

Beckhoff TwinCAT 3 and FAULHABER Motion Controller V2.5 / V3.0 CANopen

Summary

This application note describes the necessary steps to control a FAULHABER MC V2.5 / V3.0 CANopen version using a TwinCAT based PLC. The MC is connected via CANopen to the PLC.

Applies To

FAULHABER Motion Controller CO (Firmware Version C), Beckhoff SPS with NC kernel, TwinCAT 3

Revision B

Description

Before it is possible to use the Motion Controller in a PLC environment, the following configurations have to be done with the Motion Manager:

- Configure baud-rate and set node number

First, baud-rate and node number of the motion controller (MC) have to be set via LSS-protocol (using Motion Manager).

Later, the baud-rate of the CANopen Gateway needs to be set to the same value.



Select a **fixed** baud-rate. It's more robust.

- Deactivate Heartbeat

```
0x1017 Producer Heartbeat      := 0;  
0x1016 Consumer Heartbeat     := 0;
```

- Activate Node Guarding

```
0x100C Guard Time             e.g.      := 100;  
0x100D Life Time Factor       e.g.      := 3;
```

It is possible to configure the heartbeat and node guarding service with the object dictionary of the Motion Manager or the CoE Object dictionary of the TwinCAT System.



If none of the services is configured in the drive, TwinCAT can do it later. However, TwinCAT will fail to change the setting, if any of the services has already been configured in the drive.



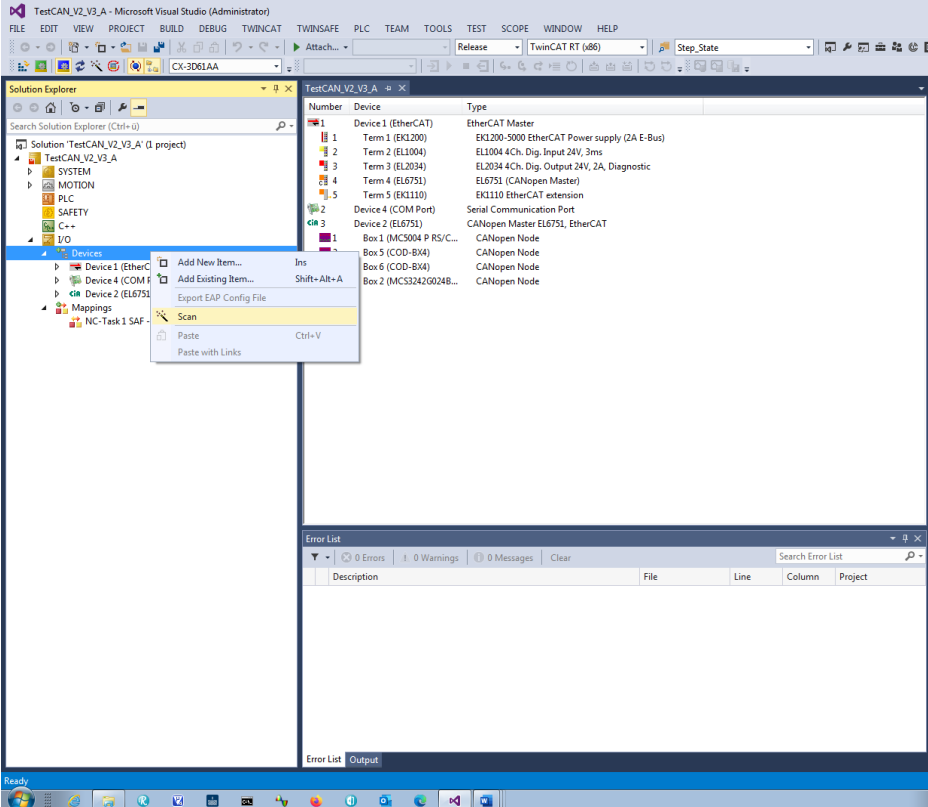
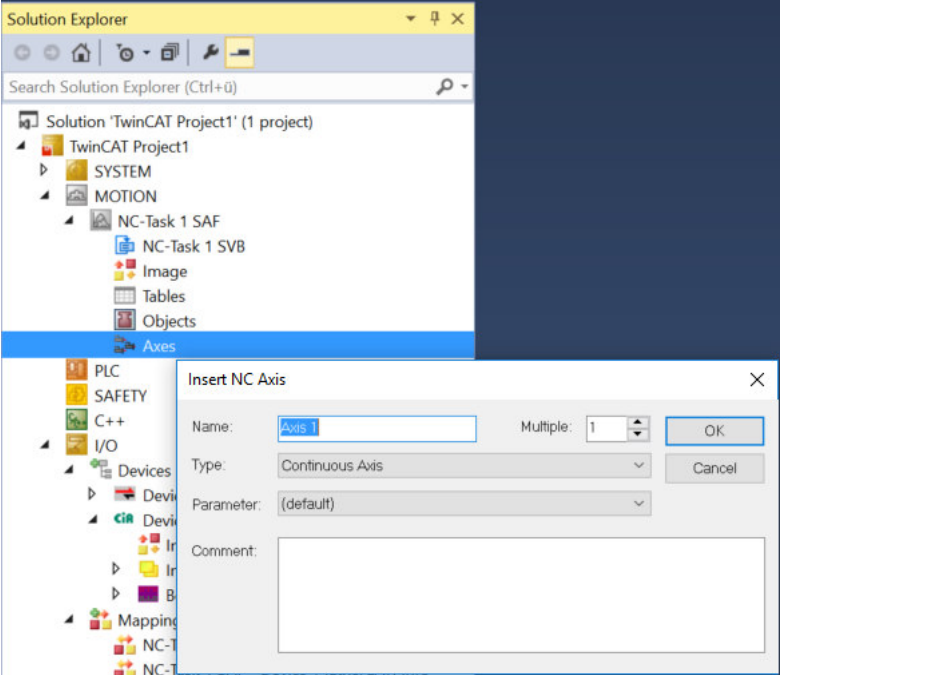
In case a homing sequence is necessary, it has to be executed by the PLC Master.

In this constellation we don't recommend to use the CANopen homing methods.

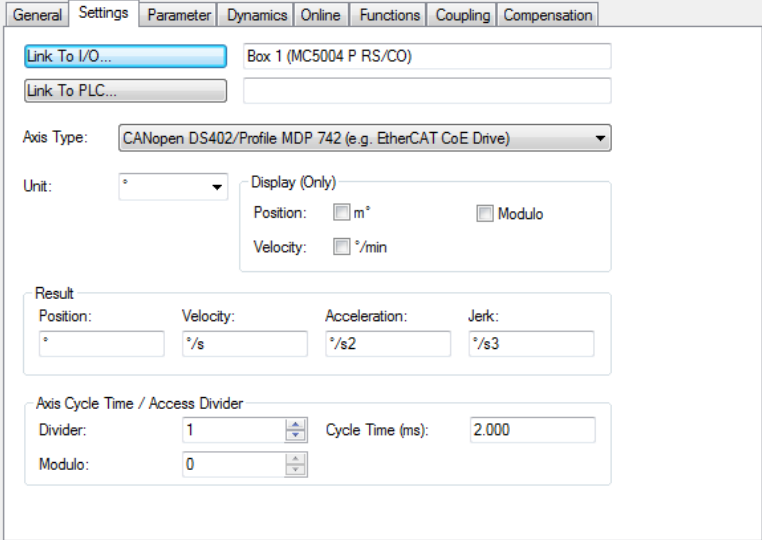


The NC axis will require the FAULHABER drive to already be in CSP mode (0x6060.00 = 8). So please select this operation mode within the FAULHABER MotionManager. Use it to test your drive and save the drive configuration before switching to the TwinCAT environment.

After the pre-configuration of the MC is done, you can continue with the configuration of the PLC master.

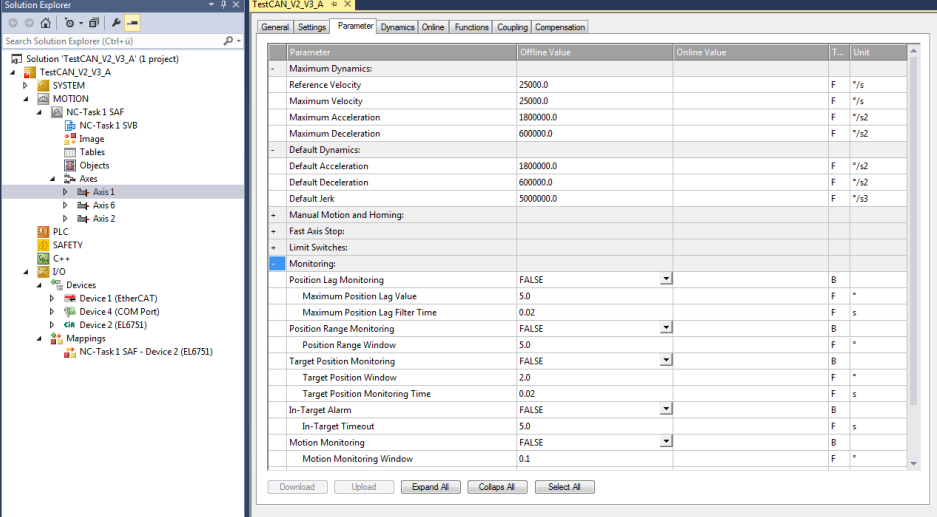
| No. | Screenshot | Description |
|-----|---|--|
| 1 |  <p>The screenshot shows the TwinCAT software interface. The Solution Explorer on the left displays a project tree with folders for SYSTEM, MOTION, PLC, SAFETY, and I/O. Under the I/O folder, there is a 'Devices' folder containing several device entries. A context menu is open over the 'Devices' folder, with the 'Scan' option highlighted. The main window shows a table of devices with columns for Number, Device, and Type. The Error List window at the bottom is empty.</p> | <ul style="list-style-type: none"> • Create new Twin-CAT solution • Select your target system from the SYSTEM in the project tree and switch the PLC to configuration mode if necessary • Add BUS slaves with „Scan“ function or manually |
| 2 |  <p>The screenshot shows the TwinCAT software interface. The Solution Explorer on the left displays a project tree with folders for SYSTEM, MOTION, and I/O. Under the I/O folder, there is a 'Motion' folder containing several motion task entries. A dialog box titled 'Insert NC Axis' is open, showing fields for Name, Multiple, Type, Parameter, and Comment. The Name field contains 'Axis1', the Multiple field is set to 1, and the Type is set to 'Continuous Axis'.</p> | <ul style="list-style-type: none"> • Create NC Motion Task as „NC/PTP NCI Configuration“) • Add „Continuous Axis“ |

3

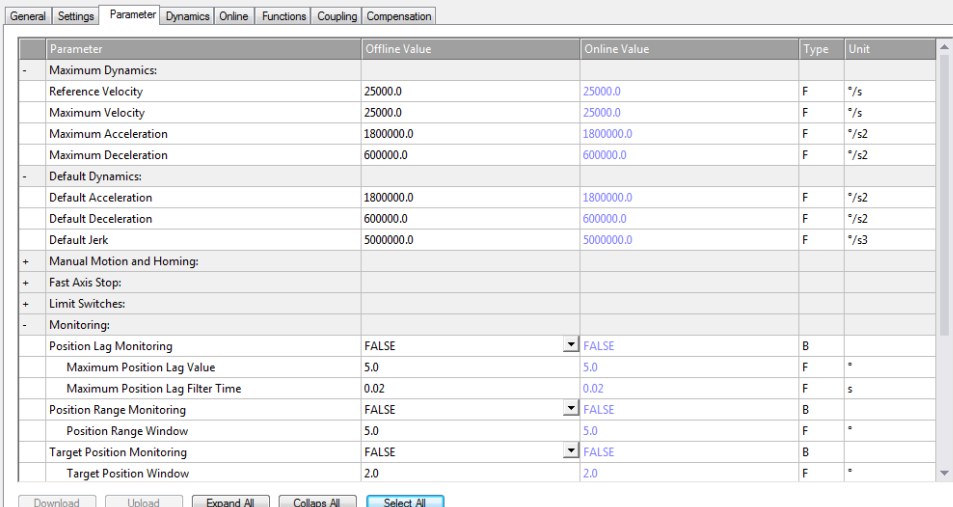
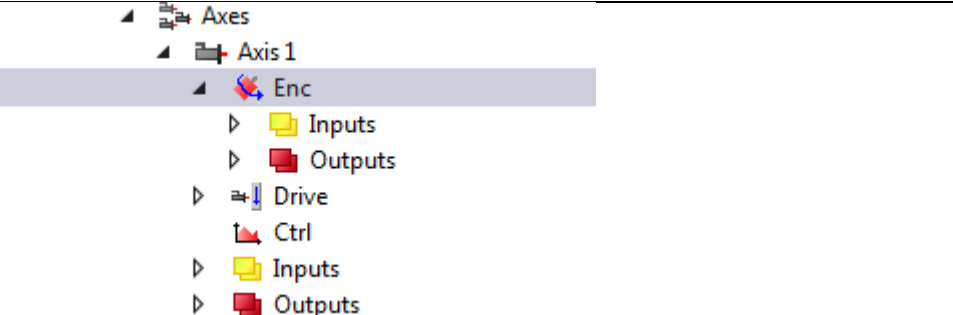


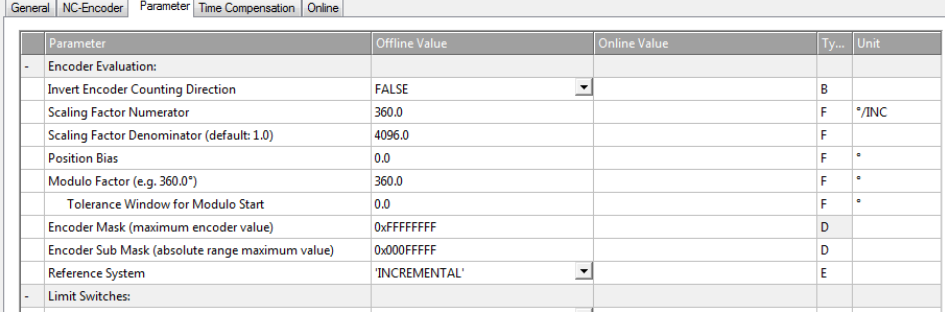
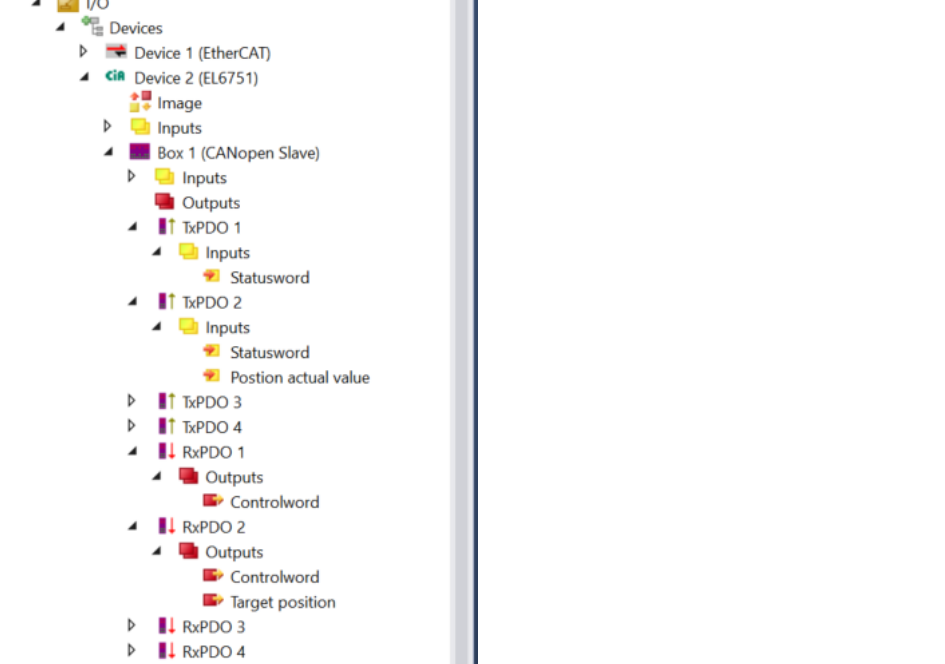
- Define NC Axis as DSP402 type
- You should select the appropriate units for your movement here. If it's a linear movement mm might be used. If it's a rotatory movement ° might be the choice.

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- Deactivate position lag monitoring functions

| <p>5</p> |  <table border="1"> <thead> <tr> <th>Parameter</th> <th>Offline Value</th> <th>Online Value</th> <th>Type</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td colspan="5">Maximum Dynamics:</td> </tr> <tr> <td>Reference Velocity</td> <td>25000.0</td> <td>25000.0</td> <td>F</td> <td>°/s</td> </tr> <tr> <td>Maximum Velocity</td> <td>25000.0</td> <td>25000.0</td> <td>F</td> <td>°/s</td> </tr> <tr> <td>Maximum Acceleration</td> <td>1800000.0</td> <td>1800000.0</td> <td>F</td> <td>°/s²</td> </tr> <tr> <td>Maximum Deceleration</td> <td>600000.0</td> <td>600000.0</td> <td>F</td> <td>°/s²</td> </tr> <tr> <td colspan="5">Default Dynamics:</td> </tr> <tr> <td>Default Acceleration</td> <td>1800000.0</td> <td>1800000.0</td> <td>F</td> <td>°/s²</td> </tr> <tr> <td>Default Deceleration</td> <td>600000.0</td> <td>600000.0</td> <td>F</td> <td>°/s²</td> </tr> <tr> <td>Default Jerk</td> <td>5000000.0</td> <td>5000000.0</td> <td>F</td> <td>°/s³</td> </tr> <tr> <td colspan="5">Manual Motion and Homing:</td> </tr> <tr> <td colspan="5">+ Fast Axis Stop:</td> </tr> <tr> <td colspan="5">+ Limit Switches:</td> </tr> <tr> <td colspan="5">Monitoring:</td> </tr> <tr> <td>Position Lag Monitoring</td> <td>FALSE</td> <td>FALSE</td> <td>B</td> <td></td> </tr> <tr> <td>Maximum Position Lag Value</td> <td>5.0</td> <td>5.0</td> <td>F</td> <td>°</td> </tr> <tr> <td>Maximum Position Lag Filter Time</td> <td>0.02</td> <td>0.02</td> <td>F</td> <td>s</td> </tr> <tr> <td>Position Range Monitoring</td> <td>FALSE</td> <td>FALSE</td> <td>B</td> <td></td> </tr> <tr> <td>Position Range Window</td> <td>5.0</td> <td>5.0</td> <td>F</td> <td>°</td> </tr> <tr> <td>Target Position Monitoring</td> <td>FALSE</td> <td>FALSE</td> <td>B</td> <td></td> </tr> <tr> <td>Target Position Window</td> <td>2.0</td> <td>2.0</td> <td>F</td> <td>°</td> </tr> </tbody> </table> | Parameter | Offline Value | Online Value | Type | Unit | Maximum Dynamics: | | | | | Reference Velocity | 25000.0 | 25000.0 | F | °/s | Maximum Velocity | 25000.0 | 25000.0 | F | °/s | Maximum Acceleration | 1800000.0 | 1800000.0 | F | °/s ² | Maximum Deceleration | 600000.0 | 600000.0 | F | °/s ² | Default Dynamics: | | | | | Default Acceleration | 1800000.0 | 1800000.0 | F | °/s ² | Default Deceleration | 600000.0 | 600000.0 | F | °/s ² | Default Jerk | 5000000.0 | 5000000.0 | F | °/s ³ | Manual Motion and Homing: | | | | | + Fast Axis Stop: | | | | | + Limit Switches: | | | | | Monitoring: | | | | | Position Lag Monitoring | FALSE | FALSE | B | | Maximum Position Lag Value | 5.0 | 5.0 | F | ° | Maximum Position Lag Filter Time | 0.02 | 0.02 | F | s | Position Range Monitoring | FALSE | FALSE | B | | Position Range Window | 5.0 | 5.0 | F | ° | Target Position Monitoring | FALSE | FALSE | B | | Target Position Window | 2.0 | 2.0 | F | ° | <ul style="list-style-type: none"> • Adjust the dynamic settings of the drive to allow for proper control. • A typical FAULHABER BX4 motor will allow for a nominal speed of 4500 rpm. This is 27k°/s. • Acceleration could be 7500 1/s² which would be 2.700k °/s² • Deceleration is 1/3 of the acceleration • Jerk depends on your application. • In a linear configuration a 1.0mm pitch would result in a speed of 75 mm/s |
|----------------------------------|---|---|---------------|------------------|------|------|--------------------------|--|--|--|--|--------------------|---------|---------|---|-----|------------------|---------|---------|---|-----|----------------------|-----------|-----------|---|------------------|----------------------|----------|----------|---|------------------|--------------------------|--|--|--|--|----------------------|-----------|-----------|---|------------------|----------------------|----------|----------|---|------------------|--------------|-----------|-----------|---|------------------|----------------------------------|--|--|--|--|-------------------|--|--|--|--|-------------------|--|--|--|--|--------------------|--|--|--|--|-------------------------|-------|-------|---|--|----------------------------|-----|-----|---|---|----------------------------------|------|------|---|---|---------------------------|-------|-------|---|--|-----------------------|-----|-----|---|---|----------------------------|-------|-------|---|--|------------------------|-----|-----|---|---|--|
| Parameter | Offline Value | Online Value | Type | Unit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Dynamics: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference Velocity | 25000.0 | 25000.0 | F | °/s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Velocity | 25000.0 | 25000.0 | F | °/s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Acceleration | 1800000.0 | 1800000.0 | F | °/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Deceleration | 600000.0 | 600000.0 | F | °/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Default Dynamics: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Default Acceleration | 1800000.0 | 1800000.0 | F | °/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Default Deceleration | 600000.0 | 600000.0 | F | °/s ² | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Default Jerk | 5000000.0 | 5000000.0 | F | °/s ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manual Motion and Homing: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| + Fast Axis Stop: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| + Limit Switches: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Monitoring: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Position Lag Monitoring | FALSE | FALSE | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Position Lag Value | 5.0 | 5.0 | F | ° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Position Lag Filter Time | 0.02 | 0.02 | F | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Position Range Monitoring | FALSE | FALSE | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Position Range Window | 5.0 | 5.0 | F | ° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Target Position Monitoring | FALSE | FALSE | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Target Position Window | 2.0 | 2.0 | F | ° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>6</p> |  <pre> graph TD Axes --> Axis1[Axis 1] Axis1 --> Enc[Enc] Enc --> Inputs1[Inputs] Enc --> Outputs1[Outputs] Enc --> Drive[Drive] Enc --> Ctrl[Ctrl] Enc --> Inputs2[Inputs] Enc --> Outputs2[Outputs] </pre> | <ul style="list-style-type: none"> • Switch to the settings of the encoder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| <p>7</p> |  <table border="1"> <thead> <tr> <th>Parameter</th> <th>Offline Value</th> <th>Online Value</th> <th>Ty...</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td colspan="5">Encoder Evaluation:</td> </tr> <tr> <td>Invert Encoder Counting Direction</td> <td>FALSE</td> <td></td> <td>B</td> <td></td> </tr> <tr> <td>Scaling Factor Numerator</td> <td>360.0</td> <td></td> <td>F</td> <td>°/INC</td> </tr> <tr> <td>Scaling Factor Denominator (default: 1.0)</td> <td>4096.0</td> <td></td> <td>F</td> <td></td> </tr> <tr> <td>Position Bias</td> <td>0.0</td> <td></td> <td>F</td> <td>*</td> </tr> <tr> <td>Modulo Factor (e.g. 360.0°)</td> <td>360.0</td> <td></td> <td>F</td> <td>*</td> </tr> <tr> <td>Tolerance Window for Modulo Start</td> <td>0.0</td> <td></td> <td>F</td> <td>*</td> </tr> <tr> <td>Encoder Mask (maximum encoder value)</td> <td>0xFFFFFFFF</td> <td></td> <td>D</td> <td></td> </tr> <tr> <td>Encoder Sub Mask (absolute range maximum value)</td> <td>0x00FFFFFF</td> <td></td> <td>D</td> <td></td> </tr> <tr> <td>Reference System</td> <td>'INCREMENTAL'</td> <td></td> <td>E</td> <td></td> </tr> <tr> <td colspan="5">Limit Switches:</td> </tr> </tbody> </table> | Parameter | Offline Value | Online Value | Ty... | Unit | Encoder Evaluation: | | | | | Invert Encoder Counting Direction | FALSE | | B | | Scaling Factor Numerator | 360.0 | | F | °/INC | Scaling Factor Denominator (default: 1.0) | 4096.0 | | F | | Position Bias | 0.0 | | F | * | Modulo Factor (e.g. 360.0°) | 360.0 | | F | * | Tolerance Window for Modulo Start | 0.0 | | F | * | Encoder Mask (maximum encoder value) | 0xFFFFFFFF | | D | | Encoder Sub Mask (absolute range maximum value) | 0x00FFFFFF | | D | | Reference System | 'INCREMENTAL' | | E | | Limit Switches: | | | | | <ul style="list-style-type: none"> Adjust the encoder scaling to your setting. The encoder has to be configured either in °/INC of the used encoder or in mm/Inc of the used encoder. E.g. for a 12 bit encoder having 4096 increments/turn, the numerator would be 360°, the denominator 4096 INC. |
|---|--|--|---------------|--------------|-------|------|---------------------|--|--|--|--|-----------------------------------|-------|--|---|--|--------------------------|-------|--|---|-------|---|--------|--|---|--|---------------|-----|--|---|---|-----------------------------|-------|--|---|---|-----------------------------------|-----|--|---|---|--------------------------------------|------------|--|---|--|---|------------|--|---|--|------------------|---------------|--|---|--|-----------------|--|--|--|--|---|
| Parameter | Offline Value | Online Value | Ty... | Unit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Encoder Evaluation: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Invert Encoder Counting Direction | FALSE | | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scaling Factor Numerator | 360.0 | | F | °/INC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scaling Factor Denominator (default: 1.0) | 4096.0 | | F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Position Bias | 0.0 | | F | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Modulo Factor (e.g. 360.0°) | 360.0 | | F | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tolerance Window for Modulo Start | 0.0 | | F | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Encoder Mask (maximum encoder value) | 0xFFFFFFFF | | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Encoder Sub Mask (absolute range maximum value) | 0x00FFFFFF | | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference System | 'INCREMENTAL' | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Limit Switches: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>8</p> |  | <ul style="list-style-type: none"> Switch to the IO section of the project tree and select the CAN drive. Load PDOs from .eds File, if necessary. C:\Program Files (x86)\Faulhaber\Motion Manager 6\EDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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General PDO

TxPDO 2

COB Id:

Ext. frame (29Bit Id - CAN 2.0B)

Trans. Type:

Modulo:

Inhibit Time:

Length:

Event Time:

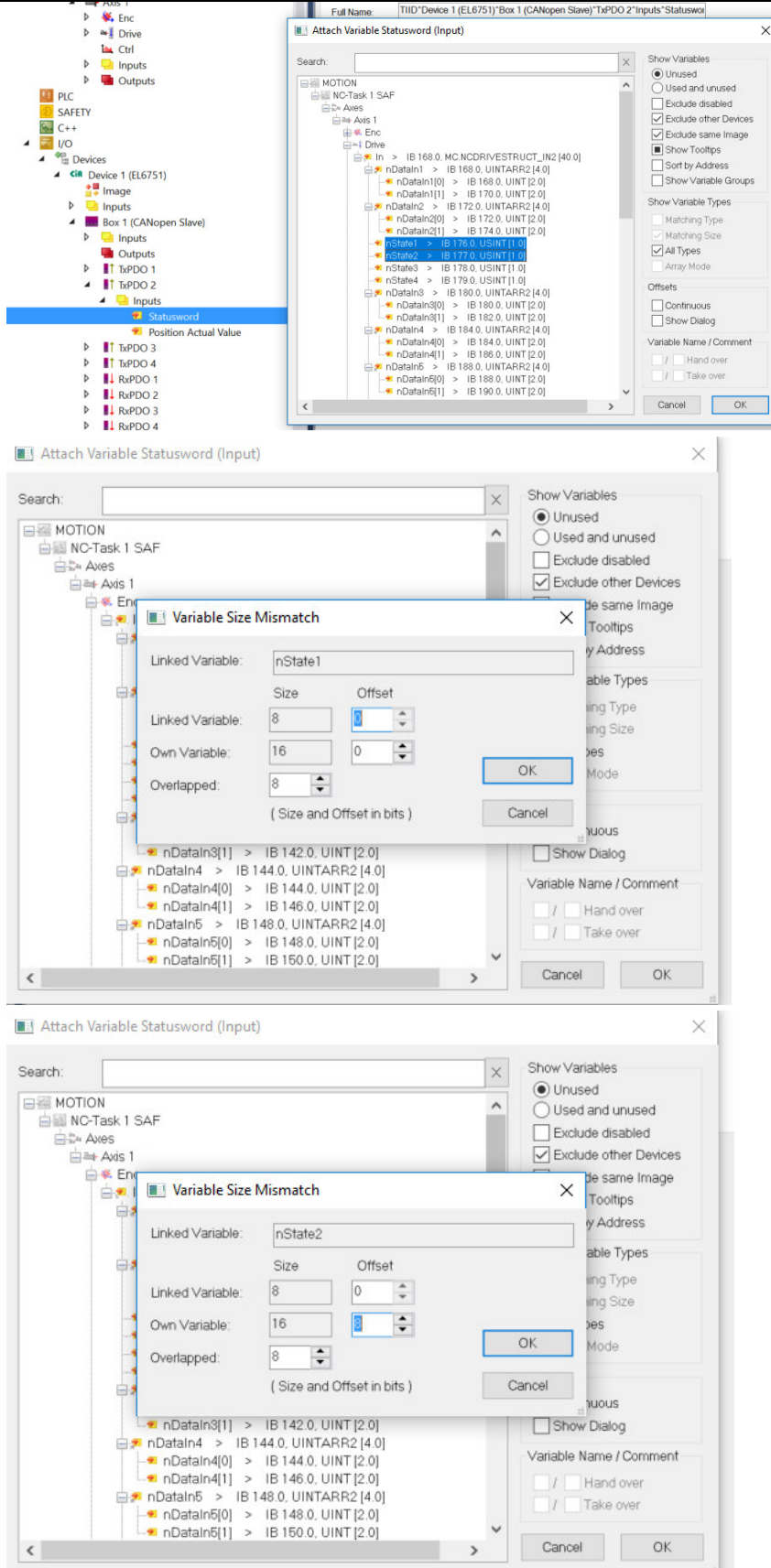
Disable checking of PDO length

PDO-Toggle/PDO-State

PDO-Control

- NC-axis uses the control word and target position (RxPDO2) plus the status word and the actual position (TxPDO2).
- Change Transmission Type of TxPDO2 to 1 to get cyclic updates of the position

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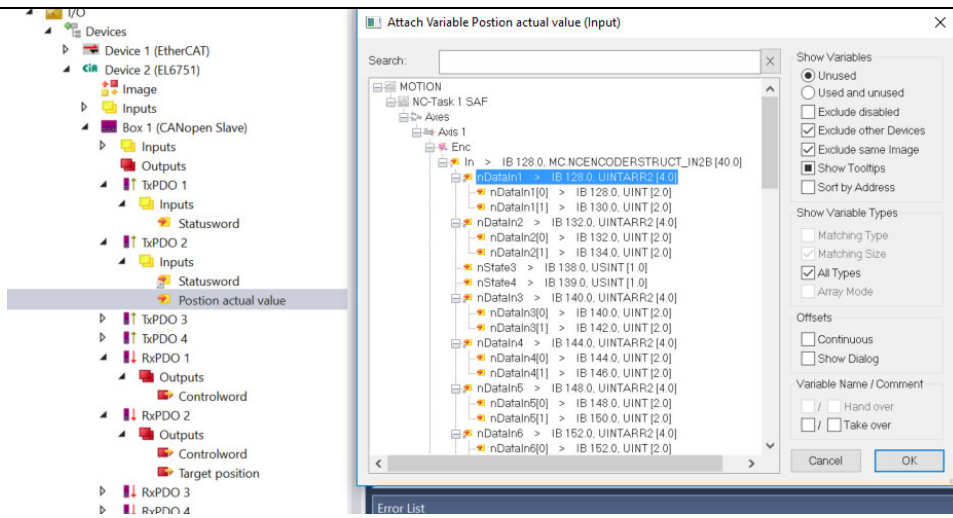


The screenshot shows the SIMATIC Manager interface with the following components:

- Left Panel:** Project tree showing 'Device 1 (EL6751)' with 'Box 1 (CANopen Slave)' and 'TxPDO 2' selected.
- Top Dialog:** 'Attach Variable Statusword (Input)' dialog. The search results list variables like 'nDataIn1' through 'nDataIn6[1]'. 'nState2' is highlighted.
- Middle Dialog:** 'Variable Size Mismatch' dialog for 'nState1'. It shows 'Linked Variable' size of 8 bits and 'Own Variable' size of 16 bits, with an 'Overlapped' value of 8 bits.
- Bottom Dialog:** 'Variable Size Mismatch' dialog for 'nState2'. It shows 'Linked Variable' size of 8 bits and 'Own Variable' size of 16 bits, with an 'Overlapped' value of 8 bits.

- Link Statusword (TxPDO2) with Axis1_Drive
- nStatus1 & nStatus2
- Offset of 8 Bit is necessary

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The screenshot shows a software interface for configuring a device. On the left, a project tree is visible with the following structure:

- I/O
 - Devices
 - Device 1 (EtherCAT)
 - Device 2 (EL6751)
 - Image
 - Box 1 (CANopen Slave)
 - Inputs
 - Outputs
 - TxPDO 1
 - Inputs
 - Statusword
 - TxPDO 2
 - Inputs
 - Statusword
 - Position actual value
 - TxPDO 3
 - TxPDO 4
 - RxPDO 1
 - Outputs
 - Controlword
 - RxPDO 2
 - Outputs
 - Controlword
 - Target position
 - RxPDO 3
 - RxPDO 4

The main window, titled "Attach Variable Position actual value (Input)", displays a tree structure for "Axis 1" with the following variables:

- In > IB 128.0, MC_NCENCODERSTRUCT_IN2B [40 0]
- nDataIn1[0] > IB 128.0, UINT [2 0]
- nDataIn1[1] > IB 130.0, UINT [2 0]
- nDataIn2 > IB 132.0, UINTARR2 [4 0]
- nDataIn2[0] > IB 132.0, UINT [2 0]
- nDataIn2[1] > IB 134.0, UINT [2 0]
- nState3 > IB 138.0, USINT [1 0]
- nState4 > IB 139.0, USINT [1 0]
- nDataIn3 > IB 140.0, UINTARR2 [4 0]
- nDataIn3[0] > IB 140.0, UINT [2 0]
- nDataIn3[1] > IB 142.0, UINT [2 0]
- nDataIn4 > IB 144.0, UINTARR2 [4 0]
- nDataIn4[0] > IB 144.0, UINT [2 0]
- nDataIn4[1] > IB 146.0, UINT [2 0]
- nDataIn5 > IB 148.0, UINTARR2 [4 0]
- nDataIn5[0] > IB 148.0, UINT [2 0]
- nDataIn5[1] > IB 150.0, UINT [2 0]
- nDataIn6 > IB 152.0, UINTARR2 [4 0]
- nDataIn6[0] > IB 152.0, UINT [2 0]

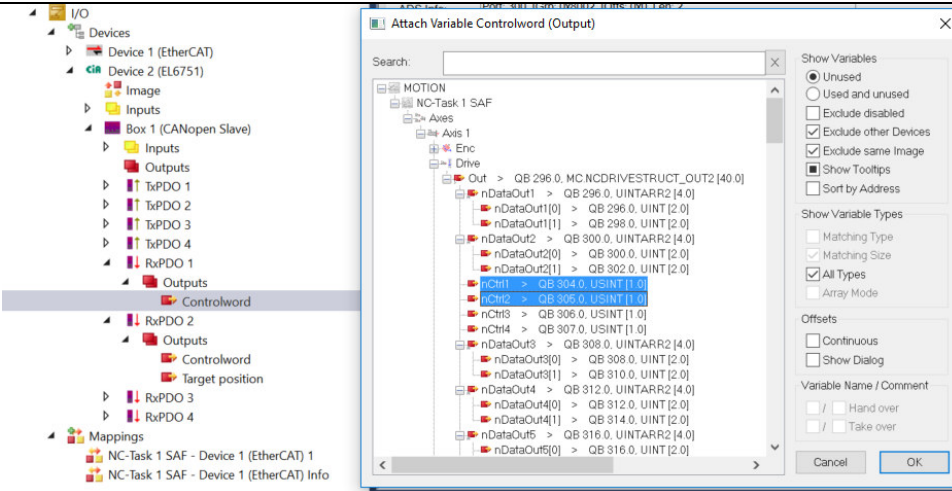
The right pane of the dialog contains the following settings:

- Show Variables:
 - Unused
 - Used and unused
 - Exclude disabled
 - Exclude other Devices
 - Exclude same Image
 - Show Tooltips
 - Sort by Address
- Show Variable Types:
 - Matching Type
 - Matching Size
 - All Types
 - Array Mode
- Offsets:
 - Continuous
 - Show Dialog
- Variable Name / Comment:
 - / Hand over
 - / Take over

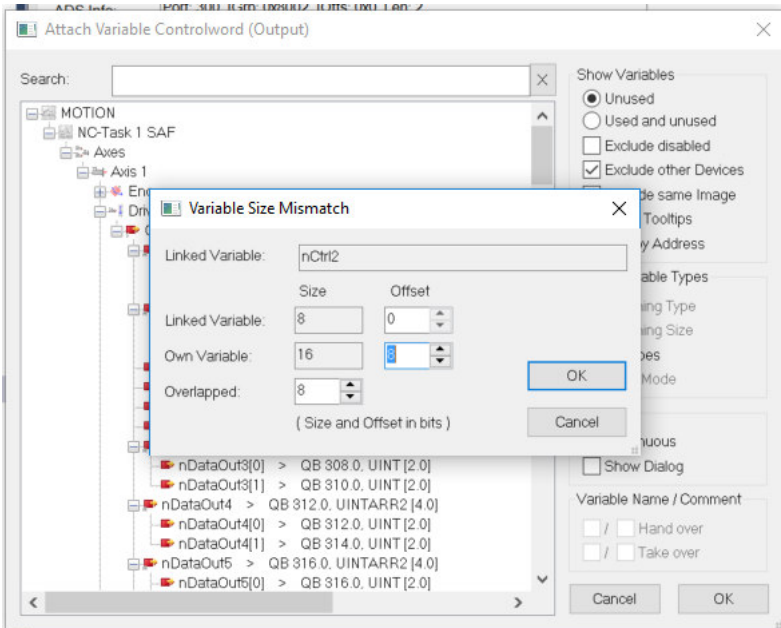
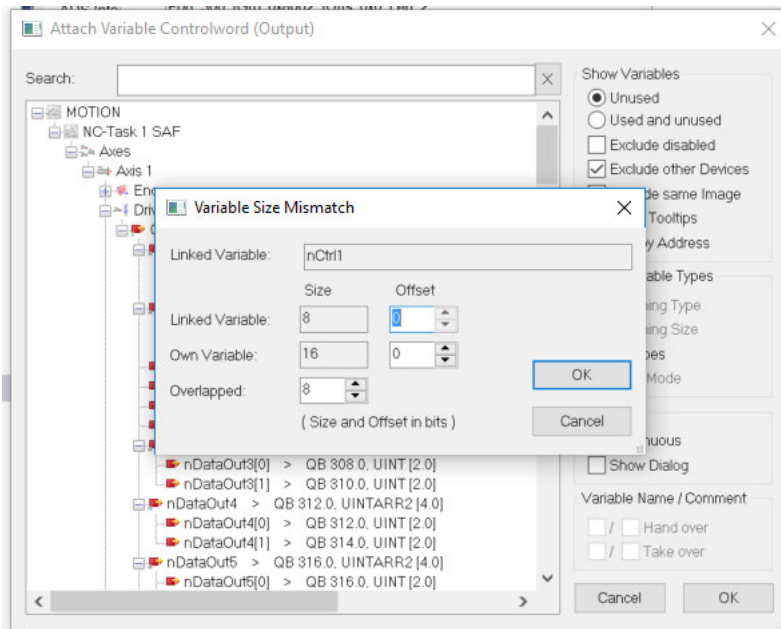
Buttons "Cancel" and "OK" are visible at the bottom right of the dialog.

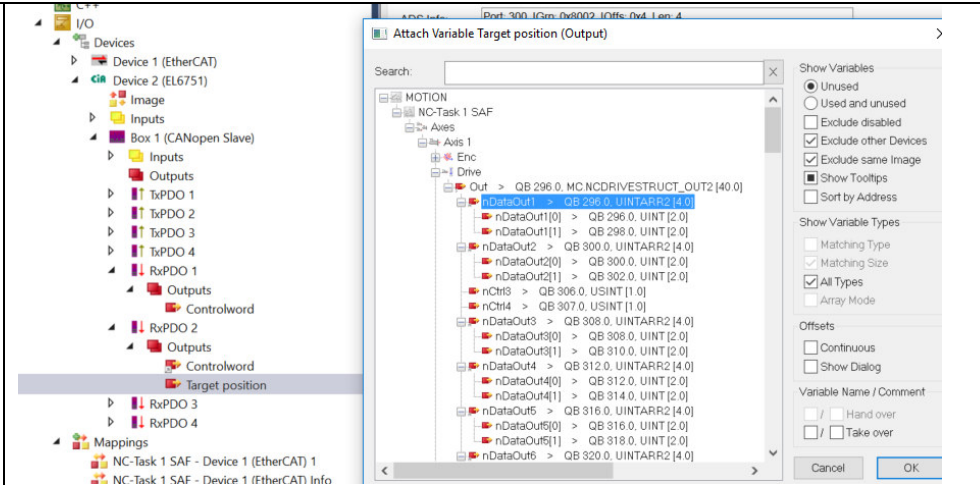
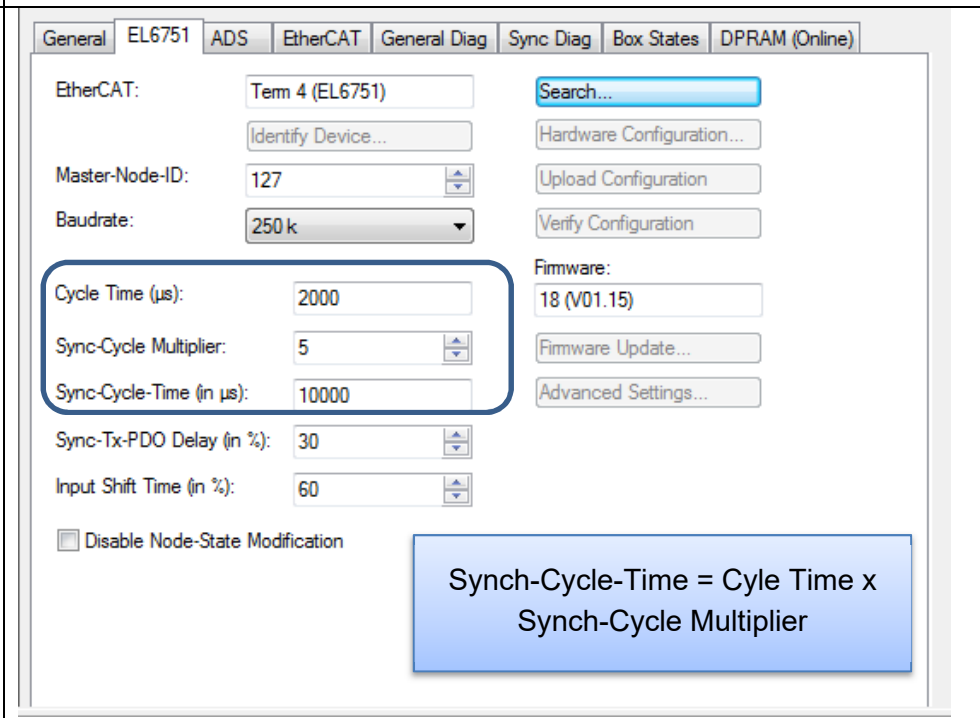
- Link Position actual value (TxPDO2) to Axis 1_Enc nInData1

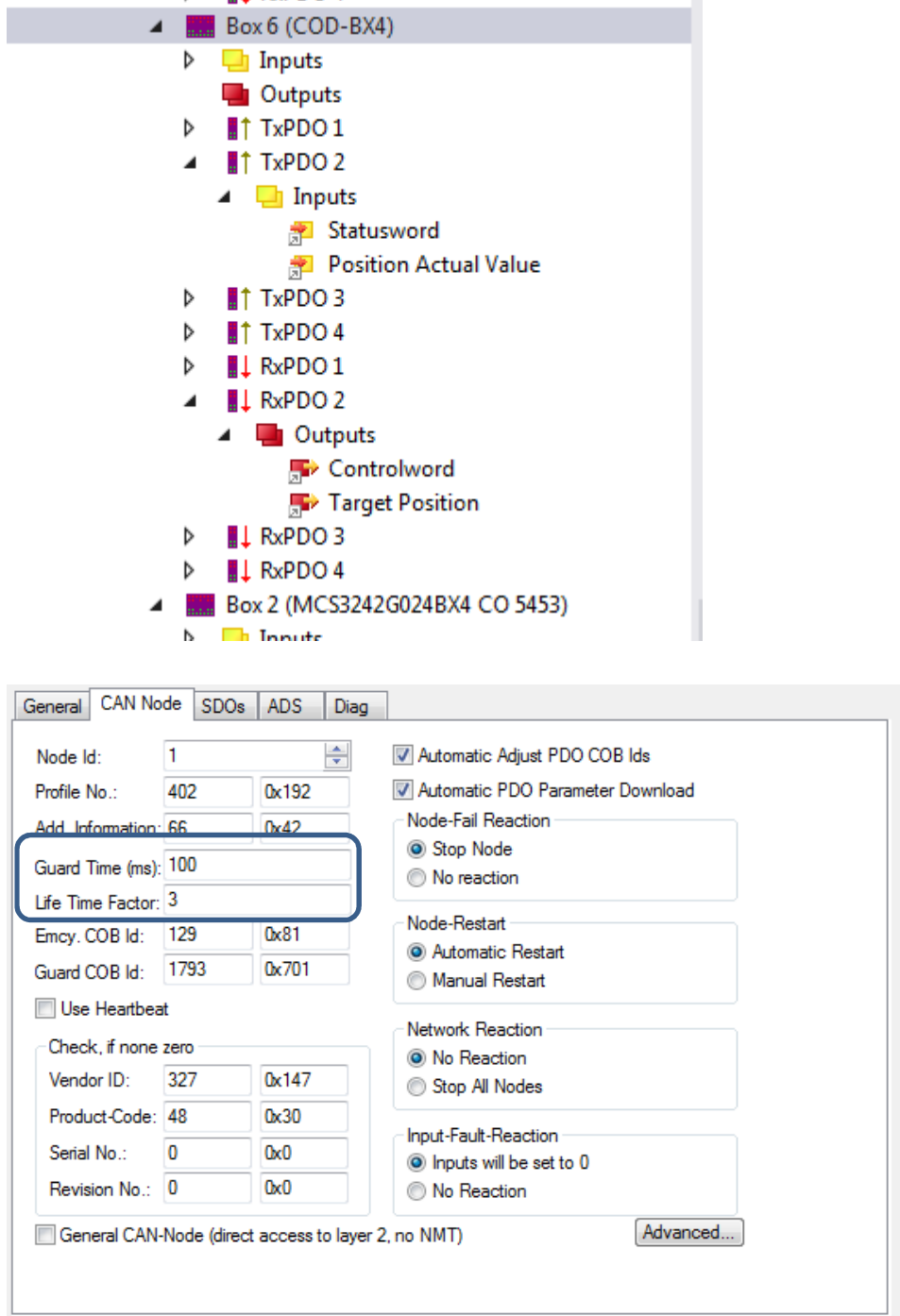
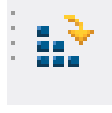
12

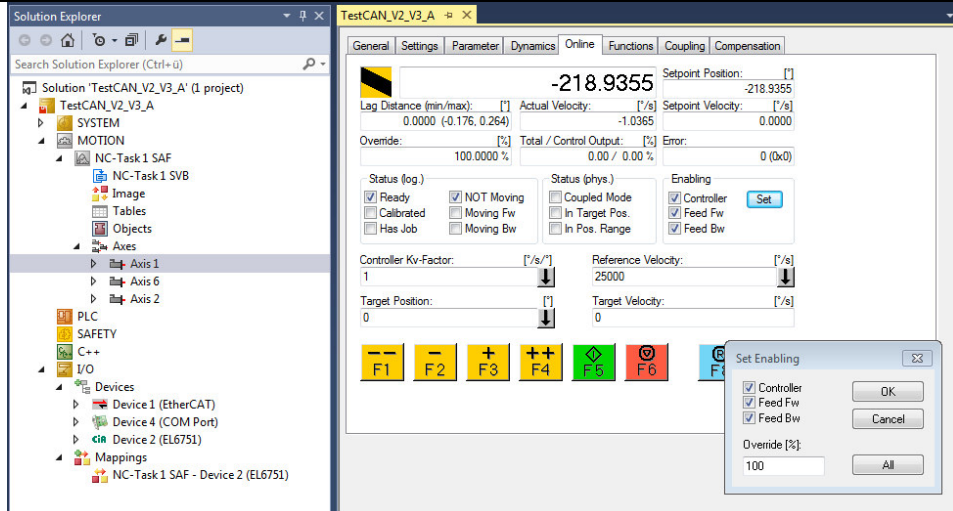



- Link Controlword (RxPDO2) to Axis 1_Drive nCtrl1 & nCtrl2
- Offset of 8 Bit is necessary



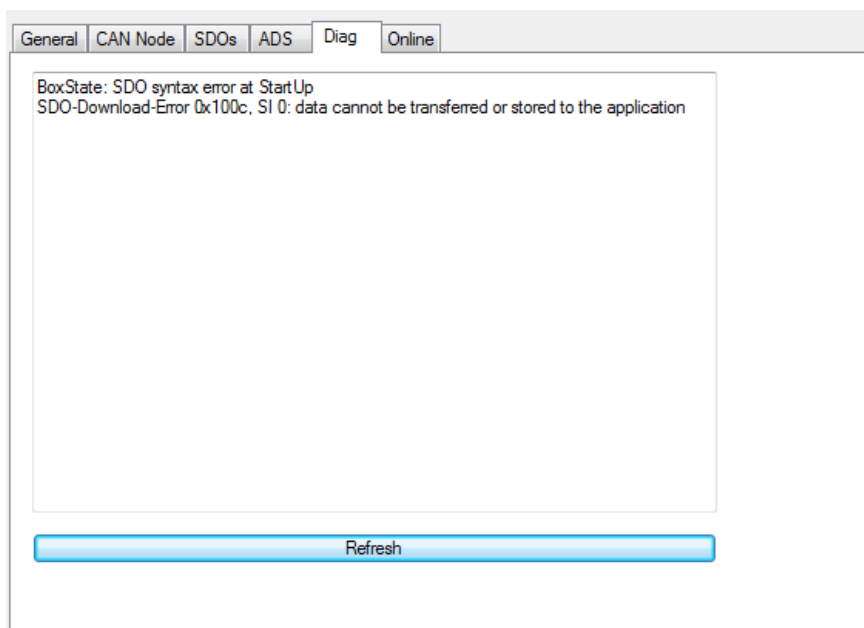
| | | |
|-----------|---|--|
| <p>13</p> |  | <ul style="list-style-type: none"> • Link Target Position (RxPOD2) to Axis 1_Drive nOutData1 |
| <p>14</p> |  | <ul style="list-style-type: none"> • In the settings of the EL 6751 CAN-open Gateway set the Synch-Cycle Multiplier to a reasonable value <p>Synch-Cycle should be > 1ms/node so 10ms could be used.</p> |

| | | |
|-----------|---|--|
| <p>15</p> |  | <ul style="list-style-type: none"> • At each of the drives (boxes) check the setting of the Heartbeat vs. Node-Guarding. • Using Node-Guarding and a Guard Time of 100ms , life time factor of 3 should work. • Make sure the checkbox for “Use Heartbeat” is turned off. |
| <p>16</p> |  | <ul style="list-style-type: none"> • Activate configuration and run the PLC |

| | | |
|-----------|--|---|
| <p>17</p> |  | <ul style="list-style-type: none"> • Enable the NC Drive |
| <p>18</p> |  | <ul style="list-style-type: none"> • After the drive is enabled reset the NC axis with F8, then activate the NC axis with F5 • From now on it is possible to run the motor with F1 – F4 |

Trouble shooting in case of the drives not being activated or not moving

- Check the box status in the TwinCAT environment:



Has TwinCAT been successful in configuring your drive? If not – where does it fail?

- Check the CAN communication using a USBtoCAN adapter and a CAN monitor. Do you see the PDOs in both directions plus the Synch message:
 - Id 0x80: Synch message
 - Id 280 + node Id: TxPDO2 sent by the drive. Should be transferred once in each synch cycle
 - Id 300 + Node Id: RxPDO2 sent by the master. If not changed to synched transmission will only be sent, if its contents is changed e.g. when the drive is moving or being enabled.
- If your drive does have a second configuration interface like a MC 50xx S/P CO, connect to the drive using a second interface if available and monitor the behaviour using the FAULHABER MotionManager. If the drive can be enabled but does not move:
 - Is the drive in CSP mode?
 - Is the scaling correct?
 - Are the PDO settings as they are expected?
- If there is no second interface at your drive like at a 22xx BX4 COD, disconnect the PLC from the CAN without resetting the drives and connect the CAN to the MotionManager and check the drive configuration
 - Is the drive in CSP mode?
 - Is the scaling correct?
 - Are the PDO settings as they are expected?

Trouble shooting in case the drive is not moving smoothly



For axis tuning please use the Motion Manager's controller tuning tool. See application note 151.

Options

Starting from MC V3.0 firmware revision L3 the target position can be interpolated between the updates via EtherCAT or CANopen. The interpolation rate is available at object 0x2332.00. Default is 1 cycle = 100µs which disables the interpolation.

For a typical EtherCAT update cycle of 1ms set the interpolation rate to 10.

For a typical CANopen update cycle of 10ms set the interpolation rate to 100.

Interpolation is not available in drives of the MC V2.5 family.

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