M16C/63,64A,64C,65,65C,6C Groups

Using the Reset Source Determine Register

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1. Abstract

This document describes an application example for discriminating the type of resets using the Reset Source Determine Register.

2. Introduction

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

MCU(s): M16C/63,64A,64C,65,65C,6C Groups

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 lists 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 VCC1
Voltage monitor 0 reset	The drop in voltage on VCC1 (reference voltage: Vdet0)
Voltage monitor 1 reset	The drop in voltage on VCC1 (reference voltage: Vdet1)
Voltage monitor 2 reset	The drop in voltage on VCC1 (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.

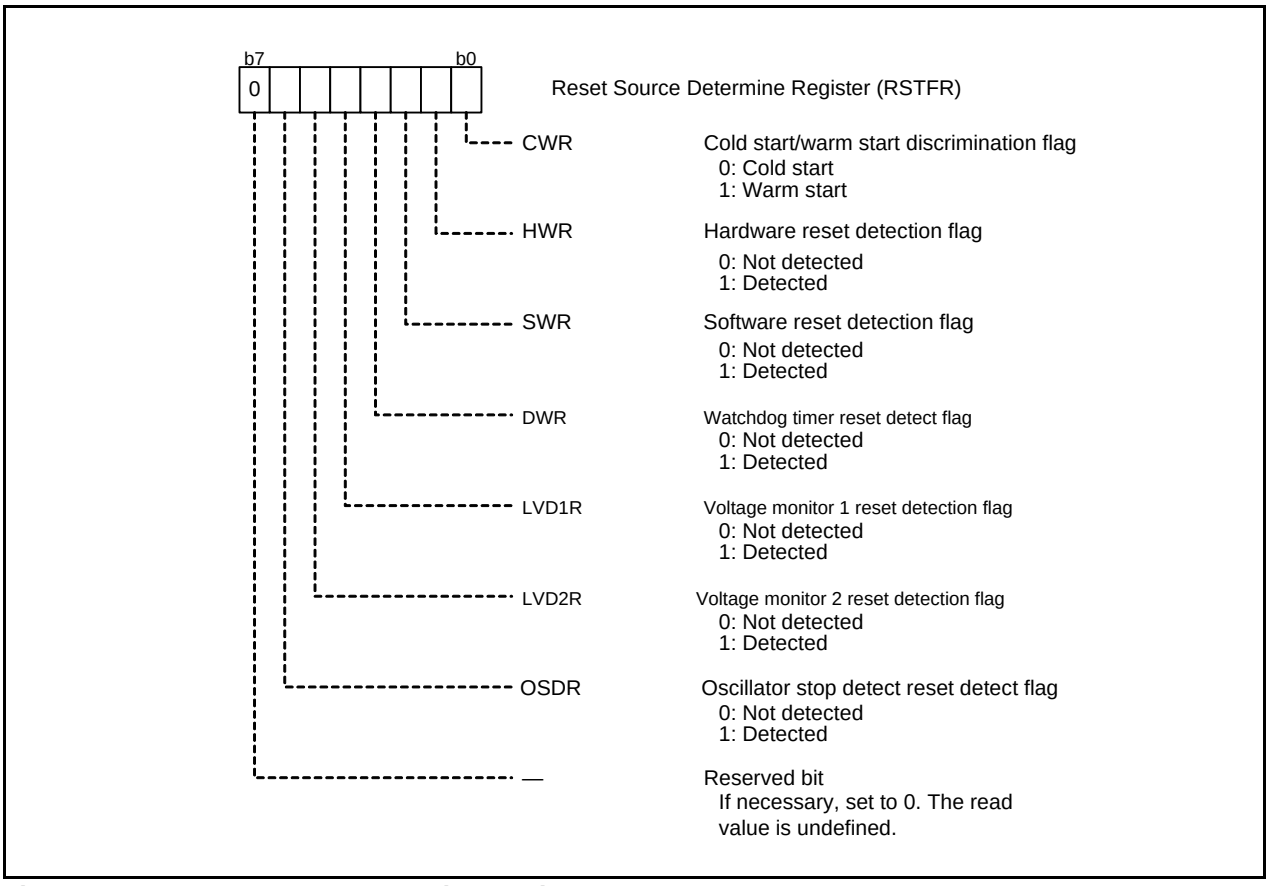


Figure 3.1 Reset Source Determine Register

Table 3.2 Bit Values in the RSTFR Register after Reset

Reset	RSTFR Register Bits						
	OSDR	LVD2R	LVD1R	WDR	SWR	HWR	CWR
Hardware reset	Not changed	0	0	0	0	1	Not changed
Power-on reset	0	0	0	0	0	0	0
Voltage monitor 0 reset	0	0	0	0	0	0	0
Voltage monitor 1 reset	0	0	1	0	0	0	Not changed
Voltage monitor 2 reset	0	1	0	0	0	0	Not changed
Oscillation stop detection reset	1	0	0	0	0	0	Not changed
Watchdog timer reset	0	0	0	1	0	0	Not changed
Software reset	0	0	0	0	1	0	Not changed

4. Application Example

The CWR bit in the RSTFR register is cleared to 0 after power-on reset and voltage monitor 0 reset. No change occurs after other resets. Set the CWR bit to detect a cold start or 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 code, the test_bss section is assigned to the 000400h address.
Figure 4.1 shows the Application Example of Section Assignment.

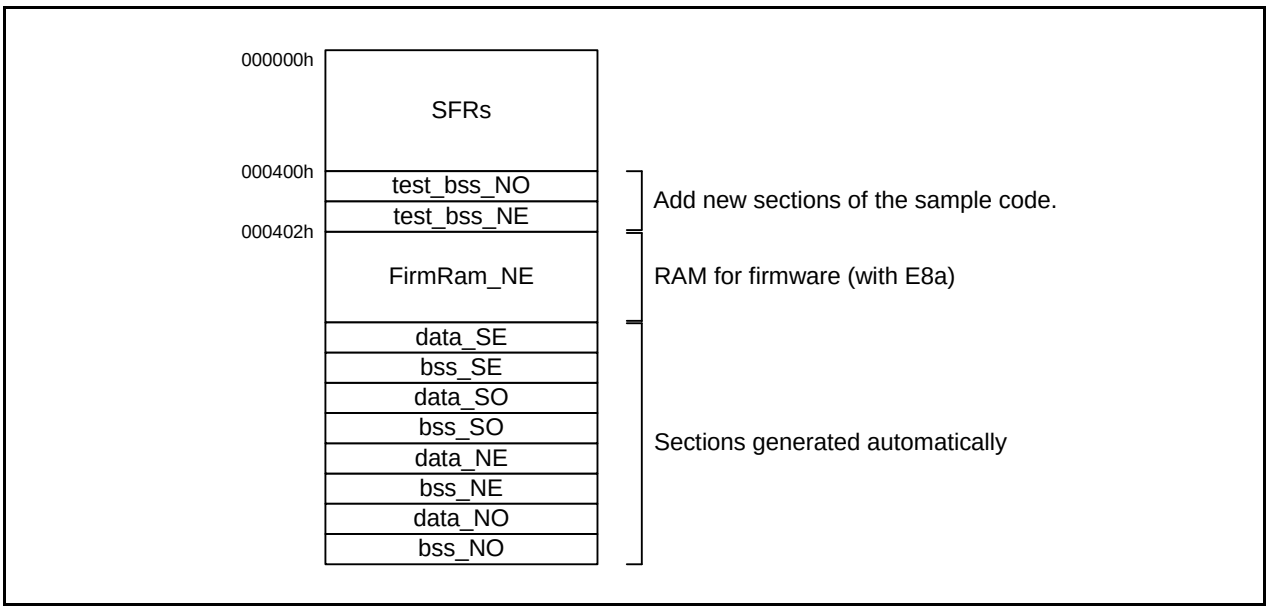


Figure 4.1 Application Example of Section Assignment

4.1 Application Example Operation

Read the CWR bit 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 RSTRF register are output to the port. Figure 4.2 shows the Main Program Flowchart.

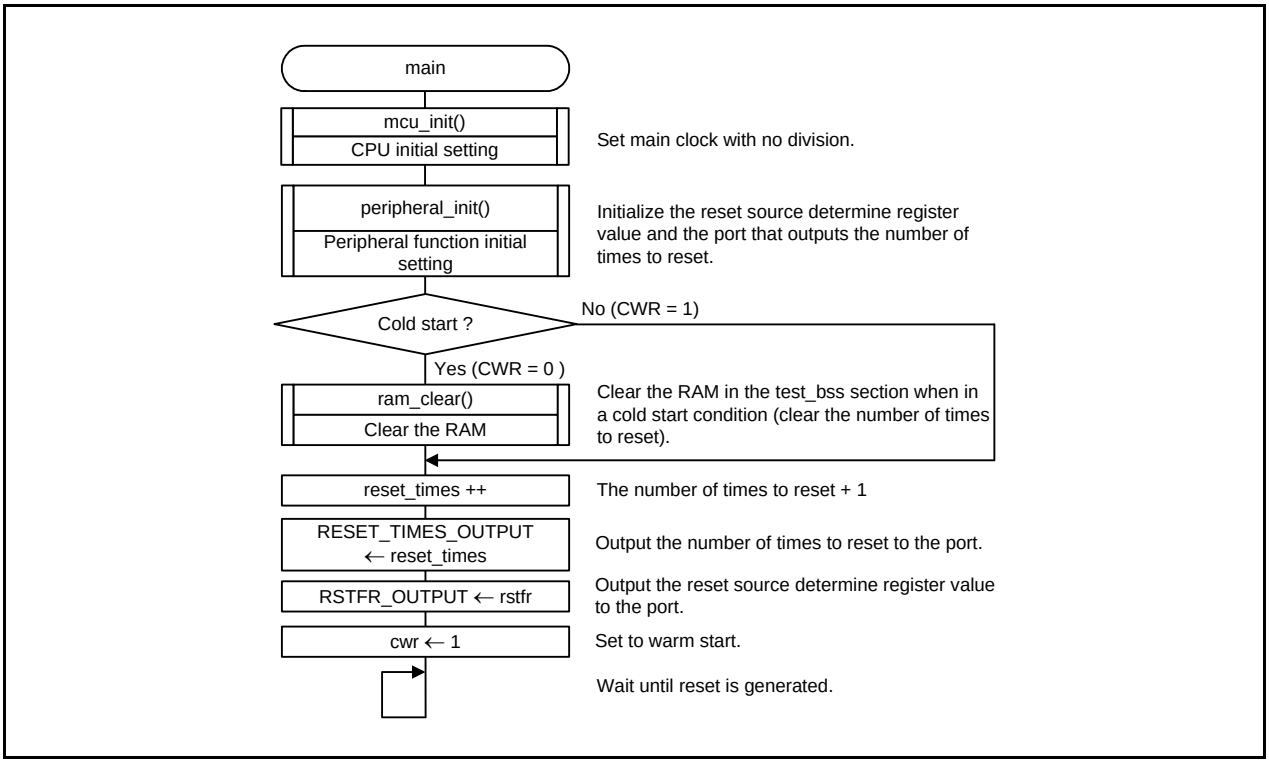


Figure 4.2 Main Program Flowchart

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 code, 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:

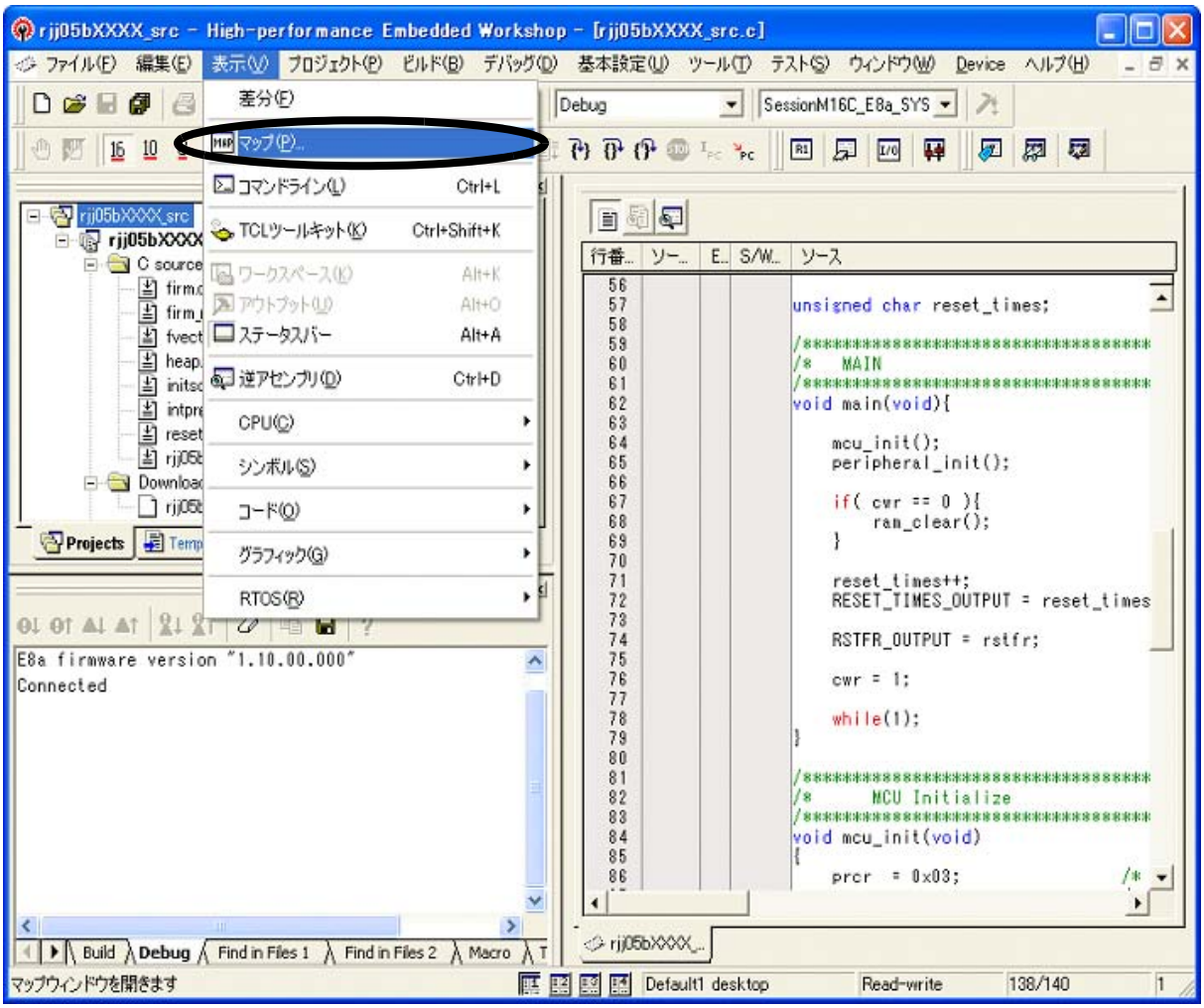
- Initialize the data near area.
  bss_NE, bss_NO, bss_SE, bss_SO sections are cleared to 0.
  Also, the initial values in the ROM areas (data_NEI, data_NOI, data_SEI, data_SOI) are transferred to RAM (data_NE, data_NO, data_SE, data_SO).

- 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).

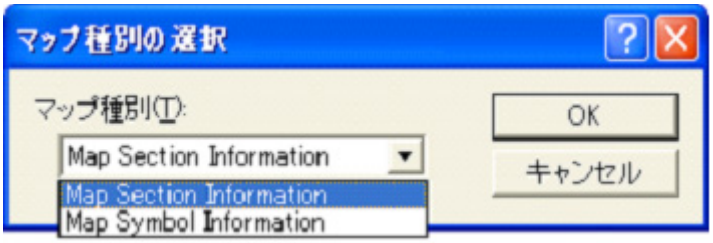
4.3 Section Setting in HEW

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 code.

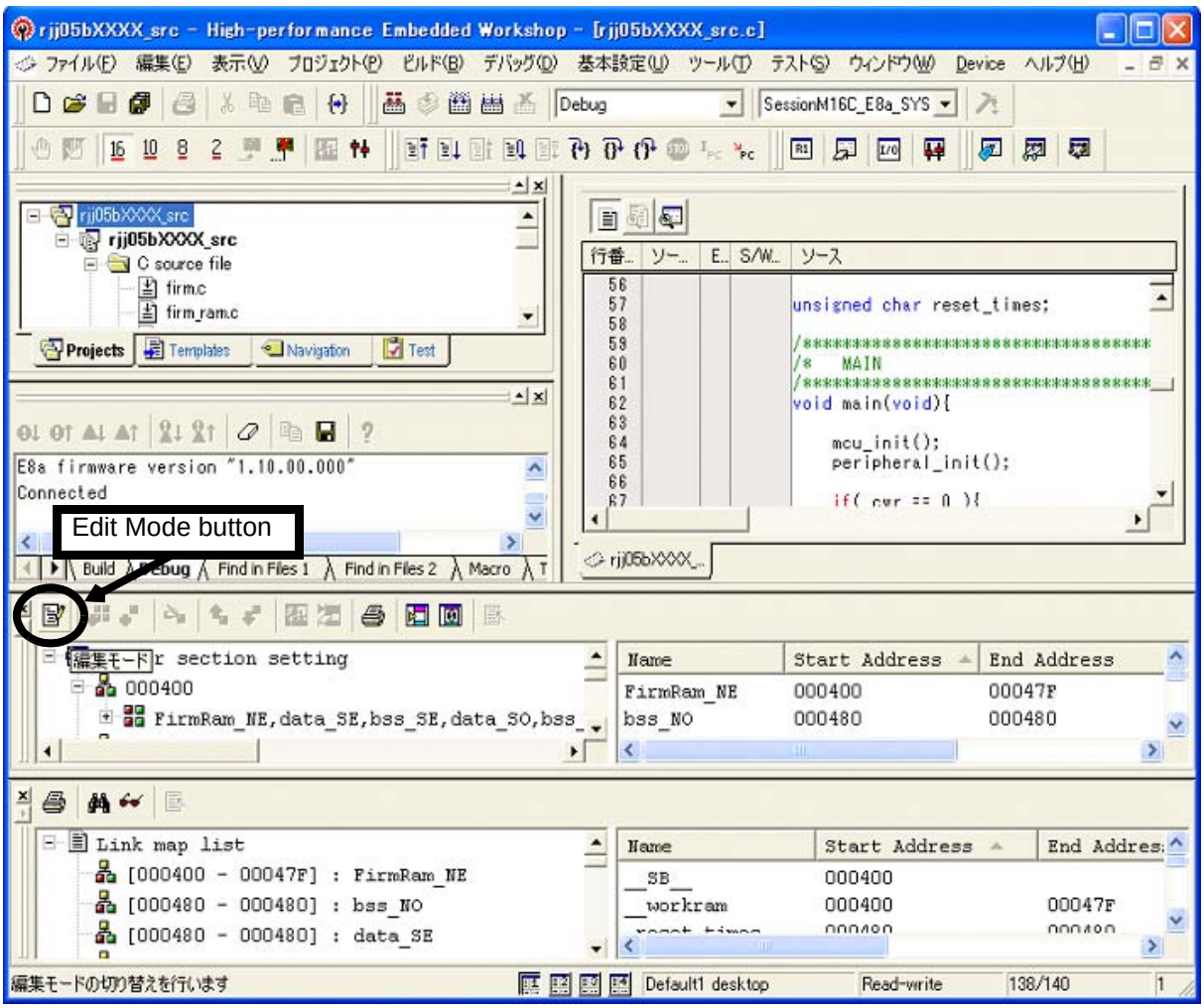
(1) Display the Map window. Select MAP from the View pull-down menu.



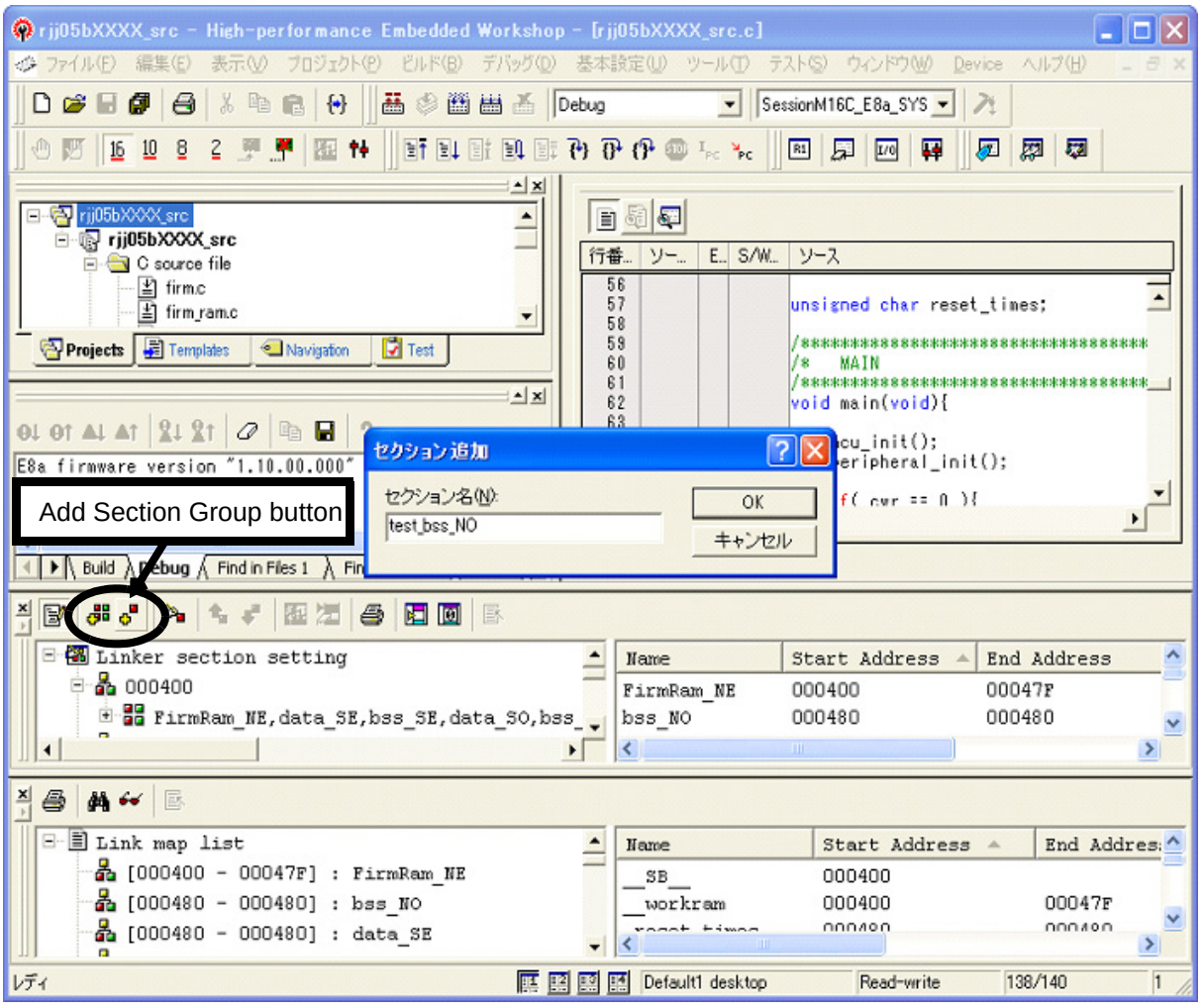
(2) Select “Map Section Information” from the type of maps. Use the same procedure to select “Map Symbol Information”.



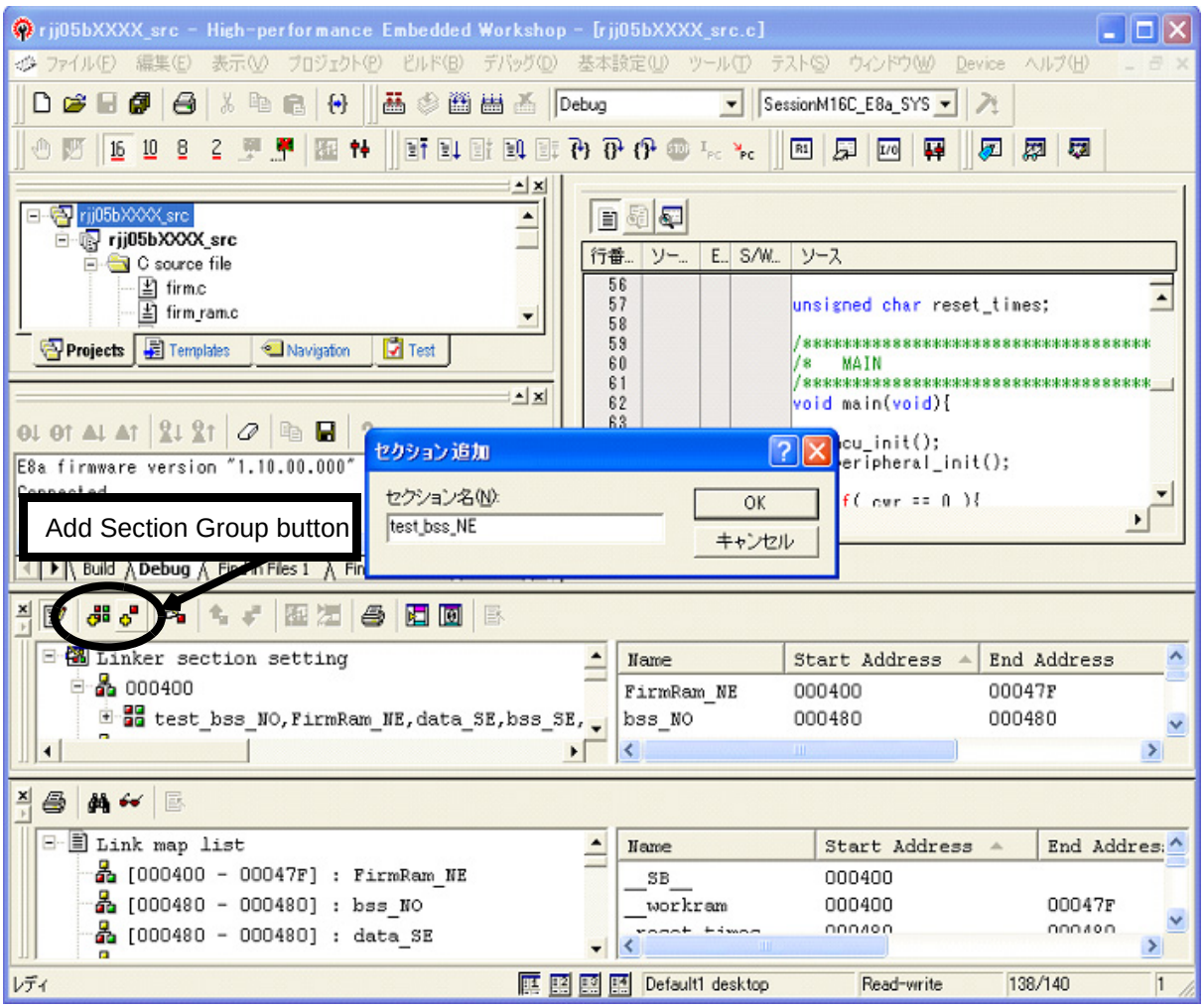
(3) Click the “Edit Mode” button to edit the section name.



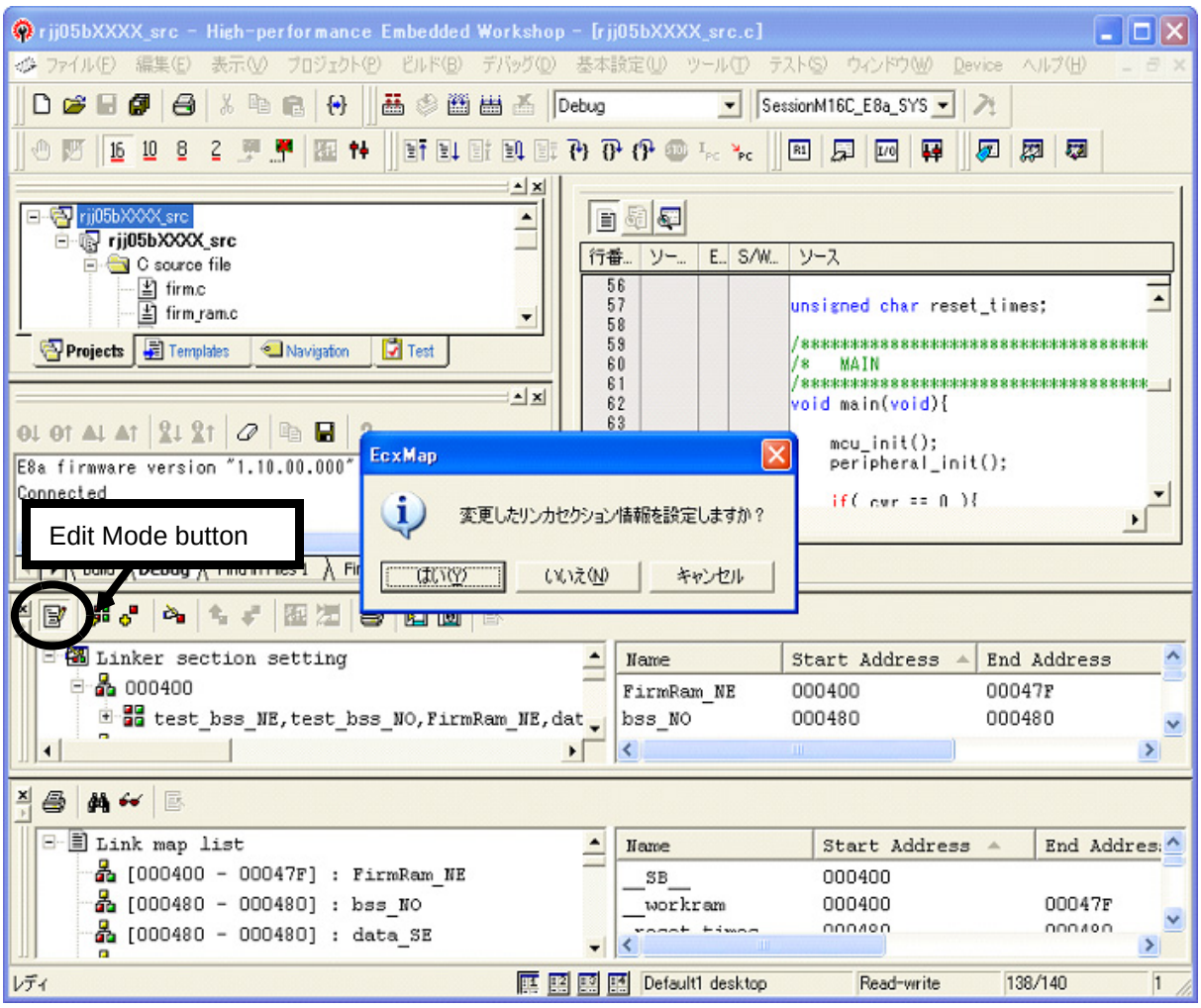
(4) Click the “Add Section Group” button to add “test_bss_NO”.



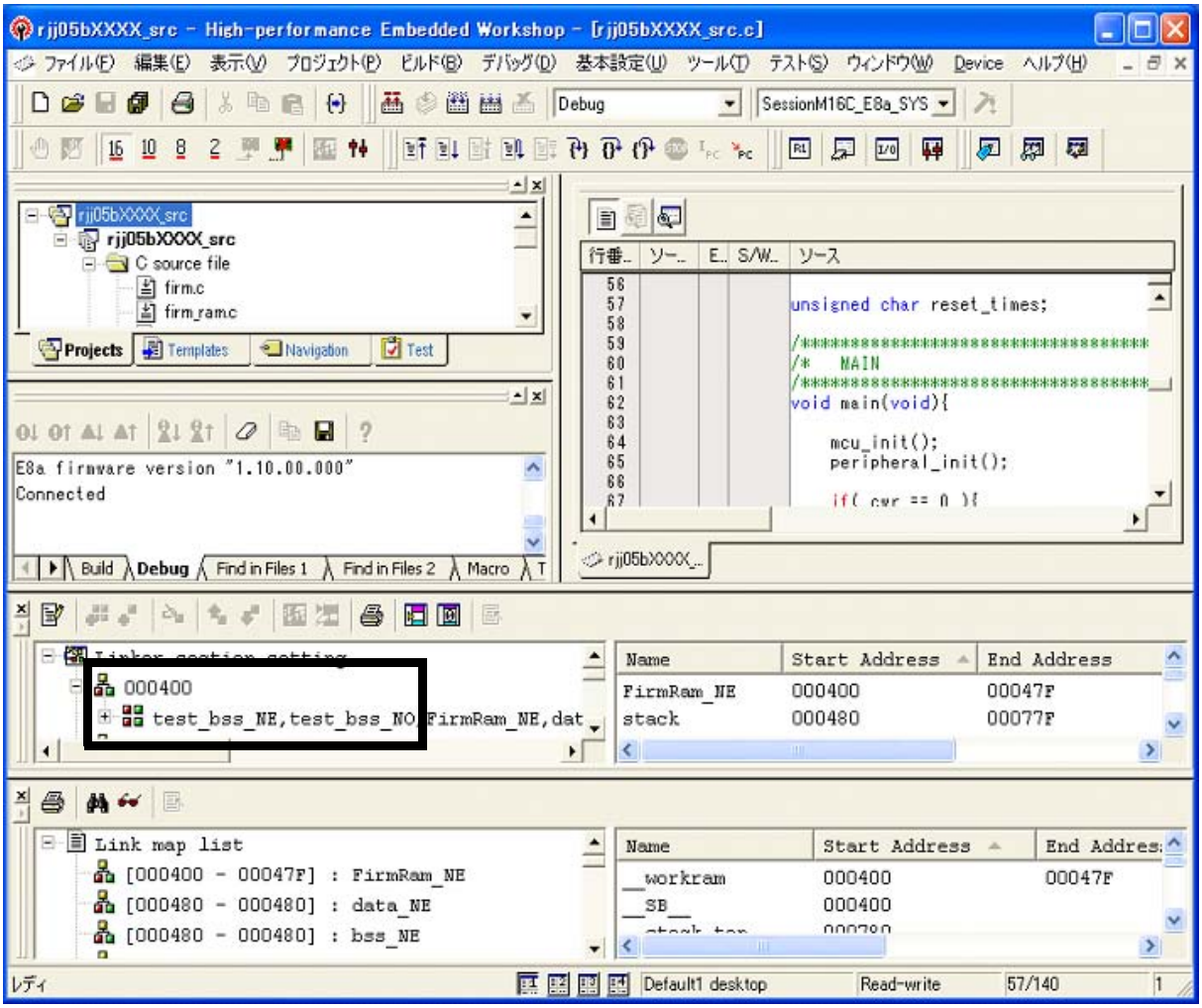
(5) Use the same procedure to add “test_bss_NE”.



(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 is assigned to the test_bss section in the user program.
Figure 4.4 shows the Assigning the Variable to the test_bss Section.

```
#pragma SECTION bss test_bss
unsigned char reset_times;
```

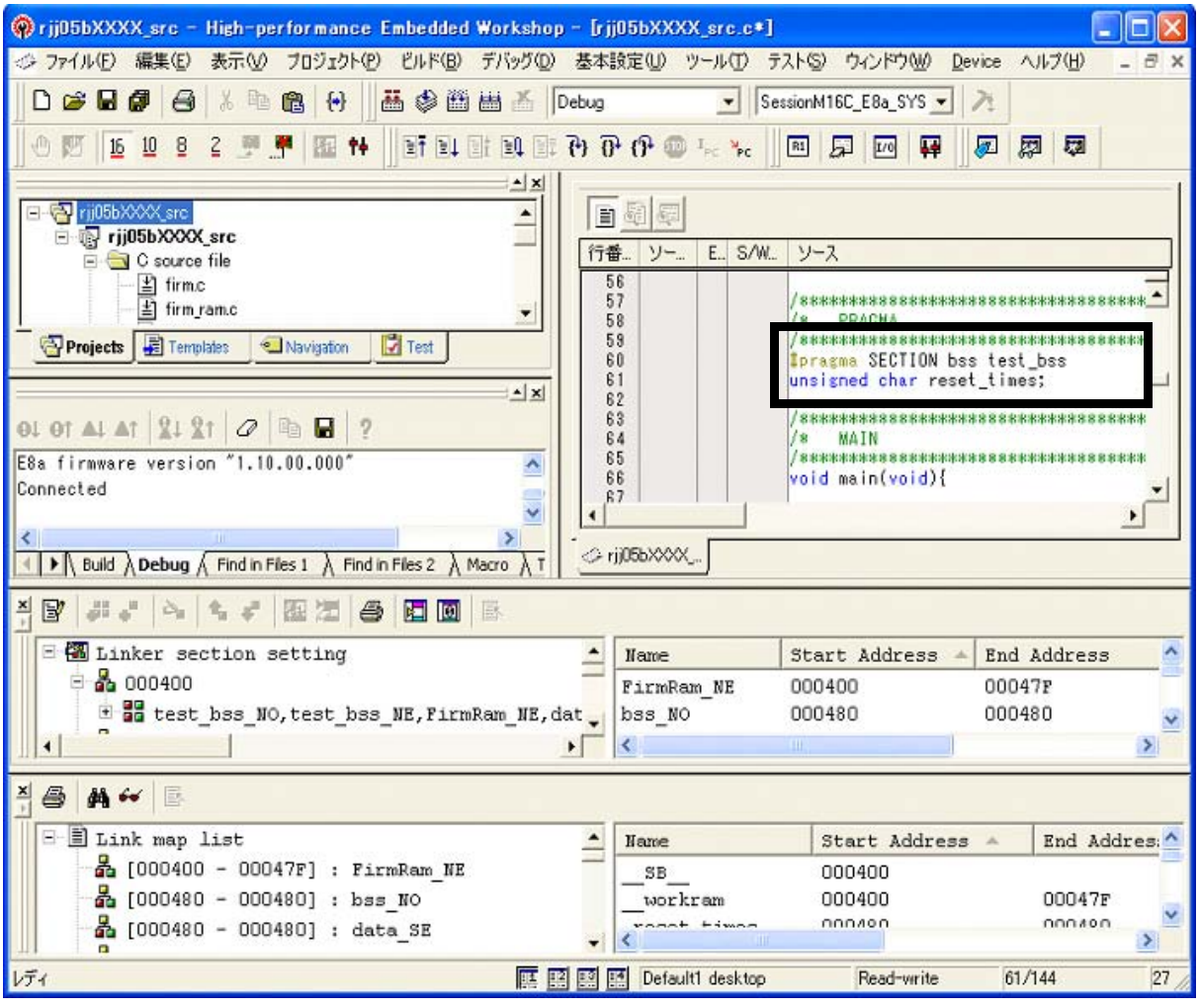
Figure 4.4 Assigning the Variable to the test_bss Section

The variables without initial values described after the #pragma SECTION declaration are assigned to the test_bss section.
Figure 4.5 shows the Example of Section Assignment by Variable Declaration Area.

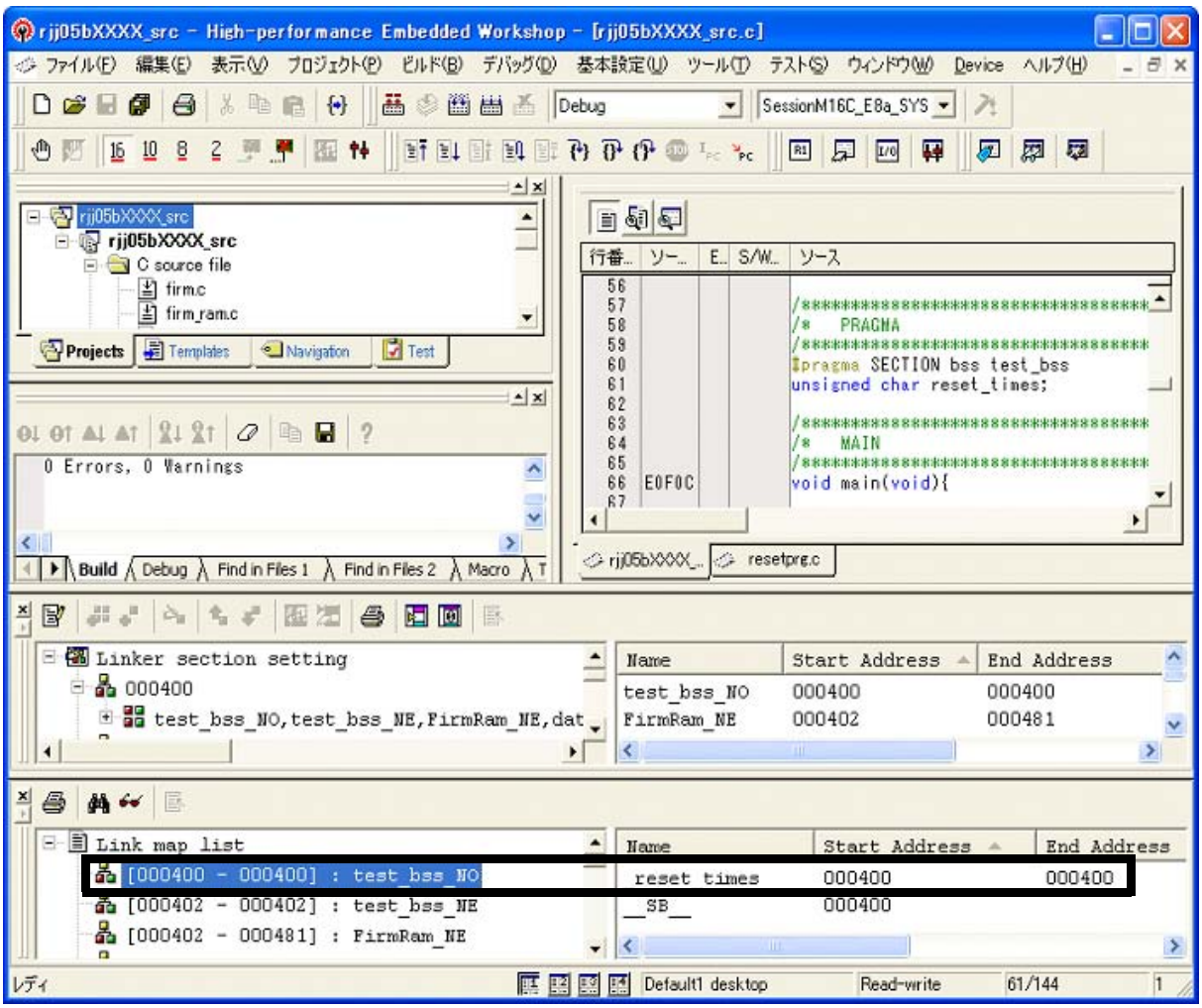
```
int i;                          ⇒ Assigned to the bss section.

#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 is assigned to the test_bss_NO section.



5. Sample Code

Sample code can be downloaded from the Renesas Electronics website.
This sample code is created by using the following versions of the tools.

HEW version: 4.08
NC30 version: 5.45.01

6. Reference Documents

M16C/63 Group User's Manual: Hardware Rev.2.00
M16C/64A Group User's Manual: Hardware Rev.2.00
M16C/64C Group User's Manual: Hardware Rev.1.00
M16C/65 Group User's Manual: Hardware Rev.2.00
M16C/65C Group User's Manual: Hardware Rev.1.00
M16C/6C Group User's Manual: Hardware Rev.2.00
The latest version can be downloaded from the Renesas Electronics website.

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

C Compiler Manual
M16C Series, R8C Family C Compiler Package V.5.45
C Compiler User's Manual Rev.2.00
The latest version can be downloaded from the Renesas Electronics website.

7. Website and Support

Renesas Electronics website
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Revision History	M16C/63,64A,64C,65,65C,6C Groups Using the Reset Source Determine Register

Rev.	Date	Description	
		Page	Summary
1.00	Dec. 29, 2009	—	First edition issued
1.01	Apr. 28, 2011	—	Add: M16C/64C, M16C/65C

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins

   Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.

   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.

   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to one with a different part number, confirm that the change will not lead to problems.

   — The characteristics of MPU/MCU in the same group but having different part numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different part numbers, implement a system-evaluation test for each of the products.

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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

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