To our customers,

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Renesas Electronics website: http://www.renesas.com

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Renesas Electronics Corporation

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Be sure to read this note

Assembler Package for 740 Family V.4.10 Release 02

Release Notes

3rd Edition

Renesas Solutions Corporation

July 16 2006

Abstract

Welcome to Assembler Package for 740 Family V.4.10 Release 02. This document contains supplementary descriptions to User's Manual. When you read certain items in the User's Manual, please read this document as well.

Inquiry

On April 1, 2003, Mitsubishi Electric Semiconductor Application Engineering Corporation, a member of the Mitsubishi Electric group, joined the new Renesas Technology group and changed its name to Renesas Solutions Corp. Please note the following new sites and mail-address:

- User Registration
  regist_tool@renesas.com
- Tool Technical Support
  http://www.renesas.com/inquiry
- Tool Homepage
  http://www.renesas.com/en/tools

The latest info

Please refer to the useful following sites:
http://www.renesas.com/en/tools

Entering user registration

To be eligible for upgrade information, technical support, and other services, you must be registered as a user with Renesas Technology Corporation. Unless you are a registered user, the said services cannot be received.

Please register your name with Renesas Technology Corporation within 30 days after purchase.

User registration

When you've installed Assembler Package, the following file is created.

¥Renesas¥SRA74¥V410R02¥support¥sra74¥regist.txt

Cut all contents of the regist.txt file and paste them into a file, then send it to the electronic mail address given bellow.

regist_tool@renesas.com

For information on our policy concerning the protection of personal information, please refer to the Renesas Technology Homepage.
The information we receive via the User Registration Form aids us greatly in our customer support activities. We provide Renesas Technology and related companies, distributors, etc., with essential user information (electronically or on paper) that will further help them provide customer support.
If you do not wish to have your user information provided to other related companies, please contact us to let us know. Note, however, this will limit our ability to provide complete product support.

1. Contents of upgrading from old versions

From V.4.10 Release 1 to V.4.10 Release 02

- High-performance Embedded Workshop V.4 support
- Machine language file converter “HEXTOS2” is added.

2. Installing

Before installing SRA74

Please confirm as follows before installing SRA74 in your computer.

- □ Please carefully read the “License Agreement” and “Release Note(this note)” included with your product before using SRA74. If you’ve installed this product in your computer, it is assumed that you’ve agreed to the provisions stipulated in the License Agreement.
- □ Use the dedicated installer to install SRA74.
- □ You need to input a license ID in the middle of installation. Before you start installing SRA74, check your license ID.
- □ When upgrading SRA74, Renesas recommends uninstalling the existing version of SRA74 before installing the new version.

  Uninstalling SRA74

  To uninstall SRA74, choose “Control Panel” and “Add/Remove programs” and then execute uninstall.

SRA74 Installer

■ English environment

Supported host	Supported OS	Installer name	Directory on CD-ROM
PC	Windows 98 Windows 2000 Windows NT Windows Me Windows XP	SETUP.EXE	¥SRA74¥W95E

■ Japanese environment

Supported host	Supported OS	Installer name	Directory on CD-ROM
PC	Windows 98 Windows 2000 Windows NT Windows Me Windows XP	SETUP.EXE	¥SRA74¥W95J

Installing

Please use the following procedure for installation on a PC.

(1) Go to the directory corresponding to your system, which can be found the name of the software you purchased, on the CD-ROM.

(2) Start up the installer and follow the messages displayed on the screen as you install SRA74.

Note!

- You cannot specify a name that contains a blank for the directory in which SRA74 will be installed.

[About entering user information]

The data you input in the intermediate of installation is necessary to create a file for user registration. For information on our policy concerning the protection of personal information, please refer to the Renesas Technology Homepage.

[About selecting contents of installation]

It is not possible selective installation. (That means only assembler or only High-performance Embedded Workshop, for example.) If any components of them are not necessity, please do uninstallation each of them after installation.

[About uninstalling programs]

The installed programs can be uninstalled according to the following instructions. Begin the uninstallation after closing all the applications.

(1) Select [Control Panel] on the Windows [Start] menu.
(2) Select the [Add or Remove Programs] icon.
(3) Click [High-performance Embedded Workshop] on the [Change or Remove Program] tab and click the [Remove] button.
   - 740 Family Assembler V.4.10 Release 02
   - High-performance Embedded Workshop

[About the AutoUpdater]

The AutoUpdater will start and station into PC automatically.

The AutoUpdater is an utility that watch the Renesas HomePage periodically and detects the renewal of the installed development tools.

[Constitution of start menu]

After installation, the folders and shortcuts that showed them below will be registered to the [start] -> [Programs] -> [Renesas].

High-performance Embedded Workshop
740 Family Assembler V.4.10 Release 02
User Registration
Renesas AutoUpdate
Renesas Tools HomePage

Software to be installed and Directories created by installation

When you've finished installing SRA74, the following directories are created below the installer's default installation directory : C:¥Renesas¥SRA74¥V410R02

And the following files are installed in each directory.

Directory	File
bin	sra74.exe (Assembler) link74.exe (Linkage editor) lib74.exe (Librarian) crf74.exe (Cross Referencer) cv74 .exe (Converter for M37280 file) loop74.exe (Branch optimizer) hextos2.exe (Machine language file converter) SRA74 help file
smp74	struct.a74 (Structured description sample program) sample.a74 (Assembly language sample program)
lib74	sra74.a74 (Library file for operating *, / and %)
manual	sra74ue.pdf (SRA74 electronic manual)

Setting environment

If you use on DOS prompt, set environment variables like the following table.

Setting PC environment

The environment variables marked by "*Auto*" in the following table can be set with the installer.
Please check the item "Let setup modify the AUTOEXEC.BAT file" in Environment Variable dialog box, when you install.

Environment variable	Example of setting
INC	*Auto* (SET INC=C:¥Renesas¥SRA74¥V410R02¥INC74)
LIB74	*Auto* (SET LIB74=C:¥Renesas¥SRA74¥V410R02¥LIB74)
TMP	*Auto* (SET TMP=C:¥Renesas¥SRA74¥V410R02¥TMP)
Command path	*Auto* (C:¥Renesas¥SRA74¥V410R02¥BIN is added)

Programs in the freeware directory

The freeware directory on the CD-ROM contains programs with functions that support the product's functions. These programs are not installed by the installer; each program must be installed directly from the CD-ROM. See the document files for the respective programs for details of how to install the program and its functions.

lst74

Converts the address data in the list files generated by the assembler into absolute addresses.

xref74

Generates a cross-reference list of local and global symbols.

Note!

Neither Renesas Technology Corporation nor Renesas Solutions Corporation, therefore, accepts any liability for damage directly or indirectly incurred by the use of this software.

3. Precautions

Precautions on PC version

Precaution on Environment to operate

SRA74 does not work under Windows 3.1 and Windows NT 3.5x or earlier. As for environment to operate, refer to the clause of “Operating Environment”.

Suggestions Concerning File Names

The file names that can be specified are subject to the following restrictions:

- Directory and file names that contain kanji cannot be used.
- Only one period (.) can be used in a file name.
- Network path names cannot be used. Assign the path to a drive name.
- Keyboard shortcuts cannot be used.
- Directory and file names that contain a space character cannot be used.
- The "..." symbol cannot be used as a means of specifying two or more directories.
- A file name in length of 128 characters or more including path specification cannot be used.

Precautions about virus check programs

If the virus check program is memory-resident in your computer, SRA74 may not start up normally. In such a case, remove the virus check program from memory before you start SRA74.

Precaution on using SRA74

1. When a pair of square brackets [ ] or curry braces { } indicating memory reference in structured description are used for the macro argument in each macro call, the macro expansion may not be accomplished properly.
   Enclose [ ] or { } in double quotation marks.

   Example:

```
mac:   .macro   para1,para2
         para1 = para2
       .endm
mac "[work]",10h
```

2. When the number of lines of one source file crosses 65535 lines, relocatable file isn't sometimes generated right in SRA74. When relocatable file isn't generated right, Internal error occurs in LINK74.
   It occurs when meeting the following two conditions.
   (1) The number of lines of one source file crosses 65535 lines.
   (2) It adds -C option and it has started SRA74.
   Avoid in either following way.
   (1) Divide a file so as not for one source file to cross 65535 lines.
   (2) Start SRA74 without adding -C option.

3. When a line with 255 or more characters exists in source file, the assembly of the line isn't sometimes done right. In the case, the error occurs in SRA74 or LINK74.
   Except for the line only of the comment, make the number of characters with 1 line less than 255.

4. Describing a symbol for forward-referencing in the conditional expression in conditional assembling results in the assembling being terminated unsuccessfully.

Example

```
.section P
.IF BBB          ; A symbol for forward-referencing described
                   in the conditional expression
lda AAA
.ELSE
nop
.ENDIF
BBB .equ 0       ; The symbol defined
.end
```

Don't describe any symbol for forward-referencing in the conditional expression in conditional assembling.

5. Forward-referencing a label in a relocatable zero-page section causes incorrect data to be written to the HEX file.

Example

```
.section P
.org 1000h
lda YY
nop

.section Z
YY:   .blkb 2      ; A label defined
.end
```

In the case of the above example, "Warning 1: Phase warning" is displayed while sra74 is running. However, no error is detected in link 74 though incorrect data is written to the HEX file.
Don't forward-reference any label in a relocatable zero-page section.

6. In a conditional expression in structured description, if the equality or inequality is tested between a memory bit variable and a memory variable, an unnecessary instruction will be created without interpreting the evaluation as an error.

Conditions

This problem occurs if the following three conditions are satisfied:
(1) An equality or inequality operator (== or !=) is used in a conditional expression in structured description.
(2) The left operand of the operator in (1) is a memory bit variable.
(3) The right operand of the operator in (1) is a memory variable.

Example

In the example shown below, flag1 and work1 denote a memory bit variable and a memory variable respectively.

```
----------------------------------
if [flag1] == [work1]
    nop
```

```
endif
-----------------------------------
```

When the above example is assembled, the following assembler instructions including an unnecessary one are generated:

```
-----------------------------------
;if [flag1] == [work1]
            CMP    work1          ; Unnecessary instruction
            BBS    flag1,.I0
    nop
;endif
.I0:
-----------------------------------
```

Workaround

In a conditional expression in structured description, don't test the equality or inequality between a memory bit variable and a memory variable.

NOTE:

When the left term of a conditional expression is a memory bit variable, only 0 (zero) or 1 is allowed in its right term. For details, see Appendix F.4 "Syntax maps of Structured Commands" in the SRA74's User's manual.

7. As shown in the list below, if the -LS option is selected, correct print files are not generated, and relocatable files may not be created depending on the environment where the SRA74 is executed.
   (1) When the High-performance Embedded Workshop used:
      - Correct print files are not generated.
      - Relocatable files are not created.
   (2) When the TM used:
      - Correct print files are not generated.
      - Error 128 arises in the MAKE.EXE file.
   (3) Command line interface used:
      - Correct print files are not generated.

   Conditions

   This problem may occur if the following conditions are both satisfied:
   (1) Assembler option -LS is selected.
   (2) the .COL pseudo-command is not used, or the number of columns of print files is set to 256 or more using .COL.

   Workarounds

   This problem can be circumvented either of the following ways:
   (1) Use the -L option instead of -LS.
   (2) Set the number of columns of print files to 255 or less using .COL.

Precaution on using CRF74

The line information of which a label and user macro call are written on same line is not output to cross reference file generated by CRF74.
When you use CRF74, write a label and user macro call on another line.

Example:

```
mac1:
            umacro  ;user macro call
```

Precaution on using CV74

When the global bit symbol information exists in the symbol file, the change of the symbol file can not be normally processed.
In the case, the following error message is output.

Error : Symbol file line characters exceed

When the global bit symbol information exists in the symbol file, before changing in CV74, put a new-line code in the end of the symbol file.

Precaution on the function for the memory beyond the 64 Kbytes

SRA74 is capable of working beyond the 64 Kbytes of the M37280.
The corresponding functions are the following.

(1) –BANK option
(2) BK single term operator
(3) BL single term operator
(4) SECTION E

These functions are the exclusive use of M37280. The other microcomputer can not use.

Correct SRA74 Manual

Page		Contents
1-30	Wrong	3. For the operands of operators BK and BL, specify labels whose values are defined in assembly execution.
	Corrects	3. For the operands of operators BK and BL, specify labels whose values are defined in assembly execution. BK and BL are the exclusive use of M37280. The other microcomputer can not use.
1-51	Wrong	-BANK Expands the address area upper limit from FFFFH to 1FFFFH. Operators BK and BL can be used. Section E information is not output to relocatable files or list files.
	Corrects	-BANK Expands the address area upper limit from FFFFH to 1FFFFH. Operators BK and BL can be used. Section E information is not output to relocatable files or list files. This option is the exclusive use of M37280. The other microcomputer can not use.
2-10	Wrong	E section
	Corrects	E section This section is the exclusive use of M37280. The other microcomputer can not use.
2-13	Wrong	-BANK Expands the address area upper limit from FFFFH to 1FFFFH.
	Corrects	-BANK Expands the address area upper limit from FFFFH to 1FFFFH. This option is the exclusive use of M37280. The other microcomputer can not use.

4. Method for Operating HEXTOS2

HEXTOS2 is a Machine language file converter.

Function

- It converters the Intel Hex format file (extension .hex) created by LINK74 into Motorola S format machine language file (extension .s2).

  Caution
  The file extension of the Motorola S format which HEXTOS2 generates is being fixed to '.s2'. When you use the generated file with other tools, please change an extension if needed.

Description rule

HEXTOS2 filename(.hex)

- The extension may be omitted. However, an error will occur if the file's extension is not '.hex' or there are two or more files.
- The output file name is formed by appending the extension '.s2' to the input file name. The output file name cannot be specified.

Description example

C:¥> hextos2 sample.hex <RET>

When you use High-performance Embedded Workshop:

Click the [740 HexToS2] of [Tools] menu.

The default output file name is formed by appending the extension '.s2' to the project name.
The output directory is configuration directory (Debug or Release).

Caution: When a tutorial is used:
The [740 HexToS2] menu is not displayed in the workspace used by the tutorial.
Please add a menu in the following procedures.

1. Start High-performance Embedded Workshop and open the workspace used by the tutorial.
2. Click [Customize] command in [Setup] menu. Customize dialog box is displayed.
3. Click [Menu] tab.
4. Click [Add] button of [Workspace wide tools]. [Add Tool] dialog box is displayed.
5. Check [Select from existing system tools] and choose [740 HexToS2 (version 2.00.00)].
6. Click the OK button of all dialog boxes.

5. Startup of High-performance Embedded Workshop

High-performance Embedded Workshop

Click [High-performance Embedded Workshop] in the [High-performance Embedded Workshop] folder in the [Renesas] folder in the [Program] folder of the Windows® [Start] menu.

Launch Manual Navigator

It displays the online manuals and attached document.

Click [Manual Navigator] in the [High-performance Embedded Workshop] folder in the [Renesas] folder in the [Program] folder of the Windows® [Start] menu.

Note!

Manual Navigator requires Adobe Reader.

If Manuals folder is moved, Manual Navigator cannot show them.

6. A Guide to Porting Projects Created with TM to HEW

Summary

To port projects created using TM V.2.xx or V.3.xx into High-performance Embedded Workshop (herefor HEW) V.4, the Import Makefile function of HEW is used. This function can create projects from such items of information as source files and build options described in the specified makefile files.

In TM, project files are created in the makefile format executable in GNU make format. When project files created with TM are selected as makefile files using HEW Import Makefile function, they are converted to files that can run in HEW. In addition to TM project files, the Import Makefile function can also convert files in the makefile formats for hmake, nmake, and gmake to HEW projects.

Porting Procedure

To port projects created using TM into HEW, perform the following steps:

- Open the File menu and select the New Workspace command.
- The New Project Workspace dialog box opens.

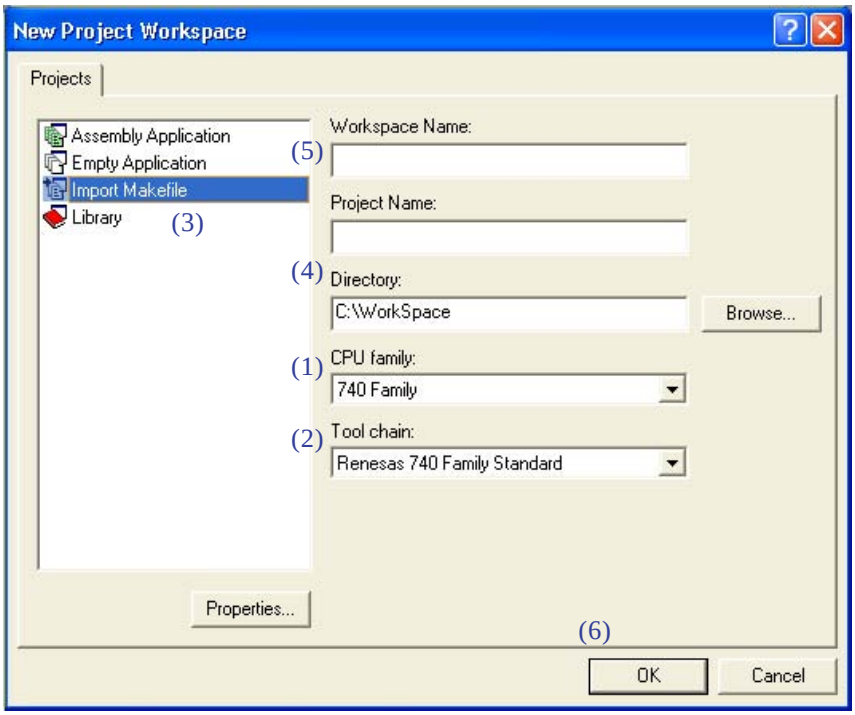

Figure 1 New Project Workspace Dialog Box

2-1. Select "740 Family" from the Type of CPU drop-down list.
2-2. Select "Renesas 740 Family Standard" from the Toolchain drop-down list.
2-3. Select "Import Makefile" from the Project list.
2-4. Type the directory path in the Directory text box.
2-5. Type the workspace name in the Workspace Name text box. The same name will be automatically entered as the project name in the Project Name text box.
2-6. Click **OK**.

- You should now be able to see the New Project-1/4-Import Makefile wizard.

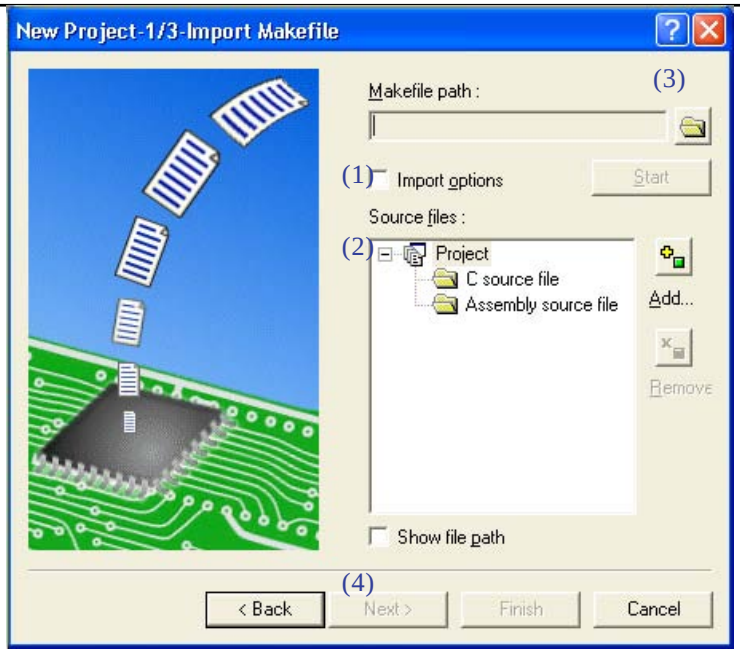

Figure 2 New Project-1/4-Import Makefile Wizard

3-1. Select the Import options check box; this will enable information on build options (assembling options and linker options etc.) to be used to create HEW projects. If you clear the Import options check box, the above information is neglected and not used in HEW.

3-2. Type the name of the TM project file (with extension .tmk) in the Makefile path text box. As soon the name is input, the specified file is analyzed, and upon analysis completion, the analyzed source files are displayed in a tree structure in the Source files box. Click the Start button to analyze the specified file again.

3-3. If there are any errors in the analysis results (tree structure in the Source files box), rectify the tree structure with the Add and Remove buttons.

3-4. Click **Next**.

- Follow the instructions according to the Wizard as it continues in the procedure.

Usage Notices

TM-to-HEW Portable and Non-Portable Information

When you port a project created using TM into HEW, not all the components of the project can be ported.

Portable information is as follows:

- Paths of assembler source files
- Assembling options
- Linking options (except linkage order)

Non-Portable Information:

- Linkage order
- Tool configurations, dependencies, and options other than Assembler, Linker

To transfer these items, edit the HEW project after processing the Import Makefile.

Linkage order

Import Makefile cannot port the linking order information to HEW. HEW arranges the linking order alphabetically. To change this order, go through the following steps:

Open the Build menu and select the Linkage Order command.
The Linkage Order dialog box opens.

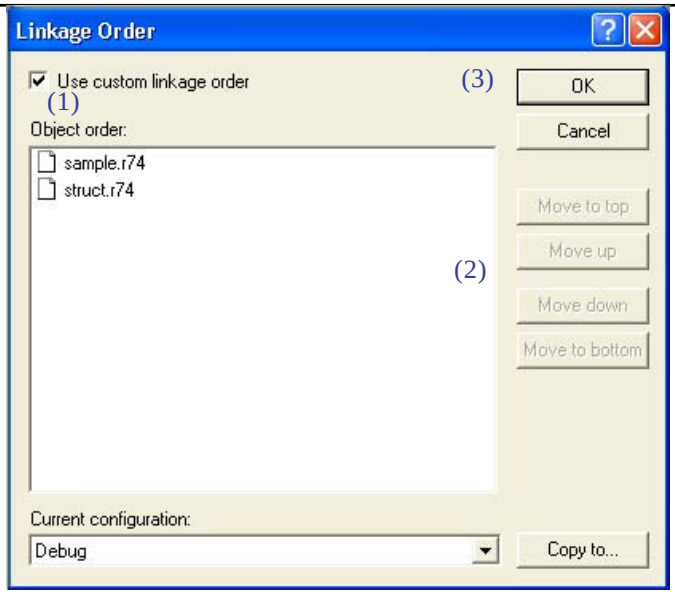

Figure 3 Linkage Order Dialog Box

2-1. Select “Use custom linkage order” check box.

2-2. Select a file from the Object order list, and click **Move up** or **Move down** to move the file. Repeat this step for all files that need to be rearranged.

2-3. Click **OK**.

7. Tips for SRA74

Writing programs for accessing the M37280's expansion memory

SRA74 is capable of working beyond the 64 Kbytes of the M37280.

BK single term operator

This operator obtains the bank value.

- Only values defined in assembly execution can be specified as the operation value.
- Forward reference values, external reference values and relocatable values cannot be specified.

Bank value

The bank value is obtained by shifting the address value to the right 12 bits and subtracting 10H. For example, the bank value of 12345H would be 2.
To calculate the bank value using a regular operator, the following equation must be written. However, with the BK operator, program readability is improved.

To calculate the bank value using a regular operator

```
# DTtBank10 / 1000H - 10H
```

To calculate the bank value using the BK single term operator

```
# BK DTtBank10
```

BL single term operator

This operator obtains the extra area value.

- Only values defined in assembly execution can be specified as the operation value.
- Forward reference values, external reference values and relocatable values cannot be specified.

Extra area value

The extra area value is obtained by adding 1000H to the low-order 12 bits of the address value. For example, the extra area value of 12345H would be 1345H.
To calculate the extra area value using a regular operator, the following equation must be written. However, with the BL operator, program readability is improved.

To calculate the extra area value using a regular operator

```
# DTtBank10 & 0FFFH + 1000H
```

To calculate the extra area value using the BL single term operator

```
# BL DTtBank10
```

SECTION E

Section E is a non-generated section.
It can be specified to avoid overlap errors that occur in linking when local information of the same address exists in multiple files.
Area exceeding 64 KB can be accessed locally. Accordingly, BL and BK single term operators, which are the only operators applicable with values defined in assembly, can be used.

Note!

Section E must be defined as an absolute section using the .ORG pseudo-command.
Capital and small case letters are not distinguished in the "E" of the section name.

Programming example

The below example programs access the M37280's expansion memory area. In this example, data DTtBank10 is loaded into the respective files starting from address 1BA00H in the expansion memory. Here also, section E of file1.a74 and section DataSecE of file2.a74 have the same contents, but link errors are avoided by specifying section E of file1.a74, which makes it possible to access DTtBank10 in each of the files locally.

file1.a74

```
        .SECTION    E
        .ORG        1BA00H
DTtBank10:
        .BYTE       0BBH
        .BYTE       0BCH
        .BYTE       0BDH
        .SECTION    prog
        LDM         #   BK   DTtBank10   |   80H, 0EDH
        LDA         BL   DTtBank10
        JSR         PRC_TSK
```

file2.a74

```
.SECTION    DataSecE
        .ORG        1BA00H
DTtBank10:
        .BYTE       0BBH
        .BYTE       0BCH
        .BYTE       0BDH
        .SECTION    subr
        LDM         #   BK   DTtBank10   |   80H, 0EDH
        LDA         BL   JUMP_TBL, X
        LDA         BL   JUMP_TBL+1, X
        JSR         CHK_TSK
```

Assembling and linking the example programs

To assemble and link the M37280 expansion memory access programs, attach the -BANK option.

```
> SRA74 file1.a74 -BANK
> SRA74 file2.a74 -BANK
> LINK74 file1 file2 , , , -BANK
```

Debugging the M37280 expansion memory access programs

Using the cv74 command, convert the machine language file (.hex extension) and symbol file (.sym extension) into debuggable format files.

Note!

Debugging is not performed correctly with files other than machine language files and symbol files which have been converted into debuggable format with the cv74 command.

Writing program into ROM

When you have finished debugging your application program, you need to evaluates its operation in an environment closer to that of the actual application product. For this evaluation, the program is written into a microcomputer that contains EPROM or one-time PROM. Following preparations are required before you can write your program into ROM.

1 Create a ROM programmer compatible format file
2 Prepare a programming adapter and other tools

Creating a ROM programmer compatible format file

With SRA74, machine language files (.hex extension) generated with the link74 command are written directly into the ROM.

Preparing a programming adapter and other tools

Refer to the data sheets included with your product or Internet home page to get the latest information necessary to prepare a programming adapter and other hardware items.

8. Operating Environment

The operation of SRA74 has been checked and confirmed on the host computers with the operating system versions shown below.

Host Machine Name	OS version	Directory of CD-ROM
IBM PC/AT compatibles	Microsoft Windows 98 Microsoft Windows NT 4.0 Microsoft Windows 2000 Microsoft Windows Me Microsoft Windows XP	W95E

9. Software version list

SRA74	V.4.10.00	Assembler
LINK74	V.4.00.00	Linkage editor
LIB74	V.4.00.00	Librarian
CRF74	V.1.00.10	Cross Referencer for source file
CV74	V.1.00.01	Converter for M37280 file
LOOP74	V.1.00.01	Branch optimizer
HEXTOS2	V.2.00.00	Machine language file converter

SRA74 includes several freeware programs.

LST74	V.1.02.01	Absolute lister
XREF74	V.1.00.01	Cross Referencer for absolute file