SIEMENS

Guideline
D435 training case
with SIMOTION 4.1 SP1

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with SIMOTION 4.1 SP1

Release 11/2007

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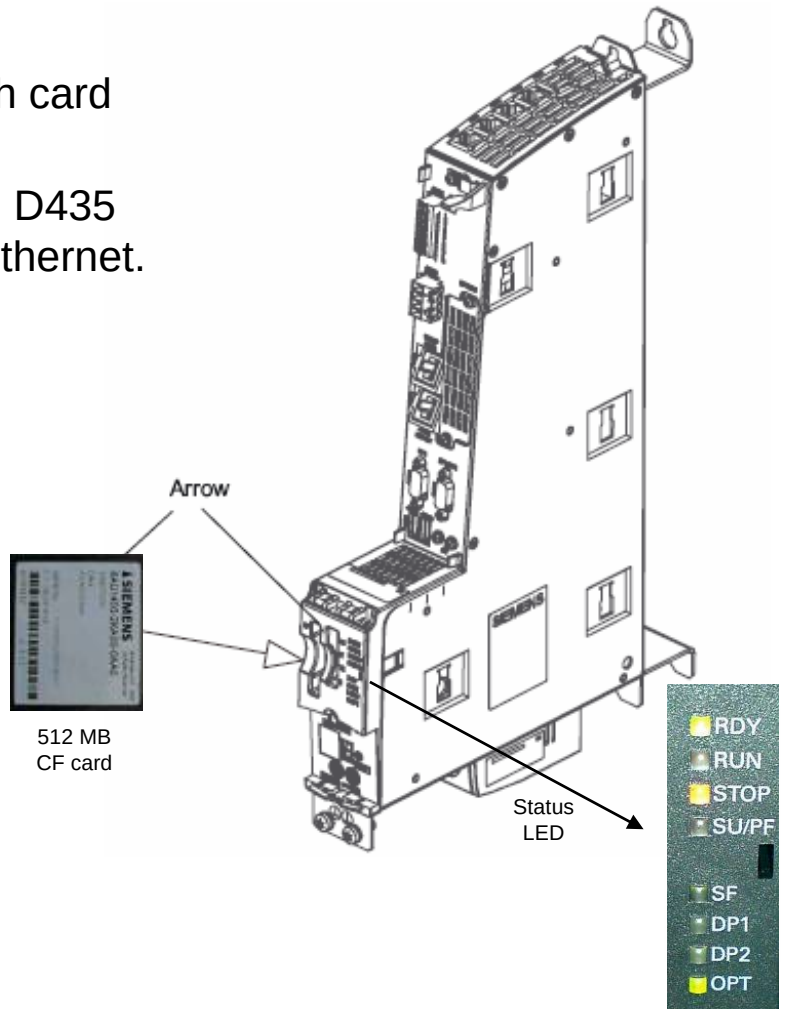
Preparation

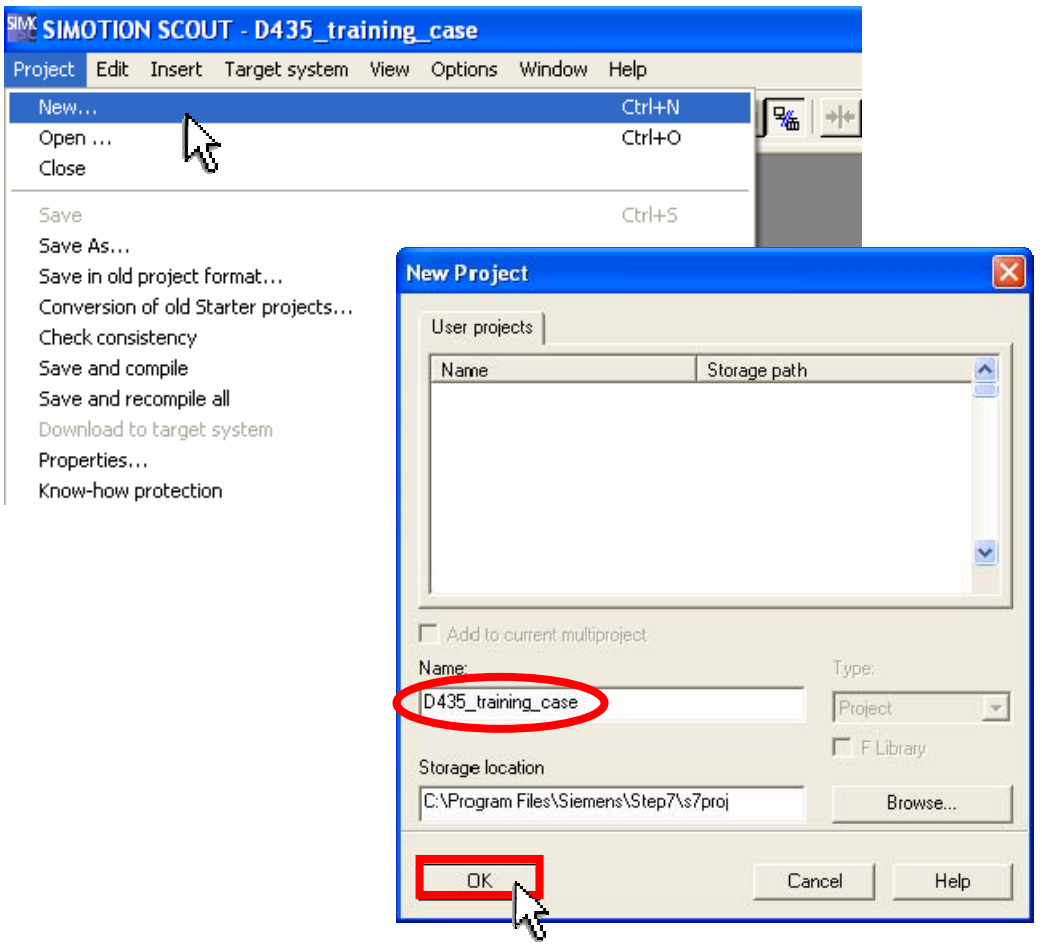
How to Start

- Insert “empty” 512 MB SIMOTION V4.1 CompactFlash card
- For communication purposes, connect the SIMOTION D435 via PROFIBUS DP, PROFINET IO with IRT, MPI or Ethernet.
- Switch on power supply
- Start SIMOTION SCOUT V4.1



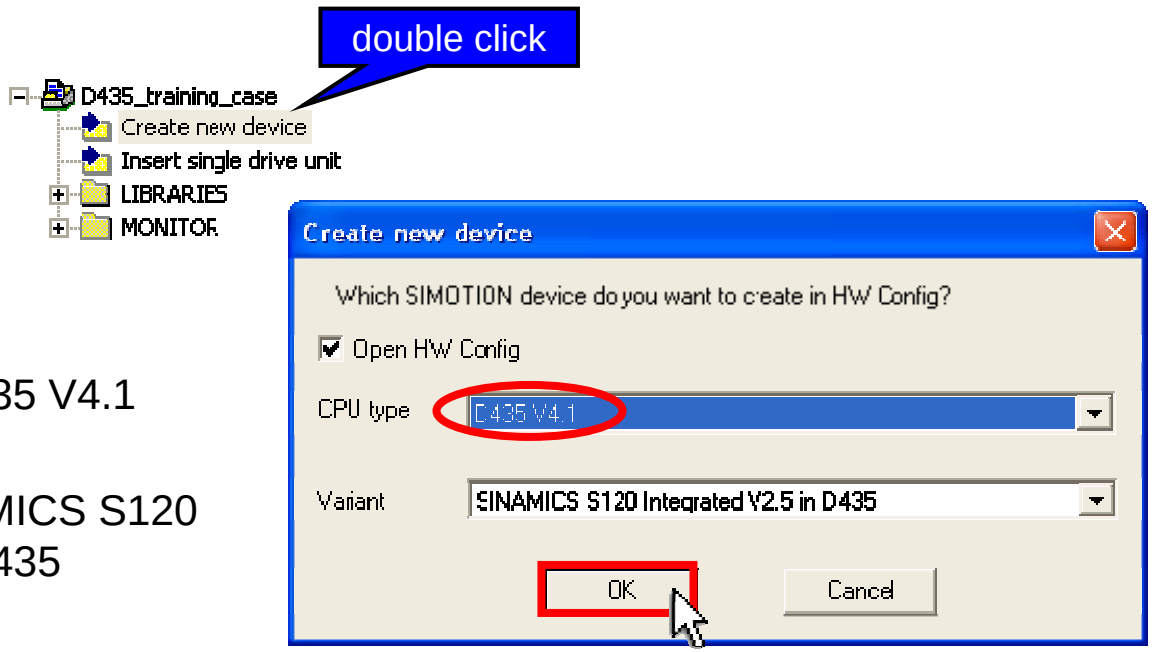
Create a new project

SIMOTION D435



Insert new device

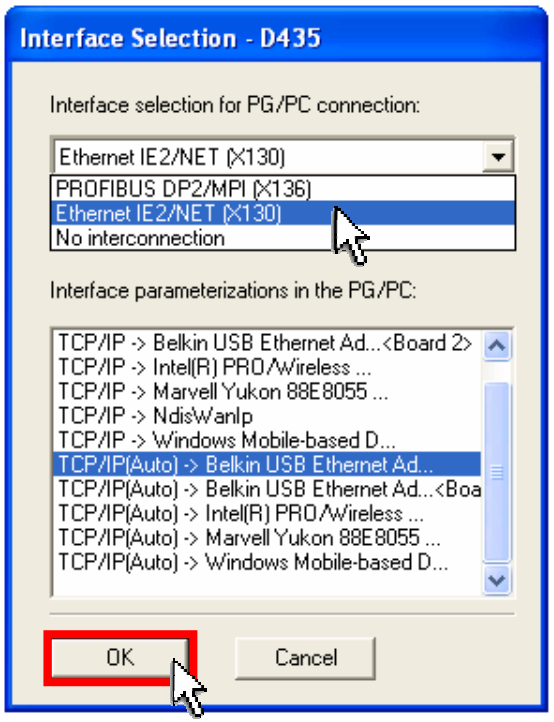
- New hardware, that combines the functionality of SIMOTION and SINAMICS.
- SIMOTION D435 can be inserted in SCOUT as the new device after creating a new project.



- Select CPU type D435 V4.1
- Select variant SINAMICS S120 Integrated V2.5 in D435

Configuration of the external ethernet interfaces

- Select your interface to D435.
  The ethernet interface cable is connected to the lower slot of the D435 (-X130, IE2/NET).



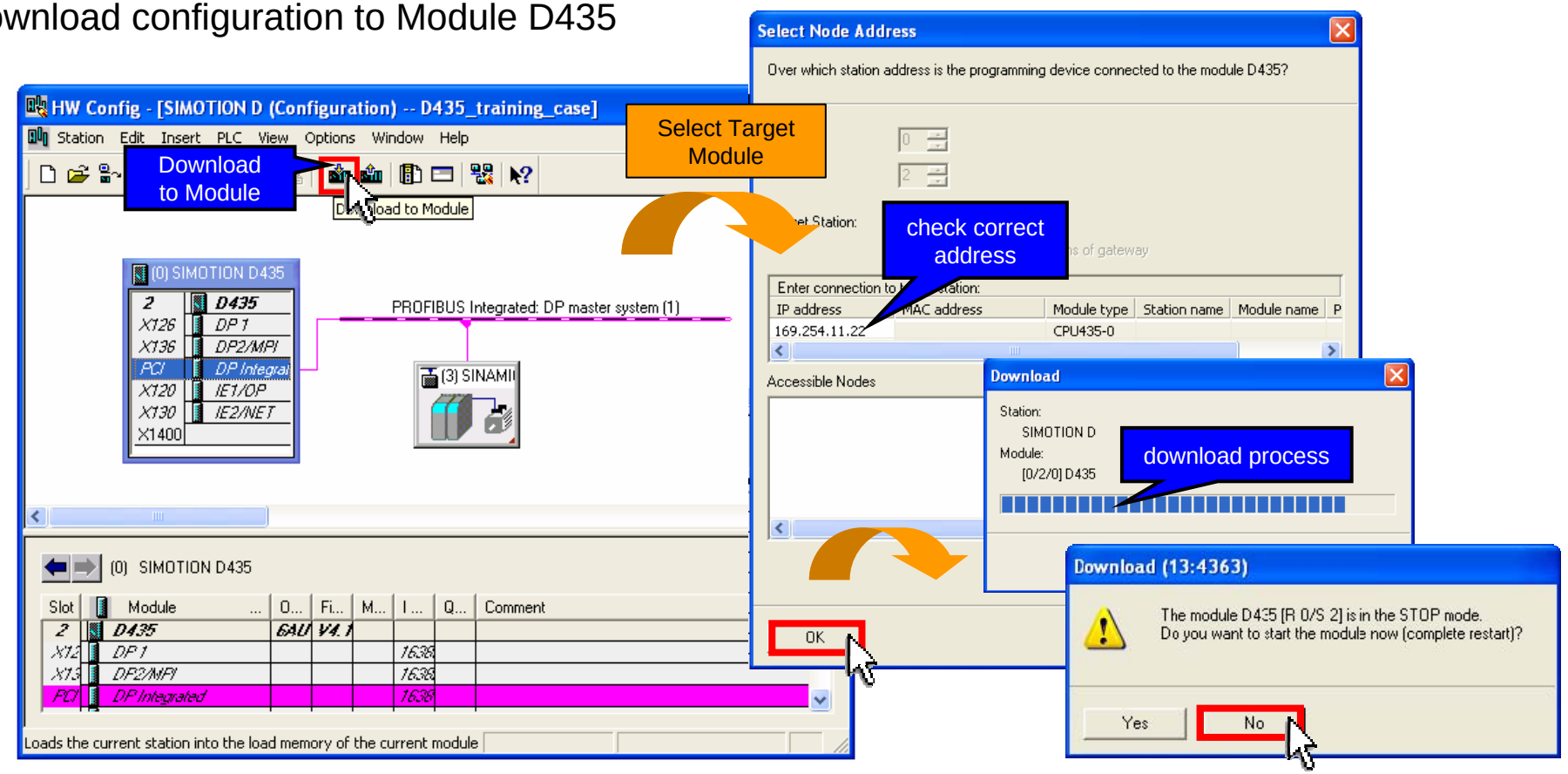
In case of connection problems check "Set PG/PC interface" and "Assign PG/PC" for correct settings.

Depending on your PC/PG another interface might be necessary.

- D435 appears on the project list and HW Config dialog will be open.

HW Config

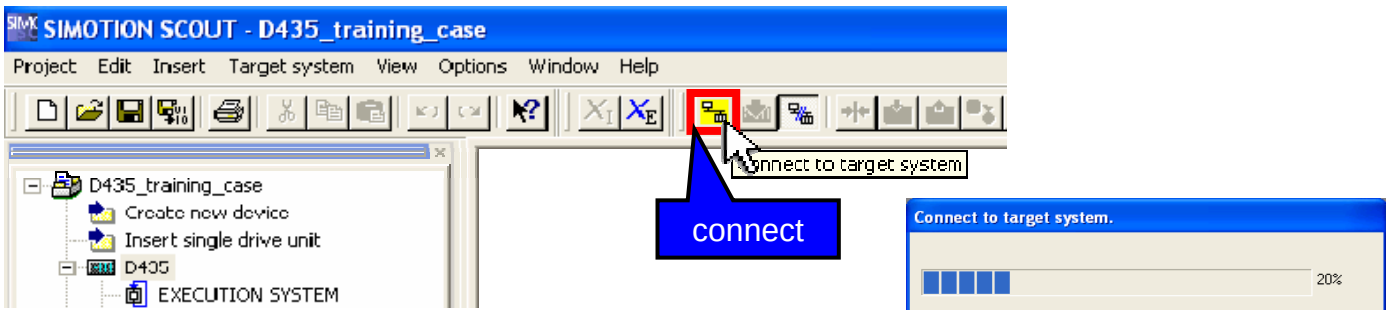
- Download configuration to Module D435



- Close HW Config after successful configuration download to Module.
- Wait until SIMOTION D435 reboot is finished. (green ready LED is on, compare page 5)

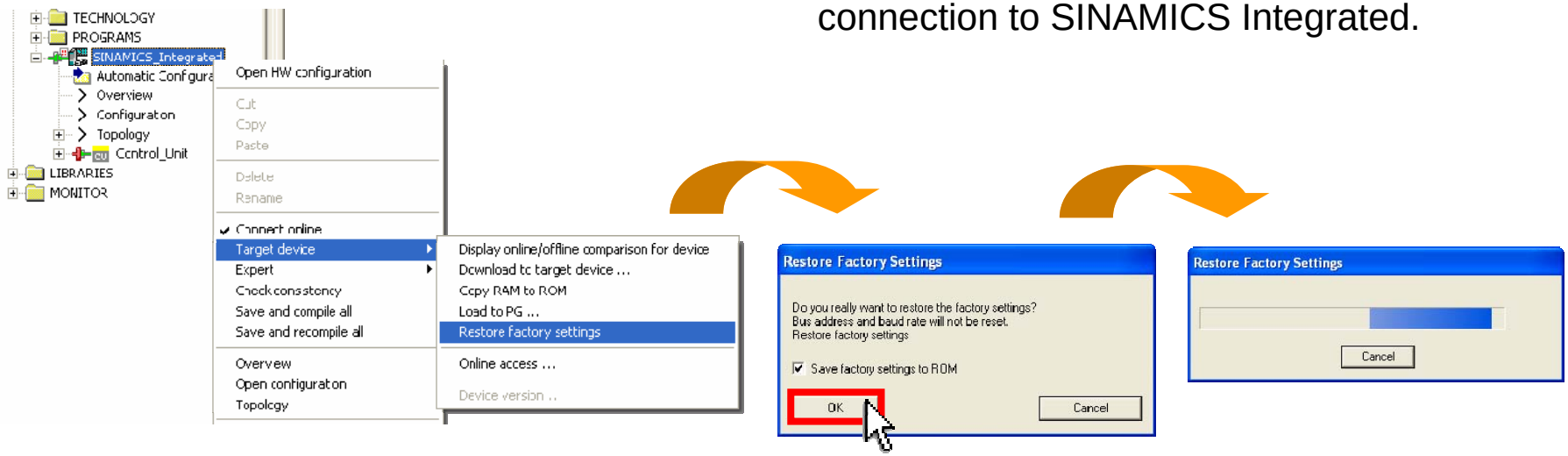
Establish connection with the target system

- Establish connection between the PG and D435

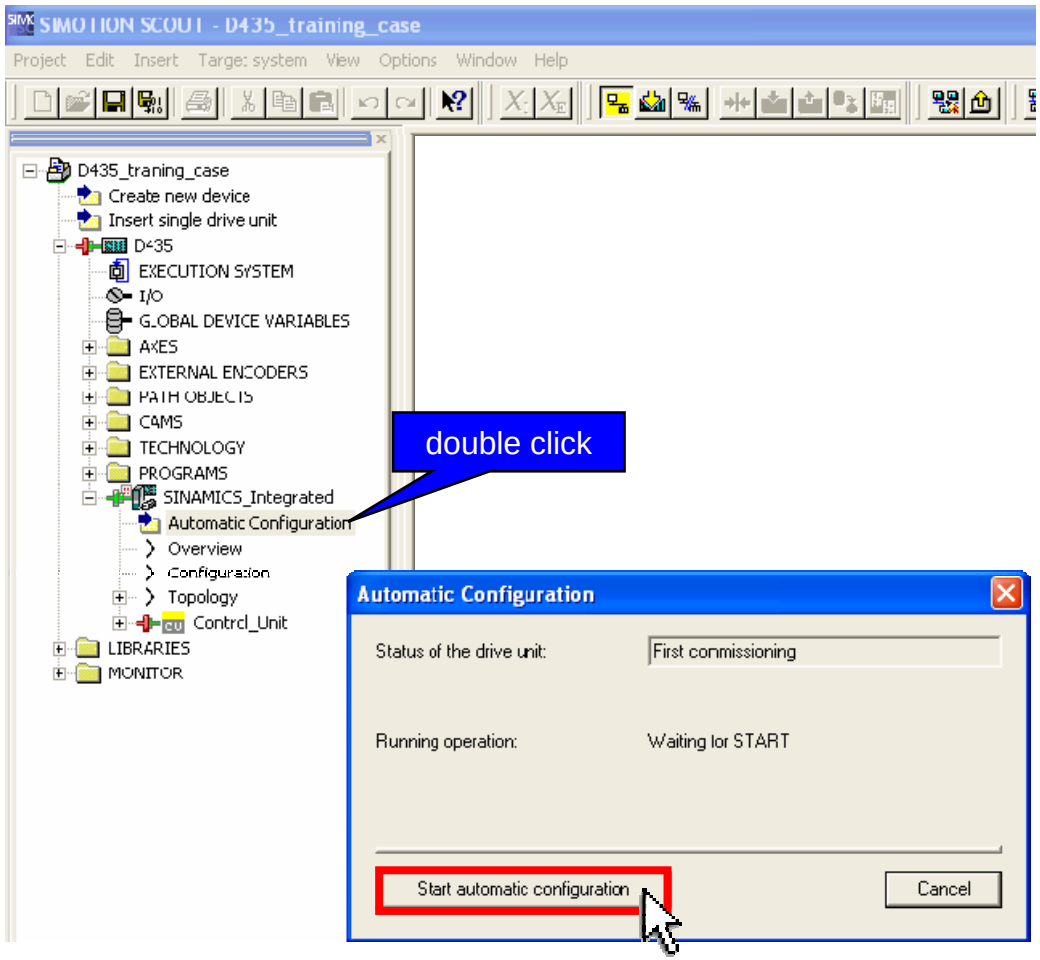


- Restore factory settings

You have established the connection to SINAMICS Integrated.



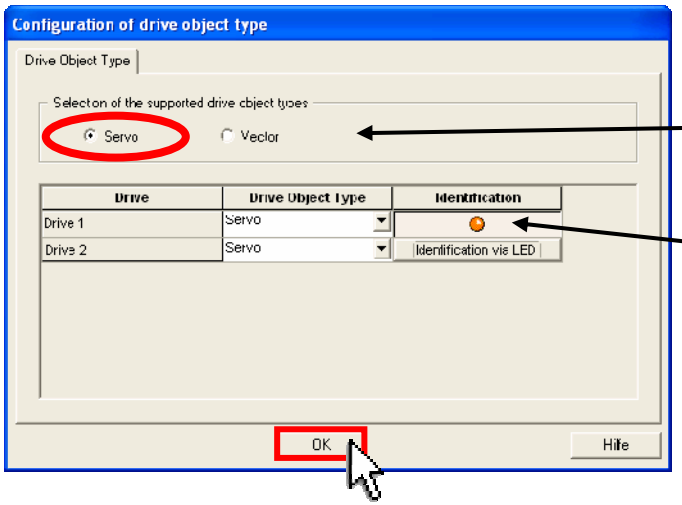
Automatic configuration



- Start automatic configuration

Automatic configuration

- Select “Servo” as object type for both drives

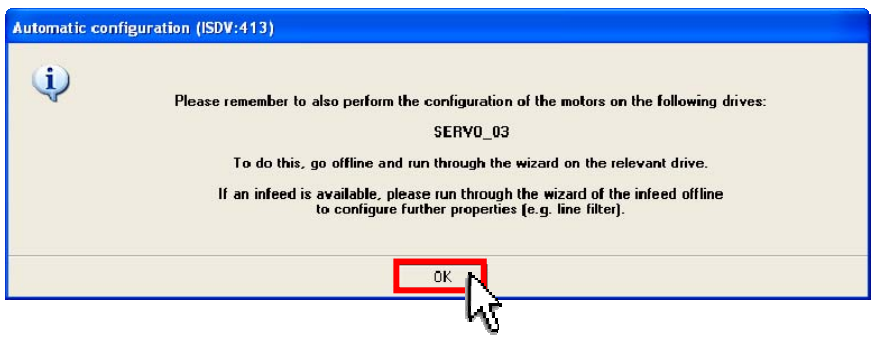


Select whether a servo- or vector-type drive object is to be used.

Click Identification via LED in order to identify the power unit of the drive object by means of LED flashing.

Click Ok to complete the automatic commissioning.

- Acknowledge with OK and close the message box.

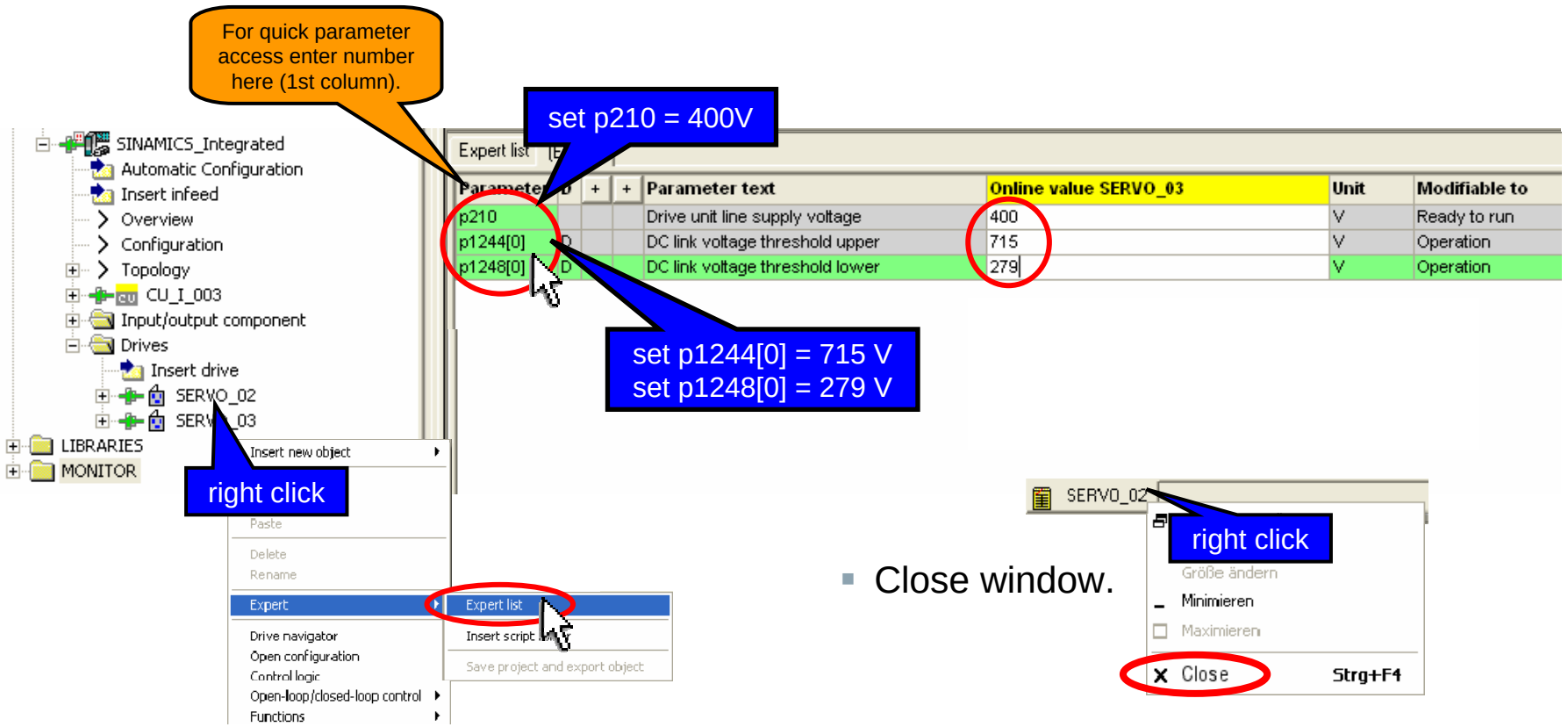


The message window is a reminder to parameterize the drive offline with the drive wizard. (SERVO_03 drive is not a motor/encoder with an electronic type label)

As soon as automatic commissioning has run, an upload operation (Load to PG) is automatically performed. Close wizard.

Set training case specific line supply voltage & DC link voltage

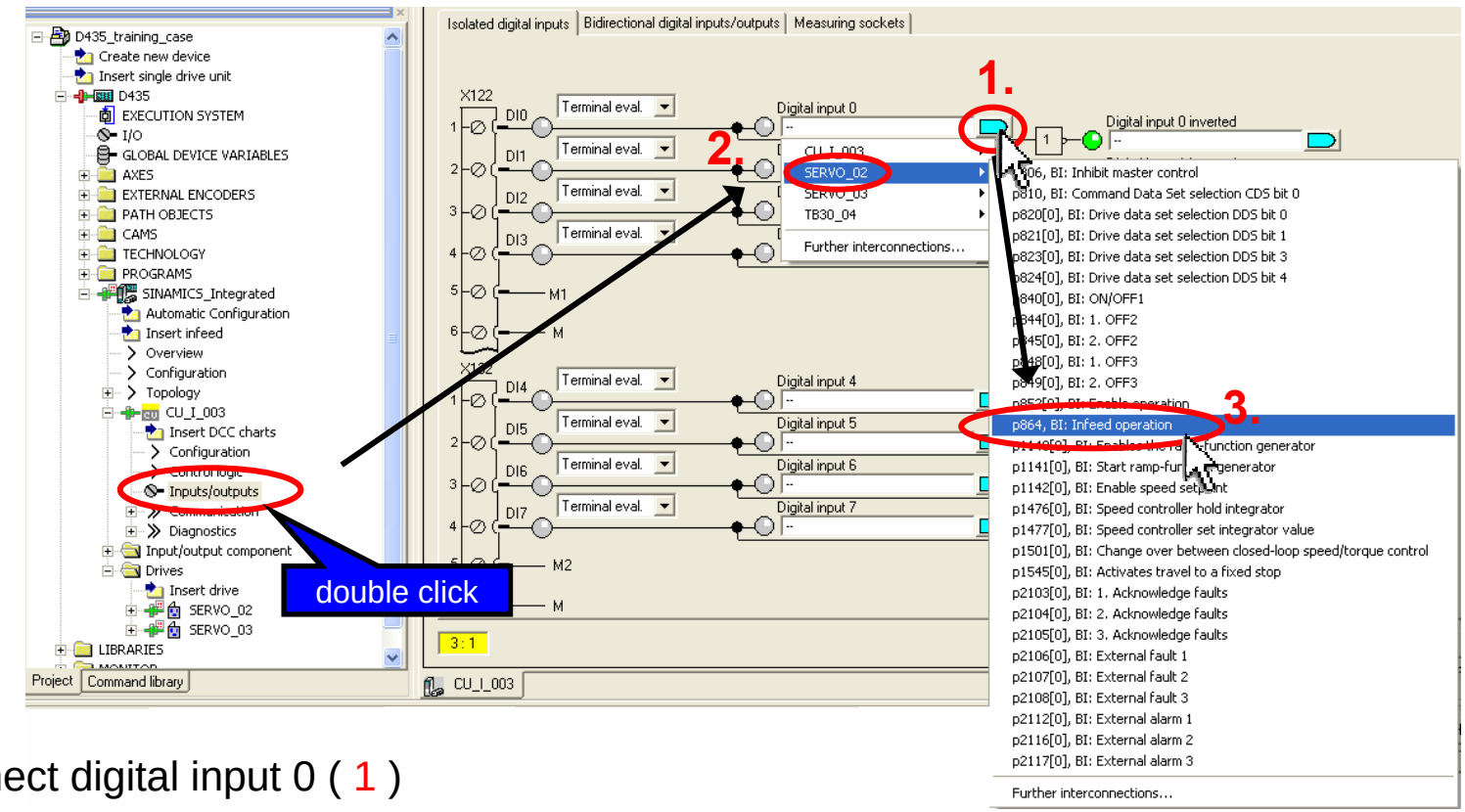
- open Expert list for SERVO_02 **and** SERVO_03
- set p210 = 400 V
- set p1244[0] = 715 V and p1248[0] = 279 V



- Close window.

Setup of digital I/O – Infeed operation

- Wiring of the digital input DI0 (P864 Infeed Operation)

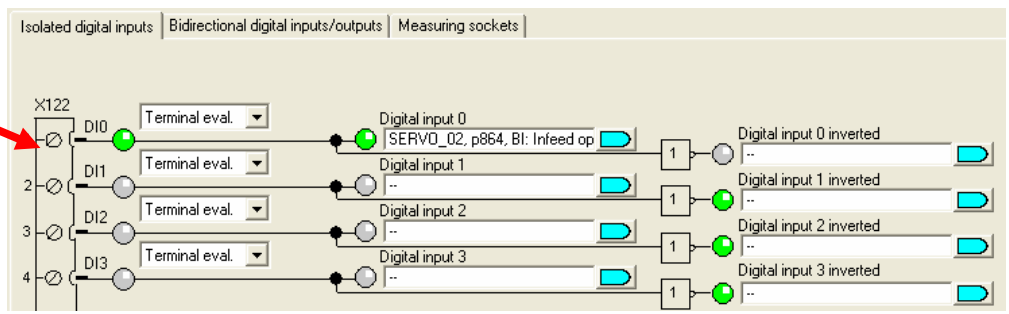


- Connect digital input 0 (1)
- The setup is to take place only for SERVO_02 (2)
- The signal “p864, BI : Infeed operation” (3) is assigned

Test setup with external panel

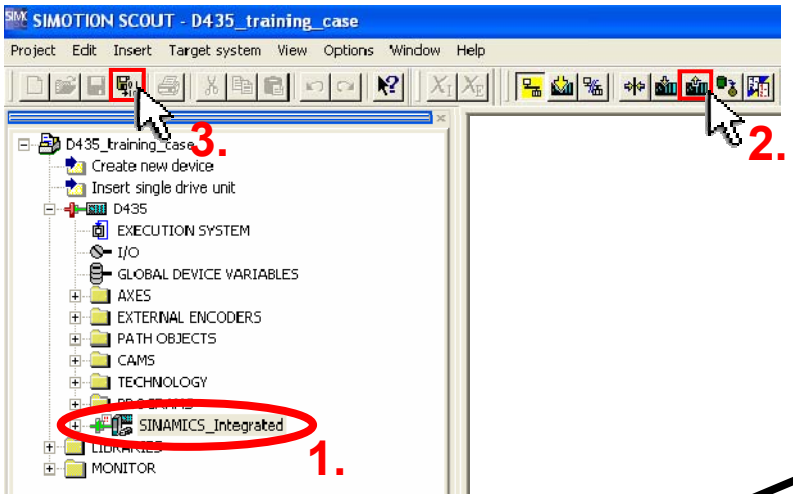
Enable infeed of SERVO_02 with SIEMENS control panel

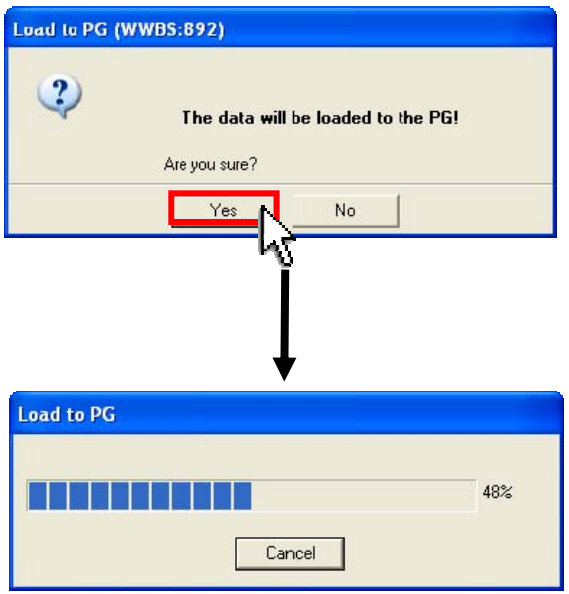
- Switch 0 (DI 0) in up position to set infeed in operation
  → Result: Infeed operation enabled



Load drive unit to PG

- Select SINAMICS_Integrated (1)

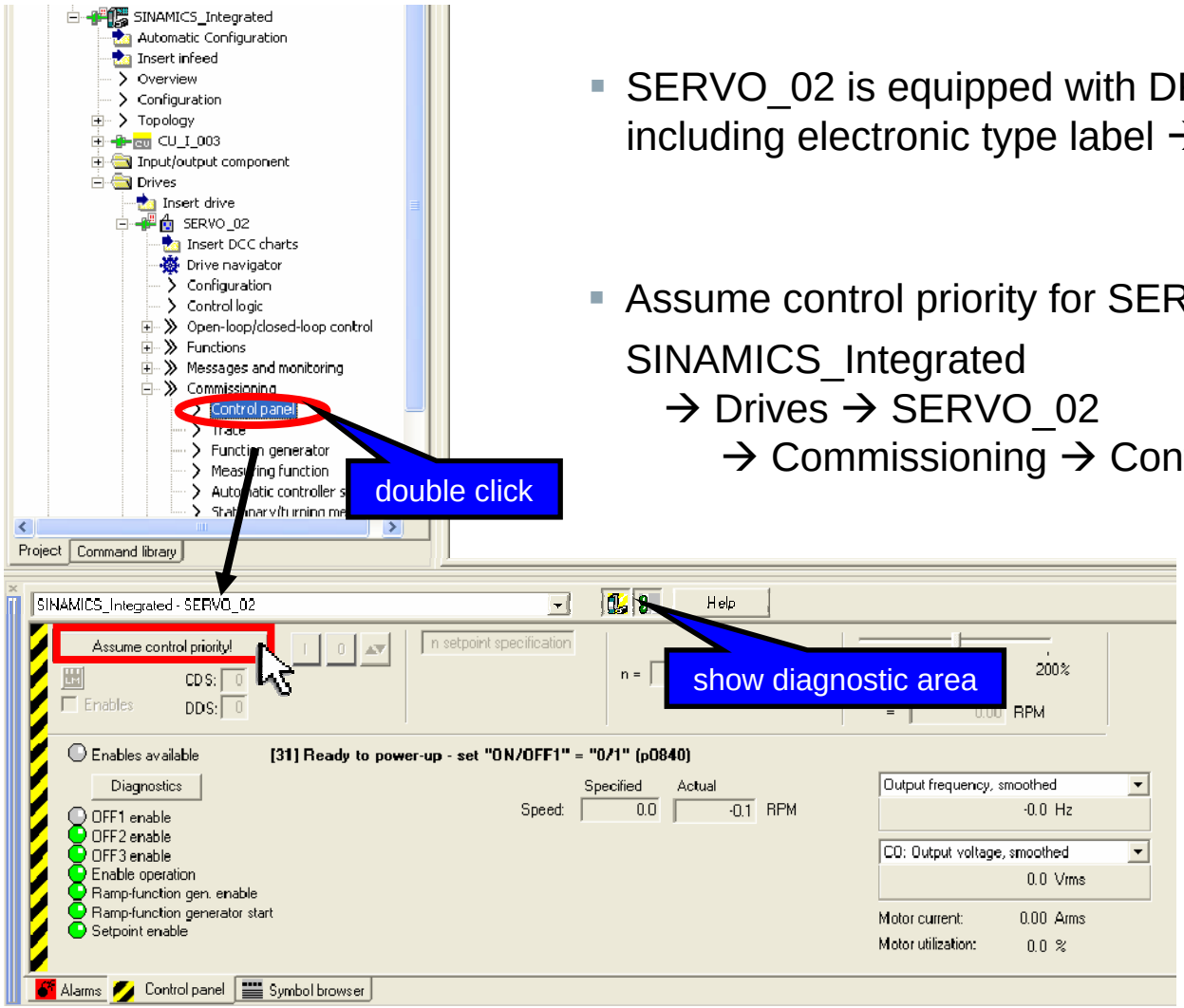




- Select  Load CPU / drive unit to PG (2)

- Save and compile (3) 

Operate SERVO_02 with the control panel



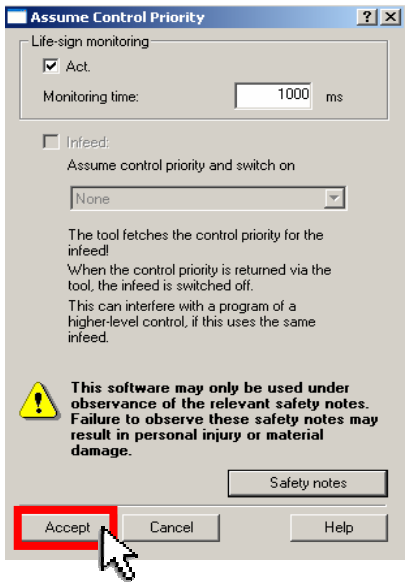
- SERVO_02 is equipped with DRIVE-CLiQ components including electronic type label → automatic commissioning.

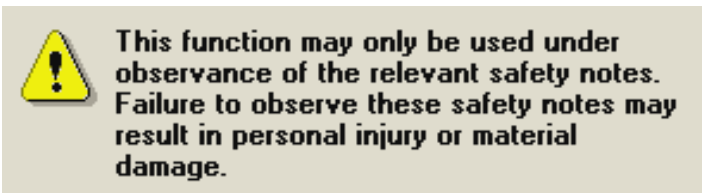
- Assume control priority for SERVO_02:

  SINAMICS_Integrated
  → Drives → SERVO_02
  → Commissioning → Control panel

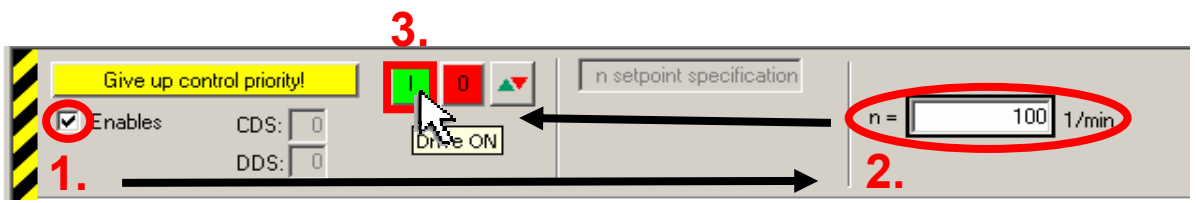
Operate SERVO_02 with the control panel

- Assume control priority





- Enables (1)
- Set speed setpoint (2)
- Turn the Drive ON (3)

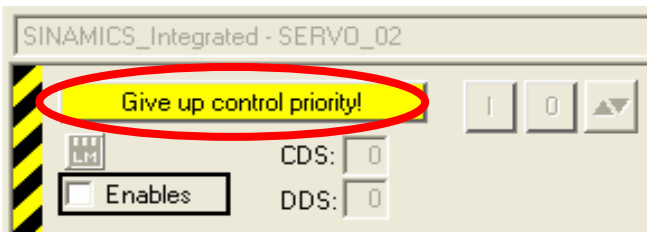


SERVO_02 is in Operation

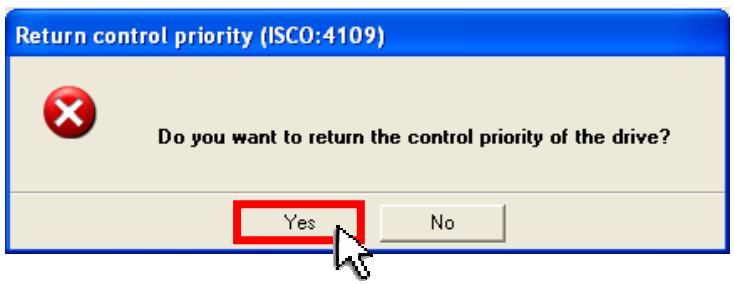
STOP SERVO_02 with the control panel

- Turn the drive off

- Return control priority

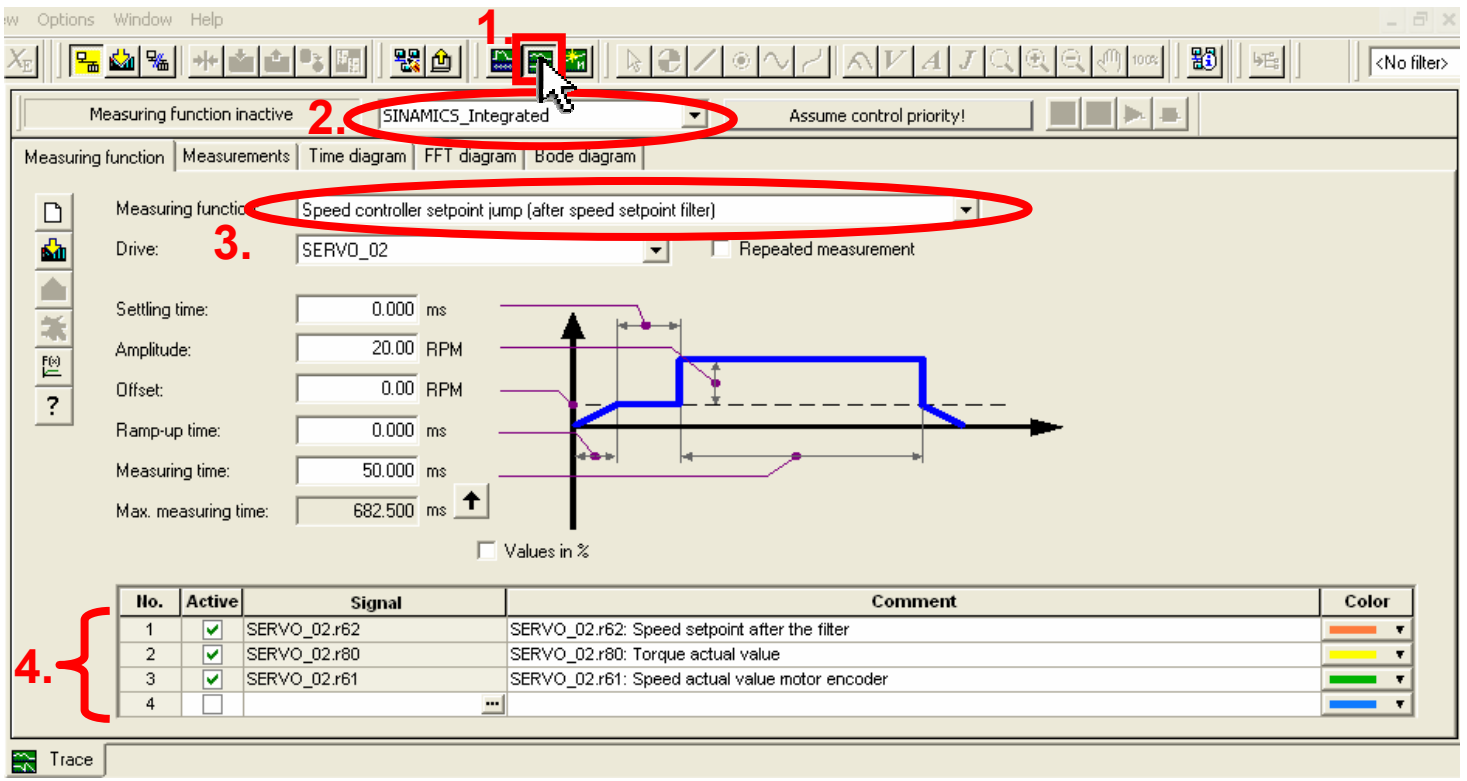


- Acknowledge the alert with “Yes”



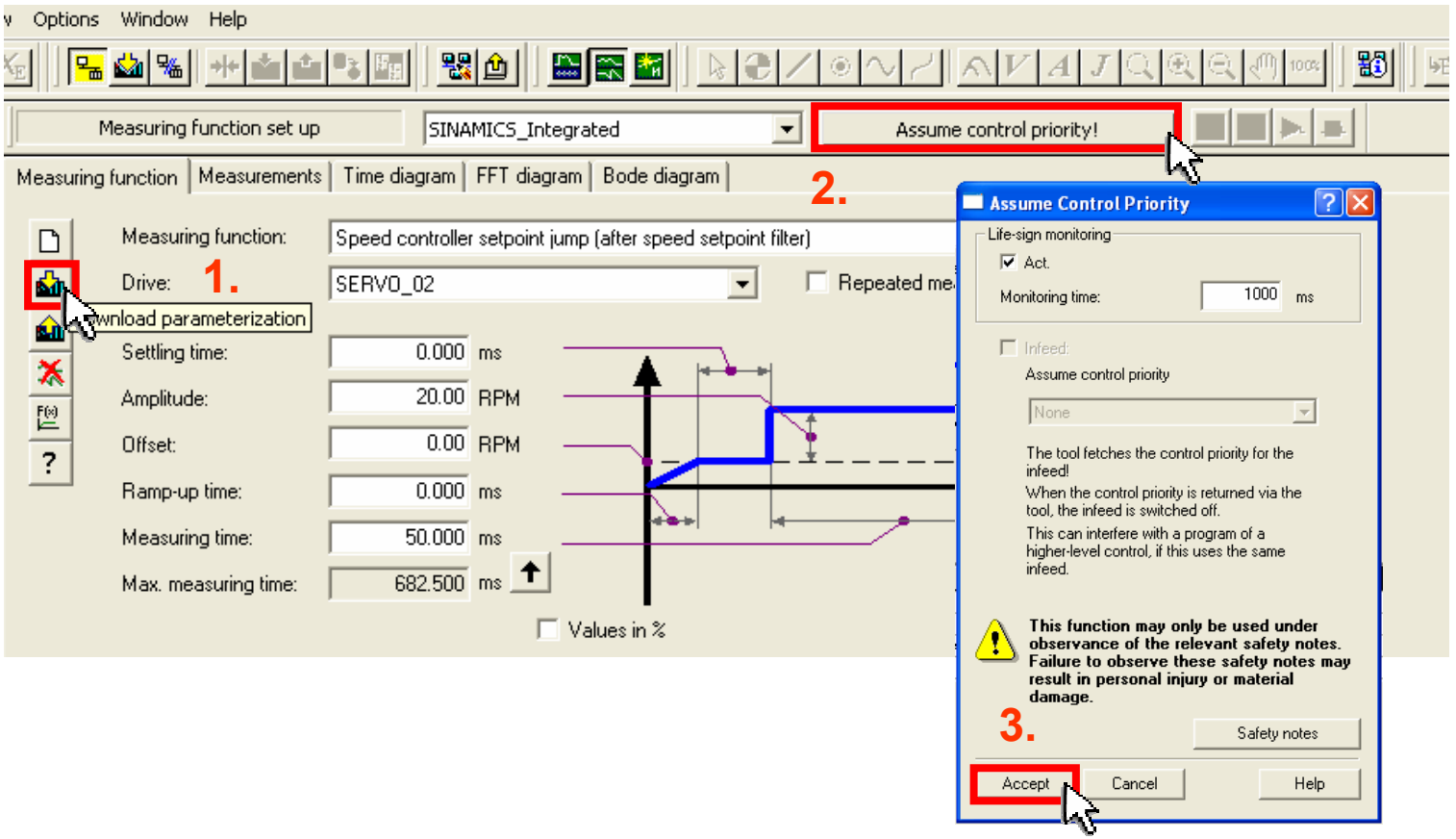
Manual controller setting - Optimize speed controller

- Open measuring function (1) from menu bar
- Select SINAMICS_Integrated (2)
- Select “Speed controller setpoint jump (after speed setpoint filter)” (3)
- Four channels can be plotted depending on the measuring function. (4)



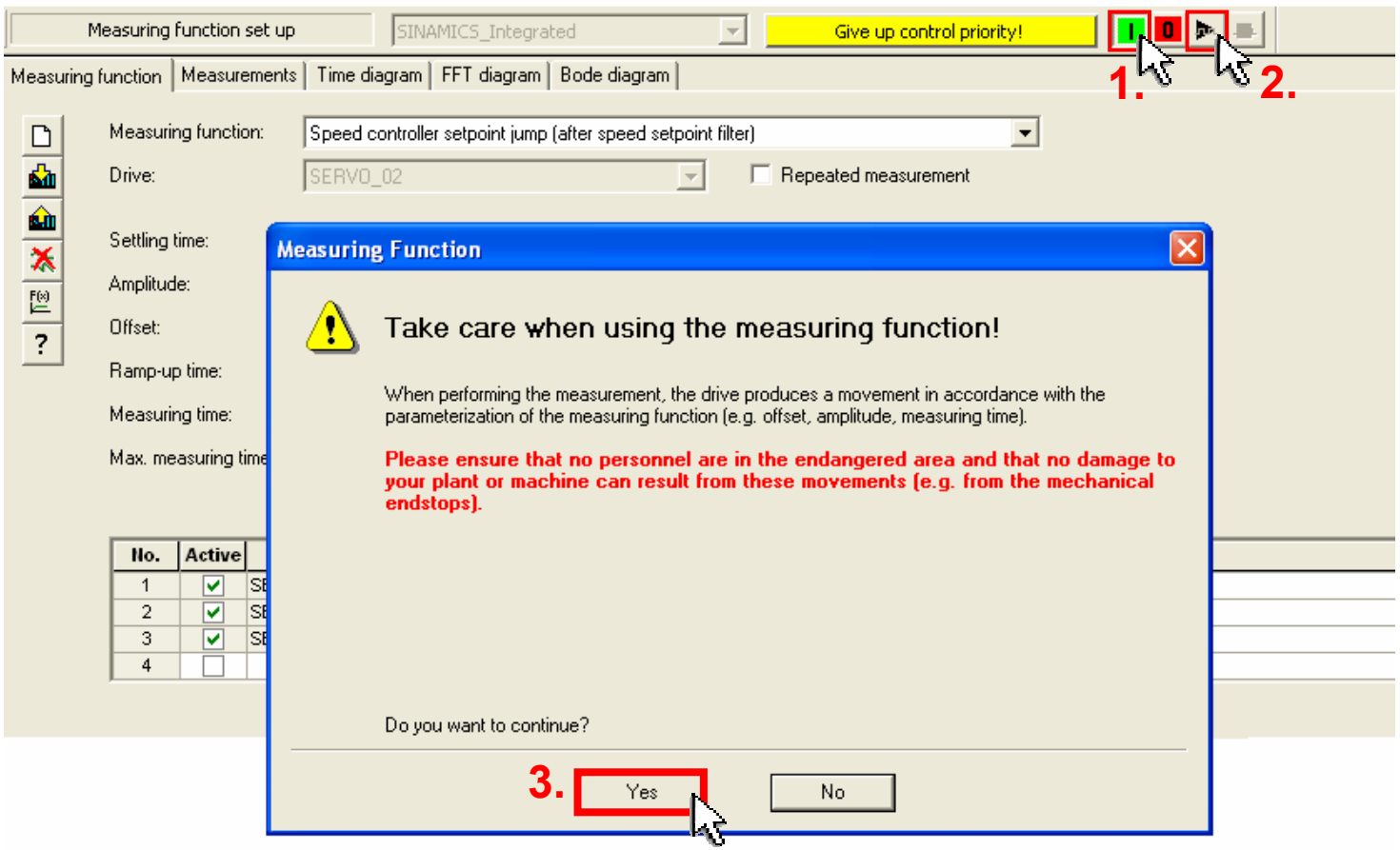
Manual controller setting - Optimize speed controller

- Download modifications to the drive (1)
- Assume control priority (2) and accept (3)



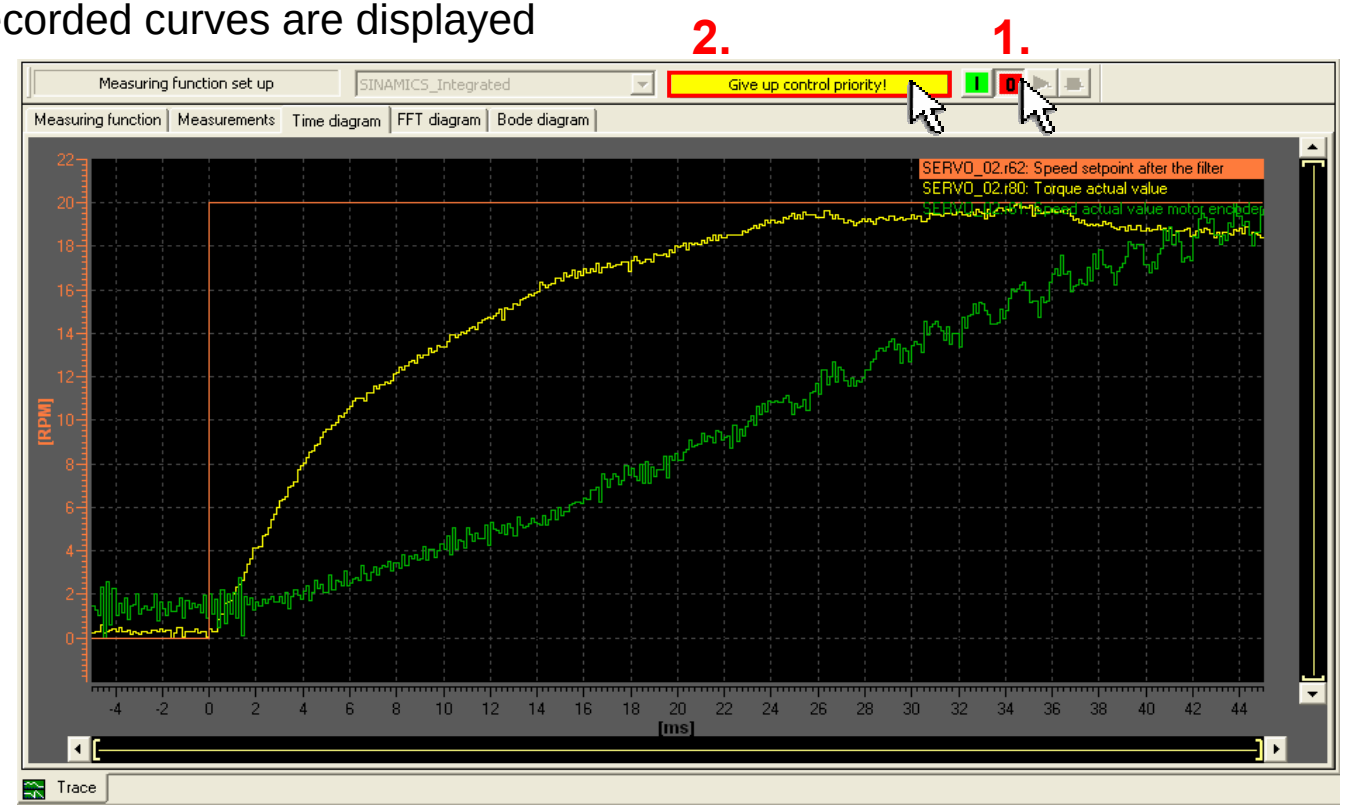
Manual controller setting - Start measuring function

- Switch Drive ON (1) and start measurement (2)
- The measurement will start after the alert has been read and understood (3)

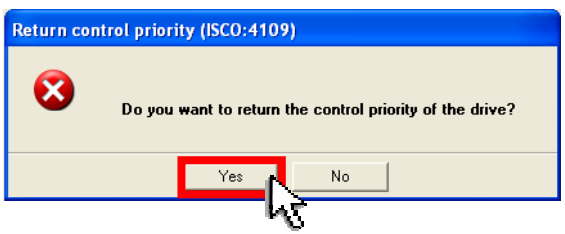


Manual controller setting - Time diagram

- The recorded curves are displayed

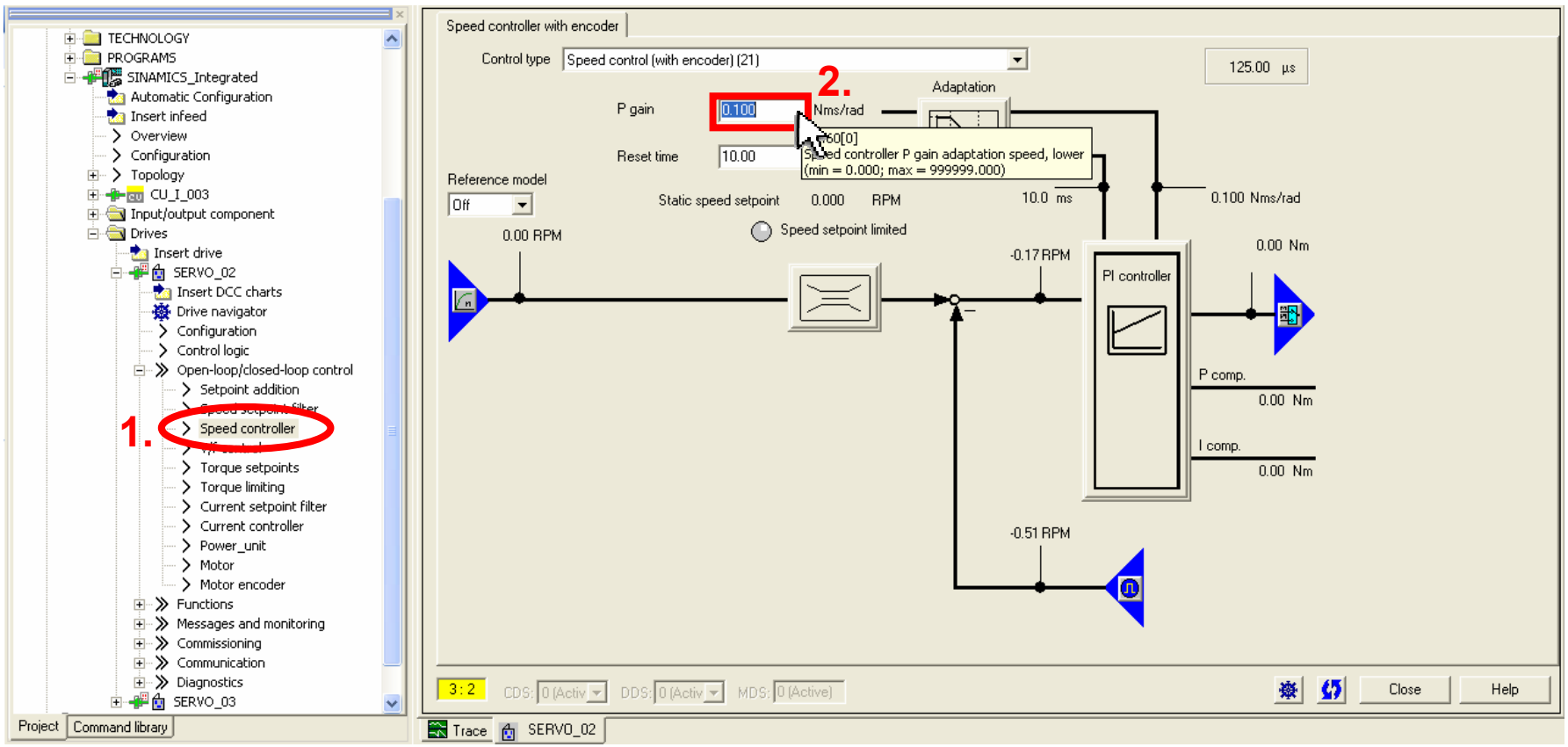


- Switch Drive OFF (1)
- Return control priority (2)



Manual controller setting - Adjust speed controller parameters

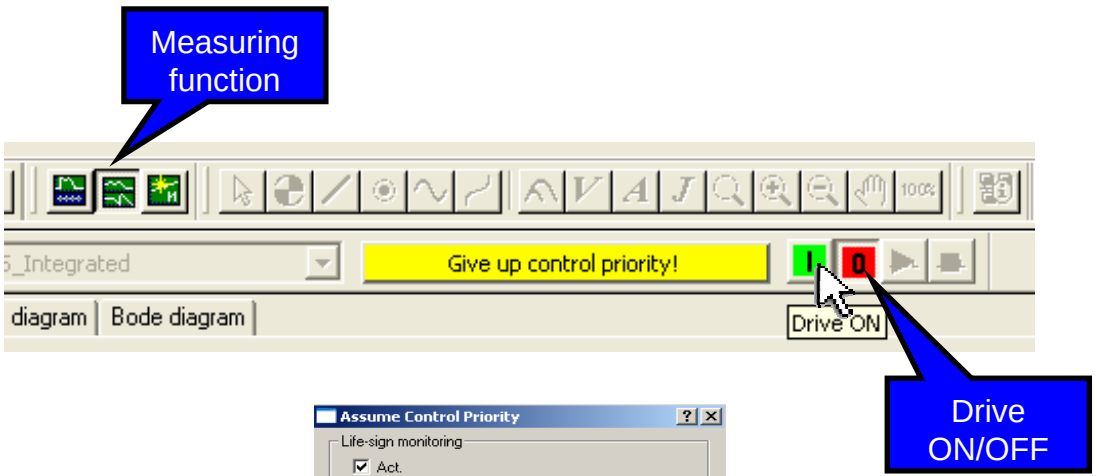
- The gain factor can be optimized by changing the value in the P gain = 0.1 Nms/rad input field (2) in the speed controller template (1)
- The values are immediately active! (after pressing ENTER)

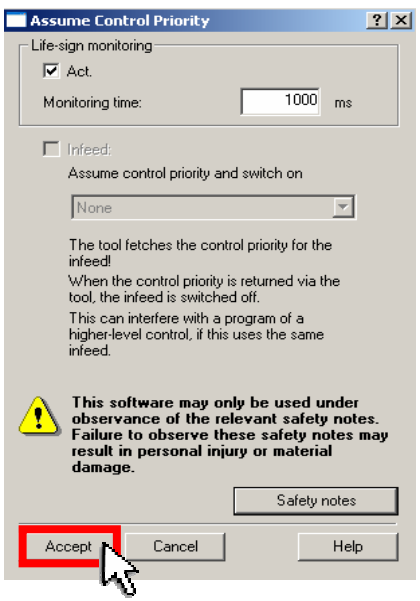


Manual controller setting – Control measurement

- Select a new measuring function 
- Press: Assume control priority
- Accept application monitoring time
- Switch Drive ON 
- Start measuring function 
- Acknowledge alert with “Yes”
- Switch Drive OFF 

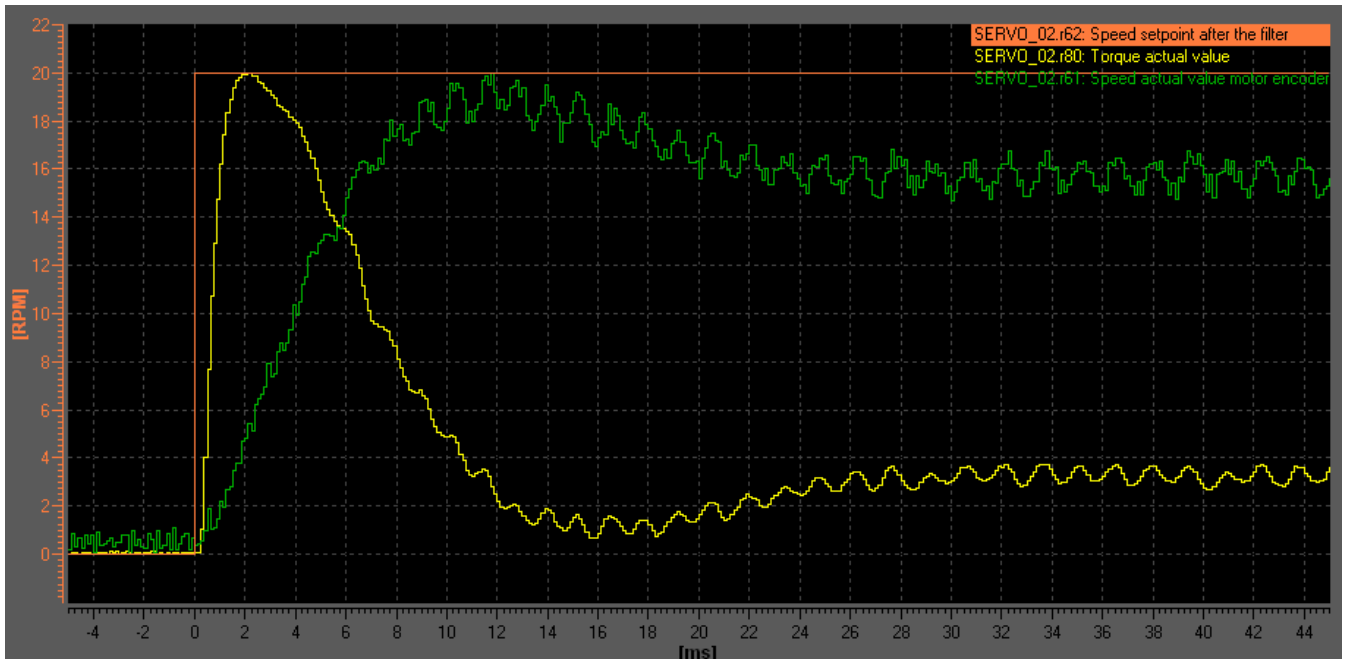
- Press: Give up control priority!



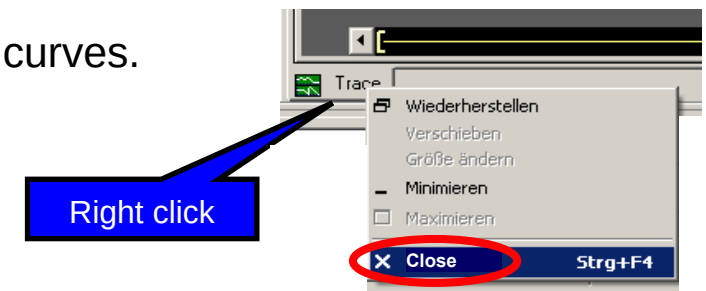


Manual controller setting - Control measurement

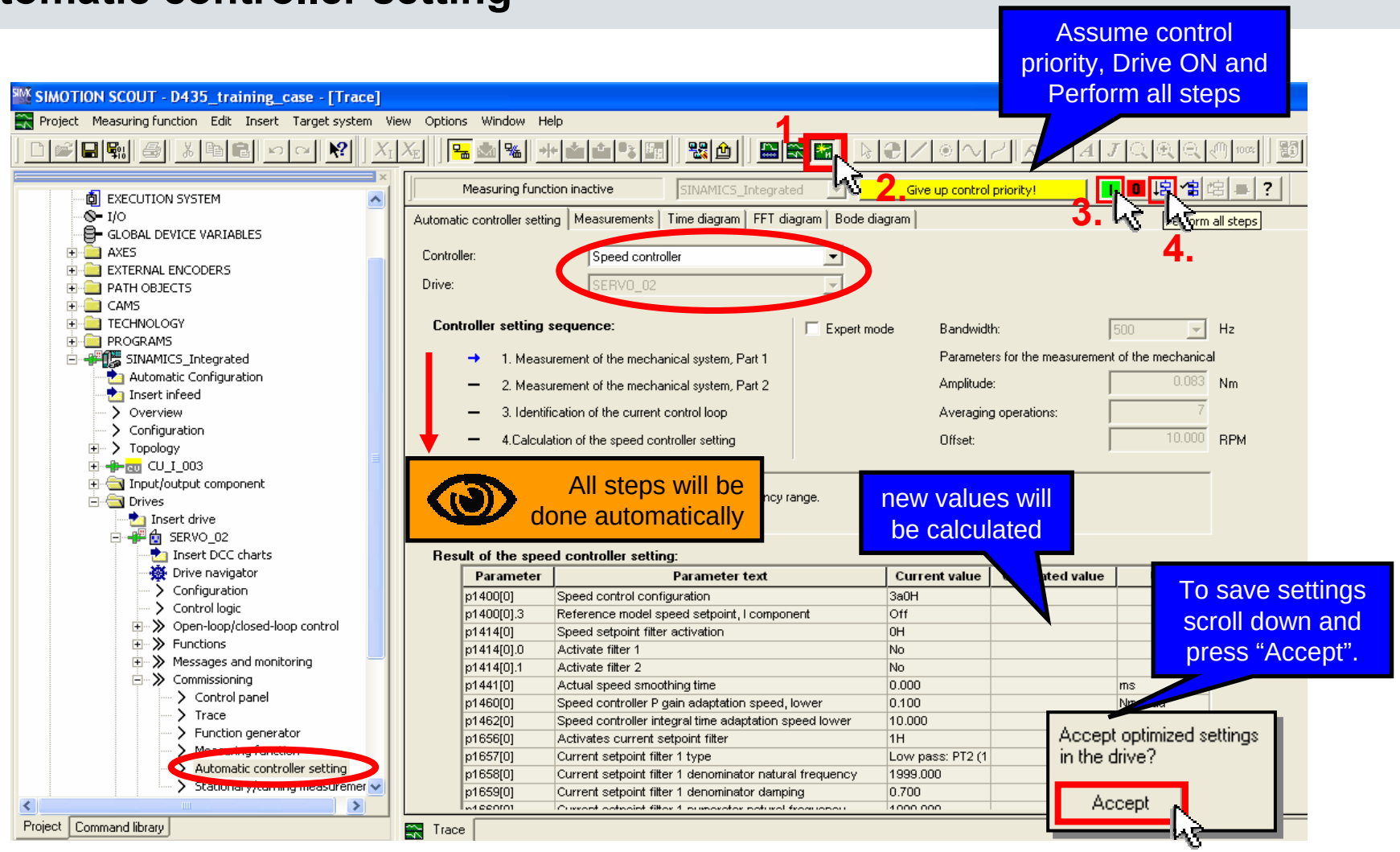
- The control measurement with optimized controller values shows a much better transcient response.



- Close the trace and don‘t save the curves.



Automatic controller setting[1]

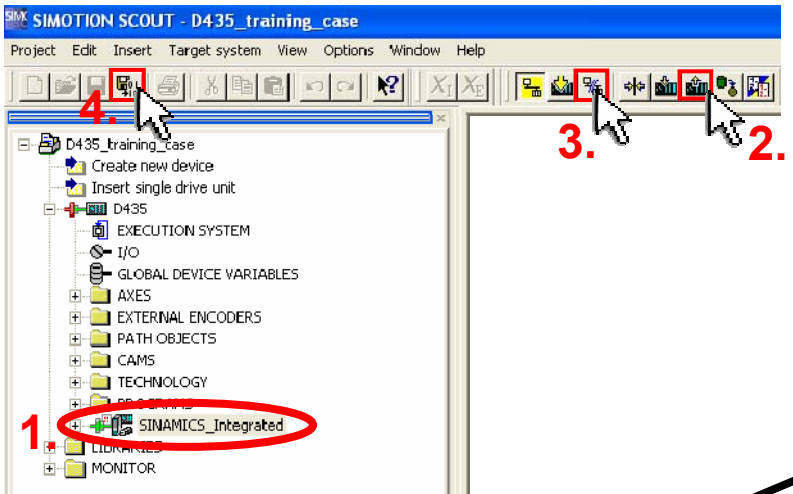


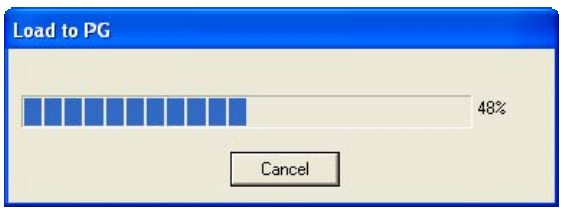
[1] in preparation

- Switch drive off and give up control priority after automatic controller setting has finished.

Load drive unit to PG and disconnect from target system

- Select SINAMICS_Integrated (1)

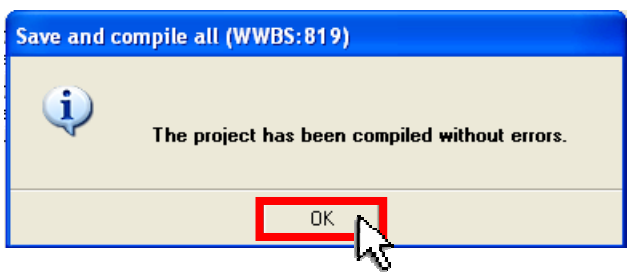




- Select  Load CPU / drive unit to PG (2)

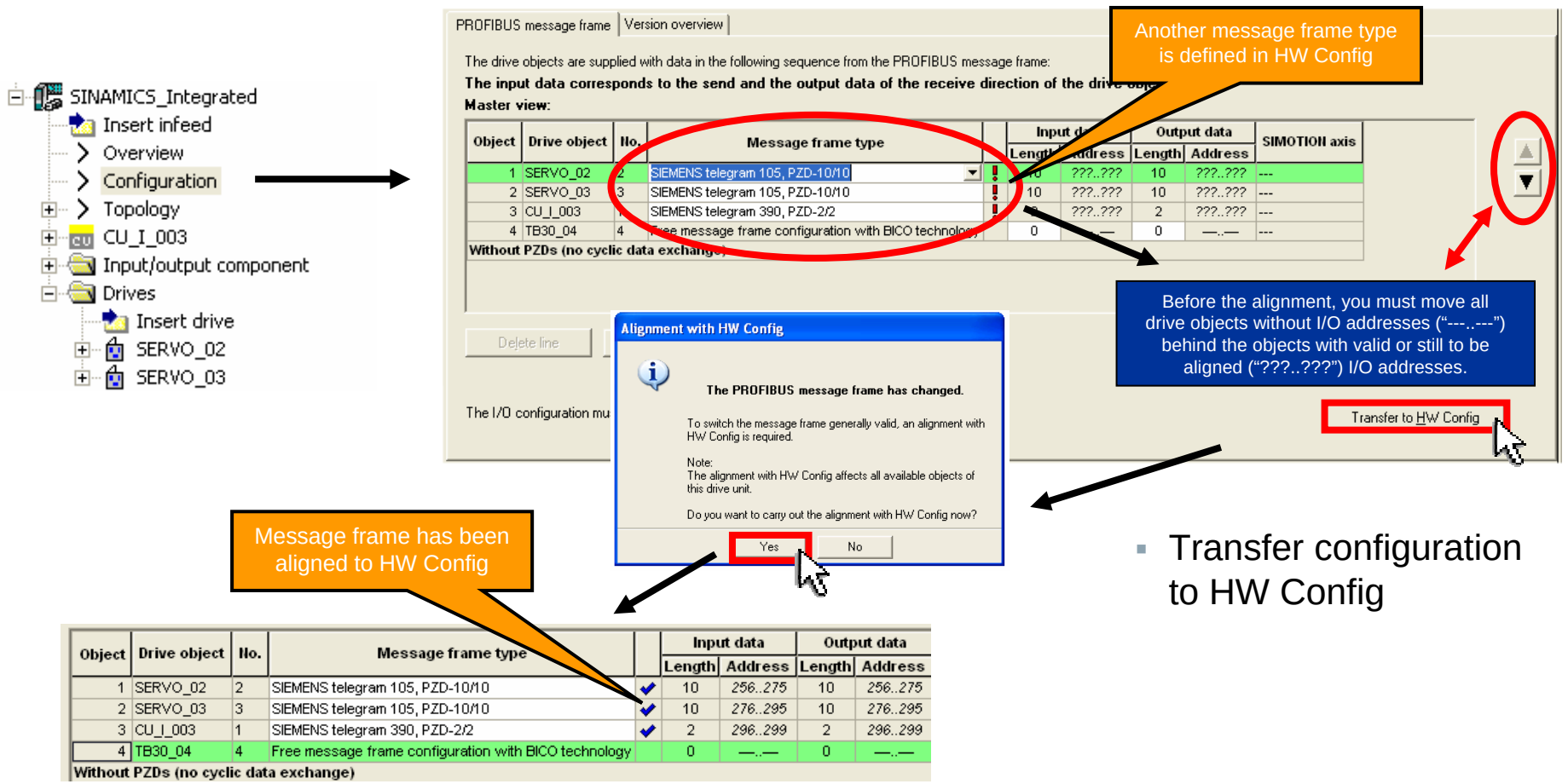
- Disconnect from target system (3) 

- Save and compile (4) 



Set PROFIBUS Message frame aligning with HW Config

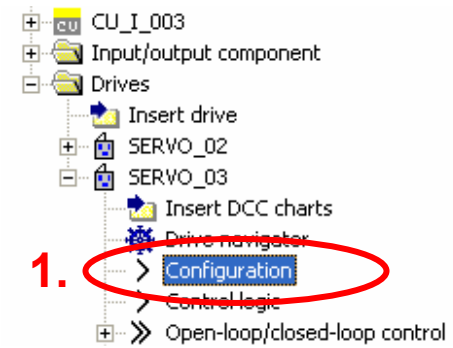
- Set correct message frame type (e.g. SIEMENS telegram 105 for drives, telegram 390 for CU)

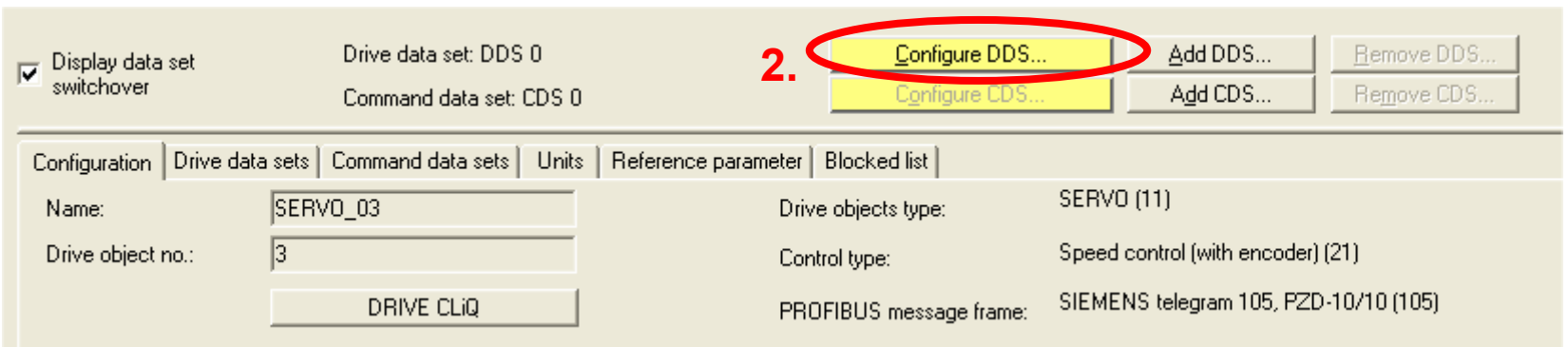


- Transfer configuration to HW Config

Completing configuration for SERVO_03

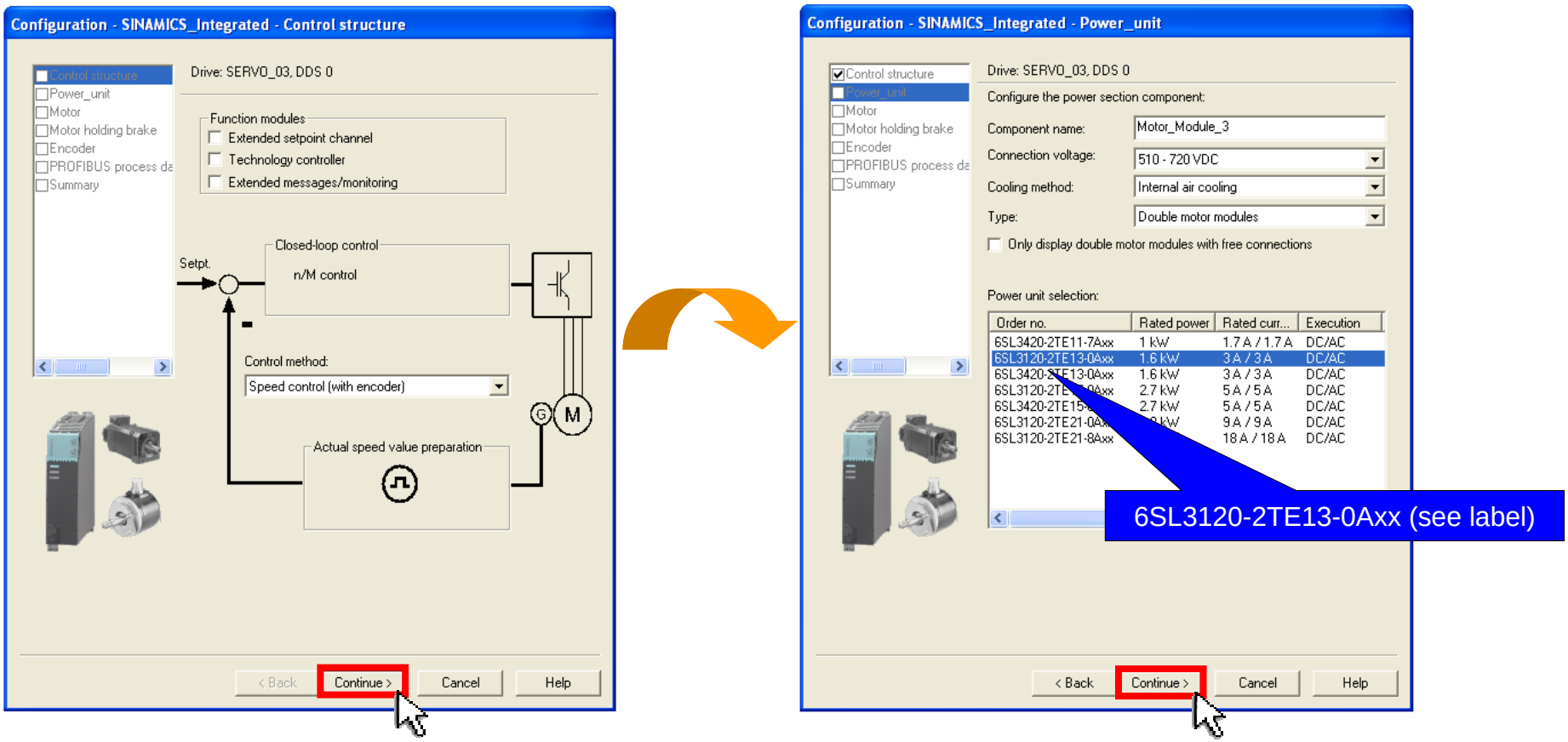
- Follow configuration templates for “SERVO_03”.
  The motor and encoder don‘t possess an electronic type label (no sensor module integrated)





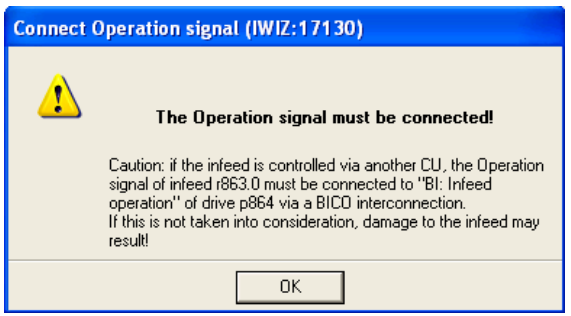
Configuration SERVO_03 control structure and power unit

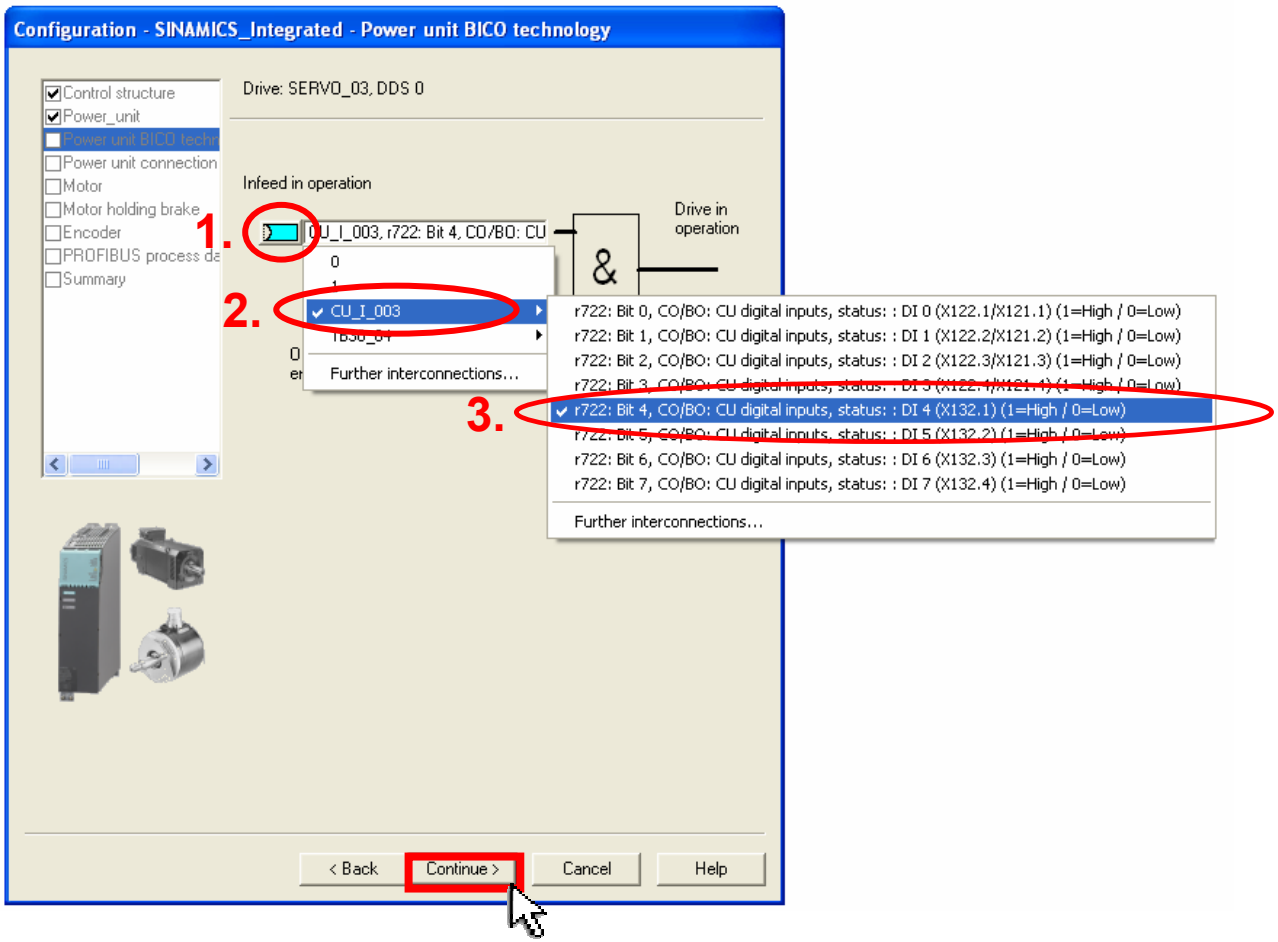
- Setup control structure and power unit for SERVO_03.



Setup of operating signal

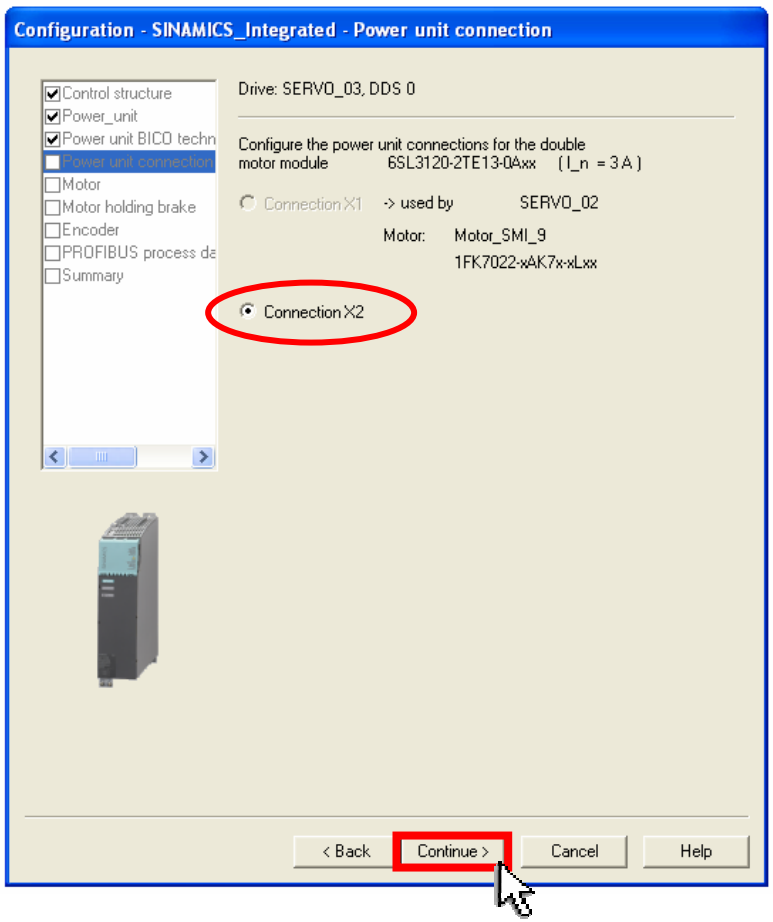
- Setup DI 4 for enable infeed operation SERVO_03.





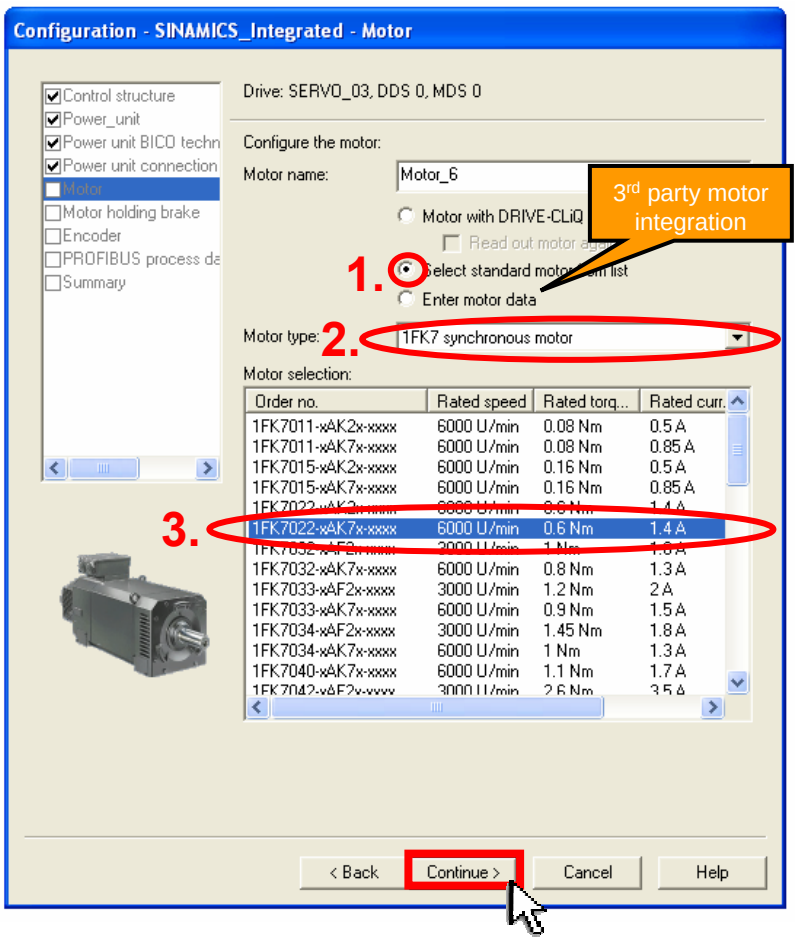
Determine power unit connection

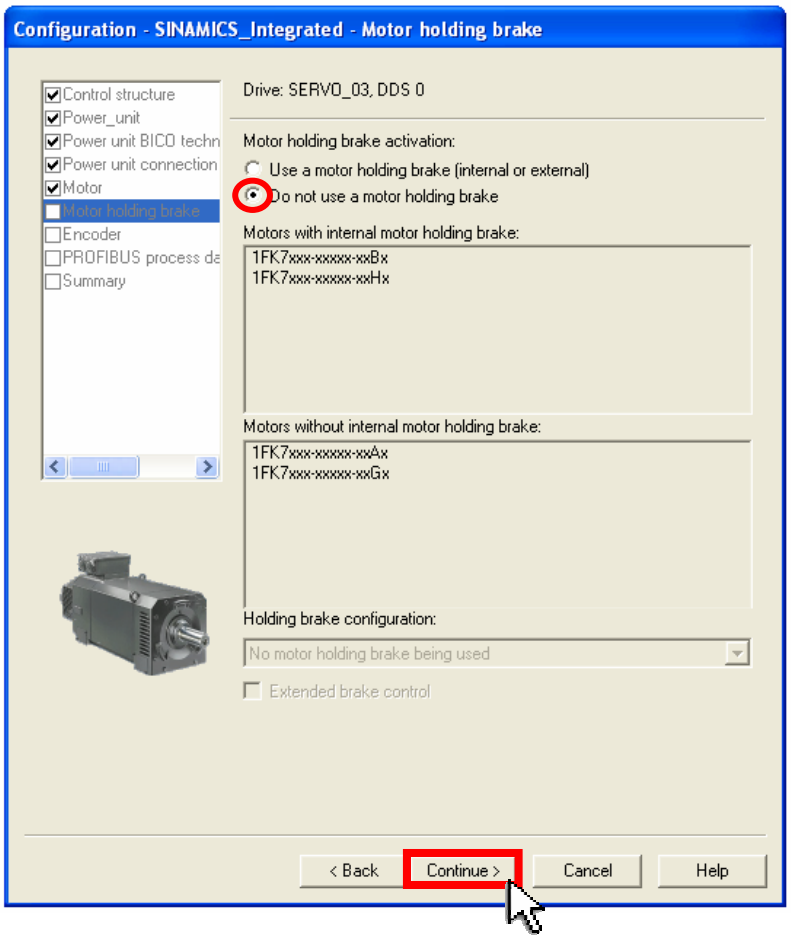
- Check correct connection for double motor module



Motor and brake selection

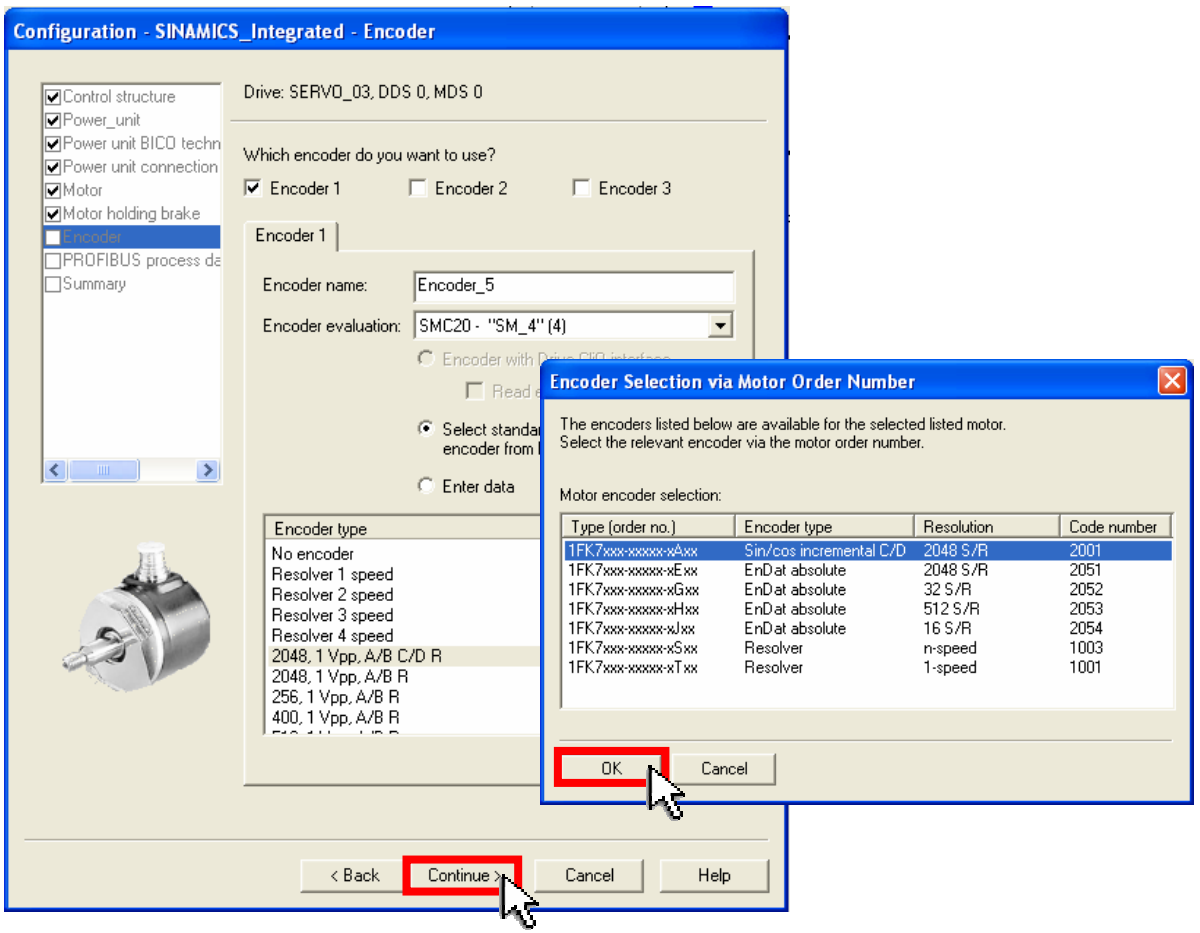
- Select motor type (1FK7022-xAK7x-xxxx) and brake





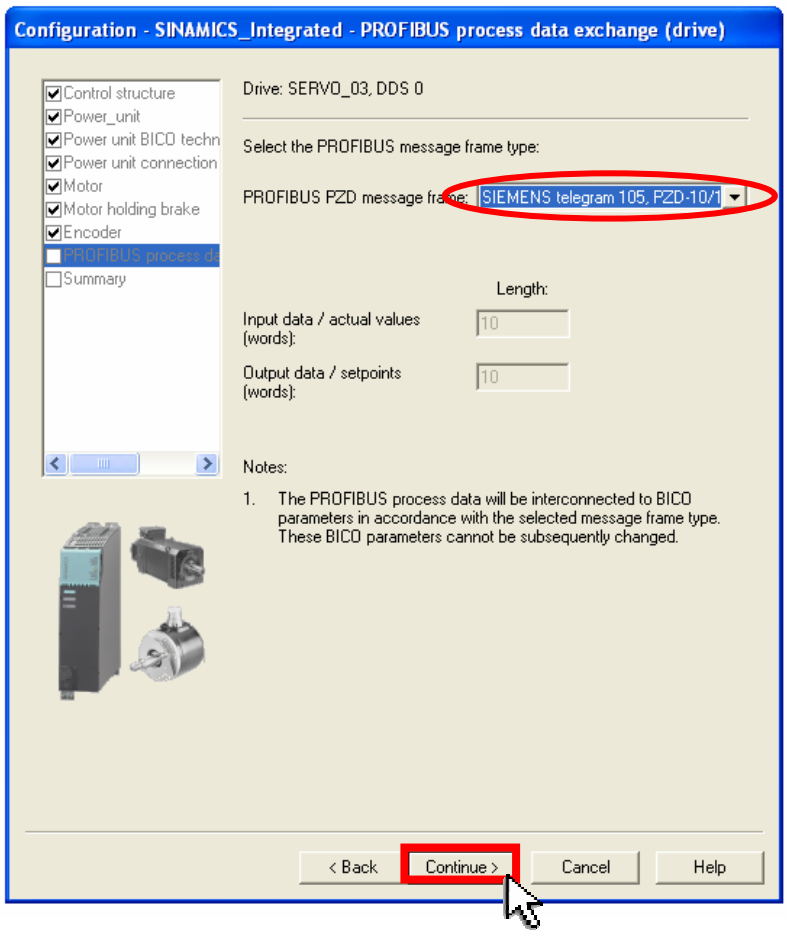
Select encoder

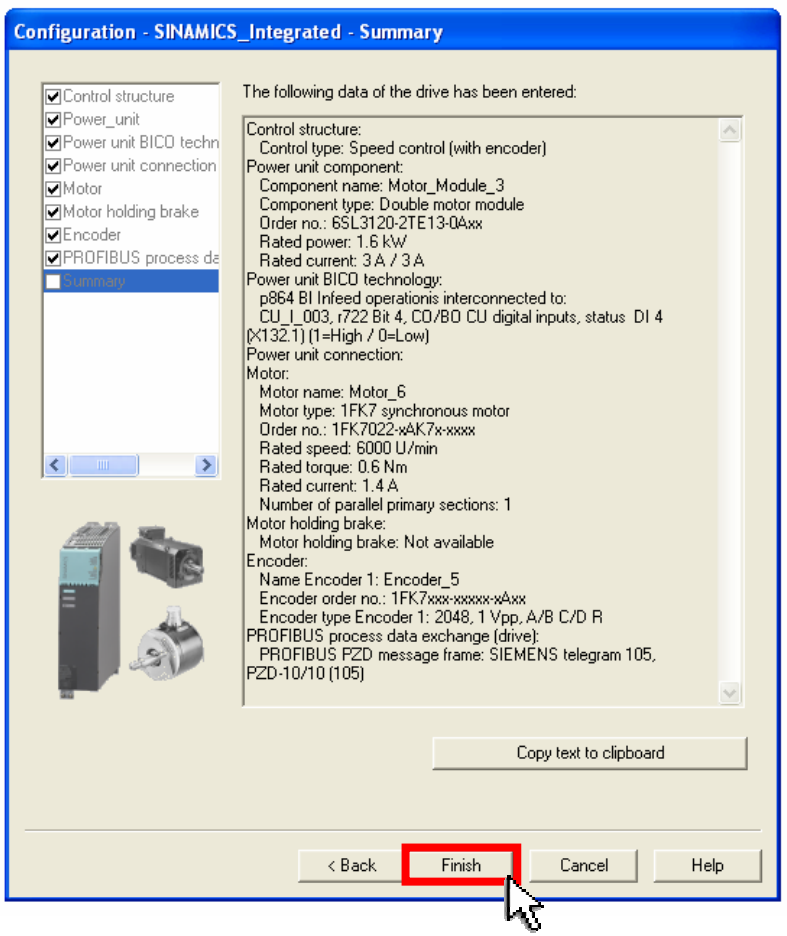
- Select encoder (sin/cos incremental encoder, code 2001)



Message frame selection / Summary

- Control correct SIEMENS telegram 105 for PROFIBUS process data exchange

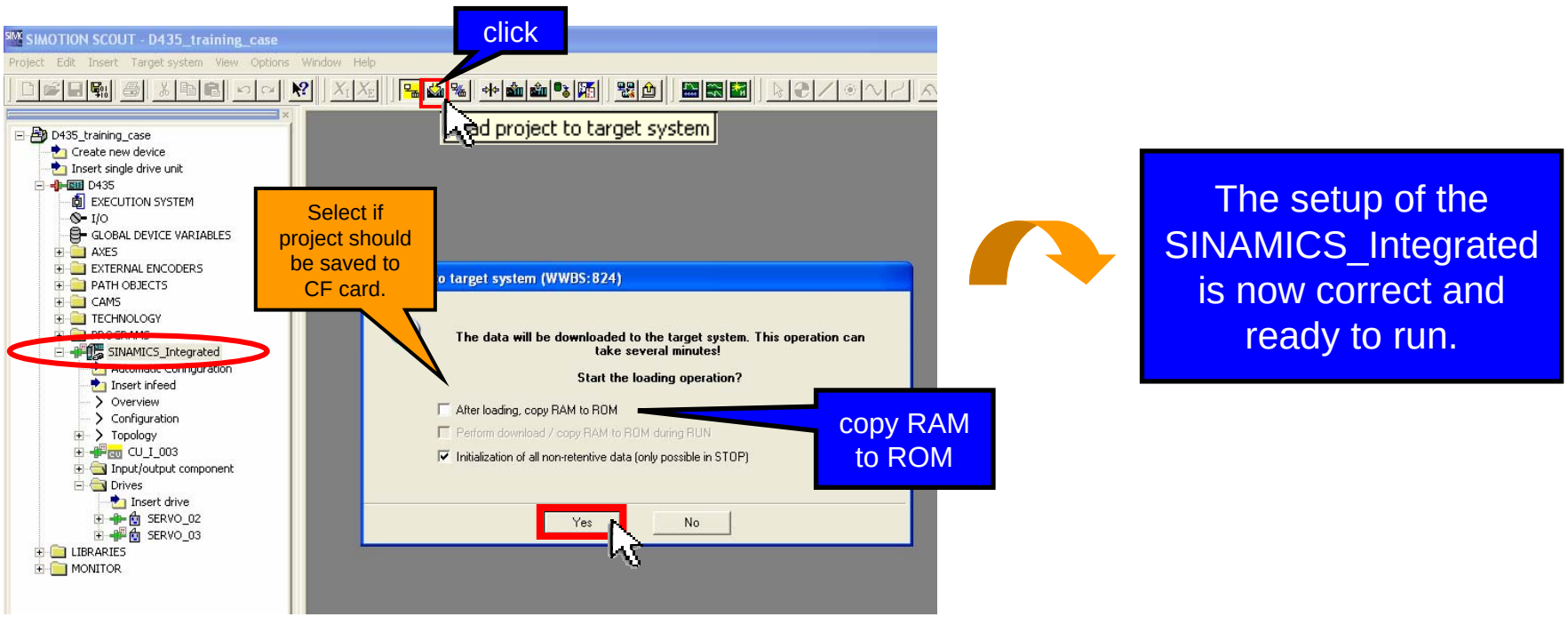




Load project to target system

- Save project and connect to target system

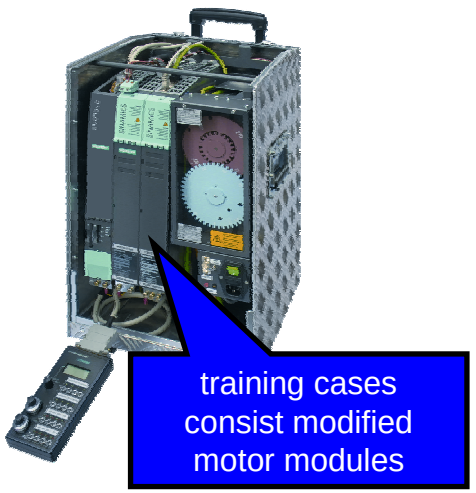
- Select SINAMICS_Integrated and load project to target system



Note

Some D435 training cases (MLFB: 6SL3120-2TE13-0AA0) will show an error (P1244):

Level	Message
Information	SINAMICS_Integrated: Consistency check of the DO configuration...
Information	SINAMICS_Integrated: Determination of the charts to be loaded...
Information	SINAMICS_Integrated: Checking the global device data...
Information	SINAMICS_Integrated: Consistency check of the DO configuration...
Information	SINAMICS_Integrated: CU_I_003: TO SINAMICS_Integrated: CU_I_003 has been downloaded.
Information	SINAMICS_Integrated: SERVO_02: TO SINAMICS_Integrated: SERVO_02 has been downloaded.
Information	SINAMICS_Integrated: SERVO_03: TO SINAMICS_Integrated: SERVO_03 has been downloaded.
Information	SINAMICS_Integrated: TB30_05: TO SINAMICS_Integrated: TB30_05 has been downloaded.
Information	SINAMICS_Integrated: Initialization of the internal data structures of the drive is running...
Error	SINAMICS_Integrated:SERVO_03: Parameter P1244 [0]: Unterhalb der gültigen Werte
Error	SINAMICS_Integrated: Download error
Information	The following devices are not consistent online: SINAMICS_Integrated.
Error	Error on: Load
Error	Download error (ret = 0xbe0b0011)

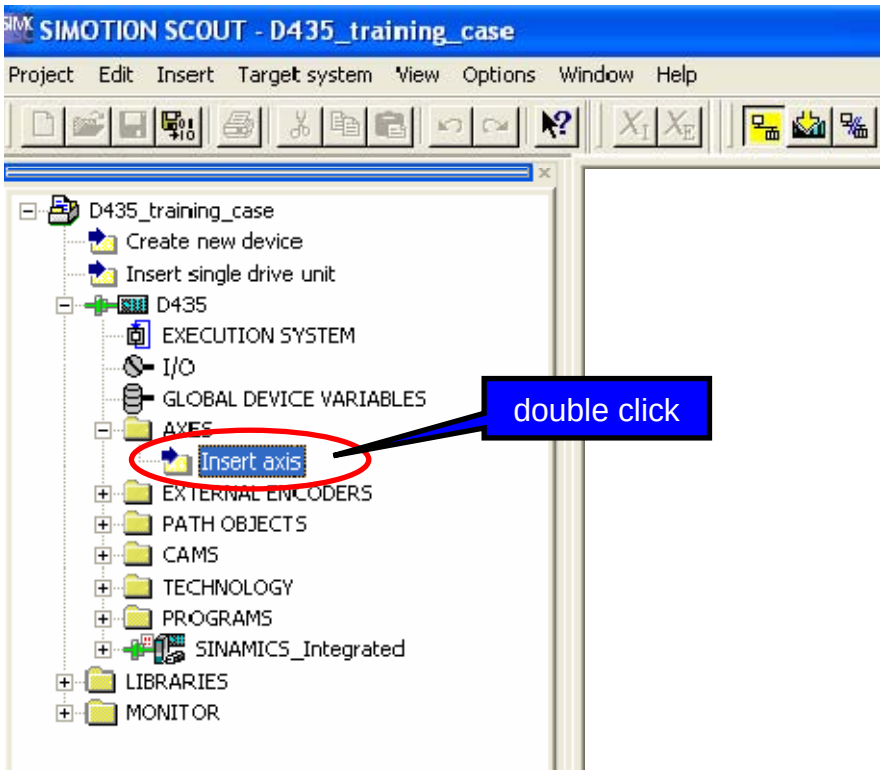


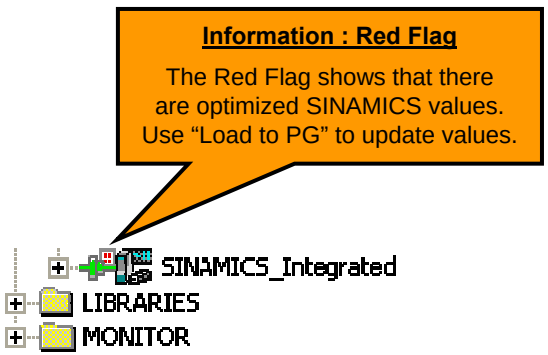
In this case:

- open expert list for SERVO_03 again
- set p1244[0] = 715 V and p1248[0] = 279 V
- Load CPU / drive unit to PG
- Save and compile

SIMOTION D435 - Insert a new axis

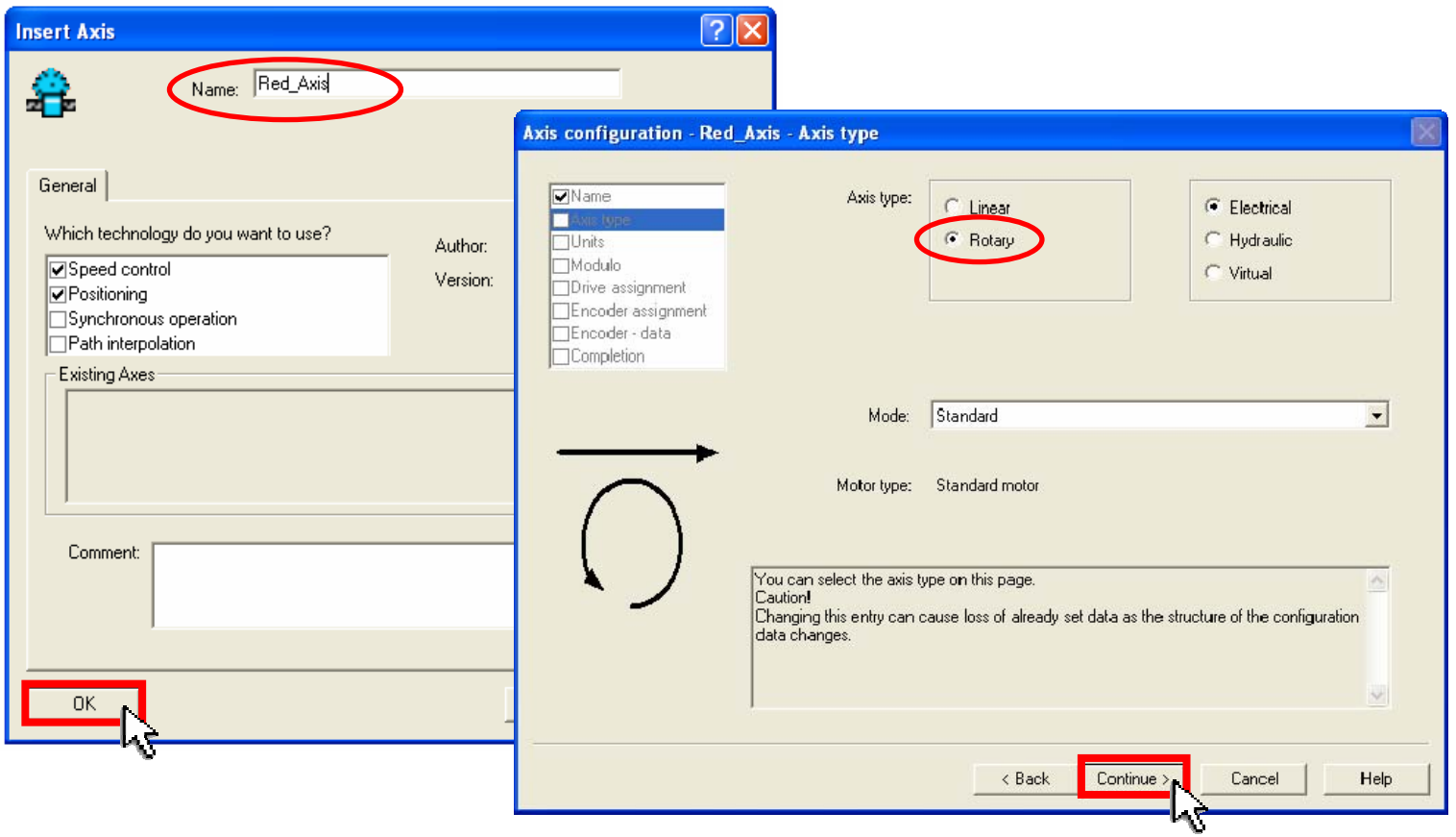
- Double click on “Insert axis”
- **Two axes** are to be inserted (“Red_Axis“ and “Blue_Axis”)





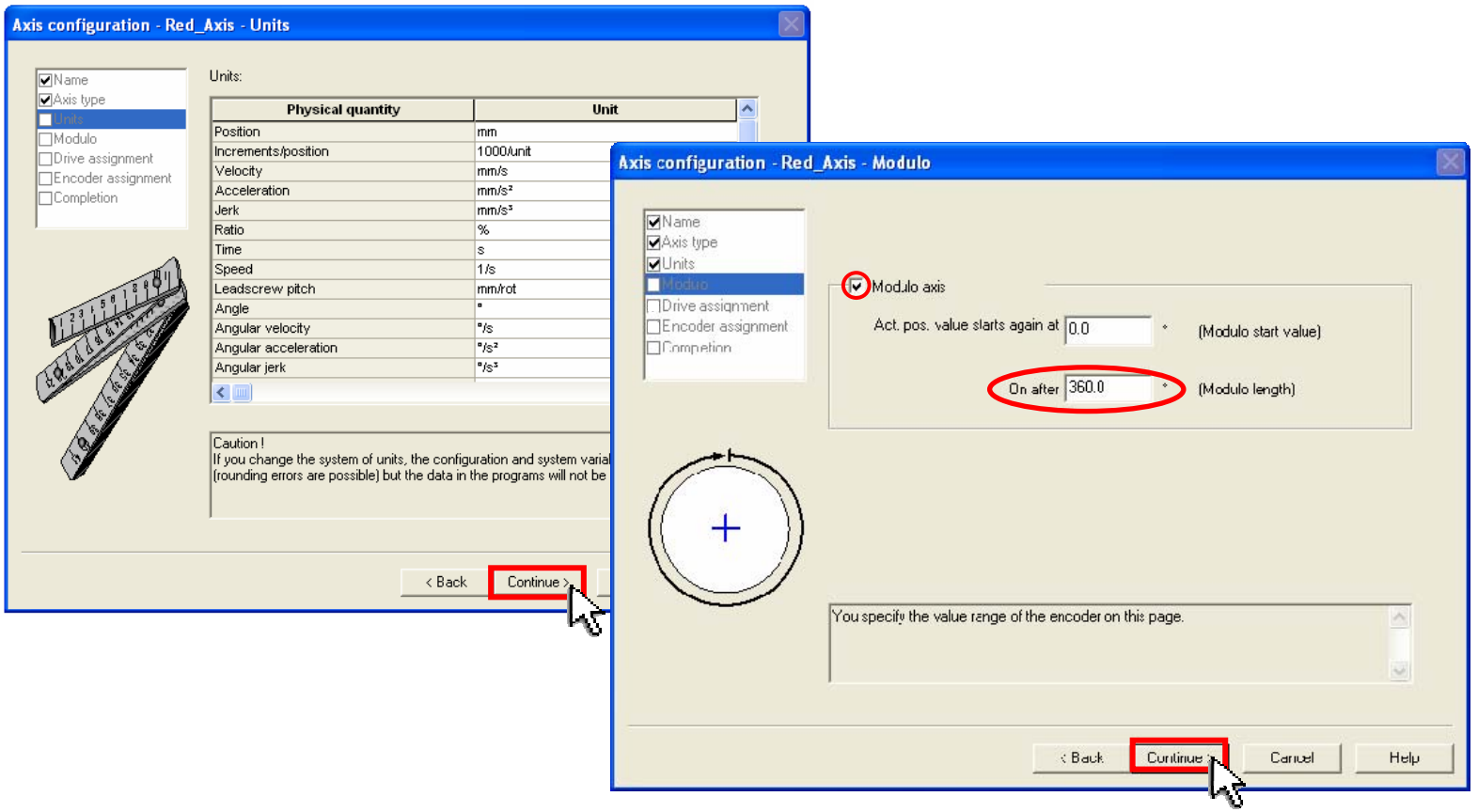
Configure “Red_Axis“

- Choose axis name “Red_Axis” and select the necessary technologies
- Determine axis type (rotary axis)



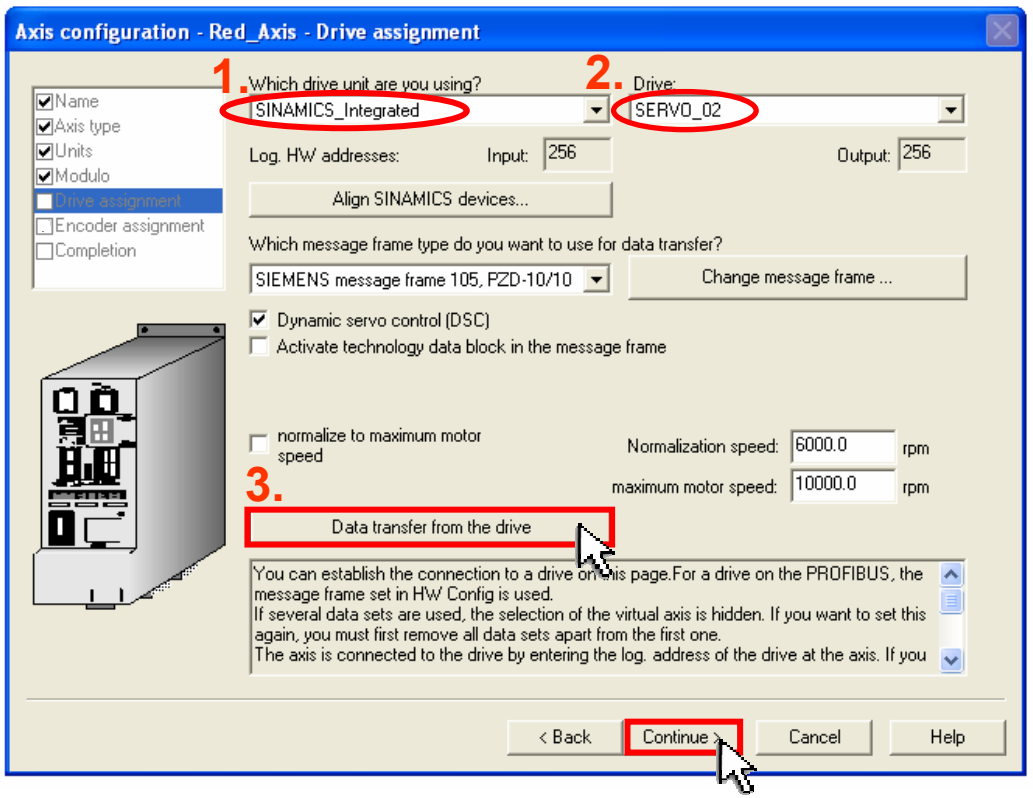
Configure “Red_Axis“

- Define units (standard settings) and select “modulo axis” with 360° modulo length.



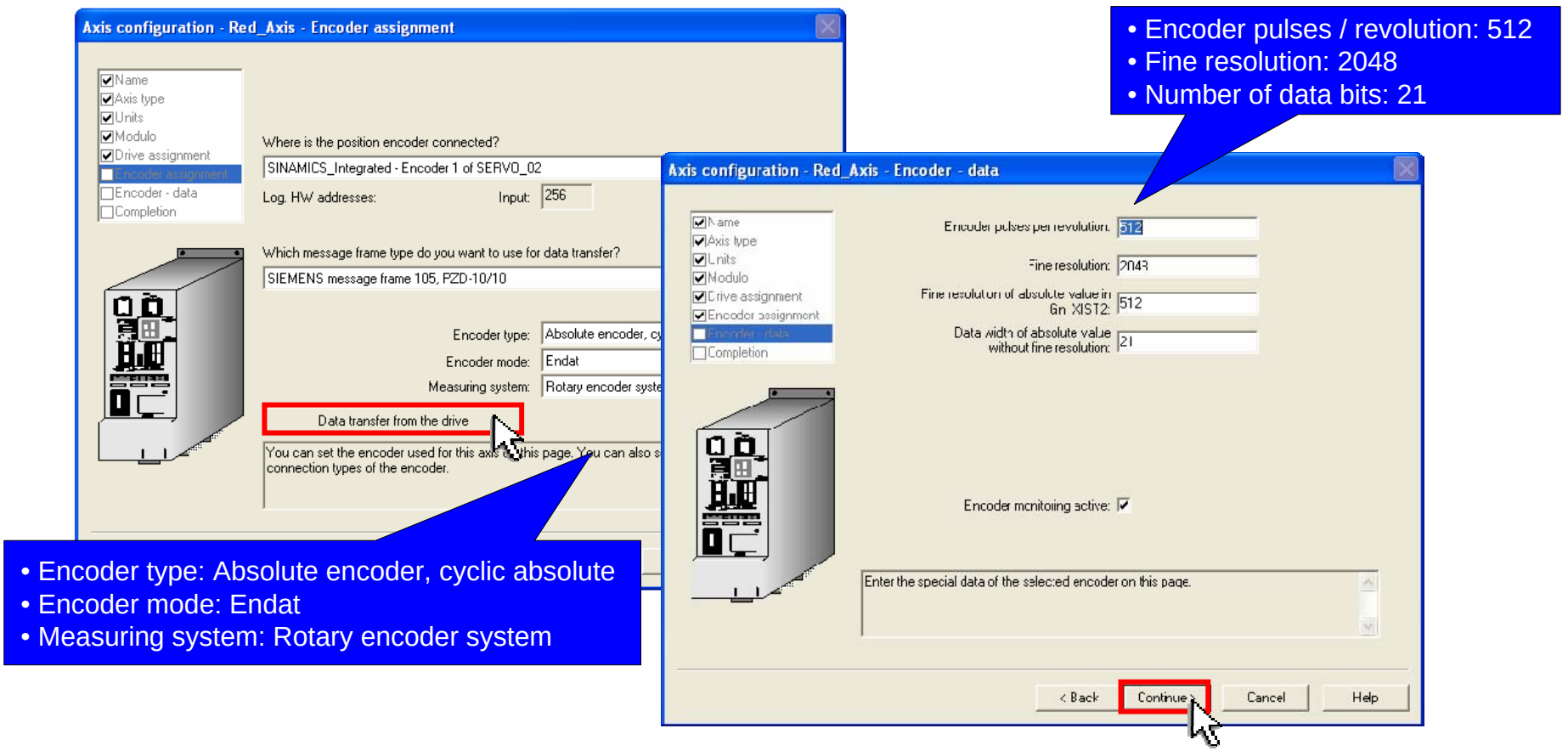
Configure “Red_Axis“

- Select drive unit SINAMICS_Integrated (1) and select drive SERVO_02 (2)
- Check message frame type (message frame 105)
- Click “Data transfer from the drive” (3)



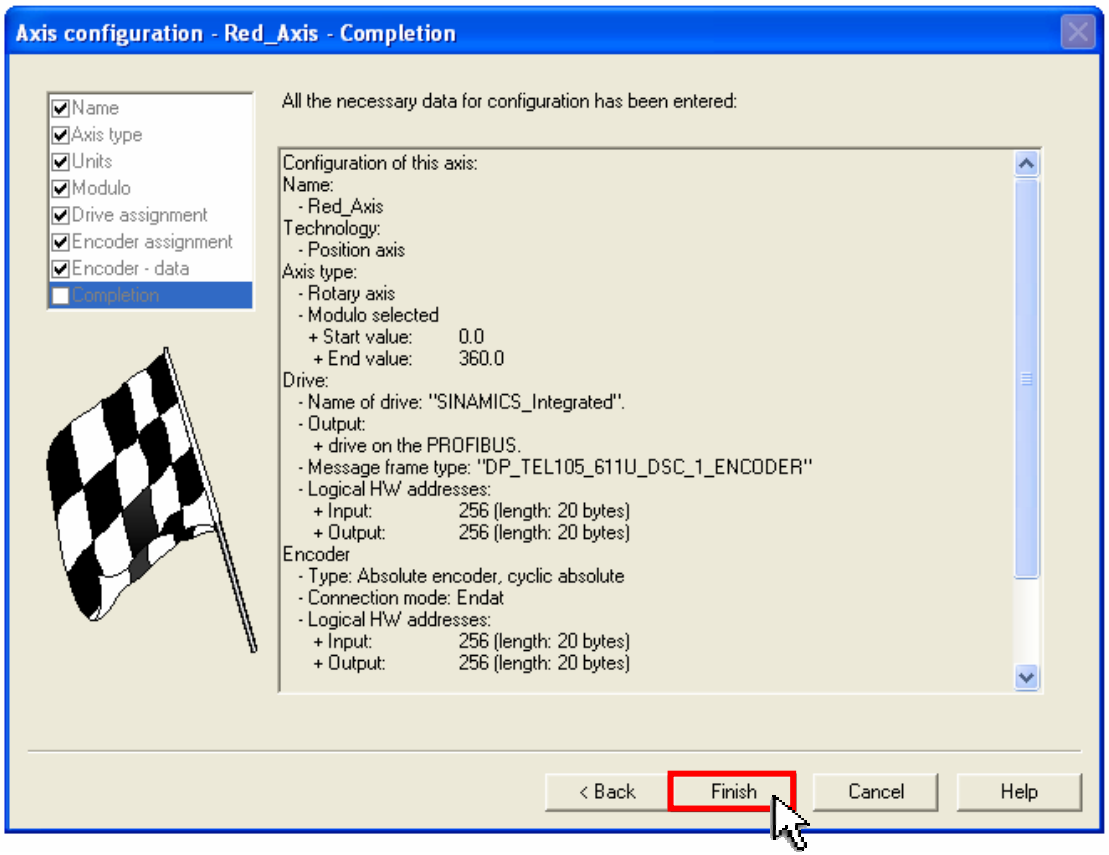
Configure “Red_Axis“

- Click “Data transfer from the drive” and control encoder properties



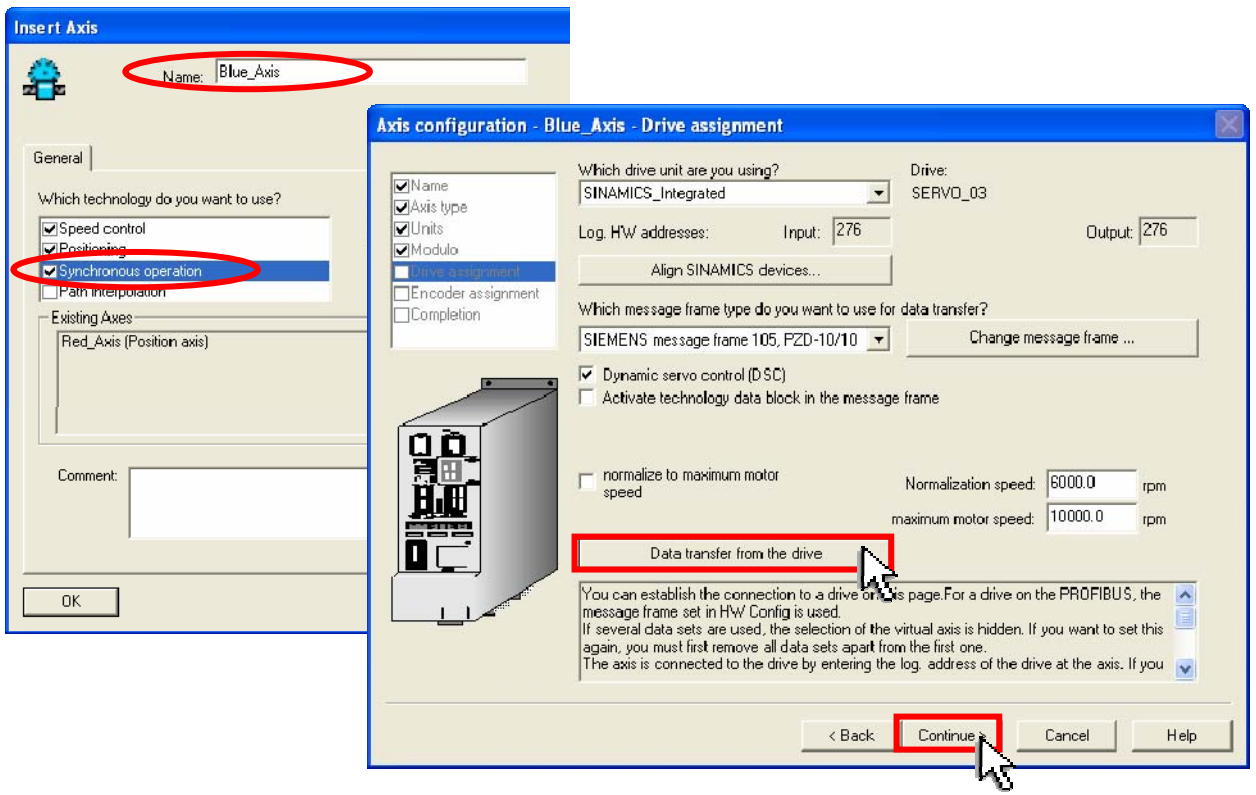
Configure “Red_Axis“

- Summary of axis configuration



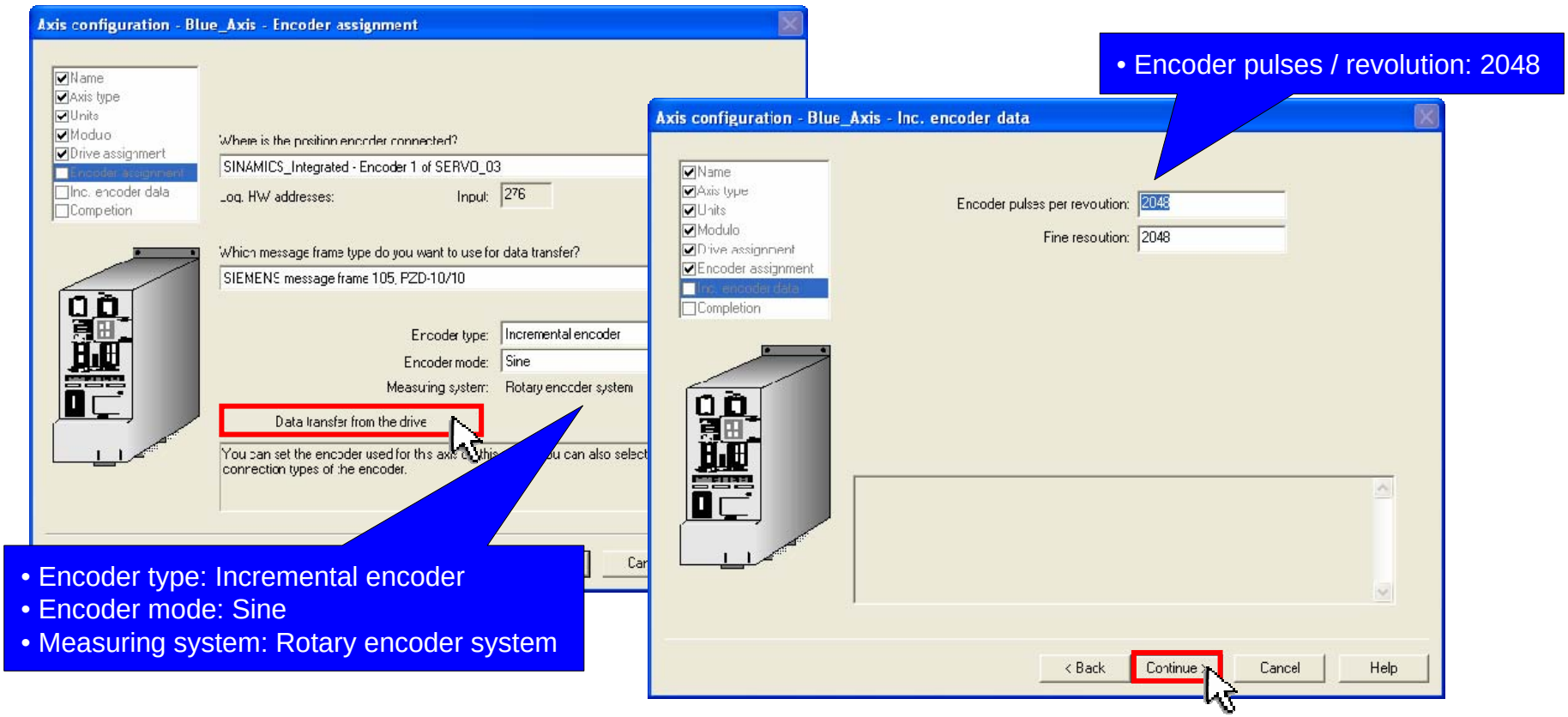
Configure the second axis : “Blue_Axis”

- The configuration of the second axis is similar to the first one (“Red_Axis”).
  - click “Insert axis” and give axis name : “Blue_Axis”
  - select technology: “Synchronous operation”
  - select axis type: rotary and modulo axis with 360 degrees modulo length



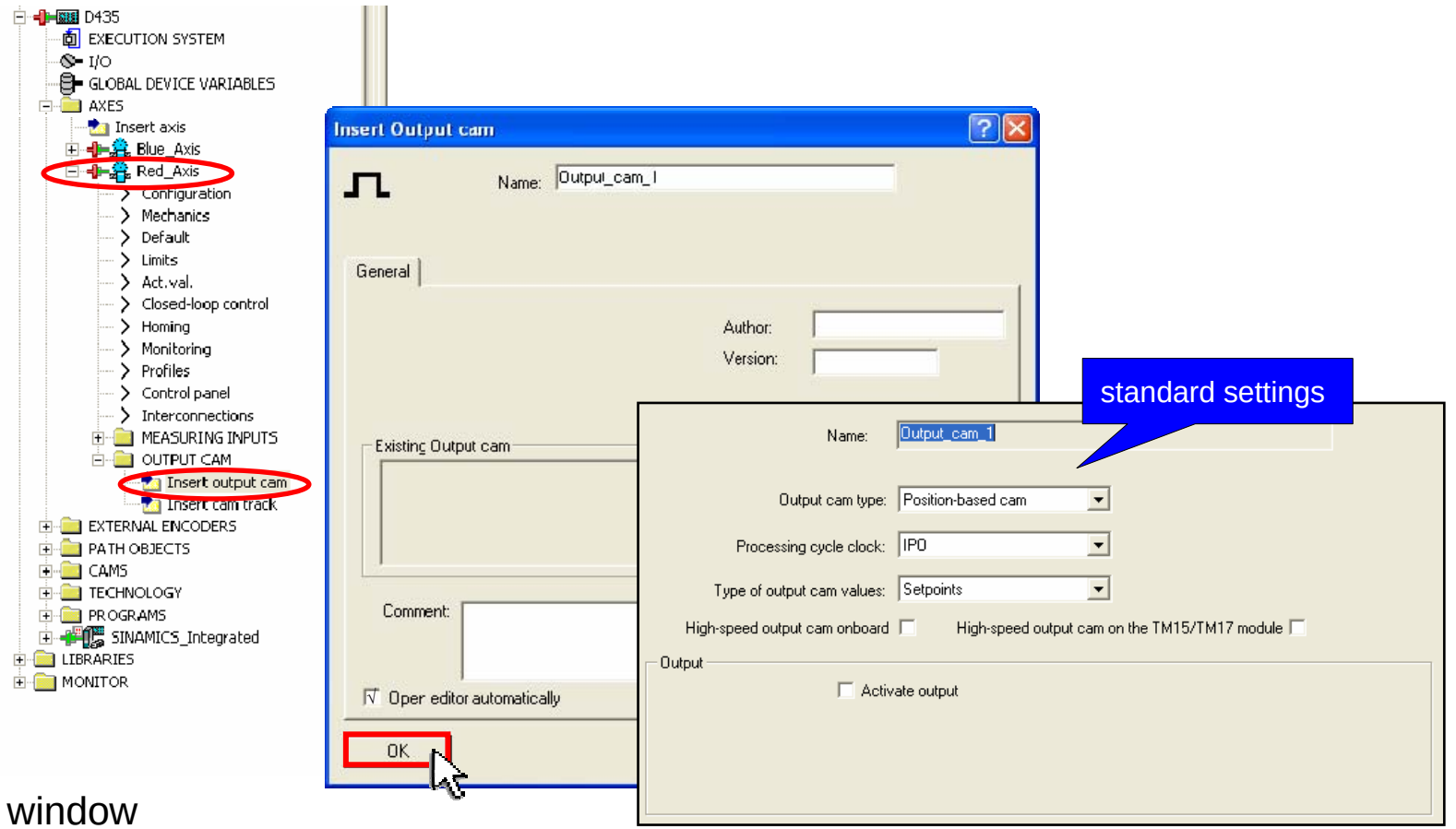
Configure “Blue_Axis”

- Click “Data transfer from the drive” and control encoder properties.



Add Output cam for “Red_Axis“

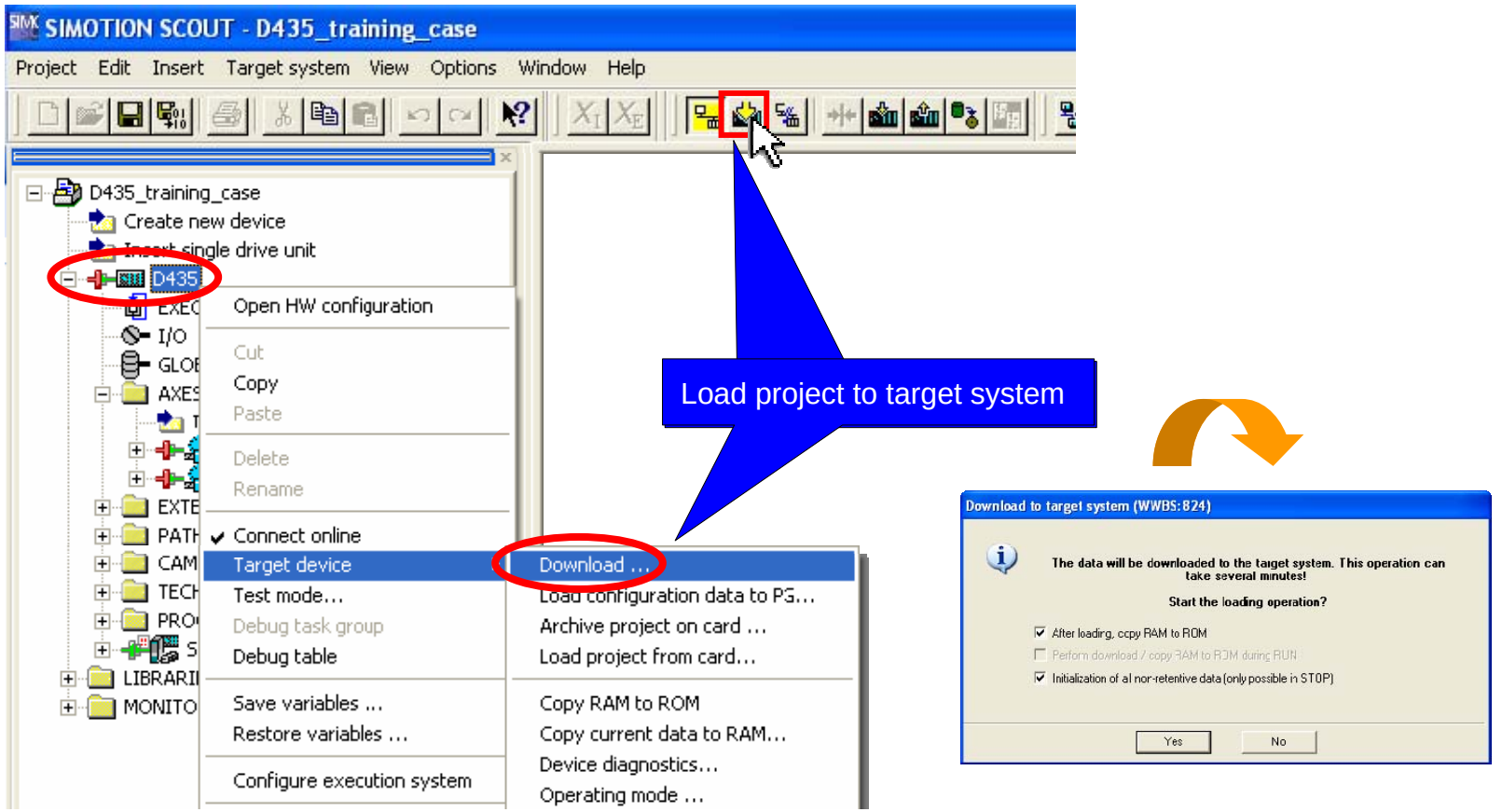
- Insert output cam



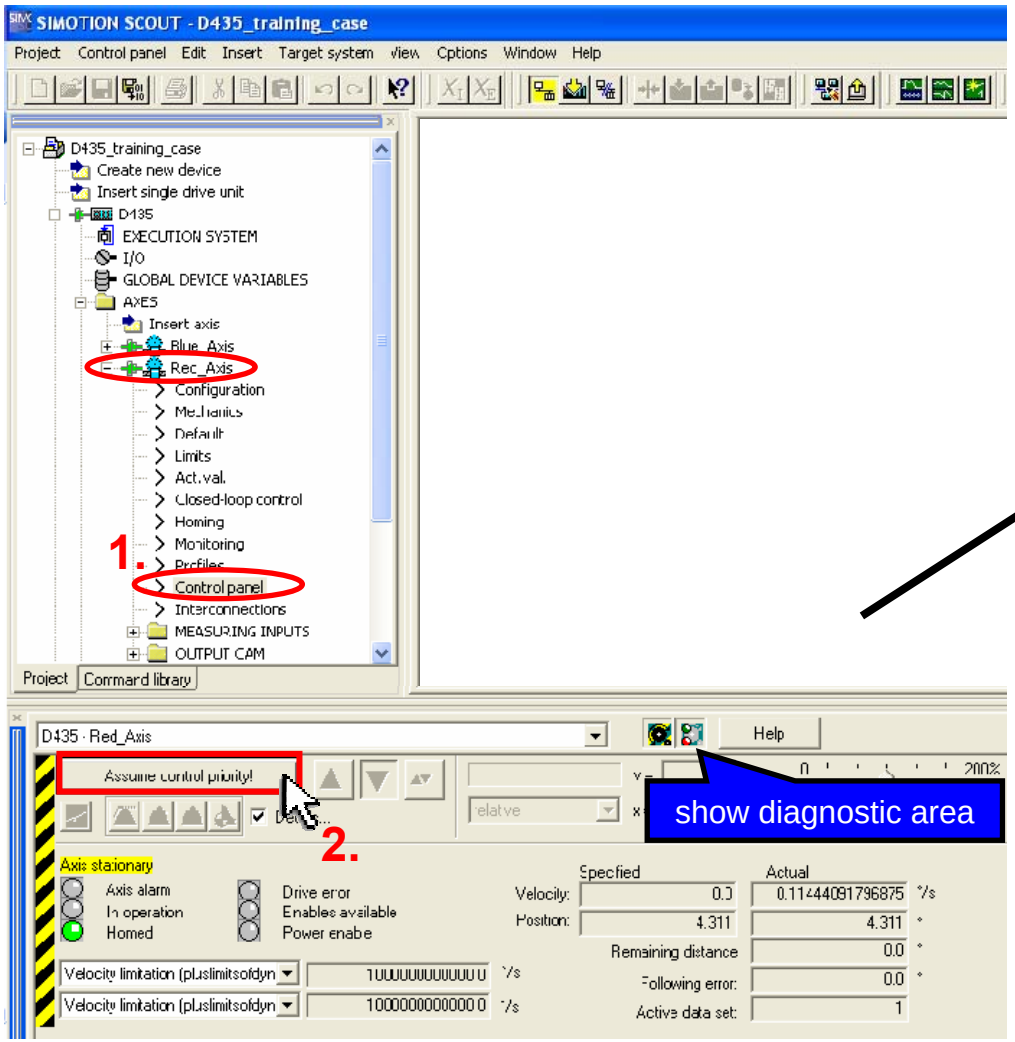
- Close window

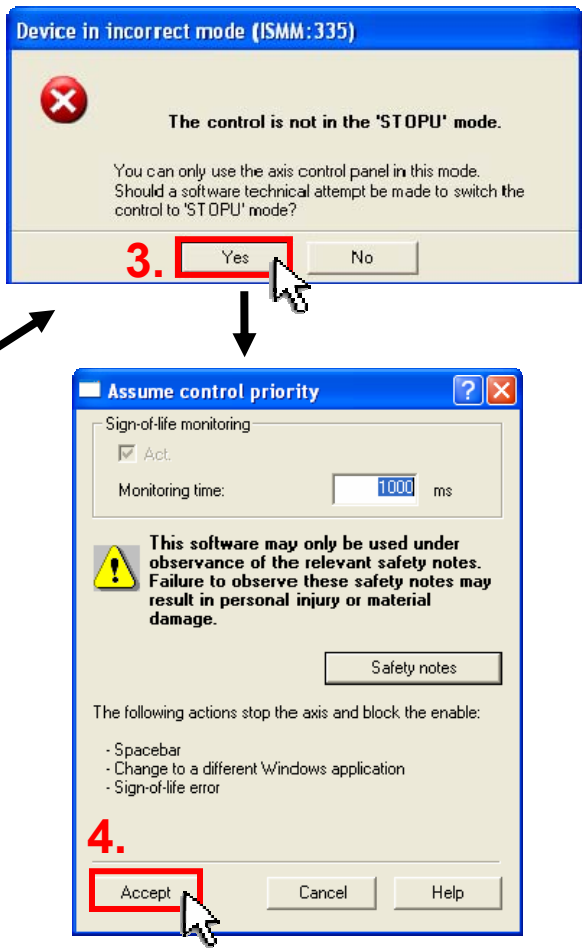
Download data to target device

- Download SIMOTION D435 project to target device
  (The 1st download (incl. TPCAM) takes longer.)

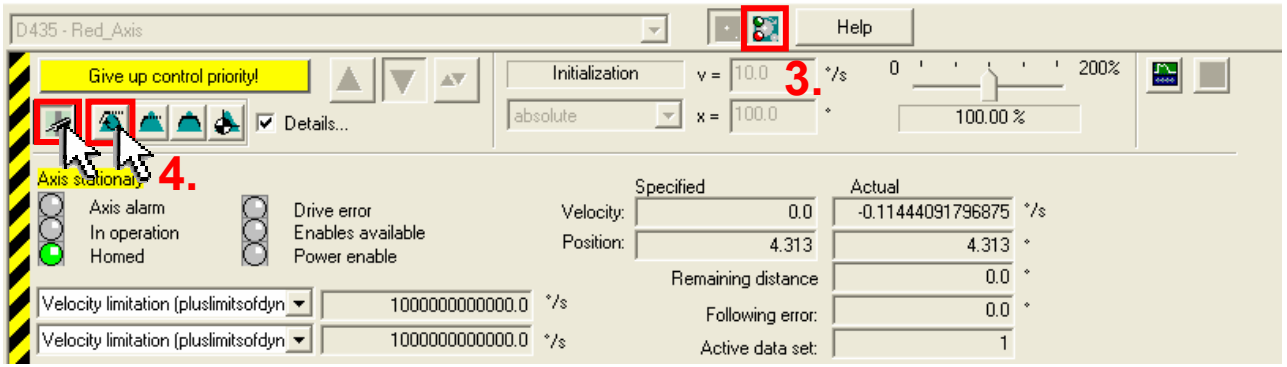


Operate “Red_Axis” with SIMOTION control panel

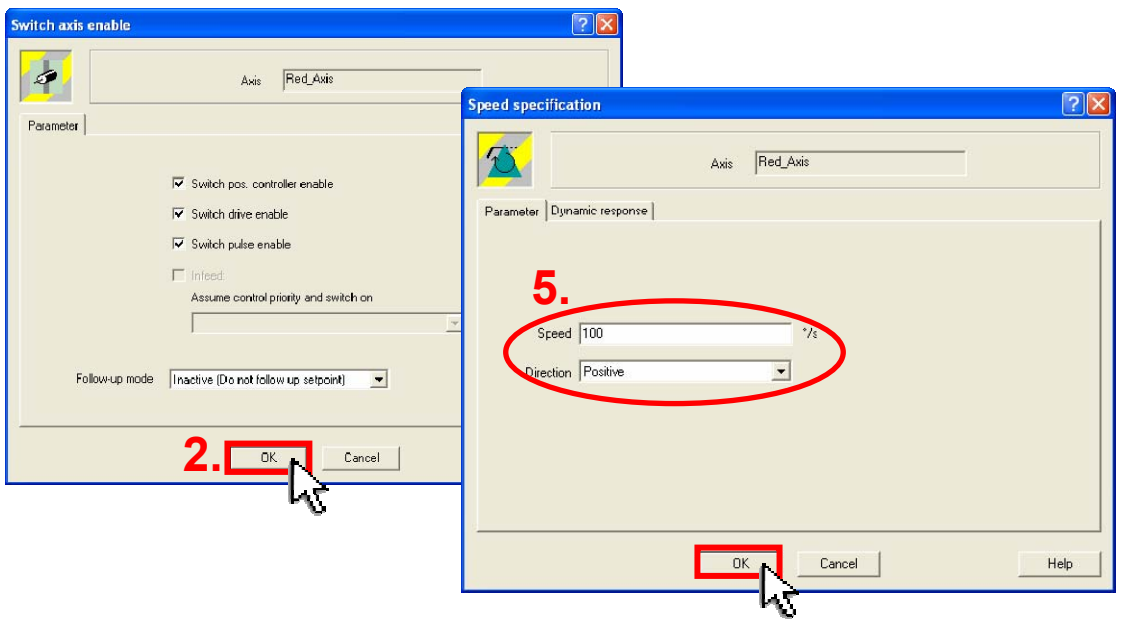


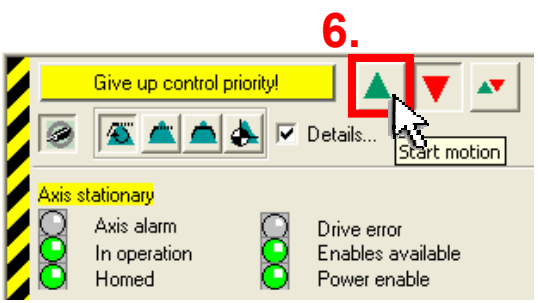


Start “Red_Axis” with SIMOTION control panel



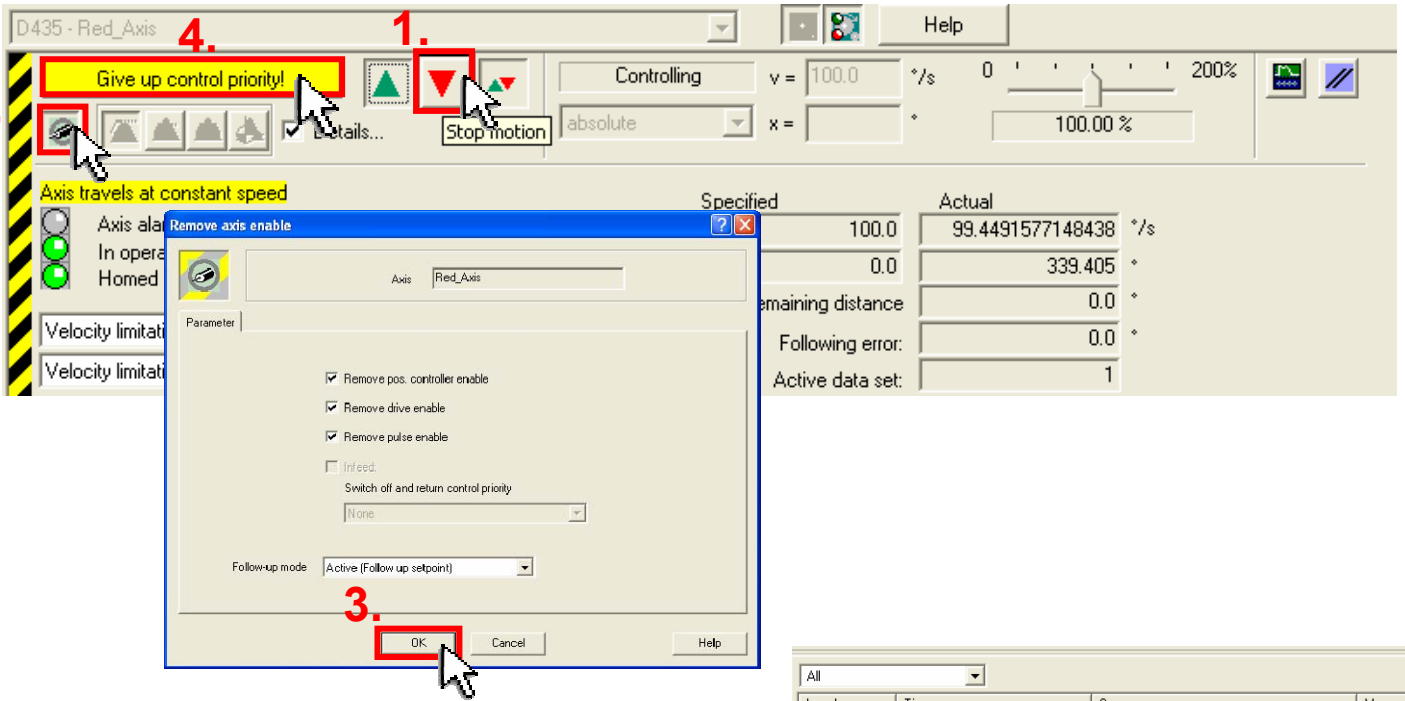
1. Set enables
2. Acknowledge with OK
3. Show Diagnostics
4. Select speed-controlled traversing of the axis
5. Enter desired speed and desired direction
6. Start motion

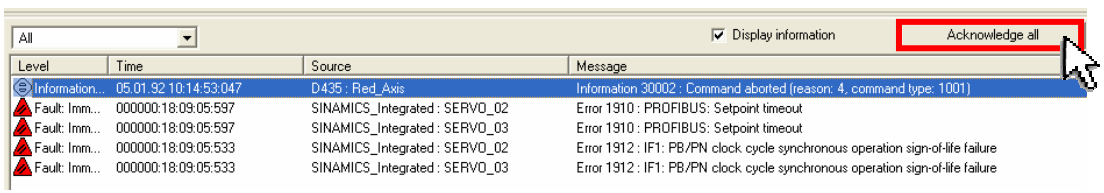




“Red_Axis“ is in Operation

Stop “Red_Axis” with SIMOTION control panel



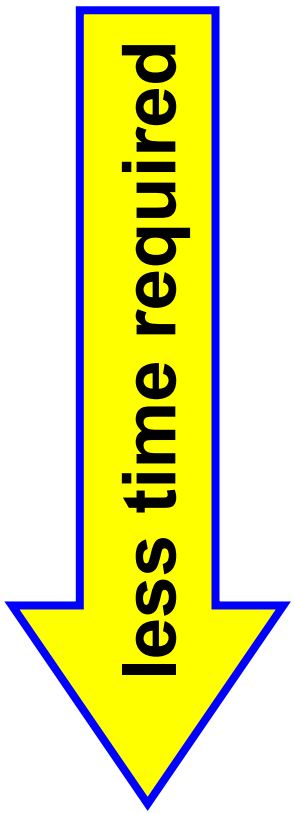


1. Stop motion
2. Remove enables
3. Acknowledge with OK → Error occurs (no PLC control) → Acknowledge Alarm
4. Give up control priority

Note: Now you can operate the Blue_Axis in the same way. Remember that the DI 4 has to be turned on.

Programming

For the next steps there are three possibilities:



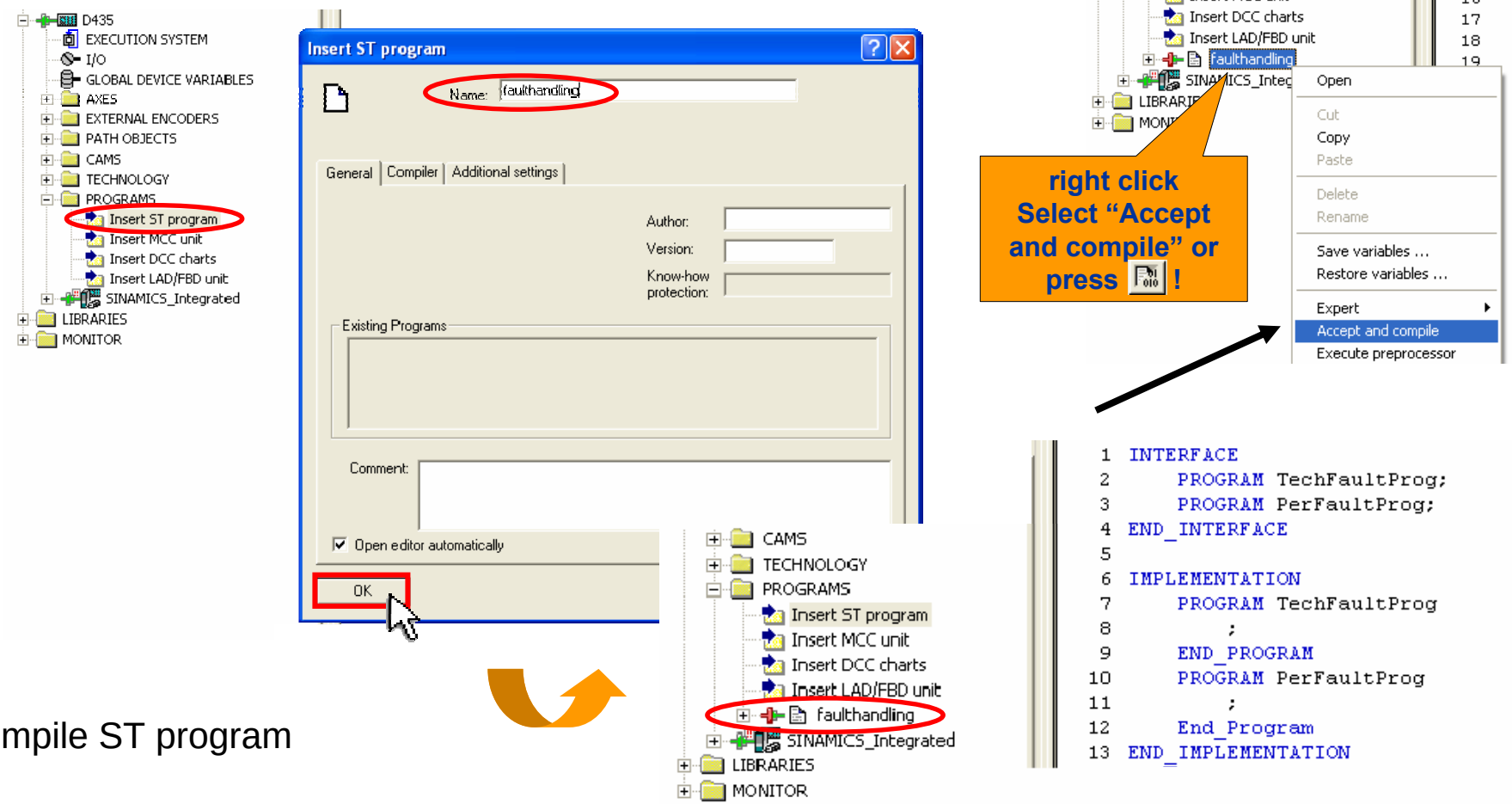
1. **Programming yourself**
   Follow the instructions how to program SIMOTION
   (needs time for writing the programs)

2. **Use your own project but copy programs from demo project**
   Start another SCOUT instance (open SCOUT a second time)
   Open the demo project with the second SCOUT
   Copy the required programs from the demo project to your own project
   (change names, if you are using other names for axes, ...)

3. **Use demo project**
   Open the demo project and just follow the next steps with the demo project

Fault Handling

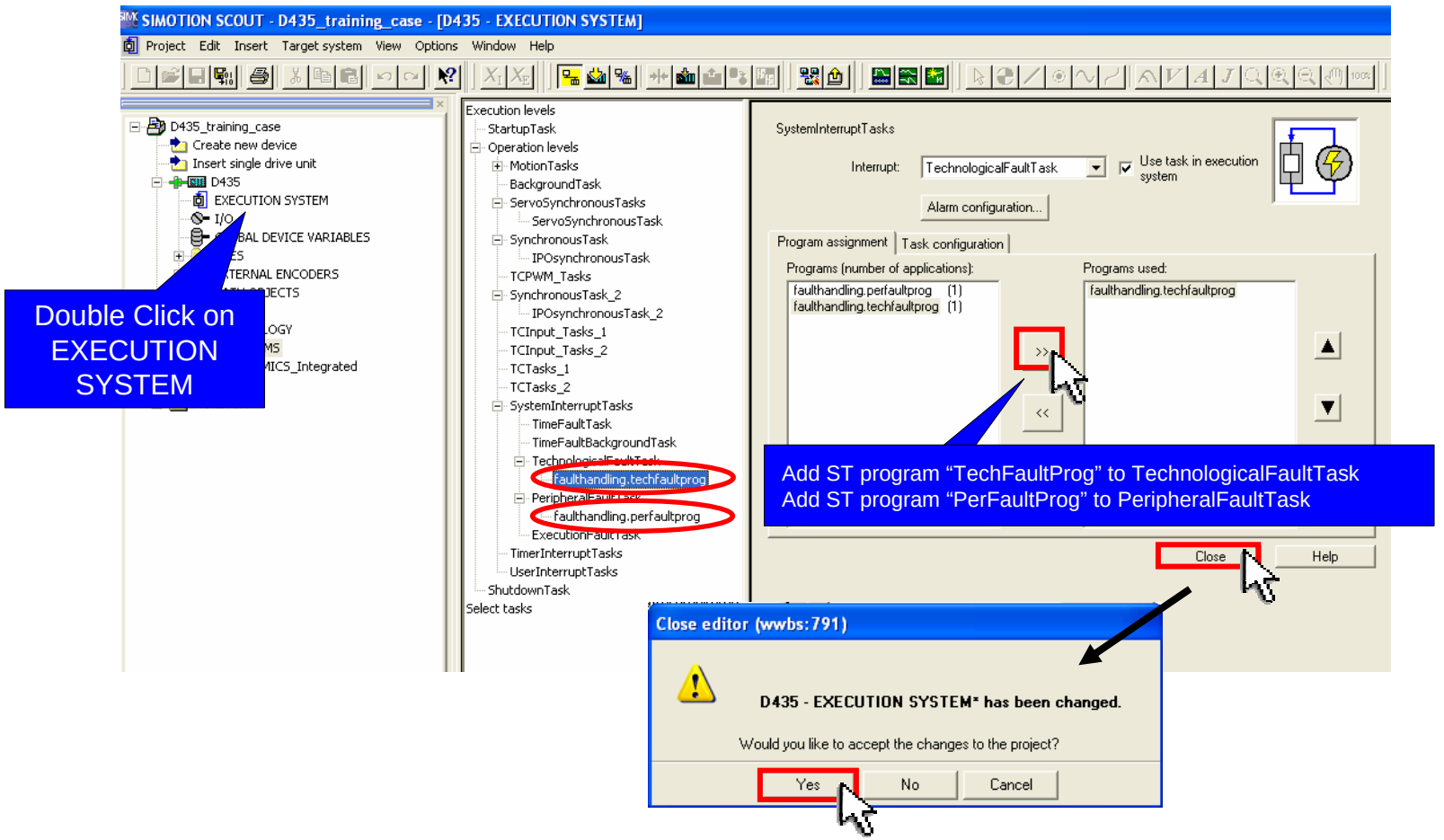
- Insert ST program “faulthandling” and write program



- compile ST program

Fault Handling

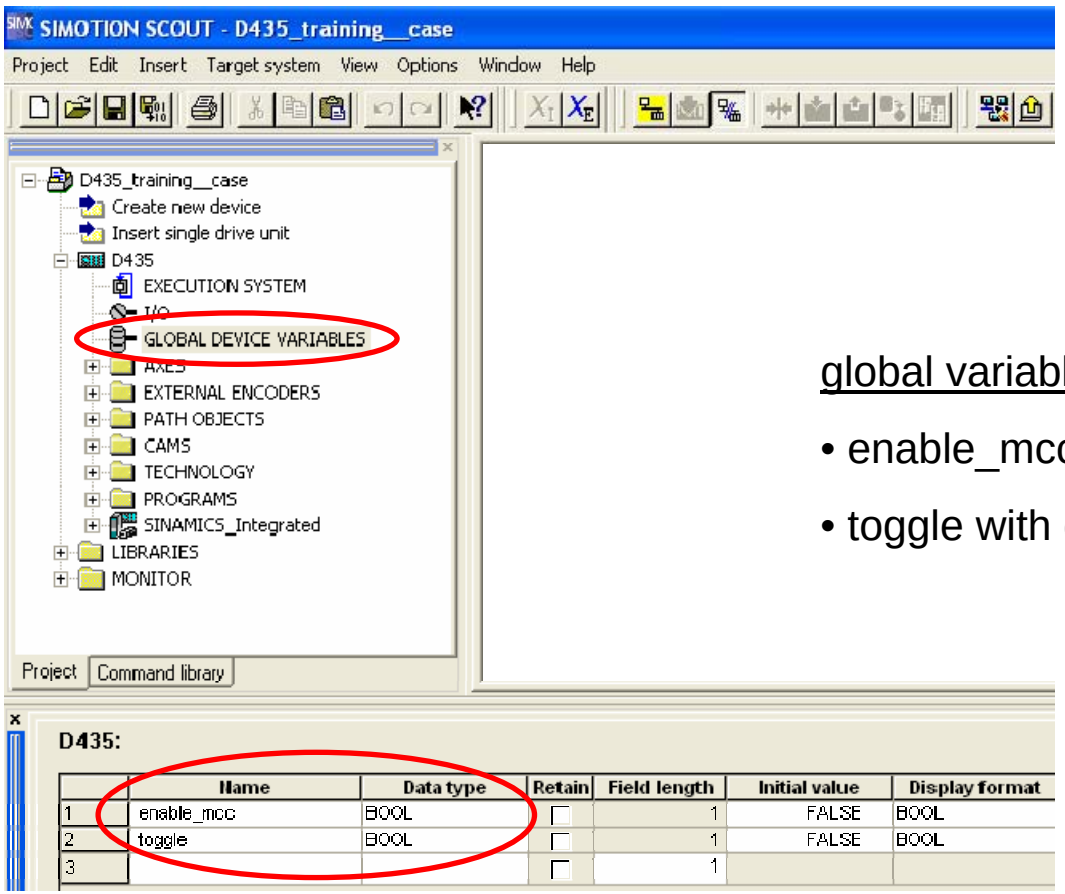
- Open EXECUTION SYSTEM and add ST program to SystemInterruptTask → FaultTasks



Create global device variables

- Disconnect from target system

- Open global device variables and create the variables “enable_mcc” and “toggle”

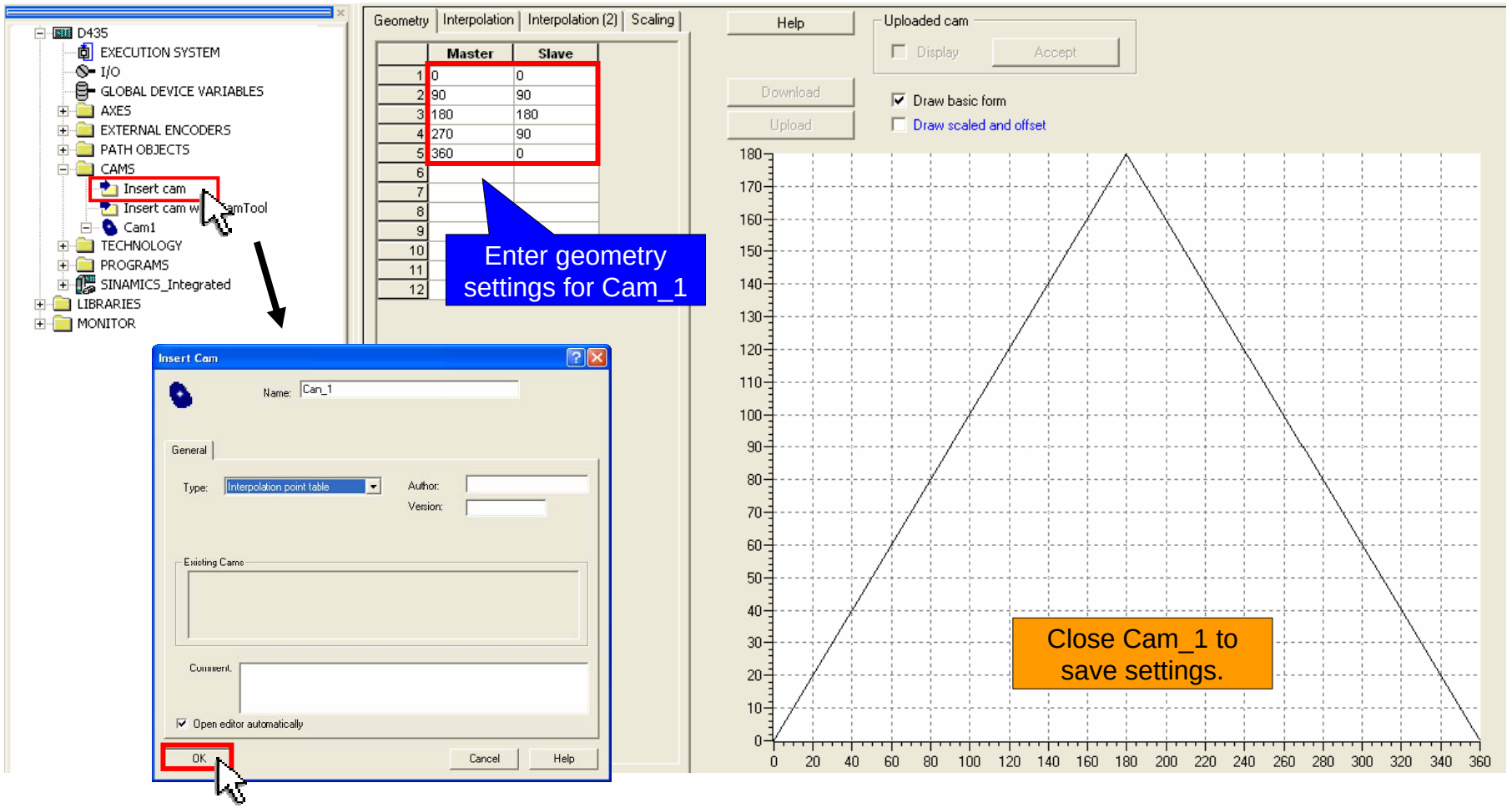


global variables

- enable_mcc with data type: bool
- toggle with data type: bool

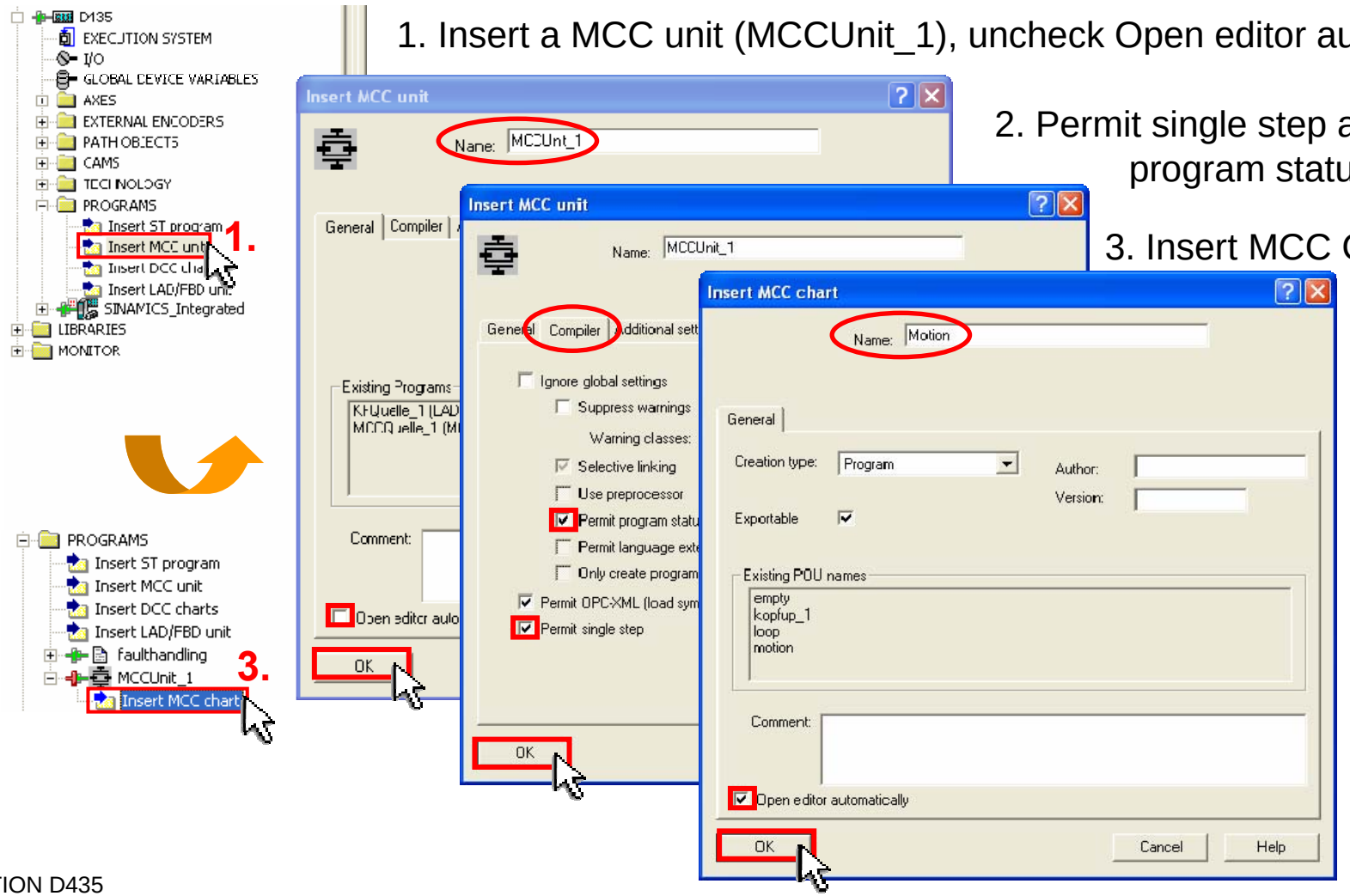
Insert CAM

- Insert cam for MCC program



Operate SIMOTION through a program

- Insert MCC unit

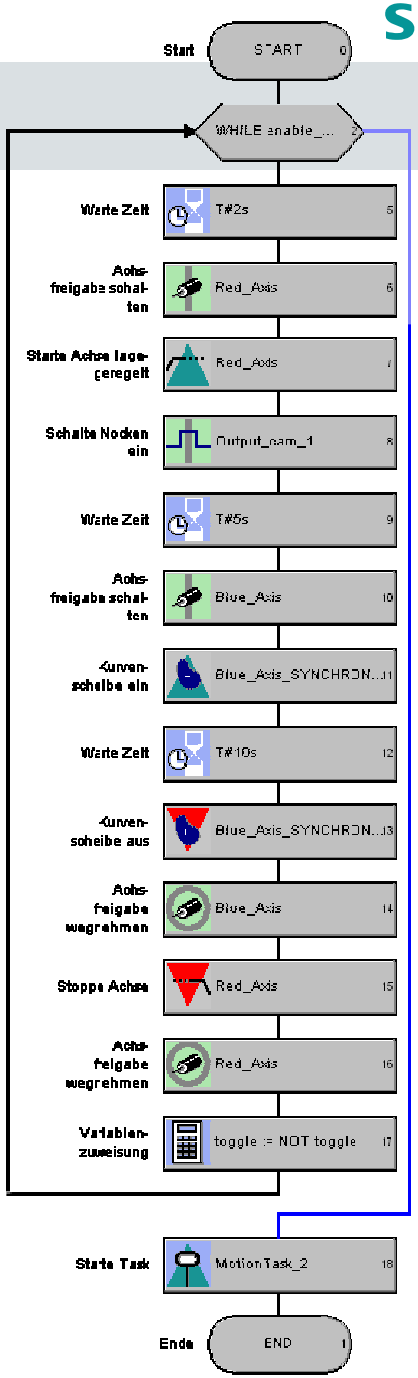


Operate SIMOTION through a program

- Construct the shown flow chart (program “Motion”)
  - While variable “enable_mcc” = true start MCC
  - Wait 2 seconds
  - Switch Red_Axis enable
  - Start Red_Axis position-controlled, velocity 200°/s
  - Switch output cam on Red Axis (switch between 10° – 20°)
  - Wait 5 seconds
  - Switch Blue_Axis enable
  - "Cam on" with Blue_Axis and 180° synchronization length
  - Wait 10 seconds
  - "Cam off" with Blue_Axis and 180° desynchronization length
  - Disable Blue_Axis
  - Stop Red_Axis
  - Disable Red_Axis
  - Set variable toggle
  - Start Motion Task_2

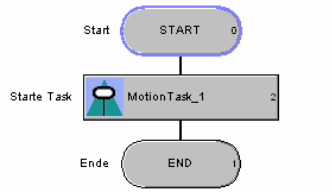
Use standard settings, change only specified values.

Save and compile.

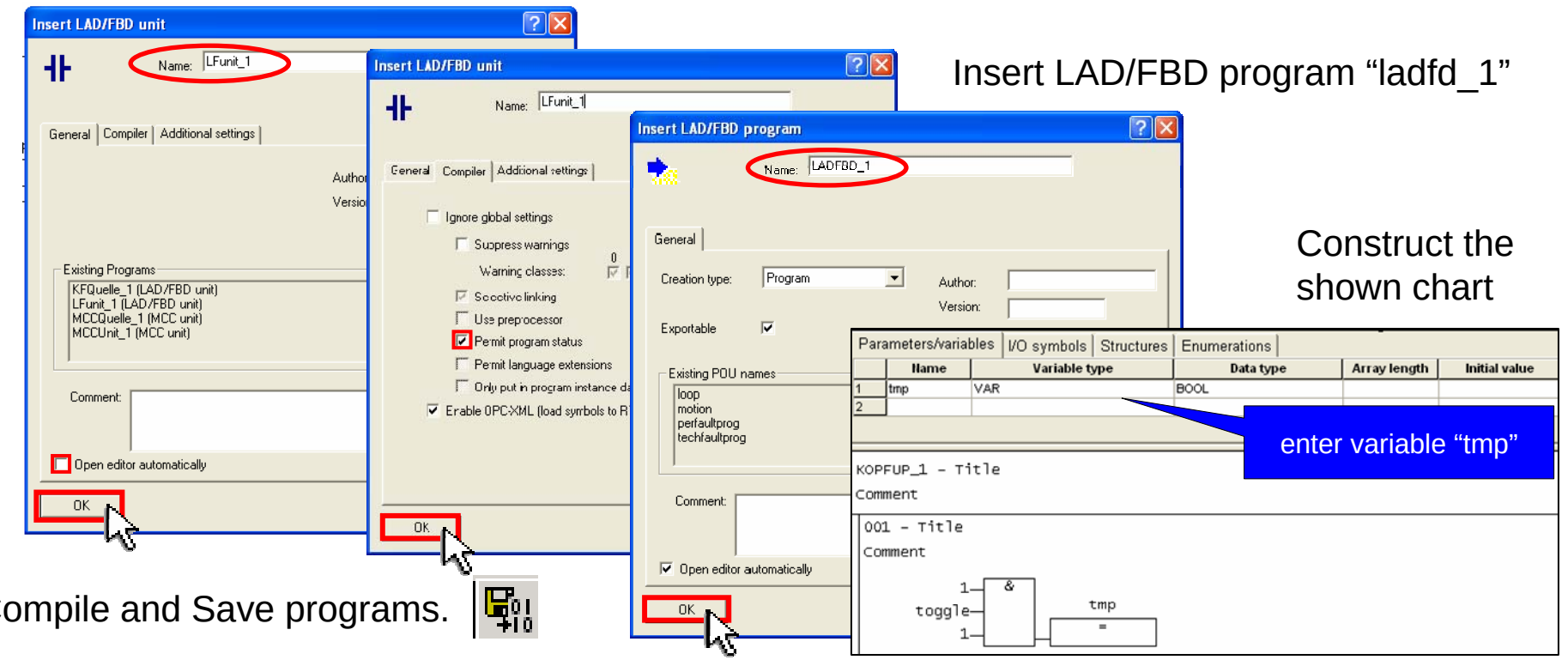


Operate SIMOTION through a program

- Insert new MCC Chart and Construct the shown flow chart (program “loop”)
  - Start Motion Task_1



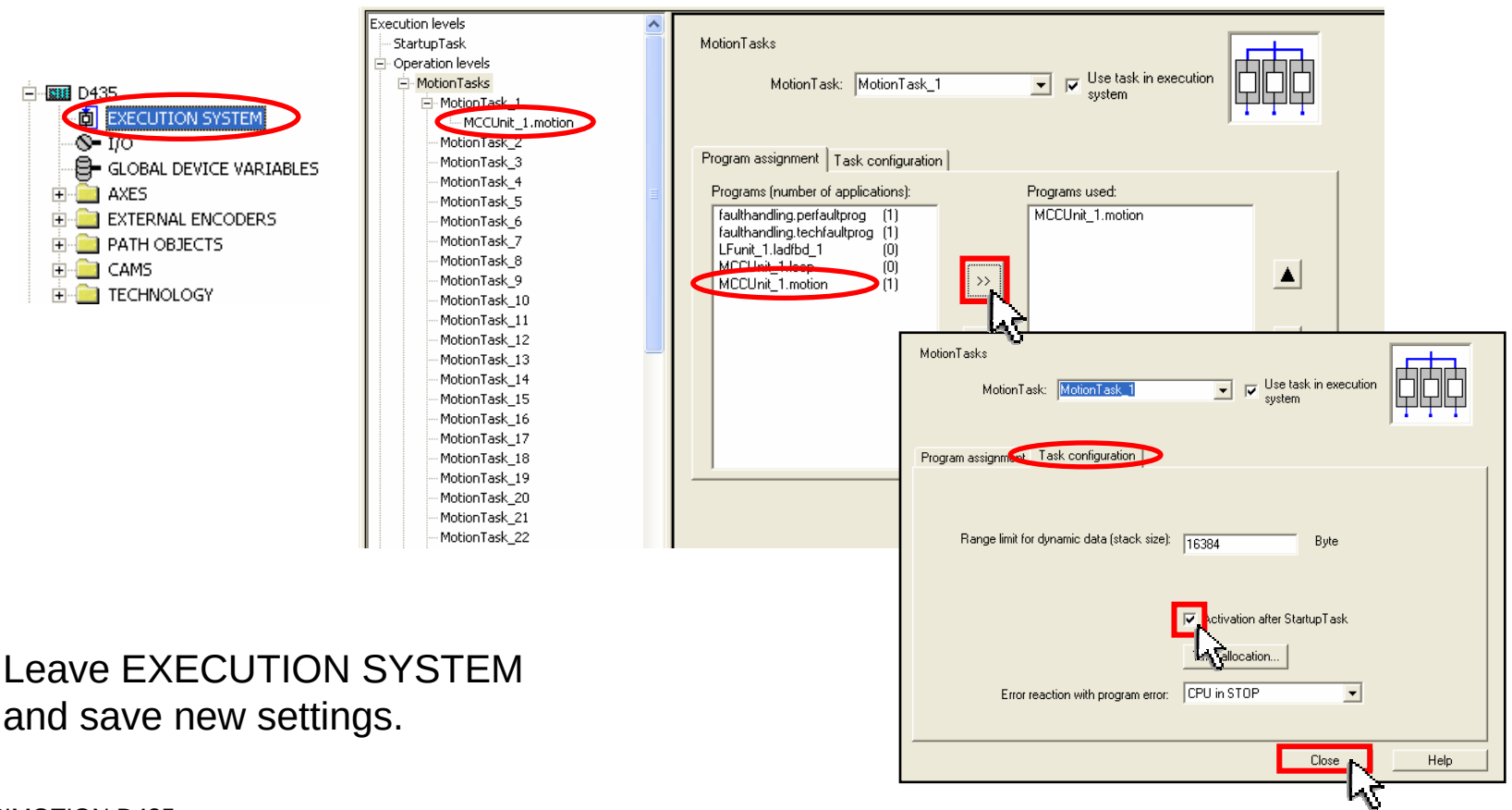
- Insert LAD/FBD unit “LFunit_1”, insert LAD/FBD program and permit program status



- Compile and Save programs.

Operate SIMOTION through a program

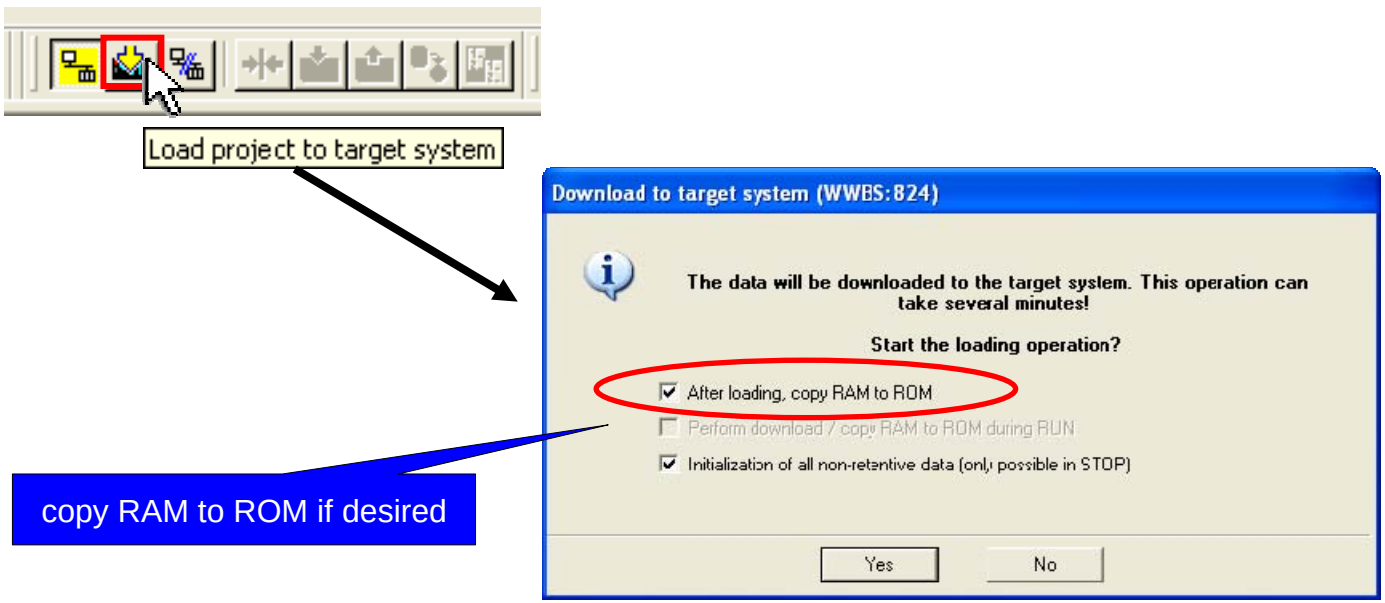
- Open execution system
- Assign program “Motion” to Motion Task 1 and “Loop” to Motion Task 2
- In task configuration, check “Activation after Startup task” for Motion Task 1
- Assign program “LFunit_1” to BackgroundTask



- Leave EXECUTION SYSTEM and save new settings.

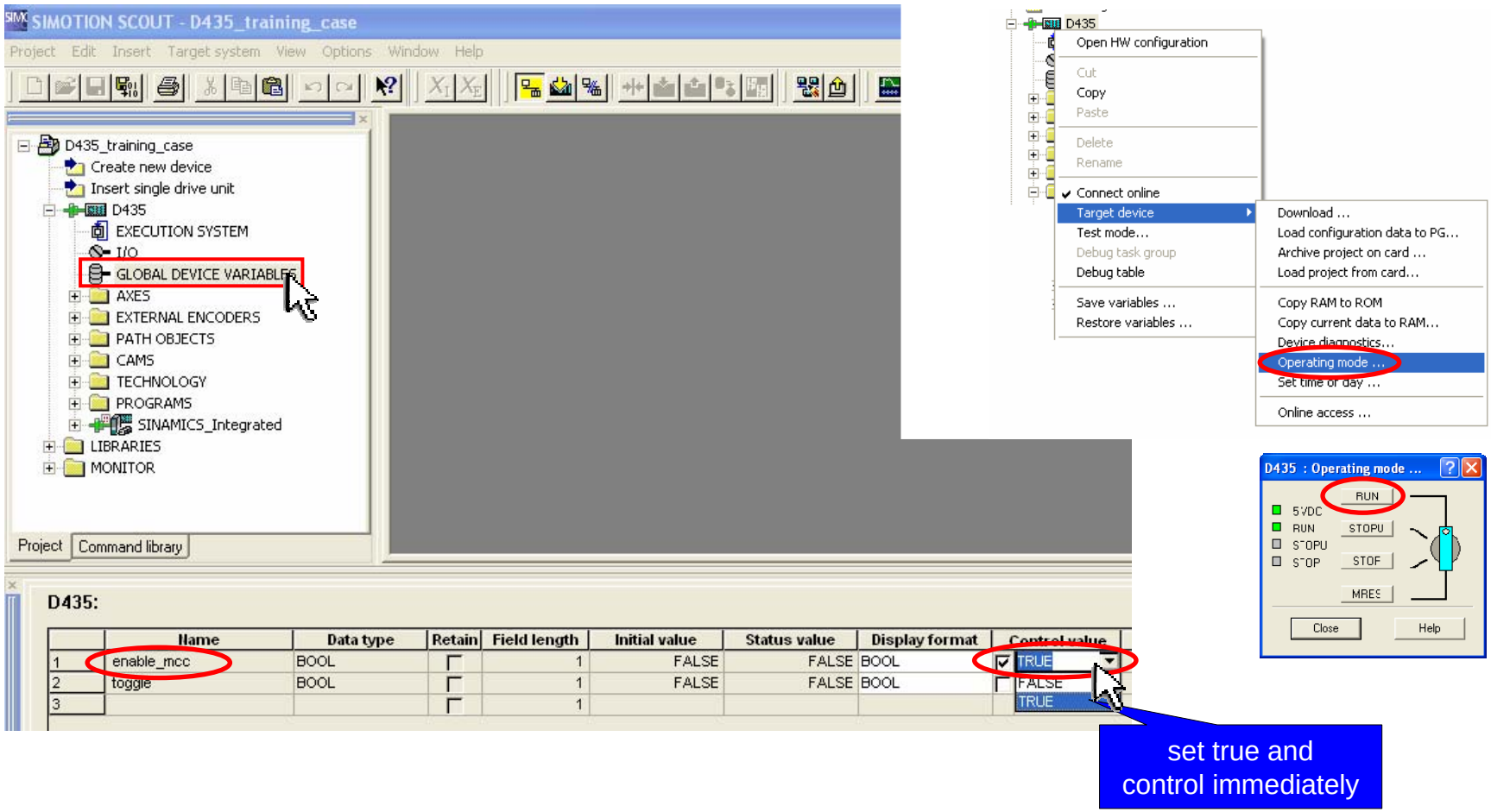
Download SIMOTION program to target system

- Save settings and compile 
- Connect to target system 
- Download SIMOTION D435 project to target device



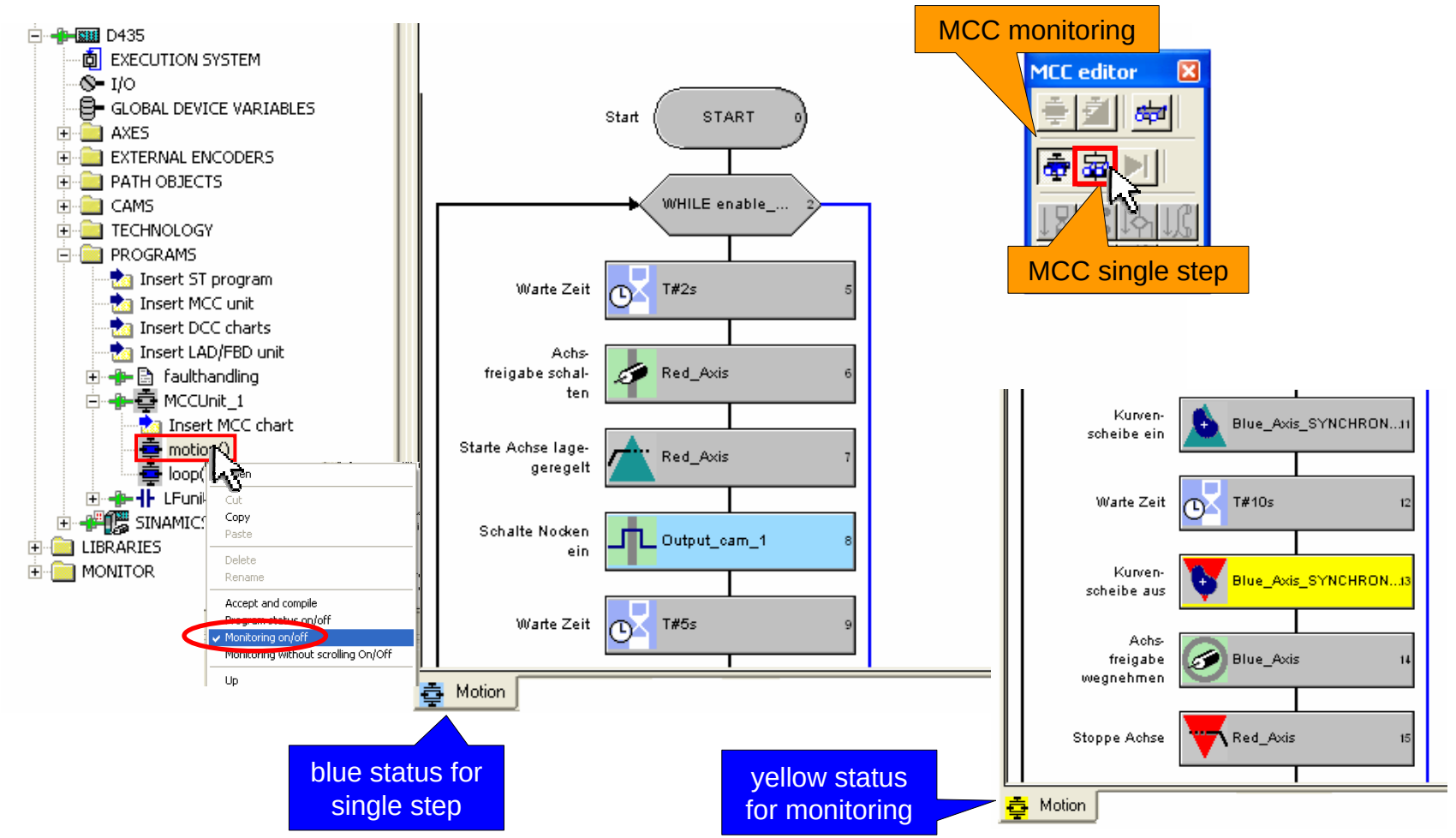
Start SIMOTION MCC program via global variable

- Open “Global Device Variables” and control variable “enable_mcc” = true to start MCC Chart



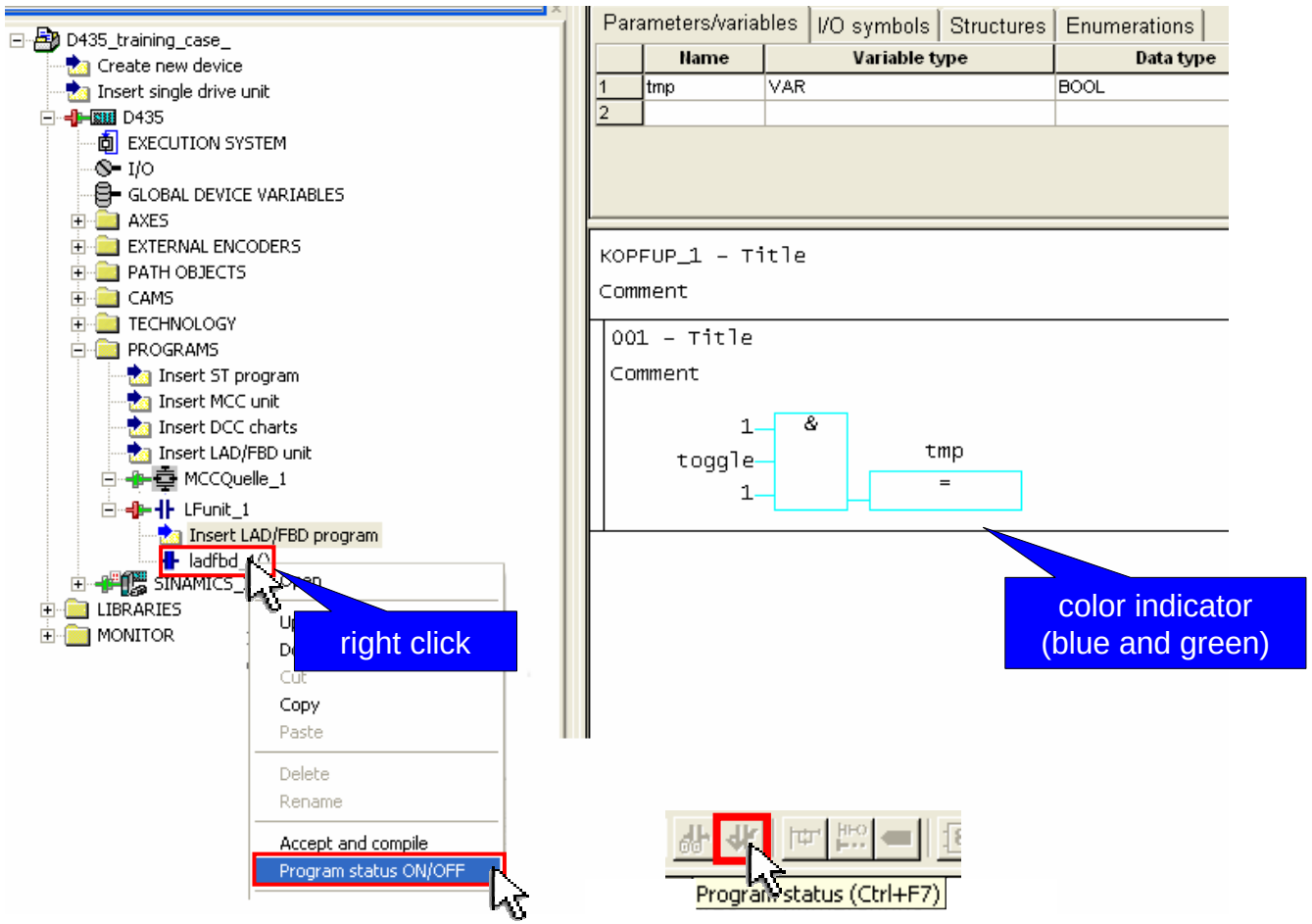
Monitoring SIMOTION MCC chart

- Enable Monitoring on/off for MCC



Monitoring SIMOTION LAD/FBD unit

- Enable Program status ON/OFF



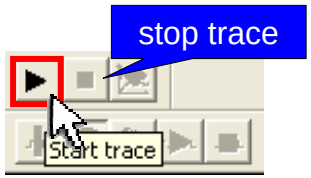
Trace online signals

- Open Trace / function generator

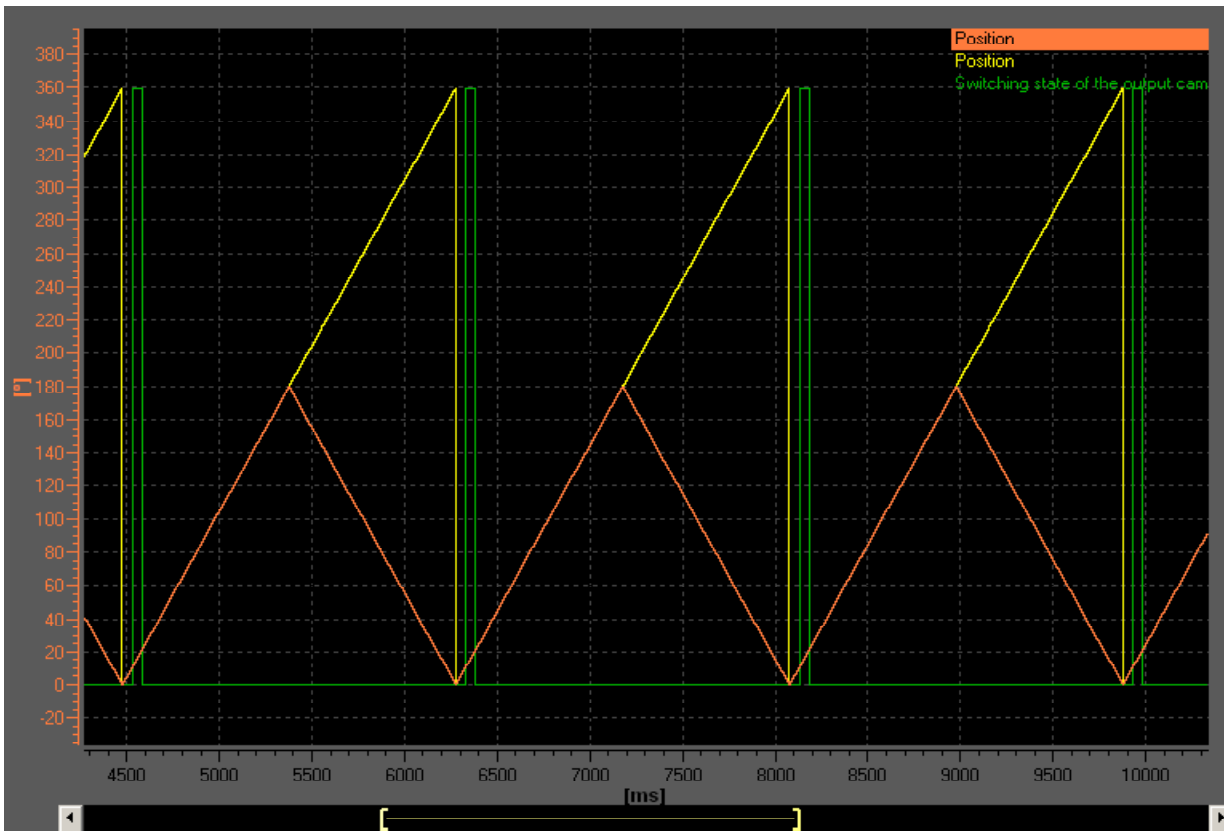
- Select D435, select signals

Trace online signals

- Start trace

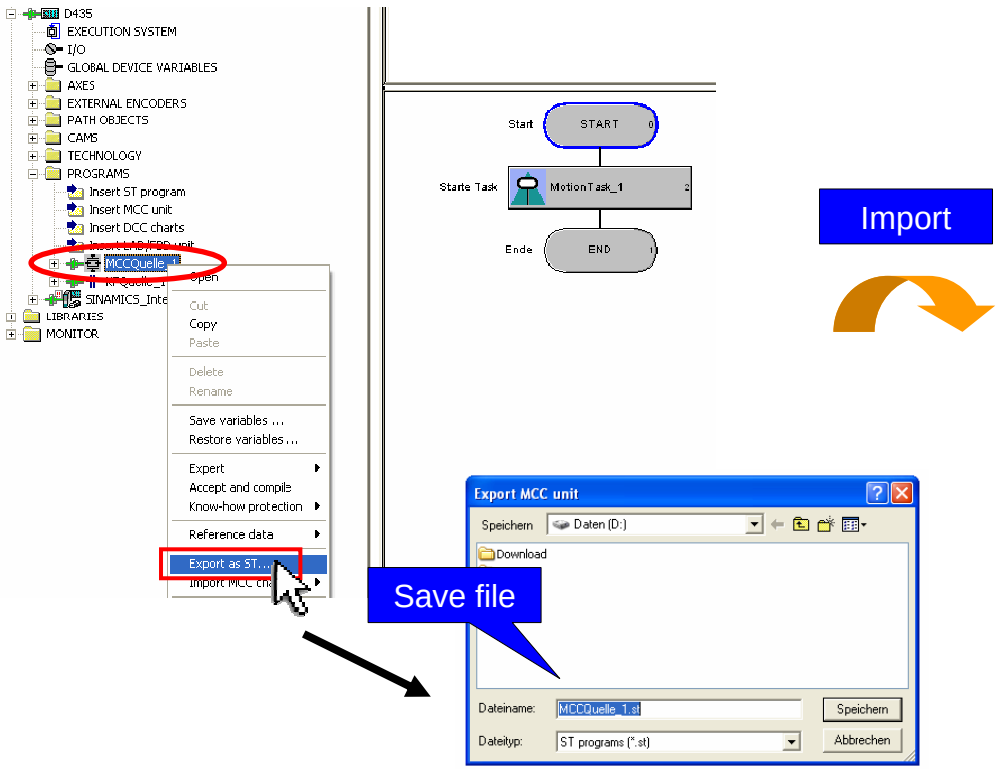


- Time diagram for position of both axes and output cam state

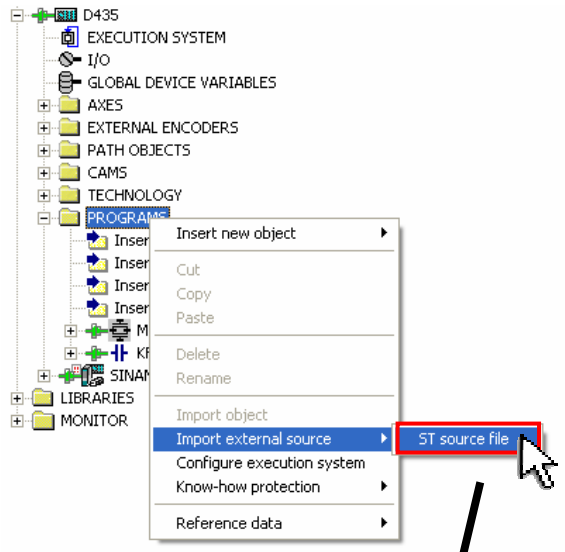


Save MCC as ST and Import ST

- Export MCC Chart as ST source and Import



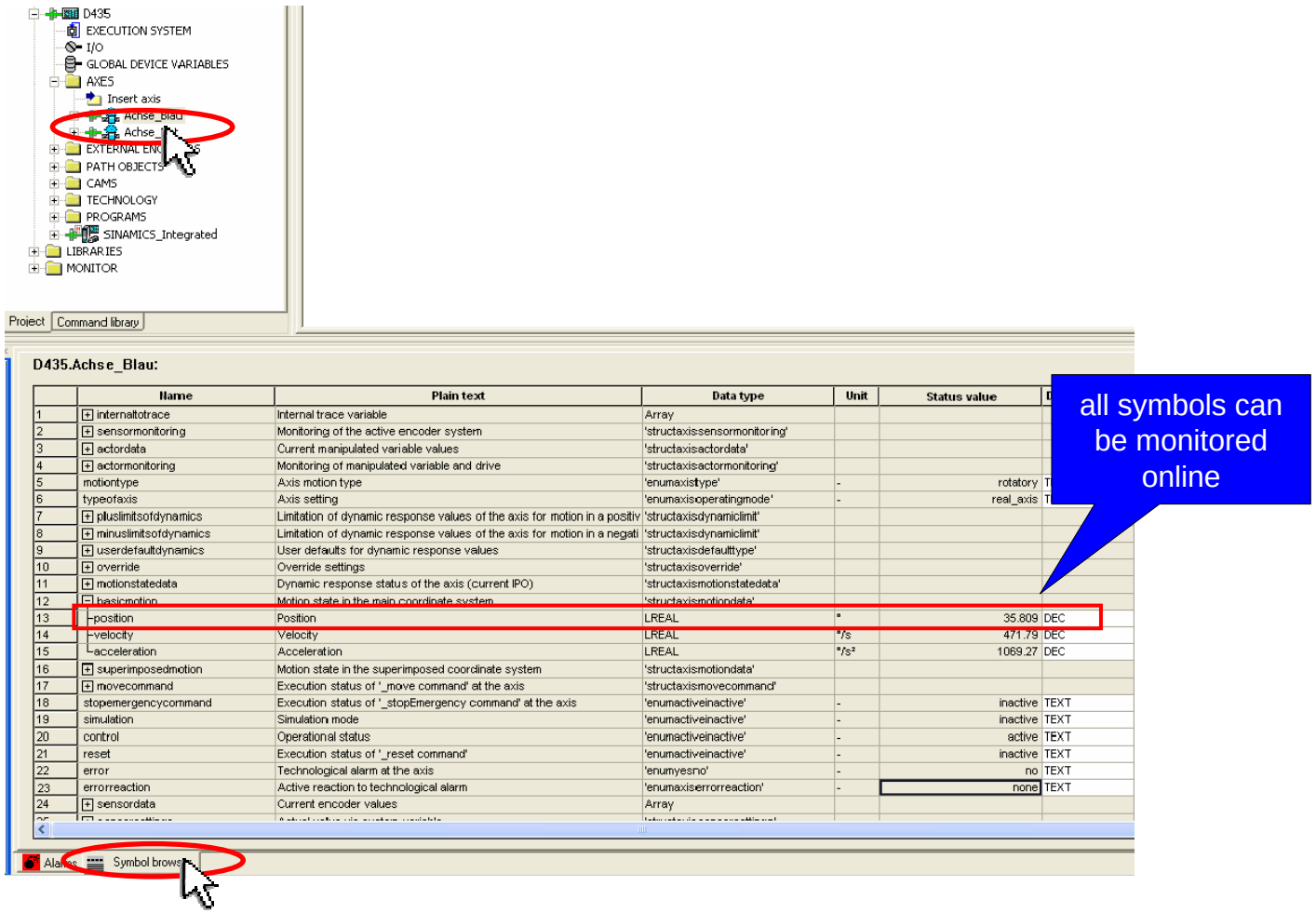
Import



MCC Chart "Loop" as ST Source

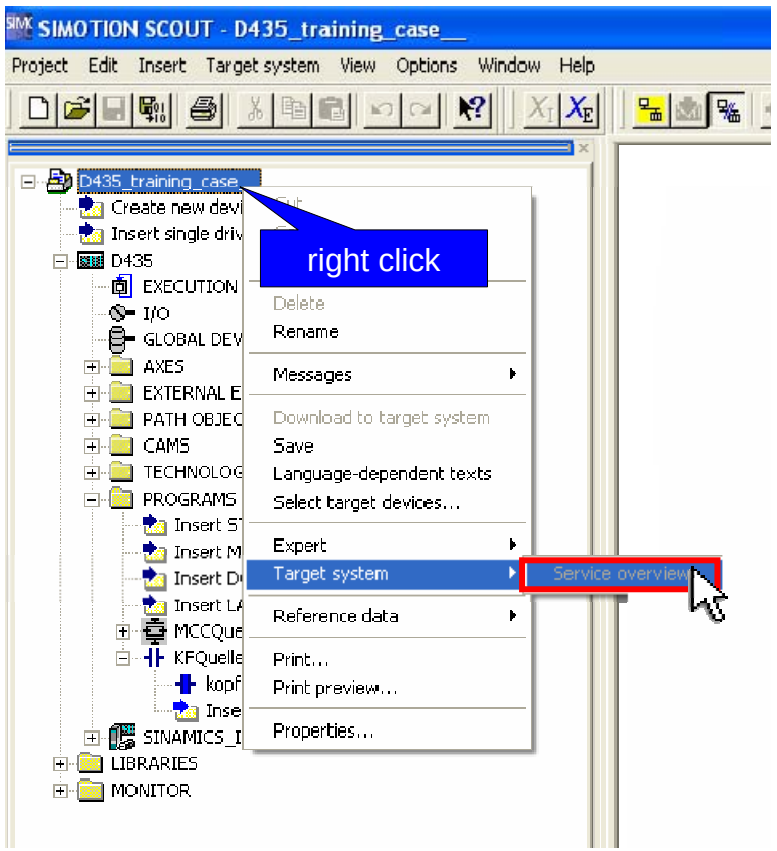
Symbol browser

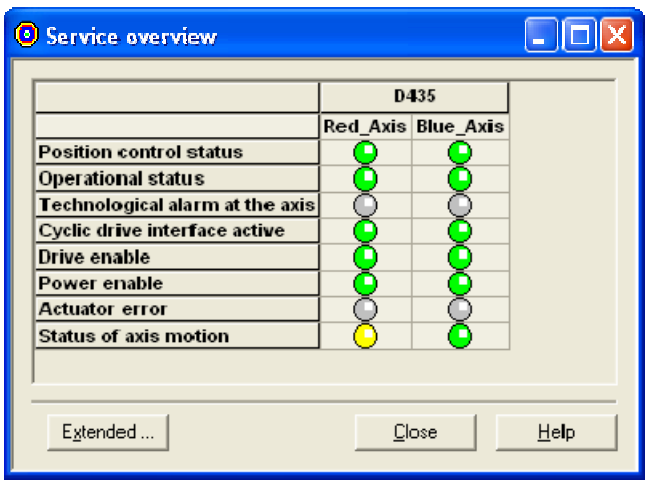
- Control system variables at symbol browser → e.g. select symbol browser and then the axis



Service overview

- The axis status could be observed by right clicking on project name, selecting Target system.

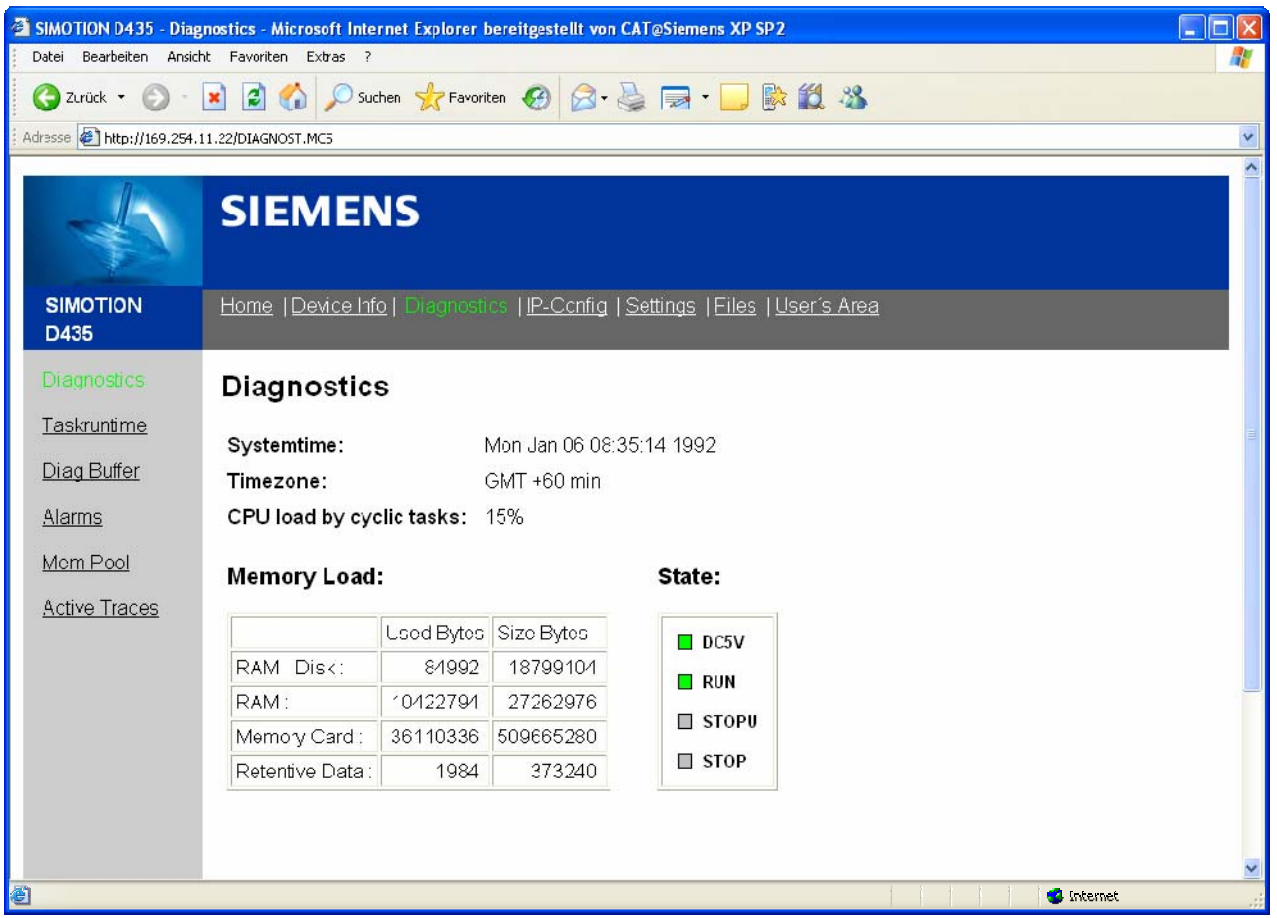




IT DIAG – integrated SIMOTION Diagnostics

- Enter SIMOTION IP Address in Webbrowser (e.g. http://169.254.11.22)

NOTE: It might be necessary to disable the “automatic configuration script" first



SIEMENS