RX Family

Adding Firmware Integration Technology Modules to Projects

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Summary

This document describes the procedure to obtain the firmware integration technology (FIT) module and add it to e² studio projects.

Products

Supported devices depend on the FIT modules.

Refer to the device list in the readme.txt file provided with the FIT module to see the supported devices.

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1. Overview

This application note describes how to manually add a FIT module in an e² studio project.

Refer to the e² studio user's manual for information on how to use e² studio. Note that the version of e² studio used in this application note is version v5.3.0.023.

1.1 Terminology

Term	Meaning
FIT	Acronym for firmware integration technology.
e² studio	e² studio is an integrated development environment tool for the Renesas RX Family. It is based on Eclipse, the globally popular open source integrated development environment, along with the CDT plug-in, which facilitates C/C++ development.
BSP	Acronym for board support package. This is a module that performs microcontroller initial settings, clock settings, and board settings. The BSP is the foundation of any project that uses FIT modules. The FIT module for the BSP is "r_bsp".
CMTW	Acronym for compare match timer W. The FIT module for the RX CMTW is "r_cmtw_rx".
Platform	Means the same as target board.

1.2 FIT Structure

The FIT consists of BSP, peripheral, middleware, and interface modules.

- BSP: Module that performs microcontroller initialization, clock settings, and board settings.
- FIT peripheral function module: Driver that controls the RX microcontroller peripheral functions.
- FIT middleware module: Middleware that implements TCP/IP, file system, and other functions.
- FIT interface module: Interface that provides the Socket API and other functions.

Software development is made easier by using these components.

Figure 1.1 shows the FIT Structure.

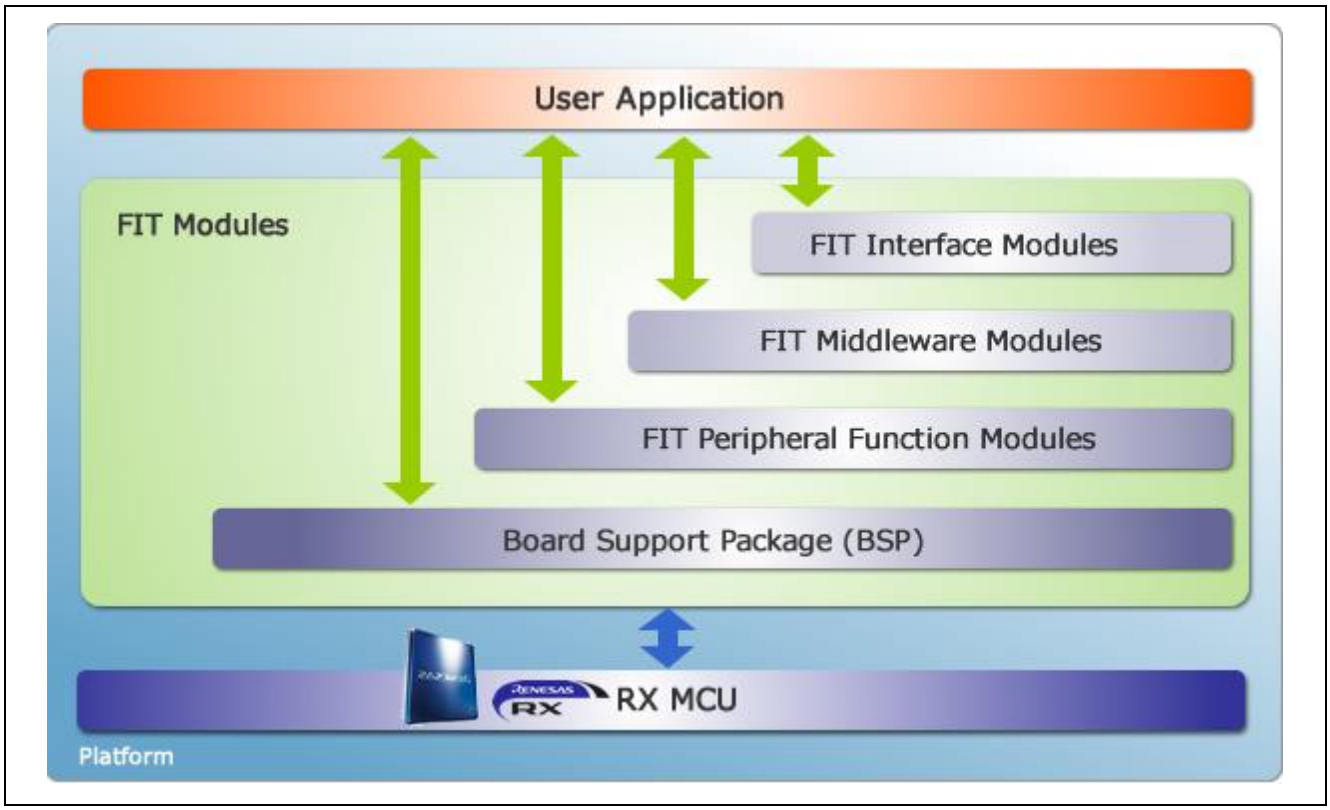


Figure 1.1 FIT Structure

1.3 File Structure of the FIT Module Application Note

The FIT module application note is a single ZIP file that can be downloaded from the Renesas website.

The FIT module application note includes common subsets for files and folders.

Figure 1.2 shows a dummy FIT module application note that includes the FIT module with the peripheral function “abc”.

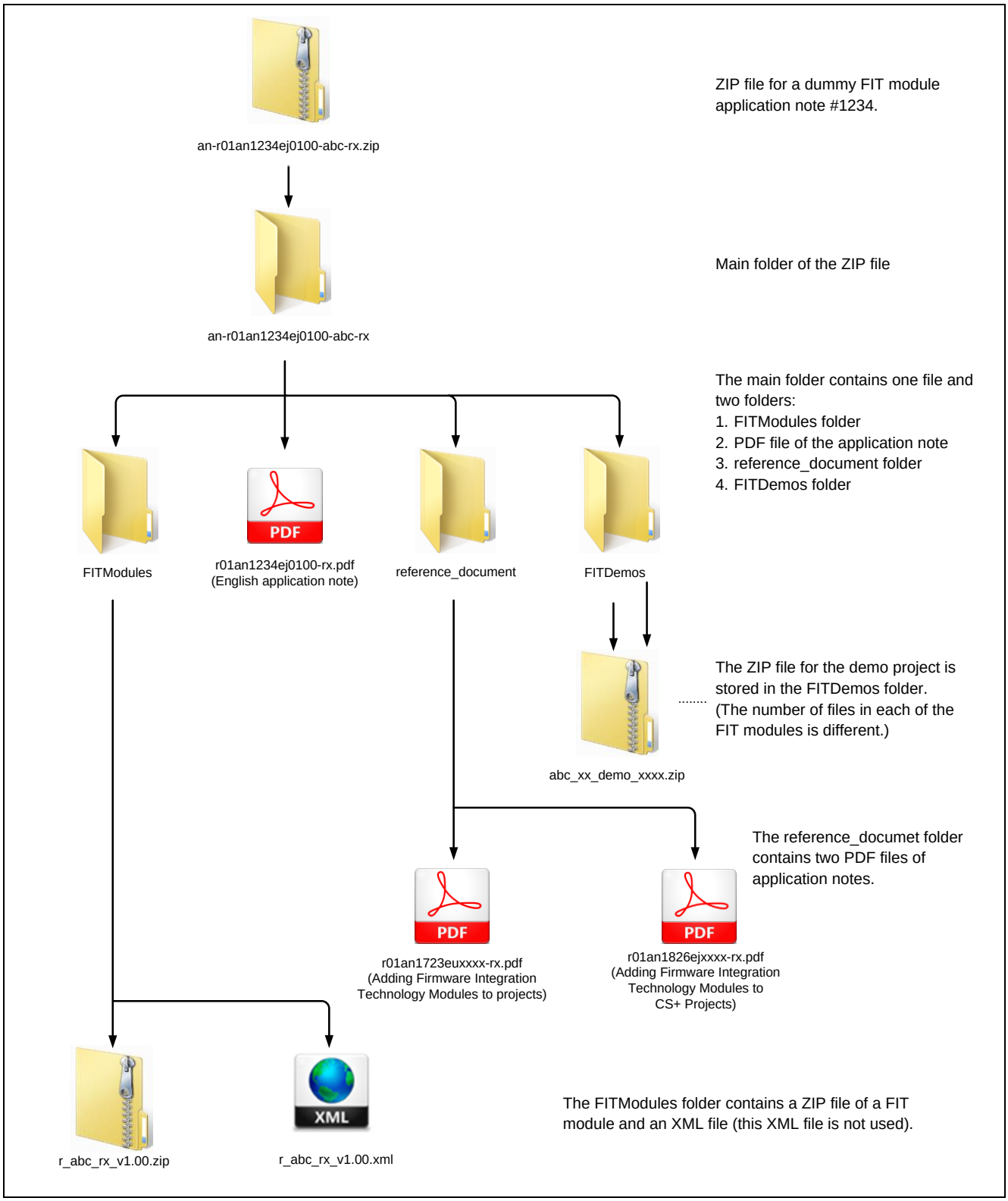


Figure 1.2 Contents of the FIT Module Application Note

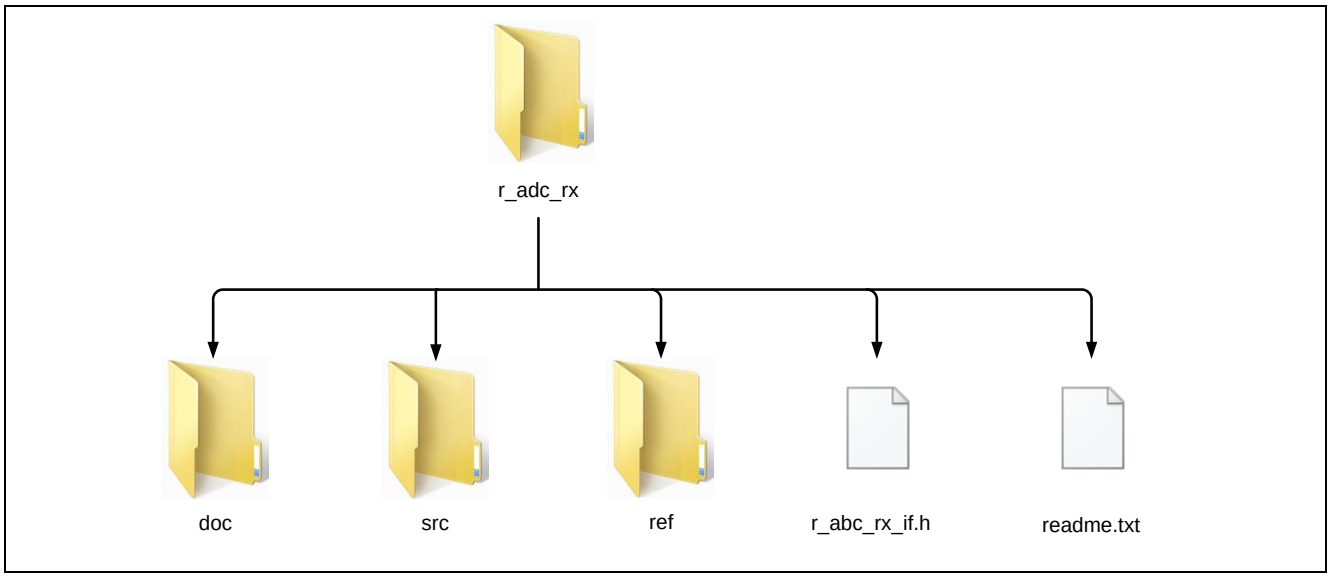


Figure 1.3 Contents of the Dummy FIT Module "r_abc_rx"

Figure 1.3 shows a typical file structure of a FIT module.

The names of any FIT modules begin with the prefix "r_" which represents the module is a Renesas module. The "r_" prefix is followed by the module function and "_rx" all in lower-case letters. "_rx" represents the RX Family.

The "doc" folder contains documents relating to the FIT module.

All of the source and header files required for the FIT module are stored in the "src" folder. The "src" folder may contain subfolders if necessary.

The "ref" folder contains configuration header files with the suffix "_config". This is the FIT module configuration file. It includes several macros for figuring code to meet the user's needs.

Two files are contained directly under the FIT module folder begin with the "r_".

One is a header file with the suffix "_if". This file includes an interface (e.g. prototype declarations for the API functions, type definitions, macros) required for using the FIT module.

The other is the readme.txt file. This file includes information such as the FIT module version and functions.

2. Procedure for Adding FIT Modules Using the FIT Configurator

2.1 Creating an e² studio Project

The procedure for creating a new e² studio project and using the FIT Configurator to added FIT modules for the BSP and CMTW will now be described.

In this section, an example is presented in which the Renesas Starter Kit+ for RX64M (referred to below as "RSK+RX64M") is used as the platform. If another platform is to be used, substitute the information for that platform as appropriate.

Figure 2.1 shows the flow of the new project configuration procedure.

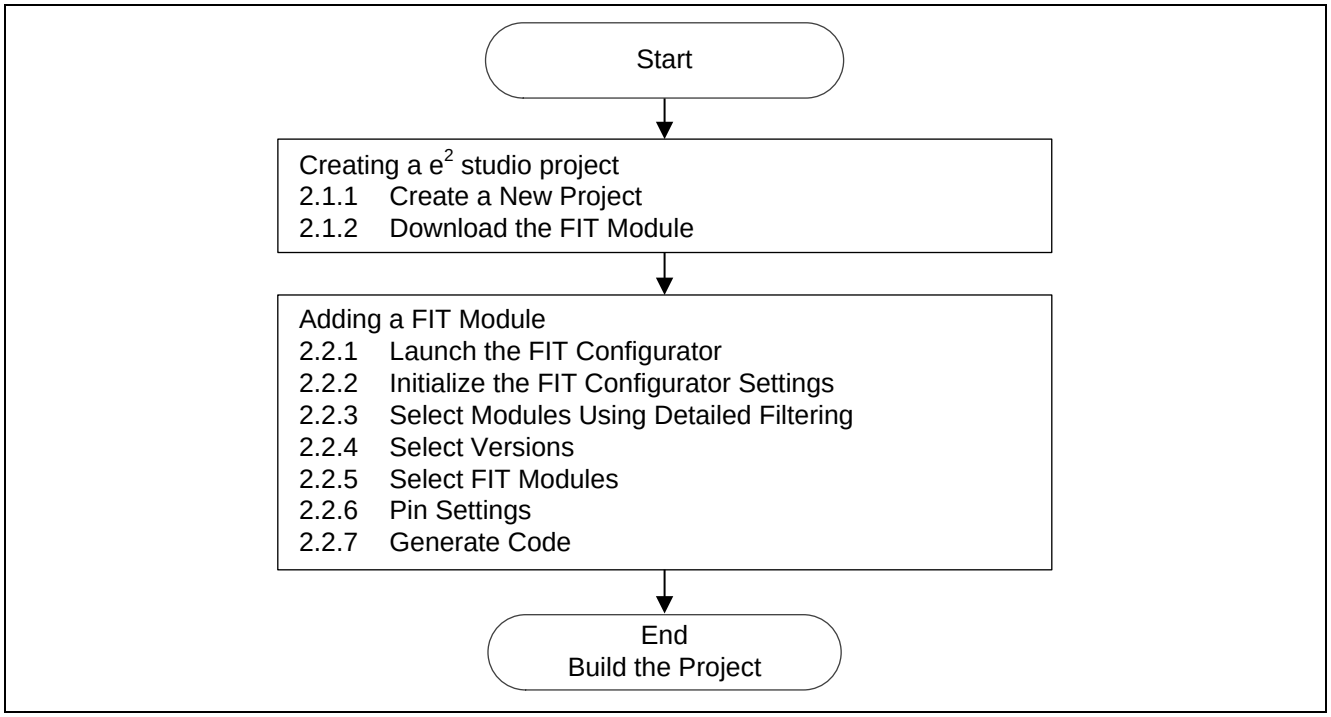
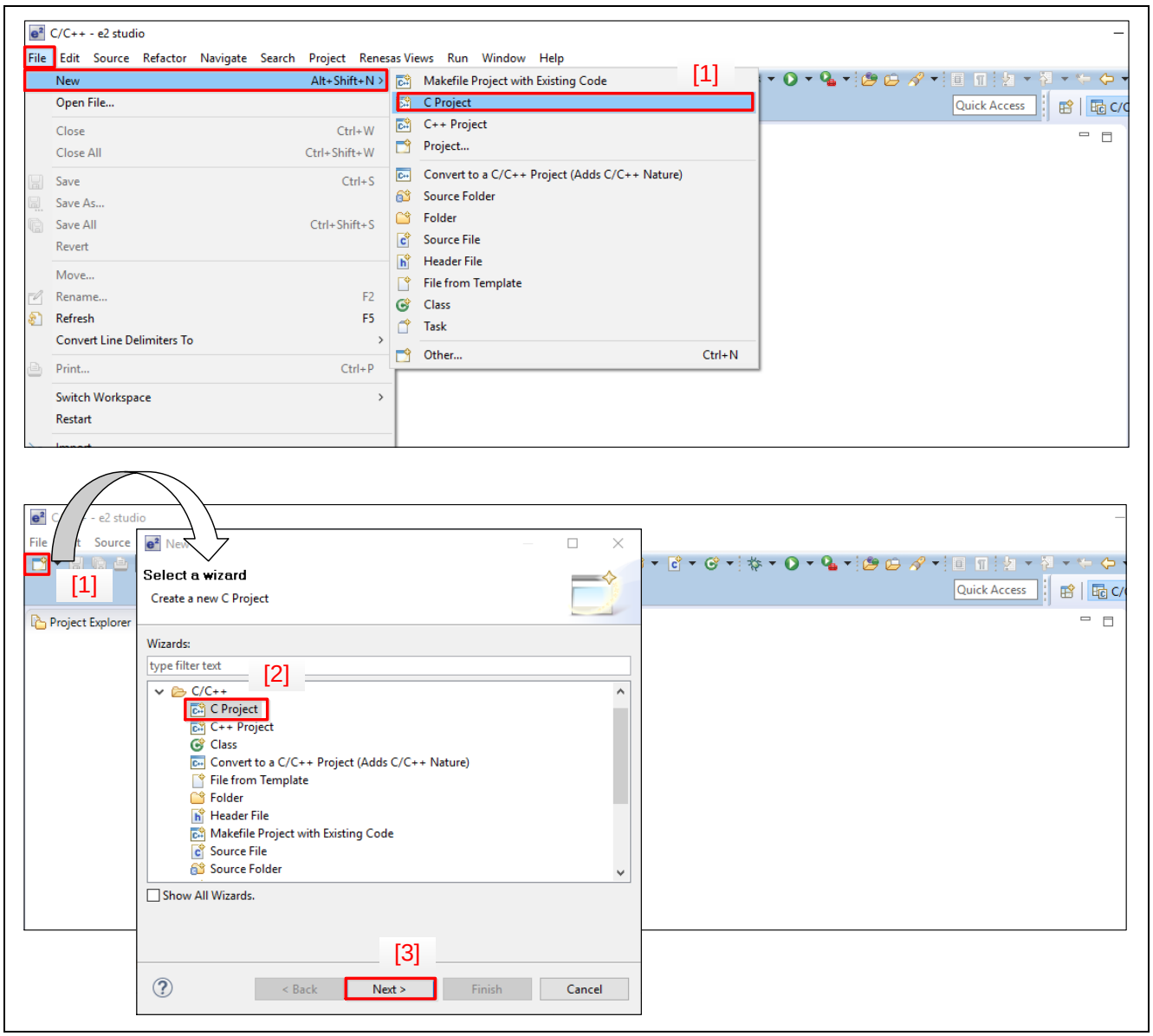
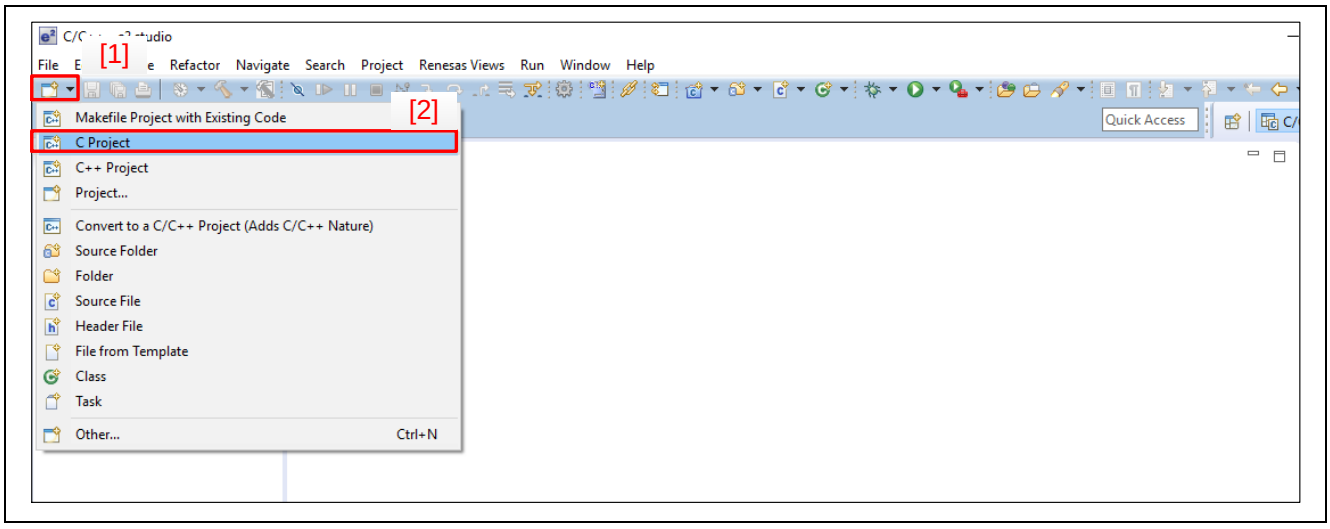


Figure 2.1 Flow of New Project Configuration Procedure

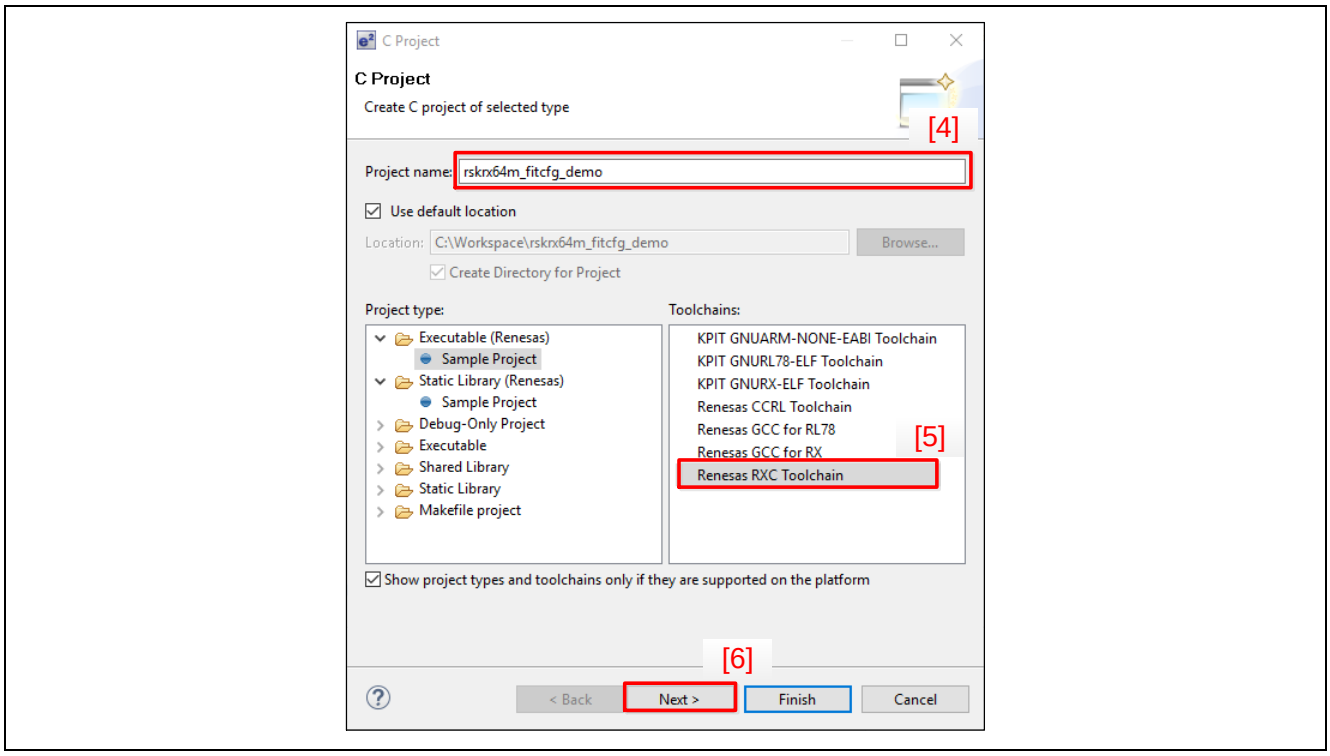
2.1.1 Create a New Project

1. Launch e² studio, and open the new project creation wizard using one of the following methods. In this example, the project is taken to be a C project.
   - Select “File” > “New” > “C Project” from the menu bar [1].
   - Click the button on the toolbar [1], select “C Project” from the wizard selection screen [2], and click the “Next” button [3].
   - Click the ▼ button next to the button on the toolbar [1], and select “C Project” [2].

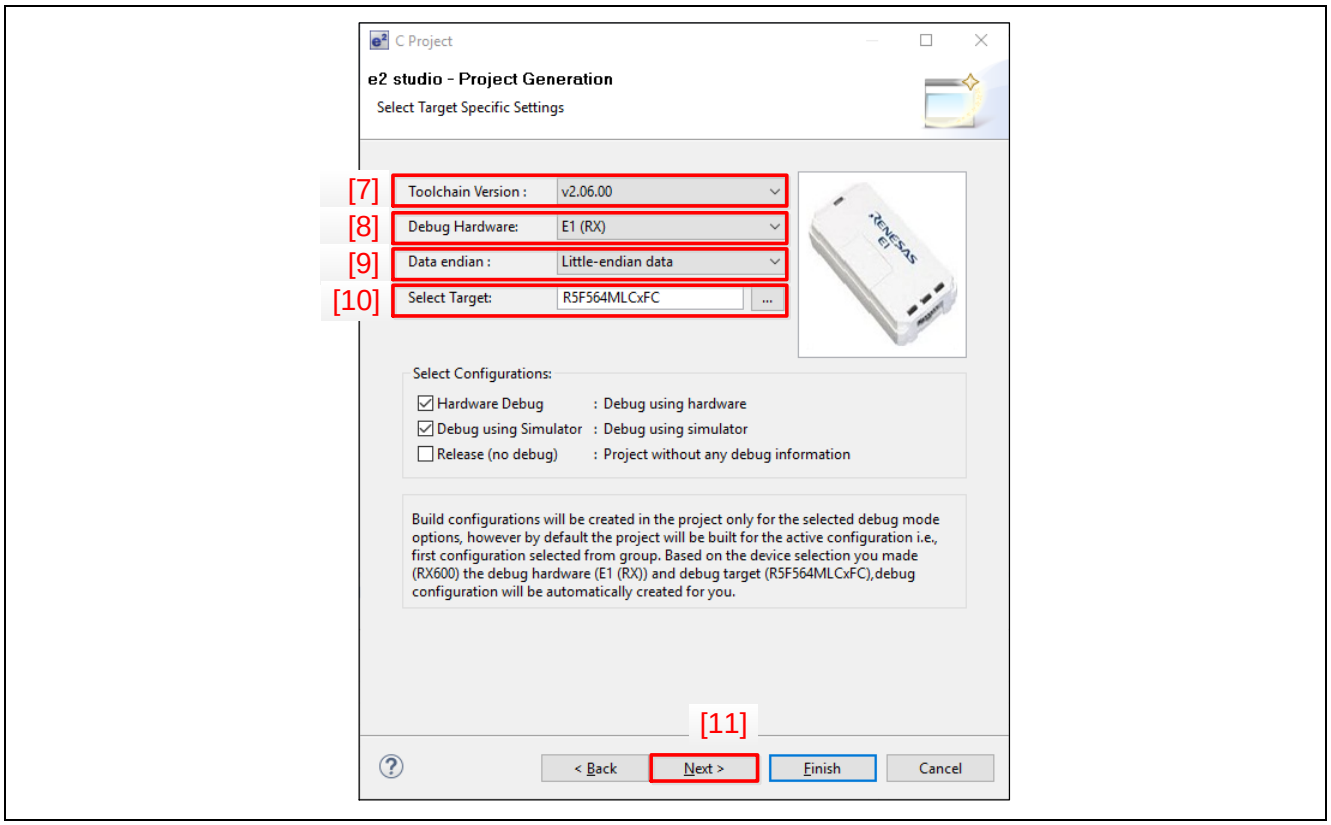




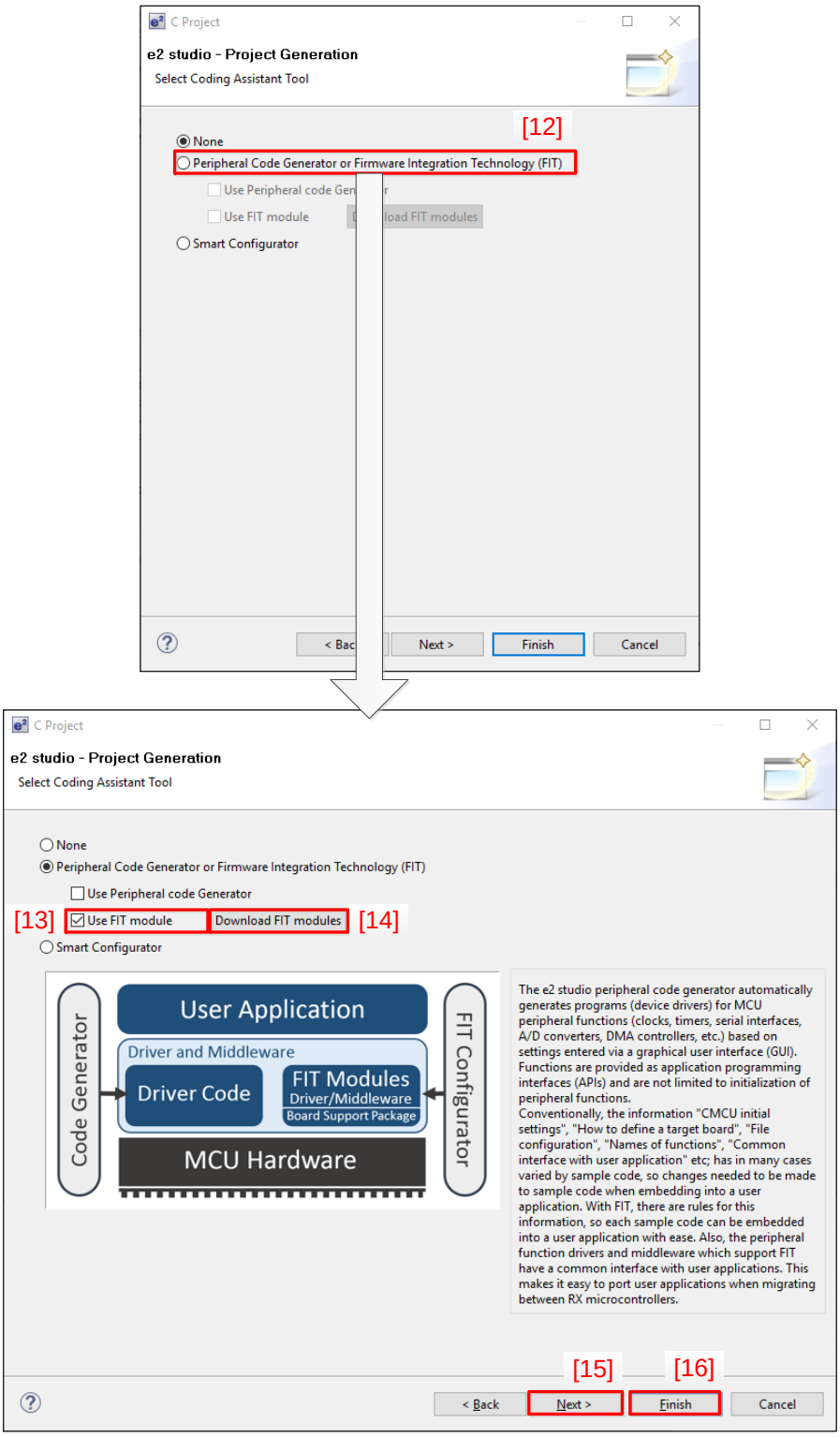
2. In “Project name” in the new project wizard (C Project), enter the project name [4]. In this example, the project name is taken to be “rskrx64m_fitcfg_demo”.
3. From “Toolchains”, select “Renesas RXC Toolchain” [5], and click the “Next” button [6].



4. From “Toolchain Version” in the new project wizard (Select Target Specific Settings), select the version [7]. In this example, the version is taken to be “v2.06.00”.
5. From “Debug Hardware”, select the debugger [8]. In this example, the debugger is taken to be “E1 (RX)”.
6. From “Data endian”, select the endian order [9]. In this example, the endian order is taken to be “Little-endian data”.
7. From “Select Target”, select MCU [10]. In this example, the target is taken to be “R5F564MLCxFC”.
8. Click the “Next” button [11].



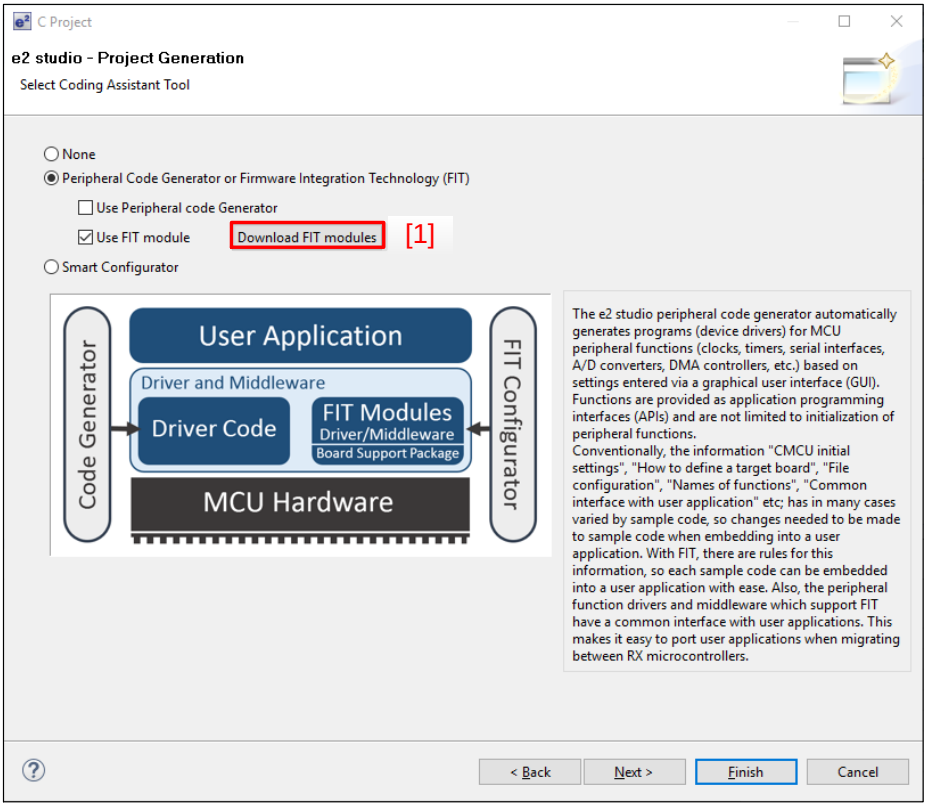
9. In the new project wizard (Select Coding Assistant Tool), select “Peripheral Code Generator or Firmware Integration Technology (FIT)” [12].
10. Select “Use FIT module” [13].
11. If it is necessary to download the FIT module, click “Download FIT modules” [14]. For details, see “2.1.2 Download the FIT Module.” In this example, the module is not downloaded.
12. The subsequent new project wizards are for selection of additional CPU options, selection of global options, and selection of standard header files. If it is necessary to configure these settings, click the “Next” button [15]; otherwise, click the “Finish” button [16].



2.1.2 Download the FIT Module

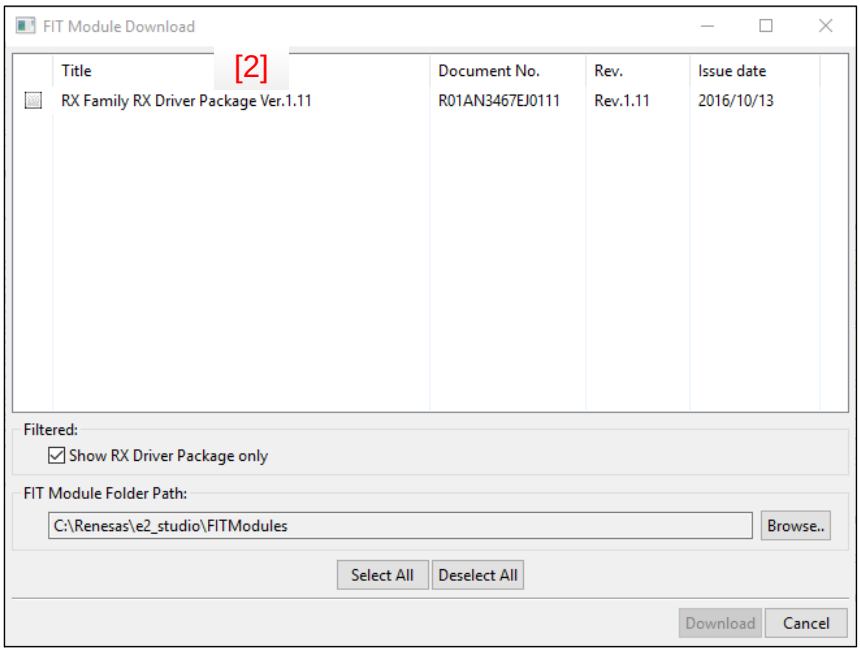
Using the e^2 studio functionality, download the FIT module from the Web. Download of FIT module can also be downloaded from existing project. For details, see item 5 in “2.4 Troubleshooting”.

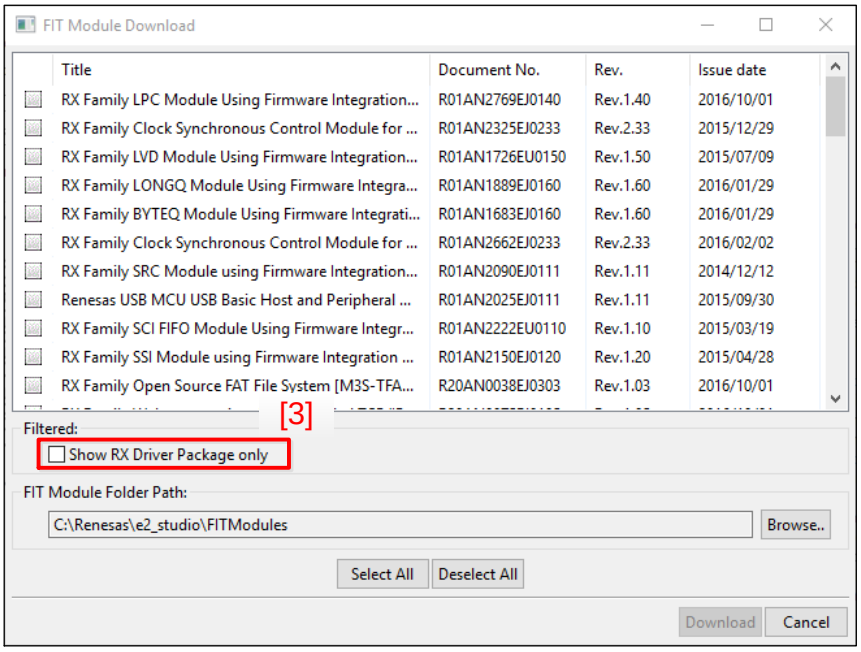
1. In the new project wizard (Select Coding Assistant Tool), click “Download FIT modules” [1].



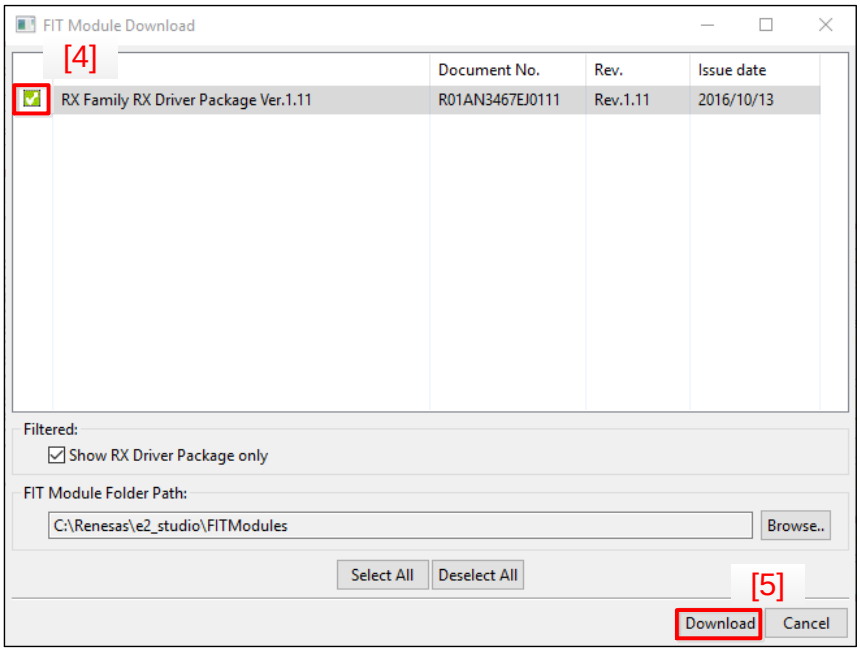
2. e² studio will retrieve the FIT module information from the Web.
3. The retrieval results will be displayed in the FIT module download wizard. By default, the filter to display only the RX Driver Package*1 is selected, so RX Driver Package is displayed [2]. To display all peripheral functions, middleware, and the like, unselect this filter [3].

Note 1. The RX Driver Package is a software platform (framework) that packages together all of the FIT modules. The use of this package is recommended.





4. Select the check boxes of the FIT modules to download [4]. In this example, select the RX Driver Package.
5. Click the “Download” button [5]. If My Renesas authentication has not yet been performed even once, the My Renesas dialog will open. Enter the email address and password that have been registered on the Renesas website.

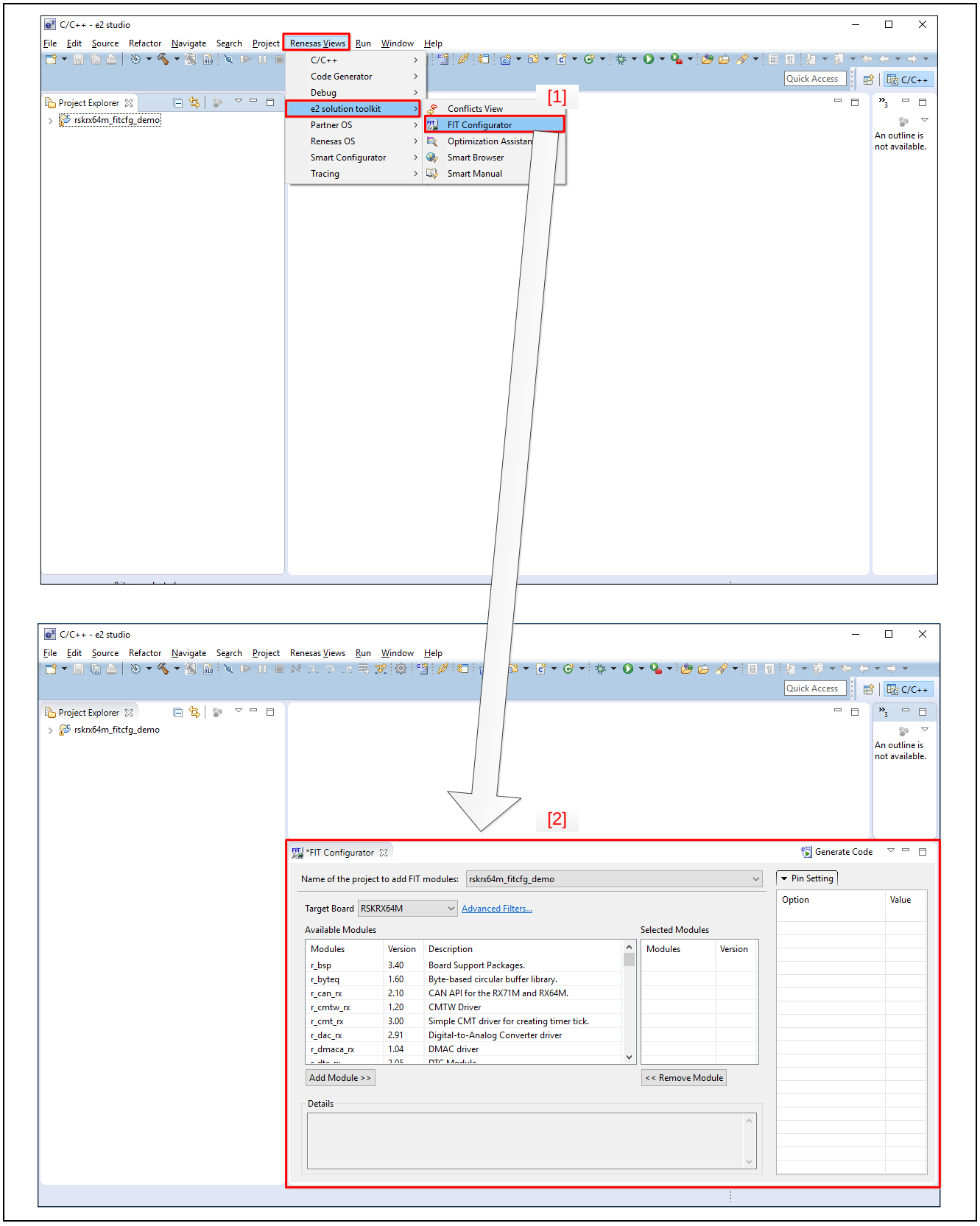


6. To proceed from here, see step 12. in “2.1.1 Create a New Project.”

2.2 Adding the FIT Module

2.2.1 Launch the FIT Configurator

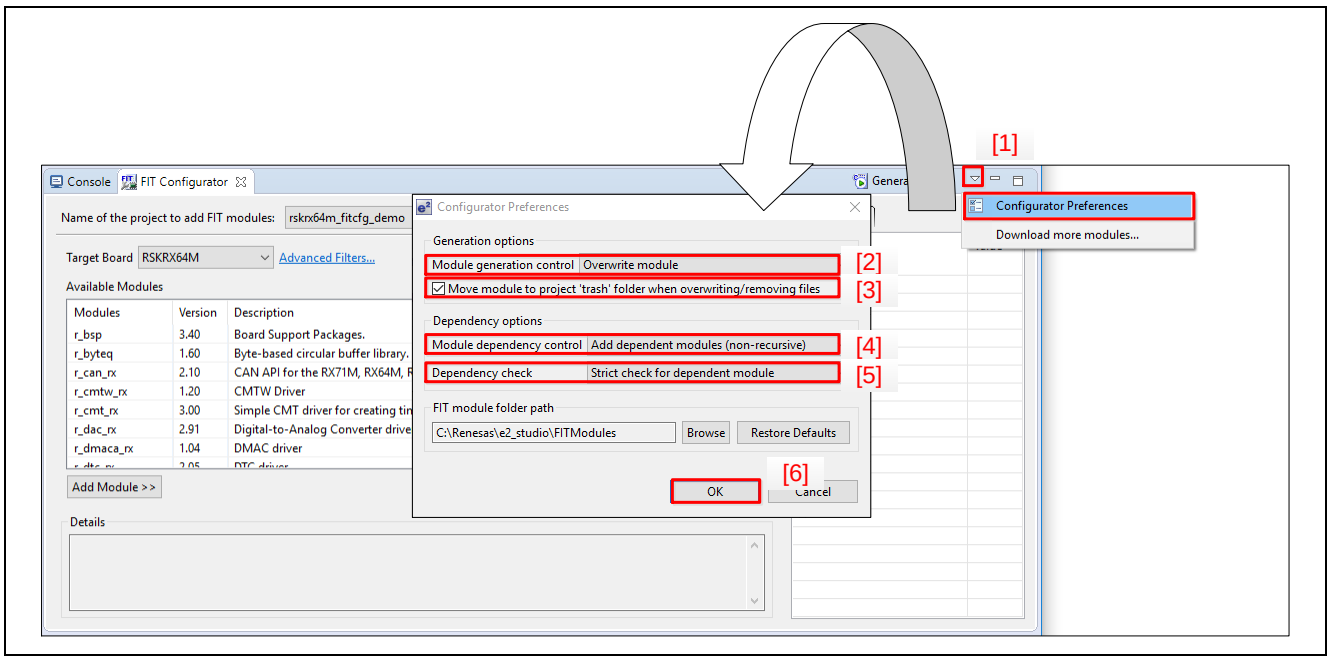
Select “Renesas Views” > “e² solution toolkit” > “FIT Configurator” from the menu bar [1], and launch the FIT Configurator [2].



2.2.2 Initialize the FIT Configurator Settings

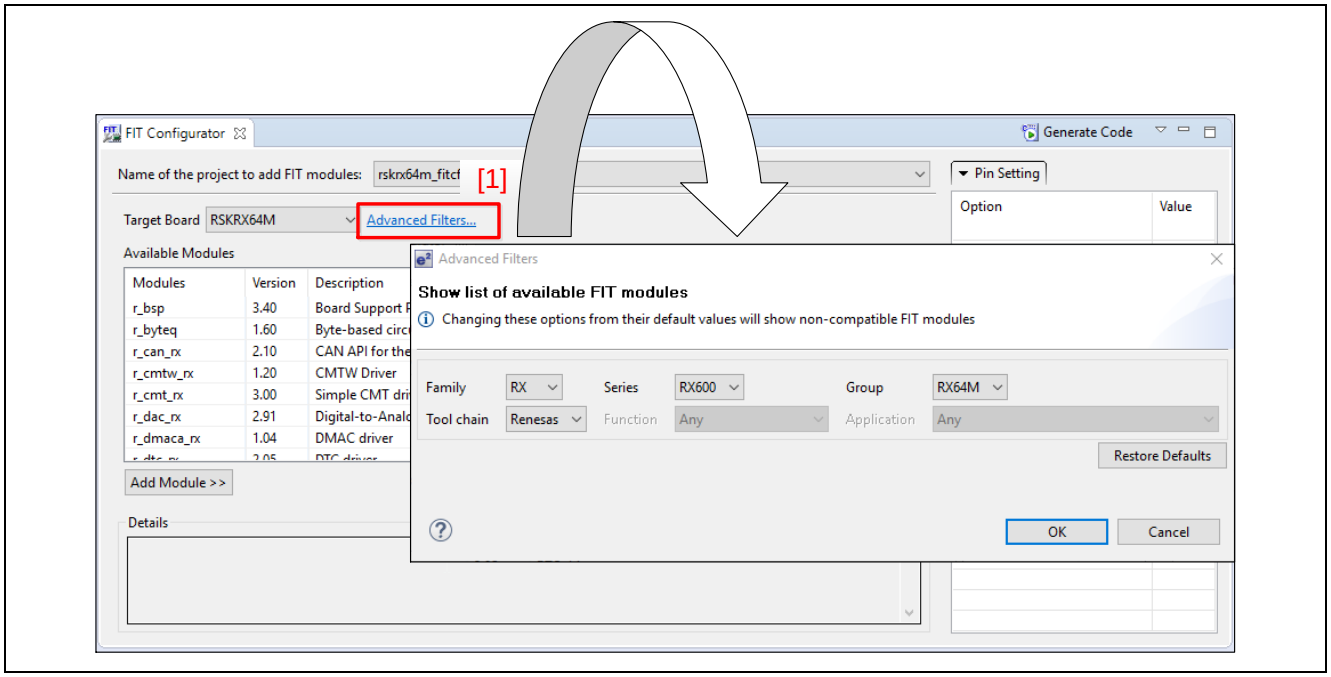
The behavior of the FIT Configurator can be customized.

1. From the ∇ drop-down menu, select “Configurator Preferences” to open the FIT Configurator initialization dialog [1].
2. Configure the module generation settings in Generation options [2]. In this example, “Overwrite module” (the default) is selected. The following are descriptions of the setting values.
   — “Overwrite module”
   All of the FIT modules are regenerated.
   — “Do nothing if module exists”
   When the “Code Generation” button is clicked, all FIT modules in the user project that already exist will not be generated.
3. Select the “Move module to project 'trash' folder when overwriting/removing files” check box [3]. In this example, select this check box (the default).
4. Select a module dependency setting in Dependency options [4]. In this example, “Add dependent modules (non-recursive)” (the default) is selected. The following are descriptions of the setting values.
   — “Add dependent modules (non-recursive)”
   The dependent modules that are directly related to the selected FIT module are automatically added.
   — “Do not add dependent modules”
   Even if there are dependent modules that are directly related to the selected FIT module, they are not automatically added.
5. Select a dependency check setting in Dependency options [5]. In this example, “Strict check for dependent module” (the default) is selected. The following are descriptions of the setting values.
   — “Strict check for dependent module”
   Strictly checks that the versions of the FIT module and the dependent modules are approved combinations.
   — “Do not check for dependent modules”
   Dependency errors and warnings will not be displayed.
   — “Ignore if dependent module version is newer”
   If a dependent module that is more recent than the required version is selected, a dependency error or warning will not be displayed. If a selected dependent module is older than the required version, a warning will be displayed.
6. Click the “OK” button [6].



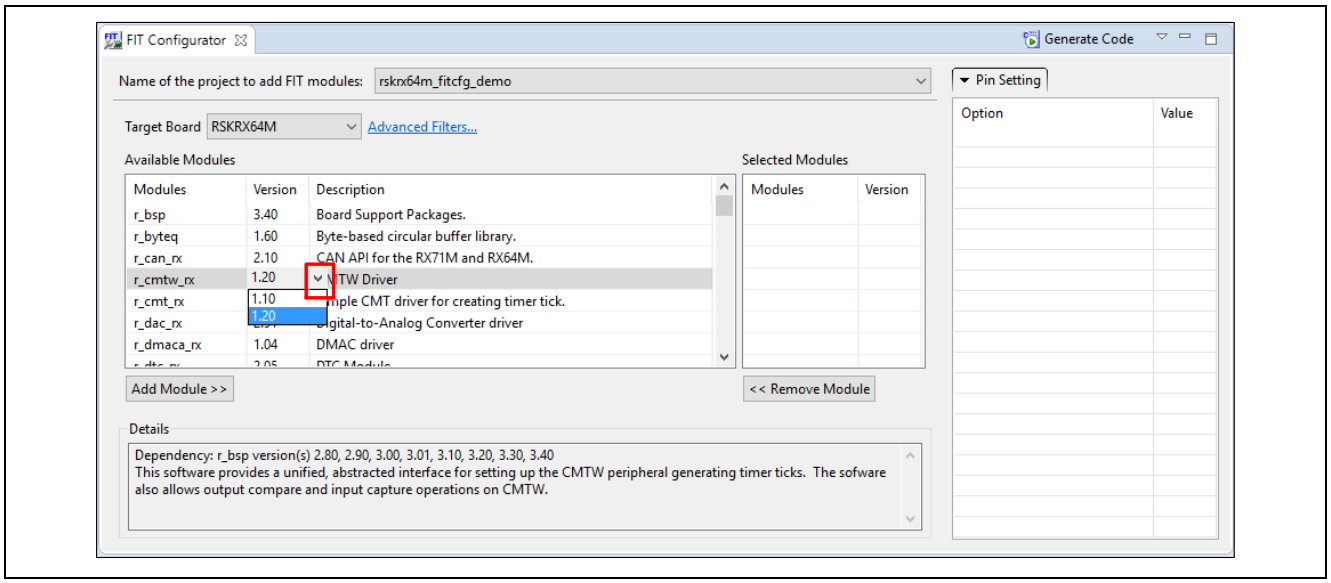
2.2.3 Select Modules Using Detailed Filtering

The FIT modules to display in the usable modules list can be controlled. When “Advanced Filters...” is selected [1], the detailed filter settings dialog is displayed. The filter options (Family, Series, Group, etc.) will be for the device that has been specified in the current project. In this example, “R5F564MLCxFC” has been selected for the device, so the “RX” Family, the “RX600” Series, and the “RX64M” Group are automatically selected.



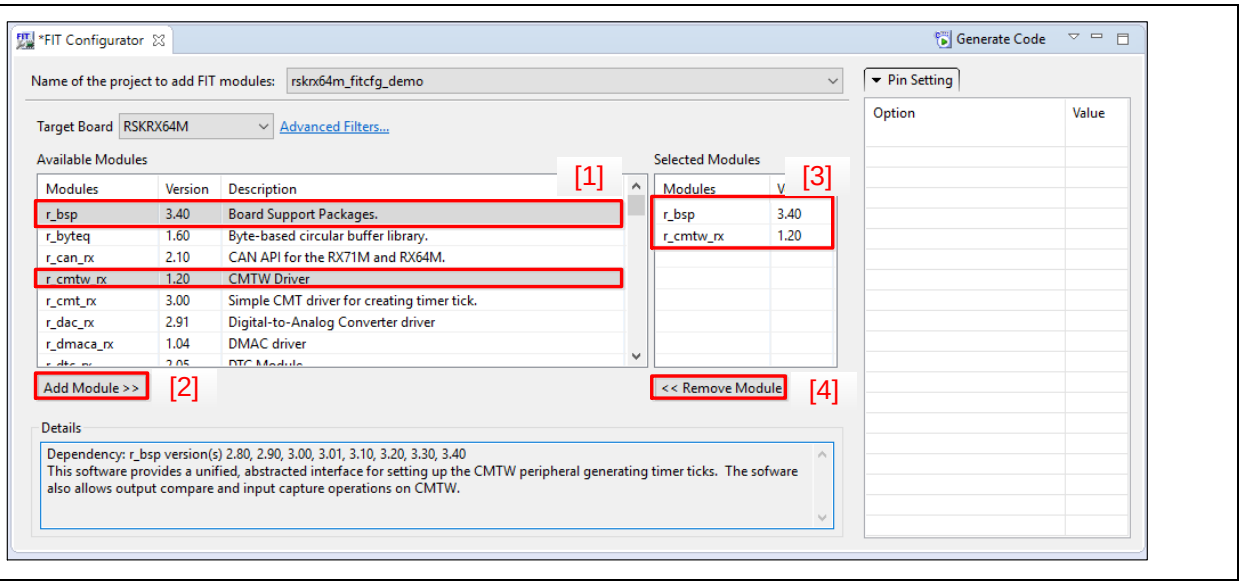
2.2.4 Select Versions

By default, the most recent version of each of the installed FIT modules is displayed in the available modules list. However, if the use of a previous version is desired, click the “Version” column of each module, and select the desired version from the displayed drop-down list.



2.2.5 Select FIT Modules

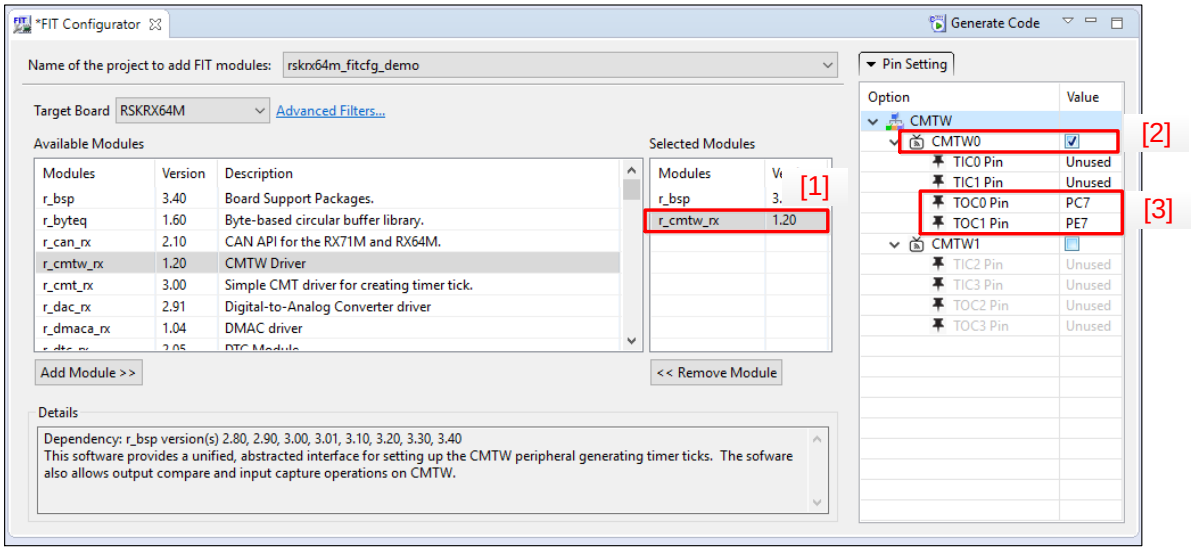
1. From the available modules list, select the FIT modules to use [1]. In this example, select the BSP and CMTW FIT modules.
2. Click the “Selected Modules >>” button [2]. The selected FIT modules will be displayed in the selected FIT modules list [3].
3. To delete FIT modules from the selected modules list, select the modules in question, and click the “<< Remove Module” button [4].



2.2.6 Pin Settings

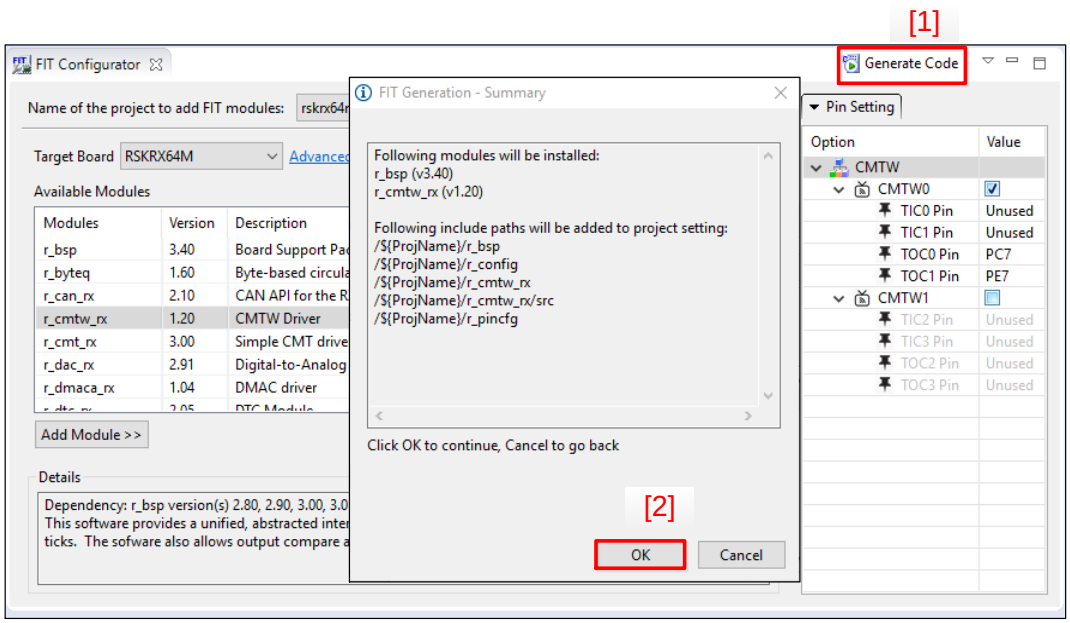
When using FIT modules for which pin settings must be specified, the pin functions to use and the pins to which to assign them can be selected.

1. From the selected modules list, select the FIT module for which to specify pin settings [1]. In this example, select “r_cmtw_rx”.
2. From the pin settings list, select the check boxes for the channels in question [2]. In this example, select the CMTW0 check box.
3. Select the pin port to use. If “Unused” is selected, a drop-down list is displayed, so select the port to use [3]. In this example, the TOC0 pin is set to “PC7”, and the TOC1 pin is set to “PE7”.

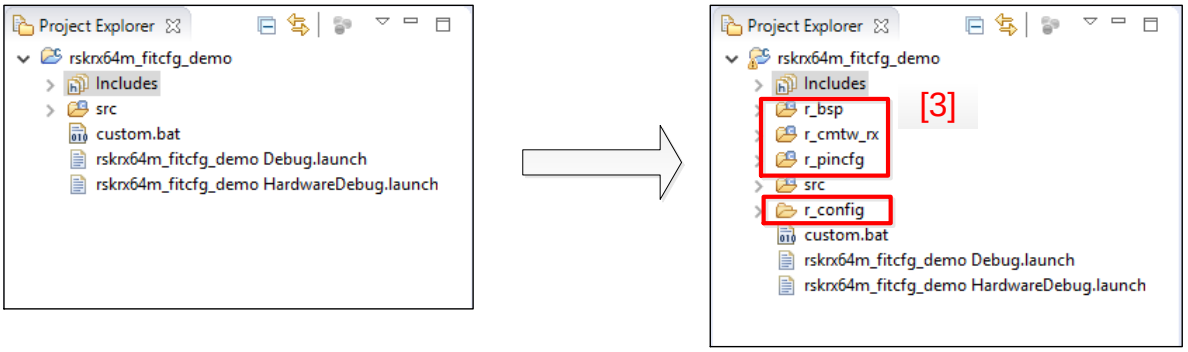


2.2.7 Generate Code

1. Click the “Generate Code” button on the FIT Configurator toolbar [1].
2. The FIT code generation dialog will be displayed. If there are no problems with the information displayed, click the “OK” button [2].



3. Code for the selected FIT modules will be generated. The generated code is added to the project in question in the Project Explorer [3]. In this example, the folders “r_bsp”, “r_cmtw_rx”, “r_pincfg”, and “r_config” are added. The “r_pincfg” folder is generated by specifying pin-specified functions, and contains a file in which there are functions that enable the pin functions. The “r_config” folder is always generated when FIT modules are used, and contains configuration files for the respective FIT modules.



Before code generation

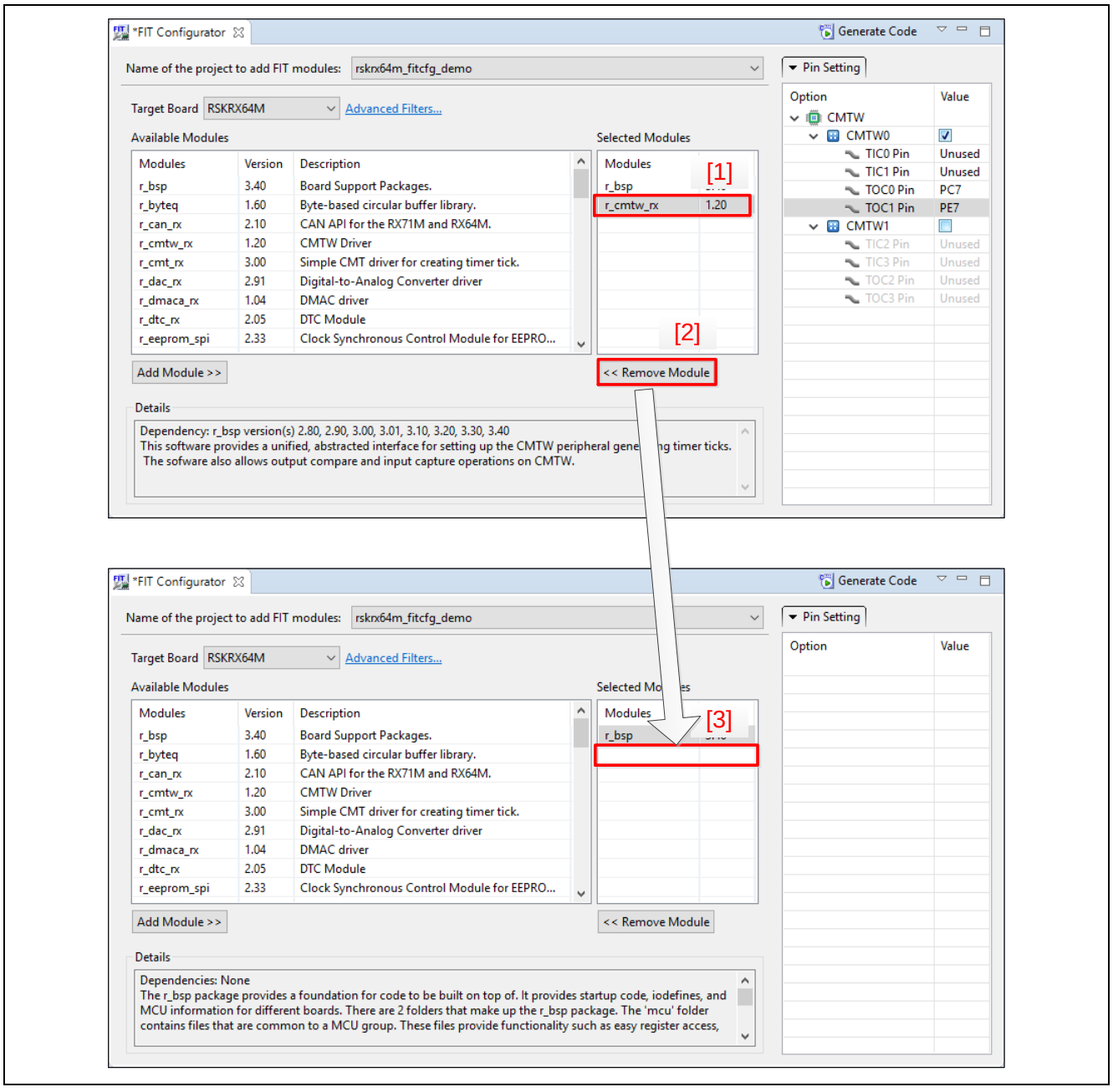
After code generation

2.3 Building a Project

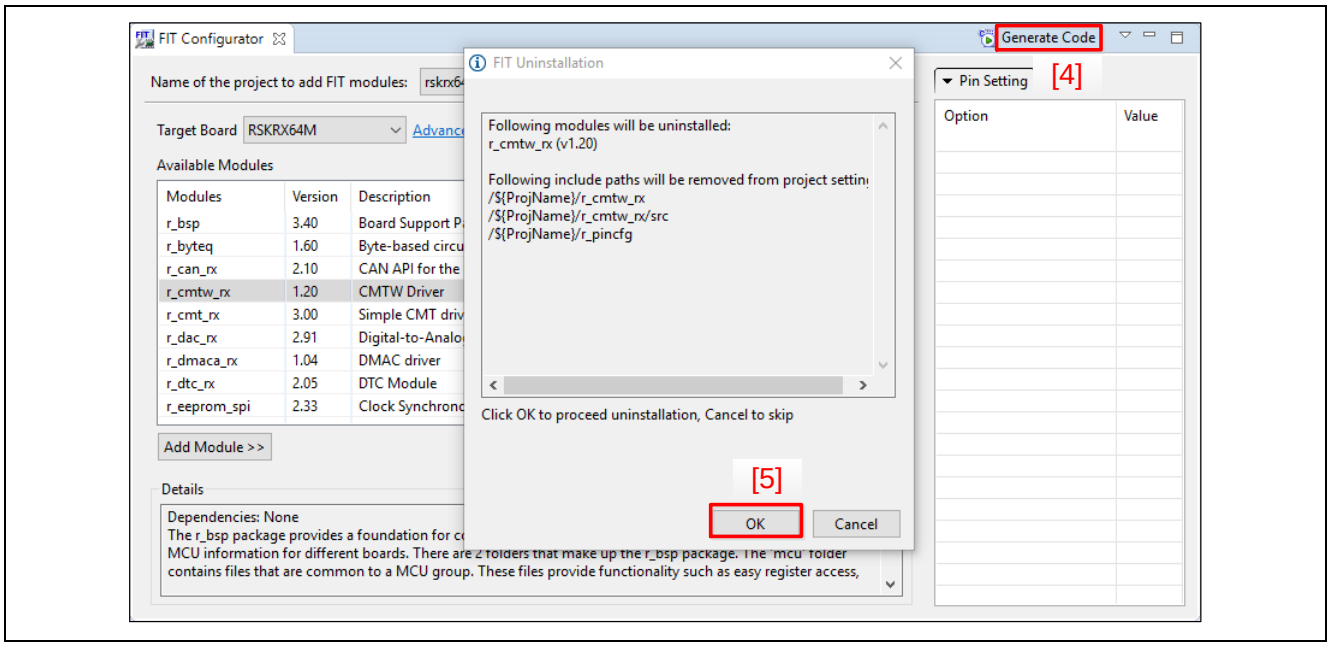
Create a user program, and build a project.

2.4 Troubleshooting

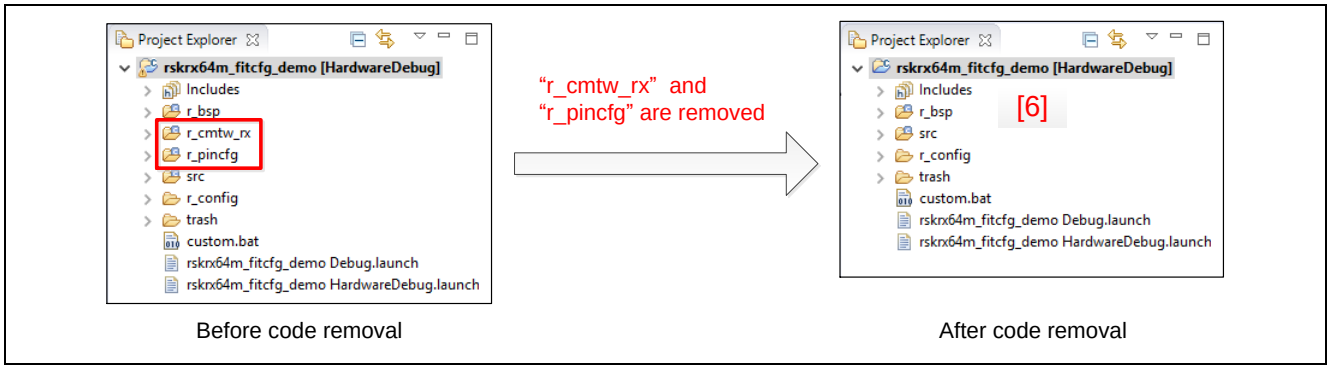
1. Q: How do you delete FIT modules that were code generated by the FIT Configurator?
   A: To remove FIT modules, follow the procedure below. In this example, remove “r_cmtw_rx”.
   — In the selected modules list in the FIT Configurator, select the FIT module to delete [1].
   — When the “<< Remove Module” button is clicked [2], the selected FIT modules are removed from the selected modules list [3].



— Click the “Generate Code” button on the FIT Configurator toolbar [4].
— A FIT uninstall dialog is displayed. If there are no problems with the information displayed, click the “OK” button [5].



— The code for the selected FIT modules will be removed [6]. In this example, “r_cmtw_rx” and “r_pincfg” are removed from the Project Explorer. (The fact that “r_pincfg” was removed is due to its dependency relationship with “r_cmtw_rx”.)



2. Q: Icons are displayed in the selected modules list. What should I do?
   A: If inconsistencies are found between the selected modules, error and warning icons are displayed. A chart of these icons is shown below. Refer to the resolution methods described in the chart.

Icon	Error/Warning Type	Description and Resolution Method
	Dependency error	A dependency error occurs if required modules used by the item shown has not been added. **Resolution method:** To resolve this error, find the required FIT dependent modules, and add them to the selected modules list.
	Dependency warning	A dependency warning occurs if there was a mismatch between the version numbers of the item shown and the selected dependencies. **Resolution method:** To resolve this warning, make the version number of the selected dependencies match the version number of the item shown. If it is not possible to provide the exact same version, use a version that is more recent than the version required.
	Contention warning	A contention warning occurs if pins used by a FIT module are already being used by other FIT modules or functions configured via code generation. **Resolution method:** To resolve this warning, assign pin functions for which contention is occurring to other pins.
	Dependency and contention warning	This icon appears if both a dependency problem and a contention problem occur in a selected FIT module. To resolve this warning, both of these problems must be addressed.

3. Q: I would like to add FIT modules that can be used in the FIT Configurator. How can I do that?
   A: Select “Download modules from the network” from the ∇ drop-down menu in the FIT Configurator. The FIT module download dialog will be displayed, and FIT module information will be retrieved from the Web. Select the required FIT modules to download them. For details, see steps 3. to 5. in “2.1.2 Download the FIT Module.”

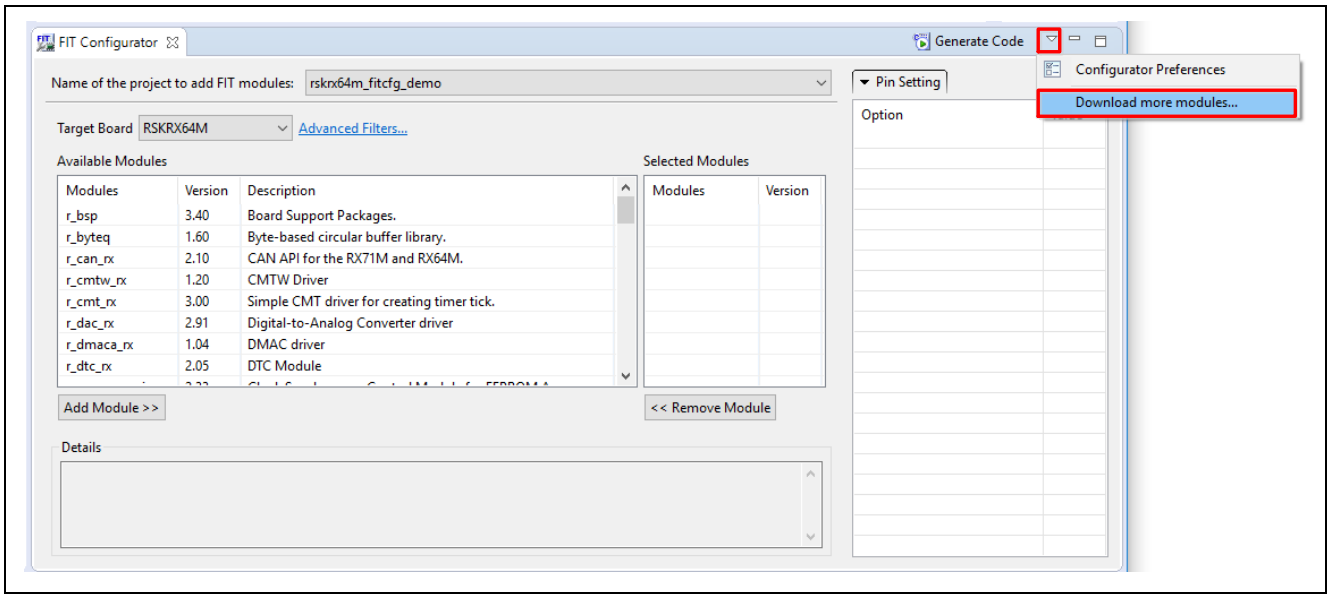
4. Q: I performed code generation using pin-specified functions, but waveforms were not output from the pins.
   A: The folder “r_pincfg”, which is generated using the pin-specified functions, contains the file “r_pinset.c”. In this file, there are functions (R_<peripheral function channel or FIT module identifier>_PinSet_<peripheral function channel>) that enable the pin functions. Call these functions from the user programs being used. For information regarding the timing with which to enable the pin functions used by FIT modules, see the manuals for the respective FIT modules.

5. Q: I did not download the FIT module when I created the e2studio project. I would like to download the FIT modules. How can I do that?

   A: To download FIT modules, follow the procedure below. A project that can use the FIT module is a project that enabled the FIT module at the time of project creation. For details, see step 9 to 12 in “2.1.1 Create a New Project.”

   — Launch the FIT configurator. For detail, see “2.2.1 Launch the FIT configurator.”

   — Select “Download modules from the network” from the ∇ drop-down menu in the FIT Configurator. The FIT module download dialog will be displayed, and FIT module information will be retrieved from the Web. Select the required FIT modules to download them. For details, see steps 3 to 5 in “2.1.2 Download the FIT Module.”



3. Reference Documents

Technical Update/Technical News

The latest information can be downloaded from the Renesas Electronics website.

User's Manual: Development Tools

CC-RX Compiler User's Manual (R20UT3248)

The latest version can be downloaded from the Renesas Electronics website.

Integrated Development Environment User's Manual: Getting Started Guide (R20UT2771)

The latest version can be downloaded from the Renesas Electronics website.

Website and Support

Renesas Electronics Website
http://www.renesas.com/

Inquiries
http://www.renesas.com/contact/

Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Jul. 17, 2013	—	First edition issued
1.10	Nov. 15, 2013	3	Updated to reflect changes to e^2 studio plug-in
1.11	Oct. 15, 2014	3	Added description to 2.1 “Install the FIT modules so that the plug-in can find them”
		4, 5	Added description to 2.2 “Add the FIT Module with the FIT Plug-In”
		6	Added description to 2.3 “FIT Plug-In Messages”
1.20	Apr. 7, 2017	—	Complete revision based on added FIT Configurator features
1.21	June. 30, 2017	11	Added description to 2.1.2 ”Download the FIT Module”
		22	Added item 5 in 2.4 “Troubleshooting”
		23	3. “Reference document" modified

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. 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has 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. Moreover, 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.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the 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 system-evaluation test for the given product.

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