EC-1 Series

REMOTE I/O edition

R01AN3326EJ0100
Rev.1.00
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Outline

Using the EC-1 series for industrial Ethernet, build a digital input-output device, and constitute a digital input and output slave unit with application software in addition.

Contents

1. Overviews

1.1 Overviews

This document describes the usage of the digital input and output slave unit corresponding to EtherCAT communication protocols using EC-1.

1.2 System Configuration

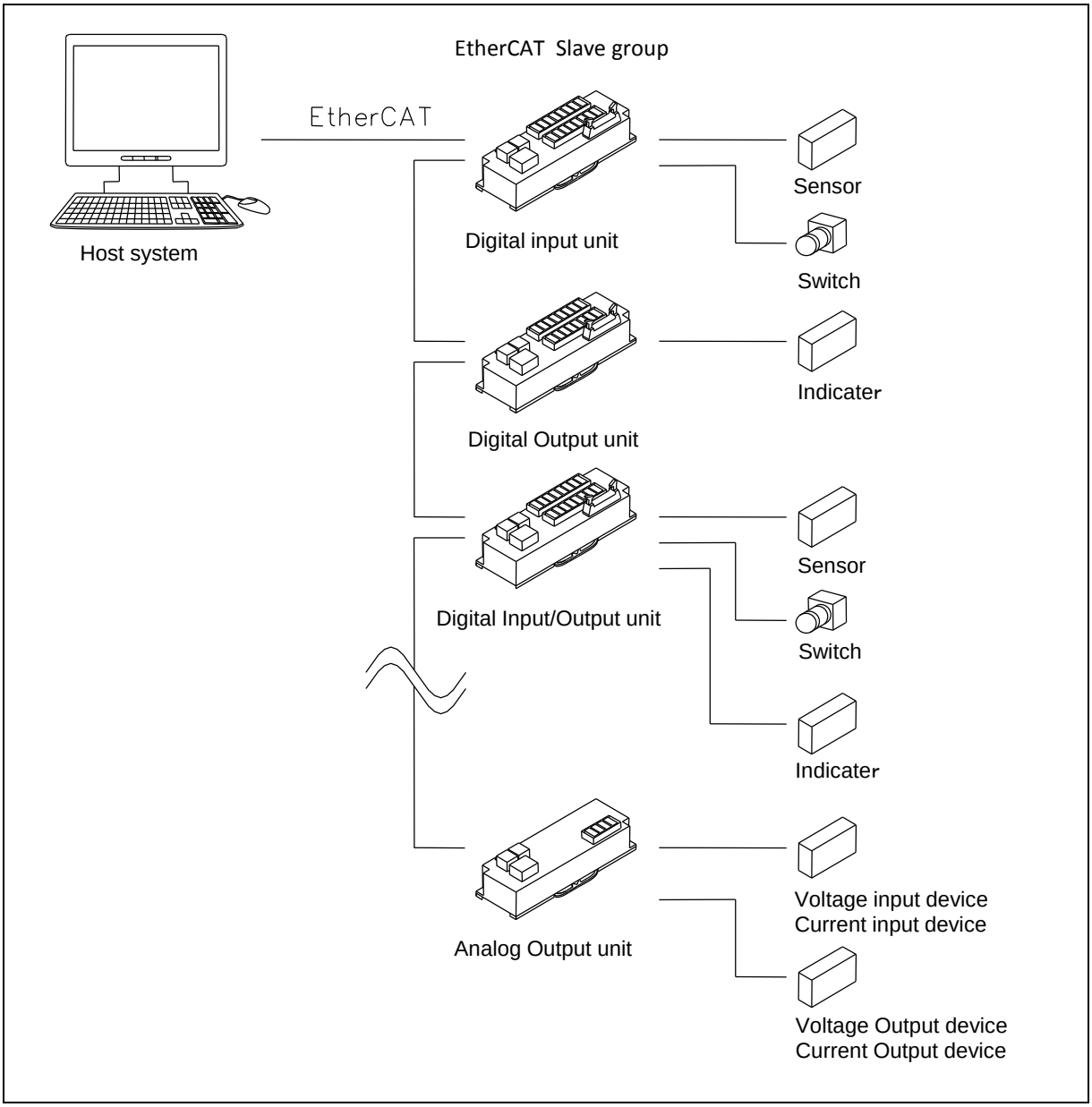


Fig1-1 System configuration

1.3 Block Diagram

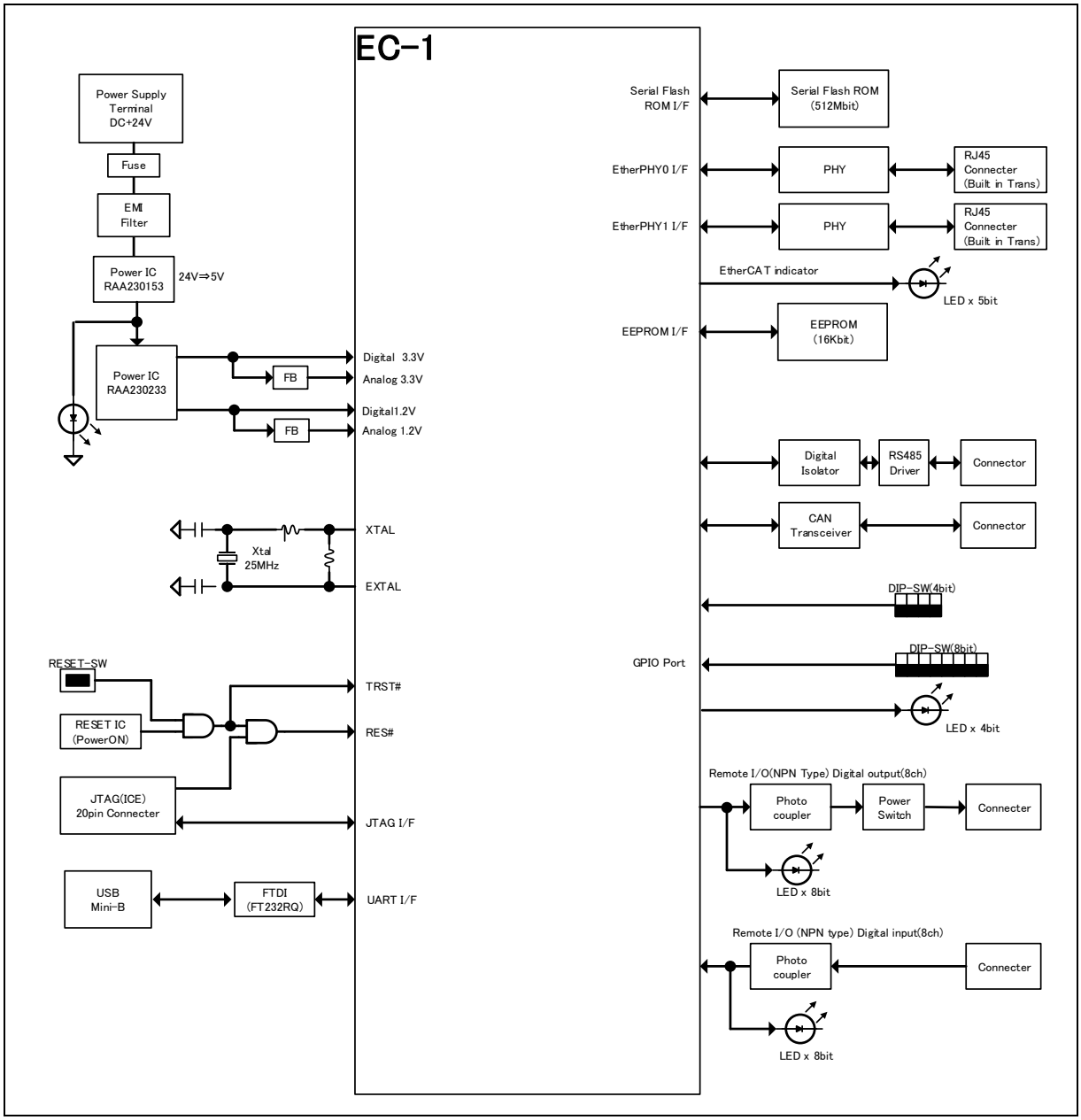


Fig1-2 Block Diagram

2. General specification

2.1 Electric

In this chapter, the electrical specifications of this I/O and performance are explained in a table

Item		Specification
PWR	Rated Voltage	DC24V
	Voltage tolerance level	DC20.4--26.4V
	Internal current consumption	≦100mA
	Status LED(POWER)	Green

2.2 Operating environment

Item		Specification
Environment	Ambient operating temp	0--55℃
	Preservation ambient temp	-25--70℃
	Ambient operating humidity	30--90%RH(no condensation)
	Preservation ambient humidity	30--90%RH(no condensation)
	Use atmosphere	No corrosive gas
Weight	-	180g
Dimension	-	71(W) x 130.6(H) x 28(D)

2.3 Communication

Item	Specification
Communication protocol	EtherCAT®
Correspondence profile	CoE
Communication control LSI	EC-1
EtherCAT PHY	TI TLK105
Communication system	IEEE802.3u (100Base-TX)
Insulation system	Pulse transformer insulation
Status LED	RUN(Green), ERR(Red), STATUS(Geen/Red) L/A IN(Green), L/A OUT(Green)
Interface	RJ-45 x 2

2.4 Digital Input

Item		Specification
Rated input voltage		DC24V
Input current		≦4mA / Input
ON voltage		≦15V (terminal--common)
OFF voltage		≦5V (terminal--common)
Input impedance		5.6kΩ
Insulation system		Photo coupler Insulation
Input logic		Active High
Delay time	OFF→ON	≦0.1ms
	ON→OFF	≦0.1ms
Common number		1 common
Status LED		Input : Turn on
Interface		Connector WAGO 734-236
Input number		8 Input unit

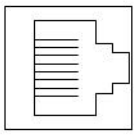
2.5 Digital Output

Item		Specification
Rated output voltage		DC24V
Output current		0.1A/Output 2A/Unit
Insulation system		Photo coupler Insulation
Output system		FET
Output protection function		Yes
Residual voltage		≦0.5V
Leak current		≦0.1mA
Output logic		Active High
Delay time	OFF→ON	≦0.05ms
	ON→OFF	≦0.5ms
Common number		1 common
Status LED		Output : Turn on
Interface		Connector WAGO 734-236
Output number		8 output unit

3. Hardware Function

3.1 Communication Part

EtherCAT Communication connector
(ECAT IN, ECAT OUT) IEEE802.3u (100Base-TX)



#8 pin

#1 pin

8	NC
7	NC
6	RXD–
5	NC
4	NC
3	RXD+
2	TXD–
1	TXD+

Conformity connector : RJ-45connector
Conformity cable : Double shielded cable
(Category 5)

Fig3-1 EtherCAT Communication connector

3.2 Power supply、I/O connector

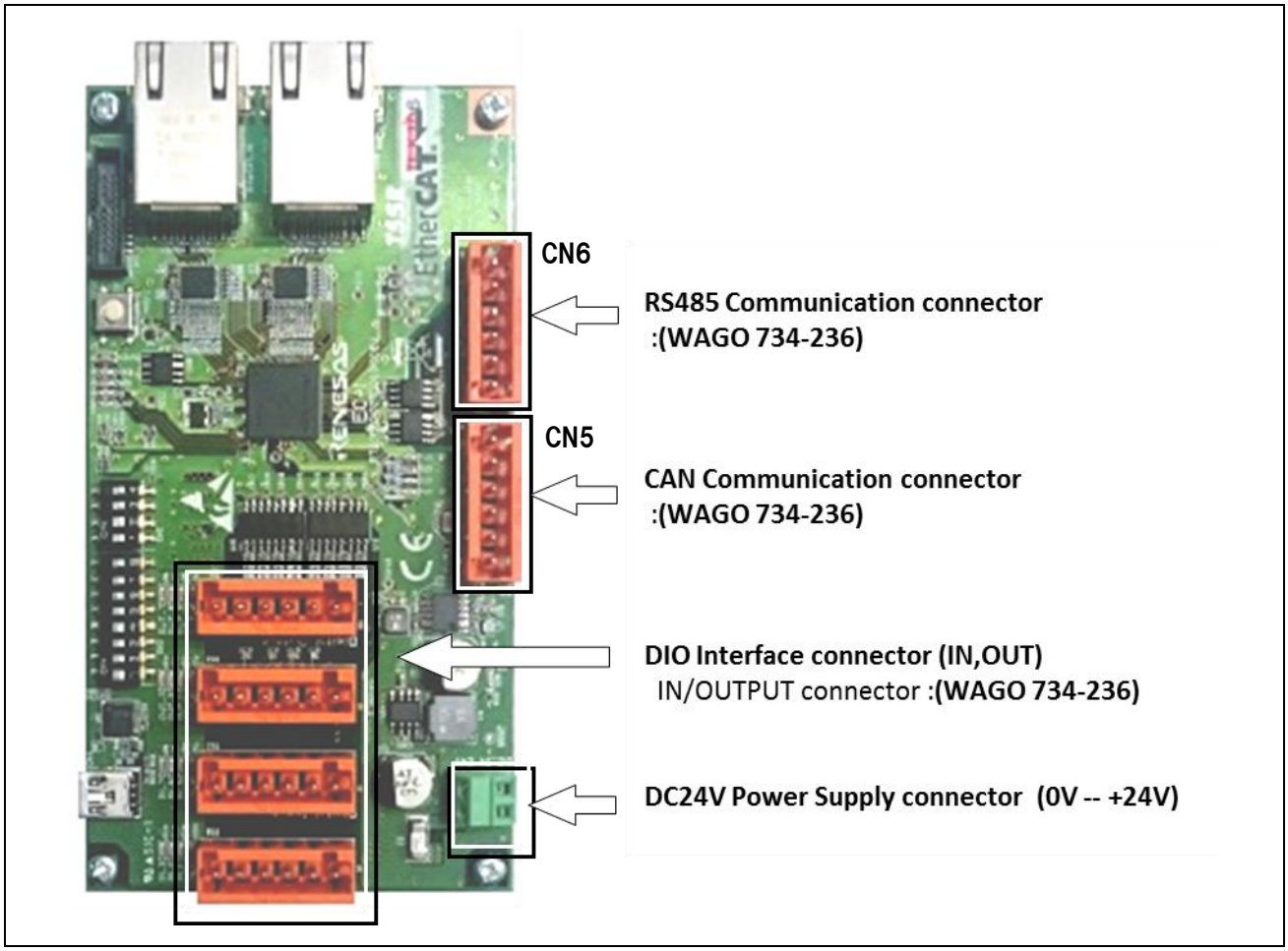


Fig3-2 Power supply、I/O connector

CAN Communication connector (CN5)

The Pin specifications is shown in the following table 3.1

Table 3-1

Pin#	I/O Dir	Signal Name
1	-	+5V
2	I/O	CANH
3	-	FG
4	I/O	CANL
5	-	GND
6	-	-

RS485 Communication connector (CN6)

The Pin specifications is shown in the following table 3.2

Table 3-2

Pin#	I/O Dir	Signal Name
1	-	+5V
2	Output	A
3	Output	B
4	Input	Z
5	Input	Y
6	-	GND

Digital I/O Interface connector (TB1-TB4)

The Pin specifications is shown in the following table 3.3

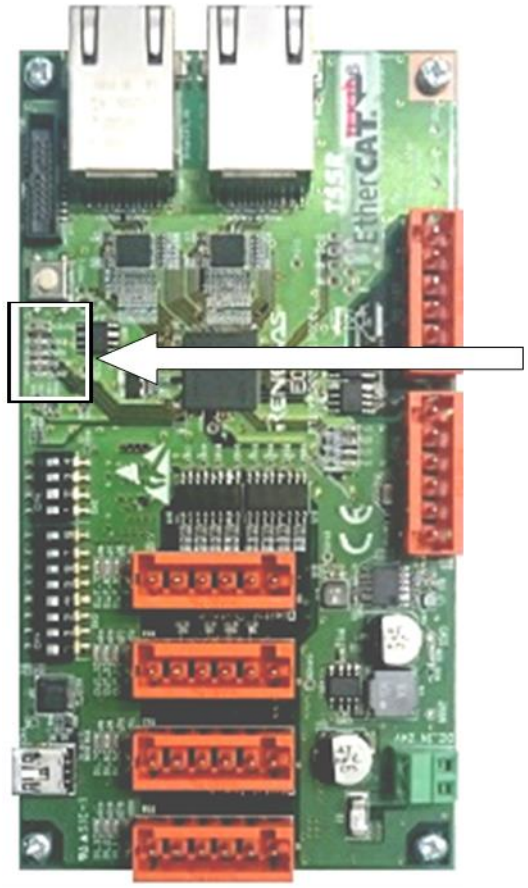
TB2 and TB4 connector are only input.

TB1 and TB3 connector are only output.

Table 3-3

Pin#	I/O Dir	Signal Name
1	-	+24V
2	IN or OUT	IN*/OUT*
3	IN or OUT	IN*/OUT*
4	IN or OUT	IN*/OUT*
5	IN or OUT	IN*/OUT*
6	-	GND

3.3 Status LED



Communication Status LED

RUN
Operation : Turn on

Safe Operation : Single flash
Pre Operation : Blinking
Initialization : Turn off

L/A IN
Link up operation : Flickering
Physical layer link up : Turn on
Physical layer non-link up : Turn off

L/A OUT
Link up operation : Flickering
Physical layer link up : Turn on
Physical layer non-link up : Turn off

ERR
WD Time Out : Double flash
Sync or Communication data are abnormal : Single flash
Communication setting is abnormal : Blinking
Normal operation : Turn off

STER
Operation : Turn on
Sync or Communication data are abnormal : Single flash
Safe Operation : Single flash
Pre Operation : Blinking

Fig3-3 Communication Status LED

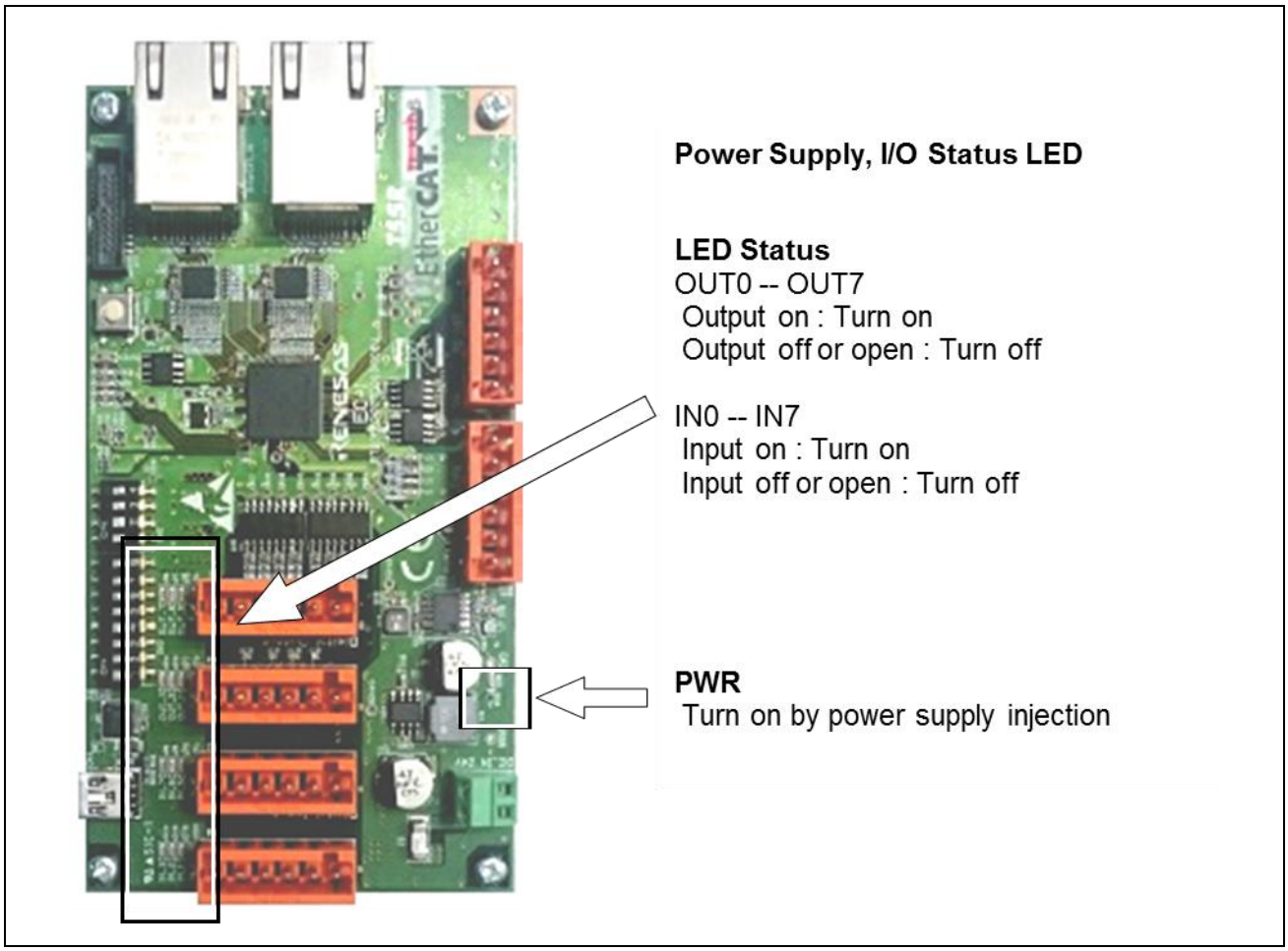


Fig3-4 Power Supply, I/O Status (user) LEDs

3.4 DIP Switch

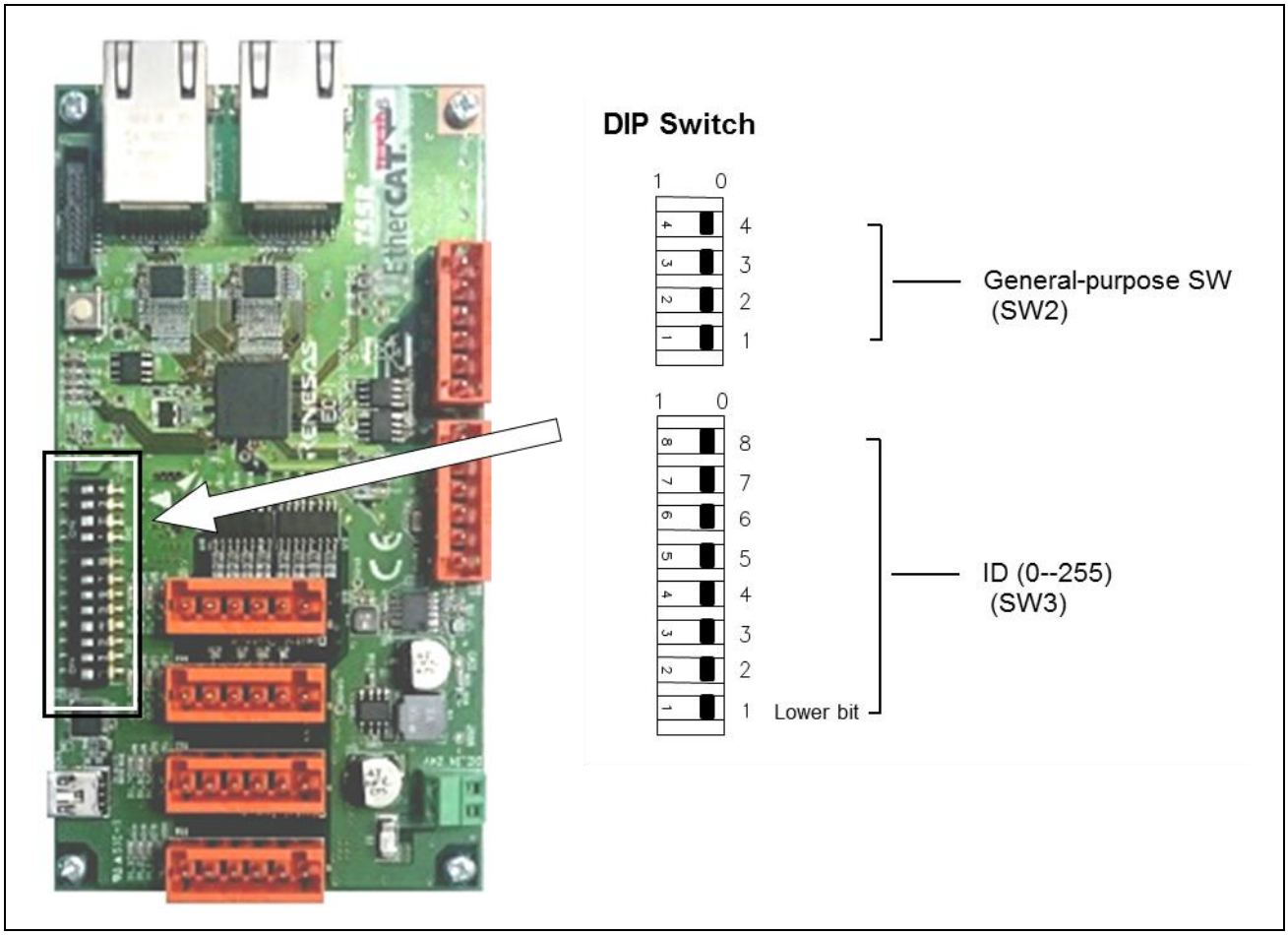


Fig3-5 DIP Switch

DIP switch 2 can set the input level to PG2-PG5.

DIP switch 3 can set the ID (0 – 255)

Table 3-4 DIP switch (SW2)

Switch	Signal name of EC-1	Function
SW2-1	PG2	General purpose SW2-1
SW2-2	PG3	General purpose SW2-2
SW2-3	PG4	General purpose SW2-3
SW2-4	PG5	General purpose SW2-4

3.5 Configuration Switch

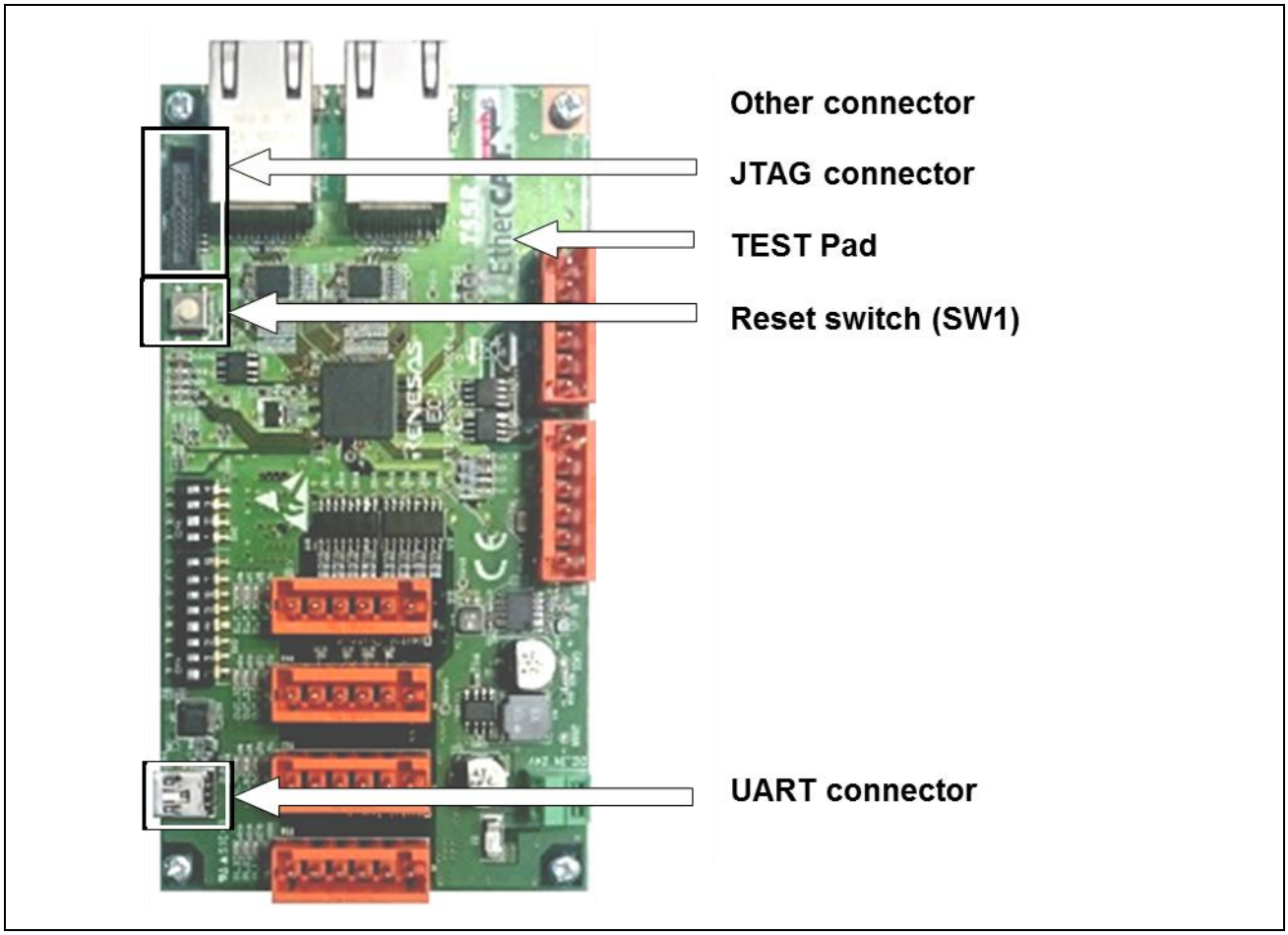


Fig3-6 Switch on the board

Reset switch (SW1)
This is a push switch to generate reset in EC-1 and this I/O.

JTAG connector (CN2)

This is half pitch connector for debug.

Connector : SHF-110-01-L-D-TH

Table 3-5 JTAG CN2

Pin#	Signal name	Pin#	Signal name
1	VRef	2	TMS
3	GND	4	TCK
5	GND	6	TDO
7	---	8	TDI
9	GND	10	RESET
11	GNDcap	12	GND
13	GNDcap	14	GND
15	GND	16	GND
17	GND	18	GND
19	GND	20	GND

UART connector (CN4)

This is USB-MiniB type connector to use for UART.

Table 3-6 UART CN4

Pin#	Signal name
1	VBUS
2	-D
3	+D
4	ID
5	GND

TEST Pad Connection Pins

The following pins are connected from EC-1 and other chips to probing pads.

PAD : Through hole φ0.8mm

Table 3-7　Pad List

Pin Name	Pad Name	PAD Connection State
ERROROUT	ERR	-
TEST#	TRSTZ	-
RES#	RESZ	-
P90	P90	-
P91	P91	-
P92	P92	-
P93	P93	-
P94	P94	-
P95	P95	-
P96	P96	-
P97	P97	-
POWER	D24V0	-
	D5V0	-
	D3V3	-
	A3V3	-
	D1V2	-
	A1V2	-
GND	GND1	-
	GND2	-

4. Object dictionary

4.1 CoE Communication area

A CoE communication object list, an object type and a data type, and the access direction are as follows.

The index which is not in a list at 0x1000-0x1FFF is a reservation domain.

Table 4-1 CoE Communication area

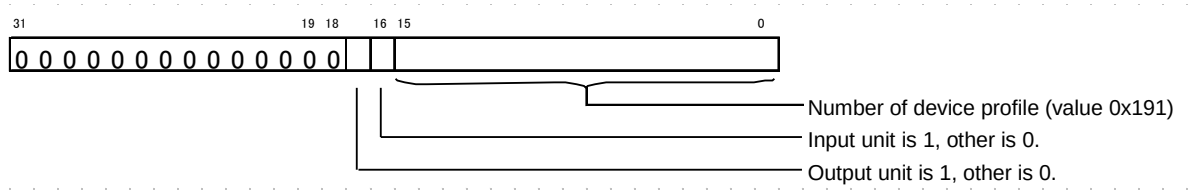
Index	Sub index	Object type	Name	Data Type	R/W
0x1000	0x00	VAR	Device Type	UINT32	RO
0x1001	0x00	VAR	Error register	UINT8	RO
0x1008	0x00	VAR	Manufacturer Device Name	VISIBLESTRING	RO
0x1009	0x00	VAR	Manufacturer Hardware Version	VISIBLESTRING	RO
0x100A	0x00	VAR	Manufacturer Software Version	VISIBLESTRING	RO
0x1018	-	RECORD	Identity Object	-	-
	0x00	-	Number of Entry	UINT16	RO
	0x01	-	Vendor ID	UINT32	RO
	0x02	-	Product Code	UINT32	RO
	0x03	-	Revision	UINT32	RO
	0x04	-	Serial Number (Not Support)	UINT32	RO
0x10F1	-	RECORD	Error behavior (Not Support)	-	-
	0x00	-	Number of Entry	UINT8	RO
	0x01	-	Local Error Reaction	UINT32	RW
	0x02	-	Sync Error Counter Limit	UINT32	RW
0x1600	-	RECORD	Receive RxPDO Mapping	PDO Mapping	-
	0x00	-	Number of mapped application objects in RxPDO	UINT8	RO
	0x01 … 0x08	-	PDO mapping for the 1st application object to be mapped. … PDO mapping for the 8th application object to be mapped.	UINT32	RW

Index	Sub index	Object type	Name	Data Type	R/W
0x1A00	-	RECORD	Transmit TxPDO Mapping	PDO Mapping	-
	0x00	-	Number of mapped application objects in TxPDO	UINT8	RW
	0x01 … 0x08	-	PDO mapping for the 1st application object to be mapped. … PDO mapping for the 8th application object to be mapped.	UINT32	RW
0x1C00	-	ARRAY	SM(Sync Manager) type	-	-
	0x00	-	Number of entry	UINT8	RO
	0x01 … 0x04	-	SM0 communication type … SM3 communication type	UINT8	RO
0x1C12 … 0x1C13	-	RECORD	SM2 - SM3 PDO Assignment	-	-
	0x00	-	Number of Entry	UINT8	RO
	0x01	-	1st allocated PDO	UINT16	RW(RO)
0x1C32 … 0x1C33	-	RECORD	SM2 - SM3 Synchronization	-	-
	0x00	-	Number of Entry	UINT8	RO
	0x01	-	Sync mode	UINT16	RW(RO)
	0x02	-	Cycle time	UINT32	RW(RO)
	0x03	-	Shift time	UINT32	RW(RO)

4.2 Device object

Information peculiar to a device is stored.

Index	Name	Description		
0x1000	Device Type	Indicates the device profile.		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	-	UINT32	RO	No



Index	Name	Description		
0x1001	Error register	The error condition of the EtherCAT slave		
Sub-Index	Parameter	Data type	Access	PDO map
0x00	Error condition 0x00 No error 0x01 General error 0x10 Communication fault 0x20 Device profile error	UINT8	RO	No

Index	Name	Description		
0x1008	Device name	Device name of the EtherCAT slave		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Device name “EC-1 Remote I/O	VISIBLE STRING	RO	No

Index	Name	Description		
0x1009	Hardware version	Hardware version of the EtherCAT slave		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Hardware version “1.0”	VISIBLE STRING	RO	No

Index	Name	Description		
0x100A	Software version	Firmware version of the EtherCAT slave		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Software version “1.01”	VISIBLE STRING	RO	No

Index	Name	Description		
0x1018	Identity	Information for identifying the slave		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Number of entry “4”	UINT16	RO	No
0x01	Vendor ID “0x00000766”	UINT32	RO	No
0x02	Product code “0x00000501”	UINT32	RO	No
0x03	Revision “0x00000001”	UINT32	RO	No
0x04	Serial number (Not Support) “0x00000000”	UINT32	RO	No

Index	Name	Description		
0x10F1	Error behavior (Not Support)	Error configuration information		
Sub-Index	Parameter	Data type	Sub-Index	Parameter
0x00	Number of entry	UINT8	RO	No
0x01	Local Error Reaction	UINT32	RW	No
0x02	Sync Error Counter Limit	UINT16	RW	No

4.3 PDO mapping

The communication transmission data between master and slaves is assigned to the EtherCAT I/O unit in advance. The user can access PDO, without changing.

The details of the PDO mapping entry of 0x1600 and 0x1A00 are shown below.

- 0x1600：Receive RxPDO Mapping

Index	Name	Description		
0x1600	RxPDO1	Entry of a RxPDO1 mapping object dictionary		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Number of Entry	UINT8	RW	No
0x01	Digital Output Bit0	UINT32	RW	0x7000：0x01
0x02	Digital Output Bit1	UINT32	RW	0x7000：0x02
0x03	Digital Output Bit2	UINT32	RW	0x7000：0x03
0x04	Digital Output Bit3	UINT32	RW	0x7000：0x04
0x05	Digital Output Bit4	UINT32	RW	0x7000：0x05
0x06	Digital Output Bit5	UINT32	RW	0x7000：0x06
0x07	Digital Output Bit6	UINT32	RW	0x7000：0x07
0x08	Digital Output Bit7	UINT32	RW	0x7000：0x08

- 0x1A00：Transmit TxPDO Mapping

Index	Name	Description		
0x1A00	TxPDO1	Entry of a TxPDO1 mapping object dictionary		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Number of Entry	UINT8	RW	No
0x01	Digital Input Bit0	UINT32	RW	0x6000：0x01
0x02	Digital Input Bit1	UINT32	RW	0x6000：0x02
0x03	Digital Input Bit2	UINT32	RW	0x6000：0x03
0x04	Digital Input Bit3	UINT32	RW	0x6000：0x04
0x05	Digital Input Bit4	UINT32	RW	0x6000：0x05
0x06	Digital Input Bit5	UINT32	RW	0x6000：0x06
0x07	Digital Input Bit6	UINT32	RW	0x6000：0x07
0x08	Digital Input Bit7	UINT32	RW	0x6000：0x08

- 0x1C00:Sync manager type

Index	Name	Description		
0x1C00	Sync manager type	Using the sync managers		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Number of entry	UINT8	RO	No
0x01	Sync-manager type channnel0: Mailbox Output	UINT8	RO	No
0x02	Sync-manager type channnel1: Mailbox Input	UINT8	RO	No
0x03	Sync-manager type channnel2: PDO Output	UINT8	RO	No
0x04	Sync-manager type channnel3: PDO Input	UINT8	RO	No

- 0x1C12:SyncManager2 PDO Assignment

Index	Name	Description		
0x1C12	RxPDO assign	PDO assign outputs		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Number of entry	UINT8	RO	No
0x01	1st allocated RxPDO1 “0x1600”	UINT16	RW(RO)	0x1600

- 0x1C13:SyncManager3 PDO Assignment

Index	Name	Description		
0x1C13	TxPDO assign	PDO assign inputs		
Sub-Index	Parameter	Data type	R/W	PDO map
0x00	Number of entry	UINT8	RO	No
0x01	1st allocated TxPDO1 “0x1A00”	UINT16	RW(RO)	0x1A00

- 0x1C32: Sync Manager2 Synchronization

Index	Name	Description
0x1C32	SM output parameter	Synchronous setup of SM2. There are no changes as a Remote I/O to the various Sub-Index.

- 0x1C33:SyncManager3 Synchronization

Index	Name	Description
0x1C33	SM input parameter	Synchronous setup of SM3. There are no changes as a Remote I/O to the various Sub-Index.

4.4 CoE Profile area

The object list of the profile area of CoE, and a data type and the access direction are shown.

Table 4-2 CoE profile area

Index	Sub-Index	Name	Data Type	R/W
0x6000	0x00	Number of entry	UINT8	RO
	0x01	Data of Digital Input Bit0	BOOLEAN	RO
	0x02	Data of Digital Input Bit1	BOOLEAN	RO
	0x03	Data of Digital Input Bit2	BOOLEAN	RO
	0x04	Data of Digital Input Bit3	BOOLEAN	RO
	0x05	Data of Digital Input Bit4	BOOLEAN	RO
	0x06	Data of Digital Input Bit5	BOOLEAN	RO
	0x07	Data of Digital Input Bit6	BOOLEAN	RO
	0x08	Data of Digital Input Bit7	BOOLEAN	RO
0x7000	0x00	Number of entry	UINT8	RO
	0x01	Data of Digital Output Bit0	BOOLEAN	RO
	0x02	Data of Digital Output Bit1	BOOLEAN	RO
	0x03	Data of Digital Output Bit2	BOOLEAN	RO
	0x04	Data of Digital Output Bit3	BOOLEAN	RO
	0x05	Data of Digital Output Bit4	BOOLEAN	RO
	0x06	Data of Digital Output Bit5	BOOLEAN	RO
	0x07	Data of Digital Output Bit6	BOOLEAN	RO
	0x08	Data of Digital Output Bit7	BOOLEAN	RO

4.5 CoE Profile area parameter

- 0x6000：Digital Input Bit0-7

Index	Digital Input1			
0x6000				
Sub-Index	Parameter	Data type	R/W	Default
0x00	Number of entry	UINT8	RO	0x08
0x01	Digital Input Bit0(DI0) The data inputted into DI0 is displayed.	BOOLEAN	RO	0
0x02	Digital Input Bit1(DI1) The data inputted into DI1 is displayed.	BOOLEAN	RO	0
0x03	Digital Input Bit2(DI2) The data inputted into DI2 is displayed.	BOOLEAN	RO	0
0x04	Digital Input Bit3(DI3) The data inputted into DI3 is displayed.	BOOLEAN	RO	0
0x05	Digital Input Bit4(DI4) The data inputted into DI4 is displayed.	BOOLEAN	RO	0
0x06	Digital Input Bit5(DI5) The data inputted into DI5 is displayed.	BOOLEAN	RO	0
0x07	Digital Input Bit6(DI6) The data inputted into DI6 is displayed.	BOOLEAN	RO	0
0x08	Digital Input Bit7(DI7) The data inputted into DI7 is displayed.	BOOLEAN	RO	0

- 0x7000：Digital Output Bit0-7

Index	Digital Output1			
0x7000				
Sub-Index	Parameter	Data type	R/W	Default
0x00	Number of entry	UINT8	RO	0x08
0x01	Digital Output Bit0(DO0) The data outputted to DO0 is displayed.	BOOLEAN	RW	0
0x02	Digital Output Bit1(DO1) The data outputted to DO1 is displayed.	BOOLEAN	RW	0
0x03	Digital Output Bit2(DO2) The data outputted to DO2 is displayed.	BOOLEAN	RW	0
0x04	Digital Output Bit3(DO3) The data outputted to DO3 is displayed.	BOOLEAN	RW	0
0x05	Digital Output Bit4(DO4) The data outputted to DO4 is displayed.	BOOLEAN	RW	0
0x06	Digital Output Bit5(DO5) The data outputted to DO5 is displayed.	BOOLEAN	RW	0
0x07	Digital Output Bit6(DO6) The data outputted to DO6 is displayed.	BOOLEAN	RW	0
0x08	Digital Output Bit7(DO7) The data outputted to DO7 is displayed.	BOOLEAN	RW	0

5. Sample software for EtherCAT protocol

This chapter describes a method of using EtherCAT Slave Stack Code (SSC), to build a remote I/O software.

Please prepare if you want to use the SSC, it is necessary to obtain a license.

5.1 Sample software construction environment

The sample program construction environment of this manual assumes the following.

IDE : IAR Systems
Embedded Workbench for ARM Version 7.7x.x and later

Emulators : IAR Systems
I-jet or or equivalent,

5.2 Directory and Files

Remote I/O sample software for EC-1 is provided the following files.

(1) Sample source files

Sample source file configuration after 5.2 and 5.3.

```
EC-1_samplesoft
 ├──Include
 ├──Library
 └──Source
     ├──Driver
     ├──Templates
     └──Project
         └──EtherCAT_RemoteIO
             ├──IAR
             |          EC_1_ecat_io_serial_boot.eww : IAR Project file
             └──SSC
                 |      EC-1_RemoteIO.esp            : SSC Tool Project file
                 ├──ESI_File
                 |      EC-1_RemoteIO.xml            : ESI file
                 └──SSC_config
                     |  Renesas_EC-1.xml             : SSC Tool config file
                     └──Src                          : SSC Source Code folder
```

(2) EtherCAT Slave Stack Code(SSC)

The source code that is automatically generated by the EtherCAT Slave Stack Code Tool (SSC Tool) is used in this sample software.

SSC Tool project file is put on the following folder.

Refer to the next chapter for automatic generation by SSC Tool.

EC-1_samplesoft/Source/Project/EtherCAT_RemoteIO/SSC/EC-1_RemoteIO.esp

(3) ESI File

Please use the following file for ESI file.

EC-1_samplesoft/Source/Project/EtherCAT_RemoteIO/SSC/ESI_File/ EC-1_RemoteIO.xml

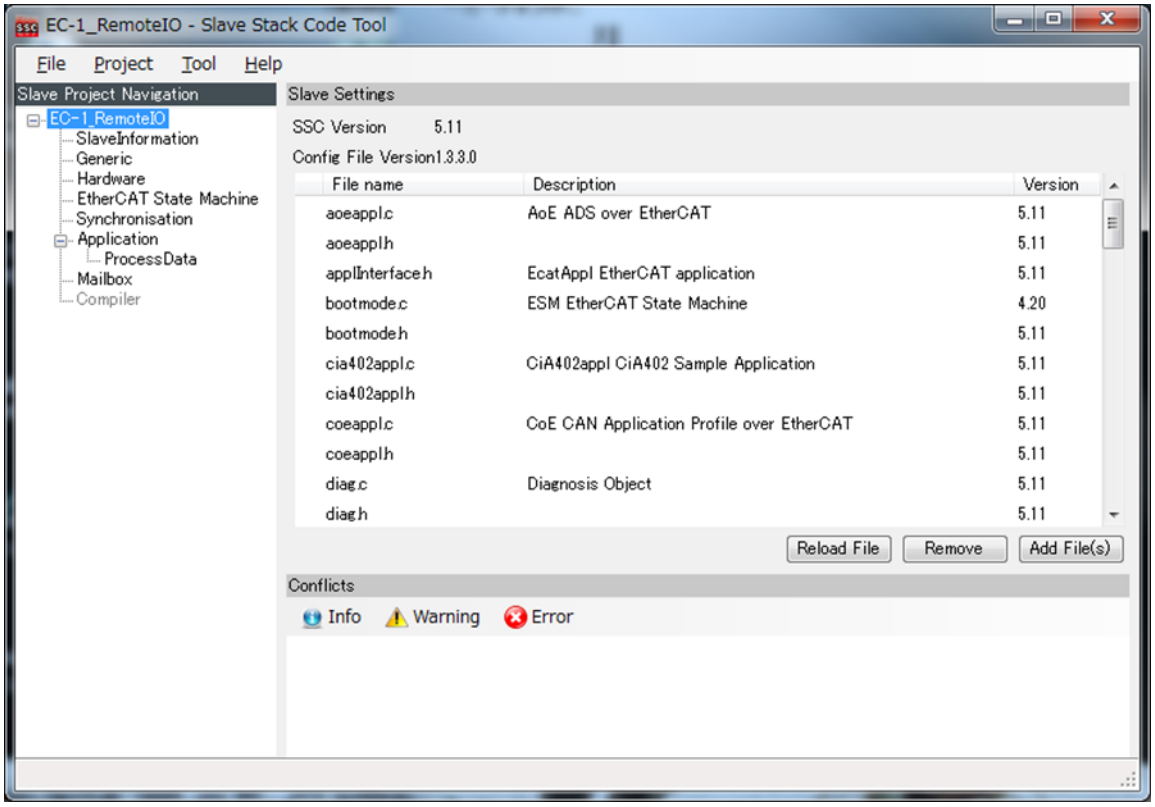
5.3 How to create EtherCAT Slave Stack Code(SSC)

The following folder contains the project file “EC-1_RemoteIO.esp”.

EC-1_samplesoft/Source/Project/EtherCAT_RemoteIO/SSC

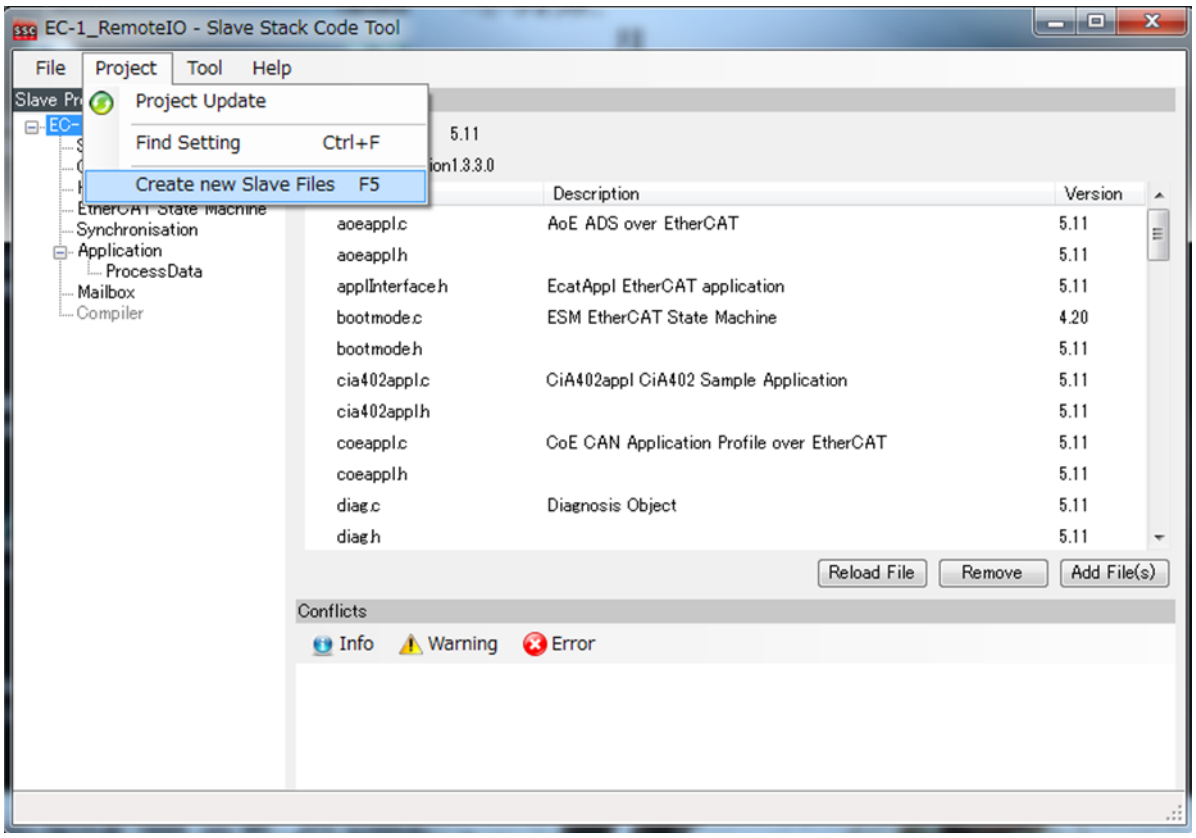
Please follow the procedure below to create source-code with project file “EC-1_RemoteIO.esp”.

(1) After executing the project file, a following dialog is displayed.



(2) Select “Create new Slave Files”.

Click the [Project] – [Create new Slave Files] from the menu.

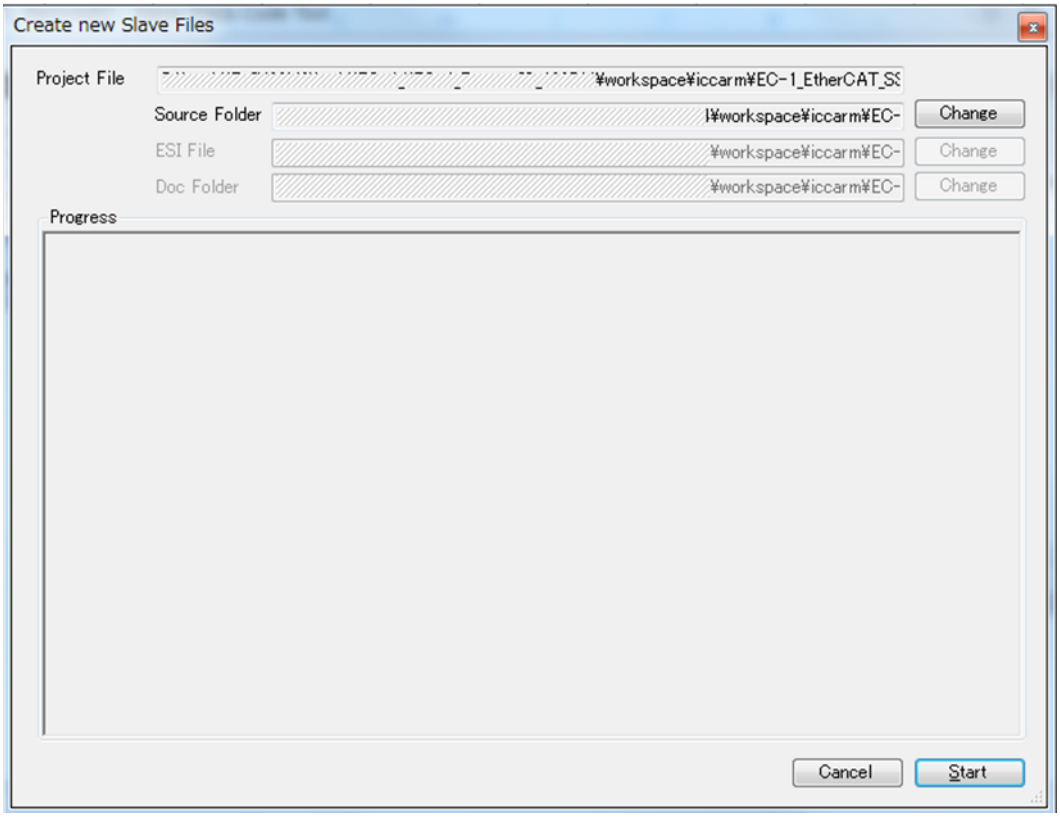


(3) Create the source files.

At open window “Create new Slave Files”, creation of source files are started by click the [start] button.

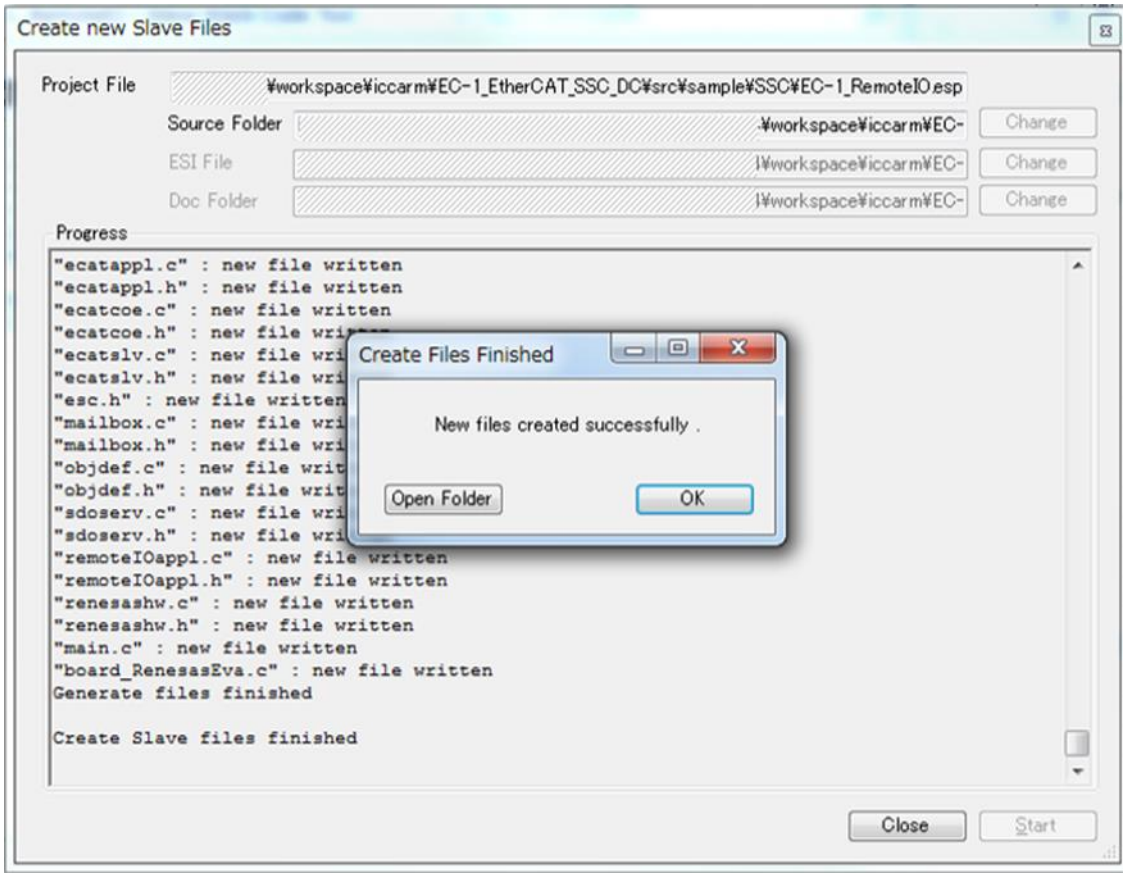
Source Folder will be automatically generated in the path of the following.

EC-1_samplesoft/Source/Project/EtherCAT_RemoteIO/SSC/Src



(4) Create the source files.

Creation of the file is complete, and the following dialog box is displayed



6. Prepare for the EtherCAT Communication

6.1 Copy ESI (EtherCAT Slave Information) file

Copy the “EC-1_RemoteIO.xml” file under the following folders which installed TwinCAT

ESI file is located in the following folder

EC-1_samplesoft/Source/Project/EtherCAT_RemoteIO/SSC/ESI_File

Obtaining of TwinCAT, please refer to Appendix A.

■in case of TwinCAT2

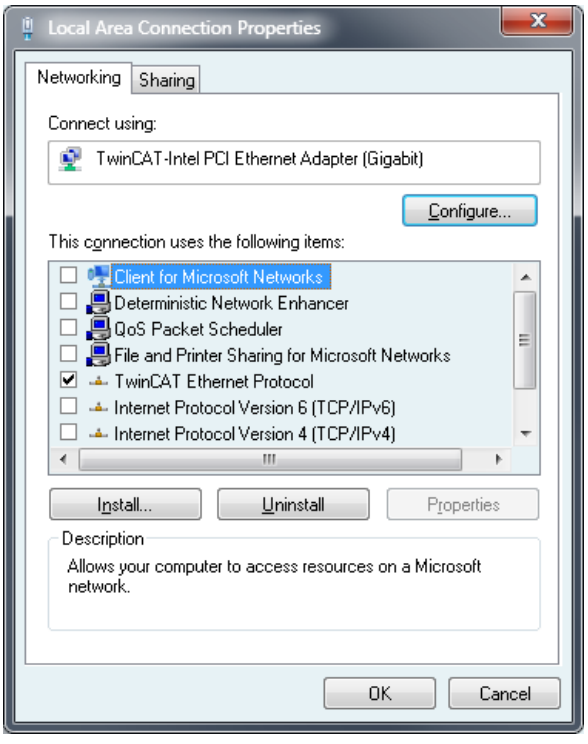
TwinCAT/Io/EtherCAT

■in case of TwinCAT3

TwinCAT/3.1/Config/Io/EtherCAT_

6.2 Setting the PC network environment

Set the network environment of the PC to use for EtherCAT driver.



Display the connect network adapter property, and choose only the TwinCAT driver "TwinCAT Ethernet Protocol".

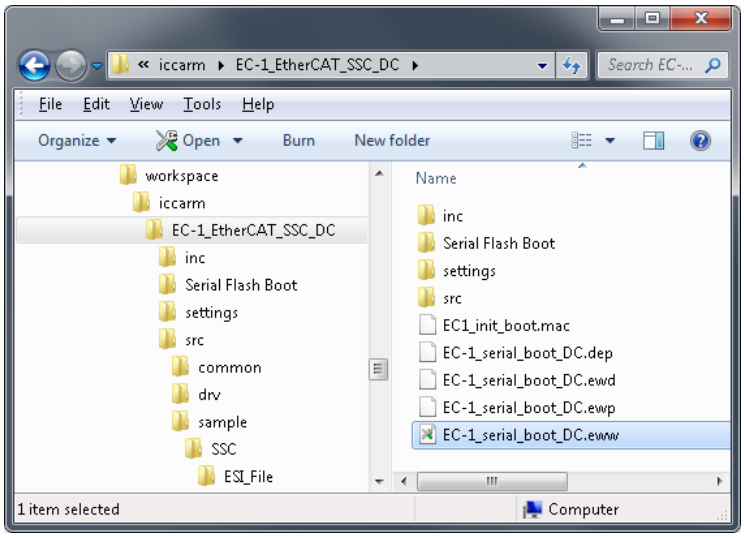
If the TwinCAT driver does not appear, or the installation of TwinCAT driver is unfinished, please refer to Appendix B.

6.3 Board Connection

Please establish the following connections between the EC-1 board and the PC

(1) Connect Ethernet Port 0 to your PC (with TwinCAT installed) with an Ethernet cable (recommend Category 5).
(2) Please connect the 20 pin half pitch connector from the debugger.
(3) Please connect the 24V-2A DC adaptor.

6.4 Start EWARM



Double click the file “EC-1_serial_boot .eww” in the SampleSoft installation found in the EC-1_samplesoft/Source/Project/EtherCAT_RemoteIO/IAR folder.
The IAR Embedded Workbench IDE will start automatically.

(1) Execute the compile
(2) Run download and debug.
(3) Run the program.

7. Connection with TwinCAT

7.1 Start up TwinCAT

■In the case of TwinCAT2

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

(1) Task tray ⇒ [TwinCAT System Manager]

(2) Start menu ⇒ [TwinCAT System] ⇒ [TwinCAT System Manager]

■In the case of 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)]

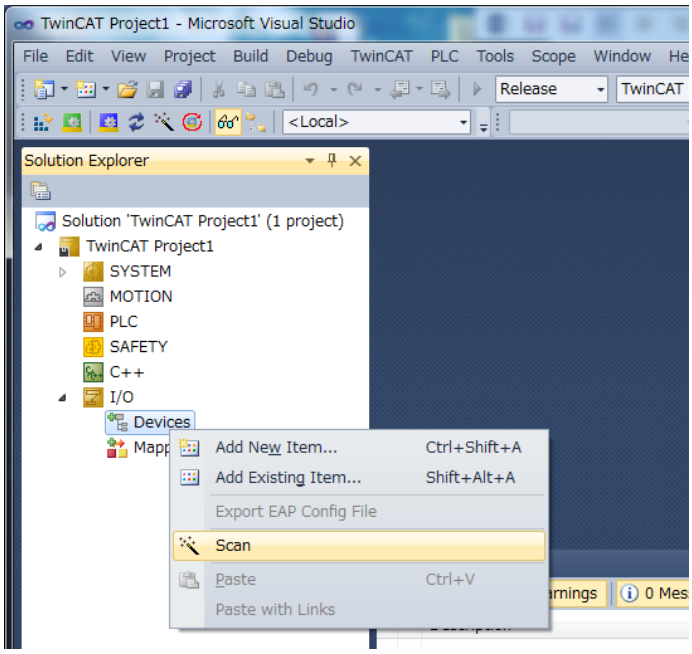
After activating the program, please select [File] ⇒ [New] ⇒ [Project] and make a new project as a TwinCAT XAE Project type.

7.2 Scan I/O devices

The following operation is similar for both TwinCAT2 and TwinCAT3

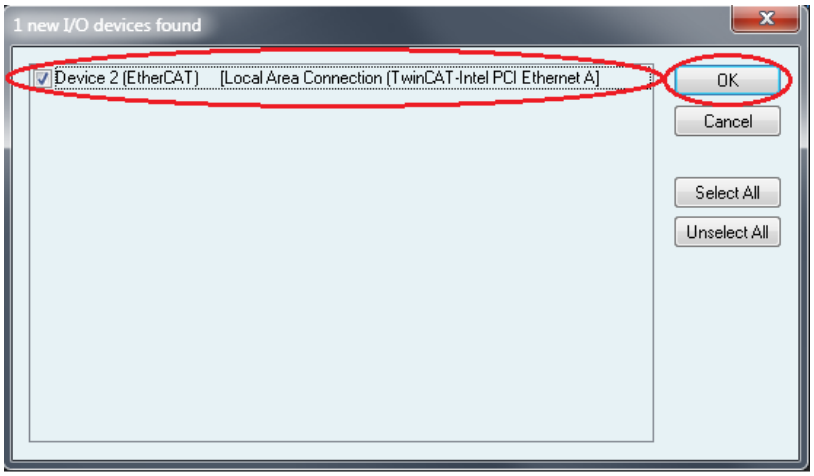
The image below is an example of the TwinCAT3 operation.

(1) Rite click on [Devices] and select [Scan].



(2) Select [OK] and Scan is running.

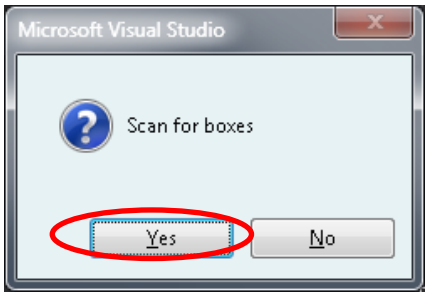
(3) Select [EtherCAT] Device and [OK].



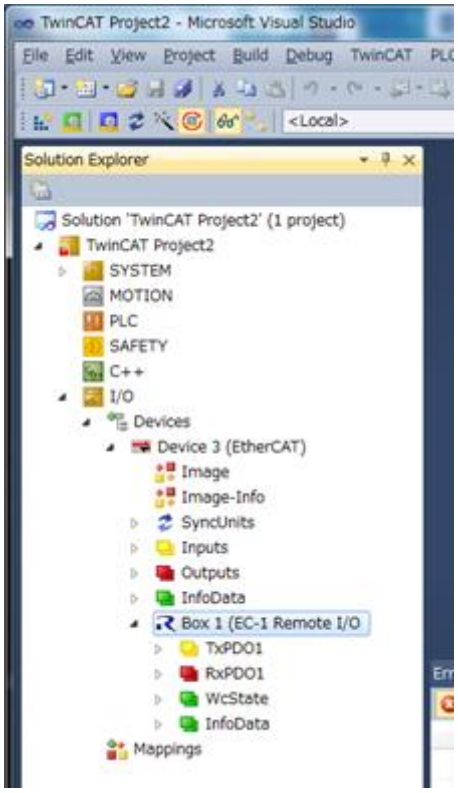
[NOTE] If the EtherCAT Device does not display, confirm the following factors

- EC-1 Board and PC(TwinCAT) disconnect
  - Connect EC-1 Board and PC with Ethernet cable
- Network adapter setting is not selected to EtherCAT
  - Refer to 6.2
- EtherCAT driver is not installed
  - Refer to Appendix B

(4) Select [Yes] and Scan Box.



(5) If the scan is successful, the Box 1(EC-1 Remote I/O) displayed.



[NOTE-1] In the case where display “Box 1 (PFFFFFFFF RFFFFFFFF)”, refer to Appendix C Need to write the Slave Information to EEPROM.

[NOTE-2] In the case where display the follow warning, refer to chapter 6.1. Copy the “EC-1_RemoteIO.xml” file under the TwinCAT folder.

[NOTE-3] In the case where Box 1 (EC-1 Remote I/O) is not displayed correctly, please re-check the following

- EC-1 board reset after writing E2PROM.
  - ⇒ After E2PROM writing, reset is necessary
- ESI file for EC-1 remote IO written in at E2PROM correctly?.
  - ⇒ Refer to Appendix C

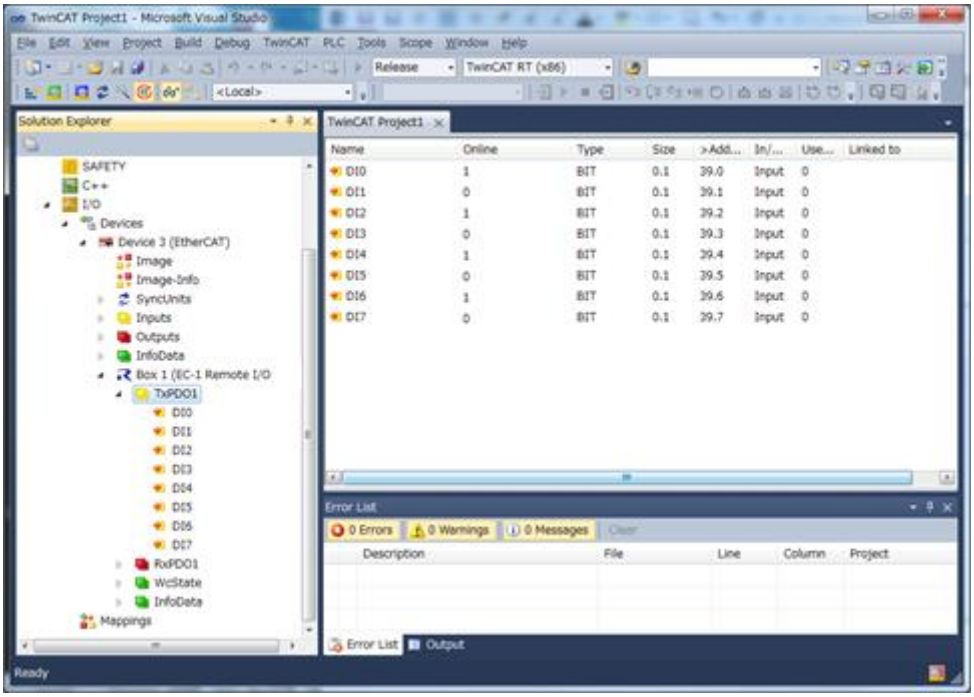
7.3 Data Read/Write

Read / Write data with TwinCAT and EC-1 Board.

■ Read (EC-1 board to TwinCAT)

(1) Open the TxPDO1 of Box1 EC-1 RemoteI/O

(2) Input any bit set to "1" from RemoteIO.
The selected bit is reflected in the onlines.

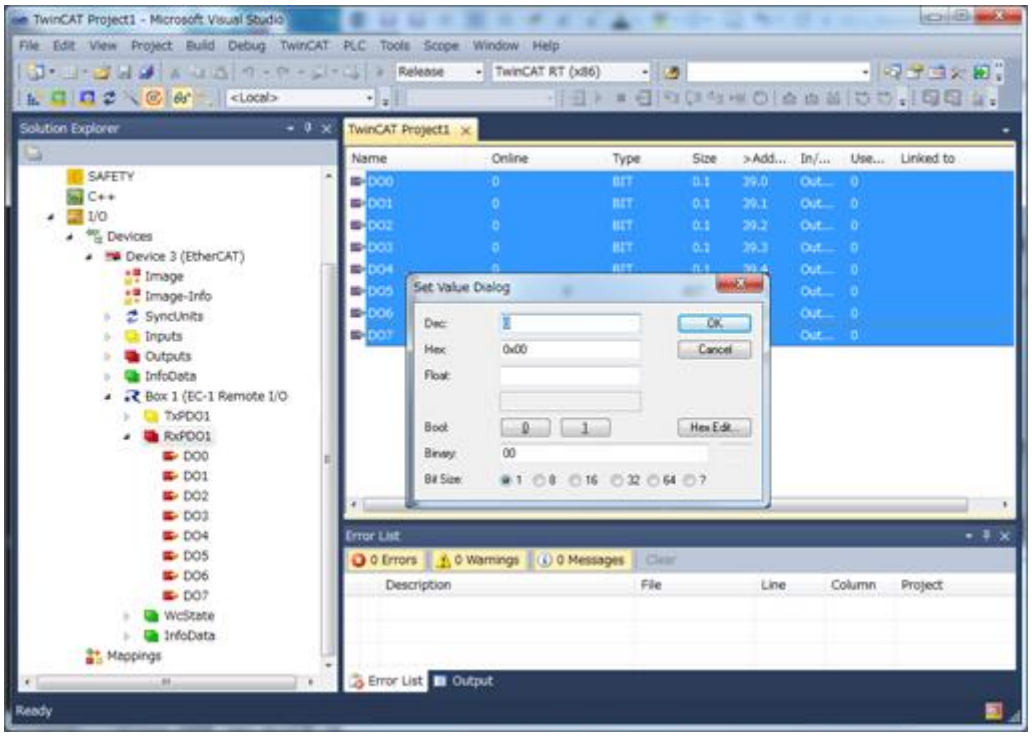


■ Write (TwinCAT to EC-1 board)

(1) Open the RxPDO1 of Box1 EC-1 RemoteI/O

(2) Select any bit and click [Online Write]

(3) Set the write values in “Set Value Dialog”, the EC-1 Board selected LED will light up.



8. Connection with external equipment

8.1 Power supply and Photo coupler input connection diagram

It is the connection method of the power supply and photocoupler input part.

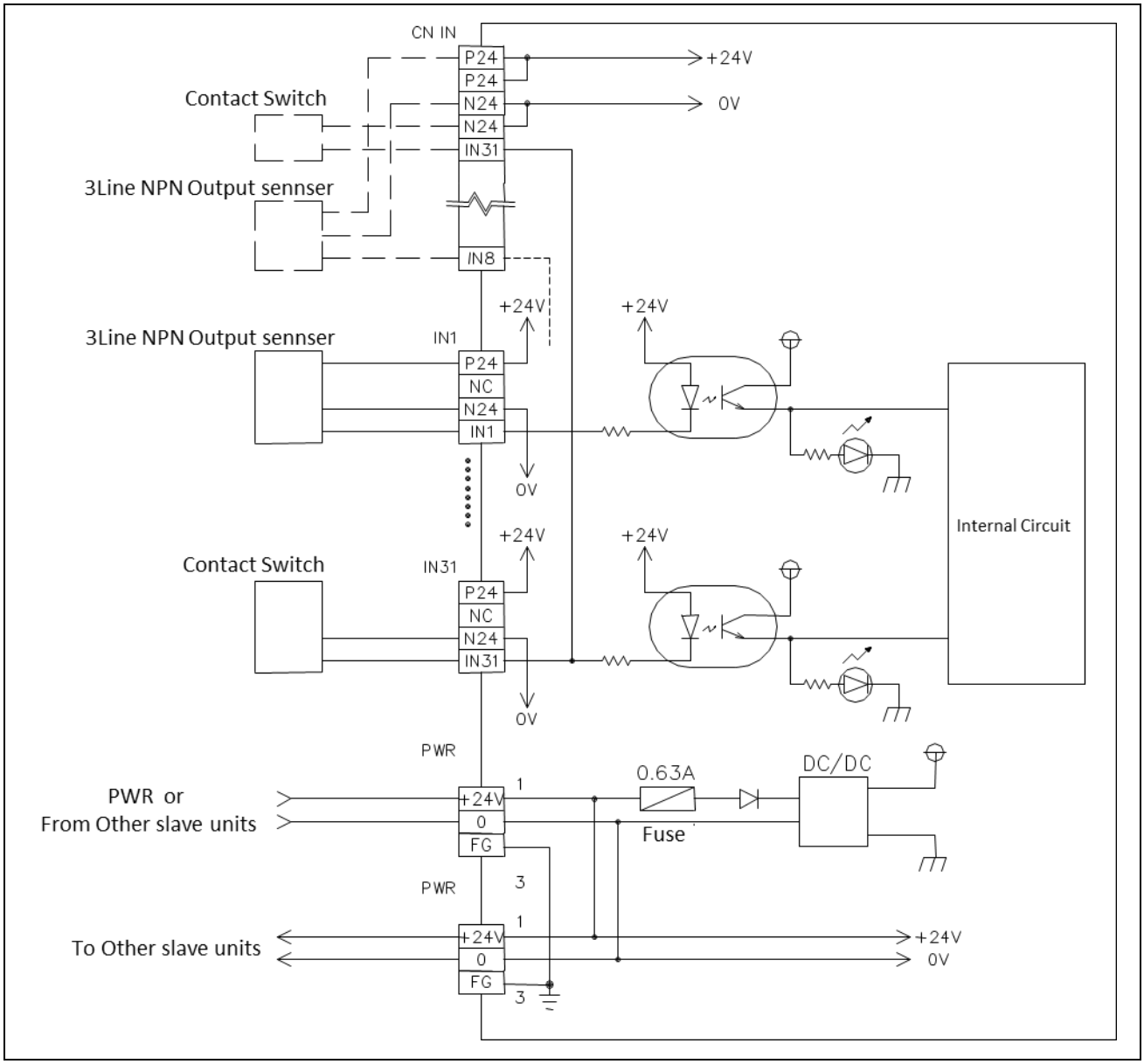


Fig8-1 Photo coupler input connection diagram

※ Power supply is less than 2A in total.
Attach a short circuit protection element to the power supply input edge or use the power supply with the short circuit protection function.

8.2 Power supply and FET output connection diagram

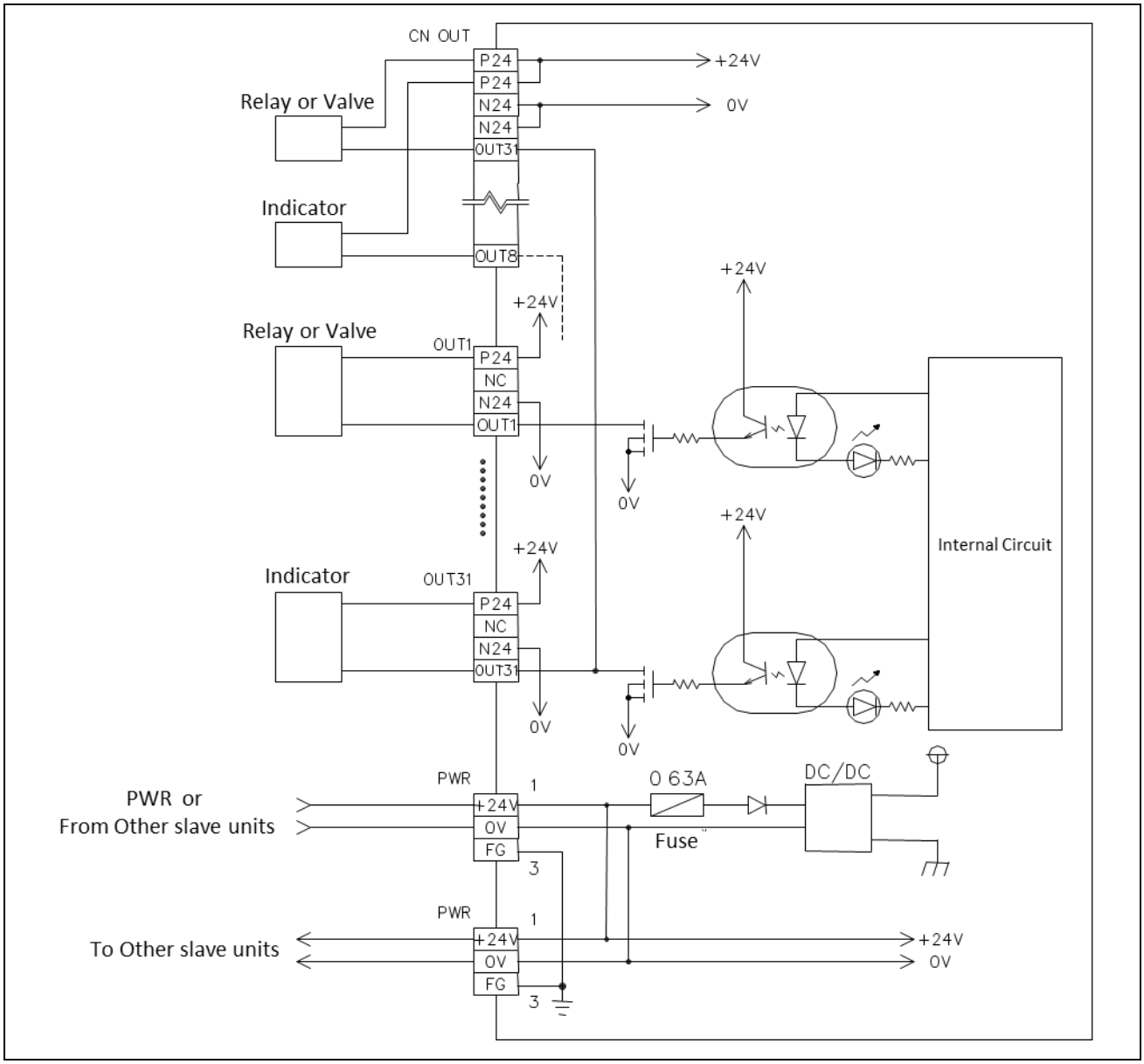


Fig8-2 FET output connection diagram

※ Power supply is less than 2A in total.
FET output is less than Max100mA per one point, and 2A in total.
Attach a short circuit protection element to the power supply input edge or use the power supply with the short circuit protection function.

9. Dimensional Outline Drawing

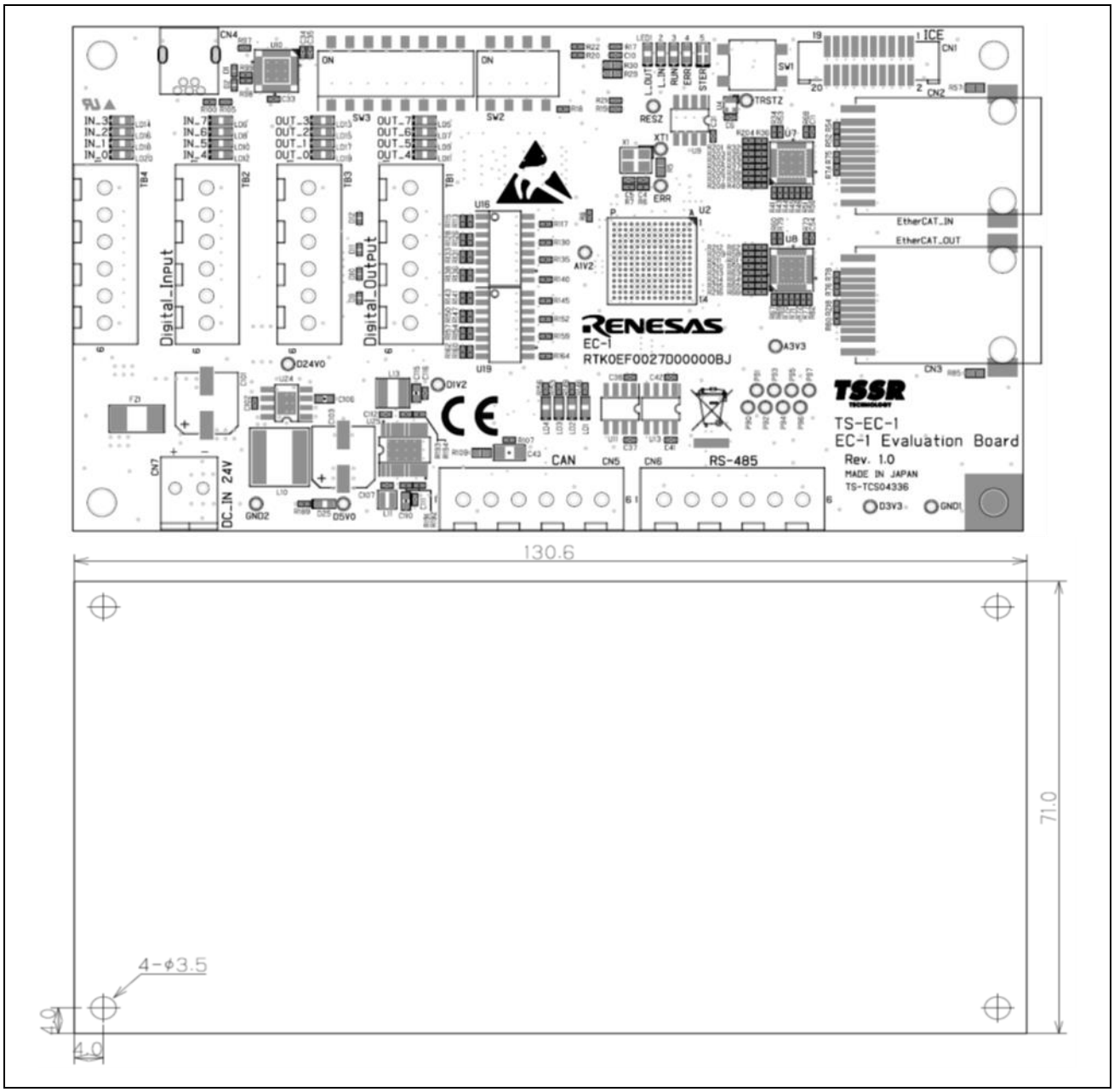


Fig9-1 Outline Drawing

10. Appendix

10.1 Appendix A TwinCAT installation

TwinCAT is available from Beckhoff Automation Corporation.
http://www.beckhoff.com/

10.2 Appendix B TwinCATdriver

To use the TwinCAT, must install the TwinCAT driver.

The installation procedure is showed as follows.

(1) TwinCAT starting

■In the case of TwinCAT2

By a method of either following, please start up a program.

- Task tray ⇒[TwinCAT System Manager]
- Start menu ⇒[TwinCAT System] ⇒ [TwinCAT System Manager]

■In the case of TwinCAT3

By a method of either following, please start up a program.

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

(2) Display the Ethernet adapter

■In the case of TwinCAT2

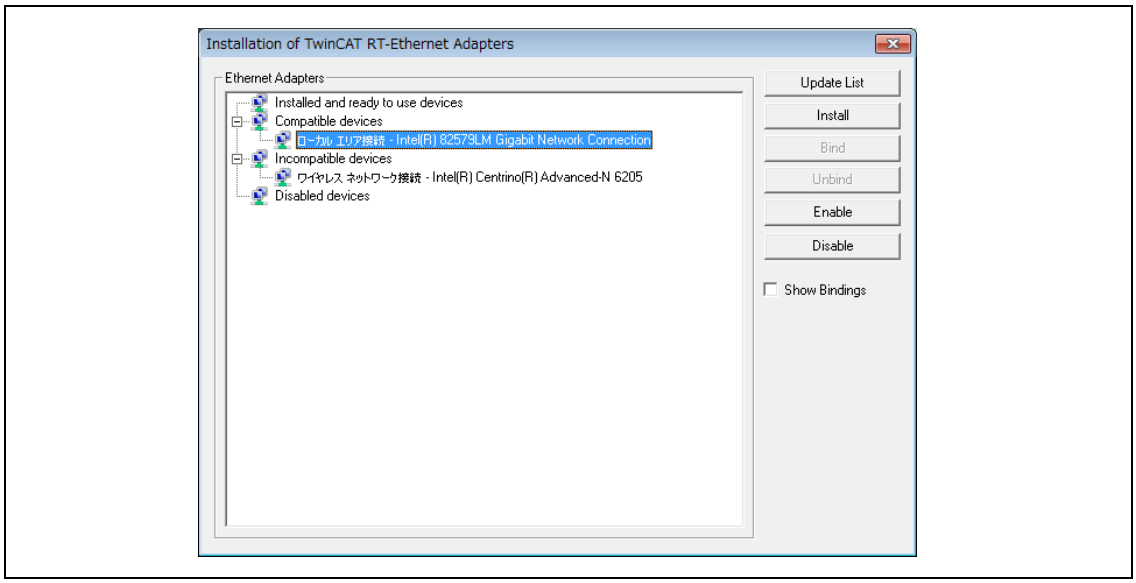
[Option] ⇒ [Show real Time Ethernet Compatible Devices…]

■In the case of TwinCAT3

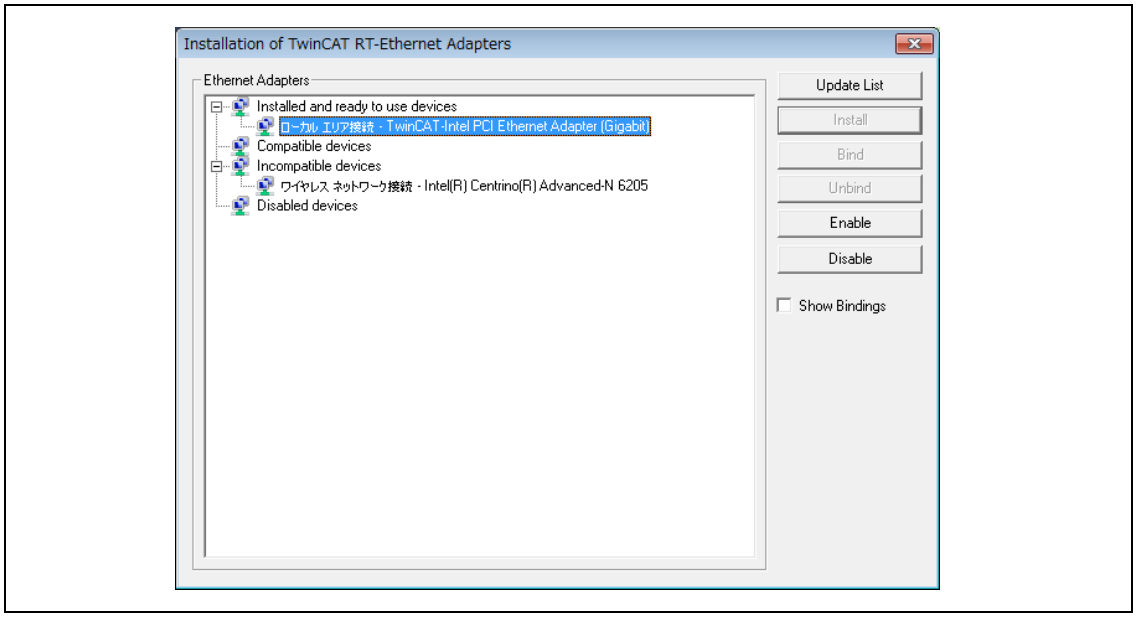
[TwinCAT] ⇒ [Show real Time Ethernet Compatible Devices…]

(3) Installation of TwinCAT driver

Select the network adapter on which want to install、and then run the [Install].



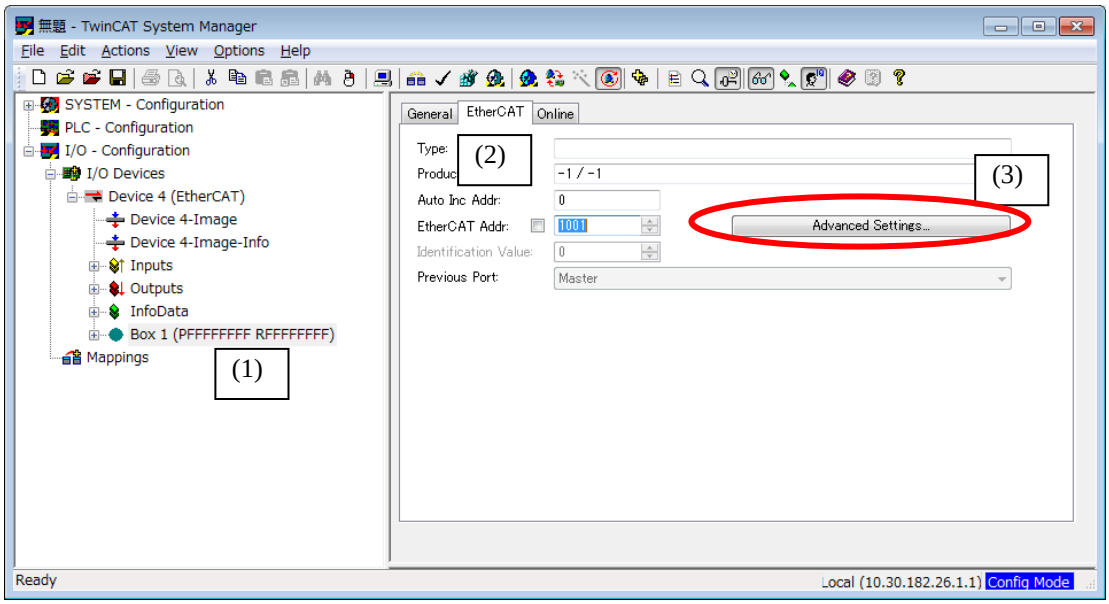
Install is complete, "Installed and ready to use devices" will appear on the network adapter.



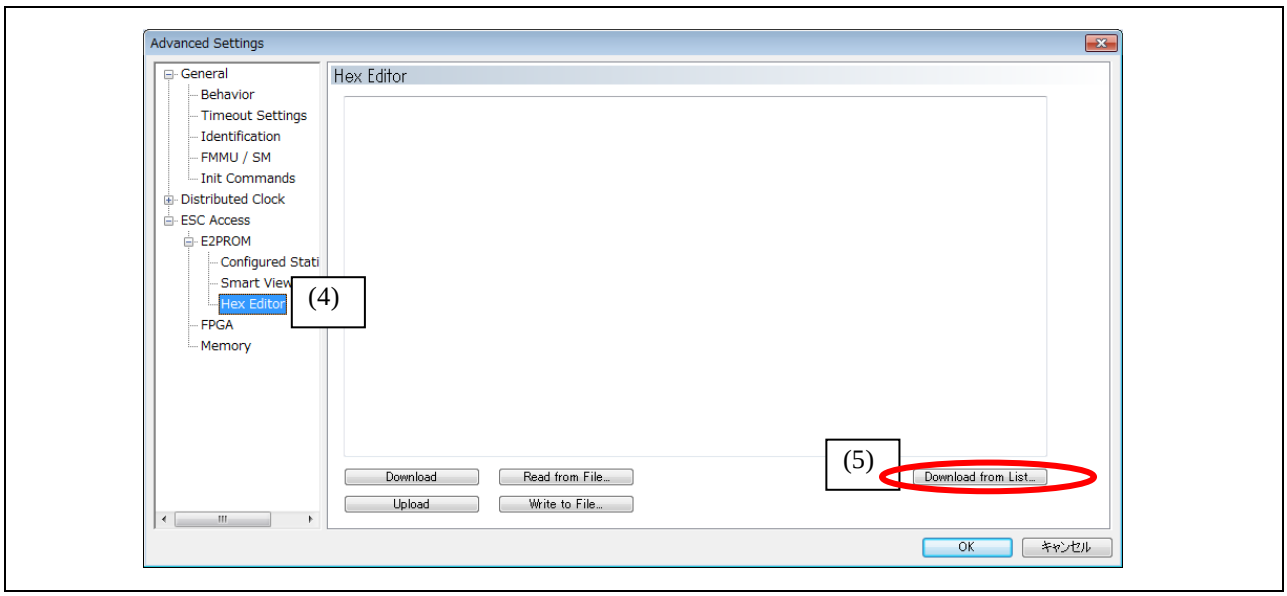
10.1 Appendix C Refresh EC-1 Board E2PROM data from TwinCAT

It is possible to refresh the E2PROM data of the EC-1 board from TwinCAT when TwinCAT is properly linked to the EC-1C.
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.

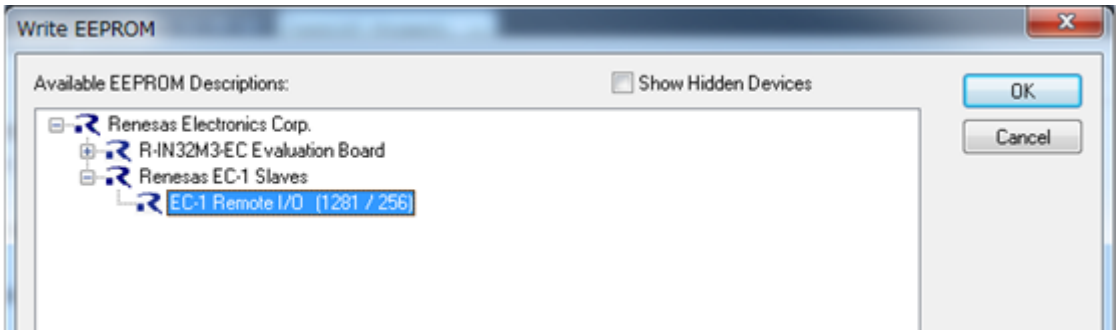
(1) Double-click on “Box 1” to show the right-hand option panel shown below
(2) Select the “EtherCAT” tab on the right-hand pane
(3) Click the “Advanced Settings” button.



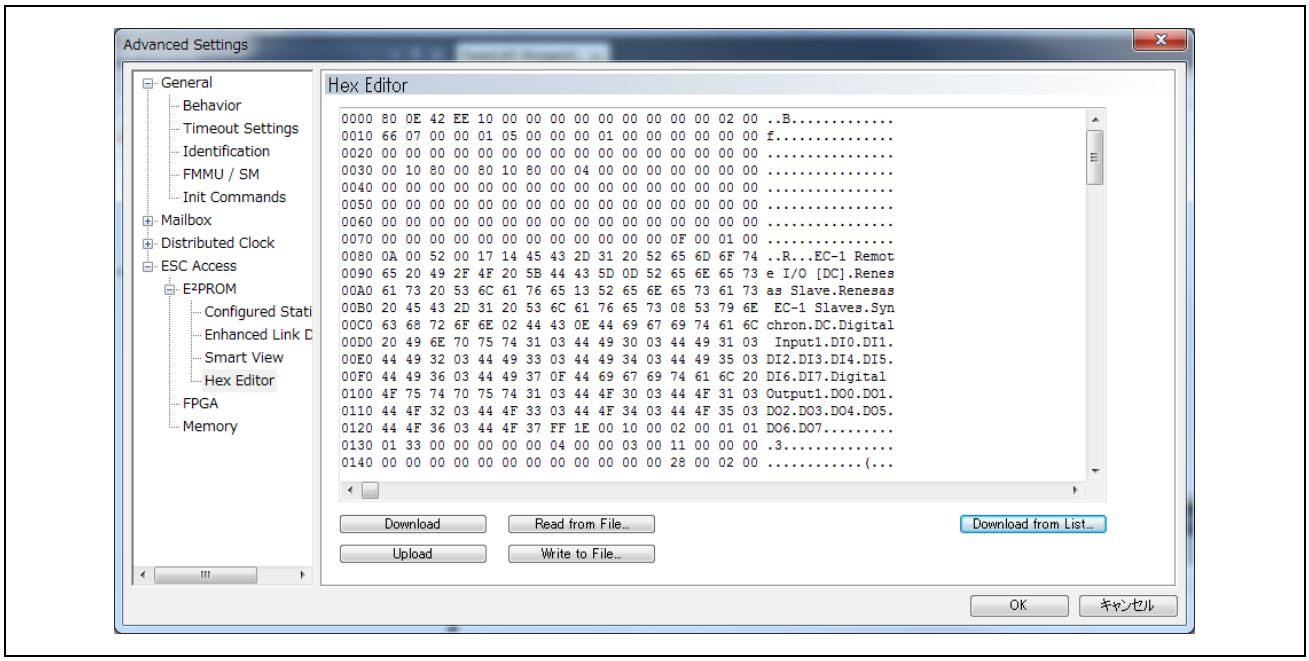
(4) Click on “E2PROM” --“Hex Editor” to show the option panel.
(5) Select the“Download from List”tab



(6) Select the EC-1 RemoteI/O ESI file “EC-1 Remote I/O”, click [OK] and EEPROM write.



(7) The transfer is successful if the data display in [Hex Editor].



REVISION HISTORY

Rev.	Date	Description	
		Page	Summary
1.00	2016.10.01	-	First edition issued

Instructions for the use of product

In this section, the precautions are described for over whole of CMOS device.
Please refer to this manual about individual precaution.
When there is a mention unlike the text of this manual, a mention of the text takes first priority

1. Handling of Unused Pins

   Handle unused pins in accord 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 LSI, associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   - The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has 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. Moreover, 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.

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