



APPLICATION NOTE

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Subject

XMC XG5000 EtherCAT Project Creation

Purpose

This application note is intended to provide a basic project configuration for controlling an LS Electric iX7NH or PHOX EtherCAT servo drive using a LS Electric XMC programmable motion controller.

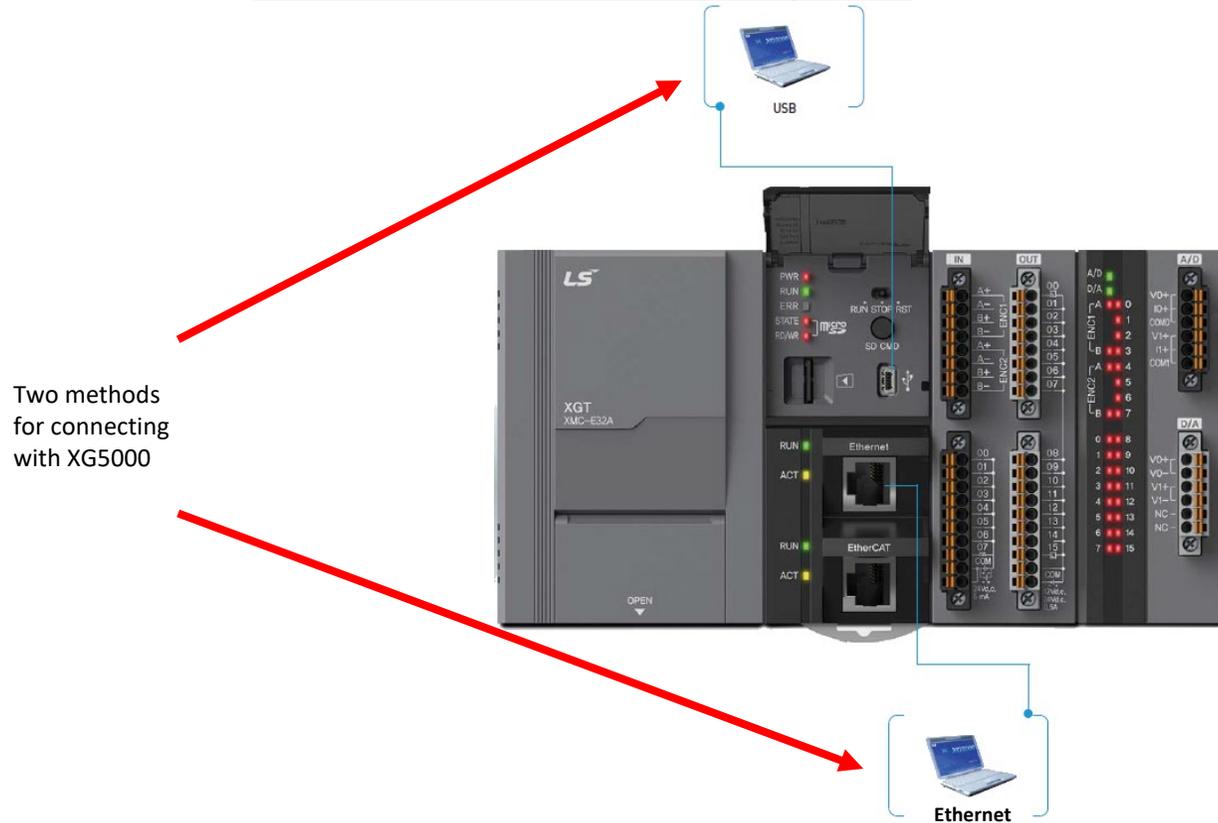
Date Issued

2-17-2025

XMC01 – Getting Connected out of the box USB and Ethernet

- XMCs are programmed in XG5000.
- After mounting and powering it up, a user can connect to it through XG5000 for programming.
- XG5000 can connect to the XMC with a USB series Mini-B cable or an Ethernet cable.
- A USB series mini-B cable will connect to the port under the RUN/STOP Mode Switch and SD CMD button. (Shown Below)
- An ethernet cable will connect to the Ethernet port on the front.
- The EtherCAT port can not be used for programming.

XG5000 XMC Connection Options



Section 1 – USB Connection to XMC

Step 1: Download and Install XG5000 software.

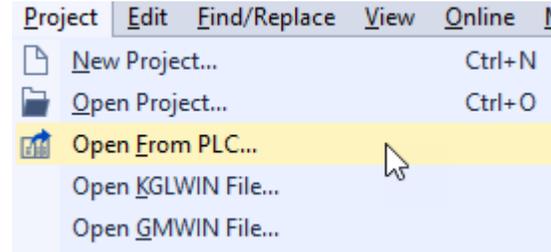
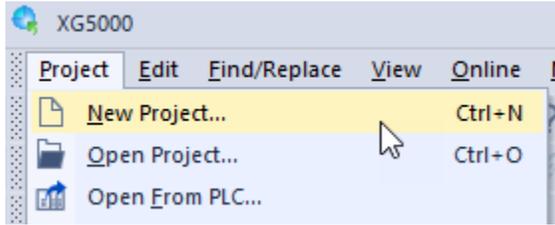


Step 2: Connect Computer with USB series Mini-B cable to the XMC.

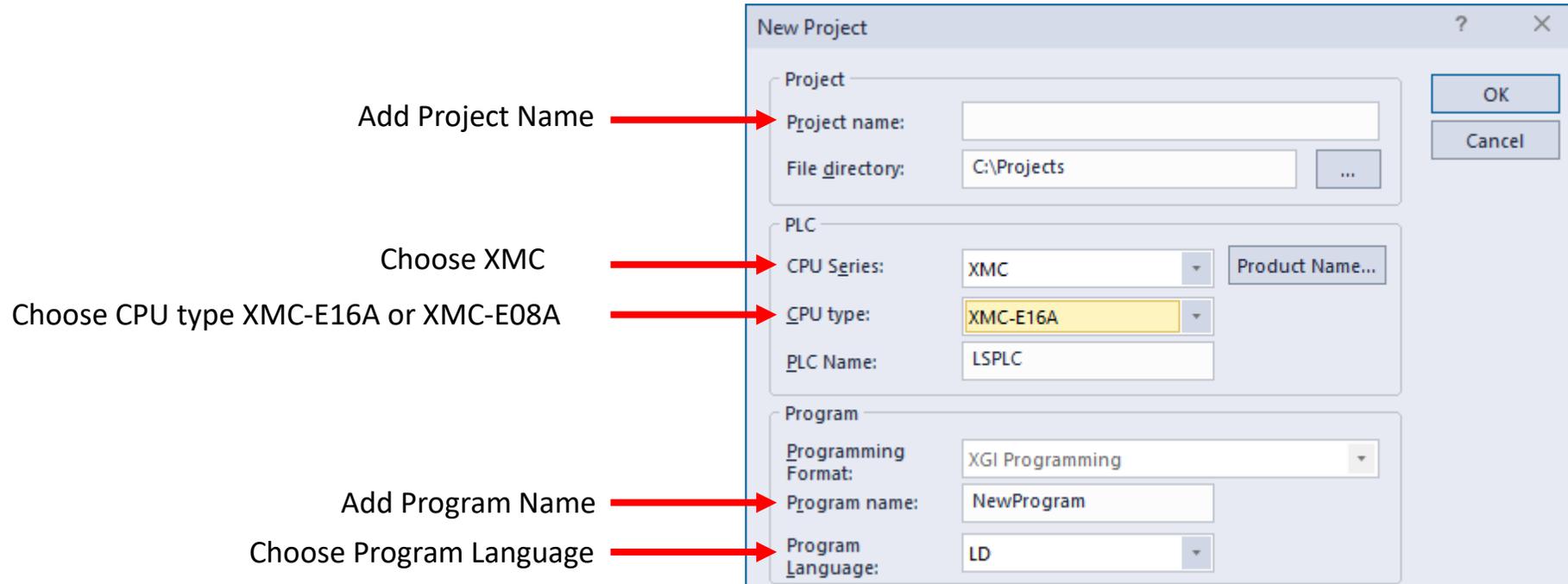


Step 3: Open XG5000. Select Project Menu → New Project.

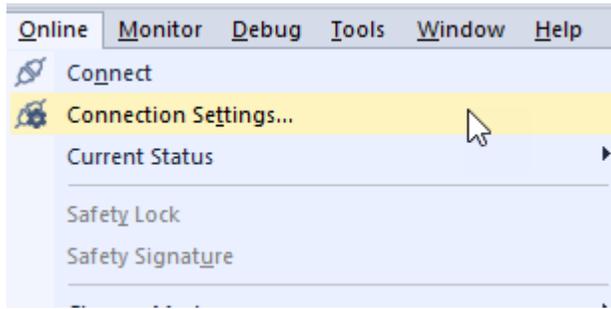
Alternate method is to Select Project Menu → Open From PLC... (Skip to Step 6).



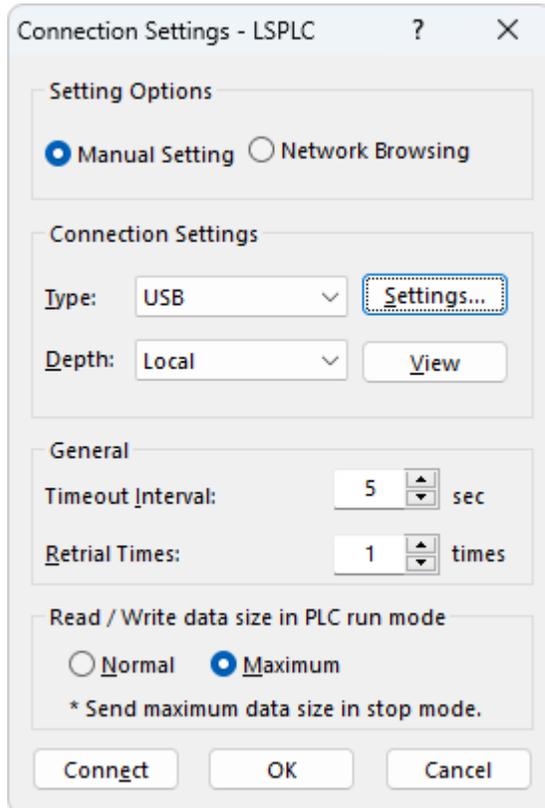
Step 4: Fill in the information for a New Project.



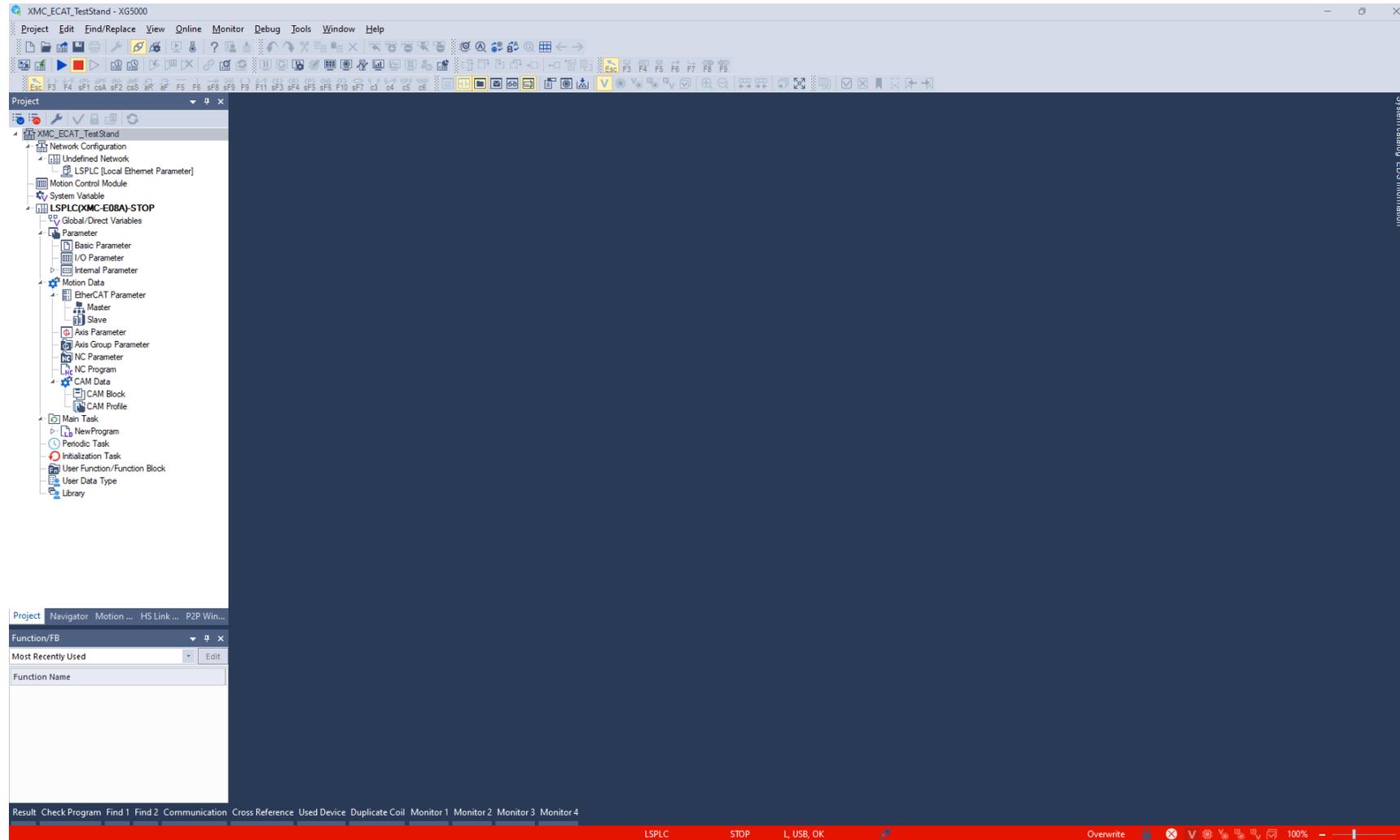
Step 5: Select Online Menu → Connection Settings...



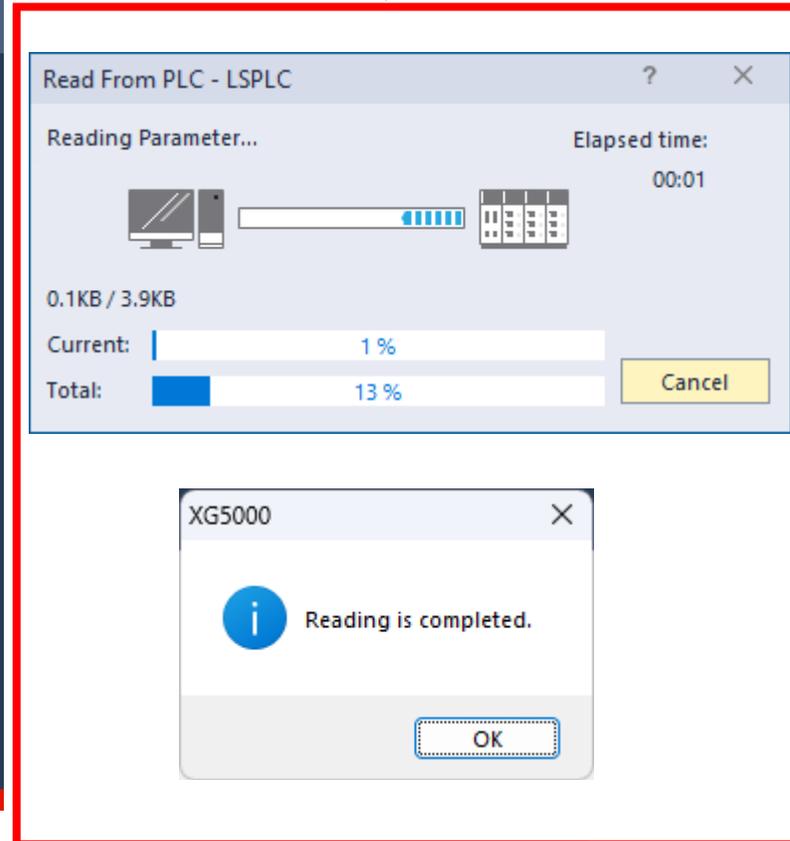
Step 6: Select USB as type. Press the Connect button when ready to connect.



Step 7: XG5000 should display connection status at the bottom part of the software. Example Below.

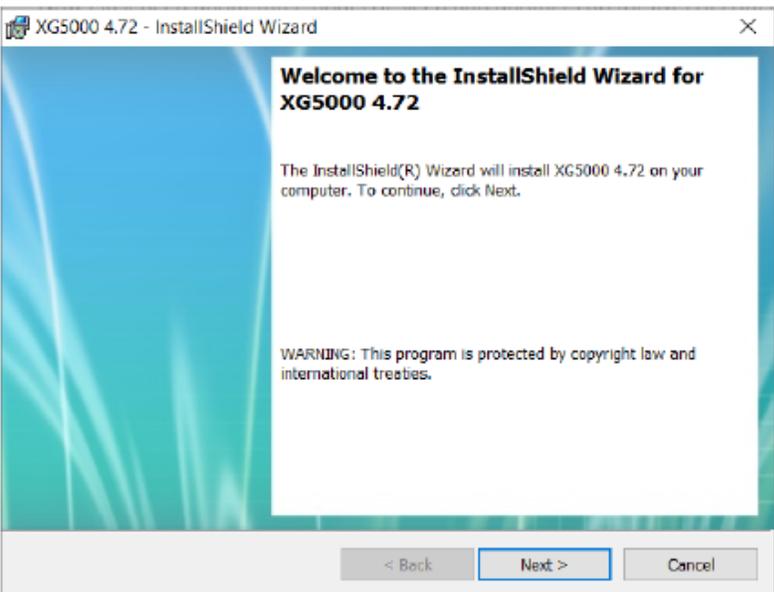


If Using Open From PLC..., These screens will appear before the project is opened and showing connection status.

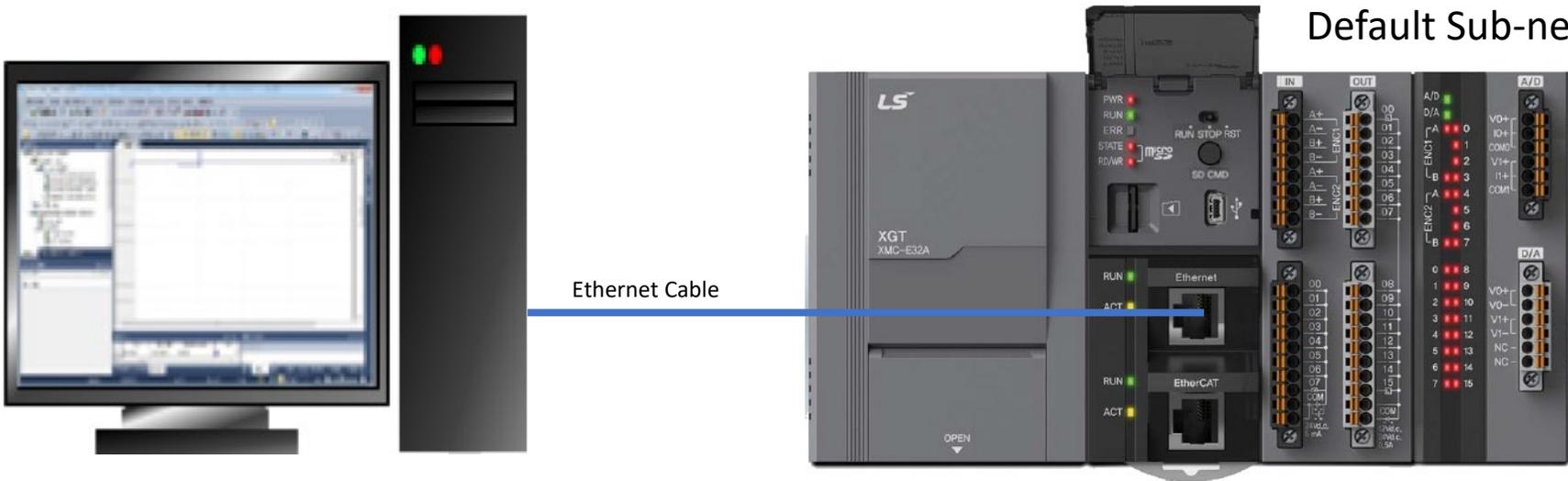


Section 2 – Ethernet Connection to the XMC

Step 1: Download and Install XG5000 software.



Step 2: Connect Computer with Ethernet cable to the XMC.



Note: Default IP address of CPU is 192.168.250.110
Default Sub-net: 255.255.255.0

Step 3: Change Computer network settings to be on the same sub-net range as the XMC.

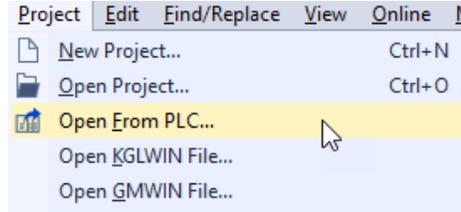
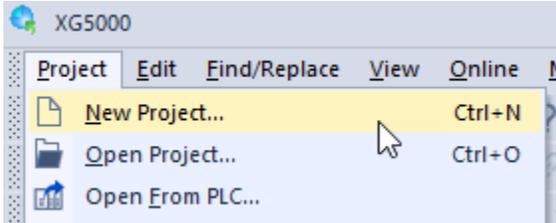
Note: If you can not change the IP address setup on your PC, try the USB connection.

Example: Set PC IP Address to 192.168.250.101

Set PC Sub-net to 255.255.255.0

Step 4: Open XG5000. Select Project Menu → New Project.

Alternate method is to Select Project Menu → Open From PLC... (Skip to Step 7).



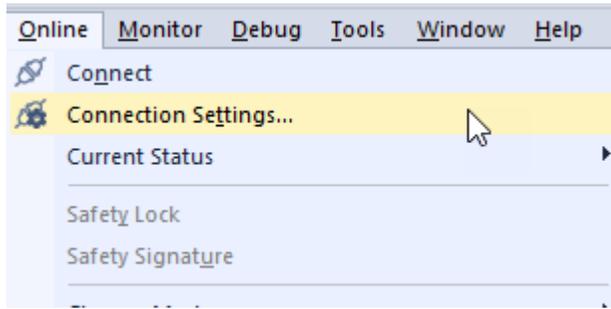
Step 5: Fill in the information for a New Project.

A screenshot of the 'New Project' dialog box in XG5000. The dialog is divided into three sections: 'Project', 'PLC', and 'Program'. Red arrows point from text labels on the left to specific fields in the dialog:

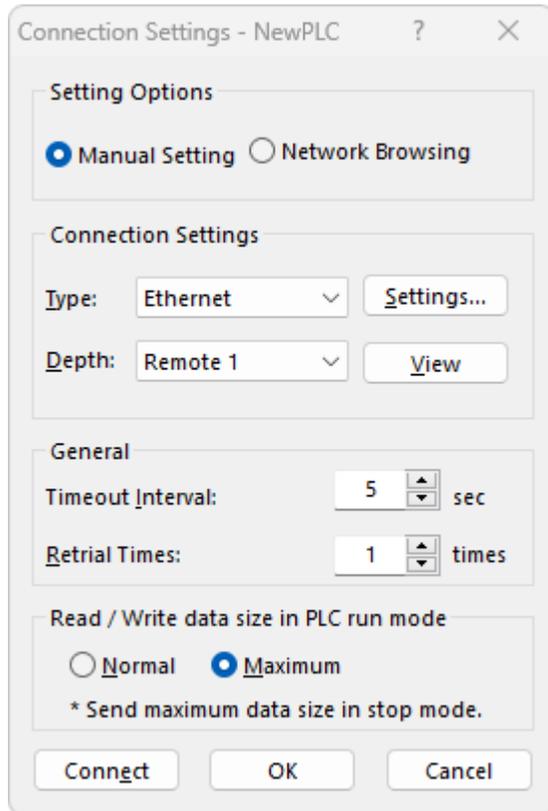
- 'Add Project Name' points to the 'Project name:' text box.
- 'Choose XMC' points to the 'CPU Series:' dropdown menu, which is set to 'XMC'.
- 'Choose CPU type XMC-E16A or XMC-E08A' points to the 'CPU type:' dropdown menu, which is set to 'XMC-E16A'.
- 'Add Program Name' points to the 'Program name:' text box, which contains 'NewProgram'.
- 'Choose Program Language' points to the 'Program Language:' dropdown menu, which is set to 'LD'.

Other fields include 'File directory:' (C:\Projects), 'PLC Name:' (LSPLC), and 'Programming Format:' (XGI Programming). 'OK' and 'Cancel' buttons are on the right.

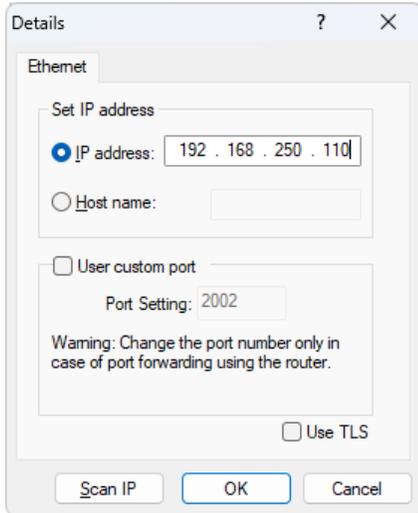
Step 6: Select Online Menu → Connection Settings...



Step 7: Select Ethernet as type. Press the Settings... Button to enter IP address information.

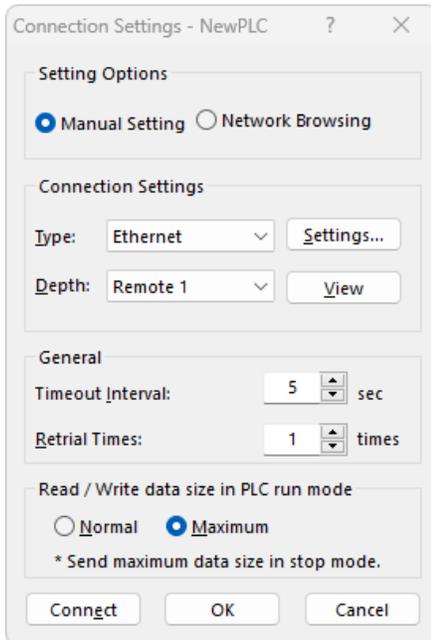


Step 8: Enter the default IP address of 192.168.250.110 in the IP address field. Press OK when done.



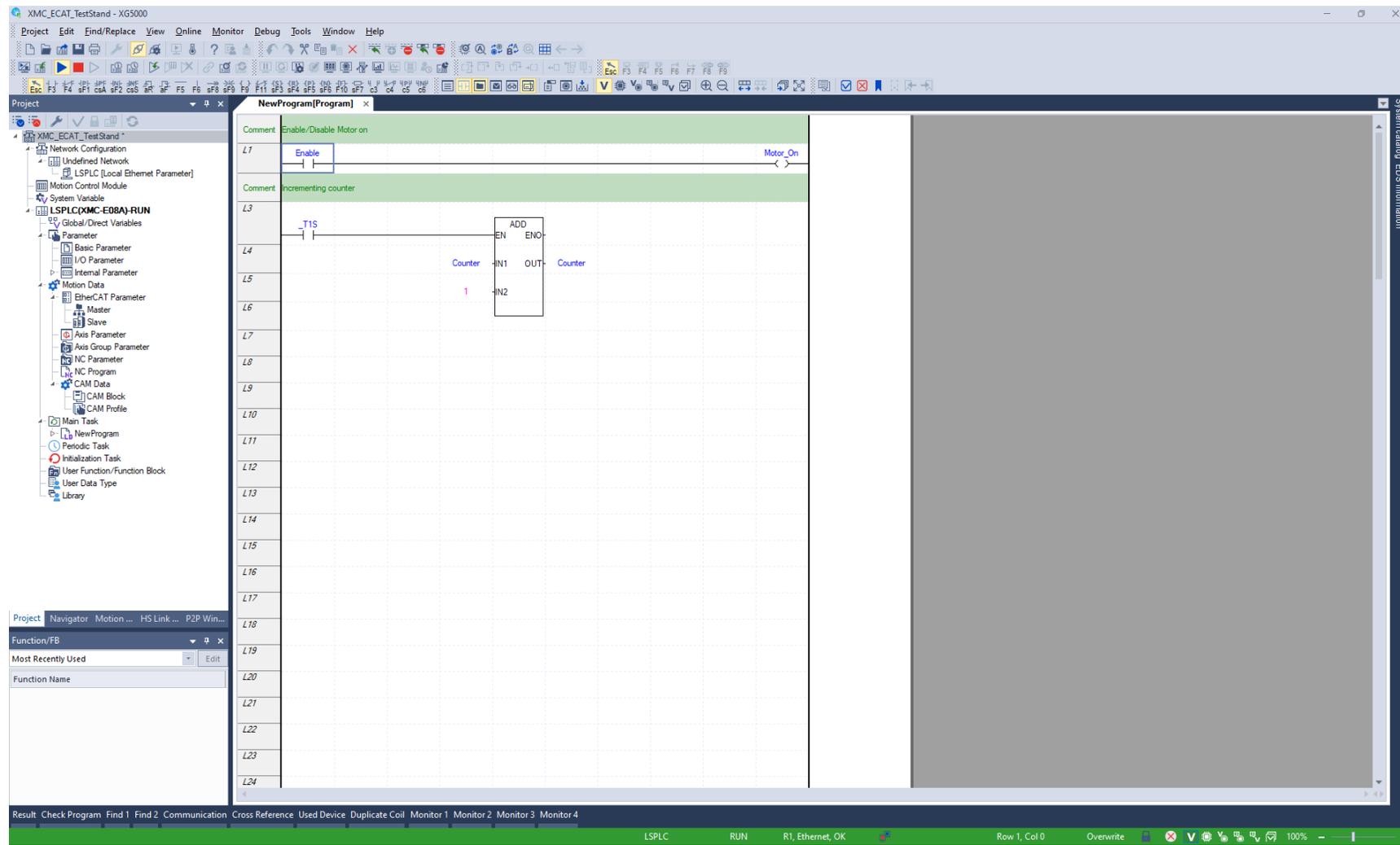
The screenshot shows a dialog box titled "Details" with a close button (X) and a help button (?). The "Ethernet" section is active. Under "Set IP address", the "IP address" radio button is selected, and the text field contains "192 . 168 . 250 . 110". The "Host name" radio button is unselected. Below, the "User custom port" checkbox is unselected, and the "Port Setting" field contains "2002". A warning message reads: "Warning: Change the port number only in case of port forwarding using the router." At the bottom, there is a "Use TLS" checkbox (unselected) and three buttons: "Scan IP", "OK", and "Cancel".

Step 9: Press Connect button to connect to XMC CPU.

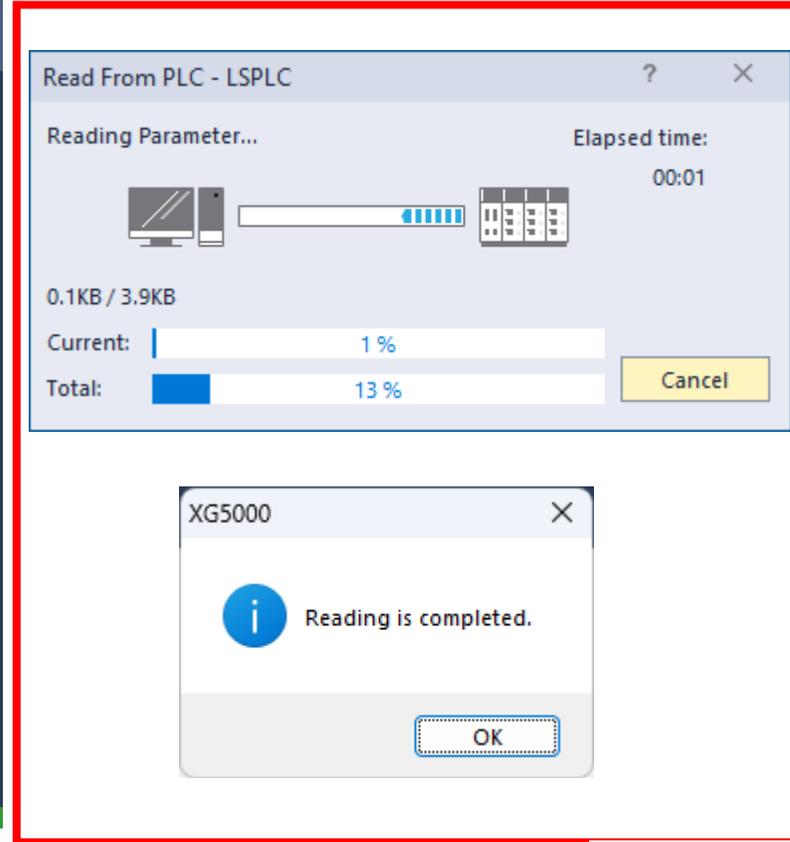


The screenshot shows a dialog box titled "Connection Settings - NewPLC" with a close button (X) and a help button (?). The "Setting Options" section has "Manual Setting" selected. The "Connection Settings" section has "Type" set to "Ethernet" (with a "Settings..." button) and "Depth" set to "Remote 1" (with a "View" button). The "General" section has "Timeout Interval" set to "5" seconds and "Retrial Times" set to "1" times. The "Read / Write data size in PLC run mode" section has "Maximum" selected. A note below reads: "* Send maximum data size in stop mode." At the bottom, there are three buttons: "Connect", "OK", and "Cancel".

Step 10: XG5000 should display connection status at the bottom part of the software. Example Below.



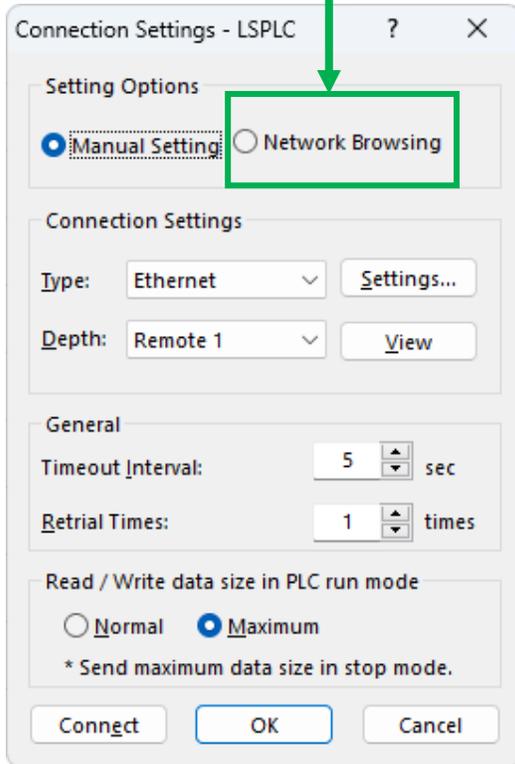
If Using Open From PLC..., These screens will appear before the project is opened and showing connection status.



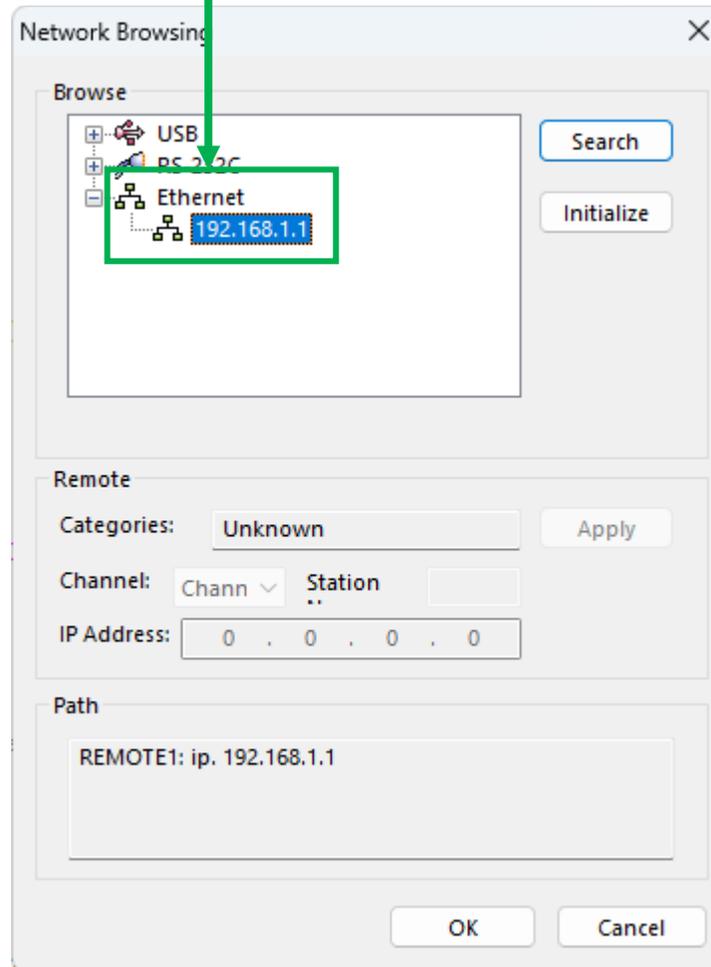
Section 2.1 – Using Network Browsing to find IP Address of XMC CPU

Network Browsing can be used to find the IP address of an XMC. Connection settings can be found in Online Menu -> Connection Settings.

Select Network Browsing to open a new window.

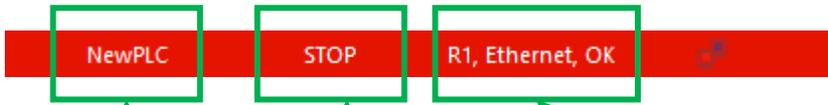


Expand Ethernet Section to see the IP address of any XMC that is found.



Section 3 – Online Status Bar

XG5000 software displays various information in the Online Status Bar.



↑
This is the name
in the project.

↑
Current mode of
the XMC.

↙
Current Connection Settings
to the XMC.



← Color will change for RUN mode versus STOP mode.

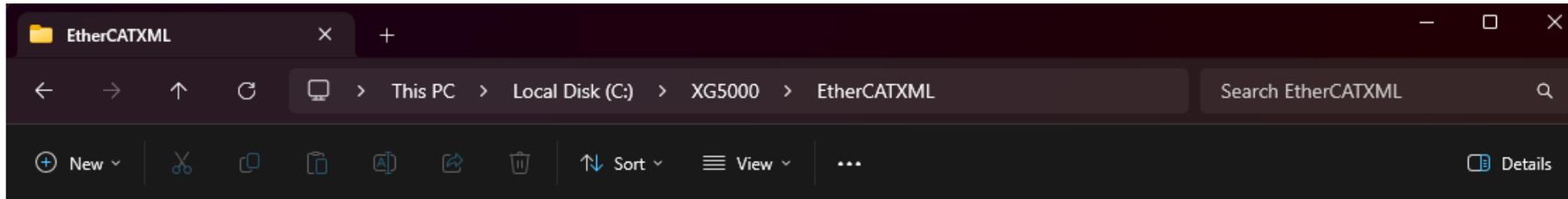
XMC02 – Adding ESI Files to XG5000 for Non-LS Devices

- The information for an EtherCAT slave is defined in the EtherCAT Slave Information (ESI) file.
- This file must be supplied by the manufacturer of the device.
- XG5000 can read the ESI file to configure communication settings for the XMC to connect with the EtherCAT slave.
- The EtherCAT slave must support the version of the ESI file being used.

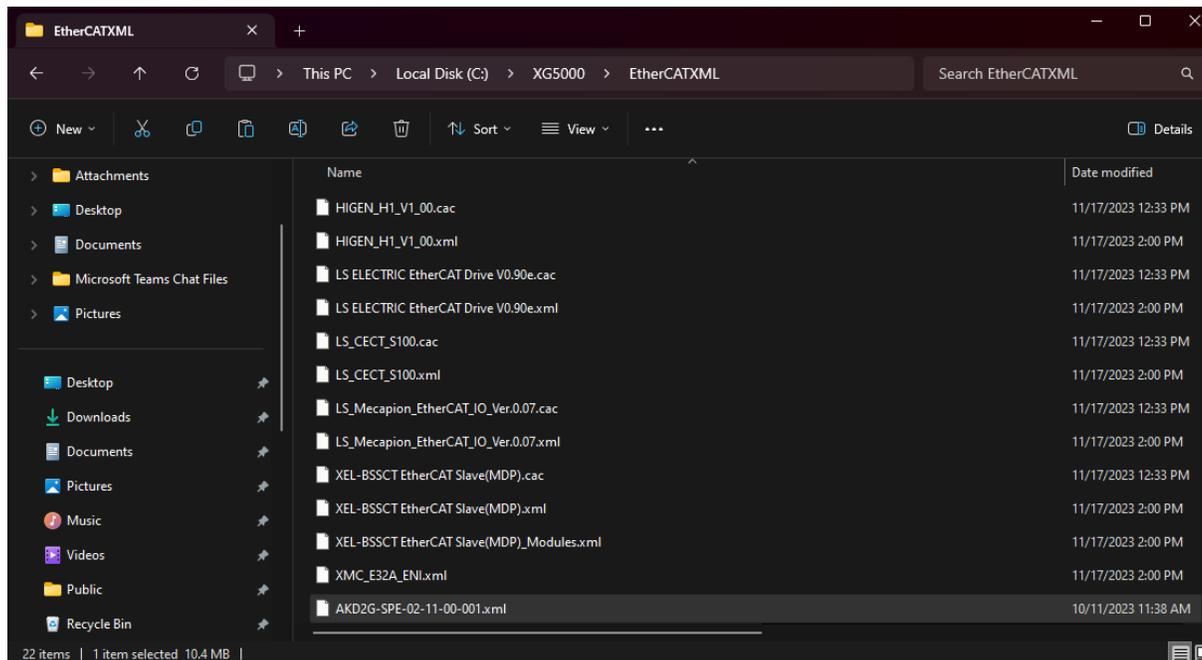
Section 1 – Adding ESI file to XG5000

Step 1: Close all Instances of XG5000 and download the ESI file for your device.

Step 2: Open a Windows Explorer and navigate to C:\XG5000\EtherCATXML.

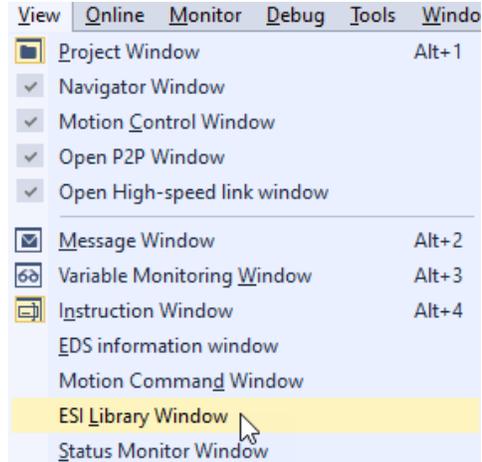


Step 3: Copy your device's ESI file to C:\XG5000\EtherCATXML. This example shows copying an ESI file for a Kollmorgen AKD2G.

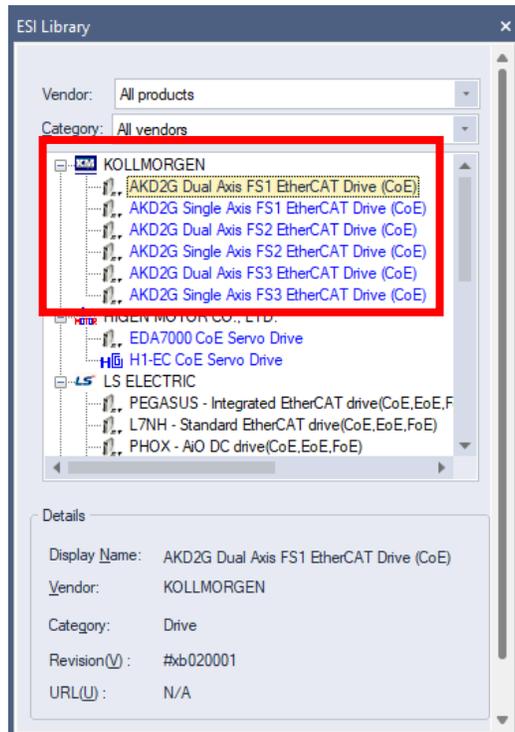


Step 4: Open your XMC project in XG5000.

Step 5: Select View Menu -> ESI Library Window



Step 6: The EtherCAT slave should appear in the ESI Library window. This device can now be added to the XMC project.



XMC03 – Adding Slaves to an XMC Project

- There are two ways to add slaves to an XMC project.
- They can be added manually or by using Auto-Connect.
- Manually adding slaves doesn't require slaves to be powered on or connected to the EtherCAT master.
- ESI files for non-LS Electric devices need to be added prior to manually adding that device.
- This example shows adding some LS Electric iX7NH Servo Drives to your project.

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Section 1 – Manually Adding a Slave to Your Project

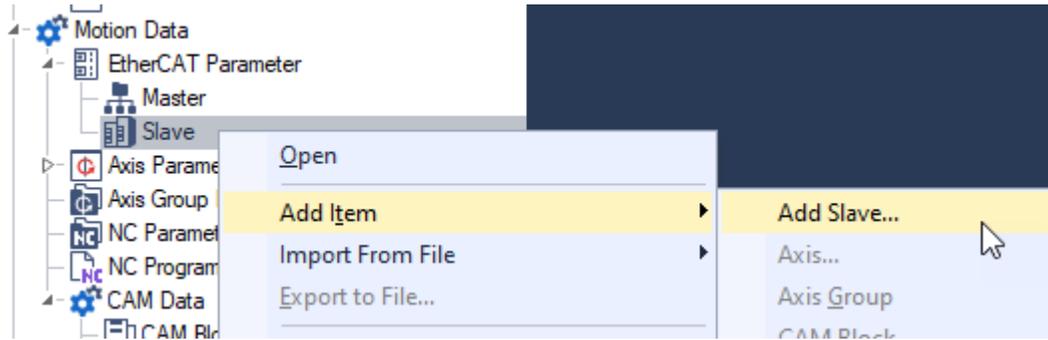
Section 2 – Automatically Adding Slaves to Your Project using Auto-Connect

Section 3 – Changing EtherCAT Cycle time

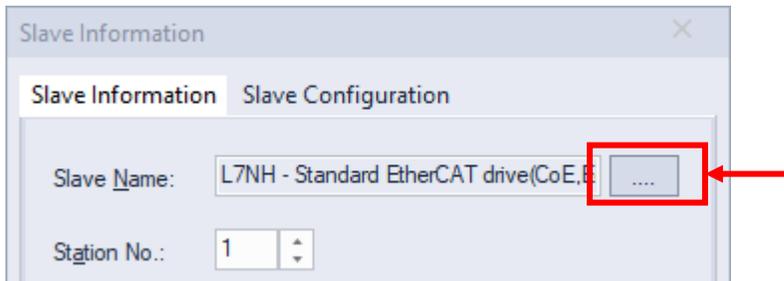


Section 1 – Manually Adding a Slave to Your Project

Step 1: In the Project Window, Right click on Slave under EtherCAT Parameter Section. Select Add item - > Add Slave...

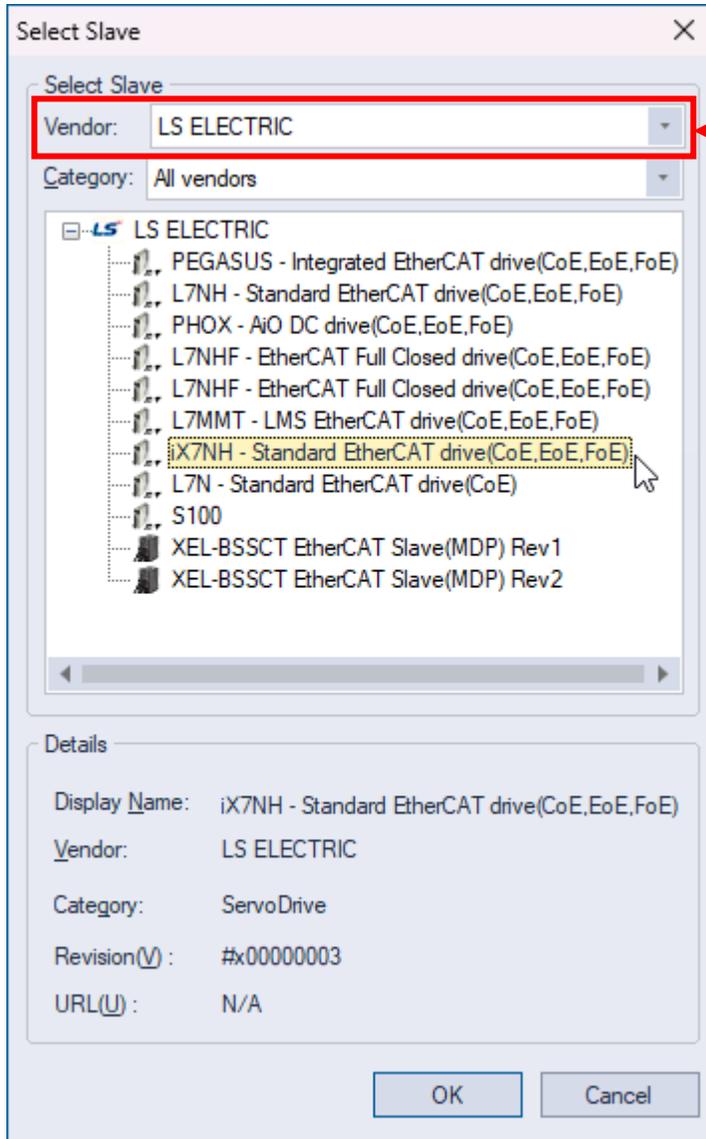


Step 2: Press the '...' button next to the Slave Name property.



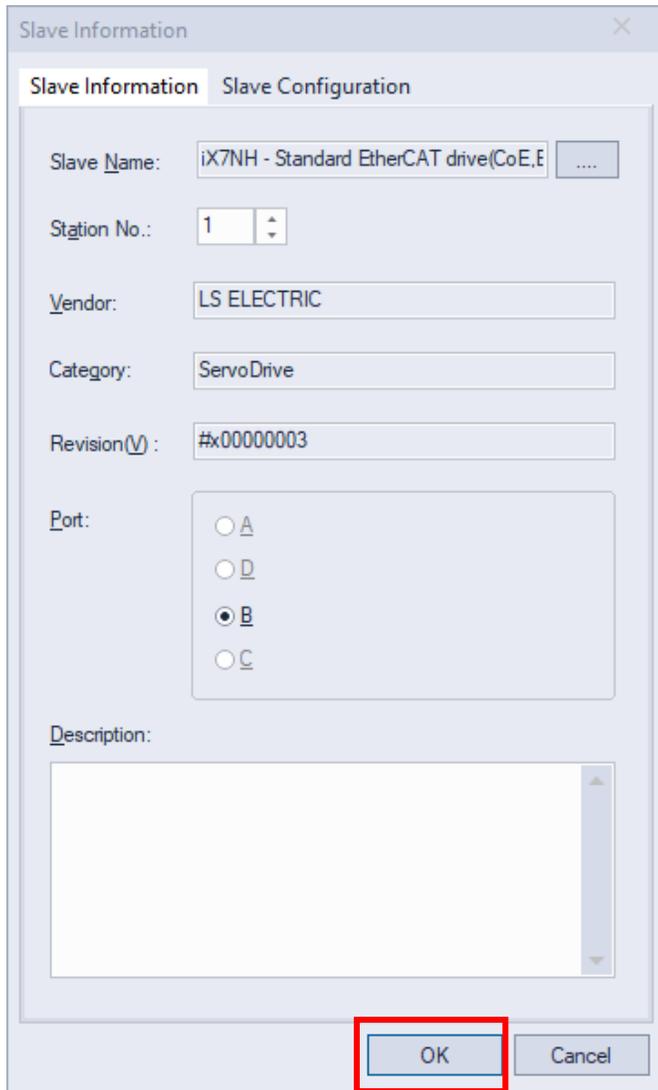
Step 3: Select Your device from the pop-up screen. Press OK when done.

Note: Vendor can be changed to find non-LS Electric devices.



Select Vendor if using a non-LS Electric device.

Step 4: Press OK on the Slave information screen to add the slave to the project.



The image shows a 'Slave Information' dialog box with two tabs: 'Slave Information' and 'Slave Configuration'. The 'Slave Information' tab is active. It contains the following fields:

- Slave Name: iX7NH - Standard EtherCAT drive(CoE,E) [.....]
- Station No.: 1 [↑ ↓]
- Vendor: LS ELECTRIC
- Category: ServoDrive
- Revision(V): #x00000003
- Port: A, D, B, C
- Description: [Empty text area]

At the bottom, there are 'OK' and 'Cancel' buttons. The 'OK' button is highlighted with a red rectangle.

Slave gets added to the Project Window. If the slave is a servo drive, stepper drive, or a compatible AC Drive, an Axis will automatically be assigned to the slave.



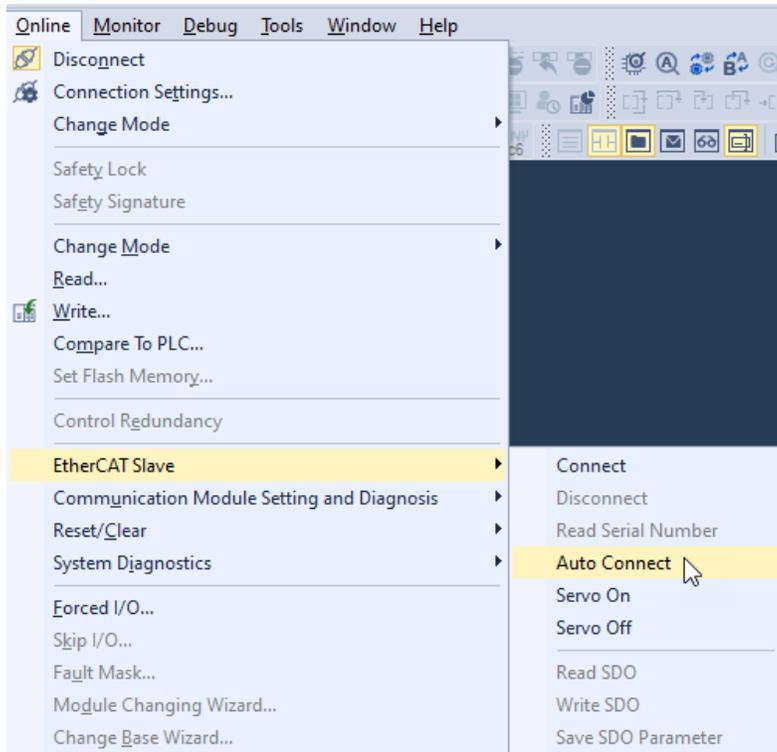
Step 5: Repeat Steps 1 thru 4 for any additional slave devices.

Section 2 – Automatically Adding Slaves to Your Project using Auto-Connect

Step 1: Connect to the XMC with your XG5000 project. Put the XMC into STOP Mode.

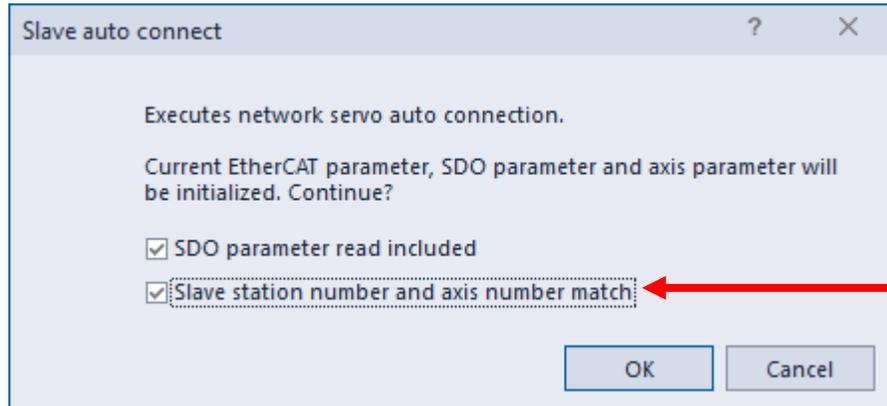


Step 2: Select Online Menu -> EtherCAT Slave -> Auto Connect



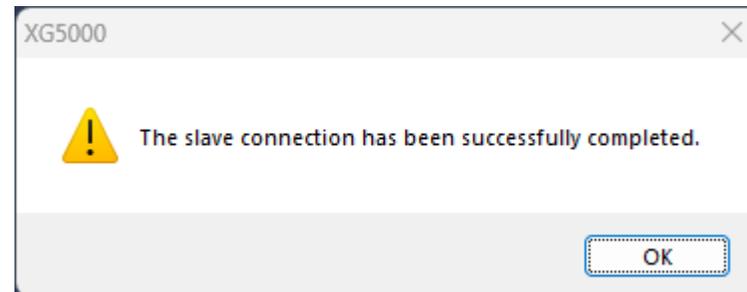
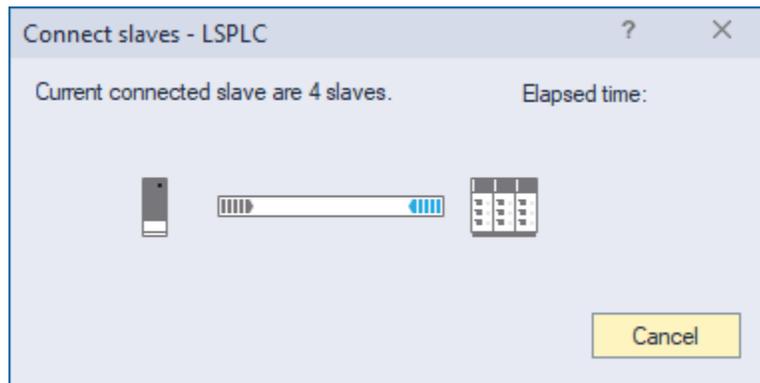
Step 3: Select the SDO parameter read included option to read the SDO object from the devices.

Select 'Slave station number and axis number match' if you want the Axis numbers for the slave servo devices to match the drive node number (station number).



XMC-E08A: Slave Node number (station number) must be between 1-8.
XMC-16A: Slave Node number (station number) must be between 1-16.

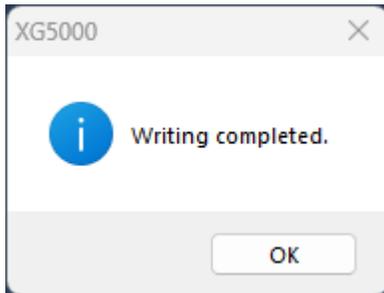
Step 4: XG5000 will show the read status. Press OK on the status screen when reading is done.



Step 5: Press OK to set axis number to slave drive node number if that option was selected. Skip if that option was not selected.



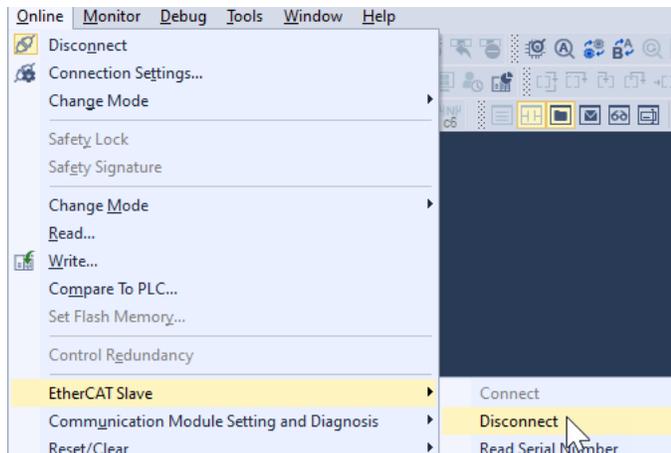
Step 6: Press OK on Writing Complete screen.



Slaves are added to the project. Axes are automatically assigned if the slave is a servo drive, stepper drive, or compatible AC drive.

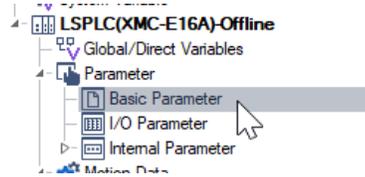


Step 7: This method will automatically connect the EtherCAT network. Go to Online Menu -> EtherCAT Slave -> Disconnect to disconnect the EtherCAT network. This will allow you to write the project to the XMC when you are ready for that.

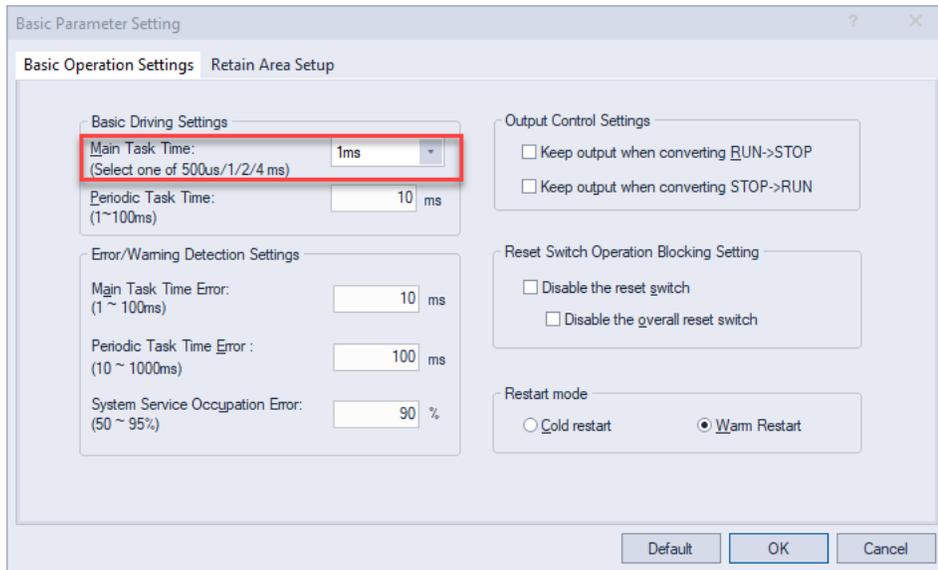


Section 3 – Changing EtherCAT Cycle Time

Step 1: Double Click Basic Parameter in the Project Window.



Step 2: Select the Main Task time for the application. .5ms/1ms/2ms/4ms are available.

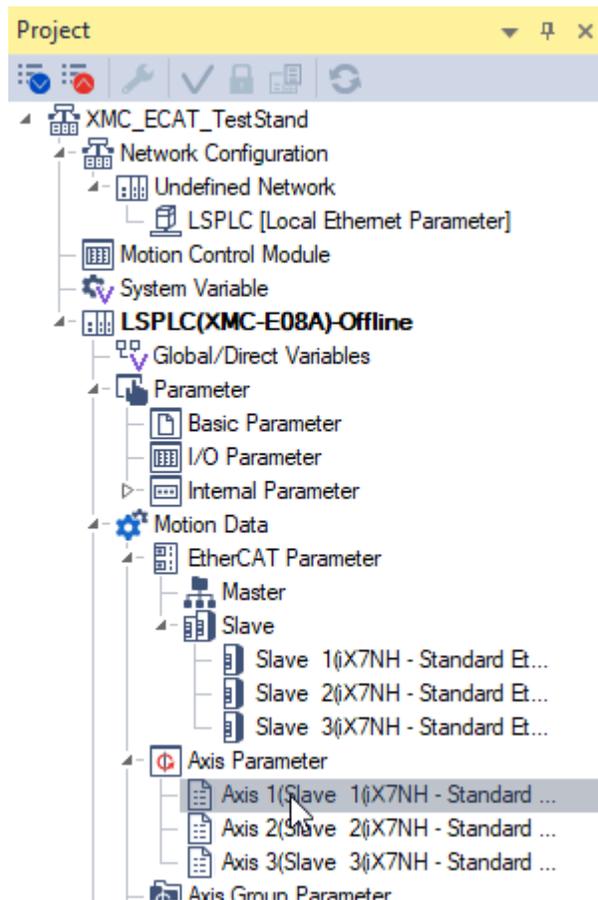


XMC04 – Configuring Axis Parameters

- After adding motion based EtherCAT slaves, the axes associated with those slaves must be configured.
- These parameters should be configured for your specific application.
- XMC User Manual 5.1.3 contains more details about configuring axis parameters. Search for '(5) Axis parameter' for quick access

Section 1 – Opening Axis Parameters.

In the Project Window, Double Click on any Axis in the Axis Parameter Section. This will open the Axis parameters for all assigned axes.



Group	Name	Axis 1	Axis 2	Axis 3
Basic Settings	Unit	0: pulse	0: pulse	0: pulse
	Pulse/Rev Value	524288 pls	524288 pls	524288 pls
	Travel distance per rotation	10 pls	10 pls	10 pls
	Speed command unit	0: Unit/sec	0: Unit/sec	0: Unit/sec
	Speed limit	20000000 pls/s	20000000 pls/s	20000000 pls/s
	Emg. stop deceleration	0 pls/s2	0 pls/s2	0 pls/s2
	Encoder selection	0: Incremental encoder	0: Incremental encoder	0: Incremental encoder
	Gear ratio of Motor side	1	1	1
	Gear ratio of Machine side	1	1	1
	Operating mode of the reverse rotation	0: Deceleration stop	0: Deceleration stop	0: Deceleration stop
	Position Control range expansion	0: No	0: No	0: No
	Velocity control operation mode	0: CSP (Cyclic Sync. Position)	0: CSP (Cyclic Sync. Position)	0: CSP (Cyclic Sync. Position)
	Maximum Allowable Acceleration Of Coordinate System Operation	0	0	0
	Maximum Allowable Deceleration Of Coordinate System Operation	0	0	0
	Extended Settings	S/W upper limit	2147483647 pls	2147483647 pls
S/W lower limit		-2147483648 pls	-2147483648 pls	-2147483648 pls
Infinite running repeat pos		360 pls	360 pls	360 pls
Infinite running repeat		0: Disable	0: Disable	0: Disable
Command in-position range		0 pls	0 pls	0 pls
Tracking error over-range value		0 pls	0 pls	0 pls
Tracking error level		0: Warning	0: Warning	0: Warning
Current pos. compensation amount		0 pls	0 pls	0 pls
Current speed filter time constant		0 ms	0 ms	0 ms
Error reset monitoring time		100 ms	100 ms	100 ms
S/W limit during speed control		0: Do not detect	0: Do not detect	0: Do not detect
Override mode		0: Specified by ratio	0: Specified by ratio	0: Specified by ratio
The sync method depending on the direction of master axis operation		0: Sync to bi-direction operation of master axis	0: Sync to bi-direction operation of master axis	0: Sync to bi-direction operation of master axis
JOG high speed		100000 pls/s	100000 pls/s	100000 pls/s
JOG low speed		10000 pls/s	10000 pls/s	10000 pls/s
JOG acceleration	100000 pls/s2	100000 pls/s2	100000 pls/s2	
JOG deceleration	100000 pls/s2	100000 pls/s2	100000 pls/s2	
JOG jerk	0 pls/s3	0 pls/s3	0 pls/s3	
Backlash compensation	0	0	0	
Drive Absolute Position Error Detection	0: No Detection	0: No Detection	0: No Detection	
NC Spindle Axis Setup	Spindle encoder	0: No	0: No	0: No
	Pulse per Revolution of Spindle EtherCAT encoder	8192 pls	8192 pls	8192 pls
	Variable/Address of Spindle EtherCAT encoder position	%ID0	%ID0	%ID0
	P gain for Spindle Position mode	30 Hz	30 Hz	30 Hz
NC Spindle Origin Settings	Spindle Position Mode Feed Forward Gain	0 %	0 %	0 %
	Home position driving method	0: Server Drive Support	0: Server Drive Support	0: Server Drive Support
	Origin driving switch navigation speed	60 rpm	60 rpm	60 rpm
	Origin driving zero navigation speed	12 rpm	12 rpm	12 rpm
	Origin driving Acc/deceleration	1000 deg/s2	1000 deg/s2	1000 deg/s2
	Z-phase variable/address	%IX0	%IX0	%IX0
NC Spindle Control Settings	Orientation speed	60 rpm	60 rpm	60 rpm
	Orientation direction	0: Forward	0: Forward	0: Forward
	Orientation offset	0 deg	0 deg	0 deg
	Spindle command speed ack. range	95 %	95 %	95 %
Spindle zero speed ack. rpm	5 rpm	5 rpm	5 rpm	

Section 2 – Basic Settings

Group	Name	Axis 1
Basic Settings	Unit	0: pulse
	Pulse/Rev Value	524288 pls
	Travel distance per rotation	10 pls
	Speed command unit	0: Unit/sec
	Speed limit	20000000 pls/s
	Emg. stop deceleration	0 pls/s ²
	Encoder selection	0: Incremental encoder
	Gear ratio of Motor side	1
	Gear ratio of Machine side	1
	Operating mode of the reverse rotation	0: Deceleration stop
	Position Control range expansion	0: No
	Velocity control operation mode	0: CSP (Cyclic Sync. Position)
	Maximum Allowable Acceleration Of Coordinate System Operation	0
	Maximum Allowable Deceleration Of Coordinate System Operation	0

- ← Axis Number for parameters in the column.
- ← Unit can be set to pulse, mm, inch, or degree.
- ← Set the number of motor pulses for 1 revolution.
- ← If unit is mm, inch or degree, set the amount of distance traveled per 1 revolution of the motor.
- ← Set speed command to unit/sec, unit/min, or rpm.
- ← Set max speed of the Axis.
- ← Set to Emergency Stop deceleration rate.
- ← Choose if Encoder on the motor is incremental or absolute.
- ← Gear ratio values are available if using unit of mm, inch, or degree.
- ← Choose the stopping method for a command that reverses the direction of motion.
NO: Position Control Range will be a 32-bit integer value.
Use: Position Control Range will be a 48-bit integer value.
- ← CSP: Cyclic Synchronous Position Control mode (This is default and should work for most applications)
CSV: Cyclic Synchronous Velocity Control Mode

Section 3 – Extended Settings

Extended Settings

S/W upper limit	2147483647 pls
S/W lower limit	-2147483648 pls
Infinite running repeat pos	360 pls
Infinite running repeat	0: Disable
Command in-position range	0 pls
Tracking error over-range value	0 pls
Tracking error level	0: Warning
Current pos. compensation amount	0 pls
Current speed filter time constant	0 ms
Error reset monitoring time	100 ms
S/W limit during speed control	0: Do not detect
Override mode	0: Specified by ratio
The sync method depending on the direction of master axis operation	0: Sync to bi-direction operation of master axis
JOG high speed	100000 pls/s
JOG low speed	10000 pls/s
JOG acceleration	100000 pls/s ²
JOG deceleration	100000 pls/s ²
JOG jerk	0 pls/s ³
Backlash compensation	0
Drive Absolute Position Error Detection	0: No Detection

Set Software upper position limit.

Set Software lower position limit.

Ring mode position value.

Enable ring mode position on the axis.

Set the range for the in position signal to be on. *Note

Set the range for tracking position deviation error *Note

Set the behavior for a position deviation error. Warning or Servo alarm are the options.

Set the current position compensation amount. *Note

Set Speed filter time constant. *Note

0: Ignores software position limits in speed control. 1: Software position limits are enforced in speed control.

Set Jogging Parameters

Set Backlash compensation amount if applicable to your system. *Note

*Note: These parameters can be default for many applications.

Section 4 – Using Engineering Units for an Axis Position

- XG5000 allows an axis to be configured to use engineering units such as millimeters, inches and degrees.
- The Axis parameter configuration is very similar between the three different unit types.
- XG5000 function blocks use the engineering units as inputs with the value range of LREAL.
- LREAL value range: 2.2250738585072e-308 ~ 1.79769313486232e+308

Example Using millimeter Units

- This example will cover setting up an axis to move an Igus Drylin series ZLW1040S-2 linear actuator.
- The servo drive will be an iX7NH drive and the motor connected to a 5:1 LS Electric gear box.
- The ZLW1040S-2 has a 70 mm pitch which means every revolution of the input shaft move the actuator mounting plate 70 mm.

Group	Name	Axis 1	
Basic Settings	Unit	1: mm	← Set to the unit for your application. This example will use mm
	Pulse/Rev Value	524288 pls	← Set to the number of motor pulses per one revolution. This is the typical value for iX7 and APMC motors.
	Travel distance per rotation	70 mm	← For our example this will be the pitch of the linear actuator.
	Speed command unit	0: Unit/sec	
	Speed limit	100 mm/s	← Set the Speed limit of the system. This should be configured to prevent damage to the system.
	Emg. stop deceleration	0 mm/s ²	
	Encoder selection	0: Incremental encoder	
	Gear ratio of Motor side	5	} 5:1 gear box will mean the motor needs to move 5 revolutions to move the gear box shaft 1 revolution.
	Gear ratio of Machine side	1	
	Operating mode of the reverse rotation	0: Deceleration stop	
	Position Control range expansion	0: No	
	Velocity control operation mode	0: CSP (Cyclic Sync. Position)	
	Maximum Allowable Acceleration Of Coordinate System Operation	0	
	Maximum Allowable Deceleration Of Coordinate System Operation	0	

Extended Settings

S/W upper limit	200 mm
S/W lower limit	0 mm
Infinite running repeat pos	360 mm
Infinite running repeat	0: Disable
Command in-position range	0 mm
Tracking error over-range value	0 mm
Tracking error level	0: Warning
Current pos. compensation amount	0 mm
Current speed filter time constant	0 ms
Error reset monitoring time	100 ms
S/W limit during speed control	0: Do not detect
Override mode	0: Specified by ratio
The sync method depending on the direction of master axis operation	0: Sync to bi-direction operation of master axis
JOG high speed	100 mm/s
JOG low speed	10 mm/s
JOG acceleration	10000 mm/s ²
JOG deceleration	10000 mm/s ²
JOG jerk	0 mm/s ³
Backlash compensation	0
Drive Absolute Position Error Detection	0: No Detection

← Actuator has a 200 mm travel limit.

← Since upper limit is set to 200 mm, we set lower limit to 0 mm.

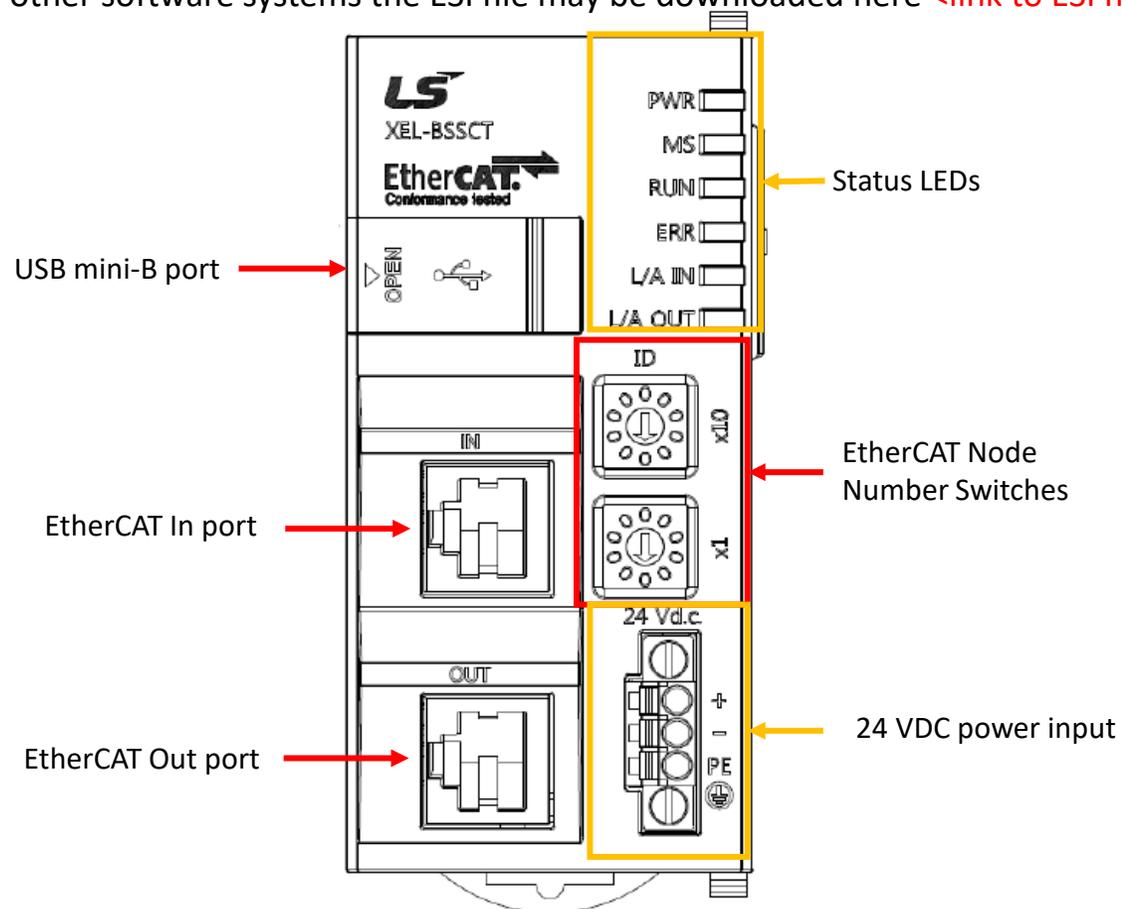
Configure JOG parameters to be valid for your system.

XMC05 – XMC EtherCAT Remote I/O with XEL-BSSCT

- The XMC support I/O expansion with EtherCAT bus couplers.
- Automation Direct offers the XEL-BSSCT as an EtherCAT bus coupler.
- This topic will cover adding remote I/O to the XMC using the XEL-BSSCT.

Section 1 – XEL-BSSCT Layout

- The XEL-BSSCT is an EtherCAT bus coupler that uses XGB I/O modules.
- An XG5000 program is used to configure the XEL-BSSCT and which I/O modules are connected to it.
- XG5000 automatically contains the ESI file for the XEL-BSSCT.
- For other software systems the ESI file may be downloaded here [<link to ESI file>](#)



Section 1.1 – XEL-BSSCT Status LEDs

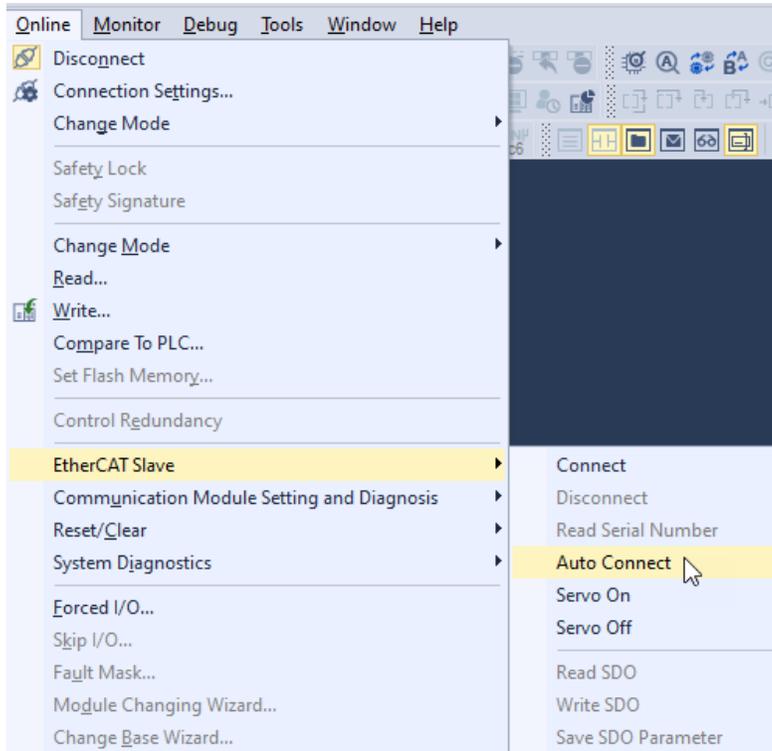
Name	Color	Status	Normal/Error	Operation by status	
PWR	Red	Off	-	Power Off	
		On	-	Power On	
RUN	Green	Off	-	INIT status	
		Blinking	-	PRE-OP status	
		Single Flash	-	SAFE-OP status	
		Flickering	-	Initialization or BOOTSTRAP status	
		On	-	OP status	
MS	Red/Green	Green	On	-	RUN mode
			Off	-	Error has caused STOP mode or operation is not available.
		Red	On	Error	Unrecoverable error has occurred
			1s Flickering	Warning	Recoverable error has occurred
			500ms Flickering	Light error	Error that has no effect on operation has occurred
			100ms Flickering	Critical error	Critical error that is halting operation has occurred
ERR	Red	Off	-	No error	
		Blinking	Error	General setting error such as register or object setting, or invalid H/W setting	
		Single Flash	Error	The EtherCAT state cannot be changed to OP due to a local error.	
		Double Flash	Error	Occurrence of sync manager watchdog timeout	
		Flickering	Error	Booting error	
		On	Error	Hardware failure has occurred.	
L/A IN	Green	Off	-	No connection to the Master.	
		On	-	Connection to the Master has been established but there is no communication.	
		Flickering	-	Connection to the Master has been established and there is communication.	
L/A OUT	Green	Off	-	No connection to the Master.	
		On	-	Connection to the Master has been established but there is no communication.	
		Flickering	-	Connection to the Master has been established and there is communication.	

Section 2 – Performing Auto-Connect to Add the Bus Coupler to your Project

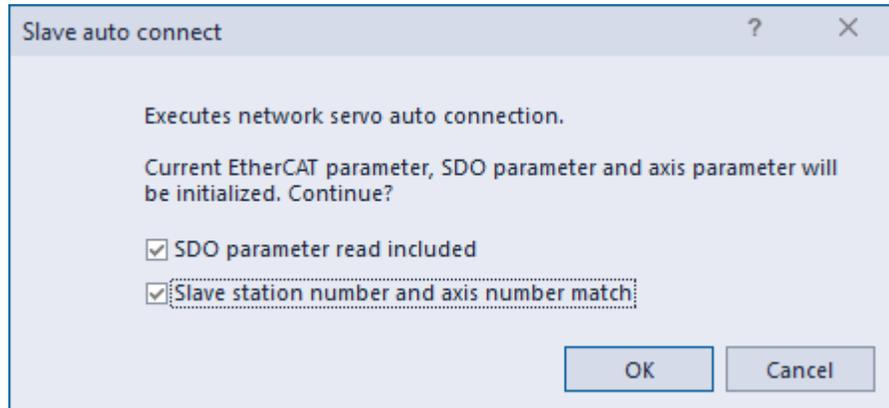
- Set a unique node number to the XEL-BSSCT with the rotary switches.
- Connect the EtherCAT network from the XMC port to the IN port of the XEL-BSSCT.

Step 1: Connect to the XMC with an XG5000 project.

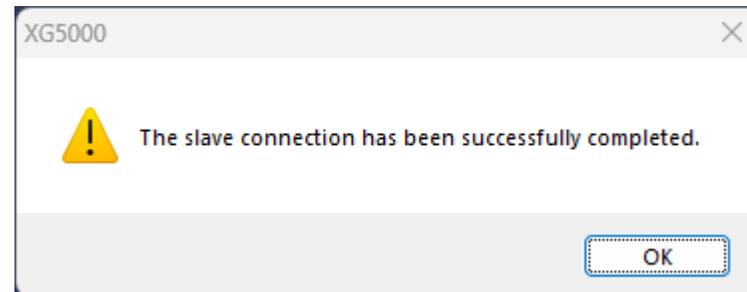
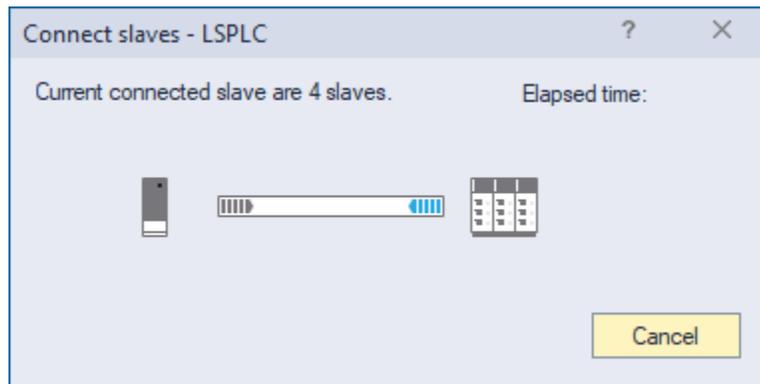
Step 2: Select Online Menu -> EtherCAT Slave -> Auto Connect



Step 3: Select the SDO parameter read included option to read the SDO object from the devices.



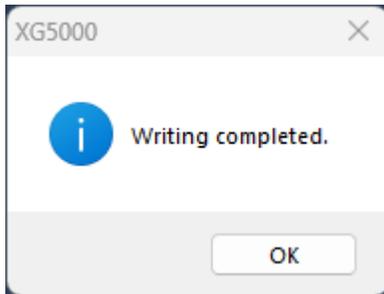
Step 4: XG5000 will show the read status. Press OK on the status screen when reading is done.



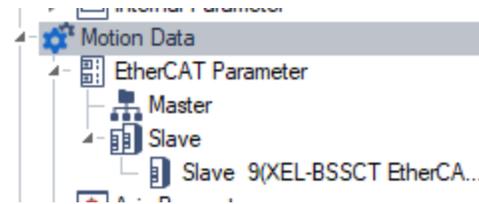
Step 5: Press OK to set axis number to slave drive node number if that option was selected. Skip if that option was not selected.



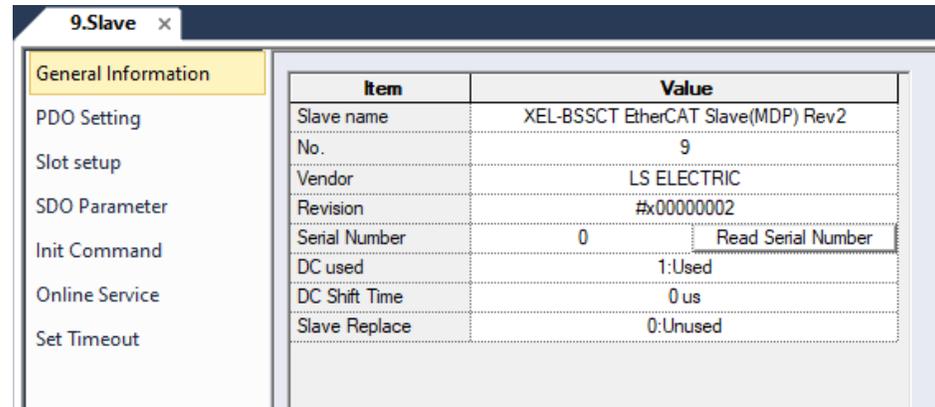
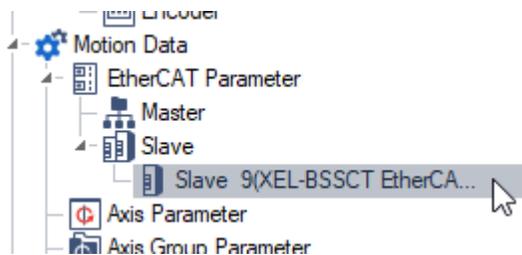
Step 6: Press OK on Writing Complete screen.



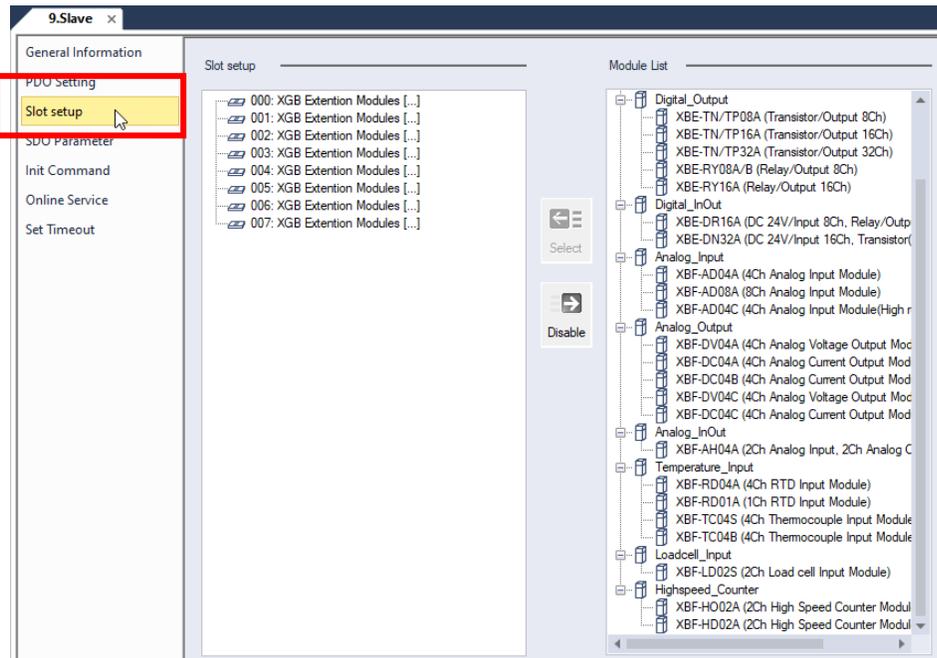
XEL-BSSCT will be added to the project.



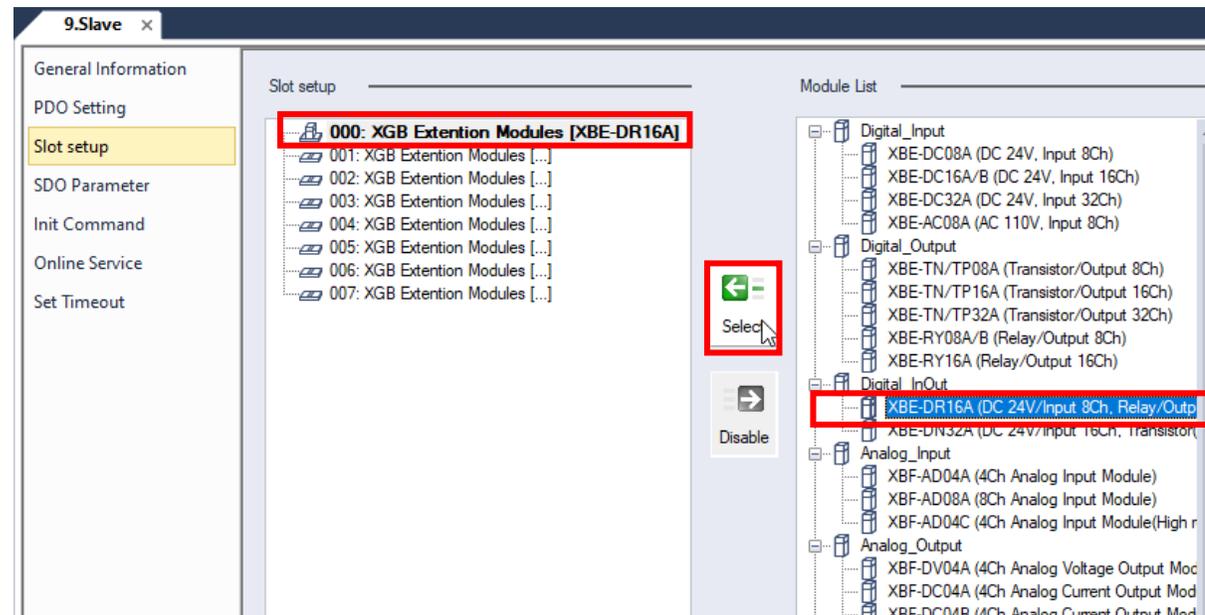
Step 7: Double Click on the XEL-BSSCT in the Slave section to open the configuration screen.



Step 8: Click 'Slot Setup' to setup the I/O modules on the XEL-BSSRT.



Step 9: Add your modules by selecting the Module Slot then selecting the module in the Module List and pressing the Left Arrow with label 'Select'.



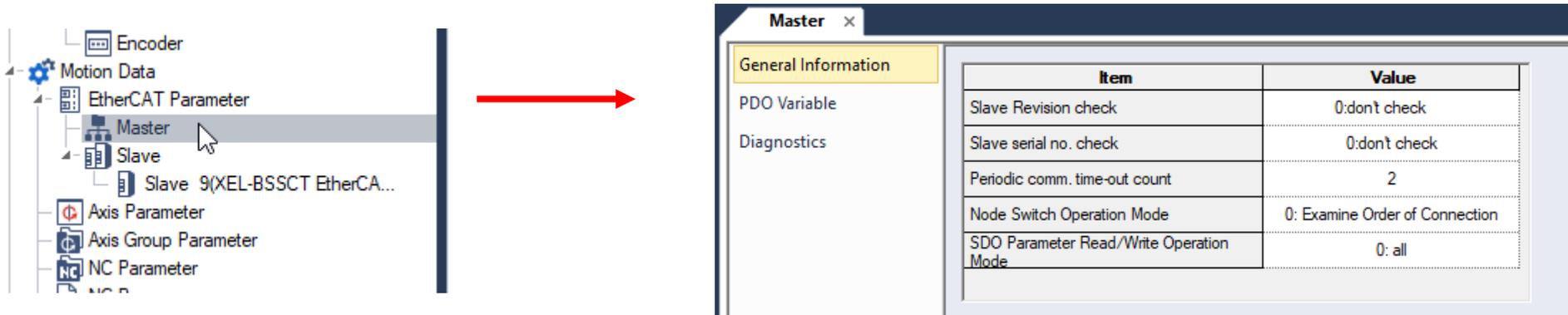
Step 10: Write your program to the XMC.



Section 3 – I/O Device Address Locations

- The direct variable addresses for the I/O configured can be found in the Master section of the EtherCAT Parameter section.
- The PDO Variable section will contain the device addresses and variable names to access the data.
- This screen can also be used to force I/O to certain values while in monitor mode.
- The variable names will start with _ECxxx where 'xxx' is the slave node number.

Step 1: Open the Master Section of the EtherCAT Parameters.



The image shows a software interface with a tree view on the left and a main panel on the right. The tree view includes 'Encoder', 'Motion Data', 'EtherCAT Parameter', 'Master', 'Slave', 'Slave 9(XEL-BSSCT EtherCA...', 'Axis Parameter', 'Axis Group Parameter', and 'NC Parameter'. A red arrow points from the 'Master' node in the tree to the 'Master' section of the main panel. The main panel has a tab labeled 'Master' and a left sidebar with 'General Information', 'PDO Variable', and 'Diagnostics'. The 'General Information' section is active and displays a table with the following data:

Item	Value
Slave Revision check	0:don't check
Slave serial no. check	0:don't check
Periodic comm. time-out count	2
Node Switch Operation Mode	0: Examine Order of Connection
SDO Parameter Read/Write Operation Mode	0: all

Step 2: Click 'PDO Variable' to see the I/O address list.

Master x

General Information

PDO Variable

Diagnostics

Format: HEX Variable setting

Send PDO initiator device: %IW64

Receive PDO initiator device: %QW64 %MX0 => %MW0.0 Displayed In Format

Used Frame: [Usage: 3 %, Frames: 1 / 4]

Station number	Rx/Tx	Object index	Object Name	Variable	Type	Device	Monitor value
1	Rx	0x1680	1. Rx PDO parameter			%QB128	
2				_EC009_RxPDO_1680_0_DC_SYNC_COUNT_CLR	BOOL	%QX1024	
3				_EC009_RxPDO_1680_1_Padding	ARRAY[0..14] OF BOOL	%QX1025	
4		0x1600	2. Rx PDO parameter			%QB130	
5				_EC009_SL000_RxPDO_1600_0_DO_0	BOOL	%QX1040	
6				_EC009_SL000_RxPDO_1600_1_DO_1	BOOL	%QX1041	
7				_EC009_SL000_RxPDO_1600_2_DO_2	BOOL	%QX1042	
8				_EC009_SL000_RxPDO_1600_3_DO_3	BOOL	%QX1043	
9				_EC009_SL000_RxPDO_1600_4_DO_4	BOOL	%QX1044	
10				_EC009_SL000_RxPDO_1600_5_DO_5	BOOL	%QX1045	
11				_EC009_SL000_RxPDO_1600_6_DO_6	BOOL	%QX1046	
12				_EC009_SL000_RxPDO_1600_7_DO_7	BOOL	%QX1047	
13				_EC009_SL000_RxPDO_1600_8_Padding	USINT	%QB131	
14		0x1601	3. Rx PDO parameter			%QB132	
15				_EC009_SL001_RxPDO_1601_0_DA0_Output_Enable	BOOL	%QX1056	
16				_EC009_SL001_RxPDO_1601_1_DA1_Output_Enable	BOOL	%QX1057	
17				_EC009_SL001_RxPDO_1601_2_Padding	ARRAY[0..13] OF BOOL	%QX1058	
18				_EC009_SL001_RxPDO_1601_3_DA0_Digital_Input_Data	INT	%QW67	
19				_EC009_SL001_RxPDO_1601_4_DA1_Digital_Input_Data	INT	%QW68	
20	Tx	0x1A80	1. Tx PDO parameter			%IB120	
21				_EC009_TxPDO_1A80_0_RUN	BOOL	%IX1024	
22				_EC009_TxPDO_1A80_1_ERROR	BOOL	%IX1025	
23				_EC009_TxPDO_1A80_2_IO_TYER	BOOL	%IX1026	
24				_EC009_TxPDO_1A80_3_IO_DEER	BOOL	%IX1027	
25				_EC009_TxPDO_1A80_4_IO_RWER	BOOL	%IX1028	
26				_EC009_TxPDO_1A80_5_IP_IFER	BOOL	%IX1029	
27				_EC009_TxPDO_1A80_6_BPRM_ER	BOOL	%IX1030	
28				_EC009_TxPDO_1A80_7_IOPRM_ER	BOOL	%IX1031	
29				_EC009_TxPDO_1A80_8_SPPRM_ER	BOOL	%IX1032	
30				_EC009_TxPDO_1A80_9_CPPRM_ER	BOOL	%IX1033	
31				_EC009_TxPDO_1A80_10_SWDT_ER	BOOL	%IX1034	
32				_EC009_TxPDO_1A80_11_IOSIZE_ER	BOOL	%IX1035	
33				_EC009_TxPDO_1A80_12_REFRESH_OT_WAR	BOOL	%IX1036	
34				_EC009_TxPDO_1A80_13_Padding	ARRAY[0..2] OF BOOL	%IX1037	
35				_EC009_TxPDO_1A80_14_EXT_ERR_FLAG_0SLT	BOOL	%IX1040	
36				_EC009_TxPDO_1A80_15_EXT_ERR_FLAG_1SLT	BOOL	%IX1041	
37				_EC009_TxPDO_1A80_16_EXT_ERR_FLAG_2SLT	BOOL	%IX1042	
38				_EC009_TxPDO_1A80_17_EXT_ERR_FLAG_3SLT	BOOL	%IX1043	
39				_EC009_TxPDO_1A80_18_EXT_ERR_FLAG_4SLT	BOOL	%IX1044	
40				_EC009_TxPDO_1A80_19_EXT_ERR_FLAG_5SLT	BOOL	%IX1045	
41				_EC009_TxPDO_1A80_20_EXT_ERR_FLAG_6SLT	BOOL	%IX1046	
42				_EC009_TxPDO_1A80_21_EXT_ERR_FLAG_7SLT	BOOL	%IX1047	
43				_EC009_TxPDO_1A80_22_Padding	USINT	%IB131	

Outputs are assigned to the RxPDO parameters.

Digital Output variable and device addresses

Analog Output variable and device addresses

	Station number	Rx/Tx	Object index	Object Name	Variable	Type	Device	Monitor value
	32				_EC009_TxPDO_1A80_11_IOSIZE_ER	BOOL	%IX1035	
	33				_EC009_TxPDO_1A80_12_REFRESH_OT_WAR	BOOL	%IX1036	
	34				_EC009_TxPDO_1A80_13_Padding	ARRAY[0..2] OF BOOL	%IX1037	
	35				_EC009_TxPDO_1A80_14_EXT_ERR_FLAG_0SLT	BOOL	%IX1040	
	36				_EC009_TxPDO_1A80_15_EXT_ERR_FLAG_1SLT	BOOL	%IX1041	
	37				_EC009_TxPDO_1A80_16_EXT_ERR_FLAG_2SLT	BOOL	%IX1042	
	38				_EC009_TxPDO_1A80_17_EXT_ERR_FLAG_3SLT	BOOL	%IX1043	
	39				_EC009_TxPDO_1A80_18_EXT_ERR_FLAG_4SLT	BOOL	%IX1044	
	40				_EC009_TxPDO_1A80_19_EXT_ERR_FLAG_5SLT	BOOL	%IX1045	
	41				_EC009_TxPDO_1A80_20_EXT_ERR_FLAG_6SLT	BOOL	%IX1046	
	42				_EC009_TxPDO_1A80_21_EXT_ERR_FLAG_7SLT	BOOL	%IX1047	
	43				_EC009_TxPDO_1A80_22_Padding	USINT	%IB131	
	44				_EC009_TxPDO_1A80_23_REFRESH_MAX	UINT	%IW66	
	45				_EC009_TxPDO_1A80_24_REFRESH_MIN	UINT	%IW67	
	46				_EC009_TxPDO_1A80_25_REFRESH_CUR	UINT	%IW68	
	47			0x1A00	2. Tx PDO parameter		%IB138	
	48				EC009_SL000_TxPDO_1A00_0_DI_0	BOOL	%IX1104	
	49				EC009_SL000_TxPDO_1A00_1_DI_1	BOOL	%IX1105	
	50				EC009_SL000_TxPDO_1A00_2_DI_2	BOOL	%IX1106	
	51				EC009_SL000_TxPDO_1A00_3_DI_3	BOOL	%IX1107	
	52				EC009_SL000_TxPDO_1A00_4_DI_4	BOOL	%IX1108	
	53				EC009_SL000_TxPDO_1A00_5_DI_5	BOOL	%IX1109	
	54				EC009_SL000_TxPDO_1A00_6_DI_6	BOOL	%IX1110	
	55				EC009_SL000_TxPDO_1A00_7_DI_7	BOOL	%IX1111	
	56				_EC009_SL000_TxPDO_1A00_8_Padding	USINT	%IB139	
	57			0x1A01	3. Tx PDO parameter		%IB140	
	58				EC009_SL001_TxPDO_1A01_0_Error_Flag	BOOL	%IX1120	
	59				EC009_SL001_TxPDO_1A01_1_Padding	ARRAY[0..13] OF BOOL	%IX1121	
	60				EC009_SL001_TxPDO_1A01_2_Ready_Flag	BOOL	%IX1135	
	61				EC009_SL001_TxPDO_1A01_3_AD0_Activation_Status	BOOL	%IX1136	
	62				EC009_SL001_TxPDO_1A01_4_AD1_Activation_Status	BOOL	%IX1137	
	63				EC009_SL001_TxPDO_1A01_5_DA0_Activation_Status	BOOL	%IX1138	
	64				EC009_SL001_TxPDO_1A01_6_DA1_Activation_Status	BOOL	%IX1139	
	65				EC009_SL001_TxPDO_1A01_7_AD0_Disconnection_Flag	BOOL	%IX1140	
	66				EC009_SL001_TxPDO_1A01_8_AD1_Disconnection_Flag	BOOL	%IX1141	
	67				EC009_SL001_TxPDO_1A01_9_Padding	ARRAY[0..1] OF BOOL	%IX1142	
	68				EC009_SL001_TxPDO_1A01_10_AD0_Error_Code	BOOL	%IX1144	
	69				EC009_SL001_TxPDO_1A01_11_AD1_Error_Code	BOOL	%IX1145	
	70				EC009_SL001_TxPDO_1A01_12_DA0_Error_Code	BOOL	%IX1146	
	71				EC009_SL001_TxPDO_1A01_13_DA1_Error_Code	BOOL	%IX1147	
	72				EC009_SL001_TxPDO_1A01_14_Padding	ARRAY[0..3] OF BOOL	%IX1148	
	73				EC009_SL001_TxPDO_1A01_15_AD0_Digital_Output_Data	INT	%IW72	
	74				EC009_SL001_TxPDO_1A01_16_AD1_Digital_Output_Data	INT	%IW73	

Inputs are assigned to the TxPDO parameters.

Digital Input variable and device addresses

Analog Input variable and device addresses



Section 4 – I/O Forcing from PDO Variable Screen

- The EtherCAT network must be connected with LS_Connect function block or use Online Menu -> EtherCAT Slave -> Connect.
- With the PDO Variable screen open, Start monitoring from the Monitor menu.

Address	Parameter Name	Property	Variable	Value
0x1600	2. Rx PDO parameter		%QB130	
	_EC009_SL000_RxPDO_1600_0_DO_0	BOOL	%QX1040	0
	_EC009_SL000_RxPDO_1600_1_DO_1	BOOL	%QX1041	0
	_EC009_SL000_RxPDO_1600_2_DO_2	BOOL	%QX1042	0
	_EC009_SL000_RxPDO_1600_3_DO_3	BOOL	%QX1043	0
	_EC009_SL000_RxPDO_1600_4_DO_4	BOOL	%QX1044	0
	_EC009_SL000_RxPDO_1600_5_DO_5	BOOL	%QX1045	0
	_EC009_SL000_RxPDO_1600_6_DO_6	BOOL	%QX1046	0
	_EC009_SL000_RxPDO_1600_7_DO_7	BOOL	%QX1047	0

Double Click to set or force I/O point.

Change Current Value ? X

Name: %QX1040

Type: BOOL

Range: (0 ~ 1)

Set value

Value: 1 [TRUE] 0 [FALSE]

Forced I/O OK Cancel

Address	Parameter Name	Property	Variable	Value
0x1601	3. Rx PDO parameter		%QB132	
	_EC009_SL001_RxPDO_1601_0_DA0_Output_Enable	BOOL	%QX1056	1
	_EC009_SL001_RxPDO_1601_1_DA1_Output_Enable	BOOL	%QX1057	1
	_EC009_SL001_RxPDO_1601_2_Padding	ARRAY[0..13] OF BOOL	%QX1058	
	_EC009_SL001_RxPDO_1601_3_DA0_Digital_Input_Data	INT	%QW67	2000
	_EC009_SL001_RxPDO_1601_4_DA1_Digital_Input_Data	INT	%QW68	3500

Double Click to set or force I/O point.

Change Current Value ? X

Name: %QW67

Type: INT

Range: (-32768 ~ 32767)

Set value

Value:

OK Cancel

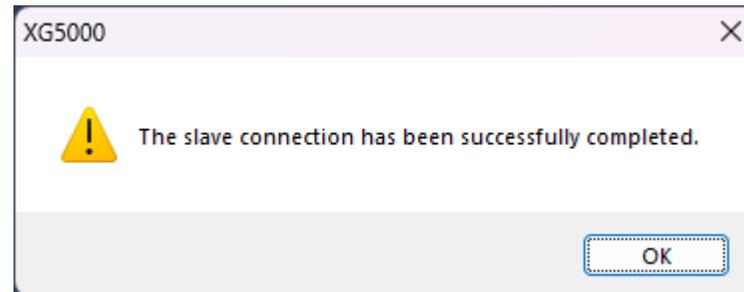
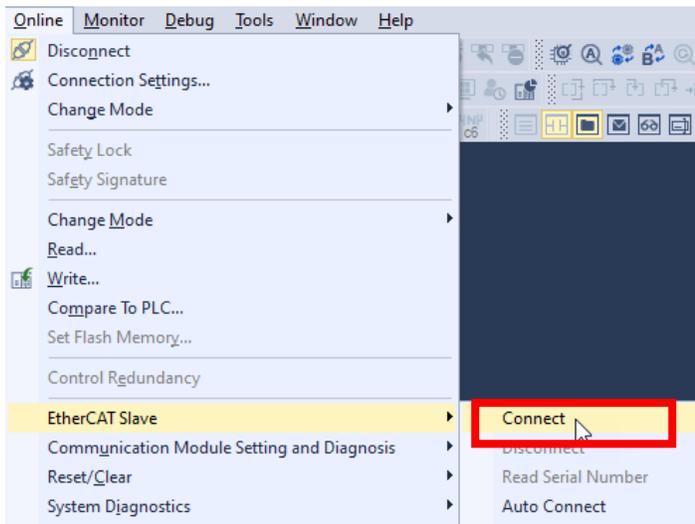
XMC06 – How to Review and Edit the EtherCAT Service Data Object (SDO)

- The EtherCAT Service Data Object (PDO) is used for asynchronous transmission of data between the master and slave nodes.
- The motion controller performs asynchronous service data communication for error information in the slave and parameter reading/writing.
- The EtherCAT Slave Information (ESI) file defines the parameters of the SDO for an EtherCAT slave device.
- XG5000 allows the SDO to be reviewed and modified for your system configuration.

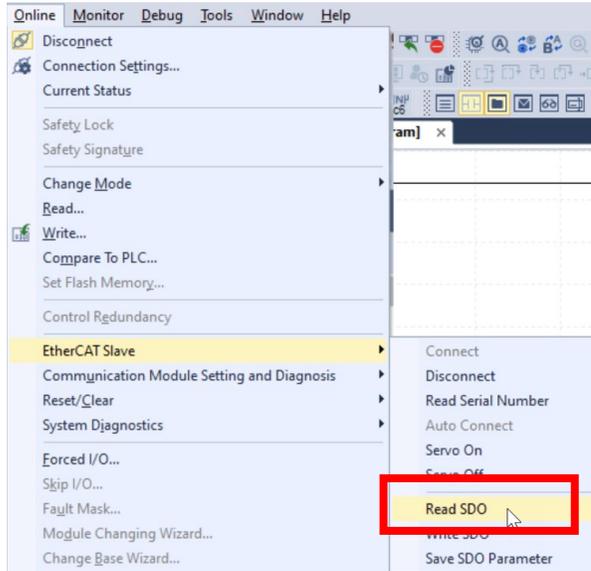
Section 1 - Reading the SDO of a EtherCAT slave

Step 1: Connect to the XMC with XG5000.

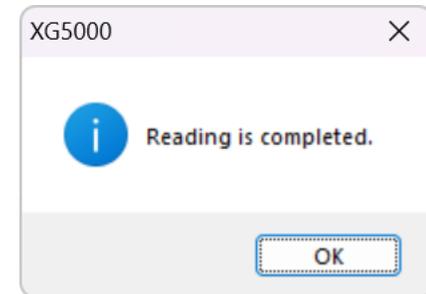
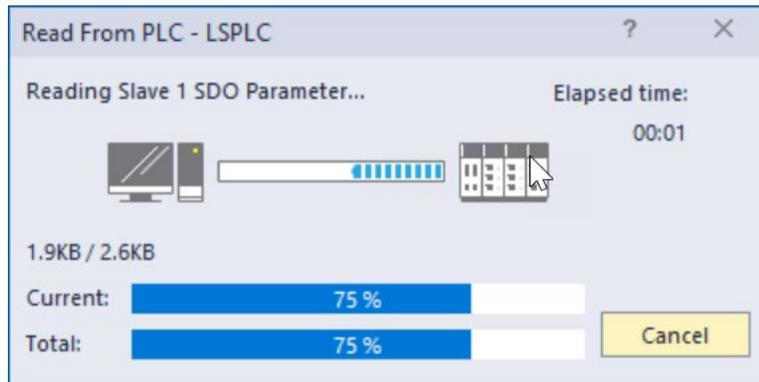
Step 2: Choose Online menu -> EtherCAT Slave -> Connect. This will connect the EtherCAT network.



Step 3: Choose Online menu -> EtherCAT Slave -> Read SDO.

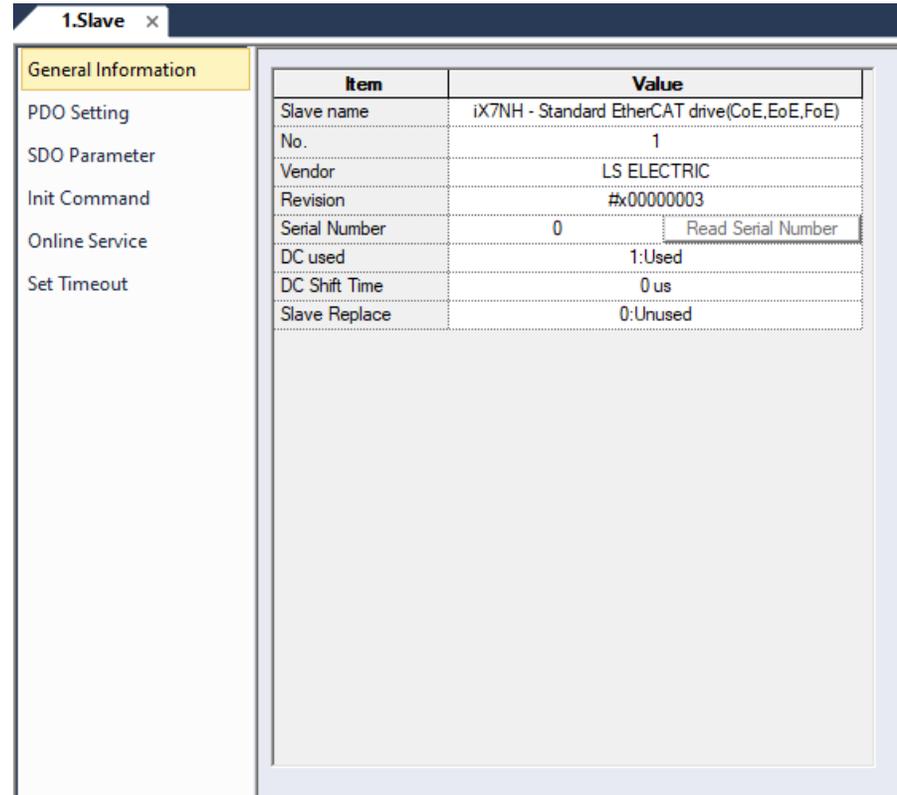
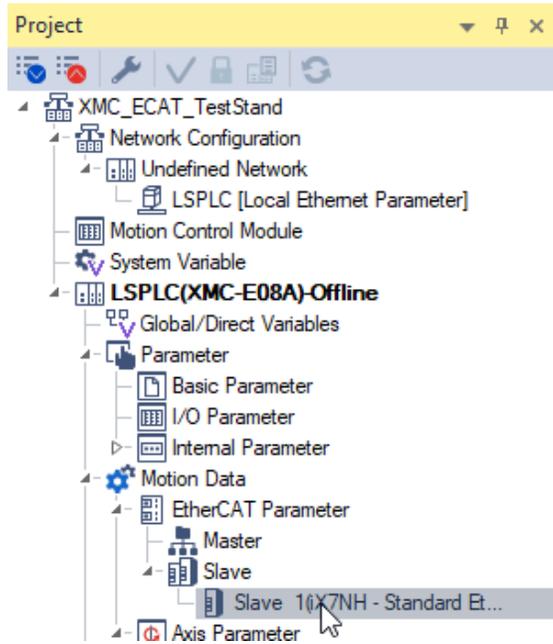


Step 4: Choose the slaves to read SDO from. Press the OK button.



Section 2 - Accessing the SDO of a EtherCAT slave

Step 1: In the XMC project, Double click on the EtherCAT slave device to open its configuration window.



Step 2: Click 'SDO Parameter' in the EtherCAT slave configuration screen.

3.Slave x

General Information

PDO Setting

SDO Parameter

Init Command

Online Service

Set Timeout

Parameter type: All

Parameter change during operation: Allow parameter(Individual) change during operation

Note) * Applied when power is turned on again

<input checked="" type="checkbox"/>	Index	Name	Unit	Set Value	Initial Value	Access
<input checked="" type="checkbox"/>	6078:00	Current Actual Value	0.1%			ro
<input checked="" type="checkbox"/>	6079:00	DC Link Circuit Voltage	0.1V			ro
<input checked="" type="checkbox"/>	607A:00	Target Position	UU	0	0	rw
<input checked="" type="checkbox"/>	607C:00	Home Offset	UU	0	0	rw
<input checked="" type="checkbox"/>	607D:00	Software Position Limit	-	2	2	ro
<input checked="" type="checkbox"/>	607D:01	Min position limit	UU	-1000000000	-1000000000	rw
<input checked="" type="checkbox"/>	607D:02	Max position limit	UU	1000000000	1000000000	rw
<input checked="" type="checkbox"/>	607F:00	Maximum Profile Velocity	UU/s	2147483647	2147483647	rw
<input checked="" type="checkbox"/>	6080:00	Maximum Motor Speed	rpm	0	0	ro

Step 3: Double Click on the Set Value Column of a parameter to modify. This example shows “Homing Method”.

<input checked="" type="checkbox"/>	6091:02	Shaft revolutions	-			rw
<input checked="" type="checkbox"/>	6098:00	Homing Method	-	28	34	rw
<input checked="" type="checkbox"/>	6099:00	Homing Speeds	-			rw

Step 4: Enter the value for the parameter and Press OK when done.

Changes the current value ✕

Name: Homing Method

Type: SINT

Range: (-128~127)

Unit: -

Display type: Decimal

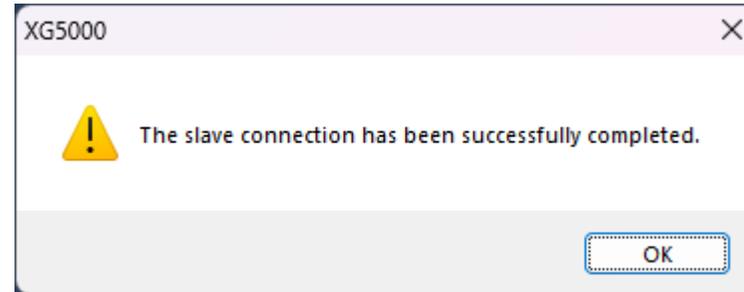
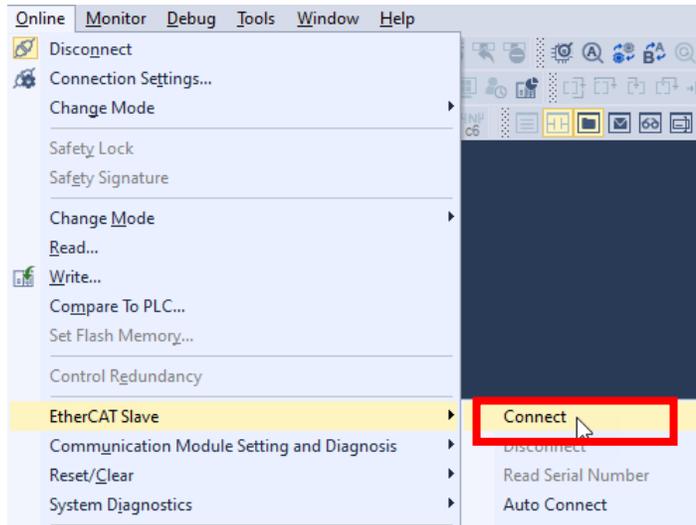
Set value

Value:

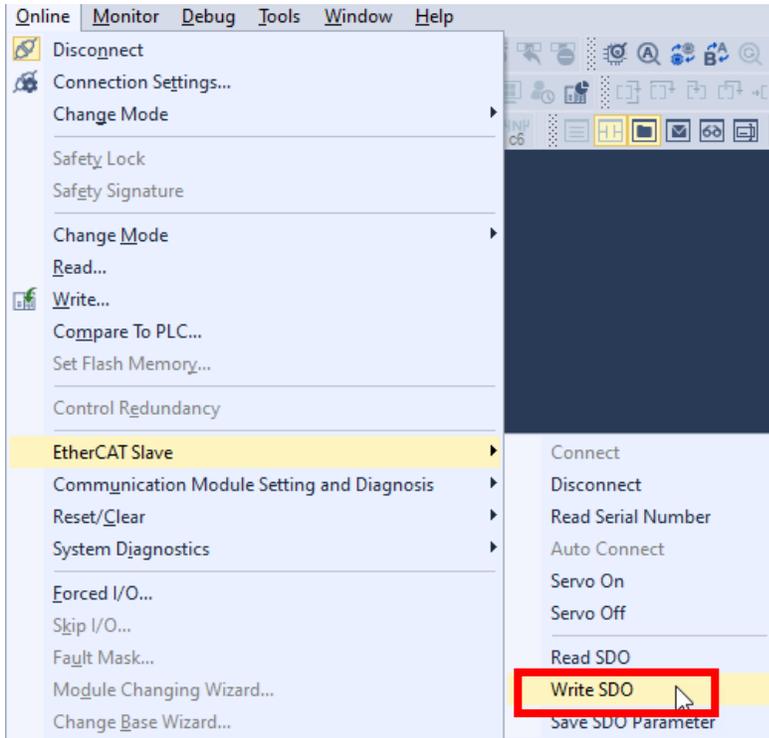
Enum:

Step 5: Connect to the XMC with XG5000.

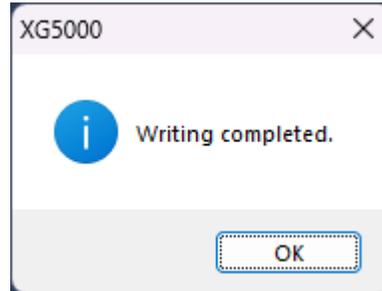
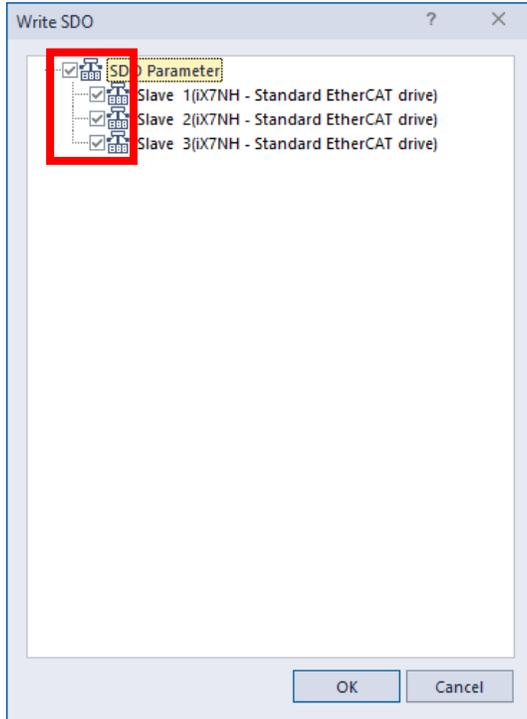
Step 6: Choose Online menu -> EtherCAT Slave -> Connect. This will connect the EtherCAT network.



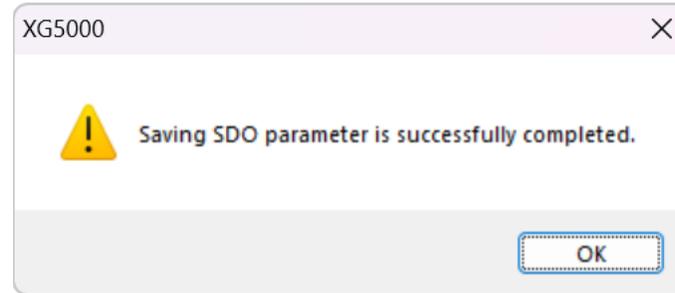
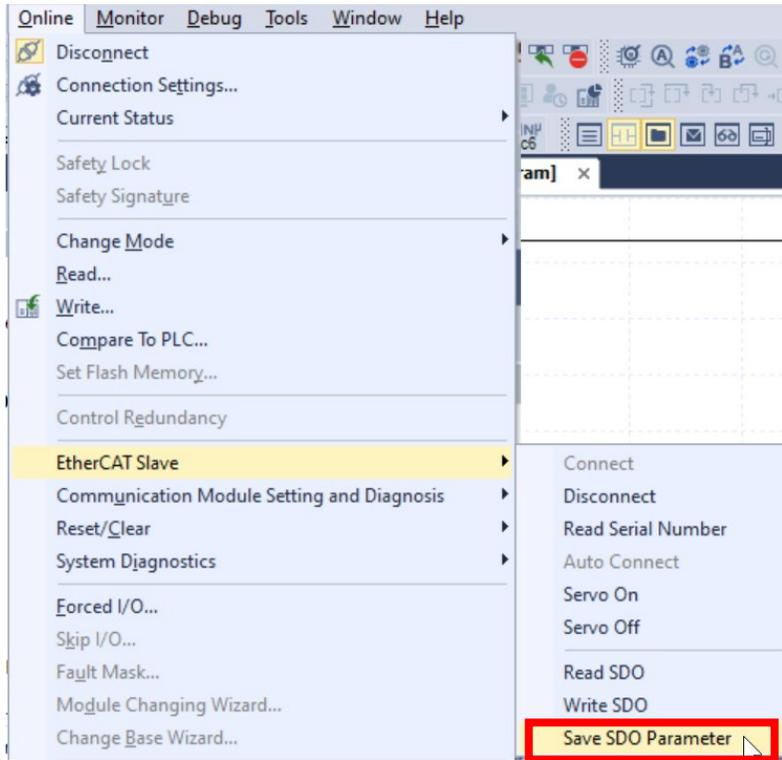
Step 7: Choose Online menu -> EtherCAT Slave -> Write SDO.



Step 8: Choose which EtherCAT slaves to write the SDO data too. Press OK when done.



Step 9: Select Online Menu -> EtherCAT Slave -> Save SDO Parameter. This will save the SDO parameters on the slave.

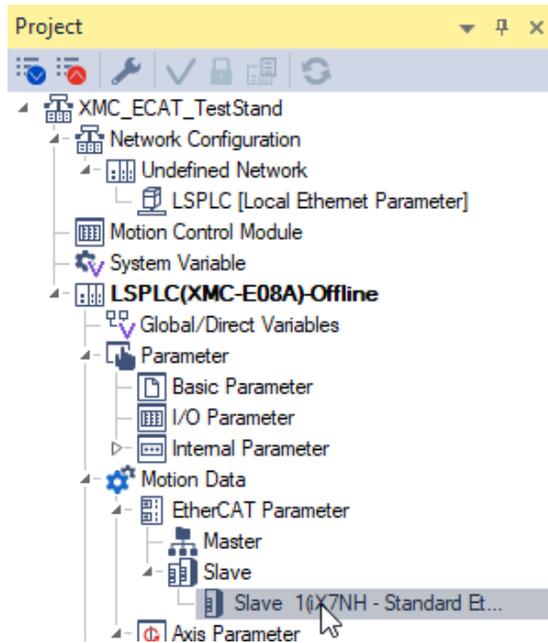


XMC07 – How to Review and Edit the EtherCAT Process Data Object (PDO)

- The EtherCAT Process Data Object (PDO) is used to configure the synchronous communication between EtherCAT master and slaves.
- The TxPDO is the data transmitted from EtherCAT slave to EtherCAT master.
- The RxPDO is the data transmitted from the EtherCAT master to the EtherCAT slave.
- The EtherCAT Slave Information (ESI) file includes many options for TxPDO and RxPDO for an EtherCAT slave device.
- XG5000 allows the PDO to be reviewed and modified for your system configuration.

Section 1 - Accessing the PDO of a EtherCAT slave

Step 1: In the XMC project, Double click on the EtherCAT slave device to open its configuration window.



The screenshot shows the '1.Slave' configuration window. The 'General Information' tab is active, displaying a table of slave parameters.

Item	Value
Slave name	iX7NH - Standard EtherCAT drive(CoE,EoE,FoE)
No.	1
Vendor	LS ELECTRIC
Revision	#x00000003
Serial Number	0 <input type="button" value="Read Serial Number"/>
DC used	1:Used
DC Shift Time	0 us
Slave Replace	0:Unused

Step 2: Click 'PDO Setting' in the EtherCAT slave configuration screen.

The screenshot shows the '1.Slave' configuration window. On the left sidebar, the 'PDO Setting' button is highlighted with a red box. The main area is divided into several sections:

- PDO Assignment:** A table with columns 'Address', 'SM', and 'Flag'. The row for '0x1A01' is checked.
- PDO Type Filter:** A dropdown menu set to 'TxPDO'.
- PDOs to Map:** A table listing various PDOs with their indices, names, data types, and sizes.
- Download PDO:** A section with checkboxes for 'PDO Assignment' and 'PDO Setting', both of which are checked.
- PDO Selection:** A dropdown menu set to '1:0x1A01' with up and down arrow buttons.
- Mapped Objects:** A table listing mapped objects with their indices, names, data types, and sizes.

At the bottom of the window, there are buttons for 'Top', 'Up', 'Down', and 'Bottom'.

Address	SM	Flag
0x1A00		
<input checked="" type="checkbox"/> 0x1A01	3	
0x1A02		
0x1A03		

Index	Name	Data type	Size(Bytes)
0x2121:0	Drive Status Output 1	UINT	2
0x2122:0	Drive Status Output 2	UINT	2
0x2600:0	Feedback Speed	INT	2
0x2601:0	Command Speed	INT	2
0x2602:0	Following Error	DINT	4
0x2604:0	Instantaneous Maximum Operation O	INT	2
0x2605:0	DC-Link Voltage	UINT	2
0x2607:0	Single Turn Data	UDINT	4
0x2608:0	Mechanical Angle	UINT	2
0x2609:0	Electrical Angle	INT	2
0x260A:0	Multi Turn Data	DINT	4
0x2614:0	Warning Code	UINT	2

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positio	DINT	4
0x60FD:0	Digital Inputs	UDINT	4

Step 3: Select between TxPDO and RxPDO using the PDO Type Filter selection drop down.

1.Slave x

General Information

PDO Setting

SDO Parameter

Init Command

Online Service

Set Timeout

PDO Assignment:

Address	SM	Flag
<input type="checkbox"/> 0x1A00		
<input checked="" type="checkbox"/> 0x1A01	3	
<input type="checkbox"/> 0x1A02		
<input type="checkbox"/> 0x1A03		

Download PDO

PDO Assignment

PDO Setting

PDO Type Filter: TxPDO

PDOs to Map:

Index		Data type	Size(Bytes)
0x2121:0	Drive Status Output 1	UINT	2
0x2122:0	Drive Status Output 2	UINT	2
0x2600:0	Feedback Speed	INT	2
0x2601:0	Command Speed	INT	2
0x2602:0	Following Error	DINT	4
0x2604:0	Instantaneous Maximum Operation O	INT	2
0x2605:0	DC-Link Voltage	UINT	2
0x2607:0	Single Turn Data	UDINT	4
0x2608:0	Mechanical Angle	UINT	2
0x2609:0	Electrical Angle	INT	2
0x260A:0	Multi Turn Data	DINT	4
0x2614:0	Warning Code	UINT	2

PDO Selection: 1:0x1A01

Mapped Objects:

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positio	DINT	4
0x60FD:0	Digital Inputs	UDINT	4

Top Up Down Bottom



Section 2 - PDO Screen Layout

Choose Which PDO assignment the XMC uses for this slave.

Flag – Data in the PDO is fixed and can't be changed.

SM- Sync manager determines which type of data is being transmitted.

These must be checked to have the master download the PDO to the slave device.

PDO Assignment:

Address	SM	Flag
<input type="checkbox"/> 0x1A00		
<input checked="" type="checkbox"/> 0x1A01	3	
<input type="checkbox"/> 0x1A02		
<input type="checkbox"/> 0x1A03		

PDO Type Filter: TxPDO

PDOs to Map:

Index	Name	Data type	Size(Bytes)
0x2121:0	Drive Status Output 1	UINT	2
0x2122:0	Drive Status Output 2	UINT	2
0x2600:0	Feedback Speed	INT	2
0x2601:0	Command Speed	INT	2
0x2602:0	Following Error	DINT	4
0x2604:0	Instantaneous Maximum Operation O	INT	2
0x2605:0	DC-Link Voltage	UINT	2
0x2607:0	Single Turn Data	UDINT	4
0x2608:0	Mechanical Angle	UINT	2
0x2609:0	Electrical Angle	INT	2
0x260A:0	MultiTurn Data	DINT	4
0x2614:0	Warning Code	UINT	2

PDO Selection: 1:0x1A01

Mapped Objects:

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positio	DINT	4
0x60FD:0	Digital Inputs	UDINT	4

Download PDO

- PDO Assignment
- PDO Setting

Top Up Down Bottom

Select between TxPDO and RxPDO.

List of PDO data from ESI file

Select Which PDO assignment to modify and moving data from data list to Mapped Objects.

PDO data configured for Master and Slave to communicate to each other.

Move items in the Mapped Object up and down in the ordering. Must select a Mapped Object for these to be active.



Section 3 - Modifying the PDO

Step 1: Select the Mapped Object that you want to change.

PDO Selection: 1:0x1A01

Mapped Objects:

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positio	DINT	4
0x60FD:0	Digital Inputs	UDINT	4

Top Up Down Bottom

Step 2: Press the Up Arrow to move the selected object to the PDOs To Map section.

PDO Selection: 1:0x1A01

Mapped Objects:

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positio	DINT	4
0x60FD:0	Digital Inputs	UDINT	4

Top Up Down Bottom



PDO Selection: 1:0x1A01

Mapped Objects:

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60FD:0	Digital Inputs	UDINT	4

Top Up Down Bottom

Step 3: Select a new PDO object to add from the PDOs to Map list.

PDOs to Map:

Index	Name	Data type	Size(Bytes)
0x6077:0	Torque Actual Value	INT	2
0x6078:0	Current Actual Value	INT	2
0x6079:0	DC Link Circuit Voltage	UDINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positi	DINT	4
0x60BB:0	Touch Probe 1 Negative Edge Positi	DINT	4
0x60BC:0	Touch Probe 2 Positive Edge Positi	DINT	4
0x60BD:0	Touch Probe 2 Negative Edge Positi	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60FC:0	Position Demand Internal Value	DINT	4
0x60FD:0	Digital Inputs	UDINT	4
0x60FE:1	Physical outputs	UDINT	4

PDO Selection: 1:0x1A01

↓ ↑

Step 4: Press the Down Arrow to move the selected object to the Mapped Objects section.

Note: Up to ten objects can be mapped in the Mapped Objects List.

PDOs to Map:

Index	Name	Data type	Size(Bytes)
0x6077:0	Torque Actual Value	INT	2
0x6078:0	Current Actual Value	INT	2
0x6079:0	DC Link Circuit Voltage	UDINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60BA:0	Touch Probe 1 Positive Edge Positi	DINT	4
0x60BB:0	Touch Probe 1 Negative Edge Positi	DINT	4
0x60BC:0	Touch Probe 2 Positive Edge Positi	DINT	4
0x60BD:0	Touch Probe 2 Negative Edge Positi	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60FC:0	Position Demand Internal Value	DINT	4
0x60FD:0	Digital Inputs	UDINT	4
0x60FE:1	Physical outputs	UDINT	4

PDO Selection: 1:0x1A01

↓ ↑



Mapped Objects:

Index	Name	Data type	Size(Bytes)
0x6041:0	Statusword	UINT	2
0x6064:0	Position Actual Value	DINT	4
0x60F4:0	Following Error Actual Value	DINT	4
0x60B9:0	Touch Probe Status	UINT	2
0x60FD:0	Digital Inputs	UDINT	4
0x60BB:0	Touch Probe 1 Negative Edge Positi	DINT	4

XMC08 – Important Motion Flag Variables

- A Flag is a pre-defined memory location that indicates the real time operation, state, and vital information of the XMC.
- These are designed to give the programmer quick access to important information and are extremely useful for ease of programming.
- Each flag is defined with a descriptive tag name that begins with an underscore (“_”).
- The tag name is aliased to a memory address located in the %F and %K area.

Flag Type Selection

Flag Variable Tag

Global/Direct Variables

Global Variable Direct Variable Comment Flag

Flag type: System System Data Log Memory Card Encoder

	Variable Name	Address	EIP/OPC UA	HMI	Description
1	_SYS_S	%FD0	<input type="checkbox"/>	<input type="checkbox"/>	PLC mode and states
2	_RUN	%FX0	<input type="checkbox"/>	<input type="checkbox"/>	RUN
3	_STOP	%FX1	<input type="checkbox"/>	<input type="checkbox"/>	STOP
4	_ERROR	%FX2	<input type="checkbox"/>	<input type="checkbox"/>	ERROR
5	_LOCAL	%FX4	<input type="checkbox"/>	<input type="checkbox"/>	Local control
6	_REMOTE	%FX6	<input type="checkbox"/>	<input type="checkbox"/>	Remote mode ON
7	_RUN_E	%FX8	<input type="checkbox"/>	<input type="checkbox"/>	Downloading a program at online editing mode
8	_RUN_EDIT_CHK	%FX9	<input type="checkbox"/>	<input type="checkbox"/>	Processing online editing internally
9	_RUN_EDIT_DONE	%FX10	<input type="checkbox"/>	<input type="checkbox"/>	Online editing done
10	_RUN_EDIT_NG	%FX11	<input type="checkbox"/>	<input type="checkbox"/>	Online editing abnormal termination

Tag name

Description

Category	Function
System	Common functions of the CPU: Run status, errors, clock, scan.
Data Log	State and data for Data logging functionality.
Memory Card	State and data for SD memory card.
Encoder	Data for the built-in Encoder inputs.
Motion Common	Common Status flags of the Motion controller.
Motion Axis	Axis specific motion state and data.
Motion Axis Group	Motion group state and data.
EtherCAT Master	EtherCAT master motion state and data.
EtherCAT Slave	EtherCAT slave motion state and data.
NC Channel	NC Channel state and data.
NC Ch/Axis	Displays the state of the axis configured for the NC Channel.



System Flags

System flags provide useful information for programming. Some helpful tags are highlighted below:

Provides high pulse for first half of time interval and low pulse for last half of time interval.

54	_T20MS	BOOL	%FX144	<input type="checkbox"/>	<input type="checkbox"/>	20ms CLOCK
55	_T100MS	BOOL	%FX145	<input type="checkbox"/>	<input type="checkbox"/>	100ms CLOCK
56	_T200MS	BOOL	%FX146	<input type="checkbox"/>	<input type="checkbox"/>	200ms CLOCK
57	_T1S	BOOL	%FX147	<input type="checkbox"/>	<input type="checkbox"/>	1s CLOCK
58	_T2S	BOOL	%FX148	<input type="checkbox"/>	<input type="checkbox"/>	2s CLOCK
59	_T10S	BOOL	%FX149	<input type="checkbox"/>	<input type="checkbox"/>	10s CLOCK
60	_T20S	BOOL	%FX150	<input type="checkbox"/>	<input type="checkbox"/>	20s CLOCK
61	_T60S	BOOL	%FX151	<input type="checkbox"/>	<input type="checkbox"/>	60s CLOCK

Provides ON/OFF or toggles by scan

62	_ON	BOOL	%FX153	<input type="checkbox"/>	<input type="checkbox"/>	Always ON
63	_OFF	BOOL	%FX154	<input type="checkbox"/>	<input type="checkbox"/>	Always OFF
64	_1ON	BOOL	%FX155	<input type="checkbox"/>	<input type="checkbox"/>	1 scan ON
65	_1OFF	BOOL	%FX156	<input type="checkbox"/>	<input type="checkbox"/>	1 scan OFF
66	_STOG	BOOL	%FX157	<input type="checkbox"/>	<input type="checkbox"/>	Every scan Toggle

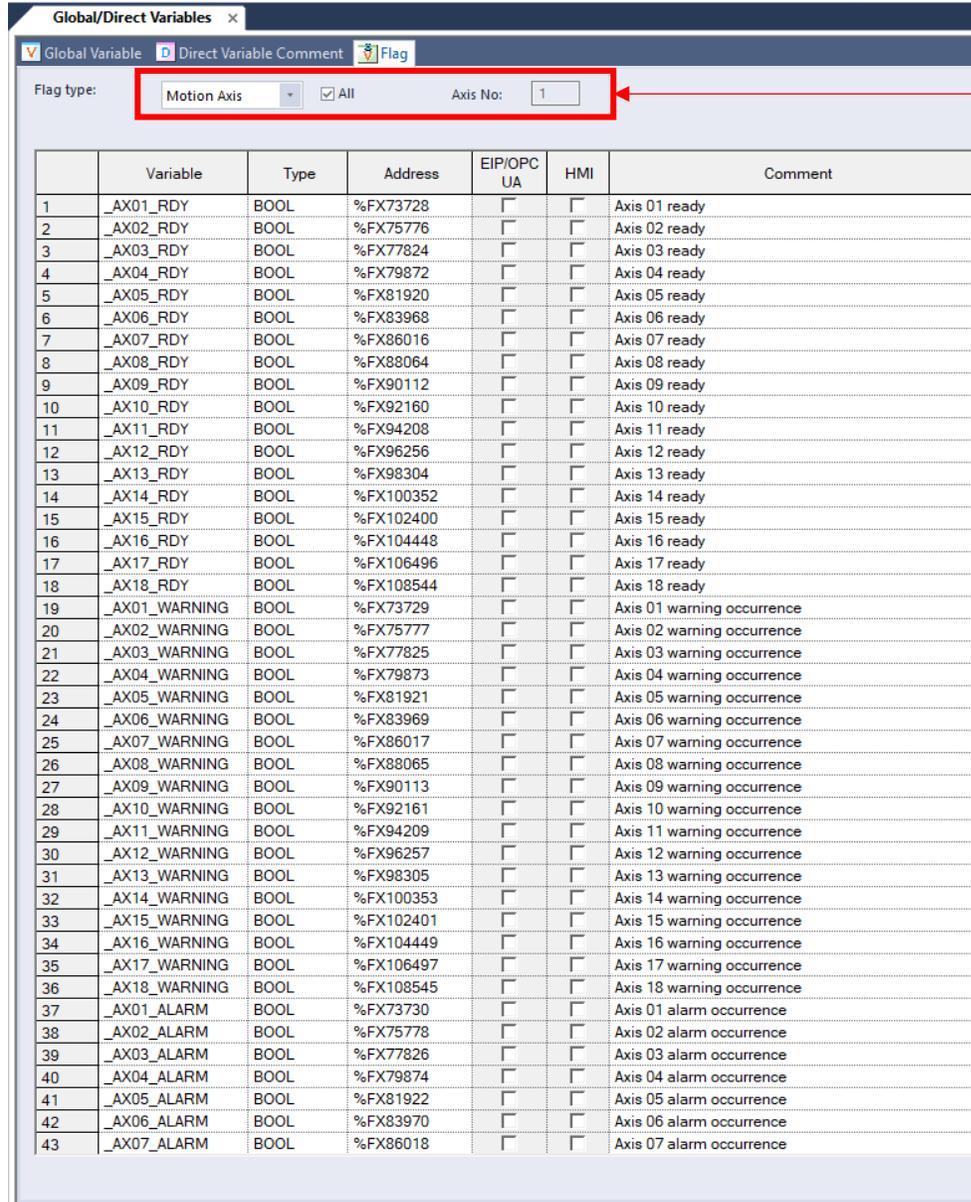
} 1st scan action

Real Time Clock tags

103	_RTC_DATE	DATE	%FW136	<input type="checkbox"/>	<input type="checkbox"/>	Current RTC date
105	_RTC_TOD	TIME_OF_DAY	%FD69	<input type="checkbox"/>	<input type="checkbox"/>	Current time of RTC(ms unit)
106	_RTC_WEEK	WORD	%FW137	<input type="checkbox"/>	<input type="checkbox"/>	Current RTC day

Motion Axis Flags

- Motion Axis Flags contain information about each axis.
- These can include axis ready status, power status, error status and more.
- These variables can be used in project code and added to the monitor window.



Global/Direct Variables

Global Variable Direct Variable Comment Flag

Flag type: Motion Axis All Axis No: 1

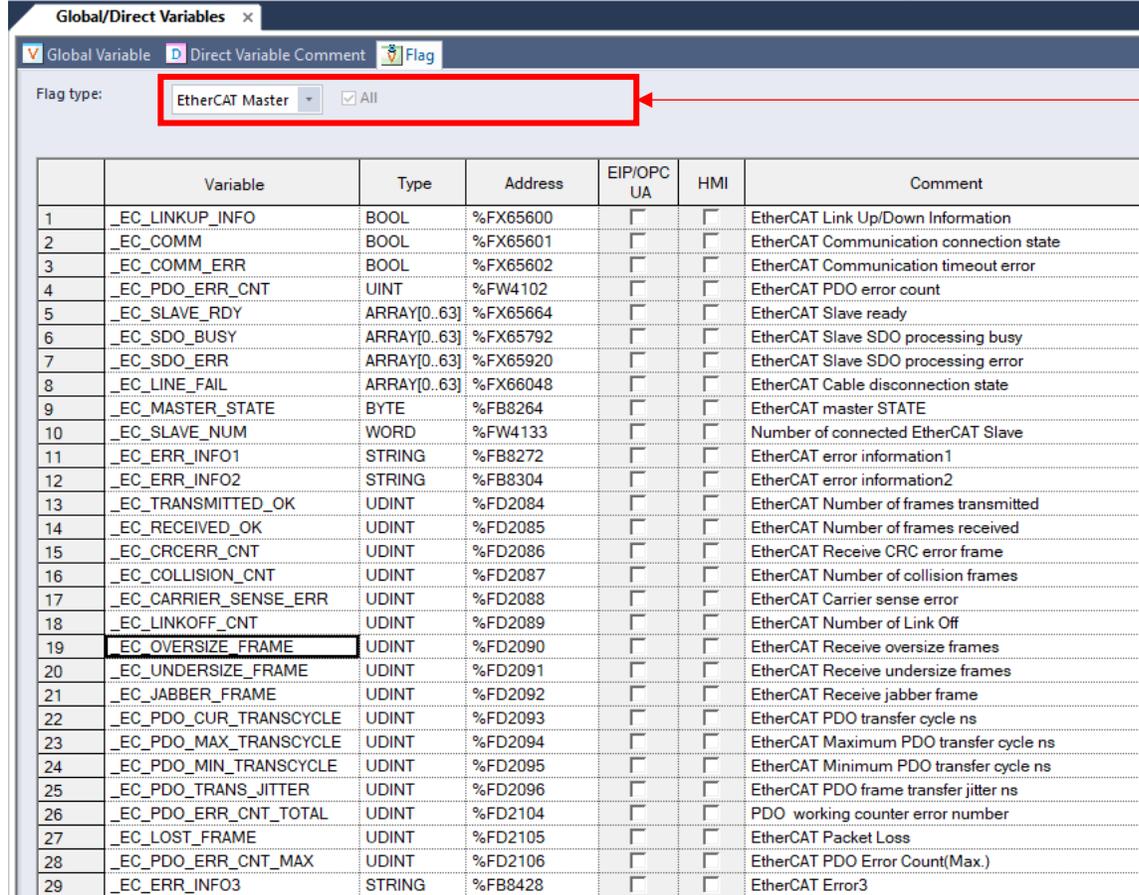
	Variable	Type	Address	EIP/OPC UA	HMI	Comment
1	_AX01_RDY	BOOL	%FX73728	<input type="checkbox"/>	<input type="checkbox"/>	Axis 01 ready
2	_AX02_RDY	BOOL	%FX75776	<input type="checkbox"/>	<input type="checkbox"/>	Axis 02 ready
3	_AX03_RDY	BOOL	%FX77824	<input type="checkbox"/>	<input type="checkbox"/>	Axis 03 ready
4	_AX04_RDY	BOOL	%FX79872	<input type="checkbox"/>	<input type="checkbox"/>	Axis 04 ready
5	_AX05_RDY	BOOL	%FX81920	<input type="checkbox"/>	<input type="checkbox"/>	Axis 05 ready
6	_AX06_RDY	BOOL	%FX83968	<input type="checkbox"/>	<input type="checkbox"/>	Axis 06 ready
7	_AX07_RDY	BOOL	%FX86016	<input type="checkbox"/>	<input type="checkbox"/>	Axis 07 ready
8	_AX08_RDY	BOOL	%FX88064	<input type="checkbox"/>	<input type="checkbox"/>	Axis 08 ready
9	_AX09_RDY	BOOL	%FX90112	<input type="checkbox"/>	<input type="checkbox"/>	Axis 09 ready
10	_AX10_RDY	BOOL	%FX92160	<input type="checkbox"/>	<input type="checkbox"/>	Axis 10 ready
11	_AX11_RDY	BOOL	%FX94208	<input type="checkbox"/>	<input type="checkbox"/>	Axis 11 ready
12	_AX12_RDY	BOOL	%FX96256	<input type="checkbox"/>	<input type="checkbox"/>	Axis 12 ready
13	_AX13_RDY	BOOL	%FX98304	<input type="checkbox"/>	<input type="checkbox"/>	Axis 13 ready
14	_AX14_RDY	BOOL	%FX100352	<input type="checkbox"/>	<input type="checkbox"/>	Axis 14 ready
15	_AX15_RDY	BOOL	%FX102400	<input type="checkbox"/>	<input type="checkbox"/>	Axis 15 ready
16	_AX16_RDY	BOOL	%FX104448	<input type="checkbox"/>	<input type="checkbox"/>	Axis 16 ready
17	_AX17_RDY	BOOL	%FX106496	<input type="checkbox"/>	<input type="checkbox"/>	Axis 17 ready
18	_AX18_RDY	BOOL	%FX108544	<input type="checkbox"/>	<input type="checkbox"/>	Axis 18 ready
19	_AX01_WARNING	BOOL	%FX73729	<input type="checkbox"/>	<input type="checkbox"/>	Axis 01 warning occurrence
20	_AX02_WARNING	BOOL	%FX75777	<input type="checkbox"/>	<input type="checkbox"/>	Axis 02 warning occurrence
21	_AX03_WARNING	BOOL	%FX77825	<input type="checkbox"/>	<input type="checkbox"/>	Axis 03 warning occurrence
22	_AX04_WARNING	BOOL	%FX79873	<input type="checkbox"/>	<input type="checkbox"/>	Axis 04 warning occurrence
23	_AX05_WARNING	BOOL	%FX81921	<input type="checkbox"/>	<input type="checkbox"/>	Axis 05 warning occurrence
24	_AX06_WARNING	BOOL	%FX83969	<input type="checkbox"/>	<input type="checkbox"/>	Axis 06 warning occurrence
25	_AX07_WARNING	BOOL	%FX86017	<input type="checkbox"/>	<input type="checkbox"/>	Axis 07 warning occurrence
26	_AX08_WARNING	BOOL	%FX88065	<input type="checkbox"/>	<input type="checkbox"/>	Axis 08 warning occurrence
27	_AX09_WARNING	BOOL	%FX90113	<input type="checkbox"/>	<input type="checkbox"/>	Axis 09 warning occurrence
28	_AX10_WARNING	BOOL	%FX92161	<input type="checkbox"/>	<input type="checkbox"/>	Axis 10 warning occurrence
29	_AX11_WARNING	BOOL	%FX94209	<input type="checkbox"/>	<input type="checkbox"/>	Axis 11 warning occurrence
30	_AX12_WARNING	BOOL	%FX96257	<input type="checkbox"/>	<input type="checkbox"/>	Axis 12 warning occurrence
31	_AX13_WARNING	BOOL	%FX98305	<input type="checkbox"/>	<input type="checkbox"/>	Axis 13 warning occurrence
32	_AX14_WARNING	BOOL	%FX100353	<input type="checkbox"/>	<input type="checkbox"/>	Axis 14 warning occurrence
33	_AX15_WARNING	BOOL	%FX102401	<input type="checkbox"/>	<input type="checkbox"/>	Axis 15 warning occurrence
34	_AX16_WARNING	BOOL	%FX104449	<input type="checkbox"/>	<input type="checkbox"/>	Axis 16 warning occurrence
35	_AX17_WARNING	BOOL	%FX106497	<input type="checkbox"/>	<input type="checkbox"/>	Axis 17 warning occurrence
36	_AX18_WARNING	BOOL	%FX108545	<input type="checkbox"/>	<input type="checkbox"/>	Axis 18 warning occurrence
37	_AX01_ALARM	BOOL	%FX73730	<input type="checkbox"/>	<input type="checkbox"/>	Axis 01 alarm occurrence
38	_AX02_ALARM	BOOL	%FX75778	<input type="checkbox"/>	<input type="checkbox"/>	Axis 02 alarm occurrence
39	_AX03_ALARM	BOOL	%FX77826	<input type="checkbox"/>	<input type="checkbox"/>	Axis 03 alarm occurrence
40	_AX04_ALARM	BOOL	%FX79874	<input type="checkbox"/>	<input type="checkbox"/>	Axis 04 alarm occurrence
41	_AX05_ALARM	BOOL	%FX81922	<input type="checkbox"/>	<input type="checkbox"/>	Axis 05 alarm occurrence
42	_AX06_ALARM	BOOL	%FX83970	<input type="checkbox"/>	<input type="checkbox"/>	Axis 06 alarm occurrence
43	_AX07_ALARM	BOOL	%FX86018	<input type="checkbox"/>	<input type="checkbox"/>	Axis 07 alarm occurrence

Select "Motion Axis" from the drop-down list.

Tip: Uncheck the "All" box and use the text entry to choose the axis number you want to look at.

EtherCAT Master Flags

- EtherCAT Master Flags contain information the XMC's EtherCAT Connection.
- These variables can be used in project code and added to the monitor window.

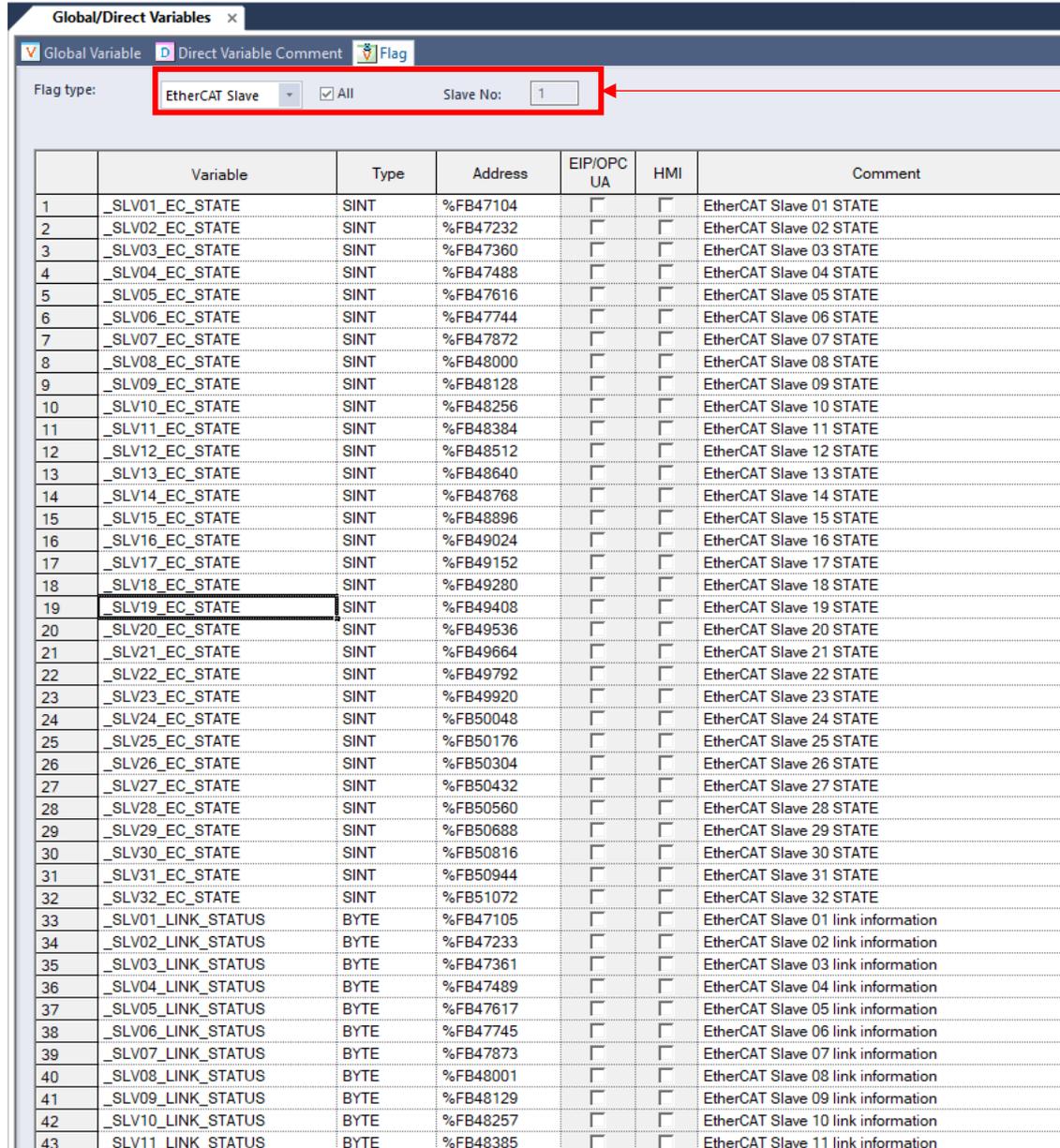


	Variable	Type	Address	EIP/OPC UA	HMI	Comment
1	_EC_LINKUP_INFO	BOOL	%FX65600	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Link Up/Down Information
2	_EC_COMM	BOOL	%FX65601	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Communication connection state
3	_EC_COMM_ERR	BOOL	%FX65602	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Communication timeout error
4	_EC_PDO_ERR_CNT	UINT	%FW4102	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT PDO error count
5	_EC_SLAVE_RDY	ARRAY[0..63]	%FX65664	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave ready
6	_EC_SDO_BUSY	ARRAY[0..63]	%FX65792	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave SDO processing busy
7	_EC_SDO_ERR	ARRAY[0..63]	%FX65920	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave SDO processing error
8	_EC_LINE_FAIL	ARRAY[0..63]	%FX66048	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Cable disconnection state
9	_EC_MASTER_STATE	BYTE	%FB8264	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT master STATE
10	_EC_SLAVE_NUM	WORD	%FW4133	<input type="checkbox"/>	<input type="checkbox"/>	Number of connected EtherCAT Slave
11	_EC_ERR_INFO1	STRING	%FB8272	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT error information1
12	_EC_ERR_INFO2	STRING	%FB8304	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT error information2
13	_EC_TRANSMITTED_OK	UDINT	%FD2084	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Number of frames transmitted
14	_EC_RECEIVED_OK	UDINT	%FD2085	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Number of frames received
15	_EC_CRCERR_CNT	UDINT	%FD2086	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Receive CRC error frame
16	_EC_COLLISION_CNT	UDINT	%FD2087	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Number of collision frames
17	_EC_CARRIER_SENSE_ERR	UDINT	%FD2088	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Carrier sense error
18	_EC_LINKOFF_CNT	UDINT	%FD2089	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Number of Link Off
19	EC_OVERSIZE_FRAME	UDINT	%FD2090	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Receive oversize frames
20	_EC_UNDERSIZE_FRAME	UDINT	%FD2091	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Receive undersize frames
21	_EC_JABBER_FRAME	UDINT	%FD2092	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Receive jabber frame
22	_EC_PDO_CUR_TRANS CYCLE	UDINT	%FD2093	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT PDO transfer cycle ns
23	_EC_PDO_MAX_TRANS CYCLE	UDINT	%FD2094	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Maximum PDO transfer cycle ns
24	_EC_PDO_MIN_TRANS CYCLE	UDINT	%FD2095	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Minimum PDO transfer cycle ns
25	_EC_PDO_TRANS_JITTER	UDINT	%FD2096	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT PDO frame transfer jitter ns
26	_EC_PDO_ERR_CNT_TOTAL	UDINT	%FD2104	<input type="checkbox"/>	<input type="checkbox"/>	PDO working counter error number
27	_EC_LOST_FRAME	UDINT	%FD2105	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Packet Loss
28	_EC_PDO_ERR_CNT_MAX	UDINT	%FD2106	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT PDO Error Count(Max.)
29	_EC_ERR_INFO3	STRING	%FB8428	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Error3

Select "EtherCAT Master" from the drop-down list.

EtherCAT Slave Flags

- EtherCAT Slave Flags contain information about each slave.
- These can include status information and connection information.
- These variables can be used in project code and added to the monitor window.



	Variable	Type	Address	EIP/OPC UA	HMI	Comment
1	_SLV01_EC_STATE	SINT	%FB47104	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 STATE
2	_SLV02_EC_STATE	SINT	%FB47232	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 02 STATE
3	_SLV03_EC_STATE	SINT	%FB47360	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 03 STATE
4	_SLV04_EC_STATE	SINT	%FB47488	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 04 STATE
5	_SLV05_EC_STATE	SINT	%FB47616	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 05 STATE
6	_SLV06_EC_STATE	SINT	%FB47744	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 06 STATE
7	_SLV07_EC_STATE	SINT	%FB47872	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 07 STATE
8	_SLV08_EC_STATE	SINT	%FB48000	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 08 STATE
9	_SLV09_EC_STATE	SINT	%FB48128	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 09 STATE
10	_SLV10_EC_STATE	SINT	%FB48256	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 10 STATE
11	_SLV11_EC_STATE	SINT	%FB48384	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 11 STATE
12	_SLV12_EC_STATE	SINT	%FB48512	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 12 STATE
13	_SLV13_EC_STATE	SINT	%FB48640	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 13 STATE
14	_SLV14_EC_STATE	SINT	%FB48768	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 14 STATE
15	_SLV15_EC_STATE	SINT	%FB48896	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 15 STATE
16	_SLV16_EC_STATE	SINT	%FB49024	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 16 STATE
17	_SLV17_EC_STATE	SINT	%FB49152	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 17 STATE
18	_SLV18_EC_STATE	SINT	%FB49280	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 18 STATE
19	_SLV19_EC_STATE	SINT	%FB49408	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 19 STATE
20	_SLV20_EC_STATE	SINT	%FB49536	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 20 STATE
21	_SLV21_EC_STATE	SINT	%FB49664	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 21 STATE
22	_SLV22_EC_STATE	SINT	%FB49792	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 22 STATE
23	_SLV23_EC_STATE	SINT	%FB49920	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 23 STATE
24	_SLV24_EC_STATE	SINT	%FB50048	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 24 STATE
25	_SLV25_EC_STATE	SINT	%FB50176	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 25 STATE
26	_SLV26_EC_STATE	SINT	%FB50304	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 26 STATE
27	_SLV27_EC_STATE	SINT	%FB50432	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 27 STATE
28	_SLV28_EC_STATE	SINT	%FB50560	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 28 STATE
29	_SLV29_EC_STATE	SINT	%FB50688	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 29 STATE
30	_SLV30_EC_STATE	SINT	%FB50816	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 30 STATE
31	_SLV31_EC_STATE	SINT	%FB50944	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 31 STATE
32	_SLV32_EC_STATE	SINT	%FB51072	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 32 STATE
33	_SLV01_LINK_STATUS	BYTE	%FB47105	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 link information
34	_SLV02_LINK_STATUS	BYTE	%FB47233	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 02 link information
35	_SLV03_LINK_STATUS	BYTE	%FB47361	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 03 link information
36	_SLV04_LINK_STATUS	BYTE	%FB47489	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 04 link information
37	_SLV05_LINK_STATUS	BYTE	%FB47617	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 05 link information
38	_SLV06_LINK_STATUS	BYTE	%FB47745	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 06 link information
39	_SLV07_LINK_STATUS	BYTE	%FB47873	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 07 link information
40	_SLV08_LINK_STATUS	BYTE	%FB48001	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 08 link information
41	_SLV09_LINK_STATUS	BYTE	%FB48129	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 09 link information
42	_SLV10_LINK_STATUS	BYTE	%FB48257	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 10 link information
43	_SLV11_LINK_STATUS	BYTE	%FB48385	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 11 link information

Select "EtherCAT Slave" from the drop-down list.

Tip: Uncheck the "All" box and use the text entry to choose the slave number you want to look at.

XMC09 – EtherCAT Diagnostics of the XMC

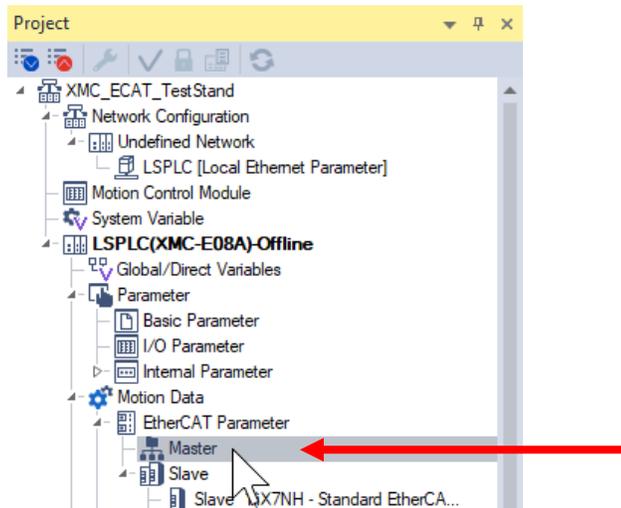
Section 1 – Offline Diagnostics

- XG5000 can perform a few offline diagnostics for the EtherCAT network.
- Offline diagnostics include:
 - EtherCAT Frame size examination
 - ESI file assessment

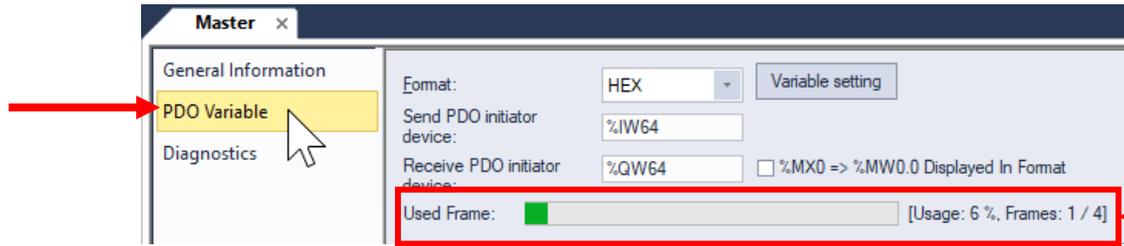
Section 1.1 – EtherCAT Frame Size Examination

- XG5000 can confirm frame sizes used by the configured EtherCAT slaves.
- A green status bar indicates that the configured PDO items and number of slaves is good for the EtherCAT frame size.
- A red status bar indicates that the configured PDO items or number of slaves are exceeding the maximum frame size.
- If the status bar is red, PDO items or slaves need to be deleted.

Step 1: In the Project Window, Double click on 'Master' under the Motion Data -> EtherCAT Parameter section.



Step 2: Click on 'PDO Variable' to view the 'Used Frame' status.

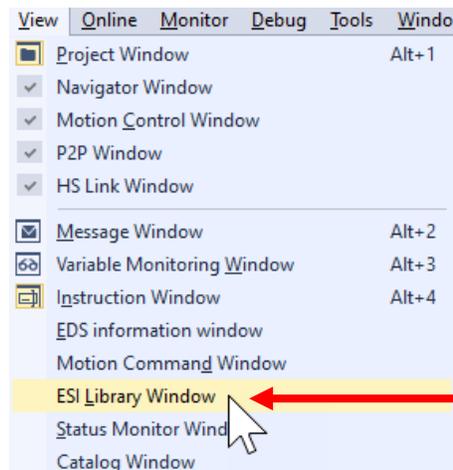


Green Status shows frame size is good.
Red Status shows that too many slaves or PDO items have been added.

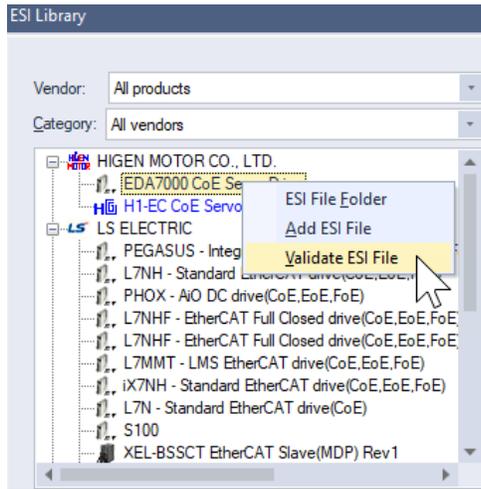
Section 1.2 – ESI File Assessment

- The ESI (EtherCAT Slave Information) file is needed for setting up EtherCAT slaves for the XMC.
- XG5000 can perform a file assessment to make sure an ESI file is valid for the XMC.

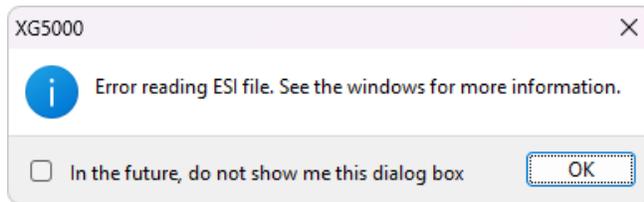
Step 1: In View menu, Select 'ESI Library Window'.



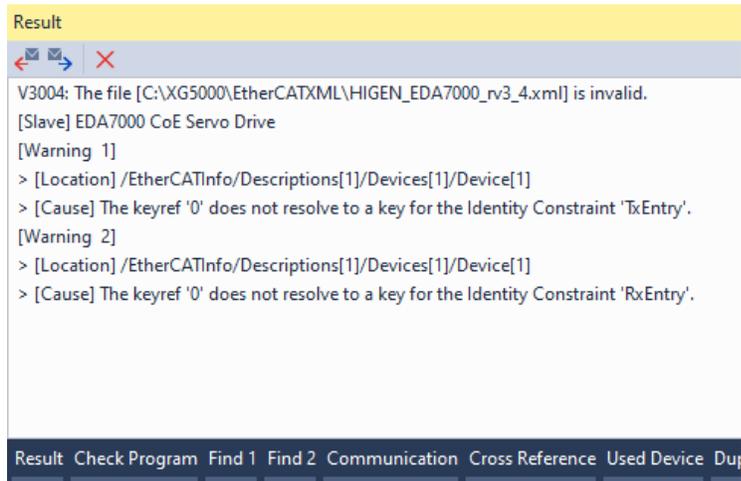
Step 2: Right Click on the ESI file to analyze. Select 'Validate ESI File'.



Step 3: Press 'OK' on the pop up window to finish the assessment.



Step 4: Open the 'Result' Window to see the file assessment results.



Section 2 – EtherCat Slave Online Diagnostics

- The XMC has direct variable flags that provide slave status information.
- These direct variable flags are populated with data after connecting the EtherCAT network.
- XG5000 has a diagnostic screen available in the master window of the EtherCAT motion data.

Section 2.1 – EtherCAT Diagnostic Flags

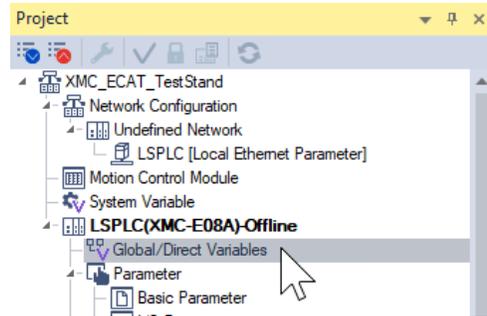
Flag Name	Flag Description
_SLVxx_ALStatus	Shows the AL status of a slave.
_SLVxx_ALStatusCode	Shows the error code of a slave.
_SLVxx_DLStatus	Shows the link status information of a slave.
_SLVxx_LinkLostCounterA _SLVxx_LinkLostCounterB _SLVxx_LinkLostCounterC _SLVxx_LinkLostCounterD	This count increases each time the port link is lost.
_SLVxx_InvalidFrameCounterA _SLVxx_InvalidFrameCounterB _SLVxx_InvalidFrameCounterC _SLVxx_InvalidFrameCounterD	This count will increase if there are errors in frame formats such as Preamble, SFC and CRC.
_SLVxx_RxErrorCounterA _SLVxx_RxErrorCounterB _SLVxx_RxErrorCounterC _SLVxx_RxErrorCounterD	This count increases if there are physical layer errors occurring on a port.
_SLVxx_ForwardRXErrCounterA _SLVxx_ForwardRXErrCounterB _SLVxx_ForwardRXErrCounterC _SLVxx_ForwardRXErrCounterD	Abnormal frames detected through the previous slaves received count.

Note: 'xx' represents the slave number.

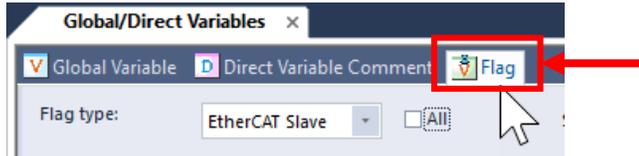


Section 2.2 – EtherCAT Diagnostic Flags XG5000 Location

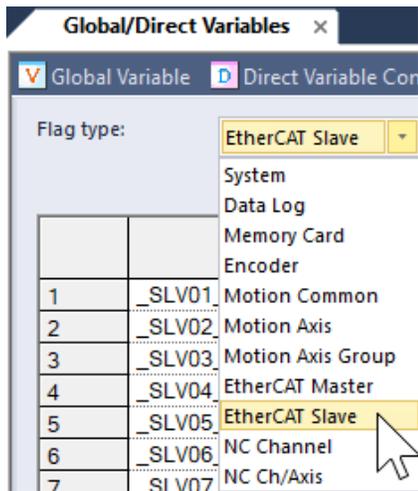
Step 1: Double click on 'Global/Direct Variables' to open the windows to access the diagnostic flags.



Step 2: Click on the 'Flag' tab.



Step 3: Select 'EtherCAT Slave' from the flag type.



Step 4: Uncheck the 'All' checkbox and enter a Slave Number to view.

Global/Direct Variables x

Global Variable | Direct Variable Comment | Flag

Flag type: EtherCAT Slave All Slave No: 1

	Variable	Type	Address	EIP/OPC UA	HMI	Comment
1	_SLV01_EC_STATE	SINT	%FB47104	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 STATE
2	_SLV01_LINK_STATUS	BYTE	%FB47105	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 link information
3	_SLV01_ERROR	WORD	%FW23553	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 error
4	_SLV01_VENDOR_ID	DWORD	%FD11777	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 VendorID
5	_SLV01_PRODUCT_CODE	DWORD	%FD11778	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 ProductCode
6	_SLV01_REVISION_NUMBER	DWORD	%FD11779	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 RevisionNumber
7	_SLV01_ALStatusCode	WORD	%FW23564	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 AL error code
8	_SLV01_DLStatus	WORD	%FW23565	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 link state
9	_SLV01_InValidFrameCounterA	BYTE	%FB47136	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 A port abnormal frame counter
10	_SLV01_RxErrorCounterA	BYTE	%FB47137	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 A port physical layer error number
11	_SLV01_InValidFrameCounterB	BYTE	%FB47138	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 B port abnormal frame counter
12	_SLV01_RxErrorCounterB	BYTE	%FB47139	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 B port physical layer error number
13	_SLV01_InValidFrameCounterC	BYTE	%FB47140	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 C port abnormal frame counter
14	_SLV01_RxErrorCounterC	BYTE	%FB47141	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 C port physical layer error number
15	_SLV01_InValidFrameCounterD	BYTE	%FB47142	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 D port abnormal frame counter
16	_SLV01_RxErrorCounterD	BYTE	%FB47143	<input type="checkbox"/>	<input type="checkbox"/>	EtherCAT Slave 01 D port physical layer error number
17	_SLV01_LinkLostCount	DWORD	%FD11783	<input type="checkbox"/>	<input type="checkbox"/>	A Port link disconnection count
18	_SLV01_ForwardedRXErrCounter	DWORD	%FD11786	<input type="checkbox"/>	<input type="checkbox"/>	Number of abnormal frames delivered

Section 2.3 – EtherCAT Slave Diagnostic Steps

If a problem occurs during EtherCAT communication, diagnosis with the diagnostic flags can be performed in the following sequences.

1. A slave with a non-zero value of the SLVxx_InvalidFrameCounter or SLVxx_RxErrorCounter shows the location where a problem has occurred.
2. Inspect the ethernet cables connected to the slave from step 1.
 1. Confirm that the cable is not located close to a power cable or noise source.
 2. Confirm that the cable is still functioning properly.
 3. Confirm that the cable shields are properly grounded.
3. Inspect the power and grounding of the slave module.
4. Confirm if the problem is related with a specific device movement or if the device is defective.



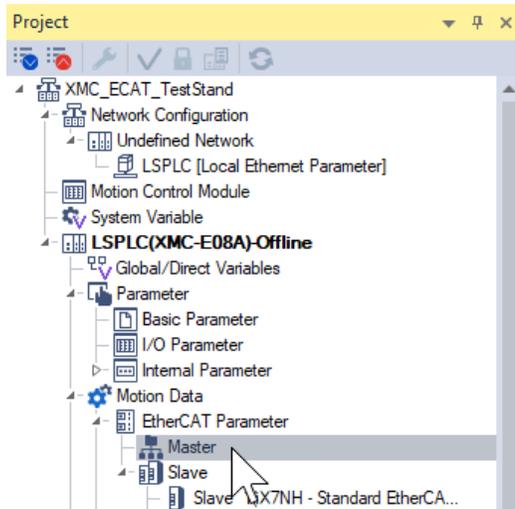
Section 3 – EtherCAT Master Online Diagnostics

- XG5000 has a diagnostic screen available in the master window of the EtherCAT motion data.
- This screen can be used to determine if a slave drive supports the CiA402 Drive Profile.
- Slave error history can be seen from this screen.
- Slave status can also be changed.

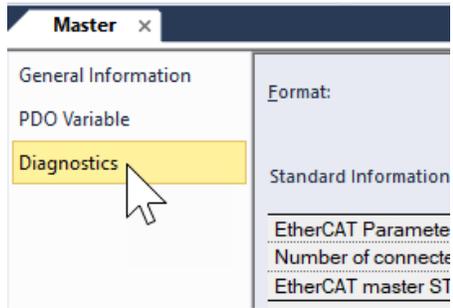
Section 3.1 – EtherCAT Master Diagnostic Screen

Step 1: Get online with the XMC.

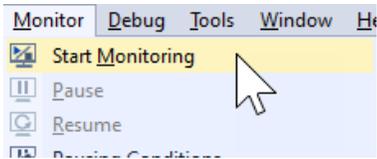
Step 2: In the Project Window, Double click on 'Master' under the Motion Data -> EtherCAT Parameter section.



Step 3: Select the 'Diagnostics' window.



Step 4: Start Monitoring by select Monitor Menu -> Start Monitoring. This will populate data in the diagnostic screen.



The screenshot shows the 'Master' window with the 'Diagnostics' tab selected. The window displays various diagnostic information, including a 'Format:' dropdown set to 'HEX', a status message '♦♦ EtherCAT Diagnosis is supported from XMC OS version 1.40.', and several data tables.

Standard Information

EtherCAT Parameter Error	OFF	EtherCAT error information1	
Number of connected EtherC	0x0000	EtherCAT error information2	
EtherCAT master STATE	CHG	EtherCAT Error3	

Send/Receive Count

EtherCAT Number of frames tr	0x0008B647	EtherCAT PDO error count	0x0000
EtherCAT Number of frames r	0x0008B647	PDO working counter error n	0x00000000
EtherCAT Packet Loss	0x00000000	EtherCAT PDO Error Count(M	0x00000000

Detailed information

Name	STATE	AL Status Code [0x134~5]	DL Status [0x110~1]	Lost Link [0x310~3]	Rx Error [0x301/3/5/7]	Inv. Frame [0x300/2/4/6]
Slave 1		0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 2		0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 3		0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 4		0x0000	0x0000	0x00000000	0x00000000	0x00000000

Section 3.2 – EtherCAT Slave Revision Information

Note: The EtherCAT network must be connected through code or the Online Menu -> EtherCAT Slave -> Connect.

Right Click on a slave and Select 'Slave Revision Information'.

Detailed information

Name	STATE	AL Status Code [0x134~5]	DL Status [0x110~1]	Lost Link [0x310~3]	Rx Error [0x301/3/5/7]	Inv. Frame [0x300/2/4/6]
Slave 1	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 2	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 3	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 4	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000

- Slave Revision Information
- Slave error history
- Change Slave Status
- Slave Connection Status
- Update Firmware

Slave Information

Basic Slave Information

Slave Name: iX7NHA004

Revision: 1.13

CiA 402 Mode

CiA 402 Mode	Support
Profile position mode	0
Velocity mode	-
Profile velocity mode	0
Torque profile mode	0
Homing mode	0
Interpolated position mode	0
Cyclic sync position mode	0
Cyclic sync velocity mode	0
Cyclic sync torque mode	0

Operation Mode: 8 (Cyclic sync position mode)

OK

Shows Slave name and firmware revision.

Shows supported CiA402 Drive Profile operation modes.

Shows current operation mode of the slave.

Section 3.3 – EtherCAT Slave Error History

Note: The EtherCAT network must be connected through code or the Online Menu -> EtherCAT Slave -> Connect.

Right Click on a slave and Select 'Slave Error History'.

Detailed information Refresh

Name	STATE	AL Status Code [0x134~5]	DL Status [0x110~1]	Lost Link [0x310~3]	Rx Error [0x301/3/5/7]	Inv. Frame [0x300/2/4/6]
Slave 1	OP	0x0000	0x5A22	0x00000000	0x00000000	0x00000000
Slave 2	OP	0x0000			0x00000000	0x00000000
Slave 3	OP	0x0000			0x00000000	0x00000000
Slave 4	OP	0x0000			0x00000000	0x00000000

Slave Revision Information
Slave error history
Change Slave Status
Slave Connection Status
Update Firmware



LSPLC - Slave Error History

Select Slave
Slave 1(X7NH - Standard EtherCAT drive)

No.	Code	Contents	Cause
1	0x43	Control power fail	Control power failure
2	0x43	Control power fail	Control power failure
3	0x43	Control power fail	Control power failure

Refresh Save as file OK

Shows which slave's error history is being viewed.

Error History of the selected slave.

Section 3.4 – EtherCAT Slave Change Slave Status

Note: The EtherCAT network must be connected through code or the Online Menu -> EtherCAT Slave -> Connect.

Right Click on a slave and Select 'Change Slave Status'.

Detailed information

Name	STATE	AL Status Code [0x134~5]	DL Status [0x110~1]	Lost Link [0x310~3]	Rx Error [0x301/3/5/7]	Inv. Frame [0x300/2/4/6]
Slave 1	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 2	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 3	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000
Slave 4	OP	0x0000	0x0000	0x00000000	0x00000000	0x00000000

Context menu for Slave 1:

- Slave Revision Information
- Slave error history
- Change Slave Status
- Slave Connection Status
- Update Firmware

Sub-menu for Change Slave Status:

- Bootstrap
- INIT
- Pre-Op
- Safe-Op
- Op

Select the slave's EtherCAT operation state status.

Shows the current EtherCAT operation state of the slave.

Section 3.5 – EtherCAT Slave Port Link Status

Note: The EtherCAT network must be connected through code or the Online Menu -> EtherCAT Slave -> Connect.

Right Click on a slave and Select 'Slave Connection Status'.

Detailed information

Name	STATE	AL Status Code [0x134~5]	DL Status [0x110~1]	Lost Link [0x310~3]	Rx Error [0x301/3/5/7]	Inv. Frame [0x300/2/4/6]
Slave 1	OP	0x0000			0x00000000	0x00000000
Slave 2	OP	0x0000			0x00000000	0x00000000
Slave 3	OP	0x0000			0x00000000	0x00000000
Slave 4	OP	0x0000			0x00000000	0x00000000

Slave Revision Information
Slave error history
Change Slave Status
Slave Connection Status
Update Firmware

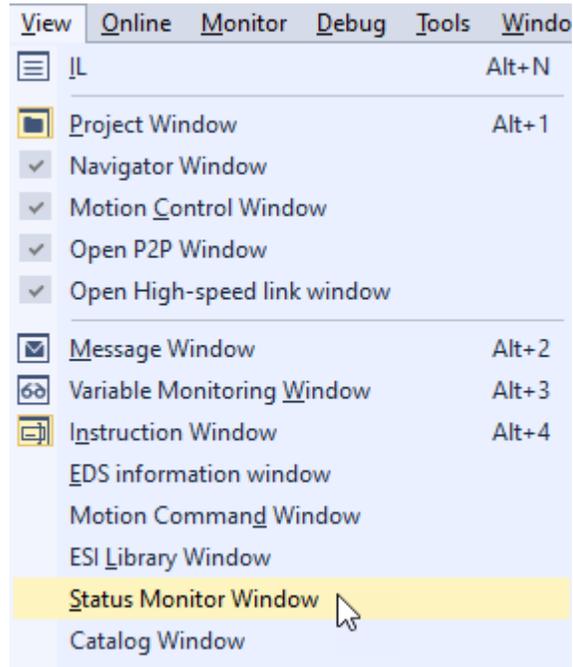
[Port 0] Link, open
[Port 1] Link, open
[Port 2] No link, closed
[Port 3] No link, closed

Shows the status on the slave's EtherCAT ports.

Section 4 – Status Monitor Screen

- The Status Monitor Screen will show information about the Axes.
- This screen is useful for troubleshooting and diagnosing issues.

Go to View Menu and Select 'Status Monitor Window'.

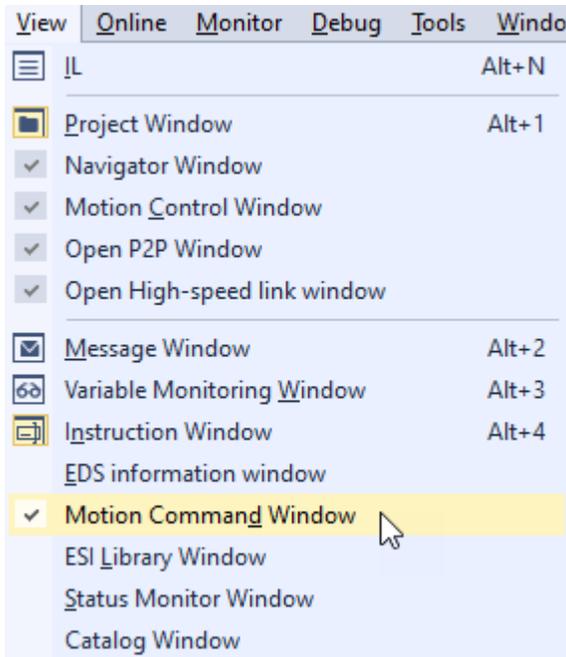


LSPLC - Status Monitor					
Status/Axis	1	2	3	4	9
Axis type	Real axis	Real axis	Real axis	Real axis	Virtual axis
Servo ready	ON	ON	ON	ON	ON
Servo on	OFF	OFF	OFF	OFF	ON
Pos/Spd unit	pls,pls/s	pls,pls/s	pls,pls/s	pls,pls/s	pls,pls/s
Command position	0.00000000 0000000e+0	1.00000000 0000000e+0	1.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0
Command speed	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0
Command torque	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0
Current position	0.00000000 0000000e+0	1.00000000 0000000e+0	1.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0
Current speed	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0
Current torque	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0	0.00000000 0000000e+0
Error code	0x0	0x0	0x0	0x0	0x0
Main axis	1	2	3	4	9
Main/Sub axis	Master	Master	Master	Master	Master
Operation status					
Position complete					
Origin fix					
Control pattern					
Stop status					
Upper limit					
Lower limit					
Ext. input(Bit 15~Bit 0)	0000 0000 0000 0000				
Ext. input(Bit 31~Bit 16)	0000 0000 0000 0000				

Section 5 – Motion Command Window

- The Motion Command Window allows the user to send commands to an axis with XG5000.
- Make sure your system is safe and use caution when sending manual motion commands.

Go to View Menu and Select 'Motion Command'.



Choose Axis to Command.

Command Buttons such as stop, error reset, and connect axes.

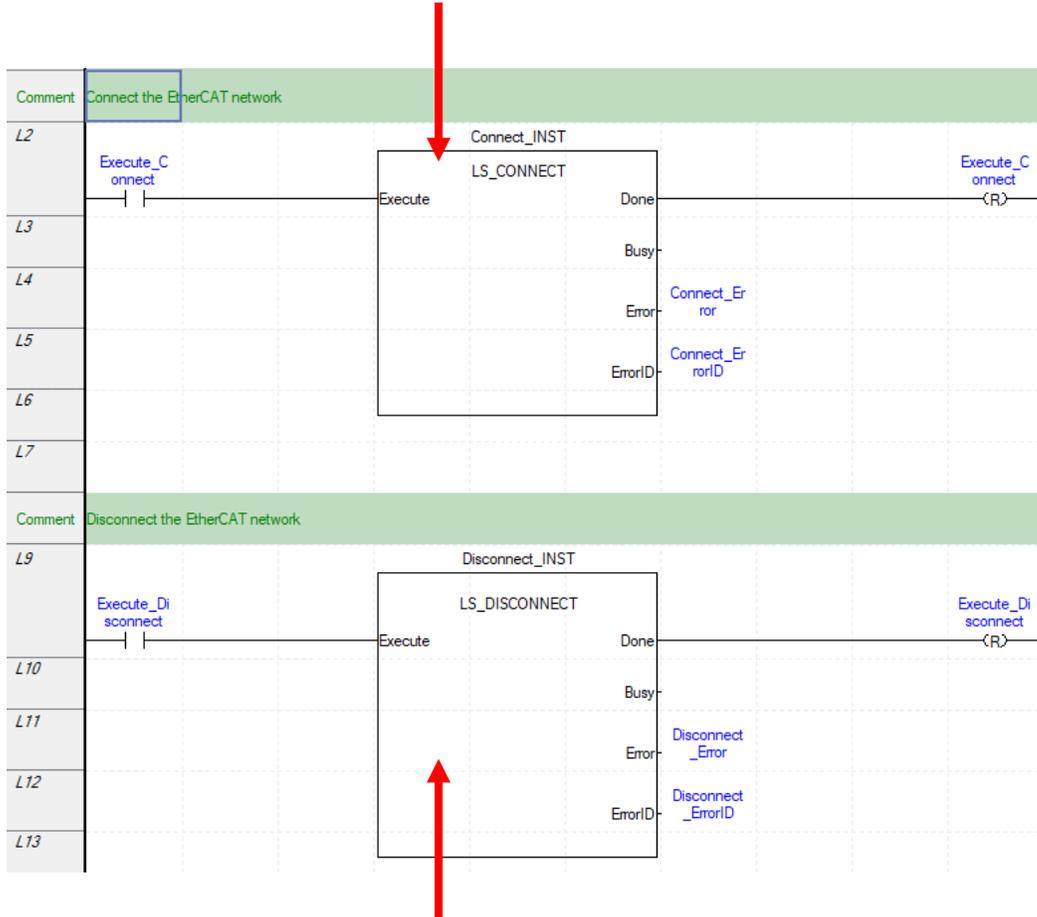
The screenshot shows the 'Motion Command' window with a title bar 'L2PLC - Motion Command'. A dropdown menu at the top left is set to 'CMD.Axis: Axis 1'. To its right is a toolbar with icons for connecting axes, stop, error reset, and other functions. Below the toolbar is a table with columns for command names, parameters, and 'Run' buttons.

Command	Item	Rst. Axis Error	Run	
Direct Start	Pos.	0 mm	Run	
	Spd.	0 mm/s		
	Accel.	0 mm/s ²		
	Decel.	0 mm/s ²		
	Jerk	0 mm/s ³		
	Coord.	ABS		
	Dir.	0: none		
Dec. Stop	Dec.	0 mm/s ²	Run	
	Jerk	0 mm/s ³		
Pos. Preset	Pos.	0 mm	Run	
Enc. Preset	Type	ENC1	Run	
	Pos.	0 pls		
Start JOG	<<	<	>	>>
Stop JOG				

Motion commands and settings.

XMC10– Example Motion Code

LS_Connect must be called first to connect the EtherCAT network.



LS_Disconnect is used to disconnect the EtherCAT network. Must be done before doing a project write if the network is connected.

Motion function blocks use an UINT variable for axis reference. The value of '1' will be axis 1. So, 'n' will be axis n.

