

RX Driver Package Ver.1.02

R01AN2606EJ0104 Rev.1.04 May 16, 2016

## Introduction

This document is the RX64M, RX71M Group RX Driver Package User's Manual, version 1.02.

This User's Manual describes basic structures, features and usage of RX Driver Package applications, and about the sample application program using the FIT modules included in this package.

## **Target Device**

RX64M Group (Renesas Starter Kit+ RX64M)

RX71M Group (Renesas Starter Kit+ RX71M)

When using this application note with your product, careful evaluation is recommended.

And when using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

## **Related Documents**

- RX Family Board Support Package Module Using Firmware Integration Technology (R01AN1685EU)
- Firmware Integration Technology User's Manual (R01AN1833EU)
- RX Family Adding Firmware Integration Technology Modules to Projects (R01AN1723EU)
- RX Family Adding Firmware Integration Technology Modules to CS+ Projects (R01AN1826EJ)
- The User's Manual provided with the RX Driver Package Application.



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## 1. Overview

## 1.1 Applicability

This User's Manual applies to the RX64M, RX71M Group RX Driver Package, version 1.02.

## 1.2 Operating Environment

This package runs under the operating environment described below.

## Table 1-1 Operating Environment (RX64M)

Microcontroller	RX64M Group
Evaluation board	Renesas Starter Kit+ RX64M
Integrated development	e <sup>2</sup> studio, V3.1.3 or later
environment (IDE)	Or:
	CS+ V3.00.00 or later
Cross tools	RX Family C/C++ Compiler Package V2.03.00 or later
Emulator	E1, E20

#### Table 1-2 Operating Environment (RX71M)

Microcontroller	RX71M Group
Evaluation board	Renesas Starter Kit+ RX71M
Integrated development	e <sup>2</sup> studio, V3.1.3 or later
environment (IDE)	Or:
	CS+ V3.00.00 or later
Cross tools	RX Family C/C++ Compiler Package V2.03.00 or later
Emulator	E1, E20



## 2. About RX Driver Package

The RX Driver Package is a software platform (framework) that combines the following modules to be required for development in a single package. Since the package contains multiple modules, you can start developing immediately without having to obtain each module separately.

- Board Support Package (BSP) module
- FIT peripheral function modules (free version)
- FIT middleware modules (free version)
- FIT interface modules

You can develop the user application layer with ease by using the Sample Application Program (RX Driver Package Application) which utilizes the RX Driver Package.

## 2.1 System Structure

The figure below shows the system structure of the RX Driver Package.



Figure 2-1 System Structure



## 2.2 RX Driver Package Features

The RX Driver Package has the following features.

#### (a) Select necessary modules and start developing immediately the application program

You can easily build a system simply by selecting the modules you need from the package. After that, all you have to do is develop the application program.



Figure 2-2 An example of system build

#### (b) Free to use

All the modules included in the RX Driver Package can be used free of charge. Free versions of middleware modules such as TCP/IP and file system are included.

#### (c) Can upgrade to paid versions of modules

The free versions of modules in the RX Driver Package can be replaced with commercial (paid) versions. By using a commercial (paid) version, all the functionality of the module will be available, as well as support about a commercial version.

#### (d) Check operation including user application

The RX Driver Package Application is provided as a sample user application that uses the RX Driver Package. The RX Driver Package Application consists of programs for operating each module in the RX Driver Package, and the project files for building the programs. It enables you to start checking the operation of your user application immediately.



## 3. Structure of the RX64M, RX71M Group RX Driver Package

## 3.1 Folder Structure

The folder structure used in this package is shown below.

When the ZIP file for this package is downloaded from the Renesas web site and decompressed, a folder of the same name will be present and it will contain a FITModules folder, a reference\_documents folder, and this document.

The FITModules folder contains the FIT modules for the modules shown in Table 3-1(as ZIP files and XML files).

The reference\_documents folder contains the documentation for using this package in various development



Figure 3-1 Folder Structure of the RX64M, RX71M Group RX Driver Package



## 3.2 Module Structure

The figure below shows the types and structure of the FIT modules included in this package.



Figure 3-2 RX64M, RX71M Group RX Driver Package FIT Module Structure



## 3.3 FIT Modules

The table below lists the FIT modules included in this package.

Туре	Module	FIT Module Name	RX64M	RX71M	Rev.
Board Support Package	Board Support Package (BSP)	r_bsp	$\checkmark$	$\checkmark$	3.00
Device Driver	Interrupt Controller (IRQ)	r_irq_rx	$\checkmark$	$\checkmark$	1.70
Device Driver	Data Transfer Controller (DTC)	r_dtc_rx	$\checkmark$	$\checkmark$	2.03
Device Driver	DMA Controller (DMAC)	r_dmaca_rx	$\checkmark$	$\checkmark$	1.03
Device Driver	I/O Ports (GPIO)	r_gpio_rx	$\checkmark$	$\checkmark$	1.70
Device Driver	Multi-Function Pin Controller (MPC)	r_mpc_rx	$\checkmark$	$\checkmark$	1.70
Device Driver	Compare Match Timer (CMT)	r_cmt_rx	$\checkmark$	$\checkmark$	2.60
Device Driver	Compare Match Timer W (CMTW)	r_cmtw_rx	$\checkmark$	$\checkmark$	1.10
Device Driver	Real-Time Clock (RTC)	r_rtc_rx	$\checkmark$	$\checkmark$	2.30
Device Driver	Serial Communications Interface (SCI: Asynchronous/Clock Synchronous)	r_sci_rx	$\checkmark$	$\checkmark$	1.70
Device Driver	Serial Communications Interface with FIFO (SCIF: Asynchronous/Clock Synchronous)	r_scif_rx	$\checkmark$	$\checkmark$	1.10
Device Driver	Serial Communications Interface with FIFO (SCIF: Device Driver for Serial Memory Control)	r_scifa_smstr_rx	$\checkmark$	$\checkmark$	1.08
Device Driver	Serial Communications Interface (SCI: Simple I <sup>2</sup> C Bus)	r_sci_iic_rx	$\checkmark$	$\checkmark$	1.70
Device Driver	I <sup>2</sup> C Bus Interface (RIIC)	r_riic_rx	$\checkmark$	$\checkmark$	1.70
Device Driver	Serial Peripheral Interface	r_rspi_rx	$\checkmark$	$\checkmark$	1.30
Device Driver	Serial Peripheral Interface (RSPI: Device Driver for Serial Memory Control)	r_rspi_smstr_rx	$\checkmark$	$\checkmark$	1.09
Device Driver	Quad Serial Peripheral Interface (QSPI: Device Driver for Serial Memory Control)	r_qspi_smstr_rx	$\checkmark$	$\checkmark$	1.08
Device Driver	USB Basic Firmware	r_usb_basic	$\checkmark$	$\checkmark$	1.10
Device Driver	USB Host Mass Storage Class	r_usb_hmsc	$\checkmark$	$\checkmark$	1.10
Device Driver	USB Host Communication Device Class	r_usb_hcdc	$\checkmark$	$\checkmark$	1.10
Device Driver	USB Host Human Interface Device Class	r_usb_hhid	$\checkmark$	$\checkmark$	1.10
Device Driver	USB Peripheral Mass Storage Class	r_usb_pmsc	$\checkmark$	$\checkmark$	1.10
Device Driver	USB Peripheral Communications Device Class	r_usb_pcdc	$\checkmark$	$\checkmark$	1.10
Device Driver	PTP Module for the Ethernet Controller (EPTPC)	r_ptp_rx	$\checkmark$	$\checkmark$	1.11
Device Driver	EPTPC Light Module	r_ptp_light_rx	$\checkmark$	$\checkmark$	1.10
Device Driver	Ethernet controller (ETHERC)	r_ether_rx	$\checkmark$	$\checkmark$	1.02
Device Driver	Parallel Data Capture Unit (PDC)	r_pdc_rx	$\checkmark$	$\checkmark$	1.02
Device Driver	12-Bit A/D Converter (S12AD)	r_s12ad_rx	$\checkmark$	$\checkmark$	2.10
Device Driver	D/A Converter (DAC)	r_dac_rx	$\checkmark$	$\checkmark$	2.50
Device Driver	Flash Memory (Flash API)	r_flash_rx	$\checkmark$	$\checkmark$	1.30
Device Driver	Sampling Rate Converter (SRC)	r_src_api_rx	$\checkmark$	$\checkmark$	1.11
Device Driver	Serial Sound Interface (SSI)	r_ssi_api_rx	$\checkmark$	$\checkmark$	1.20
Device Driver	Byte Queue Buffer (Data Management)	r_byteq	$\checkmark$	$\checkmark$	1.50
Device Driver	Long Queue Buffer (Data Management)	r_longq	$\checkmark$	$\checkmark$	1.50



Туре	Module	FIT Module Name	RX64M	RX71M	Rev.
Middleware	TCP/IP M3S-T4-Tiny for Embedding	r_t4_rx	$\checkmark$	$\checkmark$	2.02
Interface	Interface conversion module for Ethernet Driver and Embedded system M3S-T4-Tiny	r_t4_driver_rx	$\checkmark$	$\checkmark$	1.02
Interface	Embedded TCP/IP M3S-T4-Tiny Socket API Module	r_socket_rx	$\checkmark$	$\checkmark$	1.22
Middleware	DHCP client using the embedded TCP/IP M3S- T4-Tiny Module	r_t4_dhcp_client_rx	$\checkmark$	$\checkmark$	1.03
Middleware	DNS client using the embedded TCP/IP M3S- T4-Tiny Module	r_t4_dns_client_rx	$\checkmark$	$\checkmark$	1.02
Middleware	FTP server using the embedded TCP/IP M3S- T4-Tiny Module	r_t4_ftp_server_rx	$\checkmark$	$\checkmark$	1.03
Middleware	Web server using the embedded TCP/IP M3S- T4-Tiny Module	r_t4_http_server_rx	$\checkmark$	$\checkmark$	1.04
Interface	File driver for FTP server and Web server Module	r_t4_file_driver_rx	$\checkmark$	$\checkmark$	1.01
Middleware	Sound playback system and compression system (original ADPCM codec)	r_s2_rx	$\checkmark$	$\checkmark$	3.03
Middleware	M3S-TFAT-Tiny (FAT file system)	r_tfat_rx	$\checkmark$	$\checkmark$	3.02
Interface	M3S-TFAT-Tiny Memory Driver Interface Module	r_tfat_driver_rx	$\checkmark$	$\checkmark$	1.02
Middleware	SPI Serial EEPROM Module	r_eeprom_spi	$\checkmark$	$\checkmark$	2.32
Middleware	SPI Serial Flash memory Module	r_flash_spi	$\checkmark$	$\checkmark$	2.33

Note: This package includes the M3S-T4-Tiny (TCP/IP protocol stack library) of evaluation version. For the commercial version, please go to the below URL.

http://www.renesas.com/mw/t4



## 4. Usage Procedures

The RX Driver Package allows programs to be easily constructed by using the FIT plugin included in  $e^2$  studio. The remainder of this section presents a simple usage example using  $e^2$  studio. To use CS+, see the document "RX Family Adding Firmware Integration Technology Modules to CS+ Projects (R01AN1826EJ)" included in this package.

## 4.1 Environment Used

The RX64M is used as the target microcontroller and the Renesas Starter Kit+ RX64M is used as the target board. If a different environment is used, replace the specifics used in the example with the ones for that environment as you read.

## 4.2 Install RX Driver Package in e<sup>2</sup> studio

Install the FIT modules in the RX Driver Package into e<sup>2</sup> studio.

- 1. Decompress the downloaded file an\_r01an2606ej\*\*\*\*\_rx.zip into an arbitrary directory.
- 2. Open the folder that was decompressed and open the FITModules folder in that folder.
- 3. Select all the files in the **FITModules** folder and click **Copy** in the **Edit** menu.





- 4. Open the e<sup>2</sup> studio install folder (Usually, this will be c:/Renesas/e2\_studio.) and open the **FITModules** folder in that folder.
- 5. Click **Paste** on the **Edit** menu.

The e<sup>2</sup> studio **FITModules** folder will be copied to the FIT modules.

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Open the **FITModules** folder and click **Paste** on the **Edit** menu. The folder will be copied.

## 4.3 Application Creation

In this section, create a simple application that drives an LED.

#### 4.3.1 Create a Workspace and a Project

First, create a new workspace and a new project.

- 1. Start e<sup>2</sup> studio.
- 2. Enter an arbitrary workspace folder in the displayed dialog box and click **OK**.





3. When the following window is displayed, click Workbench.



4. When the workbench has started, select New from the File menu and click C Project.

e	<sup>2</sup> C	/C++ - e2 studio						
	File Edit Source Refactor Navigate Search Project Run Window Help							
		New	Alt+Shift+N ►	C	Renesas FIT Module		ø	
		Open File		<b>C</b> ++	C Project			Click her
		Close Close All	Ctrl+W Ctrl+Shift+W	©‡ ©‡	C++ Project Makefile Project with Existing Code Project			
6		Save Save As Save All Revert	Ctrl+S Ctrl+Shift+S		Convert to a C/C++ Project (Adds C/C Source Folder Folder Source File	C++ Nature)		
	2	Move Rename Refresh Convert Line Delimiters To	F2 F5		Header File File from Template Class Task			
d	Ē,	Print	Ctrl+P	E\$	Other	Ctrl+N		
	7	Switch Workspace Restart Import Export Properties Exit	Alt+Enter		<u> </u>	Carry		
	-							



5. Enter the project name. For the project type, click **Sample Project** under **Executable** (**Renesas**). For the tool chain, click **Renesas RXC Toolchain**. After making these settings, click **Next**.

e <sup>2</sup> C Project		
C Project		
Create C project of selected type		
		Ententhe
Project name: led_sample		Enter the
Use default location		project name
Location: C:\sample_workspace\led_sample_	-I- Derver	
	ple B <u>r</u> owse	
Create Directory for Project		
Project type:	Toolchains:	
Executable (Renesas)	KPIT GNUARM-RZ-EABI Toolchain	
Sample Project	KPIT GNURL78-ELF Toolchain	Click here.
Static Library (Renesas)	KPIT GNURX-ELF Toolchain	
Sample Project	KPIT GNUSH-ELF Toolchain	
Debug-Only Project	Renesas RXC Toolchain	
Executable	Renesas SHC Toolchain	
Executable (IAR)	Refeases on the Poolenant	
Shared Library		
Static Library		
V800 Standalone Executable (Green Hills)		
V800 Standalone Static Library (Green Hill	s)	
V800 ThreadX Executable (Green Hills)		
Makefile project		
< III	•	
Show project types and toolchains only	if they are supported on the platform	
2		
	Next > Finish Cancel	

6. Select the target. Click the "..." button under **Target Selection** and select **R5F564MLCxFC**. After making these settings, click **Next**.

C Project	
e2 studio - Project Generation Select Target Specific Settings	
Toolchain Version :       v2.01.00         Debug Hardware:       E1         Data endian :       iittle-endian data         Select Target:       RSF56107VxFP         Select Configurations:         Image: Image: Image: Image: Debug using hardware         Image: Image: Debug using Simulator         Image: Image: Debug using Simulator         Image: Release (no debug)         Image: Project without any debug information         Build configurations will be created in the project only for the selected debug mode options, however by default the project will be built for the active configuration i.e., first configuration selected from group. Based on the device selection you made	Click here and select <b>R5F564MLCxFC</b> .
(RX600) the debug hardware (E1) and debug target (R5F56107VxFP), debug configuration will be automatically created for you.	
	Click here.



8.

7. Set the check box of "Use FIT module" and click **Next** here.

C Project				- • •	
2 studio - Project Generation				$\rightarrow$	
Code Generator and FIT Settings					
Use Peripheral code Generator					
Vuse FIT module Downloa	ad FIT modules			Set the	e check bo
The e2 studio peripheral code ge interfaces, A/D converters, DMA programming interfaces (APIS) a Conventionally, the information " with user application" etc; has in application. With FIT, there are r function drivers and middleware migrating between RX microcont	controllers, etc.) based on se nd are not limited to initializi CMCU initial settings", "how many cases varied by samp ules for this information, so e which support FIT have a co	ettings entered via a graphical ation of peripheral functions. to define a target board", "File ele code, so changes needed to each sample code can be emb	user interface (GUI). Function configuration", "Names of func- be made to sample code whe edded into a user application w	s are provided as application tions", "Common interface n embedding into a user rith ease. Also, the peripheral	
l	Jser Application	1			
	Middlew	are	1		
		FIT			
CG	RTOS	S			
Device Driver	Devic	ce Driver (BSP)			
	MCU				
	inco				
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< Back Next >

Einish

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#### 9. Simply click Next here.

e <sup>2</sup> C Project		
e2 studio - Project Generation Global Options Settings		
Patch code generation None	•	
Fast interrupt vector register: None	•	
ROM: None	•	
RAM: None	•	
Address (H'): 0000000		
Address Register: None	•	
(?) < <u>Back</u> Next > <u>Finish</u>	Cancel	Click here.

#### 10. Simply click **Finish** here.

e <sup>2</sup> C Project						
e2 studio - Project Gener Standard Header Files	ation					
Library configuration:	C(C99)	-				
Select Header Files:						
✓ runtime	: Runtime routines (Checked and disabled by default)					
Ctype.h	: Character classification routines					
math.h	: Mathematical/trigonometric operations(double-precision)					
mathf.h	: Mathematical/trigonometric operations(single-precision)					
🔲 stdarg.h	: Variable argument functions					
✓ stdio.h	: Input/Output					
✓ stdlib.h	: General purpose library features					
✓ string.h	: String handling operations					
ios(EC++)	: Input/Output Streams					
✓ new(EC++)	: Memory allocation and deallocation routines					
complex(EC++)	: Complex number operations					
string(EC++)	: String manipulation operations					
complex.h(C99)	: Performs complex number calculation					
fenv.h(C99)	: Sets floating point environment					
inttypes.h(C99)	: Converts integer type format					
wchar.h(C99)	: Performs wide character					
wctype.h(C99)	: Performs wide character conversion					
	Select All Deselect All					
?	< Back Next > Finish Cancel		Click here.			



## 11.Click **OK**. The project will be generated.

PROJECT GENERA		*	
PROJECT NAME : PROJECT DIRECTORY :	led_sample C:\WorkSpace\RDP\led_sample		
CPU SERIES :	RX600		
CPU TYPE :	RX64M		
TOOLCHAIN NAME :	Renesas RXC Toolchain		
TOOLCHAIN VERSION :	v2.03.00		
GENERATION FILES :			
C:\WorkSpace\RDP\led_sa Main Program	ample\src\led_sample.c		
		-	
٠	Þ		
lick OK to generate the pr	oject or Cancel to abort.		



## 4.3.2 Install the FIT Modules with the FIT Plugin.

Install the required modules with the FIT plugin into the created project.

Here, install the BSP module (r\_bsp) and the compare match timer driver (r\_cmt\_rx).

e <sup>2</sup> C/C++ - e2 studio						
File Edit Source Refactor Navigate Search Project	Renesas Views Run Winde	ow_Help				
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🖉 led_sample						
🚱 🖉 📜 🔍 🚺	e <sup>2</sup> N e <sup>2</sup>			jp 💽 A 🕏	1 😒 🕫 🥩 😧	сары 🖉 кана 👻 🔺 🍽 🕼 🏗 🔶 4:45 РМ 10/1/2015

1. In the Renesas Views menu, select e2 solution toolkit and click FIT Configurator.

#### 2. In the **FIT Configurator** tab,

Select the created project with **Project to Add FIT Module** to. Next, select **RX64M** under **Group** and select **RSKRX64M** from **Target Board**. Next, click **r\_cmt\_rx** in the module list and click **Add Module** >>.

File Edit Source Refactor Naviga	ate Search Project Rene	sas Views	Run Window Help		
	X 🧐 🖉 🖸 👩 🖲	62 🔹 🖻	╡ <b>╾╔╶</b> ╡╬ <b>╴Ѹ╴ᅆ<sub>╸</sub>╴╔</b> <i>┩╺</i> ╡┇╗╠╝╶╠╶┾╺┾╸┥		Quick Access
🎦 Project Explorer 🛛 📟				BE Outli	ine 🔀 🛞 Make Target 🛛 🗖
E 😓 > 🖉 led_sample [HardwareDebug]	▽			An outlin	ne is not available.
	🖹 Problems 🧔 Ta	sks 📮 Con	sole 🔲 Properties 🔋 Memory Usage 🐚 Stack Analysis 🦓 Smart Browser 🕎 FIT Configurator 😒		🐻 Generate Code 🛛 🖓 🗖
	Name of the projec	t to add FIT	modules: led_sample		-
	Target Board RSK	RX64M	Advanced Filters	;	Select the project.
	Available Module	s			Selected Modules
	Modules	Version	Description	*	Modules Version
	r_bsp	3.00	Board Support Packages.	=	
	r_byteq	1.50	Byte-based circular buffer library.		
	r_cmtw_rx	1.10	CMTW Driver		O allo and the factor of
	r_cmt_rx	2.60	Simple CMT driver for creating timer tick.		Select this item.
	r_dac_rx	2.50	Digital-to-Analog Converter driver		
	r_dmaca_rx	1.03	DMACA driver		
	r_dtc_rx	2.03	DTC driver		
	r_eeprom_spi	2.32	Renesas R1EX25xxx series Serial EEPROM control software RX Driver Package	-	
	r athar rv	1.02	Etharnat Driver		Semove Module Click her
	Add Module >>				<< Remove Module
	Details				
	Dependency: r_b				•
	This module crea	stes a timer t	ick using a CMT channel based on a frequency input by the user.		



Then, click Generate Code.

#### 3. In the **Console** tab,

The **r\_bsp** having a dependency with **r\_cmt\_rx** is also added at a time. Note\* Click **FIT Configurator** again.

Note\*: Additional FIT driver specifies the adaptable "r\_bsp" version.

If the "r\_bsp" versions specified and added mismatch according to the time of FIT driver release,

Warning (W0000001) is output on the console screen.

If the "r\_bsp" version added is the one specified or later, Warning can be ignored, as the new "r\_bsp" version is backward compatible.

😰 Problems 🧔 Tasks 📮 Console 🙁 🥅 Properties 🔋 Memory Usage 🍡 Sta	ack Analysis 👒 Smart Browser 💯 *FIT Configurator 🛛 🗟 🔝 🖂 🛫 🖻 💌 🗖
FIT Configurator Console	
M0000001: The following dependencies have been added for the follo	owing module:
r_cmt_rx: r_bsp version(s) 2.90	Click here.
W0000001: The following dependencies versions are mismatched:	
r_cmt_rx: r_bsp version(s) 2.90	This is an example of CMT driver specifying the BSP ver. 2.90.
	This is an example of CMT unver specifying the DSP ver. 2.90.
	If the r_bsp added is ver. 2.9 or later, ignore this warning because of backward compatible.

4. Check **r\_bsp** and **r\_cmt\_rx** are added in **Selected Modules**. The mark **o** on **r\_cmt\_rx** indicates occurrence of the Warning explained in the above 3.

	3	Version 3.00
r_byteq 1.50 Byte-based circular buffer library. r_cmtw_rx 1.10 CMTW Driver r_cmt_rx 2.60 Simple CMT driver for creating timer tick. r_dac_rx 2.50 Digital-to-Analog Converter driver		3.00
r_cmtw_rx 1.10 CMTW Driver r_cmt_rx 2.60 Simple CMT driver for creating timer tick. r_dac_rx 2.50 Digital-to-Analog Converter driver CI	_rx 2	
cmt_rx 2.60 Simple CMT driver for creating timer tick. 		2.60
dac_rx 2.50 Digital-to-Analog Converter driver Cl		
	neck he	ore
_dmaca_rx 1.03 DMACA driver		010.
_dtc_rx 2.03 DTC driver		
_eeprom_spi 2.32 Renesas R1EX25xxx series Serial EEPROM control software RX Driver Package		
ether rv 1.02 Ethernet Driver		
Add Module >> <a>&gt;</a>	ve Module	
ependency: r bsp version(s) 2.90		



5. Click **OK** with changing anything.

FIT Generation - Summary	23	
Following modules will be installed: r_bsp	*	
r_cmt_rx		
Following include paths will be added to project setting: /\${ProjName}/r_bsp /{{Inclume}/r_costin		
\${ProjName}/r_config \${ProjName}/r_cmt_rx \${DraiName/r_cmt_rx		
/\${ProjName}/r_cmt_rx/src		
	Ŧ	
lick OK to continue, Cancel to go back		
OK Can	ncel	



## 4.3.3 Create an LED Driving Program

Create a program that toggles the LED0 on/off state every 0.5 seconds using the compare match timer.

Open the file src/(the project name).c and modify it as shown below.

#### src/(the project name).c

```
#include "platform.h"
#include "r cmt rx if.h"
/* LED Currently status */
uint32 t ledstatus = LED OFF;
void call_back(void *pdata)
{
 if (ledstatus == LED OFF)
 {
    /* Turn ON the LEDO If the status is LED_OFF */
  LEDO = LED ON;
  ledstatus = LED_ON;
 }
 else
 {
   /* Turn OFF the LEDO If the status is LED ON */
  LEDO = LED OFF;
  ledstatus = LED_OFF;
 }
}
void main(void)
{
 uint32 t cmt ch;
 /* LED0 off */
 LEDO =LED OFF;
 /* Create of 0.5 second(2Hz) cyclic timer. */
 R CMT CreatePeriodic(2, &call back, &cmt ch);
 while(1);
}
```



## 4.3.4 Build and Try Running the Program

Build the program just created and verify that it runs.

1. Click **Build Project** on the **Project** menu.



2. When the build completes, the following will be displayed in **Console** view.

Problems Tasks Console Console Console Console Console Properties Memory Usage Stack Analysis

 CDT Build Console [led\_sample]

 C:\Renesas\E22FCB-1\DEBUGC-1\RX\RX\_CON-1.EXE led\_sample.abs led\_sample.x

 Loading input file led\_sample.abs

 Parsing the ELF input file.....

 25 segments required LWA fixes

 Converting the OWARF information....

 Constructing the output ELF image....

 Saving the ELF output file led\_sample.x

 'Build complete.'

 17:31:13 Build Finished (took 19s.594ms)

3. Click Debug Build on the Run menu.





4. Click *d* under the **Renesas GDB Hardware Debugging and c**lick **led\_sample HardwareDebug**. Click the **Debugger** tab and click **Connection Setting**.

Modify **EXTAL Frequency** to be **24.0000** and change **Provide Power from Emulator** to **No** \*. When these changes have been made, click **Debug**.

Note : This is setting when using an external power supply. When supplying power from the emulator, select Yes.

e <sup>2</sup> Debug Configurations		
Create, manage, and run configuration	5	
[] [] [] ★ [] ] ★ -	Name: led sample HardwareDebug	
type filter text	Main      Debugger     Startup      Source     Common	
c <sup>®</sup> Debug-only	i Main Ar Debugger Startup V Source Common	
GDB Hardware Debugging	Debug hardware: E1 Target Device: R5F564ML	—— Click here.
© GDB Simulator Debugging (SH, RL7€		
GHS Local C/C++ Launch	GDB Settings Connection Settings Debug Tool Settings	
▲ C <sup>™</sup> Renesas GDB Hardware Debugging	▲ Clock	
c <sup>×</sup> led_sample HardwareDebug	Main Clock Source         EXTAL         T           Extal Frequency[MHz]         24.0000         =	Modify to be
Renesas Simulator Debugging (RX o	Permit Clock Source Change On Writing Intel Yes	24.0000
	Emulator (Auto)	
	Connection Type JTag 👻	
	JTag Clock Frequency[MHz] 16.5	
	Fine Baud Rate[Mbps] 2.00	
	Hot Plug No 👻	
	⊿ Power	Madify to be No.
	Power Target From The Emulator (MAX 200n No	— Modify to be No.
	Supply Voltage 3.3V 💌	
	CPU Operating Mode	
	Register Setting Single Chip 👻	
	Mode pin Single-chip mode 👻	
	Communication Mode	
	Mode Debug Mode 💌	
	Execute The User Program After Ending The ( No	
< III >>		
Filter matched 9 of 13 items	Apply Re <u>v</u> ert	
?		——— Click here.
	<u>D</u> ebug Close	Choix Horo.



5. When the following message is displayed, click **Yes**.



6. When the load module download completes, a **Debug** perspective opens.

e Debug - led_sample/r_bsp/board/rskn64m/resetprg.c - e2 studio					
<u>Eile Edit Source Refactor Navigate Search Project Run Window H</u> elp					
C1 ▼    (5, Δ   (8) ▼ <b>%</b> ▼    ( <b>%</b> )    (2)    (2)    (2) ▼ <b>%</b> ▼ <b>0</b> ▼ <b>%</b> ▼    <b>x</b>    <b>x</b>    <b>x</b>    <b>x</b>    (2)    (2	र 🙋 😂 🖋 📲 🏄 🖢	$\star \boxtimes \star \not \simeq \Leftrightarrow \Leftrightarrow \star \Rightarrow \star$	📑 Quick Access 🔡 🖬 C/C++ 🗱 Debug		
<ul> <li>★ Debug S2</li> <li>★ Q<sub>0</sub> × % 2 → M</li> <li>★ Q<sub>0</sub> &lt; ¬ □</li> <li>★ End sample HardwareDebug [Renesas GDB Hardware Debugging]</li> </ul>	👀= Variables 🔉 💁 Break	points 🚻 Registers 🛋 Mo	odules 🍕 Expressions 👴 Eventpoints 📄 IO Registers 🖓 🖪		
	Name	Туре	Value		
P platform.h       ▷ led.sample.c       ② resetprop.c S       □       ② Cutline S       > Project Explore       □         118					
Console 22	d6-902dd,902e6-902ed,90 b6-903bd,903c6-903cd,90 76-9127d,91286-9128d,91	2f6-902fd,90306-9030d, 3d6-903dd,903e6-903ed,9 296-9129d,912a6-912ad,1	■ ★ ☆   ☆ @ @ @ @ @ @ @ ~ @ ~ 99316-9931d, 99326-9933d, 99336-9933d, 99346-9934d, 90 ^ 99376-9937d, 99529-99837, 99848-99653, 99656, 91266-911 91266-91240, 9126-91240, 911		
Suspended					

7. Click Restart on the toolbar. The program will be executed and a break will occur at the start of the main function.

Debug - led_sample/r_bsp/board/rskn	64m/resetprg.c - e2 studio	
<u>File Edit Source Refactor Navigat</u>	e Se <u>a</u> rch <u>P</u> roject <u>R</u> un <u>W</u> indow <u>H</u> elp	
iti • II 🦷 📥 📎 • 🗞 • 🖻	🚳 🗐 🥖 🔄 🎄 🔹 🔾 🕶 🗛 🔹 🔌 💷 😽	Click here.
🏇 Debug 😒	🍇 🔩 - 🍬 🍓 🕹 🕷 i i	
	nfo available) (Suspended : Signal : SIGTRAP:Trace/breakpoint trap)	
GDB server	) at resetprg.c:122 0xffc017e8	
h platform.h	i resetprg.c ⊠	

8. After the break at the start of the main function, click **Restart** on the tool bar again. The project will be run and the program will iterate toggling LED0 with a period of 0.5 seconds.



## 5. RX Driver Package Application

## 5.1 RX Driver Package Application Structure

The RX Driver Package Application is a sample application program provided so that users can use the RX Driver Package easily. The RX Driver Package Application consists of an application program that operates using device drivers and middleware included in the RX Driver Package and a project file for building that application. This allows users to start evaluation quickly.



Figure 5-1 RX Driver Package Application Structure

Renesas plans to release a variety of types of this RX Driver Package Application in the future, such as system programs that operate using a combination of multiple drivers and middleware and evaluation programs for independent modules from the RX Driver Package.



Figure 5-2 Types of RX Driver Package Application



## 6. Supplement

## 6.1 M3S-T4-Tiny (TCP/IP protocol stack)

This package include the M3S-T4-Tiny (TCP/IP protocol stack library) of evaluation version. For the commercial version, please go to the below URL.

http://www.renesas.com/mw/t4



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## **Revision History**

		Descripti	ion
Rev.	Date	Page	Summary
1.00	Sep 1, 2014	-	First edition issued
1.01	Jan 5, 2015	-	Updated existing modules to latest modules.
			Added new release modules to the package.
1.03	Feb 29, 2016	-	Updated existing modules to latest modules.
			Added RX71M.
			Updated e2studio version and changed set-up procedure.
		8	In Table 3-1 RX64M, RX71M Group RX Driver Package FIT Modules in 3.3 FIT Modules,
			Changed Rev. of GPIO, MPC, RTC, Serial Peripheral Interface and Flash API.
			Change "PTP controller for Ethernet controller (EPTPC)" to "EPTPC Light Module".
		9	In Table 3-1 RX64M, RX71M Group RX Driver Package FIT Modules in 3.3 FIT Modules,
			Change "r_socket" to "r_socket_rx ".
		-	Removed the PTP controller for Ethernet controller (EPTPC)
			module.
			Added the EPTPC Light module.
1.04	May.16, 2016	4	2.1 System Structure
		Changed 'POSIX Wrapper' to 'POSIX Wrapper *'.	
		Added '*' item in Figure 2-1.	
	5	2.2 RX Driver Package Features	
			Removed 'POSIX API I/F' in Figure 2-2.
		6	3.1 Folder Structure
			Removed 'POSIX API I/F' in Figure 3-1.
		7	3.2 Module Structure
			Removed 'POSIX API I/F' in Figure 3-1.
		8	3.3 FIT Modules
			Added the PTP controller for Ethernet controller (EPTPC)
			module.
			Updated the EPTPC Light module.
			Removed the POSIX Wrapper module.
		18	4.3.2 Install the FIT Modules with the FIT Plugin
			3. In the Console tab,
			Changed the description for r_bsp.

## 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 document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

#### 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 a product with a different type number, confirm that the change will not lead to problems.

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