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M16C/5LD and 56D Groups

How to Determine Reset Source

1. Abstract

This document describes an application example for discriminating between a cold start and warm start using the RAM. When determining a warm start, discriminate the reset source using the Reset Source Determine Register.

2. Introduction

The application example described in this document applies to the following microcomputers (MCUs):

• MCUs: M16C/5LD Group
M16C/56D Group

This application note can be used with other M16C Family MCUs which have the same special function registers (SFRs) as the above groups. Check the manual for any modifications to functions. Careful evaluation is recommended before using the program described in this application note.

3. Resets

Table 3.1 lists the Reset Types, Figure 3.1 shows the Reset Source Determine Register, and Table 3.2 shows the Bit Values in the RSTFR Register after Reset.

Table 3.1 Reset Types

Reset Name	Source
Hardware reset	A low-level signal is applied to the $\overline{\text{RESET}}$ pin.
Power-on reset	The rise in voltage on VCC
Voltage monitor 0 reset	The drop in voltage on VCC (reference voltage: Vdet0)
Voltage monitor 2 reset	The drop in voltage on VCC (reference voltage: Vdet2)
Oscillation stop detection reset	A stop in the main clock oscillator is detected.
Watchdog timer reset	The watchdog timer underflows.
Software reset	Setting the PM03 bit in the PM0 register to 1.

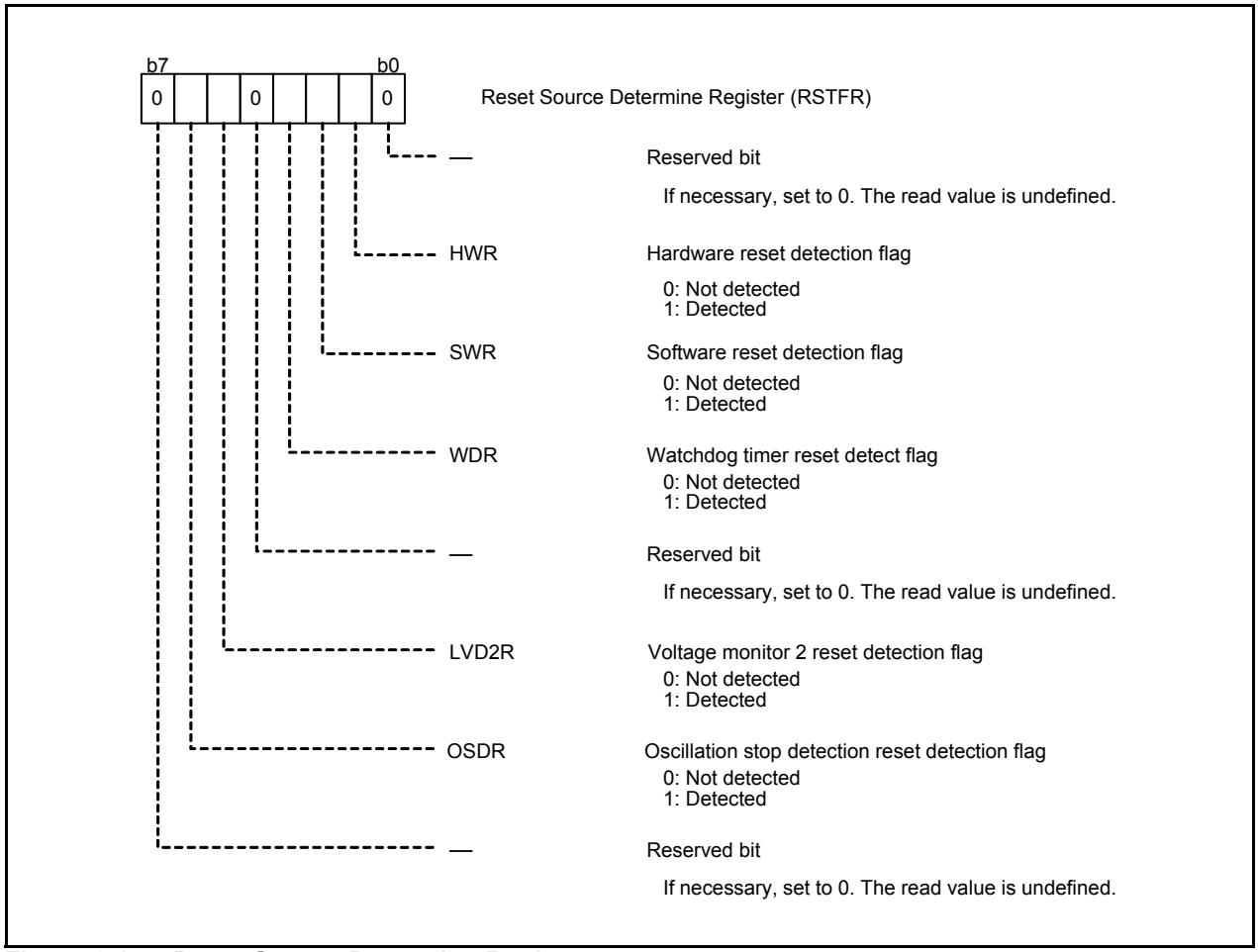


Figure 3.1 Reset Source Determine Register

Table 3.2 Bit Values in the RSTFR Register after Reset

Reset	RSTFR Register Bits				
	OSDR	LVD2R	WDR	SWR	HWR
Hardware reset	Not changed	0	0	0	1
Power-on reset	0	0	0	0	0
Voltage monitor 0 reset	0	0	0	0	0
Voltage monitor 2 reset	0	1	0	0	0
Oscillation stop detection reset	1	0	0	0	0
Watchdog timer reset	0	0	1	0	0
Software reset	0	0	0	1	0

4. Application Example

After reset, read the 256-byte cold start/warm start decision data (hereafter referred to as decision data) assigned to the RAM area. If the read decision data is undefined, it denotes the cold start (power source is turned ON) condition. If the decision data is written, it denotes the warm start condition.

Set the test_bss section and assign variables to be used. In the test_bss section, RAM is cleared only when in the cold start condition.
In this sample program, the test_bss section is assigned to the 000400h address.

Figure 4.1 shows the Application Example of Section Assignment.

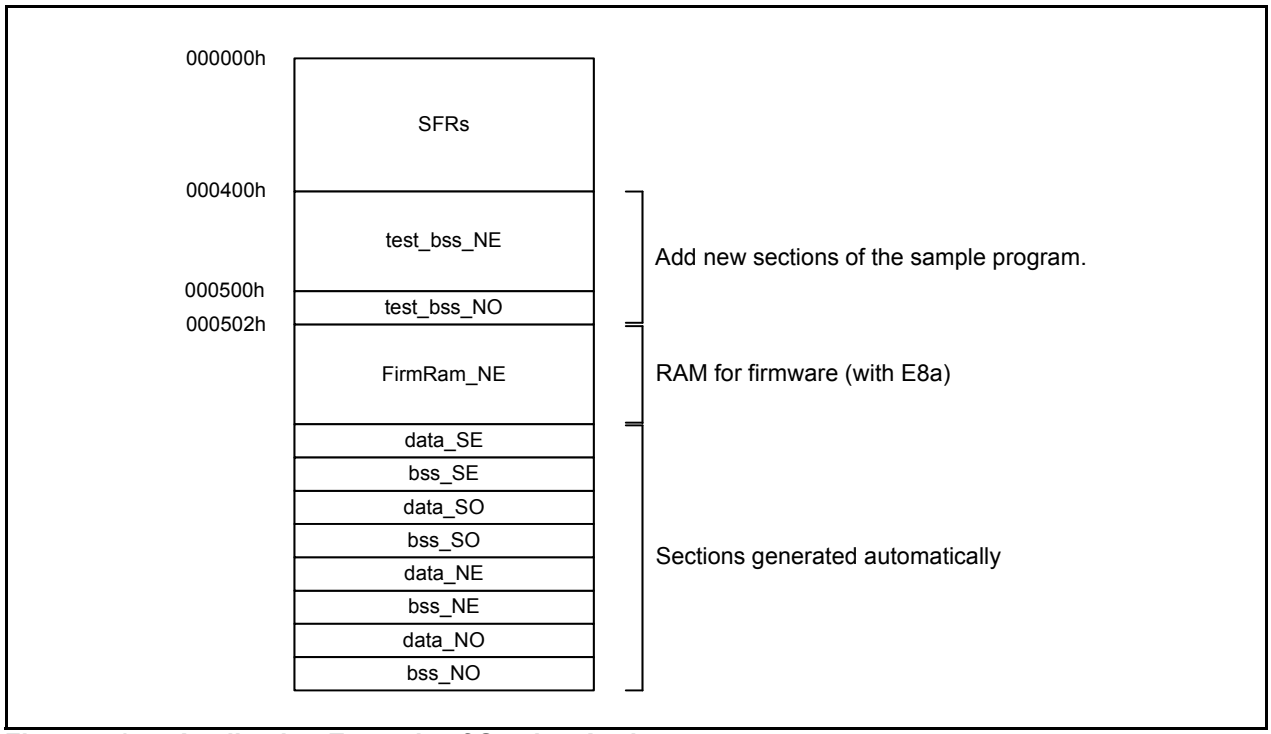
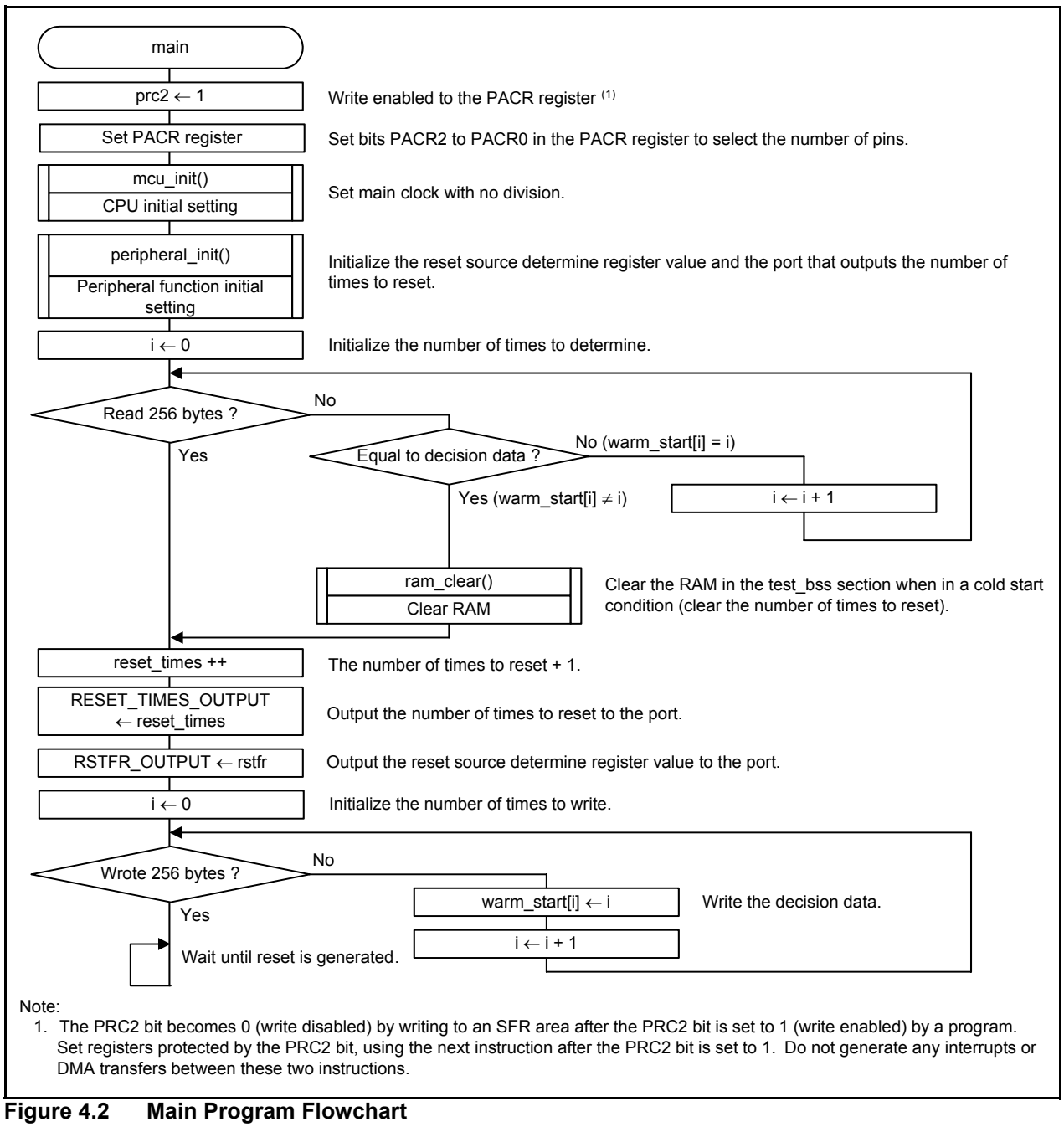


Figure 4.1 Application Example of Section Assignment

4.1 Application Example Operation

Read the decision data and clear the RAM in the test_bss section when in the cold start condition. Then, the number of times to reset and the value in the RSTFR register are output to the port. Figure 4.2 shows the Main Program Flowchart.



Note:
1. The PRC2 bit becomes 0 (write disabled) by writing to an SFR area after the PRC2 bit is set to 1 (write enabled) by a program. Set registers protected by the PRC2 bit, using the next instruction after the PRC2 bit is set to 1. Do not generate any interrupts or DMA transfers between these two instructions.

Figure 4.2 Main Program Flowchart

4.2 Section Setting

When declaring variables without assigning a value to them, a compiler usually assigns them to the bss_NO and bss_NE sections, and clears the sections to 0.
In this sample program, assign the variables for use to the test_bss section made by user.
This section describes the program section setting. Refer to the C Compiler User's Manual for details of the section.

As shown in Figure 4.3, the Section Name is comprised of the section base name followed by an attribute.

Section base name_attribute

Figure 4.3 Section Name

Table 4.1 Section Base Name

Section Base Name	Contents
data	Store data with initial values.
bss	Store data without initial values.
rom	Store data specified by character strings, #pragma ROM and const modifiers.

Table 4.2 Attributes

Attribute	Meaning		Corresponding Section Base Name
I	Section to hold the initial value in data		data
N/F/S	N	near attribute	data, bss, rom
	F	far attribute	data, bss
	S	SBDATA attribute	
E/O	E	Even-sized data	data, bss, rom
	O	Odd-sized data	

RAM is cleared using the start-up program as follows:

- Initialize the data near area.

  bss_NE, bss_NO, bss_SE, bss_SO sections are cleared to 0.
  Also, the initial values in the ROM areas (data_NEI, data_NOI, data_SEI, data_SOI) are transferred to RAM (data_NE, data_NO, data_SE, data_SO).

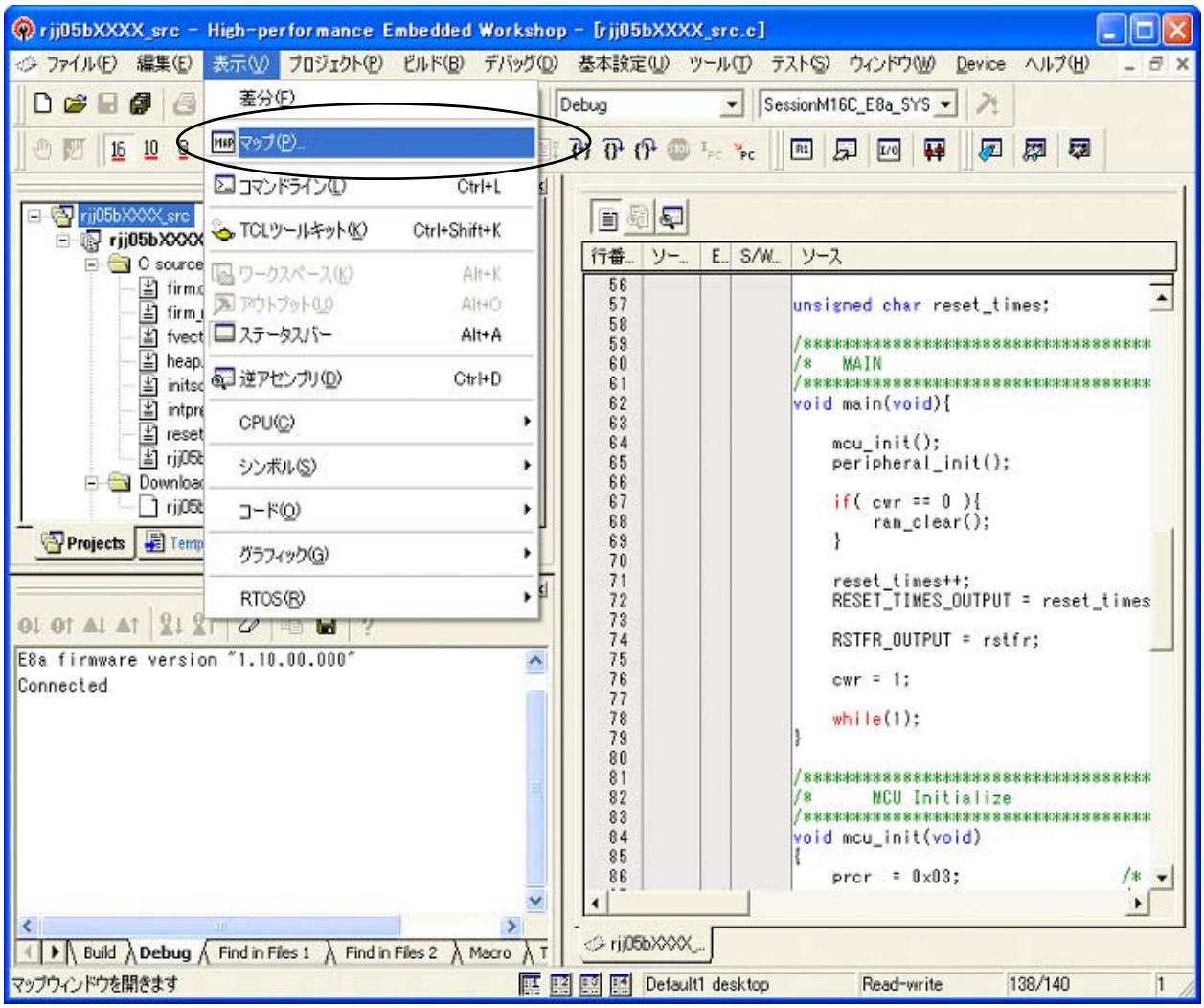
- Initialize the data far area.

  bss_FE and bss_FO sections are cleared to 0.
  Also, the initial values in the ROM areas (data_FEI, data_FOI) are transferred to RAM (data_FE, data_FO).

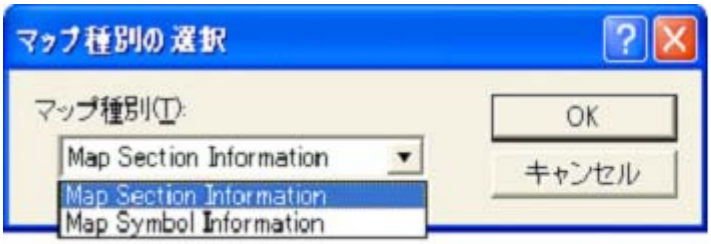
4.3 Section Setting in HEW

This section describes the method for setting sections in HEW. In the section, “C source startup Application” must be selected when creating a work space.
The test_bss section is already set in this sample program.

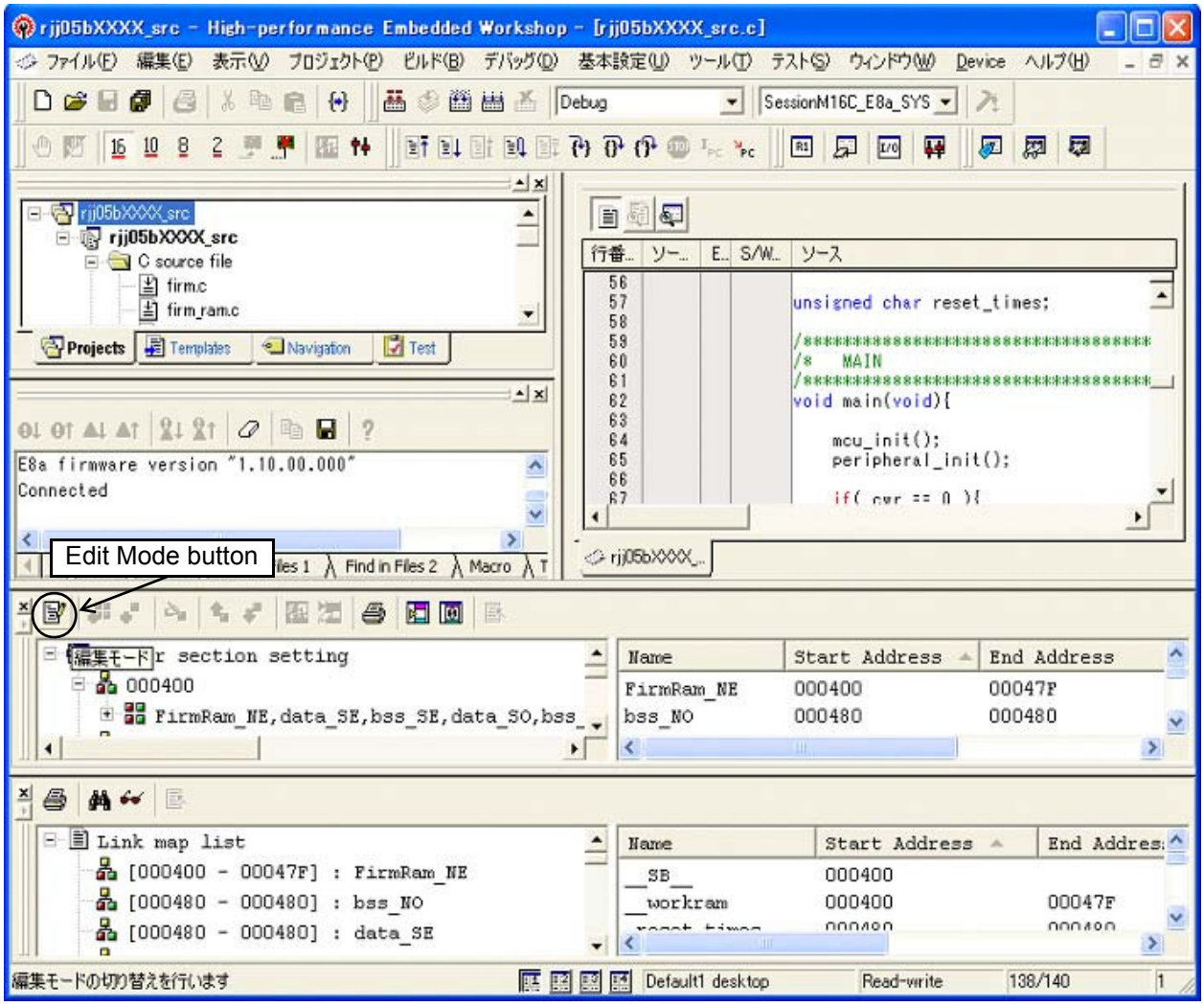
(1) Display the Map window. Select MAP from the View pull-down menu.



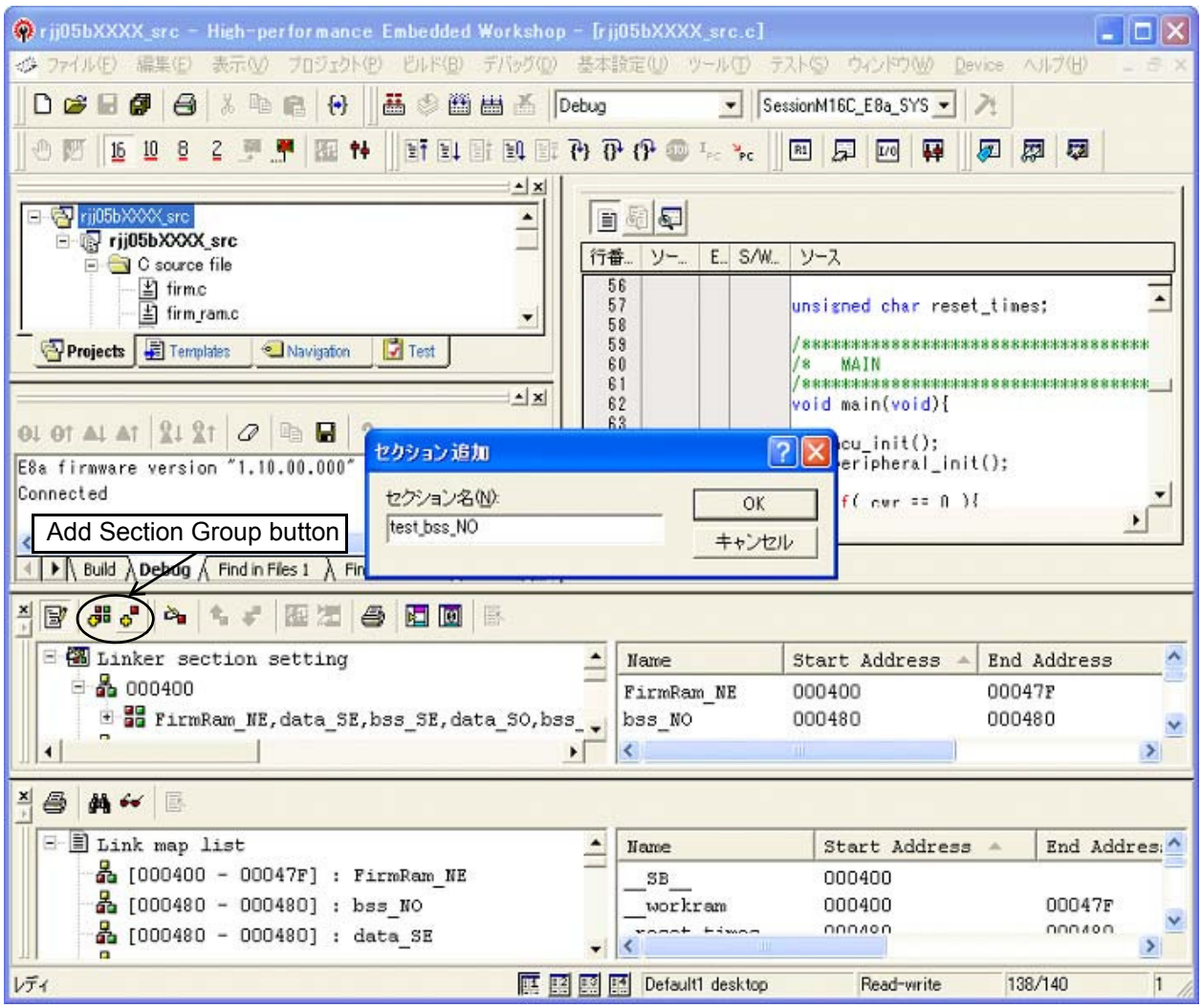
(2) Select “Map Section Information” from the type of maps. Use the same procedure to select “Map Symbol Information”.



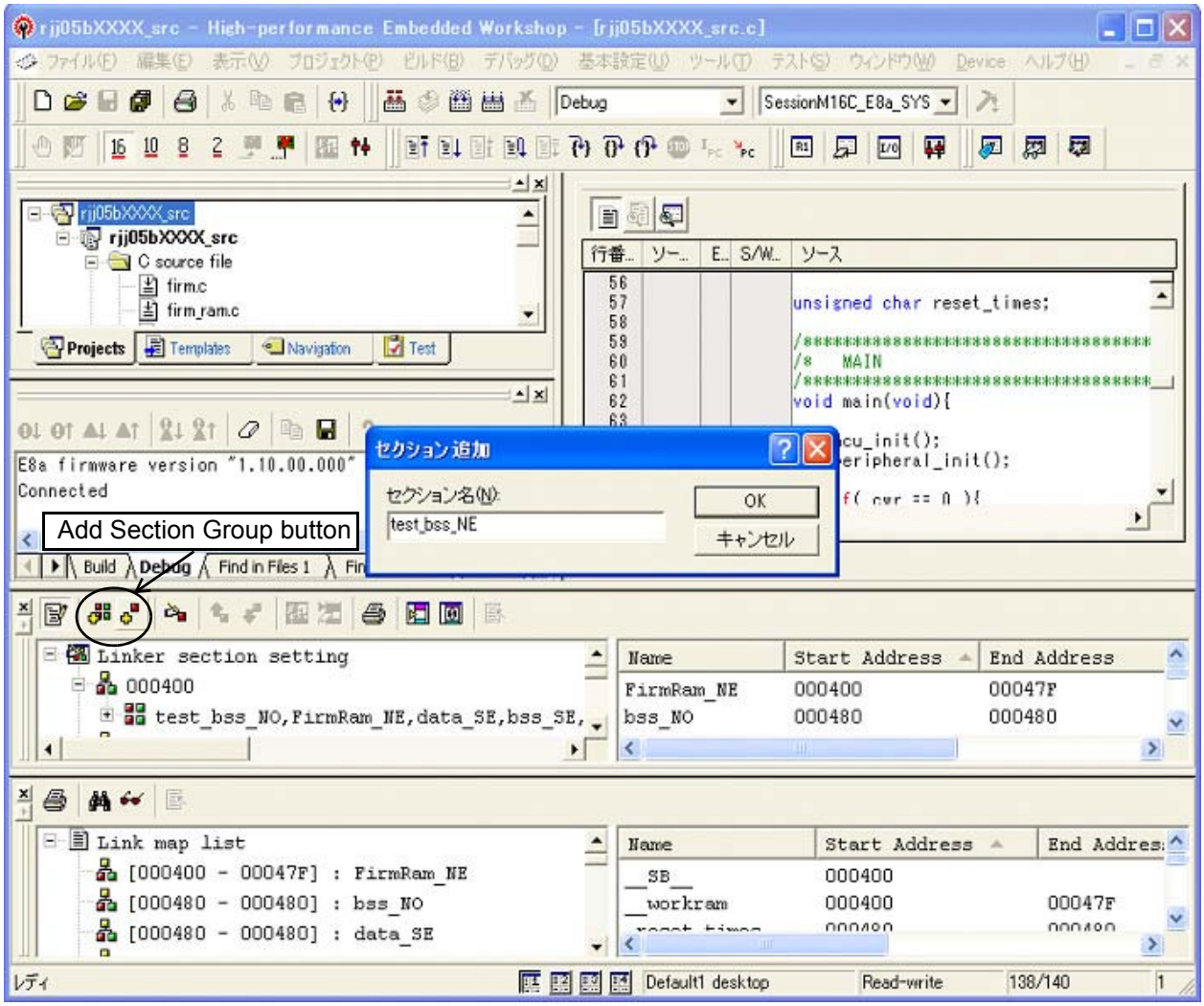
(3) Click the “Edit Mode” button to edit the section name.



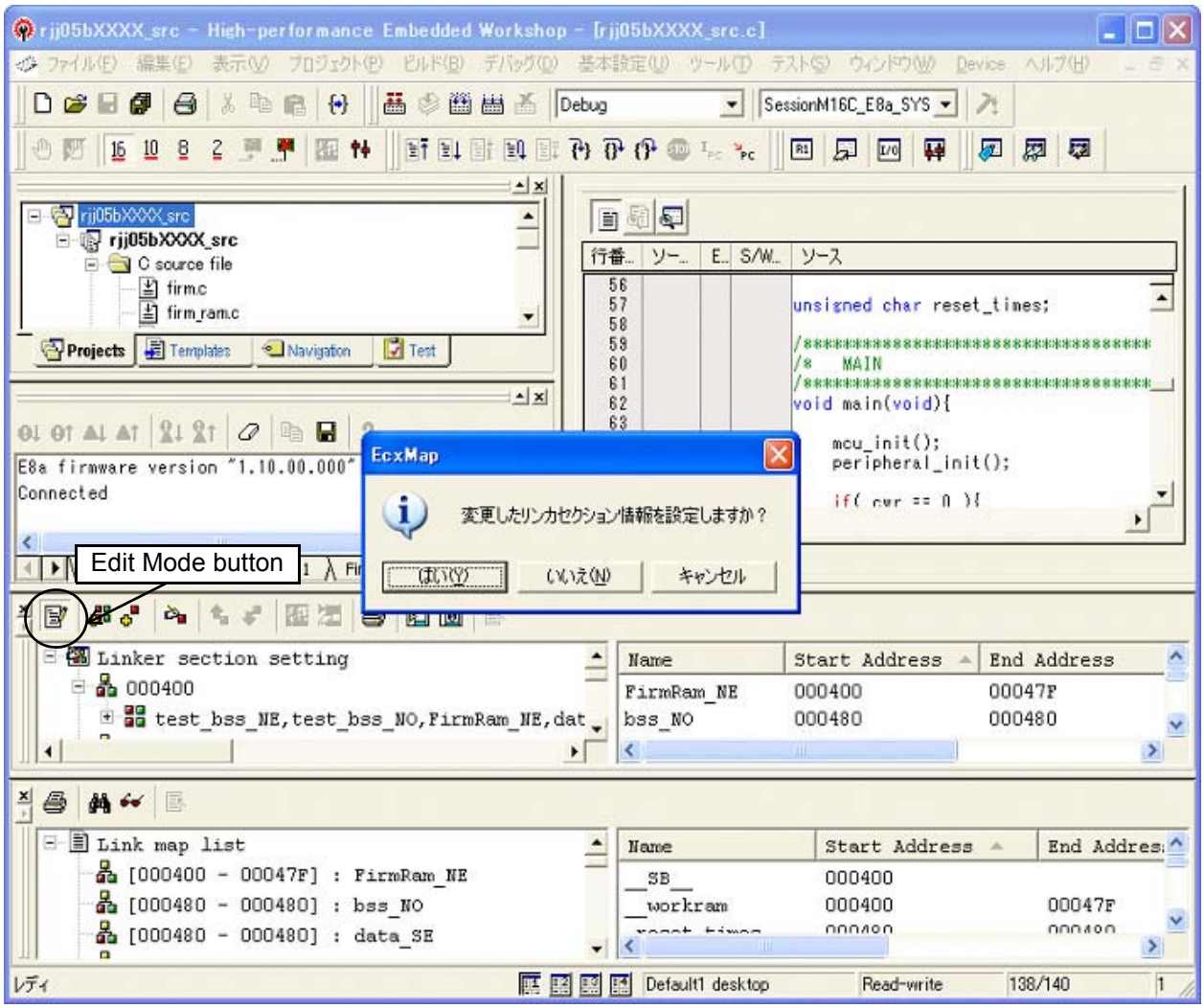
(4) Click the “Add Section Group” button to add “test_bss_NO”.



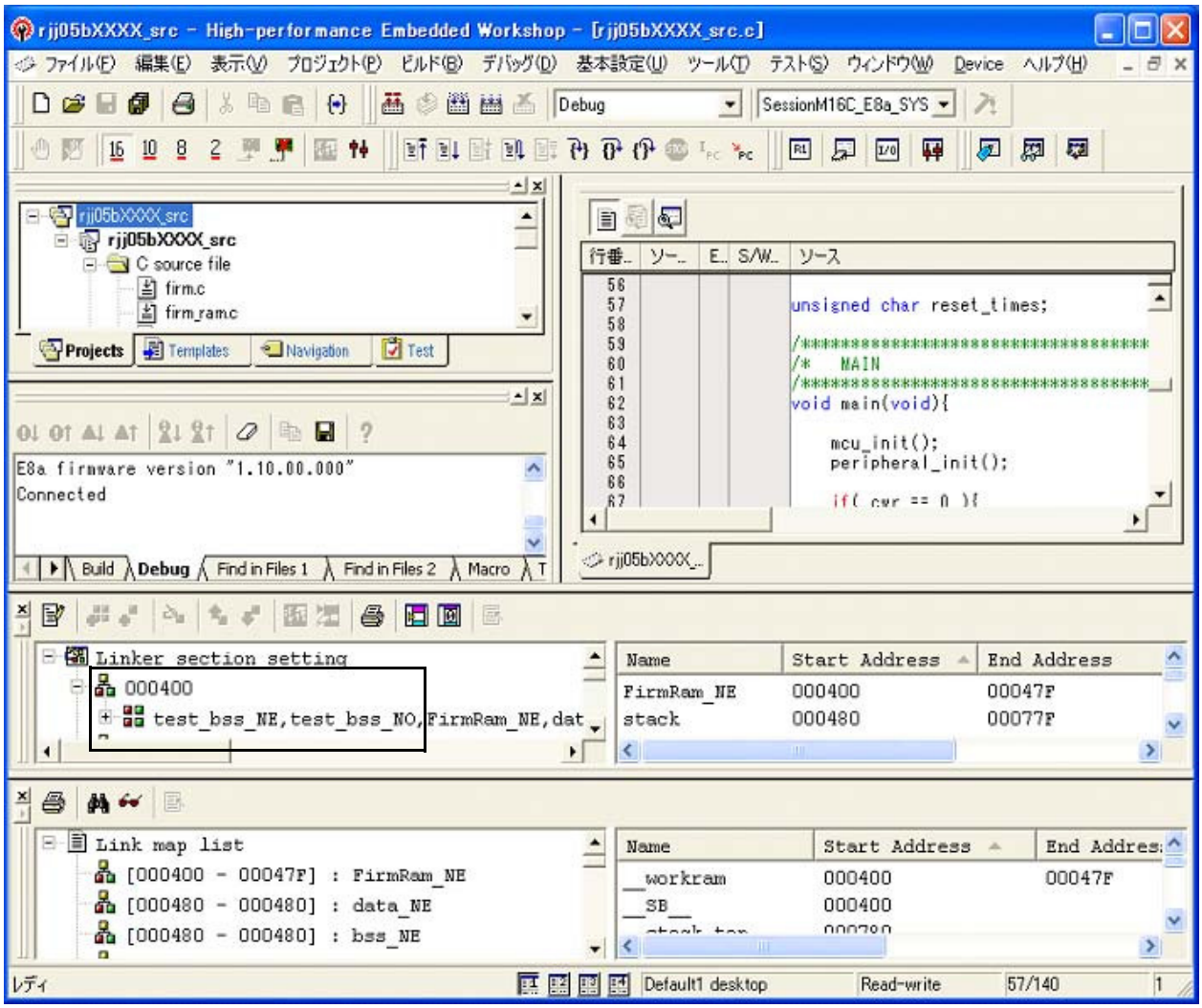
(5) Use the same procedure to add “test_bss_NE”.



(6) Click the “Edit Mode” button to verify the changed linker section information.



(7) test_bss_NE and test_bss_NO sections are assigned.



(8) The variable reset_times and array warm_start [256] are assigned to the test_bss section in the user program.

Figure 4.4 shows the Assigning the Variable and Array to the test_bss Section.

```
#pragma SECTION bss test_bss
unsigned char reset_times;
unsigned char warm_start[256];
```

Figure 4.4 Assigning the Variable and Array to the test_bss Section

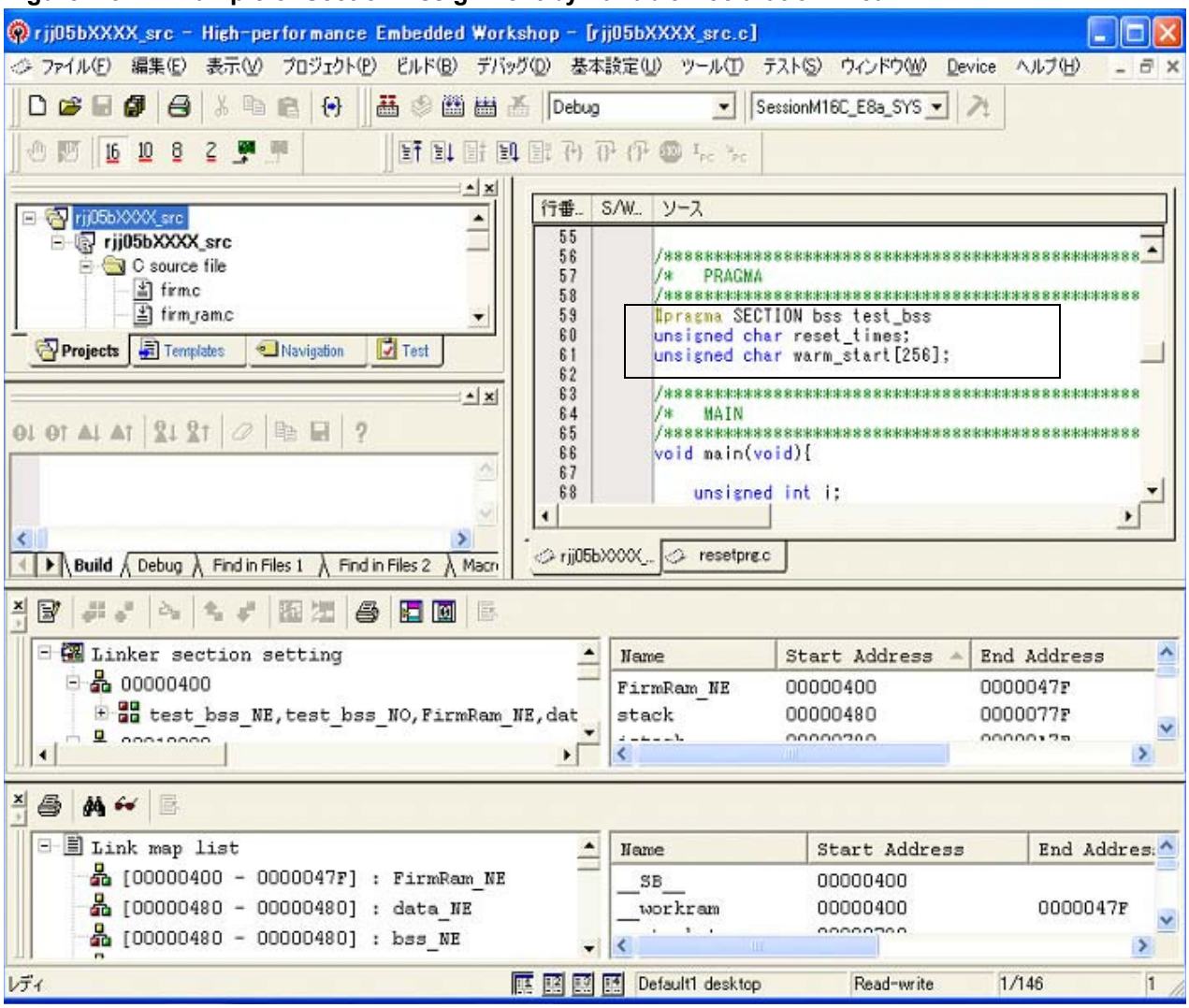
The variables without initial values described after the #pragma SECTION declaration are assigned to the test_bss section.

Figure 4.5 shows an Example of Section Assignment by Variable Declaration Area.

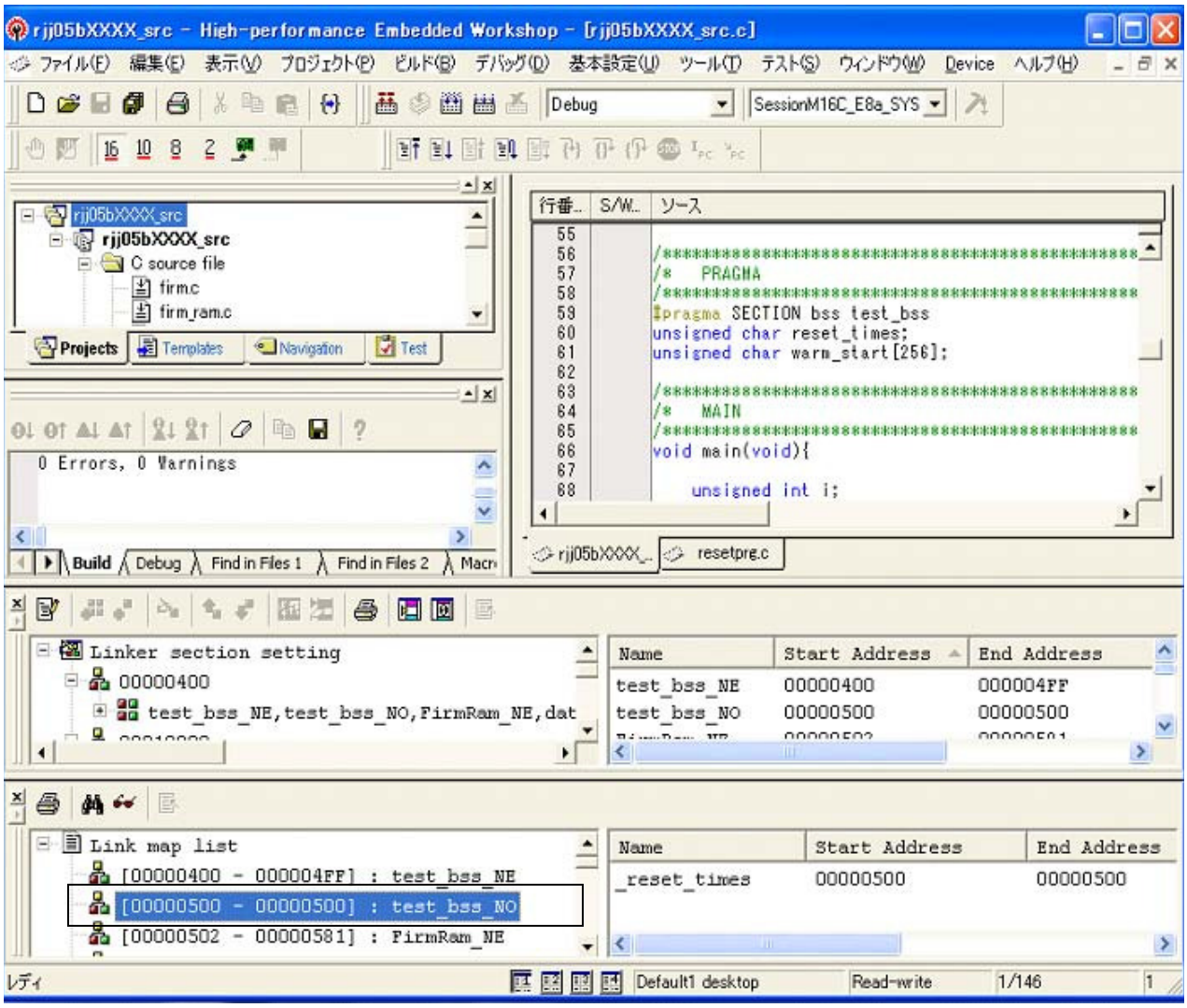
```
int i;                          ⇒ Assigned to the bss section.

#pragma SECTION bss test_bss ⇒ Variable without initial values not described after this (variable
                                  assigned to bss section) is assigned to the test_bss section.
int j;                          ⇒ Assigned to the test_bss section.
int k=10;                       ⇒ Variables with initial values are assigned to the data section.
```

Figure 4.5 Example of Section Assignment by Variable Declaration Area



(9) When executing the build, the variable reset_times and array warm_start [256] are, respectively assigned to the test_bss_NO section and the test_bss_NE section.



5. Sample Program

A sample program can be downloaded from the Renesas Technology website.
To download, click “Application Notes” in the left-hand side menu of the M16C Family page.
This sample program is created by using the following versions of the tools.

HEW version: 4.06
NC30 version: 5.45.00

6. Reference Documents

Hardware Manual
M16C/5LD Group, M16C/56D Group Hardware Manual
The latest version can be downloaded from the Renesas Technology website.

Technical Update/Technical News
The latest information can be downloaded from the Renesas Technology website.

C Compiler User’s Manual
C complier package V.5.45 for M16C Series and R8C Family.
C Compiler User’s Manual Rev.1.00.
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REVISION HISTORY	M16C/5LD and 56D Groups How to Determine Reset Source

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