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Beckhoff TwinCAT

The Windows Control and Automation Technology

TwinCAT NC PTP Examples

Last change: 31.08.2001

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1. Overview

TwinCAT NC PTP offers the PLC programmer simple function blocks for the operation of NC axes. This example describes the integration and operation of an axis within the TwinCAT system.

2. Moving axis

Install and Start the Example Program

TwinCAT NC PTP offers the PLC programmer simple function blocks for the operation of NC axes. This example describes the integration and operation of an axis within the TwinCAT system.

- Saving the example Program NC PTP

The example program uses simulation axes (axes with simulated encoders), and can thus be run on any Windows NT PC without additional hardware. The file *TcNcsample PTPmove.wsm* is loaded into the TwinCAT System Manager, and the system is started with these settings.

- Load the WSM file
- Register the setting via the menu *Actions - Save To Registry*
- Start the TwinCAT system via the gear wheel symbol

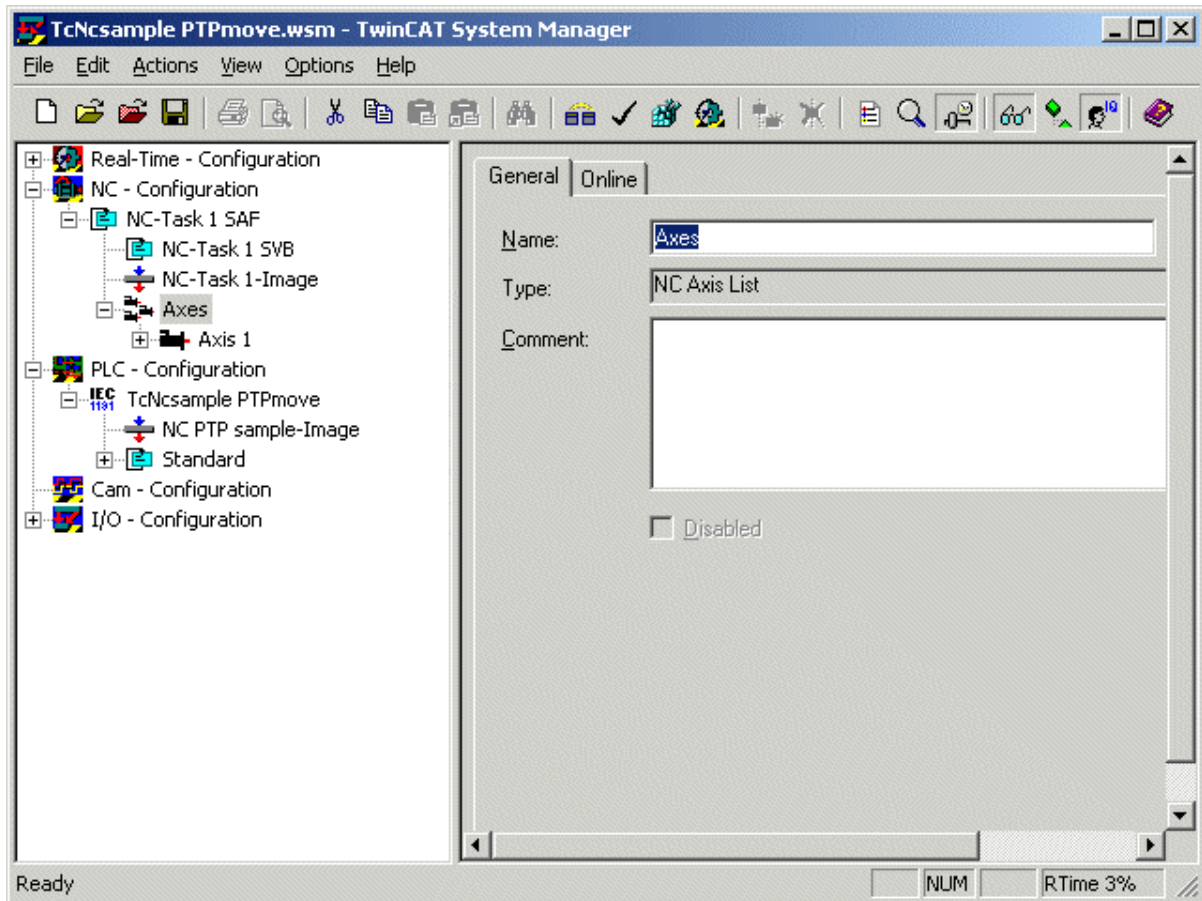
TwinCAT Scope is used in order to be able to examine the result. The supplied setting, *TcNcsample PTPmove.scp*, allows the axis motion to be recorded.

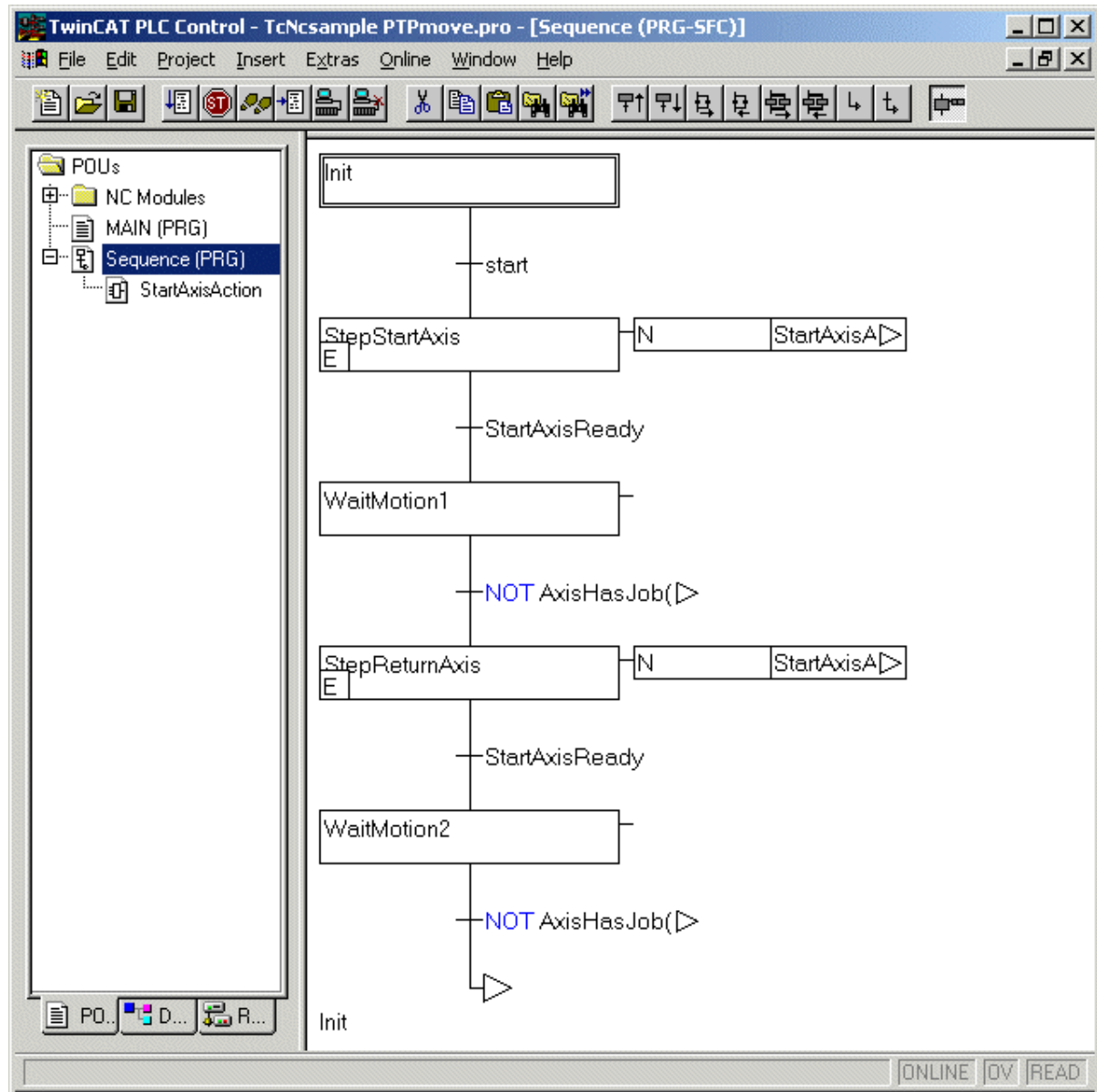
- Load the SCP file into TwinCAT ScopeView
- Start recording via the menu or via the F5 key. (The Scope configuration contains a trigger condition so that, after starting the process with F5, recording will only commence once the axis has started)

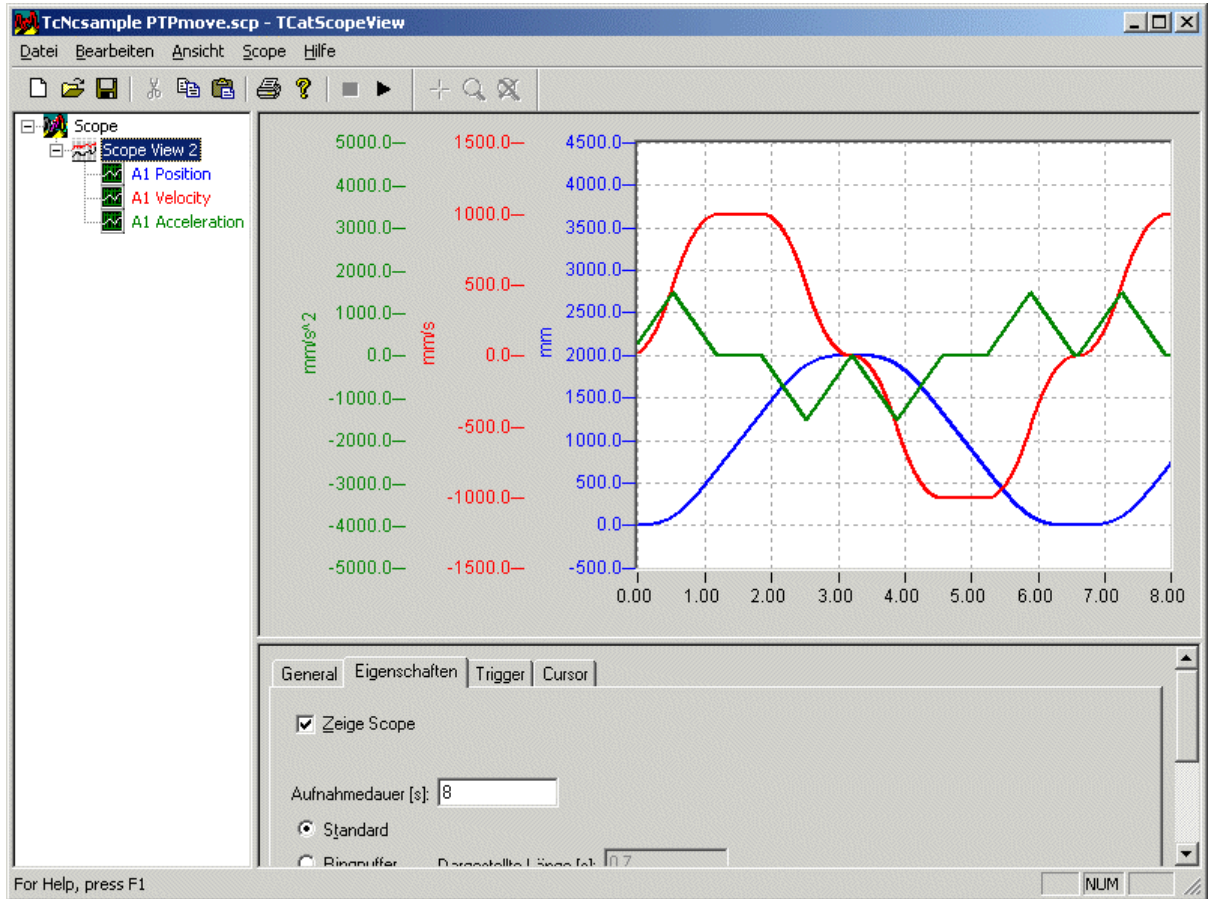
Finally, the example program *TcNcsample PTPmove.pro* is loaded into TwinCAT PLC Control, compiled and started.

- Load the PRO file
- Compile the PLC project via the menu *Project - Rebuild All*.
- Load the PLC project via the menu *Online - Login* into the runtime system
- Start the program via the menu *Online - Run*

Once the program has started, the axis is moved in simulation mode, and recording commences. The image shows position, velocity and acceleration of the axis.

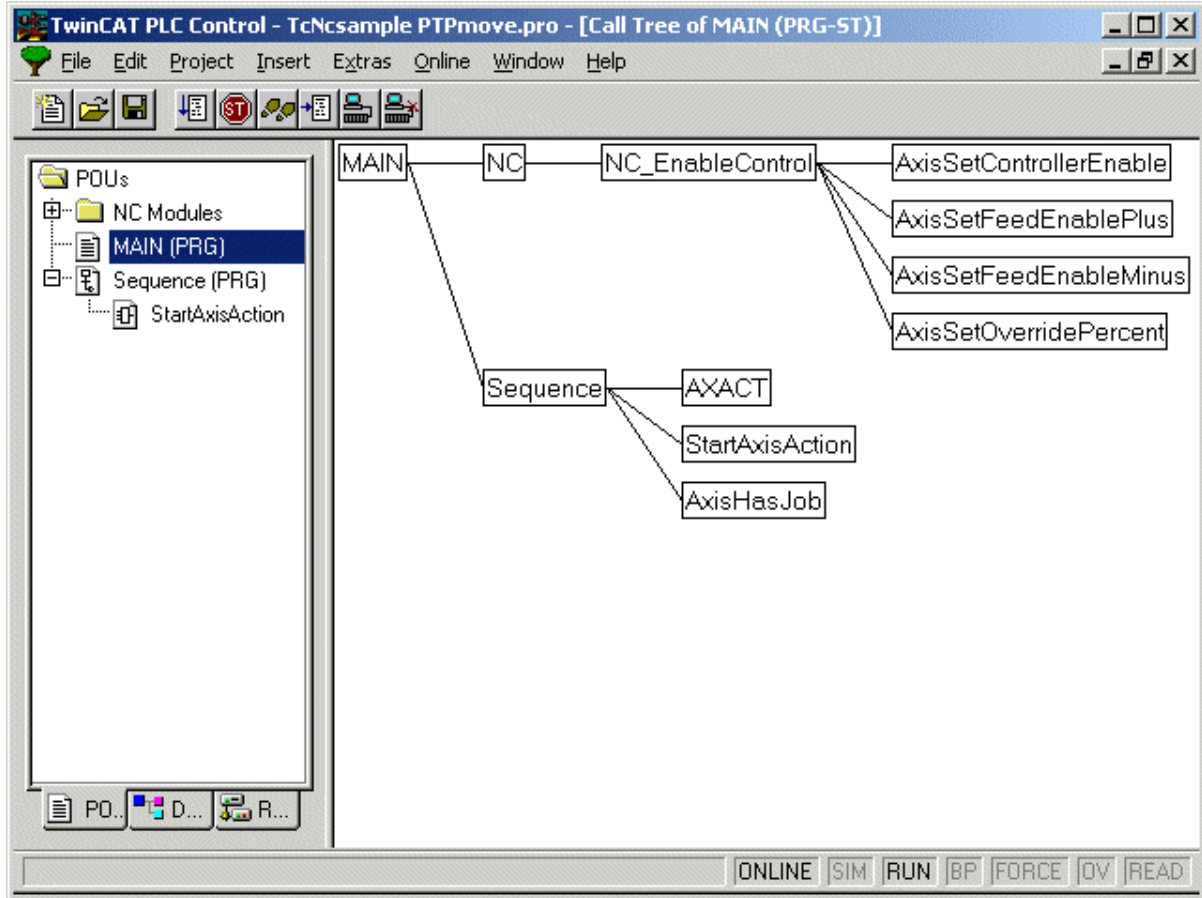






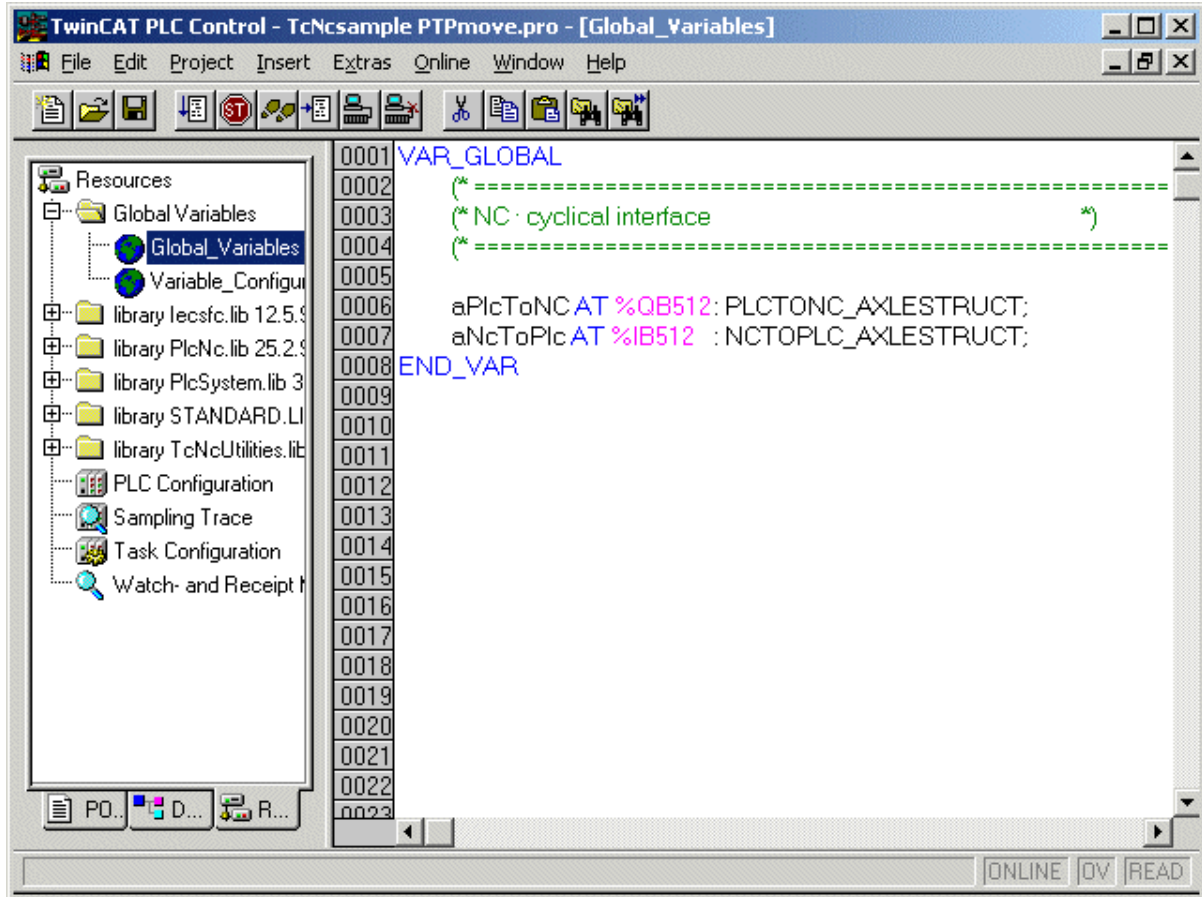
Program Structure

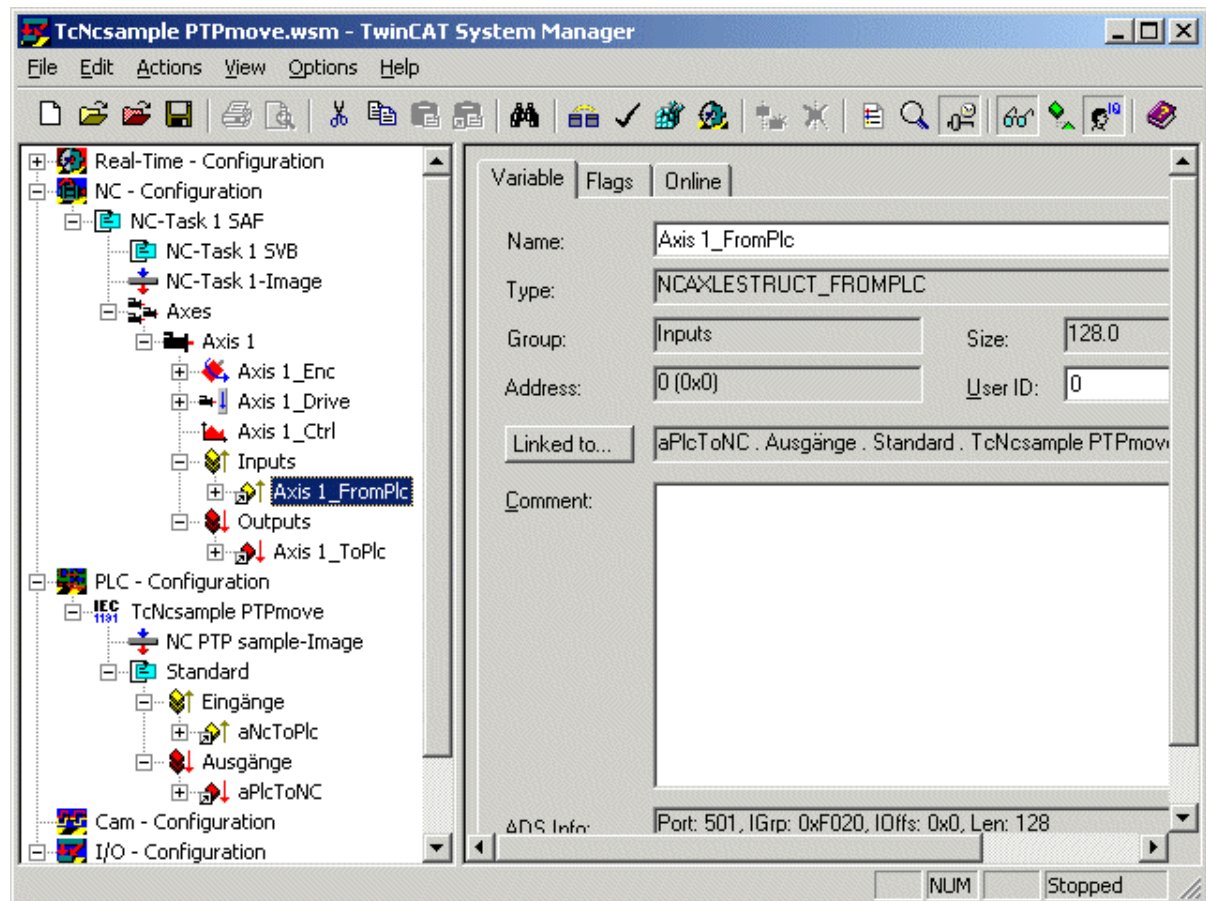
The *Main* module calls the *NC* and *Sequence* blocks. The *NC* block, with its dependent blocks in the *NC Modules* folder, activates all the necessary enable signals for the axis. The *Sequence* program module governs the flow of actions required for operation of the axis.



Cyclic axis interface

Each axis has a cyclic interface for connecting NC and PLC. This interface consists of two data structures for exchanging information between NC and PLC. One structure contains data made available by the NC for the PLC; conversely, the other structure contains PLC data for the NC. Both data structures are declared as variables in the PLC and later connected with the interface structures of the NC axis via the TwinCAT System Manager.



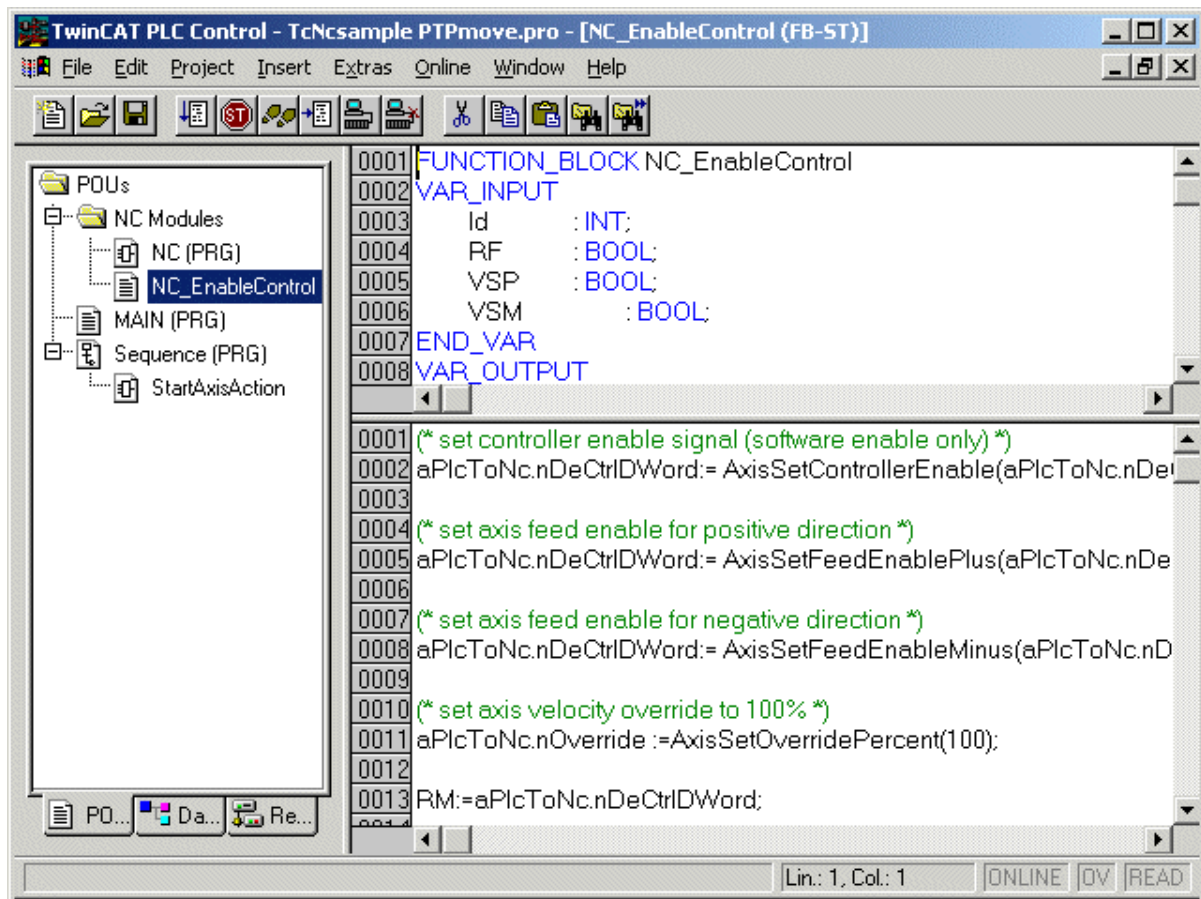


Setting of axis enables

Enable signals will have to be set by the PLC in order to enable axis movement. A distinction is made between software enabling and hardware enabling. A hardware enable signal switches a drive into a ready-to-run state via a digital signal. Hardware enabling is not necessary here, since this example uses simulation axes. Irrespective of this, the TwinCAT NC requires software enabling in order to switch an axis into the ready-to-run state. Furthermore, the set velocity of each axis may be influenced via a velocity override between 0% and 100%, which is normally set to 100%. With a value of 0%, the axis would not move.

- Enable controller
- Feed enabling for the positive direction
- Feed enabling for the negative direction
- Velocity override 100%

In the example program, the enabling functions are written into the cyclic axis interface via the function block *NC_EnableControl*.



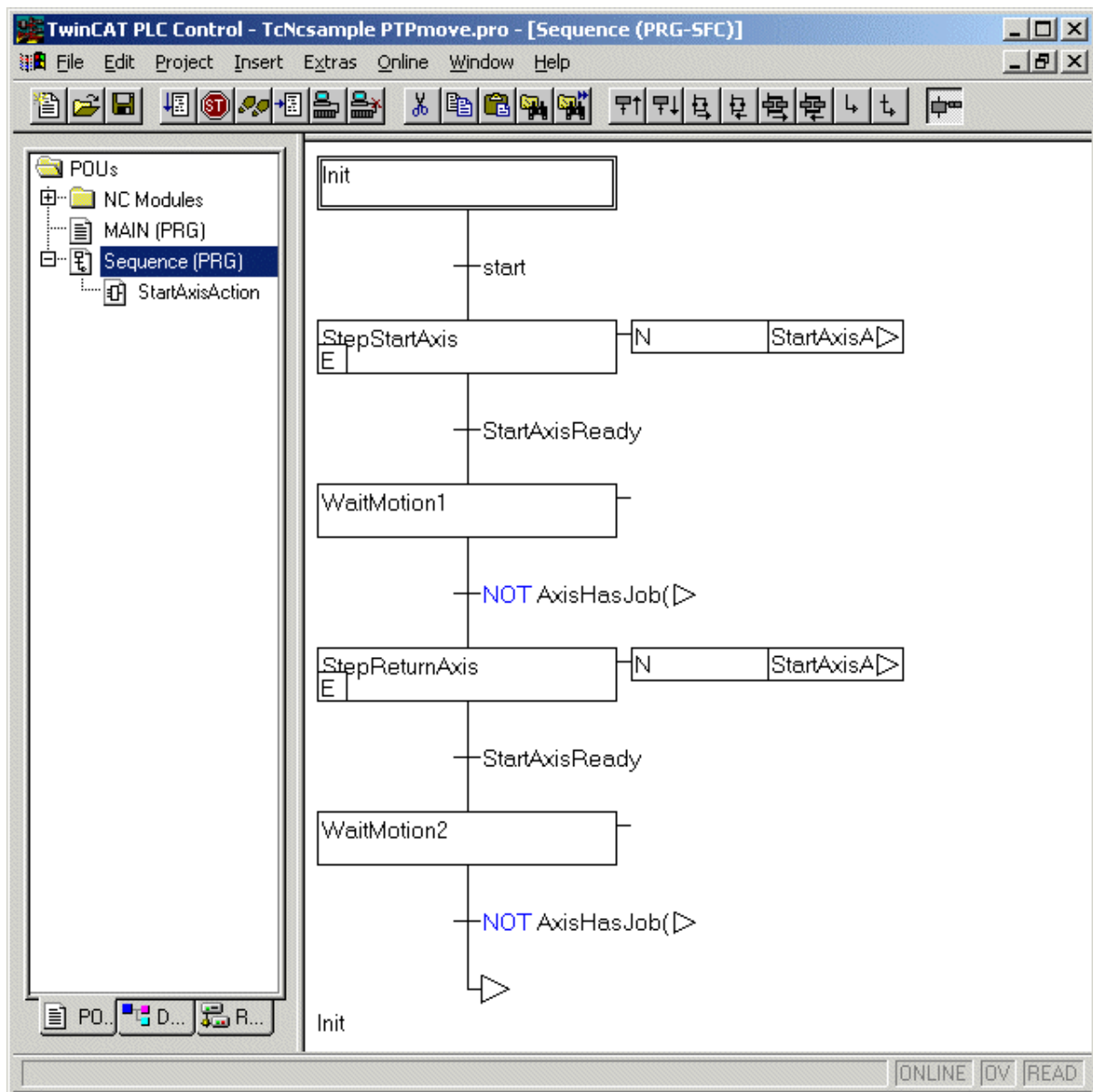
Program flow

Setting of axis enables

The program starts with the program block *MAIN*, in which initially the program *NC* for setting of the required axis enables is run. After the enable signals are set, the axis is ready for operation.

Program block "Sequence"

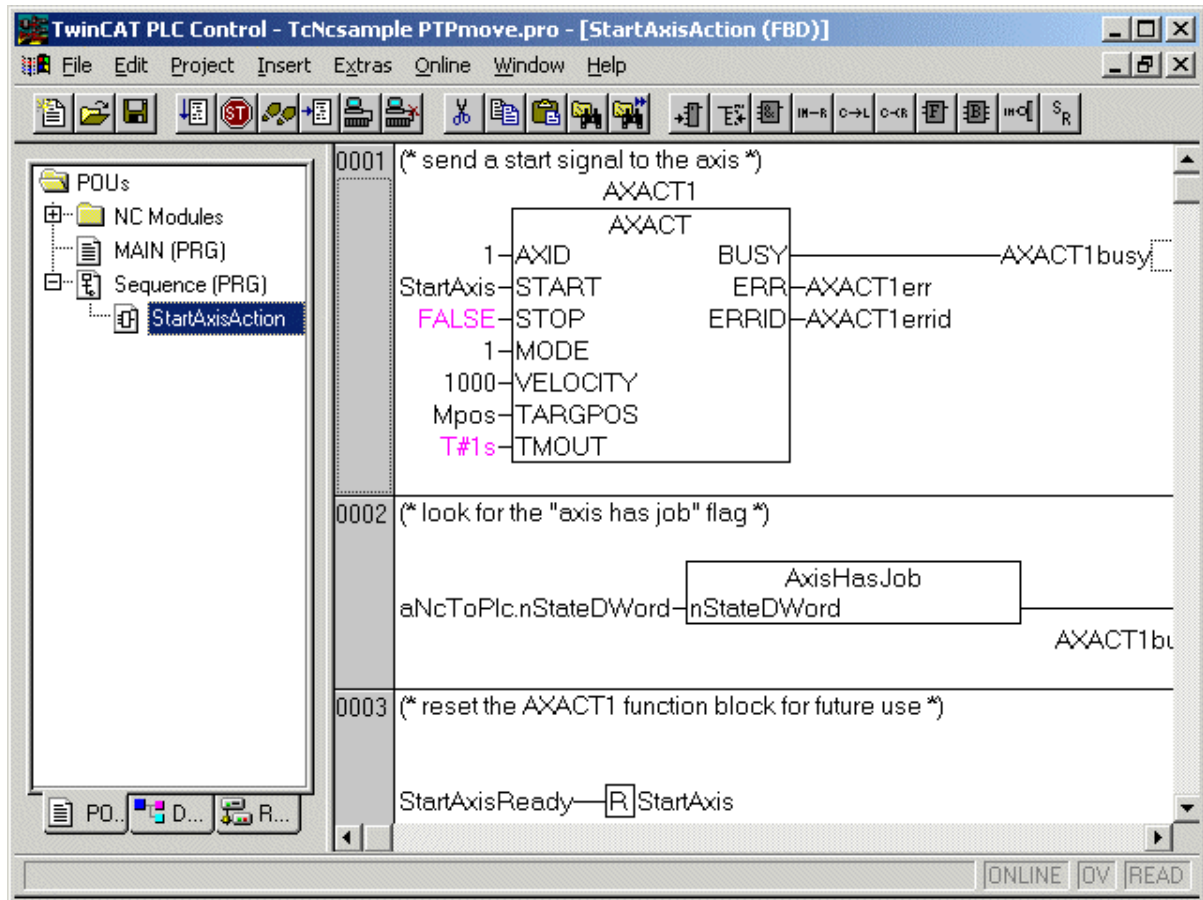
The axis motion sequence is programmed in the program block *Sequence*. The axis is started at target position 2000 mm and subsequently moved to position 0 mm. This cycle is repeated continuously.



Starting and monitoring of an axis

In the second step, *StepStartAxis*, the axis is started at target position 2000 mm with a velocity of 1000 mm/s. The start is initiated within the action *StartAxisAction* via the function block *AXACT*. In the subsequent step, the axis is monitored, and the end of the motion is awaited. Monitoring is possible via status bits supplied by the NC in the cyclic axis interface. Here, the status bit *AxisHasJob* is read via a library function during the transition of the step *WaitMotion1*. The axis motion commences as soon as the status bit is set. It is stopped as soon as this

bit is deleted.



3. Axis Coupling

Axis coupling with gearing factor

TwinCAT NC PTP offers the PLC programmer simple function blocks for the operation of NC axes. This example demonstrates coupling of a slave axis to a master axis via a fixed gearing factor.

The procedure for saving and installing the example program is similar to the Axis movement example.

- Example program "Axis Coupling"

4. Position compensation

Axis position compensation

TwinCAT NC PTP offers the PLC programmer simple function blocks for the operation of NC axes. This example demonstrates position compensation on an axis in motion.

The procedure for saving and installing the example program is similar to the Axis movement example.

- Example program "Position compensation"

Slave axis position compensation

TwinCAT NC PTP offers the PLC programmer simple function blocks for the operation of NC axes. This example demonstrates position compensation during motion of a slave axis coupled to a master.

The procedure for saving and installing the example program is similar to the Axis movement example.

- Example program "Slave axis position compensation"

5. Changing of target position and velocity

Example

TwinCAT NC PTP offers the PLC programmer simple function blocks for the operation of NC axes. This example shows how the target position and velocity can be changed during axis motion.

The procedure for saving and installing the example program is similar to the Axis movement example.

- Example program "Changing of target position and velocity"