SIEMENS

Getting Started SIMOTION SCOUT - sample project SIMOTION D435-2

Getting Started

04/2014

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

Scope and standards

This **document** is part of the **Engineering System Handling documentation package.**

Scope of validity

This manual is valid for SIMOTION SCOUT V4.4.

SIMOTION Documentation

An overview of the SIMOTION documentation can be found in the SIMOTION Documentation Overview document.

This documentation is included as electronic documentation in the scope of delivery of SIMOTION SCOUT. It comprises ten documentation packages.

The following documentation packages are available for SIMOTION V4.4:

- SIMOTION Engineering System Handling
- SIMOTION System and Function Descriptions
- SIMOTION Service and Diagnostics
- SIMOTION IT
- SIMOTION Programming
- SIMOTION Programming - References
- SIMOTION C
- SIMOTION P
- SIMOTION D
- SIMOTION Supplementary Documentation

Hotline and Internet addresses

Additional information

Click the following link to find information on the the following topics:

- Ordering documentation / overview of documentation
- Additional links to download documents
- Using documentation online (find and search manuals/information)

http://www.siemens.com/motioncontrol/docu

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following e-mail address:
docu.motioncontrol@siemens.com

My Documentation Manager

Click the following link for information on how to compile documentation individually on the basis of Siemens content and how to adapt it for the purpose of your own machine documentation:

http://www.siemens.com/mdm

Training

Click the following link for information on SITRAIN - Siemens training courses for automation products, systems and solutions:

http://www.siemens.com/sitrain

FAQs

Frequently Asked Questions can be found in SIMOTION Utilities & Applications, which are included in the scope of delivery of SIMOTION SCOUT, and in the Service&Support pages in **Product Support**:

http://support.automation.siemens.com

Technical support

Country-specific telephone numbers for technical support are provided on the Internet under **Contact**:

http://www.siemens.com/automation/service&support

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Safety notes 1

1.1 Fundamental safety instructions

1.1.1 General safety instructions

⚠ DANGER

Danger to life due to live parts and other energy sources

Death or serious injury can result when live parts are touched.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, six steps apply when establishing safety:

1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
   - Switch off the machine.
   - Wait until the discharge time specified on the warning labels has elapsed.
   - Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
   - Check whether the existing auxiliary supply circuits are de-energized.
   - Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Secure the energy sources against switching on again.
6. Ensure that the correct machine is completely interlocked.

After you have completed the work, restore the operational readiness in the inverse sequence.

⚠ WARNING

Danger to life from hazardous voltage when connecting an unsuitable power supply

Touching live components can result in death or severe injury.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠ WARNING

Danger to life from touching live parts on damaged devices

Improper handling of devices can result in damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Observe the limit values specified in the technical specifications during transport, storage, and operation.
- Do not use damaged devices.

⚠ WARNING

Danger to life through electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

⚠ WARNING

Danger to life due to electric shock when not grounded

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠ WARNING

Danger to life due to fire spreading if housing is inadequate

Fire and smoke development can cause severe personal injury or material damage.

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire inside and outside the device is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠ WARNING

Danger to life from unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile radios or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or causing material damage.

- Switch off wireless devices or mobile phones in the immediate vicinity of the components.

⚠ WARNING

Danger to life due to fire if overheating occurs because of insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating of components followed by fire and smoke development. This can cause death or serious injury. This can also result in increased downtime and reduced service life for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

⚠ WARNING

Danger of an accident occurring due to missing or illegible warning labels

Missing or illegible warning labels can result in accidents involving death or serious injury.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, in the national language if necessary.
- Replace illegible warning labels.

⚠ WARNING

Danger to life when safety functions are inactive

Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for safety functions

If you want to use safety functions, you must observe the safety notices in the safety manuals.

⚠ WARNING

Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

1.1.2 Safety instructions for electromagnetic fields (EMF)

⚠ WARNING

Danger to life from electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment such as transformers, converters or motors.

People with pacemakers or implants are at a special risk in the immediate vicinity of these devices/systems.

- Ensure that the persons involved are the necessary distance away (minimum 2 m).

1.1.3 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.1.4 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit http://www.siemens.com/industrialsecurity.

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit http://support.automation.siemens.com

⚠ WARNING

Danger as a result of unsafe operating states resulting from software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can lead to death, severe injuries and/or material damage.

- Keep the software up to date.
  Information and newsletters can be found at:
  http://support.automation.siemens.com
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial security concept for the installation or machine.
  For more detailed information, go to:
  http://www.siemens.com/industrialsecurity
- Make sure that you include all installed products into the integrated industrial security concept.

1.1.5 Residual risks of power drive systems

The control and drive components of a drive system are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are enabled.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety instructions on the components and in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer must take into account the following residual risks emanating from the controller and drive components of a drive system:

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example:
   - Hardware faults and/or software errors in sensors, controllers, actuators, and connection systems
   - Response times of the controller and drive
   - Operating and/or ambient conditions outside of the specification
   - Condensation / conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices/cellular phones in the immediate vicinity of the controller
   - External influences / damage
2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions outside of the specification
   - External influences / damage

   Inverters of the Open Type / IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that the contact with fire inside and outside the inverter is not possible.
3. Hazardous touch voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions outside of the specification
   - Condensation / conductive contamination
   - External influences / damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc. if they are too close.
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly.

Note

The components must be protected against conductive contamination (e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12).

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.

For more information about residual risks of the components in a drive system, see the relevant sections in the technical user documentation.

1.2 Specific safety information

Make sure your training system is fully disconnected from productive operation.

Observe the safety notes in the documentation of the devices used.

2 Getting Started with SIMOTION SCOUT

2.1 Aim of Getting Started

Getting Started introduces you to working with the SIMOTION SCOUT engineering system. You will create a simple sample project and in so doing, you will work through the typical steps involved in configuring devices, drives, and axes. You will become familiar with the most important tools that SIMOTION SCOUT provides for configuring, programming, and diagnostics.

2.2 Sample project

Getting Started provides you with instructions for creating a simple sample project.

Configuring steps

Prepare the configuration

- You reset the SIMOTION device to the factory settings.
- You configure the interface for network communication between the PG/PC and the SIMOTION device.

Create project, configure SIMOTION device and network communication with the PG/PC

- You create a project.
- You create a SIMOTION device and set up the network communication between the PG/PC and the SIMOTION device.

Configure the drive

- You commission the drive.

Configure the infeed

- You interconnect the infeed with the drive.

Configure and test the axis

- You set up an axis.
- You interconnect the axis with the drive.
- You test the axis with the axis control panel.

Configure inputs/outputs

- You configure I/Os for use in the sample program.

Program, set up and monitor SIMOTION

- You write a simple SIMOTION user program that controls the configured axis.
  - You create the variables required by the program.
  - You create the program and additional auxiliary programs with the graphical editors.
- You assign the finished programs to the tasks of the execution system.
- You start program execution in the SIMOTION runtime system.
- You monitor the program-controlled axis movement.
  - You monitor program execution.
  - You monitor the values in the symbol browser.
  - You compile values in a watch table.
  - You record the course of the axis motion with the trace.

Scope of the sample project

The SIMOTION documentation contains two versions of Getting Started with different sample project scopes:

- **Print version of Getting Started:** The present print version deals with configuring a SIMOTION D435-2 device. Auto configuration is used for configuring the drive, and only this is described.
- **Online help version of Getting Started:** The Getting Started you will find in the SIMOTION SCOUT online help is more general in nature. The sample project presented there takes account of the three platforms SIMOTION C, SIMOTION D, and SIMOTION P. The online help version also describes:
  - Configuring the drive with the drive wizard
  - Testing the drive with the drive control panel
  - Configuring a virtual axis. The virtual axis does not require a drive

  You can find the general version of Getting Started in the online help under **Getting Started SIMOTION SCOUT**.

Completed sample project

The completed sample project is included in the SIMOTION Utilities & Applications. You can find it there under **Examples > Getting Started**.

You can find information on the Utilities & Applications in the following section Utilities & applications (Page 21).

Following Getting Started

We recommend that, following Getting Started, you continue to familiarize yourself with SIMOTION SCOUT using the sample projects of the Utilities & Applications.

You can find information on the Utilities & Applications in the following section Utilities & applications (Page 21).

2.3 Preconditions

Training system

To create the sample project, you require a training system with a few components:

- SIMOTION D435-2 device with the latest firmware V4.4
- PG/PC with free Ethernet interface card
  A USB Ethernet adapter is also suitable for the Ethernet connection.
- SINAMICS drive with infeed, power unit, and motor for operating an axis
- Full DRIVE-CLiQ wiring of the components; motor with DRIVE-CLiQ interface and thus with automatic encoder identification (SMI Sensor Module Integrated)
- SIMOTION SCOUT Engineering System

A SIMOTION D435-2 DP/PN device is used in the sample project. However, you can use any D4x5-2 device.

The PROFINET interface of the SIMOTION device is not used in the sample project. In the project, reference is made to PROFINET only when creating the SIMOTION device for the first time, in order to fully represent the work sequence.

Note

Getting Started deals with automatic drive configuration and not configuration using the drive wizard. To be able to carry out automatic drive configuration fully, full DRIVE-CLiQ wiring of the components involved is a necessary requirement.

Preparation of the training system

Your training system has been prepared for configuring with SIMOTION SCOUT:

- The hardware is ready installed and wired.
- The CF card with the latest firmware V4.4 is plugged in.
- The PG/PC and SIMOTION D435-2 are connected direct via Ethernet cable. The Ethernet X127 interface on the SIMOTION D435-2 is used for the connection.
- SIMOTION SCOUT has been installed on the PG/PC and correctly licensed.
- You have started SIMOTION SCOUT. The SIMOTION SCOUT Workbench is visible on the screen of the PG/PC.
- No project is open in SIMOTION SCOUT.

2.4 General information

2.4.1 SIMOTION SCOUT online help

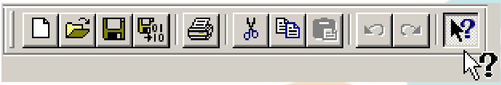
SIMOTION SCOUT has a comprehensive online help. This is divided into general help and context-sensitive help.

You open the general help as follows

- Select **Help > Help topics** in the menu, or
- press the **F1** key.

You open the context-sensitive help as follows

- Click the Help button of the dialog or window, or
- press the key combination **Shift+F1**, or
- click in the toolbar on the **Help** button.



With the mouse pointer (changed to a question mark), click the parameter or the window for which you require help.

You can find detailed information on using the context-sensitive help in the online help under **SIMOTION SCOUT > General > Use Help**.

Full text search in the online help

You can find important information on full text searching in the online help under **Basic > Use Online Help and Function Block Diagrams > Use Online Help > Full Text Search.**

Note

Full text search in the online help

Enclose the search term between asterisks * to include search results that contain the search term as part of a longer character string, e.g.

- **variable** finds only the whole words "variable" or "Variable",
- ***variable*** also finds "system variables", "variable assignment", etc.

2.4.2 Available documentation

Electronic documentation

The SIMOTION documentation is included in electronic form in the scope of delivery of SIMOTION SCOUT (SIMOTION SCOUT DVD Documentation, Utilities & Applications). You can search for all PDF documents in the electronic documentation with an index (SIMOTION.pdx). You can find an overview of the structure and content of the SIMOTION PDF documentation in the separate document *Overview of the SIMOTION Documentation*.

The content of the documents is also available in the SIMOTION SCOUT online help, with a few exceptions.

In the online help, you can find the *Overview of the SIMOTION Documentation* under **Overview of the SIMOTION Documentation > … > Overview of the SIMOTION Documentation.**

Overview of SIMOTION

You can find a brief system overview of SIMOTION in the online help under **Basic > Basic Functions > System Overview**.

The manuals contain comprehensive information especially for configuring and commissioning a SIMOTION D, see the *SIMOTION D4x5-2 Manual* as well as the *SIMOTION D4x5-2 Commissioning and Hardware Installation Manual*. You can also find the SIMOTION D manuals in the online help under **SIMOTION Devices > SIMOTION D**.

2.4.3 Project generator

With SIMOTION easyProject, basic functions required in just about every SIMOTION application can be quickly and conveniently integrated into an existing project or a new project. The desired components and functions are selected and configured here via dialogs. There is thus no need for time-consuming programming, and a uniform and standardized project configuration is guaranteed while simultaneously reducing potential errors. As of SIMOTION SCOUT V4.4, the project generator can be started direct from SIMOTION SCOUT.

The project generator is not used in Getting Started.

2.4.4 Utilities & applications

The free SIMOTION Utilities & Applications provide you with a wealth of important background information on all aspects of SIMOTION, tools, special functions, blocks, SIMOTION sample projects, as well as off-the-shelf standard applications for illustration or for use in your projects.

There you can also find detailed information on scripting and a host of sample scripts that facilitate working with SIMOTION.

1. FAQs
   Interesting FAQs such as control of hydraulic axes or communication issues.
2. Scripts
   A host of scripts, helpful tips, but also extensive solutions that make recurring tasks easier, for example.
3. Tools and documentation
   You are provided with easy-to-use tools and in-depth documentation for many tasks.
4. Examples
   Sample projects for first-time-users, e.g. "Getting Started", as well as examples of special topics.
5. Applications
   For SIMOTION, there is a host of applications available to you that provide you with a sound basic framework. With the aid of the supplied documentation, you can use the applications as a basis for your own application, and adapt and expand them.
   Furthermore, functions are available to you under "Cross-Sector applications" that are of general help when creating your own applications, e.g. a LDPV1 library for drive communication via DPV1 services (read and write SINAMICS parameters, read errors and warnings from SINAMICS, deactivate objects, ramp-up coordination and much more), or the LCom library with functions for communication with TCP/IP for SIMOTION and SIMATIC.
   The new SIMOTION easyProject project generator significantly speeds up the creation of a standardized project basis for machine applications, and therefore reduces costs.
6. SIMOTION IT
   Under SIMOTION IT, you can find innovative examples and tools for bringing control and drive solutions a little closer to the IT world. These include a trace function that is executed via an Internet browser, as well as examples for user-defined Web pages for the SIMOTION IT Web server or for using OPC XML DA.

3 Prepare the configuration

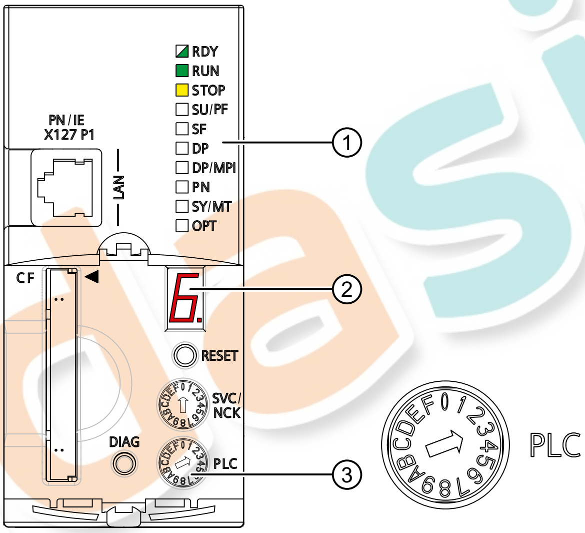
3.1 Restore factory settings

For the sample project, it is useful to reset the SIMOTION device to the factory settings.

In this way, you restore the default communications parameters and you delete user data installed on the device and the CF card by a previous configuration. The runtime licenses are retained.

You restore the factory settings on the SIMOTION device as follows

1. Switch off the power supply of the SIMOTION device.
2. Set the mode selector switch ③ of the SIMOTION device to position **3**.



① LED display

② 7-segment display

③ Mode selector switch in position 3

Figure 3-1 SIMOTION D435-2 module front

NOTICE
Damage from electrostatic discharge
The rotary switch can be destroyed by static electricity.
Operate the rotary switch only with an insulated screwdriver.
Observe the ESD regulations.

3. Switch on the power supply of the SIMOTION device.
   The default settings are loaded. SIMOTION D435-2 switches to STOP mode.
   Wait for the procedure to finish. The elements on the front of the module indicate completion:
   – The 7-segment display ② shows status digit **6**: SIMOTION D435-2 has started up.
   – LEDs ①:
     LED **RDY** flashes green (0.5 Hz): the SIMOTION device is ready for commissioning.
     LED **STOP** shows a yellow light: the SIMOTION device is in STOP mode.
     All other LEDs are off.
4. Turn the mode selector switch ③ to position **0**.
   – The LED **RUN** shows a green light: the SIMOTION device is in RUN mode.

Result

The SIMOTION device has been restored to its factory settings and is ready for commissioning.

3.2 Set up interface for online communication

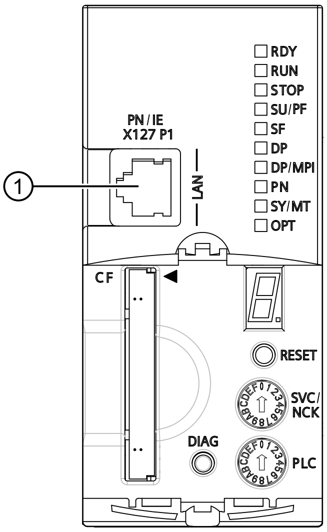
Online communication of the PG/PC with the SIMOTION device can be set up via PROFIBUS, PROFINET, or Industrial Ethernet. The sample project is restricted to the most frequent application case: communication via Industrial Ethernet.

Configuration of the Ethernet interface encompasses two steps:

- You insert the Ethernet address of the PG/PC into the default subnet of the SIMOTION device.
- You assign the Ethernet address to an access point in SIMOTION SCOUT.

Preconditions

- The PG/PC and the SIMOTION device are connected via an Ethernet cable.
- The X127 PN/IE interface on the SIMOTION device is used for the Ethernet connection.



① Ethernet interface X127 PN/IE

Figure 3-2 SIMOTION D435-2 module front

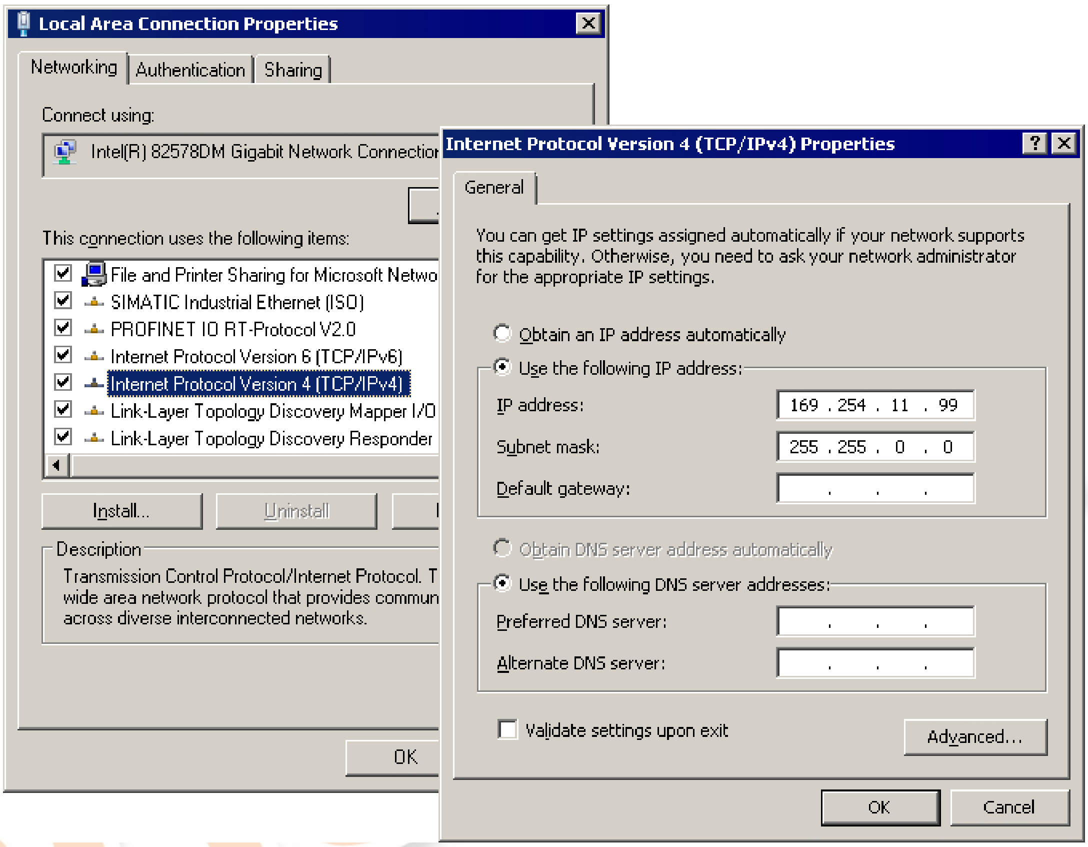
- The Ethernet interface X127 PN/IE has the default address:
  IP address: **169.254.11.22** - Subnet: **255.255.0.0**

3.2.1 Prepare the Ethernet interface of the PG/PC

The PG/PC must be located in the same subnet as the SIMOTION device. The subnet is specified by the factory settings of the SIMOTION device.

You insert the PG/PC into the subnet of the SIMOTION device as follows

1. In the Windows Control Panel of the PG/PC, open the Properties window of the network connection used, and then open the dialog Properties of Internet protocol Version 4 (TCP/IPv4).


Local Area Connection Properties
Networking
Authentication
Sharing
Connect using:
Intel(R) 82578DM Gigabit Network Connectior
This connection uses the following items:
Install...
Uninstall
Description
OK
Internet Protocol Version 4 (TCP/IPv4) Properties
General
Advanced...
OK
Cancel

☑ File and Printer Sharing for Microsoft Netwo
☑ SIMATIC Industrial Ethernet (ISO)
☑ PROFINET IO RT-Protocol V2.0
☑ Internet Protocol Version 6 (TCP/IPv6)
☑ Internet Protocol Version 4 (TCP/IPv4)
☑ Link-Layer Topology Discovery Mapper I/O
☑ Link-Layer Topology Discovery Responder

Transmission Control Protocol/Internet Protocol. T wide area network protocol that provides commun across diverse interconnected networks.

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:
IP address: 169 . 254 . 11 . 99
Subnet mask: 255 . 255 . 0 . 0
Default gateway: . . .

○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

□ Validate settings upon exit

Figure 3-3 IP address of the PG/PC in subnet 169.254

2. Assign the following address:
   IP address: **169.254.11.99** - Subnet: **255.255.0.0**
3. Confirm with **OK**. Close the dialog.

3.2.2 Define the access point of the SIMOTION device

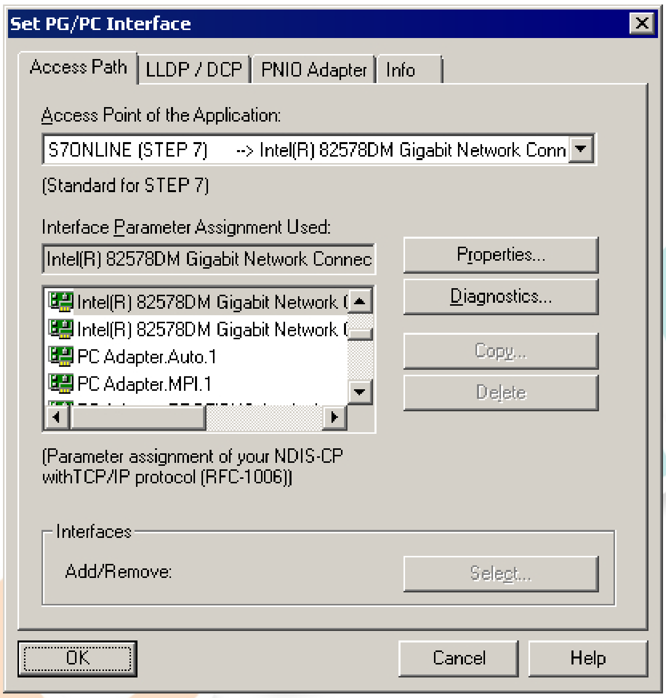
SIMOTION SCOUT has two access points for communication with controllers and individual drives:

- S7ONLINE
- DEVICE

In the sample project, the S7ONLINE access point is used for communication with the PG/PC.

You define the access point as follows

1. Go to SIMOTION SCOUT.
2. Select **Options > Set PG/PC interface** in the menu bar.
   The **Set PG/PC interface** dialog opens.
3. In the field **Access point of the application**, select the access point **S7ONLINE (STEP7)**.
   The interface currently still assigned to the access point is shown after the arrow pointing to the right.
4. Select the prepared Ethernet interface in the list **Interface programming used**.



Access Point of the Application:
S7ONLINE (STEP 7)   --> Intel(R) 82578DM Gigabit Network Conn
(Standard for STEP 7)

Interface Parameter Assignment Used:
Intel(R) 82578DM Gigabit Network Connec

- Intel(R) 82578DM Gigabit Network (
- Intel(R) 82578DM Gigabit Network (
- PC Adapter.Auto.1
- PC Adapter.MPI.1

(Parameter assignment of your NDIS-CP withTCP/IP protocol (RFC-1006))

Figure 3-4 Set PG/PC interface

5. Confirm with **OK**.
   The S7ONLINE access point is activated.
   The Ethernet interface is assigned to the S7ONLINE access point.

3.3 Result in the sample project

The factory settings of the SIMOTION device have been restored.

The Ethernet interface has been prepared and can be used for configuring online communication between the PG/PC and the SIMOTION device.

Create a project 4

4.1 Overview

Aim of Getting Started

In this part of Getting Started, you create the sample project Sample_1. All of the subsequent configuring steps refer to this sample project.

4.2 Project

A project contains all the information that describes a machine and its function: configuration data, programs, motion profiles, drive data.

A project can contain several SIMOTION devices.

4.3 Create new project

You create a new project as follows

You start a new configuration in SIMOTION SCOUT by creating a new project.

1. Select **Project** > **New** from the menu bar. The **New Project** dialog is displayed.
2. Enter the project name under **Name**, e.g. **Sample_1**.
3. Under **Storage location (path)**, enter the path where you wish to store the project. The default path is already set.
4. Acknowledge with **OK**.
   The dialog closes.

Additional information about creating a new project

Default path of the project

The default path depends on the operating system:

- Windows XP
  C:\Program Files\Siemens\Step7\s7proj
- Windows 7
  C:\Program Files (x86)\Siemens\Step7\s7proj

Project name and project directory name

The name of a SIMOTION SCOUT project can contain not more than 24 characters. The project appears under the full name in the dialogs.

When initially saving the project, SIMOTION SCOUT creates the directory name from the first 8 characters of the project name. SIMOTION SCOUT uses a numerical counter "_1", "_2", … to resolve conflicting names resulting from the abbreviation of the 8 characters. The counter replaces the last characters of the directory name.

Note

It is useful to select project names in such a way that they can be uniquely distinguished by their first 8 characters. The project name and the directory name derived from it thus uniquely identify the same project.

4.4 Result in the sample project

The sample project of Getting Started has been created in SIMOTION SCOUT.

The project folder Sample_1 is visible in the project navigator.

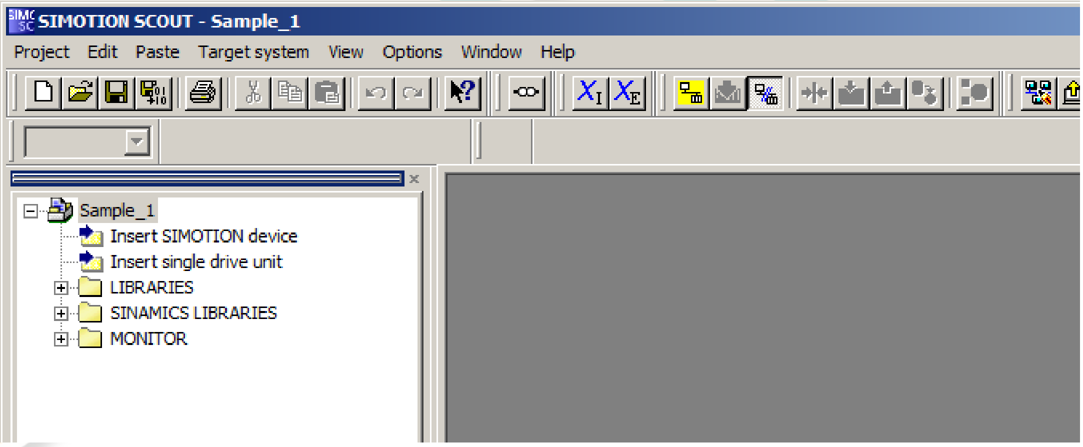


Figure 4-1 SIMOTION SCOUT Workbench, newly created sample project Sample_1

Create SIMOTION device and configure online communication

5

5.1 Overview

Aim of Getting Started

This part of Getting Started shows you how to create a SIMOTION device in the project and how to set up communication between the PG/PC and the SIMOTION device.

5.2 SIMOTION D platform

SIMOTION D is the drive-based version of the SIMOTION Motion Control System, based on the SINAMICS family of drives. With SIMOTION D, the SIMOTION motion control functionalities and the SINAMICS drive software run on a SINAMICS-type closed-loop control hardware device. SIMOTION D devices have the following characteristic features:

- Motion control functionality and control functionality integrated direct in the drive
- Suitable for modular machine concepts with fast isochronous coupling

On SIMOTION D, the SINAMICS functionality of the closed-loop-control module of the SINAMICS S120 multi-axis drive system is integrated (SINAMICS Integrated).

You will find a brief introduction to SIMOTION D in the online help using the example of the D435 Control Unit. Click **Help > Tutorials > SIMOTION Drive-Based** in the SIMOTION SCOUT menu bar.

5.3 Create SIMOTION device

5.3.1 Steps

Creating a new SIMOTION device in the project involves three steps. SIMOTION SCOUT combines the steps into one coherent process:

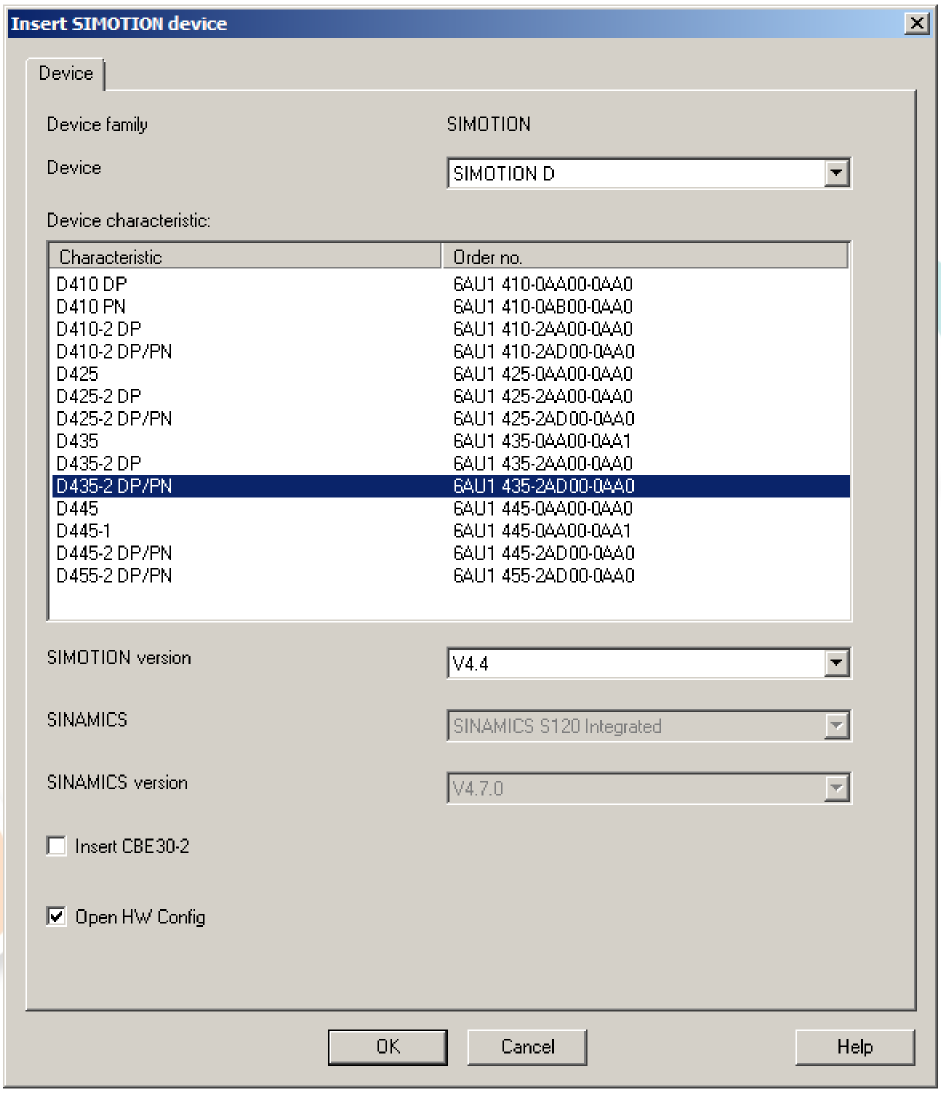
1. Create SIMOTION device.
2. Configure PROFINET interface of the device.
   This step is omitted in the sample project. PROFINET is not used. However, SIMOTION SCOUT opens the configuration dialog if the PROFINET-supporting device version D4x5-2 DP/PN is installed in your training system.
3. Set up communication between the PG/PC and the SIMOTION device.

The newly created SIMOTION device appears in the project tree.

5.3.2 Create SIMOTION device

You create a SIMOTION D435-2 device in the project as follows

1. In the project navigator, double-click **Insert SIMOTION device**.
   The **Insert SIMOTION device** dialog appears.



Device family: SIMOTION

Device: SIMOTION D

Device characteristic:

Characteristic	Order no.
D410 DP	6AU1 410-0AA00-0AA0
D410 PN	6AU1 410-0AB00-0AA0
D410-2 DP	6AU1 410-2AA00-0AA0
D410-2 DP/PN	6AU1 410-2AD00-0AA0
D425	6AU1 425-0AA00-0AA0
D425-2 DP	6AU1 425-2AA00-0AA0
D425-2 DP/PN	6AU1 425-2AD00-0AA0
D435	6AU1 435-0AA00-0AA1
D435-2 DP	6AU1 435-2AA00-0AA0
D435-2 DP/PN	6AU1 435-2AD00-0AA0
D445	6AU1 445-0AA00-0AA0
D445-1	6AU1 445-0AA00-0AA1
D445-2 DP/PN	6AU1 445-2AD00-0AA0
D455-2 DP/PN	6AU1 455-2AD00-0AA0

SIMOTION version: V4.4

SINAMICS: SINAMICS S120 Integrated

SINAMICS version: V4.7.0

☐ Insert CBE30-2

☑ Open HW Config

Figure 5-1 Select SIMOTION device

2. In the **Device** list field, the **SIMOTION D** platform is already pre-selected.

3. In the **Device version** list, select the SIMOTION device **D435-2 DP/PN**, and under **SIMOTION version**, select the firmware version of the device used.

   Note

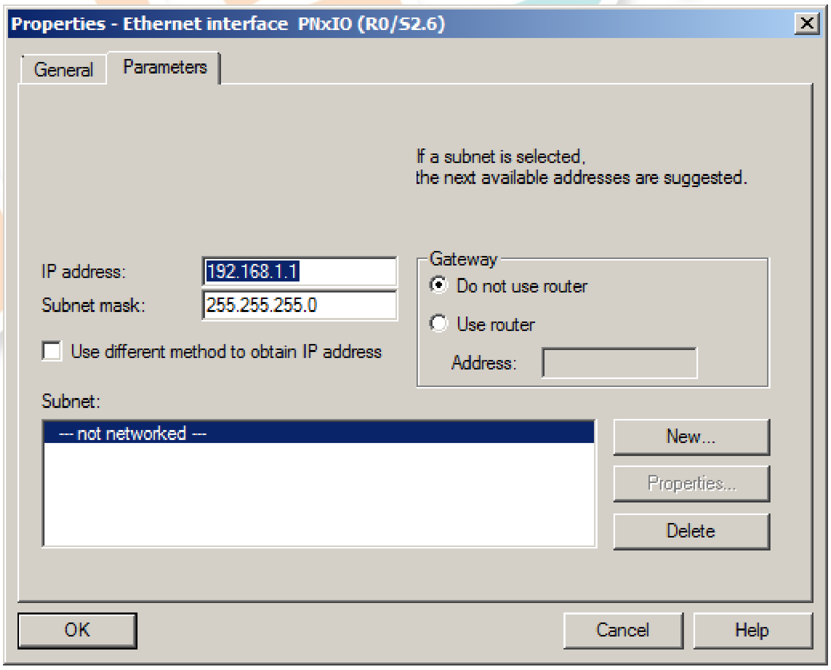
   The configured device version must agree with the firmware version on the memory card of the SIMOTION device. Otherwise, you will receive an error message when going online with the device.

4. With the checkbox **Open HW Config**, you define whether the window for hardware configuration **HW Config** is to be opened after the new device has been created. Leave the checkbox activated.
5. Acknowledge with **OK**. The **Insert SIMOTION device** dialog is closed. SIMOTION SCOUT takes you to the next step Configure the PROFINET interface (Page 33).

5.3.3 Configure the PROFINET interface

If the SIMOTION device has a PROFINET IO interface, the dialog **Properties – Ethernet interface PNxIO** appears. The dialog enables integration of the SIMOTION device into an existing PROFINET IO subnet. If no subnet is known, you can create it here.

PROFINET is not used in the sample project. Click **Cancel**. The dialog closes. SIMOTION SCOUT takes you to the next step Set up PG/PC communication (Page 34).



Properties - Ethernet interface PNxIO (R0/S2.6)

If a subnet is selected,
the next available addresses are suggested.

IP address: 192.168.1.1

Subnet mask: 255.255.255.0

□ Use different method to obtain IP address

Gateway

● Do not use router

○ Use router

Address:

Subnet:

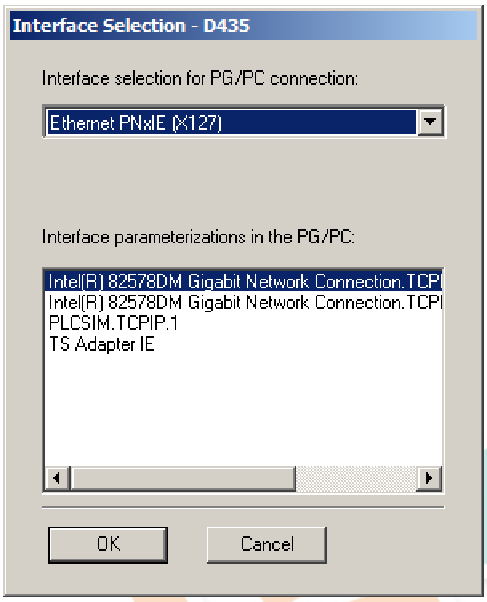
--- not networked ---

Figure 5-2 Dialog for selecting an Ethernet interface

5.3.4 Set up PG/PC communication

Interface Selection dialog

SIMOTION SCOUT opens the **Interface Selection** dialog. You configure the network communication between the PG/PC and the SIMOTION device in this dialog.



Interface Selection - D435

Interface selection for PG/PC connection:

Ethernet PNxIE (X127)

Interface parameterizations in the PG/PC:

Intel(R) 82578DM Gigabit Network Connection.TCPI
Intel(R) 82578DM Gigabit Network Connection.TCPI
PLCSIM.TCPIP.1
TS Adapter IE

Figure 5-3 Set up PG/PC communication

Note

If a PG/PC is already available in the project and it is connected with a subnet, SIMOTION SCOUT automatically establishes the connection between the PG/PC and the SIMOTION device. In this case, the **Interface Selection** dialog does not appear.

The list field **Interface selection for PG/PC connection** in the upper half of the dialog provides the list of SIMOTION device interfaces for selection.

The lower field **Interface parameterizations in the PG/PC** lists the interfaces of the PG/PC. The upper field functions as a filter so that only the interfaces with suitable transmission protocol are available for selection.

You set up data communication between the SIMOTION device and the PG/PC as follows

1. Select the Ethernet interface **Ethernet PNxIE (X127)** for the SIMOTION D435-2 device.
2. Then select the prepared Ethernet interface of the PG/PC.
3. Confirm the configuration with **OK**.
   The **Interface Selection** dialog is closed.

5.4 Result in the sample project

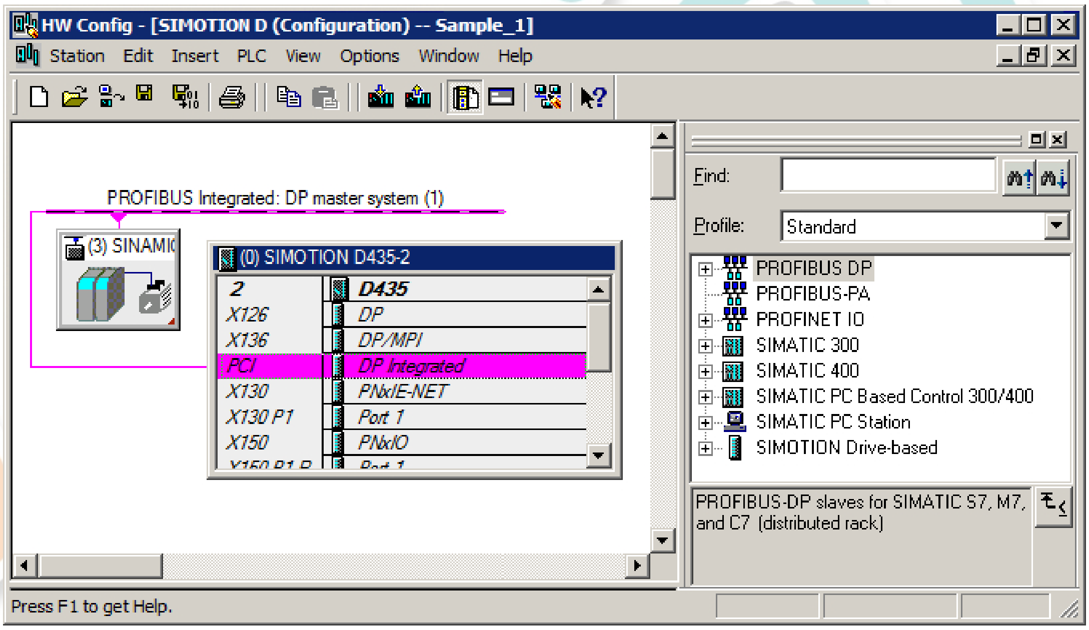
Newly created SIMOTION device

Configuring of the SIMOTION device and network communication between the PG/PC and the SIMOTION device is complete.

- The newly created SIMOTION D435-2 device is shown in the project tree of the workbench.
- The PG/PC is connected with the SIMOTION device via Ethernet.
- SIMOTION SCOUT automatically opens the **HW Config** window and thus leads you to hardware configuration.

HW Config

HW Config shows the newly created SIMOTION device, the integrated SINAMICS drive unit (SINAMICS_Integrated), and the integrated PROFIBUS (DP-Integrated).



2	D435
X126	DP
X136	DP/MPI
PCI	DP Integrated
X130	PN/IE-NET
X130 P1	Port 1
X150	PN-IO
X150 P1 R	Port 1

Profile: Standard

PROFIBUS-DP slaves for SIMATIC S7, M7, and C7 (distributed rack)

Press F1 to get Help.

Figure 5-4 HW Config, SIMOTION D device with SINAMICS_Integrated

No other hardware configuration is required for the sample project. You can close HW Config. In the menu bar of **HW Config**, select the command **Station > Exit**.

Download the project to the target system 6

6.1 Overview

Aim of Getting Started

In this configuring step, you create the prerequisites for configuring the drive.

- You back up the created sample project to the hard disk.
- You compile the project into executable code.
- You establish online communication with the SIMOTION device.
- You download the project from the PG/PC to the SIMOTION device.

6.2 Save and compile the project

To be able to download a project created in SIMOTION SCOUT to the target system, the project must be saved in executable code.

The command **Save project and compile changes** combines both steps. The project is backed up to the hard disk. SIMOTION SCOUT searches the entire project for changes and compiles only the changes.

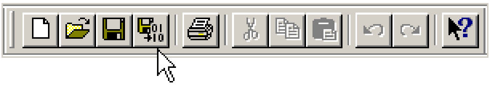
Note

Use the command **Save project and compile changes** for preference for day-to-day work.

Several variations of the "Save" command are available for selection under the menu title **Project**. You can find information on this in the online help under **Save and compile**.

You save and compile a project as follows

Select the menu command **Project > Save and compile changes** or click the relevant button in the toolbar.



SIMOTION SCOUT shows progress indicators for symbolic assignment and for compilation.

The compilation run is logged in the detail view of the workbench. Information, warning and compilation errors are shown there in plain text.

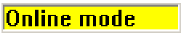
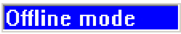
Switch on detail view

The detail view might be switched off. Click the menu item **View > Detail view** to activate the view.

6.3 Connect to selected target devices – Go online

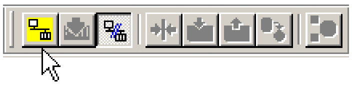
To download project data from SIMOTION SCOUT to the hardware, or to transfer machine data in the other direction from the hardware to the SIMOTION SCOUT project, communication between the PG/PC and the SIMOTION device must be activated.

The status of the network communication is displayed in the footer of the workbench:

Online mode	Network communication is switched on. Data can be exchanged.
Offline mode	The network connection is switched off.

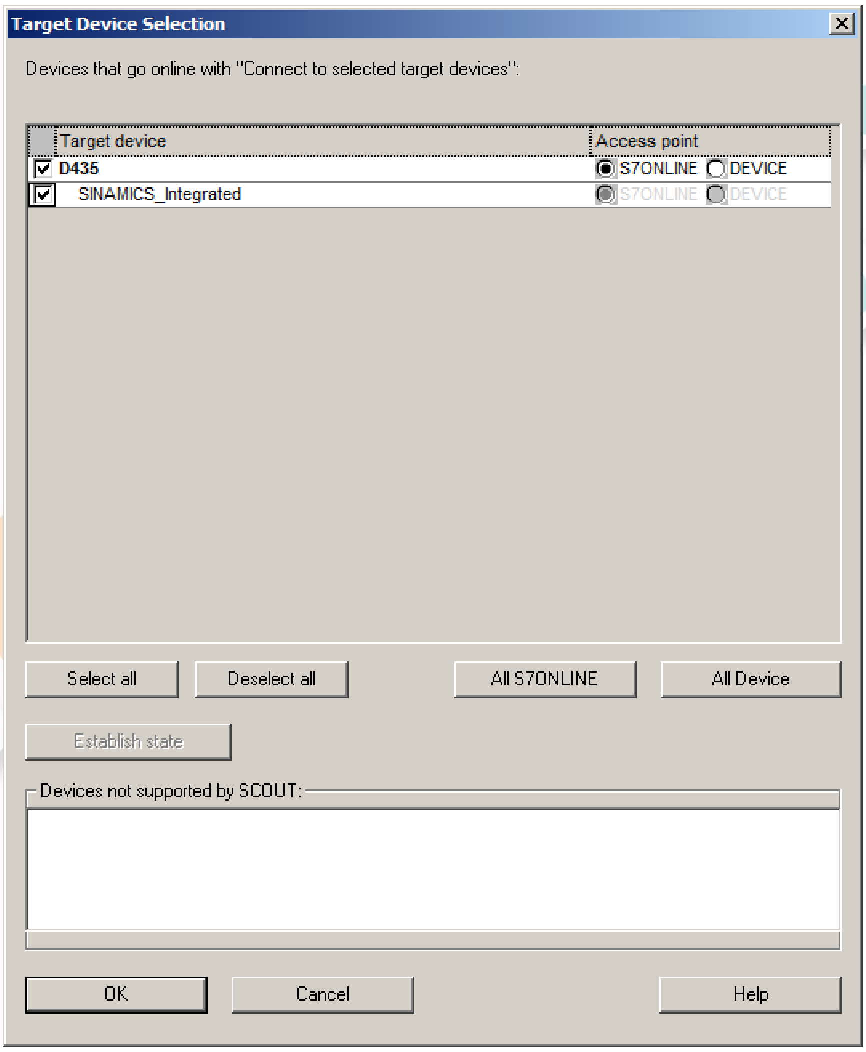
You go online as follows

1. Select the menu command **Project > Connect to selected target devices** or click the relevant button in the toolbar.



When the command is first called, SCOUT opens the **Target Device Selection** dialog. The dialog enables individual selection of the devices to which SIMOTION SCOUT is to connect.

2. In the dialog, select the configured SIMOTION device **D435** and the integrated drive **SINAMICS_Integrated**.



Target Device Selection

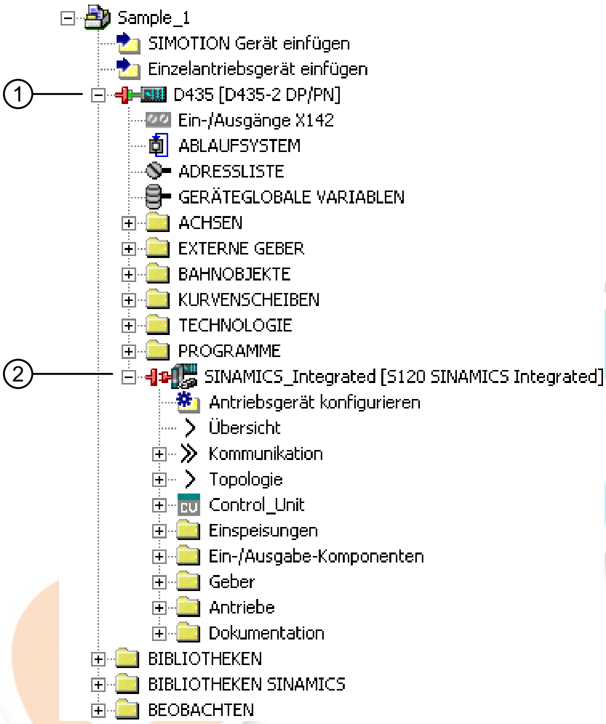
Devices that go online with "Connect to selected target devices":

	Target device	Access point
☑	**D435**	● S7ONLINE ○ DEVICE
☑	SINAMICS_Integrated	● S7ONLINE ○ DEVICE

Devices not supported by SCOUT:

Figure 6-1 Target Device Selection dialog

3. Click **OK**.
   SIMOTION SCOUT establishes the online connection.
4. When first going online, SIMOTION SCOUT reports that access to the drive is not possible. Close the message. Track the consistency check to completion on the **Target system output** tab in the detail area.
   In the project tree, the connector symbols on the SIMOTION device and on the integrated SINAMICS drive change. Only the connector symbol of the SIMOTION device is partially colored in green. Green indicates the existing online connection.



```
⊟ Sample_1
    SIMOTION Gerät einfügen
    Einzelantriebsgerät einfügen
  ⊟ D435 [D435-2 DP/PN]
      Ein-/Ausgänge X142
      ABLAUFSYSTEM
      ADRESSLISTE
      GERÄTEGLOBALE VARIABLEN
    ⊞ ACHSEN
    ⊞ EXTERNE GEBER
    ⊞ BAHNOBJEKTE
    ⊞ KURVENSCHEIBEN
    ⊞ TECHNOLOGIE
    ⊞ PROGRAMME
    ⊟ SINAMICS_Integrated [S120 SINAMICS Integrated]
        Antriebsgerät konfigurieren
        Übersicht
      ⊞ Kommunikation
      ⊞ Topologie
      ⊞ Control_Unit
      ⊞ Einspeisungen
      ⊞ Ein-/Ausgabe-Komponenten
      ⊞ Geber
      ⊞ Antriebe
      ⊞ Dokumentation
  ⊞ BIBLIOTHEKEN
  ⊞ BIBLIOTHEKEN SINAMICS
  ⊞ BEOBACHTEN
```

① Device is in ONLINE mode. There is an inconsistency between the project data of the device in the PG/PC and the current values of the device in the target system.

② Element is not in ONLINE mode.

Figure 6-2 Project tree after first going online

No connection to the drive when first going online

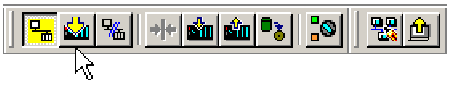
To allow SIMOTION SCOUT to connect with the drive, the project must be downloaded to the SIMOTION device. A project download has not yet been carried out in the sample project. You therefore receive the corresponding error messages.

6.4 Download the project to the target system

A complete project download is only possible in STOP mode. If required, SIMOTION SCOUT offers a change of operating mode during the download procedure.

You download the project as follows

1. Select **Project > Download to target system** in the menu, or click the **Download project to target system** button in the toolbar.

   The dialog **Download to target system** appears.

2. Activate the checkbox **After loading, copy RAM to ROM**. This saves the RAM of the SIMOTION device to the memory card (ROM) of the SIMOTION device. In this way, the configuration is retained after the power supply has been switched off and on again.

3. Start the download operation with **Yes**.
   The project data and the data of the hardware configuration are downloaded to the RAM of the target system.
   If you are asked whether the CPU is to be switched to STOP, confirm with **Yes**.
   SIMOTION SCOUT carries out numerous checks that are logged on the **Target system output** tab in the detail area. You will find there the concluding entry **Download to target system completed successfully**.

Note

The first download to the target system also downloads the data of the technology package. This operation can take several minutes.

Note

Depending on the firmware version on the CF card and on the SINAMICS components (DRIVE-CLiQ components such as Line Module, Motor Modules, Terminal Modules, etc.), the firmware of the components is automatically upgraded or downgraded.

The update can take several minutes and its progress is tracked by corresponding messages appearing in the output window of SIMOTION SCOUT.

A firmware update on DRIVE-CLiQ components is signaled by red-green flashing of the RDY LED:

- FW update in progress: RDY LED flashes slowly (0.5 Hz)
- FW update finished: RDY LED flashes quickly (2 Hz), POWER ON required

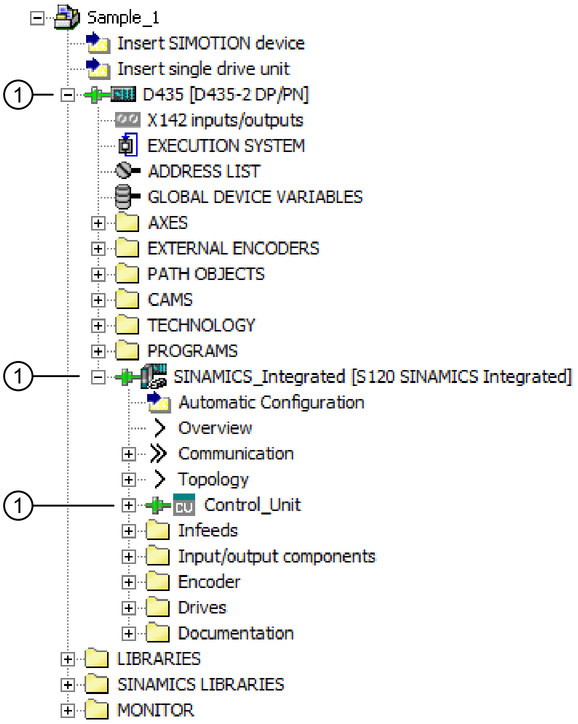
These flashing patterns are displayed additionally via a yellow RDY LED on the SIMOTION D, indicating that components connected to SIMOTION D are carrying out a firmware update or that all components have completed their firmware update.

Components requiring POWER ON following a firmware update signal this by means of the fast flashing RDY LED. Go offline with SIMOTION SCOUT and switch the 24 V supply to the relevant components off/on (POWER ON) to initialize.

Automatically established connection to the drive

SIMOTION SCOUT automatically establishes the online connection to the drive immediately following the project download.

In the project tree, the connector symbol changes on the SIMOTION device, the integrated SINAMICS drive, and the SINAMICS Control Unit. The connector symbol is entirely green, indicating that the project data in the PG/PC is identical with the project data in the target system.



```
Sample_1
    Insert SIMOTION device
    Insert single drive unit
    D435 [D435-2 DP/PN]
        X142 inputs/outputs
        EXECUTION SYSTEM
        ADDRESS LIST
        GLOBAL DEVICE VARIABLES
        AXES
        EXTERNAL ENCODERS
        PATH OBJECTS
        CAMS
        TECHNOLOGY
        PROGRAMS
        SINAMICS_Integrated [S120 SINAMICS Integrated]
            Automatic Configuration
            Overview
            Communication
            Topology
            Control_Unit
            Infeeds
            Input/output components
            Encoder
            Drives
            Documentation
    LIBRARIES
    SINAMICS LIBRARIES
    MONITOR
```

① Green connector symbol: Element is in online mode. The project data in the PG/PC is identical with the project data saved in the target system.

Figure 6-3 Project tree

From this point, you can access the drive online with the PG/PC.

7 Configure the drive

7.1 Overview

Aim of Getting Started

In this part of Getting Started, you configure the integrated drive of the SIMOTION D435-2 device. You use auto-configuration for this purpose.

Preconditions

- You have downloaded the sample project to the target system, refer to the section Download the project to the target system (Page 37).
- SIMOTION SCOUT is online with the SIMOTION device and the integrated drive (green connector symbols).
- The SINAMICS drive components Infeed and Power unit, as well as Motor and Encoder, are connected to the SIMOTION Control Unit via DRIVE-CLiQ. This requirement for auto-configuration was referred to at the start of Getting Started, see the section Preconditions (Page 19).

7.2 Drive

The speed and current for controlling the motor are regulated in the drive.

7.3 Automatic drive configuration

SIMOTION SCOUT can read out the electronic type plates of the SINAMICS drive components via the DRIVE-CLiQ interface and can use this data to configure the drive automatically. Manual data entry is thus dispensed with. The sample configuration of a SIMOTION D435-2 device shown here requires full DRIVE-CLiQ wiring.

As an alternative to automatic drive configuration, you can also configure a D4x5-2 device offline. Offline configuring is shown in the online help version of Getting Started for SIMOTION C and SIMOTION P.

7.4 Automatic configuration of the drive

You open automatic configuration as follows

Double-click on **Automatic Configuration** in the project navigator under the drive SINAMICS_Integrated.

The **Automatic Configuration** dialog is displayed.

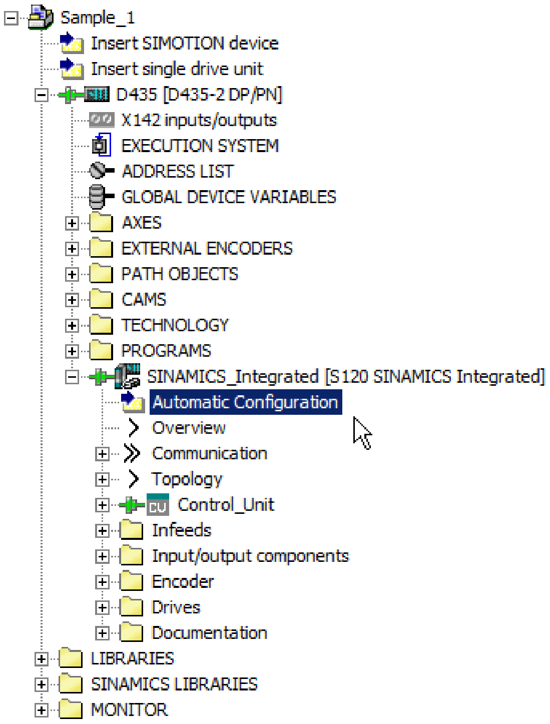


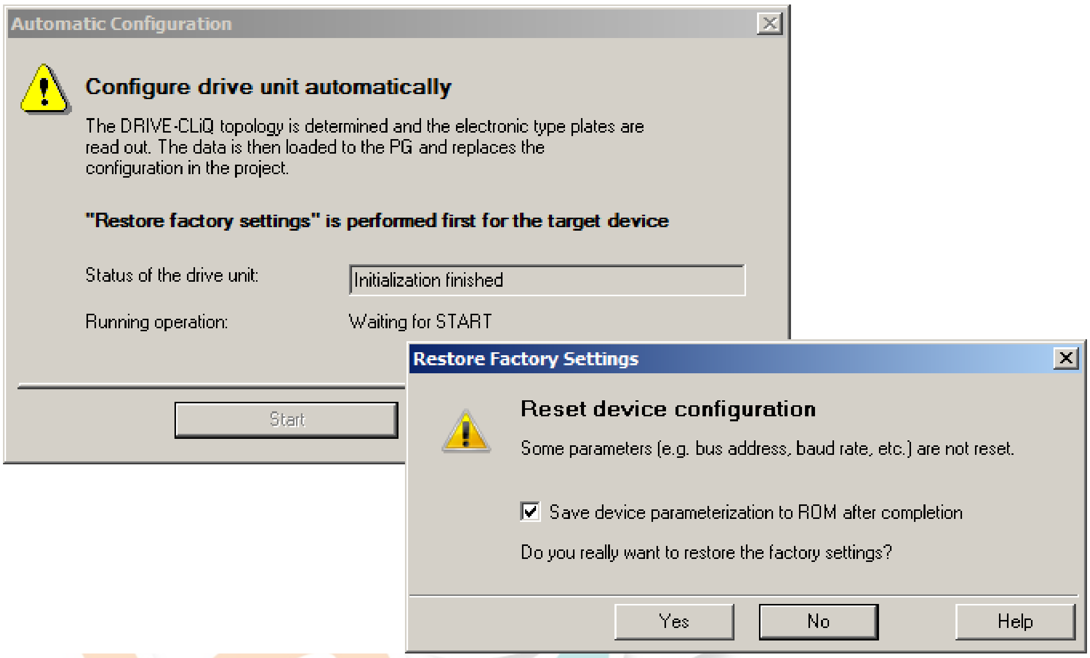
Figure 7-1 Call Project tree, Automatic Configuration

Note

In the project tree, the element **Automatic Configuration** is only visible if you have downloaded the project to the target system, and SIMOTION SCOUT is online with the SIMOTION device. The project must be consistent; see the section Download the project to the target system (Page 37).

You cause the drive to be configured automatically as follows

1. Click the **Configure** button in the **Automatic Configuration** dialog.
2. Confirm the prompt regarding restoring the factory settings with **Yes**.
   The confirmation prompt appears if the drive unit is not in the "First commissioning" state.



Automatic Configuration

Configure drive unit automatically

The DRIVE-CLiQ topology is determined and the electronic type plates are read out. The data is then loaded to the PG and replaces the configuration in the project.

"Restore factory settings" is performed first for the target device

Status of the drive unit: Initialization finished

Running operation: Waiting for START

Restore Factory Settings

Reset device configuration

Some parameters (e.g. bus address, baud rate, etc.) are not reset.

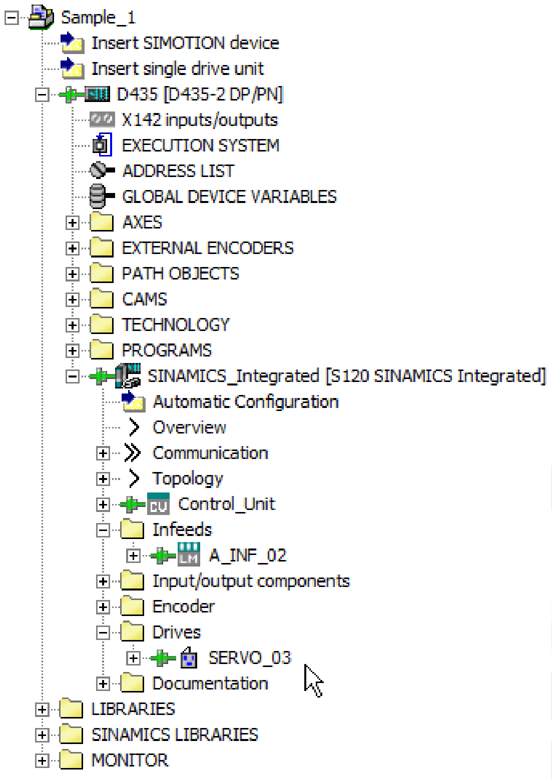
☑ Save device parameterization to ROM after completion

Do you really want to restore the factory settings?

Figure 7-2 Start automatic drive configuration and restore factory settings

3. In the **Automatic Commissioning** dialog, you can specify whether you are using a drive object of the type servo or vector.
   Select **Servo**.
4. Click the **Create** button in the **Automatic Commissioning** dialog.
   Automatic configuring is started.
   As soon as automatic commissioning has finished, SIMOTION SCOUT carries out an upload. With this upload, the configuration data of the component is uploaded to the SIMOTION SCOUT project.
   SIMOTION SCOUT signals completion of the automatic configuration.
5. The **Go OFFLINE** and **Stay ONLINE** buttons close the configuration dialog.
   Remain online to be able to see the changes in the project tree:
6. Open the **Infeeds** system folder in the project tree under the integrated drive.
   - If you are using an infeed with DRIVE-CLiQ interface, the auto configuration has created the infeed there.
   - If you are using an infeed without DRIVE-CLiQ interface, the folder is empty. The infeed is not known in the project.
     The other configuring requirements resulting in this way are dealt with in the next section Configure the infeed (Page 49).

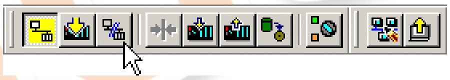
7. Open the **Drives** system folder in the project tree under the integrated drive. The folder contains the drive detected by the auto configuration.



```
Sample_1
  Insert SIMOTION device
  Insert single drive unit
  D435 [D435-2 DP/PN]
    X142 inputs/outputs
    EXECUTION SYSTEM
    ADDRESS LIST
    GLOBAL DEVICE VARIABLES
    AXES
    EXTERNAL ENCODERS
    PATH OBJECTS
    CAMS
    TECHNOLOGY
    PROGRAMS
    SINAMICS_Integrated [S120 SINAMICS Integrated]
      Automatic Configuration
      Overview
      Communication
      Topology
      Control_Unit
      Infeeds
        A_INF_02
      Input/output components
      Encoder
      Drives
        SERVO_03
      Documentation
  LIBRARIES
  SINAMICS LIBRARIES
  MONITOR
```

Figure 7-3 Project navigator, configured infeed and drives

8. Go offline.
   Click in the toolbar on the **Disconnect from target system** button.



In the footer of the workbench, **Offline mode** is indicated. Network communication between the PG/PC and the SIMOTION device has been cleared down.

Change the name of the drive

The automatic configuration also assigns the object name of the drive; in this example, SERVO_03.

You can change the name later. Changing is only possible in offline mode.

Proceed as follows:

1. Open the context menu of the drive by right-clicking. Select the **Rename** command there.
2. Assign the new name. Then confirm with **OK**.

As with all changes carried out in the project offline, the name change makes the project inconsistent. To restore the consistency between the "Project on the PG/PC" and the "Project on the SIMOTION device", another project download is necessary. The procedure is described in the section Download the project to the target system (Page 37).

7.5 Result in the sample project

If you are using an infeed with DRIVE-CLiQ interface, the drive is ready for operation. It can be interconnected with an axis.

Configure the infeed 8

8.1 Overview

Aim of Getting Started

In this part of Getting Started, you configure the infeed.

The integrated SINAMICS Control Unit only starts the drive when the infeed is ready. The project must therefore know the interface via which the drive receives the ready signal of the infeed.

Two cases must be distinguished here:

- Infeed with DRIVE-CLiQ interface
If an infeed with DRIVE-CLiQ connection has already been created, the ready signal of the infeed (r0863.0) is automatically interconnected with "Infeed operation, p0864" of the drive when drives are inserted (only applies to drives that are attached to the same drive unit as the infeed).
You can continue immediately with the next configuring step, see the section Configure the axis (Page 53).
- Infeed without DRIVE-CLiQ interface
If you are using an infeed without a DRIVE-CLiQ interface, e.g. a Smart Line Module, you must wire the ready signal of the infeed via terminals. The following section describes the procedure.

Preconditions

- You have configured the integrated drive of the SIMOTION D435-2 device, see the section Configure the drive (Page 43).
- SIMOTION SCOUT is in offline mode.

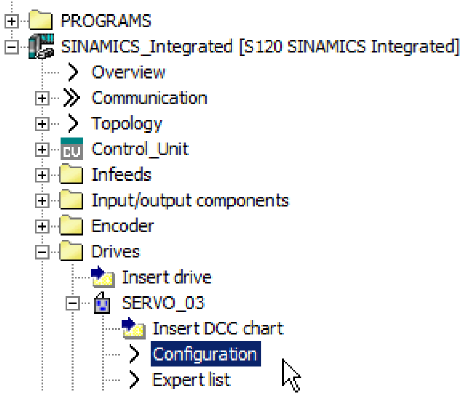
8.2 Configuring an infeed without DRIVE-CLiQ interface

An infeed without DRIVE-CLiQ interface provides the ready signal (p0863.0) via an output terminal. In the project, you specify the input (r0722) of the integrated SINAMICS Control Unit at which the signal is active. The drive supplied by the infeed uses the signal as a ready signal (p0864).

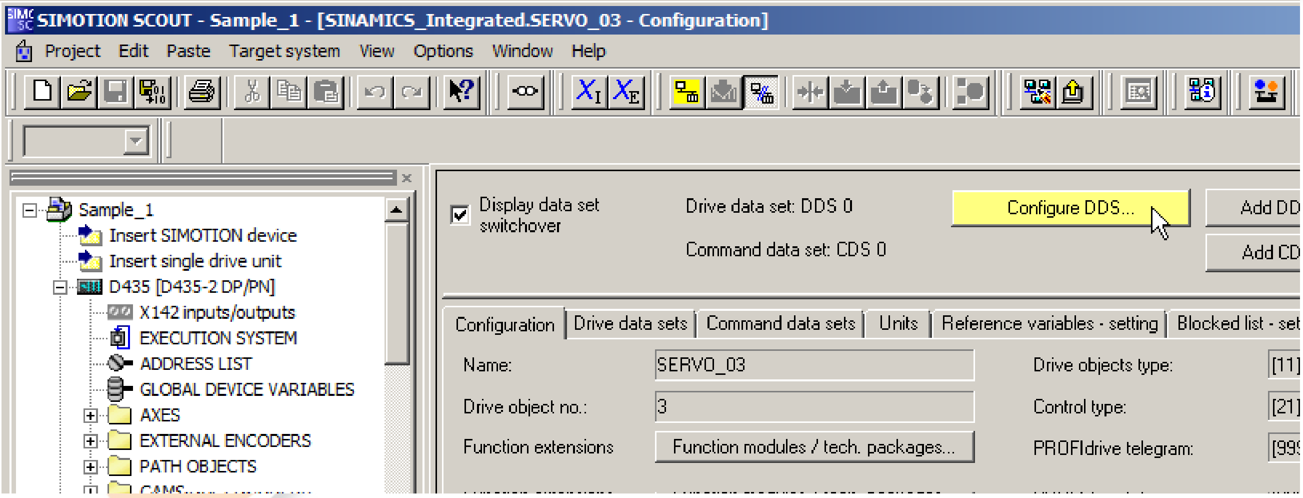
You interconnect the ready signal of the infeed as follows

In the sample project, the ready signal of the infeed (terminal "DO: Ready" of the infeed) is wired to the DI 0 of the D435-2.

1. Open the configuration dialog of the drive. To do so, double-click **Configuration** in the project tree below the drive.



2. Click in the working area on the **Configure DDS** button with the yellow background.



☑ Display data set switchover

Drive data set: DDS 0

Command data set: CDS 0

Name: SERVO_03

Drive objects type: [11]

Drive object no.: 3

Control type: [21]

Function extensions

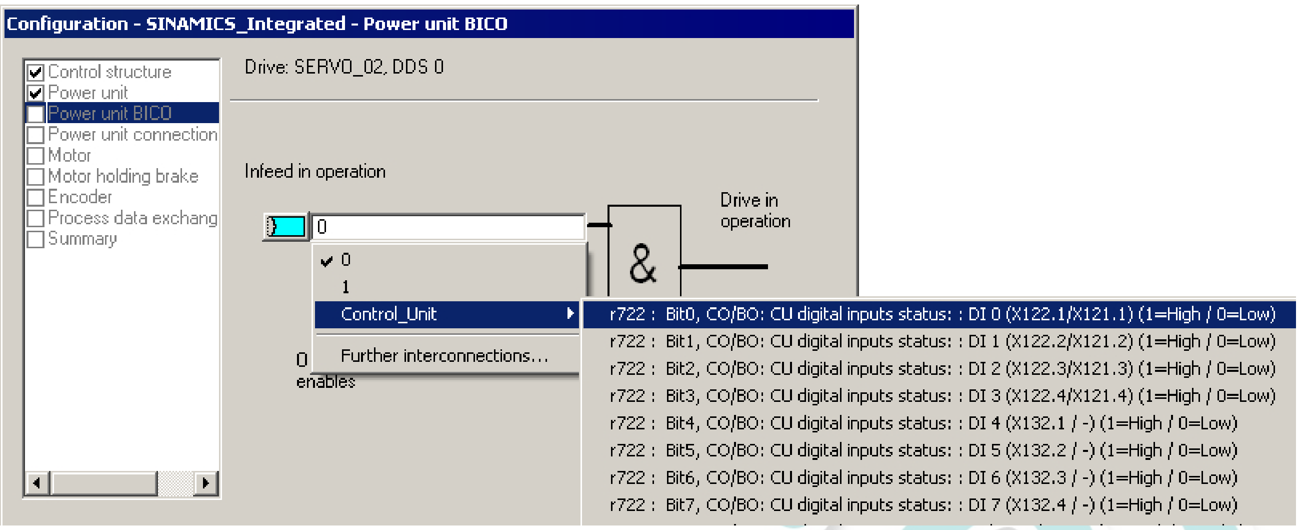
PROFIdrive telegram: [99

Figure 8-1 Configure DDS

The drive wizard opens.

3. Click **Next** in the drive wizard until you reach the dialog **Configuration - SINAMICS_Integrated - Power Unit BICO Technology**.

4. In the **Power unit BICO** dialog, input field **p0864**, select the digital input to which the ready signal of the infeed is wired (e.g. **DI** 0).



r722 : Bit0, CO/BO: CU digital inputs status: : DI 0 (X122.1/X121.1) (1=High / 0=Low)
r722 : Bit1, CO/BO: CU digital inputs status: : DI 1 (X122.2/X121.2) (1=High / 0=Low)
r722 : Bit2, CO/BO: CU digital inputs status: : DI 2 (X122.3/X121.3) (1=High / 0=Low)
r722 : Bit3, CO/BO: CU digital inputs status: : DI 3 (X122.4/X121.4) (1=High / 0=Low)
r722 : Bit4, CO/BO: CU digital inputs status: : DI 4 (X132.1 / -) (1=High / 0=Low)
r722 : Bit5, CO/BO: CU digital inputs status: : DI 5 (X132.2 / -) (1=High / 0=Low)
r722 : Bit6, CO/BO: CU digital inputs status: : DI 6 (X132.3 / -) (1=High / 0=Low)
r722 : Bit7, CO/BO: CU digital inputs status: : DI 7 (X132.4 / -) (1=High / 0=Low)

Figure 8-2 BICO interconnection in the drive wizard

5. Click **Next**. Run through all the other dialogs without change until the final **Summary** dialog.
6. Click **Finish**.
   The configuration is thus completed.
7. The configuration dialog of the drive is no longer required. Click **Close** at the bottom right of the dialog box.

Configure the axis 9

9.1 Overview

Aim of Getting Started

This part of Getting Started shows you how to create and configure an axis in the project, and how to interconnect it with the integrated drive of the SIMOTION D device. SIMOTION SCOUT provides the axis wizard for this purpose.

Preconditions

You have configured the integrated drive of the SIMOTION D device, see the section Configure the drive (Page 43).

9.2 Technology object axis

Technology objects represent the respective real objects (e.g. a position axis) in the controller.

The technology object axis offers the user a technological view of the drive and the encoder (actuator and encoder), provides technological functions for this, and conceals the actual hardware interface.

The technology object axis contains extensive functionality, e.g. communication with the drive, actual value processing, position control, and positioning functionality. It executes control and motion commands and indicates states and actual values.

Technological limitations and mechanical values of the axis and encoder (e.g. leadscrew pitch and gears) are set on the axis. You can then work exclusively with technological variables.

9.3 Axis wizard

Creation of new axes in the project

SIMOTION SCOUT provides the axis wizard for creating a new axis. The wizard scans the basic settings and interconnects the TO axis with a drive.

The wizard can only be run through once. Later changes to the configuration are possible in the corresponding dialogs of the TO.

9.4 Creating an axis

For the sample project, create the axis **Axis_2**. Assign the axis to the drive you have configured in the section Configure the drive (Page 43).

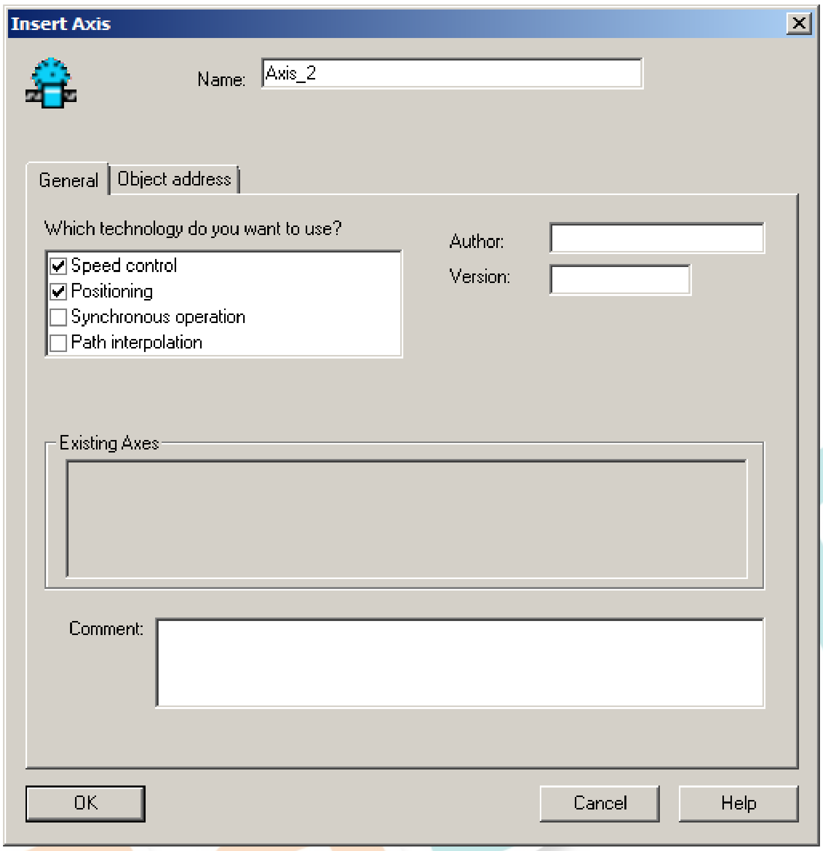
Run through the wizard and confirm all standard settings with **Next**.

> **Note**
>
> **Axis_2**
>
> In the online help version of Getting Started, 2 axes are created, a virtual axis Axis_1 and a real axis Axis_2. In agreement with the designation there for the real axis, the designation Axis_2 is used here.
>
> You can find Getting Started in the online help under **Getting Started SIMOTION SCOUT**.

You create a real axis in the project as follows

1. Open the **AXES** folder in the project navigator.
2. Double-click **Insert axis**. The **Insert axis** dialog appears.
3. Name the axis in the **Name** field. Use the designation **Axis_2** for the axis of the sample project.

4. Leave the preset axis technology at the default **Positioning**.



Insert Axis

Name: Axis_2

General | Object address

Which technology do you want to use?

☑ Speed control
☑ Positioning
☐ Synchronous operation
☐ Path interpolation

Author:

Version:

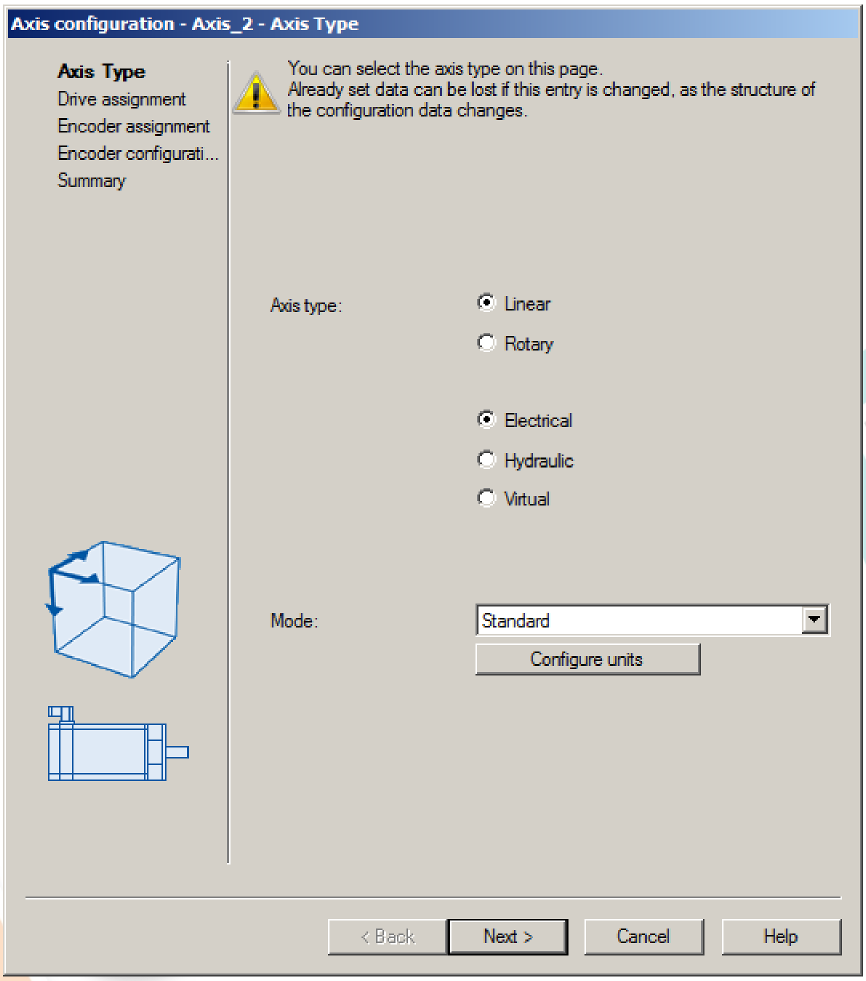
Existing Axes

Comment:

Figure 9-1 Axis wizard, create real axis

5. Click **OK**.
   The axis configuration wizard appears.

6. Define the axis type.
   For the sample project, select preferably a linear axis with an interconnection to an electrical drive.
   Activate the fields **linear** and **electrical**.



Axis configuration - Axis_2 - Axis Type

You can select the axis type on this page.
Already set data can be lost if this entry is changed, as the structure of the configuration data changes.

Axis type: ● Linear ○ Rotary

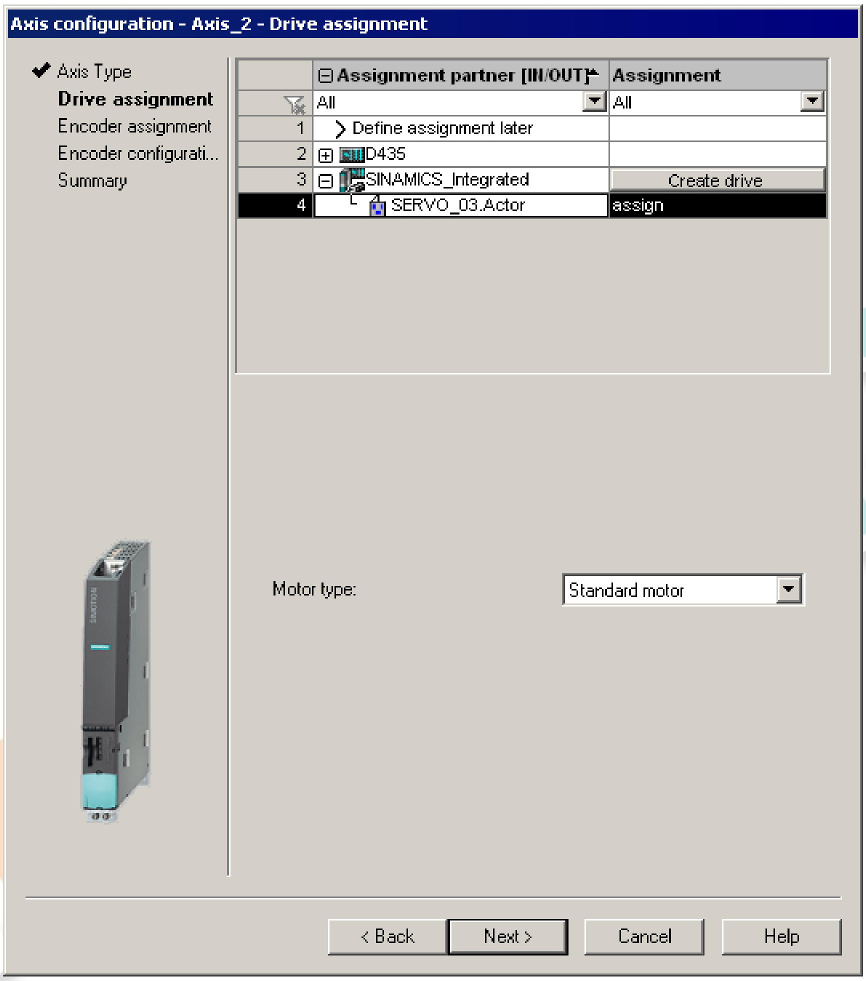
● Electrical ○ Hydraulic ○ Virtual

Mode: Standard

Figure 9-2 Axis wizard, determine axis type

7. Click **Next**.
   The **Drive assignment** dialog appears.

8. Assign the axis to the drive you have configured in the section Configure the drive (Page 43).
   To do so, click the drive unit in the **Assignment partner** column. Click in the tree under the drive object on the drive object you want to interconnect. **Assign** appears in the **Assignment** column. The axis/drive assignment is thus defined.



	⊟ Assignment partner [IN/OUT]	Assignment
	All	All
1	Define assignment later	
2	⊞ D435	
3	⊟ SINAMICS_Integrated	Create drive
4	SERVO_03.Actor	assign

Figure 9-3 Axis wizard, assign drive

Click **Next**.

Note

As an alternative to assigning the axis to an already configured drive, the axis wizard offers two further selection options:

- Define the axis/drive assignment later:
  The axis is to be created and not assigned to a drive until later. Programming and simulation of the axis are also possible here.
- Create drive:
  The drive wizard can can be called up from the axis wizard (offline configuring). The axis can thus be created in one step along with the drive, and assigned to the drive.

The alternative procedures are not considered further in Getting Started.

9. Assign the motor encoder.
   In the **Encoder assignment** window, you use the motor encoder connected to the drive as the standard setting.
   Click **Next**.
10. The axis wizard then assembles the configuration data in an overview. You thus have an opportunity to check and correct the data before accepting it into the project.
    Close the dialog with **Finish**.
    The configured axis is displayed in the project navigator.

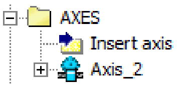


Figure 9-4 Created axis in the project navigator

Automatic settings of the engineering system

The engineering system automatically defines the PROFIdrive axis telegrams required for communication, as well as the addresses used.

In the same way, telegrams are extended and interconnections automatically created in the drive, depending on the selected TO technology (e.g. SINAMICS Safety Integrated).

Drive and encoder data, as well as reference variables, maximum variables, torque limits, and granularity in torque reduction of the SINAMICS S120 are accepted automatically for the configuration of the SIMOTION technology objects "TO axis" and "TO external encoder". This data no longer has to be entered in SIMOTION.

Further axis configuration

Further axis configuration is possible via dialogs that can be accessed in the project navigator under the axis. No other configuration is required for the sample project.

9.5 Download the axis configuration to the target system

Download the sample project with the axis configuration to the target system to be able to test the functioning of the axis in the next configuration step.

Steps

1. Save project and compile changes.
2. Establish online connection if offline.
3. Download the project to the target system.

Save and compile changes

Click in the toolbar on the **Save project and compile changes** button.

Establish an online connection

Click in the toolbar on the **Connect to selected target devices** button.

Download to target system

Click in the toolbar on the **Download project to target system** button.

Test the axis with the axis control panel 10

10.1 Overview

Aim of Getting Started

In this part of Getting Started, you test the configured axis. SIMOTION SCOUT provides you with the axis control panel for this purpose.

Preconditions

- You have configured the infeed, see the section Configure the infeed (Page 49).
- You have created and fully configured an axis in the sample project, see the section Configure the axis (Page 53).
- The project with the axis configuration has been downloaded to the target system, see the section Download the axis configuration to the target system (Page 58).
- SIMOTION SCOUT is in online mode.

10.2 Axis control panel

Control and monitoring of individual axes

The axis control panel is used for controlling and monitoring individual axes. You can use it to traverse axes along with the drive.

You can use the control panel for the following tasks, for example:

- Test each part of the system individually before program-driven axis motions are initiated.
- In the event of an error, test whether the individual axes and drives can be traversed from the control panel.
- Moving the axes for optimization purposes (controller optimization).
- Carry out homing.
- Setting and revoking an axis enable.

10.3 Working with the axis control panel

In the sample project, you traverse the set-up axis in jog mode to test the correct functioning of the axis.

You open the axis control panel as follows

Open the **AXES** folder in the project navigator. Double-click below the axis on **Control panel**.

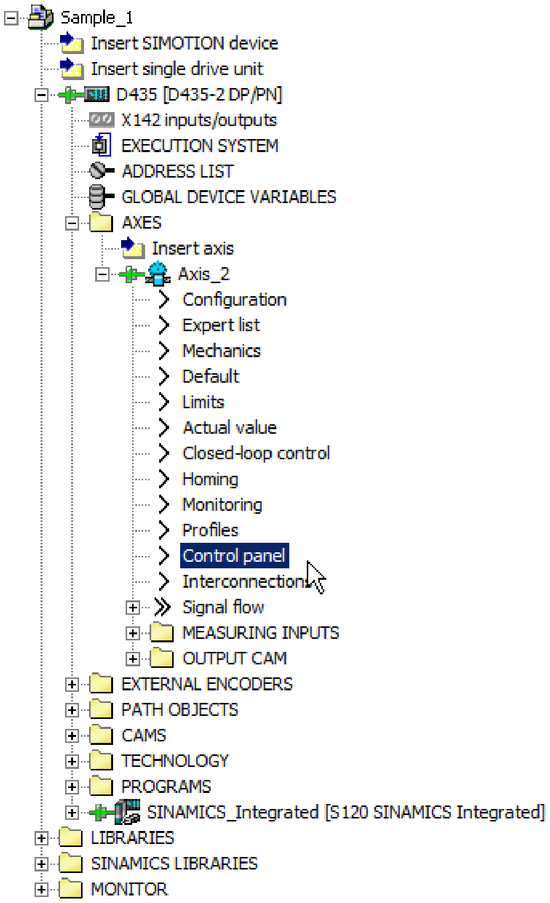
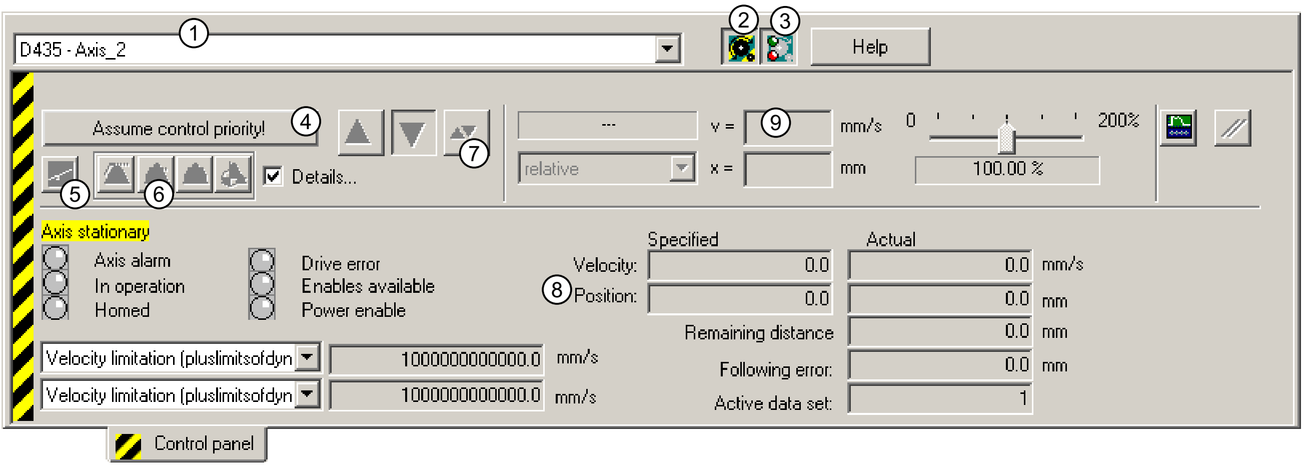


Figure 10-1 Calling the axis control panel

The axis control panel is opened in the detail view.



D435 - Axis_2

--- v = mm/s 0 200%

relative x = mm 100.00 %

	Specified	Actual	
Velocity:	0.0	0.0	mm/s
Position:	0.0	0.0	mm
Remaining distance		0.0	mm
Following error:		0.0	mm
Active data set:		1	

Velocity limitation (pluslimitsofdyn 1000000000000.0 mm/s

Velocity limitation (pluslimitsofdyn 1000000000000.0 mm/s

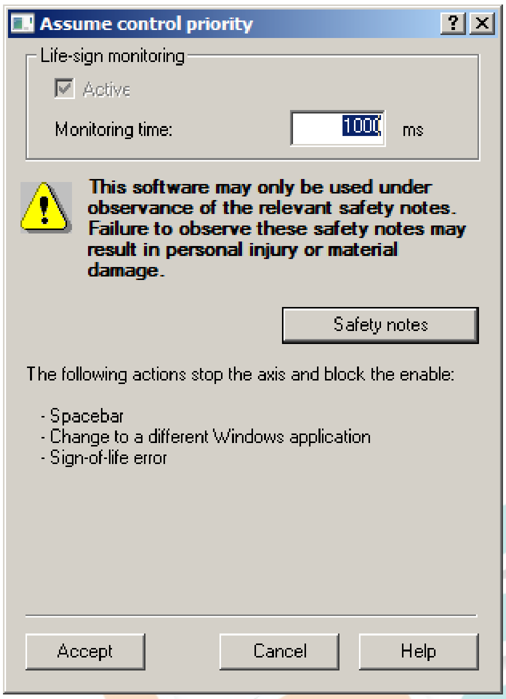
① … ⑨ Reference is made to the circled digits in the text below.

Figure 10-2 Axis control panel

You traverse an axis with the axis control panel as follows

1. The field at top left of the control panel ① shows the currently selected axis.
2. Showing areas in the control panel:
   The control panel is divided into a control area and a diagnostics area. The areas may be hidden.
   Click the **Show/hide control area** button ② and/or the **Show/hide diagnostics area** button ③ to show the respective area.

3. Assume control priority – Observe safety regulations:
   To be able to traverse the axis from the PG/PC, the PG/PC must obtain control priority.
   Click the **Assume Control Priority** button ④.
   The **Assume Control Priority** dialog opens.



Assume control priority

Life-sign monitoring

☑ Active

Monitoring time: 1000 ms

This software may only be used under observance of the relevant safety notes. Failure to observe these safety notes may result in personal injury or material damage.

The following actions stop the axis and block the enable:

- Spacebar
- Change to a different Windows application
- Sign-of-life error

Figure 10-3 Axis control panel, assume control priority

Observe the safety regulations and confirm with **Accept**.
The PG/PC now has control priority.

Note

You can stop the axis at any time by pressing the spacebar.

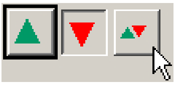
4. Click the **Position-controlled traversing of the axis** button ⑥.

   The **Start axis position-controlled** dialog appears.
   Specify the velocity of the axis. Click **OK** to close the dialog.
   The velocity appears in the field **v=** ⑨.

5. Enable the axis:
   Click the **Set/remove enables** button ⑤ to enable the axis.

   Confirm the **Switch axis enable** dialog that appears with **OK**.
   The switches **Start motion**, **Stop motion** and **Jog** ⑦ are enabled.

6. Start the axis motion:
   Click **Jog** ⑦.

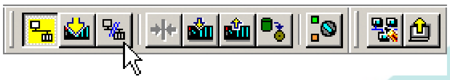
   

   The axis is traversed while you press the switch. In the fields **Velocity** and **Position** ⑧, you can monitor the traverse motion.
   The axis test is thus executed.

7. Deactivate axis enable:
   Click **Set/remove enables** ⑤.
   Confirm the **Disable axis** dialog with **OK**.

8. Return control priority:
   Click **Give up control priority** ④ to deactivate control of the axes from the PG/PC. In this operating state, the axes can no longer be controlled from the PG/PC.

9. Go offline:
   Select **Project > Disconnect from target system** in the menu. Or click in the toolbar on the **Disconnect from target system** button.

10.4 Result in the sample project

You have traversed the axis of the sample project with the axis control panel and thus ensured its correct functioning. Configuring the axis is thus completed.

11 Configure digital outputs

Aim of Getting Started

In this part of Getting Started, you configure two of the digital inputs/outputs available on the SIMOTION D device as outputs.

You require the outputs for the program you will write in the subsequent configuring step, see the section Programming the SIMOTION application (Page 69).

Preconditions

SIMOTION SCOUT is in offline mode.

I/O channels of the terminal X142

You use the I/O channels of the terminal X142 for the sample project.

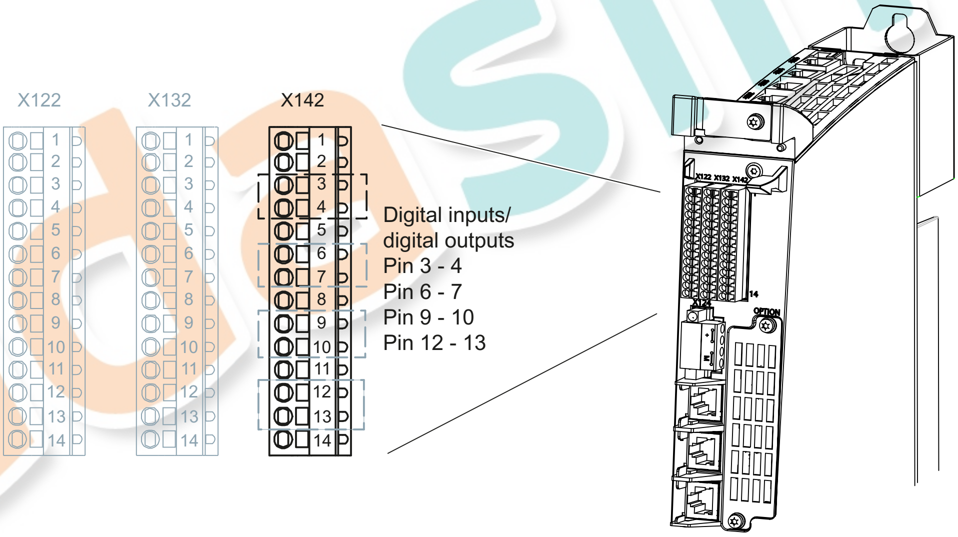


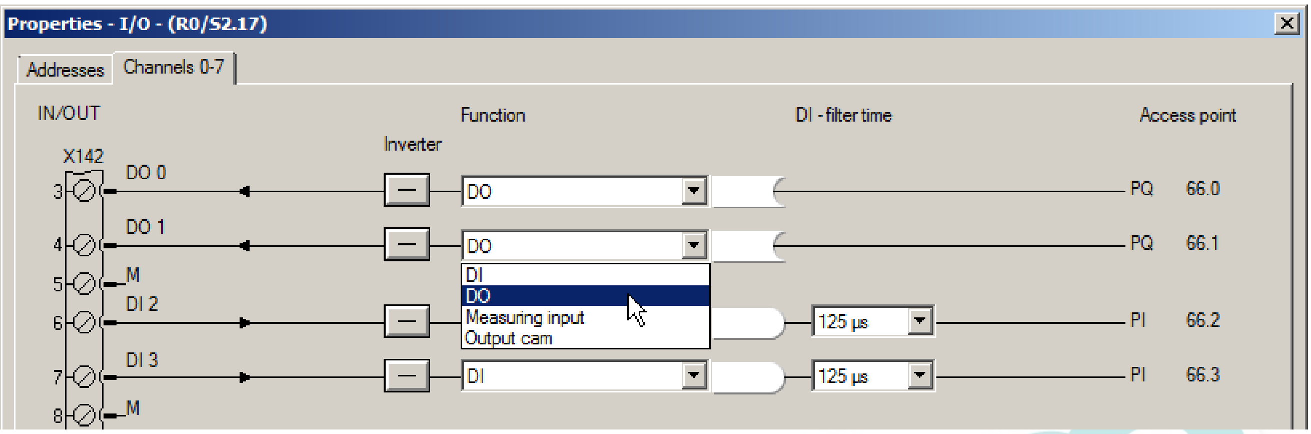
Figure 11-1 SIMOTION D445-2 DP/PN, position of the digital interface X142

The I/Os of the terminal X142 are permanently assigned to SIMOTION D4x5-2. The terminal is thus visible in the project tree under the SIMOTION device.

You define the digital outputs as follows

1. Double-click the element **Inputs/outupts X142** in the project tree below the SIMOTION device.
   The **I/O properties** dialog opens.
2. Go to the **Channels 0-7** tab.
   The terminal **X142** is represented on the tab, specifying the pin numbers and the current use of the channels.

3. Channels 0 and 1 on pins **3** and **4** are preset at the factory as digital inputs DI 0 and DI 1. Define the two channels as digital outputs DO 0 and DO 1. Select the value **DO** in each case in the **Function** list field.



Properties - I/O - (R0/S2.17)

Addresses | Channels 0-7

X142

IN/OUT	Inverter	Function	DI - filter time	Access point
3 DO 0	—	DO		PQ 66.0
4 DO 1	—	DO		PQ 66.1
5 M				
6 DI 2	—		125 µs	PI 66.2
7 DI 3	—	DI	125 µs	PI 66.3
8 M				

Figure 11-2 I/O properties

4. Confirm with **OK**.
   Configuring the digital outputs is thus completed.

Programming the SIMOTION application 12

12.1 Overview

Aim of Getting Started

In this section, you write a simple SIMOTION user program for the sample project.

- You create the variables required by the program.
- You create the program and additional auxiliary programs with the graphical editors supplied by SIMOTION SCOUT.

Purpose of the program

The program controls the axis set up in the sample project.

- The infeed is switched on via a SINAMICS system call.
- The axis is traversed to a specific position and returned to the original position.
- The program states "Program started" and "Program end reached" are applied to digital outputs to evaluate them in the I/O.

Preconditions

- You have configured the infeed, see the section Configure the infeed (Page 49).
- You have configured an axis and tested its function, see the sections Configure the axis (Page 53) and Test the axis with the axis control panel (Page 61).
- You have prepared two digital outputs for use in the program, see the section Configure digital outputs (Page 67).
- SIMOTION SCOUT is in offline mode.

12.2 Variables

12.2.1 Variable types

Variable types

Several variable types are distinguished in SIMOTION:

- **System variables**
  Each SIMOTION device and each technology object has specific system variables. You can access system variables within the SIMOTION device from all programs.
- **I/O variables**
  An I/O variable is a symbolic variable name that is assigned to an I/O address of the SIMOTION device or to the I/O. Direct access to the I/O is thus possible.
  I/O variables are valid across all devices. All programs of the SIMOTION device have access to them.
- **Global device variables, unit variables, and local variables** are user-defined variables with a limited scope of validity:
  All programs of a SIMOTION device can access global device variables.
  Unit variables can be accessed by all programs, function blocks and functions defined within the same unit, e.g. ST unit, MCC unit, LAD/FBD unit.
  A unit (source) is a logic unit that you can create in your project and that can contain programs, functions and function blocks.
  Local variables can only be accessed within the program, the function or the function block in which they are defined.

You can find further information on variables in the online help under **Variable model**.

12.2.2 Variables of the sample project

You require the following variables for the sample project of Getting Started:

2 global device variables

- g_bo_start
- g_bo_ready

2 I/O variables

- q_bo_output0
- q_bo_output1

Additionally when using an infeed with DRIVE-CLiQ interface:

2 I/O variables

- LineModule_STW
- LineModule_ZSW

Instance

- myFB_LineControl

Use of the variables in the sample project

The variables **g_bo_start** and **g_bo_ready** redundantly describe the program states "Program started" and "Program end reached".

The I/O variables **q_bo_output0** and **q_bo_output1** apply the program state to the configured digital outputs of the SIMOTION device, e.g. for a display.

The instance **myFB_LineControl** and the I/O variables **LineModule_STW** and **LineModule_ZSW** control the infeed.

12.2.3 Creating global device variables

You create global device variables in the **Symbol browser** tab of the detail view.

You create global device variables as follows

Create the global device variables **g_bo_start** and **g_bo_ready** for the sample project as follows.

The variable definition encompasses:

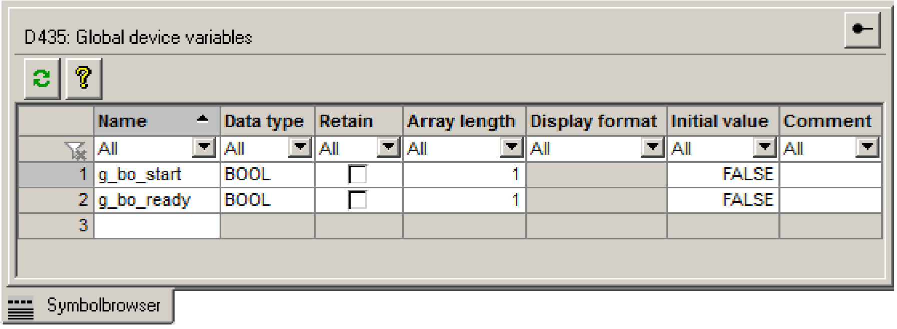
- Variable name
- BOOL data type

Note

You can only create global device variables in offline mode.

1. Click in the project navigator under the SIMOTION device on the element **GLOBAL DEVICE VARIABLES**.
   The **Global device variables** table is displayed in the symbol browser.
2. Click in the **Name** column on the first free cell and enter the variable name **g_bo_start**.
   Press RETURN or TAB. The input focus jumps to the **Data type** field. Alternatively, you can click in the field to move the input focus there.
3. Enter the data type **BOOL** in the **Data type** field.
4. Press RETURN to confirm.
   The variable is created and is available in the project. A new empty line is opened for input in the symbol browser.
5. Create the global device variable **g_bo_ready** accordingly.

The figure below shows the full definition.



D435: Global device variables

	Name	Data type	Retain	Array length	Display format	Initial value	Comment
	All	All	All	All	All	All	All
1	g_bo_start	BOOL	□	1		FALSE	
2	g_bo_ready	BOOL	□	1		FALSE	
3							

Figure 12-1 Global device variables of the sample project

12.2.4 Creating I/O variables

When configuring I/Os, SIMOTION SCOUT (as of Version 4.2) supports the symbolic assignment of inputs and outputs located on SIMOTION/SINAMICS components. To be able to access the drive-level I/O with an I/O variable, it is only necessary to assign the I/O variable to the I/O channel. SIMOTION SCOUT automatically sets up telegrams, BICO interconnections and addresses.

You create the I/O variables for output to the configured digital outputs as follows

You create the I/O variables q_bo_output0 and q_bo_output1 for the sample project as follows.

The variable declaration encompasses:

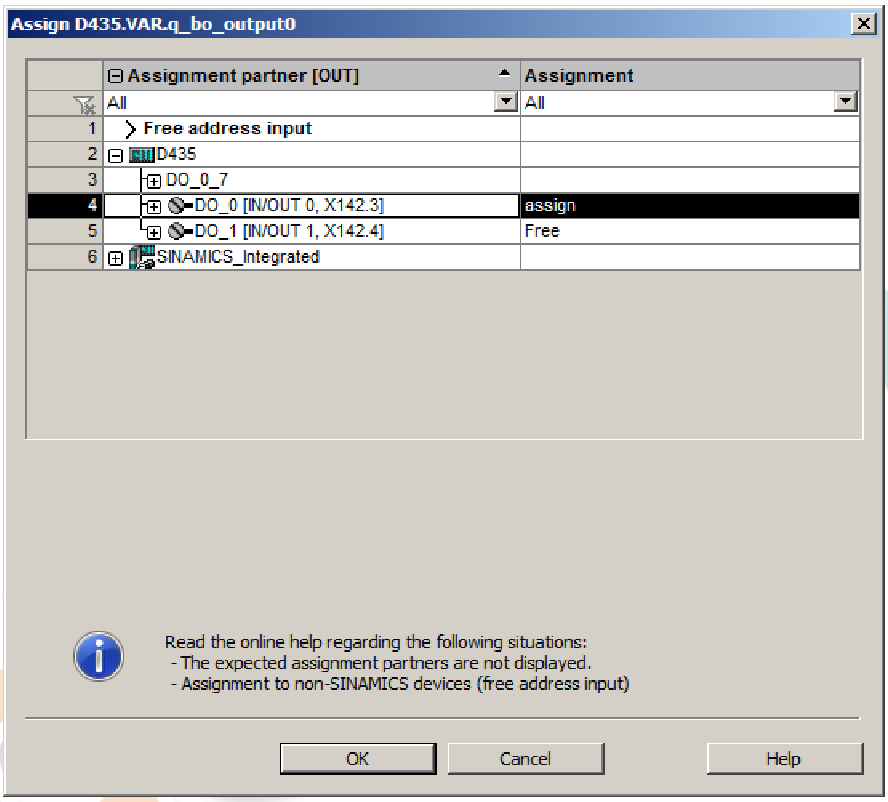
- Variable name
- Definition as output variable OUT
- BOOL data type
- Assignment to a digital output

Note

I/O variables can only be created in offline mode.

1. Double-click the element **ADDRESS LIST** in the project navigator below the SIMOTION device.
   The **Address list** tab opens in the detail view.
2. Click the first free cell in the **Name** column. Enter the variable name **q_bo_output0**. Press RETURN or TAB. The input focus jumps to the **I/O address** field. Alternatively, you can click in the field to move the input focus there.
3. Enter the keyword **OUT** in the **I/O address** field.
4. Enter the data type **BOOL** in the **Data type** field, or leave the field empty.

5. Assign the configured digital output to the variable:
   – Click the button ... in the **Assignment** cell. The Assignment dialog opens.
   – Open the **D435** element in the Assignment dialog.
   – Click the digital output **DO_0** below the **D435** element. **Assign** appears in the **Assignment** column.



Assign D435.VAR.q_bo_output0

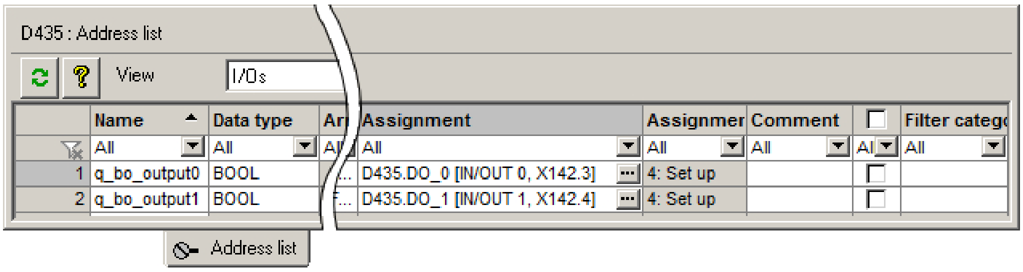
	⊟ Assignment partner [OUT]	Assignment
	All	All
1	> Free address input	
2	⊟ D435	
3	⊞ DO_0_7	
4	⊞ DO_0 [IN/OUT 0, X142.3]	assign
5	⊞ DO_1 [IN/OUT 1, X142.4]	Free
6	⊞ SINAMICS_Integrated	

Read the online help regarding the following situations:
- The expected assignment partners are not displayed.
- Assignment to non-SINAMICS devices (free address input)

Figure 12-2 Assigning I/O variable and I/O channel

6. Confirm with **OK**.
   The assignment of I/O variable and I/O channel has been completed. The I/O variable is created and is available in the project. A new empty line is opened for input in the **Address list** table.

7. Create the I/O variable **q_bo_output1** in the same way. Assign the variable to the configured digital output DO 1.
   The figure below shows the full declaration:



D435 : Address list

View I/Os

	Name	Data type	Ar	Assignment	Assignmer	Comment	□	Filter categ
	All	All	Al	All	All	All	Al	All
1	q_bo_output0	BOOL	...	D435.DO_0 [IN/OUT 0, X142.3] ···	4: Set up		□	
2	q_bo_output1	BOOL	F...	D435.DO_1 [IN/OUT 1, X142.4] ···	4: Set up		□	

Figure 12-3 I/O variables of the sample project

8. Leave the **Address list** tab open for declaring further I/O variables.

You create the I/O variables for controlling the infeed as follows

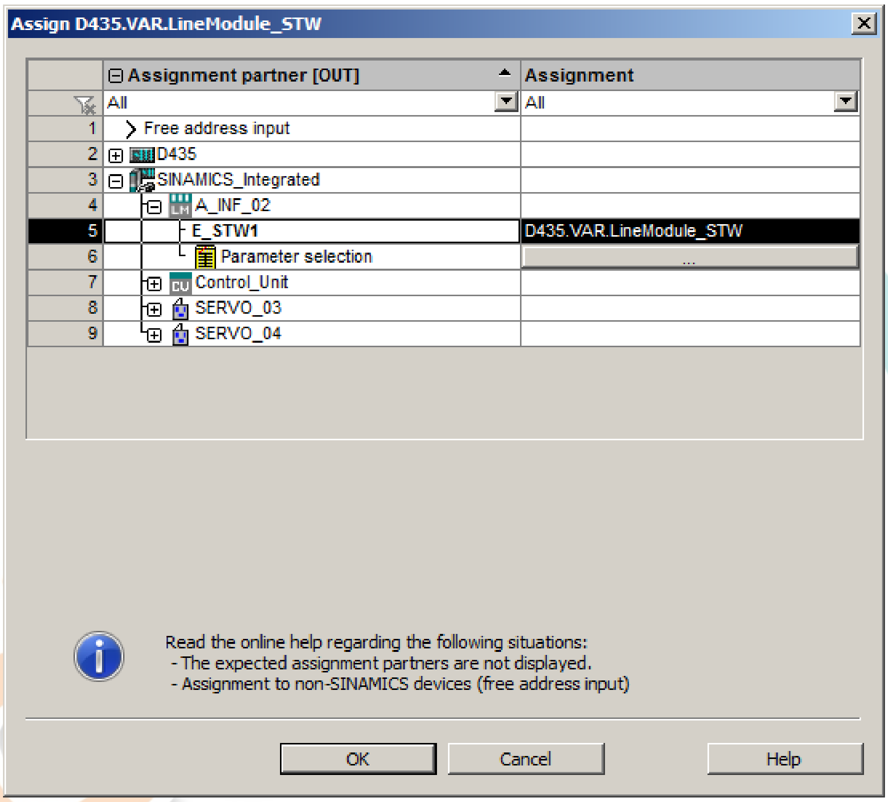
If you are using an infeed with DRIVE-CLiQ interface, create also the I/O variables **LineModule_STW** and **LineModule_ZSW**.

Note

I/O variables can only be created in offline mode.

Proceed as for the definition of the I/O variables **q_bo_output0** and **q_bo_output1**.

1. Open the **Address list** tab in the detail area if not already visible.
2. Create the I/O variable **LineModule_STW**.
   - **I/O address**: OUT
   - **Data type**: WORD
   - **Assignment**: Control word E_STW1 of the SINAMICS infeed



Assign D435.VAR.LineModule_STW

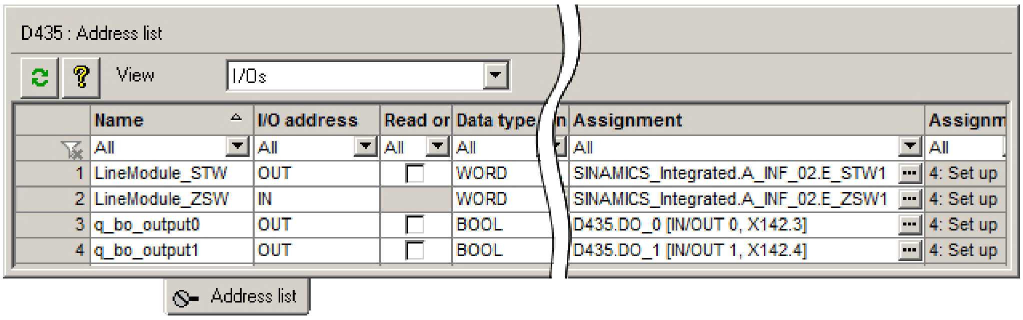
	⊟ Assignment partner [OUT]	Assignment
	All	All
1	Free address input	
2	⊞ D435	
3	⊟ SINAMICS_Integrated	
4	⊟ A_INF_02	
5	E_STW1	D435.VAR.LineModule_STW
6	Parameter selection	...
7	⊞ Control_Unit	
8	⊞ SERVO_03	
9	⊞ SERVO_04	

Read the online help regarding the following situations:
- The expected assignment partners are not displayed.
- Assignment to non-SINAMICS devices (free address input)

Figure 12-4 Assigning I/O variable and control word of the infeed

3. Create the I/O variable **LineModule_ZSW**.
   - **I/O address**: IN
   - **Data type**: WORD
   - **Assignment**: Status word E_ZSW1 of the SINAMICS infeed

The figure below shows the full declaration:



D435 : Address list

View: I/Os

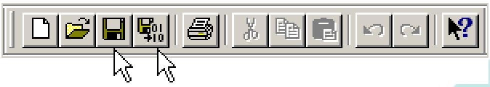
	Name	I/O address	Read or	Data type	n	Assignment	Assignm
	All	All	All	All		All	All
1	LineModule_STW	OUT	☐	WORD		SINAMICS_Integrated.A_INF_02.E_STW1	4: Set up
2	LineModule_ZSW	IN		WORD		SINAMICS_Integrated.A_INF_02.E_ZSW1	4: Set up
3	q_bo_output0	OUT	☐	BOOL		D435.DO_0 [IN/OUT 0, X142.3]	4: Set up
4	q_bo_output1	OUT	☐	BOOL		D435.DO_1 [IN/OUT 1, X142.4]	4: Set up

Figure 12-5 I/O variables of the sample project

12.2.5 Back up the configuration

Back up the variables created in the sample project.

To do so, click in the toolbar on the **Save project** or **Save project and compile changes** button.



12.3 Programming

12.3.1 Programming languages in the sample project

Within the scope of the sample project, you create a simple user program with the programming languages MCC and LAD/FBD.

For this, you use the variables you created in the previous section Variables (Page 70).

12.3.2 MCC Motion Control Chart

12.3.2.1 The programming language MCC

MCC (Motion Control Chart) is a graphical programming language.

The programmed motion sequences (machine sequences) are shown in the MCC as flowcharts (MCC charts). The structure of the flowcharts is oriented around the actual operating sequence of the machine. A sequential motion sequence is programmed.

System in SIMOTION SCOUT

The **PROGRAMS** folder under the SIMOTION device contains the MCC units created in the project.

An MCC unit contains the MCC programs that are to run on the SIMOTION device.

"MCC program" is a collective term for different program organization units (POU).

A POU can be a program, a function, or a function block. The type of the POU is indicated in the project navigator by an icon:

Program

Function

Function block

An MCC chart is the graphical representation of a program organization unit POU.

An MCC unit can contain several MCC charts.

Program creation steps

Creation of an MCC program encompasses the following steps:

1. Creating the MCC unit.
2. Creating the MCC charts in the MCC unit.
3. Inserting MCC commands in the MCC chart and parameterizing the commands.

12.3.2.2 Creating the MCC unit

You create the MCC unit **motion** for the sample project as follows.

You create an MCC unit in the project as follows

1. Open the **PROGRAMS** folder under the SIMOTION device in the project navigator. Double-click **Insert MCC unit**. The **Insert MCC unit** window appears.
2. Enter the name **motion**.
3. Go to the **Compiler** tab. For diagnostics purposes, activate the options **Permit program status** and **Permit single step**. In this way, you can monitor program execution later in online mode.
4. Confirm with **OK**.
   The MCC unit is created.
   - The unit appears in the project navigator under the PROGRAMS branch.
   - In the working area of the workbench, the declaration table of the unit opens. The variables declared there apply within the MCC unit and can be linked in other units.

   No other variable declaration is required for the sample project. You have already created the necessary variables as global device variables in the symbol browser.

12.3.2.3 Creating the MCC chart

You create the MCC chart **pos_axis** for the sample project as follows. The MCC chart **pos_axis** is a POU of the type program.

You create an MCC chart as follows

1. Open the **PROGRAMS** folder under the SIMOTION device in the project navigator.
2. Open the MCC unit **motion** in the **PROGRAMS** folder.
3. Double-click **Insert MCC chart.**
   The **Insert MCC Chart** window appears.
4. Enter the name **pos_axis.**
5. Select the creation type **Program.**
6. Confirm with **OK.**
   The MCC chart is created in the project.
   - The created MCC chart **pos_axis** appears in the **PROGRAMS** folder under the **motion** unit.
   - The MCC editor is opened in the working area of the workbench. The start and end nodes are already pre-defined. You can start MCC programming.

12.3.2.4 Inserting command blocks into an MCC chart

Every newly created MCC chart already contains a start and end node.

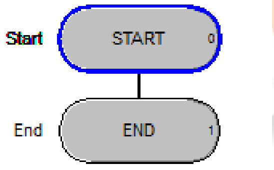


Figure 12-6 MCC chart, start and end block

You insert the MCC command blocks between these. The commands are processed in the direction from the start to the end node.

The MCC commands are available to you via:

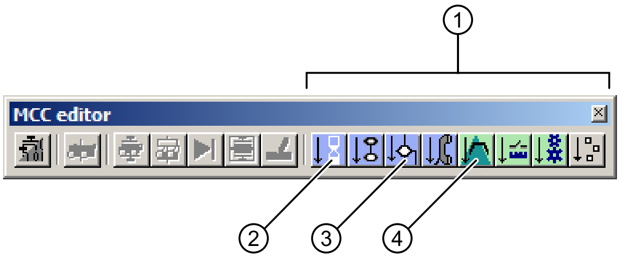
- **MCC editor** toolbar
- **MCC Chart > Paste** menu command
- Context menu of the command block

You work with the MCC editor toolbar as follows

Open the toolbar

The **MCC editor** toolbar becomes visible in the workbench as soon as you open an MCC chart.

The commands are arranged into command groups. The sample project uses commands from the command groups **Basic commands**, **Program structures**, and **Single axis commands**.



①	Command groups
②	Basic commands
③	Program structures
④	Single axis commands

Figure 12-7 MCC editor toolbar

Note

If you do not see the toolbar, check that the display is switched on: Open the menu **View > Toolbars**. Activate the checkbox for **MCC editor** in the **Toolbars** window.

Open the command group

Move the mouse over the colored buttons of the toolbar to show the command groups.

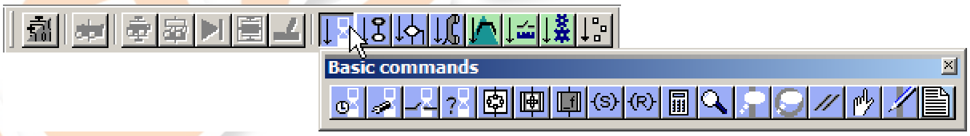


Figure 12-8 Open the command group

Keeping command groups open or closed continuously

Click the window title of a command group to keep the command group open continuously.

Select **Hide** in the context menu of a command group to close the command group.

Placing the command group as required

Drag the toolbar or the command groups of the toolbar with the mouse to any location on the workbench.

Docking the toolbar

Drag the toolbar or the command groups of the toolbar with the mouse to the edge areas of the workbench to dock them there.

Showing a tooltip for the command

Hold the mouse pointer briefly over a command button. The designation of the command is shown.

You insert commands into an MCC chart with the help of the MCC editor toolbar as follows

1. Click in the active MCC chart on the connecting line between two commands, or click the command after which the new command is to be inserted.
   The connecting line or the border of the command button is marked in blue. The marking flashes.
2. Select the command group in the **MCC editor** toolbar. Click the desired command in the command group.
   The command is inserted into the chart.

The newly inserted command is empty. It must then be parameterized; e.g. for a variable assignment, the name of the variable and the assigned value must be specified.

The following section Creating an MCC sample program: basic framework (Page 80) describes the procedure in detail.

12.4 Creating an MCC sample program: basic framework

12.4.1 Overview

In the sample project, you create the MCC program **pos_axis**. This program traverses an axis to a target position and back to the starting position.

Handling the infeed

If you are using an infeed without a DRIVE-CLIQ interface, the basic framework for program-controlled operation of the axis dealt with in this section is sufficient. The ready signal of the infeed is wired to the digital input DI 0 of the D435-2, see section Configure the infeed (Page 49).

If you are using an infeed with a DRIVE-CLiQ interface, the program must switch the infeed on. Getting Started deals with this additional program sequence separately in the section Expanding the MCC sample program: control of the infeed (Page 93).

12.4.2 Program flow

The finished MCC chart

The figure below shows the finished MCC chart of the sample program.

The first two command blocks initialize the variables **g_bo_ready** and **g_bo_start**. The axis is then enabled, referenced, and traversed to the target position. When the position has been reached, the axis returns to the starting position. The enable is revoked. Finally, the variable **g_bo_start** is reset and the variable **g_bo_ready** is set.

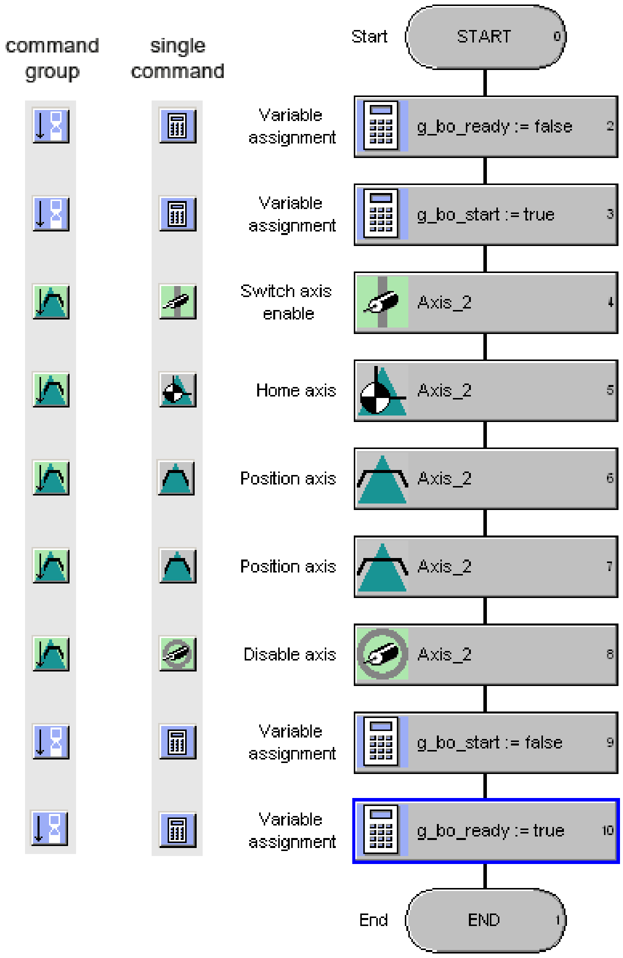


Figure 12-9 MCC chart of the sample program

Command groups and individual commands

In the figure above, the icons of the command group and of the individual command that you must click in sequence to insert the command into the MCC chart are shown in front of every MCC command.

The sections below describe the procedure in detail.

12.4.3 Variable assignment g_bo_ready:=false

Variable initialization of **g_bo_ready** to FALSE to set the variable to a defined starting point.

You assign the value FALSE to the variable g_bo_ready as follows

1. Insert the statement block **Variable assignment** into the MCC chart:

   – Click the START node.
   The node is marked in blue.

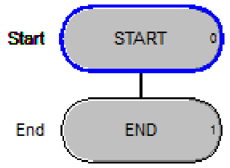


Figure 12-10 Empty MCC chart

   – Open the **Basic commands** command group in the **MCC editor** toolbar. Click the **Variable assignment** command in the command group.

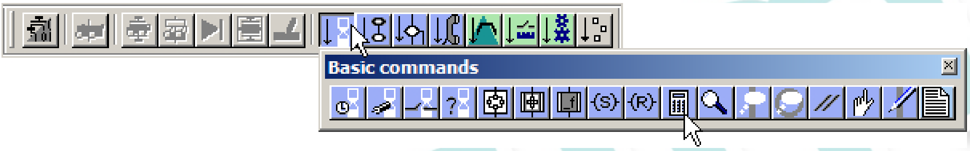


Figure 12-11 MCC editor toolbar, variable assignment command

   – The **Variable assignment** command block is inserted into the MCC chart after the start node.

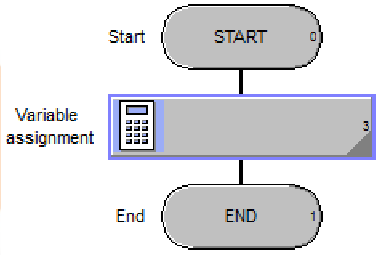


Figure 12-12 MCC chart with inserted variable assignment command block

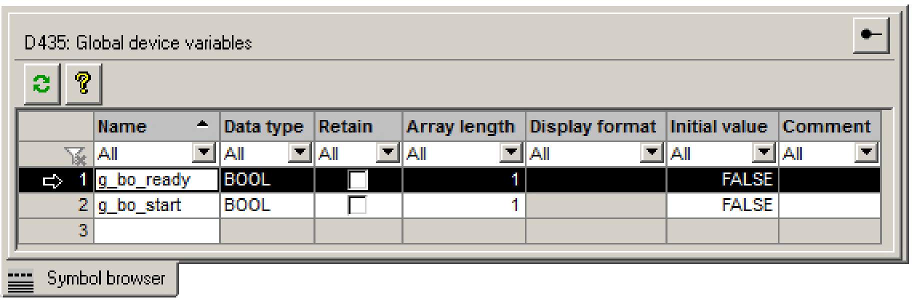
2. Assign the value FALSE to the variable **g_bo_ready**. You transfer the variable name from the symbol browser to the command block:

   – Double-click the **Variable assignment** command block.
   The **Variable assignment** window appears.

   – Select the value **Formula** in the drop-down list.
   A table with the columns **Variables** and **Expression** appears.

   – Open the symbol browser. To do so, click **GLOBAL DEVICE VARIABLES** under the SIMOTION device in the project navigator.

   – Select the variable **g_bo_ready** in the symbol browser. To do so, click in the first column of the symbol browser on the preceding line number. The line is shown on a black background.

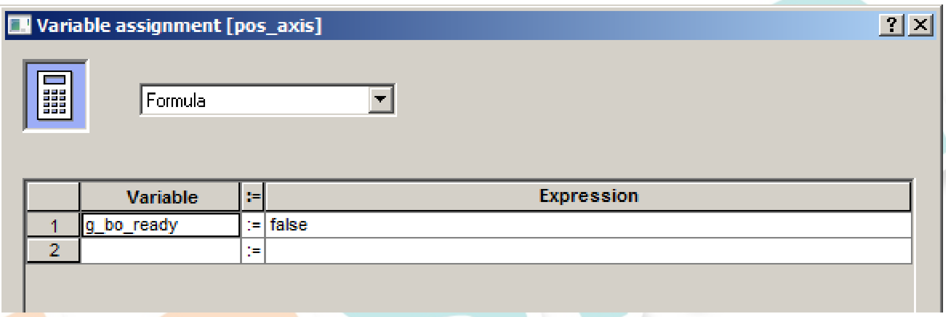


D435: Global device variables

	Name	Data type	Retain	Array length	Display format	Initial value	Comment
	All	All	All	All	All	All	All
1	g_bo_ready	BOOL	☐	1		FALSE	
2	g_bo_start	BOOL	☐	1		FALSE	
3							

Figure 12-13 Symbol browser

- Drag and drop the marked line to the **Variable** column of the **Variable assignment** window. The variable is inserted and its name displayed.
- In the **Expression** column, enter the value **false** and confirm with RETURN.



Variable assignment [pos_axis]

Formula

	Variable	:=	Expression
1	g_bo_ready	:=	false
2		:=	

Figure 12-14 Variable assignment

3. Click **OK** to close the window.
   The command is parameterized.

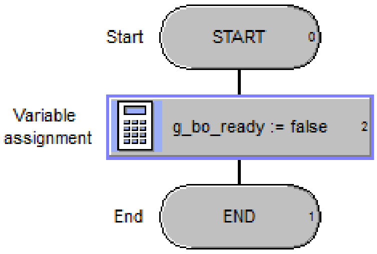


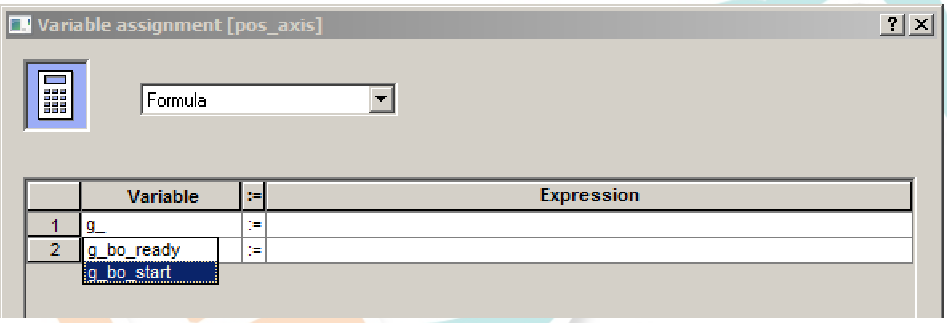
Figure 12-15 MCC chart, executed variable assignment

12.4.4 Variable assignment g_bo_start:=true

The variable **g_bo_start** is set to TRUE to indicate the start of the axis.

You assign the value TRUE to the variable g_bo_start as follows

1. Insert a second **Variable assignment** block into the MCC chart in front of the end node:
   - Click the command block to be followed by the new block.
     The node is marked in blue.
   - Select the **Basic commands > Variable assignment** command in the **MCC editor** toolbar.
     The **Variable assignment** command block is inserted into the MCC chart.
2. Assign the value TRUE to the variable **g_bo_start**. Use the Autocomplete function to select the variable:
   - Double-click on the empty **Variable assignment** command block in the MCC chart.
     The **Variable assignment** window appears.
   - Select the value **Formula** in the drop-down list.
   - Enter the initial characters of the variable name **g_bo_start** in the **Variable** column. Press the keys **Ctrl+space bar** for autocomplete. Select the variable from the list.



	Variable	:=	Expression
1	g_	:=	
2	g_bo_ready g_bo_start	:=	

Figure 12-16 MCC chart, selection of the variable using the Autocomplete function

   - In the **Expression** column, enter the value **true** and confirm with RETURN.
3. Click **OK** to close the window.
   The command is parameterized.

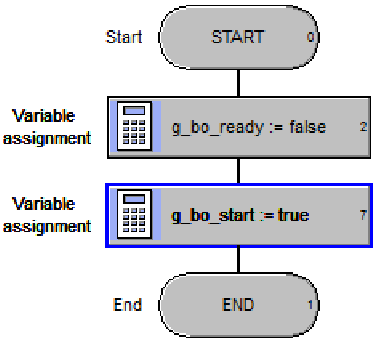


Figure 12-17 MCC chart, executed variable assignment

12.4.5 Switch axis enable

You switch the axis enable as follows

1. Insert the statement block **Switch axis enable** into the MCC chart in front of the end node:
   - Click the last block before the end node. The node is marked in blue.
   - Open the **Single axis commands** command group in the **MCC editor** toolbar. Click the **Switch axis enable** command in the command group.

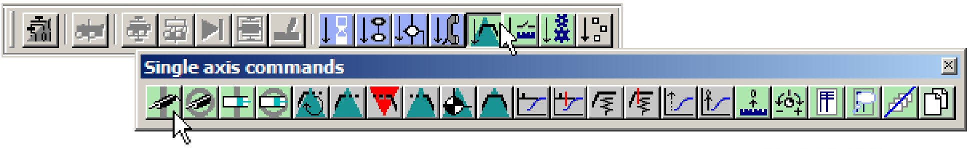
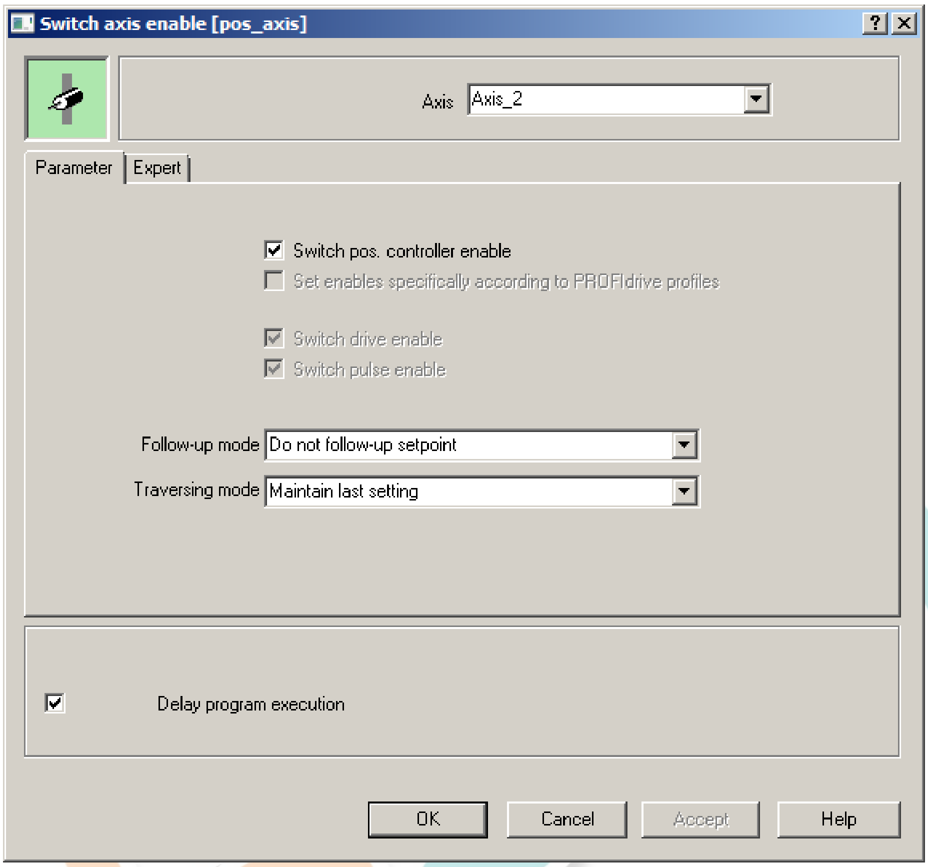


Figure 12-18 MCC editor toolbar, Switch axis enable command

The **Axis enable** command block is inserted into the MCC chart after the selected block and marked in blue.

2. Parameterize the axis enable:
   - Double-click the inserted **Switch axis enable** command block in the MCC chart. The **Switch axis enable** window is displayed.
   - In the **Axis** field, select the axis that is controlled by the program.
   - Make sure that the **Delay program execution** option is selected for the sample project.
     The command is only finished when the axis is enabled.
     Leave the other parameters at the default values.



Switch axis enable [pos_axis]

Axis: Axis_2

☑ Switch pos. controller enable

□ Set enables specifically according to PROFIdrive profiles

☑ Switch drive enable

☑ Switch pulse enable

Follow-up mode: Do not follow-up setpoint

Traversing mode: Maintain last setting

☑ Delay program execution

Figure 12-19 MCC chart, Switch axis enable

3. Click **OK** to close the window.
   The command is parameterized.

12.4.6 Home axis

Homing of the axis is implemented as follows

1. Insert the statement block **Home axis** into the MCC chart in front of the end node:
   - Click the last block before the end node. The node is marked in blue.
   - Open the **Single axis commands** command group in the **MCC editor** toolbar. Click the command **Home axis** in the command group.

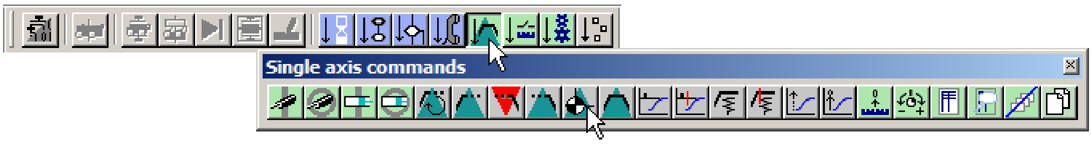
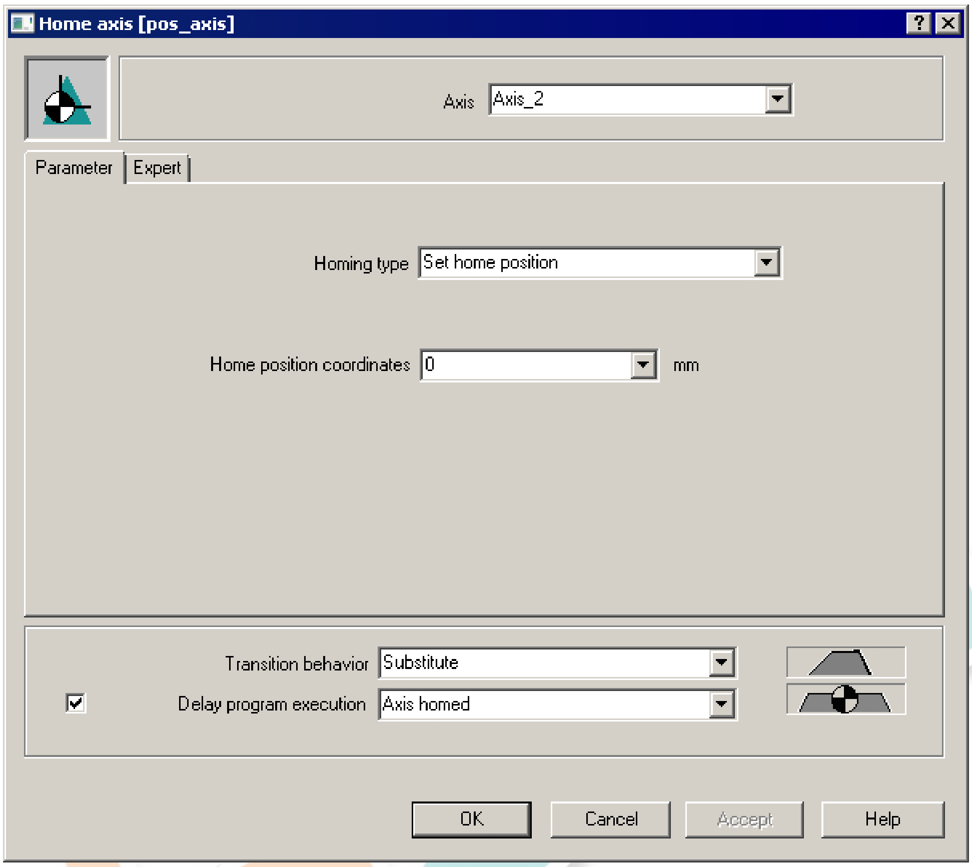


Figure 12-20 MCC editor toolbar, Home axis command

The **Home axis** command block is inserted into the MCC chart after the selected block and marked in blue.

2. Parameterize axis homing:
   - Double-click the inserted **Home axis** command block in the MCC chart. The **Home axis** window appears.
   - In the **Axis** field, select the axis that is controlled by the program.
   - In the **Parameters** tab, select the homing type **Set home position**. Enter the value **0** in the **Home position coordinates** field.
     With this homing type, the value of the home position coordinates are assigned to the current position of the axis (actual value). There is no active traversing motion.
   - Leave the other parameters at the default values.



Axis: Axis_2

Homing type: Set home position

Home position coordinates: 0 mm

Transition behavior: Substitute

☑ Delay program execution: Axis homed

Figure 12-21 MCC chart, Home axis

3. Click **OK** to close the window.
   The command is parameterized.

12.4.7 Position the axis to the target position

The program is to traverse the axis at a velocity of 500 mm/s to the position 2000 mm.

You traverse the axis to the target position as follows

1. Insert the statement block **Position axis** into the MCC chart in front of the end node:
   - Click the last block before the end node. The node is marked in blue.
   - Open the **Single axis commands** command group in the **MCC editor** toolbar. Click the **Position axis** command in the command group.

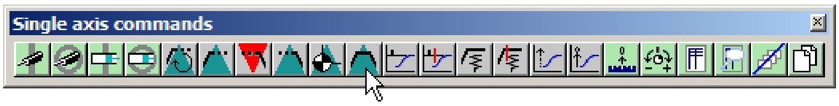
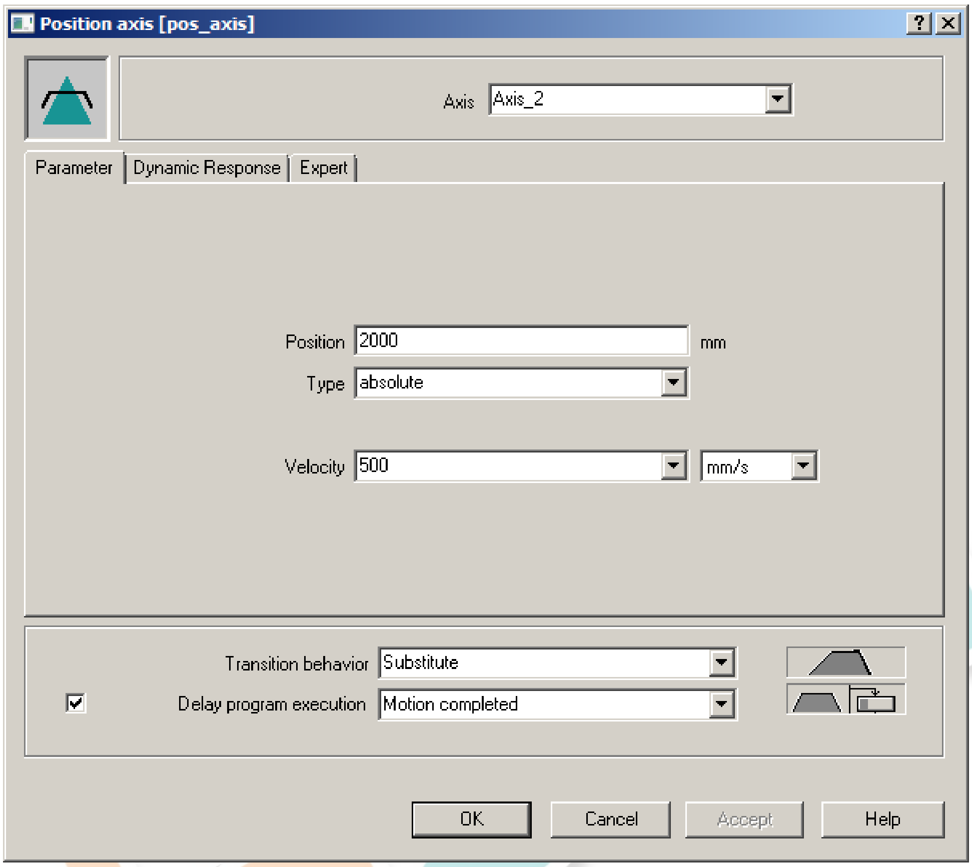


Figure 12-22 MCC editor toolbar, Position axis command

The **Position axis** command block is inserted into the MCC chart after the selected block and marked in blue.

2. Parameterize the axis motion:
   - Double-click the inserted **Position axis** command block in the MCC chart. The **Position axis** window appears.
   - In the **Axis** field, select the axis that is controlled by the program.
   - Enter the position 2000 in the **Parameters** tab. Set the velocity to 500 mm/s.
   - Leave the other parameters at the default values.



Position axis [pos_axis]

Axis: Axis_2

Parameter | Dynamic Response | Expert

Position: 2000 mm

Type: absolute

Velocity: 500 mm/s

Transition behavior: Substitute

☑ Delay program execution: Motion completed

Figure 12-23 MCC chart, position the axis to the target position

3. Click **OK** to close the window.
   The command is parameterized.

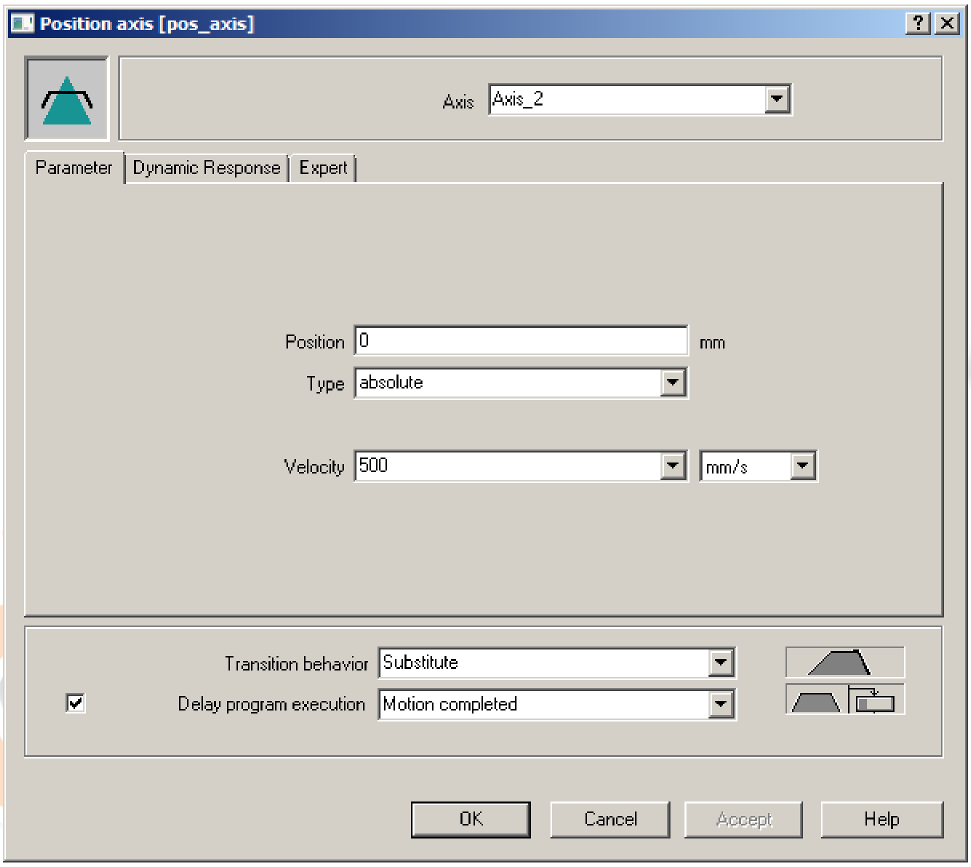
12.4.8 Position the axis to the starting position

The program is to return the axis to the starting position 0 mm at a velocity of 500 mm/s.

You return the axis to the starting position as follows

Proceed as for the step Position the axis to the target position (Page 88).

1. Insert the statement block **Position axis** into the MCC chart in front of the end node.
2. Parameterize the axis motion:
   - Enter the position 0 in the **Parameters** tab. Set the velocity to 500 mm/s.
   - Leave the other parameters at the default values.



Position axis [pos_axis]

Axis: Axis_2

Position: 0 mm

Type: absolute

Velocity: 500 mm/s

Transition behavior: Substitute

☑ Delay program execution: Motion completed

Figure 12-24 MCC chart, position the axis to the starting position

3. Click **OK** to close the window.
   The command is parameterized.

12.4.9 Disable axis

You disable the axis as follows

1. Insert the statement block **Disable axis** into the MCC chart in front of the end node:
   - Click the last block before the end node. The node is marked in blue.
   - Open the **Single axis commands** command group in the **MCC editor** toolbar. Click the **Disable axis** command in the command group.

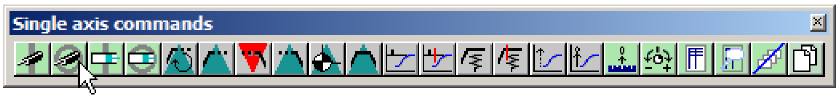
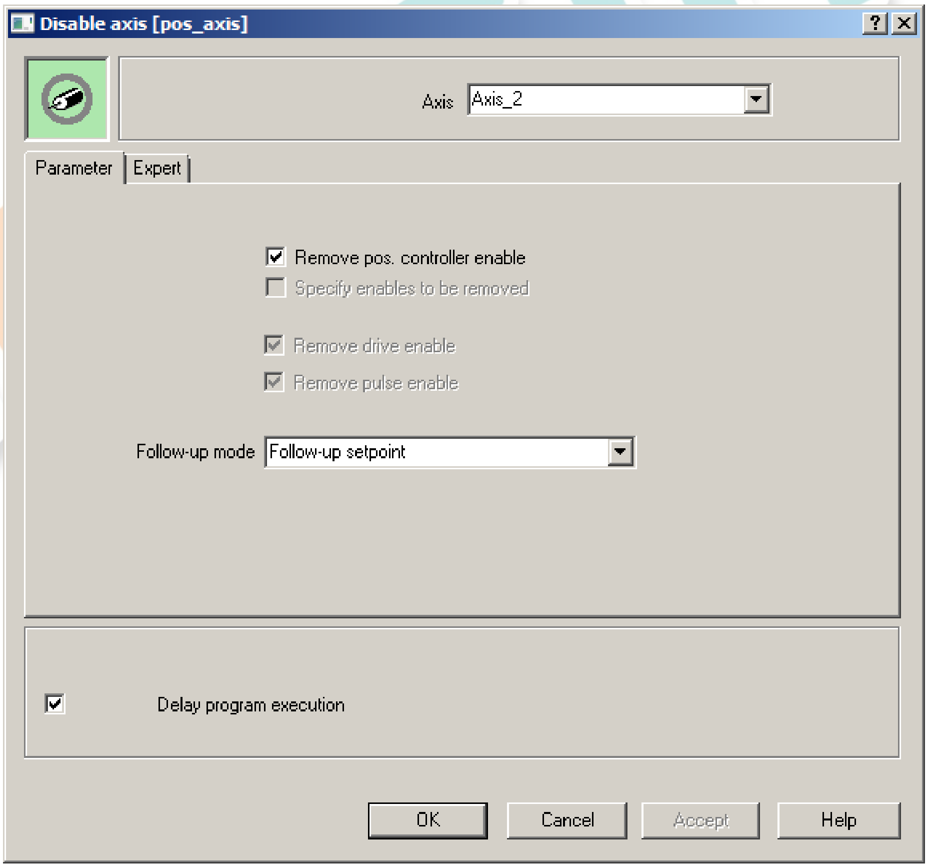


Figure 12-25 MCC editor toolbar, Disable axis command

The **Disable axis** command block is inserted into the MCC chart after the selected block and marked in blue.

2. Parameterize the command:
   - Double-click the inserted **Disable axis** command block in the MCC chart. The **Disable axis** window is displayed.



Disable axis [pos_axis]

Axis: Axis_2

☑ Remove pos. controller enable
□ Specify enables to be removed
☑ Remove drive enable
☑ Remove pulse enable

Follow-up mode: Follow-up setpoint

☑ Delay program execution

Figure 12-26 MCC chart, Disable axis

   - In the **Axis** field, select the axis that is controlled by the program.

- Leave the other parameters at the default values.

3. Click **OK** to close the window.
   The command is parameterized.

12.4.10 Variable assignment g_bo_start:=false

The axis motion is finished. The variable **g_bo_start** is set to FALSE.

You assign the value FALSE to the variable g_bo_start as follows

Proceed as for the step Variable assignment g_bo_start:=true (Page 83).

1. Insert the statement block **Variable assignment** into the MCC chart in front of the end node.
2. Assign the value **false** to the variable **g_bo_start**.
3. Click **OK** to close the window.
   The command is parameterized.

12.4.11 Variable assignment g_bo_ready:=true

The axis motion is finished. The variable **g_bo_ready** is set to TRUE.

You assign the value TRUE to the variable g_bo_ready as follows

Proceed as for the step Variable assignment g_bo_ready:=false (Page 81).

1. Insert the statement block **Variable assignment** into the MCC chart in front of the end node.
2. Assign the value **true** to the variable **g_bo_ready**.
3. Click **OK** to close the window.
   The command is parameterized.

12.5 Expanding the MCC sample program: control of the infeed

12.5.1 Program flow

If you are using an infeed with DRIVE-CLiQ interface, the programmed controller must switch on the infeed before the axis commands can then be issued. The program sequence shown below handles this task. The **pos_axis** program created until now must be expanded accordingly.

The finished MCC chart

The two times two blocks **_linemodule_control** system function call and **LineModule_STW** variable assignment are located in the MCC chart **pos_axis** before the first command for axis control **Switch axis enable**.

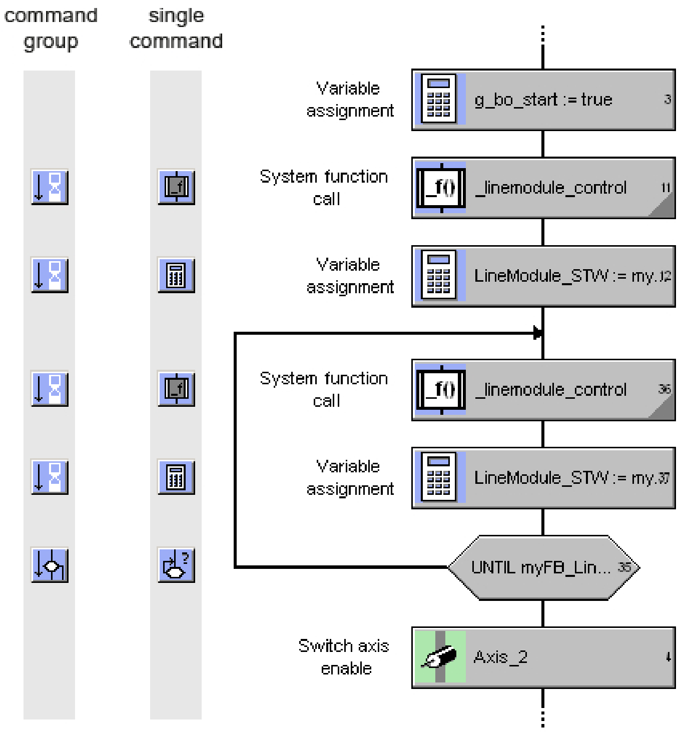


Figure 12-27 MCC chart of the sample program, control of the infeed

The first two blocks before the **UNTIL** loop reset the operating parameters of the infeed to the start values. Without this initialization, it may not be possible to switch the infeed on. In addition, this also acknowledges alarm messages that prevent enabling of the infeed.

The blocks within the **UNTIL** loop switch the infeed on. The loop repeats the switching command until the infeed is ready for operation.

Note

To avoid excess load on the performance of the round robin execution level (background task, motion tasks) during endless loops, it makes sense to use a _waitTime (T#0ms) in the loop while actively waiting for an event.

12.5.2 System function call _LineModule_control[FB]

You create the system function call _LineModule_control[FB] as follows

1. Insert the statement block **System function call** into the MCC chart:
   - Click the command block **g_bo_start := true**.
     The node is marked in blue.
   - Select the **Basic commands > System function call** command in the **MCC editor** toolbar.

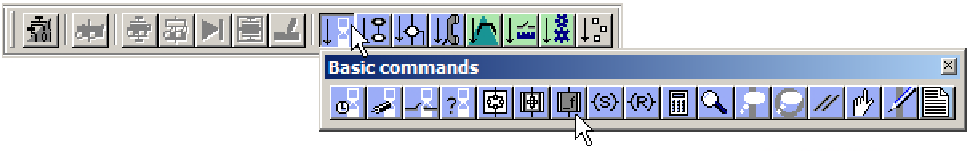


Figure 12-28 MCC editor toolbar, System function call command

The command block is inserted into the MCC chart.

2. Parameterize the function call:
   - Double-click the empty **System function call** command block in the MCC chart.
     The **System function call [pos_axis]** dialog appears.
   - Open the command library. You can find the command library in the screen area of the project navigator as a separate tab.

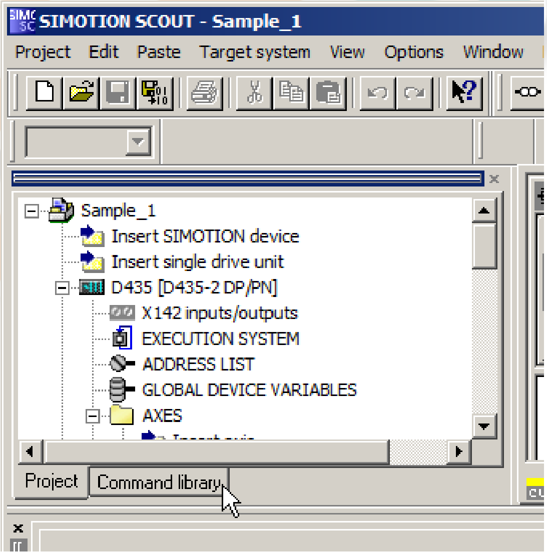
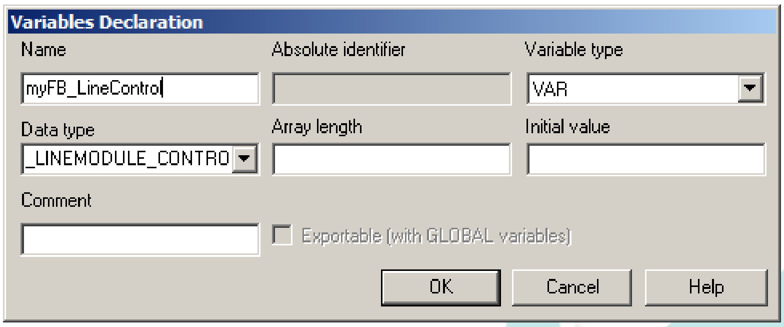


Figure 12-29 Open the command library

   - Go to the **Drives > SINAMICS** branch of the command library.
   - Drag & drop the **_LineModule_control[FB]** function call from the command library to the **System function** field of the **System function call[pos_axis]** window.

3. Define an instance for the system function call:

   – Enter the instance name **myFB_LineControl** in the **Instance** field of the **System function call [pos_axis]** window.
   As soon as you exit the field, e.g. by clicking on another element or with the TAB or RETURN keys, the **Variables declaration** dialog appears. The instance variable **myFB_LineControl** is assigned to the variable type **VAR** as default. The variable is thus valid locally within the program **pos_axis**.



Name: myFB_LineControl

Variable type: VAR

Data type: _LINEMODULE_CONTRO

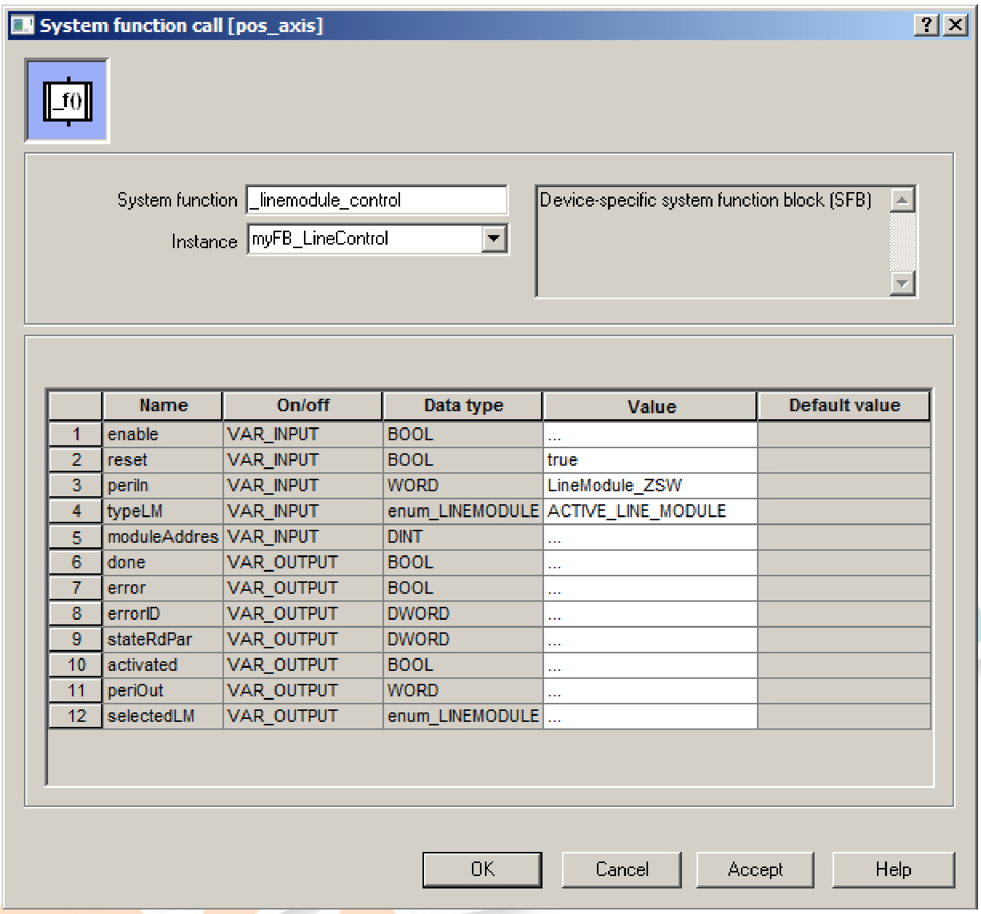
Figure 12-30 Variable declaration of the instance variable myFB_LineControl

Accept the default. Click **OK** to confirm the dialog.

   – Set the input variables VAR_INPUT of the instance to the following values. Make use of the convenience of the autocomplete operator function **Ctrl+spacebar**:

Variable name	Value	Meaning
reset	true	Reset the infeed
periIn	LineModule_ZSW	Status word of the infeed
typeLM	ACTIVE_LINE_MODULE SMART_LINE_MODULE BASIC_LINE_MODULE	Type of the module to be controlled depending on the infeed used

4. Confirm with **OK**. The command is parameterized.



System function: _linemodule_control

Instance: myFB_LineControl

Device-specific system function block (SFB)

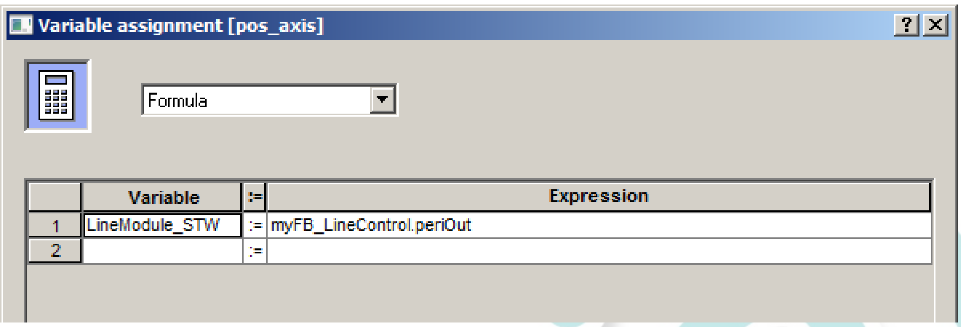
	Name	On/off	Data type	Value	Default value
1	enable	VAR_INPUT	BOOL	...	
2	reset	VAR_INPUT	BOOL	true	
3	periIn	VAR_INPUT	WORD	LineModule_ZSW	
4	typeLM	VAR_INPUT	enum_LINEMODULE	ACTIVE_LINE_MODULE	
5	moduleAddres	VAR_INPUT	DINT	...	
6	done	VAR_OUTPUT	BOOL	...	
7	error	VAR_OUTPUT	BOOL	...	
8	errorID	VAR_OUTPUT	DWORD	...	
9	stateRdPar	VAR_OUTPUT	DWORD	...	
10	activated	VAR_OUTPUT	BOOL	...	
11	periOut	VAR_OUTPUT	WORD	...	
12	selectedLM	VAR_OUTPUT	enum_LINEMODULE	...	

Figure 12-31 MCC chart, system function call _linemodule_control

12.5.3 Variable assignment LineModule_STW:=myFB_LineControl.periOut

You assign the myFB_LineControl.periOut variable to the LineModule_STW variable as follows

1. Create a **Variable assignment** block after the **System function call** block.
2. Assign the **myFB_LineControl.periOut** variable to the **LineModule_STW** I/O variable. You can use autocomplete or drag & drop in both **Variable** and **Expression** fields.



Variable assignment [pos_axis]

Formula

	Variable	:=	Expression
1	LineModule_STW	:=	myFB_LineControl.periOut
2		:=	

Figure 12-32 MCC chart, variable assignment LineModule_STW:=myFB_LineControl.periOut

3. Click **OK** to close the window.
   The command is parameterized.

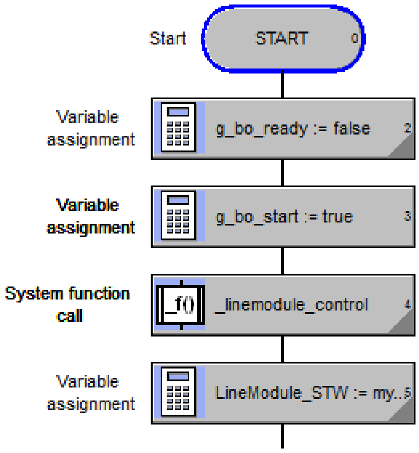


Figure 12-33 MCC chart, system function call and variable assignment

12.5.4 Create UNTIL loop

You create the UNTIL loop as follows

1. Click the connecting line between the blocks **Variable assignment LineModule_STW:=myFB_LineControl.periOut** and the subsequent axis command **Switch axis enable.**
   The reference point is marked in blue.
2. In the **MCC editor** toolbar, select the command **Program structures > UNTIL: Loop with condition at end**

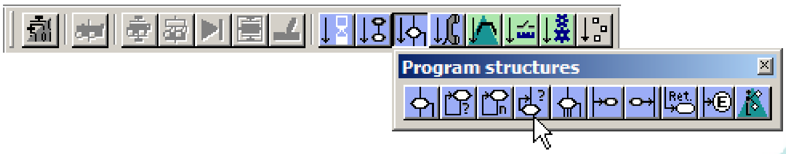


Figure 12-34 MCC editor toolbar, UNTIL loop

The **UNTIL** block with loop is inserted.

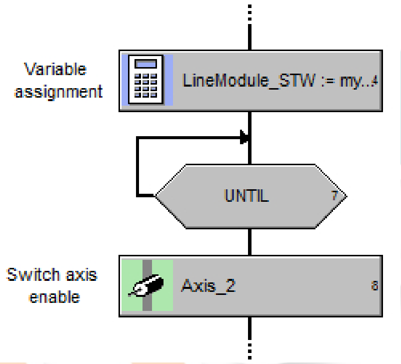


Figure 12-35 MCC editor, UNTIL loop

3. Parameterize the loop condition:
   The loop is to be run through until the infeed is ready for operation.
   – Double-click the UNTIL block. The window **UNTIL: Loop with condition at end[]pos_axis]** appears.
   – Select the value **Formula** in the field at top left.
   – Enter the loop condition in the **Until** field: **myFB_LineControl.activated=TRUE**. You can use the autocomplete function **Ctrl+spacebar** in this field too.
4. Confirm with **OK**.
   The loop is created and parameterized in the program.

12.5.5 Copy blocks

You copy the statement blocks in the MCC chart as follows

Copy the statement blocks **System function call _LineModule_control[FB]** and **Variable assignment LineModule_STW:=myFB_LineControl.periOut** into the **UNTIL** loop. Use the operator functions **Copy** and **Paste** for this purpose.

1. Mark the blocks:
   - Hold the **Shift** key down.
   - Click the blocks one after the other. Both blocks are edged in blue.
2. Copy the selected blocks to the clipboard:
   - Open the context menu with the right mouse key.
   - Select the **Copy** command in the context menu.

   Or use the **Ctrl+C** key function.
3. Select the target of the copy operation in the MCC chart:
   - Click the connecting line within the **UNTIL** loop. The connecting piece is marked in blue.

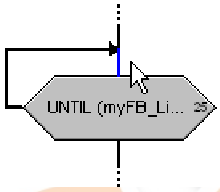


Figure 12-36 MCC chart, mark the UNTIL loop internal area

4. Insert the copied blocks at the target position:
   - Open the context menu again with the right mouse key.
   - Select the **Paste** command in the context menu.

   Or use the **Ctrl+V** key function.
   The blocks are inserted within the loop.

12.5.6 Adapt the system function call _linemodule_control

You change the system function call _linemodule_control as follows

The system function call **_linemodule_control** within the **UNTIL** loop switches the infeed on.

1. Open the system function block by double-clicking.
2. Adapt the parameter variables of the **myFB_LineControl** instance as shown below:

Variable name	Value	Meaning
enable	true	Switches the infeed on
reset		Empty field. The variable is thus set to **false**
periIn	LineModule_ZSW	Status word of the infeed
typeLM	ACTIVE_LINE_MODULE SMART_LINE_MODULE BASIC_LINE_MODULE	Type of the module to be controlled depending on the infeed used

3. Confirm with **OK**.

12.6 Create additional MCC programs for the sample project

Handling system events

The execution system that you will set up in the later section Configure execution system (Page 113) requires two further MCC programs:

- technology_fault
- peripheral_fault

These programs are used for handling system events. Handling is generally necessary. If a system event occurs that is not handled by the user program, the CPU goes to STOP mode.

Within the scope of the sample project, no specific handling of system events is necessary. The programs technology_fault and peripheral_fault therefore remain empty.

You create the MCC programs technology_fault and peripheral_fault as follows

1. Create the MCC unit **fault**.
   Open the **PROGRAMS** folder under the SIMOTION device in the project navigator. Double-click **Insert MCC unit**. Assign the name **fault** to the MCC unit.
2. Create the MCC chart **technology_fault**.
   Open the MCC unit **fault** in the **PROGRAMS** folder. Double-click **Insert MCC chart**. Assign the name **technology_fault** to the MCC chart. Select the creation type **Program**.
   The program remains empty.

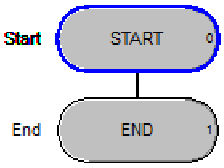


Figure 12-37 Empty program technology_fault

3. Create the MCC chart **peripheral_fault** within the MCC unit **fault**.
   This program also remains empty.

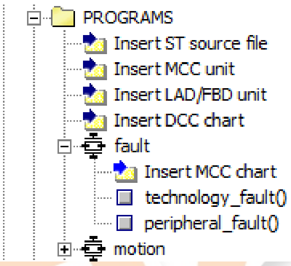
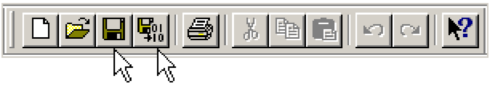


Figure 12-38 MCC programs technology_fault and peripheral_fault in the MCC unit fault

12.7 Back up MCC sample programs

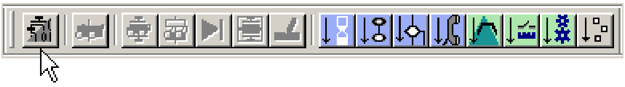
Back up the created MCC programs.

To do so, click in the toolbar on the **Save project** or **Save project and compile changes** button.



Additional information

As an alternative to the command **Save project and compile changes**, you can find the command **Accept and compile** in the **MCC editor** toolbar.



This command compiles the currently selected program as well as all other programs of the same unit.

However, the command does not save the changes.

You thus have the option of accepting changes to a program into the project without having to save or compile the entire project again.

12.8 LAD/FBD ladder logic/function block diagram

12.8.1 The LAD and FBD programming languages

LAD (ladder logic)

LAD stands for ladder logic. LAD is a graphical programming language. The syntax for the statements is similar to a circuit diagram. LAD enables simple tracking of the signal flow between conductor bars via inputs, outputs and operations. The LAD statements comprise elements and blocks that are connected graphically to form networks. LAD operations follow the rules of Boolean logic.

FBD (function block diagram)

FBD stands for function block diagram. FBD is a graphical programming language. To represent the logic relationships, it uses the logic boxes familiar from Boolean algebra. In addition, complex functions (e.g. mathematical functions) can be represented directly in conjunction with the logic boxes.

System in SIMOTION SCOUT

The **PROGRAMS** folder under the SIMOTION device contains the LAD/FBD units created in the project.

A LAD/FBD unit contains the LAD/FBD programs that are to run on the SIMOTION device. A LAD/FBD unit can contain several LAD/FBD programs.

"LAD/FBD program" is a collective term for different program organization units (POU).

A POU can be a program, a function, or a function block. The type of the POU is indicated in the project navigator by an icon:

- Program
- Function
- Function block

Program creation steps

Creation of a LAD/FBD program encompasses the following steps:

1. Creating a LAD/FBD unit.
2. Creating a LAD/FBD program in the LAD/FBD unit.
3. Inserting LAD/FBD commands in the LAD/FBD program and parameterizing the commands.
4. Saving and compiling the LAD/FBD program.

Switching the programming language

SIMOTION SCOUT allows simple switching between ladder logic and function block diagram. The LAD/FBD editor contains the command **LAD/FBD program > Switch to FBD** or **Switch to LAD**.

12.8.2 Create LAD/FBD unit

You create the LAD/FBD unit **bg_out** for the sample project as follows.

You create a LAD/FBD unit in the project as follows

1. Open the **PROGRAMS** folder under the SIMOTION device in the project navigator. Double-click **Insert LAD/FBD unit**. The **Insert LAD/FBD unit** window appears.
2. Enter the name **bg_out** for the unit.
3. Go to the **Compiler** tab. For diagnostics purposes, activate the option **Permit program status**. In this way, you can monitor program execution later in online mode.
4. Confirm with **OK**.
   The LAD/FBD unit is created.
   – The LAD/FBD unit **bg_out** appears in the **PROGRAMS** folder.

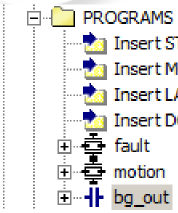


Figure 12-39 MCC and LAD/FBD units in the PROGRAMS folder

   – In the working area of the workbench, the declaration table of the unit opens. The variables declared there apply within the LAD/FBD unit and can be linked in other units. No other variable declaration is required for the sample project. You have already created the necessary variables as global device variables in the symbol browser.

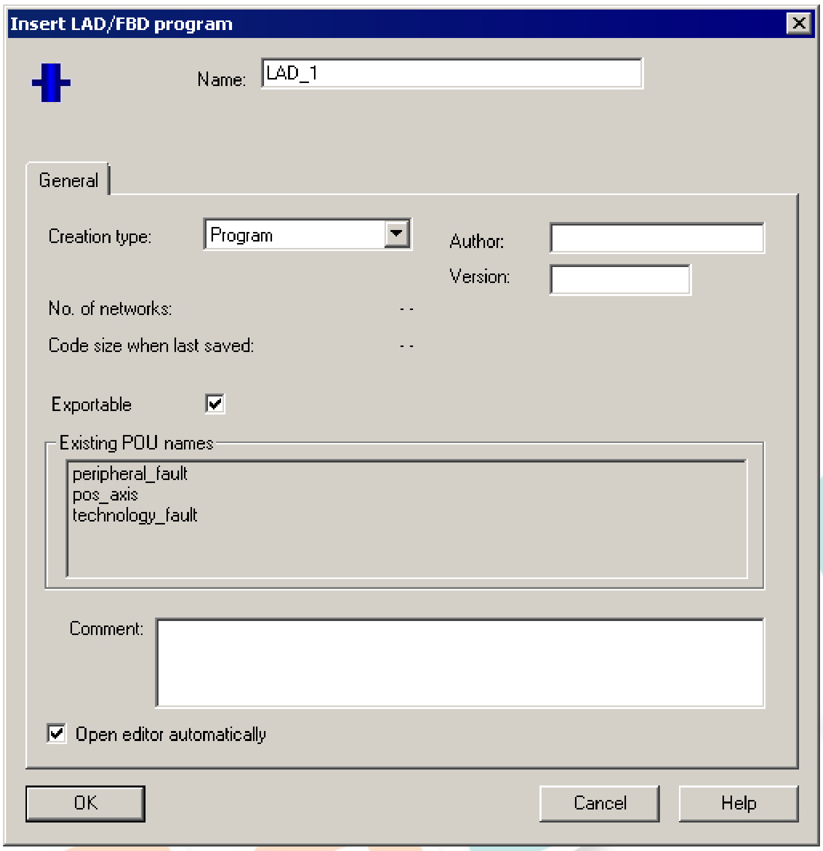
12.8.3 Create LAD/FBD program

You create the LAD/FBD program **LAD_1** within the LAD/FBD unit **bg_out** as follows.

You create a LAD/FBD program in a LAD/FBD unit as follows

1. Open the **PROGRAMS** folder under the SIMOTION device in the project navigator.
2. Open the LAD/FBD unit **bg_out** in the **PROGRAMS** folder. Double-click **Insert LAD/FBD program**. The **Insert LAD/FBD program** window appears.
3. Enter the name **LAD_1**. The name must be unique throughout the project.

4. Select the creation type **Program**.



Insert LAD/FBD program

Name: LAD_1

General

Creation type: Program

Author:

Version:

No. of networks: - -

Code size when last saved: - -

Exportable ☑

Existing POU names

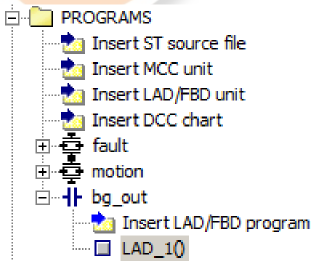
peripheral_fault
pos_axis
technology_fault

Comment:

☑ Open editor automatically

Figure 12-40 Insert LAD/FBD program

5. Confirm with **OK**.
   The LAD/FBD program **LAD_1** is created in the project.
   - The LAD/FBD program appears in the **PROGRAMS** folder.



```
PROGRAMS
  Insert ST source file
  Insert MCC unit
  Insert LAD/FBD unit
  Insert DCC chart
  fault
  motion
  bg_out
    Insert LAD/FBD program
    LAD_1()
```

Figure 12-41 LAD program LAD_1 in the PROGRAMS folder

   - The LAD/FBD editor is opened in the working area of the workbench. You can start programming.

12.8.4 Creating a LAD sample program

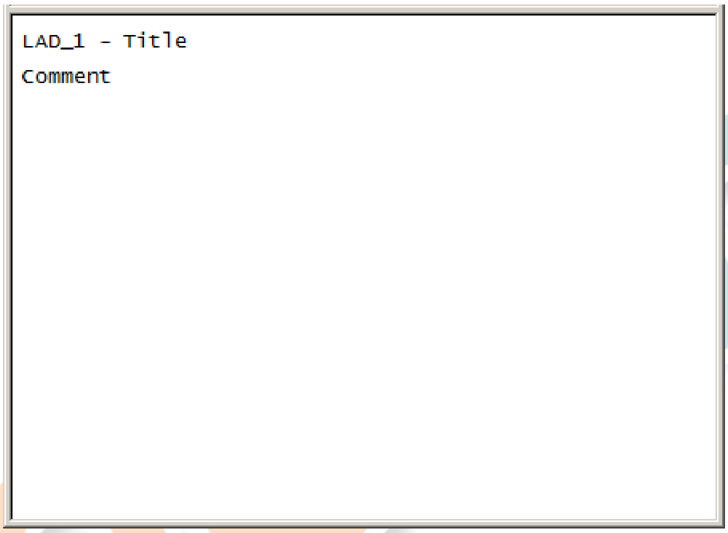
You write the LAD program **LAD_1** for the sample project.

In this program, the global device variables **g_bo_start** and **g_bo_ready** are read cyclically, and the I/O variables **q_bo_output0** and **q_bo_output1** are set accordingly.

Transfer of the program status to the digital outputs DO 0 and DO 1 could also be programmed direct in the MCC chart **pos_axis**. However, Getting Started implements the assignment in an autonomous LAD program to introduce you to LAD programming.

You create the LAD program LAD_1 for the sample project as follows

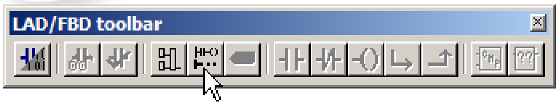
1. Open the LAD/FBD program if it is not already visible in the working area of the workbench.
   For this purpose, double-click the LAD/FBD program under the LAD/FBD unit in the **PROGRAMS** folder of the project navigator.
   In the sample program, the empty LAD/FBD program **LAD_1** is already open.



LAD_1 - Title
Comment

Figure 12-42 Empty LAD program following first-time creation in the LAD/FBD unit

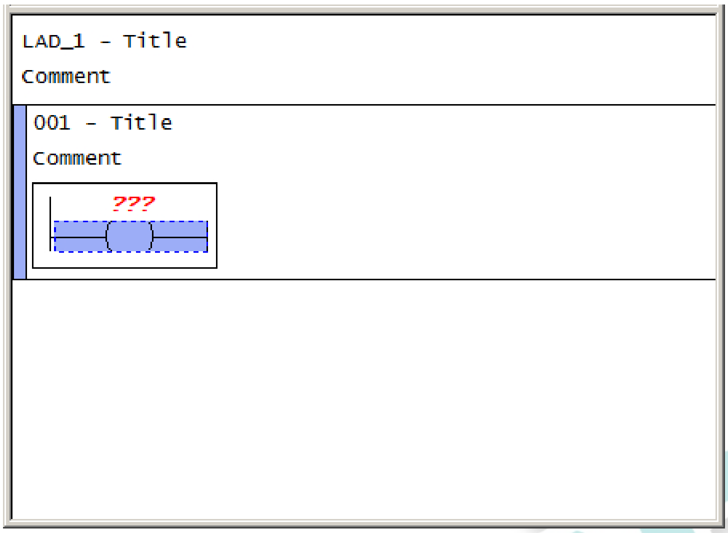
2. Insert a network:
   – Click **Insert network** in the LAD/FBD toolbar.



The **001** block with a coil is inserted.

3. Insert an NO contact in front of the coil:

   – Select the coil.



LAD_1 - Title

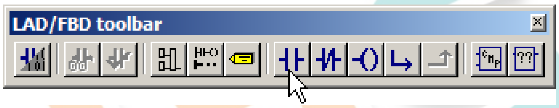
Comment

001 - Title

Comment

Figure 12-43 LAD program, selected coil

   – Click **NO Contact** in the toolbar.



The NO contact is inserted in front of the coil.

4. Assign the **g_bo_start** variable to the NO contact and the **q_bo_output0** variable to the coil:
   - Click above the symbols for NO contact and coil on **???**.

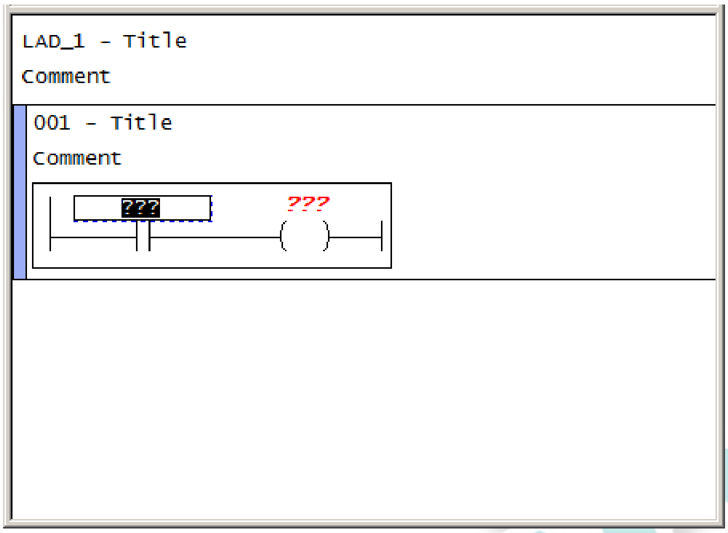

LAD_1 - Title
Comment
001 - Title
Comment

Figure 12-44 LAD program, opened field for entering the variable name

   - Transfer the variable names from the symbol browser or the ADDRESS LIST by dragging and dropping. Or use the Autocomplete function. Use RETURN to confirm each entry.

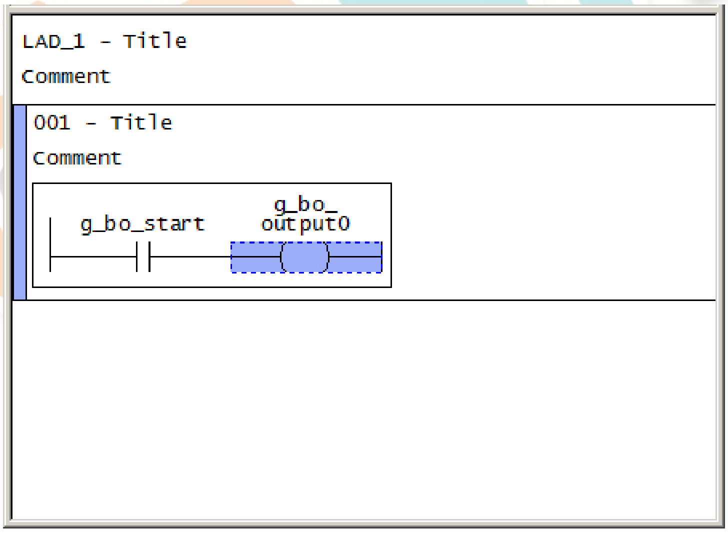

LAD_1 - Title
Comment
001 - Title
Comment

Figure 12-45 LAD program with inserted variables

5. Insert a network **002**:
   - Click the block **001** to select the block.
     A selected block has a blue background on the left edge.
   - Click **Insert network** in the LAD/FBD toolbar.
     The block **002** is inserted after the block **001**.

6. Insert an NO contact in front of the coil in network **002**.
7. Assign the **g_bo_ready** variable to the NO contact and the **q_bo_output1** variable to the coil. The LAD program is finished.

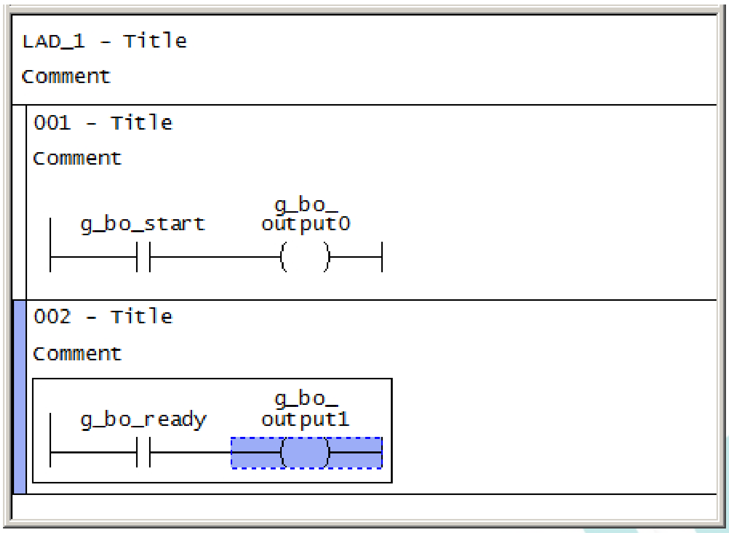
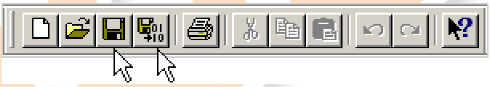


Figure 12-46 Finished LAD program LAD_1

12.8.5 Back up LAD/FBD sample program

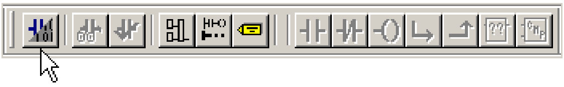
Back up the created LAD/FBD sample program.

To do so, click in the toolbar on the **Save project** or **Save project and compile changes** button.



Additional information

As an alternative to the command **Save project and compile changes**, you can find the command **Accept and compile** in the **LAD/FBD toolbar**.



This command compiles the currently selected program as well as all other programs of the same unit.

However, the command does not save the changes.

You thus have the option of accepting changes to a program into the project without having to save or compile the entire project again.

12.9 Other programming languages

SIMOTION SCOUT provides other programming languages in addition to MCC and LAD/FBD.

- ST (Structured Text)

  ST is a text-based, PASCAL-based programming language. The language is based on the international standard IEC 61131-3. This standardizes the programming languages for programmable controllers (PLC). ST is based on the Structured Text part of this standard.

  In addition to the standardized programming language in accordance with IEC 61131-3, SIMOTION ST features technological commands.

  An easy-to-use text editor is provided for creating programs. The ST compiler compiles the edited program into executable code and indicates every syntax error, specifying the program line and the cause of the error.

  In the Command library tab of the project navigator, the commands and functions required for programming are shown in a tree. You can use these in all programming languages, e.g. when programming.

- DCC (Drive Control Chart)

  Drive Control Chart (DCC) means graphic configuration and expansion of the device functionality by means of freely available control, calculation and logic blocks.

  DCC comprises the DCC editor and the DCB library (block library with standard DCC blocks).

  The user-friendly DCC Editor enables easy graphical configuration and a clear representation of control loop structures as well as a high degree of reusability of existing diagrams.

  The open-loop and closed-loop control functionality is defined by using multi-instance-capable blocks (Drive Control Blocks (DCBs)) from a predefined library (DCB library) that are selected and graphically linked by dragging and dropping

- Libraries

  Libraries allow modular software development and provide you with user-defined data types, functions and function blocks that you can use from all SIMOTION devices.

  Libraries can be written in all programming languages and used in all program sources (e.g. ST units, MCC units).

All programming languages enable you to structure the application using programs, functions and function blocks so that the application is manageable and re-usable.

To test the programs, there are comprehensive test functions available to you with program status and breakpoints in all languages. You can visualize and test your programs online.

For further information on programming languages, please refer to the respective manuals.

12.10 Result in the sample project

You have created the programs required for program-controlled traversing of the axis in the sample project of Getting Started.

13 Configure execution system

13.1 Overview

Aim of Getting Started

In this part of Getting Started, you get to know the SIMOTION execution system.

You assign the sample project programs to the tasks of the execution system. You thus transfer the programs from the SIMOTION SCOUT engineering system to the SIMOTION runtime system. The programs control the system as soon as the operating mode of the SIMOTION device is switched to RUN.

Preconditions

You have created the programs pos_axis, technology_fault, peripheral_fault, and LAD_1 for the sample project, see the section Programming the SIMOTION application (Page 69).

13.2 Execution system

Execution levels and tasks

Execution levels define the chronological sequence of tasks in the execution system. One level can contain several tasks. The tasks provide the framework for program execution. One task can contain several programs. By assigning the created programs to the tasks, you can, for example, define the priority, the time frame, or the order in which the programs are to be executed.

13.3 Assign programs to tasks

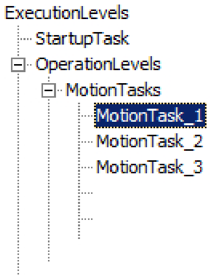
Below you will assign the sample project programs to the tasks of the execution system.

Table 13-1 Assignment of programs to tasks

Programs of the sample project	Tasks
pos_axis	MotionTask_1
lad_1	BackgroundTask
technology_fault	TechnologicalFaultTask
peripheral_fault	PeripheralFaultTask

You assign programs to tasks in the execution system as follows

1. Double-click in the project navigator under the SIMOTION device on **EXECUTION SYSTEM**.
   The **EXECUTION SYSTEM** window appears in the working area.
2. Assign the MCC program **motion.pos_axis** to the task **MotionTask_1**:
   – In the tree of the execution system, select the branch **ExecutionLevels > OperationLevels > MotionTasks > MotionTask_1**.

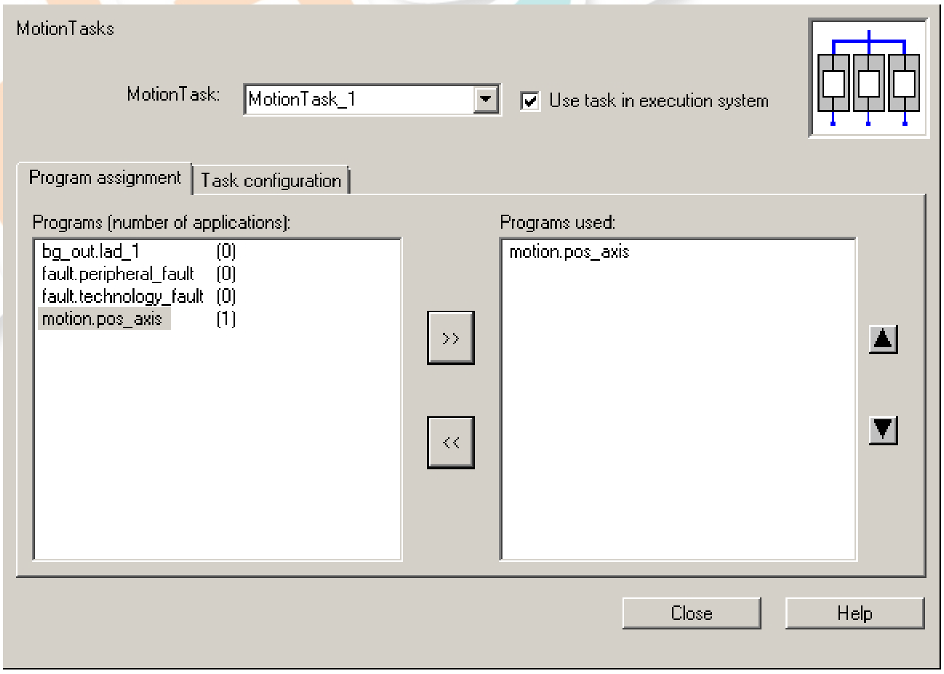


ExecutionLevels
StartupTask
OperationLevels
MotionTasks
MotionTask_1
MotionTask_2
MotionTask_3

Figure 13-1 Execution system, tree view of the execution levels and tasks

The **MotionTasks** window appears on the right of the working area. The programs **pos_axis** and **LAD_1** as well as auxiliary programs of the **fault** unit are visible on the **Program assignment** tab under **Programs**.

– Select the MCC program **motion.pos_axis** and click the **>>** button. The program is displayed under **Programs used**. It is thus assigned to the task **MotionTask_1**.



MotionTasks

MotionTask: MotionTask_1

☑ Use task in execution system

Program assignment | Task configuration

Programs (number of applications):

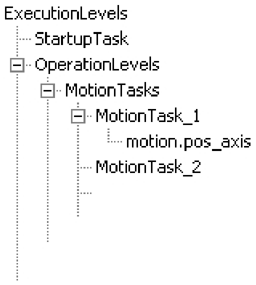
bg_out.lad_1 (0)
fault.peripheral_fault (0)
fault.technology_fault (0)
motion.pos_axis (1)

Programs used:

motion.pos_axis

Figure 13-2 Execution system, MotionTasks window

The assignment is visible in the tree of the execution system. The program **motion.pos_axis** appears below the branch **MotionTask_1**.



```
ExecutionLevels
  StartupTask
  OperationLevels
    MotionTasks
      MotionTask_1
        motion.pos_axis
      MotionTask_2
```

Figure 13-3 Execution system, MotionTask_1 with assigned program pos_axis

- Activate the checkbox **Activation after StartupTask** in the **Task configuration** tab. This executes the MCC program immediately after the SIMOTION device is started. If this checkbox is not activated, the program must be started explicitly by the call from another program that is assigned to the StartupTask or another active task.

3. Assign the LAD program **bg_out.kop_1** to the task **BackgroundTask**:
   - In the tree of the execution system, select the branch **ExecutionLevels > OperationLevels > BackgroundTask**. Assign the LAD program **bg_out.kop_1** to this task.
4. Assign the error handling routines:
   - In the tree of the execution system, select the branch **ExecutionLevels > OperationLevels > SystemInterruptTasks > TechnologicalFaultTask**. Assign the MCC program **fault.technology_fault** to this task.
   - In the tree of the execution system, select the branch **ExecutionLevels > OperationLevels > SystemInterruptTasks > PeripheralFaultTask**. Assign the MCC program **fault.peripheral_fault** to this task.
5. Click **Close**. Confirm with **Yes** if you are prompted to save.
   The execution system is configured.

13.4 Download the configured execution system to the target system

Download the sample project with the configured execution system to the target system.

Steps

1. Save project and compile changes
2. Establish an online connection
3. Download the project to the target system

Save and compile changes

Click in the toolbar on the **Save project and compile changes** button.

Establish an online connection

Click in the toolbar on the **Connect to selected target devices** button.

Download to target system

Click in the toolbar on the **Download project to target system** button.

13.5 Result in the sample project

Configuring the axis control is thus completed:

- You have set up an axis in the sample project.
- You have created a program for traversing an axis, as well as other programs that are necessary for operation.
- You have assigned these programs to the tasks of the SIMOTION runtime system.

In the following configuring steps, you will start the axis control on the SIMOTION device and monitor the program-controlled axis motion.

Starting and stopping the system 14

14.1 Overview

Aim of Getting Started

You switch the SIMOTION CPU of the sample project to RUN mode to start execution of the **pos_axis** program. You can see on the hardware that the axis rotates twice for approximately 4 seconds. After execution of the program, switch back to the STOP state.

You switch the operating mode in the dialog **Control Operating State**.

Preconditions

- You have created the programs pos_axis, technology_fault, peripheral_fault and LAD_1 for the sample project, and you have assigned them to the tasks of the SIMOTION execution system, see the sections Programming the SIMOTION application (Page 69) and Configure execution system (Page 113).
- The project has been compiled and downloaded to the target system, see the section Download the configured execution system to the target system (Page 115).
- SIMOTION SCOUT is in online mode.

14.2 RUN and STOP operating states

Operating states

In the SIMOTION SCOUT dialog **Control Operating State**, you can switch a SIMOTION CPU to RUN or STOP mode.

RUN mode

SIMOTION executes the user program and the associated system services:

- Read process image input
- Execution of the user programs assigned to the execution system
- Write process image output

The technology packages are active in this state. They can execute commands from the user program.

STOP mode

SIMOTION does not process any user program.

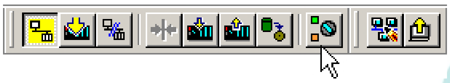
- It is possible to load a complete user program.
- All system services (communication, etc.) are active.
- The I/O modules are in a secure state. (This means, for example, the digital outputs are at "LOW level" and the analog outputs are de-energized)
- The technology packages are inactive, that is, all enables are deleted. No axis motions can be executed.

You can find the full description of the operating states in the online help under **SIMOTION device: Operating state**, or in the *SIMOTION SCOUT* Configuration Manual.

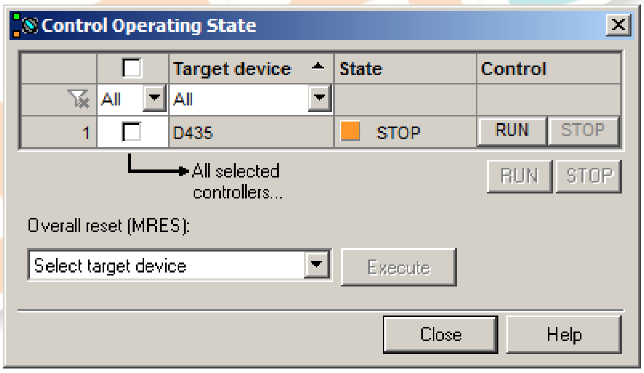
14.3 Mode selector switch on the software side and the hardware side

Control Operating State dialog

The menu command **Target system > Control operating state** or the button **Control operating state** in the toolbar of the workbench open the dialog **Control Operating State**.



The dialog lists all configured CPUs. The **State** column shows the current operating mode. The assigned switches in the **Control** column switch the CPU to the RUN or STOP mode. The switches are deactivated when the CPU is in offline mode.



	□	Target device	State	Control
	All	All		
1	□	D435	🟧 STOP	RUN STOP

Figure 14-1 Control Operating State dialog

Note

As of SIMOTION V4.4, the **Control Operating State** dialog represents all configured SIMOTION CPUs. The previous dialog had to be opened individually for each CPU.

You can find a detailed description of the dialog in the *SIMOTION SCOUT* Configuration Manual.

Priority of the mode selector switch on the SIMOTION device

The setting of the mode selector switch on the SIMOTION device has priority. SIMOTION SCOUT can only switch a SIMOTION device to RUN mode if the mode selector switch on the device is set to 0 (RUN).

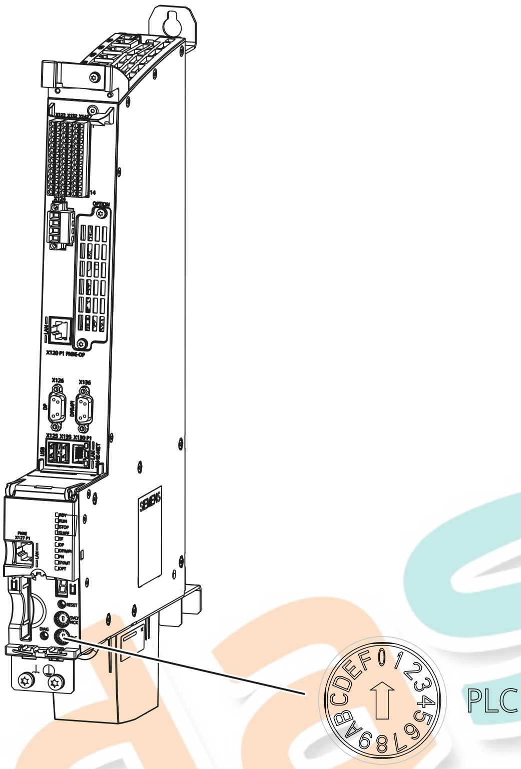


Figure 14-2 Mode selector switch of the SIMOTION D435-2, switch position 0 (RUN)

You can find detailed information on the mode selector switch of the SIMOTION D4x5-2 devices in the Manuals and Commissioning Manuals, as well as in the online help.

14.4 Start program control of the sample project

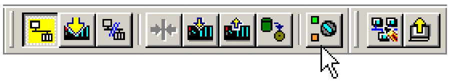
You start the axis control of the sample project on the SIMOTION device as follows

⚠ WARNING

Danger to life through unexpected machine movement

Make sure this presents no hazard to personnel or property.

1. Open the **Control Operating Mode** dialog. To do so, click **Control Operating Mode** in the toolbar.

2. Switch the SIMOTION CPU of the sample project to the RUN mode. To do so, click the assigned **RUN** switch in the **Control** column of the **Control Operating Mode** dialog.
   The axis starts to rotate immediately. The axis returns to a standstill after approximately 8 seconds.
   The SIMOTION device remains in the RUN mode after execution of the **pos_axis** program.

3. Switch the SIMOTION device to STOP mode. To do so, click the assigned **STOP** switch in the **Control** column.

Monitor the application 15

15.1 Overview

Aim of Getting Started

In this part of Getting Started, you monitor the program-controlled axis motion.

- You monitor program execution.
- You monitor the values in the symbol browser.
- You compile certain values in a watch table.
- You record the course of the axis motion with the trace.

Preconditions

- You have created the programs pos_axis, technology_fault, peripheral_fault and LAD_1 for the sample project, and you have assigned them to the tasks of the SIMOTION execution system, see the section Configure execution system (Page 113).
- The project has been compiled and downloaded to the target system, see the section Download the configured execution system to the target system (Page 115).
- SIMOTION SCOUT is in online mode.
- Operating mode of the SIMOTION device:
  - The SIMOTION device of the sample project has been switched to STOP mode on the software side. The SIMOTION SCOUT mode selector switch, **Control Operating State** dialog, shows the STOP mode.
  - The SIMOTION device of the sample project has been switched to RUN mode on the hardware side. The mode selector switch on the SIMOTION device is at position **0** (RUN).

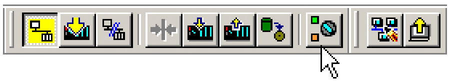
15.2 Monitoring program execution

SIMOTION SCOUT provides several functions for monitoring program execution.

In the sample project, you use the function **Monitor**. With this function, you can track execution of the command blocks in an MCC chart. The currently executed command block is shown against a yellow background in the chart. The marking runs at the same speed as the actual program execution. The marking is therefore only visible with the "slow" commands that wait for the machine to implement the command.

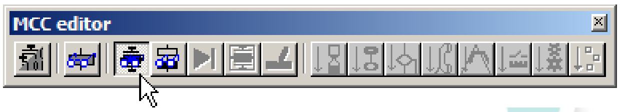
You monitor the execution of the commands in the MCC chart pos_axis as follows

1. Open the **Control Operating State** dialog.



The SIMOTION device must be in **STOP** mode.

2. Open the MCC chart **pos_axis**.
3. Switch the monitoring function on:
   - To do so, select the command **MCC chart > Monitor** in the menu bar of the workbench. The function is switched on if a checkmark is visible next to the menu item.
   - Or click in the **MCC editor** toolbar on **Monitor**.



4. Start program control: Switch the SIMOTION device to **RUN** mode in the **Control Operating State** dialog.
   The **pos_axis** program is run through once. The currently executed command block is shown against a yellow background.

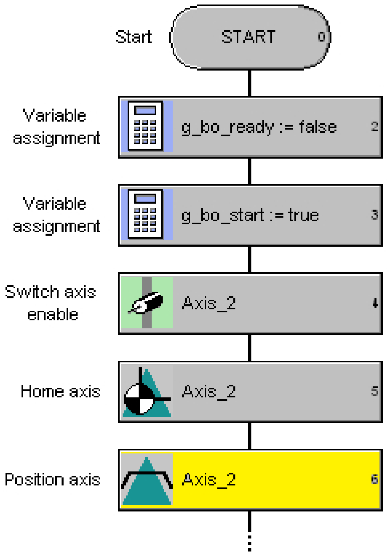


Figure 15-1 Monitor the program execution of the MCC chart pos_axis

5. Switch the SIMOTION device to **STOP** mode in the **Control Operating State** dialog.

Further information

You can find further information on program monitoring in the online help under **Monitoring program execution**.

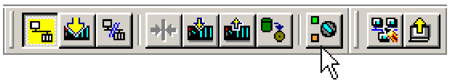
15.3 Monitor variables in the symbol browser

In the symbol browser, you can monitor variables (read out status value) or assign values to them (assign control values).

For the sample project, you monitor the actual position of the axis during the program run.

You monitor the values in the symbol browser as follows

1. Open the **Control Operating State** dialog.

   The SIMOTION device must be in **STOP** mode.
2. In the **AXIS** folder of the project navigator, select the axis created in the sample project. The system variables and configuration data of the axis are displayed on the **Symbol browser** tab of the detail view.
3. Open the system variable **positioningstate.actualposition** (actual position of the axis) in the symbol browser.
   You find the variable as follows:
   - Filter the list: You can specify a filter criterion in the filter line of the symbol browser. The last 5 criteria are saved and can be selected for re-use.
     Enter a suitable filter term, e.g.**positioningstate**, in the filter line. Press **RETURN** to confirm.
   - Search for variable: As an alternative to the filter function, you can search for the variable. Select the menu command **Edit > Find**. Enter a suitable search term in the **Find** dialog, e.g. **positioningstate**. Click **Find next**.

   The actual position of the axis is displayed in the **Status value** column of the symbol browser.
4. Start program control: Switch the SIMOTION device to RUN mode in the **Control Operating State** dialog.
   The **pos_axis** program is run through once. The changing values of the actual position of the axis are displayed in the symbol browser.
   After the program execution, the SIMOTION device remains in RUN mode.
5. Switch the SIMOTION device to STOP mode in the **Control Operating State** dialog.

You can also monitor the values of global device variables and I/O variables as well as the values of variables from the declaration tables of the units. To do so, click in the project navigator on the **ADDRESS LIST** or **GLOBAL DEVICE VARIABLES** folder, or on the respective unit. The variables are displayed in the symbol browser.

15.4 Monitor variables in the watch table

You can combine different variables (system variables of several devices and technological objects, user variables of several programs) and drive parameters in a table to monitor them jointly, and to control them if applicable.

You combine variables in a watch table as follows

1. Open the symbol browser.
2. Right-click in the symbol browser on the variable you want to add to the watch table. Select the **Add to watch table** command in the context menu.

You open a watch table as follows

You will find all created watch tables in the **MONITOR** folder of the project navigator. Double-click a watch table to open it.

You can find detailed information on this topic in the online help under **Working with the SCOUT Workbench > Working with lists > Watch table**.

15.5 Recording signals with the trace

15.5.1 Trace

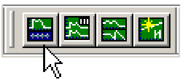
You can use the trace to record and save signal characteristics and variable values. The recorded data can be used, for example, for diagnostics purposes in machine motion sequences, and for troubleshooting in user programs.

For the sample program, you record the actual position of the axis over time and represent it in the diagram.

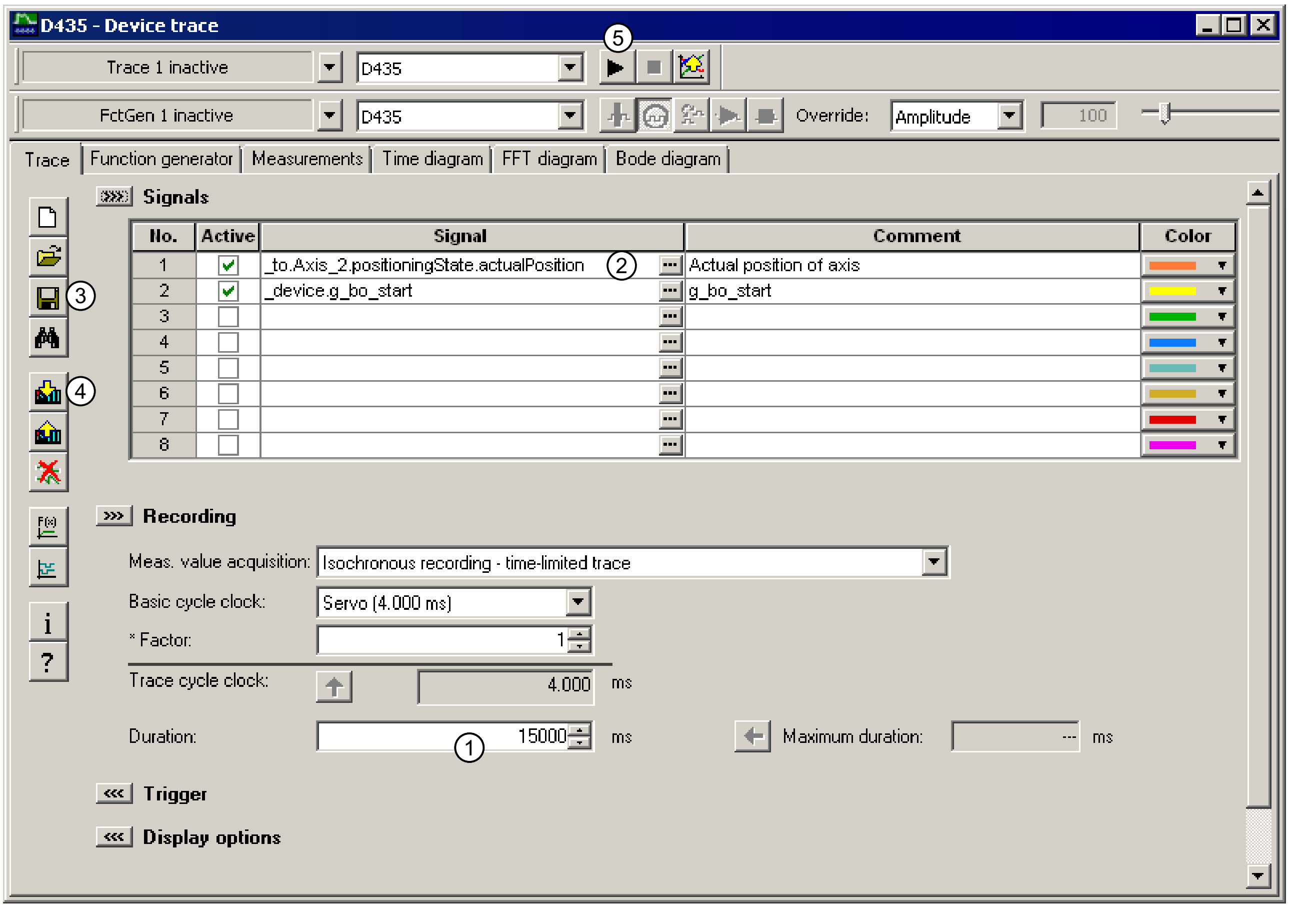
15.5.2 Working with the trace

You call the trace as follows

1. Select the SIMOTION device in the project navigator.
2. Select the menu command **Target system > Device trace** or click the **Device trace function generator** button in the **Trace toolbar.**



The **Device trace** window appears in the working area.



No.	Active	Signal	Comment	Color
1	☑	_to.Axis_2.positioningState.actualPosition	Actual position of axis	🟧
2	☑	_device.g_bo_start	g_bo_start	🟨
3	□			🟩
4	□			🟦
5	□			🟦
6	□			🟨
7	□			🟥
8	□			🟪

Meas. value acquisition: Isochronous recording - time-limited trace

Basic cycle clock: Servo (4.000 ms)

* Factor: 1

Trace cycle clock: 4.000 ms

Duration: 15000 ms

Maximum duration: --- ms

① … ⑤ Reference is made to the circled digits in the text below.

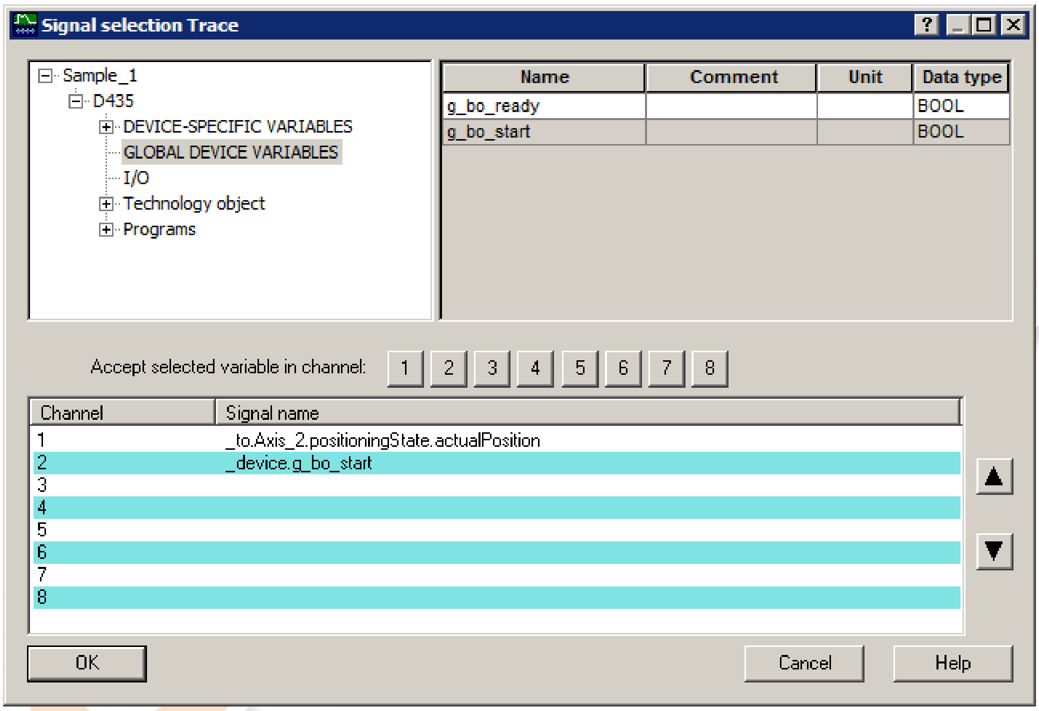
Figure 15-2 Device trace window

You parameterize the trace for recording as follows

1. In the **Duration** field ① of the **Trace** tab, enter the recording duration 15000 ms.
2. Click the button ... ② in line **No 1** of the **Signals** table.
   The **Trace Signal Selection** window appears.

3. In the tree, select the branch **Sample_1** > (SIMOTION device, e.g. **D435**) > **TO** > **Axis_2** > **positioningstate**.
4. Select the system variable **actualPosition** in the variable table.
5. Click the button **1** to accept the system variable for channel 1.

The variable is displayed under **Signal name**.



Name	Comment	Unit	Data type
g_bo_ready			BOOL
g_bo_start			BOOL

Channel	Signal name
1	_to.Axis_2.positioningState.actualPosition
2	_device.g_bo_start
3	
4	
5	
6	
7	
8	

Figure 15-3 Trace signal selection

6. Repeat the channel assignment for the variable **g_bo_start**:
Select the branch **(Project)** > **(SIMOTION device)** >**GLOBAL DEVICE VARIABLES**. Select the system variable **g_bo_start** in the variable table. Click the button **2**.

Note

You can also drag & drop the variables from the symbol browser or the watch table to the signal field of the Trace dialog. Procedure for dragging & dropping, see the section Variable assignment g_bo_ready:=false (Page 81).

7. Confirm with **OK**.
The **Trace Signal Selection** window is closed.
The trace is now parameterized for recording.

You save the parameterization of the trace as follows

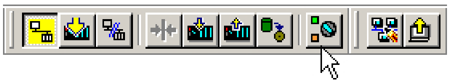
The trace parameterization is not saved in the project data. When you close the project, the trace parameterization is deleted.

To save the parameterization, click the **Accept in catalog** button ③ on the **Trace** tab. In the **Catalog entry** field, enter the name under which the setting/parameterization is to be saved in the catalog of the trace.

You record with the trace as follows

1. Go online.
2. Download the parameterization of the trace to the target system:
   - Click the **Download parameterization** button ④ on the **Trace** tab.

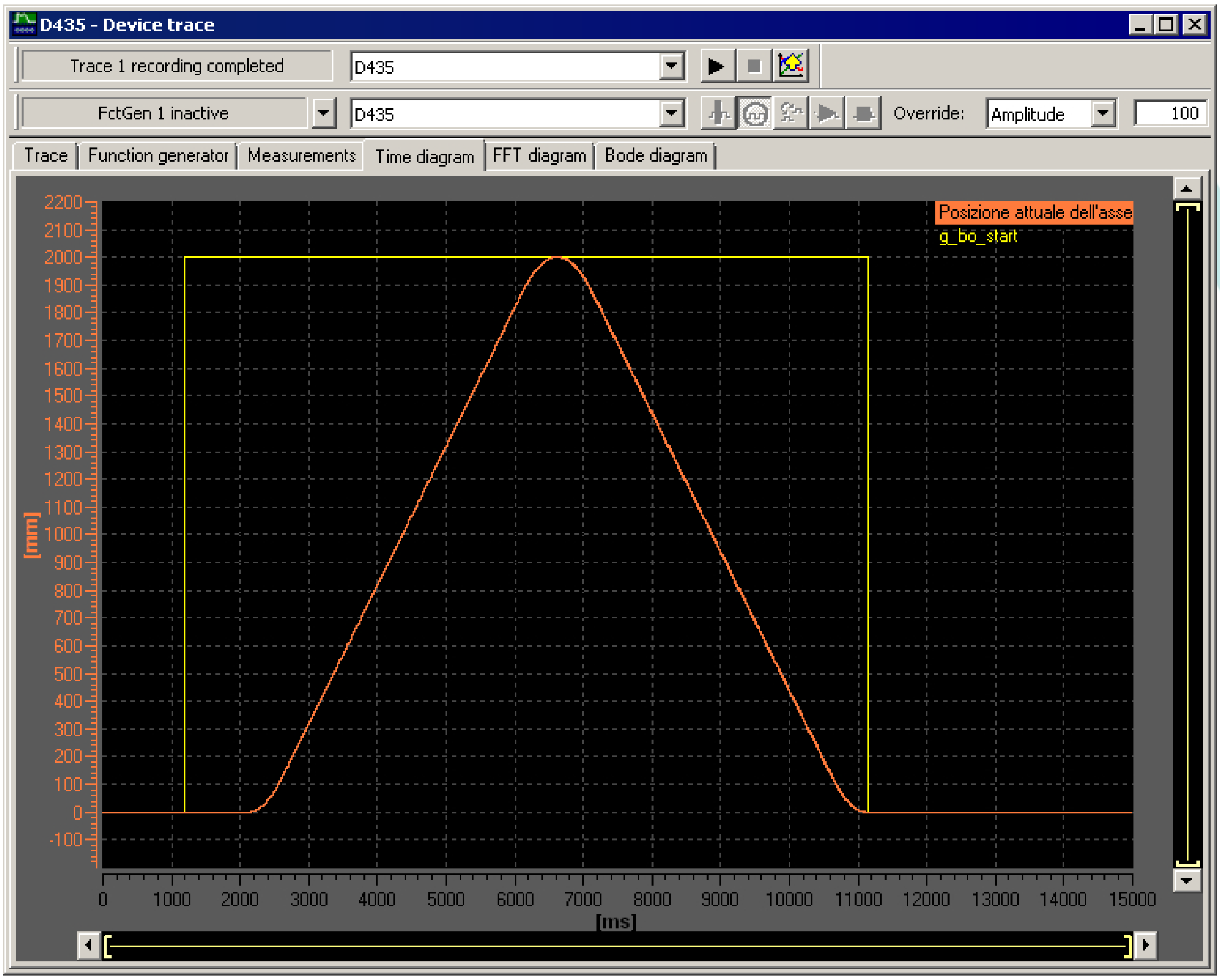
   - Click **OK** to confirm the dialog that appears following successful downloading.
3. Open the **Control Operating State** dialog.

   The SIMOTION device must be in **STOP** mode.
4. Open the **Time diagram** tab in the **Device trace** window.

5. Start recording of the trace:
   – Click **Trace start** ⑤ in the **Device trace** window.
     ▶
   – Then immediately switch the SIMOTION device to RUN mode in the **Control Operating State** dialog.

   The program is started. The actual position of the axis is recorded and represented in the time diagram. After expiry of the recording duration, the signal profile of the actual position is displayed.


D435 - Device trace

Trace 1 recording completed | D435

FctGen 1 inactive | D435 | Override: Amplitude | 100

Figure 15-4 Time diagram of the axis

6. If the recorded curve is only partially displayed, select the menu item **Auto-scaling** in the context menu of the time diagram.
7. Switch the SIMOTION device to STOP mode in the **Control Operating State** dialog box.

Carrying out several measurements

You can carry out several measurements. They are shown on the **Measurements** tab and can be displayed in the diagram.

You can save and re-open recorded measurements for documentation purposes.

15.5.3 Further diagnostic functions

You can find a detailed overview of the extensive service and diagnostics options in the online help under **Diagnostics**, as well as in the product information *SIMOTION SCOUT Overview of service and diagnostics options*.

15.6 Result in the sample project

Creation of the trace time diagram concludes Getting Started.

We recommend that you continue to familiarize yourself with SIMOTION SCOUT using the sample projects of the Utilities & Applications.

You can find information on the Utilities & Applications in the section Utilities & applications (Page 21).

ESD directives A

A.1 ESD definition

What does ESD mean?

Electrostatic sensitive devices (ESDs) are individual components, integrated circuits, modules or devices that may be damaged by either electrostatic fields or electrostatic discharge.

NOTICE

Damage caused by electric fields or electrostatic discharge

Electric fields or electrostatic discharge can result in malfunctions as a result of damaged individual parts, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber or aluminum foil.
- Only touch components, modules and devices if you are first grounded by applying one of the following measures:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

A.2 Electrostatic charging of individuals

Any person who is not conductively connected to the electrical potential of the environment can accumulate an electrostatic charge.

This figure indicates the maximum electrostatic charges that can accumulate on an operator when he comes into contact with the indicated materials. These values comply with the specifications in IEC 801-2.

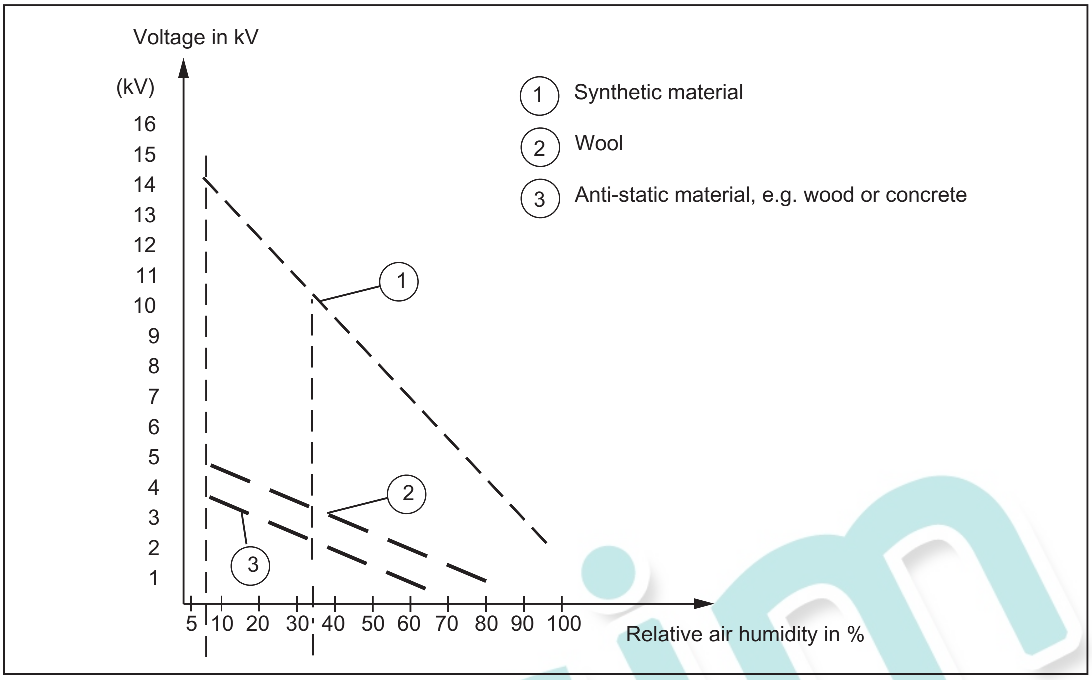


Figure A-1 Electrostatic voltage that can accumulate on operating personnel

A.3 Basic measures for protection against discharge of static electricity

Ensure sufficient grounding

When working with electrostatic sensitive devices, make sure that the you, your workstation, and the packaging are properly grounded. This prevents the accumulation of static electricity.

Avoid direct contact

You should only touch ESD components if unavoidable (for example, during maintenance work). When you touch modules, make sure that you do not touch either the pins on the modules or the printed conductors. If you follow these instructions, electrostatic discharge cannot reach or damage sensitive components.

If you have to take measurements on a module, make sure that you first discharge any static that may have accumulated in your body. To do this, touch a grounded metal object. Only use grounded measuring instruments.

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