RX72M Group

Communications Board OPC UA Startup Manual

Introduction

This is a quick start guide to running OPC UA (Micro / Nano) Server communications on the RX72M communications board for evaluating industrial networks.

Target Device

RX72M Group

Sample Program

This sample program uses the evaluation version of the OPC UA stack produced by one of our partners, Another-ware Corporation. The stack's major communications specifications are as follows.

- Communications protocol: Compliant with OPC UA Specifications Release 1.03
- Transfer protocol : UA-Binary
- Security policy : None

For purchase of the official version of the stack and the specifications of the sample program, contact Another-ware Corporation.

Another Ware Co., Ltd.: https://www.another-ware.co.jp/

[Restrictions]

The evaluation version of the OPC UA stack consists of library files which were built with the functional limitations as listed below. This version is only made available for purposes of evaluation.

- The evaluation stack automatically stops running after 90 minutes. Re-starting the program requires resetting the device.

Please note that the evaluation stack cannot be used in commercial products. Purchasing the official version of the OPC UA stack is required if it is to be used in a commercial product.

Contents

1. Operating Environment

The sample program covered in this manual runs in the environment below.

Table 1.1   Operating Environment

Item	Description
Board	RX72M communications board 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 • 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	OPC UA (UA-Binary)
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. Setting up and Connecting the Evaluation Board

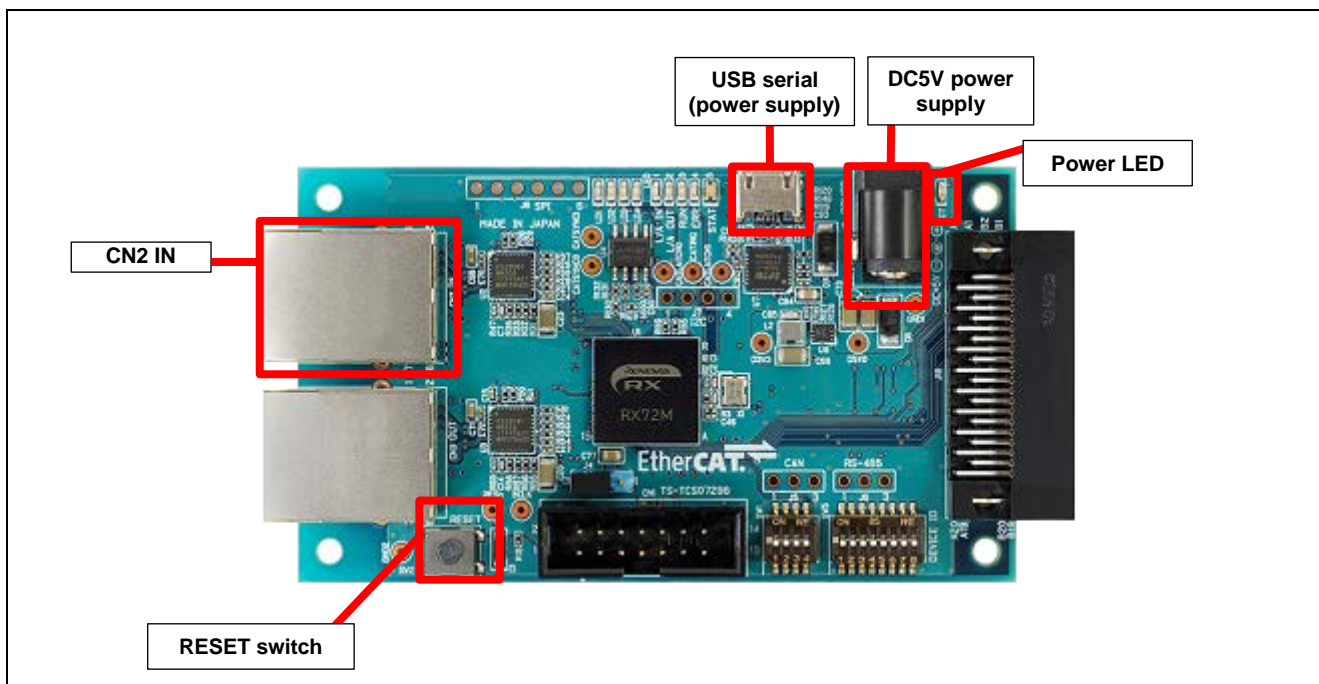For detailed information on the board, refer to the *RX72M Group Communications Board Hardware Manual*.

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.

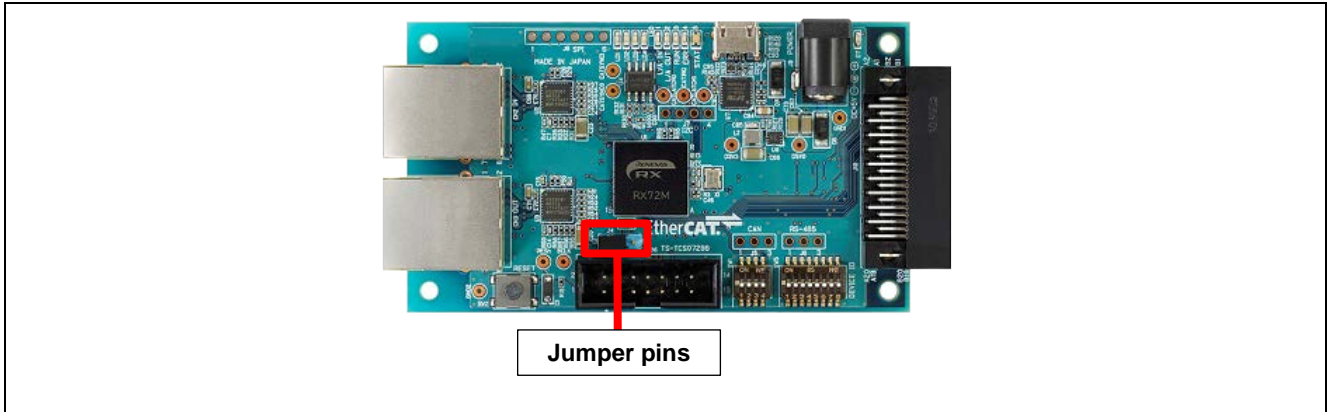For the detailed locations of the related parts, refer to the *RX72M Communications Board Hardware Manual.*

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.
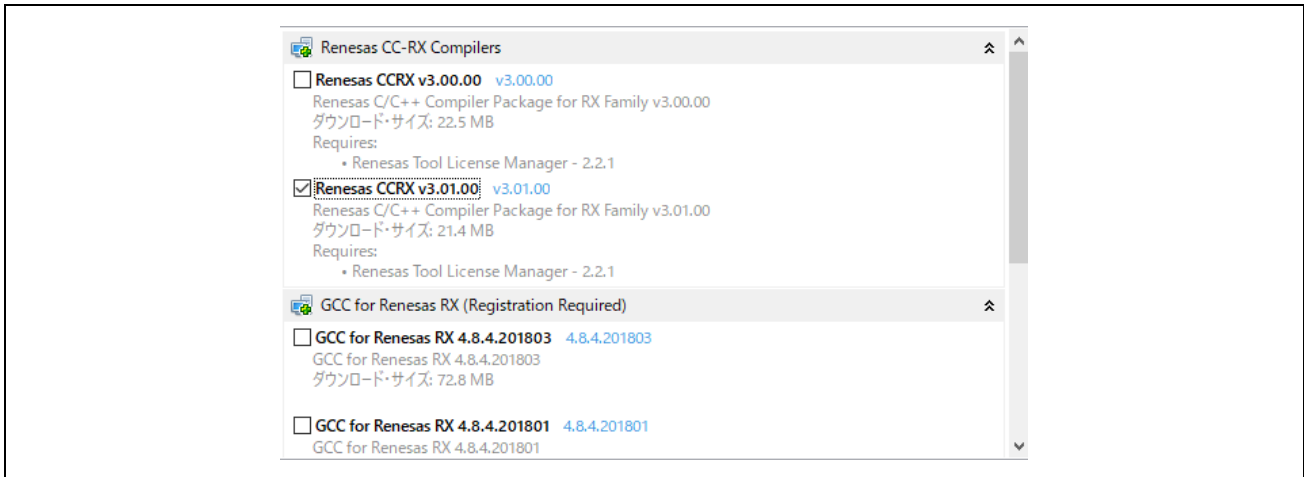
3. Installing the e² studio

Download the e² studio for RX72M (V7.5.0 or later) from the Web site below.

https://www.renesas.com/e2studio_download

3.1 Installing the CC-RX Compiler V3.01.00

The compiler selection dialog box appears while installing the e² studio. Click [Renesas CCRX v3.01.00] and select [Next]. CC-RX V3.01.00 Compiler for RX72M will be installed with the e² studio.
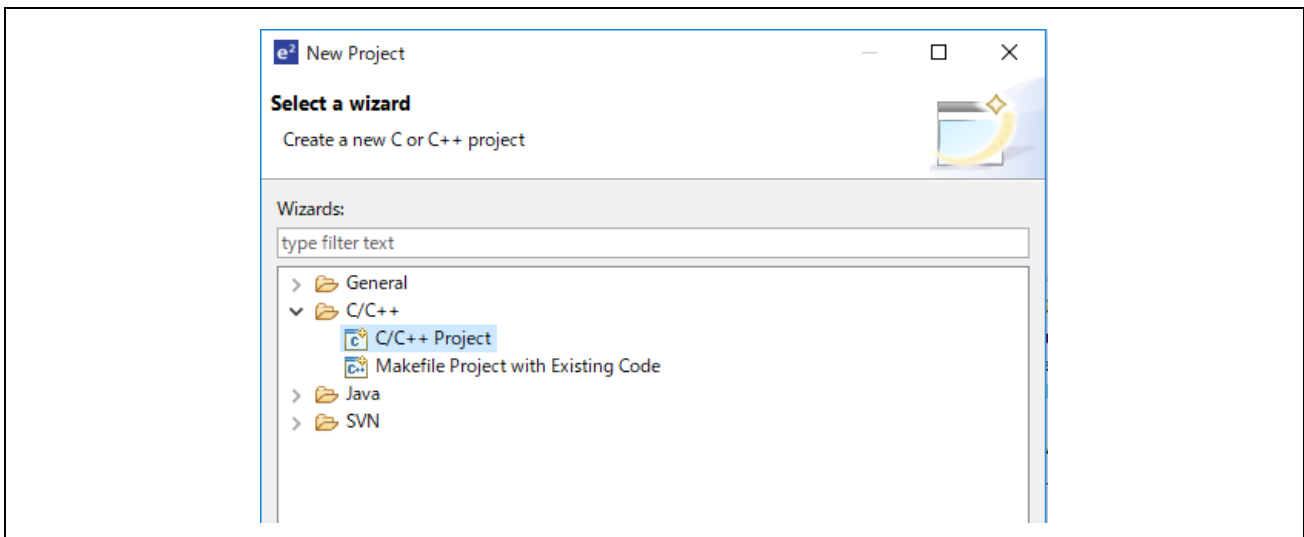

To start the e² studio, execute "e2studio.exe" in the following installation folder.
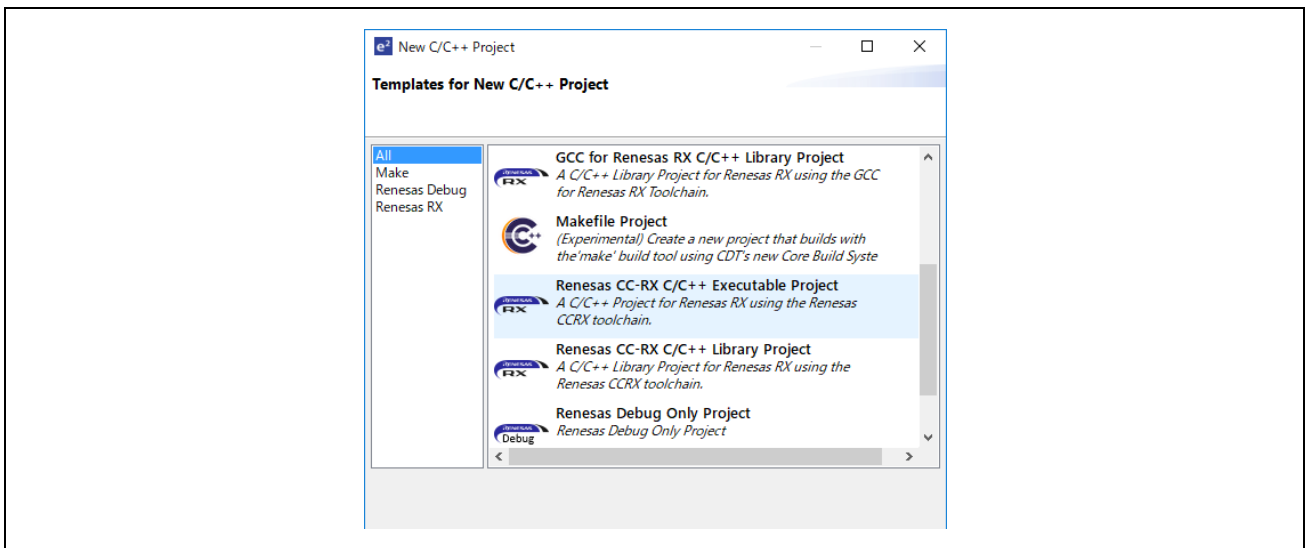
e2_studio_rx72m\eclipse

3.2 How to check the registered Compiler

(1) Start the e² studio.

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

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

(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 [Manage Toolchains...] under [Toolchain Settings].

(6) In the [Renesas Toolchain Management] dialog box, the registration was successful if "v3.01.00" has been added under "Renesas CCRX".
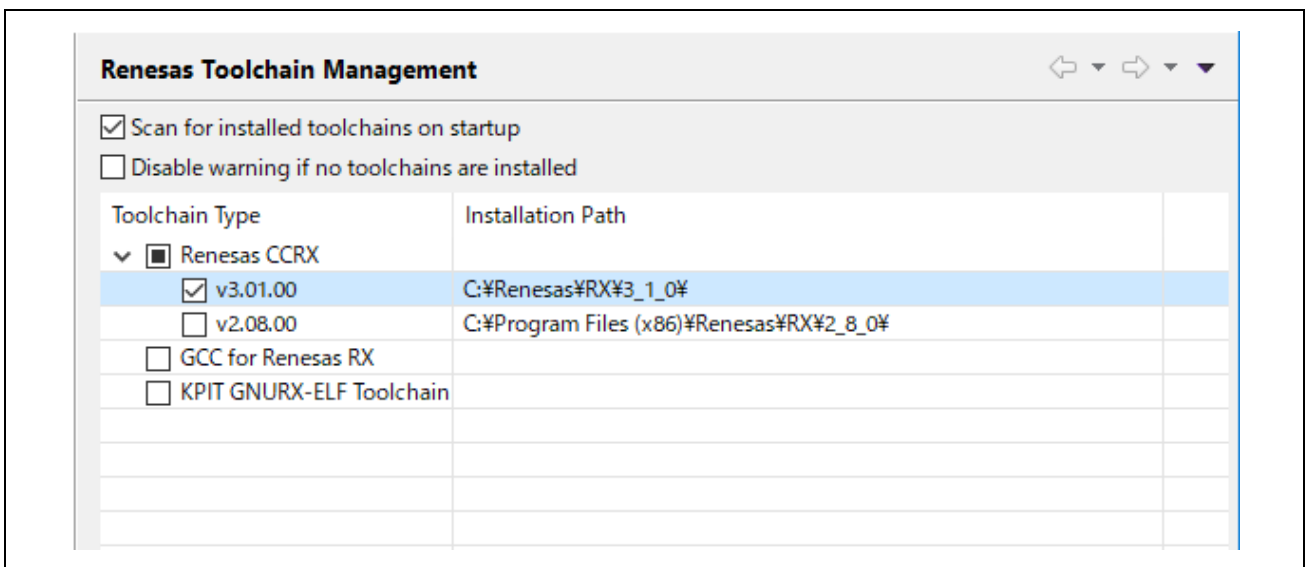
4. Connections

(1) Connect the LAN cable to the "CN2 IN" side.
Refer to "7.1.1 Connection Configuration" for connection configuration.

(2) Connect the E2 Emulator Lite to the JTAG connector on the communications board with the user interface cable.

(3) Connect the E2 Emulator Lite to a USB port of the PC you are using. The "ACT" LED on the E2 Emulator Lite starts to blink.

(4) The "Found new hardware" wizard appears. Follow the procedure described below to install the driver. Installation on a PC running Windows^{TM} 7, 8, or 8.1 requires logging in with a user name that has administrator rights.

       Windows^{TM} 7/8/8.1: A notice appears on the Windows taskbar when the installation is finished.

       Windows^{TM} 10:   A button for device configuration appears on the Windows taskbar and installation is automatic.

(5) Supply power to the communications board from a 5-V DC power source or through the USB port.

5.   Importing a Sample Project to the e² studio

(1) Extract the archived sample project and store it in any folder.

(2) Select [File] → [Import].

(3) In the [Select] dialog box, select [General] → [Existing Projects into Workspace] and select [Next].
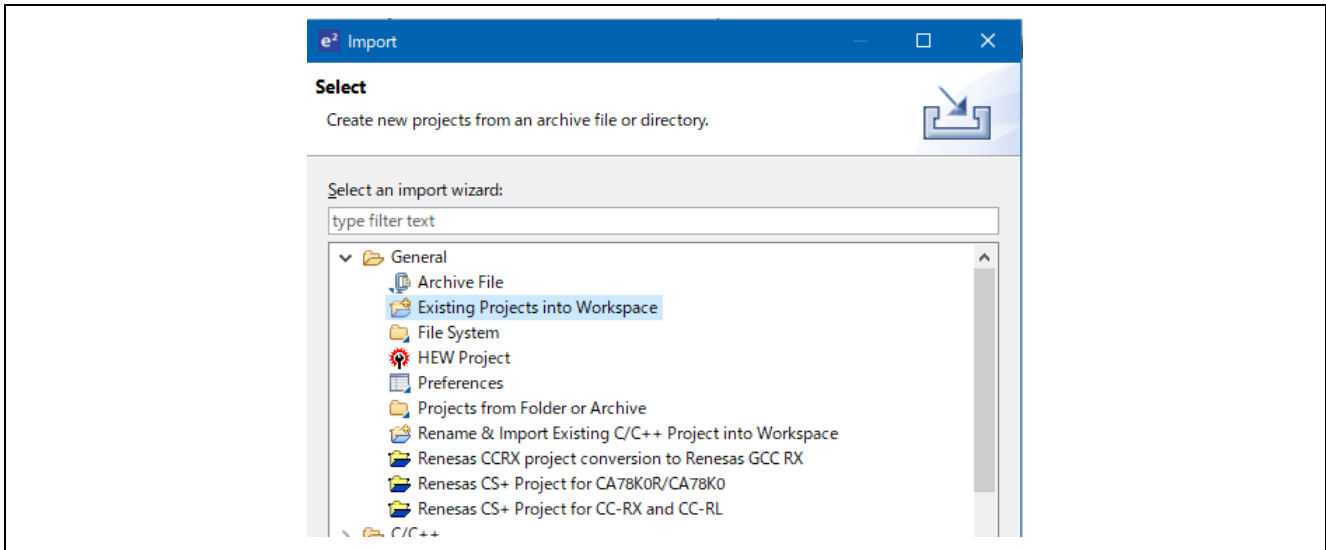
(4) In the [Import Projects] dialog box, check the "Select archive file:" button, then select [Browse...].

(5) Select the "opcuaserver_RX72M" folder of the sample project stored in any folder in (1), and select [Open].
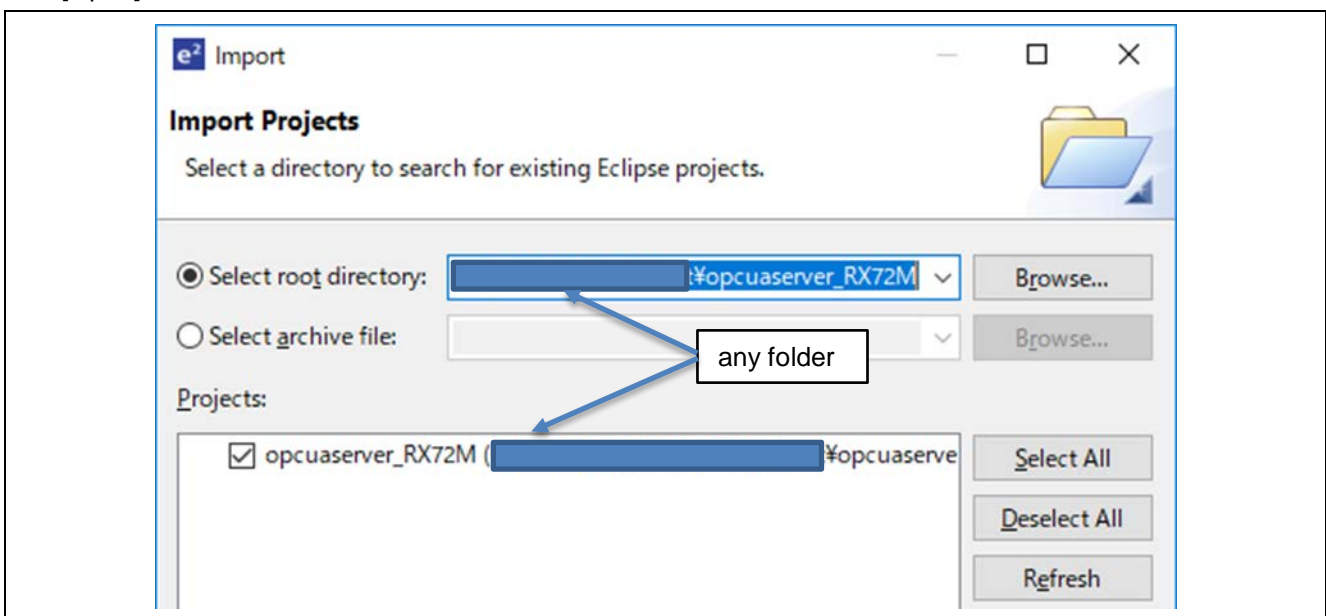
Check "RX72M_DnetSlave(RX72M_DnetSlave/)" under the "Projects" label and select [Next]. The project will be imported into the workspace.

6. Programming and Debugging

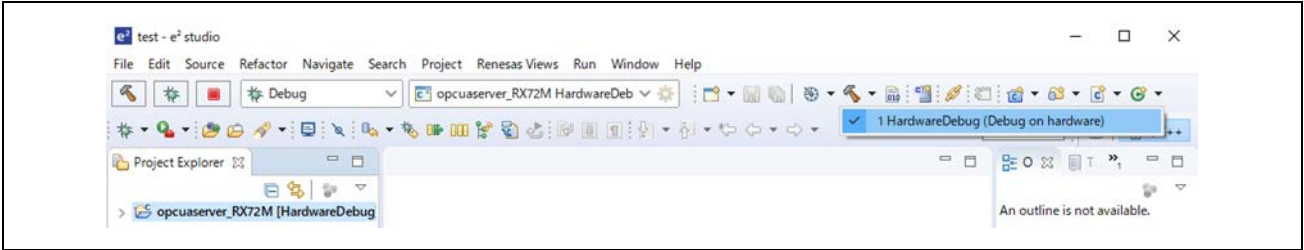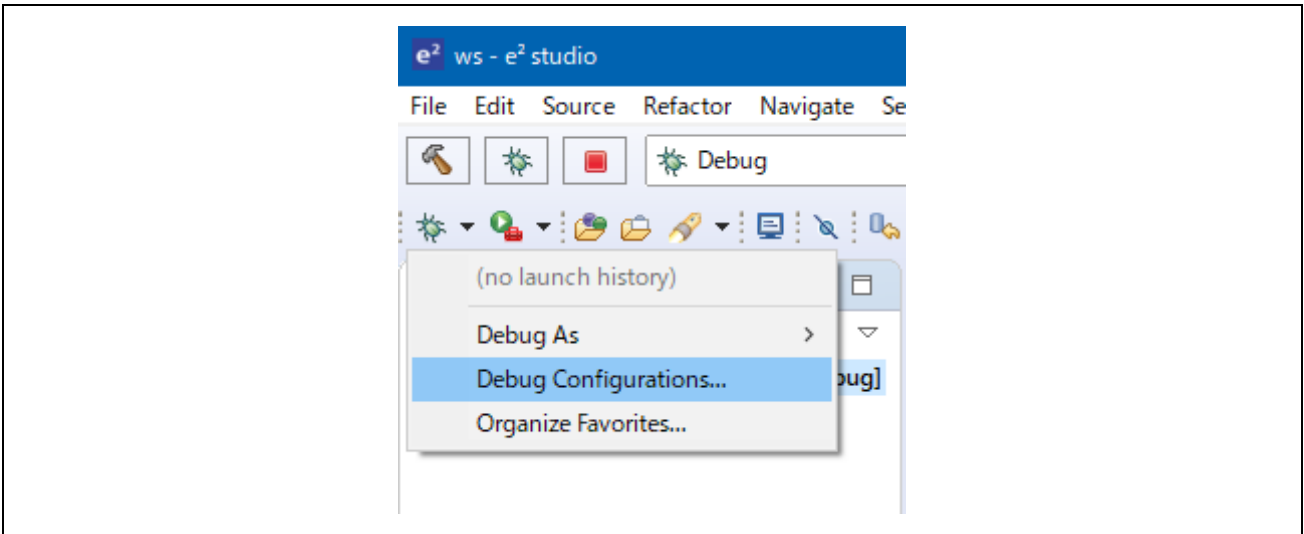(1) Select the "opcuaserver_RX72M" project in the Project Explorer view. Select the arrow next to the build button (hammer icon) and select [HardwareDebug] from the drop-down menu.

(2) e² studio will build the project. After the build is completed, select the arrow next to the debug button (bug icon). You can start debugging by selecting [Debug Configurations...].

(3) Select the file " opcuaserver_RX72M HardwareDebug" and download the program to the target device. Click on the [Debug] button to start debugging.
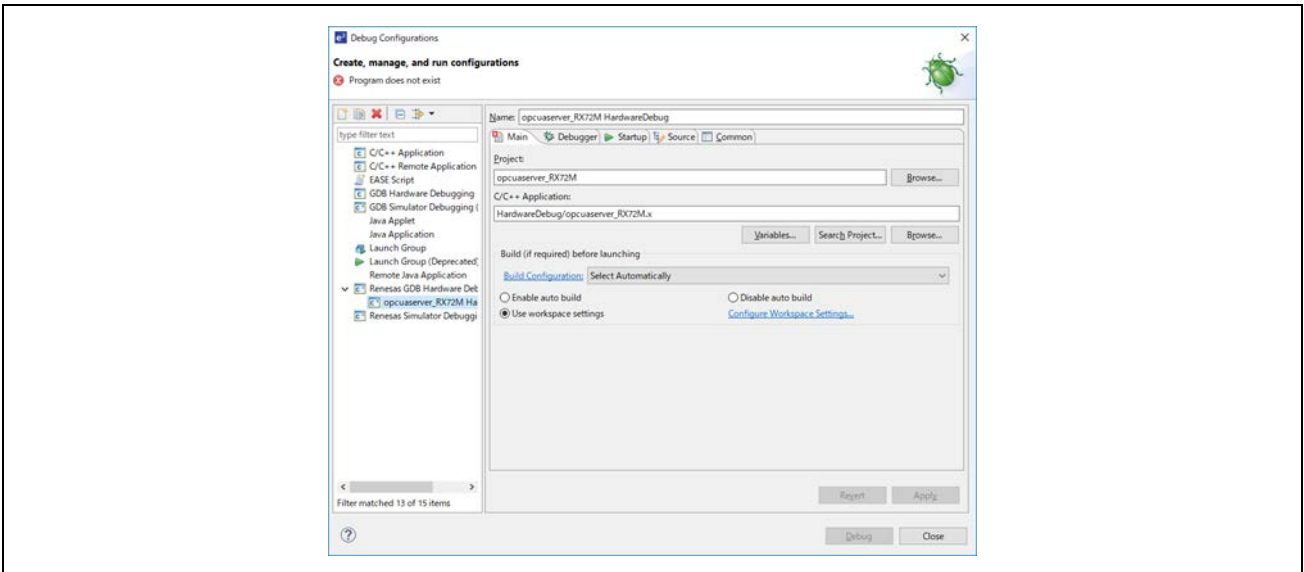
(4) If a firewall warning is displayed for "e2-server-gdb.exe", check the checkbox for [Private networks, such as my home or work network] and select [Allow access].

(5) The User Account Control (UAC) dialog box may appear. Enter the administrator's password and select [Yes].

(6) If the Confirm Perspective Switch dialog box appears prompting you to switch the perspective, check the checkbox for [Remember my decision] and select [Yes].

(7) The green "ACT" LED on the E2 Lite debugger will be continuously lit.

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.

7. Appendix

7.1 Verifying Operation of the Sample Program

Operation of the sample program can be verified as follows.

7.1.1 Configuration of Connections
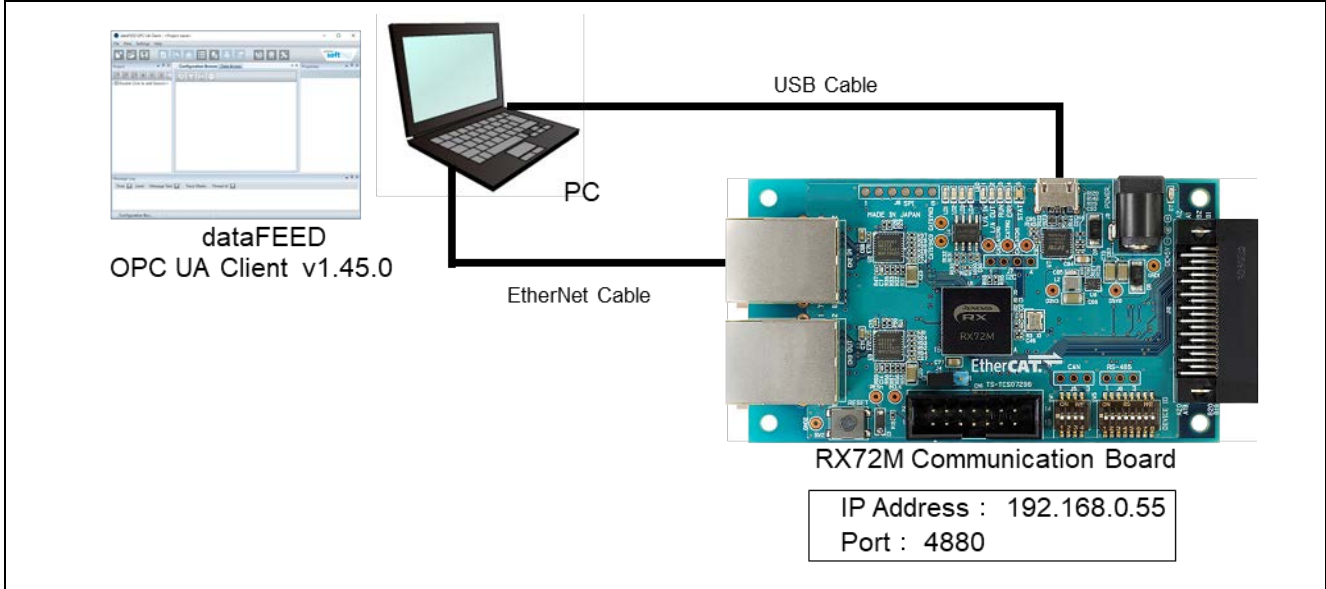
Figure 7.1   Configuration of Connections

Table 7.1   List of Devices

Item	Description
OPC UA Server device	RX72M communications board (with this sample program already written to it) TS-TCS02796 from Tessera Technology
PC software	dataFEED OPC UA Client (Softing)

7.1.2　Evaluation procedure

7.1.2.1　Connection with the Communication Board

Connect the communication board and PC, [refer to 7.1.1 System Configuration]
Power is supplied from communication board when PC and the USB serial of the communication board are connected.

7.1.2.2　Setting up the IP address of PC

(1) Set the IP address of PC. Open "Network Settings".

Windows10 : Control panel->Network and Sharing Center->Change adapter settings

(2) Select local area connection and select properties.
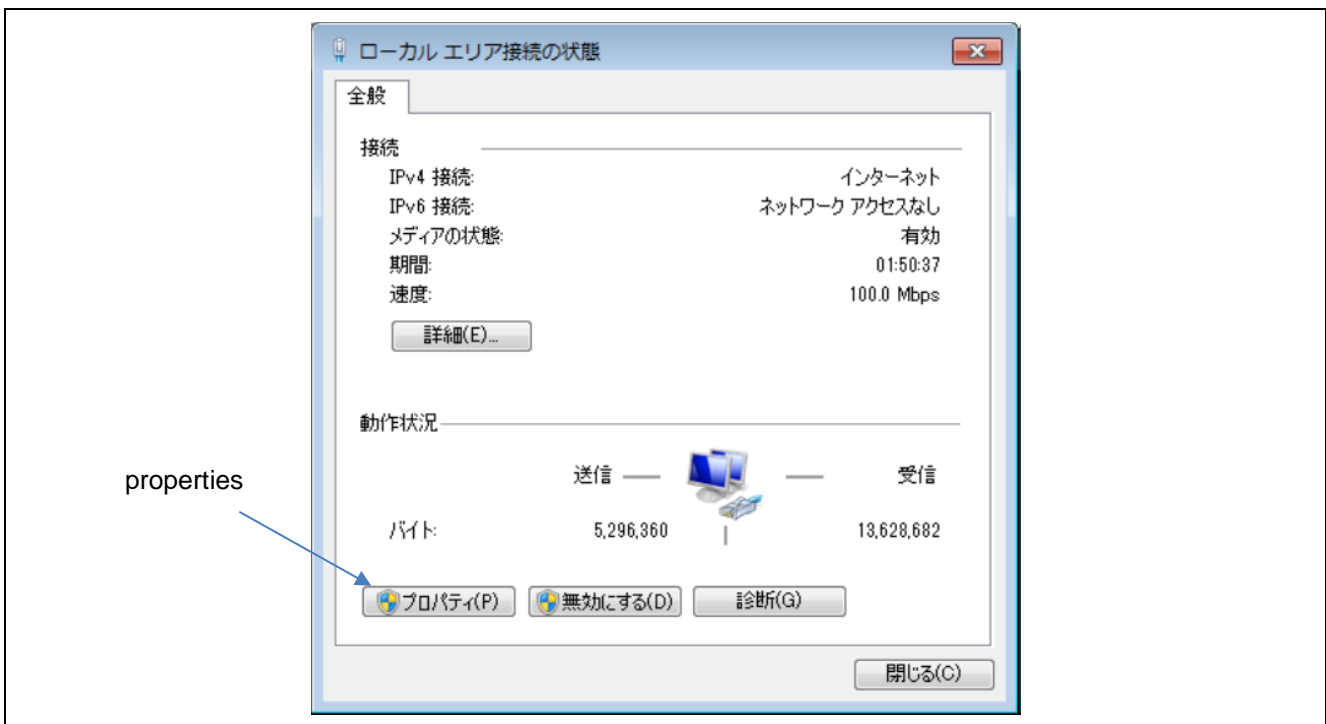
(3) Select "Internet Protocol Version 4(TCP/IPv4) and click on the [Properties] button.
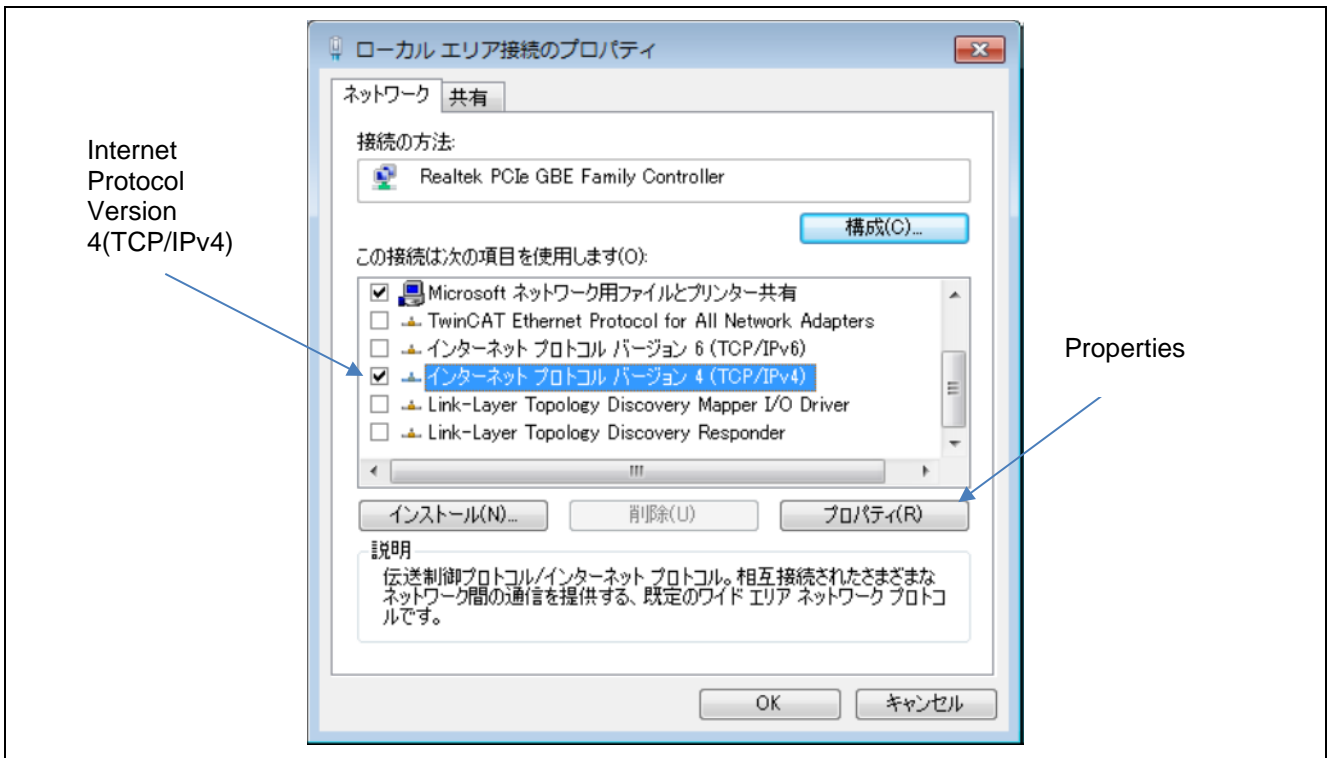
(4) Select the IP address and subnet mask in the area indicated by the red frame in the figure below.

IP address setting example　　　　　: 192.168.0.xx

Subnet mask setting example　　　　: 255.255.255.0
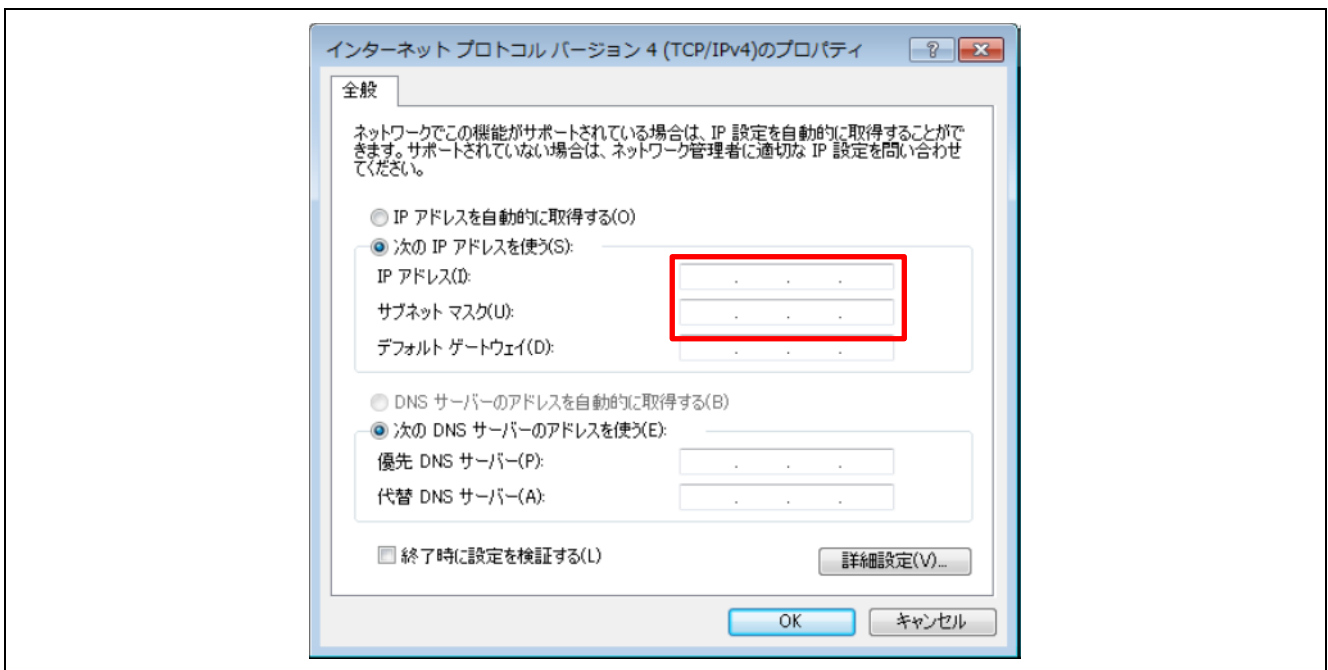
The setting up is complete.

7.1.2.3   Starting OPC UA Client

(1) From the Windows start up menu, start up the dataFEED.
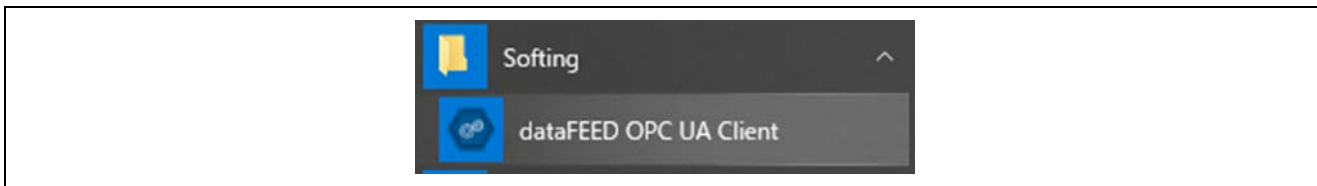
For information on install of dataFEED OPC UA Client refer to [Installation of 7.3 OPC UA Client].

(2) Click on the upper left, [Double click to added session].
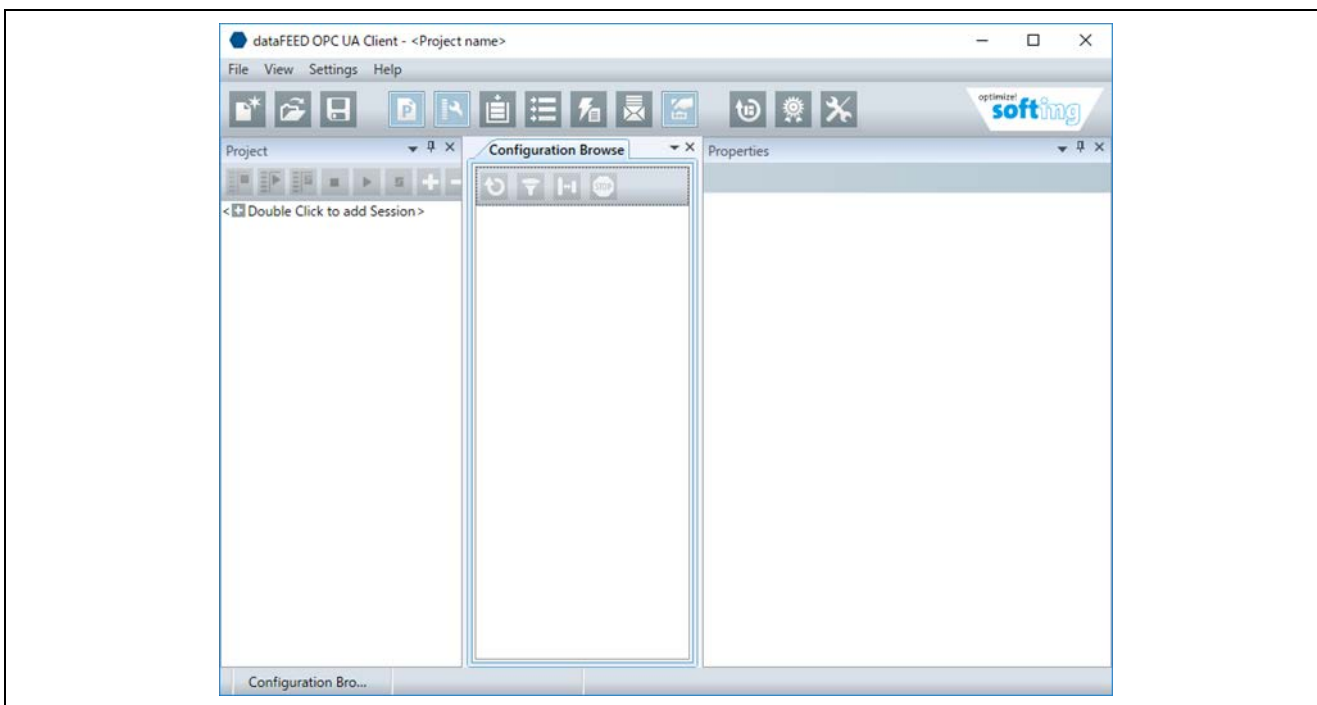
(3) Session Connect screen is displayed, enter the following information and click on OK.

   - Session Name：Any session name (ex：dataFEED OPC UA Client 1)

   - Endpoint URL：Endpoint の URL（ex：opc.tcp://192.168.0.55:4880/Renesas/MicroUaServer）

   - Security Mode: None

   - Security Policy: None

   - Message Encoding: Binary
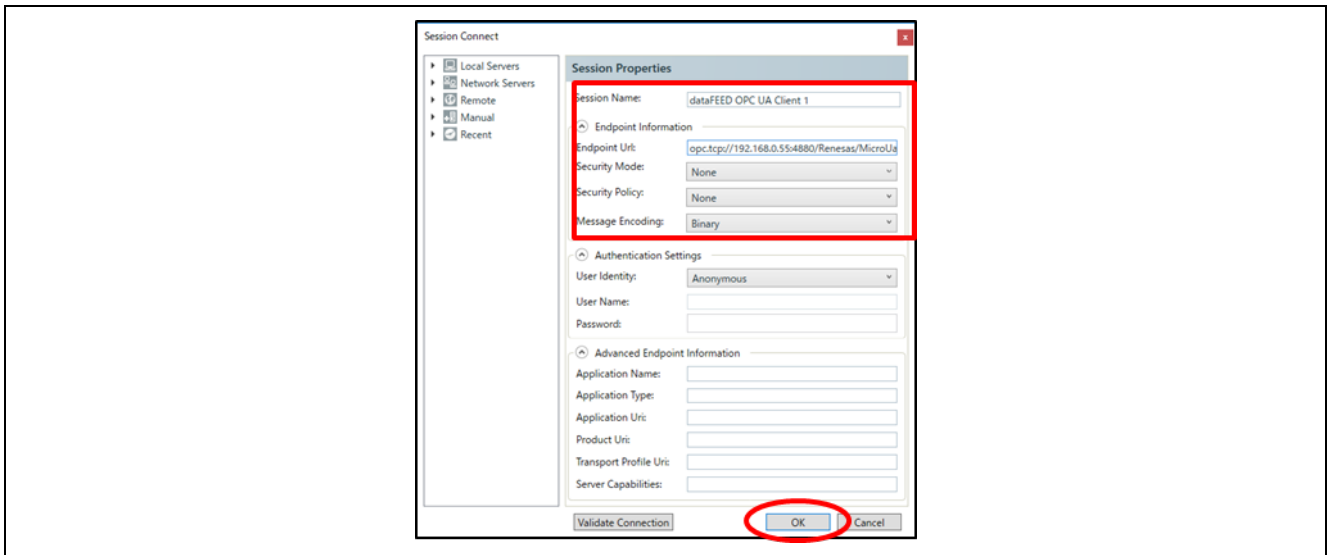
(3) Check whether the text at the bottom of the window has been［Active］.The connection with the OPC UA Server is complete.
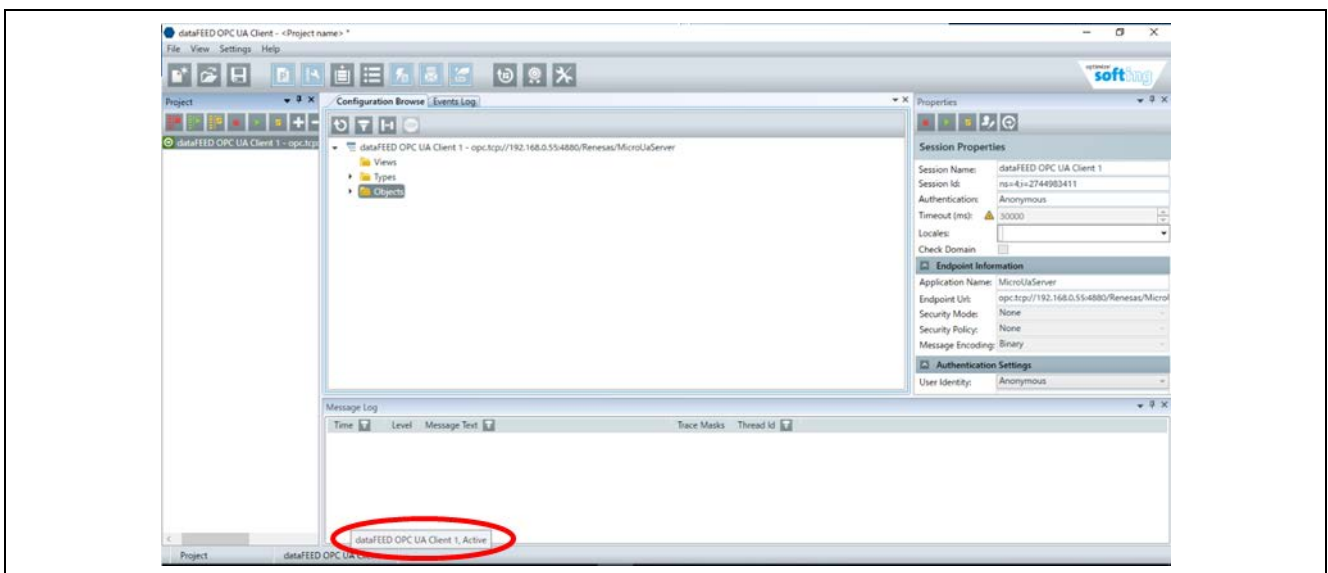
7.1.2.4   Reading out the data and Writing data of OPC UA Server

(1) Method of reading data

①   Open the Configuration Browse tab and select the browse name of the data want to read.
    (ex.Line_Fan1_RotasSpeed)

②   The data sent from the OPC UA Server is displayed in the Value window at the lower right of the screen.

③   The data is updated each time you click on the notepad icon at the bottom right of the Value window.
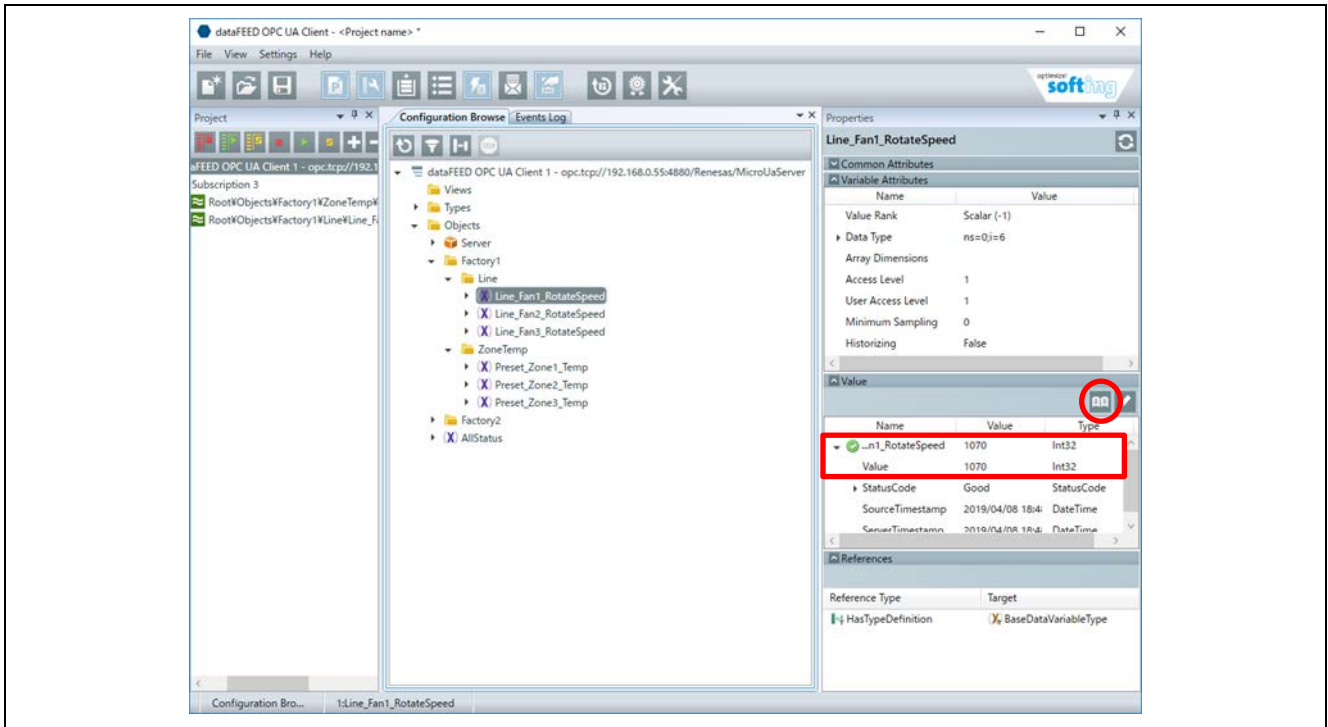
(2) Method of writing data

①   Open the [Configuration Brows tab]and select the browse name. (ex.Preset_Zone1_Temp)

②   Check the [Access Level] displayed on Variable Attributes is [3].

【Access Level】

   1：only reading out / can be read out and written

    （Change of Access Level can be configured by constructing the address area.）

③   It is written when pressing the Enter key or selecting the pencil mark at the upper right of the Value window.

④   Check that the value written in "Value" is displayed and " ● " is displayed.
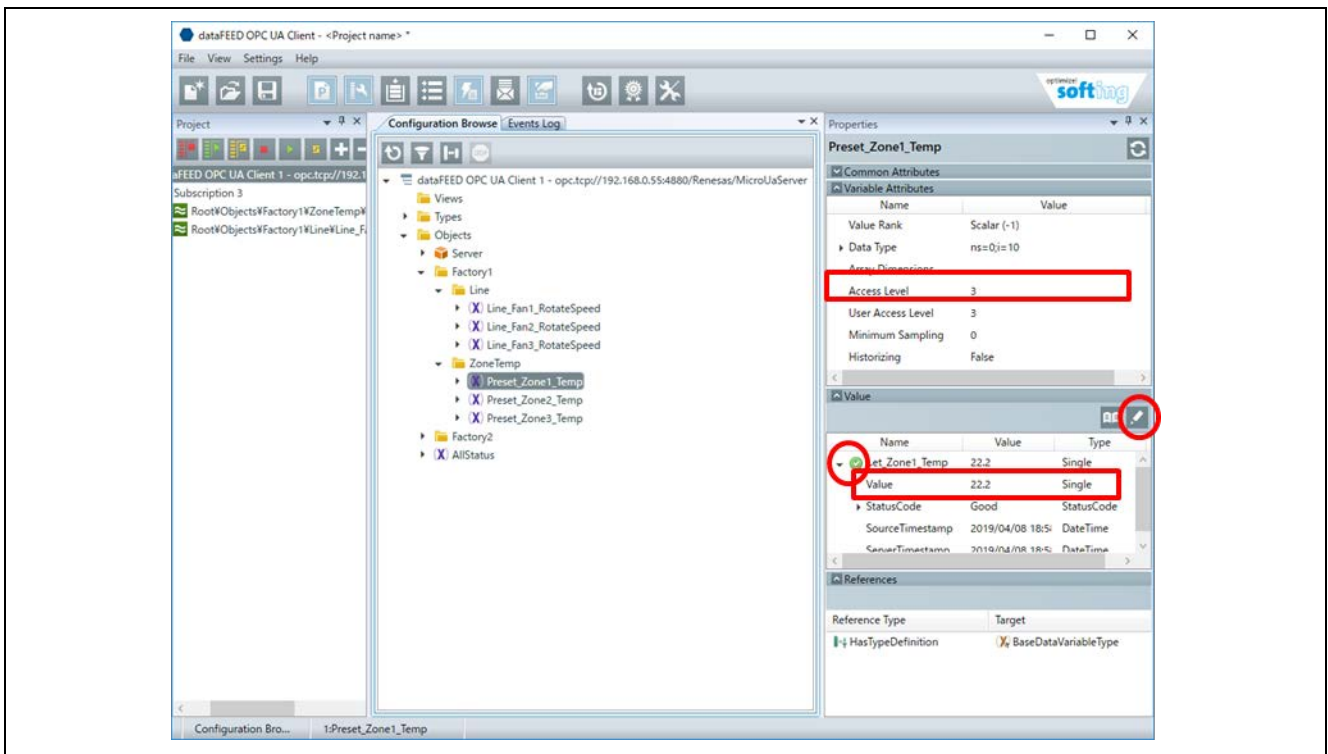
7.2   Setting IP address and port number

To change the IP address and port number of the communication board, change [APPLICATION/AppServer/appserver_ip_address.h] in this sample proglam.

■ If want to change the IP address.
①   Enter the IP address in NETCONFIG_IP_ADDRESS as a string.
②   Enter the IP address in hexadecimal in NETCONFIG_IP_ADDRESS.

      Ex.) If IP address is "192.168.0.32"

        #define NETCONFIG_IP_ADDRESS   "192.168.0.32"

        #define NETCONFIG_IP_ADDRESS_BIN   0xC0A80020

■ If want to change the Subnet Mask
①   Enter Subnet Mask as a string in NETCONFIG_NET_MASK.

②   Enter Subnet Mask in hexadecimal in NETCONFIG_NET_MASK.

      Ex.) If Subnet Mask is "255.255.255.0"

        #define NETCONFIG_NETMASK   "255.255.255.0"
        #define NETCONFIG_NETMASK_BIN   0xFFFFFF00

■ If want to change the Port number
③   Enter the port number in decimal in NETCONFIG_ PORT_NUMBER.

      Ex.) If Port number is 4840

        #define NETCONFIG_PORT_NUMBER   4840

7.3   Installing OPC UA Client

7.3.1   Downloading of dataFEED OPC UA Client

You need to register an account when downloading dataFEED OPC UA Client of Softing.
Register an account from the following URL and downloading.

Softing :   https://company.softing.com/en/startpage.html

7.3.2   Installing dataFEED OPC UA Client

①   Start the installer (InstallDataFFEDOpcUaClientxxx.exe), Clic on [Next>](xxx: Version)
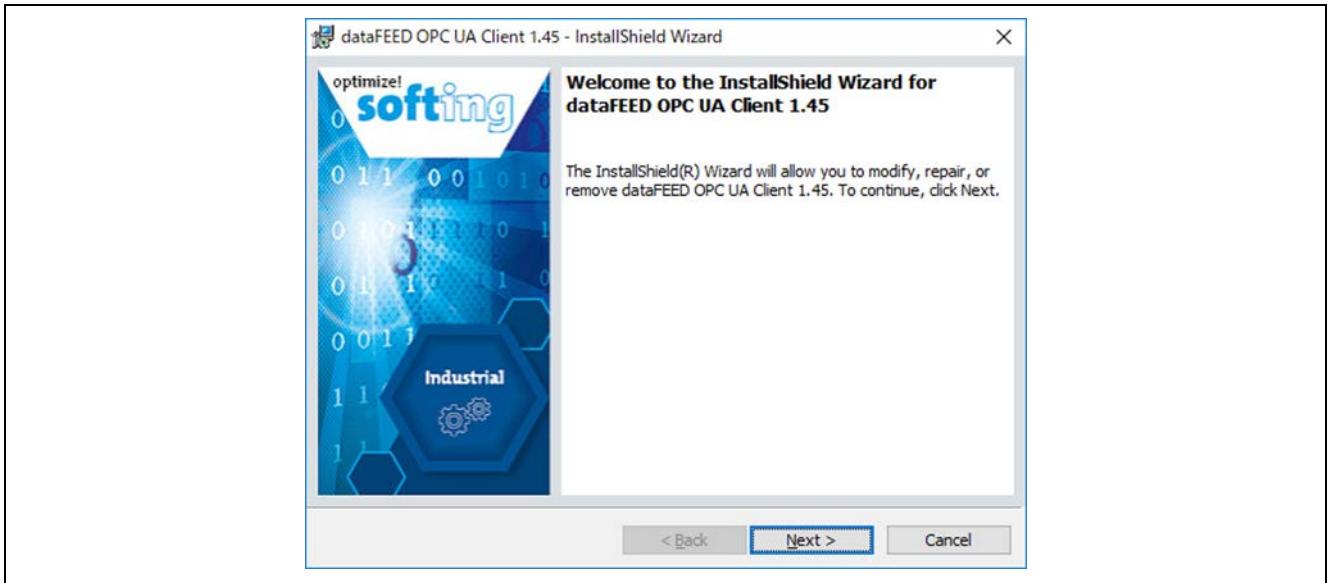
②   Select [I accept the terms in the license agreement] and click on the [Nexst>] button.
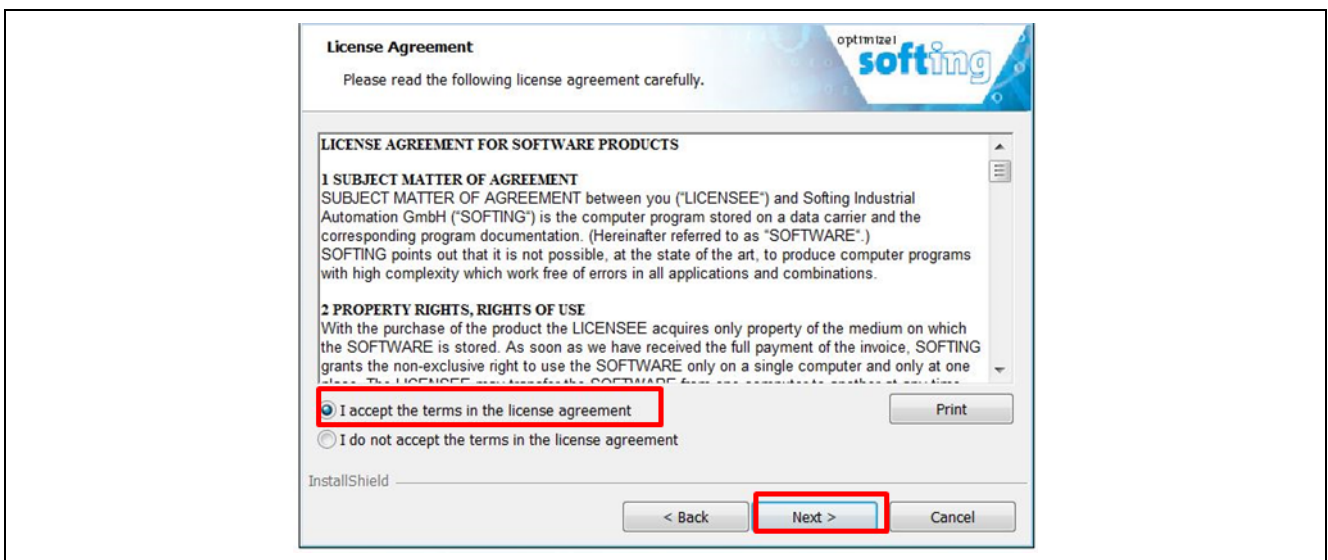
③   Click on the [Install] and start the installation.
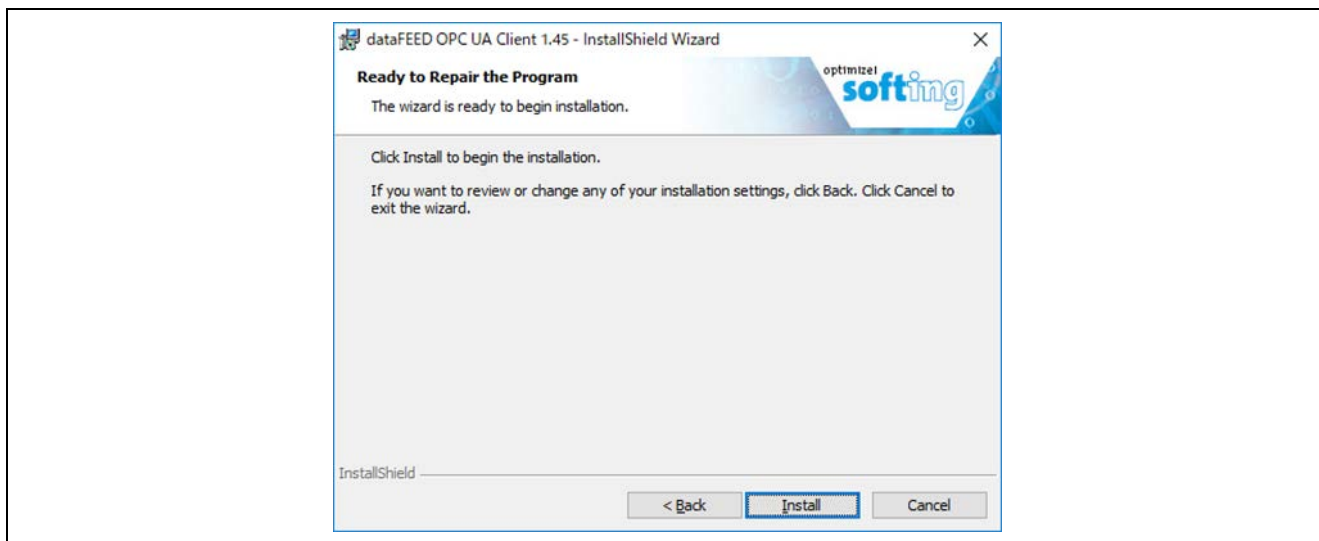
④   When the installation is complete, the view results screen is displayed and click on the［Finish］.

⑤   A shortcut of 「dataFEED OPC UA Client」 is created on the desktop.
    dataFFED of installation is completed.

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Revision History

| | | Description | |
Rev.	Date	Page	Summary
1.00	Aug. 2, 2019	—	First edition issued

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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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   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.

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