

Peripheral Driver Generator User's Manual

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Introduction

This document gives the outline of the Peripheral Driver Generator (PDG) V.2.xx features and basic usage.

For how to set up peripheral modules for each MCU, specifications of functions output by the PDG, and other points for caution, refer to the reference manual for the MCU in use.

Contents

1. Overview	5
1.1 Peripheral Driver Generator.....	5
1.2 System Configuration and Procedures.....	5
1.3 Functions Output by the PDG and Renesas Peripheral Driver Library (RPDL).....	6
1.4 Compatibility with PDG V.1.0x.....	7
2. Preparations.....	8
2.1 Preparing the IDE.....	8
2.1.1 When the HEW is in Use.....	8
2.1.2 When the CubeSuite+ is in Use.....	8
2.2 Installing the PDG.....	8
2.3 HewTargetServer Setting in the HEW (When the HEW is in Use).....	9
3. Operating the PDG	10
3.1 Procedure.....	10
3.2 Starting up.....	11
3.3 Creating or Loading a Project.....	11
3.4 Window.....	12
3.4.1 Main Menu.....	13
3.4.2 Toolbar.....	14
3.4.3 Peripheral-Module Selection Tabs	14
3.4.4 Resource Pane.....	15
3.4.5 Detailed-Setting Pane.....	16
3.4.6 Source-File Pane.....	17
3.5 Setting up Peripheral Modules.....	18
3.5.1 Basic Operation	18
3.5.2 Errors and Warnings.....	19
3.6 Generating Source Files.....	20
3.6.1 Starting Generation of Source Files	20
3.6.2 Location of Output Source Files	20
3.6.3 Changing Peripheral-Module Settings and Generating Source Files Again	20
3.6.4 When an Error or Warning is Encountered.....	20
3.6.5 Checking the Source Files.....	20
3.7 Adding Source Files to the IDE.....	21
3.7.1 Processes of Adding Source Files to the HEW.....	21
3.7.2 Processes of Adding Source Files to the CubeSuite+.....	23

1. Overview

1.1 Peripheral Driver Generator

The Peripheral Driver Generator (hereafter referred to as the PDG) outputs functions for controlling the MCU's peripheral modules (e.g. serial communications interface, timers, I/O ports) when the corresponding settings have been input through the GUI. Calling these functions from a user program makes the peripheral modules operate in the way you have defined.

When the source files output by the PDG is registered with the integrated development environment (IDE) High-performance Embedded Workshop: hereafter referred to as the HEW or CubeSuite+ and built with a user program, the control of the peripheral modules will also be implemented in the user program.

1.2 System Configuration and Procedures

Figure 1.1 shows the system configuration of the PDG and associated tools and the procedures.

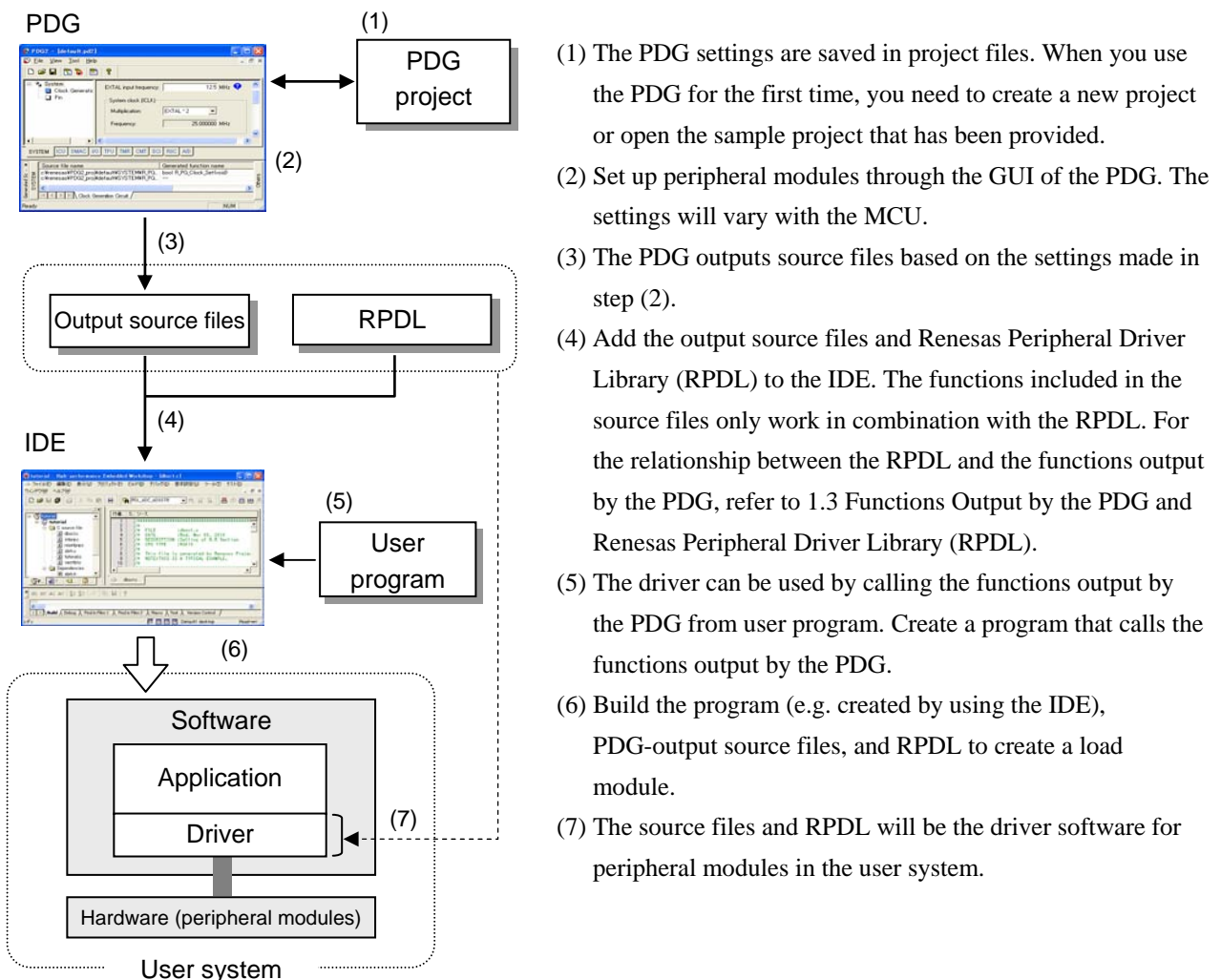


Figure 1.1 System Configuration and Procedures

1.3 Functions Output by the PDG and Renesas Peripheral Driver Library (RPDL)

The functions output by the PDG use the API functions of the RPDL included in the PDG package. The RPDL is a driver-API library that is provided for each of the MCUs. The API functions of the RPDL control the peripheral modules that correspond to the parameters being called.

Each of the functions output by the PDG internally calls the corresponding API function(s) of the RPDL so that the peripheral module will operate in the way that has been defined. The parameters to call the API functions are automatically selected from the settings made through the GUI. You can control peripheral modules by calling simple functions output by the PDG through a user program. Always use the RPDL included in the PDG package. Correct operation of the PDG is not guaranteed if the RPDL alone is upgraded. Figure 1.2 shows the relationship between an API function of the RPDL, function output by the PDG, and user program in the case of setting up the 8-bit timer (TMR) in the RX610 group as an example.

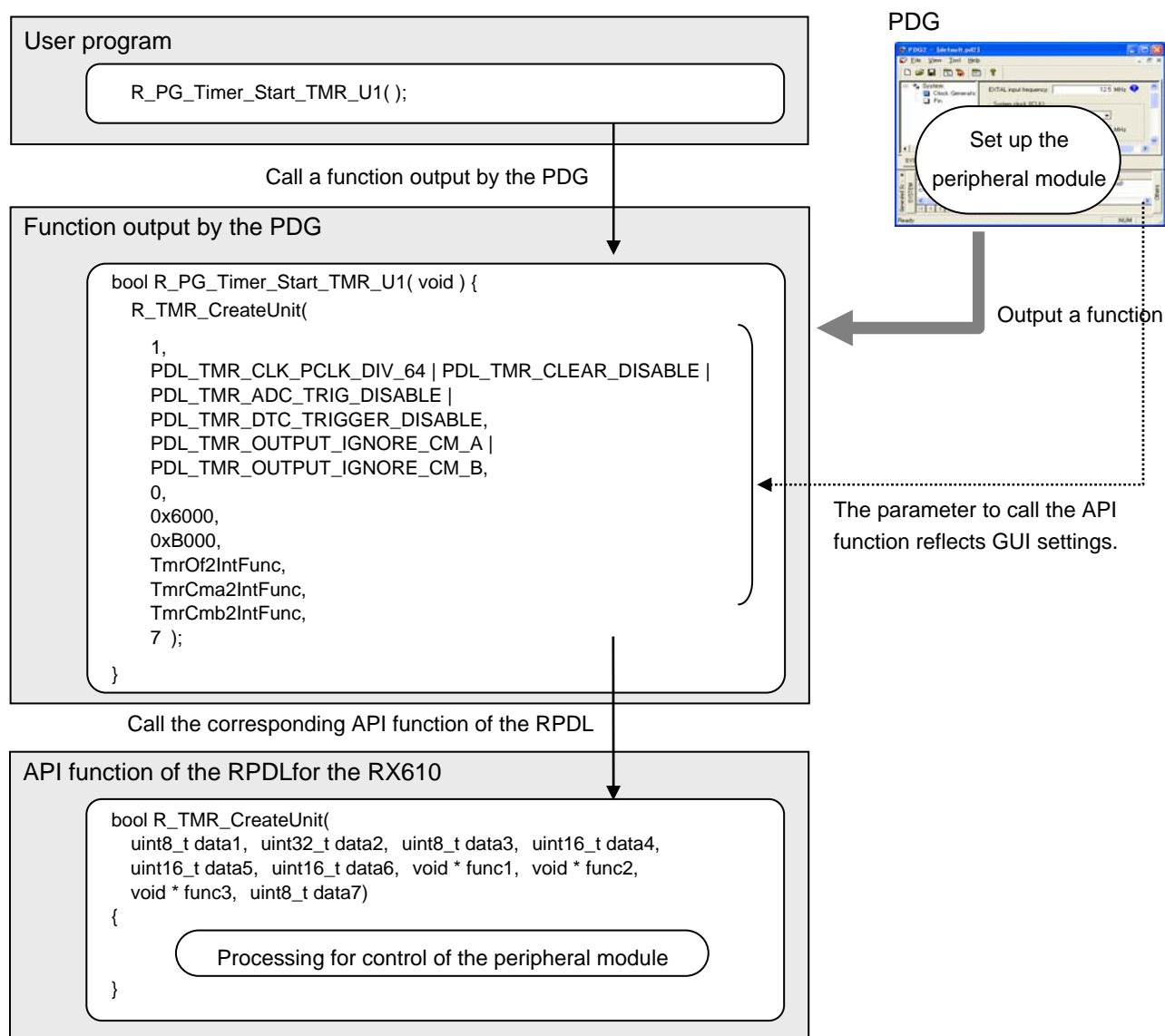


Figure 1.2 Relationship between an API Function of the RPDL, Function Output by the PDG, and User Program

It is also possible to directly call API functions from a user program. For specifications of the API functions of the RPDL, refer to the RPDL user's manual specific to the MCU.

1.4 Compatibility with PDG V.1.0x

V.1.0x and V.2.xx of the PDG support different types of MCUs. Thus V.2.xx cannot load project files created by V.1.0x. It is also not possible to convert project files created by V.1.0x to suit the MCUs supported by V.2.xx.

2. Preparations

2.1 Preparing the IDE

2.1.1 When the HEW is in Use

If you wish to use the source files generated by the PDG to create programs or build files in the HEW, install the HEW and set it up so that files for the MCU in use can be built. You need to upgrade the HEW to V.4.05.01 if the version of the HEW you are currently using is V.4.05.00 or earlier.

2.1.2 When the CubeSuite+ is in Use

If you wish to use the source files generated by the PDG to create programs or build files in the CubeSuite+, install the CubeSuite+ and set it up so that files for the MCU in use can be built. You need to upgrade the CubeSuite+ to V1.02.01 if the version of the CubeSuite+ you are currently using is V1.02.00 or earlier.

2.2 Installing the PDG

Start up the installer and follow the instructions given on the screen. You should have an administrator right to install the PDG.

If you are installing the PDG in an environment where no HEW has been installed, the message shown in figure 2.1 will be displayed. Click on [Yes] to continue installation.

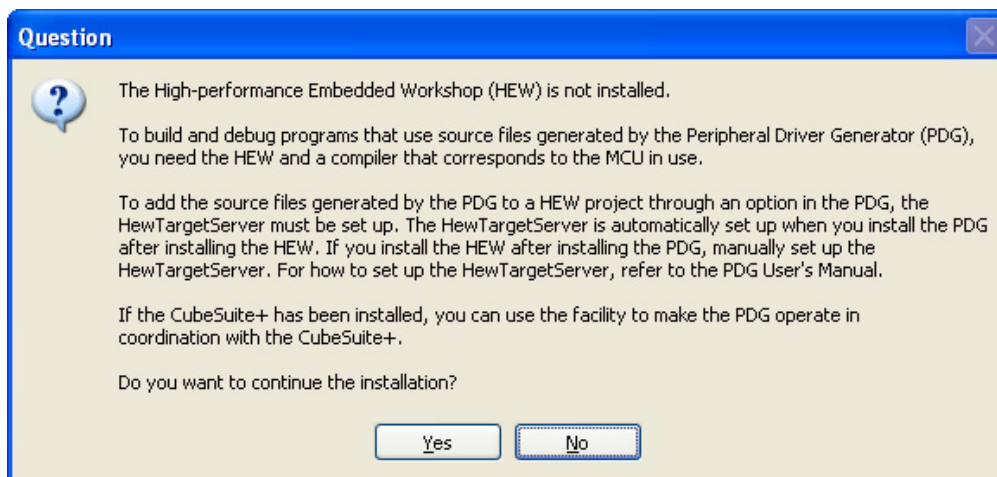


Figure 2.1 Message in Cases Where No HEW has been Installed

Even if PDG V2.0 is installed in an environment where V.1.0x has been installed, V.1.0x will not be overwritten. Thus you can also use V.1.0x after V2.0 is installed.

2.3 HewTargetServer Setting in the HEW (When the HEW is in Use)

The PDG is capable of adding source files to the HEW and automatically making settings on the HEW required to build the files. To utilize this facility to add source files to the HEW, you need to set up the HewTargetServer in the HEW.

Follow the procedures below to check the current HewTargetServer setting and modify it if necessary. If multiple HEWs have been installed, select one that you wish to add source files to. For how to add sources from the PDG to the HEW, refer to 3.7 Adding Source Files to the HEW.

(1) Check the HewTargetServer setting

Take the following steps to check the HewTargetServer setting.

1. Select [Administration...] from the [Tool] menu in the HEW.
2. Click on [Extension Components] in the [Tools Administration] dialog box and see if the HewTargetServer is included in the list. Also check the version number of the HewTargetServer.

(2) Set up the HewTargetServer

When the HewTargetServer is not included in the list or the version number is earlier than 1.07.00, take the following steps.

1. Select [Administration...] from the [Tool] menu in the HEW with no workspaces open.
2. If the version number of the HewTargetServer listed under [Extension Components] in the [Tools Administration] dialog box is earlier than 1.07.00, select the HewTargetServer and click on the [Unregister] button.
3. Click on the [Search disk...] button in the [Tools Administration] dialog box. The [Search Disk for Components] dialog box opens.
4. Enter the name of the directory in which the HEW has been installed and click on the [Start] button. The PDG starts searching for components.
5. The results of the search are shown in the [Located Components] list. Select a HewTarget Server whose version number is 1.07.00 or later, and click on the [Register] button.
6. Click on the [Close] button to close the [Search Disk for Components] dialog box. Then click on the [OK] button in the [Tools Administration] dialog box.

(3) Add the HewTargetServer to the registry

If you have used Install Manager Version 1.02 or earlier to install multiple HEWs and switched the active HEW to another, add the HewTargetServer to the registry again as follows.

1. Execute REGISTERSERVER.bat stored in the HEW installation directory. When you are using the Windows Vista operating system, execute the file via the command prompt you have opened as an administrator.

3. Operating the PDG

3.1 Procedure

Figure 3.1 shows the procedure from setting up peripheral modules in the PDG to adding source files to the IDE to build them. For details on how to operate the IDE, refer to the related documents.

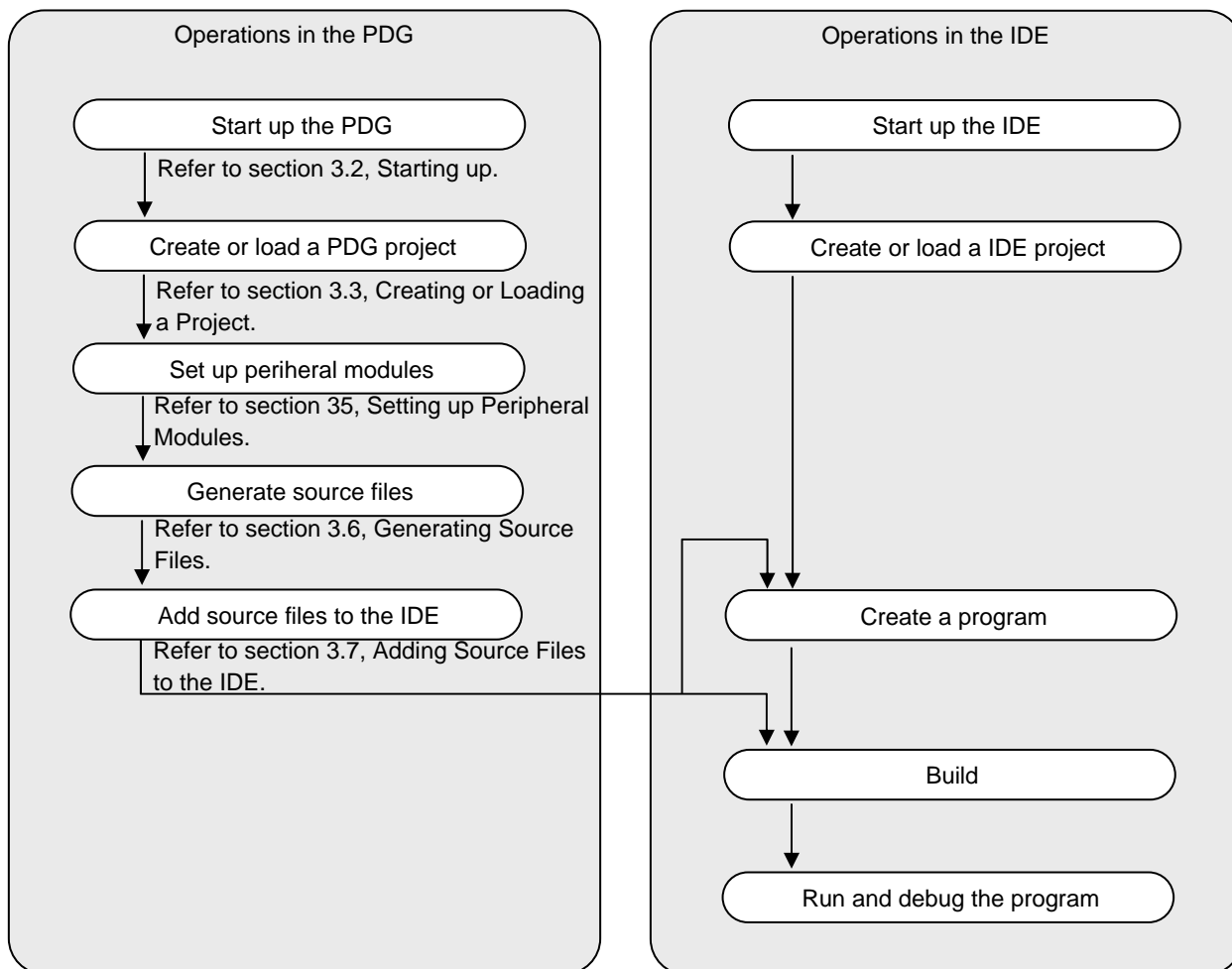


Figure 3.1 Operating Procedures in the PDG and IDE

3.2 Starting up

Select [Peripheral Driver Generator 2] from the Windows [Start] menu.

3.3 Creating or Loading a Project

MCU settings created with the PDG must be saved in a project. Create a new project or open an existing project.

(1) Create a new project

1. Select [New Project] from the [File] menu in the PDG.
2. Make necessary settings in the [New Project] dialog box and click on [OK].

Items shown in the [New Project] dialog box are listed below.

The settings made in the [New Project] dialog box cannot be modified after a project has been created.

Table 3.1 Items in the [New Project] Dialog Box

Item	Description
Project Name	Enter the name of a new project.
Directory	Specify the directory in which you wish to create a project.
CPU Type	Select the series, group, and type names of the MCU that you wish to use.

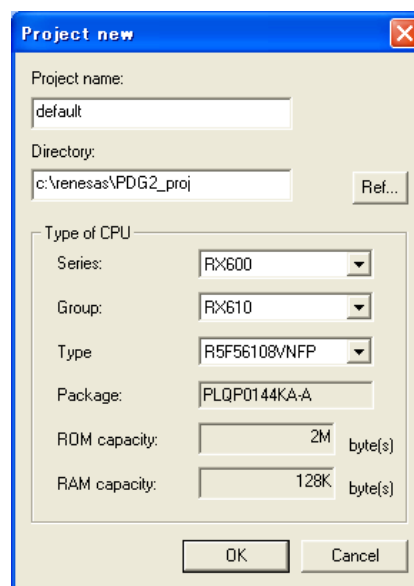


Figure 3.2 [New Project] Dialog Box

(2) Load an existing project

1. Select [Open...] from the [File] menu in the PDG.
2. Select a project file in the [Open File] dialog box. The extension for project files is .pg2. Clicking on the [OK] button opens the selected project.

3.4 Window

The PDG's main window appears when a project is opened. The configuration of the main window is shown below.

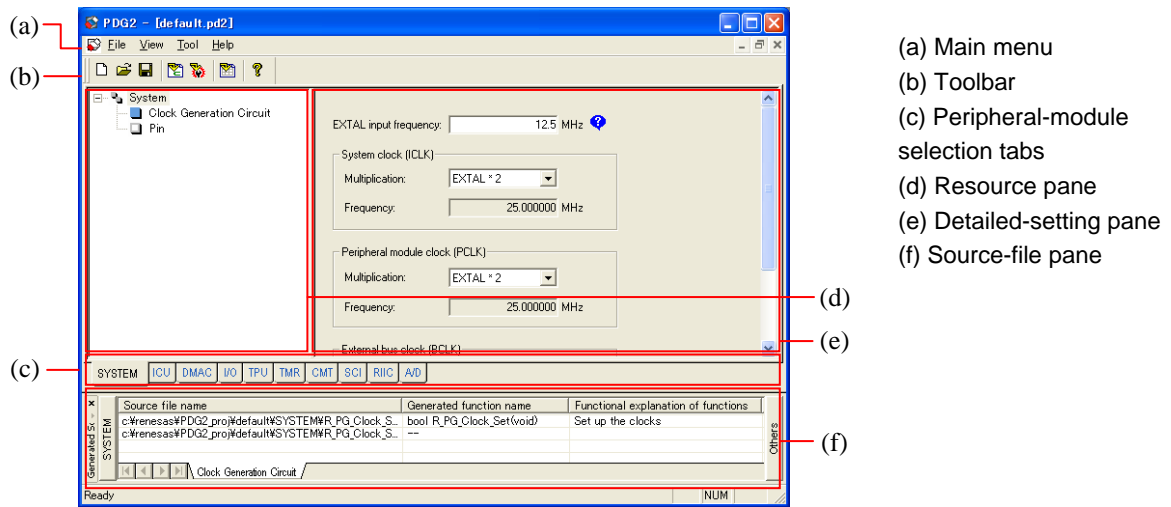


Figure 3.3 Main Window

3.4.1 Main Menu

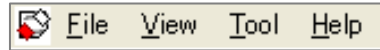


Figure 3.4 Main Menu

Table 3.2 lists the menu items.

Table 3.2 Menu Items

Menu		Description
File	New Project...	Opens the [New Project] dialog box that allows you to create a new project.
	Open...	Opens the [Open File] dialog box that allows you to open an existing project.
	Close	Closes the current project. When the project has been modified, the confirmation dialog box appears asking whether you wish to save the project.
	Save	Saves the current project.
	Save As...	Opens the [Save As] dialog box that allows you to save the current project with a new name.
	1 to 5 project names	Shows the names of the five projects most recently opened.
	Exit	Quits the PDG
View	Toolbar	Switches showing and hiding of the toolbar.
	Status bar	Switches showing and hiding of the status bar.
	Generated source file information window	Switches showing and hiding of the source-file pane.
	Character size of the generated source information window	The size (large, medium, or small) of characters in the source-file pane is selectable from the sub-menu.
Tool	Options...	Opens the [Options] dialog for setting up the editor used when opening the source file generated in the project.
	Generate source files	Generates source files.
	Add files to a HEW project	Adds the generated source files to a HEW project.
	Add files to a CubeSuite+ project	Adds the generated source files to a CubeSuite+ project.
	Generate pin lists	Outputs pin lists to CSV files.
Help	About PDG2...	Shows the version information.
	Device Information...	Shows the device information.

3.4.2 Toolbar

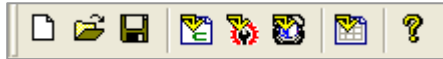


Figure 3.5 Toolbar

Some items in the main menu are also available as toolbar buttons. Table 3.3 lists these items.

Table 3.3 Toolbar Buttons and Corresponding Menu Items

Toolbar Button	Menu Item
	[File] → [New]
	[File] → [Open]
	[File] → [Save]
	[Tool] → [Generate source files]
	[Tool] → [Add files to a HEW project]
	[Tool] → [Add files to a CubeSuite+ project]
	[Tool] → [Generate pin lists]
	[Help] → [About PDG2...]

3.4.3 Peripheral-Module Selection Tabs



Figure 3.6 Peripheral-Module Selection Tabs (RX610)

Use these tabs to select peripheral modules that you wish to set up. When you click on a tab, the resource, detailed-setting, and source-file panes all show the information specific to the selected peripheral module.

Along with the tabs specific to peripheral modules, the [SYSTEM] tab is provided for settings associated with the entire system of the MCU (e.g. clock sources and pin functions).

When the PDG is reporting an error or warning in setting of a peripheral module, the icon shown in figure 3.7 appears on the corresponding tabbed page. For details on errors or warnings, refer to 3.5.2 Errors and Warnings.

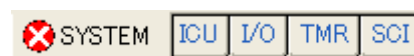


Figure 3.7 Tabbed Page in Case of an Error or Warning

The tabs vary with the MCU. For details on the tabs, refer to the reference manual for the MCU in use.

3.4.4 Resource Pane

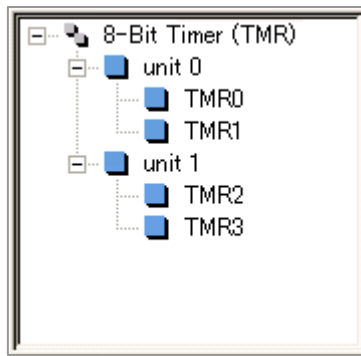


Figure 3.8 Resource Pane (RX610/TMR)

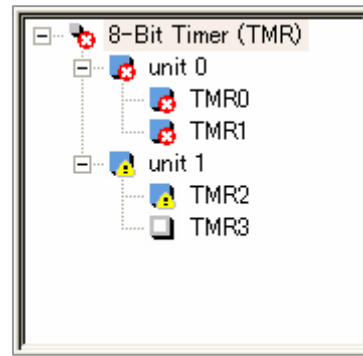


Figure 3.9 Icon Indicating an Error or Warning

This pane shows the resources (e.g. timer channels and ports) of the selected peripheral module. Clicking on a resource switches the display in the detailed-setting pane: the information will now be specific to the selected resource. For some peripheral modules, other categories (e.g. pin functions) are displayed as well as the MCU resources.

When the PDG is reporting an error or warning in setting of a peripheral module, the icon shown in figure 3.9 is attached to the resource having the problem. For details on errors or warnings, refer to 3.5.2 Errors and Warnings.

The contents of this pane vary with the MCU. For details on the resources, refer to the reference manual for the MCU in use.

3.4.5 Detailed-Setting Pane

EXTAL input frequency: MHz

System Clock (ICLK)

Multiplication: ▼

Frequency: MHz

Peripheral Module Clock (PCLK)

Multiplication: ▼

Frequency: MHz

External Bus Clock (BCLK)

Multiplication: ▼

Frequency: MHz

BCLK pin output: ▼

Figure 3.10 Detailed-Setting Pane (RX610/Clock)

This pane allows you to set up details on the selected peripheral module or entire system. When opened, the pane shows the current settings on the hardware resources or other categories selected in the resource pane. When the PDG is reporting an error or warning in setting of a peripheral module, the icon shown in figure 3.11 is attached to the item having the problem. For details on errors or warnings, refer to 3.5.2 Errors and Warnings.

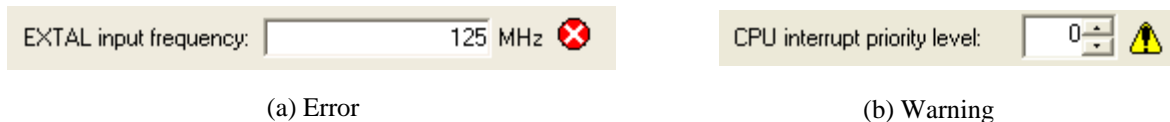


Figure 3.11 Icon Indicating an Error or Warning

3.4.6 Source-File Pane

Source file name	Generated function name	Functional explanation of functions
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_Start_TMR_U0_C0(void)	Set up the TMR and start the count
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_HaltCount_TMR_U0_C0...	Halt the TMR count
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_ResumeCount_TMR_U...	Resume the TMR count
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_GetCounterValue_TMR...	Acquire the TMR counter value
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_SetCounterValue_TMR...	Set the TMR counter value
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_GetRequestFlag_TMR...	Acquire and clear the TMR interrup...
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.c	bool R_PG_Timer_StopModule_TMR_U0(v...	Shut down the TMR unit
c:\renesas\PDG2_proj\default\TMR\R_PG_Timer_TMR_U0.h	--	

Figure 3.12 Source-File Pane (RX610)

This pane shows the information on the source files generated by the PDG. Nothing is displayed in the pane if you have created a project but have not executed [Generate source files] yet. When [Generate source files] is executed, the PDG generates source files based on the current settings on the selected peripheral module and the contents of this pane are updated.

Source files are managed in units of peripheral modules. Clicking on button for a peripheral module opens a list of source files for that module. Other related files are shown on [Others].

Table 3.4 lists the columns in the source-file pane.

Table 3.4 Columns in the Source-File Pane

Column	Description
Source file name	Name of the source file (full path)
Generated function Name	Definition of the output function
Explanation of functions	Action triggered by the function

For how to generate source files, refer to 3.6 Generating Source Files.

For specifications of the output functions, refer to the reference manual for the MCU in use.

3.5 Setting up Peripheral Modules

3.5.1 Basic Operation

Take the following steps to set up peripheral modules.

1. Select the tab for a peripheral module that you wish to set up. The resource pane is updated to show information specific to the selected module (figure 3.13-1).
2. Select a resource in the resource pane. The detailed-setting pane is updated to show information specific to the selected resource (figure 3.13-2).
3. Make settings in the detailed-setting pane (figure 3.13-3).

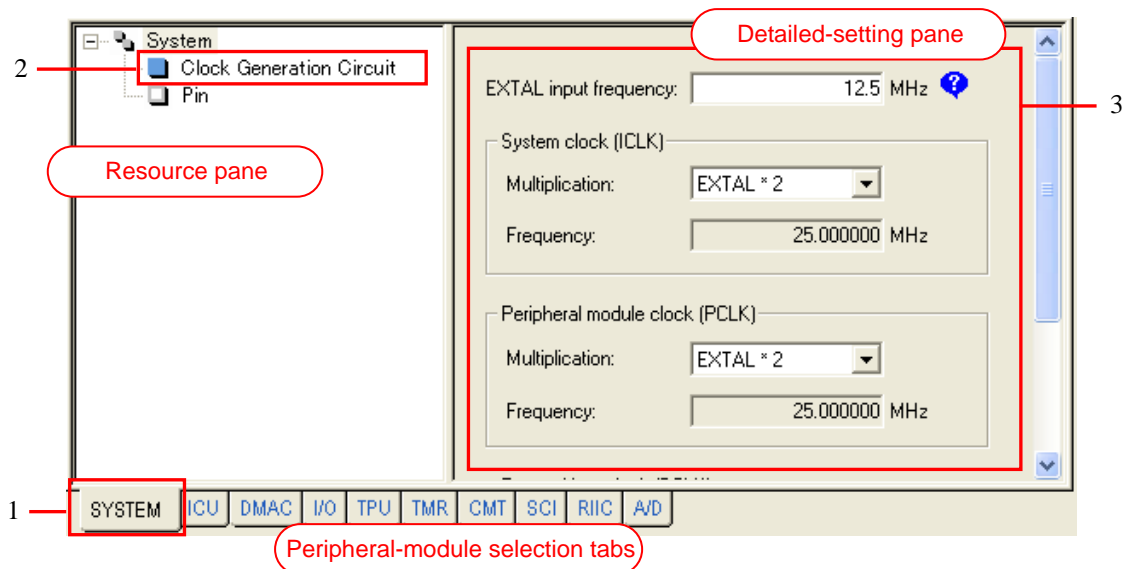


Figure 3.13 Setting up a Peripheral Module

3.5.2 Errors and Warnings

(1) Error and Warning Icons

When there is a problem with setting of a peripheral module, an error or warning icon appears on the corresponding section in the detailed-setting pane, resource pane, and peripheral-module selection tabbed page.

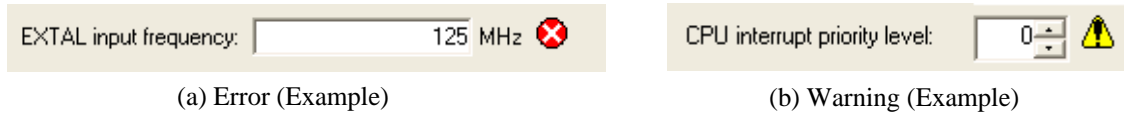


Figure 3.14 Error and Warning Icons

To show the additional information, the information icon appears.

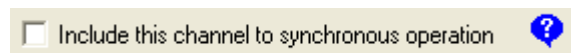


Figure 3.15 Information Icon

(2) Detailed Information

Placing the mouse pointer on each icon shows the tooltip information on the error or warning.

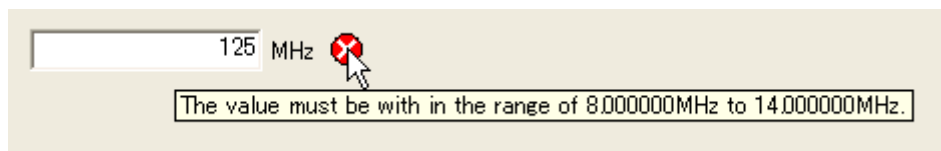


Figure 3.16 Tooltip Information on an Error and Warning

(3) Definitions

Table 3.5 shows the definitions of error and warning and whether the PDG will still generate source files.


Table 3.5 Definitions of Error and Warning

Type	Definition	Source Generation
Error	Not allowed by hardware specification or may cause a problem with behavior of the PDG	Available
Warning	Allowed by hardware specification but may cause unintended behavior of the PDG	Not available

For how to generate source files, refer to 3.6 Generating Source Files.

3.6 Generating Source Files

3.6.1 Starting Generation of Source Files

To start generation of source files, select [Generate source files] from the [Tool] menu or click on the [Generate source files] toolbar button ().

3.6.2 Location of Output Source Files

Source files are generated in the PDG's project directory and its subdirectories.

3.6.3 Changing Peripheral-Module Settings and Generating Source Files Again

Executing [Generate source files] generates all source files associated with the peripheral modules for which settings have been made. If any of the source files has the same name as an existing source file that has already been generated in the current project, the older file is overwritten (i.e. the older file is replaced with new one regardless of whether peripheral-module settings have been changed or not since the previous generation). When [Generate source files] is executed after the settings for a peripheral module at the time of previous generation have been cleared, the existing files associated with the cleared settings are deleted. Note, however, that these files are not automatically removed from the IDE. You need to manually remove obsolete files from IDE projects.

3.6.4 When an Error or Warning is Encountered

When there are one or more errors in peripheral-module settings, the message shown in figure 3.17 appears indicating that [Generate source files] is not executable. Check the location of the error and modify the setting.

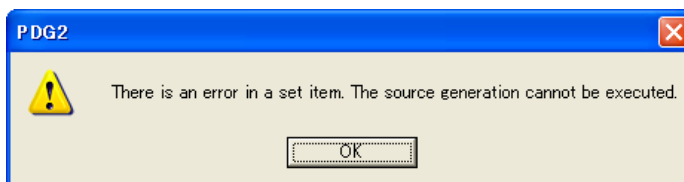


Figure 3.17 Message When an Error is Encountered

3.6.5 Checking the Source Files

As soon as [Generate source files] is executed, the source-file pane displays the source files and functions. For contents of the source-file pane and how to handle them, refer to 3.4.6 Source-File Pane.

3.7 Adding Source Files to the IDE

3.7.1 Processes of Adding Source Files to the HEW

(1) Processes of adding source files

Executing [Add files to a HEW project] not only adds source files to the HEW but also makes further setting for building the source files and RPDL. The following processes are included.

(a) Add source files to the HEW

C source files generated by the PDG are added to the HEW. These files are displayed within the AddFromPDG folder in the HEW's workspace window.

'Adding source files' does not mean copying the C source files and header files generated by the PDG into the HEW project file directory. The files are just registered with the HEW.

(b) Make setting for linkage of library files

The functions output by the PDG use the API functions of the RPDL. So linkage setting must be made to build source files. The RPDL's library files are not copied into the HEW project file directory: these files in the PDG installation directory are just registered with the HEW.

During this process, the library link priority setup dialog box appears so that you can specify the linkage order of the library files, including those you have already added. For how to make settings in the library link priority setup dialog box dialog box, refer to 3.7.3 Specifying the Linkage Order of Library Files.

For the relationship between the RPDL and the functions output by the PDG, refer to 1.3 Functions Output by the PDG and Renesas Peripheral Driver Library (RPDL).

(c) Assigning an include-file directory

The PDG assigns the folder containing each of the header files, which are necessary for the use of functions output by the PDG, as an include-file directory.

(d) Exclude conflicting files from building

The application project created by the HEW includes a startup program. Part of the program (mostly the processes related to interrupt handlers) may conflict with some source files to be added to the HEW so the PDG excludes such files from building.

For details on source files excluded from building, refer to the reference manual for the MCU in use.

(2) User Operation


To add source files to the HEW, select [Generate source files] from the [Tool] menu in the PDG or click on the [Generate source files] toolbar button (). The confirmation message shown in figure3.18 appears. Click on [OK] to start adding of source files to the HEW.



Figure 3.18 Confirmation Message on Adding Source

(3) Specifying the Linkage Order of Library Files

When all of the source files have been added to the HEW, the library link priority setup dialog box appears so that the linkage order of the RPD L library and other library files can be specified.

Select desired library files and click on the [Up] or [Down] button to change the linkage order of those files.

Clicking on [OK] finalizes the linkage order and starts to make the setting.

(4) Completion of Adding Source Files

When all processes are completed, a dialog box shown in figure 3.19 appears.

(5) Points for Caution

Take the following points into account when adding source files to the HEW.

(a) HewTargetServer setting

To add source files to the HEW, you need to set up the HewTargetServer in the HEW in advance. If you execute [Add source files to a HEW project] with no HewTargetServer set up in the HEW, source files are not added to the HEW (but no error messages are displayed). For details on setting up the HewTargetServer, refer to 2.3 HewTargetServer Setting in the HEW.

(b) Location of the added source files

Source files are added to the current project in the HEW that is active when [Generate source files] is executed. Do not execute [Generate source files] while two or more HEWs are open.

(c) State of the HEW at the time of adding source files

The PDG cannot add source files if the HEW has not been started up or no workspaces are open. Before executing [Generate source files], check that the HEW has been activated and a workspace is open.

If building or some related setting is attempted or already in progress in the HEW when [Generate source files] is executed, the message shown in figure 3.20 appears to stop the process of adding source files.

Execute [Generate source files] after building or other setting has been completed.

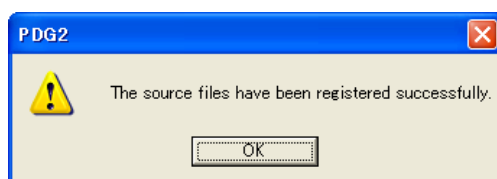


Figure 3.19 Message on completion

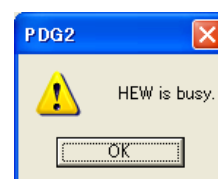


Figure 3.20 Message on HEW busy

(6) Creating Programs Including the PDG-Output Functions

You can control peripheral modules by simply calling PDG-output functions through a user program. For details on the functions and usage, refer to the reference manual for the MCU in use.

3.7.2 Processes of Adding Source Files to the CubeSuite+

(1) Processes of adding source files

Executing [Add files to a CubeSuite+ project] not only adds source files to the CubeSuite+ but also makes further setting for building the source files and RPD. The following processes are included.

(a) Add source files to the CubeSuite+

C source files generated by the PDG are added to the CubeSuite+. These files are displayed within the AddFromPDG folder in the CubeSuite+'s workspace window.

'Adding source files' does not mean copying the C source files and header files generated by the PDG into the CubeSuite+ project file directory. The files are just registered with the CubeSuite+.

(b) Make setting for linkage of library files

The functions output by the PDG use the API functions of the RPD. So linkage setting must be made to build source files. The RPD's library files are not copied into the CubeSuite+ project file directory: these files in the PDG installation directory are just registered with the CubeSuite+.

During this process, the library link priority setup dialog box appears so that you can specify the linkage order of the library files, including those you have already added. For how to make settings in the library link priority setup dialog box, refer to 3.7.3 Specifying the Linkage Order of Library Files.


For the relationship between the RPD and the functions output by the PDG, refer to 1.3 Functions Output by the PDG and Renesas Peripheral Driver Library (RPD).

(c) Delete conflicting files from project

The application project created by the CubeSuite+ includes a startup program. Part of the program (mostly the processes related to interrupt handlers) may conflict with some source files to be added to the CubeSuite+ so the PDG deletes such files from project.

For details on source files deleted from project, refer to the reference manual for the MCU in use.

(2) User Operation

To add source files to the CubeSuite+, select [Generate source files] from the [Tool] menu in the PDG or click on the [Generate source files] toolbar button ().

(3) Specifying the Linkage Order of Library Files

When all of the source files have been added to the HEW, the library link priority setup dialog box appears so that the linkage order of the RPD library and other library files can be specified.

Select desired library files and click on the [Up] or [Down] button to change the linkage order of those files.

Clicking on [OK] finalizes the linkage order and starts to make the setting.

(4) Completion of Adding Source Files

When all processes are completed, a dialog box shown in figure 3.21 appears.

(5) Points for Caution

Take the following points into account when adding source files to the CubeSuite+.

(a) Location of the added source files

Source files are added to the current project in the CubeSuite+ that is active when [Generate source files] is executed. Do not execute [Generate source files] while two or more CubeSuite+s are open.

(b) State of the CubeSuite+ at the time of adding source files

The PDG cannot add source files if the CubeSuite+ has not been started up or no projects are open. Before executing [Generate source files], check that the CubeSuite+ has been activated and a workspace is open. If building or some related setting is attempted or already in progress in the CubeSuite+ when [Generate source files] is executed, the message shown in figure 3.22 appears to stop the process of adding source files. Execute [Generate source files] after building or other setting has been completed.

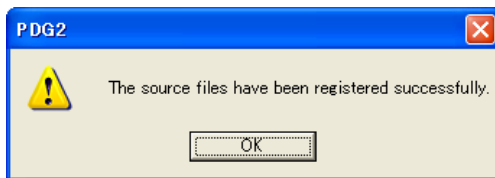


Figure 3.21 Message on completion

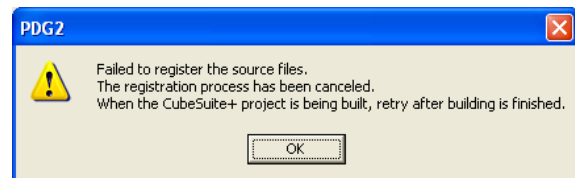


Figure 3.22 Message on CubeSuite+ busy

(6) Creating Programs Including the PDG-Output Functions

You can control peripheral modules by simply calling PDG-output functions through a user program. For details on the functions and usage, refer to the reference manual for the MCU in use.

Peripheral Driver Generator
User's Manual

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