User's Manual

CubeSuite Ver.1.40

Integrated Development Environment

User's Manual: Analysis

Target Device
78K0 Microcontroller
78K0R Microcontroller
V850 Microcontroller

Renesas Electronics
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How to Use This Manual

This manual describes the role of the CubeSuite integrated development environment for developing applications and systems for 78K0 microcontrollers, 78K0R microcontrollers and V850 microcontrollers, and provides an outline of its features.

CubeSuite is an integrated development environment (IDE) for 78K0 microcontrollers, 78K0R microcontrollers and V850 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
APPENDIX A WINDOW REFERENCE
APPENDIX B 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:	$\overline{XXX}$ (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	R20UT0256E
	Analysis	This manual
	Programming	R20UT0266E
	Message	R20UT0267E
	Coding for CX compiler	R20UT0259E
	Build for CX compiler	R20UT0261E
	78K0 Coding	R20UT0004E
	78K0 Build	R20UT0005E
	78K0 Debug	R20UT0262E
	78K0 Design	R20UT0006E
	78K0R Coding	U19382E
	78K0R Build	U19385E
	78K0R Debug	R20UT0263E
	78K0R Design	R20UT0007E
	V850 Coding	U19383E
	V850 Build	U19386E
	V850 Debug	R20UT0264E
	V850 Design	R20UT0257E

Caution The related documents listed above are subject to change without notice. Be sure to use the latest edition of each document when designing.

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TABLE OF CONTENTS

CHAPTER 1 GENERAL

This chapter gives an overview of the analyze tool (Program Analyzer).

1.1 Summary

The analyze tool is a component provided by CubeSuite. It supports the analysis of the behavior of programs developed for the 78K0 microcontroller, 78K0R microcontroller and V850 microcontroller.

1.1.1 What is analyzed

The analyze tool only analyzes C source files (including header files) in a project being set to the active project in the Project Tree panel.

Consequently, assembler source files are not analyzed. Note, however, that symbols defined in assembler source files that are referenced from C source files are analyzed.

Cautions 1. The analyze tool cannot be used in the debug-dedicated project (see "CubeSuite Start").

2. [CA850]
Files in K&R format are not analyzed.

Remark It is possible to forcibly display the function/variable information for C source files and header files in a project other than the active project by importing information files (Function list file (*.csfl)/Variable list file (*.csvl)) (see "2.10 Import or Export Information File" for details).

1.1.2 Types of analysis information

The analyze tool acquires, analyzes, and displays the following two types of information.

(1) Static analysis information

This is the function information/variable information that can be displayed when a build has completed without any compiler or assembler errors.

This is the result of acquiring and analyzing the load module and cross reference information generated by the build tool.

Caution [CX]
When "-Xno_cube_suite_inf" option is specified, the cross reference information is not generated. Accordingly, no analysis information is displayed on the panels provided by this tool (exclude the [Variable Value Changing Chart] tab of the Analysis Chart panel).

Remark [CA78K0][CA78K0R][CA850]
In order to acquire static analysis information, you must configure your build tool to generate cross reference information when performing the build.

The analyze tool does, however, provide a property to force the build tool to generate cross reference information (the [Compulsorily output cross reference file] property in the [General] category on the [Settings] tab of the Property panel).

This property is enabled by default ([Yes]), so as long as you do not change this setting, it is possible to generate cross reference information regardless of the build tool's configuration (note that if this property is changed to [No], the setting in the build tool will take precedence).

(2) Dynamic analysis information

This is the function information/variable information that can be displayed when program execution is stopped.
This is the result of acquiring and analyzing the trace, coverage results, or real-time RAM monitoring acquired from the debug tool via program execution.
Consequently, the debug tool's trace functions, coverage functions, or RRM functions must be enabled (see "1.1.3 Setting of the debug tool") in order to acquire dynamic analysis information.
Note that the debug tool's function required in order to acquire the information differs depending on an item of dynamic analysis information. Furthermore, items of dynamic analysis information that can be acquired differ depending on the debug tool used because functions supported differ depending on the debug tool. See the section explaining the corresponding panel for details on the relationship between the item and the debug tool's function required.

Caution When the analysis tool for "RX series" (i.e. "AZ series (AZ78K0R/AZ850/AZ850V4)", etc.) is used, the dynamic analysis information cannot be acquired.

1.1.3 Setting of the debug tool

The debug tool settings necessary for the analyze tool to acquire Dynamic analysis information are as follows.
You can make the setting on the [Debug Tool Settings] tab of the debug tool to use.

(1) Trace function
(2) Coverage function
(3) RRM function

(1) Trace function

Debug Tool		Setting of [Debug tool] Tab in Property Panel of Debug Tool
IECUBE	78K0 78K0R	None (always enabled)[Note 1]
	V850E1 V850ES	**[Function information]** (Function List panel/Call Graph panel) The following setting is only necessary if [Trace] is specified for the [Use for trace data] property in the [Trace] category[Note 2]. [Trace] category [Select trace data] property >> Specify one of the following - [Branch PC] - [All PC] - [Branch PC + Access Data] - [All PC + Access Data] - [Branch PC + Access PC + Access Data]
		[Variable information] (Variable List panel/Analysis Chart panel (Trace data analysis)) [Trace] category [Use for trace data] property >> [Trace] [Select trace data] property >> Specify one of the following - [Access Data] - [Branch PC + Access Data] - [All PC + Access Data] - [Access PC + Access Data] - [Branch PC + Access PC + Access Data]

Debug Tool		Setting of [Debug tool] Tab in Property Panel of Debug Tool
IECUBE2	V850E2M Single-core	**[Function information]** (Function List panel/Call Graph panel) The following setting is only necessary if [Trace] is specified for the [Use for trace data] property in the [Trace] category[Note 3]. [Trace] category [Select trace data] property >> Specify one of the following - [Branch PC] - [Branch PC + Access Data] - [Branch PC + Access PC + Access Data]
		[Variable information] (Variable List panel/Analysis Chart panel (Trace data analysis)) [Trace] category [Use for trace data] property >> [Trace] [Select trace data] property >> Specify one of the following - [Branch PC + Access Data] - [Branch PC + Access PC + Access Data]
	V850E2M Multi-core	Not supported
MINICUBE		Not supported
MINICUBE2		Not supported
E1		Not supported
Simulator	78K0 78K0R V850	[Trace] category [Use trace function] property >> [Yes]

Notes 1. [IECUBE [78K0]]

Execution time of functions and graphs via the Trace data analysis cannot be displayed because the trace time tag function is not supported.

2. [IECUBE [V850]]

Some of the trace functions, RRM functions and coverage functions are mutually exclusive. For this reason, it is necessary to specify the function to take precedence in the [Use for trace data] property of the [Trace] category. When doing so, if this property is set to other than [Trace] ([RRM] or [Coverage]), the trace functions necessary to acquire dynamic analysis information will still be enabled.

3. [IECUBE2]

Some of the trace functions, timer functions and coverage functions are mutually exclusive. For this reason, it is necessary to specify the function to take precedence in the [Use for trace data] property of the [Trace] category. When doing so, if this property is set to other than [Trace] ([Timer] or [Coverage]), the trace functions necessary to acquire dynamic analysis information will still be enabled.

(2) Coverage function

Debug Tool		Setting of [Debug tool] Tab in Property Panel of Debug Tool
IECUBE	78K0 78K0R	None (always enabled)
	V850E1 V850ES	[Trace] category [Use for trace data] property >> [Coverage] Note that only the code coverage (Function List panel) is supported. The coverage function cannot be enabled when the coverage board is not mounted on IECUBE used.

Debug Tool		Setting of [Debug tool] Tab in Property Panel of Debug Tool
IECUBE2	V850E2M Single-core	[Trace] category [Use for trace data] property >> [Coverage] Note that only the code coverage (Function List panel) is supported.
	V850E2M Multi-core	Not supported
MINICUBE		Not supported
MINICUBE2		Not supported
E1		Not supported
Simulator	78K0 78K0R V850	[Coverage] category [Use coverage function] property >> [Yes]

(3) RRM function

Debug Tool		Setting of [Debug tool] Tab in Property Panel of Debug Tool
IECUBE	78K0 78K0R	[Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number*
	V850E1 V850ES	[Trace] category [Use for trace data] property >> [RRM] [Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number* [Set update display during the execution automatically] property >> [Yes]
IECUBE2	V850E2M Single-core	[Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number*
	V850E2M Multi-core	Not supported
MINICUBE	V850	[Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number*
MINICUBE2	78K0	[Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number* [Set update display during the execution automatically] property >> [Yes]
	78K0R V850	[Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number*

Debug Tool		Setting of [Debug tool] Tab in Property Panel of Debug Tool
E1		[Access Memory While Running] category [Access by stopping execution] property >> [Yes] [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number*
Simulator	78K0 78K0R V850	[Access Memory While Running] category [Update display during the execution] property >> [Yes] [Display update interval[ms]] property >> *Valid number*

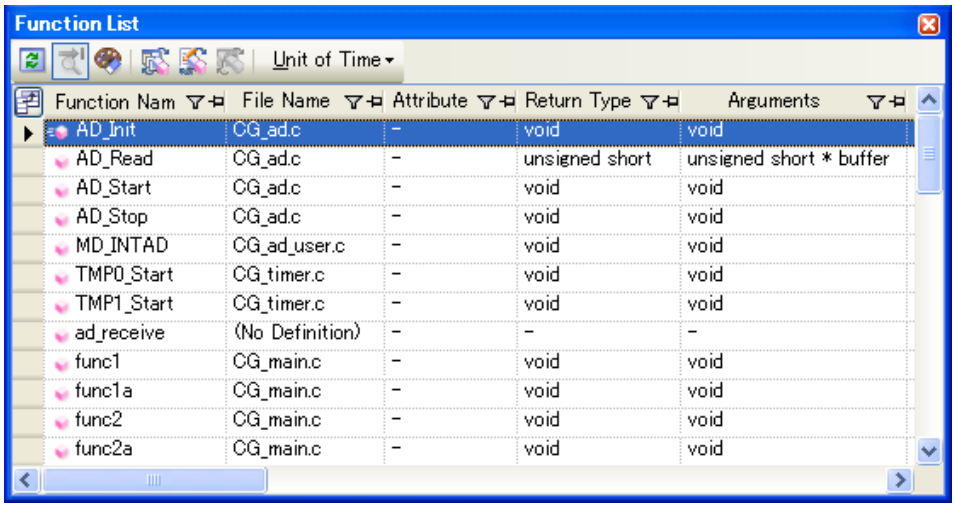
1.2 Features

The features of the analyze tool are shown below.

- Displaying function information

The following information about functions is displayed:

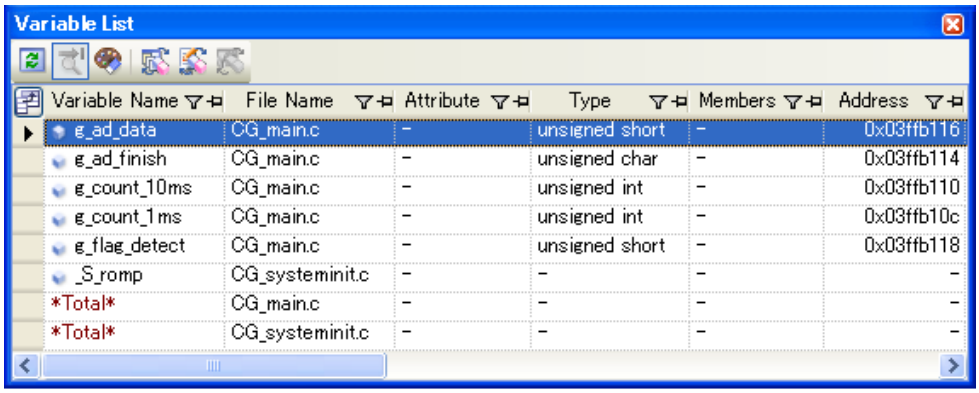
Static analysis information (e.g. function name, file name, attribute, return type, etc.) and Dynamic analysis information (e.g. reference count, execution count, execution time, code coverage, etc.).



- Displaying variable information

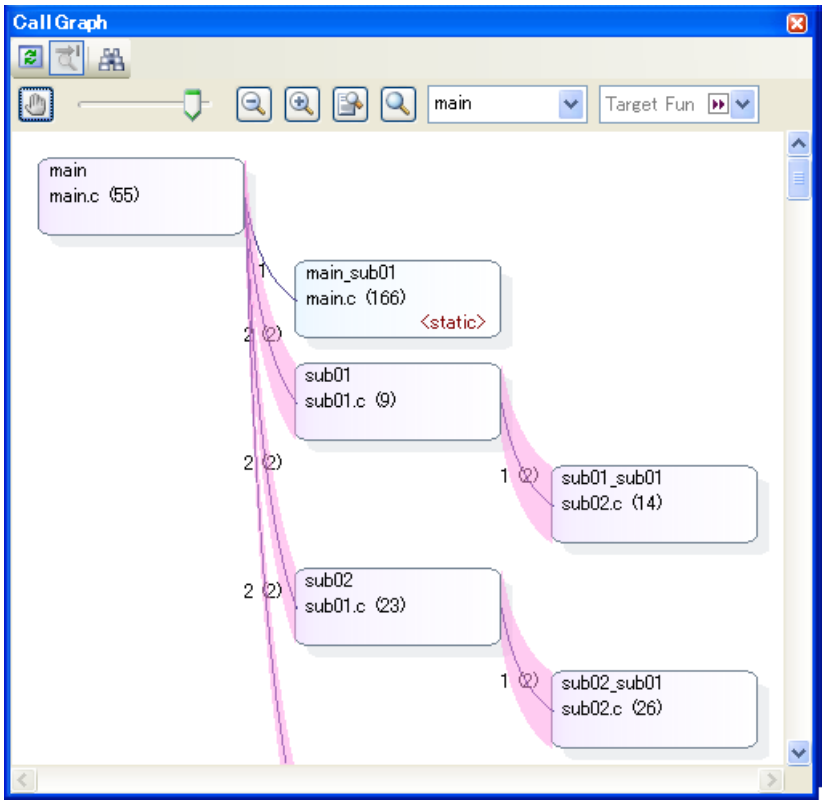
The following information about variables is displayed:

Static analysis information (e.g. variable name, file name, attribute, type, etc.) and Dynamic analysis information (e.g. read count, write count, data coverage, etc.).



- Displaying the call graph

A tree-structured chart (call graph) indicating calling relationships between functions in the program is displayed.



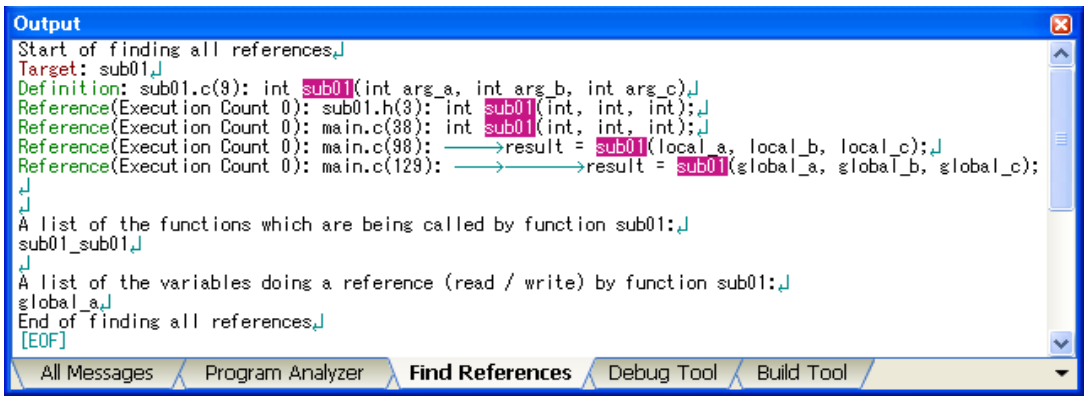
- Linked operation with debug tool

The following operations can be performed on the debug tool from the various panels of the analyze tool (Function List panel/Variable List panel).

- Jump to the location in the source text where the specified function or variable is defined
- Set a break event at the specified function or variable
- Register a watch expression for the specified variable

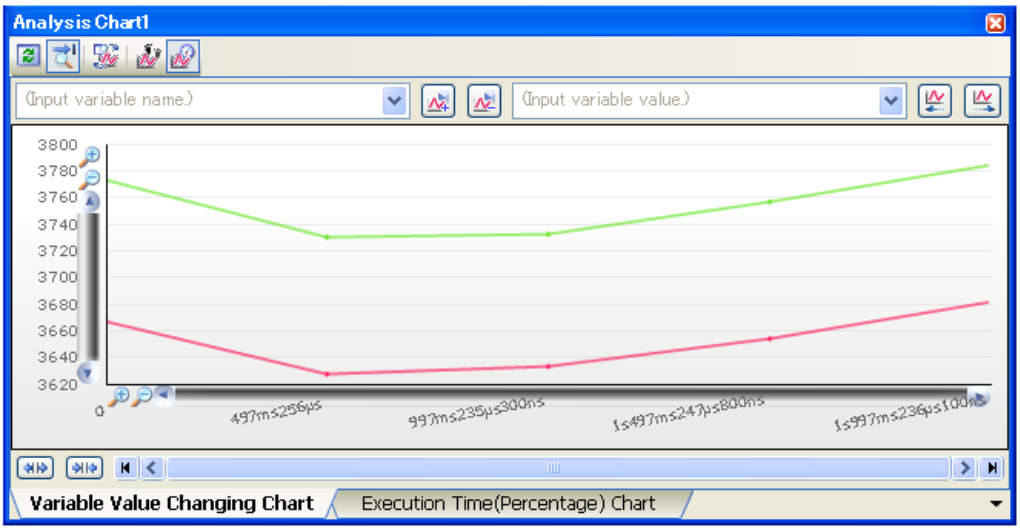
- View list of locations referencing function/variable

You can find and display a list of locations referencing a function/variable.

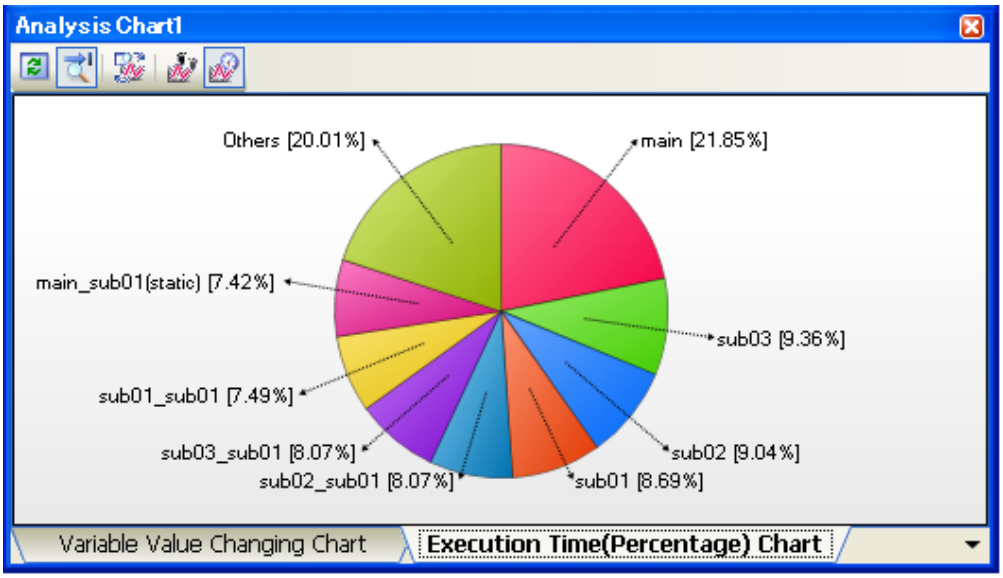


- Graph analysis information

- A line chart indicating changes in variable values is displayed.



- A pie chart indicating function execution time ratios is displayed.



CHAPTER 2 FUNCTIONS

This chapter describes the main features and operating procedures of the analyze tool.

2.1 Overview

The analysis information acquired by the analyze tool is displayed on the following panels:

Table 2-1. Panels Displaying Analysis Information

Panel	Description	
Function List panel	Displays the function information.	
Variable List panel	Displays the variable information.	
Call Graph panel	Displays calling relationships between functions (call graph).	
Analysis Chart panel	Displays charts of the function information and the variable information.	
	[Variable Value Changing Chart] tab	Displays changes in variable values (line chart).
	[Execution Time(Percentage) Chart] tab	Displays function execution time ratios (pie chart)

By validating this analysis information, it is possible to search for unused functions and variables, and processing that is creating bottlenecks, allocate memory effectively to reduce code size, and the like.

The basic operation sequence of the analyze tool is as follows:

(1) Start CubeSuite

Launch CubeSuite from the [Start] menu of Windows®.

Remark For details on "Start CubeSuite", see "CubeSuite Start".

(2) Set a project

Create a new project, or load an existing one.

Remark For details on "Set a project", see "CubeSuite Start".

(3) Create a load module

Create a load module by running a build after setting of the active project and the build tool to be used.

Remarks 1. For details on "Create a load module", see "CubeSuite Build" of the compiler to use.

2. If the build completes without compiler or assembler errors, then at this point the Static analysis information can be displayed in the Function List panel/Variable List panel/Call Graph panel.

(4) Execute downloading

Download the load module created in steps (3) to the debug tool after configuring the operational environment of the debug tool.

Remark For details on "Execute downloading", see "CubeSuite Debug" of the microcontroller to use.

(5) Execute programs

Execute the program on the debug tool.

Remarks 1. For details on "Execute programs", see "CubeSuite Debug" of the microcontroller to use.

2. When program execution is stopped, Dynamic analysis information can be displayed on the various panels. Note that it is necessary to enable the various functions of the debug tool (see "1.1.3 Setting of the debug tool") in order to acquire the Dynamic analysis information.

(6) Display Function Information

Display the Function List panel in order to validate the acquired function information.
The Function List panel can be operated as follows, in accordance with the purpose.
Note that if the program is modified during debugging, the operation is repeated via (3), above.

(a) Customize Display Method

Change the display method (e.g. set which columns to display and the sorting order) on the panels.

(b) Jump to Defined Location

Jump to the location of source text where the function on the panel has been defined.

(c) Set a breakpoint to a function

Set a breakpoint to the function on the panel.

(d) Display List of Referencing Location

Find and display a list of locations referencing the function on the panel.

Remark It is also possible to display the function information defined in other than the active project.
For detailed instructions on displaying function information, see "2.10 Import or Export Information File".

(7) Display Variable Information

Display the Variable List panel in order to validate the acquired variable information.
The Variable List panel can be operated as follows, in accordance with the purpose.
Note that if the program is modified during debugging, the operation is repeated via (3), above.

(a) Customize Display Method

Change the display method (e.g. set which columns to display and the sorting order) on the panels.

(b) Jump to Defined Location

Jump to the location of source text where the function on the panel has been defined.

(c) Set a break event to a variable

Set a break event with access condition to the variable on the panel.

(d) Register Watch-Expressions

Register variables to the Watch panel (Watvh1) as watch-expressions.

(e) Display List of Referencing Location

Find and display a list of locations referencing the variable on the panel.

Remark It is also possible to display the function information defined in other than the active project.
For detailed instructions on displaying function information, see "2.10 Import or Export Information File".

(8) Display Calling Relationships between Functions (Call Graph)

Display the Call Graph panel in order to validate the relationship between functions.
The Call Graph panel can be operated as follows, in accordance with the purpose.

(a) Jump to Defined Location

Jump to the location of source text where the function on the call graph has been defined.

(b) Search for a function

Search for an arbitrary function existing in the call graph.

(9) Display Analysis Information in Chart

Display acquired function information/variable information in a chart.
Note that if the program is modified during debugging, the operation is repeated via (3), above.

(a) Graph transitions in variable values

Display the relationship of variable/register values to time in a line chart.

(b) Chart the function execution time ratios

Display a pie chart of the function execution time ratios.

(10) Save Analysis Information

Save the acquired analysis information to a file.

(11) Save the project file

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

Remark For details on "Save the project file", see "CubeSuite Start".

2.2 Display Function Information

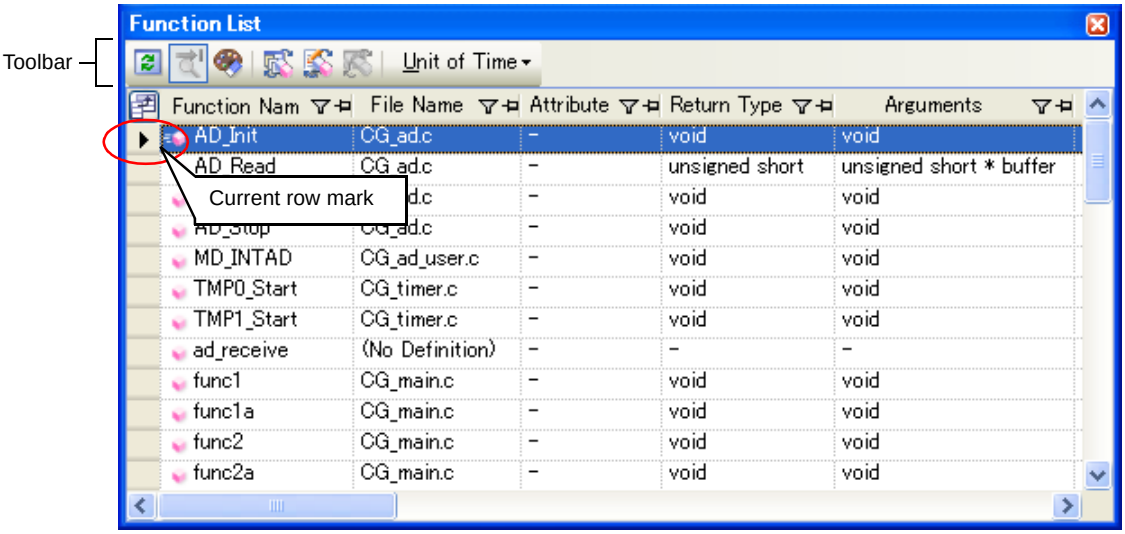
Display the function information (function name, file name, attribute, reference count, execution count, etc.) in the program.

The function information is displayed on the following Function List panel, which is opened by clicking the button on the Main window's toolbar.

Click the button on this panel's toolbar to display the latest information that can currently be displayed (see "1.1.2 Types of analysis information").

See the Function List panel for details on each of the function information items displayed.

Figure 2-1. Display the Function Information (Function List Panel)



Remarks 1. The display contents are updated each time program execution is stopped.
Note, however, that if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Yes] (default), the information will be updated in accordance with the setting on the Property panel.

2. The value of the information that has been changed because of the execution of a program is shown highlighted (the color depends on the configuration in the [General - Font and Color] category of the Option dialog box). To reset the highlighting, click the button on the toolbar.

3. The current row mark (▶) indicates the current row.
The following operations can be performed on the function with the current row mark.
- Jump to Defined Location
- Set Break Events
- Display List of Referencing Location

4. Information for functions defined outside the active project, and which are never referenced from the active project, is ordinary not displayed in the Function List panel.
For detailed instructions on displaying function information in this case, see "2.10 Import or Export Information File".

2.3 Display Variable Information

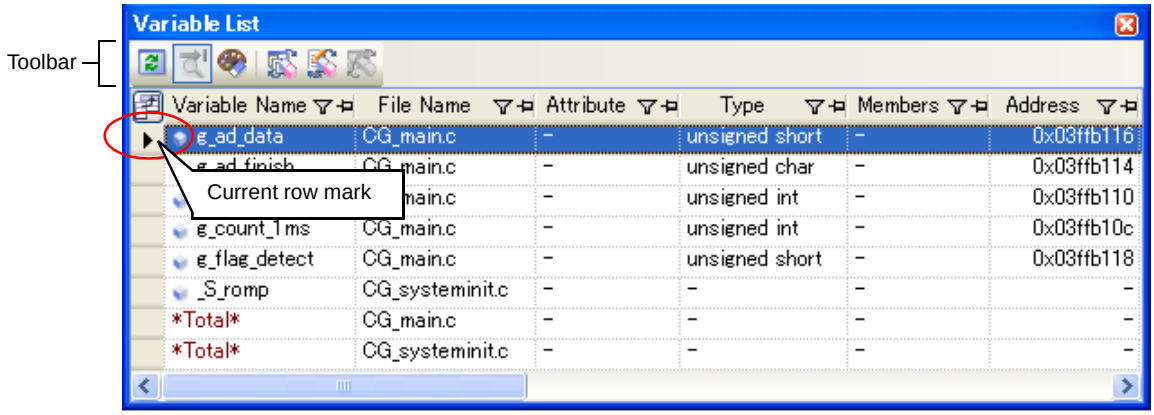
Display the variable information (variable name, file name, attribute, type, read count, write count, data coverage, etc.) in the program.

The variable information is displayed on the following Variable List panel, which is opened by clicking the button on the Main window's toolbar.

Click the button on this panel's toolbar to display the latest information that can currently be displayed (see "1.1.2 Types of analysis information").

See the Variable List panel for details on each of the variable information items displayed.

Figure 2-2. Display the Variable Information (Variable List Panel)



Remarks 1. The display contents are updated each time program execution is stopped.
Note, however, that if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Yes] (default), the information will be updated in accordance with the setting on the Property panel.

2. The value of the information that has been changed because of the execution of a program is shown highlighted (the color depends on the configuration in the [General - Font and Color] category of the Option dialog box). To reset the highlighting, click the button on the toolbar.

3. The current row mark (▶) indicates the current row.
The following operations can be performed on the function with the current row mark.
- Jump to Defined Location
- Set Break Events
- Display List of Referencing Location

4. Information for functions defined outside the active project, and which are never referenced from the active project, is ordinary not displayed in the Variable List panel.
For detailed instructions on displaying function information in this case, see "2.10 Import or Export Information File".

2.4 Display Calling Relationships between Functions (Call Graph)

You can display a tree-structured chart (call graph) that represents calling relationships between functions in the program based on the acquired function information.

The call graph is displayed on the following Call Graph panel, which is opened by clicking the button on the Main window's toolbar.

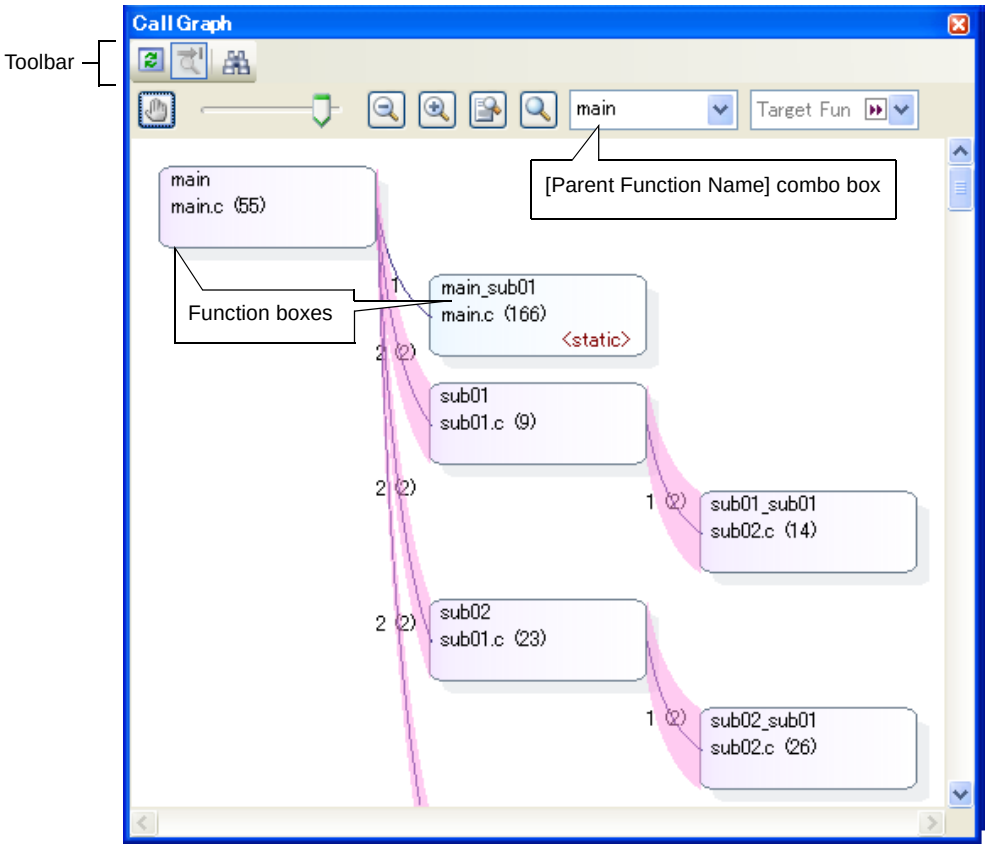
Click the button on this panel's toolbar to display the latest information that can currently be displayed (see "1.1.2 Types of analysis information").

See the Call Graph panel for details on the call graph displayed.

Cautions 1. If the debug tool to use does not support the Trace function, or if the debug tool's trace function is not enabled, then the Dynamic analysis information (an execution count) in the call graph cannot be displayed.

2. If a clean is executed in the build tool, the call graph currently being displayed will be erased.

Figure 2-3. Display Calling Relations hips between Functions (Call Graph Panel)



The following operations can be performed on the call graph displayed.

(1) Change a parent function

By default, the first function to appear named "main" or containing the word "main" is considered to be the parent function, and that function is placed on the left edge of the call graph.

Select a function from the drop-down list of the [Parent Function Name] combo box to change the parent function to be displayed in call graph.

Remark [V850E2M]

If the selected microcontroller version supports multi-core, you can select "PE*n*" in the [Parent Function

Name] combo box. In this case, the call graph will only be displayed for the functions executed in the selected PE*n*.

(2) Jump to defined location

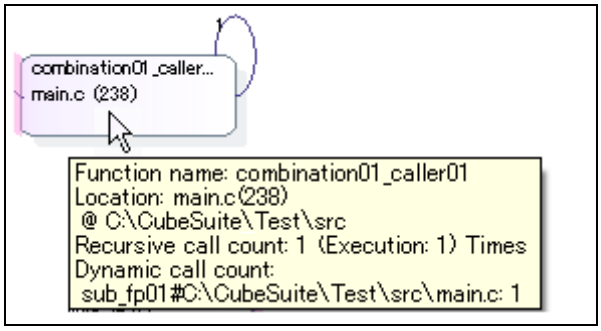
By double-clicking on a function box in the call graph, you can jump to the location of the source text where the function is defined (see "2.6 Jump to Defined Location").

(3) Pop-up display of the function information

When the mouse cursor is hovered over a function box in the call graph, information about that function appears in a pop-up (see "(c) Pop-up display" for details on the display format).

Caution This function cannot be used when scrolling of the call graph is being allowed by using the button on the display setting area in the Call Graph panel.

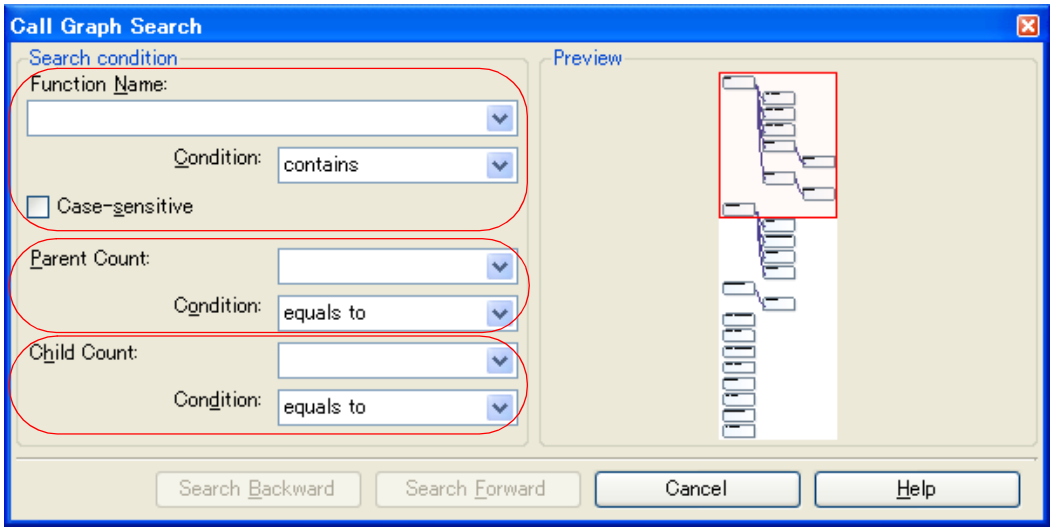
Figure 2-4. Pop-up Display of Function Information



(4) Search for a function

You can search for an arbitrary function existing in the call graph.
To do this, click the button on the Call Graph panel's toolbar to open the Call Graph Search dialog box.
In this dialog box, follow the steps below.

Figure 2-5. Search for Functions (Call Graph Dialog Box)



(a) Specify [Function Name]

Specify a function name to search.

You can either type character strings directly into the text box, or select one from the input history via the drop-down list (up to 10 items).

Next, to specify conditions for the specified character strings, select the desired conditions in the [Condition] combo box ([contains] is selected by default).

Searches are case-insensitive if the [Case-sensitive] check box is selected.

Remark You can also specify the function name with any one of the following methods.

- Drag and drop an arbitrary function row of the Function List panel to this dialog box.
- Drag and drop an arbitrary character strings to this combo box.

(b) Specify [Parent Count]

If required as a search parameter, you can specify the number of parent functions to search.

You can either type a value directly into the text box (settable range: 0 to 65535), or select one from the input history via the drop-down list (up to 10 items).

Next, to specify conditions for the specified value, select the desired conditions in the [Condition] combo box ([equals] is selected by default).

(c) Specify [Child Count]

If required as a search parameter, you can specify the number of child functions to search.

You can either type a value directly into the text box (settable range: 0 to 65535), or select one from the input history via the drop-down list (up to 10 items).

Next, to specify conditions for the specified value, select the desired conditions in the [Condition] combo box ([equals] is selected by default).

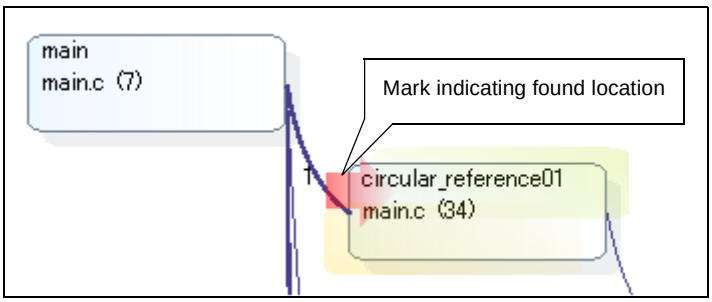
(d) Click the [Search Backward]/[Search Forward] button

When the [Search Backward] button is clicked, the search uses the specified conditions, starting from the function name at the bottom of the call graph, and proceeding upward. The corresponding function box is highlighted.

When the [Search Forward] button is clicked, the search uses the specified conditions, starting from the function name at the top of the call graph, and proceeding downward. The corresponding function box is highlighted.

If a function has been specified in the [Target Function Name] combo box on the Call Graph panel, then the search starts from the corresponding function, moving upward/downward.

Figure 2-6. Location Where a Function Has been Found



Remarks 1. The display contents are updated each time program execution is stopped.

Note, however, that if the [Refresh at program stop] property in the [General] category on the [Settings]

tab of the Property panel is set to other than [Yes] (default), the information will be updated in accordance with the setting on the Property panel.

2. A function whose source file does not exist in the project can be displayed in the call graph if the [Display the function without definition at Call Graph panel] property in the [General] category on the [Settings] tab of the Property panel is set to [Yes].

2.5 Customize Display Method

The following operations will enable you to customize the displaying of items (columns) and the analysis information on the Function List panel/Variable List panel.

All operations refer to the header area of each panel (the area where the column labels are displayed).

- Set the columns to display
- Change the order of the columns to display
- Lock the specific column to display
- Sort the analysis information
- Filter the analysis information

Remark In the Column Chooser dialog box, click the [Default] button to return all the customizations you have performed via the operations above to the default values.

2.5.1 Set the columns to display

You can show or hide any of the items (columns) displayed on the Function List panel/Variable List panel.

(1) Restricting the columns displayed
(2) Adding columns to display

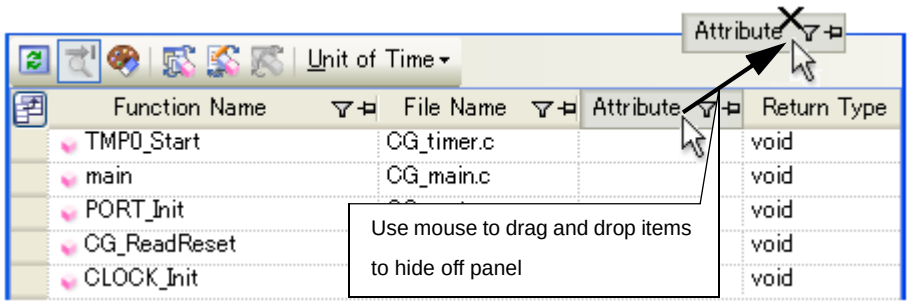
(1) Restricting the columns displayed

There are two ways to perform this operation, as shown below.

(a) Performing the operation from the panel

Use the mouse to drag and drop the items to hide off of the panel.

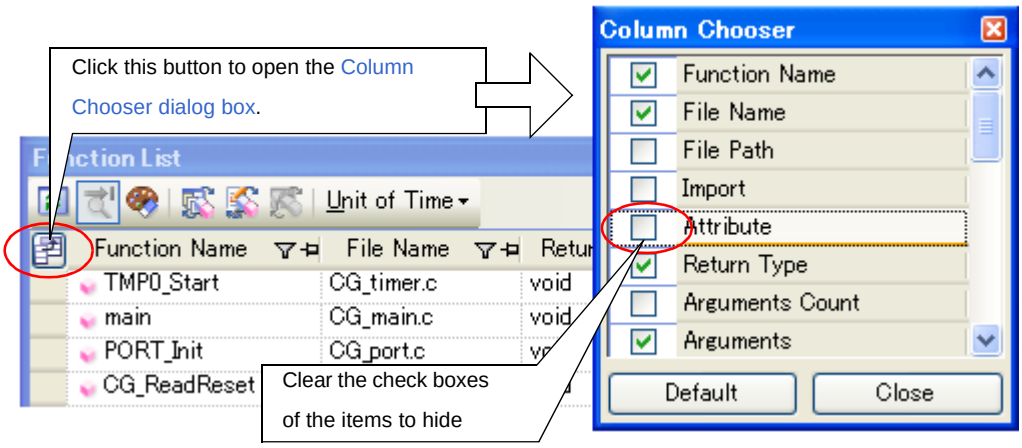
Figure 2-7. Restricting the Columns Displayed (Operation from the Panel)



(b) Performing the operation from the Column Chooser dialog box

On the left edge of the panel's header area, click the button to open the Column Chooser dialog box, and then clear the check boxes of the names of the items to hide.

Figure 2-8. Restricting the Columns Displayed (Operation from the Column Chooser Dialog Box)



(2) Adding columns to display

On the left edge of the panel's header area, click the button to open the Column Chooser dialog box, and then select the check boxes of the names of the columns to display, or drag and drop them directly from the dialog box to the information display area on the panel using the mouse.

Figure 2-9. Adding Columns to Display (Clearing Check Boxes in the Column Chooser Dialog Box)

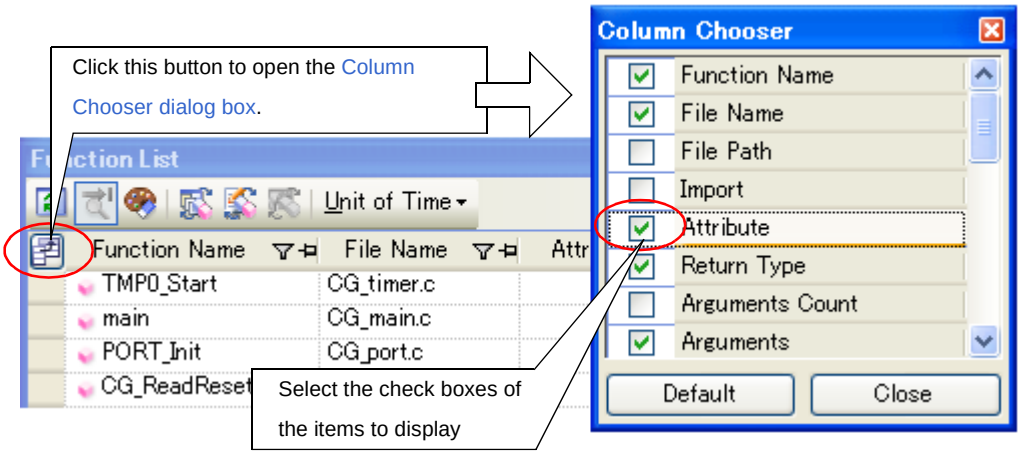
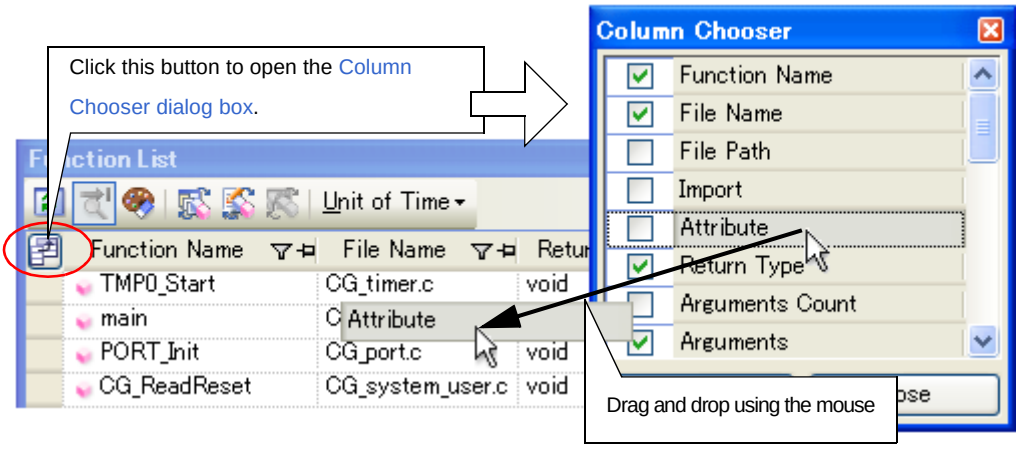


Figure 2-10. Adding Columns to Display (Dragging and Dropping from the Column Chooser Dialog Box)



2.5.2 Change the order of the columns to display

You can change the display order of the items (columns) displayed on the Function List panel/Variable List panel. There are two ways to perform this operation, as shown below.

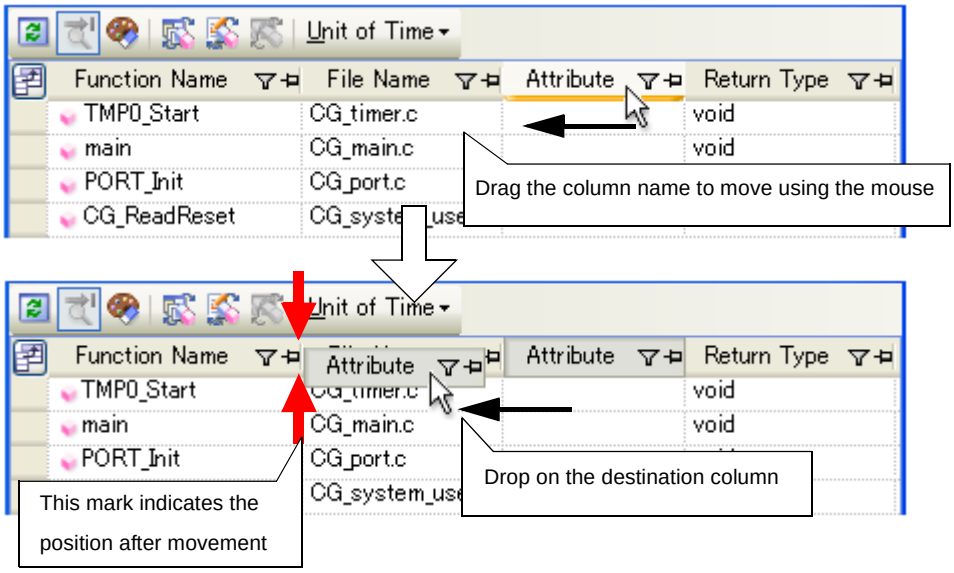
There are two ways to perform this operation, as shown below.

(1) Performing the operation from the panel
(2) Performing the operation from the Column Chooser dialog box

(1) Performing the operation from the panel

Use the mouse to drag and drop the column name to move directly to an arbitrary column (header area).

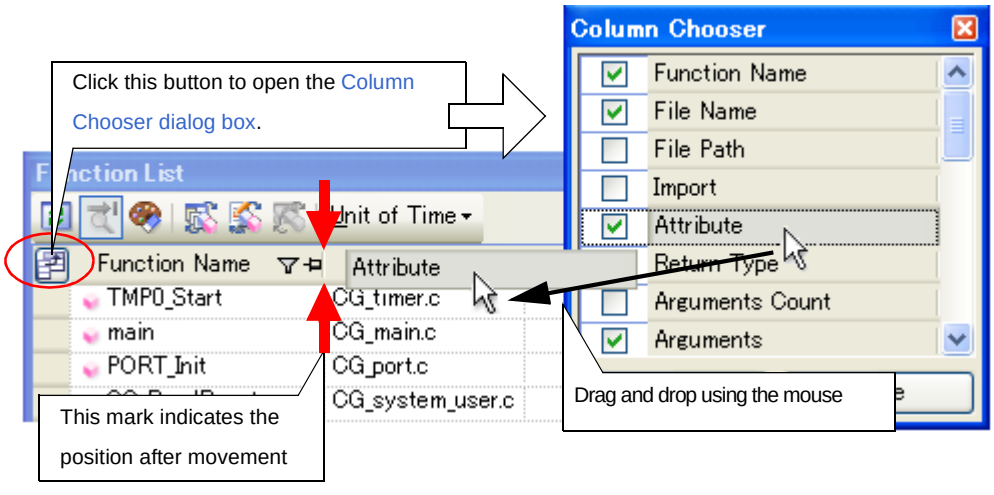
Figure 2-11. Change the Order of the Displayed Items (Operation from the Panel)



(2) Performing the operation from the Column Chooser dialog box

On the left edge of the panel's header area, click the button to open the Column Chooser dialog box, and then drag and drop the column names to move directly to the desired column (header area) on the panel using the mouse.

Figure 2-12. Change the Order of the Displayed Items (Operation from the Column Chooser Dialog Box)



2.5.3 Lock the specific column to display

You can set specified items (columns) to always be displayed on the Function List panel/Variable List panel, even if the screen display is scrolled.

To do this, use the mouse to click the lock display icons (/) of the desired column name (clicking repeatedly toggles the item display between locked and unlocked).

Columns configured for locked display are locked at the leftmost column, so they will not be scrolled even if the user scrolls horizontally.

The meanings of the lock display icons are as follows:

Table 2-2. Lock Display Icons

Icon	Description
	Indicates that the display is not locked (default).
	Indicates that the display is locked.

Remarks 1. You can also lock the display of a column by dragging and dropping it between two items with locked displays, or to the rightmost column.

2. You can also unlock the display of a locked item by dragging and dropping it between two items with unlocked displays.

2.5.4 Sort the analysis information

You can sort the information values on the Function List panel/Variable List panel by column, and in ascending or descending order.

To do this, use the mouse to click the desired column name (clicking repeatedly toggles the sort order between ascending and descending).

If the items to sort are numbers (decimal or hexadecimal), then the information is sorted by numerical value. For other types of data (e.g. strings), the information is sorted by character code.

The following mark appears by the column name of the column that the information is sorted on:

Table 2-3. Marks that Indicate Sorted Display

Mark	Description
△	Indicates that the information is being sorted in ascending order. Click again with the mouse to sort in descending order.
▽	Indicates that the information is being sorted in descending order. Click again with the mouse to sort in ascending order.

Remark Click while holding down the [Shift] key to sort on multiple columns.

2.5.5 Filter the analysis information

You can set filters for displaying information on the Function List panel/Variable List panel.

The following types of filters are available.

(1) Filtering via custom settings for each column

(2) Filtering results linked to panel

Caution The Filtering via custom settings for each column and the Filtering results linked to panel are mutually exclusive functions. For this reason, the two filtering functions described here cannot be

enabled simultaneously (when one of the filters is active, setting the other filter will disable the first one).

(1) Filtering via custom settings for each column

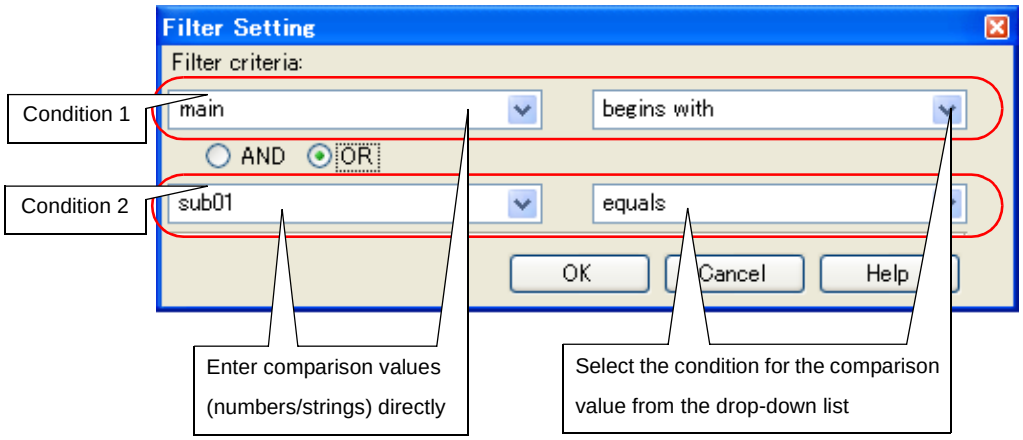
Configure a custom filter for each column, and display the acquired information.
To do this, click on the filter icon (/) of the target column name, then select the following menu item.

Table 2-4. Filter Display Settings

Item	Description
(All)	Does not set filter (resets filter display). Displays all information.
(Custom)	Opens the Filter Settings dialog box to set detailed filtering conditions. Only information matching the conditions specified in this dialog will be displayed.
(Blanks)	Displays empty ("-") fields.
(NonBlanks)	Does not display empty ("-") fields.
Information list	All acquired information is displayed in a list as strings. Only values matching the string selected from the list are displayed.

Select [(Custom)] to open the Filter Settings dialog box. Use this dialog box to set up to two condition groups. Both conditions can be linked into a single filtering condition via the logical operator buttons ([AND] / [OR]).
Use the top condition-specification area if you only wish to specify one filtering condition.

Figure 2-13. Filtering via Custom Settings for Each Column (Filter Settings Dialog Box)



The meanings of the filter icons are as follows:

Table 2-5. Filter Icons

Icon	Description
	Indicates that no filtering is taking place (default).
	Indicates that the information is being filtered.

Remark If "(2) Filtering results linked to panel" is configured while the information is being filtered via this operation, all custom filter displays that have been taking place will be reset.

(2) Filtering results linked to panel

(a) Linking with the Project Tree panel
(b) Linking with the Editor panel
(c) Linking with the Debug Manager panel [V850E2M]

(a) Linking with the Project Tree panel

Only display values for functions/variables in a file/category selected in the Project Tree panel.
To do this, click the  button on the Function List panel/Variable List panel toolbar to enable this filtering function, then from the Project Tree panel, select the desired file(s)/category(s). Click this button again to disable this function.
The relationship between the selections in the Project Tree panel and the filtered functions/variables is as follows:

Table 2-6. Filtering Linked to the Project Tree panel

Selection	Display
Single file in active project	Functions/variables defined in single file
Multiple files in active project	Functions/variables defined in multiple files
Single category in active project	Functions/variables defined in single category
Multiple categories in active project	Functions/variables defined in multiple categories
Combination of files and categories in active project	Functions/variables defined in the selected files and categories
Other than the above	All functions/variables defined in files included in the active project

Caution Assembler source files cannot be analyzed.

Remarks 1. If a header file is selected, then functions/variables defined in that header file are displayed.
2. If "(1) Filtering via custom settings for each column" is configured while the information is being filtered via this operation, linking displays that have been taking place will be reset.
3. This filtering function can be used together with "(b) Linking with the Editor panel"/"(c) Linking with the Debug Manager panel [V850E2M]".

(b) Linking with the Editor panel

Only display information for functions/variables starting with the word at the caret position in the Editor panel.
To do this, click the  button on the Function List panel/Variable List panel toolbar to enable this filtering function, then move the caret to the desired function/variable name in the Editor panel. Click this button again to disable this function.
Note, however, that if there is no word at the caret position (e.g. if it is at a space or tab character), then the display will not be filtered linked to the Editor panel.

Remarks 1. If "(1) Filtering via custom settings for each column" is configured while the information is being filtered via this operation, linking displays that have been taking place will be reset.
2. This filtering function can be used together with "(a) Linking with the Project Tree panel"/"(c) Linking with the Debug Manager panel [V850E2M]".

(c) Linking with the Debug Manager panel [V850E2M]

Only display information for functions/variables in the Common area and PE selected in the Debug Manager panel.

To do this, click the  button on the Function List panel/Variable List panel toolbar to enable this filtering function. Click this button again to disable this function.

Note, however, that if the selected microcontroller version does not support multi-core, then this function will be invalid.

Remarks 1. If "(1) Filtering via custom settings for each column" is configured while the information is being filtered via this operation, linking displays that have been taking place will be reset.

2. This filtering function can be used together with "(a) Linking with the Project Tree panel"/"(b) Linking with the Editor panel".

2.6 Jump to Defined Location

You can jump to the location of the source text where the function/variable on the Function List panel/Variable List panel/Call Graph panel is defined.

To do this, double-click on the desired function/variable in the Function List panel/Variable List panel, in the same way, double-click on the desired function box in the Call Graph panel.

When the jump is executed, the source file in which the target function/variable is defined opens in the Editor panel, and the caret moves to the line where it is defined.

Cautions 1. In the Call Graph panel, when the scroll function is allowed by clicking the button on the display setting area, this function cannot be used. In this case, select [Jump to Source] from the context menu after selecting the target function with the [Target Function Name] combo box.

2. [CA850]
This jump function may not be performed correctly if "#pragma directive" (like examples below) is described following "#include statement" in the source text.
In this case, move "#pragma directive" before the description of "#include statement".

Examples 1. #pragma task TASK_A
2. #pragma interrupt INTP0 functionA

It is also possible to jump to the disassembly data/memory list corresponding to the starting address of the function/variable by the following method (but this is only possible while connecting to the debug tool).

When the jump is executed, the disassembly data/memory list corresponding to the starting address of the target function/variable opens in the Disassemble panel (Disassemble1)/Memory panel (Memory1), and the caret moves to the corresponding location.

- In the Function List panel/Variable List panel
  Select the row in which the target function/variable is displayed (make sure that the current row mark (▶) appears to the left of the selected row), then from the context menu, select [Jump to Disassemble] or [Jump to Memory].

- In the Call Graph panel
  Select the target function box (make sure that the target function name is displayed in the [Target Function Name] combo box), then from the context menu, select [Jump to Disassemble] or [Jump to Memory].

2.7 Set Break Events

You can set a break event in the debug tool at a function/variable on the Function List panel/Variable List panel.

- Set a breakpoint to a function
- Set a break event to a variable

2.7.1 Set a breakpoint to a function

Set a breakpoint at the start of the function on the Function List panel (the first executable line in the function).

To do this, select the row in which the target function is displayed (make sure that the current row mark (▶) appears to the left of the selected row), then from the context menu, select [Set Break to Function].

A breakpoint set via this operation is managed in the Events panel as an event whose name is "Break at start of function".

Caution This operation is invalid while disconnecting from the debug tool.

Remark If there is already a breakpoint set at the corresponding location, the behavior is as follows:
- If a breakpoint in a valid state is set: No effect
- If a breakpoint in an invalid state is set: Sets the breakpoint to a valid state

2.7.2 Set a break event to a variable

Set a break event with access condition to a variable on the Variable List panel.

To do this, select the row in which the target variable is displayed (make sure that the current row mark (▶) appears to the left of the selected row), then from the context menu, select one of the following and then press the [Enter] key.

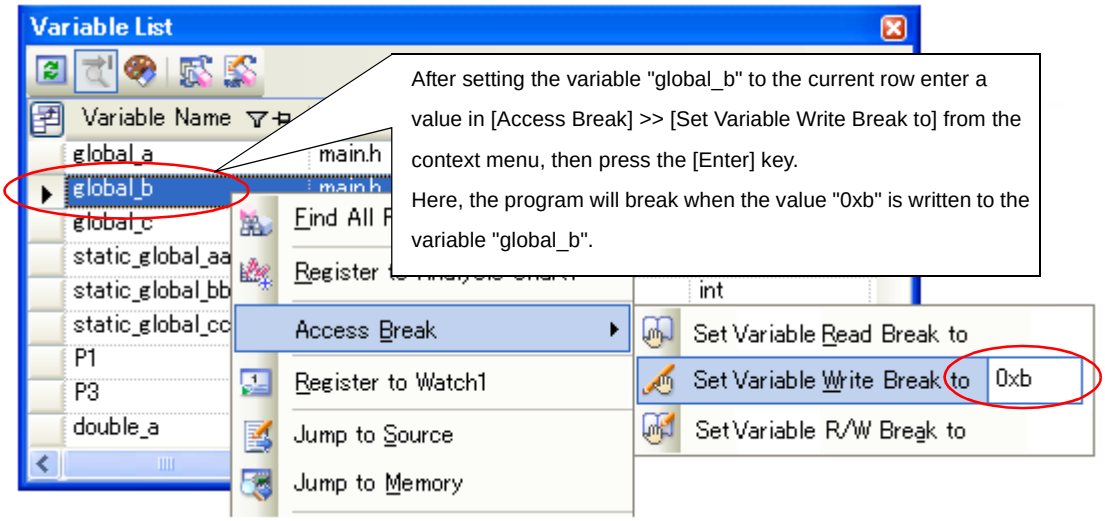
- [Access Break] >> [Set Variable Read Break to]: Sets a break event with read access condition.
- [Access Break] >> [Set Variable Write Break to]: Sets a break event with write access condition.
- [Access Break] >> [Set Variable R/W Break to]: Sets a break event with read/write access condition.

Note that at this time, you can specify the value in the text box in the context menu.

In this case, execution will only break if it is accessed with the specified value. If you press [Enter] key without entering a value in the text box, then execution will break when the target variable is accessed, regardless of the value.

A break event set via this operation is managed in the Events panel as an event whose name is "Access break to variable".

Figure 2-14. Example of Setting a Break Event on Variable



Caution This operation is invalid while disconnecting from the debug tool.

Remark If there is already a breakpoint set at the corresponding location, the behavior is as follows:
- If a break event in a valid state is set: No effect
- If a break event in an invalid state is set: Sets the break event to a valid state

2.8 Register Watch-Expressions

You can register a variable on the Variable List panel as a watch-expression in the Watch panel (Watch1).
To do this, drag and drop the row of the target variable directly onto the Watch panel (Watch1).

Cautions 1. This operation is invalid while disconnecting from the debug tool.
2. This operation is invalid for the [*Total*] row.

Remark The name of the watch-expression registered in the Watch panel differs depending on the type of the target variable, as follows:

- Global variable: *"variable name"*
- File-internal static variable: *"file name#variable name"*
- Static variable inside functions: *"file name#function name#variable name"*

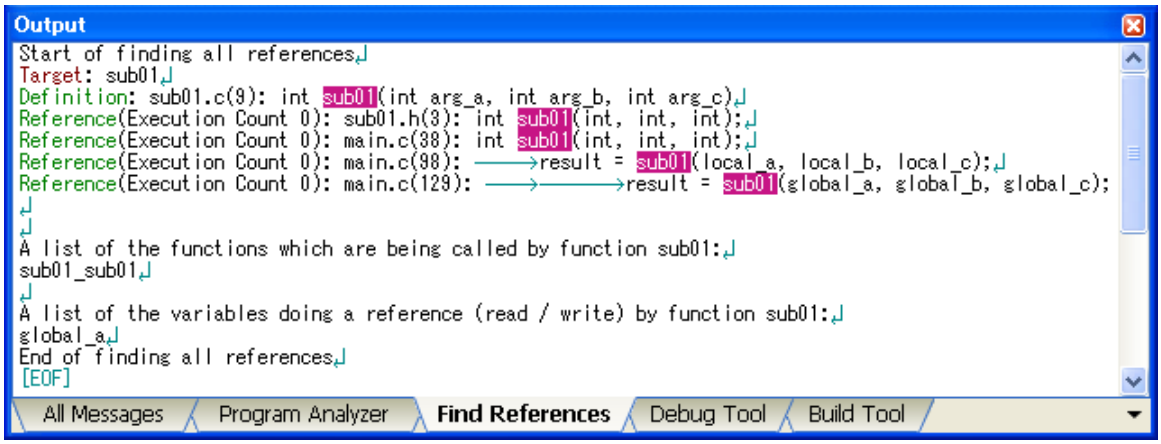
2.9 Display List of Referencing Location

You can find and display a list of locations referencing a function/variable on the Function List panel/Variable List panel.

To do this, select the row in which the target function/variable is displayed (multiple selections possible), then from the context menu, select [Find All references].

The results of the search are output to the next Output panel's [Find References] tab.

Figure 2-15. Sample List of Locations Referencing a Function (Output Panel)



The following information about the referencing locations is output to the list as the search results.

For details on the output format, see the section of the Output panel's [Find References] tab.

- Performing the operation from the Function List panel
  - Location where target function is defined
  - List of locations referencing the target function
  - List of functions called within the target function
  - List of variables referenced (read/write) inside the target function

- Performing the operation from the Variable List panel
  - Location where target variable is defined
  - List of locations referencing the target variable

Caution Code in C source files that is referenced but is eliminated by the preprocessor during compilation (e.g. via "#if" or "#ifdef" statements) is not output as referenced locations.

Remarks 1. When the function name/variable name on this panel is double-clicked, the Editor panel appears and the caret moves to the line where the function/variable is defined.

2. You can save the contents displayed on this panel to a text file (*.txt) by selecting [Save Output-Find References As...] from the [File] menu.

2.10 Import or Export Information File

Information for functions or variables defined outside the active project, and which are never referenced from the active project, is ordinary not displayed in the Function List panel/Variable List panel.

In this case, it is possible to force this function information/variable information to be displayed by importing an information file (Function list file (*.csfl)/Variable list file (*.csvl)).

The procedure for doing this is as follows:

Caution The objects of the import/export via the information file are limited to the following items on the Function List panel/Variable List panel.

Function List panel	[Function Name], [File Name], [File Path], [PE Information]Note, [Attribute], [Return Type], [Arguments Count], [Arguments], [Code Size[Bytes]], [Stack Size[Bytes]]
Variable List panel	[Variable Name], [File Name], [Function Name], [File Path], [PE Information]Note, [Attribute], [Type], [Members], [Size[Bytes]]

Note This item appears only when the selected microcontroller version supports multi-core.

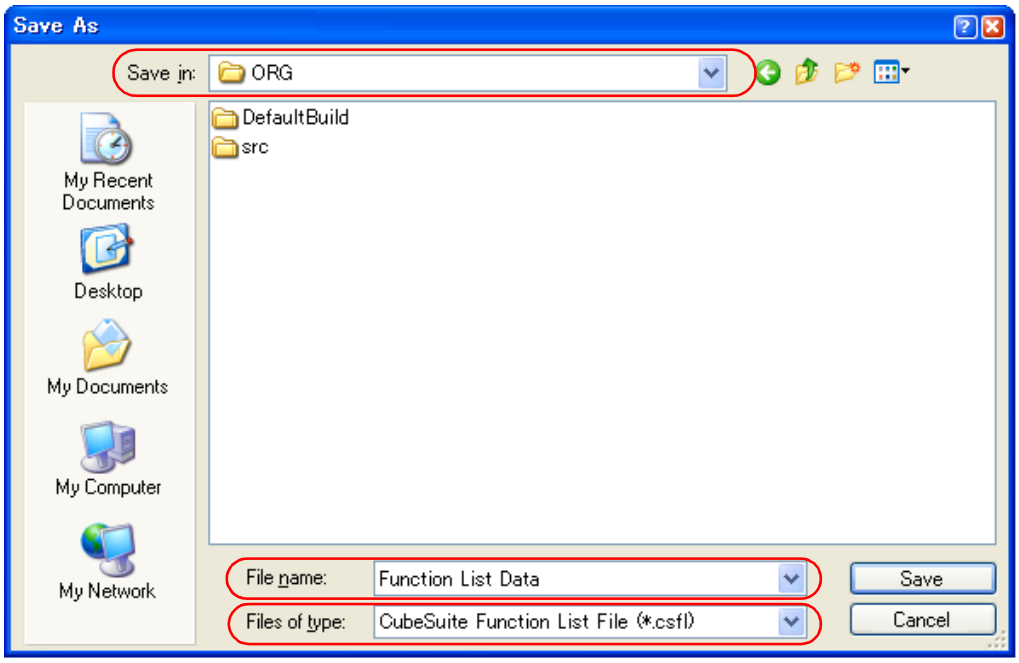
(1) Generate (Export) information file

Generate an information file (Function list file (*.csfl)/Variable list file (*.csvl)) with the functions/variables needed to be imported.

To do this, first make the project in which the target functions/variables are defined the active project, then display the necessary information of the target functions/variables in the Function List panel/Variable List panel.

Next, select all the rows displaying the target functions/variables in this panel (multiple rows can be selected by holding down the [Shift]/[Ctrl] key while selecting), then from the [File] menu, select [Save Function List Data As...]/[Save Variable List Data As...]. The following Save As dialog box opens.

Figure 2-16. Generate the Information File (Example of Generating Function List File)



In the [Save in] area of the above dialog, select a folder of your choice in which to save the generated information file, then select the following file format from the drop-down list in the [Files of type] area.

Caller Panel	File of Type	Description
Function List panel	CubeSuite Function List File (*.csfl)	Generates a function list file (*.csfl).
Variable List panel	CubeSuite Variable List File (*.csvl)	Generates a variable list file (*.csvl).

Enter a file name of your choice for the information file in the [File name] area (note, however, that the file extension must be "csfl" for a Function list file, and "csvl" for a Variable list file).
Click the [Save] button to generate the information file (Function list file (*.csfl)/Variable list file (*.csvl)) in the specified folder, with the specified file name.

Caution **Only the current active project is subject to this export.**

Remark The generated information file contains only the functions/variables selected on the Function List panel/ Variable List panel.
If you also need information about functions/variables defined outside the active project specified here, then generate a separate information file using the same procedure.

(2) Import the information file

Import the information file (Function list file (*.csfl)/Variable list file (*.csvl)) you generated (exported).
To do this, set the [Import files] property in the [Import / Export] category on the [Settings] tab of the Property panel.
When the [Import files] property is selected, a [...] button appears. When this button is clicked the following Path Edit dialog box opens.

Figure 2-17. [Import files] Property in [Import / Export] Category

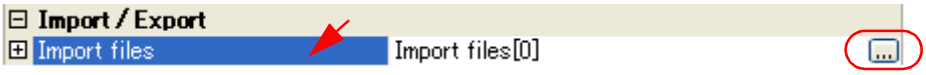
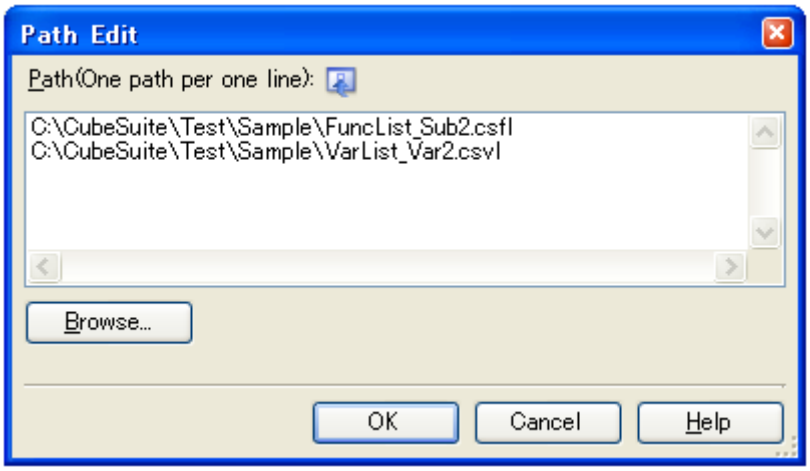


Figure 2-18. Specification of Import Files (Path Edit Dialog Box)

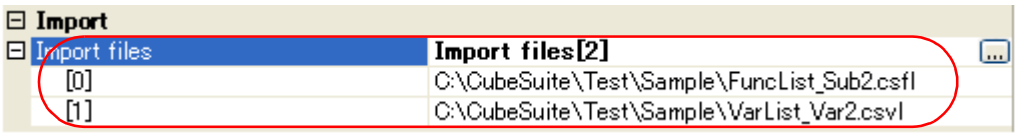


In the Path Edit dialog box, in the [Path(One path per one line)] area, specify the names of the information files generated in (1) (including the path), one path per line (up to 259 characters per line/up to 64 lines). If you specify a relative path, specify the project folder as the base.
Note that at this time, you can use the following macro names for embedded macros.

Macro Name	Function
%ProjectName%	Replaces itself with the project name.
%CubeSuitePath%	Replaces itself with the absolute path of the CubeSuite install folder.

You can also use the [Browse...] button to specify information files. After you have entered the names of all the files to import, click the [OK] button. The specified paths appear as sub-properties of the [Import files] property.

Figure 2-19. [Import files] Property (After Adding Import Files)



The above setting completes the import of the information file (Function list file (*.csfl)/Variable list file (*.csvl)).

Remarks 1. To cancel the file import, delete the import files specified in the Path Edit dialog box.

2. If a function/variable with the same name exists in a import file and an active project, the determination is made according to the following rules.

- If the file names are different, and the attribute in the import file is for static functions/variables, then it is interpreted as a static function/variable, and loaded as different function information/variable information.
- If the file names are the same and the function names are different, and the attribute in the import file is for static variables, then it is interpreted as a static variable in a function, and loaded as different function information/variable information.
- Functions/variables other than the above are interpreted as global functions/variables, and merged as identical function information/variable information.
  In this case, the rules for determining merging are as follows:

Items	Rules
[Function information] [Function Name]/[File Pass]/[PE Information][Note]/[Stack Size[Bytes]]/[Arguments Count]/[Arguments]/[Return Type]/[Attribute] **[Variable information]** [Function Name]/[Function Name]/[File Path]/[PE Information][Note]/[Attribute]/[Type]/[Members]	The precedence is as follows: "active project value" > "import file value" Note, however, that if there is function information/variable information from multiple import files to merge, then the function information/variable information of the last file to be imported is loaded. If a value does not exist in either the active project or import file, then it is left blank ("-").
[Function information] [Code Size[Bytes]] **[Variable information]** [Size[Bytes]]	The precedence is as follows: "import file value" > "active project value" Note, however, that if there is function information/variable information from multiple import files to merge, then the function information/variable information of the last file to be imported is loaded. If a value does not exist in either the active project or import file, then it is left blank ("-").

Note This item appears only when the selected microcontroller version supports multi-core.

2.11 Display Analysis Information in Chart

You can display the acquired function information and variable information in a chart.

To display a chart, click the button on the Main window's toolbar to open the Analysis Chart panel (the button can only be selected while connecting to the debug tool).

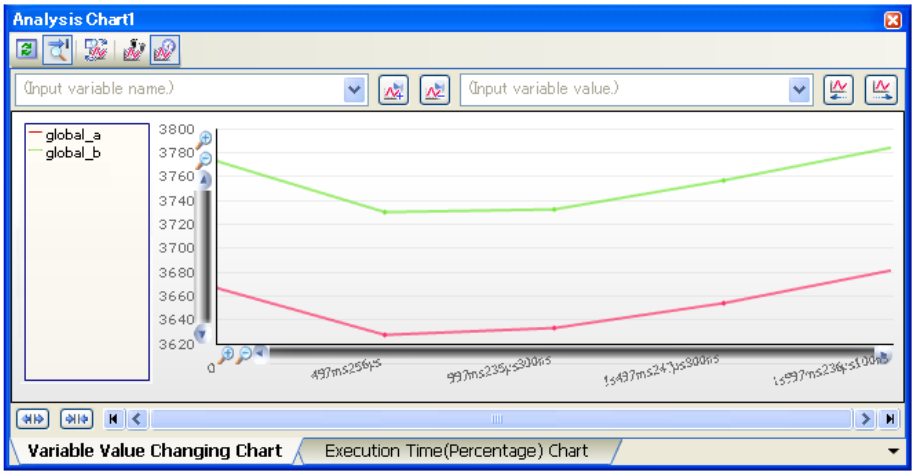
Up to a maximum of four of the Analysis Chart panels can be opened at one time; they are identified by the names "Analysis Chart1", "Analysis Chart2", "Analysis Chart3", and "Analysis Chart4" (displayed in title bar).

The following content is graphed in the Analysis Chart panel.

- Graph transitions in variable values
- Chart the function execution time ratios

Caution The Analysis Chart panel can only be displayed while connecting to the debug tool. All panels of this type are closed when the debug tool is disconnected.

Figure 2-20. Example of Graphs for the Analysis Information (Analysis Chart Panel)



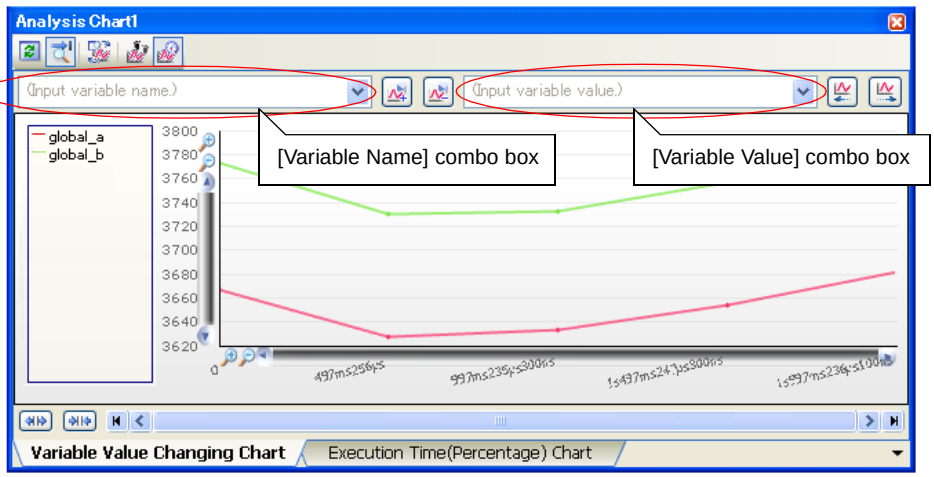
2.11.1 Graph transitions in variable values

Display the relationship of registered variable/register/other values to time in a line chart.

The graph is displayed in the Analysis Chart panell's [Variable Value Changing Chart] tab.

See the Analysis Chart panel for details on each of the area displayed.

Figure 2-21. Graph of Transition in Variable Values



The procedure for displaying the chart is as follows:

(1) Register graphing targets

Register the item to graph.
The following types of items can be registered.

- Global variable
- File-internal static variable
- Static variable inside functions
- CPU register
- SFR **[78K0][78K0R]**
- IOR **[V850]**
- Address

There are two ways to register graphing targets, shown below.

(a) Registering targets separately
(b) Linking with the Watch panel (Auto registration)

Caution The registered graphing target cannot be changed during program execution.

(a) Registering targets separately

From the following panel, drag and drop the target directly onto this tab.

- Variable List panel[Note]
- Editor panel
- CPU register panel
- SFR panel **[78K0][78K0R]**
- IOR panel **[V850]**
- Watch panel

Note The name of the graphing target registered differs depending on the type of the variable, as follows:

- Global variable: "*variable name*"
- File-internal static variable: "*file name*#*variable name*
- Static variable inside functions: "*file name*#*function name*#*variable name*"

This Analysis Chart panel is identified by the names "Analysis Chart*1-4*". From this tab on the panel, you can register targets individually for each tab on the various panels.
You can also register up to four targets per tab. Note, however, that there may be restrictions on the number and size of targets that can be graphed, depending on the debug tool used and the method by which the graph data was acquired (see "(2) Select the method for acquiring the graph data").

Remarks 1. Graphing targets can be registered in this tab's [Variable Name] combo box, by entering the target name directly via the keyboard, and then clicking the  button.
See "Table A-2. Input Format of Graphing Targets" for the input format for registering target names in this way.

2. To delete a graphing target after it has been registered, select the target name to delete from the [Variable Name] combo box drop-down list, then click the  button.

3. Once you have finished registering graphing targets, this information will not be lost if you close this panel.

(b) Linking with the Watch panel (Auto registration)

You can register watch-expressions registered in the current Watch panel automatically as graphing targets, by setting it via the  button on this tab's toolbar (toggle).
At this time, the linking relationship between the Watch panel (Watch*1-4*) and the Analysis Chart panel (Analysis Chart*1-4*) is as follows:

- Analysis Chart1: The 1st - 4th watch-expressions from the top registered in the Watch1
- Analysis Chart2: The 1st - 4th watch-expressions from the top registered in the Watch2
- Analysis Chart3: The 1st - 4th watch-expressions from the top registered in the Watch3
- Analysis Chart4: The 1st - 4th watch-expressions from the top registered in the Watch4

Note that if you enable this function via the "(a) Registering targets separately" operation when there is already a target registered on the tab, then the previously registered targets are cleared, and then the targets are linked to watch-expressions (if this function is subsequently disabled by clicking the  button again, the cleared targets are re-registered).

(2) Select the method for acquiring the graph data

There are two ways to acquire the data for graphing, as shown below. Select the toolbar button in accordance with your requirements.

Table 2-7. Method for Acquiring Graph Data

Method for Acquiring Graph Data	Button	Description
Trace data analysis **[IECUBE[78K0R]]** **[IECUBE[V850]]** **[IECUBE2]**Note **[Simulator]**		Display a graph based on the trace data acquired via the Trace function of the debug tool.
Real-time sampling analysis		Display a graph based on the data acquired via the RRM function of the debug tool (default).

Note This excludes the case when the selected microcontroller version supports multi-core.

The differences depending on the method for acquiring graph data are as follows:

Table 2-8. Differences Depending on the Method for Acquiring Graph Data

Differences	Trace Data Analysis **[IECUBE][Simulator]**	Real-time Sampling Analysis
Data that can be graphed	Can only be displayed if the debug tool's Trace function is enabled[Note 1].	Can only be displayed if the debug tool's RRM function is enabled[Note 1].
Graph format	Step-plot line chart	Normal line chart
Number of targets that can be graphed	If trace data is acquired via Point Trace events, then the number depends on the maximum number of enabled events[Note 2] in the debug tool.	**[IECUBE [V850]] [MINICUBE2 [78K0]]** Depends on the target range for the RRM function of the debug tool[Note 3].
Size of targets that can be graphed	- Less than or equal to 2 bytes **[78K0][78K0R]** - Less than or equal to 4 bytes **[V850]**	Less than or equal to 4 bytes

Differences	Trace Data Analysis **[IECUBE][Simulator]**	Real-time Sampling Analysis
Time display range	Time registered as trace data	The execution time, from the start to the end of program execution (Run-Break time)
Transition points of value	Matches actual timing (can be checked from Pop-up display)	Not possible to identify accurate time/change points, because they depend on the specified sampling interval[Note 4].
Note	It is not possible to analyze changes in values in the following case: - In regions where the variable is assigned to a register via compiler optimizations - When a 2-byte region is written in units of 1 byte, or a 4-byte region is written in units of 1 or 2 bytes	It may not be possible to identify the sampling interval, depending on the number of graphing targets registered.

Notes 1. For details on the settings to enable each function, see "1.1.3 Setting of the debug tool".

2. The number of events that can be set to "valid state" simultaneously differs according to the microcontroller and the debug tool. For details on "Maximum number of enabled events", see "CubeSuite Debug" of the microcontroller to use.

3. The target range for the RRM function differs according to the microcontroller and the debug tool. For details on "The target range for the RRM function", see "CubeSuite Debug" of the microcontroller to use.

4. The following setting in the Property panel for the debug tool:
- [Debug Tool Settings] tab >> [Access Memory While Running] category >> [Display update interval[ms]

Cautions 1. The method for acquiring the graph data cannot be changed during program execution.

2. If graph data has already been acquired, then changing this setting will cause the stored graph data to be deleted (the graph being displayed will be erased).

(3) Display the graphs

After you have executed and stopped the program, click the  button on the toolbar to display the latest chart for the registered graphing target.

Note, however, that the graph will not be displayed if the corresponding data could not be acquired.

The display of this graph can be configured as follows.

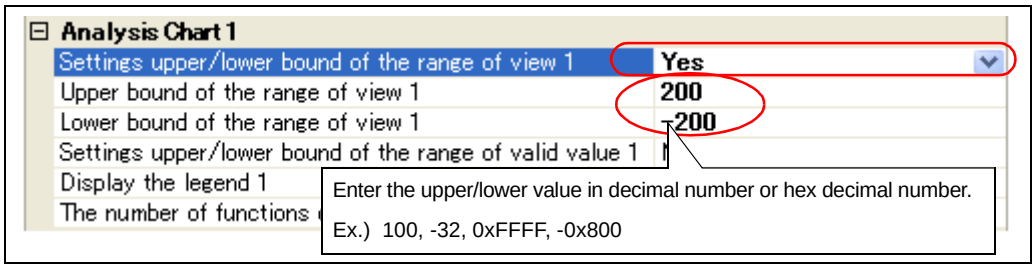
(a) Setting the display range

You can specify the value range to display on the graph's Y axis. In this case, the display range is fixed, so acquired data that falls outside the specified range will not be displayed in the corresponding section of the graph.

To make the setting, set the [Settings upper/lower bound of the range of view *1-4*] property in the [Analysis Chart*1-4*] category on the [Settings] tab of the Property panel to [Yes], then specify the upper and lower bounds in the property value that appears underneath it.

Caution If the value of the difference between the maximum and minimum values is extremely low, then it may not be possible to display the specified range.

Figure 2-22. Setting the Display Range for Graphs



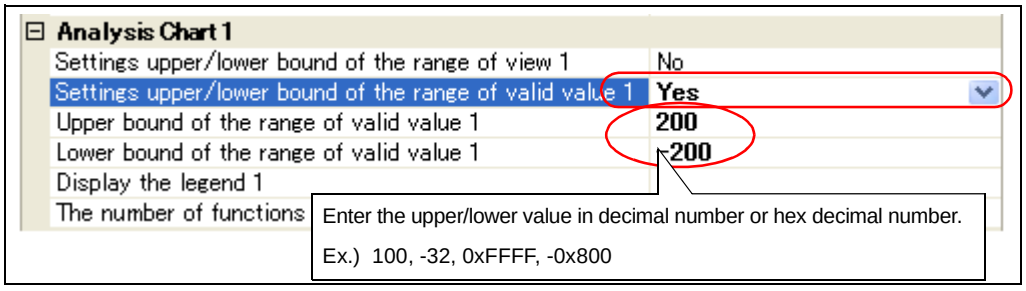
(b) Setting the valid range (Discard abnormal values)

You can specify the valid range of values for the graphing target. In this case, acquired values exceeding the valid range you specify are treated as abnormal values, and not displayed as transitions of the value in question. On the graph, the value is displayed as if there was no change.

To make the setting, set the [Settings upper/lower bound of the range of valid value *1-4*] property in the [Analysis Chart*1-4*] category on the [Settings] tab of the Property panel to [Yes], then specify the upper and lower bounds in the property value that appears underneath it.

Caution This function is only available when the graph data was acquired via the Real-time sampling analysis.

Figure 2-23. Setting the Valid Range for Graphs



Remarks 1. Click (toggle) the  button on the toolbar to display the latest information automatically each time program execution is stopped.

Note, however, that this button will be disabled if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (default) (this button is locked in accordance with the setting on the Property panel).

2. You can hide the legend for the graphs by setting the [Display the legend *1-4*] property in the [General] category on the [Settings] tab of the Property panel to [No].

3. If the acquired graph data exceeds the buffer capacity, then the oldest graph data is overwritten by the new graph data (ring buffer system).

In this case, part of the graph rendering will be blank.

4. There are limitations to the trace memory area of the debug tool.

Consequently, if the graph is displayed via the Trace data analysis, then we recommend setting a Point Trace event for the graphing target in the Watch panel, in order to display transitions of values over a wider range.

(4) Validate the graph data

You can perform the following operations on the displayed graph as needed.

(a) Pop-up display at a transition point

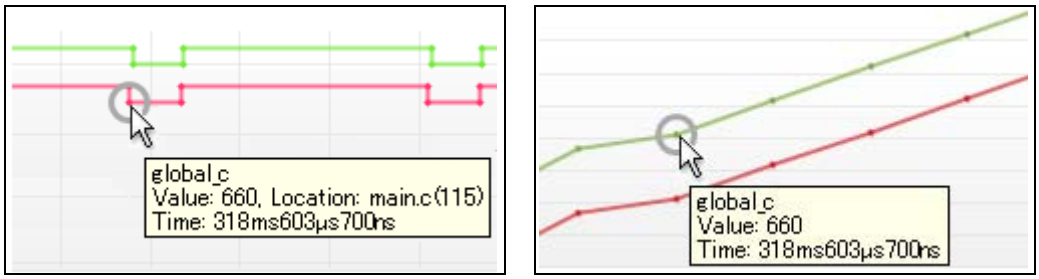
Check the information about transition points in the graph.

When the mouse cursor is hovered over a transition point on the graph, information about that location appears in a pop-up.

Note, however, that the content displayed will differ depending on the method for acquiring the graph data.

Figure 2-24. Pop-up Display at a Transition Point

[Trace data analysis] [Real-time sampling analysis]



Remark The [Location] information is displayed only when the transition location information exists in the graph data acquired via the Trace data analysis (when the information does not exist, "-" is displayed). In this case, furthermore, you can display the applicable location in the Editor panel by clicking the transition point.

Note, however, that the [Location] information may be invalid value when the graph data is acquired by simultaneously using a Trace event and a Point Trace event in the debug tool.

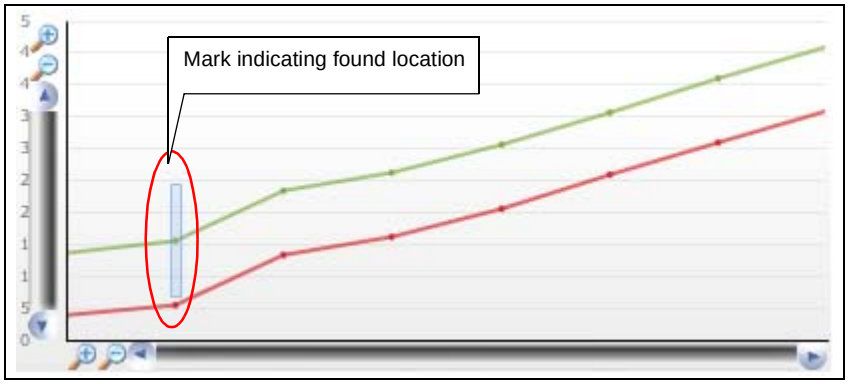
(b) Find values

Find locations where a variable changed to a specified value on a specified graph.

To do this, first specify the graph to search via the drop-down list in the [Variable Name] combo box, and then enter the transition value directly in the [Variable Value] combo box.

Next, click the / button to search to the left or right for locations where the variable changed to the specified value in the specified graph. The following mark is displayed at the location found.

Figure 2-25. Location Where Graph Data Has Been Found



2.11.2 Chart the function execution time ratios

Display a pie chart of the function execution time ratios.

The chart display is performed via the Analysis Chart panel's [Execution Time(Percentage) Chart] tab.

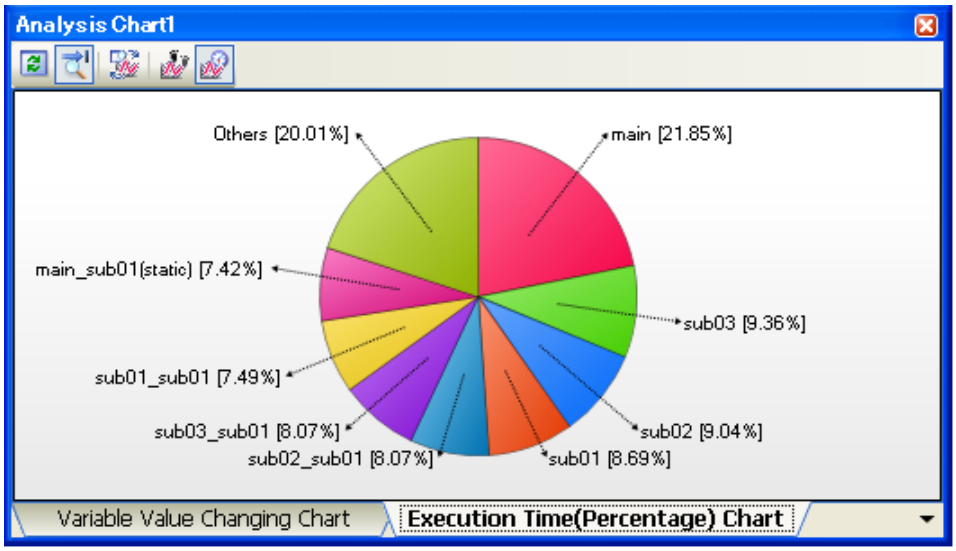
Click the toolbar's button to display a chart based on the currently acquired Dynamic analysis information (equivalent to [Execution Time(Percentage)[%]] in the Function List panel). If the trace memory is empty, the message "There is no execution time information." will appear.

See the Analysis Chart panel for details on each of the area displayed.

Cautions 1. When the debug tool to use does not support the Trace function, or when the debug tool's trace function is not enabled, this chart cannot be displayed.

2. [IECUBE [78K0]]
Because the trace time tag function is not supported, this chart cannot be displayed.

Figure 2-26. Chart of the Function Execution Time Ratios



The following operations can be performed on the call graph displayed.

(1) Specify the number of functions to display

You can change the number of functions displayed in the chart.

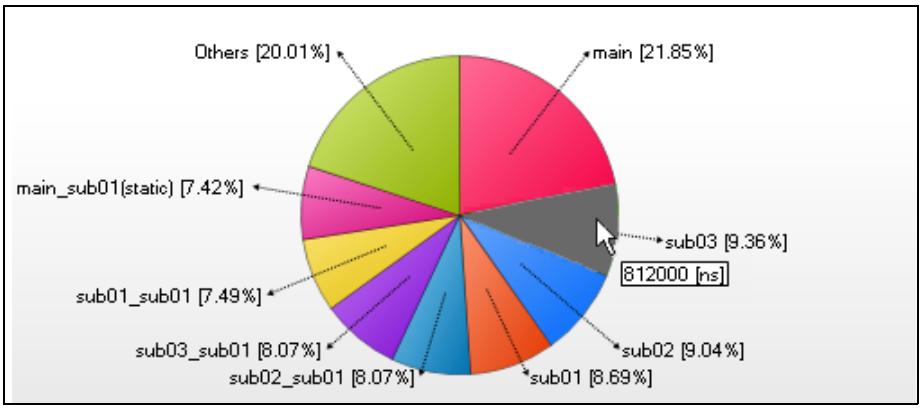
To do this, specify the number in the [The number of functions displaying in the Execution Time(Percentage) Chart*1-4*] property in the [Analysis Chart*1-4*] category on the [Settings] tab of the Property panel (set to [10] by default).

The targets are graphed in ranking order of highest proportion of execution time taken. Functions exceeding the number specified here are displayed together under "Others".

(2) Pop-up display of execution time

When the mouse cursor is hovered over a function, information about that function's execution time appears in a pop-up.

Figure 2-27. Pop-up Display of Execution Time



Remark Click (toggle) the button on the toolbar to display the latest information automatically each time program execution is stopped.
Note, however, that this button will be disabled if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (default) (this button is locked in accordance with the setting on the Property panel).

2.12 Save Analysis Information

You can save the contents of the Function List panel, Variable List panel, Call Graph panelandAnalysis Chart panelto a file.

(1) Save function information

To do this, with the focus on the Function List panel, select [Save Function List Data As...] from the [File] menu. The Save As dialog box opens; perform the operation from this dialog.
The following file formats can be specified when saving the information.

Text Files (*.txt)	Text format
CSV(Comma-Separated Variables) (*.csv)	CSV format
Microsoft Office Excel Workbook (*.xls)	Microsoft Excel 97 - Excel 2003, and 5.0/95 book format
CubeSuite Function List file (*.csfl)	File format to import the function information (see "2.10 Import or Export Information File".)

Caution Only the items/analysis information currently displayed in the panel can be saved.

(2) Save variable information

To do this, with the focus on the Variable List panel, select [Save Variable List Data As...] from the [File] menu. The Save As dialog box opens; perform the operation from this dialog.
The following file formats can be specified when saving the information.

Text Files (*.txt)	Text format
CSV(Comma-Separated Variables) (*.csv)	CSV format
Microsoft Office Excel Workbook (*.xls)	Microsoft Excel 97 - Excel 2003, and 5.0/95 book format
CubeSuite Variable List file (*.csvl)	File format to import the variable information (see "2.10 Import or Export Information File".)

Caution Only the items/analysis information currently displayed in the panel can be saved.

(3) Save call graph information

To do this, with the focus on the Call Graph panel, select [Save Call Graph Data As...] from the [File] menu. The Save As dialog box opens; perform the operation from this dialog.
The following file formats can be specified when saving the information.
Note that when "(Only the visible part)" is selected, only the part currently being displayed in the panel will be saved.

Bitmap(Only the visible part) (*.bmp)	Bitmap format (32-bit) (Graphic file format)
JPEG(Only the visible part) (*.jpg)	JPEG format (Graphic file format)
PNG(Only the visible part) (*.png)	PNG format (Graphic file format)
Bitmap (*.bmp)	Bitmap format (32-bit) (Graphic file format)
JPEG (*.jpg)	JPEG format (Graphic file format)
PNG (*.png)	PNG format (Graphic file format)
EMF (*.emf)	EMF format (Graphic file format)

Caution **All part of the call graph may not successfully be saved as a graphic file format if the project is too big.**

Remark If the zoom function has been applied, then the image will be saved at the current zoom ratio (except for EMF format).

(4) Save graph information

To do this, with the focus on the Analysis Chart panel, select [Save Analysis Chart Data As...] from the [File] menu.
The Save As dialog box opens; perform the operation from this dialog.
The following file formats can be specified when saving the information.

Text Files (*.txt)	Text format
CSV(Comma-Separated Variables) (*.csv)	CSV format
Microsoft Office Excel Workbook (*.xls)	Microsoft Excel 97 - Excel 2003, and 5.0/95 book format
Bitmap (*.bmp)	Bitmap format (32-bit) (Graphic file format)
JPEG (*.jpg)	JPEG format (Graphic file format)
PNG (*.png)	PNG format (Graphic file format)

Caution **Only the contents of the currently displayed tab can be saved.**

APPENDIX A WINDOW REFERENCE

Appendix A provides detailed explanations of windows/panels/dialog boxes used by the analyze tool.

A.1 Description

The analyze tool has the following windows, panels and dialog boxes.

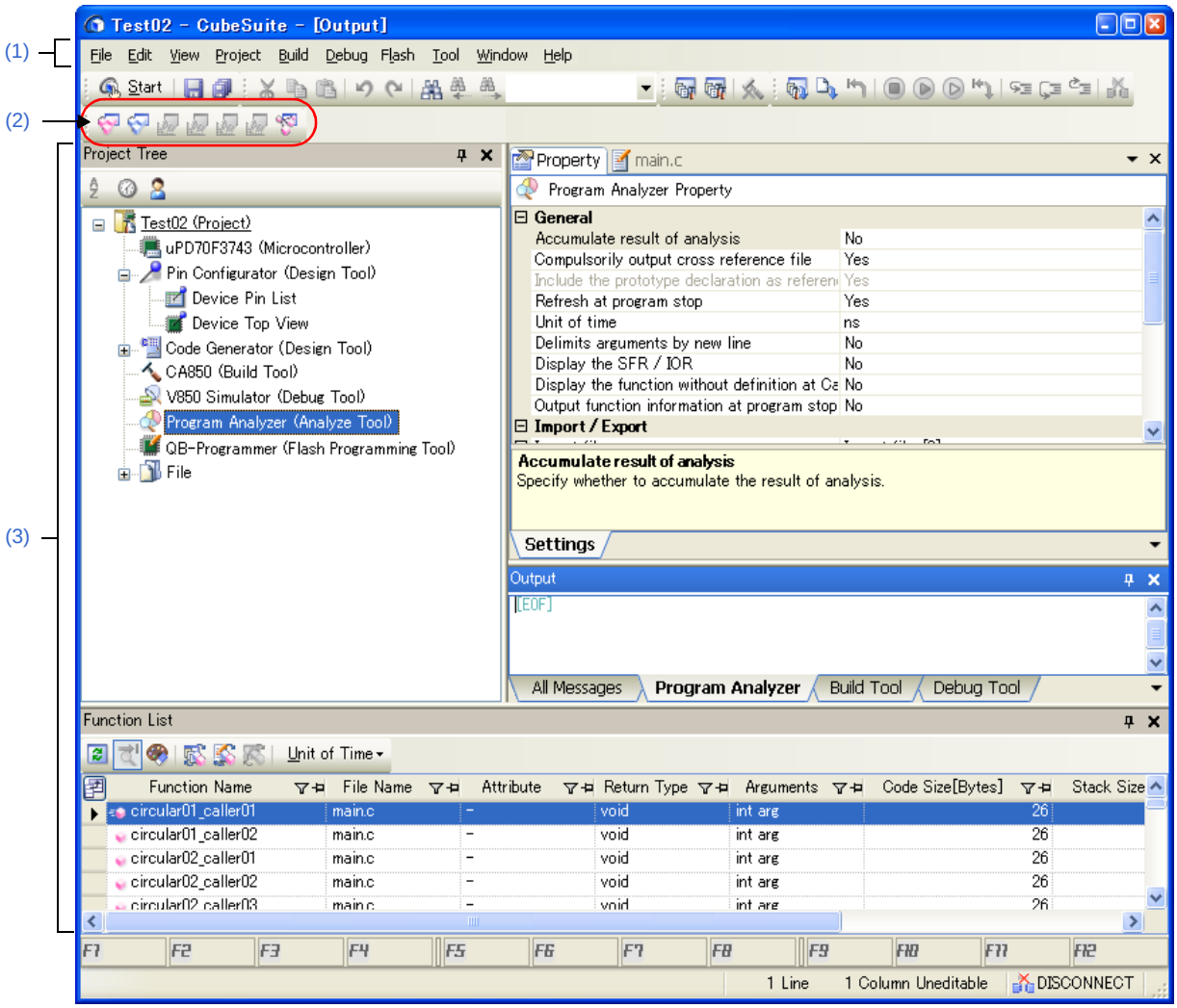
Table A-1. Window/Panel/Dialog Box List

Window/Panel/Dialog Box Name	Description
Main window	This is the first window to open when CubeSuite is launched.
Project Tree panel	Displays the components of the project in a tree structure.
Property panel	Displays detailed information on the analyze tool and changes the settings of the information.
Function List panel	Displays the acquired function information.
Variable List panel	Displays the acquired variable information.
Call Graph panel	Displays calling relationships between functions (call graph).
Analysis Chart panel	Displays charts of the acquired function information and variable information.
Output panel	Displays operation logs for various components provided by CubeSuite and the reference list for functions/variables.
Path Edit dialog box	Specifies the information file (Function list file (*.csfl)/Variable list file (*.csvl)) to import.
Column Chooser dialog box	Changes the order of the display items and the setting of display/non-display for the Function List panel/Variable List panel.
Call Graph Search dialog box	Searches for a function that exists in the call graph displayed in the Call Graph panel.
Filter Settings dialog box	Specifies the filter conditions to display the information on the Function List panel/Variable List panel.
Save As dialog box	Saves the contents of the Function List panel/Variable List panel/Call Graph panel/Analysis Chart panel to a file with a name. Generates the information file (Function list file (*.csfl)/Variable list file (*.csvl)).

Main window

This is the first window to open when CubeSuite is launched.
In this window. you can open panels for the analyze tool.

Figure A-1. Main Window



The following items are explained here.

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

[How to open]

- From the Windows [start] menu, select [All Programs] >> [NEC Electronics CubeSuite] >> [CubeSuite].

[Description of each area]

(1) Menubar

(a) [View]

The [View] menu for the analyze tool provides the following items and functions (default).

Program Analyzer	The following cascade menus are displayed to open panels for the analyze tool.
Function List	Opens the Function List panel.
Variable List	Opens the Variable List panel.
Analysis Chart1	Opens the Analysis Chart panel (Analysis Chart1). Note that this menu item is invalid while disconnecting from the debug tool.
Analysis Chart2	Opens the Analysis Chart panel (Analysis Chart2). Note that this menu item is invalid while disconnecting from the debug tool.
Analysis Chart3	Opens the Analysis Chart panel (Analysis Chart3). Note that this menu item is invalid while disconnecting from the debug tool.
Analysis Chart4	Opens the Analysis Chart panel (Analysis Chart4). Note that this menu item is invalid while disconnecting from the debug tool.
Call Graph	Opens the Call Graph panel.

(2) Toolbar

The toolbar for the analyze tool provides the following items and functions (default).

	Opens the Function List panel. The function of this item is the same as that of [Function List] in the [View] menu.
	Opens the Variable List panel. The function of this item is the same as that of [Variable List] in the [View] menu.
 (First)	Opens the Analysis Chart panel (Analysis Chart1). Note that this item is invalid while disconnecting from the debug tool. The function of this item is the same as that of [Analysis Chart1] in the [View] menu.
 (Second)	Opens the Analysis Chart panel (Analysis Chart2). Note that this item is invalid while disconnecting from the debug tool. The function of this item is the same as that of [Analysis Chart2] in the [View] menu.
 (Third)	Opens the Analysis Chart panel (Analysis Chart3). Note that this item is invalid while disconnecting from the debug tool. The function of this item is the same as that of [Analysis Chart3] in the [View] menu.
 (Fourth)	Opens the Analysis Chart panel (Analysis Chart4). Note that this item is invalid while disconnecting from the debug tool. The function of this item is the same as that of [Analysis Chart4] in the [View] menu.
	Opens the Call Graph panel. The function of this item is the same as that of [Call Graph] in the [View] menu.

(3) Panel display area

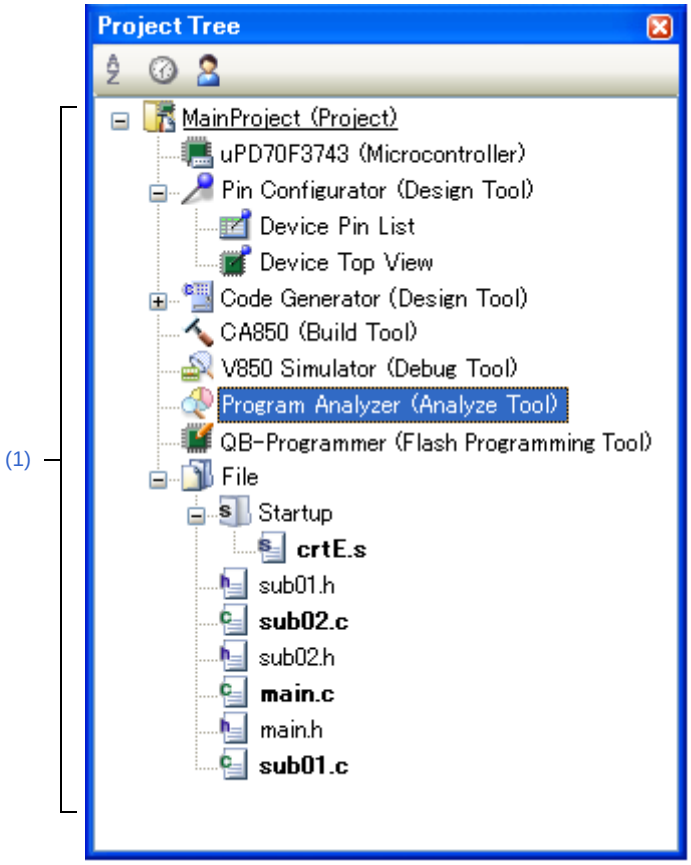
This area consists of multiple panels, each dedicated to a different purpose.
See the following sections for details on a panel used by the analyze tool.

- Project Tree panel
- Property panel
- Function List panel
- Variable List panel
- Call Graph panel
- Analysis Chart panel
- Output panel

Project Tree panel

This panel is used to display components of the project (microcontroller, design tool, build tool, debug tool, etc.) in a tree structure.

Figure A-2. Project Tree Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [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
Program Analyzer (Analyze Tool)	This is the analyze tool to use.

Remark When the node is selected, the detailed information (property) is displayed in the Property panel, and you can change the settings.
The Property panel can be opened by double-clicking on the node when the Property panel is not opened.

[Context menu]

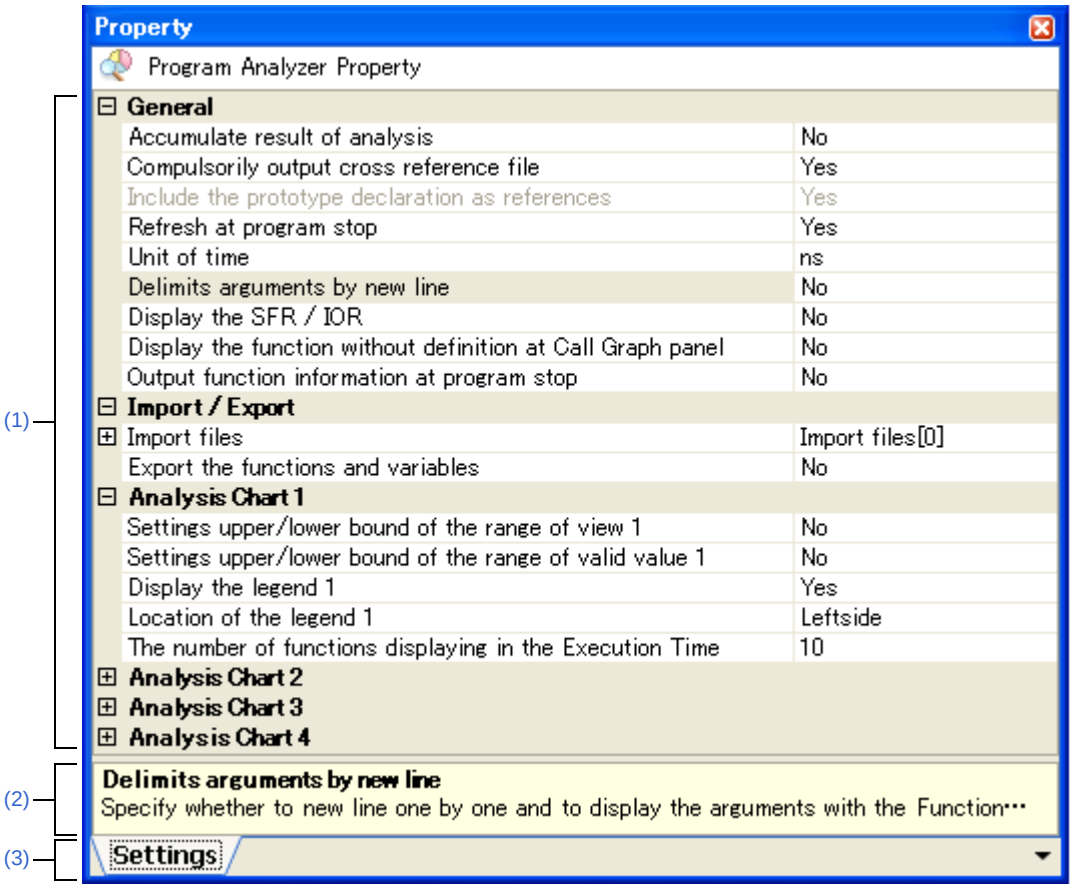
The following context menu items are displayed by right clicking the mouse on [Program Analyzer (Analyze Tool)] node.

Function List	Opens the Function List panel.
Variable List	Opens the Variable List panel.
Analysis Chart	The following cascade menus are displayed to open the Analysis Chart panel. Note that this menu item is invalid while disconnecting from the debug tool.
Analysis Chart1	Opens the Analysis Chart1.
Analysis Chart2	Opens the Analysis Chart2.
Analysis Chart3	Opens the Analysis Chart3.
Analysis Chart4	Opens the Analysis Chart4.
Call Graph	Opens the Call Graph panel.
Property	Opens the Property panel containing the information for the analyze tool.

Property panel

This panel is used to display the detailed information on the analyze tool 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 (Property panel-dedicated items)]
- [Context menu]

[How to open]

- On the Project Tree panel, select the [Program Analyzer (Analyze Tool)] node, and then select [Property] from the [View] menu.
- On the Project Tree panel, select the [Program Analyzer (Analyze Tool)] node, and then select [Property] from the context menu.

Remark If the Property panel has been opened, the detailed information on the analyze tool is displayed by selecting the [Program Analyzer (Analyze Tool)] node on the Project Tree panel.

[Description of each area]

(1) Detailed information display/change area

In this area, the detailed information on the analyze tool is displayed by category in the list. Also, you can directly change its settings.

The ⊟ mark is indicates all the items in the category are expanded. The ⊞ mark indicates all the items are shrink. You can expand/shrink the items by clicking these marks or double-clicking the category name.

For details on the information/how to setup in the category and property items contained in it, see the section explaining the corresponding tab.

(2) Property description area

In this area, brief description of the categories and properties selected in the detailed information display/change area is displayed.

(3) Tab selection area

Categories for the display of the detailed information are changed when each tab is selected.

In this panel, a following tab is contained (see the section explaining the tab for details on the display/setting).

- [Settings] tab

[[Edit] menu (Property panel-dedicated items)]

The [Edit] menu for this panel provides the following items and functions.

Undo	Undoes the latest property value editing being done.
Cut	Deletes the selected character string(s) and copies them to the clipboard while editing the property value.
Copy	Copies the contents of the selected range to the clipboard as character string(s).
Paste	Pastes the contents of the clipboard to the property value while editing the property value.
Delete	Deletes the selected character string(s) while editing the property value.
Select All	Selects all the character strings in the selected property while editing the property value.

[Context menu]

The context menu displayed by right-clicking on this panel provides the following items and functions.

(1) While not editing the property value

Reset to Default	Restores the selected setting of the property item to default value.
Reset All to Default	Restores all the selected settings of the property items on the tab to default value.

(2) While editing the property value

Undo	Undoes the latest property value editing being done.
Cut	Deletes the selected character string(s) and copies them to the clipboard while editing the property value.
Copy	Copies the contents of the selected range to the clipboard as character string(s).

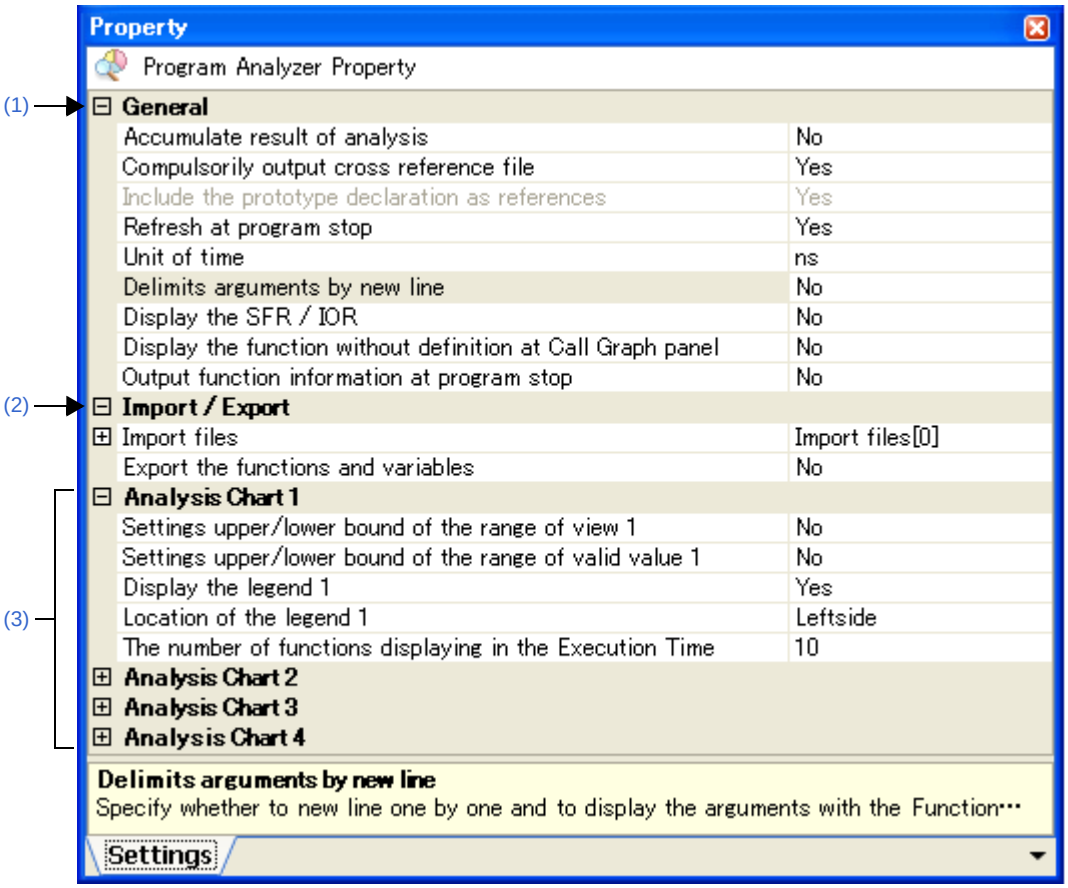
Paste	Pastes the contents of the clipboard to the property value while editing the property value.
Delete	Deletes the selected character string(s) while editing the property value.
Select All	Selects all the character strings in the selected property while editing the property value.

[Settings] tab

The [Setting] tab is used to display the detailed information categorized by the following and the configuration can be changed.

(1) [General]
(2) [Import / Export]
(3) [Analysis Chart1 - 4]

Figure A-4. Property Panel: [Settings] Tab



[Description of Each Category]

(1) [General]

The general information on the analyze tool is displayed and its configuration can be changed.

Accumulate result of analysis	Specify whether to display the cumulative value for each program execution for the execution count and execution time as the analysis information. The target items for this property are as follows: - Function List panel [Execution Count]/[Execution Time[*unit*]] - Variable List panel [Read Count]/[Write Count]/[Read/Write Count]/[Minimum Value]/[Maximum Value] - Call Graph panel [Execution Count]		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Displays the sum of the measurements from the last program execution and from this one.
		No	Displays the measurements for each program execution. If the value is changed from [Yes] to [No], then the current analysis results will be cleared, and the measured values displayed.
Compulsorily output cross reference file	Specify whether the analyze tool should force output of cross reference information when performing a build in order to obtain the cross-reference information necessary to acquire Static analysis information, ignoring the property setting[Note 1] on the build tool specifying whether to output cross reference information.		
	Default	Yes	
	Modifying	**[CA78K0][CA78K0R][CA850]** Select from the drop-down list. **[CX]** Changes not allowed	
	Available values	Yes	Ignores the build tool's property settings, and forces the output of cross reference information.
		No	Gives priority to the build tool's property settings.
Include the prototype declaration as references	Specify whether to target the prototype declaration as the information of the function references when displaying a list of locations referencing a function (see "2.9 Display List of Referencing Location").		
	Default	Yes	
	Modifying	**[CA78K0][CA78K0R][CA850]** Changes not allowed **[CX]** Select from the drop-down list.	
	Available values	Yes	Displays the prototype declaration.
		No	Does not display the prototype declaration.

Refresh at program stop	Specify whether to update the contents of the Function List panel/Variable List panel/Call Graph panel/Analysis Chart panel/ when the program stops executing.		
	Default	Yes	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Updates the contents of the panel after the program execution is stopped.
		No	Does not update the contents of the panel even if the program execution is stopped.
		Specify individually	Enables the  button on each panel (updates the contents of the panel by clicking this button).
Unit of time	Specify the time unit for the analyze tool.		
	Default	ns	
	Modifying	Select from the drop-down list.	
	Available values	ns	Displays the time in nanosecond units. The value is rounded to integer number.
		µs	Displays the time in microsecond units. The value is rounded to three decimal places.
		ms	Displays the time in millisecond units. The value is rounded to three decimal places.
		s	Displays the time in second units. The value is rounded to three decimal places.
		h:min:s	Displays the time as "hours, minutes (0 - 59), seconds (0 - 59)".
Delimits arguments by new line	Specify whether to display the [Arguments] items in the Function List panel with newlines.		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Displays in multiple lines, one value per line.
		No	Displays without newlines, comma (",") separated.
Display the SFR/IOR	Specify whether to display the SFR/IOR on the Variable List panel by treating it as a variable.		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Displays the SFR/IOR.
		No	Does not display the SFR/IOR.
Display the function without definition at Call Graph panel	Specify whether to display the function without definition (i.e. a function whose source file does not exist) in the Call Graph panel.		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Displays the function without definition.
		No	Does not display the function without definition.

Output function information at program stop	Specify whether to output the information file for STF[Note 2] to the folder specified with "[Common Options] tab >> [Output File Type and Path] category >> [Intermediate file output folder] property" on the property panel of the build tool to use.		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	When [Yes] is selected, the contents of the Function List panel currently being displayed is output to a file (if the Function List panel is not displayed, the information acquired from the last trace data is output). Thereafter, the information acquired from the last trace data is output to the file each time program execution is stopped. Note that the file is always overwritten.
		No	Does not output the information file for STF.

Notes 1. The settings on the following property of your build tool's Property panel.

- **[CA78K0][CA78K0R]**
  [Compile Options] tab >> [List File] category >> [Output cross reference list file] property
- **[CA850]**
  [Cross Reference Options] tab >> [Cross Reference Tool] category >> [Use cross reference tool] property

2. The same information as the content on the Function List panel is output to the STF information file (FuncInfo.csv) (including information for items that are currently hidden).

(2) [Import / Export]

The detailed information on import/export functions is displayed and its configuration can be changed.
For details on the import/export function, see "2.10 Import or Export Information File".

Import files	Specify the file to import. The names of files to be imported are listed in the lower area.		
	Default	Import files [0]	
	Modifying	Specify with the Path Edit dialog box. The Path Edit dialog box is opened when clicking the [...] button appears at right by selecting this property (you cannot specify the file to download on this panel).	
Export the functions and variables	Specify whether to generate the information files (Function list file (*.csfl) and Variable list file (*.csvl)) with the contents of the Function List panel/Variable List panel when a build or rebuild is performed.		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Generates the information files.
		No	Does not Generate the information files.

Export file name for functions	This property appears only when the [Export the functions and variables] property is set to [Yes]. Specify the name of the information file (Function list file (*.csfl)) generated.	
	Default	%ProjectName%.csfl
	Modifying	Directly enter from the keyboard. Note that the extension cannot be changed. "%ProjectName%" indicates a macro name that replaces itself with the project name.
Export file name for variables	This property appears only when the [Export the functions and variables] property is set to [Yes]. Specify the name of the information file (Variable list file (*.csvl)) generated.	
	Default	%ProjectName%.csvl
	Modifying	Directly enter from the keyboard. Note that the extension cannot be changed. "%ProjectName%" indicates a macro name that replaces itself with the project name.

(3) [Analysis Chart*1 - 4*]

The detailed information on analysis graphs is displayed and its configuration can be changed.
For details on the analysis graph, see "2.11 Display Analysis Information in Chart".

Caution The contents of the Analysis Chart panel is updated automatically if you change the setting of the property in this category.

Settings upper/lower bound of the range of view *1 - 4*	Specify whether to set upper bounds and lower bounds for graphs on the [Variable Value Changing Chart] tab of the Analysis Chart panel.		
	Default	No	
	Modifying	Select from the drop-down list.	
	Available values	Yes	Sets upper bounds and lower bounds.
		No	Does not set upper bounds and lower bounds.
Upper bound of the range of view *1 - 4*	This property appears only when the [Settings upper/lower bound of the range of view 1 - 4] property is set to [Yes]. Specify the value of the upper bound of the Y-axis.		
	Default	2147483647	
	Modifying	Directly enter from the keyboard.	
	Available values	- In decimal number -2147483648 to 4294967295 - In hexadecimal number (the value needs to start with "0x"), 0x80000000 to 0xFFFFFFFF	

<table>
<tr><td rowspan="4">Lower bound of the range of view 1 - 4</td><td colspan="3">This property appears only when the [Settings upper/lower bound of the range of view 1 - 4] property is set to [Yes].
Specify the value of the lower bound of the Y-axis.</td></tr>
<tr><td>Default</td><td colspan="2">-2147483648</td></tr>
<tr><td>Modifying</td><td colspan="2">Directly enter from the keyboard.</td></tr>
<tr><td>Available values</td><td colspan="2">- In decimal number
-2147483648 to 4294967295
- In hexadecimal number (the value needs to start with "0x"),
0x80000000 to 0xFFFFFFFF</td></tr>
<tr><td rowspan="4">Settings upper/lower bound of the range of valid value 1 - 4</td><td colspan="3">Specify whether to set the effective range of values for graphs on the [Variable Value Changing Chart] tab of the Analysis Chart panel^{Note}.</td></tr>
<tr><td>Default</td><td colspan="2">No</td></tr>
<tr><td>Modifying</td><td colspan="2">Select from the drop-down list.</td></tr>
<tr><td>Available values</td><td>Yes</td><td>Sets the effective range of values.</td></tr>
<tr><td></td><td>No</td><td>Does not set the effective range of values.</td></tr>
<tr><td rowspan="4">Upper bound of the range of valid value 1 - 4</td><td colspan="3">This property appears only when the [Settings upper/lower bound of the range of valid value 1 - 4] property is set to [Yes].
Specify the value of the upper bound of the effective range of values.
A transition to a larger value than the value specified here is not displayed on the graph.</td></tr>
<tr><td>Default</td><td colspan="2">2147483647</td></tr>
<tr><td>Modifying</td><td colspan="2">Directly enter from the keyboard.</td></tr>
<tr><td>Available values</td><td colspan="2">- In decimal number
-2147483648 to 4294967295
- In hexadecimal number (the value needs to start with "0x"),
0x80000000 to 0xFFFFFFFF</td></tr>
<tr><td rowspan="4">Lower bound of the range of valid value 1 - 4</td><td colspan="3">This property appears only when the [Settings upper/lower bound of the range of valid value 1 - 4] property is set to [Yes].
Specify the value of the lower bound of the effective range of values.
A transition to a smaller value than the value specified here is not displayed on the graph.</td></tr>
<tr><td>Default</td><td colspan="2">-2147483648</td></tr>
<tr><td>Modifying</td><td colspan="2">Directly enter from the keyboard.</td></tr>
<tr><td>Available values</td><td colspan="2">- In decimal number
-2147483648 to 4294967295
- In hexadecimal number (the value needs to start with "0x"),
0x80000000 to 0xFFFFFFFF</td></tr>
<tr><td rowspan="4">Display the legend 1 - 4</td><td colspan="3">Specify whether to display a legend for graphs on the [Variable Value Changing Chart] tab of the Analysis Chart panel.</td></tr>
<tr><td>Default</td><td colspan="2">Yes</td></tr>
<tr><td>Modifying</td><td colspan="2">Select from the drop-down list.</td></tr>
<tr><td>Available values</td><td>Yes</td><td>Displays a legend.</td></tr>
<tr><td></td><td>No</td><td>Does not display a legend.</td></tr>
</table>

<table>
<tr><td rowspan="6">Location of the legend 1 - 4</td><td colspan="3">This property appears only when the [Display the legend 1 - 4] property is set to [Yes].
Specify the location where the explanatory notes are displayed.</td></tr>
<tr><td>Default</td><td colspan="2">Leftside</td></tr>
<tr><td>Modifying</td><td colspan="2">Select from the drop-down list.</td></tr>
<tr><td rowspan="4">Available values</td><td>Upside</td><td>Displays on the upper part of graphs.</td></tr>
<tr><td>Downside</td><td>Displays on the lower part of graphs.</td></tr>
<tr><td>Leftside</td><td>Displays on the left part of graphs.</td></tr>
<tr><td>Rightside</td><td>Displays on the right part of graphs.</td></tr>
<tr><td rowspan="4">The number of functions displaying in the Execution Time(Percentage) Chart 1 - 4</td><td colspan="3">Specify the number of the functions displayed on the [Execution Time(Percentage) Chart] tab of the Analysis Chart panel.
The function with a large ratio of the execution time is displayed in the graph by priority, and the remainder is collectively displayed as "Others".</td></tr>
<tr><td>Default</td><td colspan="2">10</td></tr>
<tr><td>Modifying</td><td colspan="2">Directly enter from the keyboard.</td></tr>
<tr><td>Available values</td><td colspan="2">Integer number between 1 and 100</td></tr>
</table>

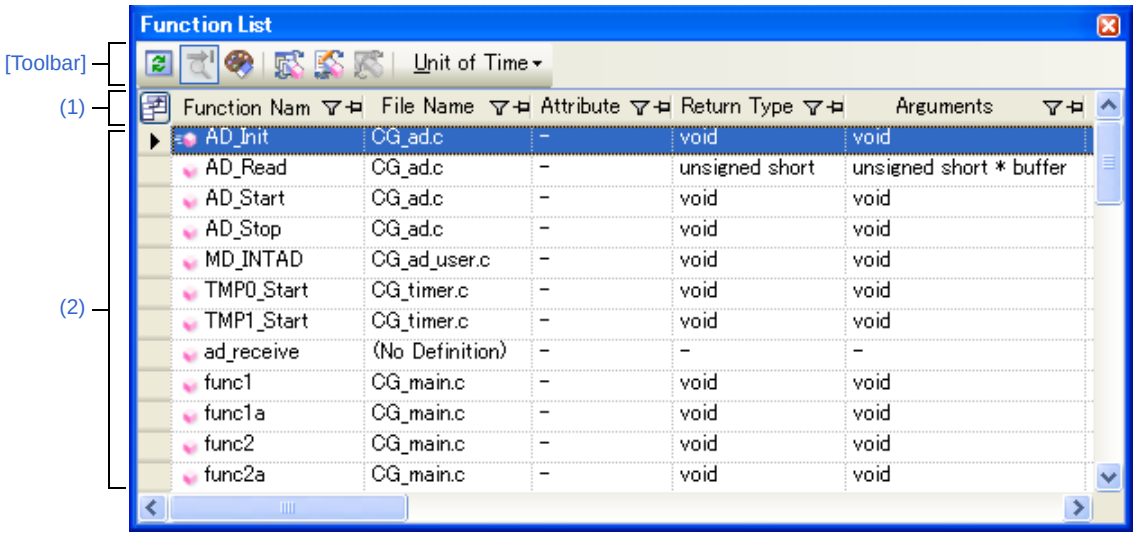
Note The valid range setting only applies to the panel displaying the chart of graph data acquired via Real-time sampling analysis.

Function List panel

This panel is used to display the acquired function information.
See "2.1 Overview" for details on how to display the function information.

Caution [CA78K0][CA78K0R][CA850]
When [Clean Project] from the [Build] menu is selected, the contents currently being displayed in this panel will be cleared.

Figure A-5. Function List Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [Toolbar]
- [[File] menu (Function List panel-dedicated items)]
- [[Edit] menu (Function List panel-dedicated items)]
- [Context menu]

[How to open]

- On the toolbar in the Main window, click the button.
- From the [View] menu, select [Program Analyzer] >> [Function List].

[Description of each area]

(1) Header area

(a) Column name

The name of the item of the acquired function information is displayed.
Marks (icons) that are displayed at the name of the item indicate as follows:

Mark (Icon)	Meaning
/	Indicates whether display is locked (see "2.5.3 Lock the specific column to display").

Mark (Icon)	Meaning
△ / ▽	Indicates whether there is a sort order setting (see "2.5.4 Sort the analysis information").
▽ / ▼	Indicates whether there is a filter display setting (see "2.5.5 Filter the analysis information").
	Indicates that a message relating to information about this item has been output to the Output panel. Hover the mouse over it to display a pop-up with the last message to be output.

Remark Columns to display can be customized via mouse operations in this area.
- Set the columns to display
- Change the order of the columns to display
- Lock the specific column to display

(b) Button

	Opens the Column Chooser dialog box in order to sort and show/hide the items (columns) displayed in the panel, and return customized settings to the defaults (see "2.5 Customize Display Method").

(2) Information area

This area displays the acquired function information.
The analyze tool acquires two types of function information: Static analysis information and Dynamic analysis information. The timing when each type of information can be displays differs (see "1.1.2 Types of analysis information").
When the active project is changed while displaying the function information, the function information of the target project is displayed. Note, however, that if the cross reference information has not been generated in the project or the analyze tool is not supported by the project, nothing is displayed on this panel.
The value of the information that has been changed because of the execution of a program is shown highlighted (the color depends on the configuration in the [General - Font and Color] category of the Option dialog box). To reset the highlighting, click the button on the toolbar.
The items and details acquired as function information are as follows:

Item	Type	Contents
Function Name	Static analysis	Displays the name of the global function or the file-internal static function that is defined/referenced in the C source file. The maximum display characters is as follows: - [CA78K0][CA78K0R]: 249 characters - [CA850]: 1022 characters - [CX]: 2046 characters The meanings of an icon displayed is as follows: - : A function
File Name	Static analysis	Displays the file name (without path) of the C source file where the function is defined. Note, however, that if it is not defined in a C source file in project, or if analysis was not completed, then this will display "(No Definition)". If it is defined in a header file, then the name of the header file is displayed.
File Pass[Note 1]	Static analysis	Displays the absolute path of the C source file where the function is defined. Note, however, that if it is not defined in a C source file in project, or if analysis was not completed, then this will be blank. If it is defined in a header file, then the absolute path of the header file is displayed.

Item	Type	Contents
PE Information **[V850E2M]**	Static analysis	Displays the following information about PE in which the function is executed. - In PE*n*: PE*n* - In common PE: Common - Unknown: - Note that this item appears only when the selected microcontroller version supports multi-core.
Import[Note 1]	Static analysis	Displays the following information about the source of the function information. - If it was acquired from inside an active project "Original" is displayed. - If it was acquired from an import file The names of all import files are displayed. - If it was acquired from inside an active project and an import file "Original" and the names of all import files are displayed. See "2.10 Import or Export Information File" for details on the import function.
Attribute	Static analysis	Displays the function's symbol attributes/symbol-modifier attributes. If there are multiple attributes, then they are displayed separated by commas (","). Note, however, that this will display "-" if analysis is not complete. The following attributes can be displayed. - [CA78K0] static, callt, callf, noauto, norec, interrupt, bank, rtos task, rtos interrupt - [CA78K0R] static, callt, interrupt, near, far, rtos task, rtos interrupt - [CA850] static - [CX] static, interrupt, inline, delete
Return Type	Static analysis	Displays the return type of the function[Note 2]. If including an alternative name by using "#define statement" or "typedef statement", then not the alternative name but the type is displayed. Note, however, that this will display "-" if analysis is not complete. The maximum number of pointers that can be displayed is as follows: - [CA78K0][CA78K0R]: 7 - [CA850]: 6 - [CX]: 8
Arguments Count[Note 1]	Static analysis	Displays the argument value of the function in decimal number notation. If including a variable argument parameter, then the string "variable" is added. Note, however, that this will display "-" if analysis is not complete.

Item	Type	Contents
Arguments	Static analysis	Displays the argument type[Note 2]/formal argument name of the function. If there are multiple arguments, then they are displayed separated by commas (","). For a variable argument, only the argument type that has been defined is displayed. If there are no arguments, then "void" is displayed. If including an alternative name by using "#define statement" or "typedef statement", then not the alternative name but the type is displayed. Note, however, that this will display "-" if analysis is not complete. The maximum number of pointers that can be displayed is as follows (the first dimension of an array is handled as a pointer): - [CA78K0][CA78K0R]: 8 - [CA850]: 6 - [CX]: 8
Code Size[Bytes]	Static analysis	Displays the function's code size in decimal number notation. Note, however, that this will display "-" if analysis is not complete.
Stack Size[Bytes]	Static analysis	Displays the function's stack size in decimal number notation. Note, however, that this will display "-" if analysis is not complete. **[CA78K0][CA78K0R]** The value displayed here is stack size secured by the compiler in the first function or first basic block. For this reason, it will be different from the stack size displayed by the stack usage tracer. It also does not include the stack size used by CALL/PUSH/POP instruction inside the function.
Start Address	Static analysis	Displays the function's start address in hexadecimal number notation. The number of digits to display is equivalent to the maximum address value of the selected microcontroller. Note, however, that this will display "-" if analysis is not complete.
End Address[Note 1]	Static analysis	Displays the end address of the function aligned in ROM in hexadecimal number notation. The number of digits to display is equivalent to the maximum address value of the selected microcontroller. Note, however, that this will display "-" if analysis is not complete.
Reference Count	Static analysis	Displays the number of times the function is referenced in the program, in decimal number notation. Prototype declarations are also counted as references. Code in C source files that is referenced but is eliminated by the preprocessor during compilation (e.g. via "#if" or "#ifdef" statements) is not included in the number of references (it is also not output by the search results from [Find All References] in the context menu). Note, however, that this will display "-" if analysis is not complete. **[CA78K0][CA78K0R]** The function names included in "#pragma directive" are also counted as references. **[CX]** References to functions via assignment to function pointers are not included in the reference count.

Item	Type	Contents
Execution Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the number of times the function was executed (called) as a result of program execution, in decimal number notation[Note 3]. This function counts the number of times that the instruction located at the address allocated to the function label is executed. For this reason, an invalid value may be displayed if the measurement starts midway through the execution of a function. Note, however, that this will display "-" if the debug tool's Trace function is disabled, or analysis is not complete.
Execution Time[*unit*] **[IECUBE [78K0R]]** **[IECUBE [V850]]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the execution time of the function (the time executing the code in the function body, not including subroutines)[Note 3, 4]. The unit of time can be changed by selecting [Unit of Time] from the [Toolbar], or from the Property panel's [Settings] tab, in the [General] category, changing the [Unit of time] property (see the [Unit of time] property in the Property panel for details on the time-display format). Note, however, that this will display "-" if the debug tool's Trace function is disabled, or analysis is not complete.
Execution Time(Percentage)[%] **[IECUBE [78K0R]]** **[IECUBE [V850]]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the proportion of total execution time (range that could be obtained as trace data) taken by the execution time of the target function, rounded to the nearest two decimal places, in the range 0.00 to 100.00[Note 3, 4]. The level of shading of the cell's background color indicates the proportion. Note, however, that this will display "-" if the debug tool's Trace function is disabled, or analysis is not complete.
Execution Time(Average)[*unit*] **[IECUBE [78K0R]]** **[IECUBE [V850]]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the average execution time of the function ("*execution time*" / "*number of executions*")[Note 3, 4]. The results of calculation are displayed rounded to the nearest nanosecond. The unit of time can be changed by selecting [Unit of Time] from the [Toolbar], or from the Property panel's [Settings] tab, in the [General] category, changing the [Unit of time] property. The unit of time can be changed by selecting [Unit of Time] from the [Toolbar], or from the Property panel's [Settings] tab, in the [General] category, changing the [Unit of time] property (see the [Unit of time] property in the Property panel for details on the time-display format). Note, however, that this will display "-" if the debug tool's Trace function is disabled, or analysis is not complete.
Code Coverage[%] **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the code coverage ratio of the function (C0: "*number of bytes of code executed in the address range*" / "*function's code size*" x 100)[Note 5]. The level of shading of the cell's background color indicates the code coverage. Note, however, that this will display "-" if the debug tool's Coverage function is disabled, or analysis is not complete.

Notes 1. This item does not appear by default.
See "2.5.1 Set the columns to display" for details on how to display this item.

2. If a "typedef" has been used assign a different name to a basic type, the following types are displayed.

Original Type of "typedef"	Type Displayed
- unsigned long - unsigned int	unsigned long

Original Type of "typedef"	Type Displayed
- signed long - signed int - long - int	long
- unsigned short	unsigned short
- signed short - short	short
- unsigned char - char (when "-Xchar=unsigned" option is specified)	unsigned char
- signed char - char (when "-Xchar=unsigned" option is not specified)	char

3. Set the [Accumulate result of analysis] property in the [General] category on the [Settings] tab of the Property panel to [Yes] to display the cumulative value for each program execution.
4. The execution time does not include the execution time of the runtime libraries provided by the compiler.
5. The code coverage ratio is calculated with the cumulative value for each program execution.
   If you need to reset the code coverage ratio, select [Clear Coverage Information] from the context menu of the Editor panel or Disassemble panel, and then click the  button.
   Furthermore, as the result of a build after editing the program, if the function's allocated address is different from its allocated address at the time of the previous build, the code coverage ratio for the function that has not been executed may be displayed.

In the bottom of the [Function Name] item, the following information for each file is shown as [*Total*].
Note that "(No Definition)" displayed in the [File Name] item is treated as one file.

Figure A-6. [*Total*] Display (Function List Panel)

Function Name	File Name	Code Size[Bytes]	Reference Count	Execution Count
Total	CG_timer.c	412	12	2
Total	(No Definition)	0	4	1
Total	CG_main.c	114	8	0

Display	Type	Item	Contents
Total	-	File Name	The target file name
		File Pass[Note]	File pass of the target file
		Code Size[Bytes]	Total of the function's code size in the target file
		Reference Count	Total number of times functions are referenced in the target file
		Execution Count	Total number of times functions were executed in the target file
		Execution Time[*unit*]	Total of the execution time of functions in the target file
		Execution Time(Percentage)[%]	The proportion of total execution time (range that could be obtained as trace data) taken by the execution time of functions in the target file
		Code Coverage[%]	The code coverage ratio of functions in the target file

Note This item does not appear by default.
See "2.5.1 Set the columns to display" for details on how to display this item.

Cautions 1. [IECUBE [78K0]]
The following items are not supported.
[Execution Time[*unit*]] / [Execution Time(Percentage)[%]] / [Execution Time(Average)[*unit*]]

2. [IECUBE [78K0R]]
"0" is output as the first trace-data time tag during program execution.
For this reason, if the user repeatedly starts and stops execution, or performs step execution, the [Execution Time[*unit*]] / [Execution Time(Percentage)[%]] / [Execution Time(Average)[*unit*]] items will be invalid.

3. [IECUBE [V850]]
If step execution (step in and step over execution) was performed, the values output in the time tags of the trace data will be invalid.
As a result, the [Execution Time[*unit*]] / [Execution Time(Percentage)[%]] / [Execution Time(Average)[*unit*]] items will be invalid.
Moreover, the [Code Coverage[%]] item does not appear when the coverage board is not mounted on IECUBE to be used.

4. [CA78K0][CA78K0R]
If a source file with the same name exists in a project, the build tool rewrites the cross reference information of them. Therefore, the information of other than the source file that has been compiled last in files with the same name cannot be acquired.

5. [CX]
Unused static functions deleted via compiler optimization cannot be displayed in the panel.

6. Values of the following items for the system library functions cannot be acquired.
[Return Type]/[Arguments Count]/[Arguments]/[Code Size[Bytes]]/[Stack Size[Bytes]]/[End Address]/[Execution Time[*unit*]]/[Execution Time(Percentage)[%]]/[Execution Time(Average)[*unit*]]/[Code Coverage[%]]

7. The items of the Dynamic analysis information do not appear while disconnecting from the debug tool (default).

Remarks 1. The display of each type of information can be customized as follows:
- Sort the analysis information
- Filter the analysis information

2. The current row mark (▶) on the left edge of this area indicates that the column in question is the current row.
The following operations can be performed on the current row:
- Jump to Defined Location
- Set Break Events
- Display List of Referencing Location

[Toolbar]

The toolbar provides the following items and functions.
Note that all these items are invalid during execution of a program.

	Acquires the latest data from the debug tool, and updates the contents of this panel.
	Displays the latest information automatically by acquiring the information each time program execution stops. Note that this button is invalid when the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (this button is locked in accordance with the setting on the Property panel).
	Resets highlighting of values that have been changed by executing a program.
	Displays only the information value for functions in a file(s)/category(s) currently selected in the Project Tree panel (see "(a) Linking with the Project Tree panel").
	Displays only the information value for functions starting with the word at the caret position in the Editor panel (see "(b) Linking with the Editor panel").
	Displays only the information value for functions in the Common area and PE currently selected in the Debug Manager panel (see "(c) Linking with the Debug Manager panel [V850E2M]"). Note that this button is invalid when the selected microcontroller version does not support multi-core. or while disconnecting from the debug tool.
Unit of Time	The following cascade menus are displayed to specify the time unit for the analyze tool. The setting of the [Unit of time] property in the [General] category on the [Settings] tab of the Property panel is specified by default. The time unit set in this toolbar is reflected in the Property panel.
H:M:S	Displays the time as "hours, minutes (0 - 59), seconds (0 - 59)".
Second	Displays the time in second units. The value is rounded to three decimal places.
Millisecond	Displays the time in millisecond units. The value is rounded to three decimal places.
Microsecond	Displays the time in microsecond units. The value is rounded to three decimal places.
Nanosecond	Displays the time in nanosecond units. The value is rounded to integer number.

[[File] menu (Function List panel-dedicated items)]

The [File] menu for this panel provides the following items and functions.

Save Function List Data	Overwrites the contents of this panel to the previously saved file (see "2.12 Save Analysis Information"). Note that when the file has never been saved or the file is write disabled, the same operation is applied as the selection in [Save Function List Data As...].
Save Function List Data As...	Opens the Save As dialog box to newly save the contents of this panel to the specified text file (see "2.12 Save Analysis Information").

[[Edit] menu (Function List panel-dedicated items)]

The [Edit] menu for this panel provides the following items and functions.

Copy	Copies the contents of the selected column (multiple selections possible) to the clipboard as character strings separated by tabs. Note that the contents of the clipboard cannot be pasted to this panel.
Select All	Selects all the columns being displayed in this panel.

[Context menu]

The context menu displayed by right-clicking on this panel provides the following items and functions.

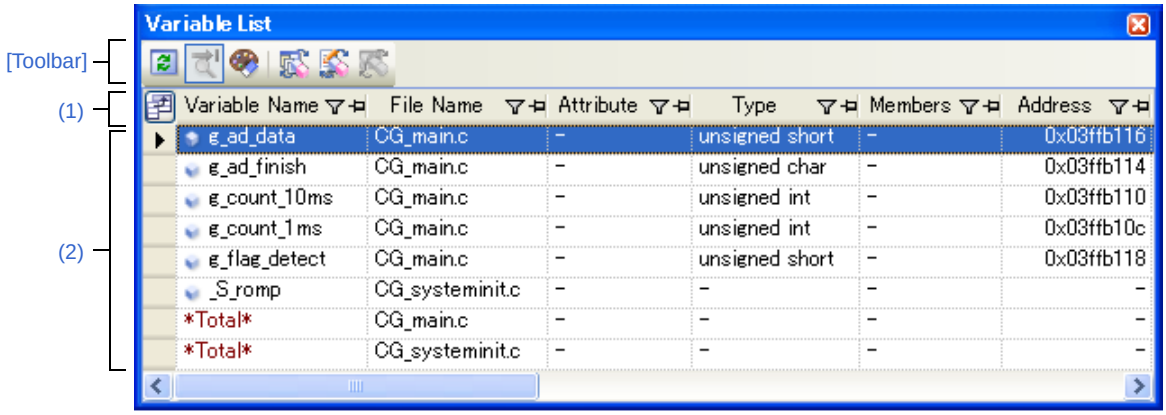
Find All References	Displays a list of the locations referencing the function(s) of the selected row(s), in the Output panel's [Find References] tab (see "2.9 Display List of Referencing Location").
Set Break to Function	Sets a breakpoint at the first line of the function at the current row (the first executable line in the target function) (see "2.7.1 Set a breakpoint to a function"). Note that this item is invalid while disconnecting from the debug tool.
Jump to Source	Opens the Editor panel and displays the source file in which the function of the current row is defined (see "2.6 Jump to Defined Location").
Jump to Disassemble	Opens the Disassemble panel (Disassemble1) and displays the disassemble data corresponding to the start address of the function of the current row (see "2.6 Jump to Defined Location"). Note that this item is invalid while disconnecting from the debug tool.
Jump to Memory	Opens the Memory panel (Memory1) and displays the memory list corresponding to the start address of the function of the current row (see "2.6 Jump to Defined Location"). Note that this item is invalid while disconnecting from the debug tool.
Copy	Copies the contents of the selected row(s) to the clipboard as character strings separated by tabs. Note that the contents of the clipboard cannot be pasted to this panel.

Variable List panel

This panel is used to display the acquired variable information.
See "2.1 Overview" for details on how to display the variable information.

Caution [CA78K0][CA78K0R][CA850]
When [Clean Project] from the [Build] menu is selected, the contents currently being displayed in this panel will be cleared.

Figure A-7. Variable List Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [Toolbar]
- [[File] menu (Variable List panel-dedicated items)]
- [[Edit] menu (Variable List panel-dedicated items)]
- [Context menu]

[How to open]

- On the toolbar in the Main window, click the button.
- From the [View] menu, select [Program Analyzer] >> [Variable List].

[Description of each area]

(1) Header area

(a) Column name

The name of the item of the acquired variable information is displayed.
Marks (icons) that are displayed at the name of the item indicate as follows:

Mark (Icon)	Meaning
⊣ / ⊣	Indicates whether display is locked (see "2.5.3 Lock the specific column to display").
△ / ▽	Indicates whether there is a sort order setting (see "2.5.4 Sort the analysis information").
▽ / ▼	Indicates whether there is a filter display setting (see "2.5.5 Filter the analysis information").

Mark (Icon)	Meaning
	Indicates that a message relating to information about this item has been output to the Output panel. Hover the mouse over it to display a pop-up with the last message to be output.

Remark Columns to display can be customized via mouse operations in this area.
- Set the columns to display
- Change the order of the columns to display
- Lock the specific column to display

(b) Button

	Opens the Column Chooser dialog box in order to sort and show/hide the items (columns) displayed in the panel, and return customized settings to the defaults (see "2.5 Customize Display Method").

(2) Information area

This area displays the acquired variable information.

The analyze tool acquires two types of function information: Static analysis information and Dynamic analysis information. The timing when each type of information can be displays differs (see "1.1.2 Types of analysis information").

When the active project is changed while displaying the variable information, the variable information of the target project is displayed. Note, however, that if the cross reference information has not been generated in the project or the analyze tool is not supported by the project, nothing is displayed on this panel.

The value of the information that has been changed because of the execution of a program is shown highlighted (the color depends on the configuration in the [General - Font and Color] category of the Option dialog box). To reset the highlighting, click the  button on the toolbar.

The items and details acquired as variable information are as follows:

Item	Type	Contents
Variable Name	Static analysis	Displays the name of the global variable, the file-internal static variable or the static variable inside functions that is defined/referenced in the C source file. Moreover, displays the name of SFR/IOR being used in the program when the [Display the SFR/IOR] property in the [General] category on the [Settings] tab of the Property panel is set to [Yes]. The maximum display characters is as follows: - [CA78K0][CA78K0R]: 249 characters - [CA850]: 1022 characters - [CX]: 2046 characters The meanings of icons displayed are as follows: -  : A variable - : A SFR [78K0][78K0R] or an IOR [V850]

Item	Type	Contents
File Name	Static analysis	Displays the file name (without path) of the C source file where the variable is defined[Note 1]. Note, however, that if it is not defined in a C source file in project, or if analysis was not completed, then this will display "(No Definition)". If it is defined in a header file, then the name of the header file is displayed. **[CA78K0][CA78K0R]** If a line with a variable described in "extern declaration" and a line with the variable definition exist in the same file, the information of the variable definition cannot be acquired. Consequently, in this case, this item will display "(No Definition)".
Function Name[Note 1]	Static analysis	Displays the name of the function where the variable is defined. Note, however, this will be blank for other than static variables inside functions.
File Path[Note 1]	Static analysis	Displays the absolute path of the C source file where the variable is defined. Note, however, that if it is not defined in a C source file in project, or if analysis was not completed, then this will be blank. If it is defined in a header file, then the absolute path of the header file is displayed.
PE Information **[V850E2M]**	Static analysis	Displays the following information about PE from which the variable can be accessed. - From PE*n*: PE*n* - From common PE: Common - Unknown: - Note that this item appears only when the selected microcontroller version supports multi-core.
Import[Note 1]	Static analysis	Displays the following information about the source of the variable information. - If it was acquired from inside an active project "Original" is displayed. - If it was acquired from an import file The names of all import files are displayed. - If it was acquired from inside an active project and an import file "Original" and the names of all import files are displayed. See "2.10 Import or Export Information File" for details on the import function.
Attribute	Static analysis	Displays the variable's symbol attributes/symbol-modifier attributes. If there are multiple attributes, then they are displayed separated by commas (","). Note, however, that this will display "-" if analysis is not complete. The following attributes can be displayed. - [CA78K0] static, const, volatile, sreg, rwsfr, rosfr, wosfr - [CA78K0R] static, const, volatile, sreg, rwsfr, rosfr, wosfr, near, far - [CA850] static - [CX] static, ior, const, volatile, delete

Item	Type	Contents
Type	Static analysis	Displays the type of the variable[Note 2]. If including an alternative name by using "#define statement" or "typedef statement", then not the alternative name but the type is displayed. Note, however, that this will display "-" if analysis is not complete. The maximum number of pointers that can be displayed is as follows (up to 4 dimensions for an array can be displayed): - [CA78K0][CA78K0R]: 8 - [CA850]: 6 - [CX]: 8
Members	Static analysis	Displays the members of the structure/union. If there are multiple members, then they are displayed separated by commas (","). Note, however, that this will display "-" if other than structures/unions or analysis is not complete.
Address	Static analysis	Displays the variable's allocated address in hexadecimal number notation. The number of digits to display is equivalent to the maximum address value of the selected microcontroller. Note, however, that this will display "-" if analysis is not complete.
Size[Bytes]	Static analysis	Displays the variable's size in decimal number notation. Note, however, that this will display "-" for bit variables or the like that cannot be displayed in bytes, or if analysis is not complete.
Reference Count	Static analysis	Displays the number of times the variable is referenced in the program, in decimal number notation. The location where the variable is defined is also counted. The totals for structures, unions, and arrays are displayed at the variable level (references to individual members and array elements are not shown). Code in C source files that is referenced but is eliminated by the preprocessor during compilation (e.g. via "#if" or "#ifdef" statements) is not included in the number of references (it is also not output by the search results from [Find All References] in the context menu). Note, however, that this will display "-" if analysis is not complete. **[CX]** In the definition of variables, a line with an assignment statement (e.g. "int variable = 10") is counted. "variable++;" is interpreted as "variable = variable + 1". Therefore, this variable is counted twice.
Read Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the number of times the variable was read, in decimal number notation[Note 3, 4]. For structures and unions, reads are counted at the structure/union variable level (the number of reads at the individual member and element levels are not shown). Note, however, that this will display "-" if the debug tool's Trace function is disabled, or if analysis is not complete.
Write Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the number of times the variable was written, in decimal number notation[Note 3, 4]. For structures and unions, writes are counted at the structure/union variable level (the number of writes at the individual member and element levels are not shown). Note, however, that this will display "-" if the debug tool's Trace function is disabled, or if analysis is not complete.

Item	Type	Contents
Read/Write Count[Note 1] **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the number of times the variable was read/written, in decimal number notation[Note 3, 4]. For structures and unions, reads/writes are counted at the structure/union variable level (the number of reads/writes at the individual member and element levels are not shown). It may not be possible to analyze reads/writes of variables is segments where variables have been assigned to registers via compiler optimization. For this reason, reads/writes in such sections will not be counted. Note, however, that this will display "-" if the debug tool's Trace function is disabled, or if analysis is not complete.
Minimum Value **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the minimum measurement time from the results of program execution, in decimal number notation[Note 3]. Note, however, that this will display "-" if for bit type variables/boolean type variables/structures/unions/arrays/pointer, if the debug tool's Trace function is disabled, or if analysis is not complete. **[CA78K0][CA78K0R]** Only a variable/SFR less than or equal to 2 bytes can be displayed. **[CA850][CX]** Only a variable/IOR less than or equal to 4 bytes can be displayed.
Maximum Value **[IECUBE]** **[IECUBE2]** **[Simulator]**	Dynamic analysis	Displays the maximum measurement time from the results of program execution, in decimal number notation[Note 3]. Note, however, that this will display "-" if for bit type variables/boolean type variables/structures/unions/arrays/pointer, if the debug tool's Trace function is disabled, or if analysis is not complete. **[CA78K0][CA78K0R]** Only a variable/SFR less than or equal to 2 bytes can be displayed. **[CA850][CX]** Only a variable/IOR less than or equal to 4 bytes can be displayed.
Data Coverage[%] **[IECUBE [78K0]]** **[IECUBE [78K0R]]** **[Simulator]**	Dynamic analysis	Displays the data coverage ratio of the variable ("*number of bytes accessed in the address range*" / "*variable size*" x 100)[Note 5]. The level of shading of the cell's background color indicates the data coverage. Note, however, that this will display "-" if the debug tool's Coverage function is disabled, or if analysis is not complete.

Notes 1. This item does not appear by default.
See "2.5.1 Set the columns to display" for details on how to display this item.

2. [CX]
If a "typedef" has been used assign a different name to a basic type, the following types are displayed.

Original Type of "typedef"	Type Displayed
- unsigned long - unsigned int	unsigned long
- signed long - signed int - long - int	long
- unsigned short	unsigned short

Original Type of "typedef"	Type Displayed
- signed short - short	short
- unsigned char - char (when "-Xchar=unsigned" option is specified)	unsigned char
- signed char - char (when "-Xchar=unsigned" option is not specified)	signed char

3. Set the [Accumulate result of analysis] property in the [General] category on the [Settings] tab of the Property panel to [Yes] to display the cumulative value for each program execution.
4. The calculation is based on the acquired trace data. So for example, if one write to a 4-byte area was output in the trace data as the upper 2 bytes and the lower 2 bytes, then two times will be displayed.
5. The data coverage ratio is calculated with the cumulative value for each program execution.
   If you need to reset the data coverage ratio, select [Clear Coverage Information] from the context menu of the Editor panel or Disassemble panel, and then click the  button.
   Furthermore, as the result of a build after editing the program, if the variable's allocated address is different from its allocated address at the time of the previous build, the data coverage ratio for the variable that has not been accessed may be displayed.

In the bottom of the [Variable Name] item, the following information for each file is shown as [*Total*].
Note that "(No Definition)" displayed in the [File Name] item is treated as one file.

Figure A-8. [*Total*] Display (Variable List Panel)

Variable Name	File Name	Size[Bytes]	Reference Count	Read Count	Write Count
Total	CG_main.c	13	9	0	4
Total	CG_systeminit.c	0	1	0	0

Display	Type	Item	Contents
Total	-	File Name	The target file name
		File Pass[Note]	File pass of the target file
		Size[Bytes]	Total of the variable's size in the target file
		Reference Count	Total number of times variables are referenced in the target file
		Read Count	Total number of times variables were read in the target file
		Write Count	Total number of times variables were written in the target file
		Read/Write Count	Total number of times variables were read/written in the target file
		Data Coverage[%]	The data coverage ratio of variables in the target file

Note This item does not appear by default.
See "2.5.1 Set the columns to display" for details on how to display this item.

Cautions 1. The [Read Count]/[Write Count]/[Read/Write Count]/[Data Coverage[%]] item for a bit type variable or a boolean type variable is measured by counting the number of accesses to the address that the variable is being allocated.
Consequently, if bit type variables or boolean type variables are allocated to the same address, these items above will display the same value.

2. **[CA78K0][CA78K0R]**
   If a source file with the same name exists in a project, the build tool rewrites the cross reference information of them. Therefore, the information of other than the source file that has been compiled last in files with the same name cannot be acquired.
3. **[CA850]**
   If there are assembler instructions coded between "#pragma asm" and "#pragma endasm", then the registers and instructions coded in that location will be displayed as variables.
4. **[CX]**
   Unused variables deleted via compiler optimization are not displayed.
5. **The items of the Dynamic analysis information do not appear while disconnecting from the debug tool (default).**

Remarks 1. If static variables inside functions with the same name are declared in a function, they are handled as follows:

[CA78K0][CA78K0R][V850]

- [Variable Name]/[File Name]/[Function Name]/[File Path]/[Import]
  The information of the variable that is first declared in a function is displayed.
- [Reference Count]
  All number of times the variable declared in a function is referenced is displayed.
- Items other than listed above
  The information of the variable that is last declared in a function is displayed.

[CX]

- [Type]/[Members]
  The information of the variable that is first declared in a function is displayed.
- Items other than listed above
  The information of the variable that is first declared in a function is displayed.

2. The display of each type of information can be customized as follows:
   - Sort the analysis information
   - Filter the analysis information
3. The current row mark (▶) on the left edge of this area indicates that the column in question is the current row.
   The following operations can be performed on the current row:
   - Jump to Defined Location
   - Register Watch-Expressions
   - Display List of Referencing Location

[Toolbar]

The toolbar provides the following items and functions.
Note that all these items are invalid during execution of a program.

	Acquires the latest data from the debug tool, and updates the contents of this panel.
	Displays the latest information automatically by acquiring the information each time program execution stops. Note that this button is invalid when the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (this button is locked in accordance with the setting on the Property panel).
	Resets highlighting of values that have been changed by executing a program.
	Displays only the information value for variables in a file(s)/category(s) currently selected in the Project Tree panel (see "(a) Linking with the Project Tree panel").

	Displays only the information value for variables starting with the word at the caret position in the Editor panel (see "(b) Linking with the Editor panel").
	Displays only the information value for variables in the Common area and PE currently selected in the Debug Manager panel (see "(c) Linking with the Debug Manager panel [V850E2M]"). Note that this button is invalid when the selected microcontroller version does not support multi-core. or while disconnecting from the debug tool.

[[File] menu (Variable List panel-dedicated items)]

The [File] menu for this panel provides the following items and functions.

Save Variable List Data	Overwrites the contents of this panel to the previously saved file (see "2.12 Save Analysis Information"). Note that when the file has never been saved or the file is write disabled, the same operation is applied as the selection in [Save Variable List Data As...].
Save Variable List Data As...	Opens the Save As dialog box to newly save the contents of this panel to the specified text file (see "2.12 Save Analysis Information").

[[Edit] menu (Variable List panel-dedicated items)]

The [Edit] menu for this panel provides the following items and functions.

Copy	Copies the contents of the selected column (multiple selections possible) to the clipboard as character strings separated by tabs. Note that the contents of the clipboard cannot be pasted to this panel.
Select All	Selects all the columns being displayed in this panel.

[Context menu]

The context menu displayed by right-clicking on this panel provides the following items and functions.

Find All References	Displays a list of the locations referencing the variable(s) of the selected row(s), in the Output panel's [Find References] tab (see "2.9 Display List of Referencing Location").
Register to Analysis Chart1	Registers the variable(s) of the selected row(s) to the Analysis Chart panel (Analysis Chart1) (see "2.11.1 Graph transitions in variable values"). Note that this item is invalid while disconnecting from the debug tool.
Access Break	The following cascade menus are displayed to set a break event with access condition (see "2.7.2 Set a break event to a variable"). Note that this item is invalid while disconnecting from the debug tool.
Set Variable Read Break to	Sets a break event with read access condition to the variable of the current row.
Set Variable Write Break to	Sets a break event with write access condition to the variable of the current row.
Set Variable R/W Break to	Sets a break event with read/write access condition to the variable of the current row.
Register to Watch1	Registers the variable(s) of the selected row(s) to the Watch panel (Watch1) as watch-expression(s) (see "2.8 Register Watch-Expressions"). Note that this item is invalid while disconnecting from the debug tool.
Jump to Source	Opens the Editor panel and displays the source file in which the variable of the current row is defined (see "2.6 Jump to Defined Location").

Jump to Memory	Opens the Memory panel (Memory1) and displays the memory list from the start address of the variable of the current row (see "2.6 Jump to Defined Location"). Note that this item is invalid while disconnecting from the debug tool.
Copy	Copies the contents of the selected row(s) to the clipboard as character strings separated by tabs. Note that the contents of the clipboard cannot be pasted to this panel.

Call Graph panel

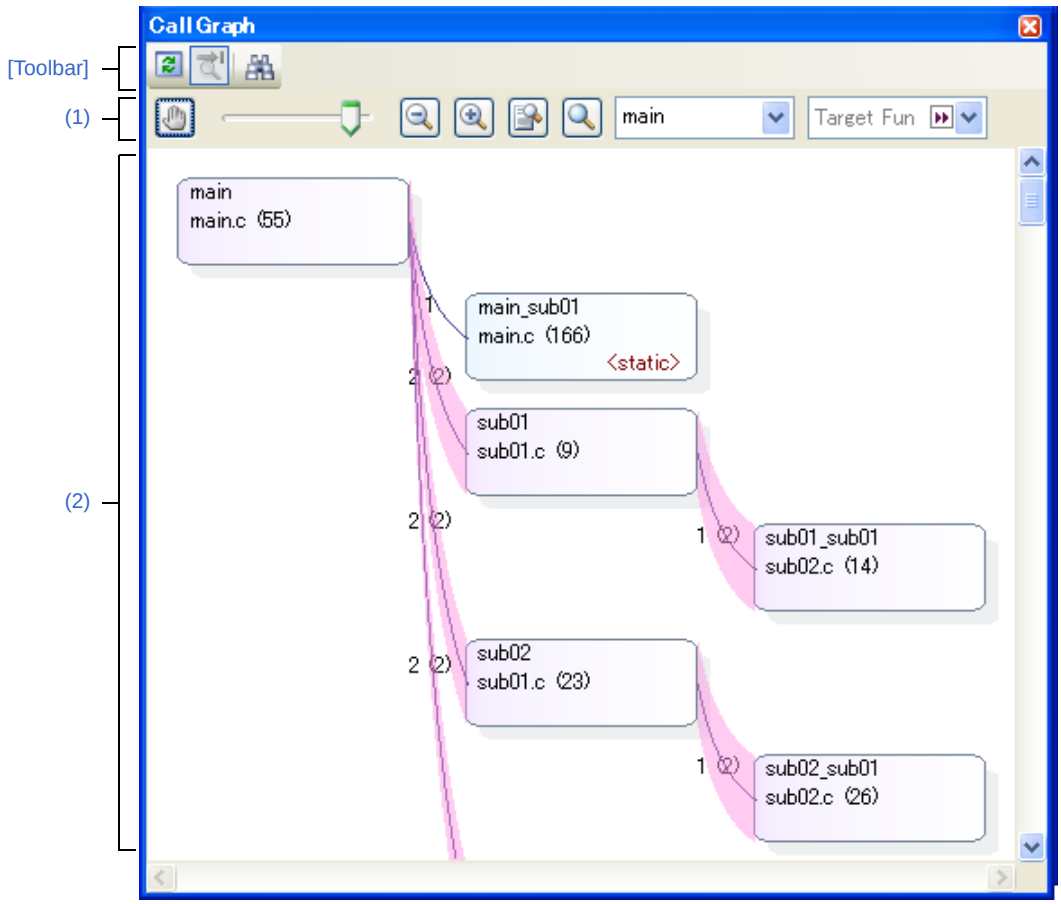
This panel is used to display the tree-structured chart (call graph) that indicates calling relationships between functions.
See "2.4 Display Calling Relationships between Functions (Call Graph)" for details on how to display the call graph.

Cautions 1. If the debug tool to use does not support the Trace function, or if the debug tool's trace function is not enabled, then the Dynamic analysis information (an execution count) in the call graph cannot be displayed.

2. If a clean is executed in the build tool, the call graph currently being displayed will be erased.

Remark A function whose source file does not exist in the project can be displayed in the call graph if the [Display the function without definition at Call Graph panel] property in the [General] category on the [Settings] tab of the Property panel is set to [Yes].

Figure A-9. Call Graph Panel



The following items are explained here.

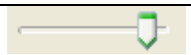
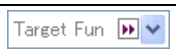
- [How to open]
- [Description of each area]
- [Toolbar]
- [[File] menu (Call Graph panel-dedicated items)]
- [[Edit] menu (Call Graph panel-dedicated items)]
- [Context menu]

[How to open]

- On the toolbar in the Main window, click the  button.
- From the [View] menu, select [Program Analyzer] >> [Call Graph].

[Description of each area]

(1) Display setting area

 Scroll button	Toggles whether scrolling of content is enabled by dragging the panel directly. By default, scrolling is disabled. Note that if scrolling is enabled, then the shape of the mouse cursor will change, and clicking on a Function box in the call graph will not cause that function to be high-lighted (it will not be reflected in the [Target function name] combo box). There will also not be a Pop-up display with information about the function.
 Zoom slider	Changes the call graph's zoom ratio. A number between 10 and 109 can be selected (by default, 100 is specified).
 Zoom in/out button	Changes the call graph's zoom ratio. Each click of one of the buttons decrements/ increments the value of the zoom slider by 1.
 Fit to panel button	Automatically changes the call graph's zoom ratio. The call graph is enlarged or shrunk in accordance with the size of the panel, so that the entire call graph can be displayed.
 Zoom to 100% button	Resets the zoom ratio of the call graph to the default value of 100.
 [Parent function name] combo box (Left combo box)	Selects the parent function to target for display in the call graph (it will be at the top of the call graph) from the drop-down list[Note]. By default, the first function to appear named "main" or containing the word "main" is specified as the parent function (if there is no corresponding function, it will be empty).
 [Target function name] combo box (Right combo box)	Selects the function to highlight (show in selected state) on the call graph from the following drop-down list. - If the [Parent function name] combo box is empty *The names of all functions in the program* - If a parent function is specified with the [Parent function name] combo box *The names of functions called by that parent function* (including child and grand-child functions) If scrolling via the Scroll button is disabled, then when a function box is clicked in the call graph, the function's name will be reflected in the combo box.

Note [V850E2M]

If the selected microcontroller version supports multi-core, you can select "PE*n*". In this case, the call graph will only be displayed for the functions executed in the selected PE*n*.

(2) Call graph area

This area displays a call graph indicating calling relationships between functions that have been acquired from the cross reference information.

By default, the first function to appear named "main" or containing the word "main" is considered to be the parent function, and that function is placed on the left edge of the call graph (the corresponding parent function name will be displayed in the [Parent function name] combo box). If there is no corresponding function name, then the functions in the program that are not called by any other functions (reference count = 0) will be considered to be parent functions, and they will be placed on the leftmost edge (the [Parent function name] combo box will be empty).

Next, the child functions, grandchild functions, and so on will be placed on the call graph, from left to right (they will be arranged from top to bottom, with the functions to appear first shown topmost).

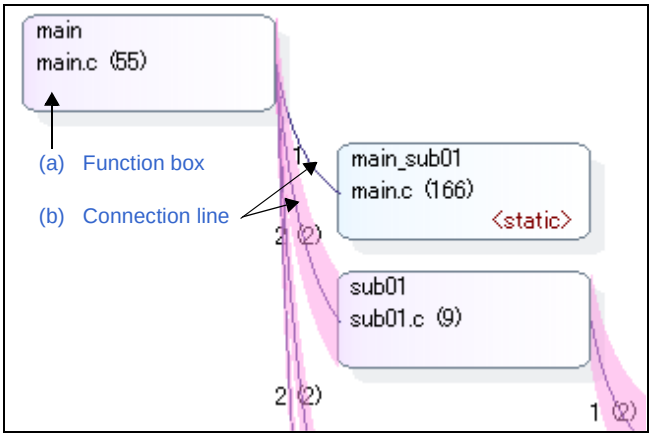
If an arbitrary parent function is specified in the [Parent function name] combo box[Note], then only the functions called by that function will appear in the call graph. If the combo box is empty, then all functions in the program will appear in the call graph.

Note [V850E2M]

If the selected microcontroller version supports multi-core and "PE*n*" is selected in the [Parent function name] combo box, the call graph will only be displayed for the functions executed in the selected PE*n*.

The composition of the call graph is as follows.

Figure A-10. Composition of Call Graph

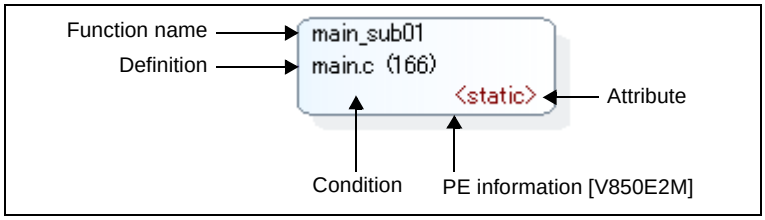


(a) Function box

The function is displayed in a box format.

The following information is displayed in a function box.

Figure A-11. Information of Function Box



Function name	Indicates the name of the target function.

Definition	Indicates the location at which the target function is defined with "*File name*(*Line number*)". Note, however, that if the definition information does not exist, then this will display "(No Definition)".
Attribute	If the target function is a static function, then "<static>" is displayed.
Condition	The current state of the target function is shown in the following background colors. - Light blue: Not executed - Purple: Executed
PE Information **[V850E2M]**	If the selected microcontroller version supports multi-core, PE in which the target function is assigned is shown in the following shadow colors. - Gray: Common - Red: PE1 - Green: PE2 - Blue: PE3 - Orange: PE4

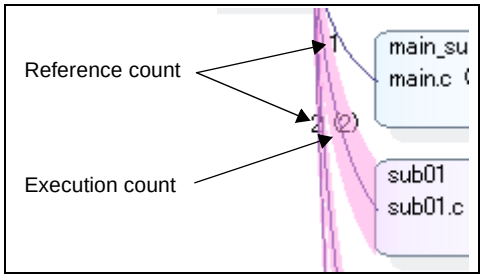
Remark By double-clicking a function box, you can jump to the location of the source text where the function is defined (see "2.6 Jump to Defined Location").
Note, however, that this function cannot be used when the scroll function for the call graph is allowed by using the Scroll button (button). In this case, select the target function with the [Target function name] combo box, then select [Jump to Source] from the context menu.

(b) Connection line

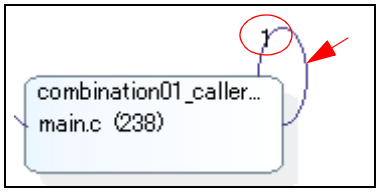
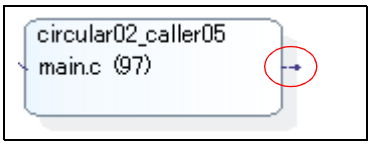
If a given function is called statically by another function, then the function boxes of the two functions will be shown linked by a connection line. Connection lines are only displayed for static function calls. Connection lines are not displayed for dynamic function calls.
The following information is displayed by each connection line.

Remark If there are no static function calls but there are dynamic function calls (e.g. if function calls are only made using function pointers), then this information can be confirmed in the Pop-up display.

Figure A-12. Information of Connection Line



Reference count	Indicates the number of times static calls have been made.
Execution count	Indicates the number of dynamic calls in parentheses: "( )". This information is the cumulative value for each program execution when the [Accumulate result of analysis] property in the [General] category on the [Settings] tab of the Property panel is set to [Yes]. Note that this information appears only when the trace data exist.

Recursive call	A connection line and reference count is displayed as follows when a function calls itself. 
Circular call	As an example, say that there are functions A, B, and C. If A calls B, which calls C, which then calls A (A -> B -> C -> A), then although connection lines will be displayed for the calls of A to B and B to C, no connection line will be shown for the call of C to A. Instead, the following line segment will only be shown, to indicate a circular call.  You can check information about functions in a circular call via the Pop-up display.

(c) Pop-up display

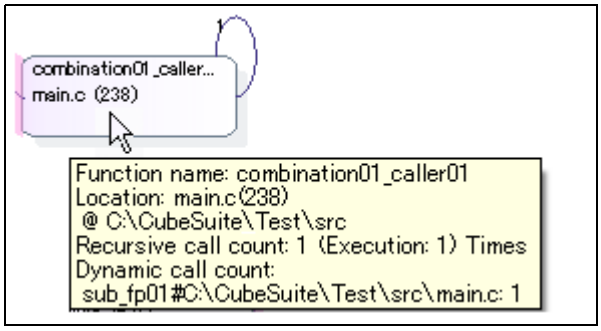
When the mouse cursor is hovered over a function box, information about that function appears in a pop-up. The display format is as follows:

Caution This function cannot be used when the scroll function for the call graph is allowed by using the Scroll button (button).

Function name: *Function name* Location: *File name*(*Line number*) *@absolute path of the file* Recursive call count: *Reference count*(Execution: *Execution count*) Circular call count *Function name*: *Reference count*(Execution: *Execution count*) *Function name*: *Reference count*(Execution: *Execution count*) ... Dynamic call count *Function name*: *Count* *Function name*: *Count* ...

Function name	Indicates the name of the target function.
Location	Indicates the location at which the target function is defined with "*File name*(*Line number*)". Note, however, that if the definition information does not exist, then this will display "(No Definition)".
Recursive call count	This item is displayed only if the target function is a recursive call. Reference count: Number of recursive calls made Execution count: Number of executions (only if there is trace data)

Circular call count	This item is displayed only if there are circular function calls from the target function. If there are multiple target functions, that at most 4 will be listed. Function name: Name of function in circular call Reference count: Number of circular calls made Execution count: Number of executions (only if there is trace data)
Dynamic call count	This item is displayed only if there are only dynamic function calls, and no static function calls. If there are multiple target functions, that at most 4 will be listed. Function name: Name of dynamic call function Count: Number of executions



Remark The cumulative value for each program execution is displayed as *Execution count* when the [Accumulate result of analysis] property in the [General] category on the [Settings] tab of the Property panel is set to [Yes].

[Toolbar]

The toolbar provides the following items and functions.
Note that all these items are invalid during execution of a program.

	Acquires the latest data from the debug tool, and updates the contents of this panel. Note that this button is invalid during execution of a program.
	Displays the latest information automatically by acquiring the information each time program execution stops. Note, however, that this button will be disabled if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (this button is locked in accordance with the setting on the Property panel).
	Opens the Call Graph Search dialog box to search for a function existing on this panel.

[[File] menu (Call Graph panel-dedicated items)]

The [File] menu for this panel provides the following items and functions.

Save Call Graph Data	Overwrites the contents of this panel to the previously saved file (see "2.12 Save Analysis Information"). Note that when the file has never been saved or the file is write disabled, the same operation is applied as the selection in [Save Call Graph Data As...].
Save Call Graph Data As...	Opens the Save As dialog box to newly save the contents of this panel to the specified text file (see "2.12 Save Analysis Information").

[[Edit] menu (Call Graph panel-dedicated items)]

The [Edit] menu for this panel provides the following items and functions.

Find...	Opens the Call Graph Search dialog box to search for a function currently existing on this panel.

[Context menu]

The context menu displayed by right-clicking on this panel provides the following items and functions.

Jump to Source	Opens the Editor panel and displays the source file in which the function currently being selected with the [Target function name] combo box is defined (see "2.6 Jump to Defined Location").
Jump to Disassemble	Opens the Disassemble panel (Disassemble1) and displays the disassemble data corresponding to the start address of the function currently being selected with the [Target function name] combo box (see "2.6 Jump to Defined Location"). Note that this item is invalid while disconnecting from the debug tool.
Jump to Memory	Opens the Memory panel (Memory1) and displays the memory list corresponding to the start address of the function currently being selected with the [Target function name] combo box (see "2.6 Jump to Defined Location"). Note that this item is invalid while disconnecting from the debug tool.
Jump to Function List	Opens the Function List panel and selects the function currently being selected with the [Target function name] combo box.

Analysis Chart panel

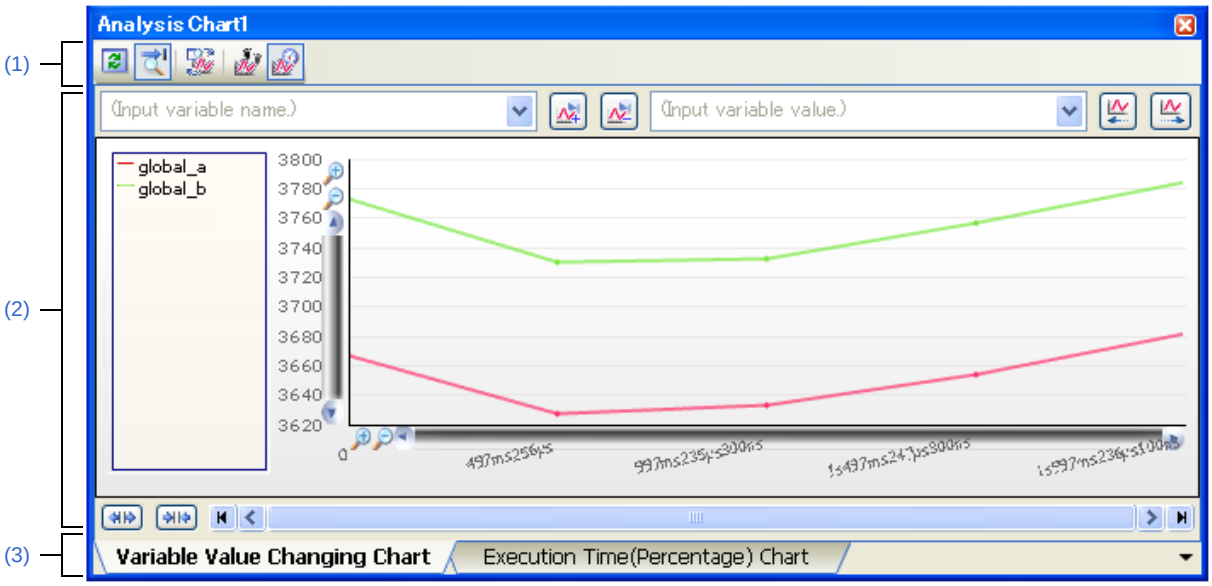
This panel is used to display charts of the acquired function information and variable information.

Up to a maximum of four of these panels can be opened. Each panel is identified by the names "Analysis1", "Analysis2", "Analysis3", and "Analysis4" on the title bar.

See "2.11 Display Analysis Information in Chart" for details on how to display the chart in this panel.

Caution This panel can be opened only while connecting to the debug tool (this panel is closed after disconnecting from the debug tool).

Figure A-13. Analysis Chart Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [[File] menu (Analysis Chart panel-dedicated items)]

[How to open]

- On the toolbar in the Main window, click the button.
- From the [View] menu, select [Program Analyzer] >> [Analysis Chart*1 - 4*]

[Description of each area]

(1) Toolbar

The available buttons on the toolbar differ depending on the currently selected tab.

See the section for the tab in question for details.

(2) Chart area

This area displays a chart relating to the acquired function information/variable information.

(3) Tab selection area

The type of chart is switched when a tab is selected.

In this panel, a following tab is contained (see the section explaining the tab for details on the display/setting).

- [Variable Value Changing Chart] tab
- [Execution Time(Percentage) Chart] tab

Remark A mark is displayed on the tab if a message relating to the chart information has been output to the Output panel.

[[File] menu (Analysis Chart panel-dedicated items)]

The [File] menu for this panel provides the following items and functions.

Save Analysis Chart Data	Overwrites the contents that are displayed on the currently selected tab to the previously saved file (see "2.12 Save Analysis Information"). Note that when the file has never been saved or the file is write disabled, the same operation is applied as the selection in [Save Analysis Chart Data As...].
Save Analysis Chart Data As...	Opens the Save As dialog box to newly save the contents that are displayed on the currently selected tab to the specified file (see "2.12 Save Analysis Information").

[Variable Value Changing Chart] tab

Use this tab to display the relationship of variable/register/other values registered as graphing targets to time in a line chart.

These tabs on the Analysis Chart panel are identified by the names "Analysis Chart1", "Analysis Chart2", "Analysis Chart3", and "Analysis Chart4". From these tabs, you can register graphing targets individually.

See "2.11.1 Graph transitions in variable values" for details on how to display graphs on this tab.

Figure A-14. Analysis Chart Panel: [Variable Value Changing Chart] Tab

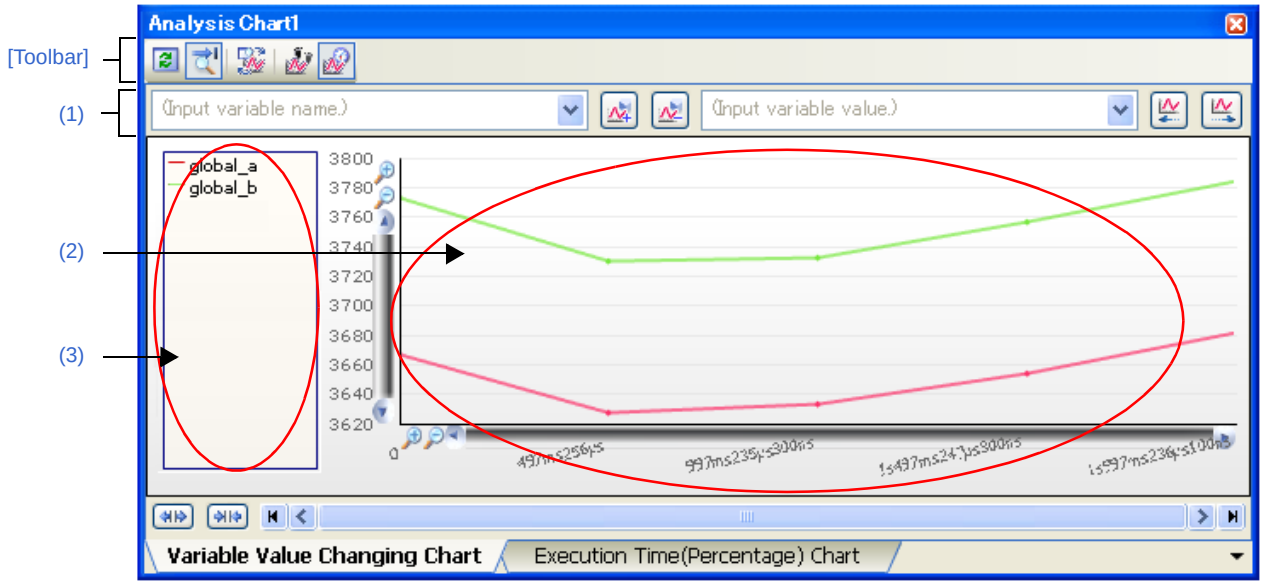
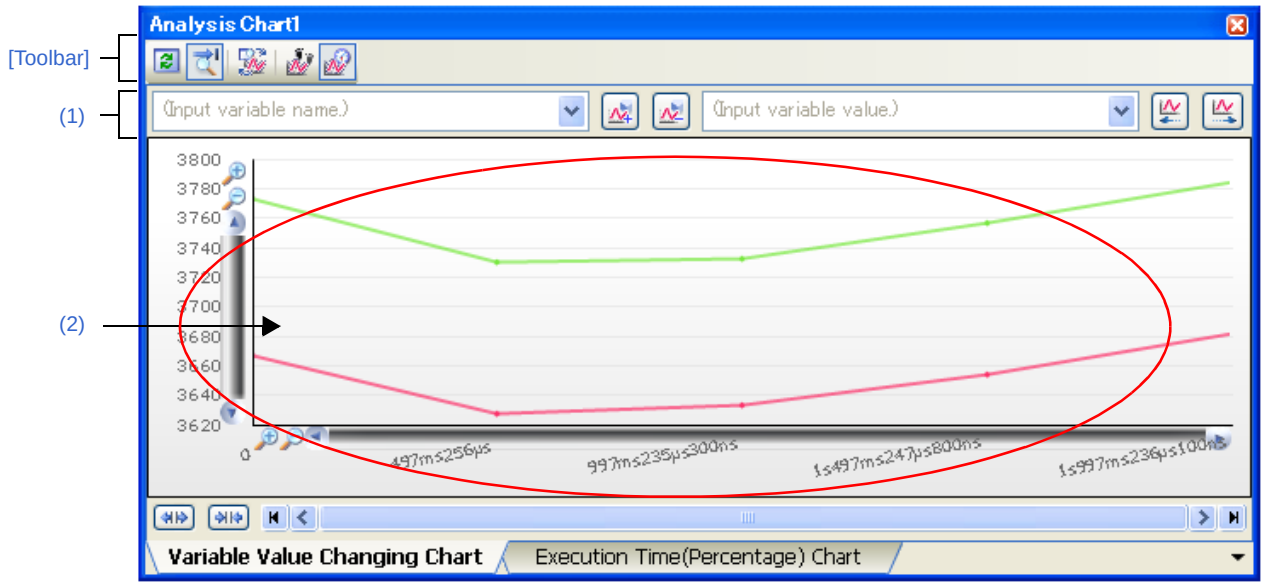


Figure A-15. Analysis Chart Panel: [Variable Value Changing Chart] Tab (without Legend)



The following items are explained here.

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

[How to open]

- On the toolbar in the Main window, click the button, and then select the [Variable Value Changing Chart] tab.
- From the [View] menu, select [Program Analyzer] >> [Analysis Chart*1-4*], and then select the [Variable Value Changing Chart] tab.

[Description of each area]

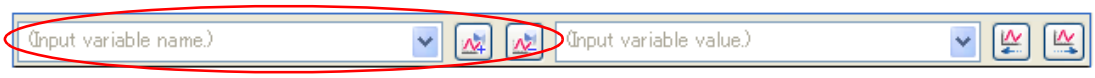
(1) Variable name/Variable value setting area

This area is provided with the following functions.

Note that these functions are invalid during execution of a program.

(a) Registering/deleting graphing targets

Register or delete targets for graphing on this tab.



 [Variable Name] combo box	**- Registering a new graphing target** Enter the name of the new graphing target to register directly via the keyboard (maximum character length: 2,046)[Note]. The following types of graphing targets can be registered. - Global variable - File-internal static variable - Static variable inside functions - CPU register - SFR **[78K0][78K0R]** - IOR **[V850]** - Address **- Deleting a graphing target that was previously registered** Select the graphing target to delete from the drop-down list. The drop-down list displays the names of all graphing targets that are currently registered. A graphing target can be selected by clicking the graph, or if a legend is displayed, by clicking on the target legend.
 Add button	Registers the target name specified in the [Variable Name] combo box as a graphing target.
 Delete button	Deletes the target name specified in the [Variable Name] combo box as a graphing target.

Note The input format is as follows (same as the input format of the Watch panel):
Note the following, however, when registering items:

- If the variable name of a structure, union, or array is registered, it cannot be graphed.
- For structures, unions, and arrays, the member name or element must be specified.
- Immediate addresses are registered with a size of 1 byte.
- There may be restrictions on the number and size of targets that can be graphed, depending on the debug tool used and the method by which the graph data was acquired (see "(2) Select the method for acquiring the graph data").

Table A-2. Input Format of Graphing Targets

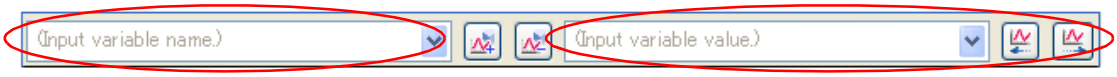
Input Format	Value to be Acquired
Variable name of C language	Value of C language variable
Variable-expression[*Variable-expression*]	Element of array
Variable-expression.Member name	Member of structures/unions
Variable-expression->Member name	Member of structures/unions that pointer designates
**Variable-expression*	Value of pointer variable
CPU register name	Value of the CPU register
SFR register name [78K0][78K0R]	SFR register value
I/O register name [V850]	I/O register value
Label, EQU symbol and immediate address	Values of label, EQU symbol and immediate address
Bit symbol	Bit symbol value

Caution **Immediate addresses of different sizes with the same address cannot be registered. In this case, the immediate addresses that has been registered previously takes precedence.**

Remark See "(1) Register graphing targets" for other ways to register graphing targets.

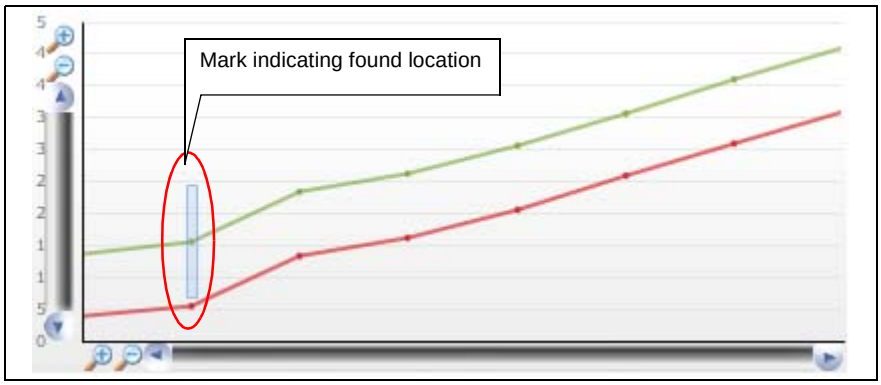
(b) Find values

Find locations where a variable changes to the specified value in the currently displayed graph (see "(4) Validate the graph data").



(Input variable name.) [Variable Name] combo box	Select the graphing target to find from the drop-down list. The drop-down list displays the names of all graphing targets that are currently registered. A graphing target can be selected by clicking the graph, or if a legend is displayed, by clicking on the target legend.
(Input variable value.) [Variable Value] combo box	Specify the value to find by entering it directly via the keyboard (maximum history size: 10 items). Note that values can only be specified in decimal number notation.
 Previous change button	Search to the left for locations where the graphing target specified in the [Variable Name] combo box changes to the value specified in the [Variable Value] combo box.
 Next change button	Search to the right for locations where the graphing target specified in the [Variable Name] combo box changes to the value specified in the [Variable Value] combo box.

If the search is successful, the following mark is displayed at the matching location (if there are no matching locations, then a message is displayed in the Output panel).

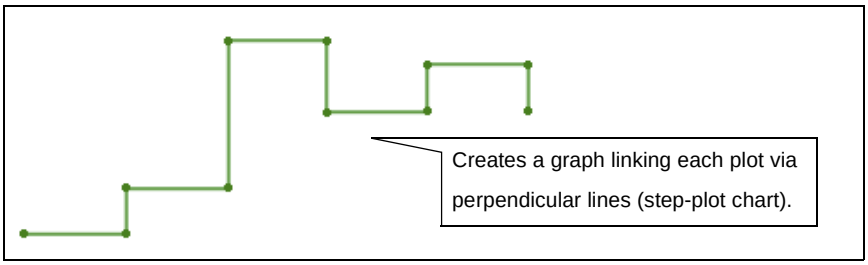


(2) Chart area

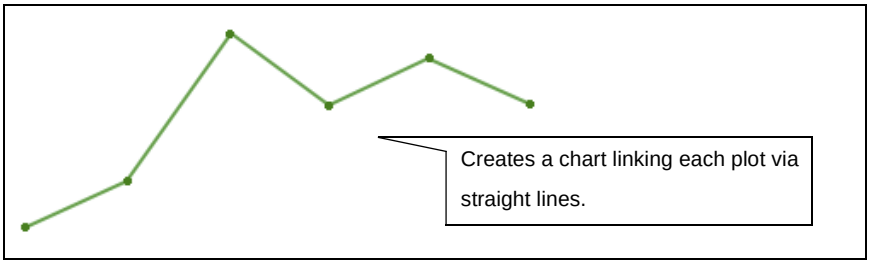
This area displays the relationship between values (Y axis) and time (X axis) in the registered graphing target, in a line chart.

The format of the line chart will differ as follows, depending on the method for acquiring the graph data.

- When the Trace data analysis is specified



- When the Real-time sampling analysis is specified



Caution **If the Trace data analysis is specified, the changes to variables are not displayed when they occur while the variable is assigned to a register due to compiler optimization.**

Remark If the acquired graph data exceeds the buffer capacity, then the oldest graph data is overwritten by the new graph data (ring buffer system).
In this case, part of the graph rendering will be blank.

This area is provided with the following functions.

(a) Time (X axis)

Displays the passage of time. The display units are in accordance with the acquired data.
Click on the / mark to expand the chart in the direction of the X axis.
The time display range depends on the method for acquiring the graph data (see "Table 2-8. Differences Depending on the Method for Acquiring Graph Data").

(b) Value (Y axis)

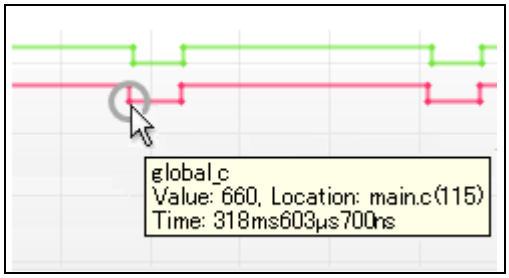
Displays the values of the registered graphing target.
By default, the maximum and minimum values of the acquired data are used as the upper and lower bounds of the chart, but it is also possible to specify a range to display (see "(a) Setting the display range").
It is also possible to specify a valid range of values, in order to avoid displaying abnormal values (see "(b) Setting the valid range (Discard abnormal values)").

(c) Pop-up display

When the mouse cursor is hovered over a transition location on the graph, information about that location appears in a pop-up.
The display format will differ as follows, depending on the method for acquiring the graph data.

- When the Trace data analysis is specified

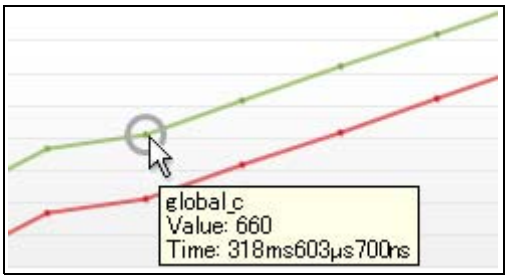
Value name Value: *Data value*, Location: *File name*(*Line number*) Time: *Data value*



Remark The [Location] information is displayed only when the transition location information exists in the graph data (when the information does not exist, "-" is displayed). In this case, furthermore, you can display the applicable location in the Editor panel by clicking the transition point.
Note, however, that the [Location] information may be invalid value when the graph data is acquired by simultaneously using a Trace event and a Point Trace event in the debug tool.

- When the Real-time sampling analysis is specified

Value name Value: *Data value* Time: *Data value*



(3) Legend area

This area displays the legend of the registered graphing target (default).
To hide it, set the [Display the legend *1 - 4*] in the [Analysis Chart*1-4*] category on the [Settings] tab of the Property panel to [No]. Moreover, in this category, you can also use the [Location of the legend *1 - 4*] property to specify where to display the legend.

[Toolbar]

The toolbar provides the following items and functions.
Note that all these items are invalid during execution of a program.

	Acquires the latest data from the debug tool, and updates the contents of this panel.
	Displays the latest information automatically by acquiring the information each time program execution stops. Note, however, that this button will be disabled if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (default) (this button is locked in accordance with the setting on the Property panel).
	Registers automatically watch-expressions on the Watch panel as the graphing targets (see "(1) Register graphing targets").
	Uses the Trace data analysis as the method for acquiring the graph data.
	Uses the Real-time sampling analysis as the method for acquiring the graph data (default).

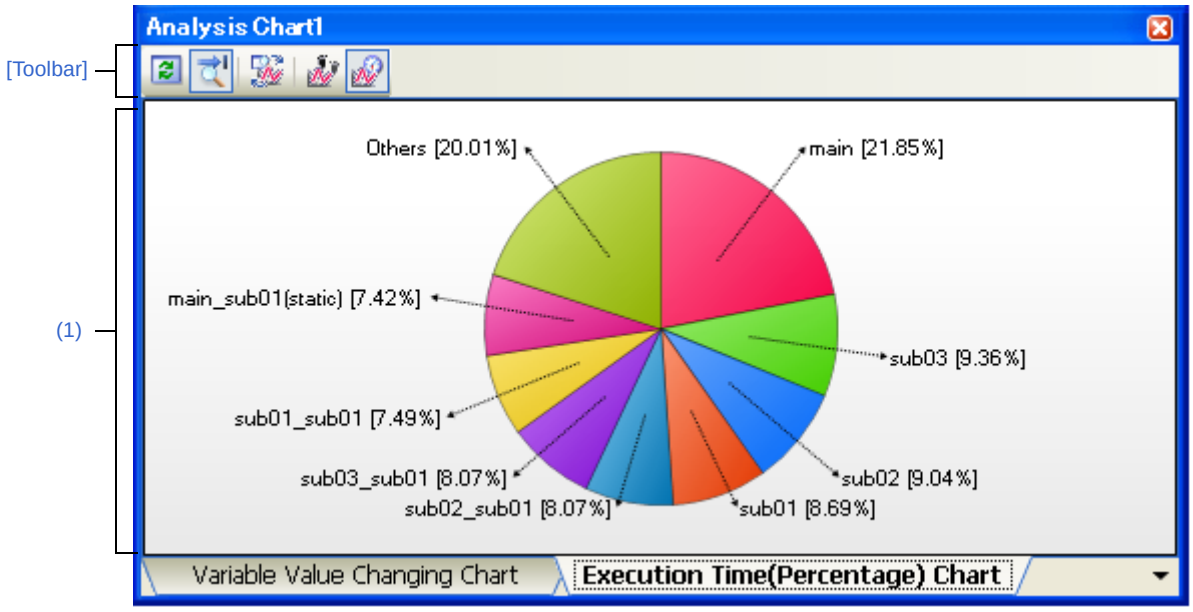
[Execution Time(Percentage) Chart] tab

Use this tab to display the acquired function information in a pie chart of the function execution times.
See "2.11.2 Chart the function execution time ratios" for details on how to display graphs on this tab.

Cautions 1. If the debug tool to use does not support the Trace function, or if the debug tool's trace function is not enabled, then this chart cannot be displayed.

2. [IECUBE [78K0]]
Because the trace time tag function is not supported, this chart cannot be displayed.

Figure A-16. Analysis Chart Panel: [Execution Time(Percentage) Chart] Tab



The following items are explained here.

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

[How to open]

- On the toolbar in the Main window, click the button, and then select the [Execution Time(Percentage) Chart] tab.
- From the [View] menu, select [Program Analyzer] >> [Analysis Chart*1-4*], and then select the [Execution Time(Percentage) Chart] tab.

[Description of each area]

(1) Chart area

This area displays a pie chart indicating function execution time ratios.
You can change the number of functions to display by setting from the [The number of functions displaying in the Execution Time(Percentage) Chart*1-4*] property in the [General] category on the [Settings] tab of the Property panel (set to [10] by default).

The targets are charted in ranking order of highest proportion of execution time taken. Functions exceeding the number specified here are displayed together under "Others".

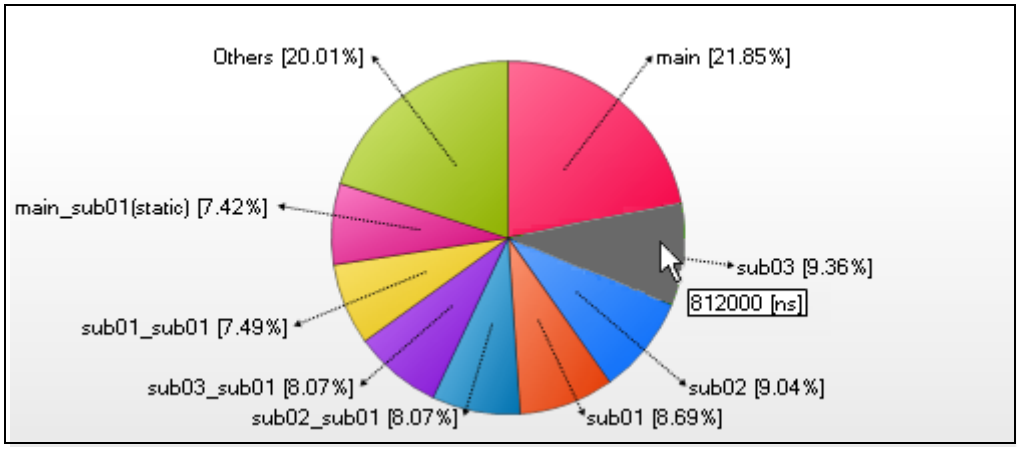
(a) Label display

Each function label is displayed in the format "*Function-name*[*proportion of execution time (%)*]".
For static files, the file name is also included inside the parentheses ( ).

Remark The *proportion of execution time* is the same as the [Execution Time(Percentage)[%]] in the Function List panel.

(b) Pop-up display

When the mouse cursor is hovered over a function, information about that function's execution time appears in a pop-up in the format "*Execution-time[unit]*".
The [Unit] can be changed by the [Unit of time] property in the [General] category on the [Settings] tab of the Property panel.



Remark The *Execution-time* is the same as the [Execution Time[*unit*]] in the Function List panel.

[Toolbar]

The toolbar provides the following items and functions.
Note that all these items are invalid during execution of a program.

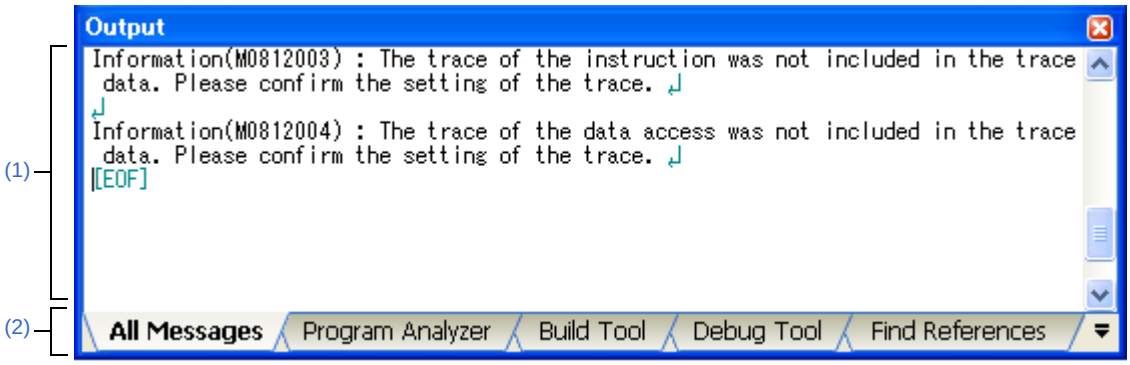
	Acquires the latest data from the debug tool, and updates the contents of this panel.
	Displays the latest information automatically by acquiring the information each time program execution stops. Note, however, that this button will be disabled if the [Refresh at program stop] property in the [General] category on the [Settings] tab of the Property panel is set to other than [Specify Individually] (default) (this button is locked in accordance with the setting on the Property panel).
	Does not work in this tab.
	Does not work in this tab.
	Does not work in this tab.

Output panel

This panel is used to display operation logs for various components (analyze tool, design tool, build tool, debug tool, etc.) provided by CubeSuite and a list of locations that refer to the specified function/variable.

See "2.9 Display List of Referencing Location" for details on how to output lists of locations referencing a function or variable.

Figure A-17. Output Panel



The following items are explained here.

- [How to open]
- [Description of each area]
- [[File] menu (Output panel-dedicated items)]
- [[Edit] menu (Output panel-dedicated items)]
- [Context menu]

[How to open]

- From the [View] menu, select [Output].

[Description of each area]

(1) Message area

This area displays operation logs for various components (analyze tool, design tool, build tool, debug tool, etc.) provided by CubeSuite and a list of places that refer to the specified function/variable.
For details on the contents displayed in this area, see the section explaining the corresponding tab.

(2) Tab selection area

The origin of messages is changed when each tab is selected.
The following tabs are available for the analyze tool.

- [All Messages] tab
- [Program Analyzer] tab
- [Find References] tab

Remark When the new message is output, "*" mark is displayed to the left of the tab name.

[[File] menu (Output panel-dedicated items)]

The [File] menu for this panel provides the following items and functions.

Save Output-*Tab Name*	Overwrites the contents that are displayed on the currently selected tab to the preciously saved text file (*.txt). Note that when the file has never been saved or the file is write disabled, the same operation is applied as the selection in [Save Output-*Tab Name* As....].
Save Output-*Tab Name* As...	Opens the Save As dialog box to newly save the contents that are displayed on the currently selected tab to the specified text file (*.txt).

[[Edit] menu (Output panel-dedicated items)]

The [Edit] menu for this panel provides the following items and functions.

Copy	Copies the contents of the selected range to the clipboard as character string(s).
Select All	Selects all the messages displayed on the currently selected tab.
Find...	Opens the Search and Replace dialog box.
Replace...	Opens the Search and Replace dialog box.

[Context menu]

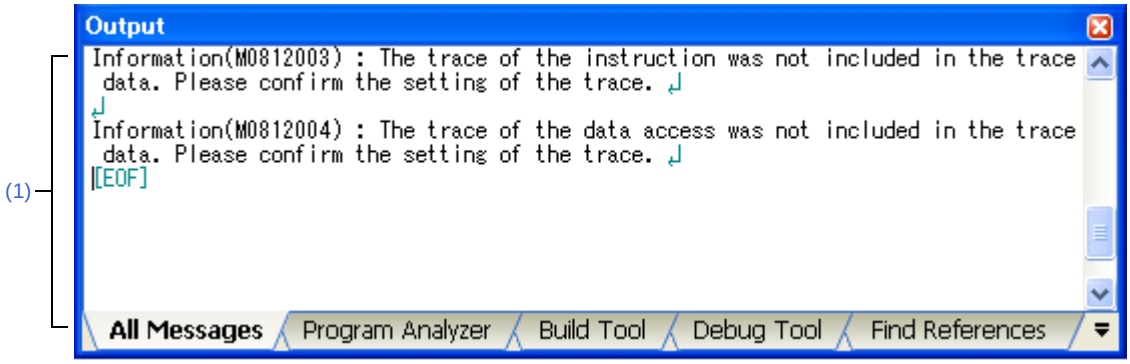
The context menu displayed by right-clicking on this panel provides the following items and functions.

Copy	Copies the contents of the selected range to the clipboard as character string(s).
Select All	Selects all the messages displayed on the currently selected tab.
Clear	Deletes all the messages displayed on the currently selected tab.
Tag Jump	Opens the Editor panel and jumps to the number of the corresponding line in the corresponding file of the message at the caret position.
Stop Searching	Cancels the current search operation. This item is in valid when is not being executed.
Help for Message	Displays online help for the message on the current caret position. This item only applies to warning messages and error messages.

[All Messages] tab

This tab is used to display operation logs for all components (analyze tool, design tool, build tool, debug tool, etc.) provided by CubeSuite.

Figure A-18. Output Panel: [All Messages] Tab



The following items are explained here.

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

[How to open]

- From the [View] menu, select [Output], and then select the [All Messages] tab.

[Description of each area]

(1) Message area

This area displays operation logs for all components (analyze tool, design tool, build tool, debug tool, etc.) provided by CubeSuite. Note that messages that the analysis tool output during analysis are not displayed on this tab (these messages are displayed only on the [Program Analyzer] tab).

The colors of message display differ with the type of message as shown below (character colors and background colors depend on the configuration in the [General - Font and Color] category of the Option dialog box).

Message Type	Display Example (Default)			Description
Normal message	AaBbCc	Character color	Black	Displayed with information notices
		Background color	White	
Warning message	AaBbCc	Character color	Blue	Displayed with warnings about operations
		Background color	Standard color	
Error message	AaBbCc	Character color	Red	Displayed when there is a critical error, or when execution is not possible due to a operational mistake
		Background color	Light gray	

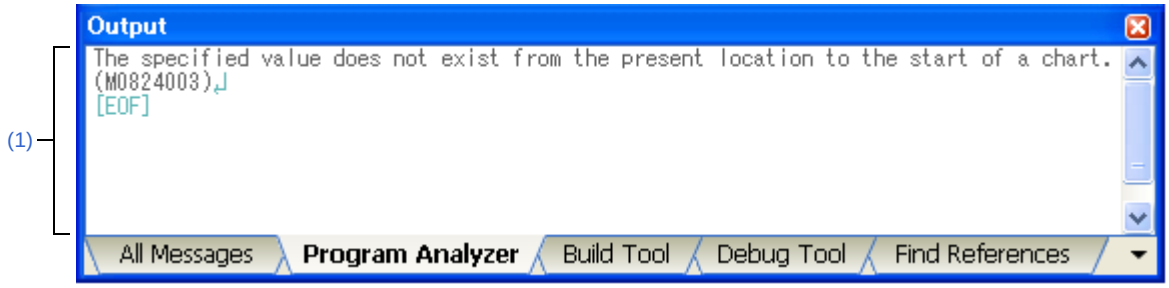
Remarks 1. When the output message is double-clicked, or the [Enter] key is pressed with the caret over the message, the Editor panel appears and the destination line number of the file is displayed.

2. Online 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.
3. You can save the contents displayed on this tab to a text file (*.txt) by selecting [Save Output-All Messages As...] from the [File] menu.

[Program Analyzer] tab

This tab is used to display only operation logs for the analyze tool out of those for various components (analyze tool, design tool, build tool, debug tool, etc.) provided by CubeSuite.

Figure A-19. Output Panel: [Program Analyzer] Tab



The following items are explained here.

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

[How to open]

- From the [View] menu, select [Output], and then select the [Program Analyzer] tab.

[Description of each area]

(1) Message area

This area displays only operation logs for the analyze tool out of those for various components (analyze tool, design tool, build tool, debug tool, etc.) provided by CubeSuite.

The colors of message display differ with the type of message as shown below (character colors and background colors depend on the configuration in the [General - Font and Color] category of the Option dialog box).

Message Type	Display Example (Default)			Description
Normal message	AaBbCc	Character color	Black	Displayed with information notices
		Background color	White	
Warning message	AaBbCc	Character color	Blue	Displayed with warnings about operations
		Background color	Standard color	
Error message	AaBbCc	Character color	Red	Displayed when there is a critical error, or when execution is not possible due to a operational mistake
		Background color	Light gray	

Remarks 1. 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.

2. Online 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.

3. You can save the contents displayed on this tab to a text file (*.txt) by selecting [Save Output-Program Analyzer As...] from the [File] menu.

[Find References] tab

Use this tab to display a list of locations referencing the specified function/variable.

See "2.9 Display List of Referencing Location" for details on how to output lists of locations referencing a function or variable.

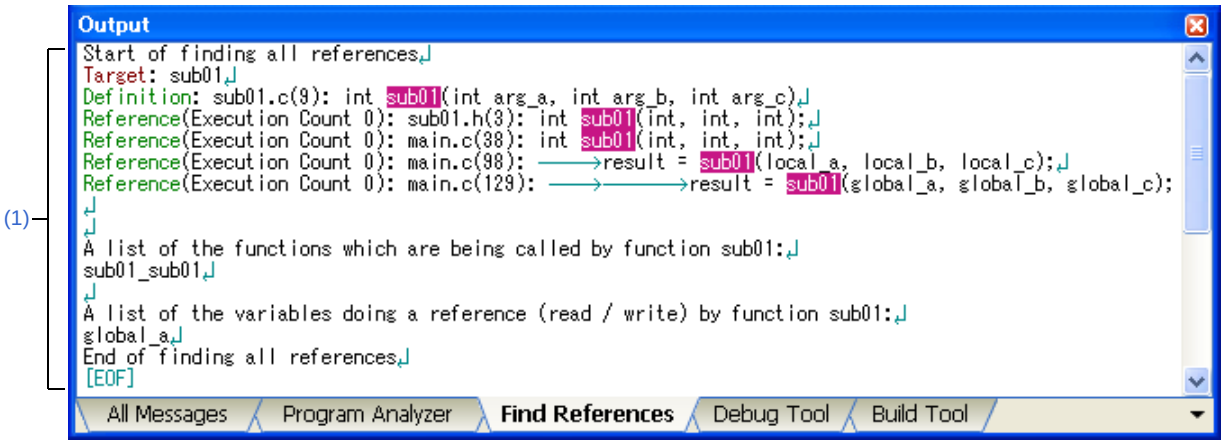
Cautions 1. This tab does not appear if the Display List of Referencing Location operation is never performed.

2. Code in C source files that is referenced but is eliminated by the preprocessor during compilation (e.g. via "#if" or "#ifdef" statements) is not output as referenced locations.

3. [CX]
Reference of a function that is assignment to function pointers is not output as referenced locations.

4. Each time a search is made for referencing locations, the output list of referencing locations is cleared.

Figure A-20. Output Panel: [Find References] Tab



The following items are explained here.

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

[How to open]

- From the [View] menu, select [Output], and then select the [Find References] tab.

[Description of each area]

(1) Message area

This area displays the following list of locations referencing a function/variable on the Function List panel/Variable List panel (see "2.9 Display List of Referencing Location").

Remarks 1. When the function name/variable name on this tab is double-clicked, the Editor panel appears and the caret moves to the line where the function/variable is defined.

2. The color of the highlighted target function name and target variable name depends on the [Highlight] item in the [General - Font and Color] category of the Option dialog box.

3. You can save the contents displayed on this tab to a text file (*.txt) by selecting [Save Output-Find References As...] from the [File] menu.

(a) Output format of list of locations referencing a function

The contents of the search results consist of the following parts:

Figure A-21. Output Format of List of Locations Referencing a Function

	Start of finding all references
A	Target: *Target function name* Definition: *File name* (*Number of lines*): *Line 1of the location* Reference(Execution Count: *Number*): *File name* (*Number of lines*): *Line 1of the location*: :
B	A list of the functions which are being called by function *Target function name*: *Calling function name* :
C	A list of the variables doing a reference (read / write) by function *Target function name*: *Reference variable name* :
	End of finding all references

A	The location at which the target function is defined and a list of locations referencing the target function		
	Target	Indicates the name of the target function.	
	Definition	Indicates the location at which the target function is defined. Note that if the information cannot be acquired from the cross reference file, then "None" is displayed.	
		File name (*Number of lines*)	Indicates the file name[Note] at which the location in question exists. The number in parentheses indicates the number of lines (line number) in the file.
		Line 1 of the location	Displays a 1-line excerpt from the file at the location. At this time, the target function name is highlighted.
	Reference	Lists the locations referencing the target function. If there is the Dynamic analysis information, then the number of times the target function is executed is included in parentheses ( ). Note that if the information cannot be acquired from the cross reference file, then "None" is displayed.	
		File name (*Number of lines*)	Indicates the file name[Note] at which the location in question exists. The number in parentheses indicates the number of lines (line number) in the file.
		Line 1 of the location	Displays a 1-line excerpt from the file at the location. At this time, the target function name is highlighted.
B	A list of functions called within the target function		
	Calling function name	Lists the names of functions called within the target function. If no functions are called, then "None" is displayed.	

C	A list of variables referenced (read/written) inside the target function	
	Reference variable name	Lists the names of variables referenced (read/written) inside the target function. If no variables are referenced, then "None" is displayed.

Note When the [File path] item is being displayed on the Function List panel (this item is not displayed by default), the absolute path of the file appears.

Figure A-22. Example of List of Locations Referencing a Function (without Dynamic Analysis Information)

```
Target: sub01↲
Definition: sub01.c(9): int sub01(int arg_a, int arg_b, int arg_c)↲
Reference: sub01.h(3): int sub01(int, int, int);↲
Reference: main.c(38): int sub01(int, int, int);↲
Reference: main.c(98): →result = sub01(local_a, local_b, local_c);↲
Reference: main.c(129): ————→————→result = sub01(global_a, global_b, global_c);
↲
↲
A list of the functions which are being called by function sub01:↲
sub01_sub01↲
↲
A list of the variables doing a reference (read / write) by function sub01:↲
global_a↲
```

Figure A-23. Example of List of Locations Referencing a Function (with Dynamic Analysis Information)

```
Target: sub01↲
Definition: sub01.c(9): int sub01(int arg_a, int arg_b, int arg_c)↲
Reference(Execution Count 0): sub01.h(3): int sub01(int, int, int);↲
Reference(Execution Count 0): main.c(38): int sub01(int, int, int);↲
Reference(Execution Count 0): main.c(98): ————→result = sub01(local_a, local_b, local_c);↲
Reference(Execution Count 0): main.c(129): ————→————→result = sub01(global_a, global_b, global_c);
↲
↲
A list of the functions which are being called by function sub01:↲
sub01_sub01↲
↲
A list of the variables doing a reference (read / write) by function sub01:↲
global_a↲
```

(b) Output format of list of locations referencing a variable

The output search results consist of the location where the target variable is defined, and a list of locations referencing the target variable.

Figure A-24. Output Format of List of Locations Referencing a Variable

```
Start of finding all references
Target: Target variable name
Definition: File name (Number of lines):    Line 1of the location
Reference (Read/Write Count:Number): File name (Number of lines):    Line 1of the location
      :
End of finding all references
```

Target	Indicates the name of the target variable.

Definition	Indicates the location at which the target variable is defined. Note that if the information cannot be acquired from the cross reference file, then "None" is displayed.	
	File name (Number of lines)	Indicates the file name[Note] at which the location in question exists. The number in parentheses indicates the number of lines (line number) in the file.
	Line 1 of the location	Displays a 1-line excerpt from the file at the location. At this time, the target variable name is highlighted.
Reference	Lists the locations referencing the target variable. If there is the Dynamic analysis information, then the number of times the target variable is executed is included in parentheses ( ). Note that if the information cannot be acquired from the cross reference file, then "None" is displayed.	
	File name (Number of lines)	Indicates the file name[Note] at which the location in question exists. The number in parentheses indicates the number of lines (line number) in the file.
	Line 1 of the location	Displays a 1-line excerpt from the file at the location. At this time, the target variable name is highlighted.

Note When the [File path] item is being displayed on the Variable List panel (this item is not displayed by default), the absolute path of the file appears.

Remarks 1. How lines with variables described in "extern declaration" are handled depending on the compiler currently used is as follows:

- **[CA78K0][CA78K0R]**
  A line with a variable described in "extern declaration" is handled as "Reference".
  Furthermore, if a line with a variable described in "extern declaration" and a line with the variable definition exist in the same file, then "None" is displayed in "Definition".
- **[CA850]**
  A line with a variable described in "extern declaration" is handled as "Definition".
- **[CX]**
  A line with a variable described in "extern declaration" is handled as "Reference".

2. **[CX]**
In the definition of variables, a line with an assignment statement (e.g. "int variable = 10") is handled as "Reference".

Figure A-25. Example of List of Locations Referencing a Variable (without Dynamic Analysis Information)

```
Target: global_a
Definition: main.h(3): extern int global_a;
Definition: main.c(10): int global_a = 10;
Refrence: main.c(95): →global_pointer = &global_a;
Refrence: main.c(112): →global_a = 0;
Refrence: main.c(125): →————→global_a++;
Refrence: main.c(129): →————→result = sub01(global_a, global_b, global_c);
Refrence: sub01.c(15): →result = tmp + global_a;
```

Figure A-26. Example of List of Locations Referencing a Variable (with Dynamic Analysis Information)

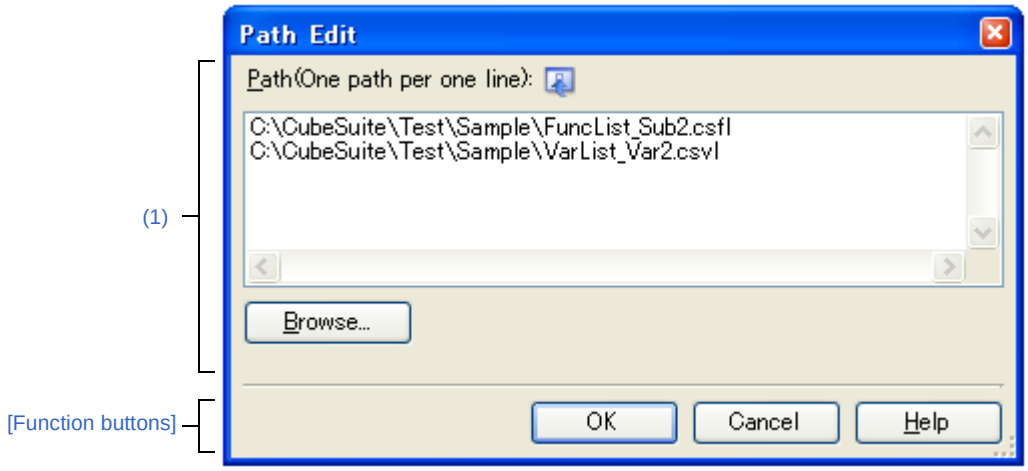
```
Target: global_a
Definition: main.h(3): extern int global_a;
Definition: main.c(10): int global_a = 10;
Refrence(Read/Write Count 0): main.c(95): ——→global_pointer = &global_a;
Refrence(Read/Write Count 0): main.c(112): ——→global_a = 0;
Refrence(Read/Write Count 0): main.c(125): ——→————→global_a++;
Refrence(Read/Write Count 0): main.c(129): ——→————→result = sub01(global_a, global_b, global_c);

Refrence(Read/Write Count 0): sub01.c(15): ——→result = tmp + global_a;
```

Path Edit dialog box

This dialog box is used to specify the file when importing an information file (Function list file (*.csfl)/Variable list file (*.csvl)).

See "2.10 Import or Export Information File" for details on the import function.

Figure A-27. Path Edit Dialog Box



The following items are explained here.

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

[How to open]

- On the [Settings] tab in the Property panel, select the [Import files] property in the [Import / Export] category, and then click the [...] button.

[Description of each area]

(1) Path edit area

(a) [Path(One path per one line)]

Specify each Function list file (*.csfl)/Variable list file (*.csvl) to import, one to a line, including the path (up to 259 characters per line, and up to 64 lines can be specified). If you specify a relative path, specify the project folder as the base.

Note that at this time, you can use the following macro names for embedded macros.

Macro Name	Function
%ProjectName%	Replaces itself with the project name.
%CubeSuitePath%	Replaces itself with the absolute path of the CubeSuite install folder.

(b) Button

Browse...	Opens a dialog box to specify files to import. The selected file name is added to [Path(One path per one line)].

[Function buttons]

Button	Function
OK	Sets the specified file(s) to the [Import files] property then closes the dialog box.
Cancel	Ignores the setting and closes this dialog box.
Help	Displays the online help of this dialog box.

Column Chooser dialog box

This dialog box is used to sort, show/hide the items (columns) displayed on the Function List panel/Variable List panel.

If the Customize Display Method operation has been performed on one of the panels, then this dialog can also be used to reset these customizations to the default settings.

Figure A-28. Column Chooser Dialog Box (For Function List Panel)

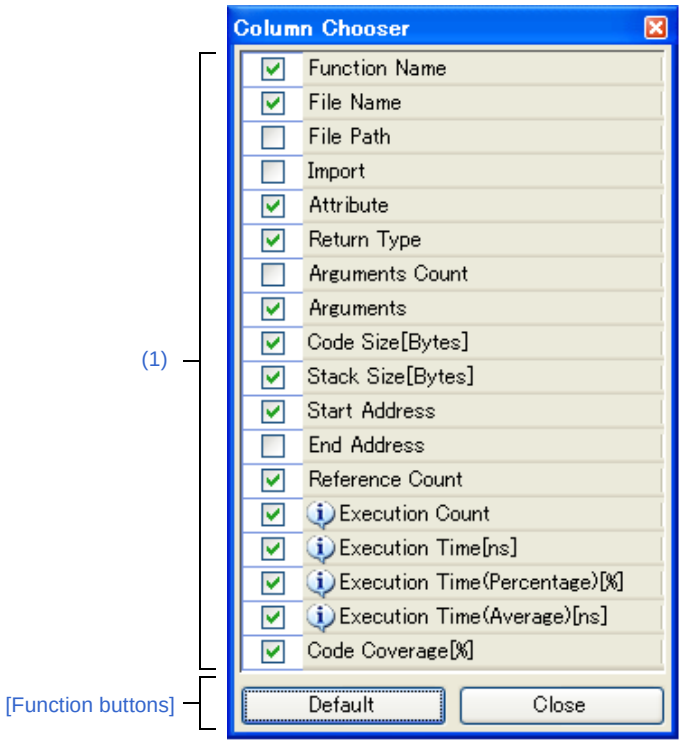
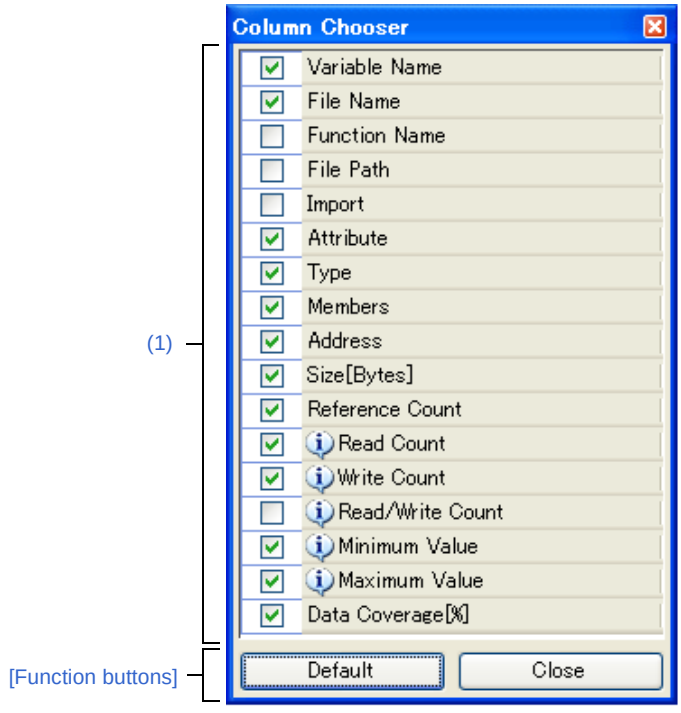


Figure A-29. Column Chooser Dialog Box (For Variable List Panel)



The following items are explained here.

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

[How to open]

- On the Function List panel, click the  button.
- On the Variable List panel, click the  button.

[Description of each area]

(1) Item list area

This area displays a list of all items (columns) that can be displayed in the Function List panel/Variable List panel (the items (columns) that can be displayed differ according to the microcontroller and the debug tool used).
The display order of the items in this list, and the state of checkboxes, are the same as the current sort order and visible/hidden status in the corresponding panel.
Specify the checkboxes of each item to show or hide that item on the panel.

	Displays this item on the panel.
	Does not display this item on the panel.
	Indicates that a message relating to information about this item has been output to the Output panel. Hover the mouse over it to display a pop-up with the last message to be output.

[Function buttons]

Button	Function
Default	Resets the display order and visible/hidden settings for each item in the Function List panel/Variable List panel to their default values.
Close	Closes this dialog box.

Remark The default display status for each item is as follows.
The order of [Item] in the table corresponds to the display order of items (columns) on each panel.
Note that all display locking, display filtering, and other customization will be cleared.
The available items are also limited depending on the microcontroller and debug tool used.

Table A-3. Default Display Status (Function List Panel)

Item	Status	
	While disconnecting from the debug tool	While connecting to the debug tool
Function Name	Display	Display
File Name	Display	Display
File Path	Non-display	Non-display
PE Information[Note] **[V850E2M]**	Display	Display
Import	Non-display	Non-display

Item	Status	
	While disconnecting from the debug tool	While connecting to the debug tool
Attribute	Display	Display
Return Type	Display	Display
Arguments Count	Non-display	Non-display
Arguments	Display	Display
Code Size[Bytes]	Display	Display
Stack Size[Bytes]	Display	Display
Start Address	Display	Display
End Address	Non-display	Non-display
Reference Count	Display	Display
Execution Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Execution Time[*unit*] **[IECUBE [78K0R]]** **[IECUBE [V850]]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Execution Time(Percentage)[%] **[IECUBE [78K0R]]** **[IECUBE [V850]]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Execution Time(Average)[*unit*] **[IECUBE [78K0R]]** **[IECUBE [V850]]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Code Coverage[%] **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Display

Note [V850E2M]

This item appears only when the selected microcontroller version supports multi-core.

Table A-4. Default Display Status (Variable List Panel)

Item	Status	
	While disconnecting from the debug tool	While connecting to the debug tool
Variable Name	Display	Display
File Name	Display	Display

Item	Status	
	While disconnecting from the debug tool	While connecting to the debug tool
Function Name	Non-display	Non-display
File Path	Non-display	Non-display
PE Information[Note] **[V850E2M]**	Non-display	Display
Import	Non-display	Non-display
Attribute	Display	Display
Type	Display	Display
Members	Display	Display
Address	Display	Display
Size[Bytes]	Display	Display
Reference Count	Display	Display
Read Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Write Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Read/Write Count **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Non-display
Minimum Value **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Maximum Value **[IECUBE]** **[IECUBE2]** **[Simulator]**	Non-display	Display
Data Coverage[%] **[IECUBE [78K0]]** **[IECUBE [78K0R]]** **[IECUBE2]** **[Simulator]**	Non-display	Display

Note [V850E2M]

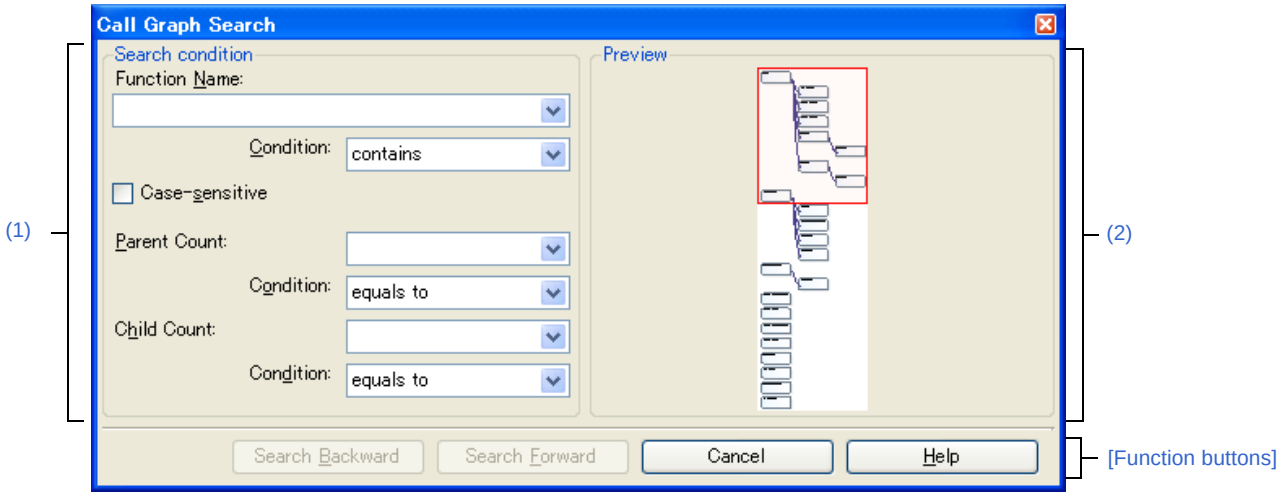
This item appears only when the selected microcontroller version supports multi-core.

Call Graph Search dialog box

This dialog box is used to search for a function existing in the call graph displayed in the Call Graph panel.

Caution Searches can be performed only for functions (function boxes) that appear in a call graph.

Figure A-30. Call Graph Search Dialog Box



The following items are explained here.

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

[How to open]

- On the toolbar of the Call Graph panel, click the button.
- Focus the Call Graph panel, and then select [Find...] from the [Edit] menu.

[Description of each area]

(1) [Search condition]

Configure the search conditions.

If the (b) [Parent Count] /(c) [Child Count] below are also specified as search conditions, then only functions meeting all conditions will be searched.

(a) [Function Name]

Specify a function name to search.

You can either type character strings directly into the text box, or select one from the input history via the drop-down list (up to 10 items).

The previous specified function name is displayed by default (if it does not exist, then this is left blank).

Remark You can also specify a function name with any one of the following methods.

- Drag and drop an arbitrary row of the Function List panel to this dialog box.
- Drag and drop an arbitrary character strings to this combo box.

<1> [Condition]

From the following drop-down list, select the condition for the character strings specified with [Function Name].

equals	Searches for the function name that exactly matches the specified string.
begins with	Searches for function names starting with the specified string.
ends with	Searches for function names ending with the specified string.
contains	Searches for function names containing the specified string (default).

<2> [Case-sensitive]

☑	Searches with the designated characters in case-sensitive.
☐	Searches with the designated characters in not case-sensitive (default).

(b) [Parent Count]

If required as a search parameter, you can specify the number of parent functions to search.
You can either type a value directly into the text box (settable range: 0 to 65535), or select one from the input history via the drop-down list (up to 10 items).
The previous specified value is displayed by default (if it does not exist, then this is left blank).

<1> [Condition]

From the following drop-down list, select the condition for the numeric value specified with [Parent Count].

is greater than	Searches for the names of functions with more (greater than) the specified number of parent functions.
is greater than or equals to	Searches for the names of functions with at least as many (greater than or equal to) the specified number of parent functions.
equals to	Searches for the names of functions with the same number of (equal to) the specified number of parent functions (default).
is less than or equals to	Searches for the names of functions with at least as less (greater than or equal to) the specified number of parent functions.
is less than	Searches for the names of functions with less (greater than) the specified number of parent functions.

(c) [Child Count]

If required as a search parameter, you can specify the number of child functions to search.
You can either type a value directly into the text box (settable range: 0 to 65535), or select one from the input history via the drop-down list (up to 10 items).
The previous specified value is displayed by default (if it does not exist, then this is left blank).

<1> [Condition]

From the following drop-down list, select the condition for the numeric value specified with [Child Count].

is greater than	Searches for the names of functions with more (greater than) the specified number of child functions.

is greater than or equals to	Searches for the names of functions with at least as many (greater than or equal to) the specified number of child functions.
equals to	Searches for the names of functions with the same number of (equal to) the specified number of child functions (default).
is less than or equals to	Searches for the names of functions with at least as less (greater than or equal to) the specified number of child functions.
is less than	Searches for the names of functions with less (greater than) the specified number of child functions.

(2) [Preview]

This area displays all part of the call graph.

If the area currently displayed in the Call Graph panel is a portion of the entire call graph, then that area is shown in a red frame.

[Function buttons]

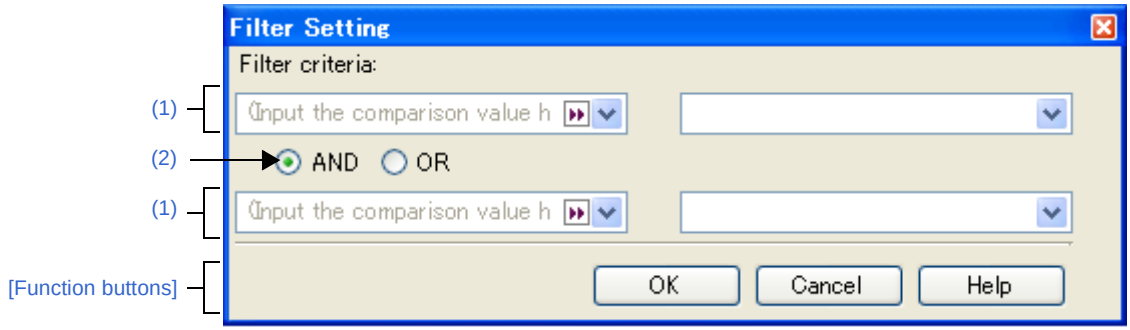
Button	Function
Search Backward	The search uses the specified conditions, starting from the function name at the bottom of the call graph, and proceeding upward. The corresponding function box is highlighted. If a function has been specified in the [Target function name] combo box on the Call Graph panel, then the search starts from the corresponding function, moving upward. Note that if an illegal value is specified, or the program is executing, then a message will appear, and the function search will not be performed. If focus moves to this dialog box from a panel other than the Call Graph panel or the Call Graph panel is hidden, then this button will be disabled.
Search Forward	The search uses the specified conditions, starting from the function name at the top of the call graph, and proceeding downward. The corresponding function box is highlighted. If a function has been specified in the [Target function name] combo box on the Call Graph panel, then the search starts from the corresponding function, moving downward. Note that if an illegal value is specified, or the program is executing, then a message will appear, and the function search will not be performed. If focus moves to this dialog box from a panel other than the Call Graph panel or the Call Graph panel is hidden, then this button will be disabled.
Cancel	Cancels the function search and closes this dialog box.
Help	Displays the help for this dialog box.

Filter Settings dialog box

This dialog box is used to set the filter conditions when filtering the display of analysis information on the Function List panel/Variable List panel.

Caution The filtering configured via this dialog box and the Filtering results linked to panel are mutually exclusive functions.
For this reason, the two filtering functions here cannot be enabled simultaneously (when one of the filters is active, setting the other filter will disable all filters set to date).
See "2.5.5 Filter the analysis information" for details on the display-filter.

Figure A-31. Filter Settings Dialog Box



The following items are explained here.

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

[How to open]

- On the Function List panel/Variable List panel, click the filter icon (/), and then select the [(Custom)].

[Description of each area]

Configure the filter conditions.

In the First condition setting area (top)/Second condition setting area (bottom), you can specify up to two conditions. Use the Logical operator buttons ([AND]/[OR]) to set the two conditions as a single filter condition.

(1) First condition setting area (top)/Second condition setting area (bottom)

(a) Comparison value (left combo box)

You can either type the comparison value of for the filter (number or string) directly via the keyboard (up to 2,048 characters), or select one from the input history via the drop-down list (maximum 10 items).
By default, the comparison value set in the current target item is displayed.

(b) Condition (right combo box)

Select the condition for the comparison value specified in (a), above, from the drop-down list.
By default, the condition set in the current target item is selected.

Item	Comparison Value	
	Numerical Value	Character String
no condition[Note]	Compared as numerical value	Compared as character string
equals		
does not equal		
is greater than		
is greater than or equal to		
is less than		
is less than or equal to		
begins with	Compared as character string	
does not begin with		
ends with		
does not end with		
contains		
does not contain		

Note If [no condition] is selected, then the comparison value will be ignored (not set as a condition).

Caution Use the top condition-specification area if you only wish to specify one filtering condition.

(2) Logical operator buttons

Select the logical relationship holding between the conditions specified in the First condition setting area (top)/Second condition setting area (bottom) via the following option button.

AND	Only information meeting both condition 1 and condition 2 is displayed. This is mutually exclusive to the [OR] button.
OR	Only information meeting either condition 1 or condition 2 is displayed. This is mutually exclusive to the [AND] button.

[Function buttons]

Button	Function
OK	Displays the analysis information in the Function List panel/Variable List panel under the specified filtering conditions. If the Filtering results linked to panel was performed, then all display-filters linked to the panel conducted prior to this are deleted.
Cancel	Ignores the setting and closes this dialog box.
Help	Displays the online help of this dialog box.

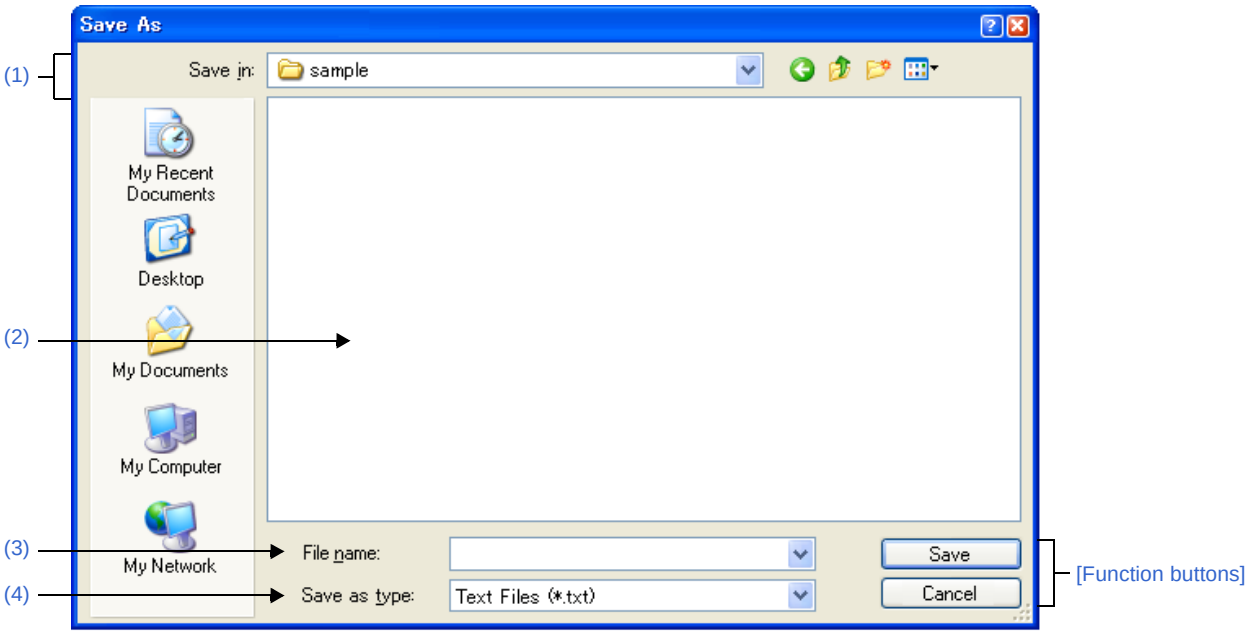
Save As dialog box

This dialog box is used to save the contents of the Function List panel/Variable List panel/Call Graph panel/Analysis Chart panel to a specified file.

Note, however, that what is saved is as follows:

- Function List panel/Variable List panel:
  Only the currently displayed items (column) and analysis information (rows)
- Call Graph panel:
  Depending on the settings of this dialog box
- Analysis Chart panel:
  Only the contents of the currently displayed tab

Figure A-32. Save As Dialog Box



The following items are explained here.

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

[How to open]

- Focus the Function List panel, and then select [Save Function List Data As...] from the [File] menu.
- Focus the Variable List panel, and then select [Save Variable List Data As...] from the [File] menu.
- Focus the Call Graph panel, and then select [Save Call Graph Data As...] from the [File] menu.
- Focus the Analysis Chart panel, and then select [Save Analysis Chart Data As...] from the [File] menu.

[Description of each area]

(1) [Save in]

Select the folder to save the panel contents in the file.

(2) List of files area

This area displays a list of files matching the conditions selected in [Save in] and [Save as type].

(3) [File name]

Specify the file name to save.

(4) [Save as type]

Select the type of file to save.

(a) For the Function List panel

The following file types are displayed:

Text Files (*.txt)	Text format
CSV(Comma-Separated Variables) (*.csv)	CSV format
Microsoft Office Excel Workbook (*.xls)	Microsoft Excel 97 - Excel 2003, and 5.0/95 book format
CubeSuite Function List file (*.csfl)	File format to import the function information (See "2.10 Import or Export Information File".)

(b) For the Variable List panel

The following file types are displayed:

Text Files (*.txt)	Text format
CSV(Comma-Separated Variables) (*.csv)	CSV format
Microsoft Office Excel Workbook (*.xls)	Microsoft Excel 97 - Excel 2003, and 5.0/95 book format
CubeSuite Variable List file (*.csvl)	File format to import the variable information (See "2.10 Import or Export Information File".)

(c) For the Call Graph panel

The following file types are displayed:

Bitmap(Only the visible part) (*.bmp)	Bitmap format (32-bit) (Graphic file format)
JPEG(Only the visible part) (*.jpg)	JPEG format (Graphic file format)
PNG(Only the visible part) (*.png)	PNG format (Graphic file format)
Bitmap (*.bmp)	Bitmap format (32-bit) (Graphic file format)
JPEG (*.jpg)	JPEG format (Graphic file format)
PNG (*.png)	PNG format (Graphic file format)
EMF (*.emf)	EMF format (Graphic file format)

Caution All part of the call graph may not successfully be saved as a graphic file format if the project is too big.

Remarks 1. When "(Only the visible part)" is selected, only the part currently being displayed in the panel will be saved.

2. If the zoom function has been applied, then the image will be saved at the current zoom ratio (except for EMF format).

(d) For the Analysis Chart panel

The following file types are displayed:

Text Files (*.txt)	Text format
CSV(Comma-Separated Variables) (*.csv)	CSV format
Microsoft Office Excel Workbook (*.xls)	Microsoft Excel 97 - Excel 2003, and 5.0/95 book format
Bitmap (*.bmp)	Bitmap format (32-bit) (Graphic file format)
JPEG (*.jpg)	JPEG format (Graphic file format)
PNG (*.png)	PNG format (Graphic file format)

Remark Items to be saved in other than the graphic file format are as follows:

- [Variable Value Changing Chart] tab

When the graph has been acquired via the Trace data analysis					
Item	Time	Value(Variable name)	Value(Variable name)	...	Location
Note	-	Outputs only the variable whose value has been changed (if the value designates an unknown, this field is left blank).			If the information does not exist, this field is left blank

When the graph has been acquired via the Real-time sampling analysis					
Item	Time	Value(Variable name)	Value(Variable name)	Value(Variable name)	...
Note	-	Outputs always the value of the variable (if the value designates an unknown, this field is left blank).			

- [Execution Time(Percentage) Chart] tab

Item	Function Name	Percentage[%]	Time

Remark The data is saved with entries separated by commas (,). If the data contains commas, each entry is surrounded by double quotes (" ") in order to avoid illegal formatting.

[Function buttons]

Button	Function
Save	Saves the file with the specified name.
Cancel	Closes this dialog box.

APPENDIX B INDEX

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		Page	Summary
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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
7F, No. 363 Fu Shing North Road Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

Colophon 1.0

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Renesas Electronics Corporation

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