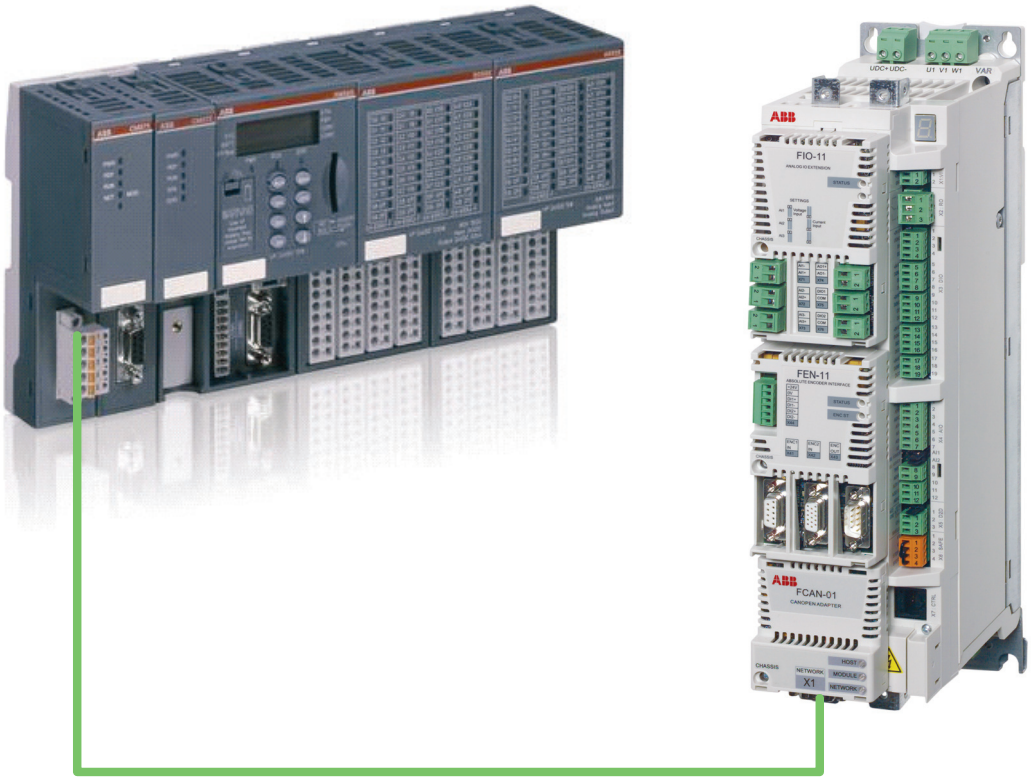
ACSM1

Application Guide
Fieldbus Control with FCAN-01 CANopen Adapter Module and ABB AC500 PLC



ACSM1 Drive Manuals

DRIVE HARDWARE MANUAL*

ACSM1-04 Drive Modules (0.75 to 45 kW) Hardware Manual – 3AFE68797543 (English)
ACSM1-04 Drive Modules (55 to 110 kW) Hardware Manual – 3AFE68912130 (English)
ACSM1-04Lx Liquid-cooled Drive Modules (55 to 160 kW) Hardware Manual – 3AUA0000022083 (English)

DRIVE FIRMWARE MANUALS

ACSM1 Speed and Torque Control Program Firmware Manual – 3AFE68848261 (English)
For drives of type ACSM1-04xS…
ACSM1 Motion Control Program Firmware Manual – 3AFE68848270 (English)
For drives of type ACSM1-04xM…

DRIVE PC TOOLS MANUALS

DriveStudio User Manual – 3AFE68749026 (English)
DriveSPC User Manual – 3AFE68836590 (English)

APPLICATION GUIDES

Safe Torque Off Function for ACSM1, ACS850 and ACQ810 Drives Application Guide – 3AFE68929814 (English)
ACSM1-04 Drive Modules System Engineering Manual – 3AFE68978297 (English)
ACSM1 Fieldbus Control with FCAN-01 CANopen Adapter Module and ABB AC500 PLC Application Guide – 3AUA0000077929 (English)

OPTION MANUALS

FIO-01 Digital I/O Extension User's Manual* – 3AFE68784921 (English)
FIO-11 Analog I/O Extension User's Manual* – 3AFE68784930 (English)
FEN-01 TTL Encoder Interface User's Manual* – 3AFE68784603 (English)
FEN-11 Absolute Encoder Interface User's Manual* – 3AFE68784841 (English)
FEN-21 Resolver Interface User's Manual* – 3AFE68784859 (English)
FEN-31 HTL Encoder Interface User's Manual* – 3AUA0000031044 (English)
ACSM1 Control Panel User's Guide – 3AUA0000020131 (English)

*A multilingual quick installation guide is included with the delivery.

AC500 manuals can be found in the CoDeSys online help. Press F1 in the CoDeSys software.

Fieldbus Control with FCAN-01 CANopen Adapter Module and ABB AC500 PLC

Application Guide

3AUA0000077929 Rev A
EN
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Table of contents

Introduction to the manual

What this chapter contains

This chapter describes the target audience, purpose and contents of this manual.

Applicability

The manual is compatible with ACSM1-04 and ACSM1-04LC drive modules of frame sizes from A to E.

Safety instructions

Follow the safety instruction given in *ACSM1-04 Drive Modules (0.75 to 45 kW) Hardware Manual* (3AFE68797543 [English]). The main instructions are repeated below.

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- **Only qualified electricians are allowed to install and maintain the drive.**
- Never work on the drive, motor cable or motor when main power is applied. After disconnecting the input power, always wait for 5 min to let the intermediate circuit capacitors discharge before you start working on the drive, motor or motor cable.

  Always ensure by measuring with a multimeter (impedance at least 1 Mohm) that:

  1. voltage between drive input phases U1, V1 and W1 and the frame is close to 0 V.
  2. voltage between terminals UDC+ and UDC- and the frame is close to 0 V.
  3. voltage between terminals R+ and R- and the frame is close to 0 V.
- Do not work on the drive when the permanent magnet motor is rotating. Also, when the supply power is switched off and the inverter is stopped, a rotating permanent magnet motor feeds power to the intermediate circuit of the drive and the supply connections become live. See the hardware manual for precautions before installation and maintenance work on the drive.
- Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.

Target audience

This manual is intended for people who plan the drive application control, commission, use, and service the drive with fieldbus communication. Read the ACSM1 firmware and hardware manuals before working on the drive.

You are expected to know the fundamentals of electricity, wiring and electrical components as well as drive control methods, fieldbus communication concepts and function block and structured text programming.

Purpose of the manual

The purpose of this manual is to show how to configure fieldbus communication with the drive control program parameters and, as an example, to show how the drive can be controlled through the fieldbus by using the ABB AC500 programmable logic controller with PS501 Control Builder.

Because of the complexity of the programming, it is highly recommended that you

- download the drive parameter file canopen_demo_acsm1_master.dsp to the drive,
- open a ready-made CoDeSys project, canopen_demo.pro,
- and then start going through this manual.

With this ready-made functional programming example, it is easier for you to take full advantage of this manual and the CANopen network.

The first four chapters of the manual describe fieldbus control and the fundamentals of the CANopen network. Use this information as a reference while programming.

The programming example is included in chapter *Starting up fieldbus communication and programming the ABB PLC (one-drive system)*. The sections of this chapter describe the detailed configuration and programming tasks, most of which are carried out by project canopen_demo.pro. That is, in most tasks there is no need for you to modify the project unless you want; you can just follow the progress of the project from the manual.

Project canopen_demo.pro contains many useful functions, such as Parameter read and write, Velocity (Speed and Torque) control, Homing and Position control.

Contents of the manual

The chapters of this manual are briefly described below.

Introduction to the manual introduces this manual.

Fieldbus control description describes how the drive can be controlled by external devices over a communication network.

Communication profiles describes the communication profiles used in the communication between the CANopen network, the FCAN-01 module, and the drive.

Communication describes the communication on a CANopen network.

Quick start-up and parametrising the FCAN-01 CANopen Adapter Module presents the steps to take during the start-up of the FCAN-01 CANopen Adapter Module with the drive.

Starting up fieldbus communication and programming the ABB PLC (one-drive system) presents the steps to take during the start-up of the drive fieldbus control with ABB AC500 PLC and the CANopen adapter module. A system with one drive is set up.

Appendix A - How to find out the serial communication parameter values of your PC? instructs how to find out the serial communication parameter values of your PC.

Related manuals

- *ACSM1-04 Drive Modules Hardware Manual* (3AFE68797543 [English])
- *ACSM1-04LC Drive Modules Hardware Manual* (3AUA0000022083 [English])
- *ACSM1 Motion Control Program Firmware Manual* (3AFE68848270 [English])
- *ACSM1 Speed and Torque Control Program Firmware Manual* (3AFE68848261 [English])
- *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English])
- *User Manual for PLC Programming with CoDeSys 2.3* by 3S – Smart Software Solutions GmbH
- ABB AC500 scalable programmable logic controller manuals

Terms and abbreviations

Term/Abbreviation	Explanation
CM572	Communication module Profibus DP Master
CM575	Communication module DeviceNet Master
CM578	Communication module CANopen Master
CPU	Central Processing Unit
FCAN-0x	Optional CANopen adapter
FDNA-0x	Optional DeviceNet adapter
FPBA-0x	Optional PROFIBUS DP adapter
Frame (size)	Size of the drive module.
EDS	Electronic Data Sheet (EDS) files specify the device properties for the CANopen master (client). EDS files for the FCAN-01 CANopen Adapter Module contain information on the supported communication objects. EDS files for ABB Drives are available through your local ABB representative of from the ABB website.
CANopen	CANopen is a higher layer protocol based on CAN (Control Area Network) serial bus system and the CAL (Control Area Layer). CANopen assumes that the hardware connected device has a CAN transceiver and a CAN controlled as specified in ISO 11898.

Standards

- IEC 61131-3:2003, Programmable controllers – Part 3: Programming languages.
- IEC 61800-7-201, Adjustable speed electrical power drive systems - Part 7-201: Generic interface and use of profiles for power drive systems - Profile type 1 specification.
- IEC 61800-7-301, Adjustable speed electrical power drive systems - Part 7-301: Generic interface and use of profiles for power drive systems - Mapping of profile type 1 to network technologies.
- ISO 11898-1 Controller area network (CAN) - Part 1: Data link layer and physical signalling.

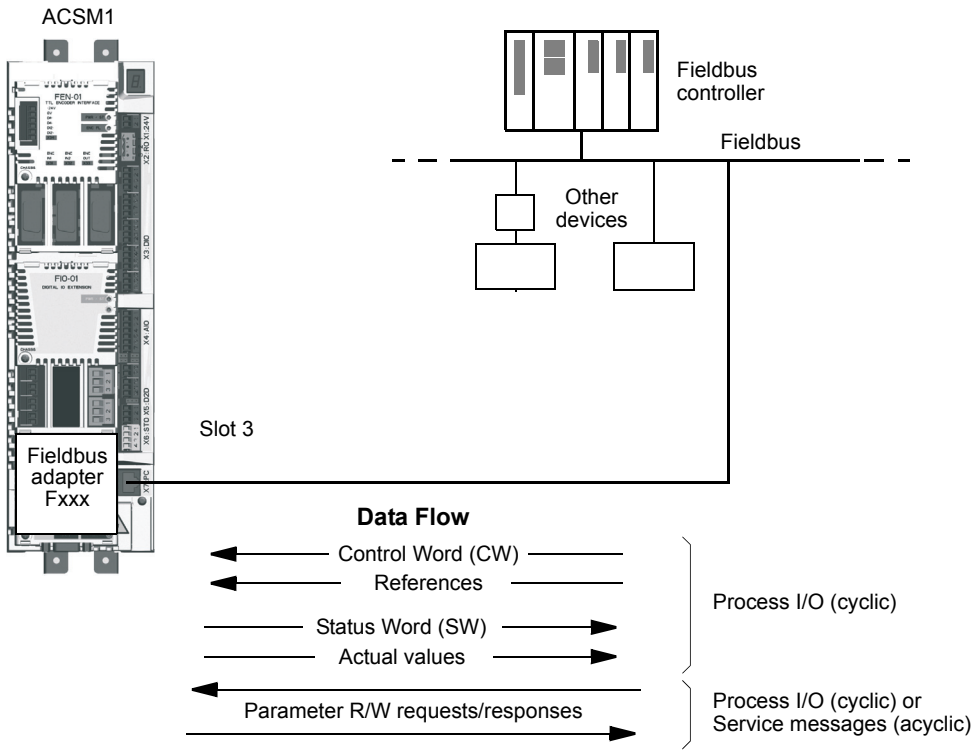
Fieldbus control description

What this chapter contains

The chapter describes how the drive can be controlled by external devices over a communication network.

System overview

The drive can be connected to a fieldbus controller via a fieldbus adapter module. The adapter module is connected to drive Slot 3.



The drive can be set to receive all of its control information through the fieldbus interface, or the control can be distributed between the fieldbus interface and other available sources, for example digital and analogue inputs.

The drive can communicate with a fieldbus controller through a fieldbus adapter using one of the following serial communication protocols:

- PROFIBUS-DP® (FPBA-01 adapter)
- CANopen® (FCAN-01 adapter)
- DeviceNet® (FDNA-01 adapter).

Setting up communication parameters through a fieldbus adapter module

Before configuring the drive for fieldbus control, the adapter module must be mechanically and electrically installed according to the instructions given in the User's Manual of the appropriate fieldbus adapter module.

The communication between the drive and the fieldbus adapter module is activated by setting parameter 50.01 FBA ENABLE to (1) ENABLE. The adapter-specific parameters must also be set. See the table below for FCAN-01 configuration.

Parameter	Setting for CANopen fieldbus control	Function/Information
COMMUNICATION INITIALISATION AND SUPERVISION		
50.01 FBA ENABLE	(1) ENABLE	Initialises communication between drive and fieldbus adapter module.
50.02 COMM LOSS FUNC	(0) NO (1) FAULT (2) SPD REF SAFE (3) LAST SPEED	Selects how the drive reacts in a fieldbus communication break.
50.03 COMM LOSS T OUT	0.3…6553.5 s	Defines the time between communication break detection and the action selected with parameter 50.02 COMM LOSS FUNC.
50.04 FBA REF1 MODESEL and 50.05 FBA REF2 MODESEL	(0) RAW DATA (1) TORQUE (2) SPEED (3) POSITION * (4) VELOCITY * (5) AUTO	Defines the fieldbus reference scaling. When (0) RAW DATA is selected, see also parameters 50.06…50.11. * in Motion Control Program only
ADAPTER MODULE CONFIGURATION		
51.01 FBA TYPE	CANopen	Displays the type of the fieldbus adapter module.
51.02 NODE ID	1...127	Shows the node address of the module. Each device on the CANopen network must have a unique node number.
51.03 BAUD RATE	(0) 1 Mbit/s (1) 500 kbit/s (2) 250 kbit/s (3) 125 kbit/s (4) 100 kbit/s (5) 50 kbit/s	Sets the bit rate for the CANopen interface. Every device in the CANopen network must have the same bit rate selected.
51.04 CONF LOC	(0) Configuration via CANopen objects (1) Configuration via parameter groups 51, 52 & 53.	PDOs can be configured either via CANopen objects (1400h, 1600h, 1405h, 1605h, etc.) or via FCAN-01 module configuration parameter groups.
51.05 PROFILE	(0) DSP 402 (1) ABB Drives (2) Transparent 16 (3) Transparent 32	Selects the communication profile type used by the FCAN-01 module.
51.06 T16 SCALE	0...65535	Defines the reference multiplier / actual value divisor for the FCAN-01 module. The parameter is effective only when Transparent 16 profile is selected and the drive is using the DCU communication profile.

Parameter	Setting for CANopen fieldbus control	Function/Information
51.07 RPDO1-COB-ID	513...639 (Dec) 201h...27Fh (Hex)	Defines the COB-ID for RxPDO1. 0=RxPDO1 is not valid (disabled). 1=RxPDO1 is valid and configured to use default COB-ID (200h+Node-ID) 513...639 (Dec) = RxPDO1 is valid and configured to use a custom COB-ID defined with this parameter.
51.08 RPDO1-TR TYPE	0 1...240 252 253 254 255	See page 20 for a detailed table. 0=Acyclic 1...240=Cyclic, Synchronous 252=Synchronous, RTR only 253=Asynchronous, RTR only 254=Asynchronous. The device is iniated by a manufacturer specific event device. 255=Asynchronous. The device is iniated by a event device. This event must be defined in the device profile.
51.09 RPDO1-EV TIME	0 1...65535 ms	Defines event time (timeout time) for the RxPDO1 in the asynchronous transmission mode. If the communication via the CANbus fails, the FCAN-01 module sets the communication to offline mode. 0 = timeout supervision disabled. 1...65535= timeout time (ms)
51.10 TPDO1-COB-ID	385...511 (Dec) 181h...1FFh (Hex)	Defines the COB-ID for TxPDO1. 0=TxPDO1 is not valid (disabled). 1=TxPDO1 is valid and configured to use default COB-ID (180h+Node-ID) 385...511 (Dec) = TxPDO1 is valid and configured to use a custom COB-ID defined with this parameter.
51.11 TPDO1-TR TYPE	0 1...240 252 253 254 255	See page 20 for a detailed table. 0=Acyclic 1...240=Cyclic, Synchronous 252=Synchronous, RTR only 253=Asynchronous, RTR only 254=Asynchronous. The device is iniated by a manufacturer specific event device. 255=Asynchronous. The device is iniated by a event device. This event must be defined in the device profile.
51.12 TPDO1-EV TIME	0 1...65535 ms	Defines event time for the TxPDO1 in the asynchronous transmission mode. 0 = timeout supervision disabled. 1...65535= timeout time (ms)
51.13 RPDO6-COB-ID	769...895 (Dec) 301h...37Fh (Hex)	Defines the COB-ID for RxPDO6. 0=RxPDO6 is not valid (disabled). 1=RxPDO6 is valid and configured to use default COB-ID (300h+Node-ID) 769...895 (Dec) = RxPDO6 is valid and configured to use a custom COB-ID defined with this parameter.

Parameter	Setting for CANopen fieldbus control	Function/Information
51.14 RPDO6-TR TYPE	0 1...240 252 253 254 255	See page 20 for a detailed table. 0=Acyclic 1...240=Cyclic, Synchronous 252=Synchronous, RTR only 253=Asynchronous, RTR only 254=Asynchronous. The device is iniated by a manufacturer specific event device. 255=Asynchronous. The device is iniated by a event device. This event must be defined in the device profile.
51.15 RPDO6-EV TIME	0 1...65535 ms	Defines event time (timeout time) for the RxPDO6 in the asynchronous transmission mode. If the communication via the CANbus fails, the FCAN-01 module sets the communication to offline mode. 0 = timeout supervision disabled. 1...65535= timeout time (ms)
51.16 TPDO6-COB-ID	641...767 (Dec) 281h...2FFh (Hex)	Defines the COB-ID for TxPDO6. 0=TxPDO6 is not valid (disabled). 1=TxPDO6 is valid and configured to use default COB-ID (280h+Node-ID) 641...767 (Dec) = TxPDO6 is valid and configured to use a custom COB-ID defined with this parameter.
51.17 TPDO6-TR TYPE	0 1...240 252 253 254 255	See page 20 for a detailed table. 0=Acyclic 1...240=Cyclic, Synchronous 252=Synchronous, RTR only 253=Asynchronous, RTR only 254=Asynchronous. The device is iniated by a manufacturer specific event device. 255=Asynchronous. The device is iniated by a event device. This event must be defined in the device profile.
51.18 TPDO6-EV TIME	0 1...65535 ms	Defines event time for the TxPDO6 in the asynchronous transmission mode. 0 = timeout supervision disabled. 1...65535= timeout time (ms)
51.19 RPDO21-COB-ID	1025...1151 (Dec) 401h...47Fh (Hex)	Defines the COB-ID for RxPDO21. 0=RxPDO21 is not valid (disabled). 1=RxPDO21 is valid and configured to use default COB-ID (400h+Node-ID) 1025...1151 (Dec) = RxPDO21 is valid and configured to use a custom COB-ID defined with this parameter.

Parameter	Setting for CANopen fieldbus control	Function/Information
51.20 RPDO21-TR TYPE	0 1...240 252 253 254 255	See page 20 for a detailed table. 0=Acyclic 1...240=Cyclic, Synchronous 252=Synchronous, RTR only 253=Asynchronous, RTR only 254=Asynchronous. The device is iniated by a manufacturer specific event device. 255=Asynchronous. The device is iniated by a event device. This event must be defined in the device profile.
51.21 RPDO21-EV TIME	0 1...65535 ms	Defines event time (timeout time) for the RxPDO21 in the asynchronous transmission mode. If the communication via the CANbus fails, the FCAN-01 module sets the communication to offline mode. 0 = timeout supervision disabled. 1...65535= timeout time (ms)
51.22 TPDO21-COB-ID	897...1023 (Dec) 381h...3FFh (Hex)	Defines the COB-ID for TxPDO21. 0=TxPDO21 is not valid (disabled). 1=TxPDO21 is valid and configured to use default COB-ID (380h+Node-ID) 897...1023 (Dec) = TxPDO21 is valid and configured to use a custom COB-ID defined with this parameter.
51.23 TPDO21-TR TYPE	0 1...240 252 253 254 255	See page 20 for a detailed table. 0=Acyclic 1...240=Cyclic, Synchronous 252=Synchronous, RTR only 253=Asynchronous, RTR only 254=Asynchronous. The device is iniated by a manufacturer specific event device. 255=Asynchronous. The device is iniated by a event device. This event must be defined in the device profile.
51.24 TPDO21-EV TIME	0 1...65535 ms	Defines event time for the TxPDO21 in the asynchronous transmission mode. 0 = timeout supervision disabled. 1...65535= timeout time (ms)
51.27 FBA PAR REFRESH	(0) DONE (1) REFRESH	Validates any changed adapter module configuration parameter settings.
51.28 PAR TABLE VER	–	Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory of the drive.
51.29 DRIVE TYPE CODE	–	Displays the drive type code of the fieldbus adapter module mapping file stored in the memory of the drive.
51.30 MAPPING FILE VER	–	Displays the fieldbus adapter module mapping file revision stored in the memory of the drive.
51.31 D2FBA COMM STA	–	Displays the status of the fieldbus adapter module communication.
51.32 FBA COMM SW VER	–	Displays the common program revision of the adapter module.

Parameter	Setting for CANopen fieldbus control	Function/Information
51.33 FBA APPL SW VER	–	Displays the application program revision of the adapter module.
Note: In the User's Manual of the fieldbus adapter module, the parameter group number is 1 or A for parameters 51.01…51.26.		
TRANSMITTED DATA SELECTION		
52.01 FBA DATA IN1 … 52.12 FBA DATA IN12	0 4…6 14…16 101…9999	Defines the data transmitted from drive to fieldbus controller. For virtual address area of the drive, see page 19. 0 = Not used 1...99 = Virtual address area of the drive control 101...9999 = Parameter area of the drive. To define parameter 1.01 enter value 101, define other parameters respectively. **Note:** If the selected data is 32 bits long, two parameters are reserved for the transmission.
53.01 FBA DATA OUT1 … 53.12 FBA DATA OUT12	0 1…3 11…13 1001…9999	Defines the data transmitted from fieldbus controller to drive. For virtual address area of the drive, see page 19. 0 = Not used 1...99 = Virtual address area of the drive control 101...9999 = Parameter area of the drive. To define parameter 1.01 enter value 101, define other parameters respectively. **Note:** If the selected data is 32 bits long, two parameters are reserved for the transmission.
Note: In the User's Manual of the fieldbus adapter module, the parameter group number is 3 or C for parameters 52.01…52.12 and 2 or B for parameters 53.01…53.12.		

After the module configuration parameters have been set, the drive control parameters (see section *Drive control parameters*) must be checked and adjusted when necessary.

The new settings will take effect when the drive is powered up the next time (before powering off the drive, wait at least 1 minute), or when parameter 51.27 FBA PAR REFRESH is activated.

The virtual address area of the drive control is allocated as follows:

Virtual address	Description	Data length	Profile								
			DSP 402						ABB Drives	Transparent 16	Transparent 32
			hm	pp	ip	pv	pt	vl			
1	Control word	16-bit	6040h	6040h		6040h	6040h	6040h	6040h	6040h	-
2	Reference 1	16-bit	-	-		-	6071h	6042h	6042h	6042h	-
3	Reference 2	16-bit	-	-		-	-	-	2000h03	2000h03	-
4	Status word	16-bit	6041h	6041h		6041h	6041h	6041h	6041h	6041h	-
5	Actual value 1	16-bit	-	-		-	6077h	6044h	6044h	6044h	-
6	Actual value 2	16-bit	-	-		-	-	-	2000h06	2000h06	-
7...10	Reserved	n/a	-	-		-	-	-	-	-	-
11	Control word	32-bit	-	-		-	-	-	-	-	2001h
12	Reference 1	32-bit	-	607Ah		60FF	-	-	-	-	2002h
13	Reference 2	32-bit	-	-		-	-	-	-	-	2003h
14	Status word	32-bit	-	-		-	-	-	-	-	2004h
15	Actual value 1	32-bit	-	6064h		606C	-	-	-	-	2005h
16	Actual value 2	32-bit	-	-		-	-	-	-	-	2006h
	Reserved	n/a	-	-		-	-	-	-	-	-

hm homing mode
pp profile position mode
ip inter-polated position mode
pv profile velocity mode
pt profile torque mode
vl velocity mode

Description of transmission type

Transmission type	PDO transmission				
	Cyclic	Acyclic	Synchronous	Asynchronous	RTR only
0		+	+		
1...240	+		+		
241...251	Reserved				
252			+		+
253				+	+
254 *				+	
255 **				+	

* The transmission of this PDO is initiated by an event on the device. The event is manufacturer specific.

** The transmission of this PDO is initiated by an event on the device. This event must be defined in the device profile.

Drive control parameters

The Setting for fieldbus control column gives the value to use when the fieldbus interface is the desired source or destination for that particular signal. The Function/ Information column gives a description of the parameter.

Parameter	Setting for fieldbus control	Function/Information
CONTROL COMMAND SOURCE SELECTION		
10.01 EXT1 START FUNC	(3) FBA	Selects fieldbus as the source for the start and stop commands when EXT1 is selected as the active control location.
10.04 EXT2 START FUNC	(3) FBA	Selects fieldbus as the source for the start and stop commands when EXT2 is selected as the active control location.
24.01 SPEED REF1 SEL	(3) FBA REF1 (4) FBA REF2	Fieldbus reference REF1 or REF2 is used as speed reference 1.
24.02 SPEED REF2 SEL	(3) FBA REF1 (4) FBA REF2	Fieldbus reference REF1 or REF2 is used as speed reference 2.
32.01 TORQ REF1 SEL	(3) FBA REF1 (4) FBA REF2	Fieldbus reference REF1 or REF2 is used as torque reference 1.
32.02 TORQ REF ADD SEL	(3) FBA REF1 (4) FBA REF2	Fieldbus reference REF1 or REF2 is used for torque reference addition.
SYSTEM CONTROL INPUTS		
16.07 PARAM SAVE	(0) DONE (1) SAVE	Saves parameter value changes (including those made through fieldbus control) to permanent memory.

Communication profiles

What this chapter contains

This chapter describes the communication profiles used in the communication between the CANopen network, the FCAN-01 module, and the drive.

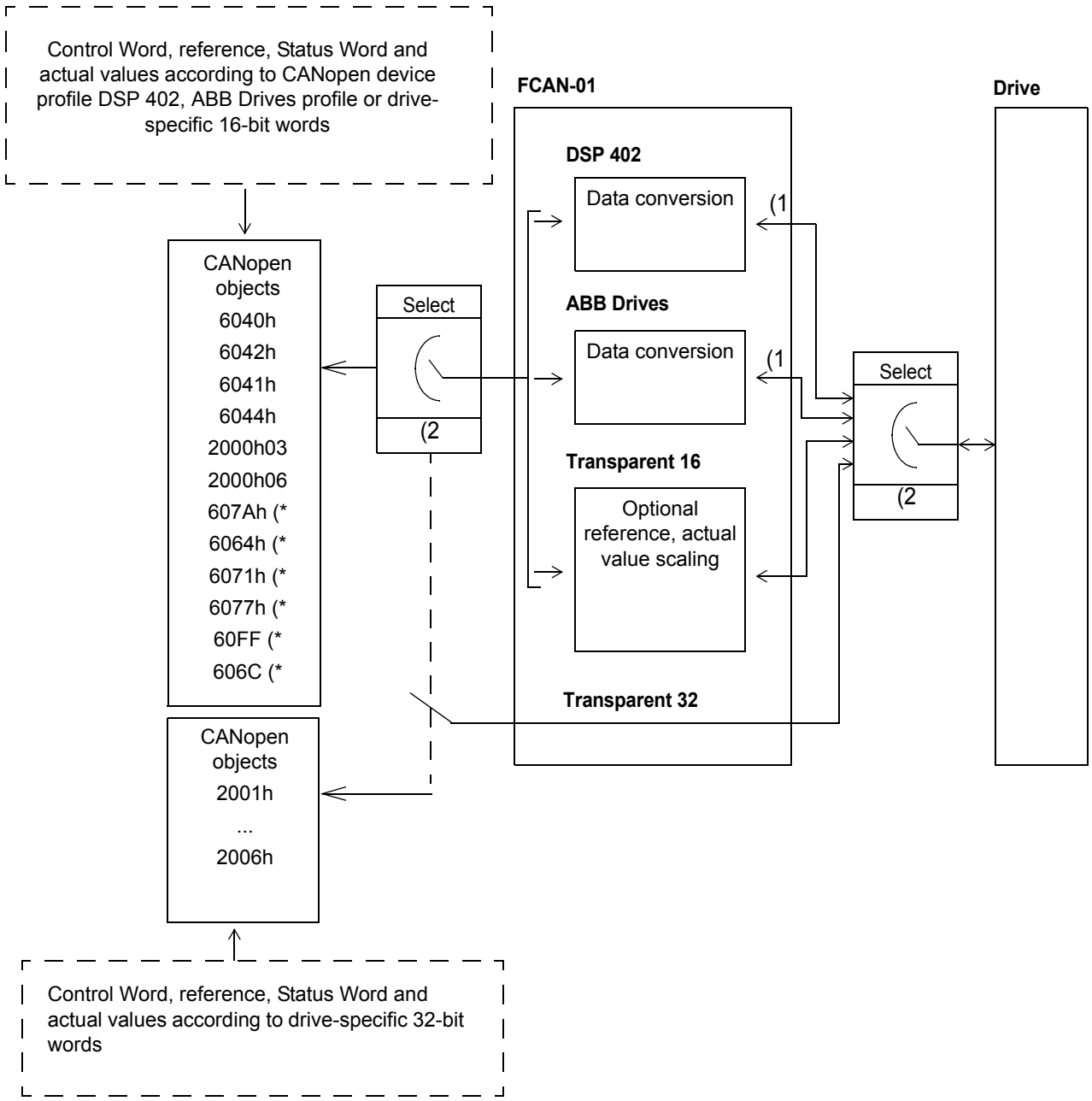
Communication profiles

Communication profiles are ways of conveying control commands (Control Word, Status Word, references and actual values) between the master station and the drive.

With the FCAN-01 module, the CANopen network may employ DSP 402 (Device Profile Drives and Motion Control) profile or the ABB Drives profile. Both are converted to the DCU profile (detailed in the drive manuals) by the FCAN-01 module. In addition, two Transparent profiles – for 16-bit and 32-bit words respectively – are available. With the Transparent modes, no data conversion takes place.

Note: The DSP 402 operation mode support is drive-specific. See section *The CANopen device profile DSP 402* on page *23* for more details.

The profile is selected from the drive with parameter 5 PROFILE of the fieldbus configuration group 1. For example, if parameter 5 PROFILE is set to 0, the Control Word of the drive is set according to the DSP 402 Standard (Device Profile Drives and Motion Control).



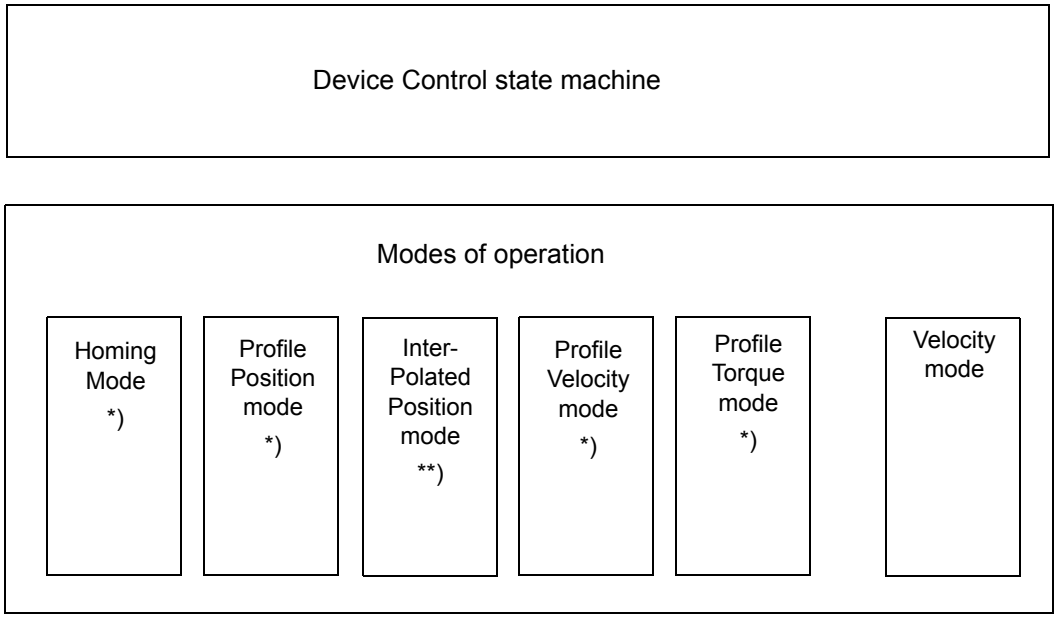
(1 DCU profile

(2 Selection via FCAN-01 configuration parameters (par. 5 PROFILE of group 1)

(* Only with ACSM1

The following sections describe the Control Word, the Status Word, references and actual values for the CANopen device profile DSP 402 and ABB Drives communication profiles. See the drive manuals for details on the DCU communication profile.

The CANopen device profile DSP 402



*) Supported with ACSM1 only

**) Not supported

Device Control state machine

The start and stop of the drive and several mode specific commands are executed by the Device Control state machine. This is described on page *29*.

The Control Word is the principal means for controlling the drive from a fieldbus system. It is sent by the fieldbus master station to the drive through the adapter module. The drive switches between its states according to the bit-coded instructions in the Control Word, and returns status information to the master in the Status Word.

The contents of the Control Word and the Status Word are detailed in section *Control Word and Status Word of the DSP 402 profile* on page *26*.

Modes of operation

The operation mode defines the behavior of the drive. DSP 402 defines following operation modes:

- *Homing mode*
- *Profile position mode*

- *Interpolated position mode*
- *Profile velocity mode*
- *Profile torque mode*
- *Velocity mode*

FCAN-01 supports minimal implementation of the operation modes. Operation mode support is drive-specific. Interpolated position mode is not supported.

In this chapter scalings of the reference and actual values are described for each operation mode. Operation mode specific objects are defined in the CANopen Object Dictionary (see *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English]).

In ACSM1, the mode of operation is automatically selected according to the control mode configured with parameter 34.03 EXT1 CTRL MODE, 34.04 EXT1 CTRL MODE2 or 34.05 EXT2 CTRL MODE1 (depending on the current control location). The correct reference scaling must be selected with par. 50.04 FBA REF1 MODESEL.

Homing mode

Homing mode describes various methods of finding a home position, or zero point. Either limit switches at the ends of travel or a home switch in mid travel are used. Most of the methods also use the index (zero) pulse from an incremental encoder. For more information on the homing mode and descriptions of the various homing methods, see the drive manual.

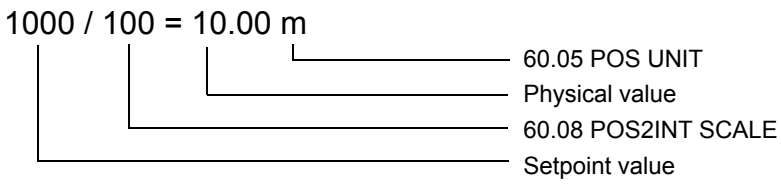
Profile position mode

This mode enables the positioning of the drive to be controlled.

Position demand value

Position demand value defines the position setpoint. The position setpoint is scaled as follows:

Drive parameter	Setting
60.05 POS UNIT (Position unit)	m**
60.08 POS2INT SCALE	100**
**Example	



Position actual value

Position actual value defines the actual position of the application. Position actual value is scaled as position demand value (see above).

Interpolated position mode

Not supported with the FCAN-01 CANopen Adapter Module.

Profile velocity mode

The profile velocity mode is used to control the velocity of the drive with no special regard of the position.

Target velocity

Target velocity is the required velocity of the application. The target velocity is scaled as follows:

Drive parameter	Example setting
60.05 POS UNIT (Position unit)	m
60.10 POS SPEED UNIT	unit/s
60.11 POS SPEED2INT	100

Velocity actual value

Velocity actual value defines the actual velocity of the application. Velocity actual value is scaled as target velocity (see above).

Profile torque mode

Profile torque mode enables the drive torque to be controlled directly.

Target torque

Target torque is the required torque of the application. The value is given per thousand of the rated torque, i.e. 10 = 1 %.

Torque actual value

Torque actual value corresponds to the instantaneous torque in the drive motor. The value is given per thousand of the rated torque, i.e. 10 = 1 %.

Velocity mode

Basic mode to control the velocity of the drive with limits and ramp functions.

Target velocity of DSP 402 Velocity mode

Target velocity is the required velocity of the application. The unit of the target velocity is interpreted as rpm. 1 = 1 rpm.

Control effort of DSP 402 Velocity mode

Control effort is the actual velocity of the application. The unit of the control effort is interpreted as rpm. 1 = 1 rpm.

Control Word and Status Word of the DSP 402 profile

Control Word of DSP 402

Bit	Description
0	Switch on
1	Enable voltage
2	Quick stop
3	Enable operation
4...6	Operation mode specific
7	Fault reset
8	Halt (not used)
9...10	Reserved
11...15	Drive-specific bit

Operation mode specific bits

Bit	Velocity mode	Profile position mode*	Profile velocity mode*	Profile torque mode*	Homing mode*	Interpolated position mode**
4	rfg enable	New setpoint	Reserved	Reserved	Homing operation start	Enable ipmode
5	rfg unlock	Change set immediately	Reserved	Reserved	Reserved	Reserved
6	rfg use ref	abs / rel	Reserved	Reserved	Reserved	Reserved

* Supported with ACSM1 only

** Not supported

Status Word of DSP 402

Bit	Description
0	Ready to switch on
1	Switched on
2	Operation enabled
3	Fault
4	Voltage disabled
5	Quick stop
6	Switch on disabled
7	Warning
8	Drive-specific bit
9	Remote
10	Target reached
11	Internal limit active
12...13	Operation mode specific
14...15	Drive-specific bit

Operation mode specific bits

Bit	Velocity mode	Profile position mode*	Profile velocity mode*	Profile torque mode*	Homing mode*	Interpolated position mode**
12	Reserved	Setpoint acknowledge	Speed	Reserved	Homing attained	IP mode active
13	Reserved	Following error	Max slippage error	Reserved	Homing error	Reserved

* Supported with ACSM1 only

**Not supported

Device control commands are triggered by the Control Word bits as follows:

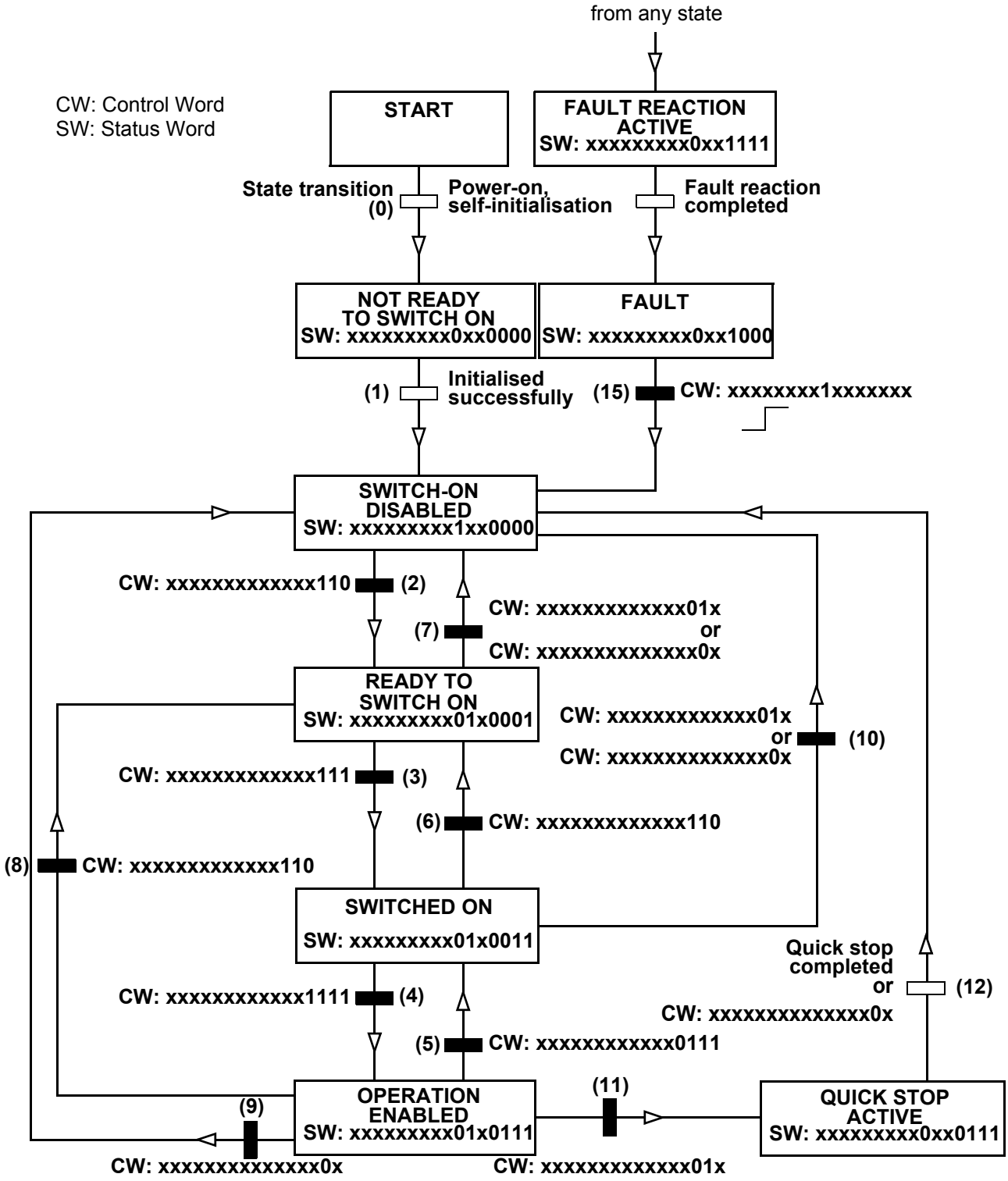
Device control commands

Command	Control Word bit					
	Fault reset, bit 7	**Enable operation, bit 3**	**Quick stop, bit 2**	**Enable voltage, bit 1**	**Switch on, bit 0**	**State transitions * (See page 29)**
Shut down	0	x	1	1	0	2, 6, 8
Switch on	0	0	1	1	1	3 *
Switch on	0	1	1	1	1	3 *
Disable voltage	0	x	x	0	x	7, 9, 10, 12
Quick stop	0	x	0	1	x	7, 10, 11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4, 1
Fault reset		x	x	x	x	15

x: Bits marked with x are irrelevant

* When Control Word bit 3 (Enable operation) is 1, the drive does not perform any tasks in the SWITCHED ON state. When bit 3 is 0, state SWITCHED ON tasks are performed.

The CANopen state machine



The ABB Drives communication profile

Control Word and Status Word

The Control Word is the principal means for controlling the drive from a fieldbus system. It is sent by the fieldbus master station to the drive through the adapter module. The drive switches between its states according to the bit-coded instructions in the Control Word, and returns status information to the master in the Status Word.

The contents of the Control Word and the Status Word are detailed in section *Control Word and Status Word of the ABB Drives profile* on page *32*. The drive states are presented in the ABB Drives profile state machine on page *35*.

References

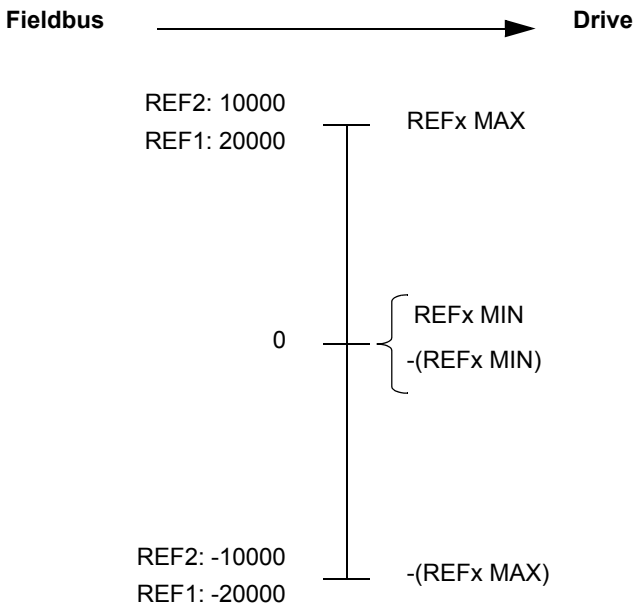
References are 16-bit words containing a sign bit and a 15-bit integer. A negative reference (indicating reversed direction of rotation) is formed by calculating the two's complement from the corresponding positive reference.

ABB drives can receive control information from multiple sources including analogue and digital inputs, the drive control panel and a communication module (for example, FCAN-01). In order to have the drive controlled through the fieldbus, the module must be defined as the source for control information, for example, reference.

Scaling

References are scaled as shown below.

Note: The values of REF1 MAX and REF2 MAX are set by drive parameters. See the drive manuals for further information.



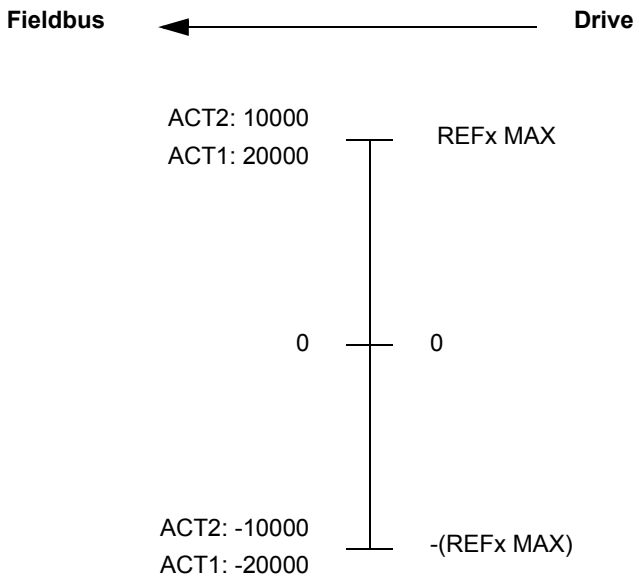
Actual values

Actual values are 16-bit words containing information on the operation of the drive. The functions to be monitored are selected by a drive parameter.

Scaling

Actual values are scaled as shown below.

Note: The values of REF1 MAX and REF2 MAX are set by drive parameters. See the drive manuals for further information.



Control Word and Status Word of the ABB Drives profile

The following table presents the Control Word of the ABB Drives communication profile. The upper case boldface text refers to the states shown in the ABB Drives profile state machine on page *35*.

Control Word of the ABB Drives profile

Bit	Name	Value	STATE/Description
0	OFF1_ CONTROL	1	Proceed to READY TO OPERATE.
		0	Stop along currently active deceleration ramp. Proceed to **OFF1 ACTIVE**; proceed to **READY TO SWITCH ON** unless other interlocks (OFF2, OFF3) are active.
1	OFF2_ CONTROL	1	Continue operation (OFF2 inactive).
		0	Emergency OFF; coast to stop. Proceed to **OFF2 ACTIVE**, proceed to **SWITCH-ON INHIBITED**.
2	OFF3_ CONTROL	1	Continue operation (OFF3 inactive).
		0	Emergency stop; stop within time defined by drive parameter. Proceed to OFF3 ACTIVE; proceed to SWITCH-ON INHIBITED. Warning: Ensure motor and driven machine can be stopped using this stop mode.
3	INHIBIT_ OPERATION	1	Proceed to **OPERATION ENABLED**. **Note:** Run enable signal must be active; see the drive manuals. If the drive is set to receive the Run enable signal from the fieldbus, this bit activates the signal.
		0	Inhibit operation; proceed to **OPERATION INHIBITED**.
4	RAMP_OUT_ ZERO	1	Normal operation; proceed to **RAMP FUNCTION GENERATOR: OUTPUT ENABLED**.
		0	Force Ramp Function Generator output to zero. Drive ramps to stop (current and DC voltage limits in force).
5	RAMP_HOLD	1	Enable ramp function; proceed to **RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED**.
		0	Halt ramping (Ramp Function Generator output held).
6	RAMP_IN_ ZERO	1	Normal operation; proceed to **OPERATING**. **Note:** Effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Force Ramp Function Generator input to zero.
7	RESET	0=>1	Fault reset if an active fault exists. Proceed to **SWITCH-ON INHIBITED**. **Note:** Effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Continue normal operation.
8 to 9	Reserved.		

Control Word of the ABB Drives profile

Bit	Name	Value	STATE/Description
10	REMOTE_ CMD	1	Fieldbus control enabled
		0	Control Word <> 0 or Reference <> 0: Retain last Control Word and Reference. Control Word = 0 and Reference = 0: Fieldbus control enabled. Reference and deceleration/acceleration ramp are locked.
11	EXT_CTRL_ LOC	1	Select external control location EXT2. Effective if control location is parameterised to be selected from fieldbus.
		0	Select external control location EXT1. Effective if control location is parameterised to be selected from fieldbus.
12 to 15	Reserved		

The following table presents the Status Word of the ABB Drives communication profile. The upper case boldface text refers to the states shown in the ABB Drives profile state machine on page *35*.

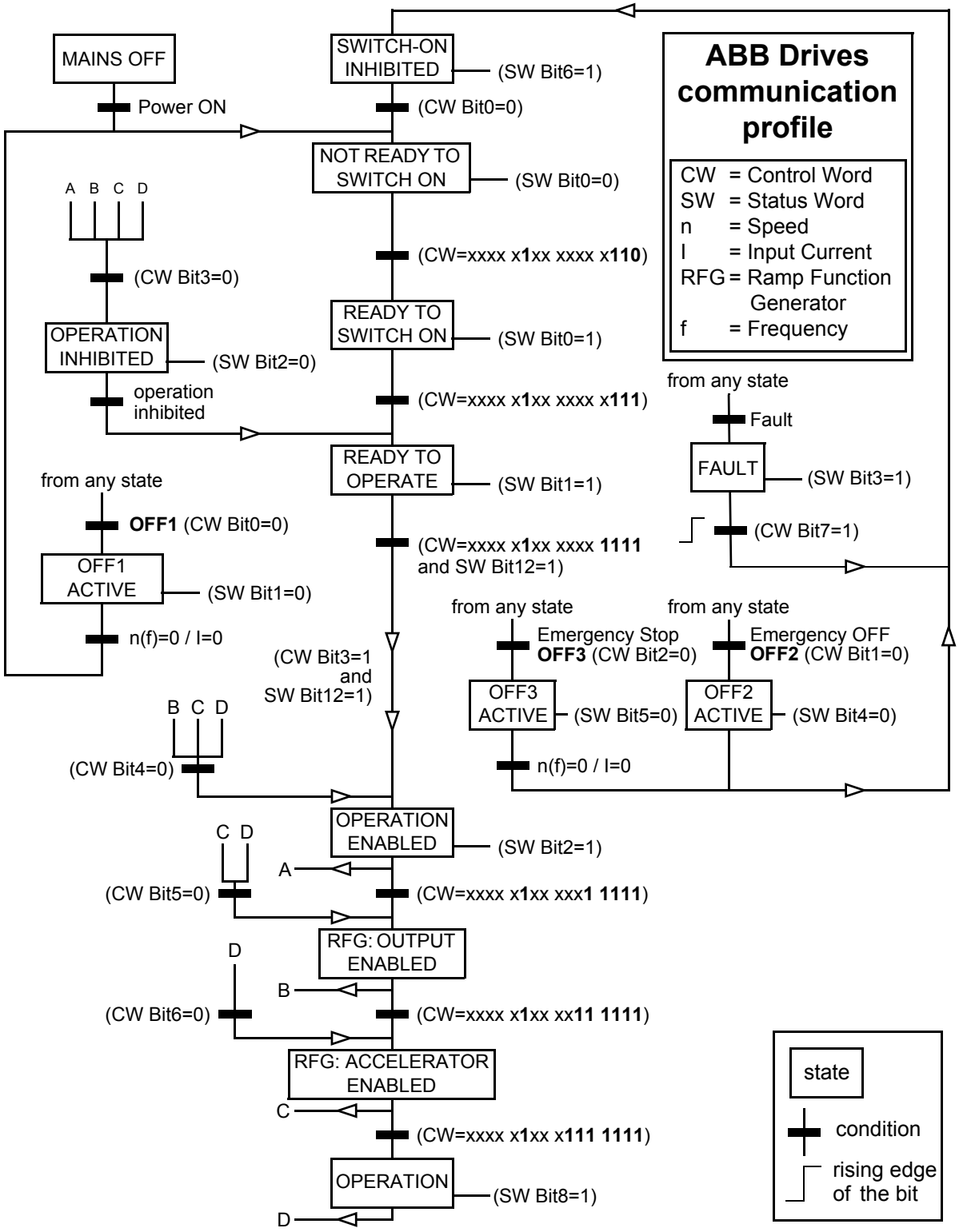
Status Word of the ABB Drives profile

Bit	Name	Value	STATE/Description
0	RDY_ON	1	READY TO SWITCH ON
		0	NOT READY TO SWITCH ON
1	RDY_RUN	1	READY TO OPERATE
		0	OFF1 ACTIVE
2	RDY_REF	1	OPERATION ENABLED
		0	OPERATION INHIBITED
3	TRIPPED	1	FAULT
		0	No fault
4	OFF_2_STA	1	OFF2 inactive
		0	OFF2 ACTIVE
5	OFF_3_STA	1	OFF3 inactive
		0	OFF3 ACTIVE
6	SWC_ON_ INHIB	1	SWITCH-ON INHIBITED
		0	–
7	ALARM	1	Warning/Alarm
		0	No warning/alarm
8	AT_ SETPOINT	1	OPERATING. Actual value equals reference = is within tolerance limits, i.e. in speed control, speed error is 10% max. of the nominal motor speed.
		0	Actual value differs from reference = is outside tolerance limits.

Status Word of the ABB Drives profile

Bit	Name	Value	STATE/Description
9	REMOTE	1	Drive control location: REMOTE (EXT1 or EXT2)
		0	Drive control location: LOCAL
10	ABOVE_ LIMIT	1	Actual frequency or speed equals or exceeds supervision limit (set by drive parameter). Valid in both directions of rotation.
		0	Actual frequency or speed within supervision limit
11	EXT_CTRL_ LOC	1	External Control Location EXT2 selected
		0	External Control Location EXT1 selected
12	EXT_RUN_ENABL E	1	External Run Enable signal received
		0	No External Run Enable signal received
13 to 14	Reserved		
15		1	Communication error detected by fieldbus adapter module
		0	Fieldbus adapter communication OK

State machine, ABB Drives communication profile



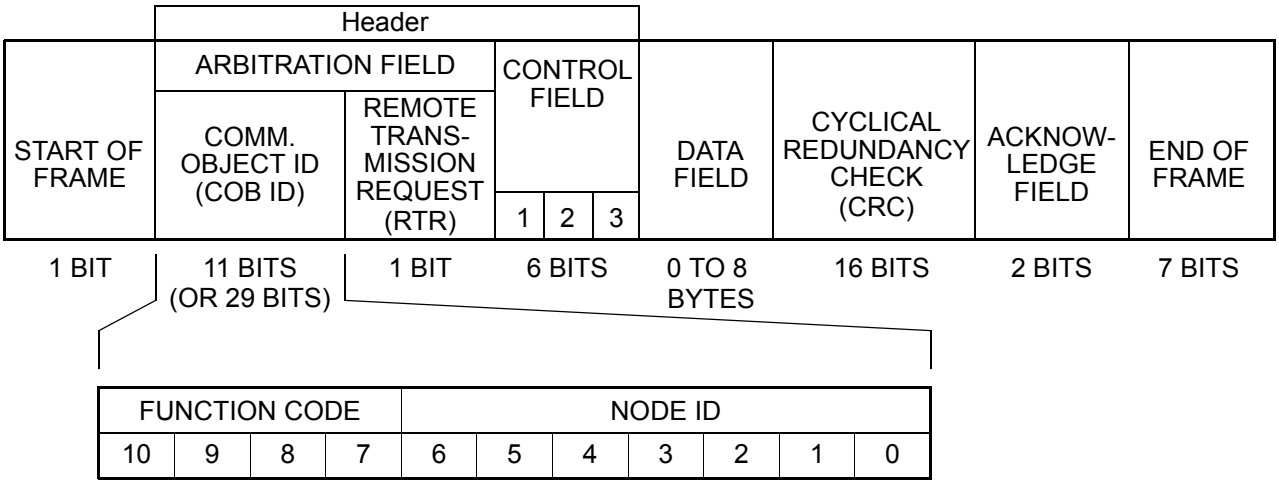
Communication

What this chapter contains

This chapter describes the communication on a CANopen network. For detailed information on the communication and the CANopen object dictionary, see *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English]).

CAN data frame

CAN employs data frames for transferring data between the host (controller) and the nodes on the bus. The following figure presents the structure of the data frame.



Communication object	Function code (Binary)	COB ID (Hex)	COB ID (Dec)
NMT	0000	00h	0
SYNC	0001	80h	128
TIME STAMP	0010	100h	256
EMERGENCY	0001	81h…FFh	129…255
PDO1 (Tx)	0011	181h...1FFh	385...511
PDO1 (Rx)	0100	201h...27Fh	513...639
PDO6 (Tx)	0101	281h...2FFh	641...767
PDO6 (Rx)	0110	301h...37Fh	769...895
PDO21 (Tx)	0111	381h...3FFh	897...1023
PDO21 (Rx)	1000	401h...47Fh	1025...1151
SDO (Tx)	1011	581h…5FFh	1409…1535
SDO (Rx)	1100	601h…67Fh	1537…1663
NODEGUARD	1110	701h…77Fh	1793…1919

1 = IDE bit = Extended format / standard format (1 bit)

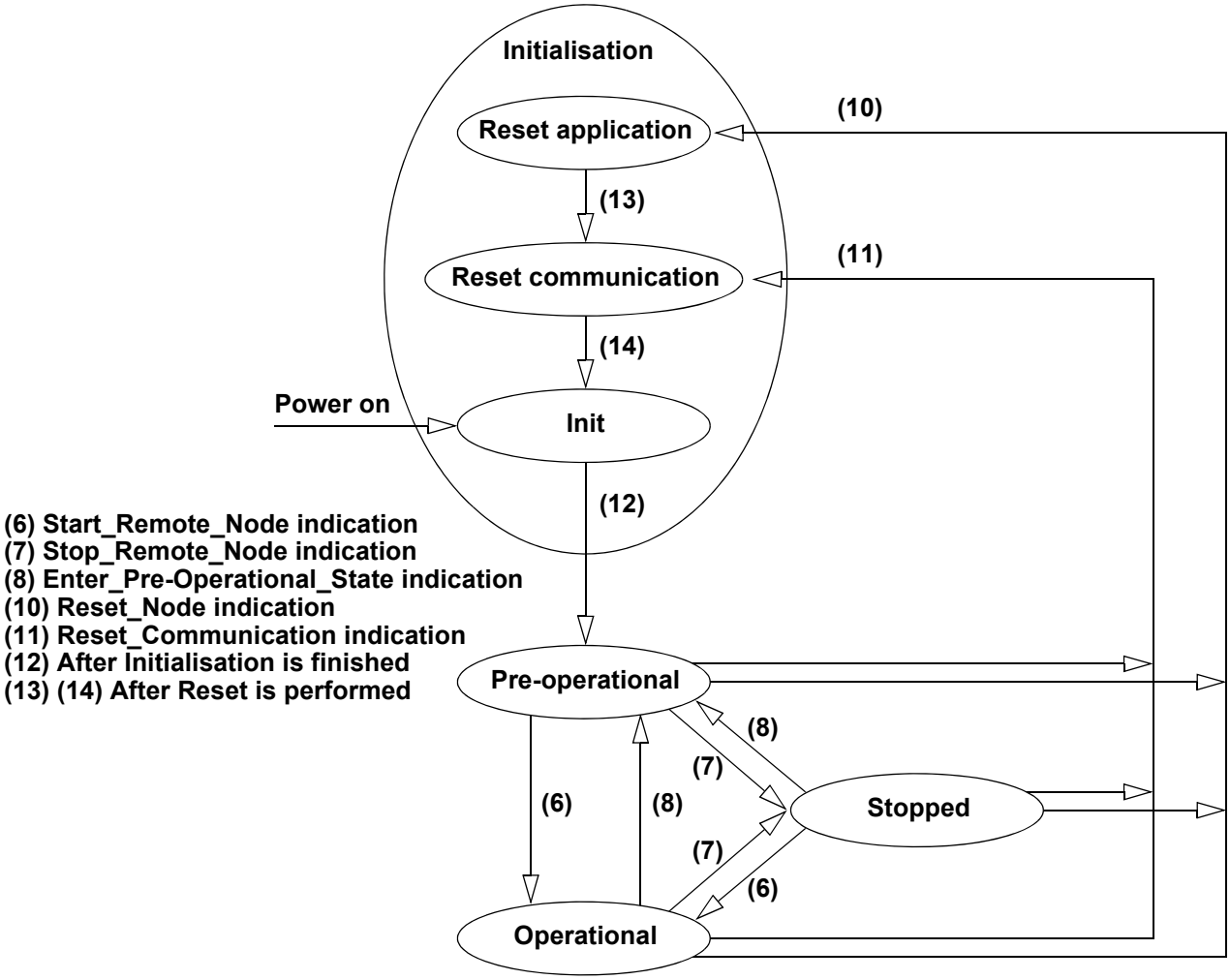
2 = ro = reserved (1 bit)

3 = DLC = Data Length Code (4 bits)

Inside the CANopen data frame, different types of Communication Objects are used to convey the data. Process Data Objects (PDO) are used for transmitting time critical process data (references, control commands, status information); Service Data Objects (SDO) are used for less time critical data, for example, parameters. In addition, there are Special Function Objects and Network Management Objects.

FCAN-01 boot-up sequence and Network Management (NMT)

FCAN-01 supports the boot-up sequence of a “Minimum Capability Device”, as defined by the CANopen Communication Profile. The boot-up state diagram of FCAN-01 is shown below.



The NMT (Network Management) message is mapped to a single CAN frame with data length of 2 bytes. Its identifier is 0. The first byte contains the command specifier and the second contains the Node ID of the device, which must perform the command (if the node ID is 0, all nodes must perform the command). The NMT message transmitted by the NMT master forces the nodes to transit to another NMT state. The CANopen state machine specifies states: Initialisation, Pre-Operational, Operational and Stopped. After power-on, each CANopen device is first in the Initialization state and then the state transits automatically to the Pre-Operational state.

The NMT commands used for controlling the node are:

Command	Name
001	Start_Remote_Node
002	Stop_Remote_Node
128	Enter_Pre-Operational_State
129	Reset_Node
130	Reset_Communication

Header	Byte	
	1	2
00000000000000010	NMT Command	Node ID

Note: If Node ID is 0, all NMT slaves are addressed.

The node state indications are as follows:

Indication	State
0	Boot-up
4	Stopped
5	Operational
127	Pre-operational

Process Data Objects (PDO)

Process Data Object (PDO) is used for time critical process data exchange. PDO transmissions can be controlled by an internal timer, by remote requests or by the received Sync message. For each PDO the transmission mode of the PDO as well as the default mappings of the application objects are described in the Object Dictionary. FCAN-01 supports also configuration of the PDOs via drive parameters.

FCAN-01 supports maximum of three PDOs in both directions. By default only PDO1 Tx and PDO1 Rx are enabled (valid) and PDO6 Tx/Rx and PDO21 Tx/Rx are disabled (not valid).

PDO mapping defines which application objects (parameters) are transmitted within a PDO. PDO mappings of FCAN-01 can be changed in the Pre-operational state (variable objects). Transmission of the enabled (valid) PDOs is possible only in the Operational state.

Each PDO can support up to 8 bytes of process data. In ACS350, the first mapping entry of PDO1 Tx/Rx and PDO6 Tx/Rx is fixed and it cannot be changed. The length of the PDOs and other mapping entries of the PDOs are configurable.

The mapping entries of the PDOs can be configured through CANopen objects or from the drive through fieldbus configuration parameters. The configuration location is selected from the drive with parameter 4 CONF LOC of the fieldbus configuration group A (group 1) (par. 51.04 in ACS350 and ACSM1).

When mapping through CANopen objects, the PDO length must be set to zero before the mapping entries can be changed.

PDO1 Rx

		Mapped obj 1		**Mapped obj 2**		**Mapped obj 3**		**Mapped obj 4**	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		6040h (Control Word) Fixed *		-		-		-	
CANopen Object for Mapping		1600h01		1600h02		1600h03		1600h04	
Mapping parameter **	**ACS350**	Not used		FBA DATA OUT 1		FBA DATA OUT 2		FBA DATA OUT 3	
	ACSM1	FBA DATA OUT 1		FBA DATA OUT 2		FBA DATA OUT 3		FBA DATA OUT 4	

* With the ACS350, the first mapping entry is fixed and the others are configurable. With the ACSM1 all mapping entries are configurable.

** Configuration group B (group 2)

Note: The mapping entries of the PDO1 Rx can be configured through CANopen object 1600h or from the drive through fieldbus configuration parameter group B (group 2). The default COB ID for PDO1 Rx is 200h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed only with CANopen object 1400h or from the drive with parameters 7, 8 and 9 of the fieldbus configuration group A (group 1).

PDO1 Tx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		6041h (Status Word) Fixed*		-		-		-	
CANopen Object for Mapping		1A00h01		1A00h02		1A00h03		1A00h04	
Mapping parameter **	**ACS350**	Not used		FBA DATA IN 1		FBA DATA IN 2		FBA DATA IN 3	
	ACSM1	FBA DATA IN 1		FBA DATA IN 2		FBA DATA IN 3		FBA DATA IN 4	

* With the ACS350, the first mapping entry is fixed and the others are configurable. With the ACSM1, all mapping entries are configurable.

** Configuration group C (group 3)

Note: The mapping entries of the PDO1 Tx can be configured through CANopen object 1A00h or from the drive through fieldbus configuration parameter group C (group 3). The default COB ID for PDO1 Tx is 180h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed with CANopen object 1600h or from the drive with parameters 10, 11 and 12 of the fieldbus configuration group A (group 1).

Mapping format

Note: Subindex 0h contains the number of valid entries within the mapping record. This number is also the number of the application variables (parameters), which shall be transmitted/received with the corresponding PDO. The subindexes from 1h to the number of objects contain information about the mapped application variables.

The mapping values in the CANopen object are hexadecimal coded. The following table presents an example of the PDO mapping entry structure:

Type	**MSB**			**LSB**
UINT32	31 16	15 8	7 0	
Description	Index e.g. 1400h $\hat{=}$ drive par.12.02 (16 bits)	Subindex e.g. 02 (8 bits)	Object length in bits e.g. 10h = 16 bits (8 bits)	

If the PDO mappings are configured through fieldbus configuration parameters group B (group 2) and group C (group 3), only objects belonging to the virtual address area of the drive control and to the drive parameter area can be mapped, that is, objects 6040h, 6042h, 6041h, 6044h, 6064h 60FF, 606C, 607Ah, 6077h, 6071h, 2001h, 2002h, 2003h, 2004h, 2005h, 2006h, 2000h03, 2000h06 and objects 4000h…4063h. The mapping values are in decimal format and only virtual addresses of the drive control (1...6 and 11...16) or drive parameter numbers (101...9999) can be set. FCAN-01 converts the values to CANopen objects. The length of the object is detected automatically.

Note: The PDO mappings should be started from subindex 1h. If a PDO mapping entry is zero, the mapping for that subindex and from that subindex onwards is neglected. That is, if there are zeros in the PDO mapping, only objects from subindex 1h to the first zero are taken into account.

Service Data Objects (SDO)

Service Data Objects are mainly used for transferring non-time critical data, for example, parameter values. SDOs provide access to the entries in the device Object Dictionary.

If 4 bytes (or less) of data is to be transmitted, an Expedited transfer SDO message can be used. Larger quantities of data can be segmented, that is, split between several CAN messages.

The following services can be applied to SDO depending on the service requirements:

- **SDO Upload**, which can be divided into

- Initiate SDO Upload

- Upload SDO Segment.

- **SDO Download**, which can be divided into

- Initiate SDO Download

- Download SDO Segment.

- **Abort SDO Transfer**

With expedited transfer all data is transferred during the initialisation phase (Initiate SDO Upload/Download). With segmented transfer only part of the data is transferred during the initialisation phase and the rest of the data is transferred during the Upload/Download SDO Segment phase.

The COB IDs for the SDO communication are:

Client to Server (Master to Slave): 600h + Node ID

Server to Client (Slave to Master): 580h + Node ID.

Quick start-up and parametrising the FCAN-01 CANopen Adapter Module

What this chapter contains

This chapter presents the steps to take during the start-up of the FCAN-01 CANopen Adapter Module with the drive. For more detailed information, see *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English]).

WARNING! Follow the safety instructions given in this manual and in the hardware manual of the drive.

Mechanical and electrical installation

- Insert the FCAN-01 module into ACSM1 slot 3 in the drive.
- Fasten the screw.
- Plug the fieldbus connector to the module.

Drive configuration

- Power up the drive.
- A parameter must be adjusted to activate the communication: set parameter 50.01 FBA ENABLE to ENABLE.
- Parameter group 51 shows the status of the configuration parameters.
- At the minimum, set the following parameters:
  51.01 FBA TYPE CANopen
  51.02 NODE ID 1...127
  51.03 BAUD RATE (3) 125 kbit/s
  51.04 CONF LOC (0) Configuration via CANopen objects
  51.05 PROFILE (0) for DSP402
- Finally, validate the settings with parameter 51.27 FBA PAR REFRESH.

Parameter setting examples for ACSM1

This section gives the recommended drive parameter settings for different control modes. For more information on the communicaton profiles used in the communication between the CANopen network, the FCAN-01 module, and the drive, see chapter *Communication profiles*.

Speed and Torque Control Mode (DSP 402 Communication profile)

The start/stop commands and reference are according to the DSP 402 profile *Velocity mode.*

The table below gives the recommended drive parameter settings.

Drive parameter	Name	Value	Description
50.01	FBA ENABLE	ENABLE	Communication enable between the drive and fieldbus module
50.04	FBA REF1 MODESEL	SPEED	Fieldbus reference 1 mode selection
50.05	FBA REF2 MODESEL	TORQUE	Fieldbus reference 2 mode selection
10.01	EXT1 START FUNC	FBA	External 1 control source selection
24.01	SPEED REF1 SEL	FBA REF 1	Fieldbus reference 1 is the source for speed reference 1.
24.02	SPEED REF2 SEL	FBA REF 2	Fieldbus reference 2 is the source for torque reference 2.
34.03	EXT1 CTRL MODE 1	SPEED	External 1 control mode 1: Speed
34.04	EXT1 CTRL MODE 2	TORQUE	External 1 control mode 2: Torque
51.01	FBA TYPE	CANopen	Displays the type of the fieldbus adapter module.
51.02	NODE ID	2*	Node ID of the fieldbus module
51.03	BAUDRATE	3*	Baudrate of the CANopen network, 3 equals to 125 kbit/s.
51.04	CONF LOC	1	Configuration via FCAN-01 module parameters
51.05	PROFILE	0 (= DSP 402)	Used communication type.
51.07	RPDO1-COB-ID	1*	RPDO1 is valid and configured to use default COB-ID (200h + Node ID)
51.08	RPDO1-TR TYPE	240	Cyclic, Synchronous
51.10	TPDO1-COB-ID	1*	TPDO1 is valid and configured to use default COB-ID (180h + Node ID)
51.11	TPDO1-TR TYPE	240	Cyclic, Synchronous
52.01	FBA DATA IN1	4	Virtual address for 16 bit Status Word
52.02	FBA DATA IN2	101	Drive parameter 1.01 SPEED ACT
53.01	FBA DATA OUT1	1	Virtual address for 16 bit Control Word
53.02	FBA DATA OUT2	2	Virtual address for 16 bit reference 1
53.03	FBA DATA OUT3	3	Virtual address for 16 bit reference 2
51.27	FBA PAR REFRESH	REFRESH	Refreshing parameter settings of the module

*Example

The following table describes the Process Data Object mapping entries that are configured through the CANopen master.

Index	Sub-index	Name	Value	Description
1600h	01	RPDO1 Mapped Obj. 1	6040h	Control Word
1600h	02	RPDO1 Mapped Obj. 2	6042h	Target Velocity
1600h	03	RPDO1 Mapped Obj. 3	6071h	Target Torque
1800h	01	TPDO1 Mapped Obj. 1	6041h	Status Word
1800h	02	TPDO1 Mapped Obj. 2	4001h01	1.01 Speed Act [rpm/100]

The Control Word is used to send commands from a master to a slave unit. The start sequence for the parameter example is given in the table below.

Instruction	Control Word (Hex)	Operation	Status Word
Power up	0x0000	Init	0x0650
Set CW bit 1, Disable voltage	0x0002		0x0650
Set CW bit 2, Quick Stop	0x0006		0x0631
Set CW bit 0, Switch On	0x0007		0x0633
Set CW bit 3, Start	0x000F	Drive starts to modulate	0x0637
Set CW bit 4, RFG Enable	0x001F		0x0637
Set CW bit 5, RFG Unlock	0x003F		0x0637
Set CW bit 6, RFG Use ref	0x007F		0x0637
Set reference value to 500	0x007F	Motor runs at reference speed	0x0637

Positioning Mode (DSP 402 Communication profile)

The start/stop commands and reference are according to the DSP 402 profile *Profile position mode*.

The table below gives the recommended drive parameter settings.

Drive parameter	Name	Value	Description
50.01	FBA ENABLE	ENABLE	Communication enable between the drive and fieldbus module
50.04	FBA REF1 MODESEL	POSITION	Fieldbus reference 1 mode selection
50.05	FBA REF2 MODESEL	VELOCITY	Fieldbus reference 2 mode selection
10.01	EXT1 START FUNC	FBA	External 1 control source selection
34.03	EXT1 CTRL MODE 1	POSITION	External 1 control mode 1: Speed
34.04	EXT1 CTRL MODE 2	PROF VEL	External 1 control mode 2: Torque
51.01	FBA TYPE	CANopen	Displays the type of the fieldbus adapter module.
51.02	NODE ID	2*	Node ID of the fieldbus module
51.03	BAUDRATE	3*	Baudrate of the CANopen network, 3 equals to 125 kbit/s.
51.04	CONF LOC	1	Configuration via FCAN-01 module parameters
51.05	PROFILE	0 (= DSP 402)	Used communication type.
51.07	RPDO1-COB-ID	1*	RPDO1 is valid and configured to use default COB-ID (200h + Node ID)
51.08	RPDO1-TR TYPE	240	Cyclic, Synchronous
51.10	TPDO1-COB-ID	1*	TPDO1 is valid and configured to use default COB-ID (180h + Node ID)
51.11	TPDO1-TR TYPE	240	Cyclic, Synchronous
51.13	RPDO6-COB-ID	769 (Dec)	RPDO6 is valid and configured to use default COB-ID (300h + Node ID)
51.14	RPDO6-TR TYPE	240	Cyclic, Synchronous
51.16	TPDO6-COB-ID	641 (Dec)	TPDO6 is valid and configured to use default COB-ID (280h + Node ID)
51.17	TPDO6-TR TYPE	240	Cyclic, Synchronous
52.01	FBA DATA IN1	4	Virtual address for 16 bit Status Word
52.02	FBA DATA IN2	101	Drive parameter 1.01 SPEED ACT
52.04	FBA DATA IN4	112	Drive parameter 1.12 POS ACT
53.01	FBA DATA OUT1	1	Virtual address for 16 bit Control Word
53.02	FBA DATA OUT2	12	Virtual address for 32 bit reference 1
53.04	FBA DATA OUT4	13	Virtual address for 32 bit reference 2
51.27	FBA PAR REFRESH	REFRESH	Refreshing parameter settings of the module
65.09	POS STYLE	0b0000100	Required positioning style

*Example

The following table describes the Process Data Object mapping entries that are configured through the CANopen master.

Index	Sub-index	Name	Value	Description
1600h	01	RPDO1 Mapped Obj. 1	6040h	Control Word
1600h	02	RPDO1 Mapped Obj. 2	607Ah	Target Position
1605h	01	RPDO6 Mapped Obj. 1	6081h	Profile Velocity
1800h	01	TPDO1 Mapped Obj. 1	6041h	Status Word
1800h	02	TPDO1 Mapped Obj. 2	4001h01	1.01 Speed Act [rpm/100]
1805h	01	TPDO6 Mapped Obj. 1	4001h0C	1.12 Pos Act [rev]

The Control Word is used to send commands from a master to a slave unit. The start sequence for the parameter example is given in the table below.

Instruction	Control Word (Hex)	Operation	Status Word
Power up	0x0000	Init	0x06D0
Set CW bit 1, Disable voltage	0x0002		0x06D0
Set CW bit 2, Quick Stop	0x0006		0x06B1
Set CW bit 0, Switch On	0x0007		0x0633
Set CW bit 3, Start	0x000F	Drive starts to modulate	0x0237
Set Target position reference value to 10	0x000F		0x0237
Set Profile velocity reference value to 100	0x000F		0x0237
Set CW bit 4, New setpoint	0x001F	Drive runs to the target position	0x1A37 -> 0x1E37
Set CW bit 5, Change set immediately	0x003F	Now you can change position and velocity reference values while running	0x1A37 -> 0x1E37
Set CW bit 6, abs/rel Disable CW bit 5	0x005F	Now the drive is in the relative posion mode. To trigger relative positioning, set CW bit 4 to TRUE.	0x1A37 -> 0x1E37

Homing Mode (DSP 402 Communication profile)

The start/stop commands and reference are according to the DSP 402 profile *Homing mode*.

The table below gives the recommended drive parameter settings.

Drive parameter	Name	Value	Description
50.01	FBA ENABLE	ENABLE	Communication enable between the drive and fieldbus module
50.04	FBA REF1 MODESEL	VELOCITY	Fieldbus reference 1 mode selection
10.01	EXT1 START FUNC	FBA	External 1 control source selection
34.03	EXT1 CTRL MODE 1	HOMING	External 1 control mode 1: Homing
51.01	FBA TYPE	CANopen	Displays the type of the fieldbus adapter module.
51.02	NODE ID	2*	Node ID of the fieldbus module
51.03	BAUDRATE	3*	Baudrate of the CANopen network, 3 equals to 125 kbit/s.
51.04	CONF LOC	1	Configuration via FCAN-01 module parameters
51.05	PROFILE	0 (= DSP 402)	Used communication type.
51.07	RPDO1-COB-ID	1*	RPDO1 is valid and configured to use default COB-ID (200h + Node ID)
51.08	RPDO1-TR TYPE	240	Cyclic, Synchronous
51.10	TPDO1-COB-ID	1*	TPDO1 is valid and configured to use default COB-ID (180h + Node ID)
51.11	TPDO1-TR TYPE	240	Cyclic, Synchronous
52.01	FBA DATA IN1	4	Virtual address for 16 bit Status Word
52.02	FBA DATA IN4	112	Drive parameter 1.12 POS ACT
53.01	FBA DATA OUT1	1	Virtual address for 16 bit Control Word
51.27	FBA PAR REFRESH	REFRESH	Refreshing parameter settings of the module
62.01	HOMING METHOD	CANmethod 19	Select CAN method 19
62.02	HOMING STARTFUNC	Normal	Select normal start function
62.04	HOME SWITCH TRIG	ENC1_DI1	Home switch is encoder 1 digital input 1
62.07	HOME SPEED REF1	100	Homing speed reference 1 is 100 u/min
62.09	HOME POSITION	0.000	Home position is set to 0.000

*Example

The following table describes the Process Data Object mapping entries that are configured through the CANopen master.

Index	Sub-index	Name	Value	Description
1600h	01	RPDO1 Mapped Obj. 1	6040h	Control Word
1800h	01	TPDO1 Mapped Obj. 1	6041h	Status Word
1800h	02	TPDO1 Mapped Obj. 2	4001h0C	1.12 Pos Act [rev]

The Control Word is used to send commands from a master to a slave unit. The start sequence for the parameter example is given in the table below.

Instruction	Control Word (Hex)	Operation	Status Word
Power up	0x0000	Init	0x06D0
Set CW bit 1, Disable voltage	0x0002		0x06D0
Set CW bit 2, Quick Stop	0x0006		0x06B1
Set CW bit 0, Switch On	0x0007		0x0633
Set CW bit 3, Start	0x000F	Drive starts to modulate	0x0237
Set CW bit 4, Start homing operation	0x001F	Drive starts the homing method	0x0A37 -> 0x1637

Starting up fieldbus communication and programming the ABB PLC (one-drive system)

What this chapter contains

This chapter presents the steps to take during the start-up of the drive fieldbus control with ABB AC500 PLC and the CANopen adapter module. A system with one drive is set up.

For more information on the fieldbus adapter module, such as

- Mechanical and electrical installation
- CANopen specific parameters
- CANopen objects
- Protocols

see *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English]).

For more information on the PLC, see ABB AC500 PLC CoDeSys Online Help (Press F1 in the CoDeSys software).

Safety

WARNING! Follow the safety instructions given in this manual and in the drive hardware manual.

Equipment and programs

Equipment used in the examples:

- **ACSM1-04 demosuitcase** (order code 68836808) containing two ACSM1-04AM-02A5-4 drives with FCAN-01 CANopen Adapter Modules

- **AC500 demosuitcase TA510-CASE**: AC500 PLC *) equipped with a CPU of type PM5x1-ETH and a communications module CM578-CN, for communication over CANopen fieldbus.

Programs used in the examples:

- ACSM1 Motion Control Program version UMFI1480
- ABB DriveStudio PC tool
- PS501 Control Builder AC500 *). Code of the installation CD: 1SAP 190 100 R0002 C3 V1.3.1 / 04.2009

*) Manufacturer ABB STOTZ-KONTAKT GmbH, http://www.abb.de/stotz-kontakt

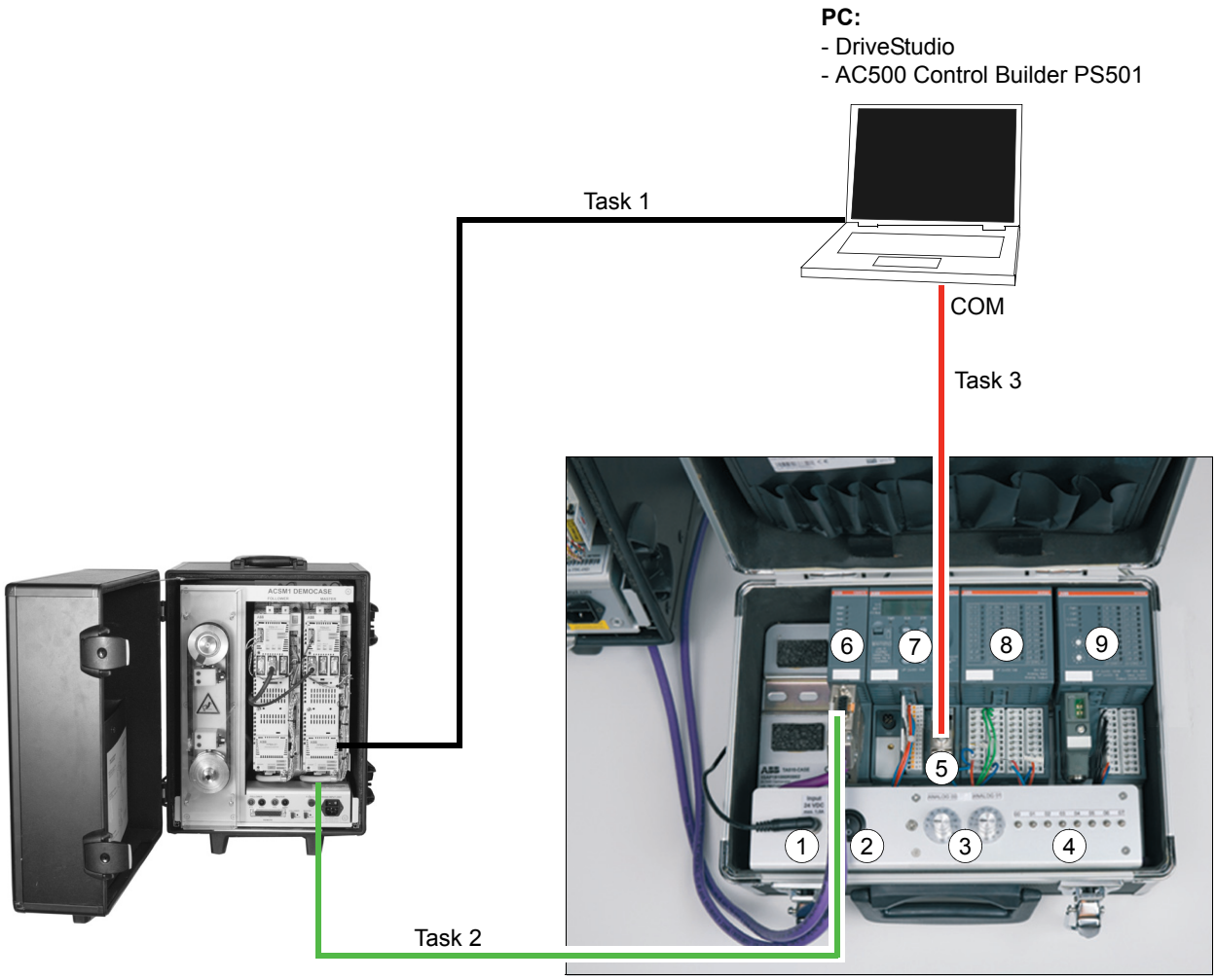
Start-up flowchart

The steps of the start-up procedure are presented below. Perform the steps from first to last.

No.	Task	Description / See instruction
	ELECTRICAL INSTALLATION	In this section, you wire the equipment used in this programming example.
1	Connect the PC RJ-45 cable to drive terminal X7.	Page 57 *ACSM1-04 Drive Modules Hardware Manual* (3AFE68797543 [English])
2	Connect the PLC fieldbus master (CM578-CN) to the fieldbus adapter module (FCAN-01) of the drive.	*Installation of the TA510-CASE*, page 57 See *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English]) for electrical installation.
3	Connect the PC serial port (COM) to the PLC programming port with a serial cable. OR: Connect the PLC Ethernet port to the PC Ethernet port with an Ethernet cable. OR: Connect the PLC serial port to the computer USB port with a TK503 programming cable.	*Installation of the TA510-CASE*, page 57 TK503 programming cable order code 1TNE968901R1100
	SOFTWARE INSTALLATION	In this section, you install the programming tools.
1	Install the DriveStudio PC tool if not yet installed.	*Installing the DriveStudio PC tool*, page 58
2	Install the AC500 Control Builder PS501 software.	*Installing the AC500 Control Builder PS501 software*, page 58
3	If needed, install additional EDS files and libraries.	*Installing additional EDS files*, page 60
	PROGRAMMING	In this section, you set up the communication between the drive and the PLC and make the PLC program that controls the drive through fieldbus. **Note:** Tasks 2-5 are carried out by project canopen_demo.pro . There is no need for you to modify the project unless you want; you can just follow the progress of the project until task 6.
1	Set the drive control program parameters.	In this section you set the drive parameters needed for communication with the FCAN-01 CANopen Adapter Module. *Setting the drive control program parameters*, page 62

No.	Task	Description / See instruction
2	Set up the communication.	In this section, you configure communication between the PLC and the drive. *Setting up the communication*, page *67* • *How to create a new project*, page *67* • *How to configure communication with the SYCON.net fieldbus configurator*, page *73*
3	Program the main program to the PLC.	In this section, you program function blocks for basic drive control. *Introduction to the PLC main program*, page *105* • *Main program, page 105* • *Local variables, page 108* • *Global variables, page 109* • *How to add function blocks, page 111*
4	Program actions to the PLC program and control the drive.	In this section, you program functions for motion control. *Introduction to the actions*, page *115* • *functions* , page *116* • *mux_1 and mux_pos_logic* , page *117* • *param_conversion, page 120* • *param_read32, page 121* • *param_write32, page 123* • *scaling, page 125* • *How to create actions, page 126*
5	Program the visualization.	In this section, you program function blocks for visualizing the motion control. *Introduction to the visualizations*, page *129* • *How to create an empty visualization field*, page *130* • *How to create and configure buttons*, page *131* • *How to create indicators*, page *133*
6	Run and test the program.	In this section, you run and test the complete program. *Running and testing the program*, page *135* • *How to load the program to the controller*, page *136* • *How to test the program*, page *138* • *How to perform online monitoring, page 147*

Connections



ACSM1-04 demosuitcase

Installation of the TA510-CASE

1. 24 V DC input socket
2. 24 V DC on/off switch
3. Analog potentiometer
4. Digital switches
5. Programming port
6. Communication module
7. CPU unit PM571
8. Analog module AX522
9. Remote digital I/O module DC505-FBP

Installing the DriveStudio PC tool

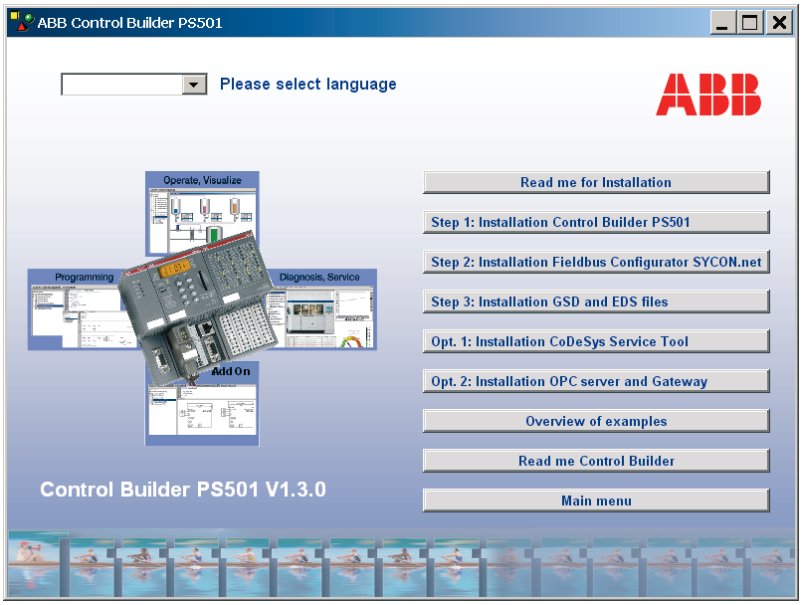
Insert the DriveStudio installation CD into the CD drive of your the PC. Follow the instructions given by the installation program.

For more information, see DriveStudio online Help folder DriveStudio: Installing and uninstalling.

Installing the AC500 Control Builder PS501 software

1. Insert the AC500 Control Builder PS501 installation CD into the CD drive of your PC. Click the **Read me first** button and read the instructions.
2. Click the **Installation PS501** button.

3. Click the **Read me for installation** button and read the instructions.

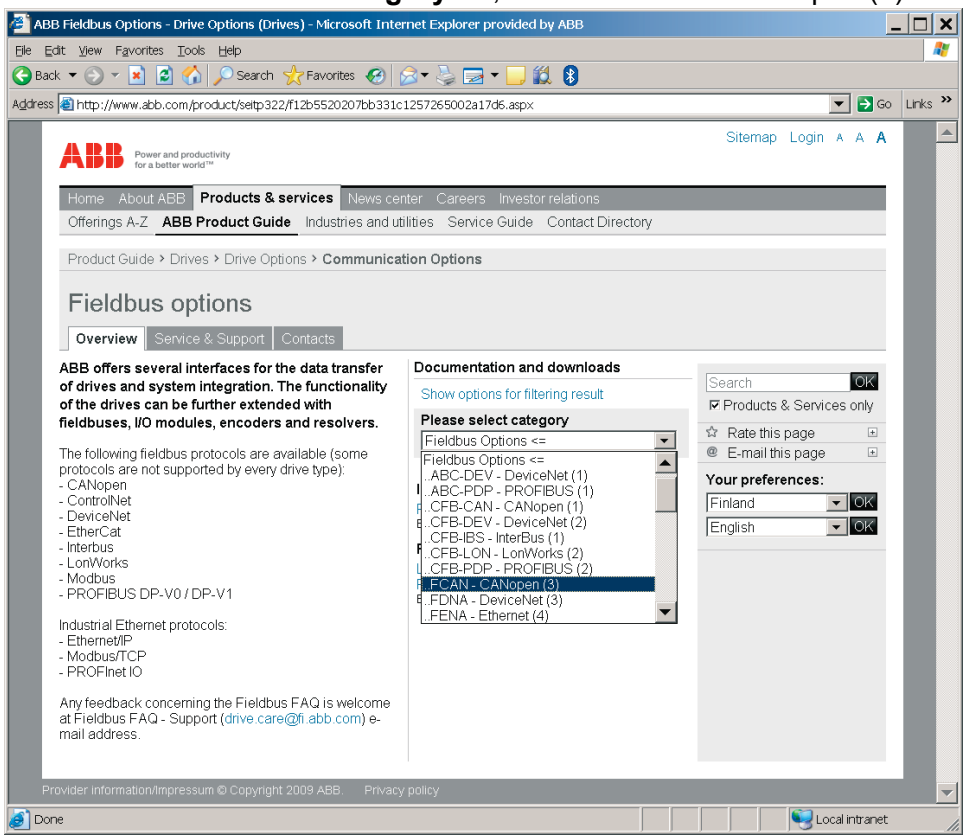


4. Click the **Step 1: Installation Control Builder PS501** button. Follow the instructions.
5. Click the **Step 2: Installation Fieldbus Configuration SYCON.net** button. Follow the instructions.
6. Click the **Installation GSD and ESD files** button. Follow the instructions.
7. Click the **Opt. 1: Installation CoDeSys Service Tool.**

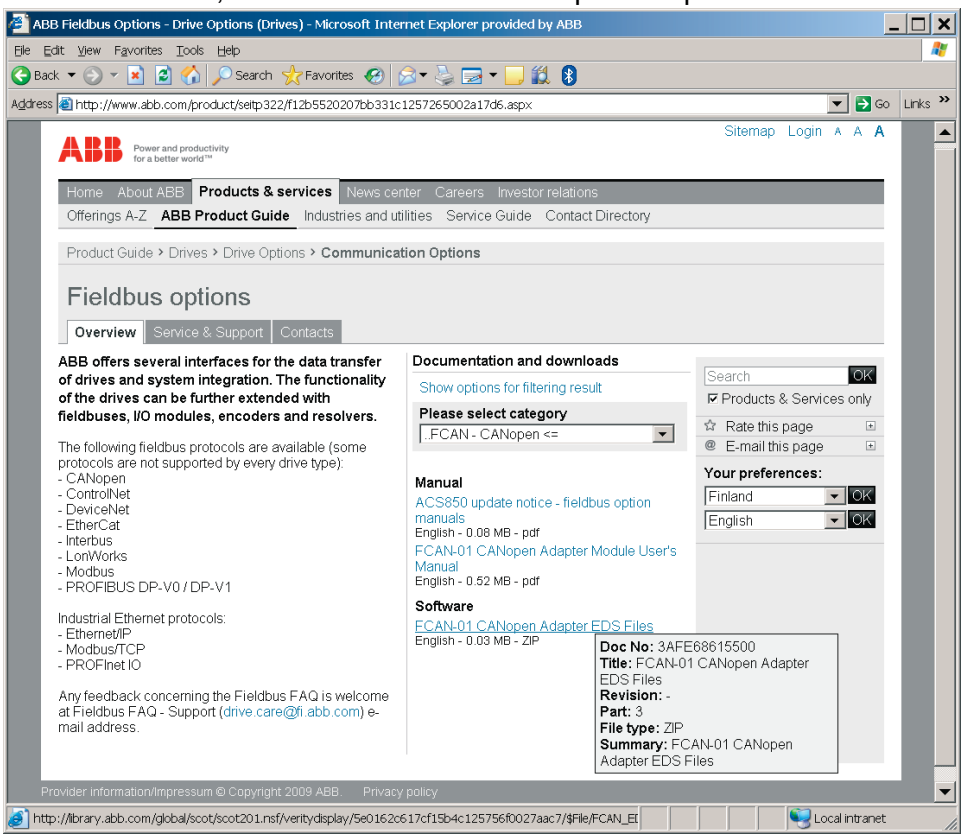
Installing additional EDS files

You can find the EDS file for the FCAN-01 module (FCAN-01_101A_ACSM1_Motion_14xx.EDS) at the manufacturer's website.

1. Go to www.abb.com and select Product Guide / Drives / Drive Options / Fieldbus options.
2. From the **Please select category** list, select "...FCAN - CANopen (3)" .

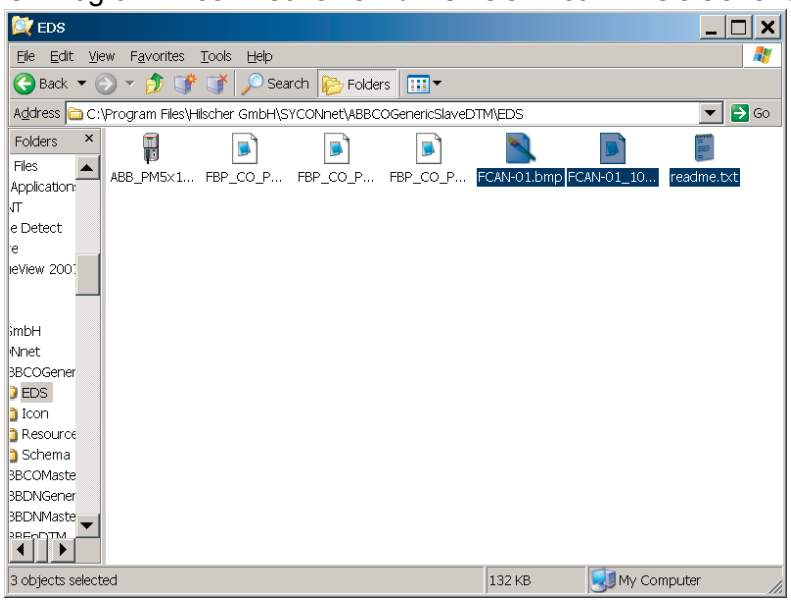


3. Under **Software**, download FCAN-01 CANopen Adapter EDS Files.



Note: Under **Manual**, you can also download *FCAN-01 CANopen Adapter Module User's Manual*.

4. Unzip the EDS files and copy them to following folder in your PC: C:\Program Files\Hilscher GmbH\SYCONnet\ABBCOGenericSlaveDTM\EDS.



Step

Setting the drive control program parameters

This section lists the ACSM1 Motion Control Program parameter settings that you need to do for successful communication with the FCAN-01 CANopen Adapter Module. If needed, set also other parameters to meet the application needs. For the demo project, the parameters are stored in file canopen_demo_acsm1_master.dsp.

For more information on the parameters, refer to *ACSM1 Motion Control Program Firmware Manual* (3AFE68848270 [English]).

For advice on using the DriveStudio, refer to the DriveStudio online Help.

1. Open the DriveStudio.
2. Set the parameters as shown below.

10 START/STOP				
1 EXT1 START FUNC	FBA		0	6
2 EXT1 START IN1	P.DI STATUS.0			
3 EXT1 START IN2	C.False			
4 EXT2 START FUNC	In1		0	6
5 EXT2 START IN1	P.DI STATUS.0			
6 EXT2 START IN2	C.False			
7 JOG1 START	C.False			
8 FAULT RESET SEL	P.DI STATUS.2			
9 RUN ENABLE	C.True			
10 EM STOP OFF3	C.True			
11 EM STOP OFF1	C.True			
12 START INHIBIT	Disabled		0	1
13 FB CW USED	P.FBA MAIN CW			
14 JOG2 START	C.False			
15 JOG ENABLE	C.False			
16 D2D CW USED	P.D2D MAIN CW			
17 START ENABLE	C.True			
24 SPEED REF MOD				
1 SPEED REF1 SEL	FBA REF1		0	8
2 SPEED REF2 SEL	FBA REF2		0	8
3 SPEED REF1 IN	P.SPEED REF1			
4 SPEED REF2 IN	P.SPEED REF2			
5 SPEED REF 1/2SEL	C.False			
6 SPEED SHARE	1.000		-8.000	8.000
7 SPEEDREF NEG ENA	C.False			
8 CONST SPEED	0	rpm	-30000	30000
9 CONST SPEED ENA	C.False			
10 SPEED REF JOG1	0	rpm	-30000	30000
11 SPEED REF JOG2	0	rpm	-30000	30000
12 SPEED REFMIN ABS	0	rpm	0	30000

Step

Setting the drive control program parameters

34 REFERENCE CTRL				
1 EXT1/EXT2 SEL	C.False			
2 EXT1 MODE 1/2SEL	C.False			
3 EXT1 CTRL MODE1	Position		1	9
4 EXT1 CTRL MODE2	Prof Vel		1	9
5 EXT2 CTRL MODE1	Position		1	9
7 LOCAL CTRL MODE	Speed		1	6
8 TREF SPEED SRC	P.TORQ REF SP CT...			
9 TREF TORQ SRC	P.TORQ REF RUSH...			
10 TORQ REF ADD SRC	P.TORQUE REF ADD			
50 FIELDBUS				
1 FBA ENABLE	Enable		0	1
2 COMM LOSS FUNC	Spd ref Safe		0	3
3 COMM LOSS T OUT	0.3	s	0.3	6553.5
4 FBA REF1 MODESEL	Position		0	5
5 FBA REF2 MODESEL	Velocity		0	5
6 FBA ACT1 TR SRC	P.SPEED ACT			
7 FBA ACT2 TR SRC	P.TORQUE			
8 FBA SW B12 SRC	C.False			
9 FBA SW B13 SRC	C.False			
10 FBA SW B14 SRC	C.False			
11 FBA SW B15 SRC	C.False			
51 FBA SETTINGS				
1 FBA TYPE	CANOpen		0	65535
2 FBA PAR2	2		0	65535
3 FBA PAR3	3		0	65535
4 FBA PAR4	0		0	65535
5 FBA PAR5	0		0	65535
6 FBA PAR6	100		0	65535
7 FBA PAR7	513		0	65535
8 FBA PAR8	10		0	65535
9 FBA PAR9	100		0	65535
10 FBA PAR10	385		0	65535
11 FBA PAR11	10		0	65535
12 FBA PAR12	100		0	65535
13 FBA PAR13	769		0	65535
14 FBA PAR14	10		0	65535
15 FBA PAR15	100		0	65535
16 FBA PAR16	641		0	65535
17 FBA PAR17	10		0	65535
18 FBA PAR18	100		0	65535
19 FBA PAR19	1025		0	65535
20 FBA PAR20	10		0	65535
21 FBA PAR21	100		0	65535
22 FBA PAR22	0		0	65535
23 FBA PAR23	0		0	65535
24 FBA PAR24	0		0	65535
25 FBA PAR25	0		0	65535
26 FBA PAR26	0		0	65535
27 FBA PAR REFRESH	DONE		0	1

Step Setting the drive control program parameters

52 FBA DATA IN				
1 FBA DATA IN1	4		0	9999
2 FBA DATA IN2	112		0	9999
3 FBA DATA IN3	0		0	9999
4 FBA DATA IN4	801		0	9999
5 FBA DATA IN5	101		0	9999
6 FBA DATA IN6	0		0	9999
7 FBA DATA IN7	0		0	9999
8 FBA DATA IN8	0		0	9999
9 FBA DATA IN9	0		0	9999
10 FBA DATA IN10	0		0	9999
11 FBA DATA IN11	0		0	9999
12 FBA DATA IN12	0		0	9999
53 FBA DATA OUT				
1 FBA DATA OUT1	1		0	9999
2 FBA DATA OUT2	12		0	9999
3 FBA DATA OUT3	0		0	9999
4 FBA DATA OUT4	3		0	9999
5 FBA DATA OUT5	3403		0	9999
6 FBA DATA OUT6	3404		0	9999
7 FBA DATA OUT7	2		0	9999
8 FBA DATA OUT8	0		0	9999
9 FBA DATA OUT9	13		0	9999
10 FBA DATA OUT10	0		0	9999
11 FBA DATA OUT11	5004		0	9999
12 FBA DATA OUT12	5005		0	9999
60 POS FEEDBACK				
1 POS ACT SEL	ENC1		0	1
2 POS AXIS MODE	Linear		0	1
3 LOAD GEAR MUL	1		-2147483...	21474836...
4 LOAD GEAR DIV	1		1	21474836...
5 POS UNIT	Revolution		0	3
6 FEED CONST NUM	1		1	21474836...
7 FEED CONST DEN	1		1	21474836...
8 POS2INT SCALE	1000		1	1000000
9 POS RESOLUTION	16	bits	10	24
10 POS SPEED UNIT	u/min		0	2
11 POS SPEED2INT	1000		1	1000000
12 POS SPEED SCALE	1.0000		0.0000	32768.0000
13 MAXIMUM POS	32768.000	rev	-32768.000	32768.000
14 MINIMUM POS	-32768.000	rev	-32768.000	32768.000
15 POS THRESHOLD	0.000	rev	-32768.000	32768.000

Step

Setting the drive control program parameters

62 POS CORRECTION					
1	HOMING METHOD	CAN Method19		0	35
2	HOMING STARTFUNC	Normal		0	1
3	HOMING START	P.FBA MAIN CW.28			
4	HOME SWITCH TRIG	ENC1_DI1		0	3
5	NEG LIMIT SWITCH	C.False			
6	POS LIMIT SWITCH	C.False			
7	HOMING SPEEDREF1	60.000	u/min	0.000	1966079....
8	HOMING SPEEDREF2	60.000	u/min	0.000	1966079....
9	HOME POSITION	0.000	rev	-32768.000	32768.000
10	HOME POS OFFSET	0.000	rev	-32768.000	32768.000
11	PRESET MODE	Disabled		0	3
12	PRESET TRIG	Homing start		0	12
13	PRESET POSITION	0.000	rev	-32768.000	32768.000
14	CYCLIC CORR MODE	Disabled		0	5
15	TRIG PROBE1	Disabled		0	28
16	PROBE1 POS	0.000	rev	-32768.000	32768.000
17	TRIG PROBE2	Disabled		0	28
18	PROBE2 POS	0.000	rev	-32768.000	32768.000
19	MAX CORRECTION	512.000	rev	0.000	32768.000
20	POS ACT OFFSET	0.000	rev	-32768.000	32768.000
21	POS COR MODE	Normal		0	1
65 PROFILE REFERENCE					
1	POS REFSOURCE	Fieldbus		0	2
2	PROF SET SEL	C.False			
3	POS START 1	C.False			
4	POS REF 1 SEL	FBA REF1		0	8
5	POS SPEED 1	100.000	u/min	0.000	1966079....
6	PROF ACC 1	200.000	min-2	0.000	1966079....
7	PROF DEC 1	-200.000	min-2	-1966080....	0.000
8	PROF FILT TIME 1	0	ms	0	1000
9	POS STYLE 1	0b0000100		0b0000000	0b1111111
10	POS END SPEED 1	0.000	u/min	-1966080....	1966079....
11	POS START 2	C.False			
12	POS REF 2 SEL	FBA REF2		0	8
13	POS SPEED 2	300.000	u/min	0.000	1966079....
14	PROF ACC 2	600.000	min-2	0.000	1966079....
15	PROF DEC 2	-600.000	min-2	-1966080....	0.000
16	PROF FILT TIME 2	0	ms	0	1000
17	POS STYLE 2	0b0000100		0b0000000	0b1111111
18	POS END SPEED 2	0.000	u/min	-1966080....	1966079....
19	POS REF 1	0.000	rev	-32760.000	32760.000
20	POS REF 2	0.000	rev	-32760.000	32760.000
21	POS REF ADD SEL	ZERO		0	8
22	PROF VEL REF SEL	POS VEL REF		0	7
23	PROF VEL REF1	0.000	u/min	-1966080....	1966079....
24	POS START MODE	NORMAL		0	1
66 PROFILE GENERATOR					
1	PROF GENERAT IN	P.POS REF			
2	PROF SPEED MUL	1.000		0.000	1.000
3	PROF ACC WEAK SP	1966079.999	u/min	0.000	1966079....
4	POS WIN	0.010	rev	0.000	32768.000
5	POS ENABLE	C.True			

Tool/Step

Setting up the communication

This section contains detailed instructions on how to configure the CANopen network using the CoDeSys program and the SYCON.net configuring tool.

The instructions illustrate how the network is configured with the ready-made project canopen_demo.pro. There is no need for you to modify canopen_demo.pro; you can just follow the progress of the project. However, if you want, you can modify the project by following these instructions.

CoDeSys

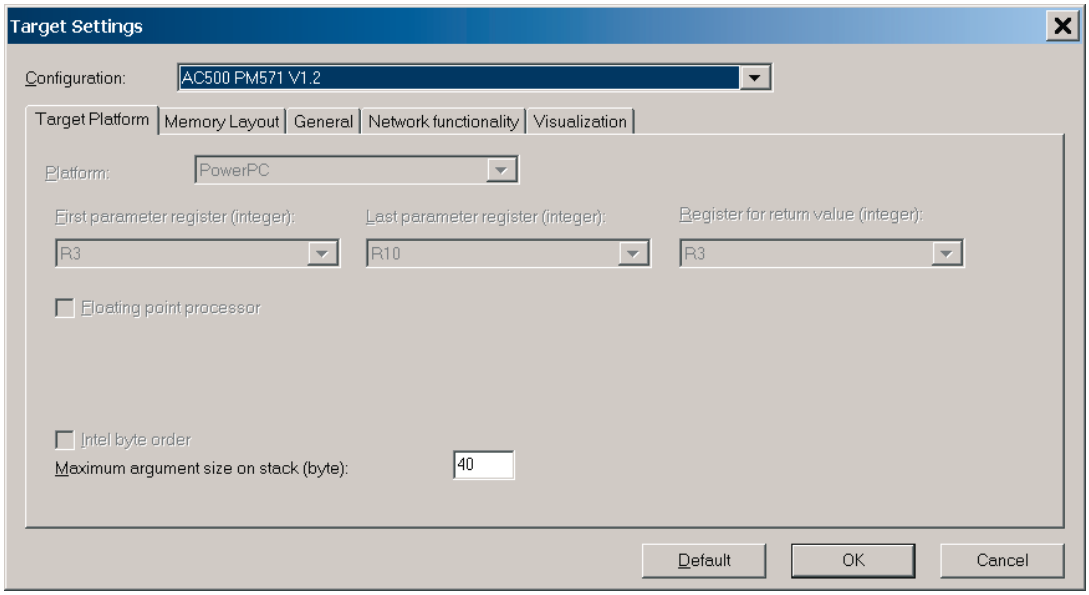
How to create a new project

1. Open the AC500 Control Builder PS501 programming tool by double-clicking the icon:

Installation path:
C:\Program Files\3S Software\CoDeSys V2.3\Codesys.exe

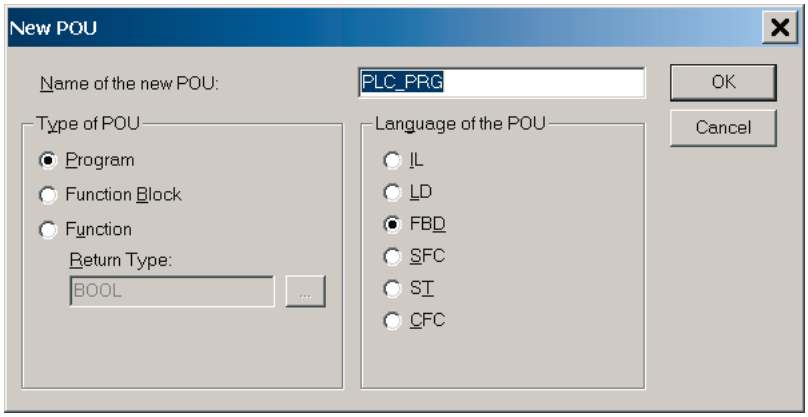
2. From the **File** menu, select **New**. -> Dialog box **Target settings** opens.

3. In the **Configuration:** box, select your CPU type, in this case AC500 PM571 V1.2. Click **OK**.

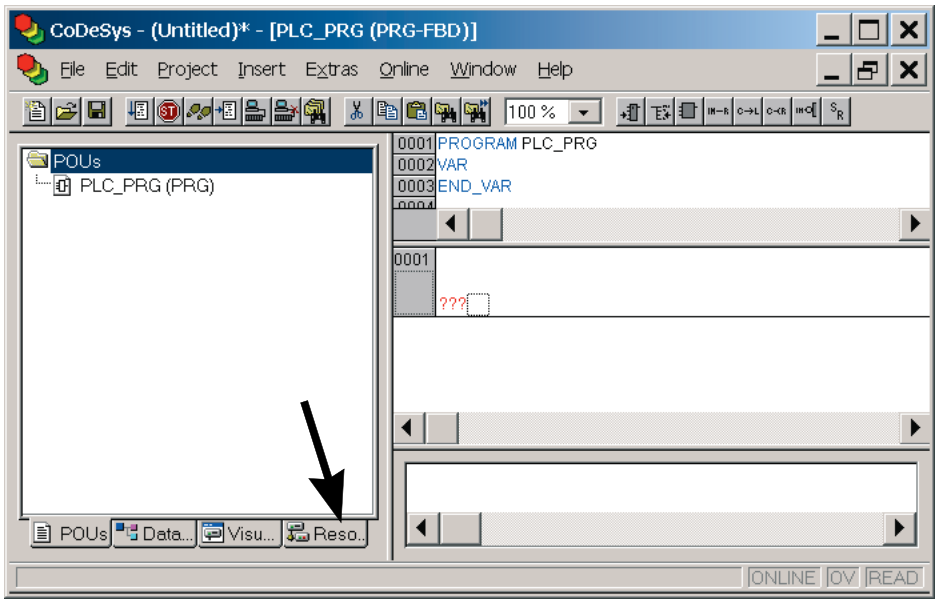


Tool/Step — Setting up the communication

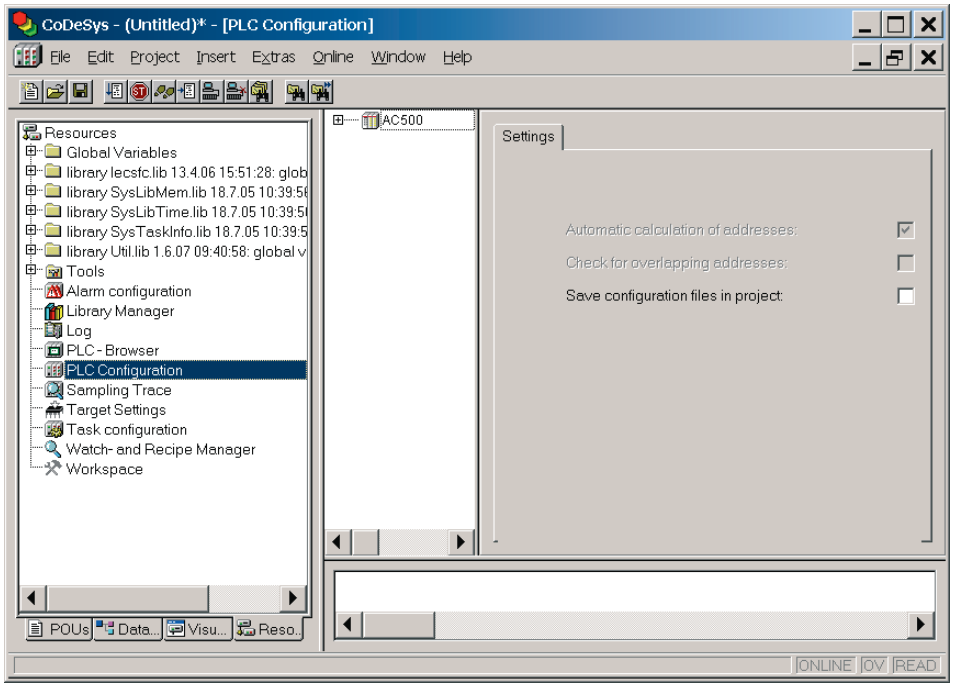
4. In the **New POU** dialog box, select as shown below.



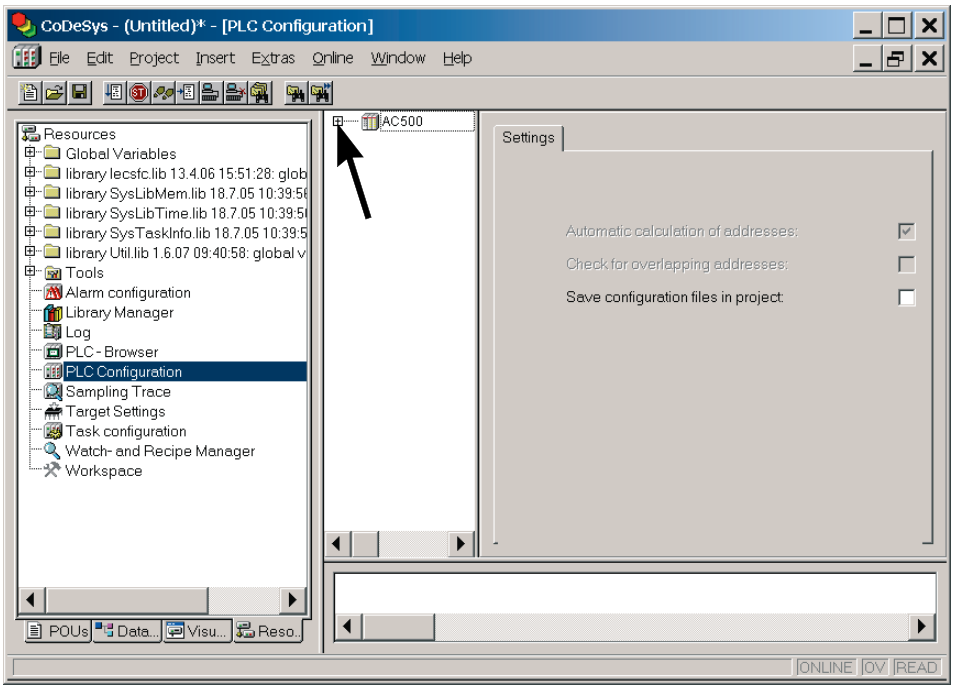
5. -> The programming view opens. Open the **Resources** field by clicking its tab.



6. In the **Resources** folder, double-click PLC Configuration.

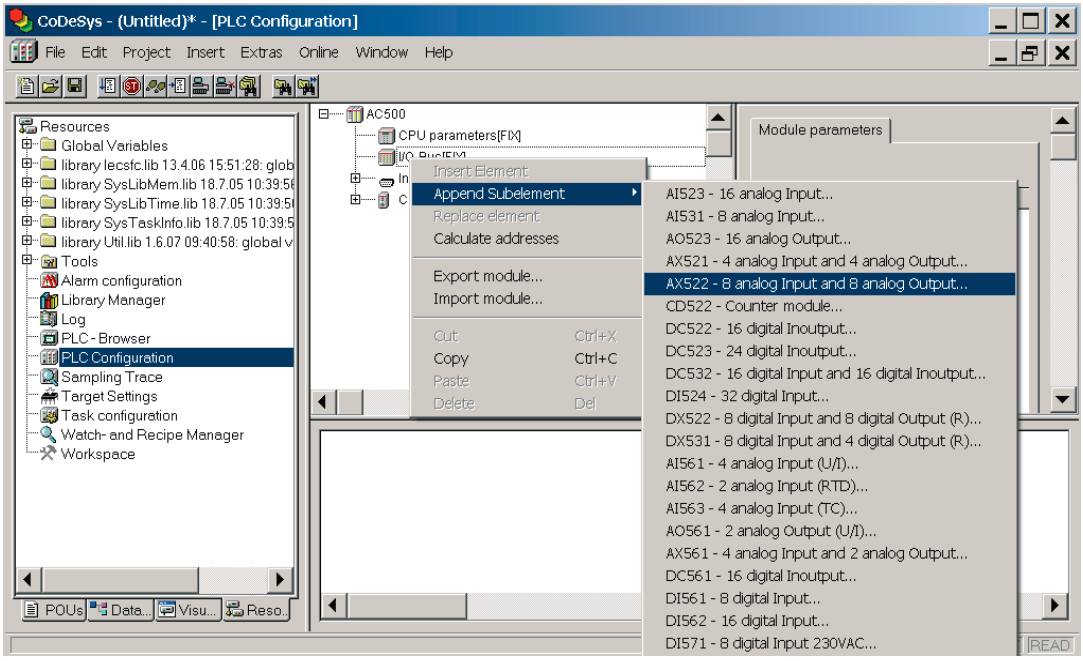


7. In the **PLC Configuration** dialog box, click the plus sign to open the AC500 folder.

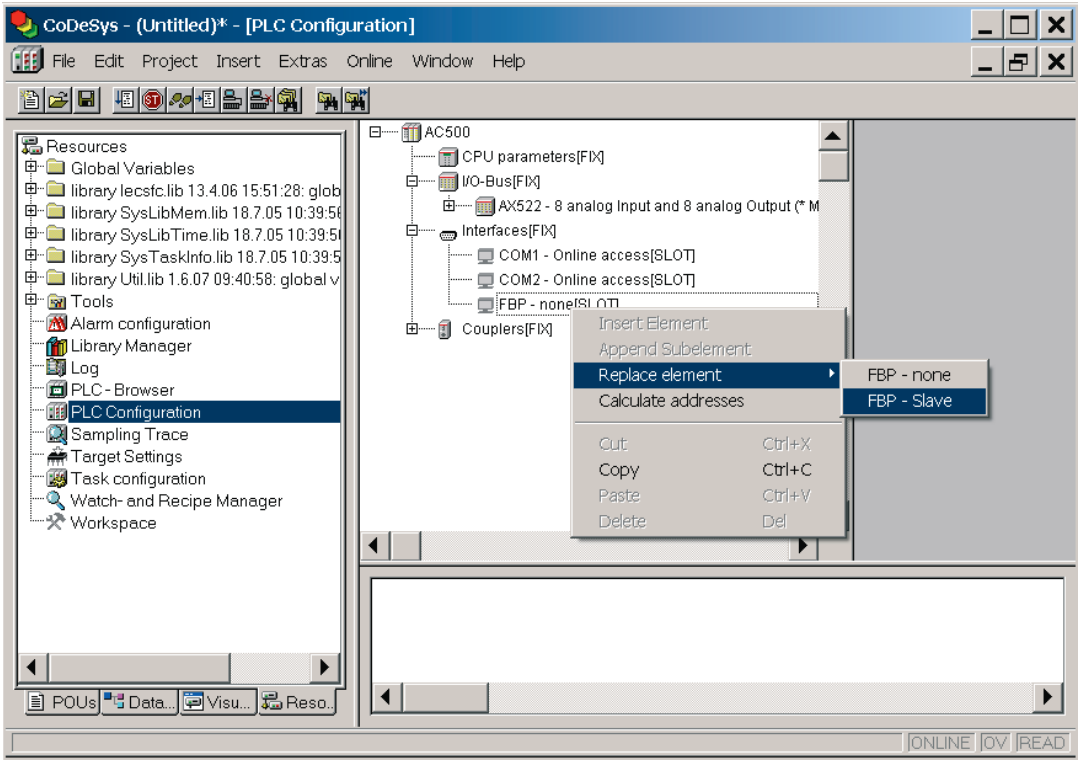


Tool/Step — Setting up the communication

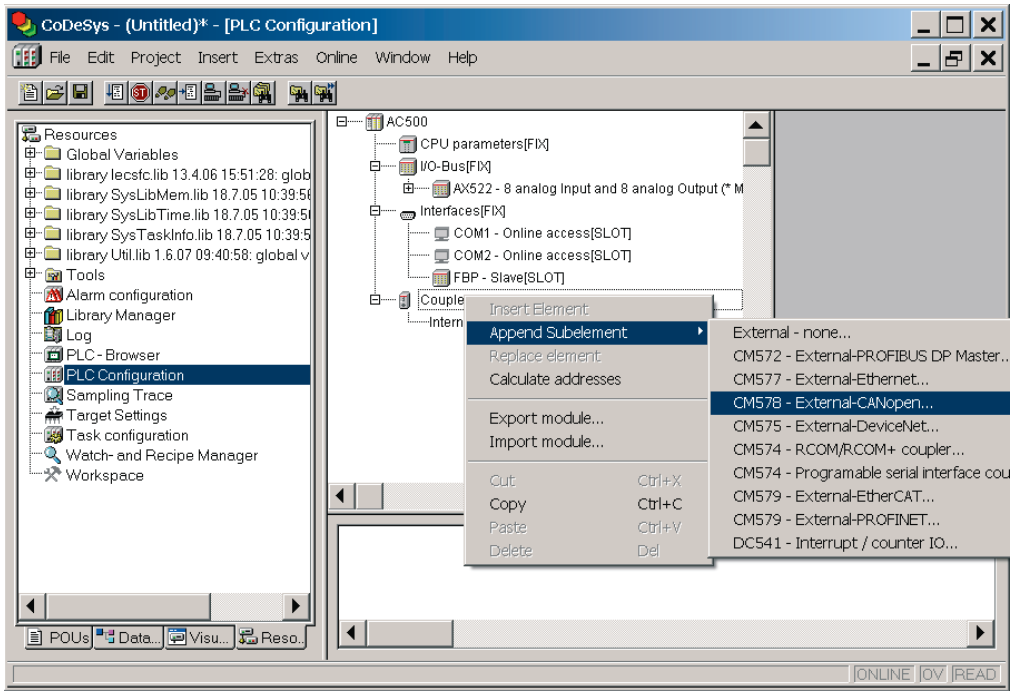
8. If you are using any I/O bus, add the relevant I/O bus to the system configuration. Right-click the I/O Bus[FIX] folder. Select **Append Subelement** and, for instance, **AX522 - 8 analog Input and 8 analog Output…**.



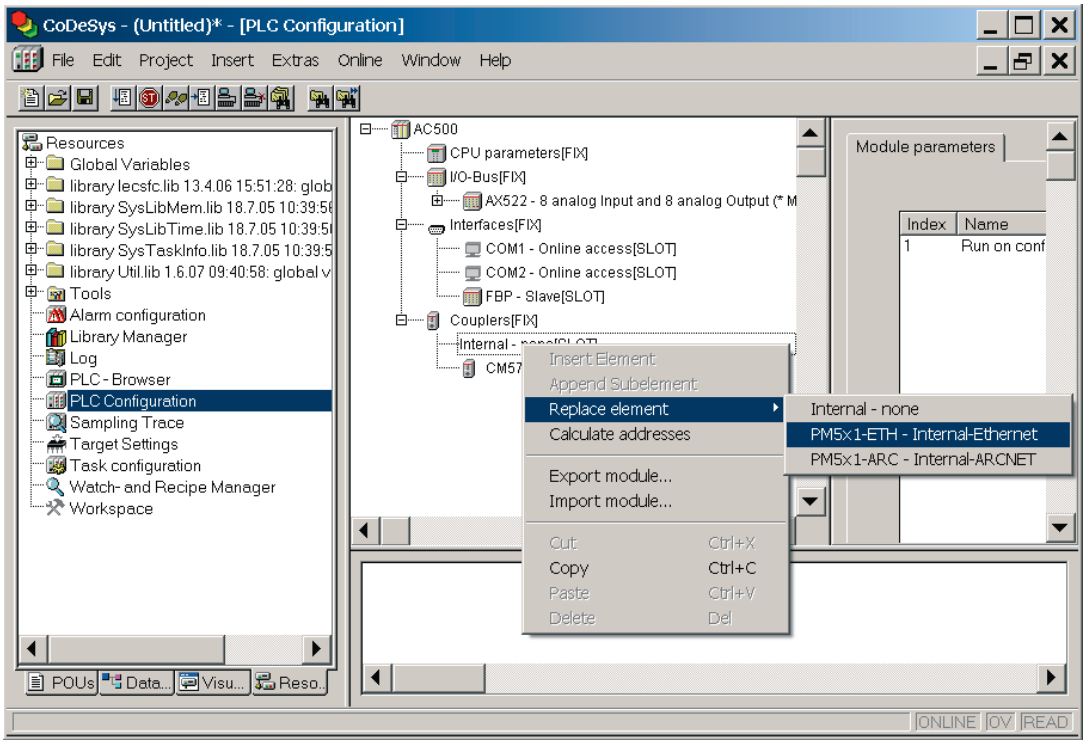
9. In the Interfaces [FIX] folder, right-click the FBP-none[SLOT] file and select **Replace element** and **FBP - Slave.**



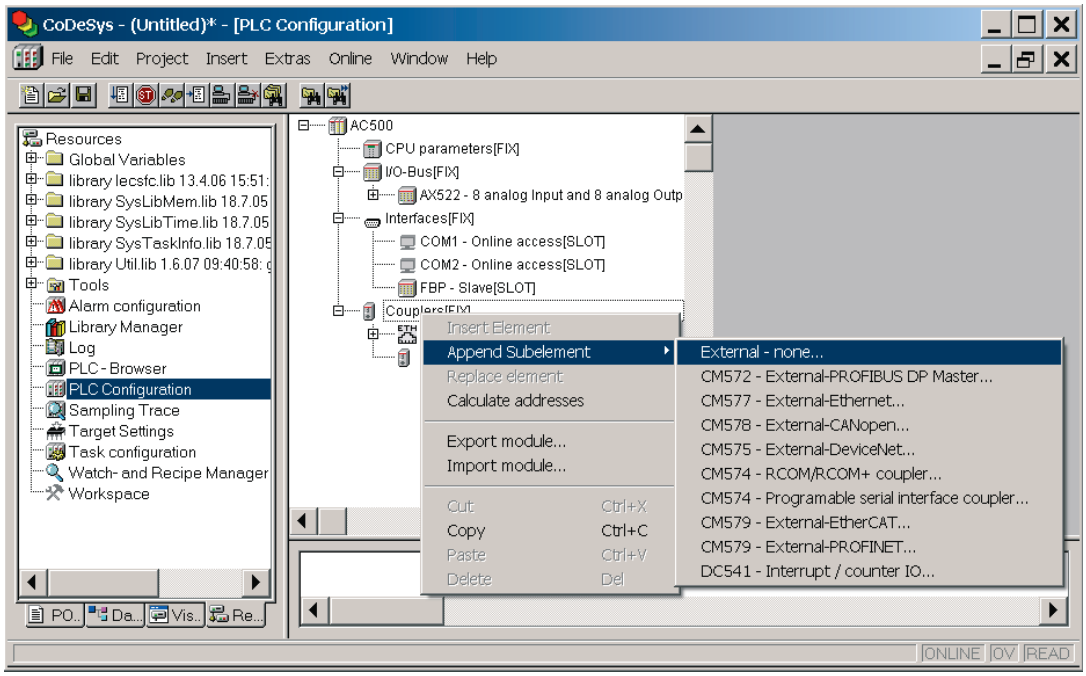
10. Right-click the Couplers[FIX] folder. Select **Append Subelement** and **CM578 - External-CANopen…**.



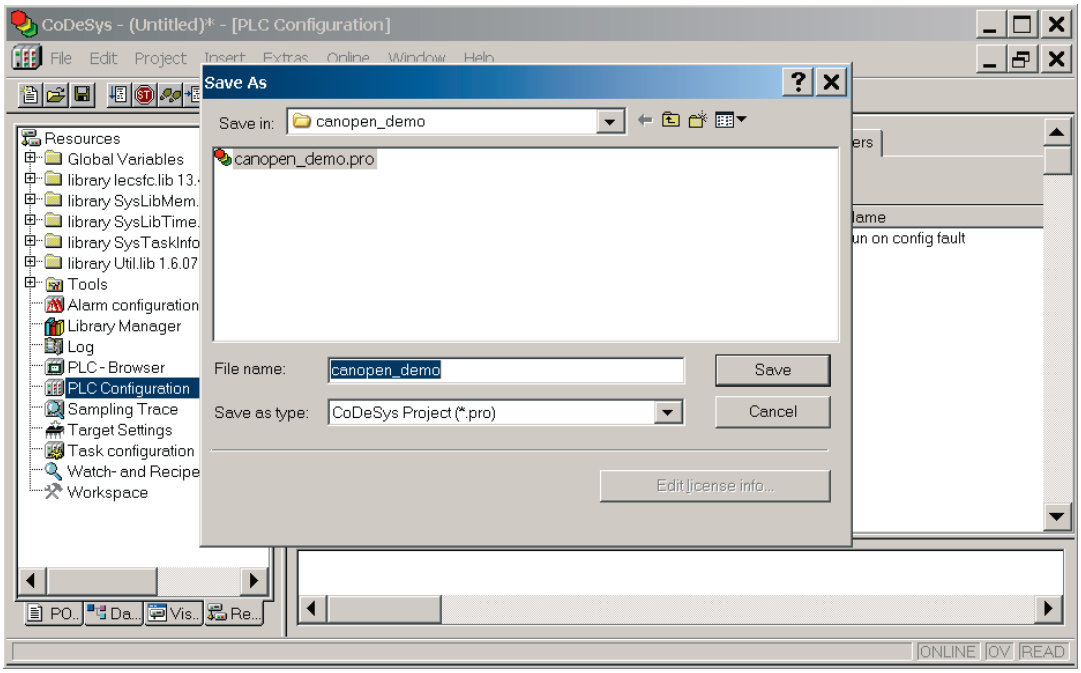
11. In the Couplers[FIX] folder, right-click the Internal - none[SLOT] file and select **Replace element** and **PM5x1-ETH - Internal-Ethernet**.



12. Right-click the Couplers[FIX] folder. Select **Append Subelement** and **External - none…**.



13. From the **File** menu, select **Save as** and name the project. Click **Save**.



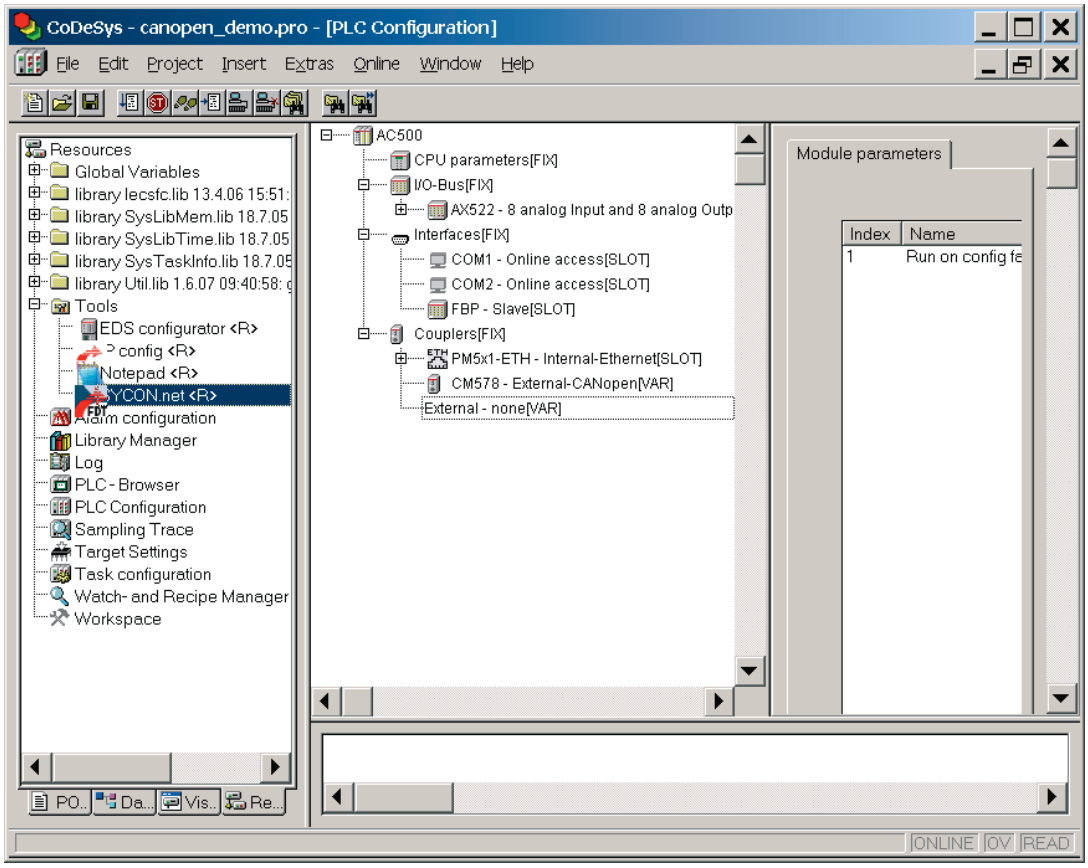
Tool/Step

Setting up the communication

CoDeSys

How to configure communication with the SYCON.net fieldbus configurator

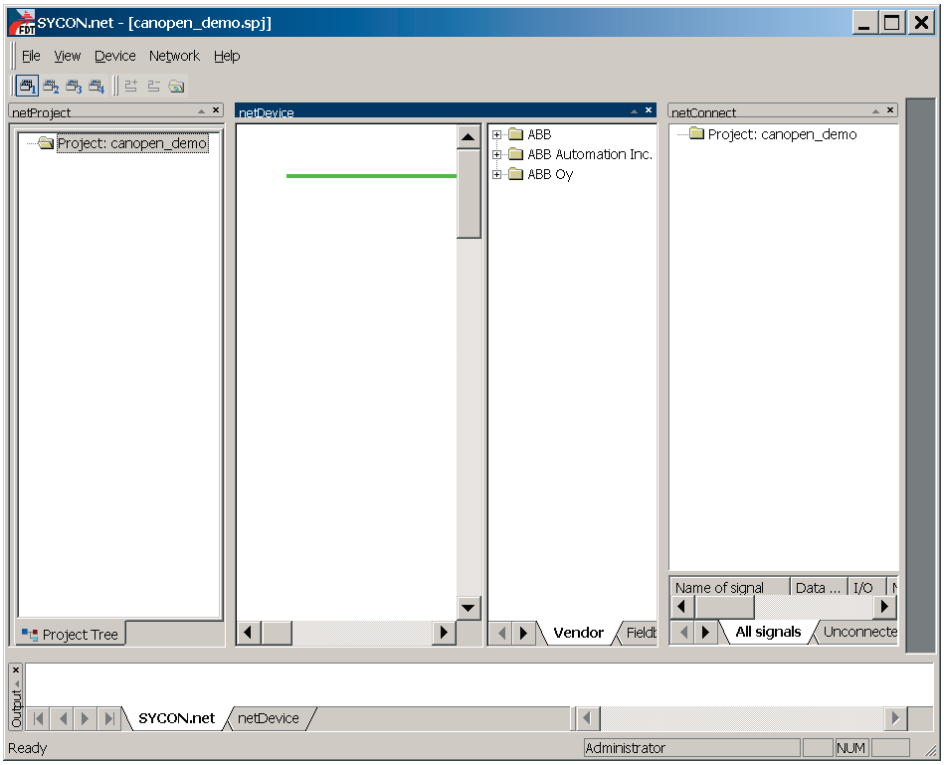
1. Click the **Resources** tab to show the Resources folders.
2. Under **Tools**, double-click SYCON.net <R>.



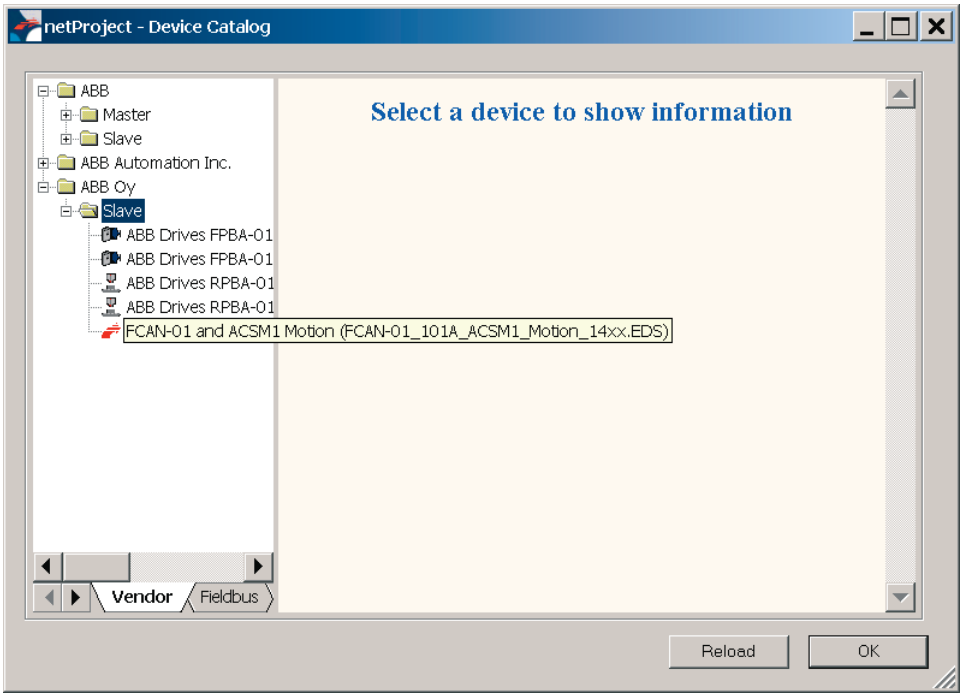
Tool/Step **Setting up the communication**

SYCON.net

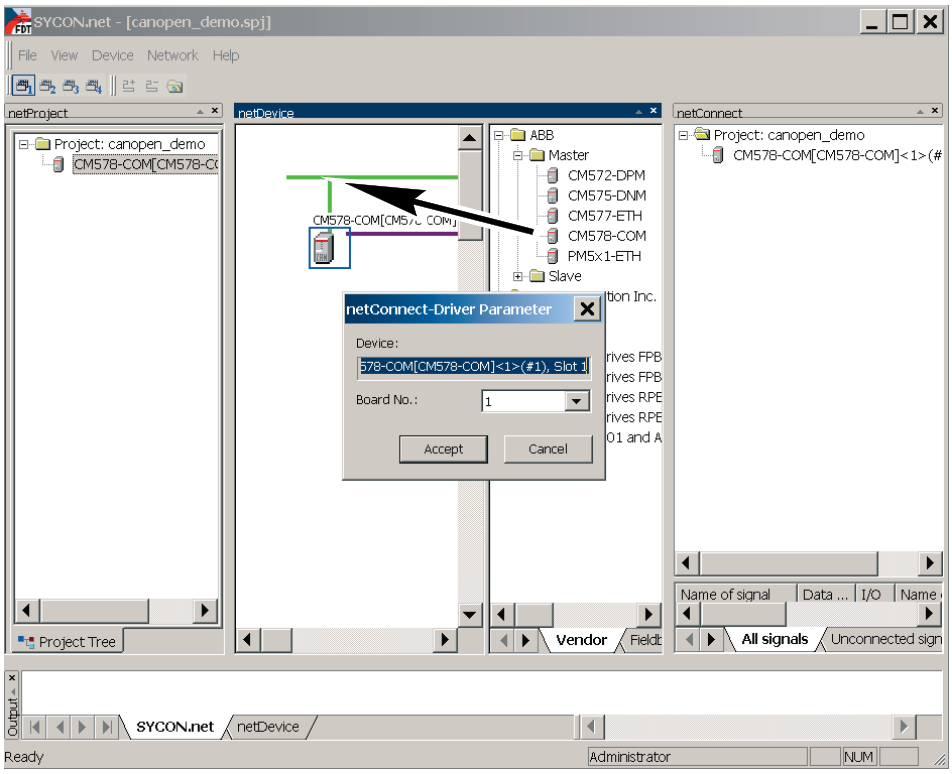
3. -> The SYCON.net tool opens:



4. From the **Network** menu, select the **Device Catalog…** command. Click the **Reload** button. -> FCAN-01 CANopen options appear in the ABB Oy folder. Click **OK**.

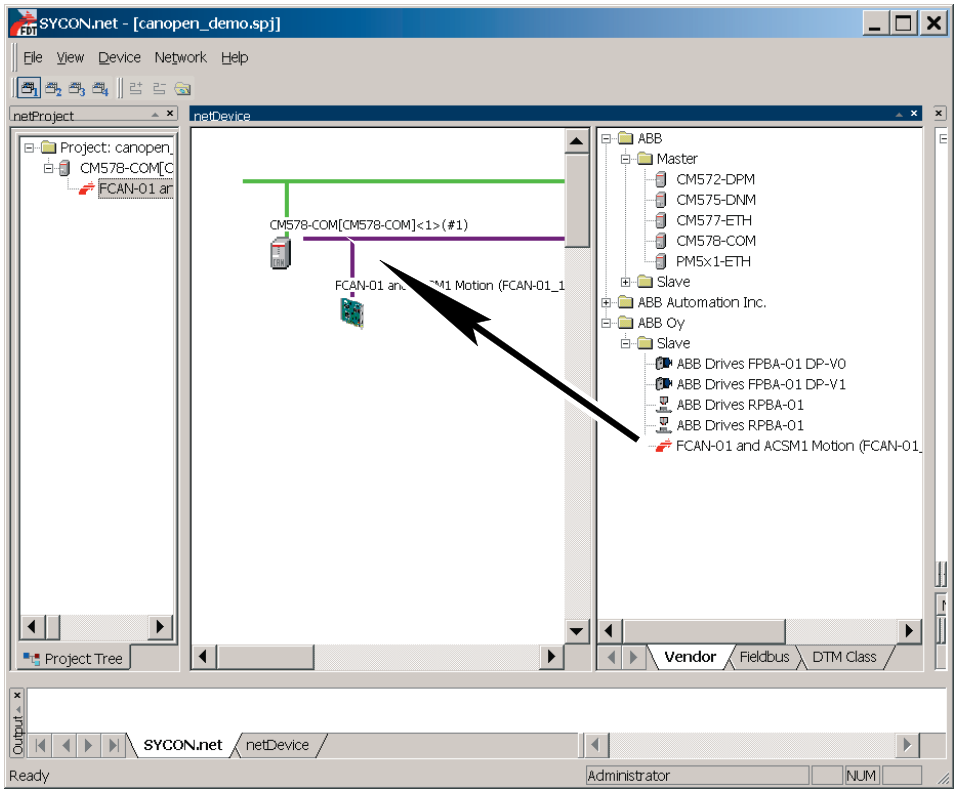


5. Drag and drop CM578-COM on the green line. In the **netConnect-Driver Parameter** dialog box, select 1 for the **Board no:** box. This is because the CM578-COM communications module is installed next to the CPU on the left-hand side in the installation example of this manual.

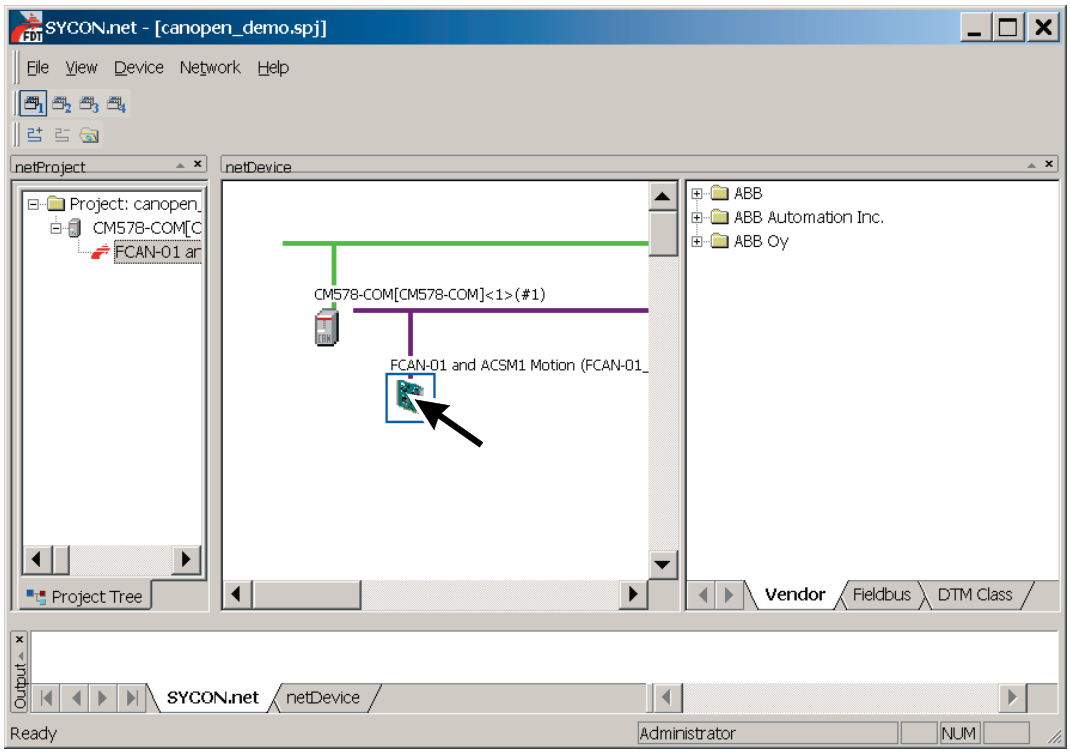


Tool/Step Setting up the communication

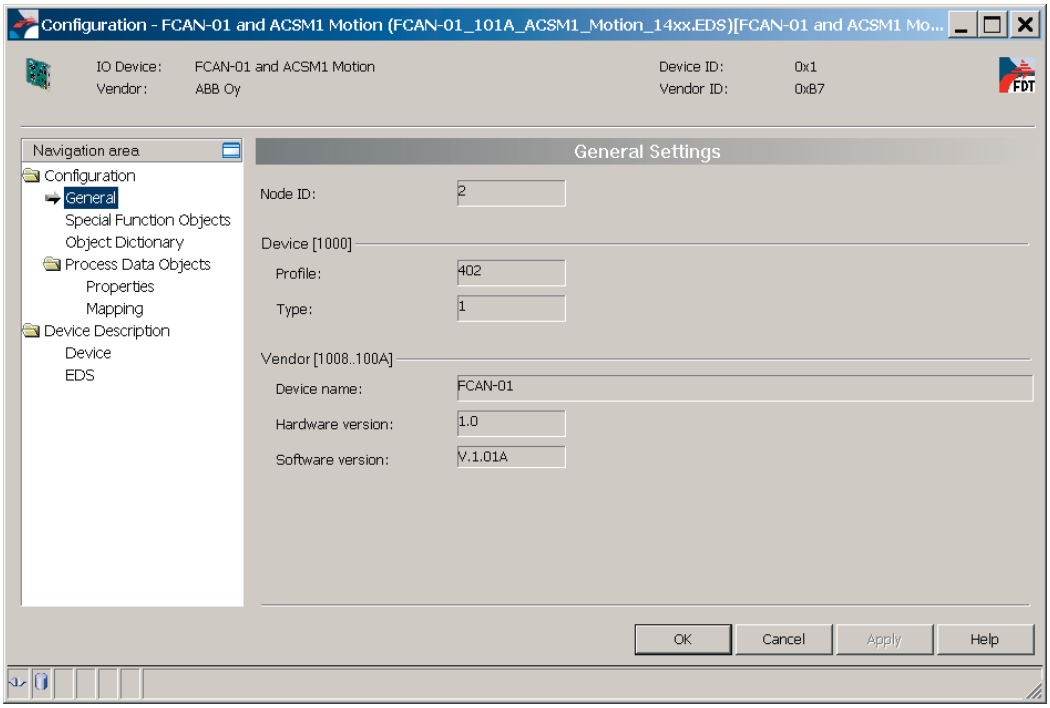
6. Drag and drop the FCAN-01 icon on the purple line.



7. In the **netDevice** field, double-click the FCAN-01 icon to open the configuration window.

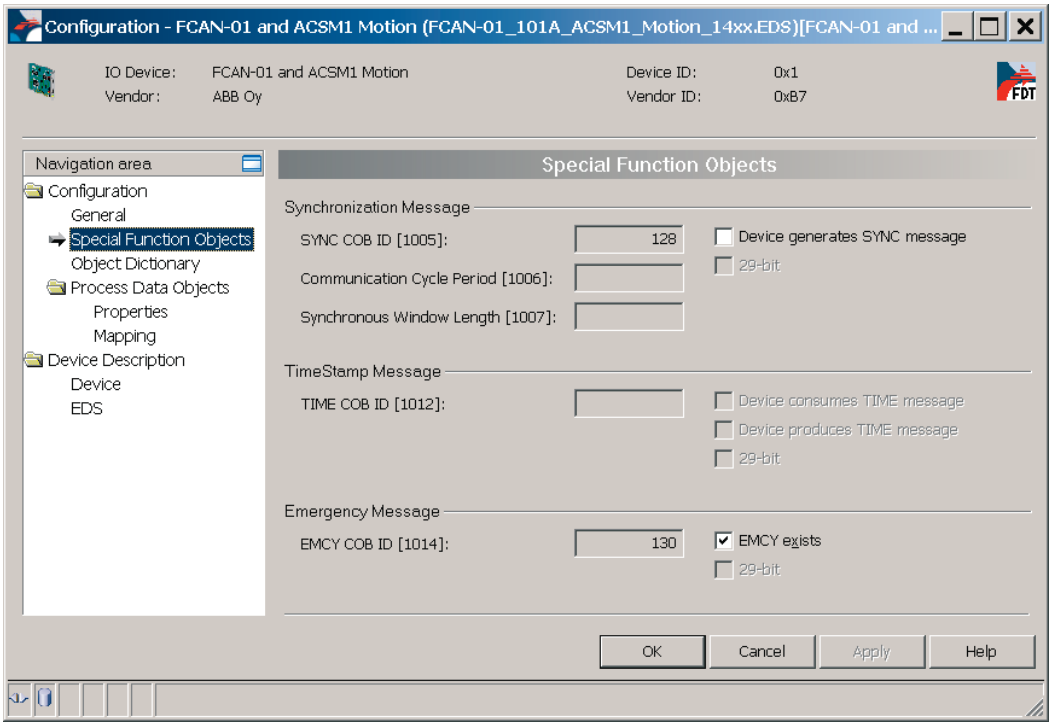


8. The following configuration window opens.



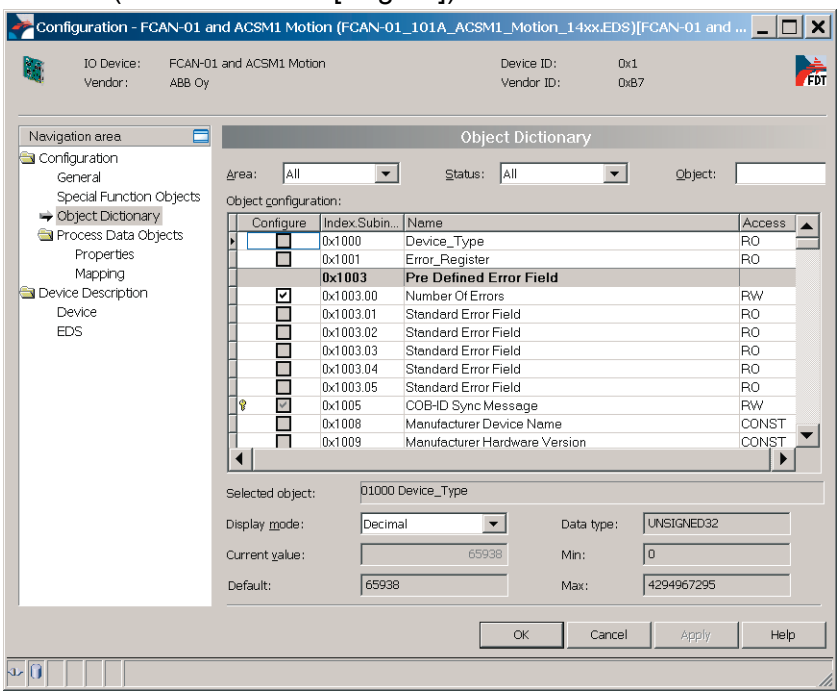
Tool/Step — Setting up the communication

9. In the **Navigation area** field, click Special Function Objects and check that the window contains the following information.

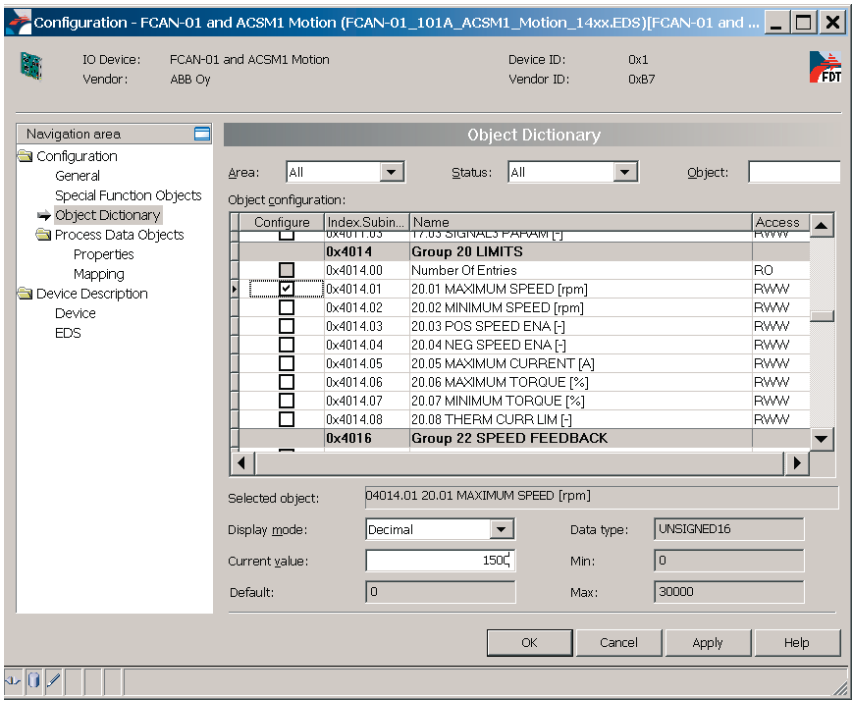


10. In the **Navigation area** field, click Object Dictionary. The Object Dictionary list contains SDOs (Service Data Objects), which are downloaded to the drive during the start-up. With SDOs it is possible to do a full initial parametrization of the drive.

    For more information on SDOs, see *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English])



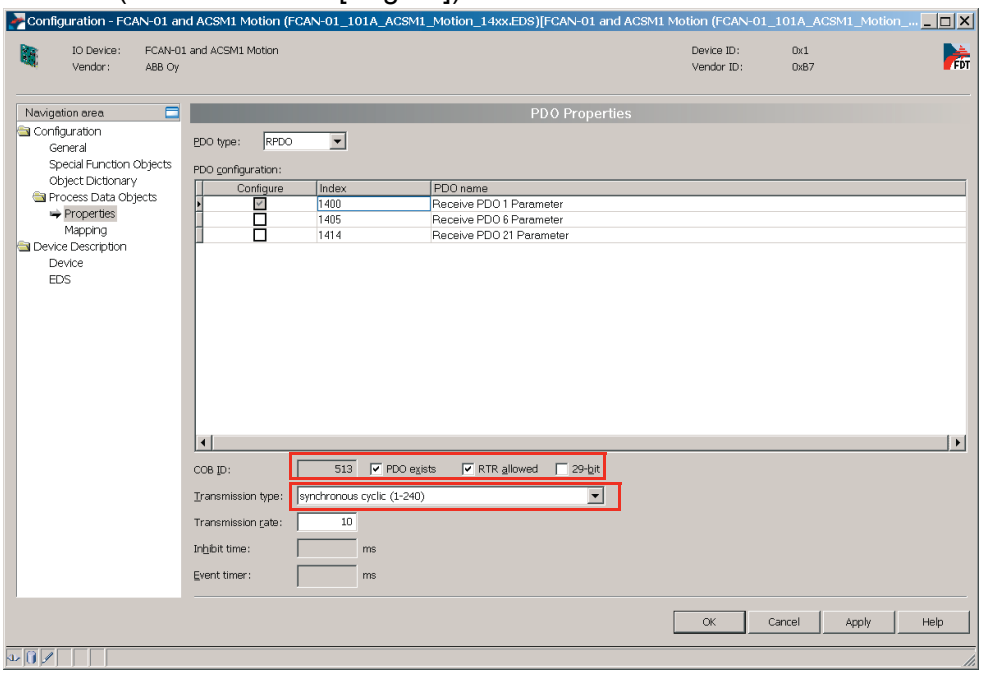
Configure the initial parameters as shown below. For example, set parameter 20.01 MAXIMUM SPEED to value 1500. When a CAN message is started between the PLC and the drive, the SDOs will be downloaded for the first time.



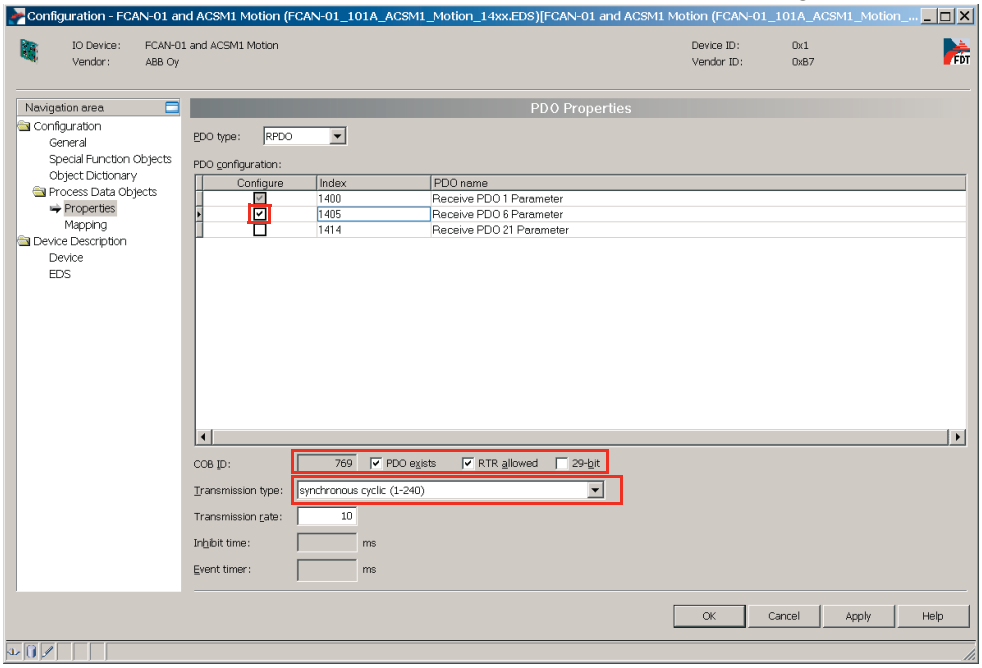
Tool/Step — Setting up the communication

11. In the **Navigation area** field, click Process Data Objects -> Properties. The **PDO Properties** window shows the Process Data Objects (PDO), which are used for time-critical process data exchange. Check that the highlighted areas match with the view below.

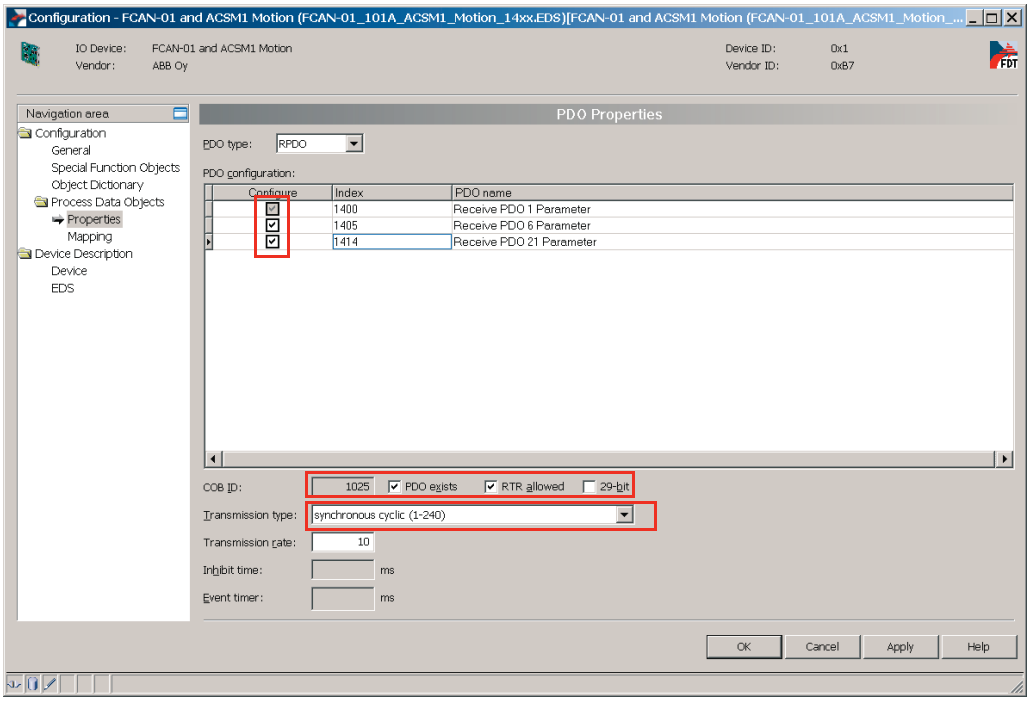
    For more information on PDOs, see *FCAN-01 CANopen Adapter Module User's Manual* (3AFE68615500 [English]).



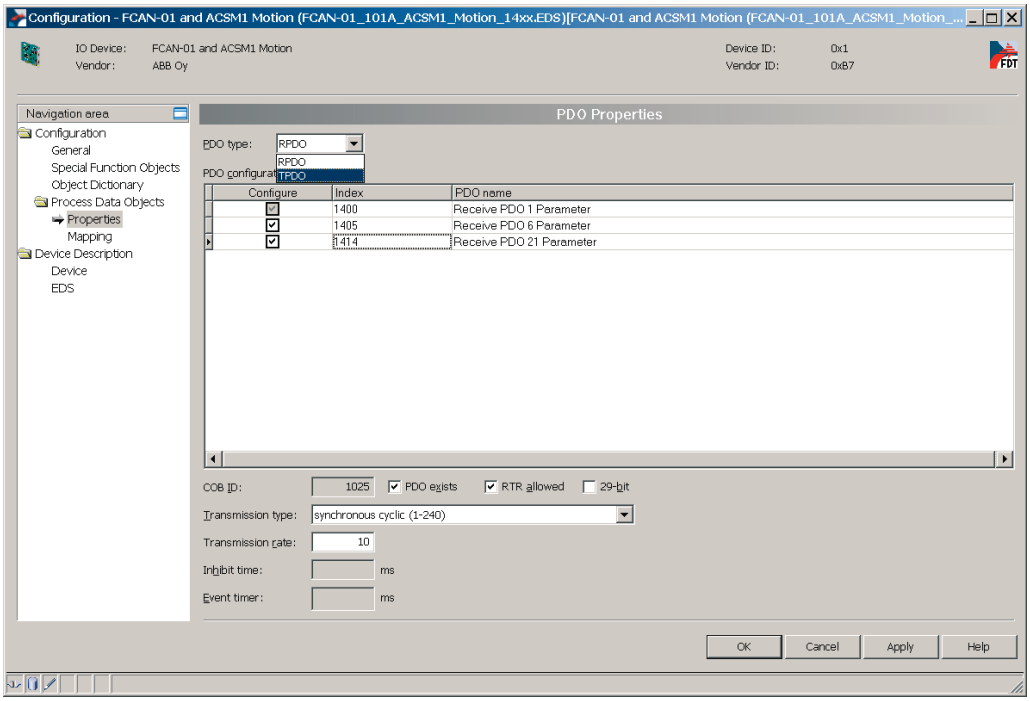
12. Under **PDO Configuration**, tick the **Configure** box for Receive PDO 6 Parameter. Next to **COB ID**, tick the **PDO exists** box. Check the following view for details.



13. Under **PDO Configuration**, tick the **Configure** box for Receive PDO 21 Parameter. Next to **COB ID**, tick the **PDO exists** box. Check the following view for details. Click the **Apply** button.

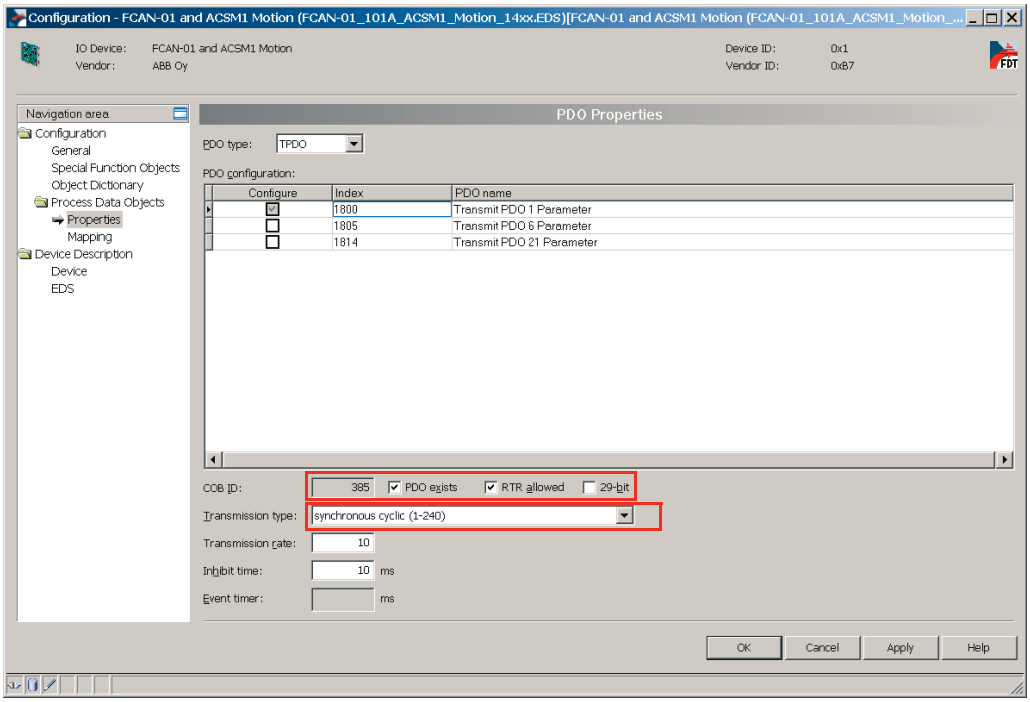


14. In the **PDO type** box, select TPDO.

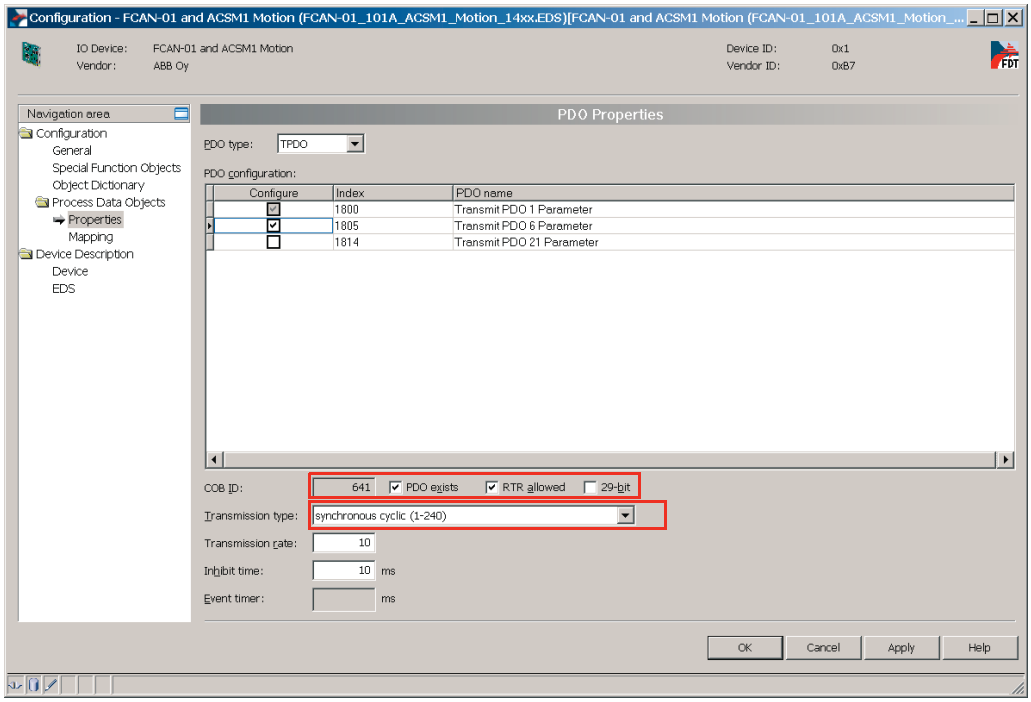


Tool/Step — Setting up the communication

15. For TPDO1, check that the highlighted areas match with the view below. When done, click **Apply**.



16. Under **PDO Configuration**, tick the **Configure** box for Transmit PDO 6 Parameter. Next to **COB ID**, tick the **PDO exists** box. Check the following view for details. Click **Apply**.

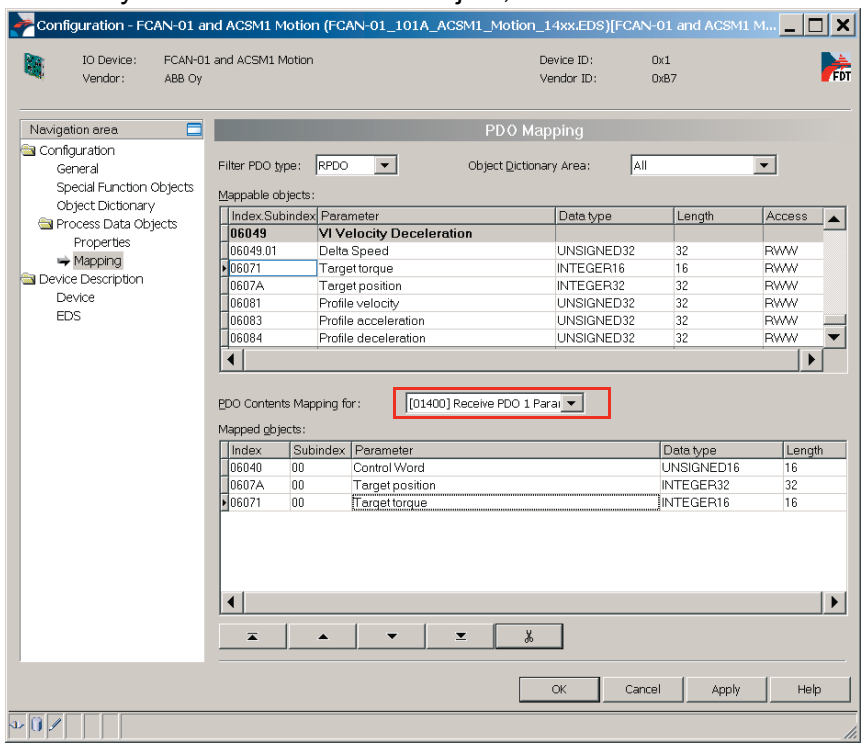


17. In the **Navigation area** field, click Process Data Objects -> Mapping. Add an object by double-clicking it in the upper list. Add the following PDO contents for RPDO1:

    - 06040/00 Control Word
    - 0607A/00 Target position
    - 06071/00 Target torque.

    When done, click **Apply**.

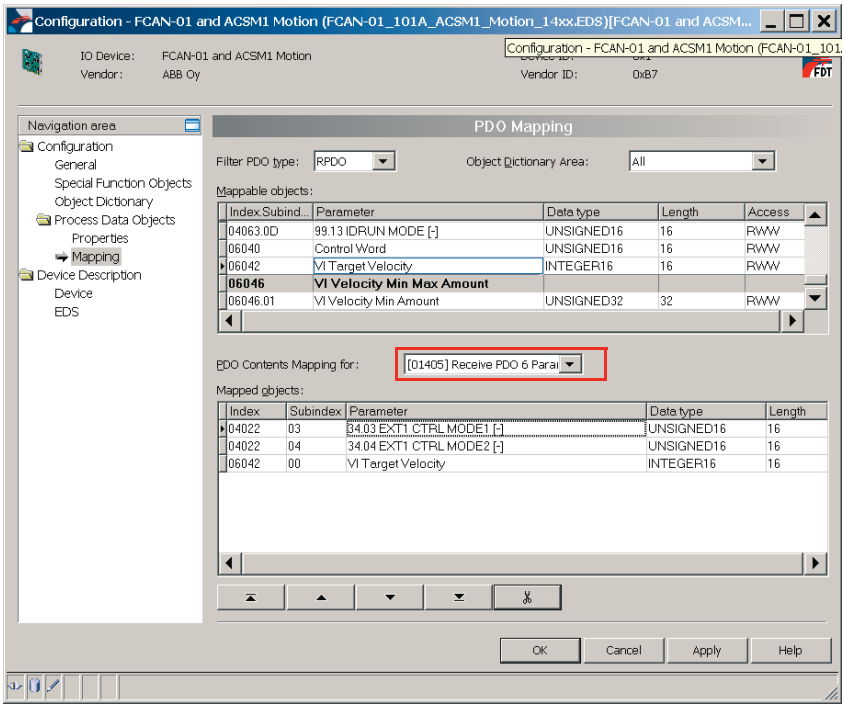
    Note: If you want to remove an object, click the scissors icon.



18. In the **PDO Contents Mapping for:** box, select [01405] Receive PDO 6 Parameter. Add an object by double-clicking it in the upper list. Add the following PDO contents for RPDO6:

    - 04022/03 34.03 EXT1 CONTROLL MODE1 [-]
    - 04022/04 34.04 EXT1 CONTROLL MODE2 [-]
    - 06042/00 VI Target Velocity.

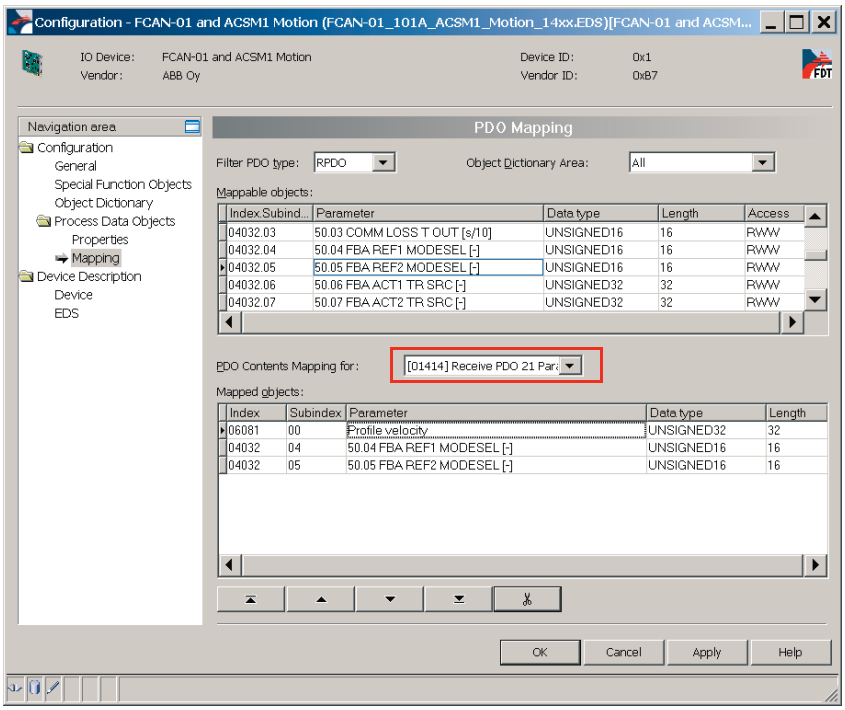
    When done, click **Apply**.



19. In the **PDO Contents Mapping for:** box, select [01414] Receive PDO 21 Parameter. Add an object by double-clicking it in the upper list. Add the following PDO contents for RPDO21:

    - 06081/00 Profile Velocity
    - 04032/04 50.04 FBA REF1 MODESEL [-]
    - 04032/05 50.05 FBA REF2 MODESEL [-].

    When done, click **Apply**.

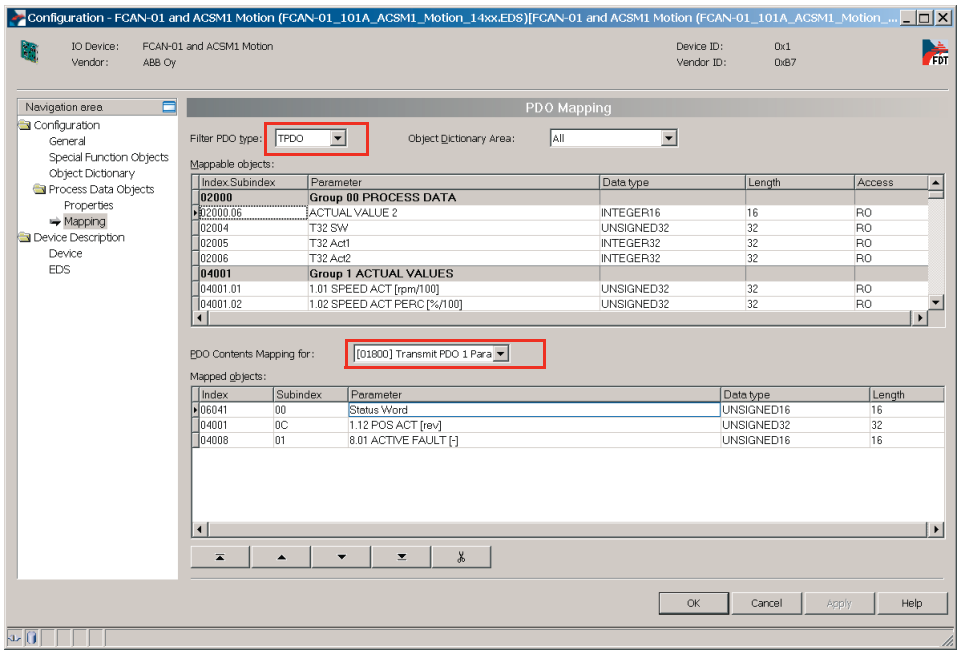


Tool/Step — Setting up the communication

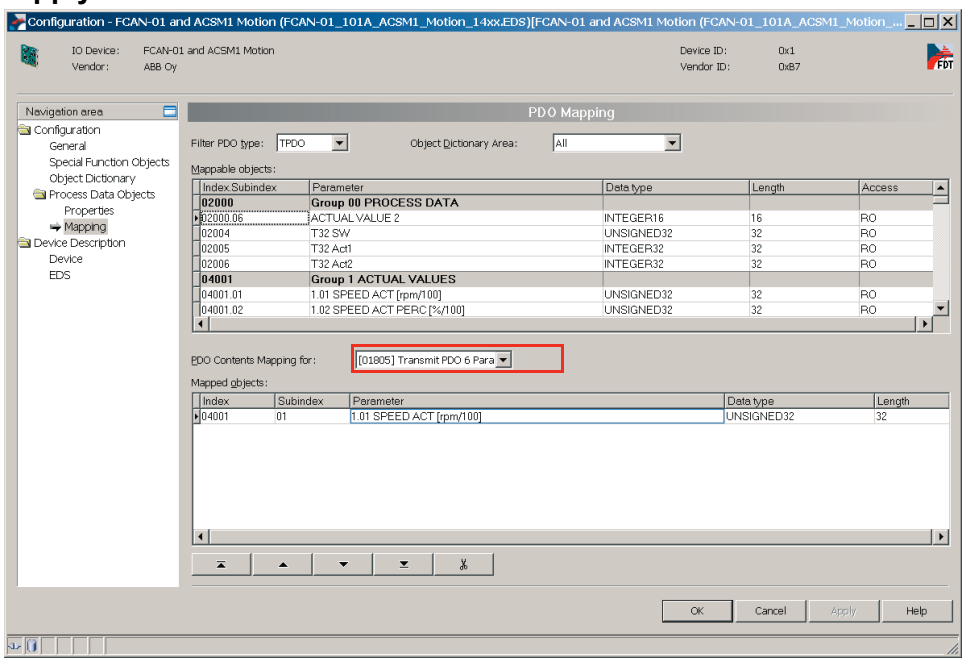
20. In the **Filter PDO type:** box, select TPDO. Add an object by double-clicking it in the upper list. Add the following PDO contents for TPDO1:

    - 06041/00 Status Word
    - 04001/0C 1.12 POS ACT [rev]
    - 04008/01 8.01 ACTIVE FAULT [-].

    When done, click **Apply**.



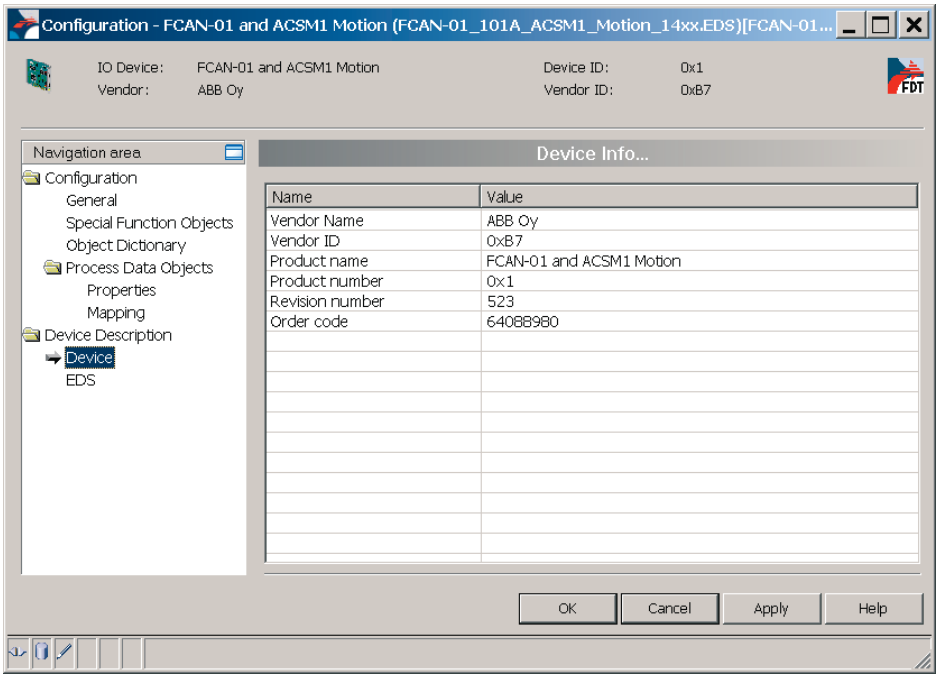
21. In the **PDO Contents Mapping for:** box, select [01805] Transmit PDO 6 Parameter. Add an object by double-clicking it in the upper list. Add the following PDO content for TPDO6: 04001/01 SPEED ACT [rpm/100]. When done, click **Apply**.



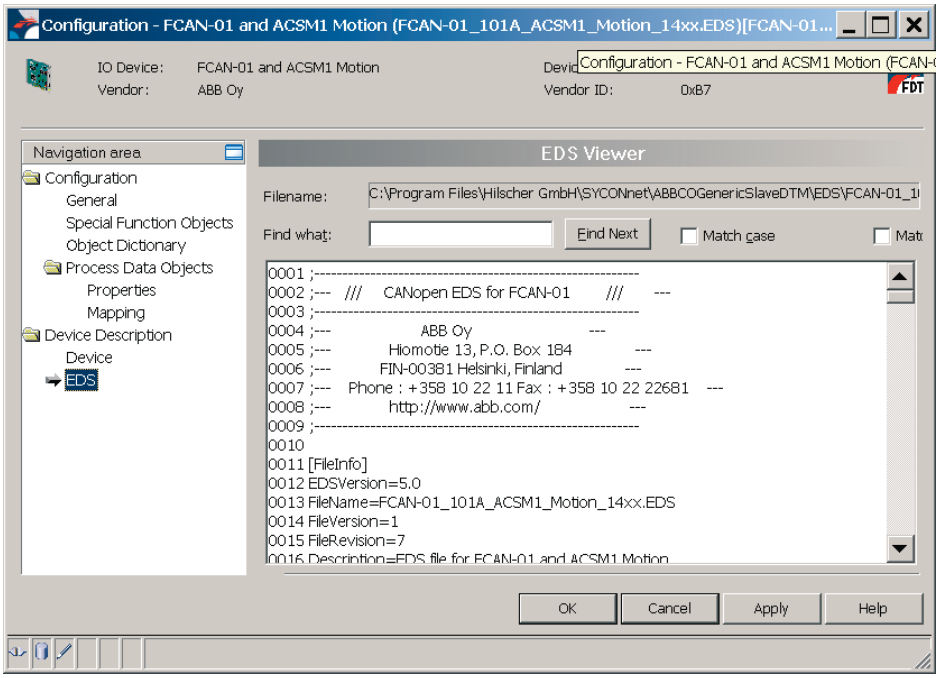
Tool/Step Setting up the communication

22. In the **Navigation area** field, under Device Description, you can check out device data and read the FCAN-01 EDS file.

The device data:



The EDS file:

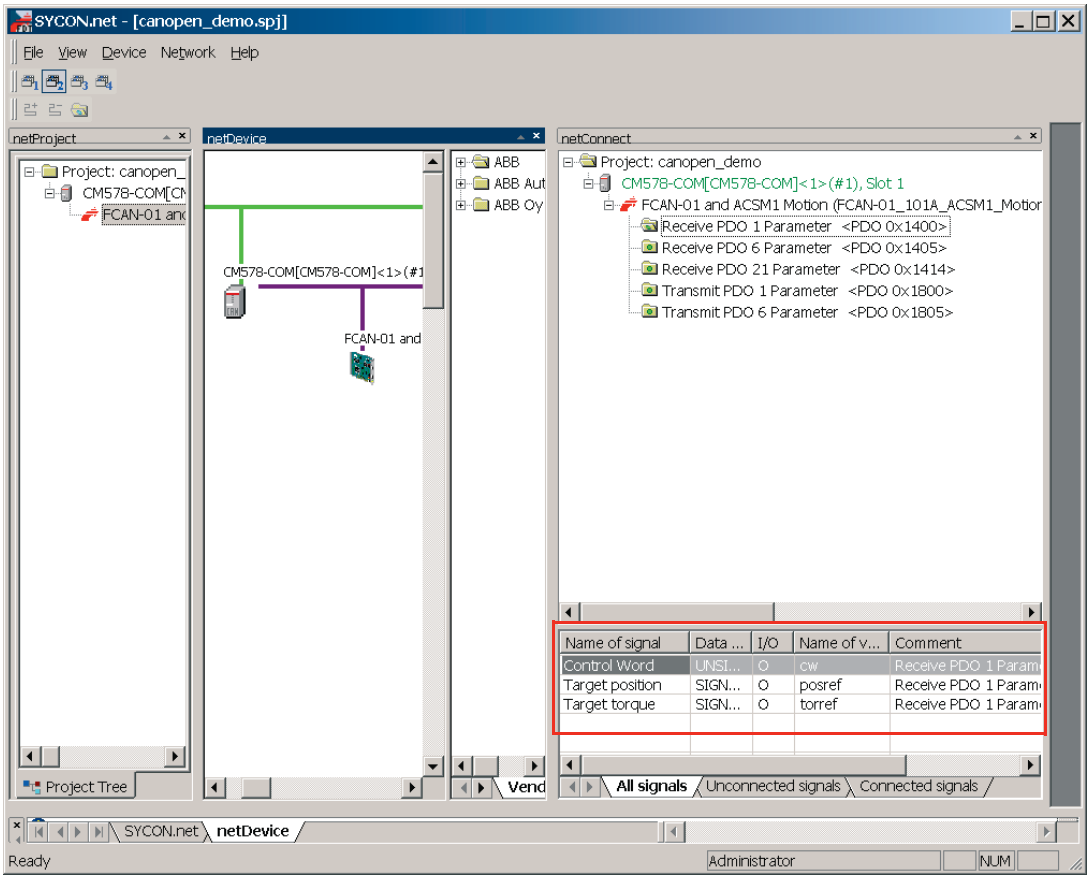


Click **Apply** and **OK** to close the configuration window.

Tool/Step — Setting up the communication

23. Name signals in the **netConnect** field. The signal names for Receive PDO 1 Parameter are:

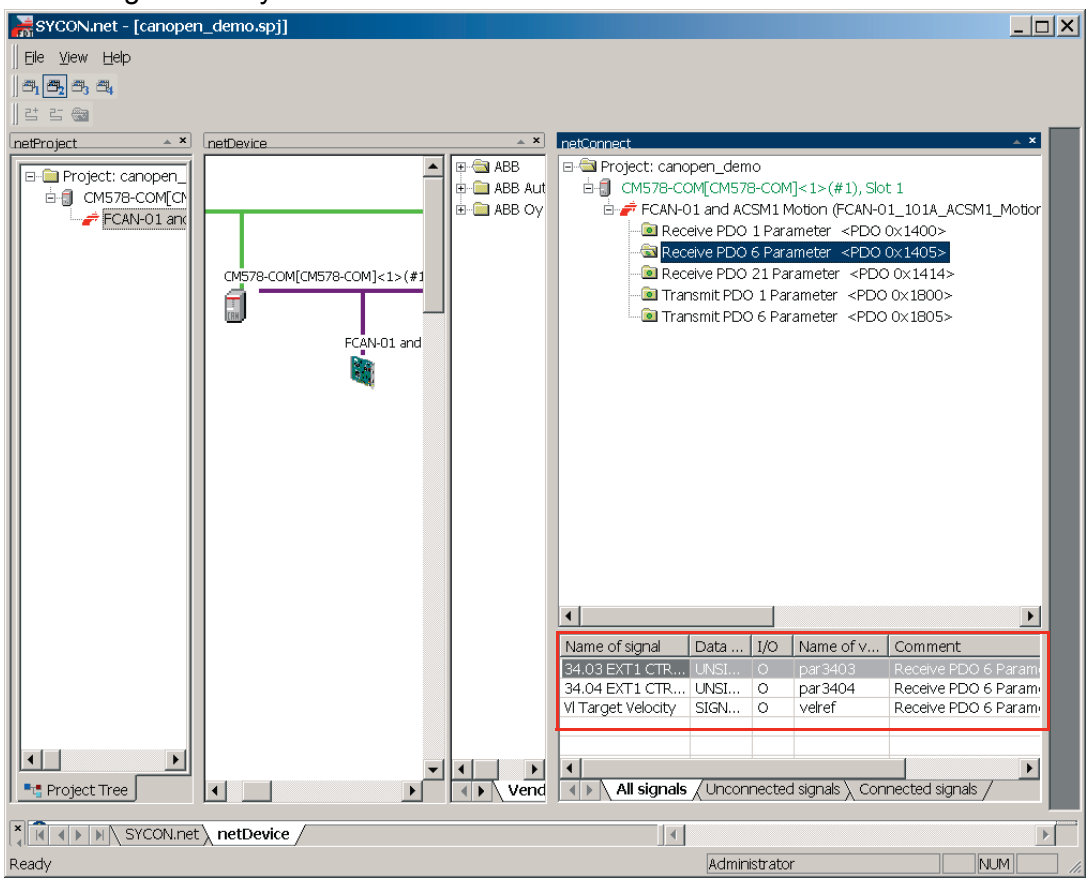
- Control Word -> cw
- Target position -> posref
- Target torque -> torref.



Tool/Step Setting up the communication

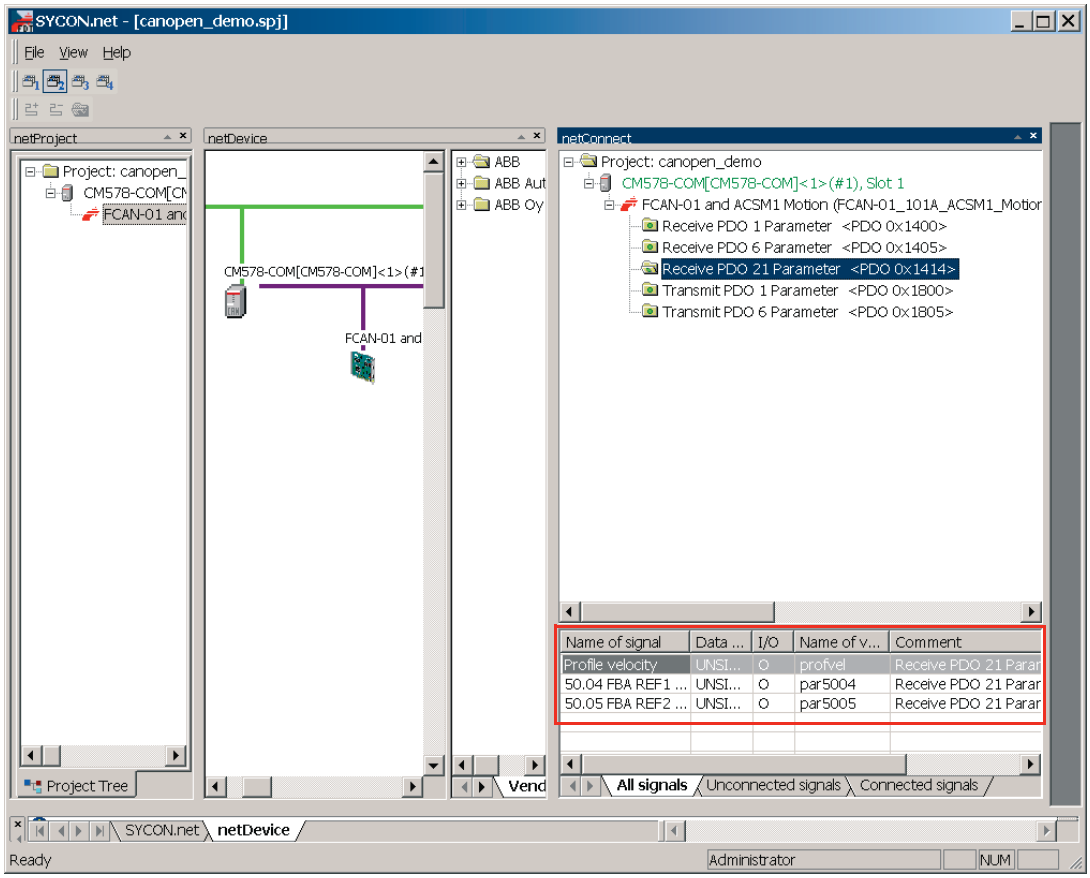
24. Name signals in the **netConnect** field. The signal names for Receive PDO 6 Parameter are:

- 34.03 EXT1 CTRL MODE1 [-] -> par3403
- 34.04 EXT1 CTRL MODE2 [-] -> par3404
- VI Target Velocity -> velref.



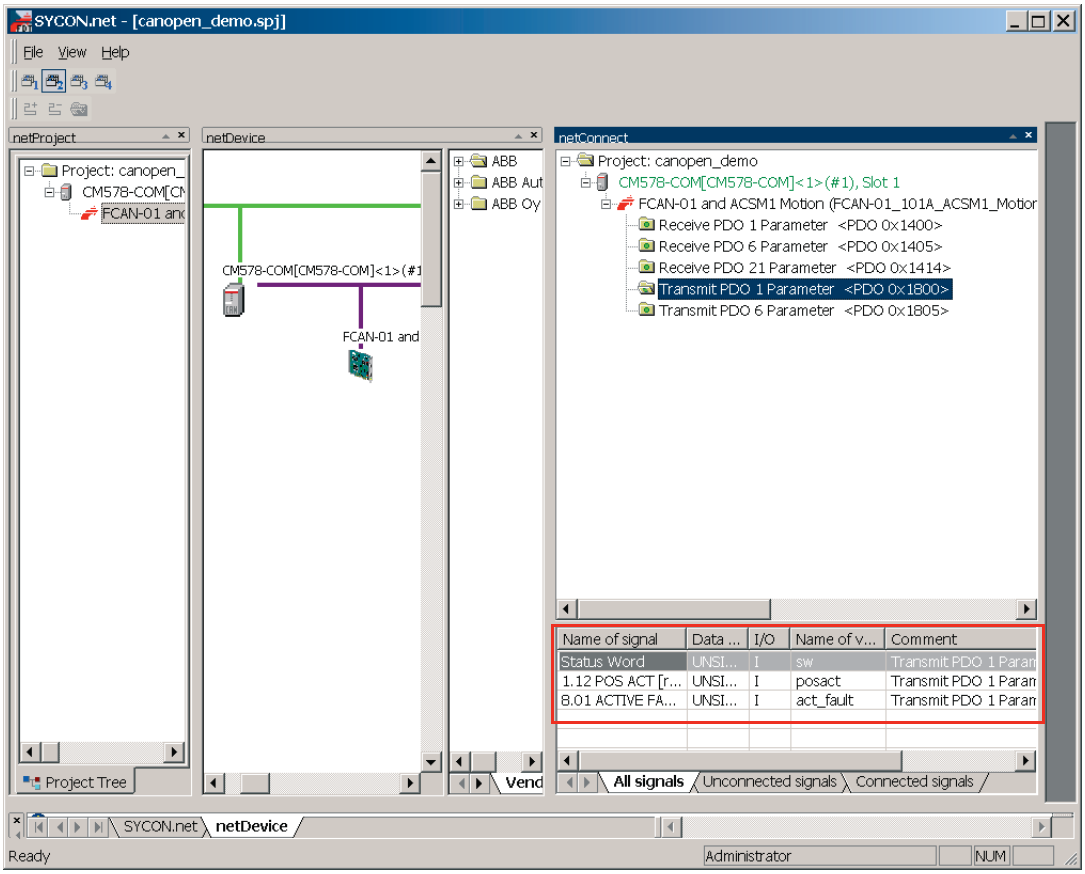
25. Name signals in the **netConnect** field. The signal names for Receive PDO 21 Parameter are:

    - Profile velocity -> profvel
    - 50.04 FBA REF1 MODESEL [-] -> par5004
    - 50.05 FBA REF2 MODESEL [-] -> par5005.

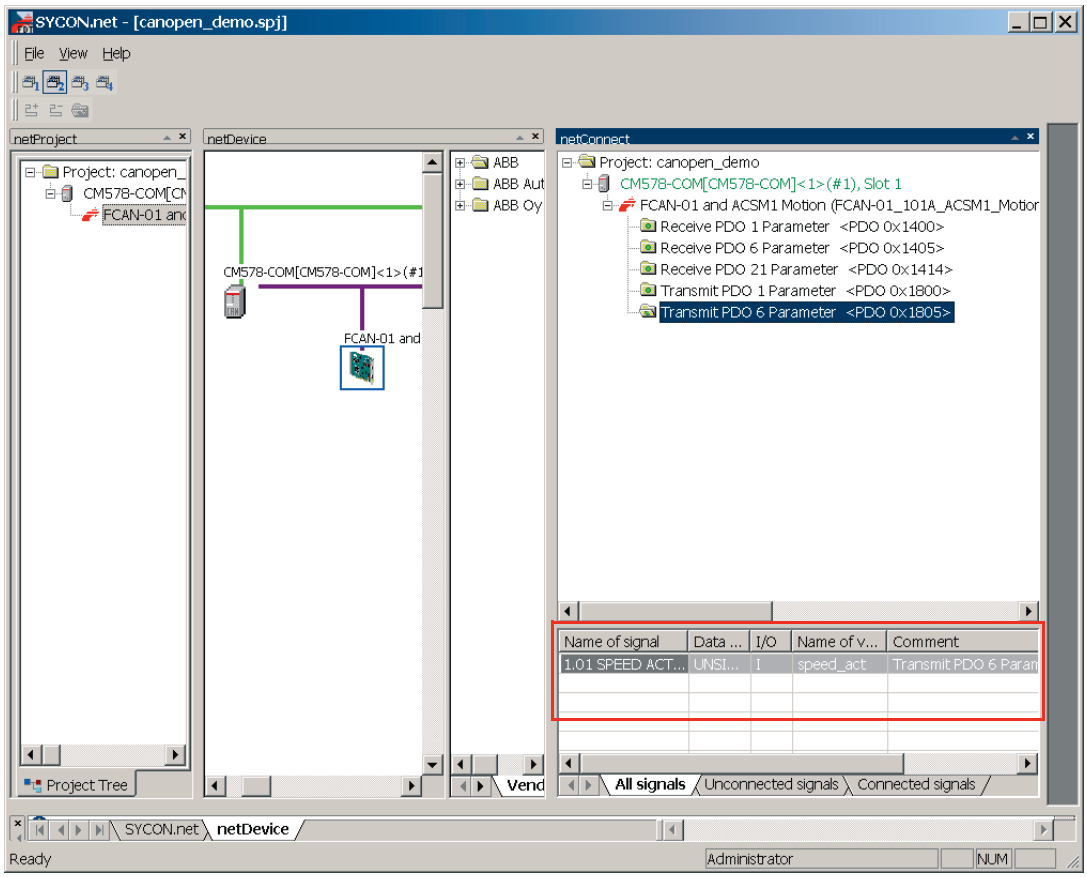


26. Name signals in the **netConnect** field. The signal names for Transmit PDO 1 Parameter are:

    - Status word -> sw
    - 1.12 POS ACT [rev] -> posact
    - 8.01 ACTIVE FAULT [-] -> act_fault.

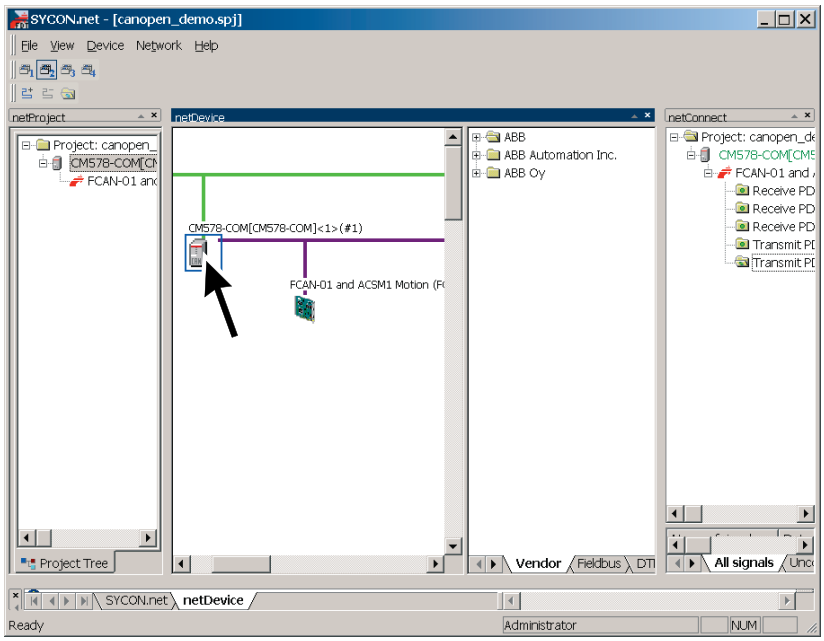


27. Name signals in the **netConnect** field. The signal name for Transmit PDO 6 Parameter are: 1.01 SPEED ACT [rpm/100] -> speed_act.

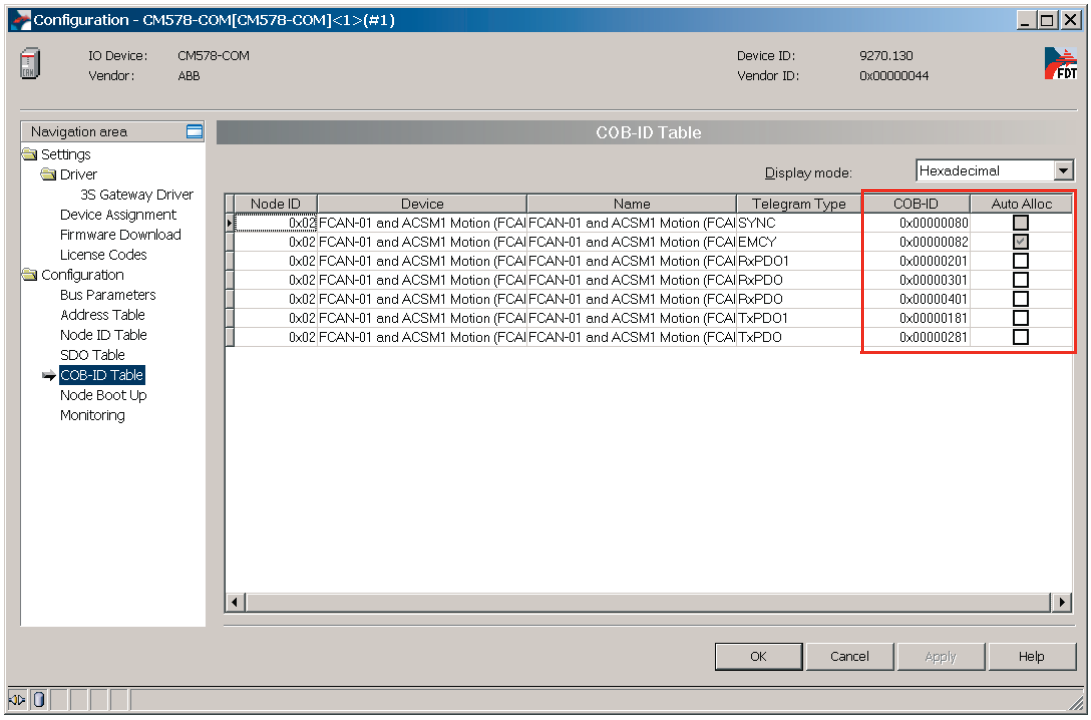


Tool/Step — Setting up the communication

28. In the **netDevice** field, double-click the CM578-COM icon to open the configuration window.



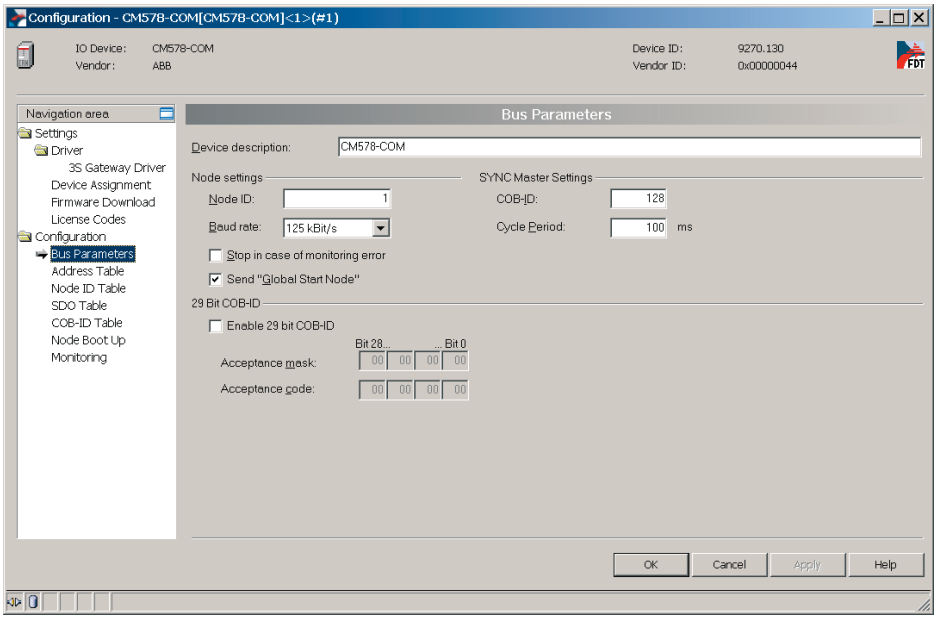
29. In the **Navigation area** field, click COB-ID Table. Configure the COB-ID Table values according to the CAN data frame on page *38*. The communication objects have the following COB-ID value range (Hex):
TxPDO1 -> 181h...1FFh
RxPDO1 -> 201h...27Fh
TxPDO6 -> 281h...2FFh
RxPDO6 -> 301h...37Fh
TxPDO21 -> 381h...3FFh
RxPDO21 -> 401h...47Fh



When done, click **Apply**.

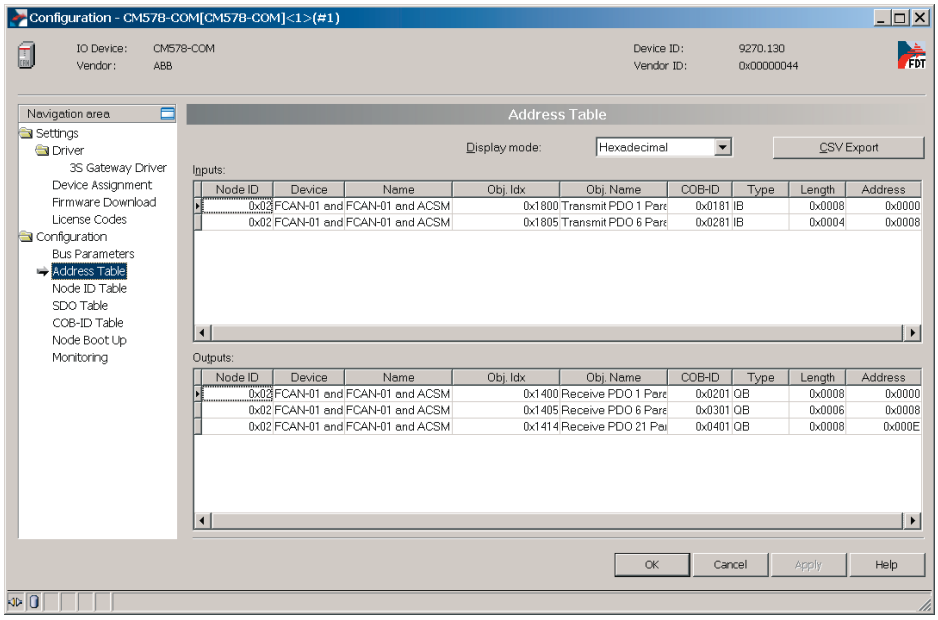
Tool/Step — Setting up the communication

30. In the **Navigation area** field, click Bus Parameters. Set Node ID as 1 and COB ID as 128. Set the Baud rate value as 125 kBit/s (according to drive parameter 51.03 BAUD RATE). Other values are set by default as shown below.

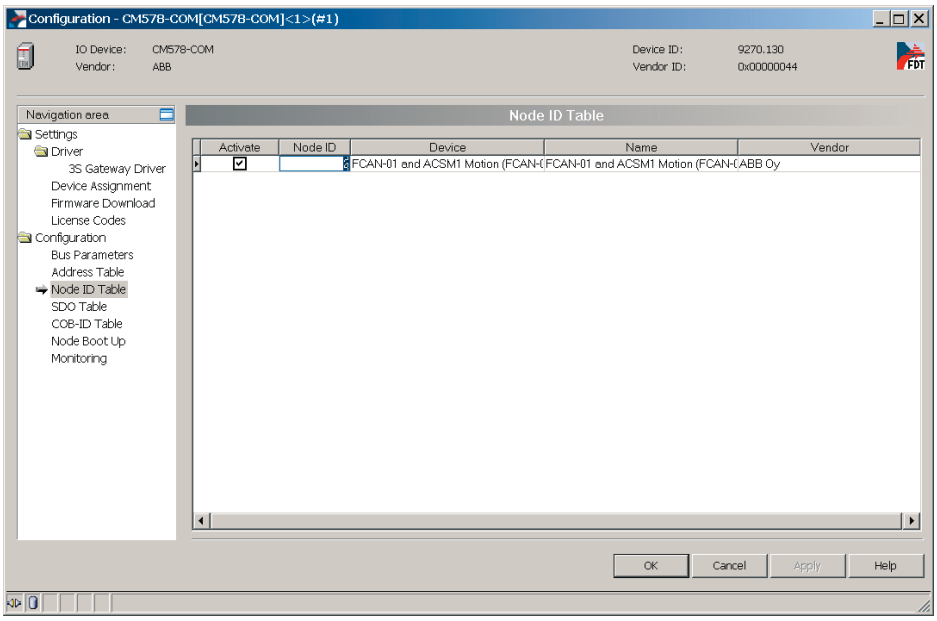


When done, click **Apply**.

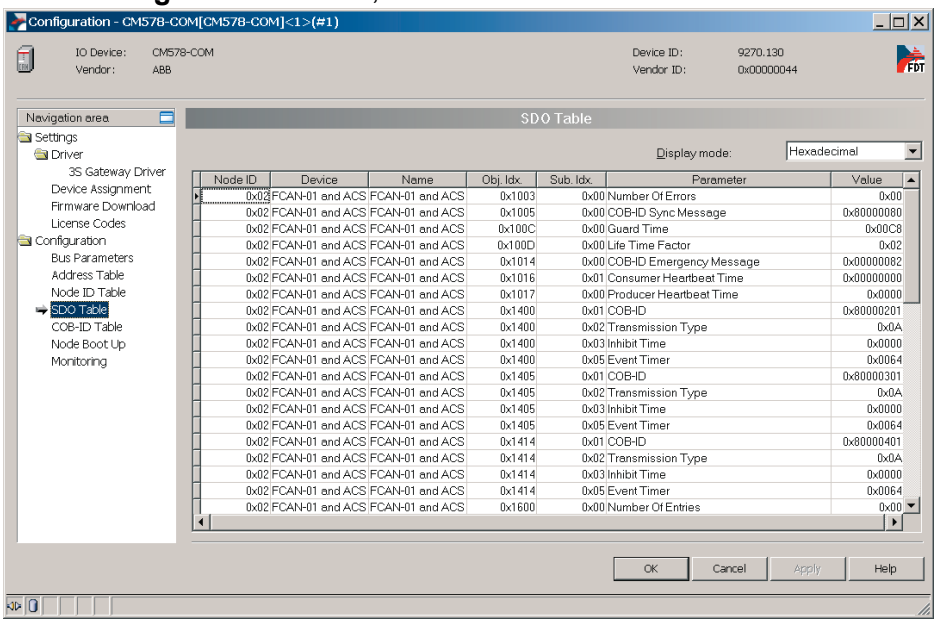
31. In the **Navigation area** field, click Address Table to review values.



32. In the **Navigation area** field, click Node ID Table to review values. Set Node ID value 2 according to drive parameter value 51.02 NODE ID.

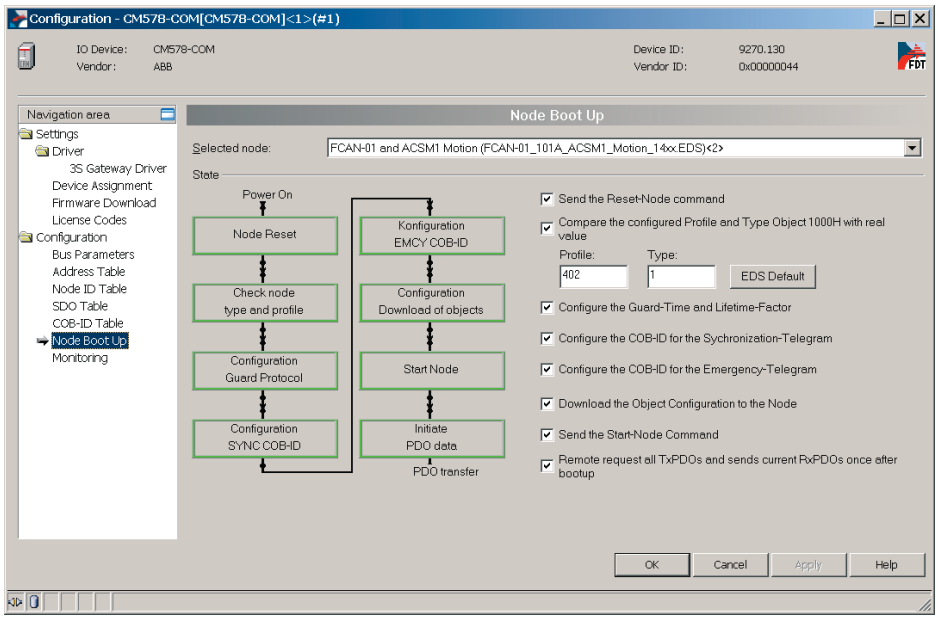


33. In the **Navigation area** field, click SDO Table to review values.

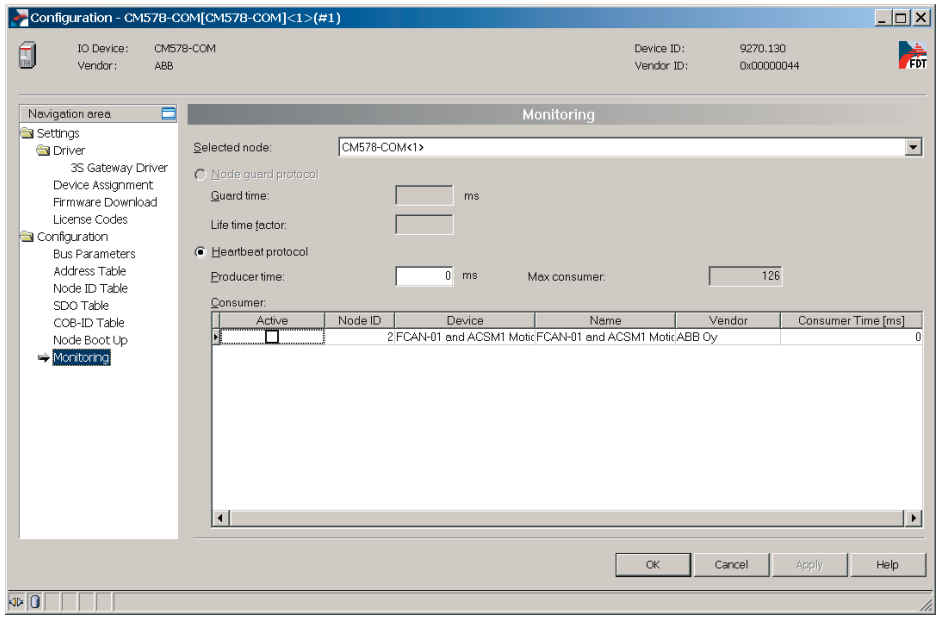


Tool/Step — Setting up the communication

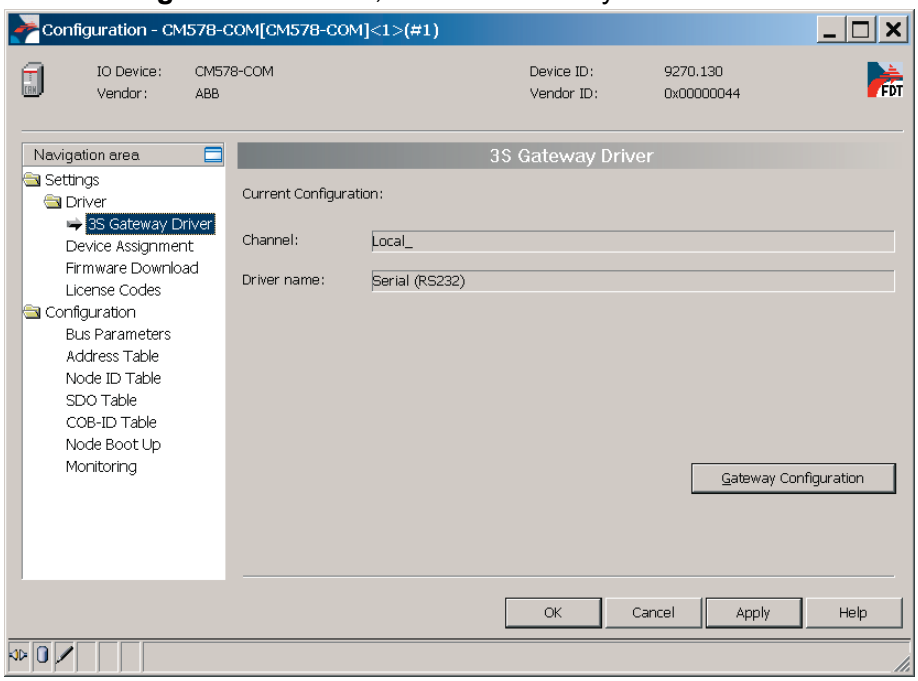
34. In the **Navigation area** field, click Node Boot Up. In this window, you can manage the node boot-up process. Keep the default values.



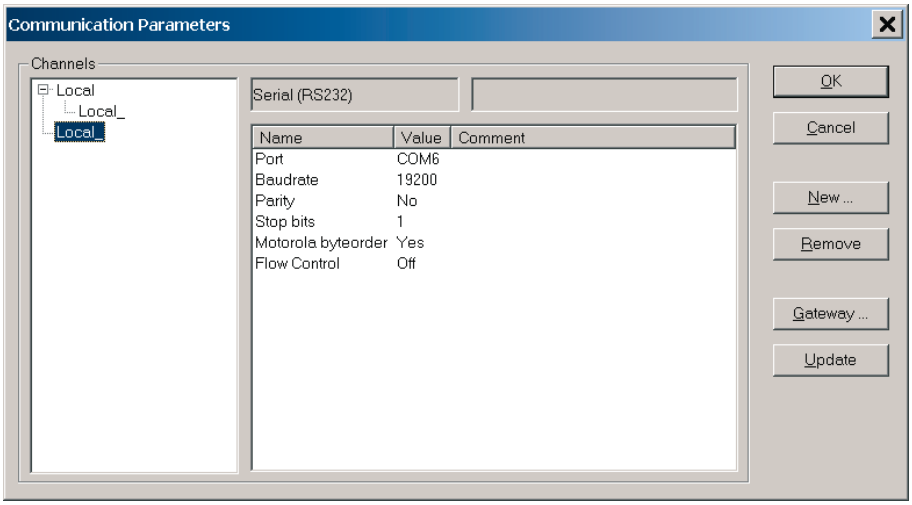
35. In the **Navigation area** field, click Monitoring. In this window, you can manage the monitoring process. Keep the default values.



36. In the **Navigation area** field, click 3S Gateway Driver.

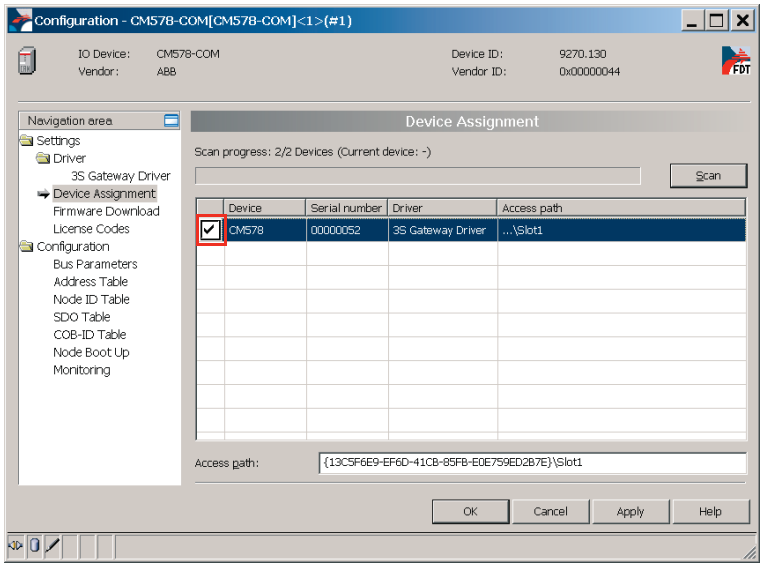


37. Click the **Gateway Configuration** button to configure your gateway according to your serial port settings. If you do not know your gateway settings, see *Appendix A - How to find out the serial communication parameter values of your PC?*.



Tool/Step — Setting up the communication

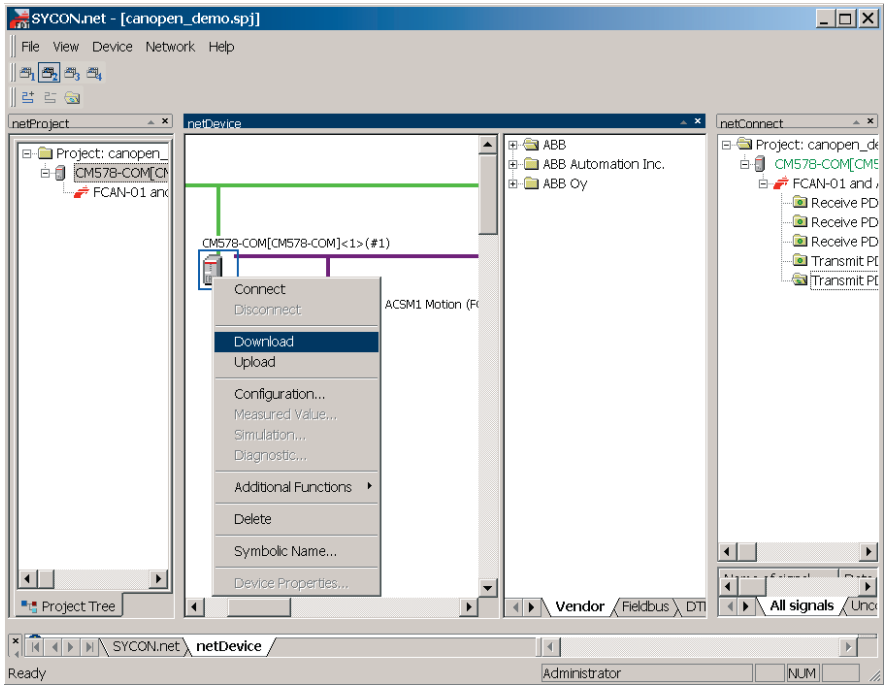
38. In the **Navigation area** field, click Device Assignment. Click the **Scan** button.
-> Device CM578 appears. Tick the box next to CM578.



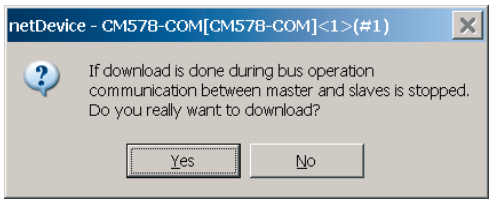
When done, click **Apply** and **OK**.

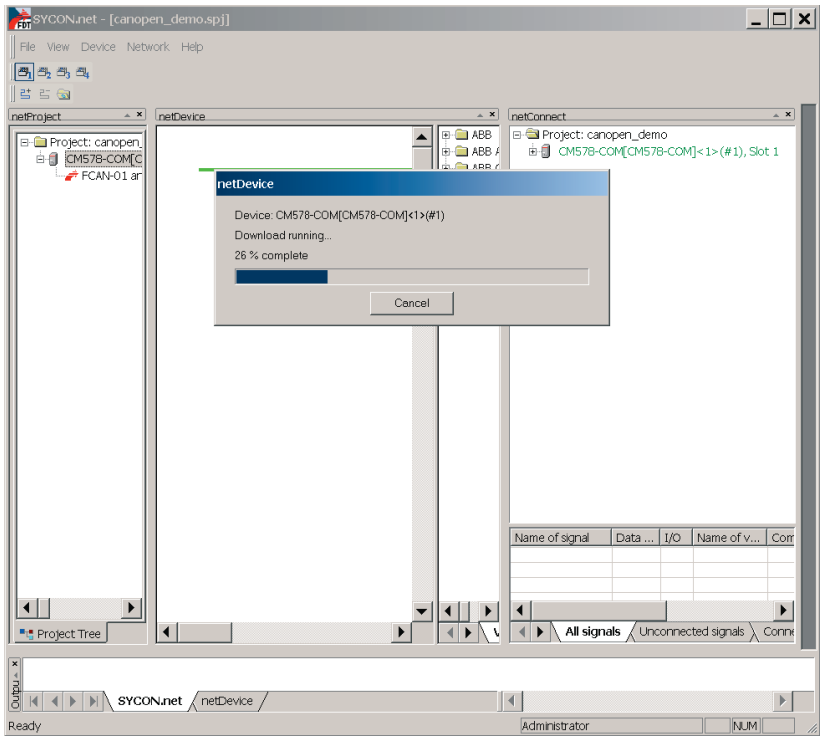
39. Download the communication configuration to the PLC: first, right-click the CM578-COM icon, and then click **Download**.

Note: Downloading is not possible if the PLC is in the Run state.



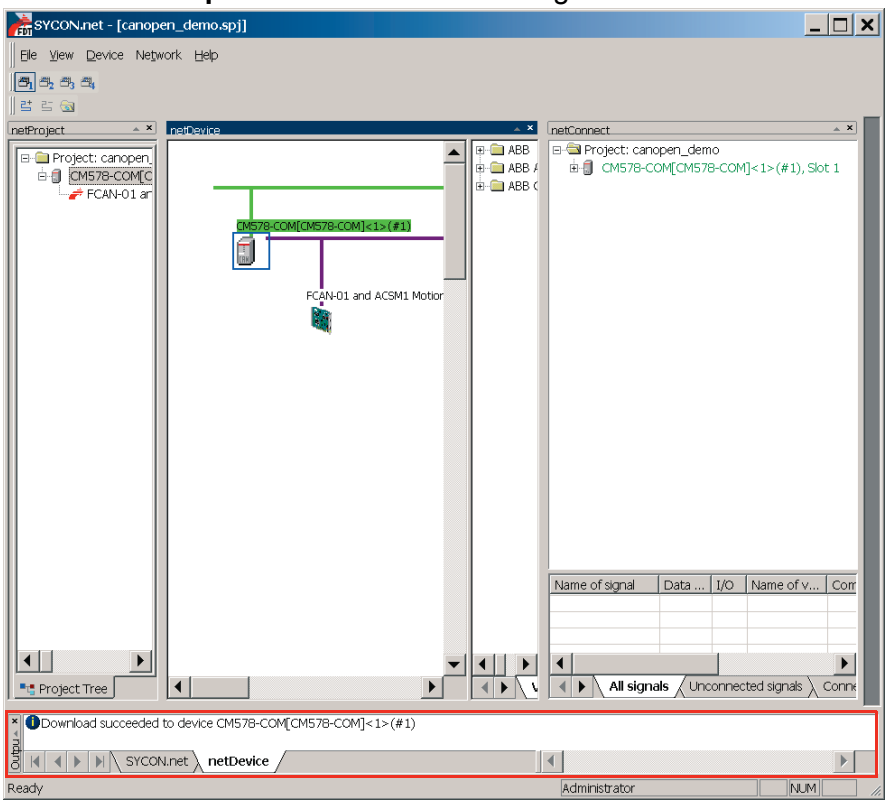
40. When asked, click **Yes** to start downloading.





Tool/Step — Setting up the communication

41. Check the **Output** window for the following information.

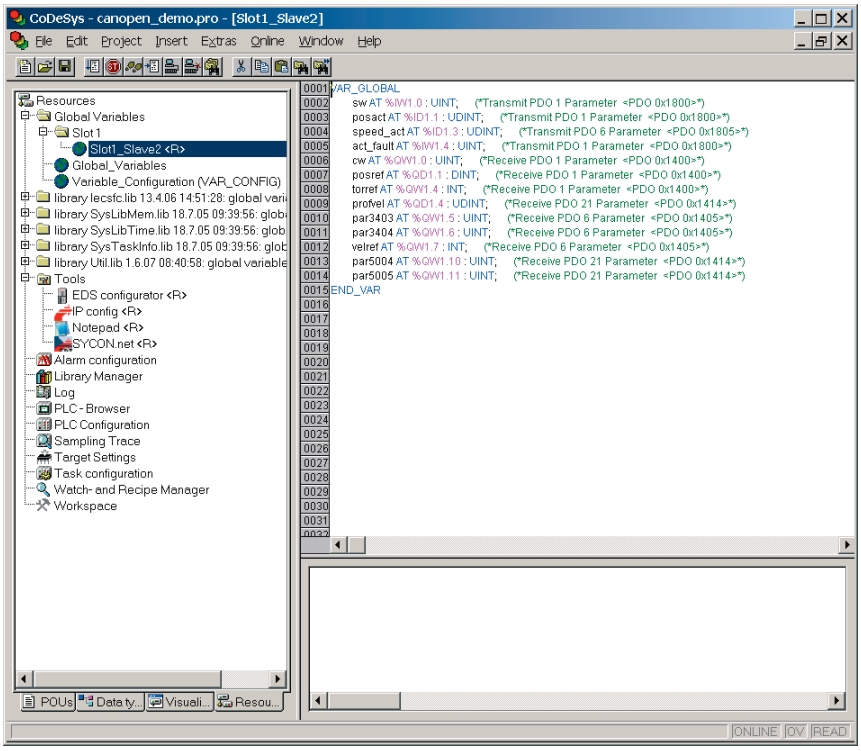


42. When the downloading is completed, right-click the CM578-COM icon and then click **Disconnect**.

43. Save the project with the **Save** command under the **File** menu.

44. Close the SYCON.net tool.

45. The configured objects can now be found under the **Resources** tab, in the Global Variables folder.



Tool/Step

Introduction to the PLC main program

This section introduces the canopen_demo.pro main program and the global and local variable lists. At the end of the section, there are also brief instructions *How to add function blocks*, in case you want to modify the ready-made project canopen_demo.pro.

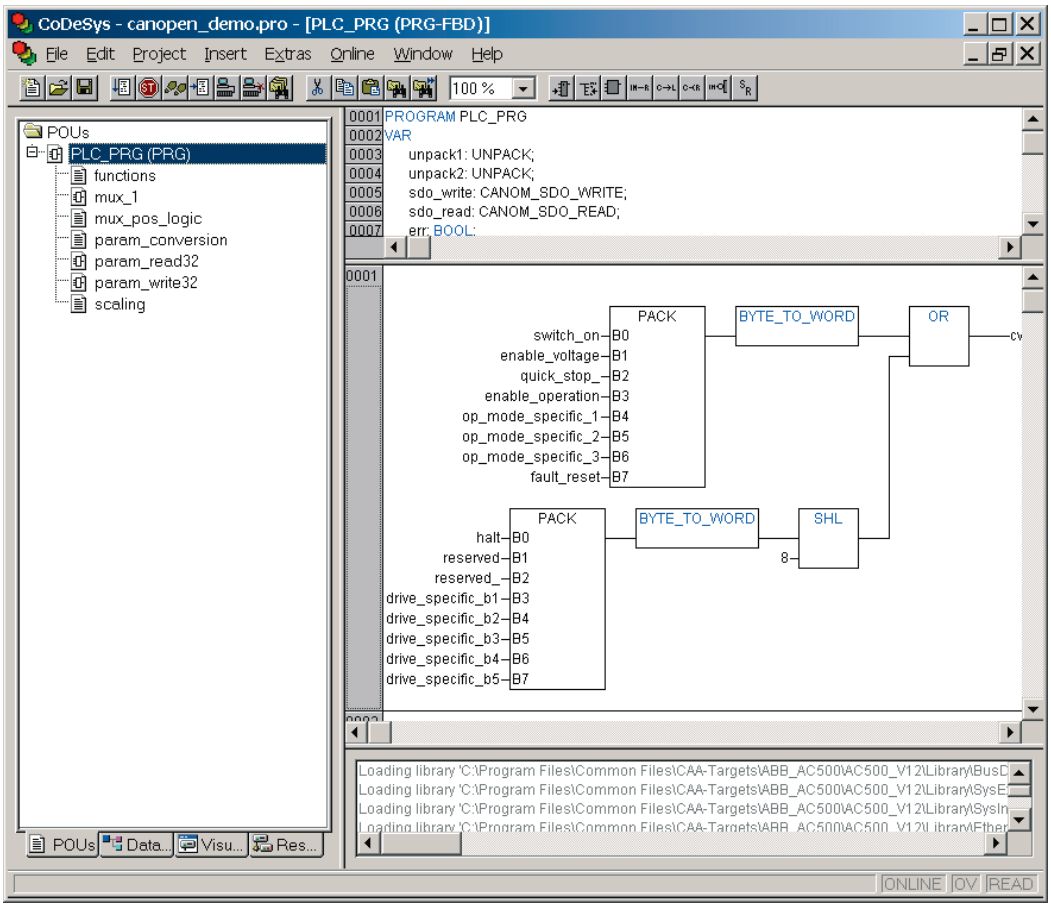
For detailed function block descriptions, refer to

- CoDeSys Online Help (Press F1 in the CoDeSys software)
- *User Manual for PLC Programming with CoDeSys 2.3* by 3S – Smart Software Solutions GmbH

Main program

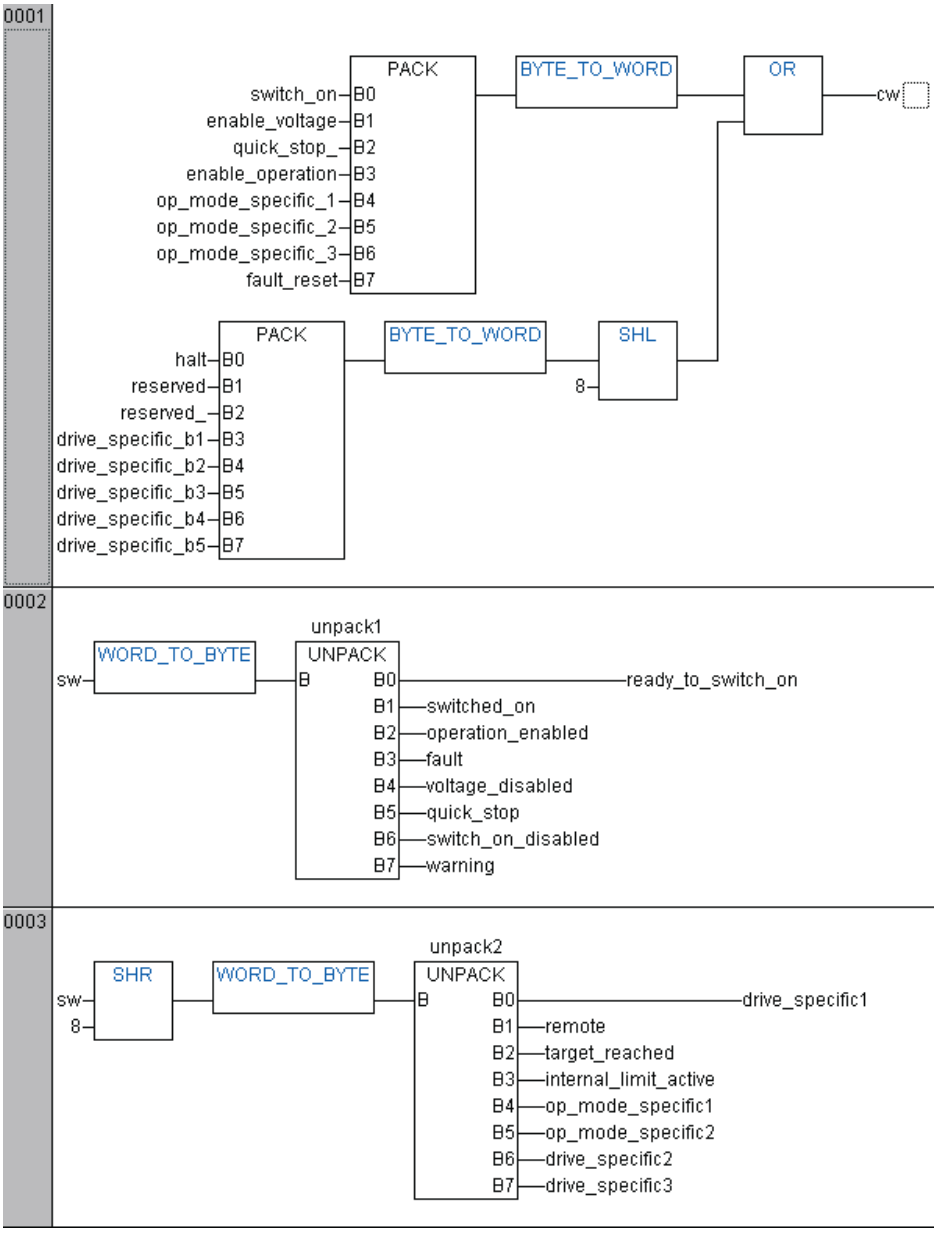
The main program has function blocks that pack Control Word and unpack Status Word, as well as function blocks that declare actions presented in section *Introduction to the actions* on page *115*.

1. The main program is located under the **POUs** tab. To open the program, double-click PLC_PRG (PRG) under the **POUs** folder.



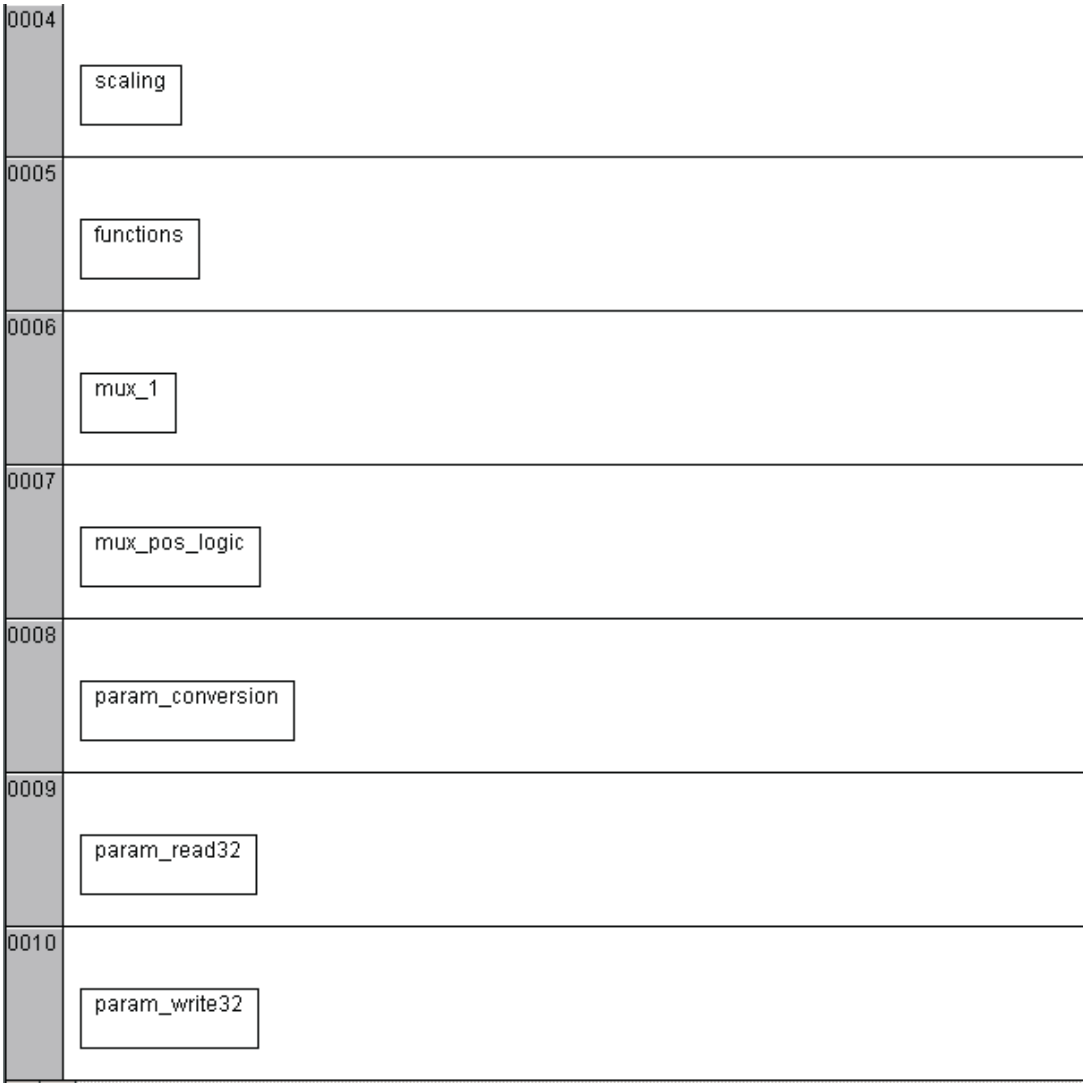
Tool/Step **Introduction to the PLC main program**

2. The function blocks of the main program on rows 1 to 3 are shown below. These function blocks show the inputs and outputs of Control Word and Status Word. The inputs and outputs are named according to the DSP 402 profile.



Tool/Step — Introduction to the PLC main program

3. The function blocks of the main program on rows 4 to 10 are shown below. These function blocks declare actions presented in section *Introduction to the actions* on page *115*.

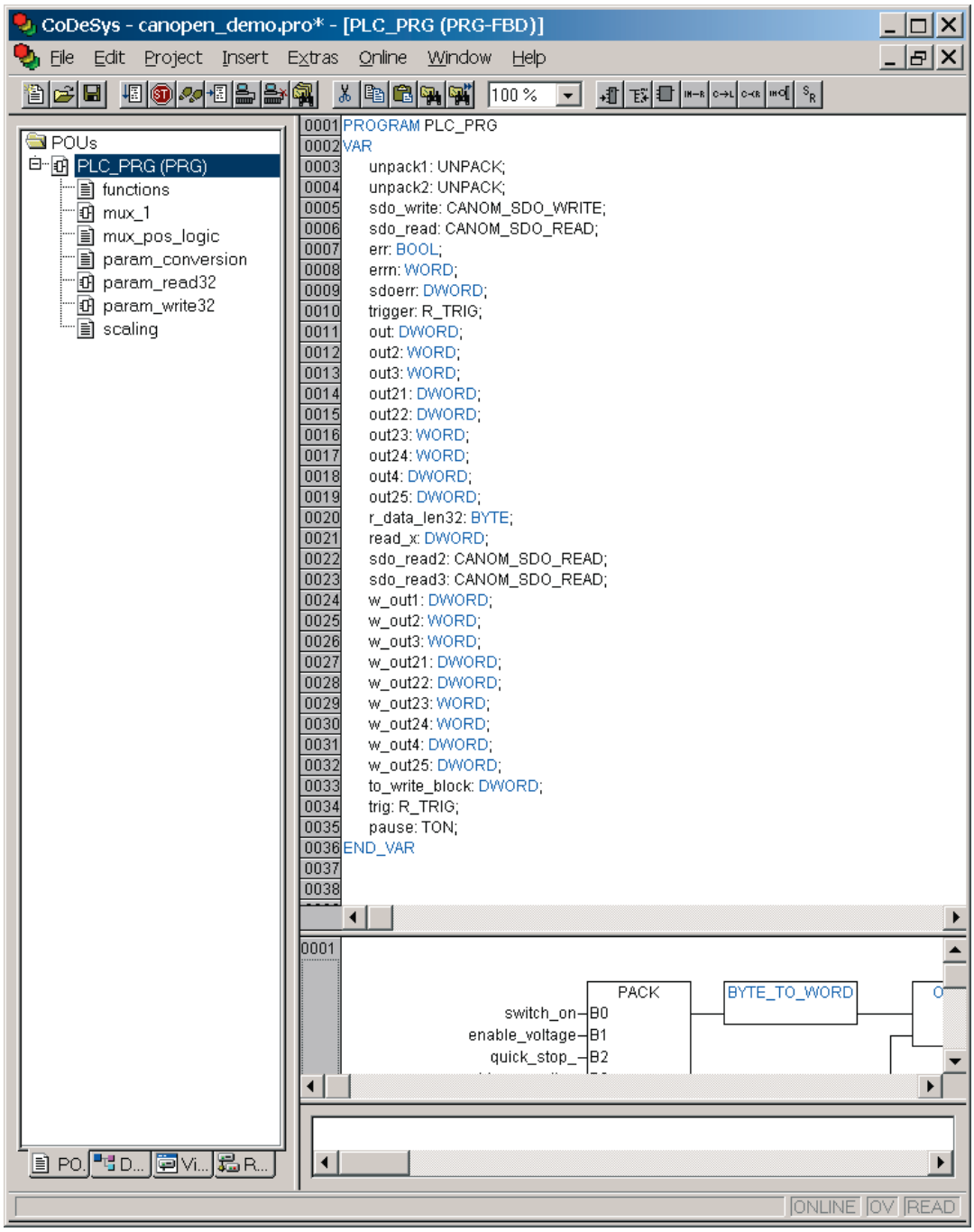


Tool/Step

Introduction to the PLC main program

Local variables

Local variables are located above the main program function blocks. The Declare Variable assistant writes variables to the local or global variable list based on user selection. All local variables used in project canopen_demo.pro are shown below.

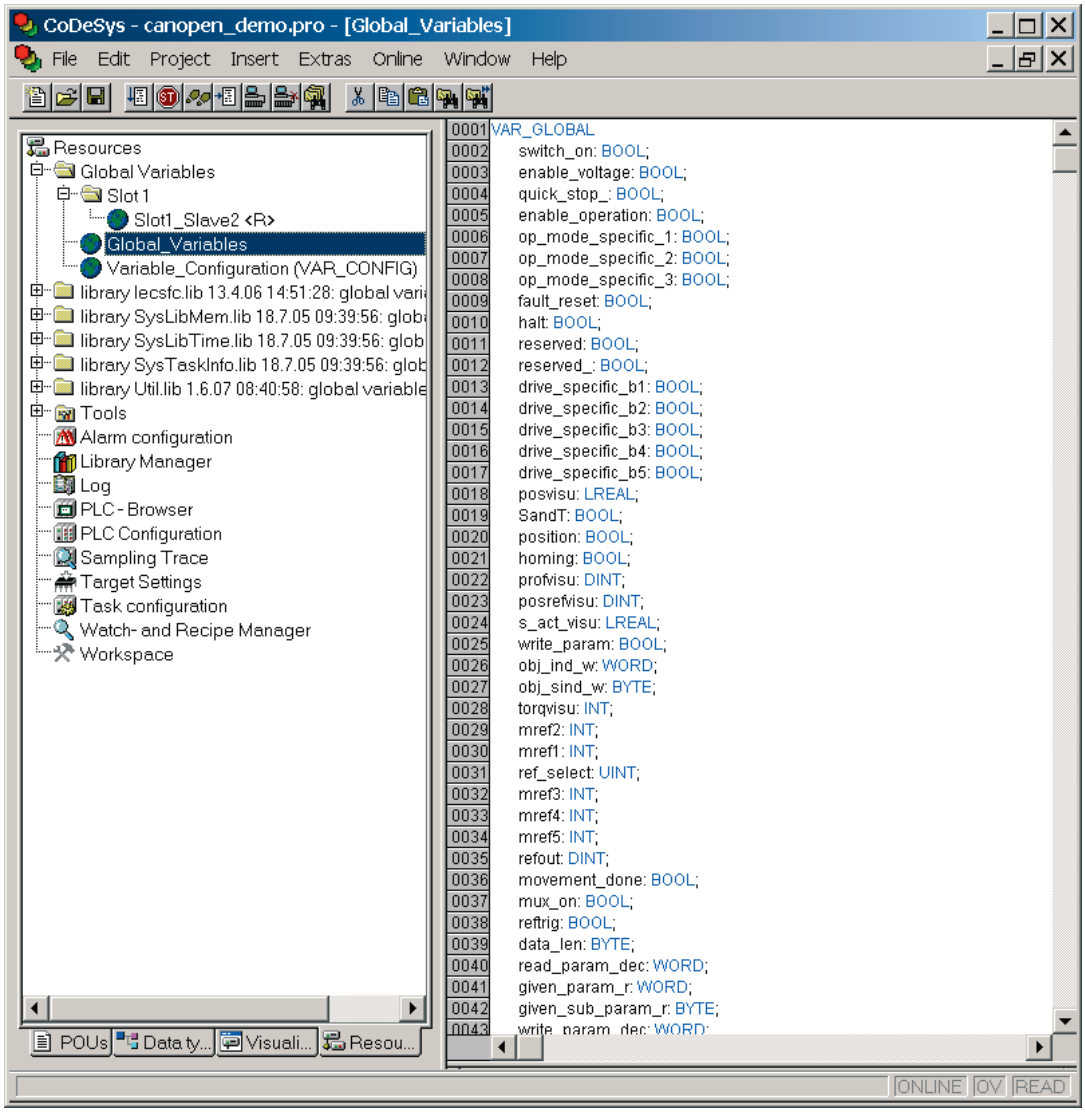


Tool/Step

Introduction to the PLC main program

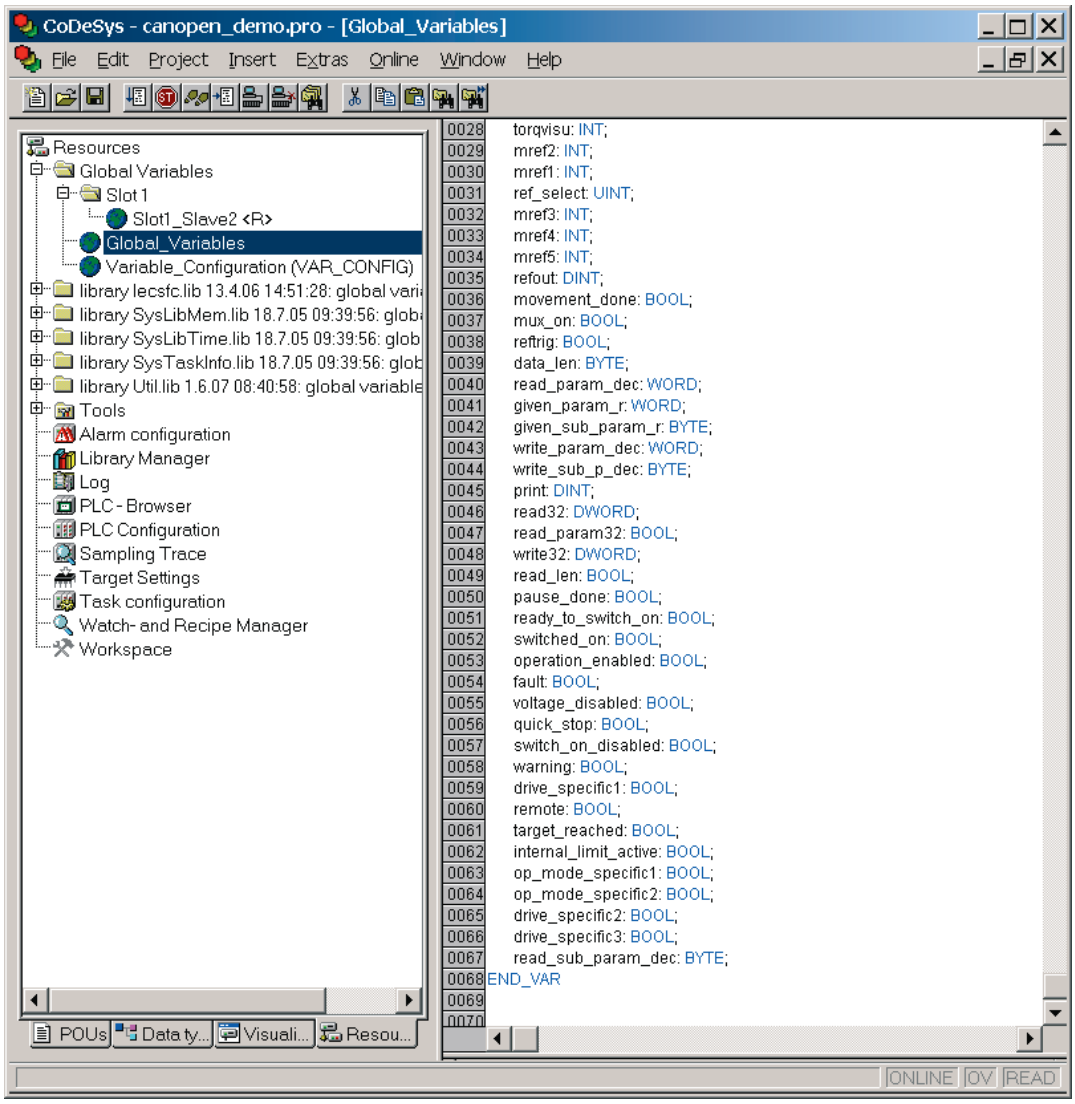
Global variables

Global variables are located under the **Resources** tab. The Declare Variable assistant writes variables to the local or global variable list based on user selection. All global variables used in project canopen_demo.pro are shown below.



Tool/Step

Introduction to the PLC main program



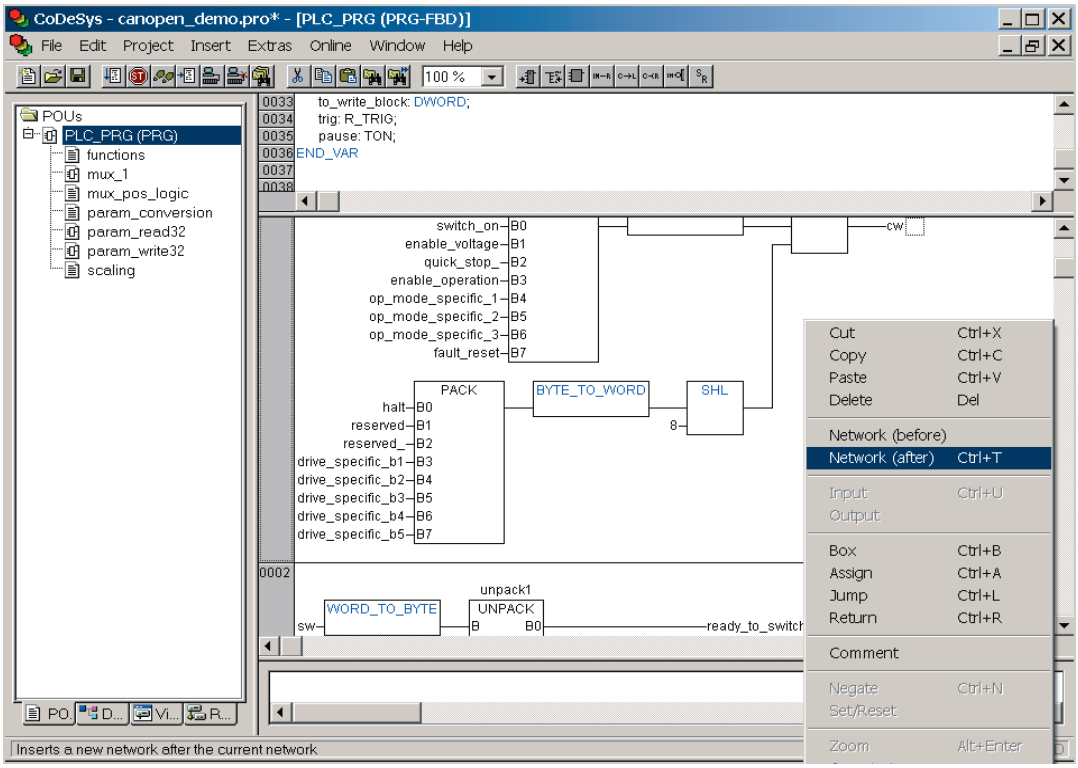
Tool/Step

Introduction to the PLC main program

How to add function blocks

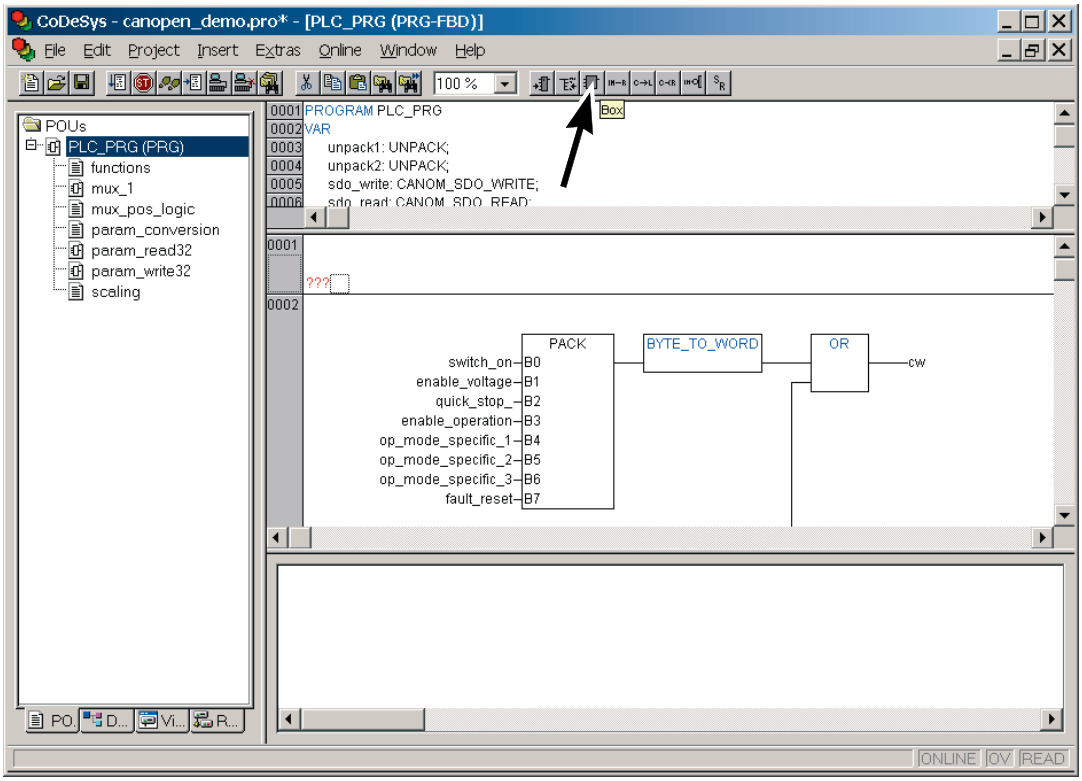
This section instructs you how to add function blocks to the project, if needed. However, it is not necessary for you to modify the project, as it is already functional.

1. To create a new programmable area, right-click on the blank area and select **Network (after) or Network (before)** from the menu.

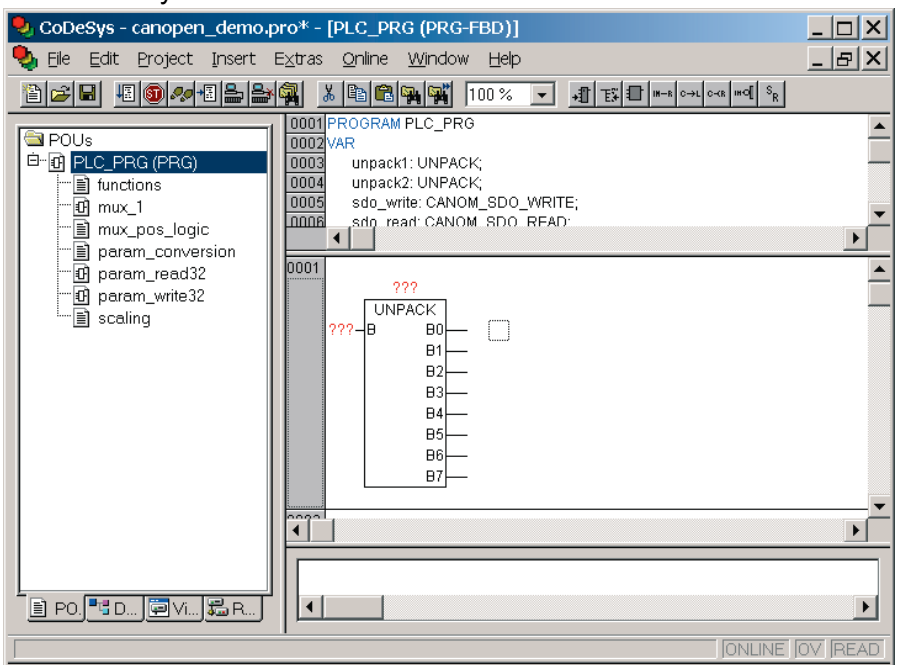


Tool/Step Introduction to the PLC main program

2. To add function blocks, click the Box button in the tool bar.

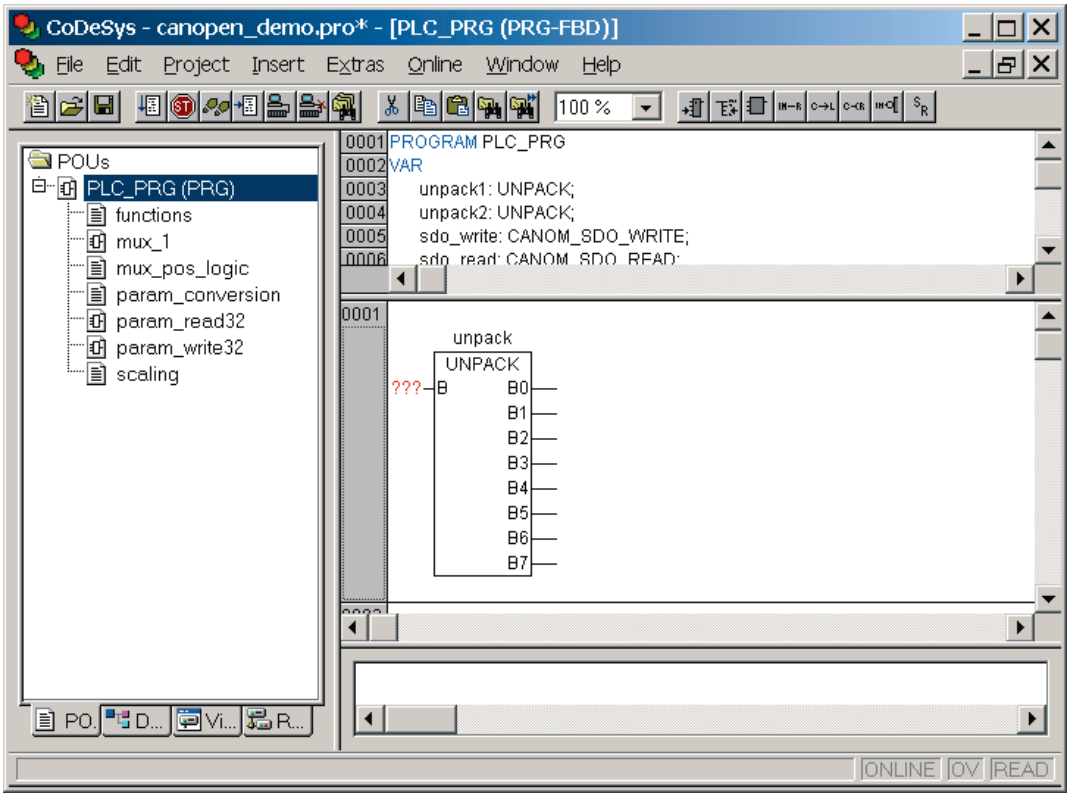


3. Replace the default text AND with text “any function block”. Now, the CoDeSys program recognizes the function block and the block appearance changes automatically.

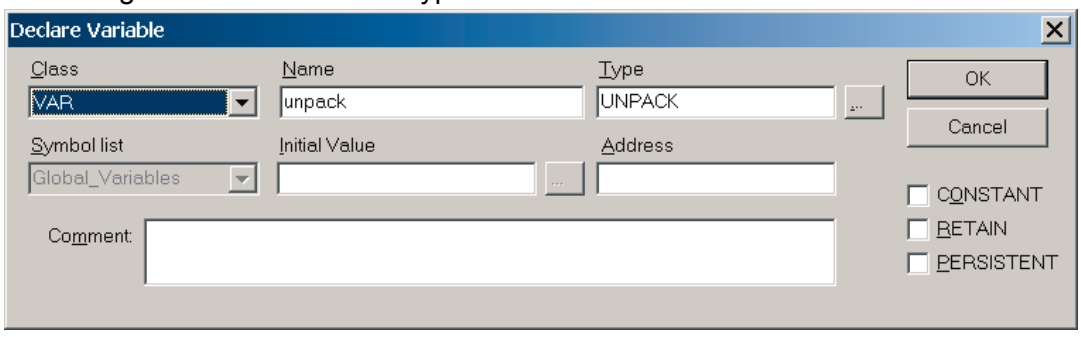


Tool/Step — Introduction to the PLC main program

4. Name the function block as you wish and press **Enter**.



5. -> The Declare Variable assistant appears. In the **Class** dialog box, select the desired variable class. The content of the **Type** box is configured automatically according to the function block type. Click **OK**.

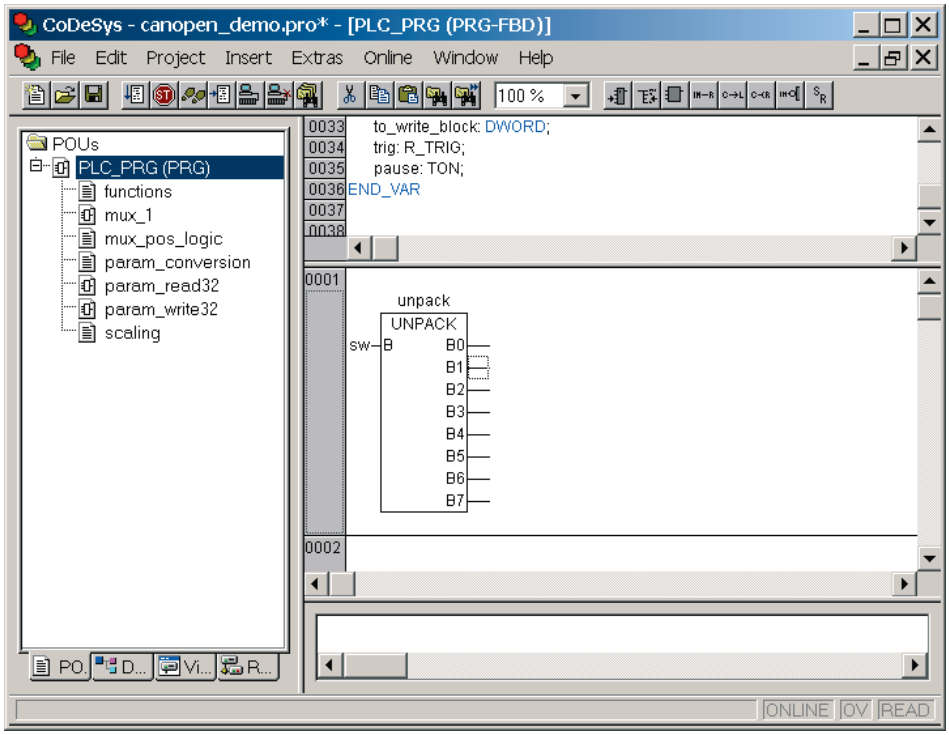


Note 1: If you want to call the Declare Variable assistant again, click the desired variable and press **Shift**+**F2**.

Note 2: When defining inputs, you can use the Input assistant. Click the desired input and press **F2**.

Tool/Step Introduction to the PLC main program

6. Configure inputs and outputs. While naming the inputs, the Declare Variable assistant appears each time you enter an unknown variable.



Tool/Step

Introduction to the actions

This section presents the actions of project canopen_demo.pro. The actions are used for:

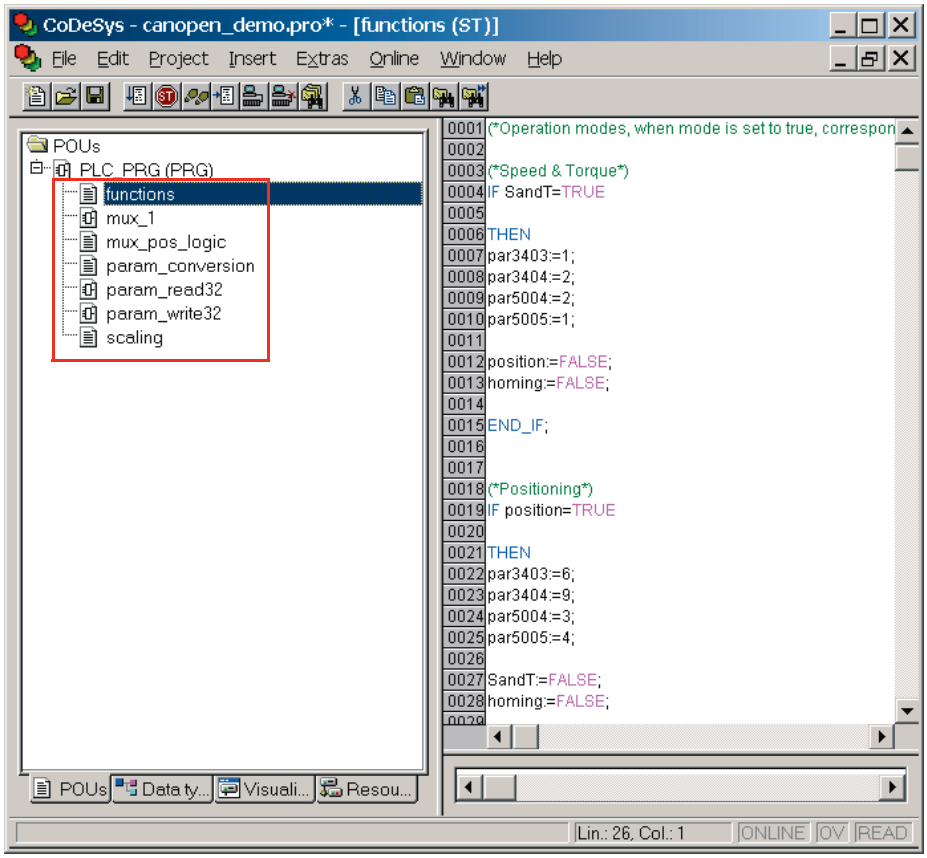
- operation mode selection for speed, position and torque control
- programming logic positioning cycles
- reading and writing parameter values
- scaling reference values.

At the end of this section, there are also brief instructions *How to create actions*, in case you want to modify the ready-made project canopen_demo.pro.

For detailed function block descriptions, refer to

- CoDeSys Online Help (Press F1 in the CoDeSys software)
- *User Manual for PLC Programming with CoDeSys 2.3* by 3S – Smart Software Solutions GmbH.

Actions are located under the **POUs** tab under the main program PLC_PRG (PRG), as shown below.



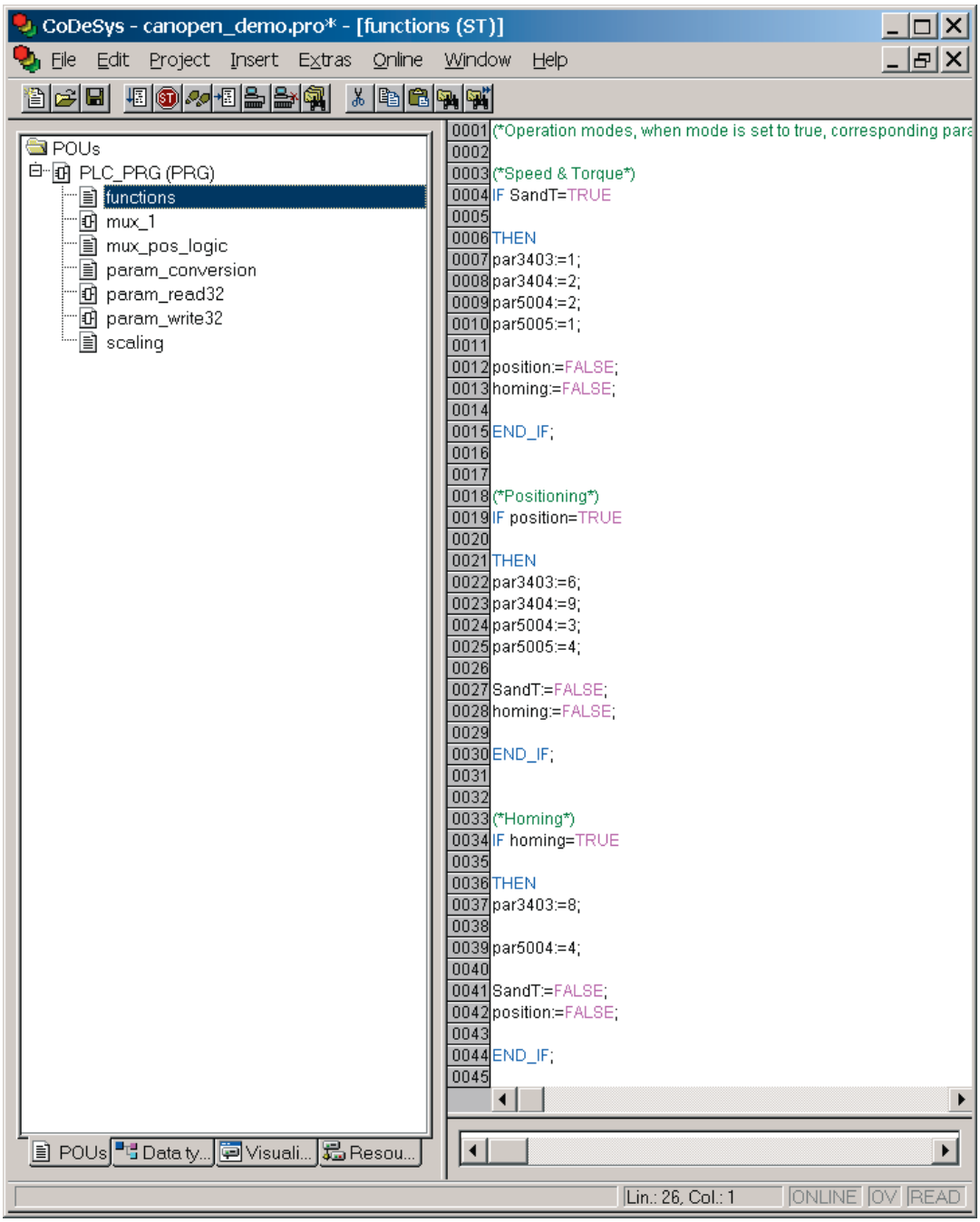
Tool/Step

Introduction to the actions

functions

Action ‘functions’ defines the operation modes of the drive: Speed and Torque (SandT), Positioning, or Homing mode. When one of the three modes is set to TRUE, the other modes are disabled. Only one operation is available at a time.

When a mode is set to TRUE, the corresponding parameters of the drive will be adjusted accordingly.



Tool/Step

Introduction to the actions

mux_1 and mux_pos_logic

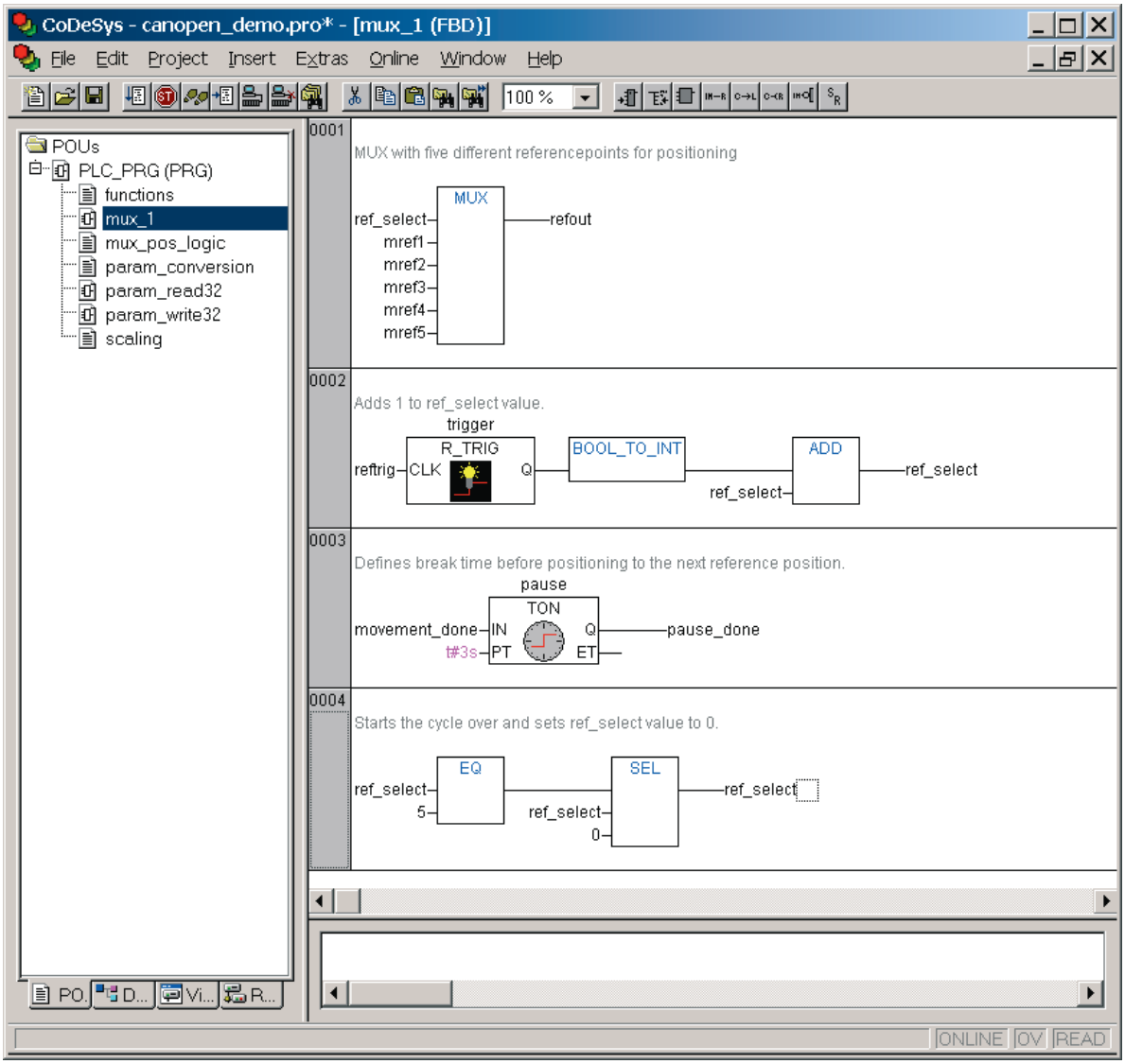
Tool/Step

Introduction to the actions

Actions ‘mux_1’ and ‘mux_pos_logic’ define logic for endless loop positioning between five different positions.

mux_1:

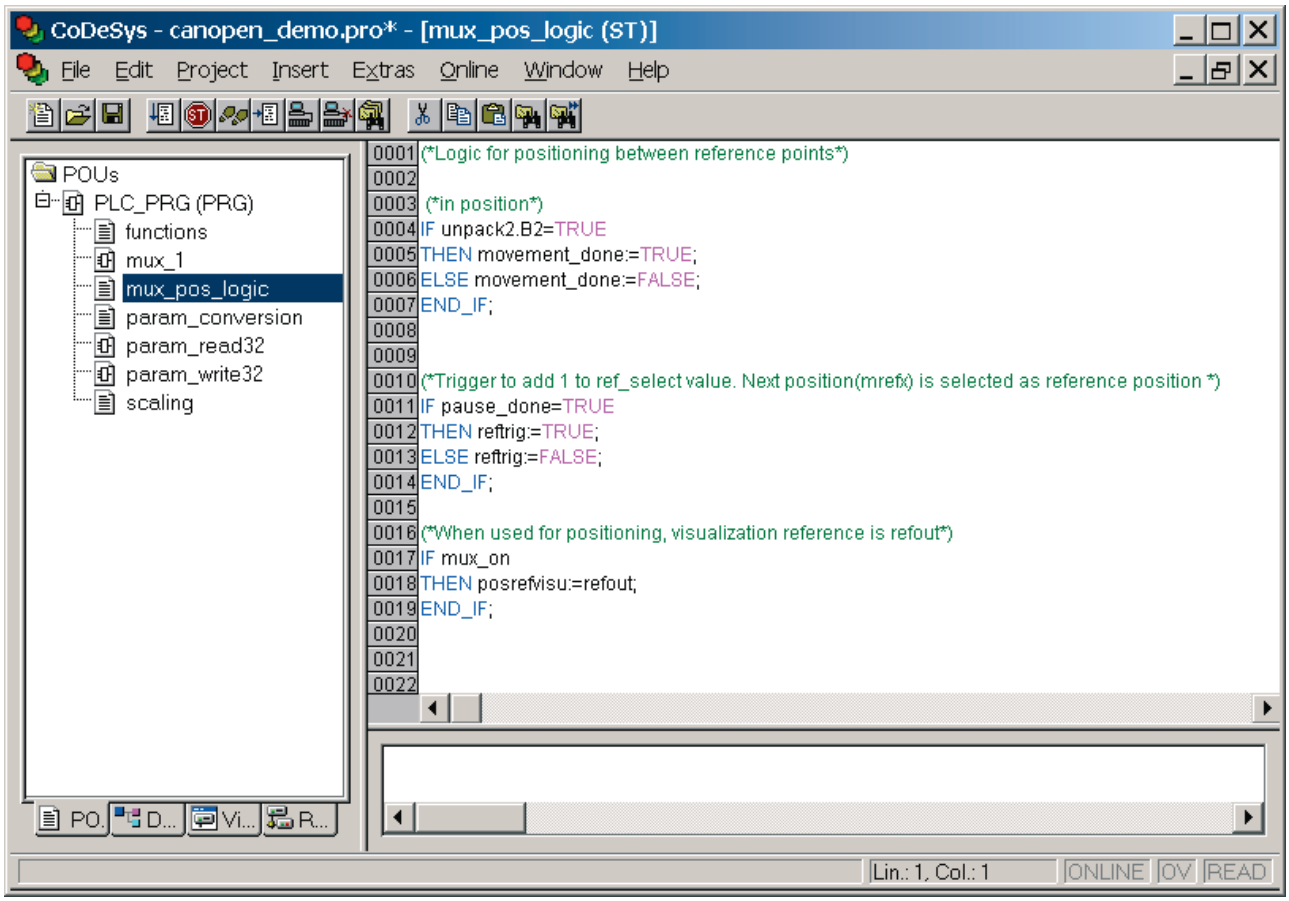
- Row 1: Defines which reference is to be used for positioning.
- Row 2: Selects the next reference position after pause is done by adding one to ref_select variable value. For more information, check reftrig at mux_pos_logic on the next page.
- Row 3: Defines the pause length between position references. Active when the target position is reached (unpack.B2 = TRUE, which stands for Status word; target_reached). For more information, see mux_pos_logic.
- Row 4: Sets ref_select to 0 after the last reference (mref5) is reached. The cycle starts again.



Tool/Step

Introduction to the actions

mux_pos_logic:

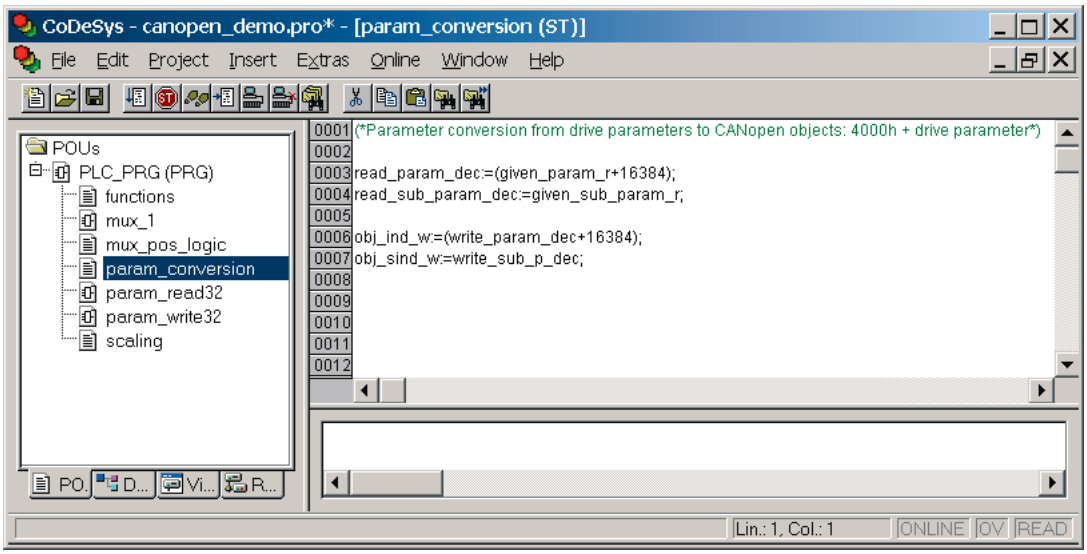


Tool/Step

Introduction to the actions

param_conversion

Action ‘param_conversion’ converts a given drive parameter value to a CANopen object. The mapped object for a drive parameter is 4000h + drive parameter (Hex), which corresponds to 16384 + drive parameter (Dec).



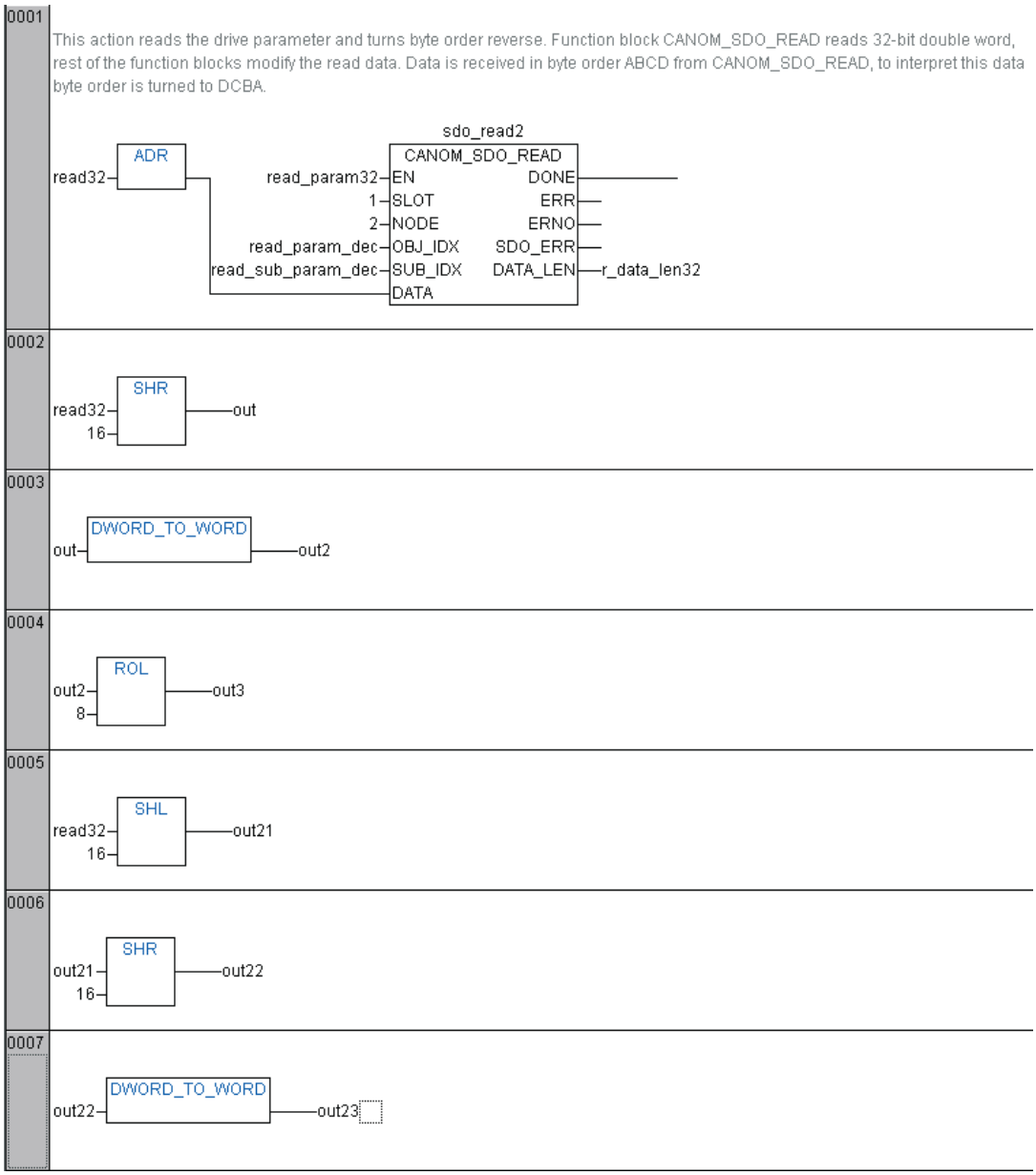
Tool/Step

Introduction to the actions

param_read32

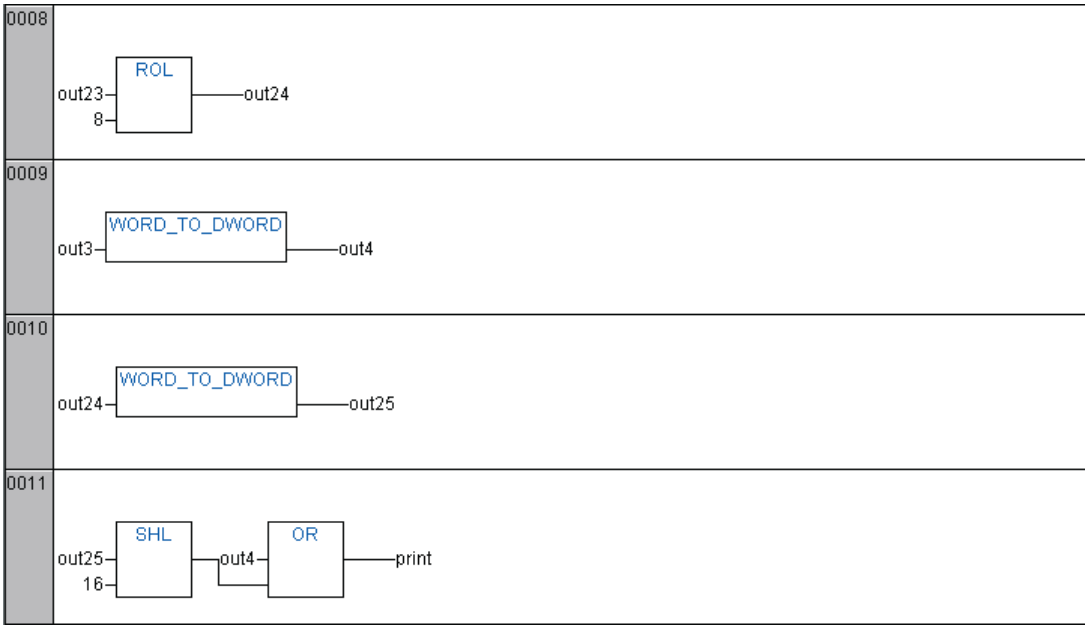
Action ‘param_read32’ reads the drive parameter and reverses the byte order. The byte order is reversed to interpret parameter values properly.

On row 1, function block CANOM_SDO_READ reads 32-bit double word; on rows 2-11 the function blocks modify the data read. The data is received in byte order ABCD from function block CANOM_SDO_READ. To interpret this data properly, the byte order is reversed as DCBA. (One letter stands for one 8-bit byte. Thus, the total length is 32 bits.)



Tool/Step

Introduction to the actions

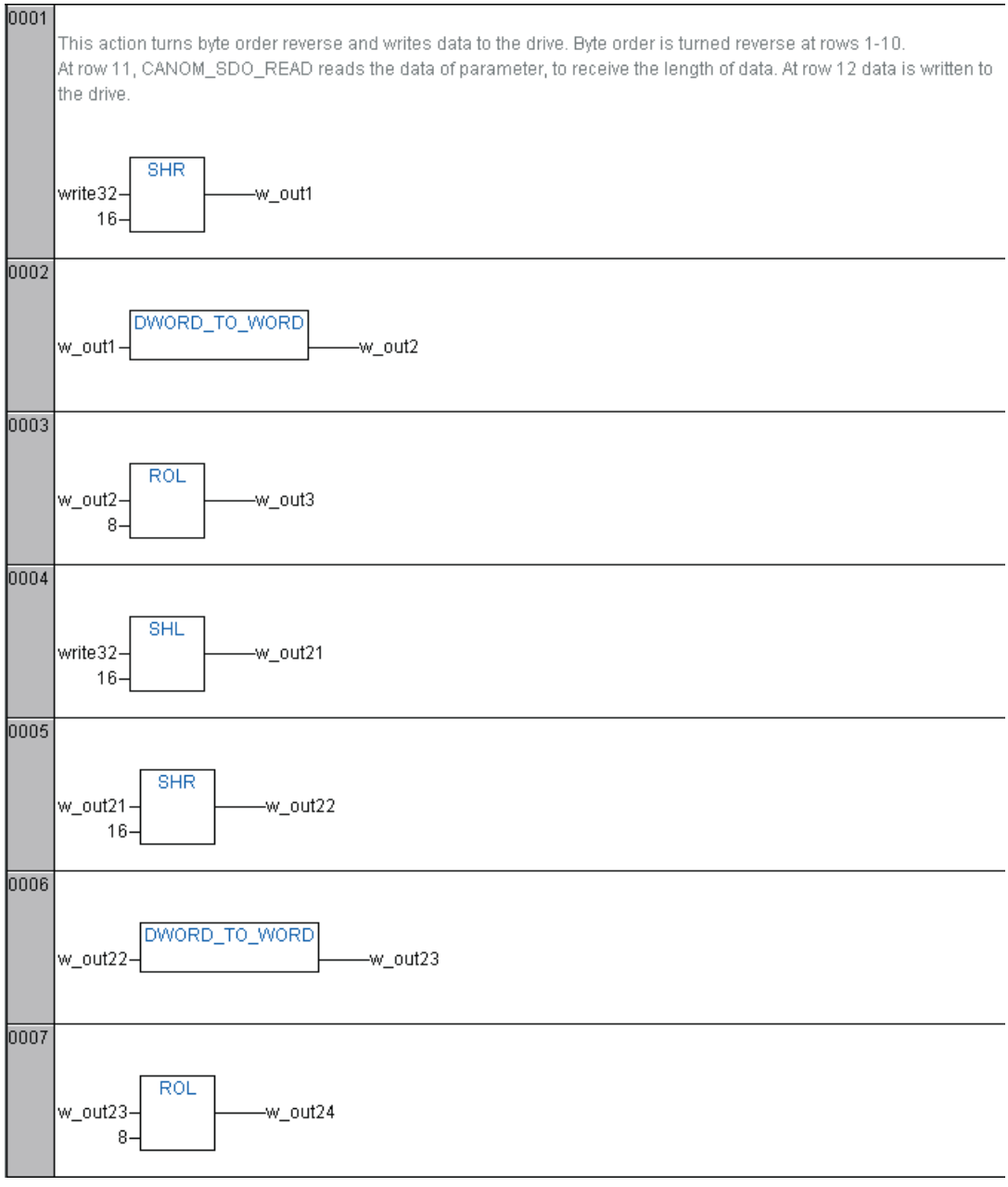


Tool/Step

Introduction to the actions

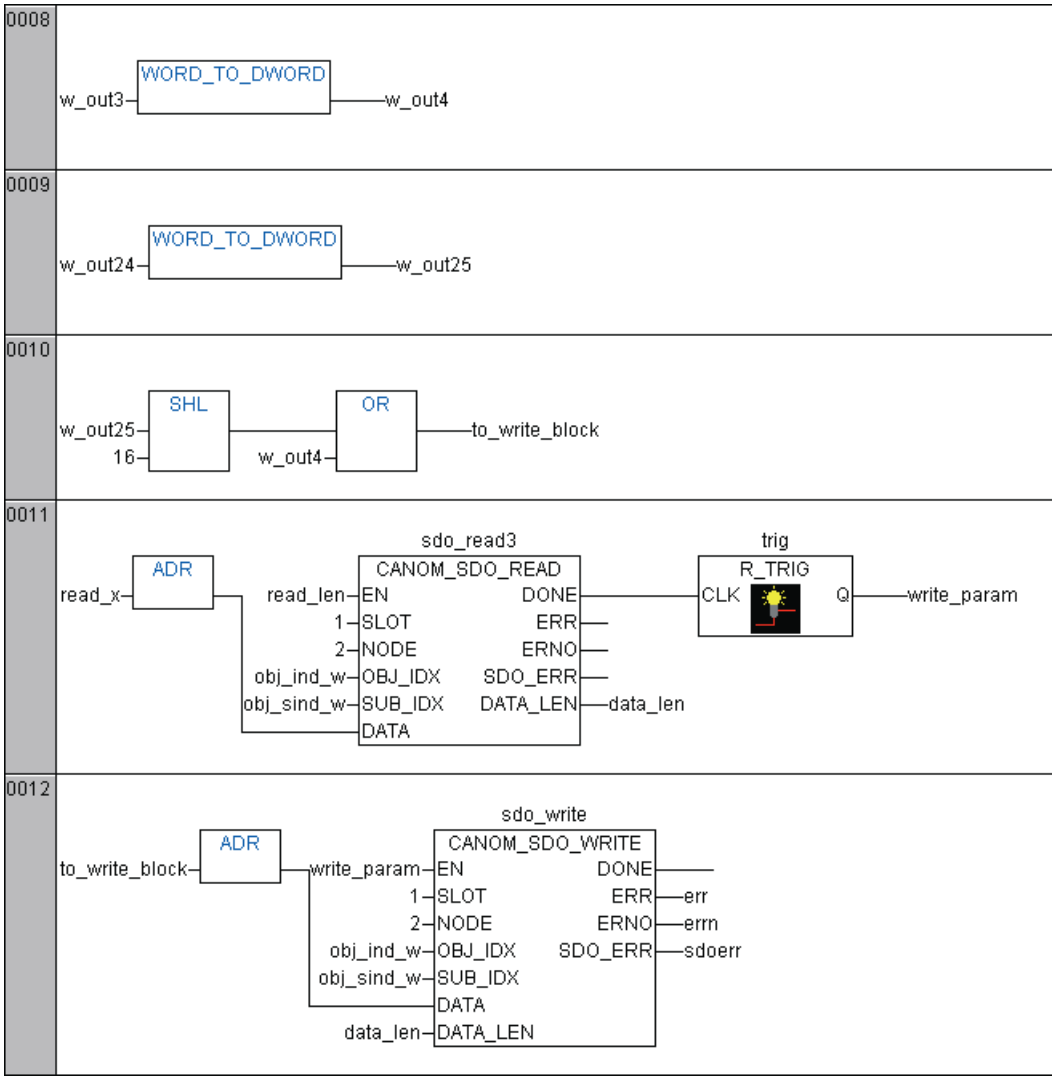
param_write32

Action ‘param_write32’ reverses the byte order and writes data to the drive. The byte order is reversed on rows 1-10. On row 11, CANOM_SDO_READ reads the data of the parameter to receive the length of the data. On row 12, the data is written to the drive.



Tool/Step

Introduction to the actions

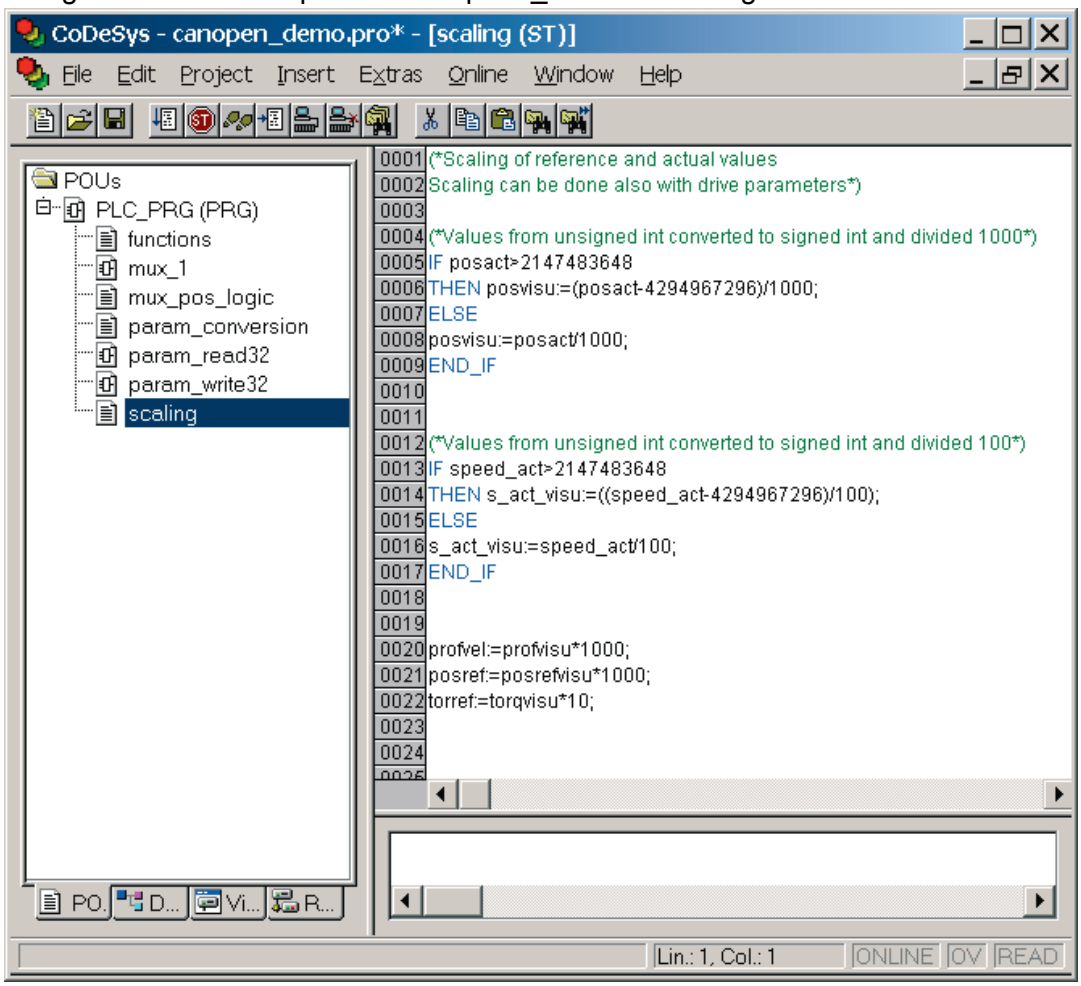


Tool/Step

Introduction to the actions

scaling

Action ‘scaling’ scales reference and actual values. This action also converts unsigned int variables posact and speed_act values to signed int.



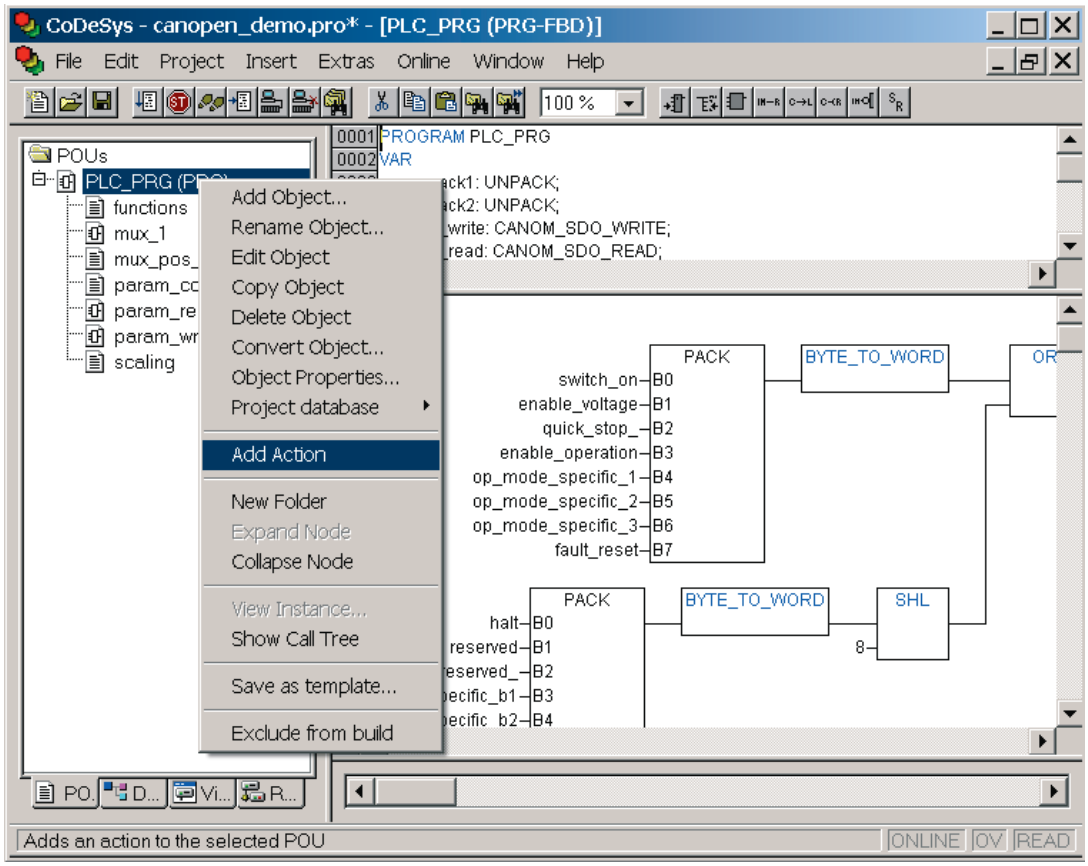
Tool/Step

Introduction to the actions

CoDeSys

How to create actions

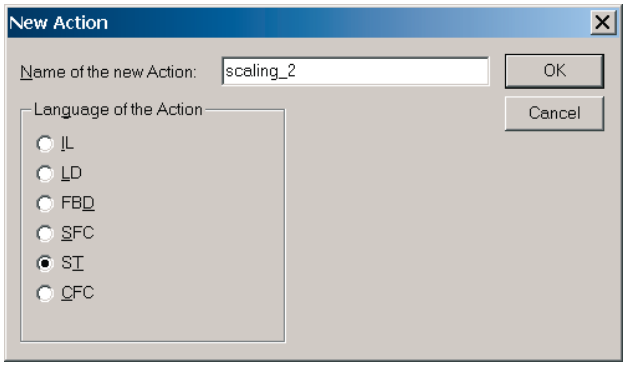
1. In the **POUs** field, right-click PLC_PROG(PRG) and select **Add Action**.



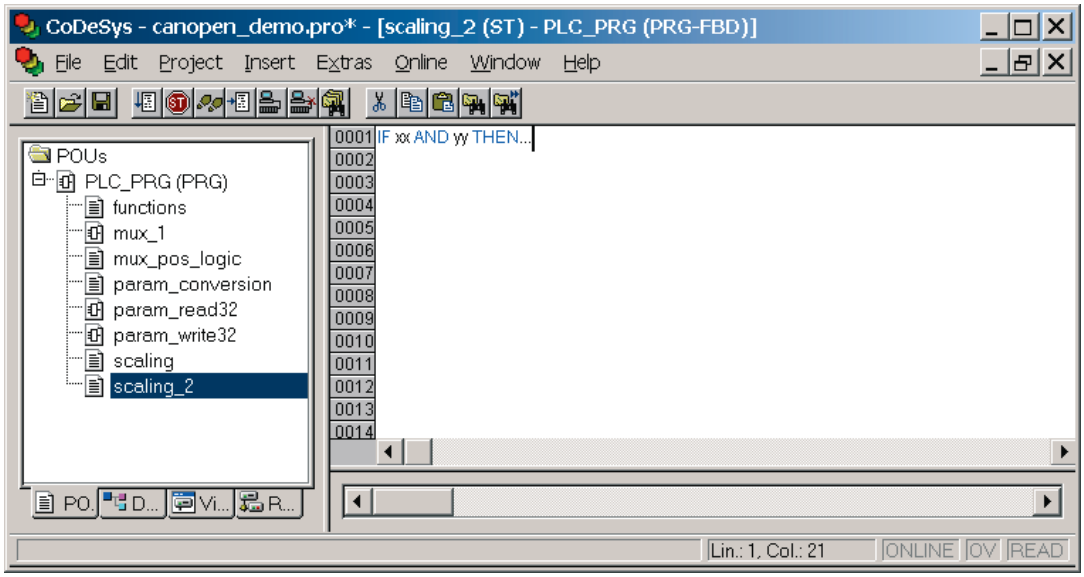
Tool/Step

Introduction to the actions

2. Name the action and select the programming language. Click **OK**.
   - IL: Instruction list
   - LD: Ladder diagram
   - FBD: Function block diagram
   - SFC: Sequential function chart
   - ST: Structured text
   - CFC: Continuous function chart



3. -> An empty programmable space appears.



Tool/Step

Introduction to the visualizations

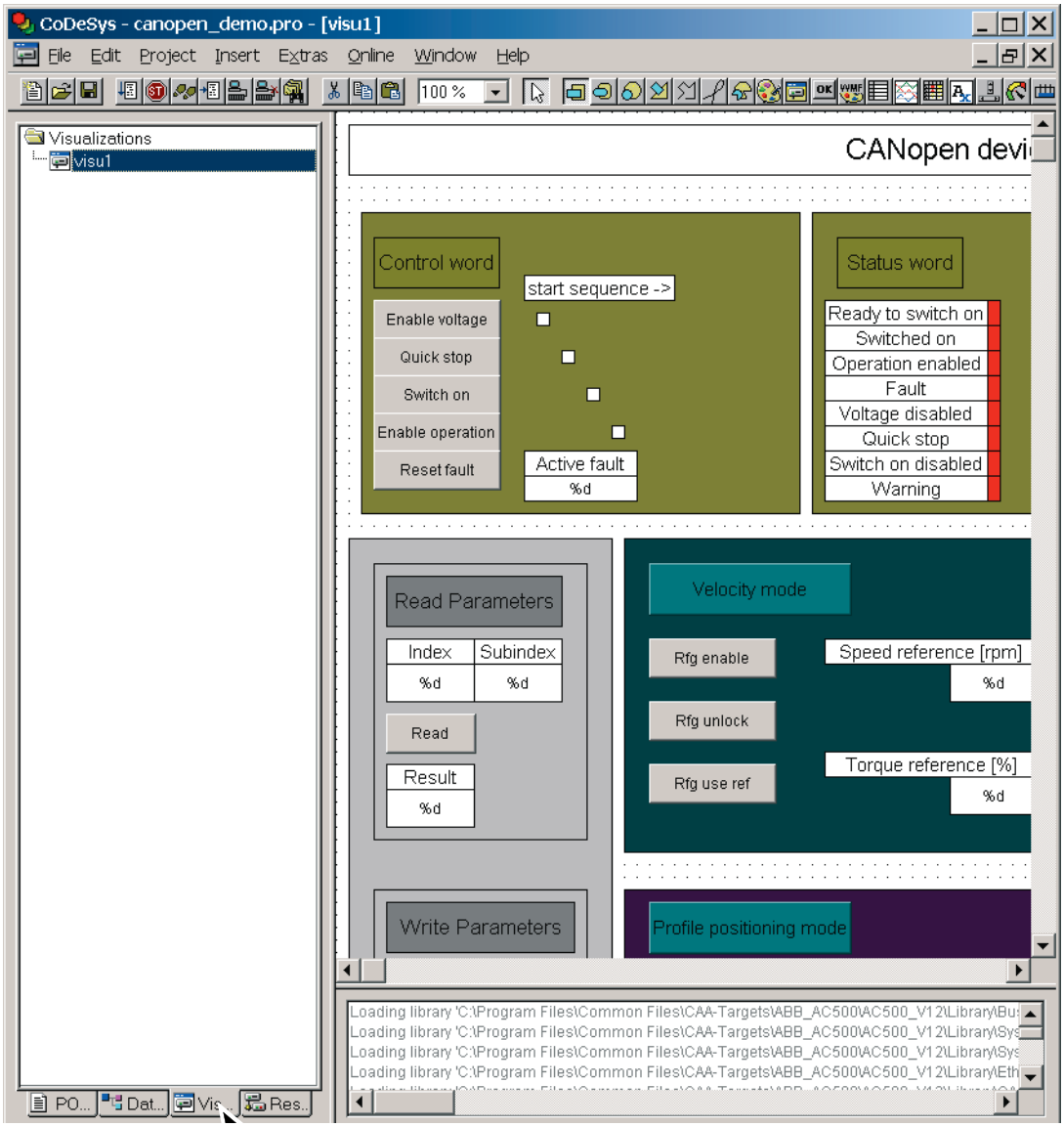
This section presents visualizations. Visualizations are the user interfaces for the PLC program: buttons, switches and indicators for measuring, viewing and controlling the movement.

This section also contains the following brief instructions, in case you want to modify the ready-made project canopen_demo.pro:

- *How to create an empty visualization field*
- *How to create and configure buttons*
- *How to create indicators*.

Visualizations are located under the **Visualization** tab, as shown below.

CoDeSys

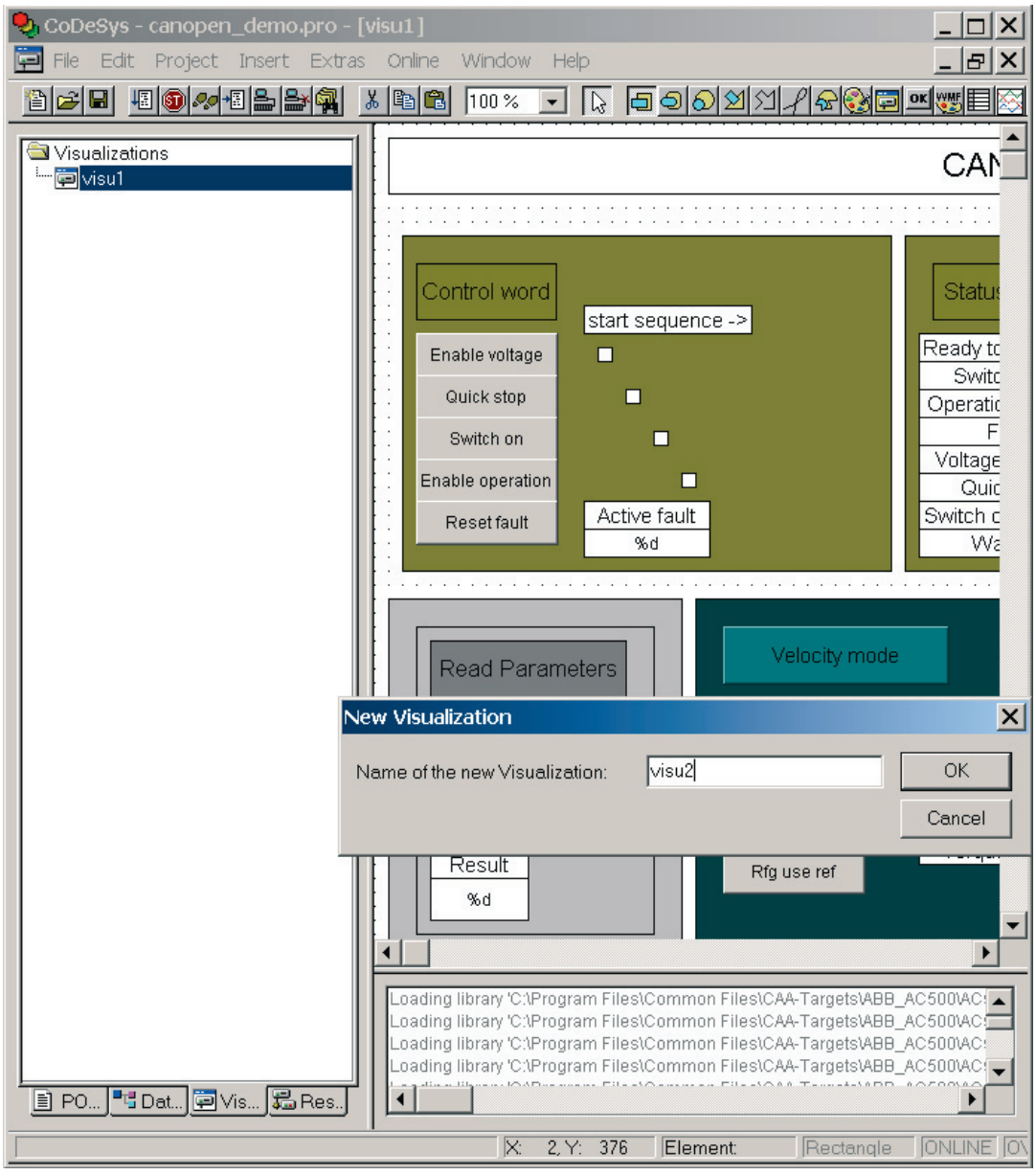


Tool/Step

Introduction to the visualizations

How to create an empty visualization field

Click the **Visualization** tab. Right-click the Visualizations folder. From the menu opening, select **Add Object…**. Name the new visualization and click **OK**.
-> A platform for the new visualization is created.

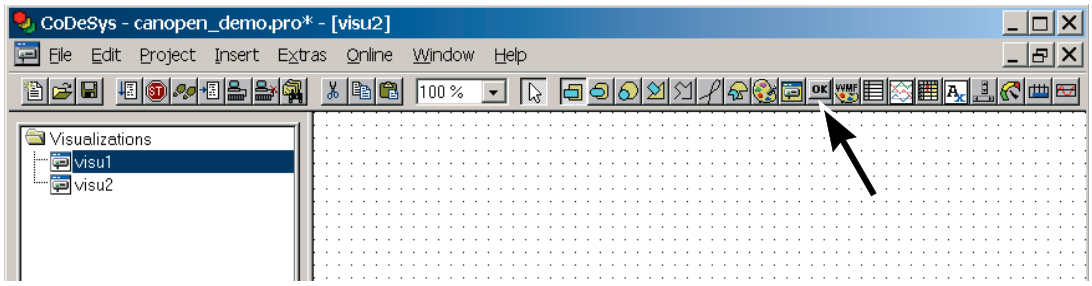


Tool/Step

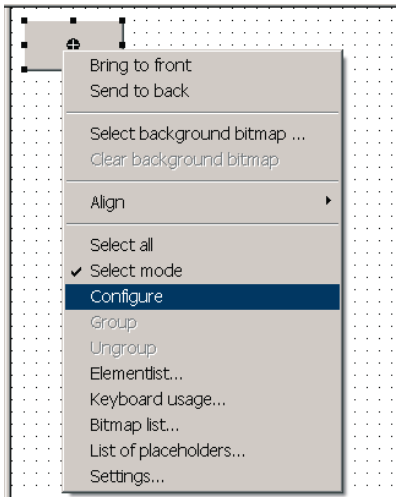
Introduction to the visualizations

How to create and configure buttons

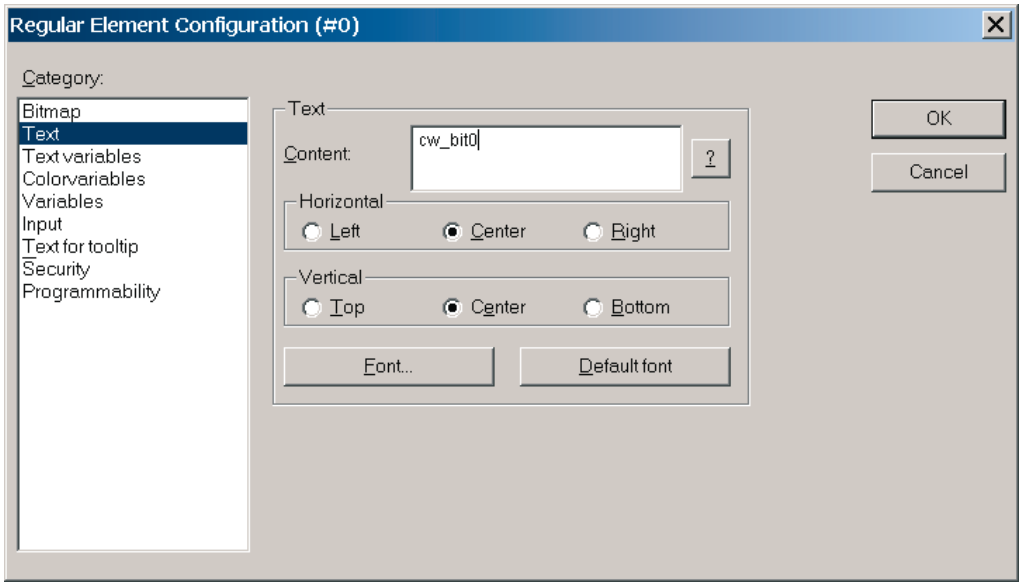
1. Create buttons for the switches needed. In the upper tool bar, click the **OK** button and, with the cursor, drag a rectangle in the visualization field.



2. Configure the button as follows. Right-click the button. From the menu opening, select **Configure**.

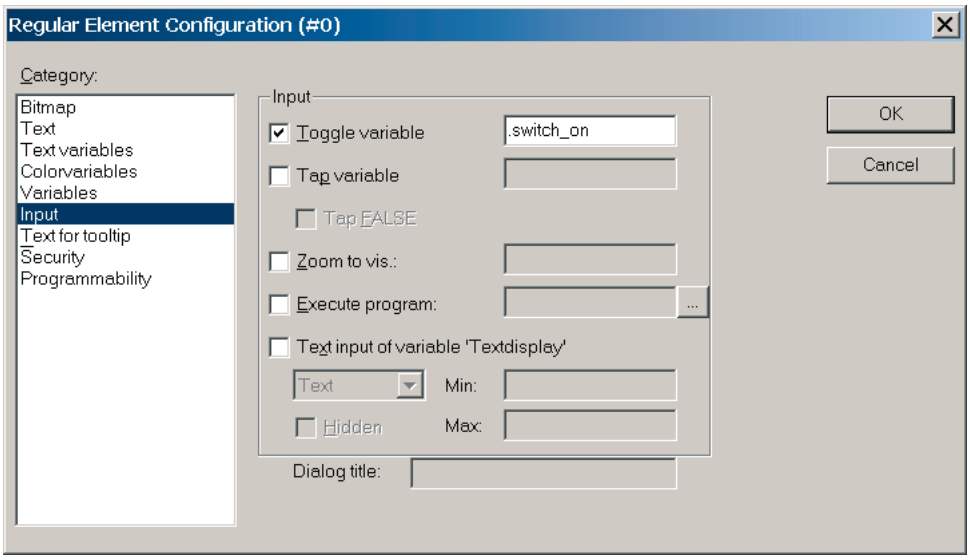


3. In the **Category:** dialog box, select **Text**. To the **Text Content:** dialog box, write a name for the button.



4. In the **Category:** dialog box, select **Input**. Under Input, tick Toggle variable or Tap variable and write the name of the input to the dialog box. Click **OK**.

   Note: When defining inputs, you can use the Input assistant. Click on Toggle variable field and press **F2**.



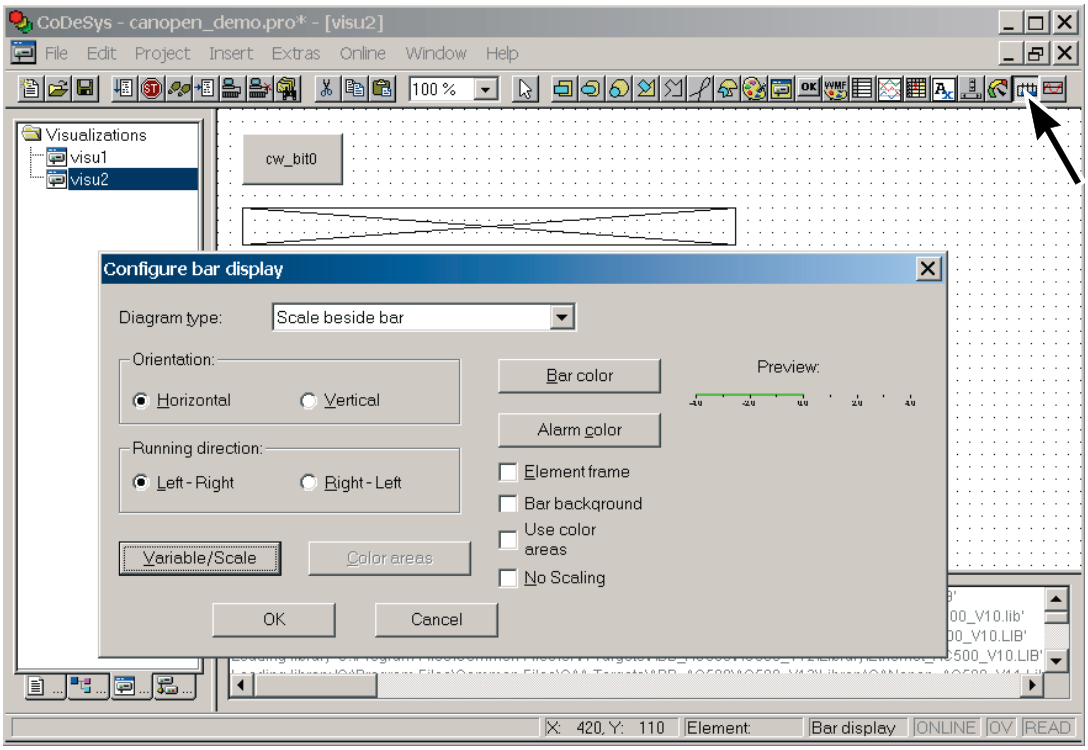
Now, you have created a button with which you can switch the value of a global variable (in this case, switch_on) between TRUE and FALSE.

Tool/Step

Introduction to the visualizations

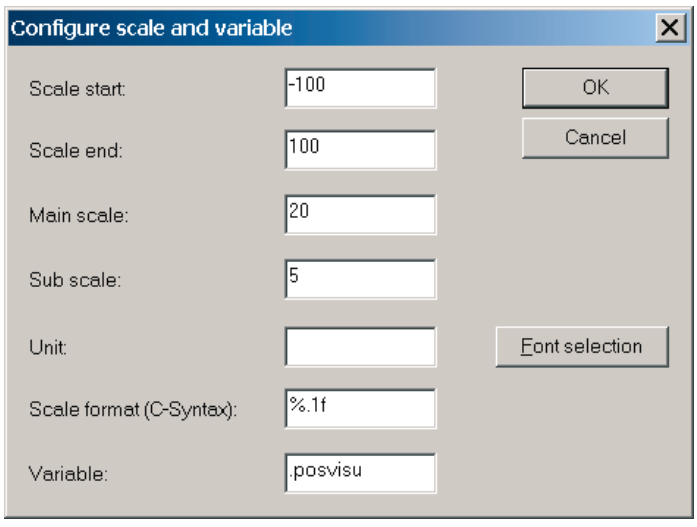
How to create indicators

1. A bar display indicator is created as follows. In the upper tool bar, click the Bar display button and, with the cursor, drag a bar in the visualization field. -> Configure bar display dialog box opens. Click the **Varible/Scale** button.



2. Set the scale. Write the name of the indicated variable (in this case, posvisu) in the **Variable:** box. Click **OK** and **OK**. -> The indicator has been created.

   Note: When defining inputs, you can use the Input assistant. Click on Toggle variable field and press **F2**.



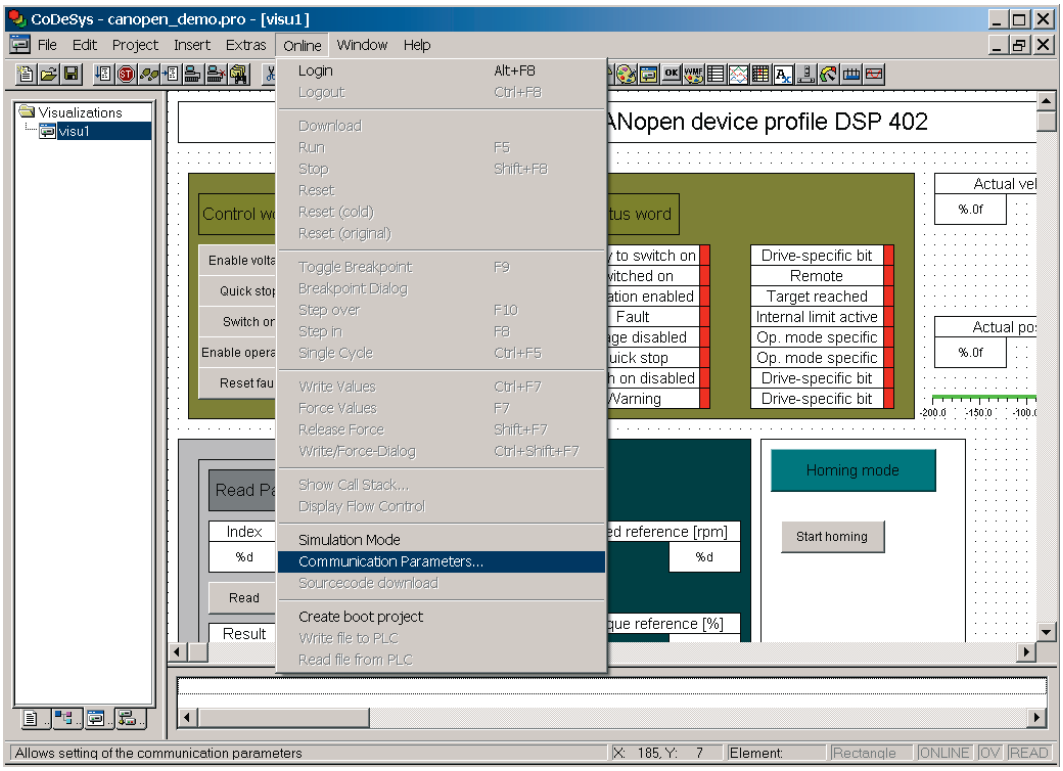
Tool/Step	Running and testing the program
CoDeSys	This section first instructs you how to download the complete program to the PLC. Thereafter, you are instructed to run the program and test it. These instructions cover the features of project canopen_demo.pro. At the end of the section, there are also brief instructions on performing online monitoring while running the program. **Note:** If you have skipped section *Setting up the communication* on page *67*, see page *100* and download the communications settings to the AC500 PLC with the SYCON.net tool.

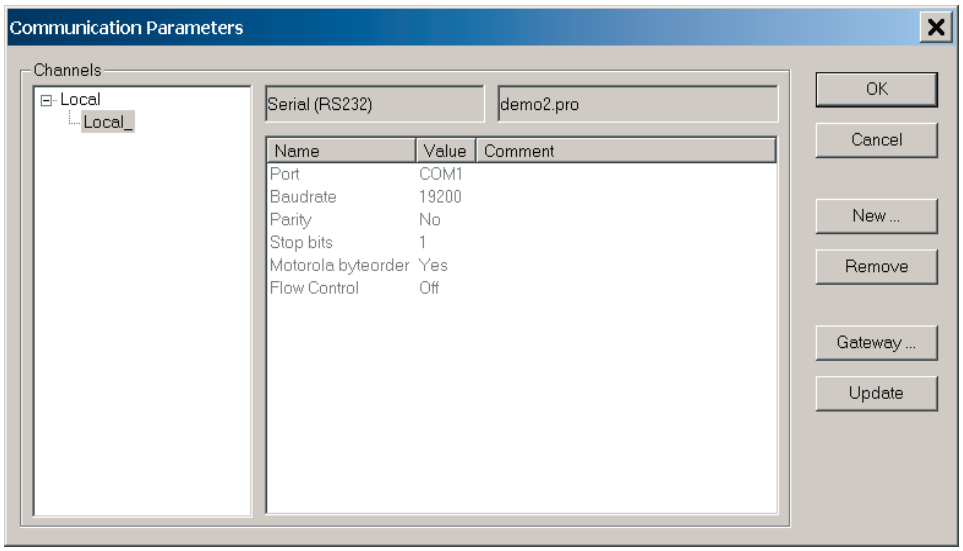
Tool/Step

Running and testing the program

How to load the program to the controller

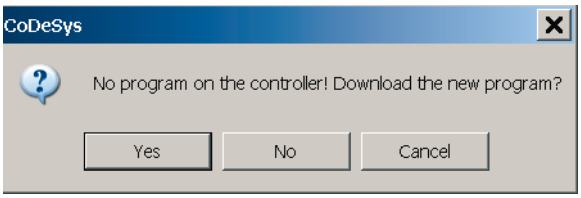
1. From the **Online** menu, select **Communication Parameters…**. Check that the communication parameters correspond to the serial port/ethernet port of your PC (see *Appendix A - How to find out the serial communication parameter values of your PC?*).



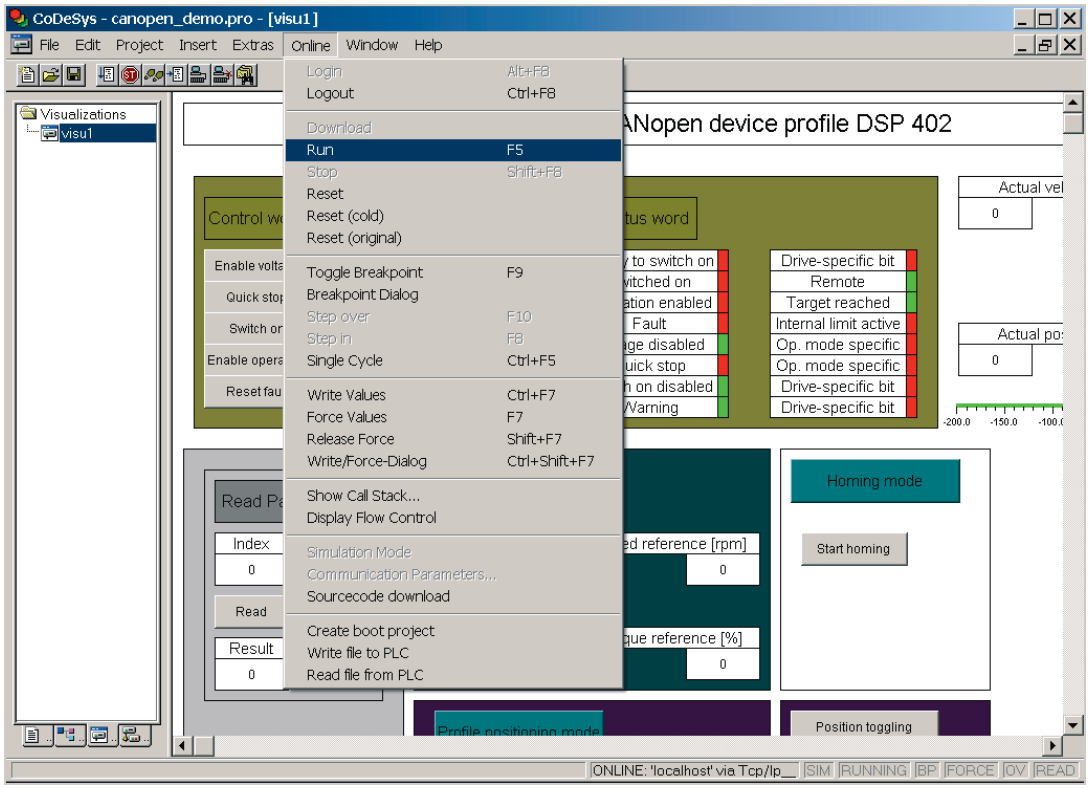


Tool/Step — Running and testing the program

2. From the **Online** menu, select **Login**. The program asks you to download the program to the controller. Click **Yes**.



3. From the **Online** menu, select **Run**. -> Now, the program is running and you can test the different features.



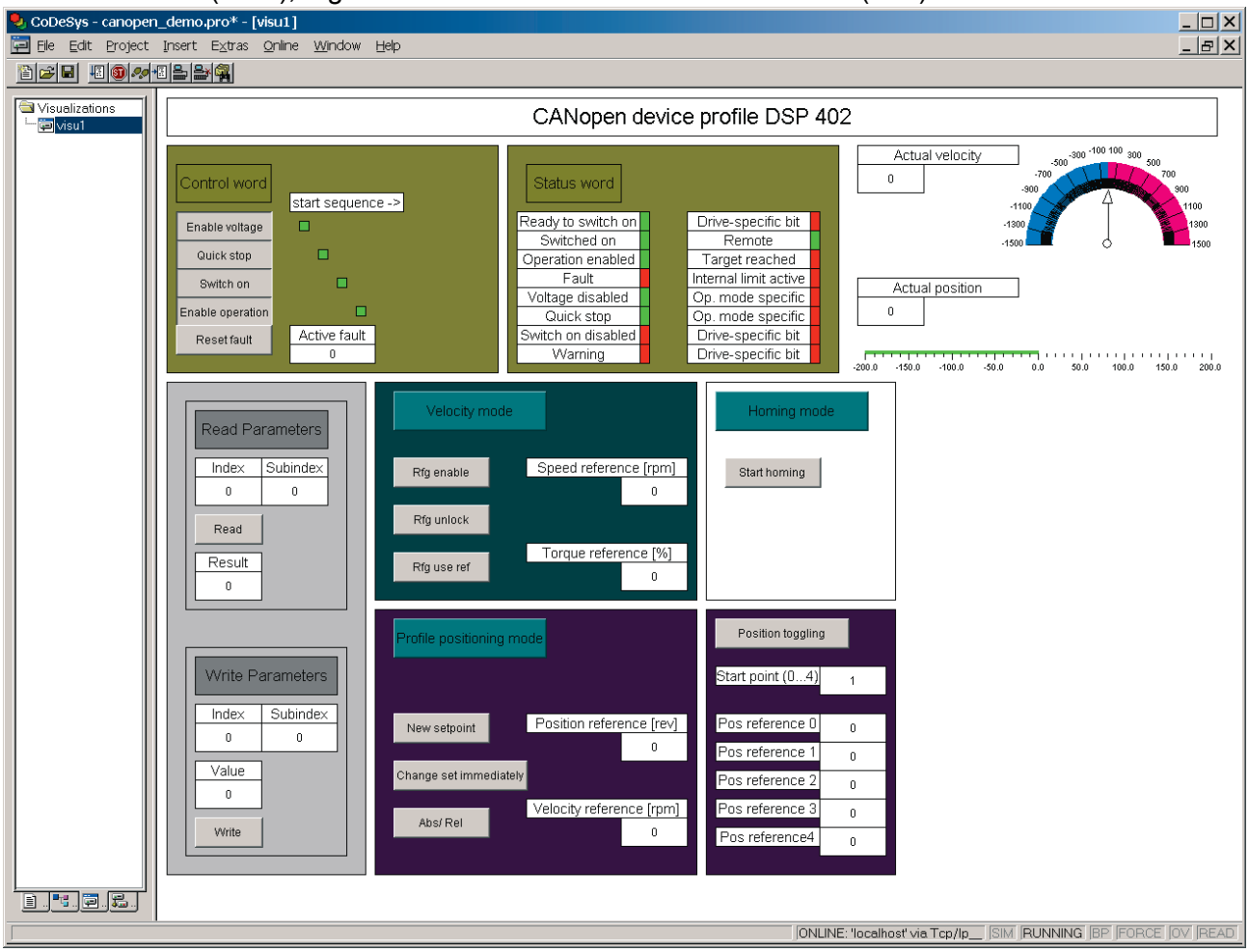
Tool/Step

Running and testing the program

How to test the program

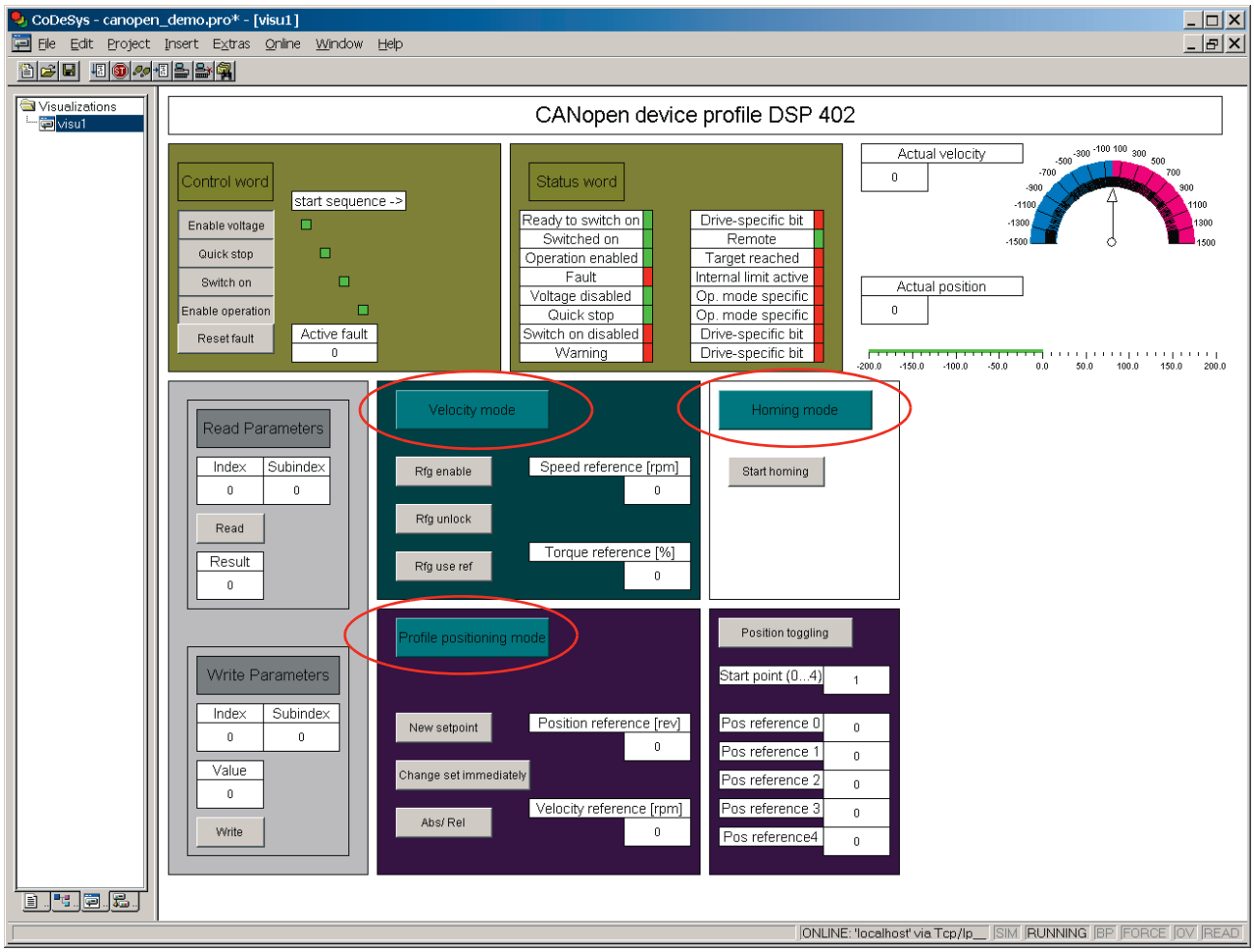
1. Start the drive. First reset any active faults, then turn Control Word bits from 0 to 1 according to the start sequence -> Enable voltage, Quick stop, Switch on, Enable operation. The green box next to the button indicates value 1 (true).

   You can supervise the Status Word: a red box next to the bit name indicates 0 (false); a green box next to the bit name indicates 1 (true).



Tool/Step Running and testing the program

2. Select the movement type by pressing the respective button: Velocity (Speed and Torque) mode, Profile positioning mode or Homing mode. Only one mode can be active at a time.



Tool/Step

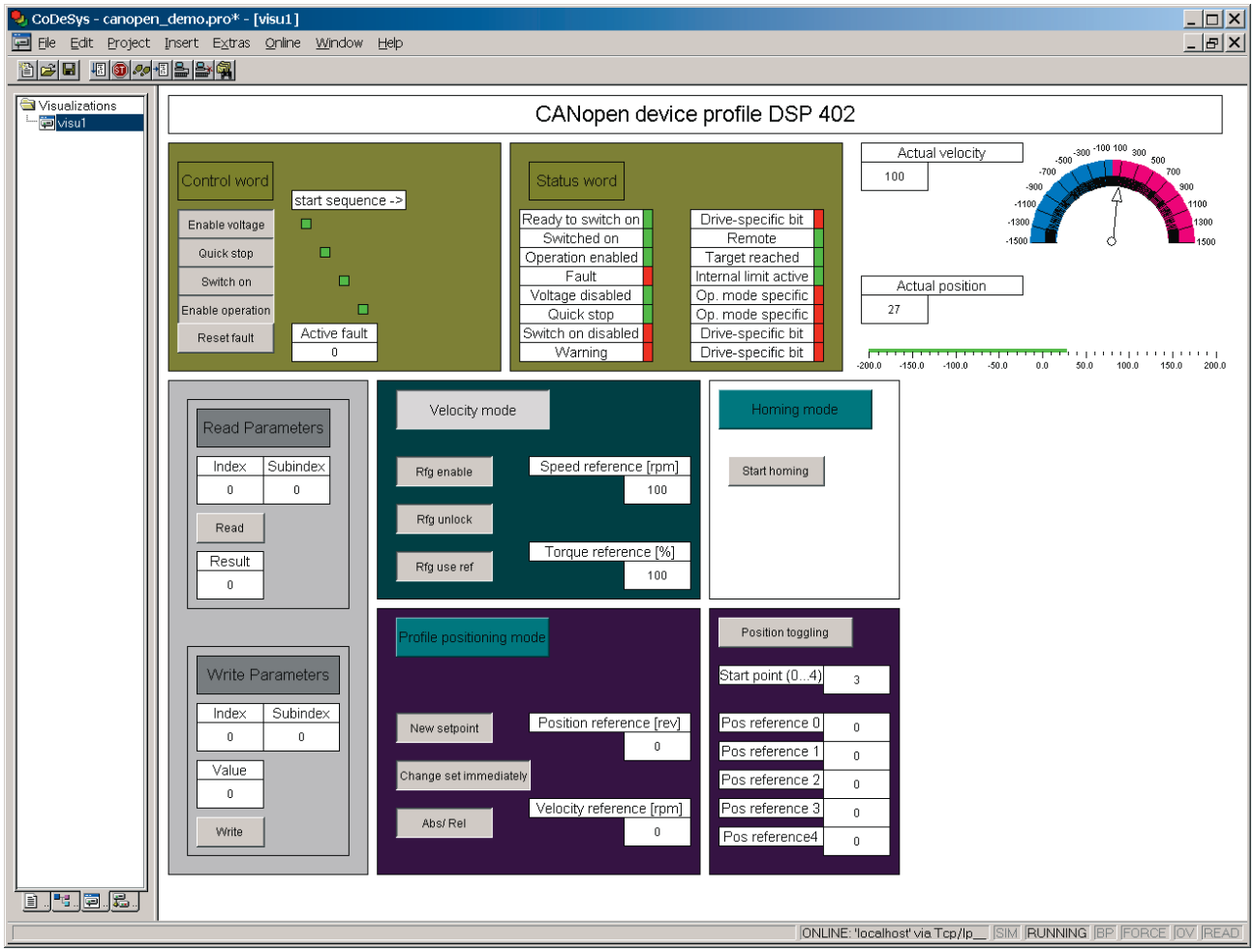
Running and testing the program

Velocity (Speed and Torque) mode

- Select the movement type: Velocity mode (Speed and Torque).
- Enter Speed reference [rpm] and Torque reference [%].
- Set the following bits from value 0 to 1, in this order: Rfg enable, Rfg unlock, Rfg use ref. -> The motor starts running at the reference speed and torque.

You can monitor velocity in the **Actual velocity** field or from the speedometer.

- To lock the current speed, disable bit Rfg unlock by clicking its button.
- To ramp down the speed, disable bit Rfg use ref by clicking its button.



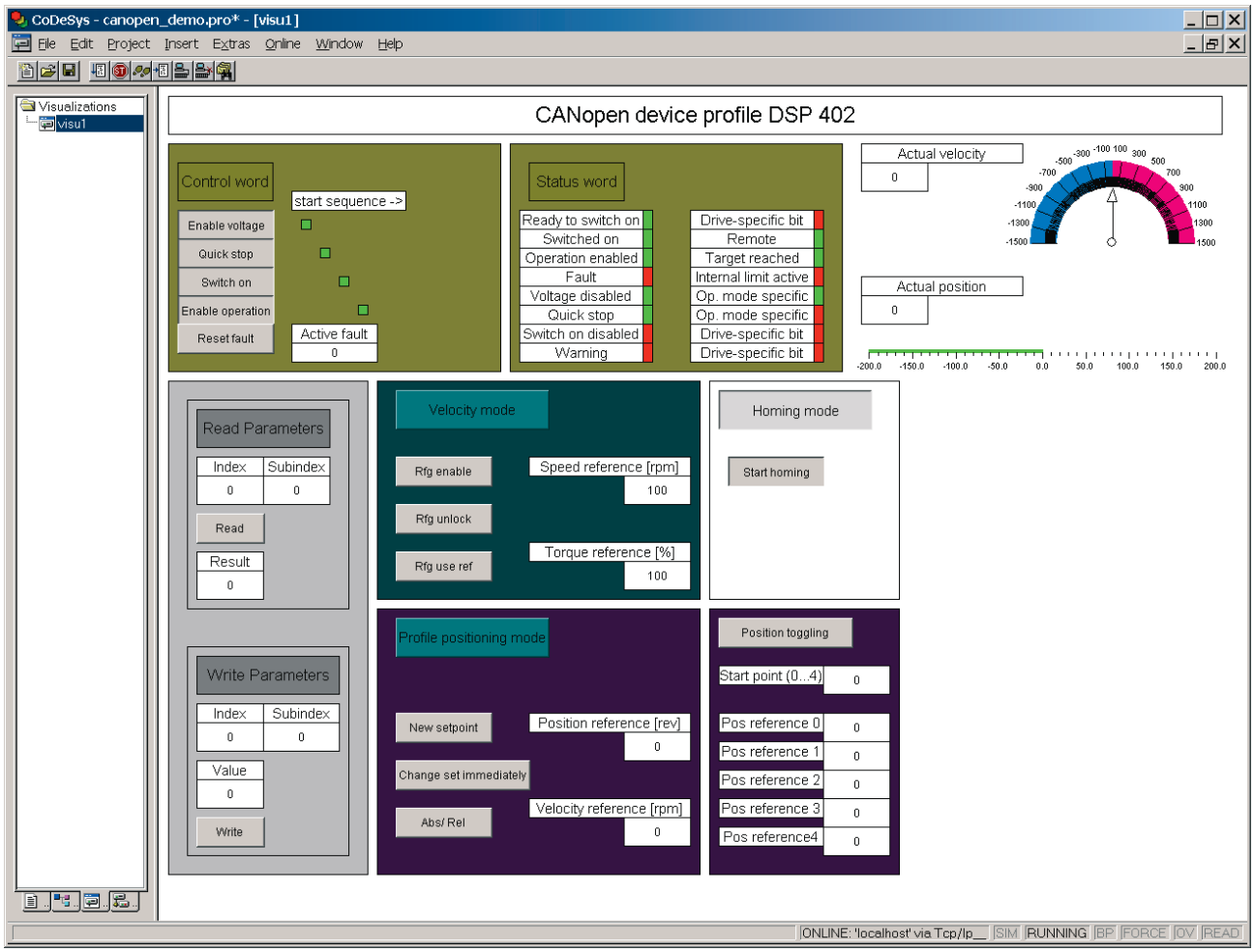
Tool/Step

Running and testing the program

Homing mode

- Select the movement type: Homing mode.
- To start homing, click the **Start homing** button. -> The drive starts a homing sequence according to the drive parameter 62.01 HOMING METHOD.

You can monitor homing in the **Actual velocity** and **Actual position** fields, from the speedometer or from the position indication bar.



Tool/Step

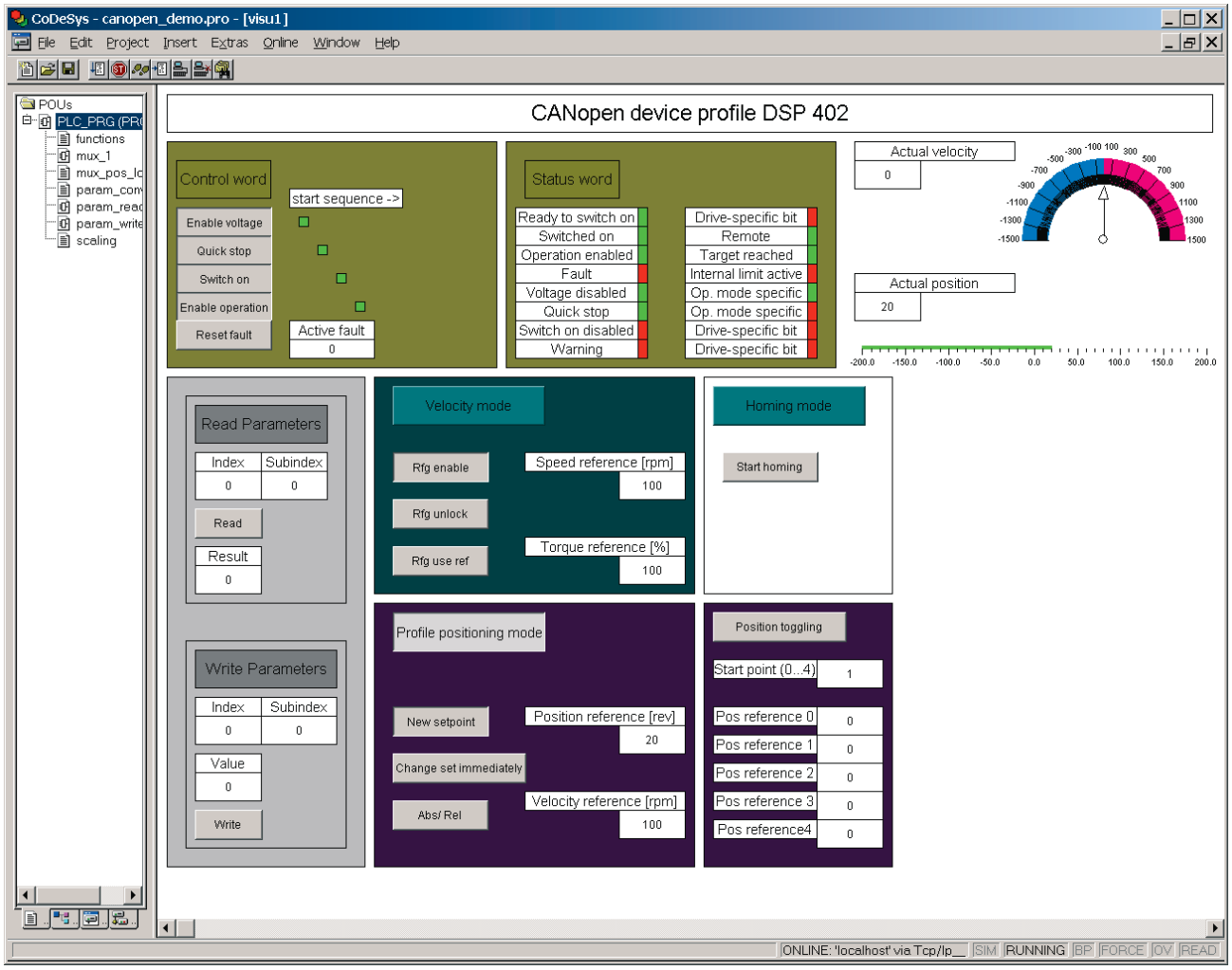
Running and testing the program

Positioning mode

1. • Select the movement type: Profile positioning mode.
   • Enter Position reference [rev] and Velocity reference [rpm].

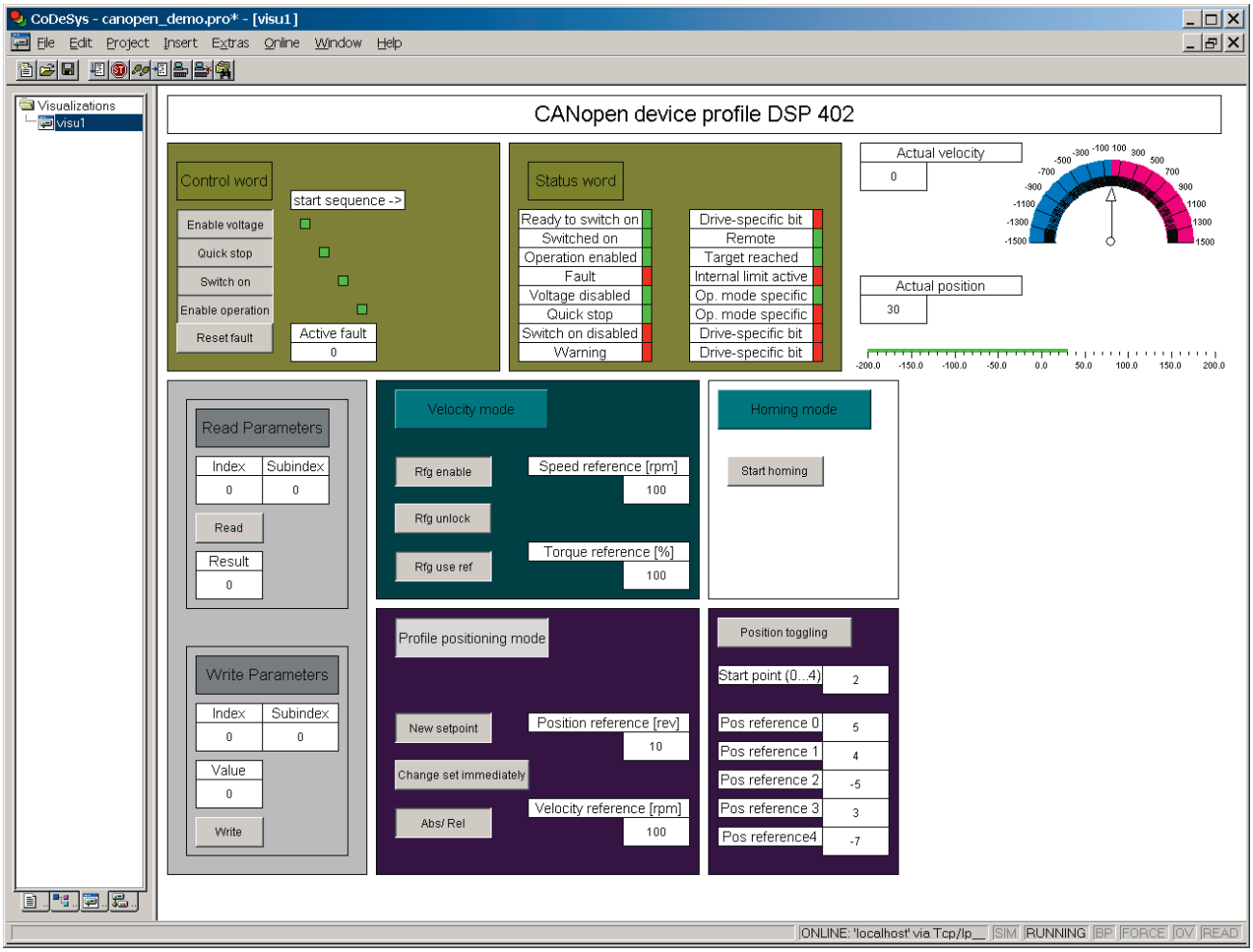
   To perform absolute positioning:

   • **Note:** The **Abs/Rel** button must remain disabled.
   • Set the New setpoint bit to value 1 (true). -> The drive runs to the absolute position reference.



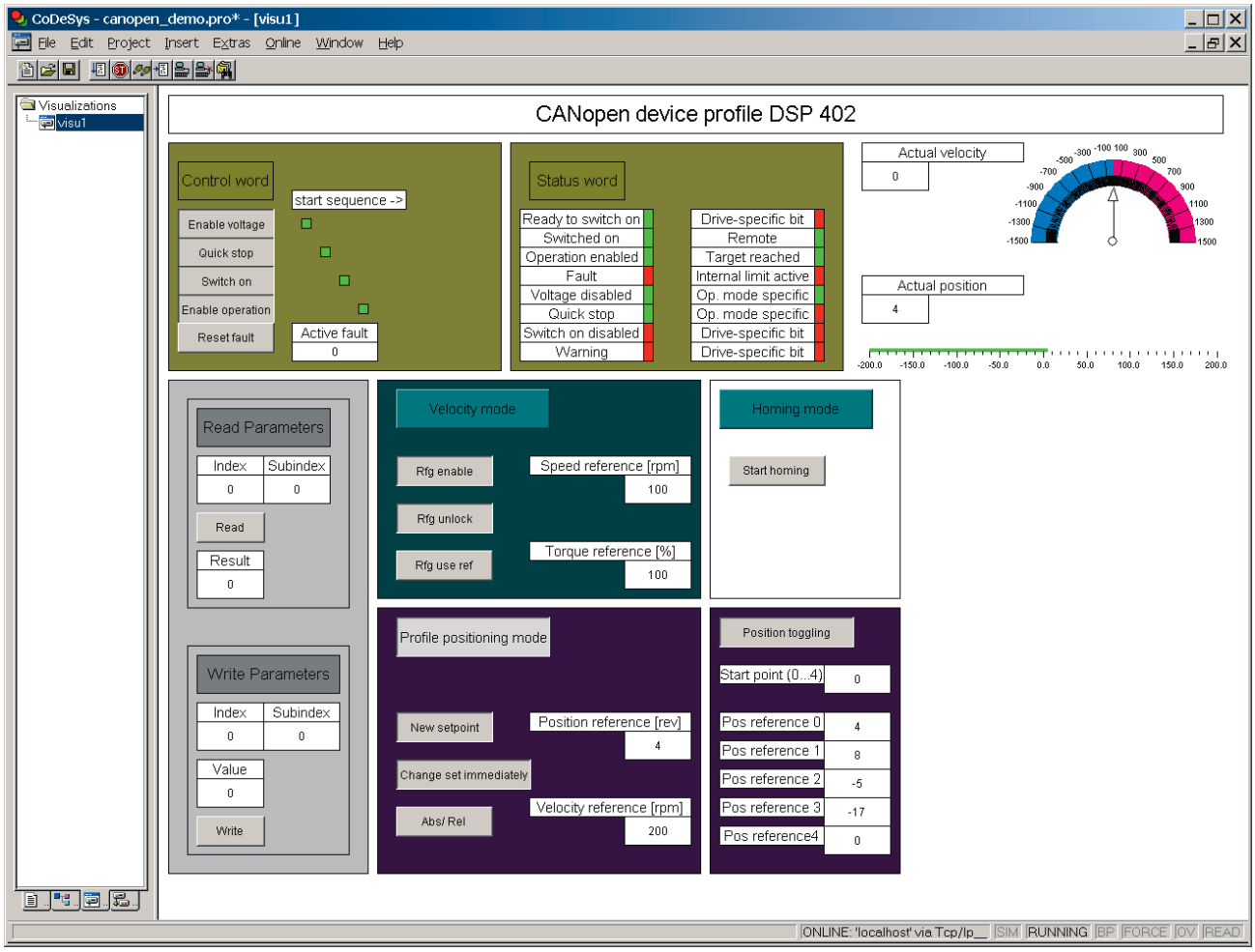
Tool/Step Running and testing the program

2. To perform relative positioning:
   - Enable the Abs/Rel bit by clicking its button.
   - Set the New setpoint bit to value 1 (true). -> The drive runs a relative distance according to the reference.



Tool/Step Running and testing the program

3. To perform position toggling between five different positions:
   - **Note:** The **Abs/Rel** button must remain disabled.
   - Enable the Change set immediately bit.
   - Enable the Position toggling bit.
   - Enter position reference values [rev] to table; Pos reference 0, Pos reference 1...
   - Enter start point; pointer to the first position reference.
   - Enter Velocity reference [rpm].
   - Set the New setpoint bit to value 1 (true). -> The drive starts positioning between five different positions in the order indicated in the table.
   - To stop the positioning sequence, disable the New setpoint bit.



Tool/Step

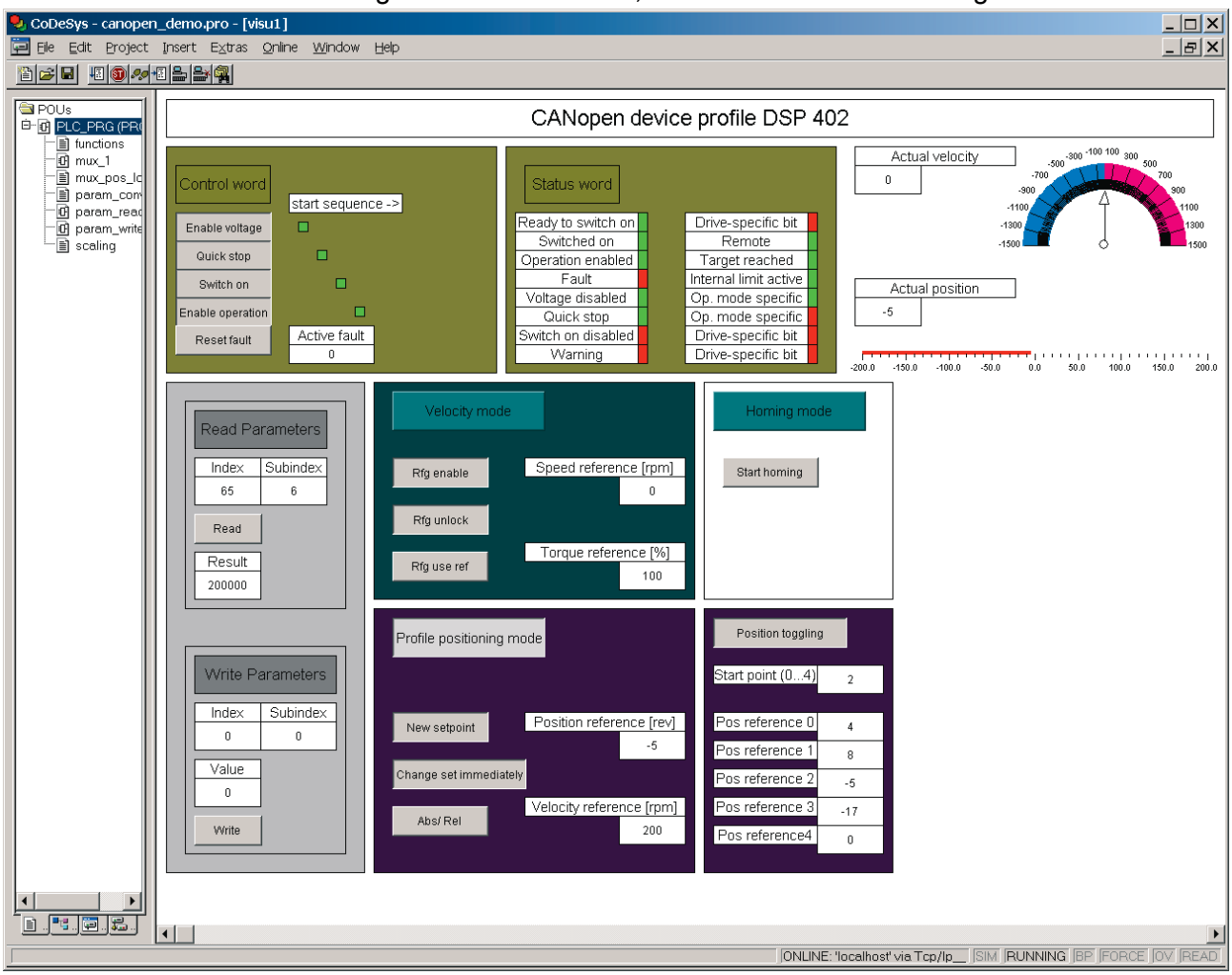
Running and testing the program

How to read and write parameters

1. To read a parameter from the drive, enter the parameter index and subindex values and click the **Read** button. -> The result is returned to the **Result** field.

   In the image below, parameter 65.06 PROF ACC 1 is read.

   Note: Drive parameter value 200.000 is returned as 200000. The Read function does not recognize decimal values; it returns all values as integers.

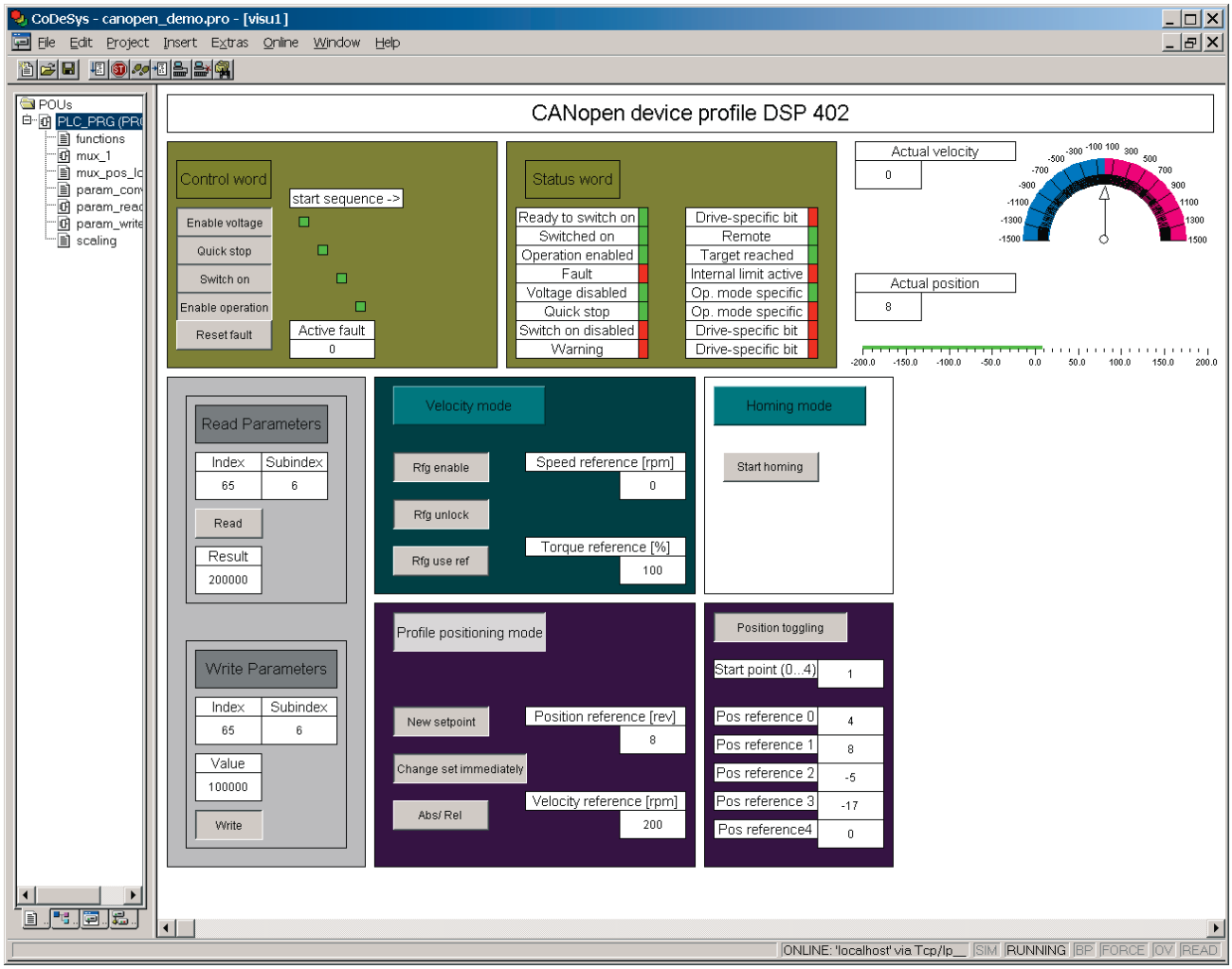


Tool/Step Running and testing the program

2. To write a parameter to the drive, enter the parameter index and subindex values. Then, enter the desired value for the parameter and click the **Write** button.

   In the image below, parameter 65.06 PROF ACC 1 is written.

   Note: Drive parameter value 100.000 is written as 100000. The Write function does not recognize decimal values; all data written is declared as integers.

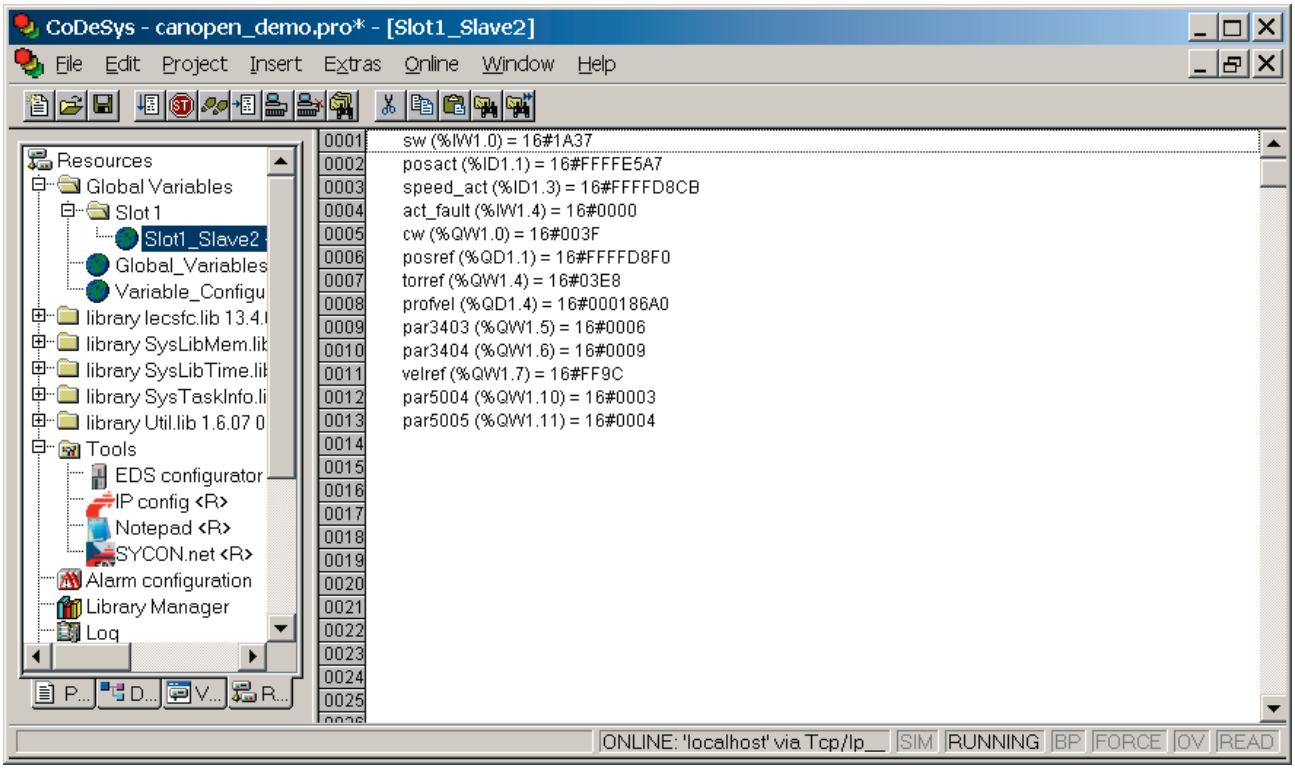


Tool/Step

Running and testing the program

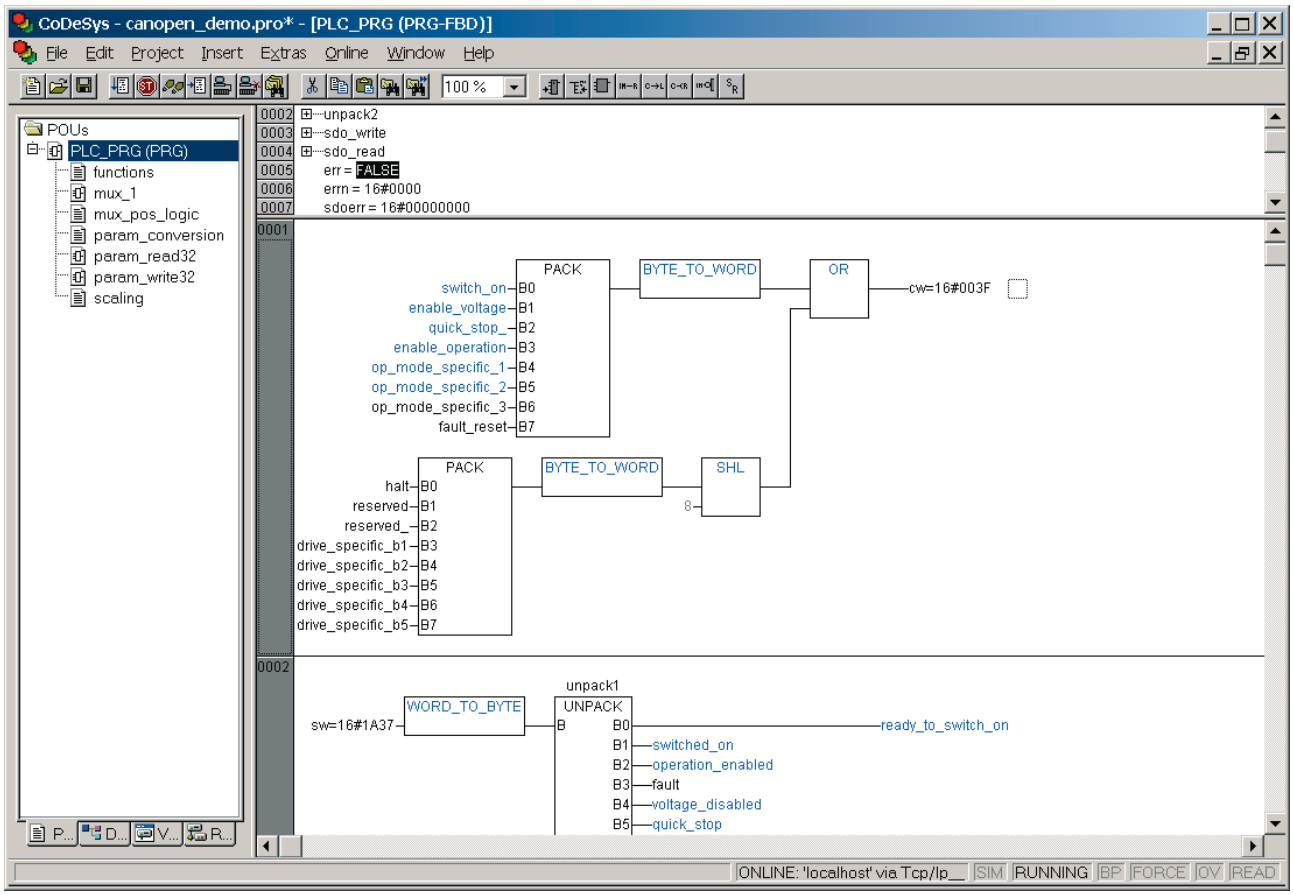
How to perform online monitoring

1. While running the program, you can use CoDeSys for online monitoring. The first image below presents inputs and outputs. The second and third image below present snapshots of the main program and actions while running.

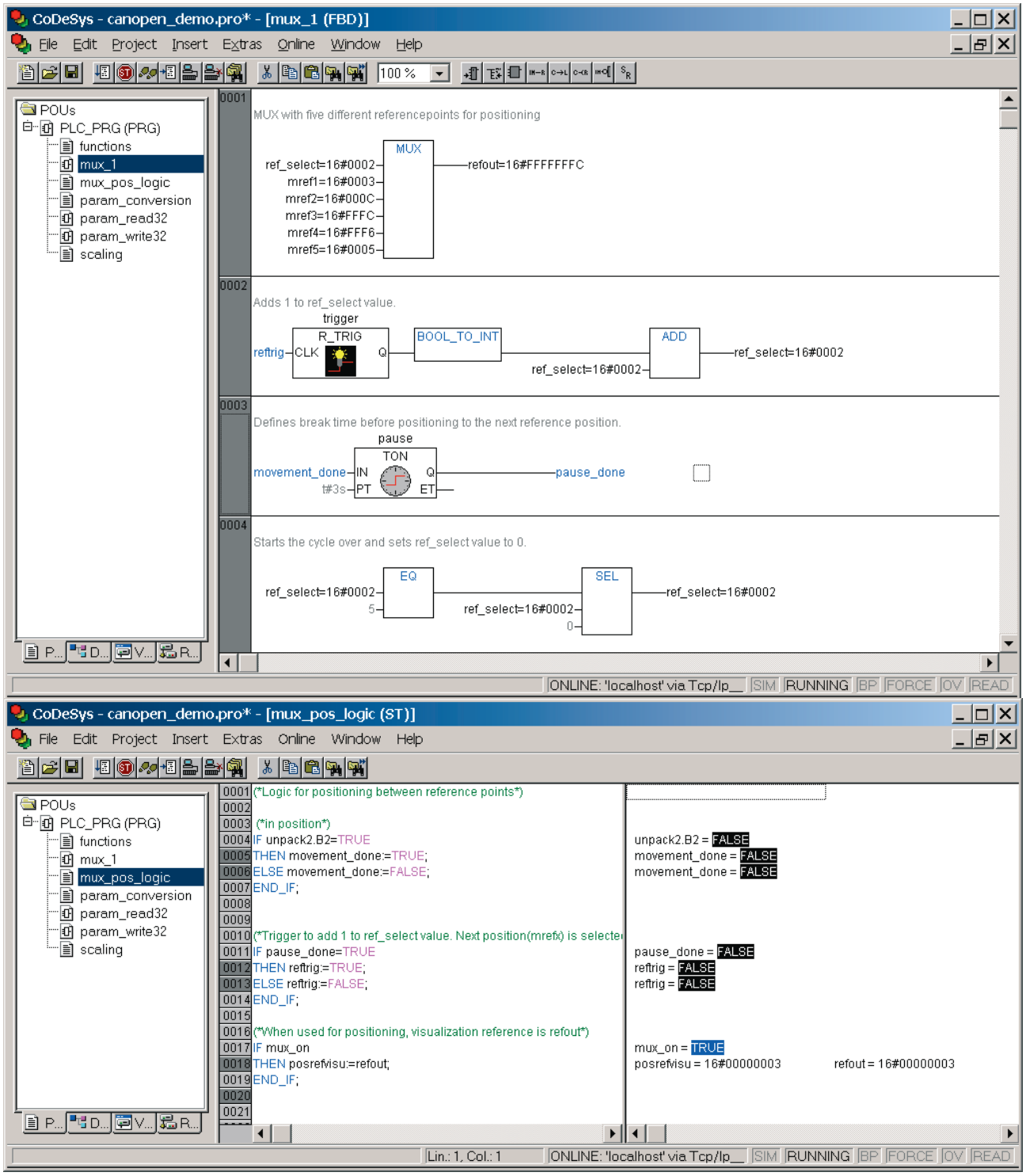


Tool/Step Running and testing the program

2. While monitoring, blue color indicates boolean value TRUE. To force variables, double-click the variable and enter a new value. Press **F7** to execute force.



3. Monitoring view while performing positioning between five different positions:



Appendix A - How to find out the serial communication parameter values of your PC?

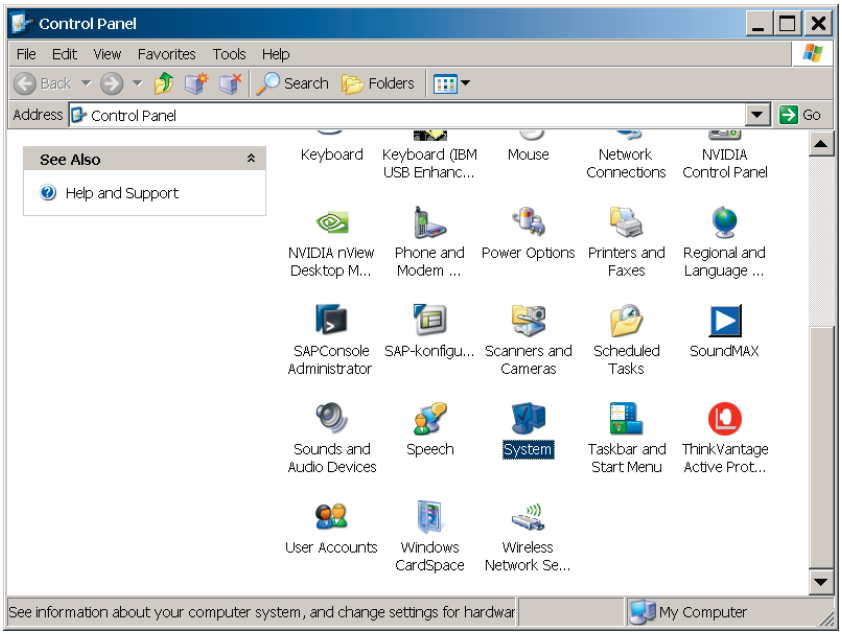
What this chapter contains

This chapter instructs how to find out the serial communication parameter values of your PC.

Tool/Step	How to find out the serial communication parameter values of your PC?

Microsoft Windows

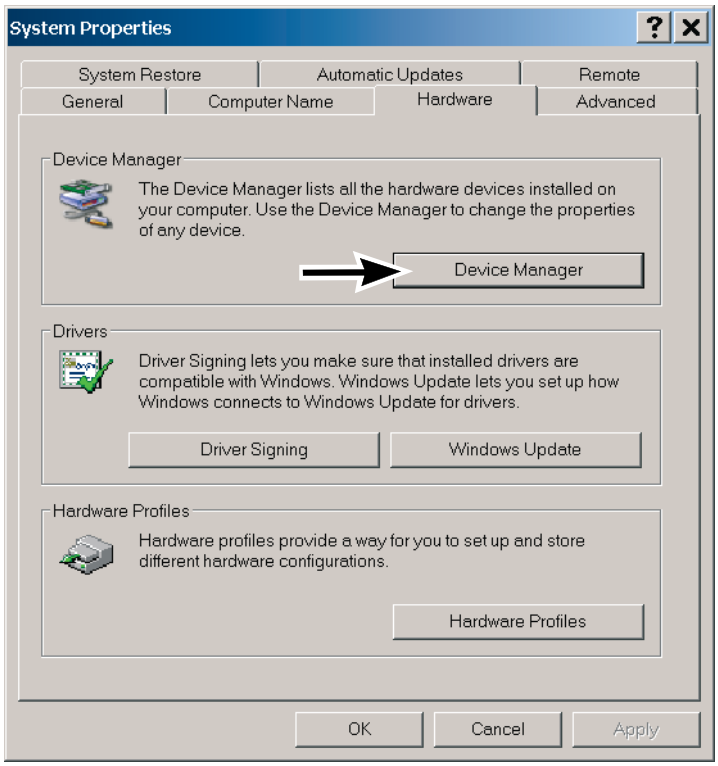
1. Go to Windows Control Panel and click the **System** icon.



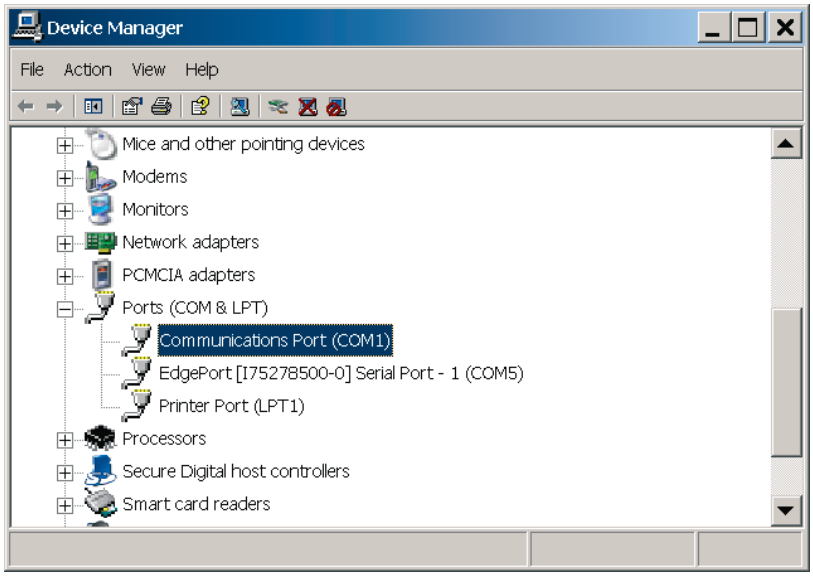
Tool/Step

How to find out the serial communication parameter values of your PC?

2. Click the **Hardware** tab and then the **Device Manager** button.

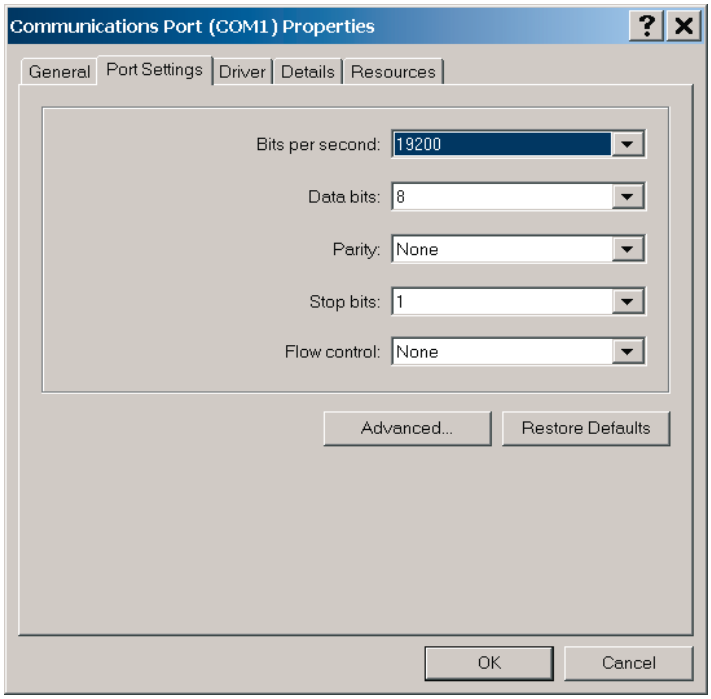


3. In the Ports (COM & LPT) folder, click Communications Port, which is connected to AC500, in this case port (COM1).



Tool/Step **How to find out the serial communication parameter values of your PC?**

4. The communication port settings are shown.



Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/drives and selecting *Sales, Support and Service network*.

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *Training courses*.

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Your comments on our manuals are welcome. Go to www.abb.com/drives and select *Document Library – Manuals feedback form (LV AC drives)*.

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