

R-IN32M3 Module (RY9012A0)

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Industrial Ethernet Module Solution

Outline

This document describes the startup procedure of R-IN32M3 Module starter kit that includes the R-IN32M3 Module. The R-IN32M3 Module starter kit with the application controller Synergy S7G2 development environment, SK-S7G2, takes care of the complex handling of several industrial Ethernet protocols (such as PROFINET® and EtherNet/IP®). Example software of the SK-S7G2 is provided as source code and can thus be ported to other development platforms such as for RX MCUs. Accordingly, this R-IN32M3 Module starter kit allows the quick development of software prototypes of the industrial network communications and applications.

The software package that comes with the R-IN32M3 Module starter kit includes not only an integrated software development environment and example software but includes a Management Tool (from the company "port industrial automation GmbH") which has the protocol master function of PROFINET and EtherNet/IP and can configure and monitor the R-IN32M3 Module.

The R-IN32M3 Module starter kit enables the user

- to quickly become familiar with the industrial Ethernet protocols (such as PROFINET or EtherNet/IP) by use of the example applications; and
- to quickly develop applications on the industry-standard Arm microcontroller of the Renesas Synergy SK-S7G2 starter kit.



1. R-IN32M3 Module Starter Kit

1.1 System Requirements

The R-IN32M3 Module starter kit requires the following environment for the evaluation.

- Renesas Synergy SK-S7G2 starter kit rev. 3.3 or a later version
- PC
 - OS: Windows[®] 7/8/10
 - Memory: At least 8 Gbytes
 - LAN ports
 - USB 2.0 ports



1.2 Hardware Configuration

1.2.1 Configuration of R-IN32M3 Module Board

The R-IN32M3 Module starter kit includes the R-IN32M3 Module board for evaluation environment, which contains the R-IN32M3 Module. This board has Arduino[™] connectors and Pmod[™] connectors according to industry standards and enables the connection with the application controller.



R-IN32M3 Module

The Pmod connector is mounted on the top side of the module board. The male Arduino connectors are on the back side of the module board to be plugged into the sockets of the Synergy S7G2 starter kit. To connect and apply control from the SK-S7G2, the J13, J8, and J7 jumper blocks must be set as follows.

- J13: Connect the Socket pin with the iRJ45 pin
- J8: For the CS signal, select PB2
- J7: For the RST signal, select PD7

This board has status LEDs conforming to the industrial Ethernet protocol. The lighting patterns of status LEDs differ with the communications standard.

Some examples of protocol state indicators were listed in the following table.



Figure 1.1 R-IN32M3 Module Board

Table 1.1 Status LEDs

Industrial Ethernet	State LED1		State LED2	
Standard		Color		Color
PROFINET ^{Note1}	System failure	Red	Bus failure	Red
EtherNet/IP ^{Note2}	Module (MS)	Green/ Red	Network (NS)	Green/ Red

1.2.2 Configuration for Using the Pmod Interfaces

The Synergy SK-S7G2 has two Pmod ports. If you will be using a Pmod interface, connect jumper J13 or J15 on the Synergy board to supply 3.3V power supply to the Pmod channel of choice of the R-IN32M3 Module.

Before connecting the Synergy board with the R-IN32M3 Module board is recommended first to get the Synergy board up and running. To do so, follow the instructions in the quick start guide manual of that processor board. Voltage supply for the Synergy SK-S7G2 is through the micro USB debug connector on the Synergy SK-S7G2. When connecting the R-IN32M3 Module board in either mode, the module board gets its power through the connectors. All operations for programming and debugging of the Synergy S7G2 are supported by this USB connection.

1.2.3 Configuration for Using the ARDUINO Interface

The R-IN32M3 Module module board and the Synergy SK-S7G2 must be plugged together by using the Arduino connection of the boards.

Voltage supply for the Synergy SK-S7G2 is through the micro USB debug connector on the Synergy SK-S7G2. When connecting the R-IN32M3 Module board in either mode, the module board gets its power through the connectors. All operations for programming and debugging of the Synergy S7G2 are supported by this USB connection.



Note1 PROFINET Diagnosis Guideline V1.4 Chapter 6.7 Signaling recommended an additional (third) maintenance LED

Note2 The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP

1.3 Software Requirements

1.3.1 Integrated Software Development Environment "Renesas Synergy"

The environment for developing software for the Synergy SK-S7G2, which acts as the application controller, requires the following elements.

- Renesas e2-studio version 7.5.1 or later
- Renesas Synergy software package (SSP) version 1.7.0 or later

The e2-studio is an integrated software development environment (ISDE). The ISDE is available on the webpage of Renesas as seen in the quick start guide of the MCU board. A free Synergy license is required to use the SSP. The evaluation license is included with SSP installer, that can be downloaded after creating a Synergy account.

1.3.2 GOAL and Project Files

Unpack the GOAL headers and library to a local folder. This folder contains the GOAL library and the associated headers for the Synergy required to build an application for the R-IN32M3 Module. In addition, example projects for each protocol are included to be processed via e2-studio.

The GOAL is part of the OSAL interface (API) which is used on the embedded MCU of the R-IN32M3 Module and on the application controller (AC) to control the module. In this configuration with the Renesas Synergy board and the R-IN32M3 Module board, the S7G2 MCU on the Renesas Synergy board acts as the AC. For details, refer to the r17us0001ed**** User's Manual for the Software API.

1.3.3 Management Tool

The Management Tool is software which simulates a PROFINET master as well as an EtherNet/IP scanner on a Windows PC and is a product of Renesas' partner *port industrial automation GmbH* in Germany. (https://www.port.de/).

The Management Tool is available on R-IN32M3 Module product web.

Here are some major hints for the installation of the Management Tool:

The file "Management Tool-*-win32.win32.x86_64.zip" has to be unpacked to a local folder. The resulting folder contains the executable *mantool.exe*, which can be started without an installation.

The Management Tool requires the NPF (NetGroup/Npcap Packet Filter) driver, that is installed with WinPcap/Npcap. For details, see next chapter.

Additionally, the Management Tool requires certain settings in the Windows firewall to receive data. If some software (such as antivirus) restricts the firewall of the Network to communication with the R-IN32M3 Module, allow (open) the port limitation of the Management Tool.

Open [Allow an app through Windows Firewall] from windows search with search word "through Windows Firewall".



Figure 1.2 Search Windows Firewall



After the [Allowed apps] window is open, click on [Change settings] and then [Allow another app..].

owed apps				-	
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llow apps to communicate throug add, change, or remove allowed apps and p hat are the risks of allowing an app to comm	h Windows Defer ports, click Change sett sunicate?	ider Fire	wall	😵 Cha <u>n</u> ge sett	tings
For your security, some settings are man	aged by your system as	Iministrato	r.		
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	Domain	Finale	Public	ble ble	
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Figure 1.3 Allowed Applications

Click [Browse..] and select the "mantool.exe" from Management Tool folder. Then, click [Network types...], check all network types to be enabled ("Domain", "Private", and "Public"), and click [OK] and [Add].

Select the app you want to add, or click Browse to find one that is not listed, and then click OK. Apps: mantool.exe	Choose Network Types
Apps: mantool.exe	Allow this app or port to communicate through Windows Firewall for the selected network type: Domain: Networks at a workplace that are
Pgth: D:¥iem_test¥iRJ45 Device Manager sw 11¥mar Browse What are the risks of unblocking an app? You can choose which network types to add this app to. Network types Add	Private: Networks at home or work where you know and trust the people and devices on the network Public: Networks in public places such as airports or coffee shops QK Cancel

Figure 1.4 Select Management Tool



"mantool.exe" is indicated in the list of allowed apps list. After that, click on [OK].

	all > Allowed apps	~ Ö	Searc	h Control Panel	
ow apps to communicate throug	h Windows Defer	der Fire	wall		
add, change, or remove allowed apps and p	ports, click Change sett	ngs.			
at are the risks of allowing an app to comm	nunicate?			😌 Cha <u>n</u> ge setti	ings
					_
For your security, some settings are man	aged by your system as	Iministrato	e.		
llowed apps and features:					_
Name	Domain	Private	Public	Group Policy	^
e				No	
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Mantool.exe	×	1		No	
	-	12		No	
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Figure 1.5 Allowed Management Tool



1.3.4 WinPcap

To use the functionality of the Management Tool, WinPcap needs to be installed. WinPcap can be found at https://www.winpcap.org

The Npcap also supports the Management Tool, if you have enabled "Winpcap API-compatible Mode" when installing Npcap. Npcap can be found at https://map.org/

1.3.5 Wireshark

The Management Tool also offers a function to create a log file of all relevant parameters of the R-IN32M3 Module. For a more detailed protocol analysis, it is recommended to install the Wireshark tools. The Wireshark tools is freeware and can be downloaded at <u>https://www.wireshark.org.</u>



2. e2studio Project

2.1 Installation

To use the sample projects with the e2studio, the e2studio and SSP must be installed.

2.2 Importing a Project

The example files provided by Renesas in the software for the R-IN32M3 Module starter kit (see chapter **Error! Reference source not found.**) can be imported into the e2studio integrated system development environment (ISDE). In the [File] dropdown menu, use the [Import] dialog box of the e2studio to import the archive with its projects located in the unpacked project delivery into e2studio. Under [General], chose [Existing projects into workspace] when prompted for the import type. This

e ² Import -	⊐ ×
Select Create new projects from an archive file or directory.	ù
Select an import source:	
type filter text	
 ✓ Error General Archive File ✓ CMSIS Pack ✓ Convert CCRX to GNURX Project ✓ DS-5 KPIT GNUARM-RZ/NONE Project ✓ Existing Projects into Workspace ✓ File System ✓ HEW Project ✓ Import KPIT GNUARM Project to GCC ARM Embedded ✓ Preferences ✓ Renesas CA78KOR Project ✓ Fenesas Common Project File ✓ C/C++ 	^
C C C A - Evenitable	 Cancel

will create new projects in the e2-studio.

Figure 2.1 e2studio Import Dialog

In the next step, the root directory of the existing archive has to be selected by using the [Browse...] button. To select the directory of the unpacked archive, make sure that all projects for importing are selected in the checkboxes, and finish importing by clicking on [Finish] as shown in the figure below. In this example, the unpacked archive files are located in the directory "C:\Renesas_exampleSW".



e ² Import						×
Import Projects Select a directory to sea	rch for existing Eclip	se projects.			V	
Select root directory: Select grchive file: Projects:	C:\Renesas_examp	oleSW\goal		× [B <u>r</u> owse B <u>r</u> owse	
✓ 01_http_get (C\Re ✓ 01_pnio_simple_ic ✓ 01_udp_receive (C ✓ 02_eip_io_data (C	enesas_exampleSW > (C:\Renesas_exam \Renesas_example \Renesas_example	\goal\projects\ pleSW\goal\proje SW\goal\proje SW\goal\proje	goal_http_rpc\01_ ojects\2015013_irj cts\goal_net_rpc\(cts\2015013_irj45\	ge 45 01_ ac'	<u>S</u> elect A Deselect R <u>e</u> fres	All : All h
Options Search for nested pro Copy projects into we Hide projects that alr	ojects orkspace ready exist in the wo	rkspace				
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Figure 2.2 e2-studio Import Project Dialog

2.3 License Register

The license registration is required to use SSP. If e2-studio requests a license, register a license. The evaluation license is included in the SSP installer, that can be downloaded after creating a Synergy account.

Figure 2.3	License	Request



2.4 Generate Project Content

Open the "configuration.xml" file from the selected project by double clicking. The pin assignment, clock configuration, and device selection are already registered, and run [Generate Project Content].

SP			Generate Pro	ject Conten
Device Select	ion			
SSP version:	1.3.3	~		
Board:	S7G2 SK	~		
Device:	R7FS7G27H3A01CFC			
DCD	Clasks Dine Throads	Messaging ICU	Components	



2.5 Project Configuration

To use the project context menu, menu item "Build Project" to do so. As a result, binary files for the projects are generated. The "Console" log of e2-studio should look like as shown in the following screenshot.

- ↓ 수 🔄 🔜 💀 = 🚉 🖃 ▾ 🗂 🛨 = 🗖 🎦 Pin Conflicts 📮 Console 🔀 🙀 Debugger Console CDT Build Console [01_pnio_simple_io] Invoking: Cross ARM C Compiler ^ 'Invoking: Cross ARM C Compiler' arm-none-eabi-gcc -mcpu=cortex-m4 -mthumb -mfloat-abi=hard -mfpu=fpv4-sp-d16 -00 -fmessage-le 'Finished building: C:/Renesas/_example/goal/ext/base64/src/cencode.c' arm-none-eabi-gcc -mcpu=cortex-m4 -mthumb -mfloat-abi=hard -mfpu=fpv4-sp-d16 -00 -fmessage-le 'Finished building: C:/Renesas/_example/goal/appl/2015013_irj45/rpc/irj45_rpc_ac.c' 'Finished building: C:/Renesas/_example/goal/appl/2015013_irj45/ac/01_pnio_simple_io/goal_app 'Finished building: C:/Renesas/_example/goal/appl/2015013_irj45/ac/01_pnio_simple_io/goal_app 15 'Building target: 01_pnio_simple_io.elf' 'Invoking: Cross ARM C Linker arm-none-eabi-gcc @"01_pnio_simple_io.elf.in" 'Finished building target: 01_pnio_simple_io.elf' 'Invoking: Cross ARM GNU Create Flash Image' arm-none-eabi-objcopy -O srec "01_pnio_simple_io.elf" "01_pnio_simple_io.srec" 'Invoking: Cross ARM GNU Print Size' arm-none-eabi-size --format=berkeley "01_pnio_simple_io.elf" text data bss dec hex filename text data bss dec hex filename 20908 3752 283176 507836 7bfbc 01_pnio_simple_io.elf 220908 'Finished building: 01_pnio_simple_io.srec 'Finished building: 01_pnio_simple_io.siz' . . 10:10:23 Build Finished. 0 errors, 0 warnings. (took 40s.300ms)

Figure 2.5 Console Log "Build Finished"



2.6 **Project Debugging**

When the Build is finished without errors and warnings, the compilation is successful. The resulting binary files can be started now. Be sure that the Renesas Synergy board is connected to the workstation via USB. Then, select the [Debug As] option from the drop-down menu and choose the item [3 Renesas GDB Hardware Debugging] as shown in the figure below.

e ² C/C++ - e2 studio			– o x
File Edit Source Re	afactor Navigate Search Projec	t Renesas Views Run	Window Help
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OI_nttp_get	io [Debug]		An outline is not available.
> 🐉 Binaries	New	>	
> 🔊 Includes	Go Into		
> 🐸 src > 🐸 synergy	Open in New Window		
> 🔁 appl 📄	Сору	Ctrl+C	
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> 🔁 ext	Delete	Delete	
> 🚰 goal_glol 🔬	Remove from Context	Ctrl+Alt+Shift+Down	
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> 🕞 protos > 🅞 script	Rename	F2	
> 🗁 synergy_	Import		
> 🎽 bsp	Export		
🍵 configura 🏊	Export Synergy Project		
> 🔊 01_udp_rece 🔨	Export Synergy User Pack		
> 🌮 02_eip_io_da	Build Project		🕱 🔲 Properties 👔 Memory Usage 👔 Stack Analysis 🛞 Smart Browser 🛛 🗖 🗖
	Clean Project		
8	Refresh	F5	
	Close Project		.o_simple_io.elf.in"
	Close Unrelated Projects		or_phio_simple_to.cll
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	Index	>	rrint Size' rec "Ol pnio simple io.elf" "Ol pnio simple io.srec"
	Build Configurations	>	t=berkeley "01_pnio_simple_io.elf"
	Exclude from build		> ·
8	Run As	>	
	Debug As	>	I EASE Script
	Profile As	>	C 2 Local C/C++ Application
	Compare With	>	🖙 3 Renesas GDB Hardware Debugging
	Restore from Local History		Debug Configurations
e²	Renesas Quick Settings	Alt+Q	
e²	Renesas Tool Settings	Alt+T	
	Save build settings report		
*	Run C/C++ Code Analysis		
	Team	>	
1 .	System Explorer		
	Command Prompt		
	Configure	>	
	Properties	Alt+Enter	

Figure 2.6 Initiate Debugging Session



In the next step, you will be prompted to select a debugging hardware. Choose "J-Link ARM" for the Renesas Synergy SK-S7G2 board. After selecting the debugging mode, it is necessary to select the chip model (R7F5G26H).

lect Debug Hardware	No configuration exists. Please select target de	vice:
E1 (RX)	R7FS5D97C	,
E2 Lite (RX)	R7FS5D97E	
E20 (RX)	R7FS7G2	
EZ (RX)	R7FS7G27G	
I-Link ARM	R7FS7G27H	
Segger JLink (RX)	R7S721000	
	R7S721000_DualSPI	
	R7S721001	
	R7S721001_DualSPI	
	R7S721010	
	R7S721010_DualSPI	
	R7S721011	
	R7S721011_DualSPI	
	R7S721020	
		Cancol
	UK UK	Cancel

After initiating the debugging session, the "Debug perspective" is shown, where the application can be started by [Resuming] execution. This needs to be done twice since two breakpoints are automatically set at the start-up.

e² [Debug	- 01_pnio	_simple_io	_lib/synergy	//ssp/src/l	bsp/cmsis	/Device/RENESA	s/s7G	2/Source/st	artup_S70	62.c - e2 stu	dio			—		×
File	Edit	Source	Refactor	Navigate	Search	Project	Renesas Views	Run	Window	Help							
2	• 🖫		- 🔨 -	🐔 🗟 🗅	& IÞ 1	🔳 🕅	3 3 .e it		ア 袋 !	1	8 i i i i i i i i i i i i i i i i i i i	• •	• 💁 🔹 🔊	🕒 🔗 🔻	B		
	• 🔁	- *= <	- + -> -	-	Res	ume (F8)]						Quick Access		C/C++	参 D	ebug
					0 - 0	12		_									

Figure 2.9 e2studio Toolbox



3. Management Tool

The Management Tool allows the development related configuration and management of the Renesas sample application. This management is based on a UDP broadcast communication. Thus, it works independently from IP settings of the management PC and the R-IN32M3 Module.

👽 iRJ45 Device Manager		-	×
File			
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පි. Network Navigator	🚾 PNIO Master 📋 Device Log 💥 ConfigMan 🔧 Firmware U 🖅 EtherNet/IR 📀 Exception L	E Outline	
🗙 🖻 Networks	Device Commands		
P Network eth10 (0)	Scan device Set station name Set IP settings Wink Reset to Factory		
Network wlan6 (0) Snapshots	Device Data		
	Station name:		
	Device Type:		
	Device Role:		
	IP Address:		
	Netmask:		
	Gateway:		
	Device Commands 1/O 1&M		
	▲ Messages		
< >			

Figure 3.1 Management Tool

This tool is organized in panels.

- The panel [Network Navigator] shows a list of available networks.
- The panel [Messages] shows the information regarding actions.
- The panel [Outline] shows the additional information relating to the selected function panel.

The following function panels are available.

Panel	Function
PNIO Master	Simple PROFINET IO master functionality
Device Log	Shows log messages under operation from both the R-IN32M3 Module and application controller.
Config Manager	Access to the config manager variables of the R-IN32M3 Module.
Firmware Update	Allows update of the R-IN32M3 module firmware.
EtherNet/IP Master	Simple EtherNet/IP master functionality
Exception Log	Not in the scope of this manual



3.1 Device Detection

Connect the R-IN32M3 Module to the PC, and then execute the scan network.

😨 iRJ45 Device M → →								
File Scan Network								
ध्व- Network Navigator 📃 🔊 PNIO Master	📋 Device Log 💥 ConfigMan 🚸 Firmware U 🏧 EtherNet/IP 😢 Exception L 🛛 ि Outl	ine						
 Retworks Network eth10 (0) Network wlan6 (0) Snapshots Device Data Station name: Device Type: Device Role: IP Address: Netmask: Gateway: Device Commar @ Messages	ands e Set station name Set IP settings Wink Reset to Factory							
< >								

Figure 3.2 Management Tool Network Scan

To communicate with the R-IN32M3 Module, open the "Networks" list in [Network Navigator]. Then, chose the network interface where the R-IN32M3 Module is reachable. Select the [Scan Network] button in the toolbar.

The following dialog appears and 1 found device will be reported.

		\times
Scan network eth10		8
Running scan using local IP 192.168.1.1		
Scan complete. Found 1 device.		
	OK Can	cel

Figure 3.3 Scan Network Dialog



As a result, the R-IN32M3 Module will be shown as a new device in [Network Navigator] within the scanned network.

👽 iRJ45 Device Manager	-	- 🗆	×
File			
💽 💽 🛝 🔯 🏈	C ^e		
육. Network Navigator	R PNIO Mas 📋 Device Log 💥 ConfigMa 🚸 Firmware 🌆 EtherNet/I 😣 Exception	Outline	
 ✓ ■ Networks ✓ ■ Network eth10 (1) ④ ccm_demo (192.168.1.11 ■ Network wlan6 (0) > ■ Snapshots 	Device Commands Scan device Set station name Set IP settings Wink Reset to Factory Device Data Station name: Device Type: Device Role: IP Address: Gateway:		
	Device Commands 1/0 18xM		
	2019/08/05 12:49:47 Found 1 device.		^
	2019/08/05 12:51:31 Scanned eth10 using local address 192.168.1.1.		
	2019/08/05 12:51:31 Found 1 device.		
< >			×

Figure 3.4 Management Tool with a Detected R-IN32M3 Module

Select the newly found R-IN32M3 Module for further steps.

3.2 Config Manager / IP Configuration

This panel provides access to the config manager variables of the R-IN32M3 Module (volatile and non-volatile stored configuration variables).

To read a list of all variables, select the [Read configuration] button.



Figure 3.5 Read Configuration



As a result, all variables with a value are shown.

C. Network Navigator	PNIO Master] Device Log 🔀 ConfigManage	- 🖧 Firmware Update	There are a constructed and the construction of the construction o	iet/IP M	aster (() Exce	ption Log	E Outline
 ✓ ■ Networks ✓ ■ Network eth10 (1) 	Module GOAL_ID_BOOT	Variable SIGNATURE	Action	Type Generic	Temp X	Read X	Write X	Value A Oxfbe481ec5ecc61cecfade	> GOAL_ID_8 > GOAL_ID_0 > GOAL_ID_0 > GOAL_ID_0
igi ccm_demo (192.168.1.11) Network wlan6 (0)	GOAL_ID_BOOT	BLVERSION		String	X	× .	х	1.0.0.0	> GOAL D.P
> 陆 Snapshots	GOAL_ID_BOOT	FWVERSION	<u>[</u>]	String	×	х	×	1.1.0.0	⇒ ≣ GOAL_ID_H ⇒ ≣ GOAL_ID_E
	GOAL_ID_BOOT	RESET_CAUSE		uin18	x	х	×	0x00	> GOAL D.C
	GOAL_ID_BOOT	IMAGE_NUMBER		uintă	х	х	х	0x00	S GOAL D.O
	GOAL_ID_BOOT	IMAGE_COUNTER		uints	x	х	х	Oxfa	GOAL D,E GOAL ID N
	GOAL_ID_COM	SPLTYPE		uintă		х	х	0x01) E GOAL D U
	GOAL_ID_CCM	SPUMODE		uint8		x	x	0x00	
	GOAL_ID_COM	SPLSPEED		uint32		х	х	0x00000000	
	GOAL_ID_CCM	SPLUNITWIDTH		uintă		x	×	0x00	
	GOAL_ID_CCM	SPLBITORDER		uintö		х	х	0x00	
	GOAL_ID_CCM	SPL_TRANSFERSIZE		uint16		x	х	0x0080	
	GOAL_ID_COM	COMM_FAULT_ERROR_STATE		uintă		х	×	0x00	
	GOAL_ID_COM	COMM_SYNC_RESET		uint8		x	х	0x00	
	< Market Market	Constant of the local division of the				1	1	, ×	
	Export Config	a Import Config	🛓 Save config to fi	ash					
	Messages								
	2019/08/0512 2019/08/0512 2019/08/0512 2019/08/0512 2019/08/0512 2019/08/0512 2019/08/0512 2019/08/0512	549x47 Scanned eth10 using loca 549x47 Found 1 device. 551:31 Scanned eth10 using loca 551:31 Found 1 device. 500:07 Read 108 variables from	I address 192.168.1.1.						

Figure 3.6 Management Tool Configuration Manager

To communicate with the R-IN32M3 Module, the IP address of the R-IN32M3 Module must be within the same IP network as the IP address of the management PC. Thus, chose a valid IP address and configure the R-IN32M3 Module accordingly.



To configure an IP address, navigate to the variables of the "Module" GOAL_ID_NET. There it is possible to configure IP, NETMASK, and GW. Modify required values. Make sure the variable "VALID" is set to 1.

The Management Tool will indicate locally modified variables by yellow highlights.

👽 iRJ45 Device Manager											×
File											
💽 💌 🛝 🔝 🥐 🄇											
😪 Network Navigator	PNIO Master] Device Log 🔀 ConfigManager	🍫 Firmware Update	EIP EtherN	let/IP M	aster (3 Exception	otion Log	Outline		
=	Module	Variable	Action	Туре	Temp	Read	Write	Value ^	> = GOA	LID_BOOT	
✓ Image Networks ✓ Image Network eth10 (1)	GOAL_ID_ETH	SPEED		uint32	х	х	Х	0x0000000b	> GOA	L_ID_DD	
ccm_demo (192.168.1.11) Network wlan6 (0)	GOAL_ID_ETH	DUPLEX		uint32	х	х	х	0x00000007	> = GOA > = GOA	L_ID_SNMP	
> 🖷 Snapshots	GOAL_ID_ETH	PORTCNT		uint32	х	х	х	0x00000002	> = GOA	L_ID_HTTP	
	GOAL_ID_NET	IP		IPv4		х	х	192.168.1.10	GOA	L_ID_CSAP	
	GOAL_ID_NET	NETMASK		IPv4		х	х	255.255.255.0	> = GOA > = GOA	L_ID_CM	E
	GOAL_ID_NET	GW		IPv4		х	х	0.0.0.0	> = GOA	L_ID_ETH	
	GOAL_ID_NET	VALID		uint8		Х	Х	0x01	> 🗧 GOA	L_ID_LM	
	GOAL_ID_NET	DHCP_ENABLED		uint8		х	х	0x00			
	GOAL_ID_NET	DHCP_STATE		uint8	х	х	Х	0×00			
	GOAL_ID_NET	DNS0		IPv4		х	х	0.0.0.0			
	GOAL_ID_NET	DNS1		IPv4		х	х	0.0.0.0			
	GOAL_ID_NET	HOSTNAME		String		х	х				
	GOAL_ID_NET	COMMIT	Apply IP settings	uint8	х	х	х	0x00			
	GOAL_ID_LM	VERSION		uint8		х	х	0x00			
	<							>			
	Export Config	Import Config	🖄 Save config to fla	sh							
	(1) Messages										
	2019/06/05 12:49:47 Scanned eth10 using local address 192.168.1.1. 2019/08/05 12:49:47 Found 1 device.										
	2019/08/05 12:51:31 Scanned eth 10 using local address 192.168.1.1.										
	2019/08/05 12	100:07 Read 108 variables from									
< >>											

Figure 3.7 Management Tool with Modified Variables

Those locally modified variables are downloaded to the R-IN32M3 Module using the [Write configuration] button in the toolbar.

File	👽 iRJ	👽 iRJ45 Device Manager					
💽 💌 🕅 🖼 🥙 🧶	File						
	1		n	Î	Ð	٢	
P= Network Navigator							

When prompted if changed values shall be written, answer "Yes". Afterwards the locally modified values are transferred to the R-IN32M3 Module, where there are only modified in RAM. To make permanent changes, use the [Save config to flash] button. Modified IP settings are applied after restarting the system (by switching the power to the Renesas Synergy board and the R-IN32M3 Module off and then on).



3.3 Updating the R-IN32M3 Module Firmware

Under control of the Management Tool, the firmware of the R-IN32M3 Module can be updated. The firmware file will be sent to the R-IN32M3 Module via the Ethernet connection.

👽 iRJ45 Device Manager					
File					
🔁 포 🗥 📧 🖑 (
🔁 Network Navigator	PNIO Master	Device Log	💥 ConfigManager	🍫 Firmware Update	EtherNet/IP Master
 ✓ □ Networks ✓ □ Network eth10 (1) (□) (192.168.1.11) (□) Network wlan6 (0) > □ Snapshots 	□ Update Settings Firmware: Firmware Info:	CC: Config: AC:	Start update	Gancel update	Select FW bundle

Figure 3.9 R-IN32M3 Module Firmware Update



4. Sample Software

4.1 **PROFINET** Sample Application (01_pnio_io_mirror)

Start the example "01_pnio_io_mirror" according to the previous description.

To establish a PROFINET communication, the R-IN32M3 Module must be selected in [Network Navigator]. Then, select the [PNIO Master] function panel. Use [Scan device] to detect the PROFINET device.

Device Commands Scan device	Set station name Set IP settings Wink Reset to Factory
Device Data	
Station name:	
Device Type:	Renesas Electronics
Device Role:	IO-Device
IP Address:	<mark>192.168.1.11</mark>
Netmask:	255.255.255.0
Gateway:	0.0.0.0

Figure 4.1 PROFINET Master

Use the "Wink" command to identify the connected R-IN32M3 Module, which will be shown with a flashing "LED1" on the R-IN32M3 Module board.

To establish a cyclic PROFINET communication, use the I/O panel of the PNIO Master.

😴 iRJ45 Device Manager		- 🗆 X
😪- Network Navigator 🛛 🗖 📋 Device Log 🕎 Network State 🙉 PNIO Maste	er 💥 ConfigManager 🔗 Firmware Update 🛛 🖓	Define
 Networks Network eth (1) ipi5_demo (192.168.0 Network eth (0) Network eth (0) Snapshots 	SDML file	
& Messages		
2018/05/04 13:25:22 Scanned eth1 using log 2018/05/04 13:25:22 Found 1 device. 2018/05/04 13:39:16 Read 81 variables from	cal address 192.168.0.25. n 02:00:00:00:28:01	^
 2018/05/04 13:41:05 Read 81 variables from 	n 02:00:00:2B:01	~

Figure 4.2 PNIO Master I/O

To continue, load the GSDML file provided with the distribution of the Renesas sample application.

In the selector [Device Access Point], select "2-port Device".

After that, press the [Connect] button. This button starts cyclic PROFINET communications.

The example application on the application controller will mirror the output data to the input data.



The I/O data can be manipulated and monitored in the I/O data table. Furthermore, once a connection is established, LED1 on the R-IN32M3 Module board will be illuminated.

Process data can be monitored and manipulated using the [IO Data] panel.

I/O Data				
Module/Submodule VI Signed8	Data Type	PS/CS	Input Data	Output Data
✓ I Signed8		128/0		
Input 64 bytes	Integer8		0x00	
✓ O Signed8				
 O Signed8 		0 /128		
Output 64 bytes	Integer8			0x00
✓ I Signed16				
✓ I Signed16		128/0		
Input 64 bytes	Integer16		0xcafe	
✓ O Signed16				
 O Signed16 		0 /128		
Output 64 bytes	Integer16			0xcafe

Figure 4.3 PNIO IO Data Panel

4.2 EtherNet/IP Sample Application (06_eip_io_data_static)

Start the example "06_eip_io_data_static " according to the previous description.

To establish an EtherNet/IP communication with the device, IP settings must be set according to the previous description. You can verify the current settings using the Management Tool.

Then, select the [EtherNet/IP Master] function panel. Use [Scan device] to detect the EtherNet/IP device.

🕾 Network Navigator	🕅 PNIO Master 📋 Device Log 💥 ConfigManager 🚸 Firmware Update 🌆 EtherNet/IP Master					
 ✓ ■ Networks ✓ ■ Network eth4 (1) ✓ ₽ R-IN32M3_Module (192.168.0.10) 	Device Commands Scan device					
Network eth13 (0)	Encapsulation protocol version:	1				
	Adress Familiy:	AF INET				
	Port:	44818				
	IP Address:	192.168.0.10				
	Vendor ID:	1105				
	Device Type:	Generic Device				
	Product Code:	768				
	Revision:	1.1				
		X Owned				
		✓ Configured				
	Chatura	💥 Minor Recoverable Fault				
	Status.	💥 Minor Unrecoverable Fault				
		💥 Major Recoverable Fault				
		💥 Major Unrecoverable Fault				
	Serial Number:	0x075BCD15				
	Product Name:	R-IN32M3_Module				
	State:	Unused				

Figure 4.4 Management Tool EtherNet/IP Scanner – Device Scan



To establish a cyclic EtherNet/IP communication, use the I/O panel of the EtherNet/IP scanner.

Device Commands	
Disconnect	
Connection Parameter O->T	Connection Parameter T->0
Asssembly Instance ID 150	Asssembly Instance ID 100
Asssembly Data Size 32	Asssembly Data Size 32
Run/IdleHeader	Run/IdleHeader
Packet interval in ms 10	Packet interval in ms 10
Connection type Point to Point ~	Connection type Multicast V
Priority Urgent V	Priority Urgent V
Transport trigger Cyclic ~	
Timeout multiplier 1 V	
Config Assembly Parameters	
Config Assembly size 151	
Config Assembly size 10	
Config Assembly Data	
I/O Data O->T	I/O Data T->O
CA FF EE 00 00 00 00 00 - 00 00 00 00 00 00 00 0	CA FF EE 00 00 00 00 00 - 00 00 00 00 00 00 00 0
Device Commands I/O Data	

Figure 4.5 Management Tool EtherNet/IP Scanner - Configuration

Default settings are compatible with the example. Press the [Connect] button. This button initiates a cyclic EtherNet/IP communication.

The example application on the application controller will mirror the output data to the input data.

The I/O data can be manipulated and monitored in the I/O data table. Furthermore, once a connection is established, LED1 and LED2 on the R-IN32M3 Module board will both be green.



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 reseting 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.

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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