

**Instruction Manual
XENAX® Xvi EtherCAT® with
OMRON and Symac Studio**

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OMRON

General

This quick start manual helps the advanced OMRON programmer to integrate the XENAX® servo controller with EtherCAT bus module in the Sysmac Studio from OMRON.

This manual contains a step by step guide and an example project.

Contents

1 Development Environment	3
1.1 Omron	3
1.1.1 Sysmac Studio	3
1.1.2 Programmable Logic Controller	3
1.2 Jenny Science	3
1.2.1 Webmotion	3
1.2.1 XENAX® servo controller	4
1.2.2 LINAX® Linear motors	4
1.2.3 ELAX® Linear motor slides	4
1.2.4 ROTAX® Rotary motor axes	4
2 Example Project in Symac Studio	5
2.1 Install ESI files	5
2.2 AREF Command	5
2.3 Open Example Project	6
2.4 Change PLC Type	6
2.5 Communications Setup	6
2.6 Download Project	7
3 New Project in Sysmac Studio	8
3.1 Start Sysmac Studio	8
3.2 Create a new Project	8
3.3 Connect to the PLC	8
3.4 Insert Xenax® Servo Controller	9
3.5 Set Node Address	10
3.6 Merge Network Configuration	11
3.7 PDO Mapping	11
3.8 Cyclic Interpolation Time & AREF	12
3.9 Configure Servo Axis	13
3.9.1 Add Axis	13
3.9.2 Basic Settings	13
3.9.3 I/O Map Encoder Position	14
3.9.4 Linear Axis only	15
3.9.5 Rotary Axis only	16
3.9.6 Servo Drive Settings	17
3.10 Insert Programm	18
3.11 Communications Setup	19
3.12 Download Project	20
4 Gantry Coupled Mode	21
4.1 Add a second axis without Controlword	21
4.2 Send target position to second axis	22

1 Development Environment

1.1 Omron

1.1.1 Sysmac Studio

Sysmac Studio

is the engineering software which is needed for programming the OMRON NJ and NX Series PLC.

All explanations in this instruction manual are based on Sysmac Studio V1.43.



1.1.2 Programmable Logic Controller

OMRON PLC

In this specific example the XENAX® Servo Controller is controlled by a NJ301-1100 or a NJ501-1500 Machine Automation Controller from OMRON. The XENAX® servo controller should be compatible with every PLC from the NJ-Series.



1.2 Jenny Science

1.2.1 Webmotion

The proprietary graphical user interface for servo controllers is stored in the embedded web server of the XENAX® servo controller as a Java applet.

WebMotion® is launched with a web browser by entering the corresponding TCP/IP address of XENAX®.

LINAX® linear motor axes, ELAX® linear motor slides and ROTAX® rotary axes are automatically recognized. The corresponding controller parameters are saved and loaded automatically. With the Quick Start button, the linear motors can easily and immediately be operated. No other user manual is needed.



1.2.1 XENAX® servo controller

XENAX® servo controller for Jenny Science Axis with integrated EtherCAT bus module. The bus module is optional but it is required for this application. One XENAX® can control one axis. The XENAX® servo controller recognises all Jenny Science motors and configures the parameters correctly.



1.2.2 LINAX® Linear motors

The LINAX® linear motor axes are highly modular and can be flexibly combined amongst each other. Four different series are available.

Lxc = compact

Lxu = universal

Lxs = shuttle

Lxe = exclusive



1.2.3 ELAX® Linear motor slides

Specifically designed for handling and Pick and Place tasks with strokes from 30mm up to 150mm. The configuration is extremely modular and there is only one cable to the XENAX® servo controller.



1.2.4 ROTAX® Rotary motor axes

Specifically designed for fast and precise assembly and handling tasks. It can be equipped with standard gripping tools which enables a 360° rotation and has a hollow shaft feedthrough for vacuum or compressed air.

Rxvp = vacuum pressure

Rxhq = high torque



2 Example Project in Sysmac Studio

This chapter describes how to put a Jenny Axis into operation. Example projects are used for this purpose.

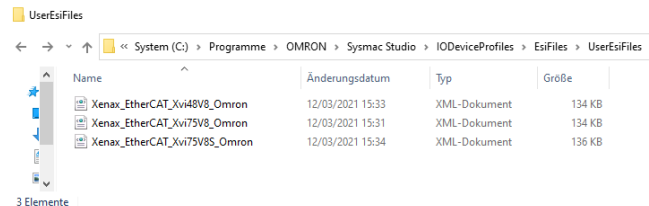
2.1 Install ESI files

Before you open a project, copy the device description file **Xenax_EtherCAT_Omron.xml** into the Sysmac Studio ESI directory.

The ESI files can be downloaded from the Jenny Science Webpage:
<https://www.jennyscience.ch/en/products/download>
 under Xenax® Servocontroller → Firmware Bus Module and EDS/ESI/GSD → FW_ETHERCAT.zip

Default ESI directory path is
C:\Program Files\OMRON\Sysmac Studio\IODeviceProfiles\EsiFiles\UserEsiFiles.

Restart Sysmac Studio



2.2 AREF Command

AREF or automatic reference drive is a setting which lets the axis reference without setting Bit4 in the Controlword. Command must be entered in Webmotion once on each XENAX® servo controller.



This step happens automatically if you use XENAX firmware version V5.08C and Bus-Module firmware version 2.68 or above.

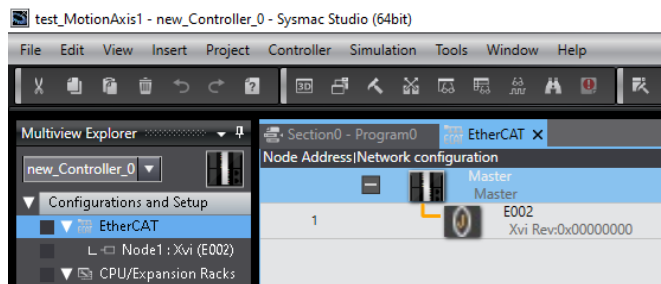
XENAX	Firmware	V5.08C
	WebMotion	V6.06
	Hardware	V1.00
	MAC	AC-6B-AC-75-32-0B
BUS-MODULE	Firmware	EtherCAT V2.68

2.3 Open Example Project

The example Project demonstrates a simple application where the axis drives between two positions

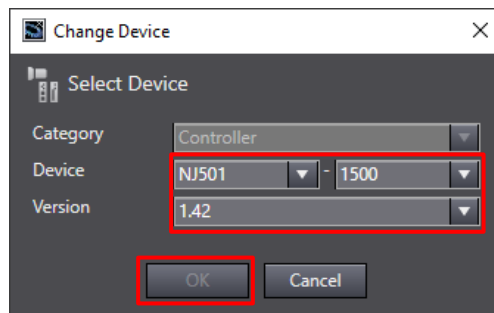
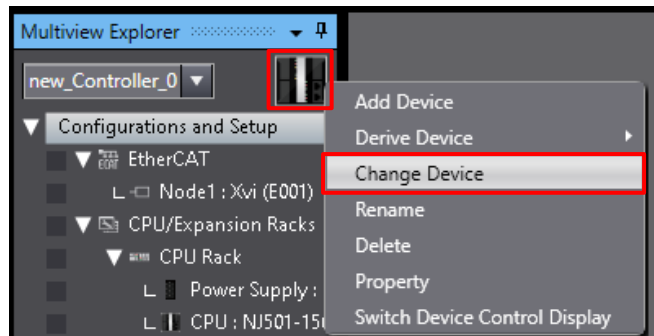
Example Project:

- Step1: Clear errors
- Step2: Power on
- Step3: Reference drive
- Step4: Drive to position 0mm
- Step5: Drive to position 44mm
- Step6: Goto Step4.



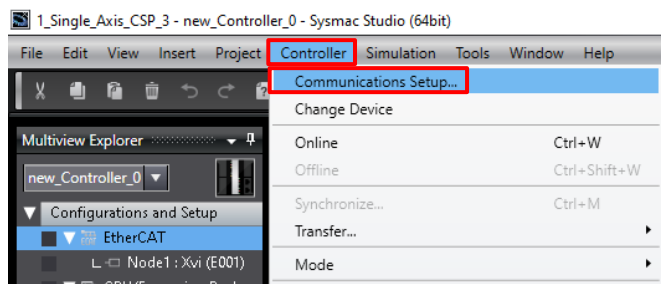
2.4 Change PLC Type

Change the PLC type to match the PLC connected with a right-click on the PLC icon.

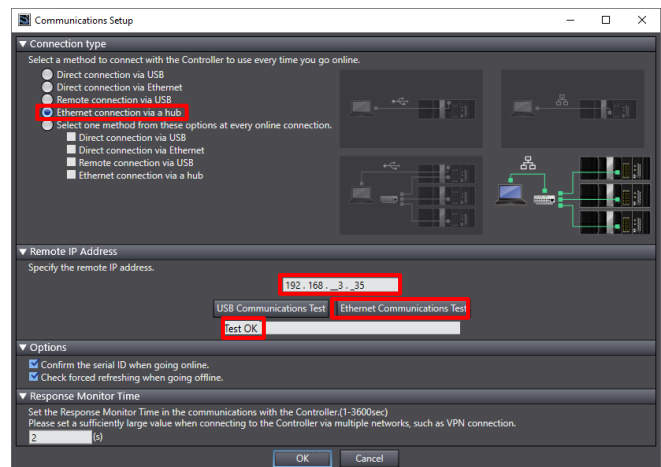


2.5 Communications Setup

Test the connection to the Controller.

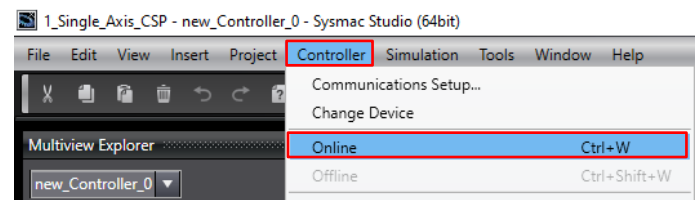


Select the desired connection type and enter the IP address of the PLC device. Note that the default address is 192.168.250.1.

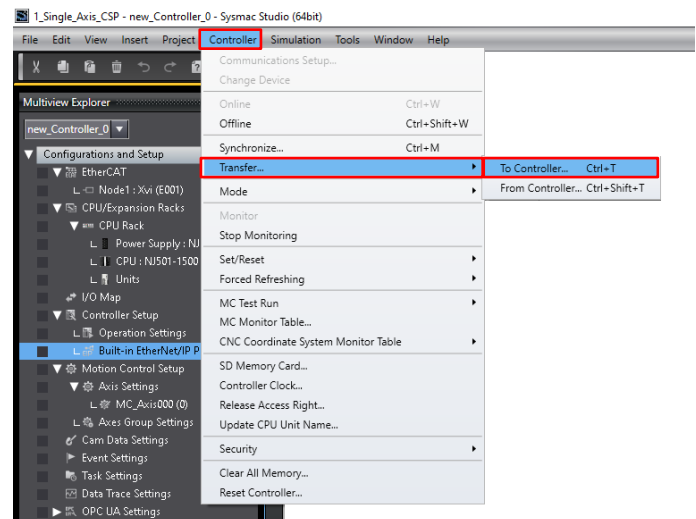


2.6 Download Project

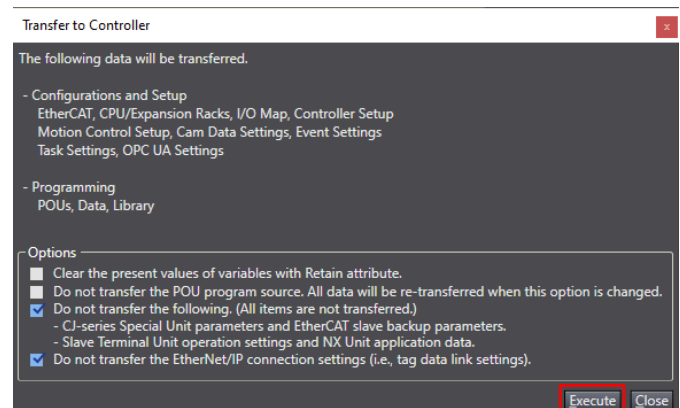
Go online.



Transfer the program to the controller.



Press execute.



3 New Project in Sysmac Studio

This section explains the procedures to set up the XENAX® servo controllers in a new Sysmac Studio project.

This chapter assumes that the ESI file is installed and the Xenax® servo controller is set up as described in chapter 2 Example Project in Symac Studio.

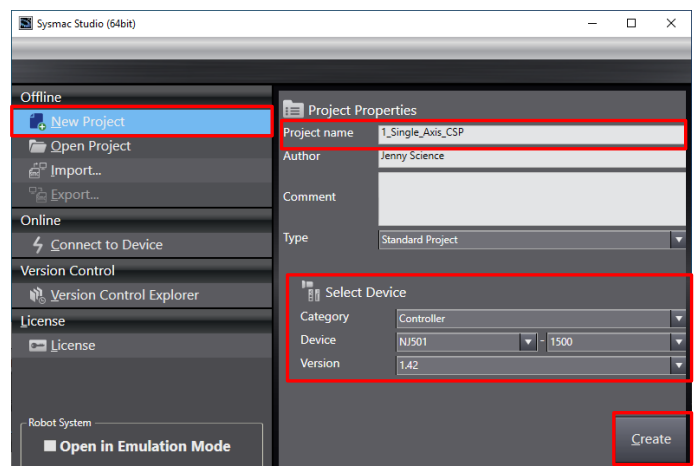
3.1 Start Sysmac Studio

Start Sysmac Studio.

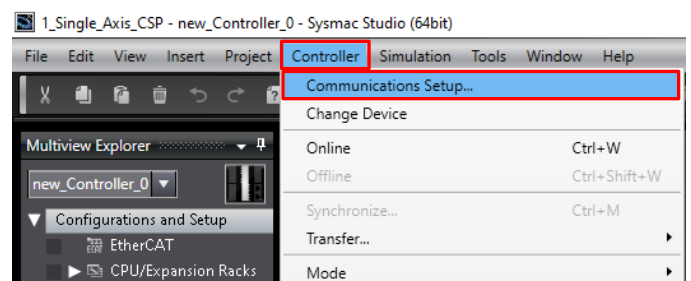


3.2 Create a new Project

Select new project. Give it a name. Choose your PLC and press create.

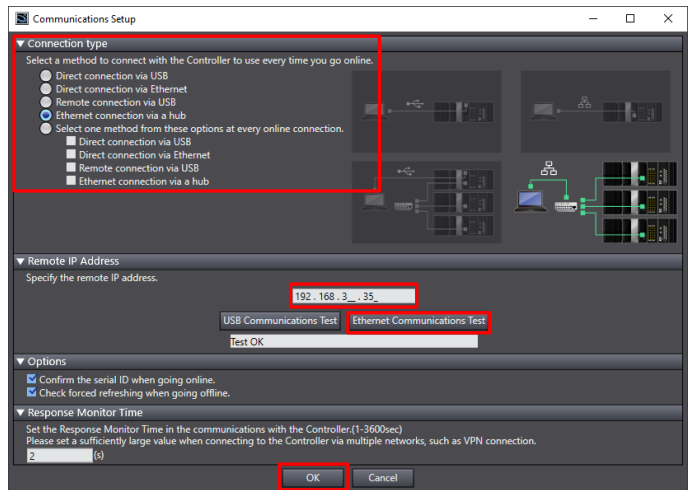


3.3 Connect to the PLC



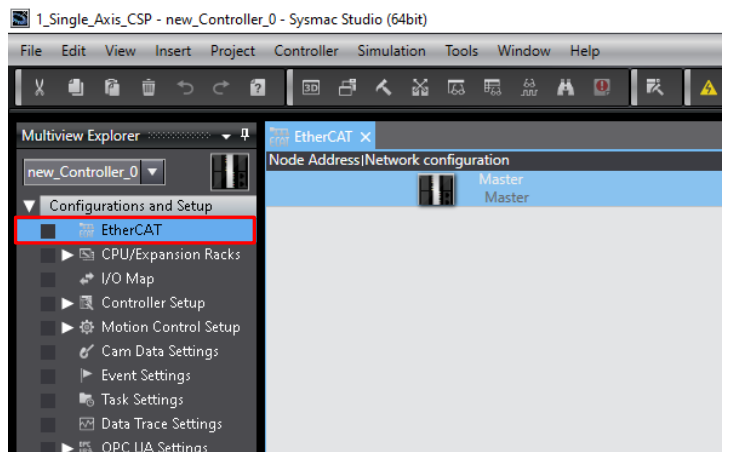
Choose the preferred connection setup and the IP Address of the controller.

It is possible to the connection before pressing ok.

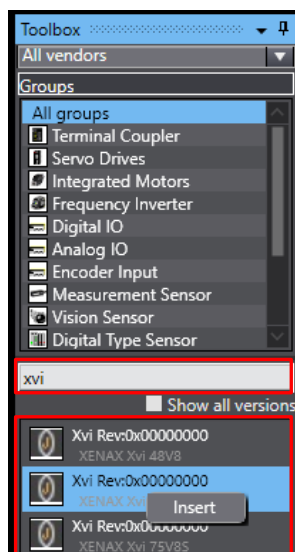


3.4 Insert Xenax® Servo Controller

Double click on EtherCAT.

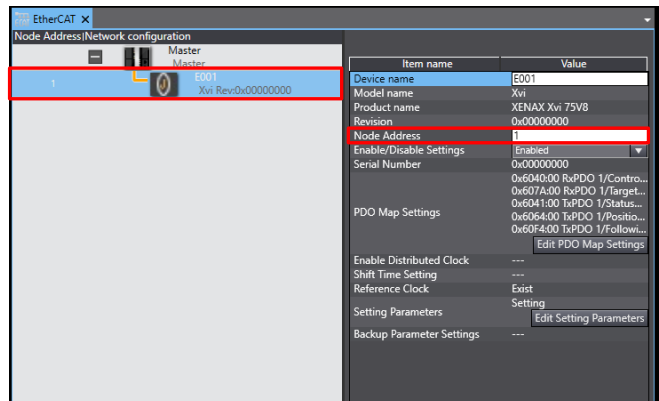


Search for xvi and with right-click insert the correct Xenax® model.

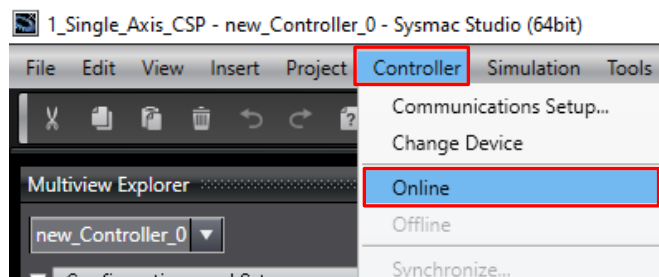


3.5 Set Node Address

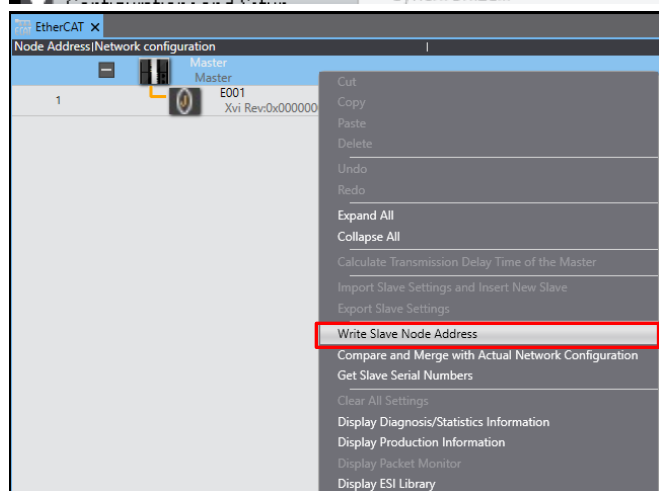
Set the Node Address for the EtherCAT bus.



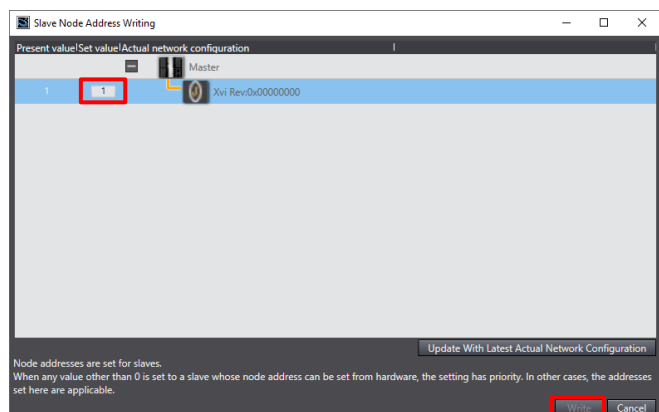
Go online.



Right-click on the Mater while online to write the Node Address to the slave.



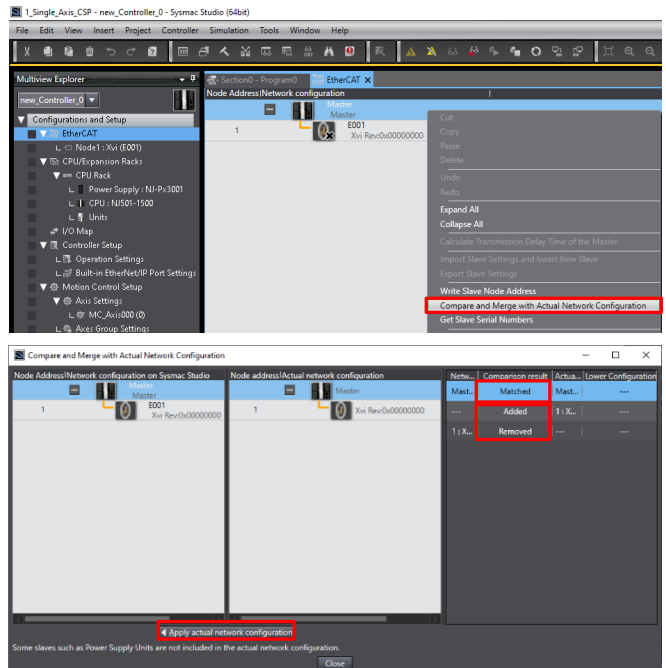
Set the desired Node Address.



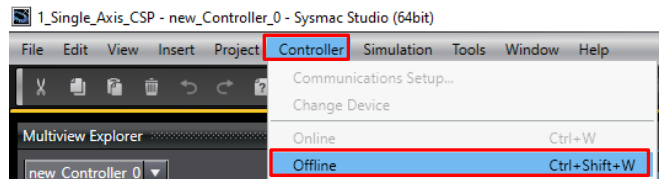
3.6 Merge Network Configuration

Merge network configuration to verify that the project configuration matches the actual configuration.

Make sure that the PLC as well as the XENAX® match in the comparison result columns. Often, it is necessary to make them match by pressing “Apply actual network configuration”.



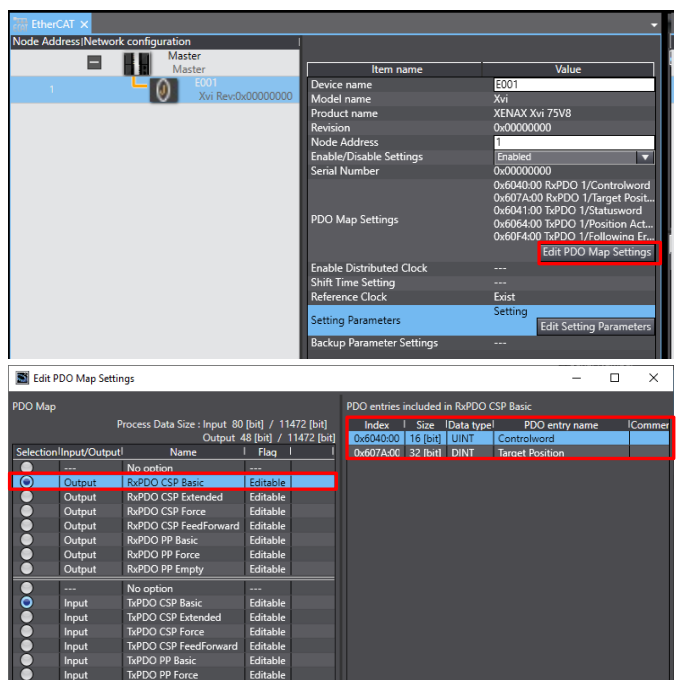
Go offline.



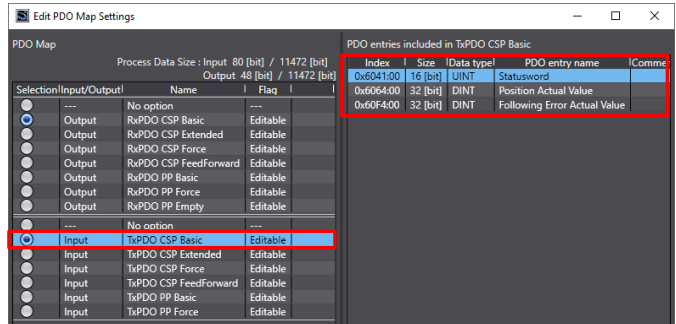
3.7 PDO Mapping

Verify the PDO mapping. All settings should be in their default state.

Leave the default RxPDO settings.



Leave the default TxPDO settings.



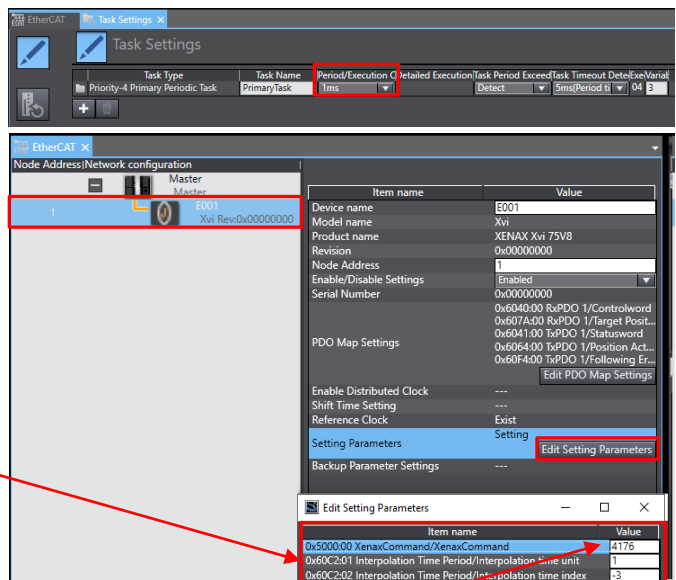
3.8 Cyclic Interpolation Time & AREF

The bus cycle interval time is usually defined by the main task

Set the Interpolation time to the same setting as the bus cycle time in the Setting Parameters option.

The time is coded in a time unit (Mantissa) and a time index (Exponent). See examples:

Time unit	Time index	Cycle time
1	-3	1ms
15	-3	15ms
15	-4	1.5ms
10	-5	100μs

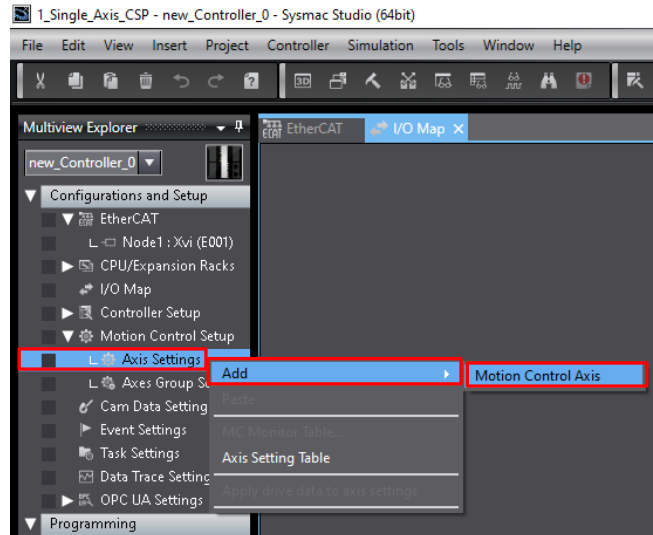


This will make an automatic AREF1 command at start up as mentioned in 2.2 AREF Command.

3.9 Configure Servo Axis

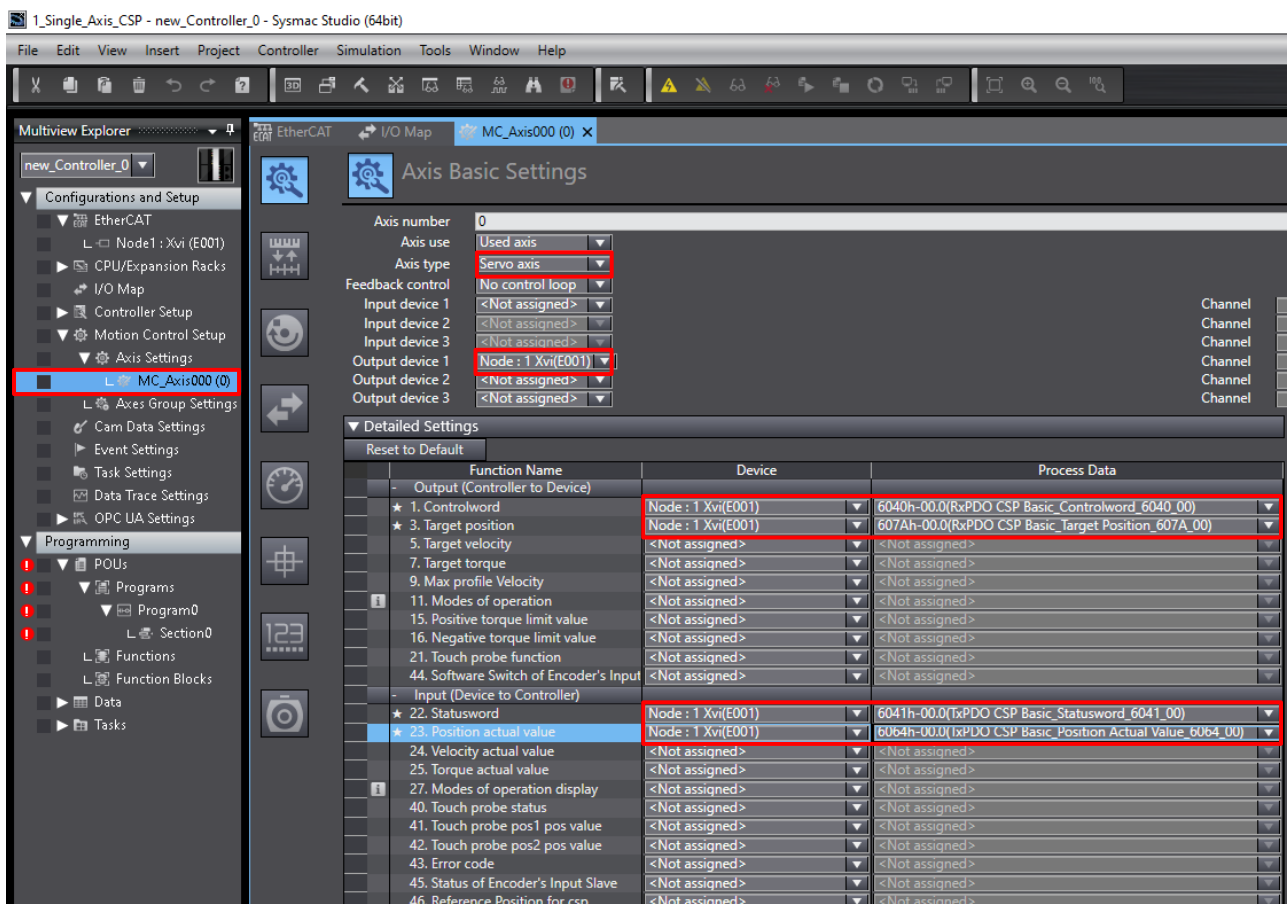
3.9.1 Add Axis

Add a Motion Control Axis with a right-click on Axis Settings.



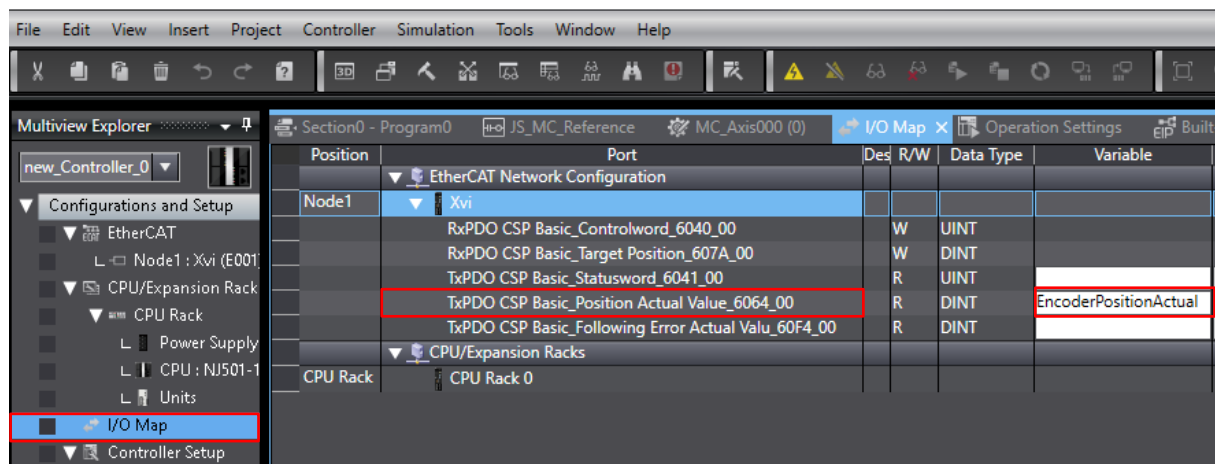
3.9.2 Basic Settings

Configure the servo axis as shown below:



3.9.3 I/O Map Encoder Position

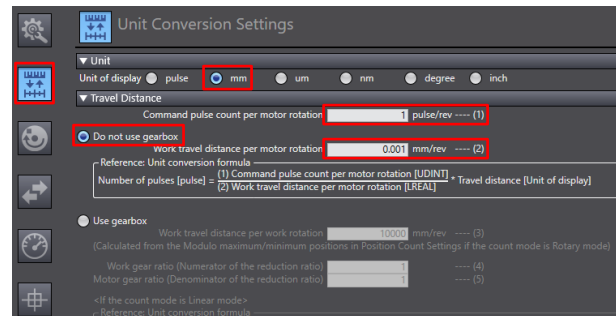
Map a variable to the Encoder position. Later, we will need to access the encoder position of the servo controller. It will be used as an input for the JS_MC_Reference function block. Create a global variable “EncoderPositionActual” in the “I/O Map”.



3.9.4 Linear Axis only

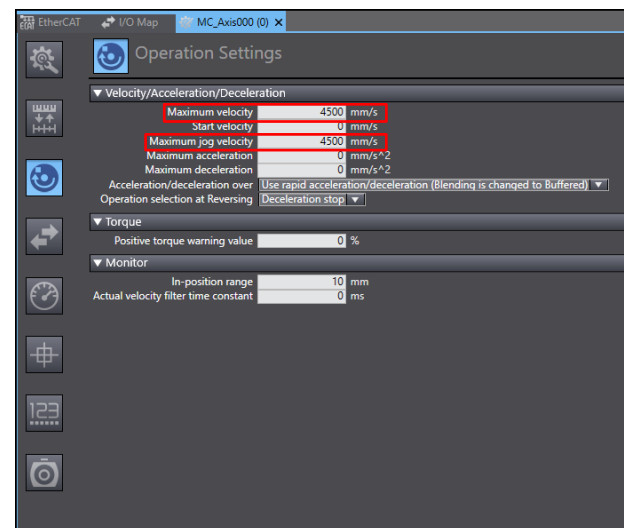
Set the Unit to mm and fill in the values as suggested by the table below.

Motor type / scale	pulse/rev	mm/rev
LINAX/ELAX 1μm	1	0.001
LINAX/ELAX 100nm	1	0.0001

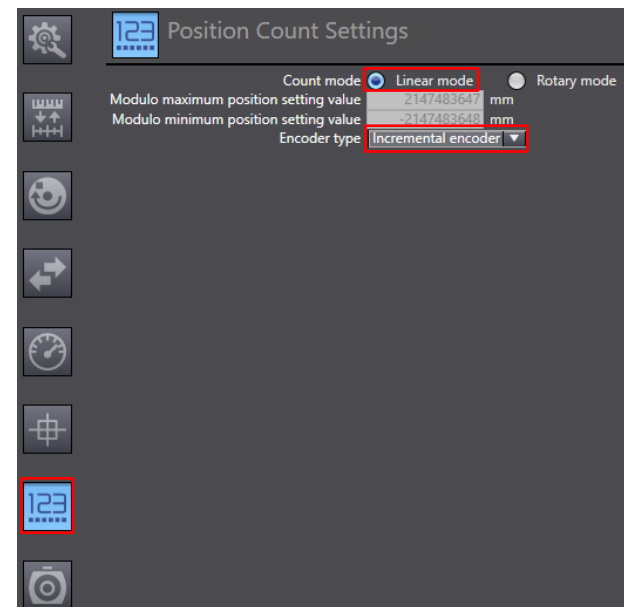


Set maximum velocity and maximum jog velocity as suggested by the table below.

Motor type	Maximum Velocity	Maximum Jog Velocity
LINAX/ELAX 1μm	4500	4500
LINAX/ELAX 100nm	900	900



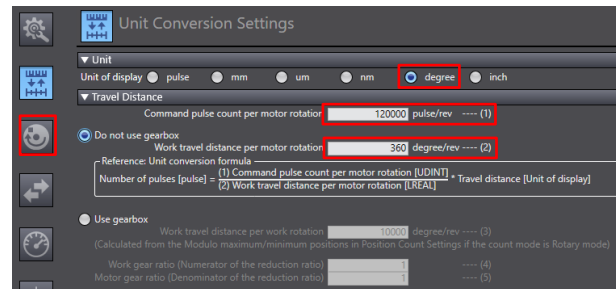
Switch to Linear mode and incremental encoder type.



3.9.5 Rotary Axis only

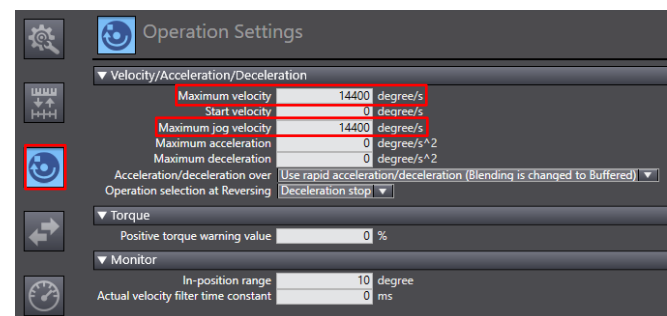
Set the Unit to degree and fill in the values as suggested by the table below.

Motor type	pulse/rev	degree/rev
ROTAX® Rxvp	64'000	360
ROTAX® Rxhq 50	120'000	360
ROTAX® Rxhq 100	120'000	360
ROTAX® Rxhq 100 8ws	162'000	360
ROTAX® Rxhq 100 2ws	648'000	360
ROTAX® Rxhq 100 0.5ws	2'592'000	360

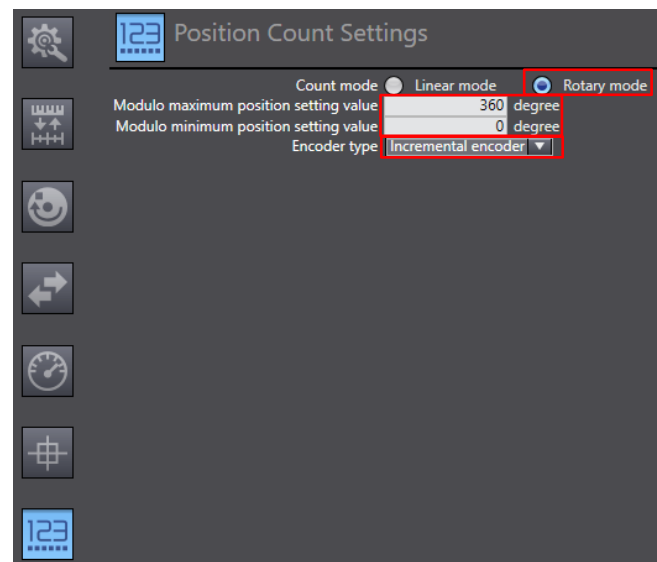


Set maximum velocity and maximum jog velocity as suggested by the table below.

Motor type / scale	Maximum Velocity	Maximum Jog Velocity
ROTAX® Rxvp	9000	9000
ROTAX® Rxhq 50	14400	14400
ROTAX® Rxhq 100	5220	5220
ROTAX® Rxhq 100 8ws	5220	5220
ROTAX® Rxhq 100 2ws	5000	5000
ROTAX® Rxhq 100 0.5ws	1250	1250

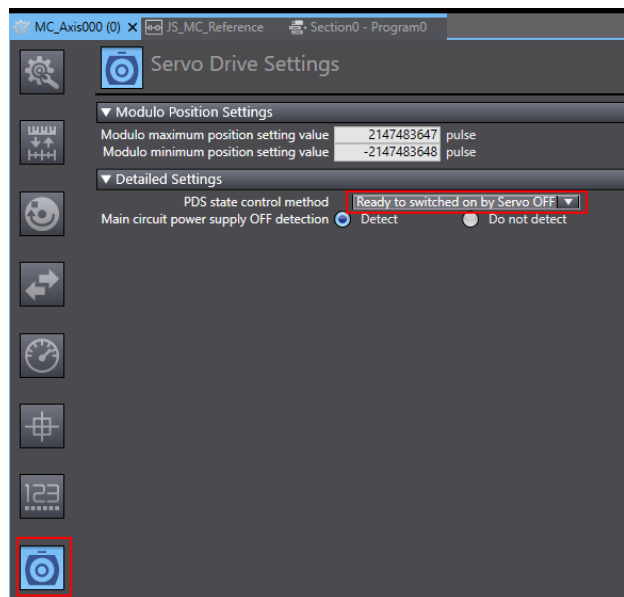


Switch to Rotary mode and incremental encoder type.



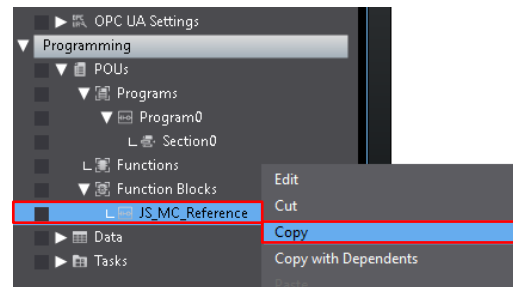
3.9.6 Servo Drive Settings

Sets PDS state control to “Ready to switched on by Servo OFF”.

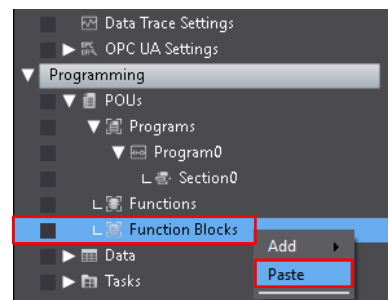


3.10 Insert Programm

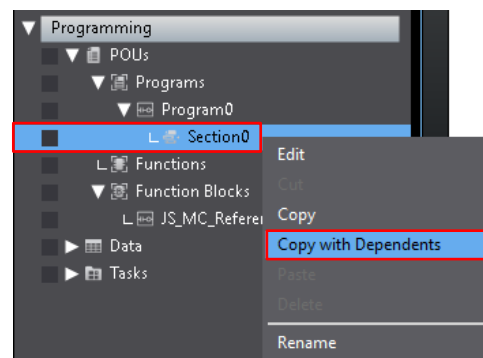
Copy the JS_MC_Reference function block from the example project.



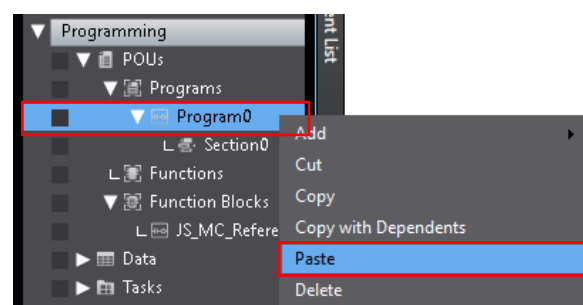
Paste the function block into the new project.



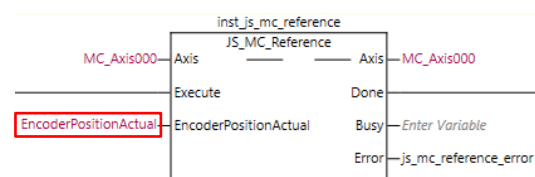
Copy the main program with dependents from the example project.



Paste the main program into the new project.

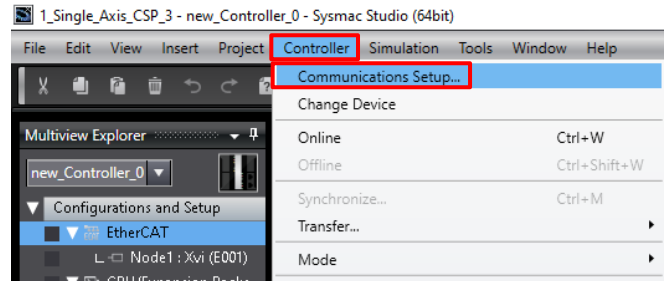


Use the previously created Variable "EncoderPositionActual" as an input for the JS_MC_Reference function block.

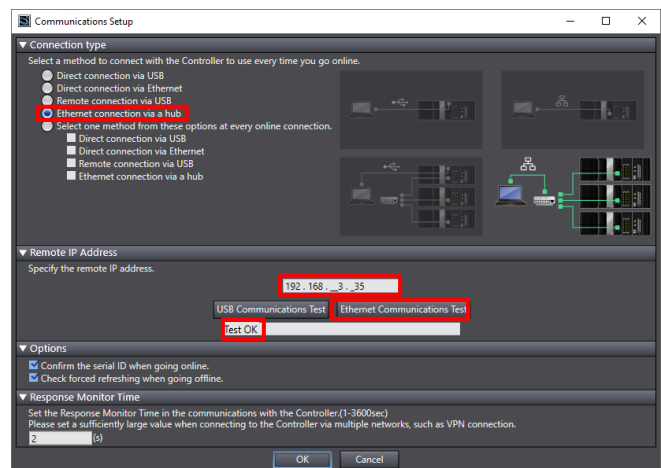


3.11 Communications Setup

Test the connection to the Controller.

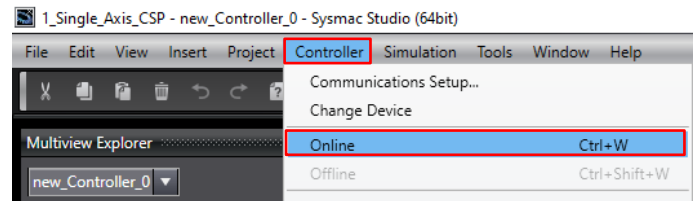


Select the desired connection type and enter the IP address of the PLC device. Note that the default address is 192.168.250.1.

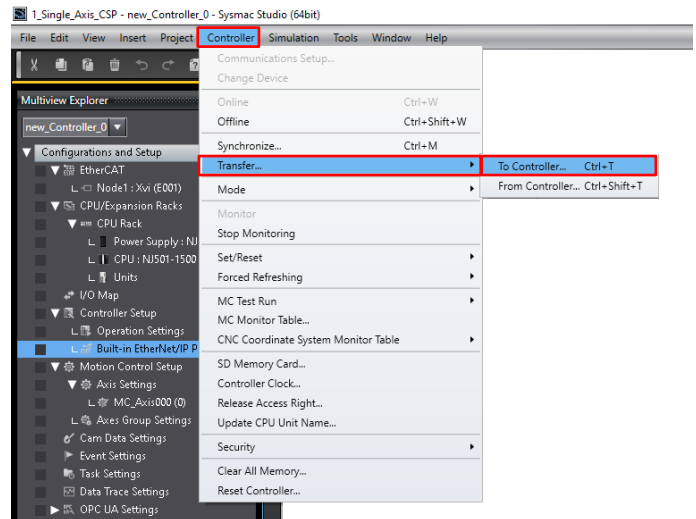


3.12 Download Project

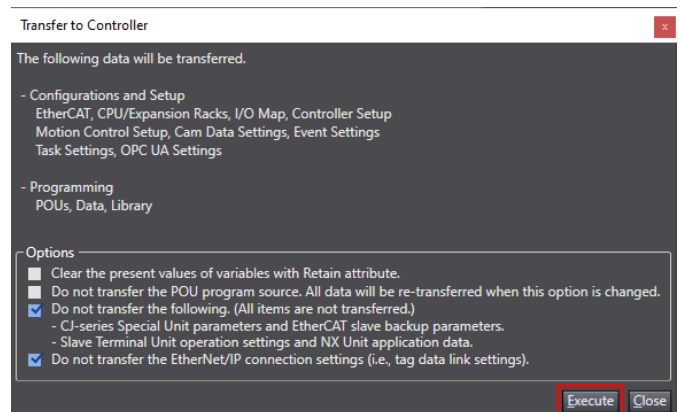
Go online.



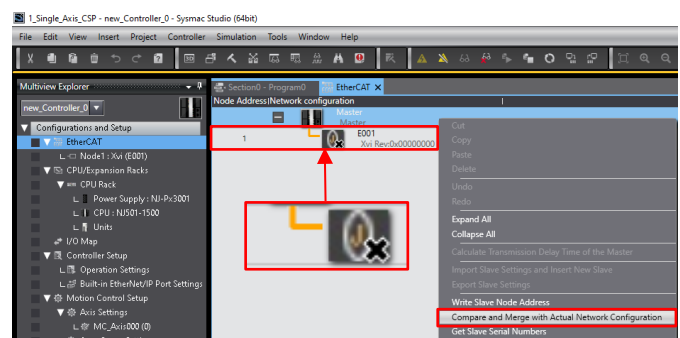
Transfer the program to the controller.



Press execute.



The program should start. Sometimes, there is an issue where the configured Xenax® can not be found. This can be solved by merging the network configuration.



4 Gantry Coupled Mode

In gantry coupled mode, there are two axes. A main axis and a sub axis. The PLC communicates only with the main axis to enable power or for error handling. The PLC only needs to send the target position to the sub axis. Everything else is controlled over the main axis. This way, two axes can be controlled as they were one.

This chapter shows the additional configuration steps required for the gantry coupled mode. There is an example project available which already includes those changes.

4.1 Add a second axis without Controlword

Add a second axis and delete the controlword.

The screenshot displays the EtherCAT configuration interface. The 'Edit PDO Map Settings' dialog is open, showing the configuration for the selected PDO. The 'PDO Map' section on the left lists various PDOs, with '1. RxPDO CSP' selected. The 'PDO entries included in 1. RxPDO CSP' section on the right shows a table with the following data:

Index	Size	Data type	PDO entry name	Comment
0x607A:00	32 [bit]	DINT	Target Position	

The 'Edit PDO Map Settings' button is highlighted in the right pane. The background shows the 'Node Address/Network configuration' window with two nodes, E001 and E002, listed.

4.2 Send target position to second axis

create a variable for the target position on the
sub axis

Multiview Explorer

new_Controller_0

Configurations and Setup

EtherCAT

Node1 : Xvi (E001)

Node2 : Xvi (E002)

CPU/Expansion Racks

I/O Map

Controller Setup

Motion Control Setup

Cam Data Settings

Event Settings

Task Settings

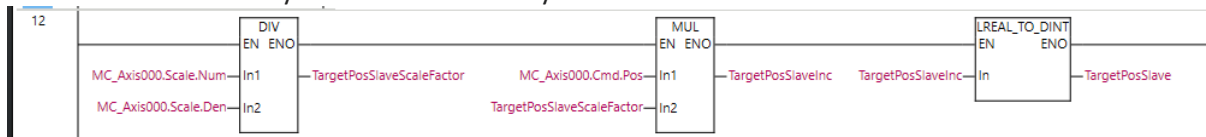
Data Trace Settings

EtherCAT

I/O Map

Position	Port	Description	R/W	Data Type	Variable	Variable Comment	Variable Type
Node1	Xvi	1. RxPDO CSP_Controlword_6040_00	W	UIINT			
		1. RxPDO CSP_Target Position_607A_0	W	DIINT			
		1. TxPDO CSP_Statusword_6041_00	R	UIINT			
		1. TxPDO CSP_Position Actual Value_60	R	DIINT	EncoderPositionAc		Global Variables
		1. TxPDO CSP_Following Error Actual V	R	DIINT			
Node2	Xvi	1. RxPDO CSP_Target Position_607A_0	W	DIINT	targetPosSlave		Global Variables
		1. TxPDO CSP_Statusword_6041_00	R	UIINT			
		1. TxPDO CSP_Position Actual Value_60	R	DIINT			
		1. TxPDO CSP_Following Error Actual V	R	DIINT			
CPU Rack	CPU Rack 0						

Calculate TargetPosition for the Slave axis from
the virtual axis. Run this Rung with the same
cycle time as the Bus-cycle.



Notes

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Information in this instruction manual is subject to change.

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