# AP4, Applilet3 Common Operations

User's Manual

Target Devices RX Family RL78 Family RZ Family RH850 Family

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# How to Use This Manual

#### 1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the hardware functions and electrical characteristics of the MCU. It is intended for users designing application systems incorporating the MCU. A basic knowledge of electric circuits, logical circuits, and MCUs is necessary in order to use this manual.

The manual comprises an overview of the product; descriptions of the CPU, system control functions, peripheral functions, and electrical characteristics; and usage notes.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

Please use the following documents in conjunction with this manual.

The related documents listed below may include preliminary versions. However, preliminary versions are not marked as such.

Document		Document	
Туре	Description	Title	Document No.
User's manual for Software	Description of CPU instruction set	RX Group User's Manual: Software	R01US0032EJ
		RL78 Group User's Manual: Software	R01US0015EJ
Renesas Technical Update	Product specifications, updates on documents, etc.	Available from R Web site.	enesas Electronics

#### 2. Terminology

The meanings of the terms used in this manual are described in the table below.

Term	Meaning
Renesas	An environment in which program development is conducted by using language tools
environment	and an integrated development environment platform made by Renesas Electronics
	Corporation.
GNU	An environment in which program development is conducted using Gcc.
environment	
IAR environment	An environment in which program development is conducted by using language tools
	and an integrated development environment platform made by IAR Systems.

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# **Chapter 1 Outline**

#### 1.1 Overview

The AP4 and Applilet3 (hereinafter, referred to as AP4) is a software tool for automatically generating control programs (device driver programs) for peripheral modules in accordance with user settings. The AP4 consistent with the device to be employed should be used.

This manual provides common operation specifications, such as the AP4 main window, menus, and dialog operating methods, which are not dependent on the specific device to be employed.

This manual provides explanations by using RX111 as examples.

#### 1.2 Names and Functions of Hardware

The flowchart of developmental tasks using the AP4 is shown in the figure below.



Remark: IAR Embedded Workbench: An integrated development environment provided by IAR Systems

DS-5: An integrated development environment provided by ARM<sup>®</sup> Limited

Green Hills MULTI: An integrated development environment provided by Green Hills Software

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#### 1.3 Functions

O Outputting device drivers

According to the parameters that are set through the GUI, the AP4 automatically generates, in a file, the source code that initializes peripheral functions. File names can be changed as desired.

O Providing API functions

In addition to peripheral function initialization code, the AP4 provides API functions, such as starting and stopping a peripheral function or modifying the conditions.

API function names can be changed as desired.

O Selecting a build tool

The type of a build tool (compiler) can be selected from gcc and IAR.

AP4 for RL78

CA78K0R, CCRL, EWRL78, GCCRL78 for e2 studio

Applilet for RL78

CA78K0R compiler, CCRL compiler, GCC compiler, IAR compiler

AP4 for RX

CCRX, EWRX, GNURX for e2 studio

AP4 for RZ

ARMCC (DS-5), GCC (e2 studio), IAR EWARM

AP4 for RH850

CC-RH, EWRH, GHSRH

The AP4 outputs the workspace/project file for the integrated development environment platform that matches the selected build tool.

· IAR environment: Project Connection file for IAR Embedded Workbench (.ipcf)

#### O Merging

Merging source codes

Programs written between the merge comments can be retained without deletion during the re-output (overwriting) of the code.

Merging workspace/project files

The AP4 stores output files as target files to be built in a workspace/project file in the integrated development environment platform. During code regeneration, the AP4 changes the storage of target build files as the number of files that are output by the AP4 increases or decreases<sup>\*</sup>. In such a case, any previously stored user files are retained without being deleted.

\* The AP4 stores files on an add-on basis, but it does not delete files that are no longer needed.

O Outputting report

Reports on peripheral function settings, API function names associated with the various functions, and file names can be output in a file. As the format of an output file, either HTML or CSV can be selected.



# **Chapter 2 Installation**

#### 2.1 Features of Installer

2.2

The AP4 Installer has the features described below.

O Accommodating multiple versions Multiple versions of the AP4 can be installed on a single PC.

Installation Procedure

# This section describes the procedure for installing the AP4, taking the installation of [AP4 for RX] in Windows 7 as an example. The contents of display may vary depending upon the particular operating system and software being used.

#### Cautions 1. You need to perform installation by logging in as a user with Administrator privileges.

2. For the execution of the AP4, you need to install ".NET Framework Version 4" as well as the "Microsoft Visual C++ 2010 SP1" run-time library. If these files have not already been installed on the host machine being used, install the files by downloading them from Microsoft Corporation's website.

Whether these files have been previously installed can be checked by viewing [Add or Remove Programs] in Windows.

#### Figure 2-1 Add or Remove Programs (Verifying .NET Framework Version 4.0)

Muu or Ker	nove Programs				<u> </u>
	Currently installed programs:	Show up <u>d</u> ates	Sort by: Name	•	
C <u>h</u> ange or Remove	🚯 Microsoft .NET Framework 3.0 Service Pack 2		Size	169.00MB	
Programs	🕞 Microsoft .NET Framework 3.5 SP1		Size	28.14MB	
5	🌄 Microsoft .NET Framework 4 Client Profile		Size	117.00MB	
Add <u>N</u> ew Programs	5 Microsoft .NET Framework 4 Extended		Size	38.04MB	
	🕼 Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.3	17	Size	9.64MB	
	🕼 Microsoft Visual C++ 2008 Redistributable - x86 9.0.30729.0	5161	Size	10.20MB	
Add/Remove Windows	Microsoft Visual C++ 2010 x86 Redistributable - 10.0.40219	)	Size	11.14MB	
Components					

(1) Using the AP4 installer, execute the [Setup.exe] file.

**Remarks** 1. The AP4 installer can be acquired from the website for Renesas Electronics.

#### http://www.renesas.com/applilet\_download

(The address of the website is subject to change without notice.)

- 2. The downloaded installer may be compressed. If it is compressed, decompress it and execute the [Setup.exe] file.
- (2) The [Choose Setup Language] dialog box appears.

Select the desired language, and click the [OK] button.

Figure 2-2 [Choose Setup Language] Dialog Box



(3) Specify installation settings according to the wizard dialog that appears. In each dialog box, clicking either the [Next] or [Yes] button brings up the next screen.

Figure 2-3 Installa	ation Wizard Dialog Box (Starting to	o Set AP4 up)
ع ا	Preparing to Install AP4 for RX V1. 10.00 Setup is preparing the InstallShield Wizard, which will guide you through the program setup process. Please wait.	
Z	Extracting: AP4 for RX V1.10.00.msi	
	Cancel	

(4) Read and accept the software license agreement to proceed with the [Next] button. Please note that user has to accept the license agreement, otherwise installation cannot be continued. Specify installation settings according to the wizard dialog that appears.

inguic 2-4 installation wizard blateg bex (our	tware
🛃 AP4 for RX V1.10.00 - InstallShield Wizard	×
License Agreement Please read the following license agreement carefully.	5
USER LICENSE AGREEMENT	* 11
This User License Agreement ("ULA") is a legal agreement between you (ether a natural person or an entity) and Renesas Electronics Corporation ("Renesas") for the SOFTWARE PRODUCT. As used herein, "SOFTWARE PRODUCT" means the Renesas software product provided with this ULA, which includes computer software and may include associated media, printed materials, and "online" files or data. By installing, copying, or otherwise using the SOFTWARE PRODUCT, you agree to be bound by the terms of this ULA. If you do not agree to the terms of this ULA, do not install or use	Ŧ
I accept the terms in the license agreement     I do not accept the terms in the license agreement  InstallShield	rint
< <u>Back</u> Next > Ca	ancel

Figure 2-4 Installation Wizard Dialog Box (Software License Agreement)

(5) Select the install location and click the [Next] button to continue. If you wish to change the install location, click [Browse...] button to modify it.



Caution: In the installation destination folder name, none of these 11 characters, [( / \* : < > ? | " ¥ ; ,] can be used. Also, a space (a single-byte blank character) cannot be used at the beginning or end of a folder name.

The installation process may fail if an illegal character is specified in the folder name.

Figure 2-6 Installation Wizard Dialog Box (Begin the installation)



(6) To end the installation process, click the [Finish] button on the [Wizard Completed] screen.

Figure 2-7 [Wizard Completed] Screen

	I 2	
🗒 AP4 for RX V1.10.00 - Inst	allShield Wizard	×
	InstallShield Wizard Completed The InstallShield Wizard has successfully installed AP4 for F V1. 10.00. Click Finish to exit the wizard.	٤x
	< Back Finish Cancel	



#### 2.3 Uninstallation Procedure

This section describes the procedure for uninstalling the AP4, taking the uninstallation of AP4 for RX in Windows 7 as an example. The contents of display may vary depending upon the particular operating system and software being used.

#### Cautions 1. You need to perform uninstallation by logging in as a user with Administrator privileges.

- 2. Uninstalling the AP4 will not uninstall the ".NET Framework Version 4" and "Microsoft Visual C++ 2010 SP1" run-time library and associated files.
- (1) In [Add or Remove Programs] of Windows 7, click the [Uninstall] button for the AP4 to be uninstalled.

Figure 2-8 Add or Remove Programs (Uninstalling AP4) - 🗆 🗵 🗴 Add or Remove Programs Currently installed programs: □ Show up<u>d</u>ates Sort by: Name Ŧ Application Leading Tool for RX111 ¥1.00.00 Size 19.34MB Click here for support information. Used rarely To change this program or remove it from your computer, click Change or Remove. Change Remove Applifet3 for DL78\_C13 V1\_03\_01

(2) In the wizard dialog box that appears, select [Yes].

Figure 2-9	9 Confirm	ning Uninstallation				
🐻 Add or Ren	nove Program	15				<u> </u>
5	Currently inst	alled programs:		Show updates	Sort by: Name	
Change or Remove	Jan Strations		14 00 00		_	- 34MB
Programs	Add or Re	emove Programs				
Add New	2	Are you sure you want to remo	ve Application Lead	ing Tool for RX111 V1.00.	00 from your computer?	move
			Yes	No		0.4MD

(3) The uninstallation process finishes.

Figure 2-1	10 Uninstall Finished			
🐻 Add or Ren	nove Programs			
Change or	Currently installed programs:	Show up <u>d</u> ates	Sort by: Name	•
Remove Programs	Appliet3 for RL78_G13 V1.03.01		Size	17.84MB
5	📚 ATI Control Panel		Size	10.66MB



# **Chapter 3 Operating Procedure**

#### 3.1 Names of Parts



<1> Title <2> Menu <3> Main Toolbar <4> Module Toolb	<ul> <li>Displays the product name and the AP4 project file name.</li> <li>Allows the user to select and execute a command.</li> <li>Allows the user to select and execute a command by clicking a button.</li> </ul>
	displayed or set up on the Module Panel.
<5> Status	: Displays information on the current project.
<6> Project Tree	: Indicates the settings for a peripheral function. Also, switches between peripheral functions that are displayed or set up on the Module Panel.
<7> Module	: Allows the user to set up a peripheral function. The Module and Preview panels can be switched by pressing the tab key.
<8> Preview	: Allows the user to set the file and API function to be output when code is
	generated. The Preview and Module panels can be switched by pressing the tab key.
<9> Property	: Allows the user to view or make output, macro, or file settings.
<10> Output	: Displays information, including the execution status of code generation or report output, or the allowable range for a selected input field.

#### 3.1.1 Title Bar

The title bar displays the product name and the AP4 project file name. A project file name tagged with a "\*" indicates that the file does not contain the latest settings.



No. AP4 for RX111 - AP4e2gcc RX111 R5F1115AxFM.cgp		X
·		

#### 3.1.2 Menu Bar

The menu bar is used to select and execute a command. For the functions of the various menus, see "Chapter 4 Menu Reference".

Figure 3-3 Menu Bar

File View Peripheral Functions Options Help

#### 3.1.3 Main Toolbar

Clicking a button on the main toolbar allows the user to execute frequently used functions. For button functions, see "4.5.1 Main Toolbar".

#### Figure 3-4 Toolbar

🗄 🖆 🛃 🖾 | 🖏 💁 📲 🛛 GNURX for e2studio 📼

#### 3.1.4 Module Toolbar

Code generation can be executed by clicking the [ Generate code ] button on the module toolbar. Also, clicking a peripheral function button switches between peripheral functions that are displayed or set up on the Module panel. For button functions, see "4.5.2 Module Toolbar".

#### Figure 3-5 Module Toolbar



#### 3.1.5 Status Bar

The status bar displays device information (the product series name and device name).

F	igure 3-	6 Status Bar	
	MCU:R)	K111(128KB) Chip:R58	F51115AxFM
	/		1 Contraction of the second se
	<12	> <	<2>

Remark: <1> Device product group name, <2> Applicable device name

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#### **3.1.6** Project Tree Panel

This panel shows the settings status of each peripheral function in the form of an icon. Double-clicking a peripheral function name switches between modules that are displayed or set up on the Module panel. For a description of what is displayed, see "5.1 Project Tree Panel".

#### Figure 3-7 Project Tree Panel



#### Remark: If the width of the Project Tree panel is too small to display all character strings, place the mouse cursor on the character string or icon of interest. This will display all character strings for an item on the tooltip.

#### 3.1.7 Module Panel

This panel is used to set up a peripheral function. For the operating procedure, see "3.6 Setting up a Peripheral Function".

#### Figure 3-8 Module Panel

💯 Peripheral Functions 🦪 Code Preview 🕋 Property 🗙								
🔞 Generate code 🛛 🚣 😩 🚜 🛬 🗱 🗱 🗱	💷 🚳 🔍 🍈 🔲 🔗 J 📲 J 🖧	\$ 🕰 🦶 🤩						
Clock setting Register write protection function setting	1	<u> </u>						
-VCC setting								
	○ 2.4 (V) ≤ VCC < 2.7 (V)	○ 1.8 (V) ≤ VCC < 2.4 (V)						
- Main clock oscillator setting								
Main clock oscillation source	Resonator							
Frequency	12	(MHz)						
Oscillator wait time	2 cycles  0.167	(μs)						
Oscillation stop detection function	Disabled 💌							

Remark: The positions of the Module panel and Preview panel can be switched by dragging and dropping the tab.

#### 3.1.8 Preview Panel

This panel is used to set the file and the API function that are output during the code generation process. For the operating procedure, see "3.7 Checking Source Code".

```
Figure 3-9 Preview Panel
```



#### **3.1.9** Property Panel

This panel is used to view or make output, macro, and file settings. For a description of what is displayed, see "5.4 Property Panel".





#### 3.1.10 Output Panel

This panel displays the execution status of code generation or report output, and information such as the allowable range for a selected input field. For a description of what is displayed, see "5.5 Output Panel".





#### 3.2 Operating Procedure

In the AP4, source code is created by performing the following procedure:





#### 3.3 Starting up

This section explains how to start up the AP4.

In Windows, select the [Start] button >> [Program] >> [Renesas Electronics Application Leading Tool] >> [RX] >> [Vx.xx.xx]. After these items are selected, the AP4 main window starts up.

Figure 3-13 Main Window (Immediately after the Startup)

S AP4	- • •
Eile View Peripheral Functions Options Help	
· * * * * * * * * * * * * * * * * * * *	1
Project Tree # X Start	x
Recent Projects	
Name Modified Location	
New Project Open Project	
Output	<b>д X</b>
	+
Ready	



#### 3.4 Creating a New Project File

1. On the main window, press the [New Project] button to display the [New Project] dialog box.

<u> </u>		V			
🍫 AP4					- • •
Eile View Peripheral Function	ns <u>O</u> ptions <u>H</u> e	elp			
🗄 🎬 📓 🐃 👘 🖏 🚮	C	*			
Project Tree 🛛 📮 🗙	🧠 Start	🔖 New Project		X	×
	Recent Projects Name	Microcontroller:	RX Using compiler:	•	
	New Project	RX110(128KB) RX110(128KB) RX110(54KB) RX110(54KB) RX110(54KB) RX110(54KB) RX110(54KB) RX1110(54KB) RX1110(54KB) RX1110(54KB) RX1110(54KB) RX111(54KB) RX1110(54KB) RX111(54KB)	TM K K F L WE E I I I I I I I I I I I I I	EWRX	
		Project name:	(Input the name of project here)		
		Plaase			
		Fidde.	C:#Renesas#AF4_proj	■ Browse	
Out	tput			OK Cancel	<b>џ х</b>
	L				]
Ready		III			4

Figure 3-14 [New Project] Dialog Box

2. Set up items and then click the [OK] button to create a new project.

#### Table 3-1 Project Creation Settings

Item	Summary
Microcontroller	Specify a target device. Peripheral functions that can be set up vary with the
	specified device.
Using compiler *1	From CCRX (made by Renesas), EWRX (made by IAR), and GNURX (made by
	KPIT), select the compiler to be used for the build process. The build tool can be
	changed even after a project is created.
Project name	Specify a project folder/file name. If IAR Embedded Workbench is specified as the
	build tool, the project folder/file name is also used as the Project Connection file
	name (.ipcf).
Place	Specify where the project is to be saved.

\*1: The item which can be chosen changes with a micro controller.

Caution: In a folder/file name, a single-byte alphanumeric character and "\_" (underbar) can be used.

Also, a space (a single-byte blank character) cannot be used at the beginning or end of a folder/file name.

The creation process may fail if an illegal character is specified in the folder/file name.

Remark: If a project with the same name already exists in a specified location, an overwrite confirmation message appears. Clicking the [OK] button overwrites the existing project file.

#### 3.5 Opening an Existing Project

If a previously created project exists, it can be opened by either specifying the file name or by selecting it from a list of recent projects.

(1) Opening a file by selecting it

In the Main window, press the [File] button. The [Open] dialog box appears.

Figure 3-7	5 [Open]	Dialog Box			
Open					? ×
Look jn:	C Sample01		•	) 🕫 📂 🛄-	
My Recent Documents Desktop My Documents My Computer	Co_src HardwareDebug Release src Sample01.cgp	3			
My Network	, File <u>n</u> ame:			•	<u>O</u> pen
Places	Files of type:	Code Generator project(*.o	:gp)	•	Cancel

Selecting the file and clicking the [Open] button opens the selected file.

#### (2) Opening a recently used file

From the [Recent Projects] displayed in the Main window, select the file to be opened.

Figure 3-16 Opening a Recent Project

	Eile	⊻iew	<u>P</u> eripher	al Functions	Options	H	elp			
ĩ		New		Ctrl+N				•		
	3	<u>O</u> pen		Ctrl+0	🖏 Sta	irt				
6		<u>S</u> ave		Ctrl+S						
Ę		Save <u>A</u> s			Rece	nt Pro	ojects		_	[
Z	*	⊆lose			Name	•		Modified		Location
9	<b>B</b>	<u>G</u> enerate	e Code	Ctrl+G						
(Second		Generate	e <u>R</u> eport							
		Recent P	rojects	•	1	: C:\D	ocuments	and Settings\toolg	ji\My [	Documents\Sample01\Sample01\Sample01.cgp
4	3	<u>E</u> ×it								

#### 3.6 Setting up a Peripheral Function

Peripheral functions to be displayed on the Module panel can be selected by one of the methods listed below. For a description of what is displayed on the Module panel, see "5.2 Module Panel".

- From the [Peripheral Functions] menu in the Main window, select a peripheral function.
- On the Tree View panel, double-click the peripheral function name.
- Click the module toolbar button.

Remark: Even when the Module panel is not being displayed, the Module panel can be opened by selecting a peripheral function from either the [Peripheral Functions] menu or the Tree View panel.



Figure 3-17 Setting up a Peripheral Function

Figure 3-18 Example of Settings in the Module Panel (Clock Setting)

Contraction of the second second second	1000			<ul> <li>row sheed cock occeases inning seault</li> </ul>				
CC setting				C Operation				
@ 27MLVCC: 36M	( 24M)+V0C<27(V)	T 10(3 + VCC < 2.4 M)		Treasence	4			(MHG)
in dock oscillato setting				- IN/ET-dedicated low-speed clock, oscillator (IV/DT	LOCO1 setting			
Operation				C Operation				
Man slock occiliaton source	Resorvers			Treasing .	10			(D.Hv)
Perquercy	20	pA-Le		System cleck setting				
Oscillator wait time	2 cycles • 01	teril		Clock source	Nain clo	ci oscilato	S	-
Distillation stop detection function	Desabled	-		System obok (KLA)	×1	•	3	- perce
cicul setting				Perpheni mudule clock (PCLK3)	×1	•	28	(MAG)
Operation				Peopheral module clock for ADC (PCLKE)	x1		29	- peul
Гланта	14 14	PART.	-	Raith IF shore (FCUR)	= 1	•	28	pate
click availator and RTC (RTCSCLR) setting				Dedicated USB clock (USB)	20			
<ul> <li>Operation</li> <li>Terrate root</li> </ul>	22.24	6.8-1		CLXDUT pin setting				
a more deals and here \$400001 entires	1			C Operation	PG4			
Decision				Dell'adox issue	Han sis	ci picifaia		-
	12	0012		Transmission -	L.L.		1	able .

Caution: The [Clock setting] can affect other peripheral function settings. If the [Clock setting] is modified, the settings for other peripheral functions need to be rechecked.

#### **3.6.1** Input Conventions

Input of information into the Module panel is subject to the following conventions:

#### (1) Character set

Table 3-2 lists character sets that the Module panel can accept for input.

#### Table 3-2 List of Character Sets

Character set	Summary
ASCII	Single-byte alphabetic, numeric, and symbol characters
Shift-JIS	Double-byte alphabetic, numeric, symbol, hiragana, katakana, and kanji characters, and
	single-byte katakana characters
EUC-JP	Double-byte alphabetic, numeric, symbol, hiragana, katakana, and kanji characters, and
	single-byte katakana characters
UTF-8	Double-byte alphabetic, numeric, symbol, hiragana, katakana, or kanji (including Chinese)
	characters, and single-byte katakana characters

#### (2) Numeric values

Table 3-3 shows radix base numbers that the Module panel can accept for input.

#### Table 3-3 List of Radix Base Numbers

Radix number	Summary		
representation			
Decimal	A number beginning with a numeral 1 to 9, followed by numerals 0 to 9, including 0.		
Hexadecimal	A number beginning with 0x, followed by 0 to 9 or alphabetic characters a to f, (not case-		
	sensitive).		

#### 3.6.2 Icon Display on Invalid Input Fields

If an illegal character string is entered or if a value is not entered in a required field, the Module panel displays a **()** icon indicating that the input data is incorrect. In addition, the Module panel represents the affected character string in red to provide a warning that input is invalid.

- Remarks 1. If an invalid input field is present, control cannot move to another peripheral function setup view.
  - 2. If the mouse cursor is moved to the **()** icon, information on the character string to be input (a helpful hint on how to resolve the input error) is displayed as a popup.

|--|

– Main clock oscillator setting		
Operation		-
Main clock oscillation source	Resonator	▼
Frequency	30	(MHz) 🧿
Oscillator wait time	2 cycles 💌	0.667 Information of valid input value range: 1~20
Oscillation stop detection function	Disabled	•



#### 3.6.3 Icon Display on Pin Contention

As peripheral functions are set on items in which pin contention can occur, the Module panel displays a icon in the affected spot to provide a warning on pin contention, indicating that a contention has occurred.

Figure 3-20 Icon Display on Pin Contention

• - P43 -	Unused	⊖ In	O Out	🗖 Pull-up	CMOS output	🗖 Output 1
• •	Unused	🔿 In 😲	🔿 Out 😲	🗖 Pull-up	CMOS output	🗖 Output 1
• - PA6	Unused	🔿 In 😗	🔿 Out 😲	🗖 Pull-up	CMOS output	🗖 Output 1
- FA0 -	Unused	C In PA4	following pin co was used as TX	nflicts have beer D5.	detected. You must change the settir	ng in that module before you can use it for other purpose.



<sup>Remarks 1. The function for which a pin contention warning icon is displayed cannot be enabled. When using the affected function, the contending peripheral function should be disabled.
If the mouse cursor is moved to the <sup>1</sup>/<sub>2</sub> icon, information on pin contention (a helpful hint on how to avoid contention) appears as a popup.</sup> 

#### 3.7 Checking Source Code

The AP4 generates source code (a device driver program) that matches peripheral function settings (see "3.6 Setting up a Peripheral Function"). The source code can be checked on the Preview panel. If the Preview panel is not open, clicking the [Preview] tab switches the Module panel to the Preview Panel.

On the tree on the Preview panel, double-clicking either the source code file name or the API function name switches the display of the source code.

On the Preview panel tree, you can specify whether to turn on or off an output, rename API functions, or rename files.

#### Figure 3-21 Verifying Source Code



**Remarks** 1. Source code cannot be edited on the Preview panel.

2. In some API functions (such as API functions for a serial array unit), register value SFRs and other values are calculated during the code generation process before the function is finalized. For this reason, the source code displayed on the Preview panel may not agree with the source code that is actually output.



#### **3.7.1** Setting Output on/off

According to the peripheral function settings, the AP4 automatically enables the output of a required API function. For non-mandatory API functions, the user can enable/disable the output of the API function.

On the Preview panel tree, right-clicking the API function name brings up a context menu. By selecting [Generate Code] / [Not Generate Code], the user can specify whether to turn on or off an output of the API function.





Remark: Whether output is on or off can be checked by the type of each icon on the Preview panel.

Icon type	Summary
fxo	The source code for this API function will be output.
	The API function for which this icon is displayed is treated as a function requiring source code output (not changeable to a
fxc	The source code for this API function will be output.
fxc)	The source code for this API function will not be output.

#### Table 3-4 Source Code Output on/off

#### **3.7.2** Renaming a File

In the AP4, the code to be output can be assigned any file name.

On the Preview panel tree, right-clicking the file name brings up the context menu. By selecting [Rename], you can edit the file name.





- **Remarks 1.** To reset the file name to the default file name provided by the AP4, select [Default] from the context menu.
  - 2. In file names, single-byte alphanumeric characters and [ ] (underscore) can be used.
  - **3.** Information on the file selected on the Preview panel is displayed in [File name] on the Property panel. File names can also be edited in [File Information].

Figure 3-24 [File Information] Tab (Renaming a File)

🧏 Peripheral Functions* 🛃 Co	de Preview Property X		
File Information			
Default name	Yes		
File name	r_cg_cgc.c		
File used	Used		
Output folder	C:\Documents and Settings\toolgi\My Documents\Sample01\Sample01\src		
Default name			
Indicates / selects whether to use by the de If "no" is changed to "yea", the file name to	stault file name.		
If no is changed to yes , the file hame re	iturns to the derault hame.		

RENESAS

#### 3.7.3 Renaming an API Function

In the AP4, the code to be output can be assigned any API function name.

On the Preview panel tree, right-clicking the API function name brings up the context menu. By selecting [Rename], you can edit the file name.



**Remarks** 1. The name of the *main* function cannot be changed.

- 2. In file names, single-byte alphanumeric characters and [\_] (underscore) can be used.
- 3. Whether output is on or off can be checked by the type of each icon on the Preview panel.



#### 3.8 Output of Source Code

Source code (a device driver program) can be output by any of the following methods:

- From the [File] menu, select [Generate Code].
- On the toolbar, click the [ 🚏 ] button.
- On the module toolbar, click the [ 👸 Generate code ] button





#### 3.8.1 Modifying the Output Modes

In the AP4, you can select an output mode (overwriting, merging, or previous-file-priority) from [Generate File Mode] on the Property panel.

To change output modes, in the [File generation control] field, click the 💽 button to select a desired mode from the list.

Figure	3-27	Chan	aina	Output	Modes
Figure	3-21	Chan	iyiniy	Output	woues

AP4 for RX111 - AP4e2gcc_RX111_R5F1115AxFM.cgp	
File View Peripheral Functions Options Help	
🗋 😂 🗟   🖏 🗟 📲 🛛 GNURX for e2studio 🛛 🗸	
ject Tree 🛛 🕂 🗶 Periphera	al Functions Property
AP4e2gcc_RX111_R5F1115AxFM	
Property Generate Fi	ile Mode
API output co	ntrol Output all API functions according to th
Greation date	Output date
File generation	n control 🔪 Merge file
Output folder	C:¥Renesas¥AP4_proj¥AP4e2gcc_!
Report type	HTML file
Text file enco	Jding Unicode(UTF-8)
	iller Information
Peripheral Functions Property	
📑 🔺 Generate File Mode	
API output control	Output all API functions according to the setting
Creation date	Output date
File generation control	Merge file
""" Output folder	Do nothing if file exists
Report type	Merge file
Text file encoding	Overwrite file
Microcontroller Information	
Microcontroller name	R5E51115A~EM

An output mode can be selected from the three modes listed in Table 3-5.

Output mode	Summary					
Overwrite file	an identically named file already exists, overwrites that file.					
Merge file	If an identically named file already exists, merges that file with the current file. Only the content of a merge comment is subject to the merging action. /* Start user code. Do not edit comment generated here */ [merge section] /* End user code. Do not edit comment generated here */					
Do nothing if file exists	If an identically named file already exists, does not output the current file.					

Remarks 1. The merge comment can vary depending on where it occurs.

2. A merge comment should not be edited or moved. If it is edited or moved, the merging cannot be performed correctly.

#### 3.8.2 Changing Output Destinations

In the AP4, where source code is to be output can be specified in [Output folder] on the Property panel.

To change destination folders, an output destination folder can be selected on the [Browse For Folder] screen,

which is displayed when the 🔜 button in the destination folder field is clicked.

Figure 3-28 Specifying an Outpu	It Destination	
S AP4 for RX111 - AP4e2gcc_RX111_R5F11	L15AxFM.cgp	
<u>File View Peripheral Functions Op</u>	tions <u>H</u> elp	
🗄 🛅 📂 🔲 🎽 🕤 🔂 🗐 🛛 GNURX for	e2studio -	1
Project Tree 📮 🗧	Peripheral Functions Property	×
AP4e2gcc_RX111_R5F1115AxFM		
Pin View	Generate File Mode	A
Device Top View	API output control Output all API functions - Creation date Output date	according to the setting
Peripheral Functions     Clock Constant	File generation control Merge file	
B → Voltage Detection Circuit	Output folder C:¥Renesas¥AP4_proj Percet type HTML file	¥AP4e2gcc_RX111_R5F1115AxFM¥
Clock Frequency Accuracy Measu	Browse For Folder	2 X
Low Power Consumption	browser of rolder	
	🞯 Desktop	
	🕀 📋 My Documents	
	🕀 👿 My Computer	
	🕀 🔍 My Network Places	
	⊕ 20130329 □□□□ □□ RH850 F1x	
	Error Report Data	▼
	Make New Folder OK	Cancel

Remark: In the installation destination folder name, none of these 11 characters, [( / \* : < > ? | " ¥ ; ,] can be used.

Also, a space (a single-byte blank character) cannot be used at the beginning or end of a folder name.

The output changing process may fail if an illegal character is specified in the folder name.

#### 3.9 Generating a Report File

A report file can be output by either of the following methods:

- From the [File] menu, select [Generate Report].
- On the toolbar, click the 🚺 button.

Figure 3-29 Report Output



Remarks 1. The names of report files are "macro" and "function".

macro : Peripheral function settings information

function : Source code information

- 2. The format (HTML or CSV) for the report file and its output destination can be selected on the [output] tab on the Property panel.
- **3.** If the destination folder for the report file already contains a report file, the existing file will be overwritten, irrespective of file generation mode settings.

#### Figure 3-30 Example of Report File Output (a) macro.html

#### (b) function.html

Favortes	is and Settings ints and Setting	toolgi/My Documer si(boolgi/My Docume	rs(SampleO1)SampleO1(Macro.html 👱	(+) × ,	alety + Tgols + 🔞 +	100	Fevortes	cuments and Settings(tookgl)/Hy	Documents	(SampleO1)SampleO1(Function Jeni 💌 🕂 🔀 🔀 🕬	ino () 2] + ⊡ mi + Bage + Safety + Tgols +		
ICU name: RX111_128KE Thip name: RSF51115AxF	9(128KB) M				-		MCU name: R0(111_1 Chip name: RSF5111	28KB(128KB) 5Ax/FM					
Peripheral function	Macro	SubMacro	Setting	Status			Peripheral	File	Macro	Function	Default		
Clock Generator				Used			function			( and the second s	and the second se		
	CGC			Used			Common		1				
			VCC setting	2.7 (V) = VCC < 3.6 (V)				r_cg_main.c			r_cg_main.c		
			Clock source	Main clock oscillator			1			void main(void)	main		
			Main clock oscillation source	Resonator	1 8	1			_	void R_MAIN_UserInit(void)	R_MAIN_UserInit		
			Main clock oscillation source	12(MHz)	1			r_cg_intprg.c		unid MMI handlerhunid)	r_cg_intprg.c		
1			Oscillator wait time	2 cycles 12 (µs)							void _BRK_handler(vo	void BRK handler(void)	BRK_handler
			Oscillation stop detection function	Disabled									
			Sub-clock oscillator and RTC (RTCSCLK) setting	32.768 (kHz)	1	н				int low_level_init(void)	low_level_init		
			High speed clock oscillator	32 (MHz)		н		r_cg_macrodriver.h			r_cg_macrodriver.h		
	-		System clock (ICLK)	x 1 12 (MHz)	4		Clock Generator						
			Peripheral module clock	x 1 12 (MHz)				r_cg_cgc.c			r_cg_cgc.c		
			(PCLKB)	a the primer					_	void R_CGC_Create(void)	R_CGC_Create		
			Peripheral module clock for ADC (PCLKD)	x 1 12 (MHz)						void R_CGC_RegisterWrite_Cgc (protect_mode_t enable)	R_CGC_RegisterWrite_Cg		
			Flash IF clock (FCLK)	x 1 12 (MHz)			1		1		and the part of th		



#### 3.10 Saving a Project

To save information that has been set, any of the following methods can be used:

#### (1) Save as

Select the [File] menu >> [Save As...], the [Save As] dialog box appears.

Figure 3-31	[Save As]	I Dialog	Box
i igui c o-o i	LOUNC HS	Dialog	DUX



To save the information that has been set, specify a destination and a file name, and click the [Save] button.

#### (2) Save

Select the [File] menu >> [Save]. Or on the toolbar, click the [ ] button. The file (project) being edited is saved on an overwrite basis.

#### (3) Close and save

When an attempt is made to exit from the AP4 without saving the modified settings, a save confirmation dialog box appears.

Clicking the [Yes] button saves the file (project) being edited on an overwrite basis.

Clicking the [No] button skips the save process.

#### Figure 3-32 Question Dialog Box

Question(W0403025)							
(W0403025)Project changed. Save?							
( <u>Y</u> es	;	<u>N</u> o	Cancel				

Remark: The name of the file to be saved (not including the extension) is identical to the AP4 project name.

#### 3.11 Closing

The AP4 can be closed by any of the following methods:

- On the Main window, select the [File] menu >> [Exit].
- On the toolbar, click the [ 🚮 ] button.
- On the Main window, click the [ 🔀 ] button.
- On the menu that appears when an icon on the title bar is clicked, select [Close].

#### 3.12 Coding

After code is generated, the source code that has been output is read using the integrated development environment platform.

The program is completed by adding user source files as necessary or adding code in the merge comment in the file that is output by the AP4.

When outputting a source code using the AP4 again after editing the source code on the integrated development environment platform, observe the following points:

- Cautions 1. If the output mode is [Overwrite file], any editing that was performed on the integrated development environment platform with respect to the AP4 output file will be disabled.
  - 2. If the output mode is [Merge file], any editing that was performed on the integrated development environment platform outside a merge comment will be disabled.
  - 3. If the output mode is [Do nothing if file exists], any changes to AP4 settings other than a new output file will be disabled.
  - 4. The AP4 does not delete files that are no longer needed due to changes in settings.
- **3.12.1** How to create a project connection between IAR Embedded Workbench and AP4

AP4 generates a so called **Project Connection** file (.ipcf) that contains references to the generated source files. Every time you add/remove or change a module in AP4, the project connection updates your IAR Embedded Workbench project with the files that the module needs. Proceed as follows to create a project connection:

 In the IAR Embedded Workbench IDE, choose [Project] >> [Add Project Connection] to display the Add Project Connection dialog box. From the drop-down menu, choose IAR Project Connection.

Connect using:	IAR Project Connection	
	OK	Cancel

- 2) In the standard **Open File** dialog box that is displayed, browse to the location where the AP4 project file (.cgp) is stored and select the generated Project Connection file (.ipcf).
- 3) The generated module files will now be placed in the group category **Renesas\_AP** in the **Workspace** window.



# **Chapter 4 Menu Reference**

### 4.1 [File] Menu

Figure 4-1 [File] Menu			
💊 AP4 for RX111 - AP4e2gcc_RX111_R5F	1115AxFM.cgp		
<u>File View</u> Peripheral Functions	ptions <u>H</u> elp		
🗄 🔛 💕 🐻 🔯 🔂 🚮 🕇 📂 File			
Project Tree	New	CHILN	🕼 Code Pr
AP4e2gcc_RX111_R5F1115AxFN	14644	COTTA	🎳 💒 💕
Device List View	Open	Ctrl+O	
Device Top View	Save	Ctrl+S	
	Save As		
	Close		
Clock Frequency Accura	Generate Code	Ctrl+G	e
Interrupt Controller Unit	Generate Report		
Data Transfer Controller Event Link Controller	Recent Projects		▶ Inction
3	Exit		

#### Table 4-1 [File] Menu

Item	Description
[New]	Creates a new project.
[Open]	Opens an existing project.
[Save]	Overwrites the currently open project with the current settings.
[Save As…]	Saves the current settings under a different project name.
[Close]	Closes the currently open project.
[Generate Code…]	Outputs the source code.
[Generate Report]	Outputs settings information to a file.
[Recent Projects]	Displays recently opened projects. Selecting a project from a submenu loads
	the project.
[Exit]	Exits from AP4.

#### 4.2 [Peripheral Functions] Menu

The [Peripheral Functions] menu displays peripheral functions that the target device has (only those peripheral functions that are supported by AP4). When a peripheral function is selected, the associated settings screen is displayed on the Module panel.



#### Table 4-2 [Peripheral Functions] Menu

Item	Description		
Peripheral function name	Displays the associated settings screen on the Module panel.		
	The names of peripheral functions that are displayed may vary from one		
	product to another.		



### 4.3 [Options] Menu

Figure	1-3	[Ontione]	Monu
riguie	4-0	[Options]	menu



Table 4-3 [Options] Menu

Item	Description
Compiler	Selects the format of the output code. The compiler names that are displayed may
	vary from one product to another.
Creation Date	Selects whether to output creation date.
File Generation Control	File generation control can be selected from: overwrite file, merge files, and do
	nothing if a file already exists.
Report Type	Select either HTML or CSV.
API Output Control	API function output control can be selected from "output all API functions according
	to the setting", and "output only initialization API function." The default is "output all
	according to the settings". Selecting the "output only initialization API function"
	option skips the generation of the file R_xxx_user.c that codes interrupt handlers, in
	which case all interrupt handlers must be coded by the customer himself/herself.
Text File Encoding	Selects the format of encoding.



## 4.4 [Help] Menu

Figure	4-4	[Help]	Menu
iguio		Li ioibl	monia

🦠 AP4 for RX111 -	AP4e2gcc_RX111_R5F1115AxFM.cgp
<u>F</u> ile <u>V</u> iew <u>P</u> e	eripheral Functions Options Help Help
🗄 🔛 💕 🔚 🖾 🛛	🛐 💁 🗐 GNURX for e2studio 🗸 🤄 About AP4
Project Tree	🕂 🗶 🚰 Peripheral Functions 📑 Code Preview 🚰 Pro
B - 💦 AP4e2gcc_RX ⊟ - 🎤 Pin View	111_R5F1115AxFM 🔹 🚺 Generate code 🔬 🖉 🦉 👹 🎆 🗱 🗱 🗰
	About AP4
eripheral	AP4 (1.06.00.09)
Voltag	© 2012, 2016 Renesas Electronics Corporation
Clock	Serials Version
	RX110 V1.05.04.04 [05 Aug 2016]
- Buses	RX113 V1.02.04.04 [05 Aug 2016] 2 cy
∎ Data I ∎ Event	RX130 V1.00.02.05 [19 Aug 2016] - ableo
	ОК

#### Table 4-4 [Help] Menu

Item	Description
About AP4	Displays version information and other items.



#### 4.5 Toolbars

AP4 provides two toolbars: The main toolbar, which is always displayed below the Manu bar, and a module toolbar, which is displayed above the Module panel.

#### 4.5.1 Main Toolbar

The main toolbar is always displayed below the menu bar.

By clicking buttons on the main toolbar, you can execute functions such as project file operation, code generation, and report output.

Liguro	1 5	Main	Toolhor
riquie	4-0	IVIAIII	Toolbal



The main toolbar contains the following buttons:

Button	Name	Description
<u> </u>	New project	Creates a new project.
	Open a project	Reads an existing project.
	Save a project	Overwrites the currently open project with the current settings, and saves the results.
X	Close	Closes the currently open project.
6	Generate Code	Outputs the source code.
0	Generate Report	Outputs a report file.
	Exit	Exits from AP4.

	Table 4-5	Functions	of Main	Toolbar
--	-----------	-----------	---------	---------



#### 4.5.2 Module Toolbar

The module toolbar is displayed above the Module panel.

Clicking the [ Generate code ] button causes the execution of the code generation process. By clicking peripheral function buttons, you can switch the peripheral functions to be displayed or set up on the Module panel.

#### Figure 4-6 Module Toolbar

S AP4 for RX111 - AP4e2gcc_RX111_R5F1115Ax	<fm.cgp< th=""><th></th><th></th></fm.cgp<>		
Eile View Peripheral Functions Options	Help udio -		
Project Tree 🛛 🗘 🕈	<ul> <li>Peripheral Functions Store Code Preview</li> </ul>	ew 🌁 Property	
AP4e2gcc_RX111_R5F1115AxFM	▲ 🔂 Generate code 🛛 🚣 🖨 🕉 还 🖋 雛 🖁 Clock setting: Block diagram	≛≍≈0000⊡2748	🍠 🏭 🏠 💺 🤤
Peripheral Functions	-VCC setting	② 2.4 (V) ≤ VCC < 2.7 (V)	

The module toolbar contains the following buttons:

Table 4-6	Functions	of Module	Toolbar
		or modulo	1001001

Button	Name	Description
🐻 Generate code	Generate code	Outputs source code.
<b>1</b>	Clock Generator	On the Module panel, displays
	Voltage Detection Circuit	that are associated with buttons.
æ	Clock Frequency Accuracy Measurement Circuit	
277.	Low Power Consumption	Remark: The buttons listed in
₩ <b>ĕ</b>	Interrupt Controller	the table are intended
	Buses	The buttons that are
	Data Transfer Controller	actually displayed
**	Event Link Controller	product to another.
<b>\$</b> #	I/O Ports	
1	Multi-Function Timer Pulse Unit 2	
Č.	Port Output Enable 2	
45	Compare Match Timer	
	Realtime Clock	
æ	Independent Watchdog Timer	
** <mark>*</mark> *	I2C Bus Interface	
P.	Serial Communications Interface	
4	12-Bit A/D Converter	
4	D/A Converter	
<sup>123</sup>	Data Operation Circuit	

# **Chapter 5 Window Reference**

The AP4 provides different windows for different microcontroller products that it supports.

This manual describes the displays and operating procedures that are common to the microcontroller products that the AP4 supports. Product-by-product descriptions of windows are omitted.

#### **5.1 Project Tree Panel**

The Project Tree panel displays, in tree format, the peripheral functions (those which are supported by the AP4) that target devices possess. By double-clicking the name of a peripheral function, you can switch between modules that are displayed or set up on the Module panel.



The shape of the icon for each peripheral function changes according to the status of the settings.

	lcon	Summary			
	e e e e e e e e e e e e e e e e e e e	The corresponding peripheral function is already set.			
	3	The corresponding peripheral function is not set/used.			

#### Table 5-1 Project Tree Panel Icons



Right-clicking the name of a peripheral function brings up a context menu. Executing [Return to Reset Value] from the Project Tree panel resets the settings to their default values.





Table 5-2 Project Tree Panel Context Menu

Item	Description
[Return to Reset Value]	Resets the settings for a selected peripheral function to their AP4 default.
	The range of initial settings may vary by function.

#### 5.2 Module Panel

The Module panel allows you to set peripheral functions. For a description on how to operate the Module panel, see "3.6 Setting up a Peripheral Function".

Figure 5-3 Displaying of Module Panel						
S AP4 for RX111 - AP4e2gcc_RX111_R5F1115AxF	M.cgp					
File View Peripheral Functions Options	<u>H</u> elp					
🗄 🞦 💕 🛃 🎬 👸 💽 🚮 🛛 GNURX for e2stud	dio +			1		
Project Tree 📮 🗙	Peripheral Functions 📓 Code Previ	ew Property		×		
AP4e2ecc_RX111_R5F1115AxFM	🐻 Generate code 🛛 🔬 📋 🕷 🚰 💓	A 😂 💷 🙆 🔍 🔘 🗔 🖉 📲	J 13 👊 🔩 💐			
Pin View Device List View	Clock setting Block diagram			*		
Device Top View	-VCC setting					
Clock Generator		$\bigcirc$ 2.4 (V) $\leq$ VCC < 2.7 (V)	⑦ 1.8 (V) ≤ VCC < 2.4 (V)			
Voltage Detection Circuit	-Main clock oscillator setting			E		
	Operation					
Clock Frequency Accuracy Measurem	Main clock oscillation source	Resonator	•			
Low Power Consumption	Frequency	10	(MHz)			
Buses	Oscillator wait time	8192 cycles - 2048	(µs)			
	Oscillation stop detection function	Disabled	<b>•</b>			
I/O Ports	-PLL circuit setting					
Multi-Function Timer Pulse Unit 2	Operation					
MTU1	Input frequency division ratio	× 1/4 -				
MTU3	Frequency multiplication factor	× 8 -				
MTU4	Frequency	32 (MHz)				
Port Output Enable 2						
Compare Match Timer     Papiting Clask	Sub-clock oscillator and RTC (RTCSCLK) setting     Operation	Z				
Independent Watchdog Timer				-		
Serial Communications Interface	Output			<b> </b>		
Serial Peripheral Interface						
CRC Calculator     A/D Converter						
D/A Converter						
□ Internation Circuit						
Common -						
4				Þ		
MCU:RX111(128KB) Chip:R5F51115AxFM				ai.		

**Remark:** The display positions of the Module panel and Preview panels can be changed by dragging and dropping the tab.



#### 5.2.1 Example of a Module Panel for Clock Generation Circuits

The figure below shows an example of a Module panel for clock generation circuits. By changing functions to be set through the tabs, you can set an operation, by function. Executing [Return to Reset Value] from the Project Tree panel resets all tab settings to their default values.

🐻 Generate Code   🚣 📋 🚜 🛬 💕		J 123 🎧 🤩
Clock setting Block diagram		
-VCC setting		
	O 2.4 (V) ≤ VCC < 2.7 (V)	O 1.8 (V) ≤ VCC < 2.4 (V)
- Main clock oscillator setting		
Operation		
Main clock oscillation source	Resonator	<b>•</b>
Frequency	16	(MHz)
Oscillator wait time	2 cycles 💌 0.5	(μs)
Oscillation stop detection function	Disabled	<b>•</b>
-PLL circuit setting		
Operation		
Frequency	x 1.5 💌 24	(MHz)
- High speed clock oscillator (HOCO) setting		
C Operation		
Frequency	32	(MHz)
Oscillator wait time	266 cycles 💽 66.5	(με)
Note: When oscillator wait time of 138 cycles is s may not be guaranteed. See the device user's m	elected, the HOCO frequency accuracy anual for details.	
-Low speed clock oscillator (LOCO) setting		
Operation		
Frequency	]4	(MHz)
- IWDT-dedicated low-speed clock oscillator (IWDTL	.0C0) setting	
Operation		
Frequency	15	(kHz)
- System clock setting		
Clock source	Main clock oscillator	•
System clock (ICLK)	x 1 🔽 16	(MHz)
Peripheral module clock (PCLKB)	x 1 💌 16	(MHz)
Peripheral module clock for ADC (PCLKD)	x 1 💌 16	(MHz)
Flash IF clock (FCLK)	x 1 💌 16	(MHz)
Dedicated USB clock (UCLK)	16	(MHz)
- CLKOUT pin setting		
Deration	P15	<b>V</b>
Clock output source	Main clock oscillator	<b>V</b>
Frequency	x1	(MHz)

#### Figure 5-4 Example of a Module Panel (Clock Generator)

#### 5.2.2 Example of a Module Panel for Ports

The figure below shows an example of a Module panel for ports. By changing ports to be set through the tabs, you can set peripheral function operations by port. Executing [Return to Reset Value] from the Project Tree panel resets all tab (port) settings to their default values.

iguit								
2	Peripheral F	unctions* [	🥈 Code Prev	/iew 🏾 🕋 Prop	erty			×
🐻 Gen	erate code	🚣 🖬 🚜	💒 💕 🏢	ä 🗱 🕯 🕉	) 🎕 🥘 🔳 🖧 🍠	📲 🍠 🏭	i 👫 👫	
Port0	Port1 Port	t2 Port3 F	Port4 Port5	PortA PortB	PortC PortE PortH	PortJ		
• - PE1 -	Unused	O In 😲	🔿 Out 😲	🗖 Pall-ap	CMOS output	Y	🗖 Output 1	
-PE2 -	Unused	O In	💿 Out	🗖 Pall-ap	N-channel open-drain	•	Dutput 1	
O - PE3 -	Unused	O In	<ul> <li>Out</li> </ul>	🗖 Pall-ap	CMOS output	•	🔽 Output 1	
• - PE4 -	Unused	🔿 In 😲	🔿 Out 😗	🗖 Pull-up	CMOS output	Ŧ	🗖 Output 1	
	Unused	🔿 In 😲	🔿 Out 😲	🗖 Pall-up	CMOS output	7	🗖 Output 1	
- PE6	Unused	⊙ In	<ul> <li>Out</li> </ul>	🗖 Pall-up	N-channel open-drain	•	🔽 Output 1	
- PE7	Unused	⊙ In	O Out	🗖 Pull-up	CMOS output	7	🗖 Output 1	
0	Unused	⊙ In	O Out	🔽 Pull-up	CMOS output	<b>v</b>	🗖 Output 1	

Figure	5-5	Example	of	а	Module	Panel	(Ports)	۱
Iguie	5-5			а	would	r and i	IF UITS	,



#### 5.2.3 Example of a Module Panel for a Peripheral Function (1 Channel)

The figure below shows an example of a Module panel for a peripheral function with only one channel installed. The operation of the peripheral function can be set by setting the various items that are displayed on the panel. Executing [Return to Reset Value] from the Project Tree panel resets the settings to their default values.

Figure 5-6 Example of a Module Panel (A/D Converter)

🧏 Peripl	heral F	unctions 🔣 Code Preview	Propert	ty	
🐻 Generate	code	🚣 🗅 🖧 🖄 🖄 🕯	5 🗱 💷 🛞	· 🌣 🍈 🔜 🔗 🍠 📲 🍠 🕮 🐔 🔩 🤤	
General sett	iing   S	etting		<u> </u>	
<ul> <li>Function set</li> </ul>	tting —				
O Unu	used				
Ana     Ana	alog inpu	t channel mode			
C Terr	operatur	e sensor mode			
O Inter	riperatar irinal refe	rence voltage mode			
inter	anariere	rence vokage mode			
General setti	ing <u>Se</u>	ting			
_Operation m	node set	ting			
💿 Single	e scan r	node	🔘 Group scan	n mode 💿 Continuous scan mode	
_Conversion	mode s	etting			
Norma	ial ( 1.8	V < AVCC < 2.4V)	High speed	1 (AVCC > 2.4V)	
-VREF(+) Se	etting				
	C0		O AVREFHU		
-VREF(-) Se	etting				
● AVSS	50		O AVREFLU		
– Double trigg	ger mode	e setting	. <b>.</b>		
) Disab	ble		🔘 Enable		
_Analog inpu	it channi	el setting			
		Convert (Group A)	Convert (Group	p B) Add AD converted value	
AN000					
AN001					
AN002					
AN003					
AN004					
AN006					
AN008					
AN009					
AN010					_
AN011	_ Data	registers setting			
AN012 AN013	A	) converted value addition cour	it	1-time conversion	
AN014	Da	ta placement		Right-alignment 👻	
AN015	A	_Conversion time setting _			
_Conversion		Total conversion time (	Group A)	0.8 (us)	
C	- AN0	Tatal community time (	Oursen (D)		
Softwar	Inp	Total conversion time (	Group B/	0.6 (US)	
	- AN0	_Interrupt setting			
Conversi TRGA i	Ing	👿 Enable AD conversi	on end interrup	pt (S12ADI0)	
1 Con L		B 1 1		Level 15 (highest)	
APTRO	- AN0	Priority			
ADTRG0	– ANOI	Priority	on end interruc	pt for group B (GBADI)	
ADTRG0	– ANOI Inp	Priority Enable AD conversion	on end interrup	pt for group B (GBADI)	

#### **5.2.4** Example of a Module Panel for a Peripheral Function (Multiple Channels)

The figure below shows an example of a Module panel for a peripheral function containing multiple channels. By changing channels to be set through the tabs, you can set peripheral function operations, by channel. Executing [Return to Reset Value] from the Project Tree panel resets the settings for the currently selected channel to their default values.

Figure 5-7 Example of a Module Panel (Compare match timer)						
💯 Peripheral Functions* 🦪 Code Preview	Property		×			
🔞 Generate code 🛛 🚣 😩 🚜 🛬 😻 🎆 🚔 😫	🕻 🗊 🛞 🎘 🍈 📰	a 7 🖷 7 🎜 🐔 🖶	<sup>123</sup>			
CMT0 CMT1			-			
- Compare match timer operation setting						
O Unused	Used					
- Count clock setting						
PCLK/8     PCLK/32	C PCLK/128	O PCLK/512				
- Interval value setting						
Interval value	100	μs 💽 (Actual value: 1	100)			
- Interrupt setting						
Enable compare match interrupt (CMI1)						
Prioritu	Level 15 (biobest)					
r noncy	Lever 13 (riighest)					
			-			

Caution: Executing the [Return to Reset Value] when a target peripheral function is not displayed on the Module panel resets the settings for the starting channel (the leftmost tab) to their default values.



#### **5.2.5** Example of a Module Panel for a Peripheral Function (1 Unit)

The figure below shows an example of a Module panel in which settings change by channel, according to a selected function. For each channel, select the function to be used, and for each selected channel, set details. Executing [Return to Reset Value] from the Project Tree panel resets all tab (channel) settings to their default values.

	🧏 Peripher	al Functions* [ 🛃 Code Pr	eview 🚰 Property					
<1>	🐻 Generate cod	e   🚣 🚊 🖧 🖄 🗰	- 🚠 😂 💷 🚳 🚳 🦉	) 🔟 🗟 🤅	ፖ 🖷 🍠 🍀 🏊 🔩 🤤			
	General Setting	]) мтио] мти1   мти2   м	ТИЗ МТИ4 МТИ5					
	- Function setting							
<2>	мтио	Normal mode		<u>-</u>				
	MTU1	Normal mode		<b>-</b>				
	MTU2	PWM mode 1		-				
	мтиз	Unused	/ <4>	•				
	MTU4	💯 Peripheral Function	s* 🧾 Code Preview	Property				
	MTU5	🐻 Generate code 🛛 🚣 👔	a 🖄 🕷 🕼 😹	🗊 🛞 🤻	L 🦚 🔲 🔗 J 📲 J	123 🎧 🤼 💱		
	MIOS	General Setting MTU0 N	<b>1TU1   MTU2  </b> MTU3   M	ТU4 МТU5				
	– External clock	- Normal mode description -						
	П мтсі к	<ul> <li>The counter counts up in</li> <li>Free-running operation: v</li> </ul>	this mode. The following type vhen [Disable counter clear]	es of operatior is selected for	n are possible: [Counter clear source], countir	ng continues until th	ne counter overflows and the	en restarts from 0.
		<ul> <li>Periodic counter operation</li> </ul>	on: when a compare match v	vith a general i gister and of t	register [TGRx] is selected for [0	Counter clear sourc	e], the counter is cleared to	0 on a compare
		- External event-count ope	eration: when an external pin	input is select	ted for [Counter clock selection]	], every edge of the	e input signal is counted.	
	E MTCLK	- Synchronous mode setting						
	E MTCLK	🔲 Include this channel i	n the synchronous operation					
		- Count source setting						
		Counter clock selection	PCLK	•				
		- Clock edge setting						
		<ul> <li>Rising edge</li> </ul>	C Falling edge	C Both edg	es			
		- TCNT0 counter setting						
		Counter clear source	Disabled counter clear				<b>_</b>	
		– General register setting –						
		TGRA0	Input capture register	•	100	μs 🔽	(Actual value: 100)	
		TGRB0	Input capture register	-	100	µs 🔻	(Actual value: 100)	
		TGRC0	Input capture register	-	100	μs 🔻	(Actual value: 100)	
		TGRD0	Input capture register	-	100	μs	(Actual value: 100)	
		TGREO	Output compare register	-	100		(Actual value: 100)	

Figure 5-8 Example of a Module panel (Multi-Function Timer Pulse Unit2)

Remark: In the example shown in Figure 5-7, settings are specified in the following order:

- <1> Select the [general Setting] tab.
- <2> Select MTU0 function (the [MTU0] tab is enabled).
- <3> Select the [MTU0] tab.
- <4> Set details on MTU0.

#### **5.3 Preview Panel**

The Preview panel is used to the file and the API function to be output during code generation. For a description of operating procedure, see "3.7 Checking Source Code".





#### (1) Preview Tree

Double-clicking the source file or API function name on the Preview tree changes the display of the source code display area.

On the Preview tree, the shapes of the icons change according to the status of the settings.

Table 5-3 Preview Tree Icons

Icon	Summary
	Peripheral function (used)
	Peripheral function (unused)
	File
fxo	The API function to be output during code generation (required)
exc)	The API function to be output during code generation (user-specifiable)
fxc)	The API function not to be output during code generation (user-specifiable)



Right-clicking the API function/file name brings up the context menu.

Item	Object of action	Description
[Generate Code]	API function (🌇, 凹)	Sets the API function as an object of output for code
		generation.
		The icon changes from  🎬 to 🎇 .
[Not Generate Code]		Excludes the API function from the object of output for
		code generation.
		The icon changes from  🎬 to 🎬 .
[Rename]	API function 🚰, 🏭, 鬥)	Renames the API function name/file name that is output
	File ( 🚺 )	during code generation. The name changes to the Edit
		mode.
[Default]		Resets to an Applilet3 initial value the API function
		name/file name that is output during code generation.

#### Table 5-4 Preview Tree Context Menu

#### (2) Source code display area

Verifies the source code (a device driver program). Double-clicking the source file name or the API function name on the Preview Tree switches the source code that is displayed.

The source code in this area is displayed in character colors listed in Table 5-5.

Color of	Summary	
display		
Green	Comment statement	
Blue	C compiler reserved word	
Red	Numeric value	
Black	Code	
Gray	File name	

#### Table 5-5 Source Code Character Colors

#### **Remarks** 1. Source code cannot be edited in this area.

2. In some API functions (such as API functions for a serial array unit), register value SFRs and other values are calculated during the code generation process before the function is finalized. For this reason, the source code displayed in this area may not agree with the source code that is actually output.

#### Figure 5-10 Example of an AP Function Display

```
void INTP_Init( void )
{
    EGP0 = INTP_EGP_RESET_VALUE;
    EGN0 = INTP_EGN_RESET_VALUE;
    EGP1 = INTP_EGP_RESET_VALUE;
    EGN1 = INTP_EGN_RESET_VALUE;
    INTP_User_Init();
```

If this API function (INTP\_Init()) is output, the function is called here. During code generation, whether this line is to be or not to be actually output depends on the settings for the API function (INTP\_User\_Init()) that is called.

#### **5.4 Property Panel**

The Property panel displays information such as the generate file mode and the API function to be output during code generation. For a description of operating procedure, see "3.7 Checking Source Code".



Section 2010 - AP4e2gcc_RX111_R5F1115	AxFM.cgp	
File View Peripheral Functions Option	ns Help	
🐑 🕞 🔲 🐹 🗺 🔊 🕼 CNURY for e2	studio -	
Project Tree		
AP4e2ecc RXIII R5FIII6AvFM     Property     Device Top View     Peripheral Functions     Clock Generator     Clock Frequency Accuracy Measure     Low Power Consumption     Interrupt Controller Unit     Buses     Duata Transfer Controller     Event Link Controller	Perpheral Functions Property     Generate File Mode     API output control     Creation date     File generation control     Output folder     Report type     Text file encoding     Microcontroller Information     Microcontroller name     Nickname     Product Information     Belease date	Output all API functions according to the setting Output date Meree file C:#Renesas¥AP4_proj¥AP4e2gcc_RX111_R5F1115AxFM¥ HTML file Unicode(UTF-8) R5F51115AxFM RX111(128KB) 2016/08/05
VO Ports     Multi-Function Timer Pulse Unit 2     Ororout Duty Enable 2     Orono Math Timer	Version  Project Information  Project name Project path	2010708705 V1.05.04.04 AP4e2gcc_RX111_R5F1115AxFM Cx#Renesas#AP4.pro;#AP4e2grc; RX111_R5F1115AxFM
Compare Match Timer     Realtime Clock     Idependent Watchdog Timer     Serial Communications Interface     Serial Peripheral Interface     CRC Calculator     A/D Converter     D/A Converter     Data Operation Circuit     Code Preview	API output control Selects whether to output All API function necessary function according to GUI setting of each peripheral. Output	to operation according to GUI setting of each peripheral, or to output only initialization API
< ► MCU:RX111(128KB) Chip:R5F51115AxFM	[ <b>*</b> ]	<b></b>

#### Table 5-6 Property Panel Icons

lcon	Summary	
	Listed in Itemized	
₹↓	Listed in an alphabetical order	

#### Table 5-7 Property Panel Menu

Item	the node selected in	Description
	the Project Tree panel.	
Generate File Mode		
API output control	Project name	API function output control can be selected from "output all API functions according to the setting", and "output only initialization API function." The default is "output all according to the settings". Selecting the "output only initialization API function" option skips the generation of the file R_xxx_user.c that codes interrupt handlers, in which case all interrupt handlers must be coded by
Text file encoding		Selects the format of encoding.



Item	the node selected in	Description
File concretion control		Eile generation control can be calented from: avenurite file, marga
		files, and do nothing if a file already exists. The default is "Merge file"
Report type		Select either HTML or CSV. The default is "HTML file".
Output folder		Specify the destination folder of output files.
Creation date		Selects whether to output creation date. The default is "Output date".
Project Information		
Project path	Project name	Displays Project path.
Project name		Displays Project name.
Project type		Displays Project type.
Microcontroller Information		
Microcontroller name	Project name	Displays Microcontroller name.
Nickname		Displays Nickname.
Product Information		
Version	🐺 Project name	Displays Version.
Release date		Displays Release date.
Device top view color setting		
Device	Device Top View	Select color setting of Device.
		The default is128, 128, 128
Device group text		Select color setting of Device group text.
	_	The default is192, 192, 192
Used pins		Select color setting of Used pins. The default is 144, 238, 144
Alternate function pins		Select color setting of Alternate function pins.
Macro highlight		Select color setting of Macro highlight. The default is255, 255, 0
Device part number text		Select color setting of Device part number text. The default is192, 192, 192
Unused pins		Select color setting of Unused pins. The default is176, 196, 222
Conflict pins		Select color setting of Conflict pins. The default is255, 0, 0
Warning pins		Select color setting of Warning pins. The default is 255, 215, 0
Peripheral function Information		
Peripheral function used	Peripheral function	Displays whether using the peripheral function.
Peripheral function error	_	Displays whether there is error in the peripheral function.
Peripheral function name		Displays the peripheral function name.
File Information		

Item	the node selected in	Description
Default name	Fie	Select whether to return the file name to the default name. The default is "Yes". To restore the default file name defined by the Code Generator,
	_	select [Default] from the context menu.
File used		Display whether or not output to a file is to proceed when the [generate code] button is clicked.
		Note that whether or not this option is used depends on the settings in the Peripheral Functions panel corresponding to the selected node.
File name		Inputs the name of the file The name of the file can be changed by selecting [Rename] from the context menu after selecting the source code node in the Project Tree panel.
Output folder		Displays the output destination folder. Note that the output destination folder can be changed by using
Function Information		
Default name	Series (1997)	Selects whether or not to restore the default name of the API function. Note that the default name of the API function can be restored by selecting [Default] from the context menu after selecting the source code node in the Project Tree panel.
Function generated		Selects whether or not to output the API function when the [Generate Code] button in the Peripheral Functions panel is clicked.
Function name		Inputs the name of the API function. Note that the name of the API function can be changed by selecting [Rename] from the context menu after selecting the API function node in the Project Tree panel.



#### 5.5 Output Panel

The Output panel displays information such as the execution status of code generation or report output, and the allowable setting range for a selected input field.

Figure	5_12	Output	Danal	Dienlav
IUUUE	J-12	Output	I anci	DISDIGV



Messages that are displayed on the Output panel are color-coded, depending on the type of message involved.

#### Table 5-8 Message Character Colors

Color	Туре	Summary	
Black	Normal message	Indicates information such as the execution status of code generation or report output.	
Blue	Warning message	Displays a warning if the value in the input field is invalid.	
Red	Error message	Indicates that the execution of processing is disabled due to a fatal error or other reasons.	

Right-clicking the Output panel displays a context menu.

#### Table 5-9 Output Panel Context Menu

Item	Description	
Clear	Selecting [Clear] from the context menu deletes all messages that are displayed on the Output panel.	
Сору	Dragging a message (character string) on the Output panel selects (producing an inverted color	
	display) the character string.	
	Selecting [Copy] from the context menu copies the selected (inverted color display) character string	
	(stores it in the clipboard).	
Select All	Selects (in inverted color display) all the messages (character strings) on the Output panel.	

## **Revision History**

		Descriptior	1
Rev.	Date	Page	Summary
Rev.1.00	Mar. 31, 2015	-	First Edition issued
Rev.1.01	Oct. 31, 2016	All	Tool name changed (applilet -> AP4)
		All	Figure, updated
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		50	5.4 Property Panel, added

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# AP4, Applilet3 Common Operations

User's Manual

