

RX72M Group

CPU Card EtherCAT Startup Manual

Introduction

This application note is a quick start guide for EtherCAT[®] communication with the RX72M CPU Card for industrial network evaluation.

Target Device

RX72M

R01AN6749EJ0101

Rev.1.01 Nov 30, 2023



Contents

1. Operating environment
2. Setting up and connecting the Communication board 4 2.1 CPU Card setting 4 2.2 Power supply selection 4 2.3 Connection of communication board 4
3. Installation of e2studio5
3.1 Installing the CC-RX Compiler V3.05.005
3.2 How to check the registered Compiler
4. Import EtherCAT slave stack code into Sample Program7
5. Import EtherCAT FIT module into e2studio9
6. Import sample projects into e2studio10
7. Programming and Debugging11
8. Connection with TwinCAT14
8.1 Preparation of ESI file14
8.2 Starting TwinCAT14
8.3 Scanning the network
8.4 Writing of SII EEPROM15
8.5 Rescan of the device15
8.6 I/O operation confirmation15
9. Appendix Conversion procedure to the IAR project16
10. Appendix e2studio setting information23
10.1 FIT module Structure
10.2 Configuration options23
10.3 Pin configuration24
10.4 Build configuration25
10.5 Debug configuration25
Revision History



1. Operating environment

The sample program in this manual assumes the following environment.

literen	Detailed content
Item	
Evaluation board	Renesas Electronics RX72M CPU Card
	Model name: RTK0EMXDE0C00000BJ
CPU	RX CPU (RXv3)
Operating frequency	CPU Clock (CPUCLK) : 240MHz
Operating voltage	3.3V
Operation mode	Single chip mode
	Boot mode (SCI interface)
	Boot mode (USB interface)
	Boot mode (FINE interface)
Device	R5F572MNDDBD
	Code flash memory
	Capacity: 4 Mbytes
	ROM cache: 8 Kbytes
	Data flash memory
	Capacity: 32 Kbytes
	RAM/extended RAM
	Capacity: 512 Kbytes / 512 Kbytes
Communication protocol	EtherCAT
IDE	CCRX compiler (V3.05.00 or later) + e2Studio(2023-10 or later)
	IAR Embedded Workbench for Renesas RX (V5.10.1 or later)
	Smart Configurator for RX (V2.19.0 or later)
Emulator	Renesas Electronics
	E2 On-Board (hereinafter, referred to as "E2OB")
SSC Tool	EtherCAT Technology Group (ETG)
	Slave Stack Code (SSC) Tool Version 5.13 or later
SoftwarePLC	Beckhoff Automation
	TwinCAT [®] 3 (Download from Beckhoff web site)

Table 1.1	Operating	environment
-----------	-----------	-------------

Note). SSC Tool, the installation of the software PLC shall have been completed.



2. Setting up and connecting the Communication board

For detailed information on this board, refer to the "RX72M CPU Card with RDC-IC User's Manual" (R12UZ0098EJ0100).



Figure 1.1 RX72M CPU Card configuration

2.1 CPU Card setting

Set the jumper pins before powering on the CPU Card.

Using E2OB : Short the Debugger switching Jumper pin.

Setting the device ID: Short the DEVICE ID Jumper pin (JP5) according to the ID. Equivalent to Bit "1" in short.

2.2 Power supply selection

CPU Card does not have DC Jack, input DC5V from USB connector.

2.3 Connection of communication board

Connect each cable as follows.

- (1) Connect an Ethernet cable (Category 5 or higher is recommended) to the Ether port (CN8 IN).
- (2) Connect the common USB connector for the emulator and power supply to the host computer.



3. Installation of e2studio

Download the e² studio for RX72M (2023-10 or later) from the Web site below.

https://www.renesas.com/e2studio_download

3.1 Installing the CC-RX Compiler V3.05.00

The device families selection dialog box appears while installing the e^2 studio. Click [RX] and install. CC-RX V3.05.00 Compiler for RX72M will be installed with the e^2 studio.

Renesas e ² studio 2023-10 Renesas e ² studio 2023-10 Select the device families you	Setup Setup I wish to install support for	
Welcome	RENESAS	RA
Device Families		Build, Debug & Code Generation support for Renesas RA devices
Extra Features	RENESAS	RZ
Customise Features		Build, Debug & Code Generation support for Renesas RZ devices
Additional	RENESAS	RL78
Software		Build, Debug & Code Generation support for Renesas RL78 devices
Licenses	RENESAS	RX
Shortcuts	™ (RX	Build, Debug & Code Generation support for Renesas RX devices
Drivers	RENESAS	RH850
Summary		Debug support for Reneras RH850 devices
Installing		being support for refressis refloto devices
Results	RENESAS	RE
		Build & Debug support for Renesas RE devices

3.2 How to check the registered Compiler

(1) Start the e^2 studio from the Windows Start menu.

(2) Select [File] \rightarrow [New] \rightarrow [C/C++Project] \rightarrow [Next].

e ² New Project Select a wizard Create a new C or C++ project		 □ ×	
Wizards: type filter text > ➢ General → ➢ C/C++ ⓒ C/C++ Project ⓒ Makefile Project with E > ➢ Java > ➢ SVN	ting Code		



(3) In the [Templates for New C/C++ Project] dialog box, select [Renesas RX] → [Renesas CC-RX C/C++ Executable Project] → [Next].

New C/C++ f	Project New C/C++ Project		×
All Make Renesas Debug Renesas RX	GCC for Renesas RX C/C++ Lib A C/C++ Library Project for Renesas for Renesas RX Toolchain. Image: Straight of the straighto	orary Project as RX using the GCC et that builds with ew Core Build Syste able Project able Project as RX using the	^ >

- (4) In the [New Renesas CC-RX C/C++ Executable Project] dialog box, enter a desired project name and select [Next].
- (5) In the [Select toolchain, device & debug settings] dialog box, select [Manage Toolchains...] under [Toolchain Settings].
- (6) In the [Renesas Toolchain Management] dialog box, the registration was successful if "v3.05.00" has been added under "Renesas CCRX".

Scan for installed toolchains o	n startup
Toolchain Type	Installation Path
✓ ■ Renesas CC-RX	
✓ v3.05.00	C:\Program Files (x86)\Renesas\RX\3_5_0\
v2.08.01	C:\Program Files (x86)\Renesas\RX\2_8_1\
> GCC for Renesas RX	
KPIT GNURX-ELF Toolchai	n



4. Import EtherCAT slave stack code into Sample Program

* EtherCAT slave stack code is not included in this sample project.

* "EtherCAT Slave Stack Code (SSC) Tool" is required to generate EtherCAT slave stack code. * SSC Tool is available from the ETG Association.

This sample program is provided in the form of "ecat_demo_cpurx72m.zip", so unzip it in any folder in advance.

- (1) Start the SSC Tool by clicking [EtherCAT Slave Stack Code] → [SSC Tool] from the Windows start menu.
- (2) In the New Project dialog, click Import, select the following SSC Tool configuration file in the sample program folder, and click [OK]. ecat_demo_cpurx72m\src\smc_gen\r_ecat_rx\utilities\rx72m\ssc_config\ Renesas_RX72M_config.xml
- (3) Check the [Custom] check box and select "Renesas RX 72 M <Renesas Electronics Corp>" from the list and click [OK].

Slave Stack C	ode Iool New Project	
🔘 Default		
Custom	Renesas RX72M <renesas corp="" electronics=""></renesas>	~
Vendor: Rer Version: 0.0 NOTE: This fragments r Automation	esas Electronics Corp.(0x766). 0.1 configuration is not provided by Beckhoff Automation and files or file nay be added which are NOT covered by the license from Beckhoff GmbH.	^
Shall be set RX72M.	if the Slave code executes on an Renesas development board for the	Ļ
Import	ОК	

(4) Click [File] -> [Save] and save the project with an arbitrary project file name. (It becomes "RX 72 M EtherCAT.esp" by default)



(5) Click [Project] → [Create New Slave Files] Click [Start] on the [Current new Slave Files] dialog.

File Project Tool Help				
Have Project Update	es Ctrl∔E in 5.11			
Create new Slave File	Version 1.3.3.0 Is F5 ame	Description	Version	^
	aceapplic	AcE ADS over EtherCAT	5.11	
Application	aoeapplh		5.11	
ProcessData Mailbox	applInterface h	EcatAppI EtherCAT application	5.11	
Compiler	bootmode.c	ESM EtherCAT State Machine	4.20	
	bootmode h		5.11	
	cia402app1.c	CiA402appl CiA402 Sample Application	5.11	
	cia402app1h		5.11	
	coeappl.c	CoE CAN Application Profile over EtherCAT	5.11	
	coeapplh		5.11	
	diag.c	Diagnosis Object	5.11	
	diagh		5.11	

(6) Source code is generated, and when it succeeds "New Files created successfully" is displayed, so click [OK].

riojectinie	¥src¥smc_gen¥r_ecat	t_rx¥utilities¥rx72m¥ssc_config¥RX72M_EtherCAT.esp
	Source Folder	n¥src¥smc_gen¥r_ecat_rx¥ut Change
	ESI File	1¥src¥smc_gen¥r_ecat_rx¥ut Change
	Doc Folder	n¥src¥smc_gen¥r_ecat_rx¥ut Change
"coeappl "ecatapp "ecatapp "ecatcoe	h" : new file written c" : new file wri Create Files Finished h" : new file wri c" : new file writ h" : new file writ New files c	d — 🗆 X



(7) Move the generated EtherCAT slave stack code to the source folder of your EtherCAT application.

Source folder: ecat_demo_cpurx72m\utilities\ssc_config\Src

Move destination folder: ecat_demo_cpurx72m\project\src\application\ecat\beckhoff

5. Import EtherCAT FIT module into e2studio

The EtherCAT FIT module is not included in the RX Driver package, so if you want to use it as a software component of the smart configurator other than the sample project, you need to manually install it in e2 studio.

For details, refer to Chapter 6.2 of "r01an4881xx0131-rx-ecat.pdf" in advance and incorporate the module.



RX72M Group

6. Import sample projects into e2studio

- (1) Click [File] \rightarrow [Import].
- (2) In the [Select] dialog, select [General] \rightarrow [Move existing project to workspace] and click [Next].

Select Create new projects from an archive file or directory.		Ľ
Select an import wizard:		
type filter text		
 General Archive File Existing Projects into Workspace File System Preferences Projects from Folder or Archive Rename & Import Existing C/C++ Project into Workspace Renesas CC-RX project conversion to Renesas GCC RX Renesas CS+ Project for CA78K0R/CA78K0 		~
? < Back Next > Fin	ish Can	cel

- (3) Select the [Select root directory] check box in the [Import Project] dialog box and click [Browse].
- (4) Select "ecat_demo_cpurx72m" which is a sample project for communication board and click [Open].

Import Projects		_
Select a directory to sea	rch for existing Eclipse projects.	
Select root directory:	C:¥ecat_demo_cpurx72m ~	Browse
O Select archive file:		Browse
Projects:		
ecat_demo_cpurx	72m (C:¥ecat_demo_cpurx72m¥project)	Select All
		Deselect All
		Refresh

(5) Check "ecat_demo_cpurx72m" in [Project] and click [Next] to import the project.



7. Programming and Debugging

(1) In the Project Explorer, Double-click on the "ecat_demo_cpurx72m.scfg", and execute [Generate Code]



(2) In the Project Explorer, left click on the "ecat_demo_cpurx72m" project, and select [Build Project] to execute the build.

🐔 🗱 🔳 🎋 Debug 🗸 🗸	ecat_demo_cpurx	(72m Hard 🗸 🌼 🗄 🗂 🖷 📓 🕼 🗎	🛞 🕶 🔦 🕶 🔛 i 💌 i
 Project Explorer × 	Project) New Go Into	Image: Second state Image: Second state	<pre>## History : D # Includes <s ##if="" defined(<="" pre=""></s></pre>
> 🔊 Includes > 🥝 src > 🗀 HardwareDebug	Open in New Wind Show In	dow Alt+Shift+W>	/* Defines MC #include < #endif /* def
 >>> trash => ecat_demo_cpurx72m_board.x => ecat_demo_cpurx72m.rcpc => ecat_demo_cpurx72m.scfg => ecat_demo_cpurx72m Hardwa O Developer Assistance >> => => for a constraint 	 Copy Paste Delete Source Move Rename 	Ctrl+C Ctrl+V Delete >	/* Define the #include " /* When using #if BSP_CFG_S
 Secal_demo_rskx72m (in project) Sopcuaserver_RX72M 	Export		<pre>#if BSP_CFG_R #if BSP_CFG_R</pre>
	Build Project Clean Project Refresh Close Project	Incremental Build o	#pragma section #pragma section of Selected Projects ection #pragma section #else



(3) When the build is completed, select [Debug Configuration] from the [Debug] button.



(4) Set up E2OB. E2OB functions as an emulator equivalent to E2Lite, so when connecting, set the emulator type to "E2Lite" and the communication interface to "FINE".

lame: ecat_demo_cpurx72m HardwareDebug		
🖹 Main 🛜 Debugger 🕨 Startup 🗔 Common 🧤 So	ource	
Debug hardware: E2 Lite (RX) \checkmark Target De	vice: R5F572MN	
GDB Settings Connection Settings Debug Tool Set	ttings	
✓ Clock		
Main Clock Source	EXTAL	~
Extal Frequency[MHz]	24	
Operating Frequency [MHz]	240.000	
Permit Clock Source Change On Writing Inter	nal Flash Memory Yes	~
✓ Connection with Target Board		
Emulator	(Auto)	
Connection Type	Fine	~
JTag Clock Frequency[MHz]	Fine	
Fine Baud Rate[Mbps]	JTag	
Hot Plug	No	~
✓ Power		
Power Target From The Emulator (MAX 200m	A) No	~
Supply Voltage (V)	3.3	\sim
✓ CPU Operating Mode		



RX72M Group

(5) Click "ecat_demo_cpurx72m Hardware Debug" to download the program to the target and start by pressing the debug button.

Image: The second s	Name: ecat_demo_cpurx72m HardwareDebug Image: Maing Debugger Startup Project: ecat_demo_cpurx72m Browse. Browse.					
 GDB Hardware Debugging GDB Simulator Debugging (RH850) Java Applet Java Application Launch Group Remote Java Application Renesas GDB Hardware Debugging ecat_cia402_demo_cpurx72m HardwareDebug ecat_demo_rskrx72m HardwareDebug opcuaserver_RX72M HardwareDebug Renesas Simulator Debugging (RX, RL78) 	C/C++ Application:					
	Variables Search Project Brow Build (if required) before launching					
	Enable auto build Use workspace settings	O Disable auto	o build kspace Settings			
1			Revert	Apply		

- (6) Firewall warning of 'e2 server gdb.exe' may be displayed. Check the checkbox of [Private network such as home or workplace network] and click <Allow access>.
- (7) User Account Control (UAC) dialog may be displayed. Enter the administrator password and click [Yes].
- (8) When a dialog recommending the change of perspective is displayed on the confirmation dialog of perspective switching, check the [Always use this setting] checkbox and click [Yes].
- (9) After downloading the code, click the <resume> button and execute the code until the first line of the main function main (). Click the <resume> button again to execute the target with the rest of the code.

Note): Not use E2OB and run in ROM mode, remove the Debugger switching Jumper pin.



8. Connection with TwinCAT

This section explains how to operate the sample program using TwinCAT3.

8.1 Preparation of ESI file

Before starting TwinCAT please copy the ESI file included in the sample program to the prescribed location of TwinCAT (\TwinCAT\3.x\Config\IO\EtherCAT).

ecat_demo_cpurx72m\src\smc_gen\r_ecat_rx\utilities\rx72m\esi\ Renesas EtherCAT RX72M.xml

8.2 Starting TwinCAT

- (1) From the start menu, select [Beckhoff] \rightarrow [TwinCAT 3] \rightarrow [TwinCAT XAE (VS 20 xx)].
- (2) After starting the program, create a new project of type TwinCAT XAE Project as [File] → [New] → [Project].

8.3 Scanning the network

- (1) In the System Manager tree, right-click $[I / O] \rightarrow [Devices]$ and select [Scan].
- (2) Click [OK] on the [HINT: Not all types of devices can be found automatically] dialog
- (3) In the [new I / O devices found] dialog box, select the check box of the Ethernet adapter to be scanned and click [OK].
- (4) Clicking [Yes] in the [Scan for Boxes] dialog starts scanning and the devices in the EtherCAT segment are automatically recognized.
- (5) "Active Free Run" dialog is displayed and click [Yes]. In the system manager tree, if Box is added as "Device1" → "Box1" under "I/O" → "Devices", it is normal.



RX72M Group

8.4 Writing of SII EEPROM

* Because the EEPROM is blank at the time of shipment of the communication board, be sure to perform writing.

* If the EEPROM has been written, the processing in this section is unnecessary.

- (1) Double-click [Box 1] in the System Manager tree, the panel will be displayed on the right side.
- (2) Select the [EtherCAT] tab and click the [Advanced Settings] button.
- (3) Select [ESC Access] -> [EEPROM] -> [Hex Editor] in the left tree of the Advanced Settings dialog.
- (4) In the [Hex Editor] dialog, select "Download from list".
- (5) In the [Write EEPROM] dialog box, select [Renesas Electronics Corp.] → [Renesas RX 72 M Group] → [Renesas EtherCAT RX 72 M]] and click [OK]. The EEPROM is written.
- (6) After writing, restart the communication board (turn the power supply on again or reset), so that the rewritten data is reflected in the operation of the microcomputer.

8.5 Rescan of the device

- (1) Press the [Restart TwinCAT (Config Mode)] button.
- (2) In the [RestartTwinCAT Sysytem in Config Mode] dialog box, click [OK].
- (3) In the [Load I / O Devices] dialog box, click [Yes].
- (4) Click [Yes] in the [Active Free Run] dialog. It is OK if "Box 1" in the system manager tree is "Box 1 (Renesas EtherCAT RX 72 M)".

8.6 I/O operation confirmation

- (1) Double-click "Box 1" in the System Manager tree, the panel will be displayed on the right side.
- (2) Select the "Online" tab and make sure "Current Status" is "OP".
- (3) Expand the + next to "Box 1" in the System Manager tree.
- (4) Select "TxPDO-Map" → "Input Counter" and select the "Online" tab on the right-side panel to display "Value".
 Check that the value is set by DEVICE ID Jumper pin.
- (5) Select "RxPDO Map" -> "Output Counter" in the system manager tree and "Value" is displayed when you select the "Online" tab on the right panel. Make sure that "0" is displayed.
- (6) Click [Write] and enter an arbitrary numerical value in the "Set Value Dialog" dialog.
- (7) Click "OK" and confirm that the value "Value" is the entered value. Lower 4 bits of the entered value is displayed on LED4-1 of the communication board. (LED lights up when bit = 1)



9. Appendix Conversion procedure to the IAR project

Download and install IAR Embedded Workbench for Renesas RX (V5.10.1 or later) for RX72M from the IAR Systems website.

https://www.iar.com/jp/

Also, Download and install Smart Configurator for RX (V2.19.0 or later) from the following website.

https://www.renesas.com/jp/ja/software-tool/rx-smart-configurator

This section describes the procedure for converting an e2 studio version project to an IAR project.

- (1) Start IAR Embedded Workbench for Renesas RX.
- (2) Click "Tools >> Convert To IAR for RX ...".
- (3) Select "ecat_demo_cpurx72" in the e2 studio version sample program directory in the Root directory of source project.
- (4) Select the "Enable" check box for Project file conversion.
- (5) Select "Renesas e2studio for RX" in Project type.
- (6) Uncheck the check box of "Enable" in the Source code substitution.
- (7) Click "Execute"

Root di	Project Converter - 4.0.2 rectory of source project	2m com		×	
Proje Er Pro Re File	ect file conversion able ect type nesas e2studio for RX extension(s)]		
source	e code substitution	ig changed code with comm	ents		
Sub Nr 1 2 3 4	stitution rules (the rules will be From [¥t] *#pragma[¥t] +in #pragma +segment * #pragma¥s +pack(?!(o sectop	applied as ordered in the I To #pragma vector=\$1¥ #pragma segment="\$ #pragma pack(1) setion_begin	st)	Add Copy Edit Remove	
5 6 7 8 Per	secend secsize setpsw_j drpsw_i form substitutions on file(s) wi	section_end section_size enable_interrupt disable interrupt th extension(s)	•	Import Export	
	;~.cpp;~.n;~.npp;~.asm;*.s	۵	✓ Execute	Close	



(8) In the Choose destination directory window, select the "Operate on a copy of the source code in the following directory" checkbox. Please freely select the destination directory.

Operate on a copy of the source code in the following directory: ::¥Users¥a5000352¥Documents¥IAR Embedded Workbench¥rx¥rx72m_com Operate on original directory Create backup files (.bak) OK Cancel	Choose destination directory	×
::¥Users¥a5000352¥Documents¥IAR Embedded Workbench¥rx¥rx72m_com Operate on original directory Create backup files (.bak) OK OK Cancel	• Operate on a copy of the source code in the following directory:	
Operate on original directory Create backup files (.bak) OK Cancel	:¥Users¥a5000352¥Documents¥IAR Embedded Workbench¥rx¥rx72m_com	
Create backup files (.bak) OK Cancel	Operate on original directory	
OK Cancel	✓ Create backup files (.bak)	
	ОК С	ancel

(9) Click "OK" in the Report window.

This file:			^
C:¥iar_workspace¥iar_project¥ConvertToIARRepo	ort.txt		
Project file conversion(s)			
C:¥iar_workspace¥iar_project¥.cproject			
C:¥iar_workspace¥iar_project¥.cproject => Rene Project converted to => C:¥iar_workspace¥iar_pro Workspace created => C:¥iar_workspace¥iar_pro	sas setup files were e oject¥iar_project.ewp ject¥iar_project.eww	xcluded.	
Source code substitutions			
			~
		>	

Please leave IAR Embedded Workbench for Renesas RX running.



(10) Then start Smart Configurator for RX.

The EtherCAT FIT module is not included in the RX Driver package, so you need to manually install in the Smart Configurator for RX when you start it for the first time.

For details, refer to Chapter 6.3 of "r01an4881xx0131-rx-ecat.pdf" in advance and incorporate the module.

(11) Click "File >> Open" and select iccrx_ecat_demo_cpurx72m.scfg in the destination directory.

<pre>ic > ewrx > ecat_IO > ecat_demo_cpurx72m</pre>
名前
settings
<pre>ecat_demo_cpurx72m.scfg iccrx_ecat_demo_cpurx72m.scfg</pre>

- (12) When the configuration window is displayed, execute "Generate Code".You can exit the Smart Configurator for RX.
- (13) Return to IAR Embedded Workbench for Renesas RX.

Click "File >> Open Workspace " to open the .eww file in the destination directory for the IAR project.

(14) Click "Project >> Add Project Connection ".

Select "IAR Project Connection File" as the connection to use and click "OK".

Select buildinfo.ipcf and click "Open".

The file generated by Smart Configurator for RX will be imported.

HardwareDebug ~
ファイル 🌣
Communication Commun



- (15) Right click on the project and click "Options".
- (16) Select "Target" on the General Options tab.
- (17) Select "Device to use". In case of RX72M, it is "R5F572MN_DUAL"

Category:					
General Options					
Static Analysis Runtime Checking			0. 1.41		
C/C++ Compiler	Library Opti	ons 2	Stack/Heap	MISRA-C:2004	MISRA-C:1998
Assembler	larger	Outpu	it Library	Configuration	Library Options 1
Output Converter	Device			Byte order	
Build Actions	R5F572MM	LDUAL	E +	Little endian	
Linker		-		O Big endian	
Debugger	-Floating-p	oint		Int	
E1/E20	Size of typ	e 'double'	:	Size of type 'int'	
E2	O 32 bits	; (64 bits	◯ 16 bits	32 bits
E2 Lite / EZ-CUBE2	Subnormal	numbers		Data model	
Simulator	Handl	e with exc	eptions	○ Near	
	Treat a	s zero		Far	
	D in the second			OHuge	
	Position-in	depender	nce		
	Code a	nd read-o	nly data		
	Read-v	vrite data			



(18) Select "Preprocessor" in the C / C ++ Compiler tab and set the same include path as the CCRX project.



Set up under \ src according to the project directory.

\$PROJ_DIR\$\src\application\ecat\beckhoff\Src
\$PROJ_DIR\$\src\application\ecat



(19) Select "Settings" on the Linker tab. Set the "Default Override" checkbox in the linker configuration file. Next, select ".icf file of target device". Please set "Inkrx700.icf" for RX72M.

Category: General Options Static Analysis	Factory Settings
Runtime Checking C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger E1 / E20 E2 E2 Lite / EZ-CUBE2 J-Link Simulator	#define Diagnostics Checksum Encodings Extra Options Config Library Input Optimizations Advanced Output List Linker configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file



(20) Select "Settings" on the debugger tab. Select "Emulator" in the driver. RX72M is "E2 Lite / EZ-CUBE2". ··Select "Default Override" in the device description file. RX72M is "ior5f572mn_dual.ddf".

Category:	Factory Settings
General Options Static Analysis Runtime Checking C/C++ Compiler Assembler Output Converter	Setup Images Extra Options Plugins Driver: E3 Lite (E7, CUPE2 and Comparing the set of t
Custom Build Build Actions Linker Debugger E1 / E20 E2 E2 Lite / EZ-CUBE2 J-Link Simulator	Setup macros Setup macro file: Device description file StooLKIT_DIR\$¥config¥debugger¥ior5f572mn_dual.ddf
	OK Cancel

- (21) Click "Project >> Rebuild All".
- (22) Click "E2 / E2 Lite >> Hardware Settings ...".
- (23) Set the following items in the Hardware Setup window and click OK.

Check "EXTAL frequency" and set the frequency to 24MHz. Select "FINE baud rate" of Communication item and set the baud rate to 1.5Mbps.

(24) Click "Project >> Download and Debug".



10. Appendix e2studio setting information

This section describes the e2 studio settings for configuring the sample program.

Please use it as a reference when creating a new project and adding the functions of the sample program.

10.1 FIT module Structure

The sample program consists of the following FIT modules.

Table 10-1 FIT Module Structure

Туре	Module name	FIT module name
Board Support	Board Support Package (BSP)	r_bsp
Package		
Device Driver	Compare Match Timer (CMT)	r_cmt_rx
Device Driver	Serial Communication Interface (SCI)	r_sci_rx
Middleware	Byte Type Queue buffer (BYTEQ)	r_byteq
Device Driver	EtherCAT	r_ecat_rx

10.2 Configuration options

The configuration file of the FIT module has been changed.

And the definitions for pins assignment of DIP switch input and LED output used in the EtherCAT application has been changed.

The changes to the configuration options are shown below.

(1) EtherCAT FIT module settings change

Set the PHY LSI to be used to the KSZ8081MNX mounted on the communication board.

Also, set the PHY reset waiting time to 500 μ s.

[r_config/r_ecat_config.h]

Macro Name	Setting
ECAT_CFG_USE_SUPPORTED_PHY	2
ECAT_CFG_PHY_DELAY_RESET	500

(2) SCI FIT module settings change

Set CH6 and send completion interrupts to enable.

[r_config/r_sci_rx_config.h]

Macro Name	Setting
SCI_CFG_CH6_INCLUDED	1
SCI_CFG_TEI_INCLUDED	1

(3) EtherCAT application settings change

Set the DIP switch input and LED output pins assignment for the communication board.

[application/ecat/sampleappl.c]

Macro Name	Setting
APPL_CFG_LED_SW	3



RX72M Group

10.3 Pin configuration

You can import the pin settings to run the sample program on the communication board.

Click the [Import the board setting] button on the [Pins] tab of the Smart Configurator.

Then select "ecat_demo_cpurx72m_board.xml" .

The xml file is included in the sample program.

Pin configuration					6
Hardware Res 庄 🕒 🕌	Pin Function	I.		2 🗉 🖬	è
Type filter text	type filter t	ext		All	``
All Clock generator Clock frequency accu Buses Clock frequency accu Cloc	Enabled	Function A0 A1 A2 A3 A4 A5	Assignment Not assigned		Pin 1 / / / / / / / / / / / / / / / / / /

Enable the pins used by the FIT module in the [Resources] property of the [Components] tab.

Components	Resources to enable	Pins to enable
r_ecat\rx	ESC	All pins
	ESC_MII0	
	ESC_MII1	
r_sci_rx	SCI6	RXD6/SMISO6 pin
		TXD6/SMOSI6 pin



10.4 Build configuration

The settings when building the sample program are shown below.

Item	Changing Contents	Description
Compiler - Source	Include path by [Include • File • Directory]	In each FIT module, for the setting please add the required include path. When installed each FIT module by using [FIT Configuration] it will be automatically set. Add the include path of sample program. In this project, "application\ecat\beckhoff\Src" and "application\ecat\renesas" are added. < Example Setting > Include file directories
Compiler – Optimization	Change optimization level Level 1: Implement a part of the optimization	To prevent the building by optimization from some code that generate by SSC, set optimization level 1

Table 10-2	Setting	Tool T	ab
------------	---------	--------	----

10.5 Debug configuration

The settings for debugging the sample program on the communication board are shown below.

Tab Item	Changing Contents	Description	
Debugger – Connection Settings	Set the EXTAL frequency to 24MHz and do power from the emulator.		
	Setting > Main Debugger Startup Source Co Debug hardware: E2 Lite (RX) Target Device:	mmon R5F572MN	
	GDB Settings Connection Settings Debug Tool Setting Clock Main Clock Source Extal Frequency[MHz]	JS EXTAL 24.0000	
	Permit Clock Source Change On Writing Internal	Yes	

Table 10-3 Debug configuration



Revision History

		Descriptior	1
Rev.	Date	Page	Summary
1.00	Jan 31, 2023	-	First edition issued
1.01	Nov 30, 2023	Program	Modify ESI file to support CTT V2.4.0
		16-22	Change "9. Appendix Conversion procedure to IAR project"
		3	Add "Smart Configurator for RX" to Table 1.1 "Operating
			environment"
		3, 5, 6, 16	Update the version of each tool.



General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit 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. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time 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 time 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 time 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 time when power is supplied until the power is supplied until the power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance 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 the 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.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is 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. Additionally, 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.

6. Voltage application waveform at input pin Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a systemevaluation test for the given product.

· Arm[®] and Cortex[®] are registered trademarks of Arm Limited (or its subsidiaries) in the EU and/or elsewhere. All rights reserved.

- · Ethernet is a registered trademark of Fuji Xerox Co., Ltd.
- · IEEE is a registered trademark of the Institute of Electrical and Electronics Engineers Inc
- · TRON is an acronym for "The Real-time Operation system Nucleus.
- · ITRON is an acronym for "Industrial TRON.
- μ ITRON is an acronym for "Micro Industrial TRON.
- TRON, ITRON, and μ ITRON do not refer to any specific product or products.
- EtherCAT[®] and TwinCAT[®] are registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- Additionally all product names and service names in this document are a trademark or a registered trademark which belongs to the respective owners. a trademark or a registered trademark which belongs to the respective owners.

Notice

- Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
- Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
- 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
- 4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
- Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
 "Standard". Computers: office computing and visual equipment: test and measurement equipment: being and visual equipment equipmen
 - "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

- 6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
- 7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
- 8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
- 9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
- 10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
- This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.
- (Note1) "Renease Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
- (Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan www.renesas.com

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit: www.renesas.com/contact/.

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.