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Compiler Package

Call Walker

This document explains usage and notes of the "Call Walker". The Call Walker is a stack information analysis tool bundled to Renesas Compiler Package (for SuperH, H8, M16C, R8C, and RX families).

Contents

Call Walker reads the stack information files (*.sni) that are output by the linkage editor or the profile information files (*.pro) that are output by the simulator debugger (for the SuperH, H8, or RX family only). Call Walker also displays the sizes of the stacks that are used statically.

Although the sizes of the stacks used by assembly language programs cannot be output to stack information files, you can add the information by using the editing feature and obtain the sizes of the stacks used in the entire system.

Once you edit information about the sizes of the used stacks, you can save the modified information in a call information file (*.cal) or read the modified information from the file.

You can also merge multiple call information files.

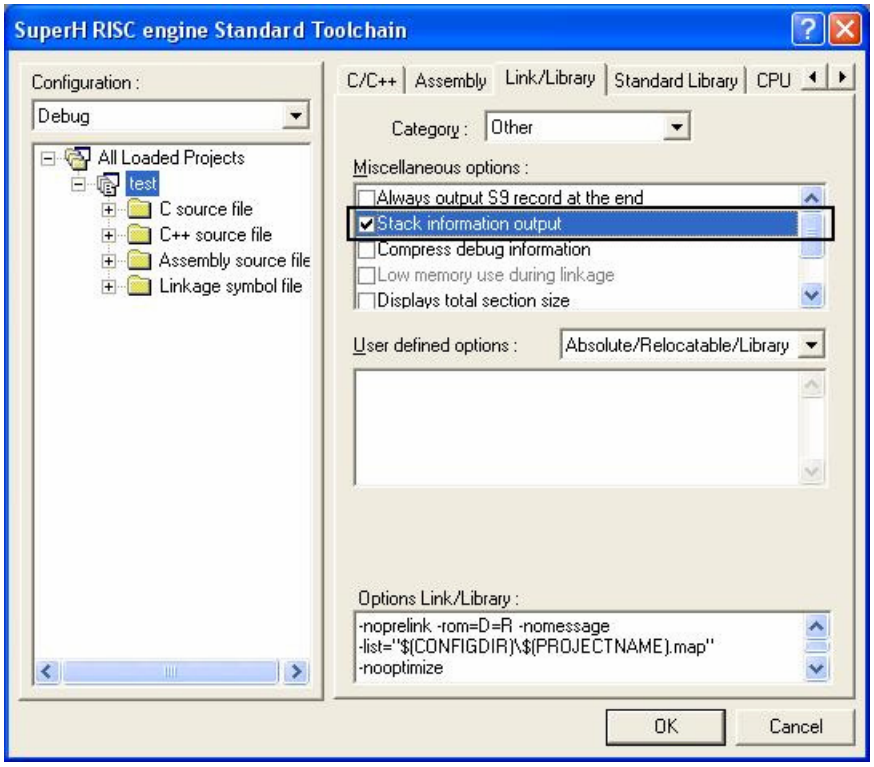
1. Creating a Stack Information File

1.1 When the SuperH, H8, or RX Family Compiler is in Use

Follow the procedure below to create a stack information file or a profile information file.

- How to create a stack information file (*.sni)

To create a stack information file, select the following option in the **Link/Library** page.



In this dialog box: Choose the **Link/Library** tab.
Then select **Other** in the **Category** list and select
Stack information output in the **Miscellaneous options** list.
Command line: *STACk*

- How to create a profile information file (*.pro)

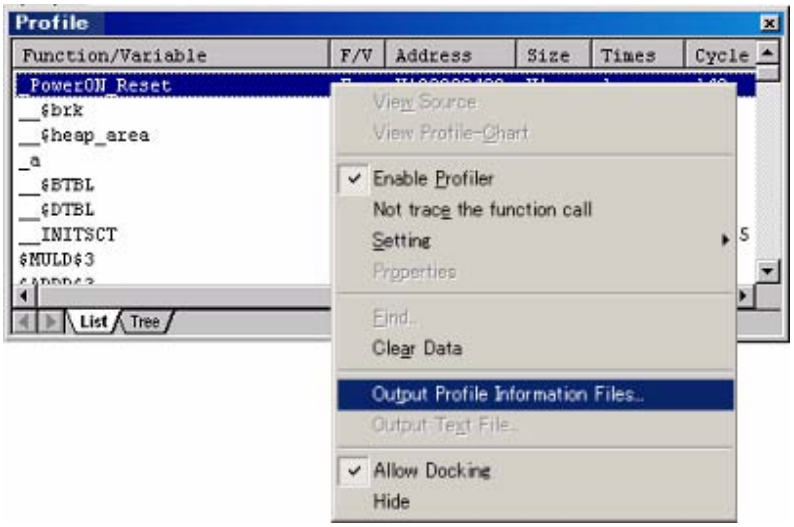
Use the profile feature to execute a desired user program.

When you complete executing the user program, right-click on the Profile window to save the profile information and create a profile information file (*.pro).

For details about how to create profile information, see section, Viewing the Profile Information, in the Simulator/Debugger User's Manual.

Profile window:

[View] -> [Performance] -> [Profile]



1.2 When the M16C or R8C Family Compiler is in Use

If you build and link by High-performance Embedded Workshop, the stack information file (*.sni) is always created without any setting. However, when compiling, you should specify **-finfo** option. If **-finfo** option is not specified, the stack information file cannot have necessary information.

If you build and link without High-performance Embedded Workshop, you should use **gensni** which is the tool generating a stack information file. You can execute **gensni** by command prompt in Windows. **gensni** inputs the absolute module file (*.x30), and outputs the stack information file.

Example: Creating stack information file (test.sni) from absolute module file (test.x30)

```
>gensni test.x30
```

Notes: 1. When the M16C or R8C family compiler is in use, you can not use a profile information file.
2. The version of each products that can use Call Walker is as follows.
- C Compiler Package for M16C Series and R8C Family [M3T-NC30WA]: V.5.42 Release 00 or later
- C Compiler Package for M32C Series [M3T-NC308WA]: V.5.41 Release 00 or later
- C Compiler Package for R32C Series: Any version can be used.

2. Starting Call Walker

You can start Call Walker in two ways.

- From the **[Start]** menu

Choose **Programs -> [Renesas High-performance Embedded Workshop] -> [Call Walker]**.

- From High-performance Embedded Workshop

Choose **[Tools] -> [Renesas Call Walker]**.

Note: When the M16C or R8C family compiler is in use, the path to Call Walker in the start menu is as follows.
Programs -> [Renesas] -> Package name -> [Call Walker]

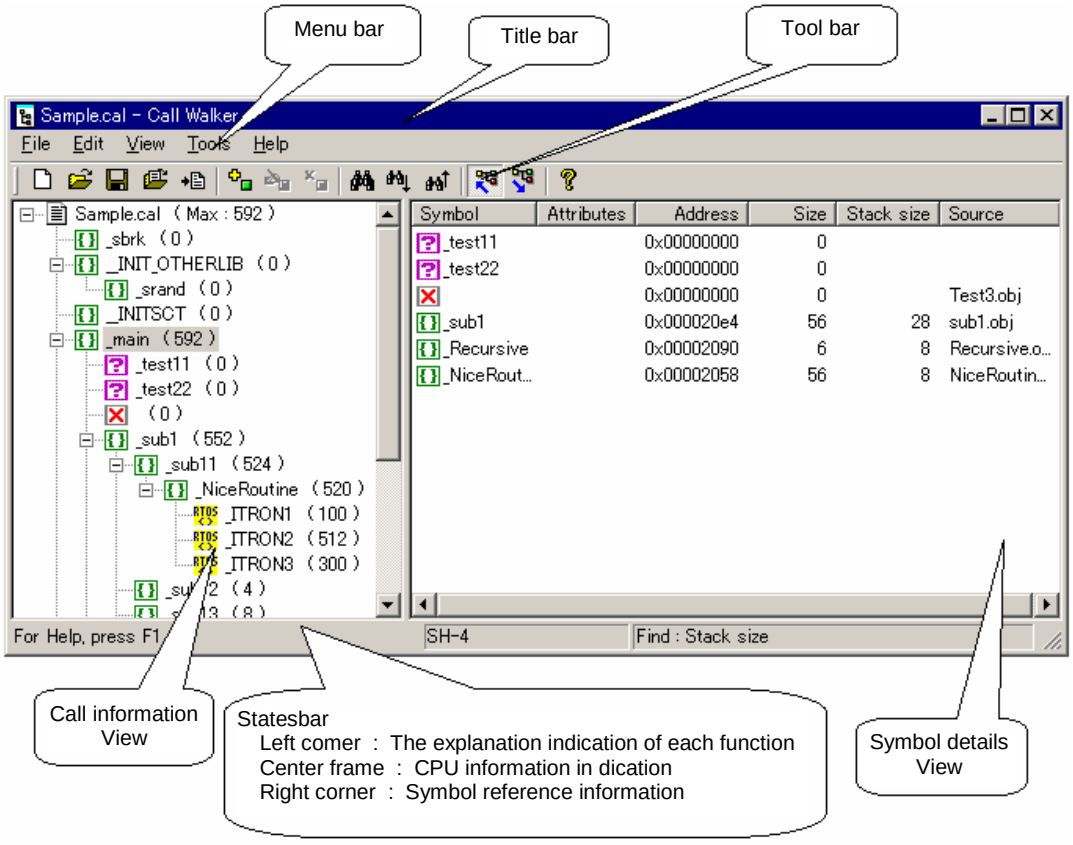
3. Call Walker Window and Opening a File

When you start Call Walker, you open a desired stack information file (*.sni) or profile information file (*.pro) by choosing **[File] -> [Import Stack File...]**.

You choose **[File] -> [Open...]** to open an existing edited file (*.cal).

When you open a file, the following window appears.

Note: When the SuperH or H8 family compiler is in use, the stack size for assembler functions other than those in the standard library is shown as 0. See section 4, Editing Stack Information and set the appropriate stack size.



• Call information view

This view shows the link hierarchy of the symbols.
The number on the right of each symbol name indicates the required stack size.

(1) Details about the symbols

The icon on the left of each symbol name indicates the type of the symbol.
The following types are available:

File being edited

Assembler

C/C++ function

Direct or indirect recursive functions

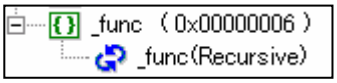
(a) Direct recursive function

This icon indicates that the indicated function directly calls itself.

[Example]

```
void func(int x)
{
    x++;
    if(x != OFF)
        func(x);

    if(x == MAX)
        return;
}
```

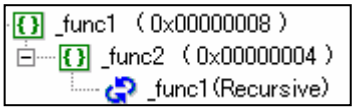


(b) Indirect recursive function

This icon also indicates that the indicated function indirectly calls itself.

[Example]

```
void func1(int a)
{
    func2(10);
}
void func2(int b)
{
    func1(9);
}
```



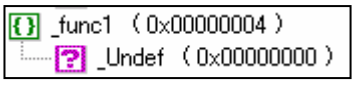
RTOS function (symbol for an RTOS such as ITRON)

Unknown reference source function

In the following example, the func1() function calls the Undef() function. However, if the Undef() function really does not exist, this icon is displayed for the Undef() function. Calling a non-existing function results in a linkage error. However, by using the change_ message link option, you can change error messages to warning messages.
You can create load modules even if warning messages exist. Therefore, you can create stack information files as well.

[Example]

```
void func1(void)
{
    Undef();
}
```

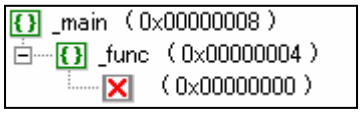


Function with unresolved reference address

This icon is displayed when the indicated function is called from a table as shown below.

[Example]

```
static int (*key[3])()=
                {nop, stop, play};
void func(int x)
{
    (*key[a])();
}
```

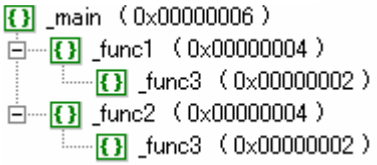


Abbreviation icon

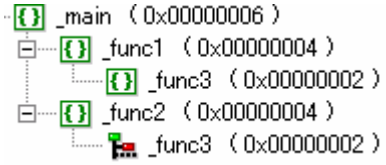
This tool displays all the link levels. If the user application is large, the number of link levels to be displayed is enormous.
Therefore, only the first symbols are displayed and other same symbols are abbreviated using the abbreviation icon.
To show all the symbols, choose **[View] -> [Show All Symbols]**.
To show part of the symbols, choose **[View] -> [Show Simple Symbols]**.

[Example]

Show All Symbols



Show Simple Symbols



RTOS handler

RTOS task function

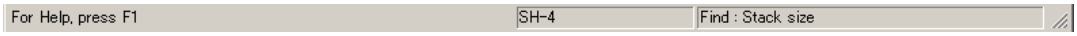
Variadic function

• Detailed symbol view

Symbol	Attri...	Address	Size	Stack size	Source
_INT_TXI1_...	I	0x000004...	0x00000002	0x00000004	intprg.obj
_abort		0x000008...	0x00000002	0x00000004	CallWalker2....
_sbrk		0x000008...	0x0000002c	0x00000008	sbrk.obj
_sub		0x000008...	0x00000002	0x00000004	CallWalker2....
_nop		0x000008...	0x00000002	0x00000004	CallWalker2....
PowerON...		0x000004...	0x00000016	0x00000004	resetprg.obj
_play		0x000008...	0x00000002	0x00000004	CallWalker2....
_stop		0x000008...	0x00000002	0x00000004	CallWalker2....
_INT_TGI1...	I	0x000004...	0x00000002	0x00000004	intprg.obj
_INT_TGI0...	I	0x000004...	0x00000002	0x00000004	intprg.obj
_INT_TGI0...	I	0x000004...	0x00000002	0x00000004	intprg.obj

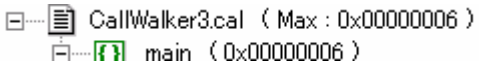
This view shows the address, attributes, stack size, and other details about each symbol.
Click a symbol and then right-click to execute editing commands.

• Status bar



The status bar shows the CPU type and other information about the stack information file (at the time of creation) that is currently open.

• Maximum stack size



"Max" indicates the maximum size of the statically-used stack in the currently open stack information file.

• Standard library version selection (for the SuperH or H8 family compiler)

Select the standard library version that is used when you create the currently open stack information file.

The stack size used by the assembler functions in the standard library is determined by the version of the standard library.

Note: You do not need to select any version when the M16C, R8C, or RX family compiler is in use. Any selection doesn't influence.

4. Editing Stack Information

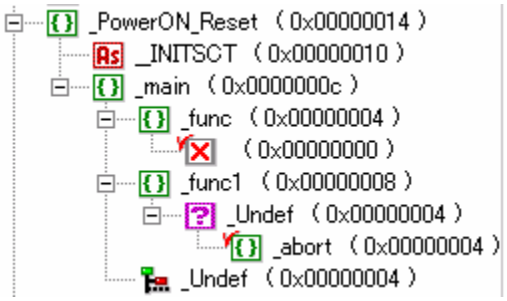
While a file is open, you can select a desired symbol name from the detailed symbol view on the right to add, change, or delete the symbol using the **Add...**, **Modify...**, or **Delete...** command in the **Edit** menu.

You can also perform the same operations by right-clicking in the detailed symbol view.

Although this tool calculates the maximum size of the statically-used stack, the user needs to edit the information file to determine the maximum size of the dynamically-used stack due to multiple interrupts and other reasons.

You can change the positions of symbols by dragging and dropping the desired symbol in the call information view on the left.

When you move or edit a symbol, a check mark appears next to the corresponding symbol in the call information view in the left.

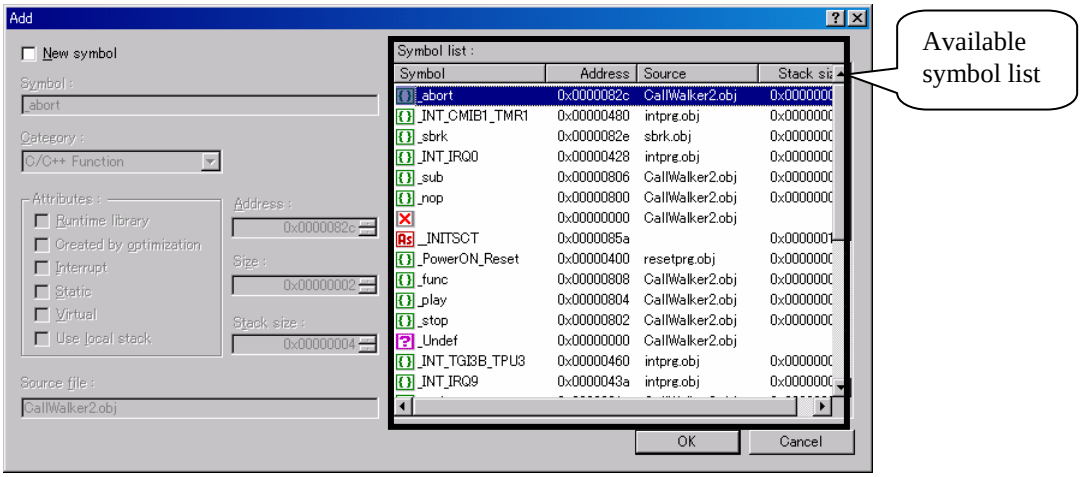


The following sections describe the available commands.

• **Add...** command

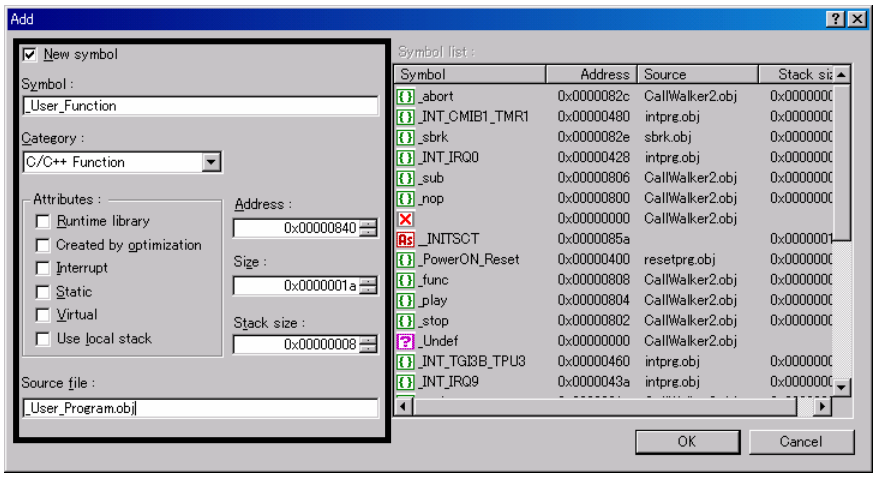
(1) Adding an existing symbol

When you click the **Add...** command, the following dialog box appears. The list on the right shows the symbols in the current file. To add an existing symbol, select a desired symbol from the list and click the **OK** button.



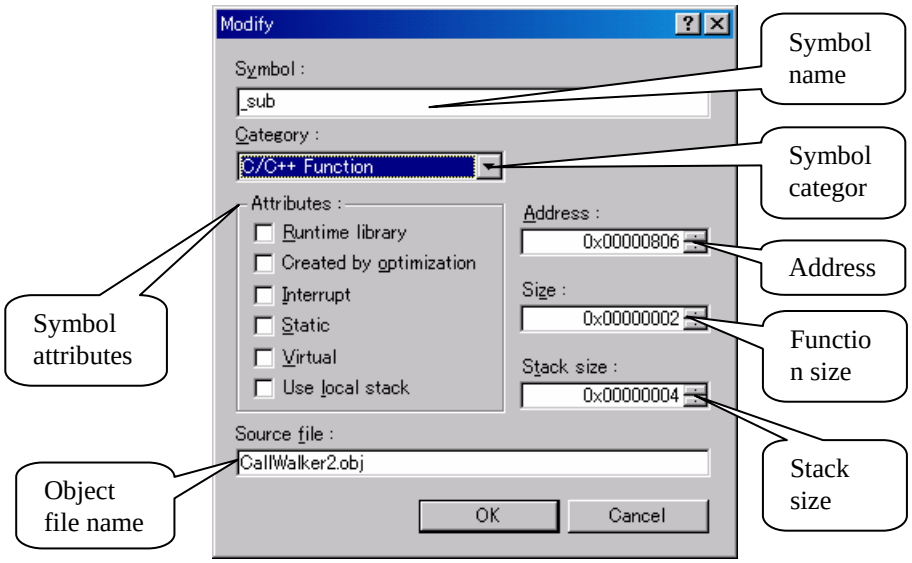
(2) Adding a new symbol

When you select the **New symbol** check box on the left, you can create a new symbol.
At the same time, you can define the symbol name, symbol category, attributes, address, stack size, and other details.



• **Modify...** command

Select the symbol whose information you want to change and click the **Modify...** command. The following dialog box appears. You can modify several information items.



• **Delete...** command

To delete the symbols that are unnecessary for determining the stack size, select such a symbol (in the left or right view) and click the **Delete...** command.

5. Stack Area Size of Assembly Program

The content of this chapter is for SuperH, H8, and RX family compilers. This content cannot be applied for the M16C or R8C family compiler.

Unlike by C/C++ program, the stack area size used by assembly program cannot be calculated automatically in assembling. Therefore the stack area size used by assembly functions should be edited by using Call Walker.
But the stack area size is specified in the assembly function by using **.STACK** directive. Call Walker displays the value specified by **.STACK** directive.

• Description of .STACK directive

Defines the stack amount for a specified symbol referenced by using Call Walker.

The stack value for a symbol can be defined only one time; the second and later specifications for the same symbol are ignored. A multiple of 2 in the range from H'00000000 to H'FFFFFFFE can be specified for the stack value, and any other value is invalid.

The stack value must be specified as follows:

- A constant value must be specified.
- Forward reference symbol, external reference symbol and relative address symbol must not be used.

• Specification Method of .STACK assembler directive

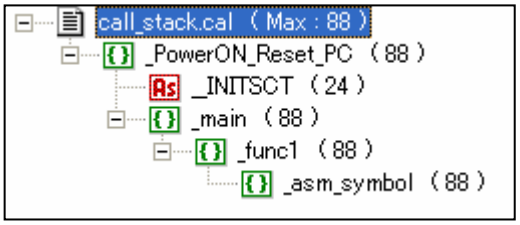
```
.STACK <symbol> = <stack value>
```

• Example of assembly program

```
      .EXPORT     _asm_symbol
      .SECTION    P,CODE,ALIGN=4
_asm_symbol:
      .STACK      _asm_symbol=88
        :
      RTS
      NOP
      .END
```

(Stack Size of the _asm_symbol function is 88

Displayed Example by Call Walker
As the following example, the stack area size used by _asm_symbol function is displayed **88** in Call Walker.



• Notes

(1) **.STACK** assembler directive can only make Call Walker display stack size, and does NOT affect the behavior of program.

(2) This assembler directive is supported by SuperH RISC engine Assembler Ver.7.00, H8S, H8/300 Series Assembler Ver.6.01, RX Family Assembler V.1.00 Release 00, and later versions.

6. Merging Stack Information

You can merge a stack information file that is saved or being edited with another stack information file.

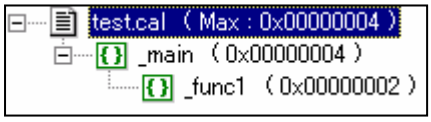
By doing so, the edited stack information is not overwritten by the post-build stack information.

• Merge example

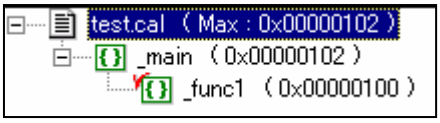
(1) Contents of test.c

```
void main(void)
{
    func1();
}
```

(2) Open a stack information file from Call Walker.



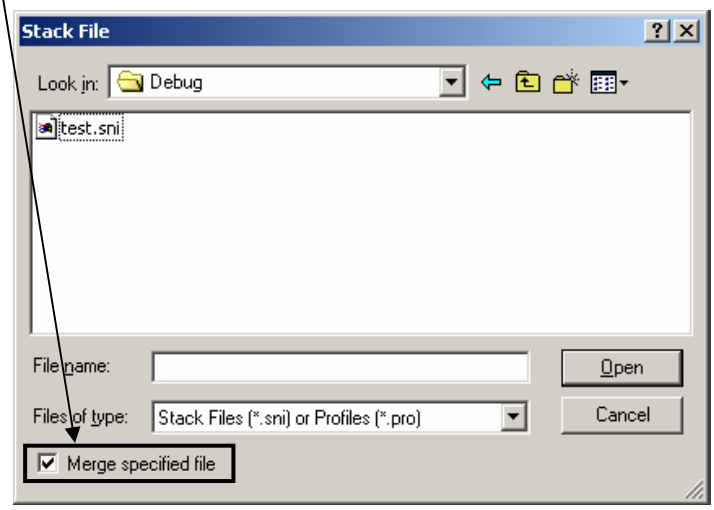
(3) Change the contents of the file (change the stack size of func1 to 100).



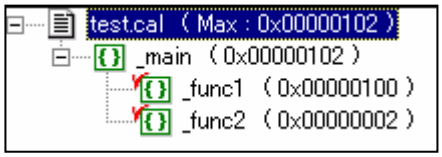
(4) Change the contents of test.c and perform build (**add a call for func2**).

```
void main(void)
{
    func1();
    func2();
}
```

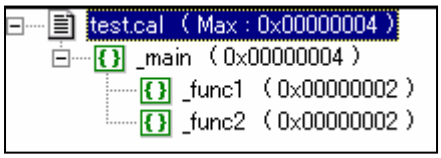
(5) Open test.sni while test.cal is open in Call Walker.
Select here and choose the **Open** button.



(6) The information of func2 is added while keeping the stack size of func1 changed in step (3). This is merging of stack information.



If you do not select the **Merge specified file** check box in step (5), the stack size of func1 changed in step (3) returns to the previous value.

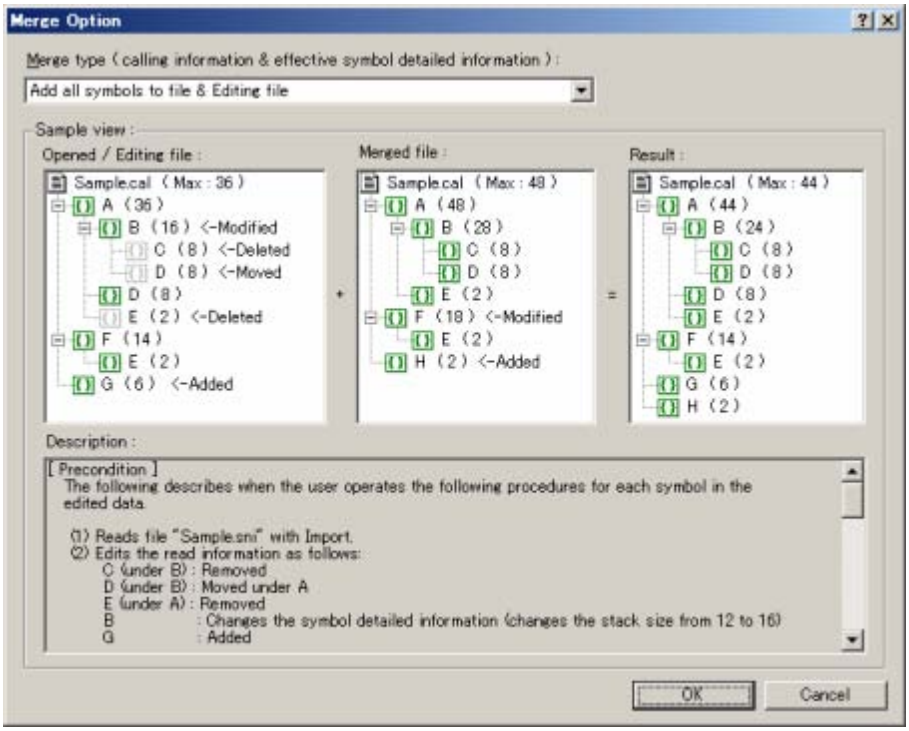


• Detailed merge options

You can change the method of merging. Five methods are available.
For details about merge methods, read **Description** in the following dialog box.

To select this feature:

[Tools] -> [Merge Option...]



• Note

The merge feature is available in Call Walker version 1.3 or later.

7. Other Features

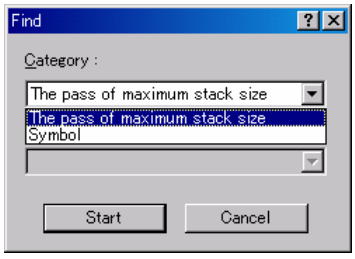
- Output of a list

Stack information can be output to a text file.

To select this feature:
[Edit] -> [Output List...]

- Search feature

You can find the following two items from the call information view by specifying the desired target in the following dialog box.



(1) Pass with the maximum stack size
(2) Symbol name

To select this feature:
[Edit] -> [Find...]
[Edit] -> [Find Next...] (find the next item)
[Edit] -> [Find Previous...] (find the previous item)

- Setting the display format for the call information view

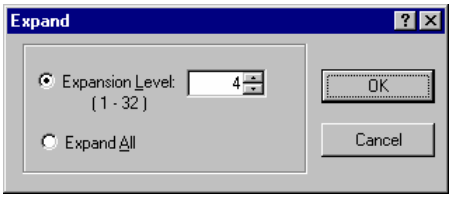
You can use the following two commands to select the format for displaying stack sizes:

(1) Show Required Stack
The largest stack size is shown at the top and the smallest stack size is shown at the bottom.
(2) Show Used Stack
The smallest stack size is shown at the top and the largest stack size is shown at the bottom.

To select this feature:
[View] -> [Show Required Stack] or **[Show Used Stack]**

- Specifying the expansion level of symbols in the call information view

You can select either of the following two options to determine the expansion level for the child symbols of the selected symbol.



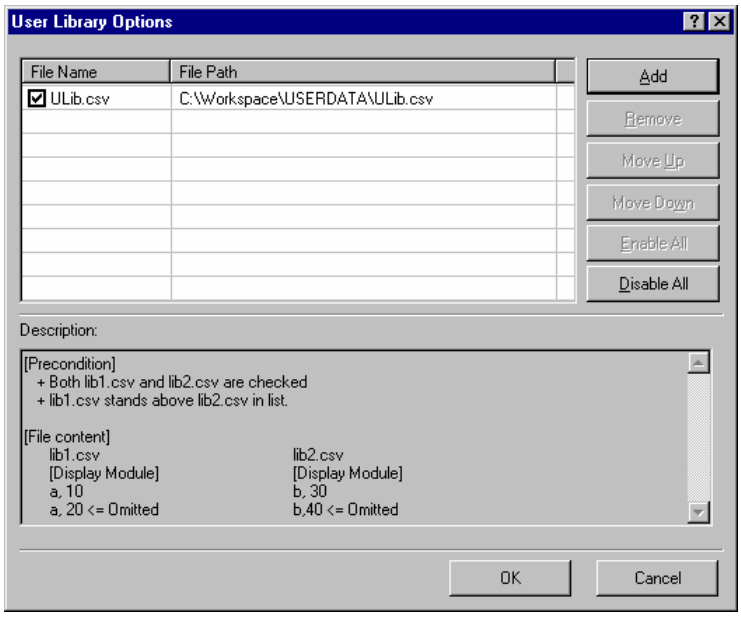
(1) Expansion Level
The child symbols will be expanded up to the specified level.
(2) Expand All
All child symbols of the selected symbol will be expanded.

To select this feature:
[View] -> [Expand…]

Note: Specifying the expansion level of symbols in the call information view is available with Call Walker Ver.2.00 or later.

- Specifying the amount of stack usage by the user library

This feature replaces the current stack sizes of symbols with those in the specified stack-information file being loaded and updates the display. The following dialog box allows you to specify a user-library stack-information file and the amount of stack usage.



To select this feature:
[Tool] -> [User Library Options…]

Note: Specifying the amount of stack usage by the user library is available with Call Walker Ver.2.00 or later.

Website and Support

Renesas Technology Website

http://www.renesas.com/

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Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Jan. 23, 09	-	First edition issued
2.00	Oct. 01, 09	1, 2, 6, 7, 11, 15	RX family added
			New features of Call Walker Ver.2.00 added

Notes regarding these materials

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