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For M16C Series, R8C Family C compiler Package V.5.45 Release 00

Guidebook (Rev.1.00)

Renesas Solutions Corporation

May 16, 2009

Abstract

This document provides a guide to the introduction of M16C Series, R8C Family C compiler Package V.5.45 Release 00. When you install this software package or create a project or want to know about the compiler, please refer to this guidebook.

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A. Installation guide of C compiler package

A.1. Before installing C Compiler Package

Please confirm as follows before installing C Compiler Package in your computer.

- Please carefully read the "License Agreement" and "Release Note" included with your product before using C Compiler Package. If you've installed this product in your computer, it is assumed that you've agreed to the provisions stipulated in the License Agreement.
- In order that C Compiler Package operates comfortably, it requires at least 32Mbytes of memory and a hard disk having 20Mbytes or more of space.
- You need to input a license ID in the middle of installation. Before you start installing C Compiler Package, check your license ID.

Host Computer	IBM ¹ PC/AT compatible
CPU	Pentium 4 (or Pentium M) or more is recommended.
OS	Windows 2000 , Windows XP and Windows Vista ²
Memory	512MB or more is recommended.
Capacity of hard disk	200MB or more in empty capacity
Display	Resolution of SVGA or more
I/O device	CD-ROM drive
Else	Pointing device of mouse etc.

A.2. Required System Configuration

A.3. Installation Procedure

Insert the CD-ROM of the C Compiler Package into the CD drive of your computer, and High-performance Embedded Workshop Install Manager will start up automatically. Follow the messages displayed by High-performance Embedded Workshop Install Manager as you install the C Compiler Package.

If High-performance Embedded Workshop Install Manager does not start up automatically, execute "HewInstMan.exe" included in the CD-ROM.

D:¥> HewInstMan.exe The drive name "D:" differs with each PC used.

Note, however, that before High-performance Embedded Workshop Install Manager starts up, all other applications must be closed.

- Precautions
 - [1] Make sure that High-performance Embedded Workshop V.4.05.01 is installed in a different directory than the one where the earlier version V.1.x is installed.
 - [2] The projects created with High-performance Embedded Workshop V.1.0x cannot be used directly in V.4.05.01 To use any project created with V.1.0x in V.4.05.01, convert it to V.1.1x once (by opening a project in V.1.1 and then saving it).

The following describes the procedure for newly installing the C Compiler Package in your computer while High-performance Embedded Workshop Install Manager is up and running.

¹ IBM and AT are registered trademarks of International Business Machines Corporation.

² Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

A.3.1. When installing for the first time

(1) When you are newly installing the C Compiler Package or when you click "Read first" in High-performance Embedded Workshop Install Manager, the Install Manager Help shown below is displayed on the screen. Please read it before you proceed.



(2) Click the Standard Install(Recommended).

S High-performance Embedded V	Workshop Install Manager 🛛 🛛 🗙
	Read first
RENESAS Everywhere you imagine.	Standard Install (Recommended)
Multi installation	Multi Install
Active High-performance	Maintenance
Switch over! Switch over! High-performance Workshop High-performance Workshop High-performance Workshop High-performance Workshop High-performance Monactive	Detail The Install Manager is the utility that guides you through steps as you install the integrated development environment High-performance Embedded Workshop. It permits you to install two or more instances of the High-performance Embedded Workshop in a single PC.
	Exit

(3) Check the folder in which the High-performance Embedded Workshop will be installed and click Next.

Select destination folder	3
Destination folder	
Click Next to install to this folder, or click Change to install to a differnt folder.	
Destination Folder	
C:\Program Files\Renesas\Hew Change	

(4) Select check boxes and click Install.

S Choose software
Please choose software to install.
✓ M16C Toolchains V.5.45 Release 00 ✓ AutoUpdate
, Detail Please choose from the list (it will installed one-by-one by this order:
Please click [Install] after choosing software to install.
Install Exit

Only "M16C Toolchains" is checked. If you install AutoUpdate, check "AutoUpdate".

(5) Click Next.

M16C Series, R8C Family C Co	ompiler V. 5.45 Release 00	×
Renesas Everywhere you imagine.	Welcome to the InstallShield Wizard for M16C Series, R8C Family C Compiler The InstallShield Wizard will install M16C Series, R8C Family C Compiler on your computer. To continue, click Next.	
High-performance Embedded Workshop ⁴		
InstallShield	< Back Next > Cancel	

(6) Carefully read the Software User License Agreement and click Yes.



- M16C Series, R8C Family C Compiler V.5.45 Release 00
 Input License ID
 Please input License ID' of this product.

 Figh-performance
 Embedded
 Workshop
 InstallStied

 Reak
 Eack
 Met>
 Cancel
- (7) Enter the license ID written in your license ID certificate and click Next.

(8) Check the folder in which the C compiler will be installed and click Next.



If changing the folder, click Browse.

Do not install the same folder with Hitachi Integration Manager or Hitachi Embedded Workshop. Refer to Renesas Tool News about the latest information.

(9) Click Install.



(10) Click Exit to close High-performance Embedded Workshop Install Manager.



A.3.2. When installing AutoUpdate

Check AutoUpdate in "Choose software" dialog box. (Refer to Page 6).

(1) Click Next.

Renesas AutoUpdate Utility	y V.1.05.00 - InstallShield Wizard 🛛 🛛 🔀
	Welcome to the InstallShield Wizard for Renesas AutoUpdate Utility V.1.05.00 The InstallShield® Wizard will install Renesas AutoUpdate Utility V.1.05.00 on your computer. To continue, click Next.
	< Back Next > Cancel

(2) Check the folder in which the " "I want to register the AutoUpdate utility to the startup folder. " will be installed and click Next.

Renesas AutoUpdate Utility V.1.05.00 - InstallShield Wizard	×
Installation options Select the options you want.	
Select the options. Click the Next to continue.	
InstallShield < Back Next >	Cancel

(3) Click Install.



(4) Click Finish.

Renesas AutoUpdate Utility V.1.05.00 - InstallShield Wizard			
	InstallShield Wizard Complete		
	Setup has finished installing on your computer.		
	K Back Finish Cancel		

(5) Click Exit to close High-performance Embedded Workshop Install Manager.

🛇 High-performance Embedded W	/orkshop Install Manager	
2	Installation has completed	
Everywhere you imagine.	instanation nas completeu.	
Multi installation		
Active		
High-performance Embedded Workshop		
Switch over!		
High-performance Workshop		
Workshop*		
Non-active		
		Exit

A.3.3. When checking of the existing environment

(1) Click Maintenance

Solution Washington Market Strength Str	/orkshop Install Manager	X
	Read first Standard Install (Recommended) Multi Install Maintenance Detail The Install Manager is the utility that guides you through steps as you install the integrated development environment High-performance Embedded Workshop. It permits you to install two or more instances of the High-performance Embedded Workshop in a single PC.	
	Exit	

(2) Check of the environment.

Maintenance							
High-performance Embedded Workshop is already installed in this PC.							
Active	Active DisplayName (Directory)						
Active High-performance Embedded Workshop (C:\Program Files\Renesas\Hew)							
C:\Prog	ram Files\Renesas\He	w					
- Displ	lay Name=High-performa ion=\/ 4.04.01.001	ince Embedded Works	hop				
Pack	age						
- T	ToolChain						
	- M16C Toolchains 5.4 imulator Dobuggor	4.00					
- Simulator Debugger - M16C R8C/Tiny Series Simulator Debugger 1.03.00							
Insta	llation Record	00					
- 3-3-2008 14:24:20,M16C/80,30,Tiny,20,10, R8C/Tiny Series C Compiler V.5.44 Release 00							
You can refer to the details when you click line. When you click [Switch active environment], switch over the active High-performance Embedded Workshop which you chose							
Swite	h active environment	Save to file	Help	About Install Manager		Exit	

A.3.4. When installing two or more High-performance Embedded Workshop in a single PC.

(1) Click Multi Install.

High-performance Embedded Workshop Install Manager			
Competition and competition an	Read first Standard Install (Recommended) Multi Install Maintenance Detail The Install Manager is the utility that guides you through steps as you install the integrated development environment High-performance Embedded Workshop. It permits you to install two or more instances of the High-performance Embedded Workshop in a single PC.		
	Exit		

Refer to the Install Manager Help about Multi Install.

A.4. Uninstalling programs

The installed programs can be uninstalled according to the following instructions. Begin the un-installation 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(Multiple Install)] on the [Add or Remove Programs] tab and click the [Remove] button.
- (4) Then, Uninstall dialog of Install Manager is displayed. Choose [High-performance Embedded Workshop] in the list and click [Uninstall] button.
- (5) Follow the instruction displayed on the screen.
- (6) After removing the program, restart Windows.

A.5. Startup or termination of program

A.5.1. Startup and termination of the High-performance Embedded Workshop

• Startup

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.

• Termination

Click [Exit] on the [File] menu.

A.5.2. Start of Manual Navigator

• Startup

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

 Termination Termination: Click [Exit] on the [File] menu.

A.5.3. Displaying the online manuals and attached documents

Displaying the online manuals and attached documents

- Note
 - [1] Manual Navigator requires Adobe Reader³.

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

A.6. Setting when compiler is used on DOS prompt and command prompt

Please execute setnc30.bat when you use the compiler on the DOS prompt and the command prompt.

A.6.1. Environment Variables and Path

Environment variable	Usage
BIN30	Directory in which the C compiler execution files (e.g., *exe) are stored
INC30	Directory in which the standard include files of the C compiler are stored
LIB30	Directory in which the standard library files of the C compiler are stored
TMP30	Directory in which the temporary files generated by the C compiler are stored
PATH	Directory in which the C compiler generates temporary files Select the directory for which you have access rights.

A.6.2. Batch file

A batch file named "setnc30.bat" will be generated in the directory in which you've installed the C compiler. This file has written in it the environment variables that the C compiler uses.

To use the C compiler from the DOS or the command prompt, execute setnc30.bat.

• Contents written in the batch file

```
REM ***** Environment variable for M16C Toolchains *****
SET BIN30=C:¥Program Files¥Renesas¥Hew¥Tools¥Renesas¥nc30wa¥v544r00¥BIN
SET LIB30=C:¥Program Files¥Renesas¥Hew¥Tools¥Renesas¥nc30wa¥v544r00¥LIB30
SET INC30=C:¥Program Files¥Renesas¥Hew¥Tools¥Renesas¥nc30wa¥v544r00¥INC30
SET TMP30=C:¥Program Files¥Renesas¥Hew¥Tools¥Renesas¥nc30wa¥v544r00¥INC30
SET PATH=%BIN30%;%PATH%
```

³ Adobe and Acrobat are registered trademarks of Adobe Systems Incorporated.

B. Guide Book for V.5.45 Release 00

This section describes the precautions to be taken when you upgrade the projects you created with old versions of the compiler to V.5.45 Release 00, and the points to be noted when you create new projects with V.5.45 Release 00.

B.1. Points to be noted when you upgrade from old versions of the compiler to V.5.45 Release 00 and use it in combination of Renesas real-time OS.

B.1.1. Modify startup file

_init0 function

Beginning with V.5.40 Release 00(A), the name of the library function init() has been changed to _init().

Therefore, if you attempt to build without modification, an error message *__init' value is undefined* may be generated during a link process. This error occurs in the following cases:

- If you created the project with an old version prior to V.5.40 Release 00, select the check box (1)
- When init function calls are enabled by altering ncrt0.a30 directly

ROM 128K - Use Standard I/O Library (UART1) Use Heap Memory Heap Size: 0x300 Generate main() Function C source file Use OnChip Debugging Emulator None	(1		
Use Heap Memory Heap Size: 0x300 Generate main() Function C source file Use OnChip Debugging Emulator None		ROM 128K Use Standard I/O Library (UART1)	
Generate main() Function C source file Use OnChip Debugging Emulator None		Heap Size: 0x300	
Use OnChip Debugging Emulator		Generate main() Function C source file	
		Use OnChip Debugging Emulator	
Firmware Address: Size:		Firmware Address: Size:	Contraction of the
WorkRAM Address: Size:		WorkRAM Address: Size:	

If this error occurs, alter a part of ncrt0.a30 that is shown below

[When you are using the startup file (ncrt0.a30) supplied with the compiler]

Before modification
; Initialize standard I/O ; .ifSTANDARD_IO_ == 1
After modification

; Initialize standard I/O

;	
.ifSTANDAF	$D_IO_= 1$
.glb	init
.call	init,G
jsr.a	init
.endif	
;	

[When you are using the startup file (crt0mr.a30) supplied with the Real Time OS]

For M3T-MR308

Before modification			
; + ; User Initial Routine (if ; + ; Initialize standard I/O	f there are)		
.GLBinit			
JSR.A _init			
After modification			
; ++ ; User Initial Routine (if there are) : ++			
; Initialize standard I/O			
.GLBinit			
JSR.Ainit			
;			

For M3T-MR30

* In several versions including the latest version (V.3.30 Release 2), the jump process shown below is 'commented out.'

I

I

Before modific	ation
Initialize stand	dard I/O
.glb jsr.a After modificat	_init _init
Initialize stand	ard I/O init

B.1.2. Change size of size_t, ptrdiff_t

Beginning with this version, size_t and ptrdiff_t have been changed in size from 16 bits to 32 bits.

If you need to use size_t and ptrdiff_t in 16 bits because you are using a size_t and ptrdiff_t type based user library created with an old version, for example, make the following settings.

• Set the compile options -fsize_t16 (-fS16) and -fptrdiff_t (-fP16).

• Change the libraries to be linked from nc30lib.lib and r8clib.lib to nc30s16.lib and r8cs16.lib when you're using NC30WA, or from nc308lib.lib and nc382lib.lib to nc30s_16.lib and nc382_16.lib when you're using NC308WA.

[Procedure for setup in HEW]

Set the compile options -fsize_t16 (-fS16) and -fptrdiff_t (-fP16).

From the Build menu of HEW, select [Renesas M16C Standard Toolchain] -> C tab.

Renesas M16C Standard Toolchain	<u> </u>	×	
Configuration : Debug All Loaded Projects C source file C source file Assembly source file	C Assembly Link Librarian Lmc Cfg MKMRTBL		(1)
	Options C: -D_STACKSIZE_=0X80 -D_ISTACKSIZE_=0X80 - DVECTOR_ADR=0x0fedc -D_E8D_WORK_RAM_=0x100 -c -finfo -dir **(CONFIGDIR)** -fS16 -fP16		(2)

(1)For Category, select Other

(2)For User-Defined Options, enter -fsize_t16 (or -fS16) and -fptrdiff_t16 (or -fP16).

Change the libraries to be linked.

From the Build menu of HEW, select [Renesas M16C Standard Toolchain] -> Link tab.

Renesas M16C Standard Toolchain					
Renesas M16C Standard Toolchain Configuration : Debug All Loaded Projects All Loaded Projects C source file Assembly source file	C Assembly Link Librarian Lmc Cfg MKMRTBL Category : Input Input	— (3) — (4)			
	data_SE=0400.bss_SE,data_SO,bss_SO,data_NE,bss_NE,data_NO,b OK キャンセル				

(3) For Category, select Input

For Show Entries-For select Library files.

(4) Click the Remove button to remove nc30lib.lib temporarily.

Remove r8clib.lib when you're using R8C/Tiny.

Remove nc308lib.lib when you're using M16C/8X

Remove nc382lib.lib when you're using M32C/8X $\,$

Renesas M16C Standard Toolchain	?×	
Configuration :	C Assembly Link Librarian Lmc Cfg MKMRTBL	
Debug	Category : Input	
⊡@ All Loaded Projects	Show Entries For :	
⊡⊸ugr testtest ⊡⊡ C source file	Library files	(.)
	[-L -LD] Specifies directory of library and library Add	— (5)
	Path File Insert	
	Remove	
	- [-E] Specifies start address of	
	absolute module :	
	Options Link :	
	-G -MS -O "\$(CONFIGDIR)¥\$(PROJECTNAME).x30" -ORDER	
	ss_NO,stack,istack,heap_NE,rom_NE,rom_NO,data_FE=010000,bss	
	OK \$20,471	

(5) Click the Add button to select [Library files].

Add library file	<u>? ×</u>
Library name :	ОК
	Cancel
	(6)

(6)Enter a library name usable for size_t and ptrdiff_t in 16-bit size. Input nc30s16.lib when you're using M16C
Input r8cs16.lib when you're using R8C/Tiny. Input nc308_16.lib when you're using M16C/8X
Input nc382_16.lib when you're using M32C/8X
Click the OK button to finish.

[When you're using the makefiles generated by the configurator of the real-time OS] Correct the following part of statements in the makefile. The following shows an example for the case where nc308_16.lib is linked.

Before modification

Use the following macro when you use C-libraries for M32C/80 series. #NEWLIB = -1 nc382lib

After modification

Use the following macro when you use C-libraries for M32C/80 series. #NEWLIB = -1 nc308_16.lib

[when you're using M3T-MR30]

Since the "LIBS" macro in the makefile is rewritten to "nc30lib.lib" by the configurator, the problem cannot be solved by correcting the "LIBS" macro.

Therefore, correct a process during "\$(LINKLIST)" generation to solve the problem. Correct the following part of statements in the makefile.

Before modification

\$(LINKLST): makefile @mrecho "-o \$(PROGRAM)" \$(LINKLST) @mrecho -a "-ld \$(LIB30)" \$(LINKLST) @mrecho -a "-l \$(LIBS)" \$(LINKLST)

After modification

\$(LINKLST): makefile

@mrecho "-o \$(PROGRAM)" \$(LINKLST) @mrecho -a "-ld \$(LIB30)" \$(LINKLST) @mrecho -a "-l nc30s16.lib -l \$(LIBS)" \$(LINKLST)

B.1.3. Interrupt vector

Beginning with this version, a vector table will be automatically generated when interrupt functions are declared by specifying vector numbers.

In old versions, it was necessary to specify the option <code>-fmake_vector-table(-fMVT)</code>. But this is unnecessary.

When projects are upgraded, this option is not inherited. Therefore, when you build a project, an error "Can't generate automatically the variable interrupt vector table" may be generated when linking. If this error occurs, correct sec30.inc following the method B.2.3.

B.2. Points to be maked new project when you use V.5.45 Release 00

B.2.1. Select CPU

When creating a new project you can select the type of microcomputer in CPU Group. However, the selection of microcomputer types is enabled when

- Registration of the sfr header file
- Registering the variable vector interrupt table entry function registration file (intprg.c) to the workspace
- · Link address settings

B.2.2. To create a new workspace with a microcomputer that is not listed in CPU Group

[In the case of R8C/Tiny series]

- (1) Choose R8C/Tiny from CPU Series.
- (2) Choose Other from CPU Group.

When you create a new project using V.5.45 Release 00, please check whether the compile option and the library file suit the ROM size of the microcomputer type you use on Renesas M16C Standard Toolchain Dialog Box of HEW.

From the Build menu of HEW, select [Renesas M16C Standard Toolchain]

ROM size	compile option	library
Less than 64 Kbytes	-R8C	r8clib.lib
64 Kbytes or more	-R8CE	nc30lib.lib

When you create a new project using V.5.43 Release 00 or earlier, please make a change shown below.

If the ROM space of the microcomputer type you use exceeds the 64 Kbyte boundary, make the following settings.

(3) Change the compile option from -R8C to -R8CE.

(4) Change the library to link from r8clib.lib to nc30lib.lib.

Change	the com	nileo	ntion	from	-R8C t	O-R8CE
Unange	une com	pne o	puon	monn	1000	0 HOUL .

Renesas M16C Standard Toolcha	in 🔹 🛛	
Configuration Debug All Loaded Projects Sample1 C source file Assembly source file	Assembly Link Librarian Lmc RTOS CPU Toc + CPU Type : Create code for R8C Family (ROM >= 64KB) With no specification Create code for R8C Family (ROM < 64KB) Create code for R8C Family (ROM >= 64KB)	_ (1)
	OK Cancel	

From the Build menu of HEW, select [Renesas M16C Standard Toolchain] -> CPU tab.

(1) From the CPU Type pulldown menu, select Create code for R8C Family (ROM >= 64KB).

Change the linked library from r8clib.lib to nc30lib.lib

From the Build menu of HEW, select [Renesas M16C Standard Toolchain] -> Link tab.

Renesas M16C Standard Toolchain	
Configuration : Debug Configuration : All Loaded Projects Configuration : Configuration : Configuratio : Configuratio : Configuration : Con	C Assembly Link Librarian Lmc RTOS CPU Tc Category: Input Show Entries For: Library files [-L -LD] Specifies directory of library and library file to be referenced: Path File Remove (3)
	[-E] Specifies start address of absolute module : Options Link : -L "r8clib" -G -MS -O "\$(CONFIGDIR)¥\$(PROJECTNAME).x 30" -ORDER data_SE=0400 bss_SE,data_SO,bss_SO,data_NE,bss_NE,data_NO,bss_NO,stack,is マ OK キャンセル

(2) For Category, select Input

For Show Entries-For select Library files.

(3) Click the Remove button to remove r8clib.lib temporarily.

Renesas M16C Standard Toolchain	<u>?</u> ×	
Configuration :	C Assembly Link Librarian Lmc Cfg MKMRTBL	
Debug □ 🖓 All Loaded Projects □ 🚯 testtest □ 🚯 C source file □ 🔂 Assembly source file	Category : Input Show Entries For : Library files [-L -LD] Specifies directory of library and library file to be referenced :	
	Path File Remove	4)
	□ [-E] Specifies start <u>a</u> ddress of absolute module :	
	Options Link : -G -MS -O "\$(CONFIGDIR)¥\$(PROJECTNAME).x30" -ORDER data SE=0400,bss SE,data S0,bss S0,data NE,bss NE,data N0,b ss_N0,stack,istack,heap_NE,rom_NE,rom_N0,data_FE=010000,bss	
	OKキャンセル	

(4) Click the Add button to select [Library files].



(5)Input nc30lib.lib and click the OK button to finish.

[To create a new workspace using microcomputers other than the R8C/Tiny]

- Choose the relevant CPU series from CPU Series.
- Choose Other from CPU Group.

In addition to the above selections, the following requires caution.

• No sfr header files are registered.

Acquire the sfr header file corresponding to the microcomputer you use from the Web site, or create one if necessary.

• The order of sections is inaccurate.

Change the address of each section according to the ROM and RAM spaces of the microcomputer you use.

 \cdot No variable vector interrupt entry functions (intprg.c) are registered.

The interrupt functions should be created in a user file.

Change the section's address at linking

From the Build menu of HEW, select [Renesas M16C Standard Toolchain] -> Link tab.

Renesas M16C Standard Toolchain	
Configuration : Debug C Assembly Link Librarian Lmc Cfg MKMRTBL Category : Section Order Category : Section Order Address Section C Assembly source file C Assembly source file C Assembly Link Librarian Lmc Cfg MKMRTBL Category : Section Order C Category : Section	(1) (2)
OK キャンセル	

(2) For Category,select Section-Order Click the Edit button



(3) select address

(4) click the Modify botton

Section address		
Address (DxC000 (Hexadecimal)	Cancel	 (6)

(6)input the address

B.2.3. When using an assembler startup

Instead of using a C language startup program, if you want to use the startups written in assembler ncrt0.a30, sect30.inc (for NC308WA, sect308.inc) or nc_define.inc to create a project and the following applies, you need to make corrections.

• No vector numbers are specified when interrupt functions are declared. If you build a project without making this correction, an error "Can't generate automatically the variable interrupt vector table" may be output when linking.

Conter	nt of correct	ion		
When u	using NC30	WA		
[sect30.	inc]			
.if	MVT_	_==0		
; ; variah	le vector se	ction		
;				
,	.section .org	vector,ROMDATA VECTOR_ADR	; variable vector table	
.if 0				Deletes .if 0 to enable .lword.
	.lword	dummy_int	; vector 0 (BRK)	
	.lword	dummy_int	; vector 1	
	.lword	dummy_int	; vector 63	
.endif	•			Deletes .endif
When u	using NC30	8WA		
[sect308	8.inc∶near t	he 428th line]		
;	lo voctor so	ction		
; variau	vector se			
,	section	vector ROMDATA	; variable vector table	0
	org	VECTOR ADR		-
.if 0	.org	villerent_ribh		Deletes .if 0 to enable .lword.
	.lword	dummy int	; BRK (software int 0))
	.lword	dummy_int	;	
		<i>v</i> <u>–</u>		
	.lword	dummy_int	; software int 63	
.endif	•	• —		Deletes .if 0 to enable .lword.

C. A Guide to Porting Projects Created with TM to High-performance Embedded Workshop V.4

This document explains how to port projects created with TM V.2.xx or V.3.xx into High-performance Embedded Workshop V.4.

C.1. Summary

To port projects created using TM V.2.xx or V.3.xx into High-performance Embedded Workshop V.4, the Import Makefile function of High-performance Embedded Workshop 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 High-performance Embedded Workshop Import Makefile function, they are converted to files that can run in High-performance Embedded Workshop. In addition to TM project files, the Import Makefile function can also convert files in the makefile formats for hmake, nmake, and gmake to High-performance Embedded Workshop projects.

C.2. Porting Procedure

To port projects created using TM into High-performance Embedded Workshop, perform the following steps:

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

New Project Workspace	? 🛛
Projects Projects Projects (3) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (5) Projects (6) Projects (7) Projects (7) Projects (7) Projects (7) Projects (7) Projects (7) Projects (7) Projects (7) P	Workspace Name: Project Name: Directory: G:\Program Files\Renesas\Hew Browse CPU family: M16C Tool chain: Renesas M16C Standard
Properties	(6)
	OK Cancel

Figure 1 New Project Workspace Dialog Box

- Select the type of CPU used in the TM project from the Type of CPU drop-down list.
- Select the tool chain (cross tool) used for the TM project from the Toolchain drop-down list. The names of tool chains and corresponding cross tools are shown in Table 1.

Tool Chain	Cross Tool
Renesas M16C Standard	NC30WA
Renesas R8C Standard	NC8C
Renesas M32C Standard	NC308WA
Renesas M32R Standard	CC32R

Table 1 Tool Chains and Corresponding Cross Tools

- Select Import Makefile from the Project list.
- Type the directory path in the Directory text box.
- 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.
- Click OK.
- 3. You should now be able to see the New Project-1/4-Import Makefile wizard.

New Project-1/4-Import Makefile	? 🛛
(2) (1)	Makefile path : Import options Start Source files : (3) Project C source file Add Remove
000000000000000000000000000000000000000	F Show file path
(4)	Next > Finish Cancel

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

- Select the Import options check box; this will enable information on build options (compiling and assembling options etc.) to be used to create High-performance Embedded Workshop projects. If you clear the Import options check box, the above information is neglected and not used in High-performance Embedded Workshop.
- 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.
- 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.
- Click Next.
- 4. Follow the instructions according to the Wizard as it continues in the procedure.

C.3. Usage Notices

C.3.1. TM-to-High-performance Embedded Workshop Portable and Non-Portable Information

When you port a project created using TM into High-performance Embedded Workshop, not all the components of the project can be ported.

Portable information is as follows:

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

Non-Portable Information:

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

To transfer these items, edit the High-performance Embedded Workshop project as described in Section 3.4 and further after processing the Import Makefile.

C.3.2. Cross Tools

Import Makefile cannot enable all cross tool versions for use in High-performance Embedded Workshop projects regardless of whether they are used with TM or not; only the following cross tools versions are valid for High-performance Embedded Workshop projects:

V.5.20 Release1 or later
V.5.30 Release1 or later
V.5.20 Release1 or later
V.4.20 Release1 or later

C.3.3. High-performance Embedded Workshop Versions

When TM projects are ported into High-performance Embedded Workshop, information portable to High-performance Embedded Workshop varies according to the High-performance Embedded Workshop version. The information that can be ported from each cross tool to various High-performance Embedded Workshop versions are shown in Table 2.

		High-performa nce Embedded Workshop				
		~V.3.01.02	V.3.01.04	V.3.01.05	V.3.01.06	V.4.00
NC30WA	V.5.20 Release1	В	В	В	В	А
	V.5.30 Release1	В	В	В	В	А
NC8C	V.5.30 Release1	В	В	В	В	А
NC308WA	V.5.20 Release1	В	В	В	В	А
CC32R	V.4.20 Release1	В	В	В	В	А
	V.4.20 Release1A	В	В	В	В	А
	V.4.30 Release 00(A)	В	В	В	В	А

Table 2 Portable Information and Corresponding High-performance Embedded Workshop Versions

A: All the items of information listed in Section 3.1 are portable.

B: Only the paths of assembler and C-language source files are portable.

C.3.4. Generated Project Workspace

Because the project workspace created for a TM project ported to the High-performance Embedded Workshop environment is simply the contents of the makefile itself, its configuration (object output directory) will be different than that of a newly generated project workspace in High-performance Embedded Workshop.

To validate the configuration, modify the output directory file names for the compiler, assembler and linker as follows:

Output Directory (compiler, assembler):	\$(CONFIGDIR)
Output Directory (linker):	\$(CONFIGDIR)¥\$(PROJECTNAME).x30

C.3.5. Load Module Converter

Import Makefile cannot port the information contained in any load module converter (for example, information on options, command executions, or dependencies) into the High-performance Embedded Workshop project. If using a load module converter to create projects in TM, change the settings of the load module converter as follows after completing the Makefile processing:

1. Open the Build menu and select the Build Phases command.

2. The Build Phases dialog box will open.

Build Phases	? 🗙
Build Order Build File Order File Mappings	
Build phase order:	
✓M16C C Compiler	Add
I M16C Assembler I M16C Linker	Modify
(1) ✓ M16C Load Module Converter	Remove
M16C Librarian M16C Configurator M16C Jump table Composer	Move Up
	Move Down
	Import
(2)к	Cancel

Figure 3 Build Phases Dialog Box

- Select the Mxxx Load Module Converter check box from the Order of Build Phases list.
- Click **OK**.
- 3. Open the Build menu and select Renesas Mxxx Standard Toolchain.
- 4. The Renesas Mxxx Standard Toolchain dialog box appears.

Renesas M16C Standard Toolchain 🛛 👔 🔀					
Configuration : Debug Configuration : Debug All Loaded Projects Configuration : Configuration : Configuratio : C	C Assembly Link Librarian Lmc Cfg M 2)Category: Output ✓ Format: Motorola S type format □ [-E] Sets the starting address : 0x00000000 ✓ [-L] Selects maximum length of data record area □ [-A] Specifies output data range : Start address : □ End address :	• •			
	0x00000000 : 0x00FFFFFF [-0] Specifies output file name : \$(CONFIGDIR)\\$(PROJECTNAME).mot Modify. 0ptions Lmc : . -L -0 \$(CONFIGDIR)\\$(PROJECTNAME).mot				

Figure 4 Renesas M16C Standard Toolchain Dialog Box

- Click the Lmc tab.
- Select the Category type from the Category drop-down list.
- Click **OK**.

C.3.6. Other Tools

Import Makefile cannot port any information (options, command executions, dependencies) contained in tools other than the assembler, C compiler, and linker. If any tools other than the assembler, C compiler, linker, and load module converter are used to create projects in TM, custom build phases must be created in High-performance Embedded Workshop. Custom build phases are specifically for operating other tools before, after, or during standard builds (in the assembler, C compiler, and linker).

For more details, see Section 3.2 "Creating Custom Build Phases" in the High-performance Embedded Workshop 4 User's Manual. The following is provided as an example of how to register the cross-reference generation tool xrf30 with High-performance Embedded Workshop.

- 1. Open the Build menu and select the Build Phases command.
- 2. The Build Phases dialog box appears; click Add.

Build Phases	? 🔀
Build Order Build File Order File Mappings	
Build phase order:	
M16C C Compiler	(1)
M16C Assembler	Modifu
✓M16C Lonker ✓M16C Load Module Converter	n osany
M16C Librarian	Hemove
MI6C Jump table Composer	Move Up
	Move Down
	> Import
·	
	OK Cancel

Figure 5 Build Phases Dialog Box

3. The New Build Phase- Step 1/4 wizard opens. Follow the instructions to register the tool as follows:

New Build Phase - S	What type of phase woul Create a new cust Add an existing sy	d you like to add ? :om phase stem phase:	? 🗙
UTCHT B	System Phase	Version	
TTX		< Back Next >	Cancel

Figure 6 New Build Phase- Step 1/4 Wizard

• Click **Next** (the Create a New Custom Phase check box is selected by default); the New Build Phase-2/4 Step wizard opens.

New Build Phase - Step 2 of 4 🛛 🔹 🛛 😨 🔀					
	What type of phase would you like to create?				
	The command is applied to each file in a file group. An example of this type of tool is a compiler or assembler. Select input file group: (3) Assembly source file				
A LIL	Single phase: The command is only ever executed once per build. An example of this type of tool is a linker.				
Louis	<back next=""> Car</back>	ncel			

Figure 7 New Build Phase- Step 2/4 Wizard

- In this wizard, select the Multiple Phase check box.
- Select Assembly Source file from the Select input file group.
- Click **Next**; the New Build Phase- Step 3/4 wizard opens.

New Build Phase - Step	3 of 4 🤶 🗙
- Edit	Phase name: xrf30 (5)
The second	Command (excluding parameters): C:\Renesas\NC30WA\V530R02\bin\xrf30.ex Browse
	Default options: \$(FULLFILE)
	Initial directory: \$(CONFIGDIR) Browse
- Constant	(6) < Back Next > Cancel

Figure 8 New Build Phase- Step 3/4 Wizard

- Type xrf30 and its fullpath name in the Phase Name and the Command text box.
- Click **Next**; the New Build Phase- Step 4/4 wizard opens.



Figure 9 New Build Phase- Step 4/4 Wizard

- In this wizard, enter the necessary environment variables in the list.
- Select "Read Output On Fly" check box.
- Click **Finish**.

4. You return to the Build Phases dialog box at this point, where you can see that xrf30 has been registered as a build phase at the end of the Order of Build phase order.

Build Phases	? 🛛
Build Order Build File Order File Mappings	1
Build phase order:	
✓M16C C Compiler ✓M16C Assembler	Add
1) ▼xrf30	Modify
✓M16C Linker ✓M16C Load Module Converter	Remove
M16C Librarian (2)	Move Up
☐M16C Jump table Composer	Move Down
	Import
OK	Cancel

Figure 10 Build Phases Dialog Box (Build Order Tab)

- Select xrf30 from the Order of Build phase order.
- Click **Move Up** to move xrf30 next to the assembler name (see Figure 10).
- Click the Build File Order tab.

B	uild Phase	is				? 🗙
1	Build Order	Build File Order	File Mapping	38		1
	File group:			Phase order:		
	Assembly s	ource file		M16C Ass	embler	
	L source ri	le	(4)	✓ xrf30		
	I					
-					(5)	
					OK	Cancel

Figure 11 Build Phases Dialog Box (Build File Order Tab)

- Select the xrf30 check box in the Order of Phase order.
- Click **OK**.
- 5. Open the Options menu and select the xrf30 command.

6. The xrf30 Options dialog box appears; select options as necessary. This setting executes xrf30 for all assembler source files after assemble is completed at a build (before linking files).

C.3.7. Linkage order

Import Makefile cannot port the linking order information to High-performance Embedded Workshop. High-performance Embedded Workshop arranges the linking order alphabetically. To change this order, go through the following steps:

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

Linkage Order	? 🛛
(1) Use custom linkage order Object order: nort0.r30 src0001.r30 src0002.r30 src0003.r30 src0004.r30 src0005.r30 src0006.r30	(3) OK Cancel (2) Move up Move down
src0007.r30 src0008.r30 src0009.r30 test.r30	
Current configuration:	
Debug	Copy to

Figure 12 Linkage Order Dialog Box

- Select "Use custom linkage order" check box.
- 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.
- Click **OK**.

C.3.8. Placing the Start Up program at the top of Linkage Order

As the Import Makefile cannot port linking order information to High-performance Embedded Workshop, and links are order alphabetically, the start up program may not be placed at the top of the linking order. To place it at the top, follow the steps described previously in Section C.3.7 "Linkage Order."