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April 1st, 2010
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User's Manual

Peripheral Driver Generator V.1.02

User's Manual

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Rev.1.00 2007.11

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Preface

The Peripheral Driver Generator (hereafter referred to as PDG) is a tool that supports the development of a driver for a peripheral I/O module in a microcomputer.

The PDG, which contains peripheral I/O module API libraries, allows users to design and automatically generate functions for calling the libraries via its user interface.

It runs on a Microsoft® Windows® operating system with an IBM PC compatible machine.

The supported microcomputers are the H8/Tiny, R8C/Tiny, and M16C/Tiny series, and main groups of the M16C/60 series. For details, refer to “Overview” in this manual.

Usage Precautions

Even though we carefully evaluate the API libraries and functions generated by the PDG, fully examine your application on your own responsibility when using this software to develop your application.

Contents

1. Overview

1.1 PDG Features

The PDG allows users to specify settings of microcomputer peripheral I/O modules such as serial, timer, and IO via its GUI and to generate functions, which reflect the settings, for calling API libraries for those modules.

[1] Assists in setting up each peripheral IO via GUI.

[2] Outputs the set contents as functions.

[3] Registers automatically-generated sources collectively into a project of the High-performance Embedded Workshop (hereafter referred to as HEW).

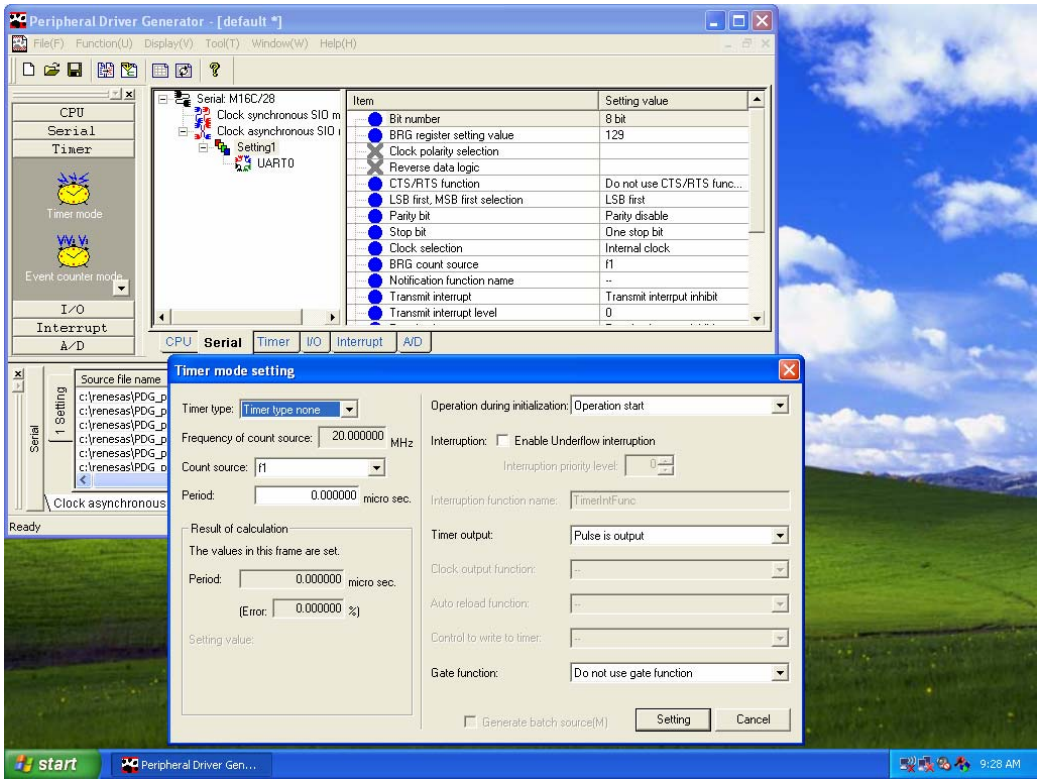

Figure 1-1 Example of PDG Display

[4] Supports conversion of the contents set by GUI for diverted use between microcomputers.

1.2 PDG Project

The PDG manages the generated software based on the concept of “project.” Following are managed as project:

[1] Setup information on each peripheral IO

[2] Function management information on set content

1.3 Roles of the PDG

The user incorporates functions for calling API libraries, which are generated by the PDG, into a user program to create an application.

The following schematically shows the relationship between the PDG and the API libraries and applications.

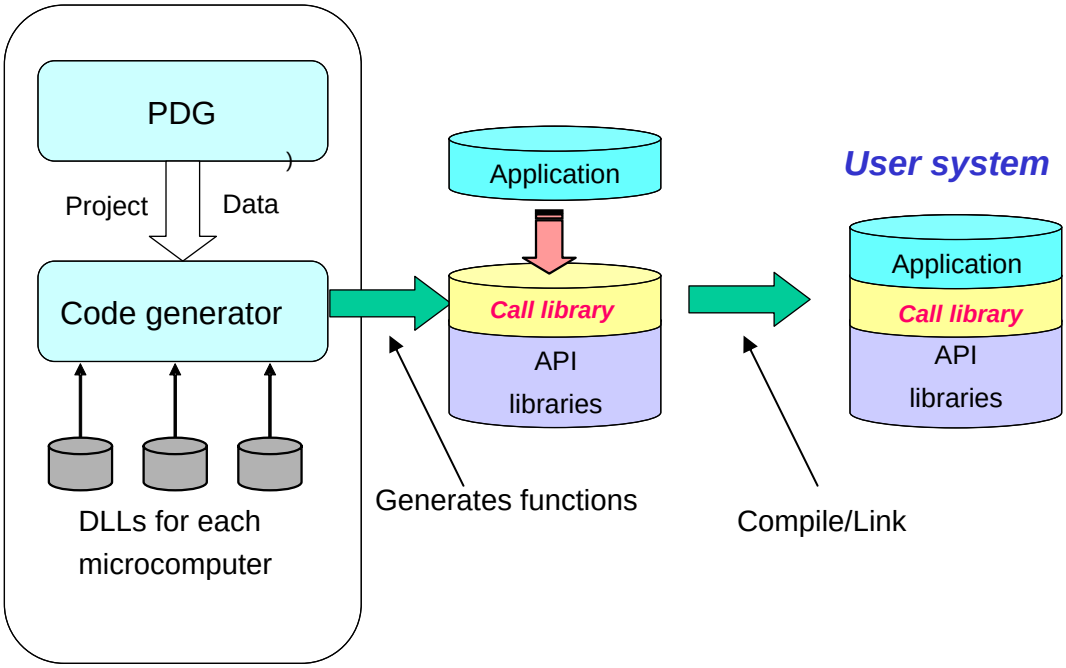

Figure 1-2 Roles of the PDG

1.4 Operating Environment

The PDG has been confirmed to be capable of operating properly on the host machines under the OS versions listed below.

Table 1-1 Host Machine

Host machine	OS version
IBM PC/AT and its compatibles	Microsoft® Windows® 2000
	Microsoft® Windows® XP

If the PDG is to be run on any other host machine or under other OS that you are using, please consult the manufacturer of your host machine or OS to confirm whether the PDG will operate properly on it.

The recommended hardware specifications are listed below.

Table 1-2 Recommended Hardware Specifications

Main memory	Sufficient memory capacity for the OS to operate normally is recommended (256 Mbytes or more)
Free disk space	70 Mbytes or more
Resolution of display	1024 × 768 or greater is recommended

1.5 Compiler Combinations

The PDG operates normally in combination with the compilers listed below.

Table 1-3 Compiler Package

PDG	Compiler products
V1.02	C compiler package M3T-NC30WA V.5.40 Release 00 for M16C series
	C/C++ compiler package V.6.01 Release 01 for H8SX, H8S, H8 family

1.6 API Libraries

The API libraries packaged in the PDG are listed below.

Table 1-4 List of API Libraries

Series	Directory	Library file name
H8/Tiny	lib\h8_tiny	rapi_h8_3687.lib rapi_h8_36049.lib rapi_h8_36077.lib rapi_h8_36109.lib
R8C/Tiny	lib\r8c_tiny	rapi_r8c_13.lib rapi_r8c_22_23.lib rapi_r8c_24_25.lib rapi_r8c_26_27.lib rapi_r8c_28_29.lib rapi_r8c_2A_2B.lib rapi_r8c_2C_2D.lib
M16C/Tiny	lib\m16c_tiny	rapi_m16c_28.lib rapi_m16c_29.lib
M16C/60	lib\m16c	rapi_m16c_62p.lib

For reference, the source files of the API libraries are stored in the “source” directory.

1.7 Main Window

1.7.1 Setting Details Display Window

This window displays the setting details of the currently opened project file.

The tabs at the bottom, the trees in the left, and the list in the right show functions, created setup pattern, and the details of the currently selected setting in the trees, respectively. Double-clicking on [Setting] in the trees or any one of the setting items in the list shows a dialog box for specifying the corresponding setting.

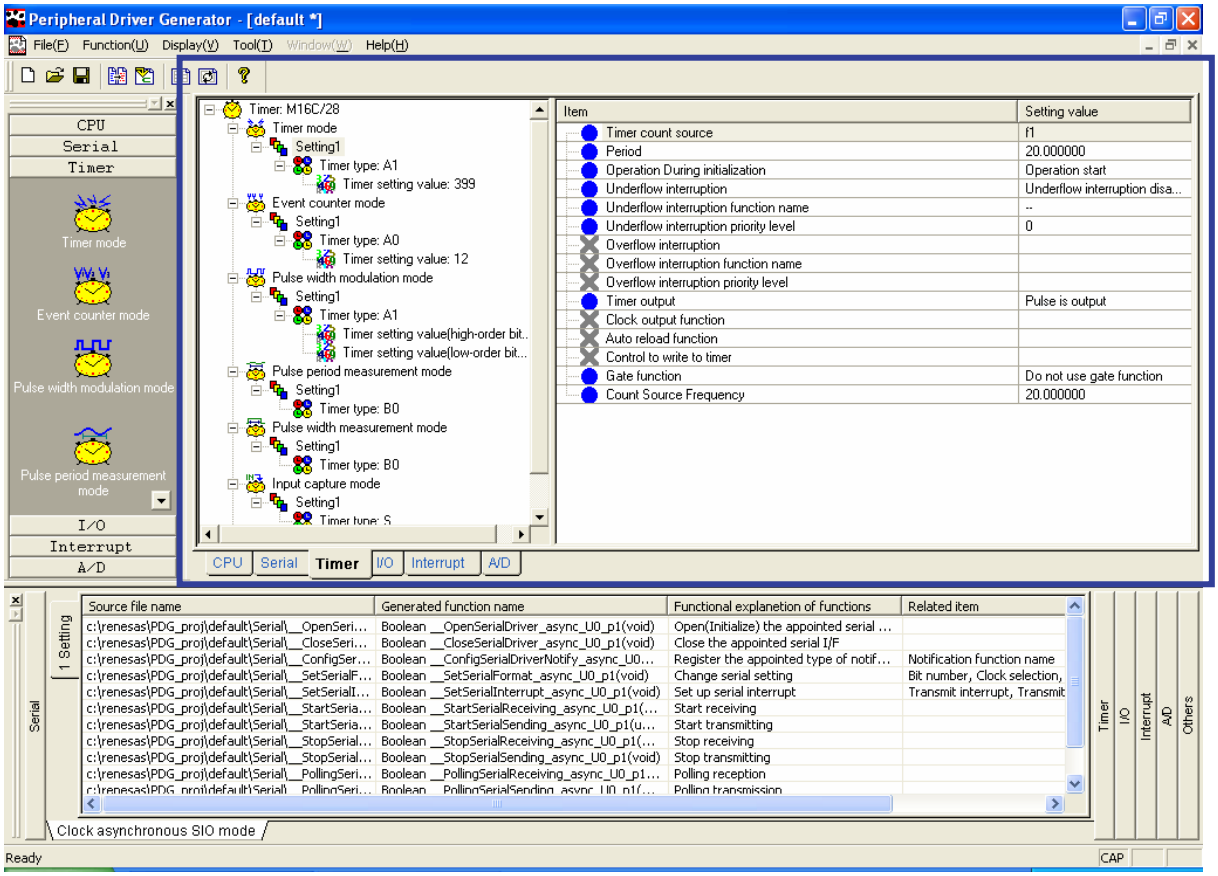

Figure 1-3 Setting Details Display Window

1.7.2 New Setup Pattern Creation Window

When a project file is opened, buttons in this window are enabled.

Selecting a function and then clicking on a mode button opens a function setup dialog box that enables user to create a new setup pattern.

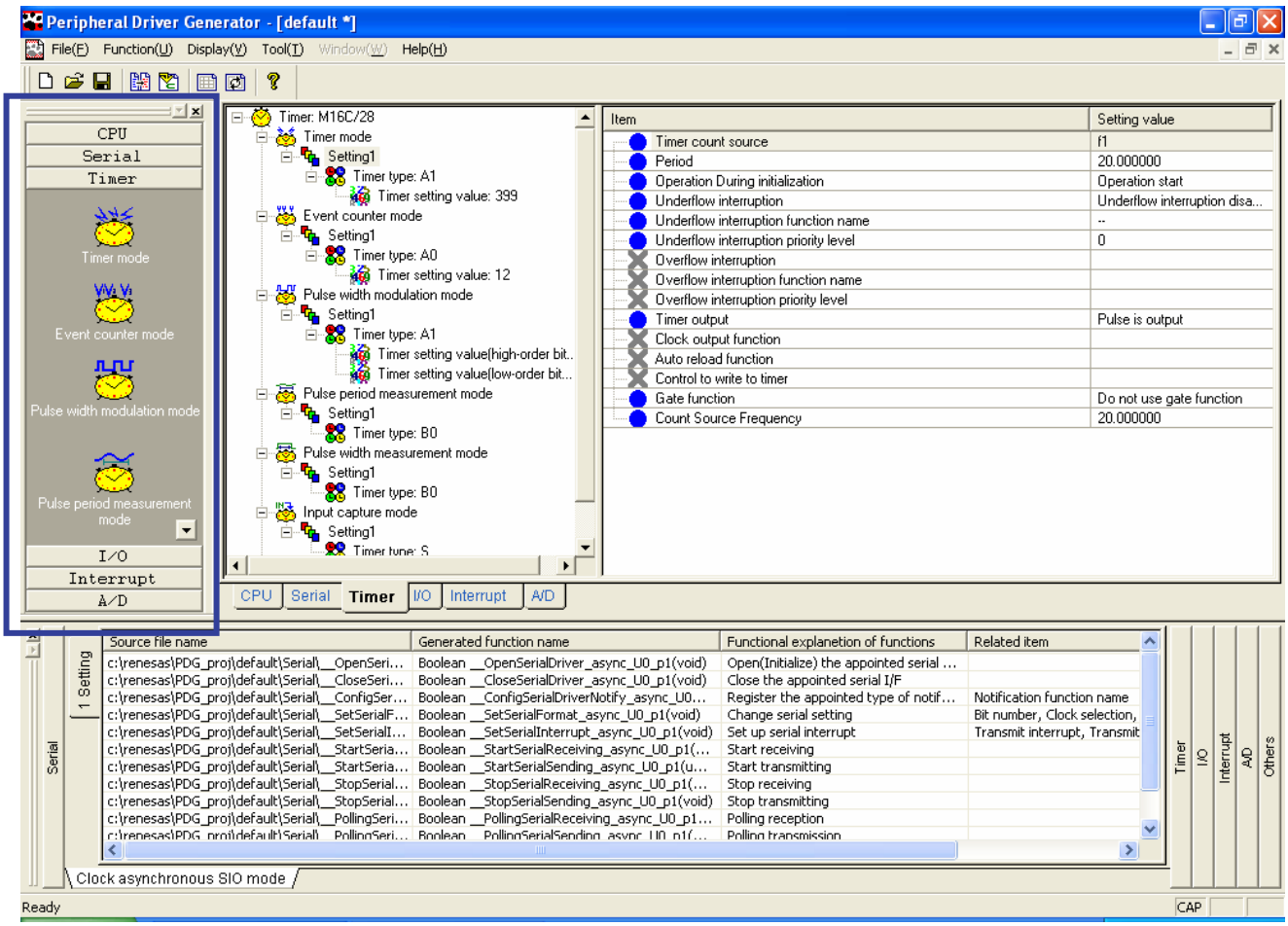

Figure 1-4 New Setup Pattern Creation Window

1.7.3 Generated File Information Window

(1) Displayed contents

The generated file information on each function and each mode in the currently opened project file is displayed.

The following are listed as the generated source information:

- Generated file name
- Generated function name
- Functional description of function
- Related item name

Double-clicking on a generated file name opens the corresponding file by using a specified editor.

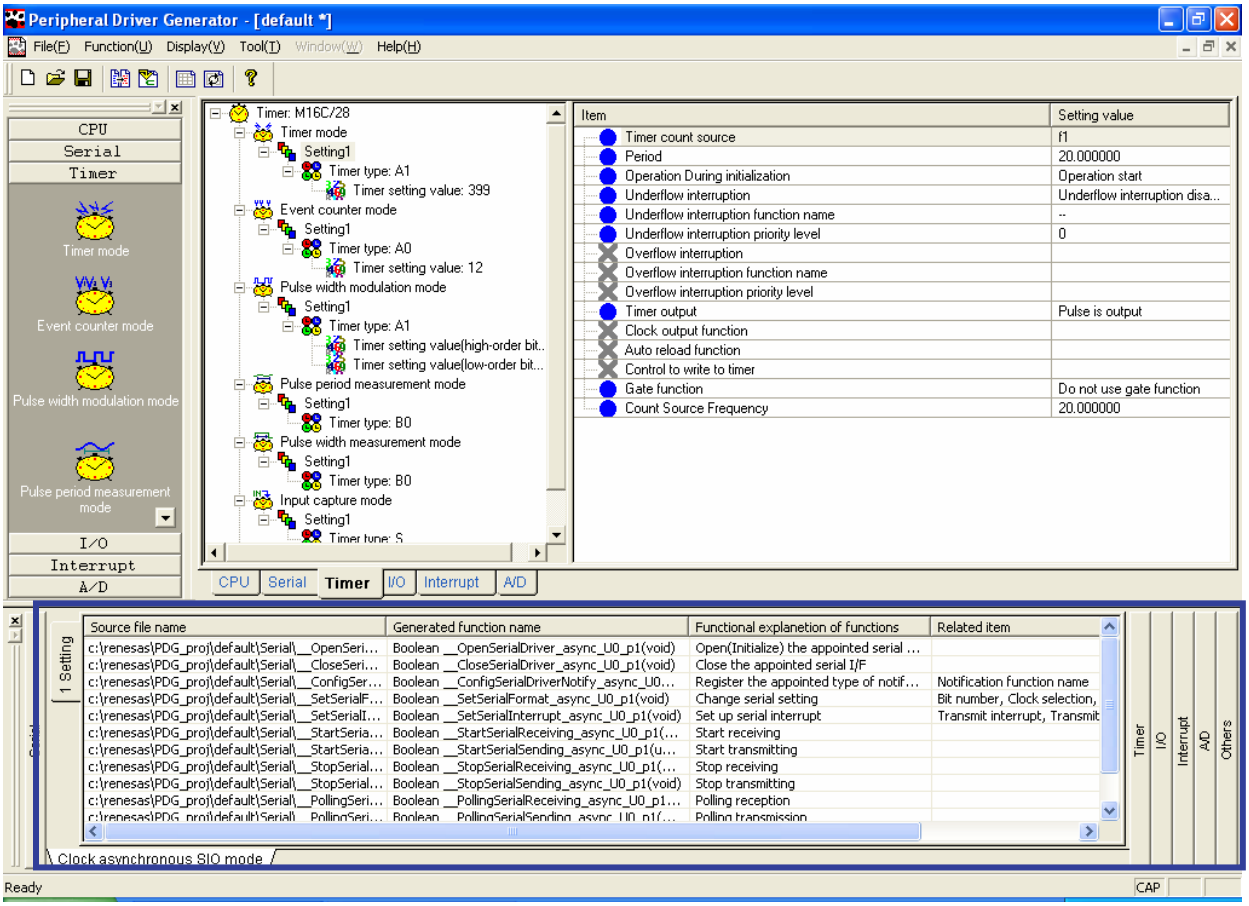

Figure 1-5 Generated File Information Window

(2) Changing Character Size

[1] Right-click on the generated file information window or select [Display] -> [Character size of the generated file information window].

[2] Select a size from [Large], [Medium], and [Small].

[3] The character size will be changed in the list.

1.8 Menu

The menu items are listed in table 1-5.

Table 1-5 Menu List

Main menu	Sub-menu			Description
File (F)	Create New Project (N)			Creates a new project. Always available.
	Open Project (O)			Opens an existing project. Always available.
	Save Project (S)			Saves the currently opened project. Always available.
	Save Project As (A)			Saves the currently opened project under a new name. Always available.
	Convert Project (C)			Converts an existing project into a new project with a different CPU. Always available.
	Generate Sources Collectively (S)			Generates source files. Available when peripheral I/O settings are completed.
	Delete Sources Collectively (D)			Deletes all the generated files. Available after source generation is performed.
	History			Lists projects that were opened. Always available.
	Exit (X)			Exits the PDG. Always available.
Function (U)	CPU(C)	Modify setting (M)		Modifies settings for a CPU. Only available when a project is opened.
	Serial (S)	Newly create setting (N)	Synchronous (S)	Creates a new setup pattern of serial synchronous. * Only available when a project is opened.
			Asynchronous (A)	Creates a new setup pattern of serial asynchronous. * Only available when a project is opened.
		Duplicate setting (C)		Duplicates a setup pattern of serial. * Only available when serial setting is selected.
		Delete setting (D)		Deletes a setup pattern of serial. * Only available when serial setting is selected.
		Modify setting (M)		Modifies serial settings. Only available when serial setting is selected.
		Set UART number (S)		Sets a UART for a setup pattern of serial. * Only available when serial setting is selected.
		Delete UART number (L)		Deletes a UART from a setup pattern of serial. * Only available when UART is selected.
	A/D (A)	Newly create	Single-shot Mode (S)	Creates a new setup pattern of A/D single mode. * Only available when a project is opened.

Main menu	Sub-menu			Description
		setting (N)	Repeat Mode (R)	Creates a new setup pattern of A/D repeat mode. * Only available when a project is opened.
			Single Sweep Mode (G)	Creates a new setup pattern of A/D single sweep mode. * Only available when a project is opened.
			Repeat Sweep Mode 0 (W)	Creates a new setup pattern of A/D repeat sweep mode 0. * Only available when a project is opened.
			Repeat Sweep Mode 1 (E)	Creates a new setup pattern of A/D repeat sweep mode 1. * Only available when a project is opened.
			Simultaneous Sampling Sweep Mode (P)	Creates a new setup pattern of A/D simultaneous sampling sweep mode. * Only available when a project is opened.
			Delay Trigger Mode 0 (D)	Creates a new setup pattern of A/D delay trigger mode 0. * Only available when a project is opened.
			Delay Trigger Mode 1 (L)	Creates a new setup pattern of A/D delay trigger mode 1. * Only available when a project is opened.
		Duplicate setting (C)		Duplicates a setup pattern of A/D. * Only available when A/D setting is selected.
		Delete setting (D)		Deletes a setup pattern of A/D. * Only available when A/D setting is selected.
		Modify setting (M)		Modifies A/D settings. Only available when A/D setting is selected.
		Set input group and pin (I)		Sets an input group and pin for a setup pattern of A/D. * Only available when A/D setting is selected.
		Delete input group and pin (L)		Deletes an input group and pin from a setup pattern of A/D. * Only available when an input group and pin are selected.
	I/O (I)	Newly create setting (N)		Creates a new setup pattern of I/O. * Only available when a project is opened.
		Duplicate setting (C)		Duplicates a setup pattern of I/O. * Only available when I/O setting is selected.
		Delete setting (D)		Deletes a setup pattern of I/O. * Only available when I/O setting is selected.
		Modify setting (M)		Modifies I/O settings. Only available when I/O setting is selected.
		Set port (P)		Sets a port for a setup pattern of I/O. * Only available when I/O setting is selected.
		Delete port (L)		Deletes a port from a setup pattern of I/O. * Only available when a port is selected.
	Timer (T)	Newly create setting (N)	Timer Mode (T)	Creates a new setup pattern of timer mode. * Only available when a project is opened.
			Event Counter Mode (E)	Creates a new setup pattern of event counter mode. * Only available when a project is opened.

Main menu	Sub-menu			Description
			Pulse Width Modulation Mode (M)	Creates a new setup pattern of pulse width modulation mode. * Only available when a project is opened.
			Pulse Period Measurement Mode (P)	Creates a new setup pattern of pulse period measurement mode. * Only available when a project is opened.
			Pulse Width Measurement Mode (W)	Creates a new setup pattern of pulse width measurement mode. * Only available when a project is opened.
			Input Capture Mode (I)	Creates a new setup pattern of input capture mode. * Only available when a project is opened.
			Output Compare Mode (O)	Creates a new setup pattern of output compare mode. * Only available when a project is opened.
		Duplicate setting (C)		Duplicates a setup pattern of a timer. * Only available when timer setting is selected.
		Delete setting (D)		Deletes a setup pattern of a timer. * Only available when timer setting is selected.
		Modify setting (M)		Modifies timer settings. Only available when timer setting is selected.
		Set timer (T)		Sets a timer type for a setup pattern of a timer. * Only available when timer setting is selected.
		Delete timer (L)		Deletes a timer type from a setup pattern of a timer. * Only available when a timer is selected.
	INT (N)	Newly create setting (N)		Creates a new setup pattern of external interrupt. * Only available when a project is opened.
		Duplicate setting (C)		Duplicates a setup pattern of external interrupt. * Only available when external interrupt setting is selected.
		Delete setting (D)		Deletes a setup pattern of external interrupt. * Only available when external interrupt setting is selected.
		Modify setting (M)		Modifies settings for external interrupt setting. Only available when external interrupt setting is selected.
		Set interrupt (I)		Sets an interrupt type for a setup pattern of external interrupt. * Only available when external interrupt setting is selected.
		Delete interrupt (L)		Deletes an interrupt type from a setup pattern of external interrupt. * Only available when external interrupt type is selected.
Display (V)	Toolbar (T)			Displays/undisplays the toolbar.
	Create new toolbar (B)			Displays/undisplays the Create New toolbar.
	Status bar (S)			Displays/undisplays the status bar.
	New setting window (N)			Displays/undisplays the new setting window.
	Generated file information window (F)			Displays/undisplays the generated file information window.
	Character size of the generated file information window (C)			Changes the character size of the generated file information window. Selectable from large, medium, or small.

Main menu	Sub-menu	Description
Tool (T)	Setting (S)…	Sets an editor to open generated files.
	Option (O)	Unsupported in version 1.02.
	Register file in HEW project (R)	Registers generated files in a HEW project.
	Display output function list (D)	Lists output functions in CSV file format.
	Place output function in the latest status (P)	Updates the output function list.
Window (W)	-	Unsupported in version 1.02.
Help (H)	About Peripheral Driver Generator (A)…	Shows the version information of the PDG.

* “Setup pattern” refers to the details of peripheral I/O settings.

1.9 Toolbar

The toolbar icons are listed in table 1-6.

Table 1-6 List of Toolbar Icons

Button Name	Icon	Operation	Situation in which button is available
New project		Creates a new project.	Always
Open		Opens an existing project.	Always
Save		Saves the open project.	When a project is opened.
Project Convert		Converts the open project for use in other microcomputers.	Always
Batch source generate		Generates the sources for each setup-completed peripheral IO collectively.	When peripheral I/O settings are completed.
Output function list display		Displays output function list.	After batch source generation is performed.
Output function list update		Updates output function list.	After batch source generation is performed.
Help		Shows the version of the PDG.	Always
CPU setting		Modifies settings for a CPU.	When a project is opened.
New serial synchronous mode setup creation		Creates a new setup pattern of serial synchronous mode.	When a project is opened.
New serial asynchronous mode setup creation		Creates a new setup pattern of serial asynchronous mode.	When a project is opened.
New A/D single-shot mode setup creation		Creates a new setup pattern of A/D single-shot mode.	When a project is opened.
New A/D repeat mode setup creation		Creates a new setup pattern of A/D repeat mode.	When a project is opened.
New A/D single sweep mode setup creation		Creates a new setup pattern of A/D single sweep mode.	When a project is opened.
New A/D repeat sweep mode		Creates a new setup pattern of A/D repeat sweep	When a project is opened.

Button Name	Icon	Operation	Situation in which button is available
0 setup creation		mode 0.	
New A/D repeat sweep mode 1 setup creation		Creates a new setup pattern of A/D repeat sweep mode 1.	When a project is opened.
New A/D simultaneous sampling sweep mode setup creation		Creates a new setup pattern of A/D simultaneous sampling sweep mode.	When a project is opened.
New A/D delay trigger mode 0 setup creation		Creates a new setup pattern of A/D delay trigger mode 0.	When a project is opened.
New A/D delay trigger mode 1 setup creation		Creates a new setup pattern of A/D delay trigger mode 1.	When a project is opened.
New I/O setup creation		Creates a new setup pattern of I/O.	When a project is opened.
New timer mode setup creation		Creates a new setup pattern of timer mode.	When a project is opened.
New timer event count mode setup creation		Creates a new setup pattern of timer event counter mode.	When a project is opened.
New timer pulse width modulation mode setup creation		Creates a new setup pattern of timer pulse width modulation mode.	When a project is opened.
New timer pulse period measurement mode setup creation		Creates a new setup pattern of timer pulse period measurement mode.	When a project is opened.
New timer pulse width measurement mode setup creation		Creates a new setup pattern of timer pulse width measurement mode.	When a project is opened.
New timer input capture mode setup creation		Creates a new setup pattern of timer input capture mode.	When a project is opened.
New timer output compare mode setup creation		Creates a new setup pattern of timer output compare mode.	When a project is opened.
New external interrupt setup creation		Creates a new setup pattern of external interrupt.	When a project is opened.

1.10 Support Range of Peripheral I/O Module Functions

1.10.1 Timer

Table 1-7 lists the operating modes supported by the timer.

Table 1-7 Operating Mode Supported by Timer

Model	M16C/Tiny	R8C/Tiny	H8/300H Tiny	M16C/60
	Timer mode	Timer mode	Timer mode	Timer mode
	Event counter mode	Event counter mode	Event counter mode	Event counter mode
	Pulse width modulation mode	Pulse width modulation mode	Pulse width modulation mode	Pulse width modulation mode
	Pulse period measurement mode	Pulse period measurement mode	Pulse period measurement mode	Pulse period measurement mode
	Pulse width measurement mode	Pulse width measurement mode	Pulse width measurement mode	Pulse width measurement mode
	Input capture mode	Input capture mode	Input capture mode	
	Output compare mode	Output compare mode	Output compare mode	

1.10.2 A/D Conversion

Table 1-8 lists the operating modes supported by the A/D conversion.

Table 1-8 Operating Mode Supported by A/D Conversion

Model	M16C/Tiny	R8C/13, 22 to 2B	H8/300H Tiny, R8C/2C, 2D	M16C/62P
Operating mode	Single-shot mode	Single-shot mode	Single-shot mode	Single-shot mode
	Repeat mode	Repeat mode	Repeat mode	Repeat mode
	Single sweep mode		Single sweep mode	Single sweep mode
	Repeat sweep mode 0		Repeat sweep mode 0	Repeat sweep mode 0
	Repeat sweep mode 1			Repeat sweep mode 1
	Simultaneous sampling sweep mode			
	Delay trigger mode 0			
	Delay trigger mode 1			

2. Preparation for Using the PDG

You will install the PDG, and specify an editor to be used via the PDG and other settings necessary for the PDG to collaborate with the HEW. Note that screen images of the HEW may differ depending on the version you are using.

2.1 Installing the PDG

After the installer launches, follow the instructions to install the PDG with administrator right.

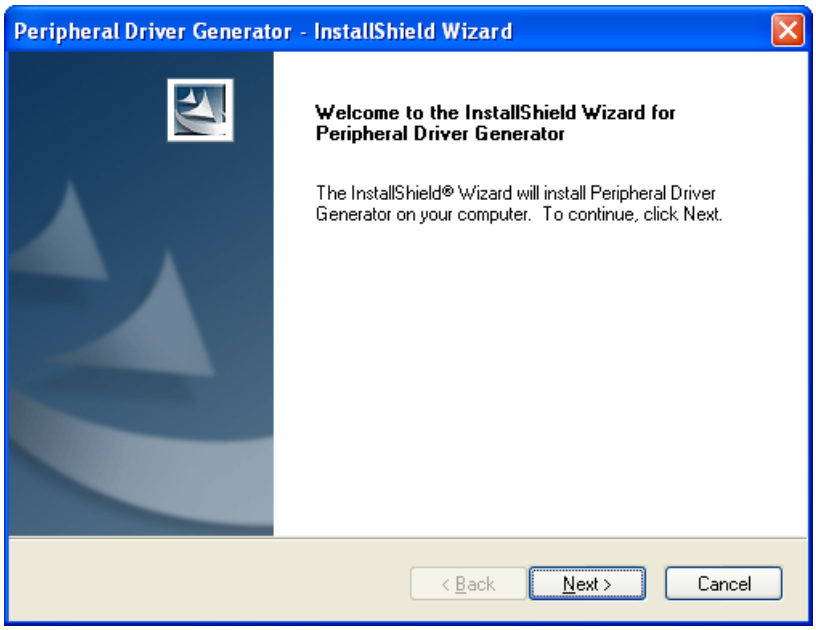

Figure 2-1 Installer after Launched

2.2 Setting an Editor

Any editor can be used to open generated source files in a project on the generated file information window.

[1] Select [Tool] -> [Setting] from the menu to open the [Setting] dialog box.
[2] Specify the name of the editor program that you wish to use when opening source files.
[3] Specify the parameters of the program according to its specifications. Replace file names and line numbers in the parameters with “%F” and %L, respectively, if necessary.

Click [OK] to close the dialog box and complete the settings.

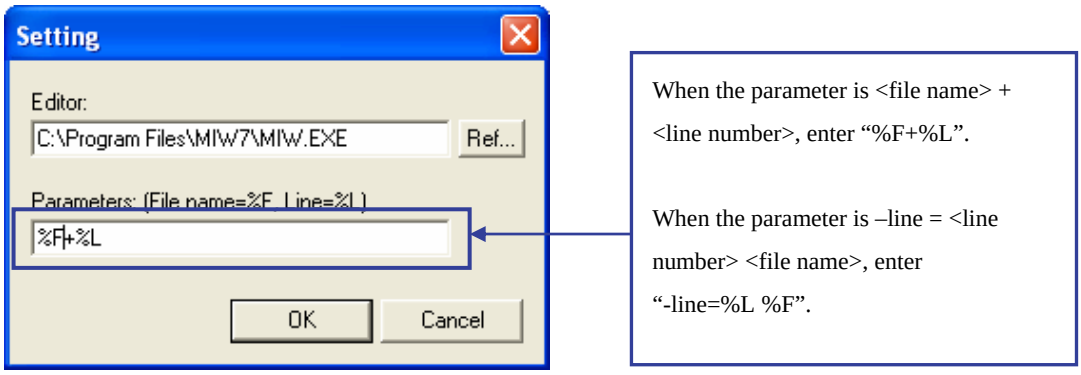

Figure 2-2 [Setting] Dialog Box

2.3 Registering the PDG in the HEW

You will register the PDG in the HEW menu so that the PDG can launch from it.

[1] Launch the HEW. If it has already launched, close all the workspaces.
[2] Click [Administration…] in the [Welcome!] dialog box.

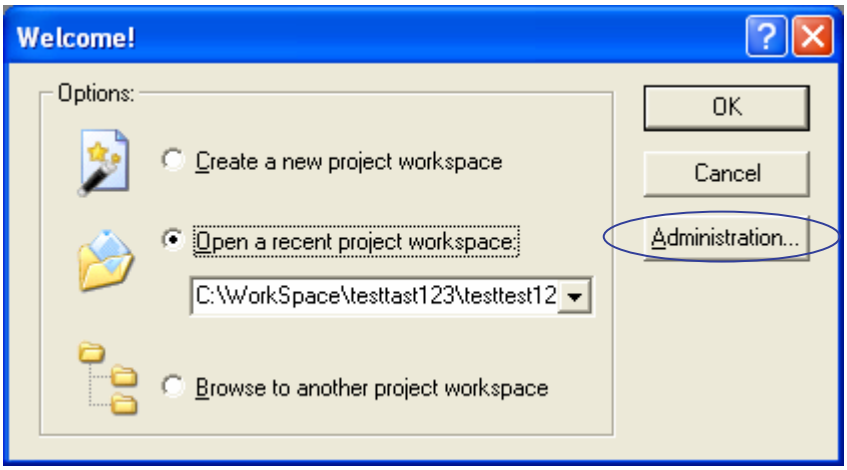

Figure 2-3 [Welcome!] Dialog Box in the HEW

[3] If the HEW has already launched, select [Administration…] from the tool menu.

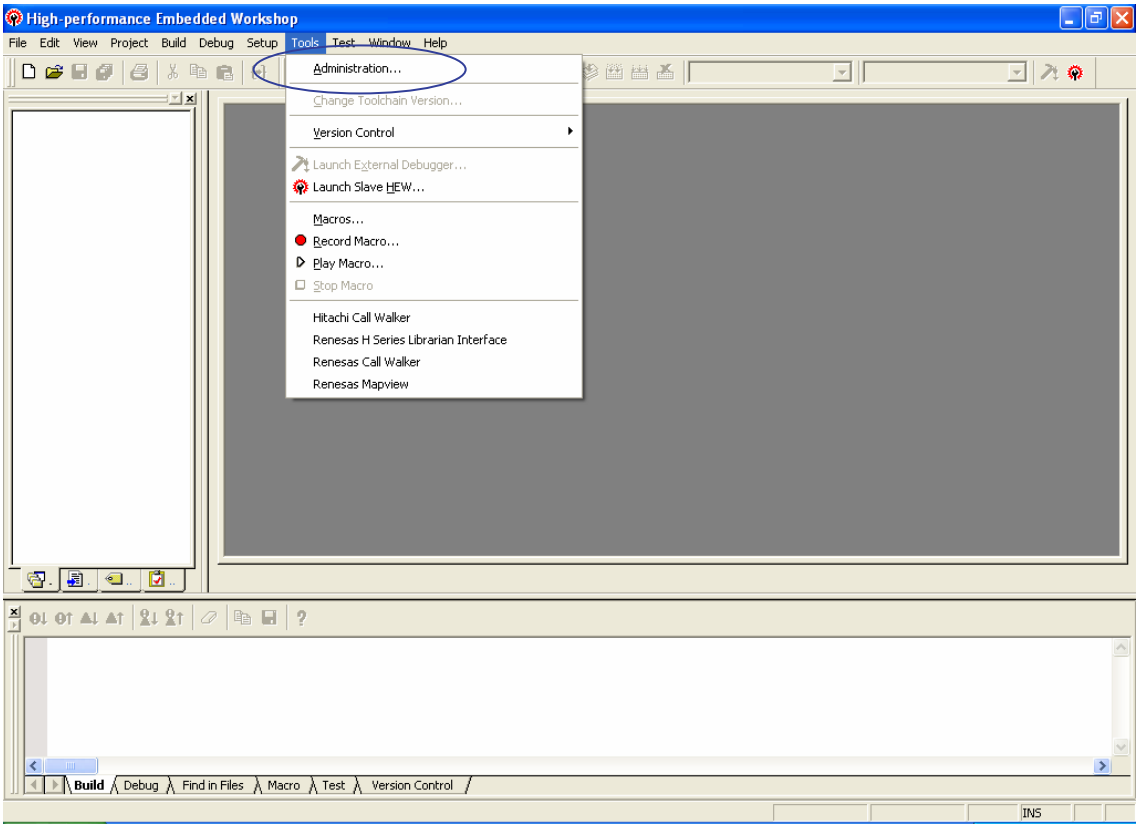

Figure 2-4 HEW Tool Menu

[4] Click on the [Register] button.

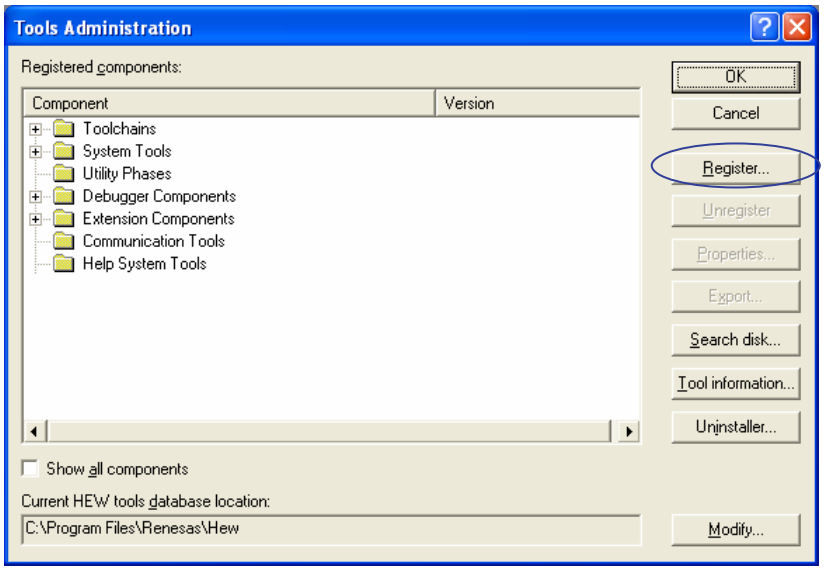

Figure 2-5 [Tools Administration] Dialog Box

[5] Select the “PDG.hrf” file in the directory where the PDG is installed. By default, the directory is ”C:/Renesas/PDG”.

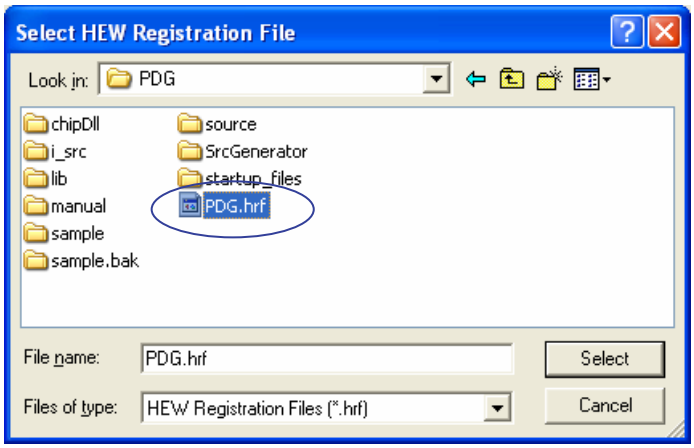

Figure 2-6 [Select HEW Registration File] Dialog Box

[6] Make sure that the PDG is registered in [System Tools] in the [Tools Administration] dialog box.

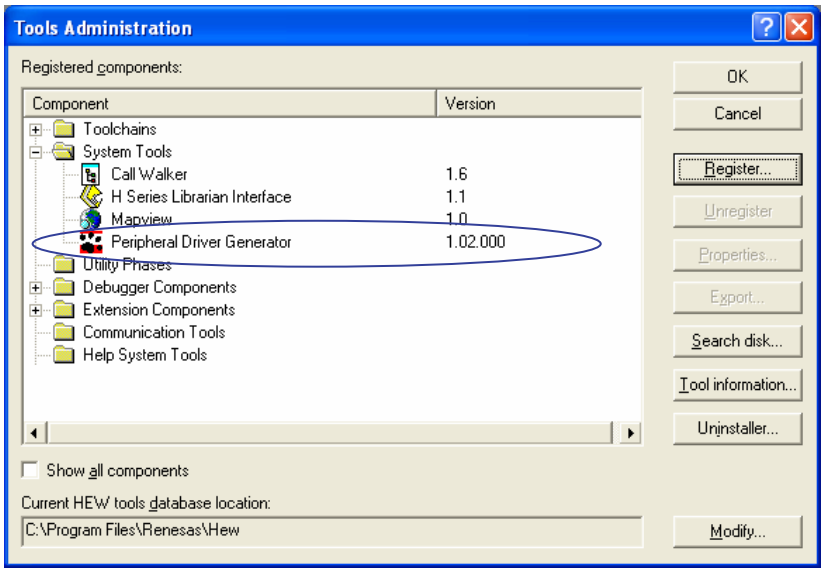

Figure 2-7 [Tools Administration] Dialog Box

[7] Click [OK] to close the [Tools Administration] dialog box.

2.4 Setting HewTargetServer

In order to register sources generated by the PDG in the HEW, HewTargetServer in the HEW requires to be set properly. Set HewTargetServer as follows.

[1] Select [Administration…] from the tool menu.

[2] Make sure that the HewTargetServer version is 1.05.00 in [Extension Components].

When earlier version than 1.05.00 is shown, select HewTargetServer and click [Unregister] to unregister it.

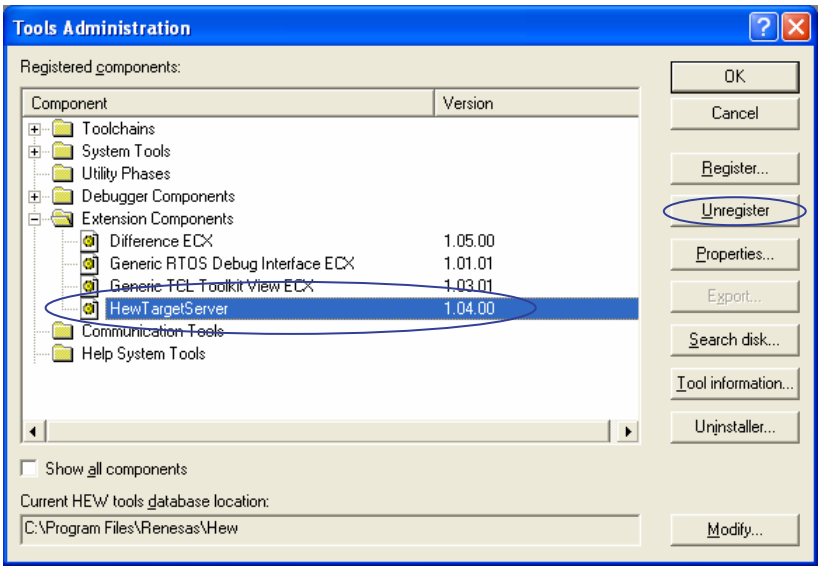

Figure 2-8 [Tools Administration] Dialog Box

[3] Click on the [Search disk…] button in the [Tools Administration] dialog box.

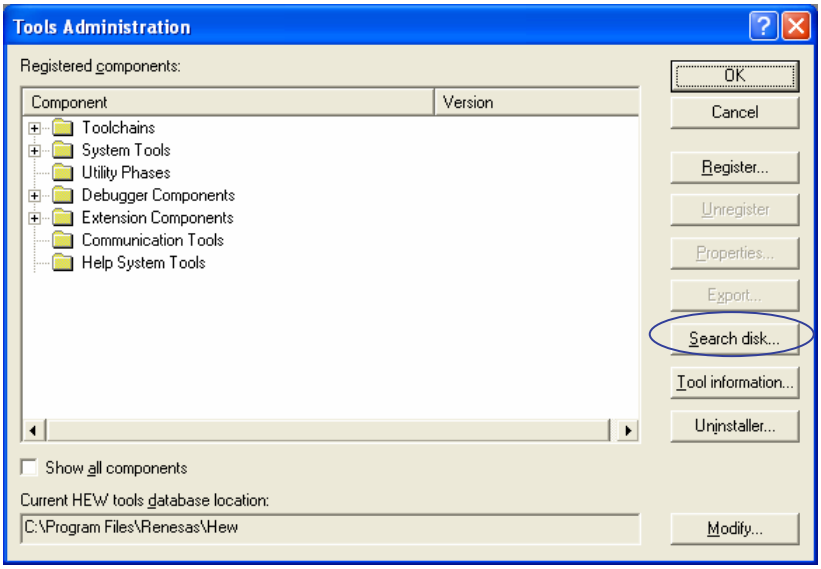

Figure 2-9 [Tools Administration] Dialog Box

[4] Enter the directory where the HEW is installed in the [Search Disk for Components] dialog box and click on the [Start] button to search for HewTargetServer.

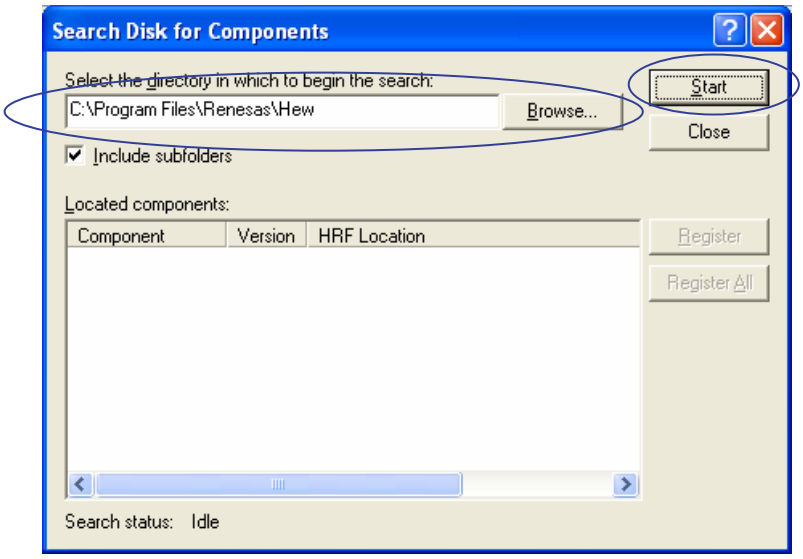

Figure 2-10 [Search Disk for Components] Dialog Box

[5] From [Located components], select HewTargetServer 1.05.00 and click on the [Register] button.

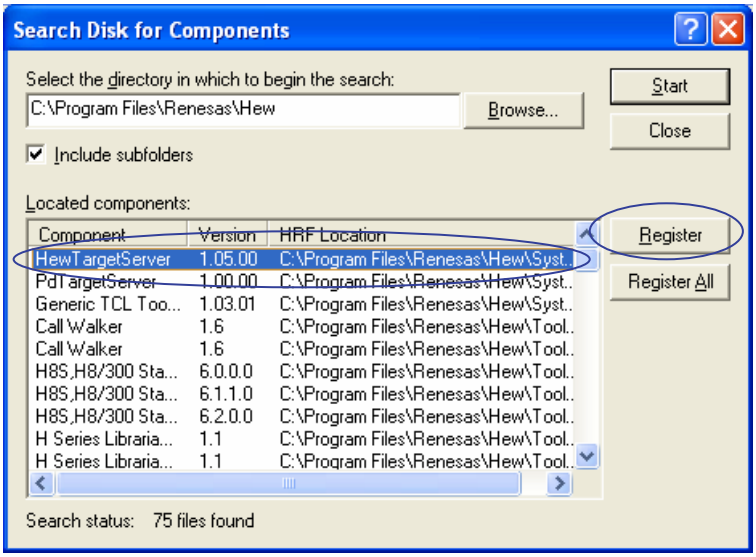

Figure 2-11 [Search Disk for Components] Dialog Box

[6] Click on the [close] button to close the [Search Disk for Components] dialog box.

[7] Click [OK] to close the [Tools Administration] dialog box.

[8] Execute REGISTERSERVER.bat in the directory where the HEW is installed.
By default, the directory is as follows:

c:\Program Files\Renesas\Hew\REGISTERSERVER.bat

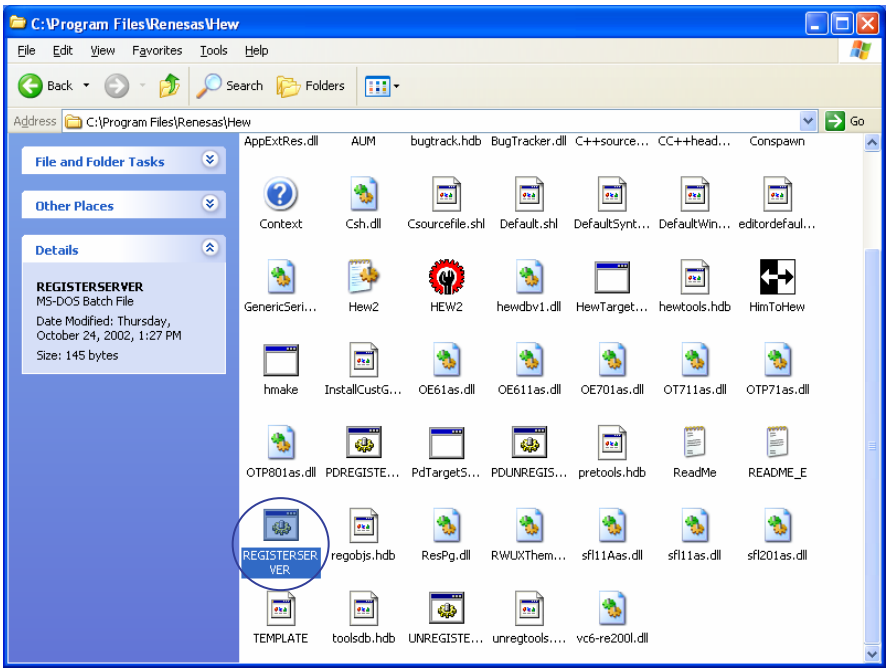

Figure 2-12 Example of the Directory where the HEW is Installed

3. How to Operate the PDG

3.1 Developing an Application with the PDG

The PDG generates C source files that contain functions reflecting settings for peripheral I/O modules.
An application that operates peripheral I/O modules can be developed by calling functions generated by the PDG.
The following gives an overview of the application development with the PDG.

[1] Creating a workspace for the application development in the HEW.
You will create a workspace for the application to be developed by selecting a menu item such as [Create a new project workspace] in the HEW.

[2] Creating a PDG project for driver development
You will select a microcomputer and create a project in the PDG.

[3] Setting peripheral I/O modules
You will set peripheral I/O modules in the created project in the PDG, beginning with CPU settings.

[4] Generating and registering sources in the workspace
After setting the peripheral I/O modules, you will generate source files collectively in the PDG and then register them in the created HEW workspace from the PDG.

[5] Creating the application
You will call the functions, which are written in the source files generated by the PDG and which operate the peripheral I/O modules, in the right places of the application. Note that when the operation functions are called, the header files generated by the PDG must be included in advance.

[6] Build
You will build the application in the HEW. Note that before performing a build, the following settings are required, and that the HEW V.4.02 or later automatically specifies library files.

- Specifying the directory path to the header files generated by the PDG (-I option)
- Specifying library files to link API libraries (-L option)

If build errors occur in the operation functions generated by the PDG, make sure that the functions are called.

[7] Debug
You will debug the application built with the HEW.

[8] Evaluation
You will evaluate the application to make sure that it functions as expected.

3.2 PDG Operation Flow

This section explains how to operate the PDG.

You will begin with settings for determining how to use peripheral I/O module functions, and then generate and use source files to develop drivers, as follows.

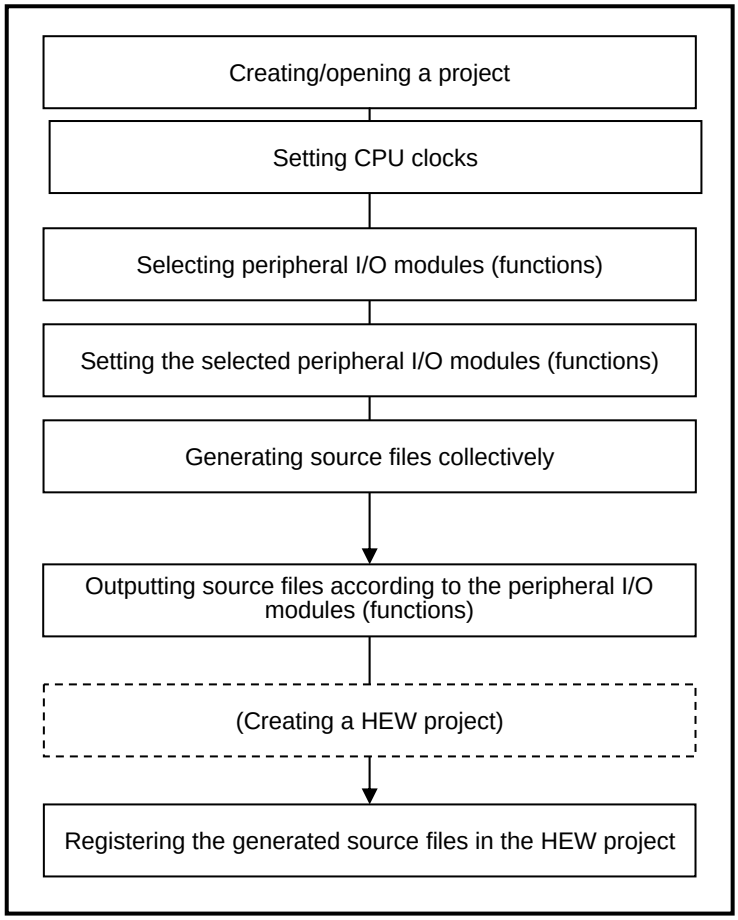

Figure 3-1 PDG Operation Flow

3.3 Creating/Opening a Project

3.3.1 Creating a New Project

Create a new project through the following steps.

[1] Select [File] -> [Create New Project] to open the [Create New] dialog box (see figure 3-2).

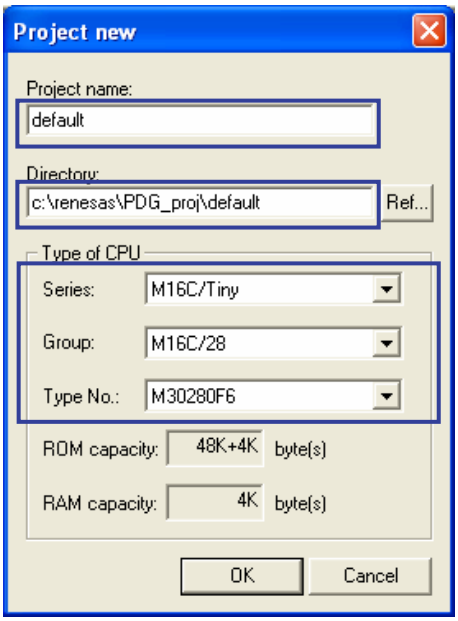

Figure 3-2 [Project new] Dialog Box

[2] Enter the name of the project to be created and specify the directory where the project is stored.

[3] Select the CPU series, group, and type No. (see table 3-1)

Table 3-1 List of Supported Microcomputers

Series	Group	Type No.
M16C/Tiny	M16C/28	M30280F6, M30280F8, M30280FA M30280FC, M30281F6, M30281F8 M30281FA, M30281FC
	M16C/28B	M30280FCB, M30281FCB
	M16C/29	M30290FA, M30290FC, M30291FA, M30291FC
H8/300H Tiny	H8/3687	HD64F3687, HD64F3684
	H8/36077	HD64F36077, HD64F36074
	H8/36049	HD64F36049
	H8/36109	HD64F36109
R8C/Tiny	R8C/13	R5F21132, R5F21133, R5F21134
	R8C/22	R5F21226, R5F21227, R5F21228 R5F2122A, R5F2122C

Series	Group	Type No.
	R8C/23	R5F21236, R5F21237, R5F21238 R5F2123A, R5F2123C
	R8C/24	R5F21244, R5F21245, R5F21246, R5F21247, R5F21248
	R8C/25	R5F21254, R5F21255, R5F21256, R5F21257, R5F21258
	R8C/26	R5F21262, R5F21264, R5F21265 R5F21266
	R8C/27	R5F21272, R5F21274, R5F21275 R5F21276,
	R8C/28	R5F21282, R5F21284
	R8C/29	R5F21292, R5F21294
	R8C/2A	R5F212A7, R5F212A8, R5F212AA R5F212AC
	R8C/2B	R5F212B7, R5F212B8, R5F212BA R5F212BC
	R8C/2C	R5F212C7, R5F212C8, R5F212CA R5F212CC
	R8C/2D	R5F212D7, R5F212D8, R5F212DA R5F212DC
M16C/60	M16C/62P	M30622F8PFP, M30622F8PGP M30623F8PGP, M30620FCPFP M30620FCPGP, M30621FCPGP M3062LFGPFP, M3062LFGPGP M30625FGPGP, M30626FHPFP M30626FHPGP, M30627FHPGP M30626FJPFP, M30626FHPGP M30627FJPGP

[4] Click [OK] to create a new project.

[5] Immediately after the creation of a new project, the [CPU clock setting] dialog box opens automatically. Proceed to setting CPU clocks.

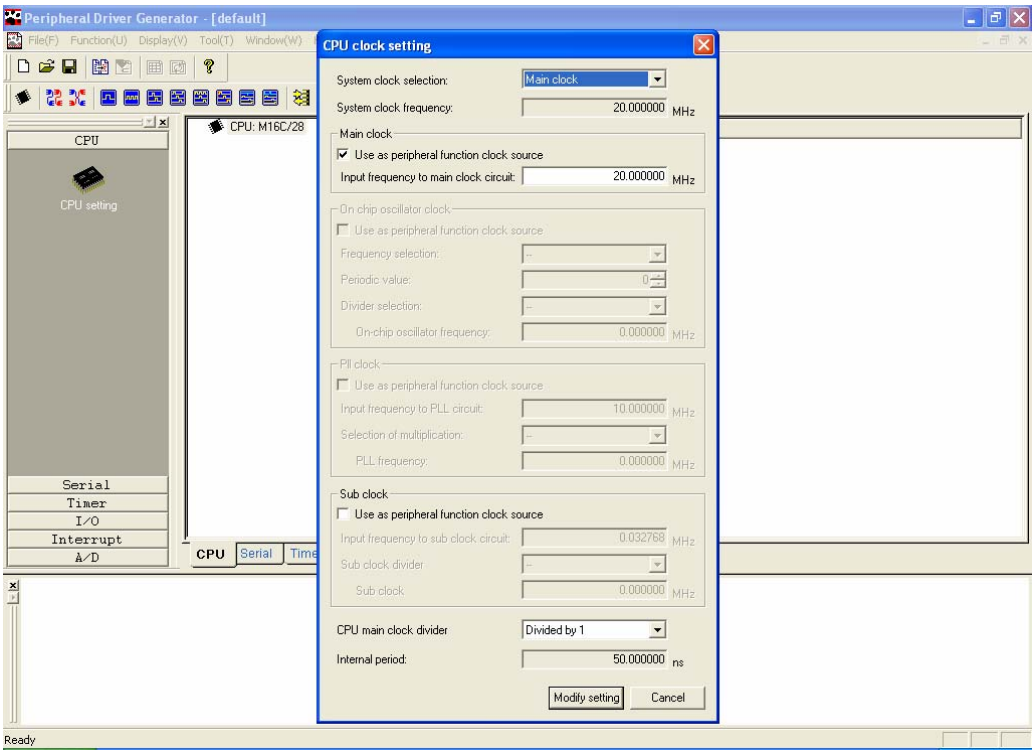

Figure 3-3 [CPU clock setting] Dialog Box

3.3.2 Opening an Existing Project

Open an existing project through the following steps.

[1] Select [File] -> [Open] from the menu to open the [Open File] dialog box.
[2] Select a project that you wish to open, and click on the [Open] button or double-click on the file name.
[3] The selected project opens.

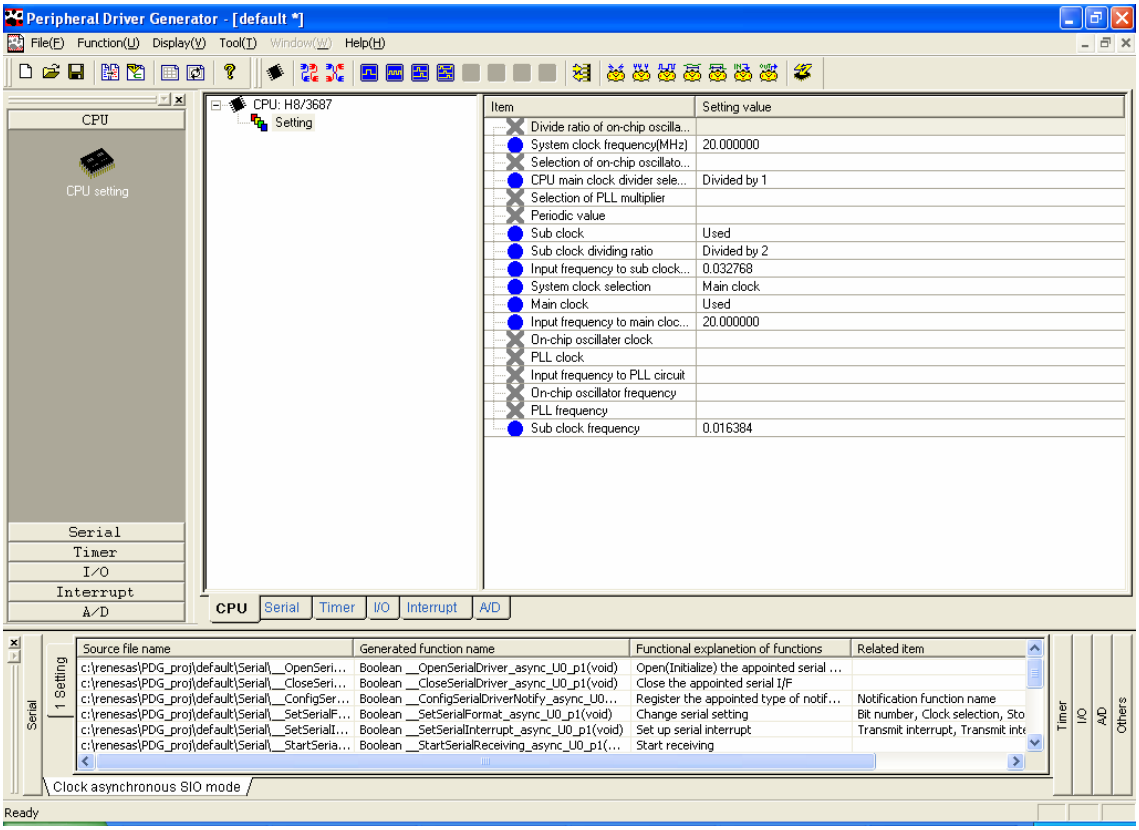

Figure 3-4 Existing Project

3.3.3 Setting CPU Clocks

After a new project is created, the [CPU clock setting] dialog box opens automatically. Perform setting for CPU clocks.

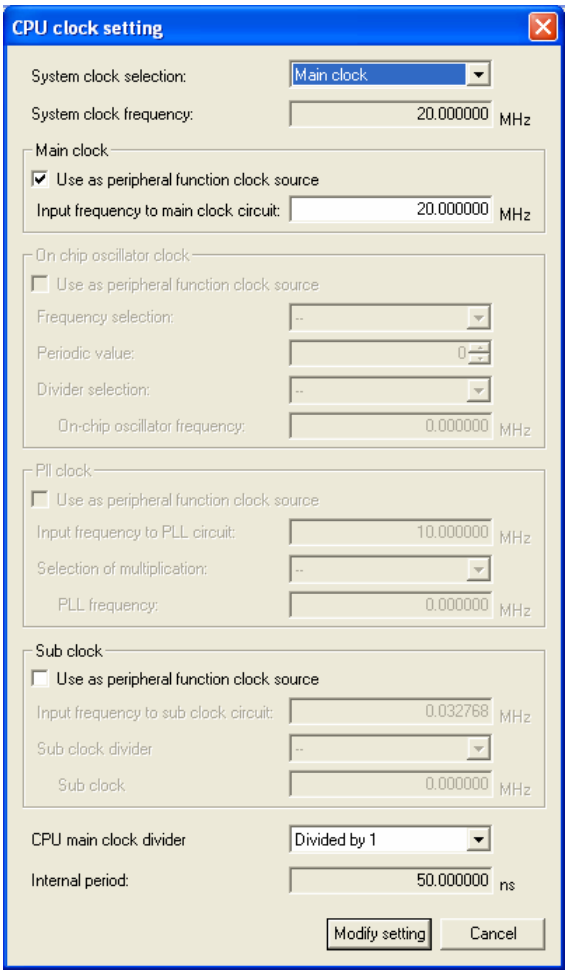

Figure 3-5 [CPU clock setting] Dialog Box

3.4 Selecting/Setting Peripheral I/O Modules

3.4.1 Creating a New Setup Pattern of Peripheral I/O Modules

Create a new setup pattern of peripheral I/O modules through the following steps.

[1] Click on the button (see figure 3-6) corresponding to the peripheral I/O module to be controlled, or select [Function] -> [Serial, A/D, I/O, Timer, or INT] -> [Create New Setting] to select a mode.

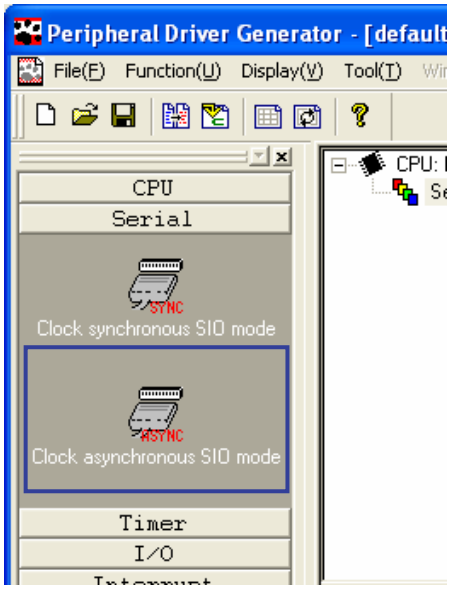

Figure 3-6 New Setup Pattern Creation Window

[2] After setting functions of each peripheral I/O modules (see figure 3-7), clicking on the [Setting] button lists the setting details (setup pattern) in the right of the main window (see figure 3-8).

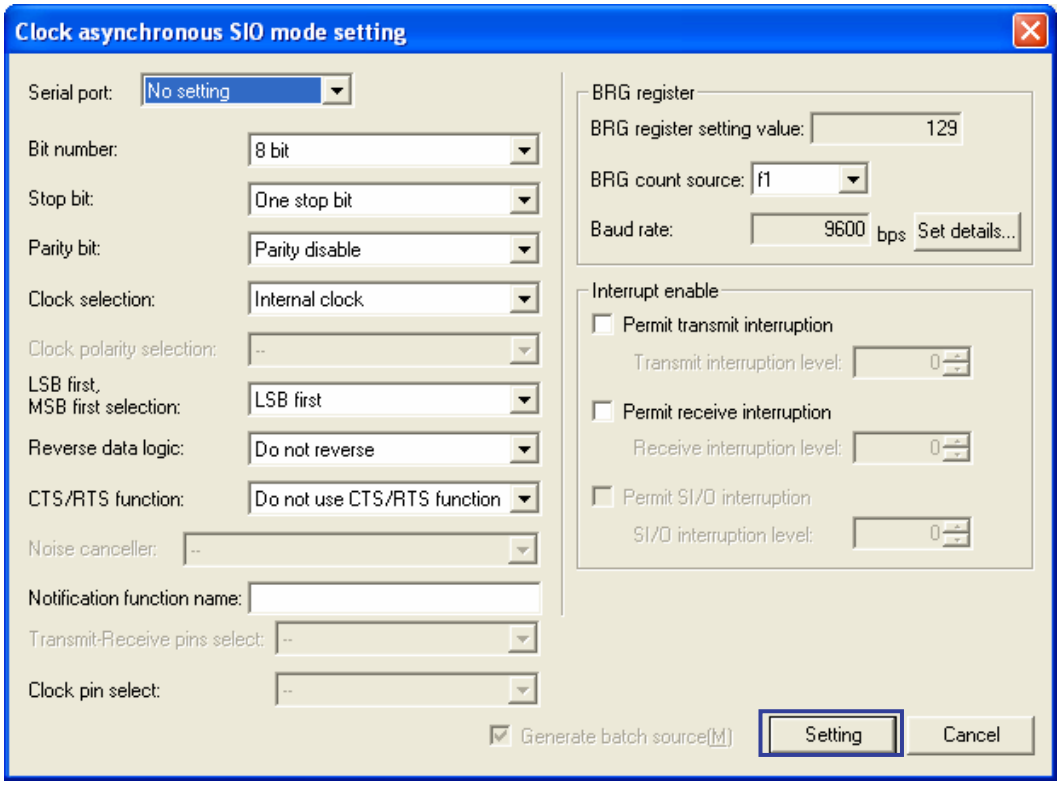

Figure 3-7 [Clock asynchronous SIO mode setting] Dialog Box

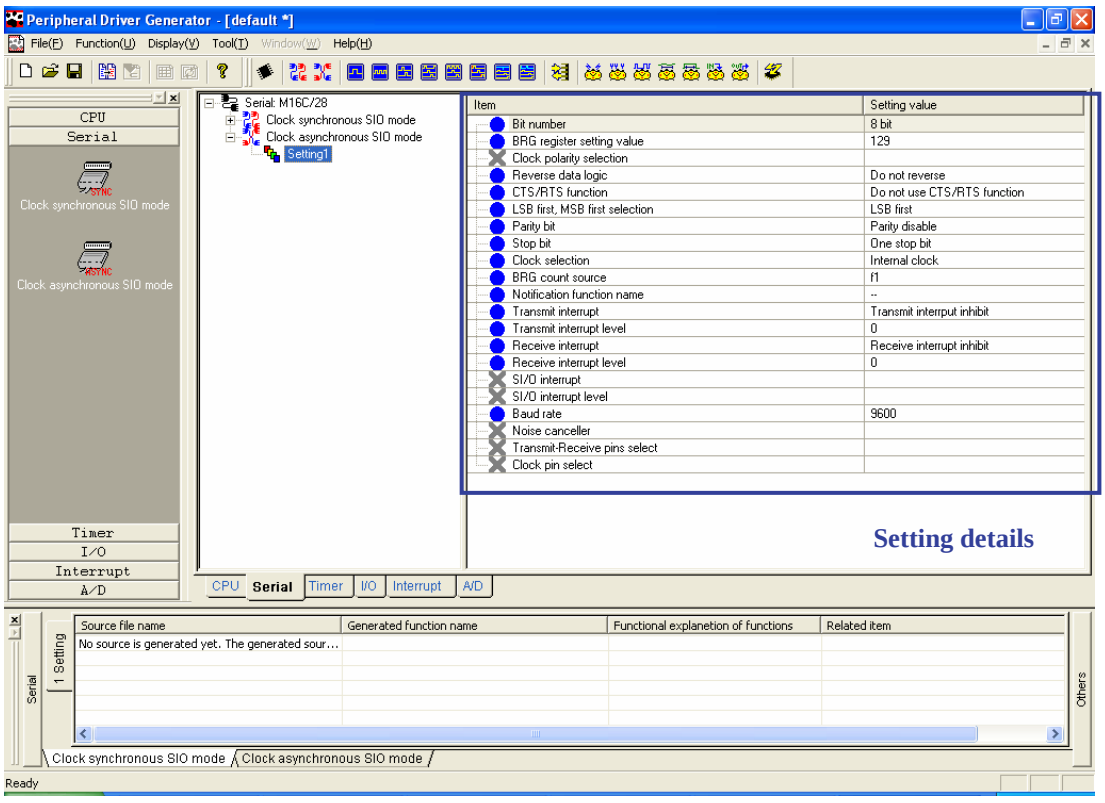

Figure 3-8 Setup Pattern Display Window

3.4.2 Modifying a Setup Pattern of Peripheral I/O Modules

Modify an existing setup pattern through the following steps.

[1] Double-click on [Setting] on the trees in the left of the main window, or double-click on the name of the setting item on the list in the right. Or, select [Function] -> [CPU, Serial, A/D, I/O, Timer, or INT] -> [Modify setting].

[2] The dialog box corresponding to the selected peripheral I/O module opens. Modify the settings.

[3] Click on the [Setting] button to close the dialog box. The list in the right of the main window reflects the modification to the settings.

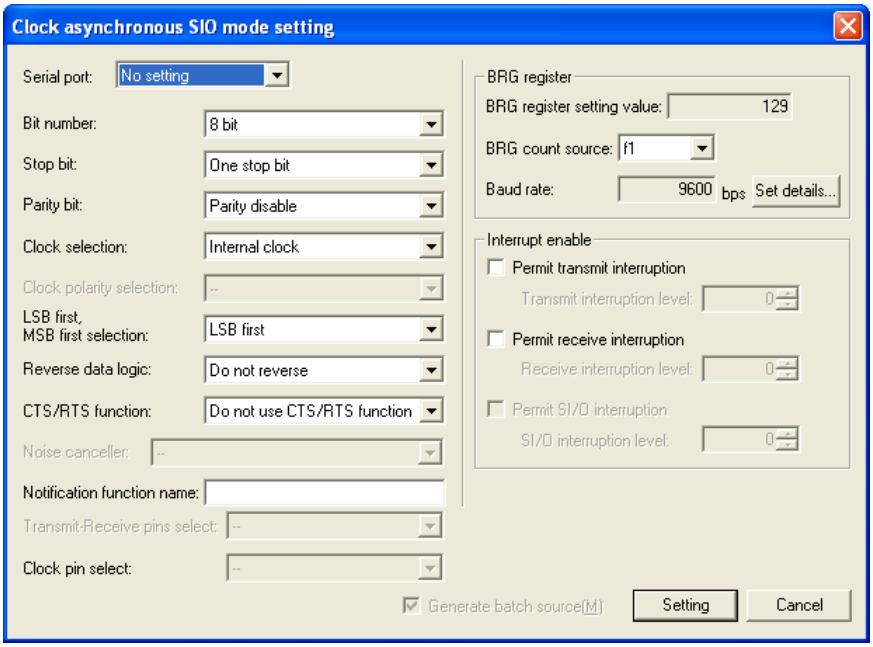

Figure 3-9 [Clock asynchronous SIO mode setting] Dialog Box

3.4.3 Duplicating a Setup Pattern of Peripheral I/O Modules

You can duplicate an existing setup pattern. When a resource is allocated to a setting to be duplicated, the resource setting is also duplicated.

A setup pattern can be duplicated only when [Setting] is selected on the trees in the left of the main window.

[1] Select [Setting] on the trees in the left of the main window and then select [Function] -> [Serial, A/D, I/O, Timer, or INT] -> [Duplicate setting] from the menu, or right-click on [Setting] and then select [Duplicate setting] from the pop-up menu.

[2] A duplicated setup pattern is shown at the bottom of the mode that the original setup pattern belongs to.

3.4.4 Deleting a Setup Pattern of Peripheral I/O Modules

You can delete an existing setup pattern. When a resource is allocated to a setting to be deleted, the resource setting is also deleted.

A setup pattern can be deleted only when [Setting] is selected on the trees in the left of the main window.

[1] Select [Setting] on the trees in the left of the main window and then select [Function] -> [Serial, A/D, I/O, Timer, or INT] -> [Delete setting] from the menu, or right-click on [Setting] and then select [Delete setting] from the pop-up menu.
[2] The selected setup pattern is deleted.

3.5 Allocating and Deleting a Resource

3.5.1 Allocating a Resource

You can allocate a resource (peripheral I/O module) to a setup pattern to which no resource is allocated, according to each peripheral function.

Only one resource can be allocated to each setup pattern. A resource can be allocated only when [Setting] is selected on the trees in the left of the main window.

[1] Select [Setting] (except for CPU clock) on the trees in the left of the main window and then select [Function] -> [Serial, A/D, I/O, Timer, or INT] -> [UART number setting, Input group/pin setting, Port setting, Timer setting, or Interrupt setting] from the menu, or right-click on [Setting] on the trees in the left of the main window and then select [(Resource) setting] from the pop-up menu.
[2] Select a resource that you wish to allocate to the selected setup pattern in the [(Resource) setting] dialog box.
[3] After clicking on [OK] closes the dialog box, the resource is allocated to the selected setup pattern. At the same time, a message appears if allocating the resource disables some items. Also, note that after the resource is allocated, settings that require to be modified are marked with  icons in the setting list.

3.5.2 Deleting a Resource

You can delete a resource allocated in [(Resource) setting].

An allocated resource can be deleted only when it is selected on the trees in the left of the main window.

[1] Select [<resource name>] on the trees in the left of the main window and then select [Function] -> [Serial, A/D, I/O, Timer, or INT] -> [Delete UART number, Delete input group/input pin, Delete port, Delete timer, or Delete interrupt] from the menu, or right-click on [<resource name>] on the trees in the left of the main window and then select [Delete (resource)] from the pop-up menu.
[2] The selected resource is deleted.

3.6 Generating Sources Collectively

You can generate source codes according to the function settings of the currently opened project.

Source codes can be generated when a resource is allocated to at least one of the created setup patterns.

[1] Select [File] -> [Generate Sources Collectively] from the menu.
[2] Source files are generated and stored in the same directory as the currently opened project. At the same time, information on those files is shown in the [Generated File Information] window.

* If you create a setup pattern and check the [Generate batch source] check box in the peripheral I/O function setting dialog box, source files are generated automatically after the dialog box is closed.
* To delete generated source files collectively, select [File] -> [Delete Sources Collectively] from the menu.

3.7 Viewing Generated Function Information in CSV Format

Function information generated collectively by the PDG can be listed in CSV file format after source files are generated collectively.

[1] Select [Tool] -> [Display output function list] from the menu.
[2] A generated function list is displayed by the program associated with the *.csv file.

3.8 Updating a Generated Function Information

You can update function information generated collectively by the PDG after source files are generated collectively.*

[1] Select [Tool] -> [Place output function list in the latest status].
[2] The CSV file of the generated function list is updated.

* The CSV file is updated when sources are generated collectively. Note that when sources are generated while the CSV file is opened, it may not be updated. In this case, close the CSV file and follow the steps above.

3.9 Registering Generated Files in a HEW Project

3.9.1 Registration Function

You can register all source files generated by the PDG collectively in an existing HEW project automatically. At the same time, API libraries used in the source files are registered in library options, and the intprg.c file is excluded from the build target when it is already registered in the HEW project so that no collision between interrupt functions occurs.

* When the already registered intprg.c file contained user codes, it is required that the user codes be manually copied into the newly registered intprg.c.

3.9.2 How to Register Generated Files

Generated files can be registered by the steps below when the sources has already been generated.

[1] Select [Tool] -> [Register file in HEW project] from the menu.

[2] When the HEW is not launched, the message dialog box appears asking whether to launch it or not. Click [Yes].

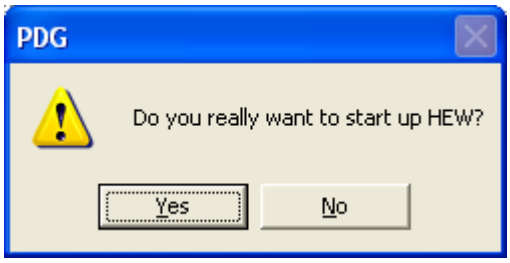

Figure 3-10 Message Asking whether to Launch the HEW (PDG)

[3] The message dialog box appears asking whether to register the files or not.

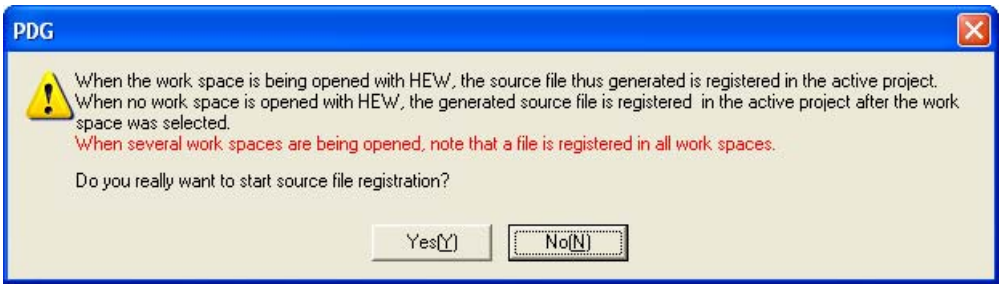

Figure 3-11 Message Asking whether to Register the Files (PDG)

- When a HEW workspace in which the files are to be registered has already been opened,
  [4] Click [Yes].

- When a HEW workspace in which the files are to be registered is an existing workspace,
  [4] Click [Yes] to open the [Open File] dialog box. Specify a HEW workspace in which the files are to be registered. Click [Open] to open the workspace.

- When a HEW workspace in which the files are to be registered is not created,
  [4] Do not close the dialog box. In the HEW, create a new HEW workspace and leave the workspace open. In the message dialog box of the PDG, click [Yes].

[5] The [Library link priority setup] dialog box appears. Move the libraries up and down according to their priorities. When [OK] is clicked, the files begin to be registered in the HEW project.*

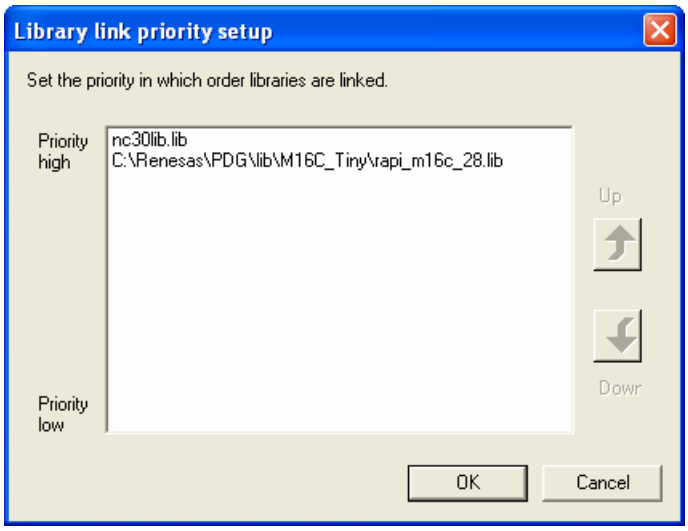

Figure 3-12 [Library link priority setup] Dialog Box

* When several HEW workspaces are opened, files are registered in all active projects, as stated in the dialog box that asks whether to register the files. Close workspaces in which you do not register the files before performing registration.

[6] The message dialog box appears telling you that the registration is completed.

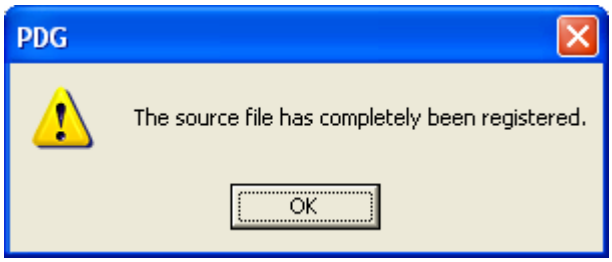

Figure 3-13 Message Telling Completion of the Registration (PDG)

3.9.3 Canceling Registration of Files

Once source files are registered in the HEW, you cannot cancel their registration via the PDG.

When you cancel them, in the project tab of the HEW workspace window, select a source file that you wish to cancel and right-click on the file to open a pop-up menu. Then, select [Remove File] or [Exclude Build].

4. Converting a Project

4.1 Project Conversion Function

You can convert a project (setting) with a certain CPU model in order to use the project with another CPU model.

When settings in the original are not appropriate in the converted project, they are modified according to the CPU model of the converted project. For information on the modification of the settings, refer to the next section.

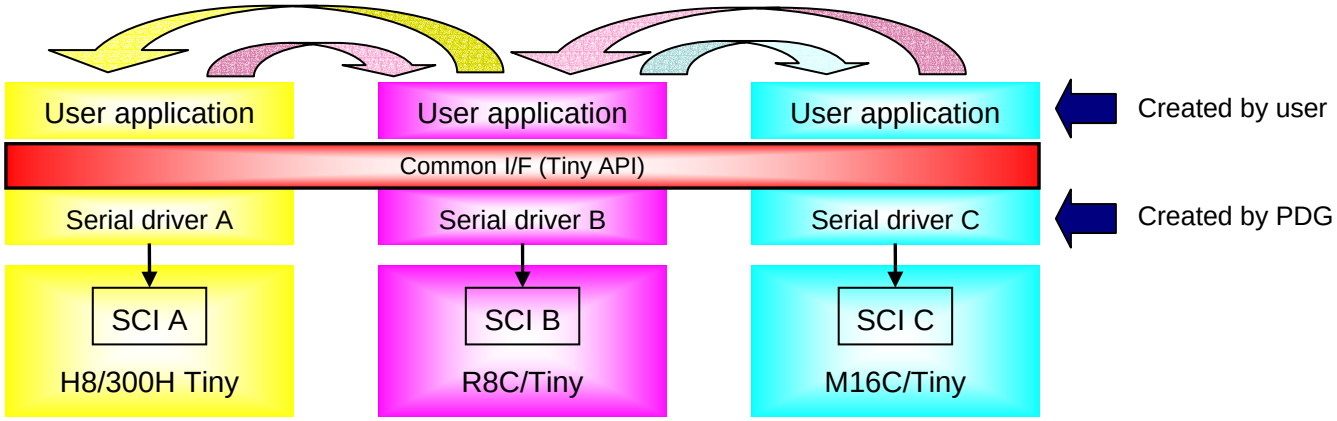

Figure 4-1 Project Conversion Overview

4.2 Modifying and Displaying the Settings through Project Conversion

[1] Settings are modified in the following two methods.

i. Setting values are modified or new setting values are set

- When the original setting values cannot be used in the converted project
- When items are invalid in the original while new setting values are required in the converted project

ii. Setting items themselves are disabled

- When the converted project CPU model does not support the setting items

[2] Resource settings

All resource settings are deleted.

[3] Displaying Project Conversion Results

Conversion results are displayed using the icons listed in table 4-1.

Table 4-1 Displaying Conversion Results

Icon	Description	Item No.
	The original setting values are used.	-
	The program modified the setting values.	i. for [1]
	The item itself was disabled through the conversion.	ii. for [1]
	The original setting values are used. (The item itself is invalid both in the original and converted project)	-

4.3 How to Convert a Project

[1] Select [File] -> [Project Convert] from the menu to open the [Convert] dialog box.
[2] Enter the names of the projects to be converted and newly created, and also enter the directory in which the new project is to be stored.
[3] Select a series, group, and type No. of the CPU into which the original is to be converted from the pull-down menu. Then, click [OK].

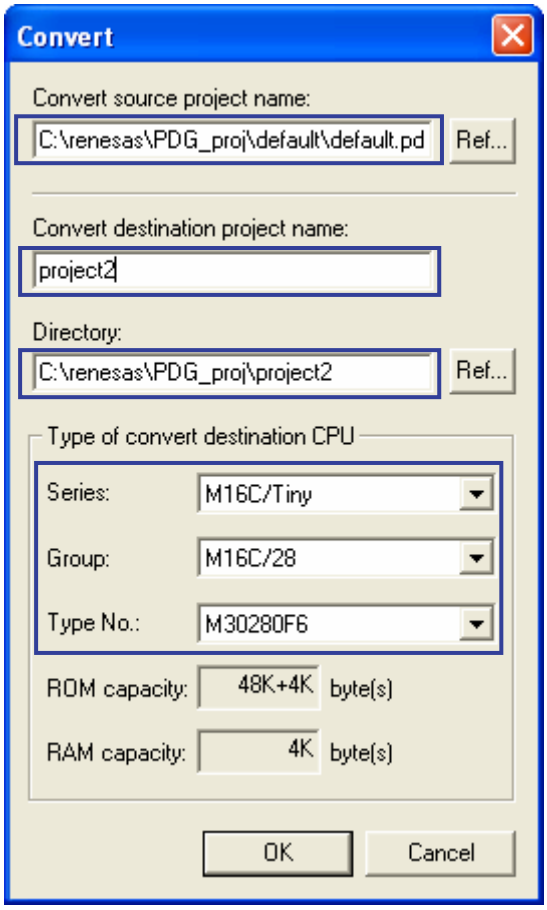

Figure 4-2 [Convert] Dialog Box

[4] A new project file is created in the specified directory. A message dialog box appears telling you that the conversion of the project is completed.

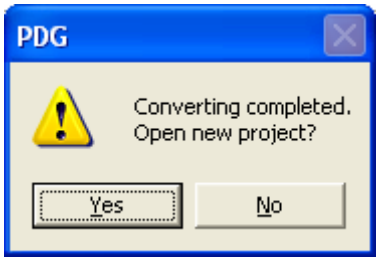

Figure 4-3 Message Telling Completion of Project Conversion (PDG)

[5] Clicking on [Yes] opens the created project file.
[6] Some of the settings may be disabled or may require to be modified depending on the CPU and other settings for the original project. Open setup pattern display window of each peripheral I/O module to check the setting details.

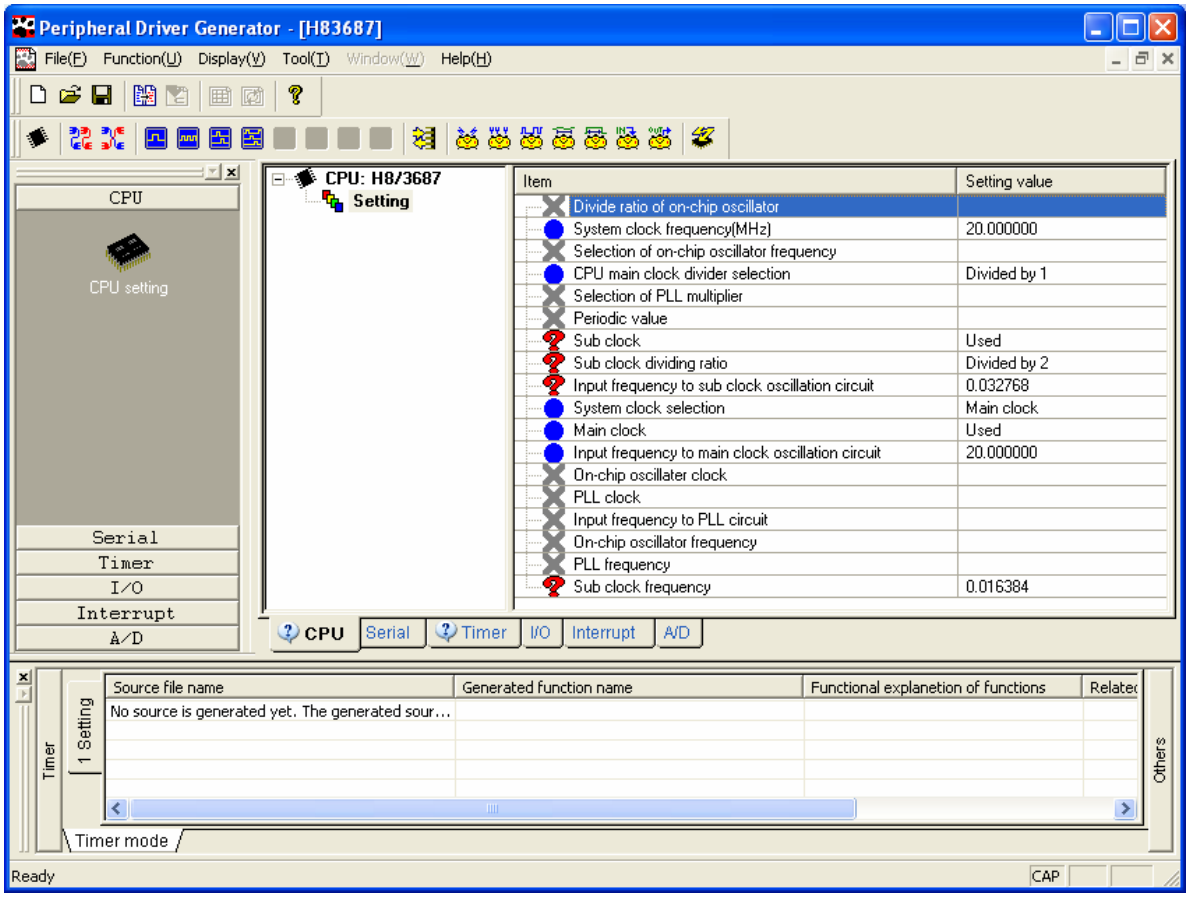

Figure 4-4 Example of Displaying Project after Conversion

[7] indicates that the corresponding item requires to be modified or checked because of the difference of the CPU specification or other reasons. Modify the setup pattern if necessary.

[8] After necessary modification is made, ? becomes ●.

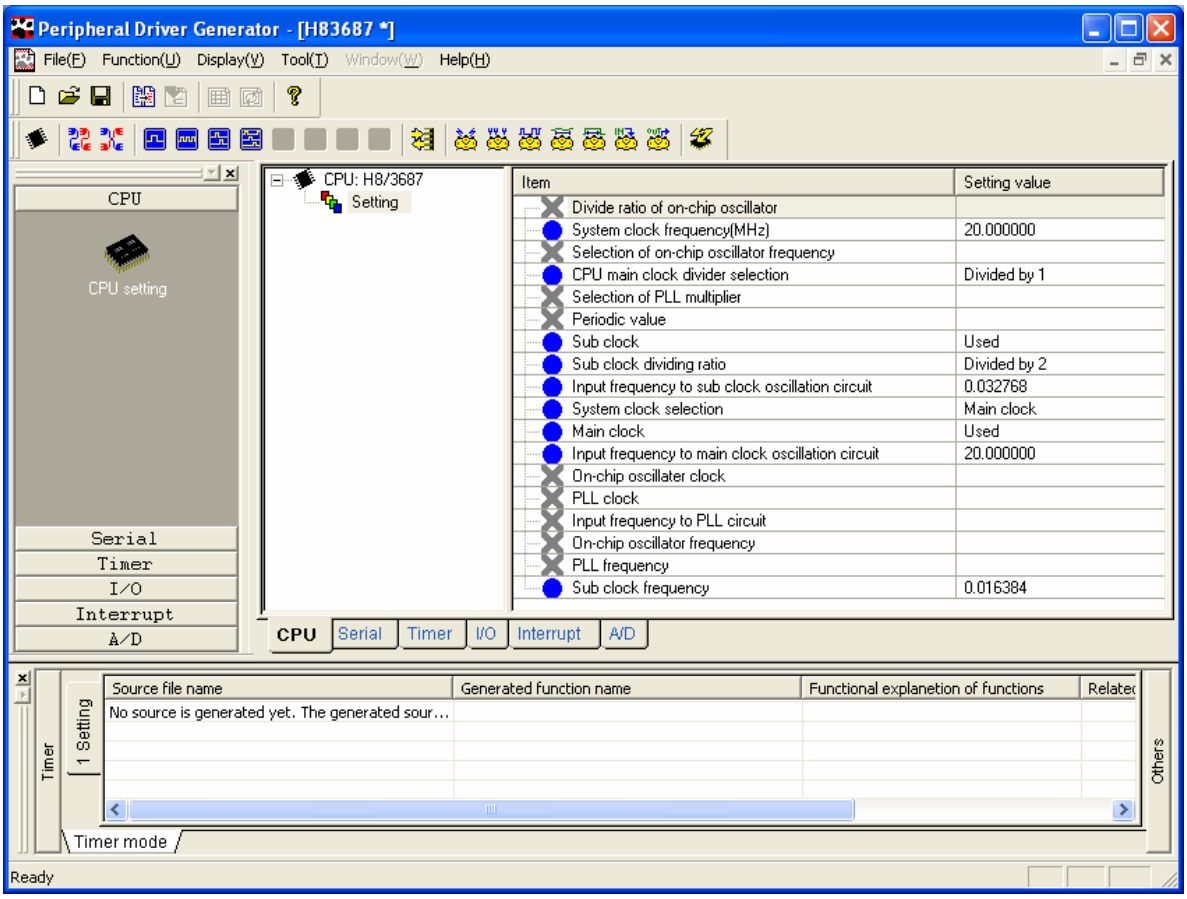

Figure 4-5 Example of Displaying Project after Conversion

Peripheral Driver Generator V.1.02 User's Manual

Publication Date: Nov. 28, 2007 Rev.1.00

Published by: Sales Strategic Planning Div.
Renesas Technology Corp.

Edited by: Microcomputer Tool Development Department
Renesas Solutions Corp.

Peripheral Driver Generator V.1.02
User's Manual

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REJ10J1769-0100