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Starting up the Axioline F bus coupler for EtherCAT® and Axioline E devices for EtherCAT® using Sysmac Studio

Quick start guide

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Quick start guide

Starting up the Axioline F bus coupler for EtherCAT® and Axioline E devices for EtherCAT® using Sysmac Studio

2016-01-11

Designation: UM EN AXL F BK EC + AXL E EC + SYSMAC STUDIO

Revision: 00

This user manual is valid for:

Designation	Order No.
AXL F BK EC	2688899
AXL E EC DI8 DO8 M12 6M	2701525
AXL E EC DI16 M12 6M	2701526
AXL E EC DIO16 M12 6M	2701528
AXL E EC DI8 DO4 2A M12 6M	2701529
AXL E EC DI8 DO8 M12 6P	2701520
AXL E EC DI16 M12 6P	2701521
AXL E EC DIO16 M12 6P	2701522
AXL E EC DI8 DO4 2A M12 6P	2701523

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Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to:

- Qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.
- Qualified application programmers and software engineers, who are familiar with the safety concepts of automation technology and applicable standards.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

There are three different categories of personal injury that are indicated with a signal word.

DANGER This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

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1 About this document

1.1 Purpose of this user manual

This user manual helps you to start up Axioline F modules on the Axioline F bus coupler for EtherCAT® and Axioline E devices using examples.

The Sysmac Studio software from Omron is used.

The examples show how to start up a selection of Axioline F I/O modules and Axioline E devices. However, the information can be applied to any I/O module from the Axioline F and Axioline E product ranges.

1.2 Axioline F bus coupler for EtherCAT®

The AXL F BK EC bus coupler provides the interface between the EtherCAT® system and the I/O modules from the Axioline F product range. It implements the bus signal configuration and the power supply required for the connected bus topology. The bus coupler is currently available for connecting copper cables.

The bus coupler supports all modules from the Axioline F product range from Phoenix Contact.

For more detailed information on the bus coupler, please refer to the module-specific documentation.

1.3 Axioline E devices for EtherCAT®

Axioline E devices are designed for use within an EtherCAT® network. Depending on the version, they are used to acquire and/or output digital signals.

For more detailed information on the Axioline E devices, please refer to the module-specific documentation.

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1.4 Hardware and software used in the example

Table 1-1 Hardware used in the example

Description	Type	Order No.
Omron NJ301-1100 V1.07 (including power supply)	See Omron	
Axioline F modules and Axioline E devices from Phoenix Contact		
Axioline F bus coupler for EtherCAT® (including bus base module and connector)	AXL F BK EC	2688475
Axioline F digital input module, 32 inputs, 24 V DC, 1-conductor connection technology (including bus base module and connectors)	AXL F DI 32/1	2688035
Axioline F digital output module, 32 outputs, 24 V DC, 500 mA, 1-conductor connection technology (including bus base module and connectors)	AXL F DO 32/1	2688051
Axioline E EtherCAT® device in plastic housing with 16 configurable inputs or outputs, 24 V DC, M12 fast connection technology	AXL E EC DIO16 M12 6P	2701522

For more detailed information on the modules used, please refer to the corresponding documentation. It can be downloaded at phoenixcontact.net/products.

Table 1-2 Software used in the example

Description	Type	Manufacturer	Order No.
Startup and parameterization of Axioline F stations (V2.30 or later)	Startup+	Phoenix Contact	–
Automation software	Sysmac Studio	Omron	Depends on the license

A PC system that meets the software requirements is required to understand the example described in this user manual.

Please refer to the online help or the corresponding documentation for detailed information on the software.

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2 The project in Sysmac Studio

2.1 Requirements for using an AXL F BK EC Axioline F bus coupler

If you wish to integrate an Axioline F station via the AXL F BK EC bus coupler in EtherCAT®, the following requirements must be observed:

– The Axioline F station is created.
– The Axioline F station is configured and the modules are parameterized.

2.1.1 Creating the Axioline F station

- Create the Axioline F station according to your requirements.
  To do so, proceed as described in the documentation for the modules used (package slip, data sheet, UM EN AXL F SYS INST user manual).

2.1.2 Configuring the Axioline F station and parameterizing the modules

- Configure and parameterize the Axioline F station using the Startup+ software.

For more detailed information on the Startup+ software, please refer to the online help or the corresponding documentation.

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2.2 Creating a new project

- To create a new project, select the “New Project” button.

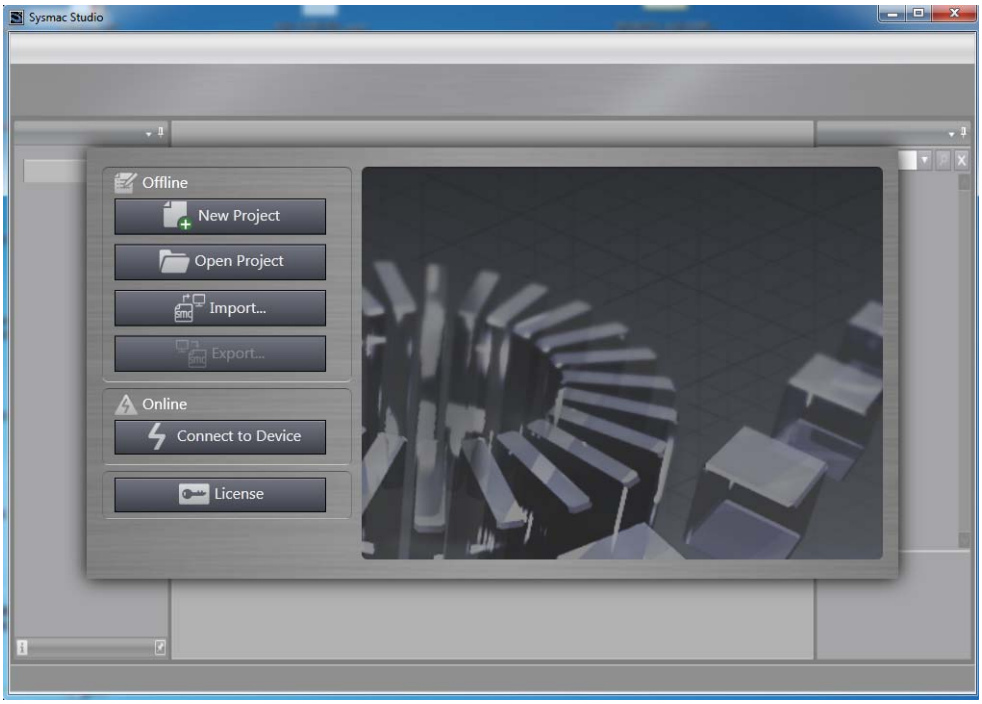

Figure 2-1 Creating a new project

- Enter the project properties in the window that opens.

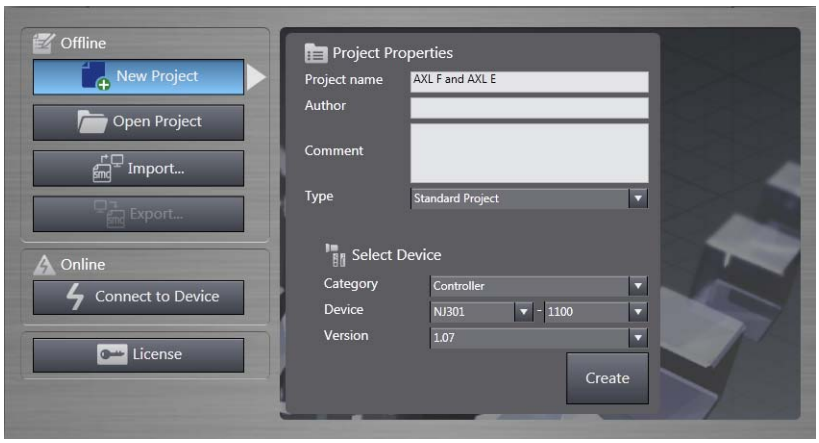

Figure 2-2 Entering the project properties

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Confirm your entry with “Create”.

The project interface opens.

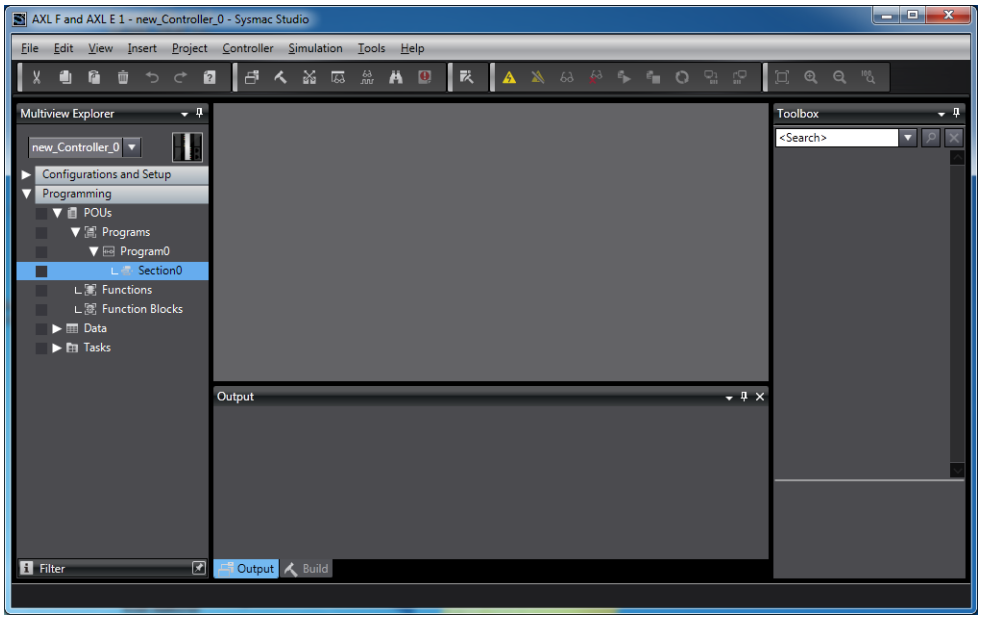

Figure 2-3 Project interface

- Make all the necessary settings in the project interface.

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2.3 Connecting to the controller

- Select “Controller, Communications Setup”.

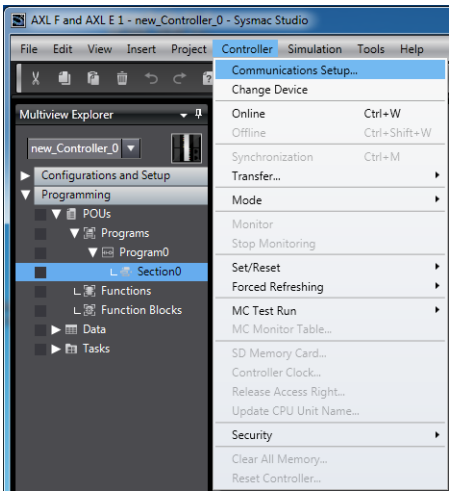

Figure 2-4 “Controller, Communications Setup”

- In the “Communications Setup” window that opens, select the connection type, e.g., “Direct connection via USB”.

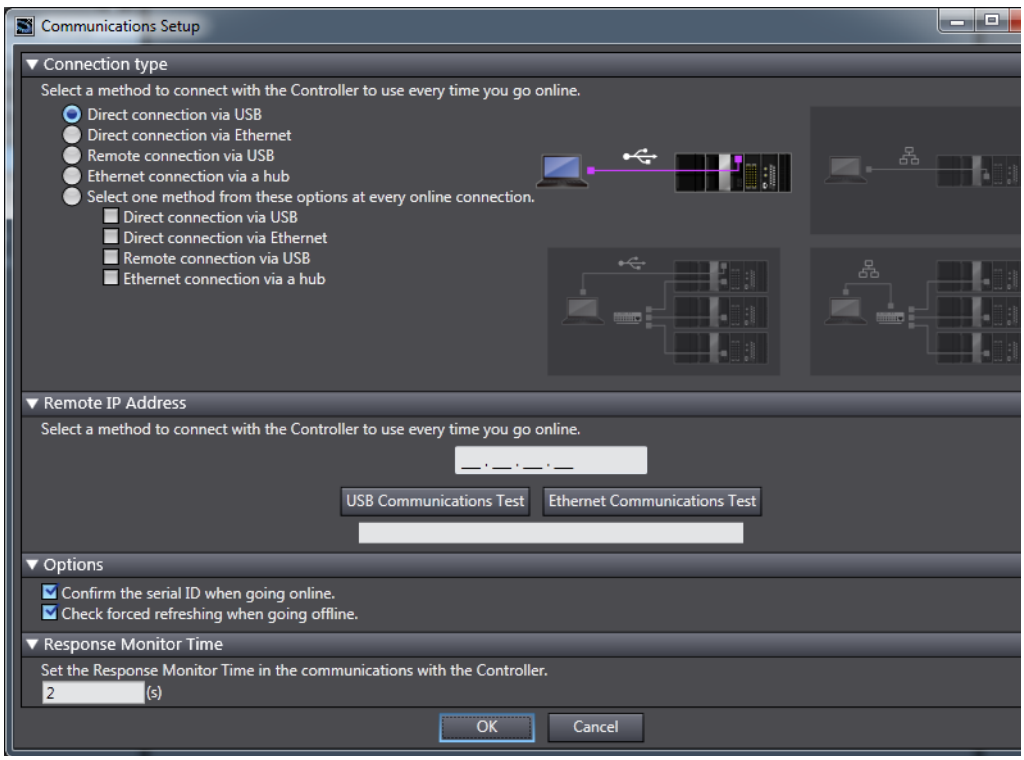

Figure 2-5 Selecting the connection type

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As an option, you can test whether the connection has been established. To do this, proceed as follows:

- Click on the corresponding button under “Remote IP Address”.
  In the example, a USB connection was selected in the preceding step, so select “USB Communications Test”.

If a connection exists, the message “Test OK” is returned.

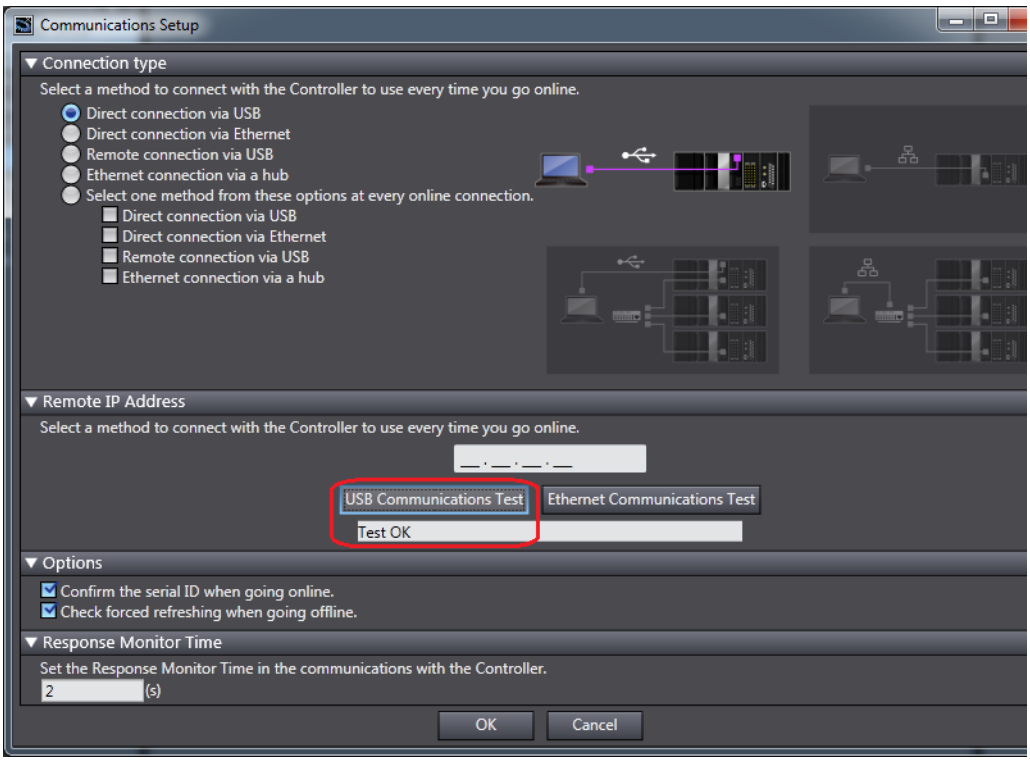

Figure 2-6 Testing the connection

- Confirm your entry with “OK”.

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2.4 Importing the EtherCAT® ESI device description file

In order to use an EtherCAT® slave, you must import its ESI device description file into the Sysmac Studio software. The software uses the ESI file to interpret the EtherCAT® hardware functions.

You can download the ESI file for the Axioline F bus coupler and the Axioline E devices from the Phoenix Contact homepage under the downloads for the bus coupler or the devices. The ESI files are in xml format.

- Download the configuration files for the devices used from the homepage via phoenix-contact.net/products. Save the file to a directory of your choice on your PC.

Copy the ESI file to the specified Sysmac Studio directory; to do so, proceed as follows:

- In the project interface, open the “Configurations and Setup” item in the project tree.
- Double-click on “EtherCAT” to open it.
- In the “Node Address/Network configuration” window that opens, right-click on the master to open the corresponding context menu.
- Select “Display ESI Library”.

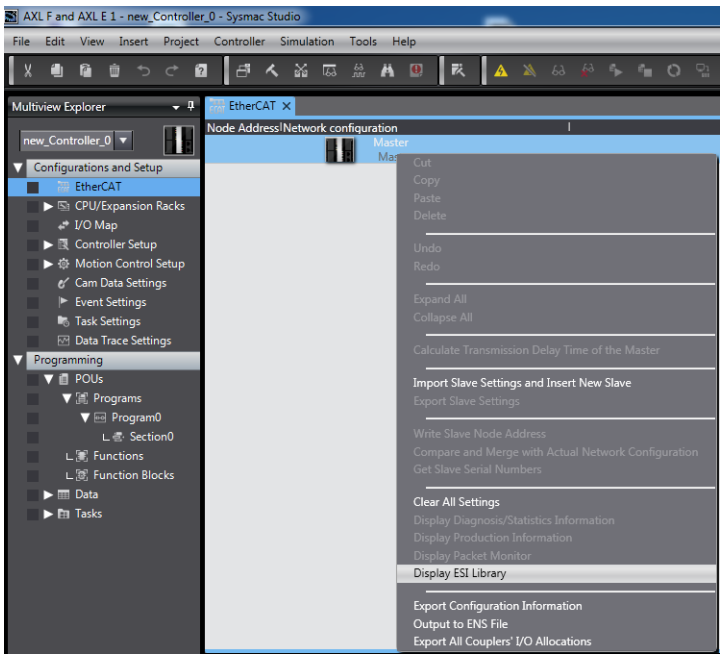

Figure 2-7 “Display ESI Library”

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The “ESI Library” window opens. All available ESI files are displayed in this window.

In Figure 2-8, the ESI files for the Axioline F bus coupler and two Axioline E devices are circled in red.

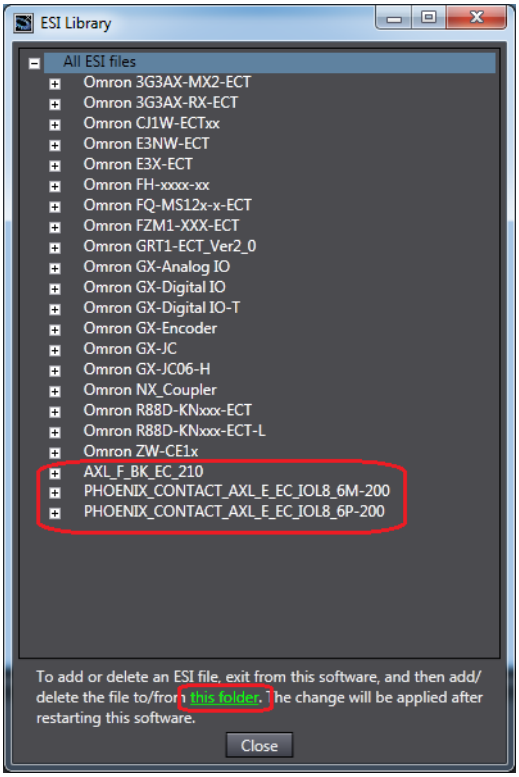

Figure 2-8 “Display ESI Library”

- If you wish to import further ESI files:
  Open the directory where you wish to import the ESI files by clicking on the “this folder” link which is highlighted in color.

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- Copy all the necessary ESI files to the directory that opens.

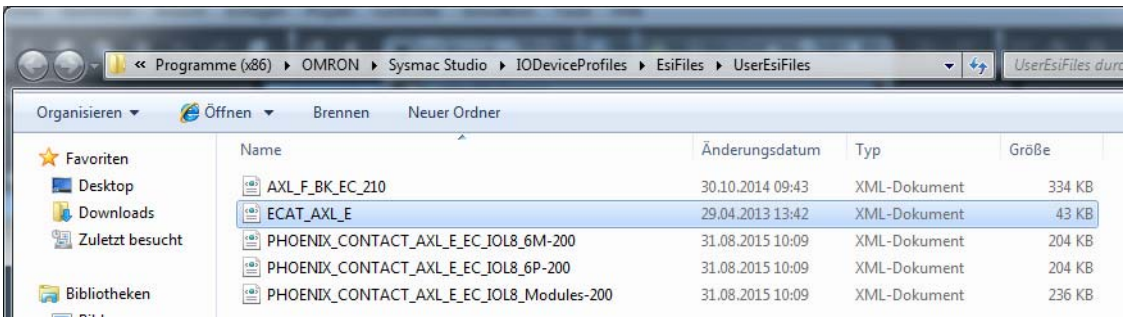

Figure 2-9 Copying the ESI file to the directory that opens

A common ESI file, ECAT_AXL_E.XML, is available for all Axioline E devices.

- Close and restart the Sysmac Studio software.
- Select “Open Project” and select your project.
- Confirm your selection with “Open”.

The ESI files appear in the library following the restart.

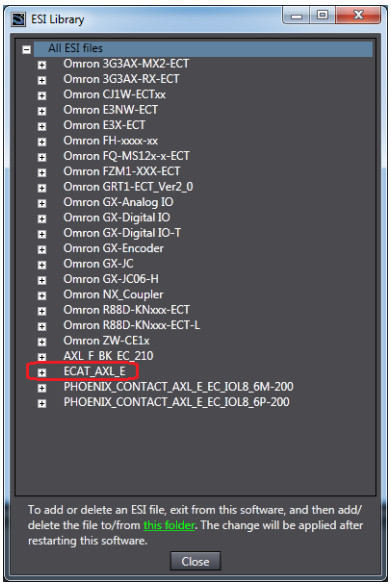

Figure 2-10 ESI file for Axioline E devices imported

You can now create the EtherCAT® bus topology.

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2.5 Creating the EtherCAT® bus topology

- Select “Phoenix Contact EtherCAT Devices” in the Toolbox under “All vendors”.

2.5.1 Inserting the AXL F BK EC bus coupler in the bus topology

- Select the AXL F BK EC bus coupler from the device catalog.
- Drag and drop the bus coupler below the master in the bus topology.

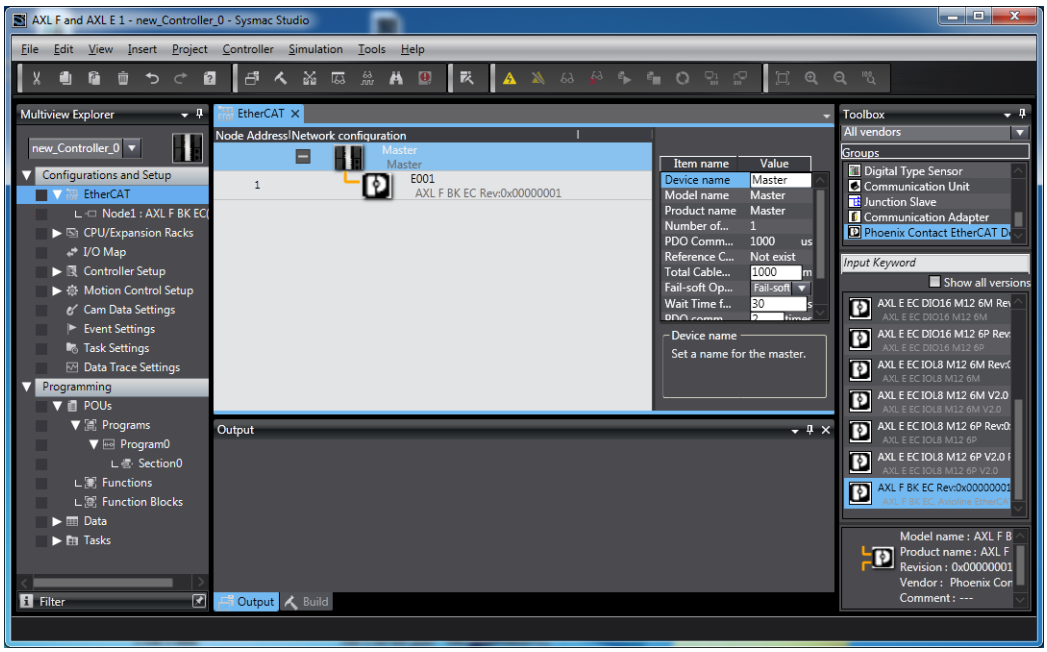

Figure 2-11 Inserting the bus coupler in the bus topology

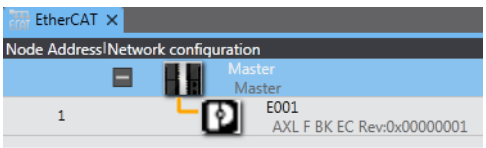

Figure 2-12 Inserted bus coupler

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2.5.2 Inserting an Axioline E device in the bus topology

To insert an Axioline E device, proceed as follows:

- Select the Axioline E device from the device catalog.
- Drag and drop the device in the bus topology (below the bus coupler in the example).

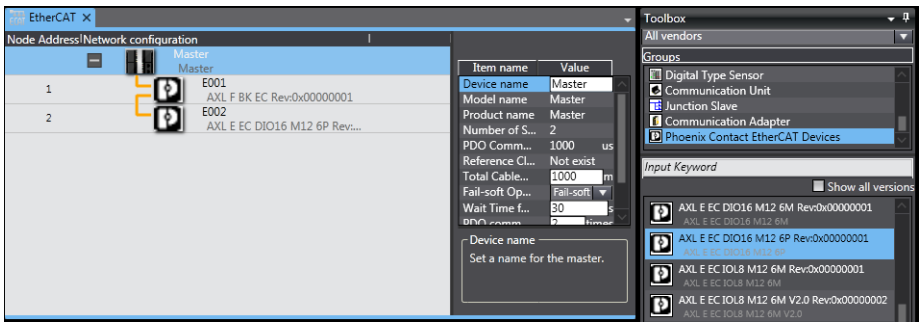

Figure 2-13 Inserting an Axioline E device in the bus topology

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2.5.3 Inserting Axioline F I/O modules in the bus topology

You can now link the necessary Axioline F I/O modules to the bus coupler. To do this, proceed as follows:

- Right-click on the bus coupler to open the context menu and select the “Edit Module Configuration” menu item.

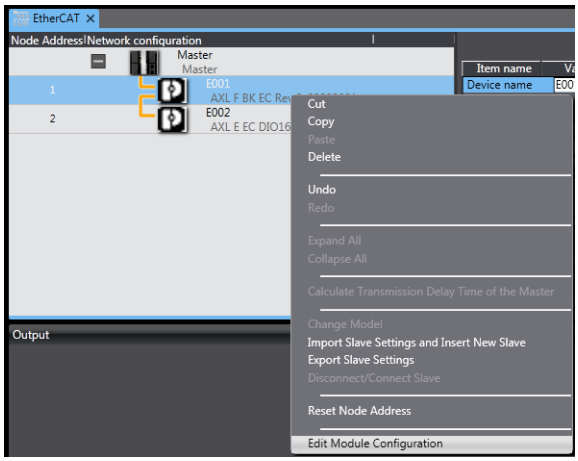

Figure 2-14 “Edit Module Configuration”

- In the window that opens, select the next Axioline F module required from the module catalog. The module catalog is located in the Toolbox.
- Drag and drop the module in the desired slot position.
- Repeat this step for all required modules.

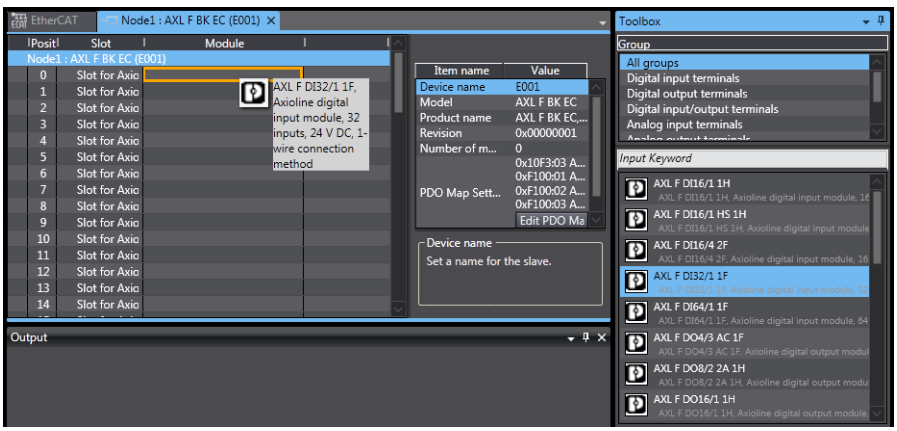

Figure 2-15 Attaching I/O modules to the bus coupler

Example: attaching modules AXL F DI 32/1 and AXL F DO 32/1

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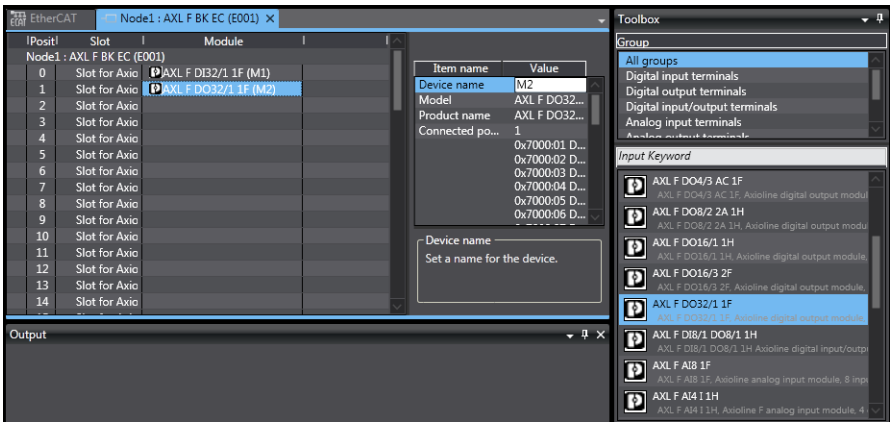

Figure 2-16 Attaching I/O modules to the bus coupler

2.6 Linking variables to process data

After you have created the bus topology, link the variables to the process data. To do this, proceed as follows:

- Double-click on “I/O Map” in the project structure.

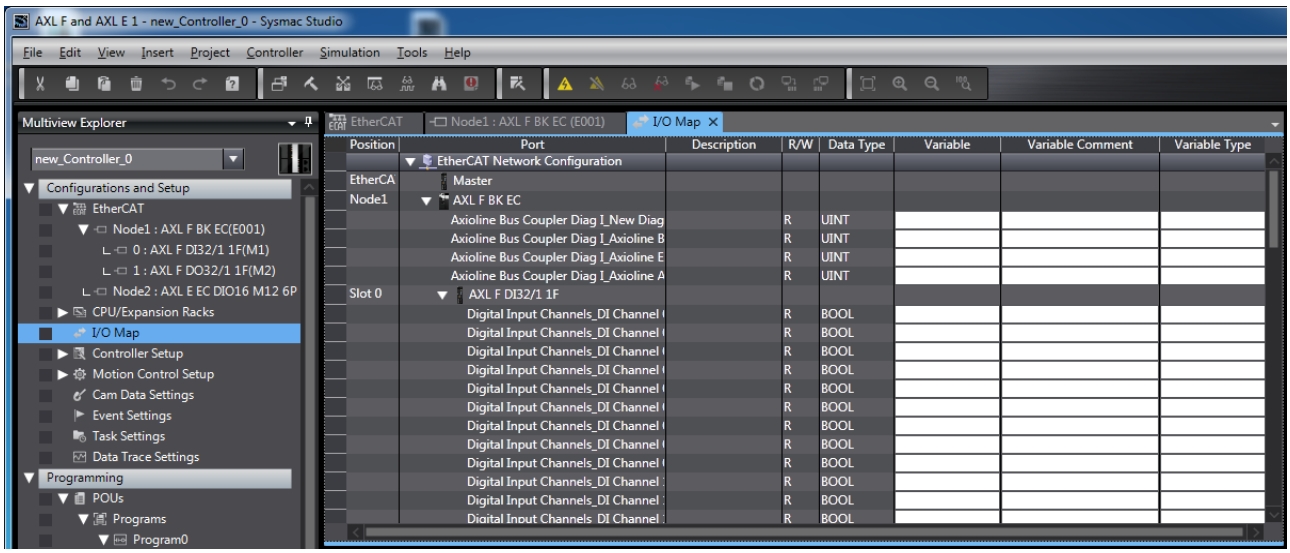

Figure 2-17 “I/O Map”

For Axioline F modules, the variables for each individual input or output are created as BOOL variables.

For Axioline E devices, the variables for a group of eight inputs or outputs are created as USINT variables.

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- Assign a name to the process data for the modules in the “Variable” column. The variables are created as global variables.
  If you wish to change this, adjust the setting under “Variable Type”.

In the example, variables DI1, DI2, DI3 and DO1, DO2, DO3 are created for Axioline F modules and variables DI5, DI6 and DO5, DO6 for Axioline E devices.

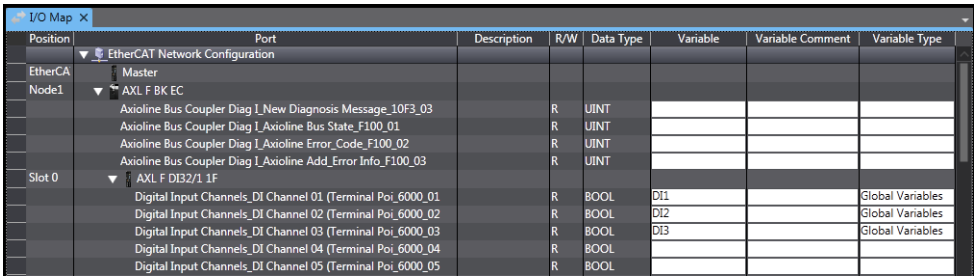

Figure 2-18 Creating variables for Axioline F modules

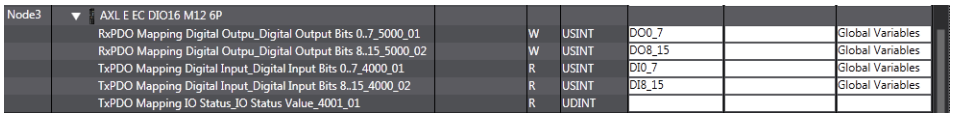

Figure 2-19 Creating variables for Axioline F devices

Once you have assigned global variable names to the process data, you can use them in the program code.

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By default, each new project that is created contains a worksheet in LD (ladder diagram) format.

In the example, an ST worksheet should be used instead. To do this, you must first delete the LD worksheet and then create an ST worksheet.

- Under “Programming” in the project tree, right-click on “Programm0” to open the context menu.
- Select “Delete” to delete the LD worksheet.

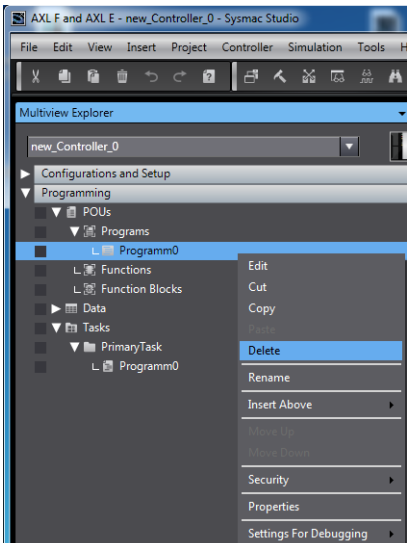

Figure 2-20 Deleting the LD worksheet

- Confirm the prompt to delete with “Yes”.
- Right-click on “Programs” to open the context menu.
- Select “Add, ST” to add the ST worksheet.

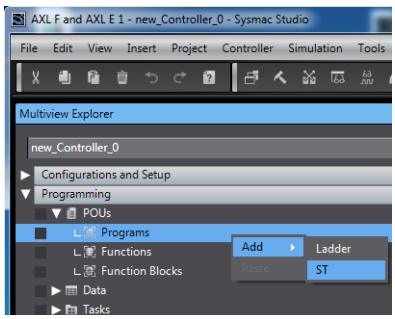

Figure 2-21 Adding the ST worksheet

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You can now create the program code.

- Double-click on “Programm0” to open the program worksheet.
- Assign the first three inputs to the first three outputs.

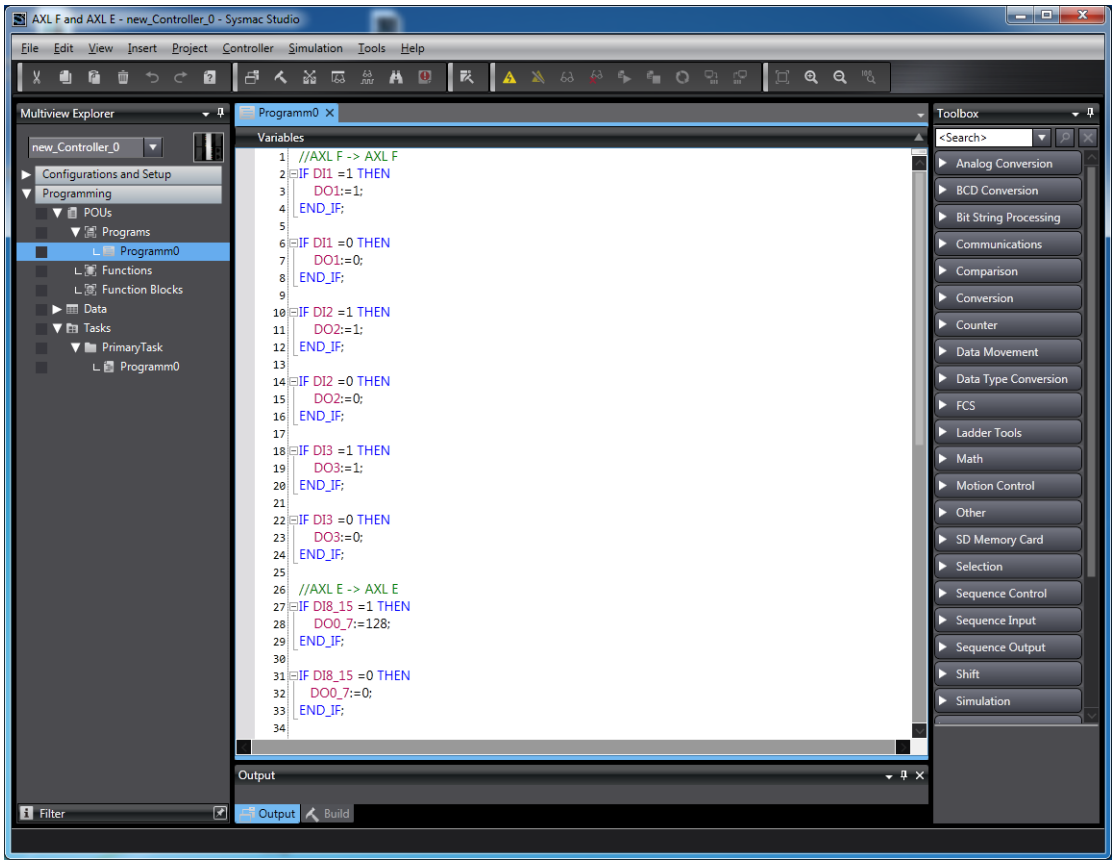

Figure 2-22 Creating the program code

Please note the different way in which Axioline F and Axioline E variables are handled.

In the case of Axioline E, you can only access individual inputs or outputs based on their value in the byte.

Table 2-1 Value of inputs or outputs for Axioline E

Input/output	8	7	6	5	4	3	2	1
Value	128	64	32	16	8	4	2	1

If you want to set the second and sixth output when using variable DO0_7 as specified above, set DO0_7:=34 (2+32).

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The program code must now be assigned to a processing task.

- Double-click on “Task Settings” under “Configurations and Setup” in the project structure.
- Check the “Task Settings”.

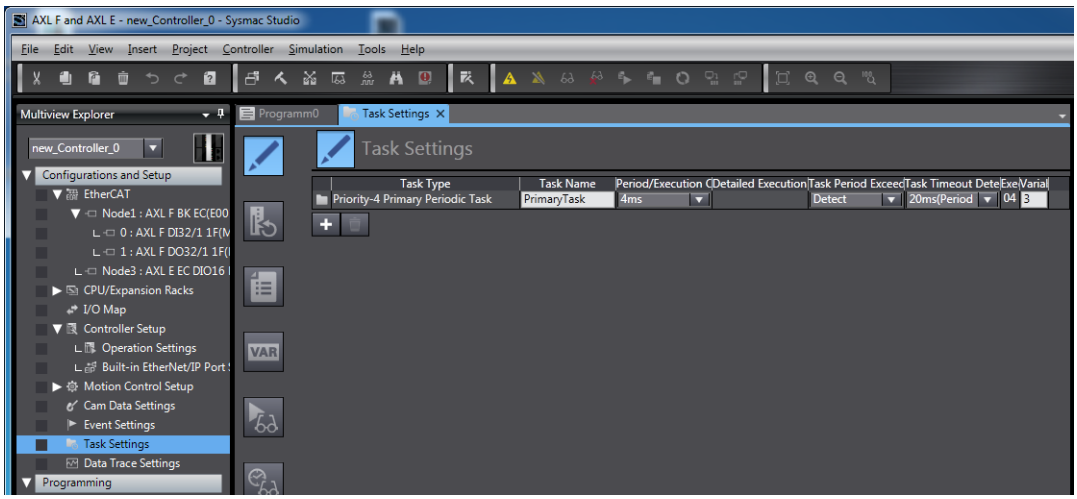

Figure 2-23 Checking the task settings

- Switch to the “Program Assignment Settings” (see highlighted icon in Figure 2-24).
- To add the program code to the task, click on the “+” button.
- Select your program from the drop-down list.

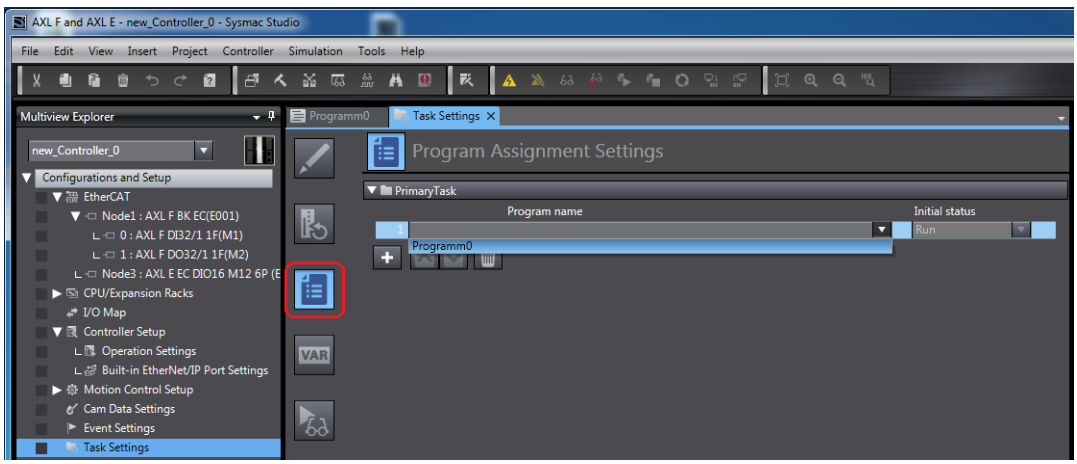

Figure 2-24 Selecting the program

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2.7 Compiling a project

- To compile the project, select the “Project, Rebuild Controller” menu item.

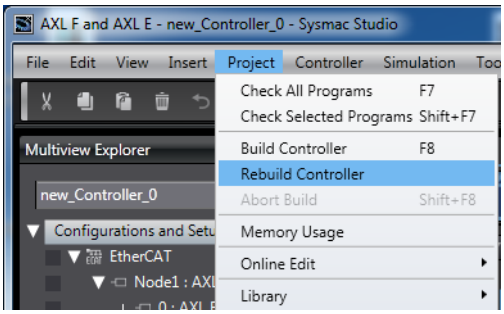

Figure 2-25 Compiling a project

- Confirm the message that opens with “Yes”.

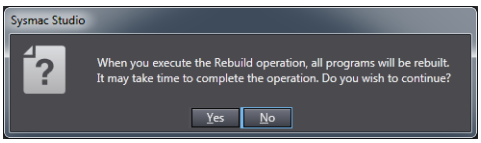

Figure 2-26 Message

If no error is indicated this means that the project has been compiled successfully.

If an error is indicated, correct it and compile the project again.

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2.8 Transferring the project to the controller

If the project has been compiled without errors, you can transfer it to the controller.

In order to transfer the project the program must be in the online state for the Omron controller.

- To switch to the online state, click on the online icon (yellow triangle).

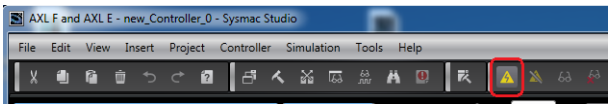

Figure 2-27 Switching to the online state

- To download the project to the controller, select the synchronization icon.

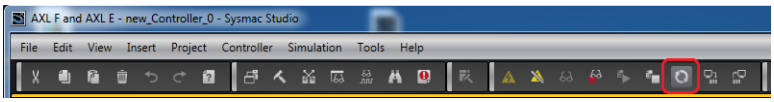

Figure 2-28 Synchronizing the project

The “Synchronization” window shows the differences between the project located on the controller.

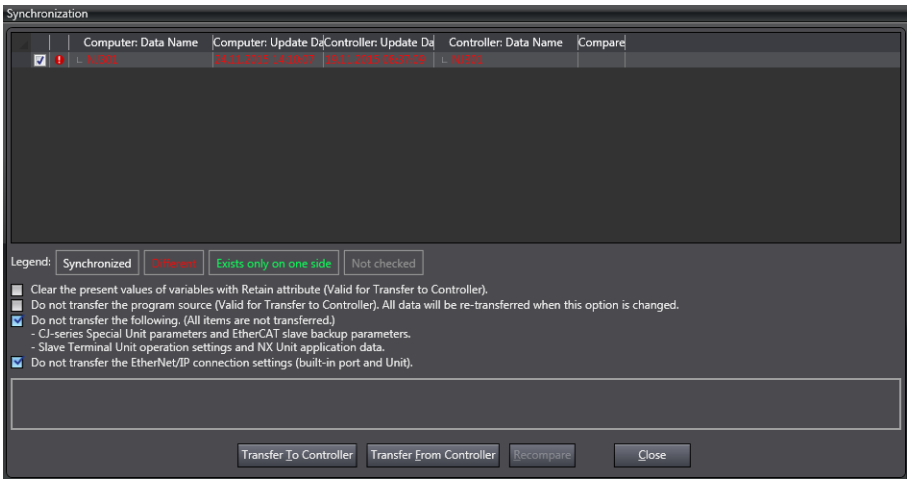

Figure 2-29 Synchronizing the project

- To transfer the project or the modified parts to the controller, activate the check box for the lines to be transferred and click on the “Transfer To Controller” button.
- If you are sure that no problem can occur when the controller is started, confirm the messages that follow with “Yes”.

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If the entire bus topology has been started up, this is indicated by the following LED states:

Axioline F bus coupler	RUN LED lights up green
	RDY LED lights up green
Axioline F modules	D LED lights up green
Axioline E devices	RDY LED lights up green
	RUN LED lights up green

If the LEDs do not light up as specified, an error has occurred.

There can be several reasons for this. To find the cause of the error and to rectify it, proceed as follows:

1. Check whether the connected bus topology corresponds to the configured topology.
2. Check the error memory; reset it if necessary.
   See “Reading and deleting the error memory” on page 29
3. Slave node address is not available.
   See “Slave node address is not available” on page 31

If an error is no longer indicated, you have successfully created your EtherCAT® structure and the project is located on the controller.

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2.9 Online status of inputs and outputs

In the example structure, you can now set or reset inputs or track the corresponding response at the outputs.

In addition, the online status of the inputs and outputs can be tracked in the program code.

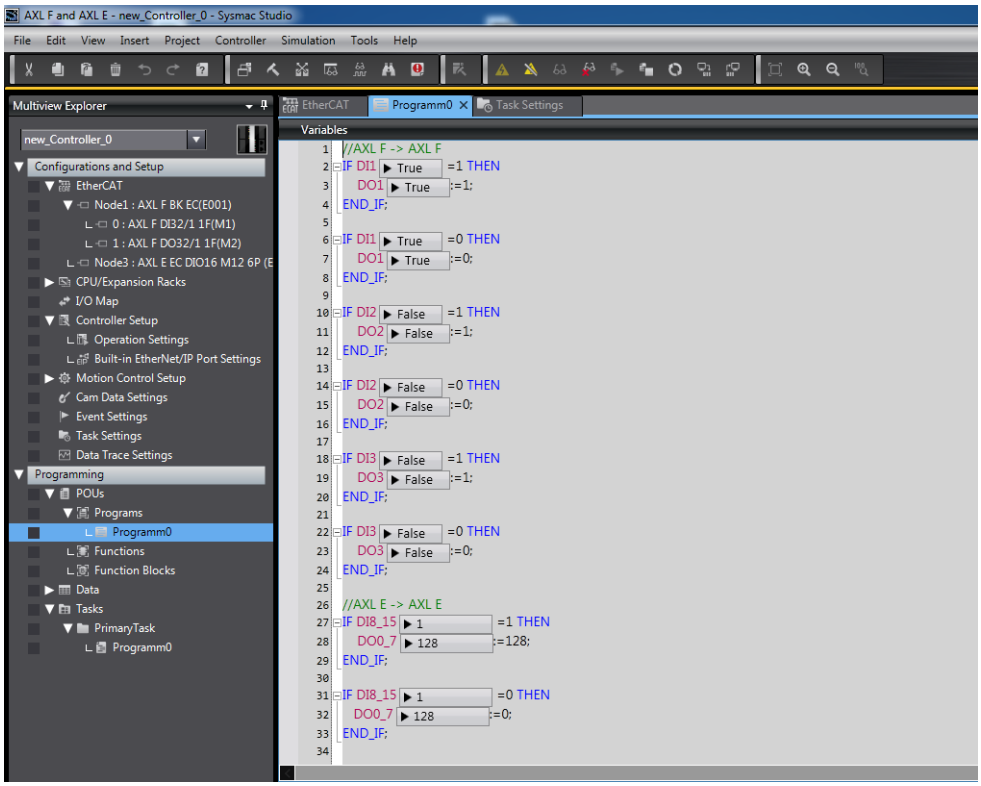

Figure 2-30 Online status of the variables

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3 Special functions

3.1 Reading and deleting the error memory

The error memory provides support when troubleshooting. In addition, after rectifying an error, you can clear the error memory.

To do this, proceed as follows:

- Open the “Troubleshooting” window in the project interface.

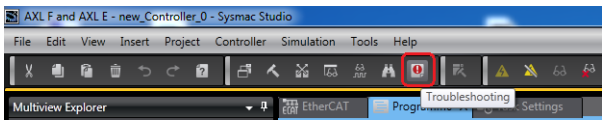

Figure 3-1 “Troubleshooting” window

- Select the “Controller Errors” window.
- Check the messages that are displayed and rectify any errors.
- To reset all errors, click on the “Reset All” button.

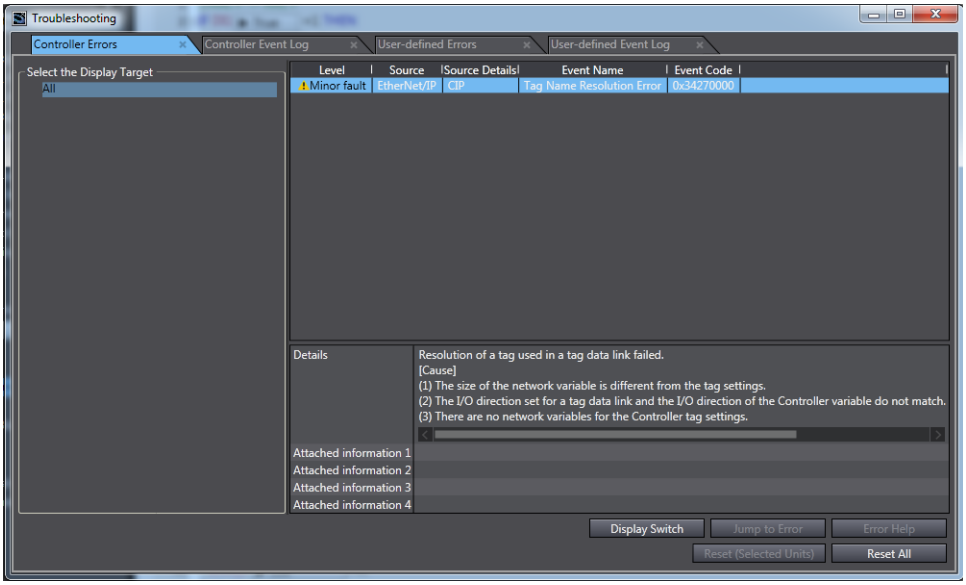

Figure 3-2 Controller errors

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- Switch to the “Controller Event Log” window.
- To clear the event log, click on the “Clear” button.

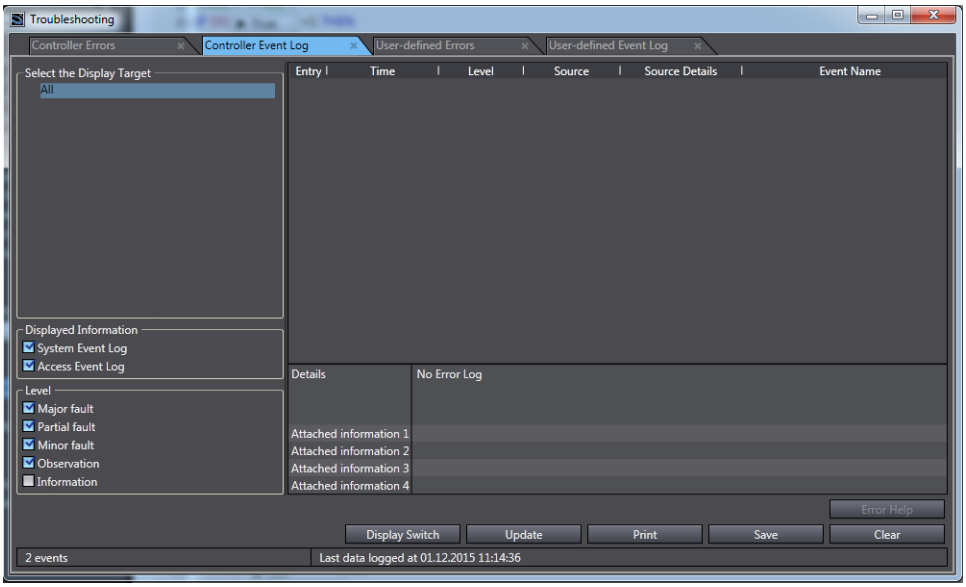

Figure 3-3 Controller event log

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3.2 Slave node address is not available

- Double-click on “EtherCAT” under “Configurations and Setup” in the project structure to open it.

If the slave is shown with an X in the bus topology, the node address of the slave is not yet available and must be transferred to the slave.

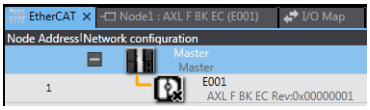

Figure 3-4 Node address not yet available

To transfer the node address, proceed as follows:

- Right-click on the master bus node to open the context menu.
- Select “Write Slave Node Address”.

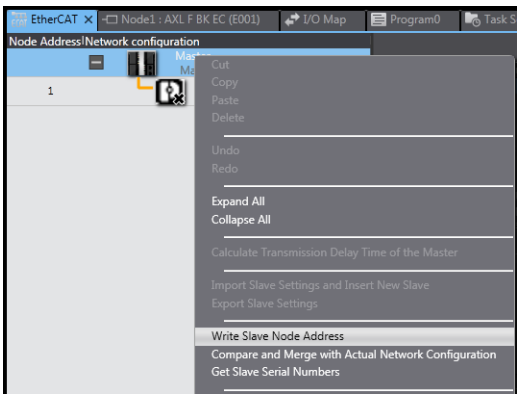

Figure 3-5 Node address not yet available

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The current values are displayed in the window that opens.

In the example in Figure 3-6, the node addresses differ. Node address 2 is entered in the hardware and node address 1 is entered in the bus topology.

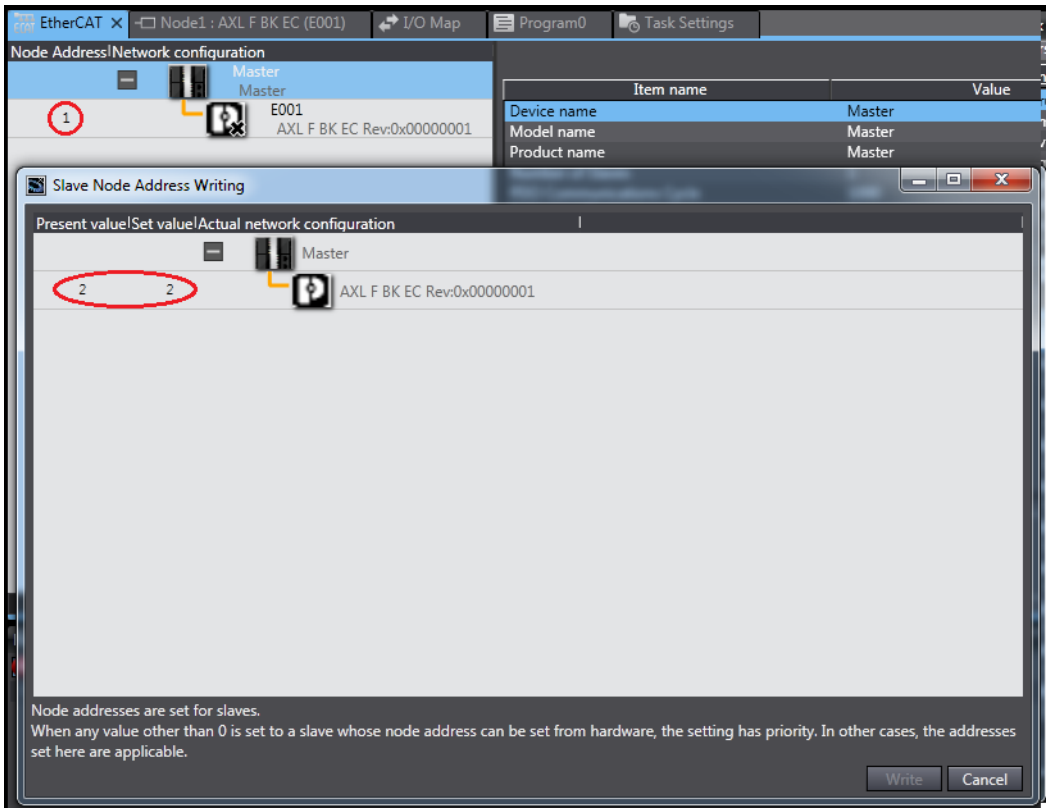

Figure 3-6 Different node addresses

There are two ways to resolve this:

1. In the bus topology, enter the same address that is used in the slave hardware (2 in the example).
2. Write the address that is stored in the bus topology to the slave (1 in the example).

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The second option is described below.

- To adapt the node address on the slave to the address in the bus topology, enter the address to be written as the “Set value” (1 in the example).

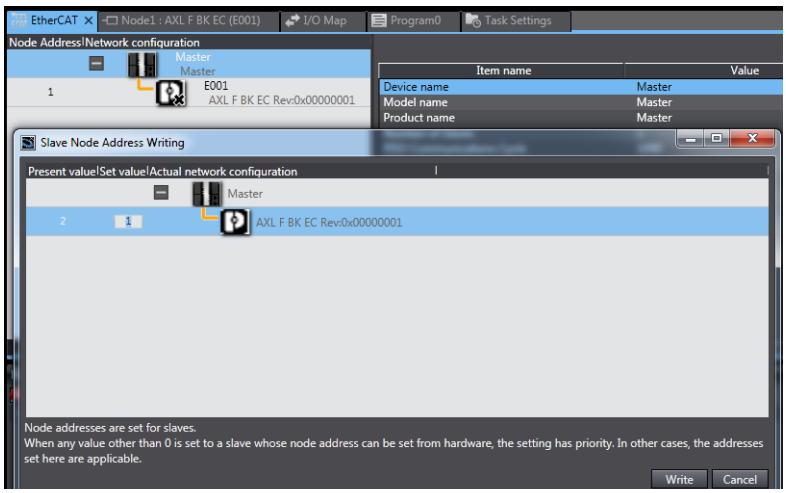

Figure 3-7 “Set value” for the node address

- Confirm your entry with “Write”. The process of writing the address to the slave is started.
- Confirm the following message by clicking on “Write”.

	Do **not** restart the slave just yet. Only perform a restart once the address has been successfully written.

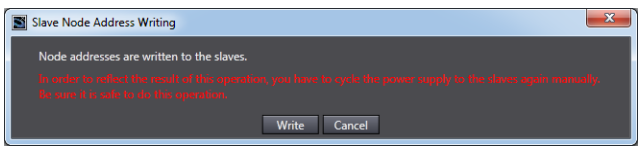

Figure 3-8 Message

When the node address has been written successfully, a corresponding message is displayed.

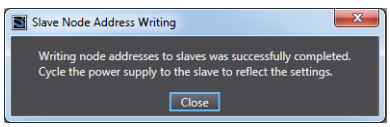

Figure 3-9 Message

- Confirm the message by clicking on “Close”.
- Now restart the slave.
  This can generally be done by switching the power supply off and on again at the slave. On the AXL F BK EC Axioline F bus coupler it is also possible to trigger a restart by pressing the reset button on the bus coupler.

As soon as the slave has been restarted the master, which is still running, automatically connects to the newly addressed slave and starts process data exchange.

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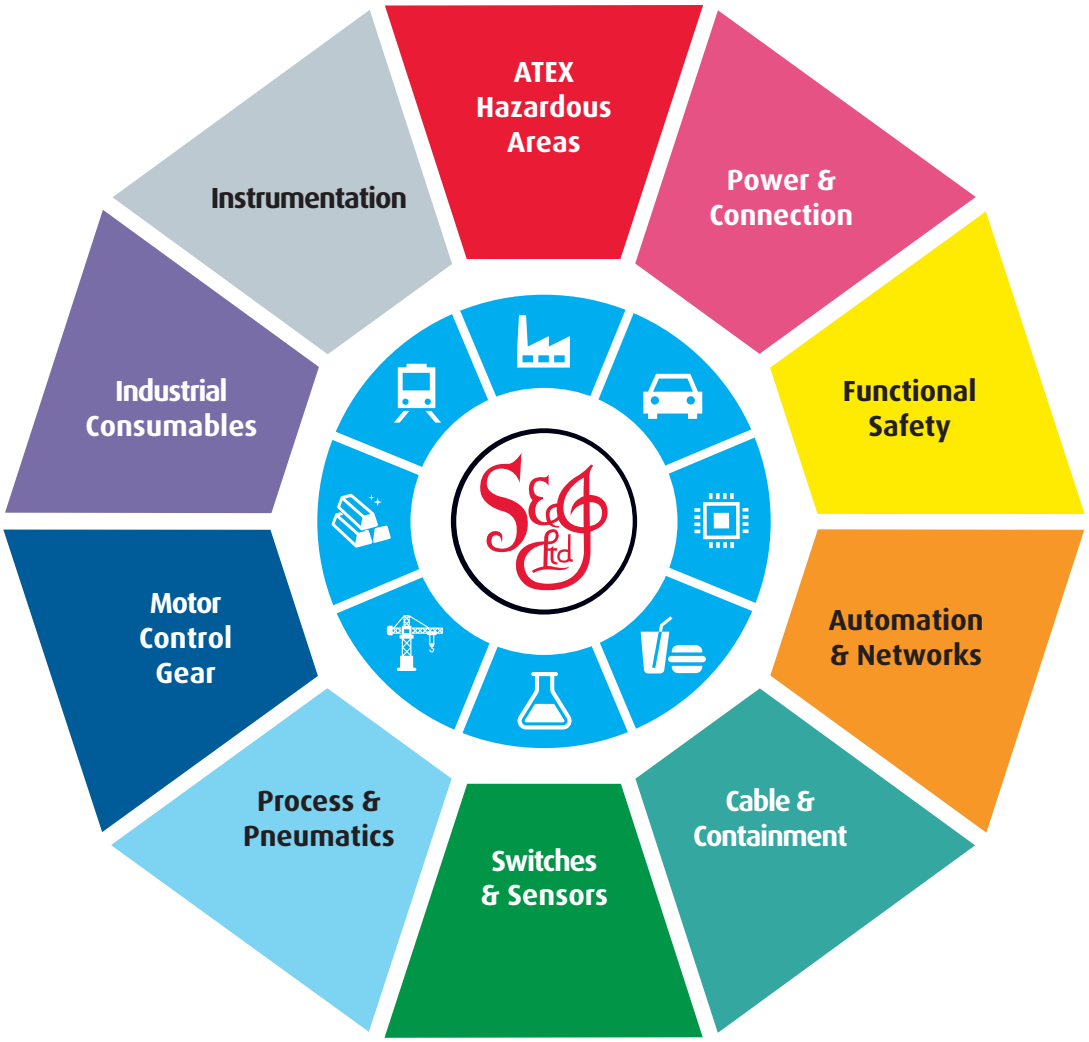

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