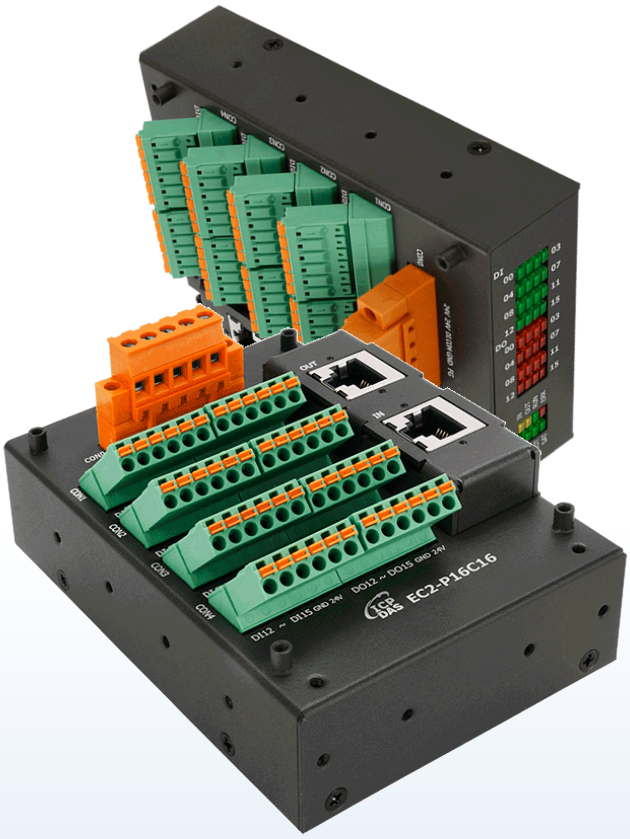
EC2-DIO Series
EtherCAT Slave I/O
Modules User Manual

English Ver. 1.0, Mar. 2023



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SUPPORT

EC2-P16C16

EC2-P32

EC2-C32

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1. Introduction

The EC2-DIO series are industrial EtherCAT slave remote I/O modules supporting EtherCAT protocol and installed by daisy chain connection which permits the flexibility in devices installation and reduces infrastructure and operation costs. All the modules can be deployed in the network topologies such as star, line or ring. The isolated input and output design protects the EC2-DIO series against the harmful interference and environment.

The EC2-DIO series has passed and verified by the conformance test tool, therefore eligible EtherCAT Master or configurator can manipulate it simply and implement your various applications easily. Fig 1.1 is shown a typical EtherCAT application.

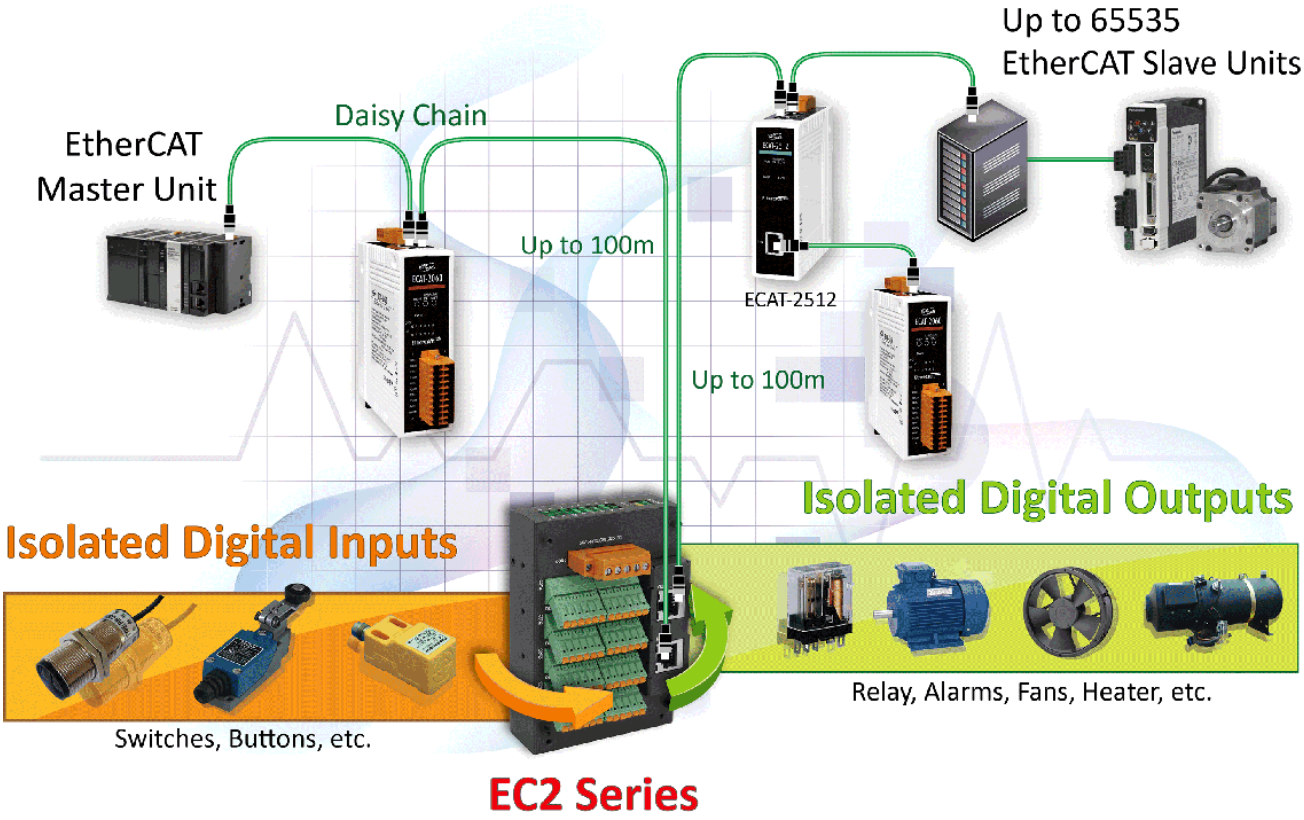


Figure 1.1 Typical Application of EC2-DIO

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1.1 Package List

The shipping package includes the following items:



EC2-DIO Series



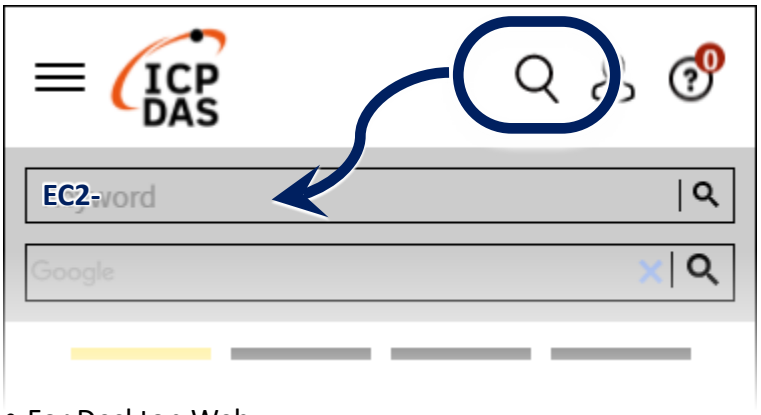
Quick Start

NOTE	If any of these items is missing or damaged, please contact your local distributor for more information. Keep the shipping materials and overall package in case you want to ship the module back in the future.

Resources

How to search for ESI, manuals and spec information on ICP DAS website(www.icpdas.com).

- For Mobile Web



- For Desktop Web



- For more detailed information related to the manual, hardware manual:
https://www.icpdas.com/en/product/guide+Industrial_Communication+EtherCAT+IO

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1.2 Product Information

The EC2-DIO series of EtherCAT slave modules support a range of I/O formats, such as photo-isolated digital input, relay contact ,and open-collector output, etc. The table below provides a description of each model.

Model	Description
EC2-P16C16	Isolated 16-ch Digital Outputs (Sink) and Isolated 16-ch Digital Intputs
EC2-P32	Isolated 32-ch Digital Intputs
EC2-C32	Isolated 32-ch Digital Outputs (Sink)

1.3 Selection Guide

DC Digital I/O					
Model	Digital Input		Digital Output		
	Channel	Type	Channel	Type	Max. Load Current
EC2-C32	-	-	32	Open Collector(Sink)	100 mA/ch
EC2-P32	32	Dry (Source), Wet (Sink/Source)	-	-	-
EC2-P16C16	16	Dry (Source), Wet (Sink/Source)	16	Open Collector(Sink)	100 mA/ch

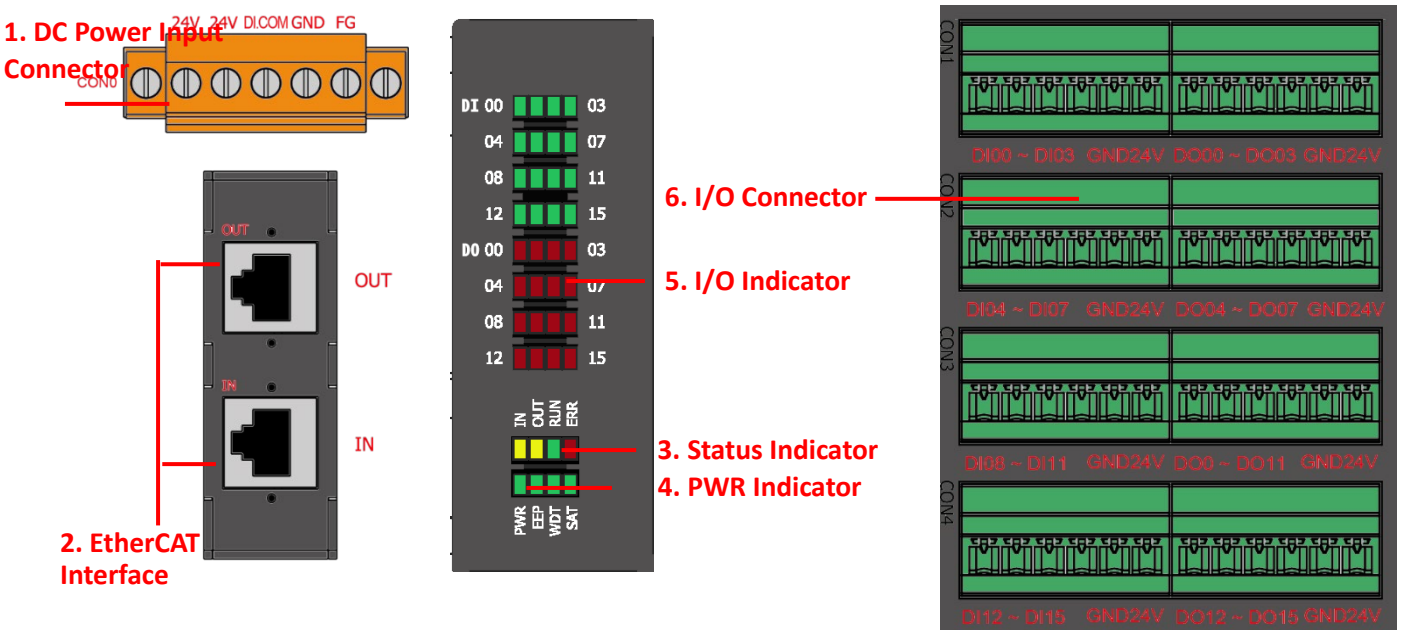
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2. Hardware Information

2.1 Appearance

The front panel and top panel of the EC2-DIO series module contain the I/O connector, LEDs, Ethernet Port and power connector.



1. DC Power Input Connector

The **"24V"** and **"GND"** pins are used for the power supply applies to all types of EC2-DIO series module. The valid power voltage range is from **+10 to +30 V_{DC}**.

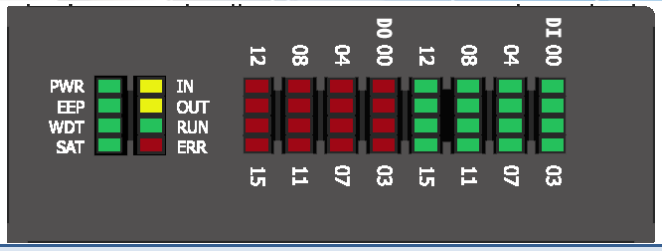
The definition of **"F.G." (Frame Ground)**: Electronic circuits are constantly vulnerable to Electrostatic Discharge (ESD), which becomes worse in a continental climate area. EC2-DIO series module feature a new design for the frame ground, which provides a path that bypasses ESD, resulting in an enhanced ESD protection capability and ensuring that the module is more reliable.

2. EtherCAT Interface

EC2-DIO series modules are equipped with two RJ-45 EtherCAT Interface ports. **IN** is EtherCAT signal input port that connect EtherCAT Master or EtherCAT signal output of previous EtherCAT slave module · **OUT** is EtherCAT signal output that connect the next EtherCAT signal input of EtherCAT slave module.

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3. Status Indicator

Notation	Color	States	Description
RUN	Green	Off	The device is in state INIT
		Blinking	The device is in state PRE-OPERARIONAL
		Single Flash	The device is in state SAFE-OPERARIONAL
		On	The device is in state OPERARIONAL
IN/OUT	Yellow	Off	No link
		Blinking	Link and activity
		On	Link without activity
ERR	Red	Off	PHY configuration is fault
		On	PHY configuration is normally
EEP	Green	Off	SII EEPROM loaded fault
		On	SII EEPROM loaded successfully
WDT	Green	Off	System watchdog event non-activity
		On	System watchdog event activily
SAT	Green	Off	Device configuration in saving mode
		On	Device configuration in protected mode

4. PWR LED Indicator

Once power is supplied to the EC2-DIO series module, the system LED indicator will illuminate.

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5. I/O Indicator

The exact design and functionality depends on the module type which indicates the I/O status.

Notation	Color	States	Description
DI	Green	Off	Input voltage is below the lower switching threshold voltage
		On	Input voltage is higher than the upper switching threshold voltage
DO	Red	Off	Digital output status is “Off”
		On	Digital output status is “On”

6. I/O Connector

For more detailed information regarding the pin assignments for the I/O connector, refer to Section 2.3 “Pin Assignments”.

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2.2 Specification

2.2.1 System Specification

Item	Specification
Communication	
Ethernet Port	2 x RJ-45, 100 BASE-TX
Protocol	EtherCAT
Distance between Station	Max. 100 m (100 BASE-TX)
Data Transfer Medium	Ethernet/EtherCAT Cable (Min. CAT 5), Shielded
LED Indicators	
PWR	1
L/A IN (Link/Activity IN)	1
L/A OUT (Link/Activity OUT)	1
RUN	1
Other	ERR/WDT/SAT/EEP
EMS Protection	
ESD (IEC 61000-4-2)	4 KV Contact for Each Channel
EFT (IEC 61000-4-4)	Power: 1 KV Class A; Signal: 1 KV Class A
Surge (IEC 61000-4-5)	1 KV Class A
Hi-Pot	1KV Class A
Power	
Powered from Terminal Block	+10 ~ +30 V_{DC}
Power Consumption	4 W (Max.)
Mechanical	
Installation	DIN-Rail Mounting
Environment	
Operating Temperature	-25 ~ +75°C
Storage Temperature	-30 ~ +80°C
Relative Humidity	10 ~ 90% RH, Non-condensing
Dimensions (L x W x D)	122 mm x 82 mm x 65 mm

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2.2.2 I/O Specification

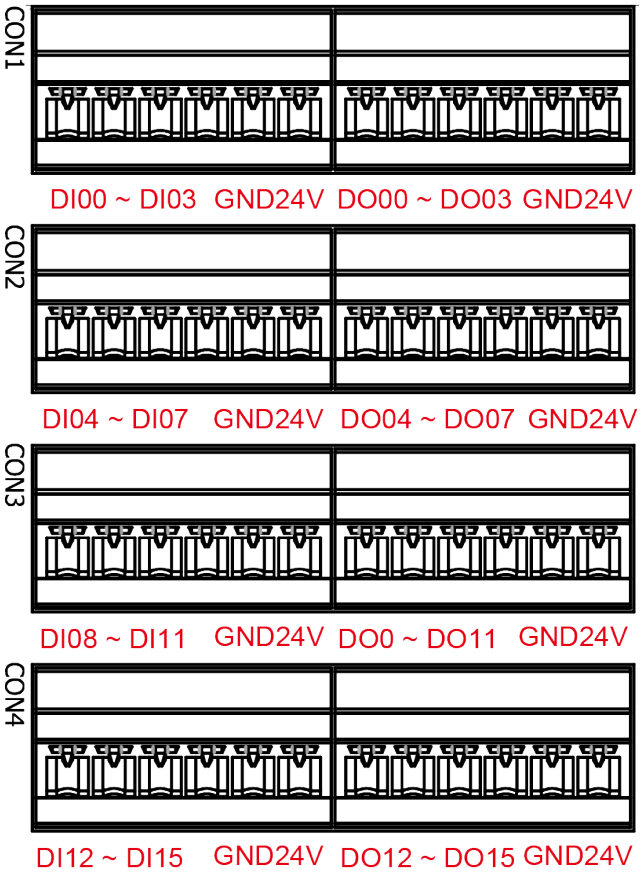
Model	EC2-P32	EC2-P16C16	EC2-C32
Digital Input			
Channels	32	16	-
Contact	Dry/Wet		-
Sink/Source (NPN/PNP)	Dry: Sink Wet: Sink/Source		-
On Voltage Level	Dry: Close to GND Wet: +10 V_{DC} ~ +40 V_{DC}		-
Off Voltage Level	Dry: Open Wet: +4 V_{DC} Max.		-
Isolation Voltage	3750 V_{DC}		-
Digital Output			
Channels	-	16	32
Type	-	Open collector	
Sink/Source (NPN/PNP)	-	Sink	
Load Voltage	-	+10 V ~ +24 V	
Max. Load Current	-	150 mA/Channel (Sink) @ 25℃ 100 mA/Channel (Sink) @ 60℃	
Isolation Voltage	-	3750 Vrms	

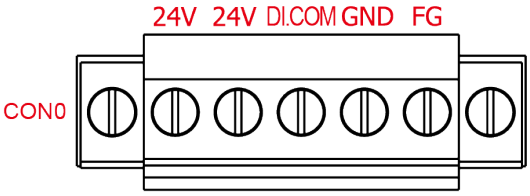
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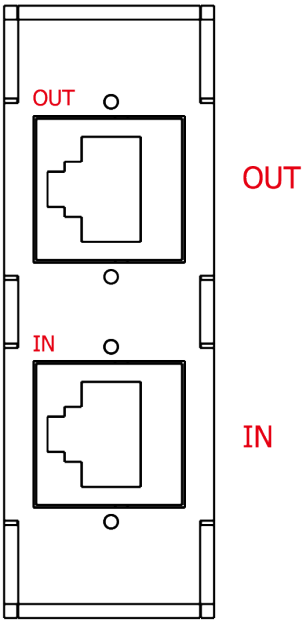
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2.3 Pin Assignments

EC2-P16C16



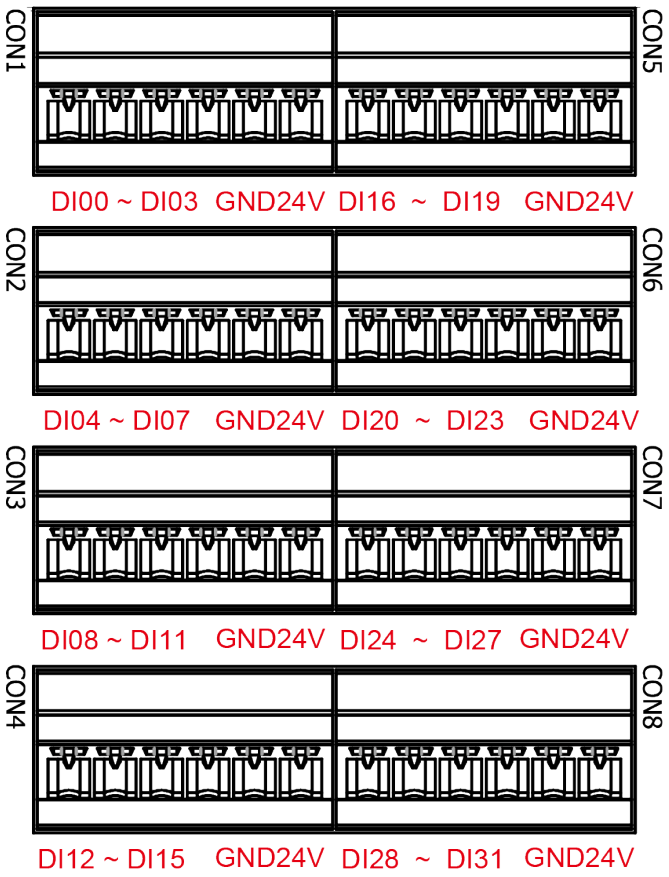


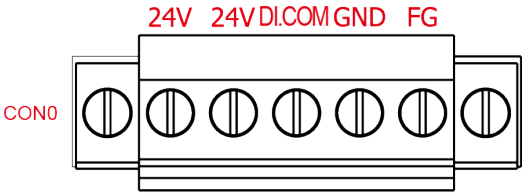


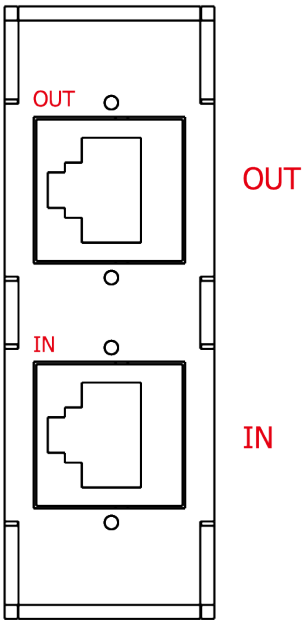
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EC2-P32

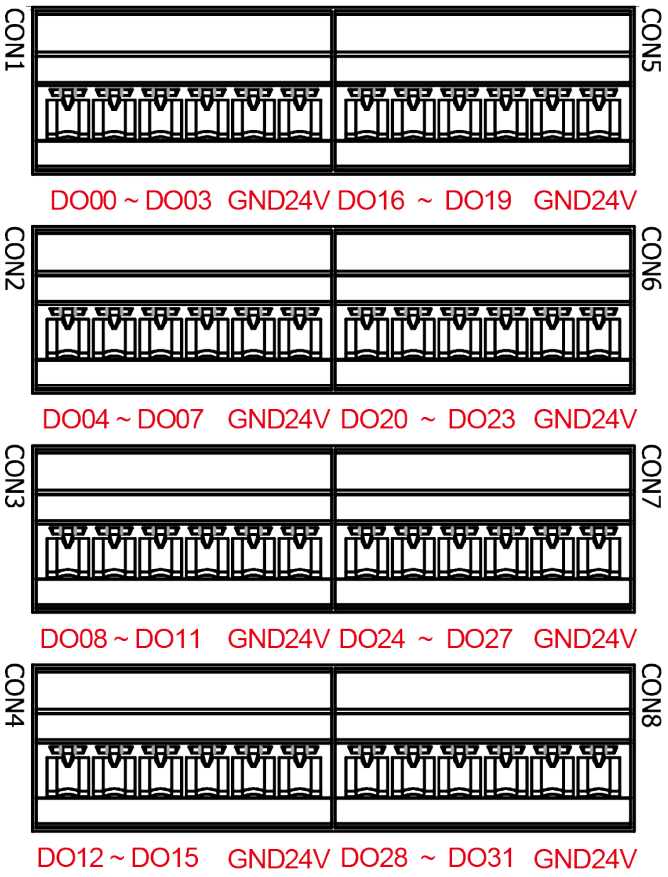


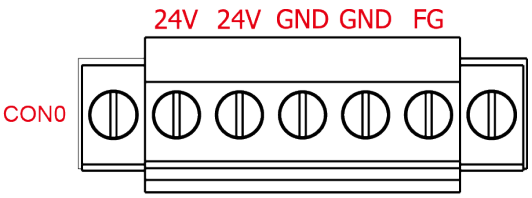


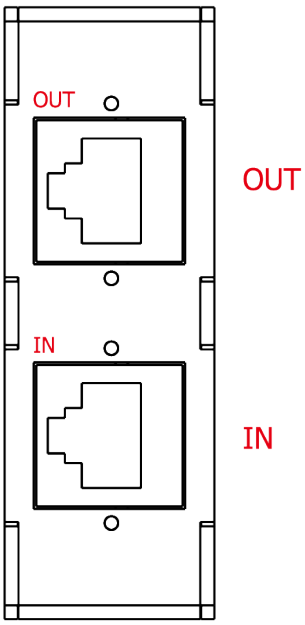


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EC2-C32



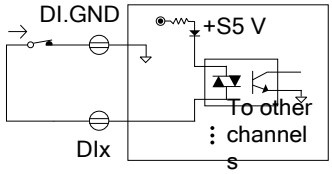
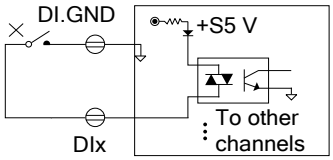
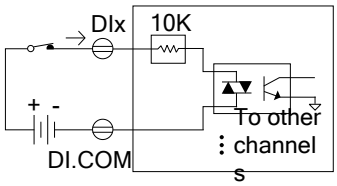
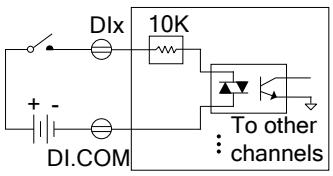
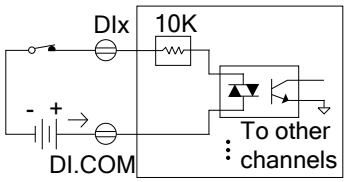
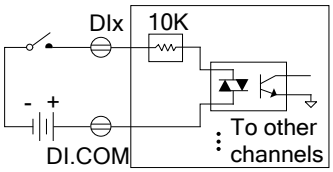




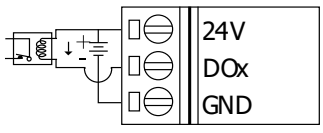
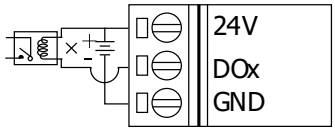
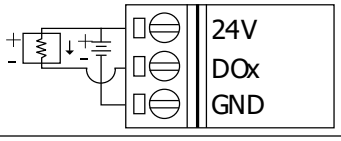
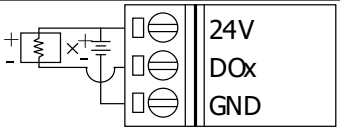
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2.4 Wiring Connections

Input Wiring

Model	Digital Input/Counter	Readback as 1	Readback as 0
EC2-P32 EC2-P16C6	Dry Contact	Close to GND	Open
			
	Sink	+10 ~ +50 VDC	OPEN or <4 VDC
			
	Source	+10 ~ +50 VDC	OPEN or <4 VDC
			

Output Wiring

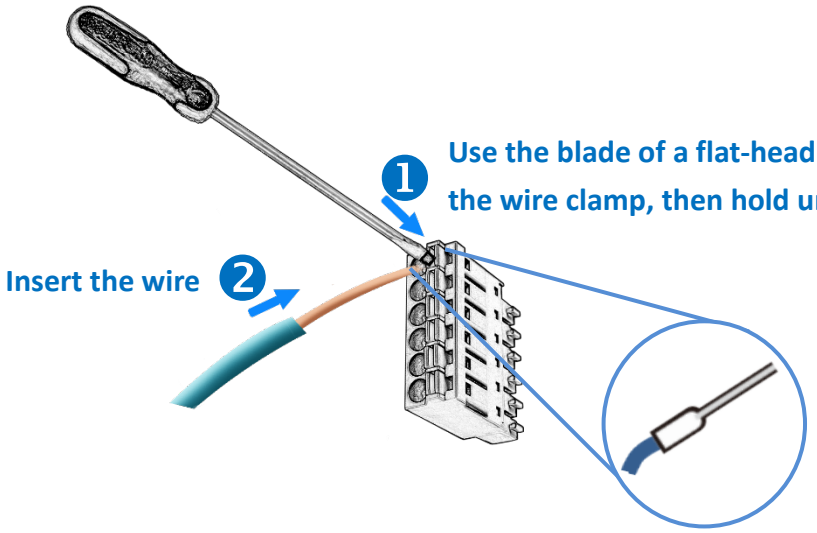
Model	Output Type	ON State Readback as 1	OFF State Readback as 0
EC2-P16C16 EC2-C32	Driver Relay		
	Resistance Load		

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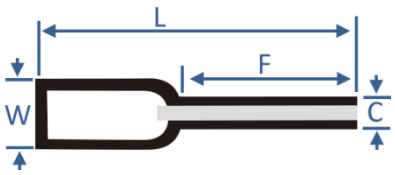
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2.5 Wiring to the Connector

A tip for connection the wire to the connector

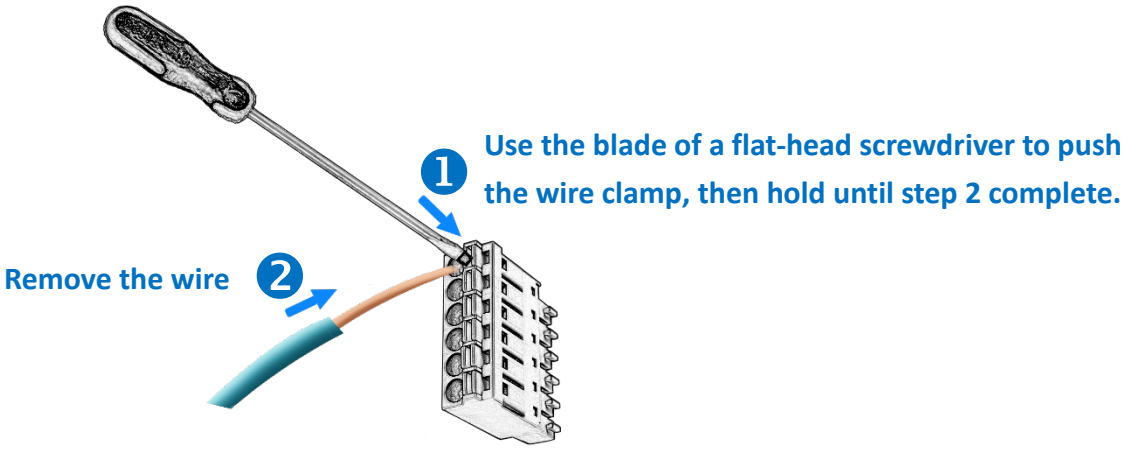


Insulated Terminals Dimensions



Dimensions (Unit: mm)				
Item NO.	F	L	C	W
CE007512	12.0	18.0	1.2	2.8

A tip for removing the wire from the connector



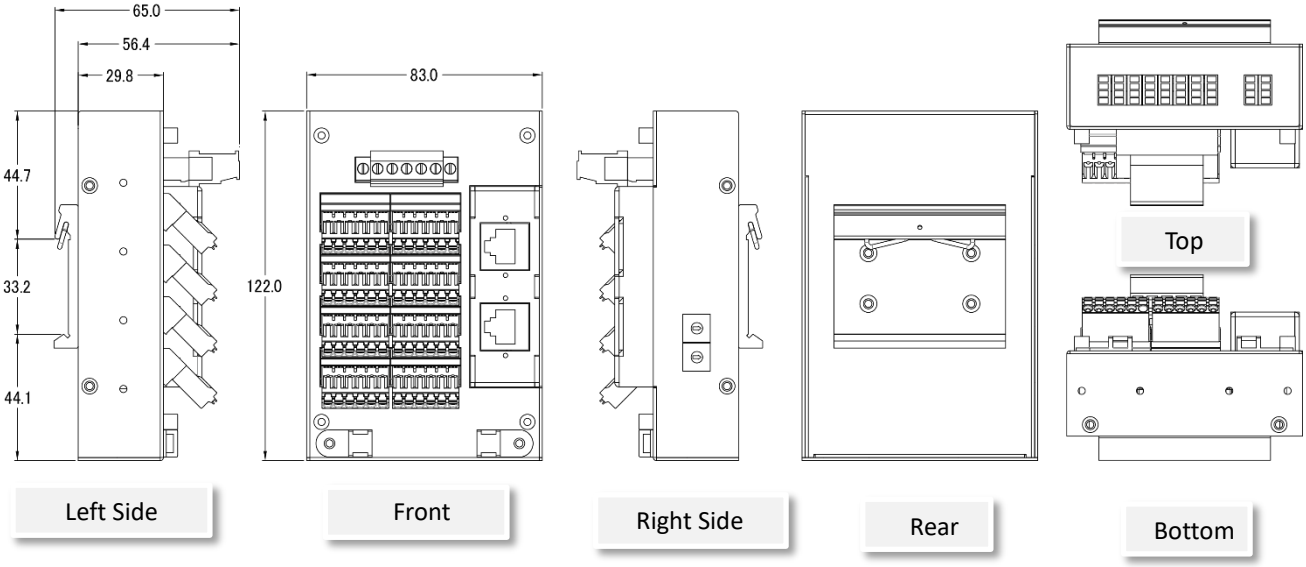
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2.6 Dimensions

The following diagrams provide the dimensions of the EC2-DIO series module and can be used as a reference when defining the specifications for any custom enclosures. All dimensions are in millimeters.

EC2-P16C16/P32/C32



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3. Getting Started

This chapter provides a basic overview of how to configure and operate your EC2-DIO series module.

3.1 Connecting the Power and the Host PC

Step 1

Connect both the IN port of EC2-DIO module and RJ-45 Ethernet port of Host PC.

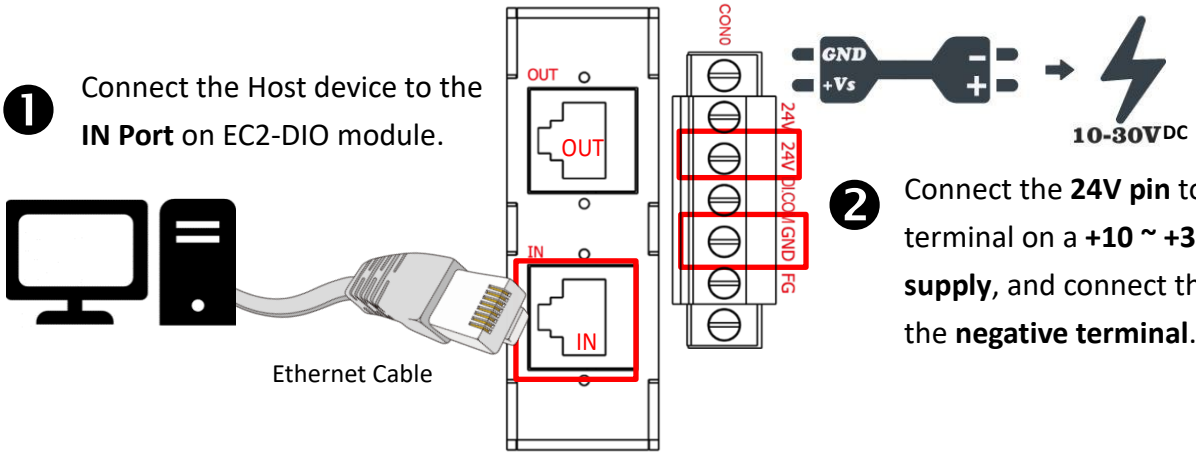
Ensure that the network settings on the Host PC have been correctly configured and are functioning normally. Ensure that the Windows firewall or any Anti-Virus firewall is properly configured to allow incoming connections, or temporarily disable these functions.

NOTE: Attaching an ESC (EtherCAT Slave Controller) directly to an office network will result in network flooding, since the ESC will reflect any frame – especially broadcast frames – back into the network (broadcast storm).

Step 2

Apply power to the EC2-DIO module

❶ Connect the Host device to the **IN Port** on EC2-DIO module.



❷ Connect the **24V pin** to positive terminal on a **+10 ~ +30 V_{DC} power supply**, and connect the **GND pin** to the **negative terminal**.

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Step 3

Verify the "PWR" LED indicator on the EC2-DIO module is Yellow, "IN" LED indicator is Green.



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3.2 Configuration and Operation

Beckhoff TwinCAT 2.X is most commonly used EtherCAT Master software to operate ECAT-2000 module.

Inserting into the EtherCAT network

NOTE

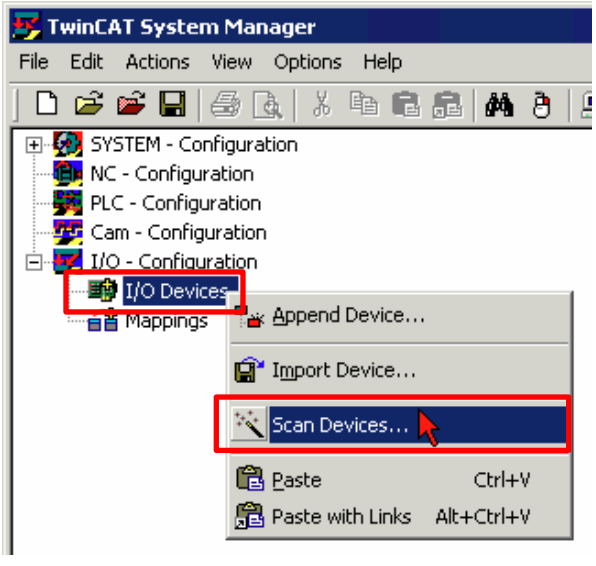
Installation of the latest XML device description(ESI)

Please ensure that you have installed the latest XML device description in TwinCAT. This can be downloaded and unzip file from the ICP DAS website (https://www.icpdas.com/tw/download/file.php?num=18279) and installed according to the installation instructions.

Step 1

Automatic Scanning

- The EtherCAT system must be in a safe, de-energized state before the module connected to EtherCAT network!
- Switch on the operating voltage, open the TwinCAT System Manager (Config mode), and scan in the devices (below the picture). Acknowledge all dialogs with **"OK"**, so that the configuration is in **"FreeRun"** mode.



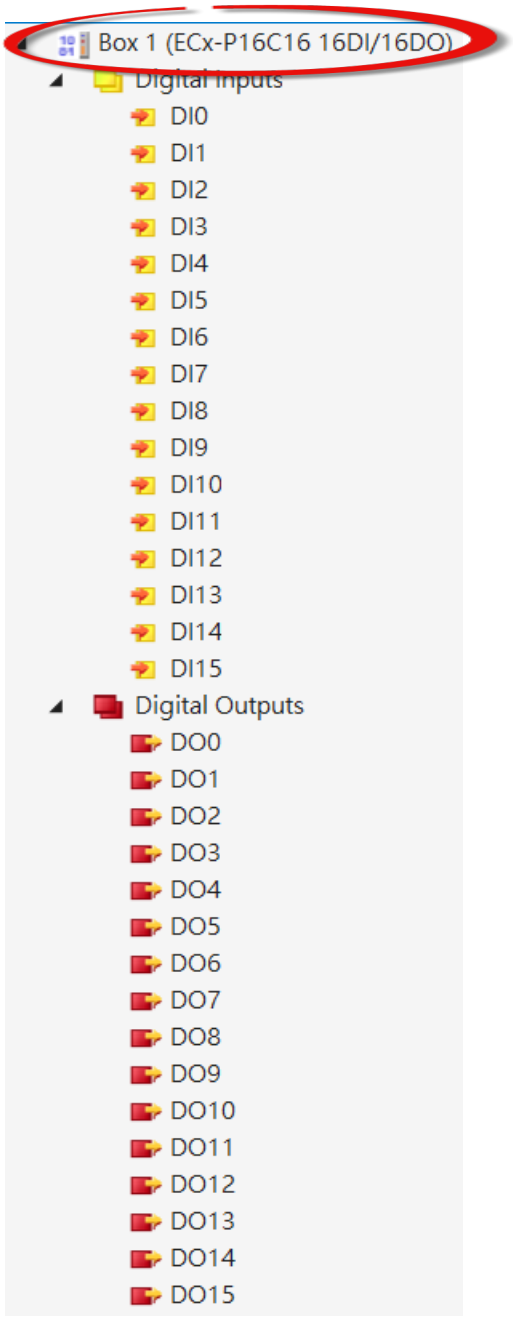
Scanning in the configuration
(I/O Devices-> right-click-> Scan Devices...)

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Step 2

Configuration via TwinCAT



In the left-hand of the TwinCAT System Manager, click on the branch of the EtherCAT Box you wish to configure (ECx-P16C16 in this example). Click DIx or DOx to get and configure state.

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4. Object Description and Parameterization

4.1 Standard Object(0x1000-0x1FFF)

[ALL]Index 1000 Device Type

Index	Name	Meaning	Data type	Flags	Default
1000:00	Device type	Device type of the EtherCAT slave: the Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x00030191 (197009dec)

[ALL]Index 1008 Device Name

Index	Name	Meaning	Data type	Flags	Default
1008:00	Device name	EtherCAT Slave Device Name	String	RO	Refer to following table

Table 4-1: Device Name

Model	Device Name
EC2-P16C16	EC2-P16C16 16DI/16DO
EC2-C32	EC2-C32 32DO
EC2-P32	EC2-P32 32DI

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[ALL]Index 1009 Hardware Version

Index	Name	Meaning	Data type	Flags	Default
1009:00	Hardware version	Hardware version of the EtherCAT slave	String	RO	1.0.0

[ALL]Index 100A Software Version

Index	Name	Meaning	Data type	Flags	Default
100A:00	Software version	Firmware version for EtherCAT slave	String	RO	1.0.0

[ALL]Index 1018 Identity

Index	Name	Meaning	Data type	Flags	Default
1018:00	Identity	Information for identifying the slave	INT8	RO	0x04(4dec)
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00494350 (4801360dec)
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	Refer to following table
1018:03	Revision	Revision number of the EtherCAT slave;	UINT32	RO	Depend on device
1018:04	Serial number	Serial number of the EtherCAT slave	UINT32	RO	Depend on device

Table 4-2: Product Code

Model	Product Code
EC2-P16C16	0xD20F0F(13766415dec)
EC2-P32	0xD10020 (13697056dec)
EC2-C32	0xD00020 (13631520dec)

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[EC2-P16C16]Index 1600 DO Outputs Process Data Mapping

Index	Name	Meaning	Data type	Flags	Default
1600:00	DO Output process data mapping	PDO Mapping RxPDO 1	UINT8	RO	0x11(17dec)
1600:01	SubIndex 001	PDO Mapping entry (object 0x7000,entry 0x01)	UINT32	RO	0x7000:01,1
1600:02	SubIndex 002	PDO Mapping entry (object 0x7000,entry 0x02)	UINT32	RO	0x7000:02,1
1600:03	SubIndex 003	PDO Mapping entry (object 0x7000,entry 0x03)	UINT32	RO	0x7000:03,3
1600:04	SubIndex 004	PDO Mapping entry (object 0x7000,entry 0x04)	UINT32	RO	0x7000:04,1
1600:05	SubIndex 005	PDO Mapping entry (object 0x7000,entry 0x05)	UINT32	RO	0x7000:05,1
1600:06	SubIndex 006	PDO Mapping entry (object 0x7000,entry 0x06)	UINT32	RO	0x7000:06,1
1600:07	SubIndex 007	PDO Mapping entry (object 0x7000,entry 0x07)	UINT32	RO	0x7000:07,1
1600:08	SubIndex 008	PDO Mapping entry (object 0x7000,entry 0x08)	UINT32	RO	0x7000:08,1
1600:09	SubIndex 009	PDO Mapping entry (object 0x7000,entry 0x09)	UINT32	RO	0x7000:09,1
1600:0A	SubIndex 010	PDO Mapping entry (object 0x7000,entry 0x0A)	UINT32	RO	0x7000:0A,1
1600:0B	SubIndex 011	PDO Mapping entry (object 0x7000,entry 0x0B)	UINT32	RO	0x7000:0B,1
1600:0C	SubIndex 012	PDO Mapping entry (object 0x7000,entry 0x0C)	UINT32	RO	0x7000:0C,1
1600:0D	SubIndex 013	PDO Mapping entry (object 0x7000,entry 0x0D)	UINT32	RO	0x7000:0D,1
1600:0E	SubIndex 014	PDO Mapping entry (object 0x7000,entry 0x0E)	UINT32	RO	0x7000:0E,1
1600:0F	SubIndex 015	PDO Mapping entry (object 0x7000,entry 0x0F)	UINT32	RO	0x7000:0F,1
1600:10	SubIndex 016	PDO Mapping entry (object 0x7000,entry 0x10)	UINT32	RO	0x7000:10,1

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[EC2-C32]Index 1600 DO Outputs Process Data Mapping

Index	Name	Meaning	Data type	Flags	Default
1600:00	DO Output process data mapping	PDO Mapping RxPDO 1	UINT8	RO	0x21(33dec)
1600:01	SubIndex 001	PDO Mapping entry (object 0x7000,entry 0x01)	UINT32	RO	0x7000:01,1
1600:02	SubIndex 002	PDO Mapping entry (object 0x7000,entry 0x02)	UINT32	RO	0x7000:02,1
1600:03	SubIndex 003	PDO Mapping entry (object 0x7000,entry 0x03)	UINT32	RO	0x7000:03,3
1600:04	SubIndex 004	PDO Mapping entry (object 0x7000,entry 0x04)	UINT32	RO	0x7000:04,1
1600:05	SubIndex 005	PDO Mapping entry (object 0x7000,entry 0x05)	UINT32	RO	0x7000:05,1
1600:06	SubIndex 006	PDO Mapping entry (object 0x7000,entry 0x06)	UINT32	RO	0x7000:06,1
1600:07	SubIndex 007	PDO Mapping entry (object 0x7000,entry 0x07)	UINT32	RO	0x7000:07,1
1600:08	SubIndex 008	PDO Mapping entry (object 0x7000,entry 0x08)	UINT32	RO	0x7000:08,1
1600:09	SubIndex 009	PDO Mapping entry (object 0x7000,entry 0x09)	UINT32	RO	0x7000:09,1
1600:0A	SubIndex 010	PDO Mapping entry (object 0x7000,entry 0x0A)	UINT32	RO	0x7000:0A,1
1600:0B	SubIndex 011	PDO Mapping entry (object 0x7000,entry 0x0B)	UINT32	RO	0x7000:0B,1
1600:0C	SubIndex 012	PDO Mapping entry (object 0x7000,entry 0x0C)	UINT32	RO	0x7000:0C,1
1600:0D	SubIndex 013	PDO Mapping entry (object 0x7000,entry 0x0D)	UINT32	RO	0x7000:0D,1
1600:0E	SubIndex 014	PDO Mapping entry (object 0x7000,entry 0x0E)	UINT32	RO	0x7000:0E,1
1600:0F	SubIndex 015	PDO Mapping entry (object 0x7000,entry 0x0F)	UINT32	RO	0x7000:0F,1
1600:10	SubIndex 016	PDO Mapping entry (object 0x7000,entry 0x10)	UINT32	RO	0x7000:10,1
1600:11	SubIndex 017	PDO Mapping entry (object 0x7000,entry 0x11)	UINT32	RO	0x7000:11,1
1600:12	SubIndex 018	PDO Mapping entry (object 0x7000,entry 0x12)	UINT32	RO	0x7000:12,1
1600:13	SubIndex 019	PDO Mapping entry (object 0x7000,entry 0x13)	UINT32	RO	0x7000:13,3
1600:14	SubIndex 020	PDO Mapping entry (object 0x7000,entry 0x14)	UINT32	RO	0x7000:14,1
1600:15	SubIndex 021	PDO Mapping entry (object 0x7000,entry 0x15)	UINT32	RO	0x7000:15,1
1600:16	SubIndex 022	PDO Mapping entry (object 0x7000,entry 0x16)	UINT32	RO	0x7000:16,1
1600:17	SubIndex 023	PDO Mapping entry (object 0x7000,entry 0x17)	UINT32	RO	0x7000:17,1
1600:18	SubIndex 024	PDO Mapping entry (object 0x7000,entry 0x18)	UINT32	RO	0x7000:18,1
1600:19	SubIndex 025	PDO Mapping entry (object 0x7000,entry 0x19)	UINT32	RO	0x7000:19,1
1600:1A	SubIndex 026	PDO Mapping entry (object 0x7000,entry 0x1A)	UINT32	RO	0x7000:1A,1
1600:1B	SubIndex 027	PDO Mapping entry (object 0x7000,entry 0x1B)	UINT32	RO	0x7000:1B,1
1600:1C	SubIndex 028	PDO Mapping entry (object 0x7000,entry 0x1C)	UINT32	RO	0x7000:1C,1
1600:1D	SubIndex 029	PDO Mapping entry (object 0x7000,entry 0x1D)	UINT32	RO	0x7000:1D,1
1600:1E	SubIndex 030	PDO Mapping entry (object 0x7000,entry 0x1E)	UINT32	RO	0x7000:1E,1
1600:1F	SubIndex 031	PDO Mapping entry (object 0x7000,entry 0x1F)	UINT32	RO	0x7000:1F,1
1600:20	SubIndex 032	PDO Mapping entry (object 0x7000,entry 0x20)	UINT32	RO	0x7000:20,1

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[EC2-P16C16]Index 1A00 DI Outputs Process Data Mapping

Index	Name	Meaning	Data type	Flags	Default
1A00:00	DI Output process data mapping	PDO Mapping TxPDO 1	UINT8	RO	0x11(17dec)
1A00:01	SubIndex 001	PDO Mapping entry (object 0x6000,entry 0x01)	UINT32	RO	0x6000:01,1
1A00:02	SubIndex 002	PDO Mapping entry (object 0x6000,entry 0x02)	UINT32	RO	0x6000:02,1
1A00:03	SubIndex 003	PDO Mapping entry (object 0x6000,entry 0x03)	UINT32	RO	0x6000:03,3
1A00:04	SubIndex 004	PDO Mapping entry (object 0x6000,entry 0x04)	UINT32	RO	0x6000:04,1
1A00:05	SubIndex 005	PDO Mapping entry (object 0x6000,entry 0x05)	UINT32	RO	0x6000:05,1
1A00:06	SubIndex 006	PDO Mapping entry (object 0x6000,entry 0x06)	UINT32	RO	0x6000:06,1
1A00:07	SubIndex 007	PDO Mapping entry (object 0x6000,entry 0x07)	UINT32	RO	0x6000:07,1
1A00:08	SubIndex 008	PDO Mapping entry (object 0x6000,entry 0x08)	UINT32	RO	0x6000:08,1
1A00:09	SubIndex 009	PDO Mapping entry (object 0x6000,entry 0x09)	UINT32	RO	0x6000:09,1
1A00:0A	SubIndex 010	PDO Mapping entry (object 0x6000,entry 0x0A)	UINT32	RO	0x6000:0A,1
1A00:0B	SubIndex 011	PDO Mapping entry (object 0x6000,entry 0x0B)	UINT32	RO	0x6000:0B,1
1A00:0C	SubIndex 012	PDO Mapping entry (object 0x6000,entry 0x0C)	UINT32	RO	0x6000:0C,1
1A00:0D	SubIndex 013	PDO Mapping entry (object 0x6000,entry 0x0D)	UINT32	RO	0x6000:0D,1
1A00:0E	SubIndex 014	PDO Mapping entry (object 0x6000,entry 0x0E)	UINT32	RO	0x6000:0E,1
1A00:0F	SubIndex 015	PDO Mapping entry (object 0x6000,entry 0x0F)	UINT32	RO	0x6000:0F,1
1A00:10	SubIndex 016	PDO Mapping entry (object 0x6000,entry 0x10)	UINT32	RO	0x6000:10,1

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[EC2-P32]Index 1A00 DI Outputs Process Data Mapping

Index	Name	Meaning	Data type	Flags	Default
1A00:00	DI Output process data mapping	PDO Mapping TxPDO 1	UINT8	RO	0x21(33dec)
1A00:01	SubIndex 001	PDO Mapping entry (object 0x6000,entry 0x01)	UINT32	RO	0x6000:01,1
1A00:02	SubIndex 002	PDO Mapping entry (object 0x6000,entry 0x02)	UINT32	RO	0x6000:02,1
1A00:03	SubIndex 003	PDO Mapping entry (object 0x6000,entry 0x03)	UINT32	RO	0x6000:03,3
1A00:04	SubIndex 004	PDO Mapping entry (object 0x6000,entry 0x04)	UINT32	RO	0x6000:04,1
1A00:05	SubIndex 005	PDO Mapping entry (object 0x6000,entry 0x05)	UINT32	RO	0x6000:05,1
1A00:06	SubIndex 006	PDO Mapping entry (object 0x6000,entry 0x06)	UINT32	RO	0x6000:06,1
1A00:07	SubIndex 007	PDO Mapping entry (object 0x6000,entry 0x07)	UINT32	RO	0x6000:07,1
1A00:08	SubIndex 008	PDO Mapping entry (object 0x6000,entry 0x08)	UINT32	RO	0x6000:08,1
1A00:09	SubIndex 009	PDO Mapping entry (object 0x6000,entry 0x09)	UINT32	RO	0x6000:09,1
1A00:0A	SubIndex 010	PDO Mapping entry (object 0x6000,entry 0x0A)	UINT32	RO	0x6000:0A,1
1A00:0B	SubIndex 011	PDO Mapping entry (object 0x6000,entry 0x0B)	UINT32	RO	0x6000:0B,1
1A00:0C	SubIndex 012	PDO Mapping entry (object 0x6000,entry 0x0C)	UINT32	RO	0x6000:0C,1
1A00:0D	SubIndex 013	PDO Mapping entry (object 0x6000,entry 0x0D)	UINT32	RO	0x6000:0D,1
1A00:0E	SubIndex 014	PDO Mapping entry (object 0x6000,entry 0x0E)	UINT32	RO	0x6000:0E,1
1A00:0F	SubIndex 015	PDO Mapping entry (object 0x6000,entry 0x0F)	UINT32	RO	0x6000:0F,1
1A00:10	SubIndex 016	PDO Mapping entry (object 0x6000,entry 0x10)	UINT32	RO	0x6000:10,1
1A00:11	SubIndex 017	PDO Mapping entry (object 0x6000,entry 0x11)	UINT32	RO	0x6000:11,1
1A00:12	SubIndex 018	PDO Mapping entry (object 0x6000,entry 0x12)	UINT32	RO	0x6000:12,1
1A00:13	SubIndex 019	PDO Mapping entry (object 0x6000,entry 0x13)	UINT32	RO	0x6000:13,3
1A00:14	SubIndex 020	PDO Mapping entry (object 0x6000,entry 0x14)	UINT32	RO	0x6000:14,1
1A00:15	SubIndex 021	PDO Mapping entry (object 0x6000,entry 0x15)	UINT32	RO	0x6000:15,1
1A00:16	SubIndex 022	PDO Mapping entry (object 0x6000,entry 0x16)	UINT32	RO	0x6000:16,1
1A00:17	SubIndex 023	PDO Mapping entry (object 0x6000,entry 0x17)	UINT32	RO	0x6000:17,1
1A00:18	SubIndex 024	PDO Mapping entry (object 0x6000,entry 0x18)	UINT32	RO	0x6000:18,1
1A00:19	SubIndex 025	PDO Mapping entry (object 0x6000,entry 0x19)	UINT32	RO	0x6000:19,1
1A00:1A	SubIndex 026	PDO Mapping entry (object 0x6000,entry 0x1A)	UINT32	RO	0x6000:1A,1
1A00:1B	SubIndex 027	PDO Mapping entry (object 0x6000,entry 0x1B)	UINT32	RO	0x6000:1B,1
1A00:1C	SubIndex 028	PDO Mapping entry (object 0x6000,entry 0x1C)	UINT32	RO	0x6000:1C,1
1A00:1D	SubIndex 029	PDO Mapping entry (object 0x6000,entry 0x1D)	UINT32	RO	0x6000:1D,1
1A00:1E	SubIndex 030	PDO Mapping entry (object 0x6000,entry 0x1E)	UINT32	RO	0x6000:1E,1
1A00:1F	SubIndex 031	PDO Mapping entry (object 0x6000,entry 0x1F)	UINT32	RO	0x6000:1F,1
1A00:20	SubIndex 032	PDO Mapping entry (object 0x6000,entry 0x20)	UINT32	RO	0x6000:20,1

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[ALL]Index 1C00 Sync Manager Type

Index	Name	Meaning	Data type	Flags	Default
1C00:00	Sync manager type	Using the sync managers	UINT8	RO	0x04(4dec)
1C00:01	SubIndex 001	Sync-Manager Channel 1:Mailbox write	UINT8	RO	0x01(1dec)
1C00:02	SubIndex 002	Sync-Manager Channel 2:Mailbox read	UINT8	RO	0x02(2dec)
1C00:03	SubIndex 003	Sync-Manager Channel 3:Process data write	UINT8	RO	0x03(3dec)
1C00:04	SubIndex 004	Sync-Manager Channel 4:Process data read	UINT8	RO	0x04(4dec)

[EC2-P16C16]Index 1C12 SyncManager 2 Assignment

Index	Name	Meaning	Data type	Flags	Default
1C12:00	Sync-Manager 2 assignment	Sync manager assign outputs	UINT8	RO	0x01(1dec)
1C12:01	SubIndex 001	1st allocated RxPDO	UINT16	RO	0x1600(5632dec)

[EC2-P16C16]Index 1C13 SyncManager 3 Assignment

Index	Name	Meaning	Data type	Flags	Default
1C13:00	Sync-Manager 3 assignment	Sync manager assign outputs	UINT8	RO	0x01(1dec)
1C13:01	SubIndex 001	1st allocated TxPDO	UINT16	RO	0x1A00(6656dec)

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4.2 Profile Specific Objects(0x6000-0x7FFF)

[EC2-P16C16]Index 6000 Digital Inputs

Index	Name	Meaning	Data type	Flags	Default
6000:00	Digital Inputs		UINT8	RO	0x11(17dec)
6000:01	DI0		BOOLEAN	RO	0x00(0dec)
6000:02	DI1		BOOLEAN	RO	0x00(0dec)
6000:03	DI2		BOOLEAN	RO	0x00(0dec)
6000:04	DI3		BOOLEAN	RO	0x00(0dec)
6000:05	DI4		BOOLEAN	RO	0x00(0dec)
6000:06	DI5		BOOLEAN	RO	0x00(0dec)
6000:07	DI6		BOOLEAN	RO	0x00(0dec)
6000:08	DI7		BOOLEAN	RO	0x00(0dec)
6000:09	DI8		BOOLEAN	RO	0x00(0dec)
6000:0A	DI9		BOOLEAN	RO	0x00(0dec)
6000:0B	DI10		BOOLEAN	RO	0x00(0dec)
6000:0C	DI11		BOOLEAN	RO	0x00(0dec)
6000:0D	DI12		BOOLEAN	RO	0x00(0dec)
6000:0E	DI13		BOOLEAN	RO	0x00(0dec)
6000:0F	DI14		BOOLEAN	RO	0x00(0dec)
6000:10	DI15		BOOLEAN	RO	0x00(0dec)

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[EC2-P32]Index 6000 Digital Inputs

Index	Name	Meaning	Data type	Flags	Default
6000:00	Digital Inputs		UINT8	RO	0x21(33dec)
6000:01	DI0		BOOLEAN	RO	0x00(0dec)
6000:02	DI1		BOOLEAN	RO	0x00(0dec)
6000:03	DI2		BOOLEAN	RO	0x00(0dec)
6000:04	DI3		BOOLEAN	RO	0x00(0dec)
6000:05	DI4		BOOLEAN	RO	0x00(0dec)
6000:06	DI5		BOOLEAN	RO	0x00(0dec)
6000:07	DI6		BOOLEAN	RO	0x00(0dec)
6000:08	DI7		BOOLEAN	RO	0x00(0dec)
6000:09	DI8		BOOLEAN	RO	0x00(0dec)
6000:0A	DI9		BOOLEAN	RO	0x00(0dec)
6000:0B	DI10		BOOLEAN	RO	0x00(0dec)
6000:0C	DI11		BOOLEAN	RO	0x00(0dec)
6000:0D	DI12		BOOLEAN	RO	0x00(0dec)
6000:0E	DI13		BOOLEAN	RO	0x00(0dec)
6000:0F	DI14		BOOLEAN	RO	0x00(0dec)
6000:10	DI15		BOOLEAN	RO	0x00(0dec)
6000:11	DI16		BOOLEAN	RO	0x00(0dec)
6000:12	DI17		BOOLEAN	RO	0x00(0dec)
6000:13	DI18		BOOLEAN	RO	0x00(0dec)
6000:14	DI19		BOOLEAN	RO	0x00(0dec)
6000:15	DI20		BOOLEAN	RO	0x00(0dec)
6000:16	DI21		BOOLEAN	RO	0x00(0dec)
6000:17	DI22		BOOLEAN	RO	0x00(0dec)
6000:18	DI23		BOOLEAN	RO	0x00(0dec)
6000:19	DI24		BOOLEAN	RO	0x00(0dec)
6000:1A	DI25		BOOLEAN	RO	0x00(0dec)
6000:1B	DI26		BOOLEAN	RO	0x00(0dec)
6000:1C	DI27		BOOLEAN	RO	0x00(0dec)
6000:1D	DI28		BOOLEAN	RO	0x00(0dec)
6000:1E	DI29		BOOLEAN	RO	0x00(0dec)
6000:1F	DI30		BOOLEAN	RO	0x00(0dec)
6000:20	DI31		BOOLEAN	RO	0x00(0dec)

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[ECAT-P16C16]Index 7000 Digital Outputs

Index	Name	Meaning	Data type	Flags	Default
7000:00	Digital Outputs		UINT8	RO	0x11(17dec)
7000:01	DO0		BOOLEAN	RW	0x00(0dec)
7000:02	DO1		BOOLEAN	RW	0x00(0dec)
7000:03	DO2		BOOLEAN	RW	0x00(0dec)
7000:04	DO3		BOOLEAN	RW	0x00(0dec)
7000:05	DO4		BOOLEAN	RW	0x00(0dec)
7000:06	DO5		BOOLEAN	RW	0x00(0dec)
7000:07	DO6		BOOLEAN	RW	0x00(0dec)
7000:08	DO7		BOOLEAN	RW	0x00(0dec)
7000:09	DO8		BOOLEAN	RW	0x00(0dec)
7000:0A	DO9		BOOLEAN	RW	0x00(0dec)
7000:0B	DO10		BOOLEAN	RW	0x00(0dec)
7000:0C	DO11		BOOLEAN	RW	0x00(0dec)
7000:0D	DO12		BOOLEAN	RW	0x00(0dec)
7000:0E	DO13		BOOLEAN	RW	0x00(0dec)
7000:0F	DO14		BOOLEAN	RW	0x00(0dec)
7000:10	DO15		BOOLEAN	RW	0x00(0dec)

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[EC2-C32]Index 7000 Digital Outputs

Index	Name	Meaning	Data type	Flags	Default
7000:00	Digital Outputs		UINT8	RO	0x21(33dec)
7000:01	DO0		BOOLEAN	RW	0x00(0dec)
7000:02	DO1		BOOLEAN	RW	0x00(0dec)
7000:03	DO2		BOOLEAN	RW	0x00(0dec)
7000:04	DO3		BOOLEAN	RW	0x00(0dec)
7000:05	DO4		BOOLEAN	RW	0x00(0dec)
7000:06	DO5		BOOLEAN	RW	0x00(0dec)
7000:07	DO6		BOOLEAN	RW	0x00(0dec)
7000:08	DO7		BOOLEAN	RW	0x00(0dec)
7000:09	DO8		BOOLEAN	RW	0x00(0dec)
7000:0A	DO9		BOOLEAN	RW	0x00(0dec)
7000:0B	DO10		BOOLEAN	RW	0x00(0dec)
7000:0C	DO11		BOOLEAN	RW	0x00(0dec)
7000:0D	DO12		BOOLEAN	RW	0x00(0dec)
7000:0E	DO13		BOOLEAN	RW	0x00(0dec)
7000:0F	DO14		BOOLEAN	RW	0x00(0dec)
7000:10	DO15		BOOLEAN	RW	0x00(0dec)
7000:11	DO16		BOOLEAN	RW	0x00(0dec)
7000:12	DO17		BOOLEAN	RW	0x00(0dec)
7000:13	DO18		BOOLEAN	RW	0x00(0dec)
7000:14	DO19		BOOLEAN	RW	0x00(0dec)
7000:15	DO20		BOOLEAN	RW	0x00(0dec)
7000:16	DO21		BOOLEAN	RW	0x00(0dec)
7000:17	DO22		BOOLEAN	RW	0x00(0dec)
7000:18	DO23		BOOLEAN	RW	0x00(0dec)
7000:19	DO24		BOOLEAN	RW	0x00(0dec)
7000:1A	DO25		BOOLEAN	RW	0x00(0dec)
7000:1B	DO26		BOOLEAN	RW	0x00(0dec)
7000:1C	DO27		BOOLEAN	RW	0x00(0dec)
7000:1D	DO28		BOOLEAN	RW	0x00(0dec)
7000:1E	DO29		BOOLEAN	RW	0x00(0dec)
7000:1F	DO30		BOOLEAN	RW	0x00(0dec)
7000:20	DO31		BOOLEAN	RW	0x00(0dec)

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4.3 Profile Specific Objects(0x8000-0x8FFF)

[EC2-P16C16/P32/C32]Index 8000 DIO Settings

Index	Name	Meaning	Data type	Flags	Default
8000:00			UINT8	RO	0xC(12dec)
8000:01	Digital output keep value	**0:** Disable The default value (80n0:13) is active. **1:** Enable	BOOLEAN	RW	0x00(0dec)
80n0:02	Digital output invert value	**0:** FALSE **1:** TRUE	BOOLEAN	RW	0x00(0dec)
80n0:03	Digital input invert value	**0:** FALSE **1:** TRUE	BOOLEAN	RW	0x00(1dec)
80n0:11	Digital output initial value	Default output value **(0x0~0xFFFFFFFF)**	UDINT	RW	0x00(0dec)
80n0:12	Digital input filter	Digital input debounce time 0:Disable Other:1-65535 ms	UDINT	RW	0x0000(0dec)

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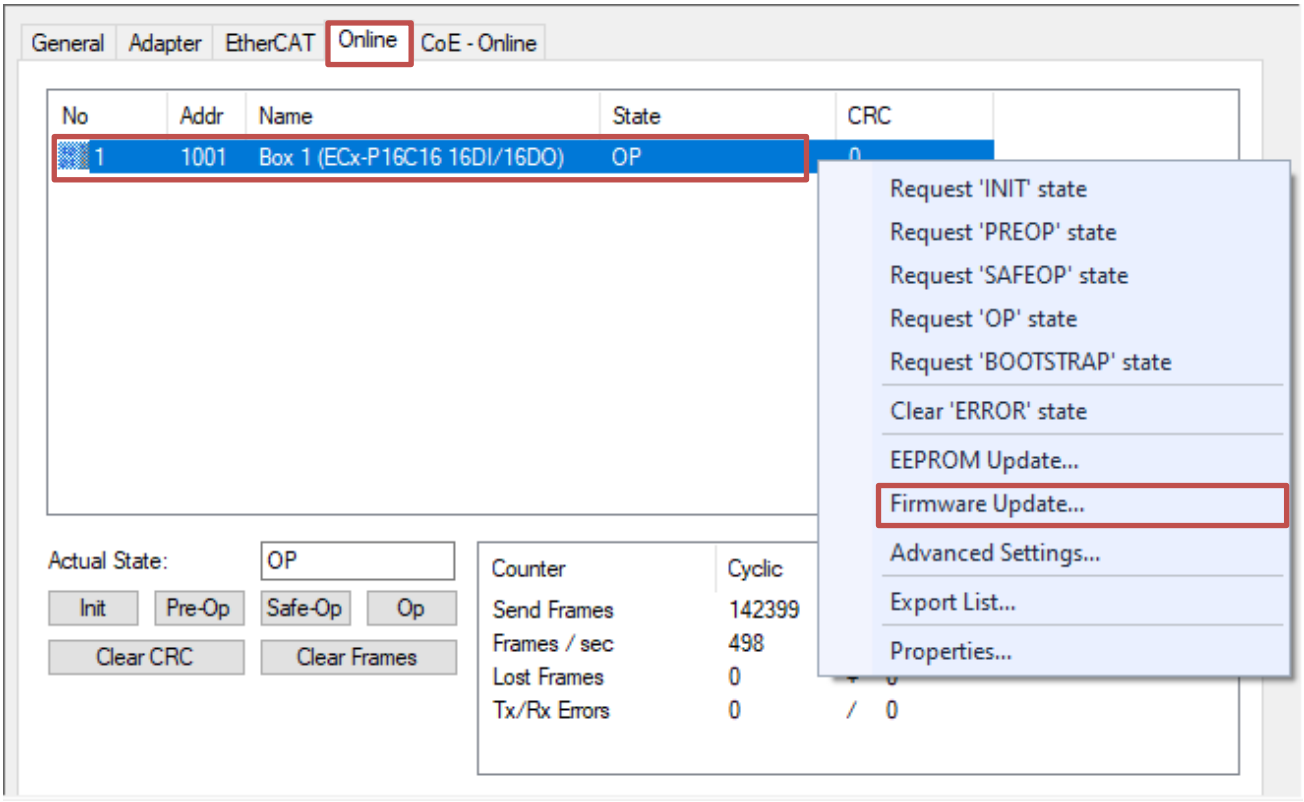
5. Firmware upgrade through EtherCAT FoE

This section describes the device update for ICP DAS EtherCAT slaves from the EC1, EC2 and EC8 series.

Demonstrate how to update firmware using Beckhoff TwinCAT 3 EtherCAT master.

Step 1

Right-click the ECx-DIO Module, click “**Firmware Update…**”.

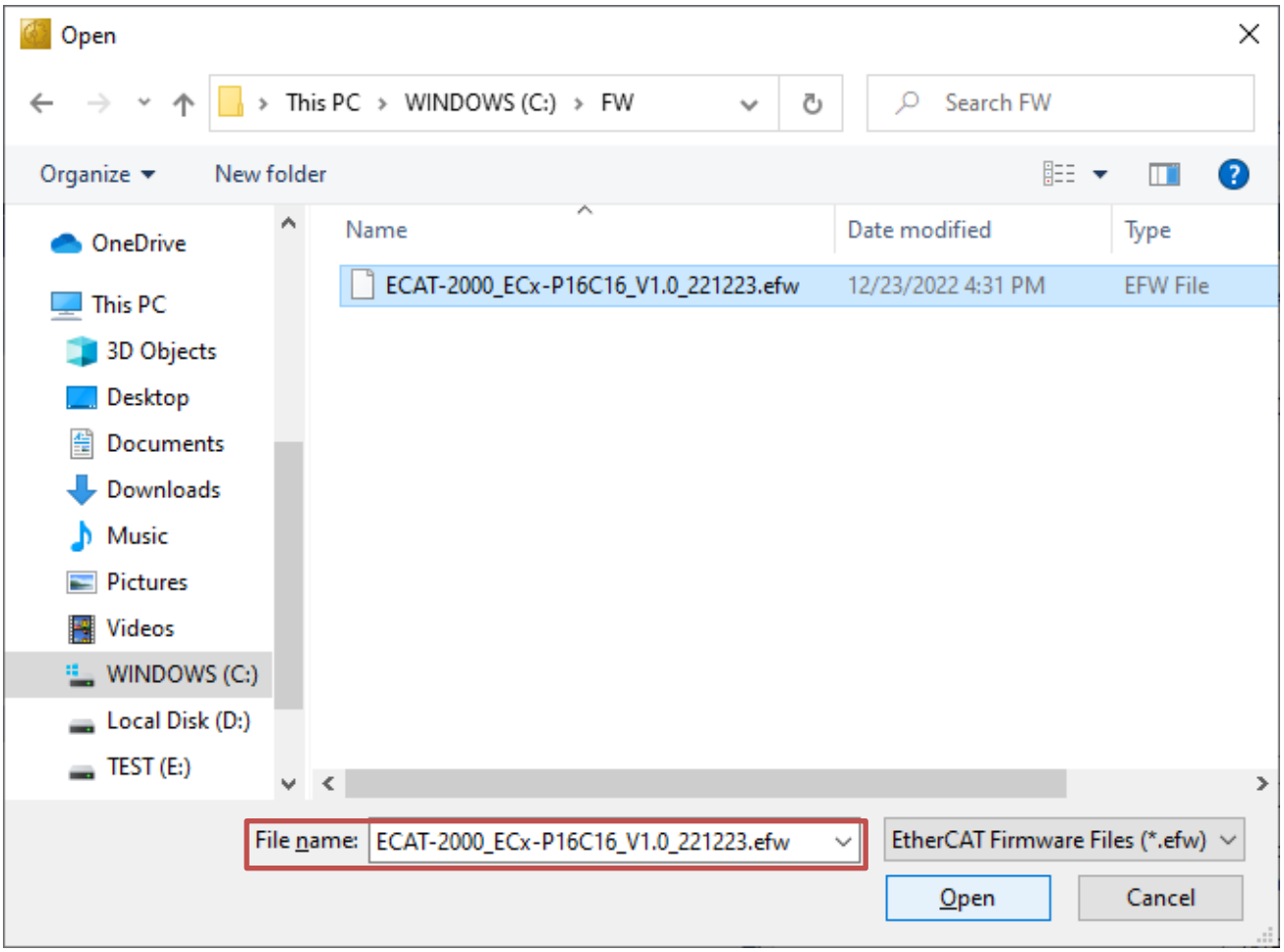


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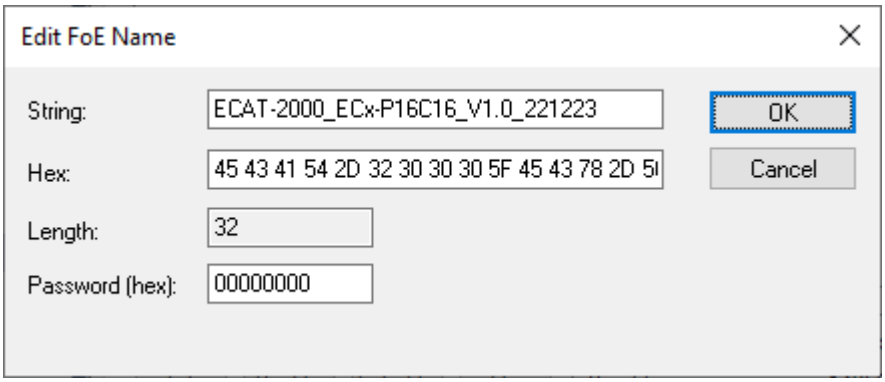
Step 2

Select the firmware file(*.efw).



Step 3

Click ok button to start upgrade firmware.

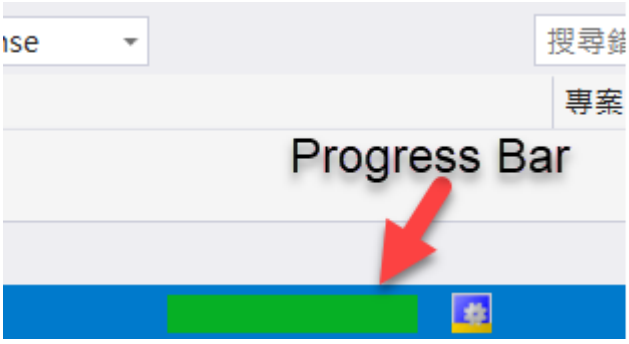


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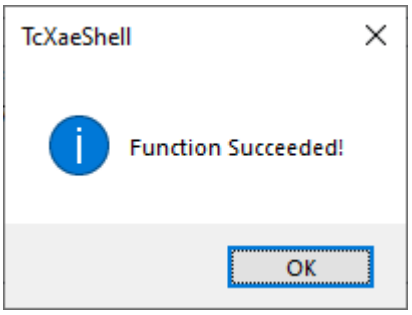
Step 4

Check out the progress bar and wait for it finish.

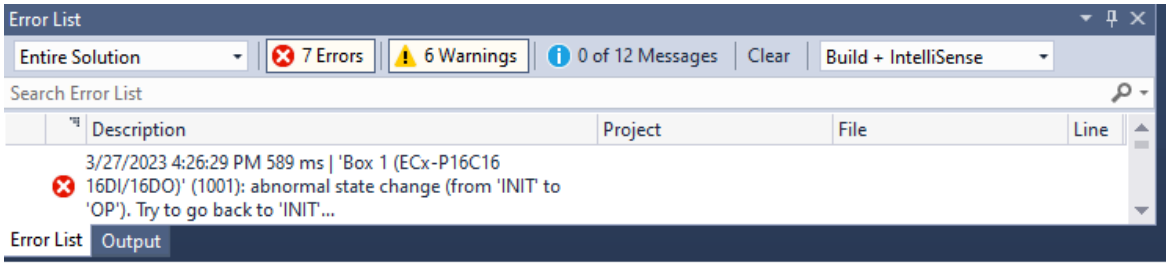


Step 5

TwinCAT master will notice user the function successes, just click “OK”.



NOTE: Due to the ECx-DIO will restart the system after firmware upgrading so that TwinCAT will indicate the slave not in the expected state. Don’t worry, this is a normal situation. TwinCAT will try to switch the slave to original state (ex: OP or BOOTSTRAP).



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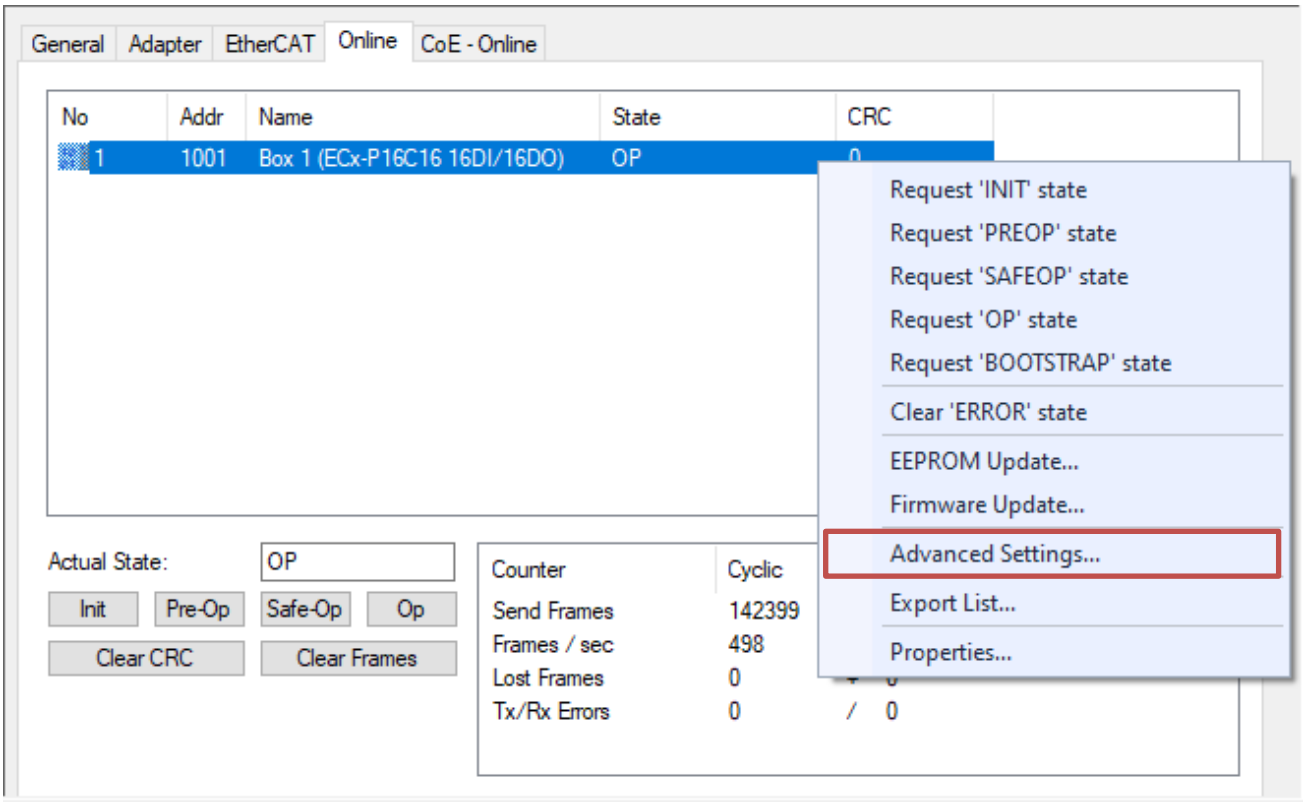
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6. Explicit Device ID

Explicit Device ID is used for met identification function of TwinCAT master.
User can specify an ID at EtherCAT slave side and setup identification at TwinCAT master side.
TwinCAT master will check if the ID of the slave matched with the expected identification value during startup the slave.

Step 1

This setting will let TwinCAT master turn on the identification function for the slave.
Select the slave, right-click and select "**Advanced Settings…**".

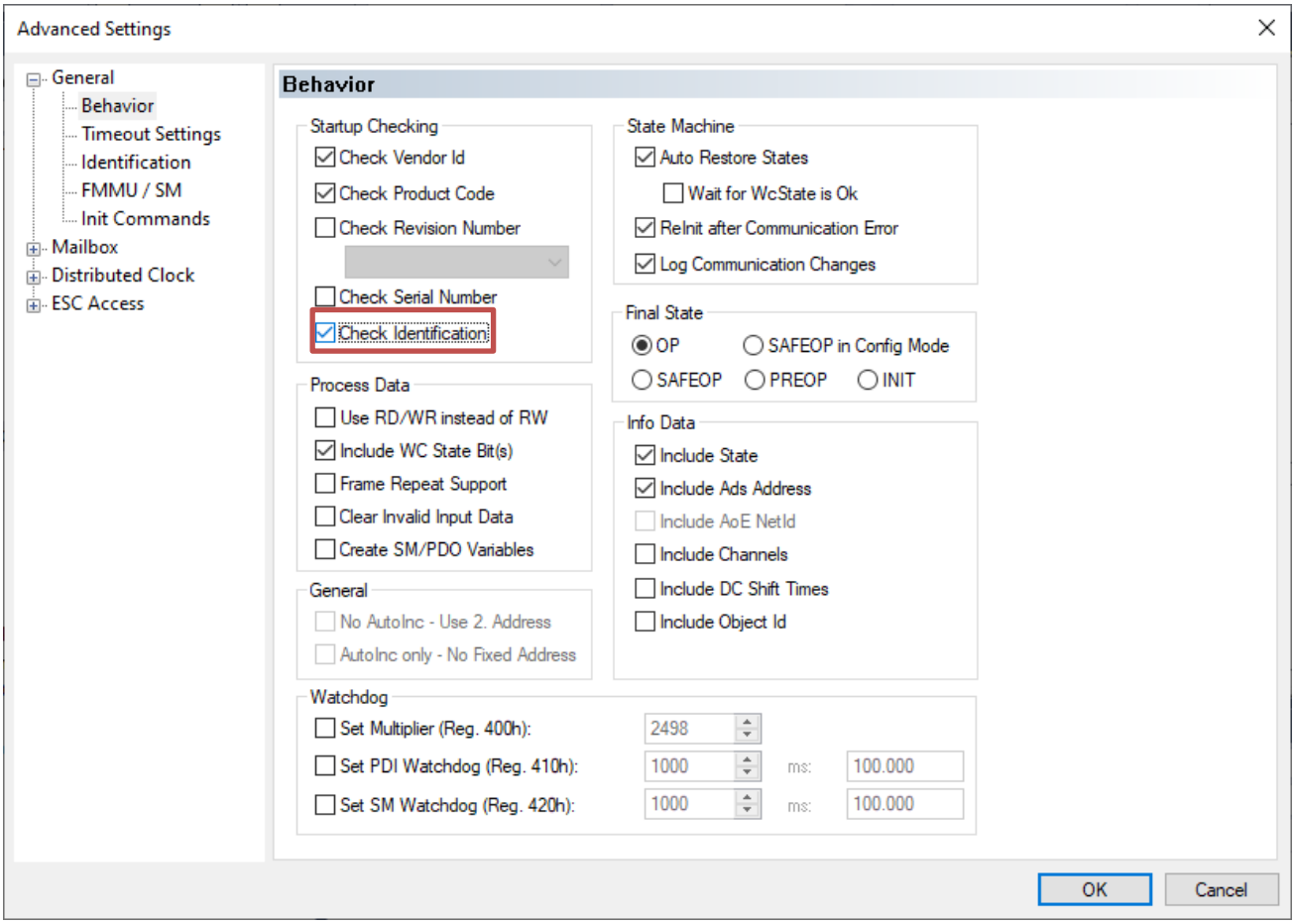


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Step 2

Go to **“General -> Behavior”** and turn on the “Check Identification”.

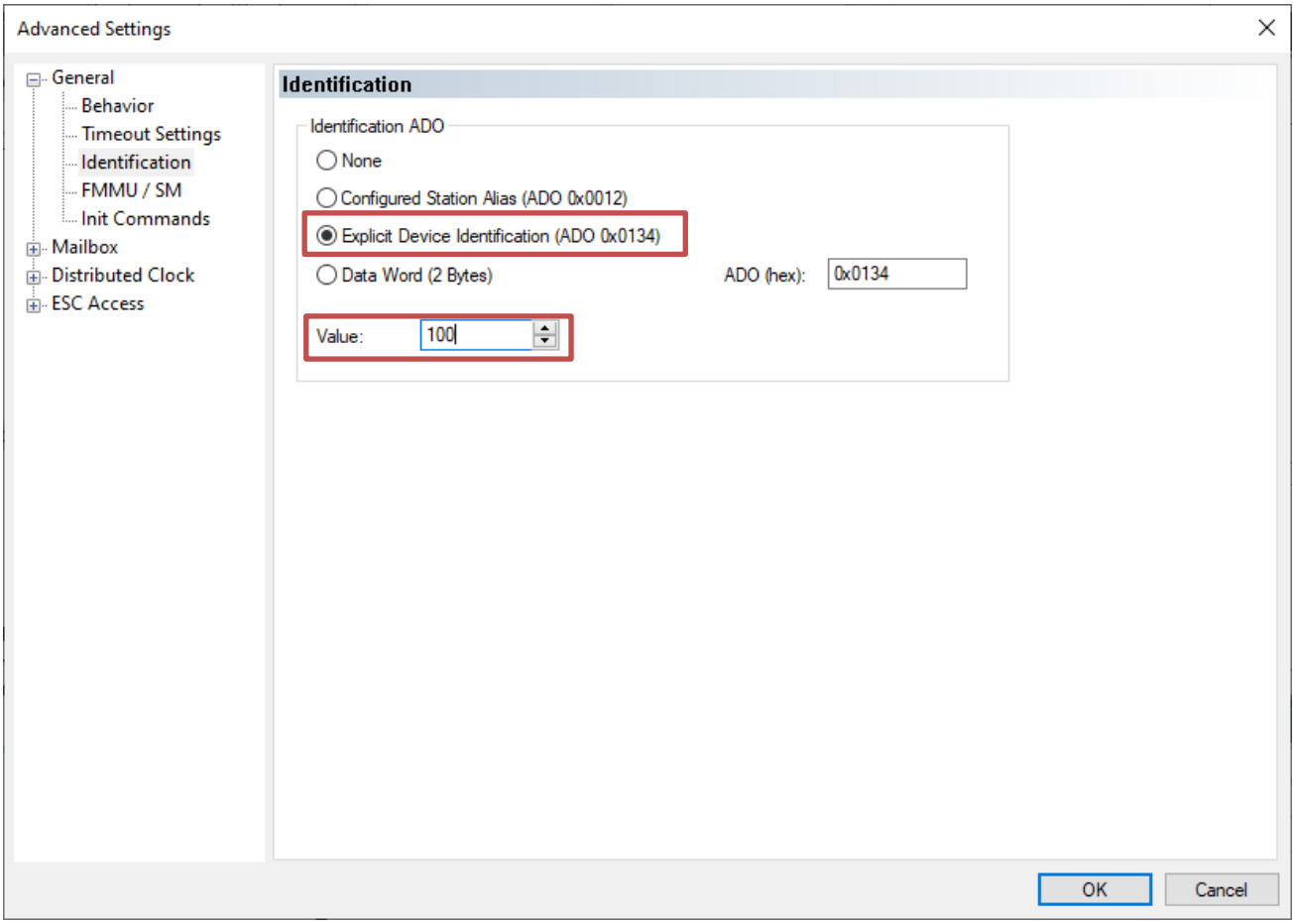


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Step 3

Confirm current identification ADO (Address Offset) is "**(ADO 0x0134)**".

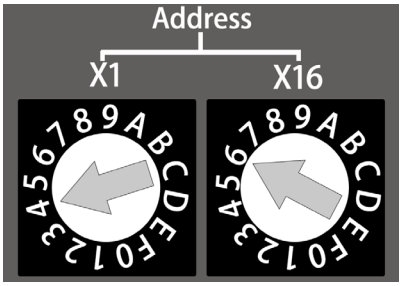
Don't forget to assign the value in decimal. The value "**100**" is just an example here.



Step 4

User should also setup the same value on moduel like following:

The digit format "Rotary Switch" is hex so that we should set it to "**0x64**".



Step 5

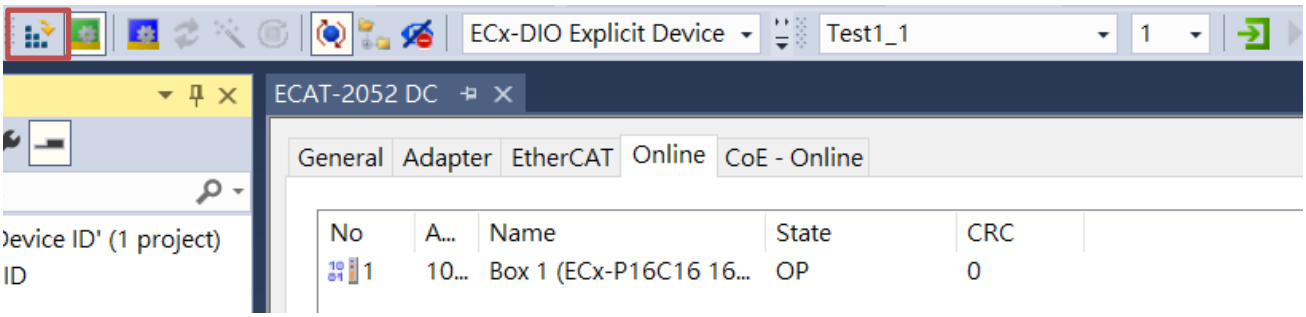
Please disconnect the power connect to **reboot** the module

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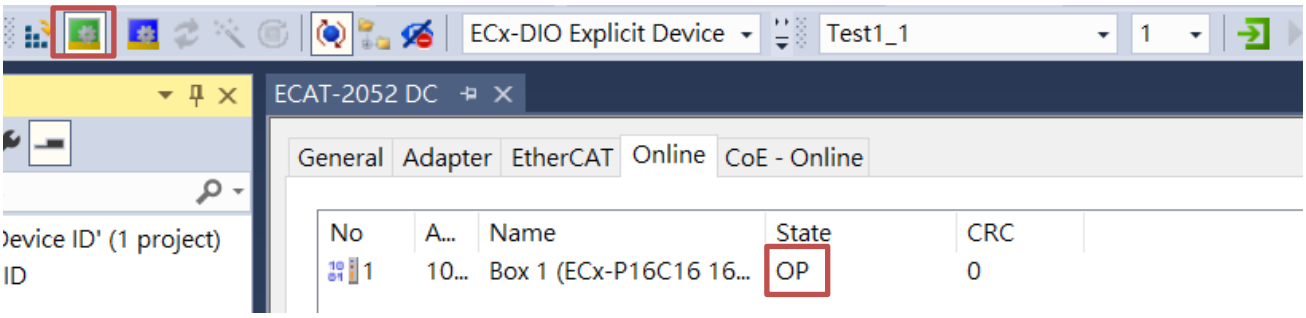
Step 6

Re-activate the TwinCAT master.



Step 7

If user see the below screen, that means that TwinCAT master already enter running mode successfully and the slave also passed the identification checking so that it can enter OP state.



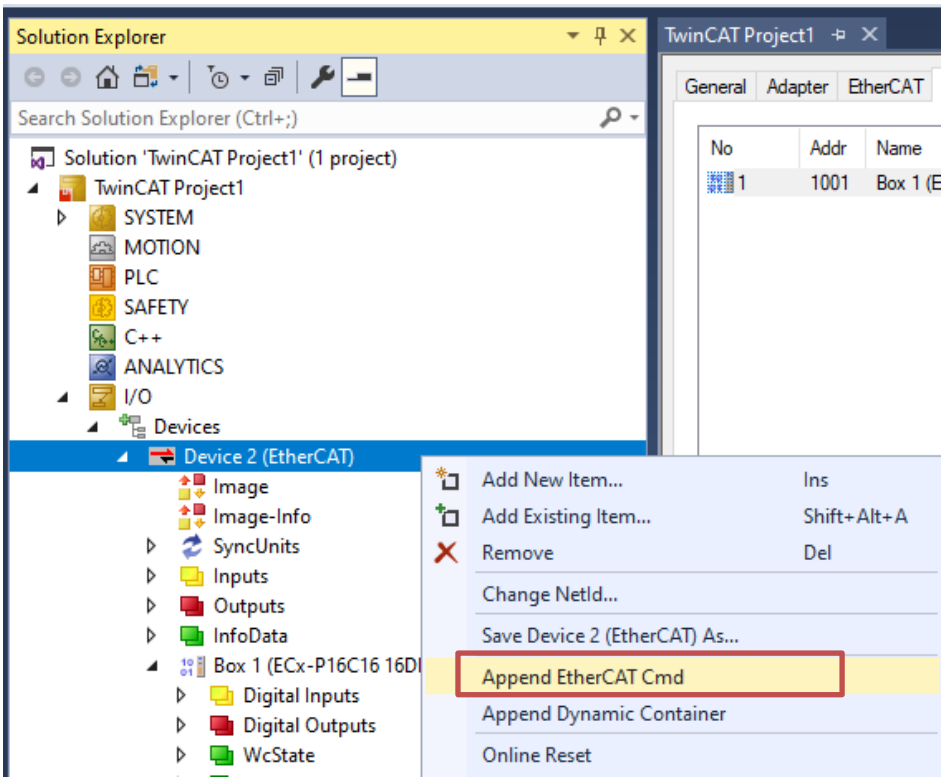
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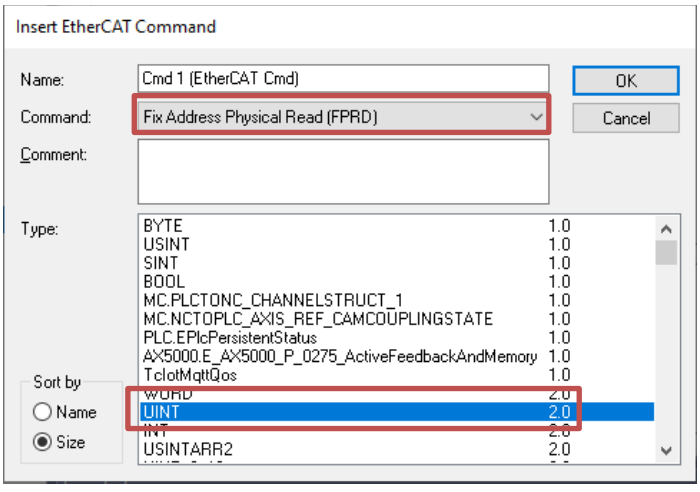
Step 8

The slave will also accept frames from TwinCAT master with 2 kinds of address (1001 or 100) at the same time.But it needs to turn on second address function in ESC register. However, we arrange command for observe this behavior first.

You can append an EtherCAT command to TwinCAT master for confirm the second address.
Click "**Device N (EtherCAT) -> Append EtherCAT Cmd**".



Please assign "**Command**" and "**Type**".
I demonstrate "**FPRD**" and "**UINT**" in this example.



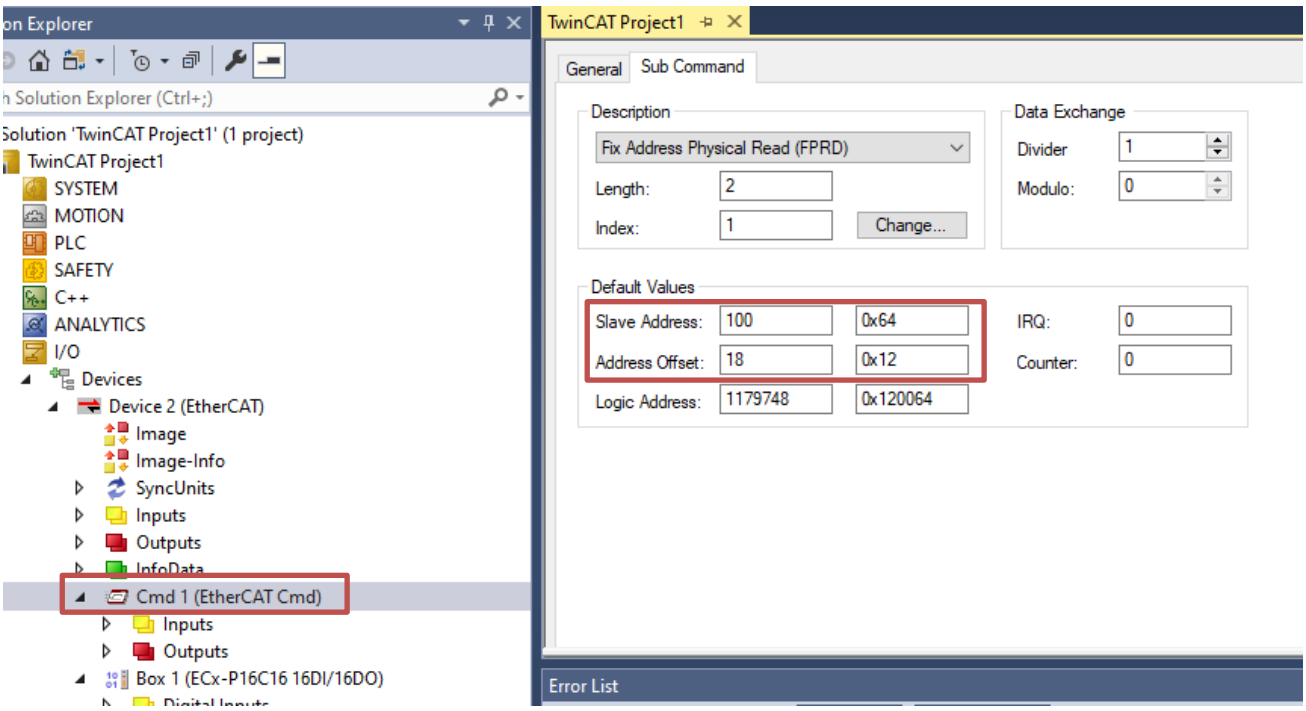
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Step 9

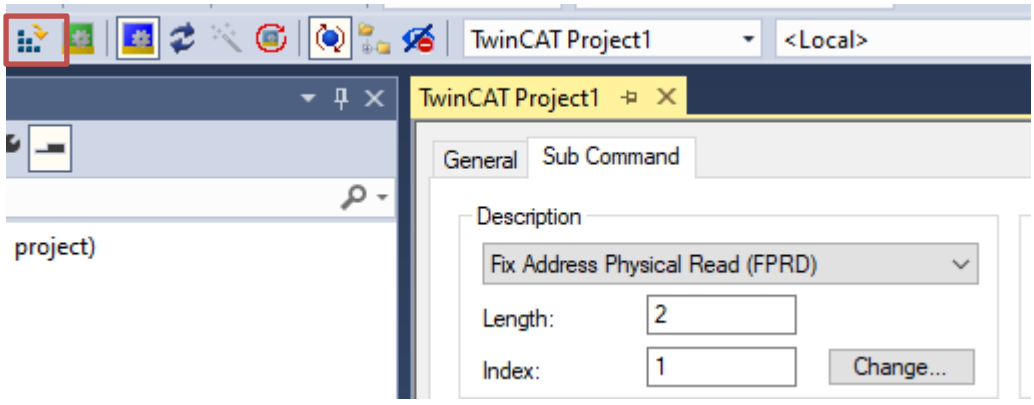
Double-click “**Cmd 1**” and setup “**Slave Address**” and “**Address Offset**”.

I setup slave address = **0x64** and address offset = **0x12** in this example.



Step 10

Re-activate the TwinCAT master again.

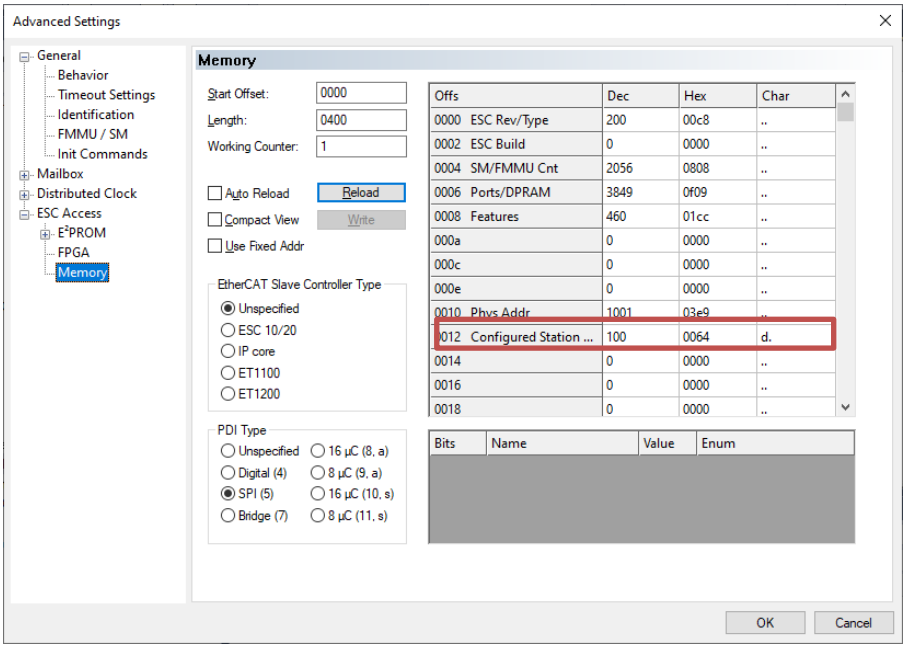


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Step 11

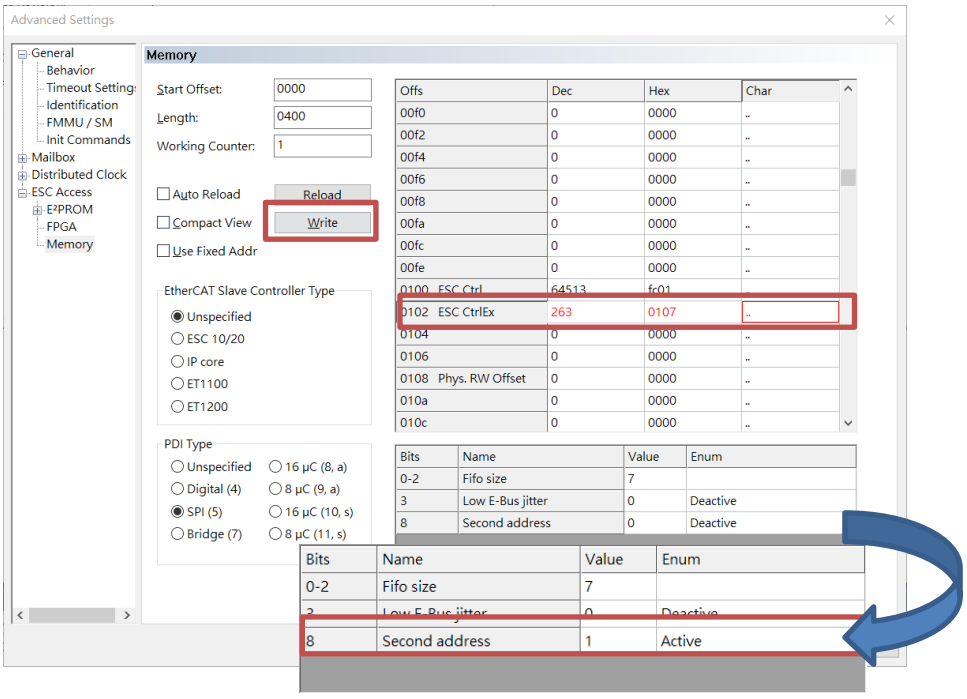
Go to “**ESC Access** -> **Memory**” in “Advanced Settings” and check out the address 0x0012.

The firmware will write the user specified Switch ID value into ESC register 0x0012 (the register named Configured Station Alias).



Step 12

If user expect that the slave can also use this Switch ID value as second slave address. user just turn on “Seconds address” bit (bit8 = 1) in ESC register 0x0102 (Need click “**Write**” button).

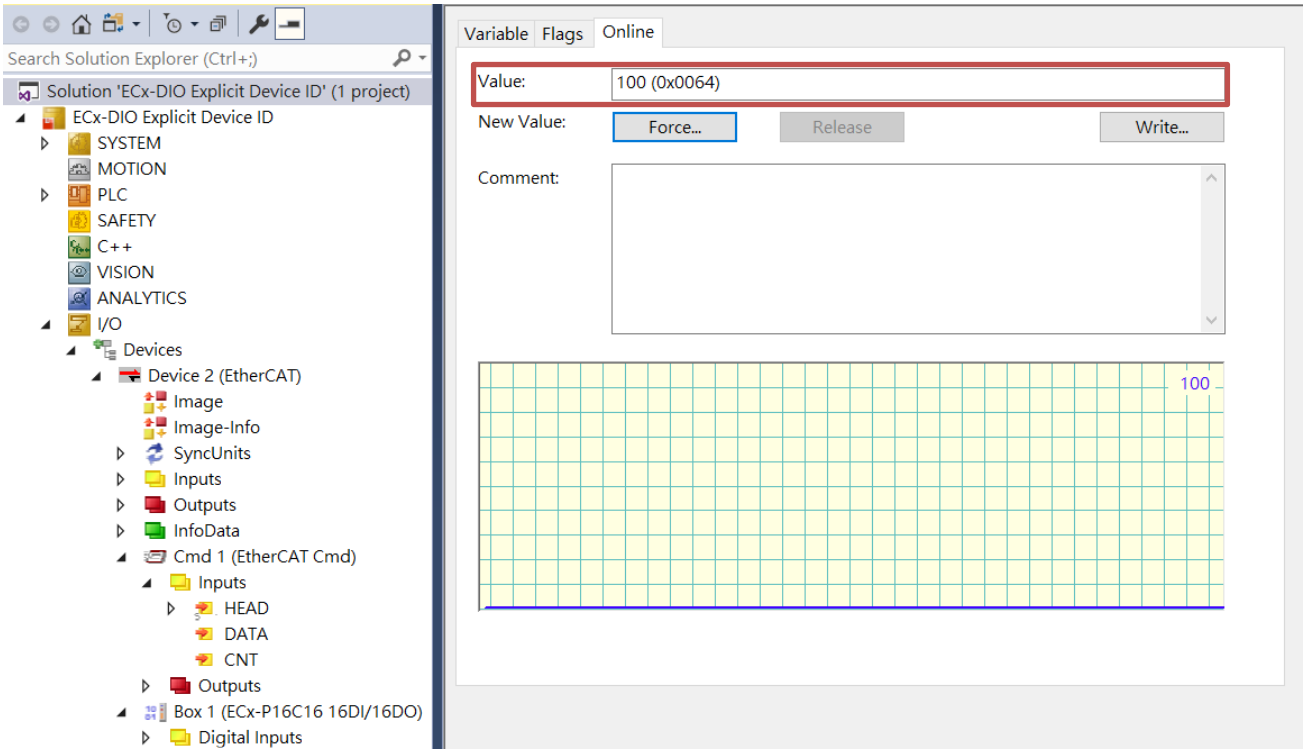


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Step 13

Click “Device N (EtherCAT) -> Cmd 1 -> DATA”, you will see the command get the value of ESC register 0x0012 back successfully. It is correct, the “0x0064” in UINT data type.



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Appendix: Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
1.0	2023.Mar	Initial issue

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