

Application Note:

Setting up Nanotec Drives as NC axis in TwinCAT via CANopen (in CSP mode)

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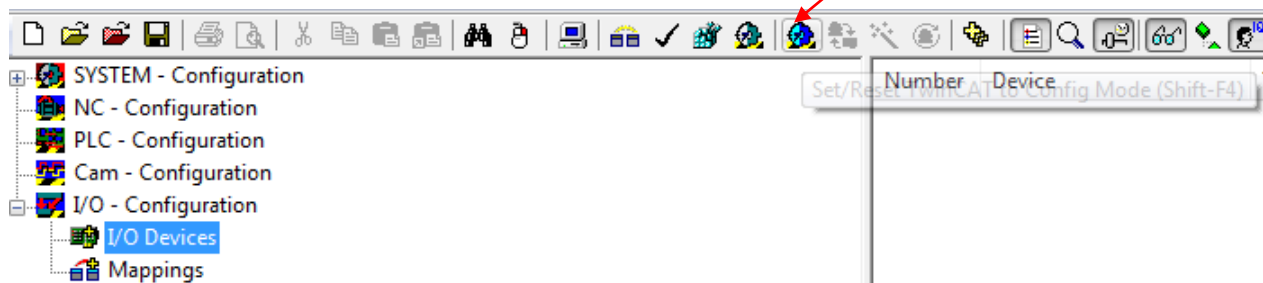
Valid with firmware version FIR-v1508

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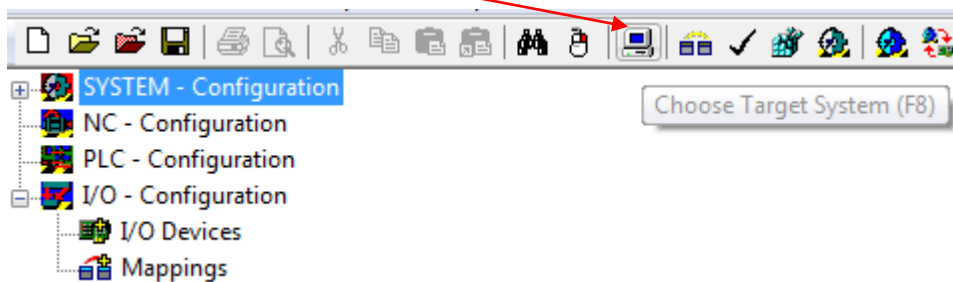
System configuration

The status of TwinCAT is shown in the lower right corner.

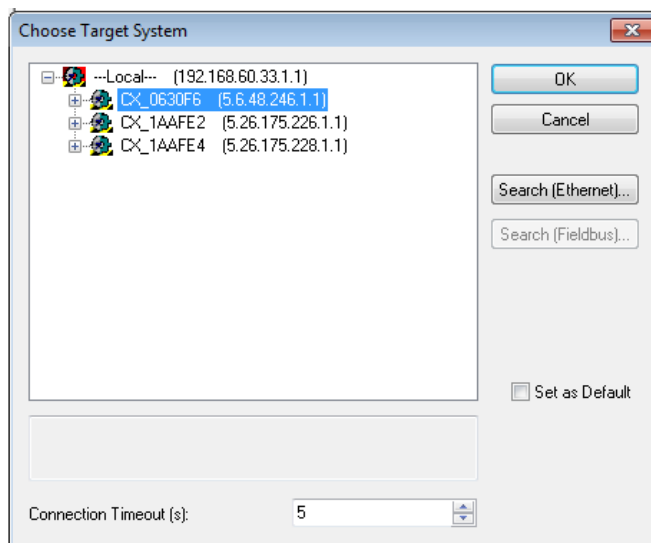
1. Make sure that TwinCAT is in configuration mode. If not, click on **this** icon.



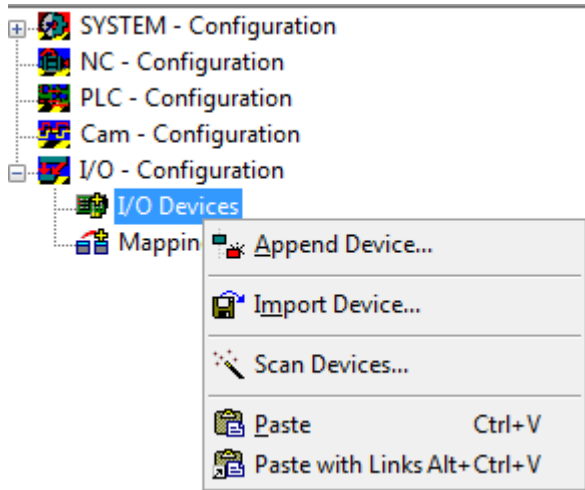
2. Choose the target system.



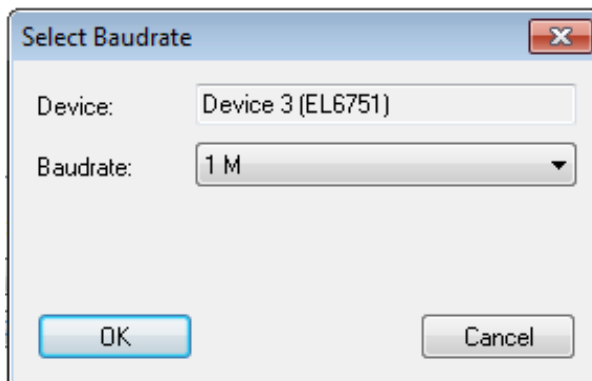
3. Select the system from the list. In case it is not listed, click on 'Search' (Ethernet) and start a broadcast search.



4. Scan for devices as shown below.

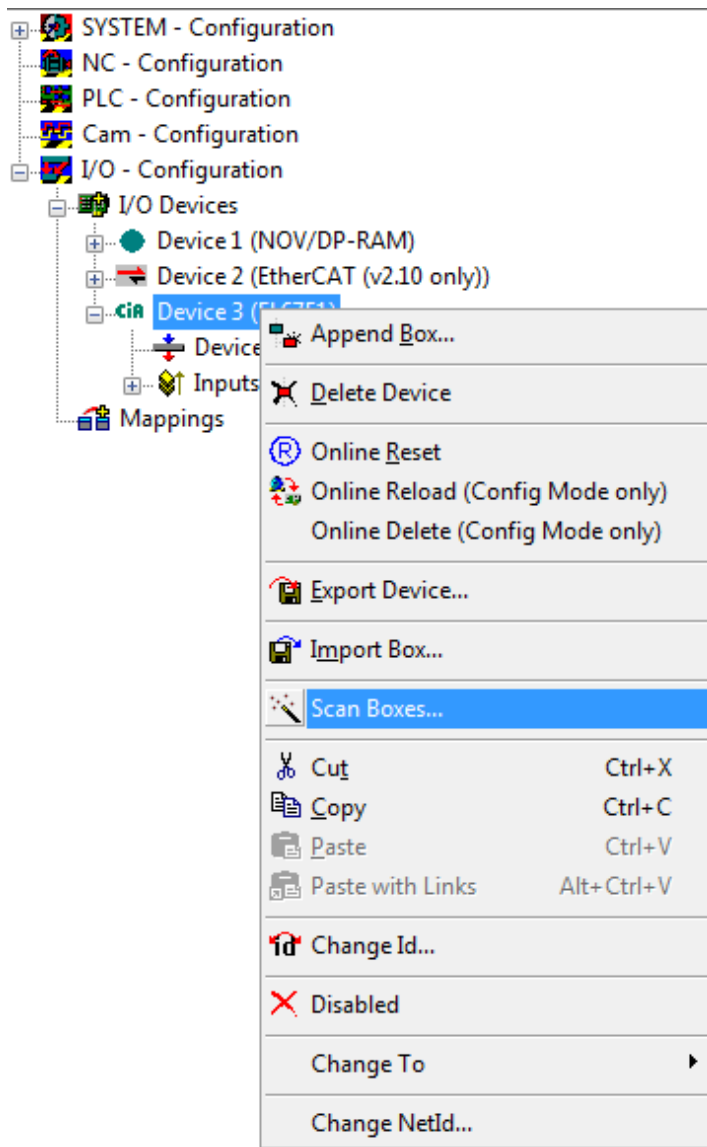


5. If CANopen Master is used, it will be detected at this point. Simply click on 'Yes' and select the appropriate Baudrate.

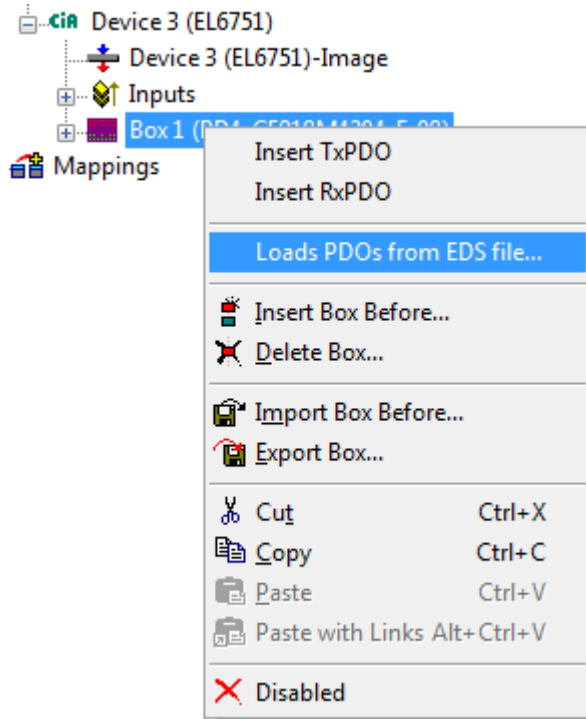


CANopen node configuration

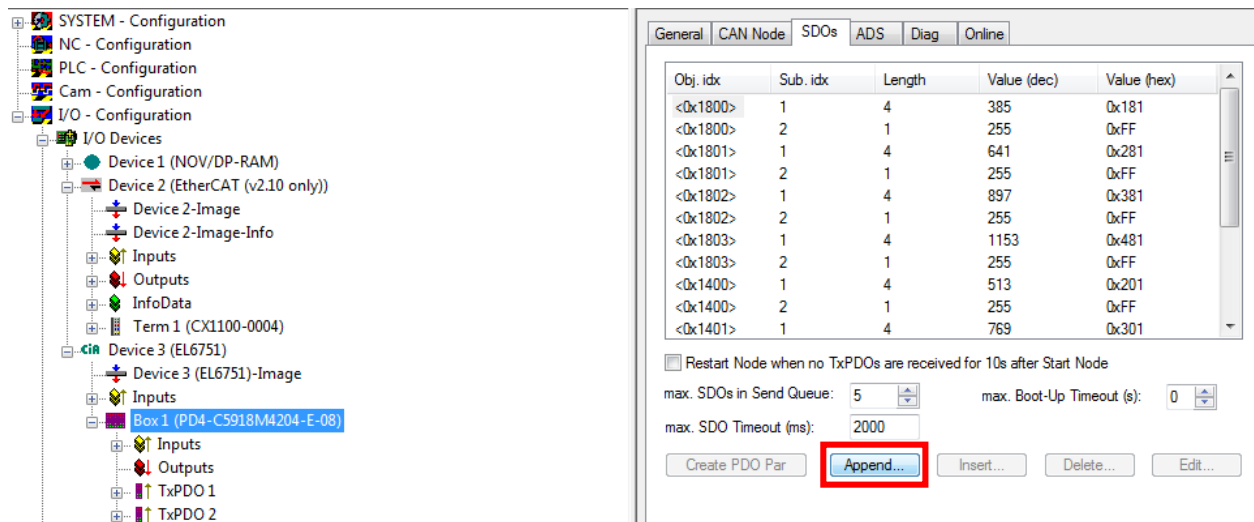
1. Once selected, click on the CANopen Master (Device 3) and scan for boxes. The Nanotec controller will be detected after this stage and displayed as a box.



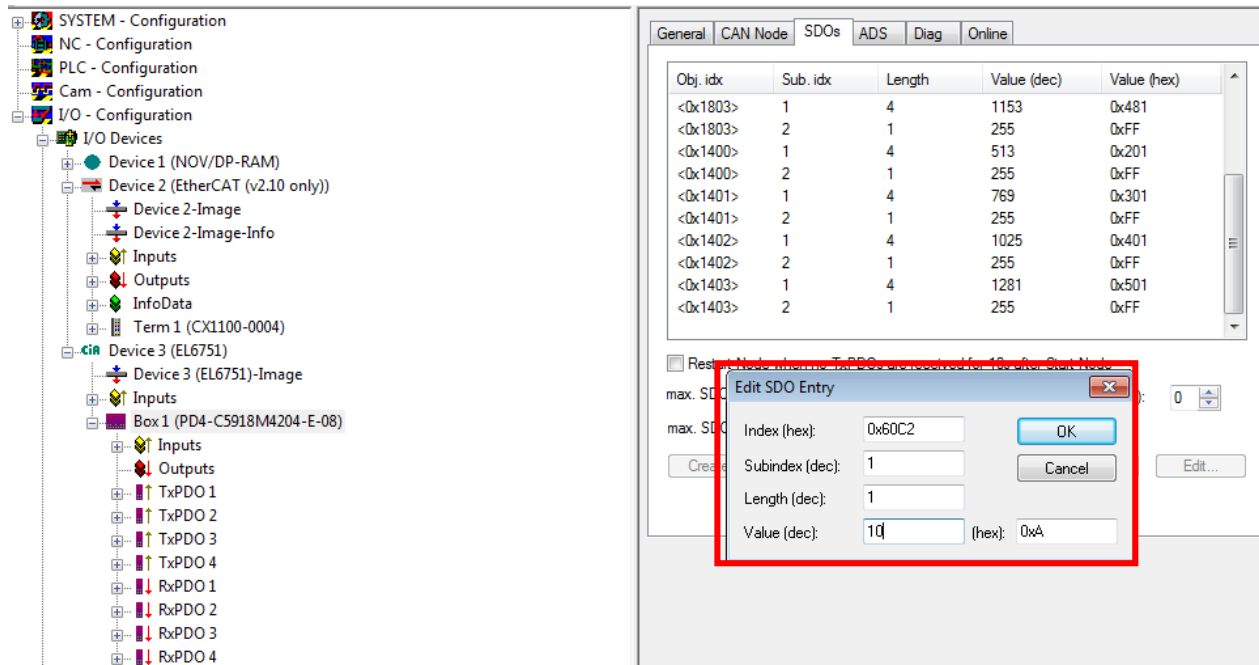
- In order to configure the Nanotec controller, select the appropriate EDS file. To do so, right click on the box with the controller name and select 'Loads PDOs from EDS file', as shown below.



- If using CSP mode, the interpolation time has to be configured. This is done by appending the object 0x60C2:01 as a SDO, which will be overwritten in the box when switching to RunTime. Click on 'Append' and follow the next screenshot.

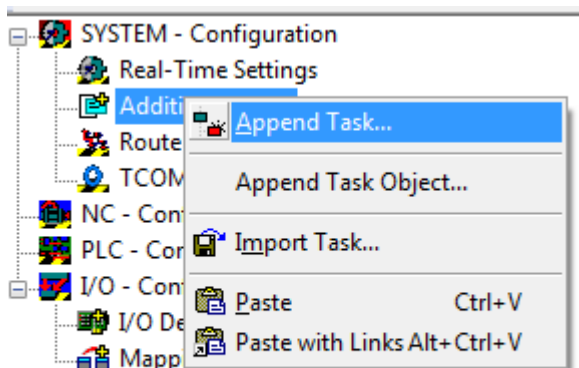


The value of the interpolation time (0x60C2:01) should equal to the cycle value of the NC axis.



Configuring a system task

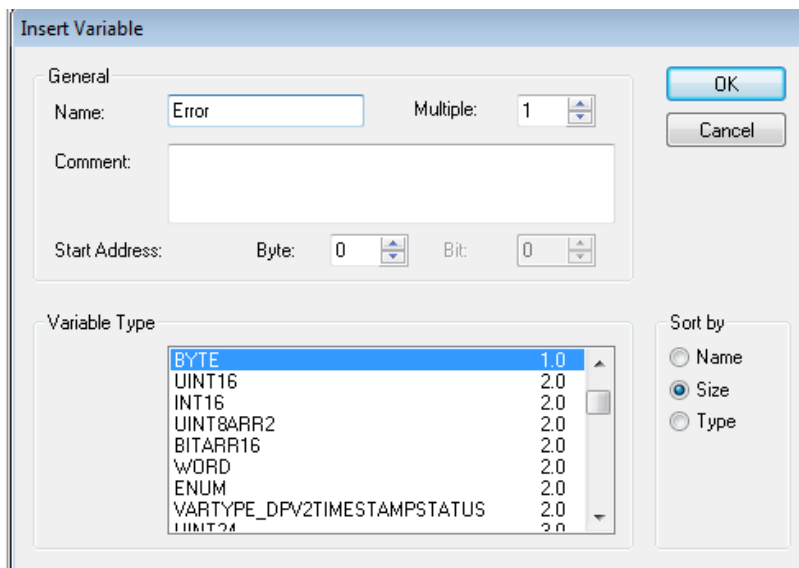
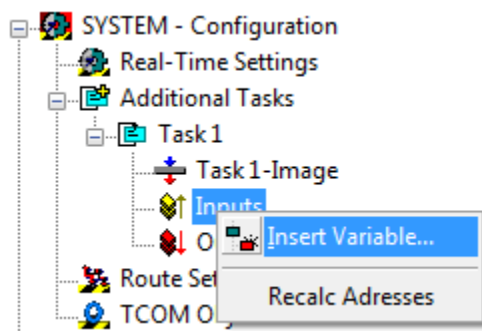
1. Add a new task by clicking on 'Append Task'.

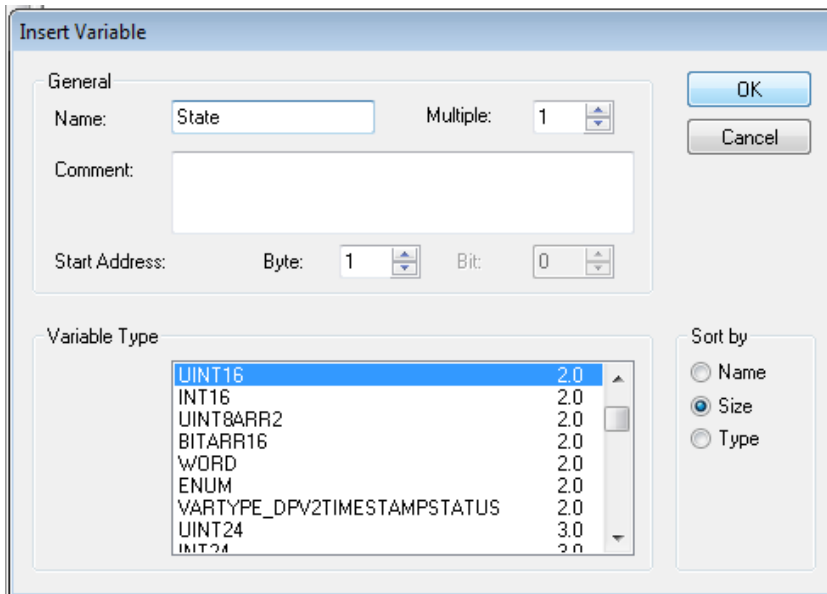


2. Click on 'Auto start' and set Cycle ticks to 1.

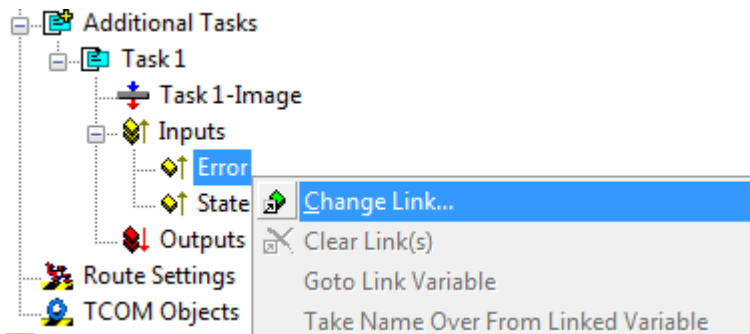


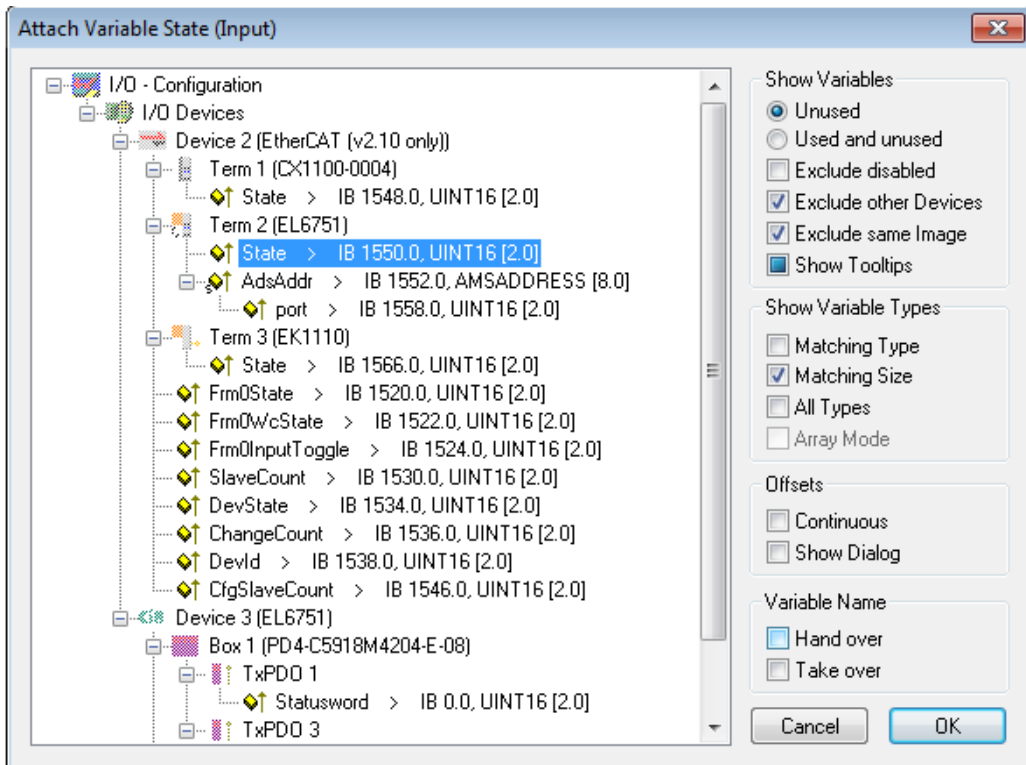
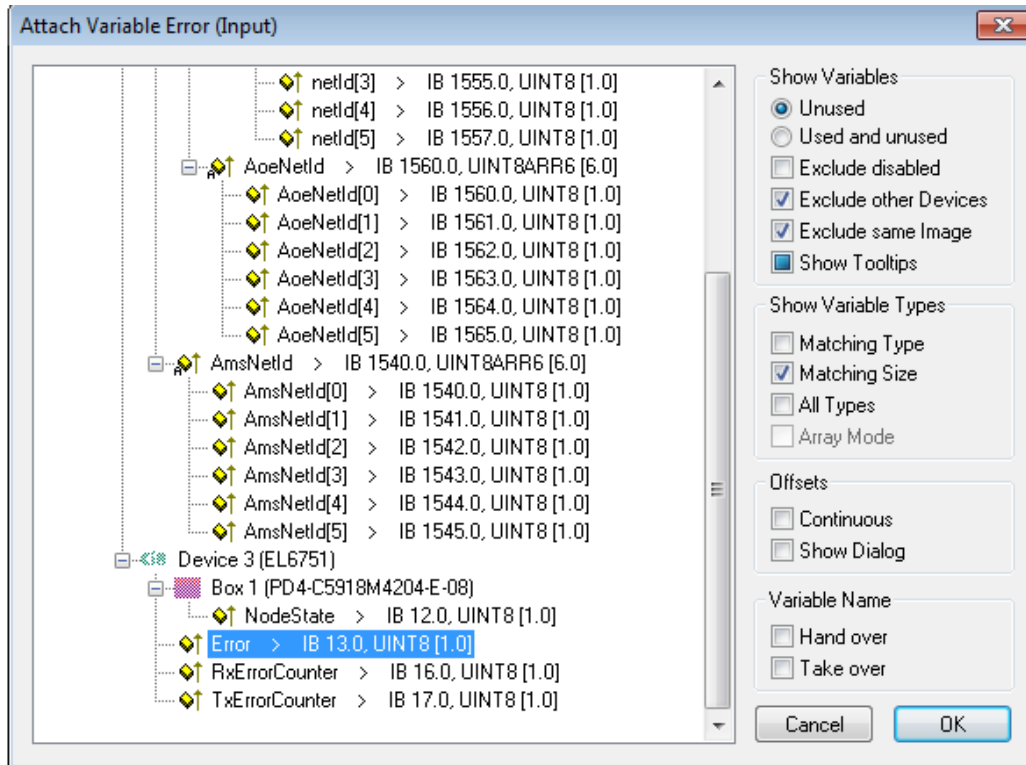
3. Click on 'Inputs' and select 'Insert Variable'. Two variables 'Error' & 'State' need to be inserted and linked as shown below.



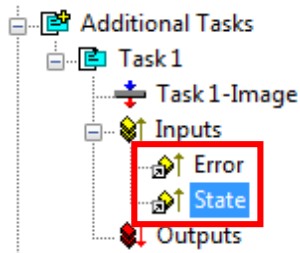


4. Link the variables to variables in CANopen Master and EtherCAT.



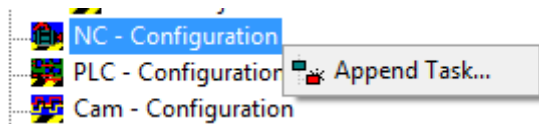


When the linking is completed, the two variables should have a link symbol.

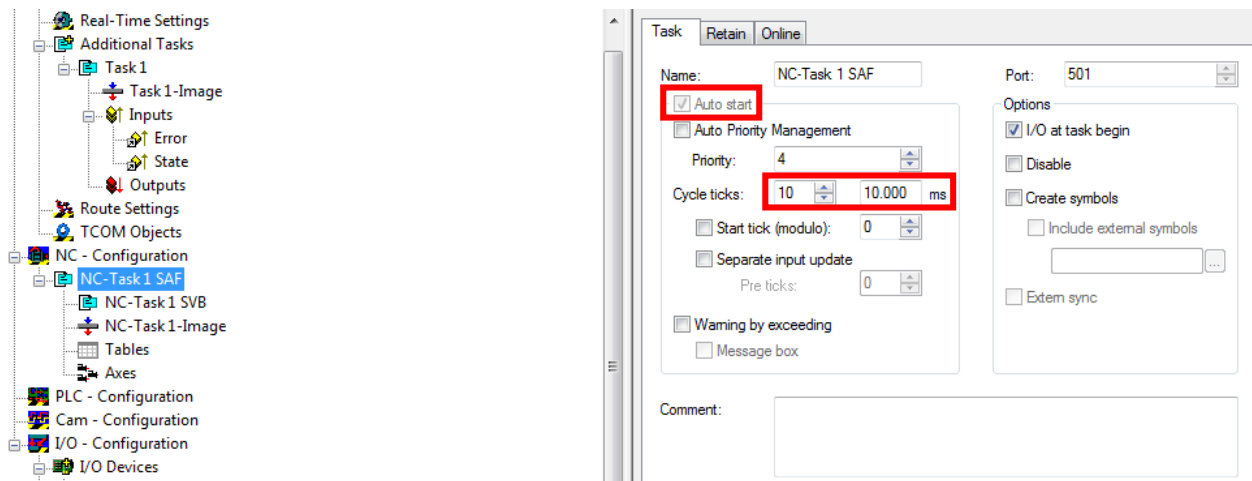


Configuring a NC axis

1. Add a new task to NC-Configuration.

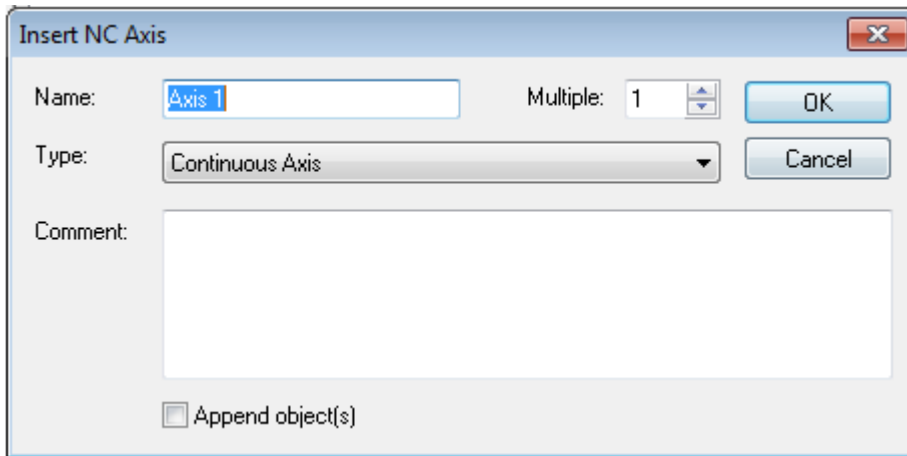
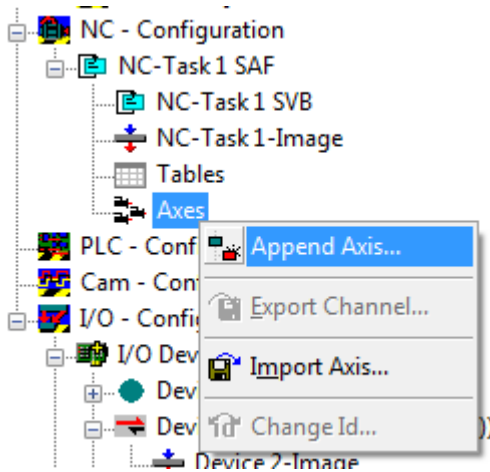


2. Select 'NC-Task1-SAF' and configure 'Cycle ticks'.

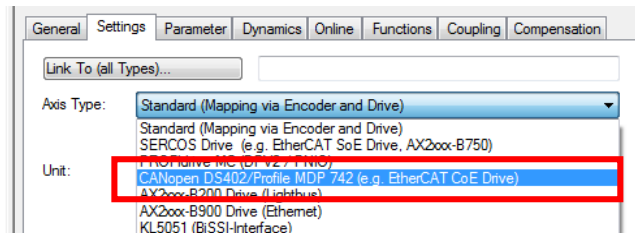
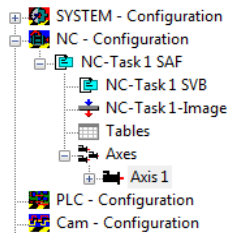


Make sure 'Cycle ticks SVB' = 'Cycle ticks SAF'

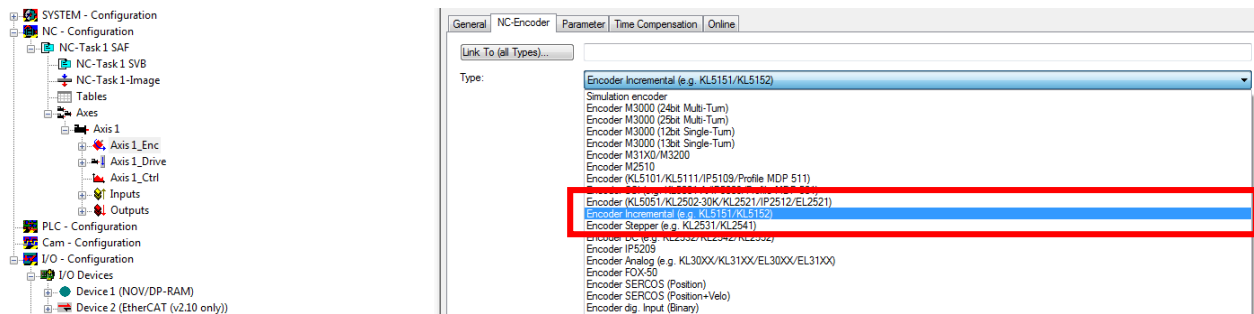
3. Add a new continuous axis.



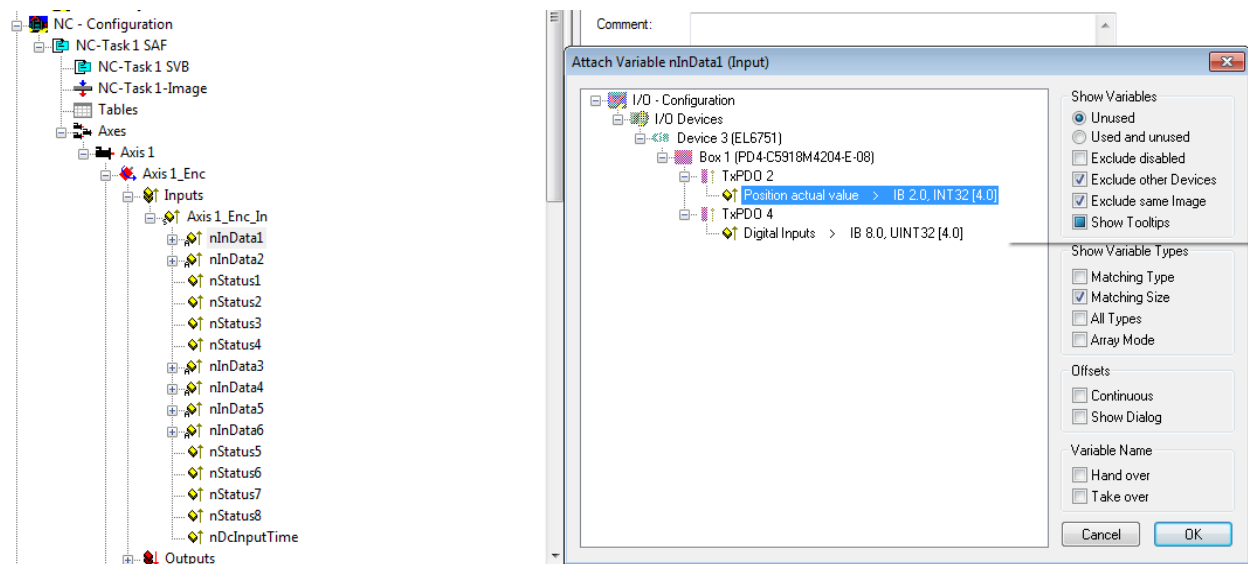
4. Configure the axis as a CANopen DS402 (CoE Drive) axis.



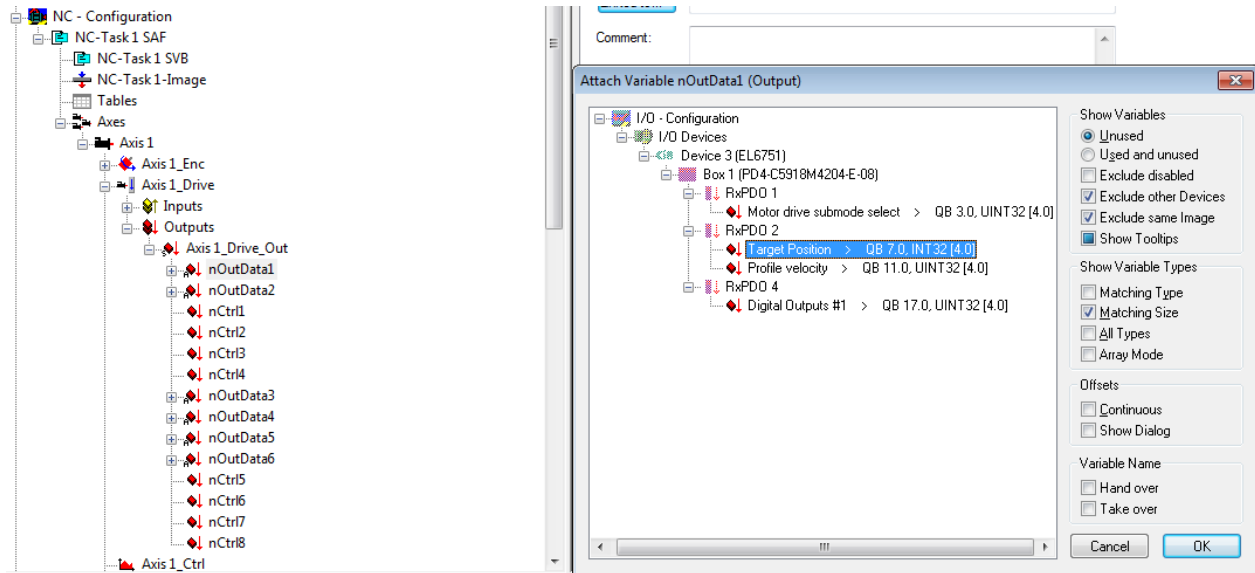
5. Configure the encoder as 'Incremental Encoder'.



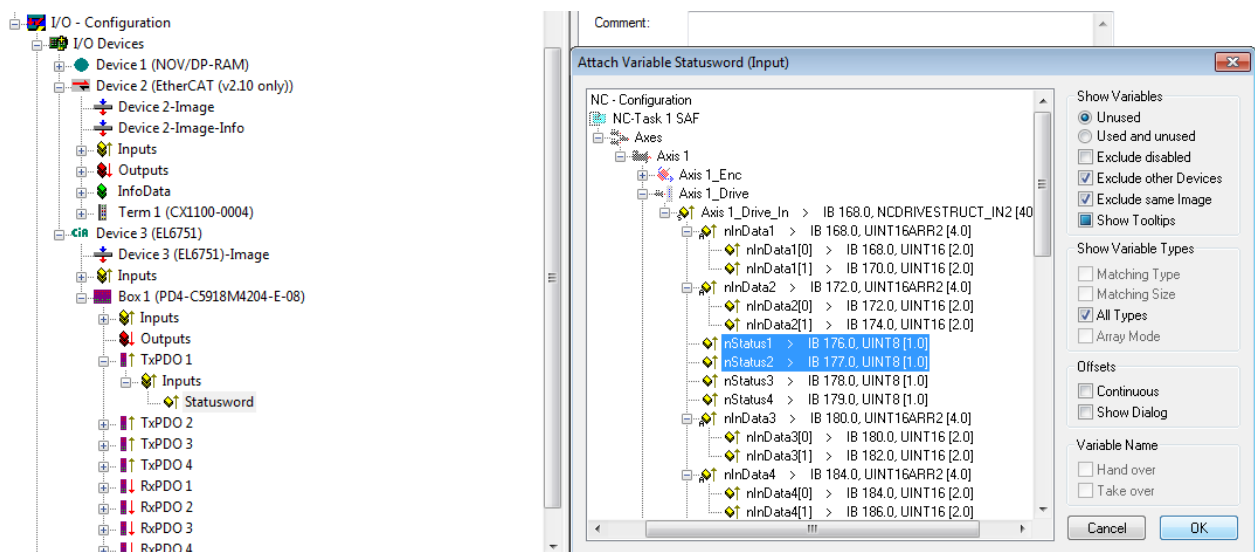
6. Link Axis Encoder Input 'nInData1' to the Position Actual Value TxPDO 2. Simply double click on 'nInData1' and select TxPDO 2 from the list.



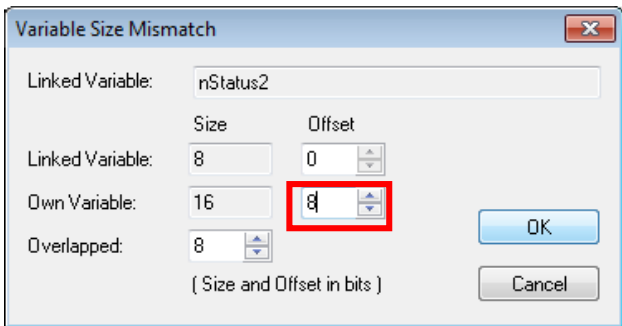
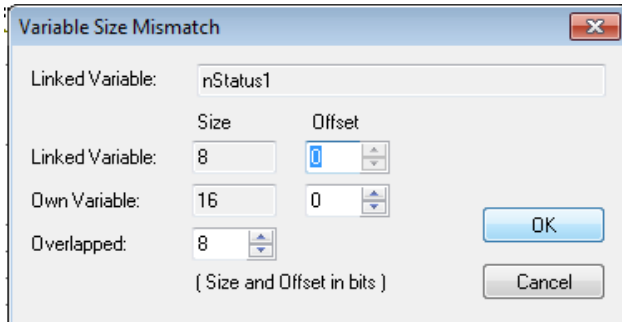
7. Similarly, link Axis Drive Output 'nOutData1' to the Target Position (RxPDO 2) variable.



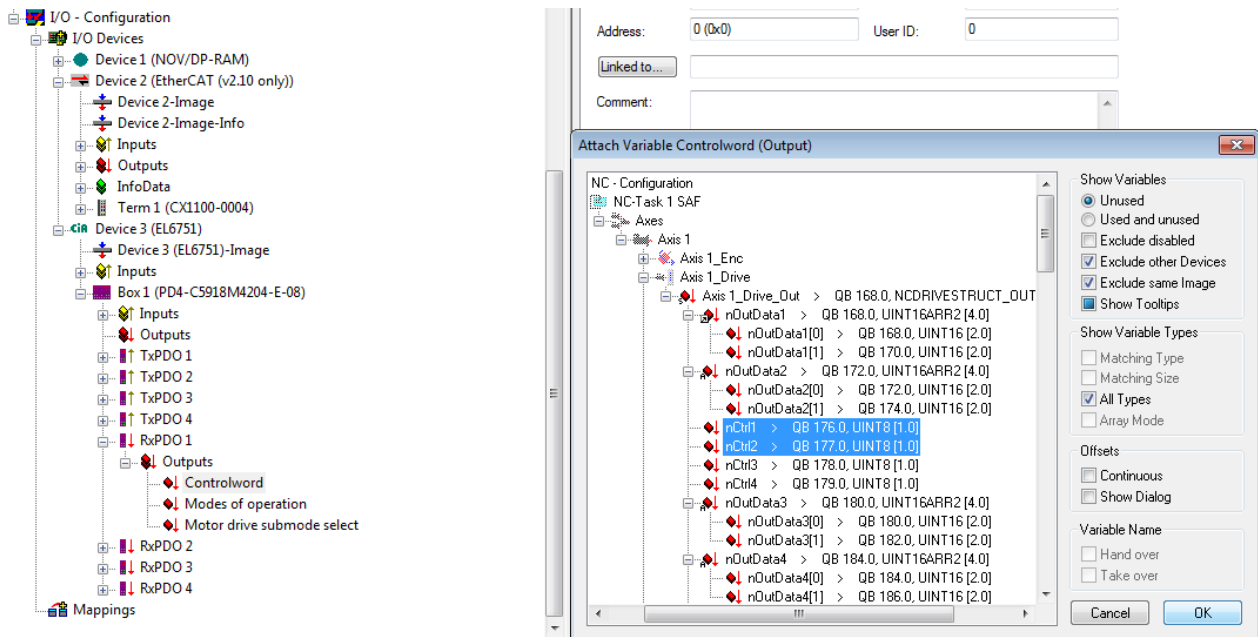
8. For linking the Statusword, click on TxPDO 1 in the box and select both nStatus1 and nStatus2 from 'Axis 1_Drive_In'.

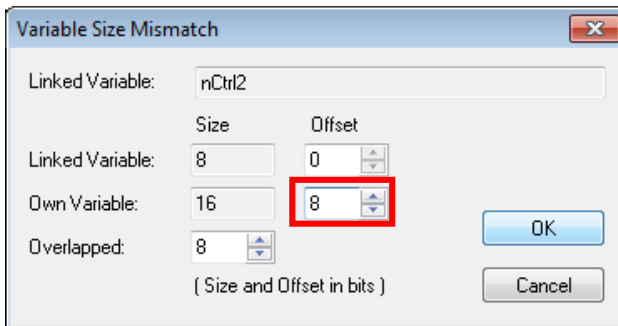
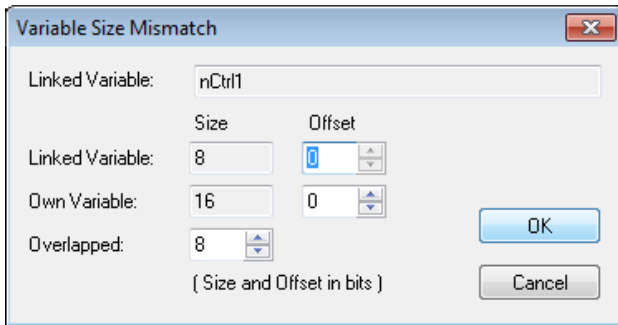


As Statusword is 2 bytes long and nStatus1 and nStatus2 are both 1 byte. Set offset '8' for nStatus2

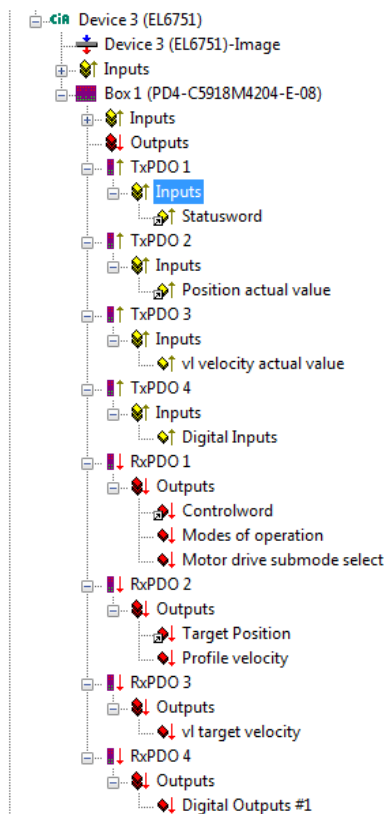


9. Similar to step 20, configure the Controlword in RxPDO 1.

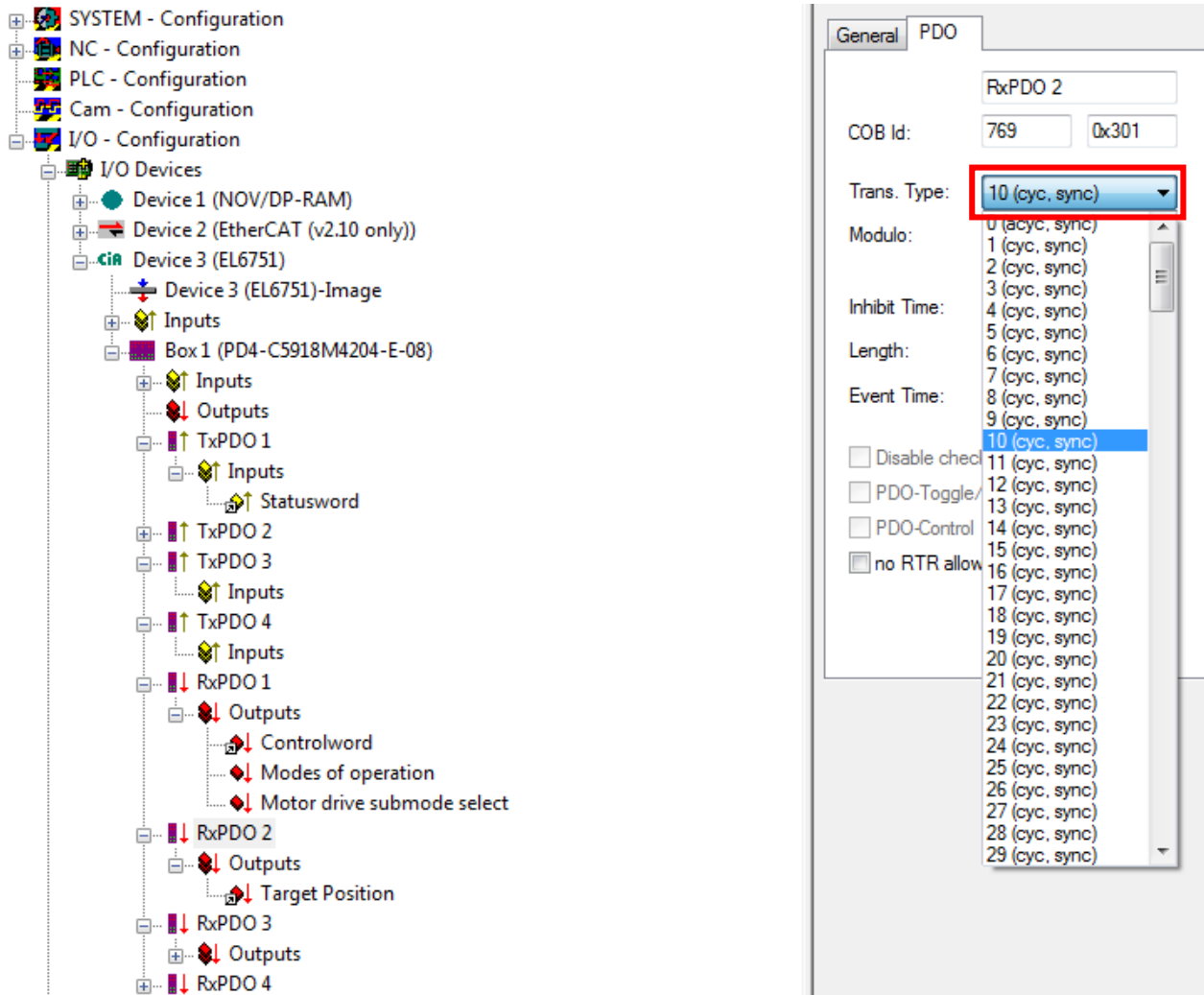




10. Once the linking is completed, the node tree should look as the one shown below.



11. Configure the RxPDO 2 (Target Position) as Cyclic Synchronous. The Cyclic value should equal the value configured in interpolation time period (0x60C2:01) and the cycle time for the NC axis.



The screenshot shows the configuration software interface. On the left, a tree view displays the configuration structure under 'I/O Devices'. The 'RxPDO 2' entry is expanded, showing its configuration options. On the right, the 'PDO' configuration dialog is open, showing the 'RxPDO 2' configuration. The 'Trans. Type' dropdown menu is highlighted with a red box, and the value '10 (cyc. sync)' is selected. The 'COB Id' is set to 769 and 0x301. The 'Module' list shows various options, with '10 (cyc. sync)' selected. The 'Event Time' is set to 10 (cyc. sync). The 'Disable check', 'PDO-Toggle', 'PDO-Control', and 'no RTR allow' checkboxes are unchecked.

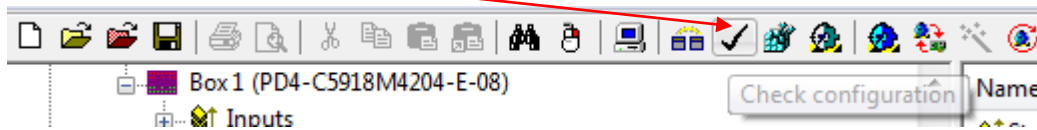
Bringing the configuration into effect

1. When the configuration is done, it can be brought into effect by clicking on 'Generate Mappings'.

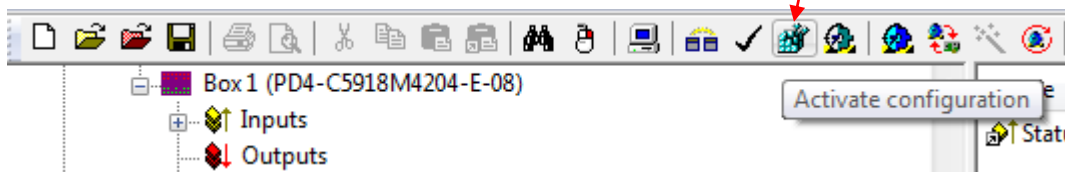


The screenshot shows the software toolbar with various icons. A red arrow points to the 'Generate mappings' button, which is highlighted. Below the toolbar, the configuration tree is visible, showing 'SYSTEM - Configuration', 'Real-Time Settings', and 'Additional Tasks'.

Click on 'Check configuration' to verify all mappings and linkages.

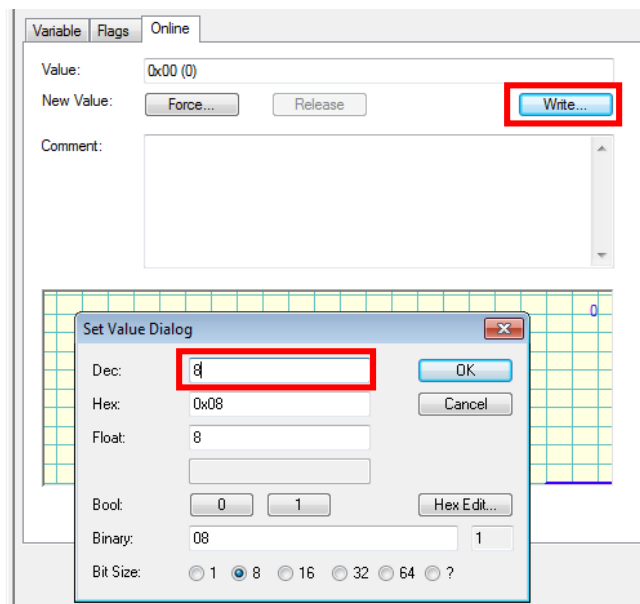
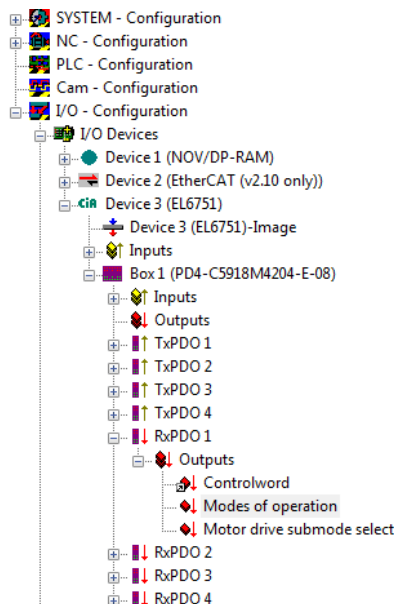


Finally, if no errors were found during checking, click on 'Activate Configuration' to switch TwinCAT into Run Time mode.

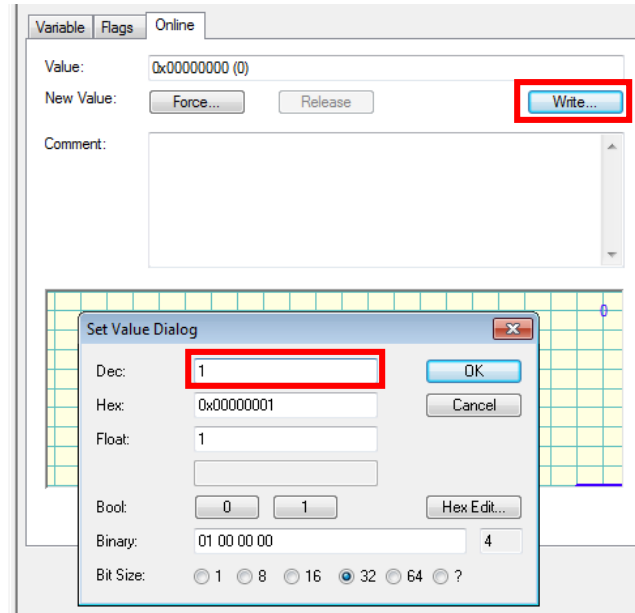
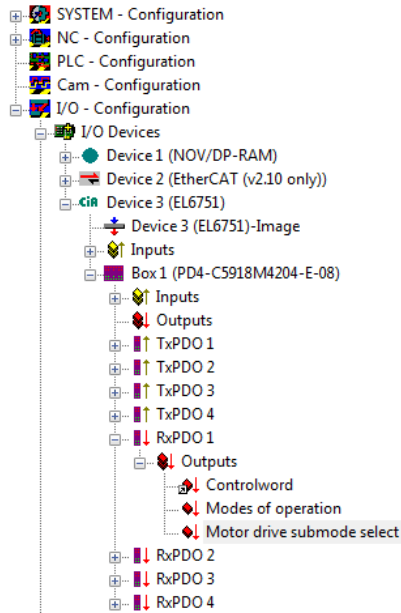


Operating the node in CSP mode

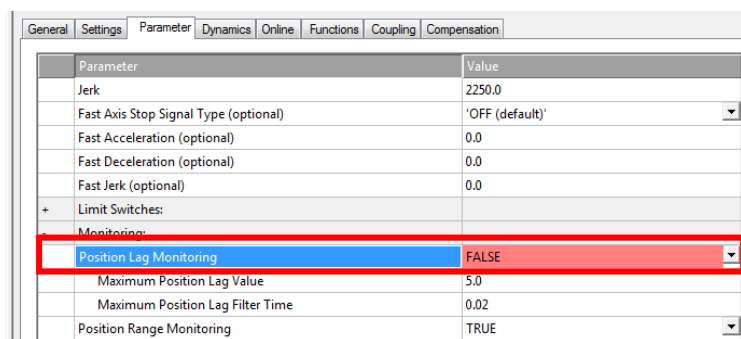
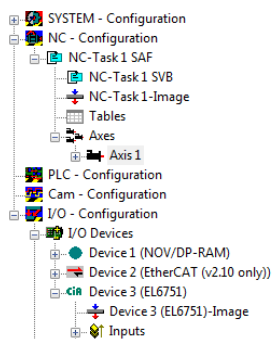
1. Click on RxPDO 1, select 'Modes of Operation'. As shown below, go to the 'Online' tab and click 'Write'. Enter value 8 (CSP mode value).



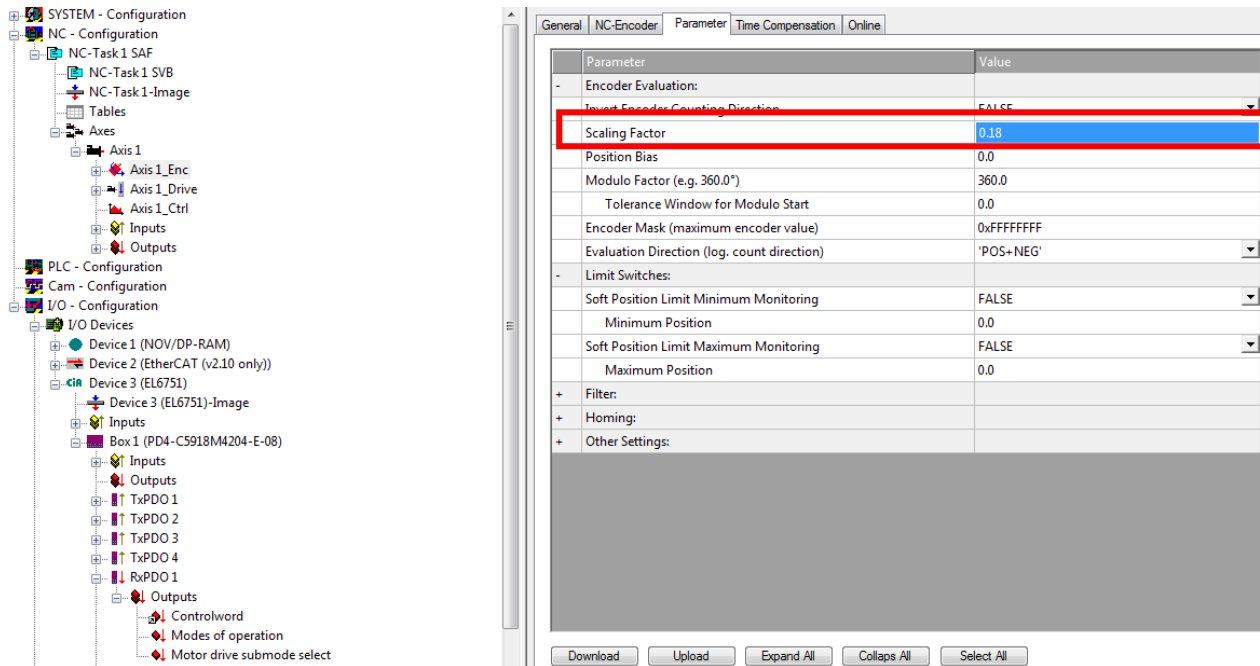
- Similarly, enter a value of 1 for 'Motor drive submode select'. Writing 1 will configure the drive to operate in closed-loop mode.



- Select the NC axis and click on 'Axis 1'. Under the 'Parameter' tab, select 'Position Lag Monitoring' and force it to FALSE. Click on the 'Download' option at the bottom.

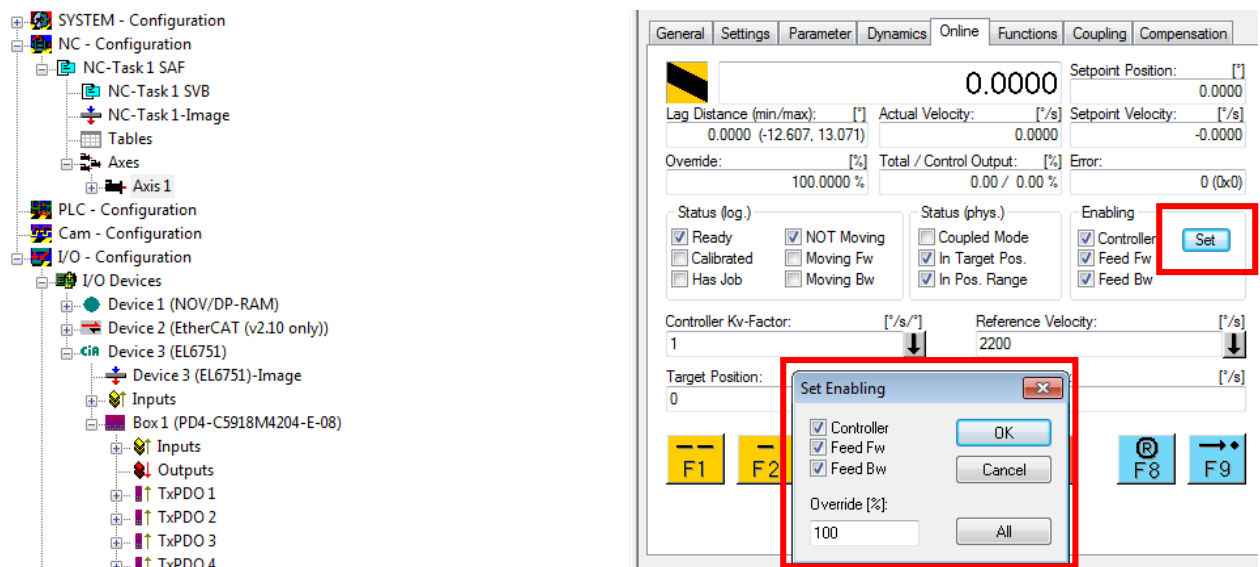


- Configure the encoder resolution. The Encoder resolution is 2000 increments per revolution. This means $360^\circ/2000 = 0.18$. Enter the value and click on 'Download'.



Parameter	Value
Encoder Evaluation:	
Invert Encoder Counting Direction	FALSE
Scaling Factor	0.18
Position Bias	0.0
Modulo Factor (e.g. 360.0°)	360.0
Tolerance Window for Modulo Start	0.0
Encoder Mask (maximum encoder value)	0xFFFFFFFF
Evaluation Direction (log. count direction)	'POS-NEG'
Limit Switches:	
Soft Position Limit Minimum Monitoring	FALSE
Minimum Position	0.0
Soft Position Limit Maximum Monitoring	FALSE
Maximum Position	0.0
Filter:	
Homing:	
Other Settings:	

- Now Axis 1 is configured to run as an NC axis. Turn the drive ON by selecting 'Set'. In the new window select all three options and set 'Override %' to 100.



The screenshot shows the 'Axis 1' configuration window. The 'Set' button is highlighted with a red box. A 'Set Enabling' dialog box is also highlighted with a red box, showing the following settings:

- Controller
- Feed Fw
- Feed Bw
- Override [%]: 100