

WEINTEK LABS., INC.

EtherCat Master

Using EtherCAT Master to Add iR-ECAT

Demo Project

Contents

1. Overview.....	1
2. Installing Weintek Library	3
3. Adding Digital Module.....	4
4. Adding Analog Module.....	7
5. Adding Motion Control Module	11
6. Configuring EtherCAT Driver	15

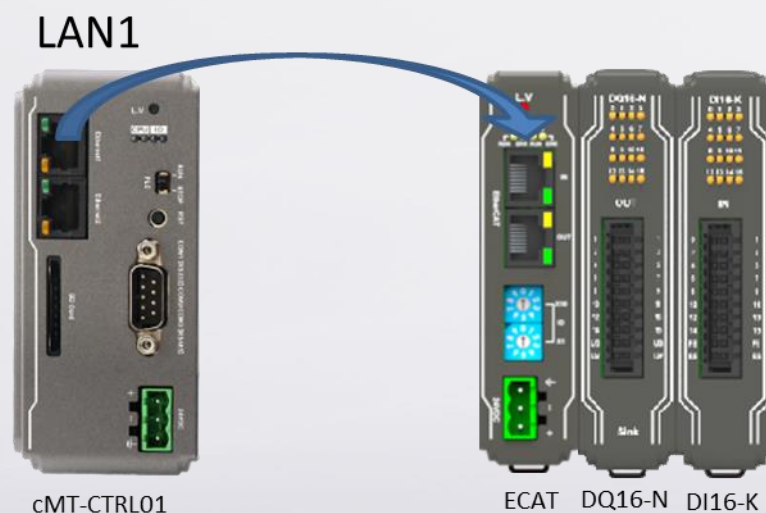
1. Overview

Overview

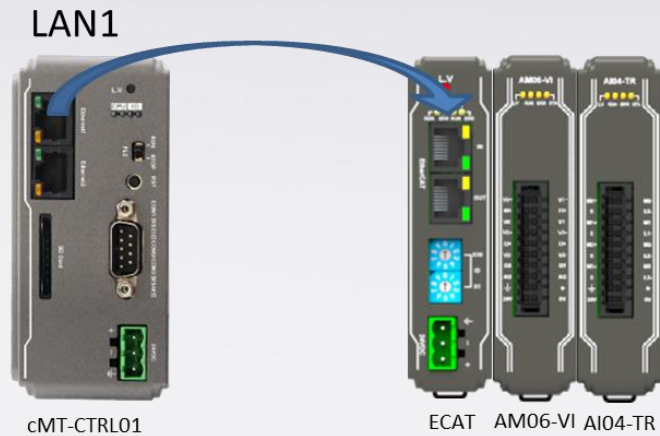
This demo project explains how to use CODESYS EtherCAT Master to add three types of iR Series modules: Digital module, Analog module, and Motion Control module, and how to execute motion control by using EtherCAT Master with Weintek CODESYS Library.

Environment

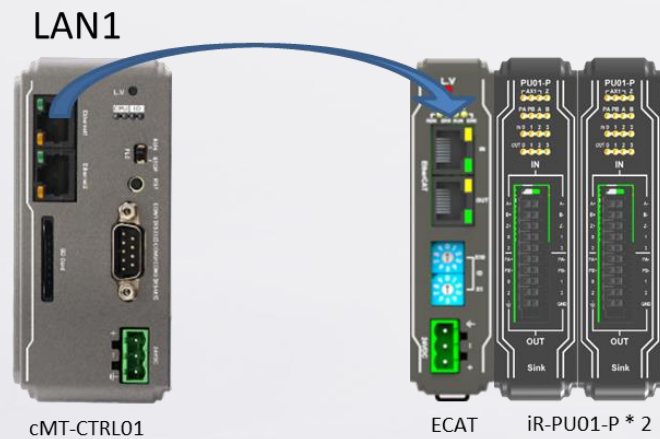
Step 1. Adding Digital Modules:



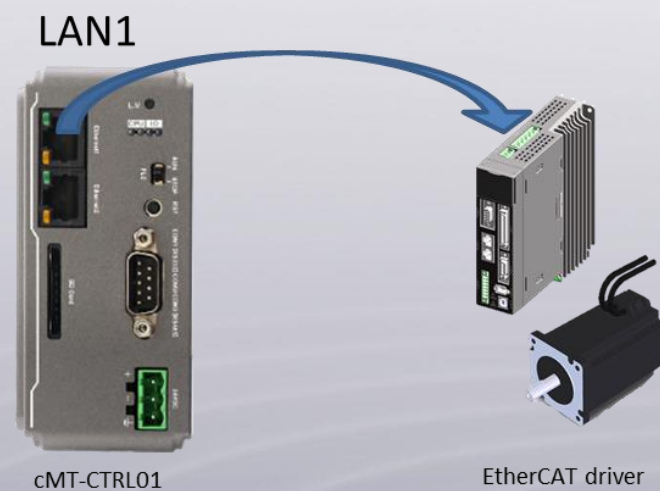
Step 2. Adding Analog Modules:



Step 3. Adding Motion Control Modules:



Step 4. Ethernet-based Motion Control: Connect to EtherCAT driver's RJ-45 port using an Ethernet cable.



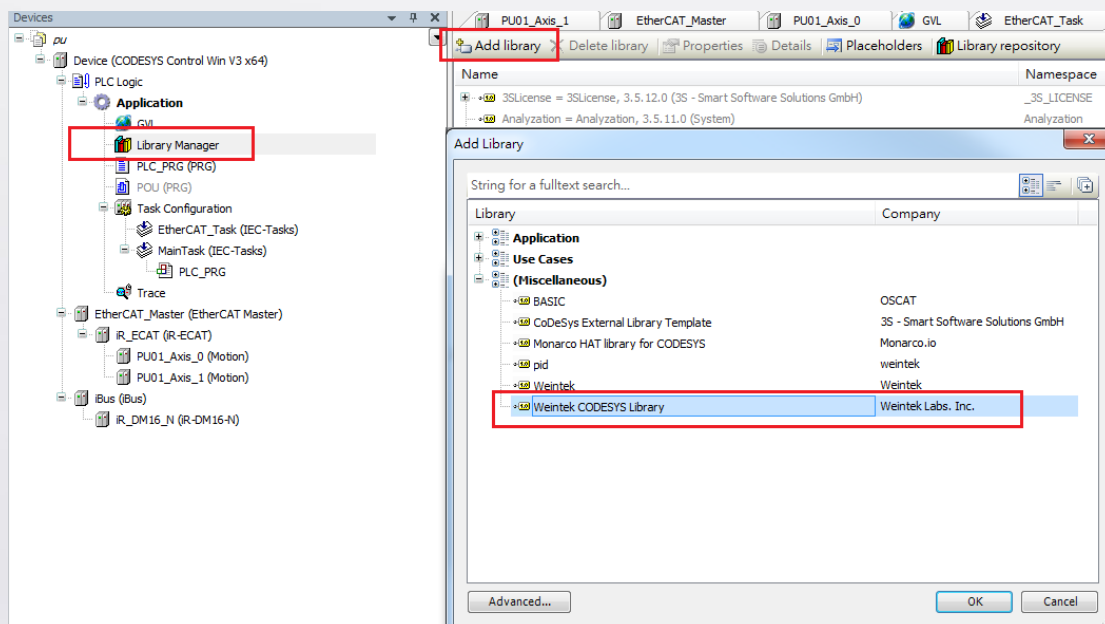
2. Installing Weintek Library

Step 1. Visit Weintek official website and search for [cMT+CODESYS Package] to download and install the file.

<https://www.weintek.com/globalw/Download/Download.aspx>

(This includes the description file of iR-PU01-P)

Step 2. In CODESYS software add Weintek CODESYS Library.

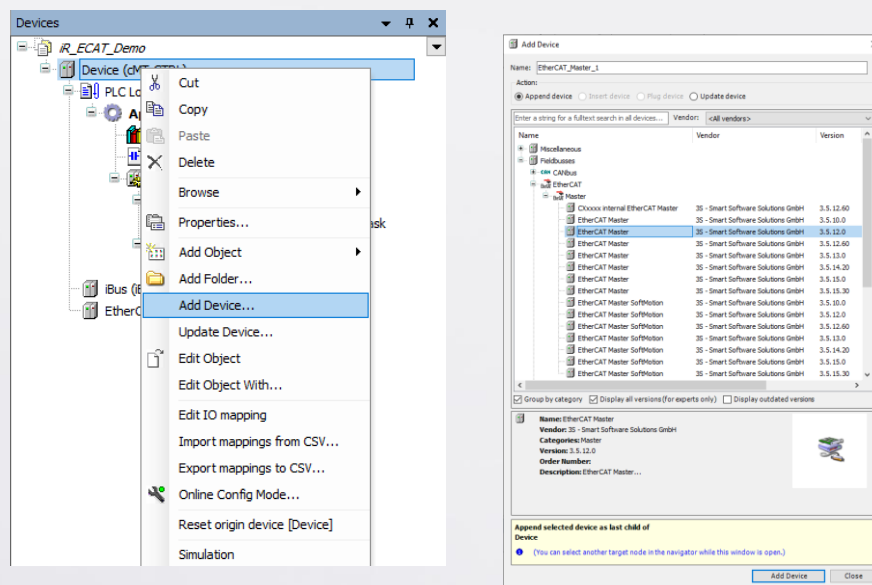


Step 3. Motion Function Blocks can be used after installation.

3. Adding Digital Module

- Adding EtherCAT_Master device(V3.5.12.0):

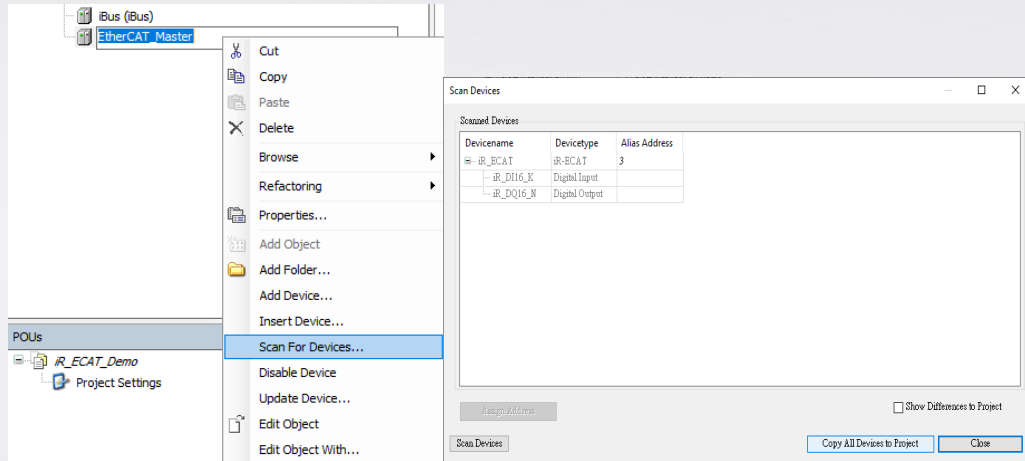
[Device]->[Add Device]->[Fieldbusses]->[EtherCAT] ->[Master] ->[EtherCAT Master]



- Adding iR-ECAT:

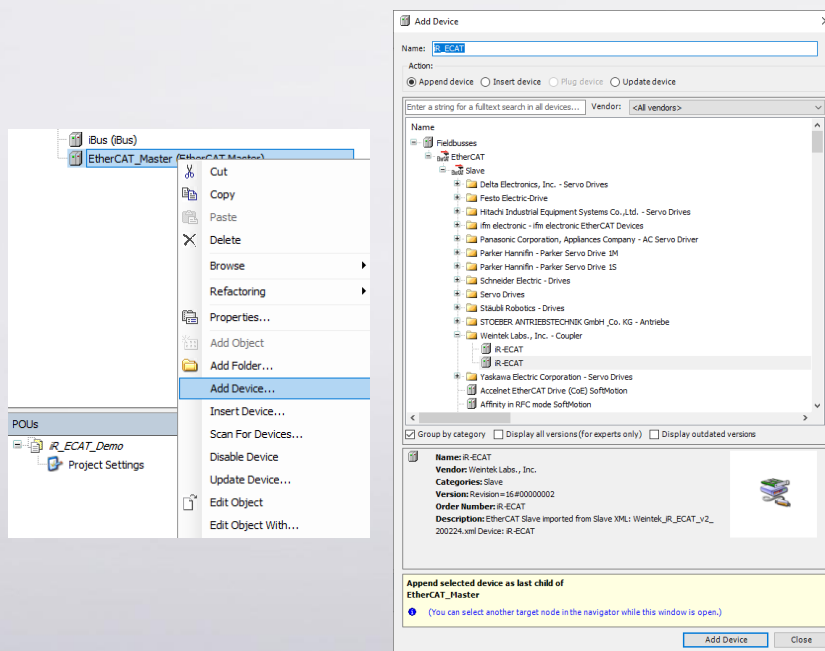
Way 1. Search for iR-ECAT on the network:

[EtherCAT_Master]->[Scan for devices]->[Copy All Devices to Project]



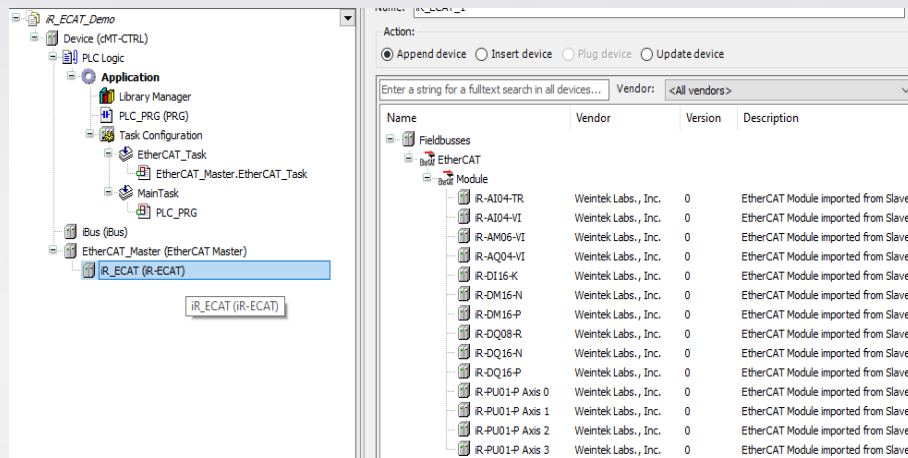
Way 2. Add iR-ECAT manually.

[EtherCAT_Master]->[Add Device] ->[Slave] ->[iR-ECAT]

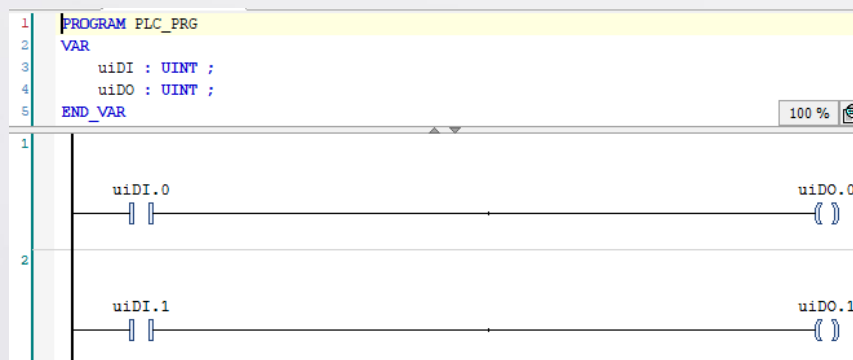


- Adding iR-ECAT module:

[iR-ECAT] ->[Add Device] ->[EtherCAT]->[Module]



Declaration and Programming:



Variable Mapping:

[iR-ECAT] ->[EtherCAT I/O Mapping]

General	Find	Filter	Show all
Process Data	Variable	Mapping	Channel
Startup Parameters	Application.PLC_PRG.uiDO		IR_DQ16_N Digital Output
EtherCAT I/O Mapping	Application.PLC_PRG.uiDI		IR_DI16_K Digital Input
Status			
Information			

Login and Program Execution:

To add a Digital module via EtherCAT, please see the related demo projects according to the device used:

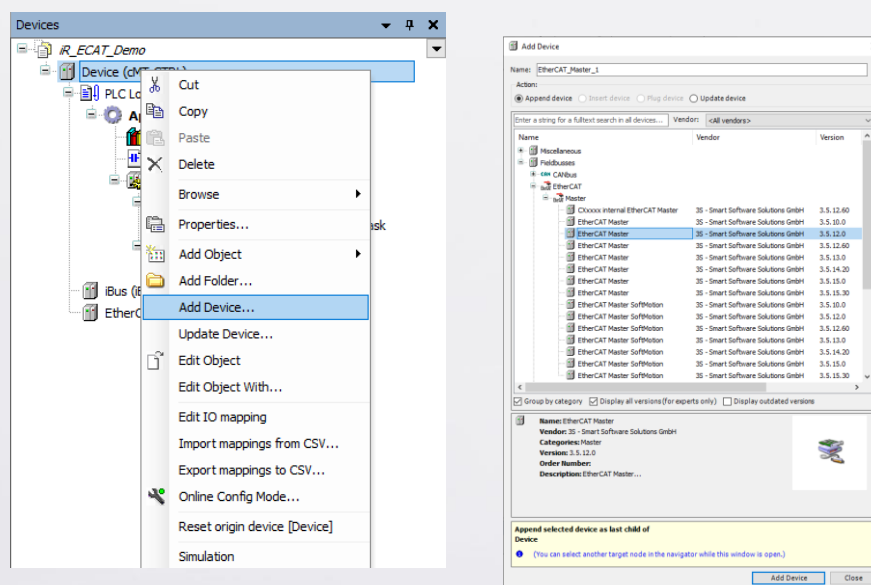
Using cMT-CTRL01: See EtherCAT_Master_Demo_CTRL01_DIO

Using cMT Series HMI: See EtherCAT_Master_Demo_HMI_DIO

4. Adding Analog Module

- Adding EtherCAT_Master device(V3.5.12.0):

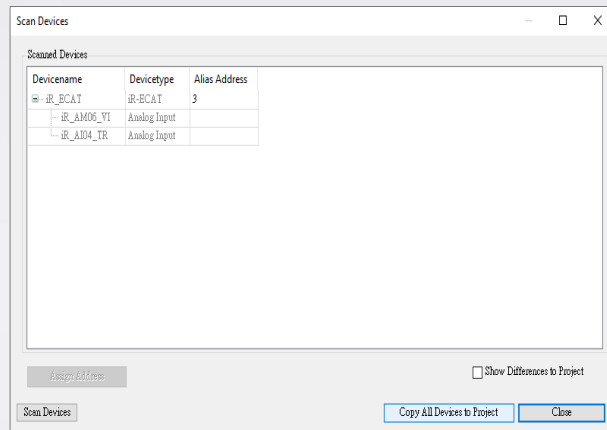
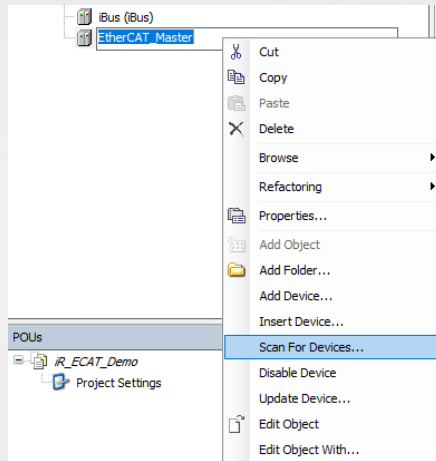
[Device]->[Add Device]->[Fieldbusses]->[EtherCAT] ->[Master] ->[EtherCAT Master]



- Adding iR-ECAT:

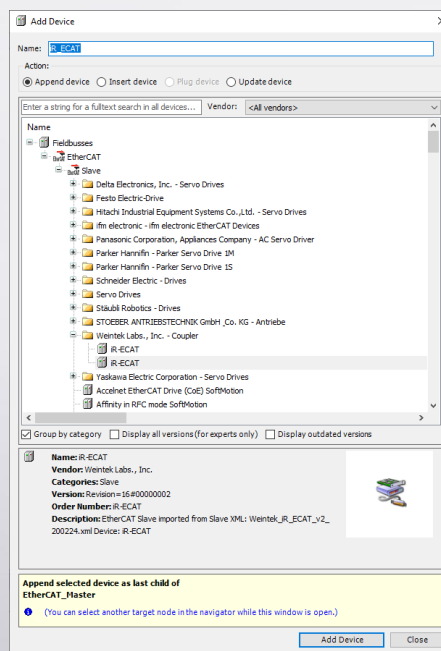
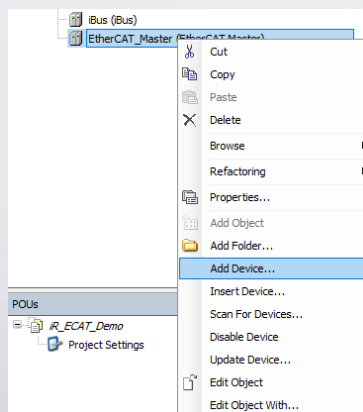
Way 1. Search for iR-ECAT on the network:

[EtherCAT_Master]->[Scan for devices]->[Copy All Devices to Project]



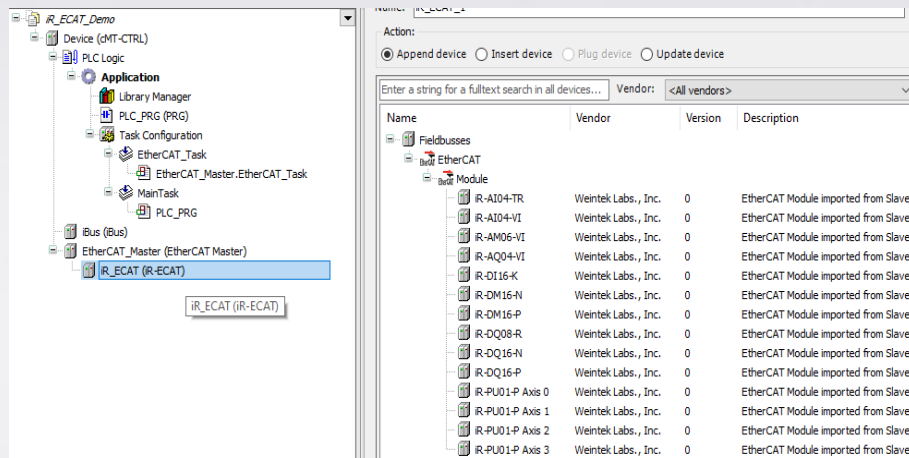
Way 2. Add iR-ECAT manually.

[EtherCAT_Master]->[Add Device] ->[Slave] ->[iR-ECAT]



- Adding iR-ECAT module:

[iR-ECAT] ->[Add Device] ->[EtherCAT]->[Module]



- Configuring Analog Channels:
- [iR-ECAT] ->[Startup Parameters] ->[Add]

Select Item from Object Directory

Index:Subindex	Name	Flags	Type	Default
16#8000:16#00	iR-AM06-VI Parameter			
16#800F:16#00	output value Parameter On error			
16#8010:16#00	iR-AI04-TR Parameter			
16#01	Channel 0 Mode	RW	UINT	16#0001
16#02	Channel 1 Mode	RW	UINT	16#0001
16#03	Channel 2 Mode	RW	UINT	16#0001
16#04	Channel 3 Mode	RW	UINT	16#0001
16#05	Channel 0 Scale Range Upper Limit	RW	INT	16#7d00
16#06	Channel 1 Scale Range Upper Limit	RW	INT	16#7d00
16#07	Channel 2 Scale Range Upper Limit	RW	INT	16#7d00
16#08	Channel 3 Scale Range Upper Limit	RW	INT	16#7d00
16#09	Channel 0 Scale Range Lower Limit	RW	INT	16#8300
16#0A	Channel 1 Scale Range Lower Limit	RW	INT	16#8300
16#0B	Channel 2 Scale Range Lower Limit	RW	INT	16#8300
16#0C	Channel 3 Scale Range Lower Limit	RW	INT	16#8300
16#0D	Channel 0 Filter Frame Size	RW	UINT	16#000a

Name:

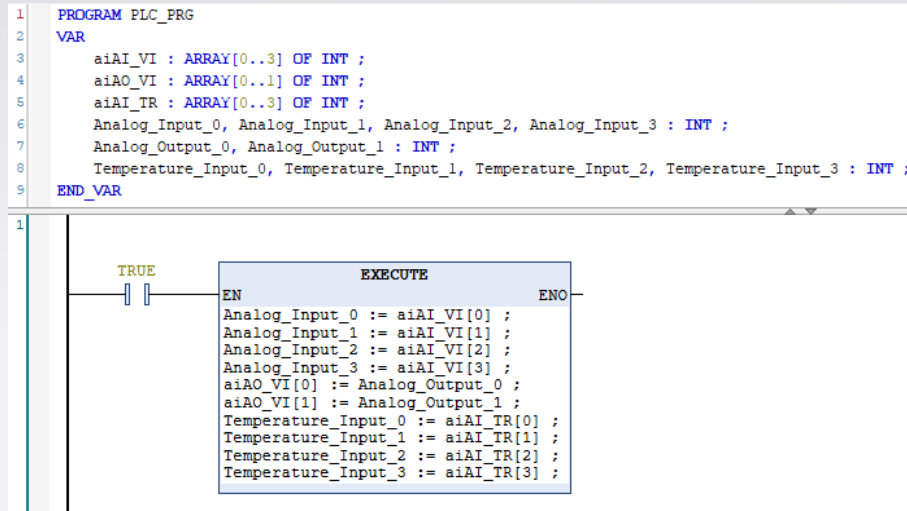
Index: 16# Bitlength:

SubIndex: 16# Value:

☐ Complete Access ☐ Byte Array

OK Cancel

- Declaration and Programming:



- Variable Mapping:

[iR-ECAT] ->[EtherCAT I/O Mapping]

General	Find	Filter	Show all
Process Data	Variable	Mapping	Channel
Startup Parameters	Application.PLC_PRG.aiAO_VI[0]		IR_AM06_VI AO 1
EtherCAT I/O Mapping	Application.PLC_PRG.aiAO_VI[1]		IR_AM06_VI AO 2
Status	Application.PLC_PRG.aiAI_VI[0]		IR_AM06_VI AI 1
Information	Application.PLC_PRG.aiAI_VI[1]		IR_AM06_VI AI 2
	Application.PLC_PRG.aiAI_VI[2]		IR_AM06_VI AI 3
	Application.PLC_PRG.aiAI_VI[3]		IR_AM06_VI AI 4
	Application.PLC_PRG.aiAI_TR[0]		IR_AI04_TR AI 1
	Application.PLC_PRG.aiAI_TR[1]		IR_AI04_TR AI 2
	Application.PLC_PRG.aiAI_TR[2]		IR_AI04_TR AI 3
	Application.PLC_PRG.aiAI_TR[3]		IR_AI04_TR AI 4

- Login and Program Execution:

To add an Analog module via EtherCAT, please see the related demo projects according to the device used:

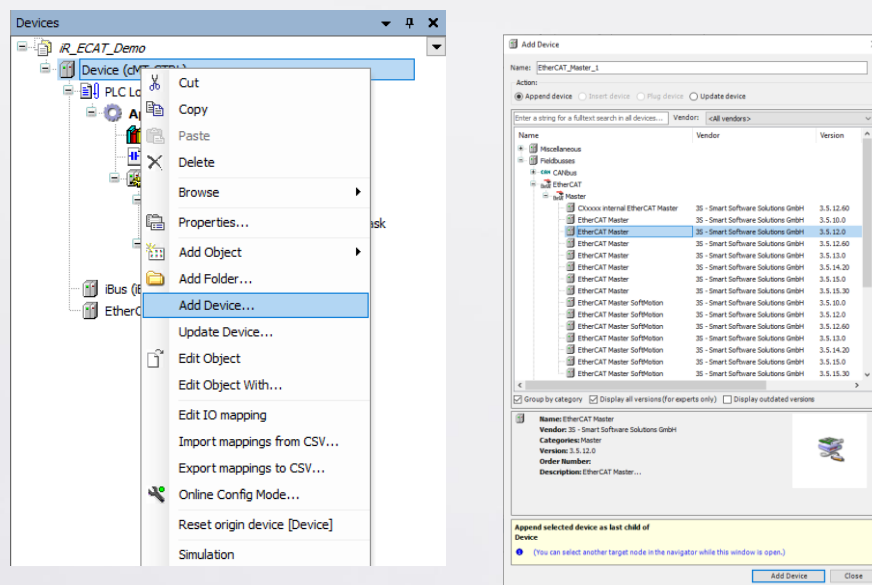
Using cMT-CTRL01: See EtherCAT_Master_Demo_CTRL01_AIO

Using cMT Series HMI: See EtherCAT_Master_Demo_HMI_AIO

5. Adding Motion Control Module

- Adding EtherCAT_Master Device(V3.5.12.0):

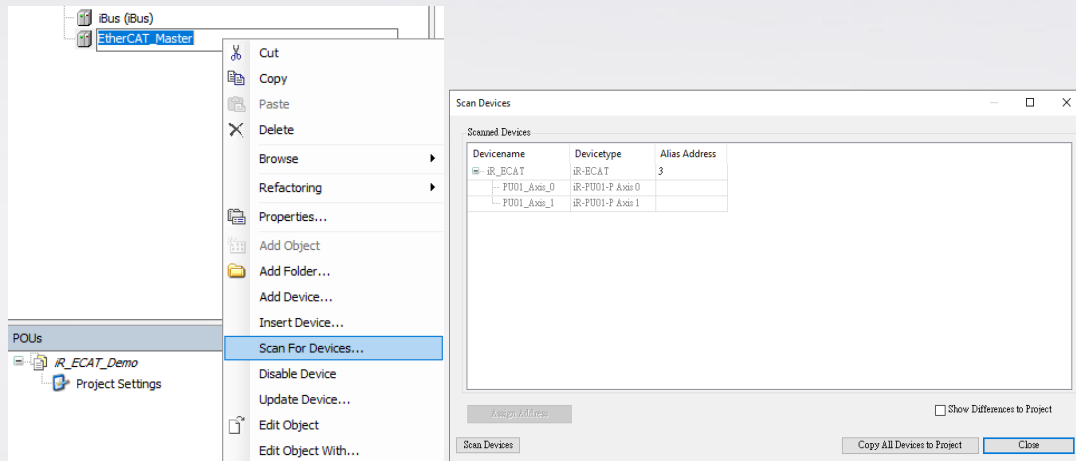
[Device]->[Add Device]->[Fieldbusses]->[EtherCAT] ->[Master] ->[EtherCAT Master]



- Adding iR-ECAT

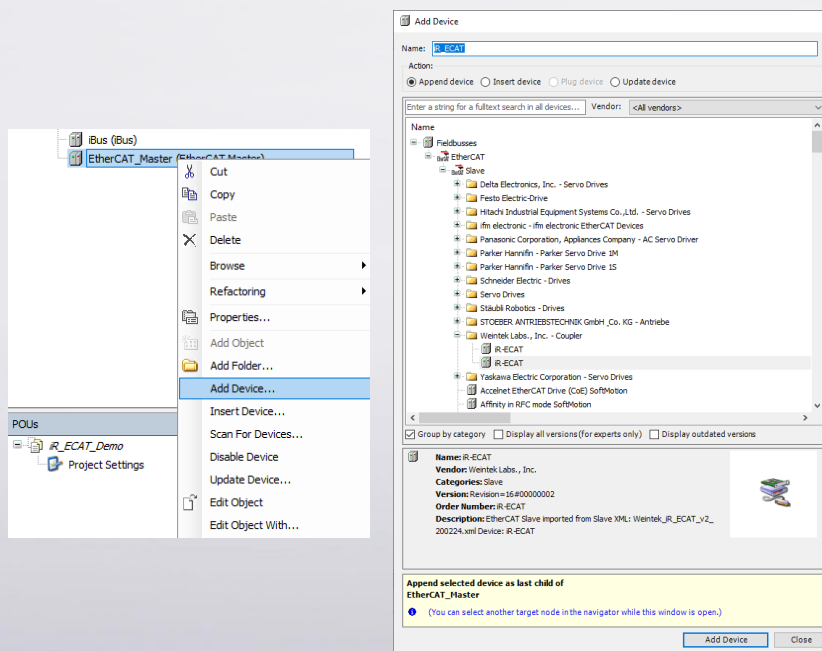
Way 1. Search for iR-ECAT on the network:

[EtherCAT_Master]->[Scan for devices]->[Copy All Devices to Project]



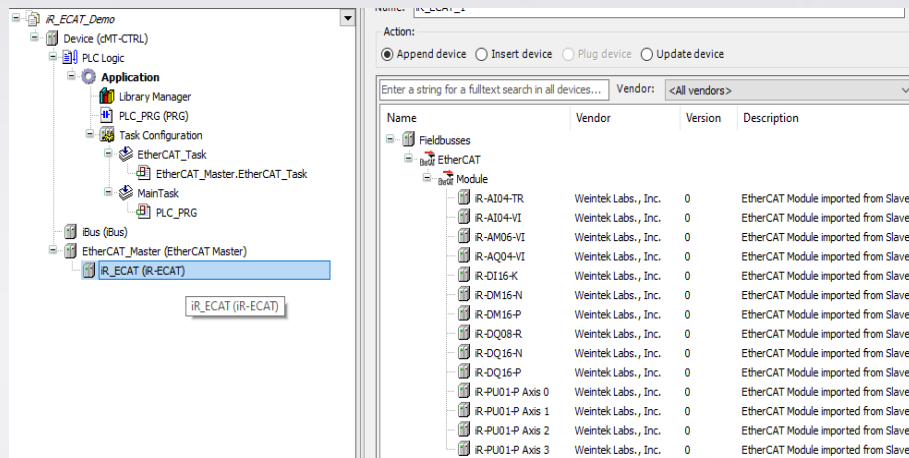
Way 2. Add iR-ECAT manually.

[EtherCAT_Master]->[Add Device] ->[Slave] ->[iR-ECAT]



- Adding EtherCAT module:

[iR-ECAT] ->[Add Device] ->[EtherCAT]->[Module]



- Configuring Motion Control Parameters:

[iR-ECAT] ->[Startup Parameters] ->[Add]

Select Item from Object Directory

Index:Subindex	Name	Flags	Type	Def ^
16#2007:16#00	Axis 0 Abort connection option code	RW	UINT	
16#2040:16#00	Axis 0 Controlword	RW	UINT	
16#205E:16#00	Axis 0 Fault reaction option code	RW	UINT	
16#2060:16#00	Axis 0 Mode of operation	RW	USINT	
16#207A:16#00	Axis 0 Target Position	RW	UDINT	
16#207B:16#00	Axis 0 Position range limit*			
16#207C:16#00	Axis 0 Home offset	RW	UDINT	
16#207D:16#00	Axis 0 Software position limit*			
16#207F:16#00	Axis 0 Max Profile velocity*	RW	UDINT	
16#2080:16#00	Axis 0 Max motor speed*	RW	UDINT	
16#2081:16#00	Axis 0 Profile velocity	RW	UDINT	
16#2083:16#00	Axis 0 Profile acceleration	RW	UDINT	
16#2084:16#00	Axis 0 Profile deceleration	RW	UDINT	
16#2085:16#00	Axis 0 Quick stop deceleration*	RW	UDINT	
16#208F:16#00	Axis 0 Position Encoder Resolution*			

Name:

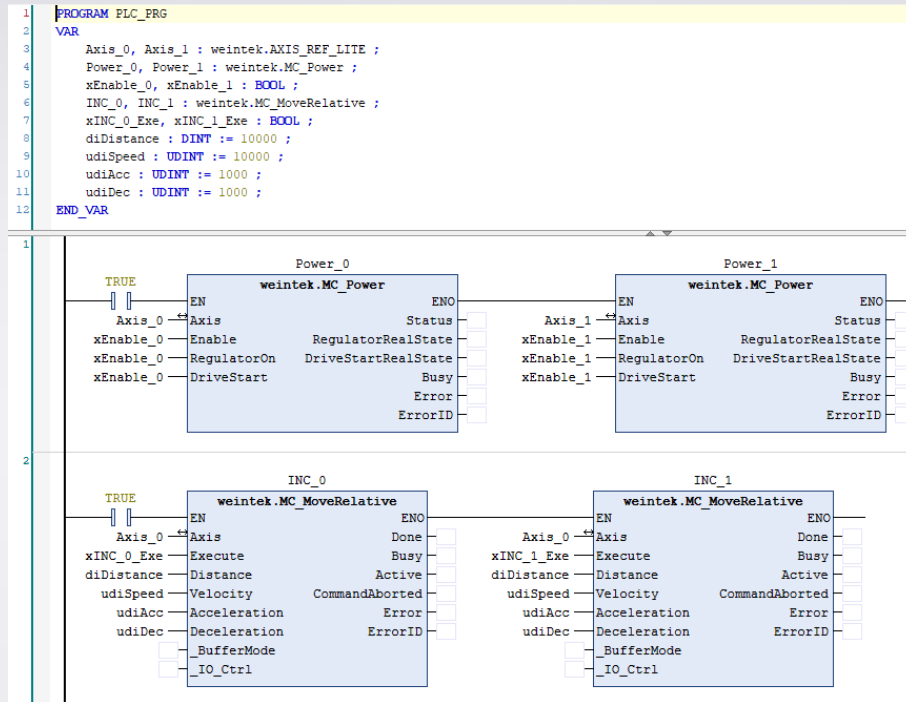
Index: 16# Bitlength:

SubIndex: 16# Value:

☐ Complete Access ☐ Byte Array

OK Cancel

- Declaration and Programming:



Variable Mapping:

[iR-ECAT] -> [EtherCAT I/O Mapping]

General	Find	Filter	Show all
Process Data	Variable	Mapping	Channel
Startup Parameters	Application.PLC_PRG.aiAO_VI[0]	IR_AM06_VI AO1	%QW0
EtherCAT I/O Mapping	Application.PLC_PRG.aiAO_VI[1]	IR_AM06_VI AO2	%QW1
Status	Application.PLC_PRG.aiAI_VI[0]	IR_AM06_VI AI1	%IW1
Information	Application.PLC_PRG.aiAI_VI[1]	IR_AM06_VI AI2	%IW2
	Application.PLC_PRG.aiAI_VI[2]	IR_AM06_VI AI3	%IW3
	Application.PLC_PRG.aiAI_VI[3]	IR_AM06_VI AI4	%IW4
	Application.PLC_PRG.aiAI_TR[0]	IR_AI04_TR AI1	%IW5
	Application.PLC_PRG.aiAI_TR[1]	IR_AI04_TR AI2	%IW6
	Application.PLC_PRG.aiAI_TR[2]	IR_AI04_TR AI3	%IW7
	Application.PLC_PRG.aiAI_TR[3]	IR_AI04_TR AI4	%IW8

Login and Program Execution:

To add a motion control module via EtherCAT, please see the related demo projects according to the device used:

Using cMT-CTRL01: See EtherCAT_Master_Demo_CTRL01_PU

Using cMT Series HMI: See EtherCAT_Master_Demo_HMI_PU

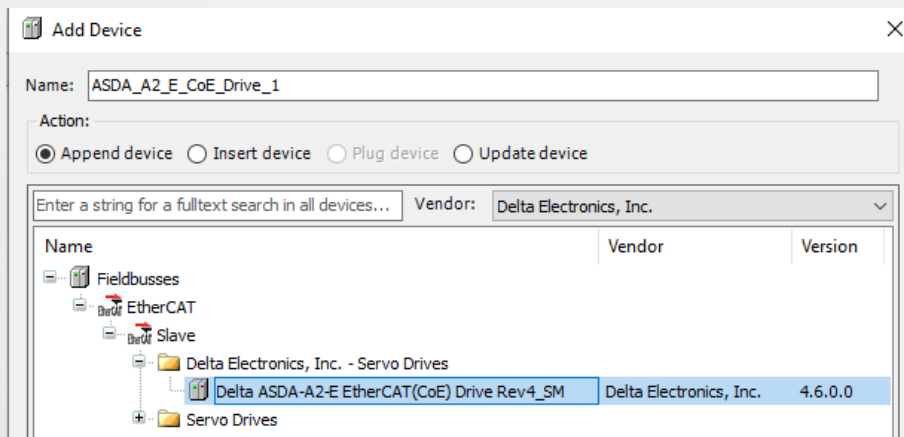
6. Configuring EtherCAT Driver

- Downloading ESI description file: Visit the official website of the driver and download the ESI file.
- CODESYS operation:

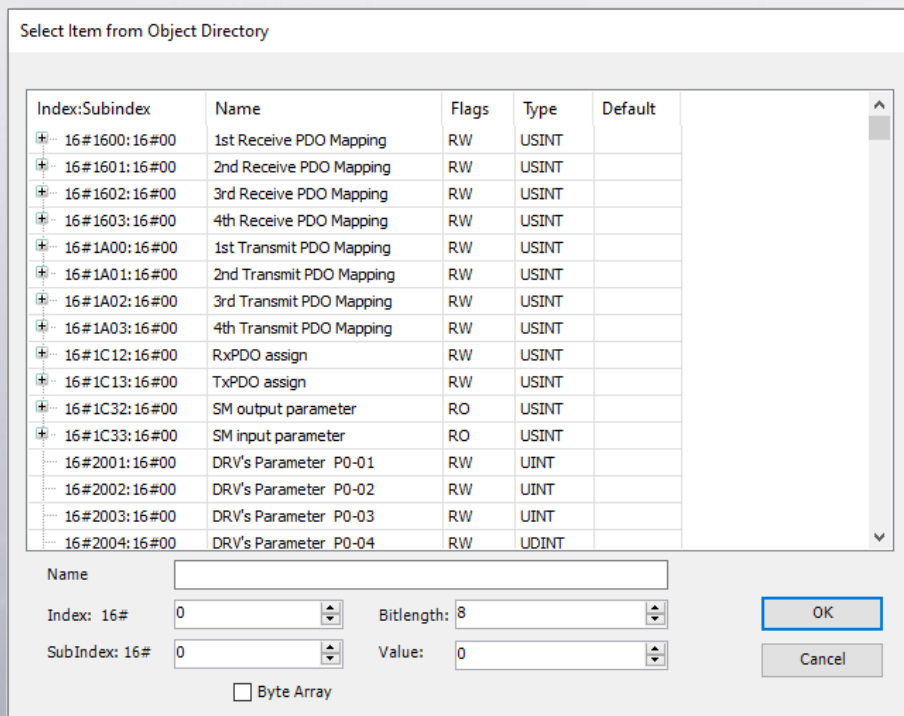
Step 1. Install ESI file: [Tools] -> [Device Repository] -> [Install]

Step 2. Add EtherCAT Master device(V3.5.12.0).

Step 3. Add the driver.



Step 4. Configure driver parameters: [Startup Parameters] -> [Add]

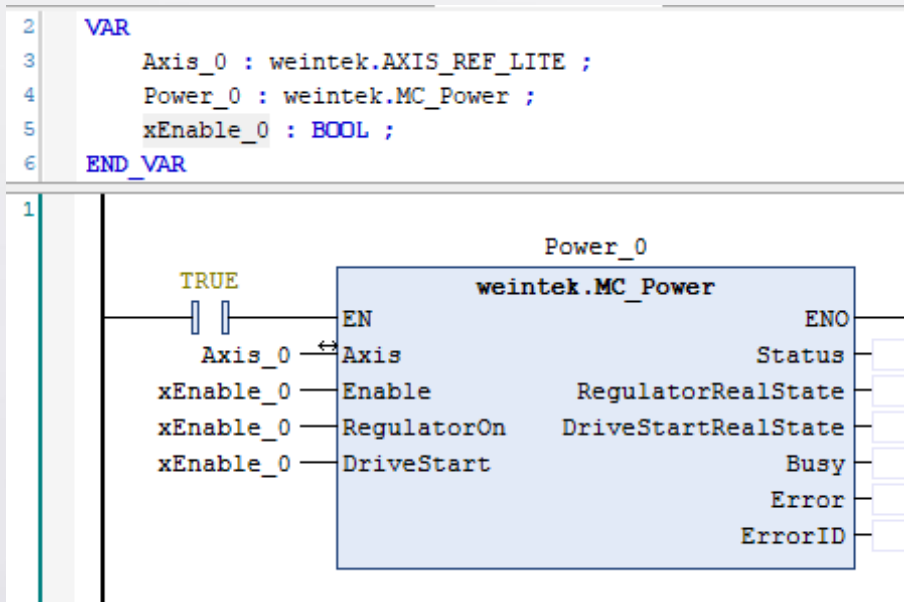


Step 5. Programming and axis variable instance mapping.

In Process Data select a mapping for controlling the driver.

General	Select the Outputs	Select the Inputs																																																																																																						
Process Data	<table border="1"> <thead> <tr> <th>Name</th><th>Type</th><th>Index</th></tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> 16#1600 1st RxPDO Mapping</td><td></td><td></td></tr> <tr> <td>Control Word</td><td>UINT</td><td>16#6040:00</td></tr> <tr> <td>TargetPosition</td><td>DINT</td><td>16#607A:00</td></tr> <tr> <td>TargetVelocity</td><td>DINT</td><td>16#60FF:00</td></tr> <tr> <td>TargetTorque</td><td>DINT</td><td>16#6071:00</td></tr> <tr> <td>ModeOfOperation</td><td>SINT</td><td>16#6060:00</td></tr> <tr> <td><input type="checkbox"/> 16#1601 2nd RxPDO Mapping (excluded by 1</td><td></td><td></td></tr> <tr> <td>Control Word</td><td>UINT</td><td>16#6040:00</td></tr> <tr> <td>TargetPosition</td><td>DINT</td><td>16#607A:00</td></tr> <tr> <td><input type="checkbox"/> 16#1602 3rd RxPDO Mapping (excluded by 1</td><td></td><td></td></tr> <tr> <td>Control Word</td><td>UINT</td><td>16#6040:00</td></tr> <tr> <td>TargetVelocity</td><td>DINT</td><td>16#60FF:00</td></tr> <tr> <td><input type="checkbox"/> 16#1603 4th RxPDO Mapping (excluded by 1</td><td></td><td></td></tr> <tr> <td>Control Word</td><td>UINT</td><td>16#6040:00</td></tr> <tr> <td>TargetTorque</td><td>DINT</td><td>16#6071:00</td></tr> </tbody> </table>	Name	Type	Index	<input checked="" type="checkbox"/> 16#1600 1st RxPDO Mapping			Control Word	UINT	16#6040:00	TargetPosition	DINT	16#607A:00	TargetVelocity	DINT	16#60FF:00	TargetTorque	DINT	16#6071:00	ModeOfOperation	SINT	16#6060:00	<input type="checkbox"/> 16#1601 2nd RxPDO Mapping (excluded by 1			Control Word	UINT	16#6040:00	TargetPosition	DINT	16#607A:00	<input type="checkbox"/> 16#1602 3rd RxPDO Mapping (excluded by 1			Control Word	UINT	16#6040:00	TargetVelocity	DINT	16#60FF:00	<input type="checkbox"/> 16#1603 4th RxPDO Mapping (excluded by 1			Control Word	UINT	16#6040:00	TargetTorque	DINT	16#6071:00	<table border="1"> <thead> <tr> <th>Name</th><th>Type</th><th>Index</th></tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> 16#1A00 1st TxPDO Mapping</td><td></td><td></td></tr> <tr> <td>Status Word</td><td>UINT</td><td>16#6041:00</td></tr> <tr> <td>ActualPosition</td><td>DINT</td><td>16#6064:00</td></tr> <tr> <td>Velocity actual value</td><td>DINT</td><td>16#606C:00</td></tr> <tr> <td>ActualTorque</td><td>DINT</td><td>16#6077:00</td></tr> <tr> <td>ModeOfOperationDisplay</td><td>SINT</td><td>16#6061:00</td></tr> <tr> <td><input type="checkbox"/> 16#1A01 2nd TxPDO Mapping (e</td><td></td><td></td></tr> <tr> <td>Status Word</td><td>UINT</td><td>16#6041:00</td></tr> <tr> <td>ActualPosition</td><td>DINT</td><td>16#6064:00</td></tr> <tr> <td><input type="checkbox"/> 16#1A02 3rd TxPDO Mapping (e</td><td></td><td></td></tr> <tr> <td>Status Word</td><td>UINT</td><td>16#6041:00</td></tr> <tr> <td>ActualPosition</td><td>DINT</td><td>16#6064:00</td></tr> <tr> <td>Velocity actual value</td><td>DINT</td><td>16#606C:00</td></tr> <tr> <td><input type="checkbox"/> 16#1A03 4th TxPDO Mapping (e</td><td></td><td></td></tr> <tr> <td>Status Word</td><td>UINT</td><td>16#6041:00</td></tr> <tr> <td>ActualPosition</td><td>DINT</td><td>16#6064:00</td></tr> <tr> <td>ActualTorque</td><td>DINT</td><td>16#6077:00</td></tr> </tbody> </table>	Name	Type	Index	<input checked="" type="checkbox"/> 16#1A00 1st TxPDO Mapping			Status Word	UINT	16#6041:00	ActualPosition	DINT	16#6064:00	Velocity actual value	DINT	16#606C:00	ActualTorque	DINT	16#6077:00	ModeOfOperationDisplay	SINT	16#6061:00	<input type="checkbox"/> 16#1A01 2nd TxPDO Mapping (e			Status Word	UINT	16#6041:00	ActualPosition	DINT	16#6064:00	<input type="checkbox"/> 16#1A02 3rd TxPDO Mapping (e			Status Word	UINT	16#6041:00	ActualPosition	DINT	16#6064:00	Velocity actual value	DINT	16#606C:00	<input type="checkbox"/> 16#1A03 4th TxPDO Mapping (e			Status Word	UINT	16#6041:00	ActualPosition	DINT	16#6064:00	ActualTorque	DINT	16#6077:00
Name	Type	Index																																																																																																						
<input checked="" type="checkbox"/> 16#1600 1st RxPDO Mapping																																																																																																								
Control Word	UINT	16#6040:00																																																																																																						
TargetPosition	DINT	16#607A:00																																																																																																						
TargetVelocity	DINT	16#60FF:00																																																																																																						
TargetTorque	DINT	16#6071:00																																																																																																						
ModeOfOperation	SINT	16#6060:00																																																																																																						
<input type="checkbox"/> 16#1601 2nd RxPDO Mapping (excluded by 1																																																																																																								
Control Word	UINT	16#6040:00																																																																																																						
TargetPosition	DINT	16#607A:00																																																																																																						
<input type="checkbox"/> 16#1602 3rd RxPDO Mapping (excluded by 1																																																																																																								
Control Word	UINT	16#6040:00																																																																																																						
TargetVelocity	DINT	16#60FF:00																																																																																																						
<input type="checkbox"/> 16#1603 4th RxPDO Mapping (excluded by 1																																																																																																								
Control Word	UINT	16#6040:00																																																																																																						
TargetTorque	DINT	16#6071:00																																																																																																						
Name	Type	Index																																																																																																						
<input checked="" type="checkbox"/> 16#1A00 1st TxPDO Mapping																																																																																																								
Status Word	UINT	16#6041:00																																																																																																						
ActualPosition	DINT	16#6064:00																																																																																																						
Velocity actual value	DINT	16#606C:00																																																																																																						
ActualTorque	DINT	16#6077:00																																																																																																						
ModeOfOperationDisplay	SINT	16#6061:00																																																																																																						
<input type="checkbox"/> 16#1A01 2nd TxPDO Mapping (e																																																																																																								
Status Word	UINT	16#6041:00																																																																																																						
ActualPosition	DINT	16#6064:00																																																																																																						
<input type="checkbox"/> 16#1A02 3rd TxPDO Mapping (e																																																																																																								
Status Word	UINT	16#6041:00																																																																																																						
ActualPosition	DINT	16#6064:00																																																																																																						
Velocity actual value	DINT	16#606C:00																																																																																																						
<input type="checkbox"/> 16#1A03 4th TxPDO Mapping (e																																																																																																								
Status Word	UINT	16#6041:00																																																																																																						
ActualPosition	DINT	16#6064:00																																																																																																						
ActualTorque	DINT	16#6077:00																																																																																																						
Startup Parameters																																																																																																								
EtherCAT I/O Mapping																																																																																																								
Status																																																																																																								
Information																																																																																																								

Use the motion control function block in Weintek_CODESYS_Library for programming.



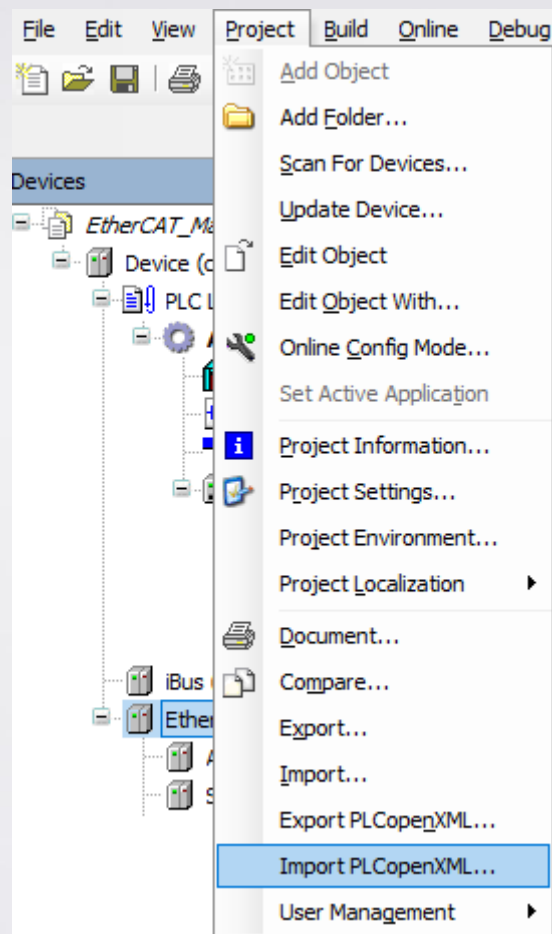
Fill in the I/O of axis variable instance in [EtherCAT I/O Mapping].

General	Find	Filter	Show all
Process Data	Variable	Mapping	Channel
Startup Parameters	Application.PLC_PRG.Axis_0.Mapping_Q.Obj.Controlword	~	Control Word
	Application.PLC_PRG.Axis_0.Mapping_Q.Obj.TargetPosition	~	TargetPosition
	Application.PLC_PRG.Axis_0.Mapping_Q.Obj.TargetVelocity	~	TargetVelocity
EtherCAT I/O Mapping	Application.PLC_PRG.Axis_0.Mapping_Q.Obj.TargetTorque	~	TargetTorque
	Application.PLC_PRG.Axis_0.Mapping_Q.Obj.ModeOp	~	ModeOfOperation
Status	Application.PLC_PRG.Axis_0.Mapping_I.Obj.Statusword	~	Status Word
	Application.PLC_PRG.Axis_0.Mapping_I.Obj.PositionActual	~	ActualPosition
	Application.PLC_PRG.Axis_0.Mapping_I.Obj.VelocityActual	~	Velocity actual value
Information	Application.PLC_PRG.Axis_0.Mapping_I.Obj.ActualTorque	~	ActualTorque
	Application.PLC_PRG.Axis_0.Mapping_I.Obj.ModeOpDisp	~	ModeOfOperationDisplay

Step 6. Log in and run a test.

✂ Weintek provides PLCopenXML file for users to quickly start using EtherCAT driver. Under [EtherCAT_Master] select [Project]->[Import PLCopenXML] and select Weintek_Axis_Template.XML (a file that can be downloaded in

the iR Resource document.)



CODESYS® is a trademark of 3S-Smart Software Solutions GmbH.

Other company names, product names, or trademarks in this document are the trademarks or registered trademarks of their respective companies.

This document is subject to change without prior notice.

Copyright© 2020 Weintek Lab., Inc. All rights reserved.