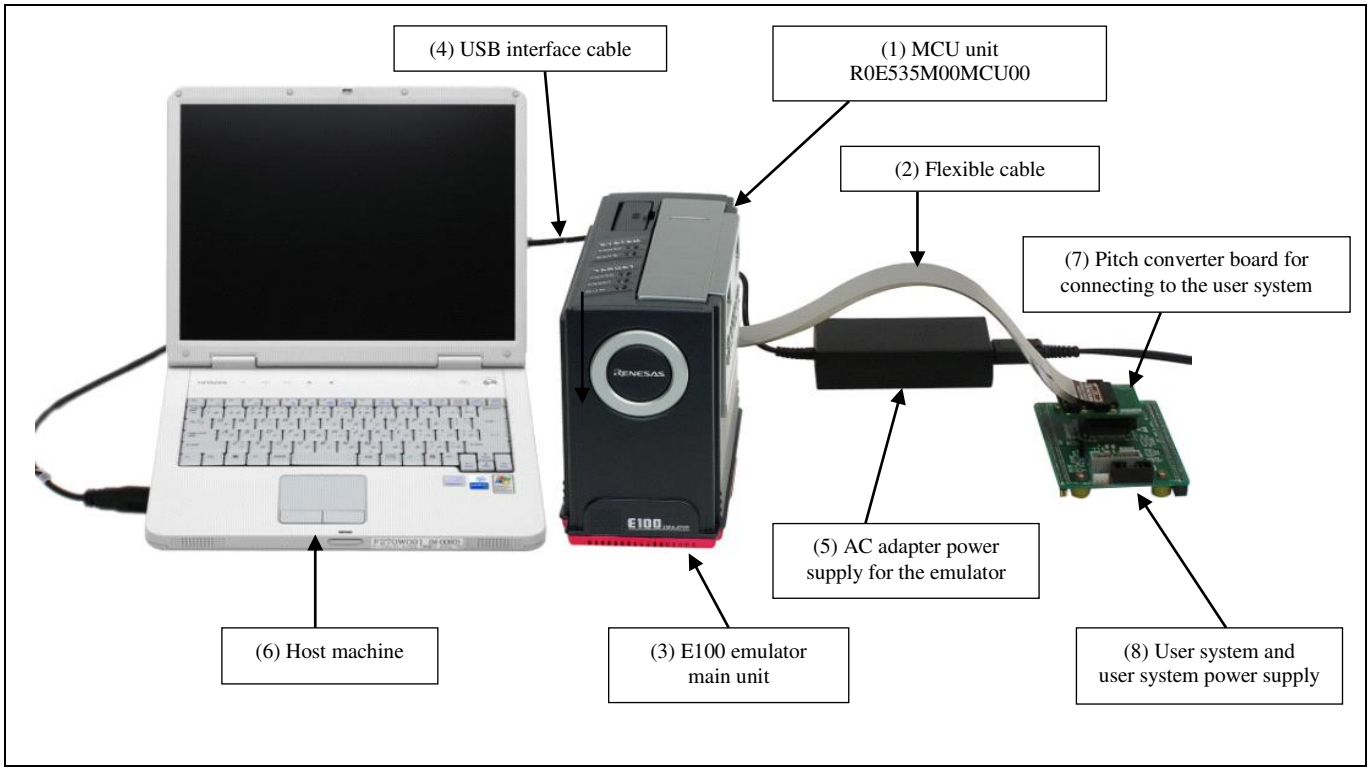

Figure 1.1 System configuration

(1) MCU Unit R0E535M00MCU00 (this product)
This is an MCU board for the M16C/50 Series M16C/5M, M16C/5L, M16C/56, M16C/5LD and M16C/56D Groups MCUs with 284 KB ROM and contains an evaluation MCU.
(2) Flexible cable R0E001000FLX10 (included)
(3) E100 Emulator main unit R0E001000EMU00
This is the E100 emulator main unit.
(4) USB interface cable
This is an interface cable for the host machine and emulator.
(5) AC adapter supply for the emulator
(6) Host machine
A personal computer to control the emulator.
(7) Pitch converter board for connecting the user system R0E0100TNPFK00, etc.
(8) User system and user system power supply
User system is your application system. This emulator can be used without the user system.
The user system power supply is power supply for the user system. This emulator cannot supply power to the user system. Get a power supply separately.

1.3.2 Names and Functions of each part of the emulator

Figure 1.2 shows the names of each part of the emulator.

Figure 1.2 Names of each part of the emulator

(1) Power switch

This is a switch to turn the emulator ON and OFF.

(2) USB cable connector

This is a connector for connecting the USB cable of the emulator.

(3) Power connector

This is a connector for connecting the DC cable of the AC power adapter of the emulator.

(4) External trigger connector

This is a connector to connect the external trigger cable of the emulator.

(5) System Status LEDs

The system status LEDs indicate the emulator E100's power supply, operating state of firmware, etc. Table 1.3 lists the definitions of each system status LED.

Table 1.3 Definitions of the system status LEDs

Name	Status	Meaning
POWER	ON	Emulator system power is turned ON.
	OFF	Emulator system power is turned OFF.
SAFE	ON	Emulator system is operating normally.
	Flashing	Emulator system cannot communicate with the host machine.
	Flashing (every 2 seconds)	The self-checking is in progress.
	OFF	Emulator system is not operating normally (system status error).

(6) Target Status LEDs

The target status LEDs indicate operating state of the target MCU and power supply of the user system. Table 1.4 lists the definition of each target status LED.

Table 1.4 Definitions of the target status LEDs

Name	Status	Meaning
POWER	ON	Power is being supplied to the user system.
	OFF	Power is not being supplied to the user system.
RESET	ON	Target MCU is being reset, or reset signal of the user system is held low.
	OFF	Target MCU is not being reset.
RUN	ON	User program is being executed.
	OFF	User program has been halted.

Note on the Target Status POWER LED:

- If your MCU has two or more Vcc pins, the LED does not light up unless power is supplied to all the pins.

1.4 Specifications

1.4.1 Product Specifications

Table 1.5 lists the specifications of the R0E535M00MCU00.

Table 1.5 Specifications of the R0E535M00MCU00

Applicable MCU	M16C/50 Series M16C/5M, M16C/5L, M16C/56, M16C/5LD and M16C/56D Groups MCUs with 284 KB ROM	
Applicable MCU mode	Single-chip mode	
Maximum ROM/RAM capacity	1. Internal flash ROM: 8KB+16KB+4KB+256KB 0E000h--0FFFFh, 10000h--13FFFh, 14000h--14FFFh, C0000h--FFFFFh 2. Internal RAM: 20KB 00400h--053FFh	
Maximum operating frequency	Power supply voltage: 2.7 to 5.5V, 25MHz (with PLL) 3.0 to 5.5V, 32MHz (with PLL)	
Software break	4096 points (uses RAM for break point capability before execution)	
Hardware break	16 points (Execution address, bus detection, interrupt, external trigger signal)	
Combination, pass count	- Cumulative AND/OR/status transition - 255 pass counts	
Detection of exceptional events	Violation of access protection/Read from uninitialized memory/ Stack access violation/Performance overflow/Realtime profile overflow/ Trace memory overflow/Task stack access violation/OS dispatch	
Real-time tracing	192bits × 4M cycles (Address, data, status, CPU status, bus status, target status, task ID, timestamp, 32 external trigger inputs)	
Trace modes	Fill until stop/fill until full/fill around TP/repeat fill until stop/repeat fill until full	
Extraction/deletion of trace data	- Extracting or deleting data by specifying events or extracting the instruction that accesses the specified data - Extracting data before and after trace points	
Real-time RAM monitor	- 16,384 bytes (512 bytes × 32 blocks) - Data/last access	
Time measurement	- Execution time between program start and stop - Maximum/minimum/average execution time and number of passes through eight specified sections - Clock used to count times: 10ns to 1.6µs	
Coverage measurement	C0: 2 Mbytes (256 Kbytes × 8 blocks) C1: 1 Mbyte (128 Kbytes × 8 blocks)	
Profile	1 MB (128 KB × 8 blocks)	
Connection to user system	100-pin 0.5mm pitch LQFP	R0E0100TNPFK00
	80-pin 0.5mm pitch LQFP	R0E535M00CFK30
	64-pin 0.5mm pitch LQFP	R0E535M00CFK40
Emulator power supply	Supplied from included AC adapter (power supply voltage: 100 to 240 V, 50/60 Hz)	

1.4.2 Regulatory Compliance Notices

● European Union regulatory notices

This product complies with the following EU Directives. (These directives are only valid in the European Union.)

CE Certifications:

・Electromagnetic Compatibility (EMC) Directive 2014/30/EU

EN 55022 Class A

WARNING: This is a Class A product. This equipment can cause radio frequency noise when used in the residential area. In such cases, the ser/operator of the equipment may be required to take appropriate countermeasures under his responsibility.

EN 55024

・Information for traceability

・Authorised representative

Name: Renesas Electronics Corporation
Address: Toyosu Foresia, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan

・Manufacturer

Name: Renesas System Design Co., Ltd.
Address: 5-20-1, Josuihon-cho, Kodaira-shi, Tokyo 187-8588, Japan

・Person responsible for placing on the market

Name: Renesas Electronics Europe GmbH
Address: Arcadiastrasse 10, 40472 Dusseldorf, Germany

・Trademark and Type name

Trademark: Renesas
Product name: E100 Emulator MCU Unit
Type name: R0E535M00MCU00

Environmental Compliance and Certifications:

・Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU

● United States Regulatory notices

This product complies with the following EMC regulation. (This is only valid in the United States.)

FCC Certifications:

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

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

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

1.4.3 Operating Environment

Make sure to use this emulator in the operating environments listed in Tables 1.6 to 1.8.

Table 1.6 Operating environmental conditions

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

Table 1.7 Operating environment of the host machine (Windows® XP)

Item	Description
Host machine	IBM PC/AT compatible
OS	Windows® XP 32-bit edition [*1] [*3]
CPU	Pentium 4 running at 1.6 GHz or more recommended
Interface	USB 2.0 / USB 1.1 [*2]
Memory	1 Gbyte or larger (more than 10 times the file size of the load module) recommended
Pointing device such as mouse	Mouse or any other pointing device usable with the above OS that can be connected to the host machine
CD drive	Needed to install the emulator debugger or refer to the user's manual

Table 1.8 Operating environment of the host machine (Windows Vista® or Windows® 7)

Item	Description
Host machine	IBM PC/AT compatible
OS	Windows Vista® 32-bit edition [*1] [*4] Windows® 7 32-bit edition / 64-bit edition [*1]
CPU	Pentium 4 running at 3GHz or Core 2 Duo running at 1GHz or more recommended
Interface	USB 2.0 / USB 1.1 [*2]
Memory	2 Gbyte or larger (more than 10 times the file size of the load module) recommended (32-bit edition) 3 Gbyte or larger (more than 10 times the file size of the load module) recommended (64-bit edition)
Pointing device such as mouse	Mouse or any other pointing device usable with the above OS that can be connected to the host machine
CD drive	Needed to install the emulator debugger or refer to the user's manual

Notes:

*1: Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other company or product names are the property of their respective owners.

*2: Operation with all combinations of host machine, USB device and USB hub is not guaranteed for the USB interface.

*3: The 64-bit edition of Windows® XP is not supported.

*4: The 64-bit edition of Windows Vista® is not supported.

2. Setup

This chapter describes the preparation for using the MCU unit, the procedure for starting up the emulator and how to change settings.

2.1 Flowchart of Starting Up the Emulator

The procedure for starting up the emulator is shown in Figures 2.1 and 2.2. For details, refer to each section hereafter. If the emulator does not start up normally, refer to "6. Troubleshooting (Action in Case of an Error)".

1	Check the package components.	Refer to "1.1 Package Components" (page 16).
2	User registration	Refer to "User Registration" (page 14).
3	Install the included software, etc.	Install them from the included CD-ROM.
4	Connect the MCU unit to the E100 main unit.	Refer to "2.3 Connecting the MCU Unit to and Disconnecting it from the E100 Emulator Main Unit" (page 26).
5	Connect the host machine.	Connect the USB interface connector of the emulator and the USB port of the host machine.
6	Connect the emulator power supply.	Connect an emulator power supply to the power connector.
7	Turn on the power supply.	Turn ON the power to the emulator.
8	Check the LEDs on the emulator.	Check that the system status LEDs are lighting. When the user system is not connected, the POWER LED does not light up.
9	Try to use the emulator debugger according to the tutorial.	When using the emulator debugger for the first time, try to use the emulator functions, referring to "3. Tutorial" (page 38). If the emulator debugger does not start, follow steps 10 through 13 in this chart to perform a self-checking.
10	Create a project in the High-performance Embedded Workshop.	Start up the High-performance Embedded Workshop and create a project by following "4. Preparing to Debug" (page 69).
11	Start up the emulator debugger from the High-performance Embedded Workshop.	Start up the High-performance Embedded Workshop to launch the emulator debugger by following "4. Preparing to Debug" (page 69).
12	Set up the operating environment of the emulator debugger.	Make settings on the Device page in the Device Setting dialog box of the emulator debugger and select the "Start booting up on successful completion of self-checking" checkbox by following "4. Preparing to Debug" (page 69).
13	Self-checking	

Figure 2.1 Flowchart of starting up the emulator (for the first time)

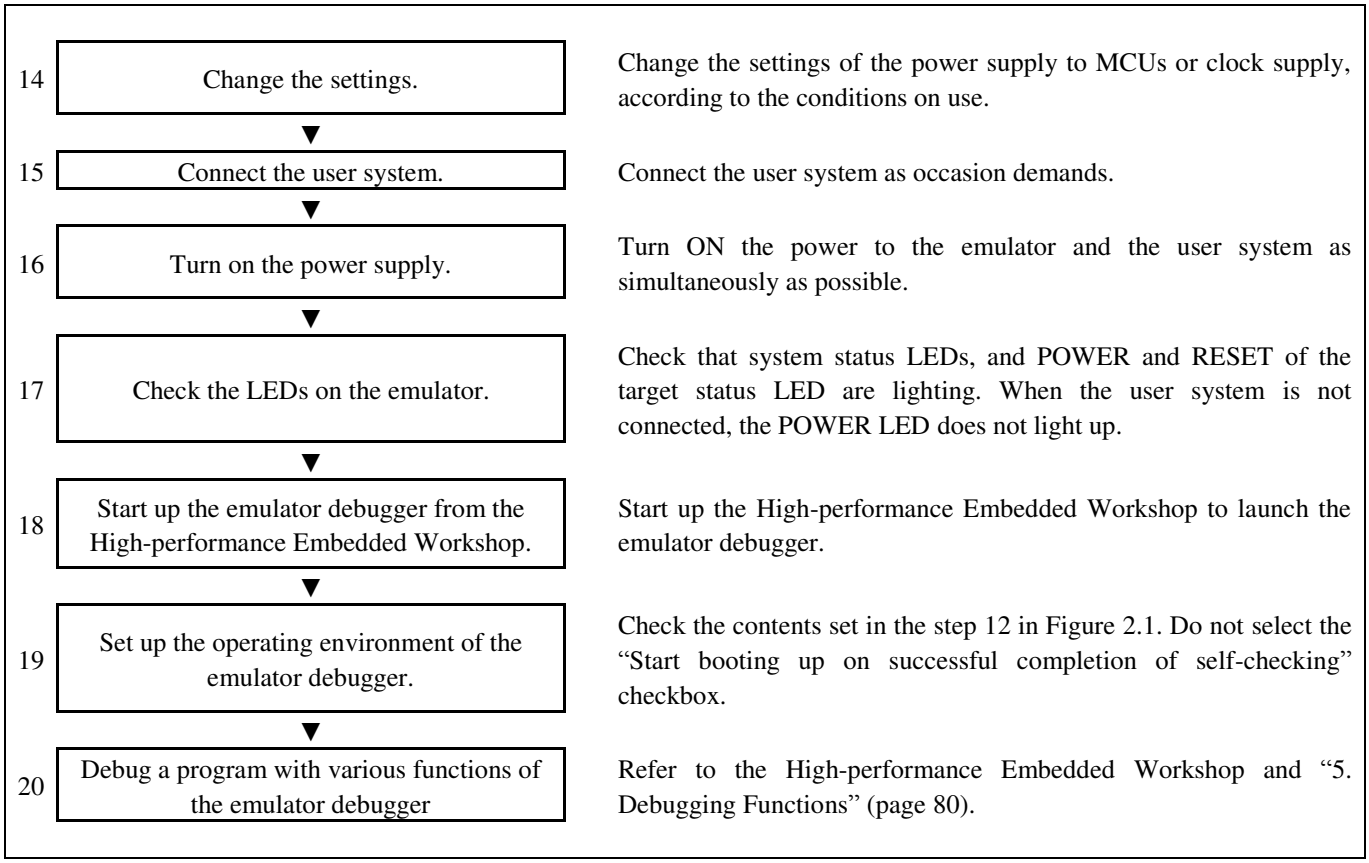

Figure 2.2 Flowchart of starting up the emulator (after the self-checking)

2.2 Installing the Included Software

If you have Windows® 7, Windows Vista® or Windows® XP on the host machine, this installation must be executed by a user with administrator rights. Note that users without administrator rights cannot complete the installation.

Place the CD-ROM in the CD-ROM drive and follow the instructions to install the software.