

SIEMENS

SIMATIC

S7 300 PLC CPU 317T-2 DP: Controlling a virtual axis

Getting Started

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Safety Guidelines

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



Danger

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



Warning

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



Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:



Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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Disclaimer of Liability

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

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Introduction

1.1 Introduction

Introduction

This Getting Started contains a practical example guiding you through eight steps in commissioning a fully functional application, and showing you how to carry out motion commands. It is thus a valuable help in getting started with the basic functions of a CPU 317T-2 DP.

To work with this Getting Started, you do not need to connect a drive to DP(DRIVE), but rather work with a virtual axis.

Depending on your degree of experience, working through the sample will take between one and two hours.

Preparation

2.1 Requirements

Requirements

Requirements:

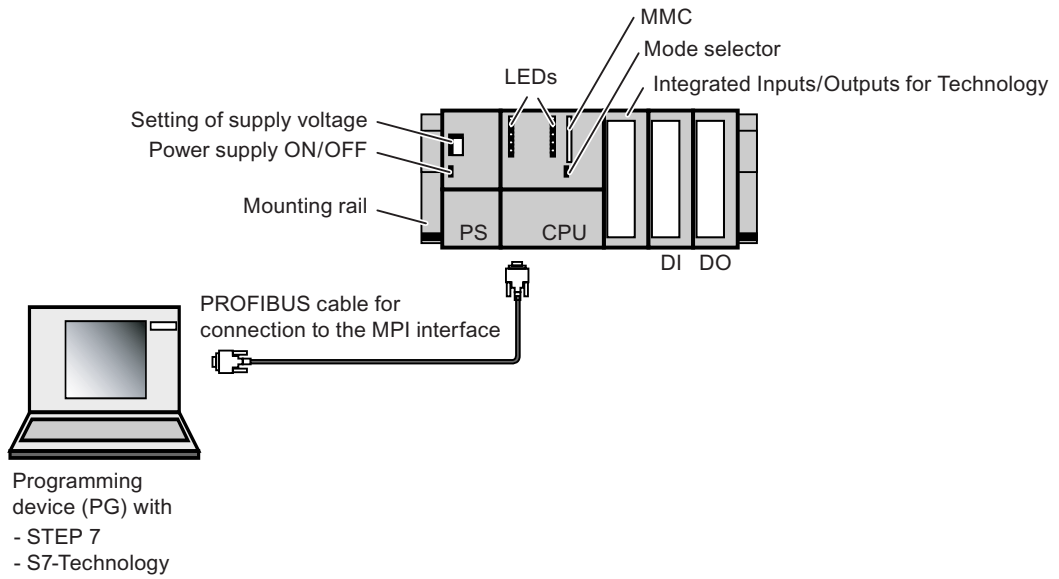
- An S7-300 station, consisting of:
 - Power supply module (PS), for example, 6ES7 307-1EA00-0AA0
 - 317T-2DP CPU with inserted MMC (4 MB or more).
 - Optional digital input module (DI) with bus connector, for example, 6ES7 321-1BH02-0AA0
 - Optional digital output module (DO) with bus connector, for example, 6ES7 322-1BH01-0AA0
 - Two optional front connectors for the digital modules
- A PG/PC with MPI interface and correctly installed software packages as listed below:
 - STEP 7 V5.3 SP3 and higher
 - S7-Technology V3.0
- The PG/PC is connected to the CPU via the MPI/DP interface (transmission rate up to 12 Mbps; default 187.5 kbps).
- The system is completely installed and wired. For information, refer to *Getting Started CPU 31x: Commissioning*.
- You installed EMERGENCY-OFF switches, in order to ensure safety and reliable operation of the system.



Warning

Operation of an S7-300 as part of plants or systems is subject to special rules and regulations, based on its field of application. Please note the current safety regulations for the prevention of accidents, e.g. IEC 204 (EMERGENCY-OFF equipment). You risk severe injury, or damage to machines and equipment if you ignore these directives.

Example configuration



Task

Configuration of an axis using HW Config and S7T Config. You then operate this axis with the help of a STEP 7 user program.

Learning units

3.1 1. Step: Wiring



Warning

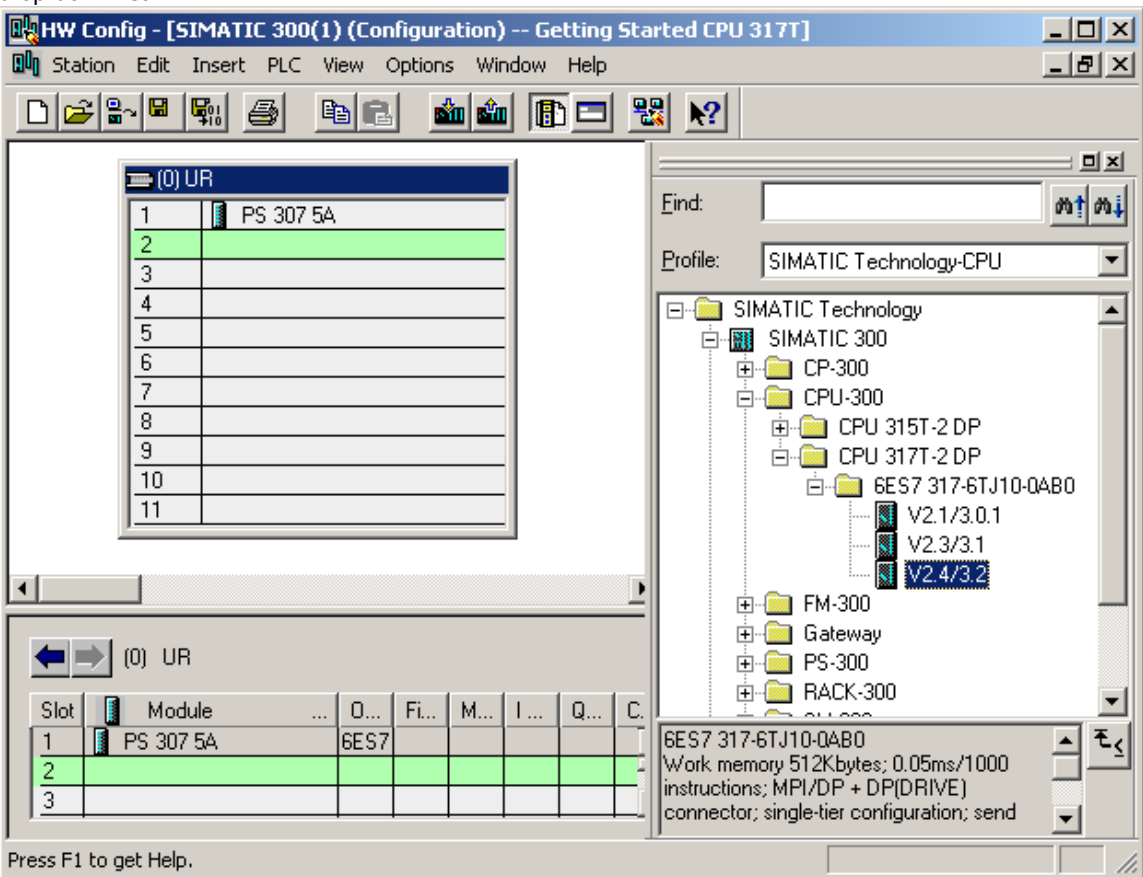
You may come into contact with live wires. Always switch off power before you start wiring the S7-300.

Procedure

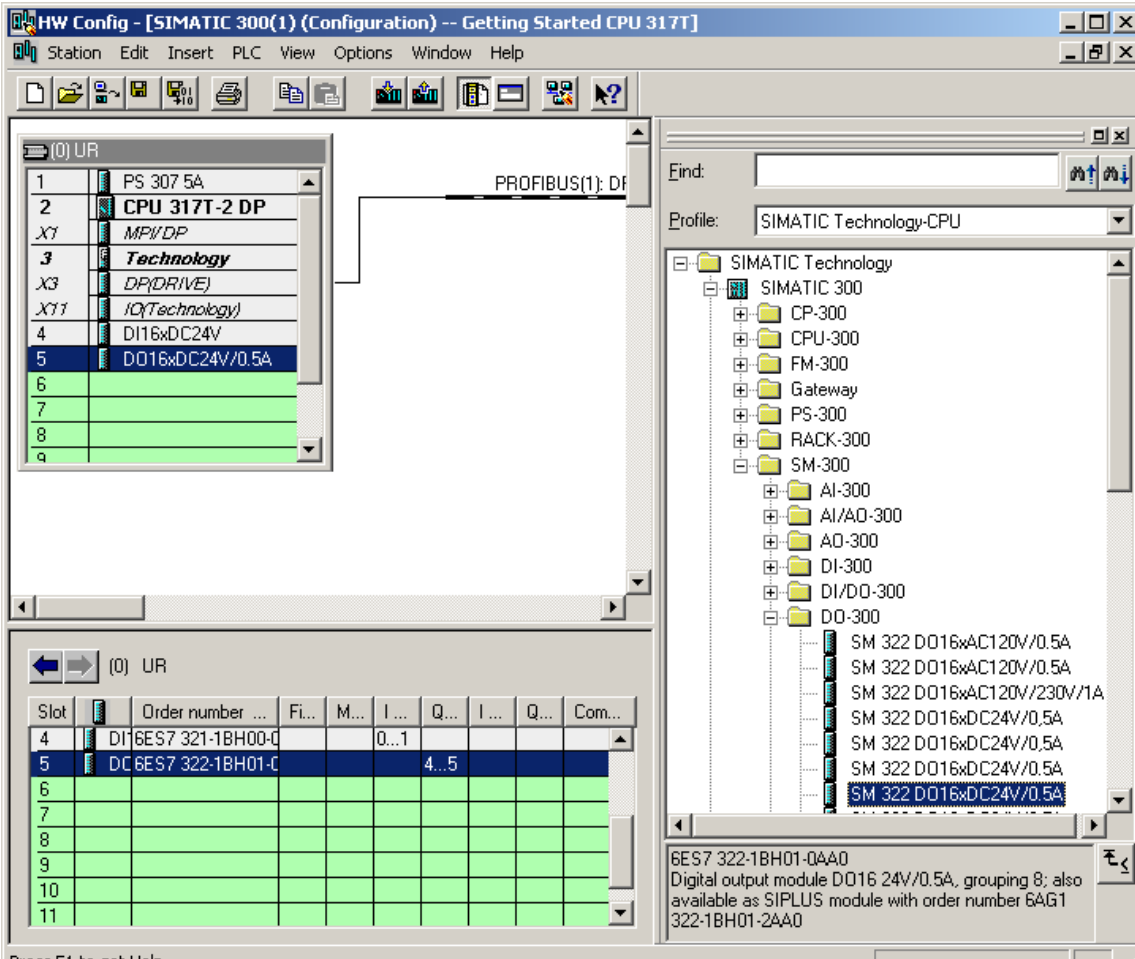
A description of the installation and wiring of your 317T-2DP CPU is found in the *Getting Started Collection S7-300 PLC: CPU 31x: Commissioning*.

3.2 2. Step: Configuring the CPU 317T-2 DP in HW -Config

Procedure

Step	Activity	Result
1	Create a new project in SIMATIC Manager (for example, "Getting Started CPU 317T"). Add a SIMATIC 300 station.	The SIMATIC 300 station appears in SIMATIC Manager.
2	Open HW Config by selecting the "SIMATIC 300" station and double-clicking "Hardware."	HW Config opens.
3	Open the "Hardware Catalog" and select the "SIMATIC Technology CPU" hardware profile in the "Profile" drop-down list.	
4	Insert a mounting rail using drag-and-drop in the station window of HW Config.	This creates a mounting rail.
5	Drag-and-drop the "PS 307 5A" power supply module onto the mounting rail.	The power supply module appears on the mounting rail.
6	Add the Technology CPU to the mounting rail by means of drag-and-drop.	A message box appears.
7	You change the transmission rate in the next step. Confirm the message box with "OK."	In the next dialog box, you can set the PROFIBUS properties at DP(DRIVE).
8	Confirm the default settings of the PROFIBUS configuration with "OK."	

3.2.2. Step: Configuring the CPU 317T-2 DP in HW-Config

Step	Activity	Result
9	<p>Add a digital input module and a digital output module. You now have this layout:</p> 	

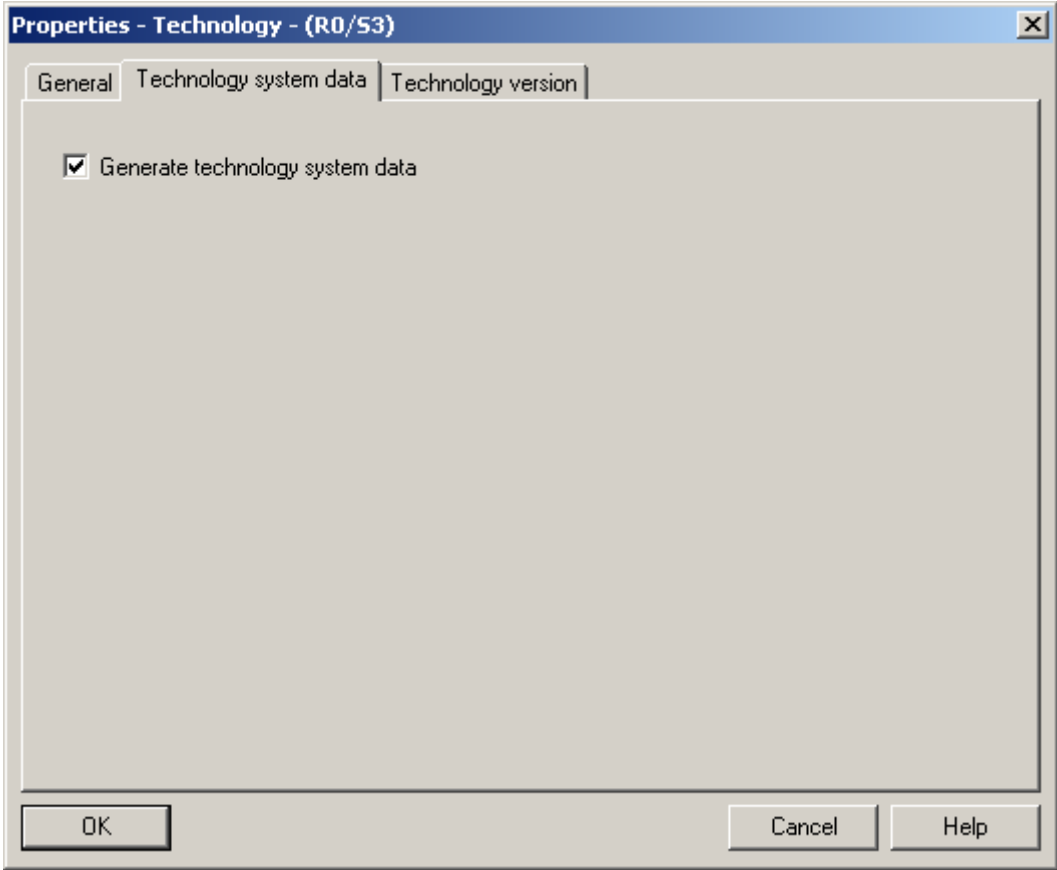
3.3 3. Step: Changing the transmission rate at the MPI/DP interface

Procedure

Sequence	Activity	Result
1	Open the MPI/DP interface (X1) in HW Config with double-click.	The "Properties - MPI/DP" dialog box opens.
2	Click "Properties".	The "Properties – MPI interface MPI/DP" dialog box opens.
3	Click MPI(1), then click "Properties".	The "Properties - MPI" dialog box opens.
4	Select the "Network settings" tab and select a transmission speed of "1.5 Mbps".	
5	Confirm all open dialog boxes with "OK".	You have now increased the configured transmission speed of the MPI interface at the CPU in order to accelerate data transfer.
6	When the CPU is in STOP, select PLC > Download to module to download the configuration. Select the CPU and confirm with "OK".	The "Select node address" dialog box opens. The default transmission rate of the MPI interface is 187 kbps, i.e. the PG/PC interfaces must be set up as described earlier in the requirements section.
7	Confirm with "OK".	The data are now downloaded from the PG/PC to the CPU.

3.4 4. Step: Generating technology system data

Procedure

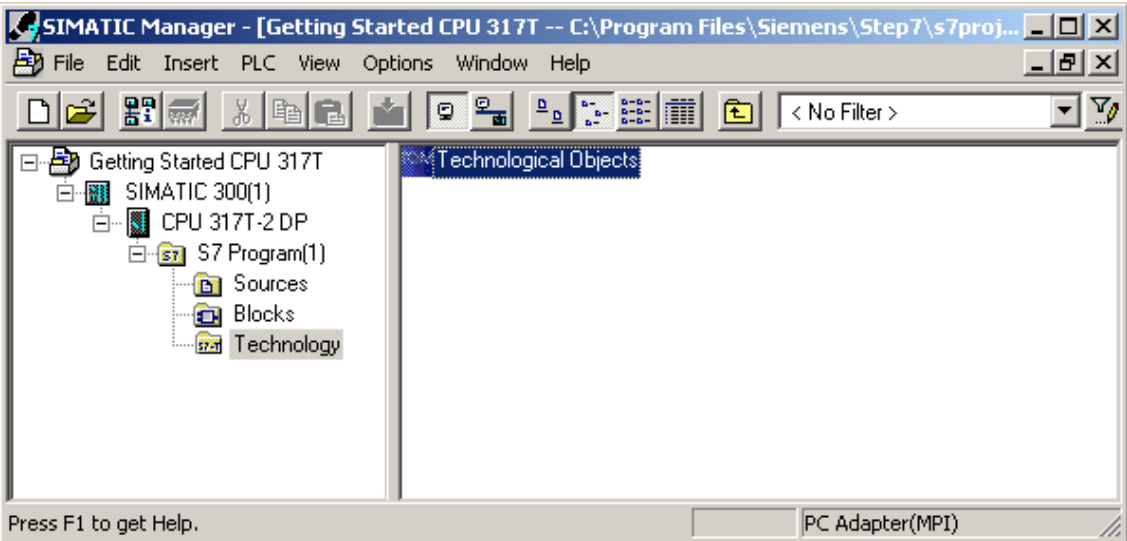
Step	Activity	Result
1	Double-click "Technology" on the mounting rail.	The "Properties - Technology" dialog box opens.
2	Select the "Technology system data" tab, then set the "Generate technology system data" check box. Confirm with "OK".	 <p>Result: When you download these data to the PLC later on in this Getting Started, the system also generates the technology system data and includes these in the download to your CPU 317T-2 DP.</p> <p>Note: If you do not activate the check box, then the technology system data is also not generated.</p>
3	Finalize your HW configuration by calling the Station > Save and compile command.	The system compiles your project, and adds the "Technological Objects" object to the project window in SIMATIC Manager.

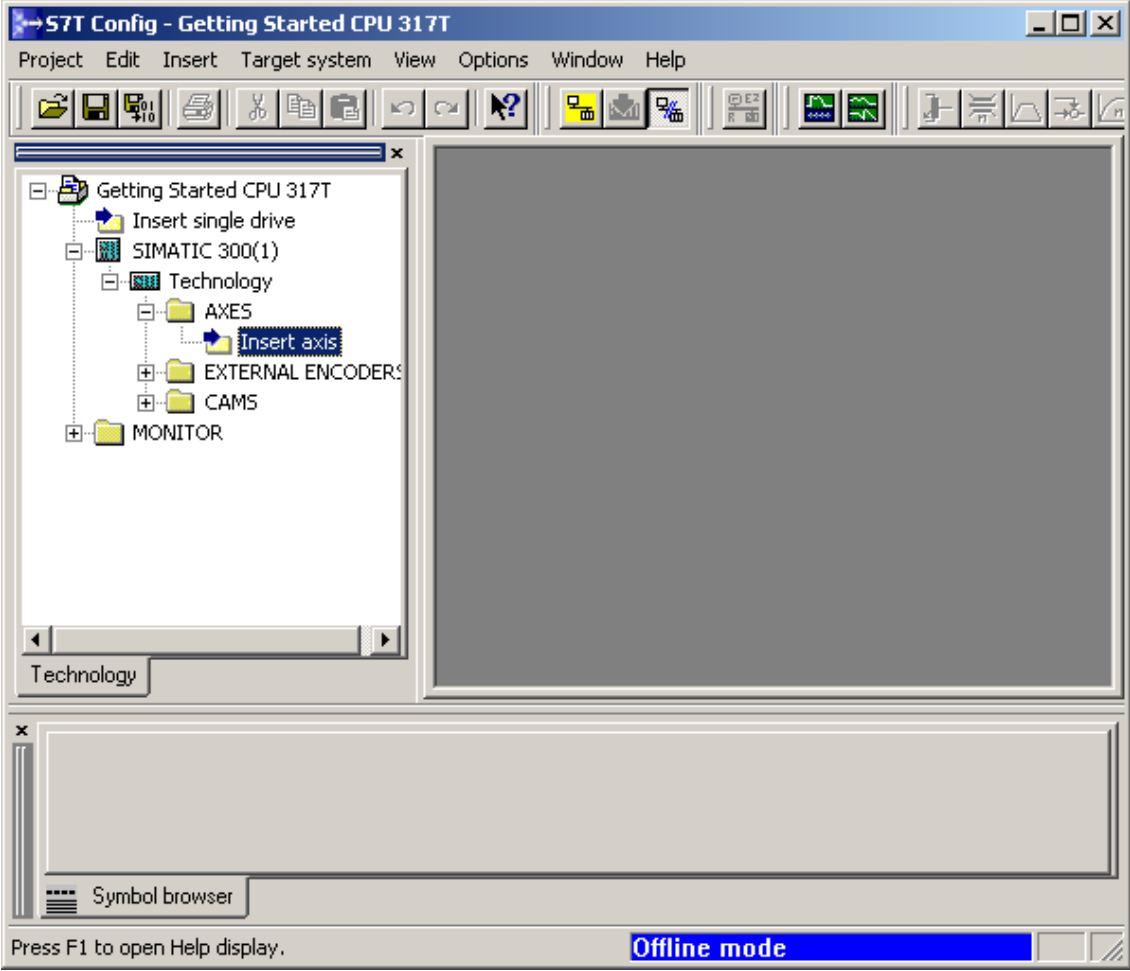
3.5 5. Step: Configuring the axis(axis) with S7T Config

Important information

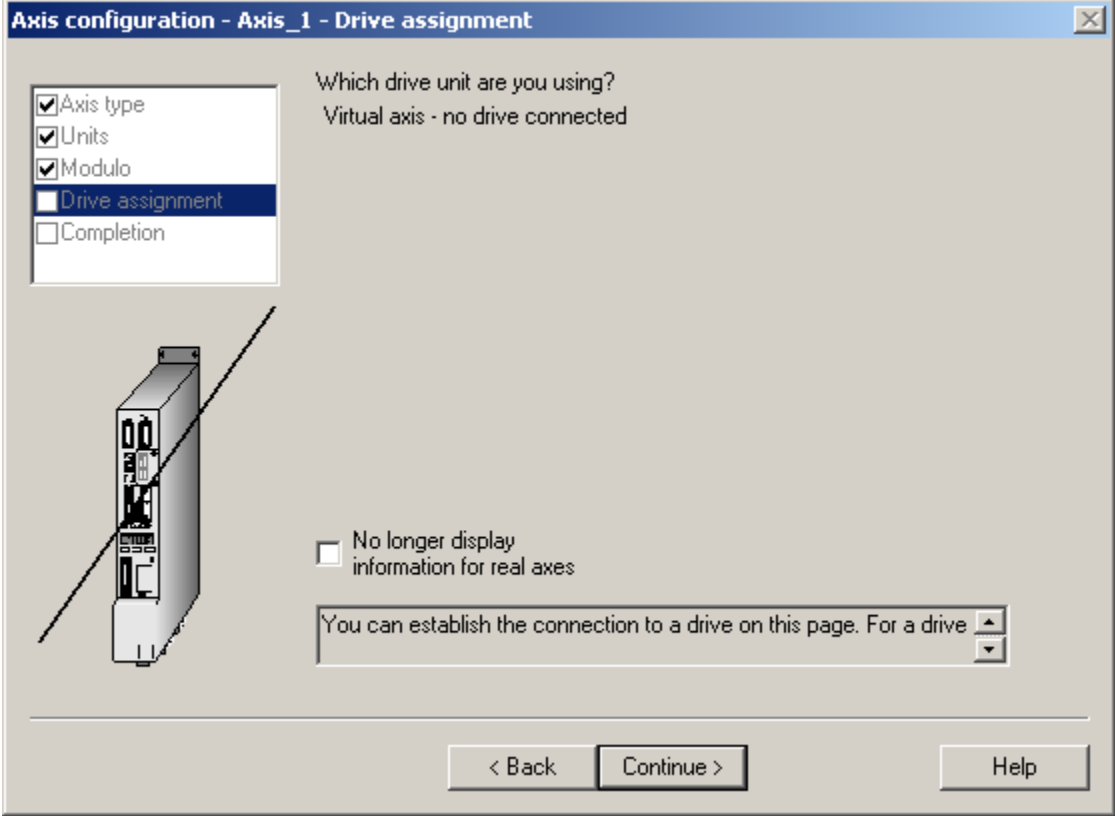
In this step, you create your technology objects such as axes by means of S7T Config. Use "Technology Objects Management" to generate a technology DB for each TO. Do not copy the technology DBs in order to ensure a defined assignment between the technology DB and its TO.

Procedure

Step	Activity	Result
1	<p>In SIMATIC Manager, double-click "Technological Objects" to open S7T Config.</p> 	<p>Result: "Technology Objects Management" opens. The system automatically runs S7T Config if you have not configured any technology objects yet, as in this example.</p> <p>You may also run S7T Config without using "Technology Objects Management". Select the "Technology Objects" object and then select the Options > Configure technology menu command.</p>

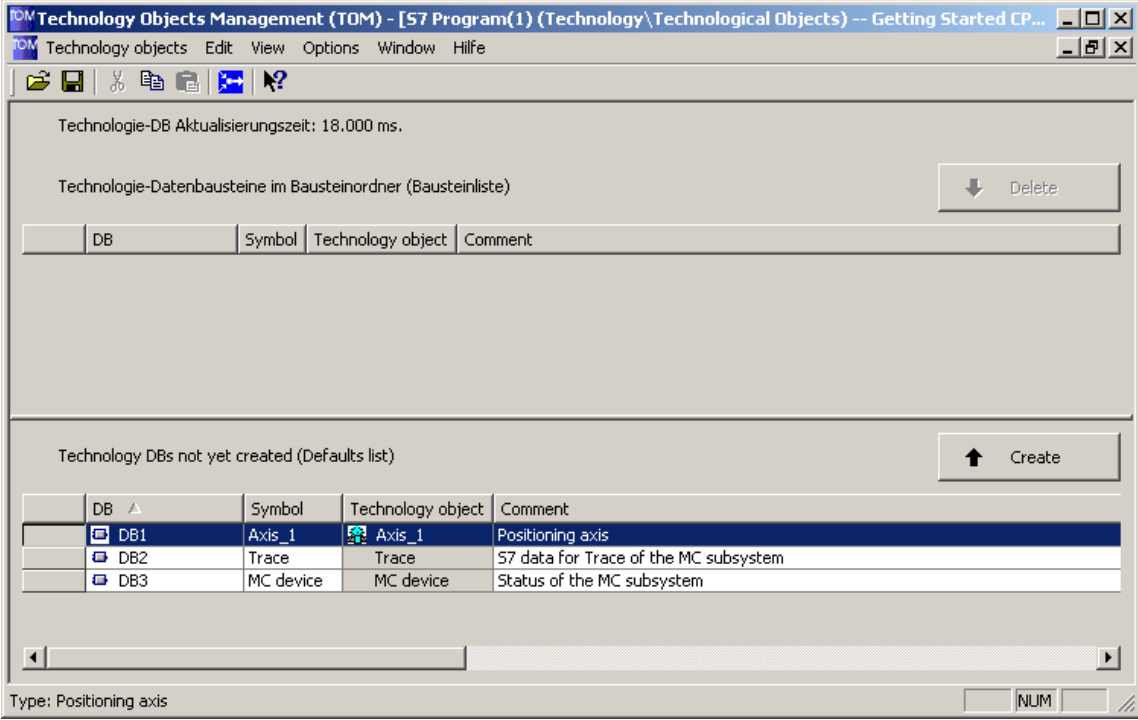
Step	Activity	Result
2	<p>In the project navigator, open the tree structure SIMATIC 300(1) > Technology > AXES. Double-click "Insert axis" to start the axis wizard.</p>  <p>Result: The "Insert axis" dialog box opens.</p>	
3	Confirm the default technology selection (speed control, positioning) with "OK".	The "Axis configuration - Axis_1 – Axis type" dialog box opens.
4	Accept the "Axis type: Linear, electric" and "Motor type: standard motor". Confirm with "Continue".	The "Axis configuration - Axis_1 - Units" dialog box opens.
5	Confirm with "Continue".	The "Axis configuration - Axis_1 - Modulo" dialog box opens.

3.5 5. Step: Configuring the axis(axis) with S7T Config

Step	Activity	Result
6	<p>Confirm with "Continue".</p> <p>Result: The "Axis configuration - Axis_1 - Drive assignment" dialog box opens.</p> 	
7	Confirm with "Continue" and "Finish".	You have now configured the virtual axis.
8	Select Project > Save and compile all to save the configuration with S7T Config.	The system now compiles the axis configuration data.

3.6 6. Step: Creating the technology DBs

Procedure

Step	Activity	Result
1	<p>Change to "Technology Objects Management". Confirm the first message box with "OK", and the second with "Yes".</p> <p>If you are not running the "Technology Objects Management" application yet, you can open it by double-clicking "Technological Objects" in the "Technology" folder in SIMATIC Manager (see also "Step 5: Configuring the axis(axis) with S7-Technology").</p> <p>Result: The "Technology Objects Management" opens.</p> 	
	<p>Edit the DB numbers as shown in the figure in order to adapt these for use in our example.</p>	
2	<p>Create the technology DBs listed below by clicking "Create":</p> <ul style="list-style-type: none"> • Axis_1 • Trace • MCDevice 	<p>The system generates the technology DB1, DB2 and DB3.</p>
3	<p>Close "Technology Objects Management".</p>	
4	<p>In SIMATIC Manager, change the MPI transmission rate to 1.5 Mbps by selecting Options > Set PG/PC interface. Confirm with "OK".</p>	
5	<p>In SIMATIC Manager, select CPU 317T-2 DP > S7 program > Blocks.</p>	
6	<p>Select PLC > Download to download the blocks and the system data to the CPU.</p>	

3.7 7. Step: Controlling the axis with the STEP 7 user program

Step	Activity	Result
7	Confirm the message box <ul style="list-style-type: none"> Download system data Overwrite existing system data 	The system data blocks are downloaded to the CPU. The initial download of your SDBs may take longer (up to a few minutes), because of their larger data volume.

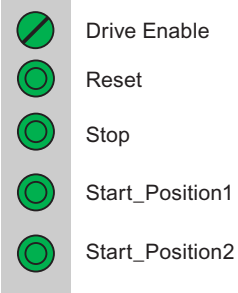
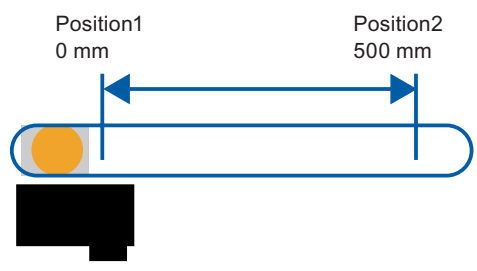
3.7 7. Step: Controlling the axis with the STEP 7 user program

Procedure

Sequence	Activity	Result
1	In SIMATIC Manager, open the sample project "\Examples\PROJECT-CPU317T". Copy the blocks listed below to your project: <ul style="list-style-type: none"> OB1 FB 100 (SimplePositioning) FB401 (MC_Power) FB402 (MC_Power) FB405 (MC_Halt) FB410 (MC_MoveAbsolute) DB 100 (IDB_SimplePositioning) AxisData (variable table for axis control) Confirm the message "The object 'OB1' already exists. Do you want to overwrite it?" with "Yes". Also copy the inputs, outputs and flags from the example symbol table to the project, so that the symbols are displayed completely in the variable table. Important: The sample program does not contain DB1 to DB4! Create these technology DBs in STEP 7 (see the step "Creating the technology DBs"), in order to maintain consistency between the user program and the technology objects.	The sample program is copied to the project.
2	You can edit the sample program in the LAD/STL/FBD Editor. To do so, click FB 100, then right-click to select "Open object".	The LAD/STL/FBD editor opens.
3	Select these settings: <ul style="list-style-type: none"> View > LAD, View > Overviews, and View > Details. 	You have now opened an extended and clear view for editing the STEP 7 user program.
4	In SIMATIC Manager, load the entire user program to the CPU with Target system > Load user program to memory card .	
5	Confirm the message box with "Yes".	The STEP 7 user program is now stored in the CPU. This download of your SDBs may take longer (up to a few minutes), because of their larger data volume.

3.8 8. Step: Trial run

Procedure

Step	Activity	Result
1	In the "Blocks" folder of your project, double-click the "AxisData" variable table.	The variable table is opened for monitoring.
2	Select PLC > Connect to > Configured CPU to go online.	The CPU "STOP" status is indicated on the bottom right.
3	Select Variable > Monitor to set monitoring mode.	The "Status value" column shows the actual values of the addresses. Use the variable table to monitor the control and status bits of the application, and the status of the axis.
4	Switch the CPU to RUN.	The CPU "RUN" status is indicated on the bottom right.
5	<p>Perform the following trials: Monitor the relevant output values.</p> <ul style="list-style-type: none"> • Enable the axis by setting I0.0 = "1" (DriveEnable) • Move the axis into position 2 (500 mm) by setting I0.4 (StartPosition2) • Move the axis into position 1 (0 mm) by setting I0.3 (StartPosition1) • Stop the moving axis with a signal at I0.2 (Stop) • Acknowledge all queued errors of the axis with I0.1 (Reset) <p>Terminal strip</p>  <p>Velocity: Axis 1: v = 100 mm/s</p> 	

Further information

4.1 Further information

Diagnostics / correction of errors

Incorrect operator input, faulty wiring or inconsistent configuration data may lead to errors. For information on how to analyze such errors and messages, refer to the *S7-Technology* manual.

Service and support on the Internet

In addition to our documentation, we offer a comprehensive online knowledge base on the Internet at:

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

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- Information about local service, repairs, and spare parts. You will find much more under "Services".

