

Connecting JVL ethercat moter to Twincat3

This is a guide to connect a Mac motor as a NC axis to a Beckhoff Twincat3 PLC.

This allows the PLC to control the motor as a synchronized axis, and bypasses most of the intelligence of the motor firmware.

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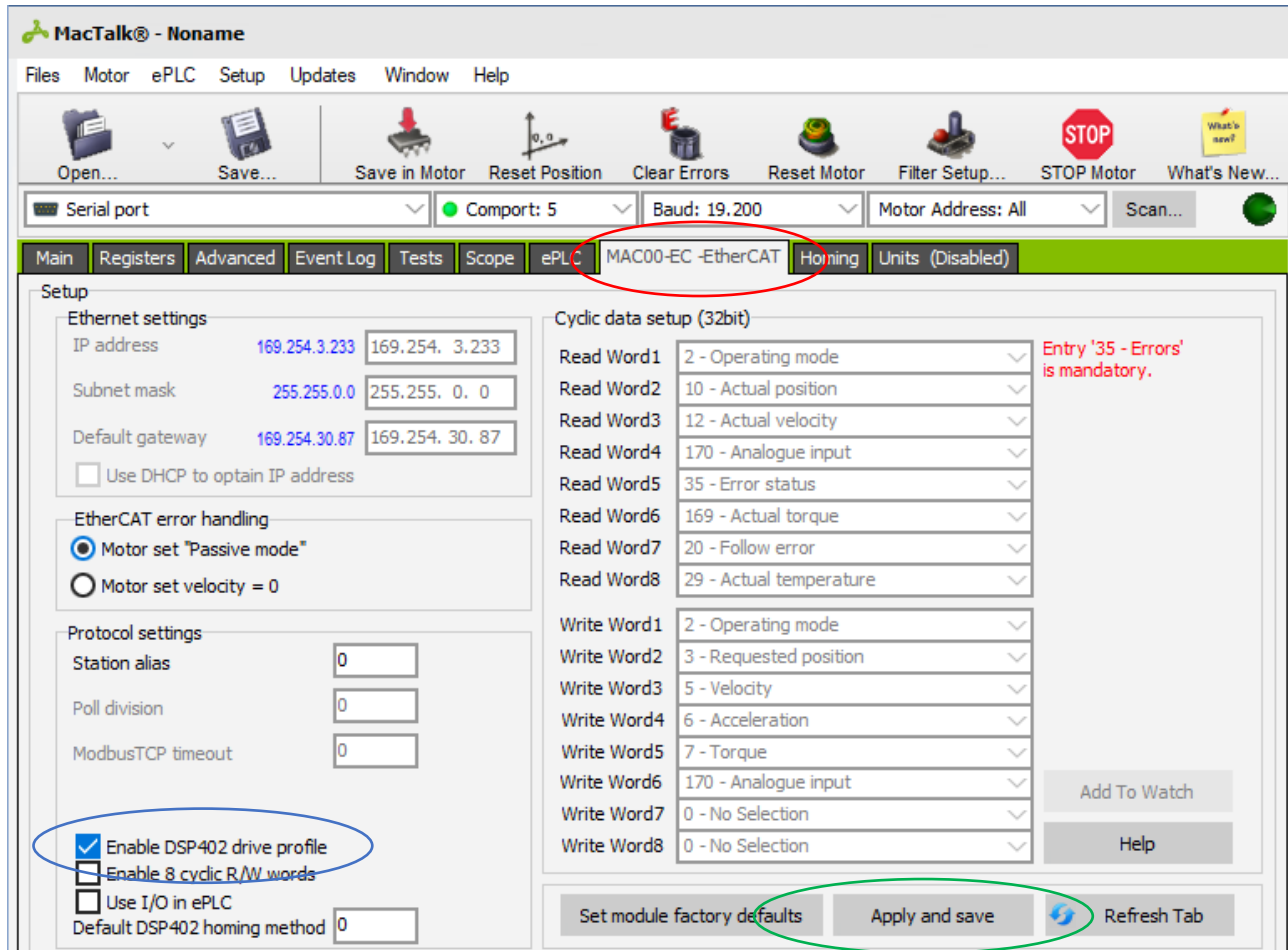
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Setup Mac motor for DSP402 profile

Before connecting the motor to the PLC, we need to enable the can profile that allows the PLC to control it as a synchronized NC axis.

This is done by enabling the DSP402 profile with the Mactalk software.

Connect Mactalk to the motor.



Select the MAC00-EC Ethercat tab

Check the “Enable DSP402 drive profile “ box

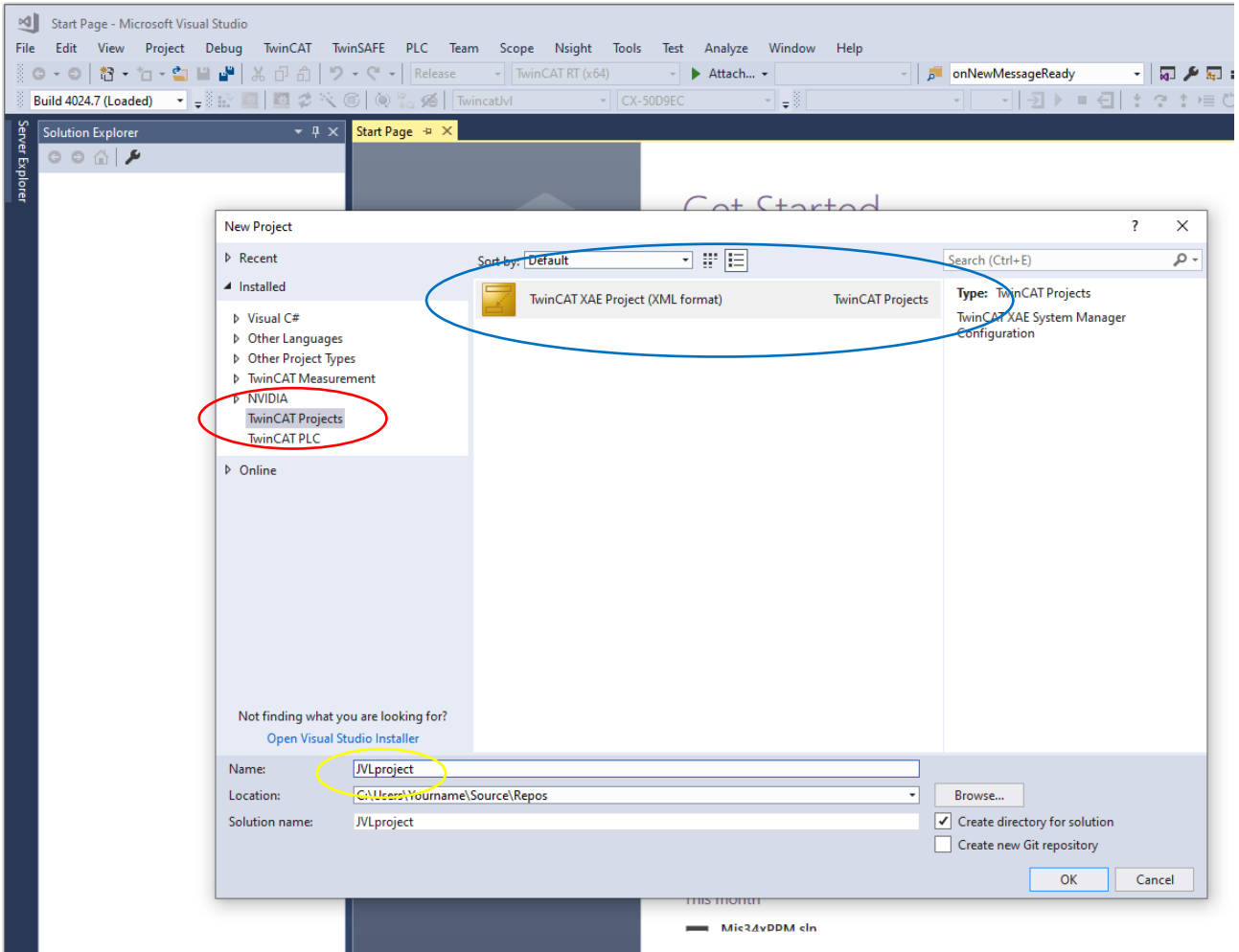
Press “Apply and save” button to store the configuration in the Ethercat module

Create empty TwinCAT project.

Open Visual studio 2017 with TwinCAT3 integration. If TwinCAT is not installed on the computer, the TwinCAT project will not be available.

The rest of this sample is done in Visual Studio.

Click File->New project.

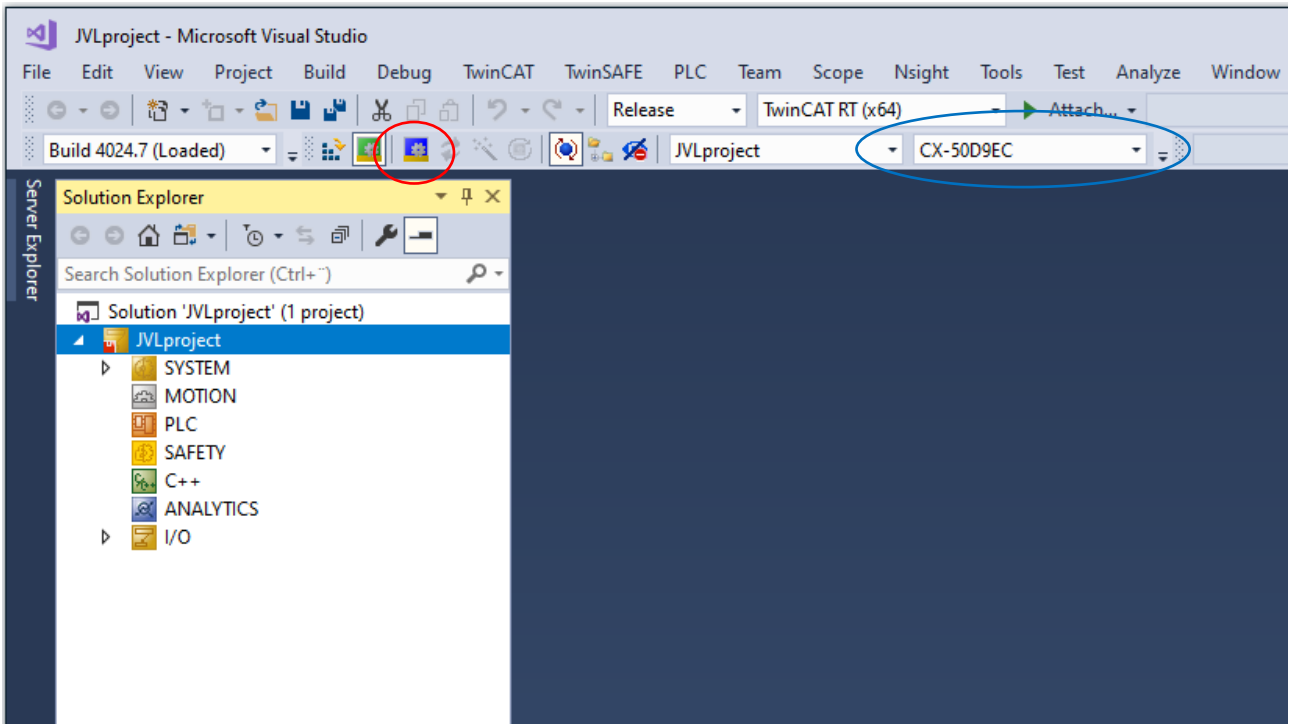


#In the new project window, select TwinCAT project.

Select the twinCAT XAE project

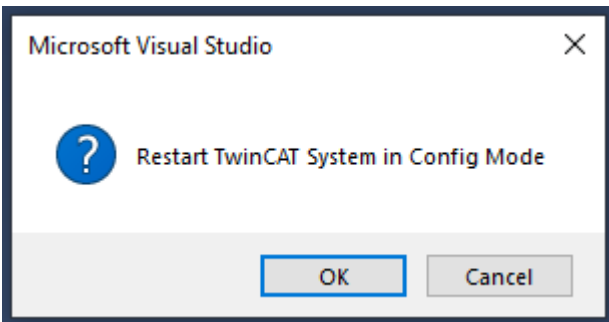
Give your project a name and click “ok” button.

Connect to PLC in Config mode



#Select the ADS connection for your PLC.

#Click the Restart TwinCAT in config mode 

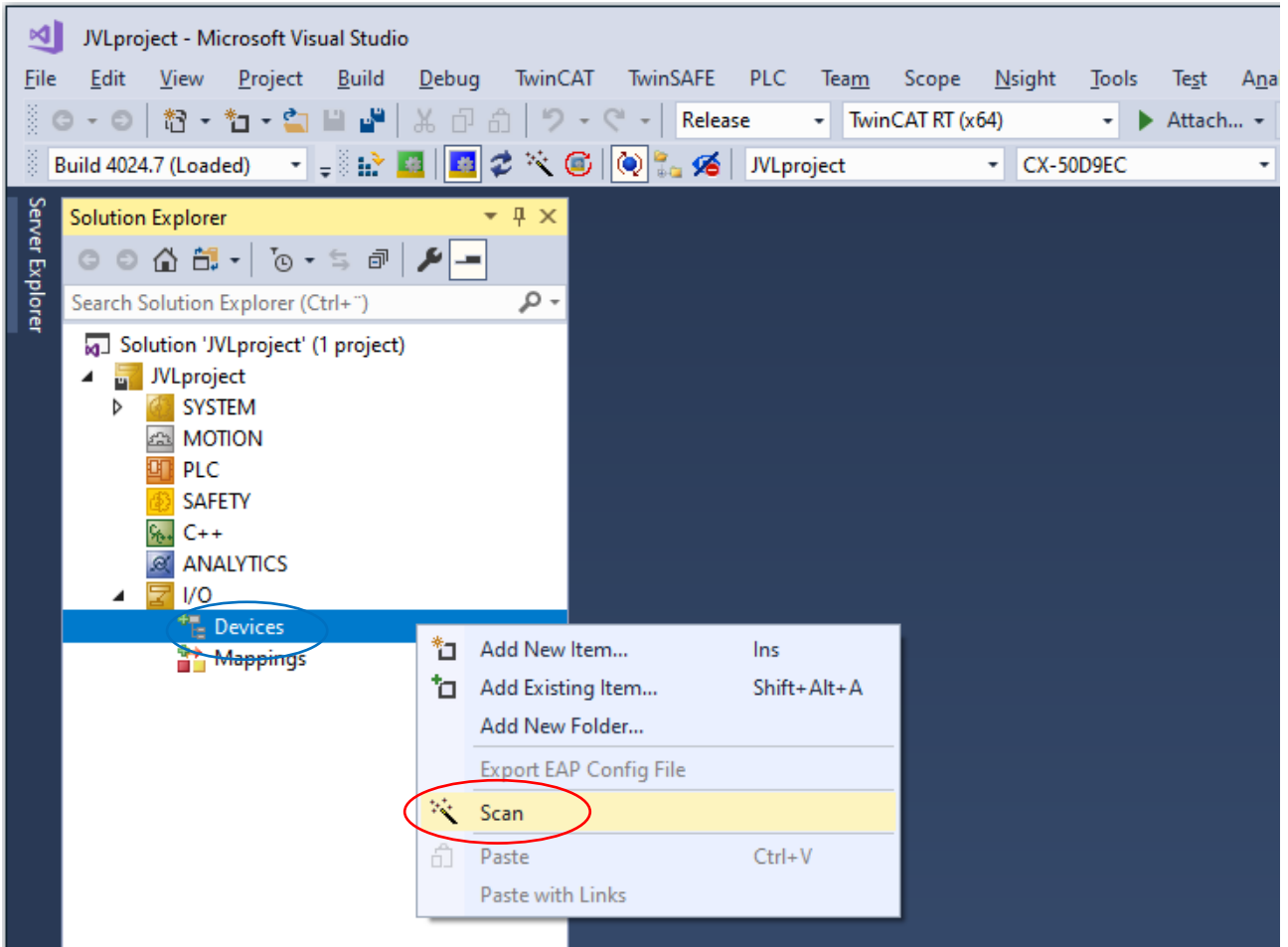


Click OK to allow TwinCAT to restart.

You should be connected to your PLC.

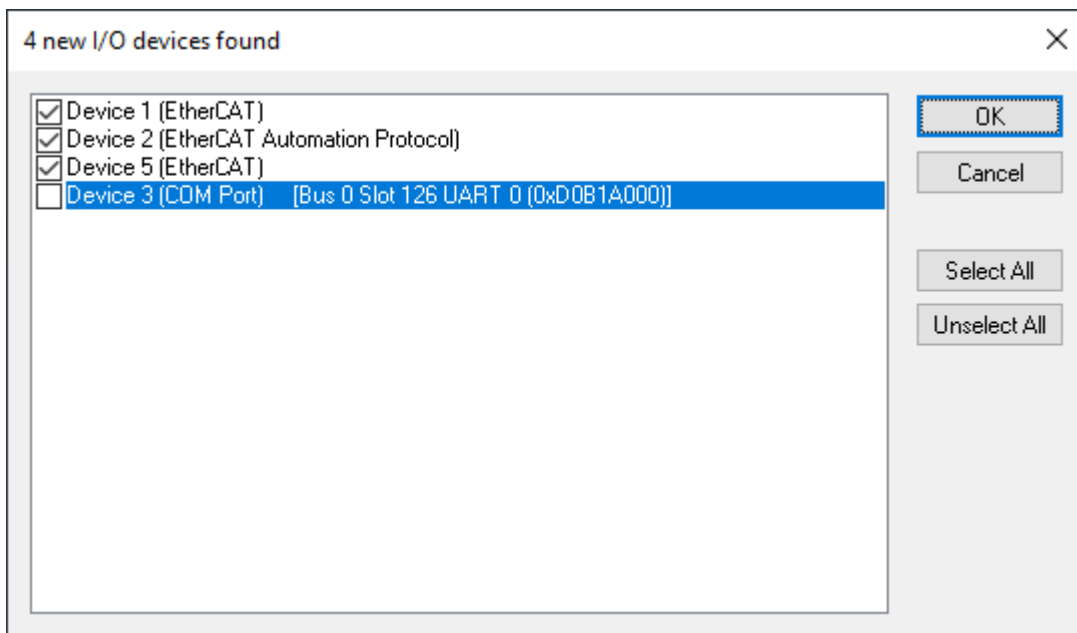
Scan for IO

Make sure your motor is connected to the Ethercat bus, and powered up.

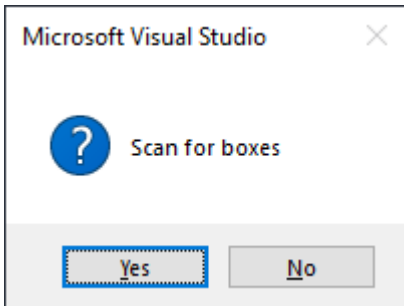


Right click IO->Devices in your solution tree.

Select Scan

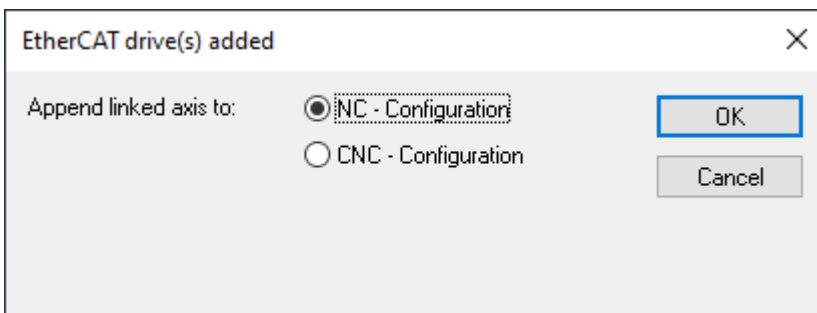


Make sure to select the Ethercat port where the motor is conneted. If you are not sure which one the motor is connected to, select all Ethercat ports.



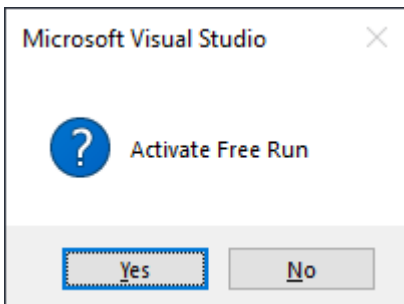
Click yes to scan for boxes

When the motor is found, the PLC will recognize it as a NC axis compatible motor. You will be prompted to select an axis type.



Select NC and click OK.

You will be prompted to activate free run after scan

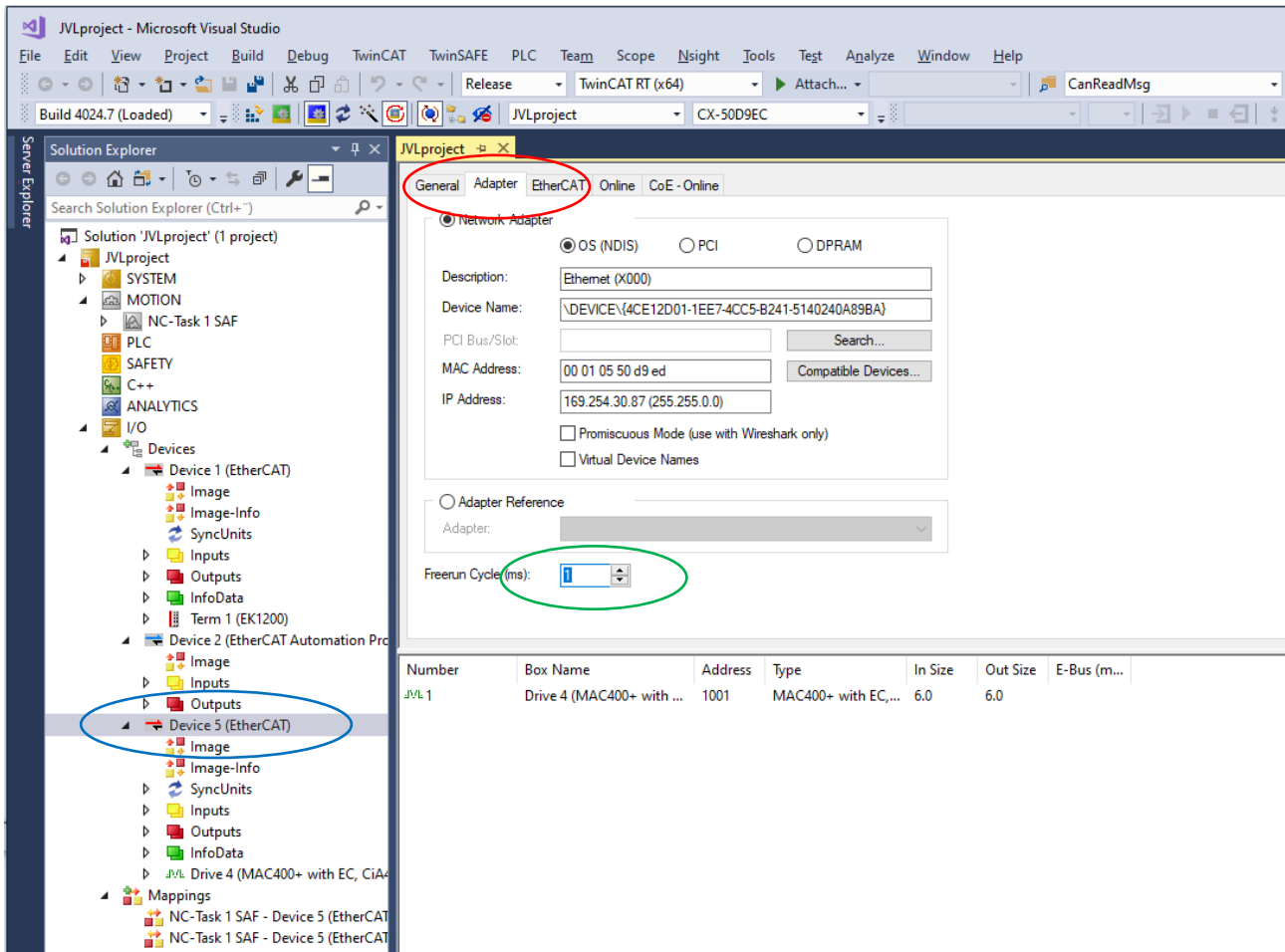


Click Yes.

Change the Ethercat cycle time

The default cycle timing of the PLC and the motor is different, so the cycle time of the PLC need to be adjustet. This needs to be done in two places.

Change Ethercat cycle time

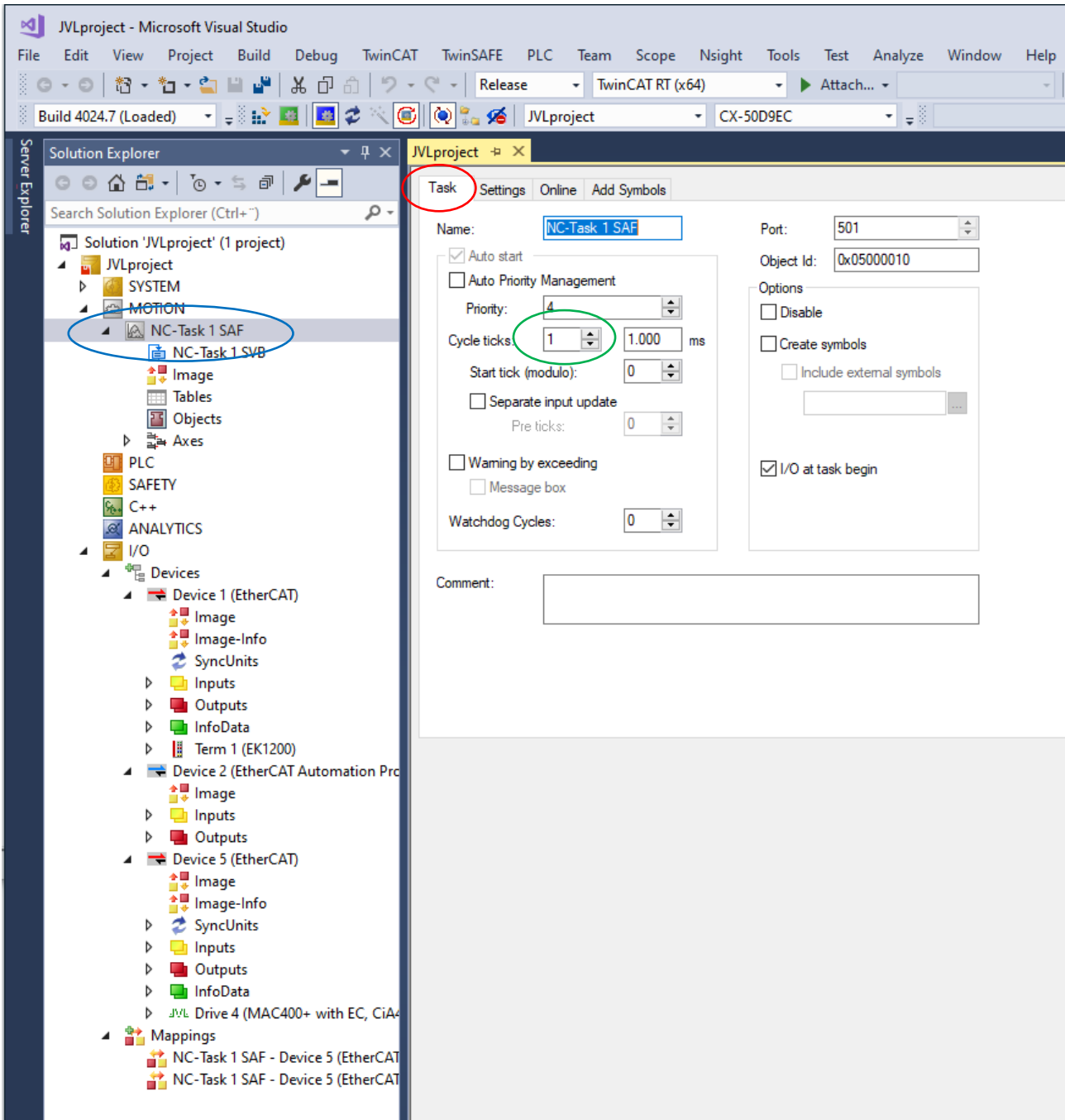


Double click on the Ethercat bus where the motor is connected. To locate the right ethercat bus, look for the JVL logo in the Drive box

Select the adapter tab

Change the Freerun Cycle to 1 ms

Change the NC Task cycle time.

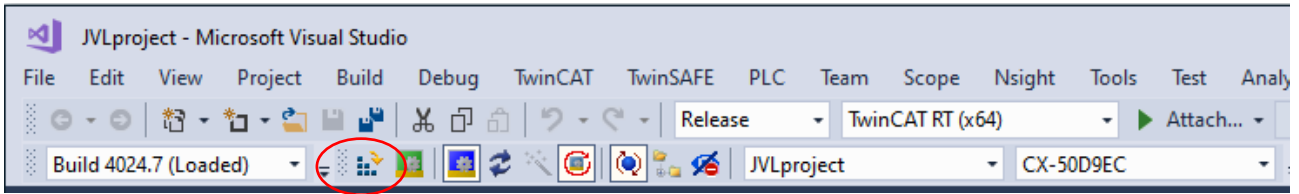


Double click on the NC Task

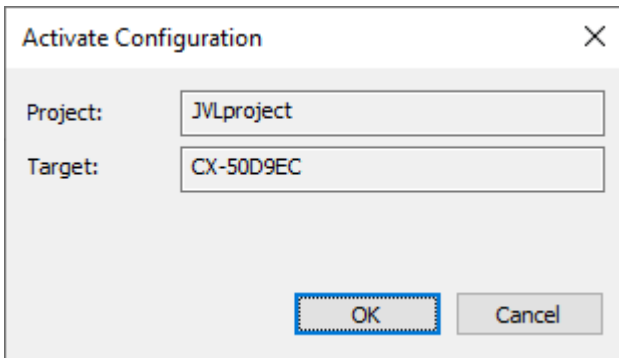
Select the task tab

Change the Cycle ticks to 1 ms

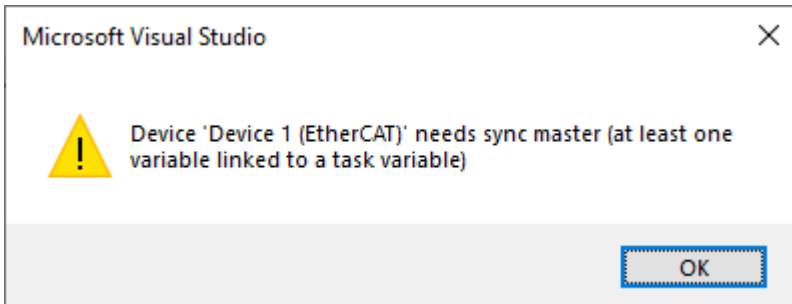
Apply the timing



You can apply the new timing setting by clicking the activate configuration button.

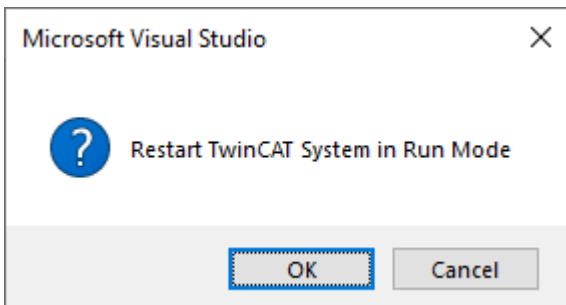


Click OK to activate the new settings.



You will get a warning when no plc program is linked to the IO's.

Ignore this warning.



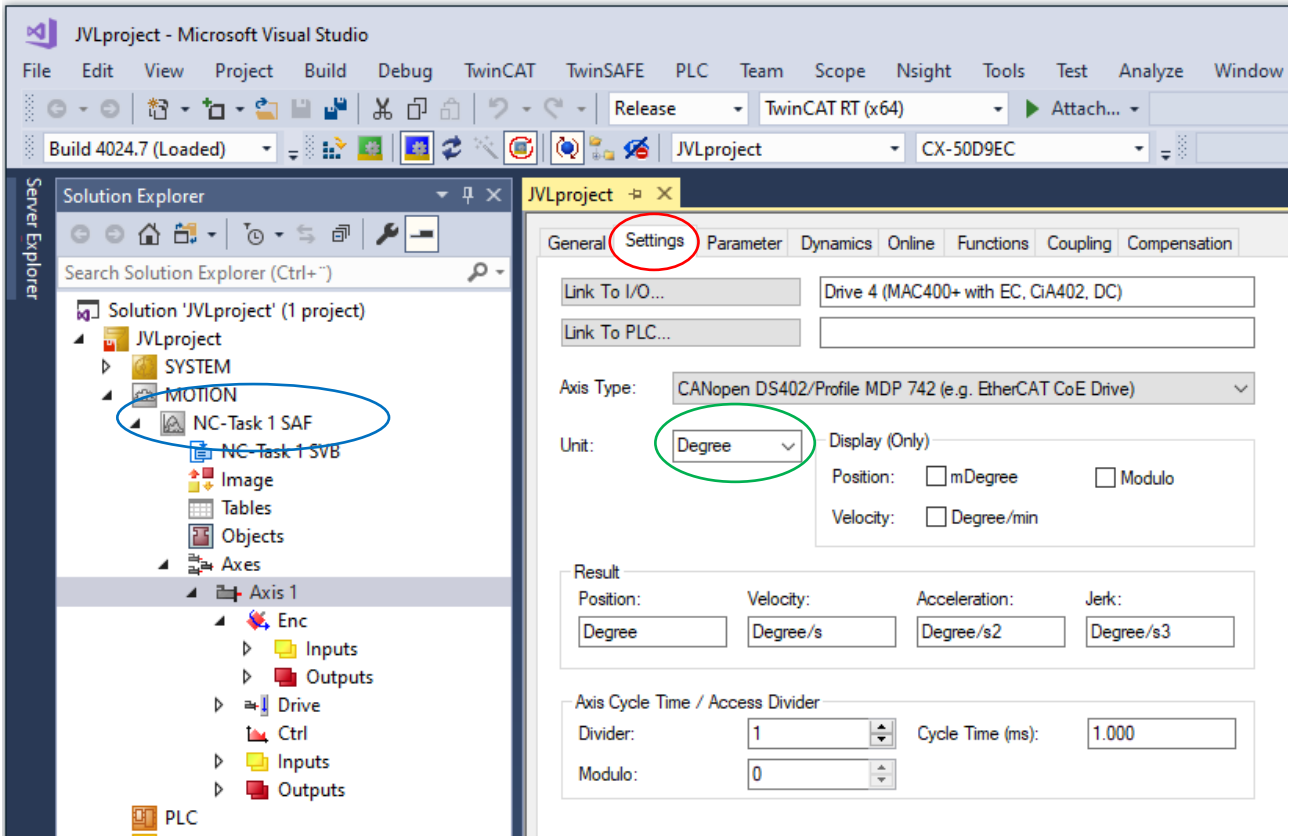
Click OK to start PLC in run mode.

The motor is now configured as a NC axis, and can be controlled from a PLC program.

Change gearing units

The default unit is in mm with a factor 0.0001 counts pr mm

In this sample we will change the unit to Degrees.

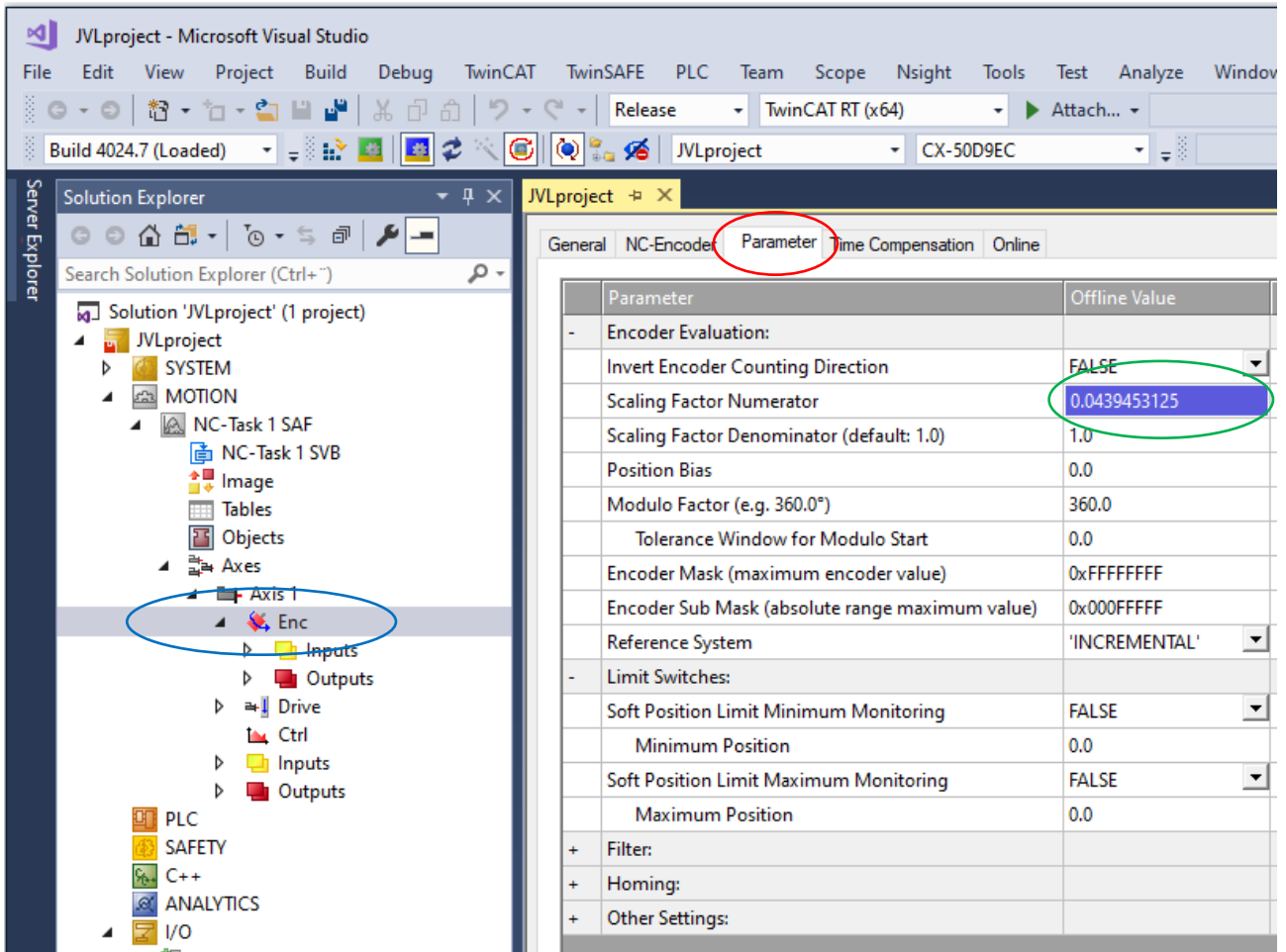


Select the axis

Select the settings tab

Change the units to Degrees.

Change the Gear factor



Select the encoder for the NC axis

Select the parameter tab

Enter the calculated unit for the motor. See sample calculation below.

Sample calculation:

Count pr. Revolution for MAC400 = 8192

Degrees pr. revolution = 360

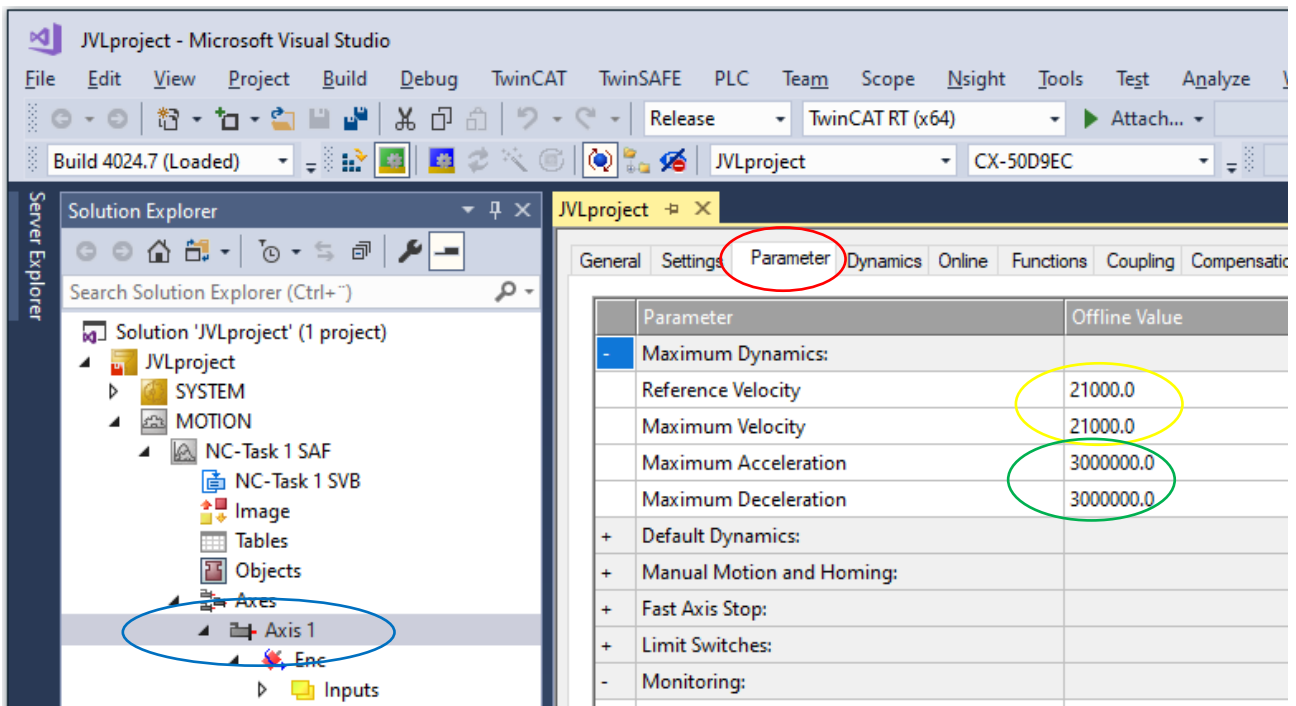
Scaling Factor Numerator:

Degrees pr. count = Degrees pr. revolution / Count pr. revolution = 360/8192= 0, 0439453125

Change the parameter limits

The velocity is limited cautiously by default.

Its is recommended to adjust the Max Velocity, Max Acceleration and the Following error.



Select the axis for the motor

Select the parameter tab

Enter the calculated values from the calculations below

Max velocity

Enter the calculated values. Sample calculation below.

Sample calculation:

Max revolution pr minute for MAC 400 = 3500

Seconds pr. minute = 60

Degrees pr. revolution = 360

Degrees pr. second = Max rpm * degrees pr. revolution / Seconds pr. Minute = 3000 * 360/ 60 = 21000

Max acceleration

Enter the calculated values. Sample calculation below.

Sample calculation:

Max acceleration RPM/s= 500000

Seconds pr. minute = 60

Degrees pr. revolution = 360

Degrees in seconds² = Max acceleration rpm * degrees pr. revolution / Seconds pr. Minute = 50000 * 360 / 60 = 3000000

Click the activate configuration  button to download data to the PLC

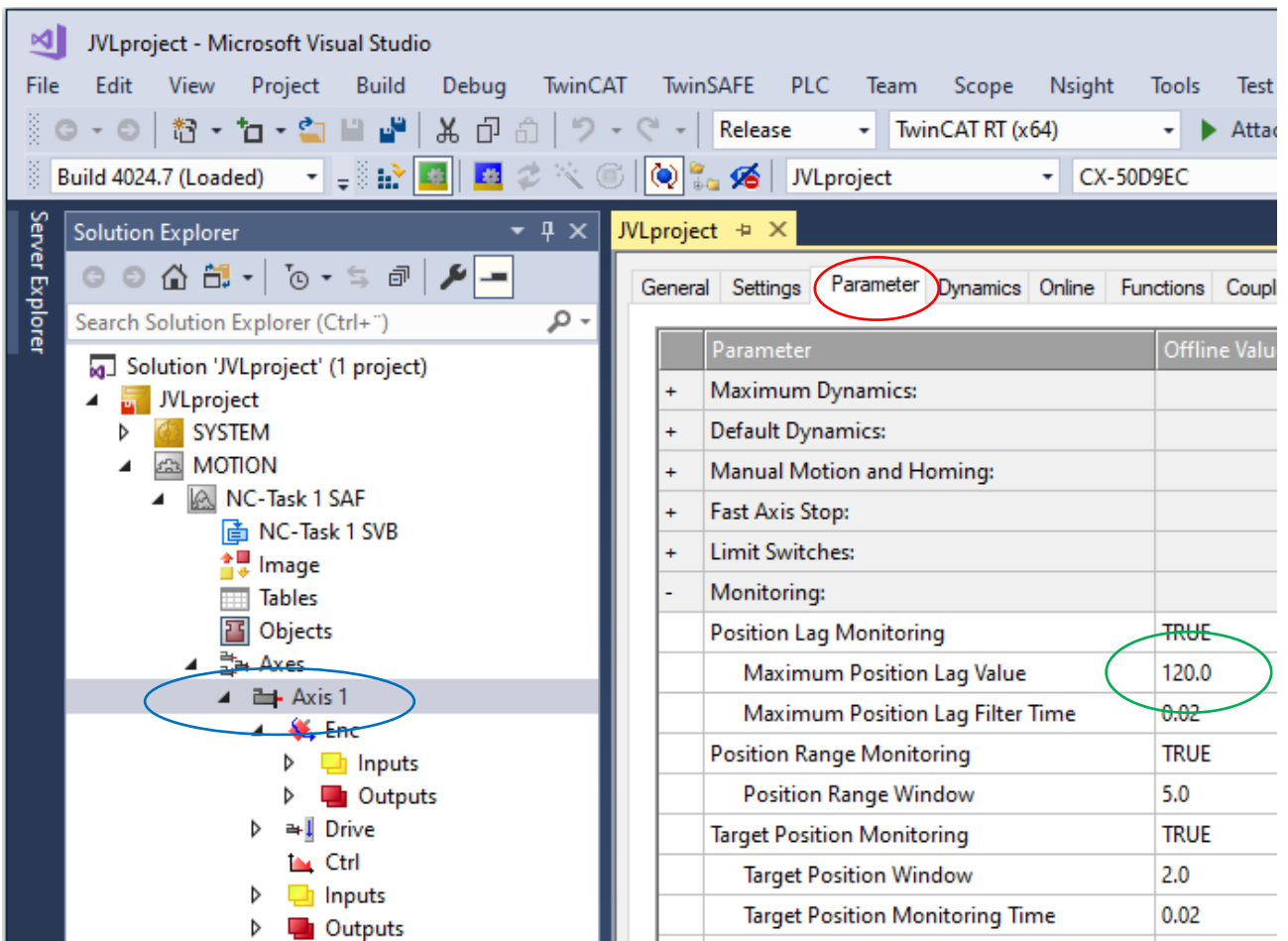
Change the following error parameters

The NC axis monitors the following error. This is how far behind the motor is at any given time. The motor will always be behind at least the time it takes to move between two sync cycles. With full speed that is significant.

Its recemented to adjust the following error limit to your suit the application.

TwinCAT call following error “Position lag Value” monitoring.

In this sample it is set to 120 degrees.



The screenshot shows the Microsoft Visual Studio interface for a TwinCAT project named 'JVLproject'. The Solution Explorer on the left displays the project hierarchy, with 'Axis 1' selected under the 'Axes' folder. The Parameter tab on the right shows a table of parameters for 'Axis 1'. The 'Maximum Position Lag Value' parameter is highlighted with a green circle and set to 120.0.

Parameter	Offline Value
Maximum Dynamics:	
Default Dynamics:	
Manual Motion and Homing:	
Fast Axis Stop:	
Limit Switches:	
Monitoring:	
Position Lag Monitoring	TRUE
Maximum Position Lag Value	120.0
Maximum Position Lag Filter Time	0.02
Position Range Monitoring	TRUE
Position Range Window	5.0
Target Position Monitoring	TRUE
Target Position Window	2.0
Target Position Monitoring Time	0.02

Select the axis for the motor

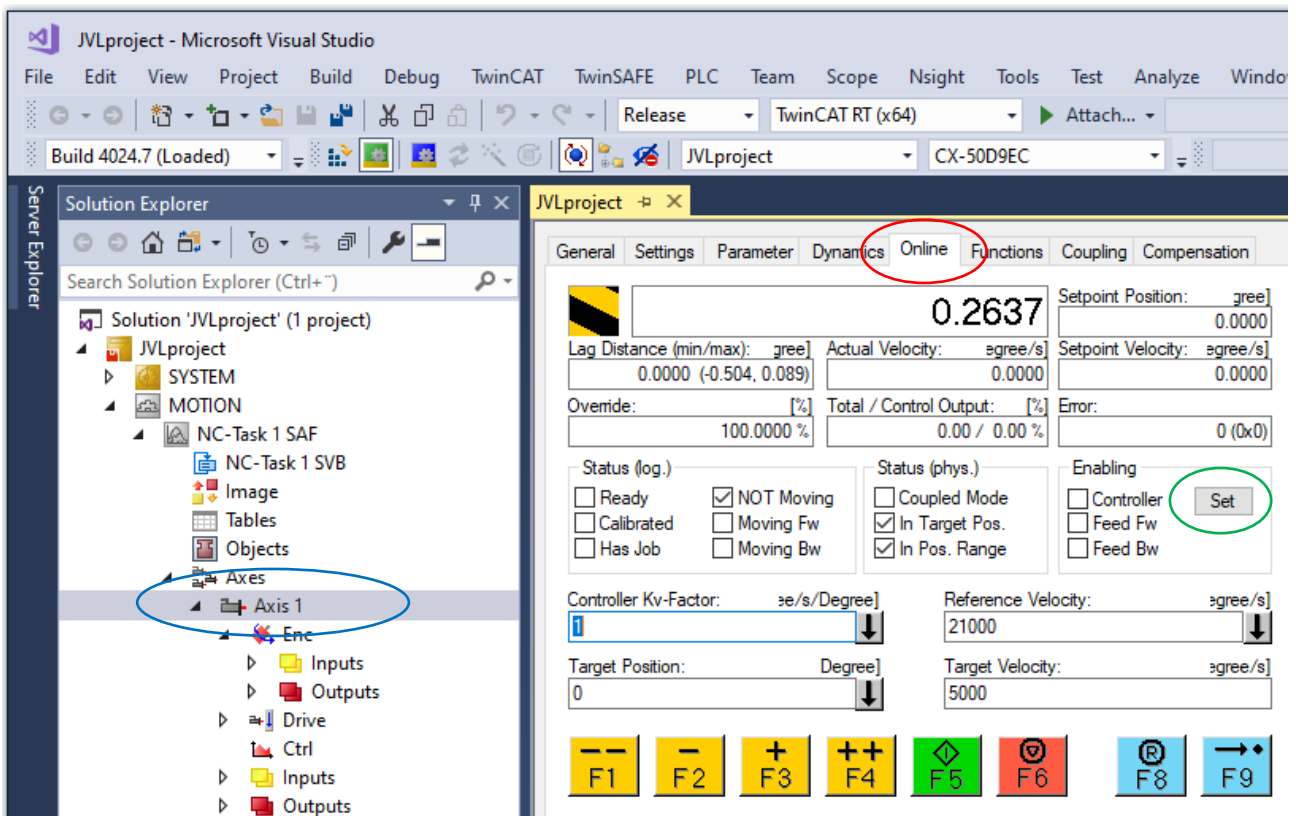
Select the parameter tab

enter the parameter.

Click the activate configuration  button to download data to the PLC

Test motor

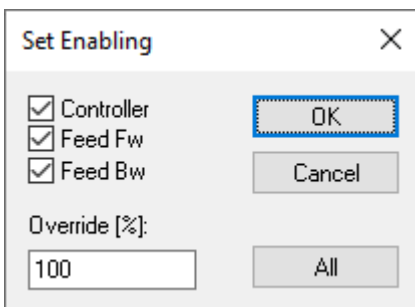
The motor can be tested on the Online Tab.



Select the axis for the motor

Select the parameter tab

Enable the motor with the set button.



Check Controller, Feed FW and Feed BW checkbox.

Enter 100% over override.

Click ok. The motor has power and read to turn.

Test the motor on the F1 to F4 buttons.