

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. 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.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. 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.
5. When exporting the 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. You should not use Renesas Electronics products or the 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. 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.
6. 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.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. 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 categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. 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 an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “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.
 - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
 - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. 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.
9. 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 system manufactured by you.
10. 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.
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.

38D5 Group

ROM Correction Function (Additional Write Using QZROM)

1. Abstract

The following article introduces and shows an example of how to use the ROM Correction Function (Additional Write Using QZROM) on the 38D5 Group device.

2. Introduction

The application explained in this document applies to the following MCU and parameter(s):

Applicable MCU: 38D5 Group

Unused ROM area: FFh

This sample program may include operations of unused bit functions for the convenience of the SFR bit layout. Set the values according to the operational conditions of the user system.

3. Contents

3.1 ROM Correction Function (Additional Write Using QZROM)

The program in the ROM can be partially corrected. Set the start address of the instruction to be corrected (Op code address of the start instruction) to the ROM correction address high-order register and low-order register. When executing the program, if the value of the program counter corresponds with the value set to the ROM correction address register, the program branches to the ROM correction vector. The correction program can be executed by setting the correction program to the correction vector. Use the JMP instruction (three-byte instruction) when returning from the correction program to the main program.

A maximum of two parts can be corrected and two vectors can be used as ROM correction vectors. In addition, the user can select the ROM correction vector in the RAM area or that in the ROM area at the ROM correction memory selection bit.

	RAM Area RC2 = 0	ROM Area RC2 = 1
Vector 1	0100h	F100h
Vector 2	0120h	F120h

The ROM correction function is controlled by the ROM correction address 1 enable bit and the ROM correction address 2 enable bit.

Figure 3.1 shows the Relevant Register Settings, and Figure 3.2 shows the ROM Correction Function Operation Example (ROM correction 1, RC2 = 1).

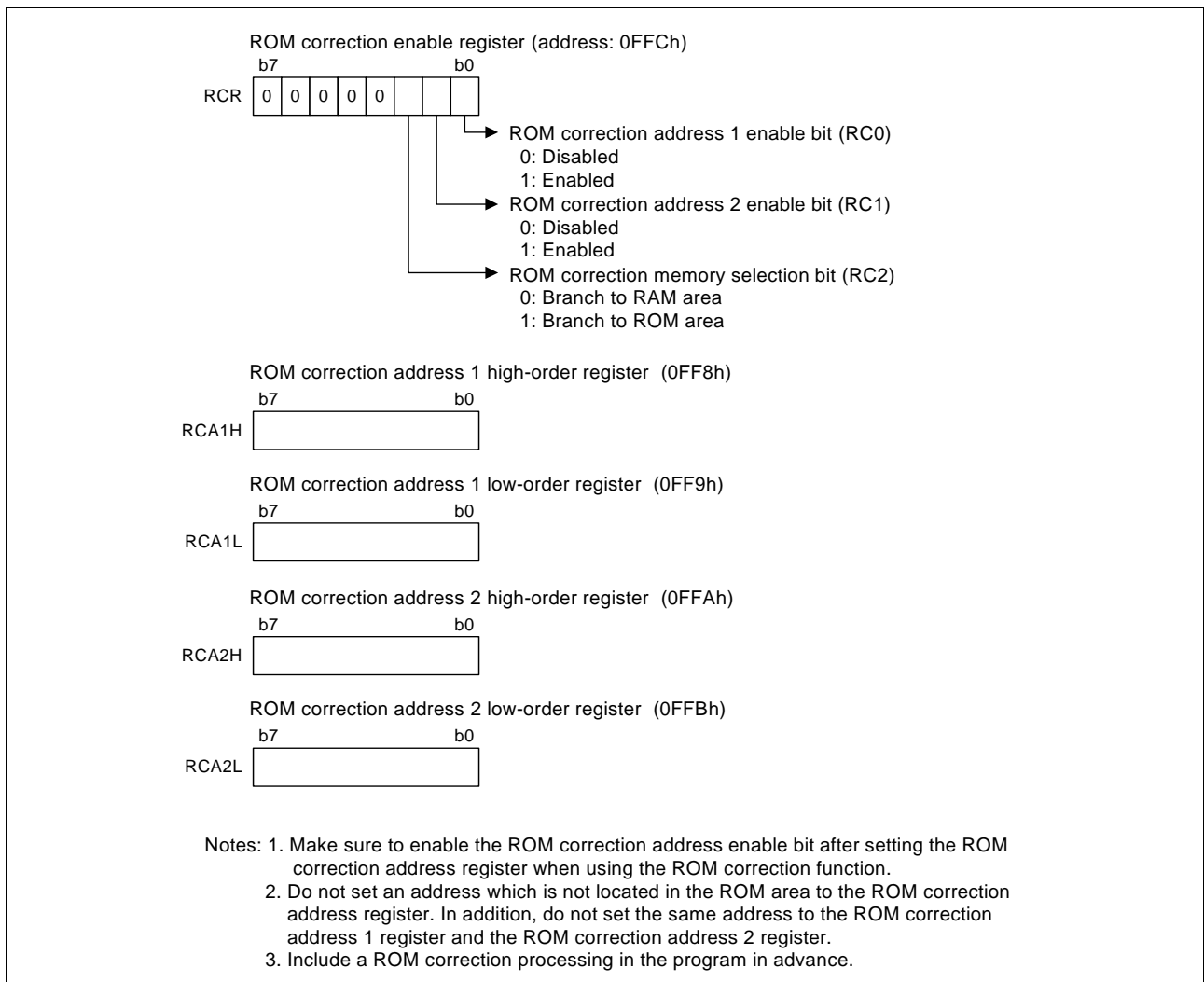


Figure 3.1 Relevant Register Settings

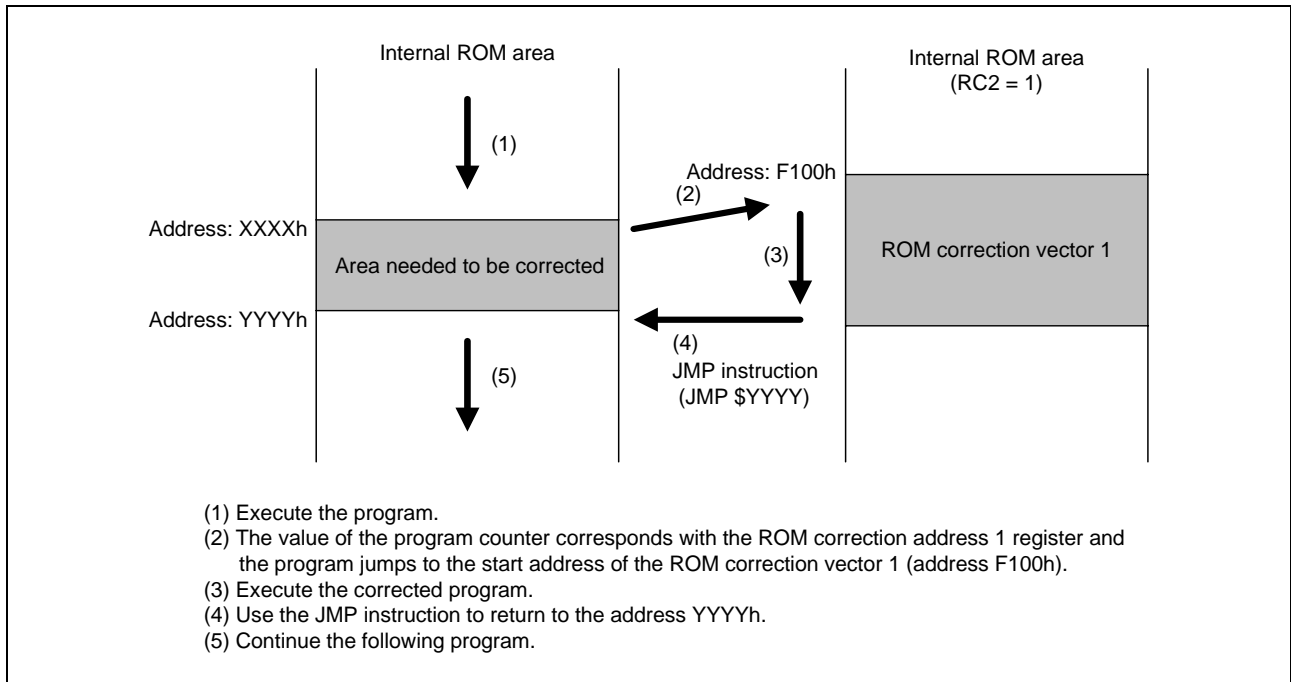


Figure 3.2 ROM Correction Function Operation Example (ROM correction 1, RC2 = 1)

3.2 Outline

The program cannot be rewritten, but additional data can be written to blank areas in the QzROM version. This application note indicates how to correct the program by writing the ROM correction program additionally to the QzROM.

In this application example, the start-up processing determines whether a ROM correction is necessary or not. When a ROM correction is necessary, the program used for the ROM correction function is set. No hardware like an external switch is required since the program determines the necessity of the ROM correction by data on the ROM area (additionally written area).

Refer to Chapter 4. Example of Program Development Procedure when developing a program.

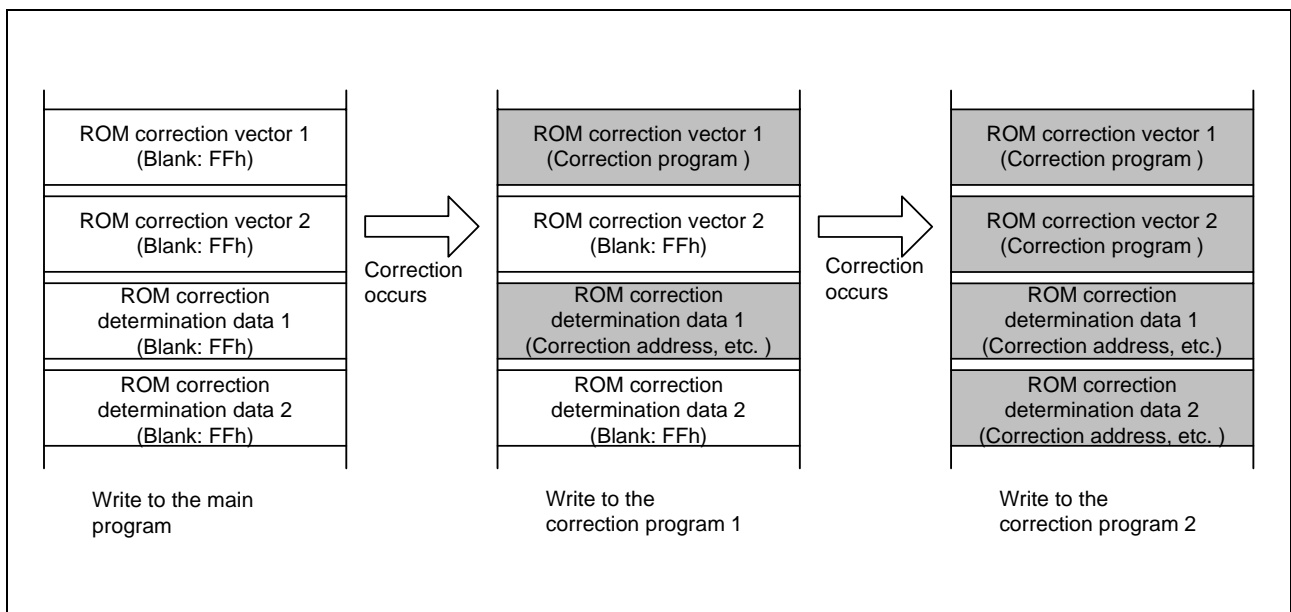


Figure 3.3 Correction Program Additional Write Example

3.3 Specifications

The ROM area is used for the ROM correction vector.

The JMP instruction is written to the ROM correction vector and the program jumps to the correction program in the other area to be prepared for a correction program over 32 bytes.

The ROM correction determination data 1, 2 are both 8 bytes (total 16 bytes), which consist of the identification code (ID code) 1, 2 (6 bytes each) and the ROM correction address data 1, 2 (2 bytes each). An additional 16 bytes are used aside from the ROM correction vector 1, 2. Set any characters or values to the ID code 1, 2. In addition, the size and location of the ROM correction determination data 1, 2 can be changed.

The ID code 1, 2 written to the specific address of the ROM area is determined by the start-up processing. When the ID code 1, 2 corresponds with the expected value, the start address of the program to be corrected is set from the ROM correction address data 1, 2 to the ROM correction address 1, 2 registers, and the ROM correction function is enabled. When the ID code 1, 2 does not correspond with the expected value, the MCU determines that the ROM correction program is not written or an unauthorized ROM correction program is written (an unauthorized user writes the correction program) and disables the ROM correction function so that the correction program is not executed.

Make sure to configure the start-up processing to the protect area 1.

The expected value is “M38D59” in this application example.

Figure 3.4 shows the ROM Map In Case of M38D59GF.

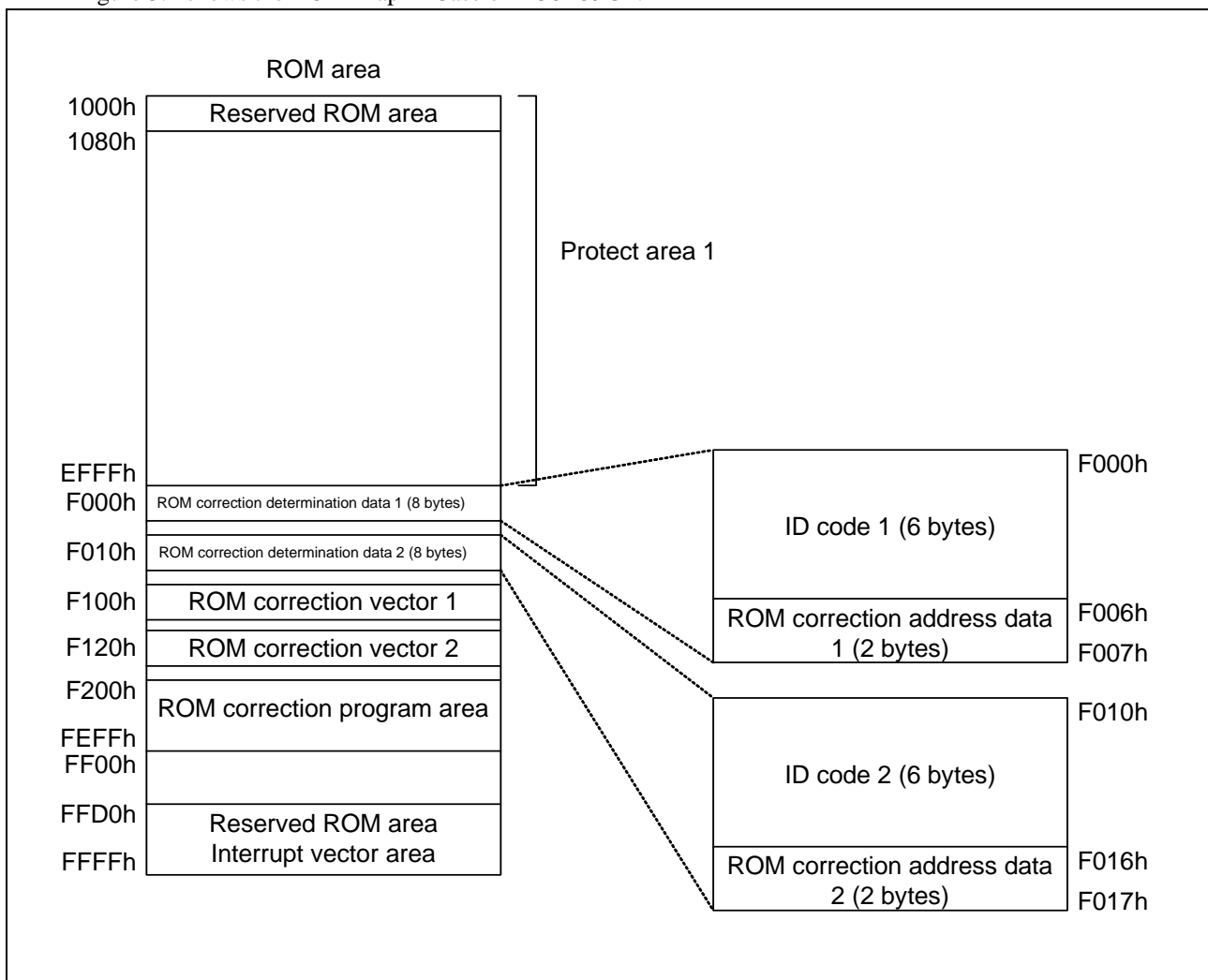


Figure 3.4 ROM Map In Case of M38D59GF

3.4 Control Procedure

Figure 3.5 shows the Control Procedure for Start-up Processing.

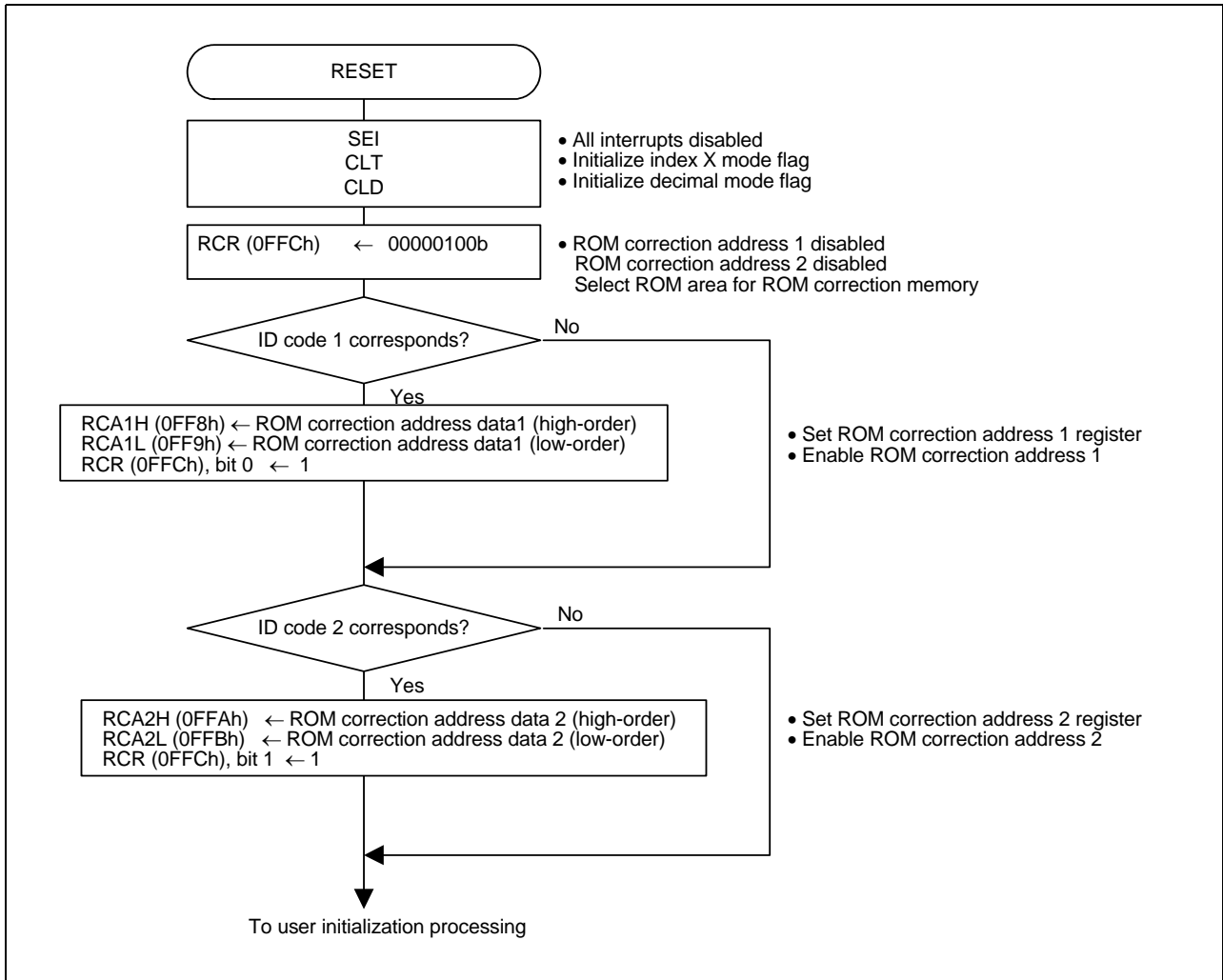


Figure 3.5 Control Procedure for Start-up Processing

4. Example of Program Development Procedure

This chapter explains the procedure for developing a program or executing the ROM correction.

Figure 4.1 shows the Development Procedure Example.

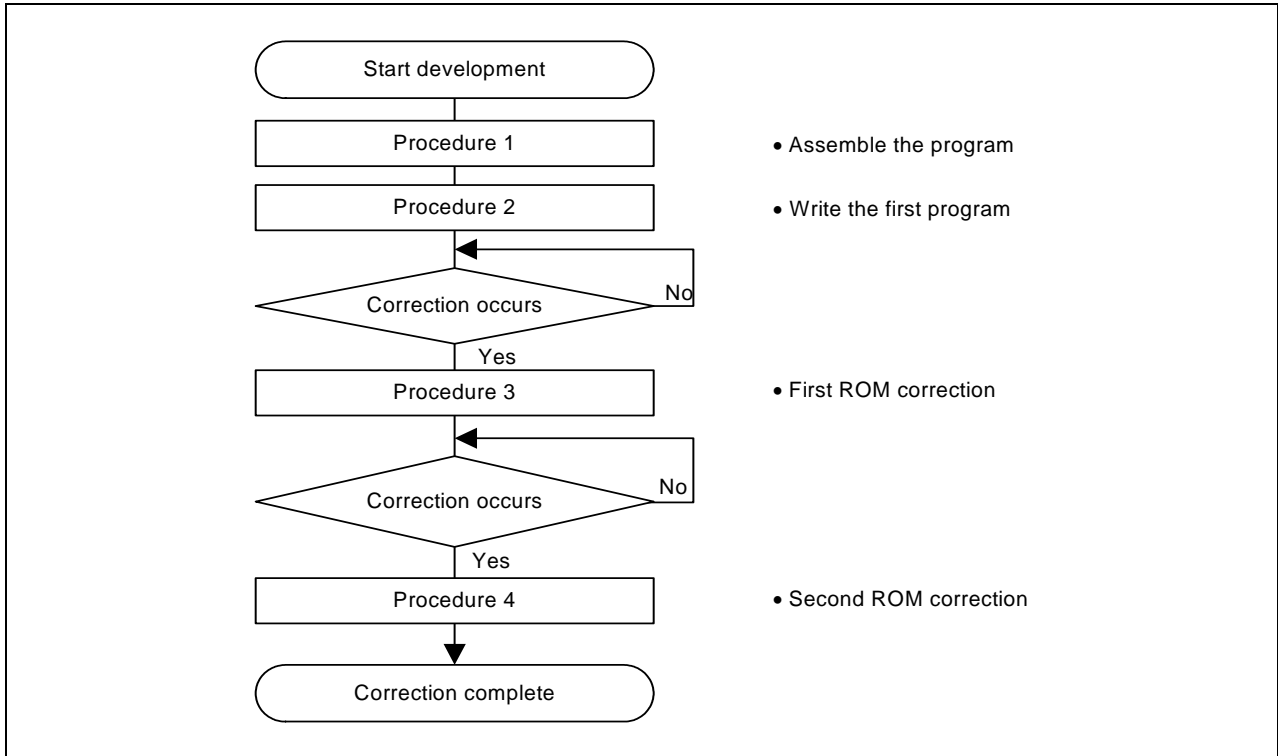


Figure 4.1 Development Procedure Example

Procedure 1:

Files necessary for this application example and files used for the user program are separated. The following three files are used in this application example. (Multiple files can be used for the user program).

- (1) Start-up processing file: startup.a74
- (2) Correction program file: correct.a74
- (3) User program processing file: user.a74

The link order in this application example is (1), (3) and (2).

Procedure 2:

Write the program to the QZROM area.
Protect the protect area 1.

Procedure 3:
Write the JMP instruction to branch to the start address of the correction address 1 into the ROM correction vector 1 in the program file for correction (correct.a74).

```
.section rom_corre_vector1
.org $F100
;
.blkb $20 ;area securing
```



Write JMP instruction to the correction program 1.

```
.section rom_corre_vector1
.org $F100
;
JMP RC_PROGRAM1 ;jump to ROM correction program 1
```

Write the ID code 1 and the ROM correction address data 1 into the ROM correction determination data 1 in the same file.

```
.section rom_corre_ID1
.org $F000
;
.blkb 6 ;area securing
;
.section rom_corre_addr1
.org $F006
;
.blkb 2 ;area securing
```



Write ROM correction determination data 1.

```
.section rom_corre_ID1
.org $F000
;
.byte 'M38D59' ;ID code 1
;
.section rom_corre_addr1
.org $F006
;
.word $C148 ;ROM correction address 1
```

Write the correction program 1 into the correction program area in the same file.

```
.section rom_corre_program
.org $F200
;
.blkb $FEFF-$F200+1 ;area securing
```



Write correction program 1.

```
.section rom_corre_program
.org $F200
;
RC_PROGRAM1: ;ROM correction program 1
    CLB 0,P1
    nop
    nop
    SEB 0,P1
    JMP $C14E
```

Assemble all the files.
Write the ROM correction vector 1, the ROM correction determination data 1 and the correction program area into the QzROM.

Procedure 4:

Write the JMP instruction to branch to the start address of the correction address 2 into the ROM correction vector 2 in the program file for correction (correct.a74).

```
.section rom_corre_vector2
.org $F120
;
.blkb $20 ;area securing
```



Write the JMP instruction to the correction program 2.

```
.section rom_corre_vector2
.org $F120
;
JMP RC_PROGRAM2 ;jump to ROM correction program 2
```

Write the ID code 2 and the ROM correction address data 2 into the ROM correction determination data 2 in the same file.

```
.section rom_corre_ID2
.org $F010
;
.blkb 6 ;area securing
;
.section rom_corre_addr2
.org $F016
;
.blkb 2 ;area securing
```



Write the ROM correction determination data 2.

```
.section rom_corre_ID2
.org $F010
;
.byte 'M38D59' ;ID code 2
;
.section rom_corre_addr2
.org $F016
;
.word $C14F ;ROM correction address 2
```

Additionally write the correction program 2 into the correction program area in the same file.

```
.section rom_corre_program
.org $F200
;
RC_PROGRAM1: ;ROM correction program 1
CLB 0,P1
;
SEB 0,P1
JMP $C14E
```



Additionally write the correction program 2.

```
.section rom_corre_program
.org $F200
;
RC_PROGRAM1: ;ROM correction program 1
CLB 0,P1
;
SEB 0,P1
JMP $C14E
;
RC_PROGRAM2: ;ROM correction program 2
CLB 1,P1
;
SEB 1,P1
JMP $C155
```

Assemble all the files.

Write the ROM correction vector 2, the ROM correction determination data 2 and the correction program area into the QZROM. Protect the whole area.

5. Sample Programming Code

Download a sample program from the Renesas Technology website.
To download, click “Application Notes” in the left side menu on the page of the 38D5 Group.

6. Reference Documents

Datasheet
38D5 Group Datasheet
Download the latest version from the Renesas Technology website.

Technical News/Technical Update
Download the latest information from the Renesas Technology website.

Website and Support

Renesas Technology website
<http://www.renesas.com>

Inquiries
<http://www.renesas.com/inquiry>
csc@renesas.com

REVISION HISTORY	38D5 Group ROM Correction Function (Additional Write Using QZROM)
------------------	---

Rev.	Date	Description	
		Page	Summary
1.00	Feb 23, 2007	-	First Edition issued

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein. The information described here may contain technical inaccuracies or typographical errors. Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors. Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination. Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.