

RX Family

Firmware Update Sample Program with Dual Bank Function, and Flash Module and SCI Module Firmware Integration Technology

Introduction

This application note describes updating the on-chip code flash memory using the dual bank function in the RX Family MCUs. Serial communication is used for application software control and data transfer.

Target Devices

RX651 Group and RX65N Group	ROM capacity: 1.5 MB to 2 MB
RX72M Group	ROM capacity: 2 MB to 4 MB

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Related Documents

RX Family Board Support Package Firmware Integration Technology Module (R01AN1685)

RX Family Flash Module Using Firmware Integration Technology (R01AN2184)

RX Family BYTEQ Module Using Firmware Integration Technology (R01AN1683)

RX Family CMT Module Using Firmware Integration Technology (R01AN1856)

RX Family SCI Multi-Mode Module Using Firmware Integration Technology (R01AN1815)



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1. Overview

1.1 About This Application Note

This application note describes the method to safely update the code flash memory using the dual bank function. The MCU is controlled from the host PC through serial communication to update the code flash memory. The MCU operates in single-chip mode and the Motorola S-record data is used as data for reprogramming. The XMODEM/SUM is used as the data transfer protocol. Therefore, the serial communication software on the host PC must be capable of XMODEM/SUM transfer.

This application note is accompanied by two versions of the sample program, one for RX65N Group and RX651 Group MCUs with 2 MB of ROM, and one for RX72M Group MCUs with 4 MB of ROM. To use a different device, refer to 6.2.1, Q: How do I change the device?

Table 1.1 lists the peripheral functions used and their applications and Figure 1.1 shows the operation overview.

Table 1.1	Peripheral Functions Used and Their Applications	;
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Peripheral Function	Application
Flash memory	Reprogramming the code flash memory
Serial communication interface	Asynchronous serial communication with the host PC
Compare match timer	Timer for checking serial communication timeout

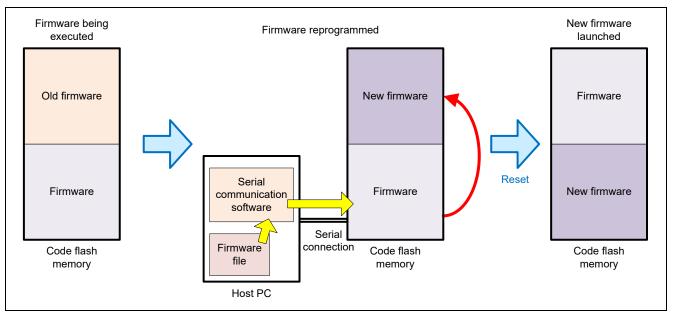


Figure 1.1 Operation Overview



1.2 Operation Confirmation Environment

The operation of the sample program in this application note has been confirmed under the following conditions.

Table 1.2 Operation Confirmation Conditions	Table 1.2	Operation	Confirmation	Conditions
---	-----------	-----------	--------------	------------

Item	Contents	
MCU used	R5F565NEDDFC (RX65N Group)	
Operating frequency	Main clock: 24 MHz	
	PLL: 240 MHz (main clock ×1/1 ×10)	
	System clock (ICLK): 120 MHz (PLL ×1/2)	
	Flash interface clock (FCLK): 60 MHz (PLL ×1/4)	
Operating voltage	3.3 V	
Integrated development	Renesas Electronics	
environment	e ² studio Version 7.5.0	
C compiler	Renesas Electronics	
	C/C++ Compiler Package for RX Family V.3.01.00	
	Compiler option	
	-lang = c99	
iodefine.h version	Version 2.3	
Endian	Little endian, big endian* ¹	
Operating mode	Single-chip mode	
Processor mode	Supervisor mode	
Sample program version	Version 1.20	
Flash programmer	Renesas Flash Programmer V3.06.00	
Board used	Renesas Starter Kit+ for RX65N-2MB (product No.: RTK50565N2C01001BR) (hereinafter referred to as RSK+RX65N-2MB)	

ltem	Contents	
MCU used	R5F572MNDDBD (RX72M Group)	
Operating frequency	Main clock: 24 MHz	
	PLL: 240 MHz (main clock ×1/1 ×10)	
	System clock (ICLK): 240 MHz (PLL ×1/1)	
	Flash interface clock (FCLK): 60 MHz (PLL ×1/4)	
Operating voltage	3.3 V	
Integrated development	Renesas Electronics	
environment	e ² studio Version 7.5.0	
C compiler	Renesas Electronics	
	C/C++ Compiler Package for RX Family V.3.01.00	
	Compiler option	
	-lang = c99	
iodefine.h version	Version 1.0C	
Endian	Little endian, big endian*1	
Operating mode	Single-chip mode	
Processor mode	Supervisor mode	
Sample program version	Version 1.20	
Flash programmer	Renesas Flash Programmer V3.06.00	
Board used	Renesas Starter Kit+ for RX72M (product No.: RTK5572MNDC00000BJ) (hereinafter referred to as RSK+RX72M)	

Note: 1. The endianness used in the sample program is little endian. To change the endianness to big endian, refer to 6.2.2, Q: How can I change the endianness to big endian?.



1.3 Module Configuration

Figure 1.2 shows the module configuration of the dual bank firmware update SCI project and Table 1.3 lists the FIT modules implemented in the project.

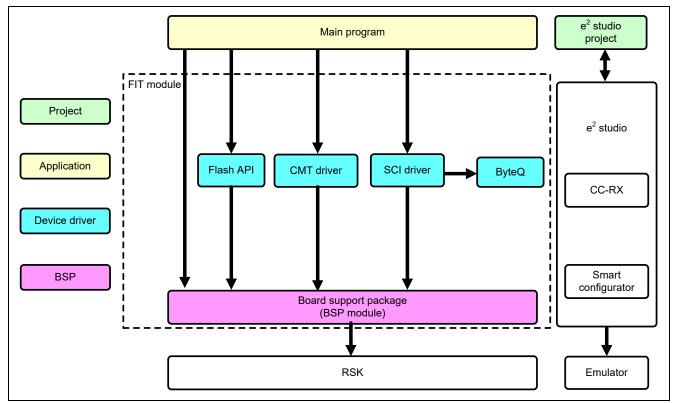


Figure 1.2 Module Configuration

Table 1.3 Module List

Category	Application Note (Document No.)	FIT Module Name	Rev.
BSP	RX Family Board Support Package Firmware Integration Technology Module (R01AN1685)	r_bsp	5.2
Device driver	RX Family BYTEQ Module Using Firmware Integration Technology (R01AN1683)	r_byteq	1.60
	RX Family CMT Module Using Firmware Integration Technology (R01AN1856)	r_cmt_rx	3.20
	RX Family Flash Module Using Firmware Integration Technology (R01AN2184)	r_flash_rx	4.20
	RX Family SCI Multi-Mode Module Using Firmware Integration Technology (R01AN1815)	r_sci_rx	2.0
Application	Main program	—	1.20



1.4 File Structure

Figure 1.3 shows the file structure of this application note.

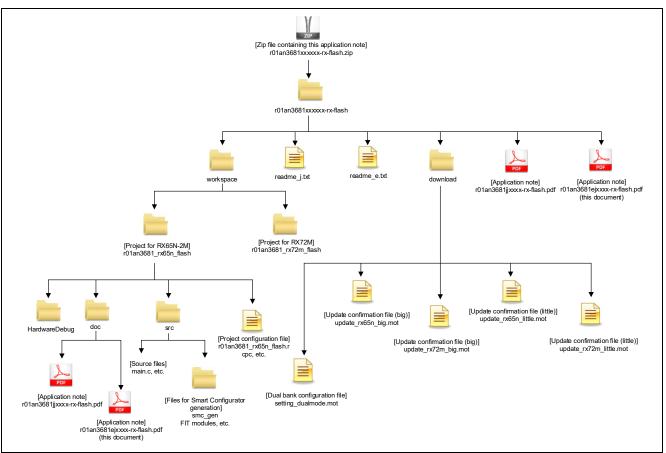


Figure 1.3 File Structure

When the ZIP file provided by this application note is unzipped, the folder is created with the same name as the ZIP, containing associated folders and files.

The "r01an3681_rx65n_flash" and "r01an3681_rx72m_flash" folders contain the project files for building the sample program described in this application note. The operation of the sample program can be confirmed by importing the appropriate project into the workspace of e² studio.



1.5 Project

This application note includes the e^2 studio project for building and evaluating the sample program. The project has the build configuration and the debug configuration which store the build setting and the debug setting, respectively.

Table 1.4 lists the build configuration and the debug configuration that are registered in the project.

Table 1.4 Project Configuration

Configuration Example		Description	
Build configuration	HardwareDebug (Debug on hardware)	Configuration to generate a load module with debug information	
	Release (Release - No Debug)	Configuration for release without debug information	
Debug configuration	r01an3681_rx65n_flash HardwareDebug	Performs hardware debugging via E2 emulator Lite using the load module	
	r01an3681_rx72m_flash HardwareDebug	generated with HardwareDebug (Debug on hardware).	

The following table lists target specific settings.

Table 1.5 Target Specific Settings

Item	Setting
Toolchain version	V3.01.00
Debug hardware	E2 emulator Lite
Endianness	Little-endian data
Target selection	R5F565NEDxFC_DUAL
	R5F572MNDxBD_DUAL
Renesas RTOS support	None



2. Obtaining the Development Environment

2.1 e² studio

Visit the following URL and download the e² studio.

https://www.renesas.com/en-us/products/software-tools/tools/ide/e2studio.html

This document assumes that V7.5.0 or later version of e^2 studio is used. If a version earlier than V7.5.0 is used, some features of e^2 studio may not be supported. Make sure to download the latest version of e^2 studio on the website.

2.2 Compiler Package

Visit the following URL and download the RX Family C/C++ compiler package.

https://www.renesas.com/en-us/products/software-tools/tools/compiler-assembler/compiler-package-for-rx-family.html

2.3 Renesas Flash Programmer

Visit the following URL and download the Renesas flash programmer.

https://www.renesas.com/en-us/products/software-tools/tools/programmer/renesas-flash-programmer-programming-gui.html

2.4 RSK USB Serial Driver

Visit the following URL and download the RSK USB serial driver.

Refer to the RSK user's manual for details on the installation.

https://www.renesas.com/en-us/software/D6000699.html



3. Importing the Project

This section describes the procedure to import the project, for building the sample program, into the e^2 studio.

3.1 Creating a Workspace

- 1. Start the e² studio. The dialog to select a workspace opens. If the dialog does not open, select "File" >> "Switch workspace" >> "Others".
- 2. Enter a workspace and click the "Launch" button. If the specified folder is not currently a workspace, then a new workspace is created.

e ² Eclipse Launcher	×
Select a directory as workspace e ² studio uses the workspace directory to store its pref	ferences and development artifacts.
Workspace: C:\workspace	Browse Enter a workspace folder.
 Use this as the default and do not ask again Recent Workspaces 	Click the "Launch" button.
	Launch Cancel



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3. If the workspace is new, the Welcome dialog opens. Click "Workbench".

e ² wo	rkspace - e² studio				- 🗆 X
	dit Source Refacto 🕃 Welcome 🔀	r Navigate Search Project Renesas Views Run Window	Help		🟠 (
	RENESAS	Welcome to e ² studio			Workbench
	0	Create a new C/C++ project Create a new e ² studio C/C++ project		Click "Workbench". Over view Get an overview of the features	
	*	Import existing projects Import existing e ² studio projects from the filesystem or archive	P	Tutorials Go through tutorials	
	•	Review IDE configuration settings Review the IDE's most fiercely contested preferences	*	Samples Try out the samples	
	Ľ	Open an existing file Open a file from the filesystem		What's New Find out what is new	
					☑ Always show Welcome at start up
				1	<u>الم</u>

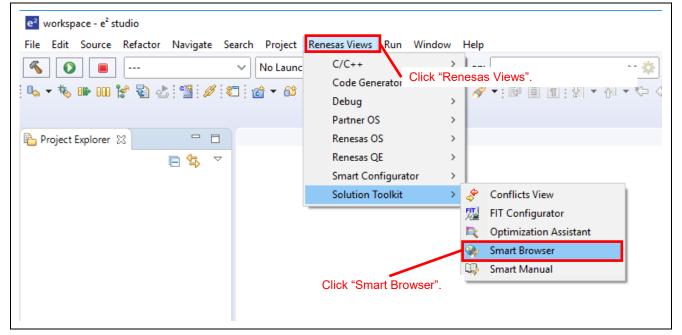


3.2 Importing from the Smart Browser

This section describes the procedure to import the project using the Smart Browser in the e² studio.

3.2.1 Importing a Project

- 1. Click the "Smart Browser" tab to switch to it.
- 2. If the "Smart Browser" tab is not displayed, click "Renesas Views" on the main menu bar. Then select "Solution Toolkit" >> "Smart Browser" from the menu that appears.

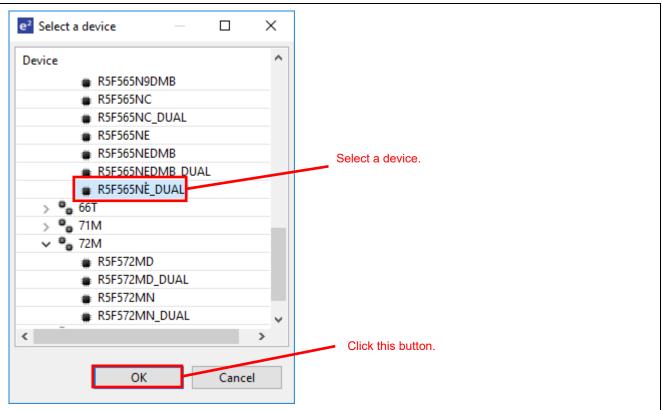


- 3. Click the "Application Note" tab to switch to it.
- 4. Click the "Select device" button.

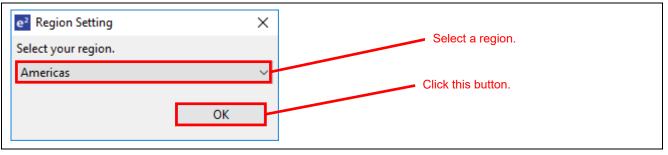
🛛 Problems 🧳 Device: -	🖥 Tasks 📃 Co	nsole 🔲 Properti	es 📱 Stack Ana Click "Sma	Call Hie			» 🔁 🍇 🔌	□ □ ✓ ▽
Context Help	User's Manual	Technical Update	Application Notes	Tool News	Notifications		_	
					Click the	e "Select de	evice" button.	
Title C	lick "Applicatio	on Note".			Document	Rev.	Issue Date	San



- 5. The "Select a device" dialog box is displayed. Select the device you wish to use.
- 6. Click the "OK" button.



- 7. If the Smart Browser is being opened for the first time, the "Region Setting" dialog box is displayed.
- 8. Select the region where you are located.
- 9. Click the "OK" button.





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- 10. After a few moments, a list of application notes is displayed.
- 11. Click the "Filter" button.

	0	송 🗳 ই	🖗 🍇 🔂 🙀	 Image: A second s
vice: R5F565NE(RX65N) Last u	pdated: 2019/08/0)8 at 10:48:52	JST	
Context Help User's Manual Technical Update Application Notes Tool Ne	ws Notifications			
163 matches	Click the '	'Filter" butto	on.	
Title	Document	Rev.	Issue Date	: ^
NE RX Family RX Driver Package Ver.1.20	R01AN479	Rev.1.20	2019/07/16	
NE RX Family, H8S Family Points of Difference between HCAN (H8S Family	R01AN466	Rev.1.00	2019/06/28	
UPD4 Renesas e2 studio Smart Configurator Application Examples: CMT, A/D,	R20AN046	Rev.1.20	2019/06/20	
UPD4 RX Family Using the Trusted Memory Function	R01AN261	Rev.2.00	2019/06/19	
UFD4 RX Family USB Basic Host and Peripheral Driver using Firmware Integrat	R01AN202	Rev.1.26	2019/05/31	
IPM BY Eamily HSP Derinheral Communications Device Class Driver (DCDC)	D01AN1202	Dev 1 26	2010/05/21	~

12. Enter "Flash" as a keyword under Document Title.

13. Click the "OK" button.

e ² Filter	×
General Details Document Title Keyword: Flash	rd
Document No. Start with:	
Subcategory of Document .	Issue Date
Compiler Device IDE Middleware Real-time OS	Click the "OK" button.
	Deselect All OK Cancel



14. Select this application note, and right-click on it.

mat	ches (filt	ering)							
	Title	_				Document No.	Rev.	Issue Date	Samp ^
	RX Family Internal Flash ROM rewrite program via USB CDC			1	R01AN3294EJ0104	Rev.1.04	2019/04/16	availa	
	RX Family Internal Flash ROM rewrite program via USB Mass Storage			orage	R01AN3503EJ0103	Rev.1.03	2019/04/16	availa	
	RX Family Flash Memory Data Management Module Using Firmware			nware	R20AN0507EJ0201	Rev.2.01	2019/02/01	availa	
	RX Fam	nily Firmware Up	date Sample Progra	m with Dual Bank Fu	unctio	R01AN3681EJ0110	Rev.1.10	2017/12/18	availa
	RX65N	Group, RX651Gr	oup Differences Bet	ween Products with	1 Mby	R01AN3866EJ0100	Rev.1.00	2017/09/25	
<									>

15. On the context menu, click "Sample Code (import project)".

Sample Code (download)	Click here.
Sample Code (import projects)	
Property	

- 16. A file save dialog box appears. Select the save location and click the "Save" button.
- 17. If your computer is not authenticated with My Renesas, the "My Renesas" dialog box appears before the file download occurs. Enter the email address and password you have registered on the Renesas website.
- 18. Click the "OK" button.

e My Renesas	×
My Renesas	
Enter the e-mail address and password that you used to register for My R They allow you to download documents and software by using Smarter Enter your email address.	
Email Address:	
Create a My Renesas account to use our tool download stories, receive Neurolater / Hodate Motice, and take advantage of our other services. Click [About My Renesas] to register it. Enter your password.	
	Click the "OK" button.
	About My Renesas OK Cancel



19. To accept the terms of the disclaimer, click the "Agree" button.

e ² End User License Agreement (Sample Code)	×
END USER LICENSE AGREEMENT	^
This End User License Agreement (this "EULA") is between you, on behalf of yourself and the company or other entity on whose behalf you are acting (together, "you" and "your") and Renesas Electronics Corporation, a Japanese corporation, with a principal place of business at 6-2 Otemachi 2-chome, Chiyoda-Ku, Tokyo, Japan ("Renesas") and is effective from the date on which you click "I AGREE." In consideration of the mutual promises and covenants herein, you and Renesas hereby agree as follows:	l
 Definitions. 1.1. "Open Source Code" means certain free or open source software and other components incorporated into or bundled with the Software which is subject to the Open Source Terms. 1.2. "Open Source Terms" means the terms and conditions that are applicable to a given piece of Open Source Code. 1.3. "Software" means, collectively, the software in source code, binary or library form, including all contents thereof, downloaded by you in connection with this EULA, including all upgl Click the "Agree" button. provided to you, if any, and all derivative works of software ("Derivatives"), and any matchesis, related to the Software made available by Agree Disagree 	~

- 20. The "Import" dialog box appears. Select either "r01an3681_rx65n_flash" or "r01an3681_rx72m_flash", displayed under "Projects:", whichever matches your device.
- 21. Click the "Finish" button.

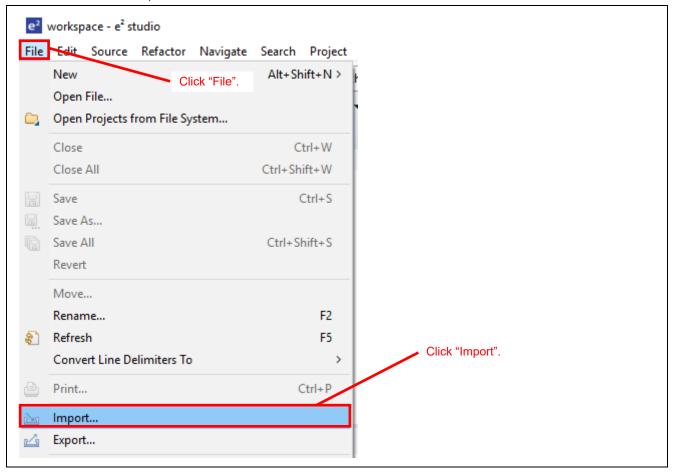


3.3 Importing from the Zip File

The project can be imported from the accompanying zip file of this application note.

3.3.1 Importing the Project into the Workspace

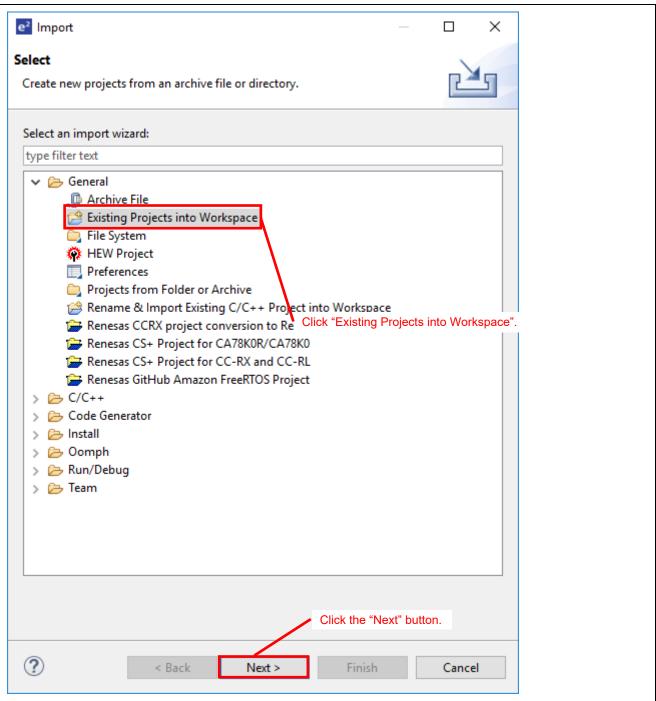
1. Select "File" >> "Import".





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- 2. Select "Existing Projects into Workspace" under "General".
- 3. Click the "Next" button.





- 4. Enter the accompanying zip file of this application note in the combo box for the "Select archive file" section.
- 5. Select either "r01an3681_rx65n_flash" or "r01an3681_rx72m_flash", displayed under "Projects:", whichever matches your device.
- 6. Click the "Finish" button.

e ² Import	— 🗆 X
Import Projects Select a directory to search for existing Eclipse projects.	
O Select root directory:	note.
Select archive file: C:\r01an3681xx0120-rx-flash.zip	✓ Browse
Projects:	
✓ r01an3681_rx65n_flash (r01an3681xx0120-rx-flash/workspace) ✓ r01an3681_rx72m_flash (r01an3681xx0120-rx-flash/workspace)	
	Deselect All
Select the project that matches your device.	Refresh
 Options Search for nested projects Copy projects into workspace Hide projects that already exist in the workspace 	>
Working sets	
Add project to working sets	New
Working sets:	✓ Select
	Click the "Finish" button.
? < Back Next > Finish	Cancel



3.4 Changed Setting Information

In the project of the sample program, changes have been made to the software component configuration and "C/C++ Build" settings. Also, pin settings are performed. The details are described below.

The information provided in this section can be referred when setting up a new project. When using the imported project, go to 4, Operation Confirmation.

3.4.1 Changes to Software Component Configuration

(1) Changes to BSP Configuration

[src/smc_gen/r_config/r_bsp_config.h]

Startup >> Generic >> r_bsp

Change the bank mode to "Dual mode".

oftware component conf	iguration	0
omponen $\downarrow^a_Z \models \oplus \Rightarrow \checkmark$	Configure	
ت ت	Property	Value
ype filter text	# ID code 4	0xFFFFFFF
	# ROM Cache Enable Register	Disabled
V 🗁 Startup 🔨	# TMEF - TM Enable Flag Register	0xFFFFFFF
V 🔁 Generic	# FAW - Flash Access Window Setting Register	0xFFFFFFF
💣 r_bsp	# ROMCODE - ROM Code Protection Register	0xFFFFFFF
✓	# Select the bank mode	Dual mode
V 🔁 Memory	# Select the startup bank	Bank 1: FFE00000h~FFEFFFFh; Bank 0: FFF
 r_flash_rx Communications 	<	
🗣 r_sci_rx	Macro definition: BSP_CFG_CODE_FLASH_BANK_MODE	~
🗸 🗁 Timers	0 = Dual mode.	
💕 r_cmt_rx 🗸 🗸	1 = Linear mode.	~



(2) Changes to Flash API Configuration

The following Flash API configuration are changed.

[src/smc_gen/r_config/r_flash_rx_config.h]

Drivers >> Memory >> r_flash_rx

The following change is made to allow the Flash API to program the code flash memory.

oftware component con		<u>e</u>
componen 🎼 🔁 🕂 🐳 🔻	Configure	
type filter text ✓ → Startup ✓ → Generic → r_bsp ✓ → Drivers ✓ → Memory ↔ r_flash_rx	Property Configurations Praameter check Parameter check Enable code flash programming Enable BGO/Non-blocking data flash operations Enable BGO/Non-blocking code flash operations Enable code flash self-programming	
✓ Communications ✓ Communications ✓ r_sci_rx ✓ Commens	Macro definition: FLASH_CFG_CODE_FLASH_ENABLE If you are only using data flash, set this to 0.	>
r_cmt_rx	Setting to 1 includes code to program the ROM area.	

The following change allows the program to be run from the ROM.

· · ·		
 \$	Configurations	
	# Parameter check	Enable parameter checks
	# Enable code flash programming	Includes code to program ROM area
	# Enable BGO/Non-blocking data flash operations	Forces data flash API function to block until c
	# Enable BGO/Non-blocking code flash operations	Forces ROM API function to block until comp
	# Enable code flash self-programming	Programming code flash while executing from
<		>
	definition: FLASH_CFG_CODE_FLASH_RUN_FROM_RC to 0 when programming code flash while executing in	
Set this		



(3) Changes to SCI API Configuration

[src/smc_gen/r_config/r_sci_rx_config.h]

Drivers >> Communication >> r_sci_rx

The SCI channel is changed to enable use of the USB serial port of the RSK+. Change the configuration for channel 1 to "Not".

oftware component confi	guration	۵
$Componen \stackrel{a}{\underset{Z}{\circ}} \models \textcircled{+} \stackrel{\bullet}{\Rightarrow} \bullet \bullet$	Configure	
👟 🐱	Property Value	^
type filter text	# Include software support for channel 0 Not	
7	# Include software support for channel 1 Not	
V 🗁 Startup	# Include software support for channel 2 Not	
V 🗁 Generic	# Include software support for channel 3 Not	
💣 r_bsp	# Include software support for channel 4 Not	
🗸 🗁 Drivers	# Include software support for channel 5 Not	~
✓ ➢ Memory Image: Provide the second sec	<	>
Communications	Macro definition: SCI_CFG_CH1_INCLUDED SPECIFY CHANNELS TO INCLUDE SOFTWARE SUPPORT FOR 1=included, 0=not NOTE: If using ASYNC mode, adjust BYTEQ_CFG_MAX_CTRL_BLKS in r_byteq_config.h to prov	ide 2
✓ 🗁 Timers ♥ r_cmt_rx v	queues per channel (static mode only). - * = port connector RDKRX63N, RSKRX210, RSKRX11x	~

On the RX65N, change the configuration for channel 8 to "Include".

te 🔁 🔁	Property Value	^
type filter text	# Include software support for channel 6 Not	
77	# Include software support for channel 7 Not	
✓ ➢ Startup ∧	# Include software support for channel 8 Include	
V 🗁 Generic	# Include software support for channel 9 Not	
💣 r_bsp	# Include software support for channel 10 Not	
 Drivers 	# Include software support for channel 11 Not	~
✓ → Memory	<	>
 r_flash_rx Communications r_sci_rx Timers 	Macro definition: SCI_CFG_CH8_INCLUDED SPECIFY CHANNELS TO INCLUDE SOFTWARE SUPPORT FOR 1=included, 0=not NOTE: If using ASYNC mode, adjust BYTEQ_CFG_MAX_CTRL_BLKS in r_byteq_config.h to provide 2 queues per channel (static mode only).	2
r_cmt_rx	- * = port connector RDKRX63N, RSKRX210, RSKRX11x	~

On the RX72M, change the configuration for channel 6 to "Include".

🔪 🐨	Property	Value	^
pe filter text	# Include software support for channel 5	Not	
	# Include software support for channel 6	Include	
➢ Startup	# Include software support for channel 7	Not	
Drivers	# Include software support for channel 8	Not	
V 🗁 Memory	# Include software support for channel 9	Not	
r_flash_rx	# Include software support for channel 10	Not	
Communications	# Include software support for channel 11	Not	
🔮 r_sci_rx	# Include software support for channel 12	Not	
V 🗁 Timers	# ASYNC mode TX queue buffer size for channel 0	80	



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Change the transmit end interrupt configuration to "Enable".

te 🔁	Property Value	^
type filter text	# ASYNC mode RX queue buffer size for channel 1(80	
21	# ASYNC mode RX queue buffer size for channel 11 80	
✓	# ASYNC mode RX queue buffer size for channel 12 80	
🗸 🗁 Generic	# Transmit end interrupt Enable	
💣 r_bsp	# GROUP12 (Receive error) interrupt priority 3	
✓ → Drivers	# GROUPBL0 (ERI, TEI) interrupt priority 3	~
V 🗁 Memory	<	>
 Pr_flash_rx ✓ ⇐ Communications Pr_sci_rx 	Macro definition: SCI_CFG_TEI_INCLUDED ENABLE TRANSMIT END INTERRUPT (ASYNCHRONOUS)	^
✓ Cimers	This interrupt only occurs when the last bit of the last byte of data has been sent and the transmitte become idle. The interrupt calls the user's callback function specified in R_SCI_Open() and passes it SCI_EVT_TEI event. A typical use of this feature is to disable an external transceiver to save power. It	an

On the RX65N, change the settings for RXD8 and TXD8 under Resources to "Use".

$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Configure		
ت ت	Property	Value	^
ype filter text	✓		
	V 📵 SCI		
🗸 🔁 Startup	> 🗉 SCI0		
🗸 🔁 Generic	> 🗉 SCI1		
💣 r_bsp	> 🗄 SCI2		
✓	> 😳 SCI3		
V 🗁 Memory	> 😨 SCI4		
💱 r_flash_rx	> 😨 SCI5		
 Communications 	> 5 SCI6		
💱 r_sci_rx	> 😨 SCI7		
🗸 🗁 Timers	✓ □ SCI8		
💱 r_cmt_rx	SCK8 Pin	Unused	
🗸 🗁 Middleware	RXD8/SMISO8/SSCL8 Pin	Vsed	
🗸 🗁 Generic	TXD8/SMOSI8/SSDA8 Pin	Used	
💱 r_byteq	CTS8#/RTS8#/SS8# Pin	Unused	
	<		>

On the RX72M, change the configuration for RXD6 and TXD6 under Resources to "Use".



oftware component co	onfiguration		🕲 🔮
com ↓ª □ □ ➡ ➡ ▼	Configure		
ت ن	Property	Value	^
type filter text	✓		
type mer text	V 🔲 SCI		
🗸 🗁 Startup	SCI0		
🗸 🗁 Generic	> 🕄 SCI1		
😵 r_bsp	> 🕄 SCI2		
✓	> E SCI3		
🗸 🗁 Memory	> 🕄 SCI4		
😜 r_flash_rx	> 🖬 SCI5		
🗸 🗁 Communicatior	✓ Ⅲ SCI6	7	
😵 r_sci_rx	SCK6 Pin	Unused	
🗸 🗁 Timers	RXD6/SMISO6 Pin	Used	
🔮 r_cmt_rx	TXD6/SMOSI6 Pin	Used	
🗸 🗁 Middleware	CTS6#/RTS6#/SS6# Pin	Unused	
✓ Generic	 ✓ Erssa, Krissa, Ssa, Fill ✓ Erssa, Krissa, Ssa, Fill 		~



3.4.2 Pin Configuration

Click the "Pins" tab to display the "Pin configuration" screen.

On the RX65N, the pins assigned to RXD8 and TXD8 are specified. When RXD8 and TXD8 are set to "Use" under Resources, the corresponding boxes are checked automatically.

rdware Resour 🔃 📄 🛱 👪	Pin Function	n	<u>र</u> ।	- 🖪 🔤 🗹
ype filter text	I		AI	
Serial communications ir A	Enabled	Function	Assignment	Pin Number
SCI0		CTS8#	Not assigned	Not assigned
SCI1		RTS8#	Not assigned	Not assigned
SCI2	\checkmark	RXD8	PJ1/MTIOC6A/RXD8/SMISO8/SSCL8/SSLC2-B/LCD	/ 59
SCI3		SCK8	Not assigned	Not assigned
		SMISO8	Not assigned	Not assigned
 SCI5 SCI6 		SMOSI8	Not assigned	Not assigned
SCI7		SS8#	Not assigned	Not assigned
		SSCL8	Not assigned	Not assigned
SCI8		SSDA8	Not assigned	Not assigned
SCI9	\checkmark	TXD8	PJ2/TXD8/SMOSI8/SSDA8/SSLC3-B/LCD_TCON2-A	/ 58
> >	<			>

On the RX72M, the pins assigned to RXD6 and TXD6 are specified. When RXD6 and TXD6 are set to "Use" under Resources, the corresponding boxes are checked automatically.

lardware 🕀 🖻	↓a₂ 🚠	Pin Function	n	것 💷 📖	èn e
Type filter text		type filter t	text	All	~
 SCI1 SCI2 	^	Enabled	Function	Assignment	Pin Nu
SCI2			CTS6#	Not assigned	/ Not
SCI4			RTS6#	Not assigned	Not
		\checkmark	RXD6	P01/TMCI0/RXD6/SMISO6/SSCL6/SSIBCK0/	/ D5
SCI6			SCK6	Not assigned	/ Not
SCI7			SMISO6	Not assigned	/ Not
			SMOSI6	Not assigned	/ Not
SCI9			SS6#	Not assigned	/ Not
			SSCL6	Not assigned	/ Not
SCI10			SSDA6	Not assigned	/ Not
SCI12			TXD6	P00/TMRI0/TXD6/SMOSI6/SSDA6/AUDIO_C	/ E3



3.4.3 Changes to "C/C++ Build" Settings

The default build-time settings in the project have been changed to values described in Table 3.1, Changed Build Settings of the Project.

You can confirm the settings changed with the following procedure:

- 1. In Project Explorer, click the target project.
- 2. Select "Project" >> "Properties".

e ² workspace - e ² studio	Click "Project".	
File Edit Navigate Search	Project Renesas Views Run Window Help	-
🐔 🔅 🔳 🔅 Debu	Open Project Close Project	wareD *
Project Explorer 🔀 🚺 Project Explorer 🕅 rolan3681_rx65n_flash rolan3681_rx72m_flash Click here.	Build All Ctrl+Alt+B Build Configurations > Build Project Ctrl+B Build Working Set > Clean Build Automatically	
Click "Properties	C/C++ Index > Update All Dependencies Alt+D Change Device	
	Properties	1



3. Select "C/C++ Build" and then "Settings".

e ² Properties for r01an3681_rx65	n_flash	— 🗆	>
type filter text	Settings	<-> →	-> -
 Resource Builders C/C++ Build Build Variables Environment Logging 		ge Configuratio	
Settings Tool Quain Editor C/C++ General Project R Click "Settings Renesas QE Run/Debug Settings Task Repository	Image: Solution of the soluti		~

4. In the "Tool Settings" tab, see the settings have been changed as listed in Table 3.1, Changed Build Settings of the Project.



Firmware Update Sample Program with Dual Bank Function, and Flash Module and SCI Module Firmware Integration Technology

ltem	Changed Item	Description
Compiler Source	src is added to the "Include file directories" section.	Add to include path to allow header files in src to be accessed from folders within src.
Linker Section	The RPFRAM2 section is added to the RAM area. <u>Setting:</u> _{Section Viewer}	1 Specify the RAM area to be used by the Flash API.
	Address Section Name 0x0000004 SU SI B_1 R_1 B_2 R_2 B R R RPFRAM2 RPFRAM2	
Linker Section Symbol file	"PFRAM2=RPFRAM2" is added to the "ROM RAM mapped section" section. Setting: ROM to RAM mapped section D=R D_1=R_1 D_2=R_2 PFRAM2=RPFRAM2	M to Add the ROM to RAM mapping since the code to switch the startup bank with the Flash FIT API needs to be executed on the RAM.
Converter Output	Check "Output hex file". <u>Setting:</u> ✓ Output hex file Output file type Motorola S format file Output file directory S{workspace_loc:/S{ProjName}/S{ConfigNan Division output file 🔊 🖗 🖗	

Table 3.1 Changed Build Settings of the Project



4. Operation Confirmation

4.1 Building the Project

Follow the procedure below to build the project and create the load module.

- 1. Click the project to be built.
- 2. Select "Project" >> "Build Project".

e ² workspace - e ² studio	Click "Project".
File Edit Source Refactor Navigate Search Pr	oject Renesas Views Run Window Help
🍕 掾 🔳 🔆 Debug 🗸	Open Project
	Close Project
I ▼ I ▼ I ♥ I ♥ ♥ ♥ ♥ ♥ Click "Build Project".	Juild All Ctrl+Alt+B
Project Explorer 🛛 📄 🔤	Build Configurations >
> 🚰 r01an3681_rx65n_flash [HardwareDebug]	Build Project Ctrl+B
> 🚰 r01an3681_rx72m_flash Click the project	
	Clean

3. The build is completed when the message "Build complete." is displayed in the Console panel.

```
-nomessage
rlink "r01an3681_rx65n_flash.abs" -subcommand="Converterr01an3681_rx65n_flash.tmp"
Renesas Optimizing Linker Completed
'Finished building target:'
'Build complete.'
14:03:04 Build Finished. 0 errors, 0 warnings. (took 21s.932ms)
```



4.2 Preparing Debugging

4.2.1 Preparing Devices

The evaluation board needs to be prepared before debugging.

Table 4.1 lists required devices and configurations.

Table 4.1 Devices and Configurations

No.	Device	Remarks
1	Development PC	PC used for development
2	Evaluation board (Renesas Starter Kit+ for RX65N-2MB) (Renesas Starter Kit+ for RX72M)	In this application note, power is supplied to the board from AC adapter.
3	Host PC Serial communication software which is capable of XMODEM/SUM transfer	Development PC can be used as the host PC.
4	USB cable	See Figure 4.1 for an example of the environment.

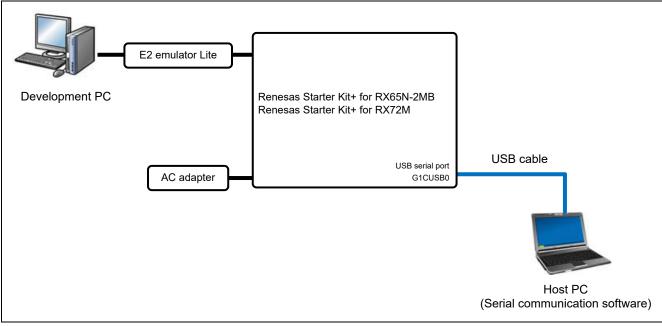


Figure 4.1 Debug Configuration



4.2.2 Host PC Settings

Table 4.2 lists the communication specification for the serial communication software. For serial communication software configuration, refer to the document for the serial communication software.

Table 4.2 Communication Specification

Item Description		
Communication method	Asynchronous communication	
Communication bit rate	115,200 bps	
Data length	8 bits	
Parity	None	
Stop bit	1 bit	
Flow control	None	



4.2.3 Presetting the MCU

To use the dual bank function, first the MCU has to be set to dual mode. Follow the procedure below for setting dual mode.

- 1. Start up the Renesas Flash Programmer.
- 2. Select "File" >> "New Project".

Renesas Flash Programmer V3	.06.00 (Free-of-charge Edition) —	
le Help	Click "File".	
New Project	Click "New Project".	
Open Project		
Save Project		
Save Image File		
File Checksum		
Set File Password		
Exit		

- 3. The "Create New Project" dialog opens.
- 4. For "Microcontroller:", select the device to be used.
- 5. Enter a project name in the "Project Name" field.
- 6. Enter a folder in the "Project Folder" field.
- 7. For "Tool:", select "E2 emulator Lite".
- 8. Click the "Connect" button.

🌠 Create New Projec	ct — □ ×
Project Information	Select the device to be used.
Microcontroller:	For "Project Name:" , enter a name of your choice.
Project Name:	dualbank
Project Folder:	C:\r01an3681xx0120-rx-flash Browse
	For "Project Folder:", enter a folder of your choice.
Communication	
Tool: E2 emulat	or Lite 🔽 Interface: 2 wire UART 🗸
	Select "E2 emulator Lite".
Tool Details	Num: AutoSelect Power: None
	Click the "Connect" button.
	Connect Cancel



- 9. The "ID Code Setting" dialog appears.
- 10. Click the "OK" button.

🗾 S	et ID Code		_		×
-ID (Code Authenticati	on			
I) Code:	FFFFFFFFFFFFF	FFFFFFFFF	FFFFFF	
				/	Click th
			ОК	Cancel	

- 11. Click the "Operation Settings" tab.
- 12. Choose "Erase Chip" for the "Erase Option" section.

ration Operation Settings Block Settings (Connect Settings Unique Choose "Erase Chip".				
Command	Erase Options				
🖂 Erase	Erase Chip 🗸 🗸				
🖂 Program	Program & Verify Options				
Verify	Erase Before Program				
Checksum	Verify by reading the device \sim				
	Checksum Type				
	32bit additive method \sim				
Fill with 0xFF					
🗌 Code Flash / User Boot	Error Settings				
🔲 Data Flash	Enable address check of program file				



- 13. Click the "Operation" tab.
- 14. Select the "setting_dualmode.mot" file in the "Program File" field. The file is located in the "download" folder under the unzipped folder of this application note.
- 15. Click the "Start" button.
- 16. The message "Operation completed." is displayed. Now the MCU has been set to dual mode.

File Device Information Help	ee-of-charge Edition) lick the "Operation" tab.	-		×
Operation Operation Settings Block Settin	gs Connect Settings Unique Code	•		
Project Information Current Project: dualbank.rpj S Microcontroller: RX Group	elect "setting_dualmode.mot".	Endian: Litt	le v	
Program File				
C:\r01an3681xx0120-rx-flash\download	d\setting_dualmode.mot		Browse	1
-	CRC-32	: 8685CC57		1
Flash Operation	Click "Start".			
Erase >> Program >> Verify				
Sta	art		ок	
[Config Area] 0xFE7F5D00 - 0xFE7F5D1F [Config Area] 0xFE7F5D40 - 0xFE7F5D7F	size : 32 size : 64			^
/erifying data [Config Area] 0xFE7F5D00 - 0xFE7F5D1F [Config Area] 0xFE7F5D40 - 0xFE7F5D7F	size : 32 size : 64			
Disconnecting the tool Operation completed. The messag	e "Operation completed" is displaye	ed.		~
		Class stat	us and messa	

The Renesas Flash Programmer requires projects for dual mode and linear mode separately. The project for linear mode cannot be connected in dual mode. If another connection needs to be made using the Renesas Flash Programmer, create a project again.

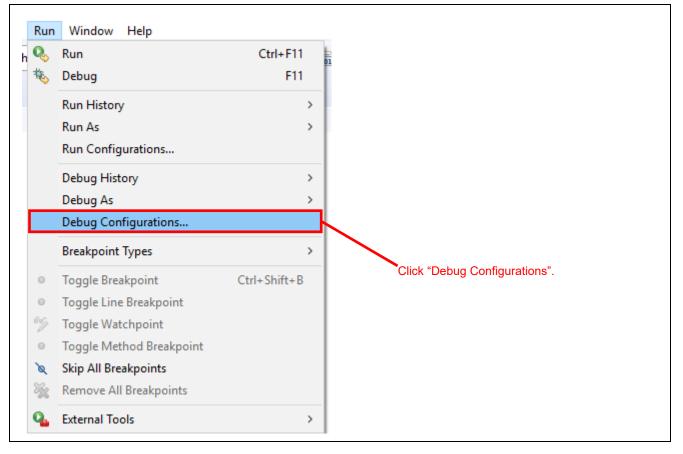


4.3 Debug Configuration

The debug configuration has been changed in the sample program. You can confirm the debug configuration changed in the project with the procedure below.

The procedure can be used to change the settings when setting up a new project. When performing debug execution, go to 4.4, Debugging.

1. Select "Run" >> "Debug Configurations" in the e^2 studio.





RX Family

- 2. Select the debug configuration you want to confirm the changes under "Renesas GDB Hardware Debugging".
- 3. Click the "Debugger" tab.
- 4. Click the "Connection Settings" tab.
- 5. The "Power Target From The Emulator" setting is changed to "No".
- 6. The "Change startup bank" setting is changed to "Yes".

ate, manage, and run configuration	s	Click the "Debugger" tab.
🗈 🗙 🖻 🕆 -	Name: r01an3681_rx65n_flash HardwareDebug	
pe filter text	📄 Main 🏇 Debugger 🕞 Startup 🔲 Common	Sour)
C/C++ Application C/C++ Remote Application		Click the "Connection Settings" ta
💼 GDB Hardware Debugging	GDB Settings Connection Settings Debug Tool Set	ttings
💽 GDB Simulator Debugging (RH850)	✓ Clock	
Java Applet	Main Clock Source	EXTAL
Java Application	Extal Frequency[MHz]	12.0000
🖶 Launch Group	Permit Clock Source Change On Writing Inter	na Yes
խ Launch Group (Deprecated)	✓ Connection with Target Board	
Remote Java Application	Emulator	(Auto) .
Renesas GDB Hardware Debugging	Connection Type	JTag
c × r01an3681_rx65n_flash Hardware	Jiag Clock Hequel(cy[ivi12]	6.00
c≚ r01an3681_rx/2m_tlash Hardware	The badd Nate[wbps]	1.50
💽 Renesas Simulator Debugging (RX, F	Hot Plug	No Changed to "No".
	✓ Power	
	Power Target From The Emulator (MAX 200m.	A) No
Click the debug	Supply Voltage[V]	3.3
configuration you	✓ CPU Operating Mode	Changed to "Yes".
wish to change.	Register Setting	Single Chip
wish to change.	Mode pin	Single-chip mode
	Change startup bank	Yes
	Startup bank	Bank 0
	Communication Mode	
	Mode	Debug Mode
	Execute The User Program After Ending The D	eb No
	✓ Flash	
	ID Code	FFFFFFFFFFFFFFFFFFFFFFFFFF
>		
Iter matched 14 of 16 items		Revert Apply
ter matched 14 of 10 items		



Г

- 7. Click the "Debug Tool Settings" tab.
- 8. See the setting for "Debug the program to re-write the on-chip ROM" has been changed to "Yes".
- 9. On the RX72M, "Performance Timer" is set to "240".
- 10. See the setting for "Internal Flash Memory Overwrite" has been changed to "0". To change this setting, click "..." button on the right.

🗎 🗙 🖻 🦆 🗸	Name: r01an3681_rx65n_flash HardwareDebug	
pe filter text C C/C++ Application C/C++ Remote Application EASE Script C GDB Hardware Debugging G GDB Simulator Debugging (RH850) Java Applet Java Application Launch Group Launch Group (Deprecated) Remote Java Application C Renesas GDB Hardware Debugging C r01an3681_rx65n_flash Hardware C r01an3681_rx72m_flash Hardware C Renesas Simulator Debugging (RX, F	Main 🕸 Debugger Startup Common 15 Debug hardware: E2 Lite (RX) Target Devic GDB Settings Connection Settings Debug Tool Setti V 10 Use Default 10 Filename IO Filename General Debum Reset Afte Changed to "0". Memory Endian Internal Flash Memory Overwrite External Memory Areas Work RAM Start Address Work RAM Start Address Work RAM Size (Bytes) System Debug the program re-writing the on-chip PRO Debug the program re-writing the on-chip DAT Performance Timer Operating Frequency [MHz] Start/Stop Function Setting Execute function before running user program Address for start function Execute function after stopping user program Address for stop function Work RAM Size (Bytes) Vork RAM Size (Bytes) Vork RAM Start Address Work RAM Size (Bytes) V External Flash Download Enabled External Flash Definition	Click the "Debug Tool Settings" tab. re: KSF565NE_DUAL ngs Yes S{support_area_loc} Click here. Yes Little Endian [0] 0x1000 Changed to "Yes". 0x500 Yes
er matched 14 of 16 items		Revert Apply



- 11. See the overwrite setting has been specified to execute overwrite operation after erasing all blocks in the on-chip flash memory. Clicking the "Deselect All" button deselects all address ranges (removes all check marks).
- 12. Click the "OK" button.

e ² Overwrite Inter	nal Flash Memory	×	
Number	Address Range	^	
0	00100000 - 0010003F		
1	00100040 - 0010007F		
2	00100080 - 001000BF		
3	001000C0 - 001000FF		
4	00100100 - 0010013F		
5	00100140 - 0010017F		
6	00100180 - 001001BF		
7	001001C0 - 001001FF		
8	00100200 - 0010023F		
9	00100240 - 0010027F		
10	00100280 - 001002BF		
11	001002C0 - 001002FF		
12	00100300 - 0010033F		
13	00100340 - 0010037F		
14	00100380 - 001003BF	~	
Selected blocks w	elect All Show Only Selected vill be overwritten rather than erased ogram is downloaded. s will be overwritten after being erased		on.
	ОК	Cancel	



- 13. Click the "Startup" tab to see the image to load into the other bank of the startup bank has been added.
- 14. To add the download module, click the "Add" button in the "Startup" tab. The "Add download module" dialog opens. To add the file in the project, click the "Search Project" button.

Debug Configurations reate, manage, and run configurations			"OL 1		45
reate, manage, and run configurations			ne "Startup" ta	D.)
* 🗎 🗙 🖻 ‡> ▼	Name: r01an3681_rx65n_flash Ha dw	/areDebug			
ype filter text	📄 Main 🕸 Debugger 🍉 Startup	📐 🔲 Common 🕻	🥖 Source		
 C/C++ Application C/C++ Remote Application EASE Script GDB Hardware Debugging GDB Simulator Debugging (RH850) Java Applet 	Initialization Commands Reset and Delay (seconds): 3 Halt		g the downloa	d module, clic	k "Add"
Java Application			g the downloa		k Add .
Launch Group (De Download mo Remote Java Application	odule has been added.				_
C Renesas GDB Hardware Debugging		oad type	Offset (hex) Or	n connect	Add
c* r01an3681_rx65n_flash Hardware		nage and Symbols	Ye		
rollan3681_rx72m_flash Hardware Reposes Simulator Debugging (RX F	✓ r01an3681_rx65n_flash Im	nage only	FFF00000 Ye	s	Edit
Renesas Simulator Debugging (RX, F			Changed to "F	FF00000"	Remove
	Changed to "Image	only" C	Changed to "F	FF00000°.	Move up
					Move down
	Set breakpoint at: Resume Run Commands	main			~ ~
				Click the "	Close" button.
< >				Revert	Apply
ilter matched 14 of 16 items				Neven	Арру
?				Debug	Close
	vnload module			Х	Close
e ² Add dov					Close
e ² Add dov Specify do	vnload module wnload module name: Debug/r01an3681_rx65n_fla	sh.x			Close
e ² Add dov Specify do Hardware	wnload module name: Debug/r01an3681_rx65n_fla		File Cu	×	Close
e ² Add dov Specify do	wnload module name: Debug/r01an3681_rx65n_fla	ish.x Workspace.	File Sy		Close



- 15. A file with the HardwareDebug extension x has been added.
- 16. See the "Load type" setting has been changed to "Image only".
- 17. On the RX65N, the "Offset" setting is changed to "FFF00000". On the RX72M, the "Offset" setting is changed to "FFE00000".*1
- 18. Click the "Close" button.
- Note: 1. The value specified here is not an address value but an offset value. On the RX65N, the significance is "address value 100000H". It is not possible to enter a negative value, so the 2's complement is entered as FFF00000H. Setting an offset of FFF00000H specifies an address value in the bank other than the current startup bank address value. On the RX72M the offset is "address value 200000H", so FFE00000H is entered.



4.4 Debugging

- 1. Select the project to be debugged.
- 2. Click the "Launch in 'debug' mode" icon.

File Edit Source Refactor Navigate Search Project Renesas Views Run Window Here Image: Search Image: Sear	e ² workspace - e ² st	udio							
Click "Launch in 'debug' mode".	File Edit Source	Refactor	Navigate	Search	Project	Renesas Views	Run	Window	He
	K 🗱 🔳	🎄 Deb	ug	\sim	c× r01an	3681_rx65n_flash	Hardw	vareDe 🗸 🐇	¥
Select the project to be debugged.		Click "La	aunch in 'de	bug' mod	e".				
	월 * 월 * 연 9	· · · ·	,		S	elect the project	to be d	ebugged.	

3. When the following message appears, click the "Yes" button.

e ² Conf	irm Perspective Switch		\times	
\bigcirc	This kind of launch is configured to open the Debug perspective when it suspends.			
	This Debug perspective is designed to support application debugging. It incorporates views for displaying the debug stack, variables and breakpoint management.			
	Do you want to open this perspective	e now?		
Rem	ember my decision	Click the "Yes" button.		
		Yes No		

- 4. When the load module has been downloaded, the "Debug" perspective opens.
- 5. Click the "Resume" icon on the toolbar. The program is executed and halted at the start of the main function where the break point is inserted.

	01an3681_rx65n_flash/src/smc_gen/r_bsp/mcu/all/resetprg.c - e² studio				-
	te Refactor Navigate Search Project Renesas Views Run Window Help			k	
S * .	🖡 Debug 🗸 💽 r01an3681_rx65n_flash HardwareD+ 🗸 🌼 🗄 👻 🔛 🔞 🛞 💌 🔦 🔻		3. 👁 🖉 🖬 🖶 🏹 💺 🕶	** 💷	18° 🖏 🕹 : 📲 : 🖉 : 💭 : ヤ 📲 🕫 (
🖗 🕶 🏹 🕶 🏷	$(\diamond \star \diamond \star)$			Quick Acc	:ess 🔡 🖹 🔂 C/C++ 📓 スマート・コンフィグレー
🎋 Debug 🖂	🍇 📴 🚱 🗢 🗖	🗆 (x)= Variables 🔀 💁	Breakpoints 🙀 Expressions 🗐 N	IMU 👴 Ev	rentpoints 📄 IO Registers
✓ 🔐 r01an3 ✓ 🔗 Thr ■	_nd55, flash HardwareDebug [Reness G08 Hardware Debugging] Click here. 681_nd55n_flashx_[11](cores: 0] read+11 (single-core) [core: 0] (Suspended : Signal : SIGTRAP:Trace/breakpoint trap) PowerON_Reset_PC() at resetprg.cl 54 0xfff01cf4 ab n-roforce-v(7.82)	Name	Туре	Value	<u>لا الم الم الم الم الم الم الم الم الم ا</u>
Renesa	s GDB server (Host)				<
💽 resetprg.c 🔀					🗄 Outline 🖾 🍋 Project Explorer
<pre> 164 fff01cf4 165 166 167 168 169 170 171 172 173 </pre>	 Exprom_FUNCTION(R BSP_STATUP_FUNCTION) /* Stack pointers are setup prior to calling this function - see comments above /* You can use auto variables in this function but such variables other than reg * will be unavailable after you change the stack from the I stack to the U stac /* The bgs sections have not been cleared and the data sections have not been ir * and constructors of C++ objects have not been executed until the _INITSCT() if /* fift defined(GNUC) 	lster variables ck (if change). */ nitialized		▲ ● ●	□ P _R ≥ 1 → P _R →
🕒 Console 🕅 🤇	🙆 夕刀⁄ 👷 問題 🔕 実行可能ファイル 🛄 Renesas Debug Virtual Console 👒 Smart Browser 🖏 Real-time Cha	art 💁 Trace 🕐 Performa	nce Analysis 滋 消費電流則定 (QE)	🔋 XEU-	-使用量 () Visual Expression ≩ Renesas Covera ■ X 後 副 副 副 伊 伊
r01an3681_rx65n_fl	lash HardwareDebug [Renesas GDB Hardware Debugging] Renesas GDB server (Host)				
User Vcc Finished targe GDB: 55670 Target connect Starting down	tion status - OK				
Suspended			🐑 Writable S	mart Insert	164:1



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6. Click the "Resume" icon on the toolbar again after the halt in step 5.

e² workspace - r01an3681_rx65n_flash/src/main.c - e² studio	
File Edit Source Refactor Navigate Search Project Renesas Views Run Window Help	
🔨 🚁 🔳 🎋 Debug 🗸 🔽 r01an3681_rx65n_flash HardwareDt 🗸 🌼 🗄 🐨 🖷 🔚 🎼 😵 🖛 🏀 🖓	X 🕨 🛙
^t / ₂ → ^t / ₂ → ^t → ^t → ^t	
☆ Debug 🛛 論 i→ i→	(x)= Variable
✓ ট r01an3681_rx65n_flash HardwareDebug [Renesas GDB Hardware Debugging]	
✓	Name
Thread #1 1 (single core) [core: 0] (Suspended : Breakpoint)	> 🏓 sci
main() at main.c:155 0xfff00907	(×)= rec
📕 rx-elf-gdb -rx-force-v2 (7.8.2)	100
📕 Renesas GDB server (Host)	
i resetprg.c i main.c ∷	



7. The following message is displayed in the serial communication software screen.

Dualbank firmware update menu ver1.20A

- 1...Update
- 2...Changing the Startup Bank and Reset

4.5 mot File for Update Confirmation

The sample program uses a mot file for update confirmation. When an update to the mot file is completed, the character string appearing in the menu display changes to "ver1.20B".

Dualbank firmware update menu ver1.20B

- 1...Update
- 2...Changing the Startup Bank and Reset

The mot file is located in the "download" folder in the zip file containing this application note. There are a total of four versions of the mot file to cover the various device and endian setting combinations.



5. Overview of the Sample Program

5.1 Operation Overview

The sample program transfers the firmware (.mot file) through serial communication using the XMODEM/SUM protocol to program the firmware into the code flash memory. The firmware operates on the startup bank of the dual bank. The mot file in addresses FFF0 0000h to FFFF FFFFh is programmed in addresses FFE0 0000h to FFEF FFFFh in the other bank of the startup bank. After confirmed that the firmware has been programmed successfully, the firmware can be updated safely by changing the startup bank and performing a software reset. Programming is not performed if the specified address range is other than the range between FFF0 0000h and FFFF FFFFh.

Note that the addresses FFF0 0000h, FFE0 0000h, and FFEF FFFFh apply to the RX65N with 2 MB of ROM. When the device is the RX72M with 4 MB of ROM, the above addresses are replaced by FFE0 0000h, FFC0 0000h, and FFDF FFFFh, respectively. This also applies to Figure 5.1 to Figure 5.6.

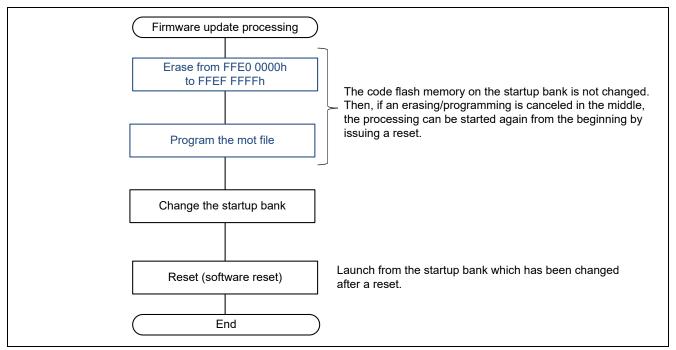


Figure 5.1 Firmware Update



5.1.1 Updating the Firmware

This section describes updating the firmware using the sample program.

1. Start the sample program. The sample program displays the menu in the serial communication software on the host PC.

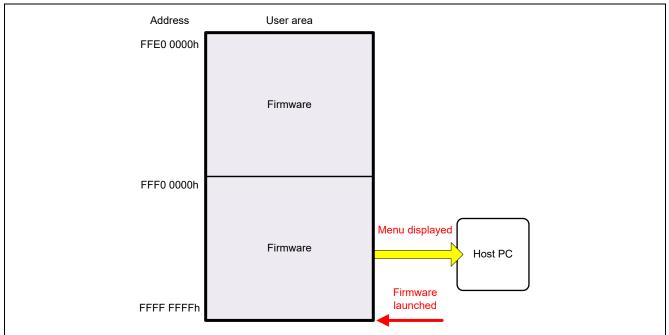


Figure 5.2 Launching the Sample Program

2. When the Update command is executed, the sample program erases the code flash memory on the other bank of the startup bank.

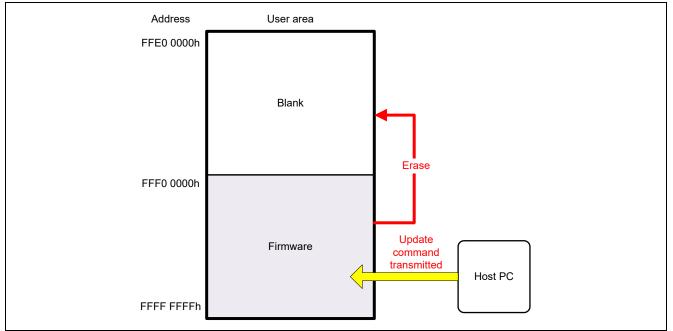


Figure 5.3 Erasing the Code Flash Memory



Firmware Update Sample Program with Dual Bank Function, and Flash Module and SCI Module Firmware Integration Technology

3. The firmware is transmitted using the serial communication software. The sample program analyzes the received data and program it into the code flash memory.

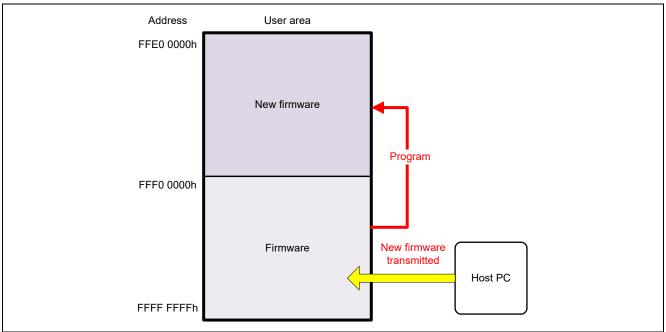


Figure 5.4 Programming New Firmware

4. When the sample program has completed to program the new firmware into the code flash memory, it displays the menu in the serial communication software on the host PC.

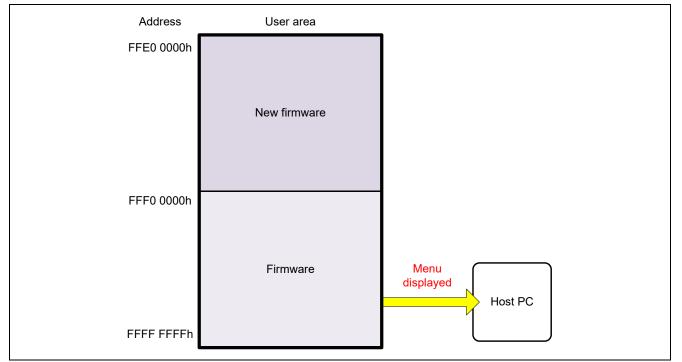


Figure 5.5 Completion of Programming New Firmware



5. When the Changing the Startup Bank and Reset command is executed, the sample program executes a software reset after reprogramming the bank select register of the option-setting memory. The startup bank is switched after a reset and the new firmware is launched.

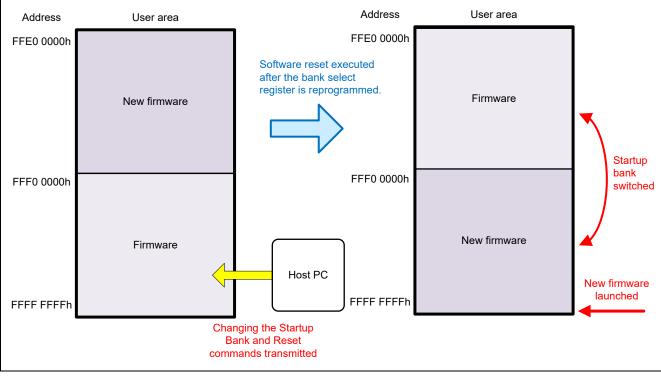


Figure 5.6 Software Reset and Launching New Firmware



5.2 Process Flowchart and Screen Output

The sample program outputs messages to the serial communication software on the host PC using the serial communication and branches to an appropriate processing according to the command input from the serial communication software.

5.2.1 Main Processing

The main processing initializes the SCI FIT module and the Flash FIT module, and uses the SCI to display the menu in the serial communication software on the host PC. Then the main processing waits for a key input from the serial communication software and branches to an appropriate processing according to the key input.

(1) Process Flowchart

Figure 5.7 shows the flowchart of main processing.

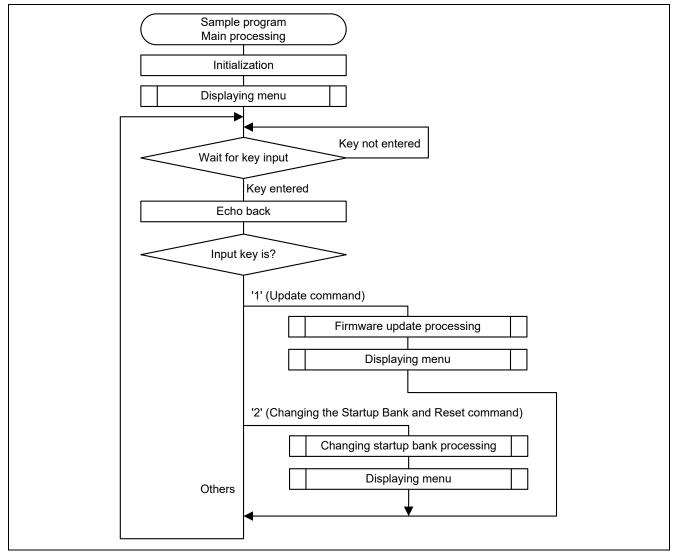


Figure 5.7 Flowchart of Main Processing



(2) Screen Output in the Serial Communication Software

When the sample program is launched, the menu is displayed in the serial communication software.

Dualbank firmware update menu ver1.20A

- 1...Update
- 2...Changing the Startup Bank and Reset

When "1" is entered in the serial communication software, the firmware update processing is executed. When "2" is entered, the changing startup bank processing is executed.



5.2.2 Firmware Update Processing

When "1" is entered, the main processing branches to the firmware update processing. The firmware is received through the serial communication using the XMODEM/SUM protocol and then programmed into the code flash memory.

(1) **Process Flowchart**

Figure 5.8 shows the flowchart of firmware update processing.

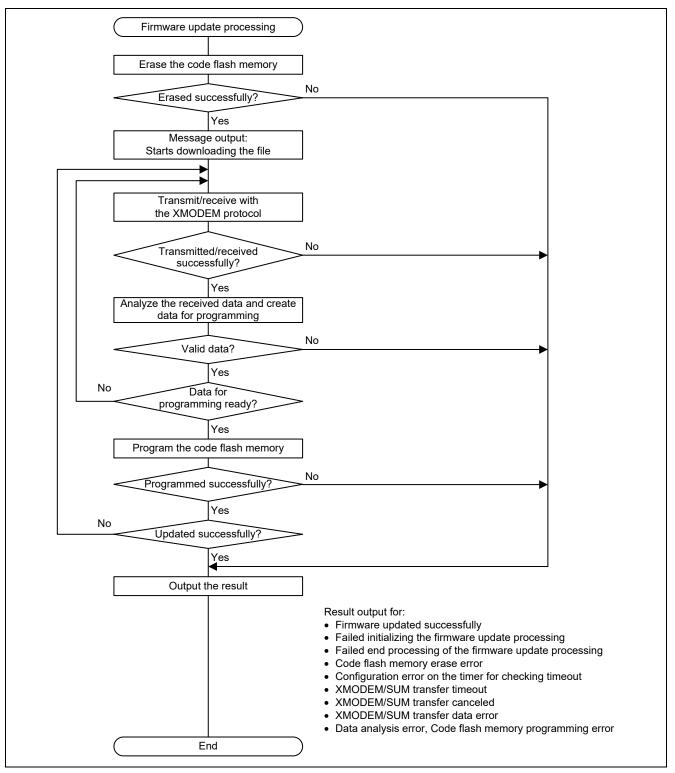


Figure 5.8 Flowchart of Firmware Update Processing



(2) Screen Output in the Serial Communication Software

1. Starting file download

When addresses FFE0 0000h to FFEF FFFFh in the code flash memory have been successfully erased, the message to start downloading is output. Then a wait processing for receiving the XMODEM/SUM transferred data is started.

Ready

Transmit the firmware with the XMODEM/SUM protocol from the serial communication software.

 Completing the firmware update When the firmware update has been completed, the following message is output and the firmware update processing is completed.

Finish

3. Error output

If an error occurs during firmware update, any of the following message is output according to the error.

initialize update error:	Failed initializing the firmware update processing
finalize update error:	Failed end processing of the firmware update processing
Erase error:	Code flash memory erase error
CMT error:	Configuration error on the timer for checking timeout
Timeout:	XMODEM/SUM transfer timeout
Received CAN:	XMODEM/SUM transfer canceled
Data error:	XMODEM/SUM transfer data error
Block processing error	: Data analysis error, Code flash memory programming error



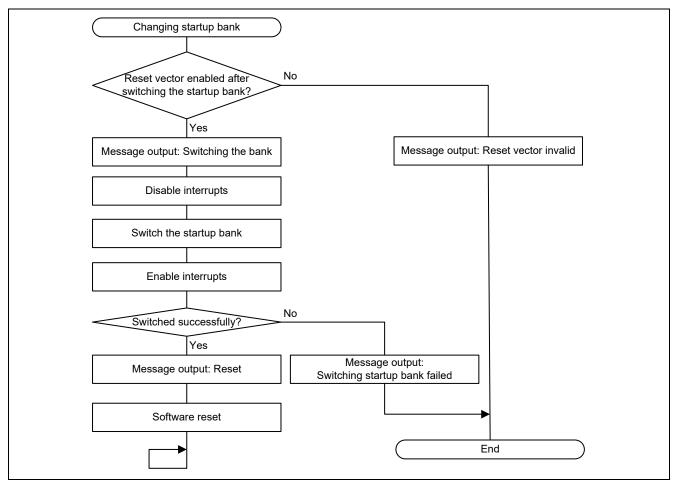
5.2.3 Changing the Startup Bank Processing

When "2" is entered, the main processing branches to the changing startup bank processing. A new firmware is launched by executing a software reset after switching the startup bank.

(1) Process Flowchart

Figure 5.9 shows the flowchart of changing startup bank processing.

The option-setting memory is not an area that can be overwritten using background operation (BGO). This means that it is not possible to read data from the code flash memory while the option-setting memory is being overwritten. The interrupt vector table is located in the code flash memory, so interrupts are disabled while switching startup banks. If you do not wish to disable interrupts during this period, allocate the interrupt vector table to the RAM.





(2) Screen Output in the Serial Communication Software

1. Changing the startup bank The following message is output and the startup bank is switched.

Changing the Startup Bank

2. Software reset

When the startup bank is switched successfully, the following message is output and a software reset is executed.

Reset



When an update is successfully performed with the update file for your device included in the ZIP file, the following menu is displayed.

The version number changes from 1.20A to 1.20B.

Dualbank firmware update menu ver1.20B

- 1...Update
- 2...Changing the Startup Bank and Reset
- 3. Error output

If an error occurs during changing the startup bank, any of the following message is output according to the error.

Reset vector is invalid:Reset vector invalidFlash error:Switching startup bank failed



5.3 Sample Program

5.3.1 File Composition

Table 5.1 lists the files used in the sample program and Table 5.2 lists the standard header files used in the sample program. Files generated by the FIT module and files generated by the integrated development environment are not included in these tables.

Table 5.1	Files Used in	the Sample	Program

File Name	Outline
main.c	Main source file
main.h	Main interface file
r_xmodem.c	XMODEM source file
r_xmodem_if.h	XMODEM interface file
r_fw_up_rx.c	Firmware update source file
r_fw_up_rx_if.h	Firmware update interface file
r_fw_up_rx_private.h	Firmware update header file
r_fw_up_buf.c	Source file to process the firmware data buffer
r_fw_up_buf.h	Header file to process the firmware data buffer

File Name	Outline
stdbool.h	Defines macros regarding the Boolean type and the Boolean value.
stdint.h	Defines macros by declaring the integer type of the specified width.
stdlib.h	Library for standard C programming processing such as storage area management
string.h	Library for processing such as string comparison and copy.



5.3.2 Constants

Table 5.3 to Table 5.6 list constants used in the sample program.

Constant	Setting Value	Description	
SCI_CH	((uint8_t)SCI_CH8)	SCI channel used on RX65N	
	((uint8_t)SCI_CH6)	SCI channel used on RX72M	
TX_MAX_SIZE	SCI_CFG_CH8_TX_BUFSIZ	Transmit buffer size when using SCI8	
	SCI_CFG_CH6_TX_BUFSIZ	Transmit buffer size when using SCI6	
RECV_BYTE_SIZE	((uint16_t)1)	1 byte size for receiving	
SEND_BYTE_SIZE	((uint16_t)1)	1 byte size for transmitting	
CHARACTER_RETURN	((uint8_t)'r')	Linefeed code	
COMMAND_UPDATE	((uint8_t)'1')	Character code for the Update command	
COMMAND_CHANGE_BANK	((uint8_t)'2')	Character code for the Changing the	
		Startup Bank and Reset command	
CMT_FREQUENCY_Hz	(2u)	Compare match timer interrupt period	
		(2 Hz)	
STRING_MAX_SIZE	((uint16_t) TX_MAX_SIZE)	Maximum size for an output string	
STRING_SIZE	((uint16_t)((sizeof((s))) - 1u))	Macro which indicates the string array	
		size in uint16_t	

Table 5.3 Constants Used in the Sample Program (main.c)

Table 5.4 Constants Used in the Sample Program (r_xmodem.c)

Constant	Setting Value	Description
XM_SOH	((uint8_t)0x01)	XMODEM control code (SOH)
XM_EOT	((uint8_t)0x04)	XMODEM control code (EOT)
XM_ACK	((uint8_t)0x06)	XMODEM control code (ACK)
XM_NAK	((uint8_t)0x15)	XMODEM control code (NAK)
XM_CAN	((uint8_t)0x18)	XMODEM control code (CAN)
XM_HEADER_SIZE	((uint8_t)(1+1+1))	Header size of the XMODEM data block (the number of bytes)
XM_DATA_SIZE	((uint8_t)128)	Data size of the XMODEM data block (the number of bytes)
XM_SUM_SIZE	((uint8_t)1)	Checksum size of the XMODEM data block (the number of bytes)
XM_BLOCK_SIZE	(XM_HEADER_SIZE + XM_DATA_SIZE + XM_SUM_SIZE)	XMODEM data block size (the number of bytes)
XM_RETRY_COUNT	((uint8_t)10)	The number of retries upon XMODEM data transfer timeout
UINT8T_0	((uint8_t)0)	0 in uint8_t
UINT8T_1	((uint8_t)1)	1 in uint8_t



Constant	Setting Value	Description
FW_UP_BINARY_BUF_SIZE	(256u)	Buffer size for data to be programmed in the code flash memory
FW_UP_BINARY_BUF_NUM	(2u)	The number of buffers for data to be programmed in the code flash memory
FW_UP_BUF_NUM	(60u)	The number of arrays to store analyzed Motorola S record data
FW_UP_BLANK_VALUE	(0xFFFFFFFFu)	Read value when the code flash memory is blank.

Constant	Setting Value	Description
MOT_S_CHECK_SUM_FIELD	(0x02)	The number of characters for the checksum field in the Motorola S-record format
ADDRESS_LENGTH_S1	(0x04)	The number of characters for the address field in the Motorola S-record format (S1 type)
ADDRESS_LENGTH_S2	(0x06)	The number of characters for the address field in the Motorola S-record format (S2 type)
ADDRESS_LENGTH_S3	(0x08)	The number of characters for the address field in the Motorola S-record format (S3 type)
BUF_LOCK	(1)	The specified buffer of Motorola S-record format is locked.
BUF_UNLOCK	(0)	The specified buffer of Motorola S-record format is open.



5.3.3 Type Definitions

This section describes type definitions used in the sample program.

Type definitions in r_xmodem.c

```
typedef enum e xmodem proc stage
{
   XMODEM PROC END = 0,
   XMODEM PROCESSING,
   XMODEM SOH RECEIVED
} e_xmodem_proc_stage_t;
typedef struct st xmodem states
{
   uint8 t retry counter;
   uint8 t expected block number;
   uint8 t recv buf index;
   uint8 t can counter;
   uint8 t *precv buf;
   e_xmodem_proc_stage_t proc_stage;
   xm_recv_func_t recv_func;
   xm_send_func_t send_func;
   xm exec func t exec func;
} st xmodem states t;
```

Type definitions in r_xmodem_if.h

```
typedef enum e_xmodem_err
{
    XMODEM_SUCCESS,
    XMODEM_SEND_ERR,
    XMODEM_RECV_ERR,
    XMODEM_TIMEOUT,
    XMODEM_PROC_BLOCK_ERR,
    XMODEM_PROC_BLOCK_ERR,
    XMODEM_DATA_ERR
} e_xmodem_err_t;
typedef e_xmodem_err_t (*xm_recv_func_t)(uint8_t* p_arg);
typedef e_xmodem_err_t (*xm_send_func_t)(uint8_t arg);
typedef e_xmodem_err_t (*xm_exec_func_t)(const uint8_t* p_buf, uint16_t size);
```



Type definitions in r_fw_up_rx_if.h

```
typedef enum e_fw_up_return_t
{
   FW UP SUCCESS,
   FW_UP_ERR_OPENED,
   FW_UP_ERR_NOT_OPEN,
   FW UP ERR NULL PTR,
   FW UP ERR INVALID RECORD,
   FW_UP_ERR_BUF_FULL,
   FW_UP_ERR_BUF_EMPTY,
   FW_UP_ERR_INITIALIZE,
   FW_UP_ERR_ERASE,
   FW UP ERR WRITE,
   FW UP ERR INTERNAL
} fw up return t;
typedef struct st_fw_up_fl_data_t
{
   uint32_t src_addr;
   uint32_t dst_addr;
   uint32_t len;
   uint16 t count;
} fw up fl data t;
```



Type definitions in r_fw_up_buf.h

```
typedef enum fw up mot s cnt t
{
   STATE_MOT_S RECORD MARK = 0,
   STATE_MOT_S_RECORD_TYPE,
   STATE MOT S LENGTH 1,
   STATE MOT S LENGTH 2,
   STATE MOT S ADDRESS,
   STATE_MOT_S_DATA,
   STATE_MOT_S_CHKSUM_1,
   STATE MOT S CHKSUM 2
} fw_up_mot_s_cnt_t;
typedef struct MotSBufS
{
   uint8 t addr length;
   uint8 t data length;
   uint8 t *paddress;
   uint8_t *pdata;
   uint8_t type;
   uint8_t act;
   struct MotSBufS *pnext;
} fw_up_mot_s_buf_t;
typedef struct WriteDataS
{
   uint32_t addr;
   uint32_t len;
   uint8 t data[FW UP BINARY BUF SIZE];
   struct WriteDataS *pnext;
   struct WriteDataS *pprev;
} fw_up_write_data_t;
```



5.3.4 Variables

Table 5.7 to Table 5.10 list static variables and Table 5.11 lists const variables.

Туре	Variable	Description	Used by Functions
static sci_hdl	sci_handle	SCI module control handle	main
			send_byte_xm
			recv_byte_xm
			send_string_sci
static volatile bool	sci_send_end_flag	SCI transmit complete	sci_callback
		determination flag	send_string_sci
static uint32_t	cmt_ch	Channel number of compare	update_dualbank
		match timer	
static volatile int32_t	timeout_count	Timeout determination counter	cmt_callback
			recv_byte_xm
static volatile bool	timeout_flag	Timeout determination flag	cmt_callback
			recv_byte_xm
static volatile bool	start_timer_flag	Timeout determination enable flag	cmt_callback
			recv_byte_xm

Table 5.8 static Variable (r_xmodem.c)

Туре	Variable	Description	Used by Functions
static uint8_t	recv_buf[XM_BLOCK_ SIZE]	XMODEM receive data buffer	exec_xmodem

Table 5.9 static Variable (r_fw_up_rx.c)

Туре	Variable	Description	Used by Functions
static bool	is_opened	Firmware update initialization complete flag	fw_up_open fw_up_close write_firmware fw_up_put_data fw_up_get_data



Table 5.10	static Variables (r_fv	v_up_buf.c)
------------	------------------------	-------------

Туре	Variable	Description	Used by Functions
static fw_up_mot_s_buf_t	*papp_put_mot_s_buf	Pointer to the Motorola S-record data buffer currently used for Motorola S format analysis processing	fw_up_buf_init fw_up_put_mot_s
static fw_up_mot_s_buf_t	*papp_get_mot_s_buf	Pointer to the Motorola S-record data buffer currently used for processing to create data to be programmed into the code flash memory	fw_up_buf_init fw_up_get_binary
static fw_up_mot_s_buf_t	mot_s_buf[FW_UP_ BUF_NUM]	Buffer to store the contents of the Motorola S-record data	fw_up_buf_init fw_up_memory_init
static fw_up_write_data_t	*papp_write_buf	Pointer to the current data buffer for programming the code flash memory	fw_up_buf_init fw_up_get_binary
static fw_up_write_data_t	write_buf[FW_UP_ BINARY_BUF_ NUM]	Buffer to store the data for programming the code flash memory	fw_up_buf_init
static fw_up_mot_s_cnt_t	mot_s_data_state	Analysis state of the Motorola S-record data	fw_up_buf_init fw_up_put_mot_s
static uint32_t	write_current_ address	Current address to program in the code flash memory	fw_up_buf_init fw_up_get_binary
static bool	detect_terminal_ flag	Detection flag for the endpoint of the record	fw_up_buf_init fw_up_put_mot_s fw_up_get_binary



Туре	Variable	Description	Used by Functions
static const uint8_t	string_menu0[]	"RX65N-2MB Dualbank	show_menu_dualbank
		firmware update menu	
		ver1.00A\r\n"	
static const uint8_t	string_menu1[]	"1Update\r\n"	show_menu_dualbank
static const uint8_t	string_menu2[]	"2Changing the Startup Bank and Reset\r\n"	show_menu_dualbank
static const uint8_t	string_change_bank[]	"Changing the Startup Bank\r\n"	change_startup_bank
static const uint8_t	string_reset[]	"Reset\r\n"	change_startup_bank
static const uint8_t	string_crlf[]	"\r\n"	main
static const uint8_t	string_start_xmodem[]	"Ready\r\n"	update_dualbank
static const uint8_t	string_finish_xmodem[]	"Finish\r\n"	update_dualbank
static const uint8_t	string_timeout[]	"Timeout\r\n"	update_dualbank
static const uint8_t	string_cmt_err[]	"CMT error\r\n"	update_dualbank
static const uint8_t	string_erase_err[]	"Erase error\r\n"	update_dualbank
static const uint8_t	string_flash_err[]	"Flash error\r\n"	change_startup_bank
static const uint8_t	string_block_err[]	"Block processing error\r\n"	update_dualbank
static const uint8_t	string_data_err[]	"Data error\r\n"	update_dualbank
static const uint8_t	string_recv_can[]	"Received CAN\r\n"	update_dualbank
static const uint8_t	string_initialize_update _err[]	"initialize update error\r\n"	update_dualbank
static const uint8_t	string_finalize_update_ err[]	"finalize update error\r\n"	update_dualbank
static const uint8_t	string_reset_vector_inv alid[]	"Reset vector is invalid\r\n"	change_startup_bank

Table 5.11 const Variables (main.c)



5.3.5 Functions

Table 5.12 lists the functions used in the sample program, Table 5.13 lists the FIT module functions used in the sample program, and Table 5.14 lists the e^2 studio smart configurator generated function used in the sample program.

Function	Description	Defined File
main	Main processing	main.c
sci_callback	Callback function for the SCI FIT module to check	main.c
	completion of an SCI transmission	
cmt_callback	Callback function for the CMT FIT module to check	main.c
	timeout with the CMT	
send_string_sci	Transmitting strings	main.c
send_byte_xm	Callback function for XMODEM protocol to transmit 1-byte data	main.c
recv_byte_xm	Callback function for XMODEM protocol to receive 1-byte data	main.c
block_proc_xm	Callback function for XMODEM protocol for data processing of 1-data block	main.c
show_menu_dualbank	Displaying menu	main.c
update dualbank	Firmware update processing	main.c
	Changing startup bank processing	main.c
exec xmodem	XMODEM protocol processing	r xmodem.c
 xmodem recv soh	Receiving the header of XMODEM protocol data block	r xmodem.c
xmodem check eot	Checking the header of XMODEM protocol data block	r xmodem.c
xmodem recv block	Receiving 1-data block of XMODEM protocol	r xmodem.c
 xmodem_analyze_block	Analyzing XMODEM protocol data block	 r_xmodem.c
xmodem_proc_data	Processing data for 1 data block of XMODEM protocol	r_xmodem.c
xmodem_send_response	Response for XMODEM protocol	r_xmodem.c
fw_up_open_flash	Flash FIT module initialization	r_fw_up_rx.c
fw_up_open	Firmware update initialization	r_fw_up_rx.c
fw_up_close	Completing firmware update	r_fw_up_rx.c
erase_another_bank	Erasing code flash memory	r_fw_up_rx.c
analyze_and_write_data	Analyzing receive data and programming code flash memory	r_fw_up_rx.c
bank_toggle	Switching startup bank	r_fw_up_rx.c
fw_up_soft_reset	Executing software reset	r_fw_up_rx.c
fw_up_check_reset_vector	Checking reset vector	r_fw_up_rx.c
write_firmware	Programming code flash memory	 r_fw_up_rx.c
 fw_up_put_data	Analyzing receive data	r_fw_up_rx.c
fw_up_get_data	Obtaining programming data for the code flash memory	 r_fw_up_rx.c
fw_up_buf_init	Initializing buffer for firmware update	r_fw_up_buf.c
fw_up_memory_init	Initializing pointer to the buffer	r_fw_up_buf.c
fw_up_put_mot_s	Analyzing Motorola S-record data	r_fw_up_buf.c
fw_up_get_binary	Obtaining programming data for the code flash memory	r_fw_up_buf.c
fw_up_ascii_to_hexbyte	Converting ASCII to binary	r_fw_up_buf.c

Table 5.12 Functions Used in the Sample Program



Function	FIT Module	Application	Used by Functions
R_FLASH_Open	Flash FIT module	Initializing the Flash FIT module	fw_up_open_flash
R_FLASH_Erase	Flash FIT module	Erasing the code flash memory	erase_another_bank
R_FLASH_Write	Flash FIT module	Programming the code flash memory	write_firmware
R_FLASH_Control	Flash FIT module	Switching the startup bank	bank_toggle
R_BSP_RegisterProtect Disable	BSP module	Disabling the write protection for the SWRR register	fw_up_soft_reset
R_SCI_Open	SCI FIT module	Starting up the SCI	main
R_SCI_Control	SCI FIT module	Enabling the transmit end interrupt	main
R_SCI_Send	SCI FIT module	Transmitting the SCI data	send_byte_xm send_string_sci
R_SCI_Receive	SCI FIT module	Receiving the SCI data	main recv_byte_xm
R_CMT_CreatePeriodic	CMT FIT module	Generating the timer for checking timeout	update_dualbank
R_CMT_Stop	CMT FIT module	Stopping the timer for checking timeout	update_dualbank

Table 5.13 FIT Module Functions Used in the Sample Press	ogram
--	-------

Table 5.14 e² studio Smart Configurator Generated Function Used in the Sample Program

Function FIT Module		Application	Used by Functions
R_SCI_PinSet_SCI8	SCI FIT module	SCI pin setting when using SCI8	main
R_SCI_PinSet_SCI6	SCI FIT module	SCI pin setting when using SCI6	main



6. Appendices

6.1 Troubleshooting

6.1.1 Operation Terminated Abnormally when Programming a mot File with the Renesas Flash Programmer

An operation may be abnormally terminated with the error: Error (E3000107): This device does not match the connection parameters. In this case, create a new project from "File" >> "Create New Project".

This error occurs when the connection information in the project does not match the device. The Renesas Flash Programmer distinguishes between linear mode and dual mode in the connection information. A project for linear mode cannot be connected to the MCU operating in dual mode. Also a project for dual mode cannot be connected to the MCU operating in linear mode.

6.1.2 File Transfer Canceled During XMODEM Transfer

The following two are possibly the causes of this issue.

1. A file other than mot file is transferred

In this case, terminate XMODEM processing in the serial communication software. Alternatively, wait until the XMODEM processing in the serial communication software becomes timeout. Then, perform the Update processing again. For terminating XMODEM processing, refer to the document for the serial communication software.

2. It takes 10 seconds or more to select a mot file:

In this case, terminate XMODEM processing in the serial communication software and execute the sample program again. Then, execute the Update processing again. For terminating XMODEM processing, refer to the document for the serial communication software.

When a XMODEM transmit file is selected, the serial communication software cannot process NAK properly. Then communication timings do not match and a data block transmission will be repeated. This is the cause of this issue.

6.1.3 Nothing Displayed Even Though XMODEM Transfer Completed

Enter a character other than "1" or "2" in the serial communication software. If the echo back is displayed, it means the sample program has completed the XMODEM processing.

If it takes time to switch between XMODEM processing and normal communication processing, the serial communication software cannot receive the message sent by the sample program. This is the cause of this issue.



6.1.4 FIT Module Setting Items Not Displayed in Software Component Configuration

If the FIT modules are grayed out and no setting items are displayed in "Software component condifuration", the version of the FIT modules used by the project may not have been downloaded to the folder recognized by Smart Configurator. To correct this, download the latest FIT modules. Click the "Add component" button.

oftware component configuration	🕲 🖨
om ja 📄 🖶 📫 🕶 Configure	
type filter text	
✓ ➢ Startup Click here.	
🗸 🦢 Generic	
💣 r_bsp	
✓ ➢ Drivers	
🗸 🗁 Memory	
💓 r_flash_rx	
🗸 🗁 Communicatior	
💓 r_sci_rx	
🗸 🗁 Timers	
🖬 r_cmt_rx	
🗸 🧁 Middleware	
🗸 🦻 Generic	
💓 r_byteq	



Click "Download more software components".

ftware Component Selection elect component from those available	in list		
ype All			~
unction All			~
ilter			
Components	Туре	Version	^
Ports	Code Generator	1.8.0	
🖶 Programmable Pulse Generator	Code Generator	1.2.0	
🖶 PWM Mode Timer	Code Generator	1.6.0	
🖶 r_bsp	FIT	5.20	
🖶 Real Time Clock	Code Generator	1.4.0	
H SCI/SCIF Asynchronous Mode	Code Generator	1.6.0	
SCI/SCIF Clock Synchronous M	Code Generator	1.6.0	
🖶 Single Scan Mode S12AD	Code Generator	1.8.0	
🖶 Smart Card Interface Mode	Code Generator	1.6.0	
Concernent and the	<u> </u>	100	>
Show only latest version Description Dependencies : None The r_bsp package provides a foundat startup code, iodefines, and MCU info that make up the r_bsp package. The	rmation for different bo	ards. There are 2 fol	lders
ownload more software components Configure general settings	Click here.		



The latest RX Driver Package is displayed. Check the box and download it.

e ²			_	
FIT Module Download				
Select the FIT modules for download				
Title RX Family RX Driver Package Ver.1.22 Check this box.	Document No. R01AN4873EJ0122	Rev. Rev.1.22	Issue date 2019-09-10	Select All Deselect All
Filtered: ✓ Show RX Driver Package only Module Folder Path: C:\Users\dummy\.eclipse\org.eclipse.platform	_download\FITMoc ^{tt} Click t	his button.	Download	Browse

If the FIT modules are still grayed out after the download completes, upgrade the FIT modules used by the project to the latest version.

On the context menu, click "Change version".

type filter text	
 ✓ ➢ Startup ✓ ➢ Generic ♀ ➢ Drivers 	Click here.
V 🗁 Memory	
💓 r_flash_rx	
🗸 🗁 Communic	Change version
♥ r_sci_rx ♥ ➢ Timers ♥ r_cmt_r	Remove Reset to default
 ✓ ➢ Middleware ✓ ➢ Generic 	Download and import sample projects



Click the "Next" button.

e ² Change Version					\times
Version Selection					
Select available ver	sion				
Component name:	r flash rx				
Current version:	4.10				
Available versions:	4.20				~
			Click this	button	
	< Back	Next >	Finish	Cance	el



Click the "Finish" button.

	— 🗆 X
Setting Overview	
The following settings will be added or removed	
Setting There are no differences	Status
There are no differences	
<	>
	Click this
? < Back Next > Finish	Cancel

Click the "Yes" button.

e ² Change Version	×
Confirm to change version and proceed to generate code	
	Click this button.
Yes	No



6.1.5 SCI FIT Module Not Displayed in "New Component" Dialog Box

In the "New Component" dialog box, click "Configure general settings...".

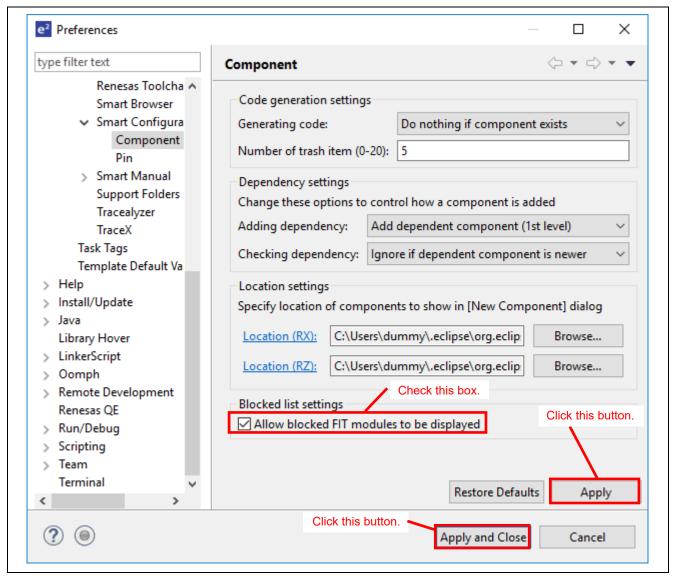
2 New Component		—) ×
oftware Component Selectio	n		
Select component from those ava	ailable in list		
Type All			~
Function All			~
Filter			
Components	Туре	Version	^
🖶 Ports	Code Generator	1.8.0	
🖶 Programmable Pulse Genera	tor Code Generator	1.2.0	
🖶 PWM Mode Timer	Code Generator	1.6.0	
🖶 r_bsp	FIT	5.20	
🖶 r_byteq	FIT	1.80	
or_can_rx	FIT	3.10	
r_cmt_rx	FIT	4.20	
🖶 r_datfrx_rx	FIT	2.01	
🖶 r_dmaca_rx	FIT	2.20	
· · · · · · · · · · · · · · · · · · ·	FIT.	2.20	>
Show only latest version			
Description			
This software component gener	ates two units (unit 0, unit 1)	of an on-chin 8-hit	
timer (TMR) module that comp			
channels.			
			\vee
Download more software compo	nents		
Configure general settings			
	Click here.		
? Kack	Next >	Finish C	ancel



Check the box next to "Allow blocked FIT Modules to be displayed".

Click the "Apply" button.

Click the "Apply and Close" button.





6.2 FAQ

6.2.1 Q: How do I change the device?

The example below shows how to modify the project for an RX65N MCU with 2 MB of ROM to work on an RX65N MCU with 1.5 MB of ROM.

In Project Explorer, display the context menu of the target project.

Click "Change Device".



	New	>
	Go Into	
	Open in New Window	
	Сору	Ctrl+C
ĥ	Paste	Ctrl+V
×	Delete	Delete
	Source	>
	Move	
	Rename	F2
èn	Import	
4	Export	
	Build Project	
	Clean Project	
ை	Refresh	F5
\$	Close Project	
	Close Unrelated Projects	
	Build Targets	>
	Index	>
	Build Configurations	>
	Run As	>
	Debug As	>
	Profile As	>
	Team	>
	Compare With	>
	Restore from Local History	
	MISRA-C Click "Change De	evice".
	Save build settings report	
	Change Device	
*	Run C/C++ Code Analysis	
P	System Explorer	
65.	Command Prompt	
	Configure	>
	Properties	Alt+Enter



Select the device to change to.

After making your selection, click the "Next" button.

e ² Refactoring				×
Change Device Select the new device for r01an3681_rx65	in_flash			
Current: R5F565NEDxFC_DUAL				
Target Device: R5F565NCDxFC_DUAL			Unlock Dev	 ices
		Click here to sele	ct a device.	
	Click the "Next" button.			
?	< Back Next >	Finish	Cance	ł



Firmware Update Sample Program with Dual Bank Function, and Flash Module and SCI Module Firmware Integration Technology

A warning is displayed. Click the "Next" button to continue.

² Refactoring		×
hange Device Review the information provided in the list below. Click 'Next >' to view the next item or 'Finish'.		
ound problems	۶	} û
1 Target device is not supported by Smart Configurator		
^b This change cannot be undone. Please make sure you backup this project before continuing.		
No context information available		
Click the "Next" button.		
? < Back Next > Finish	Cance	I



Click the "Finish" button.

e ² Refactoring	– 🗆 X
Change Device The following changes are necessary to perform the refactoring.	
Changes to be performed	
 ✓ ✓ ✓ Mean Change Device for r01an3681_rx65n_flash ✓ ✓ Mean Configurations 	
 r01an3681_rx65n_flash HardwareDebug Real Build Settings Project Files 	
No preview available]
	Click this button.
? < Back Next >	Finish Cancel



Change the selected device in Smart Configurator.

In Project Explorer, double-click r01an3681_rx65n_flash.scfg.

Click the "Board" tab to switch to it.

Select the same device selected previously here as well.

Device se	lection	è 🕹
Board:	Custom User Board	~
Device:	R5F565NEDxFC	(Device mismatched! Current device of project is R5F565N
	Download more boards	Click here to select a device.
	Click this tab.	

A dialog box to confirm the device change appears. Click the "Save and continue" button.

e ² Con	firm device change	×	
?	Changing the device will refresh all conf Configurations that are incompatible wi		
	Do you want to continue?	Click the "Save and continue" button.	
	Save and continue	e Continue Cancel	



Click the "Generate Code" button.

巅 *r01an36	81_rx65n_flash.scfg ⊠	
Device s	election	💽 🗎
Device se	lection	<u>ت</u> در
Board:	Custom User Board 🛛 🗸	Click the "Generate Code" button.
Device:	R5F565NCDxFC	
	Download more boards	
Overview B	oard Clocks Components Pins Interrupt	S

The settings for the RPFRAM2 section added to the RAM area have been deleted. Refer to 3.4.3, Changes to "C/C++ Build" Settings, and add the RPFRAM2 section.

When changing the SCI channel used, refer to 3.4.1(3), Changes to SCI API settings, 3.4.2, Pin Settings, 5.3.2, Constants, and 5.3.5, Functions.



6.2.2 Q: How can I change the endianness to big endian?

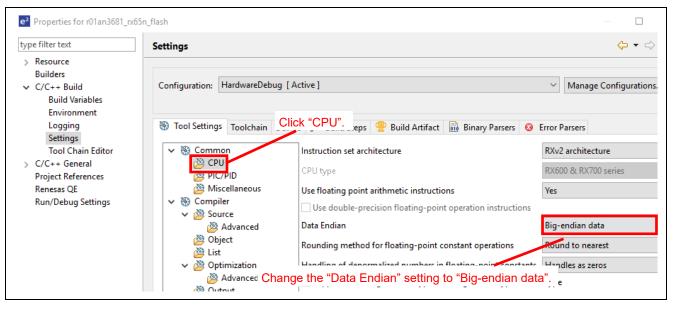
For this, settings for "C/C++ Build" and "Debug Configurations" need to be changed.

Changing the C/C++ configurations:

- 1. Open the "Properties" window of the project.
- 2. Select "C/C++ Build" >> "Settings" in the "Properties" window.
- 3. Select "Common" >> "CPU" in the "Tool Settings" tab.
- 4. Change the "Data Endian" setting to "Big-endian data".

The HardwareDebug configuration and the Release configuration need to be changed.

Selecting "All configurations" changes both configurations at a time. Refer to 3.4.3, Changes to "C/C++ Build" Settings for the detailed procedure.



Clean the project with the "Clean" menu and then build the project with the "Build" menu. They can be done in the HardwareDebug configurations and the Release configurations, respectively.



Changing the debug configurations:

- 1. Select "Run" >> "Debug Configurations".
- 2. Click the debug configuration to change under "Renesas GDB Hardware Debugging".
- 3. Click the "Debug Tool Settings" tab in the "Debugger" tab.
- 4. Change the "Endian" setting under "Memory" to "Big endian".

Refer to 4.3, Debug Configuration for the detailed procedure.

🖹 🗎 🗶 🖻 🎲 🗸	Name: r01an3681_rx65n_flash HardwareDebug Image: Startup Image: Startup Image: Startup <t< th=""></t<>				
type filter text					
C C/C++ Application C C/C++ Remote Application	Debug hardware: E2 Lite (RX) V Target	Device: R5F565NE_DUAL			
C GDB Hardware Debugging	GDB Settings Connection Settings Debug Too	l Settings			
GDB Simulator Debugging (✓ 10		^		
Java Applet Java Application	Use Default IO Filename	Yes	~		
	IO Filename	\${support_area_loc}			
🛃 Launch Group	✓ General	erte "Dier En diere"			
Launch Group (Deprecated)	Rese Change the "Endian" setting to "Big Endian".				
Remote Java Application	✓ Memory				
✓ C [™] Renesas GDB Hardware Deb C [™] r01an3681_rx65n_flash H C [™] r01an3681_rx72m_flash I	Endian	Big Endian	×		
	Internal Flash Memory Overwrite	[0]			
	External Memory Areas	[0]			
🖻 Renesas Simulator Debuggi	Work RAM Start Address	0x1000			
	Work RAM Size (Bytes)	0x500			



6.2.3 Q: How can I change the interface to an interface other than the SCI?

When changing the interface, functions in main.c and the pin setting function generated by the Smart Configurator need to be changed.

Table 6.1 lists the functions to be changed the settings. Change values of these functions to values appropriate to the interface used. sci_callback is the callback function to detect completion of a transmission. Change the method to detect completion of a transmission according to the interface. If there is no method to detect completion of a transmission, add necessary processing such as inserting a wait processing in the send_string_sci function or in the point where the send_string_sci function is called.

Use the smart configurator to perform the pin setting for the FIT module. The setting can be done in the "Properties" in the "Component" tab.

Function Name	Application	File
main	Initialization of the interface and reception other than XMODEM protocol.	main.c
sci_callback	Detection for completion of a string transmission	main.c
send_string_sci	String transmission	main.c
send_byte_xm	1-byte transmission in XMODEM protocol. The transmission result (success or error) is returned as the return value.	main.c
recv_byte_xm	1-byte reception in XMODEM protocol. Timeout occurs after 10 seconds elapses. The reception result (success, reception error, or timeout) is returned as the return value.	main.c
R_SCI_PinSet_SCI8	Performing the pin setting	r_sci_rx_pinset.c

 Table 6.1 Functions to be Changed the Settings

6.2.4 Q: How can I erase the option-setting memory?

Perform the following procedure with the Renesas Flash Programmer.

- 1. Click the "Operation Setting" tab.
- 2. Select "Command" >> "Erase".
- 3. Specify "Chip Erase" for the "Erase Option".
- 4. Uncheck the following items: "Program", "Checksum", and "Verify".
- 5. Click the "Operation" tab.
- 6. Click the "Start" button.
- 7. Now the option-setting memory is erased.

Note that the data flash memory and the code flash memory are also erased at the same time as the optionsetting memory. If "Chip Erase" is not selected as the erase option, the Renesas Flash Programmer does not erase the option-setting memory.

Refer to the RX65N Group, RX651 Group User's Manual: Hardware and RX72M Group User's Manual: Hardware for details on the option-setting memory.



6.2.5 Q: How can I specify to read the other bank of the startup bank?

In the debug perspective, select "Window" >> "Show View" >> "Memory". In the Memory Monitors pane, click the "Add Memory Monitor" button to open the "Memory Monitor" dialog. Enter the address for the other bank of the startup bank in the "Memory Monitor" dialog.

Also, confirm that in the debug configuration "Debugger" >> "Debug Tool Settings" >> "Debug program that overwrites on-chip program ROM" is set to "Yes". If it is set to "No", the overwritten content will not be updated in the debugger.

6.2.6 Q: How can I check the bank currently specified as the startup bank?

The startup bank can be checked by reading the BANKSEL register immediately after the startup. The register value changed in the BANKSEL register indicates the startup bank after a reset.

Refer to the RX65N Group, RX651 Group User's Manual: Hardware and RX72M Group User's Manual: Hardware for details on the BANKSEL register.



6.2.7 Q: How can I import the sample program into CS+?

When using CS+, follow the steps below to import the sample program into CS+.

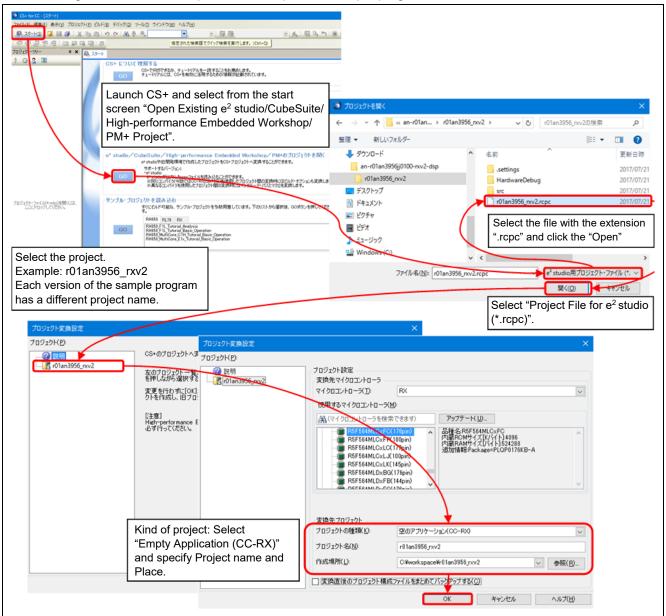


Figure 6.1 Importing a Project into CS+



7. Others

7.1 Notes on Using the Evaluation Version of C/C++ Compiler Package for RX Family

When using the evaluation version of C/C++ compiler package for RX Family, the evaluation period and usage limitations apply. When the evaluation period expires, the size of linkable object is reduced to 128 KB or less and this may cause the incorrect generation of the load module.

For details, refer to the following software tool page for evaluation versions on the Renesas website:

https://www.renesas.com/en-us/products/software-tools/evaluation-software-tools.html



Revision History

		Description	
Rev.	Date	Page	Summary
1.00	Oct. 2, 2017	—	First edition issued
1.10	Dec. 18, 2017	_	Since the flash FIT module Rev 3.2 bundled with Rev 1.00 was the evaluation version, it was updated.
1.20	Sep. 6, 2019	-	Added support for RX72M Group. Changed integrated development environment to e ² studio version 7.5.0.
			Changed description of FIT module configuration to procedure using Smart Configurator.
			Changed description of changing ROM capacity to procedure using functionality of e ² studio.
			Changed debugger hardware to E2 Emulator Lite.



General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power is supplied until the power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a systemevaluation test for the given product.

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