User's Manual

CubeSuite+ V1.00.00

Integrated Development Environment
User's Manual: RL78,78K0R Build

Target Device
RL78 Family
78K0R Microcontroller

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How to Use This Manual

This manual describes the role of the CubeSuite+ integrated development environment for developing application systems for 78K0 microcontrollers, RL78 family, 78K0R microcontrollers, and provides an outline of its features.

CubeSuite+ is an integrated development environment (IDE) for RL78 family, 78K0R microcontrollers, integrating the necessary tools for the development phase of software (e.g. design, implementation, and debugging) into a single platform.

By providing an integrated environment, it is possible to perform all development using just this product, without the need to use many different tools separately.

Readers

This manual is intended for users who wish to understand the functions of the CubeSuite+ and design software and hardware application systems.

Purpose

This manual is intended to give users an understanding of the functions of the CubeSuite+ to use for reference in developing the hardware or software of systems using these devices.

Organization

This manual can be broadly divided into the following units.

CHAPTER 1 GENERAL
CHAPTER 2 FUNCTIONS
CHAPTER 3 BUILD OUTPUT LISTS
CHAPTER 4 SAMPLE PROGRAMS
CHAPTER 5 CAUTIONS
APPENDIX A WINDOW REFERENCE
APPENDIX B COMMAND REFERENCE
APPENDIX C INDEX

How to Read This Manual

It is assumed that the readers of this manual have general knowledge of electricity, logic circuits, and microcontrollers.

Conventions

Data significance:	Higher digits on the left and lower digits on the right
Active low representation:	$\overline{\text{XXX}}$ (overscore over pin or signal name)
Note:	Footnote for item marked with Note in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numeric representation:	Decimal … XXXX
	Hexadecimal … 0xXXXX

Related Documents The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name		Document No.
CubeSuite+ Integrated Development Environment User's Manual	Start	R20UT0545E
	78K0 Design	R20UT0546E
	78K0R Design	R20UT0547E
	RL78 Design	R20UT0548E
	V850 Design	R20UT0549E
	R8C Design	R20UT0550E
	78K0 Coding	R20UT0551E
	RL78,78K0R Coding	R20UT0552E
	V850 Coding	R20UT0553E
	Coding for CX Compiler	R20UT0554E
	R8C Coding	R20UT0576E
	78K0 Build	R20UT0555E
	RL78,78K0R Build	This manual
	V850 Build	R20UT0557E
	Build for CX Compiler	R20UT0558E
	R8C Build	R20UT0575E
	78K0 Debug	R20UT0559E
	78K0R Debug	R20UT0560E
	RL78 Debug	R20UT0561E
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CHAPTER 1 GENERAL

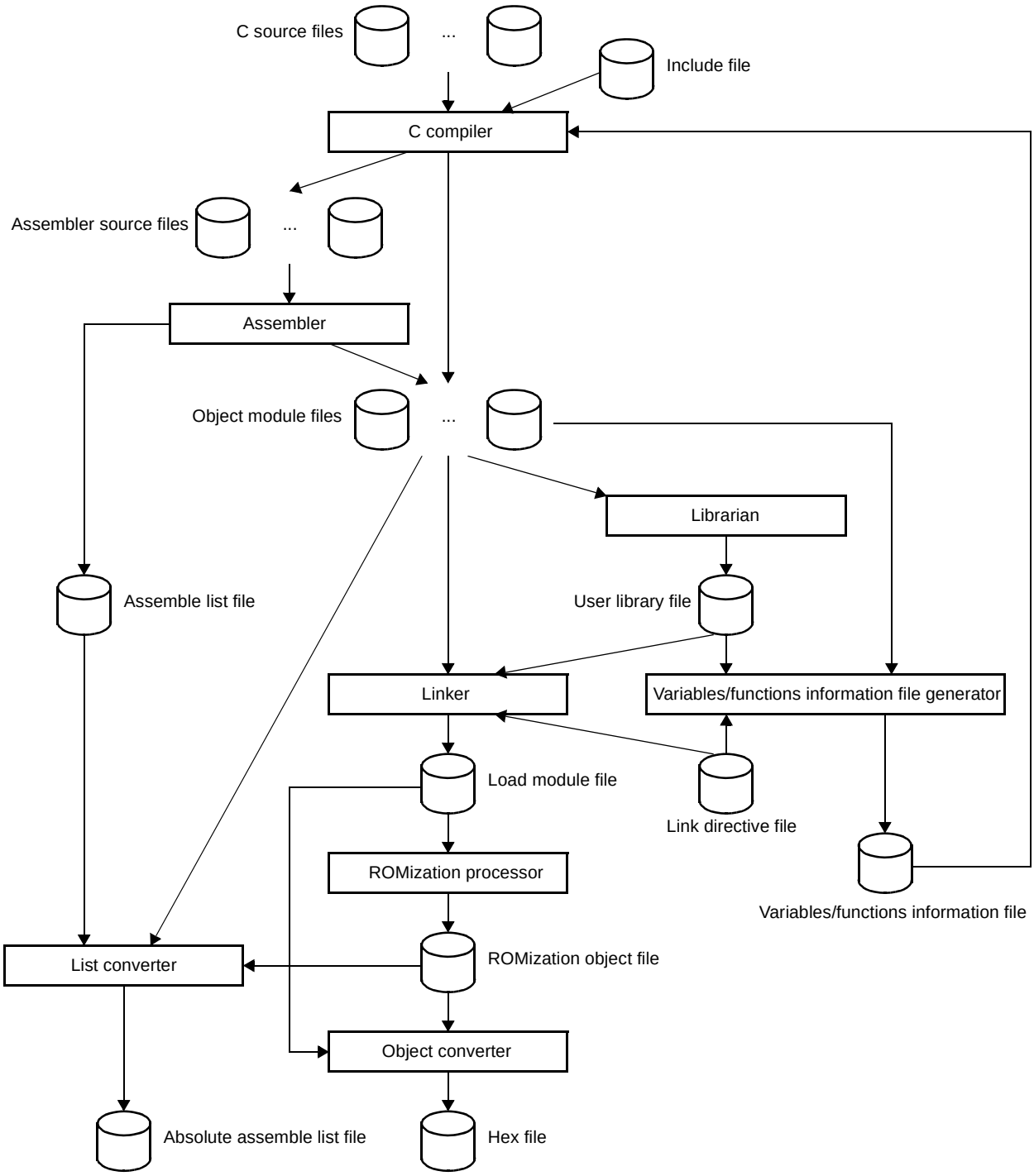
This chapter explains the product overview of the build tool.

1.1 Overview

The build tool is comprised of components provided by this product. It enables various types of information to be configured via a GUI tool, enabling you to generate load module file, hex file, or library file from your source files, according to your objectives.

The build tool process flow is shown below.

Figure 1-1. Build Tool Process Flow



1.2 Features

The features of the build tools are shown below.

- Optimization function
  You can generate efficient object module files by performing optimizations such as prioritizing code size or execution speed when compiling.

- ROMization function
  ROMization is processing that locates in ROM the initial values for external variables that have initial values and copies them to RAM when the system is executed.
  The CA78K0R provides a program startup routine with ROMization processing so you can eliminate the effort to code ROMization processing at startup.

  Remark See "CubeSuite+ RL78,78K0R Coding" about the ROMization function.

- Macro function
  When you write the same instructions multiple times in the assembler source file, you can define that instructions as a single macro name.

  Remark See "CubeSuite+ RL78,78K0R Coding" about the macro function.

CHAPTER 2 FUNCTIONS

This chapter describes the build procedure using CubeSuite+ and about the main build functions.

2.1 Overview

This section describes how to create a load module and user library.

2.1.1 Create a load module

The procedure for creating a load module is shown below.

(1) Create or load a project

Create a new project, or load an existing one.

Remark See "CubeSuite+ Start" for details about creating a new project or loading an existing one.

(2) Set a build target project

Set a build target project (see "2.15 Make Settings for Build Operations").
If there is no subproject, the project is always active.

Remarks 1. If there is no subproject in the project, the project is always active.
2. When setting a build mode, add the build mode (see "2.15.5 Add a build mode").

(3) Set build target files

Add or remove build target files and update the dependencies (see "2.3 Set Build Target Files").

Remarks 1. See "2.7.1 Add a user library" for the method of adding a user library to the project.
2. Also, you can set the link order of object module files and library files (see "2.15.1 Set the link order of files").

(4) Specify the output of a load module

Select the type of the load module to be generated (see "2.4 Set the Type of the Output File").

(5) Set build options

Set the options for the compiler, assembler, linker, and the like (see "2.5 Set Compile Options", "2.6 Set Assemble Options", "2.7 Set Link Options").

(6) Run a build

Run a build (see "2.16 Run a Build").
The following types of builds are available.

- Build (see "2.16.1 Run a build of updated files")
- Rebuild (see "2.16.2 Run a build of all files")
- Rapid build (see "2.16.3 Run a build in parallel with other operations")
- Batch build (see "2.16.4 Run builds in batch with build modes")

Remark If there are any commands you wish to run before or after the build process, on the Property panel, from the [Common Options] tab, in the [Others] category, set the [Commands executed before build processing] and [Commands executed after build processing] properties.
If there are any commands you wish to run before or after the build process at the file level, you can set

them from the [Individual Compile Options] tab (for a C source file) and [Individual Assemble Options] tab (for an assembler source file).

(7) Save the project

Save the setting contents of the project to the project file.

Remark See "CubeSuite+ Start" for details about saving the project.

Caution The following controls are performed for input object module files and library files.
It is not possible to link for input files which device types are different (unless the objects common to the various devices are output) (error).

		Input			
		78K0R/Product without RL78 extensions	Product with RL78 extensions	78K0R/Product without RL78 extensions Output common object file for various devices	Product with RL78 extensions Output common object file for various devices
Output	78K0R/Product without RL78 extensions	Link	Not link (Error)	Link	Not link (Error)
	Product with RL78 extensions	Link	Link	Link	Link

2.1.2 Create a user library

The procedure for creating a user library is shown below.

(1) Create or load a project

Create a new project, or load an existing one.
When you create a new project, set a library project.

Remark See "CubeSuite+ Start" for details about creating a new project or loading an existing one.

(2) Set a build target project

Set a build target project (see "2.15 Make Settings for Build Operations").
If there is no subproject, the project is always active.

Remarks 1. If there is no subproject in the project, the project is always active.
2. When setting a build mode, add the build mode (see "2.15.5 Add a build mode").

(3) Set build target files

Add or remove build target files and update the dependencies (see "2.3 Set Build Target Files").

(4) Set build options

Set the options for the compiler, assembler, librarian, and the like (see "2.5 Set Compile Options", "2.6 Set Assemble Options", "2.10 Set Create Library Options").

(5) Run a build

Run a build (see "2.16 Run a Build").

The following types of builds are available.

- Build (see "2.16.1 Run a build of updated files")
- Rebuild (see "2.16.2 Run a build of all files")
- Rapid build (see "2.16.3 Run a build in parallel with other operations")
- Batch build (see "2.16.4 Run builds in batch with build modes")

Remark If there are any commands you wish to run before or after the build process, on the Property panel, from the [Common Options] tab, in the [Others] category, set the [Commands executed before build processing] and [Commands executed after build processing] properties.
If there are any commands you wish to run before or after the build process at the file level, you can set them from the [Individual Compile Options] tab (for a C source file) and [Individual Assemble Options] tab (for an assembler source file).

(6) Save the project

Save the setting contents of the project to the project file.

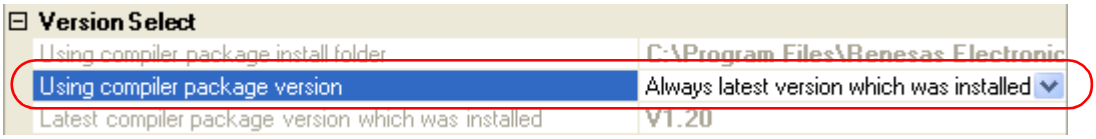
Remark See "CubeSuite+ Start" for details about saving the project.

2.2 Change the Build Tool Version

You can change the version of the build tool (compiler package) used in the project (main project or subproject).

Select the build tool node on the project tree and select the [Common Options] tab on the Property panel. Select [Always latest version which was installed] or the version on the [Using compiler package version] property in the [Version Select] category.

Figure 2-1. [Version Select] Category



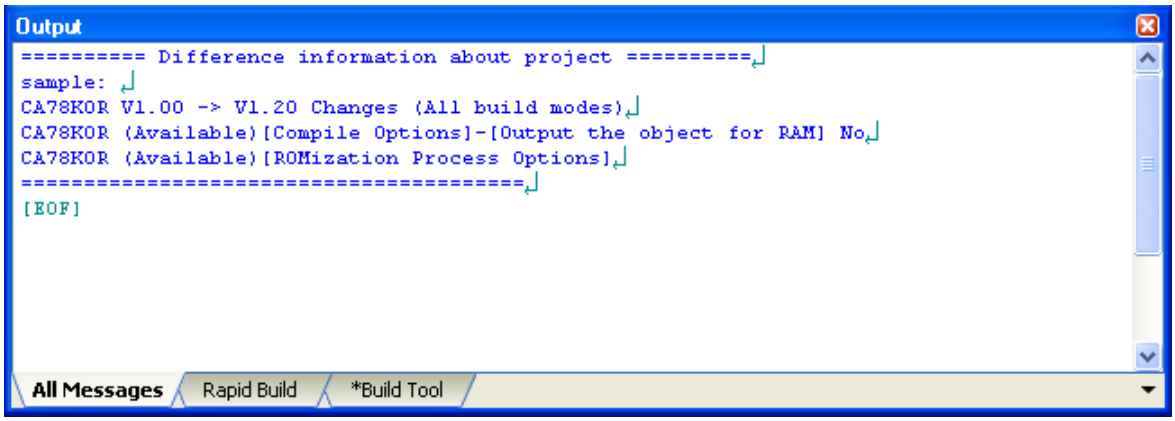
Remarks 1. When the build tool used in the main project and subprojects is the same, you can collectively change the build tool version by selecting all of the Build tool nodes and setting the property.

2. If you have selected a compiler package that has not been installed (e.g. if you open a project created in another execution environment), then that version is also displayed.

3. If the options change depending on the compiler package, then the display of the build tool's properties will change according to the selected version.
Properties that are hidden when the version is changed are saved in the project file's settings, and the values will be reproduced when the properties are displayed again.
Options are changed in accordance with the following rules. Information about changes is displayed in the Output panel.

- If you change from an older version to a newer version, the option settings will be inherited and converted (only if necessary).
- If you change from a newer version to an older version, only identical option settings will be inherited.
  Options that only exist in the older version will be set to the default values.

Figure 2-2. Output Image of Information about Changed Options



2.3 Set Build Target Files

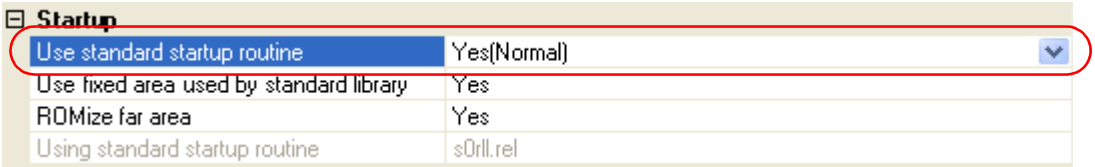
Before running a build, you must add the build target files (such as C source file, assembler source file) to the project. This section explains operations on setting files in the project.

2.3.1 Set a startup routine

(1) Using the standard startup routine

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.
To use the standard startup routine, select [Yes(Normal)]/[Yes(For boot area)]/[Yes(For flash area)] on the [Use standard startup routine] property in the [Startup] category.

Figure 2-3. [Use standard startup routine] Property

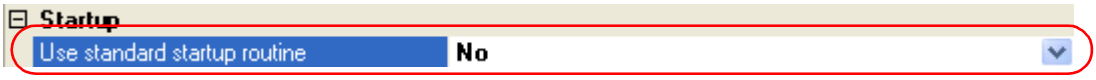


The object file name of the standard startup routine to be used will be displayed on the [Using standard startup routine] property.

(2) Using other than the standard startup routine

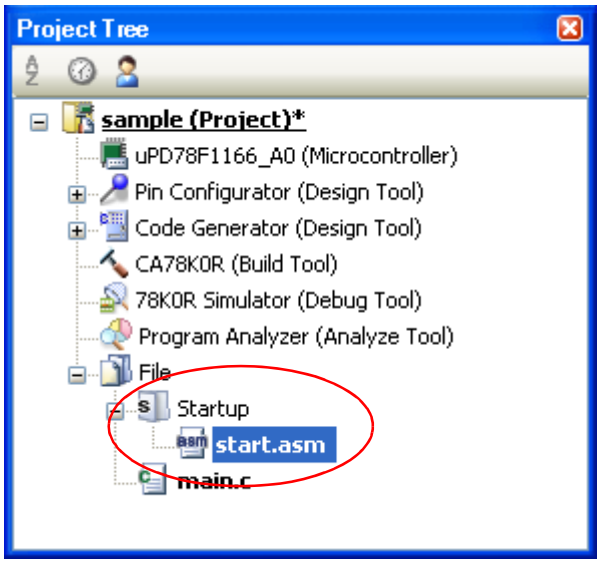
Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.
To use other than the standard startup routine, select [No] on the [Use standard startup routine] property in the [Startup] category ([Yes(Normal)] is selected by default).

Figure 2-4. [Use standard startup routine] Property



Next, add a startup file (a file that the startup routine is described) to the Startup node on the project tree. See "2.3.2 Add a file to a project" for the method of adding the file to the project tree.

Figure 2-5. Project Tree Panel (After Adding Startup File)



Caution **A build target file added directly below the Startup node on the project tree is treated as the startup file. It is not treated as a startup file if it is added to the category below the Startup node. When adding a startup file to the Startup node, if a startup file has already been added then only the latest startup file to be added is targeted by a build; any such files added prior to this one will not be targeted.**
When setting a startup file that is not targeted by a build as a build target, if other startup files have also been added then the file will be targeted by the build, and the others will not be targeted.

Remark See "CubeSuite+ RL78,78K0R Coding" for the method of creating the startup routine.

2.3.2 Add a file to a project

Files can be added to a project by the following methods.

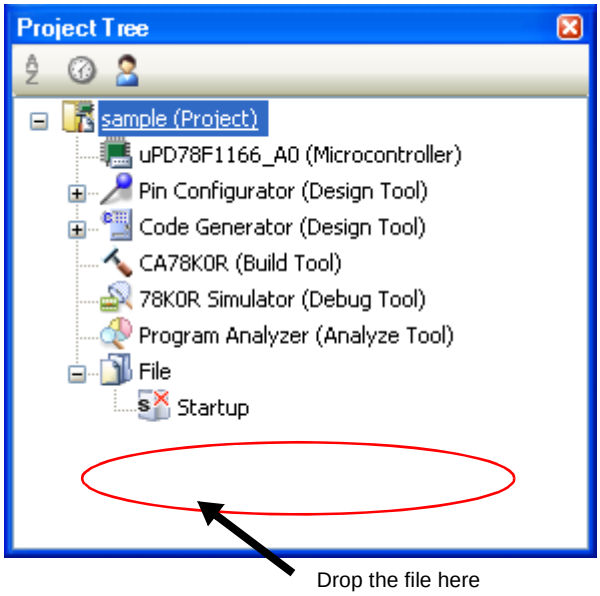
- Adding an existing file
- Creating and adding an empty file

(1) Adding an existing file

(a) Add individual files

Drag a folder from Explorer or the like, and drop it onto the empty space below the project tree.
The file is added below the File node.

Figure 2-6. Project Tree Panel (File Drop Location)



Caution **To add a startup routine, drop a file onto the Startup node. See "2.3.1 Set a startup routine" for details about using a startup routine.**

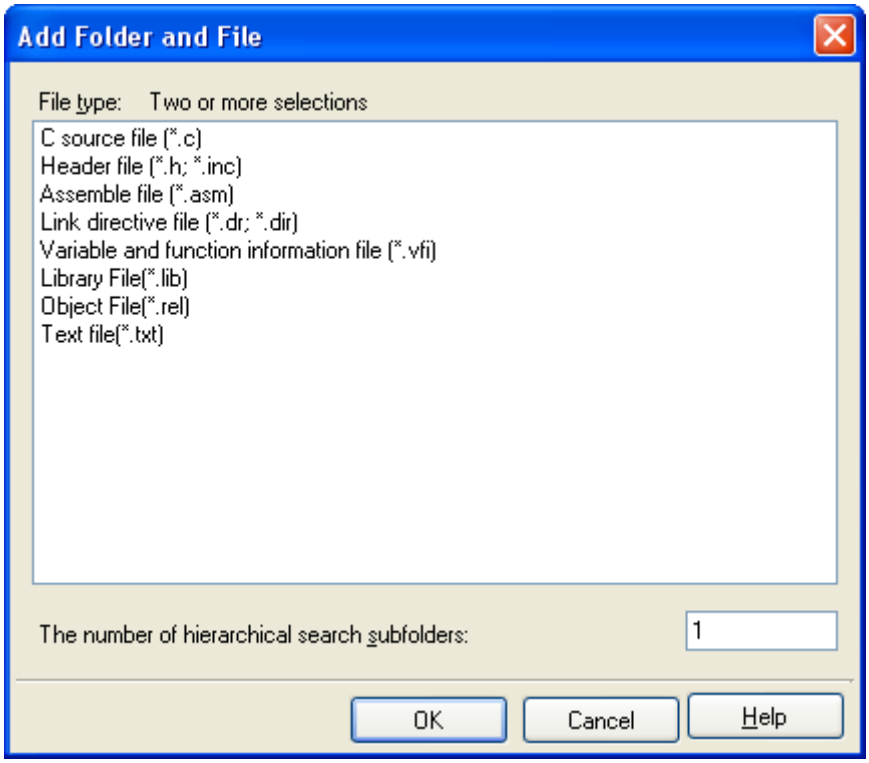
(b) Add a folder

Drag a folder from Explorer or the like, and drop it onto the empty space below the project tree. The Add Folder and File dialog box opens.

Remark You can also add multiple folders to the project at the same time by dragging multiple folders at same time and dropping them onto the project tree.

Caution **When a folder with the name that is more than 200 characters is dropped, the folder is added to the project tree as a category with the name that 201st character and after are deleted.**

Figure 2-7. Add Folder and File Dialog Box



In the dialog, select the file types to add to the project, specify the number of subfolder levels to add, and then click the [OK] button.

Remark You can select multiple file types by left clicking while holding down the [Ctrl] or [Shift] key.
If nothing is selected, it is assumed that all types are selected.

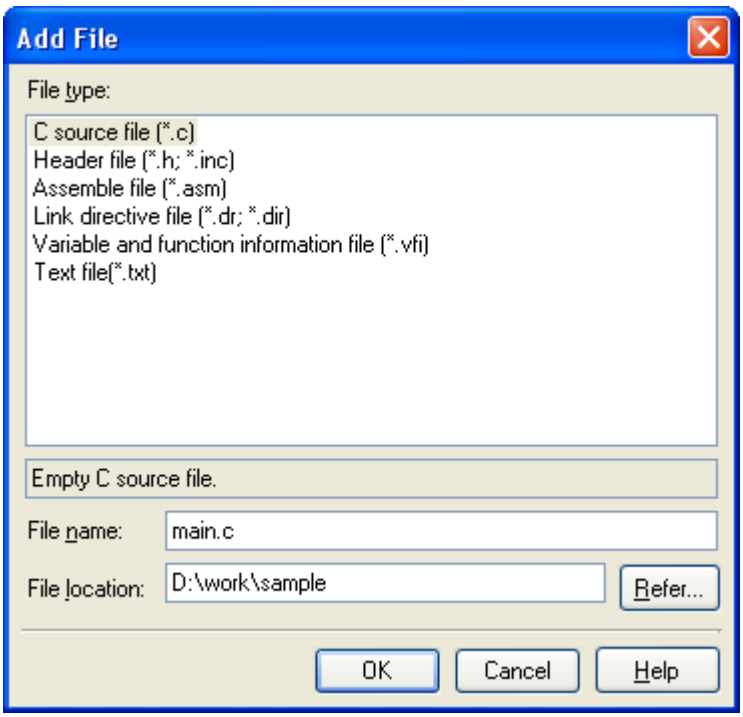
The folder is added below the File node.
Note that on the project tree, the folder is the category.

Remark When the category node created by the user exists, you can add a file below the node by dropping the file onto the node (see "2.3.5 Classify a file into a category" for a category node).

(2) Creating and adding an empty file

On the project tree, select either one of the Project node, Subproject node, or File node, and then select [Add] >> [Add New File...] from the context menu. The Add File dialog box opens.

Figure 2-8. Add File Dialog Box



In the dialog box, specify the file to be created and then click the [OK] button.
The file is added below the File node.

The project tree after adding the file will look like the one below.

Figure 2-9. Project Tree Panel (After Adding File "main.c")

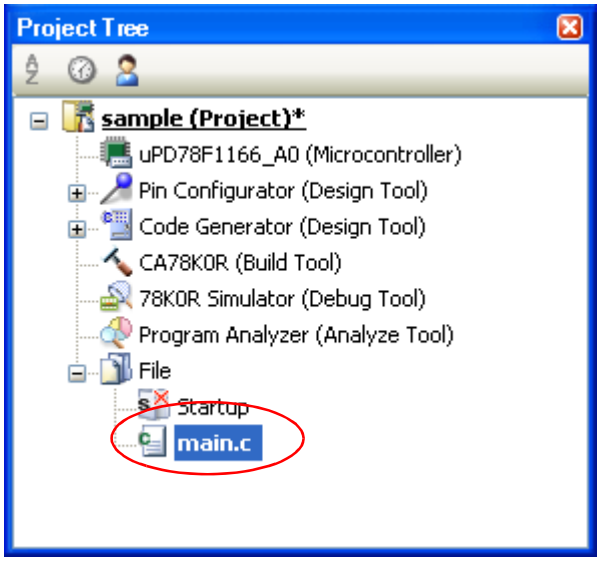
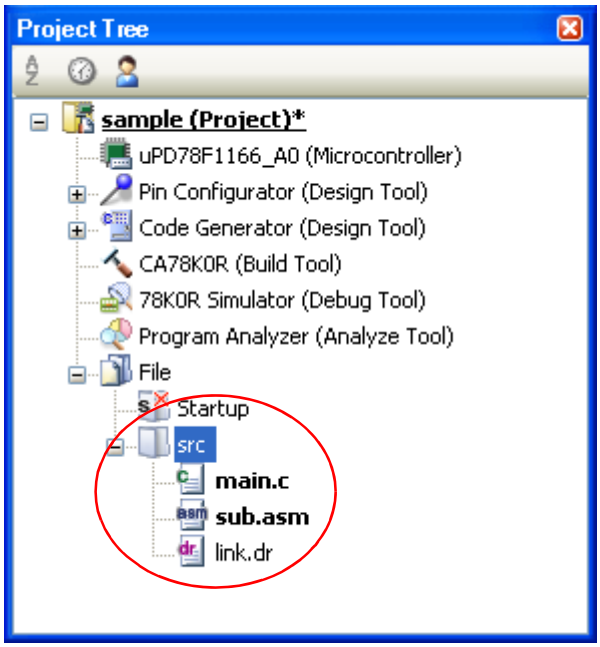


Figure 2-10. Project Tree Panel (After Adding Folder "src")



Remark The location of the file added below the File node depends on the current file display order setting. See "2.3.6 Change the file display order" for the method of changing the file display order.

Cautions 1. If the paths differ, you can add source files with the same name. Note, however, that if the setting of the output file name is left as the default, the output files will have the same name, which will prevent the build from running correctly (for example, when adding D:\sample1\func.c and D:\sample2\func.c, the default output file name for these files is both func.rel).
To avoid this problems, set the output file name for each of those files to a different name with the individual build options for the source files.
Changing the name of the C source file is made with the [Object file name] property in the [Output File] category from the [Individual Compile Options] tab. Changing the name of the assembler source file is made with the [Object file name] property in the [Output File] category from the [Individual Assemble Options] tab. See "2.12.2 Set build options at the file level" for how to set the individual build options.

2. If source files with the same name are added, the target file cannot opened during debugging.

3. If a file with an extension of "dr" or "dir" is added to the project, it is treated as a link directive file. It is also treated as a link directive file if it is added below the Startup node.
When adding a link directive file to the project, if a link directive file has already been added then only the latest link directive file to be added is targeted by a build; any such files added prior to this one will not be targeted.
When setting a link directive file that is not targeted by a build as a build target, if other link directive files have also been added then the file will be targeted by the build, and the others will not be targeted.

4. Up to 5000 files can be added to the main project or subproject.
However, up to 1000 souce files can be added.

When a new file is added, an empty file is created in the location specified in the Add File dialog box.
By double clicking the file name on the project tree, you can open the Editor panel and edit the file.

The files that can be opened with the Editor panel are shown below.

- C source file (.c)
- Assembler source file (.asm)
- Header file (.h, .inc)
- Link directive file (.dr, .dir)
- Variables/functions information file (.vfi)
- Map file (.map)
- Symbol table file (.sym)
- Hex file (.hex, .hxb, .hxf)
- Text file (.txt)

Remarks 1. You can use one of the methods below to open files other than those listed above in the Editor panel.
- Drag a file and drop it onto the Editor panel.
- Select a file and then select [Open with Internal Editor...] from the context menu.

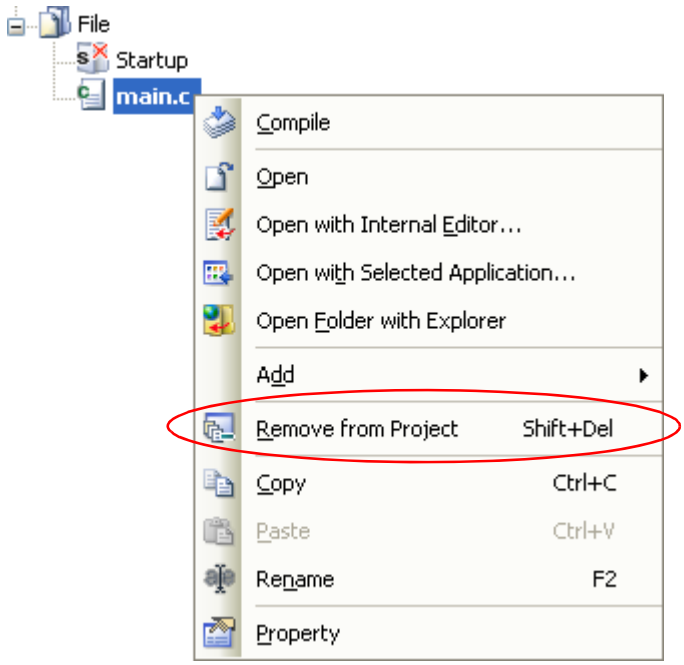
2. When the environment is set to use an external editor on the Option dialog box, the file is opened with the external editor that has been set. Other files are opened with the applications associated by the host OS.

2.3.3 Remove a file from a project

To remove a file added to a project, select the file to be removed from the project on the project tree and then select [Remove from Project] from the context menu.

In addition, the file itself is not deleted from the file system.

Figure 2-11. [Remove from Project] Item

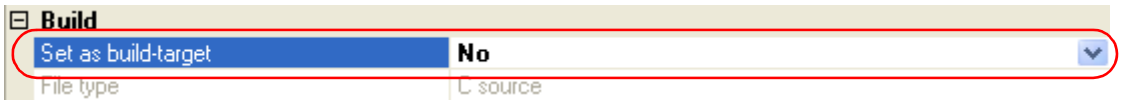


2.3.4 Remove a file from the build target

You can remove a specific file from the build target out of all the files added to the project.

Select the file to be removed from the build target on the project tree and select the [Build Settings] tab on the Property panel. Select [No] on the [Set as build-target] property in the [Build] category.

Figure 2-12. [Set as build-target] Property



Remark The files that can be applied this function are C source files, assembler source files, link directive files, variables/functions information files, object files, and library files.

2.3.5 Classify a file into a category

You can create a category under the File node and classify files by the category. This makes it easier to view files added to the project on the project tree, and makes it easier to manage files according to function.

To create a category node, select either one of the Project node, Subproject node, or File node on the project tree, and then select [Add] >> [Add New Category] from the context menu.

Figure 2-13. [Add New Category] Item (For File Node)

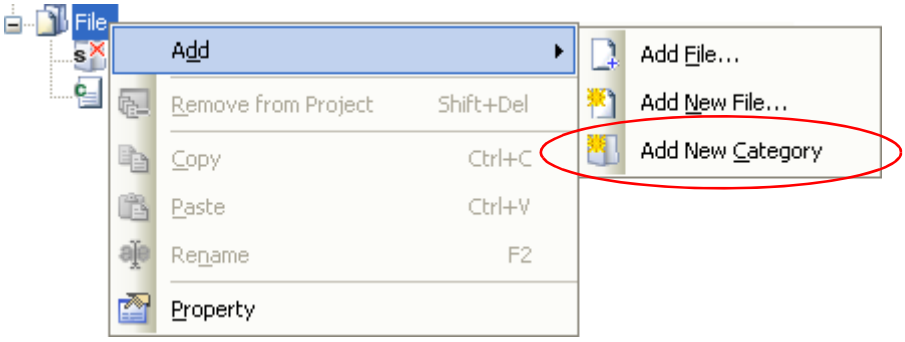
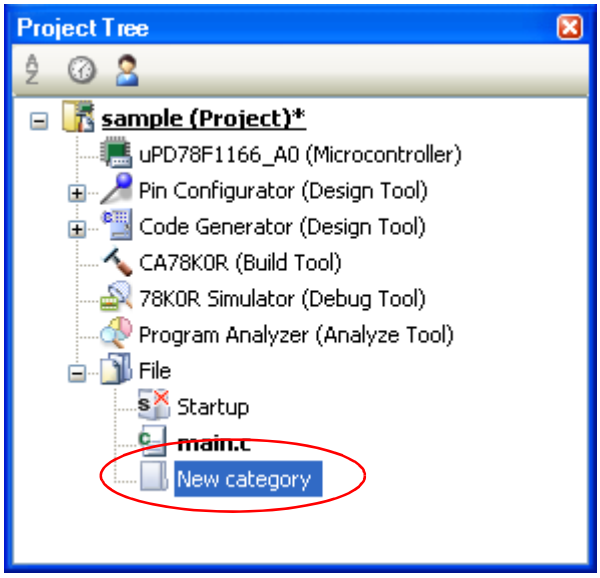


Figure 2-14. Project Tree Panel (After Adding Category Node)



Remarks 1. The default category name is "New category".
To change the category name, you can use [Rename] from the context menu of the category node.

2. You can also add a category node with the same name as an existing category node.

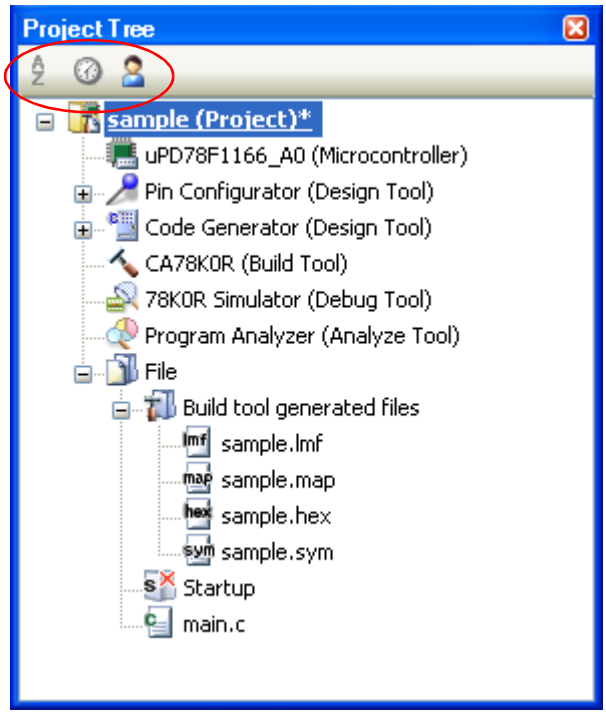
3. Categories can be nested up to 20 levels.

You can classify files into the created category node by dragging and dropping the file.

2.3.6 Change the file display order

You can change the display order of the files and category nodes using the buttons on the project tree.

Figure 2-15. Toolbar (Project Tree Panel)



Select any of the buttons below on the toolbar of the Project Tree panel.

Button	Description
	Sorts category nodes and files by name. : Ascending order : Descending order : Ascending order
	Sorts category nodes and files by timestamp. : Descending order : Ascending order : Descending order
	Displays category nodes and files in the specified order by the user (default). You can change the display order of the category nodes and files arbitrarily by dragging and dropping them.

2.3.7 Update file dependencies

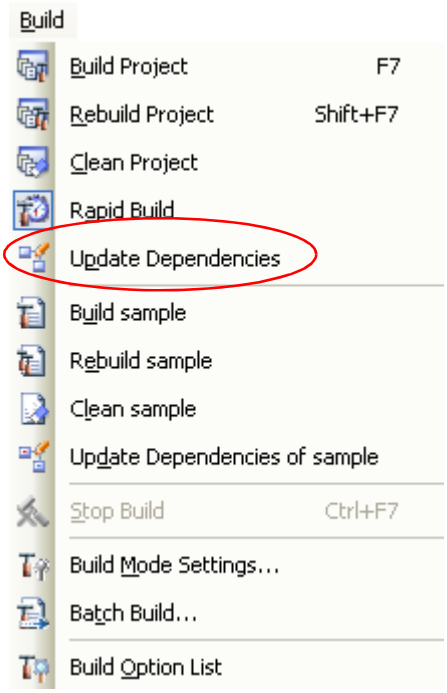
When you perform a change (changing include file paths, adding an include statement of the header file to the C source file and assembler source file, etc.) that effects the file dependencies in the compile option settings or assemble option settings, you must update the dependencies of the relevant files.

Updating file dependencies is performed for the entire project (main project and subprojects) or active project.

(1) For the entire project

From the [Build] menu, select [Update Dependencies].

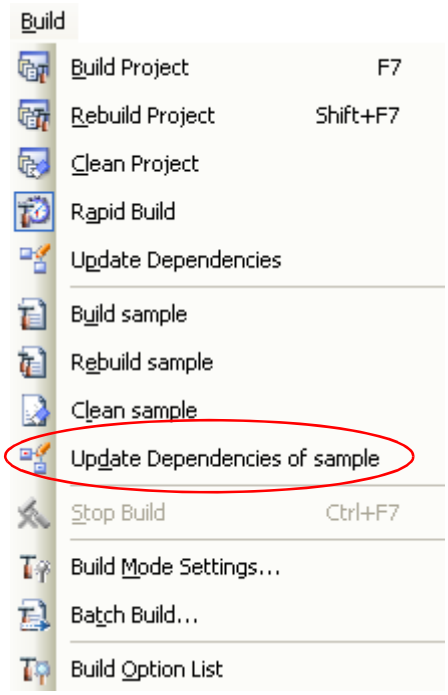
Figure 2-16. [Update Dependencies] Item



(2) For the active project

From the [Build] menu, select [Update Dependencies of *active project*].

Figure 2-17. [Update Dependencies of *active project*] Item



Remark If there are files being edited with the Editor panel when updating file dependencies, then all these files are saved.

Cautions 1. During checking of dependence relationships of include files with CubeSuite+, condition statements such as #if and comments are ignored. Therefore, include files not required for build are mistaken as required files (In the example below, header1.h and header5.h are judged as required for build).

```
#if         0
#include    "header1.h"     /* Dependence relationship judged to exist */
#else                       /* ! zero */
#include    "header2.h"     /* Dependence relationship to exist */
#endif

#define     AAA
#ifdef      AAA
#include    "header3.h"     /* Dependence relationship to exist */
#else
#include    "header4.h"     /* Dependence relationship to exist */
#endif

/*
#include    "header5.h"     /* Dependence relationship judged to exist */
*/
```

2. During checking of dependence relationships of include files with CubeSuite+, include statements described after comments are ignored. Therefore, include files required for build

are mistaken as no-required files (In the example below, header6.h and header7.h are judged as no-required for build).

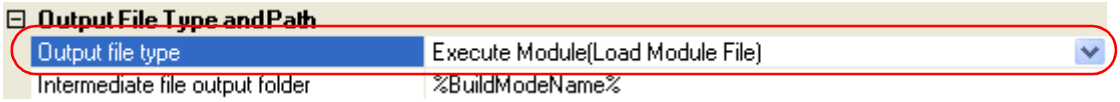
```
/* Dependence relationship judged not to exist */
/* comment */   #include        "header6.h"

/* Dependence relationship judged not to exist */
/*
comment
*/  #include    "header7.h"
```

2.4 Set the Type of the Output File

Set the type of the file to be output as the product of the build.

Select the build tool node on the project tree and select the [Common Options] tab on the Property panel. Select the file type on the [Output file type] property in the [Output File Type and Path] category.

Figure 2-18. [Output file type] Property



(1) When [Execute Module(Load Module File)] is selected (default)

A load module file is created.

The file set in the [Output File] category on the [Link Options] tab is the debug target.

(2) When [Execute Module(Hex File)] is selected

A hex file is also created.

The file set in the [Hex File] category on the [Object Convert Options] tab is the debug target.

Caution For library projects, this property is always [Library] and cannot be changed.

2.4.1 Change the output file name

The names of the load module file, hex file, and library file output by the build tool are set to the following names by default.

"%ProjectName%" is an embedded macro. It is replaced to the project name.

Load module file name: %ProjectName%.lmf

Hex file name: %ProjectName%.hex

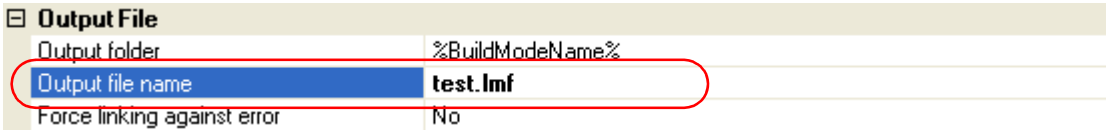
Library file name: %ProjectName%.lib

The method to change these file names is shown below.

(1) When changing the load module file name

Select the build tool node on the project tree and select the [Link Options] tab on the Property panel. Enter the file name to be changed to on the [Output file name] property in the [Output File] category.

Figure 2-19. [Output file name] Property (For Load Module File)

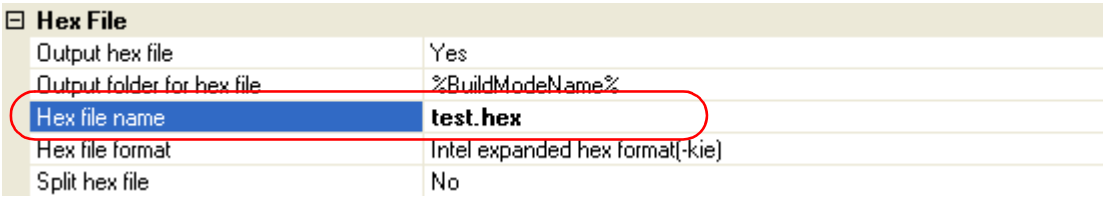


Remark You can also change the option in the same way with the [Output file name] property in the [Frequently Used Options(for Link)] category on the [Common Options] tab.

(2) When changing the hex file name

Select the build tool node on the project tree and select the [Object Convert Options] tab on the Property panel. Enter the file name to be changed to on the [Hex file name] property in the [Hex File] category.

Figure 2-20. [Hex file name] Property



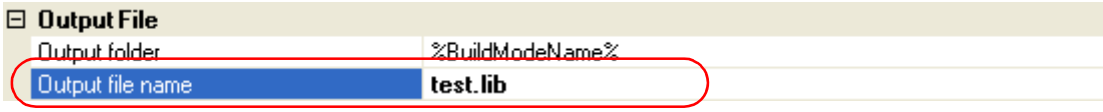
Caution **When [Yes(-zf)] on the [Split hex file] property is selected, the hex file is split into separate files: .hxb and .hxf.**
See "B.5.2 Functions" for details.

Remark You can also change the option in the same way with the [Hex file name] property in the [Frequently Used Options(for Object Convert)] category on the [Common Options] tab.

(3) When changing the library file name

Select the build tool node on the project tree and select the [Create Library Options] tab on the Property panel. Enter the file name to be changed to on the [Output file name] property in the [Output File] category.

Figure 2-21. [Output file name] Property (For Library File)

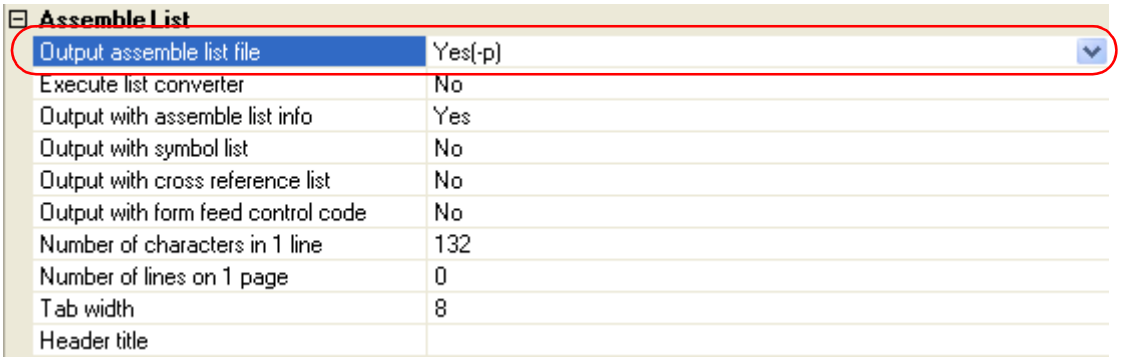


2.4.2 Output an assemble list

The results of the assembly are output to the assembler list file.

Select the build tool node on the project tree and select the [Assemble Options] tab on the Property panel. To output the assemble list, select [Yes(-p)] (default) on the [Output assemble list file] property in the [Assemble List] category.

Figure 2-22. [Output assemble list file] Property



Remarks 1. See "3.2.2 Assemble list" for the assemble list.

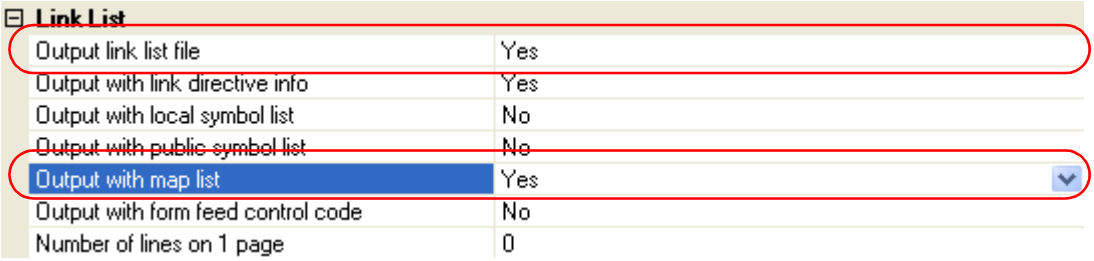
2. If you select [No(-np)] on the [Output assemble list file] property when performing assembly only to output an object module file, you can reduce the assembly time.

2.4.3 Output map information

Map information (information on the location of segments) is output to the link list file.

Select the build tool node on the project tree and select the [Link Options] tab on the Property panel. The setting to output a link list file is made with the [Link List] category.

Figure 2-23. [Link List] Category (For Map Information)



If you select [Yes] (default) on the [Output link list file] property, the [Output with map list] property is displayed. To output map information to the link list file, select [Yes] (default).

Remark See "3.3.2 Map list" for map information.

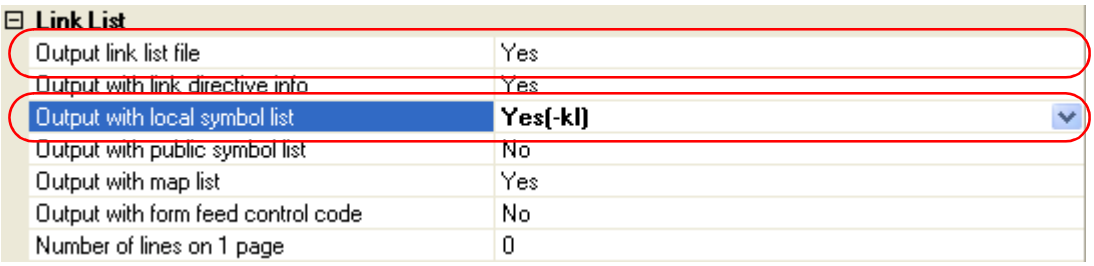
2.4.4 Output symbol information

Symbol information (local symbols and public symbols) defined in the input module is output to the link list file. Select the build tool node on the project tree and select the [Link Options] tab on the Property panel.

The setting to output symbol information is made with the [Link List] category.

(1) When outputting the local symbol list

Figure 2-24. [Link List] Category (For Local Symbol Information)

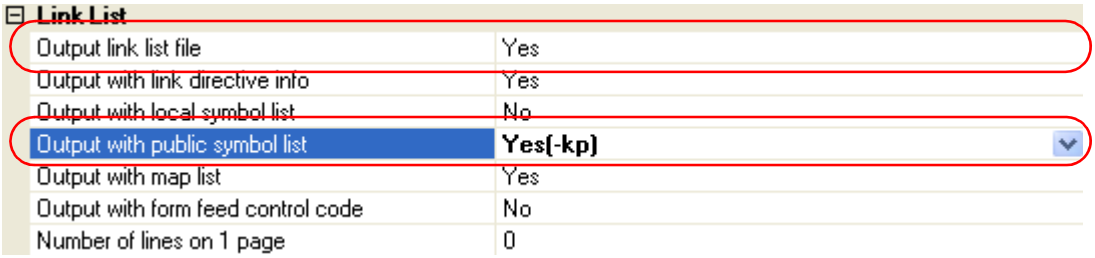


If you select [Yes] (default) on the [Output link list file] property, the [Output with local symbol list] property is displayed. To output local symbol list to the link list file, select [Yes(-kl)] ([No] is selected by default).

Remark See "3.3.4 Local symbol list" for the local symbol list.

(2) When outputting the public symbol list

Figure 2-25. [Link List] Category (For Public Symbol Information)



If you select [Yes] (default) on the [Output link list file] property, the [Output with public symbol list] property is displayed. To output public symbol list to the link list file, select [Yes(-kp)] ([No] is selected by default).

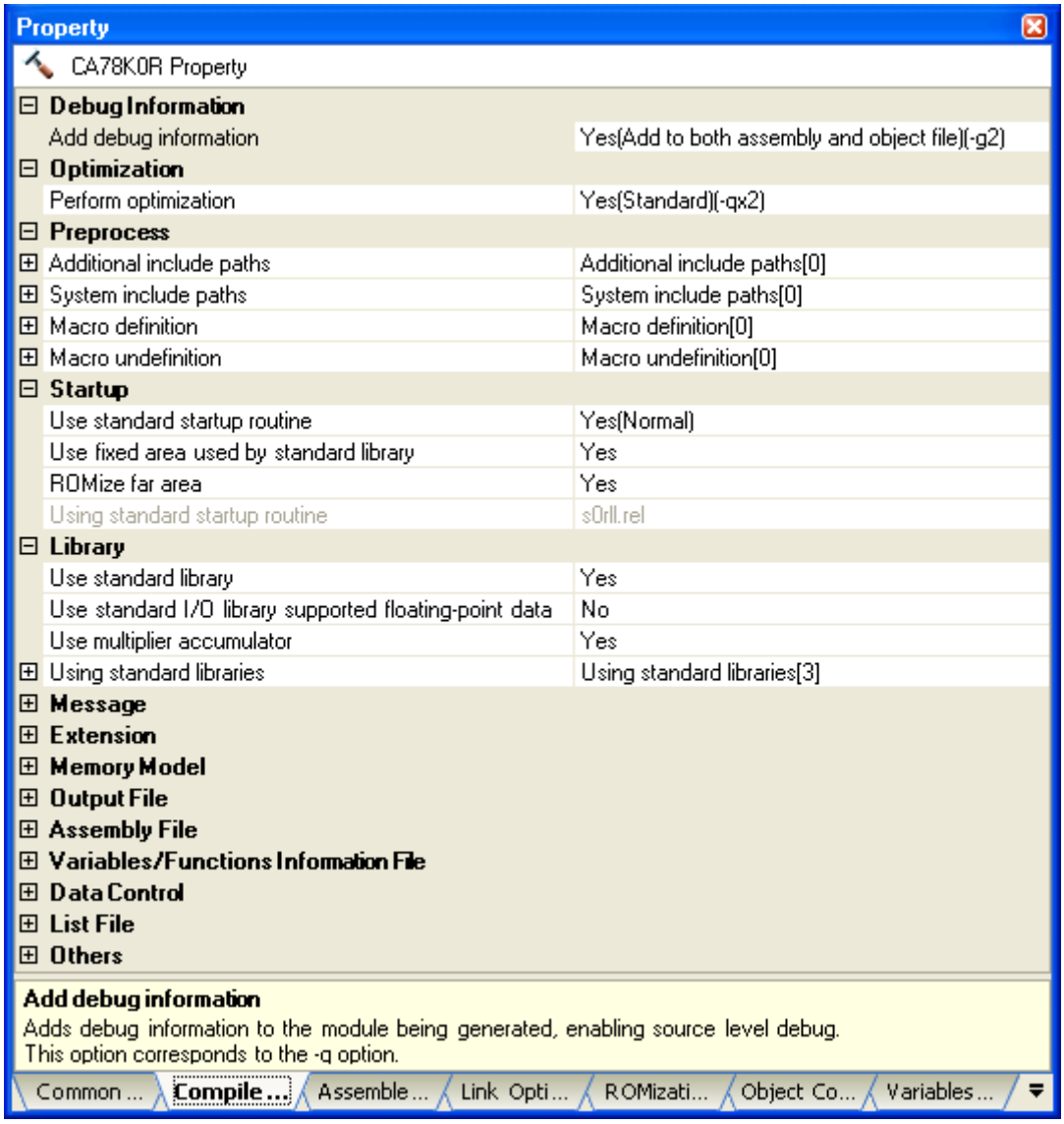
Remark See "3.3.3 Public symbol list" for the public symbol list.

2.5 Set Compile Options

To set options for the compiler, select the Build tool node on the project tree and select the [Compile Options] tab on the Property panel.

You can set the various compile options by setting the necessary properties in this tab.

Figure 2-26. Property Panel: [Compile Options] Tab



Remark Often used options have been gathered under the [Frequently Used Options(for Compile)] category on the [Common Options] tab.

2.5.1 Perform optimization with the code size precedence

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.

To perform optimization with the code size precedence, select [Yes(Code size)(-qx3)] on the [Perform optimization] property in the [Optimization] category ([No] is selected by default).

Figure 2-27. [Perform optimization] Property (Code Size Precedence)

Remark You can also set the option in the same way with the [Perform optimization] property in the [Frequently Used Options(for Compile)] category on the [Common Options] tab.

2.5.2 Perform optimization with the execution speed precedence

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.

To perform optimization with the execution speed precedence, select [Yes(Speed precedence)(-qx1)] on the [Perform optimization] property in the [Optimization] category ([No] is selected by default).

Figure 2-28. [Perform optimization] Property (Execution Speed Precedence)

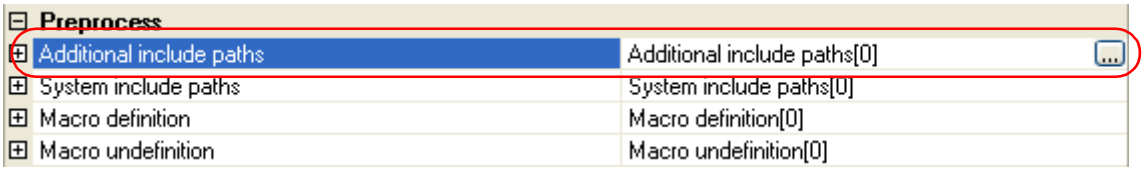
Remark You can also set the option in the same way with the [Perform optimization] property in the [Frequently Used Options(for Compile)] category on the [Common Options] tab.

2.5.3 Add an include path

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.

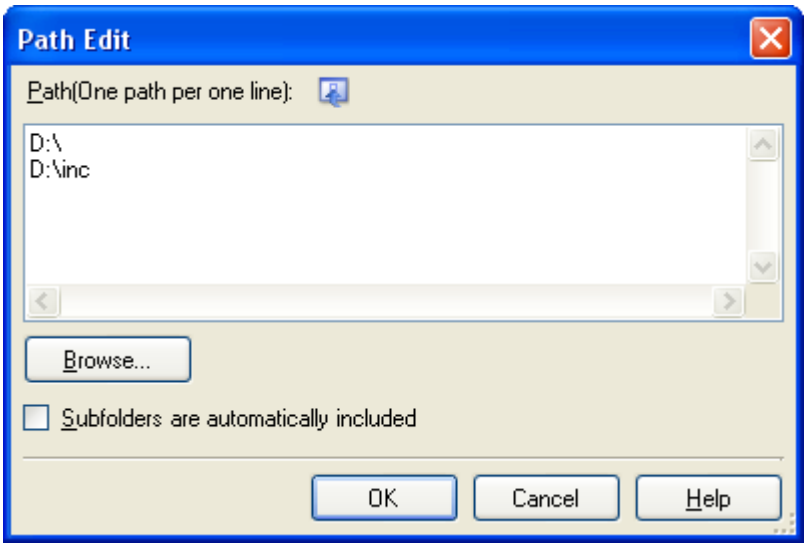
The include path setting is made with the [Additional include paths] property in the [Preprocess] category.

Figure 2-29. [Additional include paths] Property



If you click the [...] button, the Path Edit dialog box will open.

Figure 2-30. Path Edit Dialog Box

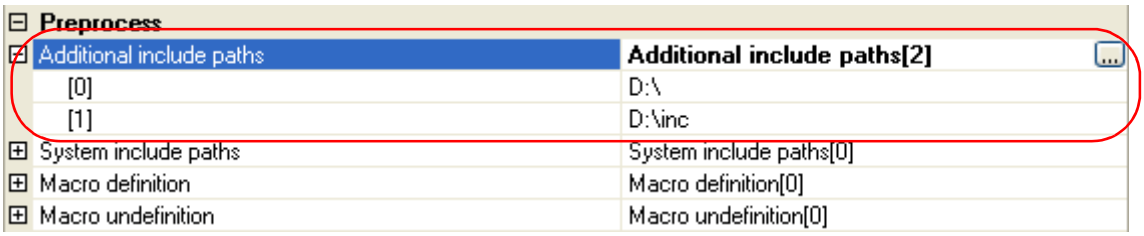


Enter an include path per line in [Path(One path per one line)]. You can specify up to 259 characters per line, up to 64 line.

Remark You can also specify the include path by dragging and dropping from Explorer or the like, or by the [Browse...] button. Select the [Subfolders are automatically included] check box before clicking the [Browse...] button to add all paths under the specified one (down to 5 levels) to [Path(One path per one line)].

If you click the [OK] button, the entered include paths are displayed as subproperties.

Figure 2-31. [Additional include paths] Property (After Adding Include Paths)



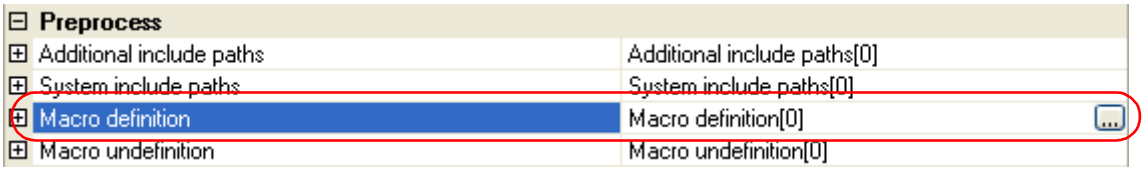
To change the include paths, you can use the [...] button or enter the path directly in the text box of the subproperty. When the include path is added to the project tree, the path is added to the top of the subproperties automatically.

Remark You can also set the option in the same way with the [Additional include paths] property in the [Frequently Used Options(for Compile)] category on the [Common Options] tab.

2.5.4 Set a macro definition

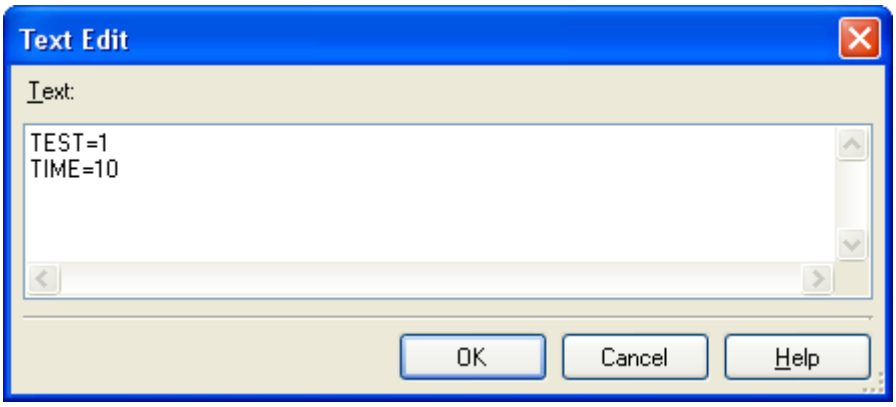
Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.
The macro definition setting is made with the [Macro definition] property in the [Preprocess] category.

Figure 2-32. [Macro definition] Property



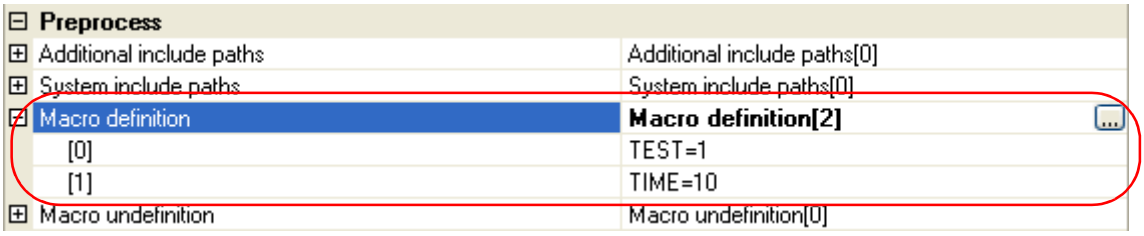
If you click the [...] button, the Text Edit dialog box will open.

Figure 2-33. Text Edit Dialog Box



Enter the macro definition in the format of "*macro name=defined value*", with one macro name per line. You can specify up to 256 characters per line, up to 30 line. The "=*defined value*" part can be omitted, and in this case, "1" is used as the defined value.
If you click the [OK] button, the entered macro definitions are displayed as subproperties.

Figure 2-34. [Macro definition] Property (After Setting Macros)



To change the macro definitions, you can use the [...] button or enter the path directly in the text box of the subproperty.

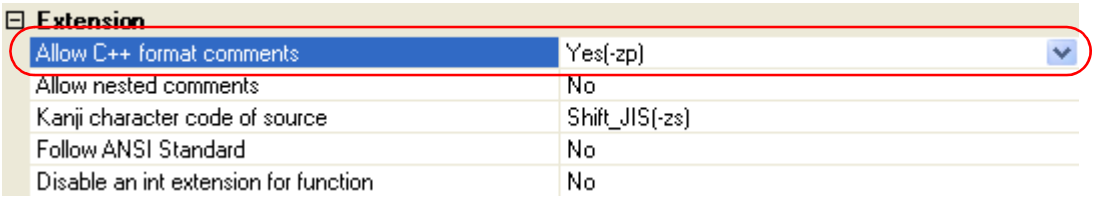
Remark You can also set the option in the same way with the [Macro definition] property in the [Frequently Used Options(for Compile)] category on the [Common Options] tab.

2.5.5 Enable C++ comments

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.

To enable C++ comments, select [Yes(-zp)] on the [Allow C++ format comments] property in the [Extension] category (default).

Figure 2-35. [Allow C++ format comments] Property

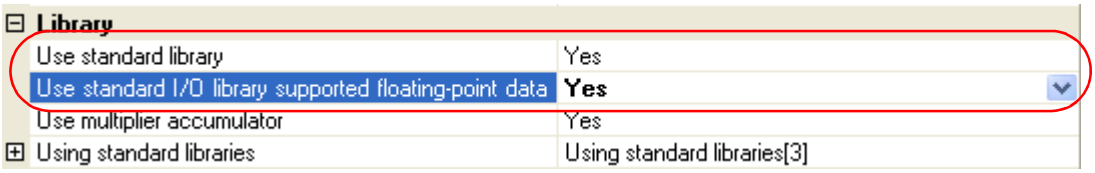


2.5.6 Use floating point-compatible standard input/output functions

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.

In the [Library] category, if you select [Yes] on the [Use standard library] property, the [Use standard I/O library supported floating-point data] property is displayed. To use the standard input/output functions which support floating-point data (sprintf, sscanf, printf, vprintf, and vsprintf), select [Yes].

Figure 2-36. [Use standard library] and [Use standard I/O library supported floating-point data] Property

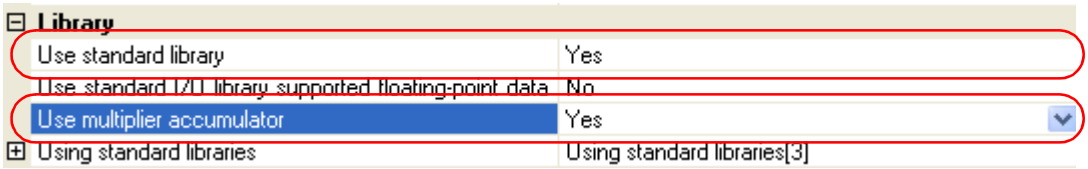


2.5.7 Change the setting to use the arithmetic unit

Select the build tool node on the project tree and select the [Compile Options] tab on the Property panel.

In the [Library] category, if you select [Yes] on the [Use standard library] property, the [Use multiplier and divider]/[Use multiplier]/[Use multiplier accumulator] property is displayed. When using a standard library which supports the multiplier and divider/multiplier/multiplier accumulator, select [Yes] (default), when not using one, select [No].

Figure 2-37. [Use standard library] and [Use multiplier accumulator] Property

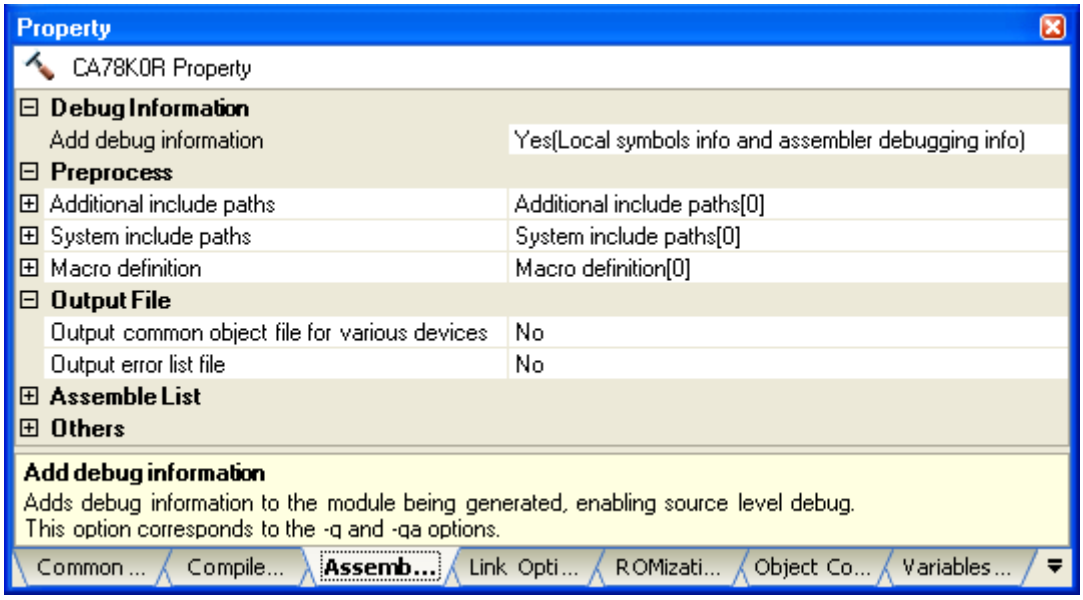


2.6 Set Assemble Options

To set options for the assembler, select the Build tool node on the project tree and select the [Assemble Options] tab on the Property panel.

You can set the various assemble options by setting the necessary properties in this tab.

Figure 2-38. Property Panel: [Assemble Options] Tab



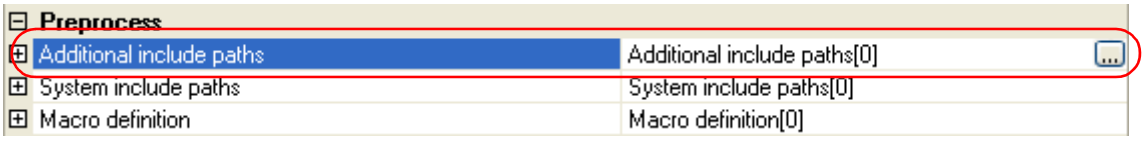
Remark Often used options have been gathered under the [Frequently Used Options(for Assemble)] category on the [Common Options] tab.

2.6.1 Add an include path

Select the build tool node on the project tree and select the [Assemble Options] tab on the Property panel.

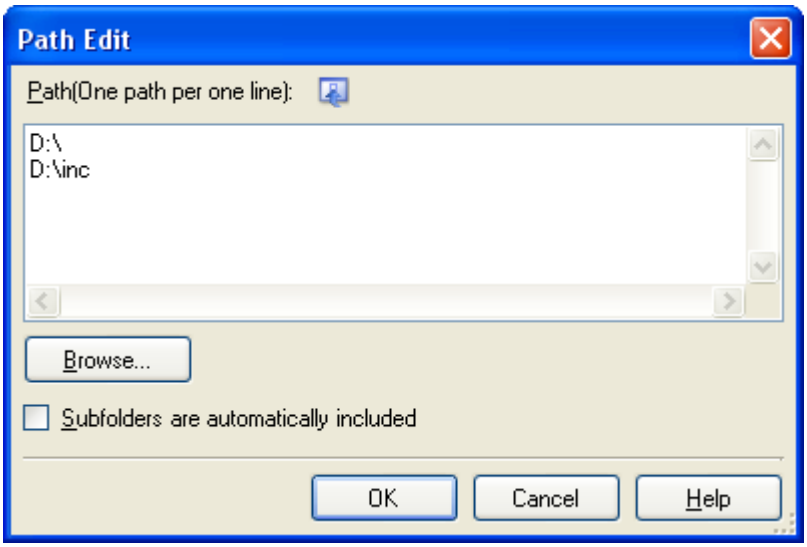
The include path setting is made with the [Additional include paths] property in the [Preprocess] category.

Figure 2-39. [Additional include paths] Property



If you click the [...] button, the Path Edit dialog box will open.

Figure 2-40. Path Edit Dialog Box

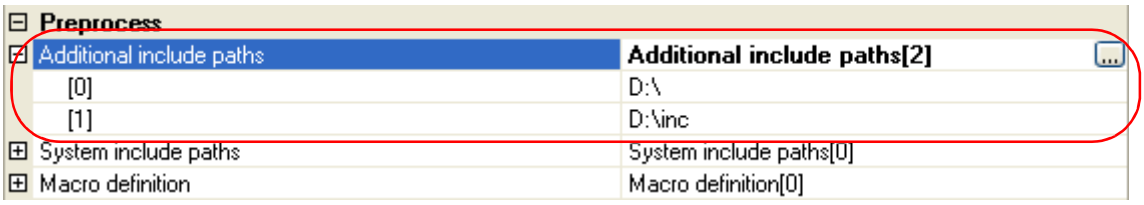


Enter an include path per line in [Path(One path per one line)]. You can specify up to 259 characters per line, up to 64 line.

Remark You can also specify the include path via the [Browse...] button. Select the [Subfolders are automatically included] check box before clicking the [Browse...] button to add all paths under the specified one (down to 5 levels) to [Path(One path per one line)].

If you click the [OK] button, the entered include paths are displayed as subproperties.

Figure 2-41. [Additional include paths] Property (After Adding Include Paths)



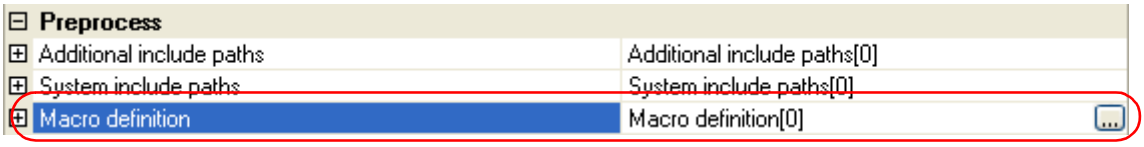
To change the include paths, you can use the [...] button or enter the path directly in the text box of the subproperty. When the include path is added to the project tree, the path is added to the top of the subproperties automatically.

Remark You can also set the option in the same way with the [Additional include paths] property in the [Frequently Used Options(for Assemble)] category on the [Common Options] tab.

2.6.2 Set a macro definition

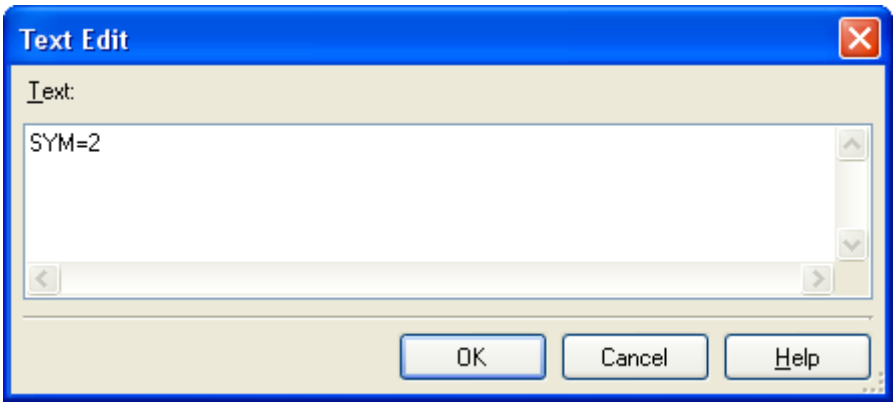
Select the build tool node on the project tree and select the [Assemble Options] tab on the Property panel.
The macro definition setting is made with the [Macro definition] property in the [Preprocess] category.

Figure 2-42. [Macro definition] Property



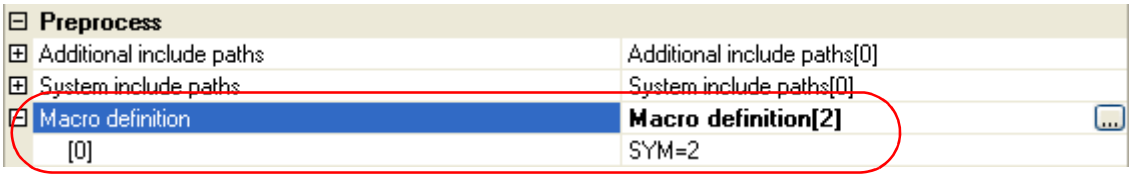
If you click the [...] button, the Text Edit dialog box will open.

Figure 2-43. Text Edit Dialog Box



Enter the macro definition in the format of "*macro name=defined value*", with one macro name per line. You can specify up to 31 characters per line, up to 30 line. The "*=defined value*" part can be omitted, and in this case, "1" is used as the defined value.
If you click the [OK] button, the entered macro definitions are displayed as subproperties.

Figure 2-44. [Macro definition] Property (After Setting Macros)



To change the macro definitions, you can use the [...] button or enter the path directly in the text box of the subproperty.

Remark You can also set the option in the same way with the [Macro definition] property in the [Frequently Used Options(for Assemble)] category on the [Common Options] tab.

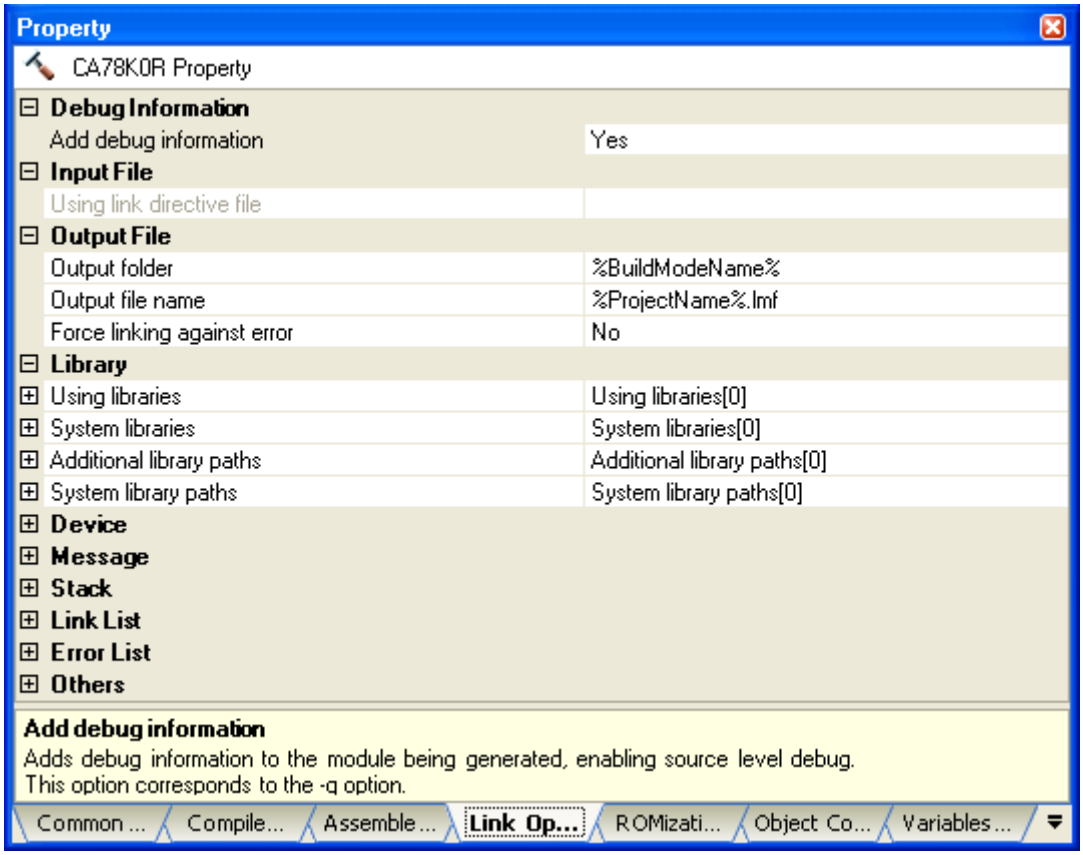
2.7 Set Link Options

To set options for the linker, select the Build tool node on the project tree and select the [Link Options] tab on the Property panel.

You can set the various link options by setting the necessary properties in this tab.

Caution This tab is not displayed for library projects.

Figure 2-45. Property Panel: [Link Options] Tab

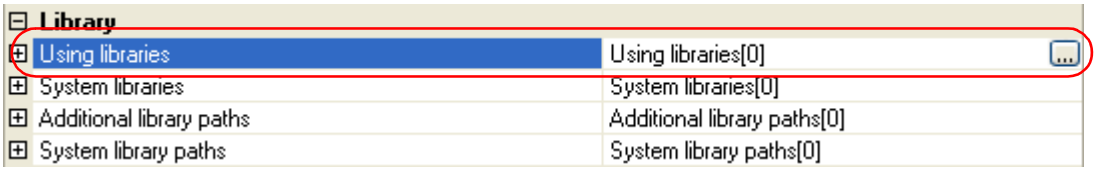


Remark Often used options have been gathered under the [Frequently Used Options(for Link)] category on the [Common Options] tab.

2.7.1 Add a user library

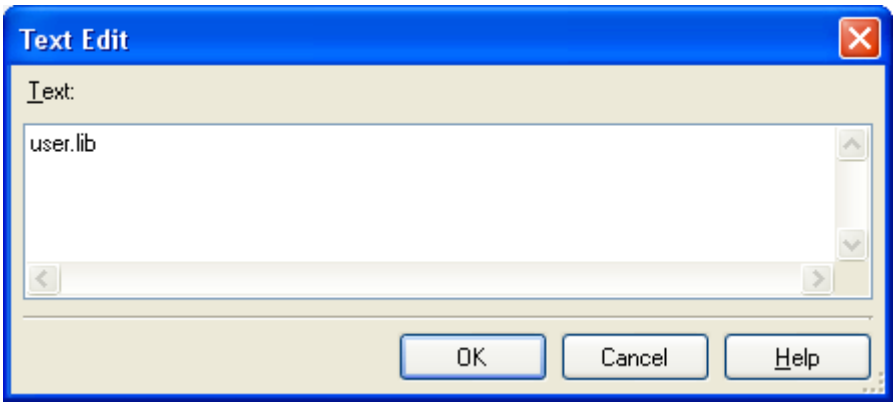
Select the build tool node on the project tree and select the [Link Options] tab on the Property panel.
Adding a user library is made with the [Using libraries] property in the [Library] category.

Figure 2-46. [Using libraries] Property



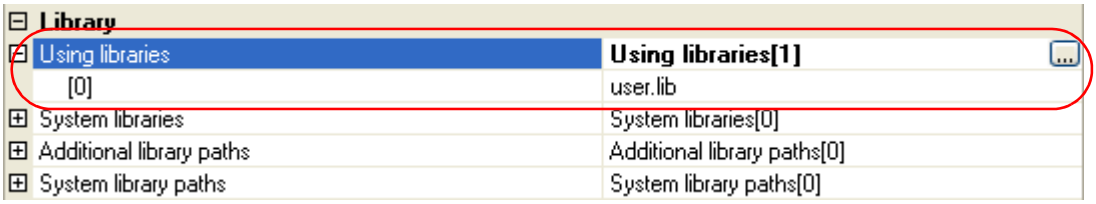
If you click the [...] button, the Text Edit dialog box will open.

Figure 2-47. Text Edit Dialog Box



Enter the library file name in [Text] with one name per line. You can specify up to 259 characters per line, up to 64 line.
If you click the [OK] button, the entered library files are displayed as subproperties.

Figure 2-48. [Using libraries] Property (After Setting Library Files)



To change the library files, you can use the [...] button or enter the path directly in the text box of the subproperty.

Remark You can also set the option in the same way with the [Using libraries] property in the [Frequently Used Options(for Link)] category on the [Common Options] tab.

The library files are searched from the library path. To add a library path, set the [Additional library paths] property.

Caution **Library files can also be linked by adding them directly to the project. In this case, the library files are not searched from the library paths because they are linked directly via their absolute paths.**

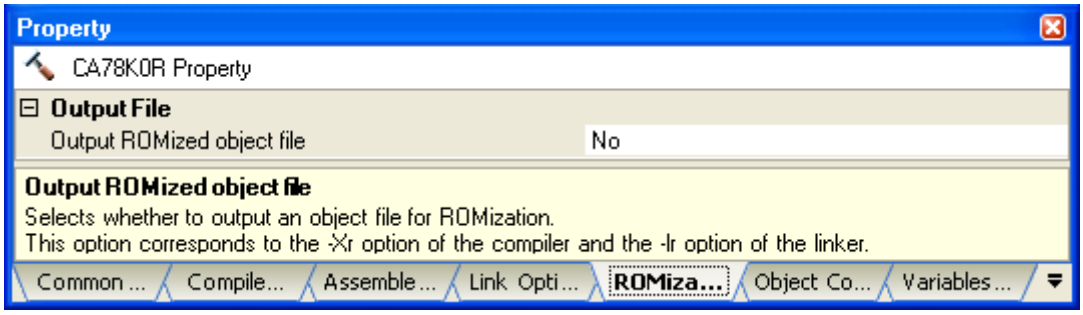
2.8 Set ROMization Process Options

To set options for the ROMization processor, select the Build tool node on the project tree and select the [ROMization Process Options] tab on the Property panel.

You can set the various ROMization process options by setting the necessary properties in this tab.

Caution **This tab is not displayed for library projects.**

Figure 2-49. Property Panel: [ROMization Process Options] Tab



Remark Often used options have been gathered under the [Frequently Used Options(for ROMization)] category on the [Common Options] tab.

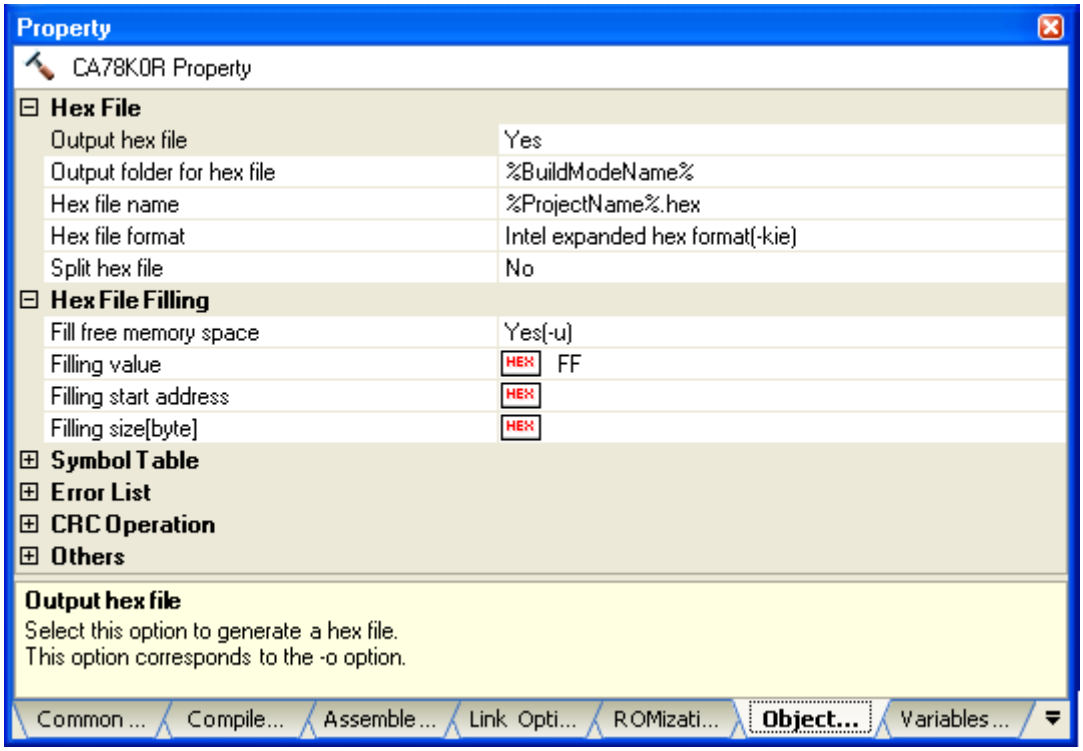
2.9 Set Object Convert Options

To set options for the object converter, select the Build tool node on the project tree and select the [Object Convert Options] tab on the Property panel.

You can set the various object convert options by setting the necessary properties in this tab.

Caution **This tab is not displayed for library projects.**

Figure 2-50. Property Panel: [Object Convert Options] Tab



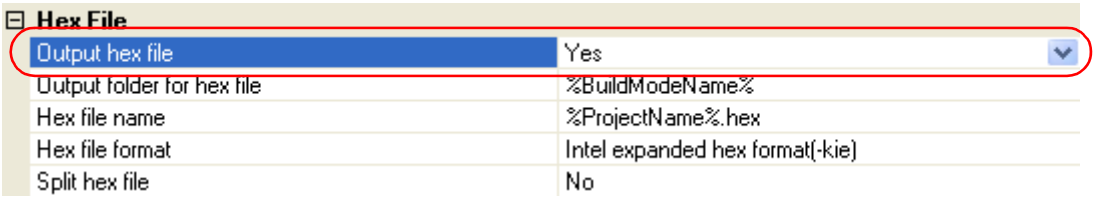
Remark Often used options have been gathered under the [Frequently Used Options(for Object Convert)] category on the [Common Options] tab.

2.9.1 Set the output of a hex file

Select the build tool node on the project tree and select the [Object Convert Options] tab on the Property panel.

The setting to output a hex file is made with the [Output hex file] property in the [Hex File] category. To output a hex file, select [Yes] (default), to not output a hex file, select [No(-no)].

Figure 2-51. [Output hex file] Property



Remark If you select [No(-no)] on the [Output hex file] property when performing object conversion only to output a symbol table file, you can reduce the object conversion time.

When outputting a hex file, you can set the output folder and output file name.

(1) Set the output folder

Setting the output folder is made with the [Output folder for hex file] property by directly entering to the text box or by the [...] button. Up to 259 characters can be specified in the text box. "%BuildModeName%" is set by default. "%BuildModeName%" is an embedded macro. It is replaced to the build mode name.

(2) Set the output file name

Setting the output file is made with the [Hex file name] property by directly entering to the text box. Up to 259 characters can be specified in the text box. "%ProjectName%.hex" is set by default. "%ProjectName%.hex" is an embedded macro. It is replaced to the project name.

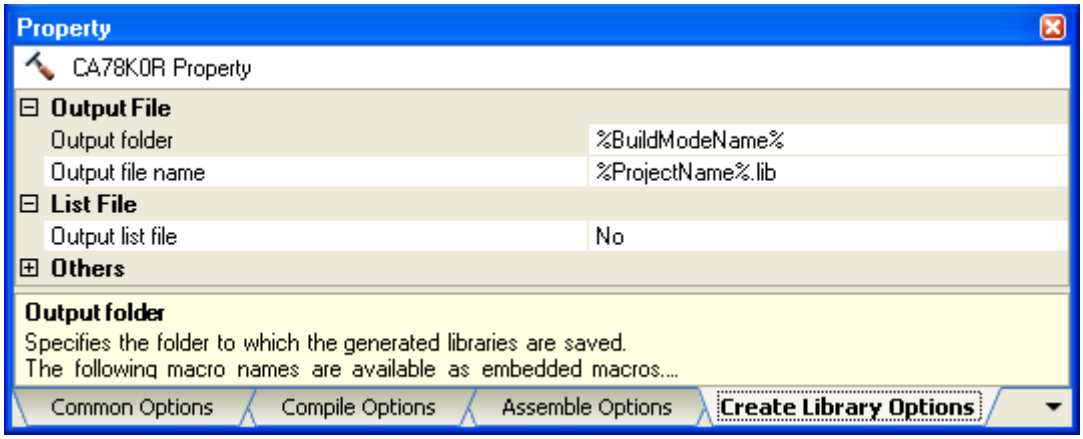
2.10 Set Create Library Options

To set options for the librarian, select the Build tool node on the project tree and select the [Create Library Options] tab on the Property panel.

You can set the various create library options by setting the necessary properties in this tab.

Caution This tab is displayed only for library projects.

Figure 2-52. Property Panel: [Create Library Options] Tab



2.10.1 Set the output of a library file

Select the build tool node on the project tree and select the [Create Library Options] tab on the Property panel.

The setting to output a library file is made with the [Output File] category.

Figure 2-53. [Output File] Category

(1) Set the output folder

Setting the output folder is made with the [Output folder] property by directly entering to the text box or by the [...] button. Up to 259 characters can be specified in the text box. "%BuildModeName%" is set by default. "%BuildModeName%" is an embedded macro. It is replaced to the build mode name.

(2) Set the output file name

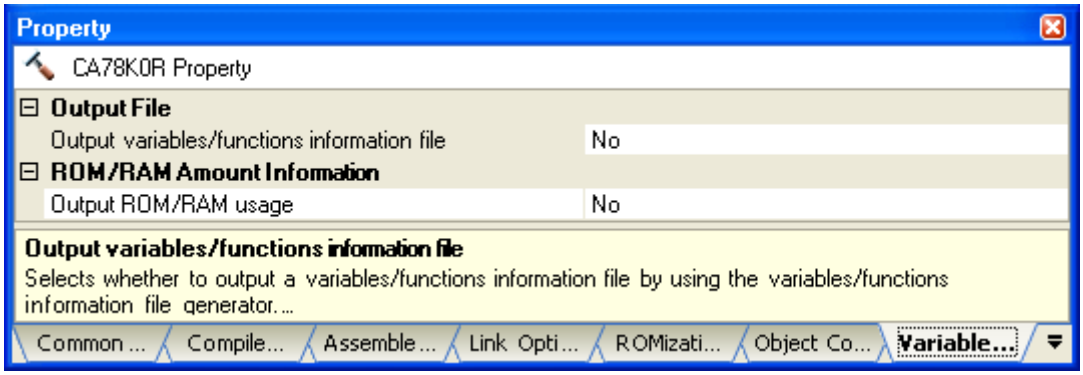
Setting the output file is made with the [Output file name] property by directly entering to the text box. Up to 259 characters can be specified in the text box. "%ProjectName%.lib" is set by default. "%ProjectName%.lib" is an embedded macro. It is replaced to the project name.

2.11 Set Variables/Functions Relocation Options

To set options for the variables/functions information file generator, select the Build tool node on the project tree and select the [Variables/Functions Relocation Options] tab on the Property panel.

You can set the various variables/functions relocation options by setting the necessary properties in this tab.

Figure 2-54. Property Panel: [Variables/Functions Relocation Options] Tab



2.11.1 Efficiently allocate variables and functions

Use the variables/functions information file generator to efficiently allocate variables and functions. This tool generates a variables/functions information file (a file containing allocation information for all variables and functions to be referenced). Variables will be allocated to the saddr area, and functions to the callt area by performing compilation using that file.

The procedures for performing this operation are described below.

- Generating a variables/functions information file automatically and allocating variables and functions
- Editing and using an auto-generated variables/functions information file

(1) Generating a variables/functions information file automatically and allocating variables and functions

Below is the procedure for generating a variables/functions information file automatically and using that file to allocate variables and functions, via one build.

(a) Set the generation of the variables/functions information file

Select the build tool node on the project tree and select the [Variables/Functions Relocation Options] tab on the Property panel.

Set the [Output variables/functions information file] property to [Yes] to generate an empty variables/functions information file, and add it to the project (it will also appear in the File node of the project tree). The output destination is the file set in the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property.

Remark If a variables/functions information file with the same name already exists, the build will be configured to use it.

Figure 2-55. [Output variables/functions information file] Property

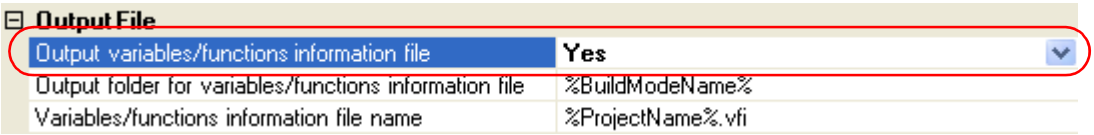
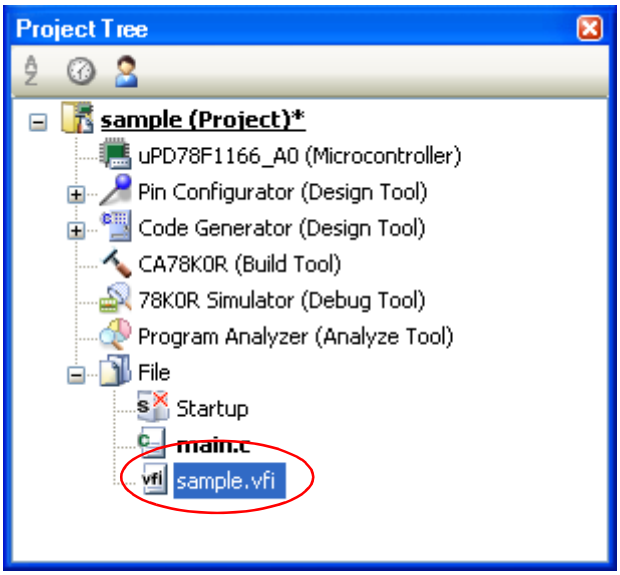


Figure 2-56. Project Tree Panel (After Generating Variables/Functions Information File)



The settings of the output folder and file of the variables/functions information file are can be changed.

<1> Set the output folder

Setting the output folder is made with the [Output folder for variables/functions information file] property by directly entering to the text box or by the [...] button. Up to 259 characters can be specified in the text box. "%BuildModeName%" is set by default. "%BuildModeName%" is an embedded macro. It is replaced to the build mode name.
If this property is changed, an empty variables/functions information file is generated and added to the project (it will also appear in the File node of the project tree).

<2> Set the output file name

Setting the output file is made with the [Variables/functions information file name] property by directly entering to the text box. Up to 259 characters can be specified in the text box. "%ProjectName%.vfi" is set by default. "%ProjectName%.vfi" is an embedded macro. It is replaced to the project name.
If this property is changed, an empty variables/functions information file is generated and added to the project (it will also appear in the File node of the project tree).

(b) Run a build of the project

Run a build of the project.
A variables/functions information file is generated. It will be input into the compiler automatically and a rebuild will be executed again.

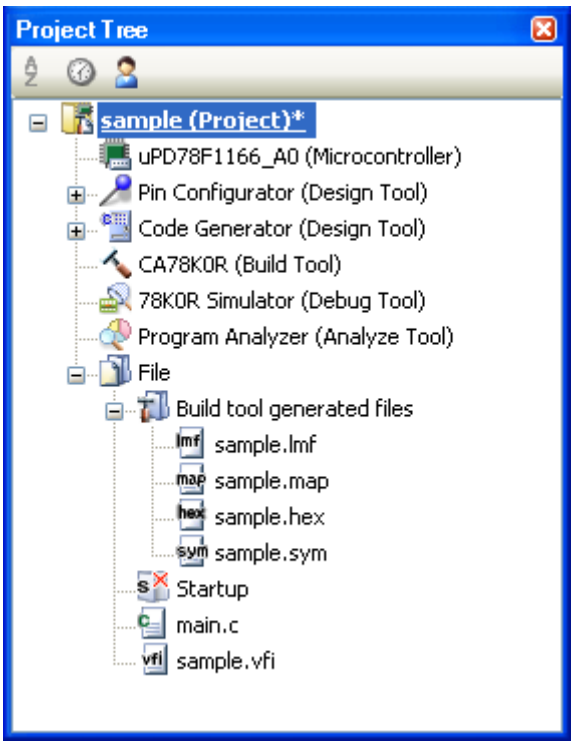
Remark The variables/functions information file in "(a) Set the generation of the variables/functions information file" is overwritten by running a build.

If the build completes successfully, a load module file is generated with the variables and functions allocated.
If the message "E7001 : The link error was found." is displayed at this time, then an error has occurred during linking.
If this happens, take the action below to disable the variable/function information file.

<1> Select [No] in the [Output variables/function information file] property on the [Variables/Functions Relocation Options] tab.

<2> Select [No] on the [Set as build-target] property of the variables/function information file (*.vfi) displayed on the project tree.
Or select the variables/function information file and select [Remove from Project] from the context menu.

Figure 2-57. Project Tree Panel (After Generating Load Module File)



(2) Editing and using an auto-generated variables/functions information file

Users can edit a variables/functions information file.
Below is the procedure for editing the generated variables/functions information file in "(1) Generating a variables/functions information file automatically and allocating variables and functions" by the user and using that file to allocate variables and functions.

(a) Edit the variables/functions information file

Edit the variables/functions information file generated automatically in "(1) Generating a variables/functions information file automatically and allocating variables and functions".

Remark See "3.8.1 Variables/functions information file" for details about the format of the auto-generated variables/functions information file.

Describe the variables/functions information file according to the following format.

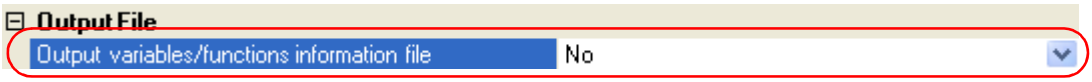
```
;***Variable information***
;static variable and const variable
variable-name,number-of-references,size,reference-type,"file-name",const

;global variable and const variable
variable-name,number-of-references,size,reference-type,,const

;static variable
variable-name,number-of-references,size,reference-type,"file-name"

;global variable
variable-name,number-of-references,size,reference-type

;global variable and const variable for the boot area
variable-name,number-of-references,size,reference-type,,const,boot

;global variable for the boot area
variable-name,number-of-references,size,reference-type,,,boot

;*** Function information***
;static variable
function-name,number-of-references,size,"file-name"

;global function
function-name,number-of-references,size

;global function for the boot area
function-name,number-of-references,size,,boot
```

Remark Describe variables and functions in the order of priority, from highest to lowest.
Comment out the lines for variables and functions that are not to be allocated by adding a semicolon (;) at the beginning of the line.

(b) Set the generation of the variables/functions information file

Select the build tool node on the project tree and select the [Variables/Functions Relocation Options] tab on the Property panel.
Select [No] on the [Output variables/functions information file] property.

Figure 2-58. [Output variables/functions information file] Property



(c) Run a build of the project

Run a build of the project.

A load module file is generated with the variables and functions allocated as specified in the variables/functions information file.

Caution **If a file with an extension of "vfi" is added to the project, it is treated as a variables/functions information file. It is also treated as a variables/functions information file if it is added below the Startup node.**
When adding a variables/functions information file to the project, if a variables/functions information file has already been added then only the latest variables/functions information file to be added is targeted by a build; any such files added prior to this one will not be targeted.
When setting a variables/functions information file that is not targeted by a build as a build target, if other variables/functions information files have also been added then the file will be targeted by the build, and the others will not be targeted.

2.11.2 Display ROM/RAM usage

You can use the variables/functions information file generator to display the ROM/RAM usage after the linking to the Output panel.

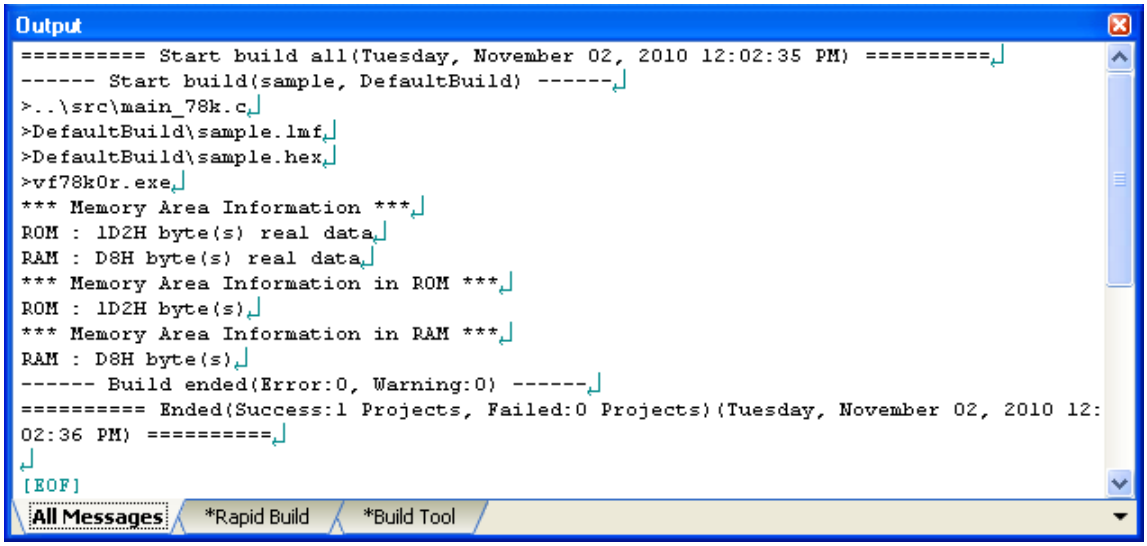
Select the build tool node on the project tree and select the [Variables/Functions Relocation Options] tab on the Property panel.

To display the ROM/RAM usage, select [Yes] on the [Output ROM/RAM usage] property in the [ROM/RAM Amount Information] category ([No] is selected by default).

Figure 2-59. [Output ROM/RAM usage] Property

When you run a build, the ROM/RAM usage is output to the Output panel following the build results.
First the total amount uses is output, followed by the usage for each memory area.

Figure 2-60. ROM/RAM Usage Display



2.12 Set Build Options Separately

Build options are set at the project or file level.

- Project level: See "2.12.1 Set build options at the project level"
- Project level: See "2.12.2 Set build options at the file level"

2.12.1 Set build options at the project level

To set options for build options for a project (main project or subproject), select the Build tool node on the project tree to display the Property panel.

Select the component tabs, and set build options by setting the necessary properties.

Compiler: [Compile Options] tab
Assembler, List Converter: [Assemble Options] tab
Linker: [Link Options] tab
ROMization processor: [ROMization Process Options] tab
Object converter: [Object Convert Options] tab
Librarian: [Create Library Options] tab
Variables/functions information file generator: [Variables/Functions Relocation Options] tab

2.12.2 Set build options at the file level

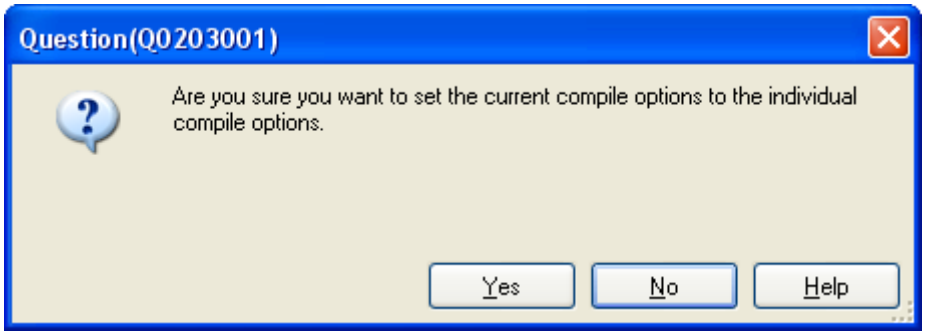
You can individually set compile and assemble options for each source file added to the project.

(1) When setting compile options for a C source file

Select a C source file on the project tree and select the [Build Settings] tab on the Property panel. In the [Build] category, if you select [Yes] on the [Set individual compile option] property, the message dialog box ("Figure 2-62. Message Dialog Box") is displayed.

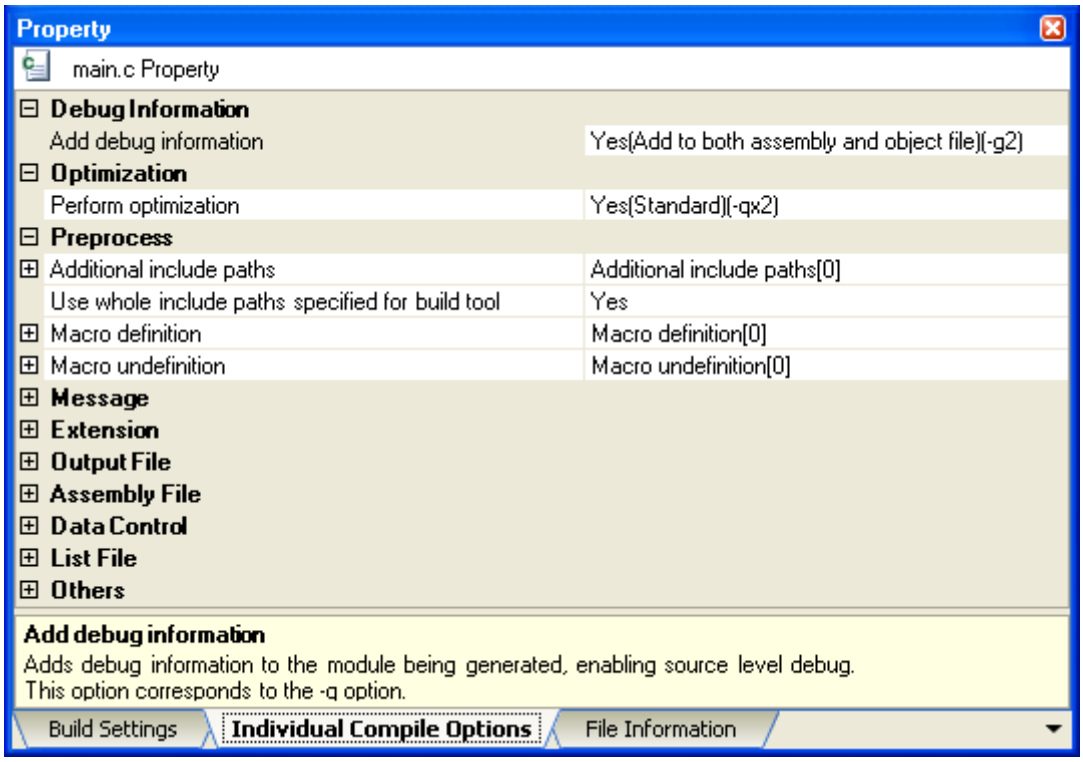
Figure 2-61. [Set individual compile option] Property

Figure 2-62. Message Dialog Box



If you click the [Yes] button in the dialog box, the [Individual Compile Options] tab will be displayed.

Figure 2-63. Property Panel: [Individual Compile Options] Tab



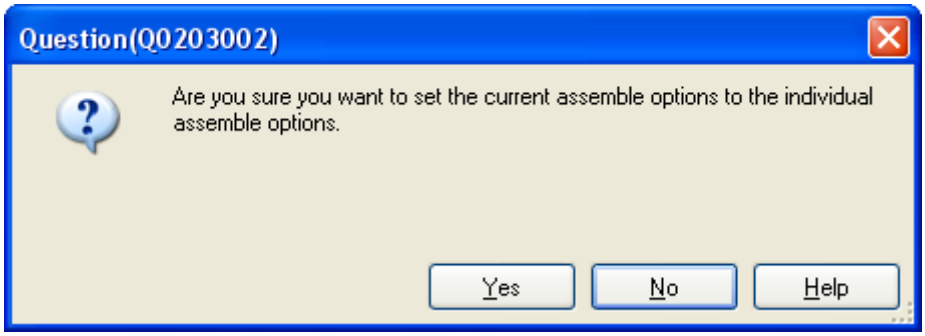
You can set compile options for the C source file by setting the necessary properties in this tab. Note that this tab takes over the settings of the [Compile Options] tab by default.

(2) When setting assemble options for an assembler source file

Select an assembler source file on the project tree and select the [Build Settings] tab on the Property panel. In the [Build] category, if you select [Yes] on the [Set individual assemble option] property, the message dialog box ("Figure 2-65. Message Dialog Box") is displayed.

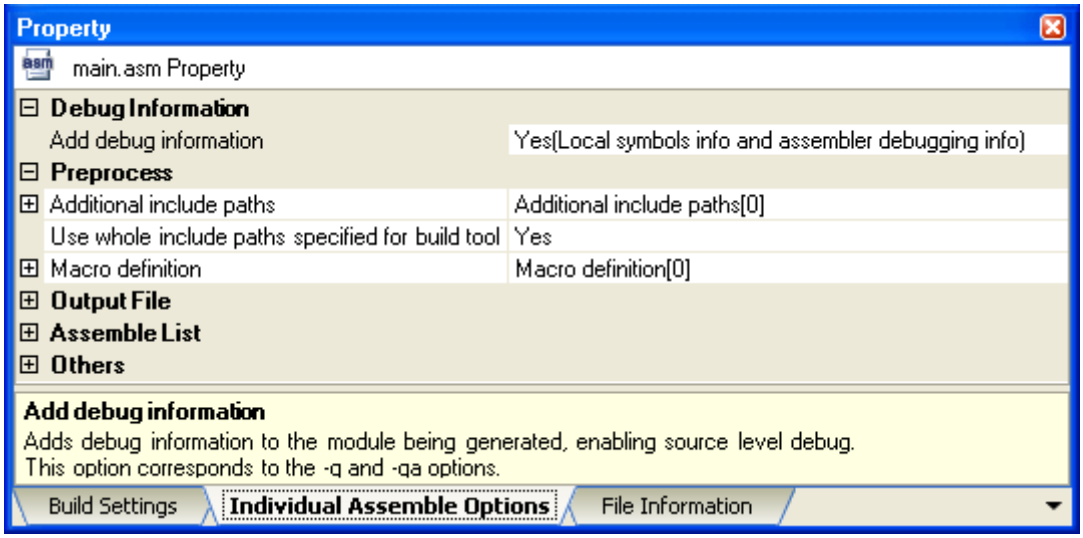
Figure 2-64. [Set individual assemble option] Property

Figure 2-65. Message Dialog Box



If you click the [Yes] button in the dialog box, the [Individual Assemble Options] tab will be displayed.

Figure 2-66. Property Panel: [Individual Assemble Options] Tab



You can set assemble options for the assembler source file by setting the necessary properties in this tab. Note that this tab takes over the settings of the [Assemble Options] tab by default.

Remark You can also set assemble options for assembler source files created from C source files. Select a C source file on the project tree and select the [Individual Compile Options] tab on the Property panel. If you select [Yes] on the [Output assemble file] property in the [Assembly File] category, the [Individual Assemble Options] tab is displayed.

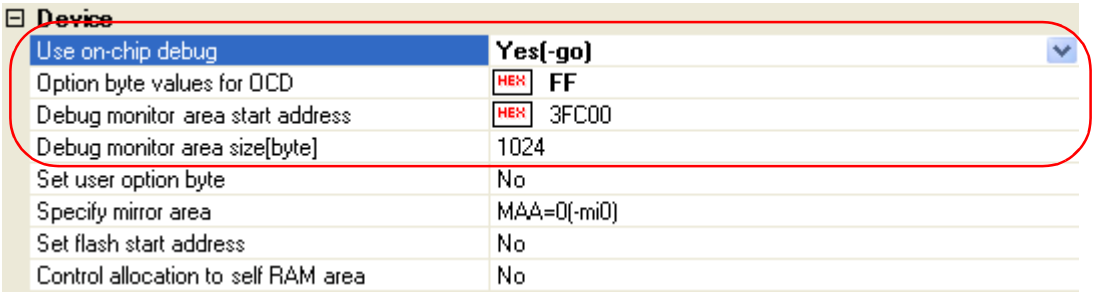
2.13 Prepare for Using On-chip Debugger

To use the on-chip debugger, you must set the on-chip debug, user option byte, and security ID.

(1) Setting the on-chip debug

The on-chip debug function of the microcontroller is enabled by setting the on-chip debug.
Select the build tool node on the project tree and select the [Link Options] tab on the Property panel. Set the on-chip debug in the [Device] category.
If you select [Yes(-go)] on the [Use on-chip debug] property, the [Option byte values for OCD] property, [Debug monitor area start address] property, and [Debug monitor area size[byte]] property are displayed.

Figure 2-67. [Use on-chip debug], [Option byte values for OCD], [Debug monitor area start address], and [Debug monitor area size[byte]] Property

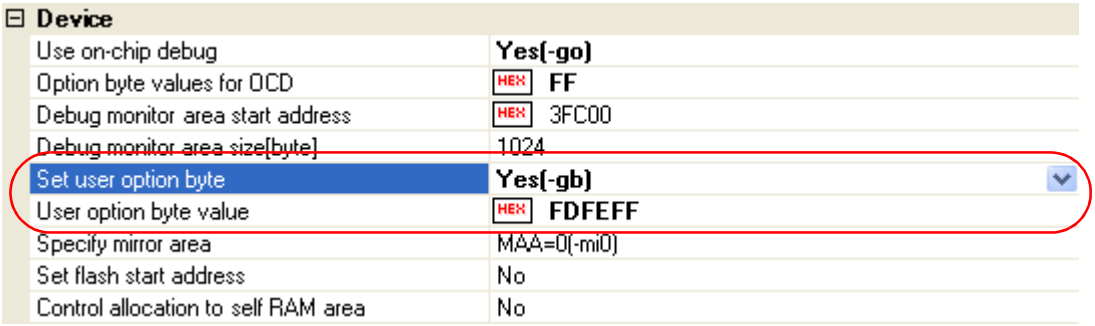


On the [Option byte values for OCD] property, specify the control value of on-chip debug option byte in hexadecimal without 0x. The range that can be specified for the value is 0 to FF.
On the [Debug monitor area start address] property, specify the start address of the debug monitor area in hexadecimal without 0x. The range that can be specified for the value is 0 to FFFFF (default: *internal ROM end address* - 1024 + 1).
On the [Debug monitor area size[byte]] property, specify the size of the debug monitor area in decimal. The range that can be specified for the value is 0 to 1024 [RL78]/88 to 1024 [78K0R] (default: 512 [RL78]/1024 [78K0R]).

(2) Set the user option byte

By setting the user option byte, settings for the watchdog timer, voltage detection circuit/low voltage detection circuit, and system reserved area are made.
The settings for the user option byte are also made in the [Device] category on the [Link Options] tab.
If you select [Yes(-gb)] on the [Set user option byte] property, the [User option byte value] property is displayed.

Figure 2-68. [Set user option byte] and [User option byte value] Property



On the [User option byte value] property, specify the user option byte value in hexadecimal without 0x. The range that can be specified for the value is 0 to FFFFFF.

If the setting is made as above, the following value is set: 0xFD to address 0xC0, 0xFE to address 0xC1, 0xFF to address 0xC2.

(3) Setting the security ID

The security ID is used to perform authentication when the debugger is activated.
Select the build tool node on the project tree and select the [Common Options] tab on the Property panel.
On the [Security ID] property in the [Device] category, specify the security ID in the 20-digit hexadecimal number.
The range that can be specified for the value is 0 to FFFFFFFFFFFFFFFFFFFE [RL78]/0 to FFFFFFFFFFFFFFFFFFFF [78K0R].

Figure 2-69. [Security ID] Property

If the setting is made as above, the following value is set: 0x11 to address 0xC4, 0x22 to address 0xC5, 0x33 to address 0xC6, 0x44 to address 0xC7, 0x55 to address 0xC8, 0x66 to address 0xC9, 0x77 to address 0xCA, 0x88 to address 0xCB, 0x99 to address 0xCC, 0xAA to address 0xCD.

Remark See "CubeSuite+ RL78,78K0R Debug" for connecting with the debug tool.

2.14 Prepare for Implementing Boot-flash Relink Function

Depending on the system, in addition to the area which cannot be rewritten/replaced (boot area), there are occasions when you can use the area which can be rewritten/replaced (flash area), such as the flash or external ROM.

In these kinds of systems, when you wish to change the program in the flash area, a function called the "relink function" correctly performs function calls between the boot area and flash area without rebuilding the program in the boot area.

By creating load module files for the boot area and flash area, you can implement the relink function. The method to implement the relink function is shown below.

Remark See "B.3.5 Boot-flash relink function" for details about the relink function and how to implement it.

2.14.1 Prepare the build target files

(1) Prepare the link directive files

Prepare link directive files for the projects for both the boot area and flash area.

Remark You can use the same link directive file with the boot area and flash area, but since the description will become complicated, it is recommend to use a separate link directive file for each area.

(2) Describe the #pragma ext_func directive

Describe the #pragma ext_func directive in the C source file.

With the #ext_func directive, specify the ID value for the target function (the actual function exists in the flash area and is called from the boot area).

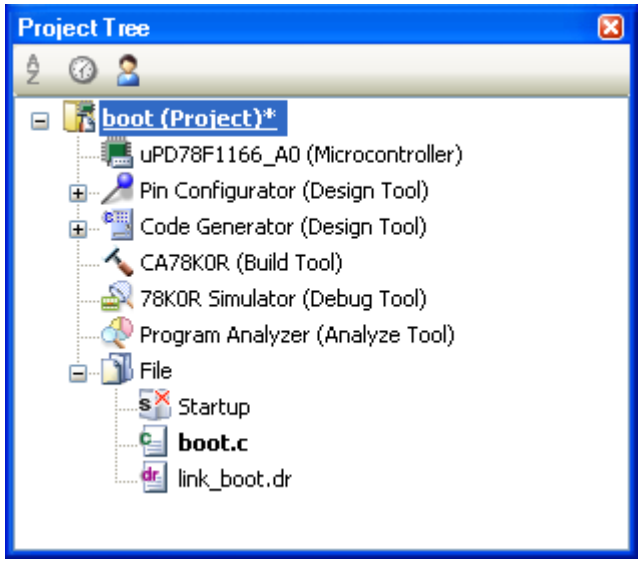
Remark In order to prevent description mistakes and inconsistencies between source files, it is recommend that you organize the #ext_func directive description in a single file, and regardless of the boot area or flash area, include that file in all the C source files.

2.14.2 Set the boot area project

(1) Create the boot area project

Create a project for the boot area and add the build target files to the project.

Figure 2-70. Boot Area Project



(2) Set the build options for the boot area project

Select the build tool node on the project tree and set each of the build options on the Property panel.

(a) Set variables/functions relocation options

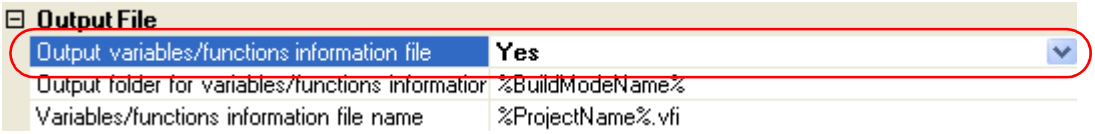
Set the variables/functions relocation options to generate a variables/functions information file and use it to allocate variables and functions.

Select the [Variables/Functions Relocation Options] tab.

In the [Output File] category, set the [Output variables/functions information file] property to [Yes] to generate an empty variables/functions information file, and add it to the project (it will also appear in the File node of the project tree). The output destination is the file set in the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property.

Remark If a variables/functions information file with the same name already exists, the build will be configured to use it.

Figure 2-71. [Output variables/functions information file] Property in Boot Area



Set the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property to change the output folder and file name of the variables/functions information file. If the [Variables/functions information file] property is changed, an empty variables/functions information file is generated and added to the project (it will also appear in the File node of the project tree).

(b) Set compile options

Select the [Compile Options] tab.

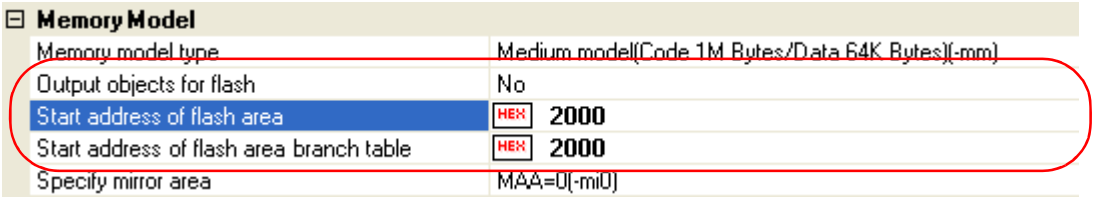
Select [No] on the [Output objects for flash] property in the [Memory Model] category.

In addition, configure the [Start address of flash area] property and the [Start address of flash area branch table] property.

The range that can be specified for both value is 0C0 to 0EDFFF.

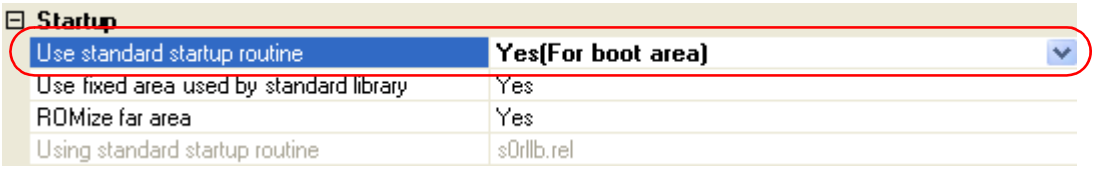
Remark The address specified in the [Start address of flash area branch table] property is an address in the flash area.

Figure 2-72. [Output objects for flash], [Start address of flash area], and [Start address of flash area branch table] Property in Boot Area



Next, select [Yes(For boot area)] on the [Use standard startup routine] property in the [Startup] category.

Figure 2-73. [Use standard startup routine] Property in Boot Area



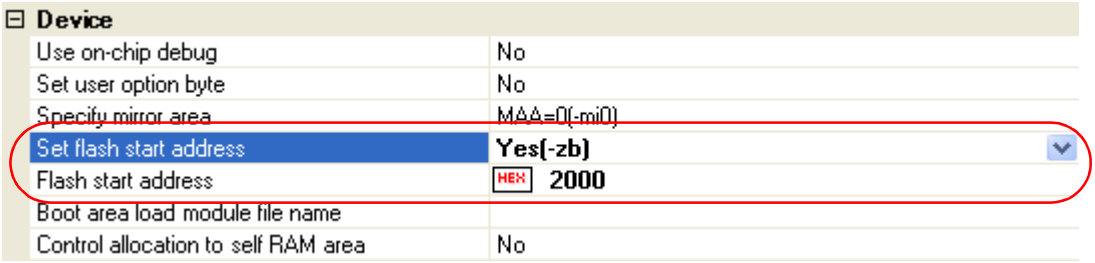
(c) Set link options

Select the [Link Options] tab.

In the [Device] category, if you select [Yes(-zb)] on the [Set flash start address] property, the [Flash start address] property is displayed.

In this property, the same value as the value of the [Start address of flash area] property on the [Memory Model] category from the [Compile Options] tab.

Figure 2-74. [Set flash start address] and [Flash start address] Property in Boot Area

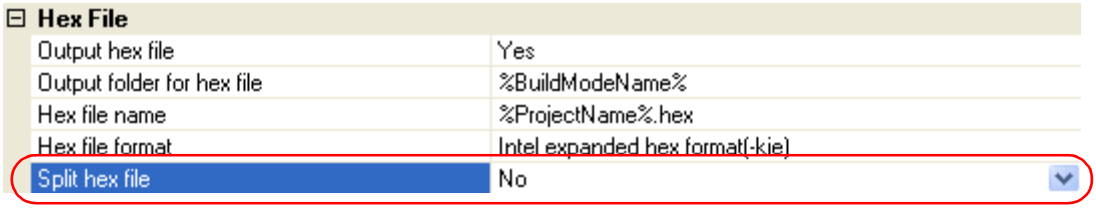


(d) Set object convert options

Select the [Object Convert Options] tab.

Select [No] on the [Split hex file] property in the [Hex File] category (default).

Figure 2-75. [Split hex file] Property in Boot Area



(3) Run a build of the boot area project

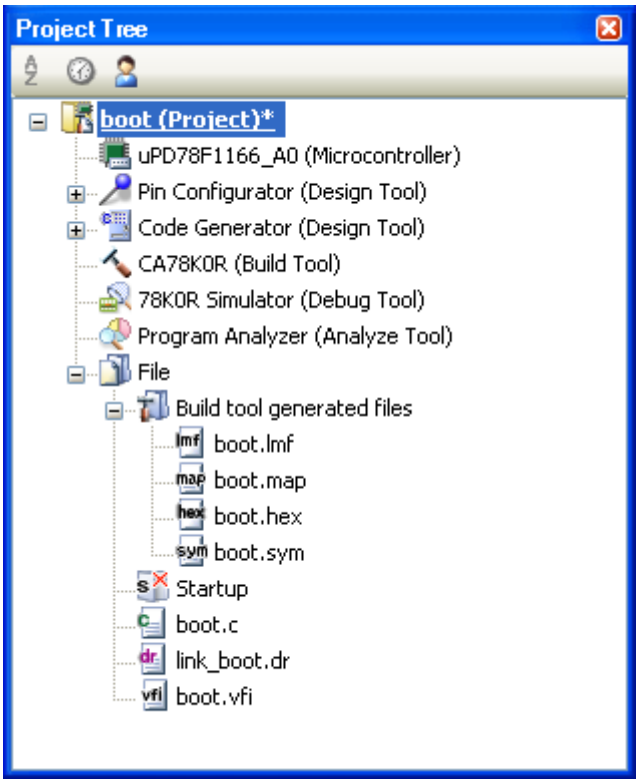
When you run a build of the boot area project, a load module file is created.

A hex file is also created.

If a variables/functions information file is generated, it will be input into the compiler automatically, and a rebuild will be executed again.

Remark The variables/functions information file generated in "(a) Set variables/functions relocation options" is overwritten by running a build.

Figure 2-76. Created Files for Boot Area

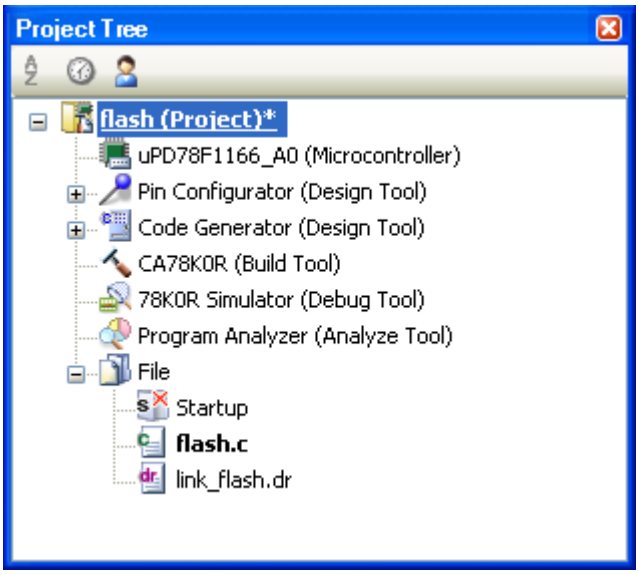


2.14.3 Set the flash area project

(1) Create the flash area project

Create a project for the boot area and add the build target files to the project.

Figure 2-77. Flash Area Project



(2) Set the build options for the flash area project

Select the build tool node on the project tree and set each of the build options on the Property panel.

(a) Set variables/functions relocation options

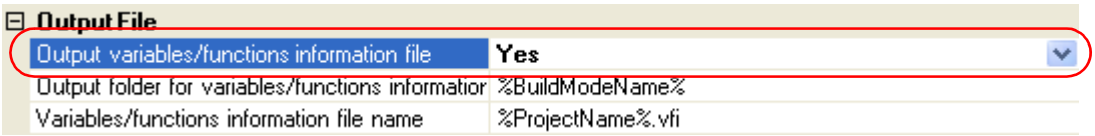
Set the variables/functions relocation options to generate a variables/functions information file and use it to allocate variables and functions.

Select the [Variables/Functions Relocation Options] tab.

In the [Output File] category, set the [Output variables/functions information file] property to [Yes] to generate an empty variables/functions information file, and add it to the project (it will also appear in the File node of the project tree). The output destination is the file set in the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property.

Remark If a variables/functions information file with the same name already exists, the build will be configured to use it.

Figure 2-78. [Output folder for variables/functions information file] Property in Flash Area



Set the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property to change the output folder and file name of the variables/functions information file. If the [Variables/functions information file] property is changed, an empty variables/functions information file is generated and added to the project (it will also appear in the File node of the project tree).

(b) Set compile options

Select the [Compile Options] tab.

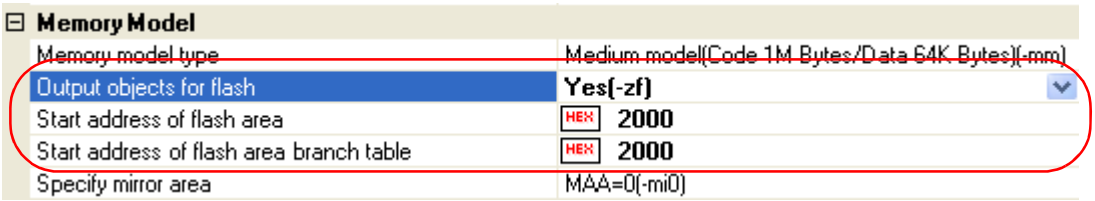
Select [Yes(-zf)] on the [Output objects for flash] property in the [Memory Model] category.

In addition, configure the [Start address of flash area] property and the [Start address of flash area branch table] property.

The range that can be specified for the value is 0C0 to 0EDFFF.

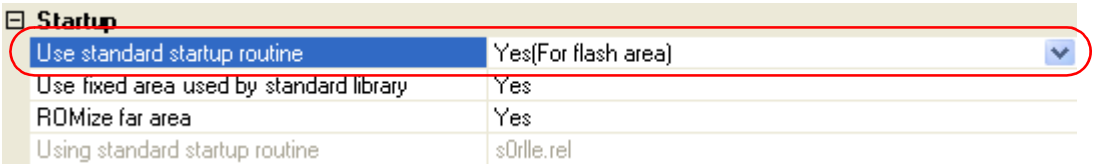
Remark The address specified in the [Start address of flash area branch table] property is the same as the address specified in the boot area project.

Figure 2-79. [Output objects for flash], [Start address of flash area], and [Start address of flash area branch table] Property in Flash Area



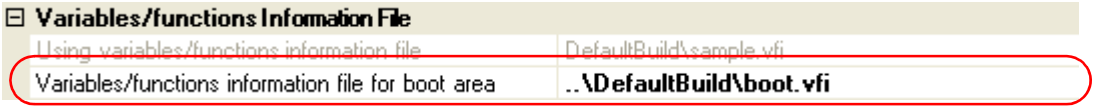
Next, select [Yes(For flash area)] on the [Use standard startup routine] property in the [Startup] category.

Figure 2-80. [Use standard startup routine] Property in Flash Area



Next, add the created variables/functions information file for the boot area in "2.14.2 Set the boot area project" to the flash area project. Specify the variables/functions information file for the boot area on the [Variables/functions information file for boot area] property in the [Variable and Function Information File] category.

Figure 2-81. [Variables/functions information file for boot area] Property in Flash Area



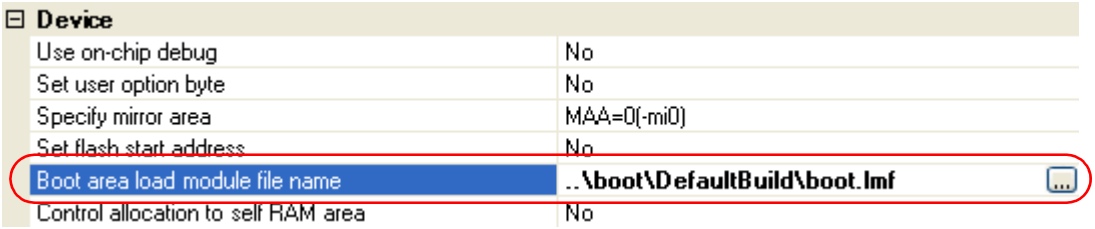
(c) Set link options

Add the created boot area load module file in "2.14.2 Set the boot area project" to the flash area project.

Select the [Link Options] tab.

Specify the boot area load module file on the [Boot area load module file name] property in the [Device] category.

Figure 2-82. [Boot area load module file name] Property in Flash Area

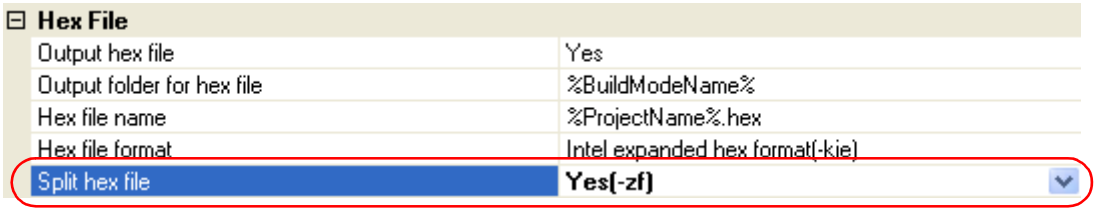


(d) Set object convert options

Select the [Object Convert Options] tab.

Select [Yes(-zf)] on the [Split hex file] property in the [Hex File] category.

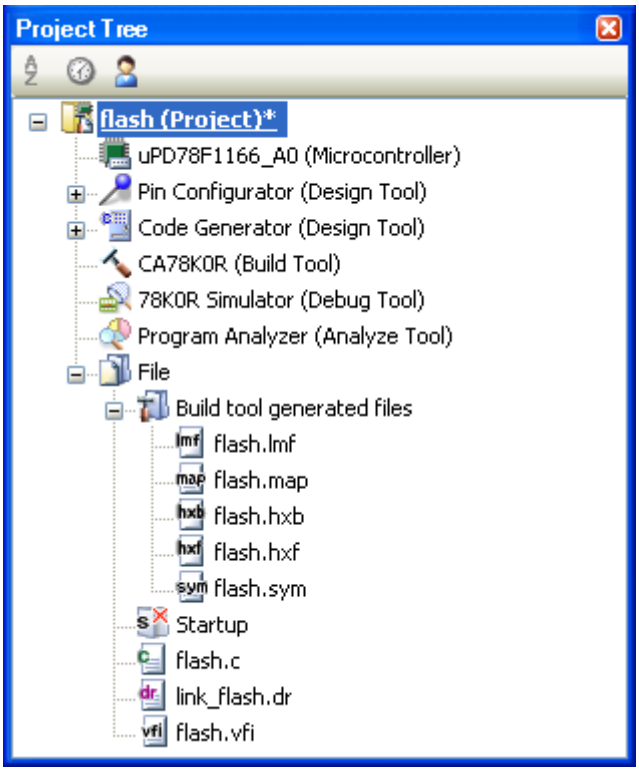
Figure 2-83. [Split hex file] Property in Flash Area



(3) Run a build of the flash area project

When you run a build of the flash area project, a load module file which implements the relink function is created. The boot area hex file (the same content as the file created in "2.14.2 Set the boot area project") and flash area hex file are also created.

Figure 2-84. Created Files for Flash Area



2.15 Make Settings for Build Operations

This section explains operations on a build.

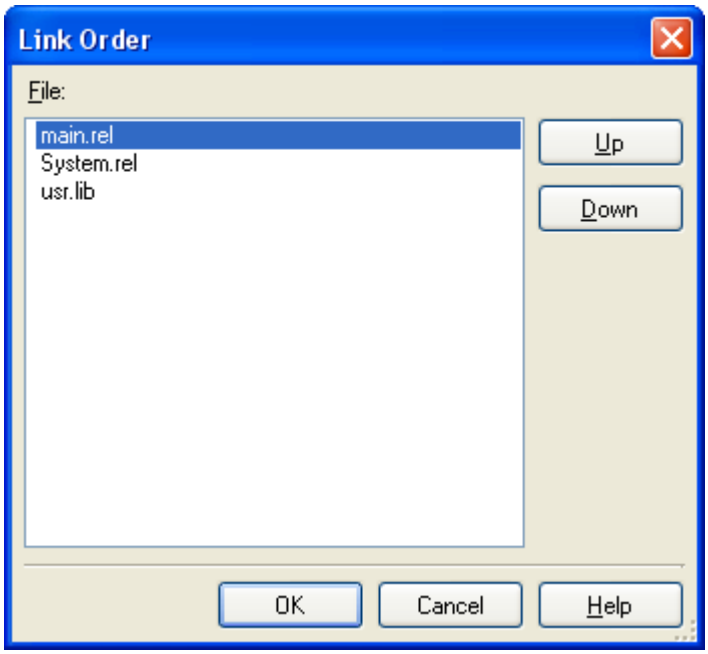
- Set the link order of files
- Change the file build order of subprojects
- Display a list of build options
- Change the file build target project
- Add a build mode
- Change the build mode
- Delete a build mode
- Set the current build options as the standard for the project

2.15.1 Set the link order of files

The link order of object module files and library files is decided automatically, but you can also set the order.

On the project tree, select the Build tool node, and then select [Set Link Order...] from the context menu. The Link Order dialog box opens.

Figure 2-85. Link Order Dialog Box



The names of the following files are listed in [File] in the order that the files are input to the linker.

- Object module files generated from the source files added to the selected main project or subproject
- Object module files added directly to the project tree of the selected main project or subproject
- Library files added directly to the project tree of the selected main project or subproject

Remark The default order is the order the files are added to the project.
Object module files created from newly added source files and newly added object module files are added after the last object module file in the list. Newly added library files are added to the end of the list.

By changing the display order of the files, you can set the input order of the files to the linker.

To change the display order, use the [Up] and [Down] buttons, or drag and drop the file names. After changing the display order, click the [OK] button.

2.15.2 Change the file build order of subprojects

Builds are run in the order of subproject, main project, but when there are multiple subprojects added, the build order of subprojects is their display order on the project tree.

To change the display order of the subprojects on the project tree, drag the subproject to be moved and drop it on the desired location.

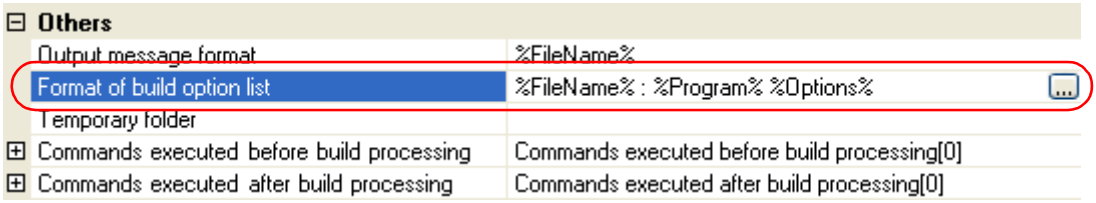
2.15.3 Display a list of build options

You can display the list of build options set currently on the Property panel for the project (main project and subproject).

If you select [Build Options List] from the [Build] menu, the current settings of the options for the project are displayed on the [Build Tool] tab from the Output panel in the build order.

Remark You can change the display format of the build option list.
Select the build tool node on the project tree and select the [Common Options] tab on the Property panel.
Set the [Format of build option list] property in the [Others] category.

Figure 2-86. [Format of build option list] Property



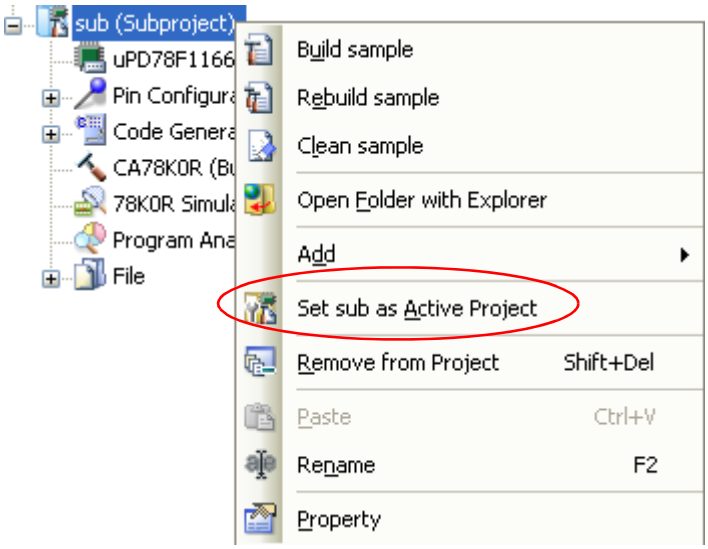
"%FileName% : "%FileName% : %Program% %Options%" is set by default.
"%FileName%", "%Program%", and "%Options%" are embedded macros. They are replaced to the file name being built, program name under execution, and command line option under build execution.

2.15.4 Change the file build target project

When running a build that targets a specific project (main project or subproject), you must set that project as the "active project".

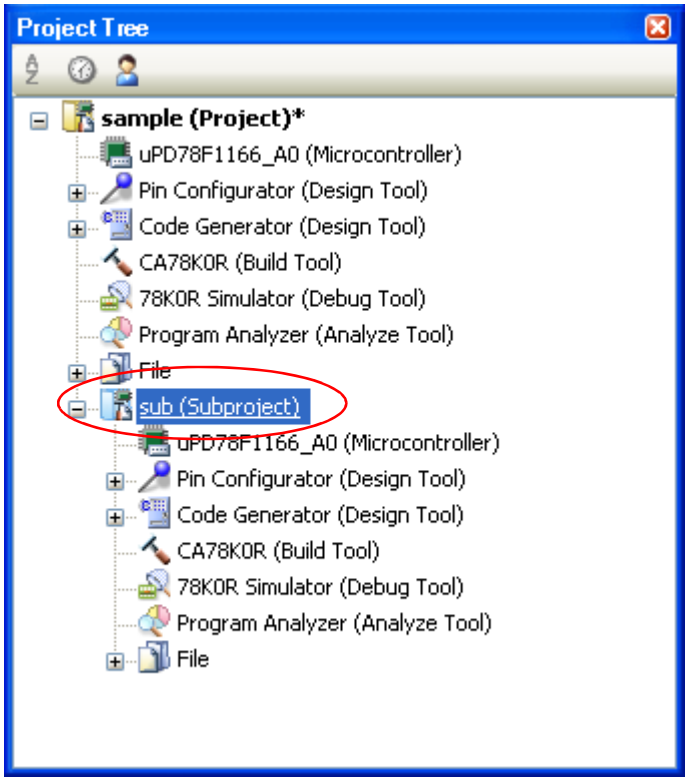
To set the active project, select the main project or subproject to be set as the active project on the project tree and select [Set *selected subproject* as Active Project] from the context menu.

Figure 2-87. [Set *selected project* as Active Project] Item



When a project is set as the active project, that project is underlined.

Figure 2-88. Active Project



Remarks 1. Immediately after creating a project, the main project is the active project.

2. When you remove a subproject that set as the active project from a project, the main project will be the active project.

2.15.5 Add a build mode

When you wish to change the build options and macro definitions according to the purpose of the build, you can collectively change those settings. Build options and macro definition settings are organized into what is called "build mode", and by changing the build mode, you eliminate the necessity of changing the build options and macro definition settings every time.

The build mode prepared by default is only "DefaultBuild". Add a build mode according to the purpose of the build.

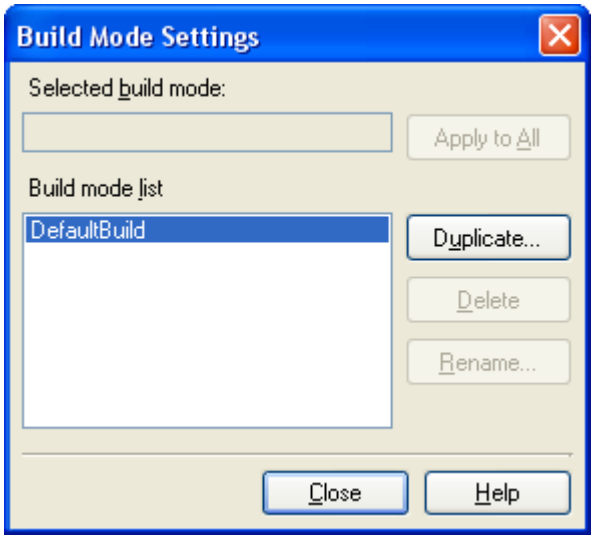
The method to add a build mode is shown below.

(1) Create a new build mode

Creating a new build mode is performed with duplicating an existing build mode.

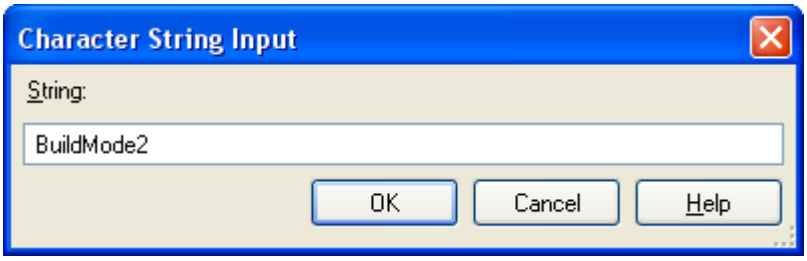
Select [Build Mode Settings...] from the [Build] menu. The Build Mode Settings dialog box opens.

Figure 2-89. Build Mode Settings Dialog Box



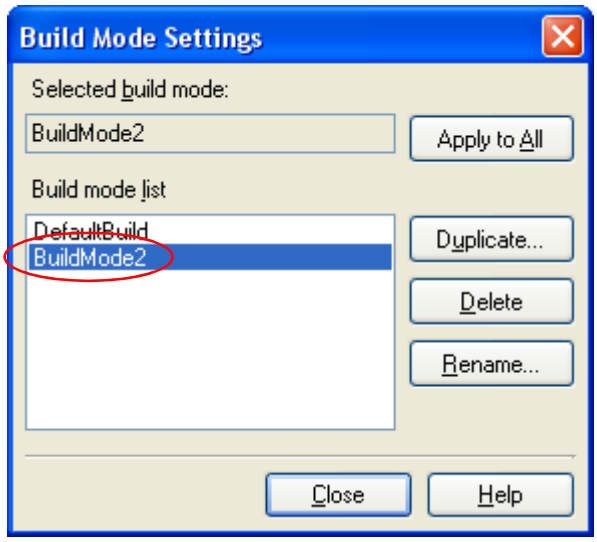
Select the build mode to be duplicated from the build mode list and click the [Duplicate...] button. The Character String Input dialog box opens.

Figure 2-90. Character String Input Dialog Box



In the dialog box, enter the name of the build mode to be created and then click the [OK] button. The build mode with that name will be duplicated. The created build mode is added to the build modes of the main project and all the subprojects which belong to the project.

Figure 2-91. Build Mode Settings Dialog Box (After Adding Build Mode)



(2) Change the build mode

Change the build mode to the newly created build mode (see "2.15.6 Change the build mode").

(3) Change the setting of the build mode

Select the build tool node on the project tree and change the build options and macro definition settings on the Property panel.

Remark Creating a build mode is regarded a project change. When closing the project, you will be asked to confirm whether or not to save the build mode.

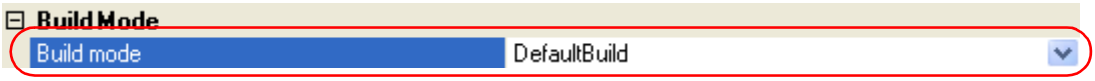
2.15.6 Change the build mode

When you wish to change the build options and macro definitions according to the purpose of the build, you can collectively change those settings. Build options and macro definition settings are organized into what is called "build mode", and by changing the build mode, you eliminate the necessity of changing the build options and macro definition settings every time.

(1) When changing the build mode for the main project or subprojects

Select the Build tool node of the target project on the project tree and select the [Common Options] tab on the Property panel. Select the build mode to be changed to on the [Build mode] property in the [Build Mode] category.

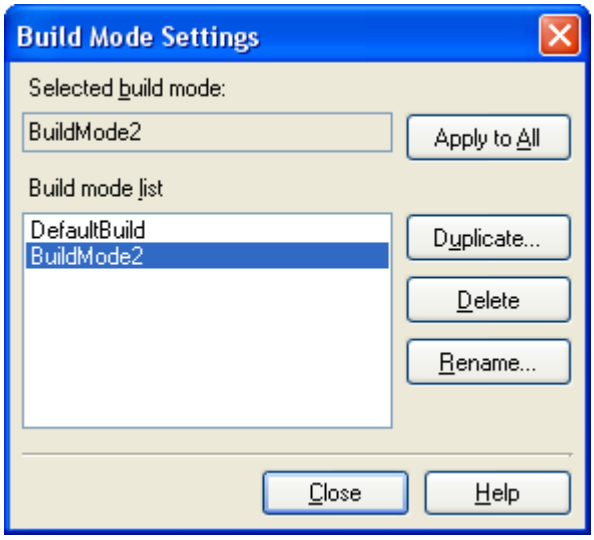
Figure 2-92. [Build Mode] Property



(2) When changing the build mode for the entire project

Select [Build Mode Settings...] from the [Build] menu. The Build Mode Settings dialog box opens.

Figure 2-93. Build Mode Settings Dialog Box



If you select the build mode to be changed from the build mode list, the selected build mode is displayed in [Selected build mode]. If you click the [Apply to All] button, the build mode for the main project and all the subprojects which belong to the project will be changed to the build mode selected in the dialog box.

Caution For projects that the selected build mode does not exist, the build mode is duplicated from "DefaultBuild" with the selected build mode name, and the build mode is changed to the duplicated build mode.

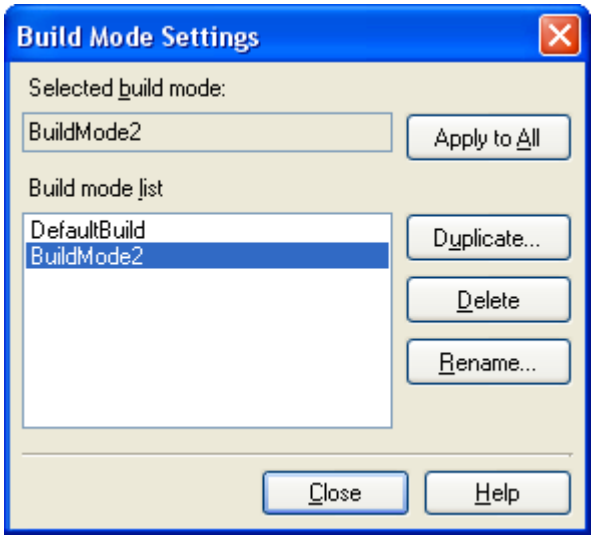
Remarks 1. The build mode prepared by default is only "DefaultBuild". See "2.15.5 Add a build mode" for the method of adding a build mode.

2. You can change the name of the build mode by selecting the build mode from the build mode list and clicking the [Rename...] button. However, you cannot change the name of "DefaultBuild".

2.15.7 Delete a build mode

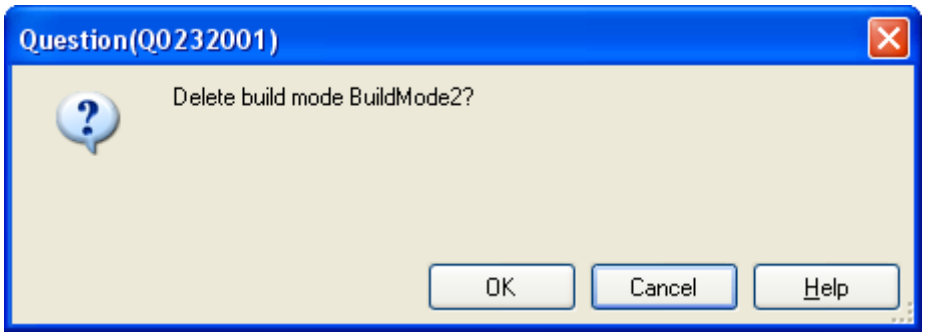
Deleting a build mode is performed with the Build Mode Settings dialog box.
Select [Build Mode Settings...] from the [Build] menu. The dialog box opens.

Figure 2-94. Build Mode Settings Dialog Box



Select the build mode to be deleted from the build mode list and click the [Delete] button. The Message dialog box below opens.

Figure 2-95. Message Dialog Box



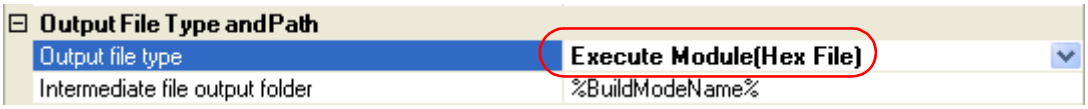
To continue with the operation, click the [OK] button in the dialog box.
The selected build mode is deleted from the project.

Caution You cannot delete "DefaultBuild".

2.15.8 Set the current build options as the standard for the project

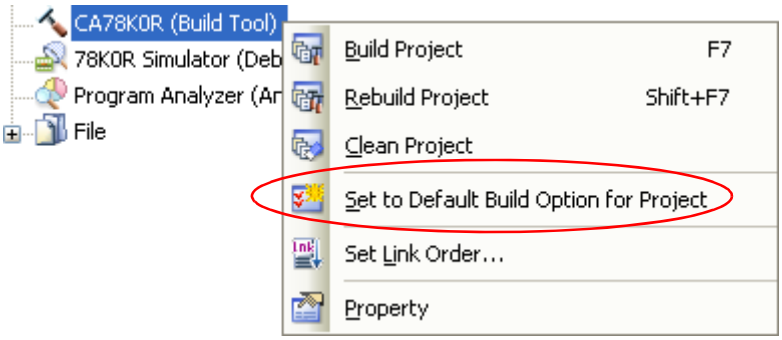
On the Property panel, if you add a change to the settings for the standard build options, the value of the property will be displayed in boldface.

Figure 2-96. Property Panel (After Changing Standard Build Option)



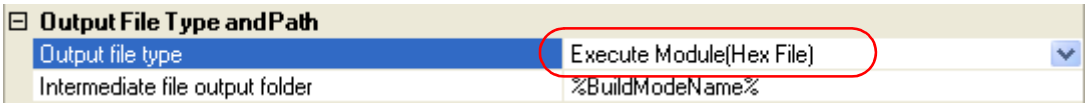
To make the build options for the currently selected project (main project or subproject) the standard build options (remove the boldface), select the Build tool node on the project tree and select [Set to Default Build Option for Project] from the context menu.

Figure 2-97. [Set to Default Build Option for Project] Item



The value of the properties after setting them as the standard build option are as shown below.

Figure 2-98. Property Panel (After Setting Standard Build Option)



Caution When the main project is selected, only the main project settings are made. Even if subprojects are added, their settings are not made.

2.16 Run a Build

This section explains operations related to running a build.

(1) Build types

The following types of builds are available.

Table 2-1. Build Types

Type	Description
Build	Out of build target files, runs a build of only updated files. See "2.16.1 Run a build of updated files".
Rebuild	Runs a build of all build target files. See "2.16.2 Run a build of all files".
Rapid build	Runs a build in parallel with other operations. See "2.16.3 Run a build in parallel with other operations".
Batch build	Runs builds in batch with the build modes that the project has. See "2.16.4 Run builds in batch with build modes".

Remarks 1. Builds are run in the order of subproject, main project.
Subprojects are built in the order that they are displayed on the project tree (see "2.15.2 Change the file build order of subprojects").

2. If there are files being edited with the Editor panel when running a build, rebuild, or batch build, then all these files are saved.

(2) Display execution results

The execution results of the build (output messages of the build tool) are displayed in each tab on the Output panel.

- Build, rebuild, or batch build: [All Messages] tab and [Build Tool] tab
- Rapid build: [Rapid Build] tab

Figure 2-99. Build Execution Results (Build, Rebuild, or Batch Build)

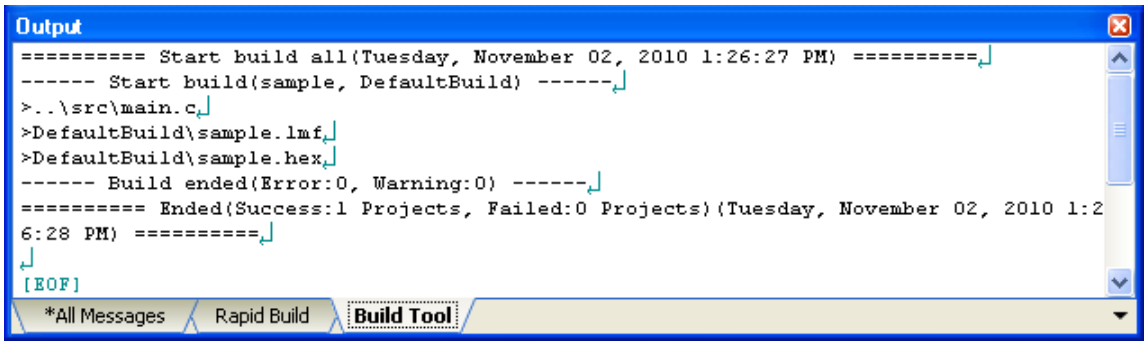
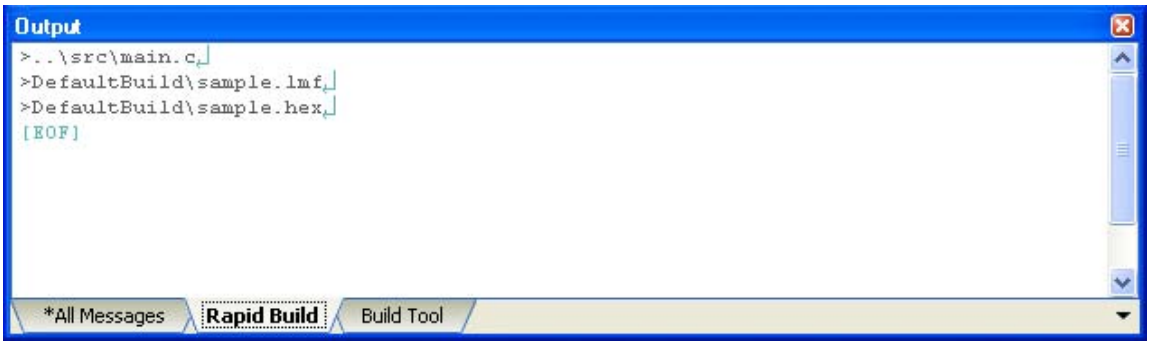


Figure 2-100. Build Execution Results (Rapid Build)



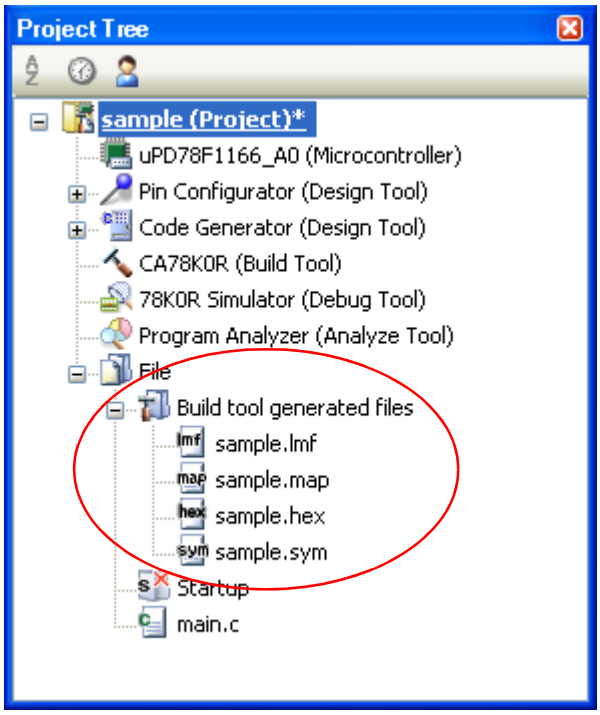
Remarks 1. The text in the [Rapid Build] tab becomes dimmed.

2. When a file name or line number can be obtained from the output messages, if you double click on the message, you can jump to the relevant line in the file.

3. If you press the [F1] key when the cursor is on a line displaying the warning or error message, you can display the help related to that line's message.

Files generated by the build tool appear on the Project Tree panel, under the Build tool generated files node.

Figure 2-101. Build Tool Generated Files



Remark Files displayed under the Build tool generated files node are as follows.

- For other than library projects

  Load module file (*.lmf)

  Link list file (*.map)

  Error list file (*.elk)

  Hex file (*.hex, *.hxb, *.hxf)

  Symbol table file (*.sym)

  Error list file (*.eoc)

- For library projects
  Library file (*.lib)
  List file (*.lst)

Caution **The Build tool generated files node is created during build.**
This node will no longer appear if you reload the project after building.

2.16.1 Run a build of updated files

Out of build target files, run a build of only updated files (hereafter referred to as "build").

Running a build is performed for the entire project (main project and subprojects) or active project (see "2.15.4 Change the file build target project").

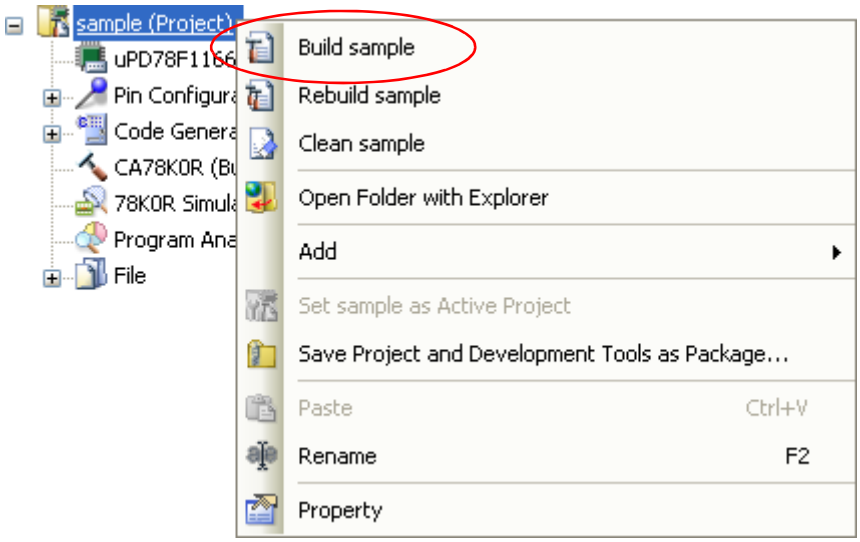
(1) When running a build of the entire project

Click on the toolbar.

(2) When running a build of the active project

Select the project, and then select [Build *active project*] from the context menu.

Figure 2-102. [Build *active project*] Item



Remark If the included source files are not built after editing the header file and running the build, update the file dependencies (see "2.3.7 Update file dependencies").

2.16.2 Run a build of all files

Run a build of all build target files (hereafter referred to as "rebuild").

Running a rebuild is performed for the entire project (main project and subprojects) or active project (see "2.15.4 Change the file build target project").

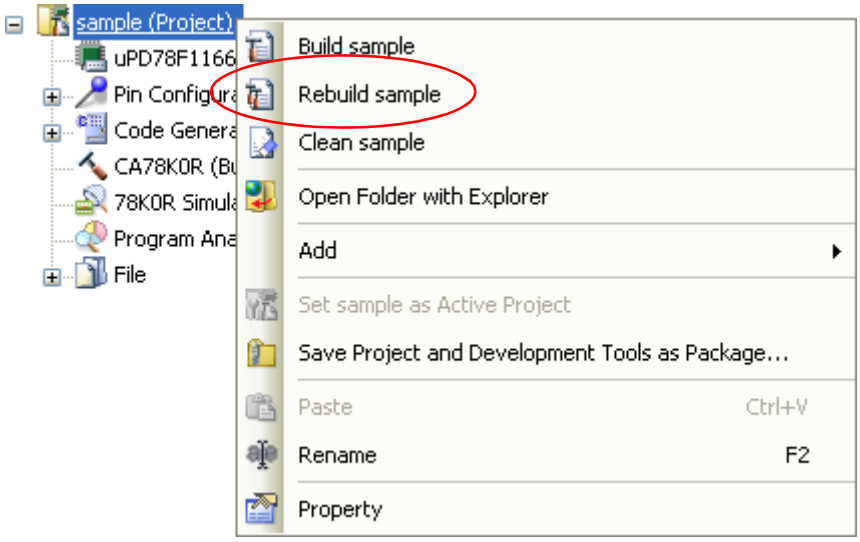
(1) When running a rebuild of the entire project

Click on the toolbar.

(2) When running a rebuild of the active project

Select the project, and then select [Rebuild *active project*] from the context menu.

Figure 2-103. [Rebuild *active project*] Item



2.16.3 Run a build in parallel with other operations

CubeSuite+ has a function that a build is started automatically when one of the following events occurs (hereafter referred to as "rapid build").

- When C source files, assembler source files, header files, link directive file, variables/functions information file, object module file, or library file that has been added to the project are updated
- When a build target file has been added to or removed from the project
- When the link order of object module files and library files has changed
- When the properties of the build tool or build target files are changed

If a rapid build is enabled, it is possible to perform a build in parallel with the above operations.

To enable/disable a rapid build, select [Rapid Build] from the [Build] menu. A rapid build is enabled by default.

Figure 2-104. [Rapid Build] Item (When Rapid Build Is Valid)

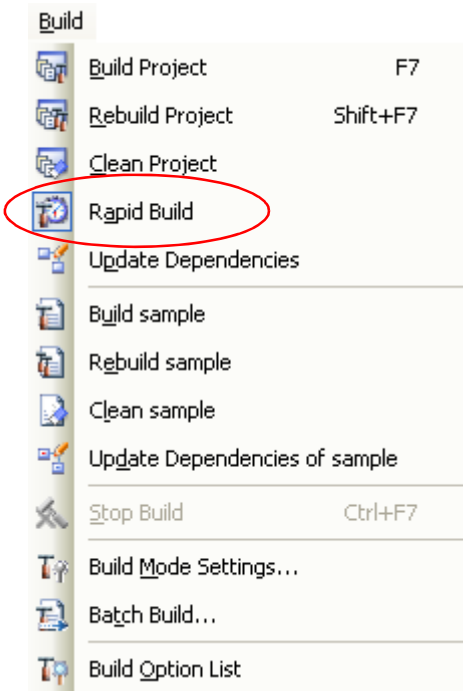
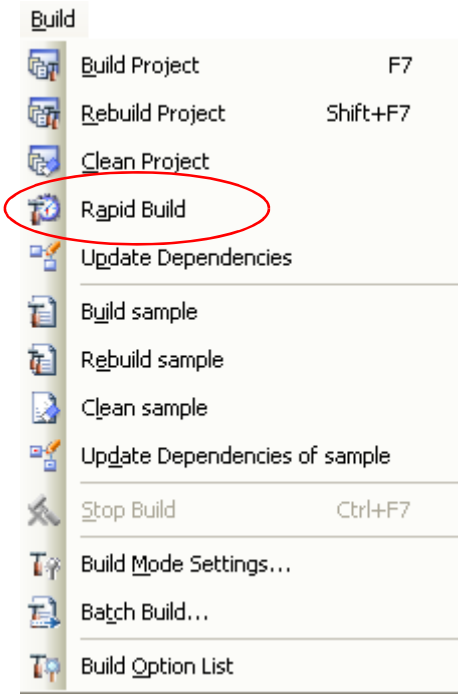


Figure 2-105. [Rapid Build] Item (When Rapid Build Is Invalid)



Remarks 1. After editing source files, it is recommend to save frequently by pressing the [Ctrl] + [S] key.

2. Enabling/disabling a rapid build is set for the entire project (main project and subprojects).

3. If you disable a rapid build while it is running, it will be stopped at that time.

Caution This function is valid only when editing source files with the Editor panel.

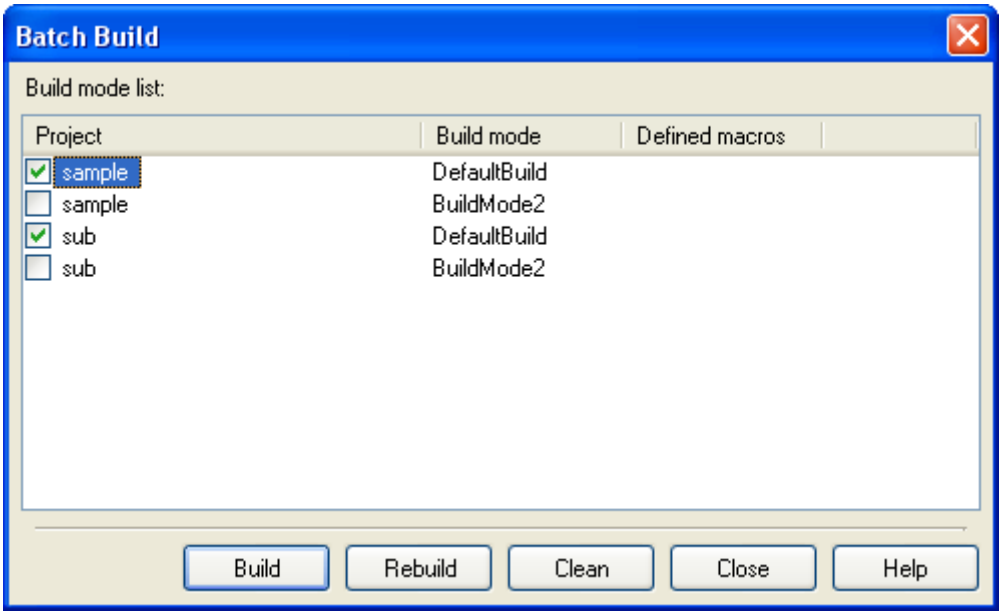
2.16.4 Run builds in batch with build modes

You can run builds, rebuilds and cleans in batch with the build modes that the project (main project and subproject) has (hereafter referred to as "batch build").

Remark See the sections below for a build, rebuild, and clean.
- Build: See "2.16.1 Run a build of updated files".
- Rebuild: See "2.16.2 Run a build of all files".
- Clean: See "2.16.8 Delete intermediate files and generated files".

Select [Batch Build] from the [Build] menu. The Batch Build dialog box opens.

Figure 2-106. Batch Build Dialog Box



In the dialog box, the list of the combinations of the names of the main project and subprojects in the currently opened project and their build modes and macro definitions is displayed.

Select the check boxes for the combinations of the main project and subprojects and build modes that you wish to run a batch build, and then click the [Build], [Rebuild], or [Clean] button.

Remark The batch build order follows the project build order, the order of the subprojects, main project.
When multiple build modes are selected for a single main project or subproject, after running builds of the subproject with all the selected build modes, the build of the next subproject or main project is run.

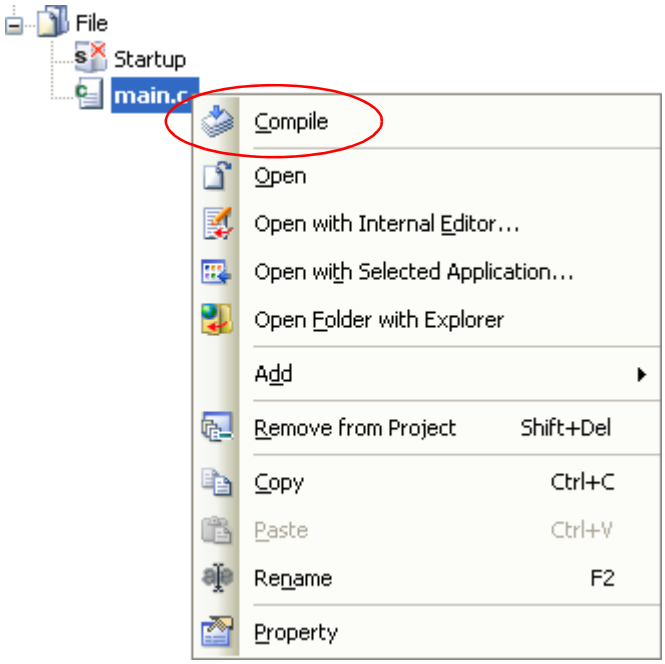
2.16.5 Compile/assemble individual files

You can just compile or assemble for each source file added to the project.

(1) When compiling a C source file

Select a C source file on the project tree and select the [Compile] from the context menu.

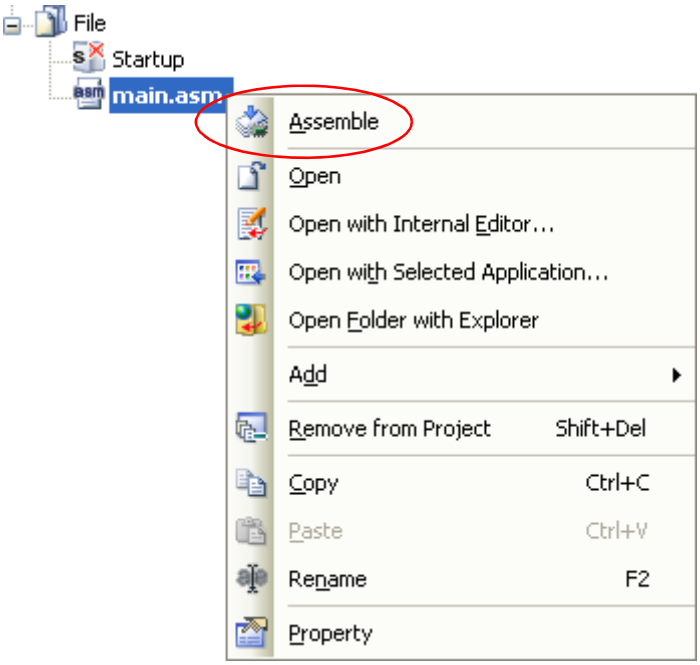
Figure 2-107. [Compile] Item



(2) When assembling an assembler source file

Select an assembler source file on the project tree and select the [Assemble] from the context menu.

Figure 2-108. [Assemble] Item



2.16.6 Stop running a build

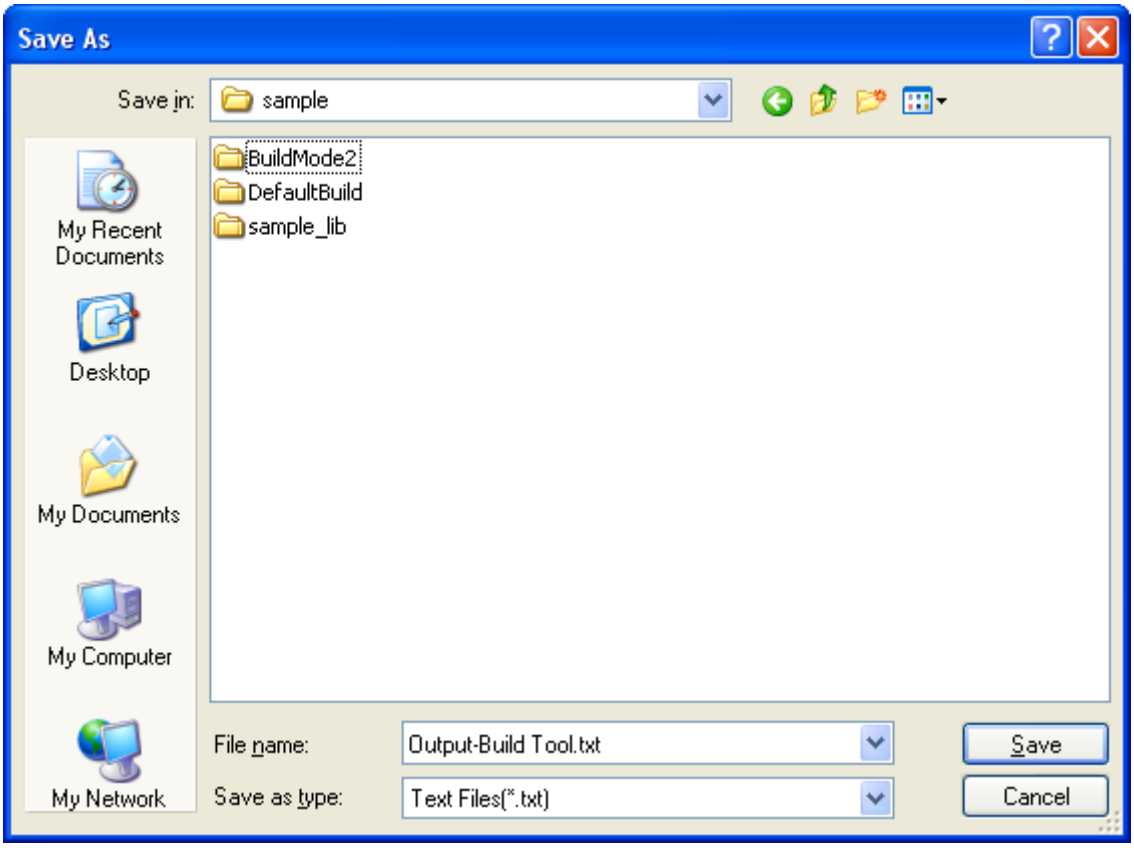
To stop running a build, rebuild, or batch build, click on the toolbar.

2.16.7 Save the build results to a file

You can save the execution results of the build (output messages of the build tool) that displayed on the Output panel.

Select the [Build Tool] tab on the panel, and then select [Save Output - Build Tool As...] from the [File] menu. The Save As dialog box opens.

Figure 2-109. Save As Dialog Box



In the dialog box, specify the file to be saved and then click the [Save] button.

2.16.8 Delete intermediate files and generated files

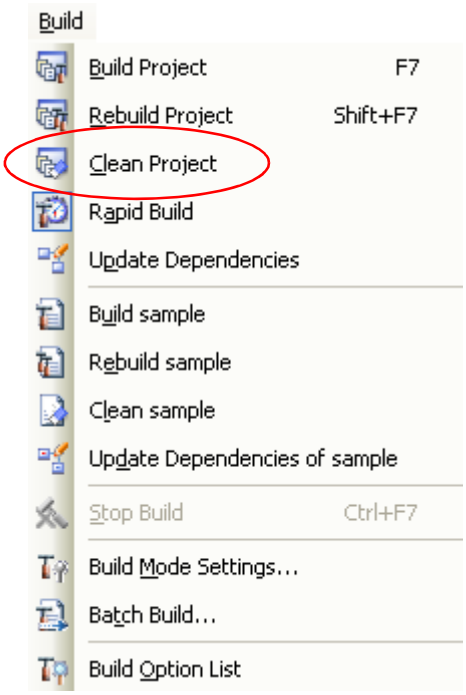
You can delete all the intermediate files and generated files output by running a build (hereafter referred to as "clean").

Running a clean is performed for the entire project (main project and subprojects) or active project (see "2.15.4 Change the file build target project").

(1) When running a clean of the entire project

From the [Build] menu, select [Clean Project].

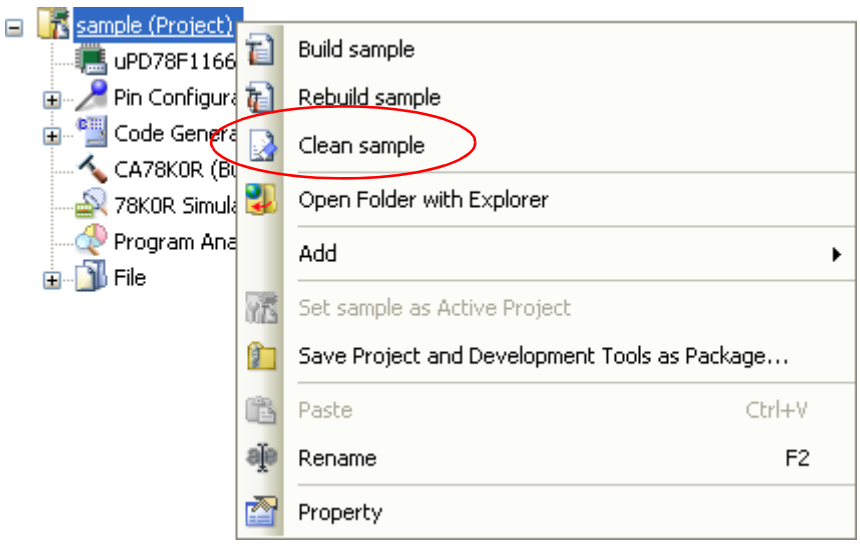
Figure 2-110. [Clean Project] Item



(2) When running a clean of the active project

Select the project, and then select [Clean *active project*] from the context menu.

Figure 2-111. [Clean *active project*] Item



2.17 Estimate the Stack Capacity

To estimate the stack capacity, use the the stack usage tracer.

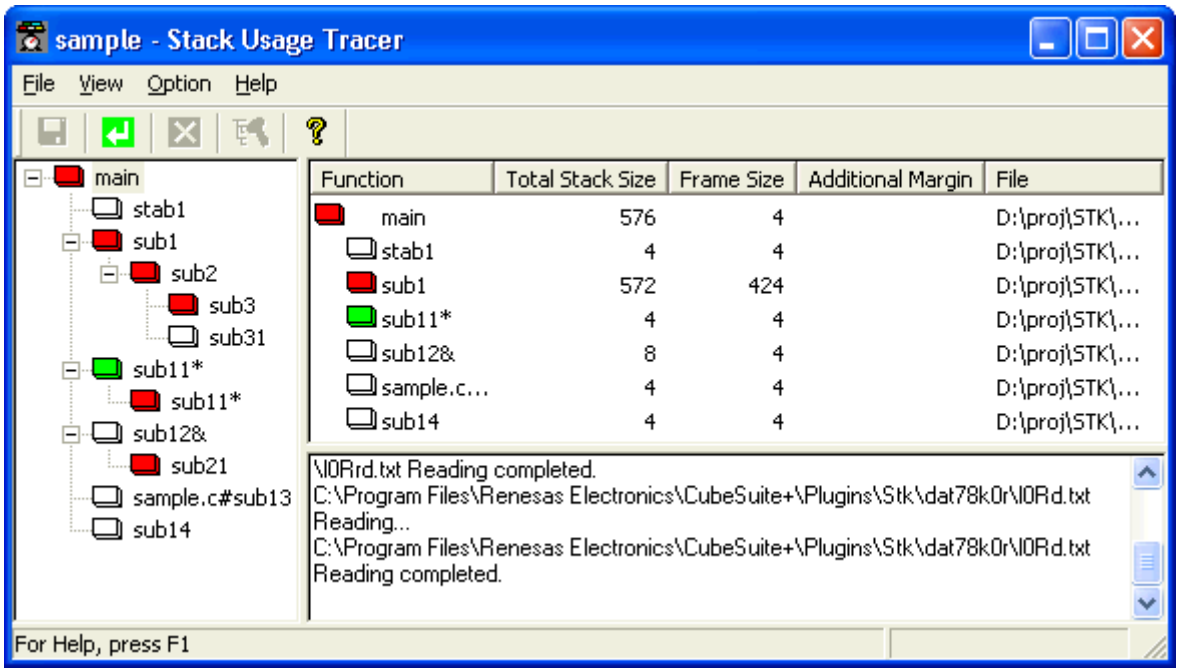
The stack usage tracer performs a static analysis, and displays the functions called by a function in a tree format, as well as stack information for each function (function name, total stack size, frame size, additional margin, and file name) in list format.

2.17.1 Starting and exiting

To start the stack usage tracer, from the Main window, select the [Tool] menu >> [Startup Stack Usage Tracer].

After the stack usage tracer finishes starting up, it will display the function call relationship and stack information for each function in the tree display area/list display area of the Stack Usage Tracer window.

Figure 2-112. Starting Up Stack Usage Tracer

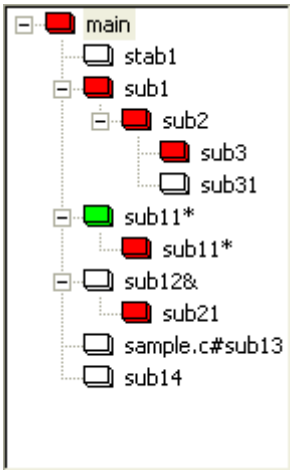


To exit the stack usage tracer, from the Stack Usage Tracer window, select [File] menu >> [Exit sk78k0r].

2.17.2 Check the call relationship

You can check the function-call relationship in the tree display area of the Stack Usage Tracer window.

Figure 2-113. Tree Display Area



Remark The table below shows the meaning of the icon displayed to the left of the string representing the function name.
The display priority for icons is from High: to Low: .

	The function directly called by a given function with the largest total stack size
	Information (additional margin, recursion depth, or callee functions) has been modified via the Adjust Stack Size dialog box or a stack size specification file
	Recursive function
	The stack usage tracer has not acquired any stack information for this function
	Other than the above

2.17.3 Check the stack information

You can check the stack information (function name, total stack size, frame size, additional margin, and file name) from the list display area of the Stack Usage Tracer window.

- Total stack size (including stack size of callee functions)
- Frame size (not including stack size of callee functions)
- Additional margin (value mandatorily added to frame size)

Figure 2-114. List Display Area

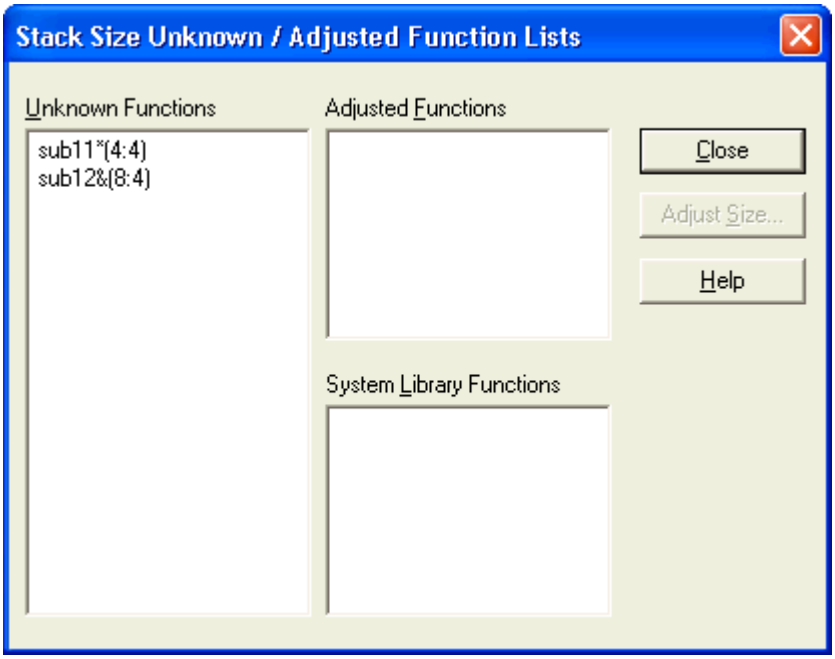
Function	Total Stack Size	Frame Size	Additional Margin	File
main	576	4		D:\proj\STK\...
stab1	4	4		D:\proj\STK\...
sub1	572	424		D:\proj\STK\...
sub11*	4	4		D:\proj\STK\...
sub12&	8	4		D:\proj\STK\...
sample.c...	4	4		D:\proj\STK\...
sub14	4	4		D:\proj\STK\...

Remark If you make changes to the project that will affect the total stack size while the stack usage tracer is running (e.g. you edit the files in your project so that the total stack size changes), then after rebuilding the project, click to update the display.

2.17.4 Check unknown functions

You can check functions for which the stack usage tracer could not obtain stack information in the Stack Size Unknown / Adjusted Function Lists dialog box, under [Unknown Functions].

Figure 2-115. Stack Size Unknown / Adjusted Function Lists Dialog Box



Remark Functions will appear under [Unknown Functions] in the following circumstances.

- The frame size could not be measured.
- A recursive function for which the recursion depth has not been set in the Adjust Stack Size dialog box.
- The function includes indirect function calls which are not set as callee functions in the Adjust Stack Size dialog box.

2.17.5 Change the frame size

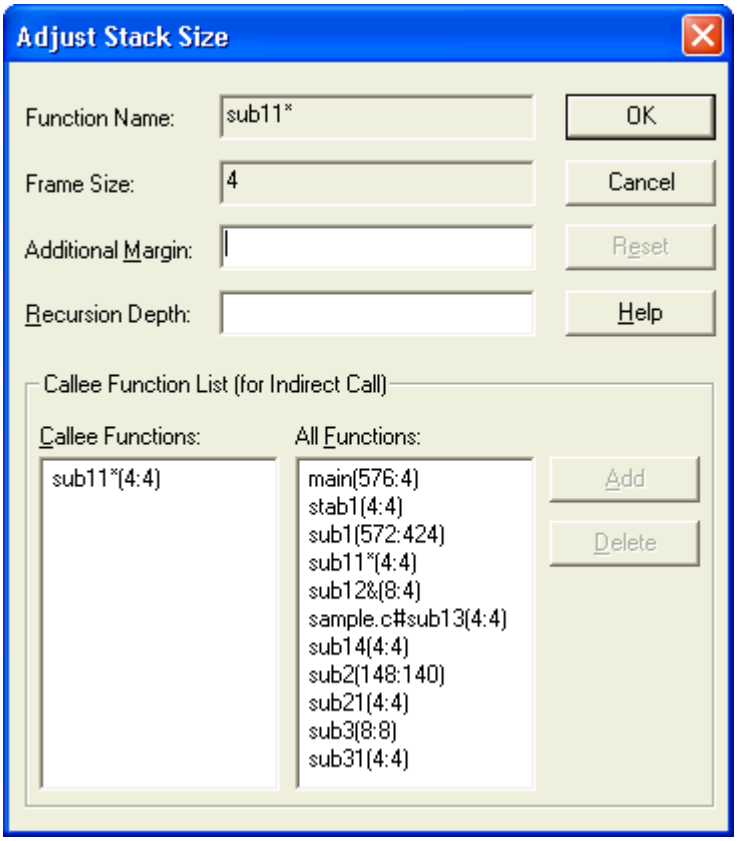
You can dynamically change the frame size of functions for which the stack usage tracer was not able to obtain stack information, or for functions that you intentionally want to modify, using the Adjust Stack Size dialog box or a stack size specification file.

(1) Using the Adjust Stack Size dialog box

The procedure for using the Adjust Stack Size dialog box is as follows.

- Select the desired item in the tree display area of the Stack Usage Tracer window, then click toolbar >> .
  The Adjust Stack Size dialog box opens.

Figure 2-116. Adjust Stack Size Dialog Box



- After setting [Additional Margin], [Recursion Depth], and [Callee Functions], click the [OK] button.

(2) Using a stack size specification file

Below is the procedure for using a stack size specification file.

- Create a stack size specification file

  Write the functions in the stack size specification file that you would like to set dynamically, using the following format.

  function name [, ADD=additional margin] [, RECTIME=recursion depth] [, CALL=callee function] ...

Figure 2-117. Sample Stack Size Specification File

```
# Set the frame size of function "_flib" written in assembly
# language to 50
[flib], ADD=50

# Set the frame size of function "sub2" written in C to 100
sub2, ADD=100

#Set the recursion depth of recursive function "sub3" written
# in C to 123
sub3, RECTIME=123
```

- From the Stack Usage Tracer window, select [File] menu >> [Load Stack Size Specification File...]. The Open dialog box opens. Specify the stack size specification file, then click the [Open] button.

CHAPTER 3 BUILD OUTPUT LISTS

This chapter describes format and other aspects of lists output by the build via various commands.

3.1 C Compiler

The C compiler outputs the following files.

- Assembler source file
- Error list file
- Preprocess list file
- Cross reference list file

Remark See "B.1.1 I/O files" for details about input and output files of the C compiler.

3.1.1 Assembler source file

The assembler source file is an ASCII image list of C source compilation results, and is a source file in assembly language that corresponds to the target C source program.

It can also include the C source to this file as comments by setting the assembler source file creation specification option (-sa).

To configure the assembler source file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Compile Options] tab. In the [Assembly File] category, set the [Output an assemble file] property to [Yes]. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property.

```
; 78K0R C Compiler V(1)x.xx Assembler Source       Date:(2)xx xxx xxxx Time:(3)xx:xx:xx

; Command   : (4)-cf1166a0 prime.c -sa
; In-file   : (5)prime.c
; Asm-file  : (6)prime.asm
; Para-file : (7)

    $PROCESSOR((8)F1166A0)
(9) $DEBUG
(10)$NODEBUGA
(11)$KANJICODE SJIS
(12)$RAM_ALLOCATE(@@CNSTR,@@CNSTLR,@@CODER)
(13)$TOL_INF        03FH, 0xxxH, 00H, 04000H, 00H, 00H, 00H

(14)$DGS    FIL_NAM, .file,         03BH, 0FFFEH, 03FH, 067H, 01H, 00H

                :

(15)        EXTRN   _@RTARG0

                :

    ; line  (16)1 : (17)#define TRUE    1
```

```
    ; line  (16)2 : (17)#define FALSE   0
    ; line  (16)3 : (17)#define SIZE    20

                :

(15)_main :
(18)$DGL    1, 39
(15)        push    hl                          ;(22)[INF] 1, 1
(15)        subw    sp,#08H                     ;(22)[INF] 2, 1
(15)        movw    hl,sp                       ;(22)[INF] 3, 1

                :

(19)??bf_main :

                :

    ; (23)*** Code Information ***
    ;
    ; (24)$FILE C:\Program Files\Renesas Electronics CubeSuite+\CubeSuite+\CA78K0R\Vx.xx\
Smp78k0r\CC78K0R\prime.c
    ;
    ; (25)$FUNC printf(8)
    ; (26)      void=(pointer s:ax, int i:[sp+4])
    ; (27)      CODE SIZE= 18 bytes, CLOCK_SIZE= 16 clocks, STACK_SIZE= 8 bytes
    ;
    ; (25)$FUNC putchar(17)
    ; (26)      void=(char c:x)
    ; (27)      CODE SIZE= 4 bytes, CLOCK_SIZE= 9 clocks, STACK_SIZE= 2 bytes
    ;
    ; (25)$FUNC main(23)
    ; (26)      void=(void)
    ; (27)      CODE SIZE= 148 bytes, CLOCK_SIZE= 107 clocks, STACK_SIZE= 16 bytes
    ;
    ; (28)$CALL printf(33)
    ; (29)      void=(pointer:ax, int:[sp+4])
    ;
    ; (28)$CALL putchar(35)
    ; (29)      void=(int:ax)
    ; (28)$CALL printf(40)
    ; (29)      void=(pointer:ax, int:[sp+4])

    ; Target chip : (20)uPD78F1166_A0
    ; Device file : (21)Vx.xx
```

Item Number	Description	Format
(1)	Version number	Displayed in "*x.yz*" format
(2)	Date	System date (Displayed in "*DD Mmm YYYY*" format)
(3)	Time	System time (Displayed in "*HH*:*MM*:*SS*" format)
(4)	Command line	Outputs the command line contents following "CC78K0R". Contents after column 80 are output beginning at column 15 on the next line. A semicolon (;) is output to column 1. One or more white-space characters or tabs are replaced by a single white-space character.
(5)	C source file name	Outputs the specified file name. If the file type is omitted, ".c" is attached as the file type (extension). Contents after column 80 are output beginning at column 15 on the next line. A semicolon (;) is output to column 1.
(6)	Assembler source file name	Outputs the specified file name. If the file type is omitted, ".asm" is attached as the file type (extension). Contents after column 80 are output beginning at column 15 on the next line. A semicolon (;) is output to column 1.
(7)	Parameter file contents	Outputs the parameter file contents. Contents after column 80 are output beginning at column 15 on the next line. A semicolon (;) is output to column 1. One or more white-space characters or tabs are replaced by a single white-space character.
(8)	Device type	This character string is specified via the -c option.
(9)	Debug information	Outputs DEBUG control. Output is either $DEBUG or $NODEBUG.
(10)	Debug information control of assembler	Outputs NODEBUGA control. Output is $NODEBUGA.
(11)	Kanji type information	Outputs the kanji code (2-byte code) type. Output is $KANJICODE SJIS, $KANJICODE EUC, or $KANJICODE NONE.
(12)	RAM area allocation specification control instruction	Allocates the segment with the specified segment name to RAM. This item is output only when the -zx option is specified.
(13)	Tool information	Outputs tool information, version number, error information, specified options, etc. (information starts with $TOL_INF).
(14)	Symbol information	Outputs symbol information (information starts with $DGS). This information is output only when the debug information output option has been specified. Even then, it is not output if the -g1 option has been specified.
(15)	Assembler source	Outputs an assembler source file containing the compilation results.
(16)	Line number	Outputs the C source module file's line numbers as right-aligned decimal value with zeros suppressed.
(17)	C source	This is the input C source image. Contents after column 80 are output beginning at column 16 on the next line. A semicolon (;) is output to column 1.
(18)	Line number information	Outputs the line number for line number entry (information starts with $DGL). This information is output only when the debug information output option has been specified. Even then, it is not output if the -g1 option has been specified.

Item Number	Description	Format
(19)	Labels for symbol information creation	Outputs function label information (information starts with ??). This information is output only when the debug information output option has been specified.
(20)	Target device for this compiler	Displays the target device as specified via command line option (-c) or the source file.
(21)	Device file version	Displays the version number of the input device file.
(22)	Size, clock	Outputs size and clock for output instructions. (Information starting with ;[INF]). If the number of clocks cannot be determined for an output instruction, clocks are output in the following format: "clock 1/clock 2." The number of clocks when accessing the internal RAM area or SFR area, or when not accessing for data, is output. For the conditional branch instruction, the number of clocks when the condition is established is output. Hazards are not considered. Note, therefore, that the output clock count is different from the actual clock count. It is just a reference value.
(23)	Function information (start)	Indicates start of function information.
(24)	Function information (file name)	Outputs target source file name with full path. (Information starting with ;$FILE).
(25)	Function information (definition function)	Outputs function name and defined line number as decimal code. (Information starting with ;$FUNC).
(26)	Function information (return value, argument of definition function)	Outputs the definition function's return value register and argument information (register or stack position).
(27)	Function information (definition function's size, clock, stack)	Outputs the size, clock, and maximum consumption stacks calculated statically for the definition function. Only the stack size used by a function itself is shown here. If a function calls another function, the stack size used by the called function is not added to the stack size of the calling function. CLOCK_SIZE is the result to which the number of clocks in item (22) is added.
(28)	Function information (call function)	Outputs the function name and function call line number as decimal code. (Information starting with ;$CALL).
(29)	Function information (Call function's return value, argument)	Outputs return value register and argument information during function call (register or stack position).

3.1.2 Error list file

An error list file contains messages regarding any errors and warnings that occurred during compilation.

The C source can be added to the error list by specifying a compile option. An error list file that contains a C source can be used as a C source file by revising the C source and deleting comments, such as the list header.

To configure the error list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Compile Options] tab. In the [List File] category, set the [Output error list file] property to [Yes]. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property.

- Error list file with C source

```
/*
78K0R C Compiler V(1)x.xx Error List   Date:(2)xx xxx xxxx Time:(3)xx:xx:xx

Command   : (4)-cf1166a0 prime.c -se
C-file    : (5)prime.c
Err-file  : (6)prime.cer
Para-file : (7)
*/

(8) #define TRUE    1
(8) #define FALSE   0
(8) #define SIZE    200

(8) char    mark [ SIZE + 1 ] ;

(8) void main ( ) {
(8)     int i , prime , k , count ;
(8)     cont = 0 ;
    *** CC78K0R error (9)E0711: (10)Undeclared 'cont' ; function 'main'
(8)     for ( i = 0 ; i <= SIZE ; i++ )
(8)             mark [ i ] = TRUE ;
(8)     for ( i = 0 ; i <= SIZE ; i++ ) {
(8)             if ( mark [ i ] ) {
(8)                     prime = i + i + 3 ;
(8)                     printf ( "%6d" , prime ) ;
    *** CC78K0R warning (9)W0745: (10)Expected function prototype
          :
/*
(11)Target chip : uPD78F1166_A0
(12)Device file : Vx.xx
Compilation complete, (13)1 error(s) and (14)5 warning(s) found.
*/
```

Item Number	Description	Format
(1)	Version number	Displayed in "*x.yz*" format
(2)	Date	System date (Displayed in "*DD Mmm YYYY*" format)
(3)	Time	System time (Displayed in "*HH*:*MM*:*SS*" format)
(4)	Command line	Outputs the command line contents following "CC78K0R". Contents after column 80 are output beginning at column 13 on the next line. One or more white-space tabs are replaced by a single white-space character.

Item Number	Description	Format
(5)	C source file name	Outputs the specified file name. If the file type is omitted, ".c" is attached as the file type (extension). Contents after column 80 are output beginning at column 13 on the next line.
(6)	Error list file name	Outputs the specified file name. If the file type is omitted, ".cer" is attached. Contents after column 80 are output beginning at column 13 on the next line.
(7)	Parameter file contents	Outputs the parameter file contents. Contents after column 80 are output beginning at column 13 on the next line. One or more white-space tabs are replaced by a single white-space character.
(8)	C source	This is the input C source image. Contents after column 80 are not wrapped to the next line.
(9)	Error message number	Outputs error numbers in the "#*nnnn*" format. "F" is output if "#" is an abort error, "E" if it is a fatal error, "C" if is an Internal error, and "W" if it is a warning. "*nnnn*" (the error number) is displayed as a 4-digit decimal number (no zero suppression).
(10)	Error message	Outputs error messages. Contents after column 80 are not wrapped to the next line.
(11)	Target device for this compiler	Displays the target device as specified via command line option (-c) or the source file.
(12)	Device file version	Displays the version number of the input device file.
(13)	Number of errors	Outputs a right-aligned decimal value with zeroes suppressed.
(14)	Number of warnings	Outputs a right-aligned decimal value with zeroes suppressed.

- Error list file with error message only

```
(1) prime.c ((2)18) : CC78K0R warning (3)W0745: (4)Expected function prototype
(1) prime.c ((2)20) : CC78K0R warning (3)W0745: (4)Expected function prototype
(1) prime.c ((2)26) : CC78K0R warning (3)W0622: (4)No return value
(1) prime.c ((2)37) : CC78K0R warning (3)W0622: (4)No return value
(1) prime.c ((2)44) : CC78K0R warning (3)W0622: (4)No return value

     Target chip : (5)uPD78F1166_A0
     Device file : (6)Vx.xx

Compilation complete, (7)0 error(s) and (8)5 warning(s) found.
```

Item Number	Description	Format
(1)	C source file name	Outputs the specified file name. If the file type is omitted, ".c" is attached as the file type (extension).
(2)	Line number	Outputs a right-aligned decimal value with zeroes suppressed.

Item Number	Description	Format
(3)	Error message number	Outputs error numbers in the "#*nnnn*" format. "F" is output if "#" is an abort error, "E" if it is a fatal error, "C" if is an Internal error, and "W" if it is a warning. "*nnnn*" (the error number) is displayed as a 4-digit decimal number (no zero suppression).
(4)	Error message	Outputs error messages.
(5)	Target device for this compiler	Displays the target device as specified via command line option -c or the source file.
(6)	Device file version	Displays the version number of the input device file.
(7)	Number of errors	Outputs a right-aligned decimal value with zeroes suppressed.
(8)	Number of warnings	Outputs a right-aligned decimal value with zeroes suppressed.

3.1.3 Preprocess list file

The preprocess list file is an ASCII image file that contains results of C source preprocessing only.

When specifying the -k option, a preprocess list file can be used as a C source file unless "n" has been specified as the processing type. When the -kd option is specified, the list with #define expansion is output.

To configure the preprocess list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Compile Options] tab. Select [Yes(-p)] on the [Output preprocess list file] property in the [List File] category. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property.

If PAGEWIDTH is 80, the result is as follows.

```
/*
78K0R C Compiler V(1)x.xx Preprocess List    Date:(2)xx xxx xxxx  Page: (3)xxxx

Command   : (4)-cf1166a0 prime.c -p -lw80
In-file   : (5)prime.c
PPL-file  : (6)prime.ppl
Para-file : (7)
*/

    (8) 1 : (9)#define TRUE    1
    (8) 2 : (9)#define FALSE   0
    (8) 3 : (9)#define SIZE    200
    (8) 4 : (9)
    (8) 5 : (9)char    mark [ SIZE + 1 ] ;
    (8) 6 : (9)
/*
 (10)Target chip : uPD78F1166_A0
 (11)Device file : Vx.xx
*/
```

Item Number	Description	Format
(1)	Version number	Displayed in "*x.yz*" format
(2)	Date	System date (Displayed in "*DD Mmm YYYY*" format)
(3)	Number of pages	Outputs a right-aligned decimal value with zeroes suppressed.
(4)	Command line	Outputs the command line contents following "CC78K0R". Contents that exceed the line length are output beginning at column 13 on the next line. One or more white-space tabs are replaced by a single white-space character.
(5)	C source file name	Outputs the specified file name. If the file type is omitted, ".c" is attached as the file type (extension). Contents that exceed the line length are output beginning at column 13 on the next line.
(6)	Preprocess list file name	Outputs the specified file name. If the file type is omitted, ".ppl" is attached. Contents that exceed the line length are output beginning at column 13 on the next line.
(7)	Parameter file contents	Outputs the parameter file contents. Contents that exceed the line length are output beginning at column 13 on the next line. A semicolon ";" is output to column 1. One or more white-space tabs are replaced by a single white-space character.
(8)	Line number	Outputs a right-aligned decimal value with zeroes suppressed.
(9)	C source	This is the input C source. Contents that exceed the line length are output beginning at column 9 on the next line.
(10)	Target device for this compiler	Displays the target device as specified via command line option (-c) or the source file.
(11)	Device file version	Displays the version number of the input device file.

3.1.4 Cross reference list file

Cross-reference list files contain lists of identifiers such as declarations, definitions, referenced functions, and variables. They also include other information, such as attributes and line numbers. These are output in the order they are found.

To configure the cross reference list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Compile Options] tab. Select [Yes(-x)] on the [Output cross reference list file] property in the [List File] category. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property.

If PAGEWIDTH is 80, the result is as follows.

```
78K0R C Compiler V(1)x.xx Cross reference List       Date:(2)xx xxx xxxx  Page: (3)xxxx

Command   : (4)-cf1166a0 prime.c -x -lw80
In-file   : (5)prime.c
Xref-file : (6)prime.xrf
Para-file : (7)
Inc-file  : (8)[ n ]

(9)ATTRIB (10)MODIFY (11)TYPE (12)SYMBOL (13)DEFINE   (14)REFERENCE

   EXTERN     NEAR       array    mark          5            14      16      22
   EXTERN     FAR        func     main          7
   AUTO1                 int      i             9            13      13      13      14
                                                             15      15      15      16
                                                             17      17      21
   AUTO1                 int      prime         9            17      18      21      21
   AUTO1                 int      k             9            21      21      21      22
   AUTO1                 int      count         9            11      19      20      25
  :
/*
 (15)Target chip : uPD78F1166_A0
 (16)Device file : Vx.xx
*/
```

Item Number	Description	Format
(1)	Version number	Displayed in "*x.yz*" format
(2)	Date	System date (Displayed in "*DD Mmm YYYY*" format)
(3)	Number of pages	Outputs a right-aligned decimal value with zeroes suppressed.
(4)	Command line	Outputs the command line contents following "CC78K0R". Contents that exceed the line length are output beginning at column 13 on the next line. One or more white-space tabs are replaced by a single white-space character.
(5)	C source file name	Outputs the specified file name. If the file type is omitted, ".c" is attached as the file type (extension). Contents that exceed the line length are output beginning at column 13 on the next line.
(6)	Cross reference list file name	Outputs the specified file name. If the file type is omitted, ".xrf" is attached. Contents that exceed the line length are output beginning at column 13 on the next line.
(7)	Parameter file contents	Outputs the parameter file contents. Contents that exceed the line length are output beginning at column 13 on the next line. One or more white-space tabs are replaced by a single white-space character.

Item Number	Description	Format
(8)	Include file	Displays the target device as specified via command line option (-c) or the source file. "n" is a number starting with "1" that indicates the include file number. Contents that exceed the line length are output beginning at column 13 on the next line. This line is not output when there is no include file.
(9)	Symbol attribute	Displays the symbol attributes. An external variable is displayed as EXTERN, an external static variable as EXSTC, an internal static variable as INSTC, an auto variable as AUTOnn, a register variable as REGnn (where nn is the scope value, a numerical value that begins with "1"), an external typedef declaration as EXTYP, an internal typedef declaration as INTYP, a label as LABEL, a structure or union tag as TAG, a member as MEMBER, and a function parameter as PARAM.
(10)	Symbol qualifier attributes	Displays the symbol qualifier attributes (left-aligned). A const variable is displayed as CONST, a volatile variable as VLT, a callt function as CALLT, an sreg-bit variable as SREG, an sfr variable as RWSFR, a read-only sfr variable as ROSFR, a write-only sfr variable as WOSFR, an interrupt function as VECT, functions and variables allocated in near area as NEAR, functions and variables allocated in far area as FAR.
(11)	Symbol type	Displays the symbol type. Types include char, int, short, long, and field. "u" is added at the start for unsigned type. Additional types include void, float, double, ldouble (long double), func, array, pointer, struct, union, enum, bit, inter, and #define.
(12)	Symbol name	If the symbol name exceeds 15 characters and fit into a line, that name is output as it is. If it exceeds 15 characters and one line, the excess is output from column 23 on the next line and items (13) and (14) are output from column 39 on the next line.
(13)	Symbol definition line number	This outputs the line number and file name defined for the symbol, and is displayed as: line number (5-digit): include file number (2-digit)
(14)	Symbol reference line number	This outputs the line number and file name that reference the symbol, and is displayed as: line number (5-digit): include file number (2-digit) If the line contents exceed the line length, the remaining contents are output beginning at column 48 of the next line.
(15)	Target device for this compiler	Displays the target device as specified via command line option (-c) or the source file.
(16)	Device file version	Displays the version number of the input device file.

3.2 Assembler

The assembler outputs the following list.

Output List File Name	Output List Name
Assemble list file	Assemble list file headers
	Assemble list
	Symbol list
	Cross reference list
Error list file	Error list

To configure the assemble list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Assemble Options] tab. Select [Yes(-p)] on the [Output assemble list file] property in the [Assemble List] category. To output the error list file, in the [Output File] category, set the [Output error list file] property to [Yes(-e)]. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property.

Remark See "B.2.1 I/O files" for details about input and output files of the assembler.

3.2.1 Assemble list file headers

The header is always output at the beginning of an assemble list file.

```
78K0R Assembler (1)Vx.xx (2)SAMPLE_TITLE     Date:(3)xx xxx xxxx  Page: (4)xxxx
(5)SAMPLE_SUBTITLE
Command:    (6) k0rmain.asm -cf1166a0
Para-file: (7) -ks -kx
In-fine:    (8) k0rmain.asm
Obj-file:   (9) k0rmain.rel
Prn-file:   (10)k0rmain.prn
```

Item Number	Description	Format
(1)	Assembler version number	Displayed in "*x.yz*" format
(2)	Title character string	Outputs the character string specified by the -lh option or TITLE control instruction.
(3)	Date of assemble list creation	Date of assemble list creation (Displayed in "*DD Mmm YYYY*" format)
(4)	Page number	Outputs a right-aligned decimal value with zeroes suppressed.
(5)	Subtitle character string	Outputs the character string specified by SUBTITLE control instruction.
(6)	Command line	Outputs the command line contents. Contents that exceed the line length are output beginning at column 11 on the next line. One or more white-space tabs are replaced by a single white-space character.
(7)	Parameter file contents	Outputs the parameter file contents. Contents that exceed the line length are output beginning at column 11 on the next line. One or more white-space tabs are replaced by a single white-space character.
(8)	Input source file name	Outputs the specified file name. If the file type is omitted, ".asm" is attached as the file type (extension). Contents that exceed the line length are output beginning at column 11 on the next line.

Item Number	Description	Format
(9)	Output object module file name	Outputs the specified file name. If the file type is omitted, ".ref" is attached. Contents that exceed the line length are output beginning at column 11 on the next line.
(10)	Print file name	Outputs the specified file name. If the file type is omitted, ".prn" is attached. Contents that exceed the line length are output beginning at column 11 on the next line.

3.2.2 Assemble list

The assemble list outputs the results of the assemble with error messages (if errors occur).

To configure the assemble list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Assemble Options] tab. Select [Yes(-p)] on the [Output assemble list file] property in the [Assemble List] category.

```
        Assemble list

(1)ALNO (2)STNO (6)ADRS   (8)OBJECT    (3)M (4)I   (5)SOURCE STATEMENT
      1       1
      2       2                                     NAME    SAMPM
      :
     31      31    0000A   RFD0000                  CALL  !CONVAH
                                                    ; convert ASCII <- HEX
     32      32                                     ; output BC-register <- ASCII code
     33      33    0000D    00000000                MOV   DE , #LOWW ( STASC )
                                                    ; set DE <- store ASCII code table
                   00011    00
(7)*** ERROR E2202, STNO 33 ( 33) Illegal operand
     34      34    00012    63                      MOV   A , B
     35      35    00013    99                      MOV   [ DE ] , A
      :
Segment informations :

(9)ADRS (10)LEN   (11)NAME

   FFE20    00003H    DATA
   00000    00002H    CODE
   00000    00019H    ?CSEG

 Target chip : (12)uPD78xxx
 Device file : (13)Vx.xx
Assembly complete, (14)1 error(s) and (15)0 warning(s) found. ( (16)33)
```

Item Number	Description	Format
(1)	Line number of source image	Outputs a right-aligned decimal value with zeroes suppressed.

Item Number	Description	Format
(2)	Line number	Outputs a right-aligned decimal value with zeroes suppressed. The expansion of INCLUDE files and macros are included.
(3)	Macro display	Displays a macro. - M: This is a macro definition line. - #n: This is a macro expansion line. "n" is the nest level. - Blank: This is not a macro definition or expansion line.
(4)	INCLUDE display	Displays INCLUDE. - In: Within an INCLUDE file. "n" is the nest level. - Blank: An INCLUDE file is not used.
(5)	Source statement	Displays source statements. Contents that exceed the line length are output beginning on the next line.
(6)	Location counter value	The line's start address appears as the label for machine instructions DB, DW, DS, and DBIT. It is displayed in hexadecimal format without zero suppression. It is displayed in hexadecimal format without zero suppression.
(7)	Line on which error occurred	This is a line on which error occurred. Required items are displayed.
(8)	Relocation information	Displays relocation information. - R: Object code or symbol value is changed by the linker. - Blank: Object code or symbol value is not changed by the linker.
(9)	Segment address	Displays a start address of a segment. It is displayed in hexadecimal format without zero suppression.
(10)	Segment size	Displays the segment size. It is displayed in hexadecimal format without zero suppression.
(11)	Segment name	Displays a segment name.
(12)	Target device for this assembler	Displays the target device as specified via command line option (-c) or the source file.
(13)	Device file version number	Displays the version number of the input device file.
(14)	Number of fatal errors	Outputs a right-aligned decimal value with zeroes suppressed.
(15)	Number of warnings	Outputs a right-aligned decimal value with zeroes suppressed.
(16)	Final error line	Outputs a right-aligned decimal value with zeroes suppressed.

3.2.3 Symbol list

A symbol list outputs the symbols (including local symbols) defined in a source.

To configure the symbol list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Assemble Options] tab. Select [Yes(-ks)] on the [Output with symbol list] property in the [Assemble List] category.

```
          Symbol Table List


(1)VALUE   (2)ATTR   (3)RTYP  (4)NAME              (1)VALUE   (2)ATTR   (3)RTYP  (4)NAME
             CSEG               ?CSEG                            CSEG               CODE
   -----H              EXT      CONVAH                           DSEG               DATA
   FFE20H    ADDR               HDTSA                     0H     ADDR      PUB      MAIN
             MOD                SAMPM                     0H     ADDR      PUB      START
   FFE21H    ADDR               STASC                 -----H               EXT      _@STBEG
```

Item Number	Description	Format
(1)	Symbol value	Displays a value with a symbol. Outputs a right-aligned hexadecimal number with zeros suppressed.
(2)	Symbol attributes	Displays the symbol attributes. (left-aligned) - CSEG: Code segment name - DSEG: Data segment name - BSEG: Bit segment name - MAC: Macro name - MOD: Module name - SET: Symbol defined by SET directive - NUM: NUMBER attribute symbol - ADDR: ADDRESS attribute symbol - BIT: BIT attribute symbol (addr.bit) - SABIT: BIT attribute symbol (saddr.bit) - SFBIT: BIT attribute symbol (sfr.bit) - RBIT: BIT attribute symbol (A.bit, X.bit, PSW.bit) - SFR: Names defined as SFRs by EQU directive - SFRP: Names defined as SFRPs by EQU directive - Blank: External reference symbol declared by EXTRN or EXTBIT - *****: Undefined symbol
(3)	Symbol reference format	Displays the symbol reference format. (left-aligned) - EXT: External reference symbol declared by EXTRN (SADDR attribute) - EXTB: External reference symbol declared by EXTBIT (saddr.bit) - PUB: External reference symbol declared by PUBLIC - Blank: Local symbol, segment name, macro name, module name - *****: Undefined symbol
(4)	Defined symbol name	Displays the defined symbol name. (left-aligned)

3.2.4 Cross reference list

A cross reference list outputs data indicating where (on what line) symbols are defined in a source.

To configure the cross reference list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Assemble Options] tab. Select [Yes(-kx)] on the [Output with cross reference list] property in the [Assemble List] category.

```
          Cross-Reference List


(1)NAME      (2)VALUE    (3)R (4)ATTR   (5)RTYP (6)SEGNAME (7)XREFS
   ?CSEG                       CSEG              ?CSEG          22#
   CODE                        CSEG              CODE           19#
   CONVAH       -----H     E              EXT                   12@    31
   DATA                        DSEG              DATA           15#
   HDTSA        FFE20H         ADDR              DATA           16#    28    29
   MAIN             0H         ADDR      PUB     CODE           11@    20#
   SAMPM                       MOD                               2#
   START            0H     R   ADDR      PUB     ?CSEG          11@    20    23#
   STASC        FFE21H         ADDR              DATA           17#    33
   _@STBEG      -----H     E              EXT                   13@    26
```

Item Number	Description	Format
(1)	Defined symbol name	Displays the defined symbol name. (left-aligned) If the symbol name exceeds 16 characters, that name is output as it is. Items (2), (4), (5), (6), (7) and (8) are output from the next line.
(2)	Symbol value	Displays a value with a symbol. Outputs a right-aligned hexadecimal number with zeros suppressed.
(3)	Relocation attributes	Displays the relocation attributes. - R: Relocatable symbol - E: External symbol - Blank: Absolute symbol - *: Undefined symbol

Item Number	Description	Format
(4)	Symbol attributes	Displays the symbol attributes. (left-aligned) - CSEG: Code segment name - DSEG: Data segment name - BSEG: Bit segment name - MAC: Macro name - MOD: Module name - SET: Symbol defined by SET directive - NUM: NUMBER attribute symbol - ADDR: ADDRESS attribute symbol - BIT: BIT attribute symbol (addr.bit) - SABIT: BIT attribute symbol (saddr.bit) - SFBIT: BIT attribute symbol (sfr.bit) - RBIT: BIT attribute symbol (A.bit, X.bit) - SFR: Names defined as SFRs by EQU directive - SFRP: Names defined as SFRPs by EQU directive - Blank: External reference symbol declared by EXTRN or EXTBIT - *****: Undefined symbol
(5)	Symbol reference format	Display the symbol reference format. (left-aligned) - EXT: External reference symbol declared by EXTRN (SADDR attribute) - EXTB: External reference symbol declared by EXTBIT (saddr.bit) - PUB: External reference symbol declared by PUBLIC - Blank: Local symbol, segment name, macro name, module name - *****: Undefined symbol
(6)	Defined segment name	Displays a segment name that a symbol is defined. (left-aligned)
(7)	Definition/reference line number	Displays the definition/reference line number. - Definition line: xxxxx# - Reference line: xxxxx Δ (Δ = 1 blank) - EXTRN declaration, EXTBIT declaration, PUBLIC declaration: xxxxx@

3.2.5 Error list

An error list stores the error messages output when the assembler is started up.

```
PASS1 Start
(1)ERROR.ASM((2)26) : RA78K0R (3)error (4)E2202: (5)Illegal operand
(1)ERROR.ASM((2)32) : RA78K0R (3)error (4)E2202: (5)Illegal operand
PASS2 Start
(1)ERROR.ASM((2)26) : RA78K0R (3)error (4)E2202: (5)Illegal operand
(1)ERROR.ASM((2)29) : RA78K0R (3)error (4)E2407: (5)Undefined symbol reference 'DTSA'
(1)ERROR.ASM((2)29) : RA78K0R (3)error (4)E2303: (5)Illegal expression
(1)ERROR.ASM((2)32) : RA78K0R (3)error (4)E2202: (5)Illegal operand
(1)ERROR.ASM((2)37) : RA78K0R (3)error (4)E2407: (5)Undefined symbol reference 'F'
(1)ERROR.ASM((2)37) : RA78K0R (3)error (4)E2303: (5)Illegal expression
```

Item Number	Description	Format
(1)	Name of source file in which error occurred	Outputs the name of source file in which error occurred.
(2)	Line on which error occurred	Outputs a left-aligned value with zeroes suppressed.
(3)	Type of error	Outputs the type of error.
(4)	Error number	Outputs error numbers in the "#*mnnn*" format. "2" is output if "*m*" is an assembler, "3" if it is a linker, "4" if is an object converter, "5" if is a librarian, and "6" if it is a list converter. "*nnn*" is the error number.
(5)	Error message	Outputs error messages.

Remark The file name and the line where the error occurred may not be displayed.

3.3 Linker

The linker outputs the following lists.

Output List File Name	Output List Name
Link list file	Link list file headers
	Map list
	Public symbol list
	Local symbol list
Error list file	Error list

To configure the link list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Link Options] tab. Select [Yes] on the [Output link list file] property in the [Link List] category. To output the error list file, in the [Error List] category, set the [Output error list file] property to [Yes(-e)]. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property. It is also shown on the project tree, under the Build tool generated files node.

Remark See "B.3.1 I/O files" for details about input and output files of the linker.

3.3.1 Link list file headers

The header is always output at the beginning of a link list file.

```
78K0R Linker (1)Vx.xx                                Date:(2)xx xxx xxxx  Page: (3)xxxx

Command:     (4)k0rmain.rel k0rsub.rel -s -ok0r.map -dk0r.dr
Para-file:   (5)
Out-file:    (6)k0rmain.lmf
Map-File:    (7)k0r.map
Direc-File:  (8)k0r.dr
Directive:   (9)MEMORY ROM  : ( 0H , 0ED800H )
             (9)MEMORY RAM1 : ( 0FCF00H , 1100H )
             (9)MEMORY RAM  : ( 0FE000H , 1F00H )

*** Link information ***

(10)      6 output segment(s)
(11)    9DH byte(s) real data
(12)     40 symbol(s) defined
```

Item Number	Description	Format
(1)	Linker version number	Displayed in "*x.yz*" format
(2)	Date of link list file creation	Date of link list file creation (Displayed in "*DD Mmm YYYY*" format)
(3)	Page number	Outputs a right-aligned decimal value with zeroes suppressed.
(4)	Command-line image	Displays the options specified at the startup line.
(5)	Parameter file contents	Outputs the parameter file contents.

Item Number	Description	Format
(6)	Output load module file name	Outputs the name of the load module file generated by the linker.
(7)	Link list file name	Output the name of the link list file generated by the linker.
(8)	Link directive file name	Output the name of the link directive file input by the linker.
(9)	Link directive file contents	Displays the contents of the link directive file.
(10)	Number of segments output to load module file	Displays the number of segments output to the load module file. Outputs a right-aligned decimal value with zeroes suppressed.
(11)	Size of data output to load module file	Displays the size of the data output to the load module file. Outputs a right-aligned decimal value with zeroes suppressed.
(12)	Number of symbols output to load module file	Displays the number of symbols output to the load module file. Outputs a right-aligned decimal value with zeroes suppressed.

3.3.2 Map list

The map list outputs data on the location of segments.

To configure the map list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Link Options] tab. Select [Yes] on the [Output with map list] property in the [Link List] category.

```
*** Memory map ***

  (1)SPACE=REGULAR

  MEMORY=(2)ROM
  BASE ADDRESS=(3)00000H    SIZE=(4)ED800H
        (6)OUTPUT    (7)INPUT     (8)INPUT     (9)BASE      (10)SIZE
           SEGMENT      SEGMENT      MODULE       ADDRESS
           CODE                                  00000H       00002H    (11)CSEG  AT
                        CODE         SAMPM        00000H       00002H
(5)  * gap *                                     00002H       000BEH
           ?CSEGOB0                              000C0H       00004H    (11)CSEG  OPT_BYTE
           ?CSEG                                 000C4H       00059H    (11)CSEG
                        ?CSEG        SAMPM        000C4H       00017H
                        ?CSEG        SAMPS        000DBH       00042H
(5)  * gap *                                     0011DH       ED6E3H


  MEMORY=RAM1
  BASE ADDRESS=(3)FCF00H    SIZE=(4)01100H
        (6)OUTPUT    (7)INPUT     (8)INPUT     (9)BASE      (10)SIZE
           SEGMENT      SEGMENT      MODULE       ADDRESS
(5)  * gap *                                     FCF00H       01100H
```

```
  MEMORY=RAM
  BASE ADDRESS=(3)FE000H    SIZE=(4)01F00H
        (6)OUTPUT    (7)INPUT     (8)INPUT     (9)BASE      (10)SIZE
           SEGMENT      SEGMENT      MODULE       ADDRESS
(5)  * gap *                                     FE000H       01E20H
           DATA                                  FFE20H       00003H    (11)DSEG  AT
                        DATA         SAMPM        FFE20H       00003H
(5)  * gap *                                     FFE23H       000DDH

 Target chip : (12)uPD78xxx
 Device File : (13)Vx.xx
```

Item Number	Description	Format
(1)	Memory space name	Displays the memory space name.
(2)	Memory area name	Displays the memory area name.
(3)	Memory area start address	Displays the start address of the memory area. It is displayed in hexadecimal format, left-padded with zeroes.
(4)	Memory area size	Displays the size of the memory area. It is displayed in hexadecimal format, left-padded with zeroes.
(5)	Output group	Displays "gap" for areas where nothing is located.
(6)	Segment names output to load module file	Displays the names of the segments output to the load module file.
(7)	Segment names read from object module file	Displays the names of the segments read from the object module file.
(8)	Input module name	Displays the module name of an input file that existed the input segment displayed in (7). If the module name exceeds 8 characters, that name is output as it is. Items (9), (10), and (11) are output from column 39 on the next line.
(9)	Segment start address	Displays the start address that output segments are allocated.
(10)	Output segment size	Displays the size of the output segments.
(11)	Segment type and reallocation attributes	Displays the segment type and the reallocation attributes.
(12)	Target device for this assembler	Displays the target device as specified via command line option (-c) or the source file.
(13)	Device file version	Displays the version number of the input device file.

3.3.3 Public symbol list

A public symbol list outputs data on public symbols defined in an input module.

To configure the public symbol list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Link Options] tab. Select [Yes(-kp)] on the [Output with public symbol list] property in the [Link List] category.

```
*** Public symbol list ***

(1)MODULE   (2)ATTR   (3)VALUE     (4)NAME

   SAMPM
              ADDR      00000H      MAIN
              ADDR      000D2H      START
   SAMPS
              ADDR      000E9H      CONVAH

              NUM       FFE20H      _@STBEG

              NUM       FE000H      _@STEND
```

Item Number	Description	Format
(1)	Name of module in which public symbols are defined	Displays the name of the input object module in which public symbols are defined.
(2)	Symbol attributes	Displays the symbol attributes. - CSEG: Code segment name - DSEG: Data segment name - BSEG: Bit segment name - MAC: Macro name - MOD: Module name - SET: Symbol defined by SET directive - NUM: NUMBER attribute symbol - ADDR: ADDRESS attribute symbol - BIT: BIT attribute symbol (addr.bit) - SABIT: BIT attribute symbol (saddr.bit) - SFBIT: BIT attribute symbol (sfr.bit) - RBIT: BIT attribute symbol (A.bit, X.bit PSW.bit) - SFR: Names defined as SFRs by EQU directive - SFRP: Names defined as SFRPs by EQU directive - Blank: External reference symbol declared by EXTRN or EXTBIT - *****: Undefined symbol
(3)	Symbol value	Displays the public symbol values.
(4)	Public symbol name	Displays the public symbol names.

3.3.4 Local symbol list

A local symbol list outputs data on local symbols defined in an input module.

To configure the local symbol list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Link Options] tab. Select [Yes(-kl)] on the [Output with local symbol list] property in the [Link List] category.

```
*** Local symbol list ***

(1)MODULE   (2)ATTR   (3)VALUE     (4)NAME

   SAMPM
              MOD                    SAMPM
              DSEG                   DATA
              ADDR      FFE20H       HDTSA
              ADDR      FFE21H       STASC
              CSEG                   CODE
              CSEG                   ?CSEG
   SAMPS
              MOD                    SAMPS
              CSEG                   ?CSEG
              ADDR      00114H       SASC
              ADDR      0011AH       SASC1
```

Item Number	Description	Format
(1)	Name of module in which local symbols are defined	Displays the name of the input object module in which local symbols are defined.
(2)	Symbol attributes	Displays the symbol attributes. - CSEG: Code segment name - DSEG: Data segment name - BSEG: Bit segment name - MAC: Macro name - MOD: Module name - SET: Symbol defined by SET directive - NUM: NUMBER attribute symbol - ADDR: ADDRESS attribute symbol - BIT: BIT attribute symbol (addr.bit) - SABIT: BIT attribute symbol (saddr.bit) - SFBIT: BIT attribute symbol (sfr.bit) - RBIT: BIT attribute symbol (A.bit, X.bit PSW.bit) - SFR: Names defined as SFRs by EQU directive - SFRP: Names defined as SFRPs by EQU directive - Blank: External reference symbol declared by EXTRN or EXTBIT - *****: Undefined symbol
(3)	Symbol value	Displays the local symbol values.
(4)	Local symbol name	Displays the local symbol names.

3.3.5 Error list

An error list stores the error messages output when the linker is started up.

```
LK78K0R (1)error (2)E3405: (3)Undefined symbol 'CONVAH' in file 'k0rmain.rel'
```

Item Number	Description	Format
(1)	Type of error	Outputs the type of error.
(2)	Error number	Outputs error numbers in the "#*nnnn*" format. "F" is output if "#" is an abort error, "E" if it is a fatal error, "C" if is an Internal error, and "W" if it is a warning. "*nnnn*" (the error number) is displayed as a 4-digit decimal number (no zero suppression).
(3)	Error message	Outputs error messages.

3.4 ROMization Processor

The ROMization processor outputs the following lists.

Output List File Name	Output List Name
Link map file	Link map file headers
	Map list
	Public symbol list
	Local symbol list
Error list file	Error list

To configure the link map file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [ROMization Process Options] tab. Select [Yes] in the [Output link map file] property in the [Link Map] category. To output the error list file, in the [Error List] category, set the [Output error list file] property to [Yes(-e)]. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property. It is also shown on the project tree, under the Build tool generated files node.

Remark See "B.4.1 I/O Files" for details about input and output files of the ROMization processor.

3.4.1 Link map file headers

The header is always output at the beginning of a link map file.

```
78K0R ROM Processor (1)Vx.xx                          Date:(2)xx xxx xxxx  Page: (3)xxxx


Command:     (4)a.lmf -rc300h -km
Para-file:   (5)
Out-file:    (6)a.lmf
Map-File:    (7)a_romp.map



*** Link information ***


(8)      6 output segment(s)
(9)    F7H byte(s) real data
(10)     78 symbol(s) defined
```

Item Number	Description	Format
(1)	ROMization processor version number	Displayed in "x.yz" format
(2)	Date of link map file creation	Date of link map file creation (Displayed in "*DD Mmm YYYY*" format)
(3)	Page number	Outputs a right-aligned decimal value with zeroes suppressed.
(4)	Command-line image	Displays the options specified at the startup line.
(5)	Parameter file contents	Outputs the parameter file contents.
(6)	Output load module file name	Outputs the name of the load module file generated by the ROMization processor.

Item Number	Description	Format
(7)	Link map file name	Outputs the name of the link map file generated by the ROMization processor.
(8)	Number of segments output to load module file	Displays the number of segments output to the load module file. Outputs a right-aligned decimal value with zeroes suppressed.
(9)	Size of data output to load module file	Displays the size of the data output to the load module file. Outputs a right-aligned decimal value with zeroes suppressed.
(10)	Number of symbols output to load module file	Displays the number of symbols output to the load module file. Outputs a right-aligned decimal value with zeroes suppressed.

3.4.2 Map list

The map list outputs data on the location of segments.

To configure the map list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [ROMization Process Options] tab. Select [Yes] on the [Output with map list] property in the [Link Map] category.

```
*** Memory map ***


  (1)SPACE=REGULAR

        (3)OUTPUT    (4)INPUT     (5)INPUT     (6)BASE      (7)SIZE
           SEGMENT      SEGMENT      MODULE       ADDRESS
           CODE                                  00000H       00002H        (8)CSEG AT
                        CODE         a.lmf
                                                 00000H       00002H
(2)  * gap *                                     00002H       000BEH
           ?CSEGOB0                              000C0H       00004H        (8)CSEG AT
                        ?CSEGOB0     a.lmf
                                                 000C0H       00004H
           ?CSEG                                 000C4H       00061H        (8)CSEG AT
                        ?CSEG        a.lmf
                                                 000C4H       00061H
(2)* gap *                                       00125H       001DBH
           @@ROMP                                00300H       00090H        (8)CSEG AT
                        _@ROMP       _rcopy      00300H       0008EH
                        PRO_RAM      a.lmf
                                                 0038EH       00002H
(2)* gap *                                       00390H       3FC70H

        (3)OUTPUT    (4)INPUT     (5)INPUT     (6)BASE      (7)SIZE
           SEGMENT      SEGMENT      MODULE       ADDRESS
(2)* gap *                                       FCF00H       02F20H
           DATA                                  FFE20H       00003H       (8)DSEG AT
                        DATA         a.lmf
```

```
                                                FFE20H      00003H
(2)* gap *                                      FFE23H      0000DH
          PRO_RAM                               FFE30H      00002H      (8)CSEG AT
                      PRO_RAM     a.lmf
                                                FFE30H      00002H
(2)* gap *                                      FFE32H      000CEH
(2)* gap (Not Free Area) *                      FFF00H      00100H


*** Segment number ***


        (9)SEGMENT NAME                                 (10)SEGMENT NUMBER
           PRO_RAM                                          1


 Target chip : (11)uPD78xxx
 Device file : (12)Vx.xx
```

Item Number	Description	Format
(1)	Memory space name	Displays the memory space name.
(2)	Output group	Displays "gap" for areas where nothing is located.
(3)	Segment names output to load module file	Displays the names of the segments output to the load module file.
(4)	Segment names read from input load module file	Displays the names of the segments read from the input load module file.
(5)	Input load module file name	Displays the module name of an input load module file that existed the input segment displayed in (4). If the module name exceeds 8 characters, that name is output as it is. Items (6), (7), and (8) are output from column 39 on the next line.
(6)	Segment start address	Displays the start address that output segments are allocated.
(7)	Output segment size	Displays the size of the output segments.
(8)	Segment type and reallocation attributes	Displays the segment type and the reallocation attributes.
(9)	Segment name	Displays the name of the ROMized segment.
(10)	Segment number	Displays the segment number (argument of _rcopy()) specified when it is deployed. The segment number is an integer that starts from 1. It is allocated in the order in which the segment appears in the input file.
(11)	Target device for this assembler	Displays the target device as specified via command line option (-c) or the source file.
(12)	Device file version	Displays the version number of the input device file.

3.4.3 Public symbol list

A public symbol list outputs data on public symbols defined in an input module.

To configure the public symbol list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [ROMization Process Options] tab. Select [Yes(-kp)] on the [Output with public symbol list] property in the [Link Map] category.

```
*** Public symbol list ***

(1)MODULE    (2)ATTR      (3)VALUE     (4)NAME

  k0rram
              ADDR         00000H       MAIN
              ADDR         000C4H       START
              ADDR         000E3H       CONVAH
              NUM          FFE20H       _@STBEG
              NUM          00300H       __rcopy
              ADDR         FFE30H       pro_ram
              NUM          FCF00H       _@STEND
              NUM          00000H       _@MAA
  _rcopy
              ADDR         00300H       _@RCP
              NUM          0038EH       _S_romp
```

Item Number	Description	Format
(1)	Name of module in which public symbols are defined	Displays the name of the input object module in which public symbols are defined.
(2)	Symbol attributes	Displays the symbol attributes. - CSEG: Code segment name - DSEG: Data segment name - BSEG: Bit segment name - MAC: Macro name - MOD: Module name - SET: Symbol defined by SET directive - NUM: NUMBER attribute symbol - ADDR: ADDRESS attribute symbol - BIT: BIT attribute symbol (addr.bit) - SABIT: BIT attribute symbol (saddr.bit) - SFBIT: BIT attribute symbol (sfr.bit) - RBIT: BIT attribute symbol (A.bit, X.bit PSW.bit) - SFR: Names defined as SFRs by EQU directive - SFRP: Names defined as SFRPs by EQU directive - Blank: External reference symbol declared by EXTRN or EXTBIT - *****: Undefined symbol
(3)	Symbol value	Displays the public symbol values.
(4)	Public symbol name	Displays the public symbol names.

3.4.4 Local symbol list

A local symbol list outputs data on local symbols defined in an input module.

To configure the local symbol list output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [ROMization Process Options] tab. Select [Yes(-kl)] on the [Output with local symbol list] property in the [Link Map] category.

```
*** Local symbol list ***

(1)MODULE    (2)ATTR      (3)VALUE     (4)NAME

   k0rram
               MOD                       SAMPM
               DSEG                      DATA
               ADDR         FFE20H       HDTSA
               ADDR         FFE21H       STASC
               CSEG                      CODE
               CSEG                      ?CSEG
   k0rram
               MOD                       SAMPS
               CSEG                      ?CSEG
               ADDR         0011CH       SASC
               ADDR         00122H       SASC1
   k0rram
               MOD                       k0rram
               CSEG                      PRO_RAM
   _rcopy
               MOD                       _rcopy
                            00300H      _@ROMP
               ADDR         00384H      ?L_RCPC
               ADDR         0037BH      ?L_RCP9
               ADDR         00386H      ?L_RCPA
               ADDR         00318H      ?L_RCP1
               ADDR         0032CH      ?L_RCP2
               ADDR         0033BH      ?L_RCP3
               ADDR         0034AH      ?L_RCP4
               ADDR         00351H      ?L_RCP5
               ADDR         00360H      ?L_RCP6
               ADDR         00372H      ?L_RCP7
               ADDR         00372H      ?L_RCP8
```

Item Number	Description	Format
(1)	Name of module in which local symbols are defined	Displays the name of the input object module in which local symbols are defined.

Item Number	Description	Format
(2)	Symbol attributes	Displays the symbol attributes. - CSEG: Code segment name - DSEG: Data segment name - BSEG: Bit segment name - MAC: Macro name - MOD: Module name - SET: Symbol defined by SET directive - NUM: NUMBER attribute symbol - ADDR: ADDRESS attribute symbol - BIT: BIT attribute symbol (addr.bit) - SABIT: BIT attribute symbol (saddr.bit) - SFBIT: BIT attribute symbol (sfr.bit) - RBIT: BIT attribute symbol (A.bit, X.bit PSW.bit) - SFR: Names defined as SFRs by EQU directive - SFRP: Names defined as SFRPs by EQU directive - Blank: External reference symbol declared by EXTRN or EXTBIT - *****: Undefined symbol
(3)	Symbol value	Displays the local symbol values.
(4)	Local symbol name	Displays the local symbol names.

3.4.5 Error list

An error list stores the error messages output when the ROMization processor is started up.

```
RP78K0R (1)error (2)E8405: (3)Undefined symbol 'CONVAH' in file 'a.lmf'
```

Item Number	Description	Format
(1)	Type of error	Outputs the type of error.
(2)	Error number	Outputs error numbers in the "#*nnnn*" format. "F" is output if "#" is an abort error, "E" if it is a fatal error, "C" if is an Internal error, and "W" if it is a warning. "*nnnn*" (the error number) is displayed as a 4-digit decimal number (no zero suppression).
(3)	Error message	Outputs error messages.

3.5 Object Converter

The object converter outputs the following list.

Output List File Name	Output List Name
Error list file	Error list

To configure the error list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Object Convert Options] tab. Select [Yes(-e)] on the [Output error list file] property in the [Error List] category. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property. It is also shown on the project tree, under the Build tool generated files node.

Remark See "B.5.1 I/O files" for details about input and output files of the object converter.

3.5.1 Error list

Error messages output when the object converter is started up are stored in an error list.
The output format is same as error list output by the linker.

3.6 Librarian

The librarian outputs the following list.

Output List File Name	Output List Name
List file	Library information output list

To configure the list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Create Library Options] tab. Select [Yes] on the [Output list file] property in the [Error List] category. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property. It is also shown on the project tree, under the Build tool generated files node.

Remark See "B.6.1 I/O files" for details about input and output files of the librarian.

3.6.1 Library information output list

The library information output list outputs data on the modules in a library file.

```
78K0R librarian (1)Vx.xx                    Date:(2)xx xxx xxxx  Page(3)xxxx

LIB-FILE NAME : (4)k0r.lib         ((5)xx xxx xxxx)

  (6)0001  (7)k0rmain.rel     ((8)xx xxx xxxx)

    (9)MAIN    (9)START

  NUMBER OF PUBLIC SYMBOLS : (10)2

  (6)0002  (7)k0rsub.rel      ((8)xx xxx xxxx)

    (9)CONVAH

  NUMBER OF PUBLIC SYMBOLS : (10)1
```

Item Number	Description	Format
(1)	Librarian version number	Displayed in "*x.yz*" format
(2)	Date of list creation	Date of list creation (Displayed in "*DD Mmm YYYY*" format)
(3)	Number of pages	Outputs a right-aligned decimal value with zeroes suppressed.
(4)	Library file name	Outputs the specified file name. If the file type is omitted, ".lib" is attached as the file type (extension).
(5)	Date of library file creation	Date of library file creation (Displayed in "*DD Mmm YYYY*" format)
(6)	Module serial number	Numbers are assigned starting with 0001.
(7)	Module name	Displays the module name. If the file type is omitted, ".ref" is attached as the file type (extension).
(8)	Date of module creation	Date of module creation (Displayed in "*DD Mmm YYYY*" format)

Item Number	Description	Format
(9)	Public symbol name	Display the public symbol name.
(10)	Number of public symbols defined in module	Displays the number of public symbols defined in the module. Outputs a right-aligned decimal value with zeroes suppressed.

3.7 List Converter

The list converter outputs the following lists.

Output List File Name	Output List Name
Absolute assemble list file	Absolute assemble list
Error list file	Error list

To configure the absolute assemble list file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Assemble Options] tab. Select [Yes] on the [Execute list converter] property in the [Assemble List] category. To output the error list file, in the [Assemble List] category, set the [Output list converter error list file] property to [Yes(-e)]. The output destination is the folder set from the [Common Options] tab, in the [Output File Type And Path] category, in the [Intermediate file output folder] property.

Remark See "B.7.1 I/O files" for details about input and output files of the list converter.

3.7.1 Absolute assemble list

The absolute assemble list embeds absolute values in the assemble list and outputs the list.
The output format is same as for the assemble list output by the assembler.

3.7.2 Error list

Error messages output when the list converter is started up are stored in an error list.
The output format is same as for the error list output by the assembler.

3.8 Variables/Functions Information File Generator

The variables/functions information file generator outputs the following file.

- Variables/functions information file

Remark See "B.8.1 I/O files" for details about input and output files of the variables/functions information file generator.

3.8.1 Variables/functions information file

The variables/functions information file contains information for efficiently allocating variables and functions.

To configure the variables/functions information file output in CubeSuite+, on the Project Tree panel, select the Build tool node, then on the Property panel, make the settings from the [Variables/Functions Relocation Options] tab. In the [Output File] category, set the [Output variables/functions information file] property to [Yes]. Specify the output destination in the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property. It is also shown on the project tree, under the Build tool generated files node.

```
;VF78K0R (1)Vx.xx
; Attention:The semicolon at the head of line means the line is a comment.
;           Please refer to the "format information" for the item of each section.
;(2)*** format information ***
;[sreg]
;variable,count,size,type,"file",const  ;static-const
;variable,count,size,type,,const        ;global-const
;variable,count,size,type,"file"        ;static
;variable,count,size,type               ;global
;variable,count,size,type,,const,boot   ;global-const in boot
;variable,count,size,type,,,boot        ;global in boot
;;type : near=1 , far=2 , sreg=0
;
;[callt]
;variable,count,type,"file"     ;static
;variable,count,type            ;global
;variable,count,type,,boot      ;global in boot
;;type : near=1 , far=2 , callt=0
;
;(3)*** gap information ***
;[callt-gap]
;(4)START     (5)SIZE
;   00080H       00040H
;[base-gap]
;(4)START     (5)SIZE
;   00190H       00E70H
;   01004H       00FFCH
;   02004H       00008H
;   02018H       000ECH
;   0210CH       03EF4H
;   060F7H       00001H
```

```
;    06100H        09EFCH
;[saddr-gap]
;(4)START      (5)SIZE
;    FFE26H        000BAH
;
;(6)*** variable information ***
[sreg]
(7)f,(8)3,(9)1,(10)1
(7)flash_a,(8)2,(9)2,(10)1
(7)flash_b,(8)2,(9)2,(10)1
;(7)var1,(8)1,(9)2,(10)1,(11)"flash.c",(12)const
;(7)var2,(8)1,(9)2,(10)1,,const
(7)var3,(8)1,(9)4,(10)1,(11)"flash.c"
;(7)boot_a,(8)1,(9)2,(10)0,,,(13)boot
;(7)boot_b,(8)1,(9)2,(10)0,,,(13)boot
;
;(14)*** function information ***
[callt]
;(15)f1,(16)1,(17)1,(18)"flash.c"
;(15)f2,(16)1,(17)1
;(15)func,(16)1,(17)1,,(19)boot
```

Item Number	Description	Format
(1)	Version number	Displayed in "*x.yz*" format
(2)	Format information (start)	Indicates start of format information of the variable and function information.
(3)	Vacant area information (start)	Indicates start of vacant area information of the saddr area, BASE area, and callt area. Comments out by adding a semicolon (;) to the beginning of the line.
(4)	Vacant area information (start address)	Outputs the start address of the vacant area.
(5)	Vacant area information (size)	Outputs the size of the vacant area.
(6)	Variable information (start)	Indicates start of variable information. Variable information is output in the order of priority, from highest to lowest. Since const, sreg, and static variables, and variables defined in the boot area that are referenced by the flash area cannot be allocated to the saddr area, comments out these variables by adding a semicolon (;) to the beginning of the line.
(7)	Variable information (variable name)	Outputs the variable name.
(8)	Variable information (number of references)	Outputs the number of references of the variable.
(9)	Variable information (size)	Outputs the size of the variable.
(10)	Variable information (reference type)	Outputs the reference type of the variable. near: 1 (changes from the near area to the saddr area) far: 2 (changes from the far area to the saddr area) sreg: 0 (Already allocated to the saddr area via the sreg specification)

Item Number	Description	Format
(11)	Variable information (file name)	Outputs the target source file name surrounded by quotation marks (" "). Although static variables are output, global variables are not.
(12)	Variable information (const variable)	"const" is output for const variables.
(13)	Variable information (variable for the boot area)	If a variable is defined in the boot area and referenced by the flash area, then "boot" is output.
(14)	Function information (start)	Indicates start of function information. Function information is output in the order of priority, from highest to lowest. Since functions in the flash area, callt functions, and static functions cannot be allocated to the saddr area, comments out these variables by adding a semicolon (;) to the beginning of the line.
(15)	Function information (function name)	Outputs the function name.
(16)	Function information (number of references)	Outputs the number of references of the function.
(17)	Function information (reference type)	Outputs the reference type of the function. near: 1 (changes from the near area to the callt area) far: 2 (changes from the far area to the callt area) sreg: 0 (Already allocated to the callt area)
(18)	Function information (file name)	Outputs the target source file name surrounded by quotation marks (" "). Although static functions are output, global functions are not.
(19)	Function information (function for the boot area)	If a function is defined in the boot area and referenced by the flash area, then "boot" is output.

CHAPTER 4 SAMPLE PROGRAMS

This chapter introduces the lists of sample programs attached to CA78K0R (build tool) in CubeSuite+.

4.1 C Compiler

This section introduces the lists of sample programs attached to the C compiler.

4.1.1 C source file

```
#define TRUE    1
#define FALSE   0
#define SIZE    200

char    mark [ SIZE + 1 ] ;

void main ( void ) {
        int     i , prime , k , count ;

        count = 0 ;

        for ( i = 0 ; i <= SIZE ; i++ )
                mark [ i ] = TRUE ;
        for ( i = 0 ; i <= SIZE ; i++ ) {
                if ( mark [ i ] ) {
                        prime = i + i + 3 ;
                        printf ( "%6d" , prime ) ;
                        count++ ;
                        if ( ( count%8 ) == 0 ) putchar ( '\n' ) ;
                        for ( k = i + prime ; k <= SIZE ; k += prime )
                                mark [ k ] = FALSE ;
                }
        }
        printf ( "\n%d primes found." , count ) ;
}

printf ( char *s , int i ) {
        int     j ;
        char    *ss ;

        j = i ;
        ss = s ;
}

putchar ( char c ) {
        char    d ;
```

```
        d = c ;
}
```

Remark The following warning is output when this file is compiled.

```
prime.c (17) : CC78K0R warning W0745 : Expected function prototype
prime.c (19) : CC78K0R warning W0745 : Expected function prototype
prime.c (33) : CC78K0R warning W0622 : No return value
prime.c (38) : CC78K0R warning W0622 : No return value
```

4.2 Assembler

This section introduces the lists of sample programs attached to the assembler.

4.2.1 k0rmain.asm

```
        NAME    SAMPM
; ***********************************************
;       HEX -> ASCII Conversion Program
;               main-routine
; ***********************************************

PUBLIC  MAIN , START
EXTRN   CONVAH
EXTRN   _@STBEG

DATA    DSEG    AT      0FFE20H
HDTSA : DS      1
STASC : DS      2

CODE    CSEG    AT      0H
MAIN :  DW      START

        CSEG
START :

        ; chip initialize
        MOVW    SP , #_@STBEG

        MOV     HDTSA , #1AH
        MOVW    HL , #LOWW ( HDTSA )    ; set hex 2-code data in HL registor

        CALL    !CONVAH                 ; convert ASCII <- HEX
                                        ; output BC-register <- ASCII code
        MOVW    DE , #LOWW ( STASC )    ; set DE <- store ASCII code table
        MOV     A , B
        MOV     [ DE ] , A
        INCW    DE
        MOV     A , C
        MOV     [ DE ] , A
        BR      $$

        END
```

4.2.2 k0rsub.asm

```
        NAME    SAMPS
; ************************************************************
;       HEX -> ASCII Conversion Program
;               sub-routine
;   input condition     : ( HL )        <- hex 2 code
;   output condition    : BC-register   <- ASCII 2 code
; ************************************************************

PUBLIC  CONVAH

        CSEG
CONVAH :
        XOR     A , A
        ROL4    [ HL ]          ; hex lower code load
        CALL    !SASC
        MOV     B , A           ; store result

        XOR     A , A
        ROL4    [ HL ]          ; hex lower code load
        CALL    !SASC
        MOV     C , A           ; store result
        RET

; ************************************************************
;       subroutine      convert ASCII code
;
;   input       Acc ( lower 4bits )     <- hex code
;   output      Acc                     <- ASCII code
; ************************************************************

SASC :
        CMP     A , #0AH        ; check hex code > 9
        BC      $SASC1
        ADD     A , #07H        ; bias ( +7H )
SASC1 :
        ADD     A , #30H        ; bias ( +30H )
        RET

        END
```

CHAPTER 5 CAUTIONS

This chapter provides notes for using CubeSuite+ and CA78K0R commands.

(1) Kanji code (2-byte code) classification

To use a source containing EUC code, set the environmental variable LANG78K to euc, or specify the -ze option.
When using CubeSuite+, on the Property panel, configure the [Kanji character code of source] property in [Extension] category from the [Compile Options] tab (for C source file) or the [Kanji character code of source files] property in the [Others] category from the [Assemble Options] tab (for assembler source).
If the specified Japanese character encoding scheme differs from the encoding scheme used in the source, an error might occur during building, or some of the code might be incorrectly processed as comments.

(2) Specification of compile options

When using CA78K0R, note the following points:

- When several specifications have been made for an option that does not allow multiple specifications, the last specification takes precedence.
- The type specification following the -c option must not be omitted. During compilation, if the specified option is different from the option in the C source, the specified option takes precedence. A warning message is output at that time.
- If the help option has been specified, all other options are ignored.

(3) Source file names

The part except the source file name extension (primary name) is used as the module name by default. Therefore, some restrictions apply to the source file names that can be used.

- Regarding the length of the file name, configure the file name with a primary name and extension within the range allowed by the host OS, and separate the primary name and the extension with a dot (.).
- The characters that can be used for the primary name and the extension consist of the characters allowed by the host OS, except parentheses (( )), semicolons (;), and commas (,). Note that a hyphen (-) cannot be used as the first character of a file name or file name. Do not specify file names that include a space or 2-byte characters.
- Sharp symbol (#) cannot be used for file names and path names in parameter files.

(4) Using assembler source as output

When a C source file contains descriptions that use assembly language such as #asm blocks or __asm statements, the load module file creation procedure sequence is compile, assemble, and then link.
Note the following if you want to use the C compiler to first output an assembly source file and then assemble it, rather than directly output an object file, as with files written in assembly language and the like.

- If the C source contains #asm blocks and __asm statements, specify the -a or -sa option to enable assembly descriptions, and assemble the output assembler source.
  When using CubeSuite+, from the Property panel, on the [Compile Options] tab, in the [Asseembly File] category, for the [Output an assemble file] property, specify to output assembler source files, or for sources for which only assembler source files are output, on the [Individual Compile Options] tab, in the [Asseembly File] category, set the [Output an assemble file] property to output assembler source files.
- When using CubeSuite+, the assembler is started regardless of compile options -o/-no when the output of assembler source files is specified.

(5) Generation of stack decision symbols specification option (-s)

To secure a stack area, specify the link option (-s) during linking.
When using CubeSuite+, The setting is performed in [Stack] category from the [Link Options] tab on the Property panel. When using CubeSuite+, the -s option is automatically attached when the source file specification includes the C source.

(6) Using the object converter

Use the object converter by specifying the -r (address sort of object) and -u (filling value specification) options.
When using CubeSuite+, on the Property panel, from the [Object Convert Options] tab, configure the [Hex File Filling] property in the [Hex File] category.
These options are specified by default.
An abort error occurs if a ROM code is ordered (work known as "across processing" or "tape out") when the addresses of the objects are not sorted. Therefore, be sure to specify -r (do not cancel the specification).

(7) Object filling value specification option (-u)

If starting address is specified by the object convert option (-u), filling is started from the start address or the address where the code is located, whichever is lower. Filling is not performed for the internal RAM area (ED800H to FFFFFH).
Description format is described below:

```
-ufilling-value[,[start-address],size]
```

Remark [ ] may be omitted.

(8) Include file dependence relationship

During checking of dependence relationships of include files with CubeSuite+, condition statements such as #if and comments are ignored. Therefore, include files not required for build are mistaken as required files (In the example below, header1.h and header5.h are judged as required for build).

```
#if         0
#include    "header1.h"     /* Dependence relationship judged to exist */
#else                       /* ! zero */
#include    "header2.h"     /* Dependence relationship to exist */
#endif

#define     AAA
#ifdef      AAA
#include    "header3.h"     /* Dependence relationship to exist */
#else
#include    "header4.h"     /* Dependence relationship to exist */
#endif

/*
#include    "header5.h"     /* Dependence relationship judged to exist */
*/
```

During checking of dependence relationships of include files with CubeSuite+, include statements described after comments are ignored. Therefore, include files required for build are mistaken as no-required files (In the example below, header6.h and header7.h are judged as no-required for build).

```
/* comment */   #include    "header6.h" /* Dependence relationship judged not to exist */


/*
comment
*/  #include    "header7.h"             /* Dependence relationship judged not to exist */
```

(9) Using a network

If you place the folder in which to create temporary files on a file system that is shared over a network, file contention could occur when using certain types of network software, causing abnormal operation. Avoid this type of contention by properly configuring the options and environment variables.
When using CubeSuite+, avoid using temporary files in a network environment.

(10) When using self-programming

The following describes notes on the command options for self-programming.

(a) Linker

Use the -zb option to create a load module file for the boot area.
Following the -zb option, specify the start address in the flash ROM area.
When using CubeSuite+, on the Property panel, from the [Link Options] tab, configure the [Set flash start address] property and the [Flash start address] property in the [Device] category.
To create a load module file for the flash area, input the load module file for the boot area and the object module file for the flash area and relink them.
Allocate the object module file for the flash area at an address later than the one specified with the -zb option.
It is permissible to mix small models and medium models for load module files for the boot area and object module files for the flash area. Note, however, that the object module file for the flash area must be either small or medium model.

(b) Object converter

Input a load module file for the boot area and an object module file for the flash area, relink them, and input the output load module file to the object converter.
By specifying the -zf option at this time, a hex file (*.hxb) for the boot area and a hex file (*.hxf) for the flash area can be separately output.
When using CubeSuite+, on the Property panel, from the [Object Convert Options] tab, in the [Hex File] category, configure the [Split hex file] property.

(11) Using the variables/functions information file generator

(a) Notation for function calls

If a function whose arguments lack type declarations is called, and the arguments have function addresses for which callt allocation is specified in the variables/functions information file, then the program may behave incorrectly due to inconsistent function interfaces.

- C source

```
int func_c()   /* callt in .vfi */
{
    return 0;
}

void func()
{
    func2(func_c);  /* W0553 */
}

int func2(int (*p)(void))
{
}
```

- Variables/functions information file

```
;*** variable information ***
[sreg]
;
;*** function information ***
[callt]
func_c,2,2
func2,1,2
```

If the above conditions are met, then the C compiler outputs warning W0553.
Include type declarations in the function-call prototype declaration.
Also comment out the callt specification in the variables/functions information file for function names in the function-parameter code.

(b) If a #pragma section directive is specified with an AT start address

In a section defined by a #pragma section directive specified with an AT start address, allocating variables and functions to the callt table area or saddr area may cause incorrect behavior.

- C source

```
#pragma section @@DATA @FCDATA AT 0FCF00H
#define dni1    (*(int *)0xfcf00)
int __near ni1; /* sreg in .vfi */
__sreg int x1, x2;

void func()
{
    x1 = ni1;
    x2 = dni1;
}

void main()
{
    ni1 = 0x10;
    func();
}
```

- Variables/functions information file

```
;*** variable information ***
[sreg]
;x2,1,2,0
;x1,1,2,0
;
;*** function information ***
[callt]
func,1,2
```

In the C source above, the values of variables x1 and x2 are both expected to be 0x10. But if variable ni1 is allocated to the saddr area (from 0xffe20) in the variables/functions information file, then the program will not behave as intended: variable x1 will have the value of ni1, which is 0x10, and variable x2 will have the value of address 0xfcf00.
The variables/functions information file generator does not specify sreg/callt for variables and functions in sections defined by #pragma section directives with AT start addresses specified.
If you edit the variables/functions information file, do not specify allocation to the callt table area or saddr area for the above functions and variables.

(c) Handling warnings

A warning may be output when the address of a function allocated to the callt table area via the variables/functions information file generator is handled.

- C source (When the memory model is the medium or large model)

```
void f1(void (*fp)()){}
void f2(void){}
void (*fp)(void);
void main(void)
{
    f1(f2);                 /* W0510: Pointer mismatch in function */
    f1((void (*)())f2);     /* Fine if cast is made */
    fp = f2;  /* W0416: Illegal type and size (far/near) pointer combination */
    fp = (void (*)())f2;    /* Fine if cast is made */
}
```

- Variables/functions information file

```
;*** variable information ***
[sreg]
fp,4,4,2
;
;*** function information ***
[callt]
f2,7,2
f1,2,2
```

Although this will not cause any problems with program behavior, if you wish to suppress this warning, perform a cast in code that handles function pointers.

(d) Reference count

References to function addresses are counted as function calls. For this reason, the number of references may not be counted appropriately.

(e) Output of local symbols generated by the compiler

The local symbols generated by the compiler are also output to the variables/functions information file, but you should leave these commented out.

- Variables/functions information file

```
[sreg]
;L0003,2,1,2,"t08.c",const
;
;*** function information ***
[callt]
```

(f) Changing the extension of a library file or load module file

If you use the variables/functions information file generator, do not change the extension of library files (.lib) or load module files (.lmf).

If you change these, variables/functions that are not eligible for processing may be output.

APPENDIX A WINDOW REFERENCE

This appendix explains windows/panels/dialog boxes used in build process.

A.1 Description

The following lists the windows/panels/dialog boxes used in build process.

Table A-1. List of Windows/Panels/Dialog Boxes

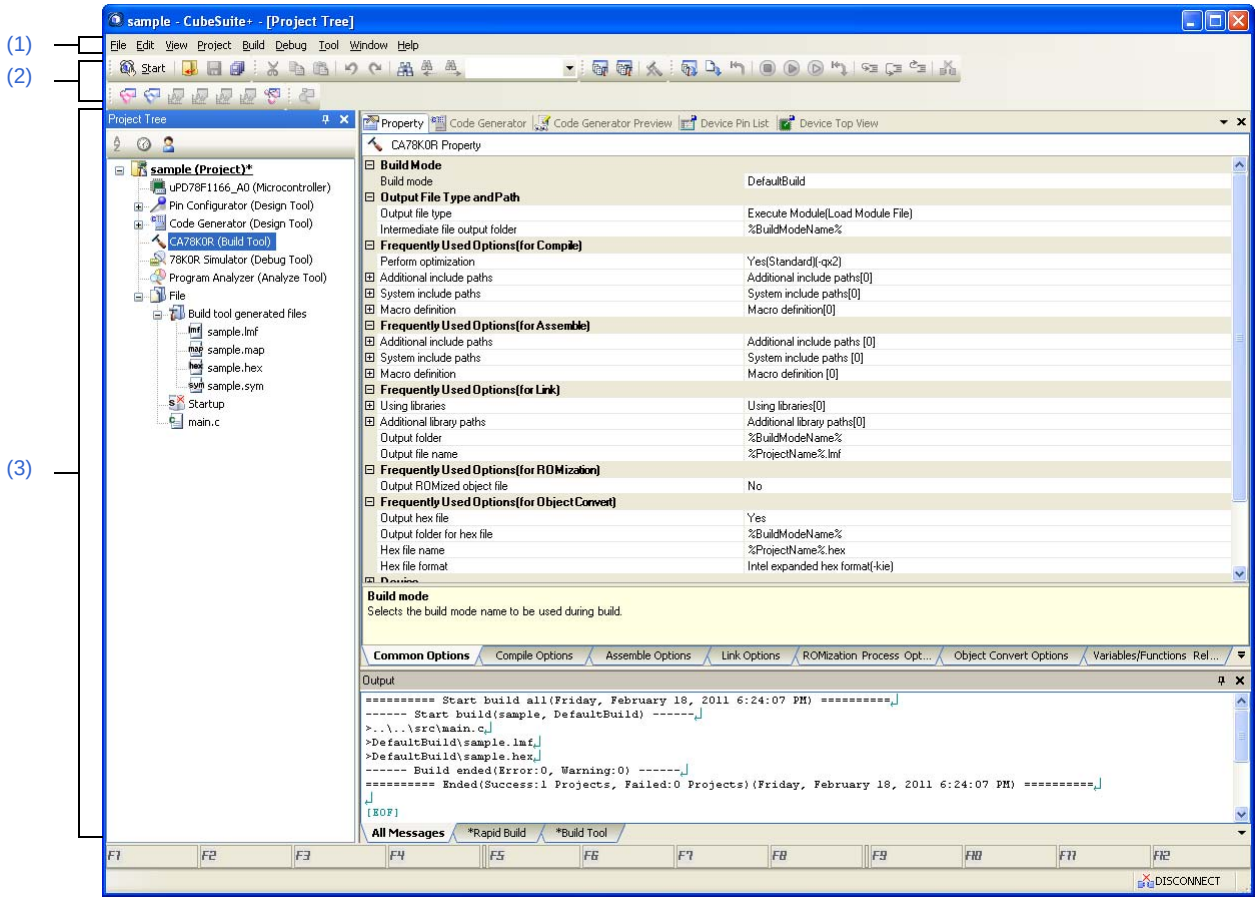
Window/Panel/Dialog Box Name	Function Description
Main window	This is the first window to be open when CubeSuite+ is launched.
Project Tree panel	This panel is used to display the project components in tree view.
Property panel	This panel is used to display the detailed information on the build tool, file, or category that is selected on the Project Tree panel and change the settings of the information.
Editor panel	This panel is used to display/edit text files/source files.
Output panel	This panel is used to display the message that is output from the build tool.
Add File dialog box	This dialog box is used to create a new file and add it to the project.
Add Folder and File dialog box	This dialog box is used to add existing files and folder hierarchies to the project.
Character String Input dialog box	This dialog box is used to input and edit characters in one line.
Text Edit dialog box	This dialog box is used to input and edit texts in multiple lines.
Path Edit dialog box	This dialog box is used to edit or add the path.
System Include Path Order dialog box	This dialog box is used to refer the system include paths specified for the compiler and set their specified sequence.
File Save Settings dialog box	This dialog box is used to set the encoding and newline code of the file that is editing on the Editor panel.
Link Order dialog box	This dialog box is used to display object module files and library files to input to the linker and configure these link order.
Build Mode Settings dialog box	This dialog box is used to add and delete build modes and configure the current build mode in batch.
Batch Build dialog box	This dialog box is used to do build, rebuild and clean process in batch with the build mode that each project has.
Go to the Location dialog box	This dialog box is used to move the caret to the designated location.
Progress Status dialog box	This dialog box is used to show how the process has been progressed.
Option dialog box	This dialog box is used to configure the CubeSuite+ environment.
Add Existing File dialog box	This dialog box is used to select existing files to add to projects.
Browse For Folder dialog box	This dialog box is used to select a folder and retrieve it for the caller.
Specify Variables/Functions Information File for Boot Area dialog box	This dialog box is used to select the variables/functions information file for boot area to set in the caller of the dialog box.
Specify Boot Area Load Module File dialog box	This dialog box is used to select the boot area load module file to set in the caller of the dialog box.
Save As dialog box	This dialog box is used to save the editing file or contents of each panel to a file with a name.

Window/Panel/Dialog Box Name	Function Description
Open with Program dialog box	This dialog box is used to select the application to open the file.
Stack Usage Tracer window	This is the first window to be open when the stack usage tracer is launched.
Stack Size Unknown / Adjusted Function Lists dialog box	This dialog box is used to display a list of functions for which the stack usage tracer could not obtain stack information; functions for which information was changed intentionally, and functions for which the stack usage tracer forcibly set an additional margin.
Adjust Stack Size dialog box	This dialog box is used to change the information for the selected function.
Open dialog box	This dialog box is used to open an existing stack size specification file.

Main window

This is the first window to be open when CubeSuite+ is launched.
This window is used to control the user program execution and open panels for the build process.

Figure A-1. Main Window



The following items are explained here.

- [How to open]
- [Description of each area]

[How to open]

- Select Windows [start] >> [All programs] >> [Renesas Electronics CubeSuite+] >> [CubeSuite+].

[Description of each area]

(1) Menu bar

Displays the menu relates to build.

(a) [Project]

The [Project] menu shows menu items to operate the project and others.

Add New Subproject...	Closes the current project and opens the Create Project dialog box to create a new project. If the currently open project or file has been modified but it has not been saved yet, a confirmation message is displayed to ask you whether you want to save it.
Open Project...	Closes the current project and opens the Open Project dialog box to open the existing project. If the currently open project or file has been modified but it has not been saved yet, a confirmation message is displayed to ask you whether you want to save it.
Favorite Projects	Displays a cascading menu to use to open or save your favorite project.
1 *path*	[Opens your favorite project registered with [Favorite Projects] >> [1 Register to Favorite Project]. If no project has been registered,"Favorite Project" is displayed.
2 *path*	[Opens your favorite project registered with [Favorite Projects] >> [2 Register to Favorite Project]. If no project has been registered,"Favorite Project" is displayed.
3 *path*	[Opens your favorite project registered with [Favorite Projects] >> [3 Register to Favorite Project]. If no project has been registered,"Favorite Project" is displayed.
4 *path*	[Opens your favorite project registered with [Favorite Projects] >> [4 Register to Favorite Project]. If no project has been registered,"Favorite Project" is displayed.
1 Register to Favorite Project	The current project path is added to [1 *path*] in [Favorite Projects].
2 Register to Favorite Project	The current project path is added to [2 *path*] in [Favorite Projects].
3 Register to Favorite Project	The current project path is added to [3 *path*] in [Favorite Projects].
4 Register to Favorite Project	The current project path is added to [4 *path*] in [Favorite Projects].
Add	Shows the cascading menu to add subprojects to the project.
Add Subproject...	Opens the Add Existing Subproject dialog box to add an existing subproject to the project.
Add New Subproject...	Opens the Create Project dialog box to add a new subproject to the project.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the file to the project. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node to the root of the File node. This allows the category name to be changed. The default category name is "New category". The new category name can be changed to the same name as the existing category node. Note that this menu is disabled when the build tool is in operation.

Sets *selected project or sub-project* as Active Project.	Set the selected project or subproject as an active project.
Close Project	Closes the current project. If the currently open project or file has been modified but it has not been saved yet, a confirmation message is displayed to ask you whether you want to save it.
Save Project	Saves the configuration information of the current project to the project file.
Save Project As...	Opens the Save Project As dialog box to save the configuration information of the current project to the project file with another name.
Remove from Project	Removes the selected project or subproject from the project. The subproject files or the file themselves are not deleted from the file system.
Save Project and Development Tools as Package...	Saves a set of the this product and the project by copying them in a folder.

(b) [Build]

The [Build] menu shows menu items for the build process and others.

Build Project	Builds the project. The subproject is also built when it is added in the project. Note that this menu is disabled when the build tool is in operation.
Rebuild Project	Rebuilds the project. The subproject is also rebuilt when it is added in the project. Note that this menu is disabled when the build tool is in operation.
Clean Project	Cleans the project. The subproject is also cleaned when it is added in the project. Note that this menu is disabled when the build tool is in operation.
Rapid Build	Toggles the rapid build function between enabled (default) and disabled.
Update Dependencies	Updates the dependency of the file in the project to build. The dependency of the file in the subproject to build is also updated when the subproject is added to the project.
Build *active project*	Builds the active project. If the active project is the main project, its subproject is not built. Note that this menu is disabled when the build tool is in operation.
Rebuild *active project*	Rebuilds the active project. If the active project is the main project, its subproject is not rebuilt. Note that this menu is disabled when the build tool is in operation.
Clean *active project*	Cleans the active project. If the active project is the main project, its subproject is not cleaned. Note that this menu is disabled when the build tool is in operation.
Update Dependencies of *active project*	Updates the dependency of the file in the active project to build.
Stop Build	Cancels the build, rebuild, batch build and clean operation.
Build Mode Settings...	Opens the Build Mode Settings dialog box to modify and add to the build mode.
Batch Build...	Opens the Batch Build dialog box to batch build.
Build Option List	Lists the currently set build option in the Output panel.

(2) Toolbar

Buttons used in build process are displayed.

(a) Build toolbar

Build toolbar shows buttons used in build process.

	Builds projects. The subproject is also built when it is added in the project. Note that this button is disabled when the build tool is in operation.
	Rebuilds projects. The subproject is also rebuilt when it is added in the project. Note that this button is disabled when the build tool is in operation.
	Cancels the build, rebuild, batch build and clean in operation.

(3) Panel display area

The following panels are displayed in this area.

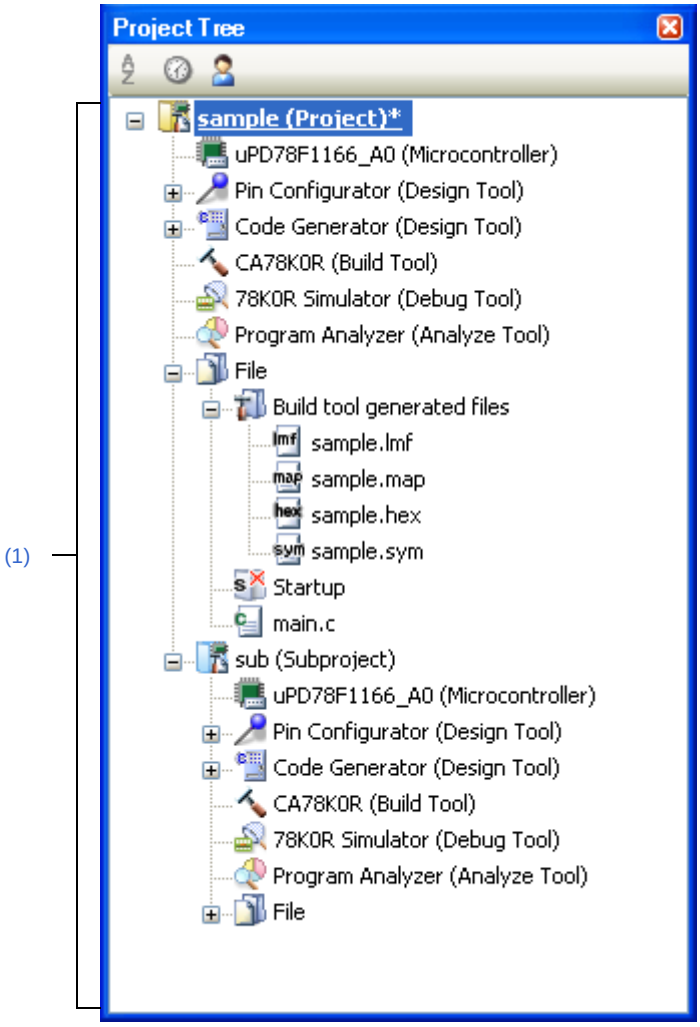
- Project Tree panel
- Property panel
- Editor panel
- Output panel

See the each panel section for details of the contents of the display.

Project Tree panel

This panel is used to display the project components such as the build tool, source files, etc. in tree view.

Figure A-2. Project Tree Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [[Edit] menu (only available for the Project Tree panel)]
- [Context menu]

[How to open]

- From the [View] menu, select [Project Tree].

[Description of each area]

(1) Project tree area

Project components are displayed in tree view with the following given node.

Node	Description
Project name (Project) (hereafter referred to as "Project node")	Project name.
Build tool name (Build tool) (hereafter referred to as "Build tool node")	The build tool (compiler, assembler, etc.) used in the project.
File (hereafter referred to as "File node")	The following files that are added to the project are displayed under the root of this node. - C source file (*.c) - Assembler source file (*.asm) - Header file (*.h, *.inc) - Object file (*.rel) - Library file (*.lib) - Link directive file (*.dr, *.dir) - Variable and function information file (*.vfi) - Other file (doc, xml, etc.)
Build tool generated files (hereafter referred to as "Build tool generated files node")	The following files generated by the build tool appear directly below the node generated during the build. - For other than library projects Load module file (*.lmf) Link list file (*.map) Error list file (*.elk, *.erp, *.eoc) Hex file (*.hex, *.hxb, *.hxf) Symbol table file (*.sym) - For library projects Library file (*.lib) List file (*.lst) Files displayed under this node cannot be renamed, deleted, or moved. This node is always placed lower than the File node. This node will no longer appear if you reload the project after building.
Startup (hereafter referred to as "Startup node")	This is a node for adding other than standard startup files to the project. This node is always placed lower than the File node.
Category name (hereafter referred to as "category node")	Categories that the user created to categorize files (see "2.3.5 Classify a file into a category"). This node is always placed lower than the File node.
Subproject name (Subproject) (hereafter referred to as "Subproject node")	Subprojects added to the project.

When each component (the node or file) is selected, the detailed information (property) is displayed in the Property panel. You can change the settings.

Remark When more than one components are selected, only the tab that is common to all the components is displayed.
When multiple files are selected and the values of their common properties are different, then the corresponding value fields are displayed blank.

This area has the following functions.

(a) Add files

You can add files by one of the following procedure.
The files are added under the File node.

<1> Add existing files

- Select either one of the Project node, Subproject node, File node or a file. Then select [Add] >> [Add File...] from the [File] menu. The Add Existing File dialog box appears. Select files to add.
- Select either one of the Project node, Subproject node, File node or a file. Then select [Add] >> [Add File...] from the context menu. The Add Existing File dialog box appears. Select files to add.
- Copy the file using windows explorer and the like and then point the mouse to this area. Select [Paste] from the [Edit] menu.
- Drag files using windows explorer and the like and then drop them at the location in this area where you want to add the files to.

Remark If the files are dragged from the windows explorer and the like and then dropped in the blank space under the lower project tree, it is regarded as dropped in the Main project.

<2> When new files are added

- Select either one of the Project node, Subproject node, File node or a file. Then select [Add] >> [Add New File...] from the [File] menu. The Add File dialog box appears. Designate the file to create.
- Select either one of the Project node, Subproject node, File node or a file. Then select [Add] >> [Add New File...] from the context menu. The Add File dialog box appears. Designate the file to create.

Remark A blank file is created at the location designated in the Add File dialog box.

(b) Remove the file from a project

You can remove files from the project by one of the following procedure.
The removed files are not deleted from the file system in this operation.

- Select the file you want to remove from the project. Then select [Remove from Project] from the [Project] menu.
- Select the file you want to remove from the project. Then select [Remove from Project] from the context menu.

(c) Move files

You can move files by the following procedure.
The file are moved under the File node.

- Drag the file you want to move and then drop it in the destination.

Remarks 1. Individual option is retained when the file is dropped in the main project or subproject.

2. The file is copied, not moved when the file is dropped between the different project, or in the main project or subproject in same project. Note that this operation does not retain the individual option set in each file.

(d) Add categories

You can add the category node by one of the following procedure.
The category node are added under the File node.

- Select [Add New Category] from the [Project] menu.
- Select [Add New Category] from the context menu of either one of the Project node, Subproject node, or File node.

Remarks 1. The default category name is "New category".
2. The new category name can be changed to the same name as the existing category node.

(e) Move categories

You can move the category node by the following procedure.
The category node are moved under the File node.

- Drag the category node you want to move and then drop it in the destination.

Remarks 1. Individual option set in the file in the category node is retained when the category node is dropped in the main project or subproject.
2. The category node is copied, not moved when the it is dropped between the different project, or in the main project or subproject in same project. Note that the individual option set in each file contained in the category node is not retained.

(f) Add folders

You can add folders from Explorer or the like by the following procedure.
The folders are added under the File node.
The folders are added as categories.

- Drag the folder from Explorer or the like, and drop it over its destination. The Add Folder and File dialog box opens. Specify the file types and subdirectory levels in the folder to add.

Caution You cannot drag and drop folders and files into this area simultaneously.

(g) Modify the display order of the subprojects placed in order of build

The subproject is displayed in order of build from the top. Therefore, the order of build can be changed by changing the display order of the subprojects.
The project must be built from the subproject then the main project.

(h) Configure the standard build option

When the standard build option is changed, the property is displayed in boldface in the Property panel.
You can change the standard build option to the current setting (cancel boldface) by the following procedure.

- Select the Build tool node and then select [Set to Default Build Option for Project] in the context menu.

Remark The configuration of the standard build option takes effect to the whole project (main project and subproject).

(i) Sort files and categories

You can sort files and category nodes in order of the file name, time stamp, or the user definition by the following procedure.

- Select one of the buttons in the toolbar.

The following table explains the buttons.
is selected default by default.

Button	Description
	Sorts files and category nodes in order of their names. : Ascending order : Descending order : Ascending order
	Sorts files and category nodes in order of their time stamp. : Descending order : Ascending order : Descending order
	Sorts files and category nodes in order of the user definition (default). You can change the display order by dragging and dropping the file and category node.

(j) Display the file while editing

When the file added to the project is edited in the Editor panel and the file is not saved once, the file name is followed by "*". When the file is saved, "*" is deleted.

The file that is saved	main.c
The file that is not saved after editing	main.c*

(k) Display the source file in boldface that the individual build option is set

The source file icon whose option is different from the project general option (individual compile option, individual assemble option) is changed to a different one from the normal icon.

The file with project general option	main.c
The file with individual build option	main.c

(l) Highlight the file with read-only attribute

The read-only file added to the project is displayed in italic.

The file without read-only attribute	main.c
The file with read-only attribute	*main.c*

(m) Highlight the file that does not exist

The file that is added to the project but does not exist is grayed out and its icon is dimmed.

The file that exists	main.c
The file that does not exist	*main.c*

(n) Highlight the build-target file

<1> The file which the error occurred during building (rapid building), rebuilding, compiling or assembling is highlighted as the example below.

The file without errors or warnings	main.c
The file with error	main.c
The file with warning	main.c

Remarks 1. The file with both the error and the warning is highlighted in red.

2. The highlight is canceled when the build option (general option or individual option) or the build mode is changed.

<2> The names of the following files are displayed in boldface.

- The source files that have not been compiled after edited
- The source files after cleaning has been executed
- The source files after build tool options have been changed
- The source files after any build mode has been changed

Remark The file names are all displayed in boldface right after the project is opened. The boldface display is canceled after building is executed.

(o) Highlight non build-target file

The file that is set as non build-target is highlighted as shown in the example below.

Build-target file	main.c
Non build-target file	main.c

(p) Highlight the project that has been changed

The file component that is added to the project and the property of the project component are changed, the project name is followed by "*" and is displayed in boldface.
The boldface is canceled when the project is saved.

The project that has not been changed	sample (Project)
The project that has been changed	**sample (Project)***

(q) Highlight the active project

The active projects is underlined.

Non-active project	**sample (Project)***
Active project	**sample (Project)***

(r) Run the editor

Open the file with the specific extension in the Editor panel. When an external editor is specified to use in the Option dialog box, open the file with the external editor. Other files are opened with the application associated with the OS.

Caution The files with the extensions that are not associated with the OS are not displayed.

You can open the editor by one of the following procedure.
- Double click the file.
- Select the file and then select [Open] from the context menu.
- Select the file and then press the [Enter] key.

The files that can be opened in the Editor panel are as follows.
- C source file (.c)
- Assembler source file (.asm)
- Header file (.h, .inc)
- Link directive file (.dr, .dir)
- Variable and function information file (.vfi)
- Map file (.map)
- Symbol table file (.sym)
- Hex file (.hex, .hxb, .hxf)
- Text file (.txt)

Remark You can use one of the methods below to open files other than those listed above in the Editor panel.
- Drag the file and drop it into the Editor panel.
- Select the file and then select [Open with Internal Editor...] from the context menu.

[[Edit] menu (only available for the Project Tree panel)]

Copy	Copies the selected file or category node to the clipboard. While editing the file name or the category name, the characters of the selection are copied to the clipboard. Note that this menu is only enabled when the file or category node is selected.
Paste	Inserts the contents of the clipboard directly below the selected node on the project tree. While editing the file name or the category name, insert the contents of the clipboard. Note that this menu is disabled when the contents of the clipboard exist in the same project, when multiple files and category nodes are selected, and when the build tool is in operation.
Rename	You can rename the selected project, subproject, file, and category node. Press the [Enter] key to confirm the rename. Press the [ESC] key to cancel. When the file is selected, the actual file name is also changed. When the selected file is added to other project, those file names are also changed. Note that this menu is only enabled when the project, subproject, file, and category node is selected. Note that rename is disabled when the build tool is in operation.

[Context menu]

(1) When the Project node is selected

Build *active project*	Builds the active project. If the active project is the main project, its subproject is not built. Note that this menu is disabled when the build tool is in operation.
Rebuild *active project*	Rebuilds the active project. If the active project is the main project, its subproject is not rebuilt. Note that this menu is disabled when the build tool is in operation.
Clean *active project*	Cleans the active project. If the active project is the main project, its subproject is not cleaned. Note that this menu is disabled when the build tool is in operation.
Open Folder with Explorer	Opens the folder that contains the project file of the selected project with Explorer.
Add	Shows the cascading menu to add subprojects and files to the project.
Add Subproject...	Opens the Add Existing Subproject dialog box to add the selected subproject to the project.
Add New Subproject...	Opens the Create Project dialog box to add the created subproject to the project.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the project. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node to the root of the File node. This allows the category name to be changed. Up to 200 characters can be specified. The default category name is "New category". The new category name can be changed to the same name as the existing category node. This menu is disabled while the build tool is running, and if categories are nested 20 levels.
Set *selected project* as Active Project	Sets the selected project to an active project.
Save Project and Development Tools as Package...	Saves a set of the this product and the project by copying them in a folder.
Paste	This menu is always disabled.
Rename	You can rename the selected project.
Property	Displays the selected project's property on the Property panel.

(2) When the Subproject node is selected

Build *active project*	Builds the active project. Note that this menu is disabled when the build tool is in operation.
Rebuild *active project*	Rebuilds the active project. Note that this menu is disabled when the build tool is in operation.
Clean *active project*	Cleans the active project. Note that this menu is disabled when the build tool is in operation.
Open Folder with Explorer	Opens the folder that contains the subproject file of the selected subproject with Explorer.
Add	Shows the cascading menu to add subprojects, files, and category nodes to the project.
Add Subproject...	Opens the Add Existing Subproject dialog box to add the selected subproject to the project. The subproject cannot be added to another subproject.
Add New Subproject...	Opens the Create Project dialog box to add the created subproject to the project. The subproject cannot be added to another subproject.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the project. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node to the root of the File node. This allows the category name to be changed. Up to 200 characters can be specified. The default category name is "New category". The new category name can be changed to the same name as the existing category node. This menu is disabled while the build tool is running, and if categories are nested 20 levels.
Set *selected subproject* as Active Project	Sets the selected subproject to an active project.
Remove from Project	Removes the selected subproject from the project. The subproject file itself is not deleted from the file system with this operation. When the selected subproject is the active project, it cannot be removed from the project. Note that this menu is disabled when the build tool is in operation.
Paste	This menu is always disabled.
Rename	You can rename the selected subproject.
Property	Displays the selected subproject's property on the Property panel.

(3) When the Build tool node is selected

Build Project	Builds the selected project (main project or subproject). The subproject is also built when it is added in the project. Note that this menu is disabled when the build tool is in operation.
Rebuild Project	Rebuilds the selected project (main project or subproject). The subproject is also rebuilt when it is added in the project. Note that this menu is disabled when the build tool is in operation.
Clean Project	Cleans the selected project (main project or subproject). The subproject is also cleaned when it is added in the project. Note that this menu is disabled when the build tool is in operation.
Set to Default Build Option for Project	Sets the current build option to the standard option for the selected project. When the subproject is added, it is not set. When the build option that is different from the standard option is set, its property is displayed in boldface.
Set Link Order...	Opens the Link Order dialog box to display object module files and library files and to setup their link order. Note that this menu is disabled when the build tool is in operation.
Property	Displays the selected build tool's property on the Property panel.

(4) When the File node is selected

Add	Shows the cascading menu to add files and category nodes to the project.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project. The file is added directly below this node. The added file can be opened with the application corresponds to the file extension.The file is added directly below this node.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the project. The file is added directly below this node. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node to the root of this node. You can rename the category. Up to 200 characters can be specified. The default category name is "New category". The new category name can be changed to the same name as the existing category node. This menu is disabled while the build tool is running, and if categories are nested 20 levels.
Remove from Project	This menu is always disabled.
Copy	This menu is always disabled.
Paste	Inserts the contents of the clipboard directly below this node. However, this menu is disabled when the contents of the clipboard exist in the same project.
Rename	This menu is always disabled.
Property	Displays the selected category node's property on the Property panel.

(5) When a file is selected

Compile	Compiles the selected C source file. Note that this menu is only displayed when a C source file (except for non build-target file) is selected. Note that this menu is disabled when the build tool is in operation.
Assemble	Assembles the selected assembler source file. Note that this menu is only displayed when an assembler source file (except for non build-target file) is selected. Note that this menu is disabled when the build tool is in operation.
Open	Opens the selected file with the application corresponds to the file extension (see "(r) Run the editor"). Note that this menu is disabled when multiple files are selected.
Open with Internal Editor...	Opens the selected file with the Editor panel. Note that this menu is disabled when multiple files are selected.
Open with Selected Application...	Opens the Open with Program dialog box to open the selected file with the designated application. Note that this menu is disabled when multiple files are selected.
Open Folder with Explorer	Opens the folder that contains the selected file with Explorer.
Add	Shows the cascading menu to add files and category nodes to the project.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project. The file is added to the same level as the selected file.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the project. The file is added to the same level as the selected file. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node at the same level as the selected file. You can rename the category. Up to 200 characters can be specified. The default category name is "New category". The new category name can be changed to the same name as the existing category node. This menu is disabled while the build tool is running, and if categories are nested 20 levels.
Remove from Project	Removes the selected file from the project. The removed file is not deleted from the file system in this operation. Note that this menu is disabled when the build tool is in operation.
Copy	Copies the selected file to the clipboard. When the file name is in editing, the characters of the selection are copied to the clipboard.
Paste	This menu is always disabled.
Rename	You can rename the selected file. The actual file is also renamed. When the selected file is added to another projects, it is also renamed.
Property	Displays the selected file's property on the Property panel.

(6) When the Build tool generated files node is selected

Property	Displays this node 's property on the Property panel.

(7) When the Startup node is selected

Add	Shows the cascading menu to add files and category nodes to the project.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project. The file is added directly below this node. The added file can be opened with the application corresponds to the file extension.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the project. The file is added directly below this node. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node to the root of this node. You can rename the category. Up to 200 characters can be specified. The default category name is "New category". The new category name can be changed to the same name as the existing category node. This menu is disabled while the build tool is running, and if categories are nested 20 levels.
Remove from Project	This menu is always disabled.
Copy	This menu is always disabled.
Paste	Inserts the contents of the clipboard directly below this node. However, this menu is disabled when the contents of the clipboard exist in the same project.
Rename	This menu is always disabled.
Property	Displays this node 's property on the Property panel.

(8) When a category node is selected

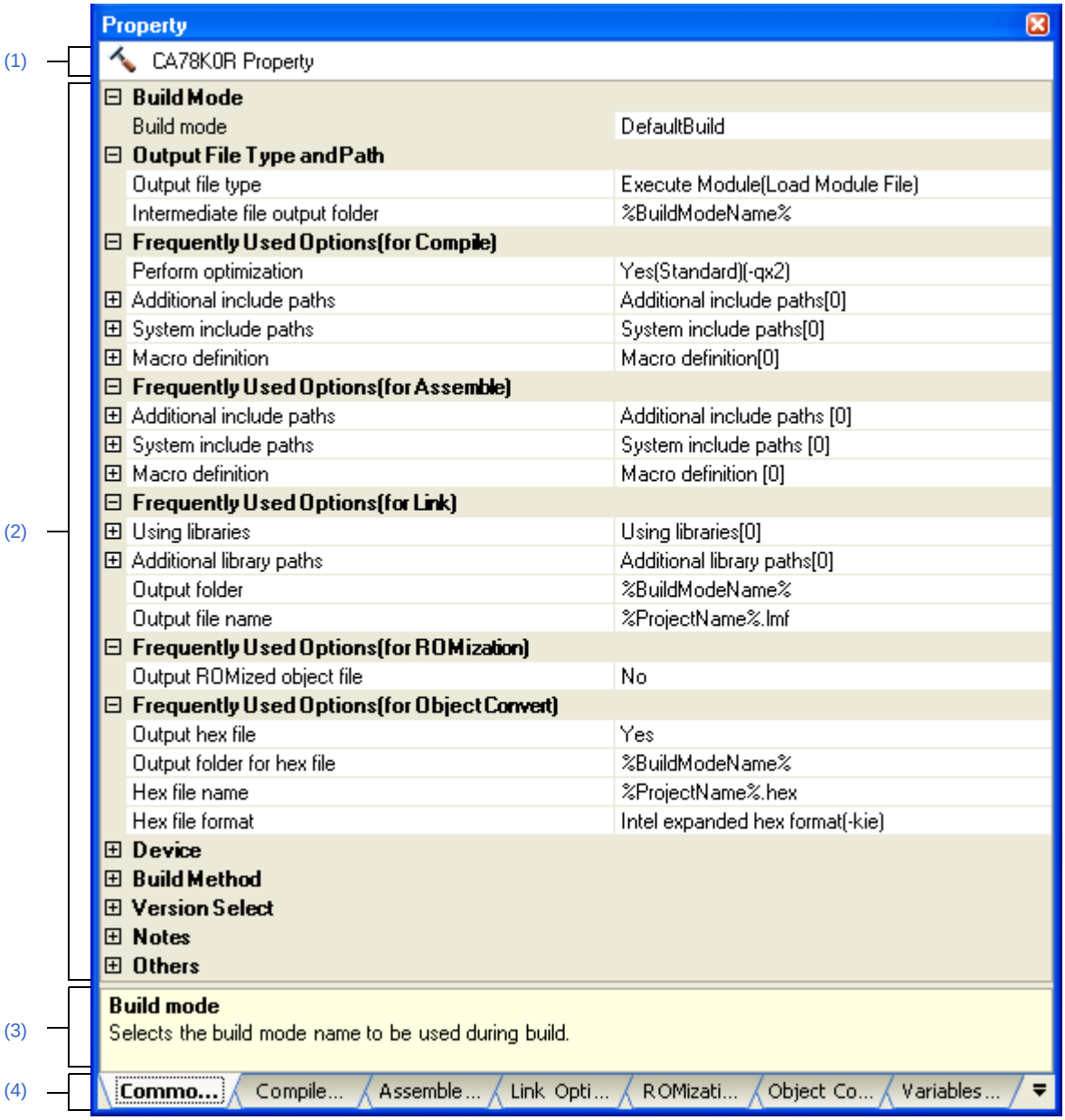
Add	Shows the cascading menu to add files and category nodes to the project.
Add File...	Opens the Add Existing File dialog box to add the selected file to the project. The file is added directly below this node. The added file can be opened with the application corresponds to the file extension.
Add New File...	Opens the Add File dialog box to create a file with the selected file type and add to the project. The file is added directly below this node. The added file can be opened with the application corresponds to the file extension.
Add New Category	Adds a new category node to the root of this node. You can rename the category. Up to 200 characters can be specified. The default category name is "New category". The new category name can be changed to the same name as the existing category node. This menu is disabled while the build tool is running, and if categories are nested 20 levels.
Remove from Project	Removes the selected category node from the project. Note that this menu is disabled when the build tool is in operation.
Copy	Copies the selected category node to the clipboard. When the category name is in editing, the characters of the selection are copied to the clipboard.

Paste	Inserts the contents of the clipboard directly below this node. However, this menu is disabled when the contents of the clipboard exist in the same project. When the category name is in editing, the contents of the clipboard are inserted.
Rename	You can rename the selected category node.
Property	Displays the selected category node's property on the Property panel.

Property panel

This panel is used to display the detailed information on the Build tool node, file, or category node that is selected on the Project Tree panel by every category and change the settings of the information.

Figure A-3. Property Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [[Edit] menu (only available for the Project Tree panel)]
- [Context menu]

[How to open]

- On the Project Tree panel, select the Build tool node, file, or category node, and then select [Property] from the [View] menu or [Property] from the context menu.

Remark When either one of the Build tool node, file, or category node on the Project Tree panel while the Property panel is opened, the detailed information of the selected node is displayed.

[Description of each area]

(1) Selected node area

Display the name of the selected node on the Project Tree panel.
When multiple nodes are selected, this area is blank.

(2) Detailed information display/change area

In this area, the detailed information on the Build tool node, file, or category node that is selected on the Project Tree panel is displayed by every category in the list. And the settings of the information can be changed directly.
Mark ⊟ indicates that all the items in the category are expanded. Mark ⊞ indicates that all the items are collapsed. You can expand/collapse the items by clicking these marks or double clicking the category name.
Mark HEX indicates that only the hex number is allowed to input in the text box.
See the section on each tab for the details of the display/setting in the category and its contents.

(3) Property description area

Display the brief description of the categories and their contents selected in the detailed information display/change area.

(4) Tab selection area

Categories for the display of the detailed information are changed by selecting a tab.
In this panel, the following tabs are contained (see the section on each tab for the details of the display/setting on the tab).

(a) When the Build tool node is selected on the Project Tree panel

- [Common Options] tab
- [Compile Options] tab
- [Assemble Options] tab
- [Link Options] tab
- [ROMization Process Options] tab
- [Object Convert Options] tab
- [Create Library Options] tab
- [Variables/Functions Relocation Options] tab

(b) When a file is selected on the Project Tree panel

- [Build Settings] tab (for C source file, assembler source file, link directive file, variables/functions information file, object file, and library file)
- [Individual Compile Options] tab (for C source file)
- [Individual Assemble Options] tab (for assembler source file[Note])
- [File Information] tab

Note This tab is also displayed when [Yes] is selected in the [Output assemble file] property in the [Assembly File] category from the [Individual Compile Options] tab.

(c) When the category node, File node, Build tool generated files node, or Startup node is selected on the Project Tree panel

- [Category Information] tab

Remark When multiple components are selected on the Project Tree panel, only the tab that is common to all the components is displayed. If the value of the property is modified, that is taken effect to the selected components all of which are common to all.

[[Edit] menu (only available for the Project Tree panel)]

Undo	Cancels the previous edit operation of the value of the property.
Cut	While editing the value of the property, cuts the selected characters and copies them to the clip board.
Copy	Copies the selected characters of the property to the clip board.
Paste	While editing the value of the property, inserts the contents of the clip board.
Delete	While editing the value of the property, deletes the selected character string.
Select All	While editing the value of the property, Selects all the characters of the selected property.

[Context menu]

Undo	Cancels the previous edit operation of the value of the property.
Cut	While editing the value of the property, cuts the selected characters and copies them to the clip board.
Copy	Copies the selected characters of the property to the clip board.
Paste	While editing the value of the property, inserts the contents of the clip board.
Delete	While editing the value of the property, deletes the selected character string.
Select All	While editing the value of the property, selects all the characters of the selected property.
Reset to Default	Restores the configuration of the selected item to the default configuration of the project. For the [Individual Compile Options] tab and [Individual Assemble Options] tab, restores to the configuration of the general option.
Reset All to Default	Restores all the configuration of the current tab to the default configuration of the project. For the [Individual Compile Options] tab and [Individual Assemble Options] tab, restores to the configuration of the general option.

[Common Options] tab

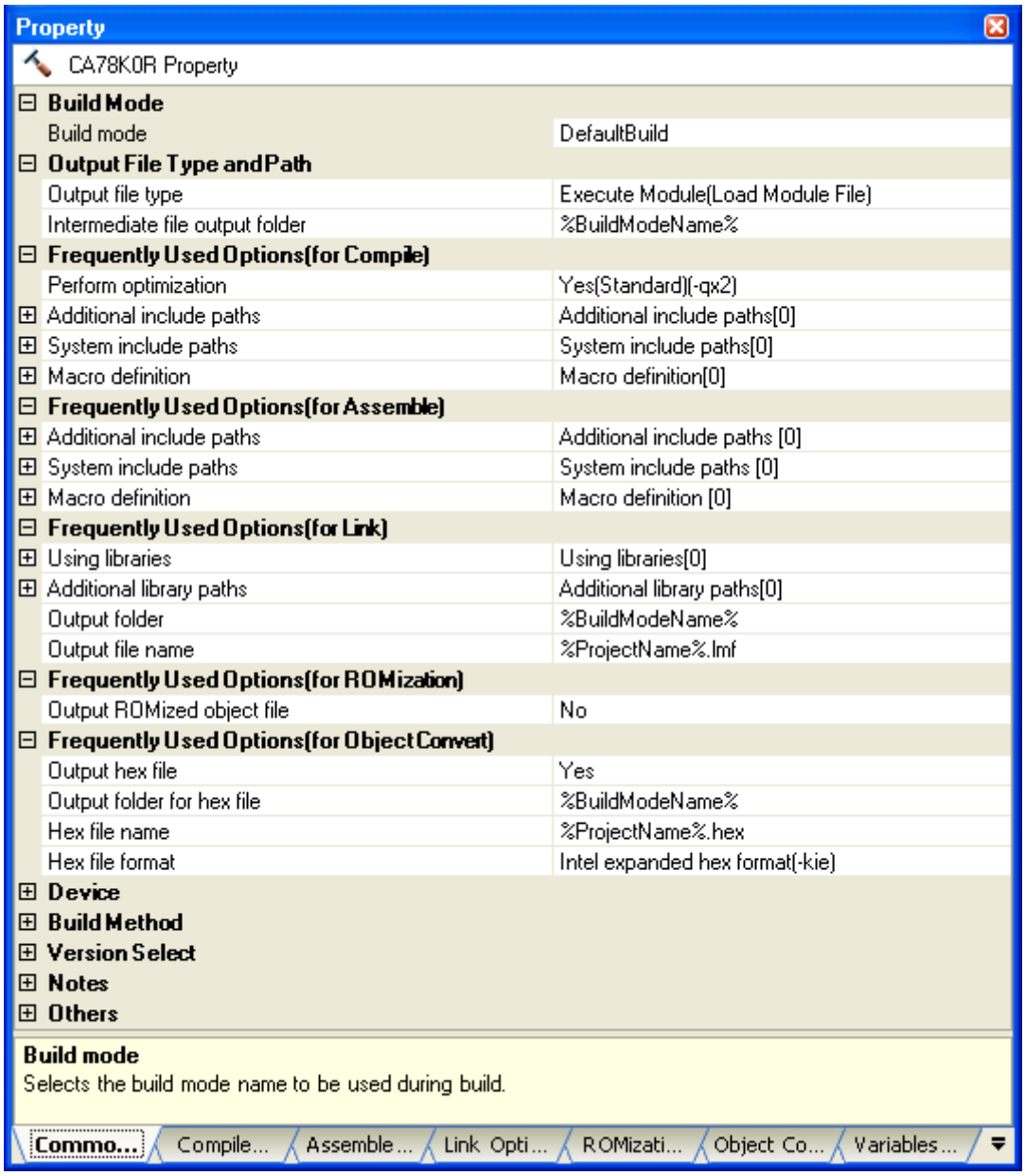
This tab shows the detailed information on the build tool categorized by the following and the configuration can be changed.

(1) [Build Mode]
(2) [Output File Type and Path]
(3) [Frequently Used Options(for Compile)]
(4) [Frequently Used Options(for Assemble)]
(5) [Frequently Used Options(for Link)]
(6) [Frequently Used Options(for ROMization)]
(7) [Frequently Used Options(for Object Convert)]
(8) [Device]
(9) [Build Method]
(10) [Version Select]
(11) [Notes]
(12) [Others]

Remark If the property in the [Frequently Used Options] category is changed, the value of the property having the same name contained in the corresponding tab will be changed accordingly.

Category from [Common Options] Tab	Corresponding Tab
[Frequently Used Options(for Compile)] category	[Compile Options] tab
[Frequently Used Options(for Assemble)] category	[Assemble Options] tab
[Frequently Used Options(for Link)] category	[Link Options] tab
[Frequently Used Options(for ROMization)] category	[ROMization Process Options] tab
[Frequently Used Options(for Object Convert)] category	[Object Convert Options] tab

Figure A-4. Property Panel: [Common options] Tab



[Description of each category]

(1) [Build Mode]

The detailed information on the build mode is displayed and the configuration can be changed.

Build mode	Select the build mode to be used during build. Note that this property is not applied to [Reset All to Default] from the context menu.		
	Default	DefaultBuild	
	How to change	Select from the drop-down list.	
	Restriction	DefaultBuild	Builds with the default build mode that is set when a new project is created.
		Build mode that is added to the project (other than DefaultBuild)	Builds with the build mode that is added to the project (other than DefaultBuild).

(2) [Output File Type and Path]

The detailed information on output file types and paths are displayed and the configuration can be changed.

Output file type	Select the type of the file to be generated during build. The file type set here is subject to debugging. For other than library projects, only [Execute Module(Load Module File)] and [Execute Module(Hex File)] are displayed. However, only [Execute Module(Load Module File)] and [Execute Module(Hex File)] are displayed when [No] is selected in the [Output ROMized object file] property in the [Output File] category from the [ROMization Process Options] tab.Only [Execute Module(ROMization Module)] and [Execute Module(Load Module File)] are displayed when [No] is selected in the [Output hex file] property in the [Hex File] category from the [Object Convert Options] tab. For library projects, only [Library] is displayed.		
	Default	Execute Module(Load Module File)	
	How to change	Select from the drop-down list.	
	Restriction	Execute Module(ROMization Module)	The file to be generated during a build is regarded as the executable format (ROMization module file).
		Execute Module(Load Module File)	The file to be generated during a build is regarded as the executable format (load module file).
		Execute Module(Hex File)	The file to be generated during a build is regarded as the executable format (hex file).
		Library	The file to be generated during a build is regarded as the library format (library file).

Intermediate file output folder	Specify the path to the folder to which intermediate files (object module files (*.rel), cross-reference list files (*.xrf), etc.) are to be output. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified.	
	Default	%BuildModeName%
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 247 characters

(3) [Frequently Used Options(for Compile)]

The detailed information on frequently used options for compilation are displayed and the configuration can be changed.

Perform optimization	Select the type of the optimization for compiling. This corresponds to the -qx option of the compiler.		
	Default	Yes(Standard)(-qx2)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Speed precedence)(-qx1)	Performs optimization with the execution speed precedence.
		Yes(Standard)(-qx2)	Performs optimization with both the execution speed and module size precedence.
		Yes(Code size precedence)(-qx3)	Performs optimization with the module size precedence.
		Yes(Detail setting)	The [Optimization(Details)] category is shown in the [Compile Options] tab. The option that is selected in the category has the precedence for the optimization. When [No(-nq)] is selected in all the properties in the [Optimization(Details)] category, the optimization will not be done.
		No(-nq)	The optimization will not be done.

Additional include paths	Specify the additional include paths during compiling. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. When this property is omitted, only the standard folder of the compiler is searched. The reference point of the path is the project folder. This corresponds to the -i option of the compiler. The specified include path is displayed as the subproperty. When the include path is added to the project tree, the path is added to the top of the subproperties. Uppercase characters and lowercase characters are not distinguished for the include paths.	
	Default	Additional include paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified. However, this also includes the number of paths used by linked tools.
System include paths	The include paths which the system set during compiling are displayed. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. The system include path is searched with lower priority than the additional include path. The reference point of the path is the project folder. This corresponds to the -i option of the compiler. The include path is displayed as the subproperty.	
	Default	System include paths[*number of defined items*]
	How to change	Edit by the System Include Path Order dialog box which appears when clicking the [...] button.
	Restriction	Changes not allowed (Only the specified order of the include paths can be changed.)
Macro definition	Specify the macro name to be defined. Specify in the format of "*macro name=defined value*", with one macro name per line. The "=*def*" part can be omitted, and in this case, "1" is used as the defined value. This corresponds to the -d option of the compiler. The specified macro is displayed as the subproperty.	
	Default	Macro definition[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 30 items can be specified.

(4) [Frequently Used Options(for Assemble)]

The detailed information on frequently used options for assembling are displayed and the configuration can be changed.

Additional include paths	Specify the additional include paths during assembling. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. When this property is omitted, only the standard folder of the assembler is searched. The reference point of the path is the project folder. This corresponds to the -i option of the assembler. The specified include path is displayed as the subproperty. When the include path is added to the project tree, the path is added to the top of the subproperties. Uppercase characters and lowercase characters are not distinguished for the include paths.	
	Default	Additional include paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified. However, this also includes the number of paths used by linked tools.
System include paths	The include paths which the system set during assembling are displayed. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. The system include path is searched with lower priority than the additional include path. The reference point of the path is the project folder. This corresponds to the -i option of the assembler. The include path is displayed as the subproperty.	
	Default	System include paths[*number of defined items*]
	How to change	Edit by the System Include Path Order dialog box which appears when clicking the [...] button.
	Restriction	Changes not allowed (Only the specified order of the include paths can be changed.)
Macro definition	Specify the macro name to be defined. Specify in the format of "*macro name=defined value*", with one macro name per line. The "=*def*" part can be omitted, and in this case, "1" is used as the defined value. This corresponds to the -d option of the assembler. The specified macro is displayed as the subproperty.	
	Default	Macro definition[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 30 items can be specified.

(5) [Frequently Used Options(for Link)]

The detailed information on frequently used options for linking are displayed and the configuration can be changed.

This category is not displayed for library projects.

Using libraries	Specify the library file name (*.lib) to be used other than the standard libraries. Add one file in one line. The library files are searched from the library path. This corresponds to the -b option of the linker. The specified library file name is displayed as the subproperty.	
	Default	Using libraries[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified.
Additional library paths	Specify the search folder to be used other than the standard libraries. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. The library files are searched from the library path.If a relative path is specified, the reference point of the path is the project folder. This corresponds to the -i option of the linker. The specified library path name is displayed as the subproperty.	
	Default	Additional library paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified.
Output folder	Specify the folder for saving the module that is generated. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified.	
	Default	%BuildModeName%
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 247 characters
Output file name	Specify the load module file name to be output. Use the extension ".lmf". If the extension is omitted, ".lmf" is automatically added. This corresponds to the -o option of the linker. The following macro name is available as an embedded macro. %ProjectName%: Replaces with the project name. If this is blank, it is assumed that "%ProjectName%.lmf" has been specified.	
	Default	%ProjectName%.lmf
	How to change	Directly enter to the text box.
	Restriction	Up to 259 characters

(6) [Frequently Used Options(for ROMization)]

The detailed information on frequently used options for ROMization is displayed and the configuration can be changed.

This category is not displayed for library projects.

Output ROMized object file	Select whether to output the ROMized object file.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the ROMized object file.
	Default	No	Does not output the ROMized object file.
Output folder for ROMized object file	Specify the folder for saving the ROMized object file. This corresponds to the -o option of the ROMization processor. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is assumed that the project folder has been specified. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.		
	Default	%BuildModeName%	
	How to change	Directly enter in the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.	
	Restriction	Up to 259 characters	
ROMized object file name	Specify the ROMized object file name. The extension other than ".lmf" cannot be specified. If the extension is omitted, ".lmf" is automatically added. This corresponds to the -o option of the ROMization processor. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.		
	Default	romp.lmf	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	

(7) [Frequently Used Options(for Object Convert)]

The detailed information on frequently used options for object conversion are displayed and the configuration can be changed.

This category is not displayed for library projects.

Output hex file	Select whether to output the hex file. This corresponds to the -o option of the object converter.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the hex file.
		No(-no)	Does not output the hex file.

Output folder for hex file	Specify the folder for saving the hex file. This corresponds to the -o option of the object converter. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified. This property is displayed only when [Yes] in the [Output hex file] property is selected.		
	Default	%BuildModeName%	
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.	
	Restriction	Up to 247 characters	
Hex file name	Specify the hex file name. This corresponds to the -o option of the object converter. The extension can be freely specified. The following macro name is available as an embedded macro. %ProjectName%: Replaces with the project name. This property is displayed only when [Yes] in the [Output hex file] property is selected.		
	Default	%ProjectName%.hex	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	
Hex file format	Select the format of the hex file to be generated. This corresponds to the -k option of the object converter. This property is not displayed when [No(-no)] in the [Output hex file] property is selected.		
	Default	Intel expanded hex format(-kie)	
	How to change	Select from the drop-down list.	
	Restriction	Intel standard hex format(-ki)	Specify the Intel standard hex format as the format of the hex file to be generated.
		Intel expanded hex format(-kie)	Specify the Intel expanded hex format as the format of the hex file to be generated.
		Motorola S type format(standard address)(-km)	Specify the Motorola S type format (standard address) as the format of the hex file to be generated.
		Motorola S type format(32-bit address)(-kme)	Specify the Motorola S type format (32-bit address) as the format of the hex file to be generated.
		Expanded Tektronix hex format(-kt)	Specify the expanded Tektronix hex format as the format of the hex file to be generated.

(8) [Device]

The detailed information on the device is displayed and the configuration can be changed.

Security ID	Specify the security ID of an on-chip flash memory device. This corresponds to the -gi option of the linker. This property is invalid when the [Boot area load module file name] property in the [Device] category from the [Link Options] tab is specified. This property is not displayed when the device does not have a security ID function.	
	Default	0x00000000000000000000 [RL78] 0xffffffffffffffffffff [78K0R]
	How to change	Directly enter to the text box.
	Restriction	0x00000000000000000000 to 0xffffffffffffffffffe [RL78] 0x00000000000000000000 to 0xffffffffffffffffffff [78K0R] (20-digit (10-byte) hexadecimal number)

(9) [Build Method]

The detailed information on the build method is displayed and the configuration can be changed.

Handling the source file includes non-existing file	Selects whether to recompile/assemble the source file if there are no files that include it.		
	Default	Re-compile/assemble the source file	
	How to change	Select from the drop-down list.	
	Restriction	Re-compile/assemble the source file	Recompiles/assembles the source file if there are no files that include it.
		Ignore re-compiling/ assembling the source file	Does not recompile/assemble the source file if there are no files that include it.

(10) [Version Select]

The detailed information on the build tool version is displayed and the configuration can be changed.

Using compiler package install folder	Display the folder in which the compiler package to be used is installed.		
	Default	*Install folder name*	
	How to change	Changes not allowed	
Using compiler package version	Select the version of the compiler package to be used. This setting is common to all the build modes. If you have selected a compiler package that has not been installed (e.g. if you open a project created in another execution environment), then that version is also displayed. If the options change depending on the compiler package, then the display of the build tool's properties will change according to the selected version.		
	Default	Always latest version which was installed	
	How to change	Select from the drop-down list.	
	Restriction	Always latest version which was installed	Uses the latest version in the installed compiler packages.
		Versions of the installed compiler packages	Uses the selected version in the compiler package.

Latest compiler package version which was installed	Display the version of the compiler package to be used when [Always latest version which was installed] is selected in the [Using compiler package version] property. This setting is common to all the build modes. This property is displayed only when [Always latest version which was installed] in the [Using compiler package version] property is selected.	
	Default	*The latest version of the installed compiler packages*
	How to change	Changes not allowed

(11) [Notes]

The detailed information on notes is displayed and the configuration can be changed.

Memo	Add memos to the build tool. Add one item in one line. This setting is common to all the build modes. The added memos are displayed as the subproperty.	
	Default	Memo[*number-of-items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 256 items can be specified.

(12) [Others]

Other detailed information on the build tool are displayed and the configuration can be changed.

Output message format	Specify the format of the message being built. This applies to the messages output by the build tool to be used, and commands added by plugins. It does not apply to the output messages of commands specified in the [Commands executed before build processing] or [Commands executed after build processing] property. The following macro names are available as embedded macros. %Program%: Replaces with the program name under execution. %Options%: Replaces with the command line option under build execution. %FileName%: Replaces with the file name being built. If this is blank, it is assumed that "%Program% %Options%" has been specified.		
	Default	%FileName%	
	How to change	Directly enter to the text box (up to 256 characters) or select from the drop-down list.	
	Restriction	%FileName%	Displays the file name in the output message.
		%FileName%: %Options%	Displays the file name and command line options in the output message.
		%Program% %Options%	Displays the program name and command line options in the output message.

Format of build option list	Specify the display format of the build option list (see "2.15.3 Display a list of build options"). This applies to the options of the build tool to be used, and commands added by plugins. It does not apply to the options of commands specified in the [Commands executed before build processing] or [Commands executed after build processing] property. The following macro names are available as embedded macros. %Program%: Replaces with the program name under execution. %Options%: Replaces with the command line option under build execution. %FileName%: Replaces with the file name being built. If this is blank, it is assumed that "%FileName% : %Program% %Options%" has been specified.	
	Default	%FileName% : %Program% %Options%
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 256 characters
Temporary folder	Specify the folder to which the temporary files generated by each command included in the build tool during execution are saved. This corresponds to the -t option of each command. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). If this is blank, it is treated as if the project folder is specified.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 200 characters
Commands executed before build processing	Specify the command to be executed before build processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. The specified command is displayed as the subproperty.	
	Default	Commands executed before build processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.

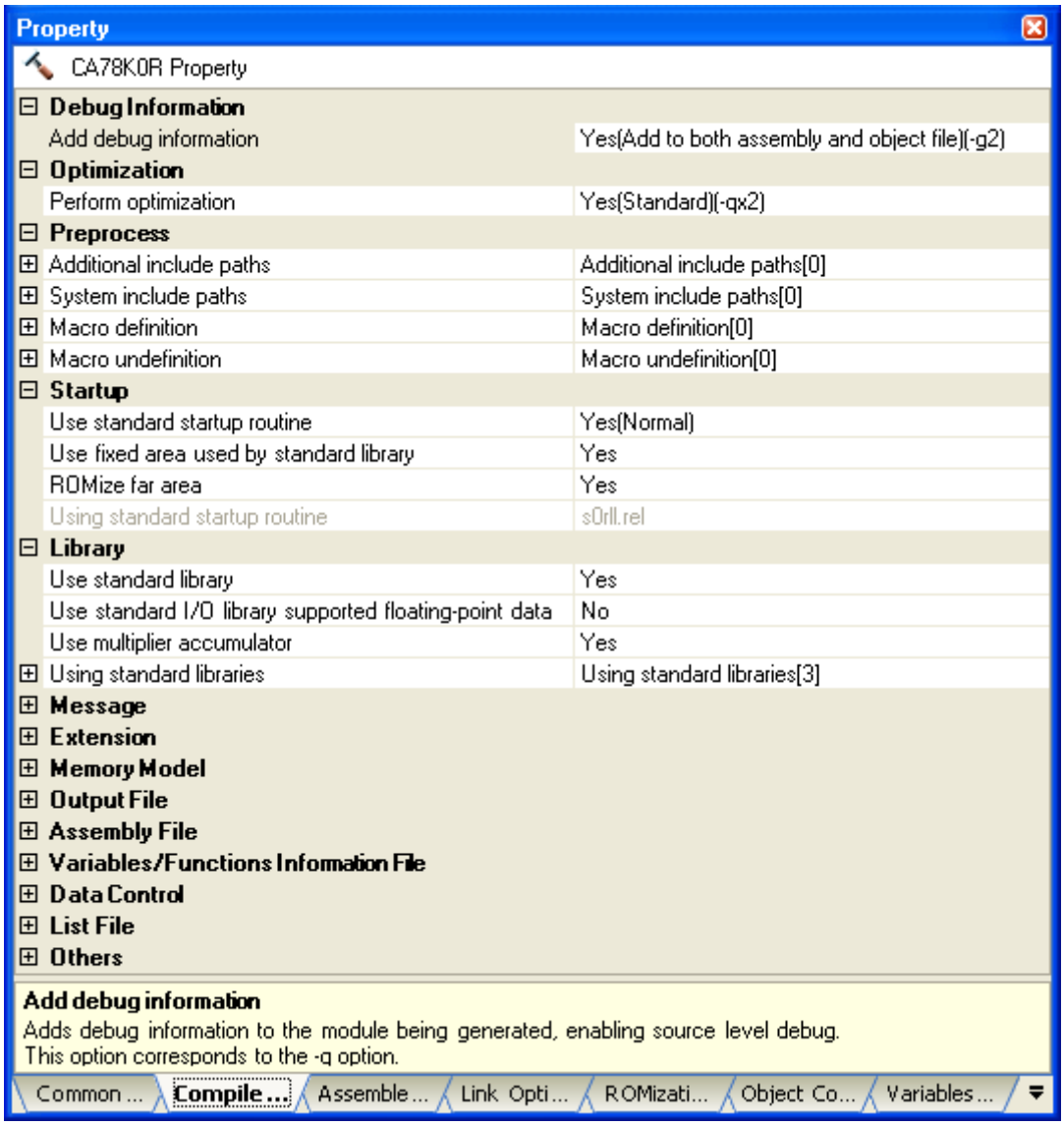
Commands executed after build processing	Specify the command to be executed after build processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. The specified command is displayed as the subproperty.	
	Default	Commands executed after build processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.

[Compile Options] tab

This tab shows the detailed information on the compiler categorized by the following and the configuration can be changed.

(1) [Debug Information]
(2) [Optimization]
(3) [Optimization(Details)]
(4) [Preprocess]
(5) [Startup]
(6) [Library]
(7) [Message]
(8) [Extension]
(9) [Memory Model]
(10) [Output File]
(11) [Assembly File]
(12) [Variables/Functions Information File]
(13) [Data Control]
(14) [List File]
(15) [Others]

Figure A-5. Property Panel: [Compile Options] Tab



[Description of each category]

(1) [Debug Information]

The detailed information on debug information is displayed and the configuration can be changed.

Add debug information	Select whether to enable source level debugging by adding debug information to the module being generated. This corresponds to the -g option of the compiler.		
	Default	Yes(Add to both assembly and object file)(-g2)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Add to object file only)(-g1)	Adds debug information to the object module file being generated.
		Yes(Add to both assembly and object file)(-g2)	Adds debug information to the object module file and assembler source module file being generated.
		No(-ng)	Does not add debug information to the object module file being generated.

(2) [Optimization]

The detailed information on the optimization is displayed and the configuration can be changed.

Perform optimization	Select the type of the optimization for compiling. This corresponds to the -qx option of the compiler.		
	Default	Yes(Standard)(-qx2)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Speed precedence)(-qx1)	Performs optimization with the execution speed precedence.
		Yes(Standard)(-qx2)	Performs optimization with both the execution speed and module size precedence.
		Yes(Code size precedence)(-qx3)	Performs optimization with the module size precedence.
		Yes(Detail setting)	The [Optimization(Details)] category is shown. The option that is selected in the category has the precedence for the optimization. When [No] is selected in all the properties in the [Optimization(Details)] category, the optimization will not be done.
		No(-nq)	Does not specify optimization.

(3) [Optimization(Details)]

The detailed information on the optimization are displayed and the configuration can be changed.

This category is displayed only when [Yes(Detail setting)] in the [Perform optimization] property in the [Optimization] category is selected.

Swap order of formula operations	Select whether to output an efficient code in order to achieve efficient register utilization by swapping the execution order of formula. This corresponds to the -qw option of the compiler.		
	Default	Yes(Swap order of formula operations)(-qw)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Swap order of formula operations)(-qw)	Swaps the order of formula operations.
		No	Does not specify swapping the order of formula operations.
Assign automatic variables to register or saddr area	Select whether to automatically assign automatic variables to a register and the saddr area. This corresponds to the -qv option of the compiler.		
	Default	Yes(-qv)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qv)	Assigns automatic variables to a register and the saddr area automatically.
		No	Does not specify assigning automatic variables to a register and the saddr area automatically.
Assign register variables to register and saddr area	Select whether to assign register variables to registers and assign them also to the saddr area. This corresponds to the -qr option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qr)	Assigns register variables to registers and assigns them also to the saddr area.
		No	Does not specify assigning register variables to the saddr area.
Not use sign extended calculation for char	Select whether to perform char-related calculations without pan-integral extension. This corresponds to the -qc option of the compiler.		
	Default	Yes(-qc)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qc)	Performs char-related calculations without pan-integral extension.[Note]
		No	Performs char-related calculations with pan-integral extension.
Interpret char to unsigned char	Select whether to interpret the char without qualifier as a unsigned char. This corresponds to the -qu option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qu)	Interprets the char without qualifier as a unsigned char.
		No	Does not specify interpreting the char without qualifier as a unsigned char.

Optimize branch instruction	Select whether to optimize branch instructions. This corresponds to the -qj option of the compiler.		
	Default	Yes(-qj)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qj)	Optimizes branch instructions.
		No	Does not specify optimizing branch instructions.
Replace fixed code to library(Size precedence optimization)	Select whether to replace the fixed code with the library. This corresponds to the -ql option of the compiler.		
	Default	Yes(Do not replace)(-ql1)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Do not replace)(-ql1)	Does not replace the fixed code with the library. Performs optimization with the module size precedence.
		Yes(Replace only process before/after function)(-ql2)	Replaces only the processing routines before and after the function with a library.
		Yes(Replace process before/after function, use low level libraries and subroutinize same codes)(-ql3)	Replaces only the processing routines before and after the function with a library. Also, uses low level libraries and subroutinizes same codes.
		No	Does not specify replacing the fixed code with the library. Performs optimization with the execution speed precedence.
Generate relative branch table for switch statement	Select whether to generate the switch branch table of the relative branch. This corresponds to the -qx option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qt)	Generates the switch branch table of the relative branch.
		No	Does not specify generating the switch branch table of the relative branch.
Optimize for debugging	Select whether to perform the optimization for debugging. This corresponds to the -qg option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qg)	Performs the optimization for debugging.
		No	Does not specify performing the optimization for debugging.

Optimize for debugging	Select whether to perform the optimization for debugging. This corresponds to the -qg option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qg)	Performs the optimization for debugging.
		No	Does not specify performing the optimization for debugging.

Note The results of the calculation when the -qc option is set are as follows.

Calculation Target	Calculation Result
unsigned char type variable and unsigned char type variable	unsigned char type
unsigned char type variable and signed char type variable	unsigned char type
signed char type variable and signed char type variable	signed char type
Constants from -128 to 255 and unsigned char type variable	unsigned char type
Constants from -128 to 127 and signed char type variable	signed char type
Constants from 0 to 255 with suffix U and signed char type variable	unsigned char type

(4) [Preprocess]

The detailed information on the preprocess are displayed and the configuration can be changed.

Additional include paths	Specify the additional include paths during compiling. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. When this option is omitted, only the standard folder of the compiler is searched. The reference point of the path is the project folder. This corresponds to the -i option of the compiler. The specified include path is displayed as the subproperty. When the include path is added to the project tree, the path is added to the top of the subproperties. Uppercase characters and lowercase characters are not distinguished for the include paths.	
	Default	Additional include paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified. However, this also includes the number of paths used by linked tools. If the number of items specified in the [System include paths] property, and in the [Additional include paths] property in the [Preprocess] category on the [Individual Compile Options] tab, together total more than 64, then an error will occur under build execution.

System include paths	The include paths which the system set during compiling are displayed. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. The system include path is searched with lower priority than the additional include path. The reference point of the path is the project folder. This corresponds to the -i option of the compiler. The include path is displayed as the subproperty.	
	Default	System include paths[*number of defined items*]
	How to change	Edit by the System Include Path Order dialog box which appears when clicking the [...] button.
	Restriction	Changes not allowed (Only the specified order of the include paths can be changed.)
Macro definition	Specify the macro name to be defined. Specify in the format of "*macro name=defined value*", with one macro name per line. The "=*defined value*" part can be omitted, and in this case, "1" is used as the defined value. This corresponds to the -d option of the compiler. The specified macro is displayed as the subproperty.	
	Default	Macro definition[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 30 items can be specified.
Macro undefinition	Specify the macro name to be undefined. Specify in the format of "*macro name*", with one macro name per line. This corresponds to the -u option of the compiler. The specified macro is displayed as the subproperty.	
	Default	Macro undefinition[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 30 items can be specified.

(5) [Startup]

The detailed information on the startup are displayed and the configuration can be changed.

Use standard startup routine	Select whether to link, during linking, the object module file provided with the compiler in which the standard startup routine is written. However, when any C source file is added to the project, the object module file provided with the compiler is not linked. The value of this property stored as the standard build option (see "2.15.8 Set the current build options as the standard for the project") is set to the default value when the [Output objects for flash] property in the [Memory Model] category is changed.		
	Default	- When selecting [Yes(-zf)] on the [Output objects for flash] property [Yes(For flash area)] - When selecting [No] on the [Output objects for flash] property [Yes(Normal)]	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Normal)	Links the object module file provided with the compiler. This item is not displayed when [Yes(-zf)] in the [Output objects for flash] property is selected.
		Yes(For boot area)	Links the object module file for the boot area provided with the compiler. This item is not displayed when [Yes(-zf)] in the [Output objects for flash] property is selected.
		Yes(For flash area)	Links the object module file for the flash area provided with the compiler. This item is not displayed when [No] in the [Output objects for flash] property is selected.
		No	Does not link the object module file provided with the compiler.
Use fixed area used by standard library	Select whether to use the fixed area (RAM) used by standard libraries brk, sbrk, malloc, calloc, realloc, free, exit, rand, srand, div, ldiv, strtok, atof, strtod, mathematical functions, and floating-point runtime library. If these functions will not be used, the RAM can be conserved by selecting [No]. This property is not displayed when [No] in the [Use standard startup routine] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Uses the fixed area used by the standard library.
		No	Does not use the fixed area used by the standard library.
ROMize far area	Select whether to ROMize the far area. This property is not displayed when [No] in the [Use standard startup routine] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	ROMizes the far area.
		No	Does not ROMizes the far area.

Using standard startup routine	Displays the file name of the standard startup routine objects used during linking, in the current settings.[Note] This property is not displayed when [No] in the [Use standard startup routine] property is selected.	
	Default	*Using startup routine file name*
	How to change	Changes not allowed

Note Naming rules of startup routine files are as follows.

```
s0r<model><lib><flash>.rel
```

<model>

m	When the memory model is either a small model or a medium model, and also ROMizing the far area is not performed
l	When the memory model is a large model, and also ROMizing the far area is performed

<lib>

None	When the fixed area used by the standard library is not used
l	When the fixed area used by the standard library is used

<flash>

None	When the standard object is generated
b	When the object for the boot area is generated
e	When the object for the flash area is generated

(6) [Library]

The detailed information on the library are displayed and the configuration can be changed.

Use standard library	Select whether to link the standard library during linking. However, when any C source file is added to the project, the library is not linked.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Links the standard library during linking.
		No	Does not link the standard library during linking.

Use standard I/O library supported floating-point data	Select whether to use sprintf, sscanf, printf, vprintf, and vsprintf which support the input and output of floating-point data. This property is not displayed when [No] in the [Use standard library] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Uses the standard library which support the input and output of floating-point data.
		No	Does not use the standard library which support the input and output of floating-point data.
Use multiplier and divider	Select whether to use the standard library which supports a multiplier and divider. Whether there is a multiplier and divider depends on the microcontroller that is used. This property is not displayed when the microcontroller does not have a multiplier and divider, when the microcontroller has built-in multiplication/division/addition instructions, or when [No] in the [Use standard library] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Uses the standard library which supports a multiplier and divider.
		No	Does not use the standard library which supports a multiplier and divider.
Use multiplier	Select whether to use the standard library which supports a multiplier. Whether there is a multiplier depends on the microcontroller that is used. This property is not displayed when the microcontroller does not have a multiplier, when the microcontroller has built-in multiplication/division/addition instructions, or when [No] in the [Use standard library] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Uses the standard library which supports a multiplier.
		No	Does not use the standard library which supports a multiplier.
Use multiplier accumulator	Select whether to use the standard library which supports a multiplier accumulator. Whether there is a multiplier accumulator depends on the microcontroller that is used. This property is not displayed when the microcontroller does not have a multiplier accumulator, when the microcontroller has built-in multiplication/division/addition instructions, or when [No] in the [Use standard library] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Uses the standard library which supports a multiplier accumulator.
		No	Does not use the standard library which supports a multiplier accumulator.

Using standard libraries	Display the file name and numbers of the standard libraries used during linking, in the current settings. The linking library file name is displayed as the subproperty.[Note] This property is not displayed when [No] in the [Use standard library] property is selected.	
	Default	Using standard libraries[*number of using standard libraries*]
	How to change	Changes not allowed

Note Naming rules of library files are as follows.

```
cl<line><mul><model><float><flash>.lib
```

<line>

0r	Product without RL78 extensions or 78K0R
78	Product with RL78 extensions

<mul>

None	When the multiplier or divider is not used
x	When the multiplier is used
d	When the multiplier and divider are used
a	When the multiplier accumulator are used

<model>

m	When the memory model is the small or medium model
l	When the memory model is the large model

<float>

None	When the standard I/O library supported floating-point data is not used
f	When the standard I/O library supported floating-point data is used

<flash>

None	When the object for the standard or for the boot area is generated
e	When the object for the flash area is generated

(7) [Message]

The detailed information on messages are displayed and the configuration can be changed.

Verbose mode	Select whether to display the execution status of the compiler to the Output panel during build. This corresponds to the -v option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-v)	Displays the execution status of the compiler during build.
		No	Does not display the execution status of the compiler during build.
Warning level	Select the warning display level under compiling. This corresponds to the -w option of the compiler.		
	Default	Normal output	
	How to change	Select from the drop-down list.	
	Restriction	No output(-w0)	Does not output warning messages.
		Normal output	Outputs normal warning messages.
		Particular output(-w2)	Outputs detailed warning messages.

(8) [Extension]

The detailed information on extensions are displayed and the configuration can be changed.

Allow C++ format comments	Select whether to allow the use of C++ format comments ("//"). This corresponds to the -zp option of the compiler.		
	Default	Yes(-zp)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zp)	Allows the use of C++ format comments.
		No	Does not allow the use of C++ format comments.
Allow nested comments	Select whether to allow the nest use of comments ("/**/"). This corresponds to the -zc option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zc)	Allows the nest use of comments.
		No	Does not allow the nest use of comments.
Kanji character code of source	Select the Kanji character code of the source. This corresponds to the -zs, -ze, and -zn option of the compiler.		
	Default	Shift_JIS(-zs)	
	How to change	Select from the drop-down list.	
	Restriction	Shift_JIS(-zs)	Interprets the kanji code of the source as Shift_JIS.
		EUC-JP(-ze)	Interprets the kanji code of the source as EUC-JP.
		Unspecified(-zn)	Interprets the source as not containing kanji codes.

Follow ANSI Standard	Select whether to disable non-ANSI standard functions and enable some of the functions of the ANSI standard. This corresponds to the -za option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-za)	Disables non-ANSI standard functions and enables some of the functions of the ANSI standard.
		No	Enables non-ANSI standard functions.
Disable an int extension for function	Select whether to disable the int extension for the char/unsigned char type arguments and the return values of functions. This corresponds to the -zb option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zb)	Disables the int extension for the char/unsigned char type arguments and the return values of functions.
		No	Enables the int extension for the char/unsigned char type arguments and the return values of functions.
Output the object for RAM	Select whether to allocate codes and ROM data to the RAM area. And specify the area that allocates a runtime library for RAM. This corresponds to the -zx option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Runtime library is allocated in the ROM area)(-zx1)	Allocates codes and ROM data to the RAM area and allocates a runtime library for the ROM area.
		Yes(Runtime library is allocated in the RAM area)(-zx2)	Allocates codes and ROM data to the RAM area and allocates a runtime library for the RAM area. The [Replace fixed code to library(Size precedence optimization)] property is assumed that [Yes(Do not replace)(-ql1)] has been selected.
		No	Does not allocate codes and ROM data to the RAM area.

(9) [Memory Model]

The detailed information on the memory model are displayed and the configuration can be changed.

Memory model type	Specify the type of memory model. This corresponds to the -m option of the compiler.		
	Default	Medium model(Code 1MBytes/Data 64KBytes)(-mm)	
	How to change	Select from the drop-down list.	
	Restriction	Small model(Code 64KBytes/Data 64KBytes)(-ms)	Specifies the small model as the memory model.
		Medium model(Code 1MBytes/ Data 64KBytes)(-mm)	Specifies the medium model as the memory model.
		Large model(Code 1MBytes/Data 1MBytes)(-ml)	Specifies the large model as the memory model.
Output objects for flash	Select whether to output the object for flash. This corresponds to the -zf option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zf)	Outputs objects for flash.
		No	Does not output objects for flash.
Start address of flash area	Specify the start address of the flash area in hexadecimal without 0x. This corresponds to the -zz option of the compiler. If this property is changed, the same value is set to the [Flash start address] property in the [Device] category from the [Link Options] tab. Values saved in versions of CubeSuite below 1.20 may be outside the allowed setting range. If the values set outside the allowed range are restored, this property is blank.		
	Default	Blank	
	How to change	Directly enter	
	Restriction	Hexadecimal number (depends on the selected device)	
Start address of flash area branch table	Specify the start address of the flash area branch table in hexadecimal without 0x. This corresponds to the -zt option of the compiler. Values saved in versions of CubeSuite below 1.20 may be outside the allowed setting range. If the values set outside the allowed range are restored, this property is blank.		
	Default	Blank	
	How to change	Directly enter	
	Restriction	Hexadecimal number (depends on the selected device)	
Specify mirror area	Specify the mirror source area. MAA is bit 0 of the processor mode control register (PMC). This corresponds to the -mi option of the compiler. If the value of the [Specify mirror area] property in the [Device] category from the [Link Options] tab is changed, the same value will be set to this property.		
	Default	MAA=0(-mi0)	
	How to change	Select from the drop-down list.	
	Restriction	MAA=0(-mi0)	Assumes that MAA=0 is set.
		MAA=1(-mi1)	Assumes that MAA=1 is set.

(10) [Output File]

The detailed information on output files is displayed and the configuration can be changed.

Output common object file for various devices	Select whether to output the objects common to the various devices. This corresponds to the -common option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-common)	Outputs the objects common to the various devices.
		No	Does not specifies outputting the objects common to the various devices.

(11) [Assembly File]

The detailed information on assembly files is displayed and the configuration can be changed.

Output assemble file	Select whether to output the assembly file. This corresponds to the -a, -sa, and -li options of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(With no C source info)(-a)	Outputs the assembly file (without C source information).
		Yes(With C source info(unexpanded include file contents))(-sa)	Outputs the assembly file (with C source information (include file contents are not expanded)).
		Yes(With C source info(expanded include file contents))(-sa,-li)	Outputs the assembly file (with C source information (include file contents are expanded)).
		No	Does not output the assembly file.

(12) [Variables/Functions Information File]

The detailed information on the variables/functions information file are displayed and the configuration can be changed.

This category is not displayed for library projects.

Using variables/functions information file	This is the variables/functions information file to be used for allocating to the saddr area for variables and the callt table area for functions. The valid variables/functions information file registered to the project is searched and the file name is displayed. This corresponds to the -ma option of the compiler.	
	Default	*The name of the variables/functions information file that is added to the project*
	How to change	Changes not allowed

Variables/functions information file for boot area	Specify the variables/functions information file which is used in the project of the boot area. This corresponds to the -ma option of the compiler. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). This property is not displayed when [No] in the [Output objects for flash] property in the [Memory Model] category is selected.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Specify Variables/Functions Information File for Boot Area dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

(13) [Data Control]

The detailed information on data control are displayed and the configuration can be changed.

Assign bit field in structure from MSB	Select whether to assign the member of the bit field structure from MSB. This corresponds to the -rb option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-rb)	Assigns the member of the bit field structure from MSB.
		No	Assigns the member of the bit field structure from LSB.
Pack structure members	Select whether to prohibit from inserting the align data to allocate the members (consisting of 2 or more bytes) in a structure to even address. This corresponds to the -rc option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-rc)	Prohibits from inserting the align data to allocate the members (consisting of 2 or more bytes) in a structure to even address.
		No	Inserts the align data to allocate the members (consisting of 2 or more bytes) in a structure to even address.
Perform indirect referencing in 1-byte units	Select whether to perform indirect referencing in 1-byte units. This corresponds to the -ra option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ra)	Performs indirect referencing in 1-byte units.
		No	Does not perform indirect referencing in 1-byte units.

Allocate static variables to saddr area	Select the type of the static variable to be allocated in the saddr area. This corresponds to the -rs option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Size of char)(-rs1)	Allocates char and unsigned char types automatic variables to the saddr area.
		Yes(Size of char, short, int)(-rs2)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer types automatic variables to the saddr area.
		Yes(Size of char, short, int, long)(-rs4)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer types automatic variables to the saddr area.
		Yes(Structure, union, array)(-rsm)	Allocates structure, union, and array types automatic variables to the saddr area.
		Yes(Size of char and structure, union, array)(-rs1m)	Allocates char, unsigned char, structure, union, and array types automatic variables to the saddr area.
		Yes(Size of char, short, int and structure, union, array)(-rs2m)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer, structure, union, and array types automatic variables to the saddr area.
		Yes(Size of char, short, int, long and structure, union, array)(-rs)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer, structure, union, and array types automatic variables to the saddr area.
		No	Does not allocate static variables to the saddr area.

Allocate external variables to saddr area	Select the type of the external variable to be allocated in the saddr area. This corresponds to the -rd option of the compiler. This property is not displayed when a file name is set in the [Using variables information file] property in the [Variables/Functions Information File] category.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Size of char)(-rd1)	Allocates char and unsigned char types external variables to the saddr area.
		Yes(Size of char, short, int)(-rd2)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer types external variables to the saddr area.
		Yes(Size of char, short, int, long)(-rd4)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer types external variables to the saddr area.
		Yes(Structure, union, array)(-rdm)	Allocates structure, union, and array types external variables to the saddr area.
		Yes(Size of char and structure, union, array)(-rd1m)	Allocates char, unsigned char, structure, union, and array types external variables to the saddr area.
		Yes(Size of char, short, int and structure, union, array)(-rd2m)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer, structure, union, and array types external variables to the saddr area.
		Yes(Size of char, short, int, long and structure, union, array)(-rd)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer, structure, union, and array types external variables to the saddr area.
		No	Does not allocate external variables to the saddr area.
Specify allocation destination of ROM data	Specify where ROM data is allocated. This corresponds to the -rf and -rm option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(far area)(-rf)	Allocates ROM data to the far area.
		Yes(near area)(-rn)	Allocates ROM data to the near area.
		No	Does not specify the allocation destination of ROM data.

(14) [List File]

The detailed information on list files are displayed and the configuration can be changed.

Output preprocess list file	Select whether to output the preprocess file. This corresponds to the -p option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-p)	Outputs the preprocess list file.
		No	Does not output the preprocess list file.
Not output comments	Select whether to disable to output comments into the preprocess list file. This corresponds to the -kc option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kc)	Does not output comments into the preprocess list file.
		No	Outputs comments into the preprocess list file.
Expand #define preprocessor directive	Select whether to expand the #define directive into the preprocess list file. This corresponds to the -kd option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kd)	Expands the #define directive into the preprocess list file.
		No	Does not expand the #define directive into the preprocess list file.
Expand #if,#ifdef,#ifndef preprocessor directive	Select whether to perform output by expanding #if, #ifdef, and #ifndef directives into the preprocess list file. This corresponds to the -kf option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	Yes(-kf)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kf)	Performs output by expanding #if, #ifdef, and #ifndef directives into the preprocess list file.
		No	Does not perform output by expanding #if, #ifdef, and #ifndef directives into the preprocess list file.
Expand #include preprocessor directive	Select whether to perform output by expanding #include directives into the preprocess list file. This corresponds to the -ki option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ki)	Performs output by expanding #include directives into the preprocess list file.
		No	Does not expand the #include directive into the preprocess list file.

Expand #line preprocessor directive	Select whether to perform output by expanding #line directives into the preprocess list file. This corresponds to the -kl option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	Yes(-kl)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kl)	Performs output by expanding #line directives into the preprocess list file.
		No	Does not expand the #line directive into the preprocess list file.
Output line numbers	Select whether to output line numbers into the preprocess list file. This corresponds to the -kn option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	Yes(-kn)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kn)	Outputs line numbers into the preprocess list file.
		No	Does not output line numbers into the preprocess list file.
Output error list file	Select whether to output the error list file. This corresponds to the -e and -se options of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Without C source)(-e)	Outputs the error list file (without C source).
		Yes(With C source)(-se)	Outputs the error list file (with C source).
		No	Does not output the error list file.
Output cross reference list file	Select whether to output the cross reference list file. This corresponds to the -x option of the compiler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-x)	Outputs the cross reference list file.
		No	Does not output the cross reference list file.
Output with form feed control code	Select whether to output a form feed code into the end of list files (preprocess list file, error list file, and cross reference list file). This corresponds to the -lf option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the end of the list files.
		No	Does not output a form feed code into the end of the list files.

Number of characters in 1 line	Specify the number of characters in each line of list files (preprocess list file, error list file, and cross reference list file). This corresponds to the -lw option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.	
	Default	132
	How to change	Directly enter to the text box.
	Restriction	72 to 132 (decimal number)
Number of lines on 1 page	Specify the number of lines on 1 page of list files (preprocess list file, error list file, and cross reference list file). If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.	
	Default	0
	How to change	Directly enter to the text box.
	Restriction	0, and 20 to 65535 (decimal number)
Tab width	Specify the tab width of list files (preprocess list file, error list file, and cross reference list file). This corresponds to the -lt option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.	
	Default	8
	How to change	Directly enter to the text box.
	Restriction	0 to 8 (decimal number)

(15) [Others]

Other detailed information on compilation are displayed and the configuration can be changed.

Commands executed before compile processing	Specify the command to be executed before compile processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be compiled. %CompiledFile%: Replaces with the absolute path of the output file under compiling. The specified command is displayed as the subproperty.	
	Default	Commands executed before compile processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.

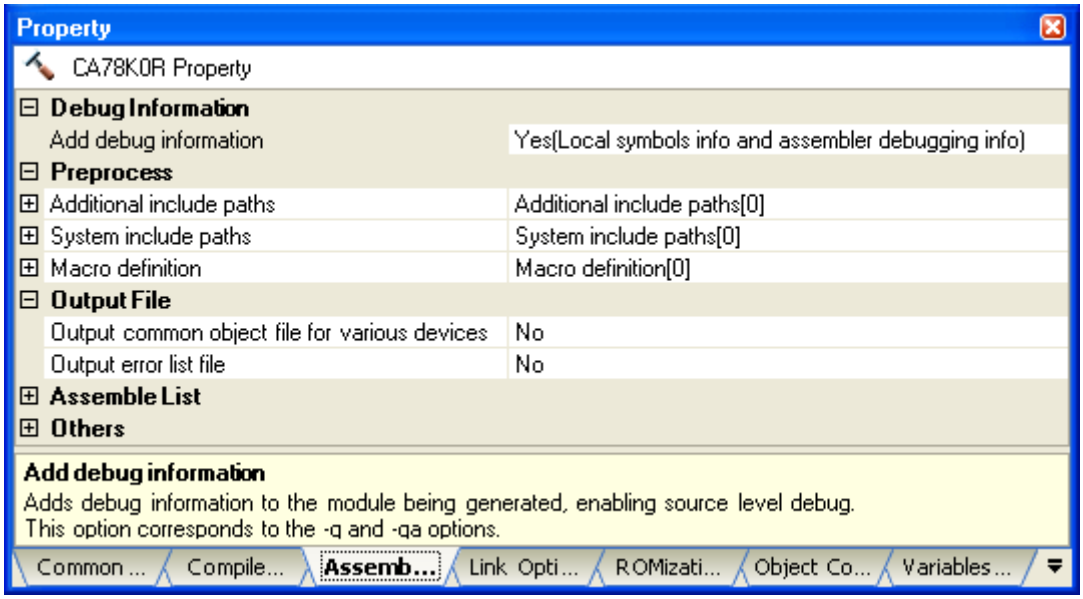
Commands executed after compile processing	Specify the command to be executed after compile processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be compiled. %CompiledFile%: Replaces with the absolute path of the output file under compiling. The specified command is displayed as the subproperty.	
	Default	Commands executed after compile processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the compile options to be added additionally. The options set here are added at the end of the compile options group.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

[Assemble Options] tab

This tab shows the detailed information on the assembler categorized by the following and the configuration can be changed.

(1) [Debug Information]
(2) [Preprocess]
(3) [Output File]
(4) [Assemble List]
(5) [Others]

Figure A-6. Property Panel: [Assemble Options] Tab



[Description of each category]

(1) [Debug Information]

The detailed information on debug information is displayed and the configuration can be changed.

Add debug information	Select whether to enable source level debugging by adding debug information to the module being generated. This corresponds to the -g and -ga options of the assembler.		
	Default	Yes(Local symbols info and assembler debugging info)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Assembler debugging info)(-ng,-ga)	Adds debug information (assembler debugging symbol information) to the object module file being generated.
		Yes(Local symbols info and assembler debugging info)	Adds debug information (local symbol and assembler debugging symbol information) to the object module file being generated.
		No(-ng,-nga)	Does not add debug information to the object module file being generated.

(2) [Preprocess]

The detailed information on the preprocess are displayed and the configuration can be changed.

Additional include paths	Specify the additional include paths during assembling. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. When this option is omitted, only the standard folder of the assembler is searched. The reference point of the path is the project folder. This corresponds to the -i option of the assembler. The specified include path is displayed as the subproperty. When the include path is added to the project tree, the path is added to the top of the subproperties. Uppercase characters and lowercase characters are not distinguished for the include paths.	
	Default	Additional include paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified. However, this also includes the number of paths used by linked tools. If the number of items specified in the [System include paths] property, and in the [Additional include paths] property in the [Preprocess] category on the [Individual Assemble Options] tab, together total more than 64, then an error will occur under build execution.
System include paths	The include paths which the system set during assembling are displayed. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. The system include path is searched with lower priority than the additional include path. The reference point of the path is the project folder. This corresponds to the -i option of the assembler. The include path is displayed as the subproperty.	
	Default	System include paths[*number of defined items*]
	How to change	Edit by the System Include Path Order dialog box which appears when clicking the [...] button.
	Restriction	Changes not allowed (Only the specified order of the include paths can be changed.)

Macro definition	Specify the macro name to be defined. Specify in the format of "*macro name=defined value*", with one macro name per line. The "*=defined value*" part can be omitted, and in this case, "1" is used as the defined value. This corresponds to the -d option of the assembler. The specified macro is displayed as the subproperty.		
	Default	Macro definition[*number of defined items*]	
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 256 characters Up to 30 items can be specified.	

(3) [Output File]

The detailed information on output files are displayed and the configuration can be changed.

Output common object file for various devices	Select whether to output the objects common to the various devices. This corresponds to the -common option of the assembler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-common)	Outputs the objects common to the various devices.
		No	Outputs objects for RL78 and 78K0R.
Output error list file	Select whether to output the error list file. This corresponds to the -e option of the assembler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file.
		No	Does not output the error list file.

(4) [Assemble List]

The detailed information on the assemble list are displayed and the configuration can be changed.

Output assemble list file	Select whether to output the assemble list file. This corresponds to the -p option of the assembler.		
	Default	Yes(-p)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-p)	Outputs an assemble list file.
		No(-np)	Does not output an assemble list file.

Execute list converter	Select whether the list converter is executed following the generation of an execution module. The list converter is not executed during library generation. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Executes the list converter after the generation of an execution module.
		No	Does not execute the list converter after the generation of an execution module.
Output list converter error list file	Select whether to output an error list file during list converter execution. This corresponds to the -e option of the list converter. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected and when [No] in the [Execute list converter] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file during list converter execution.
		No	Does not output an error list file during list converter execution.
Output with assemble list info	Select whether to output the assemble list information into the assemble list file. This corresponds to the -ka option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the assemble list information into the assemble list file.
		No(-nka)	Does not output the assemble list information into the assemble list file.
Output with symbol list	Select whether to output the symbol list information into the assemble list file. This corresponds to the -ks option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ks)	Outputs the symbol list information into the assemble list file.
		No	Does not output the symbol list information into the assemble list file.

Output with cross reference list	Select whether to output the cross reference list information into the assemble list file. This corresponds to the -kx option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kx)	Outputs the cross reference list information into the assemble list file.
		No	Does not output the cross reference list information into the assemble list file.
Output with form feed control code	Select whether to output a form feed code into the end of list files. This corresponds to the -lf option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the end of the list files.
		No	Does not output a form feed code into the end of the list files.
Number of characters in 1 line	Specify the number of characters in each line of the list file. This corresponds to the -lw option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	132	
	How to change	Directly enter to the text box.	
	Restriction	72 to 2046 (decimal number)	
Number of lines on 1 page	Specifies the number of lines on 1 page of the list file. If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	0	
	How to change	Directly enter to the text box.	
	Restriction	0, and 20 to 32767 (decimal number)	
Tab width	Specify the tab width of the list file. This corresponds to the -lt option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	8	
	How to change	Directly enter to the text box.	
	Restriction	0 to 8 (decimal number)	

Header title	Specify the header of the assemble list file. A string containing double-byte characters and single-byte spaces can be specified. This corresponds to the -lh option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	Up to 60 single-byte characters (30 double-byte characters)	

(5) [Others]

Other detailed information on assembly are displayed and the configuration can be changed.

Kanji character code of source	Select the Kanji character code of the source. This corresponds to the -zs, -ze, and -zn options of the assembler.		
	Default	Shift_JIS(-zs)	
	How to change	Select from the drop-down list.	
	Restriction	Shift_JIS(-zs)	Interprets the kanji code of the source as Shift_JIS.
		EUC-JP(-ze)	Interprets the kanji code of the source as EUC-JP.
		Unspecified(-zn)	Interprets the source as not containing kanji codes.
Allow 78K0 macro to assemble	Select whether to enable assembly of the assembler source file generated by the assembler for 78K0 microcontrollers. This corresponds to the -compati option of the assembler.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-compati)	Enables assembly of the assembler source file generated by the assembler for 78K0 microcontrollers.
		No	Does not enable assembly of the assembler source file generated by the assembler for 78K0 microcontrollers.
Commands executed before assemble processing	Specify the command to be executed before assemble processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be assembled. %AssembledFile%: Replaces with the absolute path of the output file under assembling. The specified command is displayed as the subproperty.		
	Default	Commands executed before assemble processing[*number of defined items*]	
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 1023 characters Up to 64 items can be specified.	

Commands executed after assemble processing	Specify the command to be executed after assemble processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be assembled. %AssembledFile%: Replaces with the absolute path of the output file under assembling. The specified command is displayed as the subproperty.	
	Default	Commands executed after assemble processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the assemble options to be added additionally. The options set here are added at the end of the assemble options group.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

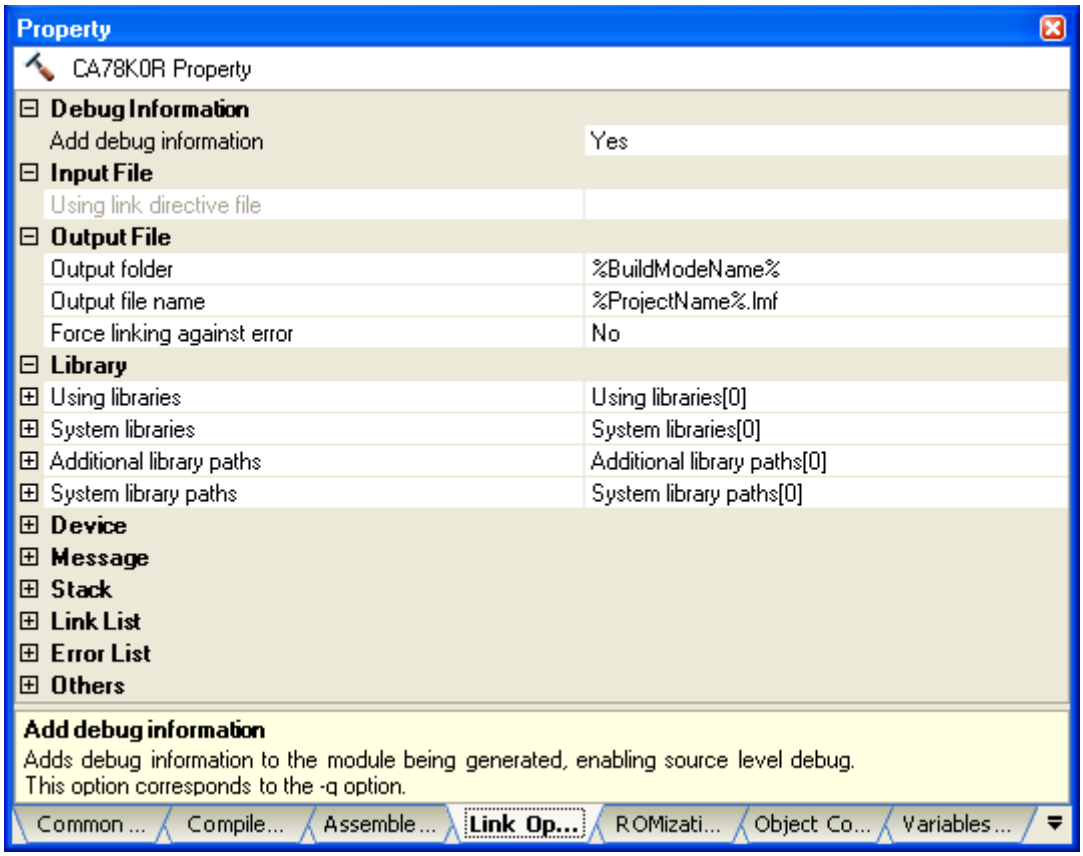
[Link Options] tab

This tab shows the detailed information on the linker categorized by the following and the configuration can be changed.

(1) [Debug Information]
(2) [Input File]
(3) [Output File]
(4) [Library]
(5) [Device]
(6) [Message]
(7) [Stack]
(8) [Link List]
(9) [Error List]
(10) [Others]

Caution This tab is not displayed for library projects.

Figure A-7. Property Panel: [Link Options] Tab



[Description of each category]

(1) [Debug Information]

The detailed information on debug information is displayed and the configuration can be changed.

Add debug information	Select whether to enable source level debugging by adding debug information to the module being generated. This corresponds to the -g option of the linker.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Adds debug information to the object module file being generated.
		No(-ng)	Does not add debug information to the object module file being generated.

(2) [Input File]

The detailed information on input files is displayed and the configuration can be changed.

Using link directive file	Display the link directive file to be used for linking. This corresponds to the -d option of the linker.	
	Default	*The link directive file name that is added to the project*
	How to change	Changes not allowed

(3) [Output File]

The detailed information on output files are displayed and the configuration can be changed.

Output folder	Specify the folder for saving the module that is generated. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified.	
	Default	%BuildModeName%
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 247 characters

Output file name	Specify the load module file name to be output. Use the extension ".lmf". If the extension is omitted, ".lmf" is automatically added. This corresponds to the -o option of the linker. The following macro name is available as an embedded macro. %ProjectName%: Replaces with the project name. If this is blank, it is assumed that "%ProjectName%.lmf" has been specified.		
	Default	%ProjectName%.lmf	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	
Force linking against error	Select whether to forcibly generate the load module file when an error occurs during linking. This corresponds to the -j option of the linker.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-j)	Forcibly generates the load module file when an error occurs during linking.
		No	Does not generate the load module file when an error occurs during linking.

(4) [Library]

The detailed information on the library are displayed and the configuration can be changed.

Using libraries	Specify the library file name (*.lib) to be used other than the standard libraries. Add one file in one line. The library files are searched from the library path. This corresponds to the -b option of the linker. The specified library file name is displayed as the subproperty.		
	Default	Using libraries[*number of defined items*]	
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 259 characters Up to 64 items can be specified. If the number of items specified in the [System libraries] property, and in the [Using standard libraries] property in the [Library] category on the [Compile Options] tab, together total more than 64, then an error will occur under build execution.	
System libraries	The name of the library file which the system uses is displayed. The system library file is searched with lower priority than the library file to be used. The library file name is displayed as the subproperty.		
	Default	System libraries[*number of defined items*]	
	How to change	Changes not allowed	

Additional library paths	Specify the search folder to be used other than the standard libraries. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. The library files are searched from the library path.If a relative path is specified, the reference point of the path is the project folder. This corresponds to the -i option of the linker. The specified library path name is displayed as the subproperty.		
	Default	Additional library paths[*number of defined items*]	
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 259 characters Up to 64 items can be specified. If the number of items specified in the [System library paths] property, and in the [Using standard libraries] property in the [Library] category on the [Compile Options] tab, together total more than 64, then an error will occur under build execution.	
System library paths	The folder to search the system library file is displayed. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. If a relative path is displayed, the reference point of the path is the project folder. This corresponds to the -i option of the linker. The library path name is displayed as the subproperty.		
	Default	System library paths[*number of defined items*]	
	How to change	Changes not allowed	

(5) [Device]

The detailed information on the device are displayed and the configuration can be changed.

Use on-chip debug	Select whether to set the on-chip debug. Change the control value of the on-chip debug, the start address of the debug monitor area and the size of the debug monitor area. This corresponds to the -go option of the linker. This property is not displayed when the device does not have an on-chip debug function.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qo)	Sets the on-chip debug.
		No	Does not set the on-chip debug.

Option byte values for OCD	Specify the control value of on-chip debug option byte in hexadecimal without 0x. This corresponds to the -go option of the linker. Values saved in versions of CubeSuite below 1.20 may be outside the allowed setting range. If the values set outside the allowed range are restored, this property is blank. This property is not displayed when the device does not have an on-chip debug function and when [No] in the [Use on-chip debug] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	Hexadecimal number (depends on the selected device)	
Debug monitor area start address	Specify the start address of the debug monitor area in hexadecimal without 0x. This corresponds to the -go option of the linker. If this is blank, it is assumed that "internal ROM end address - 1024 + 1" has been specified. This property is not displayed when the [Use on-chip debug] property is not displayed or when [No] is selected in the property.		
	Default	Internal ROM end address - 1024 + 1	
	How to change	Directly enter to the text box.	
	Restriction	0 to FFFFF (hexadecimal number)	
Debug monitor area size[byte]	Specify the size of the debug monitor area in decimal. This corresponds to the -go option of the linker. If this is blank, an error will occur. This property is not displayed when the [Use on-chip debug] property is not displayed or when [No] is selected in the property.		
	Default	512 [RL78] 1024 [78K0R]	
	How to change	Directly enter to the text box.	
	Restriction	0 to 1024 (decimal number) [RL78] 88 to 1024 (decimal number) [78K0R]	
Set user option byte	Select whether to set the user option byte. This corresponds to the -gb option of the linker.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-gb)	Sets the user option byte. However, if the [User option byte value] property is blank, the user option byte is not set.
		No	Does not set the user option byte.
User option byte value	Specify the user option byte value in hexadecimal without 0x. This corresponds to the -gb option of the linker. Values saved in versions of CubeSuite below 1.20 may be outside the allowed setting range. If the values set outside the allowed range are restored, this property is blank. This property is not displayed when [No] in the [Set user option byte] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	Hexadecimal number (The range that can be specified depends on the selected device)	

Specify mirror area	Select the area to allocate the segment that is mirrored in the RAM space. This corresponds to the -mi option of the linker. If the value of the [Specify mirror area] property in the [Output File] category from the [Compile Options] tab is changed, the same value will be set to this property.		
	Default	MAA=0(-mi0)	
	How to change	Select from the drop-down list.	
	Restriction	MAA=0(-mi0)	Allocates the segment to the area that is mirrored when MAA = 0.
		MAA=1(-mi1)	Allocates the segment to the area that is mirrored when MAA = 1.
Allocate segment to last byte of 64 KB boundary area	Select whether to allocate a segment to the last byte of each 64 KB boundary area. This corresponds to the -ccza option of the linker. This property is not displayed when [No] in the [Follow ANSI Standard] property in the [Extension] category from the [Compile Options] tab is selected.		
	Default	- When a C source file is added to the project [No] - When only an assembler source file is added as the source file to the project. [Yes(-ccza)] - Immediately after creating the project [Yes(-ccza)]	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ccza)	Allocates a segment to the last byte of each 64 KB boundary area.
		No	Does not allocate a segment to the last byte of each 64 KB boundary area.
Set flash start address	Select whether to set the flash start address for the built-in flash ROM product. This corresponds to the -zb option of the linker. Do not set this property for a device that does not have a flash ROM area self-programming function. This property is changed to [No] when [Yes(-zf)] in the [Output objects for flash] property in the [Memory Model] category from the [Compile Options] tab is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zb)	Sets the flash start address for the built-in flash ROM product.
		No	Does not set the flash start address for the built-in flash ROM product.
Flash start address	Display the same value as the value of the [Start address of flash area] property on the [Memory Model] category from the [Compile Options] tab. This corresponds to the -zb option of the linker. Values saved in versions of CubeSuite below 1.20 may be outside the allowed setting range. If the values set outside the allowed range are restored, this property is blank. This property is not displayed when [No] in the [Set flash start address] property.		
	Default	Blank	
	How to change	Changes not allowed	

Boot area load module file name	Specify the boot area load module file name when the load module file for the flash area is generated. This corresponds to the -zf option of the linker. If this field is blank, a link error occurs. Be sure to specify the boot area load module file name. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). When this property is specified, the setting of the [Security ID] property in the [Device] category form [Common Options] tab is invalid.		
	Default	Blank	
	How to change	Directly enter to the text box or edit by the Specify Boot Area Load Module File dialog box which appears when clicking the [...] button.	
	Restriction	Up to 259 characters	
Control allocation to self RAM area	Select whether to control the allocation to the self RAM area. This corresponds to the -self and -selfw options of the linker. Do not set this property for a device that does not have a flash ROM area self-programming function.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Error message)(-self)	Prohibits the allocation to the self RAM area and outputs an error.
		Yes(Warning message)(-selfw)	Outputs a warning when allocating to the self RAM area.
		No	Uses the self RAM area as the internal RAM area.

(6) [Message]

The detailed information on messages is displayed and the configuration can be changed.

Warning level	Select the warning display level under linking. This corresponds to the -w option of the linker.		
	Default	Normal output	
	How to change	Select from the drop-down list.	
	Restriction	No output(-w0)	Does not output warning messages.
		Normal output	Outputs normal warning messages.
		Particular output(-w2)	Outputs detailed warning messages.

(7) [Stack]

The detailed information on the stack are displayed and the configuration can be changed.

Generate stack solution symbol	Select whether to generate a stack solution symbol. This corresponds to the -s option of the linker. If a C source file is added to the project and [Yes] is selected in the [Use standard startup routine] property in the [Startup] category from the [Compile Options] tab, this property is always set to [Yes(-s)] and cannot be changed.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-s)	Generates a stack solution symbol.
		No	Does not generate a stack solution symbol.
Area name	Specifies the name of the memory area that generates the stack solution symbol. If the area name is omitted, it is assumed that "RAM" has been specified. This corresponds to the -s option of the linker. This property is not displayed when [No] in the [Generate stack solution symbol] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.	
	Restriction	Up to 256 characters	

(8) [Link List]

The detailed information on the link list are displayed and the configuration can be changed.

Output link list file	Select whether to output the link list file. This corresponds to the -p option of the linker.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs a link list file.
		No(-np)	Does not output the link list file.
Output with link directive info	Select whether to output link directive information to the link list file. This corresponds to the -kd option of the linker. This property is not displayed when [No] in the [Output link list file] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs link directive information to the link list file.
		No(-nkd)	Does not output link directive information to the link list file.
Output with local symbol list	Select whether to output local symbol list information to the link list file. This corresponds to the -kl option of the linker. This property is not displayed when [No] in the [Output link list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kl)	Outputs local symbol list information to the link list file.
		No	Does not output local symbol list information to the link list file.

Output with public symbol list	Select whether to output public symbol list information to the link list file. This corresponds to the -kp option of the linker. This property is not displayed when [No] in the [Output link list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kp)	Outputs public symbol list information to the link list file.
		No	Does not output public symbol list information to the link list file.
Output with map list	Select whether to output map list information to the link list file. This corresponds to the -km option of the linker. This property is not displayed when [No] in the [Output link list file] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs map list information to the link list file.
		No(-nkm)	Does not output map list information to the link list file.
Output with form feed control code	Select whether to output a form feed code into the end of the link list file. This corresponds to the -lf option of the linker. This property is not displayed when [No] in the [Output link list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the end of the link list file.
		No	Does not output a form feed code into the end of the link list file.
Number of lines on 1 page	Specify the number of lines on 1 page of the link list file. If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the linker. This property is not displayed when [No] in the [Output link list file] property is selected.		
	Default	0	
	How to change	Directly enter to the text box.	
	Restriction	0, and 20 to 32767 (decimal number)	

(9) [Error List]

The detailed information on the error list is displayed and the configuration can be changed.

Output error list file	Select whether to output the error list file. This corresponds to the -e option of the linker.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file.
		No	Does not output the error list file.

(10) [Others]

Other detailed information on linking are displayed and the configuration can be changed.

Commands executed before link processing	Specify the command to be executed before link processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %LinkedFile%: Replaces with the absolute path of the output file under link processing. The specified command is displayed as the subproperty.	
	Default	Commands executed before link processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Commands executed after link processing	Specify the command to be executed after link processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %LinkedFile%: Replaces with the absolute path of the output file under link processing. The specified command is displayed as the subproperty.	
	Default	Commands executed after link processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the link options to be added additionally. The options set here are added at the end of the link options group.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

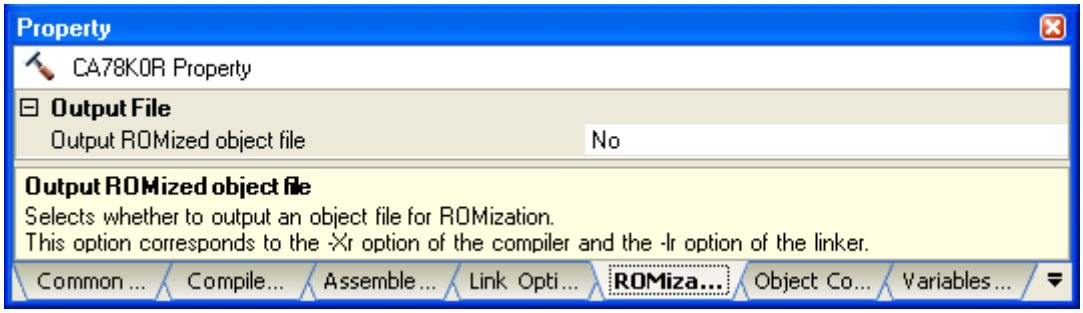
[ROMization Process Options] tab

This tab shows the detailed information on the ROMization processor categorized by the following and the configuration can be changed.

(1) [Output File]
(2) [Link Map]
(3) [Error List]
(4) [Others]

Caution This tab is not displayed for library projects.

Figure A-8. Property Panel: [ROMization Process Options] Tab



[Description of each category]

(1) [Output File]

The detailed information on output files is displayed and the configuration can be changed.

Output ROMized object file	Select whether to output the ROMized object file.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the ROMized object file.
		No	Does not output the ROMized object file.

Output folder for ROMized object file	Specify the folder for saving the ROMized object file. This corresponds to the -o option of the ROMization processor. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is assumed that the project folder has been specified. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.	
	Default	%BuildModeName%
	How to change	Directly enter in the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters
ROMized object file name	Specify the ROMized object file name. The extension other than ".lmf" cannot be specified. If the extension is omitted, ".lmf" is automatically added. This corresponds to the -o option of the ROMization processor. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.	
	Default	romp.lmf
	How to change	Directly enter to the text box.
	Restriction	Up to 259 characters
Start address of copy routine	Specify the start address of copy routine in hexadecimal without 0x (example: 100A0). This corresponds to the -rc option of the ROMization processor. If this is blank, the start address is determined automatically. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.	
	Default	Blank
	How to change	Directly enter to the text box.
	Restriction	0 to *The largest address of the program space*
ROMization area start address	Specify the start address for ROMization in hexadecimal without 0x (example: 100A0). This corresponds to the -ra option of the ROMization processor. If this is blank, it is assumed that "0" has been specified. If the [ROMization area size[byte]] property is also blank, it is assumed that the internal RAM range has been specified. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.	
	Default	Blank
	How to change	Directly enter to the text box.
	Restriction	0 to *The largest address of the program space*

ROMization area size[byte]	Specify the size from the start address for ROMization in hexadecimal (example: F00). If this property is specified, configure the [ROMization area size[byte]] property. This corresponds to the -ra option of the ROMization processor. If this is blank, it is assumed that "0" has been specified. If the result of changing the [ROMization area size[byte]] property is outside the range that can be specified for this property, then this property will be blank. This property is displayed only when [Yes] in the [Output ROMization object file] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	1 to *the largest address of the program space - filling start address* + 0x1	

(2) [Link Map]

The detailed information on the link map is displayed and the configuration can be changed.
This category is not displayed when [No] in the [Output ROMized object file] property in the [Output File] category is selected.

Output link map file	Select whether to output the link map file. This corresponds to the -p option of the ROMization processor. The output file name will be the file name specified in the [ROMized object file name] property with the extension replaced by ".map". If a file having the same name exists, it will be deleted.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the link map file.
		No(-np)	Does not output the link map file.
Output with local symbol list	Select whether to output local symbol list information to the link map file. This corresponds to the -kl option of the ROMization processor. This property is not displayed when [No] in the [Output link map file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kl)	Outputs local symbol list information to the link map file.
		No	Does not output local symbol list information to the link map file.
Output with public symbol list	Select whether to output public symbol list information to the link map file. This corresponds to the -kp option of the ROMization processor. This property is not displayed when [No] in the [Output link map file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kp)	Outputs public symbol list information to the link map file.
		No	Does not output public symbol list information to the link map file.

Output with map list	Select whether to output map list information to the link map file. This corresponds to the -km option of the ROMization processor. This property is not displayed when [No] in the [Output link map file] property is selected.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs map list information to the link map file.
		No(-nkm)	Does not output map list information to the link map file.
Output with form feed control code	Select whether to output a form feed code into the end of the list map file. This corresponds to the -lf option of the ROMization processor. This property is not displayed when [No] in the [Output link map file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the end of the list map file.
		No	Does not output a form feed code into the end of the list map file.
Number of lines on 1 page	Specifies the number of lines on 1 page of the link map file. If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the ROMization processor. This property is not displayed when [No] in the [Output link map file] property is selected.		
	Default	0	
	How to change	Directly enter to the text box.	
	Restriction	0, and 20 to 32767 (decimal number)	

(3) [Error List]

The detailed information on the error list is displayed and the configuration can be changed.
This category is not displayed when [No] in the [Output ROMized object file] property in the [Output File] category is selected.

Output error list file	Select whether to output the error list file. This corresponds to the -e option of the ROMization processor. The output file name will be the file name specified in the [ROMized object file name] property with the extension replaced by ".erp".		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file.
		No	Does not output the error list file.

(4) [Others]

Other detailed information on ROMization process are displayed and the configuration can be changed.
This category is not displayed when [No] in the [Output ROMized object file] property in the [Output File] category is selected.

Commands executed before ROMization processing	Specify the command to be executed before ROMization processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %RomizedFile%: Replaces with the absolute path of the output file under ROMization processing. The specified command is displayed as the subproperty.	
	Default	Commands executed before ROMization processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can enter directly in the text box.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Commands executed after ROMization processing	Specify the command to be executed after ROMization processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %RomizedFile%: Replaces with the absolute path of the output file under ROMization processing. The specified command is displayed as the subproperty.	
	Default	Commands executed after ROMization processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can enter directly in the text box.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the ROMization process options to be added additionally. The options set here are added at the end of the ROMization process options group.	
	Default	Blank
	How to change	Directly enter in the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

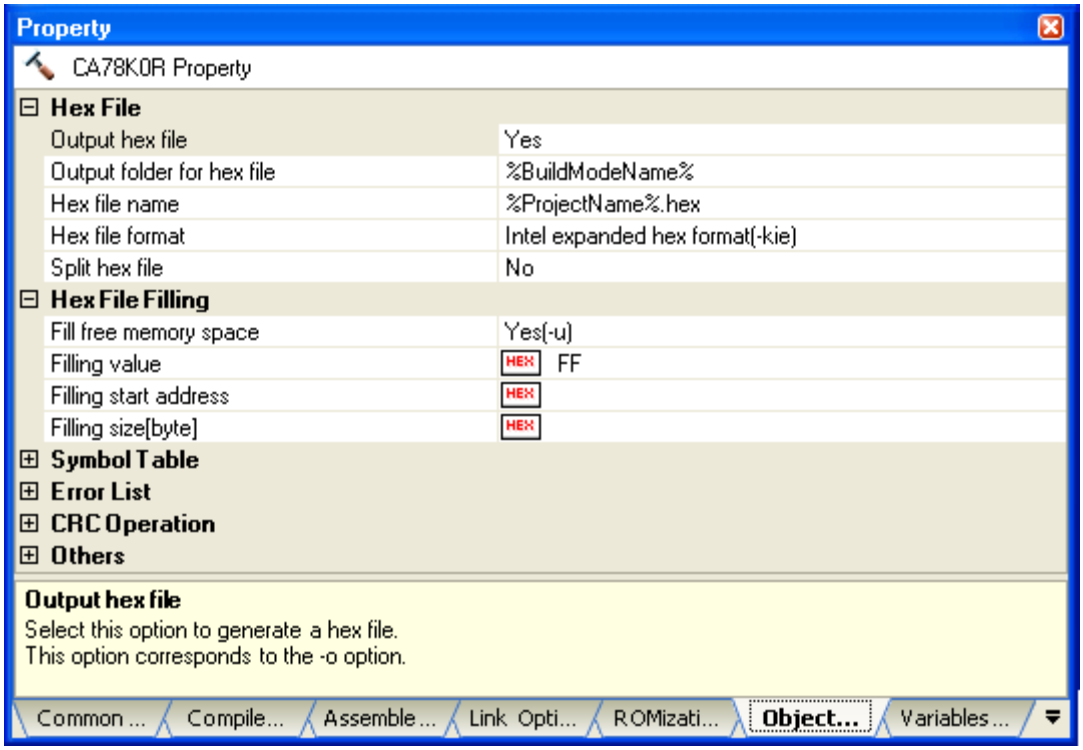
[Object Convert Options] tab

This tab shows the detailed information on the object converter categorized by the following and the configuration can be changed.

(1) [Hex File]
(2) [Hex File Filling]
(3) [Symbol Table]
(4) [Error List]
(5) [CRC Operation]
(6) [Others]

Caution This tab is not displayed for library projects.

Figure A-9. Property Panel: [Object Convert Options] Tab



[Description of each category]

(1) [Hex File]

The detailed information on hex files are displayed and the configuration can be changed.

Output hex file	Select whether to output the hex file. This corresponds to the -o option of the object converter.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the hex file.
		No(-no)	Does not output the hex file.
Output folder for hex file	Specify the folder for saving the hex file. This corresponds to the -o option of the object converter. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified. This property is not displayed when [No(-no)] in the [Output hex file] property is selected.		
	Default	%BuildModeName%	
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.	
	Restriction	Up to 247 characters	
Hex file name	Specify the hex file name. This corresponds to the -o option of the object converter. The extension can be freely specified. The following macro name is available as an embedded macro. %ProjectName%: Replaces with the project name. This property is not displayed when [No(-no)] in the [Output hex file] property is selected.		
	Default	%ProjectName%.hex	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	

Hex file format	Select the format of the hex file to be generated. This corresponds to the -k option of the object converter. This property is not displayed when [No(-no)] in the [Output hex file] property is selected.		
	Default	Intel expanded hex format(-kie)	
	How to change	Select from the drop-down list.	
	Restriction	Intel standard hex format(-ki)	Specify the Intel standard hex format as the format of the hex file to be generated.
		Intel expanded hex format(-kie)	Specify the Intel expanded hex format as the format of the hex file to be generated.
		Motorola S type format(standard address)(-km)	Specify the Motorola S type format (standard address) as the format of the hex file to be generated.
		Motorola S type format(32-bit address)(-kme)	Specify the Motorola S type format (32-bit address) as the format of the hex file to be generated.
		Expanded Tektronix hex format(-kt)	Specify the expanded Tektronix hex format as the format of the hex file to be generated.
Split hex file	Select whether to split up the file into separate hex format files, one for the boot area and one for other areas, when specifying boot area ROM program linking for a product with built-in flash memory. This corresponds to the -zf option of the object converter. Do not set this property for a device that does not have a flash ROM area self-programming function. This property is not displayed when [No(-no)] in the [Output hex file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zf)	Splits the file into separate hex files: one for the boot area and one for other areas.
		No	Does not split the file into separate hex files: one for the boot area and one for other areas.

(2) [Hex File Filling]

The detailed information on hex file filling are displayed and the configuration can be changed.

Fill free memory space	The unnecessary code may be written to address to which the hex-format object is not output. Specify whether to write a code in advance to prevent the program runaway by accessing the address. This corresponds to the -u option of the object converter. This property is not displayed when [No(-no)] in the [Output hex file] property in the [Hex File] category is selected.		
	Default	Yes(-u)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-u)	Writes a code in advance to address to which the hex-format object is not output.
		No(-nu)	Does not write a code in advance to address to which the hex-format object is not output.

Filling value	Specify the values, in hexadecimal number without 0x (example: FF), to be written to the address for which no hex-format object is output. If this is blank, it is assumed that "FF" has been specified. This corresponds to the -u option of the object converter. This property is not displayed when [No(-nu)] in the [Fill free memory space] property is selected.	
	Default	FF
	How to change	Directly enter to the text box.
	Restriction	0 to FF (hexadecimal number)
Filling start address	Specify the start address for filling in hexadecimal without 0x (example: 100A0). If this is blank, it is assumed that 0 has been specified. If this property is specified, configure the [Filling size[byte]] property. If the [Filling size[byte]] property is blank, the specification of this property is invalid. This corresponds to the -u option of the object converter. This property is not displayed when [No(-nu)] in the [Fill free memory space] property is selected.	
	Default	Blank
	How to change	Directly enter to the text box.
	Restriction	0 to *the largest address of the program space* (hexadecimal)
Filling size[byte]	Specify the size from the start address for filling in hexadecimal without 0x (example: F00). If the result of changing the [Filling start address] property is outside the range that can be specified for this property, then this property will be blank. This corresponds to the -u option of the object converter. This property is not displayed when [No(-nu)] in the [Fill free memory space] property is selected.	
	Default	Blank
	How to change	Directly enter to the text box.
	Restriction	1 to 0xFFFFF - *filling start address* + 0x1 (hexadecimal) However, the compiler's bounds checking will be stricter. As a result, the actual upper bound during a build may be smaller than this value, causing a error during linking.

(3) [Symbol Table]

The detailed information on the symbol table is displayed and the configuration can be changed.

Output symbol table file	Select whether to output the symbol table file. This corresponds to the -s option of the object converter.		
	Default	Yes(-s)	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-s)	Outputs the symbol table file.
		No(-ns)	Does not output the symbol table file.

(4) [Error List]

The detailed information on the error list is displayed and the configuration can be changed.

Output error list file	Select whether to output the error list file. This corresponds to the -e option of the linker.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file.
		No	Does not output the error list file.

(5) [CRC Operation]

The detailed information on CRC operation are displayed and the configuration can be changed.

Operate CRC	Select whether to perform the CRC (Cyclic Redundancy Check) operation. This corresponds to the -crc option of the object converter.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-crc)	The CRC operation is performed on the hex-format objects in the specified range, from low address to high address, and the results of the operation are output to the specified address.
		No	The CRC operation and outputting the result are not performed.
CRC result output address	Specify the address that the result of the CRC operation is output in hexadecimal without 0x (example: FFF00). Be sure to specify this property. This corresponds to the -crc option of the object converter. This property is displayed only when [Yes(-crc)] in the [Operate CRC] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	0 to FFF00 (hexadecimal number)	
Range of CRC	Specify the range for the CRC operation in the form of a start address followed by an end address. Add "0" to the head of the address that starts with "A" to "F". Add "h" to the end of the address. Two or more ranges can be specified by separating them with commas (example: 0h-0FFh,400h-4FFh). Be sure to specify this property. This corresponds to the -crc option of the object converter. This property is displayed only when [Yes(-crc)] in the [Operate CRC] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	0h to 0FFF00h (hexadecimal number)	

Type of CRC	Select the method of CRC operation. See the user's manual of the device for details about each method. This corresponds to the -crc option of the object converter. This property is displayed only when [Yes(-crc)] in the [Operate CRC] property is selected.		
	Default	High-speed CRC	
	How to change	Select from the drop-down list.	
	Restriction	High-speed CRC	Outputs the result of the high-speed CRC operation. The initial value of CRC is 0H.
		General-purpose CRC	Outputs the result of the general-purpose CRC operation.
Initial value of CRC	Specify the initial value of the CRC operation in hexadecimal without 0x (example: FFFF). If this is blank, it is assumed that 0 has been specified. This corresponds to the -crc option of the object converter. This property is displayed only when [Yes(-crc)] in the [Operate CRC] property is selected and [General-purpose CRC] in the [Type of CRC] property is selected.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	0 to FFFF (hexadecimal number)	

(6) [Others]

Other detailed information on object conversion are displayed and the configuration can be changed.

Commands executed before object convert processing	Specify the command to be executed before object convert processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with absolute path of the input file under object convert processing. %ObjectConvertedFile%: Replaces with absolute path of the output file under object convert processing. The specified command is displayed as the subproperty.	
	Default	Commands executed before object convert processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.

Commands executed after object convert processing	Specify the command to be executed after object convert processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with absolute path of the input file under object convert processing. %ObjectConvertedFile%: Replaces with absolute path of the output file under object convert processing. The specified command is displayed as the subproperty.	
	Default	Commands executed after object convert processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the object convert options to be added additionally. The options set here are added at the end of the object convert options group.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

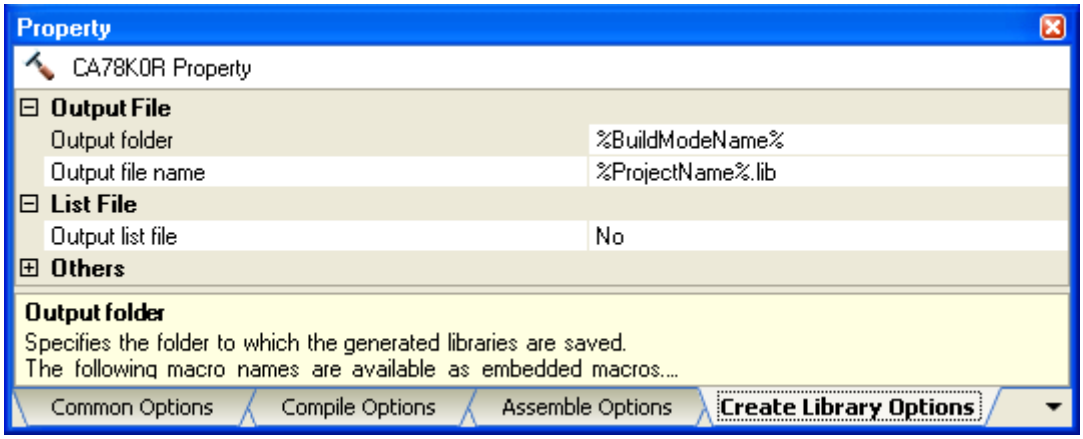
[Create Library Options] tab

This tab shows the detailed information on the librarian categorized by the following and the configuration can be changed.

(1) [Output File]
(2) [List File]
(3) [Others]

Caution This tab is displayed only for library projects.

Figure A-10. Property Panel: [Create Library Options] Tab



[Description of each category]

(1) [Output File]

The detailed information on output files are displayed and the configuration can be changed.

Output folder	Specify the folder for saving the library that is generated. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified.	
	Default	%BuildModeName%
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

Output file name	Specify the library file name to be output. Use the extension ".lib". If the extension is omitted, ".lib" is automatically added. The following macro name is available as an embedded macro. %ProjectName%: Replaces with the project name.		
	Default	%ProjectName%.lib	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	

(2) [List File]

The detailed information on list files are displayed and the configuration can be changed.

Output list file	Select whether to output the list file with the librarian. This corresponds to the -o option of the list subcommand.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the list file (information on modules in the library file).
		No	Does not output the list file (information on modules in the library file).
Output with public symbol information	Select whether to output public symbol information to the list file with the librarian. This corresponds to the -public option of the list subcommand. This property is not displayed when [No] in the [Output list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs public symbol information to the list file.
		No	Does not output public symbol information to the list file.
Output with form feed control code	Select whether to output a form feed code into the end of list files. This corresponds to the -lf option of the librarian. This property is not displayed when [No] in the [Output list file] property is selected.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the end of the list files.
		No	Does not output a form feed code into the end of the list files.
Number of characters in 1 line	Specify the number of characters in each line of the list file. This corresponds to the -lw option of the librarian. This property is not displayed when [No] in the [Output list file] property is selected.		
	Default	132	
	How to change	Directly enter to the text box.	
	Restriction	72 to 260 (decimal number)	

Number of lines on 1 page	Specifies the number of lines on 1 page of the list file. If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the librarian. This property is not displayed when [No] in the [Output list file] property is selected.	
	Default	0
	How to change	Directly enter to the text box.
	Restriction	0, and 20 to 32767 (decimal number)

(3) [Others]

Other detailed information on libraries are displayed and the configuration can be changed.

Commands executed before making library processing	Specify the command to be executed before library generation processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %LibraryFile%: Replaces with the absolute path of the output file under the library generation processing. The specified command is displayed as the subproperty.	
	Default	Commands executed before making library processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Commands executed after making library processing	Specify the command to be executed after library generation processing. Use the call instruction to specify a batch file (example: call a.bat). The following macro name is available as an embedded macro. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %LibraryFile%: Replaces with the absolute path of the output file under the library generation processing. The specified command is displayed as the subproperty.	
	Default	Commands executed after making library processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.

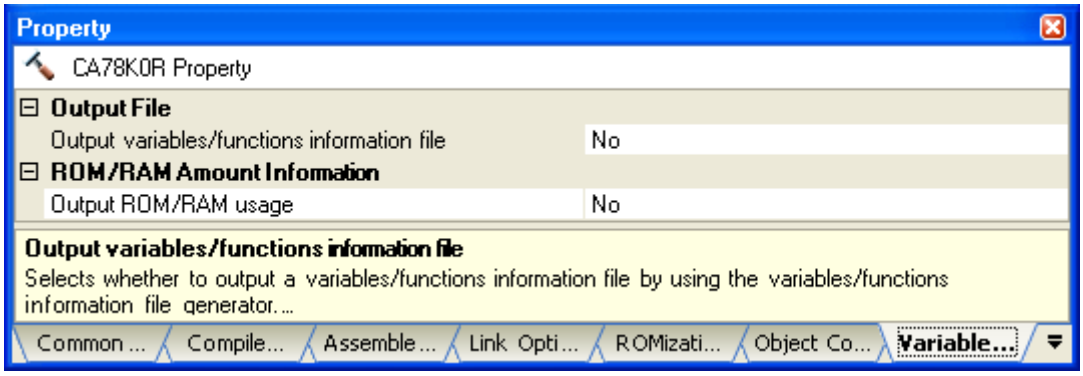
Other additional options	Input the librarian options to be added additionally. The options set here are added at the end of the librarian options group.	
	Default	Blank
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

[Variables/Functions Relocation Options] tab

This tab shows the detailed information on the variables/functions information file generator categorized by the following and the configuration can be changed.

(1) [Output File]
(2) [Margin]
(3) [ROM/RAM Amount Information]

Figure A-11. Property Panel: [Variables/Functions Relocation Options] Tab



[Description of each category]

(1) [Output File]

The detailed information on output files are displayed and the configuration can be changed.

Output variables/functions information file	Select whether to output the variables/functions information file.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the variables/functions information file.
		No	Does not output the variables/functions information file. The variables/functions information file will be removed from the rapid build target.

Output folder for variables/functions information file	Specify the folder for saving the variables/functions information file. This corresponds to the -vo option of the variables/functions information file generator. If a relative path is specified, the reference point of the path is the main project or subproject folder. If an absolute path is specified, the reference point of the path is the main project or subproject folder (unless the drives are different). The following macro name is available as an embedded macro. %BuildModeName%: Replaces with the build mode name. If this is blank, it is treated as if the project folder is specified. This property is not displayed when [No] in the [Output variables/functions information file] property is selected.	
	Default	%BuildModeName%
	How to change	Directly enter to the text box or edit by the Browse For Folder dialog box which appears when clicking the [...] button.
	Restriction	Up to 247 characters
Variables/functions information file name	Specify the variables/functions information file name. This corresponds to the -vo option of the variables/functions information file generator. Use the extension ".vfi". If the extension is omitted, ".vfi" is automatically added. The following macro name is available as an embedded macro. %ProjectName%: Replaces with the project name. This property is not displayed when [No] in the [Output variables/functions information file] property is selected.	
	Default	%ProjectName%.vfi
	How to change	Directly enter to the text box.
	Restriction	Up to 259 characters

(2) [Margin]

The detailed information on the margin is displayed and the configuration can be changed.

This category is not displayed when [No] in the [Output variables/functions information file] property in the [Output File] category is selected.

Margin for saddr area	Specify the Margin for saddr area. After allocating variables to the saddr area via the variables/functions information file generator, an alignment error may occur during compilation or linking due to the relationship between processing order and alignment. In this situation, setting the margin in the saddr area can avoid this error. This corresponds to the -vs option of the variables/functions information file generator.	
	Default	0
	How to change	Directly enter to the text box.
	Restriction	0 to 192 (decimal number)

(3) [ROM/RAM Amount Information]

The detailed information on the ROM/RAM usage is displayed and the configuration can be changed.

Output ROM/RAM usage	Select whether to display the ROM/RAM usage to the Output panel. This corresponds to the -vx option of the variables/functions information file generator.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the ROM/RAM usage.
		No	Does not output the ROM/RAM usage.

[Build Settings] tab

This tab shows the detailed information on each C source file, assembler source file, link directive file, variables/functions information file, object file, and library file categorized by the following and the configuration can be changed.

(1) [Build]

Figure A-12. Property Panel: [Build Settings] Tab (When Selecting C Source File)

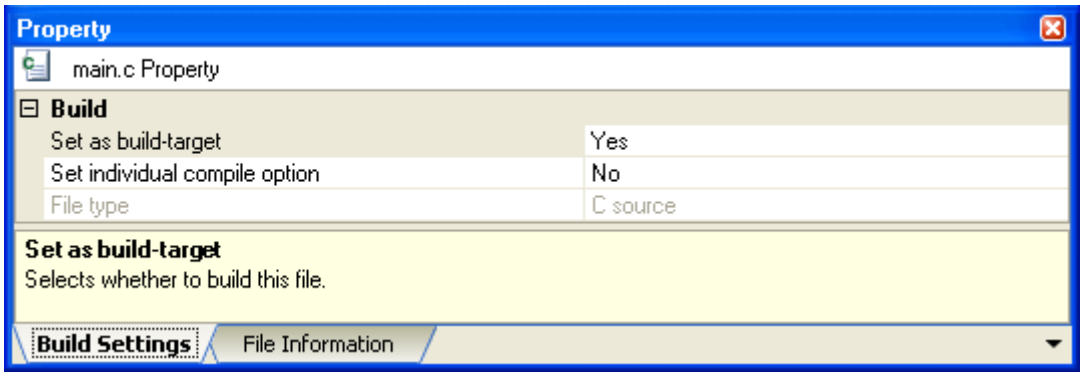


Figure A-13. Property Panel: [Build Settings] Tab (When Selecting Assembler Source File)

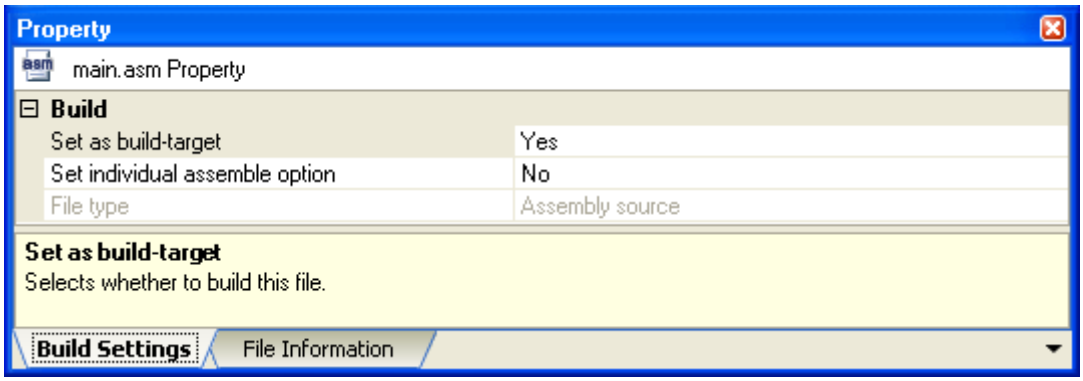


Figure A-14. Property Panel: [Build Settings] Tab (When Selecting Link Directive File)

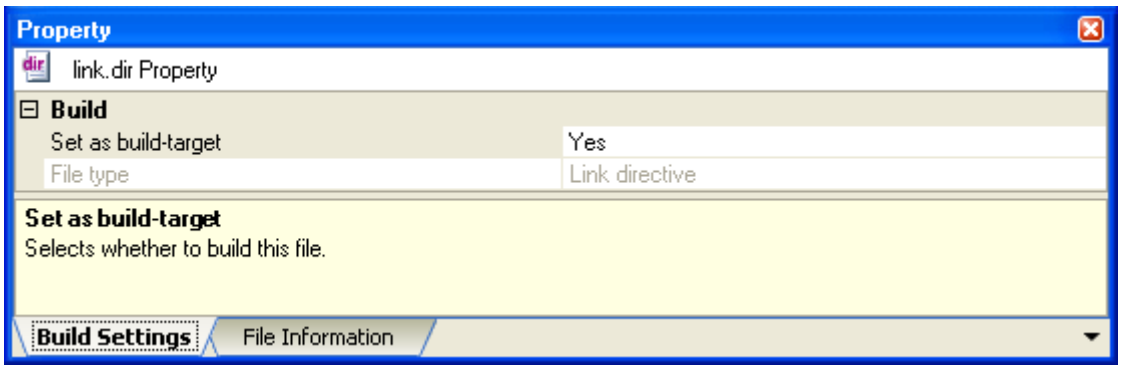


Figure A-15. Property Panel: [Build Settings] Tab (When Selecting Variables/Functions Information File)

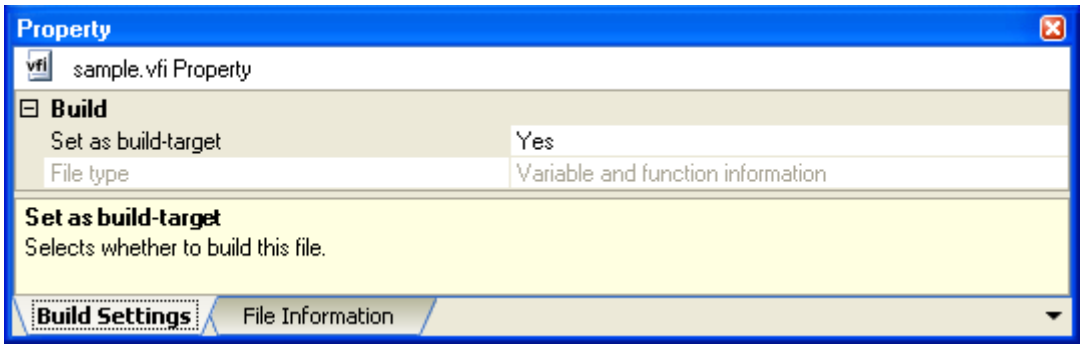


Figure A-16. Property Panel: [Build Settings] Tab (When Selecting Object File)

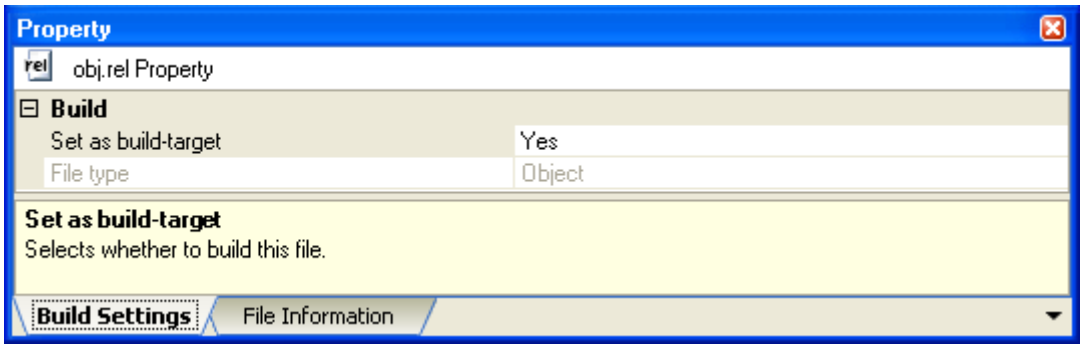
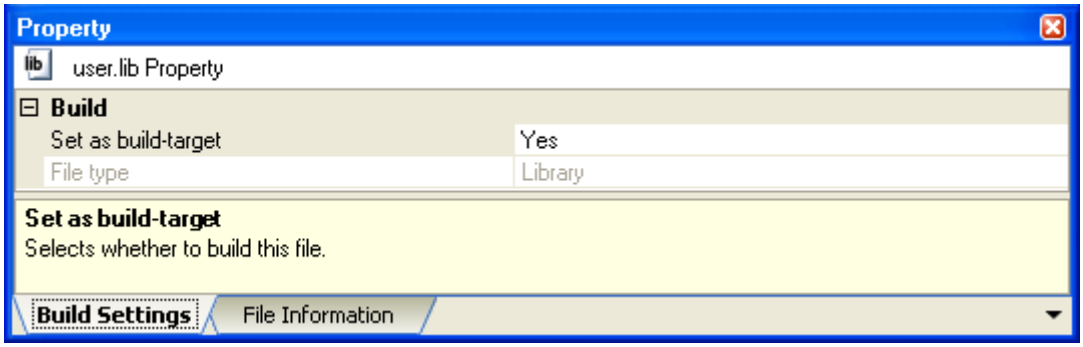


Figure A-17. Property Panel: [Build Settings] Tab (When Selecting Library File)



[Description of each category]

(1) [Build]

The detailed information on the build are displayed and the configuration can be changed.

Set as build-target	Select whether to build the selected file.		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Builds the selected file.
		No	Does not build the selected file.
Set individual compile option	Select whether to set a compile option that differs from the project settings to the selected C source file. This property is displayed only when a C source file is selected on the Project Tree panel and [Yes] is selected in the [Set as build-target] property.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Sets a compile option that differs from the project settings to the selected C source file.
		No	Does not set a compile option that differs from the project settings to the selected C source file.
Set individual assemble option	Select whether to set an assemble option that differs from the project settings to the selected assembler source file. This property is displayed only when an assembler source file is selected on the Project Tree panel and [Yes] is selected in the [Set as build-target] property.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Sets a compile option that differs from the project settings to the selected assembler source file.
		No	Does not set a compile option that differs from the project settings to the selected assembler source file.
File type	Display the type of the selected file.		
	Default	C source (when C source file is selected) Assembly source (when assembler source file is selected) Link directive (when link directive file is selected) Variable and function information (when variables/functions information file is selected) Object (when object file is selected) Library (when library file is selected)	
	How to change	Changes not allowed	

[Individual Compile Options] tab

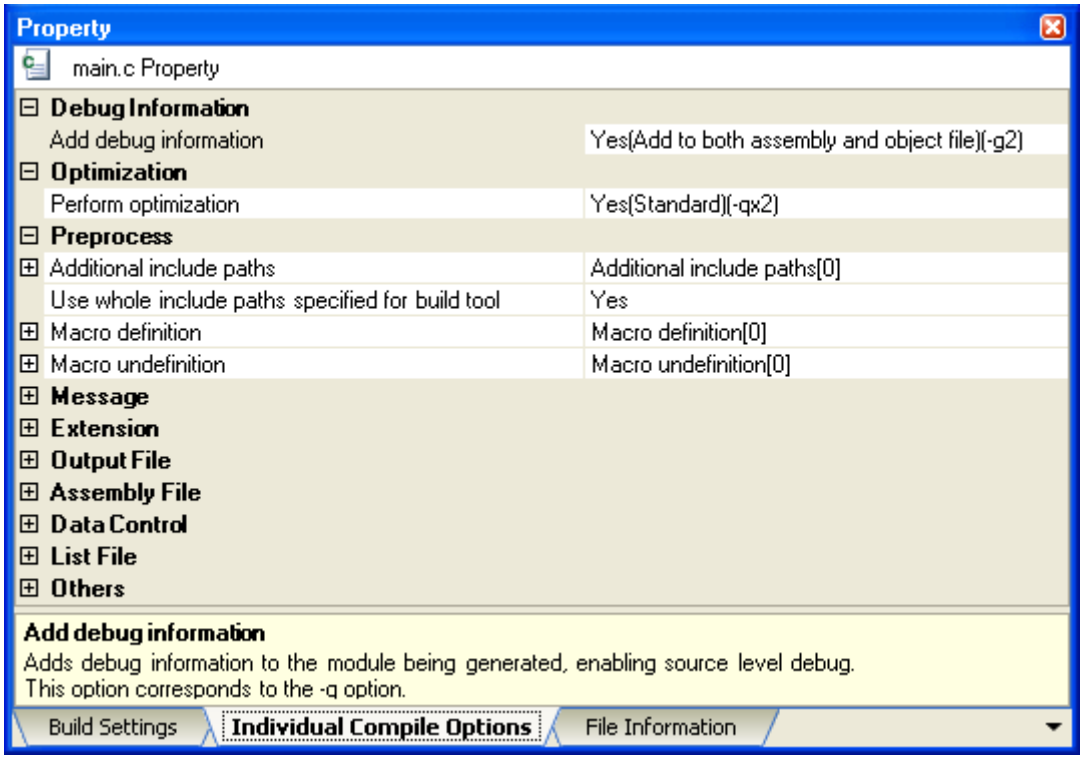
This tab shows the detailed information on a C source file categorized by the following and the configuration can be changed.

Note that this tab takes over the settings of the [Compile Options] tab. If the settings are changed from the [Compile Options] tab, the properties are displayed in boldface.

Remark This tab is displayed only when [Yes] in the [Set individual compile option] property in the [Build] category from the [Build Settings] tab is selected.

(1) [Debug Information]
(2) [Optimization]
(3) [Optimization(Details)]
(4) [Preprocess]
(5) [Message]
(6) [Extension]
(7) [Output File]
(8) [Assembly File]
(9) [Data Control]
(10) [List File]
(11) [Others]

Figure A-18. Property Panel: [Individual Compile Options] Tab



[Description of each category]

(1) [Debug Information]

The detailed information on debug information is displayed and the configuration can be changed.

Add debug information	Select whether to enable source level debugging by adding debug information to the module being generated. This corresponds to the -g option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Add to object file only)(-g1)	Adds debug information to the object module file being generated.
		Yes(Add to both assembly and object file)(-g2)	Adds debug information to the object module file and assembler source module file being generated.
		No	Does not add debug information to the object module file being generated.

(2) [Optimization]

The detailed information on the optimization is displayed and the configuration can be changed.

Perform optimization	Select the type of the optimization for compiling. This corresponds to the -qx option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Speed precedence)(-qx1)	Performs optimization with the execution speed precedence.
		Yes(Standard)(-qx2)	Performs optimization with both the execution speed and module size precedence.
		Yes(Code size precedence)(-qx3)	Performs optimization with the module size precedence.
		Yes(Detail setting)	The [Optimization(Details)] category is shown. The option that is selected in the category has the precedence for the optimization. When [No(-nq)] is selected in all the properties in the [Optimization(Details)] category, the optimization will not be done.
		No(-nq)	Does not specify optimization.

(3) [Optimization(Details)]

The detailed information on the optimization are displayed and the configuration can be changed.
This category is displayed only when [Yes(Detail setting)] in the [Perform optimization] property in the [Optimization] category is selected.

Swap order of formula operations	Select whether to output an efficient code in order to achieve efficient register utilization by swapping the execution order of formula. This corresponds to the -qw option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Swap order of formula operations)(-qw)	Swaps the order of formula operations.
		No	Does not specify swapping the order of formula operations.
Assign automatic variables to register or saddr area	Select whether to automatically assign automatic variables to a register and the saddr area. This corresponds to the -qv option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qv)	Assigns automatic variables to a register and the saddr area automatically.
		No	Does not specify assigning automatic variables to a register and the saddr area automatically.
Assign register variables to register and saddr area	Select whether to assign register variables to registers and assign them also to the saddr area. This corresponds to the -qr option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qr)	Assigns register variables to registers and assigns them also to the saddr area.
		No	Does not specify assigning register variables to the saddr area.
Not use sign extended calculation for char	Select whether to perform char-related calculations without pan-integral extension. This corresponds to the -qc option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qc)	Performs char-related calculations without pan-integral extension.[Note]
		No	Performs char-related calculations with pan-integral extension.

Interpret char to unsigned char	Select whether to interpret the char without qualifier as a unsigned char. This corresponds to the -qu option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qu)	Interprets the char without qualifier as a unsigned char.
		No	Does not specify interpreting the char without qualifier as a unsigned char.
Optimize branch instruction	Select whether to optimize branch instructions. This corresponds to the -qj option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qj)	Optimizes branch instructions.
		No	Does not specify optimizing branch instructions.
Replace fixed code to library(Size precedence optimization)	Select whether to replace the fixed code with the library. This corresponds to the -ql option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Do not replace)(-ql1)	Does not replace the fixed code with the library. Performs optimization with the module size precedence.
		Yes(Replace only process before/after function)(-ql2)	Replaces only the processing routines before and after the function with a library.
		Yes(Replace process before/after function, use low level libraries and subroutinize same codes)(-ql3)	Replaces only the processing routines before and after the function with a library.Also, uses low level libraries and subroutinizes same codes.
		No	Does not specify replacing the fixed code with the library. Performs optimization with the execution speed precedence.
Generate relative branch table for switch statement	Select whether to generate the switch branch table of the relative branch. This corresponds to the -qx option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qt)	Generates the switch branch table of the relative branch.
		No	Does not specify generating the switch branch table of the relative branch.

Optimize for debugging	Select whether to perform the optimization for debugging. This corresponds to the -qg option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qg)	Performs the optimization for debugging.
		No	Does not specify performing the optimization for debugging.
Optimize for debugging	Select whether to perform the optimization for debugging. This corresponds to the -qg option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-qg)	Performs the optimization for debugging.
		No	Does not specify performing the optimization for debugging.

Note The results of the calculation when the -qc option is set are as follows.

Calculation Target	Calculation Result
unsigned char type variable and unsigned char type variable	unsigned char type
unsigned char type variable and signed char type variable	unsigned char type
signed char type variable and signed char type variable	signed char type
Constants from -128 to 255 and unsigned char type variable	unsigned char type
Constants from -128 to 127 and signed char type variable	signed char type
Constants from 0 to 255 with suffix U and signed char type variable	unsigned char type

(4) [Preprocess]

The detailed information on the preprocess are displayed and the configuration can be changed.

Additional include paths	Specify the additional include paths during compiling. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. When this option is omitted, only the standard folder of the compiler is searched. The reference point of the path is the project folder. This corresponds to the -i option of the compiler. The specified include path is displayed as the subproperty.	
	Default	Additional include paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified.However, this also includes the number of paths used by linked tools.

Use whole include paths specified for build tool	Select whether to compile using the include path specified in the [Additional include paths] property in the [Preprocess] category from the [Compile Options] tab of the build tool to be used. This corresponds to the -i option of the compiler. The paths are added to the -i option according to the following sequence. - Paths specified in the [Additional include paths] property - Paths specified in the [Additional include paths] in the [Preprocess] category from the [Compile Options] tab - Paths specified in the [System include paths] in the [Preprocess] category from the [Compile Options] tab		
	Default	Yes	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Compiles using the include path specified in the property of the build tool to be used.
		No	Does not use the include path specified in the property of the build tool to be used.
Macro definition	Specify the macro name to be defined. Specify in the format of "*macro name=defined value*", with one macro name per line. The "=*def*" part can be omitted, and in this case, "1" is used as the defined value. This corresponds to the -d option of the compiler. The specified macro is displayed as the subproperty.		
	Default	*Configuration of the general option*	
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 256 characters Up to 30 items can be specified.	
Macro undefinition	Specify the macro name to be undefined. Specify in the format of "*macro name*", with one macro name per line. This corresponds to the -u option of the compiler. The specified macro is displayed as the subproperty.		
	Default	Macro undefinition[*number of defined items*]	
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 256 characters Up to 30 items can be specified.	

(5) [Message]

The detailed information on messages are displayed and the configuration can be changed.

Verbose mode	Select whether to display the execution status of the compiler to the Output panel during build. This corresponds to the -v option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-v)	Displays the execution status of the compiler during build.
		No	Does not display the execution status of the compiler during build.

Warning level	Select the warning display level under compiling. This corresponds to the -w option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	No output(-w0)	Does not output warning messages.
		Normal output	Outputs normal warning messages.
		Particular output(-w2)	Outputs detailed warning messages.

(6) [Extension]

The detailed information on extensions are displayed and the configuration can be changed.

Allow C++ format comments	Select whether to allow the use of C++ format comments ("//"). This corresponds to the -zp option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zp)	Allows the use of C++ format comments.
		No	Does not allow the use of C++ format comments.
Allow nested comments	Select whether to allow the nest use of comments ("/*_*/"). This corresponds to the -zc option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zc)	Allows the nest use of comments.
		No	Does not allow the nest use of comments.
Kanji character code of source	Select the Kanji character code of the source. This corresponds to the -zs, -ze, and -zn option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Shift_JIS(-zs)	Interprets the kanji code of the source as Shift_JIS.
		EUC-JP(-ze)	Interprets the kanji code of the source as EUC-JP.
		Unspecified(-zn)	Interprets the source as not containing kanji codes.
Follow ANSI Standard	Select whether to disable non-ANSI standard functions and enable some of the functions of the ANSI standard. This corresponds to the -za option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-za)	Disables non-ANSI standard functions and enables some of the functions of the ANSI standard.
		No	Enables non-ANSI standard functions.

Disable an int extension for function	Select whether to disable the int extension for the char/unsigned char type arguments and the return values of functions. This corresponds to the -zb option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-zb)	Disables the int extension for the char/unsigned char type arguments and the return values of functions.
		No	Enables the int extension for the char/unsigned char type arguments and the return values of functions.
Output the object for RAM	Select whether to allocate codes and ROM data to the RAM area. And specify the area that allocates a runtime library for RAM. This corresponds to the -zx option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Runtime library is allocated in the ROM area)(-zx1)	Allocates codes and ROM data to the RAM area and allocates a runtime library for the ROM area.
		Yes(Runtime library is allocated in the RAM area)(-zx2)	Allocates codes and ROM data to the RAM area and allocates a runtime library for the RAM area. The [Replace fixed code to library(Size precedence optimization)] property is assumed that [Yes(Do not replace)(-ql1)] has been selected.
		No	Does not allocate codes and ROM data to the RAM area.

(7) [Output File]

The detailed information on output files are displayed and the configuration can be changed.

Object file name	Specify the name of the object file generated after compilation. If this field is blank, the file is saved under the file name with extension .c replaced by .rel. This corresponds to the -o option of the compiler.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	
Output common object file for various devices	Select whether to output the objects common to the various devices. This corresponds to the -common option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-common)	Outputs the objects common to the various devices.
		No	Does not specifies outputting the objects common to the various devices.

(8) [Assembly File]

The detailed information on assembly files is displayed and the configuration can be changed.

Output assemble file	Select whether to output the assembly file. This corresponds to the -a, -sa, and -li options of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(With no C source info)(-a)	Outputs the assembly file (without C source information).
		Yes(With C source info(unexpanded include file contents))(-sa)	Outputs the assembly file (with C source information (include file contents are not expanded)).
		Yes(With C source info(expanded include file contents))(-sa,-li)	Outputs the assembly file (with C source information (include file contents are expanded)).
		No	Does not output the assembly file.

(9) [Data Control]

The detailed information on data control are displayed and the configuration can be changed.

Assign bit field in structure from MSB	Select whether to assign the member of the bit field structure from MSB. This corresponds to the -rb option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-rb)	Assigns the member of the bit field structure from MSB.
		No	Assigns the member of the bit field structure from LSB.
Pack structure members	Select whether to prohibit from inserting the align data to allocate the members (consisting of 2 or more bytes) in a structure to even address. This corresponds to the -rc option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-rc)	Prohibits from inserting the align data to allocate the members (consisting of 2 or more bytes) in a structure to even address.
		No	Inserts the align data to allocate the members (consisting of 2 or more bytes) in a structure to even address.
Perform indirect referencing in 1-byte units	Select whether to perform indirect referencing in 1-byte units. This corresponds to the -ra option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ra)	Performs indirect referencing in 1-byte units.
		No	Does not perform indirect referencing in 1-byte units.

Allocate static variables to saddr area	Select the type of the static variable to be allocated in the saddr area. This corresponds to the -rs option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Size of char)(-rs1)	Allocates char and unsigned char types automatic variables to the saddr area.
		Yes(Size of char, short, int)(-rs2)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer types automatic variables to the saddr area.
		Yes(Size of char, short, int, long)(-rs4)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer types automatic variables to the saddr area.
		Yes(Structure, union, array)(-rsm)	Allocates structure, union, and array types automatic variables to the saddr area.
		Yes(Size of char and structure, union, array)(-rs1m)	Allocates char, unsigned char, structure, union, and array types automatic variables to the saddr area.
		Yes(Size of char, short, int and structure, union, array)(-rs2m)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer, structure, union, and array types automatic variables to the saddr area.
		Yes(Size of char, short, int, long and structure, union, array)(-rs)	Allocates char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer, structure, union, and array types automatic variables to the saddr area.
		No	Does not allocate static variables to the saddr area.
Specify allocation destination of ROM data	Specify where ROM data is allocated. This corresponds to the -rf and -rm option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(far area)(-rf)	Allocates ROM data to the far area.
		Yes(near area)(-rn)	Allocates ROM data to the near area.
		No	Does not specify the allocation destination of ROM data.

(10) [List File]

The detailed information on list files are displayed and the configuration can be changed.

Output preprocess list file	Select whether to output the preprocess file. This corresponds to the -p option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-p)	Outputs the preprocess list file.
		No	Does not output the preprocess list file.

Not output comments	Select whether to disable to output comments into the preprocess list file. This corresponds to the -kc option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kc)	Does not output comments into the preprocess list file.
		No	Outputs comments into the preprocess list file.
Expand #define preprocessor directive	Select whether to expand the #define directive into the preprocess list file. This corresponds to the -kd option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kd)	Expands the #define directive into the preprocess list file.
		No	Does not expand the #define directive into the preprocess list file.
Expand #if,#ifdef,#ifndef preprocessor directive	Select whether to perform output by expanding #if, #ifdef, and #ifndef directives into the preprocess list file. This corresponds to the -kf option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kf)	Performs output by expanding #if, #ifdef, and #ifndef directives into the preprocess list file.
		No	Does not perform output by expanding #if, #ifdef, and #ifndef directives into the preprocess list file.
Expand #include preprocessor directive	Select whether to perform output by expanding #include directives into the preprocess list file. This corresponds to the -ki option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ki)	Performs output by expanding #include directives into the preprocess list file.
		No	Does not expand the #include directive into the preprocess list file.
Expand #line preprocessor directive	Select whether to perform output by expanding #line directives into the preprocess list file. This corresponds to the -kl option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kl)	Performs output by expanding #line directives into the preprocess list file.
		No	Does not expand the #line directive into the preprocess list file.

Output line numbers	Select whether to output line numbers into the preprocess list file. This corresponds to the -kn option of the compiler. This property is not displayed when [No] in the [Output preprocess list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kn)	Outputs line numbers into the preprocess list file.
		No	Does not output line numbers into the preprocess list file.
Output error list file	Select whether to output the error list file. This corresponds to the -e and -se options of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Without C source)(-e)	Outputs the error list file (without C source).
		Yes(With C source)(-se)	Outputs the error list file (with C source).
		No	Does not output the error list file.
Output cross reference list file	Select whether to output the cross reference list file. This corresponds to the -x option of the compiler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-x)	Outputs the cross reference list file.
		No	Does not output the cross reference list file.
Output with form feed control code	Select whether to output a form feed code into the end of list files (preprocess list file, error list file, and cross reference list file). This corresponds to the -lf option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the end of the list files.
		No	Does not output a form feed code into the end of the list files.
Number of characters in 1 line	Specify the number of characters in each line of list files (preprocess list file, error list file, and cross reference list file). This corresponds to the -lw option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Directly enter to the text box.	
	Restriction	72 to 132 (decimal number)	

Number of lines on 1 page	Specify the number of lines on 1 page of list files (preprocess list file, error list file, and cross reference list file). If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.	
	Default	*Configuration of the general option*
	How to change	Directly enter to the text box.
	Restriction	0, and 20 to 65535 (decimal number)
Tab width	Specify the tab width of list files (preprocess list file, error list file, and cross reference list file). This corresponds to the -lt option of the compiler. This property is displayed only when [Yes] in the [Output error list file] property is selected or when [Yes(-p)] in the [Output preprocess list file] property is selected or when [Yes(-x)] in the [Output cross reference list file] property is selected.	
	Default	*Configuration of the general option*
	How to change	Directly enter to the text box.
	Restriction	0 to 8 (decimal number)

(11) [Others]

Other detailed information on compilation are displayed and the configuration can be changed.

Commands executed before compile processing	Specify the command to be executed before compile processing. The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be compiled. %CompiledFile%: Replaces with the absolute path of the output file under compiling. The specified command is displayed as the subproperty.	
	Default	Commands executed before compile processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.

Commands executed after compile processing	Specify the command to be executed after compile processing. The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be compiled. %CompiledFile%: Replaces with the absolute path of the output file under compiling. The specified command is displayed as the subproperty.	
	Default	Commands executed after compile processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the compile options to be added additionally. The options set here are added at the end of the compile options group.	
	Default	*Configuration of the general option*
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

[Individual Assemble Options] tab

This tab shows the detailed information on an assemble source file categorized by the following and the configuration can be changed.

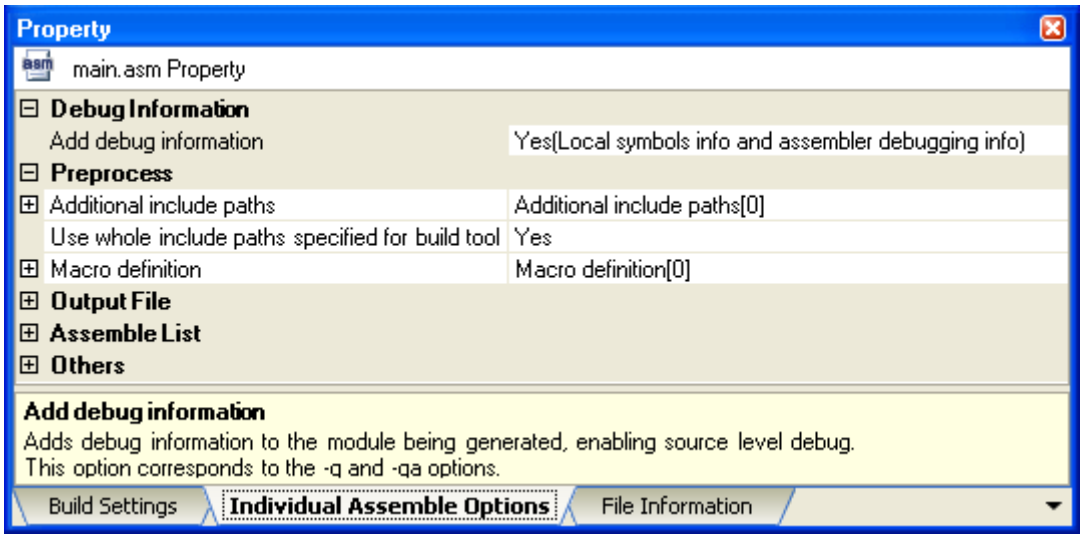
Note that this tab takes over the settings of the [Assemble Options] tab. If the settings are changed from the [Assemble Options] tab, the properties are displayed in boldface.

Remarks 1. This tab is displayed when [Yes] in the [Set individual assemble option] property in the [Build] category from the [Build Settings] tab is selected.

2. This tab is also displayed when a C source file is selected and [Yes] is selected in the [Output assemble file] property in the [Assembly File] category from the [Individual Compile Options] tab.

(1) [Debug Information]
(2) [Preprocess]
(3) [Output File]
(4) [Assemble List]
(5) [Others]

Figure A-19. Property Panel: [Individual Assemble Options] Tab



[Description of each category]

(1) [Debug Information]

The detailed information on debug information is displayed and the configuration can be changed.

Add debug information	Select whether to enable source level debugging by adding debug information to the module being generated. This corresponds to the -g and -ga options of the assembler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(Assembler debugging info)(-ng,-ga)	Adds debug information (assembler debugging symbol information) to the object module file being generated.
		Yes(Local symbols info and assembler debugging info)	Adds debug information (local symbol and assembler debugging symbol information) to the object module file being generated.
		No(-ng,-nga)	Does not add debug information to the object module file being generated.

(2) [Preprocess]

The detailed information on the preprocess are displayed and the configuration can be changed.

Additional include paths	Specify the additional include paths during assembling. The following macro names are available as embedded macros. %BuildModeName%: Replaces with the build mode name. %ProjectName%: Replaces with the project name. %MicomToolPath%: Replaces with the absolute path of the product install folder. When this option is omitted, only the standard folder of the assembler is searched. The reference point of the path is the project folder. This corresponds to the -i option of the assembler. The specified include path is displayed as the subproperty.	
	Default	Additional include paths[*number of defined items*]
	How to change	Edit by the Path Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 259 characters Up to 64 items can be specified.However, this also includes the number of paths used by linked tools.

Use whole include paths specified for build tool	Select whether to assemble using the include path specified in the [Additional include paths] property in the [Preprocess] category from the [Assemble Options] tab of the build tool to be used. This corresponds to the -i option of the assembler. The paths are added to the -i option according to the following sequence. - Paths specified in the [System include paths] property in the [Preprocess] category from the [Assemble Options] tab - Paths specified in the [Additional include paths] property in the [Preprocess] category from the [Assemble Options] tab - Paths specified in the [Additional include paths] property in the [Preprocess] category		
	Default	Yes	
	How to change	Select from the drop-down list.	
Macro definition	Specify the macro name to be defined. Specify in the format of "*macro name=defined value*", with one macro name per line. The "=*def*" part can be omitted, and in this case, "1" is used as the defined value. This corresponds to the -d option of the assembler. The specified macro is displayed as the subproperty.		
	Default	*Configuration of the general option*	
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.	
	Restriction	Up to 256 characters Up to 30 items can be specified.	

(3) [Output File]

The detailed information on output files are displayed and the configuration can be changed.

Object file name	Specify the name of the object file generated after assembling. If this field is blank, the file is saved under the file name with extension .asm replaced by .rel. This corresponds to the -o option of the assembler.		
	Default	Blank	
	How to change	Directly enter to the text box.	
	Restriction	Up to 259 characters	
Output common object file for various devices	Select whether to output the objects common to the various devices. This corresponds to the -common option of the assembler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-common)	Outputs the objects common to the various devices.
		No	Outputs objects for RL78 and 78K0R.
Output error list file	Select whether to output the error list file. This corresponds to the -e option of the assembler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file.
		No	Does not output the error list file.

(4) [Assemble List]

The detailed information on the assemble list are displayed and the configuration can be changed.

Output assemble list file	Select whether to output the assemble list file. This corresponds to the -p option of the assembler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-p)	Outputs an assemble list file.
		No(-np)	Does not output an assemble list file.
Execute list converter	Select whether the list converter is executed following the generation of an execution module. The list converter is not executed during library generation. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Executes the list converter after the generation of an execution module.
		No	Does not execute the list converter after the generation of an execution module.
Output list converter error list file	Select whether to output an error list file during list converter execution. This corresponds to the -e option of the list converter. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected and when [No] in the [Execute list converter] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-e)	Outputs an error list file during list converter execution.
		No	Does not output an error list file during list converter execution.
Output with assemble list info	Select whether to output the assemble list information into the assemble list file. This corresponds to the -ka option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Outputs the assemble list information into the assemble list file.
		No(-nka)	Does not output the assemble list information into the assemble list file.

Output with symbol list	Select whether to output the symbol list information into the assemble list file. This corresponds to the -ks option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-ks)	Outputs the symbol list information into the assemble list file.
		No	Does not output the symbol list information into the assemble list file.
Output with cross reference list	Select whether to output the cross reference list information into the assemble list file. This corresponds to the -kx option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-kx)	Outputs the cross reference list information into the assemble list file.
		No	Does not output the cross reference list information into the assemble list file.
Output with form feed control code	Select whether to output a form feed code into list files. This corresponds to the -lf option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-lf)	Outputs a form feed code into the list file.
		No	Does not output a form feed code into the list file.
Number of characters in 1 line	Specify the number of characters in each line of the list file. This corresponds to the -lw option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Directly enter to the text box.	
	Restriction	72 to 2046 (decimal number)	
Number of lines on 1 page	Specifies the number of lines on 1 page of the list file. If 0 is specified, no page breaks will be made. This corresponds to the -ll option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.		
	Default	*Configuration of the general option*	
	How to change	Directly enter to the text box.	
	Restriction	0, and 20 to 32767 (decimal number)	

Tab width	Specify the tab width of the list file. This corresponds to the -lt option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.	
	Default	*Configuration of the general option*
	How to change	Directly enter to the text box.
	Restriction	0 to 8 (decimal number)
Header title	Specify the header of the assemble list file. A string containing double-byte characters and single-byte spaces can be specified. This corresponds to the -lh option of the assembler. This property is not displayed when [No(-np)] in the [Output assemble list file] property is selected.	
	Default	*Configuration of the general option*
	How to change	Directly enter to the text box.
	Restriction	Up to 60 single-byte characters (30 double-byte characters)

(5) [Others]

Other detailed information on assembly are displayed and the configuration can be changed.

Kanji character code of source	Select the Kanji character code of the source. This corresponds to the -zs, -ze, and -zn options of the assembler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Shift_JIS(-zs)	Interprets the kanji code of the source as Shift_JIS.
		EUC-JP(-ze)	Interprets the kanji code of the source as EUC-JP.
		Unspecified(-zn)	Interprets the source as not containing kanji codes.
Allow 78K0 macro to assemble	Select whether to enable assembly of the assembler source file generated by the assembler for 78K0 microcontrollers. This corresponds to the -compati option of the assembler.		
	Default	*Configuration of the general option*	
	How to change	Select from the drop-down list.	
	Restriction	Yes(-compati)	Enables assembly of the assembler source file generated by the assembler for 78K0 microcontrollers.
		No	Does not enable assembly of the assembler source file generated by the assembler for 78K0 microcontrollers.

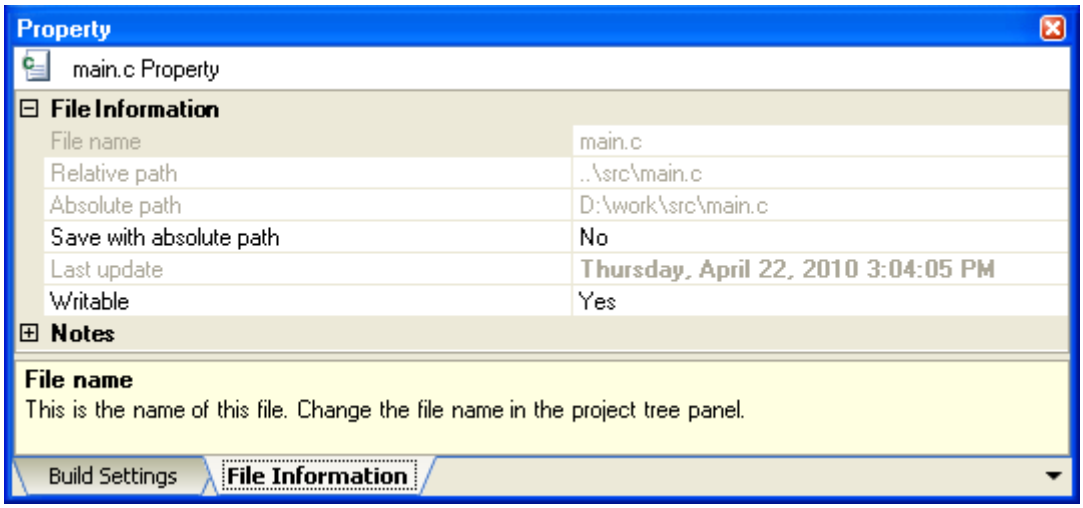
Commands executed before assemble processing	Specify the command to be executed before assemble processing. The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be assembled. %AssembledFile%: Replaces with the absolute path of the output file under assembling. The specified command is displayed as the subproperty.	
	Default	Commands executed before assemble processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Commands executed after assemble processing	Specify the command to be executed after assemble processing. The following macro names are available as embedded macros. %ProjectFolder%: Replaces with the absolute path of the project folder. %OutputFolder%: Replaces with the absolute path of the output folder. %OutputFile%: Replaces with the absolute path of the output file. %InputFile%: Replaces with the absolute path of the file to be assembled. %AssembledFile%: Replaces with the absolute path of the output file under assembling. The specified command is displayed as the subproperty.	
	Default	Commands executed after assemble processing[*number of defined items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 1023 characters Up to 64 items can be specified.
Other additional options	Input the assemble options to be added additionally. The options set here are added at the end of the assemble options group.	
	Default	*Configuration of the general option*
	How to change	Directly enter to the text box or edit by the Character String Input dialog box which appears when clicking the [...] button.
	Restriction	Up to 259 characters

[File Information] tab

This tab shows the detailed information on each file categorized by the following and the configuration can be changed.

(1) [File Information]
(2) [Notes]

Figure A-20. Property Panel: [File Information] Tab



[Description of each category]

(1) [File Information]

The detailed information on the file are displayed and the configuration can be changed.

File name	Display the file name. Change the file name on the Project Tree panel.		
	Default	*File name*	
	How to change	Changes not allowed	
Relative path	Display the relative path of the file from the project folder.		
	Default	*The relative path of the file from the project folder*	
	How to change	Changes not allowed	
Absolute path	Display the absolute path of the file.		
	Default	*The absolute path of the file*	
	How to change	Changes not allowed	
Save with absolute path	Select whether to save the file location with the absolute path.		
	Default	No	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Saves the file location with the absolute path.
		No	Saves the file location with the relative path.

Last update	Display the time and date on which this file was changed last.		
	Default	*File updated time and date*	
	How to change	Changes not allowed	
Writable	Select whether to enable writing to the file.		
	Default	Yes (when the file is write enabled) No (when the file is not write enabled)	
	How to change	Select from the drop-down list.	
	Restriction	Yes	Enables the file to write.
		No	Does not enable the file to write.

(2) [Notes]

The detailed information on notes is displayed and the configuration can be changed.

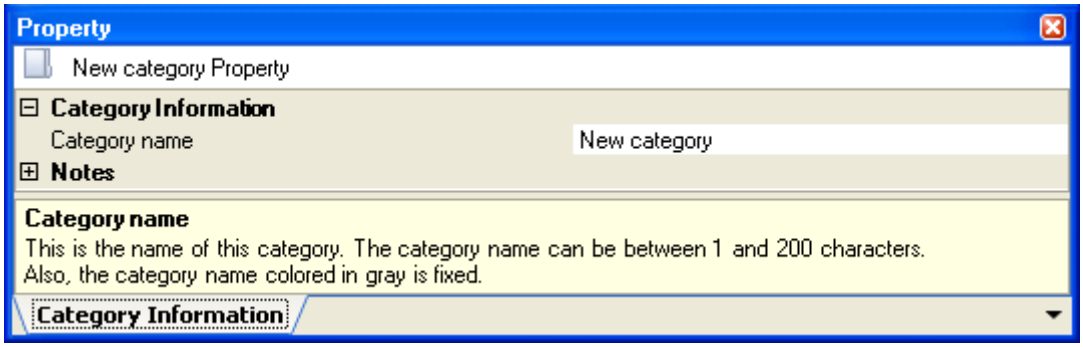
Memo	Add memos to the file. Add one item in one line. The added memos are displayed as the subproperty.	
	Default	Memo[*number-of-items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 256 memos can be specified.

[Category Information] tab

This tab shows the detailed information on the category that the user added, File node, Build tool generated files node, and Startup node categorized by the following and the configuration can be changed.

(1) [Category Information]
(2) [Notes]

Figure A-21. Property Panel: [Category Information] Tab



[Description of each category]

(1) [Category Information]

The detailed information on the category is displayed and the configuration can be changed.

Category name	Specify the category name to categorize files. This property of the File node, Build tool generated files node, and Startup node is displayed in gray and you cannot change the attribute.	
	Default	*Category name of files*
	How to change	Directly enter to the text box.
	Restriction	1 to 200 characters

(2) [Notes]

The detailed information on notes is displayed and the configuration can be changed.
This category of the File node, Build tool generated files node, and Startup node is not displayed.

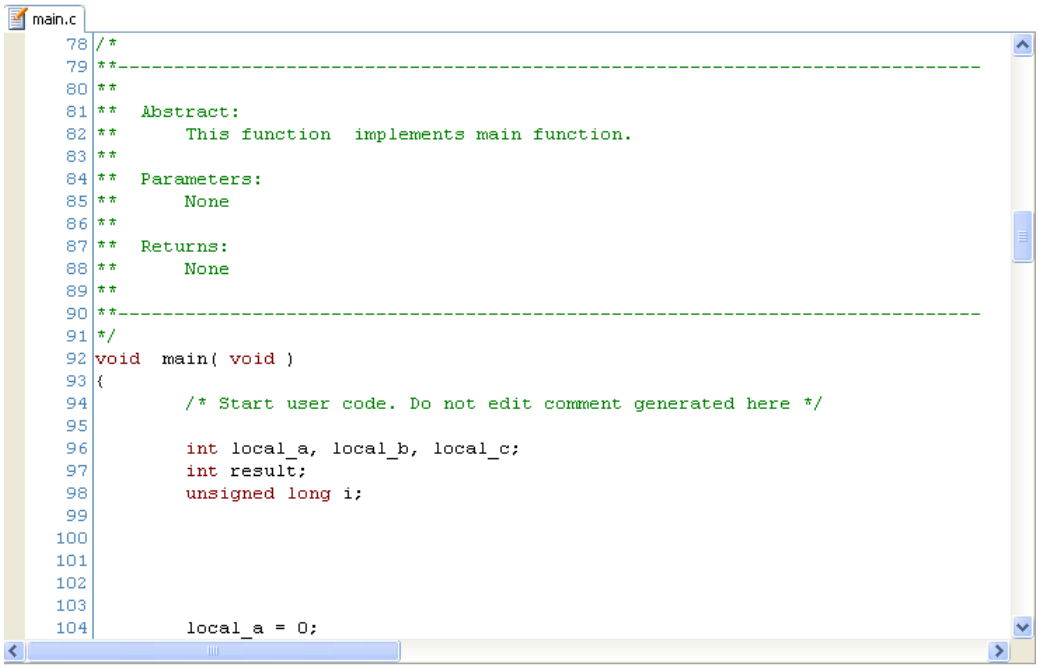
Memo	Add memos to the category of files. Add one item in one line. The added memos are displayed as the subproperty.	
	Default	Memo[*number-of-items*]
	How to change	Edit by the Text Edit dialog box which appears when clicking the [...] button. For the subproperty, you can use the text box directly enter the text.
	Restriction	Up to 256 characters Up to 256 memos can be specified.

Editor panel

This panel is used to display/edit text files/source files.

See "CubeSuite+ RL78,78K0R Coding" for details about this panel.

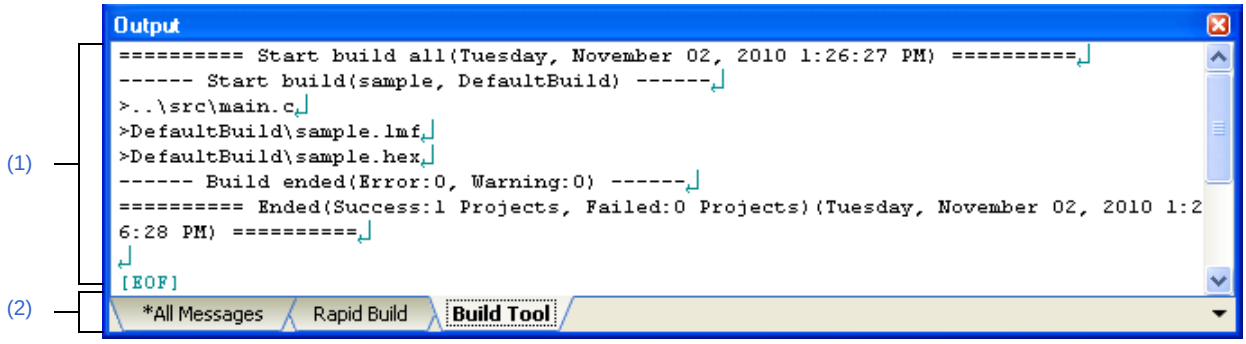
Figure A-22. Editor Panel



Output panel

This panel is used to display the message that is output from the build tool.
Messages are shown individually on the tab categorized by the output tool.

Figure A-23. Output Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [[File] menu (only available for the Output panel)]
- [[Edit] menu (only available for the Output panel)]
- [Context menu]

[How to open]

- From the [View] menu, select [Output].

[Description of each area]

(1) Message area

Display messages and the search results output from each tool.
In build result/search result (batch search) display, a new message is displayed deleting the previous message every time build/search is done (but not the [All Messages] tab).

Remark Up to 500000 lines of messages can be displayed. If 500001 lines or more of messages are output, then the excess lines are deleted, oldest first.

The message colors differ as follows depends on the type of the output message (the character color/background color is set in [General - Font and Color] category in the Option dialog box).

Message Type	Example (Default)			Description
Normal message	AaBbCc	Character color	Black	Information on something.
		Background color	White	
Warning	AaBbCc	Character color	Blue	Warning for the operation.
		Background color	Normal color	
Error message	AaBbCc	Character color	Red	Fatal error or operation disabled because of an error in operation.
		Background color	Light gray	

This area has the following functions.

(a) Tag jump

When the output message is double-clicked, or the [Enter] key is pressed with the caret over the message, the Editor panel appears and the destination line number of the file is displayed.
You can jump to the line of the source file that generated the error from the error message output when building.

(b) Display help

help with regard to the message in the line is shown by selecting [Help for Message] in the context menu or pressing the [F1] key while the caret is in the line where the warning message or the error message is displayed.

(c) Save log

The contents displayed on the currently selected tab can be saved in a text file (*.txt) by selecting [Save Output - *tab name* As...] from the [File] menu and opens the Save As dialog box (messages on the tab that is not selected will not be saved).

(2) Tab selection area

Select tabs that messages are output from.
Tabs that are displayed are as follows.

Tab Name	Description
All Messages	Shows all the messages by order of output. (Except while executing a rapid build)
Rapid Build	Shows the message output from the build tool by running a rapid build.
Build Tool	Shows the message output from the build tool by running build/rebuild/clean.

Caution Tab is not automatically switched when a new message is output on the non-selected tab.
If this is the case, is added to the tab informing a new message is output.

[[File] menu (only available for the Output panel)]

The following items are exclusive for the [File] menu in the Output panel (other items are common to all the panels).

Save Output - *tab name*	Saves the contents on the currently selecting tab in the previously saved text file (*.txt) (see "(c) Save log"). When this item is selected for the first time after launching the program, the operation is equivalent to when selecting [Save Output - *tab name* As...].
Save Output - *tab name* As...	Opens the Save As dialog box to save the contents on the currently selecting tab in the designated text file (*.txt) (see "(c) Save log").

[[Edit] menu (only available for the Output panel)]

The following items are exclusive to the [Edit] menu in the Output panel (other items are all invalid).

Copy	Copies the selected characters to the clipboard.
Select All	Selects all the messages displayed on this panel.
Find...	Opens the Find and Replace dialog box with the [Quick Find] tab target.
Replace...	Opens the Find and Replace dialog box with the [Replace in Files] tab target.

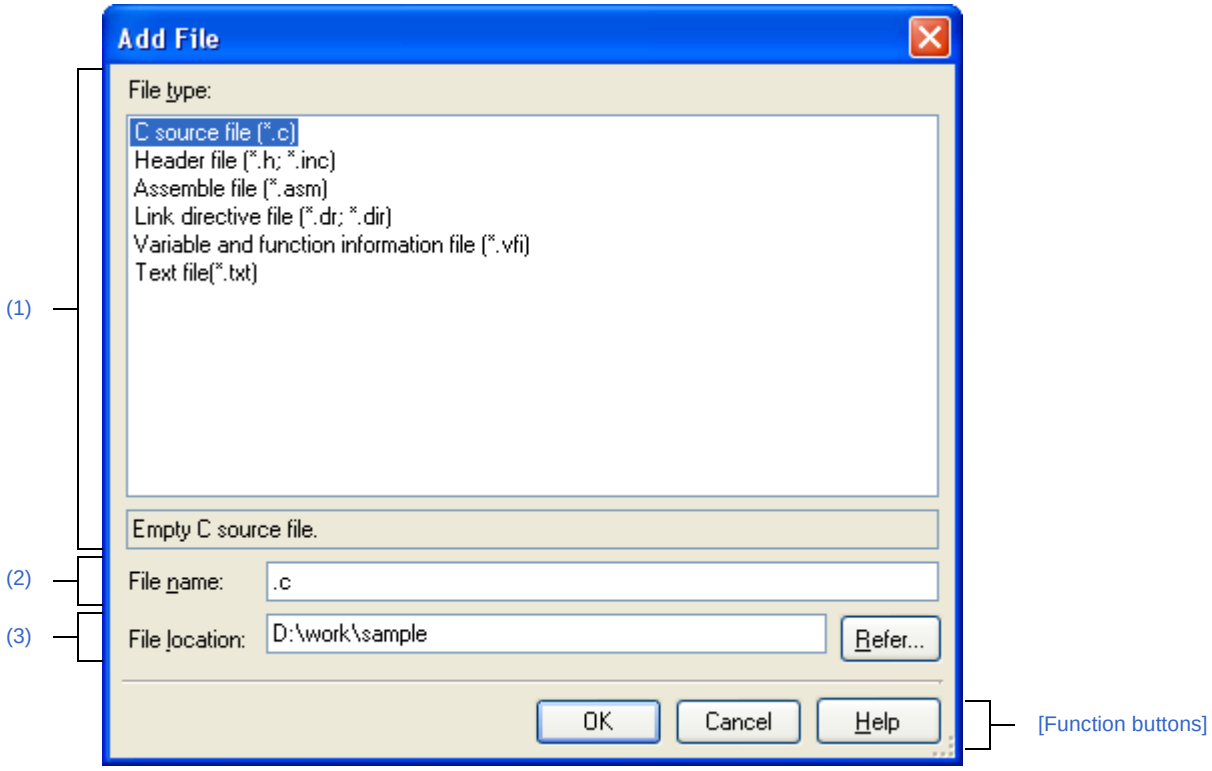
[Context menu]

copy	Copies the selected characters to the clipboard.
Select All	Selects all the messages displayed on this panel.
Clear	Deletes all the messages displayed on this panel.
Tag Jump	Jumps to the caret line in the editor indicated by the message (file, line, and column).
Help for Message	Shows the help with regard to the message at the current caret. Note that the help is only for warning/error messages.

Add File dialog box

This dialog box is used to create a new file and add it to the project.

Figure A-24. Add File Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [File] menu, select [Add] >> [Add New File...].
- On the Project Tree panel, select either one of the Project node, Subproject node, File node, or category node, and then select [Add] >> [Add New File...] from the context menu.

[Description of each area]

(1) [File type] area

Select file types to create.

The description is shown at the lower box when a file type is selected.

File types to be shown are as follows.

- C source file (*.c)
- Header file (*.h; *.inc)
- Assemble file (*.asm)
- Link directive file (*.dr; *.dir)
- Variable and function information file (*.vfi)

- Text file (*.txt)

(2) [File name] area

Directly enter the name of the file to create.
The default file extension is "txt".

Remark If extensions are not designated, the one selected in the [File type] area are is added. Also that if extensions different from the one selected in the [File type] area are designated, the one selected in the [File type] area is added as an extension (for example, if you designate "aaa.txt" as a file name and select "C source file (*.c)" as file type, the file is named as "aaa.txt.c").

(3) [File location] area

Designate the location to create a file by directly entering its path or selecting from [Refer...] button.
The default file location is the project folder path.

(a) Button

Refer...	Opens the Browse For Folder dialog box. When a folder is selected, a path is added in the text box.

Remarks 1. When the text box is left blank, the project folder is regarded to be designated.
2. When the relative path is used, the path is regarded to be from the project folder.

Remark The number of characters that can be entered in the [File name] area and the [File location] area is up to 259 both for the path name and file name together. When the input violates any restriction, the following messages are shown in the tooltip in the [File name] area.

Message	Description
The file name including the path is too long. Make it within 259 characters.	The file name with the path is more than 259 characters.
The specified path contains a folder that does not exist.	The path includes the folder that does not exist.
The file name or path name is invalid. The following characters cannot be used: \, /, :, *, ?, ", <, >, |	The file name with the invalid path is designated. The characters, \, /, :, *, ", <, >, |, cannot be used for the file name and folder name.

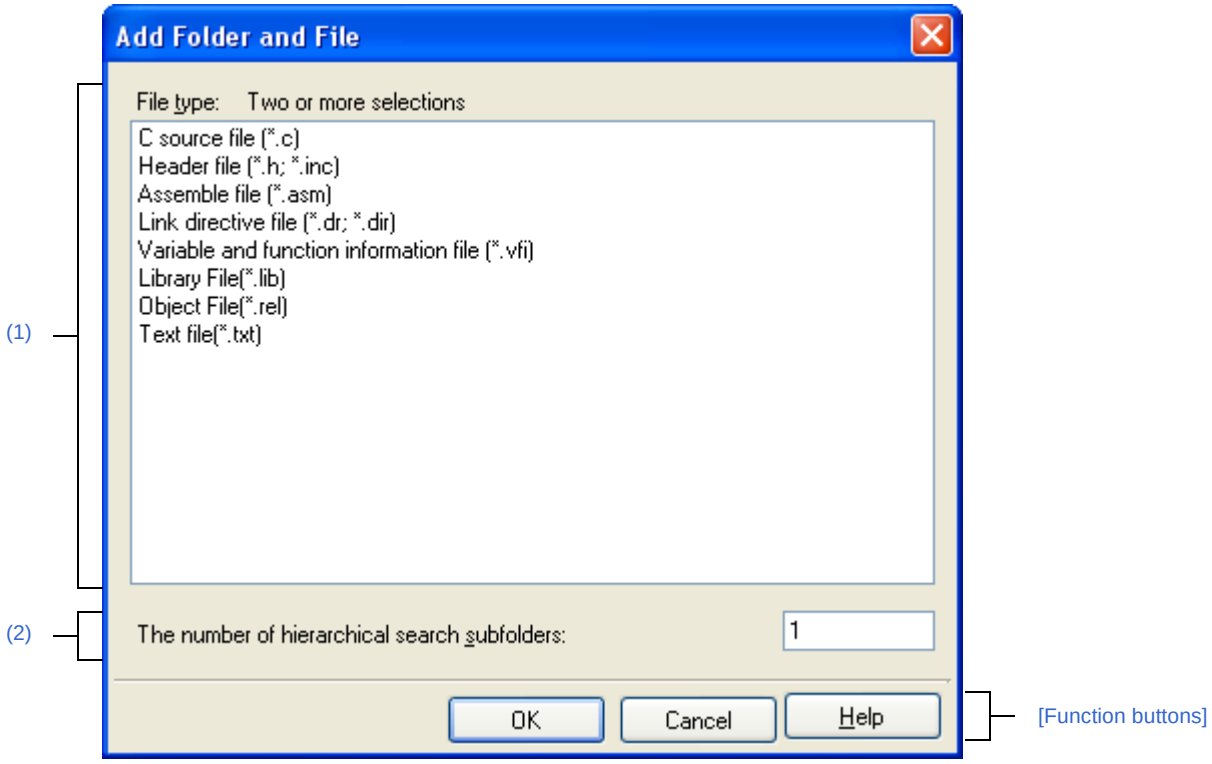
[Function buttons]

Button	Function
OK	Creates the file with the entered file name, adds it to the project, and opens with the Editor panel. Then closes this dialog box.
Cancel	Does not create a file and closes this dialog box.
Help	Displays the help of this dialog box.

Add Folder and File dialog box

This dialog box is used to add existing files and folder hierarchies to the project.
The folder is added as a category.

Figure A-25. Add Folder and File Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- Drag the folder from Explorer or the like, and drop it on the Project Tree panel.

[Description of each area]

(1) [File type] area

Select the file types to add to the project.
You can select multiple types by left clicking while holding down the [Ctrl] or [Shift] key.
If nothing is selected, it is assumed that all types are selected.
The file types displayed are shown below.

- C source file (*.c)
- Header file (*.h; *.inc)
- Assemble file (*.asm)
- Link directive file (*.dr; *.dir)
- Variable and function information file (*.vfi)

- Library file (*.lib)
- Object file (*.rel)
- Text file (*.txt)

(2) [Subfolder level to search] area

Directly enter the number of subfolder levels to add to the project.
The default number is "1".

Remark Decimal numbers of up to 10 are allowed. When the input violates any restriction, the following messages are shown in the tooltip.

Message	Description
Fewer than 0 or more than 10 values cannot be specified.	More than 10 subfolder levels have been specified.
Specify in decimal.	A number in other than base-10 format or a string has been specified.

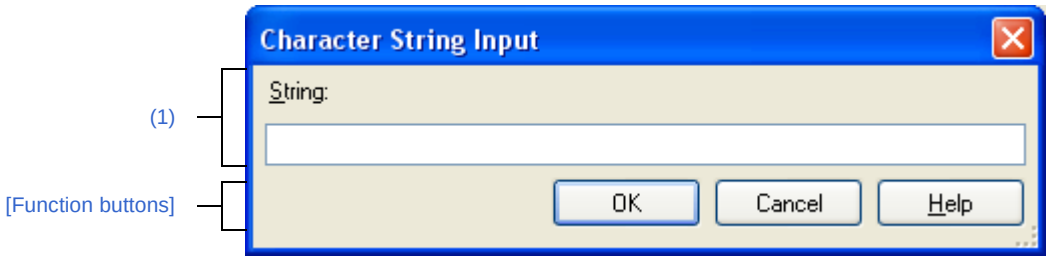
[Function buttons]

Button	Function
OK	The folder that was dragged and dropped and the files in that folder are added to the project.And then close the dialog box.
Cancel	Do not add a folder and files, and then closes this dialog box.
Help	Displays the help of this dialog box.

Character String Input dialog box

This dialog box is used to input and edit characters in one line.

Figure A-26. Character String Input Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Property panel, select the following properties, and then click the [...] button.
  - From the [Common Options] tab, [Format of build option list] in the [Others] category.
  - From the [Compile Options] tab, [Other additional options] in the [Others] category.
  - From the [Assemble Options] tab, [Other additional options] in the [Others] category.
  - From the [Link Options] tab, [Area name] in the [Stack] category, and [Other additional options] in the [Others] category.
  - From the [Object Convert Options] tab, [Other additional options] in the [Others] category.
  - From the [Create Library Options] tab, [Other additional options] in the [Others] category.
  - From the [Individual Compile Options] tab, [Other additional options] in the [Others] category.
  - From the [Individual Assemble Options] tab, [Other additional options] in the [Others] category.
- In the [General - External Tools] category of the Option dialog box, check [Require options at start-up] in the New registration area. Then the dialog box automatically opens when an external tool is launched from [Tool] menu.

[Description of each area]

(1) [String] area

Input characters in one line.

By default, this dialog box opens with its edit box reflecting the current value of the property selected to call the dialog box.

Line break is not allowed.

Remark Up to 32767 characters can be entered. When the input violates any restriction, the following messages are shown in the toolchip.

Message	Description
More than *maximum number of restriction in the property that called this dialog box* characters cannot be specified.	The characters exceeds the maximum number of restriction in the property that called this dialog box.

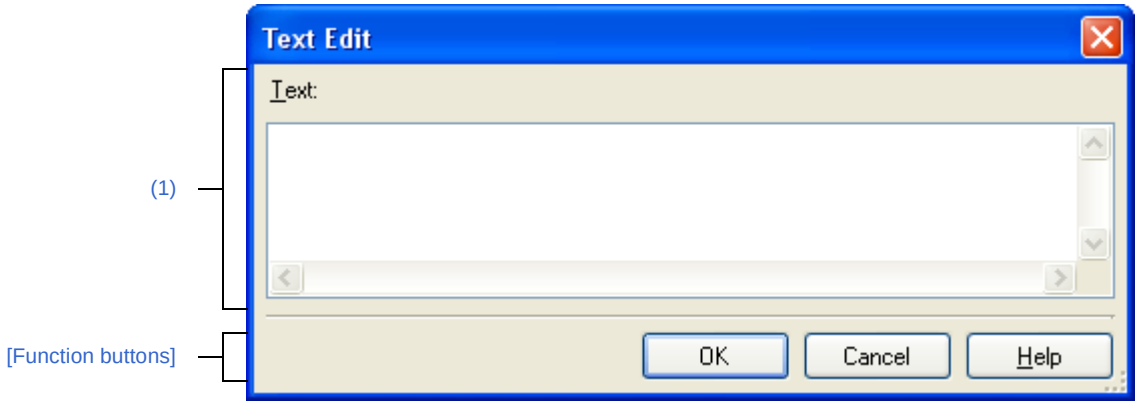
[Function buttons]

Button	Function
OK	Reflects the entered characters to the property that called this dialog box then closes the dialog box.
Cancel	Does not reflect the entered characters to the property that called this dialog box then closes the dialog box.
Help	Displays the help of this dialog box.

Text Edit dialog box

This dialog box is used to input and edit texts in multiple lines.

Figure A-27. Text Edit Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Property panel, select the following properties, and then click the [...] button.
  - From the [Common Options] tab, [Macro definition] in the [Frequently Used Options(for Compile)] category, [Macro definition] in the [Frequently Used Options(for Assemble)] category, [Using libraries] in the [Frequently Used Options(for Link)] category, [Memo] in the [Notes] category, and [Commands executed before build processing], [Commands executed after build processing] in the [Others] category.
  - From the [Compile Options] tab, [Macro definition], [Macro undefinition] in the [Preprocess] category, and [Commands executed before compile processing], [Commands executed after compile processing] in the [Others] category.
  - From the [Assemble Options] tab, [Macro definition] in the [Preprocess] category, and [Commands executed before assemble processing], [Commands executed after assemble processing] in the [Others] category.
  - From the [Link Options] tab, [Using libraries] in the [Library] category, and [Commands executed before link processing], [Commands executed after link processing] in the [Others] category.
  - From the [Object Convert Options] tab, [Commands executed before object convert processing], [Commands executed after object convert processing] in the [Others] category.
  - From the [Create Library Options] tab, [Commands executed before making library], [Commands executed after making library] in the [Others] category.
  - From the [Individual Compile Options] tab, [Macro definition], [Macro undefinition] in the [Preprocess] category, and [Commands executed before compile processing], [Commands executed after compile processing] in the [Others] category.
  - From the [Individual Assemble Options] tab, [Macro definition] in the [Preprocess] category, and [Commands executed before assemble], [Commands executed after assemble] in the [Others] category.
  - From the [File Information] tab, [Memo] in the [Notes] category
  - From the [Category Information] tab, [Memo] in the [Notes] category

[Description of each area]

(1) [Text] area

Input and edit texts in multiple lines.

By default, this dialog box opens with its edit box reflecting the current value of the property selected to call the dialog box.

Remark Up to 65535 lines and 65535 characters are allowed. When the input violates any restriction, the following messages are shown in the tooltip.

Message	Description
More than *maximum number of restriction in the property that called this dialog box* characters cannot be specified. The current number of characters is displayed between brackets at the beginning of the line in excess of the limit.	The characters exceeds the maximum number of restriction in the property that called this dialog box.

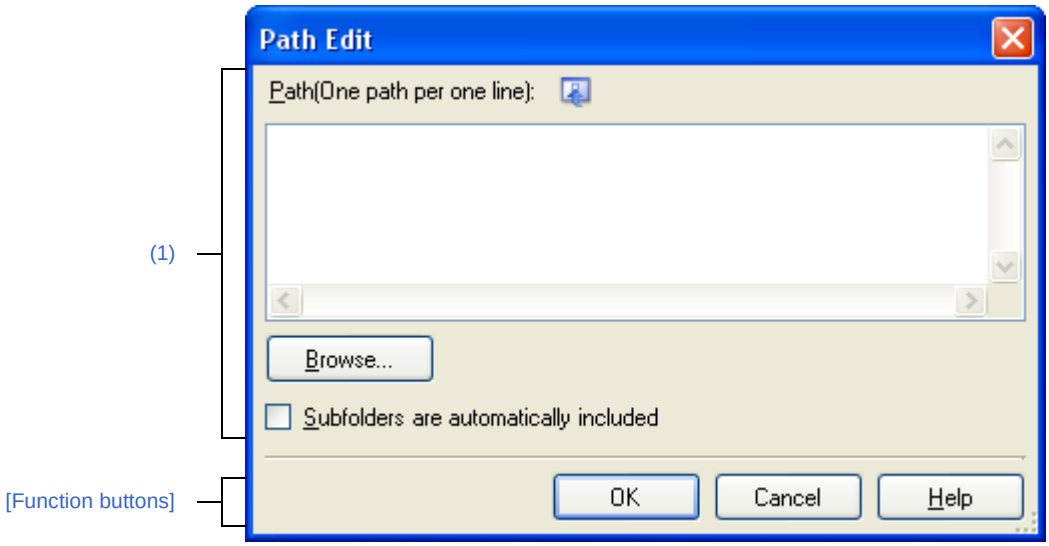
[Function buttons]

Button	Function
OK	Reflects the entered text to the text box that opened this dialog box and closed the dialog box.
Cancel	Does not reflect the entered text to the text box that opened this dialog box and closed the dialog box.
Help	Displays the help of this dialog box.

Path Edit dialog box

This dialog box is used to edit or add the path.

Figure A-28. Path Edit Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Property panel, select the following properties, and then click the [...] button.
  - From the [Common Options] tab, [Additional include paths] in the [Frequently Used Options(for Compile)] category, [Additional include paths] in the [Frequently Used Options(for Assemble)] category, and [Additional library paths] in the [Frequently Used Options(for Link)] category.
  - From the [Compile Options] tab, [Additional include paths] in the [Preprocess] category.
  - From the [Assemble Options] tab, [Additional include paths] in the [Preprocess] category.
  - From the [Link Options] tab, [Additional include paths] in the [Library] category.
  - From the [Individual Compile Options] tab, [Additional include paths] in the [Preprocess] category.
  - From the [Individual Assemble Options] tab, [Additional include paths] in the [Preprocess] category.

[Description of each area]

(1) Path edit area

Edit or add the path.

(a) [Path(One path per one line)]

Edit or adds the path by directly entering the path.

Path can be designated in multiple lines. Designate a path at a line.

By default, the contents of the text box that opened this dialog box are reflected in this area.

Path can be added by one of the following method.

- Click the [Browse...] button, and then select folders in the Browse For Folder dialog box.
- Drag and drop the folder using such as Explorer.

Caution **If an extremely long absolute path is specified as a relative path, an error could occur when clicking the [OK] button. In this case, designate the absolute path.**

Remark Up to 10000 lines are allowed. Up to the maximum characters that are limited by the Windows OS are allowed. When the input violates any restriction, the following messages are shown in the tooltip.

Message	Description
Specify a path.	The field is empty.
The path is too long. Specify a path with a number of characters equal to or fewer than *maximum number of restriction in the property that called this dialog box*.	The file name including the path is exceeding the character limit defined in the original path.
The specified path contains a folder that does not exist.	The path includes the folder that does not exist.
The file name or path name is invalid. The following characters cannot be used: \, /, :, *, ?, ", <, >, |	The file name with the invalid path is designated. The characters, \, /, :, *, ", <, >, |, cannot be used for the file name and folder name.
More than *maximum number of paths or files specified by the caller* lines cannot be specified.	The number of paths or files which have been input exceeds the maximum number of paths or files specified by the caller.

(b) Button

Browse...	Opens the Browse For Folder dialog box. When a folder is selected, the path is added to [Path(One path per one line)].

(c) [Subfolders are automatically included]

After checking this check box, designate the path from [Browse...] button and a path is added to [Path(One path per one line)] including subfolders (up to 5 layers).

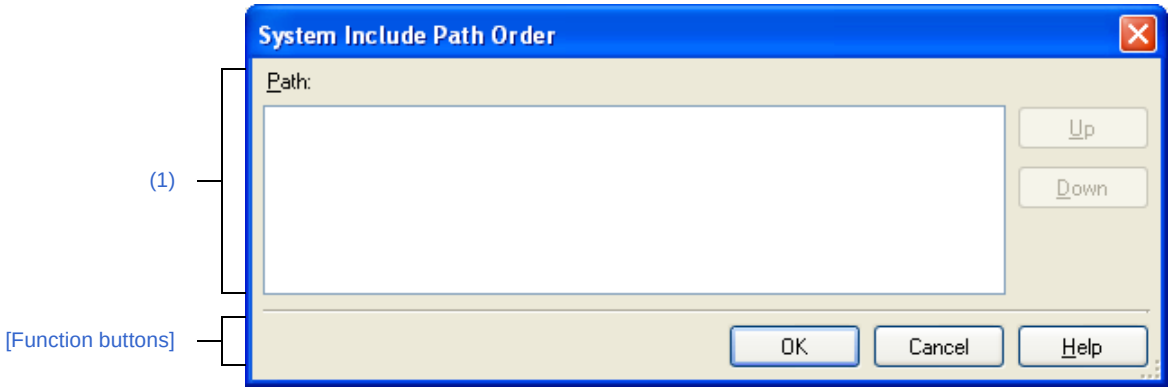
[Function buttons]

Button	Function
OK	Reflects the entered path to the property that called this dialog box then closes the dialog box.
Cancel	Does not reflect the entered path to the property that called this dialog box then closes the dialog box.
Help	Displays the help of this dialog box.

System Include Path Order dialog box

This dialog box is used to refer the system include paths specified for the compiler and set their specified sequence.

Figure A-29. System Include Path Order Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Property panel, select the following properties, and then click the [...] button.
  - From the [Common Options] tab, [System include paths] in the [Frequently Used Options(for Compile)] category, and [System include paths] in the [Frequently Used Options(for Assemble)] category
  - From the [Compile Options] tab, [System include paths] in the [Preprocess] category
  - From the [Assemble Options] tab, [System include paths] in the [Preprocess] category

[Description of each area]

(1) Path list display area

This area displays the list of the system include paths specified for the compiler.

(a) [Path]

This area displays the list of the system include paths in the specified sequence for the compiler.
The default order is the order that the files are registered to the project.
By changing the display order of the paths, you can set the specified order of the paths to the compiler.
To change the display order, use the [Up] and [Down] buttons, or drag and drop the path names.

Remarks 1. Move the mouse cursor over a file name to display a tooltip with the absolute path of that file.
2. Newly added system include paths are added next to the last path of the list.
3. When the path names are dragged and dropped, the multiple path names which are next to each other can be selected together.

(b) Button

Up	Moves the selected path to up.

Down	Moves the selected path to down.

Remark Note that above buttons are disabled when any path is not selected.

[Function buttons]

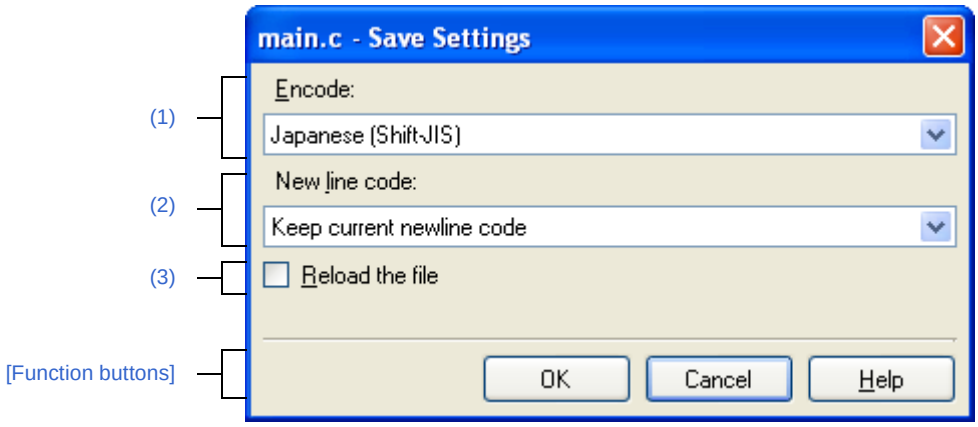
Button	Function
OK	Sets the specified order of the paths to the compiler as the display order in the Path list display area and closes this dialog box.
Cancel	Cancels the specified order of the paths and closes the dialog box.
Help	Displays the help of this dialog box.

File Save Settings dialog box

This dialog box is used to set the encoding and newline code of the file that is being edited on the Editor panel.

Remark The target file name is displayed on the title bar.

Figure A-30. File Save Settings Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- Focus the Editor panel, and then select [*file name* Save Settings...] from the [File] menu.

[Description of each area]

(1) [Encode]

Select the encoding to be set from the drop-down list.

The items of the drop-down list are displayed according to the following sequence.

Note that the same encoding and encoding which are not supported by the current OS will not be displayed.

- *Encoding of the current file* (default)
- *Default encoding of the current OS*
- *Encoding of code page 932 (SJIS)*
- *Encoding of code page 50222 (JIS)*
- *Encoding of code page 51932 (EUC)*
- *Encoding of code page 65001 (UTF8)*
- *Encoding supported by the current OS other than those mentioned above*

(2) [Newline code]

Select the newline code to be set from the drop-down list.

You can select any of items below.

- Keep current newline code
- Windows (CR LF)
- Macintosh (CR)

- Unix (LF)

"Keep current newline code" is selected by default.
After the newline code is changed, the set newline code is selected by default.

(3) [Reload the file]

Use this check box to select whether to reload the file with the selected encoding and newline code when the [OK] button is clicked.
The check box is not selected by default.

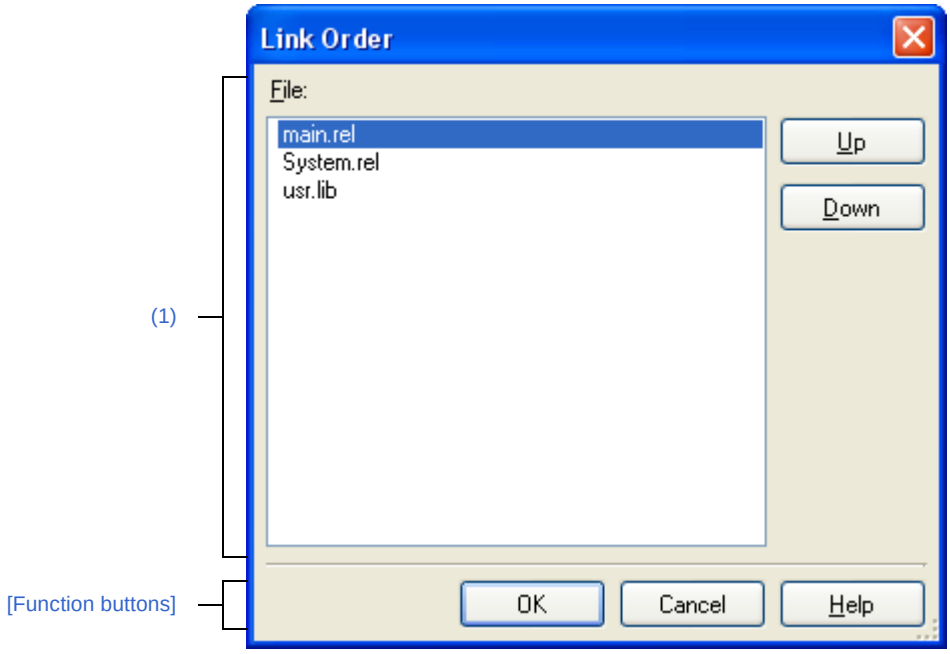
[Function buttons]

Button	Function
OK	Sets the selected encoding and newline code to the target file and closes this dialog box. If [Reload the file] is selected, sets the selected encoding and newline code to the target file and reloads the file.And then closes this dialog box.
Cancel	Cancels the settings of the encoding and newline code and closes the dialog box.
Help	Displays the help of this dialog box.

Link Order dialog box

This dialog box is used to display object module files and library files to input to the linker and configure these link order.

Figure A-31. Link Order Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Project Tree panel, select the Build tool node, and then select [Set Link Order...] from the context menu.

[Description of each area]

(1) File list display area

Show the file list to input to linker.

(a) [File]

Display the following file name lists in input order to linker.

- Object module files that are generated from the source file registered in the selected main project or sub-project.
- Object module files that are directly added to the project tree in the selected main project or subproject.
- Library files that are directly added to the project tree in the selected main project or subproject.

By default, input order to linkers is the order registered in the project.
You can change the input order by changing the display order of files.
Use [Up] or [Down] buttons, or drag and drop the file name to change the display order.

Remarks 1. When the mouse cursor is hovered over a file name, the path of the file appears in a popup. If the file is on the same drive as the project file, then it appears as the relative path; if it is on the different drive, then it appears as the absolute path.

2. The object module file that is generated from the newly added source file and newly added object module file are added to the end of the module file list. The newly added library file is added to the end of the list.

3. When the file is dragged and dropped, the multiple files that are next to each other can be selected together.

(b) Button

Up	Moves the selected file to up.
Down	Moves the selected file to down.

Remark Note that above buttons are disabled when any file is not selected.

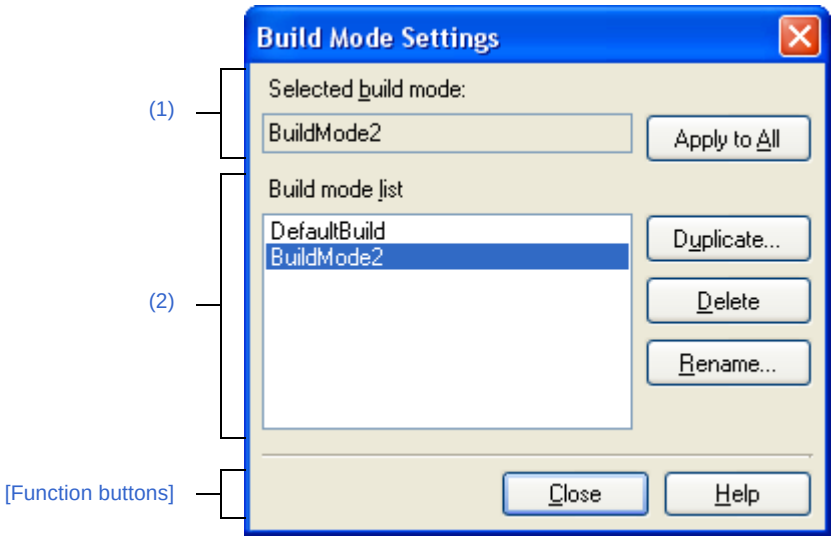
[Function buttons]

Button	Function
OK	Sets the file input order to linker as the display order of the File list display area and closes this dialog box.
Cancel	Cancels the link order settings and closes this dialog box.
Help	Displays the help of this dialog box.

Build Mode Settings dialog box

This dialog box is used to add and delete build modes and configure the current build mode in batch.

Figure A-32. Build Mode Settings Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [Build] menu, select [Build Mode Settings...].

[Description of each area]

(1) [Selected build mode] area

Show the build mode selected in the [Build mode list] area.

(a) Button

Apply to All	Sets the build mode of the main project and all subprojects of the currently opened project to the currently displayed build mode.

(2) [Build mode list] area

Show all the build modes that exist in the currently opening project (main project and subproject) in a list.
Current build mode in the selected project is selected by default.
The current build modes of all projects are same, the build mode is selected by default. If they are not same, "DefaultBuild" will be selected.
Note that the "DefaultBuild" is the default build mode and is always shown at the top.

(a) Button

Duplicate...	Duplicates the selected build mode. The Character String Input dialog box opens and the build mode is duplicated with the name entered and added to the main project and all the subprojects in the currently opening project. When the build mode with "*" mark does not exist in the main project or subproject and duplicate the build mode, DefaultBuild is duplicated. Up to 20 build modes can be added.
Delete	Deletes the selected build mode. Note that DefaultBuild cannot be deleted.
Rename...	Renames the selected build mode. Rename the build mode with entered name in the opening the Character String Input dialog box.

Caution When duplicating or renaming the build mode, the existing build mode name cannot be used.

Remarks 1. Up to 127 characters can be used as a build mode name. When the input violates any restriction, the following messages are shown in the tooltip.

Message	Description
A build mode with the same name already exists.	The entered build mode name already exists.
More than 127 characters cannot be specified.	Build mode name is too long (more than 128 characters).
The build mode name is invalid. The following characters cannot be used: \, /, :, *, ?, ", <, >, |	Invalid build mode name is entered. The characters, (\, /, :, *, ?, ", <, >, |) cannot be used as the name is used for the folder name.

2. Up to 20 build modes can be added. When the input violates any restriction, the following messages are shown in the tooltip.

Message	Description
The maximum number of build modes that can be set per project/subproject is 20.	The number of build modes exceed 20.

[Function buttons]

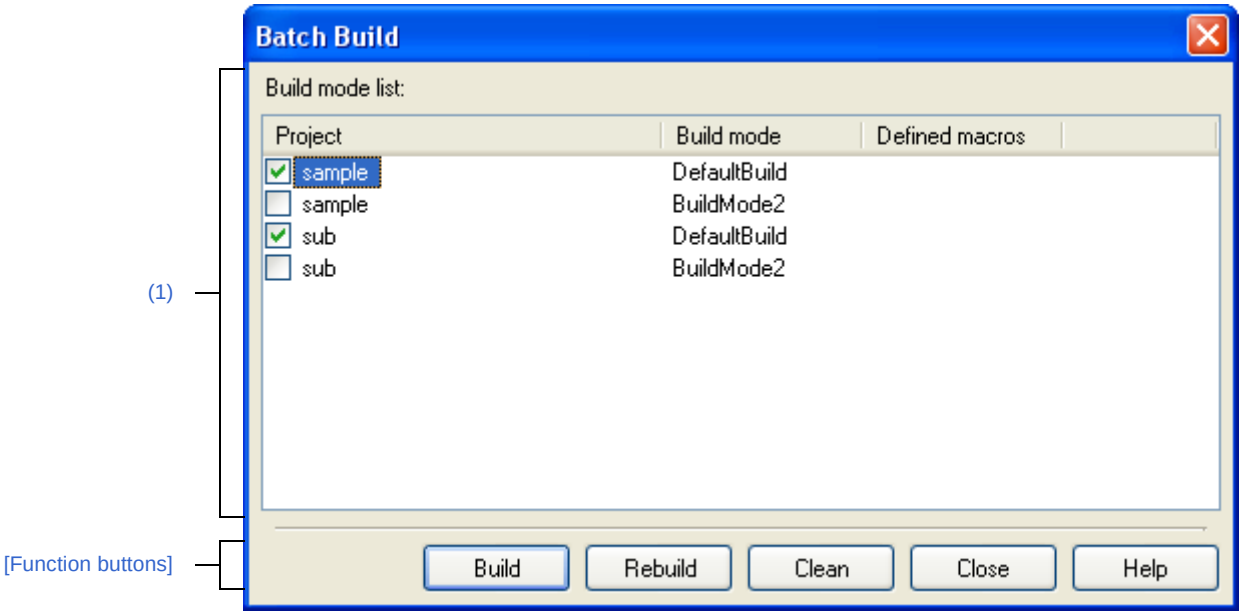
Button	Function
Close	Closes this dialog box.
Help	Displays the help of this dialog box.

Batch Build dialog box

This dialog box is used to do build, rebuild and clean process in batch with the build mode that each project (main project and subproject) has.

Remark Order of the batch build follows the build order of the project which the subproject comes before the main project.
When more than one build mode is selected for a main project or a subproject, all the selected build modes are built and then the next subproject or main project is built.

Figure A-33. Batch Build Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [Build] menu, select [Batch Build...].

[Description of each area]

(1) [Build mode list] area

Show the combination list of the names of the main project and the subproject which the currently opening project has and build modes and defined macros which they have.

(a) [Project]

Show the main project and the subproject which the currently opening project has.
Select the combination of the main project and subproject to build and the build modes.
When this dialog box is opened for the first time after the project is created, all the check boxes are unchecked. From the second time, the previous setting is retained.

(b) [Build mode]

Show build modes which the main project and subproject have.

(c) [Defined macros]

Show defined macros separated with "|", configured for the combination of the main project and the subproject and their build modes in the [Compile Options] tab and the [Assemble Options] tab in the Property panel.
Note that the defined macro in Compile Option comes before the one in Assemble Option and they are separated with ", ".

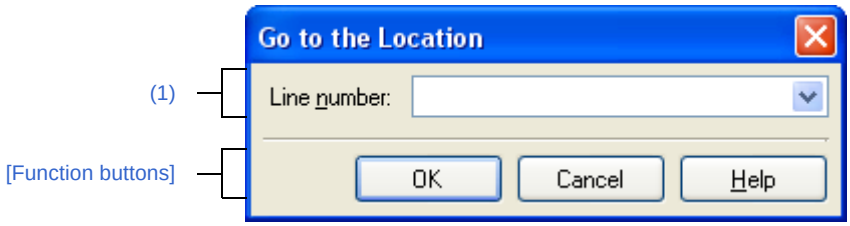
[Function buttons]

Button	Function
Build	Closes this dialog box and executes a batch build of the selected projects in the respective build modes. The execution result of the build are displayed on the Output panel. After the batch build is complete, the build mode configuration restores to the one before this dialog box was opened. Note that this buttons is disabled when any project is not selected.
Rebuild	Closes this dialog box and executes a batch rebuild of the selected projects in the respective build modes. The execution result of the rebuild are displayed on the Output panel. After the batch rebuild is complete, the build mode configuration restores to the one before this dialog box was opened. Note that this buttons is disabled when any project is not selected.
Clean	Closes this dialog box and deletes the files built in the respective build modes set for the selected projects. The execution result of the clean are displayed on the Output panel. After the clean is complete, the build mode configuration restores to the one before this dialog was opened. Note that this buttons is disabled when any project is not selected.
Close	Closes this dialog box.
Help	Displays the help of this dialog box.

Go to the Location dialog box

This dialog box is used to move the caret to the designated location.

Figure A-34. Go to the Location Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [Edit] menu, select [Go To...].

[Description of each area]

(1) [Line number] area

Specify the line number (decimal number) or symbol name of the location to which the caret is moved.

You can directly enter the characters into the text box or select from the input history in the drop down list (maximum numbers of the history: 10).

[Function buttons]

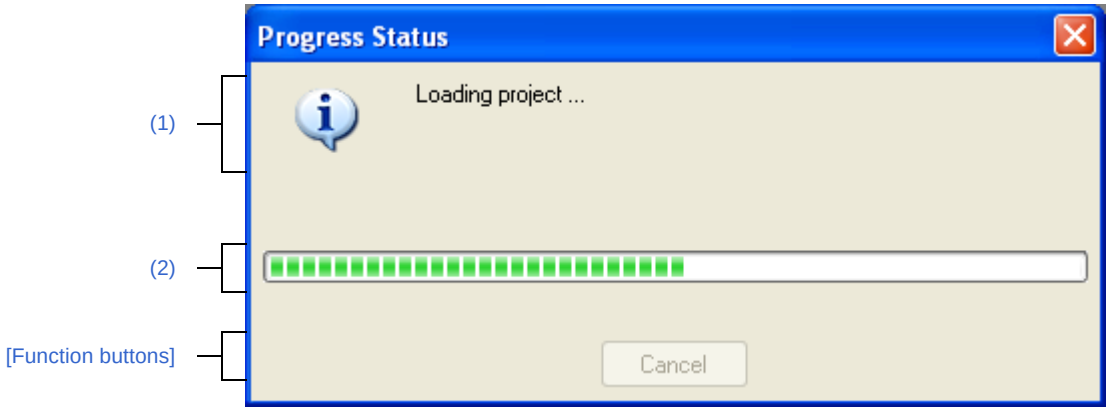
Button	Function
OK	Displays the designated location at the top of the target panel display and moves the caret there. Note that this button is enabled when the project that the opened file is registered is the active project and other than library project.
Cancel	Cancels the criteria and closes this dialog box.
Help	Displays the help of this dialog box.

Progress Status dialog box

This dialog box is used to show how the process has been progressed when the time consuming process is taken place.

This dialog box automatically closes when the process in progress is done.

Figure A-35. Progress Status Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- This dialog box automatically opens when a message is output while the time consuming process is in progress.

[Description of each area]

(1) Message display area

Display the message output while process is in progress (edit not allowed).

(2) Progress bar

The progress bar shows the current progress of the process in progress with the bar length.

When the process is 100% done (the bar gets to the right end), this dialog box automatically closed.

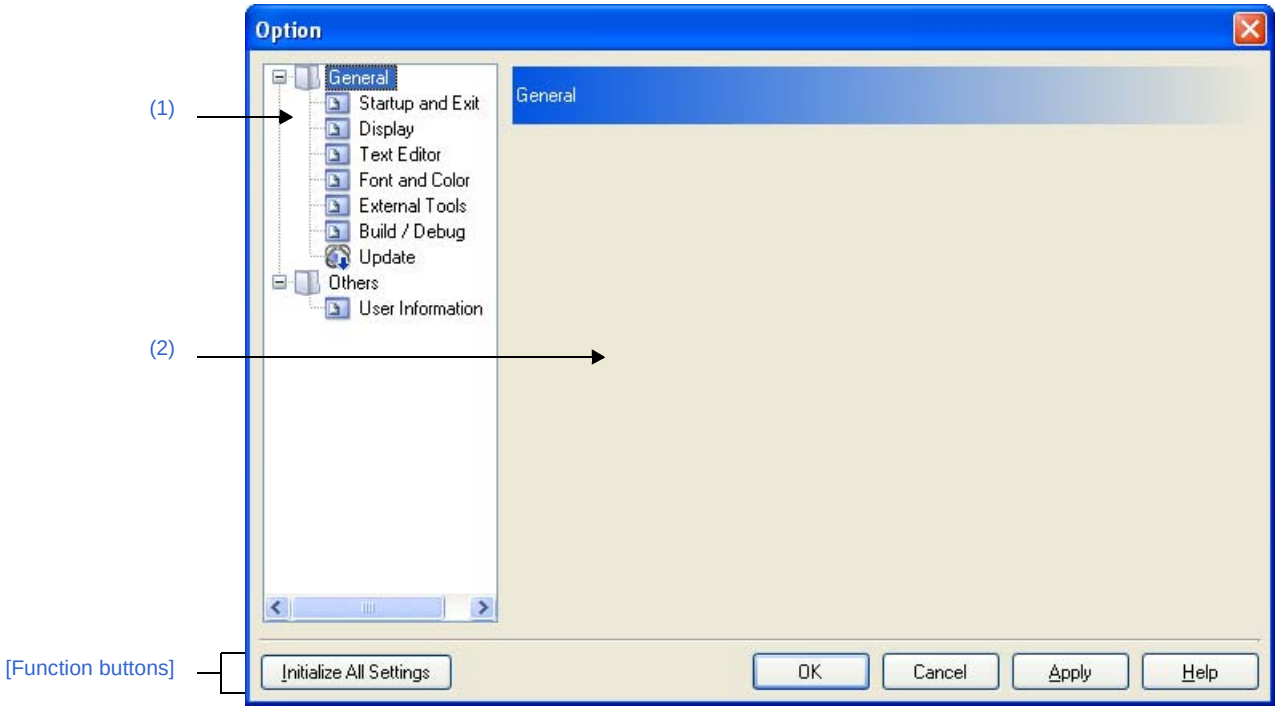
[Function buttons]

Button	Function
Cancel	Cancels the process in progress and closes this dialog box. Note that if the process termination is impossible, this button is disabled.

Option dialog box

This dialog box is used to configure the CubeSuite+ environment.
All settings made via this dialog box are saved as preferences for the current user.

Figure A-36. Option Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [Tool] menu, select [Options...].

[Description of each area]

(1) Category selection area

Select the items to configure from the following categories.

Category	Description
[General - Startup and Exit] category	Configure startup and shutdown.
[General - Display] category	Configure messages from the application.
[General - Text Editor] category	Configure the text editor.
[General - Font and Color] category	Configure the fonts and colors shown on each panel.
[General - External Tools] category	Configure the startup of external tools.
[General - Build/Debug] category	Configure building and debugging.

Category	Description
[General - Update] category	Configure update.
[Other - User Information] category	Configure user information.

Remark See "CubeSuite+ Start" for details about categories other than [General - Build/Debug].

(2) Settings

This area is used to configure the various options for the selected category.

For details about configuration for a particular category, see the section for the category in question.

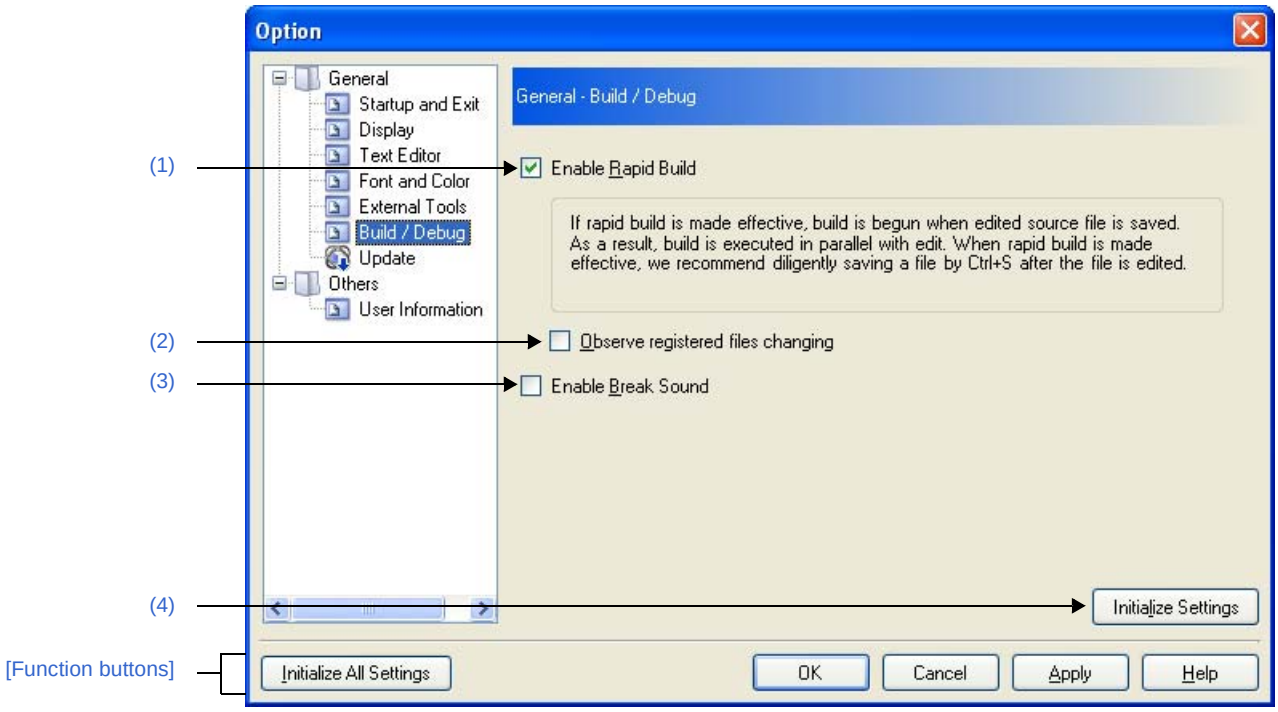
[Function buttons]

Button	Function
Initialize All Settings	Restore all settings on this dialog box to their default values. Note, however, that newly added items in the [General - External Tools] category will not be removed.
OK	Apply all setting and closes this dialog box.
Cancel	Ignore the setting and closes this dialog box.
Apply	Applied all setting (does not close this dialog box).
Help	Display the help of this dialog box.

[General - Build/Debug] category

Use this category to configure general setting relating to building and debugging.

Figure A-37. Option Dialog Box ([General - Build/Debug] Category)



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [Tool] menu, select [Options...].

[Description of each area]

(1) [Enable Rapid Build]

☑	Enable the rapid build [Note] feature (default).
☐	Do not use the rapid build feature.

Note This feature automatically begins a build when the source file being edited is saved.
Enabling this feature makes it possible to perform builds while editing source files.
If this feature is used, we recommend saving frequently after editing source files.

(2) [Observe registered files changing]

This item is only enabled if the [Enable Rapid Build] check box is selected.

☑	Start a rapid build when a source file registered in the project is edited or saved by an external text editor or the like.
☐	Do not start a rapid build when a source file registered in the project is edited or saved by an external text editor or the like (default).

Remark This item is only enabled if the [Enable Rapid Build] check box is selected.

Cautions 1. The rapid build will not finish if this item is selected, and the files to be built have been registered for automatic editing or overwriting (e.g. by commands executed before or after the build).
If the rapid build does not finish, unselect this item, and stop the rapid build.

2. If this item is selected, a file that is registered in the project but does not exist (a file grayed out) will not be observed even if it is registered again by the Explorer etc.
To observe the file, reload the project file, or select this item again after unselecting this item and closing this dialog box.

(3) [Enable Break Sound]

☑	Beep when the execution of a user program is halted due to a break event (hardware or software break).
☐	Do not beep when the execution of a user program is halted due to a break event (hardware or software break) (default).

(4) Buttons

Initialize Settings	Return all currently displayed setting to their default values.

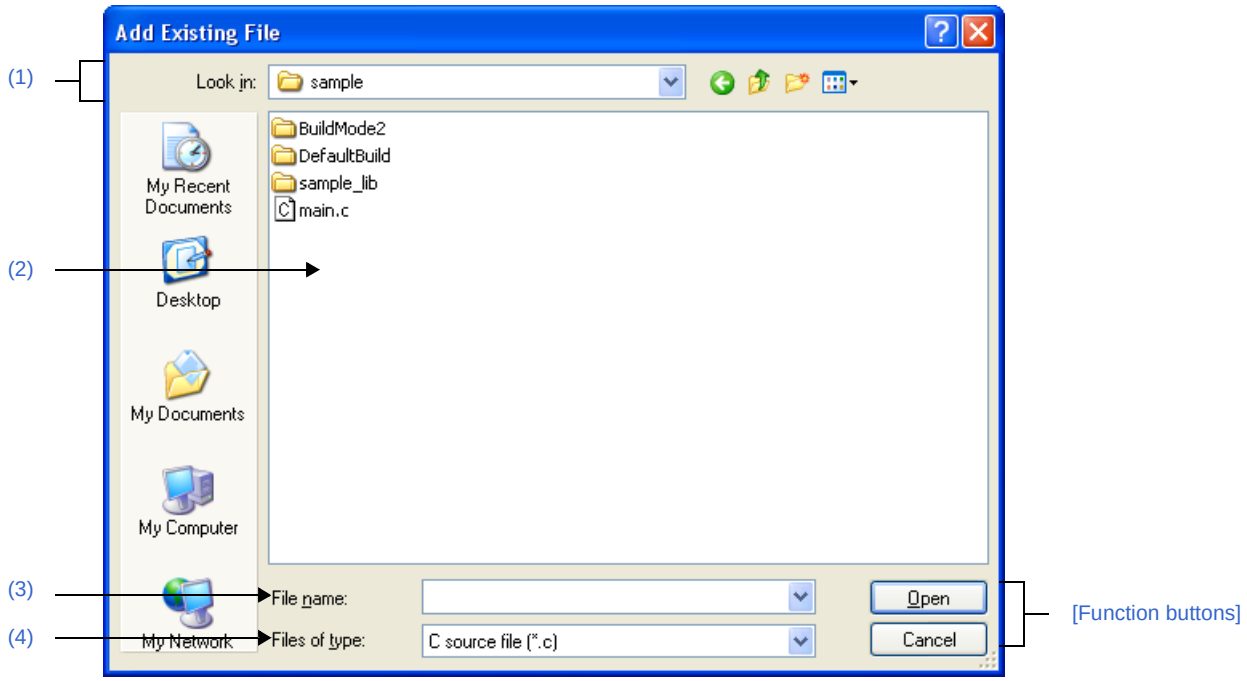
[Function buttons]

Button	Function
Initialize All Settings	Restore all settings on this dialog box to their default values. Note, however, that newly added items in the [General - External Tools] category will not be removed.
OK	Apply all setting and closes this dialog box.
Cancel	Ignore the setting and closes this dialog box.
Apply	Apply all setting (does not close this dialog box).
Help	Display the help of this dialog box.

Add Existing File dialog box

This dialog box is used to select existing files to add to projects.

Figure A-38. Add Existing File Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- From the [File] menu, select [Add] >> [Add File...].
- On the Project Tree panel, select either one of the Project node, Subproject node, File node, or file, and then select [Add] >> [Add File...] from the context menu.

[Description of each area]

(1) [Look in] area

Select the folder that the file to add to projects exists.
The project folder is selected by default.

(2) File list area

File list that matches to the selections in [Look in] and [Files of type] is shown.

(3) [File name] area

Designate the file name of the file to add to projects.

(4) [Files of type] area

Designate the file type of the file to add to projects.

C source file(*.c)	C language source file
Header file(*.h; *.inc)	Header file
Assemble file(*.asm)	Assembly language source file
Link directive file(*.dr; *.dir)	Link directive file
Variable and function information file (*.vfi)	Variable and function information file
Library file(*.lib)	Library file
Object file(*.rel)	Object file
Text file(*.txt)	Text format
All Files(*.*)	All the format (default)

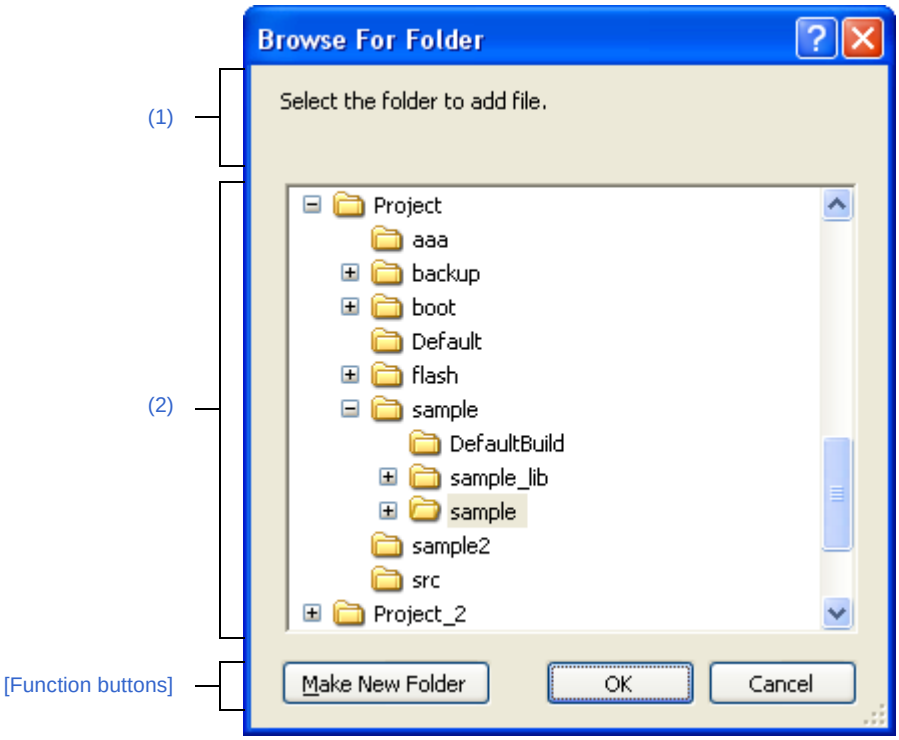
[Function buttons]

Button	Function
Open	Adds the designated file to a project.
Cancel	Closes this dialog box.

Browse For Folder dialog box

This dialog box is used to select a folder and retrieve it for the caller.

Figure A-39. Browse For Folder dialog box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- In the Add File dialog box, click the [...] button in the [File location] area.
- In Path Edit dialog box, click [...] button in the path edit area.
- On the Property panel, select the following properties, and then click the [...] button.
  - From the [Common Options] tab, [Intermediate file output folder] in the [Output File Type and Path] category, [Output folder] in the [Frequently Used Options(for Link)] category, [Output folder for hex file] in the [Frequently Used Options(for Object Convert)] category, and [Temporary folder] in the [Others] category.
  - From the [Link Options] tab, [Output folder] in the [Others] category.
  - From the [Object Convert Options] tab, [Output folder for hex file] in the [Hex File] category.
  - From the [Create Library Options] tab, [Output folder] in the [Output File] category.
  - From the [Variables/Functions Relocation Options] tab, [Output folder for variables/functions information file] in the [Output File] category.

[Description of each area]

(1) Message area

Show messages related to folders selected in this dialog box.

(2) Folder location area

Select a folder to set in the caller of the dialog box.
By default, the folder set in the caller is selected.

Remark When the area is blank or the path which does not exist is entered, "C:\Documents and Settings*user name*\My Documents" is selected instead.

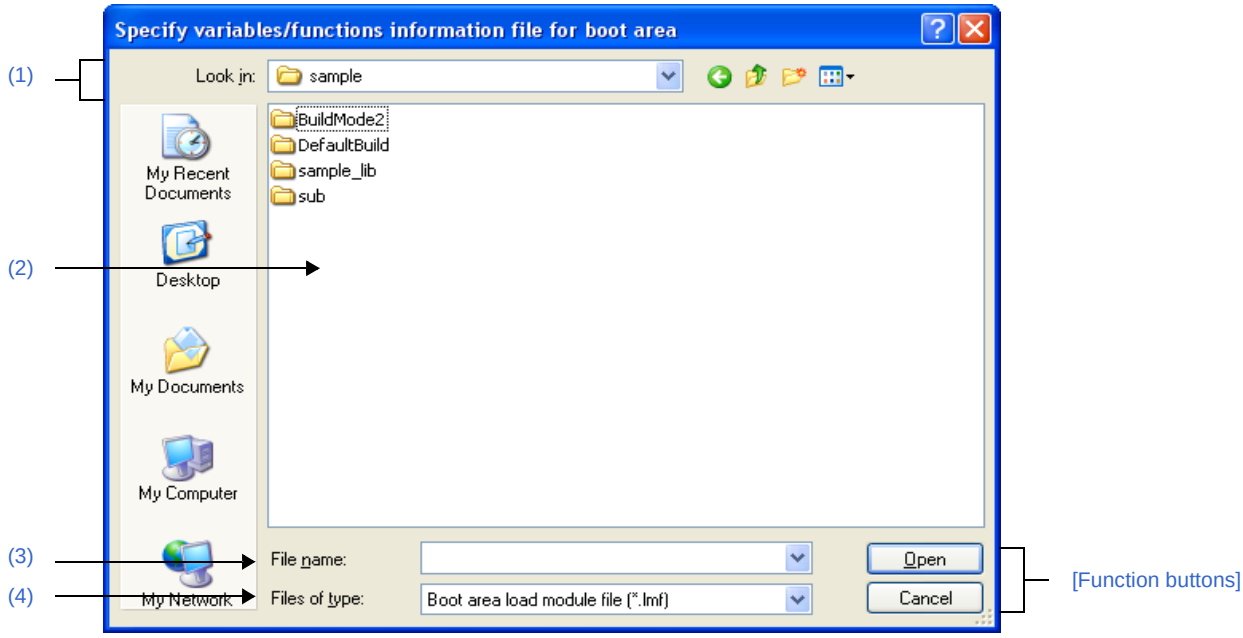
[Function buttons]

Button	Function
Make New Folder	Creates a new folder in the root of the selected folder. The default folder name is "New Folder".
OK	The designated folder path is set to the area that this dialog box is called from.
Cancel	Closes this dialog box.

Specify Variables/Functions Information File for Boot Area dialog box

This dialog box is used to select the variables/functions information file for boot area to set in the caller of the dialog box.

Figure A-40. Specify Variables/Functions Information File for Boot Area Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Property panel, select the following property, and then click the [...] button.
- From the [Compile Options] tab, [Variables/functions information file for boot area] in the [Variables Information File] category.

[Description of each area]

(1) [Look in] area

Select the folder where the file to be set in the caller of this dialog box exists.

The project folder is selected by default.

(2) File list area

File list that matches to the selections in the [Look in] area and [File of type] area is shown.

(3) [File name] area

Specify the file name to set in the caller of the dialog box.

(4) [Files of type] area

Specify the file type to set in the caller of the dialog box.

Variables/functions information file for boot area (*.vfi)	Variables/functions information file for boot area

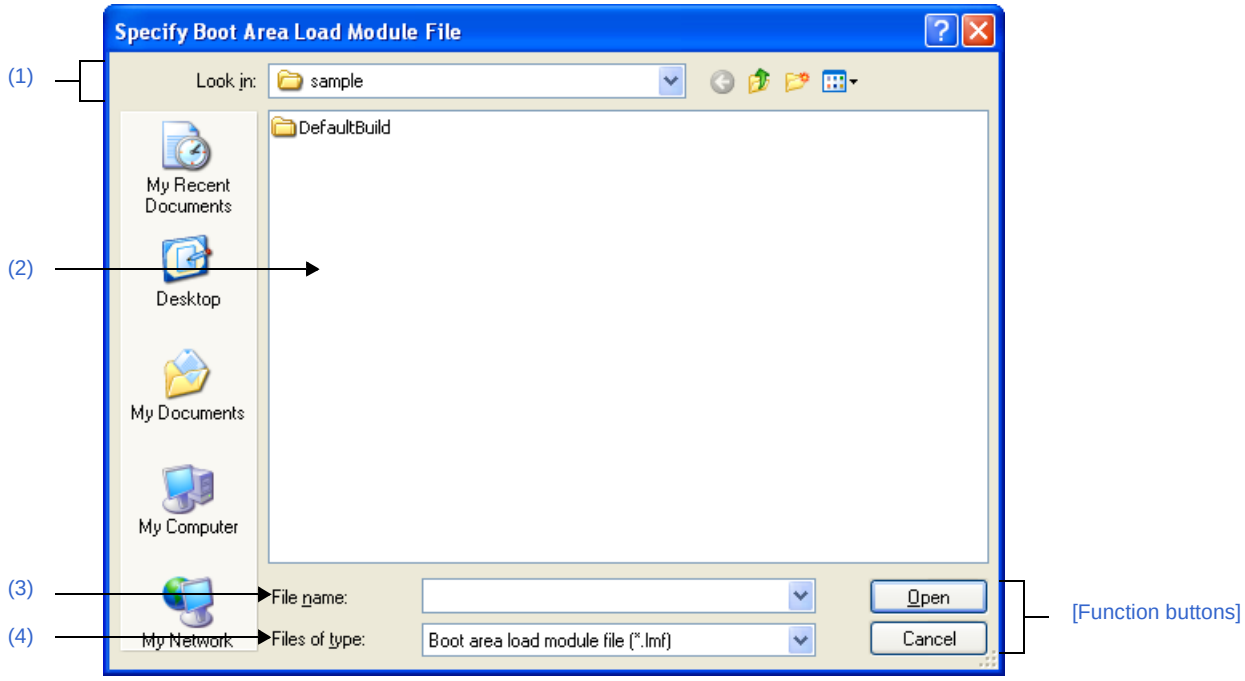
[Function buttons]

Button	Function
Open	Sets the specified file in the caller of the dialog box.
Cancel	Closes the dialog box.

Specify Boot Area Load Module File dialog box

This dialog box is used to select the boot area load module file to set in the caller of the dialog box.

Figure A-41. Specify Boot Area Load Module File Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Property panel, select the following properties, and then click the [...] button.
- From the [Link Options] tab, [Boot area load module file name] in the [Device] category.

[Description of each area]

(1) [Look in] area

Select the folder where the file to be set in the caller of this dialog box exists.

The project folder is selected by default.

(2) File list area

File list that matches to the selections in the [Look in] area and [File of type] area is shown.

(3) [File name] area

Specify the file name to set in the caller of the dialog box.

(4) [Files of type] area

Specify the file type to set in the caller of the dialog box.

Boot area load module file(*.lmf)	Boot area load module file (default)
All files(*.*)	All the formats34

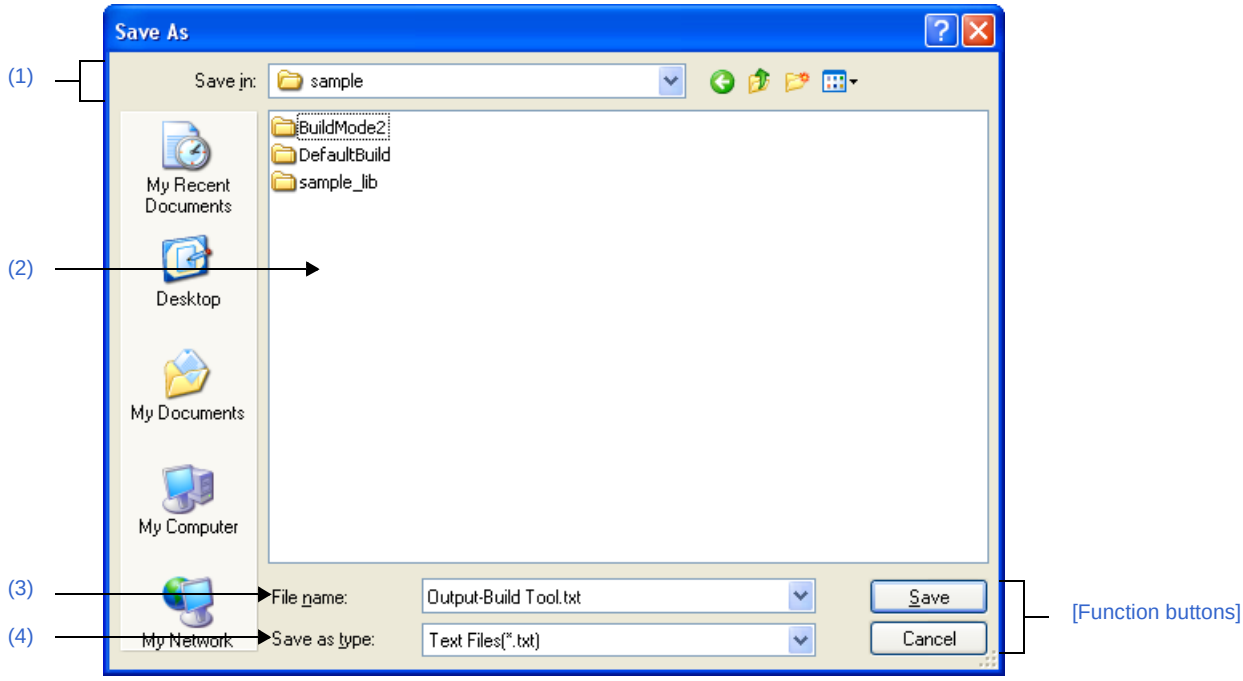
[Function buttons]

Button	Function
Open	Sets the specified file in the caller of the dialog box.
Cancel	Closes the dialog box.

Save As dialog box

This dialog box is used to save the editing file or contents of each panel to a file with a name.

Figure A-42. Save As Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- Focus the Editor panel, and then select [Save *file name* As...] from the [File] menu.
- Focus the Output panel, and then select [Save *tab name* As...] from the [File] menu.

[Description of each area]

(1) [Save in] area

Select the folder to save the panel contents in the file.
The following folders are selected by default.

(a) In the Editor panel

The folder that currently editing file is saved.

(b) In the Output panel

The project folder is selected when the file is save for the first time. The previously selected file is selected after the second time.

(2) File list area

File list that matches the selections in the [Save in] area and [Save as type] area is shown.

(3) [File name] area

Specify the file name to save.

(4) [Save as type] area

(a) In the Editor panel

The following file types are displayed depend on the file type of the currently editing file.

Text file(*.txt)	Text format
C source file(*.c)	C language source file
Header file(*.h; *.inc)	Header file
Assemble file(*.asm)	Assembly language source file
Link directive file(*.dr; *.dir)	Link directive file
Variable and function information file (*.vfi)	Variable and function information file
Map file(*.map)	Map file
Symbol table file (.sym)	Symbol table file
Hex file (.hex; .hxb; .hxf)	Hex file

(b) In the Output panel

The following file types are displayed.

Text file(*.txt)	Text format

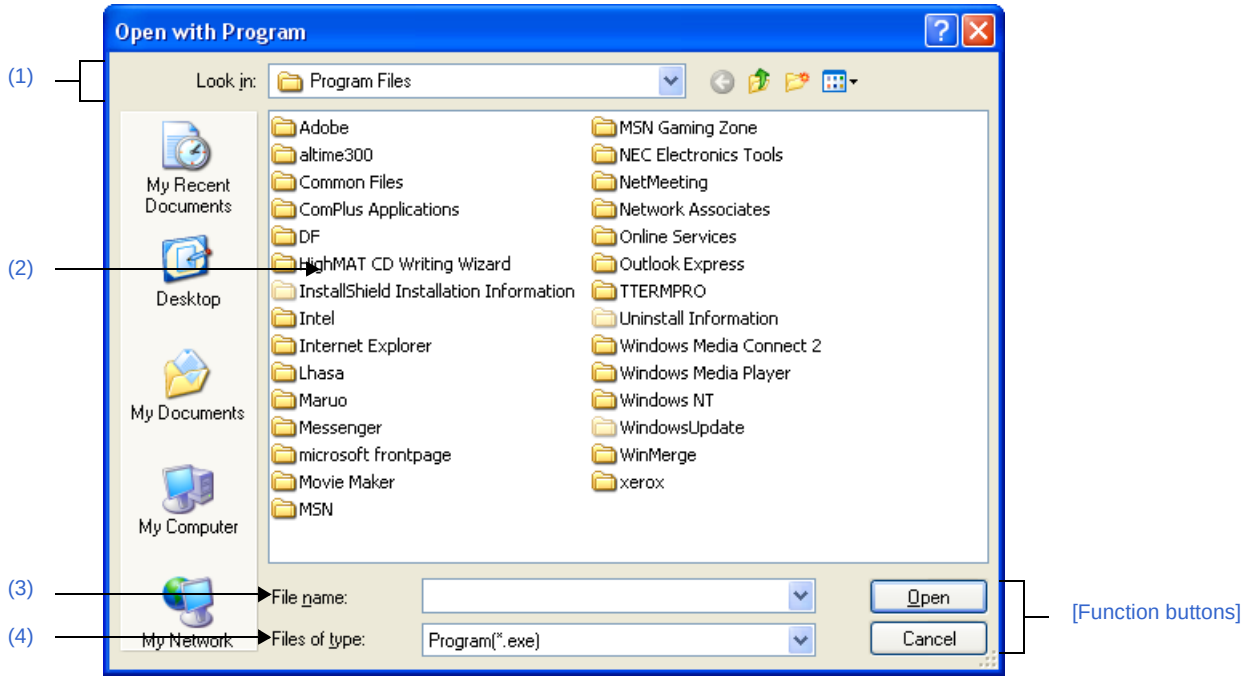
[Function buttons]

Button	Function
Save	Saves the file as the designated file name.
Cancel	Closes this dialog box.

Open with Program dialog box

This dialog box is used to select the application to open the file selected in Project Tree.

Figure A-43. Open with Program Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Project Tree panel, select a file, and then select [Open with Selected Application...] from the context menu.

[Description of each area]

(1) [Look in] area

Select the folder where the application to open the file is stored.

Program folder (for Windows XP, "C:\Program Files") is selected by default.

(2) File list area

File list that matches to the selections in the [Look in] area and [File of type] area is shown.

(3) [File name] area

Specify the executable file name of the application to open the file.

(4) [Files of type] area

Specify the executable file type of the application to open the file.

Program(*.exe)	Executable format (default)
All Files (*.*)	All the formats

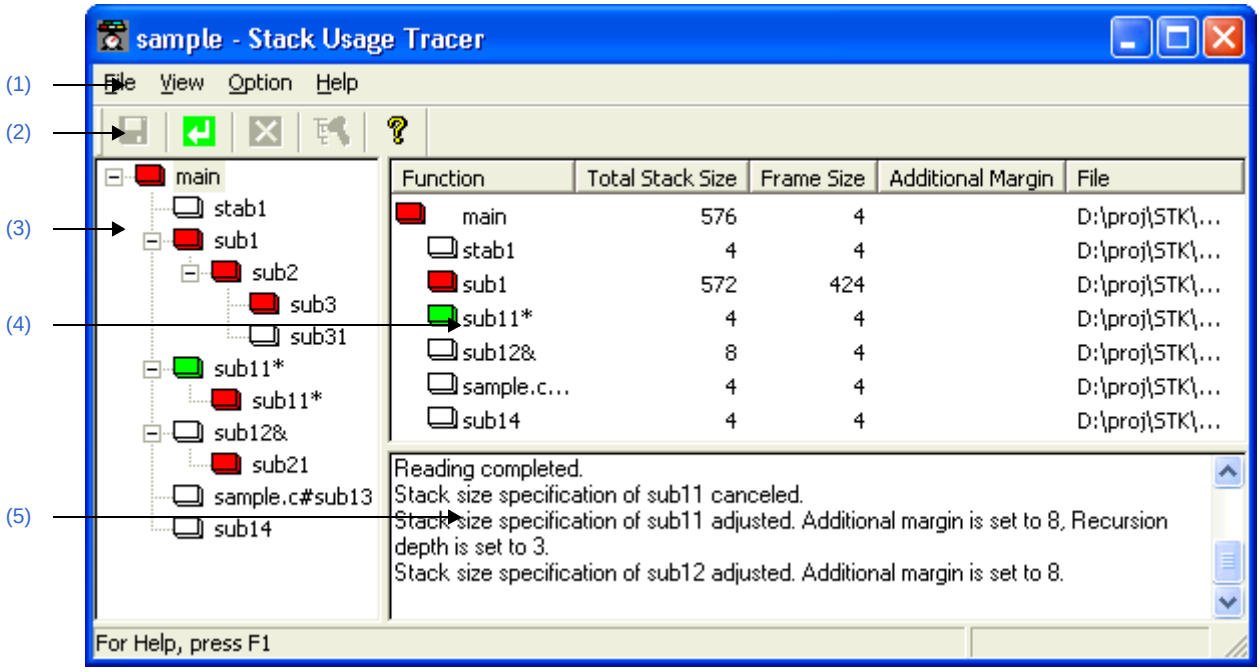
[Function buttons]

Button	Function
Open	Opens the file with the specified application.
Cancel	Closes this dialog box.

Stack Usage Tracer window

This is the first window to open when the stack usage tracer is launched.
Use this window to check or modify the amount of stack used on a per-function basis.

Figure A-44. Stack Usage Tracer Window



The following items are explained here.

- [How to open]
- [Description of each area]
- [Caution]

[How to open]

- From the [Tool] menu, select [Startup Stack Usage Tracer].

[Description of each area]

(1) Menu bar

This area consists of the following menu items.

(a) [File] menu

Save Call Chain with Maximum Stack from Selected Function...	Opens the Save As dialog box for saving the call chain with the greatest total stack size (including the stack size of callee functions) of the function selected in the tree display area / list display area to an output result file. Functions in the same manner as the button.
Save All Call Chains from Selected Function...	Opens the Save As dialog box for saving all call chains of the function selected in the tree display area / list display area to an output result file.
Save Call Chain with Maximum Stack from Every Root...	Opens the Save As dialog box for saving the call chain of the function displayed in the tree display area with the largest total stack size to an output result file.

Save All Call Chains from Every Root...	Opens the Save As dialog box for saving all call chains of all functions displayed in the tree display area to an output result file.
Load Stack Size Specification File...	Opens the Open dialog box for loading a stack size specification file.
Save Stack Size Specification File...	Opens the Save As dialog box for saving the results of the operations made in the Adjust Stack Size dialog box (e.g. changes to function information) to a stack size specification file.
Exit sk78k0r	Closes this window.

Remark The output result file can only be saved in text format (*.txt) or CSV format (*.csv).

(b) [View] menu

Recalculate Stack Size	Recalculates the total stack size. Functions in the same manner as the button.	
Stop	Forcibly stop the action of the stack usage tracer (e.g. recalculating the total stack size). Functions in the same manner as the button.	
Sort List by	Changes the function display order in the list display area.	
	Function Name	Sort by function name.
	Icon Type	Sort by icon display priority (High: to Low:).
	Stack Size	Sort by total stack size.
	Frame Size	Sort by frame size.
	Additional Margin	Sort by additional margin.
	File Name	Sort by file name.

(c) [Option] menu

Stack Size Unknown / Adjusted Function Lists...	Opens the Stack Size Unknown / Adjusted Function Lists dialog box to display a list of functions with unknown frame size, functions for which information (additional margin, recursion depth, or callee functions) has been modified, and functions for which the stack usage tracer has forcibly set an additional margin.
Adjust Stack Size...	Opens the Adjust Stack Size dialog box to change the information (additional margin, recursion depth, and callee functions) for the function selected in the tree display area / list display area. This dialog box is used to change the information (additional margin, recursion depth, and callee functions) for the selected function. Functions in the same manner as the button.
Reset Function	Resets the information (additional margin, recursion depth, and callee functions) for the selected function to the default values. This button will be grayed out if all the information for the selected function has the default values.
Reset All Functions	Resets the information (additional margin, recursion depth, and callee functions) for all functions to the default values. This button will be grayed out if all the information for all functions has the default values.

(d) [Help] menu

sk78k0r Help	Displays the help of this window. Functions in the same manner as the button.
About sk78k0r...	Opens the Version Information dialog box of the stack usage tracer.

(2) Toolbar

This area consists of the following buttons.

	Opens the Save As dialog box for saving the call chain with the greatest total stack size (including the stack size of callee functions) of the function selected in the tree display area / list display area to an output result file. Functions in the same manner as when [Save Call Chain with Maximum Stack from Selected Function...] is selected from the [File] menu.
	Recalculates the total stack size. Function in the same manner as when [Recalculate Stack Size] is selected from the [View] menu.
	Forcibly stop the action of the stack usage tracer (e.g. recalculating the total stack size). Functions in the same manner as when [Stop] is selected from the [View] menu.
	Opens the Adjust Stack Size dialog box to change the information (additional margin, recursion depth, and callee functions) for the function selected in the tree display area / list display area. Functions in the same manner as when [Adjust Stack Size...] is selected from the [Option] menu.
	Displays the help of this window. Functions in the same manner as when [sk78k0r Help] is selected from the [Help] menu.

(3) Tree display area

The calling relationship of the functions is shown in tree format.

The table below shows the meaning of the icon displayed to the left of the string representing the function name.

	The function directly called by a given function with the largest total stack size
	Information (additional margin, recursion depth, or callee functions) has been modified via the Adjust Stack Size dialog box or a stack size specification file
	Recursive function
	The stack usage tracer has not acquired any stack information for this function
	Other than the above

Remark The display priority for icons is from High: to Low: .

(a) Context menu

Select a function in this area, and then right click with the mouse. The context menu described below appears.

Adjust Stack Size...	Opens the Adjust Stack Size dialog box to change the information (additional margin, recursion depth, and callee functions) for the selected function.

(4) List display area

Display the stack information for a single function (function name, total stack size, frame size, additional margin, and file name) in list format.

Function	Displays the function name. Note that this area will only display functions from level 1 (the selected function) and level 2 (functions called directly by the selected function).
Total Stack Size	Displays the total stack size (including the stack size of callee functions; in bytes).
Frame Size	Displays the frame size (not including the stack size of callee functions; in bytes).
Additional Margin	Displays the value to mandatorily added to frame size (in bytes).
File	Displays the file name.

The table below shows the meaning of the icon displayed to the left of the string representing the function name.

	The function directly called by a given function with the largest total stack size
	Information (additional margin, recursion depth, or callee functions) has been modified via the Adjust Stack Size dialog box or a stack size specification file
	Recursive function
	The stack usage tracer has not acquired any stack information for this function
	Other than the above

(a) Context menu

Select a function in this area, and then right click with the mouse. The context menu described below appears.

Adjust Stack Size...	Opens the Adjust Stack Size dialog box to change the information (additional margin, recursion depth, and callee functions) for the selected function.	
Sort List by	Changes the function display order in the list display area.	
	Function Name	Sort by function name.
	Icon Type	Sort by icon display priority (High: to Low:).
	Stack Size	Sort by total stack size.
	Frame Size	Sort by frame size.
	Additional Margin	Sort by additional margin.
	File Name	Sort by file name.

(5) Message display area

Display operation logs of the stack usage tracer.

[Caution]

- Assembly files
  The stack usage tracer calculates total stack size by collecting information from the assembly files output by the C compiler as intermediate files, with debugging information added. As a consequence, in order to obtain stack information at the function level using the stack usage tracer, it is necessary to configure the compiler options to output "Assembly files with debugging information".

- Timing of static analysis
  The stack usage tracer performs static analysis upon startup, and displays the calling relationship between functions and function-level stack information in its main window. Consequently, changes to the calling relationship between functions or function-level stack information (e.g. adding files, changing compiler options, or modifying the source code) will not be reflected in this window.

- Functions analyzed
  The stack usage tracer only analyzes functions contained in assembly files with debugging information output by the C compiler as intermediate files, and in library files provided by the build tool. Consequently, functions in assembly files written by the user and library files created by the user are not analyzed. For this reason, the information for these files must be set using the Adjust Stack Size dialog box.

- Icon display colors
  Display priorities (High: to Low:) are assigned to icons displayed in the tree display area/list display area in the window. Consequently, you must be aware that even if the icon (function called directly by same function with greatest total stack size) is displayed, information with relatively low priority, such as the icon (frame size unknown) will be hidden by the GUI.

- Determining the maximum stack size
  When the stack usage tracer searches for the path with the largest stack size, it assumes that functions that are not analyzed have a stack size of zero. Consequently, when determining the maximum stack size, you must make sure that there are no functions under [Unknown Functions] in the Stack Size Unknown / Adjusted Function Lists dialog box.

- Tree display for recursive functions
  The window's tree display area only displays up to the second call of a recursive function. Consequently, the third and subsequent calls are hidden.

- Library functions bsearch, exit, and qsort
  The stack usage tracer treats bsearch, exit, and qsort as unknown functions, even if they are in a library file provided by the build tool. Consequently, if you are using these functions, you must set the relevant information (e.g. recursion depth and callee functions) in the Adjust Stack Size dialog box.

- Callee functions
  The stack usage tracer only allows the following types of "callee functions" to be added in the Adjust Stack Size dialog box: functions contained in C source files, and functions that are explicitly called (not called using a pointer). Consequently, the [All Functions] section of the Adjust Stack Size dialog box only displays functions meeting the above conditions.

- Functions called by multiple functions

  The stack usage tracer treats the stack information of functions called by multiple functions as unique. Consequently, it is not possible to change the stack information for such functions depending on which function is calling them.

Example If you select function sub called by func1 in the tree display area and open the Adjust Stack Size dialog box, the changes are reflected in sub called by func2 as well.

```
int     sub ( int i );
void    func1 ( void );
void    func2 ( void );

void main ( void ) {
    func1 ( );
    func2 ( );
}
int sub ( int i ) {
    i++;
    return ( i );
}

void func1 ( void ) {
    int ret, i = 0;
    ret = sub ( i );
}

void func2 ( void ) {
    int ret, i = 100;
    ret = sub ( i );
}
```

- ASM statements in C source

  If C source contains ASM statements, the stack usage tracer may output the following message: "W9432 : Illegal format in file (path name : line number)". If this occurs, fix the problem by disabling the code in question using #if declarations or the like, or commenting it out.

- Calls to indirectly recursive functions

  If a recursion path consists of multiple functions, the stack size may be calculated incorrectly.

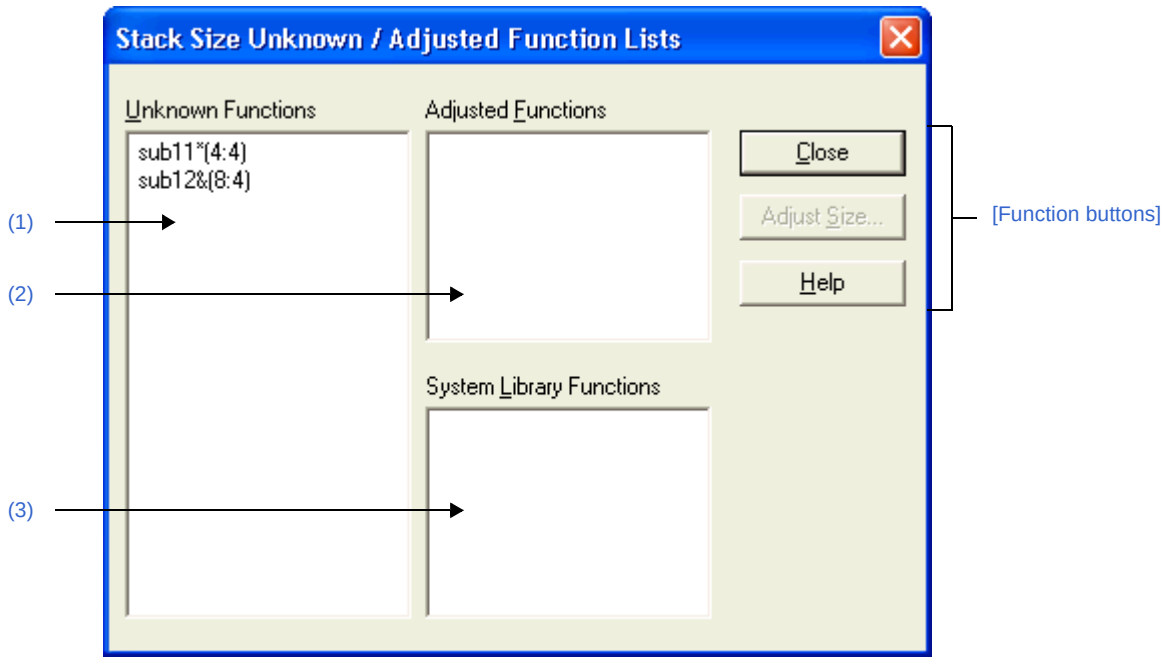
Example Assuming that the frame size of recursive functions "func_rec1/func_rec2" is 8 bytes, if the recursion depth of "func_rec1/func_rec2" is set to 3 in the Adjust Stack Size dialog box, then although the stack size of func1 will be calculated correctly as "(8 + 24) * 3", the stack size of func2 will be calculated as "8 * 3", ignoring calls to func_rec1.

```
void    func_rec1 ( int i );
void    func_rec2 ( int i );
void    func1 ( void );
void    func2 ( void );

void main ( void ) {
    func1 ( );
    func2 ( );
}
void func_rec1 ( int i ) {
    func_rec2 ( i );
}

void func_rec2 ( int i ) {
    if ( i ) {
        func_rec1 ( i - 1 );
    }
}

void func1 ( void ) {
    func_rec1 ( 2 );
}

void func2 ( void ) {
    func_rec2 ( 2 );
}
```

Stack Size Unknown / Adjusted Function Lists dialog box

This dialog box is used to display a list of functions for which the stack usage tracer could not obtain stack information; functions for which information (additional margin, recursion depth, and callee functions) was changed intentionally, and functions for which the stack usage tracer forcibly set an additional margin.

Figure A-45. Stack Size Unknown / Adjusted Function Lists Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Stack Usage Tracer window, select the [Stack Size Unknown / Adjusted Function Lists...] from the [Option] menu.

[Description of each area]

(1) [Unknown Functions]

Display a list of "unknown functions" -- functions for which the stack usage tracer could not obtain stack information. This area generally displays unknown functions in the following format.

function name (total stack size : frame size)

Remarks 1. If the unknown function is written in assembly language, then the underscore (_) pre-appended to the symbol name is deleted, and the name is surrounded by square brackets ([ ]); this is displayed as the function name.

2. If the unknown function is a recursive function, then an asterisk (*) is appended to the end of the function name.

3. If the unknown function includes functions called indirectly using function pointers, then an ampersand (&) is appended to the end of the function name.
4. If the unknown function is a static function, then "file name#" is appended to the end of the function name.

(2) [Adjusted Functions]

Display a list of functions for which information (additional margin, recursion depth, or callee functions) has been modified intentionally via the Adjust Stack Size dialog box or a stack size specification file. This area generally displays modified ("adjusted") functions in the following format.

function name (total stack size : frame size : additional margin)

Remarks 1. If the adjusted function is written in assembly language, then the underscore (_) pre-appended to the symbol name is deleted, and the name is surrounded by square brackets ([ ]); this is displayed as the function name.

2. If the adjusted function is a recursive function, then an asterisk (*) is appended to the end of the function name.
3. If the adjusted function includes functions called indirectly using function pointers, then an ampersand (&) is appended to the end of the function name.
4. If the adjusted function is a static function, then "file name#" is appended to the end of the function name.
5. If the only action performed in the Adjust Stack Size dialog box was adding "callee functions", then the display format of this area will be as follows.

   function name (total stack size : frame size)

(3) [System Library Functions]

Display a list of automatically configured system library functions for which the frame size is unknown, and the stack usage tracer has forcibly set an additional margin. This area generally displays modified system library functions in the following format.

function name (total stack size : ? : additional margin)

Remarks 1. The underscore (_) pre-appended to the symbol name is deleted, and the name is surrounded by square brackets ([ ]); this is displayed as the function name.

2. An appropriate frame size is added to corresponding system library functions in the stack usage tracer's database as additional margin.

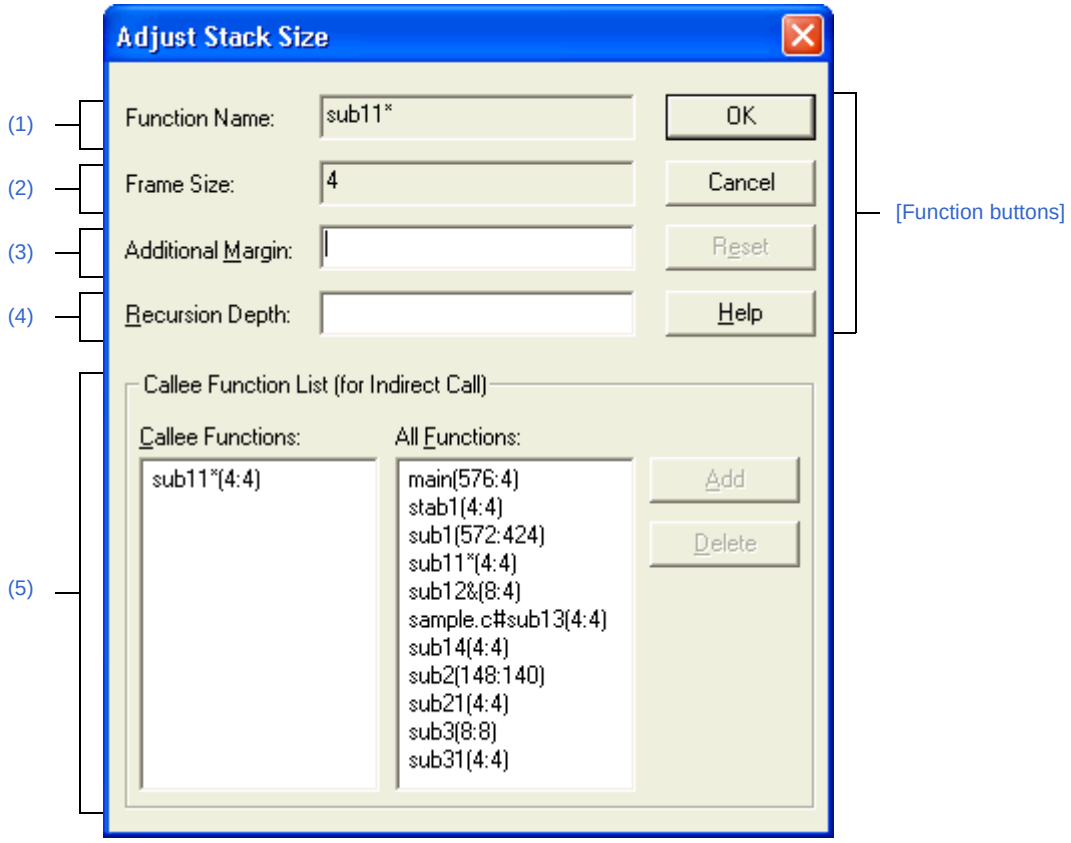
[Function buttons]

Button	Function
Close	Closes this dialog box.
Adjust Size...	Opens the Adjust Stack Size dialog box to change the information (additional margin, recursion depth, and callee functions) for the function selected in the [Unknown Functions]/[Adjusted Functions]/[System Library Functions].
Help	Displays the help of this dialog box.

Adjust Stack Size dialog box

This dialog box is used to change the information (additional margin, recursion depth, and callee functions) for the selected function.

Figure A-46. Adjust Stack Size Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the tree display area/list display area of the Stack Usage Tracer window, select a function, and then select [Adjust Stack Size...] from the [Option] menu.
- On the tree display area/list display area of the Stack Usage Tracer window, select a function, and then click the button from toolbar.
- On the tree display area/list display area of the Stack Usage Tracer window, select a function, and then select [Adjust Stack Size...] from the context menu.
- On the [Unknown Functions]/[Adjusted Functions]/[System Library Functions] of the Stack Size Unknown / Adjusted Function Lists dialog box, select a function, and then click the [Adjust Size...] button.

[Description of each area]

(1) [Function Name]

Display the function name of the selected function.

Remarks 1. If the selected function is written in assembly language or it is a system library function, then the underscore (_) pre-appended to the symbol name is deleted, and the name is surrounded by square brackets ([ ]); this is displayed as the function name.

2. If the selected function is a recursive function, then an asterisk (*) is appended to the end of the function name.

3. If the selected function includes functions called indirectly using function pointers, then an ampersand (&) is appended to the end of the function name.

4. If the selected function is a static function, then "file name#" is appended to the end of the function name.

(2) [Frame Size]

Display the frame size (not including the stack size of callee functions; in bytes) of the selected function.

Remark If the frame size is not known, then a question mark (?) is displayed; if it is over the maximum limit, then "SIZEOVER" is displayed.

(3) [Additional Margin]

Specify the value to forcibly add to the selected function (in bytes), either as a decimal number, or as a hexadecimal number starting with "0x" or "0X".

(4) [Recursion Depth]

Specify the recursion depth, either as a decimal number, or as a hexadecimal number starting with "0x" or "0X".

Remark If the selected function is not a recursive function, then this item will be grayed out.

(5) [Callee Function List (for Indirect Call)] area

(a) [Callee Functions]

Display a list of "callee" functions called by the selected function (functions called indirectly using a function pointer or the like).

This area generally displays callee functions in the following format.

function name (total stack size : frame size : additional margin)

Remarks 1. If the callee function is written in assembly language or it is a system library function, then the underscore (_) pre-appended to the symbol name is deleted, and the name is surrounded by square brackets ([ ]); this is displayed as the function name.

2. If the callee function is a recursive function, then an asterisk (*) is appended to the end of the function name.

3. If the callee function includes functions called indirectly using function pointers, then an ampersand (&) is appended to the end of the function name.

4. If the callee function is a static function, then "file name#" is appended to the end of the function name.

5. Functions added intentionally from [All Functions] by clicking the [Add] button are shown with a plus sign (+) appended to the end of the function name.

(b) [All Functions]

Display a list of functions that can be added as functions called by the selected function ("callee functions").
This area generally displays functions that can be added in the following format.

function name (total stack size : frame size : additional margin)

Remarks 1. If the function that can be added is written in assembly language or it is a system library function, then the underscore (_) pre-appended to the symbol name is deleted, and the name is surrounded by square brackets ([ ]); this is displayed as the function name.

2. If the function that can be added is a recursive function, then an asterisk (*) is appended to the end of the function name.

3. If the function that can be added includes functions called indirectly using function pointers, then an ampersand (&) is appended to the end of the function name.

4. If the function that can be added is a static function, then "file name#" is appended to the end of the function name.

(c) Button area

Add	Adds the function selected in [All Functions] to [Callee Functions]. If no function is selected in [All Functions], then this button will be grayed out.
Delete	Deletes the function selected in [Callee Functions] from [Callee Functions]. If no function is selected in [Callee Functions], then this button will be grayed out.

Remark Functions can only be deleted from [Callee Functions] if the function name ends with a plus sign (+) (functions added from [All Functions] intentionally by clicking [Add]).

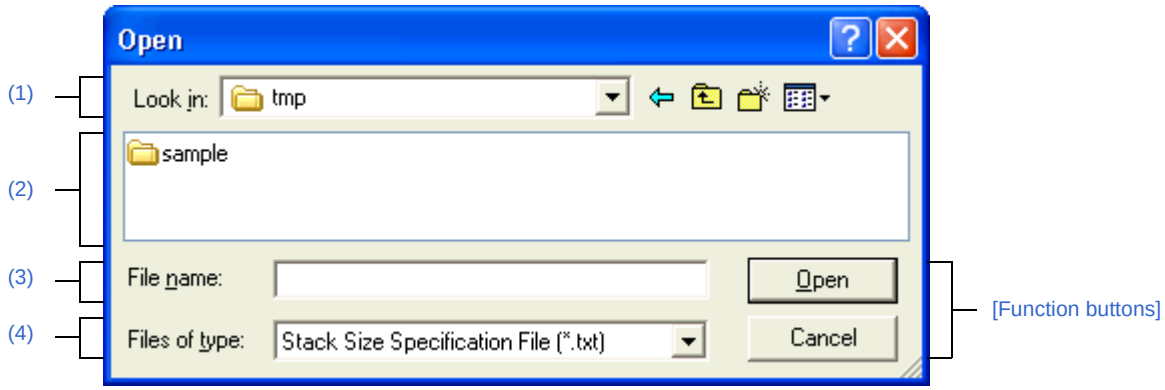
[Function buttons]

Button	Function
OK	Reflects the settings in the Stack Usage Tracer window / save them to the project file (*.prj), then close the dialog.
Cancel	Ignores the setting and closes this dialog box.
Reset	Resets the information (additional margin, recursion depth, and callee functions) for the selected function to the default values. This button will be grayed out if all the information for the selected function has the default values.
Help	Displays the help of this dialog box.

Open dialog box

This dialog box is used to open an existing stack size specification file.

Figure A-47. Open Dialog Box



The following items are explained here.

- [How to open]
- [Description of each area]
- [Function buttons]

[How to open]

- On the Stack Usage Tracer window, select [Load Stack Size Specification File...] from the [File] menu.

[Description of each area]

(1) [Look in] area

Select the folder containing the stack size specification file you wish to open.

(2) List of files

This area displays a list of files matching the conditions selected in [Look in] area and [Files of type] area.

(3) [File name] area

Specify the file name of the stack size specification file to open.

(4) [Files of type] area

Select the type of file to open.

Stack Size Specification File (*.txt)	Text format

[Function buttons]

Button	Function
Open	Opens the specified file.
Cancel	Ignores the setting and closes this dialog box.

APPENDIX B COMMAND REFERENCE

This appendix describes the detailed specifications of each command included in the build tool.

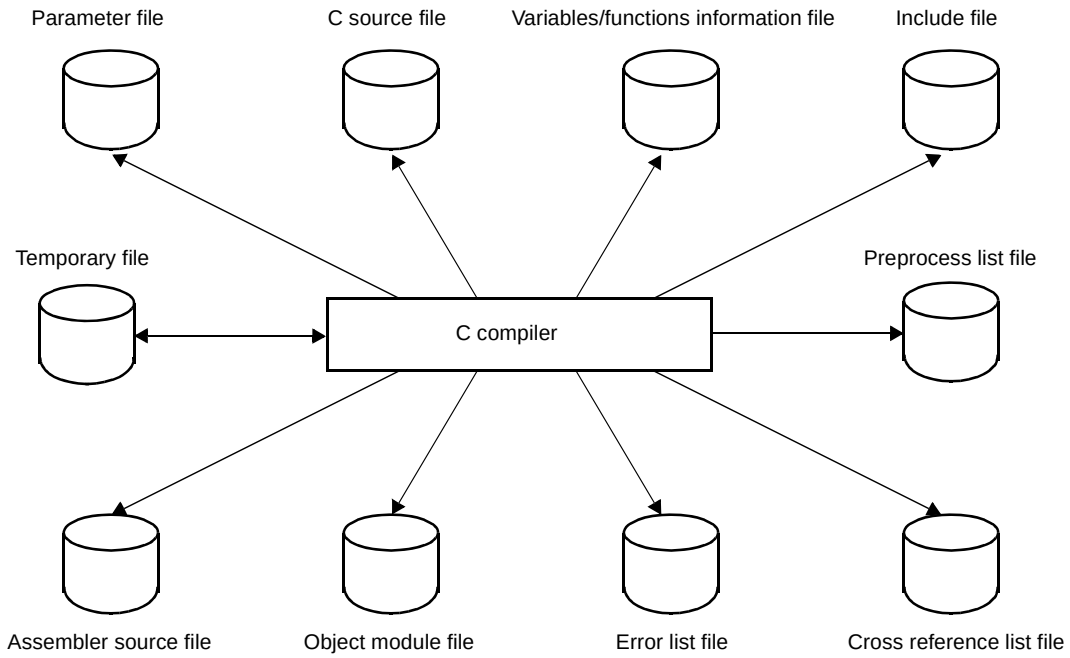
B.1 C Compiler

The C compiler inputs the C source files written in the C language, converts them into machine language, and output as an object module file. After compiling, the assembler source files are output so that the user can check and revise the contents at the assembly language level.

Based on the compile options, the list files such as the preprocess list, cross reference list, and error list are output.

If there is a compiler error, the error message is output to the console and the error list file. If errors occur, various files other than an error list file cannot be output.

Figure B-1. I/O Files of C Compiler



Remark If there are compiling errors, a variety of files other than the error list and cross reference files cannot be output.
A temporary file is renamed to an appropriate name when the compiling ends without error. If compiling ends in error, the temporary files are deleted.

B.1.1 I/O files

The I/O files of the C Compiler are shown below.

See "3.1 C Compiler" for details about output files.

Table B-1. I/O Files of C Compiler

Type	File Name	Explanation	Default File Type
Input files	C source file	- Source file written in the C language (user-created file)	.c
	Include file	- File referenced from C source files - File written in C language (user-created file)	.h
	Parameter file	- File created by the user when the user wants to specify multiple commands that cannot be specified in the command line when the C compiler is run	.pcc
	Variables/functions information file	- File related to the allocation of variables and functions	.vfi
Output files	Object module file	- Binary image file containing machine language information, relocatable information related to the location address of the machine language, and symbol information	.rel
	Assembler source file	- ASCII image file of the object code output by the compiler	.asm
	Preprocess list file	- List file output by the preprocess instructions such as #include - ASCII image file	.ppl
	Cross reference list file	- List file containing the function name and variable name information used in the C source file	.xrf
	Error list file	- List file containing the source file and compiler error messages[Note]	.cer .her .er .ecc
I/O file	Temporary file	- Intermediate file for compiling - The file is renamed to an appropriate name when compiling ends without error and is deleted when compiling ends in error.	$nn (file name fixed)

Note The following 4 file types are available for error list files.

File Type	Description
.cer	Error list files with C source corresponding to *.c' files (output by specifying the -se option)
.her	Error list files with C source corresponding to *.h' files (output by specifying the -se option)
.er	Error list files with C source corresponding to files other than the above (output by specifying the -se option)
.ecc	Error list files without C source corresponding to all of the source files (output by specifying the -e option)

B.1.2 Functions

(1) Optimization method

Optimization is performed to create efficient object module files in the CA78K0R.
The supported optimization methods are shown below.

Table B-2. Optimization Methods

Phase		Contents	Example
Syntax Analyzer	(a)	Execute constant computations during compilation	`a = 3 * 5 ;  -> a = 15 ;`
	(b)	True or false decision based on partial evaluation of a logical expression	`0 && ( a || b ) -> 0` `1 || ( a && b ) -> 1`
	(c)	Offset calculations of pointers, arrays, etc.	Calculate the offsets during compilation.
Code Generator	(d)	Register management	Effectively use unused registers.
	(e)	Use the special instructions of the target CPU	`a = a + 1 ; -> Use the inc instruction.` Use the move instruction to substitute array elements.
	(f)	Use short instructions	If there is an instruction with the same operation, use the instruction with fewer bytes. """mov a , #0 -> clrb a
	(g)	Change long jump instructions to short jump instructions	The intermediate code that was output is reprocessed.

Phase		Contents	Example
Optimizer	(h)	Delete common partial expressions.	`a = b + c ;  -> a = b + c ;` `d = b + c + e ;  d = a + e ;`

	(i)	Move outside an instruction loop	`for ( i = 0 ; i < 10 ; i++ )`
			`{`
			`  :`
			`  a = b + c ;`
			`  :`
			`}`
			↓
			`a = b + c ;`
			`for ( i = 0 ; i < 10 ; i++ )`
			`{`
			`  :`
			`}`

	(j)	Delete unused instructions	`a = a ; -> Delete`
			`After "a = b;", "a" is not referenced -> Delete`
			("a" is an automatic variable)

	(k)	Delete copies	`a = b ;  -> c = b + d ;`
			`c = a + d ;`
			"a" is not referenced any more (a is an automatic variable).

	(l)	Change the calculation order in an expression	The results of operations are left in the register, and valid operations are executed first.
	(m)	Memory device allocation (temporary variables)	Variables used locally are allocated to registers.
	(n)	Peephole optimization	Replacement of special patterns Example: a * 1 -> a , a + 0 -> a
	(o)	Decrease the strength of the calculation	Example: a * 2 -> a + a , a << 1
	(p)	Memory device allocation (register variables)	Data is allocated to rapidly accessible memory. Example: Registers, saddr (only when the -qr option is specified)
	(q)	Jump optimization (the -qj option)	Consecutive jump instructions are combined into one instruction.
	(r)	Register allocation (the -qv/-qr/-rd/-rs options)	Variables are automatically allocated to registers.

Remark (a) to (g), (n), and (o) are performed regardless of the optimization option specifications.
The optimizations in (h) to (m), (q), and (r) are performed when optimization options are specified.
(p) is performed when there are register declarations in the C source. However, the saddr area is only allocated when the -qr option is specified.
See "Optimization specification" about the optimization options.

(2) ROMization function

ROMization is processing that locates in ROM the initial values for external variables that have initial values and copies them to RAM when the system is executed.
The CA78K0R provides startup routines with the ROMization processes of programs. Using the startup routines eliminates the problem of describing ROMization processes for startup.
See "CubeSuite+ RL78,78K0R Coding" about the startup routines.

(a) How to store a program on ROM

During linking, the startup routine, object module files, and libraries are linked. The startup routine initializes the object program.

<1> s0r*.rel

These are startup routines (when stored on ROM)
The copy routine for the initialization data is included, and the beginning of the initial data is indicated.
The label "_@cstart" (symbol) is added to the start address.

<2> cl0r*.lib

These are libraries attached to CA78K0R.
These files include the following libraries.

- Runtime library
  "@@" is appended to the start of the symbol for runtime library names.
- Standard library
  "_" is appended to the start of the symbol for standard library names.

<3> *.lib

These are libraries created by a user.
"_" is added to the symbol head.

Caution The CA78K0R provides various kinds of startup routines and libraries. See "CubeSuite+ RL78,78K0R Coding" about startup routines and libraries.

B.1.3 Method for manipulating

(1) C compiler startup

The following two methods can be used to start up the C compiler.

(a) Startup from the command line

```
X:[path-name]>cc78k0r[Δoption]...Csource-file-name[Δoption]...
```

X	Current drive name
Path name	Current folder name
cc78k0r	Command name of the C compiler
Option	Enter detailed instructions for the operation of the C compiler. When specifying two or more compile options, separate the options with a blank space. Specify the suboption or file name after a compile option without inserting a blank, such as a space. Uppercase characters and lowercase characters are not distinguished for the compile options. See "B.1.4 Option" for details about compile options. Enclose a path that includes a space in a pair of double quotation marks (" ").

C source file name	File name of source to be compiled Enclose the file name of a path that includes a space in a pair of double quotation marks (" ").

Example To output the assembler source file (prime.asm) and perform optimization based on the precedence of code size, describe as:

```
cc78k0r -cf1166a0 prime.c -aprime.asm -qx3
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the C compiler will not fit on the command line, or when the same compile option is specified repeatedly each time compilation is performed.
To start up the assembler from a parameter file, specify the parameter file option (-f) on the command line.
Start up the C compiler from a parameter file as follows:

```
X>cc78k0r[ΔCsource-file-name]Δ-fparameter-file-name
```

-f	Parameter file specification option
parameter-file-name	A file which includes the data required to start up the C compiler

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the C source file name is omitted from the command line, only 1 C source file name can be specified in the parameter file.
- The C source file name can also be written after the option.
- Write in the parameter file all compile options and output file names specified in the command line.

Example Create a parameter file k0rmain.pcc using an editor, and then start up the C compiler.

```
; parameter file
-cf1166a0 k0rmain.c -e -a
```

```
C:\>cc78k0r -fk0rmain.pcc
```

(2) Execution start and end messages

(a) Execution start message

When the C compiler is started up, an execution startup message appears on the display.

```
78K0R C Compiler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
```

(b) Execution end message

If it detects no compile errors resulting from the C compiler, the C compiler outputs the following message to the display and returns control to the host operating system.

```
Target chip : uPD78F1166_A0
Device file : Vx.xx

Compilation complete, 0 error(s) and 0 warning(s) found.
```

If it detects a compile errors resulting from the C compiler, the C compiler outputs the number of errors and warnigs to the display and returns control to the host operating system.

```
prime.c(18) : CC78K0R warning W0745 : Expected function prototype
prime.c(20) : CC78K0R warning W0745 : Expected function prototype
prime.c(26) : CC78K0R warning W0622 : No return value
prime.c(37) : CC78K0R warning W0622 : No return value
prime.c(44) : CC78K0R warning W0622 : No return value

Target chip : uPD78F1166_A0
Device file : Vx.xx

Compilation complete, 0 error(s) and 5 warning(s) found.
```

If the C compiler detects a fatal error during compilation which makes it unable to continue compiling processing, the C compiler outputs a message to the display, cancels compilation and returns control to the host operating system.

Example A non-existent compile option is specified.

```
C:\>cc78k0r k0rmain.c -s
```

```
78K0R C Compiler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

CC78K0R error F0018 : Option is not recognized '-s'
Please enter 'CC78K0R--' , if you want help messages.
Program aborted.
```

In the above example, a non-existent compile option is specified. An error occurs and the C compiler aborts the compilation.

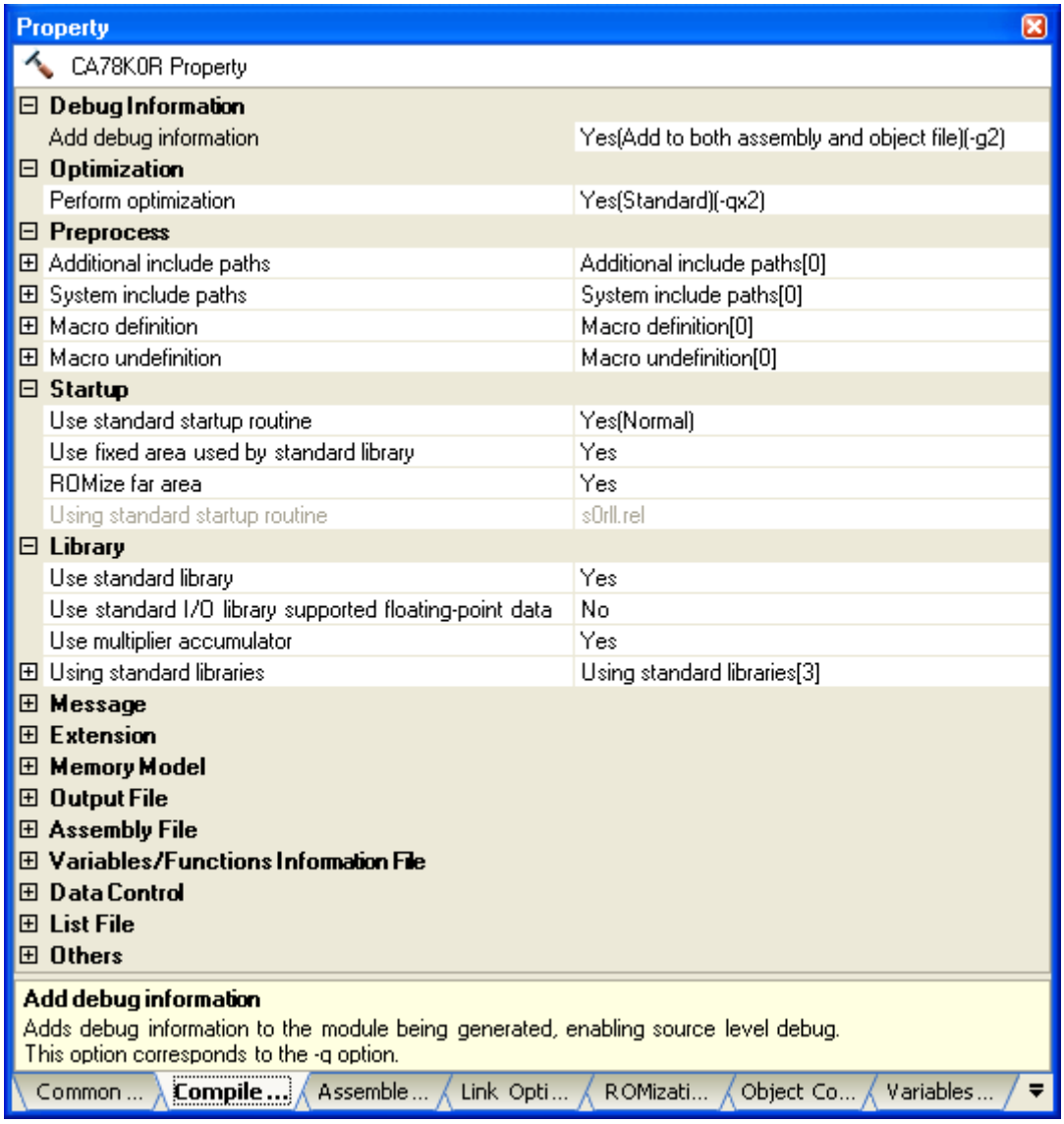
(3) Set options in CubeSuite+

This section describes how to set compile options from CubeSuite+.

On CubeSuite+'s Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu. The Property panel opens. Next, select the [Compile Options] tab.

You can set the various compile options by setting the necessary properties in this tab.

Figure B-2. Property Panel: [Compile Option] Tab



B.1.4 Option

(1) Types

The compile options are detailed instructions for the operation of the C compiler.
The types and explanations for compile options are shown below.

Table B-3. Compile Options

Classification	Option	Description
Device type specification	-c	Specifies the type of the target device.
Object module file creation specification	-o	Specifies the output of an object module file.
	-no	
Memory assignment specification	-r	Specifies how to assign a program to the memory.
	-nr	
	-rd	Specifies to assign an external variable/external static variable automatically to the saddr area.
	-nr	
	-rs	Specifies to assign an static auto variable automatically to the saddr area.
	-nr	
Optimization specification	-q	Specifies optimization types.
	-nq	
Debug information output specification	-g	Specifies the output of the C source level debugging information.
	-ng	
Preprocess list file creation specification	-p	Specifies the output of the preprocess list file.
	-k	Specifies the processing for the preprocess list.
Preprocess specification	-d	Performs macro definitions.
	-u	Invalidates macro definitions.
	-i	Reads an include file from a specified folder.
Assembler source file creation specification	-a	Specifies the output of the assembler source file.
	-sa	
Error list file creation specification	-e	Specifies the output of the error list file.
	-se	
Cross reference list file creation specification	-x	Specifies the output of the cross reference list file.
List format specification	-lw	Specifies the number of characters per line in each list file.
	-ll	Specifies the number of lines per page in each list file.
	-lt	Specifies the number of expansion characters of a tab in each list file.
	-lf	Inserts a form feed code at the end of each list file.
	-li	Adds the C source in the include file to the assembler source file with C source comments.
Warning output specification	-w	Specifies whether or not a warning message is output to the console.

Classification	Option	Description
Execution state display specification	-v	Specifies whether the execution status of compilation is output to the console.
	-nv	
Parameter file specification	-f	Inputs the input file name and options from a specified file.
Temporary file creation folder specification	-t	Creates a temporary file in the specified drive and folder.
Function expansion specification	-z	Enables the processing for extended functions.
	-nz	
Device file search path specification	-y	Specifies paths that search device files.
Memory model specification	-m	Specifies the memory model used for compilation.
Mirror area specification	-mi	Specifies the allocation destinations of segments in the mirrored area.
Common object specification	-common	Specifies the output of an object common to the RL78 and 78K0R.
Variables/functions information file specification	-ma	Specifies a variables/functions information file.
Help specification	--	Outputs a help message on the display.
	-?	
	-h	

(2) Precedence

For the compile options shown in the following table, the precedence is explained in a case where two or more options along the vertical axis and options along the horizontal axis are specified at the same time.

Table B-4. Precedence of Compile Options

	-no	-p	-np	-d	-u	-a	-e	-x	-sa
-r	NG								
-q	NG								
-g	NG								
-k		Δ	NG						
-d					OK				
-u				OK					
-sa						NG			
-lw		Δ				Δ	Δ	Δ	
-ll		Δ				Δ	Δ	Δ	
-lt		Δ				Δ	Δ	Δ	
-lf		Δ				Δ	Δ	Δ	
-li									Δ

- Location marked with NG
  If an option in the horizontal axis is specified, the option in the vertical axis is invalid.

  Example The -rd and -g options are invalid.

```
C:\>cc78k0r -cf1166a0 -e sample.c -no -rd -g
```

- Location marked with Δ
  If an option in the horizontal axis is not specified, the option in the vertical axis is invalid.

  Example The -p option is specified, so the -k option is valid.

```
C:\>cc78k0r -cf1166a0 -e sample.c -p -k
```

- Location marked with OK
  The last option on the horizontal or vertical axis to be specified takes precedence.

  Example The -d option is specified last, so the -u option is invalid and the -d option takes precedence.

```
C:\>cc78k0r -cf1166a0 -e sample.c -utest -dtest=1
```

- Blank area
  If an option in the horizontal axis is specified, the option in the vertical axis is valid.

As with the -o/-no options, if two options for which "n" can be added to the beginning of the option name are specified at the same time, the option specified last is valid.

Example The -no option is specified after the -o option, so the -o option is invalid and the -no option is valid.

```
C:\>cc78k0r -cf1166a0 -e sample.c -o -no
```

Options not described in "Table B-4. Precedence of Compile Options" are not particularly affected by other options. However, if the help specification option (--/-?-h) is specified, all of other option specifications become invalid.

Device type specification

The device type specification option is as follows.

- -c

-c

[Description format]

```
-cdevice-type
```

- Interpretation when omitted
  Cannot be omitted.

[Function]

- The -c option specifies the target device for performing compilation.

[Application]

- Be sure to specify the -c option. The CA78K0R performs compilation for the target device and generates an object code for that device.

[Description]

- See "CubeSuite+ Operating Precautions" for the target devices that can be specified by the -c option and the corresponding device type.
- When CA78K0R is used, device files are required.

[Cautions]

- The -c option cannot be omitted.

[Example of use]

- To specify the uPD78F1166_A0 as the target device in the command line, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c
```

Object module file creation specification

The object module file creation specification options are as follows.

- -o/-no

-o/-no

[Description format]

```
-o[output-file-name]
-no
```

- Interpretation when omitted
  -o*input-file-name*.rel

[Function]

- The -o option specifies the output of an object module file. It also specifies the location to which it is output and the file name.
- The -no option specifies not to output an object module file.

[Application]

- Use the -o option to specify the location to which an object module file is output or to change its file name.
- Specify the -no option when performing compilation only to output an assembler source file. This will shorten compilation time.

[Description]

- If the output file name is omitted when the -o option is specified, the output file name will be "*input-file-name*.rel".
- If the extension for the output file name is omitted when the -o option is specified, the output file name will be "*output-file-name*.rel".
- Even if the -o option is specified, when a compilation error occurs, the object module file cannot be output.
- If the drive name is omitted when the -o option is specified, the object module file will be output to the current drive.
- If both the -o and -no options are specified at the same time, the option specified last takes precedence.

[Cautions]

- To change the output destination when using CubeSuite+, on the Property panel, from the [Link Options] tab, in the [Output File] category, specify the output destination.
- When setting an individual compile option, it is also possible to change the name of the output file.From the [Individual Compile Options] tab, in the [Output File] category, specify the file name.

[Example of use]

- The -no option that is specified first is ignored, the -o option that is specified last is valid, so the object module file (prime.rel) will be output.

```
C:\>cc78k0r -cf1166a0 prime.c -no -o
```

Memory assignment specification

The memory assignment options are as follows.

- -r/-nr
- -rd/-nr
- -rs/-nr

-r/-nr

[Description format]

```
-rprocess-type (two or more types can be specified)
-nr
```

- Interpretation when omitted
  -nr

[Function]

- The -r option specifies how to assign a program to the memory.
- The -nr option disables the -r option.

[Application]

- Use the -r option to specify how to assign a program to the memory.

[Description]

- The process types that can be specified by the -r option are shown below.
  Process type specification cannot be omitted. A fatal error (F0012) occurs if the specification is omitted.

Process Type	Function
a	Performs indirect reference in 1-byte units.
b	Assigns a bit field from the most significant bit (MSB).
d[*n*][m] (*n* = 1, 2, 4)	Assigns an external variable/external static variable (except for the const-type variable) automatically to the saddr area, regardless of whether there is a sreg declaration or not. See "-rd/-nr" for details.
s[*n*][m] (*n* = 1, 2, 4)	Assigns a static auto variable automatically to the saddr area, regardless of whether sreg has been declared. See "-rs/-nr" for details.
c	Performs indirect reference in 1-byte units. Packs a structure and aligns the structure members to 1 byte.
f	Assigns ROM data in the far area.
n	Assigns ROM data in the near area.

Remark Two or more process types can be specified.

- If the -nr option is specified, the process types are interpreted as follows.

Process Type	Function
a	Does not perform indirect reference in 1-byte units.
b	Assigns a bit field from the least significant bit (LSB).
d	Does not automatically assign any variable to the saddr area.
s	Does not automatically assign any variable to the saddr area.
c	Do not perform indirect reference in 1-byte units. Does not pack a structure and does not align the structure members to 1 byte.

[Example of use]

- To assign the external variable or external static variable, and static auto variable automatically to the saddr area, regardless of whether sreg has been declared, describe as:

```
C:\>cc78k0r -cf1166a0 -rds
```

-rd/-nr

[Description format]

```
-rd[n][m] (n = 1, 2, 4)
-nr
```

- Interpretation when omitted
  -nr

[Function]

- The -rd option specifies to assign an external variable/external static variable automatically to the saddr area.
- The -nr option disables the -rd option.

[Application]

- Use the -rd option to assign an external variable/external static variable (except for the const-type variable) automatically to the saddr area, regardless of whether there is an sreg declaration or not.

[Description]

- Variables to be assigned change depending on the value of *n* and the specification of "m".

Specification of *n*, "m"	Variable Types to Be Assigned to saddr Area
n	- When *n* = 1: char, unsigned char - When *n* = 2: char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer - When *n* = 4: char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer
m	Structure, union, array
Omitted	All variables

- The sreg-declared variable is assigned to the saddr area regardless of the -rd option specification.
- The variable that is referenced by an extern declaration is processed as are to be assigned to the saddr area.
- The variable assigned to the saddr area by specifying this option is handled in a similar way to a sreg variable.

[Example of use]

- To assign the char or unsigned char type external variable or external static variable automatically to the saddr area, regardless of whether sreg has been declared, describe as:

```
C:\>cc78k0r -cf1166a0 -rd1
```

-rs/-nr

[Description format]

```
-rs[n][m] (n = 1, 2, 4)
-nr
```

- Interpretation when omitted
  -nr

[Function]

- The -rs option specifies to assign an static auto variable automatically to the saddr area.
- The -nr option disables the -rs option.

[Application]

- Use the -rs option to assign a static auto variable automatically to the saddr area, regardless of whether sreg has been declared.

[Description]

- Variables to be assigned change depending on the value of *n* and the specification of "m".

Specification of *n*, "m"	Variable Types to Be Assigned to saddr Area
n	- When *n* = 1: char, unsigned char - When *n* = 2: char, unsigned char, short, unsigned short, int, unsigned int, enum, near pointer - When *n* = 4: char, unsigned char, short, unsigned short, int, unsigned int, enum, long, unsigned long, pointer
m	Structure, union, array
Omitted	All variables

- The sreg-declared variable is assigned to the saddr area regardless of the -rs option specification.
- The variable assigned to the saddr area by specifying this option is handled in a similar way to a sreg-declared auto variable.

[Example of use]

- To assign the char or unsigned char type static auto variable automatically to the saddr area, regardless of whether sreg has been declared, describe as:

```
C:\>cc78k0r -cf1166a0 -rs1
```

Optimization specification

The optimization specification options are as follows.

- -q/-nq

-q/-nq

[Description format]

```
-q[optimization-type] (two or more types can be specified)
-nq
```

- Interpretation when omitted
  -qx2 (-qcjlvw)

[Function]

- The -q option specifies to call the optimization phase to generate efficient objects.
- The -nq option disables the -q option.

[Application]

- Use the -q option to improve the execution speed of the objects and reduce the code size.
  If you want to perform multiple optimizations simultaneously when the -q option is specified, specify the optimization types consecutively. See [Description] for details.

[Description]

- The optimization types that can be specified by the -q option are shown below.

<table>
<tr><th>Optimization Type</th><th>Process Description</th></tr>
<tr><td>No specification</td><td>It is assumed that the -qx2 (-qcjlvw) has been specified.</td></tr>
<tr><td>u</td><td>Regards the char with no qualifier as a unsigned char to improve code efficiency.</td></tr>
<tr><td>c</td><td>Performs calculations including char without sign extension.
<table>
<tr><th>Calculation Target</th><th>Calculation Result</th></tr>
<tr><td>unsigned char type variable and unsigned char type variable</td><td>unsigned char type</td></tr>
<tr><td>unsigned char type variable and signed char type variable</td><td>unsigned char type</td></tr>
<tr><td>signed char type variable and signed char type variable</td><td>signed char type</td></tr>
<tr><td>Constants from -128 to 255 and unsigned char type variable</td><td>unsigned char type</td></tr>
<tr><td>Constants from -128 to 127 and signed char type variable</td><td>signed char type</td></tr>
<tr><td>Constants from 0 to 255 with suffix U and signed char type variable</td><td>unsigned char type</td></tr>
</table></td></tr>
<tr><td>r</td><td>Adds a register variable to a register and assigns it to the saddr area.</td></tr>
<tr><td>j</td><td>Optimizes branch instructions.</td></tr>
</table>

Optimization Type	Process Description
x[*n*] (*n* = 1 - 3)	Assigns the optimization options automatically according to the precedence of speed/code size. The assigned option differs depending on the value of *n* as follows. When *n* is omitted, it is interpreted as *n* = 2. - When *n* = 1: Speed precedence. It is assumed that the -qcjvw option has been specified. - When *n* = 2: Default. It is assumed that the -qcjlvw option has been specified. - When *n* = 3: Code size precedence. It is assumed that the -qcjl3vw option has been specified.
w	Performs aggressive optimization. Reshuffles the execution order in an expression.
v	Assigns an argument and automatic variable automatically to a register or the saddr area.
l[*n*] (*n* = 1 - 3)	Performs optimization based on the precedence of code size and replaces the standard code pattern with a library. If this type is not specified, the code is optimized based on the precedence of speed. The scope replacing with a library differs depending on the value of *n* as follows. If *n* is omitted, it is interpreted as *n* = 1. - When *n* = 1: Nothing is replaced with the library. - When *n* = 2: Replaces only function pre and post-processing with the library. - When *n* = 3: In addition to 2, the low-level library is used, and common code is placed in subroutines.
t	Makes the branch table in a switch statement of a function allocated to the far area into of a relative branch. If the branch distance exceeds 64 KB, an error message (F0924) will be output.
g	Gives precedence to debugging.

- Multiple optimization types can be specified.
- If the -q option or optimization types are omitted, the optimization is identical to when the -qcjlvw option is specified.
- To delete a portion of the default options, specify the options other than the options you want to delete (example: -qr is specified -> Deletes -qcjlvw).
- If both the object module file and assembler source module file are not output, the -q options other than -qu are invalid.
- If both the -q and -nq options are specified at the same time, the option specified last is valid.
- If two or more -q options are specified at the same time, the option specified last is valid.
- The real-time OS does not support the -qr option.

[Example of use]

- To regard the char with no qualifier as a unsigned char to improve code efficiency, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -qu
```

- The -qc option that is specified first is ignored, the -qr option that is specified last is valid, and arguments of norec, auto variables, and register variables are allocated to the saddr area.

```
C:\>cc78k0r -cf1166a0 prime.c -qc -qr
```

- To validate both the -qc and -qr options, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -qcr
```

Debug information output specification

The debug information output specification options are as follows.

- -g/-ng

-g/-ng

[Description format]

```
-g[n] (n = 1, 2)
-ng
```

- Interpretation when omitted
  -g2

[Function]

- The -g option specifies that debug information is to be added into an object module file.
- The -ng option disables the -g option.

[Application]

- If the -g option is not specified, the line numbers and symbol information needed in the object module file to be input to the debugger are not output. Therefore, in source level debugging, all of the modules to be linked are compiled by specifying the -g option.

[Description]

- The operation differs depending on the value of *n* as follows.

Value of *n*	Function
No specification	It is assumed that the *n* has been specified.
1	Adds debug information (information starting with $DGS or $DGL) to the object module file only. No debug information is added to the assembler source file. This option makes it easier to reference an assembler file. Source debugging of object files is available since debug information is added to them.
2	Adds debug information to the object module file and the assembler source module file.

- If both the -g and -ng options are specified at the same time, the option specified last is valid.
- If both the object module file and assembler source module file are not output, the -g option is invalid.

[Example of use]

- To add assembler source debug information to an object module file (prime.rel), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -g
```

Preprocess list file creation specification

The preprocess list file creation specification options are as follows.

- -p
- -k

-p

[Description format]

```
-p[output-file-name]
```

- Interpretation when omitted
  None (no file is output)

[Function]

- The -p option specifies the output of a preprocess list file. It also specifies the location to which it is output and the file name. If the -p option is omitted, no preprocess list file is output.

[Application]

- Use the -p option to output the source file after preprocess processing is executed according to the -k option process type, or to change the output destination or the output file name of the preprocess list file.

[Description]

- If the output file name is omitted when the -p option is specified, the output file name will be "*input-file-name*.ppl".
- If the extension for the output file name is omitted when the -p option is specified, the output file name will be "*output-file-name*.ppl".
- If the drive name is omitted when the -p option is specified, the preprocess list file will be output to the current drive.

[Cautions]

- When using CubeSuite+, it is not possible to change the name of the output file.

[Example of use]

- To output the preprocess list file (sample.ppl), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -psample.ppl
```

-k

[Description format]

```
-k[process-type] (two or more types can be specified)
```

- Interpretation when omitted
  -kfln

[Function]

- The -k option specifies the processing for the preprocess list.

[Application]

- Use the -k option to delete comments and reference definition expansions when the preprocess list file is output.

[Description]

- The process types that can be specified by the -k option are shown below.

Process Type	Function
No specification	It is assumed that the -kfln has been specified.
c	Deletes comments.
d	Expands #define.
f	Performs conditional compilations of #if, #ifdef, and #ifndef.
i	Expands #include.
l	Performs #line processing.
n	Performs line number and paging processing.

Remark Two or more process types can be specified.

- If the -p option is not specified, the -k option is invalid.
- If two or more -k options are specified at the same time, the option specified last is valid.

[Example of use]

- To delete comments and perform line number and paging processing when the preprocess list file (prime.ppl) is output.

```
C:\>cc78k0r -cf1166a0 prime.c -p -kcn
```

Output example is shown below.

```
/*
78K0R C Compiler Vx.xx Preprocess List          Date:xx xxx xxxx    Page:   1

Command   : -cf1166a0 prime.c -p -kcn
In-file   : prime.c
PPL-file  : prime.ppl
Para-file :
*/

        1 : #define TRUE    1
        2 : #define FALSE   0
        3 : #define SIZE    200
        4 :
        5 : char    mark [ SIZE + 1 ] ;
        6 :
        7 : main ( )
        8 : {
         :
/*
 Target chip : uPD78F1166_A0
 Device file : Vx.xx
*/
```

Preprocess specification

The preprocess specification options are as follows.

- -d
- -u
- -i

-d

[Description format]

```
-dmacro-name[=definition-name][,macro-name[=definition-name]] ... (two or more types can be
specified)
```

- Interpretation when omitted
  Only the macro definitions in the C source file are valid.

[Function]

- The -d option specifies the same macro definition as the #define statement in the C source file.

[Application]

- Use the -d option to validate the special macro definition.

[Description]

- Up to 30 macro definitions can be specified at once by separating them with ",".
- A space cannot be entered before or after "=" and ",".
- If the definition name is omitted, the compiler presumes that "*macro-name*=1" was defined.
- If the same macro name is specified in both the -d and -u options, the option specified last is valid.

[Example of use]

- The following codes are defined in the C source file (prime.c).
  #define TEST 1
  #define TIME 10

```
C:\>cc78k0r -cf1166a0 prime.c -dTEST,TIME=10
```

-u

[Description format]

```
-umacro-name[,macro-name] ... (two or more macro names can be specified)
```

- Interpretation when omitted
  A macro definition specified with -d is valid.

[Function]

- The -u option disables macro definitions similar to the #undef statement in the C source file.

[Application]

- Use the -u option to invalidate the macro name defined by the -d option.

[Description]

- Up to 30 macro definitions can be disabled at once by separating them with ",".
  A space cannot be entered before or after ",".
- A macro definition that can be disabled by the -u option is one that has been defined by the -d option.
  A macro name defined by #define in a C source file or a system macro name of the CA78K0R cannot be disabled by the -u option.
- If the same macro name is specified in both the -d and -u options, the option specified last is valid.

[Example of use]

- The -d option that is specified first is ignored and the -u option that is specified last is valid, the macro definition for TEST thus becomes invalid.

```
C:\>cc78k0r -cf1166a0 prime.c -dTEST,TIME=10 -uTEST
```

-i

[Description format]

```
-ifolder[,folder] ... (two or more folders can be specified)
```

- Interpretation when omitted
  It is assumed that the following folders have been specified.

(1) Folder with source file[Note 1]

(2) Folder specified by environmental variable INC78K0R

(3) C:\Program Files\Renesas Electronics\CubeSuite+\CA78K0R\V*x.xx*\inc78k0r[Note 2]

Notes 1. If the include file name is specified with " " (double quotation marks) in the #include statement, folders with source files are searched first. If the include file name is specified with < >, search is not performed.

2. This is an example of when the C compiler is installed to C:\Program Files\Renesas Electronics\CubeSuite+\CA78K0R\V*x.xx*.

[Function]

- The -i option specifies that an include file specified by #include statement in a C source file is to be input from a specified folder.

[Application]

- Use the -i option to search an include file from a certain folder.

[Description]

- Up to 64 folders can be specified at once by separating them with ",".
  A space cannot be entered before or after ",".
- If two or more folders are specified following the -i option, or if two or more -i options are specified, the files specified by #include is searched in the specified order.
- The search sequence is as follows.

(1) Folder with source file[Note 1]

(2) The folder specified by the -i option

(3) Folder specified by environmental variable INC78K0R

(4) C:\Program Files\Renesas Electronics\CubeSuite+\CA78K0R\V*x.xx*\inc78k0r[Note 2]

Notes 1. If the include file name is specified with " " (double quotation marks) in the #include statement, folders with source files are searched first. If the include file name is specified with < >, search is not performed.

2. This is an example of when the C compiler is installed to C:\Program Files\Renesas Electronics\CubeSuite+\CA78K0R\V*x.xx*.

[Example of use]

- To input the include file that is specified in an #include statement in the C source file (prime.c) from folder D: and D:\sample, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -iD:,D:\sample
```

Assembler source file creation specification

The assembler source file creation specification options are as follows.

- -a
- -sa

-a

[Description format]

```
-a[output-file-name]
```

- Interpretation when omitted
  No assembler source file is output.

[Function]

- The -a option specifies the output of the assembler source file. It also specifies the location to which it is output and the file name.

[Application]

- Use the -a option to specify the location to which an assembler source file is output or to change its file name.

[Description]

- If the output file name is omitted when the -a option is specified, the output file name will be "*input-file-name*.asm".
- If the extension for the output file name is omitted when the -a option is specified, the output file name will be "*output-file-name*.asm".
- If the drive name is omitted when the -a option is specified, the assemble source file will be output to the current drive.
- If both the -a and -sa options are specified at the same time, the -sa option is ignored.

[Cautions]

- When using CubeSuite+, it is not possible to change the name of the output file.

[Example of use]

- To output the assembler source file (sample.asm) describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -asample.asm
```

-sa

[Description format]

```
-sa[output-file-name]
```

- Interpretation when omitted
  No assembler source file is output.

[Function]

- The -sa option adds the C source as a comment to the assembler source file.
  It also specifies the location to which it is output and the file name.

[Application]

- Use the -sa option to output an assembler source file and a C source file together.

[Description]

- If the output file name is omitted when the -sa option is specified, the output file name will be "*input-file-name*.asm".
- If the extension for the output file name is omitted when the -sa option is specified, the output file name will be "*output-file-name*.asm".
- If the drive name is omitted when the -sa option is specified, the assemble source file will be output to the current drive.
- If both the -sa and -a options are specified at the same time, the -sa option is ignored.
- The C source in an include file is not added to the comments in the output assembler source file. However, if the -li option is specified, the C source in the include file is also added to the comments.

[Cautions]

- When using CubeSuite+, it is not possible to change the name of the output file.

[Example of use]

- To add the C source file (prime.c) as a comment to the assembler source file (prime.asm), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -sa
```

Output example is shown below.

```
; 78K0R C Compiler Vx.xx Assembler Source              Date:xx xxx xxxx  Time:xx:xx:xx

; Command   : -cf1166a0 prime.c -sa
; In-file   : prime.c
; Asm-file  : prime.asm
; Para-file :

$PROCESSOR ( f1166a0 )
$DEBUG
$NODEBUGA
$KANJICODE SJIS
$TOL_INF        03FH , 100H , 00H , 00H , 00H

$DGS    FIL_NAM , .file ,       037H , 0FFFEH , 03FH , 067H , 01H , 00H
$DGS    AUX_FIL , prime.c
$DGS    MOD_NAM , prime ,       00H , 0FFFEH , 00H , 077H , 00H , 00H
          :
        EXTRN   _@RTARG0
        EXTRN   @@isrem
        PUBLIC  _printf
        PUBLIC  _putchar
        PUBLIC  _mark
        PUBLIC  _main
          :
@@CODEL CSEG
_main :
$DGL    1 , 19
        push    hl                      ; [ INF ] 1 , 1
        subw    sp , #08H               ; [ INF ] 2 , 1
        movw    hl , sp                 ; [ INF ] 3 , 1
??bf_main :
; line   9 :    int i , prime , k , count ;
; line  10 :
; line  11 :    count = 0 ;
$DGL    0 , 4
        clrw    ax                      ; [ INF ] 1 , 1
        movw    [ hl ] , ax     ; count ; [ INF ] 1 , 1
; line  12 :
; line  13 :    for ( i = 0 ; i <= SIZE ; i++ )
$DGL    0 , 6
        movw    [ hl + 6 ] , ax ; i     ; [ INF ] 2 , 1
?L0003 :
        movw    ax , [ hl + 6 ] ; i     ; [ INF ] 2 , 1
        cmpw    ax , #0C8H      ; 200   ; [ INF ] 3 , 1
        or1     CY , a.7                ; [ INF ] 2 , 1
```

```
        skc                             ; [ INF ] 2 , 1
        bnz     $?L0004                 ; [ INF ] 2 , 4
          :

; *** Code Information ***
;
; $FILE C:\Program Files\Renesas Electronics\CubeSuite+\CA78K0R\Vx.xx\smp78k0r\cc78k0r\ prime.c
;
; $FUNC main ( 8 )
;       bc = ( void )
;       CODE SIZE = 117 bytes , CLOCK_SIZE = 86 clocks , STACK_SIZE = 16 bytes
;
; $CALL printf ( 18 )
;       bc = ( pointer : ax , int : [ sp + 2 ] )
;
; $CALL putchar ( 18 )
;       bc = ( pointer : ax , int : [ sp + 2 ] )
;
; $CALL putchar( 20 )
;       bc = ( int : ax )
;
; $CALL printf ( 25 )
;       bc = ( pointer : ax , int : [ sp + 2 ] )
;
; $FUNC printf ( 31 )
;       bc = ( pointer s : ax , int i : [ sp + 4 ] )
;       CODE SIZE = 22 bytes , CLOCK_SIZE = 20 clocks , STACK_SIZE = 14 bytes
;
; $FUNC putchar ( 41 )
;       bc = ( char c : x )
;       CODE SIZE = 16 bytes , CLOCK_SIZE = 16 clocks , STACK_SIZE = 6 bytes

; Target chip : uPD78F1166_A0
; Device file : Vx.xx
```

Error list file creation specification

The error list file creation specification options are as follows.

- -e
- -se

-e

[Description format]

```
-e[output-file-name]
```

- Interpretation when omitted
  No error list file is output.

[Function]

- The -e option specifies the output of an error list file. It also specifies the location to which it is output and the file name.

[Application]

- Use the -e option to specify the location to which an error list file is output or to change its file name.

[Description]

- If the output file name is omitted when the -e option is specified, the output file name will be "*input-file-name*.ecc".
- If the extension for the output file name is omitted when the -e option is specified, the output file name will be "*output-file-name*.ecc".
- If the drive name is omitted when the -e option is specified, the error list file will be output to the current drive.
- If the -w0 option is specified, warning messages cannot be output.

[Cautions]

- When using CubeSuite+, it is not possible to change the name of the output file.

[Example of use]

- To output the error list file (prime.ecc), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -e
```

Output example is shown below.

```
prime.c( 18 ) : CC78K0R warning W0745: Expected function prototype
prime.c( 20 ) : CC78K0R warning W0745: Expected function prototype
prime.c( 26 ) : CC78K0R warning W0622: No return value
prime.c( 37 ) : CC78K0R warning W0622: No return value
prime.c( 44 ) : CC78K0R warning W0622: No return value

 Target chip : uPD78F1166_A0
 Device file : Vx.xx
Compilation complete, 0 error(s) and 5 warning(s) found.
```

-se

[Description format]

```
-se[output-file-name]
```

- Interpretation when omitted
  No error list file is output.

[Function]

- The -se option adds the C source file to the error list file. It also specifies the location to which it is output and the file name.

[Application]

- Use the -se option to output a error list file and a C source file together.

[Description]

- If the output file name is omitted when the -se option is specified, the output file name will be "*input-file-name*.cer".
- If the extension for the output file name is omitted when the -se option is specified, the output file name will be "*output-file-name*.cer".
- If the drive name is omitted when the -se option is specified, the error list file will be output to the current drive.
- The folder and file name cannot be specified for include files.
  If the file type of the include file is "H", the error list file with the file type of "her" is output to the current drive. It the file type of the include file is "C", the error list file with the file type of "cer" is output. In all other cases, the error list file with the file type of "er" is output.
- If an error does not occur, the C source is not added. In this case, the error list file is not created for the include file.
- If the -w0 option is specified, warning messages cannot be output.

[Cautions]

- When using CubeSuite+, it is not possible to change the name of the output file.

[Example of use]

- To add the C source file (prime.c) to the error list file (prime.cer), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -se
```

Output example is shown below.

```
/*
78K0R C Compiler Vx.xx Error List              Date:xx xxx xxxx  Time:xx:xx:xx

Command   : -cf1166a0 prime.c -se
In-file   : prime.c
Err-file  : prime.cer
Para-file :
*/

#define TRUE    1
#define FALSE   0
#define SIZE    200

char    mark [ SIZE + 1 ] ;

void main ( void ) {
          :
        prime = i + i + 3 ;
        printf ( "%6d" , prime ) ;
*** CC78K0R warning W0745: Expected function prototype
        count++ ;
        if ( ( count%8 ) == 0 ) putchar ( '\n' ) ;

*** CC78K0R warning W0745: Expected function prototype
        for ( k = i + prime ; k <= SIZE ; k += prime )
          :
}
```

Cross reference list file creation specification

The cross reference list file creation specification options are as follows.

- -x

-x

[Description format]

```
-x[output-file-name]
```

- Interpretation when omitted
  No cross reference list file is output.

[Function]

- The -x option specifies the output of a cross reference list file. It also specifies the location to which it is output and the file name. The cross reference list file is valuable for checking the referencing frequency, definition, and referenced point of a symbol.

[Application]

- Use the -x option to output the cross reference list file and specify the location to which a cross reference list file is output or to change its file name.

[Description]

- If the output file name is omitted when the -x option is specified, the output file name will be "*input-file-name*.xrf".
- If the extension for the output file name is omitted when the -x option is specified, the output file name will be "*output-file-name*.xrf".
- Even if an internal error other than C0101 or a compilation error with the number F0024 or a number starting from E occurs, a cross reference list file is created. However, the contents of the file are not guaranteed.

[Cautions]

- When using CubeSuite+, it is not possible to change the name of the output file.

[Example of use]

- To output the cross reference list file (prime.xrf), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -x
```

Output example is shown below.

```
78K0R C Compiler Vx.xx Cross reference List                Date:xx xxx xxxx  Page:   1

Command   : -cf1166a0 prime.c -x
In-file   : prime.c
Xref-file : prime.xrf
Para-file :

ATTRIB MODIFY TYPE    SYMBOL          DEFINE   REFERENCE

EXTERN NEAR   array   mark                 5       29      31      37
EXTERN FAR    func    printf               7       33      40
REG1          pointer s                    7       13
PARAM
REG1          int     i                    7       12
PARAM
REG1          int     j                    9       12
REG1          pointer ss                  10       13
EXTERN FAR    func    putchar             16       35
REG1          char    c                   16       19
PARAM
REG1          char    d                   18       19
EXTERN FAR    func    main                22
REG1          int     i                   24       28       28       28       29       30
                                                   30       30       31       32       32
                                                   36
REG1          int     prime               24       32       33       36       36
REG1          int     k                   24       36       36       36       37
REG1          int     count               24       26       34       35       40
              #define TRUE                 1       29
              #define FALSE                2       37
              #define SIZE                 3        5       28       30       36


 Target chip : uPD78F1166_A0
 Device file : Vx.xx
```

List format specification

The list format specification options are as follows.

- -lw
- -ll
- -lt
- -lf
- -li

-lw

[Description format]

```
-lw[number-of-characters]
```

- Interpretation when omitted
  -lw132 (80 characters in the case of console output)

[Function]

- The -lw option specifies the number of characters per line in each type of list file.

[Application]

- Use the -lw option to change the number of characters per line in each type of list file.

[Description]

- The range of number of characters that can be specified with the -lw option is 72 to 132 and does not include terminators (CR, LF).
- - If the number of characters is omitted, the number of characters per line is 132 characters (80 characters in the case of console output).
- If the list file is not specified, the -lw option is invalid.

[Example of use]

- To specify 72 as the number of characters per line in the cross reference list file (prime.xrf), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -x -lw72
```

-ll

[Description format]

```
-ll[number-of-lines]
```

- Interpretation when omitted
  No page breaks

[Function]

- The -ll option specifies the number of lines per page in each type of list file.

[Application]

- Use the -ll option to change the number of lines per page in each type of list file.

[Description]

- The range number of lines that can be specified with the -ll option is 20 to 65535.
- If -ll0 is specified, no page breaks will be made.
- If the number of lines is omitted, no page breaks will be made.
- If the list file is not specified, the -ll option is invalid.

[Example of use]

- To specify 20 as the number of lines per page in the cross reference list file (prime.xrf), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -x -ll20
```

-lt

[Description format]

```
-lt[number-of-characters]
```

- Interpretation when omitted
  -lt8

[Function]

- The -lt option specifies the basic number of characters for outputting a horizontal tabulation (HT) code in the source file, replacing it with several blanks (spaces) in each list (tabulation processing).

[Application]

- Use the -lt option to reduce the number of characters per line by reducing the number of blanks per HT code, for example when a small number of characters per line has been specified for lists via the -lw option.

[Description]

- The range number of characters that can be specified with the -lt option is 0 to 8.
- If -lt0 is specified, tabulation processing will not be performed, and a tabulation code will be output.
- If the number of characters is omitted, the number of expansion characters of a tab is 8.
- If the list file is not specified, the -lt option is invalid.

[Example of use]

- If the -lt option is omitted, the compiler assumes that the -lt8 option is specified and the number of blanks entered by the HT code is set to 8.

```
C:\>cc78k0r -cf1166a0 prime.c -p
```

- To specify 1 blank entered by the HT code, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -p -lt1
```

-lf

[Description format]

```
-lf
```

- Interpretation when omitted
  No form feed code is inserted.

[Function]

- The -lf option inserts a form feed code at the end of each list file.

[Description]

- If the list file is not specified, the -lf option is invalid.

[Example of use]

- To insert a form feed code at the end of an assembler source file (prime.asm), describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -a -lf
```

-li

[Description format]

```
-li
```

- Interpretation when omitted
  No C sources in the include file will be added.

[Function]

- The -li option adds the C source in the include file to the assembler source file with C source comments.

[Description]

- If the -sa option is specified, the -li option is invalid.

[Example of use]

- To add the C source file in the include file to the assembler source file (prime.asm) with C source comments, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -sa -li
```

Warning output specification

The warning output specification option is as follows.

- -w

-w

[Description format]

```
-w[level]
```

- Interpretation when omitted
  -w1

[Function]

- The -w option specifies whether or not a warning message is output to the console.

[Application]

- Use -w option to specify whether or not a warning message is output to the console.
  Detailed messages can also be output.

[Description]

- The levels of the warning message are as follows.

Level	Description
0	No warning messages are output.
1	Normal warning messages are output.
2	Detailed warning messages are output.

- If the -e or -se option is specified, the warning messages are also output to the error list file.
- If the level 0 is specified, the warning messages are not output to the console and the error list file (when -e or -se is specified).

[Example of use]

- If the -w option is omitted, the compiler assumes that the -w1 option is specified and outputs normal warning messages.

```
C:\>cc78k0r -cf1166a0 prime.c
```

Execution state display specification

The execution state display specification options are as follows.

- -v/-nv

-v/-nv

[Description format]

```
-v
-nv
```

- Interpretation when omitted
  -nv

[Function]

- The -v option outputs the execution state of the current compilation to the console.
- The -nv option disables the -v option.

[Application]

- Use the -v option to check the execution status of compilation.

[Description]

- The phase name and function names in the process are output.
- If both the -v and -nv options are specified at the same time, the option specified last takes precedence.

[Example of use]

- To output the execution state of the current compilation to the console, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -v
```

Parameter file specification

The parameter file specification option is as follows.

- -f

-f

[Description format]

```
-ffile-name
```

- Interpretation when omitted
  Options and input file names can only be input from the command line.

[Function]

- The -f option inputs options and input file names from a specified file.

[Application]

- Use the -f option when the information required to start up the CA78K0R will not fit on the command line because two or more options are input while compiling.
- When specifying options repeatedly every time you perform compilation, describe the options in the parameter file and specify the -f option.

[Description]

- Nesting of parameter files is not permitted.
- The number of characters that can be described within a parameter file is unlimited.
- Separate options or input file names with a blank space and a tab.
- Options and input file names within a parameter file will be expanded at the position specified for the parameter file on the command line.
- The expanded options specified last takes precedence.
- The characters following ";" or "#" are all assumed to be comments, before the end of the line.

[Example of use]

- Contents of the parameter file (prime.pcc)

```
; parameter file
prime.c -cf1166a0 -aprime.asm -e -x
```

Perform compilation using a parameter file (prime.pcc).

```
C:\>cc78k0r -fprime.pcc
```

Temporary file creation folder specification

The temporary file creation folder specification option is as follows.

- -t

-t

[Description format]

```
-tfolder
```

- Interpretation when omitted
  The temporary files are created in the drive folder specified by the environment variable TMP. If the environment variable TMP is not specified, the temporary files are created in the current drive and current folder.

[Function]

- The -t option specifies the drive and folder in which a temporary file is created.

[Application]

- Use the -t option to specify the location for creation of a temporary file.

[Description]

- Even if a previously created temporary file exists, if the file is not protected, it will be overwritten the next time.
- As long as the required memory size is available, the temporary file will be expanded in memory.
  If the required memory size is no longer available, the temporary file is created in the specified folder and the memory contents are written to the file. Accesses to subsequent temporary files are to files not in memory.
- Temporary files are deleted when compilation is finished. They are also deleted when compilation is aborted by pressing the [CTRL] + [C] key.

[Example of use]

- To output a temporary file to folder C:\tmp, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -ttmp
```

Function expansion specification

The function expansion specification options are as follows.

- -z/-nz

-z/-nz

[Description format]

```
-ztype (two or more types can be specified)
-nz
```

- Interpretation when omitted
  -nz

[Function]

- The -z option enables extended functions.
- The -nz option disables the -z option.
- *type* is cannot be omitted. A fatal error (F0012) occurs if the specification is omitted.

[Application]

- The functions for processing by the following type specifications are available for the RL78 and 78K0R extended functions.

[Description]

- The type specifications of the -z option is as follows.

Type Specification	Description
p	The characters after "//" before the line feed code are interpreted as a comment.
c	Nesting of comments is permitted.
s[Note]	Interprets the kanji code in comments as SJIS.
e[Note]	Interprets the kanji code in comments as EUC.
n[Note]	Interprets comments as not containing kanji codes.
b	char-/unsigned char-type argument and return value are not int-extended.

Type Specification	Description
a	Functions not in the ANSI standard are invalid. The portion of functions in the ANSI standard are valid. Specifically, the following tasks are performed. - The following are no longer reserved words. callt/sreg/bit/boolean/#asm/#endasm - The trigraph sequence (3-character representation) is valid. - The compiler-defined macro __STDC__ is regarded as 1. - Data allocation to the last one byte of a 64 KB boundary area is enabled by performing a relational expression for the far pointer for three bytes. - The following warning is output for a int type bit field. (CC78K0R warning W0787 : Bit field type is not int) - If -w2 is specified for the -qc, -zp, -zc options, the following warnings are output. (CC78K0R warning W0029 : ' -QC ' option is not portable) (CC78K0R warning W0031 : ' -ZP ' option is not portable) (CC78K0R warning W0032 : ' -ZC ' option is not portable) - If -w2 is specified for each #pragma statement, the following warning is output. (CC78K0R warning W0849 : #pragma statement is not portable) - If -w2 is specified for an __asm statement, the following warning is output and the assemble output is performed. (CC78K0R warning W0850 : Asm statement is not portable) - If -w2 is specified for an #asm to #endasm block, the following error is output. (CC78K0R error E0801 : Undefined control, etc.)
f	Outputs objects for flash.
t*address*	Specifies the start address of the flash area branch table.
z*address*	Specifies the start address of the flash area.
x	Outputs the object for the RAM allocation. - The following error is output for the callt function definition. (CC78K0R error E0791 : '-ZF'/'-ZX' option specified - cannot allocate a callt function 'function name') - The following error is output for the #pragma interrupt/rtos_interrupt directive. (CC78K0R error E0873 : '-ZX' option specified - cannot specify #pragma interrupt /rtos_interrupt) - On devices with no self-programming feature for RAM allocation, the following error will be output in response to an interrupt function definition when -zf is not specified. (CC78K0R error E0768 : Cannot allocate interrupt function in RAM area) - The following warning is output, and all functions will have the far attribute, regardless of whether __near/__far is specified, or the memory model. (CC78K0R warning W0070 : Functions are treated as far function) - The runtime library to be called differs depending on the value of *n*. If *n* is omitted, it is interpreted as *n* = 2. - When *n* = 1, the runtime library calls the library for the ROM allocation. - When *n* = 2, the runtime library calls the library for the RAM allocation. - If -ql is specified when -zx2 is specified, the following warning is output and the level of -ql is forcibly set to -ql1. (CC78K0R warning W0046 : '-ZX2' option specified - regarded as '-QL1')

Note s, e, and n cannot be specified at the same time.

[Example of use]

- The characters after "//" before the line feed code in the C source file (prime.c) are interpreted as a comment. Also, nesting of comments is permitted.

```
C:\>cc78k0r -cf1166a0 prime.c -zpc
```

Device file search path specification

The device file search path specification option is as follows.

- -y

-y

[Description format]

```
-yfolder
```

- Interpretation when omitted
  Normal search path only

Remark The normal search paths are as follows.

(1) < ..\..\..\dev > (Path by which the cc78k0r.exe was started up)

(2) Path by which the cc78k0r.exe was started up

(3) Current folder

(4) The environmental variable PATH

[Function]

- The -y option first searches the path specified as the search path for reading device files. If it does not exist, the normal paths are searched.

[Application]

- If the device file is not installed in the normal search path, but in a special folder, the path is specified by this option.

[Cautions]

- When using CubeSuite+, folders are determined by the microcontroller selected when the project was created.Therefore, it is not necessary to specify this option when setting options with this compiler.

[Example of use]

- To search "C:\tmp\dev" read the device file, describe as:

```
C:\>cc78k0r -cf1166a0 -yC:\tmp\dev
```

Memory model specification

The memory model specification option is as follows.

- -m

-m

[Description format]

```
-mtype
```

- Interpretation when omitted
  -mm

[Function]

- The -m option specifies the memory model used for compilation.
- Two or more process types cannot be specified.
- *type* is cannot be omitted. A fatal error (F0012) occurs if the specification is omitted.

[Application]

- Use the -m option to specify whether each function and variable is allocated in the near or far area is specified by specifying a memory model.
- If a __near or __far qualifier is described for functions or variables in a C source file, specification of the near or far area that is specified by the __near or __far qualifier takes precedence.

[Description]

- The type specifications of the -m option are as follows.

Type Specification	Memory Model	Description
s	Small model	Considers the memory to consist of a code portion 64 KB (max.) and a data portion of 64 KB (max.), 128 KB in total, and specifies the near or far area.
m	Medium model	Considers the memory to consist of a code portion of 1 MB (max.) and a data portion 64 KB (max.), 1 MB in total, and specifies the near or far area.
l	Large model	Considers the memory to consist of a code portion of 1 MB (max.) and a data portion of 1 MB (max.), 1 MB in total, and specifies the near or far area.

Caution **Even if a memory model that consists of a data portion or code portion of 64 KB (max.) is specified, functions and variables for which the __far qualifier is specified can be allocated to the space of 1 MB (max.).**
Memory model specification specifies the location of functions or variables for which the __near/__far qualifier is not specified.

[Example of use]

- To use the small model for the memory model during compilation, describe as:

```
C:\>cc78k0r -cf1166a0 prime.c -ms
```

Mirror area specification

The mirror area specification option is as follows.

- -mi

-mi

[Description format]

```
-mi0 or -mi1
```

- Interpretation when omitted
  -mi0

[Function]

- The -mi option specifies the allocation destinations of segments in the mirrored area.

[Application]

- Use the -mi option to specify the allocation destinations of segments in the mirrored area.

[Description]

- If -mi0 is specified, the segment is allocated in the mirror area when MAA = 0. If -mi1 is specified, the segment is allocated in the mirror area when MAA = 1.
  See the user's manual of the device for details about the mirror area.

[Example of use]

- To allocate the segment in the mirror area when MAA = 1, describe as:

```
C:\>cc78k0r prime.c -mi1
```

Common object specification

The common object specification option is as follows.

- -common

-common

[Description format]

```
-common
```

- Interpretation when omitted
  The object for the specified device is output.

[Function]

- The -common option specifies the output of an object common to the RL78 and 78K0R.

[Application]

- Use the -common option to generates an object that can be used commonly in the RL78 and 78K0R, regardless of the device type specification option (-c).

[Description]

- Specify this option to generate an object that can be used commonly in the RL78 and 78K0R.

[Example of use]

- To generate an object that can be used commonly in the RL78 and 78K0R, describe as:

```
C:\>cc78k0r prime.c -cf1166a0 -common
```

Variables/functions information file specification

The variables/functions information file specification option is as follows.

- -ma

-ma

[Description format]

```
-mafile-name[ -mafile-name]
-mafile-name[,file-name]
```

- Interpretation when omitted
  A variables/functions information file is not used.

[Function]

- The -ma option specifies the variables/functions information file to be used.

[Application]

- Use the -ma option to efficiently allocate variables and functions using a variables/functions information file.

[Description]

- Up to 2 file names can be specified.
- A variables/functions information file can be used to specify attributes for variables and functions separate from the C source code.
  See "B.8 Variables/Functions Information File Generator" for details about a variables/functions information file.
- If the -ma and -rd options are specified at the same time, a warning message that the -rd option will be ignored is output.
- If the -ma and -rs options are specified at the same time, allocation via -ma will be suppressed because -rs takes higher precedence.

[Example of use]

- To allocate variables/functions by using the variables/functions information file (info.vfi), describe as:

```
C:\>cc78k0r prime.c -cf1166a0 -mainfo.vfi
```

Help specification

The help options are as follows.

- --/-?/-h

--/-?/-h

[Description format]

```
--/-?/-h
```

- Interpretation when omitted
  No display

[Function]

- The --, -?, and -h options display brief explanations of the options and the help messages such as the default options on the console.

Caution This option cannot be specified from CubeSuite+.

[Application]

- The option and its description are displayed. See these when executing the compiler.

[Description]

- When the --, -?, or -h option is specified, all other options are invalid.
- To view the continuation of a displayed help message, press the [Enter] key. To quit the display, press any key other than the [Enter] key and then press the [Enter] key.

[Example of use]

- Outputs a help message on the console.

```
C:\>cc78k0r -h
```

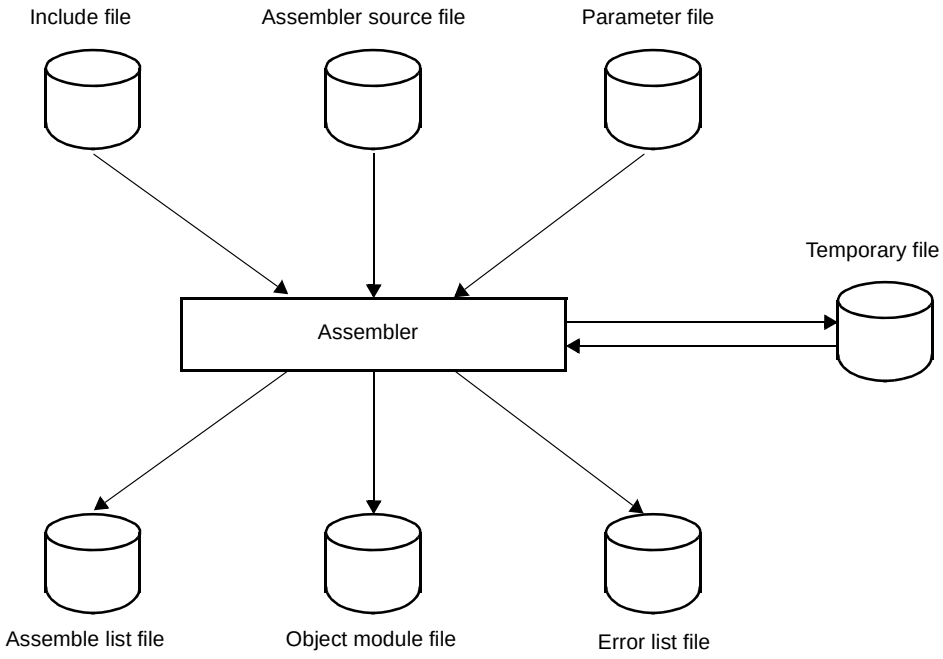
B.2 Assembler

The assembler inputs source files written in the assembly language for RL78 and 78K0R microcontrollers, converts them into machine language coding, and outputs them as an object module file.

The assembler also outputs list files such as assemble list files and error list files.

If assembly errors occur, an error message is output to the assemble list file and error list file to clarify the cause of the error.

Figure B-3. I/O Files of Assembler



B.2.1 I/O files

The I/O files of the assembler are shown below.

See "3.2 Assembler" for details about output lists.

Table B-5. I/O Files of Assembler

Type	File Name	Explanation	Default File Type
Input files	Assembler source file	- Source file written in assembly language for RL78 and 78K0R microcontrollers (user-created file)	.asm
	Include file	- File referenced from assembler source files - File written in assembly language for RL78 and 78K0R microcontrollers (user-created file)	None
	Parameter file	- File containing the parameters for the executed programs (user-created file)	.pra

Type	File Name	Explanation	Default File Type
Output files	Object module file	- Binary file containing relocation information and symbol information regarding machine language information and machine language location addresses	.rel
	Assemble list file	- File containing assembly information such as assemble lists and cross reference lists	.prn
	Error list file	- File containing error information generated during assembling	.era
I/O files	Temporary file	- File created automatically by the assembler for assembly purposes Temporary files are deleted when assembling ends.	RA*xxxxx*.$$n (n = 1 to 4)

B.2.2 Functions

(1) Conversion of assembly language into machine language

The assembler reads source files and converts them from assembly language files into machine language files.

B.2.3 Method for manipulating

(1) Assembler startup

The following two methods can be used to start up the assembler.

(a) Startup from the command line

```
X:[path-name]>ra78k0r[Δoption]...source-file-name[Δoption]...
```

X	Current drive name
path-name	Current folder name
ra78k0r	Command name of the assembler
option	Enter detailed instructions for the operation of the assembler. When specifying two or more assemble options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the assemble options. See "B.2.4 Option" for details about assemble options. Enclose a path that includes a space in a pair of double quotation marks (" ").
source-file-name	File name of source to be assembled Enclose the file name of a path that includes a space in a pair of double quotation marks (" ").

Example To output an error list file k0rmain.era, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -e -np
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the assembler will not fit on the command line, or when the same assemble option is specified repeatedly each time assembly is performed.

To start up the assembler from a parameter file, specify the parameter file option (-f) on the command line. Start up the assembler from a parameter file as follows:

```
X>ra78k0r[ΔSource-file]Δ-fparameter-file-name
```

-f	Parameter file specification option
parameter-file-name	A file which includes the data required to start up the assembler

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the source file name is omitted from the command line, only 1 source file name can be specified in the parameter file.
- The source file name can also be written after the option.
- Write in the parameter file all assemble options and output file names specified in the command line.

Example Create a parameter file k0rmain.pra using an editor, and then start up the assembler.

```
; parameter file
k0rmain.asm -osample.rel
-psample.prn
```

```
C:\>ra78k0r -fk0rmain.pra
```

(2) Execution start and end messages

(a) Execution start message

When the assembler is started up, an execution startup message appears on the display.

```
78K0R Assembler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
```

(b) Execution end message

If it detects no assembly errors resulting from the assembly, the assembler outputs the following message to the display and returns control to the host operating system.

```
PASS1 Start
PASS2 Start

 Target chip : uPD78xxx
 Device file : Vx.xx

Assembly complete, 0 error(s) and 0 warning(s) found.
```

If it detects an assembly errors resulting from the assembly, the assembler outputs the number of errors and warnings to the display and returns control to the host operating system.

```
PASS1 Start
k0rmain.asm ( 12 ) : RA78K0R error E2201 : Syntax error
PASS2 Start
k0rmain.asm ( 12 ) : RA78K0R error E2201 : Syntax error
k0rmain.asm ( 29 ) : RA78K0R error E2407 : Undefined symbol reference 'CONVAH'
k0rmain.asm ( 29 ) : RA78K0R error E2303 : Illegal expression

 Target chip : uPD78xxx
 Device file : Vx.xx

Assembly complete, 3 error(s) and 0 warning(s) found.
```

If the assembler detects a fatal error during assembly which makes it unable to continue assembly processing, the assembler outputs a message to the display, cancels assembly and returns control to the host operating system.

Examples 1. A non-existent source file is specified.

```
C:\>ra78k0r sample.asm
```

```
78K0R Assembler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F2006 : File not found 'sample.asm'
Program aborted.
```

In the above example, a non-existent source file is specified. An error occurs and the assembler aborts assembly.

2. A non-existent assemble option is specified.

```
C:\>ra78k0r k0rmain.asm -z
```

```
78K0R Assembler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F2012 : Missing parameter '-z'
Please enter 'RA78K0R--' , if you want help messages.
Program aborted.
```

In the above example, a non-existent assemble option is specified. An error occurs and the assembler aborts assembly.

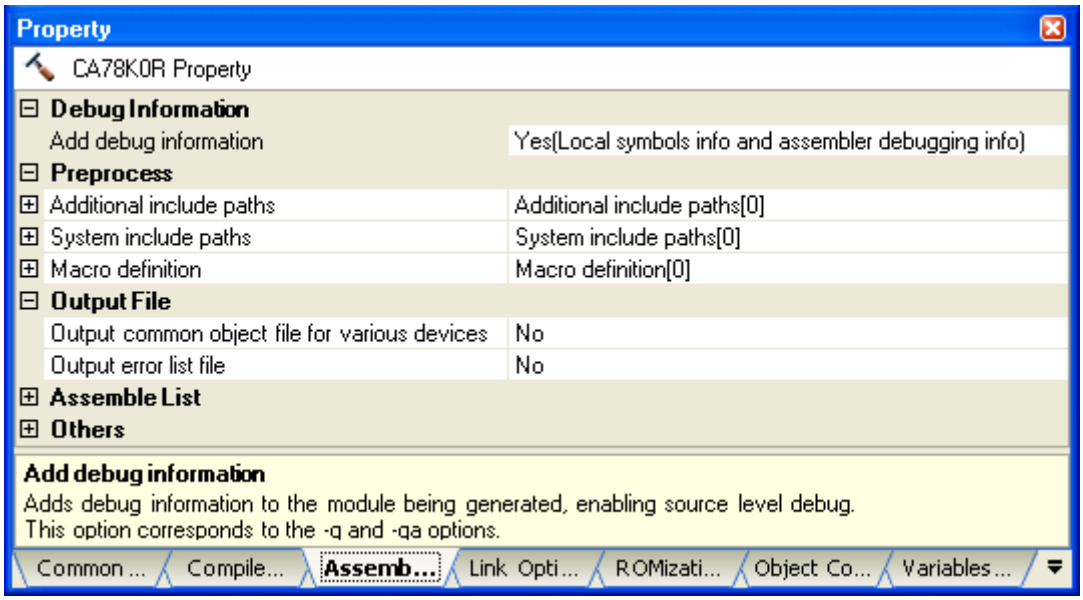
(3) Set options in CubeSuite+

This section describes how to set assemble options from CubeSuite+.

On CubeSuite+'s Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu. The Property panel opens. Next, select the [Assemble Options] tab.

You can set the various assemble options by setting the necessary properties in this tab.

Figure B-4. Property Panel: [Assemble Option] Tab



B.2.4 Option

(1) Types

The assemble options are detailed instructions for the operation of the assembler.

The types and explanations for assemble options are shown below.

Table B-6. Assemble Options

Classification	Option	Description
Device type specification	-c	Specifies the type of the target device.
Object module file output specification	-o	Specifies the output of an object module file.
	-no	
Forced object module file output specification	-j	Forces the output of an object module file.
	-nj	
Debug information output specification	-g	Specifies that debug information (local symbol information) is to be added to an object module file.
	-ng	
	-ga	Specifies that assembler source debug information is to be added to an object module file.
	-nga	

Classification	Option	Description
Include file read path specification	-i	Reads an include file from a specified path.
Assemble list file output specification	-p	Specifies the output of an assemble list file.
	-np	
Assemble list file information specification	-ka	Outputs an assemble list into an assemble list file.
	-nka	
	-ks	Outputs a symbol list into an assemble list file.
	-nks	
	-kx	Outputs a cross reference list into an assemble list file.
	-nkx	
Assemble list file format specification	-lw	Changes the number of characters printed per line in an assemble list file.
	-ll	Changes the number of lines printed per page in an assemble list file.
	-lh	Outputs the specified character strings in the header of an assemble list file.
	-lt	Specifies the number of expansion characters of a tab.
	-lf	Inserts a form feed code at the end of an assemble list file.
	-nlf	
Error list file output specification	-e	Outputs an error list file.
	-ne	
Parameter file specification	-f	Inputs the input file name and options from a specified file.
Temporary file creation path specification	-t	Creates a temporary file in the specified path.
Kanji code (2-byte code) specification	-zs	Interprets Kanji described in the comment as Shift-JIS code.
	-ze	Interprets Kanji described in the comment as EUC code.
	-zn	Characters described in the comment are not interpreted as kanji.
Device file search path specification	-y	Reads a device file from a specified path.
Symbol definition specification	-d	Defines symbols.
Common object specification	-common	Specifies the output of an object module file common to the RL78 and 78K0R.
78K0 compatible macro	-compati	Enables assembly of assembler source files generated by the 78K0 assembler.
	-ncompati	
Help specification	--	Outputs a help message on the display.

(2) Precedence

For the assemble options shown in the following table, the precedence is explained in a case where two or more options along the vertical axis and options along the horizontal axis are specified at the same time.

Table B-7. Precedence of Assemble Options

	-no	-np	-nka	-nks	-kx	-nkx	--
-j	NG						NG
-g	NG						NG
-p			Δ	Δ		Δ	NG
-ka		NG					NG
-ks		NG			NG		NG
-kx		NG					NG
-lw		NG					NG
-ll		NG					NG
-lh		NG					NG
-lt		NG					NG
-lf		NG					NG

- Location marked with NG

  If an option in the horizontal axis is specified, the option in the vertical axis is invalid.

  Example The -lw and -lf options are invalid.

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -np -lw80 -lf
```

- Location marked with Δ

  If all three of the options in the horizontal axis are specified at the same time, the option in the vertical axis is invalid.

  Example If the -nka, -nks, and -nkx options are specified at the same time, the -p option is invalid.

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -p -nka -nks -nkx
```

- Blank area

  If an option in the horizontal axis is specified, the option in the vertical axis is valid.

As with the -o/-no options, if two options for which "n" can be added to the beginning of the option name are specified at the same time, the option specified last is valid.

Example The -no option is specified after the -o option, so the -o option is invalid and the -no option is valid.

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -o -no
```

Options not described in "Table B-7. Precedence of Assemble Options" are not particularly affected by other options. However, if the help specification option (--) is specified, all of other option specifications become invalid.

Device type specification

The device type specification option is as follows.

- -c

-c

[Description format]

```
-cdevice-type
```

- Interpretation when omitted
  Cannot be omitted.

[Function]

- The -c option specifies the target device for performing assembly.

[Application]

- Be sure to specify the -c option. The assembler performs assembly for the target device and generates an object code for that device.

[Description]

- See "CubeSuite+ Operating Precautions" for the target devices that can be specified by the -c option.

[Cautions]

- The -c option cannot be omitted. However, if a control instruction ($PROCESSOR) with the same function as the -c option is described at the beginning of the source, command line specification can be omitted.

```
Δ$ΔPROCESSORΔ(Δdevice-typeΔ)
Δ$ΔPCΔ(Δdevice-typeΔ)              ; Abbreviated form
```

[Example of use]

- To specify the uPD78F1166_A0 as the target device, describe as:

```
C:\>ra78k0r -cf1166a0 main.asm
```

Object module file output specification

The object module file output specification options are as follows.

- -o/-no

-o/-no

[Description format]

```
-o[output-file-name]
-no
```

- Interpretation when omitted
  -o*input-file-name*.rel

[Function]

- The -o option specifies the output of an object module file. It also specifies the location to which it is output and the file name.
- The -no option disables the -o, -j, -g, and -ga option.

[Application]

- Use the -o option to specify the location to which an object module file is output or to change its file name. Specify the -no option when performing assembly only to output an assemble list file. This will shorten assembly time.

[Description]

- Even if the -o option is specified, when a fatal error occurs, the object module file cannot be output.
- If the drive name is omitted when the -o option is specified, the object module file will be output to the current drive.
- If the output file name is omitted when the -o option is specified, the output file name will be "*input-file-name*.rel".
- If both the -o and -no options are specified at the same time, the option specified last is valid.

[Example of use]

- To output a hex file (sample.rel), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -osample.rel
```

Forced object module file output specification

The forced object module file output specification options are as follows.

- -j/-nj

-j/-nj

[Description format]

```
-j
-nj
```

- Interpretation when omitted
  -nj

[Function]

- The -j option specifies that the object module file can be output even if a fatal error occurs.
- The -nj option disables the -j option.

[Application]

- Normally, when a fatal error occurs, the object module file cannot be output. When you wish to execute the program with a notice that a fatal error has occurred, specify the -j option to output the object module file.

[Description]

- When the -j option is specified, the object module file will be output even if a fatal error occurs.
- If both the -j and -nj options are specified at the same time, the option specified last is valid.
- If the -no option is specified, the -j option is invalid.

[Example of use]

- To output an object module file (k0rmain.rel) even if a fatal error occurs, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -j
```

Debug information output specification

The debug information output specification options are as follows.

- -g/-ng
- -ga/-nga

-g/-ng

[Description format]

```
-g
-ng
```

- Interpretation when omitted
  -g

[Function]

- The -g option specifies that debug information (local symbol information) is to be added to an object module file.
- The -ng option disables the -g option.

[Application]

- Use the -g option when performing symbolic debugging of data that includes local symbol.
- Use the -ng option in the following three cases.

(1) Symbolic debugging of global symbols only

(2) Debugging without symbols

(3) When only the object is required (evaluation using PROM, etc.)

[Description]

- If both the -g and -ng options are specified at the same time, the option specified last is valid.
- If the -g/-ng and -ga/-nga options are specified at the same time, the -ga/-nga option is valid regardless of the position in which it is specified.
- If the -no option is specified, the -g option is invalid.

[Cautions]

- A control instruction (DEBUG/NODEBUG or DG/NODG) with the same function as the -g and -ng options can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔDEBUG
Δ$ΔDG          ; Abbreviated form
Δ$ΔNODEBUG
Δ$ΔNODG        ; Abbreviated form
```

[Example of use]

- To add debug information (local symbol information) to an object module file (k0rmain.rel), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -g
```

-ga/-nga

[Description format]

```
-ga
-nga
```

- Interpretation when omitted
  -ga

[Function]

- The -ga option specifies that assembler source debug information is to be added to an object module file.
- The -nga option disables the -g and -ga option.

[Application]

- Use the -ga option when performing debugging at the source level of the assembler. To perform debugging at the source level, you will need the separately available integrated debugger.
- Use the -nga option in the following three cases.

(1) Debugging without an assembler source

(2) When only the object is required (evaluation using PROM, etc.)

(3) Debugging at the source level of the C compiler

[Description]

- If both the -ga and -nga options are specified at the same time, the option specified last is valid.
- If the -g/-ng and -ga/-nga options are specified at the same time, the -ga/-nga option is valid regardless of the position in which it is specified.
- If the -no option is specified, the -ga option is invalid.

[Cautions]

- A control instruction (DEBUGA/NODEBUGA) with the same function as the -ga and -nga options can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔDEBUGA
Δ$ΔNODEBUGA
```

[Example of use]

- To add assembler source debug information to an object module file (k0rmain.rel), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -ga
```

Include file read path specification

The include file read path specification option is as follows.

- -i

-i

[Description format]

```
-ipath-name[,path-name] ... (two or more path names can be specified)
```

- Interpretation when omitted
  The include file is searched in the following sequence.

(1) Path where the source file exists

(2) Path specified by environmental variable (INC78K0R)

[Function]

- The -i option specifies that an include file specified by "$include" in a source is to be input from a specified path.

[Application]

- Use the -i option to search an include file from a certain path.

[Description]

- Two or more path names can be specified at once by separating them with ",".
- A space cannot be entered before or after ",".
- The include file specified by "$include" is searched in the following sequence.

(1) If two or more path names are specified following the -i option, the include file is searched in the specified order.

(2) If two or more -i options are specified, the include file is searched with the option specified later taking priority.

(3) After the path specified by the -i option is searched, the include file is searched in the same order as interpretation when the option is omitted.

- An abort error occurs if anything other than a path name is specified after -i, or if the path name is omitted.
- An abort error occurs if 65 or more -i options are specified.

[Example of use]

- To search and read an include file from folders C:\sample1 and C:\sample2 in that order, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -iC:\sample1,C:\sample2
```

- To read an include file from folder D:\include files, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -i"D:\include files"
```

Assemble list file output specification

The assemble list file output specification options are as follows.

- -p/-np

-p/-np

[Description format]

```
-p[output-file-name]
-np
```

- Interpretation when omitted
  -p*input-file-name*.prn

[Function]

- The -p option specifies the output of an assemble list file.
  It also specifies the location to which it is output and the file name.
- The -np option disables the -p, -ka, -ks, -kx, -lw, -ll, -lh, -lt, and -lf option.

[Application]

- Use the -p option to specify the location to which an assemble list file is output or to change its file name.
- Specify the -np option when performing assembly only to output an object module file. This will shorten assembly time.

[Description]

- If the output file name is omitted when the -p option is specified, the output file name will be "*input-file-name*.prn".
- If the drive name is omitted when the -p option is specified, the assemble list file will be output to the current drive.
- If both the -p and -np options are specified at the same time, the option specified last is valid.

[Example of use]

- To output an assemble list file (sample.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -psample.prn
```

Assemble list file information specification

The assemble list file information specification options are as follows.

- -ka/-nka
- -ks/-nks
- -kx/-nkx

-ka/-nka

[Description format]

```
-ka
-nka
```

- Interpretation when omitted
  -ka

[Function]

- The -ka option outputs an assemble list into an assemble list file.
- The -nka option disables the -ka option.

[Application]

- Use the -ka option to output an assemble list.

[Description]

- If both the -ka and -nka options are specified at the same time, the option specified last is valid.
- If the -nka, -nks, and -nkx options are all specified, the assemble list file cannot be output.
- If the -np option is specified, the -ka option is invalid.

[Example of use]

- To output an assemble list file into an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -ka
```

The contents of k0rmain.prn is as follows.

```
      Assemble list

ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT
   1     1
   2     2                            NAME    SAMPM
   3     3                     ;****************************************
   4     4                     ;
   5     5                     ;     HEX -> ASCII Conversion Program
   6     6                     ;
   7     7                     ;              main-routine
   8     8                     ;
   9     9                     ;****************************************
  10    10
  11    11                     PUBLIC  MAIN , START
  12    12                     EXTRN   CONVAH
  13    13                     EXTRN   _@STBEG
  14    14
  15    15 -----               DATA    DSEG    AT 0FFE20H
  16    16 FFE20               HDTSA:  DS      1
  17    17 FFE21               STASC:  DS      2
  18    18
  19    19 -----               CODE    CSEG    AT 0H
  20    20 00000 R0000         MAIN:   DW      START
  21    21
  22    22 -----                       CSEG
  23    23 00000               START :
  24    24
  25    25                             ; chip initialize
  26    26 00000 RCBF80000             MOVW    SP , #_@STBEG
  27    27
  28    28 00004  CD201A               MOV     HDTSA , #1AH
  29    29 00007  3620FE               MOVW    HL , #LOWW ( HDTSA )  ; set hex 2-code
data in HL registor
        :
```

-ks/-nks

[Description format]

```
-ks
-nks
```

- Interpretation when omitted
  -nks

[Function]

- The -ks option outputs a symbol list followed by an assemble list into an assemble list file.
- The -nks option disables the -ks option.

[Application]

- Use the -ks option to output a symbol list.

[Description]

- If the -nka, -nks, and -nkx options are all specified, the assemble list file cannot be output.
- If the -ks and -kx options are specified at the same time, -ks is ignored.
- If both the -ks and -nks options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -ks option is invalid.

[Example of use]

- To output a symbol list followed by an assemble list file into an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -ks
```

The contents of k0rmain.prn is as follows.

```
          Symbol Table List

VALUE  ATTR  RTYP NAME

       CSEG       ?CSEG
-----H       EXT  CONVAH
FFE20H ADDR       HDTSA
       MOD        SAMPM
FFE21H ADDR       STASC
```

```
VALUE  ATTR  RTYP NAME

       CSEG            CODE
       DSEG            DATA
    0H ADDR  PUB       MAIN
    0H ADDR  PUB       START
-----H       EXT       _@STBEG
```

-kx/-nkx

[Description format]

```
-kx
-nkx
```

- Interpretation when omitted
  -nkx

[Function]

- The -kx option outputs a cross reference list followed by an assemble list into an assemble list file.
- The -nka option disables the -kx option.

[Application]

- Use the -kx option to output a cross reference list when you wish to know where and to what degree each symbol defined in a source file is referenced in the source, or when you wish to know such information as which line of the assemble list a certain symbol is referenced on.

[Description]

- If the -nka, -nks, and -nkx options are all specified, the assemble list file cannot be output.
- If the -ks and -kx options are specified at the same time, -ks is ignored.
- If both the -kx and -nkx options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -kx option is invalid.

[Cautions]

- A control instruction (XREF/NOXREF or XR/NOXR) with the same function as the -kx and -nkx options can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔXREF
Δ$ΔXR        ; abbreviated form
Δ$ΔNOXREF
Δ$ΔNOXR      ; abbreviated form
```

[Example of use]

- To output a cross reference list followed by an assemble list file into an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -kx
```

The contents of k0rmain.prn is as follows.

```
        Cross-Reference List

NAME     VALUE    R ATTR  RTYP SEGNAME XREFS

?CSEG               CSEG       ?CSEG      22#
CODE                CSEG       CODE       19#
CONVAH   -----H   E       EXT            12@    31
DATA                DSEG       DATA       15#
HDTSA    FFE20H     ADDR       DATA       16#    28     29
MAIN         0H     ADDR  PUB  CODE       11@    20#
SAMPM               MOD                    2#
START        0H   R ADDR  PUB  ?CSEG      11@    20     23#
STASC    FFE21H     ADDR       DATA       17#    33
_@STBEG  -----H   E       EXT            13@    26
```

Assemble list file format specification

The assemble list file format specification options are as follows.

- -lw
- -ll
- -lh
- -lt
- -lf/-nlf

-lw

[Description format]

```
-lw[number-of-characters]
```

- Interpretation when omitted
  -lw132 (80 characters in the case of display output)

[Function]

- The -lw option specifies the number of characters per line in a list file.

[Application]

- Use the -lw option to change the number of characters per line in any type of list file.

[Description]

- The range of number of characters that can be specified with the -lw option is 72 to 2046 (80 characters in the case of display output).
  An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of characters is omitted, it is assumed that 132 has been specified.
  However, when an assemble list file is output to display, it is assumed that 80 has been specified.
- The specified number of characters does not include the terminator (CR, LF).
- If the -np option is specified, the -lw option is invalid.

[Cautions]

- A control instruction (WIDTH) with the same function as the -lw option can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔWIDTH
```

[Example of use]

- To specify 80 as the number of characters per line in an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -lw80
```

The contents of the assemble list file (k0rmain.prn) is as follows.

```
      Assemble list

ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT

   1     1
   2     2                            NAME    SAMPM
   3     3                      ;****************************************
   4     4                      ;
   5     5                      ;     HEX -> ASCII Conversion Program
   6     6                      ;
   7     7                      ;              main-routine
   8     8                      ;
   9     9                      ;****************************************
  10    10
  11    11                      PUBLIC  MAIN , START
  12    12                      EXTRN   CONVAH
  13    13                      EXTRN   _@STBEG
  14    14
  15    15 -----                DATA    DSEG    AT 0FFE20H
  16    16 FFE20                HDTSA:  DS      1
  17    17 FFE21                STASC:  DS      2
  18    18
  19    19 -----                CODE    CSEG    AT 0H
  20    20 00000 R0000          MAIN:   DW      START
  21    21
  22    22 -----                        CSEG
  23    23 00000                START:
  24    24
  25    25                              ; chip initialize
  26    26 00000 RCBF80000      MOVW    SP , #_@STBEG
  27    27
  28    28 00004  CD201A        MOV     HDTSA , #1AH
  29    29 00007  3620FE        MOVW    HL , #LOWW ( HDTSA ) ; set hex 2-code data in
HL registor
        :
```

-ll

[Description format]

```
-ll[number-of-lines]
```

- Interpretation when omitted
  -ll0 (No page breaks)

[Function]

- The -ll option specifies the number of lines per page in an assemble list file.

[Application]

- Use the -ll option to change the number of lines per page in an assemble list file.

[Description]

- The range number of lines that can be specified with the -ll option is 20 to 32767.
- An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of lines is omitted, it is assumed that 0 has been specified.
- If the number of lines specified is 0, no page breaks will be made.
- If the -np option is specified, the -ll option is invalid.

[Cautions]

- A control instruction (LENGTH) with the same function as the -ll option can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔLENGTH
```

[Example of use]

- To specify 20 as the number of lines per page in an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -ll20
```

The contents of k0rmain.prn is as follows.

```
78K0R Assembler Vx.xx                                    Date:xx xxx xxxx  Page:  1

Command:  -cf1166a0 k0rmain.asm -ll20
Para-file:
In-file:  k0rmain.asm
Obj-file: k0rmain.rel
Prn-file: k0rmain.prn

        Assemble list

--------------------------------------------------------------------------------



78K0R Assembler Vx.xx                                    Date:xx xxx xxxx  Page:  2

ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT

   1     1
   2     2                            NAME    SAMPM
   3     3                     ;****************************************
   4     4                     ;
   5     5                     ;     HEX -> ASCII Conversion Program
   6     6                     ;
   7     7                     ;              main-routine
   8     8                     ;

--------------------------------------------------------------------------------



78K0R Assembler Vx.xx                                    Date:xx xxx xxxx  Page:  3


ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT

   9     9                     ;****************************************
  10    10
  11    11                     PUBLIC  MAIN , START
  12    12                     EXTRN   CONVAH
  13    13                     EXTRN   _@STBEG
  14    14
  15    15 -----               DATA    DSEG    AT 0FFE20H
  16    16 FFE20               HDTSA:  DS      1
        :
```

-lh

[Description format]

```
-lhcharacter-string
```

- Interpretation when omitted
  None

[Function]

- The -lh option specifies the character string printed in the title column of the header of an assemble list file.

[Application]

- Use the -lh option to display a title that briefly explains the contents of an assemble list file.
- By printing the title on each page, the contents of the assemble list file can be understood at a glance.

[Description]

- Up to 60 characters can be specified in the title. The character string cannot include blank spaces.
- If more than 61 characters are specified, the first 60 characters will be valid and no error message will be output.
  A kanji and hiragana (2-byte character) is calculated as two characters.
  If the maximum number of characters per line is 119 or less, the length of the effective character string changes as follows.
  Effective length = (Max. number of characters per line) - 60
- An abort error occurs if he character string is not specified.
- If the -np option is specified, the -lh option is invalid.
- If the -lh option is omitted, the title column of the assemble list file will be blank.
- The character set that can be described in the title column is as follows.

Character	In Command Line	In Parameter File
* ? > < |	Can be described if enclosed in " ".	Can be described. Interpreted in the same way as in the command line even if enclosed in " ".
;	Can be described if enclosed in " ".	Cannot be described. (Assumed to be a comment.)
#	Can be described.	Cannot be described. (Assumed to be a comment.)
" (double quotation mark)	Cannot be described as a valid character.	Cannot be described as a valid character.
00H	Cannot be described.	Can be described. However, it is interpreted as the end of the character string.

Character	In Command Line	In Parameter File
03H, 06H, 08H, 0DH, 0EH, 10H, 15H, 17H, 18H, 1BH, 7FH	Cannot be described.	Can be described. However, these will appear in the assemble list file as '!'. (A single 0DH will not be output to the list.)
01H, 02H, 04H, 05H, 07H, 0BH, 0CH, 0FH, 11H, 12H, 13H, 14H, 16H, 19H, 1CH, 1DH, 1EH, 1FH	Can be described. However, these will appear in the assemble list file as '!'.	Can be described. However, these will appear in the assemble list file as '!'.
1AH	Can be described. However, these will appear in the assemble list file as '!'.	Cannot be described. (end of file)
Alphabetic characters	Uppercase and lowercase characters are input as is.	Uppercase and lowercase characters are input as is.
Other	Can be described.	Can be described.

Remark If an asterisk (*) on the startup line is not a target for wild card expansion, it can be written even if it is not enclosed in " ".

[Cautions]

- A control instruction (TITLE or TT) with the same function as the -lh option can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔTITLEΔ(Δ'character-string'Δ)
Δ$ΔTTΔ(Δ'character-string'Δ)          ; abbreviated form
```

[Example of use]

- To print the title "RA78K0R_MAINROUTINE" in the header of an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -lhRA78K0R_MAINROUTINE
```

The contents of k0rmain.prn is as follows.

```
78K0R Assembler Vx.xx   RA78K0R_MAINROUTINE     Date:xx xxx xx  Page:1
                                |
                              Title


Command:  -cf1166a0 k0rmain.asm -lhRA78K0R_MAINROUTINE
Para-file:
In-file:  k0rmain.asm
Obj-file: k0rmain.rel
Prn-file: k0rmain.prn


        Assemble list


ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT
```

```
1     1
2     2                          NAME    SAMPM
3     3                    ;*****************************************
4     4                    ;
5     5                    ;     HEX -> ASCII Conversion Program
6     6                    ;
7     7                    ;              main-routine
      :
```

-lt

[Description format]

```
-lt[number-of-characters]
```

- Interpretation when omitted
  -lt8

[Function]

- The -lt option specifies the basic number of characters for outputting a horizontal tabulation (HT) code in the source file, replacing it with several blanks (spaces) in each list (tabulation processing).

[Application]

- Use the -lt option to reduce the number of characters per line by reducing the number of blanks per HT code, for example when a small number of characters per line has been specified for lists via the -lw option.

[Description]

- The range number of characters that can be specified with the -lt option is 0 to 8.
- An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of characters is omitted, it is assumed that 8 has been specified.
- If -lt0 is specified, tabulation processing will not be performed, and a tabulation code will be output.
- If the -np option is specified, the -lt option is invalid.

[Cautions]

- A control instruction (TAB) with the same function as the -lt option can be described at the beginning of the source. The description format is shown below.

```
Δ$ΔTABΔnumber-of-tabs
```

[Example of use]

- To reference an assemble list file (sample.prn) when the -lt option is omitted, describe as:

```
C:\>ra78k0r -cf1166a0 sample.asm
```

The contents of sample.prn is as follows.

```
      Assemble list

ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT

   1     1
   2     2                            NAME    SAMPM
   3     3                     ;****************************************
   4     4                     ;
   5     5                     ;     HEX -> ASCII Conversion Program
   6     6                     ;
   7     7                     ;              main-routine
   8     8                     ;
   9     9                     ;****************************************
  10    10
  11    11                     PUBLIC  MAIN , START
  12    12                     EXTRN   CONVAH
  13    13                     EXTRN   _@STBEG
  14    14
  15    15    -----            DATA    DSEG    AT 0FFE20H
  16    16    FFE20            HDTSA:  DS      1
  17    17    FFE21            STASC:  DS      2
  18    18
  19    19    -----            CODE    CSEG    AT 0H
  20    20    00000 R0000      MAIN:   DW      START
        :
```

- To specify 1 blank entered by the HT code, describe as:

```
C:\>ra78k0r -cf1166a0 sample.asm -lt1
```

The contents of sample.prn is as follows.

```
       Assemble list

ALNO  STNO ADRS   OBJECT   M I  SOURCE STATEMENT

   1     1
   2     2                            NAME    SAMPM
   3     3                     ; ****************************************
   4     4                     ;
   5     5                     ;       HEX -> ASCII Conversion Program
   6     6                     ;
   7     7                     ;             main-routine
   8     8                     ;
   9     9                     ; ****************************************
  10    10
```

```
11    11                      PUBLIC  MAIN , START
12    12                      EXTRN   CONVAH
13    13                      EXTRN   _@STBEG
14    14
15    15 -----                DATA    DSEG    AT 0FFE20H
16    16 FFE20                HDTSA:  DS      1
17    17 FFE21                STASC:  DS      2
18    18
19    19 -----                CODE    CSEG    AT 0H
20    20 00000 R0000          MAIN:   DW      START
      :
```

Remark The number of blanks entered by the HT code is 1.

-lf/-nlf

[Description format]

```
-lf
-nlf
```

- Interpretation when omitted
  -nlf

[Function]

- The -lf option inserts a form feed (FF) code at the end of an assemble list file.
- The -nlf option disables the -lf option.

[Application]

- Use the -lf option to insert a form feed code if you wish to add a page break after the contents of an assemble list file are printed.

[Description]

- If the -np option is specified, the -lf option is invalid.
- If both the -lf and -nlf options are specified at the same time, the option specified last takes precedence.

[Cautions]

- A control instruction (FORMFEED/NOFORMFEED) with the same function as the -lf and -nlf options can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔFORMFEED
Δ$ΔNOFORMFEED
```

[Example of use]

- To insert a form feed code at the end of an assemble list file (k0rmain.prn), describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -p -lf
```

Error list file output specification

The error list file output specification options are as follows.

- -e/-ne

-e/-ne

[Description format]

```
-e[output-file-name]
-ne
```

- Interpretation when omitted
  -ne

[Function]

- The -e option specifies the output of an error list file. It also specifies the location to which it is output and the file name.
- The -ne option disables the -e option.

[Application]

- Use the -e option to save an error message into a file.
- Use the -e option to specify the location to which an error list file is output or to change its file name.

[Description]

- If the output file name is omitted when the -e option is specified, the output file name will be "*input-file-name*.era".
- If the drive name is omitted when the -e option is specified, the error list file will be output to the current drive.
- If both the -e and -ne options are specified at the same time, the option specified last is valid.

[Example of use]

- To output an error list file k0rmain.era, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -ek0rmain.era
```

```
78K0R Assembler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
PASS1 Start
k0rmain.asm(31) : RA78K0 error E2202: lllegal operand
PASS2 Start
k0rmain.asm(26) : RA78K0 error E2312: Operand out of range ( byte )
k0rmain.asm(31) : RA78K0 error E2202: lllegal operand
 Target chip : uPD78F1166_A0
 Device file : Vx.xx

Assembly complete, 3 error(s) and 0 warning(s) found.
```

The contents of k0rmain.era is as follows.

```
PASS1 Start
k0rmain.asm(31) : RA78K0R error E2202: lllegal operand
PASS2 Start
k0rmain.asm(26) : RA78K0R error E2312: Operand out of range ( byte )
k0rmain.asm(31) : RA78K0R error E2202: lllegal operand
```

Parameter file specification

The parameter file specification option is as follows.

- -f

-f

[Description format]

```
-ffile-name
```

- Interpretation when omitted
  Options and input file names can only be input from the command line.

[Function]

- The -f option inputs options and input file names from a specified file.

[Application]

- Use the -f option when the information required to start up the assembler will not fit on the command line.
- When specifying options repeatedly every time you perform assembly, describe the options in the parameter file and specify the -f option.

[Description]

- An abort error occurs if the file name is omitted.
- Nesting of parameter files is not permitted. An abort error occurs if the -f option is specified within a parameter file.
- The number of characters that can be described within a parameter file is unlimited.
- Separate options or input file names with a blank space, a tab or the line feed code (LF).
- Options and input file names within a parameter file will be expanded at the position specified for the parameter file on the command line.
- The expanded options specified last takes precedence.
- The characters following ";" or "#" are all assumed to be comments, up to the line feed code (LF) or EOF.
- An abort error occurs if the -f option is specified two or more times.

[Example of use]

- Perform assembly using a parameter file.
  Set the contents of the parameter file (k0rmain.pra) as follows.

```
; parameter file

k0rmain.asm -osample.rel -g -cf1166a0
-psample.prn
```

Enter the following from the command line.

```
C:\>ra78k0r -fk0rmain.pra
```

Temporary file creation path specification

The temporary file creation path specification option is as follows.

- -t

-t

[Description format]

```
-tpath-name
```

- Interpretation when omitted
  Path specified by environmental variable TMP
  Current path, if no path is specified.

[Function]

- The -t option specifies a path in which a temporary file is created.

[Application]

- Use the -t option to specify the location for creation of a temporary file.

[Description]

- Only a path can be specified as a path name.
- The path name is cannot be omitted.
- Even if a previously created temporary file exists, if the file is not protected it will be overwritten.
- As long as the required memory size is available, the temporary file will be expanded in memory.
  If not enough memory is available, the contents of the temporary file will be written to a disk.
  Such temporary files may be accessed later through the saved disk file.
- Temporary files are deleted when assembly is finished. They are also deleted when assembly is aborted by pressing the keys ([CTRL] + [C] key).
- The path in which the temporary file is created is determined according to the following sequence.

(1) The path specified by the -t option

(2) Path specified by environmental variable TMP (when the -t option is omitted)

(3) Current path (when TMP is not set)

Caution When (1) or (2) is specified, if the temporary file cannot be created in the specified path, an abort error occurs.

[Example of use]

- To output a temporary file to folder C:\tmp, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -tC:\tmp
```

- To output a temporary file to folder D:\temporary files, describe as:

```
C:\>ra78k0r -cf1166a0 k0rmain.asm -t"D:\temporary files"
```

Kanji code (2-byte code) specification

The kanji code (2-byte code) specification options are as follows.

- -zs/-ze/-zn

-zs/-ze/-zn

[Description format]

```
-zs
-ze
-zn
```

- Interpretation when omitted
  -zs

[Function]

- Kanji (2-byte character) described in the comment is interpreted as the specified kanji code (2-byte code).
- Kanji code is interpreted as follows depending on the option
  -zs: Shift-JIS code
  -ze: EUC code
  -zn: Not interpreted as kanji

[Application]

- Use these options to specify the interpretation of the kanji code in the comment line.

[Description]

- If the -zs, -ze, and -zn options are specified at the same time, the option specified last is valid.
- A control instruction (KANJICODE) with the same function as the -zs, -ze, and -zn option can be described at the beginning of the source.
  The description format is shown below.

```
Δ$ΔKANJICODEΔSJIS
Δ$ΔKANJICODEΔEUC
Δ$ΔKANJICODEΔNONE
```

- Kanji code can also be specified by using the environmental variable LANF78K.

[Example of use]

- To interpret the kanji code as EUC code, describe as:

```
C:\>ra78k0r k0rmain.asm -cf1166a0 -ze
```

Device file search path specification

The device file search path specification option is as follows.

- -y

-y

[Description format]

```
-ypath-name
```

- Interpretation when omitted
  The path from which the device file is read is determined according to the following sequence.

(1) Path registered in the device file installer

(2) Path by which the ra78k0r.exe was started up

(3) Current folder

(4) The environmental variable PATH

[Function]

- The -y option reads a device file from the specified path.

[Application]

- Use the -y option to specify a path where a device file exists.

[Description]

- An abort error occurs if something other than a path name is specified after the -y option.
- An abort error occurs if the path name is omitted after the -y option.
- The path from which the device file is read is determined according to the following sequence.

(1) The path specified by the -y option

(2) Path registered in the device file installer

(3) Path by which the RA78K0R was started up

(4) Current folder

(5) The environmental variable PATH

[Example of use]

- To specify the path for the device file as folder C:\78k0r\dev, describe as:

```
C:\>ra78k0r k0rmain.asm -cf1166a0 -yC:\78k0r\dev
```

- To specify the path for the device file as folder D:\device files, describe as:

```
C:\>ra78k0r k0rmain.asm -cf1166a0 -y"D:\device files"
```

Symbol definition specification

The symbol definition specification option is as follows.

- -d

-d

[Description format]

```
-dsymbol-name[=value][,symbol-name[=value] ... ]
```

- Interpretation when omitted
  None

[Function]

- The -d option defines symbols.

[Application]

- Use the -d option to define symbols.

[Description]

- The value given to a symbol is binary, octal, decimal, or hexadecimal. If the value is omitted, it is assumed that 1 has been specified.
- Up to 30 symbols can be specified by using a comma as a delimiter.
- Up to 31 characters can be described for a symbol name.
- If duplicate names are specified, the symbol specified last is valid.
- Uppercase characters and lowercase characters are distinguished for symbol names.
  Symbols defined with -d are used instead of EQU/$SET/$RESET. An abort error occurs if a symbol name specified for -d was also defined in the source.

[Example of use]

- To specify 2 as the symbol definition, describe as:

```
C:\>ra78k0r k0rmain.asm -cf1166a0 -dSYM=2
```

Common object specification

The common object specification option is as follows.

- -common

-common

[Description format]

```
-common
```

- Interpretation when omitted
  The object file for the specified device is output.

[Function]

- The -common option specifies the output of an object module file common to the RL78 and 78K0R.

[Application]

- Use the -common option to generates an object code that can be used commonly in the RL78 and 78K0R, regardless of the device type specification option (-c).
  The output object module file can be linked with an object file for which a different device in the RL78 and 78K0R is specified.

[Description]

- Specify this option to generate an object code that can be used commonly in the RL78 and 78K0R.

[Cautions]

- Even when the -common option is specified, the device type specification option (-c) or control instruction of the same function must not be omitted.
  An abort error occurs if the common object specification option (-common) is specified for all the input object module files to be linked.

[Example of use]

- To generate an object code that can be used commonly in the RL78 and 78K0R, describe as:

```
C:\>ra78k0r k0rsub.c -cf1166a0 -common
```

78K0 compatible macro

The 78K0 compatible macro options are as follows.

- -compati/-ncompati

-compati/-ncompati

[Description format]

```
-compati
-ncompati
```

- Interpretation when omitted
  -ncompati

[Function]

- The -compati option enables assembly of assembler source files generated by the 78K0 assembler.
- The -ncompati option disables the -compati option.

[Application]

- A fatal error (E2337) occurs if an attempt is made to assemble an assembler source file that includes instructions for the 78K0, which normally cannot be used for the RL78 and 78K0R.
  Specify the -compati option to assemble an assembler source without changing the following 78K0 instructions that cannot be used for the RL78 and 78K0R.
  DIVUW/ROR4/ROL4/ADJBA/ADJBS/CALLF/DBNZ

[Description]

- When the -compati option is specified, the assembler includes file "..\inc78k0r\compati.inc" (for the path through which ra78k0r.exe is activated) and performs macro conversion for 78K0 instructions that cannot be used for the RL78 and 78K0R.

[Example of use]

- To perform macro conversion for 78K0 instructions that are removed from the RL78 and 78K0R, describe as:

```
C:\>ra78k0r k0rsub.asm -cf1166a0 -compati
```

Help specification

The help option is as follows.

- --

--

[Description format]

```
--
```

- Interpretation when omitted
  No display

[Function]

- The -- option outputs a help message on the display.

[Application]

- The help message is a list of explanations of the assemble options. See these when executing the assembler.

[Description]

- When the -- option is specified, all other options are invalid.
- To read the next part of the help message, press the return key.
  To quit the help display, press any key other than the return key and then press the return key.

Caution This option cannot be specified from CubeSuite+.

[Example of use]

- To output a help message on the display, describe as:

```
C:\>ra78k0r --
```

```
78K0R Assembler Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

usage : ra78k0r [option[...]] input-file [option[...]]
The option is as follows ([] means omissible).
-cx          :Select target chip. (x = f1166a0 etc.) * Must be specified.
-o[file]/-no :Create the object module file [with the specified name] / Not.
-e[file]/-ne :Create the error list file [with the specified name] / Not.
-p[file]/-np :Create the print file [with the specified name] / Not.
-ka/-nka     :Output the assemble list to print file / Not.
-ks/-nks     :Output the symbol table list to print file / Not.
-kx/-nkx     :Output the cross reference list to print file / Not.
-lw[width]   :Specify print file columns per line.
-ll[length]  :Specify print file lines per page.
-lf/-nlf     :Add Form Feed at end of print file / Not.
-lt[n]       :Expand TAB character for print file(n=1 to 8) / Not expand(n=0).
-lhstring    :Print list header with the specified string.
-g/-ng       :Output debug information to object file / Not.
-j/-nj       :Create object file if fatal error occurred / Not.
-idirectory[,directory ...] :Set include search path.
-tdirectory  :Set temporary directory.
-ydirectory  :Set device file search path.
-ffile       :Input option or source module file name from specified file.
-ga/-nga     :Output assembler source debug information to object file / Not.
-dname[=data][,name[=data][...]] :Define name [with data].
-common      :Create the common object module file for 78k0r.
-self        :Use Self-programming.
-zs/-ze/-zn  :Change source regulation.
               -zs:SJIS code usable in comment.
               -ze:EUC code usable in comment.
               -zn:no multibyte code in comment.
-compati/-nocompati :Use macro for DIVUW,ROR4,ROL4,ADJBA,ADJBS,CALLF,DBNZ / Not.
--           :Show this message.
DEFAULT ASSIGNMENT :
          -o -ne -p -ka -nks -nkx -lw132 -ll0 -nlf -lt8 -g -nj -ga
```

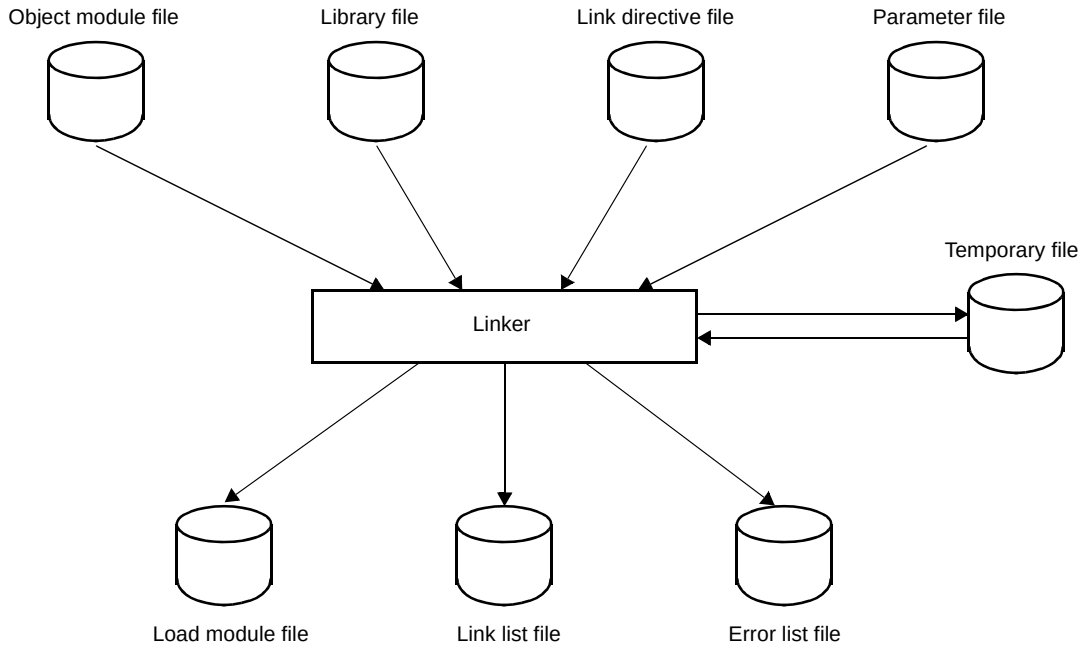
B.3 Linker

The linker inputs a number of object module files output by the RL78 and 78K0R assembler, determines a location address and outputs them as a single load module file.

The linker also outputs list files such as a link list file and an error list file.

If a link error occurs, an error message is output to an error list file to clarify the cause of the error. When an error occurs, the load module file will not be output.

Figure B-5. I/O Files of Linker



B.3.1 I/O files

The I/O files of the linker are shown below.

See "3.3 Linker" for details about output lists.

Table B-8. I/O Files of Linker

Type	File Name	Explanation	Default File Type
Input files	Object module file	- Binary file containing relocation information and symbol information regarding machine language information and machine language location addresses - File output by the assembler	.rel
	Library file	- File in which two or more object module files are included - File output by the librarian	.lib
	Link directive file	- File which contain link directives for the linker (user-created file)	.dr
	Parameter file	- File containing the parameters for the executed programs (user-created file)	.plk

Type	File Name	Explanation	Default File Type
Output files	Load module file	- Binary image file which contain all information created as a result of linking This file is input to the object converter.	.lmf
	Link list file	- List file which display the result of linking	.map
	Error list file	- File containing error information generated during linking	.elk
I/O files	Temporary file	- File created automatically by the linker for linking purposes Temporary files are deleted when linking ends.	LK*xxxxx*.$$n (n = 1 to 3)

B.3.2 Functions

(1) Joining of input segments

The linker determines and controls the location address of each segment.
The linker identifies identical segments and joins them into a single segment, even if they are in separate object module files.

(2) Determination of input modules

When a library file is specified for input, the module to which an input object module file refers is retrieved from the library and handled as an input module.

(3) Determination of location addresses for input segments

The linker determines location addresses for each segment of an input module. If location attributes for a segment are specified in the source file, the segment is located according to those attributes. The linker can also specify location attributes in the link directive file of the linker.

(4) Correction of object codes

When location addresses are buried in object codes, the linker corrects the object code according to the location address determined in (3) above.

B.3.3 Method for manipulating

(1) Linker startup

The following two methods can be used to start up the linker.

(a) Startup from the command line

```
X:[path-name]>lk78K0R[Δoption]...object-module-file-name[Δoption]...
```

X	Current drive name
path-name	Current folder name
lk78k0r	Command name of the linker

option	Enter detailed instructions for the operation of the linker. When specifying two or more link options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the link options. See "B.3.4 Option" for details about link options. Enclose a path that includes a space in a pair of double quotation marks (" ").
object-module-file-name	File name of object module to be linked Up to 1024 items can be input as an input module. Enclose the file name of a path that includes a space in a pair of double quotation marks (" ").

Example To add debug information to a load module file (k0r.lmf), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -ok0r.lmf -g
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the linker will not fit on the command line, or when the same link option is specified repeatedly each time linking is performed.

To start up the linker from a parameter file, specify the parameter file option (-f) on the command line.

Start up the linker from a parameter file as follows:

```
X>lk78k0r[Δobject-module-file]Δ-fparameter-file-name
```

-f	Parameter file specification option
parameter-file-name	A file which includes the data required to start up the linker

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the source file name is omitted from the command line, only 1 source file name can be specified in the parameter file.
- The source file name can also be written after the option.
- Write in the parameter file all link options and output file names specified in the command line.

Example Create a parameter file k0r.plk using an editor, and then start up the linker.

```
; parameter file
k0rmain.rel k0rsub.rel -ok0r.lmf -pk0r.map -e
-tC:\tmp
```

```
C:\>lk78k0r -fk0r.plk
```

(2) Execution start and end messages

(a) Execution start message

When the linker is started up, an execution startup message appears on the display.

```
78K0R Linker Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
```

(b) Execution end message

If it detects no link errors resulting from the link, the linker outputs the following message to the display and returns control to the host operating system.

```
Target chip : uPD78xxx
Device file : Vx.xx

Link complete, 0 error(s) and 0 warning(s) found.
```

If it detects a link errors resulting from the link, the linker outputs the number of errors and warnings to the display and returns control to the host operating system.

```
Target chip : uPD78xxx
Device file : Vx.xx

Link complete, 1 error(s) and 0 warning(s) found.
```

If the linker detects a fatal error during linking which makes it unable to continue link processing, the linker outputs a message to the display, cancels linking and returns control to the host operating system.

- A non-existent object module file is specified.

```
C:\>lk78k0r samp1.rel samp2.rel
```

```
78K0R Linker Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F3006 : File not found 'samp1.rel'
RA78K0R error F3006 : File not found 'samp2.rel'
Program Aborted.
```

In the above example, a non-existent object module file is specified. An error occurs and the linker aborts the link.

- A non-existent link option is specified.

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -z
```

```
78K0R Linker Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F3018 : Option is not recognized '-z'
Please enter 'LK78K0R --' , if you want help messages.
Program Aborted.
```

In the above example, a non-existent link option is specified. An error occurs and the linker aborts the link.

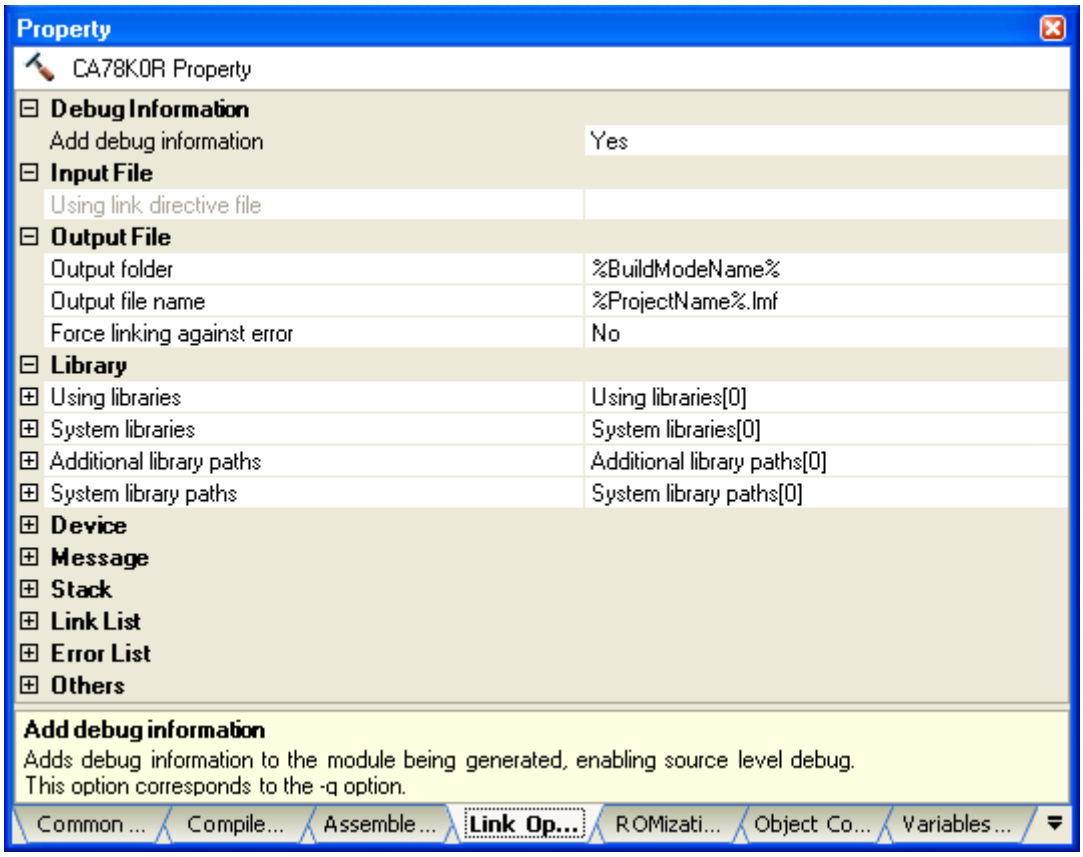
(3) Set options in CubeSuite+

This section describes how to set link options from CubeSuite+.

On CubeSuite+'s Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu. The Property panel opens. Next, select the [Link Options] tab.

You can set the various link options by setting the necessary properties in this tab.

Figure B-6. Property Panel: [Link Option] Tab



B.3.4 Option

(1) Types

The link options are detailed instructions for the operation of the linker.
The types and explanations for link options are shown below.

Table B-9. Link Options

Classification	Option	Description
Load module file output specification	-o	Specifies the output of a load module file.
	-no	
Forced load module file output specification	-j	Forces the output of a load module file.
	-nj	
Debug information output specification	-g	Specifies that debug information is to be added to a load module file.
	-ng	
Stack decision symbols generation specification	-s	Automatically generates public symbols for stack decision.
	-ns	
Link directive file specification	-d	Inputs the specified file as a link directive file.
Link list file output specification	-p	Specifies the output of a link list file.
	-np	
Link list file information specification	-km	Outputs a map list into a link list file.
	-nkm	
	-kd	Outputs a link directive file into a link list file.
	-nkd	
	-kp	Outputs a public symbol list into a link list file.
	-nkp	
	-kl	Outputs a local symbol list into a link list file.
	-nkl	
Link list file format specification	-ll	Changes the number of lines printed per page in a link list file.
	-lf	Inserts a form feed code at the end of a link list file.
	-nlf	
Error list file output specification	-e	Outputs an error list file.
	-ne	
Library file specification	-b	Inputs the specified file as a library file.
Library file read path specification	-i	Reads a library file from a specified path.
Parameter file specification	-f	Inputs the input file name and options from a specified file.
Temporary file creation path specification	-t	Creates a temporary file in the specified path.
Device file search path specification	-y	Reads a device file from a specified path.

Classification	Option	Description
Warning message output specification	-w	Specifies whether or not a warning message is output to the console.
Boot area ROM program linking specification for a product with built-in flash memory	-zb	Specifies the start address of the flash memory area.
On-chip debug specification	-go	Specifies whether on-chip debug is used or not.
Security ID specification	-gi	Specifies a security ID.
User option byte specification	-gb	Specifies the value set for the user option byte.
Mirror area specification	-mi	Specifies the allocation destinations of segments in the mirrored area.
64 KB boundary allocation specification	-ccza	Specifies whether to allocate a segment to the last byte of each 64 KB boundary area.
	-nccza	
Self RAM area allocation control	-self	Specifies whether to restrict allocation to the self RAM area.
	-selfw	
Copy routine address specification	-rc	Specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.
ROMization area specification	-ra	Specifies the ROMization target area.
Help specification	--	Outputs a help message on the display.

(2) Precedence

For the link options shown in the following table, the precedence is explained in a case where two or more options along the vertical axis and options along the horizontal axis are specified at the same time.

Table B-10. Precedence of Link Options

	-no	-ng	-np	-nkm	-nkp	-nkl	--
-j	NG						NG
-g	NG						NG
-p				Δ	Δ	Δ	NG
-km			NG				NG
-kd			NG	NG			NG
-kp		NG	NG				NG
-kl		NG	NG				NG
-ll			NG				NG
-lf			NG				NG

- Location marked with NG

  If an option in the horizontal axis is specified, the option in the vertical axis is invalid.

Example The -km option is invalid.

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -np -km
```

- Location marked with Δ
  If all three of the options in the horizontal axis are specified at the same time, the option in the vertical axis is invalid.

  Example If the -nkm, -nkp, and -nkl options are specified at the same time, the -p option is invalid.

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -p -nkm -nkp -nkl
```

- Blank area
  If an option in the horizontal axis is specified, the option in the vertical axis is valid.

As with the -o/-no options, if two options for which "n" can be added to the beginning of the option name are specified at the same time, the option specified last is valid.

Example The -no option is specified after the -o option, so the -o option is invalid and the -no option is valid.

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -o -no
```

Options not described in "Table B-10. Precedence of Link Options" are not particularly affected by other options. However, if the help specification option (--) is specified, all of other option specifications become invalid.

Load module file output specification

The load module file output specification options are as follows.

- -o/-no

-o/-no

[Description format]

```
-o[output-file-name]
-no
```

- Interpretation when omitted
  -o*input-file-name*.lmf

[Function]

- The -o option specifies the output of a load module file.
  It also specifies the location to which it is output and the file name.
- The -no option disables the -o, -j, and -g option.

[Application]

- Use the -o option to specify the location to which a load module file is output or to change its file name.
- Specify the -no option when performing linking only to output a link list file. This will shorten link time.

[Description]

- Even if the -o option is specified, when a fatal error occurs, the load module file cannot be output.
- If "*output-file-name*" is omitted when the -o option is specified, the load module file "*input-file-name*.lmf" will be output to the current folder.
- If only the path name is specified in "*output-file-name*", "*input-file-name*.lmf" will be output to the specified path.
- If both the -o and -no options are specified at the same time, the option specified last is valid.

[Example of use]

- To output a load module file (k0r.lmf), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -ok0r.lmf
```

Forced load module file output specification

The forced load module file output specification options are as follows.

- -j/-nj

-j/-nj

[Description format]

```
-j
-nj
```

- Interpretation when omitted
  -nj

[Function]

- The -j option specifies that the load module file can be output even if a fatal error occurs.
- The -nj option disables the -j option.

[Application]

- Normally, when a fatal error occurs, the load module file cannot be output.
  When you wish to execute the command with a notice that a fatal error has occurred, specify the -j option to output the load module file.

[Description]

- When the -j option is specified, the load module file will be output even if a fatal error occurs.
- If both the -j and -nj options are specified at the same time, the option specified last is valid.
- If the -no option is specified, the -j option is invalid.

[Example of use]

- To output a load module file (k0rsub.lmf) even if a fatal error occurs, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -j
```

Debug information output specification

The debug information output specification options are as follows.

- -g/-ng

-g/-ng

[Description format]

```
-g
-ng
```

- Interpretation when omitted

  -g

[Function]

- The -g option specifies that debug information (local symbol information) is to be added to a load module file.
- The -ng option disables the -g, -kp, and -kl option.

[Application]

- Be sure to use the -g option when performing symbolic debugging with the source debugger.

[Description]

- If the -ng option is specified, the public symbol list and local symbol list cannot be output.
- If both the -g and -ng options are specified at the same time, the option specified last is valid.
- If the -no option is specified, the -g option is invalid.

[Example of use]

- To add debug information to a load module file (k0rsub.lmf), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -g
```

Stack decision symbols generation specification

The stack decision symbols generation options are as follows.

- -s/-ns

-s/-ns

[Description format]

```
-s[area-name]
-ns
```

- Interpretation when omitted
  -ns

[Function]

- The -s option generates the stack decision public symbols "_@STBEG" and "_@STEND".
- The -ns option disables the -s option.

[Application]

- Use the -s option to reserve a stack area.

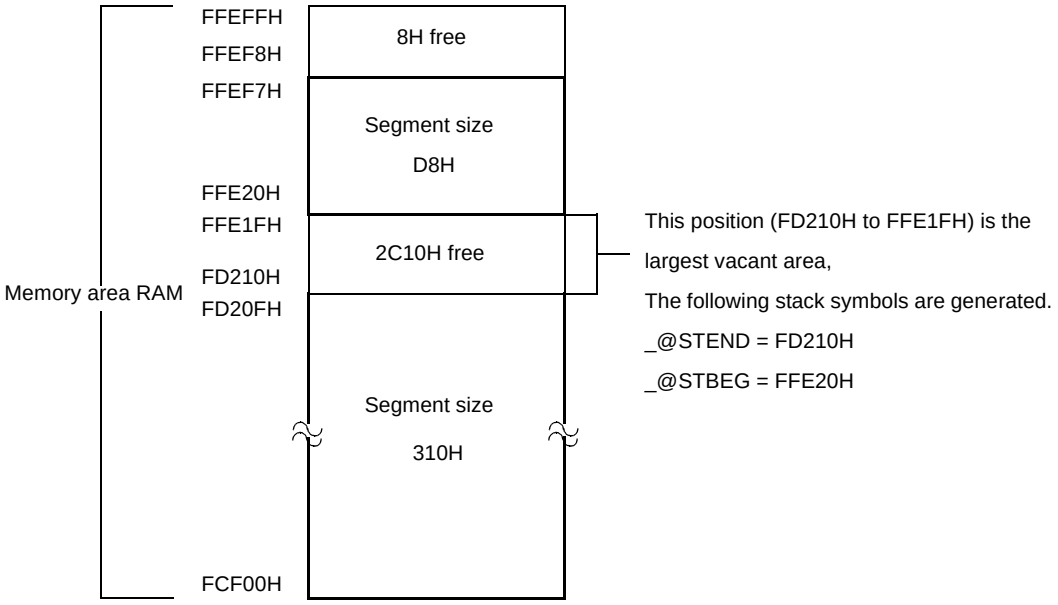
[Description]

- Specify a memory area name defined by the user or a memory area name defined by default as *area-name*.
- Uppercase characters and lowercase characters are distinguished for *area-name*.
- The linker searches the memory area specified by the -s option for the largest vacant area in which no segment is allocated. The linker then generates public symbol "_@STEND", which holds the start address of the largest vacant area as its value, and public symbol "_@STBEG", which holds the end address +1 as its value.
  These symbols are handled as publicly declared NUMBER attribute symbols, and are registered at the end of the linker's symbol table. When these symbols are output to a link list file, the module name column is left blank.
- If the largest vacant area is 10 bytes or smaller, a warning message is output.
- If no vacant area exists, a warning message is output and both "_@STEND" and "_@STBEG" hold the end address + 1 as their values.
- If *area-name* is omitted, it is assumed that "RAM" has been specified.
- If both the -s and -ns options are specified at the same time, the option specified last is valid.

[Example of use]

- To reserve a stack area in memory area RAM, describe as:
  However, the linker will assume that a segment of size 310H in RAM area and a segment of size D8H allocated in the saddr area are input.

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -s
```


FFEFFH
FFEF8H
FFEF7H
FFE20H
FFE1FH
FD210H
FD20FH
FCF00H
Memory area RAM
8H free
Segment size
D8H
2C10H free
Segment size
310H
This position (FD210H to FFE1FH) is the
largest vacant area,
The following stack symbols are generated.
_@STEND = FD210H
_@STBEG = FFE20H

Link directive file specification

The link directive file specification option is as follows.

- -d

-d

[Description format]

```
-dfile-name
```

- Interpretation when omitted
  None

[Function]

- The -d option specifies that the specified file is to be input as a link directive file.

[Application]

- When you wish to define a new memory area, redefine the default memory area, or allocate a segment to a specific address or memory area, you will need to create a link directive file. Use the -d option to input this link directive file to the linker.

[Description]

- An abort error occurs if the file name is omitted.
- Nesting of link directive files is not permitted.
- The number of characters that can be described within a link directive file is unlimited.
- An abort error occurs if the -d option is specified two or more times, or if two or more file names are specified.
- See "CubeSuite+ RL78,78K0R Coding" for details about link directive files.

[Example of use]

- Redefine the default memory area ROM/RAM.
  The contents of the link directive file (k0r.dr) is as follows.

```
MEMORY ROM : ( 0H , 40000H )
MEMORY RAM : ( 0FCF00H , 3000H )
```

To link the link directive file (k0r.dr), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -dk0r.dr
```

Link list file output specification

The link list file output specification options are as follows.

- -p/-np

-p/-np

[Description format]

```
-p[output-file-name]
-np
```

- Interpretation when omitted
  -p*input-file-name*.map

[Function]

- The -p option specifies the output of a link list file. It also specifies the location to which it is output and the file name.
- The -np option disables the -p, -km, -kd, -kp, -kl, -ll, and -lf option.

[Application]

- Use the -p option to specify the location to which a link list file is output or to change its file name.
- Specify the -np option when performing linking only to output a load module file. This will shorten link time.

[Description]

- If "*output-file-name*" is omitted when the -p option is specified, the link list file "*input-file-name*.map" will be output to the current folder.
- If only the path name is specified in "*output-file-name*", "*input-file-name*.map" will be output.
- If both the -p and -np options are specified at the same time, the option specified last is valid.

[Example of use]

- To create a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -pk0r.map
```

Link list file information specification

The link list file information specification options are as follows.

- -km/-nkm
- -kd/-nkd
- -kp/-nkp
- -kl/-nkl

-km/-nkm

[Description format]

```
-km
-nkm
```

- Interpretation when omitted
  -km

[Function]

- The -km option outputs a map list into a link list file.
- The -nkm option disables the -kd and -km option.

[Application]

- Use the -km option to output a map list into a link list file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link list file cannot be output.
- If the -nkm option is specified, the link directive file cannot be output into a link list file.
- If both the -km and -nkm options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -km option is invalid.

[Example of use]

- To output a map list into a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -s -pk0r.map -km
```

The contents of k0r.map is as follows.

```
78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   1

Command:    k0rmain.rel k0rsub.rel -s -pk0r.map -km
Para-file:
Out-file:   k0rmain.lmf
Map-file:   k0r.map
Direc-file:
Directive:

*** Link information ***

     4 output segment(s)
   5FH byte(s) real data
    41 symbol(s) defined

*** Memory map ***

  SPACE=REGULAR

  MEMORY=ROM
  BASE ADDRESS=00000H   SIZE=40000H
         OUTPUT   INPUT    INPUT    BASE     SIZE
         SEGMENT  SEGMENT  MODULE   ADDRESS
         CODE                       00000H   00002H   CSEG AT
                  CODE     SAMPM    00000H   00002H
* gap *                             00002H   000BEH
         ?CSEGOB0                   000C0H   00004H   CSEG OPT_BYTE
         ?CSEG                      000C4H   00059H   CSEG
                  ?CSEG    SAMPM    000C4H   00017H
                  ?CSEG    SAMPS    000DBH   00042H
* gap *                             0011DH   3FEE3H

  MEMORY=LRAM
  BASE ADDRESS=FCF00H   SIZE=03100H
         OUTPUT   INPUT    INPUT    BASE     SIZE
         SEGMENT  SEGMENT  MODULE   ADDRESS
* gap *                             FCF00H   02F20H
         DATA                       FFE20H   00003H   DSEG AT
                  DATA     SAMPM    FFE20H   00003H
* gap *                             FFE23H   000DDH
* gap (Not Free Area) *             FFF00H   00100H
```

-kd/-nkd

[Description format]

```
-kd
-nkd
```

- Interpretation when omitted
  -kd

[Function]

- The -kd option outputs a link directive into a link list file.
- The -nkd option disables the -kd option.

[Application]

- Use the -kd option to output a link directive file into a link list file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link list file cannot be output.
- If the -nkm option is specified, the link directive file cannot be output into a link list file.
- If both the -kd and -nkd options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -kd option is invalid.

[Example of use]

- To output a link directive file into a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -s -dk0r.dr -pk0r.map -kd
```

The contents of k0r.map is as follows.

```
78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   1


Command:    k0rmain.rel k0rsub.rel -s -dk0r.dr -pk0r.map -kd
Para-file:
Out-file:   k0rmain.lmf
Map-file:   k0r.map
Direc-file: k0r.dr                          <- Link directive file name
Directive:  MEMORY ROM : ( 0H , 0ED800H )   <- Contents of link directive file
            MEMORY RAM : ( 0FCF00H , 1100H )
            MEMORY RAM : ( 0FE000H , 1F00H )


*** Link information ***
```

```
     6 output segment(s)
   9DH byte(s) real data
    40 symbol(s) defined

*** Memory map ***

  SPACE=REGULAR

  MEMORY=ROM
  BASE ADDRESS=00000H   SIZE=ED800H
         OUTPUT   INPUT    INPUT    BASE     SIZE
         SEGMENT  SEGMENT  MODULE   ADDRESS
         CODE                       00000H   00002H   CSEG AT
          :
```

-kp/-nkp

[Description format]

```
-kp
-nkp
```

- Interpretation when omitted
  -nkp

[Function]

- The -kp option outputs a public symbol list into a link list file.
- The -nkp option disables the -kp option.

[Application]

- Use the -kp option to output a public symbol list into a link list file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link list file cannot be output.
- If the -ng option is specified, the public symbol list cannot be output.
- If both the -kp and -nkp options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -kp option is invalid.

[Example of use]

- To output a public symbol list into a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -s -g -pk0r.map -kp
```

The contents of k0r.map is as follows.

```
78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   1


Command:    k0rmain.rel k0rsub.rel -s -g -pk0r.map -kp
Para-file:
Out-file:   k0rmain.lmf
Map-file:   k0r.map
Direc-file:
Directive:


*** Link information ***


     6 output segment(s)
   9DH byte(s) real data
```

```
    40 symbol(s) defined

*** Memory map ***

  SPACE=REGULAR

  MEMORY=ROM
  BASE ADDRESS= 00000H   SIZE=40000H
        :
-------------------------------------------------------------------------------------

78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   2

*** Public symbol list ***

MODULE  ATTR  VALUE    NAME

SAMPM
        ADDR  00000H   MAIN
        ADDR  000D2H   START
SAMPS
        ADDR  000E9H   CONVAH
        NUM   FFE20H   _@STBEG
        NUM   FCF00H   _@STEND

 Target chip : uPD78xxx
 Device file : Vx.xx
```

-kl/-nkl

[Description format]

```
-kl
-nkl
```

- Interpretation when omitted
  -nkl

[Function]

- The -kl option outputs a local symbol list into a link list file.
- The -nkl option disables the -kl option.

[Application]

- Use the -kl option to output a local symbol list into a link list file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link list file cannot be output.
- If the -ng option is specified, the local symbol list cannot be output.
- If both the -kl and -nkl options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -kl option is invalid.

[Example of use]

- To output a local symbol list into a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -s -g -pk0r.map -kl
```

The contents of k0r.map is as follows.

```
78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   1


Command:    k0rmain.rel k0rsub.rel -s -g -pk0r.map -kl
Para-file:
Out-file:   k0rmain.lmf
Map-file:   k0r.map
Direc-file:
Directive:


*** Link information ***


     6 output segment(s)
   9DH byte(s) real data
```

```
    40 symbol(s) defined

*** Memory map ***

  SPACE=REGULAR
        :
-------------------------------------------------------------------------------------

78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   2

*** Local symbol list ***

MODULE  ATTR  VALUE    NAME

SAMPM
        MOD            SAMPM
        DSEG           DATA
        ADDR  FFE20H   HDTSA
        ADDR  FFE21H   STASC
        CSEG           CODE
        CSEG           ?CSEG
SAMPS
        MOD            SAMPS
        CSEG           ?CSEG
        ADDR  0015CH   SASC
        ADDR  00162H   SASC1

 Target chip : uPD78xxx
 Device file : Vx.xx
```

Link list file format specification

The link list file format specification options are as follows.

- -ll
- -lf/-nlf

-ll

[Description format]

```
-ll[number-of-lines]
```

- Interpretation when omitted
  -ll0 (No page breaks)

[Function]

- The -ll option specifies the number of lines per page in a link list file.

[Application]

- Use the -ll option to change the number of lines per page in a link list file.

[Description]

- The range number of lines that can be specified with the -ll option is 20 to 32767.
- An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of lines is omitted, it is assumed that 0 has been specified.
- If the number of lines specified is 0, no page breaks will be made.
- If the -np option is specified, the -ll option is invalid.

[Example of use]

- To specify 20 as the number of lines per page in a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -s -pk0r.map -ll20
```

The contents of k0r.map is as follows.

```
78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   1


Command:    k0rmain.rel k0rsub.rel -s -pk0r.map -km -ll20
Para-file:
Out-file:   k0rmain.lmf
Map-file:   k0r.map
Direc-file:
Directive:
```

```
*** Link information ***

     4 output segment(s)
   5FH byte(s) real data
    41 symbol(s) defined

-------------------------------------------------------------------------------------

78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   2

*** Memory map ***

  SPACE=REGULAR

  MEMORY=ROM
  BASE ADDRESS=00000H  SIZE=40000H
         OUTPUT   INPUT    INPUT    BASE    SIZE
         SEGMENT  SEGMENT  MODULE   ADDRESS
         CODE                       00000H  00002H  CSEG AT
                  CODE     SAMPM    00000H  00002H
* gap *                             00002H  000BEH
         ?CSEGOB0                   000C0H  00004H  CSEG OPT_BYTE
         ?CSEG                      000C4H  00059H  CSEG
                  ?CSEG    SAMPM    000C4H  00017H
-------------------------------------------------------------------------------------

78K0R Linker Vx.xx                                        Date:xx xxx xxxx  Page:   3

                  ?CSEG    SAMPS    000DBH  00042H
* gap *                             0011DH  3FEE3H

  MEMORY=RAM
  BASE ADDRESS=FCF00H  SIZE=03100H
         OUTPUT   INPUT    INPUT    BASE    SIZE
         SEGMENT  SEGMENT  MODULE   ADDRESS
* gap *                             FCF00H  02F20H
         DATA                       FFE20H  00003H  DSEG AT
                  DATA     SAMPM    FFE20H  00003H
* gap *                             FFE23H  000DDH
* gap (Not Free Area) *             FFF00H  00100H

 Target chip : uPD78xxx
 Device file : Vx.xx
```

-lf/-nlf

[Description format]

```
-lf
-nlf
```

- Interpretation when omitted
  -nlf

[Function]

- The -lf option inserts a form feed (FF) code at the end of a link list file.
- The -nlf option disables the -lf option.

[Application]

- Use the -lf option to insert a form feed code if you wish to add a page break after the contents of a link list file are printed.

[Description]

- If the -np option is specified, the -lf option is invalid.
- If both the -lf and -nlf options are specified at the same time, the option specified last is valid.

[Example of use]

- To insert a form feed code at the end of a link list file (k0r.map), describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -pk0r.map -lf
```

Error list file output specification

The error list file output specification options are as follows.

- -e/-ne

-e/-ne

[Description format]

```
-e[file-name]
-ne
```

- Interpretation when omitted
  -ne

[Function]

- The -e option specifies the output of an error list file. It also specifies the location to which it is output and the file name.
- The -ne option disables the -e option.

[Application]

- Use the -e option to specify the location to which an error list file is output or to change its file name.

[Description]

- If the output file name is omitted when the -e option is specified, the output file name will be "*input-file-name*.elk".
- If the drive name is omitted when the -e option is specified, the error list file will be output to the current drive.
- If both the -e and -ne options are specified at the same time, the option specified last is valid.

[Example of use]

- To create an error list file k0r.elk, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -dk0r.dr -ek0r.elk
```

An error has occurred in the contents of the link directive file (k0r.dr).
The contents of the error list file (k0r.elk) is as follows.

```
k0r.dr(3) : RA78K0R error E3102: Directive syntax error
```

Library file specification

The library file specification option is as follows.

- -b

-b

[Description format]

```
-bfile-name
```

- Interpretation when omitted
  None

[Function]

- The -b option specifies that the specified file is to be input as a library file.

[Application]

- The linker retrieves the module referenced by the input module from a library file and joins only that module to the input module.
- The purpose of a library file is to register two or more modules in a single file.
- By creating library files that can be used in common with many programs, file management and operation become easier and more efficient. Use the -b option to input the library file to the linker.

[Description]

- The file name is cannot be omitted.
- If a file name which includes a path name is specified, a library file will be input from that path. An error occurs if no library file exists in the specified path.
- If a file name which does not include a path name is specified, a library file will be input from the path specified by the -i option or from the default search path.
- If two or more -b options are specified, library files will be input in a specified sequence. Up to 64 -b options can be specified.
- See "B.6 Librarian" for details about the method of creating library files.

[Example of use]

- To input a library file (k0r.lib), describe as:
  k0rsub.rel is registered in the library file.

```
C:\>lk78k0r k0rmain.rel -bk0r.lib
```

Library file read path specification

The library file read path specification option is as follows.

- -i

-i

[Description format]

```
-ipath-name[,path-name] ... (two or more path names can be specified)
```

- Interpretation when omitted
  Path specified by environmental variable (LIB78K0R)
  Current path, if environmental variable (LIB78K0R) is not specified.

[Function]

- The -i option specifies that a library file is to be input from the specified path.

[Application]

- Use the -i option to search a library file from a certain path.

[Description]

- The -i option is only valid when a library file name is specified by the -b option without including a path name.
- Two or more -i options can be specified. Two or more path names can be specified at once by separating them with ",". A space cannot be entered before or after ",".
- Up to 64 path names can be specified per link. If two or more path names are specified, library files will be searched in a specified sequence.
- An error will not occur even if no library file exists in the specified path.
- An abort error occurs if the path name is omitted.
- If a library file is specified by the -b option without including a path name, the linker will search paths in the following sequence.

(1) The path specified by the -i option

(2) Path specified by environmental variable (LIB78K0R)

(3) Current path

Caution An error occurs if a library file with the specified name does not exist in any of these paths.

[Example of use]

- To search and read a library file from folders C:\lib1 and C:\lib2 in that order, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -bk0r.lib -iC:\lib1,C:\lib2
```

- To read a library file from folder D:\library files, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -bk0r.lib -i"D:\library files"
```

Parameter file specification

The parameter file specification option is as follows.

- -f

-f

[Description format]

```
-ffile-name
```

- Interpretation when omitted
  Options and input file names can only be input from the command line.

[Function]

- The -f option inputs options and input file names from a specified file.

[Application]

- Use the -f option when the information required to start up the linker will not fit on the command line.
- When specifying options repeatedly every time you perform linking, describe the options in the parameter file and specify the -f option.

[Description]

- An abort error occurs if the file name is omitted.
- Nesting of parameter files is not permitted. An abort error occurs if the -f option is specified within a parameter file.
- The number of characters that can be described within a parameter file is unlimited.
- Separate options or input file names with a blank space, a tab or the line feed code (LF).
- Options and input file names within a parameter file will be expanded at the position specified for the parameter file on the command line.
- The expanded options specified last is valid.
- The characters following ";" or "#" are all assumed to be comments, up to the line feed code (LF) or EOF.
- An abort error occurs if two or more -f option is specified.

[Example of use]

- Perform linking using a parameter file (k0r.plk).
  The contents of the parameter file (k0r.plk) is as follows.

```
; parameter file
k0rmain.rel k0rsub.rel -ok0r.lmf -pk0r.map -e
-tC:\tmp -g
```

Enter the following from the command line.

```
C:\>lk78k0r -fk0r.plk
```

Temporary file creation path specification

The temporary file creation path specification option is as follows.

- -t

-t

[Description format]

```
-tpath-name
```

- Interpretation when omitted
  Path specified by environmental variable TMP
  Current path, if no path is specified.

[Function]

- The -t option specifies a path in which a temporary file is created.

[Application]

- Use the -t option to specify the location for creation of a temporary file.

[Description]

- Only a path can be specified as a path name.
- The path name is cannot be omitted.
- Even if a previously created temporary file exists, if the file is not protected it will be overwritten.
- As long as the required memory size is available, the temporary file will be expanded in memory.
  If not enough memory is available, the contents of the temporary file will be written to a disk.
  Such temporary files may be accessed later through the saved disk file.
- Temporary files are deleted when linking is finished. They are also deleted when linking is aborted by pressing the keys ([CTRL] + [C] key).
- The path in which the temporary file is created is determined according to the following sequence.

(1) The path specified by the -t option

(2) Path specified by environmental variable TMP (when the -t option is omitted)

(3) Current path (when TMP is not set)

Caution When (1) or (2) is specified, if the temporary file cannot be created in the specified path, an abort error occurs.

[Example of use]

- To output a temporary file to folder C:\tmp, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -tC:\tmp
```

- To output a temporary file to folder D:\temporary files, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -t"D:\temporary files"
```

Device file search path specification

The device file search path specification option is as follows.

- -y

-y

[Description format]

```
-ypath-name
```

- Interpretation when omitted
  The path from which the device file is read is determined according to the following sequence.

(1) Path registered in the device file installer

(2) Path by which the lk78k0r.exe was started up

(3) Current folder

(4) The environmental variable PATH

[Function]

- The -y option reads a device file from the specified path.

[Application]

- Use the -y option to specify a path where a device file exists.

[Description]

- An abort error occurs if something other than a path name is specified after the -y option.
- An abort error occurs if the path name is omitted after the -y option.
- The path from which the device file is read is determined according to the following sequence.

(1) The path specified by the -y option

(2) Path registered in the device file installer

(3) Path by which the LK78K0R was started up

(4) Current folder

(5) The environmental variable PATH

[Example of use]

- To specify the path for the device file as folder C:\78k0r\dev, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -yC:\78k0r\dev
```

- To specify the path for the device file as folder D:\device files, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -y"D:\device files"
```

Warning message output specification

The warning message output specification option is as follows.

- -w

-w

[Description format]

```
-w[level]
```

- Interpretation when omitted
  -w1

[Function]

- The -w option specifies whether or not a warning message is output to the console.

[Application]

- Use the -w option to specify the level at which a warning message will be output.

[Description]

- An abort error occurs if something other than a level is specified after the -w option.
- Only levels 0, 1 and 2 can be specified.
- The output levels are as follows.
  0: No warning message is output.
  1: A normal warning message is output.
  2: A detailed warning message is output.

[Example of use]

- To output a detailed warning message, describe as:

```
C:\>lk78k0r k0rmain.rel k0rsub.rel -w2
```

Boot area ROM program linking specification for a product with built-in flash memory

The boot area ROM program linking specification option for a product with built-in flash memory is as follows.

- -zb

-zb

[Description format]

```
-zbaddress
```

- Interpretation when omitted
  No limitation for the allocation range

[Function]

- The -zb option specifies the start address of the flash memory area.

[Description]

- Specify boot area ROM program linking for a product with built-in flash memory, and specify the start address of the flash memory area.
- The range that can be specified for the value is 0H to 0FFFFH.
- An error occurs if the address is omitted.
- No codes can be allocated at addresses higher than the specified address.

Caution **Do not specify this option for a device that does not have a flash memory area self-programming function.**

[Example of use]

- To specify 2000H as the start address of flash memory area, describe as:

```
C:\>lk78k0r k0rmain.rel -zb2000h
```

On-chip debug specification

The on-chip debug specification option is as follows.

- -go

-go

[Description format]

```
-gocontrol-value,start-address[,size]
```

- Interpretation when omitted
  On-chip debug is not used.
  Address C3H is the default value specified the device file.

[Function]

- The -go option specifies whether on-chip debug is used or not.

[Application]

- Use the -go option to change the control value for on-chip debug operation, the start address and size of the debug monitor area.

[Description]

- For the control value, specify the control value for on-chip debug operation.
  An abort error occurs if a value that cannot be specified for the control value is specified.
  See QB-MINI2 On-Chip Debug Emulator with Programming Function User's Manual (U18371EJ) for details about the control value.
- For the start address, specify the allocation start address of the debug monitor area.
  The range that can be specified for the start address is 0 to 0FFFFFH.
  If the start address is omitted, it is assumed that “(internal ROM end address - 512) + 1” [RL78]/“(internal ROM end address - 1024) + 1” [78K0R] has been specified.
  See QB-MINI2 On-Chip Debug Emulator with Programming Function User's Manual (U18371EJ) for details about the start address.
- For the size, specify the size of the debug monitor area.
  The range that can be specified for the size is 0 to 1024 [RL78]/88 to 1024 [78K0R].
  If the size is omitted, it is assumed that 512 [RL78]/1024 [78K0R] has been specified.
  See QB-MINI2 On-Chip Debug Emulator with Programming Function User's Manual (U18371EJ) for details about the program size.
- An abort error occurs if something other than a numerical value is specified for the control value, start address, or size.
  However, the allocation end address of the OCD program (start address + size) must be less than the internal ROM end address.
- If the -go option is specified, the control value will be allocated at address C3H.
  No segments can be allocated at addresses 2H, 3H, and CEH to D7H, nor an area of the size starting from an address specified with the -go option, because these areas will be filled with FFH.
  Addresses C0 to C2H are reserved as the user option byte area by specifying the -gb option.

- Even if the -go option is not specified, no user codes can be allocated at address C3H because the address is reserved.
- The control value to be allocated at address C3H can also be specified by defining the segment with relocation attributes shown below, in the assembler source file. However, define the segment with 4 bytes in total, including the user option byte starting from address C0H.

```
[Any segment name]      CSEG    OPT_BYTE
                        DB      0FDH    ; Address 0xC0
                        DB      0FEH    ; Address 0xC1
                        DB      0FFH    ; Address 0xC2
                        DB      04H     ; Address 0xC3
```

If specification of the assembler source file and specification of this option are made in duplicate, this option takes precedence.

- Be sure to see the user's manual of the device and set the on-chip debug option byte and user option byte.

[Example of use]

- Embed 04H at address C3H as a control value.
- Reserve the area starting from the start address (address 02FC00H) up to 1024 bytes as the debug monitor area.

```
C:\>lk78k0r k0rmain.rel -go04H,02FC00H,1024
```

Security ID specification

The Security ID specification option is as follows.

- -gi

-gi

[Description format]

```
-gisecurity-ID
```

- Interpretation when omitted
  A security ID is not set.

[Function]

- The -gi option specifies a security ID.

[Application]

- Use the -gi option to set a security ID.

[Description]

- The range that can be specified for the security ID is 0H to 0FFFFFFFFFFFFFFFFFFFEH [RL78]/0H to 0FFFFFFFFFFFFFFFFFFFFH [78K0R].
- Specify a hexadecimal value that ends with "H". An abort error occurs if any other value is omitted.
- Specify a security ID within 10 bytes. If the specified value is less than 10 bytes, the higher bits are filled with 0.
- The security ID is set at addresses C4H to CDH. If a security ID is set, no segment can be allocated at addresses C4H to CDH.
- An abort error occurs if this option is specified for a device that does not have a security ID function.
- A security ID can also be specified by defining the segment with relocation attributes shown below, in the assembler source file. However, be sure to specify SECUR_ID as the relocation attribute of the segment.

```
[Any segment name]      CSEG    SECUR_ID
                        DB      11H     ; Address 0xC4
                        DB      22H     ; Address 0xC5
                        DB      33H     ; Address 0xC6
                        DB      44H     ; Address 0xC7
                        DB      55H     ; Address 0xC8
                        DB      66H     ; Address 0xC9
                        DB      77H     ; Address 0xCA
                        DB      88H     ; Address 0xCB
                        DB      99H     ; Address 0xCC
                        DB      0AAH    ; Address 0xCD
```

If specification of the assembler source file and specification of this option are made in duplicate, this option takes precedence.

[Cautions]

- If this option is not specified for a device that has a security ID function, any code may be allocated.

[Example of use]

- To specify the same "112233445566778899aah" as the specification in the above assembler source file, describe as:

```
C:\>lk78k0r k0rmain.rel -gi112233445566778899aah
```

User option byte specification

The user option byte specification option is as follows.

- -gb

-gb

[Description format]

```
-gbuser-option-byte-value
```

- Interpretation when omitted
  Default value specified the device file

[Function]

- The -gb option specifies the value set for the user option byte.

[Application]

- Use the -gb option to specify the user option byte value.

[Description]

- The range that can be specified for the user option byte is 0 to 0FFFFFFH.
- An abort error occurs if a value that cannot be specified for the user option byte is specified.
- Specify a hexadecimal value that ends with "H". An abort error occurs if any other value is omitted.
- The user option byte is specified at addresses C0H to C2H.
- If the -gb option is not specified, no user codes can be allocated at addresses C0 to C2H because these addresses are reserved.
- Specify a security ID within 3 bytes. If the specified value is less than 3 bytes, the higher bits are filled with 0.
- The user option byte value to be allocated at addresses C0H to C2H can also be specified by defining the segment with relocation attributes shown below, in the assembler source file.
  However, define the segment with 4 bytes in total, including the control value at address C3H.

```
[Any segment name]      CSEG    OPT_BYTE
                        DB      0FDH    ; Address 0xC0
                        DB      0FEH    ; Address 0xC1
                        DB      0FFH    ; Address 0xC2
                        DB      04H     ; Address 0xC3
```

  If specification of the assembler source file and specification of this option are made in duplicate, this option takes priority.
- Be sure to see the user's manual of the device and set the on-chip debug option byte and user option byte.

[Example of use]

- To specify FDH at address C0H, FEH at address C1H, and FFH at address C2H as the user option byte value, describe as:

```
C:\>lk78k0r k0rmain.rel -gb0FDFEFFH
```

Mirror area specification

The mirror area specification option is as follows.

- -mi

-mi

[Description format]

```
-mi0 or -mi1
```

- Interpretation when omitted
  -mi0

[Function]

- The -mi option specifies the allocation destinations of segments in the mirrored area.

[Application]

- Use the -mi option to specify the allocation destinations of segments in the mirrored area.

[Description]

- The allocation destinations of segments with relocation attribute CSEG MIRRORP are specified by the linker.
- If -mi0 is specified, the segment is allocated in the mirror area when MAA = 0. If -mi1 is specified, the segment is allocated in the mirror area when MAA = 1.
  See the user's manual of the device for details about the mirror area.
- Public symbol "_@MAA" will be generated. This is a NUMBER attribute symbol that holds "0" when -mi0 is specified, and holds "1" when -mi1 is specified.

[Example of use]

- To allocate the segment in the mirror area when MAA = 1, describe as:

```
C:\>lk78k0r k0rmain.rel -mi1
```

With a device in which a mirror area is reserved at F1000H or higher address, segments with CSEG MIRRORP are allocated at address 11000H and higher.
The example of use with startup routine provided by the compiler is as follows.

```
MOVW    PMC , #_@MAA
```

In this case, "1" is stored in PMC.

64 KB boundary allocation specification

The 64 KB boundary allocation specification options are as follows.

- -ccza/-nccza

-ccza/-nccza

[Description format]

```
-ccza
-nccza
```

- Interpretation when omitted
  -ccza (when input files are assembler output files only)
  -nccza (when compiler output file is included in input files)

[Function]

- The -ccza option specifies whether to allocate a segment to the last byte (xFFFFH[Note]) of each 64 KB boundary area.

Note x: 0H to EH

[Application]

- Use the -ccza option to specify whether to allocate a segment to the last byte of each 64 KB boundary area.

[Description]

- If development is performed only with the assembler, specification of this option is not necessary because a segment is automatically allocated to the last byte of each 64 KB boundary area.
- If an object module file output from the compiler is input to the linker, the linker automatically assumes that the -nccza option is specified, so no segment is allocated to the last byte of each 64 KB boundary area.
- If the -za option is specified in the compiler, allocation of a segment to the last byte of each 64 KB boundary area is enabled, so specify the -ccza option.
- See “CubeSuite+ RL78,78K0R Coding” for details about segment allocation to the last byte of each 64 KB boundary area.

Self RAM area allocation control

The self RAM area allocation control options are as follows.

- -self/-selfw

-self/-selfw

[Description format]

```
-self
-selfw
```

- Interpretation when omitted
  The self RAM area is used as internal RAM.

[Function]

- The -self and -selfw options specify whether to restrict allocation to the self RAM area.

[Application]

- Use the -self and -selfw options to specify whether to restrict allocation to the self RAM area.

[Description]

- If -self is specified, it is prohibited to allocate segments in the self RAM area and an error occurs.
- If -selfw is specified, it is enabled to allocate segments in the self RAM area, but a warning message is output.
- If the -self or -selfw option is specified, the stack area is allocated outside the saddr area.

Copy routine address specification

The copy routine address specification option is as follows.

- -rc

-rc

[Description format]

```
-rcaddress
```

- Interpretation when omitted
  The copy routine is allocated to the vacant area of the ROM area.

[Function]

- The -rc option specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Application]

- Use the -rc option to specify the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Description]

- This option specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Example of use]

- To allocate the copy routine for expanding ROMized segments in RAM area at address 300H, describe as:

```
C:\>lk78k0r k0rmain.rel -rc300H
```

ROMization area specification

The ROMization area specification option is as follows.

- -ra

-ra

[Description format]

```
-rastart-address,end-address
```

- Interpretation when omitted
  The internal RAM area is the ROMization target.

[Function]

- The -ra option specifies the ROMization target area.

[Application]

- Use the -ra option to specify the ROMization target area.

[Description]

- Specify the start address and end address of the ROMization target area.

[Example of use]

- To target addresses 0FCF00H to FFFFFH for ROMization, describe as:

```
C:\>lk78k0r k0rmain.rel -ra0FCF00H,0FFFFFH
```

Help specification

The help option is as follows.

- --

--

[Description format]

```
--
```

- Interpretation when omitted
  No display

[Function]

- The -- option outputs a help message on the display.

[Application]

- The help message is a list of explanations of the link options. See these when executing the linker.

[Description]

- When the -- option is specified, all other options are invalid.
- To read the next part of the help message, press the return key. To quit the help display, press any key other than the return key and then press the return key.

Caution This option cannot be specified from CubeSuite+.

[Example of use]

- To output a help message on the display, describe as:

```
C:\>lk78k0r --
```

```
78K0R Linker Vx.xx [xx xxx xx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

usage : lk78K0r [option[...]] input-file [option[...]]
The option is as follows ([] means omissible).
-ffile           :Input option or input-file name from specified file.
-dfile           :Read directive file from specified file.
-bfile           :Read library file from specified file.
-idirectory[,directory...] :Set library file search path.
-o[file]/-no     :Create load module file [with specified name] / Not.
-p[file]/-np     :Create link map file [with specified name] / Not.
-e[file]/-ne     :Create error list file [with specified name] / Not.
```

```
-tdirectory      :Set temporary directory.
-km/-nkm         :Output map list to link map file/Not.
-kd/-nkd         :Output directive file image to link map file / Not.
-kp/-nkp         :Output public symbol list to link map file / Not.
-kl/-nkl         :Output local symbol list to link map file / Not.
-ll[page length] :Specify link map file lines per page.
-lf/-nlf         :Add Form Feed at end of the link map file / Not.
-s[memory area]/-ns : Create stack symbol [in specified memory area] / Not.
-g/-ng           :Output symbol information to load module file / Not.
-ydirectory      :Set device file search path.
-j/-nj           :Create load module file if fatal error occurred / Not.
-w[n]            :Change warning level(n=0 to 2).
-zbaddress       :Create Boot file (address:flash start address).
-godata,address[,size] :Change On-Chip Debug Option Bytes, start address, size(size=88 to
1024).
-giid            :Set Security ID.
-gbdata          :Set User Option Bytes.
-mi[0 or 1]      :Select allocation for MIRRORP segment.
-self[-selfw]    :Allocate user code to BRCROSS / Not.
-ccza/-nccza     :Allocate user code to nFFFFH / Not.
-rcaddress       :Specify _rcopy routine allocate address.
-rastart,end     :Specify area for ROM process the start and end.
--               :Show this message.

DEFAULT ASSIGNMENT: -o -p -ne -km -kd -nkp -nkl -ll0 -nlf -ns -g -nj -w1

directive file usage:
 MEMORY memory-area-name:(origin-value, size)[/memory-space-name]
 MERGE segment-name:[location-type-definition][merge-type-definition]
       [=memory-area-name][/memory-space-name]

 example: MEMORY ROM:(0H,4000H)
          MEMORY RAMA:(0FEF00H,100H)
          MERGE CSEG1:=OM
          MERGE DSEG1:AT(0FF000H)
```

B.3.5 Boot-flash relink function

(1) Relink function

Some systems are equipped with flash area or detachable ROM.
To upgrade the version of the program, the contents of the flash area may be rewritten or the detachable ROM may be replaced with a new ROM.
When changing the program even partially, basically the project itself is reorganized or "rebuilt". However, it would be convenient if the allocation to be upgraded was limited to the flash area or external ROM and if it was not necessary to reorganize the project. The boot area is fixed to the internal ROM. If a function is called between the flash area to be rewritten and the boot area, and if the start address of the function is changed as a result of modifying the function in the flash area, the function cannot be called correctly.
The "boot-flash relink function" (hereafter referred to as the "relink function") is used to prevent this and enable functions to be called correctly.
This function is realized as follows.

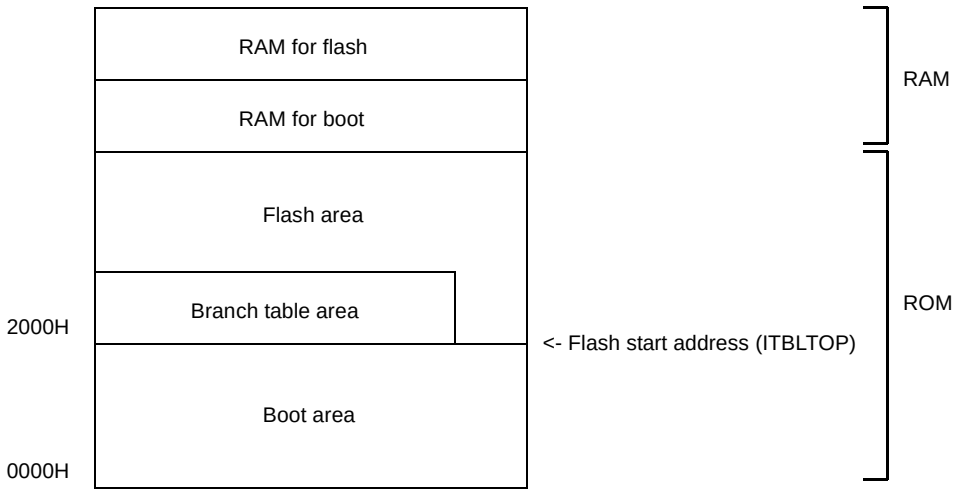
(a) A "branch table" where instructions to branch to the functions in the flash area are written is prepared in the flash area.

(b) When a function in the flash area is called from the boot area, execution jumps to the branch table in the flash area, and then the instruction used to branch to the intended function is executed and jump occurs.

This mechanism can be realized by the user. If the "relink function" is used, this can be done relatively easily.
To use this function, however, the functions to be called in the flash area must be determined when the boot area is created. This mechanism is used to call a function from the boot area even if the function is modified in the flash area.

Operation during a reset is as follows.

RESET interrupt vector (boot area)
-> _@cstart (boot area)
-> _boot_main function (boot area)
-> ITBLTOP address (flash area)
-> _@cstart (flash area)
-> _main function (flash area)



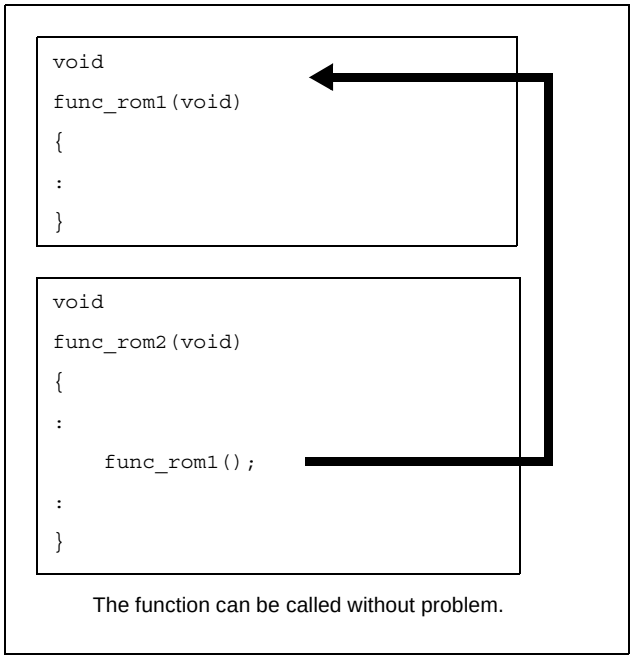
(2) Image of relink function

A function is called as shown below when the relink function is used.

(a) To call function in the boot area from the boot area

The function can be called without problem because addresses have been resolved before they are programmed to the boot area.

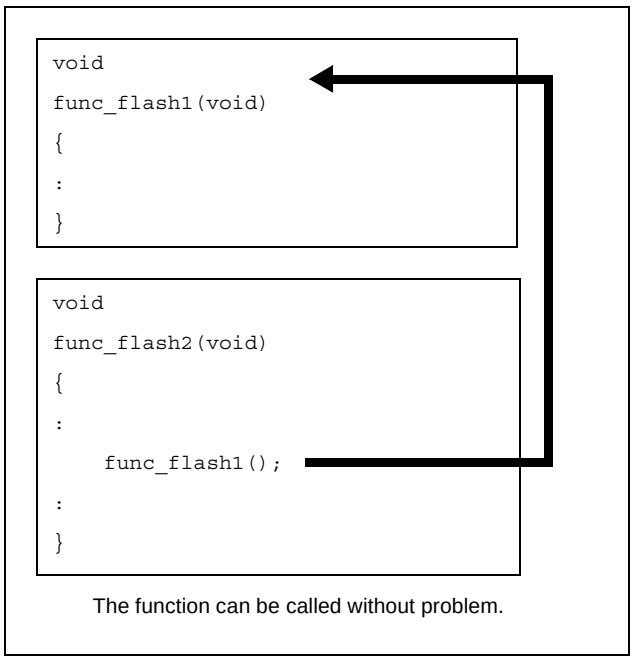
Figure B-7. In Boot Area



(b) To call function in the flash area from the flash area

The function can be called without problem because addresses have been resolved in the flash area.

Figure B-8. In Flash Area

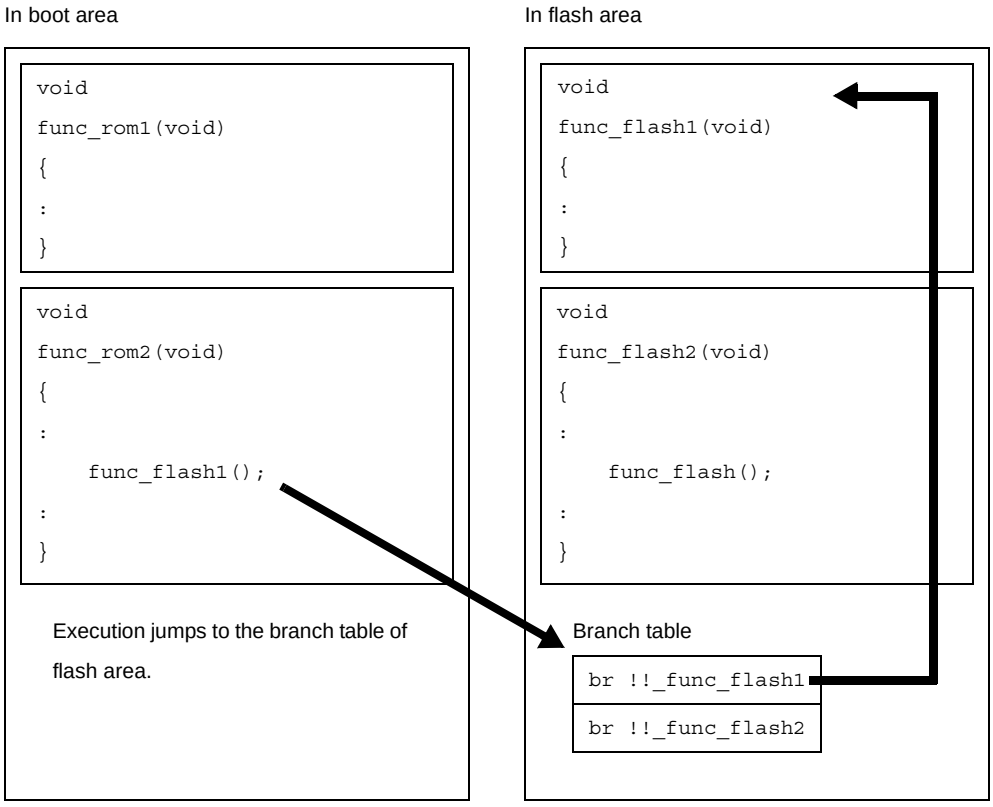


(c) To call function in the flash area from the boot area

When a function in the flash area is called from the boot area, the address of the function cannot be known from the boot area because the function size, etc., have been changed in the flash area. In other words, a function in the flash area cannot be directly called. To solve this, execution jumps to the branch table in the flash area.

Execute the jump instruction to the relevant function from that table and jump to the intended function.

Figure B-9. From Boot Area to Flash Area



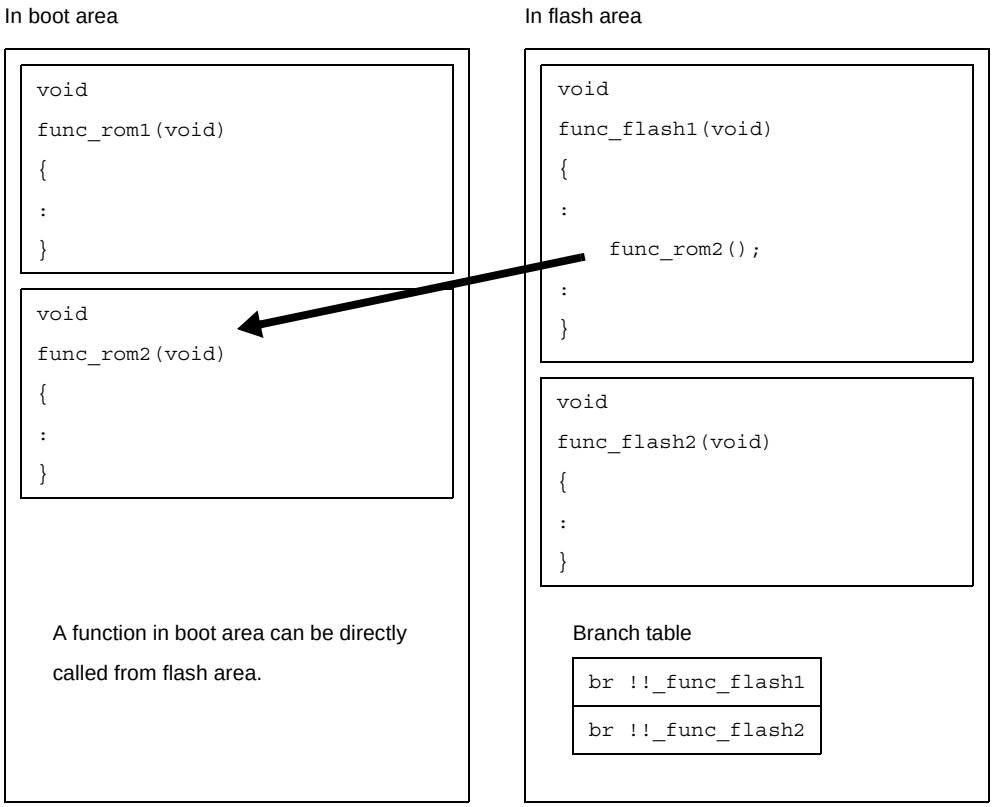
In the same manner as functions, this is relevant to referencing external variables.

A global variable defined in the flash area cannot be referenced from the boot area. Therefore, an external variable of the same name can be defined in both the boot area and flash area. Each of these external variables is referenced only from the respective areas.

(d) To call function in the boot area from the flash area

When a function in the boot area is called from the flash area, the contents of the boot area are not changed. Therefore, a function in the boot area can be directly called from the flash area.

Figure B-10. From Flash Area to Boot Area



In the same manner as functions, this is relevant to referencing external variables. A global variable defined in the boot area cannot be referenced from the flash area.

(3) Realizing relink function

This section describes specifically how to realize the relink function.

(a) Project of CubeSuite+

To realize the relink function, a boot area and flash area must be separately created. This means that only the flash area is modified after the boot area has been created (after a program has been stored in ROM). When creating a project with CubeSuite+, therefore, divide the projects as follows.

- Project to be allocated to the boot area
- Project to be allocated to the flash area (project that may be modified in the future)

In addition, separately prepare a startup routine and link directive file for each project.

(b) #pragma ext_func directive

When calling a function in the flash area from the boot area, the name of the function to be called (label name) and ID number are assigned to the boot area by using the #pragma ext_func directive. The format of the #pragma ext_func directive is as follows.

```
#pragma ext_func function-name ID-number
```

Specify a positive number as the ID number. The different ID number must not be specified for the same function name or the same ID number must not be specified for the different function names.

When a function name in the flash area is specified in the boot area by using the #pragma ext_func directive, a branch table is created. The address of this branch table is specified by the user.

Specify the address as follows, by using compile option "-zt", when a load module of the boot area and a load module of the flash area are created.

```
-zt start-address-of-branch-table
```

When execution branches to the body of a function, the actual function address is obtained by referencing the offset of the ID number from the beginning of the created branch table, and then execution branches.

The example is shown below.

```
func_flash0()
func_flash1()
```

If the above two C functions are allocated to the flash area and they are called from the boot area, describe as follows in the C source file for the boot area.

```
#pragma ext_func func_flash0 1
#pragma ext_func func_flash1 2
```

It is recommended to describe these #pragma ext_func directive in one file and include this file in all source files by using the #include directive, in order to prevent missing descriptions or the occurrence of contradictions, i.e., to prevent the error of specifying the different ID numbers for the same function name or specifying the same ID number for the different function names.

An image of relink function is shown below.

<1> C source file for the boot area

```
#include "ext_def.h"

int boot_a = 0x12;
int boot_b = 0x34;
extern  int func_flash1( int );
extern  int func_flash2( int );

void boot_main( )
{
        :
}

void func( void )
{
    int k;
    boot_a = func_flash1(boot_a);
    boot_b = func_flash2(boot_b);
}
```

<2> C source file for the flash area

```
#include "ext_def.h"

extern  void func( void );

void main( void )
{
    func();
}
void func_flash1( )
{
        :
}
void func_flash2( )
{
        :
}
```

<3> ext_def.h

```
#pragma ext_func func_flash1 1
#pragma ext_func func_flash2 2
```

(c) Startup routine

Separately prepare a startup routine for the boot area and a startup routine for the flash area. Startup routines are provided for both the boot area and the flash area by the CA78K0R.

Each startup routine must perform the following processing.

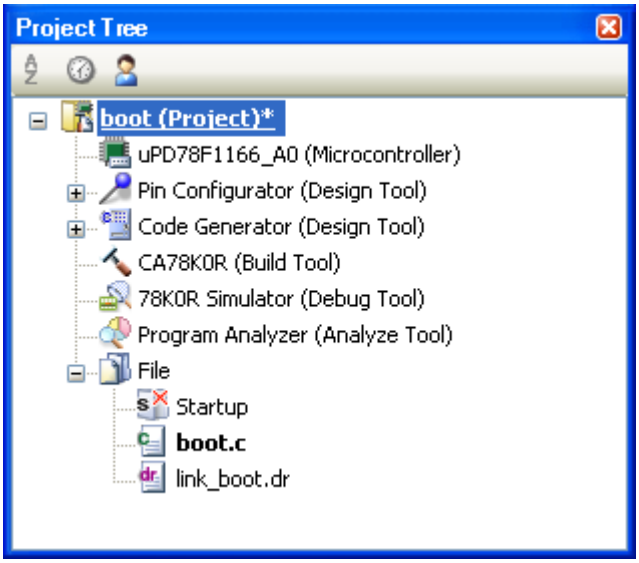
- Perform processing to initialize the RAM area to be used for the boot area
- Branching from the boot area to the startup routine of the flash area
- Perform processing to initialize the RAM area to be used for the flash area
- Moving to the processing of the flash area

(d) How to create the projects specifically

<1> Create the boot area project

Create a project for the boot area and add the build target files to the project.

Figure B-11. Boot Area Project



<2> Set the build options for the boot area project

Select the build tool node on the project tree and set each of the build options on the Property panel.

<3> Set variables/functions relocation options

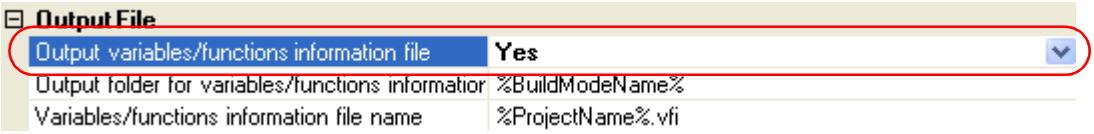
Set the variables/functions relocation options to generate a variables/functions information file and use it to allocate variables and functions.

Select the [Variables/Functions Relocation Options] tab.

In the [Output File] category, set the [Output variables/functions information file] property to [Yes] to generate an empty variables/functions information file, and add it to the project (it will also appear in the File node of the project tree). The output destination is the file set in the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property.

Remark If a variables/functions information file with the same name already exists, the build will be configured to use it.

Figure B-12. [Output folder for variables/functions information file] Property in Boot Area



Set the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property to change the output folder and file name of the variables/functions information file. If the [Variables/functions information file] property is changed, an empty variables/functions information file is generated and added to the project (it will also appear in the File node of the project tree).

<4> Set compile options

Select the [Compile Options] tab.

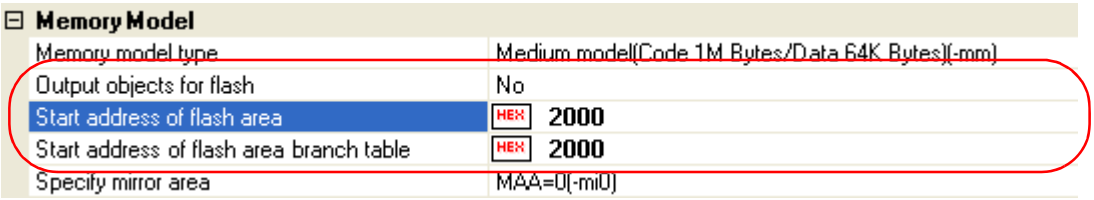
Select [No] on the [Output objects for flash] property in the [Memory Model] category.

In addition, configure the [Start address of flash area] property and the [Start address of flash area branch table] property.

The range that can be specified for both value is 0C0 to 0EDFFF.

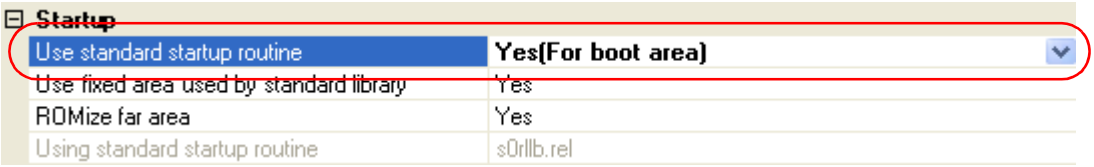
Remark The address specified in the [Start address of flash area branch table] property is an address in the flash area.

Figure B-13. [Memory Model] Category in Boot Area



Next, select [Yes(For boot area)] on the [Use standard startup routine] property in the [Startup] category.

Figure B-14. [Use standard startup routine] Property in Boot Area



<5> Set link options

Select the [Link Options] tab.

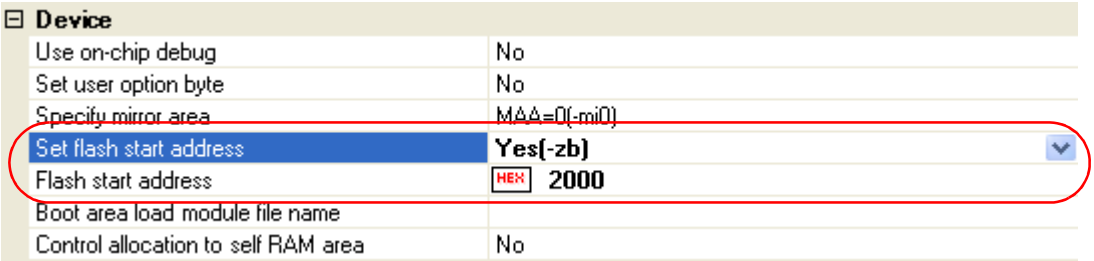
In the [Device] category, if you select [Yes(-zb)] on the [Set flash start address] property, the [Flash start address] property is displayed.

Specify the start address of the flash memory area here. The range that can be specified depends on the selected device.

Remark The same value as the value of the [Start address of flash area] property in the [Memory Model] category from the [Compile Options] tab is set to this property.

If this property is changed, the same value is set to the [Start address of flash area] property.

Figure B-15. [Device] Category in Boot Area

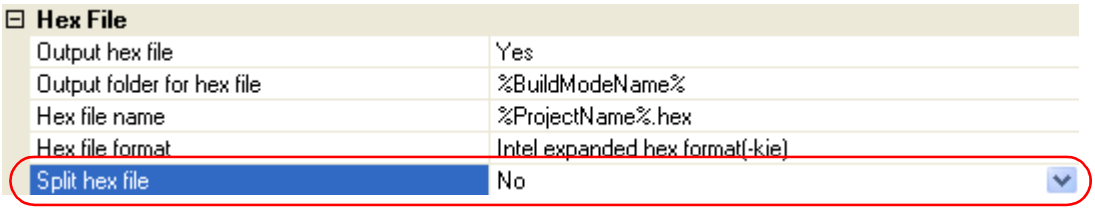


<6> Set object convert options

Select the [Object Convert Options] tab.

Select [No] on the [Split hex file] property in the [Hex File] category (default).

Figure B-16. [Split hex file] Property in Boot Area



<7> Run a build of the boot area project

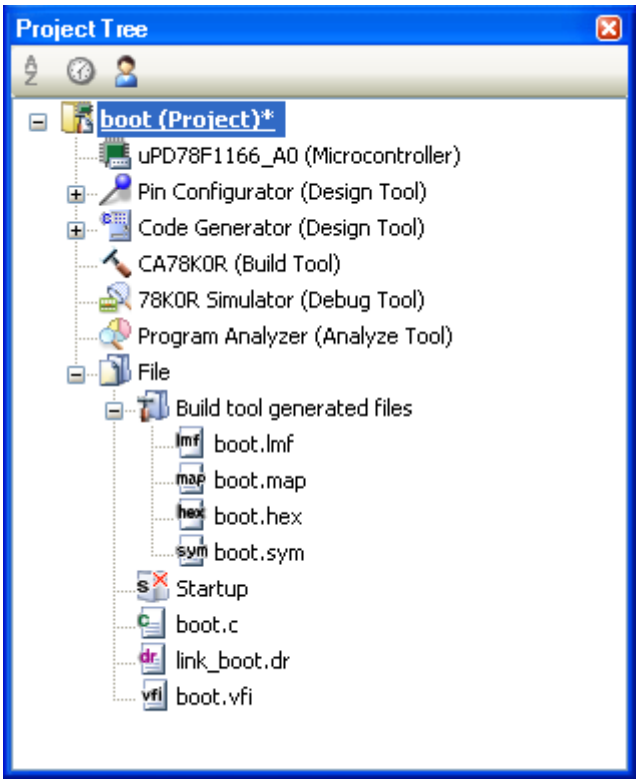
When you run a build of the boot area project, a load module file is created.

A hex file is also created.

If a variables/functions information file is generated, it will be input into the compiler automatically, and a build will be executed again.

Remark The variables/functions information file generated in "<3> Set variables/functions relocation options" is overwritten by running a build.

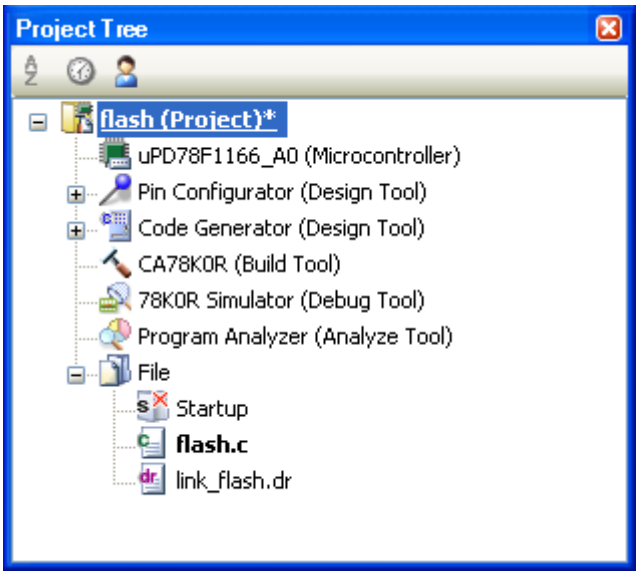
Figure B-17. Created Files for Boot Area



<8> Create the flash area project

Create a project for the boot area and add the build target files to the project.

Figure B-18. Flash Area Project



<9> Set the build options for the flash area project

Select the build tool node on the project tree and set each of the build options on the Property panel.

<10> Set variables/functions relocation options

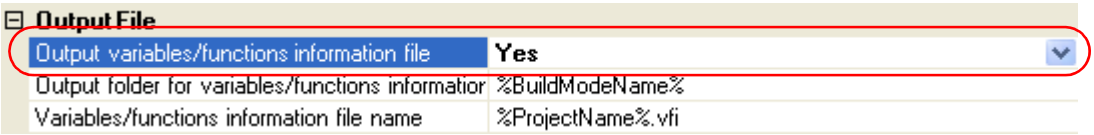
Set the variables/functions relocation options to generate a variables/functions information file and use it to allocate variables and functions.

Select the [Variables/Functions Relocation Options] tab.

In the [Output File] category, set the [Output variables/functions information file] property to [Yes] to generate an empty variables/functions information file, and add it to the project (it will also appear in the File node of the project tree). The output destination is the file set in the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property.

Remark If a variables/functions information file with the same name already exists, the build will be configured to use it.

Figure B-19. [Output folder for variables/functions information file] Property in Flash Area



Set the [Output folder for variables/functions information file] property and the [Variables/functions information file name] property to change the output folder and file name of the variables/functions information file. If the [Variables/functions information file] property is changed, an empty variables/functions information file is generated and added to the project (it will also appear in the File node of the project tree).

<11> Set compile options

Select the [Compile Options] tab.

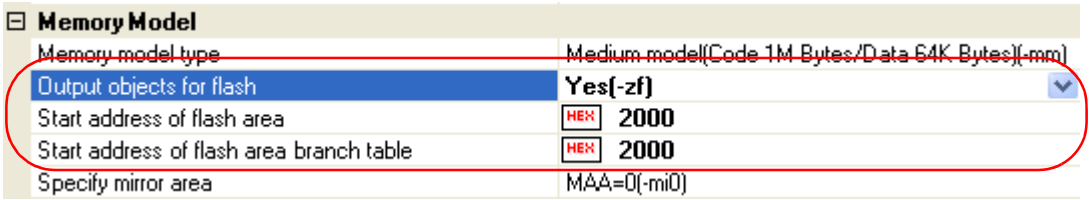
Select [Yes(-zf)] on the [Output objects for flash] property in the [Memory Model] category.

In addition, configure the [Start address of flash area] property and the [Start address of flash area branch table] property.

The range that can be specified for both value is 0C0 to 0EDFFF.

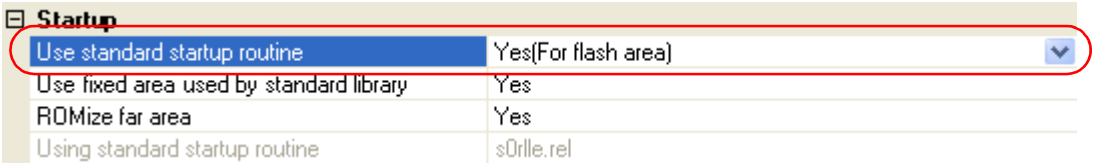
Remark The address specified in the [Start address of flash area branch table] property is the same as the address specified in the boot area project.

Figure B-20. [Memory Model] Category in Flash Area



Next, select [Yes(For flash area)] on the [Use standard startup routine] property in the [Startup] category.

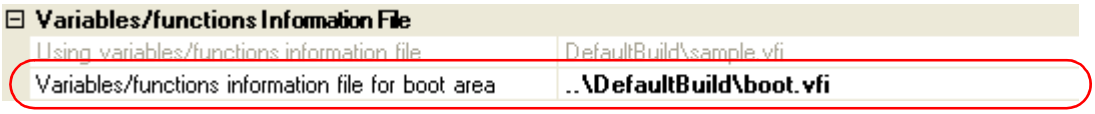
Figure B-21. [Use standard startup routine] Property in Flash Area



Next, add the created variables/functions information file for the boot area to the flash area project.

Specify the variables/functions information file for the boot area on the [Variables/functions information file for boot area] property in the [Variable and Function Information File] category.

Figure B-22. [Variables/functions information file for boot area] Property in Flash Area

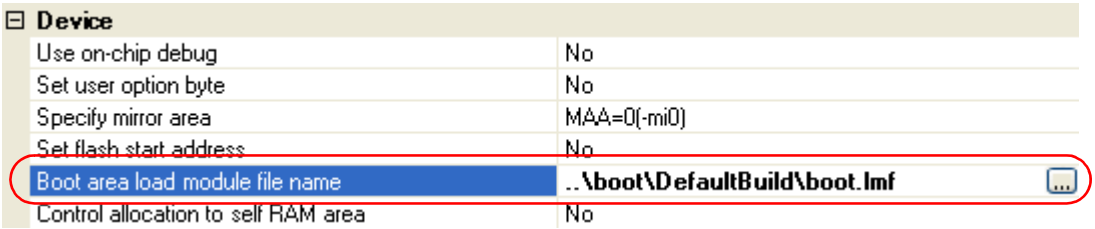


<12> Set link options

Add the created boot area load module file to the flash area project. Select the [Link Options] tab.

Specify the boot area load module file on the [Boot area load module file name] property in the [Device] category.

Figure B-23. [Boot area load module file name] Property in Flash Area

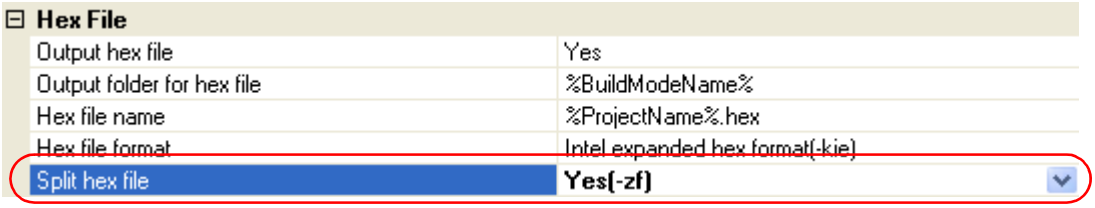


<13> Set object convert options

Select the [Object Convert Options] tab.

Select [Yes(-zf)] on the [Split hex file] property in the [Hex File] category.

Figure B-24. [Split hex file] Property in Flash Area

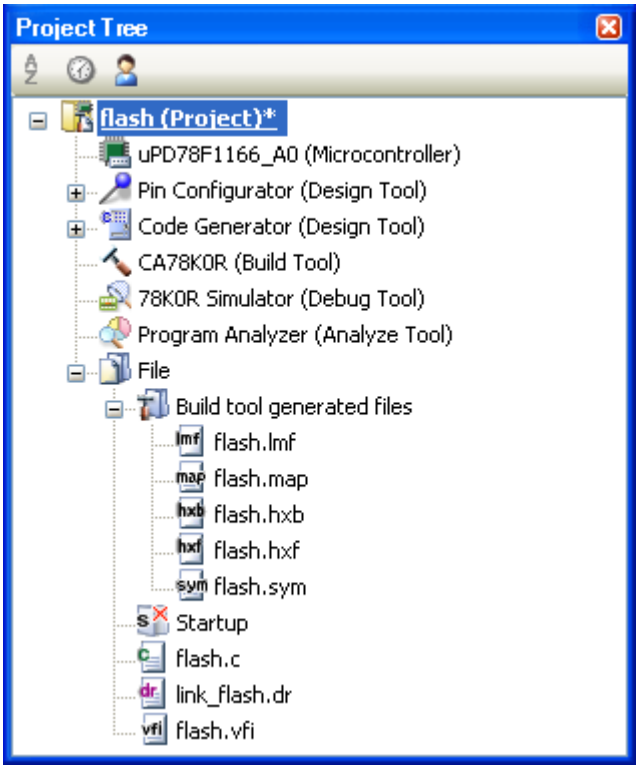


<14> Run a build of the flash area project

When you run a build of the flash area project, a load module file which implements the relink function is created.

The boot area hex file (the same content as the file created by building the boot area project) and flash area hex file are also created.

Figure B-25. Created Files for Flash Area



(e) How to change the branch table address

When setting the branch table's start address to other than 2000H, also change the interrupt vector processing in the following manner.

- Change the address value of "ITBLTOP EQU 2000H" in vect.inc
  The default installation location for vect.inc is as follows.
  C:\Program Files\Renesas Electronics\CubeSuite+\CA78K0R\Vx.xx\src\cc78k0r\src
- ..\bat\repvect.bat
  ..\bat\mkstup.bat
  on the DOS prompt and update the startup routine and library, copy to ..\..\..\lib78k0r and use for linking.

(f) Describing a link directive file

The following points should be noted when using a link directive file.

- If the address of a section placed in the RAM area overlaps in the boot area and flash area, the linker outputs an error. For the RAM area that must be referenced simultaneously in the boot area and flash area, addresses must be specified so that they do not overlap.
- A link directive file related to the branch table does not have to be described. It is automatically allocated to an address specified by the link option.
  However, the following points must be noted.
  - If a vacant area of the size of the branch table is at the address specified by -zt, the link directive file is allocated as is. The other segments are not affected.
  - If a vacant area of the size of the branch table is not at the address specified by -zt, an error occurs.

(g) Library

If a library function is called from the boot area or flash area, the library is linked to the object on the calling side. For example, even if a library is linked to the flash area, the same library is linked to the boot area if the same library function is called from the boot area. When a library function is called, therefore, branching does not take place between the boot area and flash area.

(h) Interrupt handler

Describe the part that calls an interrupt handler in the area where the address of the interrupt handler exists. In the following case, an interrupt handler function name must also be specified by the #pragma interrupt directive.

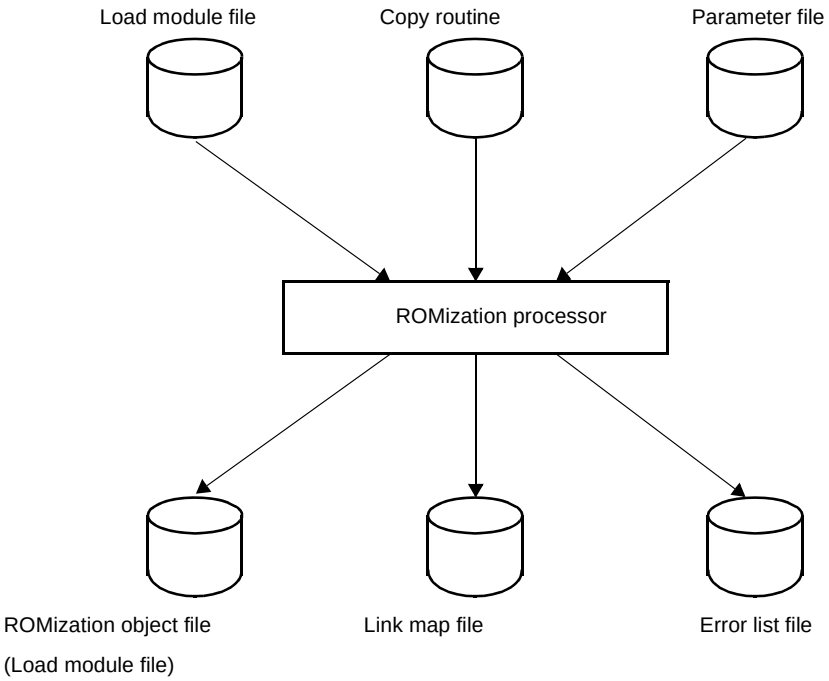
- Interrupt handler address is in the boot area.
- Interrupt handler body is in the flash area.

B.4 ROMization Processor

The ROMization processor inputs the load module file that the linking completed successfully and outputs the load module file that ROMization processing is performed.

A part of the program can be allocated to the RAM area and executed without changing the C source.

Figure B-26. I/O Files of ROMization Processor



B.4.1 I/O Files

The I/O files of the ROMization processor are shown below.

Table B-11. I/O Files of ROMization Processor

Type	File Name	Explanation	Default File Type
Input files	Load module file	- ROMization target file after the linking Input the file that the linking completed successfully.	.lmf
	Copy routine (Always "_rcopy.rel")	- Copy routine The ROMization processor links automatically.	-
	Parameter file	- File containing the parameters for the executed programs (user-created file)	.ppr

Type	File Name	Explanation	Default File Type
Output files	ROMization object file (load module file)	- File which ROMization processing is performed The default file name is "*primary name of input file*_orig.lmf". If a file having the same name exists, it will be overwritten.	.lmf
	Link map fie	- Map file which contains ROMization information The default file name is "*primary name of input file*_romp.map". If a file having the same name exists, it will be overwritten.	.map
	Error list file	- File which has error information under ROMization	.erp

B.4.2 Functions

(1) Copy routine

The ROMization processor reads copy routines from _rcopy.rel and links with the output file.
The allocation address is determined by the linker and it can be also specified using the option.

(2) ROMization target area

The ROMization target area is the internal RAM area defined by the device file.
However, it can also be specified using the option.

(3) Generation information

The address information of the copy routine/ROMization target segment is added to the input file as a @@ROMP segment, and the output file is generated with the raw-data segment of the ROMization target segment moved from the segment during linking to a @@ROMP segment.

Remark @@ROMP is a reserved word.
This segment name cannot be changed.

B.4.3 Method for manipulating

(1) ROMization processor startup

The following two methods can be used to start up the ROMization processor.

(a) Startup from the command line

```
X:[path-name]>rp78k0r[Δoption]...load-module-file-name
```

X	Current drive name
path-name	Current folder name
rp78k0r	Command name of the ROMization processor
option	Enter detailed instructions for the operation of the ROMization processor. When specifying two or more ROMization process options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the ROMization process options. See "B.4.4 Option" for details about ROMization process options. Enclose a path that includes a space in a pair of double quotation marks (" ").
load-module-file-name	File name of load module to be ROMized Up to 1024 items can be input as an input module. Enclose the file name of a path that includes a space in a pair of double quotation marks (" ").

Example To output the link map file (k0r.map), describe as:

```
C:\>rp78k0r a.lmf -pk0r.map
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the ROMization processor will not fit on the command line, or when the same ROMization process option is specified repeatedly each time ROMization processing is performed.

To start up the ROMization processor from a parameter file, specify the parameter file option (-f) on the command line.

Start up the ROMization processor from a parameter file as follows:

```
X>rp78k0r[Δload-module-file]Δ-fparameter-file-name
```

-f	Parameter file specification option
parameter-file-name	A file which includes the data required to start up the ROMization processor

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the source file name is omitted from the command line, only 1 source file name can be specified in the parameter file.

- The source file name can also be written after the option.
- Write in the parameter file all ROMization process options and output file names specified in the command line.

Example Create a parameter file k0r.ppr using an editor, and then start up the ROMization processor.

```
; parameter file
a.lmf -ok0r.lmf -pk0r.map -e
-tC:\tmp
```

```
C:\>rp78k0r -fk0r.ppr
```

(2) Execution start and end messages

(a) Execution start message

When the ROMization processor is started up, an execution startup message appears on the display.

```
78K0R ROM Processor Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
```

(b) Execution end message

If it detects no ROMization errors resulting from the ROMization processing, the ROMization processor outputs the following message to the display and returns control to the host operating system.

```
Target chip : uPD78xxx
Device file : Vx.xx

Link complete, 0 error(s) and 0 warning(s) found.
```

If it detects a ROMization errors resulting from the ROMization processing, the ROMization processor outputs the numbers of errors and warnings to the display and returns control to the host operating system.

```
Target chip : uPD78xxx
Device file : Vx.xx

Link complete, 1 error(s) and 0 warning(s) found.
```

If the ROMization processor detects a fatal error during ROMization processing which makes it unable to continue ROMization processing, the ROMization processor outputs a message to the display, cancels ROMization processing and returns control to the host operating system.

- A non-existent load module file is specified.

```
C:\>rp78k0r samp.lmf
```

```
78K0R ROM Processor Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
RP78K0R error F8006 : File not found 'samp.lmf'
Program Aborted.
```

In the above example, a non-existent load module file is specified. An error occurs and the ROMization processor aborts the ROMization processing.

- A non-existent ROMization process option is specified.

```
C:\>rp78k0r a.lmf -z
```

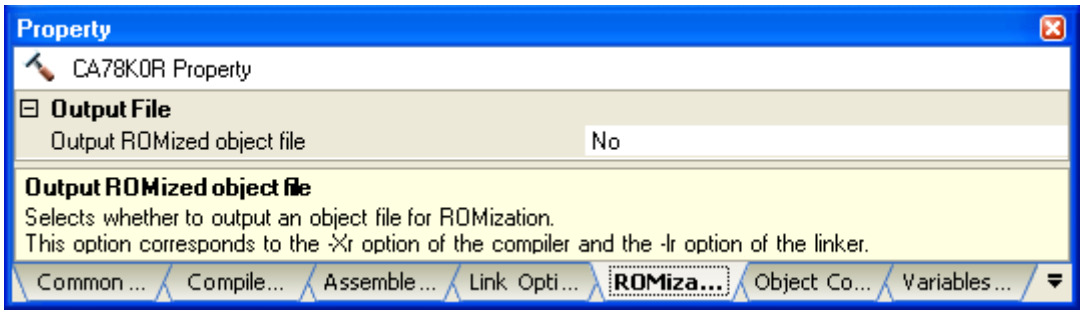
```
78K0R ROM Processor Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RP78K0R error F8018 : Option is not recognized '-z'
Please enter 'RP78K0R --' , if you want help messages.
Program Aborted.
```

In the above example, a non-existent ROMization process option is specified. An error occurs and the ROMization processor aborts the ROMization processing.

(3) Set options in CubeSuite

This section describes how to set ROMization process options from CubeSuite.
On the CubeSuite's Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu.
The Property panel opens.Next, select the [ROMization Process Options] tab.
You can set the various ROMization process options by setting the necessary properties in this tab.

Figure B-27. Property Panel: [ROMization Process Options] Tab



(4) Example of using copy function

Caution Note that the specifications of self-programming differs between 78K0R and RL78.

(a) The C source and link directive below allocate the main function to the ROM area, and the self_init function to the RAM_CODE area.
Be sure to call the _rcopy function before calling the self_init function that is executed in the RAM area.

- main.c

```
int _rcopy(int);
void main()
{
    int ret;
    ret = _rcopy(1);
      :
    self_init();
      :
}
```

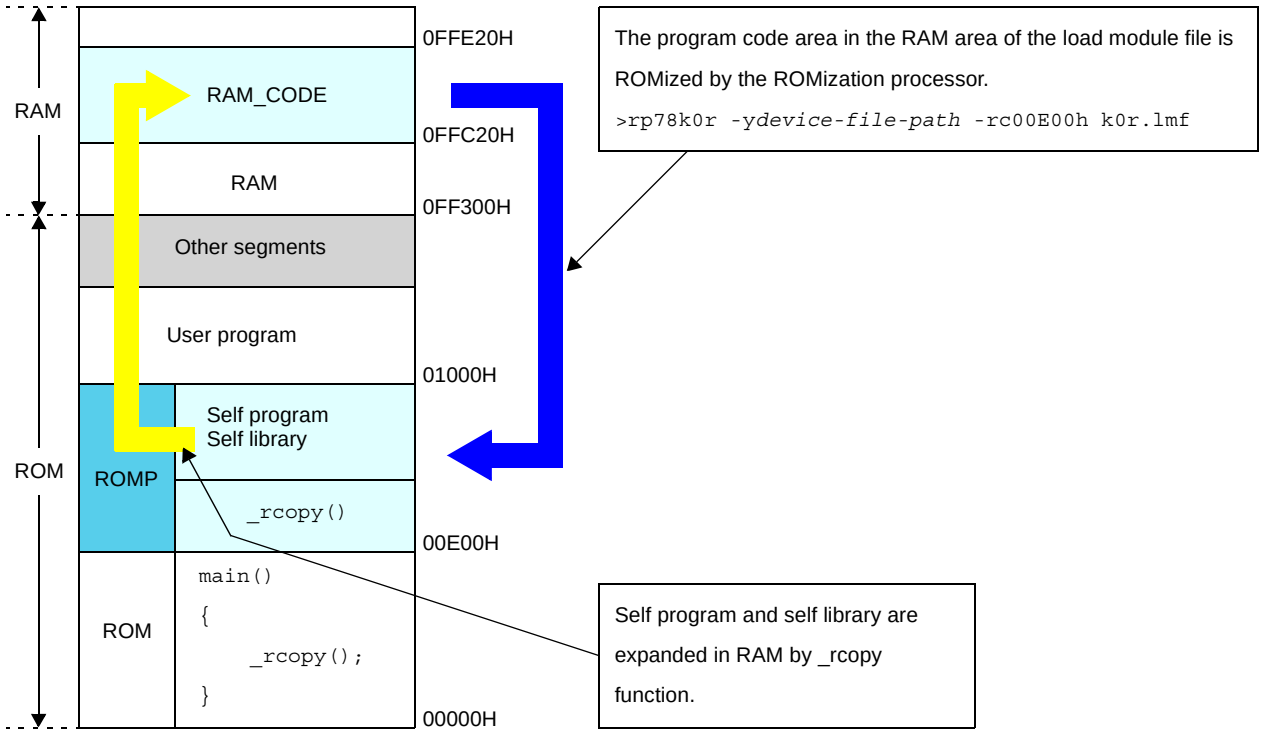
- self_tmp.c

```
#pragma section @@CODEL PROG_RAM
void self_init()
{
      :
}
```

- 78k0r.dr

```
memory ROM      :(000000H, 000E00H)
memory ROMP     :(000E00H, 000200H)
memory RAM      :(0FF300H, 00920H)
memory RAM_CODE :(0FFC20H, 00200H)
;
merge PROG_RAM  := RAM_CODE
merge @@LCODE   := RAM_CODE
merge @@FSL_RCD := RAM_CODE
```

Figure B-28. Map Image



(b) The program code area in the RAM area of the load module file generated when building the image in (a) is ROMized by the ROMization processor.
In this example, the _rcopy function and the program code with area name "PROG_RAM" are ROMized to address 0E00H.
The command is shown below.

```
>rp78k0r -ydevice-file-path -rc00E00h k0r.lmf
```

B.4.4 Option

(1) Types

The ROMization process options are detailed instructions for the operation of the ROMization processor.
The types and explanations for ROMization process options are shown below.

Table B-12. ROMization Process Options

Classification	Option	Description
Load module file output specification	-o	Specifies the output of a load module file.
	-no	
Link map file output specification	-p	Specifies the output of a link map file.
	-np	
Link map file information specification	-km	Outputs a map list into a link map file.
	-nkm	
	-kp	Outputs a public symbol list into a link map file.
	-nkp	
	-kl	Outputs a local symbol list into a link map file.
	-nkl	
Link map file format specification	-ll	Changes the number of lines printed per page in a link map file.
	-lf	Inserts a form feed code at the end of a link map file.
	-nlf	
Error list file output specification	-e	Outputs an error list file.
	-ne	
Parameter file specification	-f	Inputs the input file name and options from a specified file.
Device file search path specification	-y	Reads a device file from a specified path.
Copy routine address specification	-rc	Specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.
ROMization area specification	-ra	Specifies the ROMization target area.
Help specification	--	Outputs a help message on the display.

(2) Precedence

For the ROMization process options shown in the following table, the priority is explained in a case where two or more options along the vertical axis and options along the horizontal axis are specified at the same time.

Table B-13. Precedence of ROMization Process Options

	-no	-np	-nkm	-nkp	-nkl	--
-p			Δ	Δ	Δ	NG
-km		NG				NG
-kp		NG				NG
-kl		NG				NG

	-no	-np	-nkm	-nkp	-nkl	--
-ll		NG				NG
-lf		NG				NG

- Location marked with NG
  If an option in the horizontal axis is specified, the option in the vertical axis is invalid.

  Example The -km option is invalid.

```
C:\>rp78k0r a.lmf -np -km
```

- Location marked with Δ
  If all three of the options in the horizontal axis are specified at the same time, the option in the vertical axis is invalid.

  Example If the -nkm, -nkp, and -nkl options are specified at the same time, the -p option is invalid.

```
C:\>rp78k0r a.lmf -p -nkm -nkp -nkl
```

- Blank area
  If an option in the horizontal axis is specified, the option in the vertical axis is valid.

As with the -o/-no options, if two options for which "n" can be added to the beginning of the option name are specified at the same time, the option specified last is valid.

Example The -no option is specified after the -o option, so the -o option is invalid and the -no option is valid.

```
C:\>rp78k0r a.lmf -o -no
```

Options not described in "Table B-13. Precedence of ROMization Process Options" are not particularly affected by other options. However, if the help specification option (--) is specified, all of other option specifications become invalid.

Load module file output specification

The load module file output specification options are as follows.

- -o/-no

-o/-no

[Description format]

```
-o[output-file-name]
-no
```

- Interpretation when omitted
  -o*input-file-name*.lmf

[Function]

- The -o option specifies the output of a load module file.
  It also specifies the location to which it is output and the file name.
- The -no option disables the -o, -j, and -g option.

[Application]

- Use the -o option to specify the location to which a load module file is output or to change its file name.
- Specify the -no option when performing ROMization processing only to output a link map file. This will shorten ROMization process time.

[Description]

- Even if the -o option is specified, when a fatal error occurs, the load module file cannot be output.
- If "*output-file-name*" is omitted when the -o option is specified, the load module file "*input-file-name*.lmf" will be output to the current folder.
  The input file name is changed to "*input-file-name*_orig.lmf".
- "If only the path name is specified in "*output-file-name*", "*input-file-name*.lmf" will be output to the specified path.
- If both the -o and -no options are specified at the same time, the option specified last is valid.

[Example of use]

- To output a load module file (k0r.lmf), describe as:

```
C:\>rp78k0r a.lmf -ok0r.lmf
```

Link map file output specification

The link map file output specification options are as follows.

- -p/-np

-p/-np

[Description format]

```
-p[output-file-name]
-np
```

- Interpretation when omitted
  -p[*input-file-name*_romp.map

[Function]

- The -p option specifies the output of a link map file. It also specifies the location to which it is output and the file name.
- The -np option disables the -p, -km, -kd, -kp, -kl, -ll, and -lf option.

[Application]

- Use the -p option to specify the location to which a link map file is output or to change its file name.
- Specify the -np option when performing ROMization processing only to output a load module file. This will shorten ROMization process time.

[Description]

- If "*output-file-name*" is omitted when the -p option is specified, the link map file "*input-file-name*_romp.map" will be output to the current folder.
- If only the path name is specified in "*output-file-name*", "*input-file-name*_romp.map" will be output.
- If both the -p and -np options are specified at the same time, the option specified last is valid.

[Example of use]

- To create the link map file (k0r.map), describe as:

```
C:\>rp78k0r a.lmf -pk0r.map
```

Link map file information specification

The link map file information specification options are as follows.

- -km/-nkm
- -kp/-nkp
- -kl/-nkl

-km/-nkm

[Description format]

```
-km
-nkm
```

- Interpretation when omitted
  -km

[Function]

- The -km option outputs a map map into a link list file.
- The -nkm option disables the -kd and -km option.

[Application]

- Use the -km option to output a map list into a link map file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link map file cannot be output.
- If the -nkm option is specified, the link directive file cannot be output into a link map file.
- If both the -km and -nkm options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -km option is invalid.

[Example of use]

- To output a map list into a link map file (a_romp.map), describe as:

```
C:\>rp78k0r a.lmf -km
```

The contents of a_romp.map is as follows.

```
78K0R ROM Processor Vx.xx                                    Date:xx xxx xxxx  Page:   1

Command:    a.lmf -rc300h -km
Para-file:
Out-file:   a.lmf
Map-file:   a_romp.map


*** Link information ***

     6 output segment(s)
   F7H byte(s) real data
    78 symbol(s) defined


*** Memory map ***


  SPACE=REGULAR

         OUTPUT   INPUT    INPUT      BASE      SIZE
         SEGMENT  SEGMENT  MODULE     ADDRESS
         CODE                         00000H    00002H  CSEG AT
                  CODE     a.lmf
                                       00000H    00002H
* gap *                               00002H    000BEH
         ?CSEGOB0                     000C0H    00004H  CSEG AT
                  ?CSEGOB0 a.lmf
                                       000C0H    00004H
         ?CSEG                        000C4H    00061H  CSEG AT
                  ?CSEG    a.lmf
                                       000C4H    00061H
* gap *                               00125H    001DBH
         @@ROMP                       00300H    00090H  CSEG AT
                  _@ROMP   _rcopy     00300H    0008EH
                  PRO_RAM  a.lmf
                                       0038EH    00002H
* gap *                               00390H    3FC70H

         OUTPUT   INPUT    INPUT      BASE      SIZE
         SEGMENT  SEGMENT  MODULE     ADDRESS
* gap *                               FCF00H    02F20H
         DATA                         FFE20H    00003H  DSEG AT
                  DATA     a.lmf
                                       FFE20H    00003H
```

```
* gap *                                FFE23H    0000DH
         PRO_RAM                       FFE30H    00002H  CSEG AT
                  PRO_RAM  a.lmf
                                       FFE30H    00002H
* gap *                                FFE32H    000CEH
* gap (Not Free Area) *                FFF00H    00100H



*** Segment number ***



         SEGMENT NAME                            SEGMENT NUMBER
         PRO_RAM                                 1



 Target chip : uPD78xxx
 Device file : Vx.xx
```

-kp/-nkp

[Description format]

```
-kp
-nkp
```

- Interpretation when omitted
  -nkp

[Function]

- The -kp option outputs a public symbol list into a link map file.
- The -nkp option disables the -kp option.

[Application]

- Use the -kp option to output a public symbol list into a link map file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link map file cannot be output.
- If the -ng option is specified, the public symbol list cannot be output.
- If both the -kp and -nkp options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -kp option is invalid.

[Example of use]

- To output a public symbol list into a link map file (a_romp.map), describe as:

```
C:\>rp78k0r a.lmf -kp
```

The contents of a_romp.map is as follows.

```
78K0R ROM Processor Vx.xx                                    Date:xx xxx xxxx  Page:   1

Command:    a.lmf -rc300h -km
Para-file:
Out-file:   a.lmf
Map-file:   a_romp.map

*** Link information ***

     6 output segment(s)
   F7H byte(s) real data
    78 symbol(s) defined

*** Memory map ***

  SPACE=REGULAR

        :

*** Public symbol list ***

MODULE    ATTR       VALUE    NAME

k0rram
          ADDR       00000H   MAIN
          ADDR       000C4H   START
          ADDR       000E3H   CONVAH
          NUM        FFE20H   _@STBEG
          NUM        00300H   __rcopy
          ADDR       FFE30H   pro_ram
          NUM        FCF00H   _@STEND
          NUM        00000H   _@MAA
_rcopy
          ADDR       00300H   _@RCP
          NUM        0038EH   _S_romp


 Target chip : uPD78xxx
 Device file : Vx.xx
```

-kl/-nkl

[Description format]

```
-kl
-nkl
```

- Interpretation when omitted
  -nkl

[Function]

- The -kl option outputs a local symbol list into a link map file.
- The -nkl option disables the -kl option.

[Application]

- Use the -kl option to output a local symbol list into a link map file.

[Description]

- If the -nkm, -nkp, and -nkl options are all specified, the link map file cannot be output.
- If the -ng option is specified, the local symbol list cannot be output.
- If both the -kl and -nkl options are specified at the same time, the option specified last is valid.
- If the -np option is specified, the -kl option is invalid.

[Example of use]

- To output a local symbol list into a link map file (a_romp.map), describe as:

```
C:\>rp78k0r a.lmf -kl
```

The contents of a_romp.map is as follows.

```
78K0R ROM Processor Vx.xx                                Date:xx xxx xxxx  Page:   1


Command:    a.lmf -rc300h -km
Para-file:
Out-file:   a.lmf
Map-file:   a_romp.map



*** Link information ***


     6 output segment(s)
   F7H byte(s) real data
    78 symbol(s) defined
```

```
*** Memory map ***


  SPACE=REGULAR

        :

*** Local symbol list ***

MODULE    ATTR       VALUE    NAME

k0rram
          MOD                 SAMPM
          DSEG                DATA
          ADDR       FFE20H   HDTSA
          ADDR       FFE21H   STASC
          CSEG                CODE
          CSEG                ?CSEG
k0rram
          MOD                 SAMPS
          CSEG                ?CSEG
          ADDR       0011CH   SASC
          ADDR       00122H   SASC1
k0rram
          MOD                 k0rram
          CSEG                PRO_RAM
_rcopy
          MOD                 _rcopy
                     00300H   _@ROMP
          ADDR       00384H   ?L_RCPC
          ADDR       0037BH   ?L_RCP9
          ADDR       00386H   ?L_RCPA
          ADDR       00318H   ?L_RCP1
          ADDR       0032CH   ?L_RCP2
          ADDR       0033BH   ?L_RCP3
          ADDR       0034AH   ?L_RCP4
          ADDR       00351H   ?L_RCP5
          ADDR       00360H   ?L_RCP6
          ADDR       00372H   ?L_RCP7
          ADDR       00372H   ?L_RCP8


 Target chip : uPD78xxx
 Device file : Vx.xx
```

Link map file format specification

The link map file format specification options are as follows.

- -ll
- -lf/-nlf

-ll

[Description format]

```
-ll[number-of-lines]
```

- Interpretation when omitted
  -ll0 (No page breaks)

[Function]

- The -ll option specifies the number of lines per page in a link map file.

[Application]

- Use the -ll option to change the number of lines per page in a link map file.

[Description]

- The range number of lines that can be specified with the -ll option is 20 to 32767.
- An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of lines is omitted, it is assumed that 0 has been specified.
- If the number of lines specified is 0, no page breaks will be made.
- If the -np option is specified, the -ll option is invalid.

[Example of use]

- To specify 20 as the number of lines per page in a link list file (a_romp.map), describe as:

```
C:\>rp78k0r a.lmf -ll20
```

The contents of a_romp.map is as follows.

```
78K0R ROM Processor Vx.xx                                    Date:xx xxx xxxx  Page:   1

Command:    a.lmf -rc300h -km
Para-file:
Out-file:   a.lmf
Map-file:   a_romp.map


*** Link information ***

     6 output segment(s)
   F7H byte(s) real data
    78 symbol(s) defined


*** Memory map ***

-------------------------------------------------------------------------------------


78K0R ROM Processor Vx.xx                                    Date:xx xxx xxxx  Page:   2


  SPACE=REGULAR

         OUTPUT   INPUT    INPUT      BASE      SIZE
         SEGMENT  SEGMENT  MODULE     ADDRESS
         CODE                         00000H    00002H  CSEG AT
                  CODE     a.lmf
                                       00000H    00002H
* gap *                               00002H    000BEH
         ?CSEGOB0                     000C0H    00004H  CSEG AT
                  ?CSEGOB0 a.lmf
                                       000C0H    00004H
         ?CSEG                        000C4H    00061H  CSEG AT
                  ?CSEG    a.lmf
                                       000C4H    00061H
* gap *                               00125H    001DBH
         @@ROMP                       00300H    00090H  CSEG AT
                  _@ROMP   _rcopy      00300H    0008EH
-------------------------------------------------------------------------------------


78K0R ROM Processor Vx.xx                                    Date:xx xxx xxxx  Page:   3
```

```
                  PRO_RAM  a.lmf
                                        0038EH    00002H
* gap *                                 00390H    3FC70H

         OUTPUT   INPUT    INPUT      BASE      SIZE
         SEGMENT  SEGMENT  MODULE     ADDRESS
* gap *                                FCF00H    02F20H
         DATA                         FFE20H    00003H  DSEG AT
                  DATA     a.lmf
                                        FFE20H    00003H
* gap *                                 FFE23H    0000DH
         PRO_RAM                      FFE30H    00002H  CSEG AT
                  PRO_RAM  a.lmf
                                        FFE30H    00002H
* gap *                                 FFE32H    000CEH
-------------------------------------------------------------------------------------


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* gap (Not Free Area) *                FFF00H    00100H


*** Segment number ***


         SEGMENT NAME                             SEGMENT NUMBER
         PRO_RAM                                  1


 Target chip : uPD78xxx
 Device file : Vx.xx
```

-lf/-nlf

[Description format]

```
-lf
-nlf
```

- Interpretation when omitted
  -nlf

[Function]

- The -lf option inserts a form feed (FF) code at the end of a link map file.
- The -nlf option disables the -lf option.

[Application]

- Use the -lf option to insert a form feed code if you wish to add a page break after the contents of a link map file are printed.

[Description]

- If the -np option is specified, the -lf option is invalid.
- If both the -lf and -nlf options are specified at the same time, the option specified last is valid.

[Example of use]

- To inserts a form feed code at the end of a link list file (k0r.map), describe as:

```
C:\>rp78k0r a.lmf -pk0r.map -lf
```

Error list file output specification

The error list file output specification options are as follows.

- -e/-ne

-e/-ne

[Description format]

```
-e[file-name]
-ne
```

- Interpretation when omitted
  -ne

[Function]

- The -e option specifies the output of an error list file. It also specifies the location to which it is output and the file name.
- The -ne option disables the -e option.

[Application]

- Use the -e option to specify the location to which an error list file is output or to change its file name.

[Description]

- If the output file name is omitted when the -e option is specified, the output file name will be "*input-file-name*.elk".
- If the drive name is omitted when the -e option is specified, the error list file will be output to the current drive.
- If both the -e and -ne options are specified at the same time, the option specified last is valid.

[Example of use]

- To create an error list file (k0r.elk), describe as:

```
C:\>rp78k0r a.lmf -ek0r.elk
```

An error has occurred in the contents of the link directive file (k0r.dr).
The contents of the error list file (k0r.elk) is as follows.

```
k0r.dr(3) : RA78K0R error E3102: Directive syntax error
```

Parameter file specification

The parameter file specification option is as follows.

- -f

-f

[Description format]

```
-ffile-name
```

- Interpretation when omitted
  Options and input file names can only be input from the command line.

[Function]

- The -f option inputs options and input file names from a specified file.

[Application]

- Use the -f option when the information required to start up the ROMization processor will not fit on the command line.
- When specifying options repeatedly every time you perform ROMization processing, describe the options in the parameter file and specify the -f option.

[Description]

- An abort error occurs if the file name is omitted.
- Nesting of parameter files is not permitted.An abort error occurs if the -f option is specified within a parameter file.
- The number of characters that can be described within a parameter file is unlimited.
- Separate options or input file names with a blank space, a tab or the line feed code (LF).
- Options and input file names within a parameter file will be expanded at the position specified for the parameter file on the command line.
- The expanded options specified last is valid.
- The characters following ";" or "#" are all assumed to be comments, up to the line feed code (LF) or EOF.
- An abort error occurs if two or more -f option is specified.

[Example of use]

- Perform ROMization processing using a parameter file (k0r.ppr).
  The contents of the parameter file (k0r.ppr) is as follows.

```
; parameter file
a.lmf -ok0r.lmf -pk0r.map -e
-tC:\tmp -g
```

Enter the following from the command line.

```
C:\>rp78k0r -fk0r.ppr
```

Device file search path specification

The device file search path specification option is as follows.

- -y

-y

[Description format]

```
-ypath-name
```

- Interpretation when omitted
  The path from which the device file is read is determined according to the following sequence.

(1) Path registered in the device file installer

(2) Path by which the rp78k0r.exe was started up

(3) Current folder

(4) The environmental variable PATH

[Function]

- The -y option reads a device file from the specified path.

[Application]

- Use the -y option to specify a path where a device file exists.

[Description]

- An abort error occurs if something other than a path name is specified after the -y option.
- An abort error occurs if the path name is omitted after the -y option.
- The path from which the device file is read is determined according to the following sequence.

(1) The path specified by the -y option

(2) Path registered in the device file installer

(3) Path by which the RP78K0R was started up

(4) Current folder

(5) The environmental variable PATH

[Example of use]

- To specify the path for the device file as folder C:\78k0r\dev, describe as:

```
C:\>rp78k0r a.lmf -yC:\78k0r\dev
```

- To specify the path for the device file as folder D:\device files, describe as:

```
C:\>rp78k0r a.lmf -y"D:\device files"
```

Copy routine address specification

The copy routine address specification option is as follows.

- -rc

-rc

[Description format]

```
-rcaddress
```

- Interpretation when omitted
  The copy routine is allocated to the vacant area of the ROM area.

[Function]

- The -rc option specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Application]

- Use the -rc option to specify the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Description]

- This option specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Example of use]

- To allocate the copy routine for expanding ROMized segments in RAM area at address 300H, describe as:

```
C:\>rp78k0r a.lmf -rc300H
```

ROMization area specification

The ROMization area specification option is as follows.

- -ra

-ra

[Description format]

```
-rastart-address,end-address
```

- Interpretation when omitted
  The internal RAM area is the ROMization target.

[Function]

- The -ra option specifies the ROMization target area.

[Application]

- Use the -ra option to specify the ROMization target area.

[Description]

- Specify the start address and end address of the ROMization target area.

[Example of use]

- To target addresses 0FCF00H to FFFFFH for ROMization, describe as:

```
C:\>rp78k0r a.lmf -ra0FCF00H,0FFFFFH
```

Help specification

The help option is as follows.

- --

--

[Description format]

```
--
```

- Interpretation when omitted
  No display

[Function]

- The -- option outputs a help message on the display.

[Application]

- The help message is a list of explanations of the ROMization process options.See these when executing the ROMization processor.

[Description]

- When the -- option is specified, all other options are invalid.
- To read the next part of the help message, press the return key. To quit the help display, press any key other than the return key and then press the return key.

Caution This option cannot be specified from CubeSuite.

[Example of use]

- To output a help message on the display, describe as:

```
C:\>rp78k0r --
```

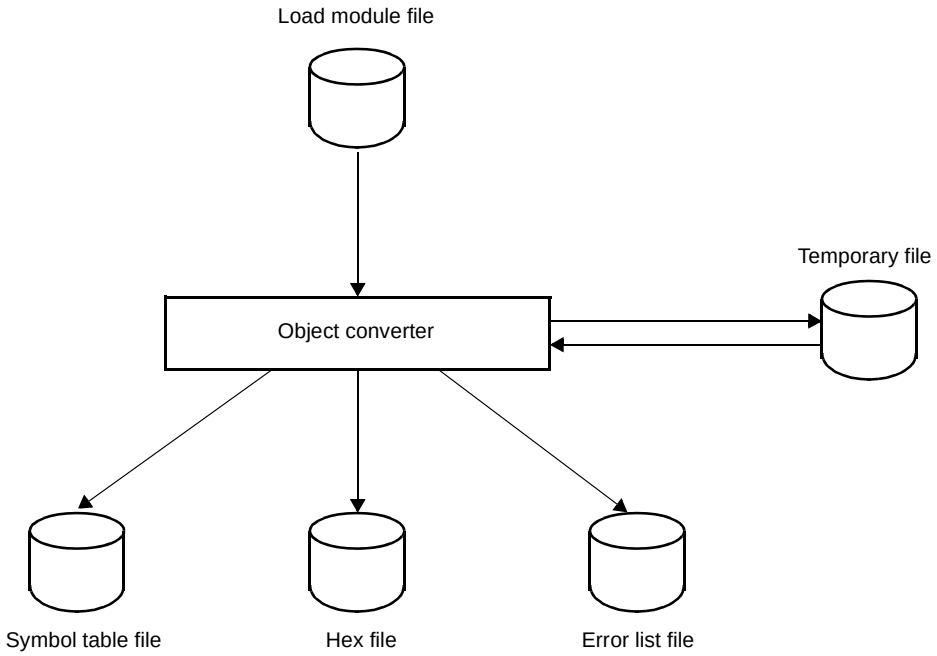
B.5 Object Converter

The object converter inputs the load module file (all reference address data must be determined at this point) output by the CA78K0R linker. It then converts this data into hexadecimal format and outputs it as an object module file.

The object converter also outputs the symbol information used for symbolic debugging as a symbol table file.

If an object converter error occurs, an error message appears on the display to clarify the cause of the error.

Figure B-29. I/O Files of Object Converter



B.5.1 I/O files

The I/O files of the object converter are shown below.

Table B-14. I/O Files of Object Converter

Type	File Name	Explanation	Default File Type
Input files	Load module file	- Binary image file of the object codes output as a result of linking - File output by the linker	.lmf
	Parameter file	- File containing the parameters for the executed commands (user-created file)	.poc
Output files	Hex file	- File created by converting the load module file into hexadecimal object format These files are used during mask ROM development and PROM program use.	.hex
	Symbol table file	- File containing the symbol information included in each module of an input files	.sym
	Error list file	- File containing error information generated during object conversion	.eoc

B.5.2 Functions

(1) Flash memory self-rewriting mode support

The object converter can create separate hex files in the boot area and flash area for the code located in the flash memory when the self-rewriting mode of the flash memory is used. To output separate hex files, specify the object convert option (-zf). The file type is as follows:

Table B-15. File Type When -zf Option Is Specified

File	File Type
Output file at boot area ROM program side	.hxb
Output file at program side other than boot area ROM	.hxf

(2) Hex files

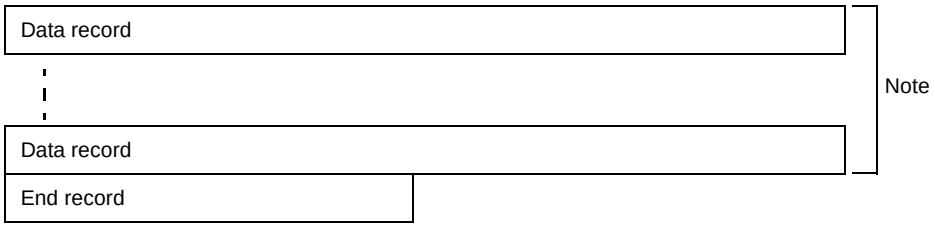
The hex file output by the object converter can be input to a hex loader such as a PROM programmer or a debugger.

The following is the hex file of the sample program.

```
: 0200000080007E
: 1000800011201A1620FE9A93001421FE63958462B3
: 1000900095FAFE617131809AA40073617131809A82
: 0D00A000A40072AF4D8D020D070D30AFA8
: 00000001FF
```

(a) Intel standard hex file format

Figure B-30. Intel Standard Format



Note The data record is repeated here.

- Data record

```
:      02     0000    00     8000    7E
(1)    (2)     (3)    (4)     (5)    (6)
```

Item Number	Description
(1)	Record mark Indicates beginning of record.

Item Number	Description
(2)	Code number (2 digits) Number of bytes in the code stored in the record. A maximum of 16 bytes can be stored.
(3)	Location address (offset) The start address (offset) of the code displayed in the record is shown as a 4-digit hexadecimal.
(4)	Record type Fixed at 00.
(5)	Code (Max. 32 digits) The object code is shown one byte at a time, with the higher 4 bits and lower 4 bits separated. A maximum of 16 bytes can be expressed in the code.
(6)	Check sum (2 digits) A value is input subtracting in order from 0 which counts down the data from the code number to the code.

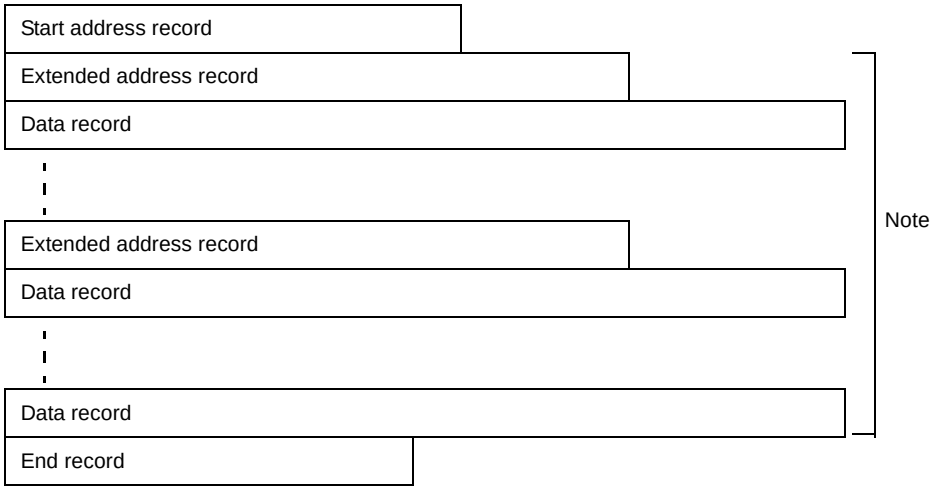
- End record

```
:       00      0000    01      FF
(1)     (2)      (3)    (4)      (5)
```

Item Number	Description
(1)	Record mark Indicates beginning of record.
(2)	Code number Fixed at 00.
(3)	Fixed at 0000.
(4)	Record type Fixed at 01.
(5)	Check sum Fixed at FF.

(b) Intel extended hex file format

Figure B-31. Intel Extended Format



Note The extended address record and the data record are repeated here.

- Extended address record

```
:       02      0000    02      XXXX    SS
(1)     (2)      (3)    (4)      (5)    (6)
```

Item Number	Description
(1)	Record mark Indicates beginning of record.
(2)	Code number Fixed at 02.
(3)	Fixed at 0000.
(4)	Record type Fixed at 02.
(5)	Paragraph value of the segment The paragraph value of the segment is shown as a 4-digit hexadecimal.
(6)	Check sum (2 digits) A value is input subtracting in order from 0 which counts down the data from the code number to the higher 8-bit value of the address.

- Data record

```
:       02      0000    00      80000   7E
(1)     (2)      (3)    (4)      (5)    (6)
```

Item Number	Description
(1)	Record mark Indicates beginning of record.
(2)	Code number (2 digits) Number of bytes in the code stored in the record. A maximum of 16 bytes can be stored.
(3)	Location address (offset) The start address (offset) of the code displayed in the record is shown as a 4-digit hexadecimal.
(4)	Record type Fixed at 00H.
(5)	Code (Max. 32 digits) The object code is shown one byte at a time, with the higher 4 bits and lower 4 bits separated. A maximum of 16 bytes can be expressed in th.e code.
(6)	Check sum (2 digits) A value is input subtracting in order from 0 which counts down the data from the code number to the code.

- Start address record

```
:       04      0000    03      0000    0000    F9
(1)     (2)      (3)    (4)      (5)     (6)    (7)
```

Item Number	Description
(1)	Record mark Indicates beginning of record.
(2)	Code number Fixed at 04.
(3)	Fixed at 0000.
(4)	Record type Fixed at 03.
(5)	Fixed at 0000.
(6)	Fixed at 0000.
(7)	Check sum Fixed at F9.

- End record

```
:       00      0000    01      FF
(1)     (2)      (3)    (4)     (5)
```

Item Number	Description
(1)	Record mark Indicates beginning of record.

Item Number	Description
(2)	Code number Fixed at 00.
(3)	Fixed at 0000.
(4)	Record type Fixed at 01.
(5)	Fixed at FF.

(c) Extended tektronix hex file format

Hex files are composed of the following three types of block.

- Data block
- Symbol block (This is an unused block. Symbol information uses the symbol table file.)
- Termination block

Each block starts with a header field composed of a common 6 characters, and ends with the string end-of-line.

Maximum length of each block is 255, not including the start character % and end-of-line.

The format for the common header field is shown below.

Table B-16. Extended Tektronix Header Field

Item	Number of ASCII Characters	Description
%	1	The percent symbol specifies that the block is in extended tektronix format.
Block length	2	This is a 2-digit hexadecimal which indicates the number of characters in the block. This number of characters does not include the start character % and end-of-line.
Block type	1	6 = Data block 3 = Symbol block 8 = Termination block
Check sum	2	This is a 2-digit hexadecimal which indicates the remainder produced when the total value of the characters[Note] in the block (except the start character %, the check sum, and end-of-line) is divided by 256.

Note Character Values for Check Sum Evaluation

Character	Value (Decimal)
0 to 9	0 to 9
A to Z	10 to 35
$	36
%	37
. (period)	38
_ (underscore)	39

Character	Value (Decimal)
a to z	40 to 65

- Data block

The format for the data block is shown below.

Table B-17. Data Block Format for Extended Tektronix

Field	Number of ASCII Characters	Description
Header	6	Standard header field Block type = 6
Load address	2 to 17	Address from which the object code is loaded. Number of characters is variable.
Object code	2n	Number of bytes n, displayed as a 2-digit hexadecimal

Caution In extended Tektronix, the number of characters in a specific field is variable within 2 to 17 (1 to 16 characters of actual data). The first character in this variable field is a hexadecimal which indicates the length of the field. The first character in this variable field is a hexadecimal which indicates the length of the field.The length of the character string is therefore 1 to 16 characters, and the length of the variable-length field including the character string length indicator is 2 to 17.

```
%       15      6       1C      3       100     020202020202
(1)     (2)     (3)     (4)     (5)     (6)         (7)
```

Item Number	Description
(1)	Header character
(2)	Block length 15H = 21
(3)	Block type 6
(4)	Check sum 1CH
(5)	Number of digits in load address
(6)	Load address 100H
(7)	Object code 6 bytes

- Termination block

The format for the termination block is shown below.

Table B-18. Termination Block Format for Extended Tektronix

Field	Number of ASCII Characters	Description
Header	6	Standard header field Block type = 8
Load address	2 to 17	Start address for program execution. Number of characters is variable.

```
%       08      8       1A      2       80
(1)     (2)     (3)     (4)     (5)     (6)
```

Item Number	Description
(1)	Header character
(2)	Block length 8H
(3)	Block type 8
(4)	Check sum 1AH
(5)	Number of digits in load address
(6)	Load address 80H

- Symbol block (unused)

The extended Tech symbol block is data used for symbolic debugging. It may be assumed to have the following characteristics.

Table B-19. Symbol Block Characteristics for Extended Tektronix

Items	Characteristics
Symbol	1 to 16 uppercase and lowercase alphabets, numerals, period and underscore. Numerals are not permitted for the start character.
Value	Up to 64 bits (16-digit hexadecimal) are possible.
Type	Address or scalar (a scalar indicates any numerical value other than an address). Addresses are divided into code addresses (instruction addresses) and data addresses (addresses of data items).
Global/local specification	Indicates whether a symbol is global (external reference enabled) or local.

Items	Characteristics
Section membership	A section may be considered a range to which a memory name is given. Each address in a program belongs to at least one section. A scalar does not belong to any section.

The format for the symbol block is shown below.

Table B-20. Symbol Block Format for Extended Tektronix

Field	Number of ASCII Characters	Description
Header	6	Standard header field Block type = 3
Section name	2 to 17	This is the name of the section which includes the symbols defined in the block. Number of characters is variable.
Section definition	5 to 35	This field must be displayed in one symbol block in each section. This field may be placed before or after any number of symbol definition fields. See "Table B-21. Symbol Block Section Definition Fields for Extended Tektronix" about this format.
Symbol definition	5 to 35 each	This is a symbol definition field greater than 0. See "Table B-22. Symbol Block Symbol Definition Fields for Extended Tektronix" about this format.

The symbols contained in a program are transferred as a symbol block. Each symbol block includes a section name and a list of the symbols that belong to that section (If necessary, a scalar can also be included in any section.)
Symbols in the same section can be placed in one or more blocks.
The formats for the section definition field and the symbol definition field in the symbol block are shown below.

Table B-21. Symbol Block Section Definition Fields for Extended Tektronix

Field	Number of ASCII Characters	Description
0	1	0 specifies that the field is a section definition field.
Base address	2 to 17	This is a section start address. Number of characters is variable.
Length	2 to 17	Indicates the section length. Number of characters is variable and is calculated by the following: 1 - (higher address - base address)

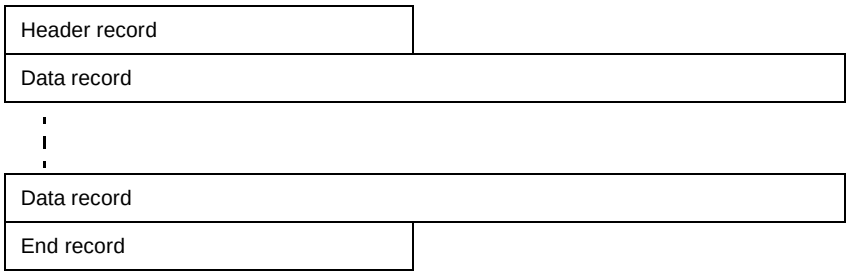
Table B-22. Symbol Block Symbol Definition Fields for Extended Tektronix

Field	Number of ASCII Characters	Description
Type	1	Displays 1-digit hexadecimal indicating global/local symbol specification and type of value. 1 = Global address 2 = Global scalar 3 = Global code address 4 = Global data address 5 = Local address 6 = Local scalar 7 = Local code address 8 = Local data address
Symbol	2 to 17	Indicates the symbol length. This is variable.
Numerical value	2 to 17	This is the value corresponding to a symbol. Number of characters is variable.

(d) Motorola S-type format

Change generated hex files have three types of records, and consist of five records. The overall structure of the file is shown in the figure below.

Figure B-32. Motorola S-type Format



Types of records are shown below.

Table B-23. Record Types for Motorola Hex File

Type	Record Type
Header record (optional)	S0
Data record	S2 (Standard 24 bits) S3 (32 bits)
End record	S8 (Standard 24 bits) S7 (32 bits)

Motorola hex format files are divided into standard 24-bit addresses and 32-bit addresses. Standard addresses are composed of records S0, S2, and S8. The 32-bit addresses are composed of records S0, S3 and S7. Header record S0 is optional and is not output. A CR character is placed at the end of each S record. The general formats and their meanings for each field in each record are shown below.

Table B-24. General Format for Each Record

Record Type	General Format
S0	S0XXYY ... YYZZZZ
S2	S2XXWWWWWWDD ... DDZZ
S3	S3XXWWWWWWWWDD ... DDZZ
S7	S7XXWWWWWWWWZZ
S8	S8XXWWWWWWZZ

Table B-25. Meanings of Fields

Field	Meaning
Sn	Record type
XX	Length of data record Number of bytes in the address, hexadecimal data and check sum
YY ... YY	File name ASCII code for the input file name expressed as a hexadecimal
WWWWWW [WW]	24th [32th] bit address
DD ... DD	Hexadecimal data 1 byte of data expressed as a 2-digit hexadecimal
ZZ	Check sum The lower 1 byte of complement 1 for the sum for each byte of the record length, address and the hexadecimal data, expressed as a 2-digit hexadecimal

```
S2      08      00FF11      D4520A20    A0
(1)     (2)       (3)          (4)      (5)
```

Item Number	Description
(1)	Record type
(2)	Record length
(3)	Load address (24-bit address)
(4)	Hexadecimal data
(5)	Check sum

- S0 record

```
S0      XX      YYYYYYYY    ZZ
(1)     (2)       (3)       (4)
```

Item Number	Description
(1)	Record type

Item Number	Description
(2)	Record length This is the number of bytes in (3) plus the number of bytes in (4).
(3)	File name
(4)	Check sum

- S2 record

```
S2      XX      WWWWWW      DD ... DD   ZZ
(1)     (2)       (3)          (4)      (5)
```

Item Number	Description
(1)	Record type
(2)	Record length This is the number of bytes in (3) plus the number of bytes in (4) plus the number of bytes in (5).
(3)	Load address This is the 24-bit load address of the data in (4) within the range 0H to FFFFFFH.
(4)	Data This is the loaded data itself.
(5)	Check sum

- S3 record

```
S3      XX      WWWWWWWW    DD ... DD   ZZ
(1)     (2)       (3)          (4)      (5)
```

Item Number	Description
(1)	Record type
(2)	Record length This is the number of bytes in (3) plus the number of bytes in (4) plus the number of bytes in (5).
(3)	Load address This is the 32-bit load address of the data in (4) within the range 0H to FFFFFFFFH.
(4)	Data This is the loaded data itself.
(5)	Check sum

- S7 record

```
S7      XX      WWWWWWWW    ZZ
(1)     (2)       (3)       (4)
```

Item Number	Description
(1)	Record type
(2)	Record length This is the number of bytes in (3) plus the number of bytes in (4).
(3)	Entry address This is the 32-bit entry address within the range 0H to FFFFFFFFH.
(4)	Check sum

- S8 record

```
S8      XX      WWWWWWWW    ZZ
(1)     (2)         (3)     (4)
```

Item Number	Description
(1)	Record type
(2)	Record length This is the number of bytes in (3) plus the number of bytes in (4).
(3)	Entry address This is the 24-bit entry address within the range 0H to FFFFFFH.
(4)	Check sum

(3) Symbol table file

The symbol table file output by the object converter is input to a debugger.
The following is the symbol table file of the sample program.

```
#05
; FF    PUBLIC
01000E9CONVAH
0100000MAIN
01000D2START
00FFE20_@STBEG
00FCF00_@STEND
; FF    SAMPM
<02FFE20HDTSA
02FFE21STASC
; FF    SAMPS
<010015CSASC
0100162SASC1
=
```

Figure B-33. Formats for Symbol Table File

Start of symbol table	#	05	CR	LF				
Start of public symbol	;	FF	5 blank spaces		PUBLIC	CR	LF	
	Note ->	Symbol attributes	Symbol value		Public symbol name	CR	LF	Public symbol
		:	5 blank spaces		:	:	:	
	;	FF	5 blank spaces		Module name 1	CR	LF	
Start of local symbol	<	Symbol attributes	Symbol value		Local symbol name	CR	LF	Local symbols for each module
		Symbol attributes	Symbol value		Local symbol name	CR	LF	
		:	:		:	:	:	
	;	FF	5 blank spaces		Module name 2	CR	LF	
Repeated in units of object module		:	:		:	:	:	
End mark of symbol table	=	CR	LF					

Note Symbol attributes are the values shown below.
See the following figure about formats of symbol values.

Value	Symbol Attribute
00	Constant defined by the EQU directive
01	Label within a code segment
02	Label within a data segment
03	Bit symbol
FF	Module name

Figure B-34. Formats for Symbol Value

- When the symbol attribute is NUMBER

Constant value 4 digits

- When the symbol attribute is LABEL

Address value 4 digits

- When the symbol attribute is a bit symbol]

Upper 13 bits	Lower 3 bits

Upper 13 bits: The relative address from 0FE00H

Lower 3 bits: Bit position (0 to 7)

B.5.3 Method for manipulating

(1) Object converter startup

The following two methods can be used to start up the object converter.

(a) Startup from the command line

```
X:[path-name]>oc78k0r[Δoption]...load-module-file-name[Δoption]...
```

X	Current drive name
path-name	Current folder name
oc78k0r	Command name of the object converter
option	Enter detailed instructions for the operation of the object converter. When specifying two or more object convert options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the object convert options. See "B.5.4 Option" for details about object convert options. Enclose a path that includes a space in a pair of double quotation marks (" ").
load-module-file-name	File name of load module to be converted Enclose the file name of a path that includes a space in a pair of double quotation marks (" ").

Example To output a hex file (sample.hex), describe as:

```
C:\>oc78k0r k0r.lmf -osamle.hex
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the object converter will not fit on the command line, or when the same object convert option is specified repeatedly each time object conversion is performed.

To start up the object converter from a parameter file, specify the parameter file option (-f) on the command line.

Start up the object converter from a parameter file as follows:

```
X>oc78k0r[Δload-module-file]Δ-fparameter-file
```

-f	Parameter file specification option
parameter-file-name	A file which includes the data required to start up the object converter

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the load module file name is omitted from the command line, only 1 load module file name can be specified in the parameter file.
- The load module file name can also be written after the option.
- Write in the parameter file all object convert options and output file names specified in the command line.

Example Create a parameter file k0r.poc using an editor, and then start up the object converter.

```
; parameter file
k0r.lmf -osample.hex
-ssample.sym -r
```

```
C:\>ra78k0r -fk0rmain.pra
```

(2) Execution start and end messages

(a) Execution start message

When the object converter is started up, an execution startup message appears on the display.

```
78K0R Object Converter Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
```

(b) Execution end message

If it detects no object conversion errors resulting from the object conversion, the object converter outputs the following message to the display and returns control to the host operating system.

```
Target chip : uPD78xxx
Device file : Vx.xx

Object Conversion Complete, 0 error(s) and 0 warning(s) found.
```

If it detects an object conversion errors resulting from the object conversion, the object converter outputs the number of errors and warnings to the display and returns control to the host operating system.

```
Target chip : uPD78xxx
Device file : Vx.xx

Object Conversion Complete, 3 error(s) and 0 warning(s) found.
```

If the object converter detects a fatal error during object conversion which makes it unable to continue object convert processing, the object converter outputs a message to the display, cancels object conversion and returns control to the host operating system.

Examples 1. A non-existent load module file is specified.

```
C:\>oc78k0r sample.lmf
```

```
78K0R Object Converter Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F4006 : File not found 'sample.lmf'
Program aborted.
```

In the above example, a non-existent load module file is specified. An error occurs and the object converter aborts the object conversion.

2. A non-existent object convert option is specified.

```
C:\>oc78k0r k0r.lmf -a
```

```
78K0R Object Converter Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F4018 : Option is not recognized '-a'
Please enter 'OC78K0R--' , if you want help messages.
Program aborted.
```

In the above example, a non-existent object convert option is specified. An error occurs and the object converter aborts the object conversion.

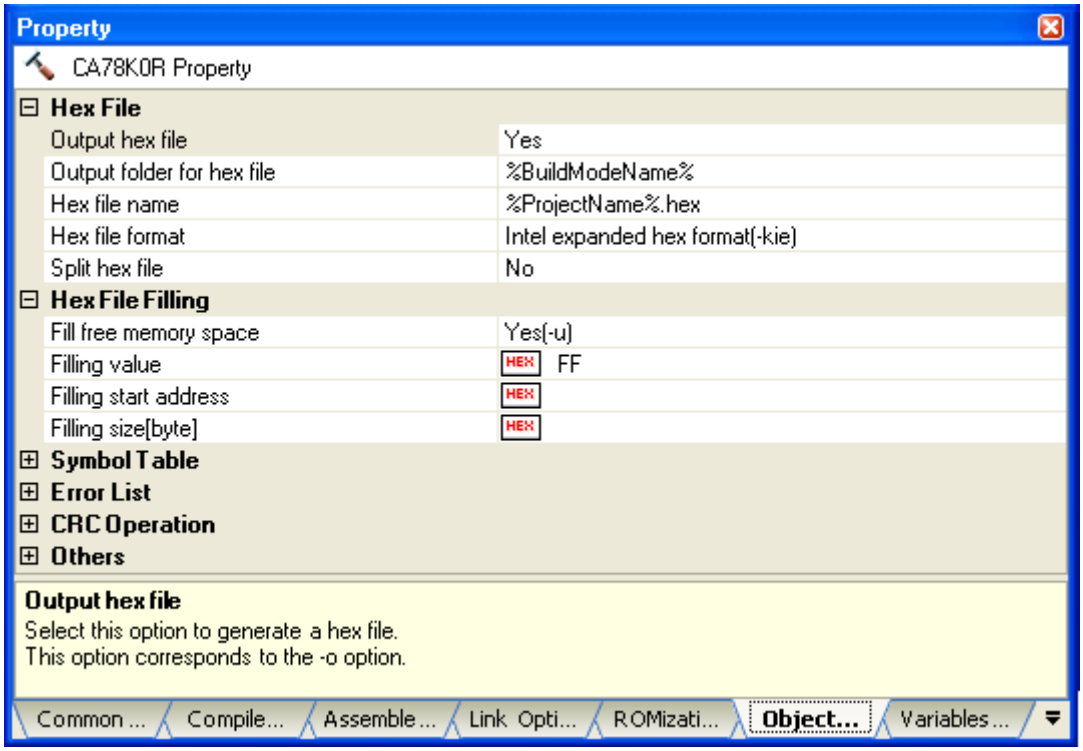
(3) Set options in CubeSuite+

This section describes how to set object convert options from CubeSuite+.

On CubeSuite+'s Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu. The Property panel opens. Next, select the [Object Convert Options] tab.

You can set the various object convert options by setting the necessary properties in this tab.

Figure B-35. Property Panel: [Object Convert Option] Tab



B.5.4 Option

(1) Types

The object convert options are detailed instructions for the operation of the object converter.

The types and explanations for object convert options are shown below.

Table B-26. Object Convert Options

Classification	Option	Description
Hex file output specification	-o	Specifies the format of a hex file.
	-no	
Symbol table file output specification	-s	Specifies the output of a symbol table file.
	-ns	
Object address order sort specification	-r	Sorts hex-format objects in order of address.
	-nr	
Object filling value specification	-u	Outputs a specified filling value as an object code for an address area to which no hex-format object has been output.
	-nu	

Classification	Option	Description
Error list file output specification	-e	Outputs an error list file.
	-ne	
Parameter file specification	-f	Inputs the input file name and options from a specified file.
Hex-format specification	-ki	Intel standard hex-format
	-kie	Intel expanded hex-format
	-kt	Extended tektronix format
	-km	Motorola S type format (standard address)
	-kme	Motorola S type format (32-bit address)
Device file search path specification	-y	Reads a device file from a specified path.
File separate output specification for built-in flash memory product	-zf	Splits the file into separate files: one for the boot area and one for other areas.
CRC operation specification	-crc	Performs the CRC operation of the hex-format object.
Help specification	--	Outputs a help message on the display.

Hex file output specification

The hex file output specification options are as follows.

- -o/-no

-o/-no

[Description format]

```
-o[output-file-name]
-no
```

- Interpretation when omitted
  -o*input-file-name*.hex

[Function]

- The -o option specifies the output of a hex file.
  It also specifies the location to which it is output and the file name.
- The -no option specifies that no hex file is output.

[Application]

- Use the -o option to specify the location to which a hex file is output or to change its file name.
- Specify the -no option when performing an object conversion only to output a symbol table file. This will shorten object conversion time.

[Description]

- If "*output-file-name*" is omitted when the -o option is specified, the hex file "*input-file-name*.hex" will be output to the current folder.
- If only the path name is specified in "*output-file-name*", "*input-file-name*.hex" will be output to the specified path.
- If both the -o and -no options are specified at the same time, the option specified last is valid.
- If the -zf option is specified, the file type is as follows.

File	File Type
Output file at boot area ROM program side	.hxb
Output file at program side other than boot area ROM	.hxf

[Example of use]

- To output a hex file (sample.hex), describe as:

```
C:\>oc78k0r k0r.lmf -osample.hex
```

Symbol table file output specification

The Symbol table file output specification options are as follows.

- -s/-ns

-s/-ns

[Description format]

```
-s[output-file-name]
-ns
```

- Interpretation when omitted
  -s*input-file-name*.sym

[Function]

- The -s option specifies the output of a symbol table file. It also specifies the location to which it is output and the file name.
- The -ns option specifies that no symbol table file is output.

[Application]

- Use the -s option to specify the location to which a symbol table file is output or to change its file name.
- Specify the -ns option when performing object conversion only to output a hex file.
  This will shorten object conversion time.

[Description]

- If "*output-file-name*" is omitted when the -s option is specified, the symbol table file "*input-file-name*.sym" will be output to the current folder.
- If only the path name is specified in "*output-file-name*", "*input-file-name*.sym" will be output to the specified path.
- If both the -s and -ns options are specified at the same time, the option specified last is valid.

[Example of use]

- To output a symbol table file (sample.sym), describe as:

```
C:\>oc78k0r k0r.lmf -ssample.sym
```

Object address order sort specification

The object address order sort specification options are as follows.

- -r/-nr

-r/-nr

[Description format]

```
-r
-nr
```

- Interpretation when omitted

  -r

[Function]

- The -r option outputs sorting of hex-format objects in order of address.
- The -nr option outputs hex-format objects in the order in which they are stored in the load module file.

[Application]

- Use the -nr option to specify when the hex-format objects do not need to be sorted in address order.

[Description]

- If both the -r and -nr options are specified at the same time, the option specified last is valid.
- If the -no option is specified, the -r and -nr option are invalid.

[Example of use]

- To sort hex-format objects in order of address, describe as:

```
C:\>oc78k0r k0r.hex -r
```

Object filling value specification

The object filling value specification options are as follows.

- -u/-nu

-u/-nu

[Description format]

```
-ufilling-value[,[start-address],size]
-nu
```

- Interpretation when omitted
  -u0FFH (filled with 0FFH)

[Function]

- The -u option outputs a specified filling value as an object code for an address area to which no hex-format object has been output.
- The -nu option disables the -u option.

[Application]

- Address areas to which no hex-format object has been output may become written with unnecessary code. When such addresses are accessed by the program for any reason, their action may be unpredictable. By specifying the -u option, write code in advance to address areas to which no hex-format object has been output.

[Description]

- The range that can be specified for the filling value is 0H to 0FFH.
  It can be specified in binary, octal, decimal or hexadecimal numbers. An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- Specify the start address of the address area for filling to be performed as *start-address*.
  The range that can be specified for the value is 0H to 0FFEFFH.
  It can be specified in binary, octal, decimal or hexadecimal numbers. An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.If the start address is omitted, it is assumed that 0 has been specified.
- Specify the size of the address area for filling to be performed as *size*.
  The range that can be specified for the value is 1H to 0FFF00H.
  It can be specified in binary, octal, decimal or hexadecimal numbers. An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified. When *start-address* has been specified, *size* cannot be omitted.
- If *start-address* nor *size* is specified, the object converter performs processing assuming that the range of the internal ROM is specified.
- If both the -u and -nu options are specified at the same time, the option specified last is valid.
- If the -no option is specified, the -u and -nu option are invalid.
- Two or more address ranges cannot be specified by using the -u option.
- Specification formats for *start-address* and *size* by the -u option and their interpretation are as follows.

(1) -u*filling-value*

If the target device contains internal ROM, the internal ROM range

(2) -u*filling-value,size*

From address 0 to "*size* - 1"

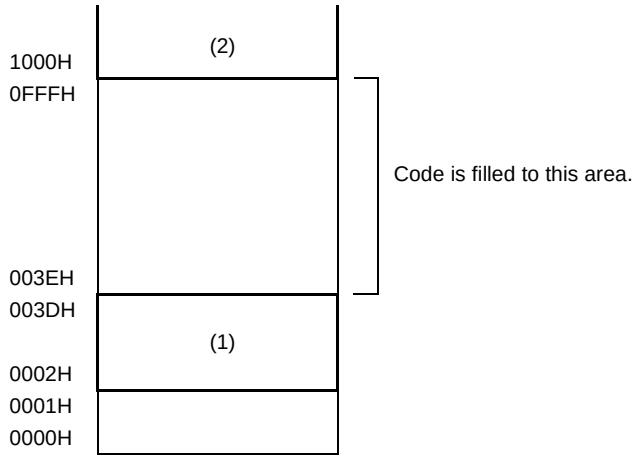
(3) -u*filling-value,start-address,size*

From *start-address* to "*start-address* + *size* - 1"

[Example of use]

- Fill an address area to which a hex-format object has not been output with code.
  It is supposed that the following hex file exists. In this case, code cannot be written to the address area 003EH to 0FFFH.

```
: 020000000200FC
: 100002002B41000BFC80FE2B40000944F7083A20EC    ; (1)
: 100012001A6720FE2822006521FED350D25014FE1A    ; (1)
: 10002200B900059F2835002431B900059F28350005    ; (1)
: 0C003200242156AF0A8302A807A830560C
: 01000003B5D0d0026A3...                        ; (2)
: 1010100024A5F622B667...                       ; (2)
    :
: 00000001FF
```



To fill 00H to the address area 003EH to 0FFFH, describe as:

```
C:\>oc78k0r k0r.lmf -u00h,003eh,0fc2h
```

Error list file output specification

The error list file output specification options are as follows.

- -e/-ne

-e/-ne

[Description format]

```
-e[output-file-name]
-ne
```

- Interpretation when omitted
  -ne

[Function]

- The -e option specifies the output of an error list file.
  It also specifies the location to which it is output and the file name.
- The -ne option disables the -e option.

[Application]

- Use the -e option to specify the location to which an error list file is output or to change its file name.

[Description]

- If the output file name is omitted when the -e option is specified, the output file name will be "*input-file-name*.eoc".
- If the drive name is omitted when the -e option is specified, the error list file will be output to the current drive.
- If both the -e and -ne options are specified at the same time, the option specified last is valid.

[Example of use]

- To create an error list file k0r.eoc, describe as:

```
C:\>oc78k0r k0r.lmf -ek0r.eoc
```

Parameter file specification

The parameter file specification option is as follows.

- -f

-f

[Description format]

```
-ffile-name
```

- Interpretation when omitted
  Options or input file names can only be input from the command line.

[Function]

- The -f option inputs options and input file names from a specified file.

[Application]

- Use the -f option when the information required to start up the object converter will not fit on the command line.
- When specifying options repeatedly every time you perform object conversion, describe the options in the parameter file and specify the -f option.

[Description]

- An abort error occurs if the file name is omitted.
- Nesting of parameter files is not permitted. An abort error occurs if the -f option is specified within a parameter file.
- The number of characters that can be described within a parameter file is unlimited.
- Separate options or input file names with a blank space, a tab or the line feed code (LF).
- Options and input file names within a parameter file will be expanded at the position specified for the parameter file on the command line.
- The expanded options specified last is valid.
- The characters following ";" or "#" are all assumed to be comments, up to the line feed code (LF) or EOF.
- An abort error occurs if two or more -f option is specified.

[Example of use]

- Perform object conversion using a parameter file (78k0r.poc).
  The contents of the parameter file (78k0r.poc) is as follows.

```
; parameter file
k0r.lmf -osample.hex
-ssample.sym -r
```

Enter the following from the command line.

```
C:\>oc78k0r k0r.lmf -f78k0r.poc
```

Hex-format specification

The hex-format specification options are as follows.

- -ki/-kie/-kt/-km/-kme

-ki/-kie/-kt/-km/-kme

[Description format]

```
-ki
-kie
-kt
-km
-kme
```

- Interpretation when omitted
  -kie

[Function]

- These options specify the format of a hex file to be output.

[Application]

- Use these options to specify the format of a hex file to be output from among "Intel standard", "Intel extended", "Extended tektronix", "Motorola S type (standard address)" and "Motorola S type (32-bit address)".

[Description]

- This section describes each option.

Option	Hex Format	Range
-ki	Intel standard	0H to FFFFH (up to 64 KB)
-kie	Intel expanded	0H to FFFFFH (up to 1 MB)
-kt	Extended tektronix	0H to FFFFFFFFH (up to 4 GB)
-km	Motorola S type (standard address)	0H to FFFFFFH (up to 16 MB)
-kme	Motorola S type (32-bit address)	0H to FFFFFFFFH (up to 4 GB)

[Example of use]

- To specify a hex file to be output as the Motorola S format (standard address), describe as:

```
C:\>oc78k0r k0r.lmf -km
```

Device file search path specification

The device file search path specification option is as follows.

- -y

-y

[Description format]

```
-ypath-name
```

- Interpretation when omitted
  The path from which the device file is read is determined according to the following sequence.

(1) Path registered in the device file installer

(2) Path by which the oc78k0r.exe was started up

(3) Current folder

(4) The environmental variable PATH

[Function]

- The -y option reads a device file from the specified path.

[Application]

- Use the -y option to specify a path where a device file exists.

[Description]

- An abort error occurs if something other than a path name is specified after the -y option.
- An abort error occurs if the path name is omitted after the -y option.
- The path from which the device file is read is determined according to the following sequence.

(1) The path specified by the -y option

(2) Path registered in the device file installer

(3) Path by which the OC78K0R was started up

(4) Current folder

(5) The environmental variable PATH

[Example of use]

- To specify the path for the device file as folder C:\78k0r\dev, describe as:

```
C:\>oc78k0r k0r.lmf -yC:\78k0r\dev
```

- To specify the path for the device file as folder D:\device files, describe as:

```
C:\>oc78k0r k0r.lmf -y"D:\device files"
```

File separate output specification for built-in flash memory product

The file separate output specification option for built-in flash memory product is as follows.

- -zf

-zf

[Description format]

```
-zf
```

- Interpretation when omitted
  Not separately output

[Function]

- The -zf option splits the file into separate files: one for the boot area and one for other areas.

[Description]

- When specifying boot area ROM program linking for a product with built-in flash memory, add this option to split up the file into separate hex format files, one for the boot area and one for other areas.
- If the -zf option is specified, the output file type at the boot area ROM program side is "hxb", and the output file type at the side of the other programs is "hxf".

Caution **Do not specify this option for a device that does not have a flash memory area self-programming function.**

[Example of use]

- To split the hex file into separate files: k0r.hxb for the boot area and k0r for other areas, describe as:

```
C:\>oc78k0r k0r.lmf -zf
```

CRC operation specification

The CRC operation specification option is as follows.

- -crc

-crc

[Description format]

```
-crcoutput-address=start-address-end-address[,start-address-end-address]...[/operation-
method][/initial-value]
```

- Interpretation when omitted
  The CRC operation and outputting the result are not performed.

[Function]

- The -crc option specifies whether to perform the CRC operation.

[Application]

- The CRC (Cyclic Redundancy Check) operation is performed on the hex-format objects in the specified range, from low address to high address, and the results of the operation are output to the output address.

[Description]

- The range that can be specified for the output address is 0H to 0FFF00H.
  It can be specified in binary, octal, decimal or hexadecimal numbers.
  An abort error occurs if a numerical value outside this range, if something other than a numerical value is specified, or if the value is omitted.
- Two or more ranges (start address - end address) can be specified by separating them with commas.
  The range that can be specified for the start address and end address is 0H to 0FFF00H.
  An abort error occurs if a numerical value outside this range, if something other than a numerical value is specified, or if the value is omitted.
- Specify "HIGH" or "GENERAL" for the operation method.
  A high-speed CRC operation can be obtained by specifying HIGH, and a general-purpose CRC operation by specifying GENERAL (See the user's manual of the device for details about the high-speed CRC and general-purpose CRC).
  If the specification of the operation method is omitted, it is assumed that "HIGH" has been specified.
- Specify the initial value for the operation for the initial value.
  The range that can be specified for the initial value is 0H to 0FFFFH.
  If "HIGH" is specified for the operation method, the specification of the initial value is omitted and it is assumed that "0H" has been specified.
  If the initial value is omitted, it is assumed that "0H" has been specified.
  An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- The vacant area in the operation range is operated using the value specified by the object filling value specification option (-u).
  If the object filling value specification option is not specified, it is assumed that "0FFH" has been specified.
  The operation result is 16-bit data from 0H to 0FFFFH.

- The address that the hex-format object is output cannot be included in the output address.
  An abort error will occur if such an address is specified.
- The output address cannot be included in the operation range.
  An abort error will occur if such an address is specified.
- The operation order is not same with the specified order of the operation range.
  The operation is performed on the specified range, from low address to high address.
- If the -no option is specified, the -crc option is invalid.

[Example of use]

- To perform a high-speed CRC operation on the area from address 1000H to address 1FFDH, and address 2000H to address 2FFFH, and output the results to address 1FFEH, describe as:

```
C:\>oc78k0r -crc k0r.lmf -crc1FFEh=1000h-1FFDh,2000h-2FFFh/HIGH
```

Help specification

The help option is as follows.

- --

--

[Description format]

```
--
```

- Interpretation when omitted
  No display

[Function]

- The -- option outputs a help message on the display.

[Application]

- The help message is a list of explanations of the object convert options.
  See these when executing the object converter.

[Description]

- When the -- option is specified, all other options are invalid.

Caution This option cannot be specified from CubeSuite+.

[Example of use]

- To output a help message on the display, describe as:

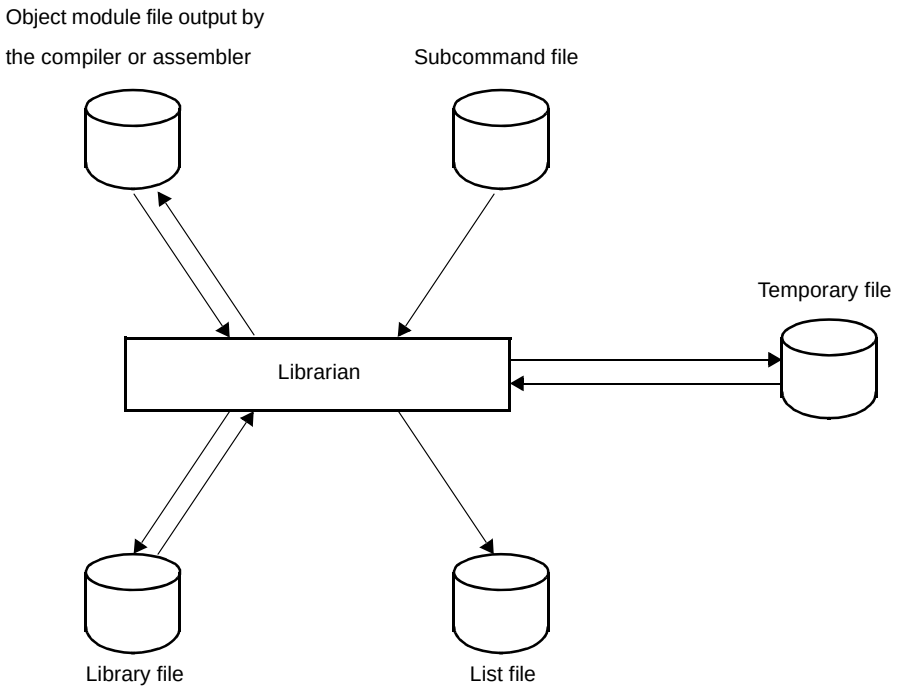
```
C:\>oc78k0r --
```

```
78K0R Object Converter Vx.xx [xx xxx xx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

usage : oc78k0r [option[...]] input-file [option[...]]
The option is as follows ([] means omissible).
-ffile           :Input option or input-file name from specified file.
-o[file]/-no     :Create HEX module file [with specified name] / Not.
-s[file]/-ns     :Create symbol table file [with specified name] / Not.
-e[file]/-ne     :Create the error list file [with the specified name] / Not.
-r/-nr           :Sort HEX object by address / Not.
-uvalue[,[start],size]/-nu :Fill up HEX object with specified value / Not.
-kkind           :Select hex format.  I;intel format  IE;intel extend format
                       T;tex format  M;s format  ME;s-32bit format
-ydirectory      :Set device file search path.
-zf              :Create boot hex module file (HXB), and flash hex module file(HXF).
-crcaddress=start-end[,start-end]...[/method][/init]
                 :Output CRC operation result value.
--               :Show this message.
DEFAULT ASSIGNMENT: -o -s -r -u0ffh
```

B.6 Librarian

The librarian edits CA78K0R object module files and library files in units of one module. It also outputs a list file.
If a librarian error occurs, an error message is output to the display indicating the cause of the error.

Figure B-36. I/O Files of Librarian



B.6.1 I/O files

The I/O files of the librarian are shown below.
See "3.6 Librarian" for details about output lists.

Table B-27. I/O Files of Librarian

Type	File Name	Explanation	Default File Type
Input files	Subcommand file	- File containing the subcommands and parameters for the executed commands (user-created file)	None
Output files	List file	- File containing the result of library file information output	.lst
I/O files	Object module file	- Object module file output by the compiler or assembler	.rel
	Library file	- File used to input the library files output by the librarian and update the contents	.lib
	Temporary file	- File created automatically by the librarian when forming a library Temporary files are deleted when execution of the librarian ends.	Lb*xxxxxx*.$$y (y = 1 to 6)

B.6.2 Functions

(1) Formation of a library of modules

The assembler and linker create one file for every module they output.
This means that if a large number of modules are created, the number of files also grows. The assembler therefore includes a function for collecting a number of object modules in a single file. This function is called module library formation, and a file which is organized as a library is called a library file.
A library file can be input to the linker. By creating a library file consisting of modules common to many programs, users can make file management and operation efficient and easy when performing modular programming.

(2) Editing of library files

The librarian incorporates the following editing functions for library files.

- Addition of modules to library files
- Deletion of modules from library files
- Replacement of modules in library files
- Retrieval of modules from library files

See "B.6.5 Subcommands" for details about these functions.

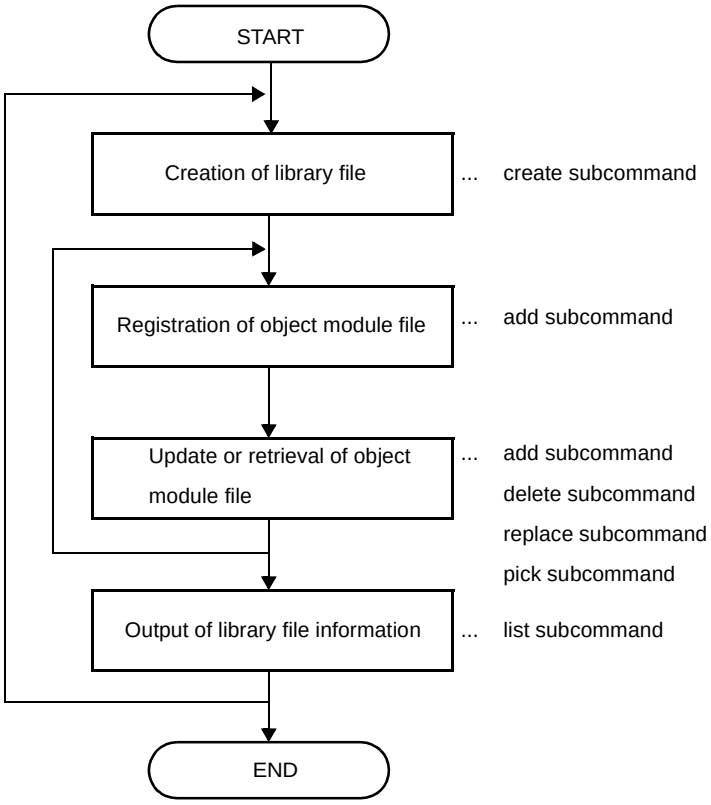
(3) Output of library file information

The librarian incorporates functions for the editing and output of the following items of information stored in library files.

- Module names
- Created programs
- Date of registration
- Date of update
- PUBLIC symbol information

Caution The librarian performs functions (2) and (3) explained above using subcommands. The librarian carries out the process while explaining each subcommand in order. See "B.6.5 Subcommands" the operation of subcommands.

The general procedure for creating library files is as follows.



B.6.3 Method for manipulating

(1) Librarian startup

The following two methods can be used to start up the librarian.

(a) Startup from the command line

```
X:[path-name]>lb78k0r[Δoption]...
```

X	Current drive name
path-name	Current folder name
lb78k0r	Command name of the librarian
option	Enter detailed instructions for the operation of the librarian. When specifying two or more create library options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the create library options. See "B.6.4 Option" for details about create library options. Enclose a path that includes a space in a pair of double quotation marks (" ").

Example To specify 20 as the number of lines per page and specify 80 as the number of characters per line in a list file, describe as:

```
C:\>lb78k0r -ll20 -lw80
```

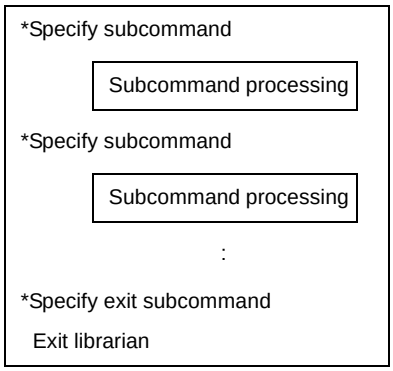
When the librarian is started up, an execution startup message appears on the display.

```
78K0R Librarian Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
*
```

After an asterisk (*), specify a librarian subcommand.

```
*create k0r.lib
*add k0r.lib k0rmain.rel k0rsub.rel
*exit
```

When input of subcommands is finished, processing of each subcommand begins. When processing of one subcommand is complete, "*" appears again on the screen and the librarian waits for the next subcommand to be entered. The librarian repeats this operation until the exit subcommand is entered.



Up to 128 characters can be specified per line.
If all the required operand data will not fit on 1 line, use "&" to continue specification on the next line.
Specification can be continued up to 15 lines.

(b) Startup from a subcommand file

A subcommand file is a file in which librarian subcommands are stored.
If a subcommand file is not specified when the librarian is started up, multiple subcommands must be specified after "*" appears. By creating a subcommand file, these multiple subcommand files can all be processed at once.
A subcommand file can also be used when the same subcommand is specified repeatedly each time library formation is performed.
When using a subcommand file, describe "< " before the file name.
Start up the librarian from a subcommand file as follows:

```
X>lb78k0rΔ<subcommand-file-name[Δoption] ...
```

<	Be sure to add this when specifying a subcommand file
subcommand-file-name	File in which subcommands are stored

Remark Create the subcommand file using an editor.

The rules for writing the contents of a subcommand file are as follows:

```
Subcommand-name operand-data
Subcommand-name operand-data
  :
exit
```

- When repeating one subcommand, describe "&" at the end of each line to indicate continuation.
- Everything described from a semicolon (";") to the end of the line will be assumed to be a comment, and will not be interpreted by the librarian command.
- If the last subcommand in a subcommand file is not the exit subcommand, the librarian will automatically interpret that an exit subcommand is specified.
- The librarian reads subcommands from the subcommand file and processes them.
  The librarian quits after it completes processing of all subcommands in the subcommand file.

Example Create a subcommand file k0r.slb using an editor, and then start up the librarian.

```
; library creation command
create k0r.lib
add k0r.lib k0rmain.rel &
k0rsub.rel
;
exit
```

```
C:\>lb78k0r <k0r.slb
```

(2) Execution start and end messages

(a) Execution start message

When the librarian is started up, an execution startup message appears on the display.

```
78K0R Librarian Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
*
```

(b) Execution end message

The librarian does not output an execution end message. When the user enters the exit subcommand after all processing is complete, the librarian returns control to the host operating system.

```
*create k0r.lib
*add k0r.lib k0rmain.rel k0rsub.rel
*exit
```

If the librarian detects a fatal error which makes it unable to continue librarian processing, the librarian outputs a message to the display and returns control to the operating system.

Example A non-existent create library option is specified.

```
C:\>lb78k0r -a
```

```
78K0R Librarian Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
RA78K0R error F5018 : Option is not recognized '-z'
Usage : LB78K0R [options]
```

In the above example, a non-existent create library option is specified. An error occurs and the librarian aborts the librarian execution.

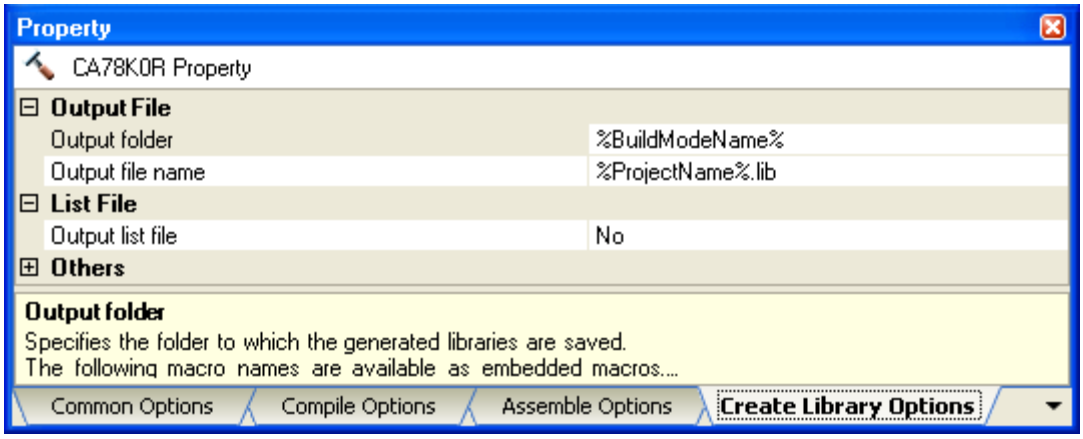
(3) Set options in CubeSuite+

This section describes how to set create library options from CubeSuite+.

On CubeSuite+'s Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu. The Property panel opens. Next, select the [Create Library Options] tab.

You can set the various create library options by setting the necessary properties in this tab.

Figure B-37. Property Panel: [Create Library Options] Tab



B.6.4 Option

(1) Types

The create library options are detailed instructions for the operation of the librarian.

The types and explanations for create library options are shown below.

Table B-28. Create Library Options

Classification	Option	Description
List file format specification	-lw	Changes the number of characters printed per line in a list file.
	-ll	Changes the number of lines printed per page in a list file.
	-lf	Inserts a form feed code at the end of a link list file.
	-nlf	
Temporary file creation path specification	-t	Creates a temporary file in the specified path.
Help specification	--	Outputs a help message on the display.

List file format specification

The list file format specification options are as follows.

- -lw
- -ll
- -lf/-nlf

-lw

[Description format]

```
-lw[number-of-characters]
```

- Interpretation when omitted
  -lw132 (80 characters in the case of display output)

[Function]

- The -lw option specifies the number of characters per line in a list file.

[Application]

- Use the -lw option to change the number of characters per line in a list file.

[Description]

- The range of number of characters that can be specified with the -lw option is 72 to 260 (80 characters in the case of display output).
- An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of characters is omitted, it is assumed that 132 has been specified.However, when a list file is output to display, it is assumed that 80 has been specified.
- The specified number of characters does not include the terminator (CR, LF).
- If the list subcommand is not specified, the -lw option is ignored.
- If two or more -lw options are specified, the option specified last is valid.

[Example of use]

- To specify 80 as the number of characters per line in a list file, describe as:

```
C:\>lb78k0r -lw80
```

-ll

[Description format]

```
-ll[number-of-lines]
```

- Interpretation when omitted
  -ll0 (No page breaks)

[Function]

- The -ll option specifies the number of lines per page in a list file.

[Application]

- Use the -ll option to change the number of lines per page in a list file.

[Description]

- The range number of lines that can be specified with the -ll option is 0 and 20 to 32767.
- An abort error occurs if a numerical value outside this range, or something other than a numerical value is specified.
- If the number of lines is omitted, it is assumed that 0 has been specified.
- If the number of lines specified is 0, no page breaks will be made.
- If the list subcommand is not specified, the -ll option is ignored.
- If two or more -ll options are specified, the option specified last is valid.

[Example of use]

- To specify 20 as the number of lines per page in a list file, describe as:

```
C:\>lb78k0r -ll20
```

-lf/-nlf

[Description format]

```
-lf
-nlf
```

- Interpretation when omitted
  -nlf

[Function]

- The -lf option inserts a form feed (FF) code at the end of a list file.
- The -nlf option disables the -lf option.

[Application]

- Use the -lf option to insert a form feed code if you wish to add a page break after the contents of a list file are printed.

[Description]

- If the list subcommand is not specified, the -lf option is ignored.
- If both the -lf and -nlf options are specified at the same time, the option specified last is valid.

[Example of use]

- Inserts a form feed code at the end of a list file.

```
C:\>lb78k0r -lf
```

Temporary file creation path specification

The temporary file creation path specification option is as follows.

- -t

-t

[Description format]

```
-tpath-name
```

- Interpretation when omitted
  Path specified by environmental variable TMP
  Current path, if environmental variable TMP is not specified.

[Function]

- The -t option specifies a path in which a temporary file is created.

[Application]

- Use the -t option to specify the location for creation of a temporary file.

[Description]

- Only a path can be specified as a path name.
- The path name is cannot be omitted.
- Even if a previously created temporary file exists, if the file is not protected it will be overwritten.
- As long as the required memory size is available, the temporary file will be expanded in memory.
  If not enough memory is available, the contents of the temporary file will be written to a disk. Such temporary files may be accessed later through the saved disk file.
- Temporary files are deleted when library formation is finished. They are also deleted when library formation is aborted by pressing the keys ([CTRL] + [C] key).
- The path in which the temporary file is created is determined according to the following sequence.

(1) The path specified by the -t option

(2) Path specified by environmental variable TMP (when the -t option is omitted)

(3) Current path (when TMP is not set)

Caution When (1) or (2) is specified, if the temporary file cannot be created in the specified path, an abort error occurs.

[Example of use]

- To output a temporary file to folder C:\tmp, describe as:

```
C:\>lb78k0r -tC:\tmp
```

- To output a temporary file to folder D:\temporary files, describe as:

```
C:\>lb78k0r -t"D:\temporary files"
```

Help specification

The help option is as follows.

- --

--

[Description format]

```
--
```

- Interpretation when omitted
  No display

[Function]

- The -- option outputs a help message on the display.

[Application]

- The help message is a list of explanations of the subcommands. See these when executing the librarian.

[Description]

- When the -- option is specified, all other options are invalid.

Caution This option cannot be specified from CubeSuite+.

[Example of use]

- To output a help message on the display, describe as:

```
C:\>lb78k0r --
```

```
78K0R Librarian Vx.xx [xx xxx xx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
+-------------------------------------------------------------------------+
| Subcommands : create,add,delete,replace,pick,list,help,exit              |
|                                                                          |
|   Usage : subcommand[ option] masterLBF[ option] transaction[ option]    |
|                                                                          |
|               transaction :== OMFname                                    |
|                               LBFname[(modulename[,...])]                |
|                                                                          |
|   <create > : create masterLBF[ transaction]                             |
|   <add    > : add masterLBF transaction                                  |
|   <delete > : delete masterLBF(modulename[,...])                         |
|   <replace> : replace masterLBF transaction                              |
|   <pick   > : pick masterLBF(modulename[,...])                           |
|   <list   > : list[ option] masterLBF[(modulename[,...])                 |
|                   option : -p = output public symbol                     |
|                            -np = no output public symbol                 |
|                            -o filename = specify output file name        |
|   <help   > : help                                                       |
|   <exit   > : exit                                                       |
|                                                                          |
+-------------------------------------------------------------------------+
```

B.6.5 Subcommands

(1) Types

The subcommands are detailed instructions for the operation of the librarian.
The types and explanations for subcommands are shown below.

Table B-29. Subcommands

Subcommand Name	Abbrev.	Description
create	c	Creates a new library file.
add	a	Adds a module to a library file.
delete	d	Deletes a module from a library file.
replace	r	Replaces a module in a library file with other module.
pick	p	Retrieves a module from the library file.
list	l	Outputs information on modules in a library file.
help	h	Outputs a help message on the display.
exit	e	Exits the librarian.

(2) General format of subcommand files

```
*subcommand[Δoption]Δlibrary-file-name[Δoption]transaction[Δoption]
```

library-file-name	The library file name specified immediately before can be replaced with '.'.
transaction	*transaction* = Δ*object-module-file-name* Δ*Dlibrary-file-name*[Δ(Δ*module-name*[Δ, ...])]

Remark Uppercase characters and lowercase characters are not distinguished for the subcommands and options.

create

[Description format]

```
createΔlibrary-file-name[Δtransaction]
cΔlibrary-file-name[Δtransaction]        ; abbreviated form
```

[Function]

- The create subcommand creates a new library file.

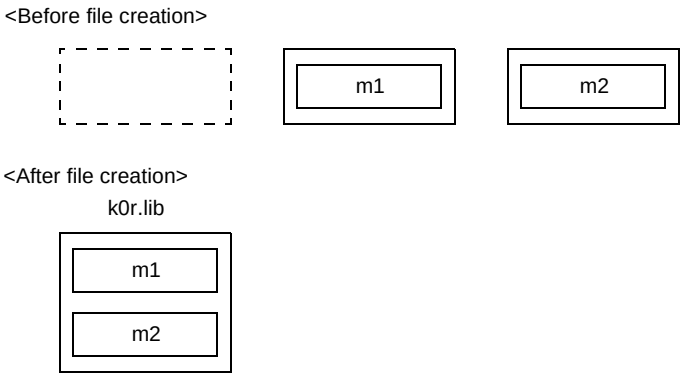
[Description]

- The size of the created library file is 0.
- When a transaction is specified, a module is registered while the library file is created.
- *library-file-name*:
  If a specified file already exists, it will be overwritten.
- *transaction*:
  An object module file carrying the same public symbol as the public symbol in the library file cannot be registered.
  A module with the same name as a module in the library file cannot be registered.
- If an error occurs, processing is interrupted and the library file cannot be created.

[Example of use]

- To register modules m1 and m2 while the library file (k0r.lib) is created, describe as:

```
*create k0r.lib m1.rel m2.rel
```



add

[Description format]

```
addΔlibrary-file-nameΔtransaction
aΔlibrary-file-nameΔtransaction          ; Abbreviated form
```

[Function]

- The add subcommand adds a module to a library file.

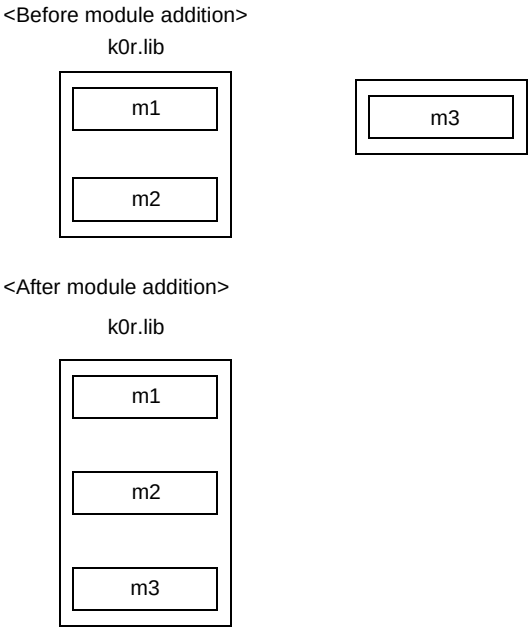
[Description]

- A module can be added to a library file even if no modules are stored in the library.
- An abort error occurs if a module with the same name as the module to be added already exists in the library file.
- An abort error occurs if the module to be added carries the same public symbol as the public symbol in the library file.

[Example of use]

- To add module m3 to the library file (k0r.lib), describe as:

```
*add k0r.lib m3.rel
```



delete

[Description format]

```
deleteΔlibrary-file-nameΔ(Δmodule-name[Δ, ... ]Δ)
dΔlibrary-file-nameΔ(Δmodule-name[Δ, ... ]Δ)            ; Abbreviated form
```

[Function]

- The delete subcommand deletes a module from a library file.

[Description]

- An error occurs if the specified module does not exist in the library file.
- If an error occurs, processing is interrupted and the condition of the library file will not be changed.

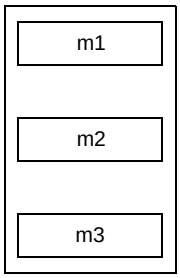
[Example of use]

- To delete modules m1 and m3 from the library file (k0r.lib), describe as:

```
*delete k0r.lib ( m1.rel , m3.rel )
```

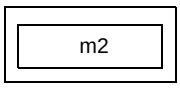
<Before module deletion>

k0r.lib



<After module deletion>

k0r.lib



replace

[Description format]

```
replaceΔlibrary-file-nameΔtransaction
rΔlibrary-file-nameΔtransaction         ; Abbreviated form
```

[Function]

- The replace subcommand replaces an existing module in a library file with the module in other object module files.

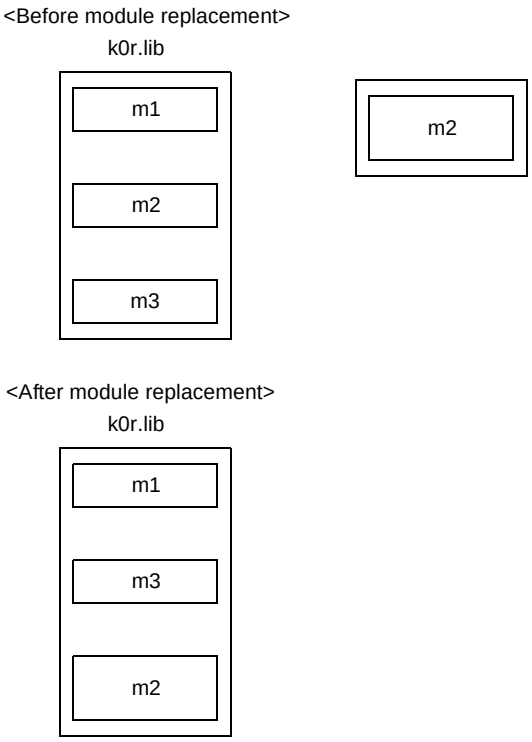
[Description]

- An abort error occurs if no module with the same name as the module to be replaced exists in the library file.
- An abort error occurs if the module to be replaced carries the same public symbol as the public symbol in the library file.
- The file name of the object module to be replaced must be the same as the file name under which it was registered in the library file.
- If an error occurs, processing is interrupted and the condition of the library file will not be changed.

[Example of use]

- To replace module m2 in the library file (k0r.lib), describe as:

```
*replace k0r.lib m2.rel
```



Because the new module (m2) is registered after the module (m2) in the library file is deleted, m2 is last in order in the library file.

pick

[Description format]

```
pickΔlibrary-file-nameΔ(Δmodule-name[Δ, ... ]Δ)
pΔlibrary-file-nameΔ(Δmodule-name[Δ, ... ]Δ)            ; Abbreviated form
```

[Function]

- The pick subcommand retrieves a specified module from an existing library file.

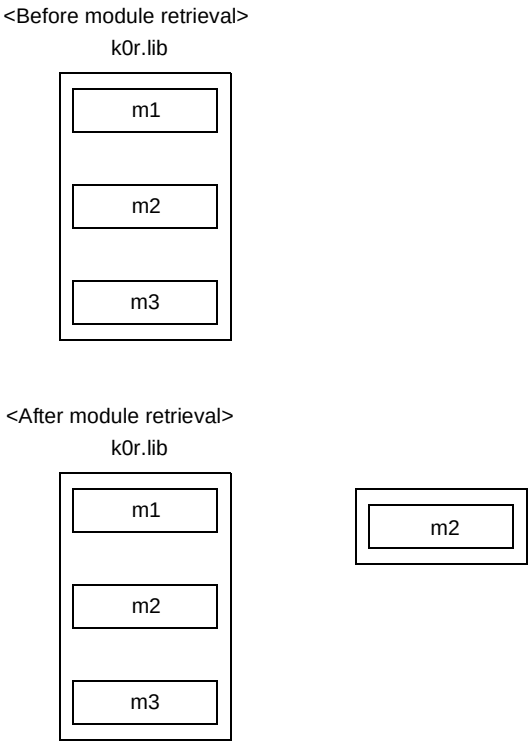
[Description]

- The retrieved module becomes an object module file with the file name under which it was registered in the library file.
- An error occurs if the specified module does not exist in the library file.
- If an error occurs, processing is interrupted. However, if an error occurs when two or more modules are specified, the modules retrieved before the module which caused the error become valid and are saved onto a disk.

[Example of use]

- To retrieve module m2 from the library file (k0r.lib), describe as:

```
*pick k0r.lib ( m2.rel )
```



list

[Description format]

```
list[Δoption]Δlibrary-file-name[Δ(Δmodule-name[Δ, ... ]Δ)]
l[Δoption]Δlibrary-file-name[Δ(Δmodule-name[Δ, ... ]Δ)]          ; Abbreviated form
  option : -public/-nopublic
         : -oΔfile-name
```

[Function]

- The list subcommand outputs information on modules in a library file.

[Description]

- Two or more options can be specified. Uppercase characters and lowercase characters are not distinguished for the options.
- -o:
  An error occurs if *output-file-name* is omitted.
  If the file type is omitted, it is assumed that "*input-file-name*.lst" is entered.
- -public/-nopublic:
  It can also be specified as -p/-np.
  -public specifies the output of public symbol information.
  The -nopublic option disables the -public option.
  If both the -public and -nopublic options are specified at the same time, the option specified last takes precedence.

[Example of use]

- Output a module information in the library file (k0r.lib) to the list file (k0r.lst). At this time, specify the -p option so as to output public symbol information.

```
*list -p -ok0r.lst k0r.lib
```

The contents of the list file (k0r.lst) is as follows.

```
78K0R librarian Vx.xx                                        DATE : xx xxx xx  PAGE   1

LIB-FILE NAME : k0r.lib         (xx xxx xxxx)

  0001  k0rmain.rel     (xx xxx xxxx)

    MAIN    START

  NUMBER OF PUBLIC SYMBOLS :       2

  0002    k0rsub.rel    (xx xxx xxxx)

    CONVAH

  NUMBER OF PUBLIC SYMBOLS :       1
```

help

[Description format]

```
help
h       ; Abbreviated form
```

[Function]

- The help command outputs a help message on the display.

[Description]

- The help message is a list of explanations of the subcommands. Specify the help command or the -- option to see these when executing the librarian.

[Example of use]

- To output a help message on the display, describe as:

```
*help
```

```
+-----------------------------------------------------------------------------+
| Subcommands : create,add,delete,replace,pick,list,help,exit                 |
|                                                                             |
|   Usage : subcommand[ option] masterLBF[ option] transaction[ option]       |
|                                                                             |
|               transaction :== OMFname                                       |
|                               LBFname[(modulename[,...])]                   |
|                                                                             |
|   <create > : create masterLBF[ transaction]                                |
|   <add    > : add masterLBF transaction                                     |
|   <delete > : delete masterLBF(modulename[,...])                            |
|   <replace> : replace masterLBF transaction                                 |
|   <pick   > : pick masterLBF(modulename[,...])                              |
|   <list   > : list[ option] masterLBF[(modulename[,...])                    |
|                   option : -p = output public symbol                        |
|                            -np = no output public symbol                    |
|                            -o filename = specify output file name           |
|   <help   > : help                                                          |
|   <exit   > : exit                                                          |
|                                                                             |
+-----------------------------------------------------------------------------+
```

exit

[Description format]

```
exit
e        ; Abbreviated form
```

[Function]

- The exit subcommand exits the librarian.

[Description]

- Use this subcommand to exit the librarian.

[Example of use]

- To exit the librarian, describe as:

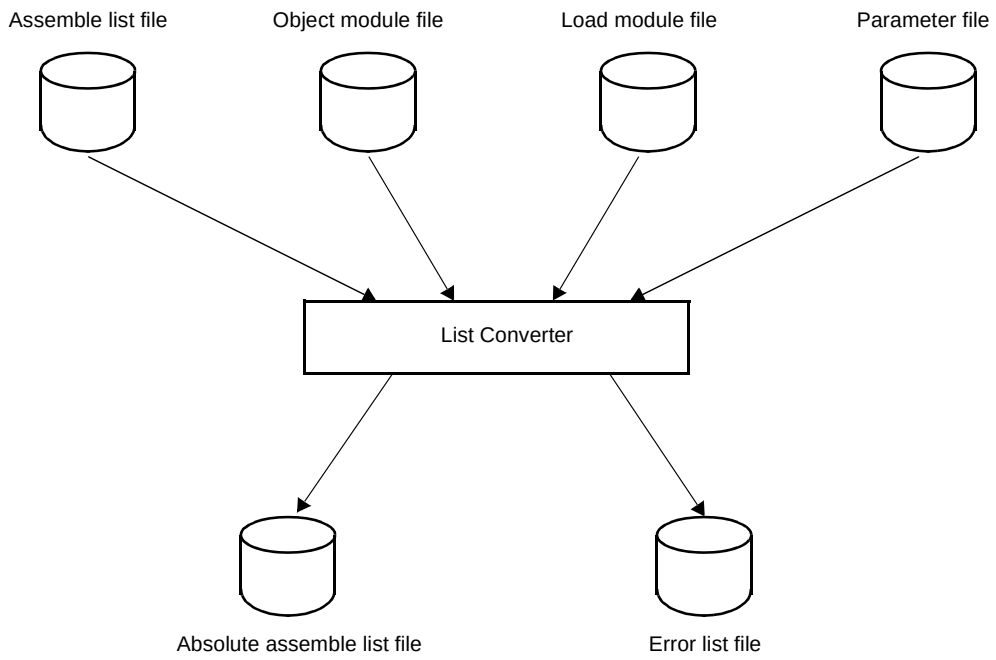
```
*exit
```

B.7 List Converter

The list converter inputs assemble list files and object module files output by the assembler and load module files output by the linker.

It embeds actual addresses in the relocatable addresses and symbols in the input file and outputs an absolute assembly list.

Figure B-38. I/O Files of List Converter



B.7.1 I/O files

The I/O files of the list converter are shown below.

Table B-30. I/O Files of List Converter

Type	File Name	Explanation	Default File Type
Input files	Object module file	- Binary fils containing relocation information and symbol information regarding machine language information and machine language location addresses	.rel
	Assemble list file	- File containing assembly information such as assemble lists and cross reference lists	.prn
	Load module file	- Binary image file of the object codes output as a result of linking	.lmf
	Parameter file	- File containing the parameters for the executed commands (user-created file)	.plv
Output files	Absolute assemble list file	- List file which embed actual addresses in relocatable addresses and symbols in input files	.p
	Error list file	- File containing error information generated during converting lists	.elv

B.7.2 Functions

(1) Resolving disadvantages of the assembler (relocatable assembler)

The list converter offers a solution to disadvantages of relocatable assembler by embedding the location and object codes in the assemble list file.

- The absolute assemble list output by the list converter agrees completely with the addresses used in actual program operation.
- The actual values of external symbols are embedded in the list.
- Relocatable values are embedded in the list as actual values.
- For the symbol values in symbol tables or cross reference lists, the actual values are embedded in the list.

Examples of the absolute assemble list file that can be acquired by the list converter are shown below.

Example Relocation data is embedded as shown below.

- Assemble list

```
22  22  -----          CSEG
23  23  00000      START :
24  24
25  25                 ; chip initialize
26  26  00000 RCBF80000 MOVW    SP , #_@STBEG
27  27
28  28  00004  CD201A   MOV     HDTSA , #1AH
29  29  00007  3620FE   MOVW    HL , #LOWW ( HDTSA )  ; set hex 2-code data in HL registor
30  30
31  31  0000A RFD0000   CALL    !CONVAH               ; convert ASCII <- HEX
32  32                                                ; output BC-register <- ASCII code
33  33  0000D  3421FE   MOVW    DE , #LOWW ( STASC )  ; set DE <- store ASCII code table
34  34  00010  63       MOV     A , B
35  35  00011  99       MOV     [ DE ] , A
36  36  00012  A5       INCW    DE
37  37  00013  62       MOV     A , C
38  38  00014  99       MOV     [ DE ] , A
39  39
40  40  00015  EFFE     BR      $$
41  41
42  42                 END
```

- Absolute assemble list

```
22  22  -----          CSEG
23  23  000D2       START :
24  24
25  25                 ; chip initialize
26  26  000D2 RCBF820FE MOVW    SP , #_@STBEG
27  27
28  28  000D6  CD201A   MOV     HDTSA , #1AH
29  29  000D9  3620FE   MOVW    HL , #LOWW ( HDTSA )  ; set hex 2-code data in HL registor
30  30
31  31  000DC RFDE900   CALL    !CONVAH               ; convert ASCII <- HEX
32  32                                                ; output BC-register <- ASCII code
33  33  000DF  3421FE   MOVW    DE , #LOWW ( STASC )  ; set DE <- store ASCII code table
34  34  000E2  63       MOV     A , B
35  35  000E3  99       MOV     [ DE ] , A
36  36  000E4  A5       INCW    DE
37  37  000E5  62       MOV     A , C
38  38  000E6  99       MOV     [ DE ] , A
39  39
40  40  000E7  EFFE     BR      $$
41  41
42  42                 END
```

Example The object codes are embedded as shown below.

- Assemble list

```
22  22  -----           CSEG
23  23  00000       START :
24  24
25  25                  ; chip initialize
26  26  00000 RCBF80000 MOVW    SP , #_@STBEG
27  27
28  28  00004  CD201A   MOV     HDTSA , #1AH
29  29  00007  3620FE   MOVW    HL , #LOWW ( HDTSA )  ; set hex 2-code data in HL registor
30  30
31  31  0000A RFD0000   CALL    !CONVAH               ; convert ASCII <- HEX
32  32                                                ; output BC-register <- ASCII code
33  33  0000D  3421FE   MOVW    DE , #LOWW ( STASC )  ; set DE <- store ASCII code table
34  34  00010  63       MOV     A , B
35  35  00011  99       MOV     [ DE ] , A
36  36  00012  A5       INCW    DE
37  37  00013  62       MOV     A , C
38  38  00014  99       MOV     [ DE ] , A
39  39
40  40  00015  EFFE     BR      $$
41  41
42  42                  END
```

- Absolute assemble list

```
22  22  -----           CSEG
23  23  000D2       START :
24  24
25  25                  ; chip initialize
26  26  000D2 RCBF820FE MOVW    SP , #_@STBEG
27  27
28  28  000D6  CD201A   MOV     HDTSA , #1AH
29  29  000D9  3620FE   MOVW    HL , #LOWW ( HDTSA )  ; set hex 2-code data in HL registor
30  30
31  31  000DC RFDE900   CALL    !CONVAH               ; convert ASCII <- HEX
32  32                                                ; output BC-register <- ASCII code
33  33  000DF  3421FE   MOVW    DE , #LOWW ( STASC )  ; set DE <- store ASCII code table
34  34  000E2  63       MOV     A , B
35  35  000E3  99       MOV     [ DE ] , A
36  36  000E4  A5       INCW    DE
37  37  000E5  62       MOV     A , C
38  38  000E6  99       MOV     [ DE ] , A
39  39
40  40  000E7  EFFE     BR      $$
41  41
42  42                  END
```

B.7.3 Method for manipulating

(1) List converter startup

The following two methods can be used to start up the list converter.

(a) Startup from the command line

```
X:[path-name]>lc78k0r[Δoption]...input-file-name[Δoption]...
```

X	Current drive name
path-name	Current folder name
lc78k0r	Command name of the list converter
option	Enter detailed instructions for the operation of the list converter. When specifying two or more list convert options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the list convert options. See "B.7.4 Option" for details about list convert options. Enclose a path that includes a space in a pair of double quotation marks (" ").
input-file-name	Primary name of assemble list Enclose the file name of a path that includes a space in a pair of double quotation marks (" "). Use the extension .prn.

Caution **If only the primary name of the assemble list is specified in the command line, the primary names of the object module file and load module file must be identical with the primary name of the assemble list file.**
The file types must also be as shown below.

File Name	Type
Object module type	.rel
Load module file	.lmf

Example If the primary name is different between an assemble list file (k0rmain.prn) and a load module file (sample.lmf), describe as follows so as to specify the input of a load module file (sample.lmf).

```
C:\>lc78k0r k0rmain.prn -lsample.lmf
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the list converter will not fit on the command line, or when the same list convert option is specified repeatedly each time list conversion is performed.
To start up the list converter from a parameter file, specify the parameter file option (-f) on the command line.
Start up the list converter from a parameter file as follows:

```
X>lc78k0r[Δinput-file-name]Δ-fparameter-file-name
```

-f	Parameter file specification option

parameter-file-name	A file which includes the data required to start up the list converter

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the input file name is omitted from the command line, only 1 input file name can be specified in the parameter file.
- The input file name can also be written after the option.
- Write in the parameter file all list convert options and output file names specified in the command line.

Example Create a parameter file k0r.plv using an editor, and then start up the list converter.

```
; parameter file
k0rmain -lk0r.lmf
-ek0r.elv
```

```
C:\>ra78k0r -fk0rmain.pra
```

(2) Execution start and end messages

(a) Execution start message

When the list converter is started up, an execution startup message appears on the display.

```
List Conversion Program for RA78K0R Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

Pass1 : start ...
Pass2 : start ...
```

(b) Execution end message

If it detects no list conversion errors resulting from the list conversion, the list converter outputs the following message to the display and returns control to the host operating system.

```
Conversion complete.
```

If the list converter detects a fatal error during list conversion which makes it unable to continue list convert processing, the list converter outputs a message to the display, cancels list conversion and returns control to the host operating system.

Example A non-existent list convert option is specified.

```
List Conversion Program for RA78K0R Vx.xx [xx xxx xxxx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

RA78K0R error F6018 : Option is not recognized '-a'
Please enter 'LC78K0R --', if you want help messages.
Program aborted.
```

(3) Set options in CubeSuite+

CubeSuite+ includes list convert options in the assemble options.

See the [Assemble Options] tab in the Property panel for details about setting the assemble options.

B.7.4 Option

(1) Types

The list convert options are detailed instructions for the operation of the list converter.

The types and explanations for list convert options are shown below.

Table B-31. List Convert Options

Classification	Option	Description
Object module file input specification	-r	Inputs an object module file.
Load module file input specification	-l	Inputs a load module file.
Absolute assemble list file output specification	-o	Outputs an absolute assemble list file.
Error list file output specification	-e	Outputs an error list file.
	-ne	
Parameter file specification	-f	Inputs the input file name and options from a specified file.
Help specification	--	Outputs a help message on the display.

Object module file input specification

The object module file input specification option is as follows.

- -r

-r

[Description format]

```
-r[input-file-name]
```

- Interpretation when omitted
  -r*assemble-list-file-name*.rel

[Function]

- The -r option specifies the input of an object module file.

[Application]

- Use the -r option when the primary name of an object module file is different from the primary name of the assemble list file, or if its file type is not ".rel".

[Description]

- When a fatal error occurs, the absolute assemble list file cannot be output.
- If only the primary name of the input file name is specified, the list converter will add ".rel" to the file name as the file type and input the file.

[Example of use]

- If the primary name is different between an assemble list file (k0rmain.prn) and an object module file (sample.rel), describe as follows so as to specify the input of a load module file (sample.rel).

```
C:\>lc78k0r k0rmain.prn -lsample.rel
```

Load module file input specification

The load module file input specification option is as follows.

- -l

-l

[Description format]

```
-l[input-file-name]
```

- Interpretation when omitted
  -l*assemble-list-file-name*.lmf

[Function]

- The -l option specifies the input of a load module file.

[Application]

- Use the -l option when the primary name of a load module file is different from the primary name of the assemble list file, or if its file type is not ".lmf".

[Description]

- When a fatal error occurs, the absolute assemble list file cannot be output.
- If only the primary name of the input file name is specified, the list converter will add ".lmf" to the file name as the file type and input the file.

[Example of use]

- If the primary name is different between an assemble list file (k0rmain.prn) and a load module file (sample.lmf), describe as follows so as to specify the input of a load module file (sample.lmf).

```
C:\>lc78k0r k0rmain.prn -lsample.lmf
```

Absolute assemble list file output specification

The absolute assemble list file output specification option is as follows.

- -o

-o

[Description format]

```
-o[output-file-name]
```

- Interpretation when omitted
  -o*assemble-list-file-name*.p

[Function]

- The -o option specifies the output of an absolute assemble list file.
  It also specifies the location to which it is output and the file name.

[Application]

- Use the -o option to specify the location to which an absolute assemble list file is output or to change its file name.

[Description]

- An abort error occurs if the same device is specified for the file name as for the error file.
- If the output file name is omitted when the -o option is specified, the output file name will be "*assemble-list-file-name*.p".
- If only the primary name of the output file name is specified, the list converter will add ".p" to the file name as the file type and output the file.
- If the drive name is omitted when the -o option is specified, the absolute assemble list file will be output to the current drive.

[Example of use]

- To output an absolute assemble list file (sample.p), describe as:

```
C:\>lc78k0r k0rmain.prn -osample.p -lk0r.lmf
```

Error list file output specification

The error list file output specification options are as follows.

- -e/-ne

-e/-ne

[Description format]

```
-e[output-file-name]
-ne
```

- Interpretation when omitted
  -ne

[Function]

- The -e option specifies the output of an error list file.
  It also specifies the location to which it is output and the file name.
- The -ne option disables the -e option.

[Application]

- Use the -e option to save an error message into a file.

[Description]

- An abort error occurs if the same device is specified for the file name as for the absolute assemble list file.
- If the output file name is omitted when the -e option is specified, the output file name will be "*assemble-list-file-name*.elv".
- If only the primary name of the output file name is specified, the list converter will add ".elv" to the file name as the file type and output the file.
- If the drive name is omitted when the -e option is specified, the error list file will be output to the current drive.
- If both the -e and -ne options are specified at the same time, the option specified last is valid.

[Example of use]

- To create an error list file (sample.elv), describe as:

```
C:\>lc78k0r k0rmain.prn -esample.elv
```

The contents of the error list file (sample.elv), is as follows.

```
RA78K0R warning W6701: Load module file is older than object module file 'k0rmain.lmf,
k0rmain.rel'

Pass1 : start


RA78K0R warning W6702: Load module file is older than assemble module file 'k0rmain.lmf,
k0rmain.prn'


Pass2 : start
```

Parameter file specification

The parameter file specification option is as follows.

- -f

-f

[Description format]

```
-ffile-name
```

- Interpretation when omitted
  Options or input file names can only be input from the command line.

[Function]

- The -f option inputs options and input file names from a specified file.

[Application]

- Use the -f option when the information required to start up the list converter will not fit on the command line.
- When specifying options repeatedly every time you perform list conversion, describe the options in the parameter file and specify the -f option.

[Description]

- An abort error occurs if the file name is omitted.
- If only the primary name of the output file name is specified, the list converter will add ".plv" to the file name as the file type and open the file.
- Nesting of parameter files is not permitted. An abort error occurs if the -f option is specified within a parameter file.
- The number of characters that can be described within a parameter file is unlimited.
- Separate options or input file names with a blank space, a tab or the line feed code (LF).
- Options and input file names within a parameter file will be expanded at the position specified for the parameter file on the command line.
- The expanded options specified last is valid.
- An abort error occurs if two or more -f option is specified.
- The characters following ";" or "#" are all assumed to be comments, up to the line feed code (LF) or EOF.

[Example of use]

- Perform list conversion using a parameter file (k0r.plv).
  The contents of the parameter file (k0r.plv) is as follows.

```
: parameter file
k0rmain -lk0r.lmf
-ek0r.elv
```

Enter the following from the command line.

```
C:\>lc78k0r -fk0r.plv
```

Help specification

The help option is as follows.

- --

--

[Description format]

```
--
```

- Interpretation when omitted
  No display

[Function]

- The -- option outputs a help message on the display.

[Application]

- The help message is a list of explanations of the list convert options. See these when executing the list converter.

[Description]

- When the -- option is specified, all other options are invalid.

Caution This option cannot be specified from CubeSuite+.

[Example of use]

- To output a help message on the display, describe as:

```
C:\>lc78k0r --
```

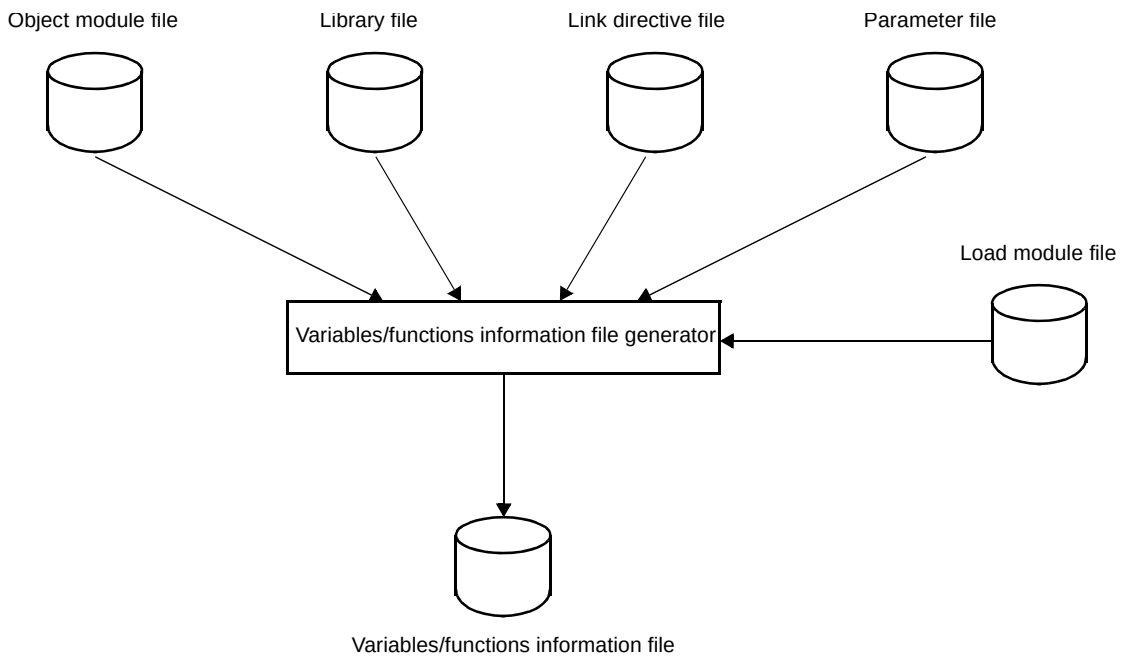
```
List Conversion Program for RA78K0R Vx.xx [xx xxx xx]
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

usage : LC78K0R [option[...]] input-file [option[...]]
The option is as follows ([] means omissible).
-r[file]: Specify object module file.
-l[file]: Specify load module file.
-o[file]: Specify output list file (absolute assemble list file).
-ffile  : Input option or input-file name from specified file.
-e[file]: Create error list file.
--      : Show this message.
```

B.8 Variables/Functions Information File Generator

The variables/functions information file generator uses a number of object module files to be output by the C compiler or assembler and outputs a variables/functions information file that contains information for efficiently allocating variables and functions.

If an error occurs, an error message is output to the display to clarify the cause of the error. When an error occurs, the variables/functions information file will not be output.

Figure B-39. I/O Files of Variables/Functions Information File Generator



B.8.1 I/O files

The I/O files of the variables/functions information file generator are shown below.

See "3.8 Variables/Functions Information File Generator" for details about output file.

Table B-32. I/O Files of Variables/Functions Information File Generator

Types	File Name	Description	Default File Type
Input files	Object module file	- Binary file including machine-language information, relocation information relating to machine-language allocation addresses, and symbol information - File output by the compiler or assembler	.rel
	Library file	- File in which two or more object module files are included - File output by the librarian	.lib
	Link directive file	- File which contain link directives for the linker (user-created file)	.dr
	Parameter file	- File containing the parameters for the executed programs (user-created file)	.plk
	Load module file	- Load module file to be re-input during self-programming	.lmf

Types	File Name	Description	Default File Type
Output file	Variables/functions information file	- File specifying allocation to the saddr area and callt table area; it is a list of variables and functions to be referenced	.vfi

B.8.2 Functions

(1) Generating the variables/functions information file

The variables/functions information file generator counts the number of references when resolving relocations of variables and functions, and outputs a file with information to allocate them efficiently.
This information file can be used to reduce code by specifying the optimum allocation to the saddr area and callt table area by the C compiler.

(2) ROM/RAM usage display

The variables/functions information file generator displays the ROM/RAM usage after the linking to the standard output.

B.8.3 Variables/functions information

(1) Areas

(a) saddr area

The RL78 and 78K0R has areas that can be addressed with a type of 8-bit addressing called saddr addressing (short direct addressing).
saddr addressing targets the 256 bytes starting at FFE20H. Note allocating user variables here, however, because this area also contains general registers and ports. The saddr area targeted by the variables/functions information file generator for alignment is thus 192 bytes (FFE20H to FFEDFH).

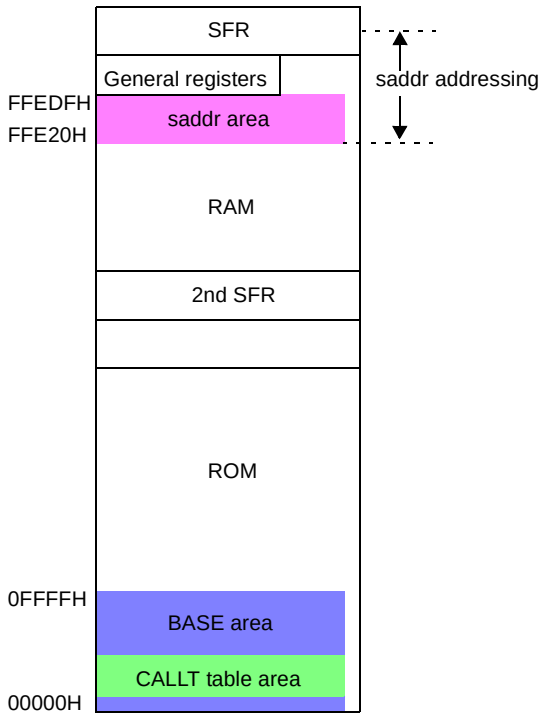
(b) CALLT table area

The area from 00080H to 000BFH can be registered as a branch destination of the 32 BASE area addresses.

(c) BASE area

This is the area from 00000H to 0FFFFH. It is a branch destination for 2-byte call instructions (CALLT).
It can be specified via the BASE relocation attribute defined by the assembler.

Figure B-40. Memory Map



(2) Variable information

(a) Reference counting

The variables/functions information file generator counts the number of times reference symbols are referenced during relocation resolution.

(b) Vacant area detection

The variables/functions information file generator detects the start address and size of vacant area in the saddr area after normal allocation.

(c) Determining priority

The value calculated via the expression below, taking into account the code reduction rate per byte, determines the priority (higher values mean higher priority).

```
number-of-references / symbol-size * reference-type[Note]
```

Note Reference type
near: 1 (changing from the near area to the saddr area reduces code by 1 byte)
far: 2 (changing from the far area to the saddr area reduces code by 2 bytes)
sreg: 0 (variables already allocated to the saddr area via the sreg specification are not targets for allocation)

Example

Variable	Number of References	Symbol Size	Reference Type	Priority
sym1	10 times	2 bytes	near	10 / 2 * 1 = 5
sym2	6 times	1 byte	far	6 / 1 * 2 = 12
sym3	6 times	1 byte	sreg	6 / 1 * 0 = 0

Changing far variable sym2 that is referenced 6 times to the saddr area improves code efficiency more than near variable sym1 that is referenced 10 times and requires 2 bytes.
Variable sym3 is not eligible for allocation, since it has already been allocated to the saddr area.

Remark The following variables are excluded from prioritization.

const variable	const variables are not eligible for allocation to the saddr area because they are allocated to the mirror source area. However, that references to them are counted, and output to the file as comments.
sreg variable	Variables for which sreg has already been specified are not eligible for allocation. However, that references to them are counted, and output to the file as comments.
static variable	static variables are not eligible for allocation, whether they are inside a file or a function. However, that references to them are counted, and output to the file as comments.
Variables not defined in the C source	Variables not defined in the C source are not eligible for allocation (e.g. definitions in the assembler source or runtime libraries). They are also not output to the output file.
Variables defined in the boot area and referenced by the flash area	Variables defined in the boot area and referenced by the flash area are not eligible for allocation. However, that references to them are counted, and output to the file as comments.
Unreferenced variables	They are also not output to the output file.

(d) Alignment considerations

The following variables can be allocated to odd addresses.

- Variables with a size of 1 byte (char, unsigned char, enumeration type, structure, and union)
- Arrays of variables with a size of 1 byte (char, unsigned char)
- Arrays of variables of enumeration type, structure, and union with a size of 1 byte, and having 1 element

(3) Function information

(a) Reference counting

The variables/functions information file generator counts the number of times reference symbols are referenced during relocation resolution.

(b) Vacant area detection

The variables/functions information file generator detects the start address and size of vacant area in the callt area and BASE area after normal allocation.

(c) Determining priority

The value calculated via the expression below determines the priority (higher values mean higher priority).

```
number-of-references * reference-type[Note]
```

Note Reference Type
near: 1 (changing from the near area to the callt area reduces code by 1 byte)
far: 2 (changing from the far area to the callt area reduces code by 2 bytes)
callt: 0 (functions already allocated to the callt area are not targets for allocation)

Example

Function	Number of References	Reference Type	Priority
func1	10 times	near	10 * 1 = 10
func2	10 times	far	10 * 2 = 20
func3	10 times	callt	10 * 0 = 0

Changing far function func2 that is referenced 10 times to the callt area improves code efficiency more than near function func1 that is referenced 10 times.
Function func3 is not eligible for allocation, since it has already been allocated to the callt area.

Remark The following functions are excluded from prioritization.

Function in the flash area	Functions in the flash area are not eligible for allocation because they cannot be registered in the callt area. However, that references to them are counted, and output to the file as comments. Allocation is also not possible if one is in the boot area and referenced from the flash area; these will be output to the file as comments.
callt function	These are not eligible for allocation because they have already been registered in the callt table. However, that references to them are counted, and output to the file as comments.
static function	static functions are not eligible for allocation, whether they are inside a file or a function. However, that references to them are counted, and output to the file as comments.
Functions not defined in the C source	Functions not defined in the C source are not eligible for allocation (e.g. definitions in the assembler source or runtime libraries). They are also not output to the output file.
Unreferenced functions	They are also not output to the output file.

(d) Considerations for function allocation status

In the case of the near reference, the corresponding function has already been allocated to the BASE area. For this reason, there is no need to take the available vacant area of the BASE area into account. In the case of the far reference, it is not possible to tell where the corresponding function has been allocated.

- near reference
  The corresponding function is registered to the callt area, because it has already been allocated to the BASE area.
- far reference where the corresponding function is not in the BASE area
  If there is enough vacant area in the BASE area, then the corresponding function is registered to the callt area.

If there is not enough vacant area in the BASE area, then the corresponding function is not registered to the callt area.

- callt reference

The corresponding function is excluded from the consideration, because it has already been registered in the callt table.

(4) Symbols not output to the variables/functions information file

The following symbols are not output to the variables/functions information file.

- Unreferenced symbols
- Symbols defined in libraries
- EXTERN symbols in other than load modules
- Symbols defined in assembler source
- The relocation attribute of the location segment is AT
- Interrupt handlers for RTOS tasks or RTOS
- Firm ROM functions
- Vector interrupt functions
- Symbols which type is T_NULL

B.8.4 Method for manipulating

(1) Variables/functions information file generator startup

The following two methods can be used to start up the variables/functions information file generator.

(a) Startup from the command line

```
X:[path-name]>vf78k0r[Δoption]...object-module-file-name[Δobject-module-file-
name]...[Δoption]...
```

X	Current drive name
path-name	Current folder name
vf78k0r	Command name of the variables/functions information file generator
option	Enter detailed instructions for the operation of the variables/functions information file generator. When specifying two or more variables/functions relocation options, separate the options with a blank space. Uppercase characters and lowercase characters are not distinguished for the variables/functions relocation options. See "B.8.5 Option" for details about variables/functions relocation options. Enclose a path that includes a space in a pair of double quotation marks (" ").
object-module-file-name	The name of the object module file to generate the variables/functions information file Up to 1024 items can be input as an input module. Enclose the file name of a path that includes a space in a pair of double quotation marks (" ").

Caution **Add options specific to the variables/functions information file generator after specifying the same options and object module file name as those specified for the linker.**

Example To output a variables/functions information file (info.vfi), describe as:

```
C:\>vf78k0r main.rel sub.rel -voinfo.vfi
```

(b) Startup from a parameter file

Use the parameter file when the data required to start up the variables/functions information file generator will not fit on the command line, or when the same variables/functions relocation option is specified repeatedly each time a variables/functions information file is generated.
To start up the variables/functions information file generator from a parameter file, specify the parameter file option (-f) on the command line.
Start up the variables/functions information file generator from a parameter file as follows:

```
X>vf78k0r[Δobject-module-file]Δ-fparameter-file-name
```

-f	Parameter file specification option
parameter-file-name	A file which includes the data required to start up the variables/functions information file generator

Remark Create the parameter file using an editor.

The rules for writing the contents of a parameter file are as follows:

```
[Δ]option[Δoption]...
```

- If the source file name is omitted from the command line, only 1 source file name can be specified in the parameter file.
- The source file name can also be written after the option.
- Write in the parameter file all variables/functions relocation options and output file names specified in the command line.

Example Create a parameter file sample.plk using an editor, and then start up the variables/functions information file generator.

```
; parameter file
main.rel sub.rel -osample.lmf -psample.map -e
-tC:\tmp
```

```
C:\>vf78k0r -fsapmle.plk -voinfo.vfi
```

(2) Execution start and end messages

(a) Execution start message

When the variables/functions information file generator is started up, an execution startup message appears on the display.

```
78K0R Var-Func-Inf Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation
```

(b) Execution end message

If it detects no errors resulting from the variables/functions information file generation, the variables/functions information file generator outputs the following message to the display and returns control to the host operating system.

```
Target chip : uPD78F1166_A0
Device file : Vx.xx

VF check complete, 0 error(s) and 0 warning(s) found.
```

If the variables/functions information file generator detects a fatal error during variables/functions information file generation which makes it unable to continue variables/functions information file generate processing, the variables/functions information file generator outputs a message to the display, cancels variables/functions information file generation and returns control to the host operating system.

The example is shown below.

- A non-existent object module file is specified.

```
C:\>vf78k0r samp1.rel samp2.rel -vosamp.vfi
```

```
78K0R Var-Func-Inf Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

VF78K0R error F0006 : File not found 'samp1.rel'
VF78K0R error F0006 : File not found 'samp2.rel'
Program Aborted.
```

In the above example, a non-existent object module file is specified. An error occurs and the variables/functions information file generator aborts the execution.

- A non-existent variables/functions relocation option is specified.

```
C:\>vf78k0r main.rel sub.rel -z
```

```
78K0R Var-Func-Inf Vx.xx [xx xxx xxxx]
 for RL78,78K0R Microcontroller
   Copyright(C) xxxx-xxxx Renesas Electronics Corporation

VF78K0R error F0018 : Option is not recognized '-z'
Program Aborted.
```

In the above example, a non-existent variables/functions relocation option is specified. An error occurs and the variables/functions information file generator aborts the execution.

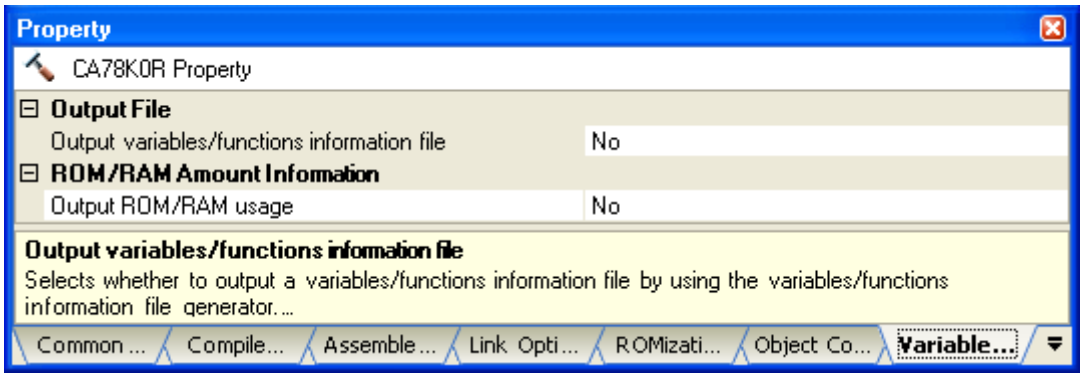
(3) Set options in CubeSuite+

This section describes how to set variables/functions relocation options from CubeSuite+.

On CubeSuite+'s Project Tree panel, select the Build Tool node. Next, select [Property] from the [View] menu. The Property panel opens. Next, select the [Variables/Functions Relocation Options] tab.

You can set the various options by setting the necessary properties in this tab.

Figure B-41. Property Panel: [Variables/Functions Relocation Options] Tab



B.8.5 Option

(1) Types

The variables/functions relocation options are detailed instructions for the operation of the variables/functions information file generator.

The types and explanations for variables/functions relocation options are shown below.

Table B-33. Variables/Functions Relocation Options

Classification	Option	Description
Variables/functions information file output specification	-vo	Specifies the output of a variables/functions information file.
Vacant saddr area specification	-vs	Specifies the margin size of the saddr area.
ROM/RAM usage output specification	-vx	Outputs ROM/RAM usage after the linking to the standard output.
Copy routine address specification	-rc	Specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.
ROMization area specification	-ra	Specifies the ROMization target area.

Variables/functions information file output specification

The variables/functions information file output specification option is as follows.

- -vo

-vo

[Description format]

```
-vooutput-file-name
```

- Interpretation when omitted
  This option cannot be omitted (except when specifying -vx option).

[Function]

- -The -vo option specifies the output of a variables/functions information file.
  It also specifies the location to which it is output and the file name.

[Application]

- Use the -vo option to specify the output of a variables/functions information file.

[Description]

- The default file type is ".vfi".
- "*output file name*" which includes a path name can be specified.
- Even if the -vo option is specified, when an error occurs before linking is complete, the variables/functions information file cannot be output.
- Both the -vo and -vx options cannot be specified at the same time.

[Example of use]

- To output a variables/functions information file (info.vfi), describe as:

```
C:\>vf78k0r main.rel sub.rel -voinfo.vfi
```

Vacant saddr area specification

The vacant saddr area specification option is as follows.

- -vs

-vs

[Description format]

```
-vs[size]
```

- Interpretation when omitted
  -vs0

[Function]

- After allocating variables to the saddr area via this tool, an alignment error may occur during compilation or linking due to the relationship between processing order and alignment. In this situation, performing allocation with a margin in the saddr area can avoid this error.
  The -vs option specifies the margin size of the saddr area.

[Application]

- Use the -vs option to avoid allocation errors during compilation or linking after allocating variables to the saddr area via this tool.

[Description]

- Specify the margin size (number of bytes) of the saddr area as "*size*".
- It can be specified in decimal, hexadecimal, or binary numbers.
  Up to 192 (in decimal numbers) can be specified. An error occurs if 193 or more is specified.
- An error occurs if the specified amount of vacant area is greater than the actual amount of vacant area.
- If the -vo option is specified, the -vs option is valid.

[Example of use]

- To specify the margin size of the saddr area as 10 bytes (in decimal numbers), describe as:

```
C:\>vf78k0r main.rel .sub.rel -voinfo.vfi -vs10
```

- To specify the margin size of the saddr area as 0AH bytes (in hexadecimal numbers), describe as:

```
C:\>vf78k0r main.rel sub.rel -voinfo.vfi -vs0AH
```

- To specify the margin size of the saddr area as 1010B bytes (in binary numbers), describe as:

```
C:\>vf78k0r main.rel sub.rel -voinfo.vfi -vs1010B
```

ROM/RAM usage output specification

The ROM/RAM usage output specification option is as follows.

- -vx

-vx

[Description format]

```
-vx
```

- Interpretation when omitted
  ROM/RAM usage is not output to the standard output.

[Function]

- The -vx option outputs ROM/RAM usage after the linking to the standard output.

[Application]

- Use the -vx option to output ROM/RAM usage after the linking.

[Description]

- Both the -vx and -vo options cannot be specified at the same time.
- ROM/RAM usage output example is shown below.
- When the default memory area name is used

```
*** Memory Area Information ***
ROM : xxxxxH byte(s) real data
RAM : xxxxxH byte(s) real data

*** Memory Area Information in ROM ***
ROM : xxxxxH byte(s)

*** Memory Area Information in RAM ***
RAM : xxxxxH byte(s)
```

- When the memory area name is defined in the memory directive

```
*** Memory Area Information ***
ROM : xxxxxH byte(s) real data
RAM : xxxxxH byte(s) real data

*** Memory Area Information in ROM ***
ROM : xxxxxH byte(s)
ROM1 : xxxxxH byte(s)

*** Memory Area Information in RAM ***
RAM : xxxxxH byte(s)
RAM1 : xxxxxH byte(s)
```

First the total amount uses is output, followed by the usage for each defined memory area.

[Example of use]

- To output ROM/RAM usage after the linking to the standard output, describe as:

```
C:\>vf78k0r main.rel sub.rel -vx
```

Copy routine address specification

The copy routine address specification option is as follows.

- -rc

-rc

[Description format]

```
-rcaddress
```

- Interpretation when omitted
  The copy routine is allocated to the vacant area of the ROM area.

[Function]

- The -rc option specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Application]

- Use the -rc option to specify the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Description]

- This option specifies the address that the copy routine for expanding ROMized segments in RAM area is allocated.

[Example of use]

- To allocate the copy routine for expanding ROMized segments in RAM area at address 300H, describe as:

```
C:\>vf78k0r main.rel -rc300H
```

ROMization area specification

The ROMization area specification option is as follows.

- -ra

-ra

[Description format]

```
-rastart-address,end-address
```

- Interpretation when omitted
  The internal RAM area is the ROMization target.

[Function]

- The -ra option specifies the ROMization target area.

[Application]

- Use the -ra option to specify the ROMization target area.

[Description]

- Specify the start address and end address of the ROMization target area.

[Example of use]

- To target addresses 0FCF00H to FFFFFH for ROMization, describe as:

```
C:\>vf78k0r main.rel -ra0FCF00H,0FFFFFH
```

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