

RX72M Group

Communications Board PROFINET Startup Manual

Application Note

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Introduction

This application note is a quick start guide for PROFINET communication with the RX72M communication board for industrial network evaluation.

This stack runs on E-Force's real-time OS "µC3 (micro-C-cube)" and TCP/IP protocol stack "µNet 3 (micro-net-cube)".

Target Device

RX72M Group

Sample program

This sample program uses the evaluation version of PROFINET stack of our partner: JSL Technology Co., Ltd.

Please contact JSL Technology Corporation for the purchase of the official version and the specifications of the sample program.

JSL Technology Co., Ltd .: <u>https://jslt.co.jp/</u>

[Restrictions]

The evaluation version of the PROFINETIP stack is a library file built with the following functional restrictions, and can only be used for evaluation. It cannot used for integration into the product. In that case, please consider purchasing the official version.

- The PROFINET stack is provided as a library
- e-Force's real-time OS "µC3" uses a time-limited evaluation version



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1. Operating Environment

The sample program in this manual assumes the following environment.

Table 1.1	Operating Environment
-----------	------------------------------

Item	Description
Board	RX72M communications board
	TS-TCS07298 from Tessera Technology
CPU	RX CPU (RXv3)
	R5F572MNDxBD
Operating frequency	CPU clock (CPUCLK): 240 MHz
Operating voltage	3.3 V
Operating modes	Single chip mode
Device requirements	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
Communications protocol	PROFINET (Version 5.4.3.0)
Available port	CN2, CN3
Integrated development environment	e2Studio V7.5.0 or later
Tool chain	C/C ++ compiler package V3.01.00 or later for RX family
Emulator (ICE)	Renesas E2 Lite

1.1 Stack compatible specifications

The supported stack specifications are as follows.

- PNIO Device Stack V5.4.3.0
- Test Bundle "2018-09-25_PN-test"対応



1.2 Sample program folder structure

The release folder structure is described below.

```
[pnet_dev]
```

```
|
|-[lib] : library
|
|-[prj_rx72m_e] : e<sup>2</sup> studio folder
|
|-[src] : Source folder
|-[app]
| |-[rx72m]
| |-[Gsdmi] : PROFINET Stack Configuration Data
| |-[uC3] : uC3 main, driver
```



2. Setting up and Connecting the Evaluation Board

For detailed information on the board, refer to the RX72M Group Communications Board Hardware Manual.



Figure 2.1 Configuration of the RX72M Communications Board

2.1 Setting up the Board

Before supplying power to the board, set up jumpers and connect the cables. In addition, make settings for the JTAG configuration mode. This mode is normally used with a short circuit between jumper pins 2 and 3.

For the detailed locations of the related parts, refer to the RX72M Communications Board Hardware Manual.



Figure 2.2 Setting up Jumper Pins

2.2 Selecting the Power Source

Power to the RX72M can be supplied from a 5-V DC power source or through the USB port. Use whichever is suitable for the configuration of your operating environment.



3. Installing the e² studio

Download RX72M compatible e2studio (V7.5.0 or later) from the following website.

https://www.renesas.com/e2studio_download

3.1 Installing the CC-RX Compiler V3.01.00

The compiler selection screen appears while installing e2studio. By selecting [Renesas CCRX v3.0 1.00] and selecting [Next], CC-RX V3.0 1.00 compiler compatible with RX72M will be installed together.

🙀 Renesas CC-RX Compilers		* ^
□ Renesas CCRX v3.00.00 v3.00.00 Renesas C/C++ Compiler Package for RX Fan ダウソロード・サイズ: 22.5 MB Requires: • Renesas Tool License Manager - 2.2.1 ☑ Renesas CCRX v3.01.00 Renesas C/C++ Compiler Package for RX Fan ダウソロード・サイズ: 21.4 MB Requires: • Renesas Tool License Manager - 2.2.1		
GCC for Renesas RX (Registration Required))	*
GCC for Renesas RX 4.8.4.201803 4.8.4.201 GCC for Renesas RX 4.8.4.201803 ダウンロード・サイズ: 72.8 MB	1803	
GCC for Renesas RX 4.8.4.201801 4.8.4.201 GCC for Renesas RX 4.8.4.201801	801	Ų

To start e2studio, please run "e2studio.exe" located in the installed folder below.

e2_studio_rx72m\eclipse



3.2 Registering the Tool Chain

Register the CC-RX compiler v3.01.00 so that it can be used with the e² studio for RX72M.

(1) Start the e^2 studio for RX72M.

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

ew Project	
ds: filter text → General → C/C++ C'C++ Project → Makefile Project with Existing Code → Java → SVN	

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

e ² New C/C++	Project	– 🗆 X
Templates for	New C/C++ Project	
All Make Renesas Debug Renesas RX	GCC for Renesas RX C/C++ Library A C/C++ Library Project for Renesas RX for Renesas RX Toolchain. Makefile Project (Experimental) Create a new project that the 'make' build tool using CDT's new Co Renesas CC-RX C/C++ Executable F A C/C++ Project for Renesas RX using th CCRX toolchain. Renesas CC-RX C/C++ Library Proje A C/C++ Library Project for Renesas RX of Renesas CCRX toolchain. Renesas CCRX toolchain. Renesas Debug Only Project Debug	i using the GCC at builds with iore Build Syste Project the Renesas ject

- (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 [Toolchain Management] under [Toolchain Settings].



(6) In the [Renesas Toolchain Management] dialog box, select [Add] → [Browse...] to refer to the installation folder "C:¥Renesas¥RX¥3_0_1".

The registration was successful if "v3.01.00 has been added under "Renesas CCRX".

□ Disable warning if no toolchains are installed Toolchain Type Installation Path ✓ ■ Renesas CCRX ✓ v3.01.00 C:¥Renesas¥RX¥3_1_0¥ □ v2.08.00 C:¥Program Files (x86)¥Renesas¥RX¥2_8_0¥ □ GCC for Renesas RX □ KPIT GNURX-ELF Toolchain	
✓ ■ Renesas CCRX ✓ v3.01.00 C:¥Renesas¥RX¥3_1_0¥ ○ v2.08.00 C:¥Program Files (x86)¥Renesas¥RX¥2_8_0¥ GCC for Renesas RX	
✓ v3.01.00 C:¥Renesas¥RX¥3_1_0¥ ✓ v2.08.00 C:¥Program Files (x86)¥Renesas¥RX¥2_8_0¥ ✓ GCC for Renesas RX C:¥Program Files (x86)¥Renesas¥RX¥2_8_0¥	
v2.08.00 C:¥Program Files (x86)¥Renesas¥RX¥2_8_0¥	
GCC for Renesas RX	
KPIT GNURX-ELF Toolchain	



4. Evaluation environment construction method

The following describes method to build a development environment.

4.1 Preparing the evaluation environment

- (1) Preparing the environment folder
 - Release environment in an optional folder.

ex : C:\proj\pnet_dev

(2) GSDML File

Use the GDSML file in the following folder for the GDSML file.

pnet_dev\src\app\rx72m\Gsmdl • GSDML-V2.33-Renesas_RX72M_Dev-Sample-20******.xml

4.2 Execution procedure

Describes the procedure to execute communication in the sample application.

- (1) After starting e2studio, click "File"-> "Import".
- (2) In the "Select" dialog, select "General" \rightarrow "To an existing project to workspace" and click "Next".

elimport		×
Select an import wizard: type filter text		^
 ➢ Rename & Import Existing (7C++ Project into Workspace ➢ Renesas CCRX project conversion to Renesas GCC RX ➢ Renesas CS+ Project for CA78K0R/CA78K0 ➢ Renesas CS+ Project for CC-RX and CC-RL > ➢ C/C++ > ➢ Code Generator > ➢ Git > △ Install 		~
? < <u>B</u> ack <u>Next</u> > Einish	Cancel	



(3) Select the "Select root directory" check box in the "Import project" dialog and click "Browse". Select "prj_rx72m_e" and click "Open". Click Finish to complete the project import.

e ² Import		
Import Projects Select a directory to sear	ch for existing Eclipse projects.	
• Select root directory:	C:¥Users¥a5000352¥Desktop¥Renesas_RX72N ∨	Browse
O Select archive file:	×	Browse
Projects:		
main (C:¥Users¥a	5000352¥Desktop¥Renesas_RX72M_EIP_Adapter_\	Select All
		Deselect All
		Refresh

(4) Select the "main" project in the [Project Explorer] field, select the arrow next to the [Build] button (hammer icon), and select [HardwareDebug] from the drop-down menu.

ne can source heractor havigate sean	ch Project Renesas Views Run Window Help	
🐔 🐐 🔳 🕸 Debug 🗸 🗸	r 💽 main HardwareDebug 🗸 🌣 🗄 🐨 🖷 🐚 🛛 🛪	• 🔦 = 🗟 🔯 🔍 🗠 = 🎨 🗰 💷 😭 🦉
a • 🚳 • 🖻 • 🞯 • 🕸 • 💁 • 🍅	<mark>∻</mark> ▾:ඔ ▣ ▣ 월 ▾ 闷 ▾ ጐ ⇔ ▾ ⇔ ▾	1 HardwareDebug (Debug on hardware
占 Project Explorer 💥 📄 🔄 ▽ 🖳 🗖		😑 🗈 📴 Outline 🛛 💿 Build T
 > Sect_demo_comrx72m > Sect_demo_rskrx72m ✓ Sect_demo_rskrx72m ✓ Section > Sin Includes > Section > HardwareDebug ⇒ main HardwareDebug.launch 		An outline is not available.



(5) e2studio builds the project. Once the build is complete, you can start debugging by selecting the arrow next to the Debug button (bug icon) and selecting "Debug Configuration".



(6) Select "main HardwareDebug" and select [Debug] to download the program to the target.

			X
Image: Second Secon	Name: main HardwareDebug Main Startup Startup Project: main C/C++ Application: HardwareDebug/main.x Build (if required) before launching Build Configuration: Select Automaticall O Enable auto build	Variables Search Project y O Disable auto build	Browse
 ecat_demo_comrx72m HardwareDebug ecat_demo_rskrx72m HardwareDebug main HardwareDebug Renesas Simulator Debugging (RX, RL78) 	Use workspace settings	Configure Workspace Settings	Apply



- (7) If a firewall warning is displayed for "e2-server-gdb.exe", check the checkbox for [Private networks, such as my home or work network] and select [Allow access].
- (8) The User Account Control (UAC) dialog box may appear. Enter the administrator's password and select [Yes].
- (9) If the Confirm Perspective Switch dialog box appears prompting you to switch the perspective, check the checkbox for [Remember my decision] and select [Yes].
- (10) The green "ACT" LED on the E2 Lite debugger will be continuously lit.
- (11) After downloading the code, select the [Resume] button to run the code. The code will break at the address where the main function starts. Select the [Resume] button again to continue to run the code.





5. Confirmation of sample project operation

This chapter describes the sample project operation check using the CODESYS software PLC.

Connect the communication board and PC according to "5.1 Connection Configuration". Connecting the PC and USB Serial of the communication board turns on the power to the communication board.



Figure 5.1 Connection configuration



5.1 Starting the CODESYS and Creating a New Project

5.1.1 Starting the CODESYS

Select "All Programs" > 3S CODESYS > CODESYS > CODESYS Vx.x (x.x represents the version number) from the Windows start menu.

You can also startup the program by double-clicking on the "CODESYS" icon, which will be created on the desktop after the installation of the program.

5.1.2 Creating a New Project

Select "New Project" from the "File" menu to create a new project.

File Edit View Project Build Online Debug Image: Seve Project Ctrl+N Image: Ctrl+O Image: Ctrl+O Image: Ctrl+O Image: Ctrl+O Image: Ctrl+O Image: Ctrl+S Image: Ctrl+S	File Edit View Project Build Online Debug Image: Solution of the state of the	File Edit View Project Build Online Debug Image: New Project Ctrl+ N Image: Ctrl+ O Image: Ctrl+ S	ک ا	CODESYS	s								
Open Project Ctrl+ O Close Project Save Project Save Project As Ctrl+S Project Archive Source Upload	Open Project Ctrl+ O Close Project Close Project Save Project As Project Archive Source Upload Source Download Print Print	Image: Constraint of the second state of the second st		_		View	P	Project	t B	Build	Onlir	ne D)ebug
Close Project Save Project Ctrl+S Save Project As Project Archive Source Upload	Close Project Save Project Ctrl+S Save Project As Project Archive Source Upload Source Download Print	Close Project Save Project Ctrl+S Save Project As Project Archive Source Download Print Print Preview Page Setup	1	New Pr	Proje	ect					(Ctrl+N	
Save Project As Project Archive Source Upload	Save Project As Project Archive Fource Upload Source Download Print	Save Project As Project Archive Source Upload Source Download	2				•				(Ctrl+O	
	Source Download	Source Download Print Print Preview Page Setup		Save Pr	Proje	ject As						Ctrl+S	
		Print Preview Page Setup											

In the "New Project" window, select "Projects" from the "Categories" section and "Standard project" from the "Templates" section.

Then, specify the name of the project and its location and click on "OK".



In the "Standard Project" window, select the controller and programming language you wish to use from the drop-down lists for "Device" and "PLC_PRG in". For this example, select "CODESYS Control Win V3" and "Structured Text (ST)", respectively. (If the 64-bit version is installed on the PC, select "CODESYS Control Win V3 x64") After that, click on "OK" to open the new project

One programmable device as specified below A program PLC_PRG in the language specified below A cyclic task which calls PLC_PRG A reference to the newest version of the Standard library currently installed. Device CODESYS Control Win V3 (3S - Smart Software Solutions GmbH) PLC PRG in Structured Text (ST)	Standard F	You are abou	It to create a new standard project. This wizard will create the following n this project:	×
		- A program - A cyclic tas	PLC_PRG in the language specified below < which calls PLC_PRG	
PLC PRG in Structured Text (ST)		Device	CODESYS Control Win V3 (3S - Smart Software Solutions GmbH)	\sim
		PLC_PRG in	Structured Text (ST)	\sim

The "Device" tree for the newly created project will be displayed as shown below.

The components that belong to "Device (CODESYS Control Win V3)" are managed in a tree structure.

Renesas-PROFINET.project - CODESYS
ファイル (E) 編集 (E) 表示 (V) プロジェクト (P) ビルド (
🛍 🚔 🔚 I 🌧 I 🗠 🖂 🐁 🗈 🛍 🗙 I 🏘 😘 I
デバイス (D) 👻 🕈 🗙
Renesas-PROFINET
Device (CODESYS Control Win V3)
🖃 🗐 Plc Logic
😑 💮 Application
🧭 GVL
一 🎁 ライブラリ マネージャ
PLC_PRG (PRG)
E I I I I I I I I I I I I I I I I I I I
Profinet_CommunicationTask
PN_Controller.CommCycle
□ 😂 Profinet_IOTask
PLC_PRG
SI VISU_TASK
UsuFlems.Visu Pro



5.1.3 Starting the Gateway Server

Check the state of the gateway server on the system tray. If the server is down, click on the " • " icon and select "Start Gateway" to start the server up. Usually, the server will automatically be started as a standard service on booting of Windows and its status is indicated in the system tray in the lower-right corner of the desktop.



5.1.4 Starting the Software PLC

Check the state of the software PLC on the system tray. If the program is stopped, click on the " III " icon and select "Start PLC" to start the program up. Usually, the program will automatically be started as a standard service on booting of Windows and its status is indicated in the system tray in the lower-right corner of the desktop





5.1.5 Configuring a Device Network

This section describes device configuration, including the setting of an IP address for use in a network of devices.

Setting the Host IP Address

Set the IP address before configuring the device.

Open "Network Connection".



In the "Local Area Connection Status" window, select "Properties".

Media State:	Internet network access Enabled
SSID: Duration: Speed: Signal Quality:	REL-W5G 1 day 03:24:23 300.0 Mbps
Details Wireless Properties	Received 58,960,147



In the "Local Area Connection Properties" window, highlight "Internet Protocol Version 4 (TCP/IPv4)" then click on the "Properties" button.

Networking Sharing Connect using: Intel(R) Ethernet Connection 1219–LM Configure This connection uses the following items: Configure Microsoft ネットワーク用ファイルとブリンター共有 QoS パケット スケジューラ インターネット プロトコル パージョン 6 (TOP/IPv6) インターネット プロトコル パージョン 6 (TOP/IPv6) インターネット プロトコル パージョン 4 (TOP/IPv4) Link-Layer Topology Discovery Mapper I/O Driver Microsoft Network Adapter Multiple xor Protocol Install Uninstall Properties Description 伝送制御プロトコル/インターネット プロトコル。相互接続をれたをまだまなネットワーク間の通信を提供する、既定のワイド エリアネットワーク 		t Properties		×
Intel(R) Ethernet Connection 1219-LM Configure This connection uses the following items: ○ Microsoft ネットワーク用ファイルとプリンター共有 ○ QoS パケット スケジューラ ○ インターネット プロトコル パージョン 6 (TOP/IPv6) ○ インターネット プロトコル パージョン 6 (TOP/IPv6) ○ インターネット プロトコル パージョン 4 (TOP/IPv4) ○ Link-Layer Topology Discovery Mapper I/O Driver ○ Microsoft Network Adapter Multiplexor Protocol < > Install Uninstall Properties Description 伝送制 御プロトコル/インターネット プロトコル。相互接続をれたさまだまなネットワーク間の通信を提供する、既定のワイド エリアネットワーク	Networking	Sharing		
Configure This connection uses the following items:	Connect u	sin 5:		
This connection uses the following items: Microsoft ネットワーク用ファイルとプリンター共有	🚍 Inte	I(R) Ethernet Connection 1219–LM		
QoS パケット スケジューラ ↓ インターネット プロトコル パージョン 6 (TOP/IPv6) ↓ インターネット プロトコル パージョン 4 (TOP/IPv4) ↓ Link-Layer Topology Discovery Mapper I/O Driver ↓ Microsoft Network Adapter Multiplexor Protocol ↓ Install Uninstall Properties Description 伝送制 御プロトコル/インターネット プロトコル。相互接続されたさまざ まねネットワーク間の通信を提供する、既定のワイド エリア ネットワーク	This conne		on figure	
Install Uninstall Properties Description		oS パケット スケジューラ ンターネット プロトコル パージョン 6 (TOP/IPv6) ンターネット プロトコル パージョン 4 (TOP/IPv4) ink-Layer Topology Discovery Mapper I/O Dr	iver	< >
Description 伝送制御プロトコル/インターネット プロトコル。相互接続されたさまざ まなネットワーク間の通信を提供する、既定のワイド エリアネットワーク	<		>	
	- Descripti 伝送制後 まなネット	on 卸プロトコル/インターネット プロトコル。相互接続さ ・ワーク間の通信を提供する、既定のワイド エリア		

Select the radio button "Use the following IP Address" and set IP and subnet mask. However, the network IP address should match with Device IP.

eneral	
	d automatically if your network supports need to ask your network administrator
Obtain an IP address auto	matically
• Use the following IP addre	ss:
IP address:	
Subnet mask:	
Default gateway:	
Obtain DNS server address	s automatically
• Use the following DNS serv	ver addresses:
Preferred DNS server:	
Alternate DNS server:	
Validate settings upon exi	it Advanced
	OK Cancel

This is the end of the configuration.



5.2 Connection setting with CODESYS

5.2.1 Select device

Make connection settings for connecting the software PLC service from your development environment. Double-click on the "Device (CODESYS Control Win V3) in the "Device" tree. On the "Device" tabbed page, select "Connection settings" and click on the "Scan network..." button.

🐞 Re	nesas	-PROF	INET.pro	ject* ·	- CODE	SYS							
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	Project	<u>B</u> uild	<u>O</u> nline	<u>D</u> ebu	ug <u>T</u> o	ols <u>W</u> in	dow	<u>H</u> elp			
1	÷ 🖬	1 🖨	00	X Q	1 6	$\times 14$	6 🖧	🛱	.	🕤 🎬 🔇	\$ 0 §) 	* (= 9
Device	s					, д	×	👔 De	vice	×			
- 6	Renes	as-PRO	OFINET									C	Mahuada
ė	🕤 D	evice ((CODESYS (Control \	Win V3)			Commur	nicati	on Settings		Scan	Network
	÷	PLC I	Logic					Applicat	ions				
			Applicati										

The "Select Device" window opens and a search for available devices that can use the local network automatically starts. Finding a software PLC service constitutes success and the name of the corresponding PC will be indicated. Double-click on the PC name to make a connection.

If the service will not be found, check the settings described in previous sections, (1)Starting the Gateway Server and (2)Starting the Software PLC.

B- A Gateway-1	name [numeric value] will be disp	played	Scan network



5.2.2 Installing the Device Information

Install an GSD (General Station Description) file which contains a description of the PROFINET slave device. A file for use with PROFINET is provided with the released stack.

Select "Device Repository..." from the "Tools" menu of the CODESYS program.

Tool	s <u>W</u> indow <u>H</u> elp
1	Package Manager
1	Library Repository
1	Device Repository
-	Visualization Styles Repository
	License Repository
	License Manager
	Scripting
	Customize
	Options



In the dialog box, click on the "Install" button to produce the dialog box where you are to enter the name of the provided GSD file. Specify "GSDML-V2.33-Renesas_RX72M_Dev-Sample-xxxx.xml". The result of installation will be indicated under the file name. An icon "¹ appears in the case of normal installation, as is shown within the blue rectangle in the figure below

(C:\ProgramData\CODESYS\Devices) astalled degice descriptions: Name Vendor Install Install Image: Profinet IO Image: Profinet IO Device Image: Profinet IO Device Image: Profinet IO Slave Image: Profinet ID Device Renesas PROFINET Device Renesas PROFINET Device" installed to device repository.	ocation:	System Repository		•	Edit Locations.
Image: State of the state		(C:\ProgramData\CODESYS\Devices)			
Image: State of the state	nstalled d	e <u>v</u> ice descriptions:			
Ethernet Adapter Profinet IO Device Profinet IO Master Profinet IO Slave Codesys Plc PN Device 3S - Smart Software Solutions GmbH SW=V1.0 EL6631-0010 V2.0 Beckhoff SW=V1.0 Renesas PROFINET Device Renesas Electronics Corporation SW=2.00 D:\GSDML-V2.31-Renesas-Template-20160520.xml	Name		Vendor	Version *	<u>I</u> nstall
Profinet IO Device Profinet IO Master Profinet IO Slave Codesys Plc PN Device 3S - Smart Software Solutions GmbH SW=V1.0 EL6631-0010 V2.0 Beckhoff SW=V1.0 Renesas PROFINET Device Renesas Electronics Corporation SW=2.00 T D:\GSDML-V2.31-Renesas-Template-20160520.xml	₿…₿	# Profinet IO			<u>U</u> ninstall
Profinet IO Master Profinet IO Slave Odesys Plc PN Device 3S - Smart Software Solutions GmbH SW=V1.0 Odesys Plc PN Device Renesas Electronics Corporation SW=2.00 Odesys PROFINET Device Renesas Electronics Corporatio	6	Ethernet Adapter			
Profinet IO Master Profinet IO Slave Codesys Plc PN Device 3S - Smart Software Solutions GmbH SW=V1.0 EL6631-0010 V2.0 Beckhoff SW=V1.0 Renesas PROFINET Device Renesas Electronics Corporation SW=2.00 D:\GSDML-V2.31-Renesas-Template-20160520.xml	6	Profinet IO Device			(
Codesys Pic PN Device 3S - Smart Software Solutions GmbH SW=V1.0 EL6631-0010 V2.0 Beckhoff SW=V1.0 Renesas PROFINET Device Renesas Electronics Corporation SW=2.00 D:\GSDML-V2.31-Renesas-Template-20160520.xml	6	E III Profinet IO Master			Install DT <u>M</u>
EL6631-0010 V2.0 Beckhoff SW=V1.0 Renesas PROFINET Device Renesas Electronics Corporation SW=2.00 III D:\GSDML-V2.31-Renesas-Template-20160520.xml	6	Profinet IO Slave		=	
Renesas PROFINET Device Renesas Electronics Corporation SW=2.00 D:\GSDML-V2.31-Renesas-Template-20160520.xml		Codesys Plc PN Device	3S - Smart Software Solutions GmbH	SW=V1.0	
D:\GSDML-V2.31-Renesas-Template-20160520.xml		EL6631-0010 V2.0	Beckhoff	SW=V1.0	
D:\GSDML-V2.31-Renesas-Template-20160520.xml		Renesas PROFINET Device	Renesas Electronics Corporation	SW=2.00 -	
<u>D</u> etails	•	III		F	
<u>D</u> etails	B- () ():\GSDML-V2.31-Renesas-Template-201	160520.xml		
	1				<u>D</u> etails



5.2.3 Adding PROFINET Device

Add necessary devices to the "Device" tree.

(1) Adding Ethernet

Right-click on "Device (CODESYS Control Win V3)" in the "Device" tree and select "Add Device".

Renesas-PROFINET	I project - CODESVS	
	Project Build Online De	
1 🖆 📕 🖓 🗠	🗠 X 🖻 🛍 🗙 🚧 🌿	角 🍇 📕 🧌 🦷
Devices		→ ∓ X
Carl Renesas-PROFINE	ET	•
□- 🚮 Device (CODE □- 🗐 PLC Logic		•
L	Update Device	



The "Add Device" dialog box opens. Select "Ethernet" under "Fieldbusses", "Profinet IO", then "Ethernet Adapter" and click on the "Add Device" button.

Action: Append	device 🔘 Insert	device 🔘 Plug device 🔘 Update devi	ce	
Device:				
Vendor:	<all vendors=""></all>			•
Name		Vendor	Version	Descr 🔺
🖃 👔 F	eldbusses			E
= =	Ethernet Adapter			_
	- 📆 Ethernet	3S - Smart Software Solutions GmbH	3.5.9.0	Etherne 🚽
•		m		•
Ve Ca Ada Ve Ore	me: Ethernet ndor: 3S - Smart Sof	ftware Solutions GmbH Adapter, Ethernet Adapter, Ethernet Link.	N	
Device	elected device as	target node in the navigator while this wir	ndow is open	.) Close



You can see that "Ethernet" has been added under "Device (CODESYS Control Win V3)" in the "Device" tree.

🍅 Re	enesas	-PROF	FINET.pro	oject*	- CODE	SYS			
Eile	<u>E</u> dit	<u>V</u> iew	<u>P</u> roject	<u>B</u> uild	<u>O</u> nline	<u>D</u> ebug	<u>T</u> ools	<u>W</u> indo	w
1	2	14		χ.	b iil :	× 1 #4	\$\$B €	1 1 🏪	•
									_
Device	es							- 4	×
8.0	Rene	sas-PR	OFINET						▣
Ė	- 👔 D	evice (CODESYS	Control	Win V3)				
		PLC	Logic						
			-						

(2) Adding PN controller

Right-click on "Ethernet (Ethernet)" in the "Device" tree and select "Add Device".

Renesas-PROFINET.pro Eile Edit View Project		Tools Window
1 🖆 🖬 🕘 🗠 🗠		
Devices		→ ₽ X
Renesas-PROFINET		
🖹 👔 Device (CODESYS (Control Win V3)	
🗉 🗐 PLC Logic		
🗂 Ethernet 👷	Cut	
	Сору	
12	Paste	
×	Delete	
	Browse	•
	Refactoring	•
e.	Properties	
12.23	Add Object	
	Add Folder	
	Add Device	
	Insert Device	



The "Add Device" dialog box opens. Select "PN-Controller" under "Fieldbusses", "Profinet IO", then "Profinet IO Master" and click on the "Add Device" button.

Device: Vendor:	<all vendors=""></all>				•
Name		Vendor		Version	Des
B 👔	Fieldbusses				
ġ., j	Profinet IO				
	😑 🛲 Profinet IO Master				
	PN-Controller	3S - Smart Software	Solutions GmbH	3.5.9.0	Frofir
•		III			•
	p by category				
	ay all versions (for experts o	inly)			
_	ay outdated versions				
Informati	on:				
1 N	ame: PN-Controller				
V	endor: 3S - Smart Software S	Solutions GmbH	-		
		nild of			



You can see that "PN-Controller" has been added under "Ethernet" in the "Device" tree.



(3) Adding PROFINET Device

Right-click on "PN-Controller" in the "Device" tree and select "Add Device".

File Edit Vie	FINET.project* - CODESYS iew Project Build Online Debu 너 다 法 🖻 🛍 🗙 🏘 🎲 🍓	
Renesas -PR((CODESYS Control Win V3) : Logic Application : Library Manager : PLC_PRG (PRG) : Task Configuration : MainTask (IEC-Tasks) : DLC_PRG : Profinet_CommunicationTask (IEC-T : PN_Controller.CommCycle : Profinet_IOTask (IEC-Tasks) ernet (Ethernet)	
	PN Coststalization	
< Devices POL	insere bevice	

The "Add Device" dialog box opens. Select " Renesas RX72M sample device " under "Fieldbusses", "Profinet IO", then "Profinet IO Slave" and click on the "Add Device" button.



Name Renesas_RX72M_sample_device		
Append device Insert device Plug dev	vice O Update device	
String for a fulltext search	Vendor <all vendors=""></all>	~
Name	Vendor	Version ^
CIFX Profinet Device	3S - Smart Software Solutions GmbH	SW=V1.0.0, HW:
	3S - Smart Software Solutions GmbH	SW=V3.x, HW=2
CODESYS Profinet Device	3S - Smart Software Solutions GmbH	3.5.13.0
EL6631-0010 V2.0	Beckhoff	SW=V1.00, HW=
Renesas RX72M sample device	Renesas Electronics	SW=, HW=
Group by category Display all versions (for Name: Renesas RX72M sample device Vendor: Renesas Electronics Categories: Profinet IO Slave Version: SW=, HW= Order Number: SDK-PFN-DEV Description: Device Access Point Descriptio		sions
Append selected device as last child of		



You can see that "Renesas_RX72M_sample_device " has been added under "PN-Controller" in the "Device" tree.

File Edit	ROFINET.project View Project 多 다 대 분	Build	Online				
	ice (CODESYS Con	trol Win V3)			↓	* ×	
i	PLC Logic Application Ethernet (Ethernet PN_Controller	(PN-Control		(Renesas R)	(72M sam)	ple dev	

(4) Configuring the Ethernet

Double-click on "Ethernet (Ethernet)" in the "Device" tree to open the configuration window. In the "General" tabbed page, click on the icon next to the text box for "Interface" section as shown in a red rectangle below

General	Interface:		
Status	Operating	g System Settings	
Information	Change Opera	ating System Settings	
	IP address	192 . 168 . 0 . 1	
	Subnet mask	255 . 255 . 255 . 0	
	Default Gateway	0.0.0.0	

In the "Network Adapters" window, select the interface you wish to use from among the interfaces offered for connection.



Interfaces:			X
Name Des	cription	IP Address	
Local Area Real	Itek PCIe GBE Family Controller	10.166.21.70	
Local Area 3 ASD	KAX88179 USB 3.0 to Gigabit Ethern	et Adapter #2 0.0.0.0	
IP Address	10 . 166 . 21 . 70		
Colorest Marali	255 . 255 . 252 . 0		
Subnet Mask	10 100 00 1		
Default Gateway	10 . 166 . 20 . 1		
	10 . 166 . 20 . 1 C&9C:DC:E9:06:20		

Confirm that the correct IP address is set for the interface you have selected

Interface:	
 Use Operating S Change Operatin IP address 	
Subnet mask Default Gateway	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

(5) Setting of PN-Controller

Double-click on "PN-Controller (PN-Controller)" in the "Device" tree to open the configuration window. Select the "General" tab in the window. Here, if you have configured an IP address as described in the previous section, (2) Configuring the Ethernet, if there are any applicable IP addresses, "adjust" will be indicated next to the corresponding IP address range, as shown in the red rectangle below. Clicking on this indication leads to automatic setting of the applicable IP address

General	Station name co	ontroller
Topology	Default Slave IP P	arameter
PNIO I/O Mapping	First IP address	192 . 168 . 0 . 2 🕕 adjust
Status	Last IP address	192 . 168 . 0 . 254 🚺
Status	Subnet mask	255 . 255 . 255 . 0
Information	Default Gateway	0.0.0.0



(6) Renesas_PROFINET_Device

Double-click on "Renesas_PROFINET_Device (Renesas_PROFINET_Device)" in the "Device" tree to open the configuration window. Then, select the "General" tab.

As the IP settings, specify the address ranges from "First IP address" to "Last IP address" you have configured according to the description in the previous section, (3) PN-Controller.

The PROFINET system recognizes slave devices by the names specified in the "Station name" section of this page. Enter the station name set within the slave device

General	Station name dut
Options	Station status
0x5	
NIO I/O Mapping	IP Parameter IP address 192.168.0.2
itatus	Subnet mask 255 . 255 . 255 . 0
nformation	Default Gateway 0 . 0 . 0 . 0
	Communication



5.3 Connection confirmation with CODESYS

This section describes how to run a program on the CODESYS development environment and how to ensure connection of the device.

Select "Build" from the "Build" menu.

1	Renes	sas-P	ROF	INET.pro	oject*	- CODES	SYS		
E	<u>File E</u> d	it <u>V</u> i	iew	Project	Build	Online	Debug	Tools	Window
*) 🖻		4	n a		Bury			F11
	_	_	_			<u>R</u> ebuild			
Dr	evices					<u>G</u> enerate	code		
8	Re	enesas	s-PRO	FINET		Generate	runtime s	ystem fil	e <u>s</u>
		Devi	ice (C	ODESYS	c	<u>C</u> lean			
	Ė		PLC L	.ogic		Clean <u>a</u> ll			

Select "Login" from the "Online" menu

Renesas-PROFINET.project* -	CODESYS
<u>File E</u> dit <u>V</u> iew <u>P</u> roject <u>B</u> uild	<u>Online</u> <u>Debug</u> <u>Tools</u> <u>Window</u> <u>H</u> elp
🎦 🚅 🔚 🛃 🗠 🗠 🐰 🛙	🥰 Login 📐 Alt+F8
	Logout Ctrl+F8
Devices	<u>C</u> reate boot application
Carling Renesas PROFINET	Download
Device (CODESYS Control V	Online Cha <u>n</u> ge

Select "Start" from the "Debug" menu. The project will automatically start on Windows

• Renesas-PROFINET.project* - CODES	SYS			
<u>File E</u> dit <u>V</u> iew <u>P</u> roject <u>B</u> uild <u>O</u> nline	Deb	ug <u>T</u> ools	Window	Help
🎦 🚅 🔚 🚭 🗠 여 🐰 🖻 🛍 🕻	►	Start		F5
		Stop	Shift	t+F8
Devices		Single Cycle	e Ctrl	I+F5
Renesas-PROFINET	徳	New Break	point	
Device [connected] (CODESYS C	5	Edit Breakp	oint	
		Toggle Bre	aknoint	FO



The states of connection will be indicated next to each device name. Successful connection is indicated by the "⁵ " icon as shown in the tree view below



The icons indicating status of each device is listed below.

- 5 : The application is connected to the PLC and is running.
- S : The application is connected to the PLC but is not running.
- **A** : Error. Check the error contents and the settings of the device.
- There is no device information in the device repository. Review the device information file and reinstall it.



6. Debug function

The debug function is described below.

6.1 Terminal software settings

Debug logs can be output via USB Serial (CN4).

(1) Start the "Tera Term", press the "new connection" in the "File", and then select the COM port.

File Edit Setup Control Window Help New connection Alt+N Dup/cate session Alt+D
Duptrate session Alt+D
Cygwin connection Alt+G
Log

(2) Select the USB serial port for log output.

Tera Term: New conr	nection		×
O TCP/ĮP	Hos <u>t</u> <mark>102 1081</mark> ✓ History Service: ○ Telnet ● <u>S</u> SH ○ Other	TCP <u>p</u> ort#: 22 SSH <u>v</u> ersion: SSH2 Proto <u>c</u> ol: UNSPE (
● S <u>e</u> rial	Po <u>r</u> t. COM8: US OK Cancel	SB Serial Port (COM8)	Y

noto	It is different from the port for
note	communication.



(3) Set serial communication parameters from "Serial Port" in "Settings".

. 💆 Tera I	🧧 Tera Term - [disconnected] VT				
. File Edit	Setup	Control	Window	Help	
	T	erminal			
	V	Vindow			
	F	ont			
		eyboard			
	(s	erial port)		
	-	revy h			

(4) Configure the serial port settings as shown in Figure 5.14.

Т	era Term: Serial port setup	,	×	
	<u>P</u> ort: Sp <u>e</u> ed: Data: P <u>a</u> rity: Stop bits: Elow control:	COM1 ~ 115200 8 8 bit ~ none ~ 1 bit ~ none ~	OK Cancel Help	
	Transmit dela		sec/line	



6.2 MAC address / IP Address confirmation method

The MAC Address / IP Address confirmation method is described below.

The following command

"ipconfig"

MAC Address / IP Address can be confirmed by typing from the console.

6.3 Heap confirmation method

The Heap confirmation method is described below.

The following command

"Heapstat"

Heap can be confirmed by typing from the console.

Heapstat displayed terminal

Heapstat

PNET free memory = 51672 / 262144 byte

OSW free memory = 32297 / 32768 byte



7. Test Option

Describe the test options.

When the option "PROFINET_IO_DEBUG_IN_TO_OUT" of the following file is enabled, the data written in the input buffer of periodic communication is written to the output buffer as it is. This option is disabled (0) by default.

pnet_dev\src\app\rx72m\Application\pniod_app_api.h



Revision History

		Descriptio	n
Rev.	Date	Page	Summary
1.00	Aug. 31, 2019	-	First edition issued
1.01	Dec. 5, 2019	9	Fix misstatements of uC3 folder names
1.02 May 22, 2020	9	Updated words, images	
		20	Added information
		37	Fixed the command
1.03	Aug. 31, 2020	3	Operating environment changed due to stack support for 2 ports
		4	Folder structure changed due to stack bundling
		9	Change the sample build due to stack bundling
1.04	Aug. 31, 2021	-	TMG Stack update v5.4.4.0 \rightarrow v5.5.0.0
		-	Certification test Test Bandle "2020-05-07_PN-test" compatible
		-	Support for CC-B
		-	SNMP support
		-	Changed the number of slots from 8 to 4 to reduce ROM/RAM
		-	CRC32 compatible for non-volatile memory verification
		-	Fixed the process of displaying the initial value on the TCP / IP stack with the console command "ipconfig".
	-	Support with one Ethernet port	
		36	Added test options

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 system-evaluation test for the given product.

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