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R8C/25 Group

Data Flash Table

1. Abstract

This document describes how to set up and use the data flash table in the R8C/25 Group.

2. Introduction

The application example described in this document is applied to the following MCU and parameter(s):

• MCU: R8C/25 Group

This program can be used with other R8C/Tiny Series MCUs which have the same special function registers (SFRs) as the R8C/25 Group. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

3. Application Description

3.1 Types of Code and Data

There are various types of data and code that constitute a program: Some are rewritable, and some are not. Some have initial values, and some do not. All data and code must be mapped into the ROM, RAM, and stack areas according to their properties.
This section explains the types of data and code generated by NC30.

3.1.1 Data and Code Generated by NC30

Figure 3.1 shows the Types of Data/Code Generated by NC30 and Mapped Areas.

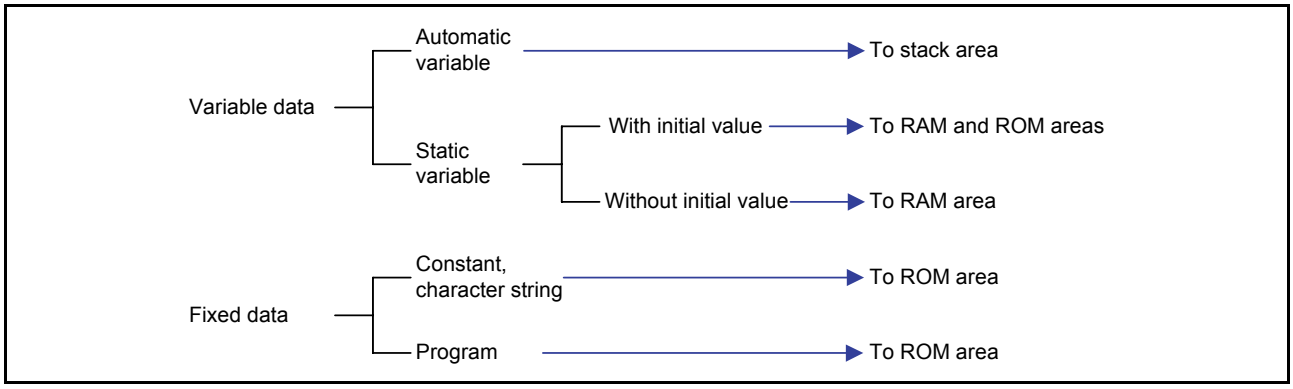


Figure 3.1 Types of Data/Code Generated by NC30 and Mapped Areas

3.1.2 Handling Static Variables with Initial Values

Since “static variables with initial values” are rewritable data, they must reside in RAM. However, if variables are stored in RAM, initial values cannot be set to them.
For such static variables with initial values, NC30 allocates areas in RAM and stores the initial values in ROM. Then it copies the values from ROM into RAM in the startup program.

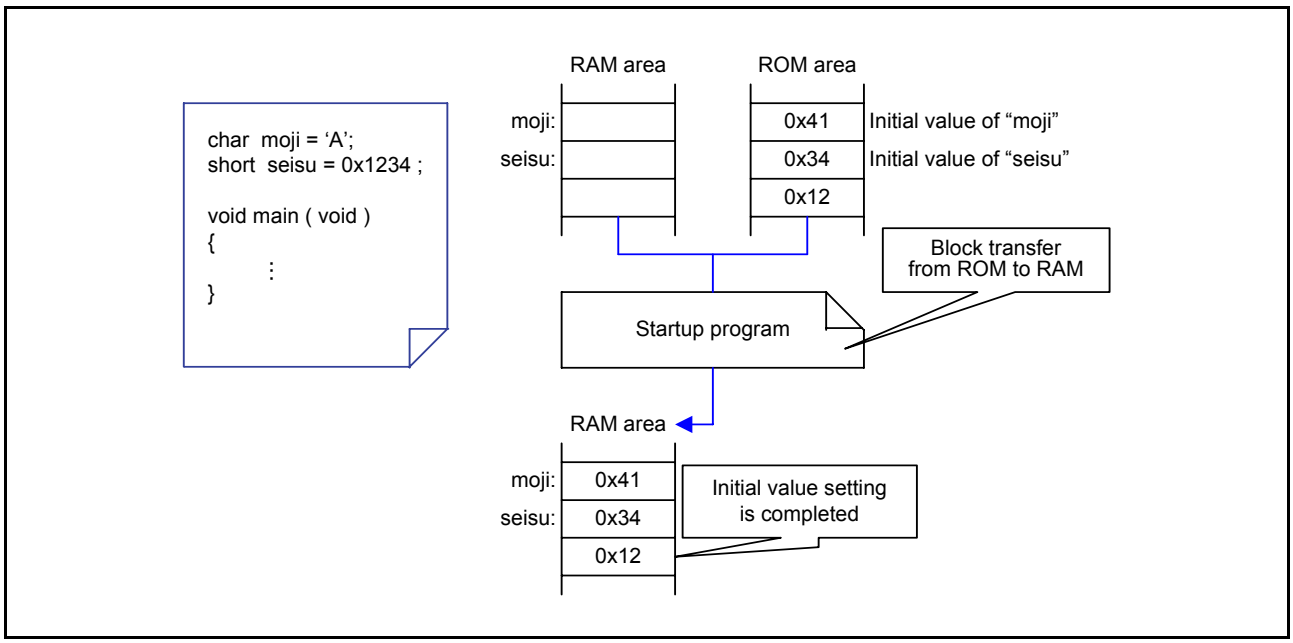


Figure 3.2 Handling Static Variables with Initial Values

3.2 Sections Managed by NC30

NC30 manages areas in which data and code are mapped as “sections”.
This section explains the types of sections generated and managed by NC30 and how they are managed.

3.2.1 Section Configuration

NC30 classifies data into sections by type for management purposes (see Figure 3.3).
Table 3.1 lists the Section Configuration Managed by NC30.

Table 3.1 Section Configuration Managed by NC30

Section Base Name	Content
data	Stores static variables with initial values.
bss	Stores static variables without initial values.
rom	Stores character strings and constants.
program	Stores programs.
vector	Variable vector area (not generated by compiler)
fvector	Fixed vector area (not generated by complier)
stack	Stack area (not generated by complier)
heap	Heap area (not generated by complier)

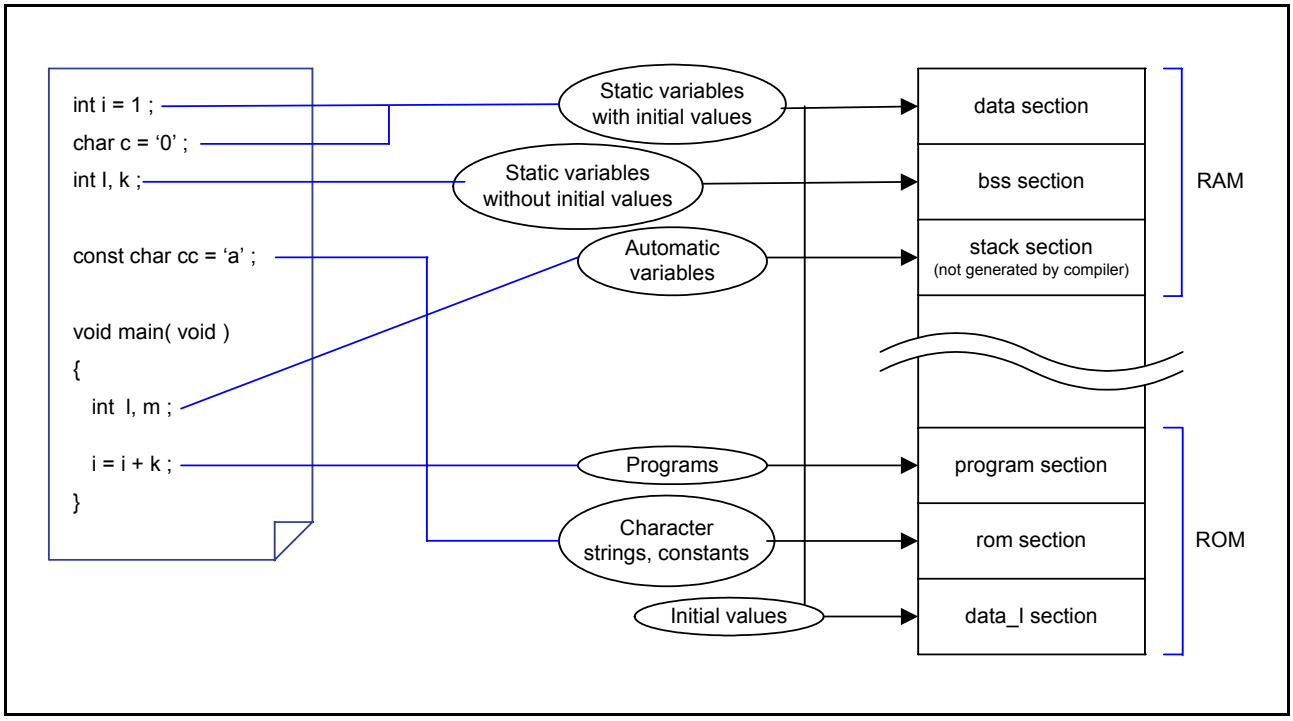


Figure 3.3 Mapping Data into Sections by Type

3.2.2 Section Attributes

The sections generated by NC30 are further classified into smaller sections by their “attributes”, i.e., whether or not they have initial value, in which area they are mapped, and their data size.

Table 3.2 lists the Section Attributes with the symbols and contents.

Table 3.2 Section Attributes

Attribute	Content	Applicable section name
I	Section to hold data’s initial value	data
N/F/S	N - near attribute (64 Kbyte area at absolute addresses from 000000H to 00FFFFH) F - far attribute (entire 1 Mbyte memory area from addresses 000000H to FFFFFFH) S - SBDATA attribute (area where SB relative addressing can be used)	data, bss, rom
E/O	Stores character strings/constant numbers.	data, bss, rom

3.2.3 Rule for Naming Sections

The sections generated by NC30 are named after their section base name and attributes.

Figure 3.4 shows the Rule for Naming Sections with a combination of each section base and attribute.

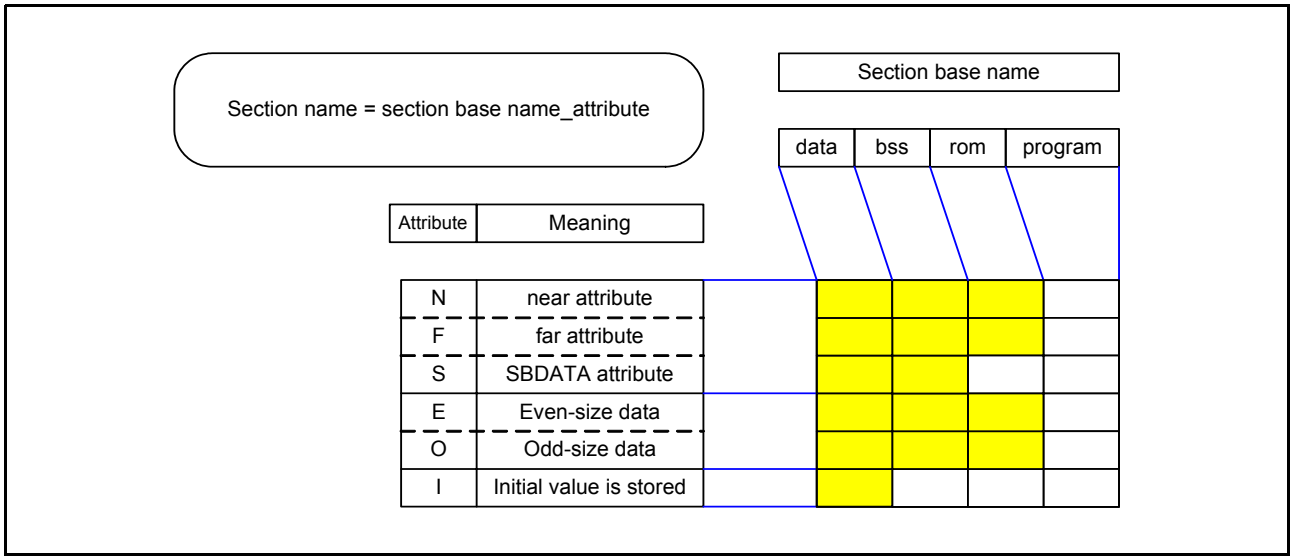


Figure 3.4 Rule for Naming Sections

3.3 Controlling Memory Mapping

NC30 provides extended functions that allow efficient memory mapping to suit the user's system. This section explains NC30's extended functions for memory mapping.

3.3.1 Changing Section Names (#pragma SECTION)

This function changes section base names generated by NC30. The effective range of a changed name varies depending when "program" is changed and when some other section base name is changed.

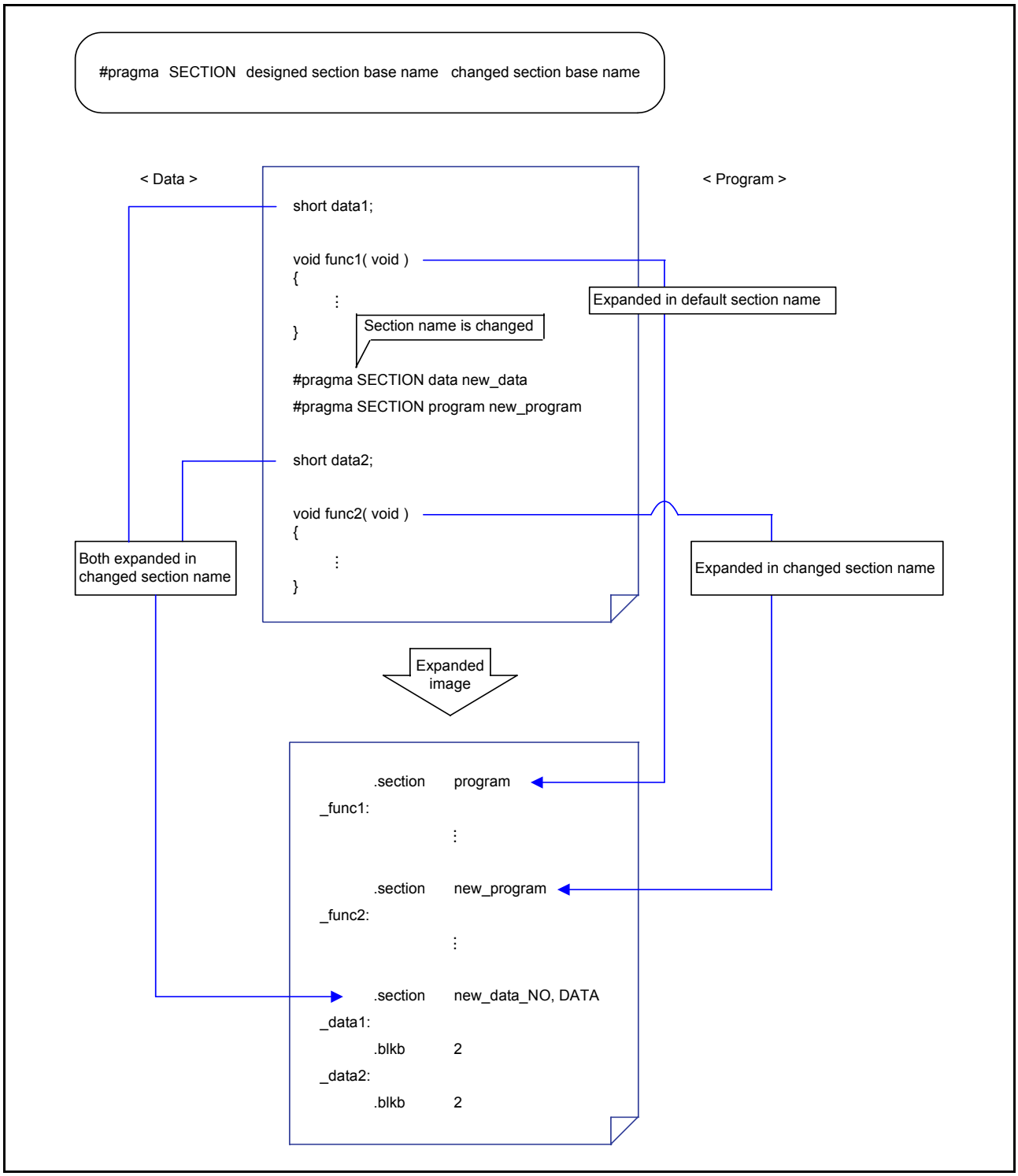


Figure 3.5 Writing Example of "#pragma SECTION"

3.3.2 Adding Section Names (“sect30.inc”)

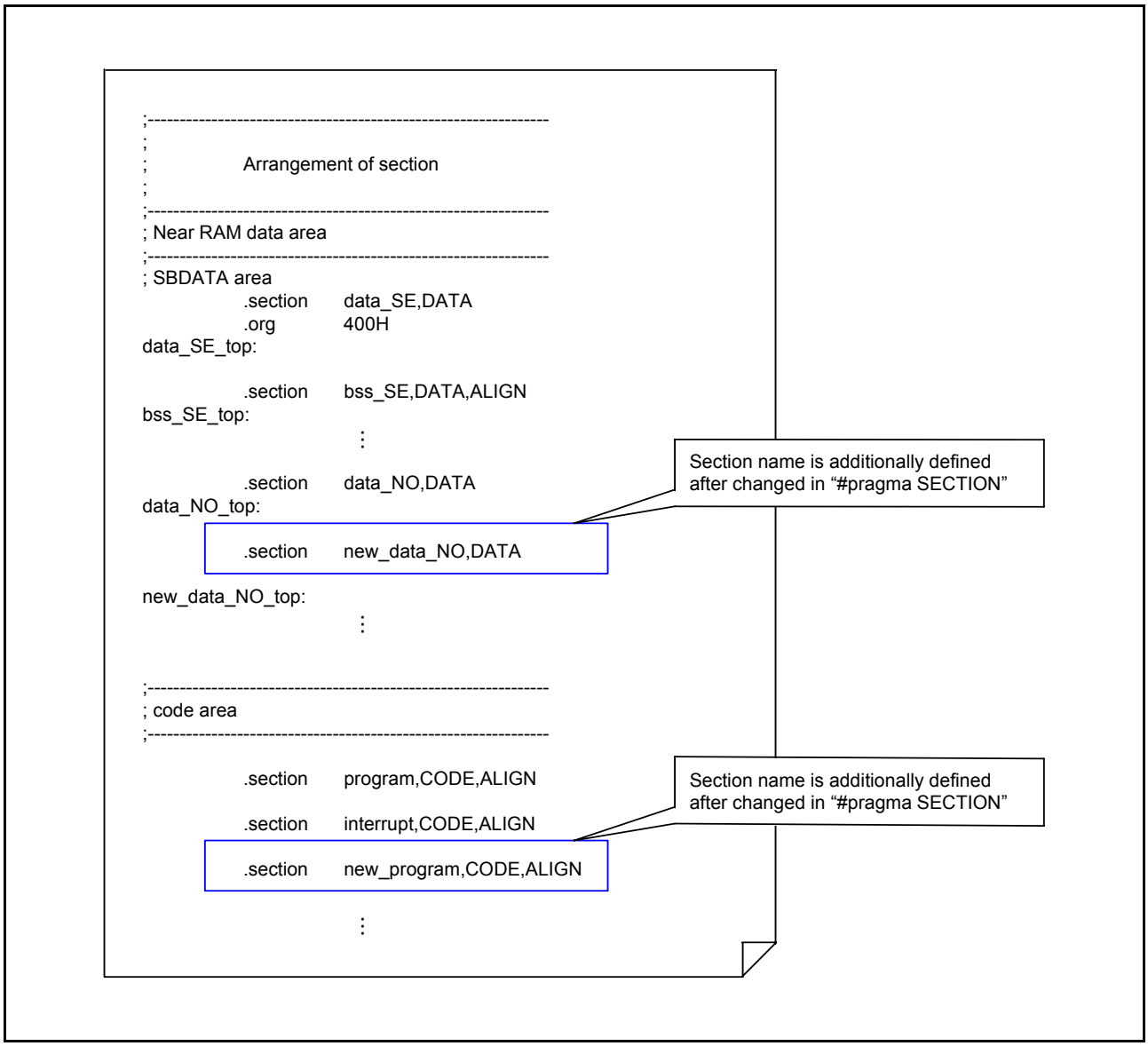


Figure 3.6 Adding Section Names (“sect30.inc”)

3.3.3 Forcible Mapping into ROM (const modifier)

Both RAM and ROM areas are allocated by writing initial data when declaring the type of a variable. However, if this data is fixed data which does not change during program execution, write the “const modifier” when declaring the type. This allows saving the amount of memory used, because only a ROM area is allocated using no RAM area.
Furthermore, explicit substitutes are checked when compiling the program so that rewrite errors can be checked.

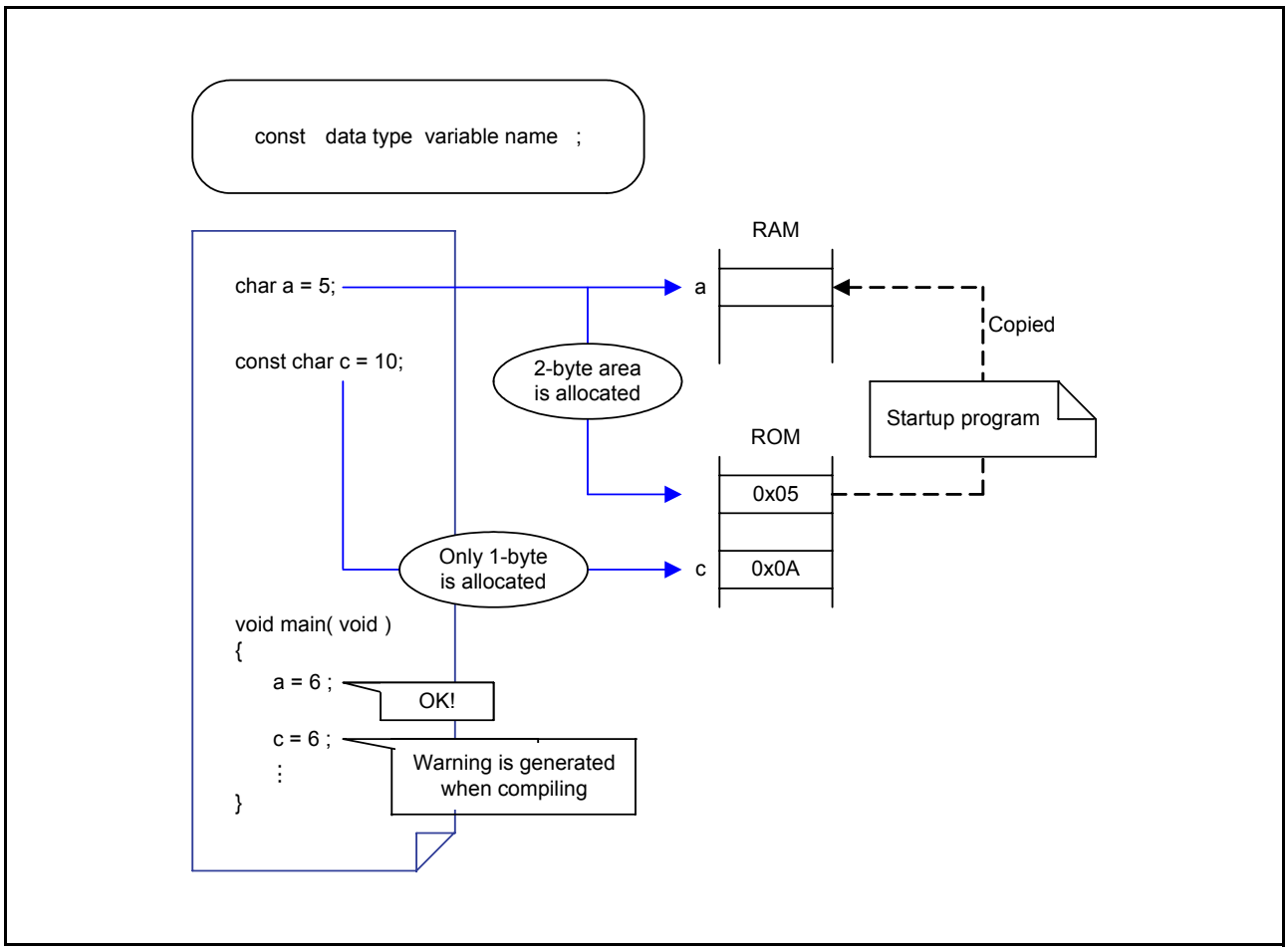


Figure 3.7 const Modifier and Memory Mapping

3.4 Controlling Memory Mapping of Structs

When mapping structs, NC30 packs them in the order they are declared to minimize the amount of memory used. However, if the processing speed has priority, write a statement "#pragma STRUCT" to control the method of mapping structs into memory.
This section explains the extended functions used for mapping structs into memory.

3.4.1 Rules for Mapping Structs into Memory

NC30 follows the following rules to maps struct members into memory.
(1) Structs are packed. No padding is generated inside the struct.
(2) Members are mapped into memory in the order they are declared.

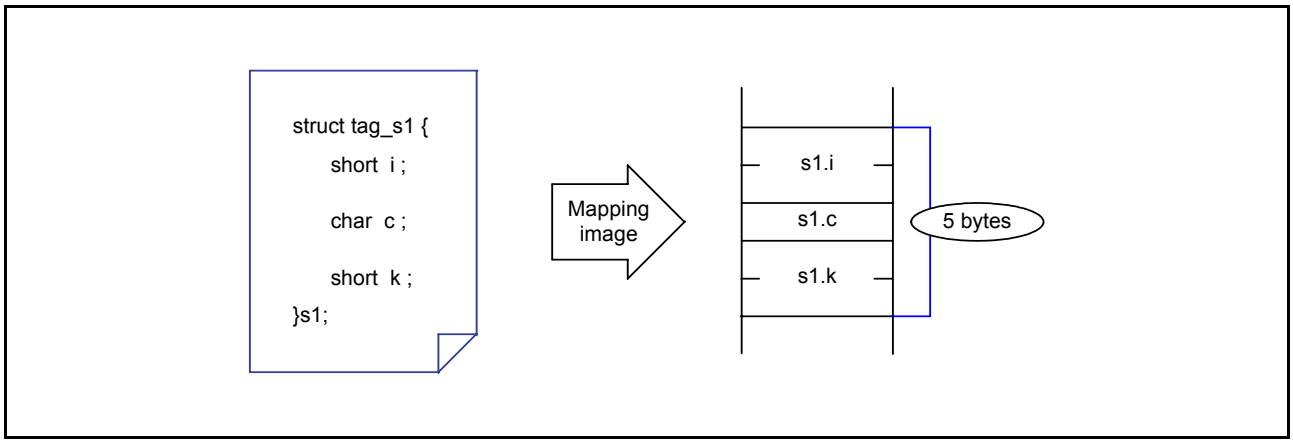


Figure 3.8 Image Depicting How NC30's Default Struct is Mapped into Memory

3.4.2 Inhibiting Packing of Struct Members (#pragma STRUCT tag name unpack)

This command statement inserts pads into a struct so that its total size of struct members is adjusted to even bytes. This statement is specified when the access speed has priority.

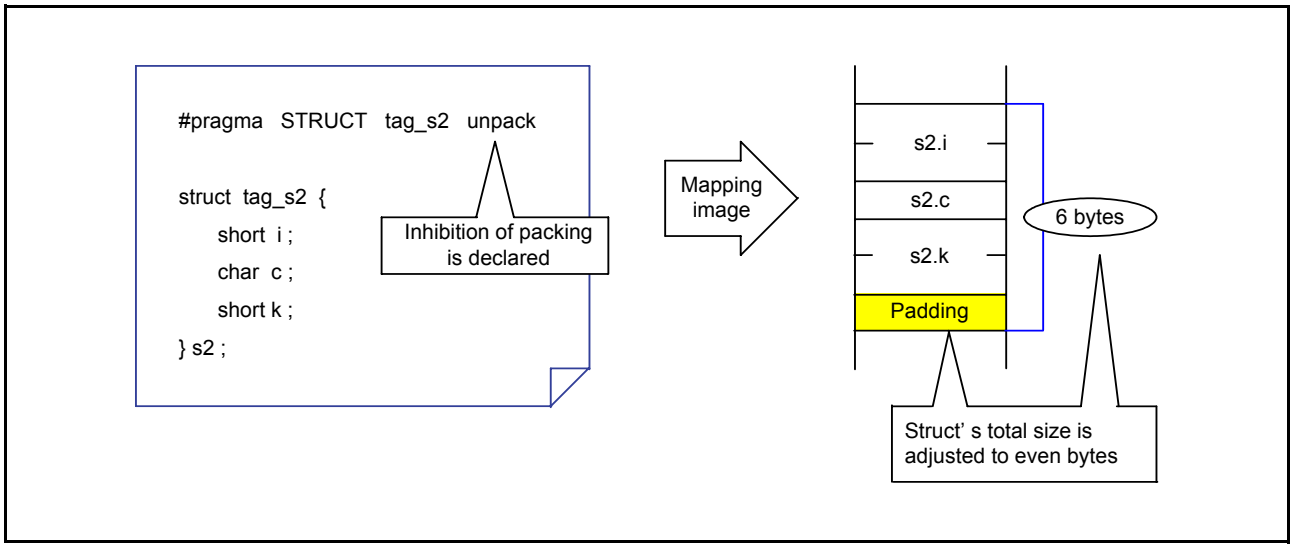


Figure 3.9 Inhibiting Packing of Struct Members

3.4.3 Optimizing Mapping of Struct Members (#pragma STRUCT tag name arrange)

This command statement maps even-size members before other members regardless of the order they are declared. If this statement is used in combination with the statement “#pragma STRUCT unpack” described above, each even-size member is mapped into memory from an even address, thus allowing efficient memory access.

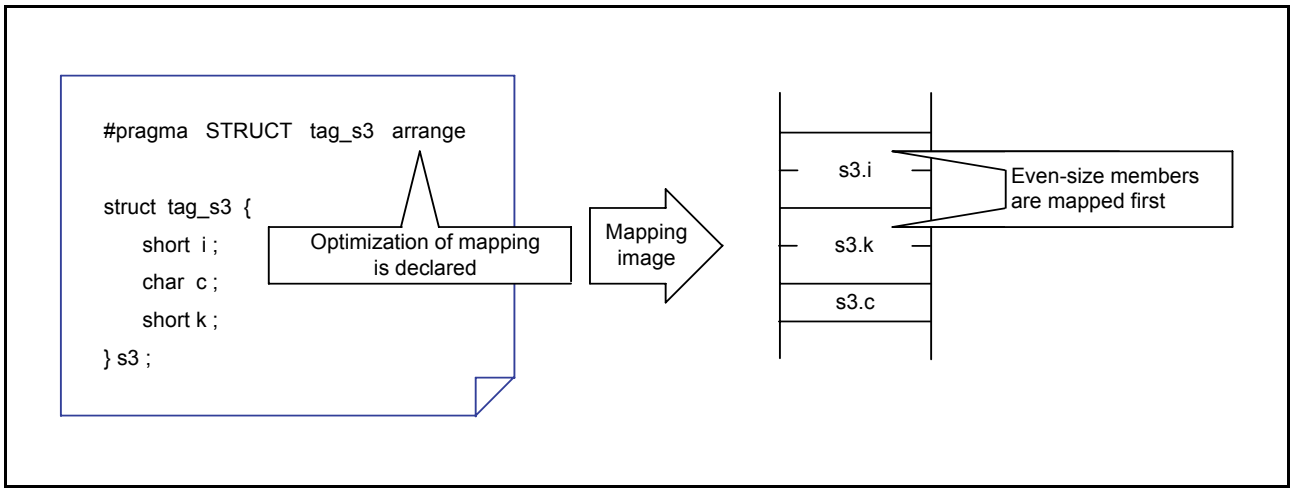


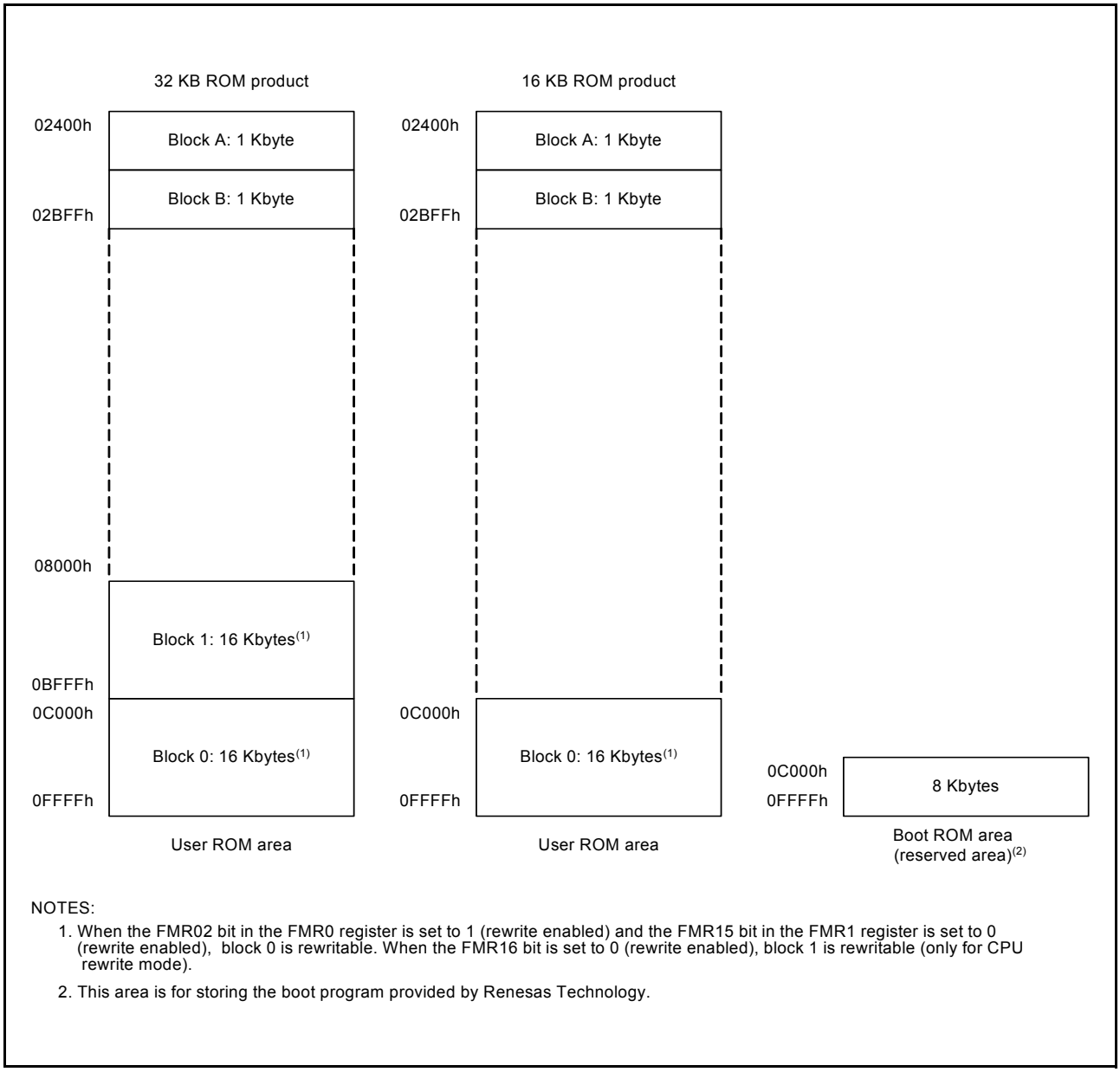
Figure 3.10 Optimizing Memory Allocation for Struct Members

3.5 Example of Writing Data Flash Table

This section describes how to map the data table in the flash memory.

3.5.1 R8C/25 Group Flash Memory

The flash contains a user ROM area and a boot ROM area (reserved area).
Figure 3.11 shows the Flash Memory Block Diagram for R8C/25 Group.
The user ROM area of the R8C/25 Group contains an area (program ROM) which stores MCU operating programs and blocks A and B (data flash) each 1 Kbyte in size.



NOTES:
1. When the FMR02 bit in the FMR0 register is set to 1 (rewrite enabled) and the FMR15 bit in the FMR1 register is set to 0 (rewrite enabled), block 0 is rewritable. When the FMR16 bit is set to 0 (rewrite enabled), block 1 is rewritable (only for CPU rewrite mode).
2. This area is for storing the boot program provided by Renesas Technology.

Figure 3.11 Flash Memory Block Diagram for R8C/25 Group

3.5.2 Writing Source File

Figure 3.12 shows the Writing Example and Expanded Image of Source File.

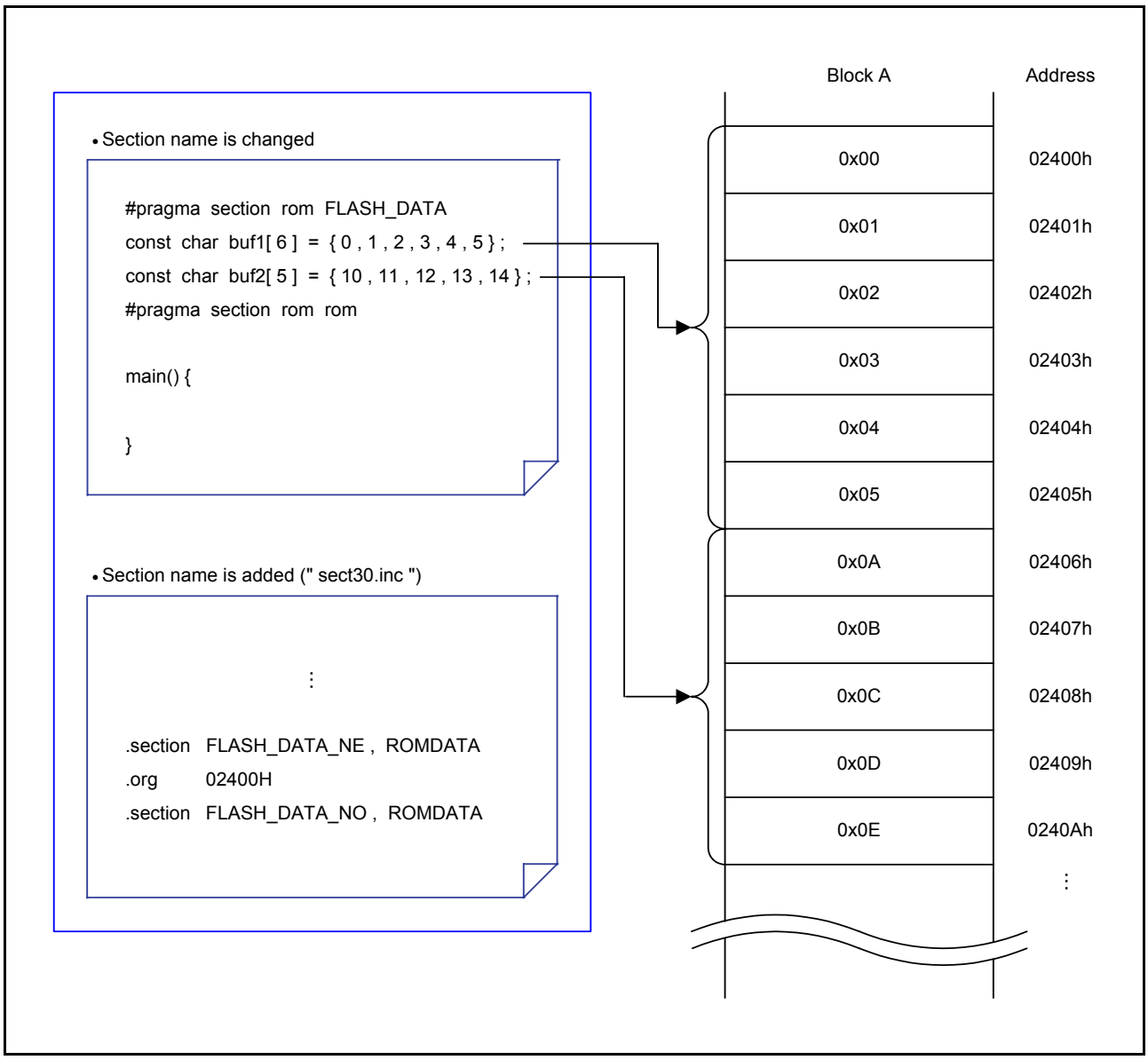


Figure 3.12 Writing Example and Expanded Image of Source File

4. Reference Documents

Hardware Manual
R8C/25 Group Hardware Manual
The latest version can be downloaded from the Renesas Technology website.

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

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		Page	Summary
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