

## port PROFINET IO demo for the Renesas Starter Kit+ for RX63N

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### Disclaimer

The software contained in this demo is provided 'as-is'. Use at your own risk. The software is only meant for demonstration purposes. Do not use it in production environments.

### Introduction

The Renesas Starter Kit+ for RX63N is an evaluation board equipped with a RX63NB. This powerful MCU is suited for Industrial Ethernet applications. It contains an Ethernet Controller that can be accessed via DMA. This allows a fast processing of a network's load. Using the Renesas RX63N a powerful and responsive *PROFINET IO* device can be implemented. Company port provides all parts to fully support *PROFINET IO* on this platform

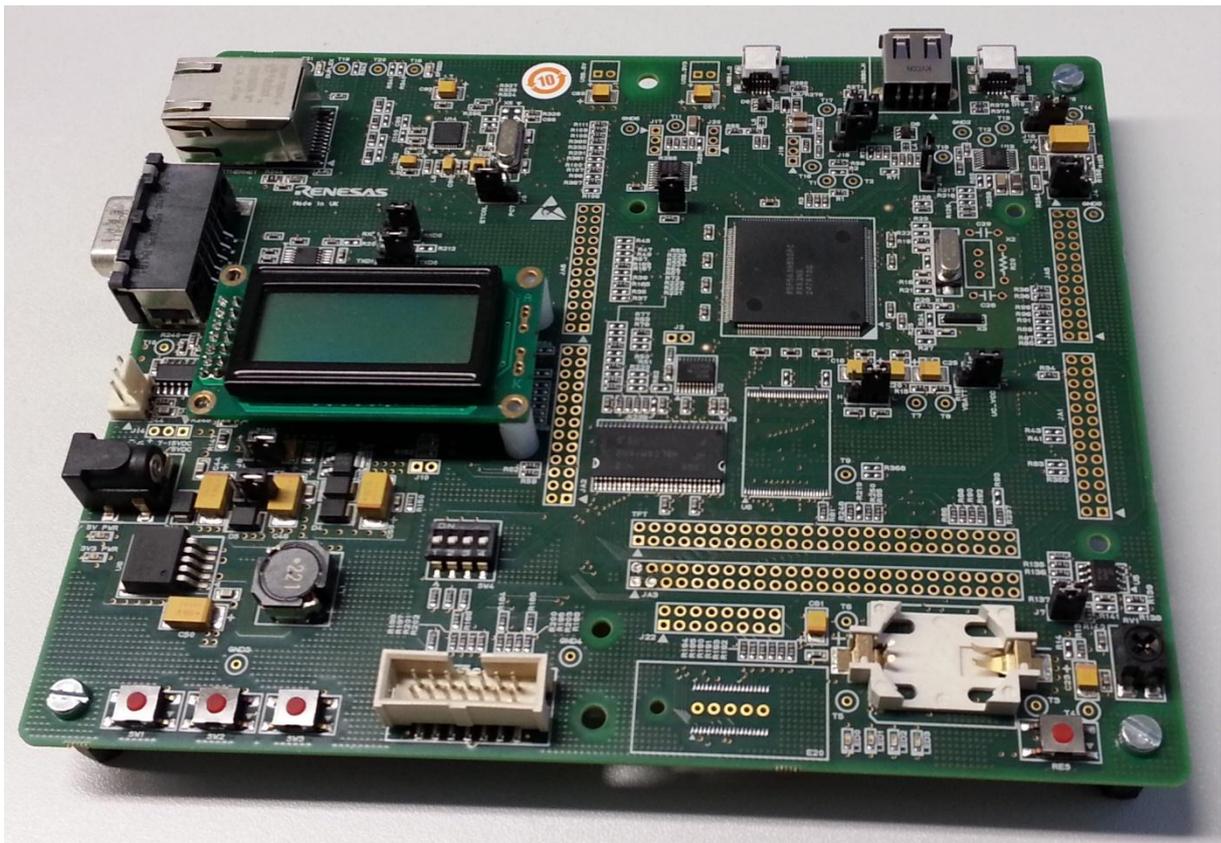


Figure 1: The Renesas Starter Kit+ for RX63N



## Features

The combination of hardware from Renesas and software from port allows usage of the strong CPU power while honoring high performance bus communication within a *PROFINET IO* network. This combination is perfect for many applications such as IO devices with high data throughput, drives or gateways. The flexibility of the hardware allows implementation of a variety of other communication protocols, where many can be implemented using port's own technology.

Feature	Description
<i>Cycle Time</i>	tested with 1 ms
<i>PROFINET IO Device functionality</i>	yes
<i>PROFINET IO Controller functionality</i>	-
<i>Support for modular devices</i>	yes
<i>Supported Conformance Class</i>	A
<i>Supported Realtime Class</i>	1
<i>Realtime Class UDP</i>	yes
<i>IRT support</i>	-
<i>Usage of nonvolatile memory</i>	yes
<i>State Machine</i>	yes
<i>Object dictionary</i>	yes
<i>Record Data</i>	yes
<i>IO Data</i>	yes
<i>Diagnosis</i>	yes
<i>Alarm</i>	yes
<i>Isochronous Mode</i>	-
<i>Physical Device Manager</i>	yes
<i>Conformance</i>	fully conformant against PROFINET IO Tester 3.1 (4415)

Table 1: Features of the PROFINET IO Implementation

## Setup

Provided with the demo you find a binary file (\*.mot) for the RX63N and a Generic Device Description (\*.xml) file for the *PROFINET IO* device. The binary must be downloaded into the MCU. For this task you need to download the "Flash Development Toolkit". An evaluation version of this software is available at <http://www.renesas.com/fdt>. Furthermore the evaluation board with the RX63N must be supplied with an external voltage and a programmer (e.g. E1) must be connected both to the board and to the PC.

If you have installed the downloaded software you can start "Flash Development Toolkit 4.xx Basic" from the Start Menu. A set of windows will consecutively open.

Steps to set up the Flash Development Toolkit:

1. Choose Device and Kernel
  - a. Select "Generic BOOT Device"
  - b. Click "Next"
2. Communication Port
  - a. Select Port: E1Direct (if you are using E1)
  - b. Click "Next"
3. Target Power Settings
  - a. Do not check any boxes, since the board has its own supply
  - b. Click "OK"
4. Pin Settings
  - a. Pin Outputs: check io3 and io2 (this is only valid if you are using the Renesas Starter Kit+ for RX63N )
  - b. Click "OK"

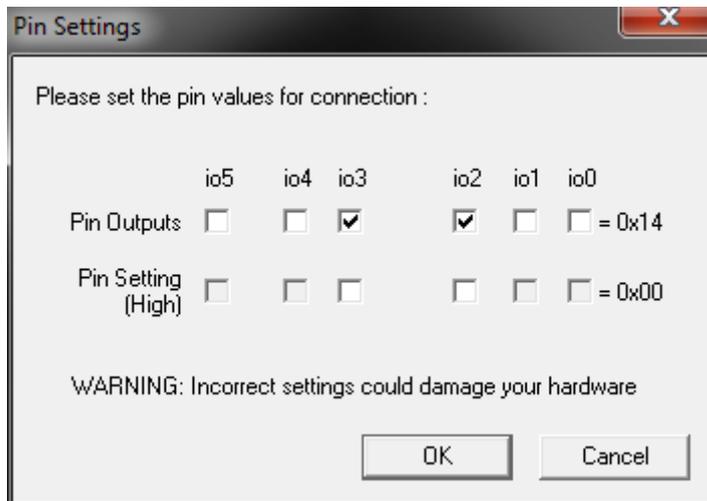


Figure 2: Pin Settings for the Renesas Starter Kit+ for RX63N

5. Query Generic Device
  - a. Click "OK" to start connection
  - b. Choose your programmer and click "OK"
  - c. Select endianness: Little Endian
  - d. Click "OK" if queries are finished
6. Device Settings
  - a. CPU frequency: 12 MHz
  - b. CKM: 8
  - c. CKP: 4
  - d. Click "Next"
7. Skip the next windows by pressing "Next" or "Finish" until the main window appears

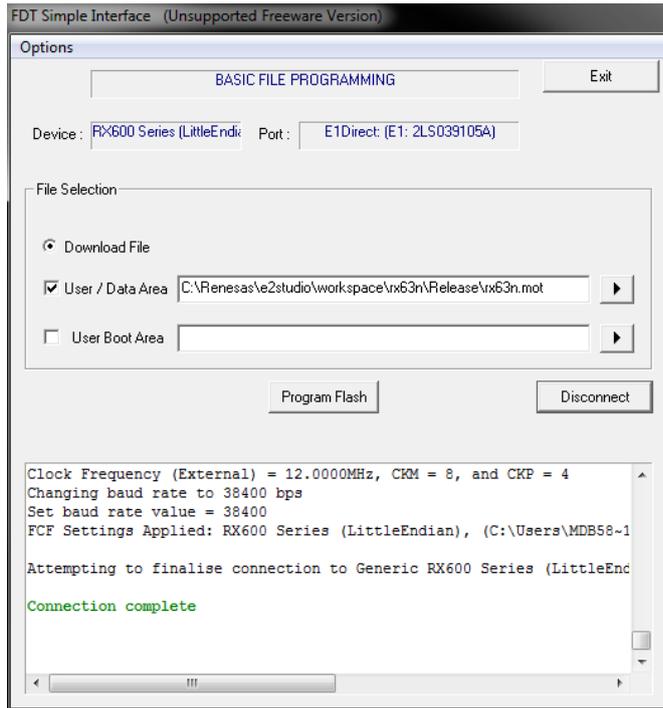


Figure 3: the main window of the Flash Development Toolkit (Simple Interface)

## 8. FTD Simple Interface

- a. Check User/Data Area
- b. Press the arrow next to a. and browse to the binary containing the *PROFINET IO* demo application
- c. Press the button “Program Flash”
- d. After flashing is finished, click the button “Disconnect”
- e. Make sure “Do Nothing” is checked and press “OK”
- f. You can exit the program by clicking “Exit”

After flashing the device disconnect the programmer from the board and cycle its power. If flashing was successful, the device should start sending out LLDP-frames once an Ethernet cable is plugged in. The chassis ID within these frames is the device’s MAC address.

Additionally the provided xml file must be imported into a *PROFINET IO* controller. The file describes the properties and supported functionality of the device. You also have to set the “Name of Station” attribute for this device. The name could be set with the help of an engineering tool. The name must be identical to the name configured in the IO Controller. Now the chassis ID within the LLDP frames should contain the Name of Station.

## Connection to a *PROFINET IO* Controller

The connection between an IO Controller and this IO device can be established by plugging the Ethernet cable from the controller into the Ethernet port of the device.

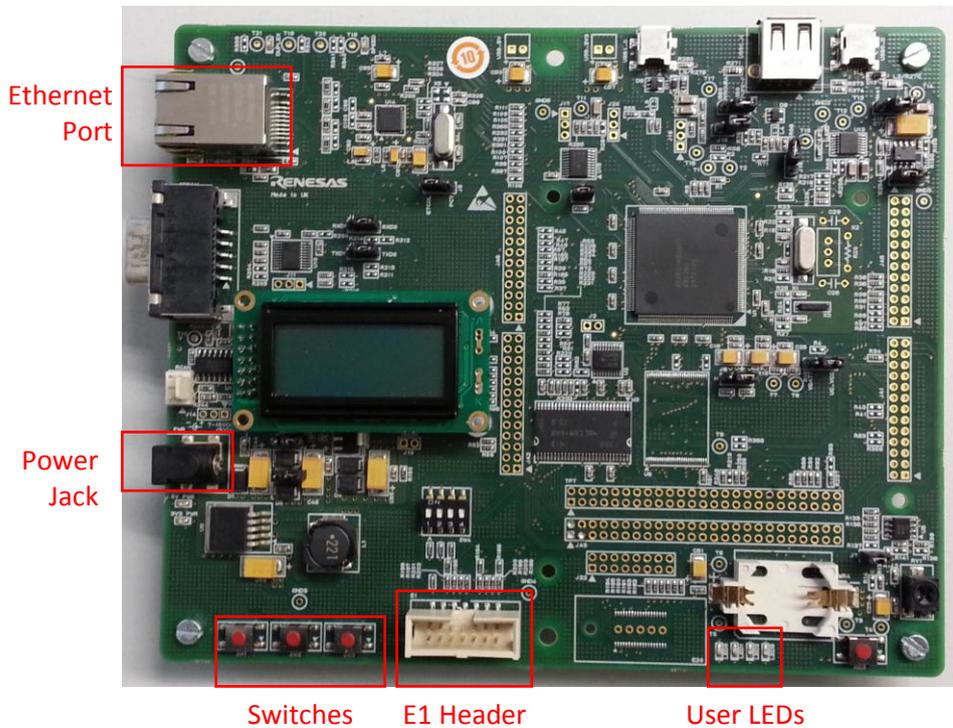


Figure 4: Interfaces of the evaluation board of the RSK+ for RX63N

## Usage

Once the connection between the IO Controller and the IO Device is physically and logically established, both devices will start exchanging cyclic real time data. Those messages carry 64 bytes of data. The board will display the first 4 bits of the first IO data byte received from the IO Controller on the User LEDs. You can also change the first byte of the data which the device sends to the Controller. By pressing the switches on the board you can toggle bit 0 to bit 2 of the first data byte.

## Cyclic IO Data

The cyclic IO data exchanged between the IO Controller and the IO Device consist of 64 bytes. The data uses the Big Endian format. The following tables show the meaning of these bytes.



Data produced by the IO Device:

Bytes	Meaning
0..3	Bits represent pressed buttons (on RSK-Board just bit 0, 1 and 2)
4..7	Mirrored bytes from consumed IO data bytes 4 to 7
8..11	32 bit counter, increased automatically
12..15	32 bit counter, increased when at least one button is pressed
16..63	One bit will be shifted trough these bytes each send cycle

Table 2: format of the IO data produced by the IO Device

Data consumed by the IO Device:

Bytes	Meaning
0..3	Bits represent active LEDs (on the RSK-Board the first four Bits represent the User LEDs)
4..7	These four bytes will be mirrored to the produced IO data
8..63	Not used

Table 3: format of the IO data consumed by the IO Device

Please make sure your IO Controller handles the cyclic IO data correctly.

## Development

If you want to have port's *PROFINET IO* stack implement into your own device, you must purchase a license from port GmbH.

For questions, comments please contact us at [service@port.de](mailto:service@port.de).