

R-IN32M3-EC

Industry Ethernet Communication LSI

R18UZ0013EJ0401

Rev.4.01

Apr 19, 2019

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1. How to obtain and install the IAR software and license

1.1 Download the IAR Embedded Workbench software

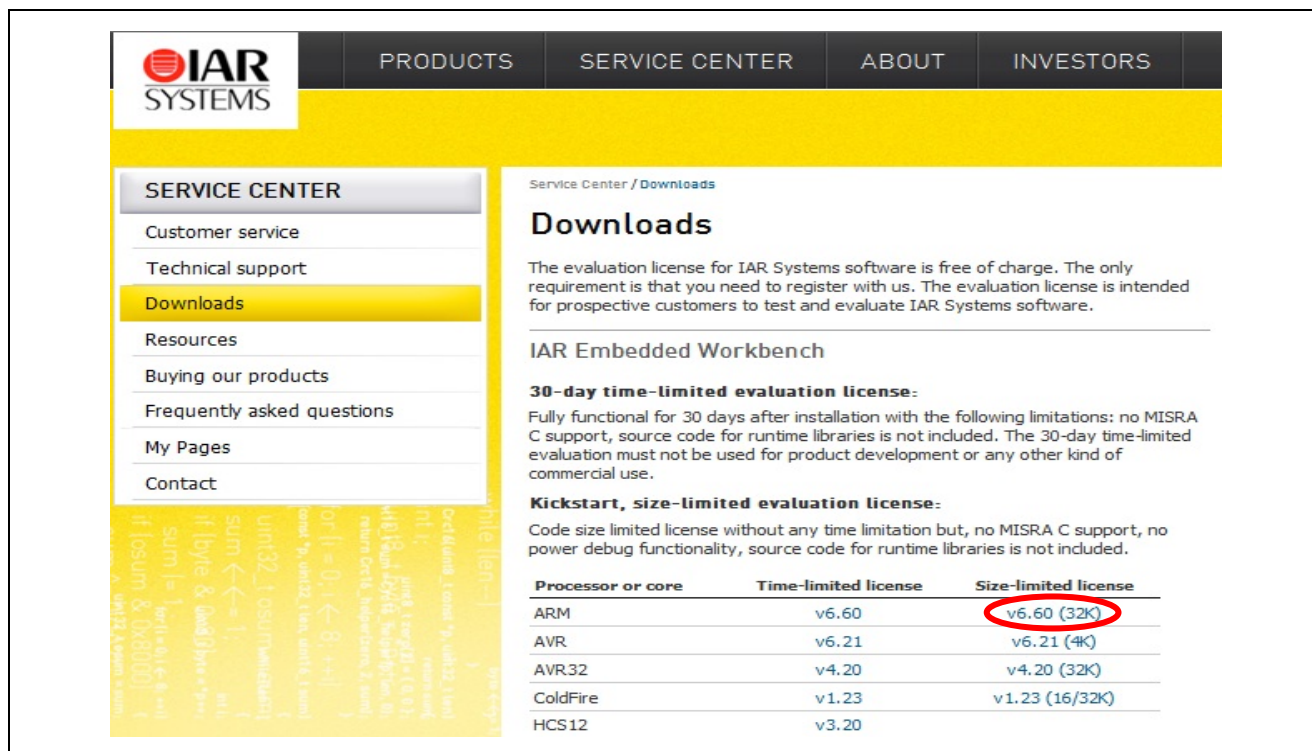
Download IAR Embedded Workbench software from <http://www.iar.com>.



Important notes:

To use the R-IN32 sample code you must install IAR Embedded Workbench version 6.60 or higher.

If you want to use one of the SEGGER J-Link debuggers (J-Link Plus or J-Link Lite CortexM-19 as shown in chapter 3) you must install the IAR Embedded Workbench version 6.70 or higher. This will include the J-Link driver software required for R-IN32M3 flash support.



IAR SYSTEMS

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The evaluation license for IAR Systems software is free of charge. The only requirement is that you need to register with us. The evaluation license is intended for prospective customers to test and evaluate IAR Systems software.

IAR Embedded Workbench

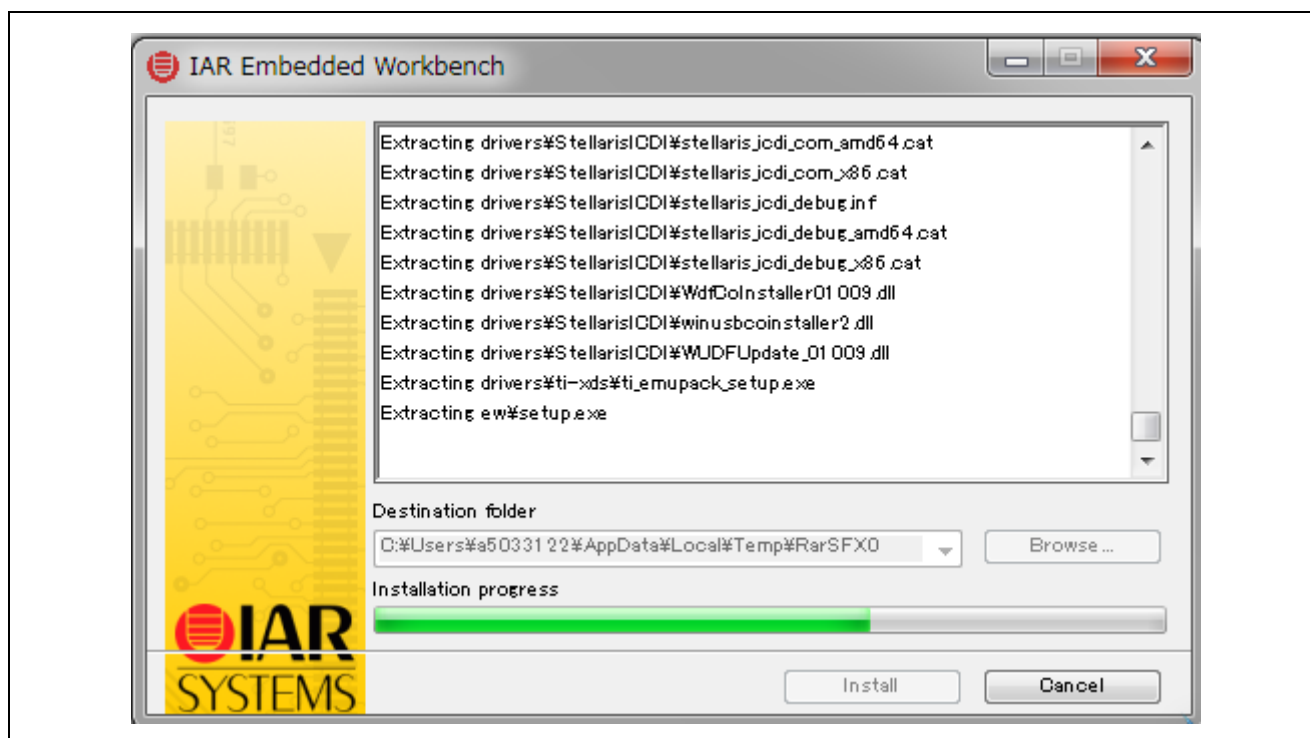
30-day time-limited evaluation license:
Fully functional for 30 days after installation with the following limitations: no MISRA C support, source code for runtime libraries is not included. The 30-day time-limited evaluation must not be used for product development or any other kind of commercial use.

Kickstart, size-limited evaluation license:
Code size limited license without any time limitation but, no MISRA C support, no power debug functionality, source code for runtime libraries is not included.

Processor or core	Time-limited license	Size-limited license
ARM	v6.60	v6.60 (32K)
AVR	v6.21	v6.21 (4K)
AVR32	v4.20	v4.20 (32K)
ColdFire	v1.23	v1.23 (16/32K)
HCS12	v3.20	

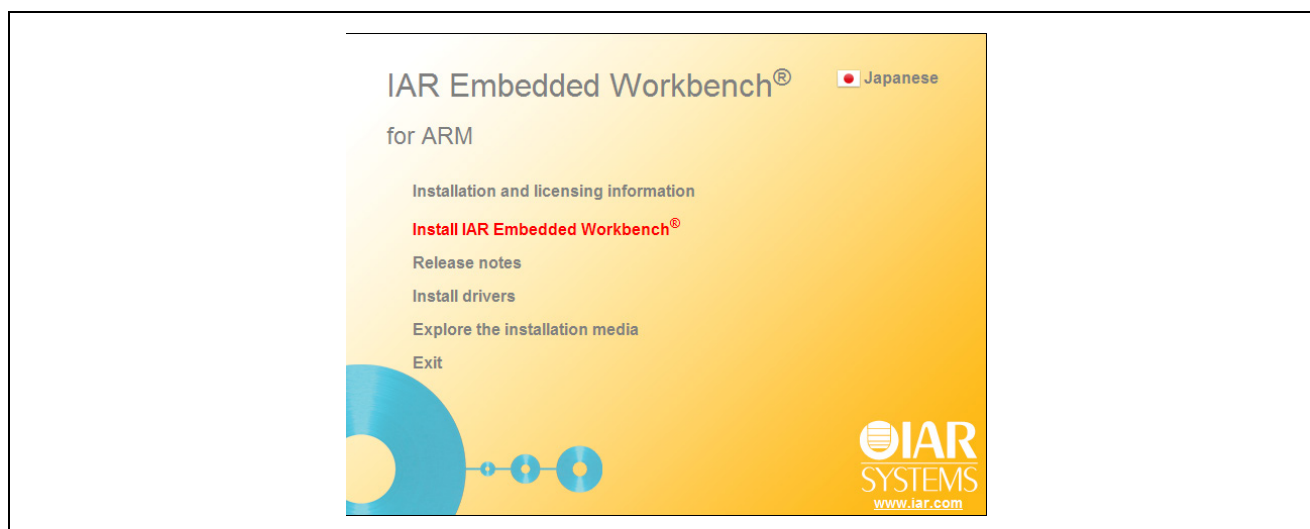
1.2 Install IAR Embedded Workbench

- (1) Double click the downloaded file, the following window will appear as the software is uncompressed.



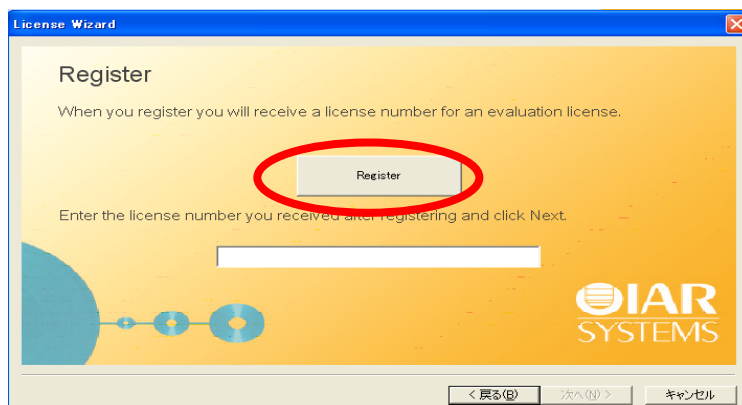
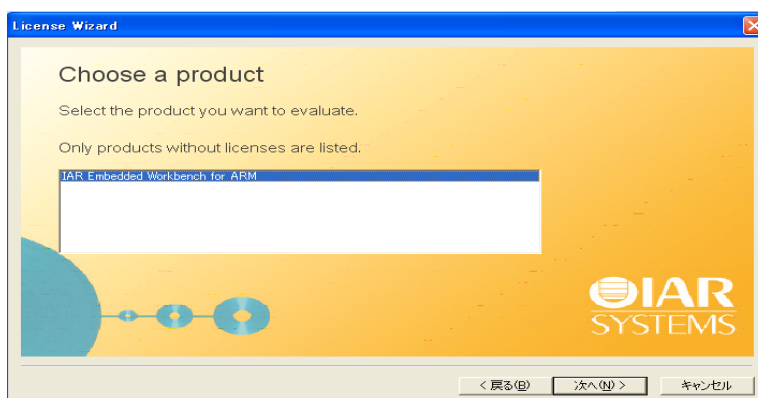
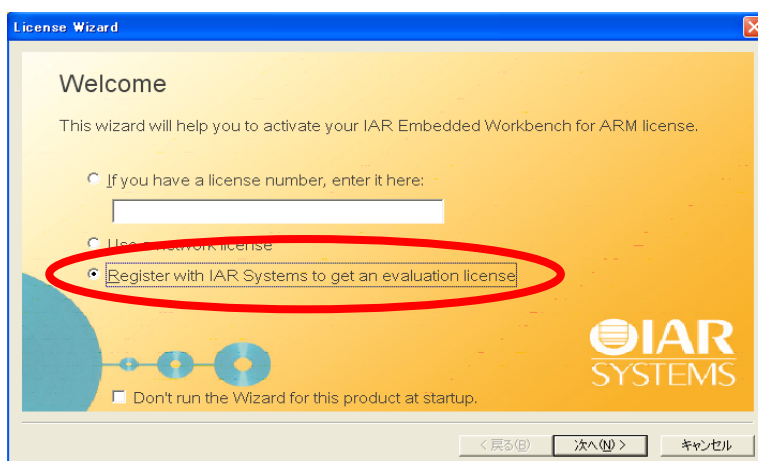
The window shown above will be opened automatically and the necessary files will be uncompressed to a temporary folder under the C:\Users directory. After uncompressing, the window shown below will open automatically.

- (2) Click [Install IAR Embedded Workbench®].

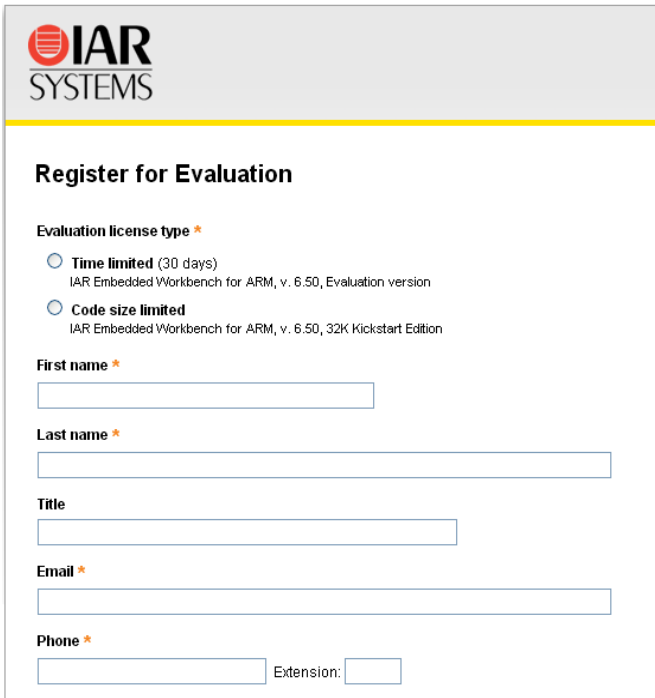


(3) Obtain an evaluation license

Note: There are two types of evaluation licenses from IAR: Time limited (30 days) and Code size limited. It is possible to use the 32KB code size-limited evaluation license for an operation check of R-IN32 sample code. Since some sample code such as TCP / IP stack exceeds 32 KB size, operation check can not be performed.

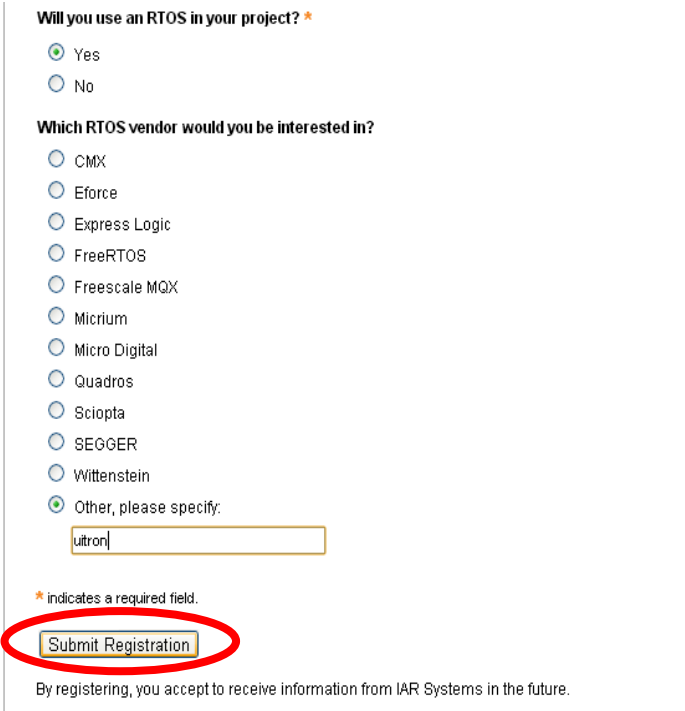


- (4) IAR will email license information to the email address entered into the form above. Generally both license types (time limited and code size limited) will work for R-IN32M3 EtherCAT® sample software (<32KB code memory size). Please refer to the IAR website for more details on the evaluation license limitations.



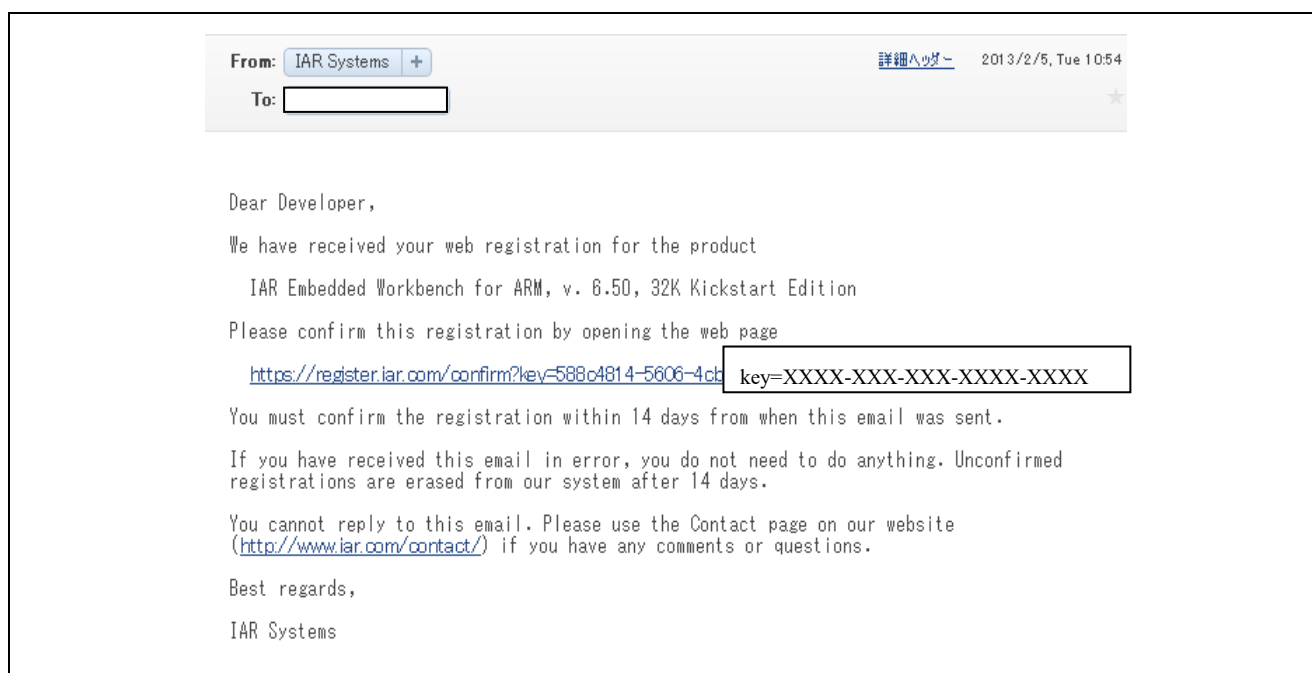
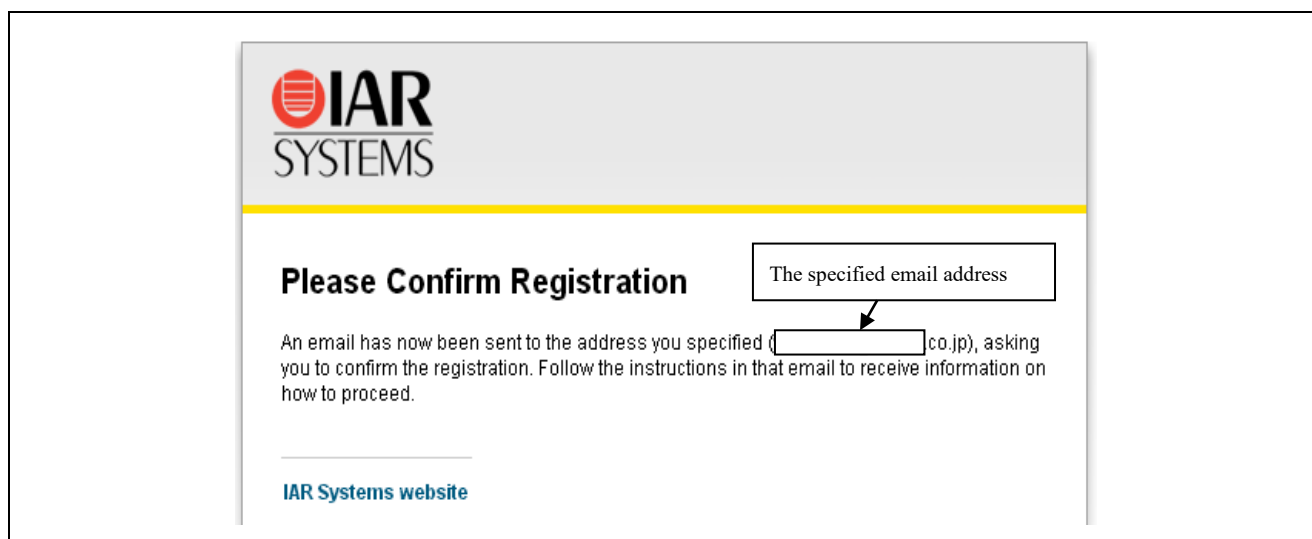
The image shows the 'Register for Evaluation' form from IAR Systems. The form includes the IAR Systems logo at the top. Below the logo, the title 'Register for Evaluation' is displayed. The form contains several sections: 'Evaluation license type' with two radio button options: 'Time limited (30 days)' (selected) and 'Code size limited'. Below these are text boxes for 'First name', 'Last name', 'Title', 'Email', and 'Phone' (with an 'Extension' field). The form is enclosed in a light gray border.

Please click [Submit Registration] after entering data into the required fields.

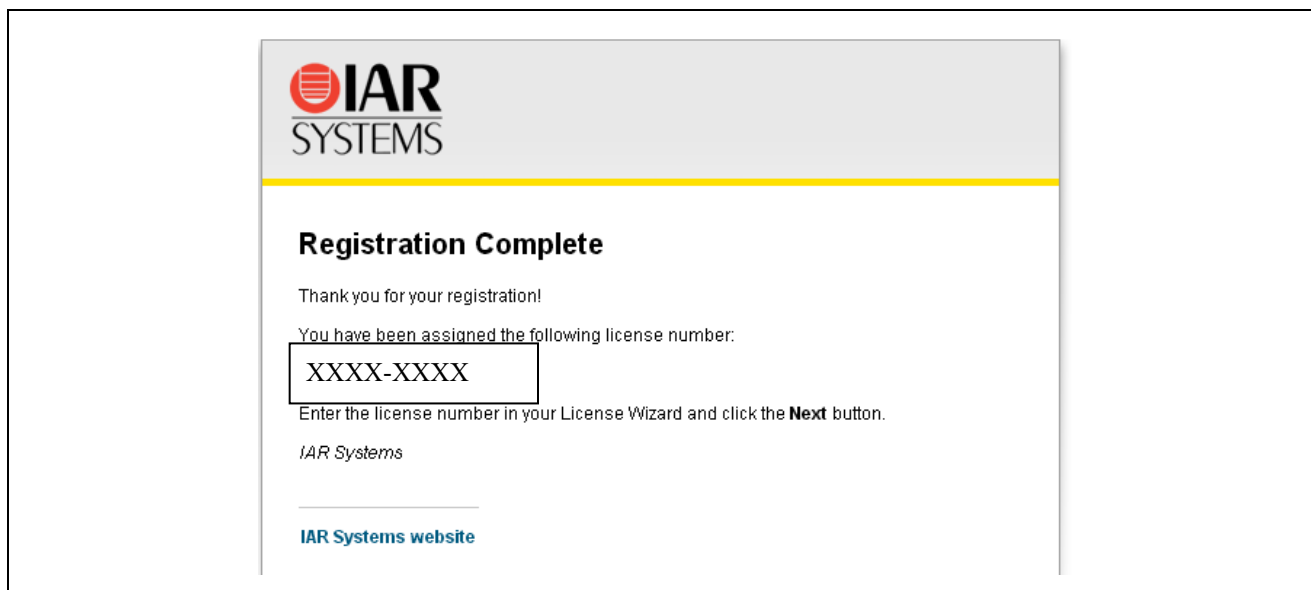


The image shows the 'Will you use an RTOS in your project?' section of the registration form. It includes a radio button for 'Yes' (selected) and 'No'. Below this is the question 'Which RTOS vendor would you be interested in?' followed by a list of vendors with radio buttons: CMX, Eforce, Express Logic, FreeRTOS, Freescale MQX, Micrium, Micro Digital, Quadros, Sciopta, SEGGER, Wittenstein, and 'Other, please specify:'. The 'Other' option is selected, and a text box contains the word 'uitron'. Below the list is a red circle around the 'Submit Registration' button. A small asterisk indicates a required field. At the bottom, a line of text states: 'By registering, you accept to receive information from IAR Systems in the future.'

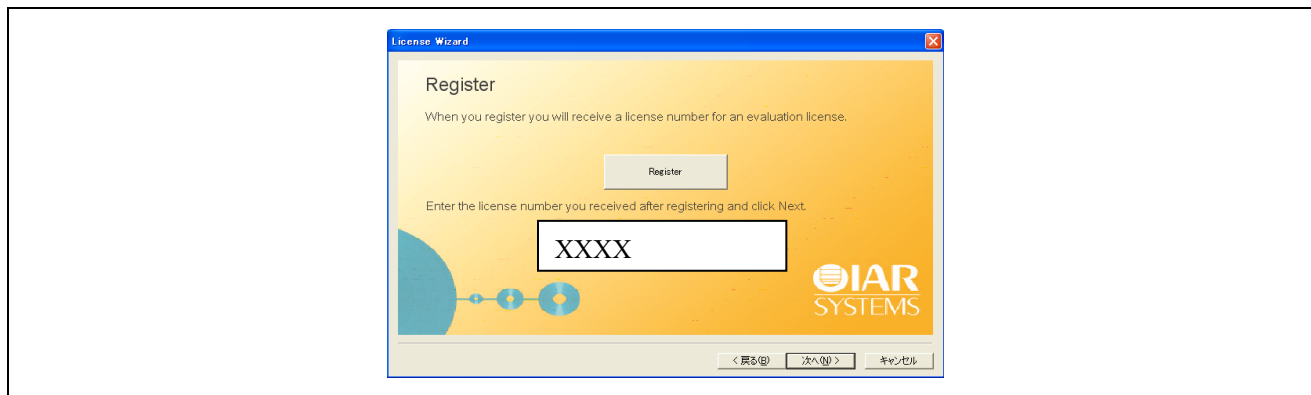
- (5) A link of the form <https://register.iar.com/confirm?key=XXXX> will be sent to your email address; please click this link to confirm registration and obtain your evaluation license key.



The 14-digit license key will be shown as below. This license key is bound to the PC you used for the registration, so different licenses are required for different PCs.



- (6) After the above procedure, installation and registration of IAR Embedded Workbench is complete.



2. TwinCAT Installation

Double click \software\TwinCAT\setup in the CD-ROM for TwinCAT® installation to install TwinCAT. Or, download TwinCAT from <http://www.beckhoff.com/english.asp?twincat/tcatdow.htm> and double-click the downloaded file.

The following sections describe the installation procedures for both TwinCAT2 and TwinCAT3. Please install one or the other; you do not need to install both of them. Note that TwinCAT3 is required for 64-bit operating systems.

[Caution 1] The Beckhoff website and TwinCAT installation procedure may differ from the images shown in this document if and when Beckhoff updates their website or releases a new version of the software.

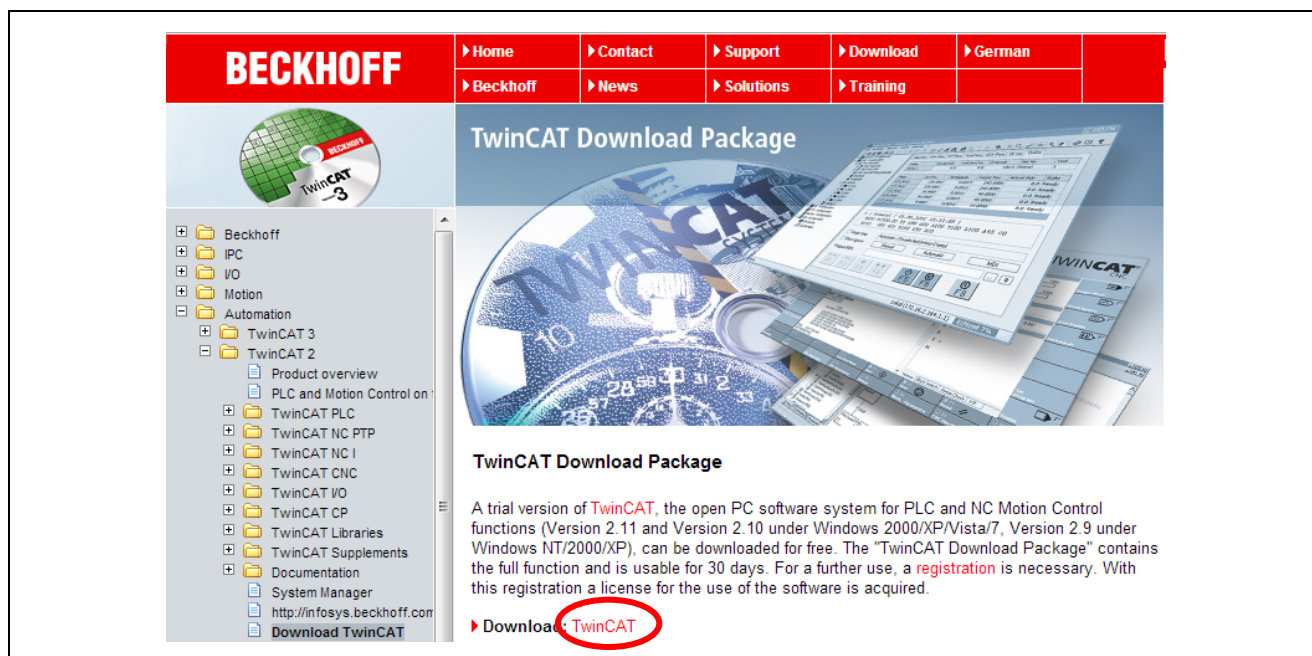
Please treat the following instructions as an example and modify as needed


[Caution 2] One of the features of TwinCAT3 is support for multi-core and 64-bit systems. If you are using a 64-bit operating system, please use the TwinCAT3 version.

[Caution 3] Renesas Electronics provides support for the description of the evaluation board operation check procedures included in this document.

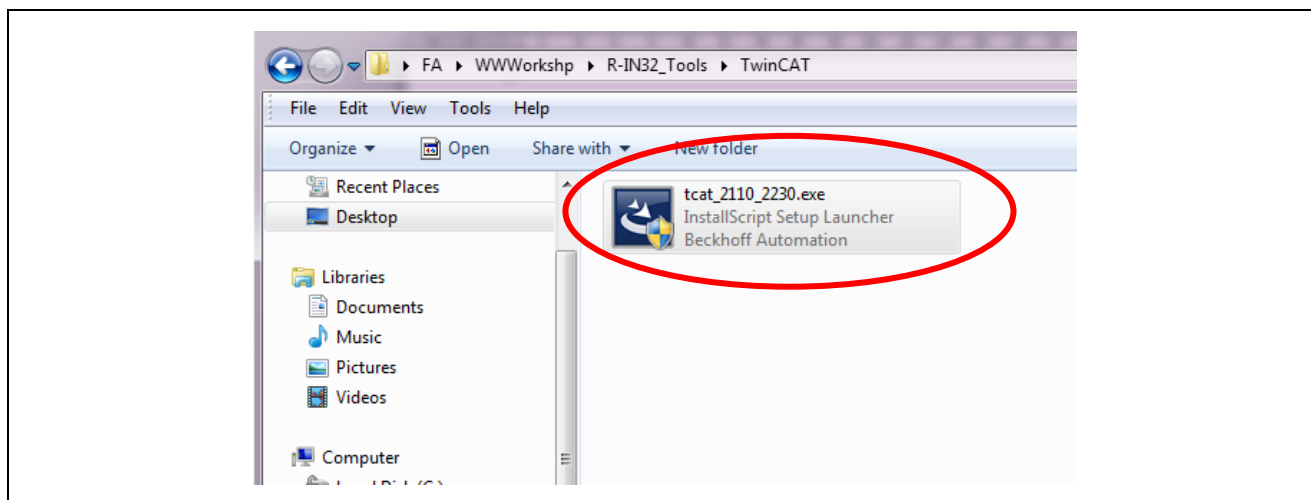
2.1 TwinCAT2 installation

2.1.1 How to install

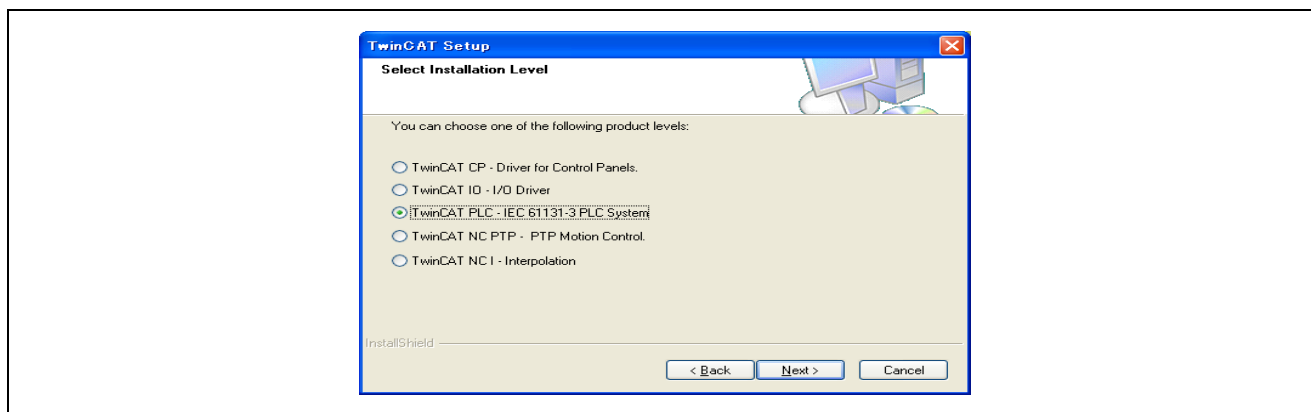
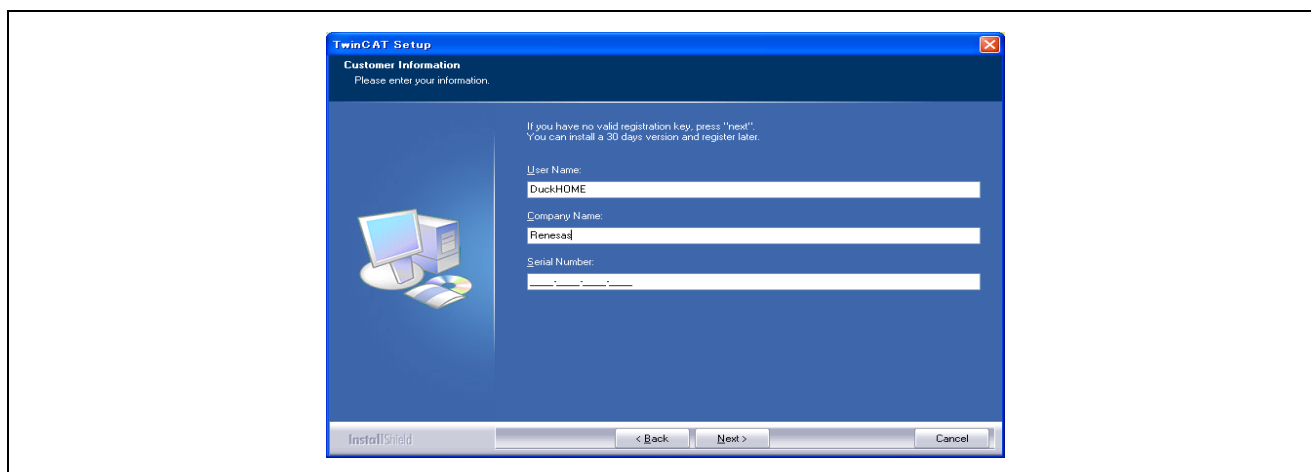


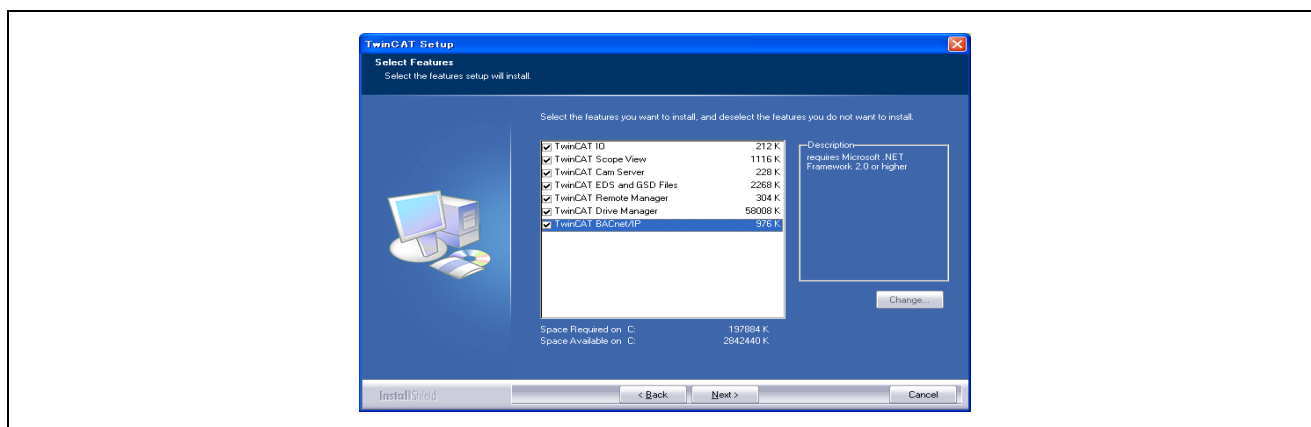
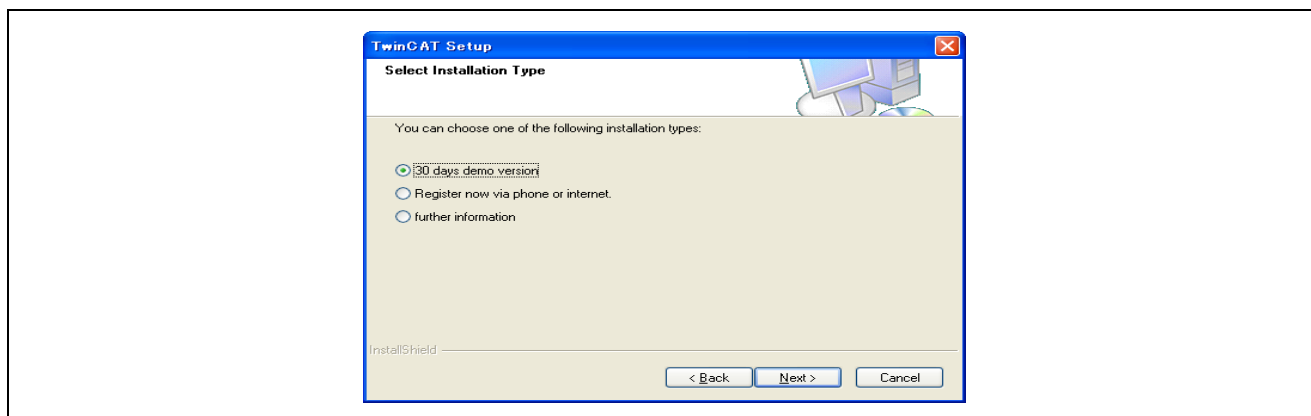
BECKHOFF		Home	Kontakt	Support	Download	English
		Beckhoff	News	Solutions	Training	
		Company: <input type="text"/> <i>Please insert your company name!</i>				
		Address: <input type="text"/> <input type="text"/>				
		ZIP Code: <input type="text"/> <i>Please insert the ZIP code!</i>				
		City: <input type="text"/> <i>Please insert the city!</i>				
		Country: <input type="text"/> <i>Please insert the country!</i>				
		eMail: <input type="text"/> <i>Please insert a valid email address!</i>				
		Phone: <input type="text"/>				
		Fax: <input type="text"/>				
		Version: <input checked="" type="radio"/> TwinCAT 2.11 R3, Build 2230 <input type="radio"/> TwinCAT 2.11 x64 Engineering, Build 2230 <input type="radio"/> previous Version Please select the TwinCAT version! <input type="text" value="TwinCAT 2.11 x64 Engineering, Build 2229"/>				
<div><div>+</div> Beckhoff</div> <div><div>+</div> IPC</div> <div><div>+</div> I/O</div> <div><div>+</div> Motion</div> <div><div>+</div> Automation</div> <div><div>+</div> Applications & Solutions</div> <div><div>+</div> Support</div> <div><div>+</div> Training</div> <div><div>+</div> Download</div> <div><div>+</div> Search</div> <div><div>+</div> Home</div>		<div>Reset</div> <div>Registration</div>				

Navigate to the location of the file you downloaded or the CD-ROM and double-click the file to install TwinCAT.

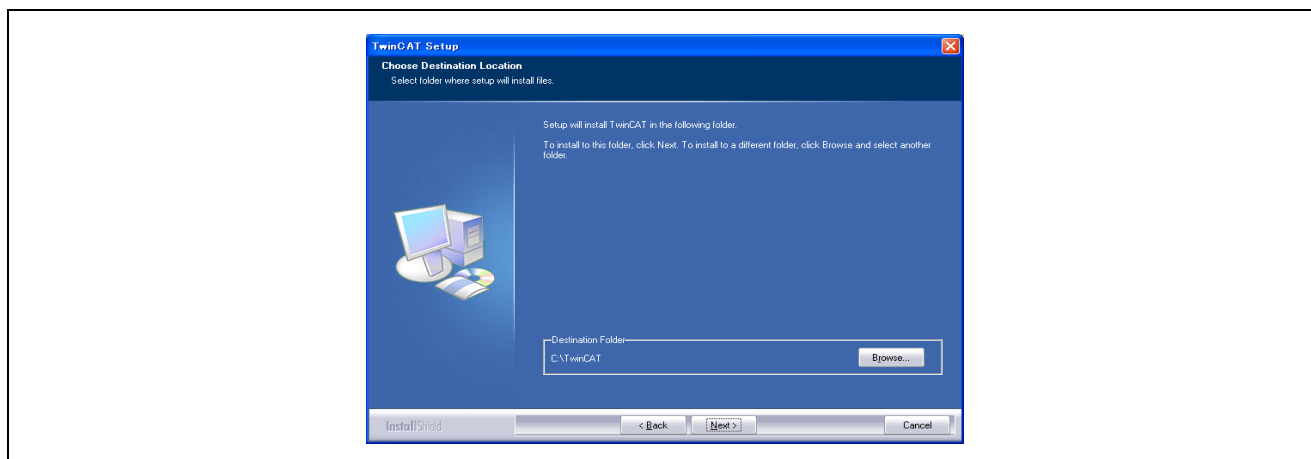


Please fill in [User Name] and [Company Name]. It is OK to keep [Serial Number] empty.





Please install the software in the C:\TwinCAT directory on your PC. It may not work correctly if TwinCAT is installed in a different directory than the default.

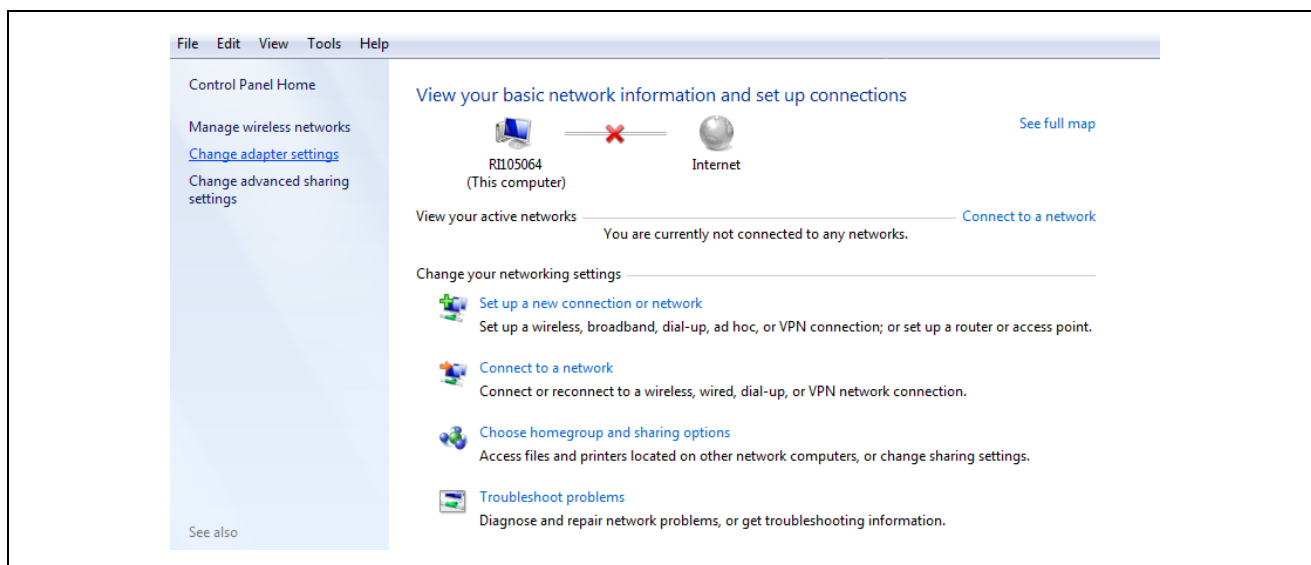


2.1.2 Add TwinCAT RT-Ethernet network service

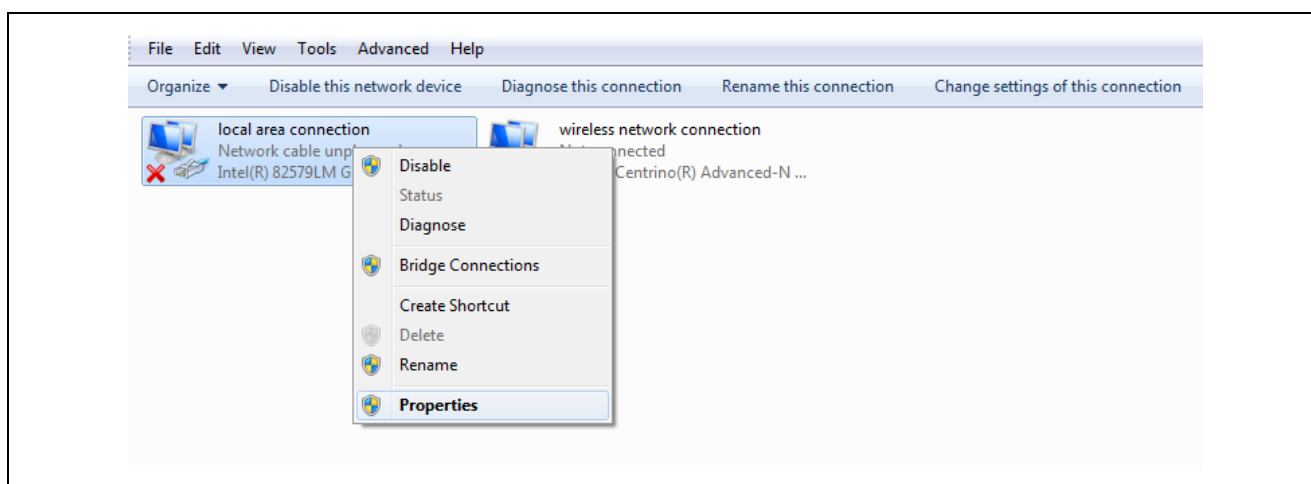
Please refer to the following website for the latest information about the installation procedure for the driver.

<http://infosys.beckhoff.com/content/1033/tcssystemmanager/fieldbus/rtethernet/tci8255xinstal.htm>

- (1) Click [Control Panel]⇒[Network and Joint Ownership Center]⇒[Change Adapter Settings],

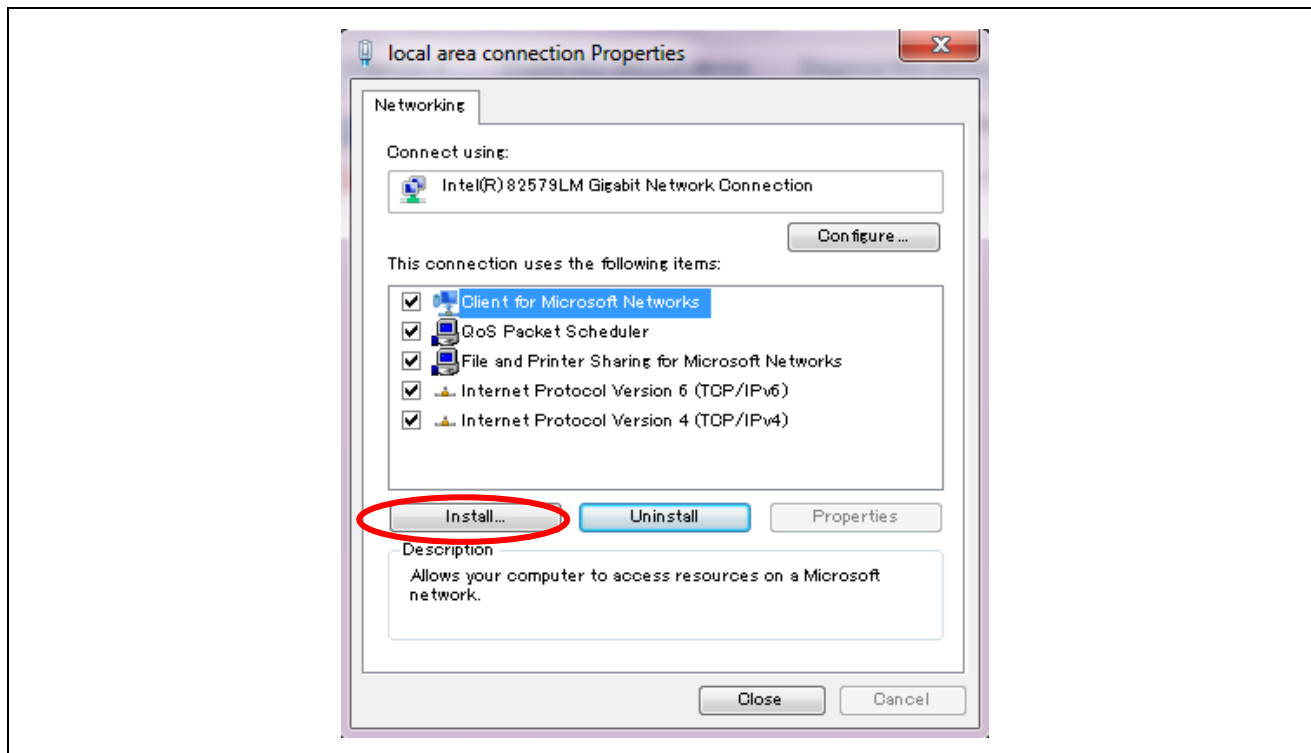


- (2) Choose [Local Area Connection], click the right mouse button and choose [Properties] as shown in the window below.

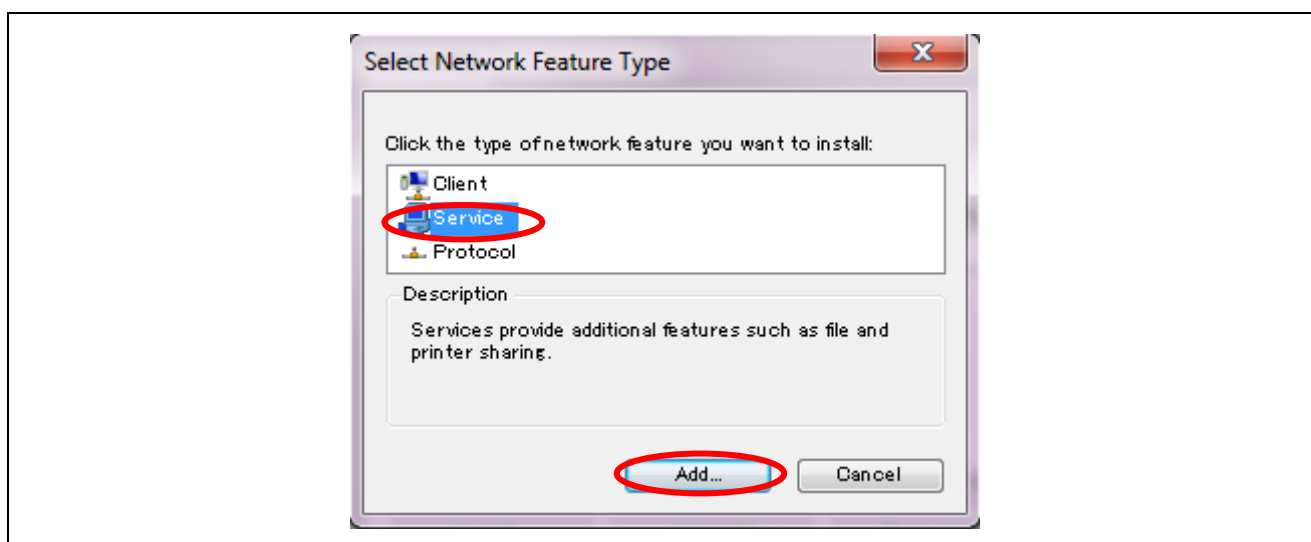


(3) Set up the driver as shown in the following images.

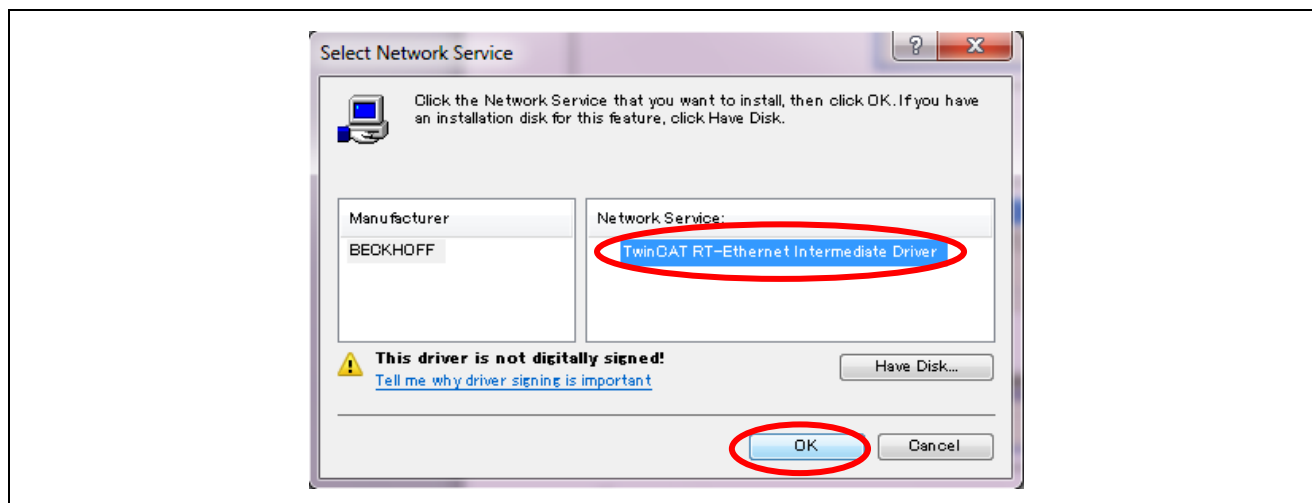
(a)



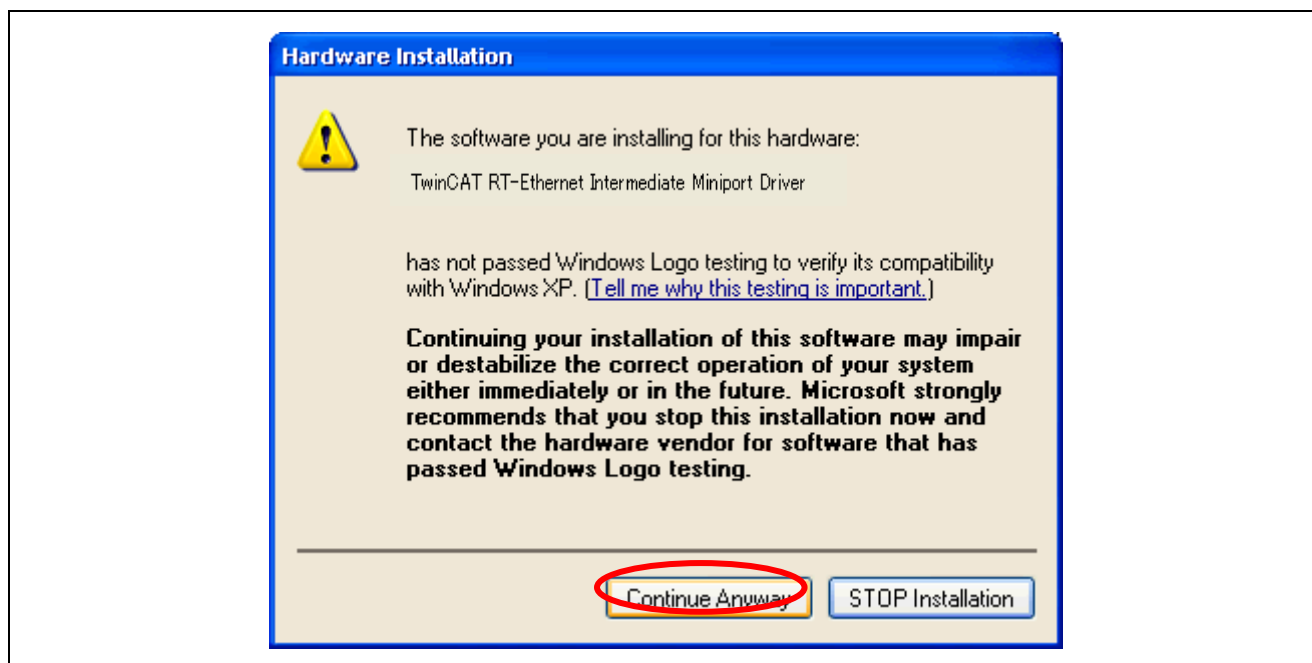
(b)



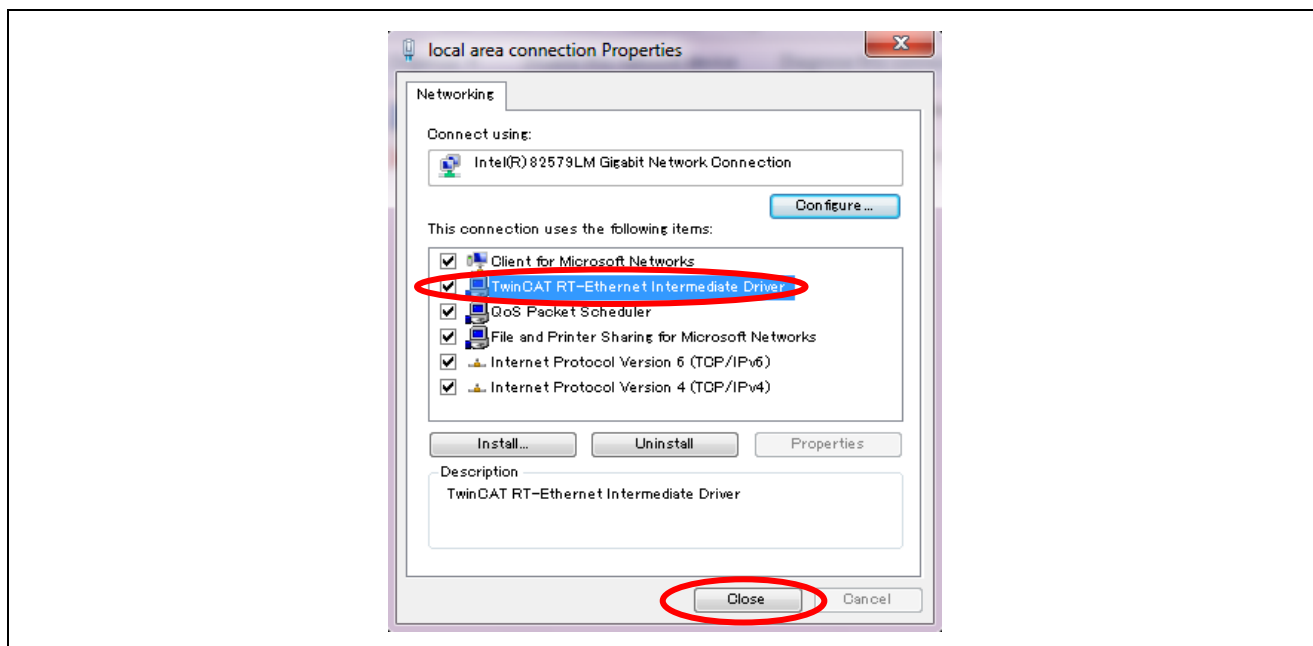
(c)



(d)

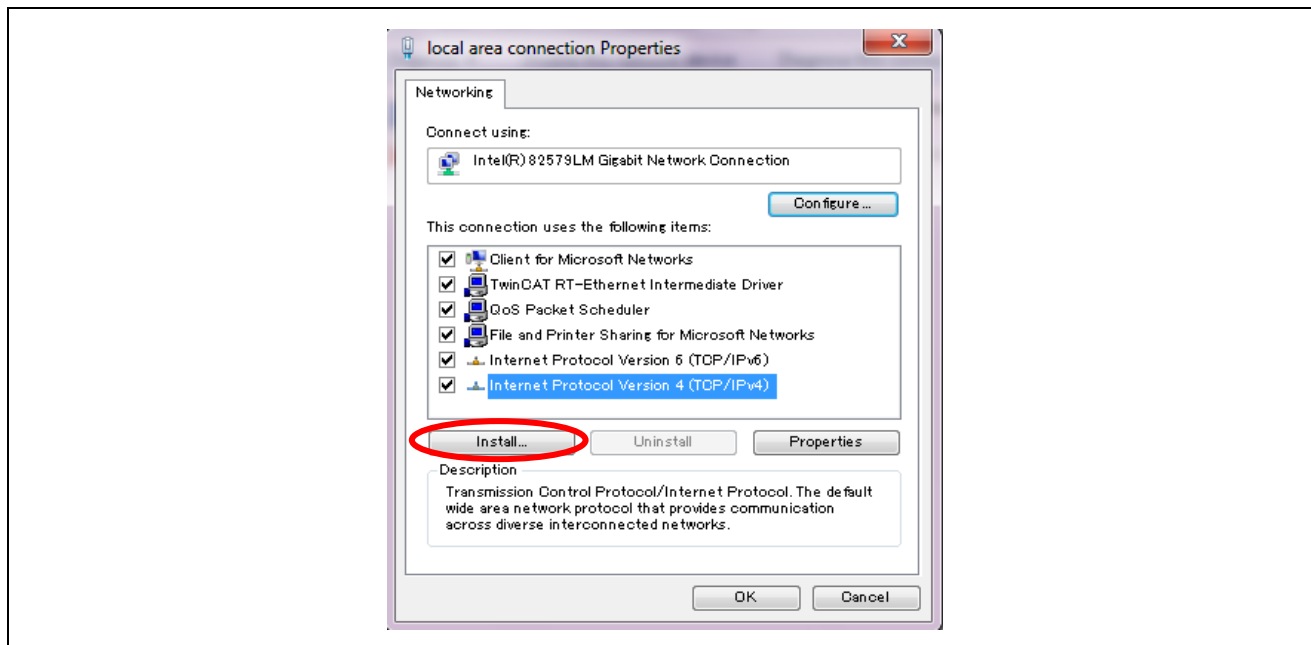


(e)

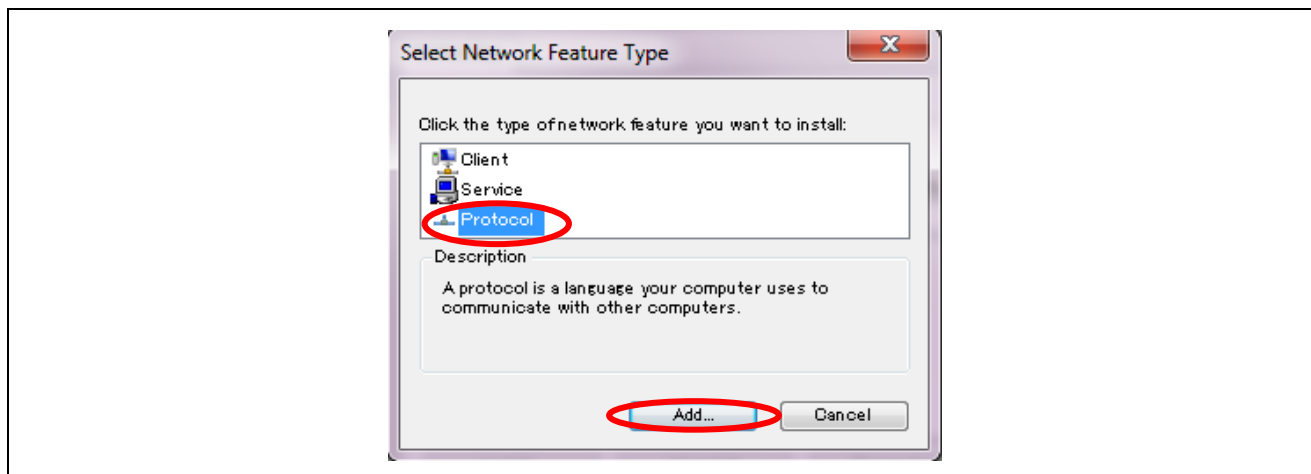


2.1.3 How to add the TwinCAT Ethernet protocol

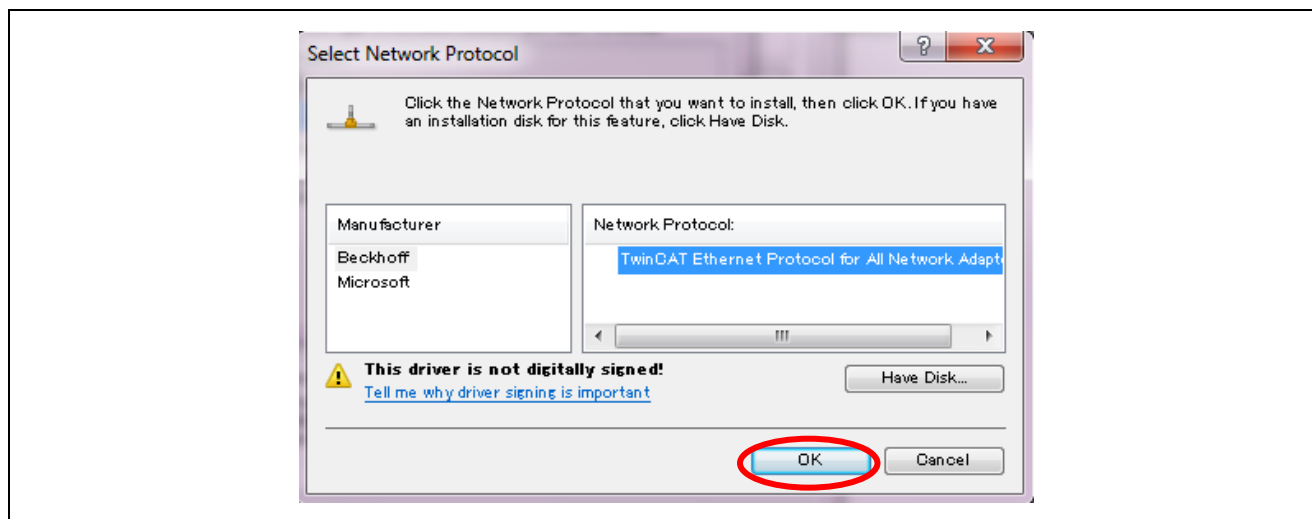
(a)



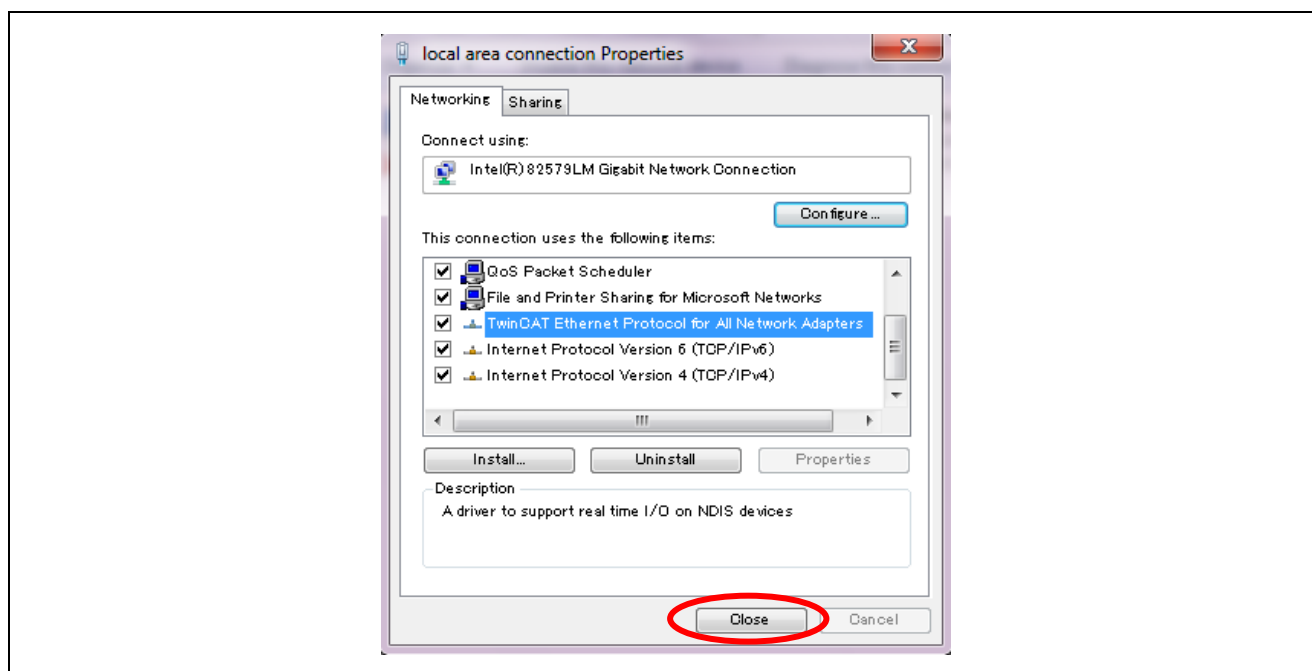
(b)



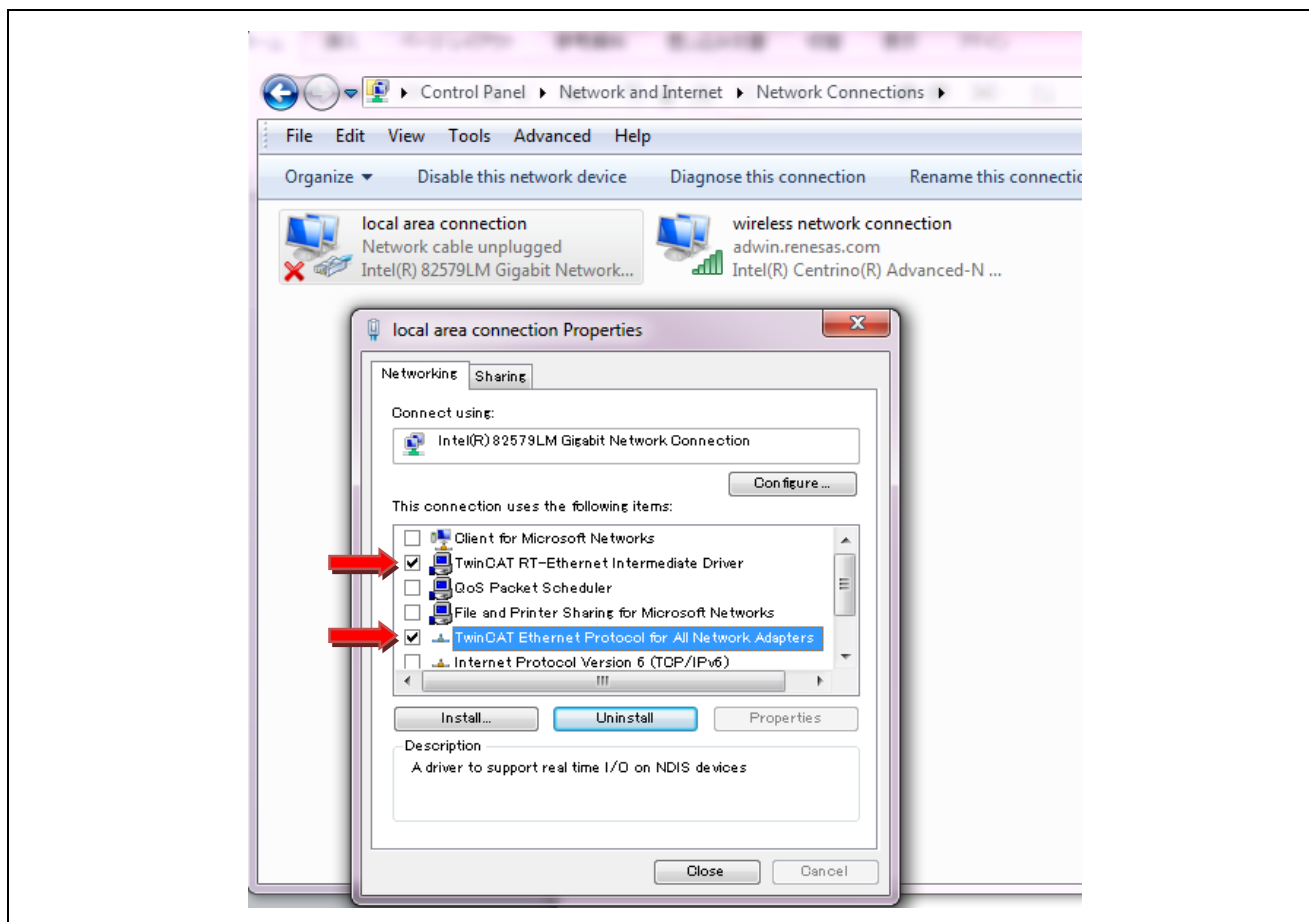
(c)



(d)



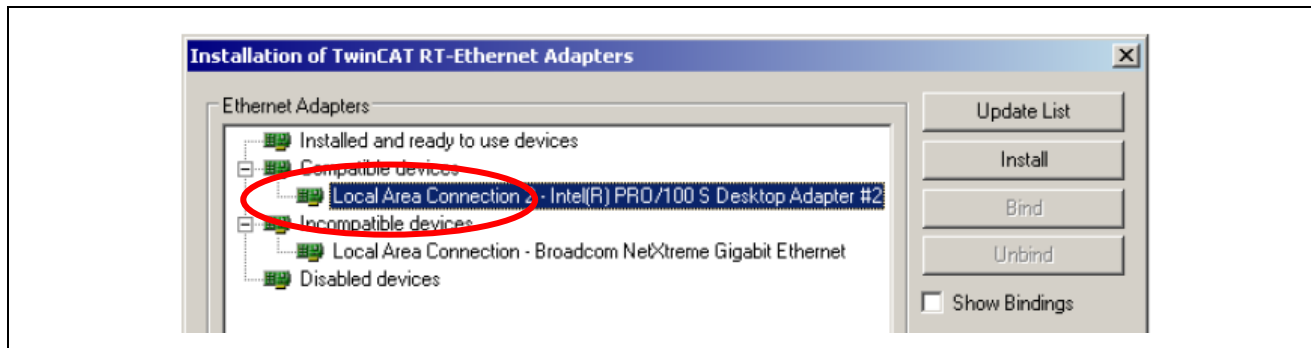
Depending on the installed network configuration, it might not be possible to connect to TwinCAT correctly. If so, please only setup [TwinCAT RT-Ethernet Intermediate Driver] and [TwinCAT Ethernet protocol for All Network Adapters] in network [properties]. (It is OK not to setup TCP/IP.)



Now the TwinCAT installation is completed.

[Note] You should disable both “Internet Protocol Version 6 (TCP/IPv6)” and “Internet Protocol Version 4 (TCP/IPv4)”

As an alternative to the description above you can use the following procedure in the TwinCAT System Manager menu. Please select in the TwinCAT [Options] menu the entry [Show Real time Ethernet Compatible Devices ...]. Here you will see the following dialog which shows the Ethernet ports that can be used for EtherCAT (Compatible devices).



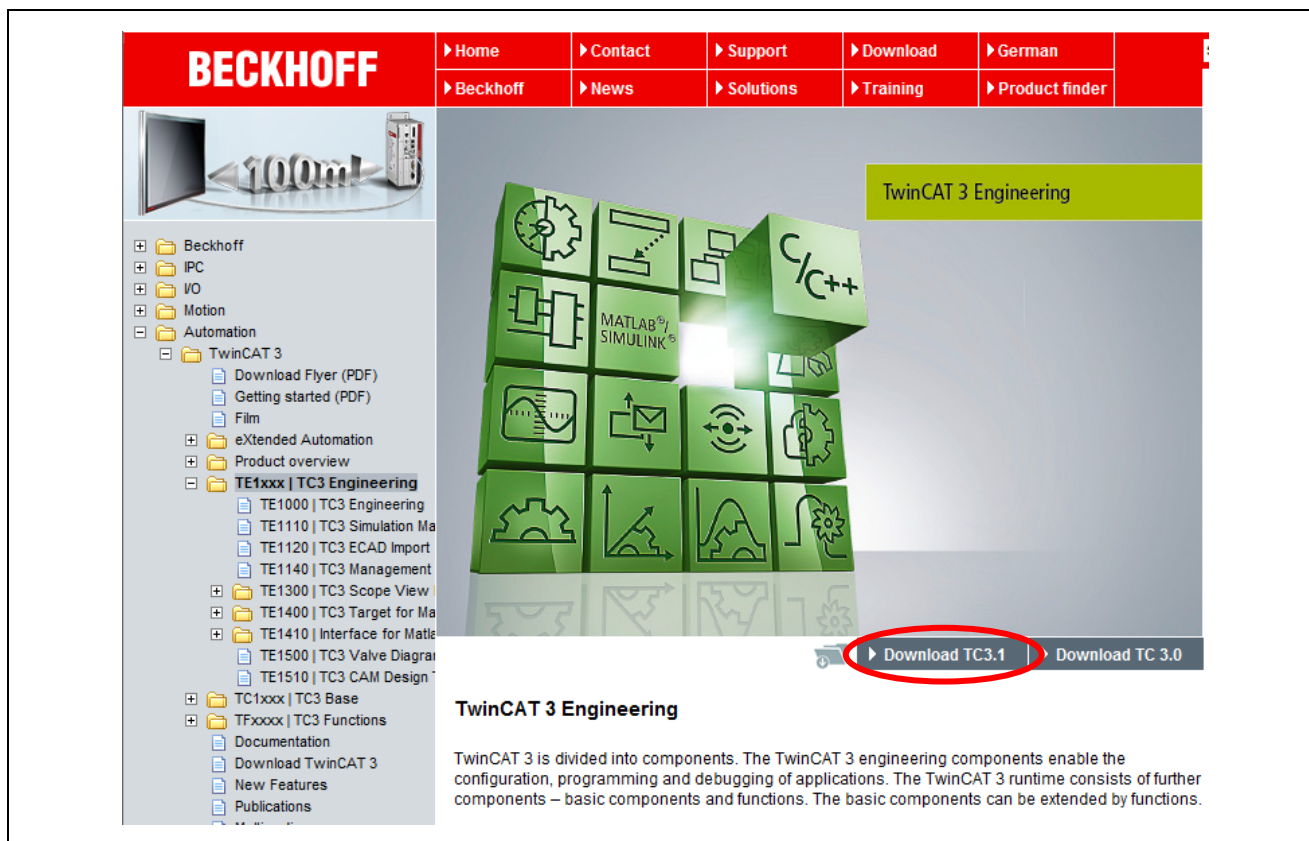
Please select the compatible port which you want to use with TwinCAT and click [Install]. After the installation the related port appears in the list “Installed and ready to use devices” above.

There might be more than one port in the compatible devices list above depending upon the PC you are using. Please also note that the Beckhoff RT-Ethernet driver generally supports Intel ® chipsets. Certain PC Ethernet ports may be listed as “Incompatible devices” and thus cannot be used for TwinCAT.

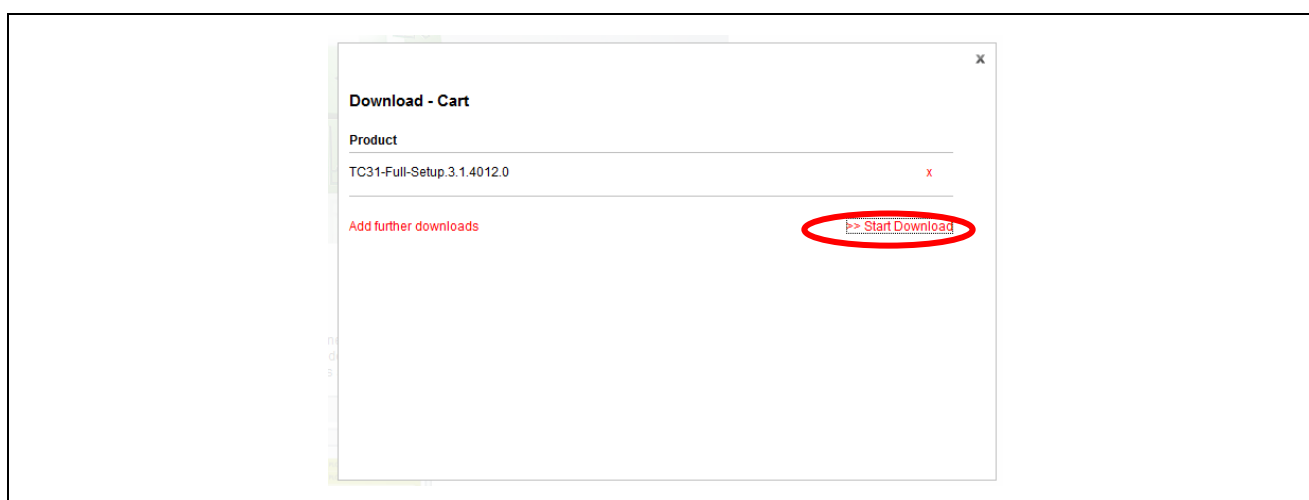
Either of the installation options should correctly install the required TwinCAT RT-Ethernet driver as described in detail above.

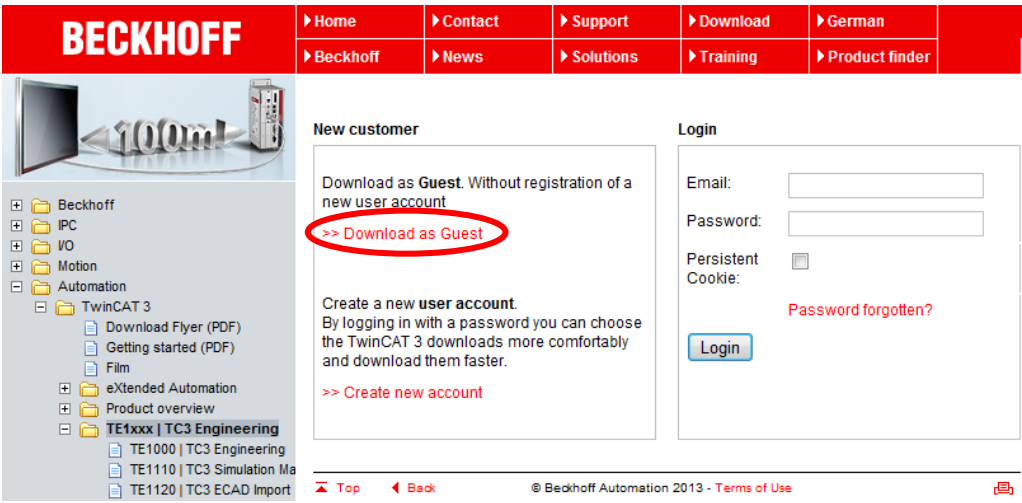
2.2 TwinCAT3 installation

2.2.1 How to install



Note: Please download the Full Setup (installation) version rather than the XAR version.





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New customer

Download as **Guest**. Without registration of a new user account.

>> Download as Guest

Create a new **user account**.
By logging in with a password you can choose the TwinCAT 3 downloads more comfortably and download them faster.

>> Create new account

Login

Email:

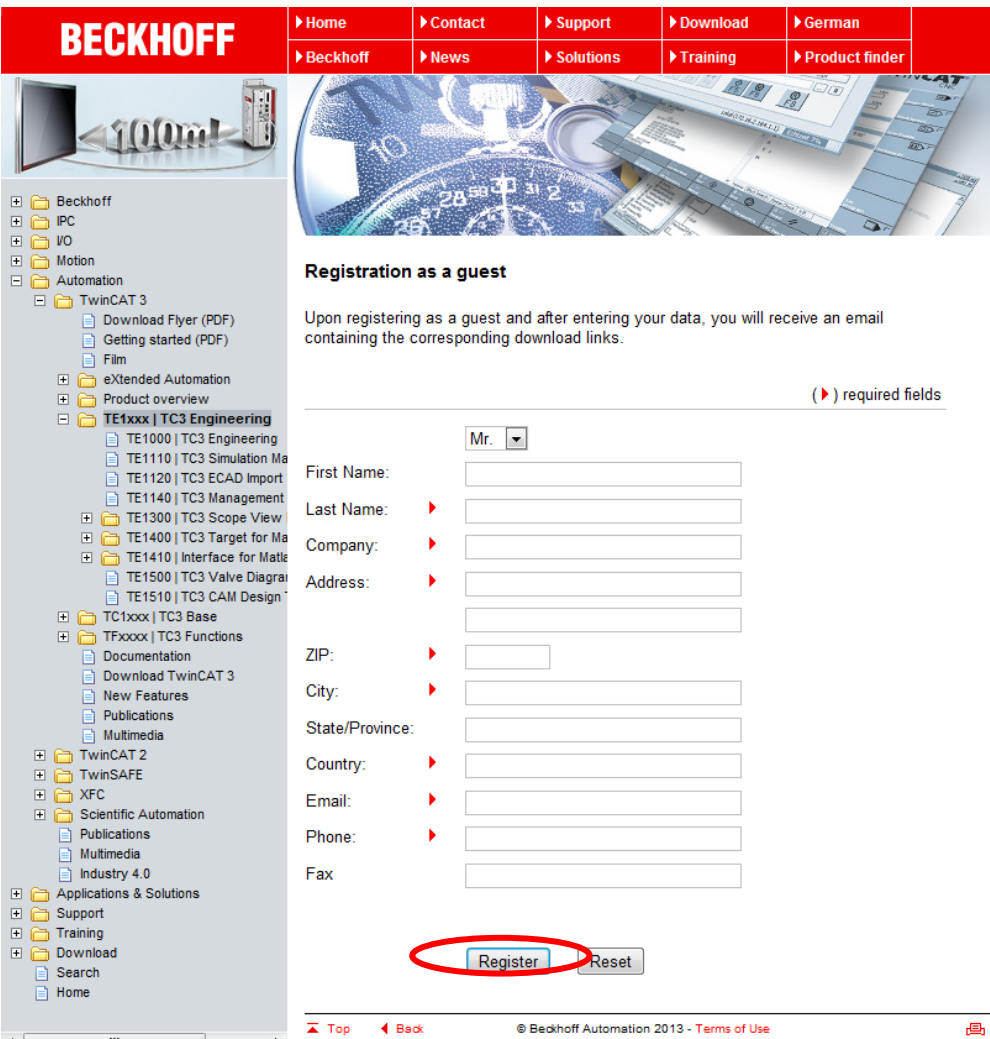
Password:

Persistent Cookie: ☐

Password forgotten?

Login

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Registration as a guest

Upon registering as a guest and after entering your data, you will receive an email containing the corresponding download links.

(*) required fields

Mr.

First Name:

Last Name:

Company:

Address:

ZIP:

City:

State/Province:

Country:

Email:

Phone:

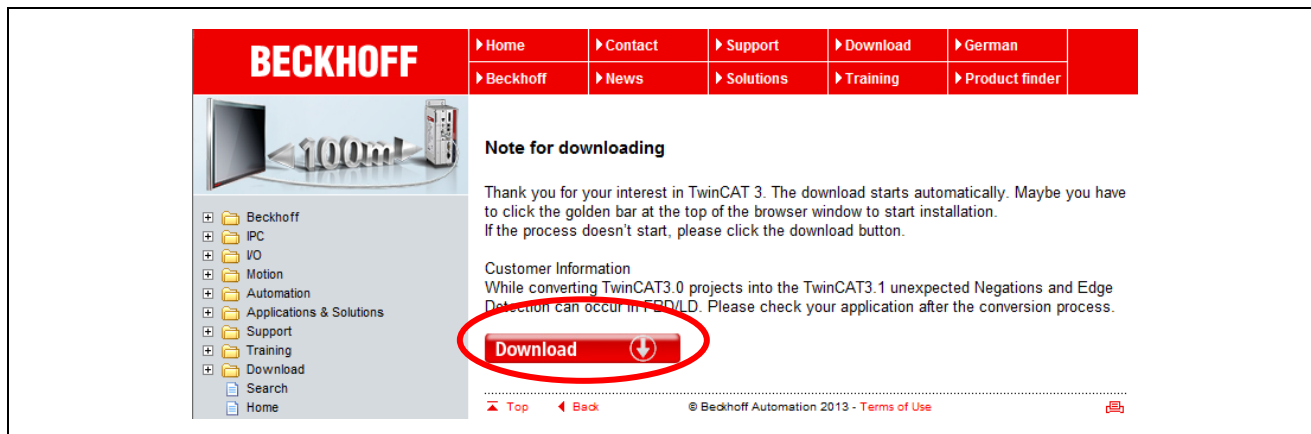
Fax:

Register **Reset**

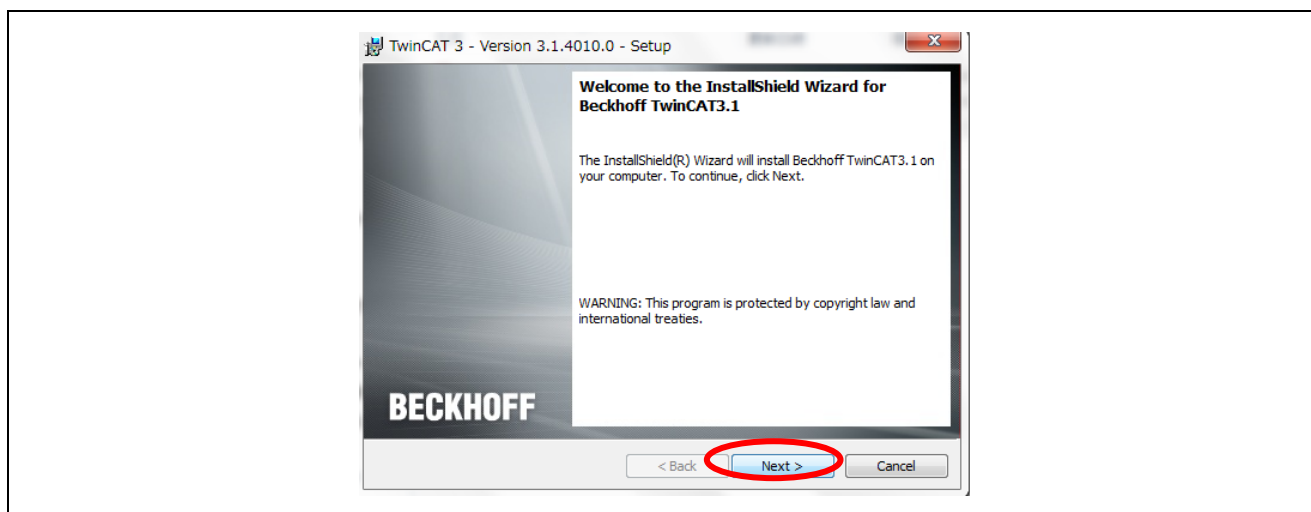
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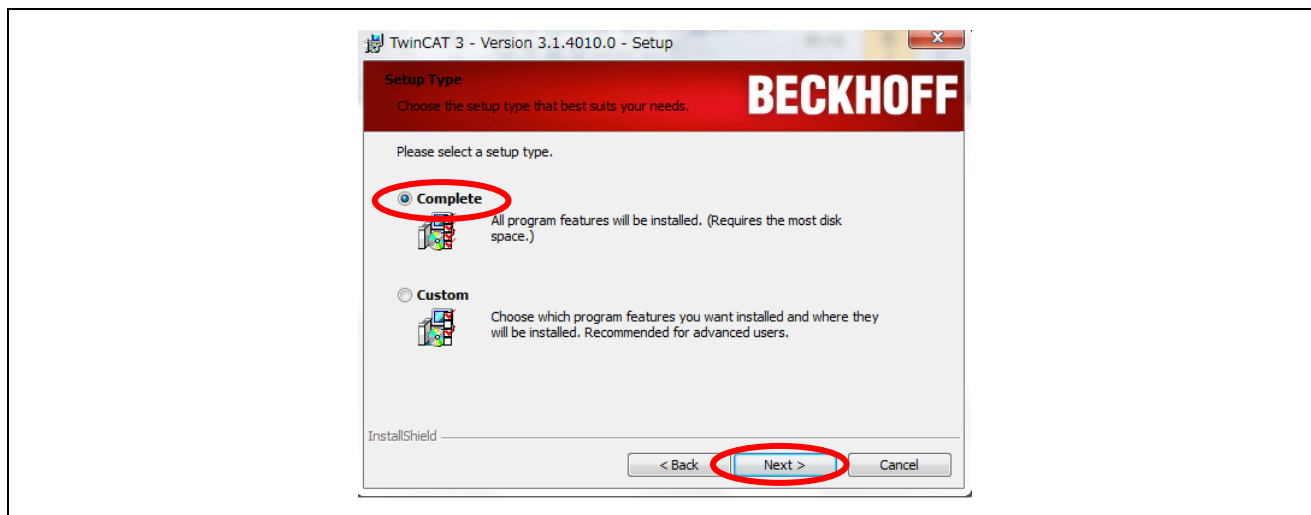
Please input the required fields and select “Register”.

Beckhoff will send an email including the link to download the software. Please access the link and download the software.

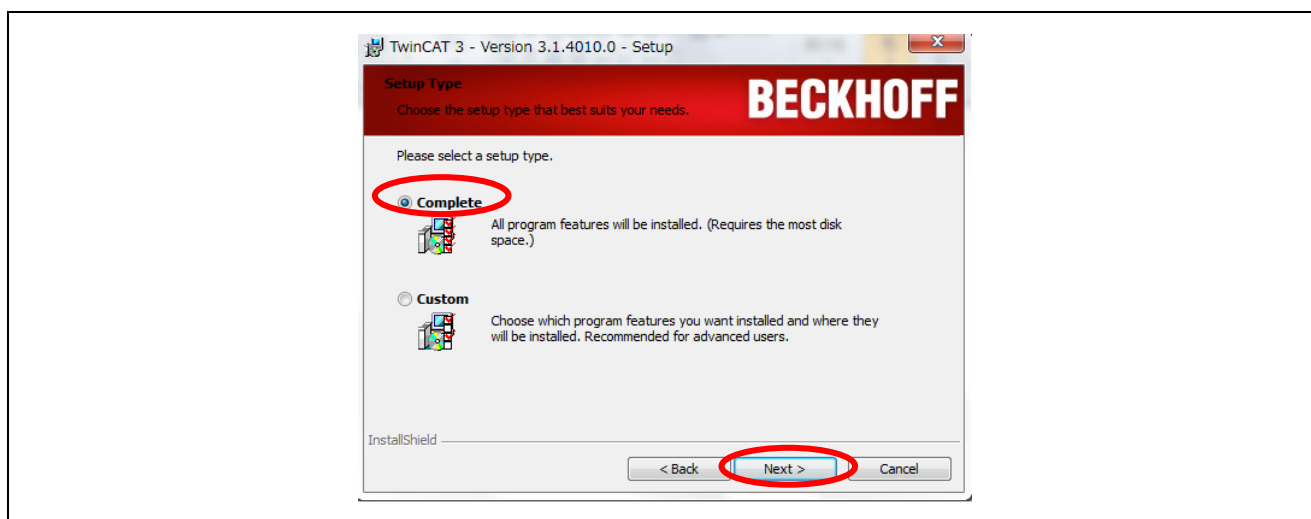


After downloading, please execute the setup file.





Please complete the installation wizard. **Important Note:** be sure to select “Complete” installation.

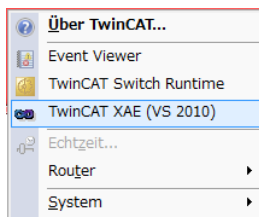


2.2.2 How to add the TwinCAT3 Ethernet protocol

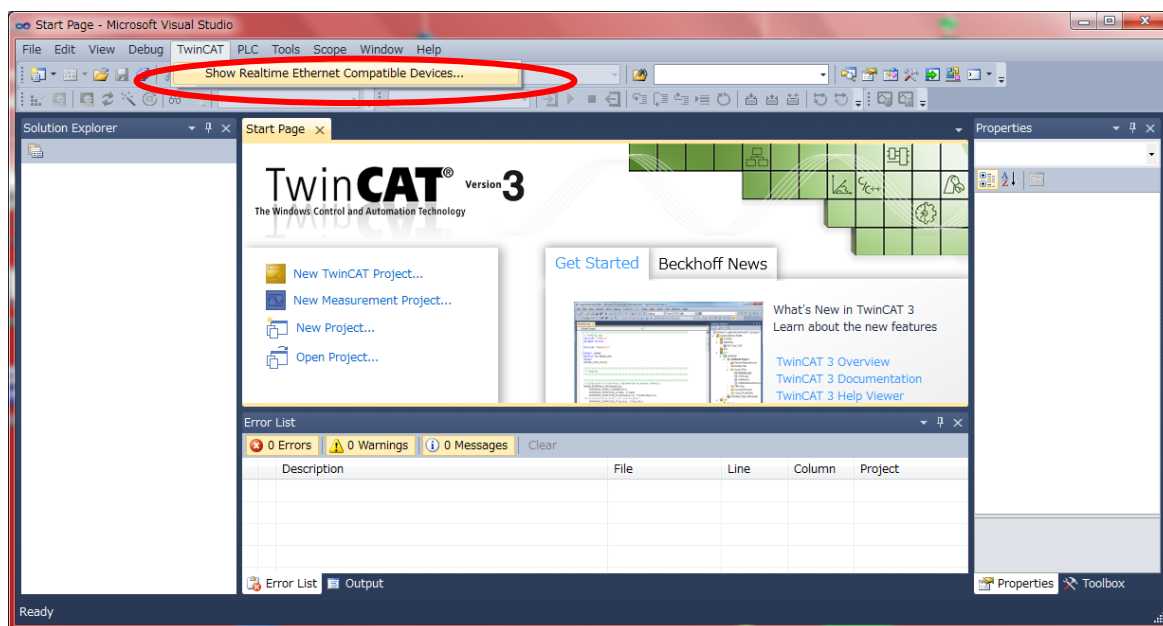
Please add the protocol in the “TwinCAT XAE” program as described below.

Please activate the “TwinCAT XAE” program using one of the following methods:

- (1) Task tray ⇒ [TwinCAT Config Mode] ⇒ [TwinCAT XAE (VS2010)]
- (2) Start menu ⇒ [Beckhoff] ⇒ [TwinCAT3] ⇒ [TwinCAT XAE (VS2010)]

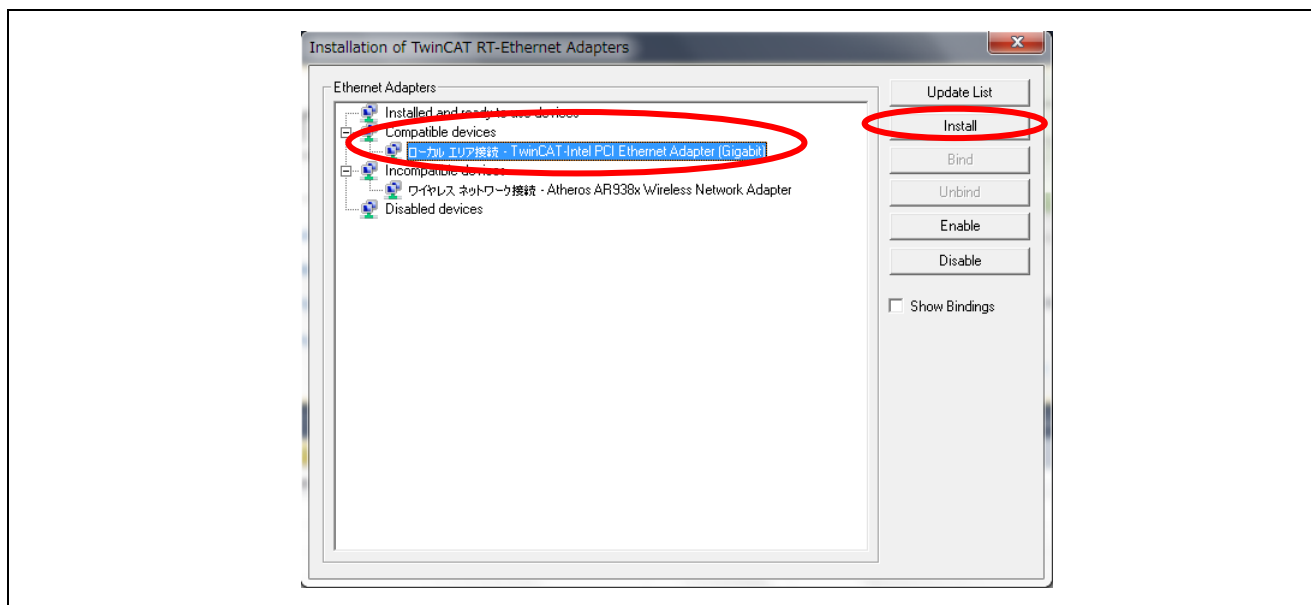


Please select the TwinCAT tab and click [Show Realtime Ethernet Compatible Devices].

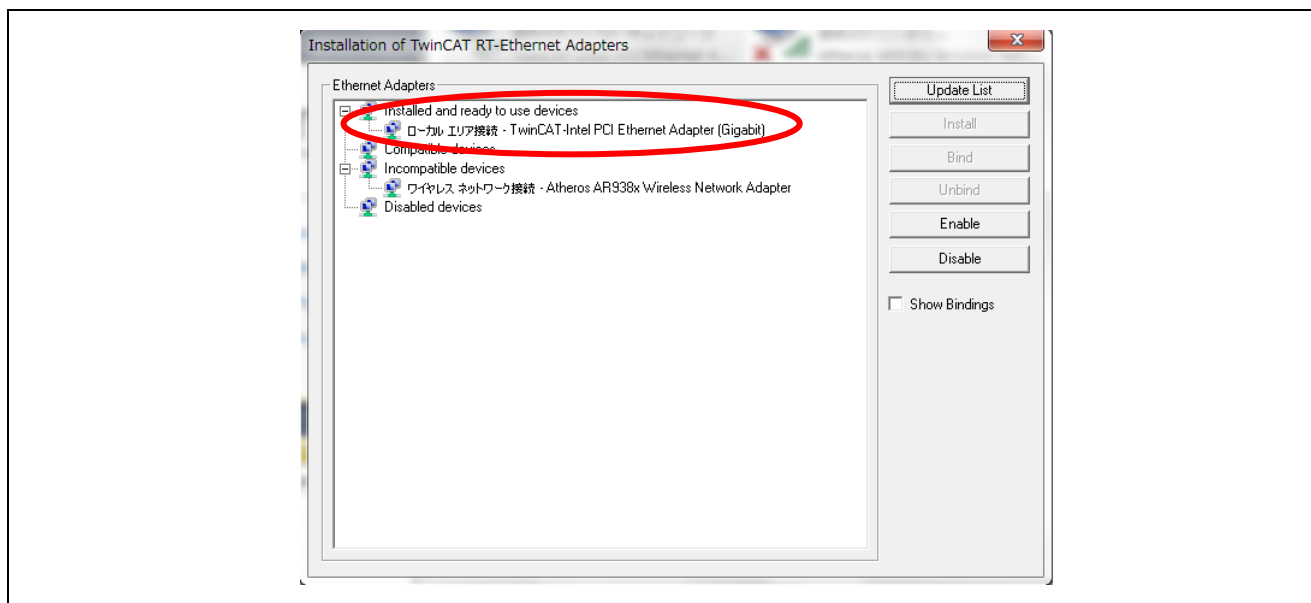


In the installation dialog that appears please make sure that at least one Ethernet adapter is listed under the “compatible devices” heading. If all adapter(s) are listed under the “Incompatible devices” heading, the PC’s Ethernet adapter(s) will not be able to work with TwinCAT3. Please refer to the list of compatible Ethernet adapters at Beckhoff’s website:

http://infosys.beckhoff.com/content/1033/tcsystemmanager/reference/ethercat/html/ethercat_supnetworkcontroller.htm?id=18955



Please select an adapter under the “compatible devices” heading and click “Install”.



If the installation is successful, the selected adapter will move to the “Installed and ready to use devices” section. Installation of TwinCAT is complete.

3. Settings and Connections for R-IN32M3-EC

Please connect the board to the PC with cables as shown below.

Please refer to the board specification for more detail. (<http://www.tessera.co.jp/eng/ts-r-in32m3-e.html>)

3.1 Boot mode settings for R-IN32M3-EC

R-IN32M3 has two external terminals named BOOT0 and BOOT1. The boot mode is selected depending on status of these terminals. The boot mode of the R-IN32M3-EC is selected by DIP-SW(SW1).

Set the MODE SW before connecting the 5V-3A DC adapter.

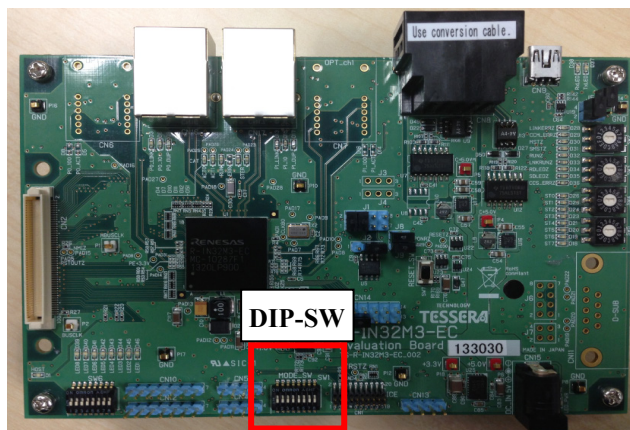
Table 3.1 Boot mode selection

DIP-SW (SW1)		Boot mode selection
1	2	
ON(High)	ON(High)	Instruction RAM boot (test)
OFF(Low)	ON(High)	External MPU boot
ON(High)	OFF(Low)	External serial flash ROM boot
OFF(Low)	OFF(Low)	External parallel flash ROM boot ^{Note}

Note: This mode is not supported for the TS-R-IN32M3-“CEC” board or the “R-IN32M3-EC Board Lite” because parallel flash isn’t included on those boards.

Instruction RAM Boot setting

■ S-R-IN32M3-EC board



MODE_SW (SW1[1:8])

TS-R-IN32-EC_002

ON ☒ ☒ ☐ ☐ ☐ ☐ ☐ ☐

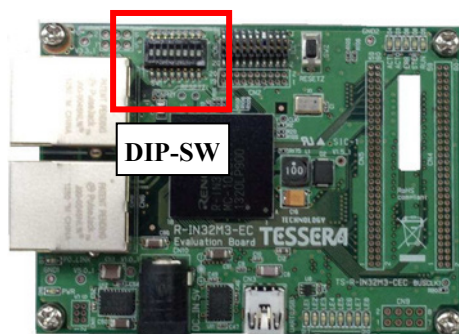
OFF ☐ ☐ ☒ ☒ ☒ ☒ ☒ ☒

TS-R-IN32-EC_001

OFF ☐ ☐ ☒ ☒ ☒ ☒ ☒ ☒

ON ☒ ☒ ☐ ☐ ☐ ☐ ☐ ☐

■ TS-R-IN32M3-CEC board



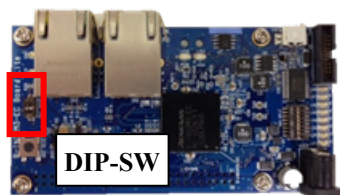
MODE_SW (SW1[1:8])

TS-R-IN32-CEC_001

ON ☒ ☒ ☐ ☐ ☐ ☐ ☐ ☐

OFF ☐ ☐ ☒ ☒ ☒ ☒ ☒ ☒

■ R-IN32M3-EC Board Lite



MODE_SW (SW[1:2])

R-IN32M3 Board Lite

ON ☒ ☒

OFF ☐ ☐

Instruction RAM boot

When using the I-jet debugger and executing on the Instruction RAM of R-IN32M3, set the MODE SW as shown below.

When you use TS-R-IN32M3-EC / CEC board

MODE SW (SW1[1:8]): **ON** **ON**|OFF|OFF|OFF|OFF|OFF|OFF|

When you use R-IN32M3-EC board Lite

MODE SW (SW1[1:2]): **ON** **ON**|

External parallel flash ROM boot

When using the I-jet debugger and executing on the External parallel flash ROM of R-IN32M3, set the MODE SW as shown below. When writing to Parallel FlashROM use the same setting.

When you use TS-R-IN32M3-EC board

MODE SW (SW1[1:8]): **OFF** **OFF**|OFF|OFF|OFF|OFF|OFF|OFF|

External serial flash ROM boot

In the case of using I-jet debugger and executing on the External serial flash ROM of R-IN32M3, set the MODE SW as shown below. When writing to Serial FlashROM, use the same setting.

MODE SW (SW1[1:8]): **ON** **OFF**|OFF|OFF|OFF|OFF|OFF|OFF|

3.2 Boot Procedure for R-IN32M3-EC board

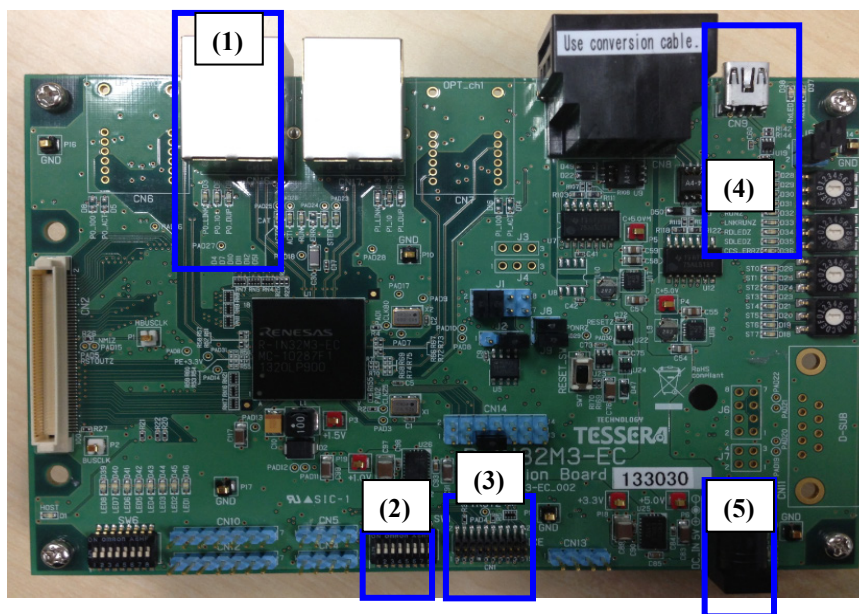
Please connect the board to the PC with cables as shown below.

Please refer to the board specification for more detail. (<http://www.tessera.co.jp/eng/ts-r-in32m3-e.html>)

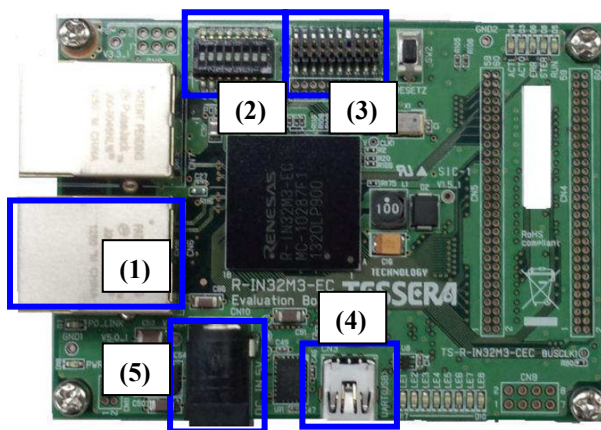
- (1) Connect Port 0 to the PC with an Ethernet cable (recommend category 5).
- (2) Please select the MODE_SW for the desired boot mode.
- (3) Please connect the 20-pin half-pitch connector included with the IAR to the header (3). The No. 1 terminal of the cable is red on the left side. Please connect the debugger to a USB port of the PC using the USB cable included with the IAR debugger. (If you use both “R-IN32M3-EC Board Lite” and “I-jet” from IAR systems, power can be supplied via debugger cable.)
- (4) Please connect the board to another USB port of the PC with the enclosed USB (mini-B) cable. (When you use “R-IN32M3-EC Board Lite”, power is supplied via the USB cable)
- (5) Please connect the DC adaptor (5V/3A.) When using “R-IN32M3-EC Board Lite”, the DC power supply is not required.

Please refer to the following images for connection details.

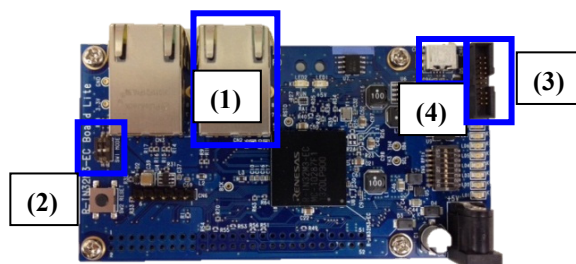
■ TS-R-IN32M3-EC board



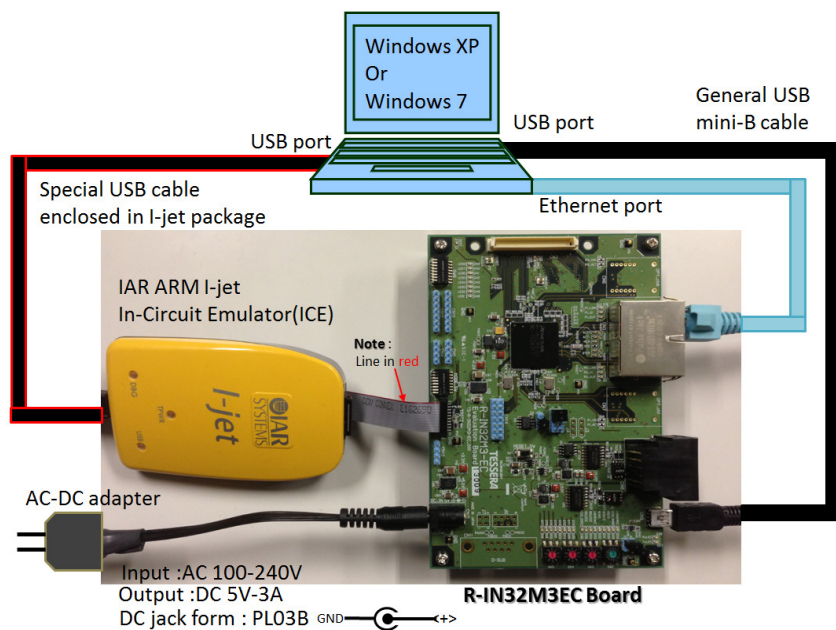
■ TS-R-IN32M3-CEC board



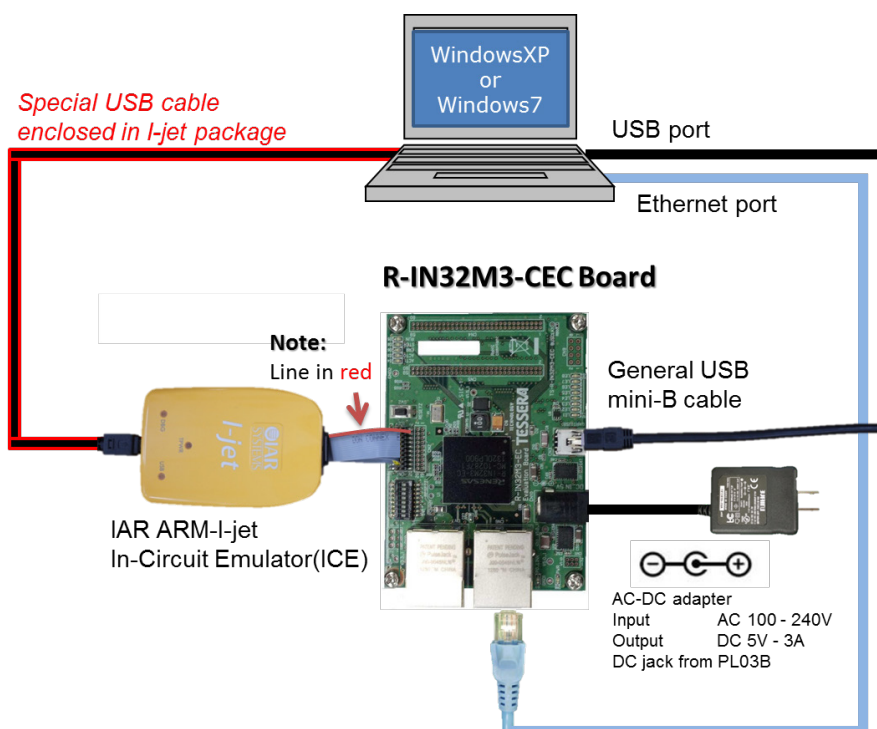
■ TS-R-IN32M3-EC board Lite



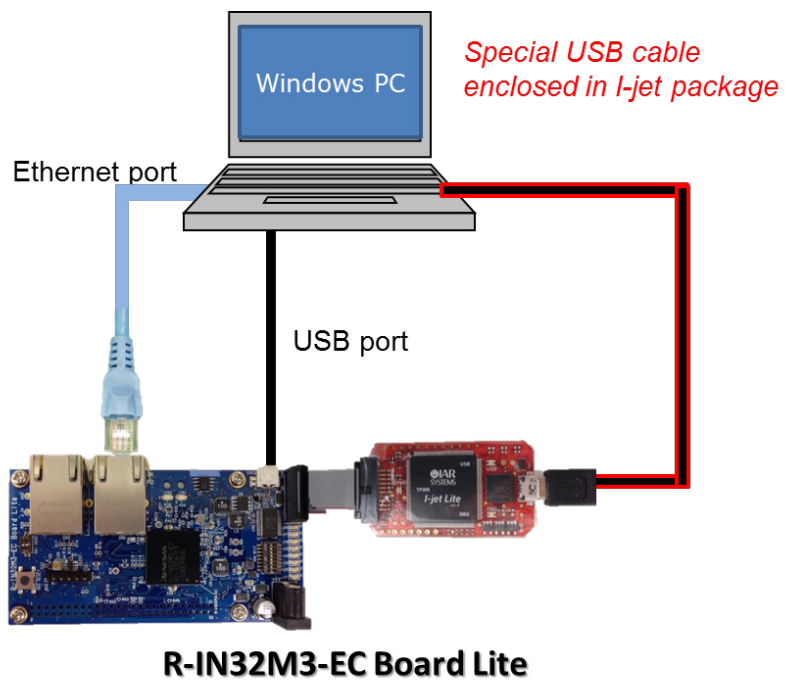
■ TS-R-IN32M3-EC board



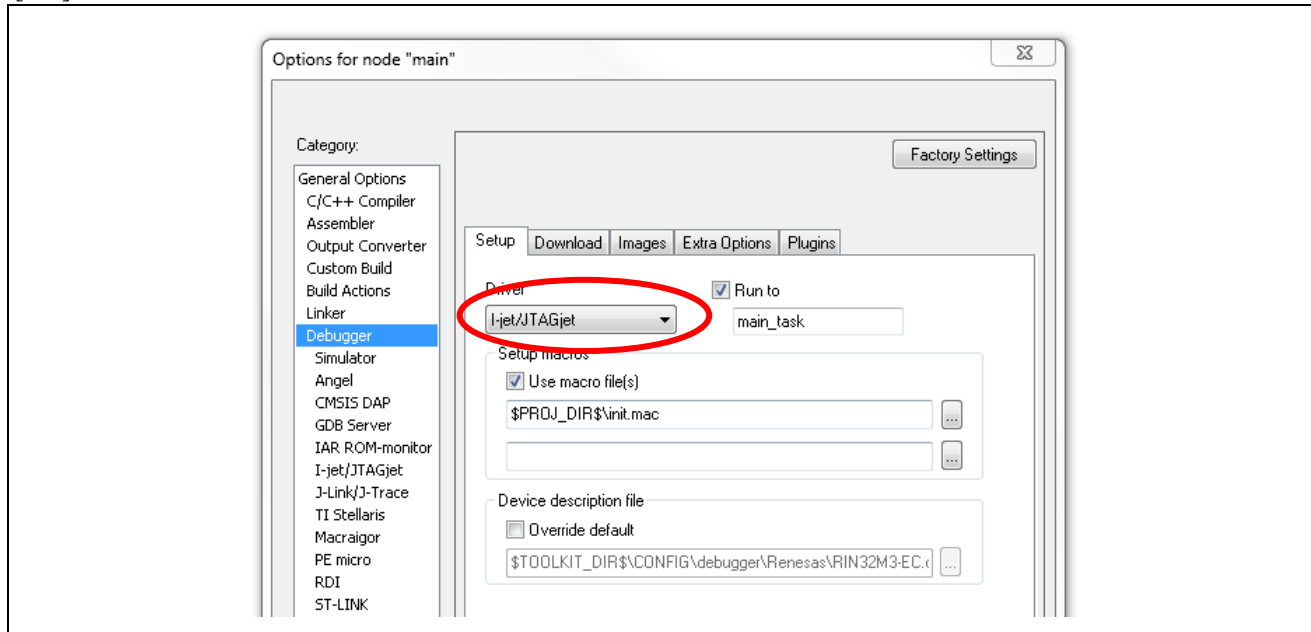
■ TS-R-IN32M3-CEC board



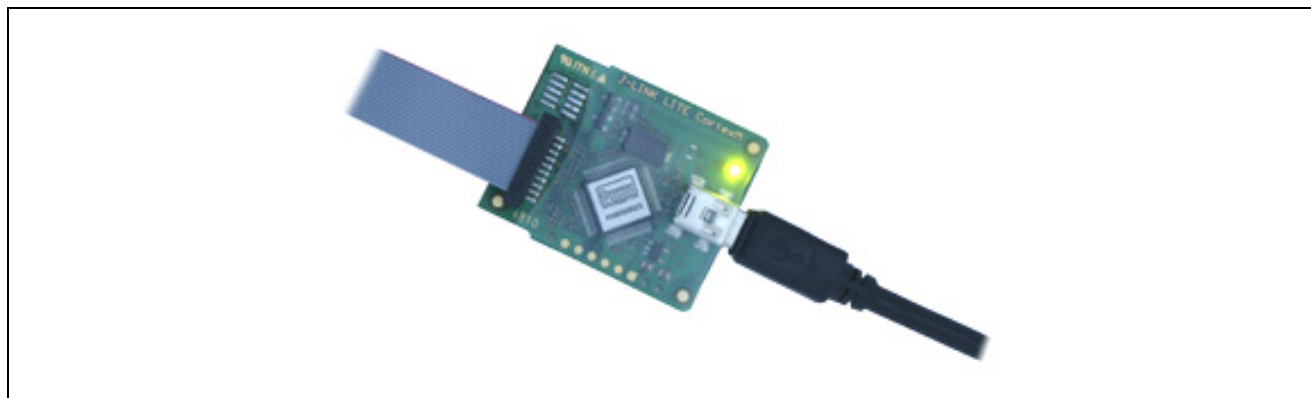
■ R-IN32M3-EC board Lite



As an alternative to the I-jet debugger you can use one of many other types of debuggers as well, as long as it is supported by the IAR Embedded Workbench. To modify the debugger type switch to the [Project] → [Options ...] dialog and select the category [Debugger]. Please click in the drop down menu, select the debugger you want to use, and click [OK].



One example alternate debugger is the SEGGER J-Link Lite CortexM-19 (<http://www.segger.com/jlink-lite-cortexm.html>). At Renesas Electronics Europe you can optionally order a R-IN32M3-EC Starter Kit with the Segger J-Link Lite debugger included.. The J-Link debugger includes the required 20 pin half pitch flat ribbon cable and the USB cable as shown in the picture below.



4. Installation of the USB Serial Conversion Driver

4.1 Obtain the driver

When connecting the PC to the R-IN32M3-EC board using the provided USB cable, the FT232R USB UART driver may be requested by the operating system.

(Note: For Windows7 OS there is no need to install driver; the driver will be installed automatically.)

Please install the driver after obtaining it from the address below.

<http://www.ftdichip.com/Drivers/VCP.htm>

FTDI drivers may be distributed in any form as long as license information is not modified.

If a custom vendor ID and/or product ID or description string are used, it is the responsibility of the product manufacturer to maintain any changes and subsequent WHQL re-certification as a result of making these changes.

Currently Supported VCP Drivers:

Operating System	Release Date	Processor Architecture							Comments
		x86 (32-bit)	x64 (64-bit)	PPC	ARM	MIPSII	MIPSIV	SH4	
Windows 8.1	2013-10-21	2.08.30 8.1	2.08.30 8.1	-	-	-	-	-	2.08.30 WHQL Certified for Win 8.1 Available as setup executable Release Notes
Windows*	2013-08-0	2.08.30	2.08.30	-	-	-	-	-	2.08.30 WHQL Certified Available as setup executable Release Notes
Linux	2009-05-14	1.5.0	1.5.0	-	-	-	-	-	All FTDI devices now supported in Ubuntu 11.10, kernel 3.0.0-19 Refer to TN-101 if you need a custom VCP VID/PID in Linux
Mac OS X	2012-08-10	2.2.18	2.2.18	2.2.18	-	-	-	-	Refer to TN-105 if you need a custom VCP VID/PID in MAC OS
Windows CE 4.2-5.2**	2012-01-06	1.1.0.10	-	-	1.1.0.14	1.1.0.10	1.1.0.10	1.1.0.10	
Windows CE 6.0	2012-01-06	1.1.0.10	-	-	1.1.0.14	1.1.0.10	1.1.0.10	1.1.0.10	

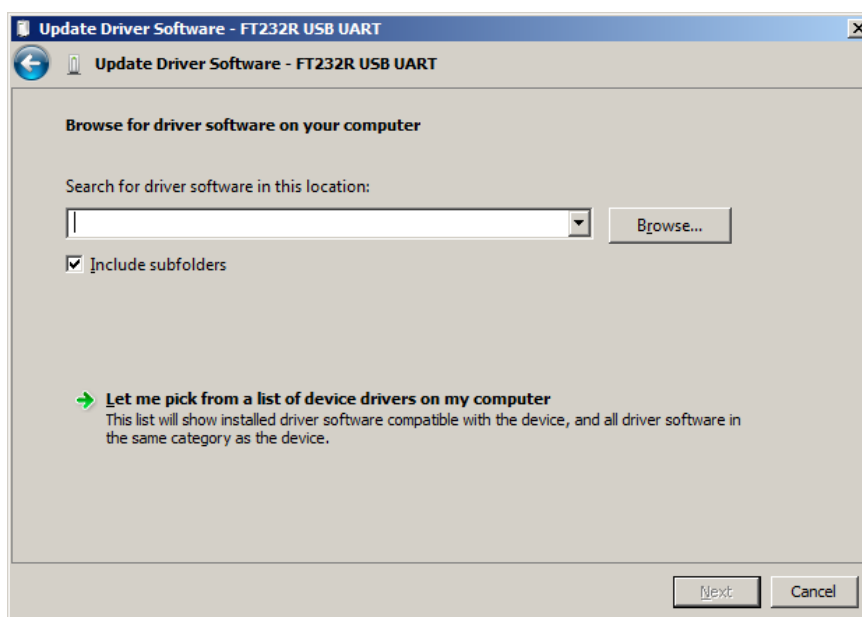
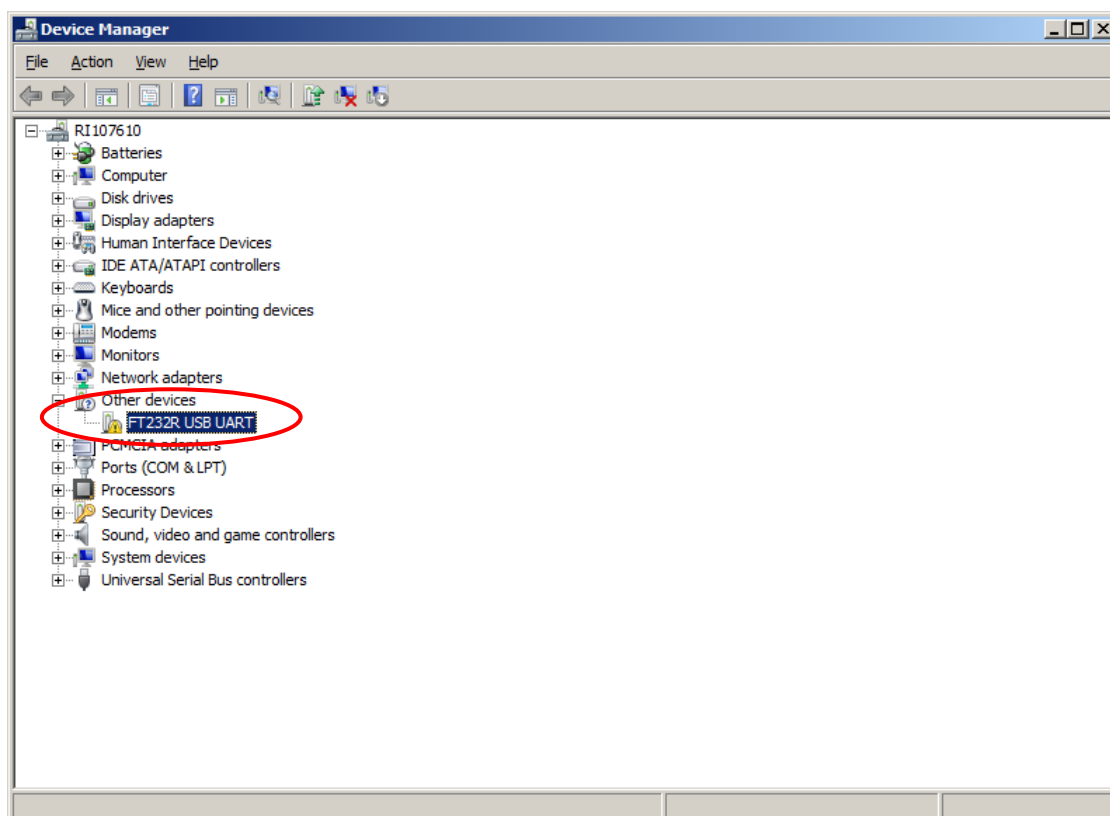
*includes the following versions of the Windows operating system: Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2 and Windows 8.

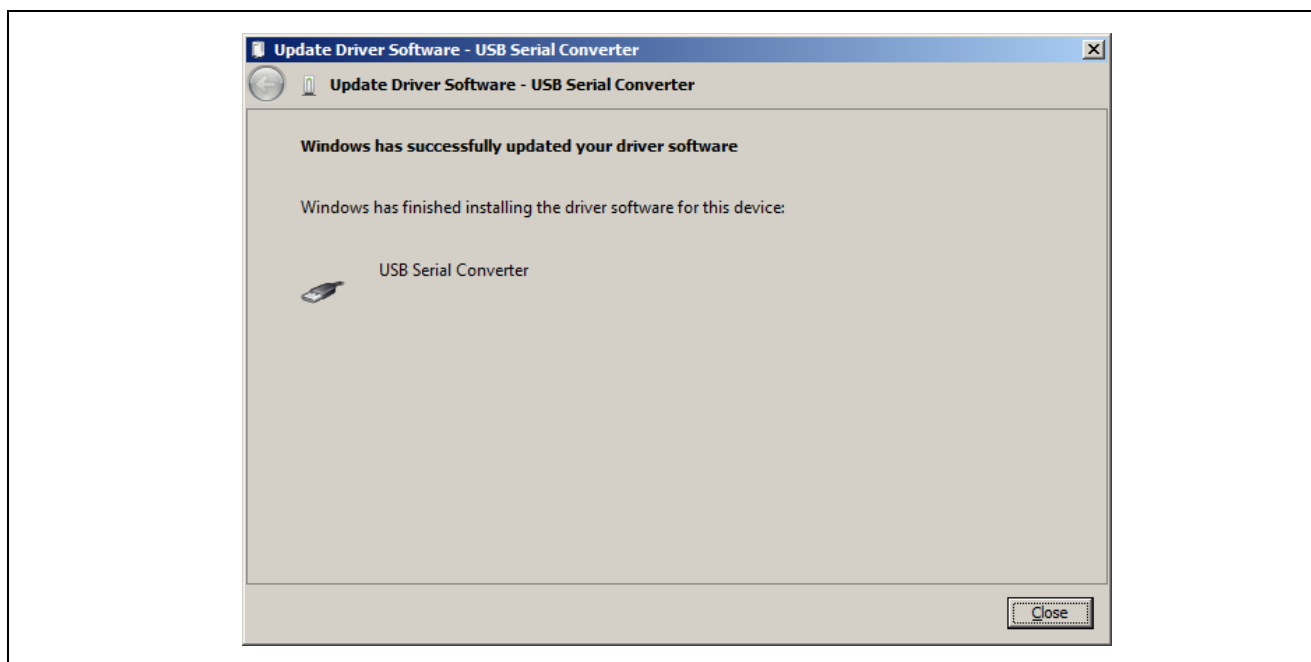
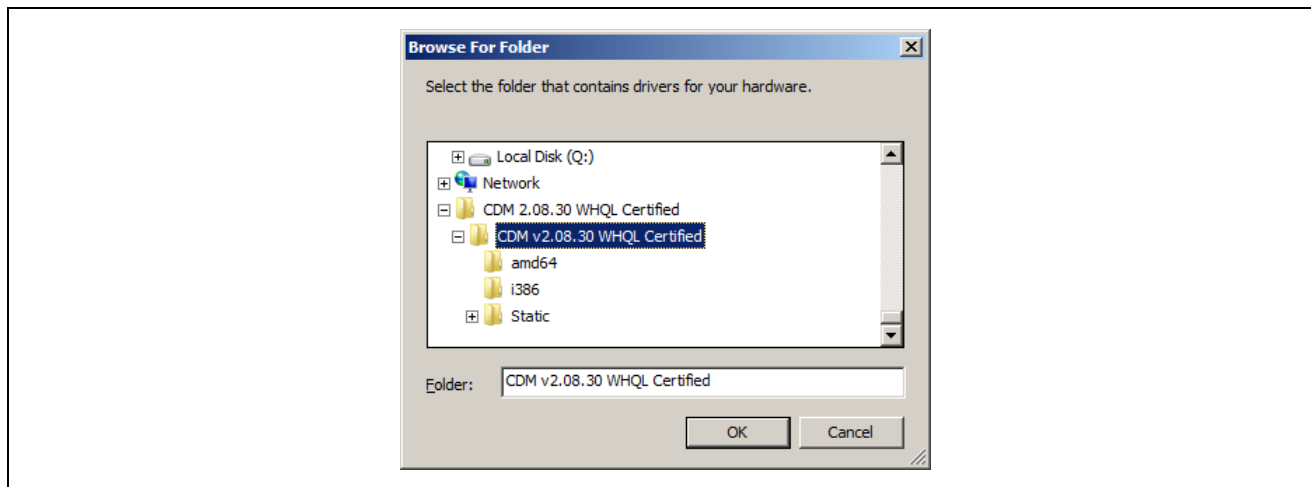
**Also, as Windows 8 RT is a closed system not allowing for 3rd party driver installation our Windows 8 driver will not support this variant of the OS.

Download the file named “CDM 2.08.30 WHQL Certified.zip”

4.2 Install FT232R USB UART driver

After uncompressing the file into local folder, select[It installs from a list or a specific place (recommendation).] and click[Next(N) >]. Please choose folder [CDM 2.08.30 WHQL Certified] and click [OK].

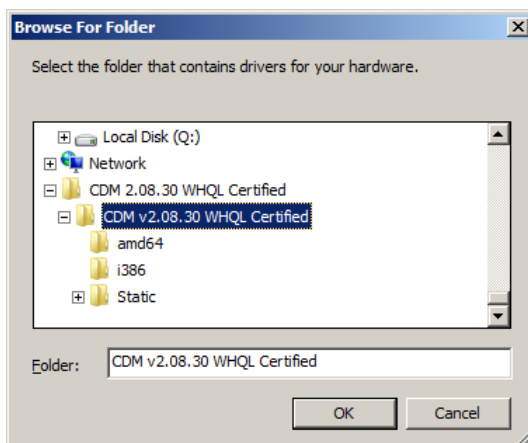
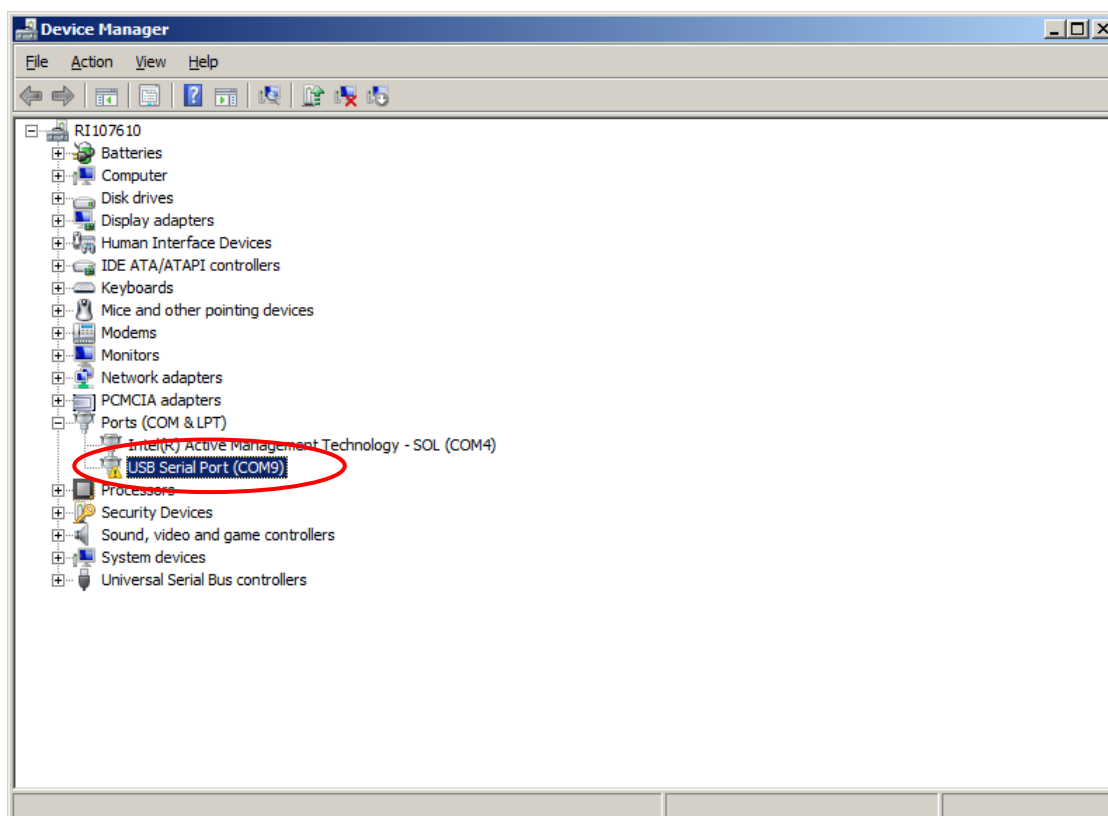


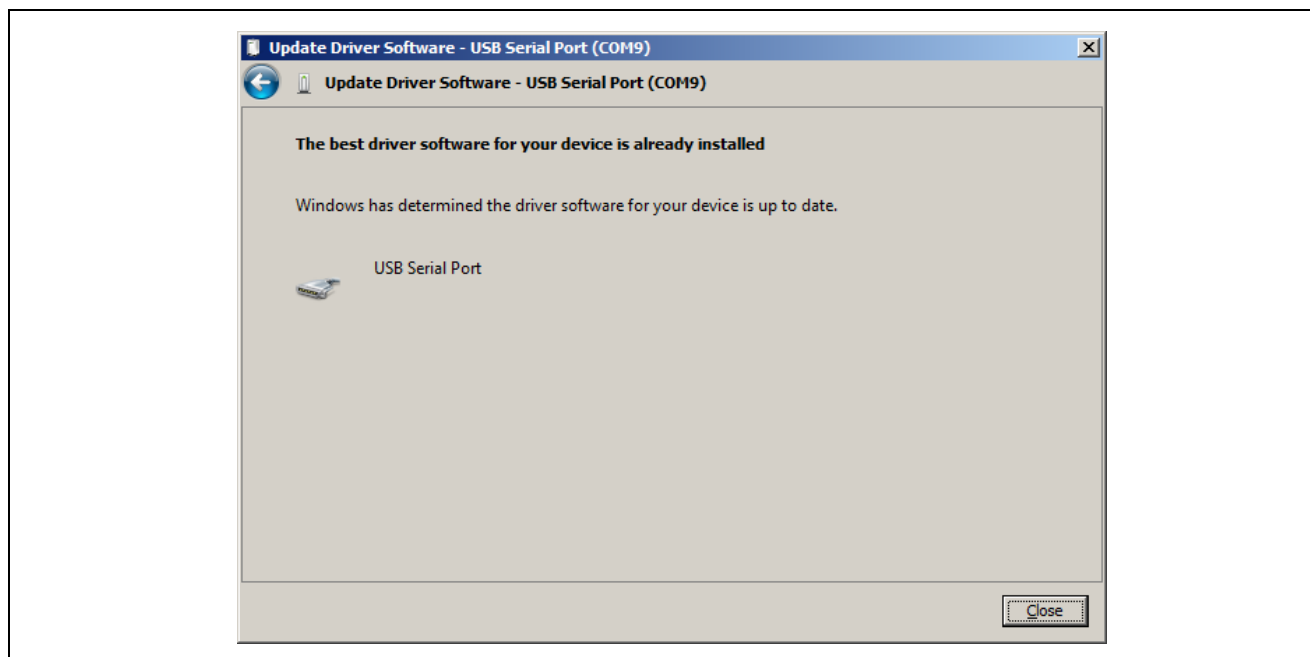


Click [Close]

4.3 Install USB Serial Port Driver

Install USB Serial Port driver. After uncompressing the file into local folder, select [It installs from a list or a specific place (recommendation).] and click[Next(N) >]. Please choose folder [CDM 2.08.30 WHQL Certified] and click [OK].

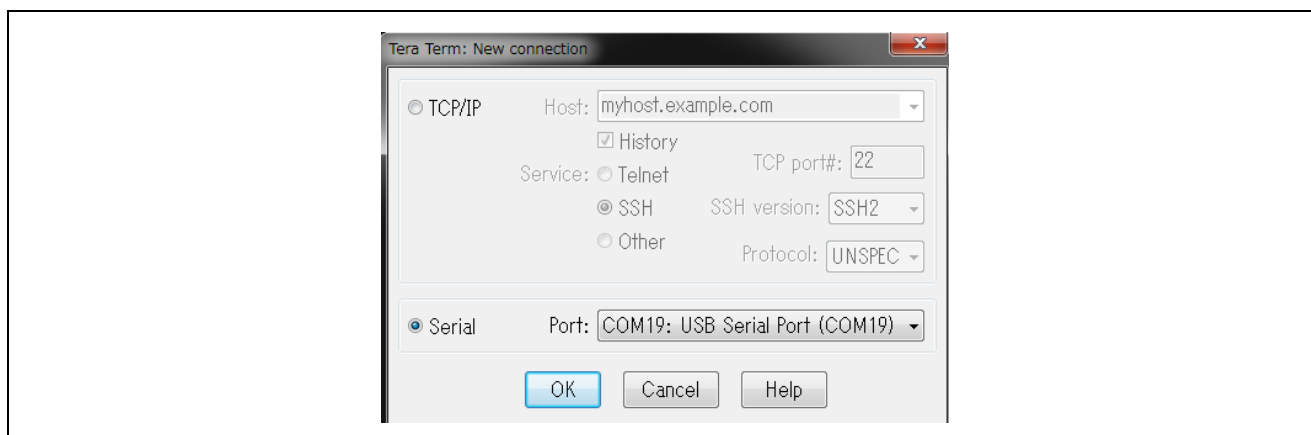




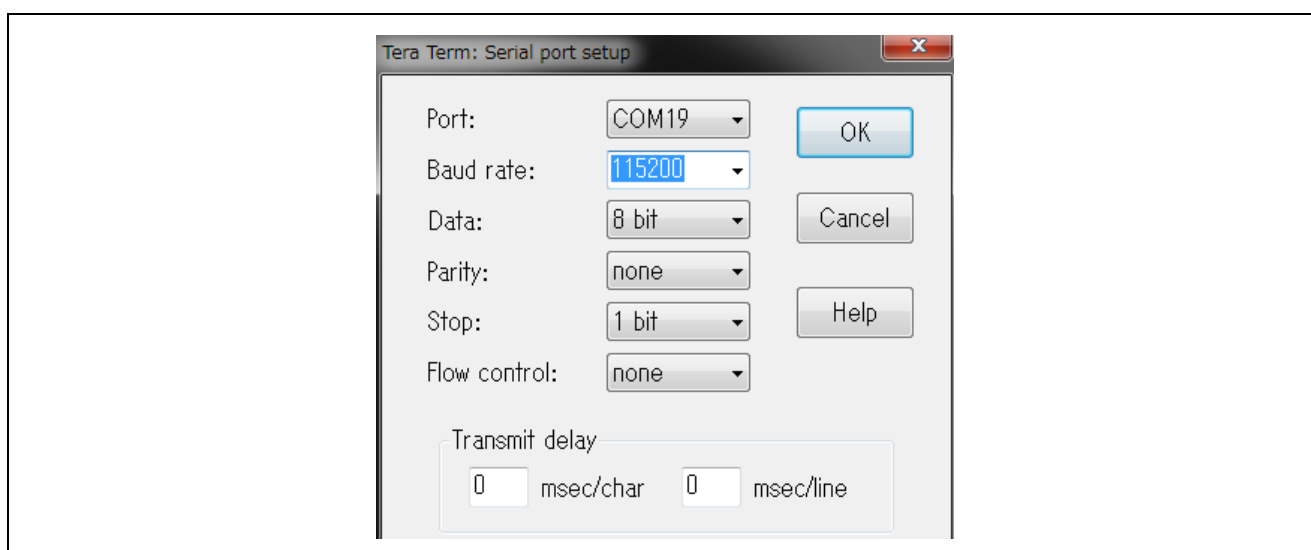
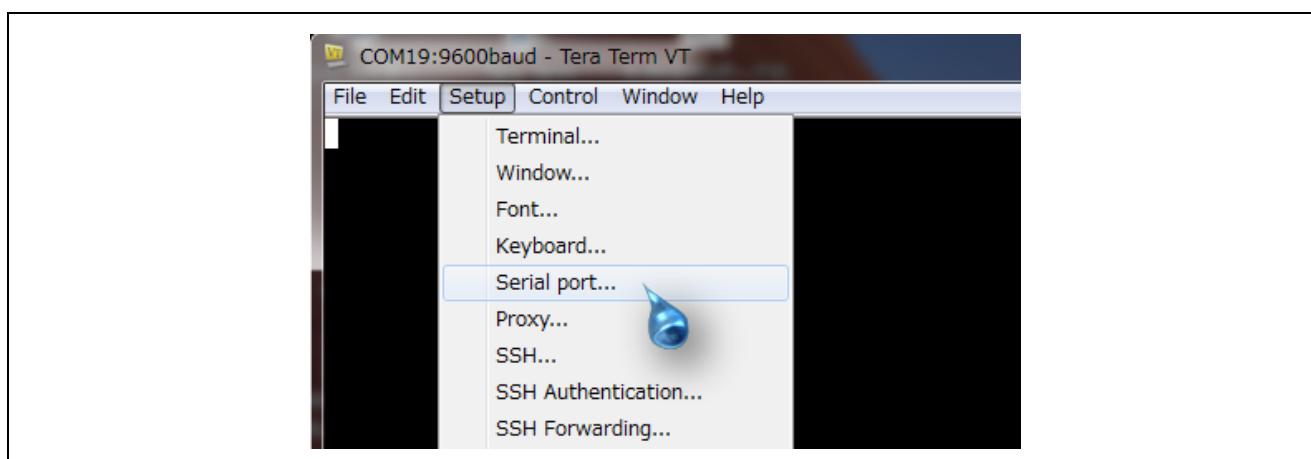
Click [Close]

5. UART Setting

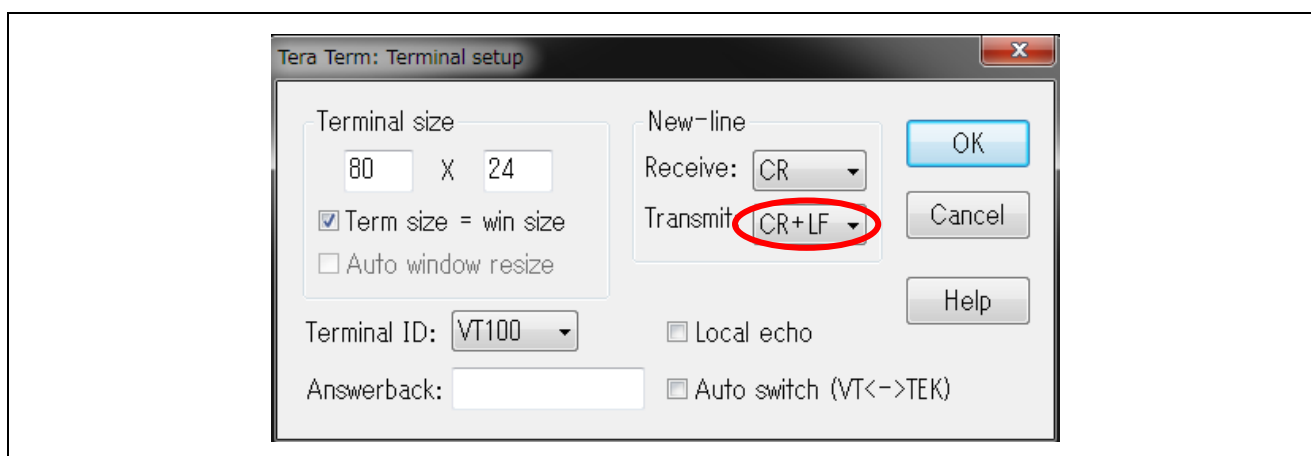
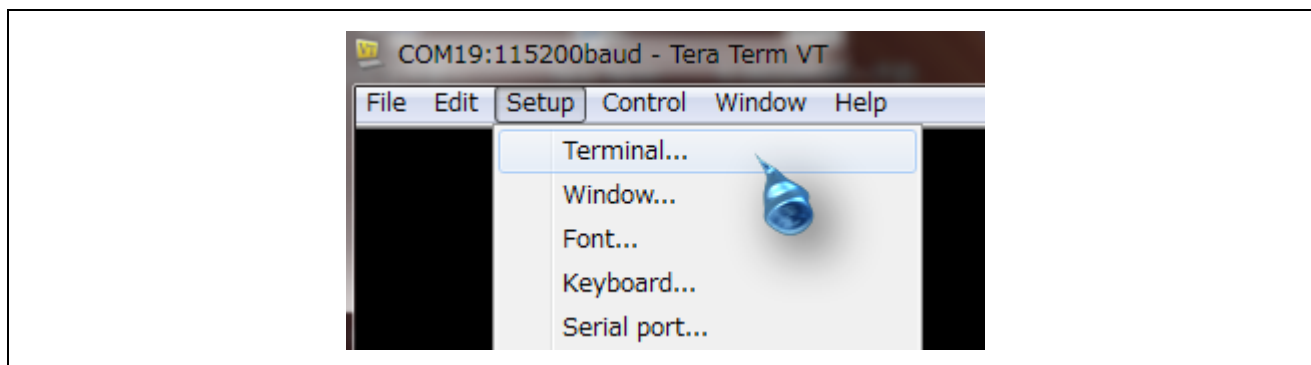
Install serial terminal software (such as TeraTerm) on your PC and set it up as shown below:



Please set the port according to your PC configuration.



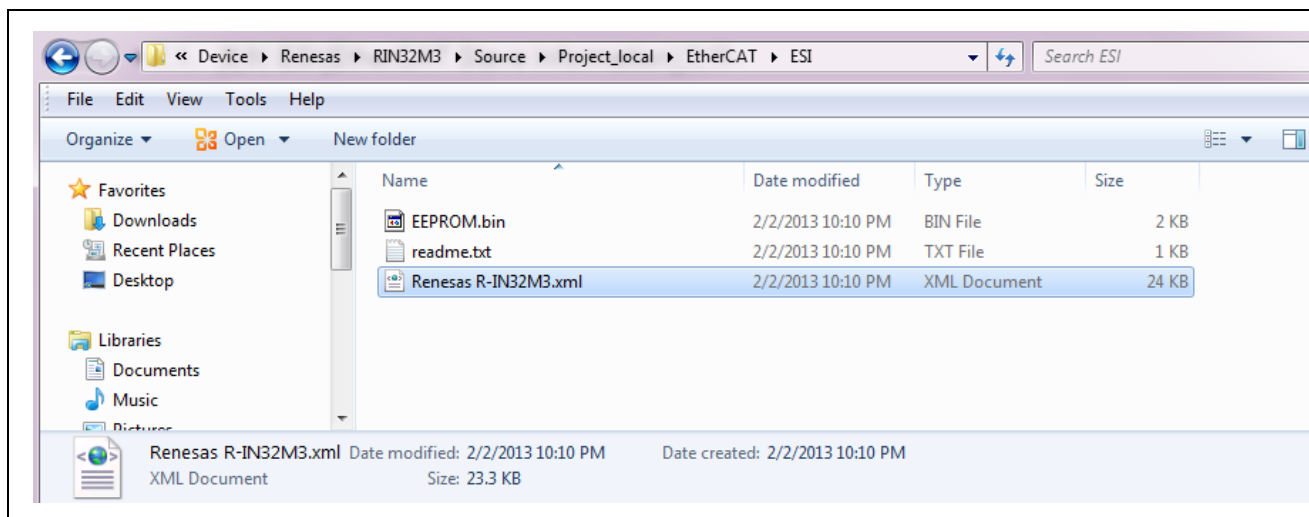
Set the baud rate to 115200, data to 8-bit, no parity, 1 stop bit, and no flow control.



Please set the terminal software to transmit “CR+LF” for new lines (In TeraTerm the option is [Transmit] under [New-line] in [Terminal setup] as shown above.)

6. Prepare for the EtherCAT Communication Check between TwinCAT and Board

6.1 Copy ESI (EtherCAT Slave Information) file



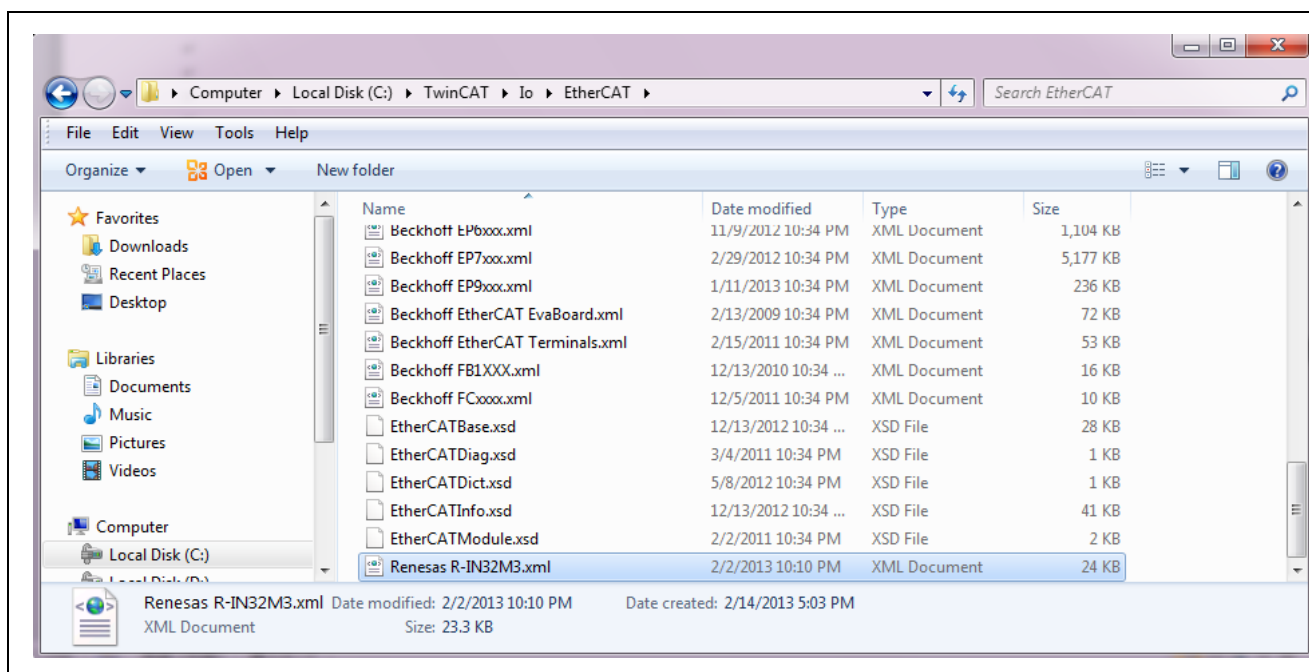
Copy the “Renesas R-IN32M3.xml” ESI file from the SampleSoft installation in folder

[\Device\Renesas\RIN32M3\Source\Project\EtherCAT\ESI](#)

to the folder:

[\TwinCAT\Io\EtherCAT](#) (for TwinCAT2)

or [\TwinCAT3.x\Config\IO\EtherCAT](#) (for TwinCAT3), as shown in the figure below.

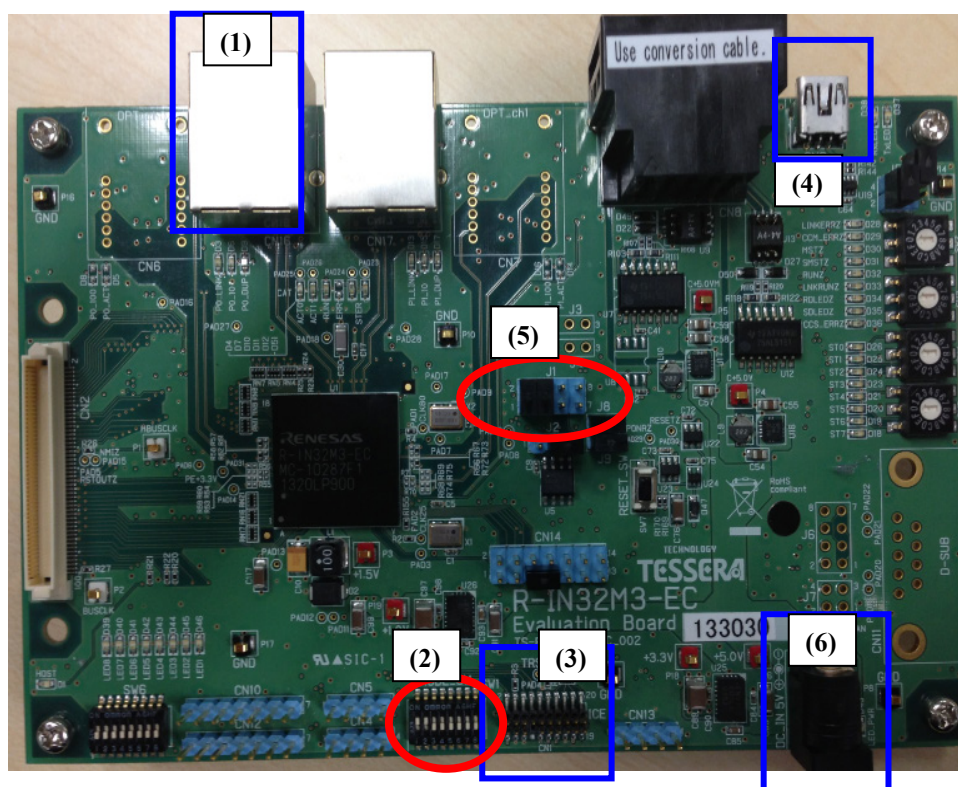


6.2 Board Connection

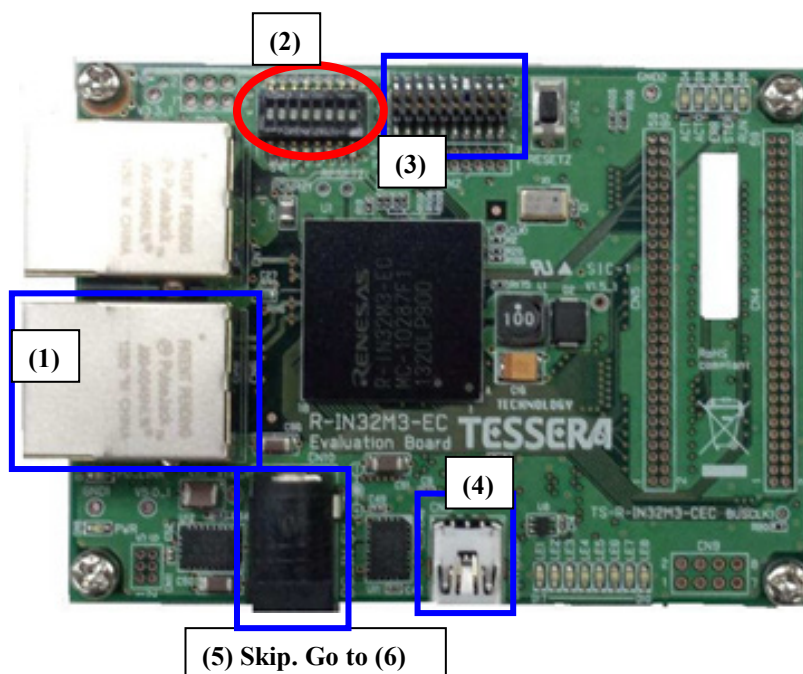
Please establish the following connections between the R-IN32M3 board and the PC

- (1) Connect Ethernet Port 0 to your PC (with TwinCAT installed) with an Ethernet cable (recommend Category 5).
- (2) Set the MODE_SW (SW1[1:8]: **|ON|ON|OFF|OFF|OFF|OFF|OFF|OFF|**) (boot from internal memory)
- (3) Please connect the 20 pin half pitch connector from the debugger. Please notice that the terminal 1 of the cable is marked red and must be placed on the left side of connector (3).
- (4) Connect the enclosed USB (mini-B) cable to the PC's USB host connector to establish a serial terminal.
- (5) Set J1 switch: 1-2:Short, 3-4:Short, 5-6:Open, 7-8:Open (only for TS-R-IN32M3-EC board)
- (6) Please connect the 5V-3A DC adaptor (the red LED next to connector (6) should turn on).

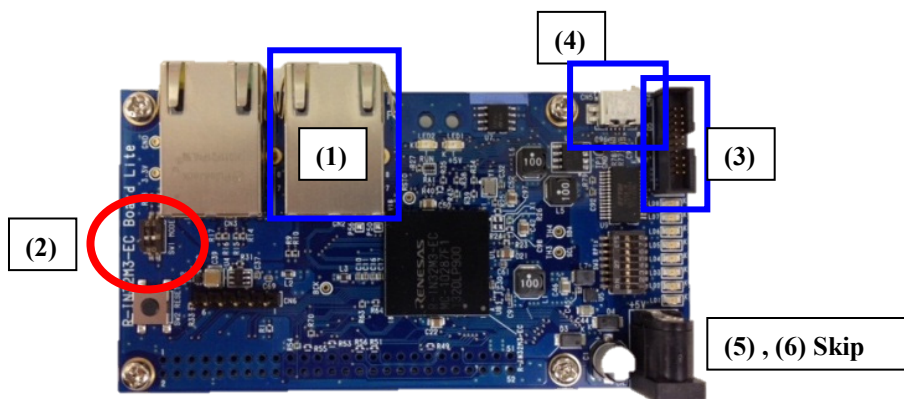
■ TS-R-IN32M3-EC board



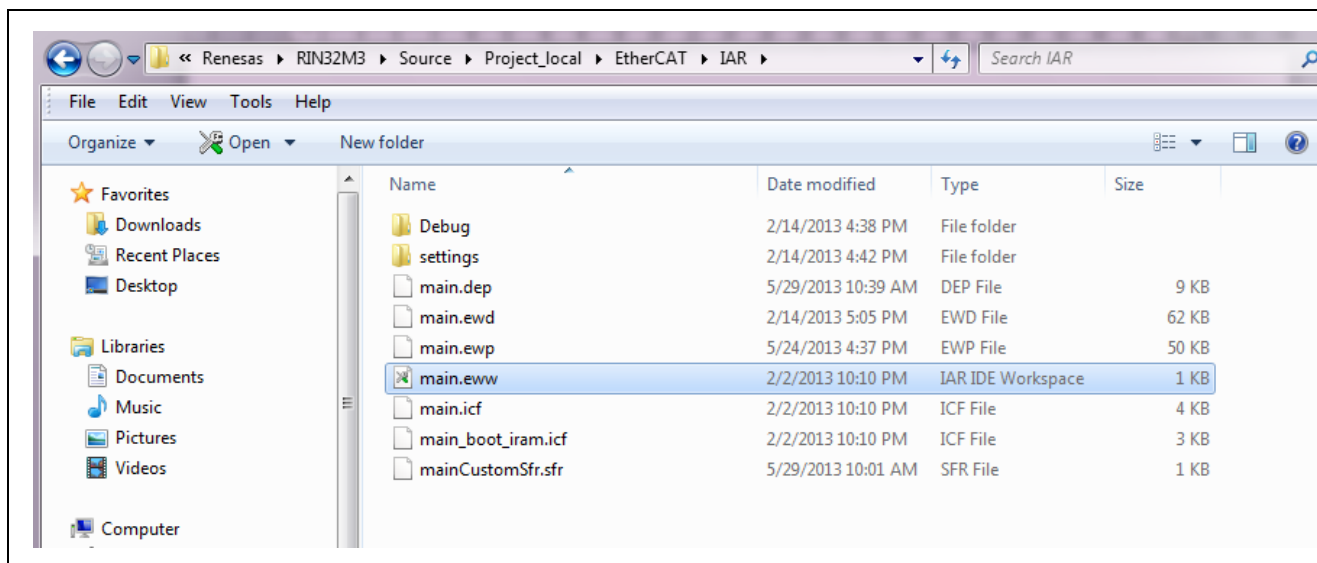
■ TS-R-IN32M3-CEC board



■ R-IN32M3-EC Board Lite



6.3 Start EWARM Sample Program for EtherCAT Communication



Double click the file “main.eww” in the

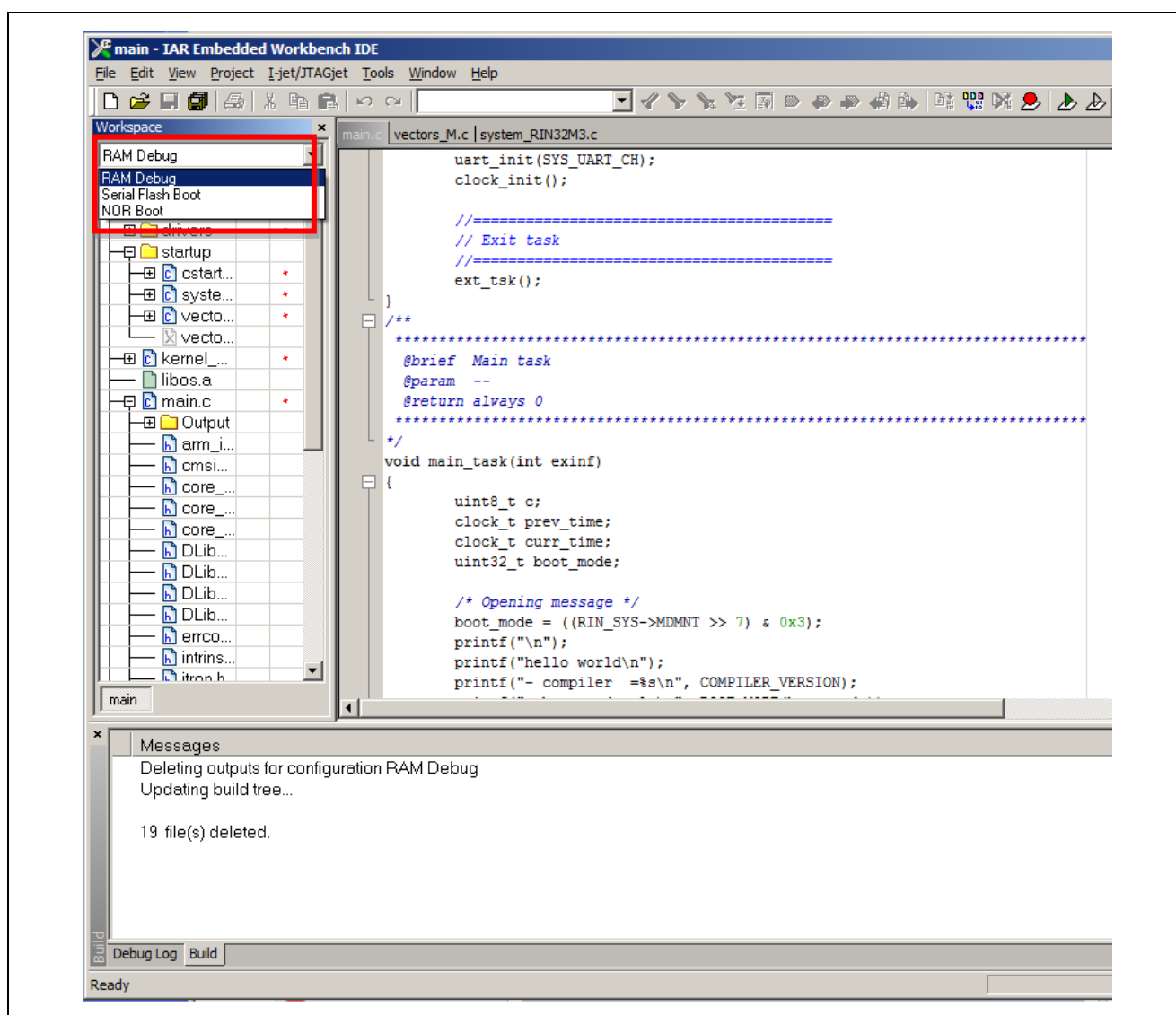
[\Device\Renesas\RIN32M3\Source\Project\EtherCAT\IAR](#)

folder. The IAR Embedded Workbench IDE will start automatically.

6.4 Build configuration setting

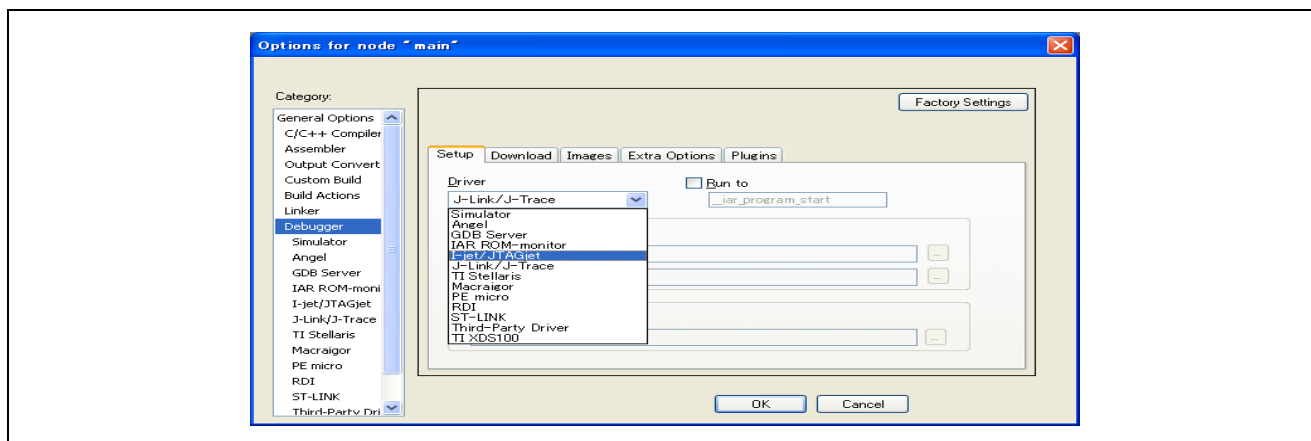
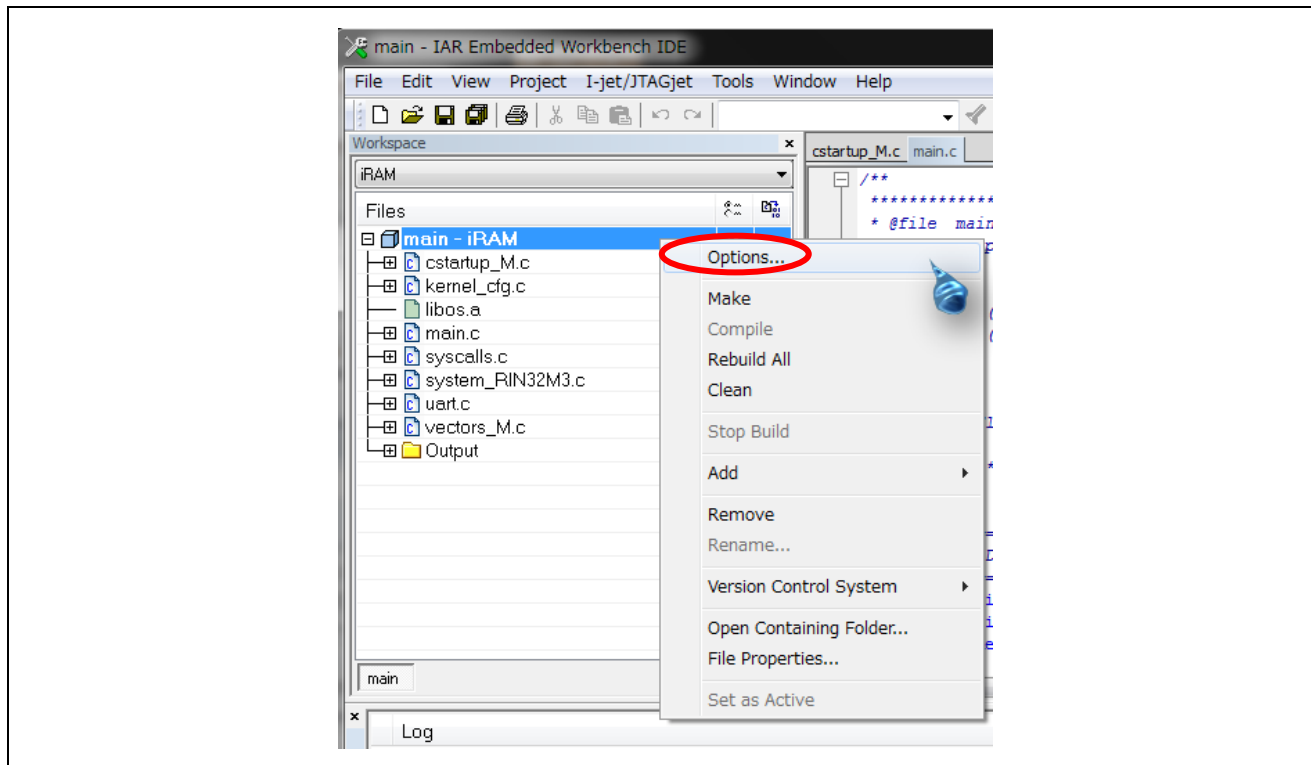
Please select the build configuration setting from the following 3 types: RAM Debug, Serial Flash Boot, or NOR Boot.

- 1) When using the I-jet debugger and executing on Instruction RAM of R-IN32M3, select “RAM debug”.
- 2) When using the I-jet debugger and executing on External serial flash ROM of R-IN32M3, select ”Serial Flash Boot”.
- 3) When using the I-jet debugger and executing on External parallel flash ROM of R-IN32M3, select “NOR Boot”



6.5 Select the Debugger Type

After starting IAR, right click the [main – xxx] file on the left side of the tool window (the picture below shows the [main – iRAM] selection). In the modification window click [Options...]



Choose the "Debugger" in the Category on the left, choose the [I-jet/JTAGjet] from the "Driver" drop down list in the [Setup] tab, and then click [OK]. Alternatively you can choose the [J-Link / J-Trace] option in case you have ordered the R-IN32M3-EC Starter Kit together with the SEGGER J-Link Lite CortexM-19 debugger.

6.6 Linker Setting

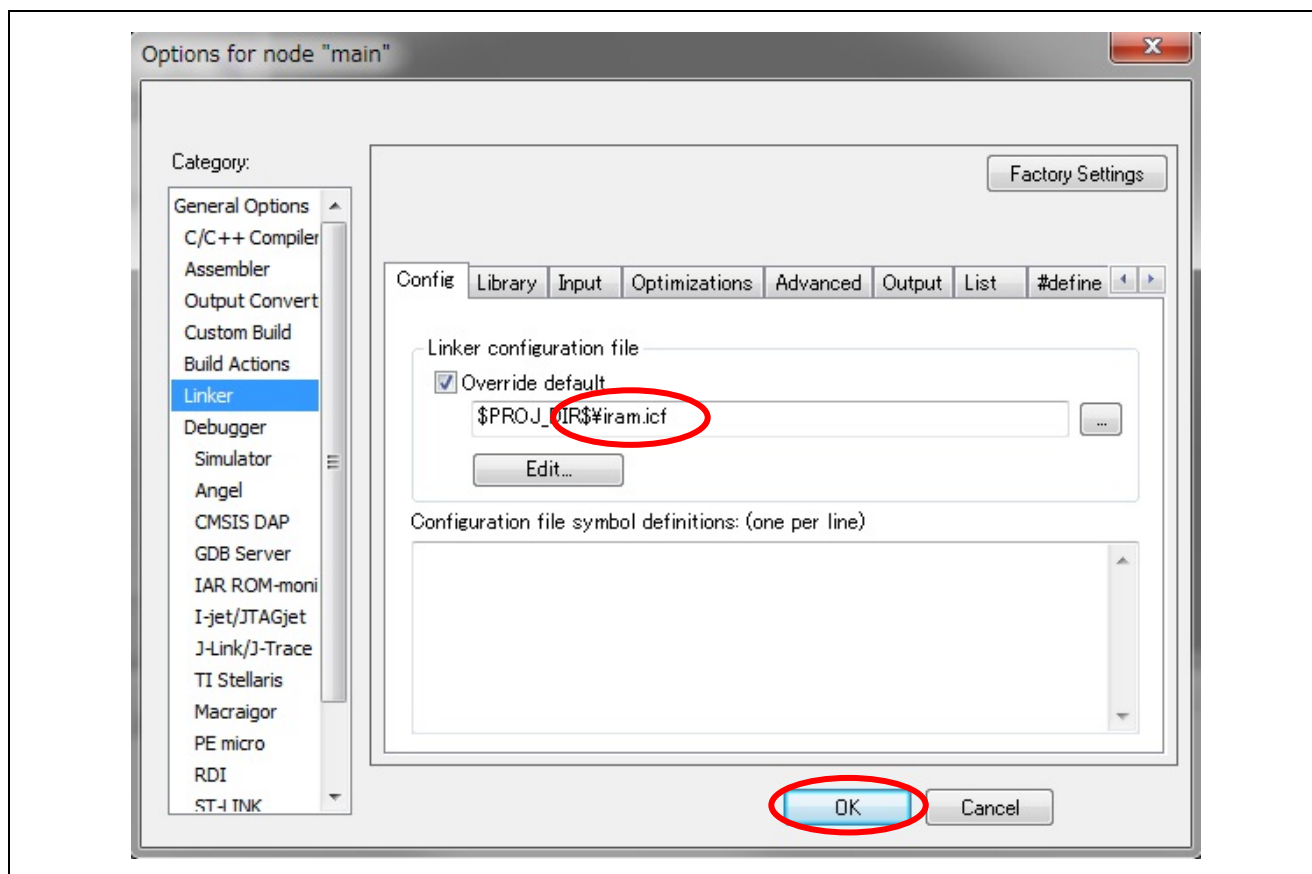
The R-IN32M3 board supports different boot options which can be selected via bit 1 and bit 2 of the MODE_SW switch. To select one of these options you must select the correct linker parameter in the IAR environment. In the Linker Category on the left side of the [Project] / [Options...] menu use the [Config] tab in the right window and modify *.icf file as shown below:

For execution on the R-IN32 internal RAM (iRAM))	: iram.icf
For booting from parallel NOR flash	: boot_norflash.icf
For booting from serial flash	: boot_serialflash.icf

The *.icf files can be found in the sub-directories at the following path:

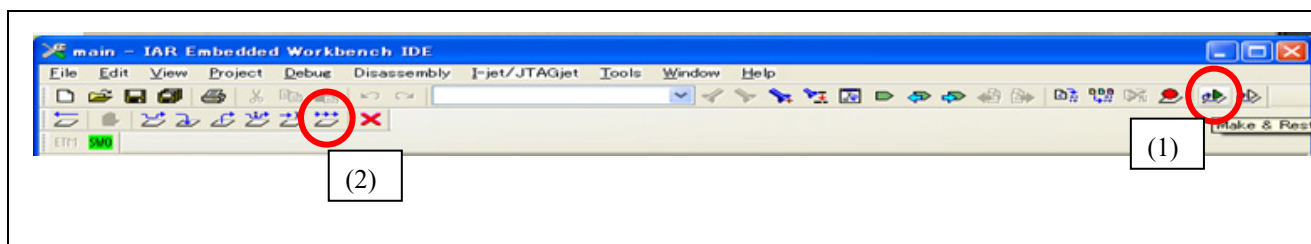
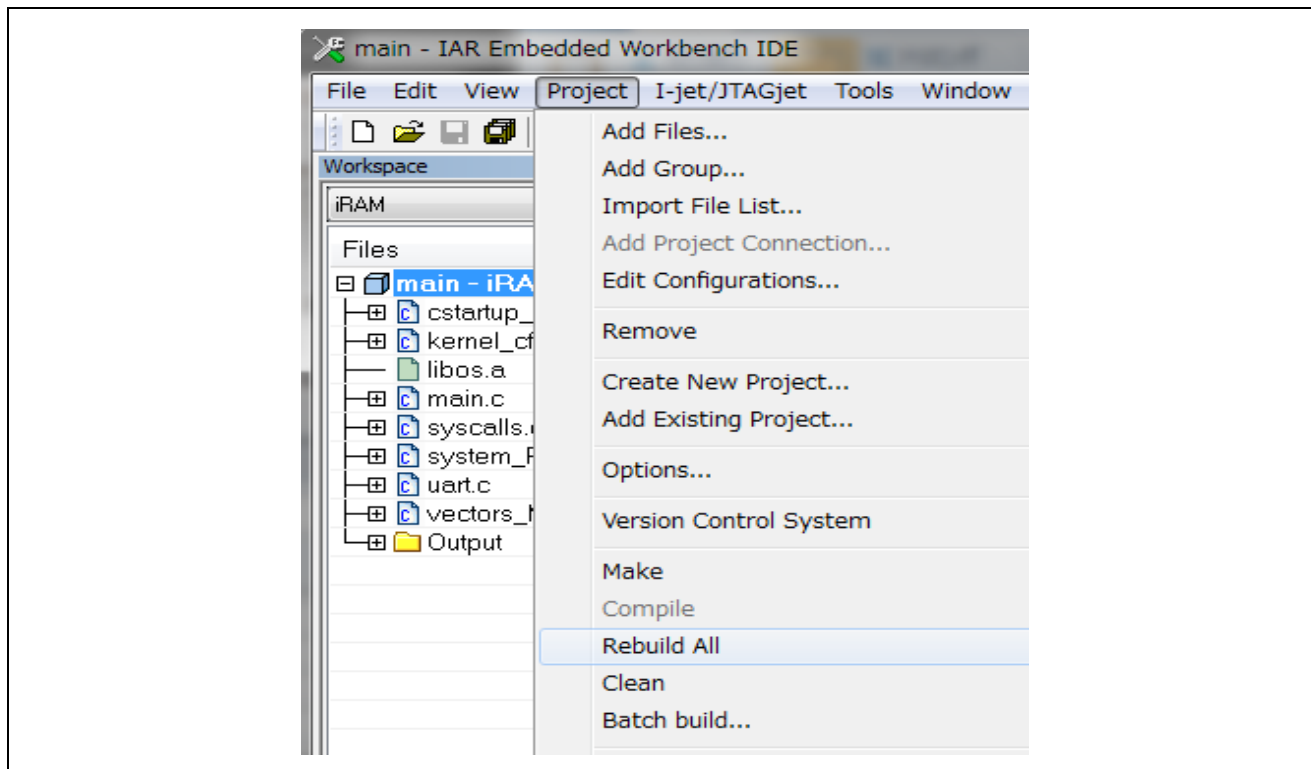
[\Device\Renesas\RIN32M3\Source\Project\EtherCAT\IAR](#)

The image below shows an example using the “iram.icf”.



6.7 Build and Execute the Program for EtherCAT Communication

Execute Build by clicking [Project]→[Rebuild All].



After completion of the build process you can execute the generated program:

Click (1) to download the code to the target.

Click (2) to run the program.

7. Start TwinCAT

7.1 In the case of using TwinCAT2

In the case of TwinCAT2 installed in the PC, the TwinCAT2 icon will be set as the startup item in the task tray (bottom right of PC display). Please click this icon and choose TwinCAT System Manager, then the TwinCAT application window will be shown.

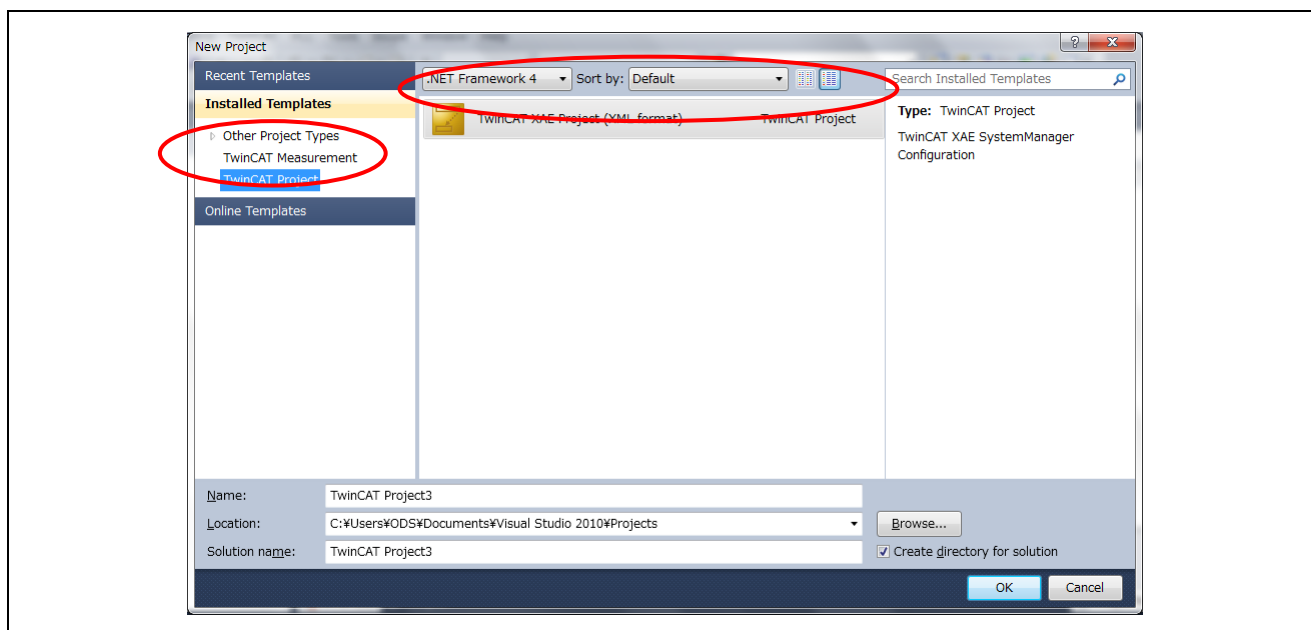
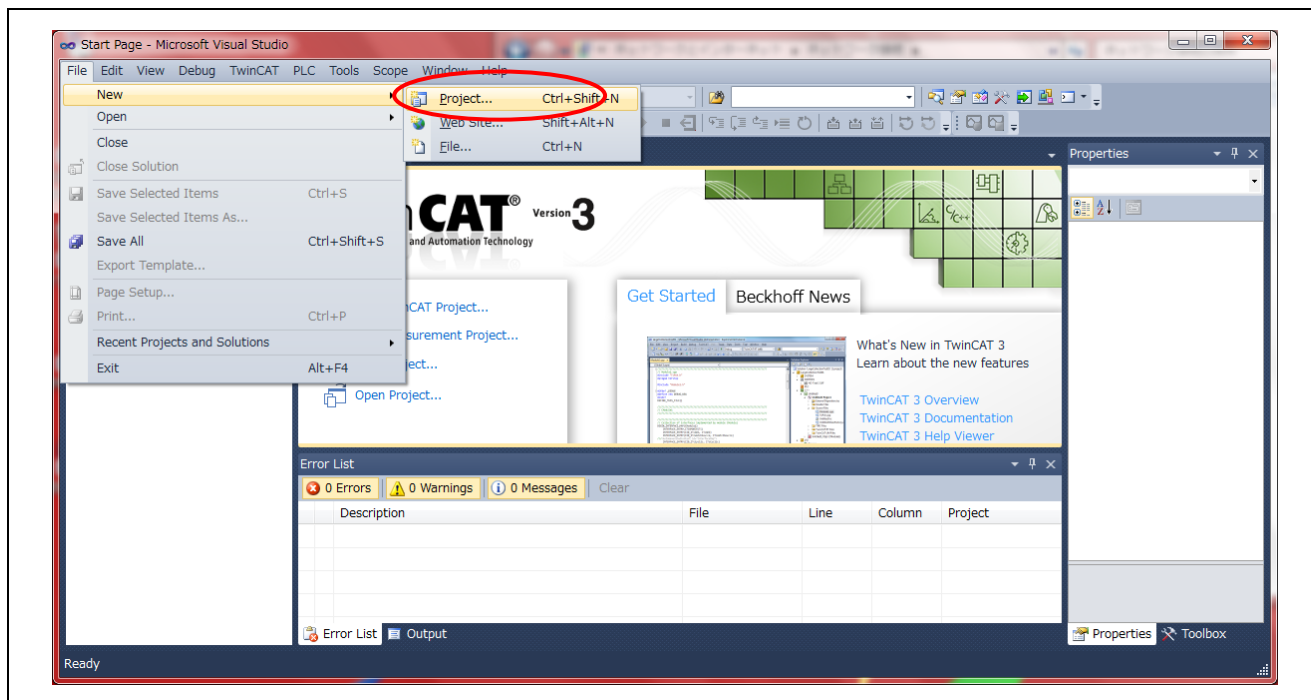
Please proceed to section 7.3.

7.2 In the case of using TwinCAT3

Please activate the “TwinCAT XAE” program using one of the following methods:

- (1) Task tray ⇒ [TwinCAT Config Mode] ⇒ [TwinCAT XAE (VS2010)]
- (2) Start menu ⇒ [Beckhoff] ⇒ [TwinCAT3] ⇒ [TwinCAT XAE (VS2010)]

After activating the program, please select [File] ⇒ [New] ⇒ [Project] and make a new project as a TwinCAT XAE Project type.

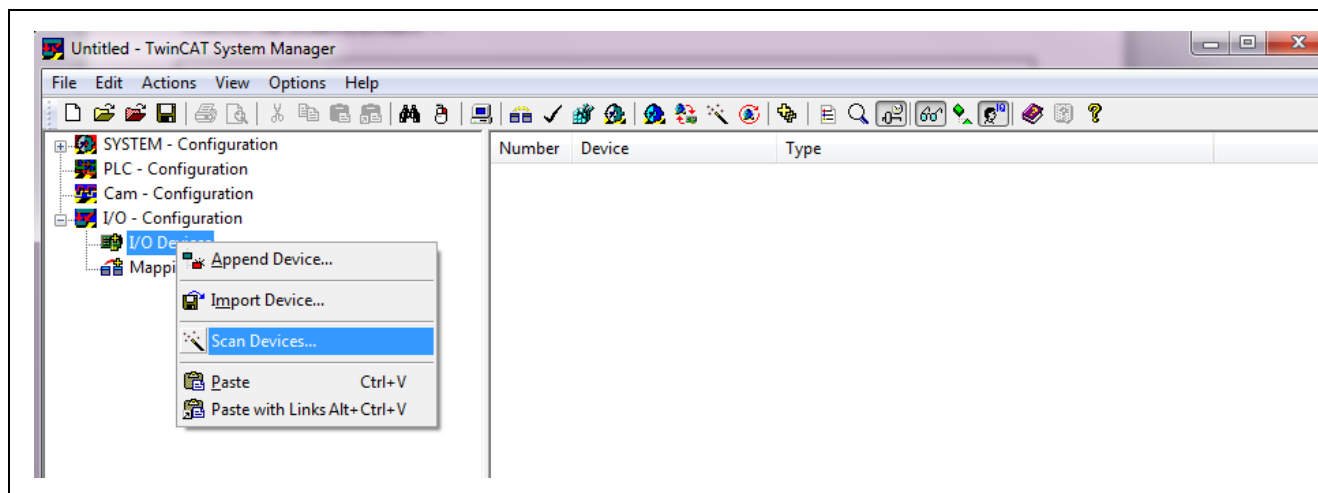


Please proceed to section 7.3.

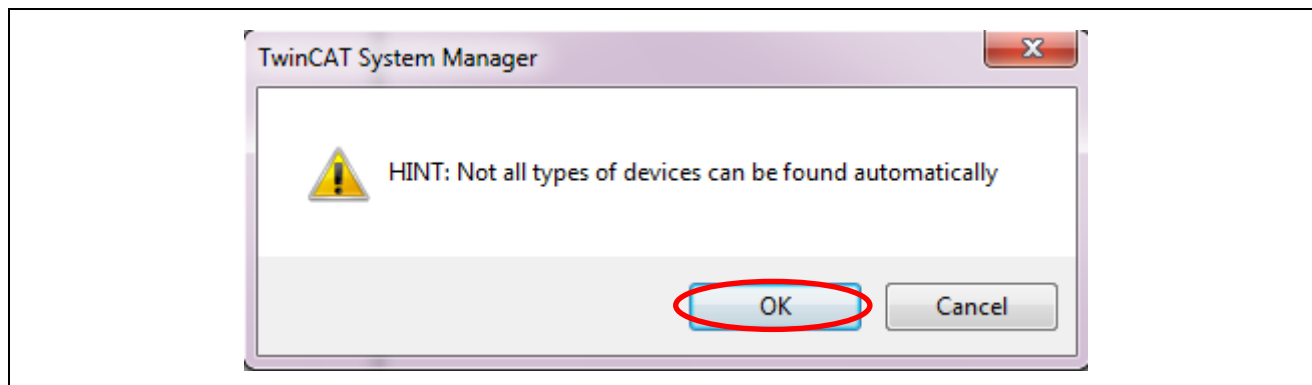
7.3 Scan I/O devices

The following operation is similar for both TwinCAT2 and TwinCAT3

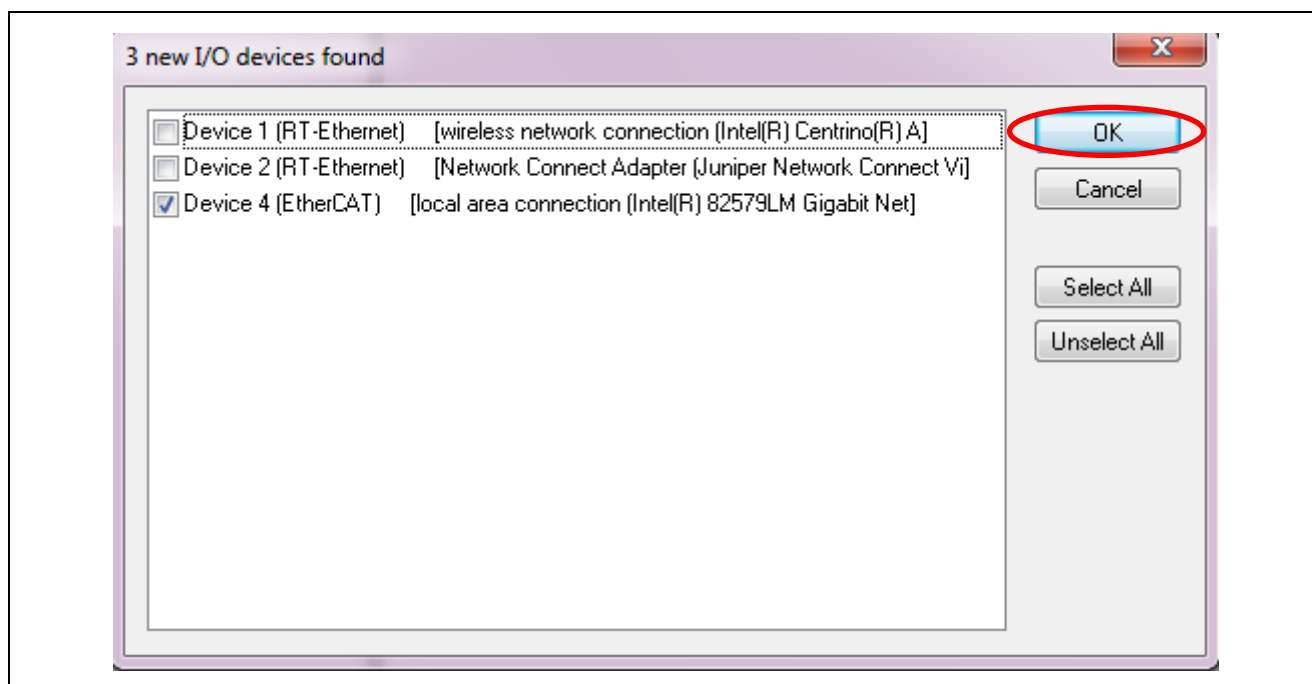
The image below is an example of the TwinCAT2 operation.

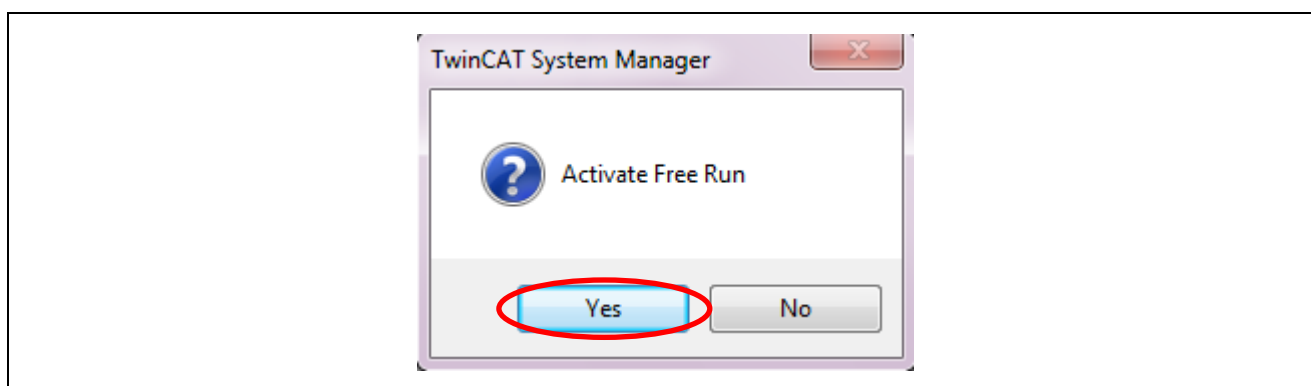
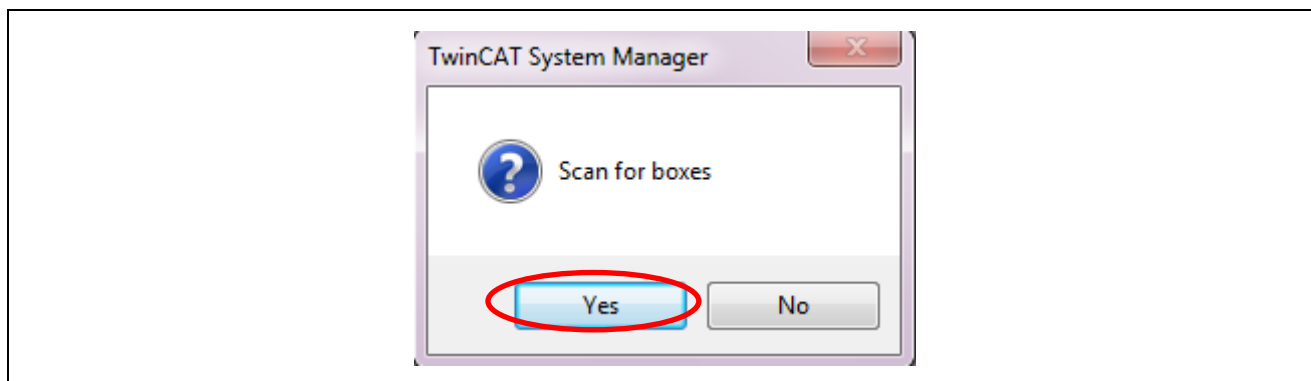


Right click on [I/O Device] and select [Scan Devices.....].



The window below will open showing the Ethernet ports on your PC. Select the Ethernet port which will run the EtherCAT communication and uncheck all other items marked with (RT-Ethernet), then click [OK].





After the procedure above, TwinCAT will start to search for the R-IN32M3-EC board automatically.

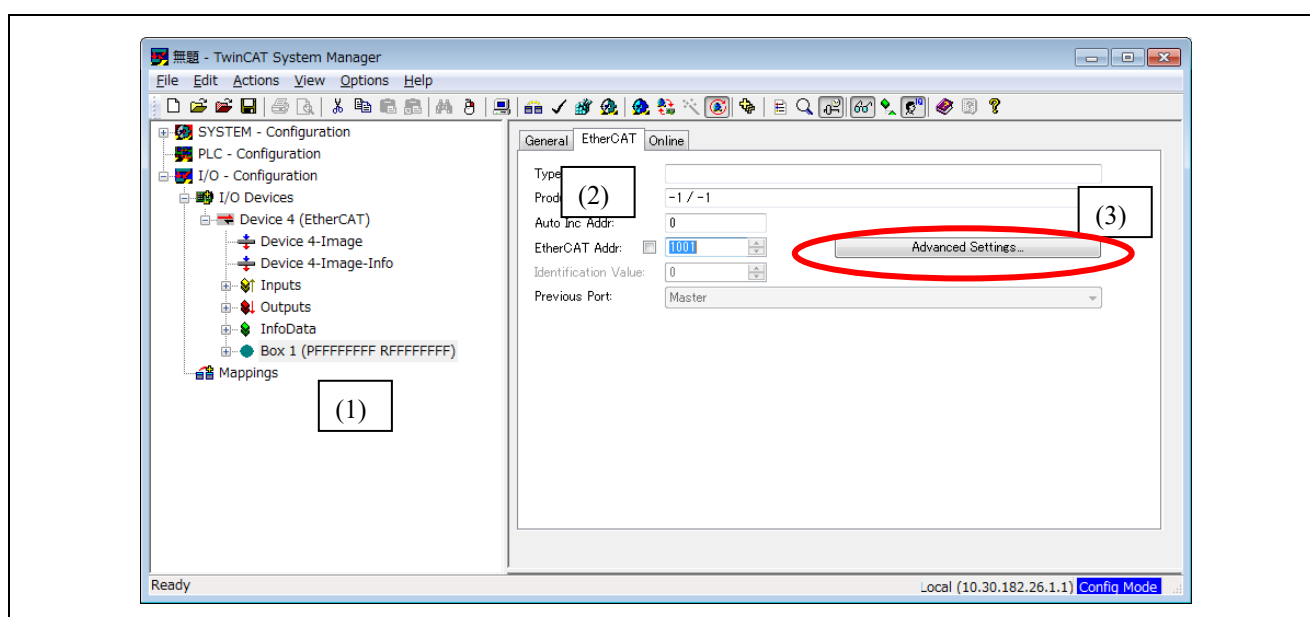
Until the evaluation board EEPROM has been updated as shown in the next section, it will show up as a device named “Box 1 (PFFFFFFFF RFFFFFFFF)” in the TwinCAT left-hand panel. After flashing the EEPROM, which only needs to be done once, the evaluation board will show up properly as “Box 1 (R-IN32M3)”.

7.4 Refresh R-IN32M3-EC Board E2PROM data from TwinCAT

It is possible to refresh the E2PROM data of the R-IN32M3-EC board from TwinCAT when TwinCAT is properly linked to the R-IN32M3-EC.

At the first launch after obtaining the board, please execute the procedure in this section because the contents of E2PROM are blank. From the second time on, as long as E2PROM is not overwritten, the procedure in this section is not needed. Please go to the next section.

- (1) Double-click on “Box 1” to show the right-hand option panel shown below (TwinCAT 2 version is shown)
- (2) Select the “EtherCAT” tab on the right-hand pane (middle pane for TwinCat 3)
- (3) Click the “Advanced Settings” button.



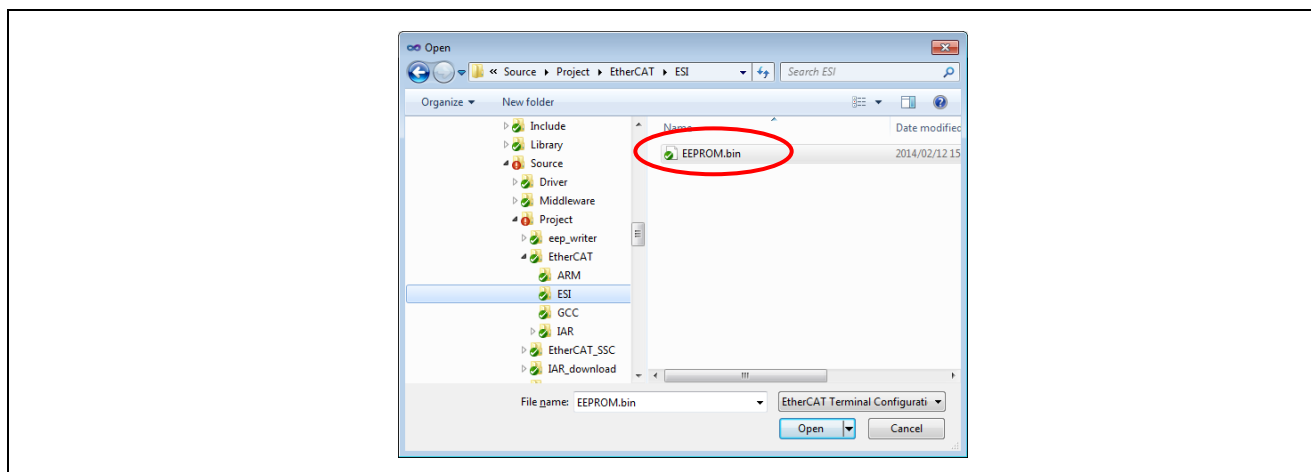
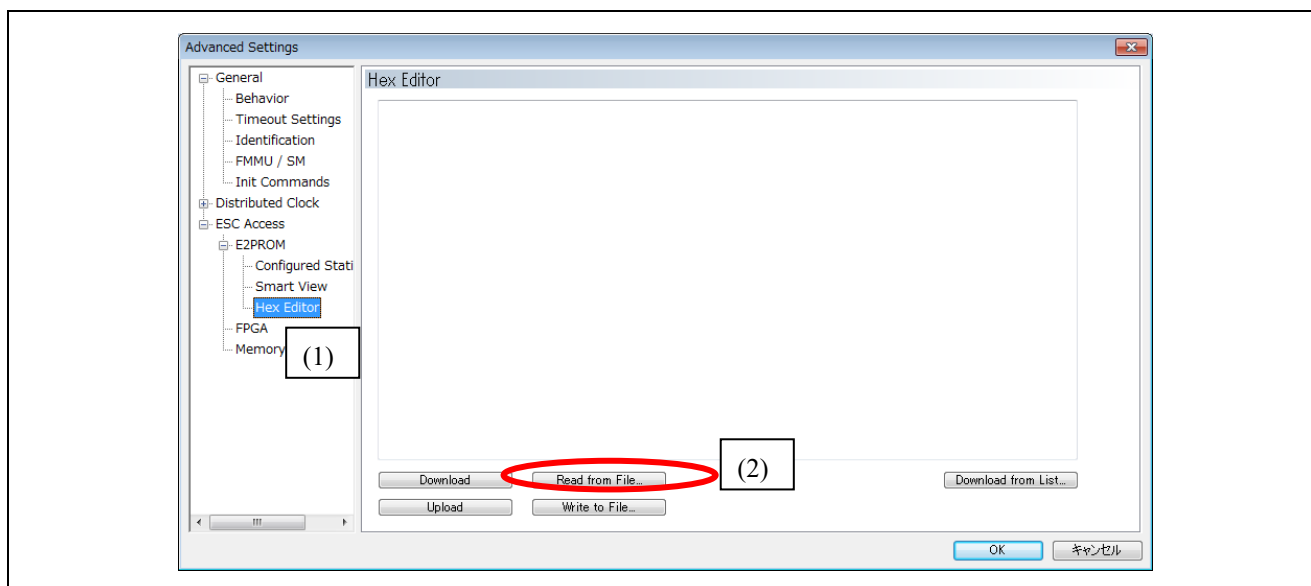
In the dialog box that opens please select the folder that contains the data file you wish to write into the EEPROM for EtherCAT communication.

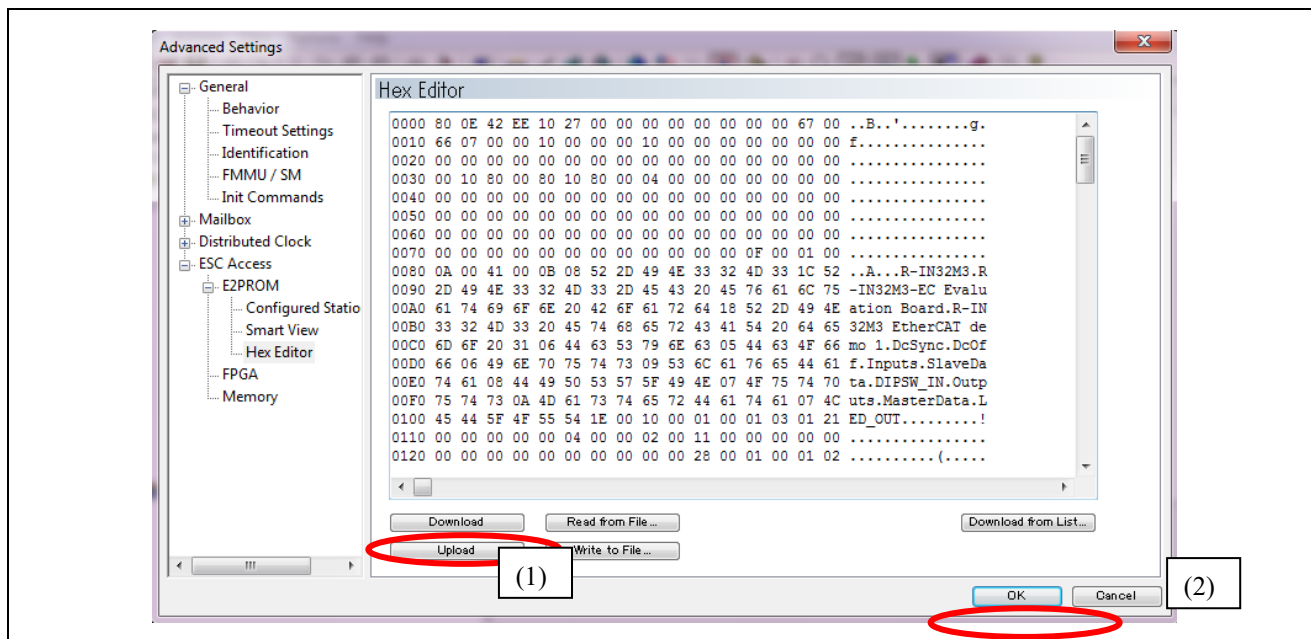
Please select the file “EEPROM.bin” in the following folder.

[\\r-in32m3_samplesoft\Device\Renesas\RIN32M3\Source\Project\EtherCAT\ESI](#)

Note: In file type tag, please choose [EtherCAT Terminal Configuration (*.bin)].

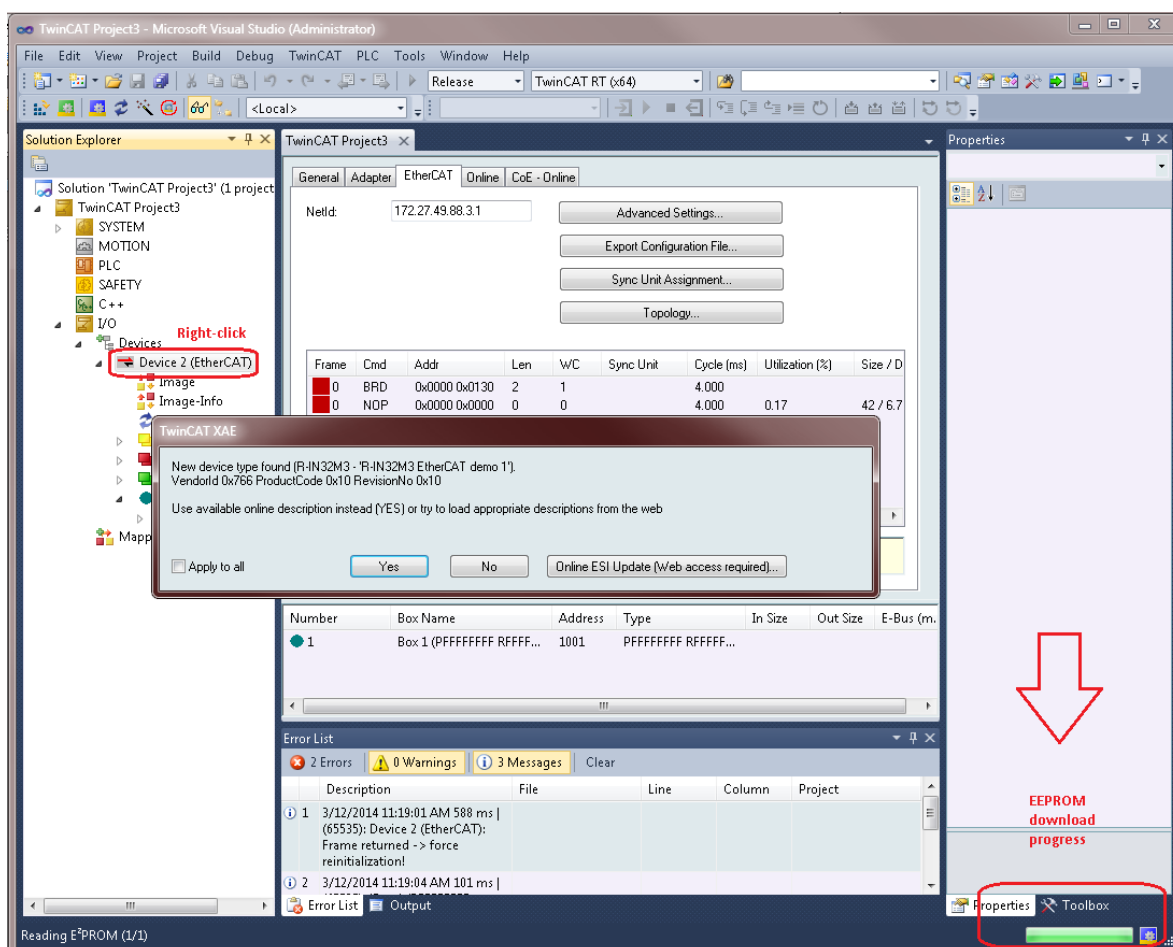
Open the selected write-into EEPROM data(*.bin) by clicking [Open(O)].





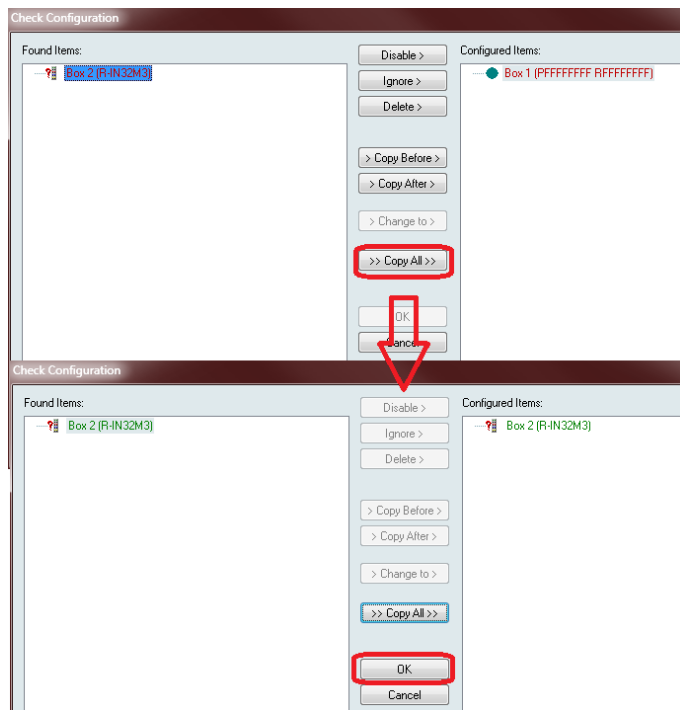
The transfer is successful if the data display in [Hex Editor] is changed from all “FF” to the data shown above.

- (1) Click [Download] and check the lower-right corner of the window to monitor the download progress. Do not close the window until the download completes.



(2) Click [OK].

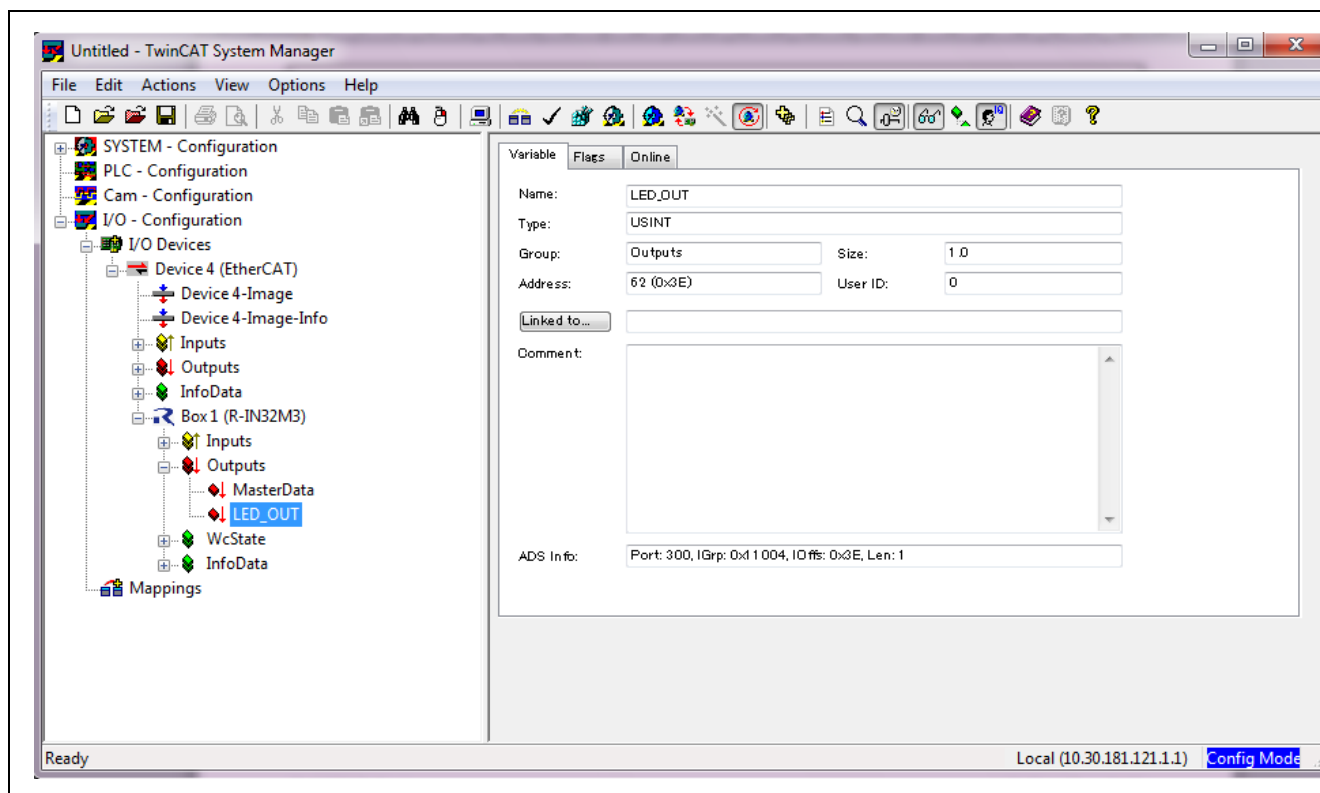
Now the EEPROM data refresh is completed. Right-click on “Device 2 (EtherCAT)” to refresh the devices list. After clicking “Yes” in the dialog box shown above, click “Copy All” then “OK” as shown in the figure below.



7.5 Checking the link to TwinCAT

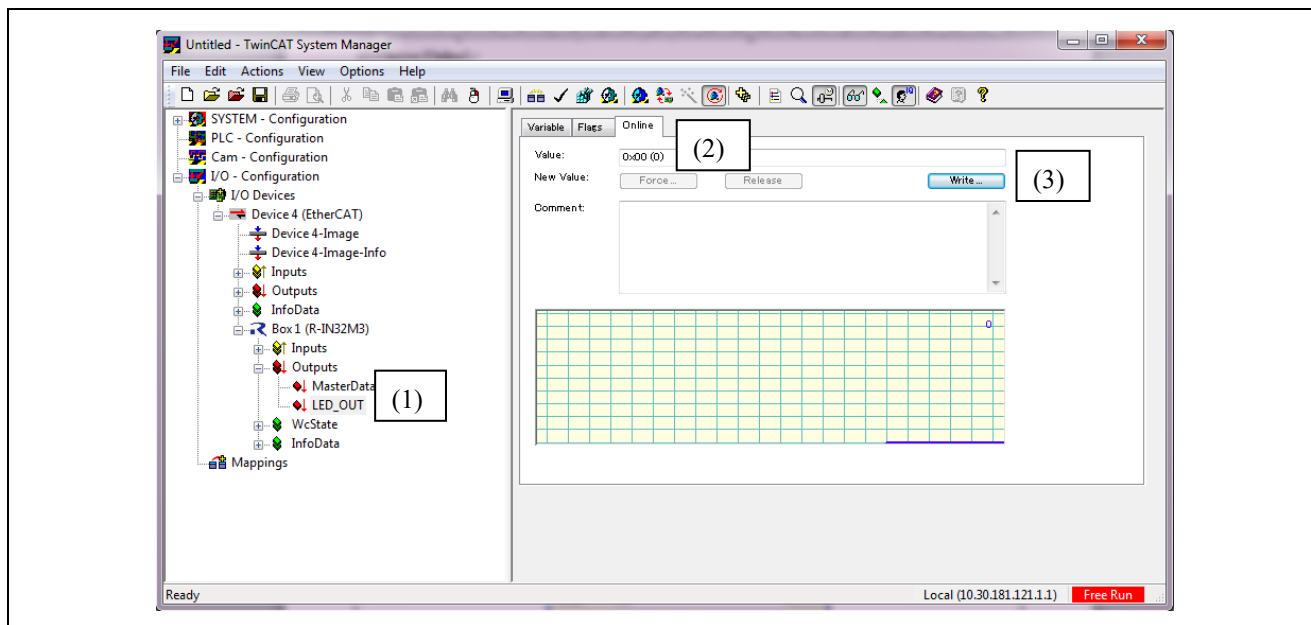
After executing “7.4 Refresh R-IN32M3-EC Board E2PROM data from TwinCAT”, please execute “7.3 Scan I/O devices” again.

If the link to TwinCAT is built successfully, “**R** Box 1(R-IN32M3)” will appear as shown in the window below.

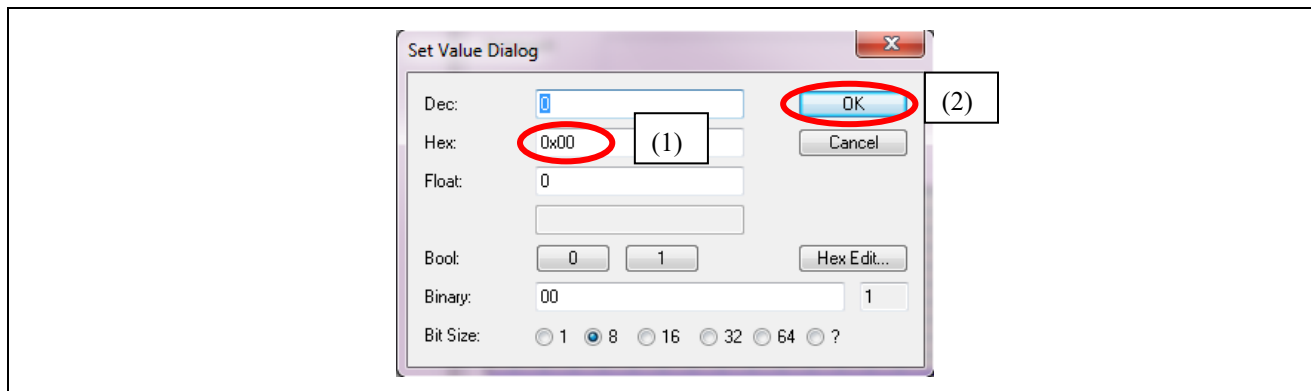


7.6 Write data to R-IN32M3-EC Board from TwinCAT

- (1) Open the “Output” tree of R Box 1 (R-IN32M3), then choose LED_OUT.
- (2) Choose the [Online] tab.
- (3) Click [Write.....].

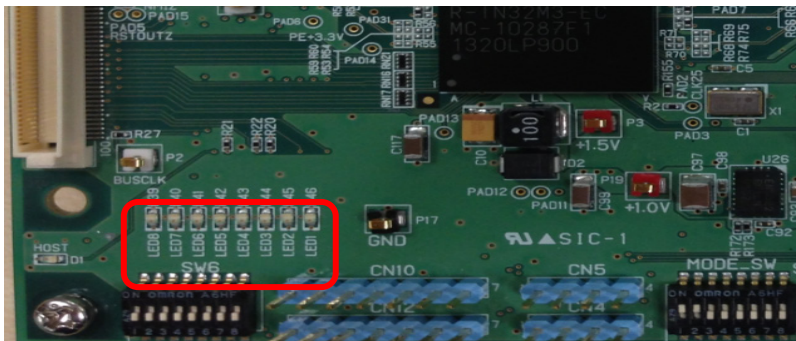


The window below will appear when (3) [Write.....] is clicked in the window above.

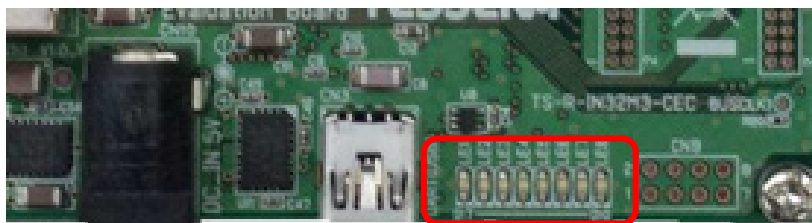


After changing Hex: 0x00 to, for example, 0x55 and clicking [OK], the board LEDs will light up according to the value set.

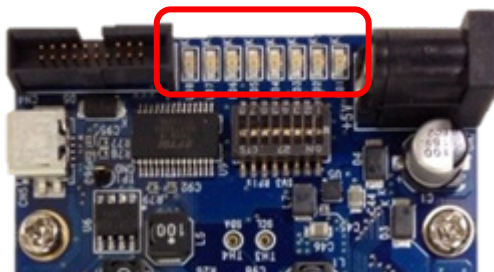
■ TS-R-IN32M3-EC board



■ TS-R-IN32M3-CEC board



■ R-IN32M3-EC board Lite



[Notes]

Even after closing the TwinCAT program, it may not be possible to use the PC's network adapter normally until the PC has been rebooted.

8. KEIL MDK-ARM Setup

This section shows how to setup KEIL MDK-ARM.

8.1 Board and emulator preparation

Prepare R-IN32M3-EC Board (e.g. TS-R-IN32M3-EC_002 from Tessera Technology) and MDK-ARM emulator (e.g. ULINK).

Please do setting the board by referring section “3.1 Boot mode settings for R-IN32M3-EC” section.

8.2 Download MDK-ARM

Install MDK-ARM from KEIL web page (<https://www.keil.com/>).

The example of MDK-ARM V5.11 is showed as follows.

The first screenshot shows the KEIL website homepage with the 'Download' menu item circled in red. The second screenshot shows the 'Overview' page with 'Product Downloads' circled in red. The third screenshot shows the 'Download Products' page with 'MDK-ARM v5' circled in red.

KEIL Tools by ARM

Product Information
Product Overview
Supported Microcontrollers
Shows and Seminars

Technical Support
Support Knowledgebase
Application Notes
Discussion Forum

Software Downloads
Product Downloads
File Downloads

Other Info

Embedded Development Tools

ARM provides complete solutions for microcontroller software development. On this website, you can find product information, updates, and technical resources.

MDK-ARM Microcontroller Development

The Keil MDK-ARM Microcontroller Kit is a complete software development environment for the wide range of ARM, Cortex-M, and Cortex-R based microcontroller devices. MDK includes the uVision IDE/Debugger, ARM C/C++ Compiler, and essential middleware components. It's easy to learn and use.

MDK - Professional

News

- ARM collaborates with IS2T for Embedded Java development
- Keil introduces MDK-ARM Atmel Edition
- ARM Keil RTX Real-Time Operating System offers 'tickless' power-

Overview

Keil downloads include software products and updates, example programs and various utilities you may use to learn about or extend the capabilities of your Keil development tools.

Product Downloads
Download current and previous versions of the Keil development tools.

File Downloads
Download example projects and various utilities which enable you to extend the capabilities of your Keil development tools.

Download Products

Select a product from the list below to download the latest version.

	MDK-ARM v5 Version 5.11a (June 2014) Development environment for Cortex and ARM devices.		MDK-ARM v4 Version 4.74 (April 2014) Development environment for Cortex and ARM devices.
	C51 Version 9.52 (July 2013) Development tools for all 8051 devices.		C166 Version 7.53 (July 2013) Development tools for C166, XC166, & XC2000 MCUs.
	C251 Version 5.55 (July 2013) Development tools for all 80251 devices.		

Keil products use a [License Management](#) system - without a current license the product runs as a Life/Evaluation edition with a few [Limitations](#).

Enter Your Contact Information Below

First Name:

Last Name:

E-mail:

Company:

Address:

City:

State/Province: Select Your State or Province

Zip/Postal Code:

Country: Select Your Country

Phone:

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(Select all that apply)

☐ Analog Devices

☐ Atmel

☐ Cypress

☐ Energy Micro

☐ Freescale

☐ Fujitsu

☐ Holtek

☐ Infineon

☐ Nuvoton

☐ NXP

☐ Other

☐ Samsung

☐ SiLabs

☐ ST

☐ TI

☐ Toshiba

☐ Other

Which ARM architectures are you using?
(Select all that apply)

☐ Cortex-M0

☐ Cortex-M1

☐ Cortex-M3

☐ Cortex-M4

☐ Other

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MDK-ARM

MDK-ARM Version 5.11a

Version 5.11a

Review the [hardware requirements](#) before installing this software.

Note the [limitations of the evaluation tools](#).

[Further installation instructions for MDK5](#)

(MD5: 9A0159C0CC5E30B406861D2CC7E1DEAB)

To install the MDK-ARM Software...

Right-click on MDK511A.EXE and save it to your computer.

PDF files may be opened with Acrobat Reader.

ZIP files may be opened with PKZIP or WINZIP.

MDK511A.EXE (308,242K)

Wednesday, June 18, 2014

Estimated File Download Time:

< 22.6 Hours: 56Kb Modem

< 9.9 Hours: 128Kb ISDN

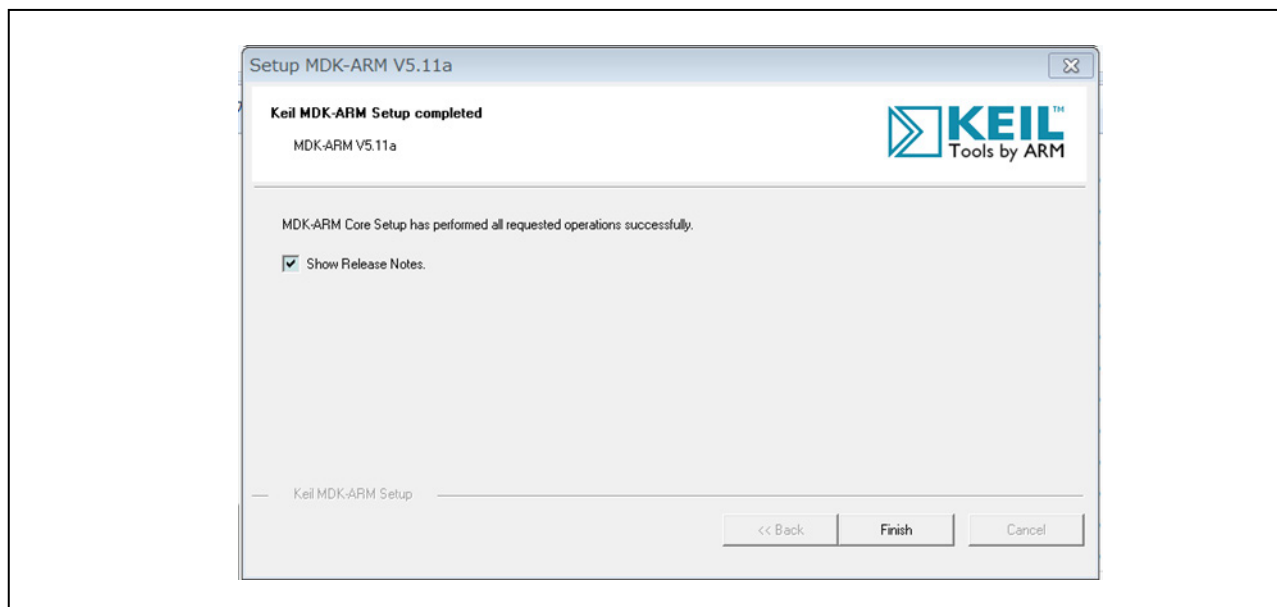
< 49 Minutes: T1/Broadband

If you are evaluating the tools, be sure to [request a quote](#) for the full version of the tools.

8.3 Install MDK-ARM

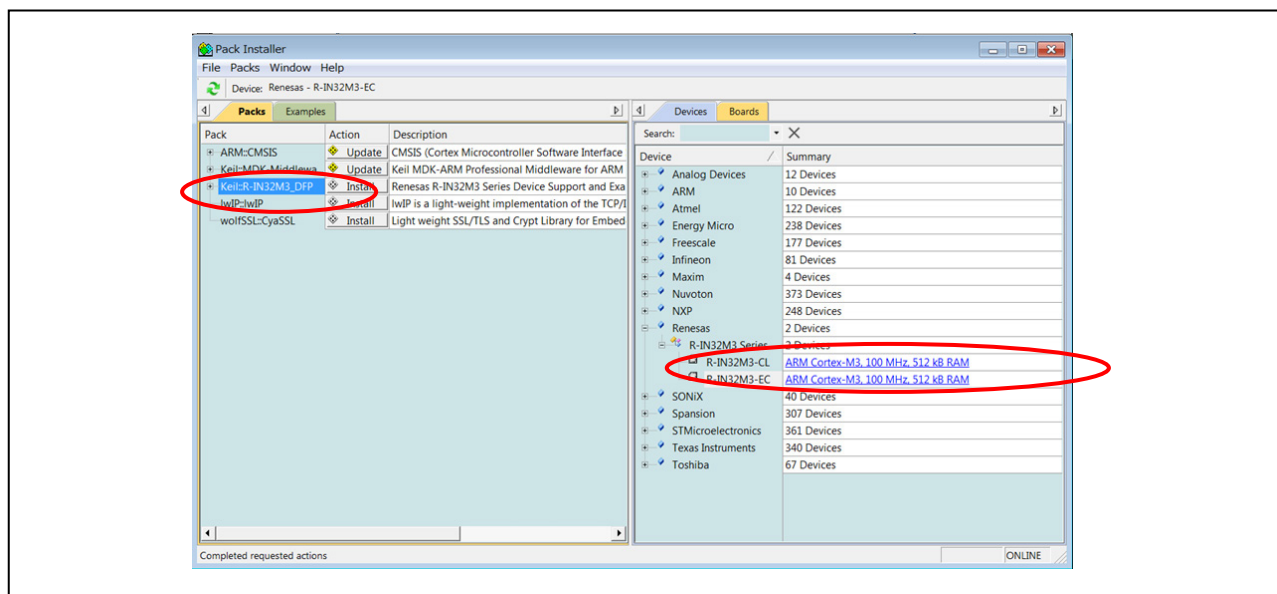
8.3.1 Install tools

Install MDK-ARM by executing “MDK5xxx.EXE” (xxx is a version).



8.3.2 Install Device Family Pack (DFP)

After install tools, “Pack Installer” window is opened^{Note}. In this window, select “R-IN32M3-EC” in “Devices” tab and press the install button with “Keil::R-IN32M3_DFP” in “Packs” tab.



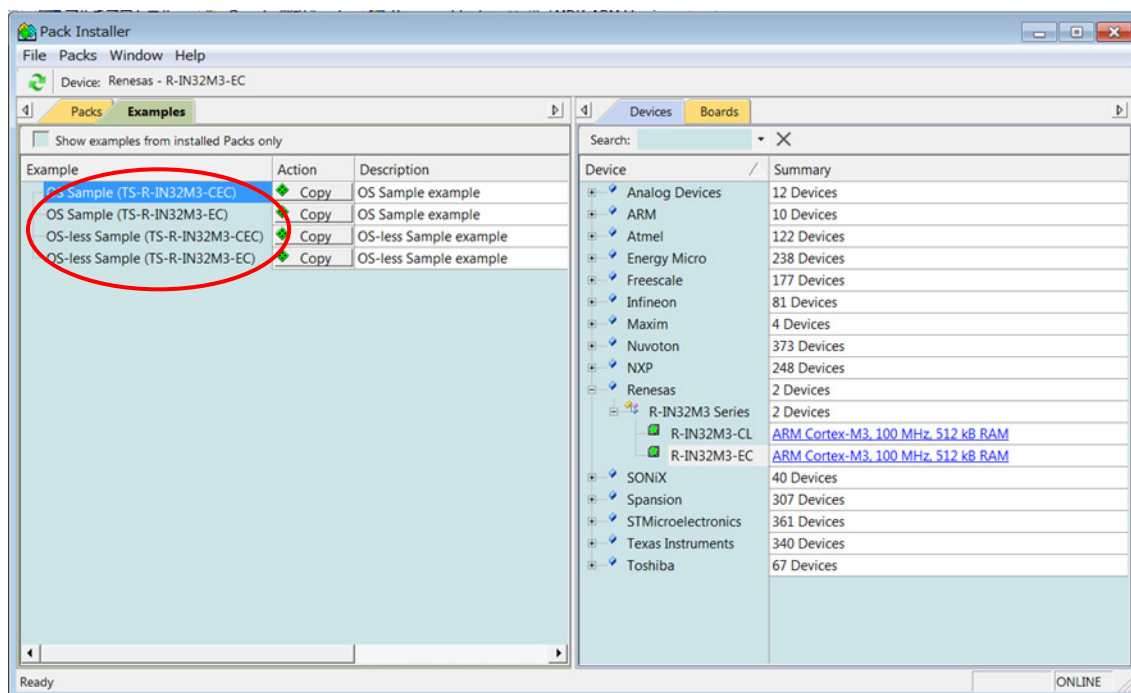
Note: The window is also opened by [Project]->[Manage]->[Pack Installer...] from tools bar.

8.3.3 Copy sample program

There are two ways to get sample program. The one way is to get from “Pack Installer”, the other way is from Renesas web page.

(1) The Pack Installer case

Select sample program in “Examples” tab, and press the “Copy” button.



(2) The Renesas web case

Please visit Renesas web page and get “Driver/Middleware” sample software.

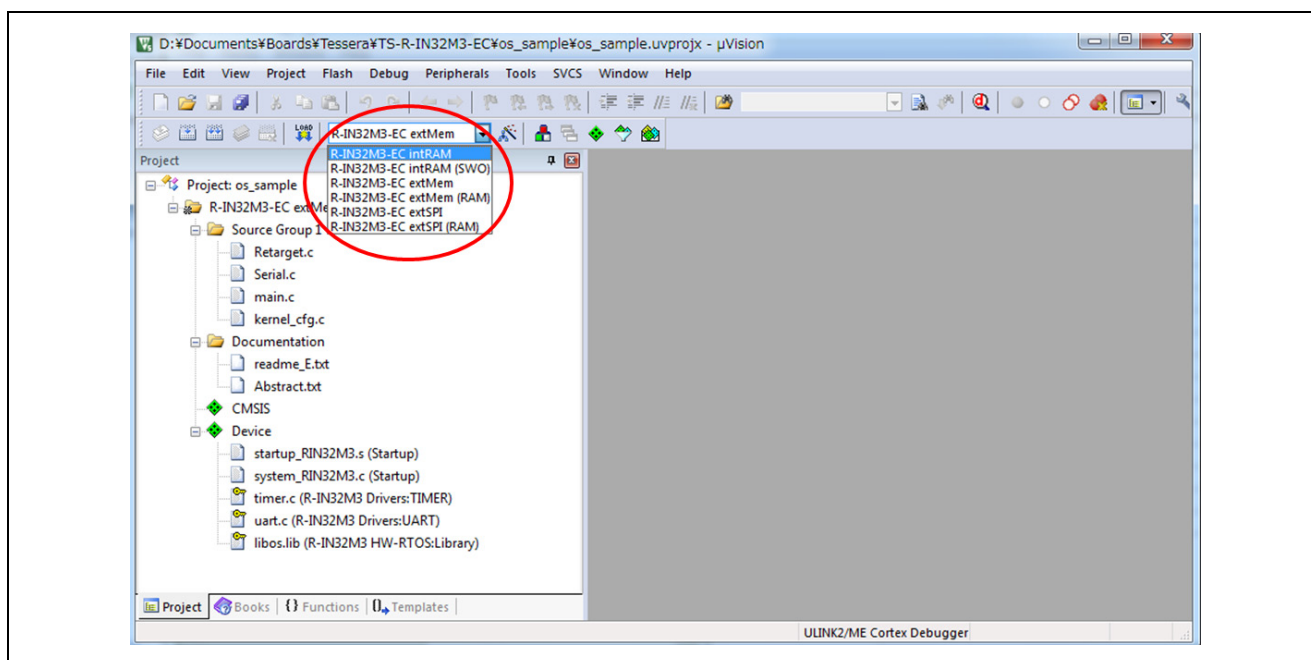
http://www.renesas.com/products/soc/assp/fa_lsi/multi_protocol_communication/r-in32m3/peer/sample_software.jsp

8.4 How to operate MDK-ARM

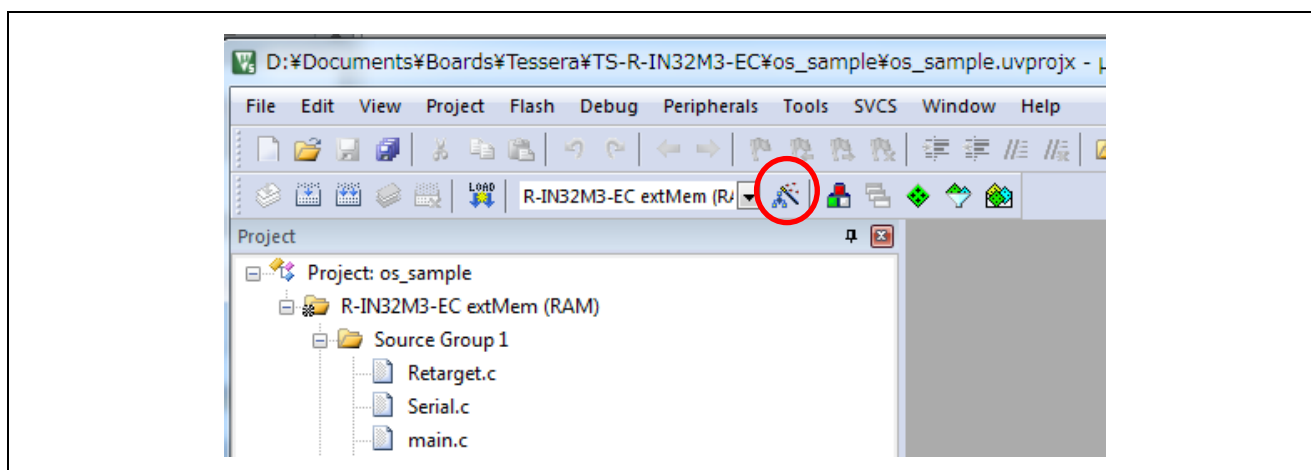
8.4.1 μ Vision5 settings

μ Vision5 is started by double clicking the project file “*.uvprojx”.

After booting μ Vision5, select the target setting for the device and boot mode.



By pressing “Options for Target...” button, target settings can be customized. For example, flash loader can be changed.



Target setting name is different between the one get from Pack Installer and the one get from Renesas web.

(1) Sample project from Pack Installer

Table8.1 μ Vision5 target setting (sample project from Pack Installer)

Target name	Settings		
	ROM code placed in	Instruction code executed in	Flash loader
R-IN32M3-EC intRAM	Instruction RAM	Instruction RAM	Not used
R-IN32M3-EC intRAM(SWO)	Instruction RAM	Instruction RAM	Not used
R-IN32M3-EC extMem	External Memory	External Memory	For S29AL032D
R-IN32M3-EC extMem(RAM)	External Memory	Instruction RAM	For S29AL032D
R-IN32M3-EC extSPI	Serial Flash	Serial Flash	For S25FL032P
R-IN32M3-EC extSPI(RAM)	Serial Flash	Instruction RAM	For S25FL032P

(2) Sample project from Renesas web

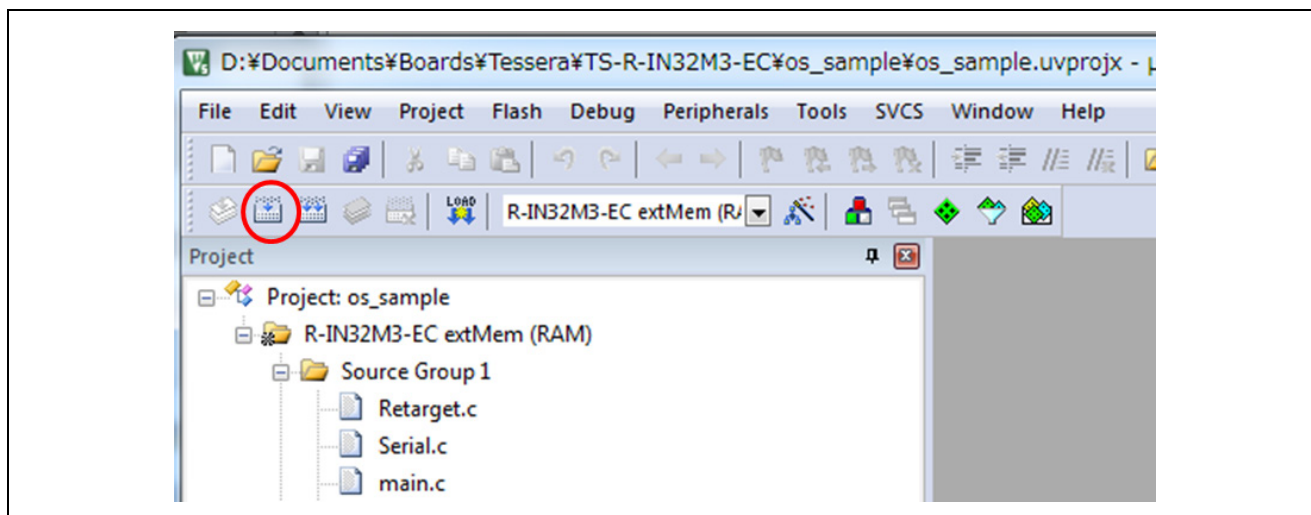
Table8.2 μ Vision5 target setting (sample project from Renesas web)

Target name	Settings		
	ROM code placed in	Instruction code executed in	Flash loader
RAM Debug - EC Board	Instruction RAM	Instruction RAM	Not used
NOR Boot - EC Board	External Memory	Instruction RAM	For S29AL032D
Serial Flash Boot - EC Board	Serial Flash	Instruction RAM	For S25FL032P

8.4.2 μ Vision5 operation

8.4.2.1 ROM code generation

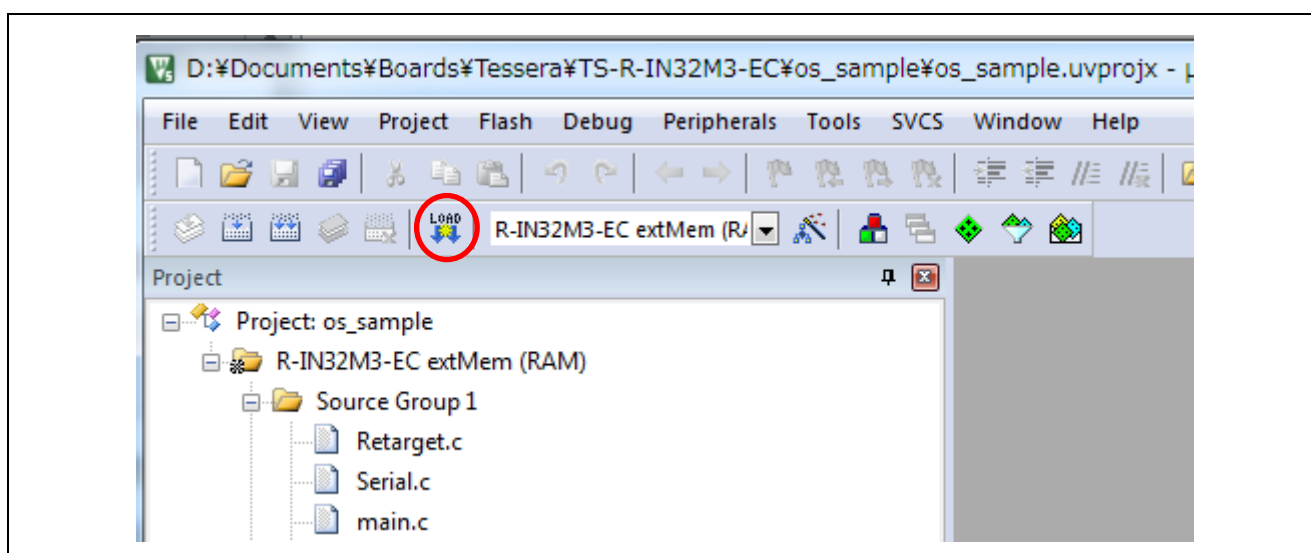
Build the program and generate ROM code by pressing “Build” button, after target settings.



8.4.2.2 Download ROM code to flash memory

If the internal RAM boot is selected, jump to “8.4.2.3 Start debugger” section.

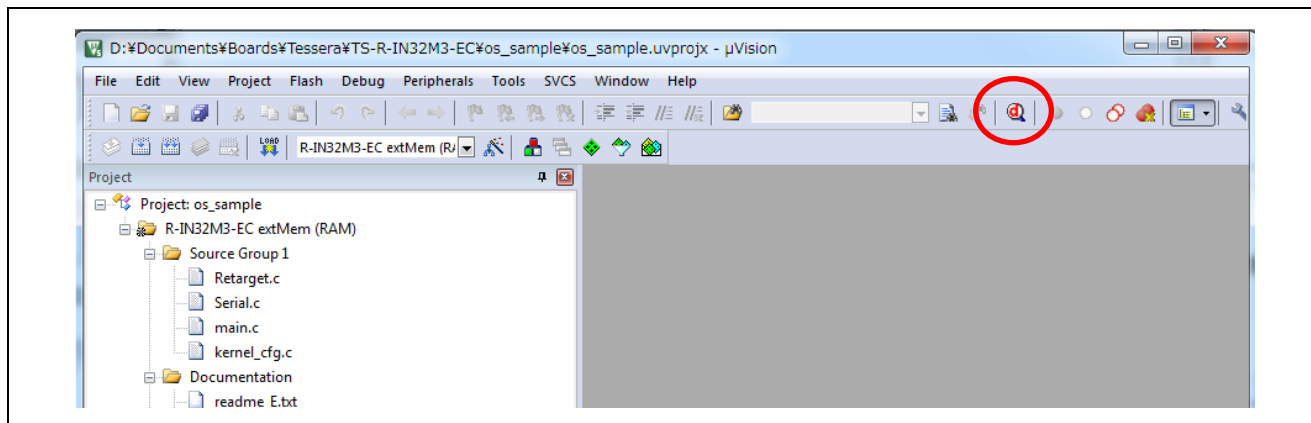
If the other boot mode is selected, press “Download” button to download ROM code to flash memory. This operation uses flash loader set by target setting.



In the case of success, “Erase Done”, “Programming Done”, “Verify OK” messages are showed in the Log.

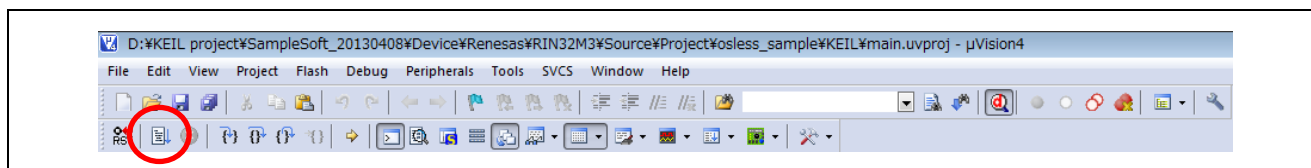
8.4.2.3 Start debugger

By pressing "Start/Stop Debug Session" button (or [Ctrl]+[F5] key), debugger starts.



8.4.2.4 Start debugging

By pressing "Run" button, program run and start debugging.



8.4.2.5 Stop debugger

By pressing "Start/Stop Debug Session" button (or [Ctrl]+[F5] key) again, debugger stops.

REVISION HISTORY	R-IN32M3 Series StarterKit Setup Procedure
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Rev.	Date	Description	
		Page	Summary
1.00	Jun 12, 2013	-	First edition issued
2.00	Sep 25, 2013	-	Revised for TS-R-IN32M3-EC_002
		-	Fixed file name main_boot_iram.icf → iram.icf main.icf → boot_norflash.icf Caution : It does not modify the file name in the diagram.
2.01	Oct 07, 2013	p4	Download version added that it is 6.60 or higher.
		p31	Appends the icf file information for serial FlashROM
		-	Delete chapter "Flash Loader (IAR's I-jet)"
		p55	"9.1 Connect R-IN32M3-EC Board with debugger" Appends a setting to user a serial FlashROM
3.00	Dec 27, 2013	Many pages	Added SEGGER J-Link Lite CortexM-19 debugger as a Starter Kit buy option Added TwinCAT RT-Ethernet Driver installation option Several smaller corrections and additions
		-	Delete chapter "Board Connection"
		-	Delete chapter "Write into E2PROM for EtherCAT® Communication"
		-	Delete chapter "R-IN32M3 Board Setting"
		p23	Added TwinCAT3 installation in the chapter "TwinCAT installation"
		p29	Added chapter "Setting and Connection"
		P41	Change the description of "IAR" "IAR" → "EWARM"
		p42	Added chapter "Build configuration Setting"
		p48	Added the case of TwinCAT3 in the chapter "Start TwinCAT"
		Many pages	Replace iCE to debugger
3.01	Feb 07, 2014	p4	Add important note about IAR SW version 6.70 for SEGGER debuggers
		27, 29, 30, 38	Add description about TS-R-IN32M3-CEC board.
		53, 56	Move the description page about "Refresh E2PROM Data of R-IN32M3-EC Board from TwinCAT". Separate the section 7.3 to section 7.3 and 7.5.
		54	Add the description of the file path of EEPROM.bin.
3.02	Mar.20 2014	29-32 45,62	Add description about R-IN32M3-EC Board Lite
3.03	Apr.18 2014	all	Change "\ " mark description.
		4	Modify title of section 1.2.
		10	Add a description for 64bit-OS system.
		42	Add the file path for putting ESI file for TwinCAT3.
		55	Add the description about TwinCAT device display until EEPROM updated.
		56	Add the description about operation procedure.
		62	Add notes about after using TwinCAT
		All	Change some picture because of described in Japanese

Rev.	Date	Description	
		Page	Summary
4.00	Dec.25 2014	35	Modify picture for Ethernet connection of R-IN32M3-EC board Lite at 3.2 Boot Procedure for R-IN32M3-EC board
		63	Add new chapter " 8. KEIL MDK-ARM Setup ".
4.01	Apr 19,2019		Update broken links, etc.

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.

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