R-IN32M3 Module (RY9012A0)

Industrial Ethernet Module Solution

R12QS0043ED0100
Rev.1.00
June 30, 2020

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.

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.

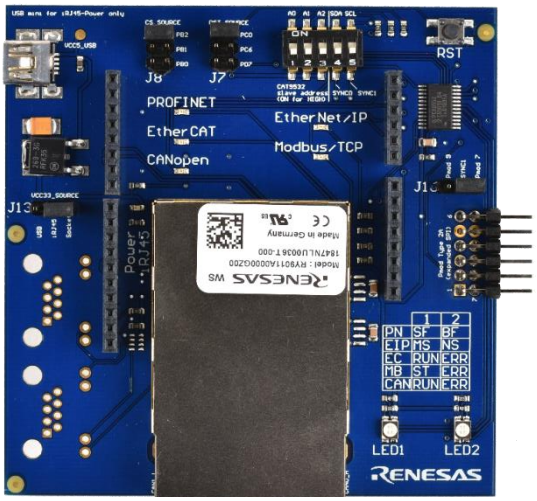


Figure 1.1 R-IN32M3 Module Board

Table 1.1 Status LEDs

Industrial Ethernet Standard	State LED1	Color	State LED2	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".

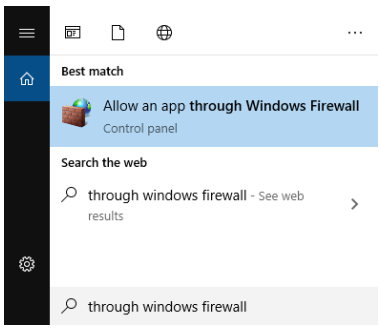


Figure 1.2 Search Windows Firewall

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

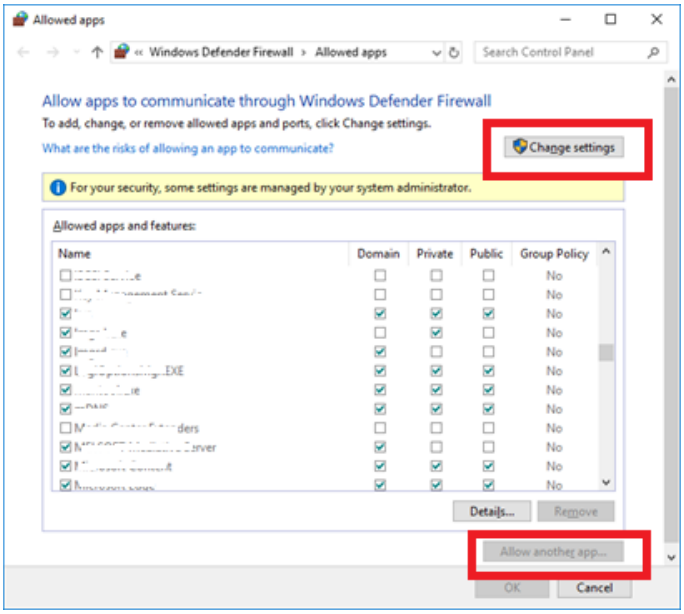
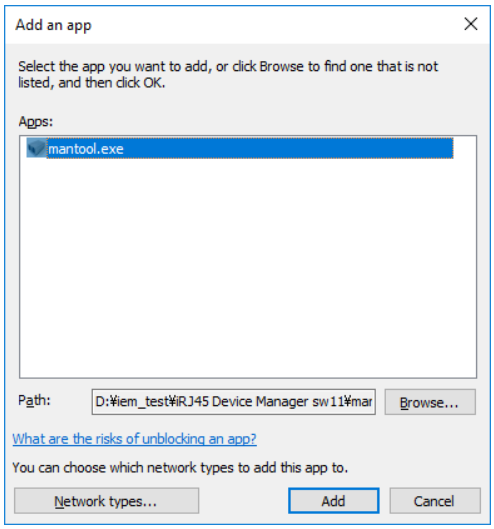


Figure 1.3 Allowed Applications

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].



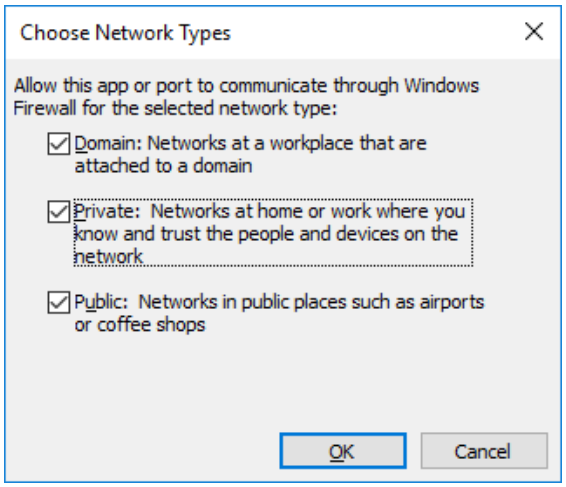


Figure 1.4 Select Management Tool

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

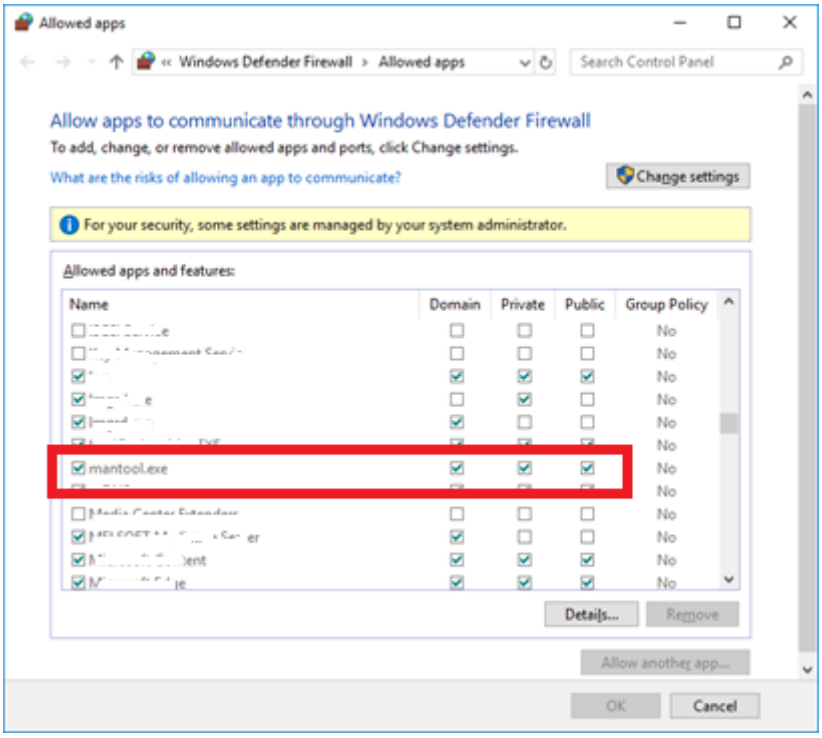


Figure 1.5 Allowed Management Tool

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://nmap.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 https://www.wireshark.org.

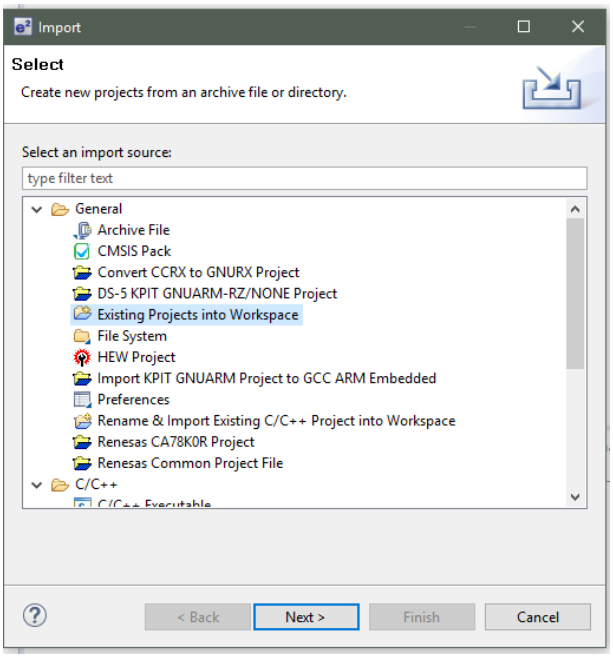
2. e2studio Project

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.**, **Error! Reference source not found.**) can be imported into the e2-studio 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



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".

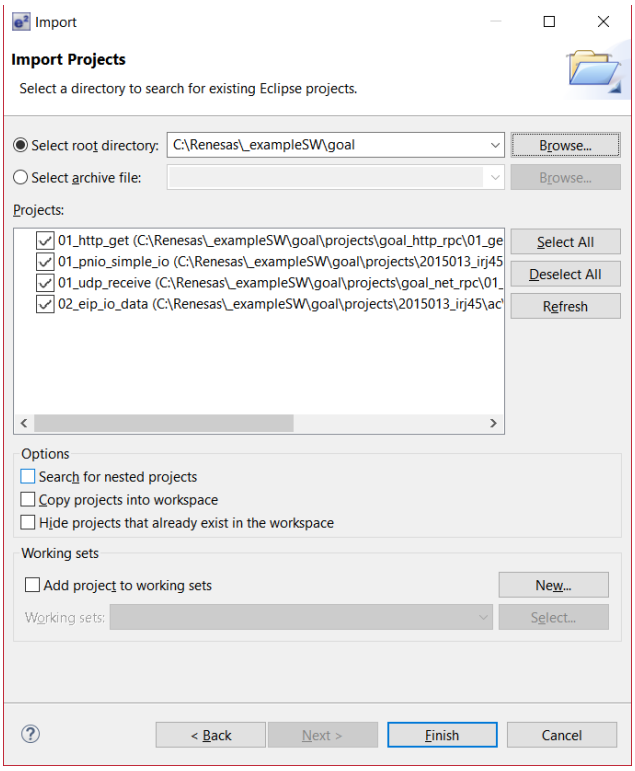


Figure 2.2 e2-studio Import Project Dialog

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].

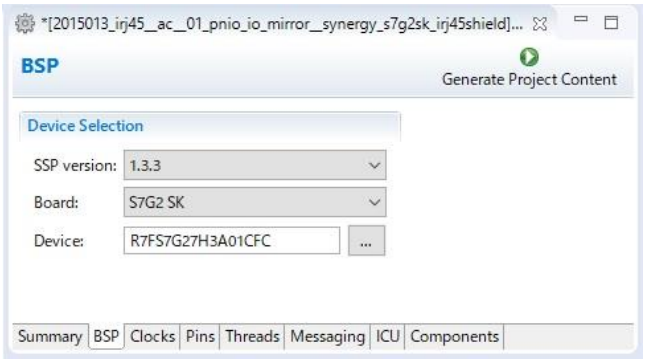


Figure 2.4 Generate Project Content

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.

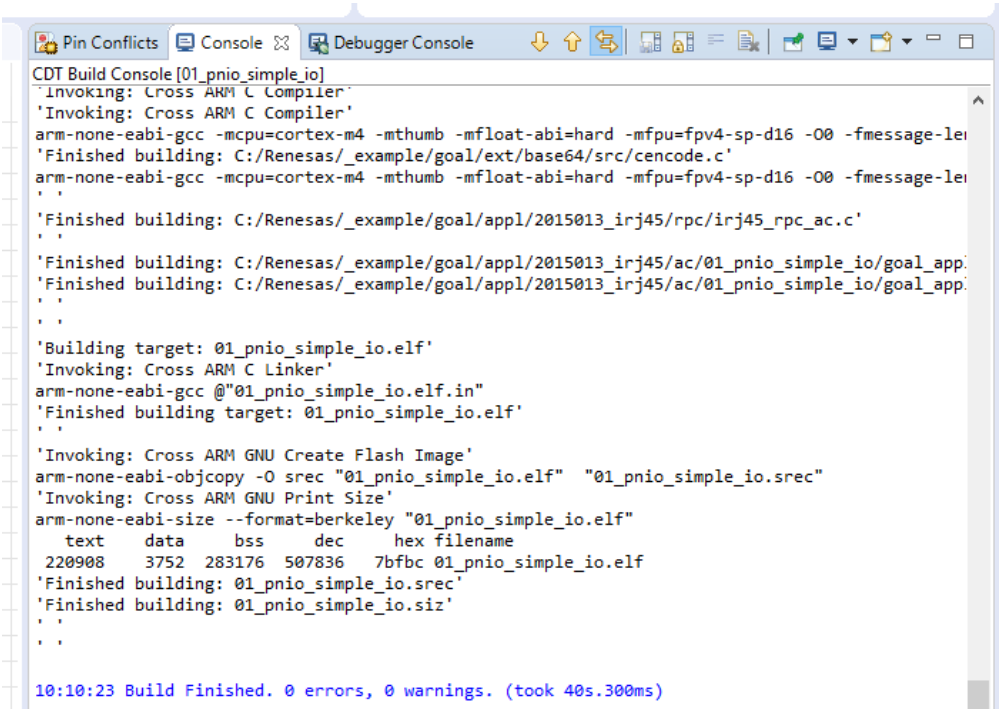


Figure 2.5 Console Log "Build Finished"

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.

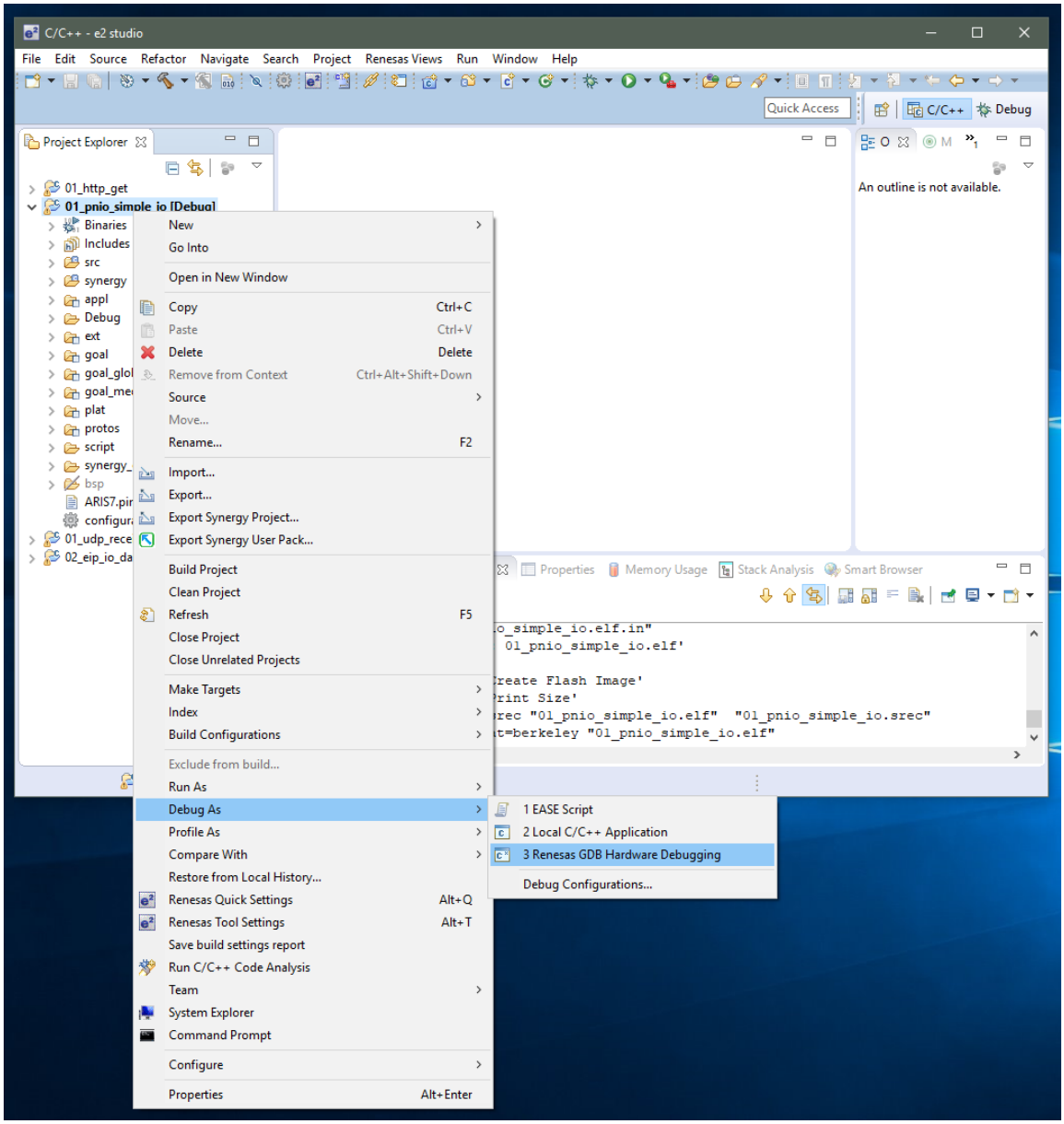


Figure 2.6 Initiate Debugging Session

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).

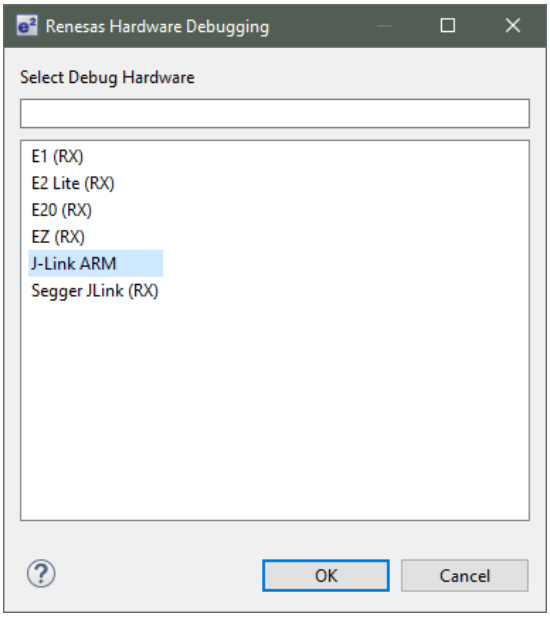


Figure 2.7 Select Debugging Hardware

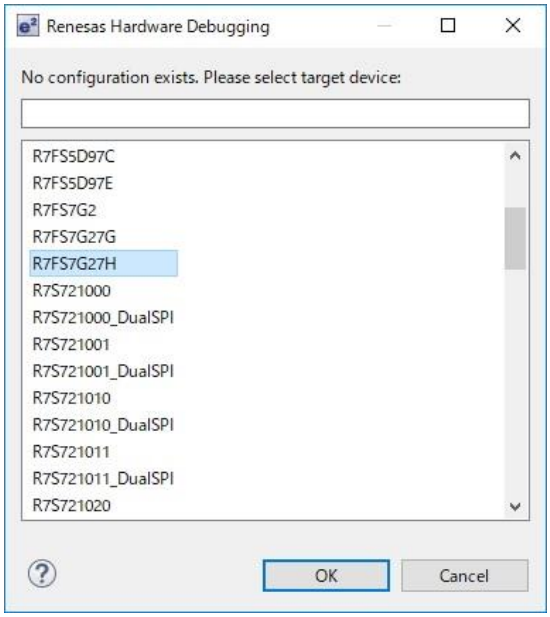


Figure 2.8 Select Target Device

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.

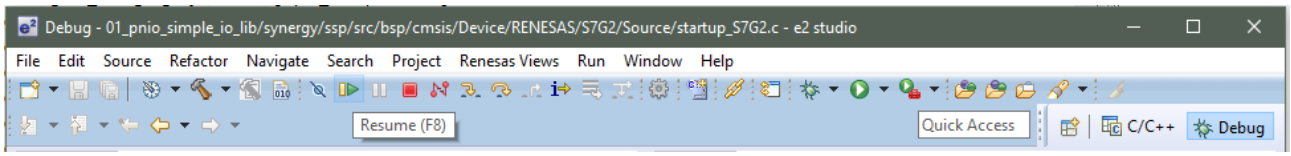


Figure 2.9 e2studio Toolbox

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.

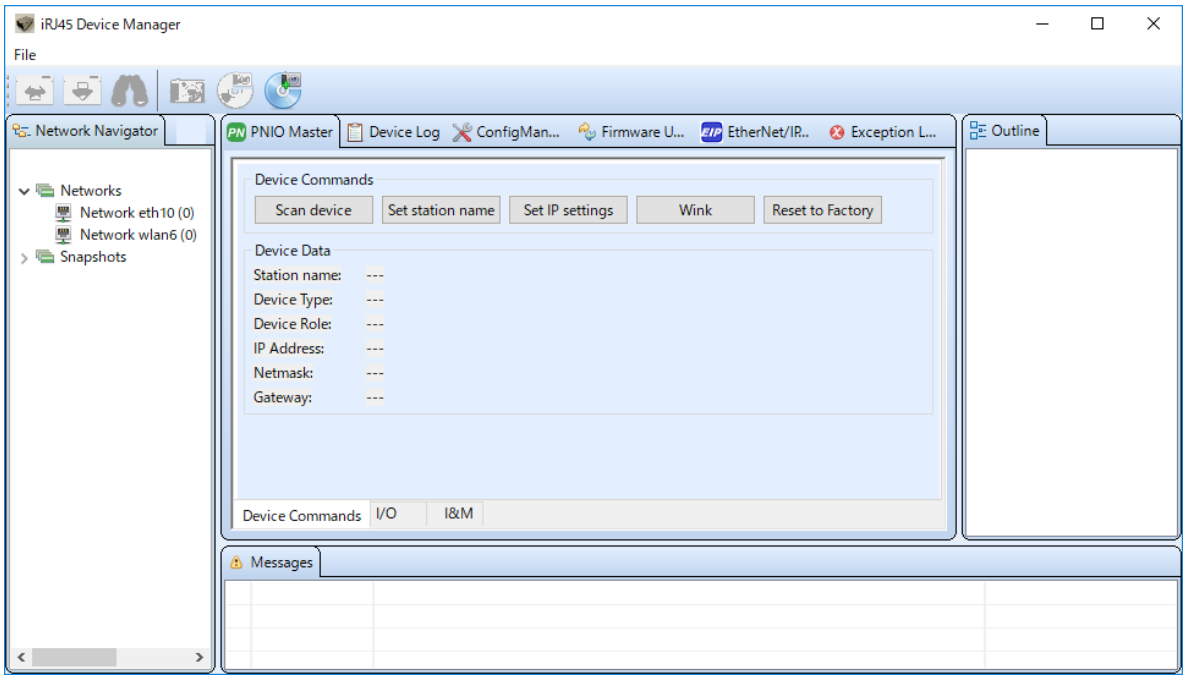


Figure 3.1 Management Tool

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.

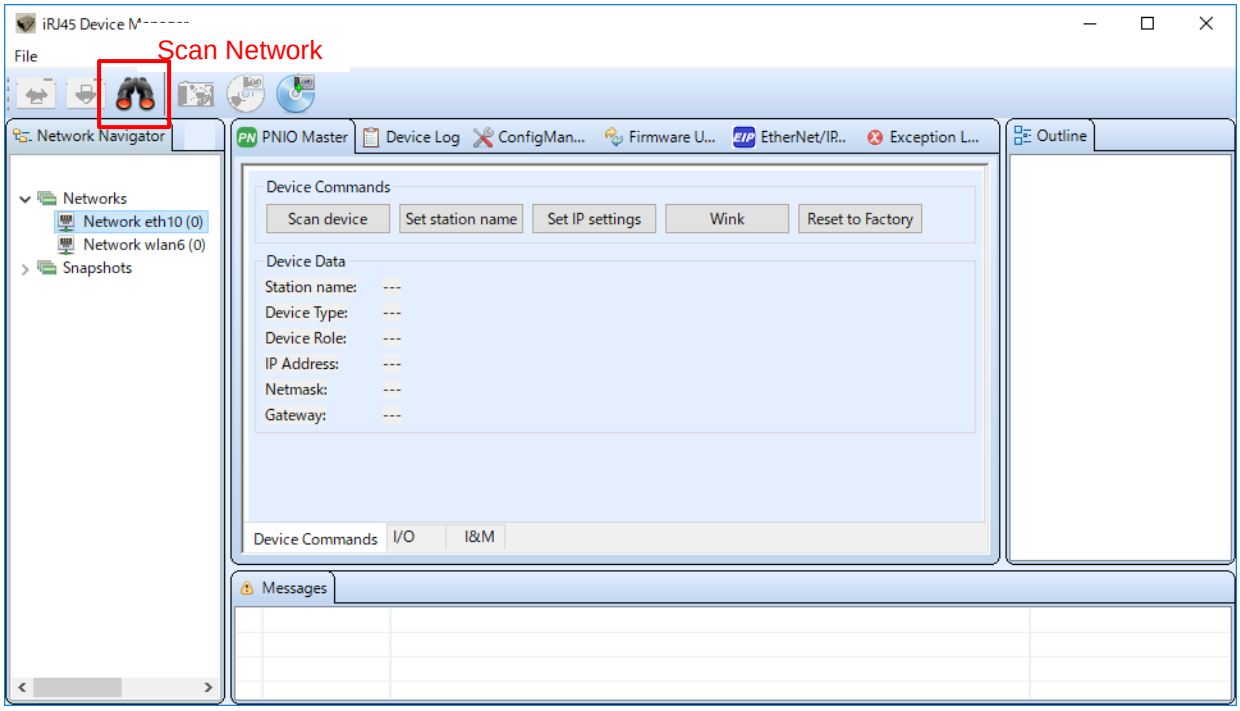


Figure 3.2 Management Tool Network Scan

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.

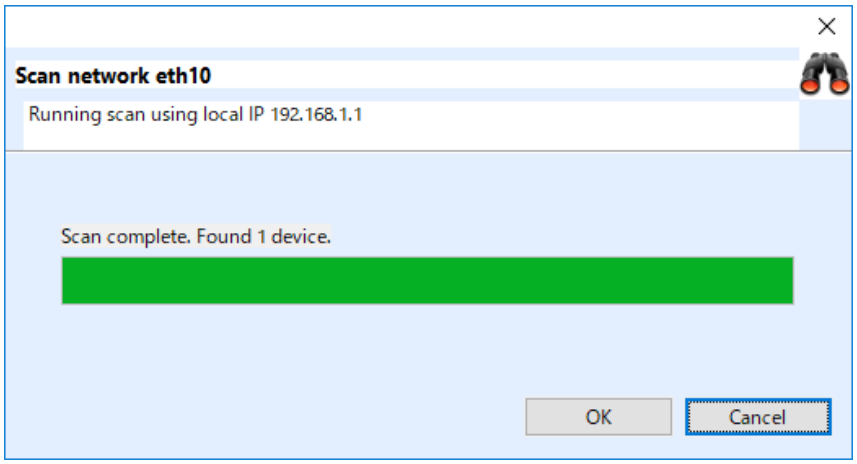


Figure 3.3 Scan Network Dialog

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

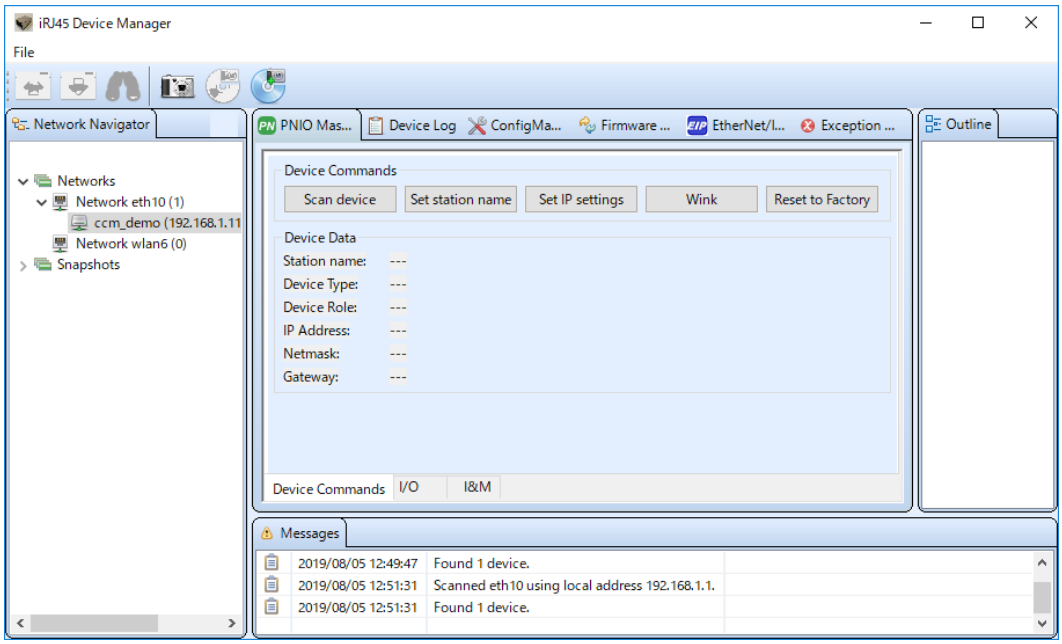


Figure 3.4 Management Tool with a Detected R-IN32M3 Module

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.

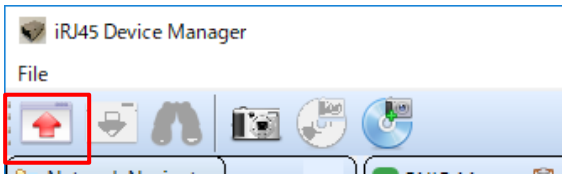


Figure 3.5 Read Configuration

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

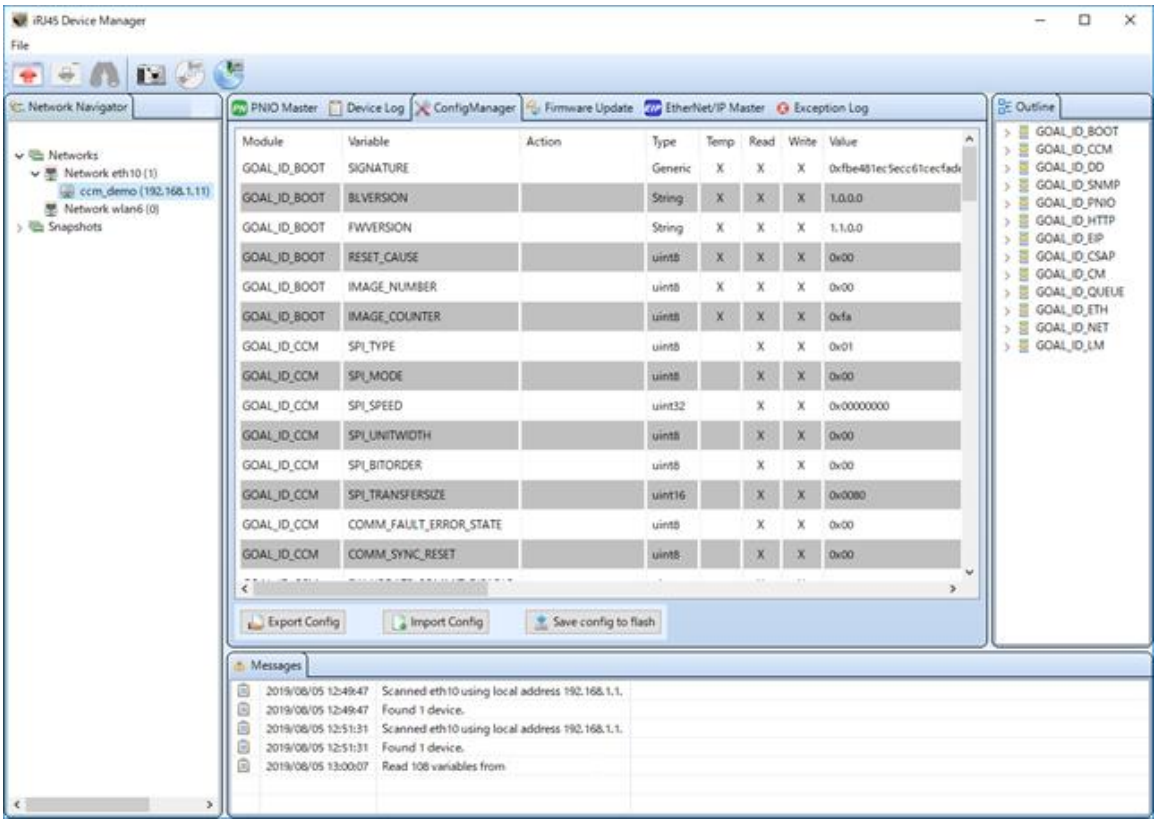


Figure 3.6 Management Tool Configuration Manager

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.

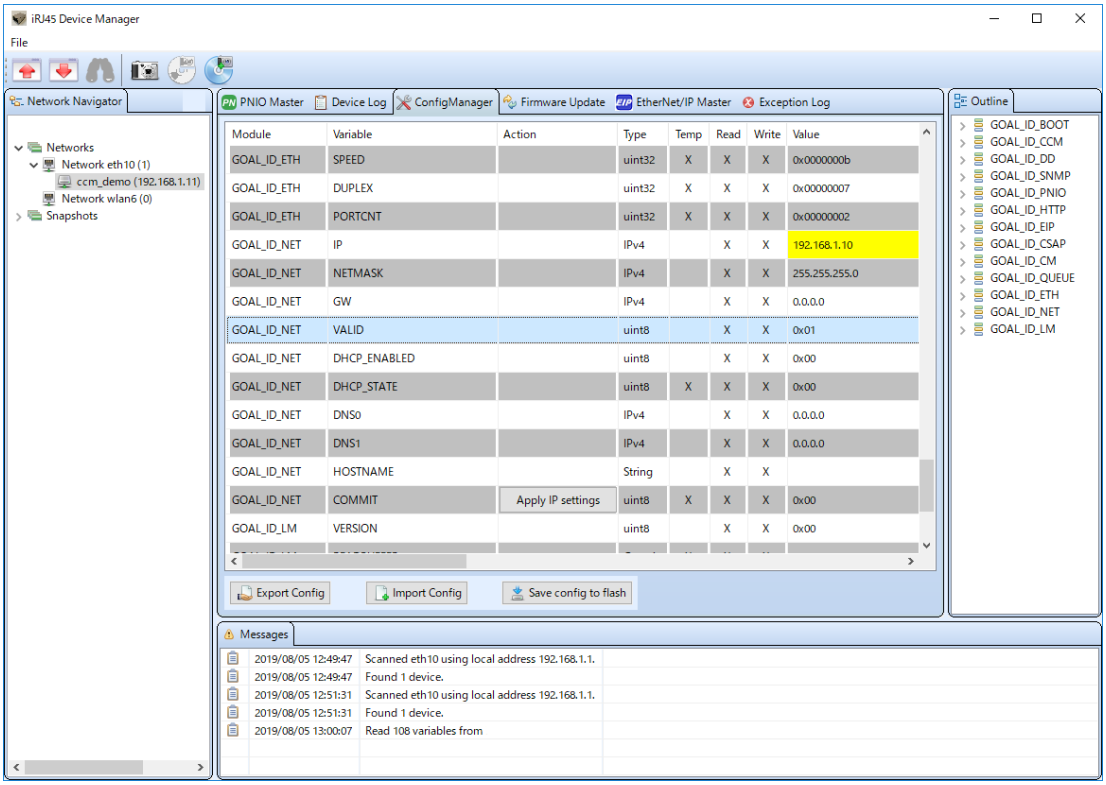


Figure 3.7 Management Tool with Modified Variables

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

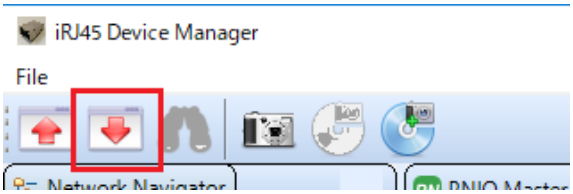


Figure 3.8 Write Configuration

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.

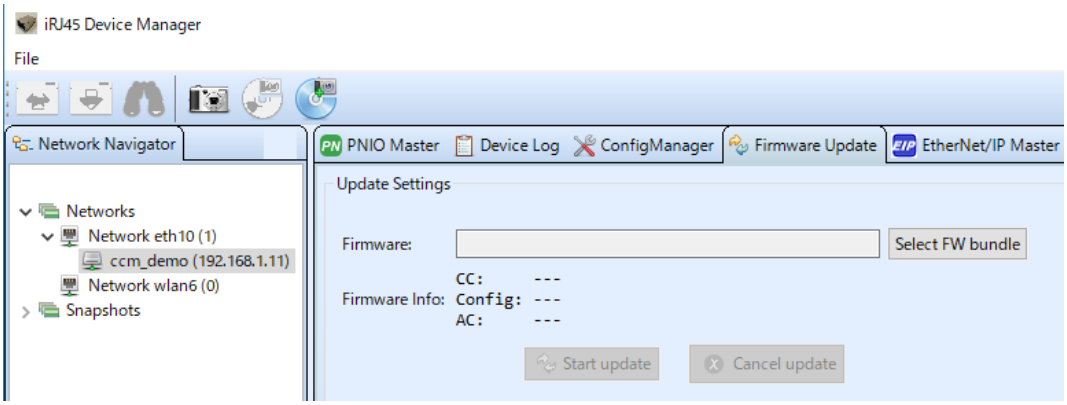


Figure 3.9 R-IN32M3 Module Firmware Update

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.

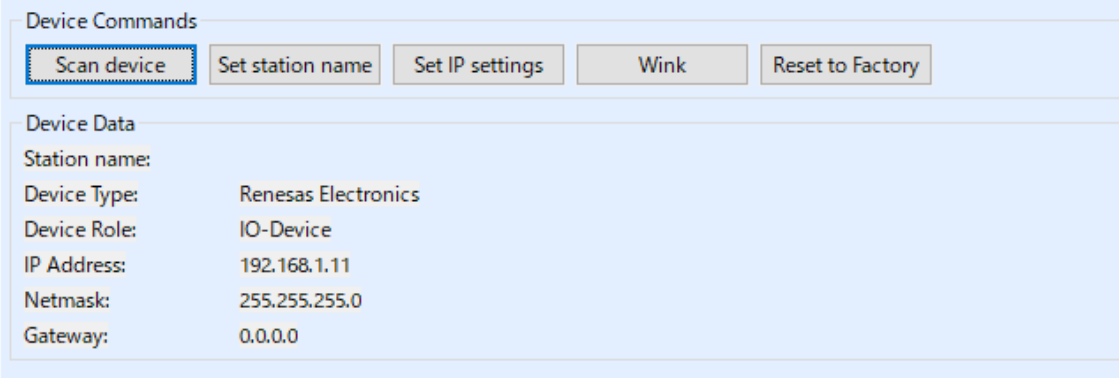


Figure 4.1 PROFINET Master

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.

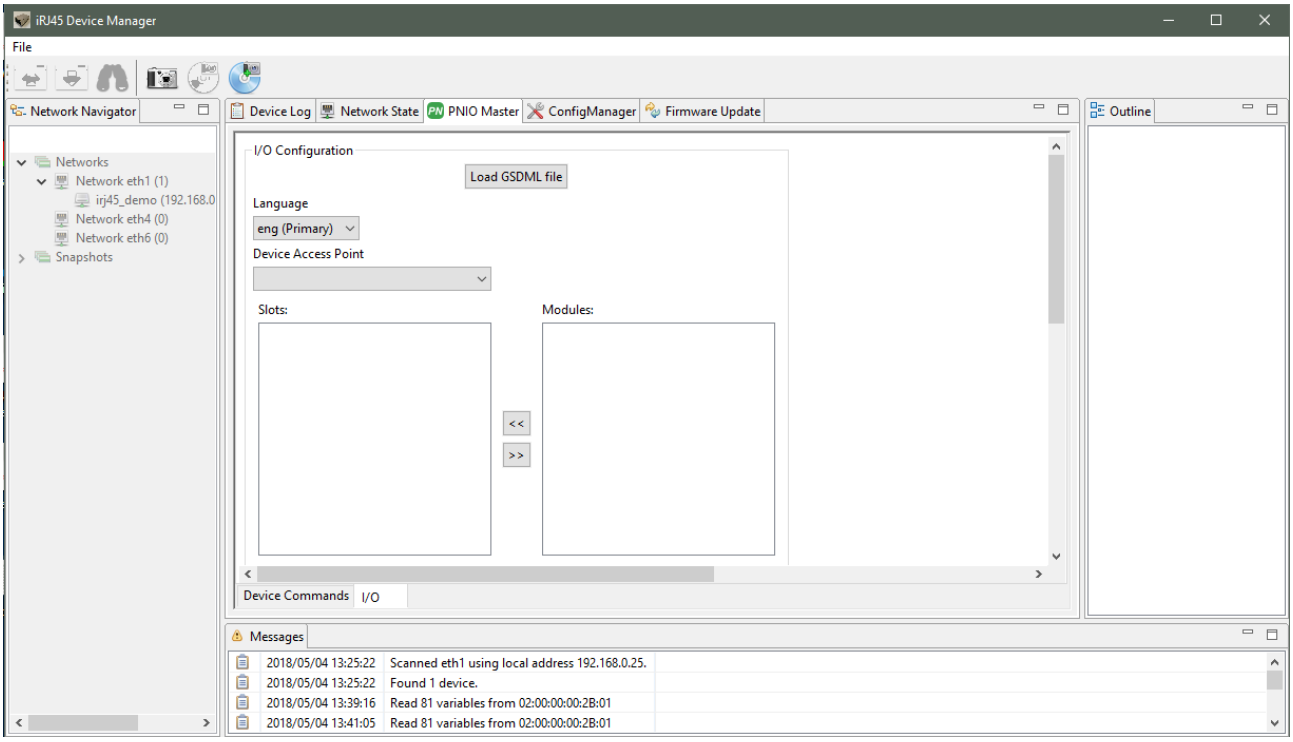


Figure 4.2 PNIO Master I/O

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	Data Type	PS/CS	Input Data	Output Data
I Signed8				
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.

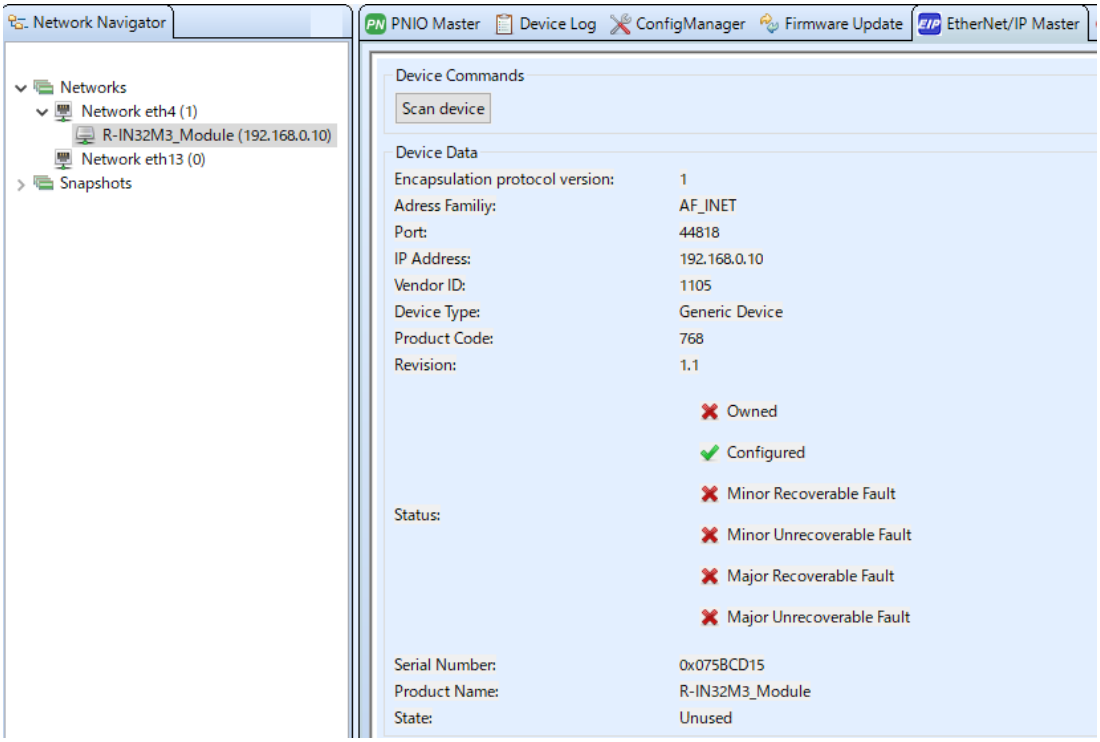


Figure 4.4 Management Tool EtherNet/IP Scanner – Device Scan

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

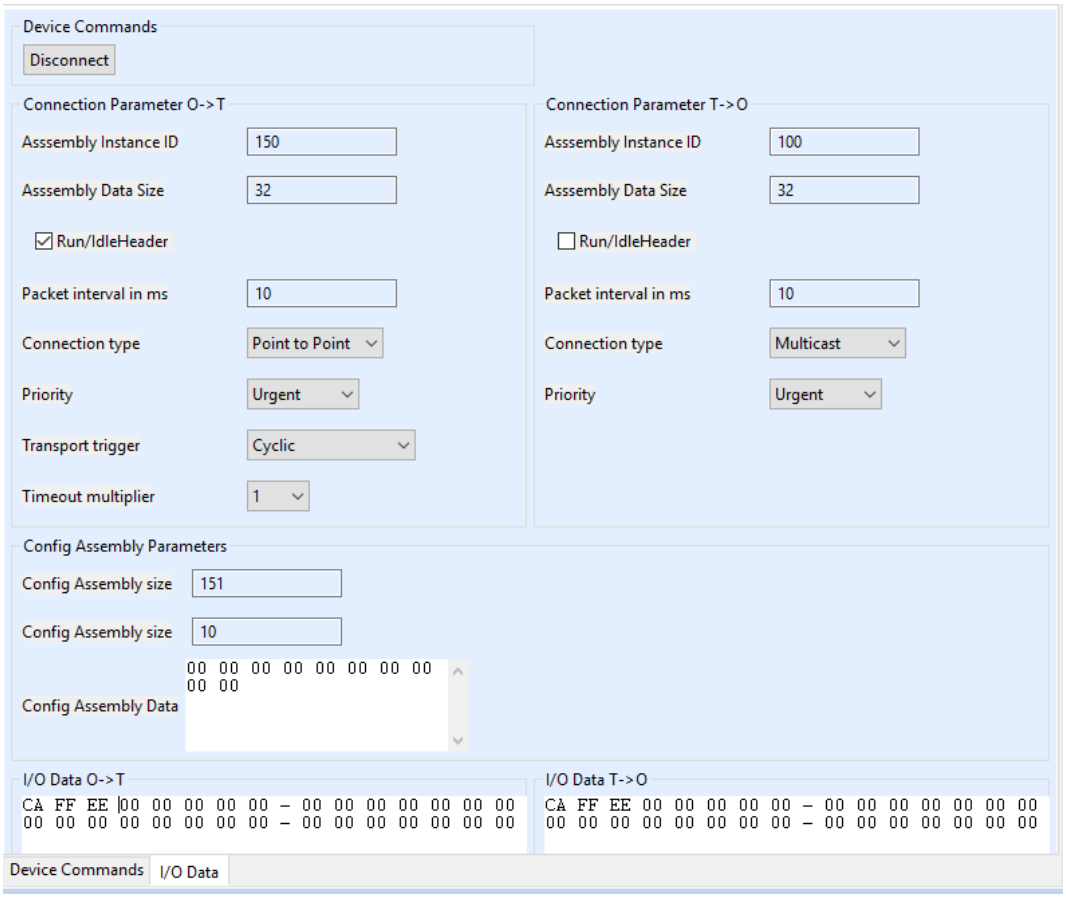


Figure 4.5 Management Tool EtherNet/IP Scanner - Configuration

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 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.

Notice

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

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

(Note1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
(Note2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

Corporate Headquarters

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

Trademarks

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

Contact information

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