

## APPLICATION NOTE

# **RISC-V MCU Smart Configurator**

User's Guide: IAREW, SEGGER Embedded Studio

## Introduction

This application note describes the basic usage of the RISC-V MCU Smart Configurator (hereafter called the Smart Configurator), and the procedure for importing its output files to IAR Embedded Workbench and SEGGER Embedded Studio.

References to the Smart Configurator and Integrated Development Environment (IDE) in this application note apply to the following version.

- IAR Embedded Workbench for RISC-V V3.30.1 and later
- SEGGER Embedded Studio 8.10 and later
- RISC-V Smart Configurator V1.1.0 and later

Target device and support compiler

Refer to the following URL for the range of supported devices:

https://www.renesas.com/software-tool/risc-v-smart-configurator



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3.4.6 4. Sett 4.1 Bo 4.1.1 4.1.2 4.1.3 4.1.4 4.2 Cl 4.3 Sy 4.4 So 4.4.1 4.4.2 4.4.3 4.4.3 4.4.4	Configuration Problems View	15 16 16 16 17 18 19 20 21 21 22 25 26
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## 1. Overview

### 1.1 **Purpose**

This application note describes the basic usage of the RISC-V MCU Smart Configurator (hereafter called the Smart Configurator), and the procedure for importing its output files to IAR Embedded Workbench / SEGGER Embedded Studio.

Refer to the User's Manual of IAR Embedded Workbench / SEGGER Embedded Studio for how to use them.

## 1.2 **Features**

The Smart Configurator is a utility for combining software to meet user's needs. It handles the following three functions to support the embedding of drivers from Renesas in user's systems: importing middleware in the form of SW integration feature, generating driver code, and making pin settings.

## 1.3 **Software Components**

The Smart Configurator supports three types of software components: Code Generator, Graphical Configurator, and RISC-V MCU Software Integration System:

- <u>Code Generator drivers (DTC, A/D Converter, Interrupt Controller, etc.)</u> The Code Generator drivers is a control program for peripheral functions of microcomputer such as DTC, A/D converter, Interrupt Controller, etc. It is convenient to embed a software component using code generation function.
- (2) <u>RISC-V MCU Software Integration System (BSP, etc.)</u> The RISC-V MCU Software Integration System module is a software component of drivers, middleware SW that provides a simple GUI for generating code.



## 2. Installing and Uninstalling the Smart Configurator

## 2.1 Installing the Smart Configurator

Download the Smart Configurator from the URL below.

https://www.renesas.com/software-tool/risc-v-smart-configurator

After activating the installer, install the Smart Configurator by following the procedure of the installer. User will require administrator privileges to do this.

## 2.2 Uninstalling the Smart Configurator

To uninstall the Smart Configurator, please select "Smart Configurator for RISC-V MCU" from [Apps & features] in the control panel.



## 3. Operating the Smart Configurator

### 3.1 **Procedure for Operations**

Figure 3-1 Operating Procedure, shows the procedure for generating IAR / SEGGER Embedded Studio related files using Smart Configurator and loading it into IAR Embedded Workbench / SEGGER Embedded Studio. For the operation of IAR Embedded Workbench / SEGGER Embedded Studio, refer to relevant document of IAR / SEGGER Embedded Studio.



Figure 3-1 Operating Procedure



## 3.2 **Starting the Smart Configurator**

Select [Smart Configurator for RISC-V MCU Vx.x.x] of [Renesas Electronics Smart Configurator] from the Windows start menu. The main window of the Smart Configurator will be starting.

Note: Please replace Vx.x.x with user's version.



Figure 3-2 Starting of Smart Configurator



## 3.3 Creating and Loading a Configuration File

Smart Configurator saves and refers to the configuration file (\*. scfg) the configuration information of the microcontroller, build tool, peripheral function, pin function etc. used in the project.

#### 3.3.1 Creating a New Smart Configurator Configuration File

On the main window, click the 📸 [New Configuration File] button to display the [New Smart Configuration File] dialog box.

- (1) In [Platform:] panel, select the Device or Board.
- (2) In [Toolchain:] panel, select the toolchain.

To use the IAR compiler, select [IAR RISC-V Toolchain].

To use the SEGGER compiler, select [SEGGER RISC-V Toolchain].

To use the LLVM compiler, select [LLVM for RISC-V Toolchain].

- (3) In [File name:], enter the file name.
- (4) Confirm [Location:], To change the location, please click [Browse] and select the save destination.

Note:

For IAR RISC-V Toolchain, the \*.eww, \*.ewp, \*.ewd, main.c and buildinfo.ipcf files will be generated to this location after clicking "Generate Code" button. The \*.eww, \*.ewp, \*.ewd and main.c files will be generated only for the first-time code generation, while the buildinfo.ipcf file will be generated always for each time code generation.

For SEGGER RISC-V Toolchain, the \*\_MemoryMap.xml, SEGGER\_Flash\_RV32.icf, \*. emProject, main.c files will be generated to this location after clicking "Generate Code" button. The \*\_MemoryMap.xml, SEGGER\_Flash\_RV32.icf and main.c files will be generated only for the first-time code generation, while the \*. emProject file will be generated always for each time code generation.

(5) Click [Next] to select the project template.

"Bare Metal – Blinky" is available for selected Board in step (1).

(6) Click [Finish] to create the configuration file.

Kow Smart Configuration File	- 🗆 X	
Smart Configuration Settings Select platform and toolchain sett	ings for the new configuration file	Image: Several configuration file       -       -       ×         Smart Configuration Settings       -       -       ×         Choose a project template for the new configuration file       -       -       -
Category: RISC-V MCU Platform: (1) type filter text > Board > Device > G021 > G021 - 16pin > G021 - 24pin > G021 - 32pin > G021 - 48pin R9A02G0214CNE	Toolchain: (2) > IAR RISC-V Toolchain SEGGER RISC-V Toolchain CLLVM for RISC-V Toolchain	Project template selection 5 Bare Metal - Minimal Bare metal project that includes BSP. This project will initialize clocks, pins, drivers and the C runtime environment. Bare Metal - Blinky Bare metal project that includes BSP and will blink LED if available. This project will initialize clocks, pins, drivers and C runtime environment.
Download more boards ROM size: 128 KB, RAM size: 16 KB File name: Smart_Configuration_Ex Location: C:/Users/yang-xiaolin/st < Back(5	ample (3)	(6) < Back Next > Finish Cancel

Figure 3-3 Create a Configuration File

(7) Add driver component, configure the setting, generate code, and save the project.



## 3.3.2 **Opening an Existing Configuration File**

On the main window, click the 🗁 [Opening an Existing Configuration File] button to display the [Open] dialog box. Select the (\*. scfg) file and click [Open].

👩 Open						×
$\leftarrow \rightarrow \cdot \cdot \uparrow$	> This PC	→ Local Disk (C:) → sr	martconfigurator > workspace	~ Ō	Search workspace	م
Organize 🔻	New folder					- 🔳 🕐
Pictures		^ Name	^	Date modified	Туре	Size
📑 Videos		Smart_Confi	gurator_Example.scfg	10/15/2018 1:31 PM	SCFG File	1 KB
🏪 Local Disk	(C:)					
i Network						
		<b>~</b>				
	File <u>n</u> ame:	Smart_Configurator_Exa	ample.scfg	~	Smart Configuratio	n files 🛛 🗸
					<u>O</u> pen	Cancel:

Figure 3-4 Opening an Existing Configuration File



## 3.4 Window

The main window is displayed when the Smart Configurator is started. The configuration of the window is shown in Figure 3-5, Main Window.

Big Smart Configurator (1) Tile Workow Help (2)	(3) -
Smart Configuration Examples.cfg ×	I wante a second a
General Information     General Information	Generate Code: Generate Repor
Contraction     Contracti	
Current Configuration	P401 9 90 20 20 20 20 20 20 20 20 20 20 20 20 20
Selected board/device R9A920214C4E (ROM size 128 KB, RAM size 16 KB, Fino count: 48) Generated location (RVOECL (LOC) suchamorgen Edul_ Selected components: Component Version Configuration @ Board Support Packagesv100. 1.00 r_bip(used) Overview Board Clocks System Components Pars Interrupt: Compose	
Smart Configurator Output	Configuration Problems
(5)	Description Type (6)

Figure 3-5 Main Window

- (1) Menu bar
- (2) Main toolbar
- (3) Smart Configurator view
- (4) MCU/MPU Package view
- (5) Console view
- (6) Configuration Problems view



#### 3.4.1 Main Menu

File Window Help

Table 3-1, Main Menu Items, lists the items of the main menu.

#### Table 3-1. Main Menu Items

Menu		Details				
File	New	The dialog box [New Smart Configurator File], which is used to create a new project, is displayed.				
	Open	The dialog box [Open], which opens an existing project, is displayed.				
	Save	Saves a project with the same name.				
	Restart	Smart Configurator is restarted.				
	Exit	Execution of the Smart Configurator is terminated.				
Window	Preference	The dialog box [Preference], which is used to specify the properties of the project, is displayed.				
	Show View	The dialog box [Show view], which is used to set the view of the window, is displayed.				
Help	Help Contents	The help menu is displayed.				
	Home Page	Open the home page of the Smart Configurator on the Renesas Electronics website.				
	Release Notes	Open the release note of the Smart Configurator on the Renesas Electronics website.				
	Tool News	Open the tool news of the Smart Configurator on the Renesas Electronics website.				
	API Manual	Open the API manual of the Smart Configurator on the Renesas Electronics website.				
	About	The version information is displayed.				

#### 3.4.2 **Toolbar**

# 📩 🗁 🔡

Some functions of the main menu are allocated to the buttons on the toolbar. Table 3-2 Toolbar Buttons and Related Menu Items, shows the description of those tool buttons.

Table 3-2. Toolbar Buttons and Related Menu Items

Toolbar button	Related menu item
	[File]→[New]
	[File]→[Open]
	[File]→[Save]



## 3.4.3 Smart Configurator View

The Smart Configurator view consists of seven pages: [Overview], [Board], [Clocks], [System], [Components], [Pins], and [Interrupts]. Select a page by clicking on a tab; the displayed page will be changed.

# Smart_Configuration_Example.scfg ×				° C
<b>Overview information</b>			Generate Code	Generate Report
- General Information				•
Overview         Get an overview of the feature         Get an overview of the feature         Smart Configurator.         Image: State of the feature         Introduction to Smart Configurator.         Introduction to Smart Configurator.         Image: State of the feature         Introduction to Smart Configurator.         Image: State of the feature         Introduction to Smart Configurator.         Image: State of the feature         Image: State of the	g <u>urator</u> latest rele CNE (ROM	Software Components Middleware & Drivers Device Drivers MCU Hardware ase. size: 128 KB, RAM size: 16 KB, Pin co	Smart Configurator	
Selected components: Component © Board Support Packages v1.00	Version	Configuration r bsp(used)		
- Dourd Support Fackages V1.00	1.00	1_05P(05C0)		
Overview Board Clocks System Comp	onents Pin	s Interrupt		

Figure 3-6 Smart Configurator View



#### 3.4.4 MCU/MPU Package View

The states of pins are displayed on the figure of the MCU/MPU package. The settings of pins can be modified from here.

Three types of package view can be switched among [Assigned Function], [Board Function] and [Symbolic Name].

- [Assigned Function] displays the assignment status of the pin setting.
- [Board Function] displays the initial pin setting information of the board. The initial pin setting
  information of the board is the pin information of the board selected by [Board:] on the [Board] page
  (refer to "chapter 4.1 Board Setting" and "chapter 4.5.6 Pin setting using board pin configuration
  information").
- [Symbolic Name] displays the symbolic name defined by user for the pin. Macro definition for the symbolic name will be generated together with port read or write functions in Pin.h file.



Figure 3-7 MCU/MPU Package View



#### 3.4.5 Console View

The Console view displays details of changes to the configuration made in the Smart Configurator or MCU/MPU Package view.



Figure 3-8 Console View

#### 3.4.6 Configuration Problems View

The Configuration Problems view displays the details of conflicts between driver used interrupts, configured peripherals, used pins, used settings.

🔝 Configuration Problems 🛛		
40 errors, 0 warnings, 2 others		
Description	Туре	
> 😣 Interrupt (5 items)		
> 📀 Peripheral (7 items)		
> 🔇 Pin (26 items)		
> 😣 Setting (4 items)		

Figure 3-9 Configuration Problems View



## 4. Setting of Peripheral Modules

User can select peripheral modules from the Smart Configurator view.

## 4.1 **Board Setting**

User can change the board and device on the [Board] page.

#### 4.1.1 Selecting the Device

Click on the [ \_\_\_\_ ] button to select a device.

戀 Smart_Co	onfigurator_Ex	ample.so	:fg ×					- 0
Device s	election				Gen	😼 erate Code	6	) e Report
Device se	election							2 4
Board:	Custom Use	r Board			$\sim$			
Device:	R7F101GLG	кFB						
	Download m	ore boa	rds	-				
		-	_	- 1	-			
Overview E	Board Clocks	System	Components	Pins	Interrupt	1		

Figure 4-1 Selecting the Device

Note: Device change is not reflected to the device (micro controller) of IAR project.

The following message is displayed when changing the device. For each button operation, refer to "Table 4-1 Device Change Confirmation Operation List".



Figure 4-2 Confirm Device Change

Button	Operation explanation
Yes	Change to the selected device.
No	It does not change the device.
Save and continue <sup>(Note*1)</sup>	After saving the current configuration contents to the configuration file, change to the selected device.
Continue <sup>(Note*1)</sup>	Changes to the selected device without saving the current configuration contents to the configuration file.
Cancel <sup>(Note*1)</sup>	It does not change the device.

Note \*1: Smart Configurator view is marked with dirty \*.



#### 4.1.2 Selecting the Board

Click on the [ ] to select a board from the list. After board selection, the pins, clock and system setting will be automatically configured according to board connection.

Smart_Configuration_Example.scfg ×	- 0
Device selection	Generate Code Generate Report
Device selection	ම ක්
Board: Custom User Board	
Device: R9A02G0214CNE	
Download more boards	
Overview Board Clocks System Components Pins Interrupt	

Figure 4-3 Selecting the Board

The following items are changed according to the configuration of the selected board.

- Pin assignment (Initial pin setting)
- Frequency of the main clock
- Frequency of the subsystem clock
- Target device
- On-chip debug operation setting and emulator setting

If user change the board, the message shown in "Figure 4-2" or the following message will be displayed. For each button operation, refer to "Table 4-2 Board Change Confirmation Operation List".

Confirm device change	×					
Changing the device will refresh all configurations. Configurations that are incompatible with the new device may be removed.						
Do you want to continue?						
Save and continue Continue Cancel						

Figure 4-4 Confirm Board Change

#### Table 4-2. Board Change Confirmation Operation List

Operation explanation					
After saving the current configuration contents to the configuration file, change to the					
selected device.					
Changes to the selected device without saving the current configuration contents to					
the configuration file.					
It does not change the device.					

Note: Depending on the board selected, the device will change, Device change is not reflected to the device (microcontroller) of IAR project.



#### 4.1.3 Exporting Board Settings

The board settings can be exported for later reference. Follow the procedure below to export the board settings.

- (1) Click on the [ 44 (Export board setting)] button on the [Board] tabbed page.
- (2) Select the output location and specify a name (Display Name) for the file to be exported.

⊜ Smart_C	onfiguration_Example.scfg ×	• 8
Device s	selection	Generate Code Generate Report
Device se	election	(1) 社会
Board:	Custom User Board V	
Device:	R9A02G0214CNE	
	Download more boards	
Overview	Board Clocks System Compo	nents Pins Interrupt

Figure 4-5 Exporting Board Settings (bdf Format)

#### 4.1.4 Importing Board Settings

Follow the procedure below to import board settings.

- (1) Click on the [ 🚵 (Import board setting)] button and select a desired bdf file.
- (2) The board of the imported settings is added to the board selection menu.

Smart_Configuration_Example.scfg ×	° 0
Device selection	Generate Code Generate Report
Device selection	(1) 🔤 🖾
Board: Custom User Board ~	
Device: R9A02G0214CNE (2)	
Download more boards	
Overview Board Clocks System Components Pins Interrupt	

Figure 4-6 Importing Board Settings (bdf Format)

Once a board setting file is imported, the added board is also displayed in the board selection menu of other projects for the same device group.



## 4.2 Clock Settings

User can set the system clock on the [Clocks] page. The settings made on the [Clocks] page is used for all drivers.

Follow the procedure below to modify the clock settings.

- (1) Specify the operation mode and VCC setting.
- (2) Select the clocks required for device operations on the board (the high-speed on-chip oscillator is selected by default).
- (3) Specify the frequency of each clock in accordance with the board specifications (note that the frequency is fixed for some internal clocks).
- (4) For the multiplexer symbol, select the clock source for the output clocks.



Figure 4-7 [Clocks] Page



## 4.3 System Settings

You can set the debug interface pins at [System] tabbed page.

There are 1 type of debug interface available: cJTAG

You can check the pins configured from Console message or MCU/MPU Package view.

*Smart_Configuration_Example.scfg ×	MCU/MPU Package ×	
System  Configuration Generate Code Generate Report	Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image: Specific text     Image: Specific text       Image: Specific text     Image	*
• On-chip debug setting     Debug interface setting     Ounused     Ounused	24     P109       23     P108       22     P306       21     P207	
	RENESAS         20         P305           19         P304	
	R9A02G021 R9A02G0214CNE	
Coverview Board Clocks System Components Pins     >>	Ν Μ 4 10 0 00 00 00 00 00 00 00 00 00 00 00 0	•
Console ×		
Smart Configurator Output	0 items	
M05000001: Pin 15 is assigned to TCKC M05000001: Pin 16 is assigned to TMSC	Description	Т

Figure 4-8 Smart Configurator [System] Page Setting



## 4.4 **Software component settings**

Drivers and middleware can be combined as software components on the [Components] page. Added components are displayed in the tree view at the left of the page.

Image: Smart_Configurator_Example.scfg ×			- 8
Software component configura	tion G	enerate Code	🕒 Generate Report
Components       ≥       ≥       ≥       E         Startup              V @ Startup         Generic            *                 *	Configure Tree view for components		^
	<		>
Overview Board Clocks System Compo	onents Pins Interrupt		

#### Figure 4-9 [Components] Page

#### 4.4.1 Switching Between the Component View and Hardware View

The Smart Configurator provides two tree view: Component View and Hardware View. Please switch two views by clicking the following icons:

- (1) Click on the [ 5 (Component View)] icon. The tree view will display the components by component category.
- (2) Click on the [ [] (Hardware View)] icon. The tree view will display the components in a hardware resource hierarchy.



Figure 4-10 Switching to the Hardware View



### 4.4.2 Adding a Software Component

The Smart Configurator provides two methods for adding a new component:

- a. Click on the [ (Add component)] icon.
- b. On Hardware Tree, double-click on a hardware resource node.

The following describes the procedure for adding a component by clicking on the [\* (Add component)] icon. a-1. Click on the [\* (Add component)] icon.

💮 Smart_Configurator_Example.scf	g 🛙		
Software component confi	🖲 Generate Code	📄 Generate Report	
Components Jª	Configure		(i)
A-1.	iomponents Pins In	terrupt	

Figure 4-11 Adding a Component

- a-2. Select a component from the list in the [Software Component Selection] page of the [New Component] dialog box (e.g. A/D Converter).
- a-3. Check that [Type] for the selected component is [Code Generator].
- a-4. Click on [Next].

	🕲 New Co	mponent				-		×
	Software Co			and the second				
	Select com			#				
	Category All							~
	Function	All						~
	Filter							
	Compon	ents	Short Name	Туре	Versi			^
a-2	⊞ A/D C		a-3.	Code Generator				
a-2.		Support Packages v1.00	r bsp	RISC-V MCU S	1.00			
	Comp		- '	Code Generator	1.0.0			
	D/A C	onverter		Code Generator	1.0.0			
	# Delay	Counter		Code Generator	1.0.0			
	# Divide	r Function		Code Generator	1.0.0			
	# Extern	al Event Counter		Code Generator	1.0.0			
	HIC Co	mmunication (Master mode)		Code Generator	1.0.0			
	HIC Co	mmunication (Slave mode)		Code Generator	1.0.0			
	# Input	Pulse Interval/Period Measure		Code Generator	1.0.0			
	🖶 Input	Signal High-/Low-Level Width		Code Generator	1.0.0			
	🖶 Intern	upt Controller		Code Generator	1.0.0			
	# Interv	al Timer		Code Generator	1.0.0			
	🖶 Key In			Code Generator	1.0.0			
		hot Pulse Output		Code Generator				
	# Ports			Code Generator	1.0.0			~
	Show o Descriptio	nly latest version						
		'' og to digital (A/D) converter is fu		ala a fara da da altat	al stands			
	The analo	ig to digital (A/D) converter is fu	nction for converting ar	alog inputs to digi	tai signais.			Ĵ
	Download	RISC-V MCU Software Integratic	on System modules					
	Configure	general settings						
	_			a-4.				
	?			< Back	Next >	Finish	Car	icel

Figure 4-12 Adding a Code Generator Component



- a-5. Specify an appropriate configuration name in the [Add new configuration for selected component] page of the [New Component] dialog box or use the default name (for e.g., Config\_ADC).
- a-6. Select a hardware resource or use the default resource (for e.g., ADC).
- a-7. Click on [Finish].

New Component	_	
Add new configuration for selected component		-
A/D Converter a-5. Configuration name: Resource: a-6. ADC		~
0.7		
? < Back Next > Finish		Cancel

Figure 4-13 Adding a Component

To add a component on Hardware Tree directly, please use the following procedure:

- b-1. Click on the [ 🛃 (Hardware View Menu)] icon. The tree will display in a hardware resource hierarchy.
- b-2. Double-click on a hardware resource node (for e.g., A/D Converter) to open the [New Component] dialog box.
- b-3. Select a component from the list (for e.g., A/D Converter) to add a new configuration.
- b-4. Follow the same procedure as above "adding a component by clicking adding icon" step a-3 to a-7.

	💰 Smart Configurator								_		×
	File Window Help	👩 New Co	mponent					×			
		Software Component Selection									i 😭 😼
			•				1				
	*Smart_Configuration_Exa	Select comp	ponent from	those available	e in list					MCU/I	MPU
	Software componen						et	oort		<b>P B</b>	
	Components 🖮 🖬 🖻 🗉	Category /							^		
b-	1. 🔬 👘	Function A	All					$\sim$			
	type filter text	Filter									
	>	Componer	nts ^	_	Short Name	Type	Vers	i			
	Realtime Clock - 3	#A/D Con	verter			Code Gene	rat 1.0.0	) 1	2		
	Watchdog Timer			,					-		
	🗀 Independent Watch							1.	nt		
	Serial Array Unit										
	> Serial Interface IICA										
	Serial Interface UAF										
b-2	<ol> <li>Remote Control Sic</li> <li>A /D Convertee</li> </ol>		ly latest vers	sion							
	<ul> <li>A/D Converter</li> <li>B-Bit D/A Converte</li> </ul>	Description									
	> Comparator			A/D) converter i	s function for	converting analog i	inputs to	^			
		digital sign	hals.					$\sim$	$\sim$		
	< >	Configure o	eneral settir	nas				,	•		
	Overview Board Clocks Sys	<u>conigure g</u>	<u>eneral secon</u>							► Legend	
	Console									7	8 - 0
	Smart Configurator Output										
	M04000001: File genera	(?)		< Back	Next >	Finish	Cancel				
	M0400001: File genera	(f)		< DdCK	Next >	FINISH	Cancer				
	M04000001: File genera										
	M04000001: File genera M04000001: File genera										
	M04000001: File genera										
	M04000001: File genera	ted:src\sm	c_gen\gene	eral\r_cg_a							
	M04000001: File genera	ted:src\sm	c_gen\gene	eral\r_cg_a(`							
	< c			>	<						>

Figure 4-14 Adding a Code Generator Component to the Hardware View



#### **Removing Software Component**

Follow the procedure below to remove a software component or multiple components from a project.

- (1) Select a software component or multiple components (press and hold CTRL key while selecting the next component) on the Components tree.
- (2) Click on the [ (Remove component)] icon.

Components 🚵 🛃 🎝 🕀 🕀	Components 🖻 🛃 🎘 🕀 🕀		
(2) <b>1</b>			
type filter text	type filter text		
✓ 🧁 Startup	🗸 🔁 Startup		
V 🗁 Generic V 🗁 Generic			
💣 r_bsp			
✓	✓		
✓	✓		
(1) Config_RTC	(1) Config_RTC		
Config_TAU0_0	Config TAU0 0		
Config_TKB0_TKB1	Config_TKB0_TKB1		
Config_TRD0_TRD1	Config_TRD0_TRD1		
✓  → A/D converter	Y 🧽 A/D converter		
Config_ADC	(1) Config_ADC		

Figure 4-15 Removing a Software Component or Multiple Components

The selected software components will be removed from the Components tree.

To delete the source files previously generated for the removed components from the IAR Embedded Workbench project tree, click [ [ Generate Code)] icon.



#### 4.4.3 Setting a Code Generator Component

Follow the procedure below to set up a Code Generator configuration.

- (1) Select a Code Generator configuration from the Components tree (for e.g., A/D Converter).
- (2) Configure the driver in the [Configure] panel to the right of the Components tree. The following steps and figures show an example.
  - a. Select [10 bits] under [Resolution setting].
  - b. Select [Software trigger no wait mode] under [Trigger mode setting].
  - c. Select [ANI0] for [A/D channel selection].
  - d. Select [2112/PCLKB] for [Conversion time].
  - e. Ensure ADC\_ENDI has been configured a vector in [Interrupt] page, detailed usage please refer to 4.6 Interrupt Settings.

Smart_Configurator_Example.scfg $\times$		
oftware component configura	ion	🔂 👜
Components 🛛 🖆 🖾 🖾 🖓	Configure	0
View State S	Comparator operation setting Stop Operation	
✓ ➢ Startup ✓ ➢ Generic (2) a	Resolution setting	◯ 12 bits
<ul> <li>✓ ➢ Drivers</li> <li>✓ ➢ I/O port</li> </ul>	VREF(+) setting VCC OAVREFP	◯ Internal reference voltage
Config_PORT	VREF(-) setting © VSS O AVREFM	
(2) b.	Trigger mode setting     Software trigger no wait mode     Software trigger wait mode     Hardware trigger no wait mode     Hardware trigger wait mode     TAU0_END11	
	Operation mode setting Continuous select mode One-shot select mode A/D channel selection One-shot scan mod One-shot scan mod One-shot scan mod One-shot scan mod One-shot scan mod	
	Conversion time setting Conversion time mode Normal 1 Conversion time (2) d. 2112/PCLKB	~ ~ (44 μs)
	Conversion result upper/lower bound value setting © Generates an interrupt request (ADC_ENDI) when ADLL ≤ AD O Generates an interrupt request (ADC_ENDI) when ADLL < AD	

Figure 4-16 Setting of a Code Generator Driver

Generation of a code in accordance with each Code Generator configuration is enabled by default.

Right-clicking on a Code Generator configuration and then selecting the [ < Generate code ] icon changes the icon to [ Generate code ] and disables code generation for the Code Generator configuration.

To enable code generation again, click on the [ Generate code ] icon and change it to [ Generate code ].



#### 4.4.4 Changing the Resource for a Code Generator Configuration

The Smart Configurator enables user to change the resource for a Code Generator configuration (for e.g., from TAU0\_1 to TAU0\_3). Compatible settings can be ported from the current resource to the new resource selected.

Follow the procedure below to change the resource for an existing software component.

- (1) Right-click on a Code Generator configuration (for e.g., Config\_TAU0\_1).
- (2) Select [Change resource] from the context menu.



Figure 4-17 Changing the Resource

- (3) Select a new resource (for e.g., TAU0\_3) in the [Resource Selection] dialog box.
- (4) The [Next] button will be active, click on it.

Resource	Selection	_		×
Resource Sel	ection			
Select resou	rce from those available in the list			
Operation:	8 bit count mode			~
Resource:	TAU0_3			~
(3)	TAU0 1 TAU0 3 ITL000 ITL001 ITL012 ITL013			
?	(4) < Back Next > Finish		Cance	el

Figure 4-18 Components Page – Selecting a New Resource



- (5) Configuration settings will be listed in the [Configuration setting selection] dialog box.
- (6) Check the portability of the settings.
- (7) Select whether to use the listed below or default settings.
- (8) Click on [Finish].

Resource Selection		_		×
Configuration setting selection				
Configuration setting list	(7)			
Confirm setting for resource change	● Use setting below 〇	Use de	efault	
Setting	Value		Portable	^
Operation clock	СК02		Yes	
Clock source	fCLK/2		Yes	
Operation mode setting	Higher 8 bits		Yes	
Interval value (higher 8 bits)	10		Yes	
Interval unit	μs		Yes	
Interval value (lower 8 bits)	10		Yes	
Interval unit	μs		Yes	$\sim$
<				>
	(8)			
. Bask	Next > Finish		Cance	1
< Back	Next > Finish		Cance	1

Figure 4-19 Checking the Settings of the New Resource

The resource is automatically changed (for e.g., changed from TAU0\_END1 to TAU0\_END3).

🕸 *Smart_Configurator_Example.scfg 🗙				- 0
Software component configuration	n			🖲 📄 Generate Code 🛛 Generate Report
Components       Image: Components         type filter text         ✓ Image: Components         ✓ Image: Components         ✓ Image: Config_TAU0_1         ✓ Image: Config_PORT         ✓ Image: Config_PORT         ✓ A/D converter         ✓ Config_ADC	Clock setting Operation clock Clock source Operation mode setting <ul> <li>Higher 8 bits</li> </ul> <li>Interval timer setting Interval value (higher 8 bits) Interval value (lower 8 bits)</li> <li>Generates TAU0_ENDI3 when a Interrupt setting <ul> <li>End of timer channel 3 count, a Priority</li> </ul> </li>	CK02 PCLKB/2 O Lower 8 bits 10 10 counting is started generate an interrup (TAU0_ENDI: Level 15 (low) generate an interrupt (TAU0 MOD	μs × μs ×	Generate Code Generate Report  (Clock frequency: 24000 kHz) Higher and lower 8 bits (Actual value: 10)
	Priority	Level 15 (low)	~	
Overview Board Clocks System Compone	ents Pins Interrupt			>

Figure 4-20 Resource Changed Automatically



To change the configuration name, follow the procedure below.

- (9) Right-click on the Code Generator configuration.
- (10) Select [Rename] to rename the configuration (for e.g., change Config\_TAU0\_1 to Config\_TAU0\_3).



Figure 4-21 Renaming the Configuration

#### 4.4.5 Adding a RISC-V MCU Software Integration System Module

The following describes the procedure for adding a RISC-V MCU Software Integration System Module.

- (1) Click on the [ (Add component)] icon.
- (2) Select components which [Type] is [RISC-V MCU Software Integration System] from the list in the [Software Component Selection] page of the [New Component] dialog box. Two or more components can be selected by clicking with the Ctrl key pressed.
- (3) Click on [Finish].

	💰 New Co	omponent				$\times$
	Software	Component Selection				
	Select con	nponent from those availa	able in li	st		
	Category	All				~
	Function	All				~
	Filter					
	Compone	ents ^	Shor	Туре	Versi	^
$\sim$	# A/D Co	nverter	(2)	Code Generator	1.0.0	
,2 <b>)</b>	Board S	Support Packages v1.10	r_bsp	RISC-V MCU Software Integration Syst	1.10	
	#Compa	rator		Code Generator	1.0.0	
	≢D/A Co	nverter		Code Generator	1.0.0	
	#Data Tr	ansfer Controller		Code Generator	1.0.1	
	#Delay C	Counter		Code Generator	1.0.0	
	Divider	Function		Code Generator	1.0.0	
	Event L	ink Controller		Code Generator	1.0.0	
	#Externa	l Event Counter		Code Generator	1.0.0	
	#IIC Con	munication (Master m		Code Generator	1.0.1	~
	Show o	nly latest version				
	Descriptio	n				
		ncies : None				^
				or code to be built on top of. It provides s		~
		ofinoc_and_MCII informat RISC-V MCU Software Int		lifferent hoards. There are 2 folders that m	nako un	
		general settings	legratio	n system modules		
	comgute	general seconds				
				(3)		
	?		< Bac	k Next > Finish	Cance	4

Figure 4-22 Adding RISC-V MCU Software Integration System Module



## 4.4.6 Changing Version of BSP Configuration

The following describes the procedure for version change of BSP configuration.

(1) From the component tree, right-click the r\_bsp component whose version user wants to change.

# *Smart_Configurator_Example	e.scfg 🛛			
Software component con	nfiguration		🕲 Generate Code	Generate Report
Compo Jª 🕒 🕀	Configure			<b>(i)</b>
Sta 🗱 🐮 🔪	Property v 🏶 Configurations		Value	^
<ul> <li>✓ ( Startup</li> <li>✓ ( Generic</li> </ul>	# Start up select     # Control of invalid memory acce     # RAM guard space(GRAM0-1)	ess detection	Enable (use BSP startup) Disable Disabled	
💱 r_bsp 🛛 Cha	ange version	rt function(GPORT)	Disabled	
•••••••	emove eset to default	ck control function, voltage detector, and RAM parity erro	Disabled Disabled Disables	
Dov	ownload and import sample projects		Enable	
	# API functions disable		Enable	
	# Parameter check enable		Enable	
	# Setting for starting the high-sport	eed on-chip oscillator at the times of release from STOP mc	High-speed	× ×
Overview Board Clocks System	n Components Pins Interrupt			

Figure 4-23 Version Change of BSP Configuration

- (2) Select [Change Version ...] from the context menu.
- (3) In the [Change Version] dialog box, select the version you want to change. If user selects a version that the device does not support, [Selected version doesn't support current device or toolchain] will be displayed.
- (4) Click [Next].

Change Version				_		×
Version Selection						
Select available ver	rsion					
Component name:	r_bsp					
Current version:	1.00					
Available versions:	1.01					$\sim$
l	< Back	Next >	Finis	h	Cance	I

Figure 4-24 Select Version of BSP Component

(5) By version change, a list of setting items to be changed is displayed. Confirm that there is no problem and click the [Finish].



👩 Change Version	_		×
Setting Overview			
The following settings will be added or removed			
Setting There are no differences		Status	
<			>
< Back Next > Finish		Cance	I

Figure 4-25 Confirm Setting Change Item

(6) As [Confirm to change version and proceed to generate code] is displayed, if user do not have any problem, click [Yes].



Figure 4-26 Confirm Version Change

(7) The BSP component version is changed, and code generation is executed automatically.



## 4.4.7 Export Component Configuration

The current configuration can be exported as \*.xml file by clicking on the [La (Export Configuration)] button on the [Components] tabbed page.

Components 🚵 🛃 🛱 🕀	
🤋 🖏	
type filter text	
∽ 🗁 Startup	
🗸 🗁 Generic	
💣 r_bsp	
✓	
✓	
Config_TAU0_1	

Figure 4-27 Export Configuration (xml format)

## 4.4.8 Import Component Configuration

Click on the [12] (Import Configuration)] button and select an exported xml file will import component configuration.

Components	èd l <sup>a</sup> z 🖻 🕀
56 ig	😜 🗟
type filter text	
🗸 🗁 Startup	
🗸 🗁 Generic	
💣 r_bsp	
🗸 🗁 Drivers	
🗸 🗁 Timers	
💣 Config_	TAU0_1

Figure 4-28 Import Configuration (xml format)



#### 4.4.9 **Configure General Setting of the Component**

The general setting of the component, such as code generation component settings, dependency settings and location settings, can be configured inside the [Preferences] dialog.

If you want to change the settings, please click the [Configure general settings...] link on the [Software Component Selection] page displayed in the [New Component] dialog (Figure 4-12) and display the [Preferences] dialog. Or click "Preferences" of "Window" in Main Menu.

C Preferences	—	$\times$
type filter text	Component 🗢 👻 🔿	▼ 8
<ul> <li>&gt; Help Module Download</li> <li>&gt; Smart Configurator Component MCU/MPU Package Appearance Pin Errors/Warnings</li> </ul>	Backup settings Enable Backup settings Number of trash item (1-20): 5 Code Generator component settings API function output: Output all API functions according to the setting API code style: Value with macro description FIT(RX) / SIS(RL78 / RISC-V MCU) component settings Code generation behavior: Re-generate all component files	× ×
	Dependency settings Change these options to control how a component is added Adding dependency: Add dependent component Checking dependency: Ignore if dependent component is newer Location settings Location settings Location settings have moved to the Module Download page	~
	Restore Defaults Apply Apply and Close Cancel	y

Figure 4-29 Configure General Setting of Component

#### Notes:

1. User can limit the number of folders created in the trash folder for backup purposes by setting the [Number of trash item (1-20)] option in the figure below. Once exceeding the limit, a folder with the newer timestamp will replace the oldest folder.

Backup settings ☑ Enable Backup settings		
Number of trash item (1-20):	5	

Figure 4-30 Trash number setting

2. The code generation behavior has two options: [Update configuration files] and [Re-generate all component files]. [Update configuration files] is the default selection. If "Update configuration files" is being selected and generate code, Smart Configurator will check whether the files are existing inside the user project. If the file exists, the file will not be overwritten. However, configuration files (e.g., xxx\_config.h) will still be refreshed when code is generated. If "Re-generate all component files" being selected and generate code, Smart Configurator does not check the existence of the file and the file will always be overwritten.

FIT(RX) / SIS(RL78 / RISC-V	MCU) component settings
Code generation behavior:	Re-generate all component files $\sim$
	Update configuration files
Change these entions to se	Re-generate all component files

Figure 4-31 [Code generation behavior] Change



To only generate initialization API function, please change to [Output only initialization API function] option in below figure. So that only void R\_{ConfigurationName}\_Create (void), void R\_{ConfigurationName}\_Create\_UserInit (void) in \*.h \*, \*c \* are generated. If user change back to default option setting: [Output all API functions according to the setting], then all API functions will be generated again.

Code Generator com	ponent settings	
API function output	Output all API functions according to the setting	~
API code style:	Output all API functions according to the setting	
rar couc styler	Output only initialization API function	

Figure 4-32 [RISC-V MCU API function output] Change

Please right-click the selected component and select the "Output only initialization API" from the context menu.



#### Figure 4-33 Context Menu "Output only initialization API" for Each Configuration

4. To generate code with HEX value, please change to [Value without macro description (raw HEX)] option in below figure. If user change back to default option setting: [Value with macro description], then all API with macro description will be generated again.

Code Generator com	ponent settings	
API function output:	Output all API functions according to the setting	~
API code style:	Value with macro description	~
FIT(RX) / SIS(RL78) co	Value with macro description Value without macro description (raw HEX)	

Figure 4-34 [API code style] Change

5. If the version of the module and its dependency do not match, a warning message W04020011 is displayed. If user check the revision history of the module and its dependencies and do not need to change the module used, please ignore this warning. To clear this warning, please select [Do not check for dependent component] in the [Checking dependency] list box in component preferences, then click [OK].

Checking dependency:	Ignore if dependent component is newer	<
	Do not check for dependent component	
	Ignore if dependent component is newer	
Specify location of comp	Strict check for dependent component	

Figure 4-35 [Checking dependency] Change



## 4.5 **Pin Settings**

The [Pins] page is used for assigning pin functions. User can switch the view by clicking on the [Pin Function] and [Pin Number] pages. The [Pin Function] list shows the pin functions for each of the peripheral functions, and the [Pin Number] list shows all pins in order of pin number.

lardware Resource 🛛 🕀 🖃 🔒	Pin Functio	on				2 🔳 🗉	a   🗠 i
Type filter text		text (* = any	string, ? = any character)			All	
🚣 All 🔨		Function P011	Assignment	Pin Number Not assigned	Direction	Remarks	
Clock Generation Circuit		P100	<ul> <li>Not assigned</li> <li>P100/TI05/TO05/SO00/T</li> </ul>		O		
🦾 Clock Frequency Accuracy Measur		P100	Not assigned	<ul> <li>Not assigned</li> </ul>	×		
Interrupt Controller Unit		P102	Not assigned	<ul> <li>Not assigned</li> </ul>			
\$# I/O Ports		P102	Not assigned	<ul> <li>Not assigned</li> <li>Not assigned</li> </ul>			
🚣 Key Interrupt Function		P103	Not assigned	Not assigned			
🗸 🦓 Timer Array Unit		P105	Not assigned	Not assigned			
> TAU0		P106	Not assigned	Not assigned			
🥨 Realtime Clock		P107	Not assigned	Not assigned			
> 🛛 🗱 Serial Array Unit		P108	Not assigned	Not assigned			
❤ ≇∰ Serial Interface IICA		P109	Not assigned	Not assigned			
IICA0		P110	Not assigned	Not assigned			
📦 IICA1		P111	Not assigned	Not assigned			
🗸 📽 Serial Interface UARTA		P200	Not assigned	Not assigned			
UARTA0		P201	Not assigned	Not assigned			
UARTA1		P202	Not assigned	Not assigned			
📽 🧱 Remote Control Signal Receiver		P203	Not assigned	Not assigned			
🗟 A/D Converter		P204	Not assigned	Not assigned			
✓ Ω. 8-Rit D/A Converter			· ·				>

Figure 4-36 [Pins] Page ([Pin Function])

When you select a board on the [Board] page, the initial pin setting information of the board is displayed in [Board Function]. In addition, the [**II**] icon displayed in the [Function] selection list indicates the initial pin function of the board.

n configu	ration					🕞 Generate Code G	enerate Repo
n Number							🖪 🔤
ype filter tex	t (* = any string, ? = any character)					All	
in Numb	Pin Name	Board Functi	Function	Direction	Remarks	Symbolic Name	Comme
1	VCL		VCL	-	Read only	-	
2	XT2	XT2	🖬 XT2 🗸 🗸	0		-	XT2
3	XT1	XT1	Not assigned			-	XT1
4	VSS/AVSS	VSS	XT2	lone		-	
5	VCC/AVCC	VCC	Not assigned	None		-	
6	P200/NMI		Not assigned	None			
7	P201/IRQ3	P201	Not assigned	None			PMOD1
8	P202/CLKOUT/RIN0/IRQ2	P202	Not assigned	None			PMOD2
9	P204/SCK21/SCL21	P204	Not assigned	None			PMOD1
10	P205/SI21/SDA21	P205	Not assigned	None			PMOD1
11	P206/SO21	P206	Not assigned	None			PMOD1
12	P307	P307	Not assigned	None			PMOD2
13	P203/MD	MD	Not assigned	None			MD
14	RES	RES	Not assigned	None		-	ResetSV
15	P300/EXTAL/TCKC/TI07/TO07/SCK00/SCL00/IRQ0	тскс	тскс	I			JlinkOB
16	P301/TMSC/TI06/TO06/SI00/SDA00/RxD0/IRQ1	TMSC	TMSC	IO			JlinkOB
17	P302/VCOUT1/TI03/TO03/SCLA0/TxD0/IRQ3	TxD0	Not assigned	None			JlinkOB
18	P303/CLKOUT/TI04/TO04/SDAA0/RxD0/IRQ2	RxD0	Not assigned	None			JlinkOB
19	P304/SO01/KR00	P304	Not assigned	None			ARDUIN >

Figure 4-37 [Pins] Page ([Pin Number])



#### 4.5.1 Changing the Pin Assignment of a Software Component

The Smart Configurator assigns pins to the software components added to the project. Assignment of the pins can be changed on the [Pins] page.

This page provides two lists: Pin Function and Pin Number.

Follow the procedure below to change the assignment of pins to a software component in the Pin Function list.

- (1) Click on [🖧 (Show by Hardware Resource or Software Components)] to switch to the component view.
- (2) Select the target software component (for e.g., Config\_ICU).
- (3) Click the [Enabled] header to sort by pins used.
- (4) In the [Assignment] column or [Pin Number] column on the [Pin Function] list, change the pin assignment (for e.g., change from P201 to P302).
- (5) In addition, assignment of a pin can be changed by clicking on the [ (Next group of pins for the selected resource)] button. Pin that has peripheral function is displayed each time the button is clicked.

*Smart_Configurator_Example.scfg n configuration	×						Generate Code Generat	te Repo
(1) Software Compone	🔒 Pin Functio	on					(5) 🔁 🗉 🔛	<u>2</u> 2
Type filter text	type filter	text (* = any stri	ng, ? = any character)				All	~
∨ 💑 r_bsp	(3) Enabled	Function	Assignment	Pin Number	Direction	Remarks		
📦 r_bsp		IRQ0	Not assigned	Not assigned	None			
🗸 🚣 Ports		IRQ1	Not assigned	Not assigned				
Config_PORT		IRQ2 (4)	Not assigned	Not assigned				
∽ 📥 A/D Converter		IRQ3	/ P201/IRQ3	/ 7	1			
Config_ADC		IRQ4	Not assigned	Not assigned	None			
🗸 🚣 Interval Timer		IRQ5	Not assigned	Not assigned				
Config_TAU0_1		IRQ6	Not assigned	Not assigned				
Controller		IRQ7	Not assigned	Not assigned				
Config_ICU		NMI	Not assigned	Not assigned	None			
	<		0					>
in Function Pin Number verview Board Clocks System Co								

Figure 4-38 Pin Settings – Assigning Pins on the [Pin Function] List

The Smart Configurator allows user to enable pin functions on the [Pins] page without linking the current software component to another. To distinguish these pins from other pins that are used by another software component, there will be a remark "There is no software initializing this pin" on the list.



#### 4.5.2 Assigning Pins Using the MCU/MPU Package View

The Smart Configurator visualizes the pin assignment in the MCU/MPU Package view. User can save the MCU/MPU Package view as an image file, rotate it, and zoom in to and out from it.

Follow the procedure below to assign pins in the MCU/MPU Package view.

- (1) Zoom in to the view by clicking the [*p* (Zoom in)] button or scrolling the view with the mouse wheel.
- (2) Right-click on the target pin.
- (3) Select the signal to be assigned to the pin.
- (4) The color of the pins can be customized through [Preference Setting...].



Figure 4-39 Assigning Pins Using the MCU/MPU Package View


#### 4.5.3 **Show Pin Number from Pin Functions**

User can go to the pin number associated with a pin function.

Follow the procedure below to jump to pin number from a pin function.

- (1) In the [Pin Function] tab, right click on a Pin Function to open the pop-up menu.
- (2) Select "Jump to Pin Number".
- (3) The [Pin Number] tab is opened with a Pin Number being selected. This is the pin number of the pin function.

n configu	iration							Generate	Code Generat	) Renv
oftware Cor	mpon 🕀 🖃 🖧 🔜	Pin Functi	ion						2	
Type filter to		type filte	r text (* = anv	string, ? = any c	haracter)				All	
∽ 🔬 r_bsp							<b>a</b> 1 - 1			
v <u>as</u> r_osp € r_b	1	Enabled		Assignment		Pin Number	Direction	Remarks		í
v 🔬 Ports			IRQ0	Not assigned		Not assigned				
	onfig_PORT		IRQ1	Not assigned		Not assigned				
~ 🔬 🗛 🗸			IRO2	/ Not assic	-	/ Not assigned	None			
	onfig_ADC		IRQ3	/ P201/IRC		/7	Ju	ump to Pin Number		
v 🔬 Interv			IRQ4	Not assigned		Not assigned	INC	ferge comment to Pin Number t	ab	
	onfig_TAU0_1		IRQ5	Not assigned		Not assigned	INO	lear comments		
	rupt Controller		IRQ6 IRQ7	Not assigned with the second secon		<ul> <li>Not assigned</li> <li>Not assigned</li> </ul>	140	ssign selected pins		
	onfig ICU		NMI	<ul> <li>Not assigned</li> <li>Not assigned</li> </ul>		<ul> <li>Not assigned</li> <li>Not assigned</li> </ul>		Inassign selected pins		
	<b>U</b>	<	INIVII	<ul> <li>Not assig</li> </ul>	gnea	<ul> <li>Not assigned</li> </ul>		inassign selected pins		>
	d Clocks System Compo	nents Pins	Interrupt		-					
Smart_Confi	igurator_Example.scfg ×	nents Pins	Interrupt		-			Generate	Code Generat	2
Smart_Confi	igurator_Example.scfg ×	nents Pins	Interrupt		-				Code Generat	è Re
Gmart_Confi configu	igurator_Example.scfg ×	nents Pins	Interrupt		-	<b></b>			Code Generat	칠 e Re
imart_Confi configu Number	igurator_Example.scfg ×	nents Pins	Interrupt	Board Functi	Function	Direction	Remarks		Code Generat	칠 e Re
imart_Confi configu Number	igurator_Example.scfg ×	nents Pins	Interrupt	Board Functi	Function VCL	-	Remarks Read only	Generate	Code Generat	칠 e Re
imart_Confi configu Number	igurator_Example.scfg × ration	nents Pins	Interrupt	Board Functi		Direction - O		Generate Symbolic Name	Code Generat	è Re
imart_Confi configu Number in Numb 1	igurator_Example.scfg × ration	nents Pins	Interrupt	Board Functi	VCL	-		Generate Symbolic Name -	Code Generat	칠 e Re
imart_Configu configu Number in Numb 1 2 3 4	igurator_Example.scfg × ration Pin Name VCL XT2	nents Pins	Interrupt	Board Functi	VCL XT2	-		Generate Symbolic Name	Code Generat	칠 e Re
imart_Confi configu Number 1 2 3 4 5	igurator_Example.scfg     X       ration       Pin Name       VCL       XT2       XT1       VSS/AVSS       VCC/AVCC	nents Pins	Interrupt	Board Functi	VCL XT2 XT1 Not assigned Not assigned	- 0 I		Generate Symbolic Name	Code Generat	칠 e Re
imart_Confi configu Number 1 2 3 4 5 5 6	igurator_Example.scfg × ration Pin Name VCL XT2 XT1 VSS/AVSS VCC/AVCC P200/NMI	nents Pins	Interrupt	Board Functi	VCL XT2 XT1 Not assigned Not assigned Not assigned	- O I None		Generate Symbolic Name	Code Generat	è Re
in Number	igurator_Example.scfg × ration Pin Name VCL XT2 XT1 VSS/AVSS VCC/AVCC P200/NMI P201/IRQ3		Interrupt	Board Functi	VCL XT2 XT1 Not assigned Not assigned	- O I None None		Generate Symbolic Name	Code Generat	è Re
imart_Confi configu Number 1 2 3 4 5 6 7 8	igurator_Example.scfg × ration Pin Name VCL XT2 XT1 VSS/AVSS VCC/AVCC P200/NMI		Interrupt	Board Functi	VCL XT2 XT1 Not assigned Not assigned Not assigned	- O I None None None		Generate Symbolic Name	Code Generat	è Re
in Number 1 2 3 4 5 6 7 8 9	igurator_Example.scfg × ration  Pin Name VCL XT2 XT1 VSS/AVSS VCC/AVCC P200/NMI P201/IRQ3 P202/CLKOUT/RIN0/IRQ2 P204/SCK21/SCL21		Interrupt	Board Functi	VCL XT2 XT1 Not assigned Not assigned IRQ3 Not assigned Not assigned	- O I None None I None None		Generate Symbolic Name	Code Generat	è Re
Smart_Confi n configu n Number Nin Numb 1 2 3 4 5 6 7 8	igurator_Example.scfg × ration  Pin Name VCL XT2 XT1 VSS/AVSS VCC/AVCC P200/NMI P201/IRQ3 P202/CLKOUT/RIN0/IRQ2		Interrupt	Board Functi	VCL XT2 XT1 Not assigned Not assigned IRQ3 Not assigned	- O I None None I None		Generate Symbolic Name	Code Generat	_

Figure 4-40 Jump to Pin Number



#### 4.5.4 Exporting pin settings

The pin settings can be exported for later reference. Follow the procedure below to export the pin settings.

- (1) Click on the [12] (Export pin assignments)] button on the [Pins] page.
- (2) Select the output location and specify a name for the file to be exported.

The exported XML file can be imported to another project having the same device part number.

n configuration							Generate Code Generat	🖆 te Repo
oftware Compon 🕕 📄 📲 🚟	Pin Function	on					(1) २   ■   ⊑	è e
	type filter	text (* = any s	string, ? = any character)				All	~
∨ 🚣 r_bsp	Enabled	Function	Assignment	Pin Number	Direction	Remarks		^
📦 r_bsp		IRQ0	Not assigned	Not assigned	None			
🗸 🚣 Ports		IRQ1	Not assigned	Not assigned	None			
Config_PORT		IRQ2	Not assigned	Not assigned	None			
🗸 🚣 A/D Converter		IRQ3	/ P201/IRQ3	/ 7	1			
Config_ADC		IRQ4	Not assigned	Not assigned	None			
🗸 🚣 Interval Timer		IRQ5	Not assigned	Not assigned	None			
Config_TAU0_1		IRQ6	Not assigned	Not assigned	None			
🗸 🚣 Interrupt Controller		IRQ7	Not assigned	Not assigned	None			
🔗 Config_ICU		NMI	Not assigned	Not assigned	None			~
	<							>
n Function Pin Number	-							-

Figure 4-41 Exporting Pin Settings to an XML File

The Smart Configurator can also export the pin settings to a CSV file. Click on the [L] (Save the list to .csv file)] button on the [Pins] page.

#### 4.5.5 Importing pin settings

To import pin settings into the current project, click on the [22] (Import pin assignments)] button and select the XML file that contains the desired pin settings. After the settings specified in this file are imported to the project, the settings will be reflected in the [Pin configuration] page.

in configuration							🕞 Generate Code	🗎 Generate Repor
Software Compon 🔃 🖻 📲 🔜	Pin Function	on					3	11   <b>F</b> ,   <b>2</b> 1 4
	type filter	text (* = any	string, ? = any character)				Al	II ~
<ul> <li>✓ Š r_bsp</li> <li>✓ r_bsp</li> <li>✓ Ports</li> <li>✓ Config_PORT</li> <li>✓ Å A/D Converter</li> <li>✓ Config_ADC</li> <li>✓ Š Interval Timer</li> <li>✓ Config_TAU0_1</li> <li>✓ Š Interrupt Controller</li> <li>✓ Config_ICU</li> </ul>	Enabled	Function IRQ0 IRQ1 IRQ2 IRQ3 IRQ4 IRQ5 IRQ6 IRQ7 NMI	Assignment Not assigned Not assigned P201/IRQ3 Not assigned Not assigned Not assigned Not assigned Not assigned Not assigned	Pin Number Not assigned Not assigned Not assigned Not assigned Not assigned Not assigned Not assigned Not assigned	None I None None None None	Remarks		
n Function Pin Number	<							>

Figure 4-42 Importing Pin Settings from an XML File

Note: The pin setting is reflected, but it is not reflected in the component setting.



#### 4.5.6 **Pin setting using board pin configuration information**

User can set the initial pin configuration according to the Renesas board that you selected to use. User can check the board that selected to use in [Board] tabbed page.

The following describes the procedure for collective setting of pins.

- (1) Select a board setting information except [Custom User Board] in [Board] page. User can refer to 4.1.3 Exporting Board Settings
- (2) Select [Board Function] in the MCU/MPU Package. (The initial pin configuration of the board can be referred.)
- (3) Open the [Pin Configuration] page and click the [Assign default board pins]
- (4) When [Assign default board pins] dialog opens, click [Select all].
- (5) Click [OK].

$^{\odot}$ *Smart_Configurator_Example.scfg $\times$	📴 Default Board Pin 🛛 🕹 👋	C MCU/MPU Package X (2)	- 0
Pin configuration	Assign default board pins	rate Code Generate Report	
Softw     Pin Function       Type filter text     bype filter text (* = ar       >     Cype filter text (* = ar       >     A/D Converter       >     Interval Timer       >     Interval Timer       >     Interval Timer       >     Interval Timer       >     ANI3       ANI16       ANI16       Pin Function	(4) Accign Pin Function ↑ Select all De-select all De-select all De-select all De-select all De-select all ANI18 ANI18 ANI18 ANI18 ANI19 AVREFM AVREFP IRQ4 MD P009 P100	rate Code Generate Report	
Overview Board Clocks System Components Pins	(5) OK Cancel		<b></b>

Figure 4-43 Setting for Initial Pin Configuration

If user does not set pin settings all at once, specify them individually in procedure (4).



#### 4.5.7 **Pin Filter Feature**

By specifying the filter range on the [Pin Function] page and [Pin Number] page on the [Pins] page, user can refer to it more easily.

n configuration				🔞 🤖 Generate Code 🛛 Generate Report				
Softw 🕀 🖃 🖓 🚵	Pin Functi	on		<b>\$</b>	9 🔳 🖬 🖬	<u>)</u>		
Type filter text	type filter	text (* = any	string, ? = any character)		All	``		
<ul> <li> <sup>*</sup> r_bsp         <sup>*</sup> Ports         <sup>*</sup> A/D Converter         <sup>*</sup> A/D Converter         <sup>*</sup> A/D Converter         <sup>*</sup> Interval Timer         <sup>*</sup> Interval Timer         <sup>*</sup> Interrupt Contro     </li> </ul>	Enabled	ANI3 ANI4 ANI5 ANI16 ANI17	Assignment Not assigned Not assigned Not assigned Not assigned Not assigned	Pin Number Not assigned Not assigned Not assigned Not assigned Not assigned	Pin Number Direction Remarks Comments			
		ANI18 ANI19 AVCC AVREFM	<ul> <li>Not assigned</li> <li>Not assigned</li> <li>Not assigned</li> <li>Not assigned</li> </ul>	<ul> <li>Not assigned</li> <li>Not assigned</li> <li>Not assigned</li> <li>Not assigned</li> </ul>	None None	_		
< >	<					>		

Figure 4-44 Filter for [Pin Function] Page

in configu	ration		Generat		e Generate Repo
in Number					🖬   🖪   🔤 🗠
type filter tex	t (* = any string, ? = any character)				All ~
Pin Numb	Pin Name	Board Functi	Function	Di	All Pin Number
10	P205/SI21/SDA21	P205	Not assigned		Pin Name
11	P206/SO21	P206	Not assigned		Board Functions
12	P307	P307	Not assigned		Function
13	P203/MD	MD	Not assigned	INC	Direction
14	RES	RES	Not assigned	No	Remarks Symbolic Name
15	P300/EXTAL/TCKC/TI07/TO07/SCK00/SCL00/IRQ0	TCKC	TCKC		Comments
16	P301/TMSC/TI06/TO06/SI00/SDA00/RxD0/IRQ1	TMSC	TMSC	10	
17	P302/VCOUT1/TI03/TO03/SCLA0/TxD0/IRQ3	TxD0	Not assigned	Nor	ne i
18	P303/CLKOUT/TI04/TO04/SDAA0/RxD0/IRQ2	RxD0	Not assigned	Nor	ne
< 10	B304/C001/KB00	D204	No.	NILL	>

Figure 4-45 Filter for [Pin Number] Page



#### 4.5.8 Pin Errors/Warnings setting

User can control how pin problem is displayed on Configuration Problems view by using the Pin Errors/Warnings setting. If you want to control it, on the [New Component] dialog, click the [Configure general settings...] link to display the [Preferences] dialog. Then select [Smart Configurator] > [Pin Errors/Warnings] and use the combo boxes to change the errors/warning setting.

<b>Preferences</b>		$\Box$ $\times$
type filter text	Pin Errors/Warnings	← ▼ ⇒ ▼ 8
<ul> <li>&gt; Help</li> <li>&gt; Smart Configurator Component</li> <li>MCU/MPU Package</li> <li>Pin Errors/Warnings</li> </ul>	<ul> <li>Pin Conflict Multiple functions are assigned in one pin number</li> <li>No Pin Allocation Function used by software but not allocated to any pin</li> <li>Mutually Exclusive Pins Mutually exclusive pins cannot be allocated to the same pin at the same time.</li> <li>No Software Assigned pins but there's no software using them</li> <li>Different Group Functions in same channel but different group</li> <li>Board Mismatch Pin assignment does not match the board suggested pin assignment</li> </ul>	Error × Error × Error × Info × Warning ×
< >>	Restore Defaults	Apply
	Apply and Close	Cancel

Figure 4-46 Pin Errors/Warnings Settings at Preferences

Example: Change "No Software" setting from "Info" to "Error"



Figure 4-47 Change "No Software" Setting from "Info" to "Error"

#### 4.6 Interrupt Settings

The [Interrupt] page displays all interrupts by each of the vector numbers. User can check and set the interrupts of the peripheral modules that have been selected on the [Components] page. When an interrupt is used in a Code Generator configuration on the [Components] page, the status of the interrupt will be changed to "Used".

To display the used interrupts only, click on the [K] (Show used interrupts)] button.



rrupt configu	ration					Generat		ienerate Re
errupt vectors us	ed							
Type filter text					Vector Numb	er		
Vector Number	Vector Table	Interrupt	Interrupt request source	Peripheral	Group	Priority	Status	Remarks
0	0x04C	IRQ0(PORT_IRQ0)	External pin interrupt 0	PORT	0	Level 15 (low)	Used	
1	0x050	IRQ1(PORT_IRQ1)	External pin interrupt 1	PORT	1	Level 15 (low)	Used	
7	0x068	IRQ7(PORT_IRQ3)	External pin interrupt 3	PORT	7	Level 15 (low)	Used	
14	0x084	IRQ14(PORT_IRQ2)	External pin interrupt 2	PORT	6	Level 15 (low)	Used	
<								

Figure 4-48 Show used interrupts

### 4.6.1 Changing Interrupt Priority Setting

User can change the interrupt priority level on the [Interrupt] page using the following procedure:

- (1) Find the interrupt which user wants to change priority setting on this page.
- (2) Click the priority cell and select an interrupt priority level from the drop-down list.

rupt configu	ration					Generate	Code 0	ienerate R
rrupt vectors								
Type filter text				Ve	ector Numb	er		
Vector Number	Vector Table	Interrupt	Interrupt request source	Peripheral	Group	Priority	Status	Remarks
0	0x04C	IRQ0(PORT_IRQ0)	External pin interrupt 0	PORT	(2)	Level 15 (low) v	Used	
1	0x050	IRQ1(PORT_IRQ1)	External pin interrupt 1	PORT	(2)	Level 0 (high)	Used	
2	0x054	IRQ2(TAU0_ENDI2)	Interrupt when counting/ca	TAU0	2	Level 1		
3	0x058	IRQ3(TAU0_ENDI3)	Interrupt when counting/ca	TAU0	3	Level 2 Level 3		
4	0x05C	IRQ4(TAU0_ENDI4)	Interrupt when counting/ca	TAU0	4	Level 3 Level 4		
5	0x060	IRQ5(TAU0_ENDI5)	Interrupt when counting/ca	TAU0	5	Level 5		
6	0x064	IRQ6(TAU0_ENDI6)	Interrupt when counting/ca	TAU0	6	Level 6		
7	0x068	IRQ7(PORT_IRQ3)	External pin interrupt 3	PORT	7	Level 7	Used	
8	0x06C	IRQ8(SAU0_ENDI0)	UART0 transmission transfe	SAU0	0	Level 8		
9	0x070	IRQ9(SAU0_ENDI1)	UART0 reception transfer e	SAU0	1	Level 9 Level 10		
10	0x074	IRQ10(TAU0_MOD	Interrupt when counting/ca	TAU0	2	Level 11		
< 11 <	0x078	IRO11(TAU0 MOD	Interrupt when counting/ca	TAU0	3	Level 12	_	3

Figure 4-49 Change the interrupt priority level



#### 4.6.2 Interrupt Filter Feature

By specifying the filter range on the [Interrupts] page, user can find interrupt more easily.

rupt configu	ration					Generat	e Code Ger	ierate R		
rrupt vectors										
Type filter text					Vector Num	nber				
Vector Number	Vector Table	Interrupt	Interrupt request source	Periphera	hera Vector Table Address					
0	0x04C	IRQ0(PORT IRQ0)	External pin interrupt 0	PORT	Interrupt	e Address				
1	0x050	IRQ1(PORT_IRQ1)	External pin interrupt 1	PORT	Interrupt request source					
2	0x054	IRQ2(TAU0_ENDI2)	Interrupt when counting/ca	TAUO	Peripheral					
3	0x058	IRQ3(TAU0_ENDI3)	Interrupt when counting/ca	TAUO	Group					
4	0x05C	IRQ4(TAU0_ENDI4)	Interrupt when counting/ca	TAU0	4	Level 15 (low)				
5	0x060	IRQ5(TAU0_ENDI5)	Interrupt when counting/ca	TAU0	5	Level 15 (low)				
6	0x064	IRQ6(TAU0_ENDI6)	Interrupt when counting/ca	TAU0	6	Level 15 (low)				
7	0x068	IRQ7(PORT_IRQ3)	External pin interrupt 3	PORT	7	Level 15 (low)	Used			
8	0x06C	IRQ8(SAU0_ENDI0)	UART0 transmission transfe	SAU0	0	Level 15 (low)				
9	0x070	IRQ9(SAU0_ENDI1)	UART0 reception transfer e	SAU0	1	Level 15 (low)				
10	0x074	IRQ10(TAU0_MOD	Interrupt when counting/ca	TAUO	2	Level 15 (low)				
11 <	0x078	IRO11/TAU0 MOD	Interrupt when counting/ca	TAU0	3	Level 15 (low)		>		

Figure 4-50 Filter for [Interrupts] Page

#### 4.6.3 Changing Interrupt Vector or Group Setting

User can change the interrupt Vector or Group setting on the [Interrupts] page using the following procedure:

(1) Find the interrupt which you want to change Vector Number or Group setting on this page.

If the interrupt has been used, please start from step a.

If the interrupt hasn't been used, please start from step b.

a. Please release interrupt by right-clicking on a Code Generator configuration and then selecting the
 [ Generate code ] icon changes the icon to [ Generate code ] and disables code generation for the Code Generator configuration.

*Smart_Configurator_Example.scfg	×		
Software component configu	Iration		😮 🤷 Generate Code 🛛 Generate Report
Components $\downarrow^a_{_Z}$ 🖃 🕀	Configure		^
type filter text	Comparator operation setting	Operation	
✓ ➢ Startup > ➢ Generic	Resolution setting I 0 bits	⊖8 bits	0 12 bits
✓  → Drivers	VREF(+) setting	OAVREFP	Internal reference voltage
> 🧁 I/O port ❤ 🗁 A/D converter	VREF(-) setting VSS	OAVREFM	
Config_ADC(1) a.	Generate code     Output only initialization API     Change resource	]	
	<ul> <li>Remove</li> <li>Duplicate</li> <li>Rename</li> </ul>		
	Reset to default	_	×
Overview Board Clocks System Co	+ Add Configuration	>	

Figure 4-51 Release used interrupt



- b. Change the filter to [interrupt].
- c. Input filter text (for e.g., ADC\_ENDI).
- (2) Find the Vector Number or Group you want to change.

Note: You cannot select the item which status is Used.

- (3) Click the [Interrupt] cell and select an Interrupt setting from the drop-down list.
- (4) When you use related components or enable code generation by clicking on the [ Generate code ] icon and change it to [ Generate code ], the interrupts with specified vector or group will be used.

errupt config	uration						Generat		눹 Generate Rep
terrupt vectors									
ADC_ENDI				(1) b. Interrupt					
Vector Number	Vector Tabl	e Interrupt	h	nterrupt request source	Peripheral	Group	Priority	Status	Remarks
3	0x058	TAU0_ENDI3	/ 1	nterrupt when counting/ca	TAU0	3	Level 15 (low)		
7	0x068	IRQ3		ternal pin interrupt 3	PORT	7	Level 15 (low)	Used	
11	0x078	IWDT_NMIUNDF		errupt when counting/ca	TAU0	3	Level 15 (low)		
15	0x088	KEY_INTKR		D conversion end	ADC12	7	Level 15 (low)		
19	0x098	CAC_MENDI SAU0 ENDI3		RT1 reception transfer e	SAU0	3	Level 15 (low)		
23	0x0A8	SAUO INTSRE1			KINT	7	Level 15 (low)		
27	0x0B8	TAU0_ENDI3		RT1 reception communic	SAU0	3	Level 15 (low)		
31	0x0C8		13	DT underflow	IWDT	7	Level 15 (low)		
	(,	3) ADC_ENDI		4					
		200_20101							
<									

Figure 4-52 Change Interrupt Vector Setting Example

#### 4.6.4 **Resolving Interrupt error**

Use IRQ5 as example, when IRQ5 is used in interrupt component, but an interrupt error is shown in "Configuration Problems" view. It means all interrupt vectors which can been used as IRQ5 have been occupied.

Software component configura	tion			Generate Code	Generate Report
Components		Detection type Falling edge Priority Level 15 (low)	<ul> <li>Digital filter No fi</li> </ul>	lter 🗸	^
v ≥ Startup v ≥ Generic er r_bsp v ⇔ Drivers	IRQ5 setting ✓ IRQ5	Dettection type Training edge	<ul> <li>Digital filter No fi</li> </ul>	lter ~	
Config_ICU	IRQ6 setting	Detection type Falling edge	<ul> <li>Digital filter No fi</li> </ul>	lter 🗸	~
Overview Board Clocks System Compo	nents Pins Interrupt				
Description	^			Туре	
<ul> <li>Interrupt (1 item)</li> <li>E04010004: PORT_IRQ5 used by C</li> </ul>	Config_ICU is not alloca	ted to any interrupt vector.		Interrupt	

Figure 4-53 An interrupt is not allocated to any interrupt vector number



To solve this error, please release an occupied vector by other components and select a vector number for IRQ5 in [Interrupt] page using the following procedure:

- (1) Change the filter to [interrupt].
- (2) Input filter text (for e.g., IRQ5).
- (3) Find the Peripheral you want to release.
- (4) Right-clicking on ELC and then selecting the [ Generate code ] icon changes the icon to [ Generate code ] and disables code generation for the Code Generator configuration.
- (5) The interrupt of ELC has been released.
- (6) Click the [Interrupt] cell and select PORT\_IRQ5 from the drop-down list.
- (7) Generate Code again.

Inte	errupt configu	ration					당 Generate Code	칠 Generate Report
Int	errupt vectors				(1)			×
(2)	IRQ5				× Interru	pt		~
	Vector Number 5	Vector Table Address 0x060	Interrupt IRQ5(ELC_SWEVT	Interrupt request source Software event 1 (3)	Peripheral ELC	Group 5	Priority Level 15 (low)	Status Used
	<							>
Over	view Board Clock	s System Components	Pins Interrupt					



IRQ5				×	Interr	rupt		
Vector Number	Vector Table Address	Interrupt	Interrupt request source	Periph	eral	Group	Priority (5)	Status
5		ELC_SWEVT1 IRQ5 PORT_IRQ5 LVD_LVD2 RTC_ALM IIC1_ENDI/IIC1_V ELC_SWEVT1 SAU0_ENDI1 SAU1_ENDI1 SAU1_INTSRE2 TAU0_ENDI5	Software event 1	ELC		5	Level 15 (low) '	
<	s System Component	Ding Interrupt						

#### Figure 4-54 Release an occupied Interrupt

Note: If want to use ELC interrupt again, please start from step (1).



### 5. Managing Conflicts

When user add a component or configuring a pin or interrupt may cause problems in terms of resource conflict and missing dependency modules. This information will be displayed in the Configuration Problems view. User can refer to the displayed information to fix the conflict issues and generate code even if there are conflicts.

#### 5.1 **Resource Conflicts**

When two software components are configured to use the same resource (for e.g., ADC), an error mark (19) will be displayed in the Components tree.

The Configuration Problems view will display messages on peripheral conflicts to inform user in which software configurations peripheral conflicts have been detected.

			- 0
Software component configuration		🗊 Generate Code	Generate Report
Components 🚵 🛃 📳 🕢 Com	figure		١
Image: Startup         V @ Startup         Config ADC         Config ADC duplicate	s Interrupt		
🔝 Configuration Problems 🗙 📮 Console 🔗 Se	arch		7 8 🗖 🗖
6 errors, 0 warnings, 0 others			
Description	Туре		^
E04010005: Interrupt vector used by ADC	Interrupt		
8 E04010005: Interrupt vector used by ADC	Interrupt		
✓ Ø Peripheral (2 items)			
8 E04010001: Peripheral A/D Converter used	Peripheral		
6 E04010001: Peripheral A/D Converter used	Peripheral		
✓ Ø Pin (2 items)			
6 E04010003: Pin used by ANIO in Config_AL	Pin		
69 E04010003: Pin used by ANIO in Config_AL	Pin		v

Figure 5-1 Resource Conflicts



# 5.2 **Resolving Pin Conflicts**

If there is a pin conflict, an error mark 🔕 will appear on the tree and [Pin Function] list.

n configuration						🛐 Generate Cod	de Generate Rep
oftware Components	€ ⊑ ↓ªz 🛃	Pin Functi	on			્ર	💷   🖪   🔤 1
Type filter text		type filter	text (* = any s	tring, ? = any character)			All
∨ 🚣 r_bsp		Enabled	Function	Assignment	Pin Number	Direction	Remarks
📦 r_bsp			IRQ0	Not assigned	Not assigned	None	
🗸 🚣 Ports			IRQ1	Not assigned	Not assigned	None	
or Config_PORT			🔇 IRQ2	P303/CLKOUT/TI04/TO04/SDAA0/RxD0	/ 18	I.	Multiple pin fur
> 🚣 A/D Converter			IRQ3	/ P201/IRQ3	17	1	
> 🚣 Interval Timer			IRQ4	Not assigned	Not assigned	None	
🗸 🚣 Interrupt Controller			IRQ5	Not assigned	Not assigned	None	
Config_ICU			IRQ6	Not assigned	Not assigned	None	
			IRQ7	Not assigned	Not assigned	None	
			NMI	Not assigned	Not assigned	None	
		<					

Figure 5-2 Pin Conflicts

Detailed information regarding conflicts is displayed in the Configuration Problems view.

🔝 Configuration Problems 🗙 🔗 Search	
3 errors, 0 warnings, 0 others	
Description	Туре
✓ (2) Pin (3 items)	
😣 E04010003: Pin used by IRQ2 in Config_ICU conflicts with pin used by P303 in Config_PORT, pin used by P303 in Pin Allocator.	Pin
📀 E04010003: Pin used by P303 in Config_PORT conflicts with pin used by IRQ2 in Config_ICU, pin used by IRQ2 in Pin Allocator.	Pin
8 E05000010: Pin 18 cannot be used multiple times. Pin 18 is assigned to P303 and IRQ2.	Pin

Figure 5-3 Pin Conflict Messages

To resolve a conflict, right-click on the node with an error mark on the tree and select [Resolve conflict].

Pin configuration	
Software Components	🕀 🖃 🖓 😹 Pi
Type filter text	t
<ul> <li>✓ ≦ r_bsp</li> <li>✓ r_bsp</li> <li>✓ ≦ Ports</li> <li>✓ Config_PORT</li> <li>&gt; ≦ A/D Converter</li> <li>&gt; ≦ Interval Timer</li> <li>✓ ≦ Interval Controller</li> </ul>	
Config_ICU	Assign all Unassign all Resolve conflict
Pin Function Pin Number	
Overview Board Clocks System	Components Pins Interrupt

Figure 5-4 Resolving Pin Conflicts

The pin function of the selected nodes will be re-assigned to other pins.



#### 6. Generating Source Code

Source generation can be generated even if there is a conflict in the Configuration Problems view.

### 6.1 Generating Source Code File

Output a source file for the configured details by clicking on the [ Generate Code ] button in the Smart Configurator view.

🔅 *Smart_Configurator_Example.scfg 2	3	- 8
Software component configu	ation	Generate Code Generate Report
Components 👌 🛓	Configure	^
हा सिंह कि स्थित के सिंह के सि	Port selection PORT2	_
✓ ➢ Startup ✓ ➢ Generic ✓ ➢ r_bsp ✓ ➢ Dimme	Apply to all Unused In Out	□ ° <b>↓</b> >
Overview Board Clocks System Com	ponents Pins Interrupt	

Figure 6-1 Generating a Source File

The Smart Configurator generates the source files in <ProjectDir>\src\smc\_gen and IAR / SEGGER Embedded Studio related files in save location (refer to 3.3.1 Creating a New Smart Configurator Configuration File). If user's Smart Configurator has already generated a file, a backup copy of that file is also generated (refer to the chapter 9 Backing up Generated Source Code).



### 6.2 **Configuration of Generated Files and File Names**

Figure 6-2 Configuration of Generated Files and File Names, shows the folders and files output by the Smart Configurator. Function main () is included in main.c which is generated when clicking "Generated Code" in the Smart Configurator.

*r\_xxx* indicates the names of Software Integration System Modules, "*ConfigName*" indicates the name of the configuration formed by the component settings and "*ProjectName*" indicates a project name set in the Smart Configurator.



Figure 6-2 Configuration of Generated Files and File Names (IAREW)





Figure 6-3 Configuration of Generated Files and File Names (SEGGER Embedded Studio)

Note: The generated files and file name under smc\_gen folder is same for IAREW and SEGGER Embedded Studio.



Folder	File	Description
Workspace	-	This folder is not generated by Smart Configurator, but is the location that user selects to create Smart Configurator
		project.
		All folders and files generated by Smart Configurator will be
		generated into this folder.
	{ProjectName}.eww	This file generates once only in the first code generation.
		{ProjectName}.ewp file path is specified in this file. It is the
		workspace file for IAREW.
	{ <i>ProjectName</i> }.ewp	This file generates once only in the first code generation.
		It appends the "buildinfo.ipcf" and "main.c" files at the end of this file. It is the project file for IAREW.
	{ <i>ProjectName</i> }.ewd	This file generates once only in the first code generation.
		It is totally same as the default *.ewd file generated by
		IAREW. It is the debug file for IAREW.
	main.c	This file generates once only in the first code generation.
		It contains function main ().
	buildinfo.ipcf	This file is generated when clicking button "Generate Code" in Smart Configurator each time. It is the connection file for IAREW.
		It includes the path for all files generated for each
		component by Smart Configurator
	{ProjectName}.emProject	This file is generated when clicking button "Generate Code"
		in Smart Configurator each time. It is the project file for
		SEGGER Embedded Studio.
	SEGGER_Flash_RV32.icf	This file generates once only in the first code generation.
		It is the linker script file for SEGGER Embedded Studio
		section placement file.
	"devicename"_MemoryMap.xml	This file generates once only in the first code generation.
		It is the memory map file for SEGGER Embedded Studio.
general	-	This folder is always generated.
		It contains header files and source files commonly used by
	n - n	Code Generator drivers of the same peripheral function.
	r_cg_xxx.h <sup>(Note*1)</sup>	The files contain macro definitions for setting SFR registers. This file is always generated.
	r_smc_entry.h	This file includes the header files of Code Generator drivers
		that are added to the project.
		When using functions of Code Generator drivers in source
		files added by user, including this file is necessary.
	r_cg_macrodriver.h	This file is always generated.
		This header file contains common macro definitions used in
		drivers.
	r_cg_userdefine.h	This file is always generated.
		User can add macro definitions in the dedicated user code
		areas.
	r_cg_systeminit.c	This file is always generated.
		This file contains all component's Create () function. it is used for peripheral modules initialization.
	r_cg_xxx_common_user.c <sup>(Note*1)</sup>	The files contain common interrupt API of used peripherals.
	r_cg_xxx_common.c <sup>(Note*1)</sup>	This file is generated when related peripherals are used.
	r_cg_xxx_common.h <sup>(Note*1)</sup>	This file is generated when related peripherals are used.



r_cg_interrupt_handlers.h	This file includes all interrupt routine declaration. If no configuration created, all interrupt routine is default routine; if specific configuration is created, corresponding interrupt routine declaration of this configuration will replace the default routine declaration.
r_cg_inthandler.c	This file includes all default interrupt routine definition.
r_cg_vect_table.c	This file includes an interrupt vector table which includes all interrupt routine entry address. if no configuration created, all interrupt routine entry address is default; if specific configuration is created, corresponding interrupt routine entry address of this configuration will replace the default routine entry address.
r_smc_cgc.c	This file is always generated. It contains the initialization of clock sources other than the clock source selected in the [Clocks] page.
r_smc_cgc.h	This file is always generated. This header file contains macro definitions to initialize clocks other than the selected clock source.



Folder	File	Description
general	r_smc_cgc_user.c	This file contains functions to be added to R_CGC_Create.
		User can add codes and functions in the dedicated user code
		areas.
	r_smc_interrupt.c	This file is always generated.
		It contains interrupt initialization (depending on hardware
		specification).
	r_smc_interrupt.h	This file is always generated. It contains the priority level of all interrupts that are
		configured in the [Interrupts] tabbed page. User can use
		these macro definitions in application codes.
r_bsp		This folder is always generated.
		It consists of multiple subfolders (board, doc, mcu) with:
		- Initialization codes to start up the MCU before entering
		main () (e.g. setup stack, initialize memory)
		- Definitions of all SFR registers in iodefine.h (mcu folder)
		<ul> <li>Application note of r_bsp (doc folder)</li> </ul>
		It also contains platform.h that will include r_bsp.h of the
		device used in the project.
r_config		This folder is always generated.
		It contains configuration header files for the MCU package,
		clocks, interrupts, and RISC-V MCU Software Integration System drivers/middleware.
	r_bsp_config.h	This file is always generated.
	L_DSP_CONIIG.II	It contains configurations of r_bsp for clock initialization and
		other MCU related settings. Some MCU related settings are
		generated by Smart Configurator (e.g. package type) and
		other settings (e.g. stack size) are configured by user
		manually.
	r_bsp_interrupt_config.h	This file is always generated.
		It contains mapping of the software configurable interrupts
		(depending on hardware specification).
r_pincfg	Pin.h	This file is always generated.
		It is generated for supporting pin symbol and included in
	- Din e	smc_entry.h.
	Pin.c	This file is always generated. It is a reference of pin function initialization for all peripherals
		configured in the [Pins] tabbed page (except I/O Ports).
{ConfigName}		This folder is generated for the Code Generator drivers that
(10 5 5 5)		are added to the project.
		API functions in this folder are named after the ConfigName
		(configuration name).
	{ConfigName}.c	This file contains functions to initialize driver
		(R_ConfigName_Create) and perform operations that are
		driver-specific, e.g. start (R_ <i>ConfigName</i> _Start) and stop
	(ConfigNama) upor a	(R_ConfigName_Stop).
	{ConfigName}_user.c	This file contains interrupt service routines and functions for user to add code after the driver initialization
		(R_ConfigName_Create).
		User can add codes and functions in the dedicated user code
		areas.
	{ConfigName}.h	This is header file for {ConfigName}.c and
		{ConfigName}_user.c.

Note \*1: *xxx* is the name of a peripheral function.



### 6.3 Initializing Clocks

Configurations of the clock source selected in the [Clocks] page are generated to the macros in the r\_bsp\_config.h file located in \src\smc\_gen\r\_config folder. Clock initialization codes will be handled by r\_bsp before entering main ().

The r\_bsp\_config.h file also contains other MCU related settings (for e.g., package, stack size).

Type setting: Typ	ph-speed mode → pe A → V/ ≤ V/C2 ≤ 5.5 V →				Generate Code	📄 Generate Rep
Operation mode: Hig Type setting: Typ VCC setting: 40	pe A 🗸 👻					
Type setting: Type VCC setting: 40	pe A 🗸 👻					
VCC setting: 40						
	V < VCC < 5.5 V *					
External clock input						
				SCKDIVCR(ICK(2-0])	System clock (ICUQ	
Frequency:	20 (MHz)	1		x1 *	32 (MHz)	
Sub-clock oscillator				SCKDIVCR(PCKB(2-0))	Peripheral module clock(PCLKB) 32 (MHz)	
Operation mode:	Normal Mode *		•	x1 +	54 (MHz)	
Margin Check:	Normal Current *	•				
High-speed on-chip osc				CKOCR(CKODIV[2:0])	Clock/Buzzer output(CLKOUT) - (MHz)	
Enable HOCO oscillation Frequency:	32 v (MHz)					
					CACMCLK/TML32MCLK/UARTAMCLK	
Middle-speed on-chip o Frequency:	8 (MHz)				CACMOCLK/TML32MOCLK/UARTAMOCLK 8 (MHz)	
Frequency:	8 (MHZ)				CACHCLK/TML32HCLK/UARTAHCLK	
Low-speed an-chip asd	(later				CACLCLK/MTCLK	
	32.768 (kHz)				22.768 (KHz) CACSCLK	
					GH4     GH4     MI32LCLK/TML32SCLK/UARTALCLK/UARTASCLK/REMCLCLK/REMCSCLK/RTCCLK     GH4	
IWDT-dedicated on-chip as	scillator				WDTCLK/CACILCLK	
	15 (kHz)				15 (kHz)	
External clock input for cJTA	AG				cJTAG clock (TCKC)	
	6.25 (MHz)				6.25 (MHz)	



#### Figure 6-3 Clocks Configuration and Generated Code in r\_bsp\_config.h

Folder	File	Macros/Functions	Description
r_config	r_bsp_config.h	Macros related to clocks	These settings are generated by Smart Configurator based on user's selection in the [Clocks] page for the clock source. <i>r_bsp</i> will handle the clock initialization before entering <i>main</i> ().
		Macros related to MCU settings	Some MCU related settings are generated by Smart Configurator (e.g. package type) macros. For the detail macro information, user can refer to the application note in <i>r_bsp</i> folder: \ <i>src</i> \ <i>smc_gen</i> \ <i>r_bsp</i> \ <i>doc</i>

Note: r\_bsp\_config.h will be backed up to trash folder before each code generation (refer to chapter 9 Backing up Generated Source Code).



### 6.4 Initializing Pins

Configurations in the [Pins] page are generated in some source files depending on driver's requirements and hardware specifications.

(1) <u>Pin initialization for drivers with {ConfigName}</u>

Pin functions are initialized in R\_ConfigName\_Create of the file \src\smc\_gen\{ConfigName}\(ConfigName).c.

Pin initialization codes will be handled before entering main ().

in configuration				Gen	erate Code G	enerate Repo
Software Compon 🕀 🖻 🛱 🔜	Pin Functi	on				<b>[]</b>   24 23
Type filter text	type filter	text (* = any s	tring, ? = any character)		All	~
✓ ﷺ r_bsp ☞ r_bsp ✓ ∰ Square Wave Output ☞ Config TAU0 1	Enabled	Function TO01	Assignment P102/TI01/TO01/SCLA0/SI20/SDA20/Rx	Pin Number / 29	Direction O	Remarks
n Function Pin Number	<					>

Figure 6-4 *Config\_TAU0\_1* in Software Components View

Folder	File	Function	Component type	Description
{ConfigName}	{ConfigName}.c	R_ConfigName_ Create	Code Generator	This API function initializes the pins used by this driver. r_cg_systeminit will call this function before entering main () function.

#### (2) Reference to pin initialization codes

Refer to *Pin.c* in \src\smc\_gen\r\_pincfg folder for all peripheral pin functions used in the project (except I/O ports).

Folder	File	Function	Driver	Description
r_pincfg	Pin.c	R_Pins_Create	-	This file contains the initialization codes of all pin functions configured in the [Pins] page except I/O ports.

### 6.5 Initializing Interrupts

Configurations in the [Interrupts] page are generated in some source files. Interrupt functions are initialized in R\_*ConfigName*\_Create of the file \src\smc\_gen\{*ConfigName*}\c.



errupt co	nfigurat	tion			G	enerate Code Ge	enerate R	ep
terrupt vec	tors							E
Type filter te	xt			Vector Number	r			~
Vector N	Vecto	Interrupt	Interrupt request source	Peripheral	Group	Priority	Status	^
0	0x04C	IRQ0(PORT_IRQ0)	External pin interrupt 0	PORT	0	Level 15 (low)		-
1	0x050	IRQ1(TAU0_ENDI1)	Interrupt when counting/capturing is completed	TAUO	1	Level 15 (low)	Used	
2	0x054	IRQ2(TAU0_ENDI2)	Interrupt when counting/capturing is completed	TAUO	2	Level 15 (low)		
3	0x058	IRQ3(TAU0_ENDI3)	Interrupt when counting/capturing is completed	TAUO	3	Level 15 (low)		
4	0x05C	IRQ4(TAU0_ENDI4)	Interrupt when counting/capturing is completed	TAUO	4	Level 15 (low)		
< 5	0x060	IRO5(TAU0 ENDI5)	Interrupt when countina/capturina is completed	TAU0	5	Level 15 (low)	>	~

Figure 6-5 Interrupts Configuration in Interrupts View

ltem	Folder	File	Component type	Description
Priority	{ConfigName}	{ConfigNa <i>me</i> }.c	Code Generator	It is initialized in R_ConfigName_Create of this file. <i>R_systeminit</i> in <i>r_cg_systeminit.c</i> will call this function before entering <i>main ()</i> function.

## 7. Loading Generated Files in Integrated Development Environment

Load source code outputted by Smart Configurator on Integrated Development Environment Platform.

### 7.1 Loading in IAR Embedded Workbench

When IAR environment is selected for the compiler to be used, Smart Configurator outputs the related files (.eww/.ewp/.ewd/main.c) together with the source file. It is not necessary for the user to create project files in IAR Embedded Workbench.

The usage procedure is as follows.

- (1) Select [Open Workspace...] from the [File] menu of IAR Embedded Workbench.
- (2) In the [Open Workspace] dialog box, browse to the folder where the project file is saved, select the project file (.eww), and click the [Open] button.

> • 🛧 📙 «	IAR ≯ S	Smart_Configurator_Example	ب ن	Search Smart_Config	jurator
Organize 🔻 🛛 New f	older			·== •	. ?
📃 Desktop	^	Name	Date modified	Туре	Size
Documents		.settings	10/10/2022 14:58	File folder	
👆 Downloads	- 11	Debug	10/10/2022 17:03	File folder	
👌 Music		settings	11/10/2022 09:11	File folder	
Pictures		src	23/09/2022 13:49	File folder	
😽 Videos		Smart_Configurator_Example.eww	23/09/2022 13:49	IAR IDE Workspace	
(C:) Windows		<			
Fil	e name:	Smart_Configurator_Example.eww	~ Wo	kspace Files (*.eww)	~

Figure 7-1 Load a \*.eww File



(3) The source file output by the Smart Configurator is added to the IAR C project workspace.

Workspace	▼ ‡ X
Debug	~
Files	¢
🗆 🌒 SC_Example - Debug *	~
📙 🕂 🖬 Renesas_SC	
└─── 🗐 💼 smc_gen	
Config_ADC	
🛛 🖂 🖬 general	
⊢ ⊞ 🛋 r_bsp	
🗆 🗁 🖬 r_pincfq	
🛛 🛏 🖹 buildinfo.ipcf	
🕂 🕀 🖸 main.c	
🖵 🛨 📹 Output	



- (4) Select [Options...] from the [Project] menu of IAR Embedded Workbench.
- (5) In the [Options for node "ProjectName"] dialog box, change the target device to match with the target device selected when creating Smart Configurator's configuration file.

ategory: ieneral Options tatic Analysis			
C/C++ Compiler Assembler	Library Configuration	Library Ontions 1	Library Ontions 2
Output Converter	Target ISA Extension		
Custom Build Linker Build Actions Debugger GDB Server I-jet Simulator Third-Party Driver	Device R9A02G021	B+	Base ISA RV32E RV32I
	Standard extensions	Flo	RV64I ating-point None ~
	Bit manipulation ☑ Zba  ☑ Zbb  □ Zbc	Zbs Xbcountzer	oes
	Code size reduction	Scalar cryptog	raphy
	Zcb	Zkn	
	Zcmp	Zks	

Figure 7-3 Change Target Device



### 7.2 Loading in SEGGER Embedded Studio

When SEGGER environment is selected for the compiler to be used, Smart Configurator outputs the related files (.emProject/Linker script file/Memory map file/main.c) together with the source file. It is not necessary for the user to create project files in SEGGER Embedded Studio.

The usage procedure is as follows.

- (1) Select [Open Solution...] from the [File] menu of SEGGER Embedded Studio.
- (2) In the [Open Solution] dialog box, browse to the folder where the project file is saved, select the project file (.emProject), and click the [Open] button.

Open Solution						;
← → • ↑ 🔤 « Do	cuments > SEGGER Embedded Stu	dio Projects > SEGGER_Blinky	~ 1	ප Search	SEGGER_Blinky	م
Organize 🔻 New folde	r					
OneDrive - Renesa ^	Name	Date modified	Туре	Size		
My PC: VNM-5CG	.settings	4/1/2024 9:23 AM	File folder			
	- Output	4/1/2024 9:24 AM	File folder			
🗊 3D Objects	src	4/1/2024 9:23 AM	File folder			
Desktop	SEGGER_Blinky.emProject	4/1/2024 9:23 AM	SEGGER Embedde	7 KB		
😫 Documents						
👆 Downloads						
👌 Music						
E Pictures						
Videos						
🏪 (C:) OS						
🗙 (N:) MobAP2 (\\						
🛫 (Y:) MobAP2 (\\ı						
🗙 (Z:) DTV (\\rvc-v						
🔿 Network 🗸 🗸						
File na	ame: SEGGER_Blinky.emProject			~ Soluti	on Files (*.emProje	ct*.em ∨
					lpen C	ancel

Figure 7-1 Load a \*.emProject File

(3) The source file output by the Smart Configurator is added to the SEGGER Embedded Studio project workspace.

Project Explorer	
C Debug	- 🖸 🚞 🖻
Project Items	
Solution 'Smart_Configu	iration_Example'
Project 'Smart_Conf	iguration_Example'
🔺 🖨 Source Files 🛛 45 file	es, modified options
🔺 🖻 Renesas_SC 🛛 44	files
Config_PORT	3 files
🕨 🚞 general 🛛 13 fi	es
Image: Prime of the second	
▷ 🗀 r_config 2 file	es
🕨 🗎 r_pincfg 🛛 2 file	es
🖻 main.c	

Figure 7-2 New Files Added to SEGGER Embedded Studio Workspace



### 7.3 Build IAR Project File

After loading Smart Configurator project file to IAR Embedded Workbench successfully, user can right-click on project name, select [Rebuild All] from context manual, then build operation will be executed successfully.

Workspace	▼ ‡ × main.c ×
Debug	~
Files	🌣 • ^ int main( void )
Smart_Configurator_Example	
- 🖓 🛋 Renesas_SC	Options rn 0;
	Make       Compile       Rebuild All       Clean       C-STAT Static Analysis       Stop Build       Add
- 🕀 💼 mcu	Remove
platform.h	Rename
Smart_Configurator_Example	Version Control System
Build Messages Linking	Open Containing Folder File Properties Set as Active
Total number of errors: 0 Total number of warnings: 0	
Build Debug Log	

Figure 7-4 Build C Project File in IAR

### 7.4 Build SEGGER Embedded Studio Project File

After loading Smart Configurator project file to SEGGER Embedded Studio successfully, user can right-click on project name, select [Build] from context manual, then build operation will be executed successfully.

-							
Project Explorer	🔄 🗙 mair	n.c					×
🗘 Debug 🔹 🔁 🔛	• ↔ 🕆 🕆 🔶 •	$\rightarrow$					) 🔛
Project Items    Project Items   Soution 'Smart_Configuration_Example'    Source Files 45 files modified options     Source Files 45 files modified options	Code Data+RO	Alt+Return			:		^
	<ul> <li>Build Configurations</li> <li>Add New File</li> <li>Add Existing File</li> <li>New Folder</li> <li>Open Solution in Editor Import Package Files Debug</li> <li>Dependencies</li> </ul>	Ctrl+P, O					
	Cut	Ctrl+X Ctrl+C					~
	Paste	Ctrl+V					> ÷
	Remove	Curre	- 🌂 🀐 Tasks -				₩× ₩
	Edit Linker Script Edit Memory Map	Ctrl+P, L	onfiguration_Example' from sole	ution 'Smart_Configuration_Examp	le' in configuration 'Debug'	19 targets in 3.0s 6 targets/s	ок
	Import Memory Map						ок
	Open Linker Map File	Ctrl+P, M	FLASH2	RAM1	RAM2		

Figure 7-4 Build Project File in SEGGER Embedded Studio



#### 8. Creating User Programs

The Smart Configurator can add custom code to the output source files. This chapter describes how to add custom code to the source file generated by the Smart Configurator. Please follow the procedure in , to create an IAR project file first and make configuration setup, build and run the project.

### 8.1 Adding Custom Code

When [Code Generator] or [Graphical Configurator] is selected as the component type, if files which have the same name already exist, new code will be merged only with the existing code that is between the comments below.

/\* Start user code for xxxx. Do not edit comment generated here \*/

/\* End user code. Do not edit comment generated here \*/

In the case of [Code Generator], three files are generated for each of the specified peripheral functions. The file names are "Config\_xxx.h", "Config\_xxx.c", and "Config\_xxx\_user.c" as the default, with "xxx" representing the name of the peripheral module. For example, "xxx" will be "ADC" for the A/D Converter (resource ADC). The comments to indicate where to add custom code are at the start and end of \*.c files, and at the end of \*.h file. Comments to indicate where to add user code are also added to the interrupt function for the peripheral module corresponding to Config\_xxx\_user.c. The following example is for ADC (Config\_ADC\_user.c).



```
Pragma directive
  /* Start user code for pragma. Do not edit comment generated here */
/* End user code. Do not edit comment generated here */
.
***************
Includes
    #include "r_cg_macrodriver.h"
#include "Config_ADC.h"
/* Start user code for include. Do not edit comment generated here */
/* End user code. Do not edit comment generated here */
#include "r_cg_userdefine.h"
*****
Global variables and functions
/* Start user code for global. Do not edit comment generated here */
/* End user code. Do not edit comment generated here */
*****
* Function Name: R_Config_ADC_Create_UserInit
* Description : This function adds user code after initializing the AD converter.
* Arguments : None
* Return Value : None
******************
void R_Config_ADC_Create_UserInit(void)
{
  /* Start user code for user init. Do not edit comment generated here */
  /* End user code. Do not edit comment generated here */
}
*************
* Function Name: r_Config_ADC_interrupt
* Description : This function is ADC_ENDI interrupt service routine.
* Arguments : None
* Return Value : None
void r_Config_ADC_interrupt(void)
{
  /* Start user code for r_Config_ADC_interrupt. Do not edit comment generated here
*/
  /* End user code. Do not edit comment generated here */
  R_ICU->IELSR15 &= 0xFFFEFFFU; /* clear ADC_ENDI interrupt flag */
}
/* Start user code for adding. Do not edit comment generated here */
/* End user code. Do not edit comment generated here */
```



### 8.2 Using Generated Code in User Application

To use the generated code of RISC-V MCU Software Integration System Modules and Code Generator, follow the below steps:

Driver initialization functions (R\_ConfigName\_Create) including initialization of pins have been called in  $R_Systeminit$  function of  $r_cg_systeminit.c$  by default. User just need to add application codes to perform operations that are driver-specific, for e.g., start ( $R_ConfigName_Start$ ) and stop ( $R_ConfigName_Stop$ ).



Figure 8-1 Call Code Generator Functions

## 9. Backing up Generated Source Code

The Smart Configurator has a function for backing up the source code at:

<ProjectDir>\trash\<Date-and-Time>

The Smart Configurator generates a backup folder for the previously generated source code when new code

is generated by clicking on the [Generate Code] button. <Date-and-Time> indicates the date and time when the backup folder is created after code generation.



## 10. How to make debug connections via J-Link OB on the FPB Board

Connecting the PC and the target Board by using a J-Link OB.



Figure 10-1 Connecting the PC and the target Board by using a J-Link OB

Use IAREW GDB server debugger as an example:

1. Create a Blinky project of IAR toolchain. Select the GDB server debugger in project's Options:

Category:	Factory Settings
General Options Static Analysis C/C++ Compiler Assembler	Setup Download Images Multicore Extra Options Plugins
Output Converter Custom Build	Driver: I Run to:
Linker Build Actions	GDB Server ~ main
1-jet Smulator Third-Party Driver	Use macro file:
	\$TOOLKIT_DIR\$\config\debugger\Renesas\R9A02G021.dc

Figure 10-2 Using GDB server debugger

2. Ensure that project is configured to use the IAREW flash loader.

Category: General Options Static Analysis		Factory Settings
C/C++ Compiler Assembler Output Converter Custom Build	Setup Download Images Multicore Extra Options Plug	ins
	☐ Suppress download ☑ Use flash loader(s) ☐ Override default.board file STOOLKIT_DIR\$\config\flashloader\Renesas\FlashR9AD Edit.	2G0

Figure 10-3 Using IAR flash loader



Using "localhost,2331" for TCP/IP address or hostname of GDB server. 3.

Options for node "blinky"		$\times$
Category:	Factory Settin	IQS
General Options Static Analysis C/C++ Compiler Assembler	Setup Breakpoints	
Output Converter Custom Build Linker Build Actions Debugger <b>CDB Server</b> I-jet Simulator Third-Party Driver	TCP/IP address or hostname [,port] localhost,2331	
	Log communication     \$PROJ_DIR\$\cspycomm.log	
	OK Cancel	

Figure 10-4 Set TCP/IP address or hostname

4. Open Command Prompt, input JLinkGDBServerCL.exe file location, device, and port information: "C:\Program Files\SEGGER\JLink\_V794\JLinkGDBServerCL.exe" -device risc-v -if cjtag -port 2331.

C:\Users\yang-xiaolin>"C:\Prog SEGGER J-Link GDB Server V7.94	ram Files\SEGGER\JLink_V794\JLinkGDBServerCL.exe" Command Line Version	-device risc-v -if	cjtag -port 2331
JLinkARM.dll V7.94 (DLL compile	ed Nov 29 2023 13:41:24)		
Command line: -device risc-v - GDB Server start settings-			
	none 2331		
SWO raw output listening port: Terminal I/O port:	2332 2333		
Accept remote connection:	localhost only		
Generate logfile: Verify download:	off off		
Init regs on start:	off		
Silent mode: Single run mode:	off off		
Target connection timeout:	0 ms		
J-Link related settings			
J-Link Host interface: J-Link script:	USB none		
J-Link settings file:			
Target related settings			
Target device: Target device parameters:	risc-v none		
Target interface:	cJTAG		
	4000kHz little		
larget endran.	1111110		
Connecting to J-Link			
J-Link is connected. Firmware: J-Link OB-RA4M2 compi	iled Oct 30 2023 12:13:20		
Hardware: V1.00			
S/N: 1086999010 Checking target voltage			
Target voltage: 3.30 V			
Listening on TCP/IP port 2331			
Connecting to target			
J-Link found 1 JTAG device, Tot	tal IRLen = 5		
JTAG ID: 0x00000001 (RISC-V) Halting core			
RISC-V RV32 detected. Using RV3	32 register set for communication with GDB		
Core implements no FPU Connected to target			
Waiting for GDB connection			

Figure 10-5 Set .exe file location/device/port information in Command Prompt

Note: J-Link version V7.94 or later.



#### 5. Click on [Download and Debug] in IAREW:

File Edit View Project GDB Server	Tools Window Help	
: 🗅 🗅 🕒 🕋 🔒 🕹 🖒 🗋	5 C	• •
Workspace 🔻 🕈 🗙	main.c ×	Download and Debug (Ctrl+D)
Debug ~		Download the application and start the debugger
Files 🗳	□	the debugger *:

#### Figure 10-6 Click on [Download and Debug] in IAREW

6. The code can be downloaded successfully and start from main() function :

File Edit View Project Debug	GDB Serve	r Tools	Window Help		
: 🗅 🗅 🕒 🕋 🖴 🕹 🖄 🛍 🗂	50	4	- < Q > ⇆ HI < 📮 > R 🖻 🔳 🌒 🛲	G	े 🛛 📑 🕞 न न 🖻 भ भ 🕨 🔘 📜
Workspace	<b>▼</b> ₽ ×	main.c			sassembly 👻 🕈 🗙
Debug	~	main()	fo		Go to:
Files  Files  Differences as SC  Files  Files Files  Files  Files Files  Files Files  Files  Files  Files  Files  Files  Files  Files  Files  Files Files  Files Files  Files Files  Files  Fil	* *		<pre>of this software. By using this software, you agree to the ac following link: http://www.renesas.com/disclaimer Copyright (C) 2024 Renesas Electronics Corporation. All right following link: File Name : main.c Description : Main Program Creation Date: 2024-04-08 This file was generated by Smart Configurator. Finclude "r_smc_entry.h" int main(void); int main(vo</pre>		Disassembly uint32_t vector = 0x20 0xd7c: 0x2000'4537 asm("add t0. zero. X0" 0xd80: 0x00a0'02b3 asm("csrv 0x307. t0") 0xd84: 0x3072'9073 ): 0xd84: 0x3072'9073 ): 0xd84: 0x8082 0xd88: 0x8082 0xd88: 0x8082 0xd88: 0x8082 0xd88: 0x6066 PIN_WRITE(LED2) = ~ ??main_0: 0xd90: 0x4004'0537 0xd94: 0x245'0513 0xd98: 0x4108 0xd98: 0x4108 0xd92: 0x0015'7613 0xd82: 0x005'0513 0xd82: 0x4004'0537 0xd86: 0x025'0513 0xd82: 0x4004'0537 0xd86: 0x025'0513 0xd82: 0x4004'0537 0xd86: 0x025'0513 0xd82: 0x4004'0537 0xd86: 0x025'0513 0xd82: 0x4004'0537 0xd86: 0x025'0513 0xd82: 0x4004'0537 0xd82: 0x005'0513 0xd82: 0x4004'0537 0xd82: 0x005'0513 0xd82: 0x4004'0537 0xd82: 0x005'0513 0xd82: 0x4004'0537 0xd82: 0x0005'0513 0xd82: 0x0005'0513 0xd82: 0x4004'0537 0xd82: 0x005'0513 0xd82: 0x4004'0537 0xd82: 0x0005'0513 0xd82: 0x4004'0537 0xd82: 0x0005'0513 0xd82: 0x4004'0537 0xd82: 0x0005'0513 0xd82: 0x0005'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'0513 0x05'05'0513 0x05'0513 0x05'05'05'05'05'05'05'05'05'05'05'05'05'0
blinky			a	1	• • •
Mon Apr 08, 2024 16:57:30: Loa Mon Apr 08, 2024 16:57:30: Dov Mon Apr 08, 2024 16:57:30: Tar	aded deb wnload co get reset	ugee: C: impleteo	compliant entry point 0, from the ELF file. Use the '-suppress_entrypoint_warni \Users\yang-xiaolin\smartconfigurator\workspace\20240408\Debug\Exe\blink during the initialization of the debugging session.		

Figure 10-7 The code can be downloaded successfully



### 11. Generating Reports

The Smart Configurator can output the configuration information of the project to the report. Follow the procedure below to generate a report.

# 11.1 Report on All Configurations (PDF or Text File)

A report is output in response to clicking on the [Generate Report] (Generate Report)] button in the Smart Configurator view.



Figure 11-1 Output of a Report on the Configuration (as a PDF/Text File)

Smart Report			×
Generate report of configurations			
Options			
Print all sections			
O Print specific sections			
Board			^
Clocks			
> 🗸 Components			
> Pins			
Output as PDF		 Selec	t Font
Output as text			
C:\		Bro	wse
[	ОК	Cancel	

Figure 11-2 Dialog Box for Output of a Report (Example is selecting "Output as PDF")



### 11.2 **Configuration of Pin Function List and Pin Number List (in csv Format)**

A list of the configuration of pin functions and pin numbers (whichever is selected at the time) is output in response to clicking on the [ III (Save the list to .csv file)] button on the [Pins] page of the Smart Configurator view.

				Gener	ate Code G	ienerate Rep
rdware Resource 🛛 🕀 📮 🔓	Pin Function	on			ି ଓ 🔳	<b>II</b> 201
ype filter text	type filter	text (* = any s	string, ? = any character)		All	
🚣 All 🔥	Enabled	Function	Assignment	Pin Number	Direction	Remarks
📕 Resets		ANIO	P002/AVREFP/ANIO	/ 48	1	
📕 Clock Generation Circuit		ANI1	Not assigned	Not assigned	None	
Clock Frequency Accuracy		ANI2	Not assigned	Not assigned	None	
🚮 Interrupt Controller Unit		ANI3	Not assigned	Not assigned	None	
\$∰ I/O Ports		ANI4	Not assigned	Not assigned	None	
🚣 Key Interrupt Function		ANI5	Not assigned	Not assigned	None	
> 獜 Timer Array Unit		ANI16	Not assigned	Not assigned	None	
🍓 Realtime Clock		ANI17	Not assigned	Not assigned	None	
> 📲 Serial Array Unit		ANI18	Not assigned	Not assigned	None	
🗸 📽 Serial Interface IICA		ANI19	Not assigned	Not assigned	None	
IICA0		AVCC	Not assigned	Not assigned	None	
CA1		AVREFM	Not assigned	Not assigned	None	
🗸 🎬 Serial Interface UARTA		AVREFP	Not assigned	Not assigned	None	
UARTA0		AVSS	Not assigned	Not assigned	None	
UARTA1		CACREF	Not assigned	Not assigned	None	
Remote Control Signal Rec		CLKA0	Not assigned	Not assigned	None	
A/D Converter	<	~~~~			••	>

Figure 11-3 Output of a List of Pin Functions or Numbers (in csv Format)

### 11.3 Image of MCU/MPU Package (in png Format)

An image of the MCU/MPU package is output in response to clicking on the [ I (Save Package View to external image file)] button of the [MCU/MPU Package] view.



Figure 11-4 Outputting a Figure of MCU/MPU Package (in png Format)



### 12. User Code Protection Feature for Smart Configurator Code Generation Component

This feature empowers users to insert codes to any location in the generated codes by utilizing the specific tags, as shown in Figure 12-1. After the next code generation, the inserted user codes will be protected and automatically merged into the generated files.

The user code protection feature will be supported on the files that are generated by the "Code Generation" component and "Clock" tool.

### 12.1 Specific Tags for the User Code Protection Feature

When using the user code protection feature, please insert /\* Start user code \*/ and /\* End user code \*/ as shown in Figure 12-1 and add the user codes between these tags. If the specific tags do not match exactly, the inserted user code will not be protected after the code generation.



Figure 12-1 Specific Tags for User Code Protection Feature

### 12.2 Examples of Using User Code Protection Feature to Add New User Code

Figure 12-2 shows an example of adding new user code into the Create API of A/D Converter module by using the specific tags shown in Figure 12-1. After updating the configuration in the A/D Converter GUI and re-generating the codes, the inserted user codes will be automatically merged into the newly generated file.



Figure 12-2 User Code Protection with Auto Merge



### 12.3 What to Do When Merge Conflict Occurs

#### 12.3.1 What is Merge Conflict

When the lines of generated codes before and after the inserted user codes are updated due to changes in GUI configuration or the version update of Smart Configurator, merge conflict codes will be generated out.

If the merge conflict occurs, conflict message will be displayed in the Smart Configurator console, as shown in Figure 12-3 The Merge Conflict Message Outputted in the Smart Configurator Console.

Console X
Smart Configurator Output
THOUDDOLL, TILE BENCHARCENTER BENCHARCH ATT THE CREEK
M03000002: File generated: <u>src\smc gen\general\r smc cgc.h</u>
M03000002: File generated:src\smc gen\general\r smc cgc user.c
M04000001: File generated: <u>src\smc gen\Config RTC\Config RTC.h</u>
M04000001: File generated:src\smc gen\Config RTC\Config RTC.c
M04000001: File generated: <u>src\smc gen\Config RTC\Config RTC user.c</u>
M04000001: File generated:src\smc gen\general\r cg interrupt handlers.h
M04000001: File generated:src\smc general\r cg vect table.c
M05000012: File generated: <u>src\smc gen\r pincfg\Pin.c</u>
M00000004: File removed:src\smc_gen\r_config\r_bsp_interrupt_config.h
M03000004: File modified: <u>src\smc gen\r config\r bsp interrupt config.h</u>
M00000005: The above files highlighted in red color have user code merge conflicts, please open the file and resolve the conflict manually
M0000002: Code generation is successful: <u>C:\Users\yang-xiaolin\e2 studio\1102\Smart Configurator Example\src\smc gen</u>

Figure 12-3 The Merge Conflict Message Outputted in the Smart Configurator Console

User can click the conflicted file in the console message to open the File Compare view and then can resolve the conflict as next chapter 12.3.2 Steps for Resolving the Merge Conflict described.



#### 12.3.2 Steps for Resolving the Merge Conflict

User can follow the steps below to solve the merge conflicts.

- (1) Click on the conflicting file in the console to open the "File Compare" view (Figure 12-4 Code before Resolving Conflict).
- (2) Click on "Copy Current Change from Left to Right" (Figure 12-4 Code before Resolving Conflict).



Figure 12-4 Code before Resolving Conflict

(3) Move user codes to the place you want to use (Figure 12-5 Code after Applying "Copy Current Change from Left to Right").





Figure 12-5 Code after Applying "Copy Current Change from Left to Right"

(4) Save the modified code (Figure 12-6 Code after Moving and Saving).



#### Figure 12-6 Code after Moving and Saving

User can also resolve the conflict by editing the code in the right panel directly.

Note: After conflict resolved, if click the confliction message, it still can open [File Compare] view.



#### 13. Help

Refer to the help system for detailed information on the Smart Configurator by clicking the [Help Contents] menu..



Figure 13-1 Help Menu

The help system can also be activated from the [Overview information] page by clicking 2 button.

Smart_Configurator_Example.scfg × a MCU/MPU Package	စြာ Help မိုကို 🖁 🗖 🗖
Overview information	<ul> <li>Contents <sup>99</sup> Search <sup>108</sup> Related Topics</li> <li>Bookmarks <sup>110</sup> Index</li> </ul>
- General Information	
Overview Get an overview of the features provided by Smart Configurator.         Videos Introduction to Smart Configurator	Smart Configurator Smart Configurator is a User Interface that combines the functionalities of Code Generator and FIT Configurator which imports, configures and generates different types of drivers and middleware modules.
Browse related videos	See also:
	1. Overview
Check out <u>what's new</u> in the latest release.	2. Creating a Project
See all <u>Release Notes</u> .	3. Operating the Smart Configurator
Product Documentation	4. Setting of Peripheral Modules
User's Guide	5. Managing Conflicts
API manual	6. Generating Source Code
- Current Configuration	7. Creating User Programs
Selected board/device: R9A02G0214CNE (ROM size: 128 KB, RAM size: 16 KB, Pin count: 48)	8. Backing up Generated Source Code
Generated location (PROJECT_LOC\): src\smc_gen Edit	9. Generating Reports
Selected components:	10. Developer Assistance
Component         Version         Configuration           Overview         Board         Clocks         System         Components         Pins	11. User Code Protection Feature for Smart Configurator Code Generation Component

Figure 13-2 Quick Start

In both ways to check Help information, the whole Help contents is the same.



### 14. Documents for Reference

User's Manual: Hardware

Obtain the latest version of the manual from the website of Renesas Electronics.

Technical Update/Technical News

Obtain the latest information from the website of Renesas Electronics.

User's Manual: Development Environment

Smart Configurator User's Manual: RISC-V MCU API Reference (R20UT5385)

Obtain the latest version of IAR Embedded Workbench for Renesas RISC-V manual from the website of IAR.



# **Revision History**

Rev.	Section	Description
1.00	-	First edition issued
1.01	Chapter Introduction	Add the SEGGER information and URL.
	Chapter 2.1	Add URL.
	Chapter 3.1	Add SEGGER information for operating procedure.
	Chapter 3.3.1	Add SEGGER information for creating a new Smart Configurator
		Configuration File
	Chapter 4.3	Update Figure 4-8.
	Chapter 6.2	Add Figure 6-3 for SEGGER.
	-	Update table for SEGGER.
	Chapter 7.2	Add SEGGER information for loading in SEGGER Embedded Studio
	Chapter 7.4	Add SEGGER information for build SEGGER Embedded Studio Project
		File
	Chapter 10	Add SEGGER information for how to make debug connections via J- Link OB on the FPB Board

### 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.).

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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# **Corporate Headquarters**

TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan

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