# RX72M Group

## Communications Board Sample program Package

R01AN6882EJ0110
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## Introduction

This document is an application note for the industrial network protocol stack sample program package for RX72M. This application note describes the structures of this package and usage of the sample programs.

## Target Device

RX72M Group

## Related Documents

- RX72M Group User's Manual: Hardware (R01UH0804EJ0100)

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# 1. Overview

This application note applies to the industrial network protocol stack sample program package for RX72M and the protocol stack common API library.

## 1.1 Operating Environment

This sample program package runs under the operating environment below.

**Table 1.1 Operating Environment**

| Item | Description |
|---|---|
| Board | RX72M communications board<br>TS-TCS07298 from Tessera Technology |
| CPU | RX CPU (RXv3) |
| Operating frequency | CPU clock (CPUCLK): 240 MHz |
| Operating voltage | 3.3 V |
| Operating modes | Single chip mode |
| Device requirements | R5F572MNDDBD<br>• Code flash memory<br>Capacity: 4 Mbytes<br>ROM cache: 8 Kbytes<br>• Data flash memory<br>Capacity: 32 Kbytes<br>• RAM/extended RAM<br>Capacity: 512 Kbytes / 512 Kbytes |
| Integrated development environment | e$^2$ studio (V7.5.0 or later) with the CC-RX compiler (V3.01.00) |
| Emulator (ICE) | Renesas E2 Lite |

## 2. About sample program package

This sample program package gathers the software of industrial network protocol stack for RX72M and the software of common API library for protocol stacks together as a one package. Sample programs for multiple protocol stacks are packaged in this.

### 2.1 Overall structure

Figure 2.1 shows the overall structure of the industrial network protocol stack software for RX72M.

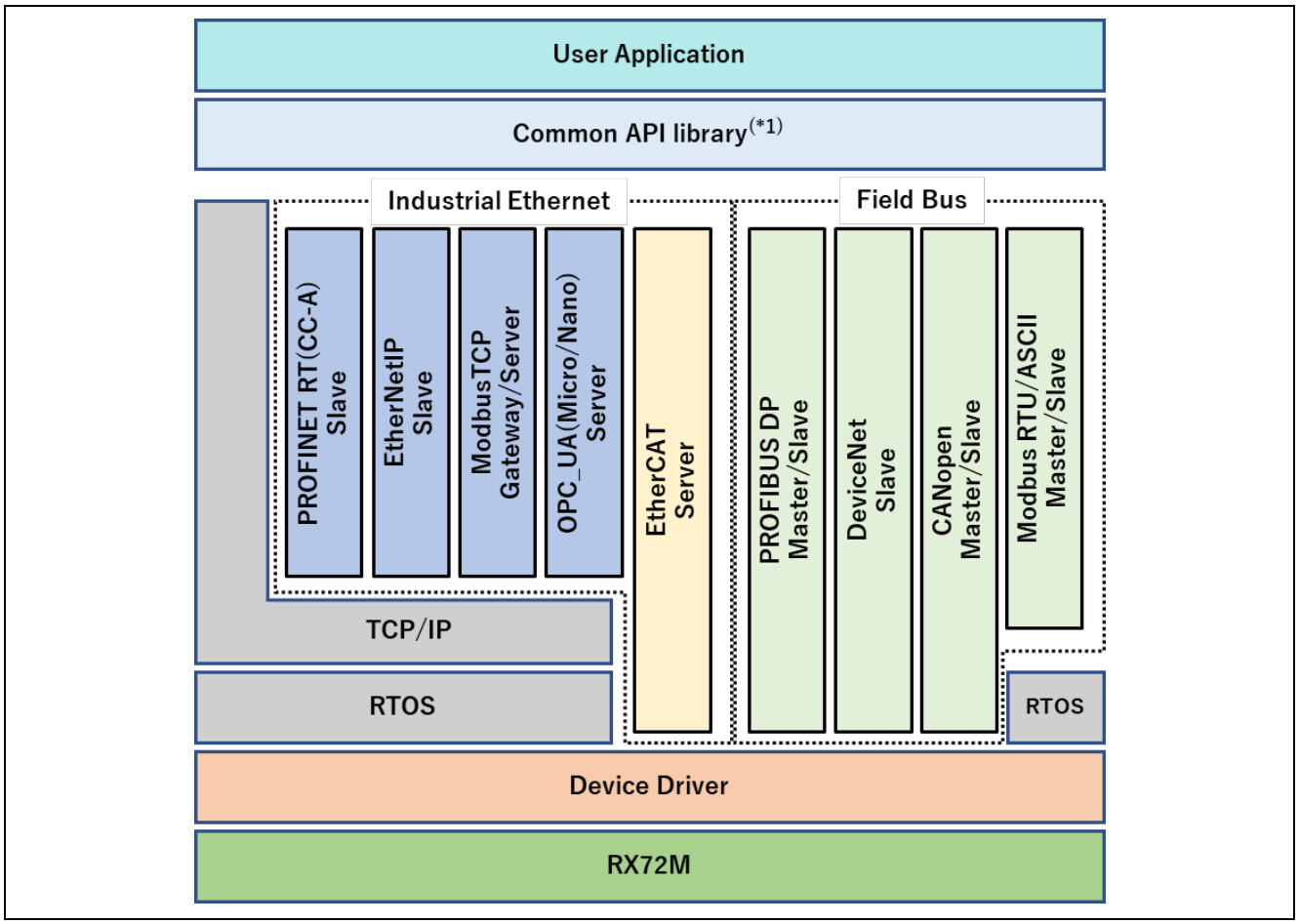



**Figure 2.1 overall structure of protocol stack software for RX72M**

This software supports the major protocol stacks for Industrial Ethernet and Field Bus. In Industrial Ethernet, EtherCAT, OPC UA, Modbus TCP, EtherNet/IP and PROFINET RT. In Field Bus, CANopen, Modbus RTU/ASCII, DeviceNet and PROFIBUS DP. For detailed information of each sample program, refer to the corresponding sample program package.

You can develop the user application layer immediately by using these sample programs which contained in this package.

Note: 1. The common API library is software that defines the interface that enhances the applicability of user applications for variable industrial network protocols. For detailed information, refer to “RX72M Group Industrial Network Common API Library Package”.

## 2.2 Package folder structure

The folder structure of this sample program package is below.

```
an-r01an4882xx0110-rx72m-sample-package
│  r01an4882ej0110-rx72m-sample-package.pdf    // This file (English version)
│  r01an4882jj0110-rx72m-sample-package.pdf    // This file (Japanese version)
│
├─Communications_Board                         // Communications Board folder
│     r01an4661ej0100-rx72m-comboard.pdf       // Communications Board Hardware Manual (English version)
│     r01an4661jj0100-rx72m-comboard.pdf       // Communications Board Hardware Manual (Japanese version)
│
├─Common_API_library                           // Common API library folder
│     an-r01an4852xx0100-rx72m-commonapi.zip   // Common API library package
│
└─Protcol_stack_samples                        // Industrial network protocol stack folder
     an-r01an4741xx0100-rx72m-canopen-master.zip
                                   // CANopen Master sample program package
     an-r01an4740xx0100-rx72m-canopen.zip
                                   // CANopen Slave sample program package
     an-r01an4738xx0100-rx72m-devicenet.zip
                                   // DeviceNet Slave sample program package
     an-r01an4881xx0121-rx-ecat.zip
                                   // EtherCAT Slave sample program package
     an-r01an4884xx0105-rx72m-ethernetip.zip
                                   // EtherNet/IP Slave sample program package
     an-r01an4862xx0103-rx72m-modbus.zip
                                   // Modbus TCP Gateway/Server, RTU/ASCII Master/Slave sample program package
     an-r01an4778xx0100-rx72m-opcua.zip
                                   // OPC UA(Micro/Nano) Server sample program package
     an-r01an4853xx0100-rx72m-profibus-master.zip
                                   // PROFIBUS DP Master sample program package
     an-r01an4739xx0100-rx72m-profibus.zip
                                   // PROFIBUS DP Slave sample program package
     an-r01an4885xx0104-rx72m-profinet.zip
                                   // PROFINET RT(CC-A) Slave sample program package
      an-r01an6977xx0100-rx72m- ccietsna.zip
                                   // CC-Link IE TSN ClassA sample program package
```

## 3. Usage

For usage of each sample program, refer to the document which contained in the corresponding sample program package.

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**Revision History**

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.00 | Sep. 11, 2019 | - | First edition issued |
| 1.01 | Nov. 1, 2019 | - | Add EtherCAT Startup Manual |
| | | - | Modbus documentation improvements |
| | | - | Add an assessment tool |
| 1.02 | Dec. 5, 2019 | - | Add EtherCAT RSK Board Sample Program |
| | | - | EtherNetIP documentation improvements |
| | | - | PROFINET documentation improvements |
| 1.03 | Jan. 31, 2020 | - | Add CC-Link IE TSN ClassA Sample Package |
| | | - | Modify the DeviceNet Slave document |
| | | - | Modify the CANopen Master document |
| | | - | Modify the CANopen Slave document |
| | | - | Modify the PROFIBUS Master document |
| 1.04 | May. 5, 2020 | - | Support EWRX<br>(refer to r01an4881xx0110 for details) |
| | | | Modify Modbus Sample Program<br>(refer to r01an4862xx0102 for details) |
| | | | Modify PROFINET Sample Program<br>(refer to r01an4885xx0102 for details) |
| | | | Modify EtherNetIP Sample Program<br>(refer to r01an4884xx0102 for details) |
| 1.05 | Aug. 31, 2020 | - | Modify EtherCAT Sample Program<br>(refer to r01an4881xx0111 for details) |
| | | | Modify PROFINET Sample Program<br>(refer to r01an4885xx0103 for details) |
| | | | Modify EtherNetIP Sample Program<br>(refer to r01an4884xx0103 for details) |
| 1.06 | Nov. 20, 2020 | - | Modify Modbus Sample Program<br>(refer to r01an4862xx0103 for details) |
| 1.07 | Aug. 31, 2021 | - | Modify EtherCAT Sample Program<br>(refer to r01an4881xx0120 for details) |
| | | | Modify PROFINET Sample Program<br>(refer to r01an4885xx0104 for details) |
| | | | Modify EtherNetIP Sample Program<br>(refer to r01an4884xx0104 for details) |
| 1.08 | Jan. 31, 2022 | - | Modify EtherCAT Sample Program<br>(refer to r01an4881xx0121 for details) |
| | | | Modify EtherNetIP Sample Program<br>(refer to r01an4884xx0105 for details) |
| 1.09 | Jan. 31, 2023 | - | Modify EtherCAT Sample Program<br>(refer to r01an4881xx0130 for details) |
| | | | Modify EtherNetIP Sample Program<br>(refer to r01an4884xx0106 for details) |
| 1.10 | Aug. 31, 2023 | - | Add CC-Link IE TSN ClassA Sample Package |

# 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.).
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