



Powerlink MappMotion for XENAX®

Version 4.0.0

Edition 28. April 2025



XENAX® Ethernet Servo Controller with
POWERLINK® fieldbus module

Functional safety, TÜV certified

Force processes for “Force Control”

General

This manual describes the integration of the XENAX® Xvi75V8 Servo Controller into a B&R PLC with the Automation Studio. Therefore the B&R library “MappMotion” based on the CANopen Motion Profile DS402 will be used.

This documentation includes a complete guide on how to set up a Automation Studio 6 Project.

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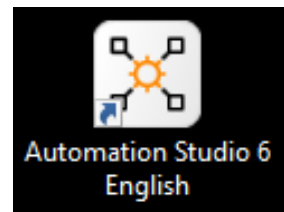
1 Development environment

1.1 Controller, Tools, Libraries

Automation Studio

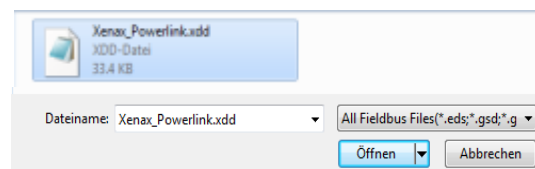
Software for the configuration of the B&R PLC with project handling.

Software for configuration and programming of the B&R PLC, including project management.
This manual is based on Automation Studio V6



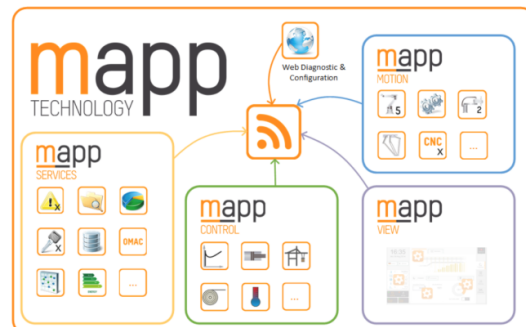
Electronic data sheet

XDD-file (XML Device Description) is a standard XML-format according to ISO 15745-4. This file includes communication parameter and objects of the XENAX® Servo Controller. These are necessary for the integration into Automation Studio V6.



Mapp Motion

Mapp Motion offers a complete package to control motion axes in a uniform and easy way. Application can range from a simple single axis to multi axes CNC application or for Robotics application.



B&R PLC with Powerlink

For example the X20-System, controls the cyclic data communication and defines the clock pulse for the "cyclic synchronous position mode" which is used for axis interpolation.



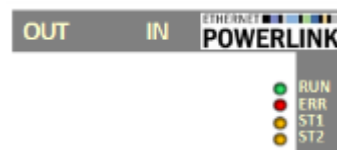
1.2 XENAX® Servo Controller

XENAX® Ethernet Servo Controller
With additional POWERLINK fieldbus module.



1.2.1 State LEDs on the Powerlink fieldbus module.

These are the states of the LED on the Powerlink fieldbus module.



LED state	RUN (STAT)	ERR	ST1 Status 1	ST2 Status 2
<OFF>	In init process or no power	Bus module no error		Bus module I ready
<ON>	Operational state	State bus off	No application in the flash	
<Blink>	Pre-Operational state			Protocol download in progress

1.2.2 Update Firmware & WebMotion

The XENAX® firmware and WebMotion can be updated with the help of the [Ethernet Installer](#). Ethernet Installer, Firmware and WebMotion can be downloaded from www.jennyscience.ch.

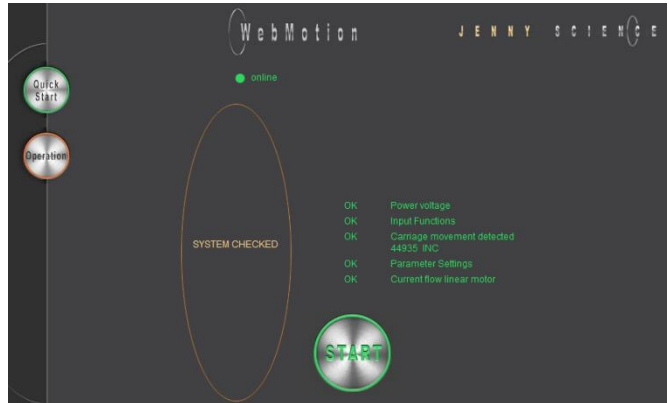
1.2.3 WebMotion®

WebMotion®

This is the graphical user interface from Jenny Science. It is stored in the embedded Web server of the XENAX® Servo Controller. WebMotion® is launched with a web browser by entering the TCP/IP address of XENAX® Servo Controller.

LINAX® / ELAX® linear motor axes are automatically recognized. The corresponding controller parameters are saved and loaded automatically.

With the Quick Start button, the linear motor axis can operate immediately. No user manual is needed.



The parametrization of the XENAX® Servo Controller is made over an Ethernet TCP/IP connection.

You can find the pre-set IP-address on the backside of your XENAX® Servo Controller.

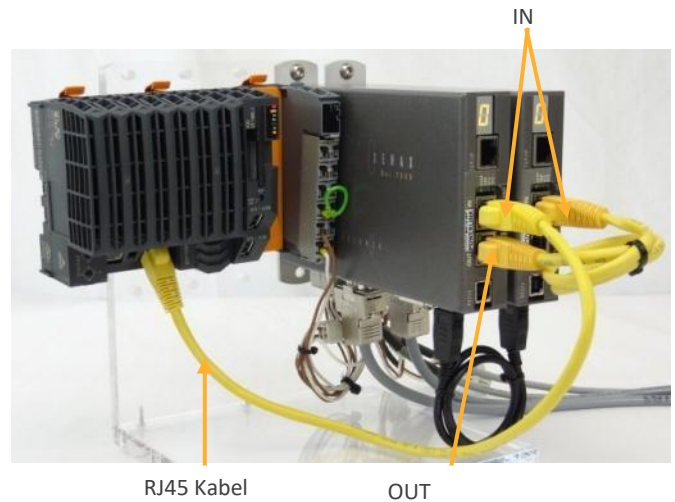
Web address:
<http://192.168.2.100/>



1.2.4 Powerlink connection from B&R PLC to XENAX®

Typically the Powerlink fieldbus is controlled with a linear structure from device to device. Shielded RJ45 cables go from the IN to the OUT to connect the devices with each other.

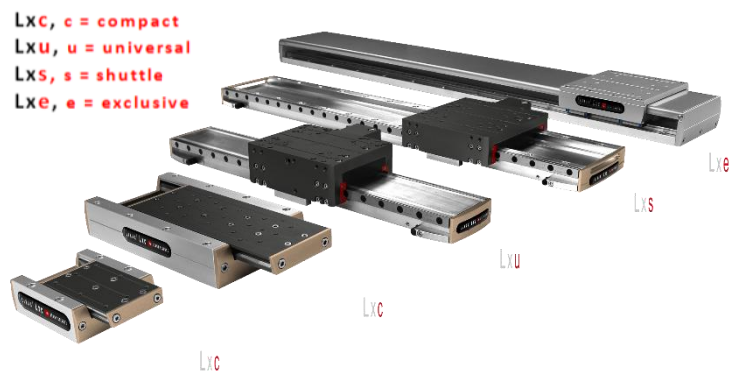
The limit of 4 Xenax controllers in a row without a Hub does no longer apply since Busmodule Version 5.0.



1.3 LINAX® Linear Motor Axis

LINAX® Linear Motor-Axis

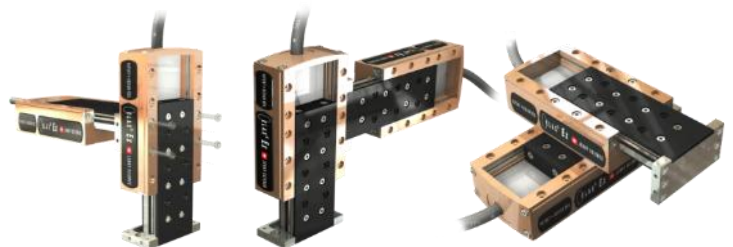
Are available in different lengths and types. The LINAX® linear motor axes are highly modular and can be combined flexibly amongst each other.



1.4 ELAX® Linear Motor Slide

ELAX® Linear Motor Slide

The ELAX® Linear Motor Slide are predestined for fast, precise positioning tasks. It's a Modular system with strokes of 30-150mm. The variable one-cable connection can be mounted on the back or sideways.



1.5 ROTAX® Rotary Motor Axes

ROTAX® Rotary motor axes

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



Rxhq = high torque



Rxvp = vacuum pressure

2 CANopen Ds402 drive Modes

This chapter shall provide a overview of the two supported drive modes.

2.1 Drive Modes: point to point or interpolated

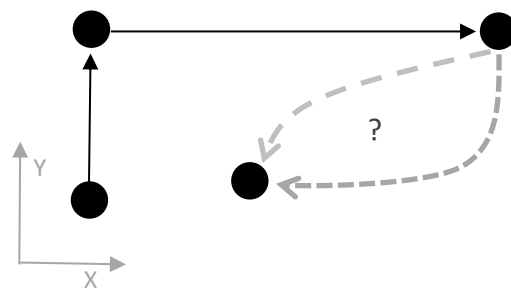
The library support two fundamental different drive modes.

1. Point to point = Profile Position Mode:

The parameters distance, speed, acceleration and s-curve are fixed before a drive. The trajectory (driving curve) is calculated on the Xenax®. This driving mode is simpler to implement in a B&R PLC, but gives less control over the driving curve to the PLC. It is not possible drive a straight line with a XY-Axis since both Axis can be started at the same time but will reach their target at different times. It is also not possible to drive a round curve because only the target position can be specified and not the path to the target location.

This mode fits a small PLC with low performance. There is no need for a virtual axis.

XY-Axis Profile Position

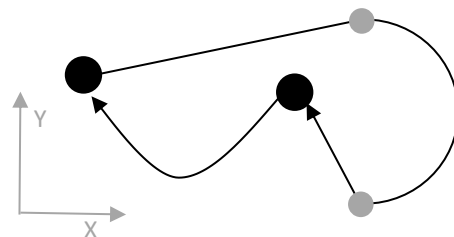


Limited control over driving path between two target positions with different X and Y coordinates. Furthermore, the speed and target position can not be changed during a drive. An Axis has to stop at every target position.

2. Interpolated = Cyclic Synchronous Position Mode:

In the cyclic synchronous position mode, the target position is passed to the XENAX® servo controller at cyclic time intervals (for example every millisecond). The trajectory (driving curve) is calculated on the B&R PLC. For this reason, a virtual Axis for each Axis is needed. This enables full control over the driving curve. Thanks to the virtual Axis, round curves or other complex driving paths are now possible.

XY-Axis Cyclic Synchronous Position



Full control over Axis movement. Two grey circles show a change in direction ab speed without a stop.

2.2 State Diagram

The following diagram shows the state and the behaviour of the axis when multiple motion control function blocks are “simultaneously” active.

Each motion command is a transition that changes the state of the axis and, as a consequence, influences the method of calculation of the current movement.

All function blocks which do not appear in the state diagram, do not affect the state of the axis.

The current state of the axis can be determined with the function block “**JS_MC_ReadStatus**”. If a function block is called where it is not allowed, the function block reports an error.

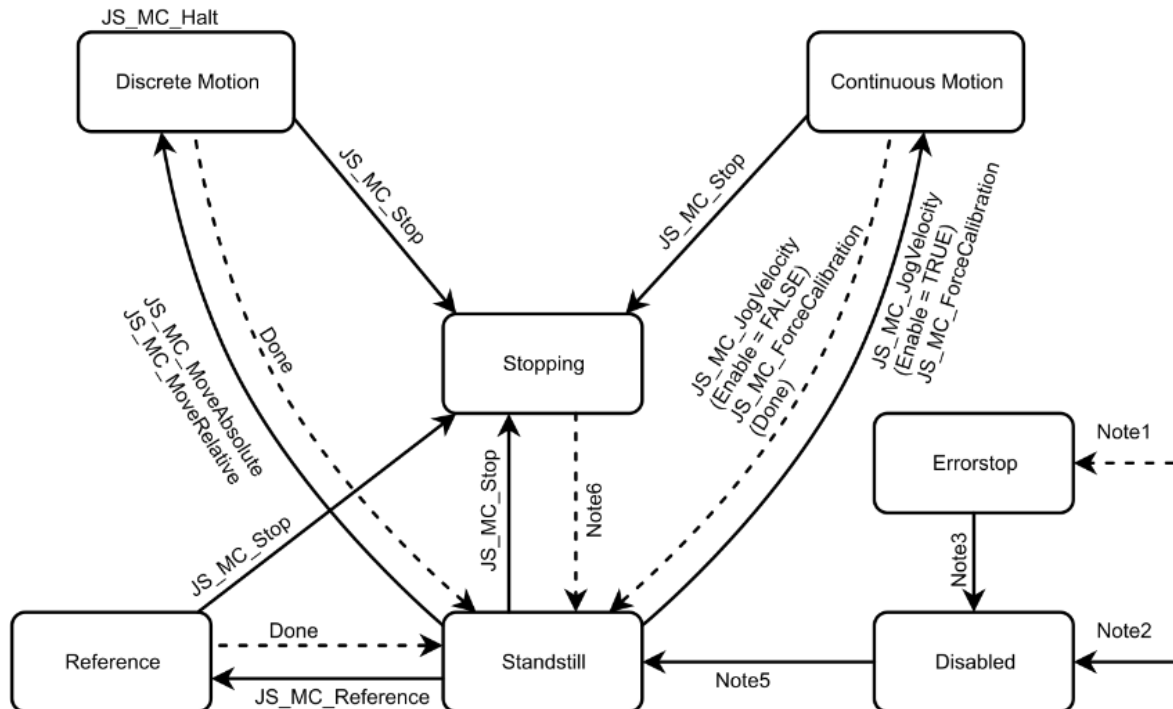
The notes describe the necessary conditions that must be met for a change in an axis state.

Important:

In the states “**Stopping**”, “**ErrorStop**”, “**Disabled**” and “**Reference**” no motion blocks can be called.

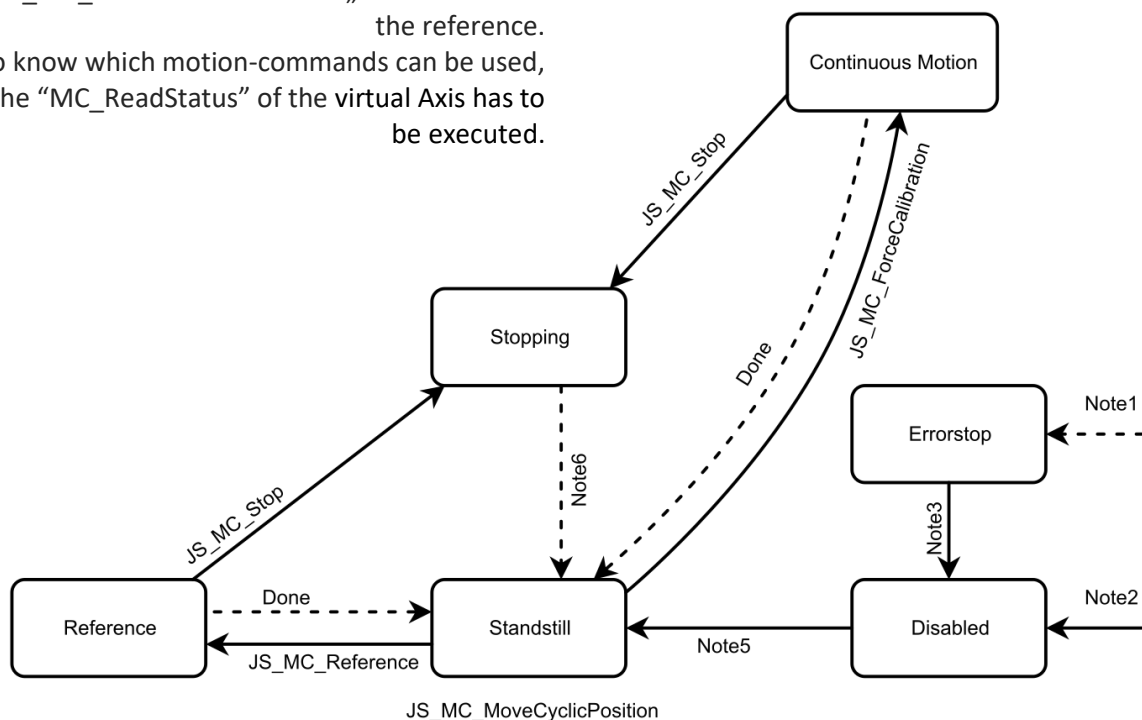
In standstill condition, an axis must always be referenced before starting a movement.

2.2.1 Profile Position Mode



2.2.2 Cyclic Synchronized Mode

In the Cyclic Synchronized mode the JS_MC_ReadStatus will be in „Standstill“ after the reference. To know which motion-commands can be used, the “MC_ReadStatus” of the virtual Axis has to be executed.



Note 1:

From any state. An error in the axis occurred.

Note 2:

From any state. JS_MC_Power.Enable = FALSE
and there is no error in the axis.

Note 3:

JS_MC_Reset AND JS_MC_Power.Status = FALSE.

Note 5:

JS_MC_Power.Enable = TRUE AND
JS_MC_Power.Status = TRUE

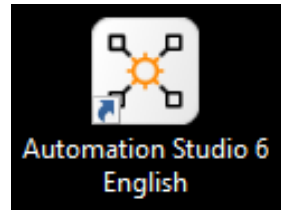
Note 6:

JS_MC_Stop.Done = TRUE AND
JS_MC_Stop.Execute = FALSE

3 New Project in Automation Studio

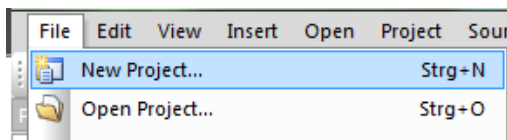
3.1 Create a new Project

In the following steps it will be shown how a new project can be opened.



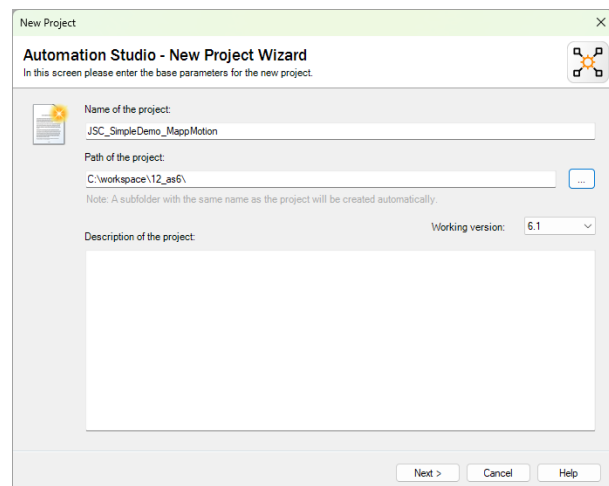
Start the Automation Studio from B&R.

File -> New Projekt ->



Enter your project name e.g. „SimpleDemo“
The storage path will be shown and can be changed.

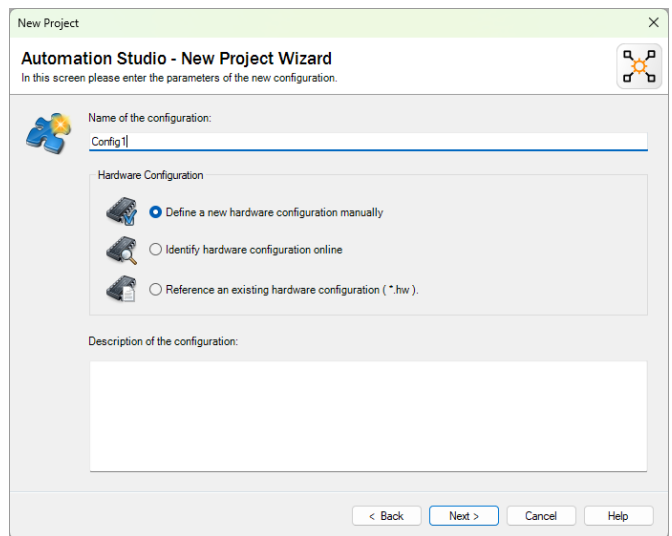
Press Next



A Configuration name suggestion will be shown.

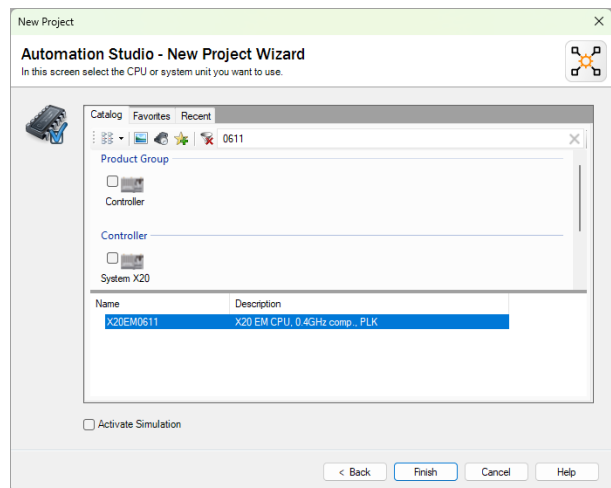
Our Configuration name is:
„ Config1“

-> Next



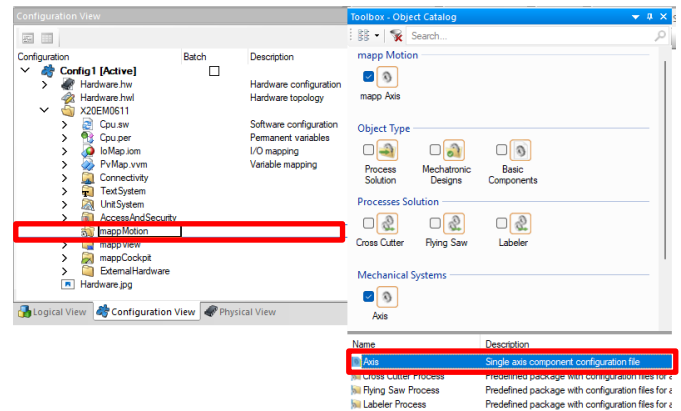
We choose the B&R PLC X20EM0611

-> Finish

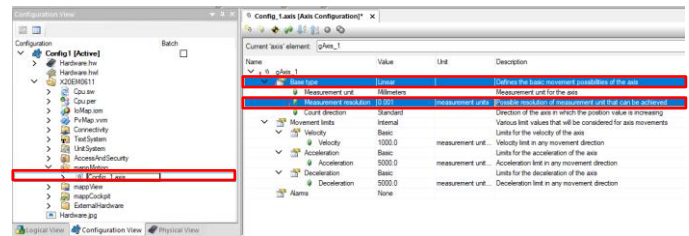


3.2 Add mapp Motion Axis

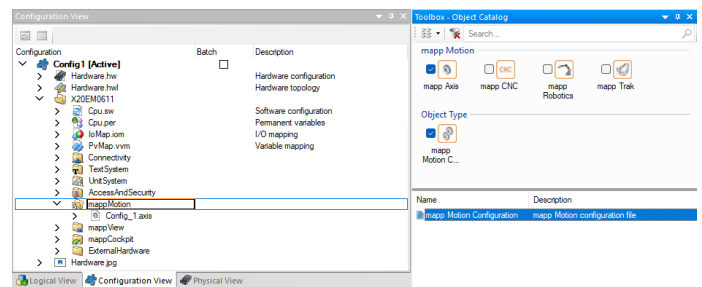
Select mappMotion in the Configuration View and Double-click on Axis in the Toolbox.



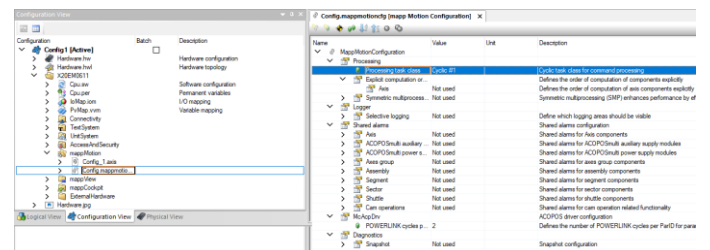
Select Base type as Linear and Measurement resolution according the axis. 1 Increment is usually 0.001mm.



Select mappMotion in the Configuration View and Double-click mapp Motion Configuration in the Toolbox.

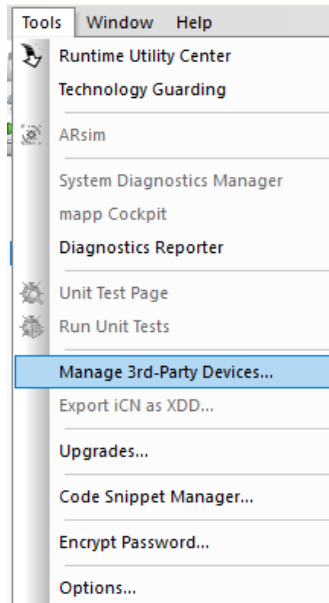


Note that Cyclic #1 is selected as motion Task. Later, this Task must be used to control the XENAX.

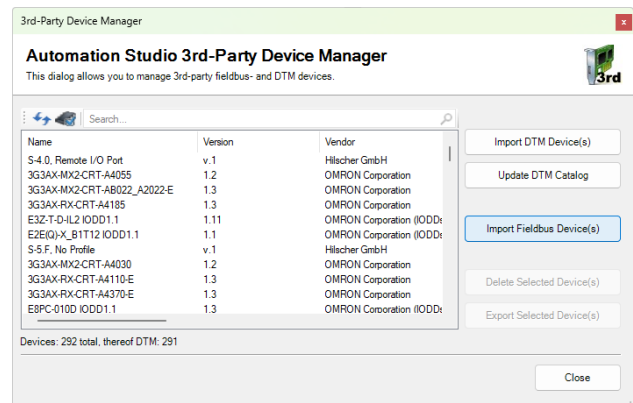


3.3 Add Jenny Science Axis

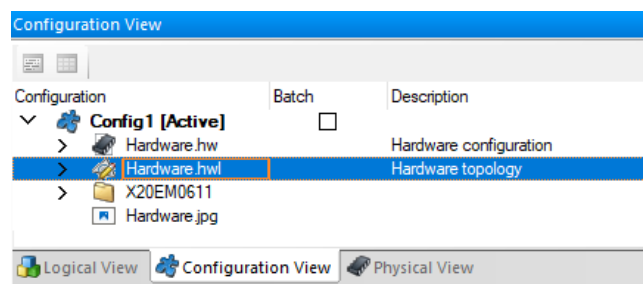
Open the 3rd-Party Device Manager.



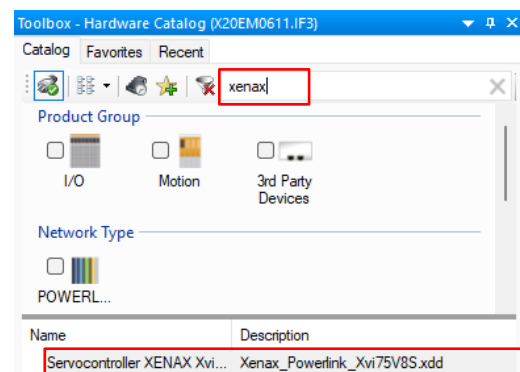
Press "Import Fieldbus Device(s)" to choose the ESI file. The Esi file can be downloaded from the Jenny Science [Webpage](#).



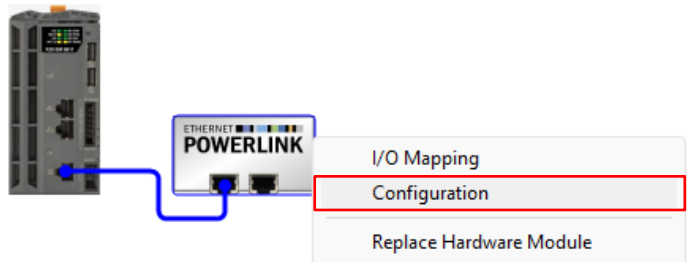
Double-click the Hardware.hwl in the Configuration View.



Enter Xenax or Intax in the search bar und Double-click on the Servocontroller.

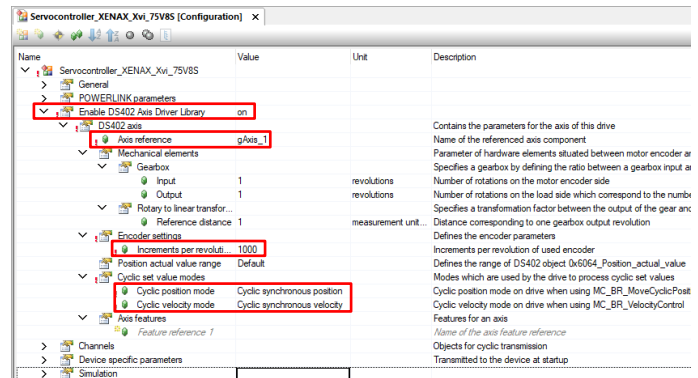


The Hardware.hwl should look like this.
Right-click on the XENAX and select
Configuration.

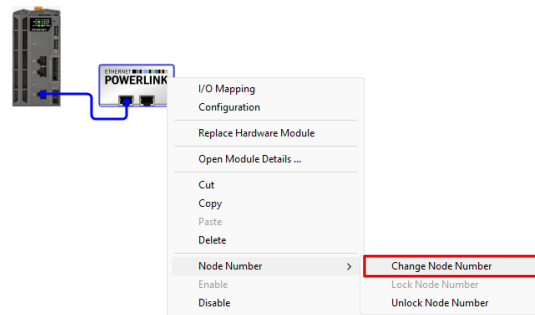


Enable DS402 Axis Driver Library. If this option
does not appear, close and reopen Automation
Studio.

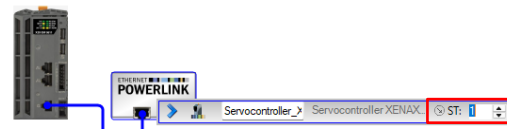
Select the previously created mappMotion axis
as "Axis reference". Increments per revolution is
the reciprocal value of the "Measurement
Resolution" of the mappMotion axis.



Right-Click on the XENAX to view the Node
Number.



The Node Number gets displayed.

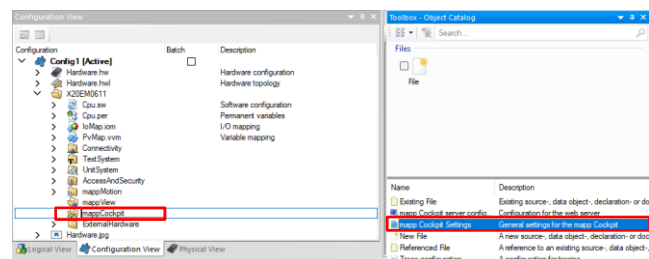


Enter the Node Number in the Webmotion
Interface of the XENAX under setup →
connectivity → card identifier and press enter.

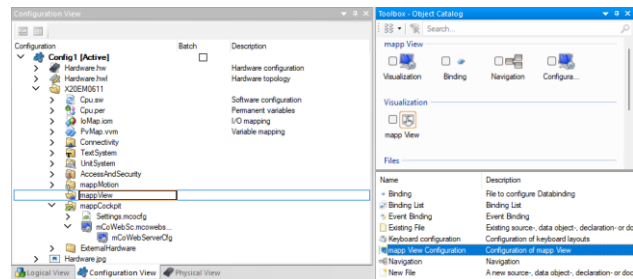


3.4 Configure mappCockpit

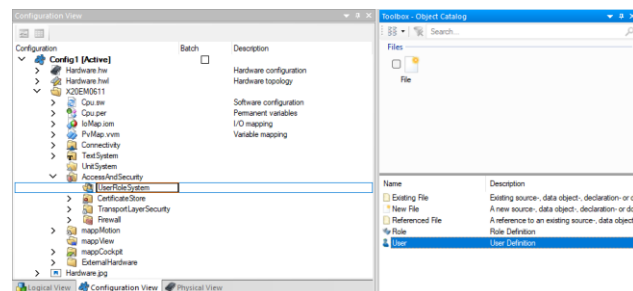
Add mapp Cockpit Settings. All Settings can be left at default.



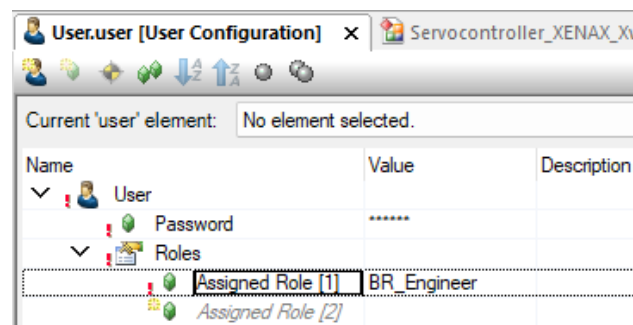
Add mapp View Configuration. All Settings can be left at default.



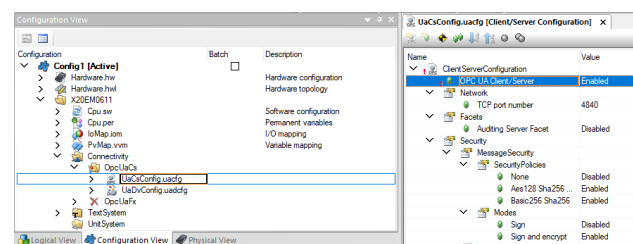
Add a new User under UserRoleSystem.



Add a Password and set the Role to BR_Engineer. This Login will be needed later.



Make sure that OPC UA Client/Server is enabled.

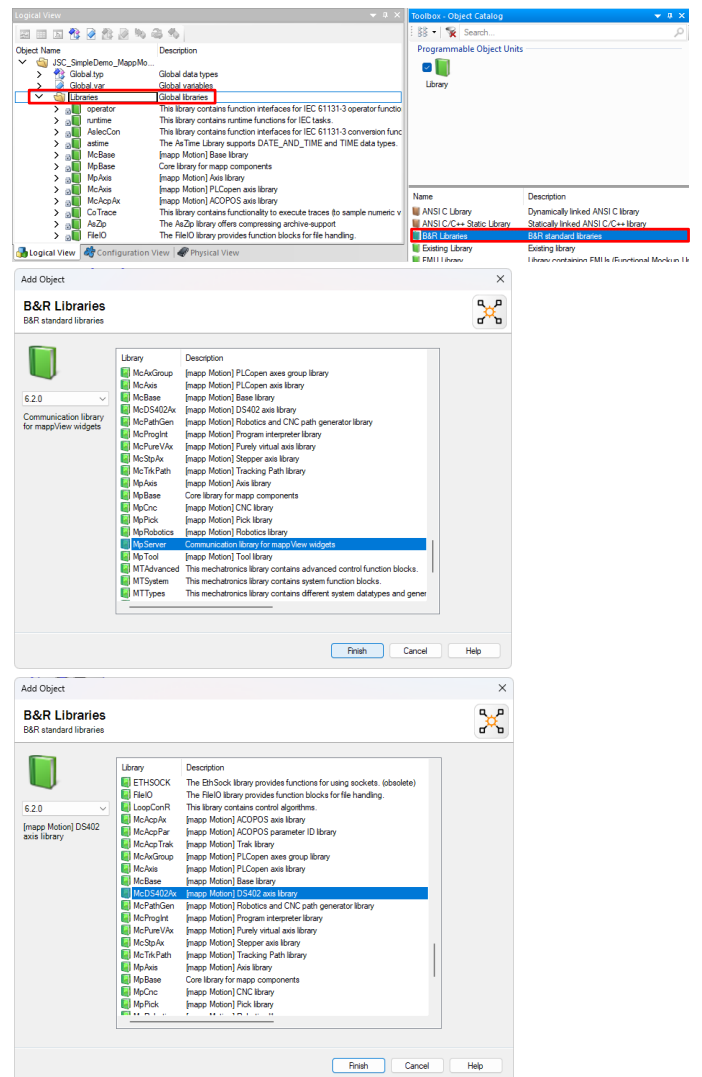


3.5 Additional Libraries

Additional Libraries are required which need to be added manually.

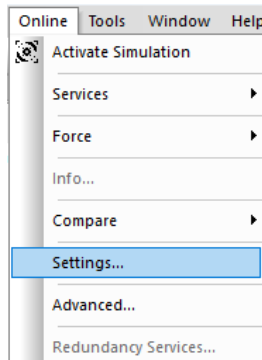
Add the MPSever library.

Add the McDS402Ax library.

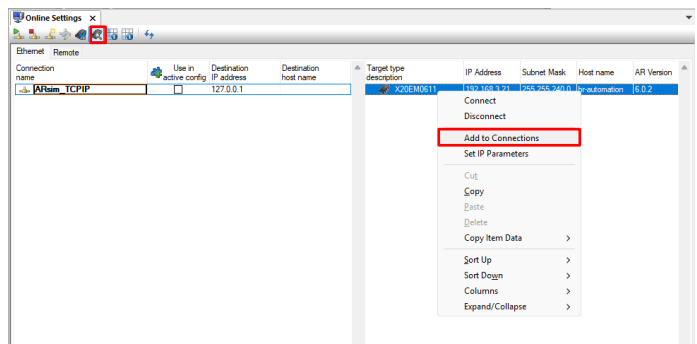


3.6 Configure PLC

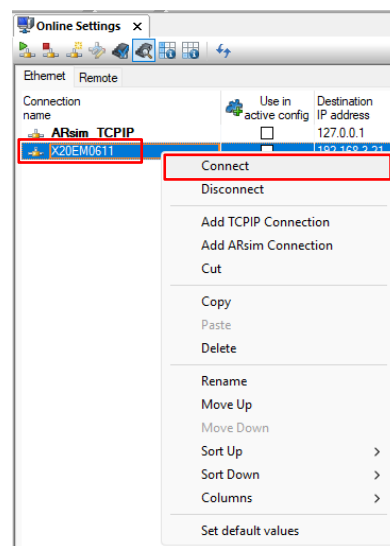
Goto Online → Settings.



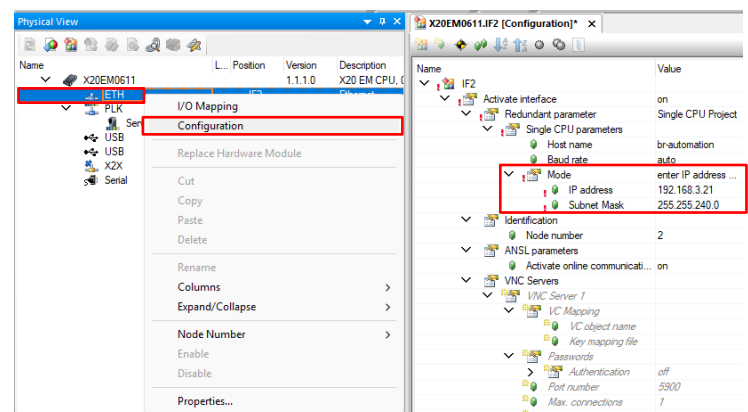
Search for the PLC and add the connection.



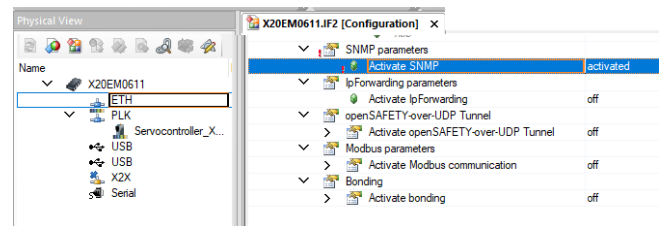
Connect to the new Connection.



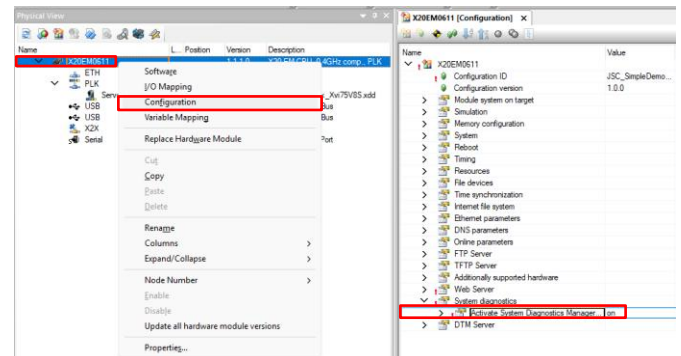
Configure the same IP-Address for the ETH interface.



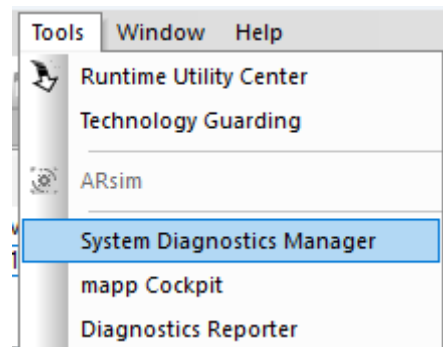
The activation of SNMP allows finding the PLC without knowing the IP-Address.



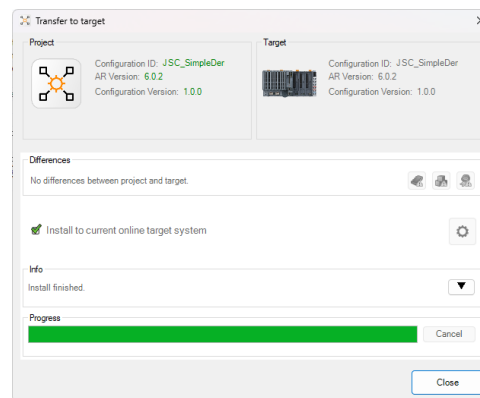
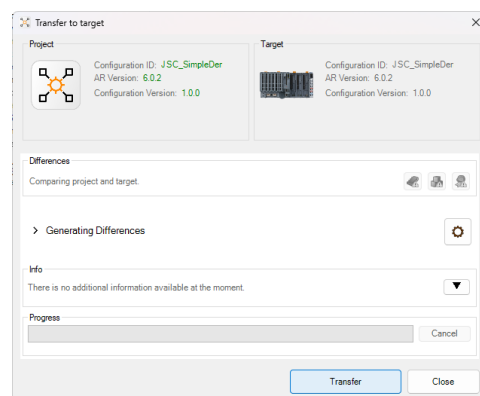
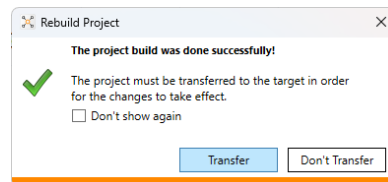
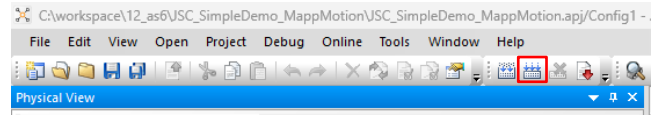
The System Diagnostics Manager is a helpful tool for debugging.



The System Diagnostics Manager can be opened under Tool if any error occurs during download or operation.

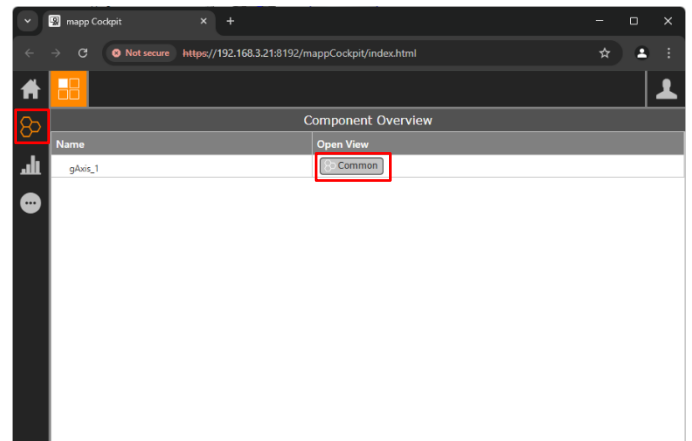
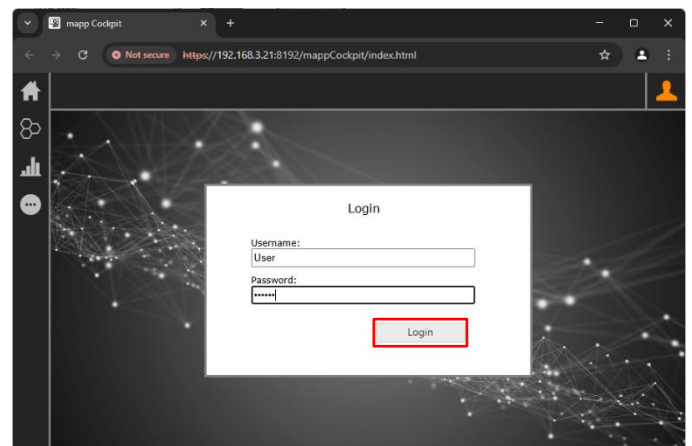
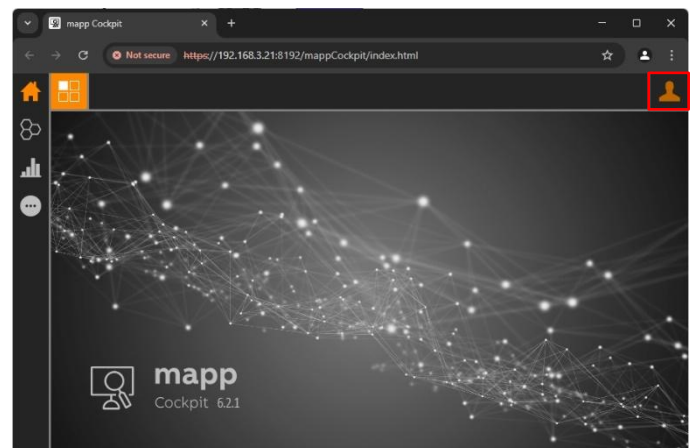
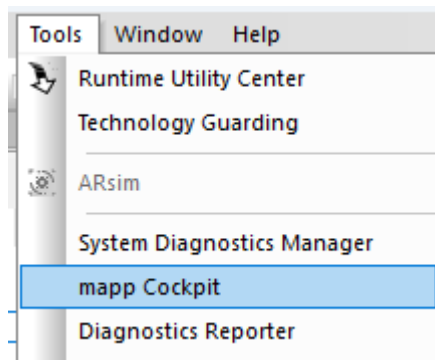


3.7 Download to PLC

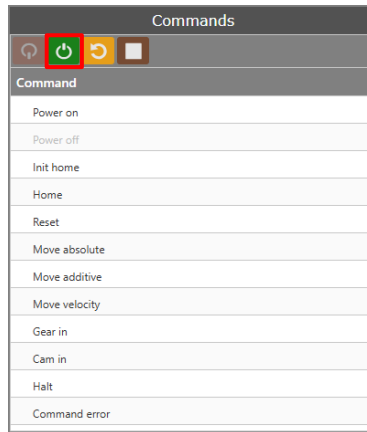


4 Control Axis with mappCockpit

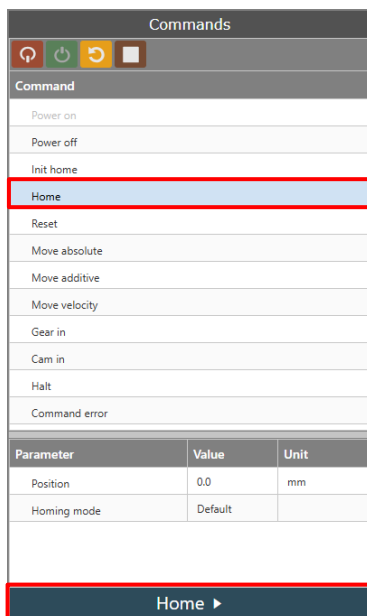
Open the mappCockpit.



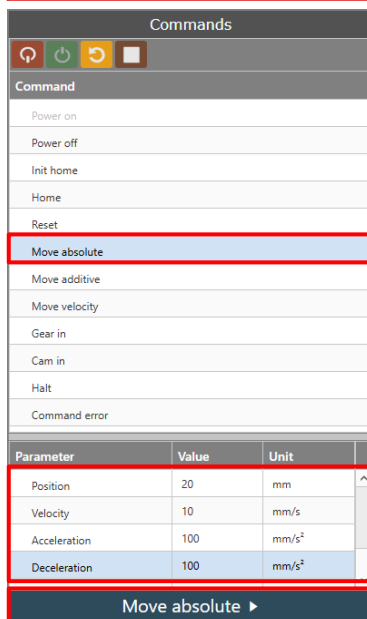
Power on axis with the green Button.



Select Home and press the Home button.



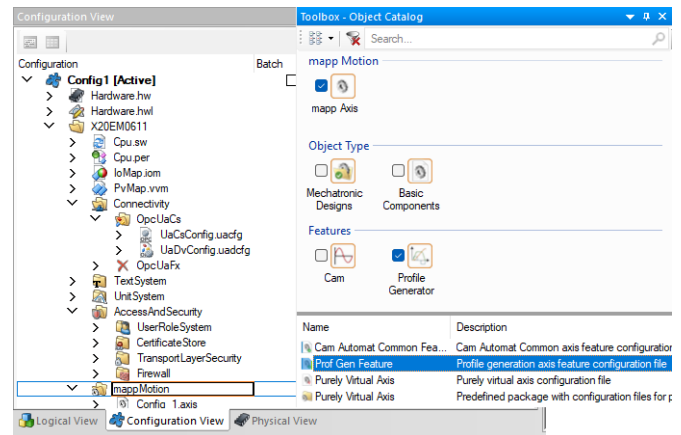
Move the axis to an absolute position as shown in the image on the right.



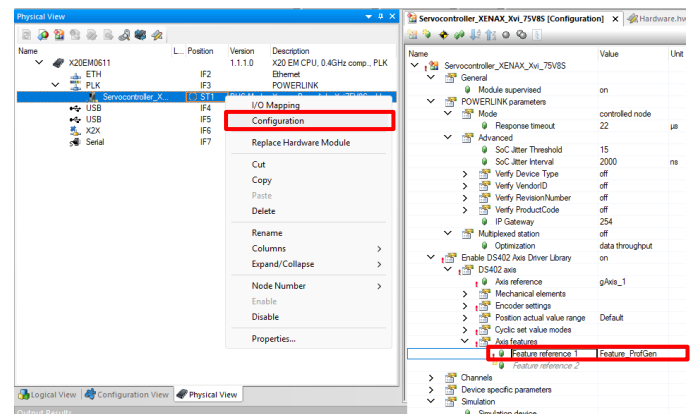
5 Configure CSP Mode

At the moment, the axis drives in Profile position Mode. This is sufficient for driving from point A to Point B. For more complex movements like CNC or Robotics, the Cyclic Synchronous Position Mode (CSP) is required. Follow this chapter to switch to CSP Mode.

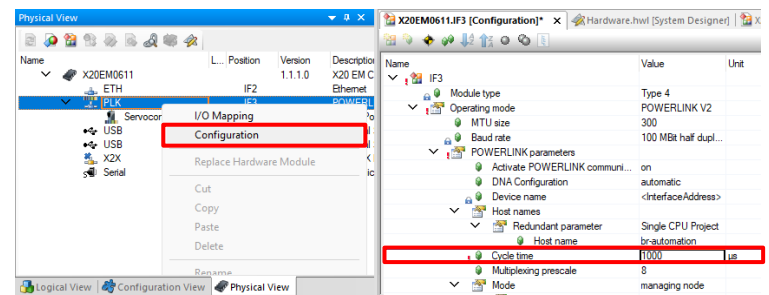
Select mappMotion in the Configuration View and add a Prof Gen Feature.



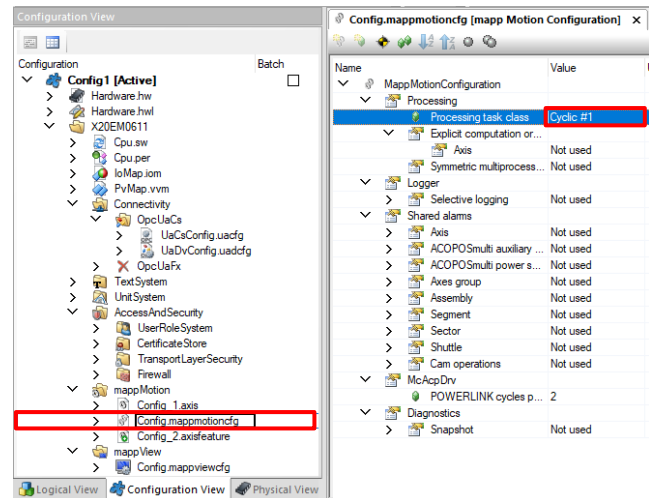
Right-click on the XENAX and select Configuration. Add the ProfGen feature.



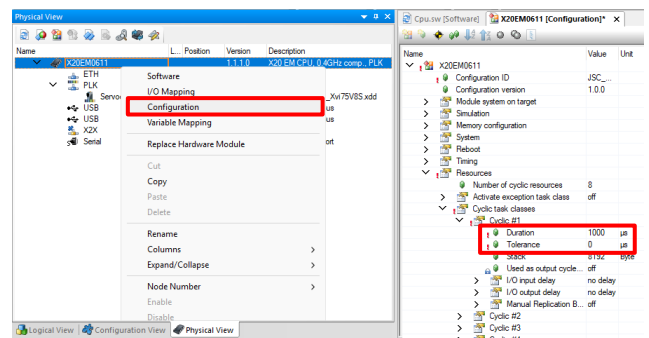
Configure the Cycle time of the Powerlink Interface. 1ms or lower is recommended.



Check in the mappMotion configuration which task is selected for processing.



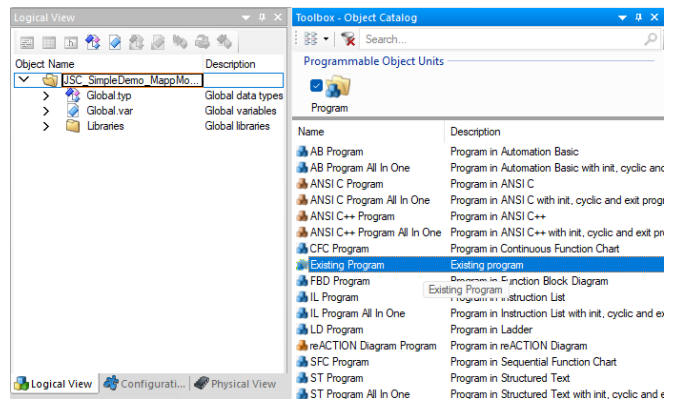
Set the duration of the mappMotion Task to the same time as the Powerlink Interface and set the tolerance to 0.



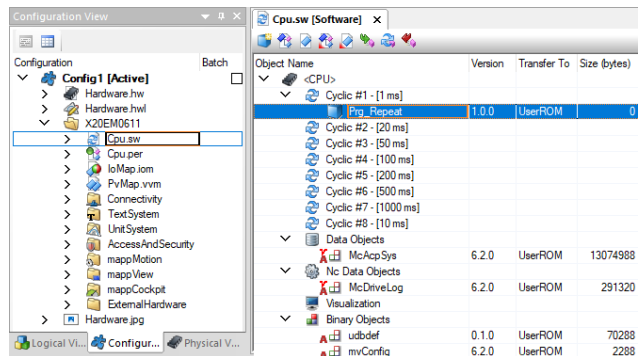
Now, the axis drives in Cyclic Synchronous Position Mode instead of Profile Position Mode with the correct timing.

6 Control Axis with Code

Add Existing Program and select the “Repeat Reverse” Program distributed with the Manual.



Move the program to the task used for mappMotion processing.



Notes

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