

RX72M Group

Communication Board EtherCAT Startup Manual

Introduction

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

Target Device

RX72M



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1. Operating environment

The sample program in this manual assumes the following environment.

ltem	Detailed content
Evaluation board	RX72M Communication Board
	TS-RX72M-COM from TESSERA TECHNOLOGY INC.
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(2025-04 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 Lite
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 the evaluation board, refer to "RX72M Communication Board Hardware Manual".

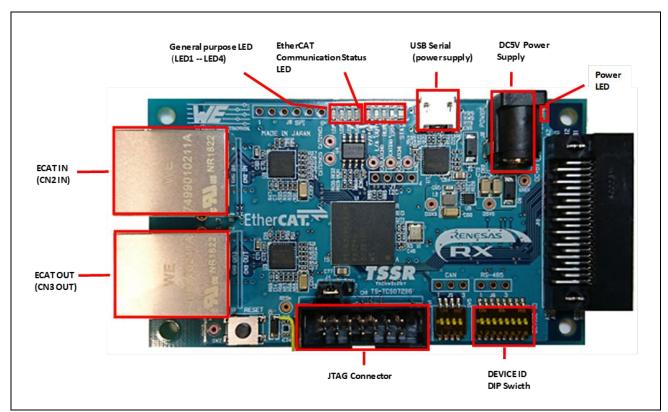


Figure 1.1 RX72M Communication board configuration

2.1 Communication board setting

Before powering on the evaluation board, make jumper settings and connect each cable. Configure the configuration mode of JTAG. Usually it is used at 2-3 short of jumper pin. To use the hot plug-in function, change it to 1-2 short and use it.

For more information about the position of the relevant parts, refer to the [RX72M communication board hardware manual].

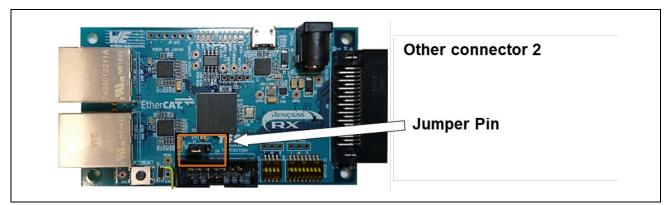


Figure 1.2 Jumper pin setting



2.2 Power supply selection

This board can supply power for RX 72 M by inputting DC 5 V by DC Jack or USB. select either.

2.3 Connection of communication board

Connect each cable as follows.

- (1) Connect Ethernet cable (category 5 or higher recommended) to Ether port (CN 2 IN).
- (2) Connect JTAG connector of ICE to JTAG Connector, USB connection with host computer.
- (3) Connect DC 5 V from DC Jack or USB and turn on the power.



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 e² studio 2023-10 Setup	— U	×
Renesas e ² studio 2023-10 Setup Select the device families you wish to insta	Ill support for	5
Welcome	RA RA	
Device Families	Build, Debug & Code Generation support for Renesas RA devices	
Extra Features	ENESAS RZ	
Customise Features	Build, Debug & Code Generation support for Renesas RZ devices	
	RL78	
Software	Build, Debug & Code Generation support for Renesas RL78 devices	
Licenses	INESAS RX	
Shortcuts	Build, Debug & Code Generation support for Renesas RX devices	
Drivers	RH850	J
Cupper and	H850 Debug support for Renesas RH850 devices	
Installing	5.11	
Results	RE	

3.2 How to check the registered Compiler

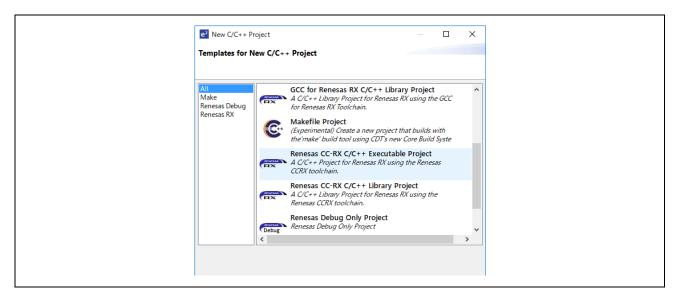
(1) Start the e^2 studio from the Windows Start menu.

(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 >	g Code			



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



- (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 of	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 Toolchair	n



RX72M Group

4. Connection

- (1) Connect the LAN cable to "CN2 IN" side.
- (2) Connect the E2 emulator Lite to the JTAG connector of the communication board with the user interface cable.
- (3) Connect the E2 emulator Lite to the USB port of the computer. The "ACT" LED of E2 emulator Lite flashes.
- (4) "Found New Hardware" wizard will be displayed. Follow the steps below to install the driver. For Windows[™] 7/8 / 8.1, administrator authority is required. Windows[™] 7/8 / 8.1: When the installation is completed, the completion is notified to the Windows task bar.
 Windows[™] 10: The device setting button is displayed on Windows Taskbar and it is automatically installed.
- (5) Supply power to the communication board.



5. 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_comrx72m.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_comrx72m\utilities\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 Tool New Project	
🔘 Default		
Custom	Renesas RX72M <renesas corp="" electronics=""></renesas>	~
Version: 0.0 NOTE: This	configuration is not provided by Beckhoff Automation and files or file nay be added which are NOT covered by the license from Beckhoff	^
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				
B-RX7 -	ject Update	ies n 5.11			
Fin	d Setting Ctrl	+F Version1.3.3.0			
	ate new Slave Files	F5 ame	Description	Version	\sim
Synchronis		aoeapplo	AoE ADS over EtherCAT	5.11	
📥 Application	n	aoeapplh		5.11	
Proces Mailbox	.sData	applInterfaceh	EcatAppl EtherCAT application	5.11	
Compiler		bootmode.c	ESM EtherCAT State Machine	4.20	
		bootmodeh		5.11	
		cia402appl.c	CiA402appl CiA402 Sample Application	5.11	
		cia402app1h		5.11	
		coeapplc	CoE CAN Application Profile over EtherCAT	5.11	
		coeapplh		5.11	
		diagic	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].

Project File	¥src¥smc_ge	¥r_ecat_rx¥utilities¥rx;	72m¥ssc_c	onfig¥RX72M Eth	herCATlesp	
	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.	c" : new file written					
"coeappl. "ecatappl "ecatappl "ecatcoe. "ecatcoe. "ecatsly. "ecatsly.	h" : new file written .c" : new file wri .h" : new file wri c" : new file writ	Finished — Files created success	. ,	×		



(7) Move the generated EtherCAT slave stack code to the EtherCAT application source folder. The sampleappl.c and sampleappl.h are stored in the destination "\application\ecat" folder. When moving the slave stack code to the application folder, be careful not to delete these files. Remove the Src code from the folder or exclude the Src code from the build target in e2studio.

Source folder: ecat_demo_comrx72m\utilities\ssc_config\Src

Move destination folder: ecat_demo_comrx72m\project\src\application\ecat\beckhoff

6. Import EtherCAT FIT module into e2studo

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.



7. 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 an import wizard: type filter text	 Import Select Create new projects from an archive file or directory. 	×	
 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 	-		
	 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 	~	

- (3) Select the [Select root directory] check box in the [Import Project] dialog box and click [Browse].
- (4) Select "ecat_demo_comrx72m" which is a sample project for communication board and click [Open].

Import Projects Select a directory to search for existing Eclipse projects. Select root directory: C*#ecat_demo_comrx72m Browse Select archive file: Browse Browse Projects: ecat_demo_comrx72m (C:#ecat_demo_comrx72m¥project) Select All Deselect All Refresh	Import		
Select root directory: C:¥ecat_demo_comrx72m Browse Select archive file: Projects:	Import Projects		
○ Select archive file: ✓ Browse Projects: ✓ ecat_demo_comrx72m (C:¥ecat_demo_comrx72m¥project) Select All Deselect All Deselect All	Select a directory to search for existing Eclipse projects.		
Projects: Image: Comparison of the second	Select root directory: C:¥ecat_demo_comrx72m	~	Browse
ecat_demo_comrx72m (C:¥ecat_demo_comrx72m¥project) Select All Deselect All	O Select archive file:	~	Browse
Deselect All	Projects:		
	ecat_demo_comrx72m (C:¥ecat_demo_comrx72m¥project)		Select All
Refresh			Deselect All
			Refresh

(5) Check "ecat_demo_comrx72m" in [Project] and click [Next] to import the project.



8. Programming and Debugging

(1) In the Project Explorer, Double-click on the "ecat_demo_comrx72m.scfg", and execute [Generate Code]

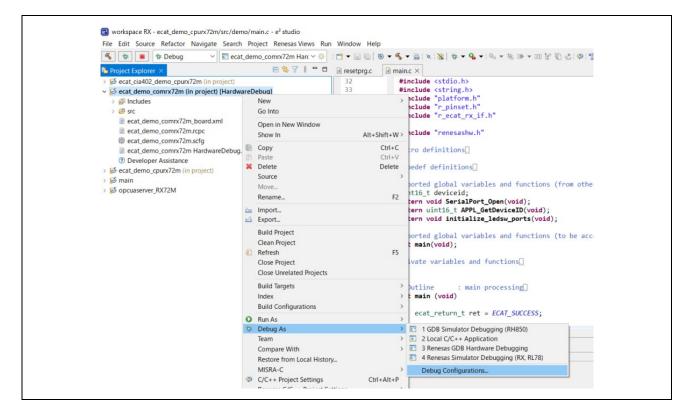
File Edit Navigate Search Project Renesas Views Run	n.scfg - e² studio Window Help	
🐔 🐐 🔳 🎋 Debug 🗸 🖓 🖻 ecat_demo_rskn	x72m Hardv 🗸 🔅 📑 🕶 🔚 🐚 🕲 🕶 🗞 🕶 📓 💸	‡ • 9 • 0 • * * 10 • • 00 †
🎦 Project Explorer 🗵 🔲 🛱 🎖 🖻 🗖	@ ecat_demo_comrx72m.scfg @ ecat_demo_rskrx7	'2m.scfg × □
 	Software component configuration	Generate Code Generate Report
	Compon 2 1 Configure	0
 ecat_demo_comrx72m HardwareDebug.launch ⑦ Developer Assistance ﷺ ecat_demo_rskrx72m (in project) ﷺ opcuaserver_RX72M 	 ✓ Startup ✓ Seneric ✓ r_bsp ✓ Drivers 	

(2) In the Project Explorer, left click on the "ecat_demo_comrx72m" project, and select [Build Project] to execute the build.

🐔 🏘 🔳 🏘 De	bug 🗸 🗸 🖂 ecat_demo_	comrx72m Harc 🗸 🔅	1 -3 - 12 (6)	18 • % • 📾 🔍 🗞 🕴
🍋 Project Explorer 🔀		🖻 🔩 🎖 🕴 🗖 🖬	resetprg.c	🖻 main.c 🗡
> 🞏 ecat_cia402_demo	_cpurx72m (in project)		32	<pre>#include <stdie< pre=""></stdie<></pre>
 is ecat_demo_comm is includes is includes 	New Go Into	>	33 34 35	<pre>#include <stri "plat="" "r_pi<="" #include="" pre=""></stri></pre>
> 😕 src 📄 ecat_demo_co 📄 ecat_demo_co	Open in New Window Show In	Alt+Shift+W>	36 37 38	<pre>#include "r_ec #include "rene</pre>
 	Paste	Ctrl+C Ctrl+V Delete	39 41 43	⊕Macro definiti
> 😂 ecat_demo_cpurx > 😂 main > 😂 opcuaserver_RX72	Source Move Rename	> F2	45 47 49 51	 Typedef defini Imported globa uint16 t devic
	import		52 53 54	extern void Se extern uint16_ extern void in:
	Build Project		55	
	Clean Project Refresh Close Project	Incremental I F5	59 60 62	d Projects ported globa int main(void) * Private variab



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



(4) Click "ecat_demo_comrx72m Hardware Debug" to download the program to the target and start by pressing the debug button.

3 2 № 1 4 9 7 •	Name: ecat_demo_cpurx72m HardwareI			
C/C++ Application	🖹 Main 券 Debugger 🕨 Startup 导 Sc	ource 🗖 Common		
C/C++ Remote Application	Project:			
EASE Script	ecat_demo_cpurx72m		Browse	
 GDB Hardware Debugging GDB Simulator Debugging (RH850) 	C/C++ Application:			
 Java Applet 	HardwareDebug/ecat_demo_cpurx72m			
Java Application		Variables See	arch Project Browse	
Launch Group Remote Java Application	Build (if required) before launching			
 E Renesas GDB Hardware Debugging 	Build Configuration: Select Automatic	cally	~	
ecat_cia402_demo_cpurx72m HardwareDebug	O Enable auto build	O Disable auto bui		
ecat_demo_comrx72m HardwareDebug ecat_demo_cpurx72m HardwareDebug	Use workspace settings	Configure Workspace	ce Settings	
main HardwareDebug				
C opcuaserver_RX72M HardwareDebug				
Renesas Simulator Debugging (RX, RL78)				
			Pouert Applu	
ilter matched 16 of 18 items			Revert Apply	



- (5) 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>.
- (6) User Account Control (UAC) dialog may be displayed. Enter the administrator password and click [Yes].
- (7) 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].
- (8) Green "ACT" LED of the E2 Lite debugger will always on.
- (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.



9. Connection with TwinCAT

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

9.1 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_comrx72m\utilities\esi\ Renesas EtherCAT RX72M.xml

9.2 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].

9.3 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.



9.4 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.

If the EEPROM is blank, it is displayed as "Box 1 (PFFFFFFF RFFFFFFFF)" in the system manager tree.

- (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.

9.5 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)".

9.6 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.
- 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 DIP SW 5.
- (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)



10. 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_comrx72" 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	R Project Converter - 4.0.2 rectory of source project Jsers¥a5000352¥Desktop¥rx72m_com	×
	ct file conversion nable @ ject type enesas e2studio for RX extension(s) cproject	
	r From To	
	#pragma +segment * #pragma segment="\$ #pragma¥s+pack(?!(o #pragma pack(1) sectop section_begin secend section_end secsize section_size	Copy Edit Remove Import
		✓ Export
	Γ	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.

Choose 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)	
ОК С	ancel

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

Report	-	×
This file: C:¥iar_workspace¥iar_project¥ConvertToIARReport.	txt	^
Project file conversion(s)		
C:¥iar_workspace¥iar_project¥.cproject		
C:¥iar_workspace¥iar_project¥.cproject => Renesas Project converted to => C:¥iar_workspace¥iar_projec Workspace created => C:¥iar_workspace¥iar_project	ct¥iar_project.ewp	
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_comrx72m.scfg in the destination directory.

名前 settings HardwareDebug src trash cat demo_comrx72m.scfg	> esc > ewrx > ecat_IO > comrx72m
 settings HardwareDebug src trash 	冬 前
src trash	

- (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

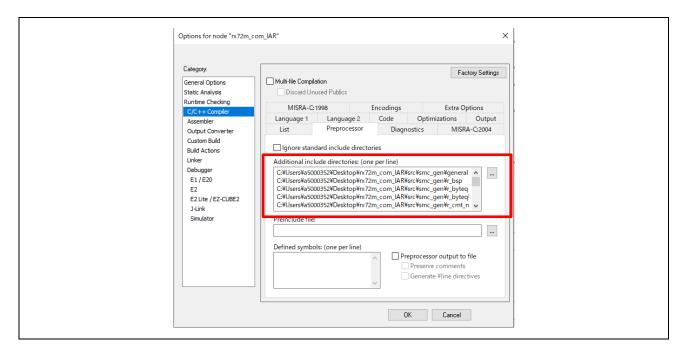


- (15) Right click on the project and click "Options".
- (16) Select "Target" on the General Options tab.
- (17) Select "Device to use". In case of RX72M, it is "R5F572MN_DUAL"

Category:					
General Options Static Analysis					
Runtime Checking C/C++ Compiler	Library Op	tions 2	Stack/Heap	MISRA-C:2004	MISRA-C:1998
Assembler	Target	Outp	ut Library	Configuration	Library Options 1
Output Converter	Device			Byte order	
Custom Build	December			 Little endian 	
Build Actions	R5F572M	N_DUAL	"⊒+	O Big endian	
Linker Debugger	-Floating-p	point		Int	
E1/E20		pe 'double	e':	Size of type 'int'	
E2	◯ 32 bit	s	64 bits	🔿 16 bits	32 bits
E2 Lite / EZ-CUBE2 J-Link	Subnorma	al numbers	s	Data model	
Simulator	Hand	le with ex	ceptions	○ Near	
	Treat	as zero		Far	
	-Position-i			OHuge	
		and read-	-		
	Read-	write 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\renesas



(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 Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Stochtking Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuration file Image: Configuratio



(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".

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



11. 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.

11.1 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 Package	Board Support Package (BSP)	r_bsp
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

11.2 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 µs.

[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	2

11.3 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_comrx72m_board.xml" .

The xml file is included in the sample program.

Pin configuration			6
Hardware Res 🕕 📄 📲	Pin Function		2 🗉 🖬 🔁
Type filter text	type filter text		All
All Clock generator Clock frequency accu Clock frequency accu Coperating mode cont System control Con-chip emulator Buses CVDMA	Enabled Function A0 A1 A2 A3 A4 A5 <	Assignment Not assigned Not assigned Not assigned Not assigned Not assigned Not assigned	Pin 1 // N // N // N // N // N // N // N

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



11.4 Build configuration

The settings when building the sample program are shown below.

Item	Changing Contents	Description
Compiler - Source		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 🛛 👰 🕫
		"\${workspace_loc:/\${ProjName}/src/application/ecat/beckhoff/Src}" "\${workspace_loc:/\${ProjName}/src/application/ecat/renesas}"
Compiler	Change optimization level	To prevent the building by optimization from some
 Optimization 	Level 1: Implement a part of the optimization	code that generate by SSC, set optimization level 1

Table 10-2 Setting Tool Tab

11.5 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 >	n' t turned on the	
	Image: Startup Image: Start		
	GDB Settings Connection Settings Debug Tool Setting Clock Main Clock Source	gs	
	Extal Frequency[MHz]	24.0000	
	Permit Clock Source Change On Writing Internal	Yes	

Table 10-3 Debug configuration



Revision History

	-	
	Description	1
Date	Page	Summary
Nov 1, 2019	—	First edition issued
Apr 30,2020	3	Table 1.1 Operating environment is revised
	11	5.(7) Change destination folder of EtherCAT slave stack code
	18-24	Add "9. Appendix Conversion procedure to IAR project"
Aug 31,2020	22	Step (15) include path is revised
Aug 31,2021	Program	Supports EtherCAT FIT module version 1.20
	25-27	Add "10. Appendix e2studio setting information"
Jan 31,2023	Program	Supports EtherCAT FIT module version 1.30
	-	Added utilities and project folders to separate SSC-related files
		and project-related files
		Supports e2 studio 64-bit version
		Supports SSC 5.13
	9,11,15,27	Change folder name due to folder structure change
	22,25	Removed r_sys_time_rx module from FIT module configuration
		as it is no longer used
Nov 30, 2023	Program	Modify ESI file to support CTT V2.4.0
	18-24	Change "10. Appendix Conversion procedure to IAR project"
	3	Add "Smart Configurator for RX" to Table 1.1 "Operating
		environment"
	3, 6, 7, 18	Update the version of each tool.
May 23, 2025	Program	Supports EtherCAT FIT module version 1.32
	Nov 1, 2019 Apr 30,2020 Aug 31,2020 Aug 31,2021 Jan 31,2023 Nov 30, 2023	Nov 1, 2019 — Apr 30,2020 3 11 18-24 Aug 31,2020 22 Aug 31,2020 22 Aug 31,2021 Program 25-27 Jan 31,2023 Jan 31,2023 Program 9,11,15,27 22,25 Nov 30, 2023 Program 18-24 3 3, 6, 7, 18 3, 6, 7, 18



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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

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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.

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