

SIEMENS

SIMATIC

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

Getting Started

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03/2008

A5E00266283-05

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

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.

Note

You can also use the CPU 315T-2 DP instead of the CPU 317T-2 DP. To do this, select CPU 315T-2 DP in HW Config. Otherwise, the configuring steps are the same.

Preparation

2.1 Requirements

Requirements

The following requirements must be fulfilled:

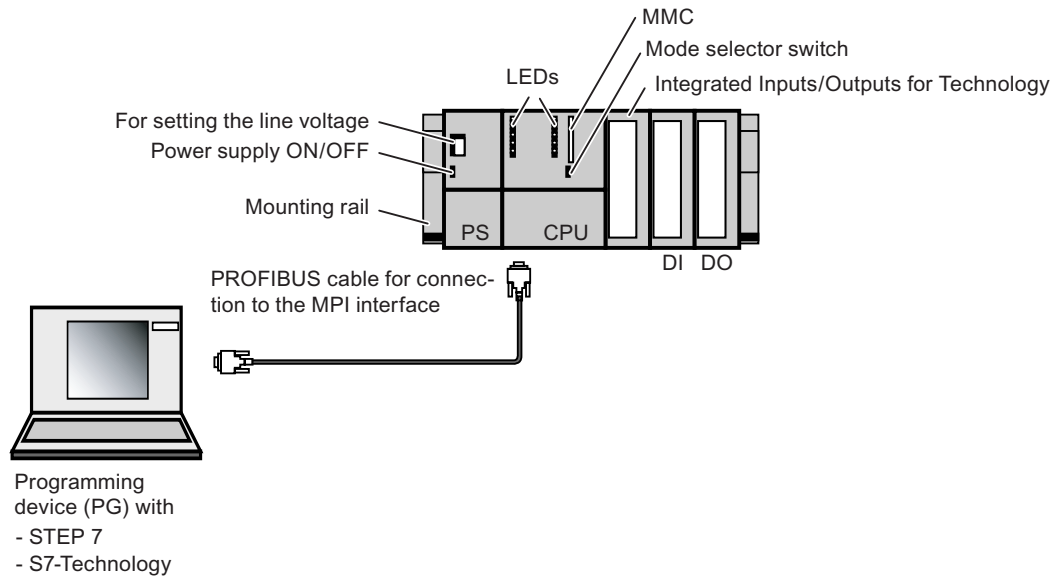
- An S7-300 station, consisting of:
 - Power supply (PS), e.g. 6ES7 307-1KA00-0AA0
 - CPU 317T-2DP with inserted MMC (4 MB or more).
 - Optional digital input module (DI) with bus connector, for example, 6ES7 321-1BH02-0AA0
 - Optional digital output module (DO) with bus connector, for example, 6ES7 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 as of V5.4 SP2
 - S7 Technology as of V4.1
- The PG/PC is connected to the CPU via the MPI/DP interface (transmission rate up to 12 Mbps; default 187.5 kbps):
 - PROFIBUS cable 6ES7901-4BD00-0XA0 (for transmission rates up to 12 Mbps)
- The configuration 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.

2.2 Task

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.

The task is divided into the following learning units:

Step	Learning unit
1	Wiring
2	Configuring the CPU 317T-2 DP in HW Config
3	Changing the transmission rate at the MPI/DP interface
4	Generating technology system data
5	Configuring the axis(axis) with S7T Config
6	Creating the technology DBs
7	Controlling the axis with the STEP 7 user program
8	Trial run

Using the station wizard

If, after step 1, you set up the T station with the aid of the station wizard, you can carry out the steps 2 to 4 in one step and then continue with step 5.

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*.

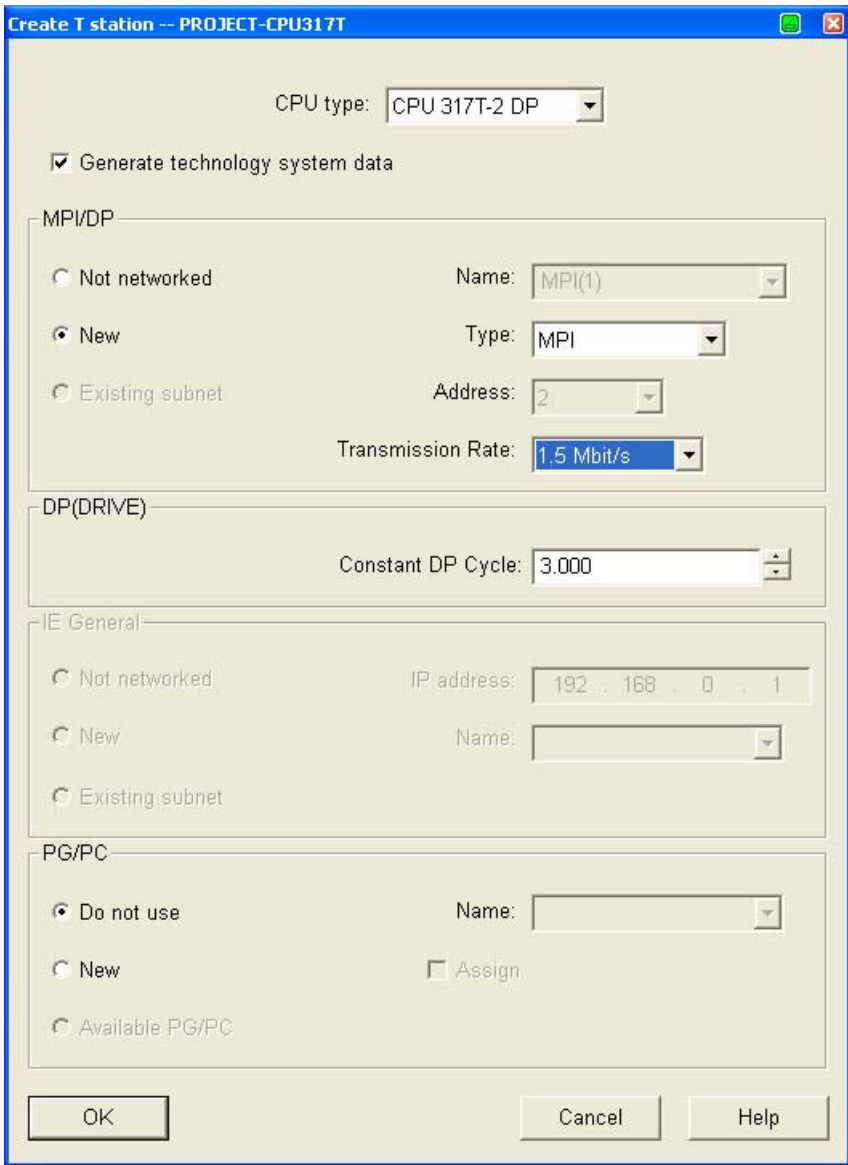
3.2 Optionally: Setting up the T station with the help of the wizard

The station wizard helps you to carry out several steps when configuring a CPU 31xT in one work cycle. You have the following options:

- Using the station wizards
Carry out the following described steps and then continue with learning unit "6th step".
- Not using the station wizards
Do not carry out the following described steps, instead, continue with the learning unit "2nd step".

Procedure

Step	Activity
1	Set up a new project in the SIMATIC Manager (e.g. "Getting Started CPU 317T").
2	<p>Select the Insert > Station > SIMATIC T Station menu command.</p> <p>The "Set up T station" dialog box opens.</p> <p>Select the following settings in the fields:</p> <p>"CPU type": CPU317T-2 DP</p> <p>"Generate Technology System Data" option activated</p> <p>"MPI/DP": New, type MPI, transmission rate 1.5 Mbps</p> <p>"PG/PC": Not used</p> <p>Carry out the settings in all other fields.</p> <p>If required, press the button "Help" to obtain additional information.</p>

Step	Activity
3	 <p>Confirm with "OK". Result: In the project a new SIMATIC 300 station is set up with a CPU 317T-2 DP (latest version).</p>
4	Open the hardware configuration and insert a digital input and a digital output module as described in the learning unit "2nd step".
5	Download the hardware configuration to the target system as described in learning unit "3rd step".
6	Skip the next learning units and continue with learning unit "5. Step: Configuring the axis(axis) with S7T Config (Page 14)".

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

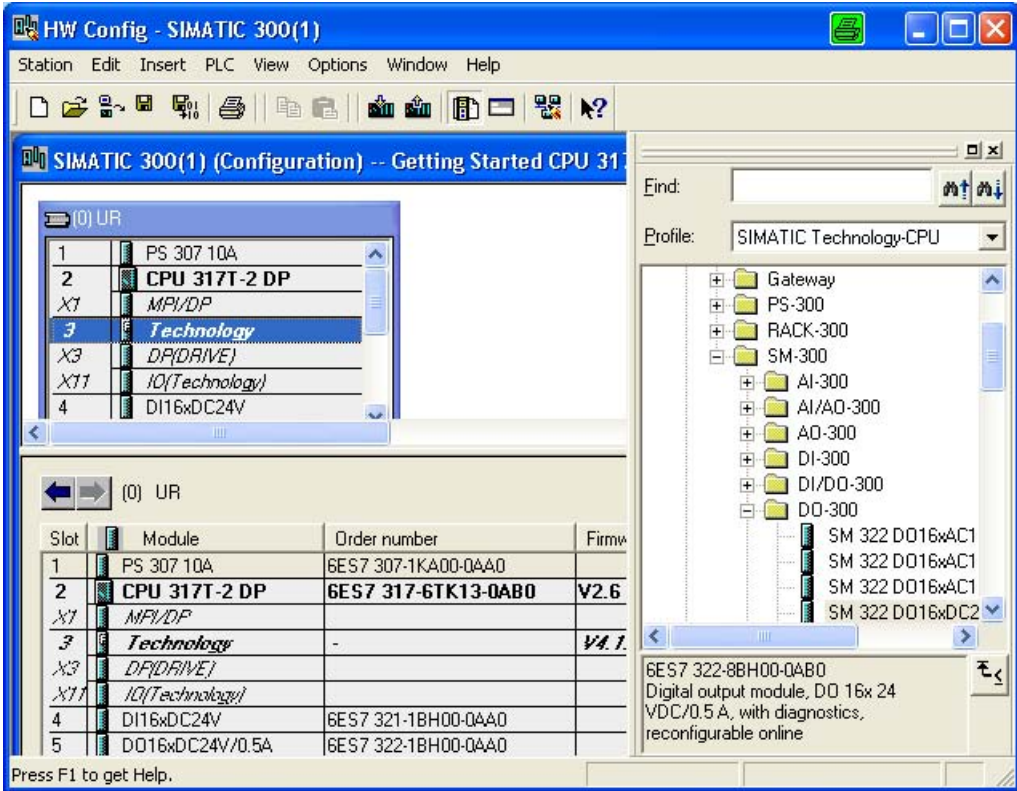
Procedure

Step	Activity	Result												
1	Set up a new project in the SIMATIC Manager (e.g. "Getting Started CPU 317T") Select the Insert > Station > SIMATIC 300 Station menu command to insert 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	To open the hardware catalog, select View > Catalog . In the "Profile" drop-down list, select the hardware profile "SIMATIC Technology CPU".	<thead> <tr> <th>Slot</th> <th>Module</th> <th>Order num</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>PS 307 10A</td> <td>6ES7 307...</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> </tbody>	Slot	Module	Order num	1	PS 307 10A	6ES7 307...	2			3		
Slot	Module	Order num												
1	PS 307 10A	6ES7 307...												
2														
3														

 On the right, there is a 'Hardware Catalog' pane showing a tree structure under 'SIMATIC 300'. The tree includes folders for CP-300, CPU-300, CPU 315T-2 DP, CPU 317T-2 DP, FM-300, and Gateway. Under 'CPU 317T-2 DP', there are sub-folders for '6ES7 317-6TJ10-QA00' and '6ES7 317-6TK13-QA00'. The '6ES7 317-6TK13-QA00' folder is expanded, showing a sub-entry 'V2.6/4.1.1'. Below the catalog, a detailed view of the selected module '6ES7 317-6TK13-QA00' is shown, listing properties: 'Work memory 1024Kbytes; 0.05ms/1000 instructions; MPI/DP + DP(DRIVE) connector; single-tier configuration; send and receive capability for direct'. At the bottom of the window, it says 'Press F1 to get Help.'

4	Use drag-and-drop to insert a mounting rail via "Rack 300" in the station window of the HW Config.	This creates a mounting rail.
5	Via "PS 300" drag-and-drop the "PS 307 10A" power supply module onto the mounting rail.	The power supply module appears on the mounting rail.
6	Use drag-and-drop to add the Technology CPU to the mounting rail.	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".	

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

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

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

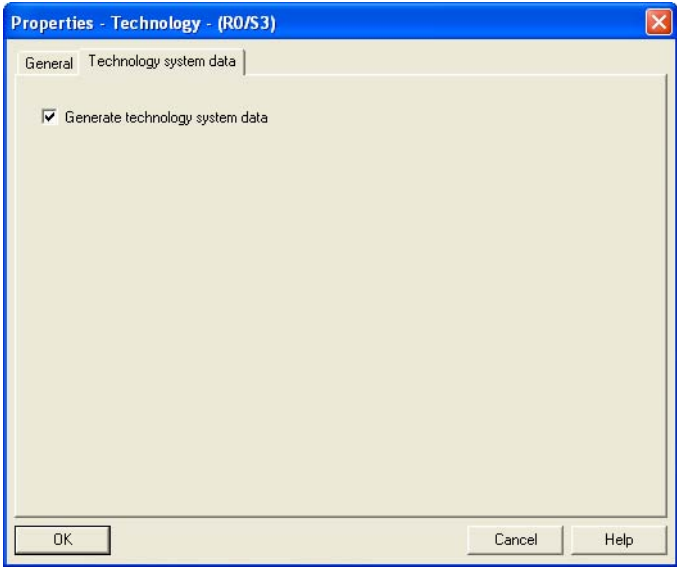
Procedure

Step	Activity	Result
1	In the mounting rail, double-click "MPI/DP" to open the MPI/DP interface (X1) in the HW Config.	The "Properties - MPI/DP" dialog box opens.
2	Click the "Properties" button.	The "Properties – MPI interface MPI/DP" dialog box opens.
3	Click MPI(1) and 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.

Step	Activity	Result
6	Select the Target system > Load to module menu command in order to transfer the configuration in the STOP mode of the CPU. In the dialog box "Select target module", 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.

3.5 4. Step: Generating technology system data

Procedure

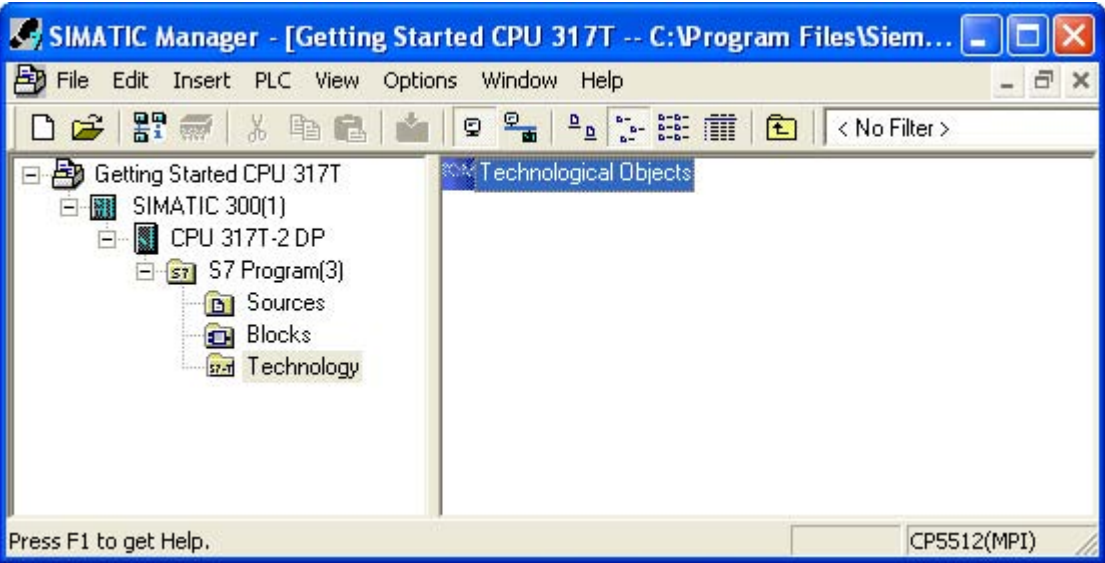
Step	Activity	Result
1	Double-click "Technology" on the mounting rail.	The "Properties - Technology" dialog box opens.
2	Select the "Technology system data" tab, then set the "Generate technology system data" check box. Confirm with "OK".	 <p>Result: When you download these data to the PLC later on in 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	Select the Station > Save and Compile menu command in order to close the HW Config.	The system compiles your project, and adds the "Technological Objects" object to the project window in SIMATIC Manager.

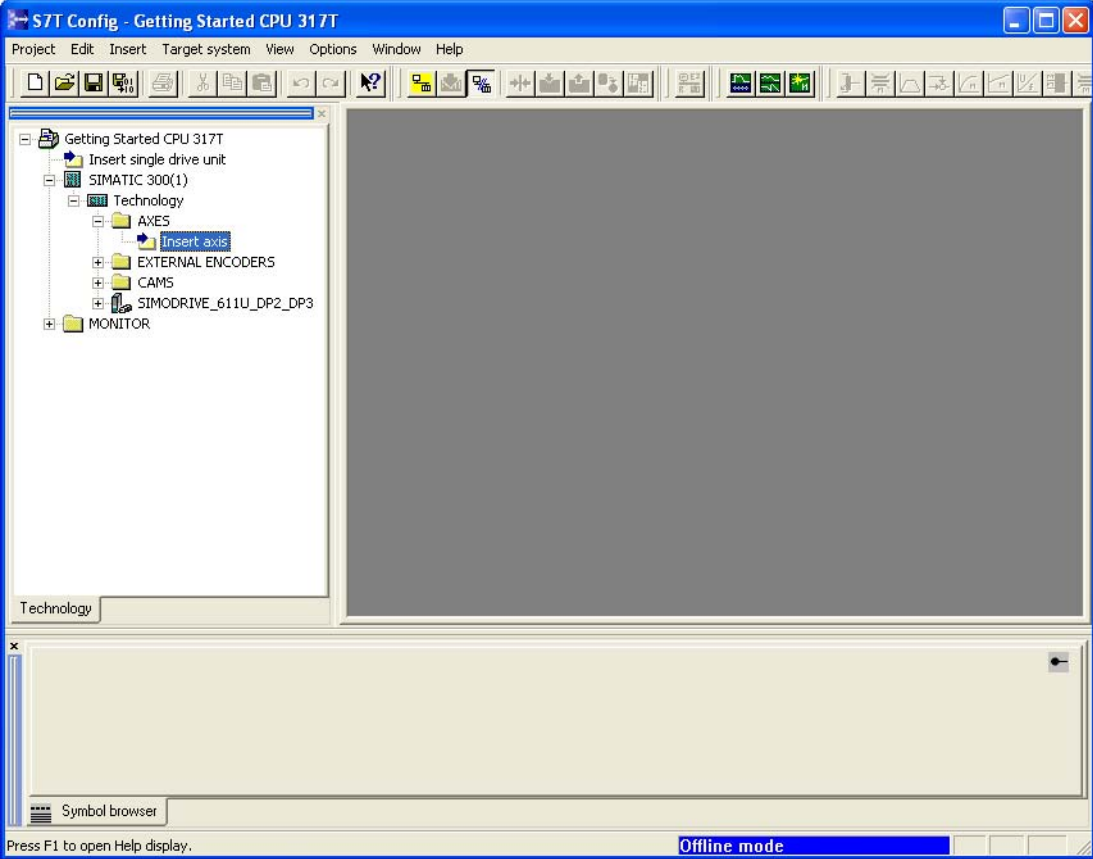
3.6 5. Step: Configuring the axis(axis) with S7T Config

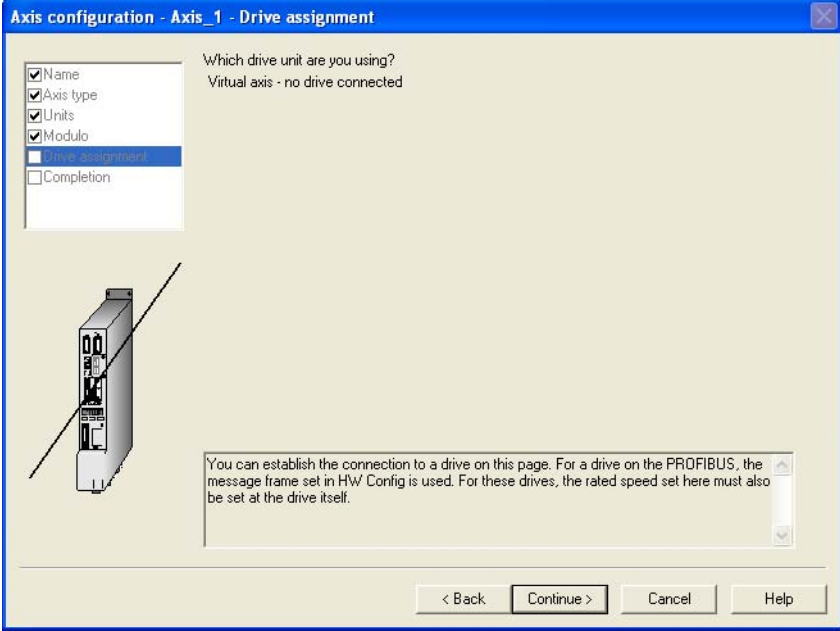
Important information

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

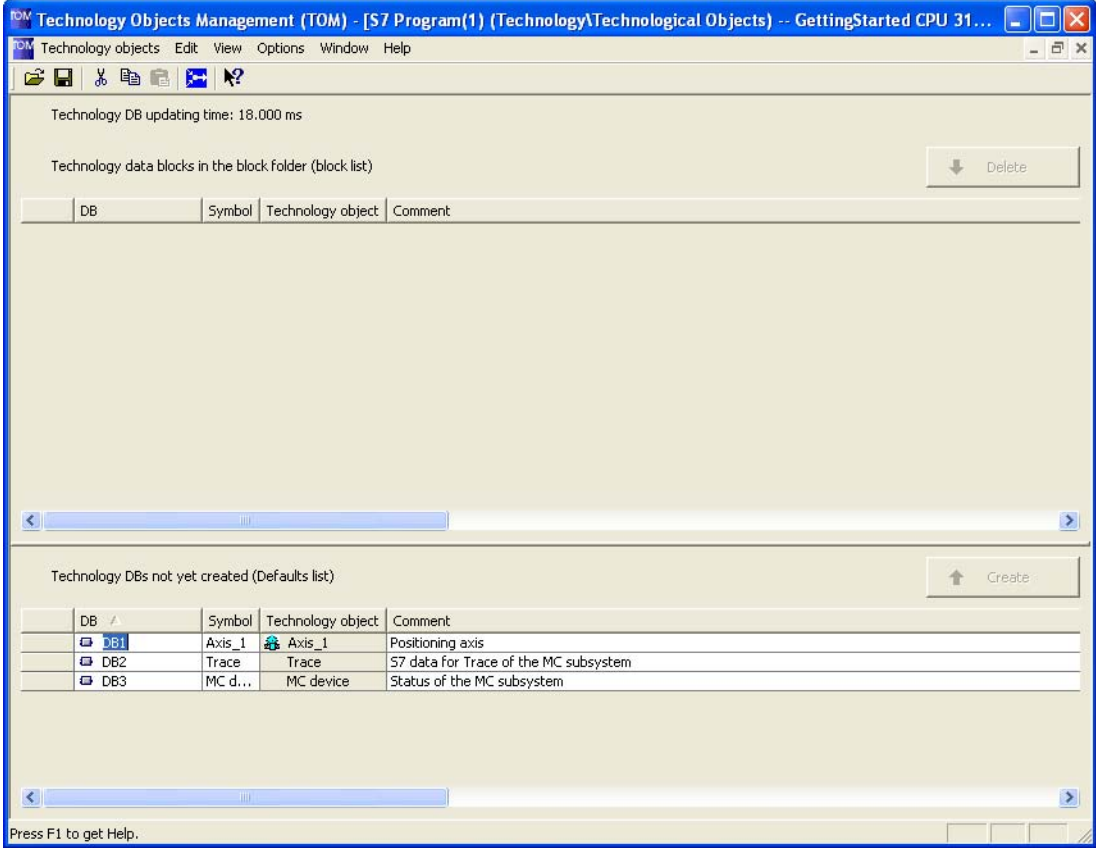
Step	Activity	Result
1	<p>In the left half of the SIMATIC Manager window, select the SIMATIC 300(1) > CPU 317T-2 DP > S7-Programm > Technology entry.</p>  <p>The screenshot shows the SIMATIC Manager interface. The left pane displays a project tree for 'Getting Started CPU 317T'. Under 'SIMATIC 300(1)', 'CPU 317T-2 DP' is expanded to show 'S7 Program(3)'. Under 'S7 Program(3)', 'Sources', 'Blocks', and 'Technology' are listed. The 'Technology' folder is highlighted. The right pane is titled 'Technological Objects' and is currently empty. The status bar at the bottom indicates 'CP5512(MPI)'.</p> <p>Double-click "Technology 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> <p>Result: "S7T Config" opens.</p>	

Step	Activity	Result
2	<p>In the project navigator, select the SIMATIC 300(1) > Technology > AXES > Insert axes entry. Execute this with a double click 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, electrical" 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.

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

3.7 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: Configuring the axis(axis) with S7-Technology").</p> <p>Result: "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 following technology DBs by selecting all lines and clicking "Create":</p> <ul style="list-style-type: none"> • Axis_1 • Trace • MCDevice 	<p>The system generates the technology DB 1 to DB 3.</p>
3	<p>Close "Technology Objects Management".</p>	

Step	Activity	Result
4	In the SIMATIC Manager, select the Options > Set PG/PC interface menu command in order to change the MPI transmission rate to 1.5 Mbit/s.	
5	Select the MPI interface. Click the properties and then change the transmission speed and confirm all open dialog boxes with "OK".	
6	In the left half of the SIMATIC Manager window, select the SIMATIC 300(1) > CPU 317T-2 DP > S7-Programm > Blocks entry.	
7	Select the Target system > Load menu command in order to load the blocks and the system data to the CPU.	
8	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.


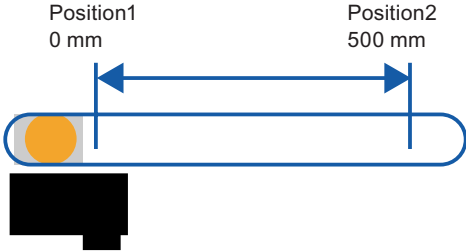
3.8 7. Step: Controlling the axis with the STEP 7 user program

Procedure

Step	Activity	Result
1	<p>In SIMATIC Manager, open the sample project "Examples\PROJECT-CPU317T". Copy the blocks listed below to your project:</p> <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) <p>Confirm the message "The object 'OB1' already exists. Do you want to overwrite it?" with "Yes".</p> <p>Also copy the inputs (I), outputs (O) and flags (F) from the example symbol table to the project, so that the symbols are displayed completely in the variable table.</p> <p>Important: The sample program does not contain DB 1 to DB 4! 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.</p>	The sample program is copied to the project.
2	Double-click the FB 100 if you want to edit the program example.	The LAD/STL/FBD editor opens.
3	<p>Select these settings:</p> <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	Load the entire user program to the CPU selecting Target system > Download user program to memory card in the SIMATIC Manager.	
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.

3.9 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 the Target system > Connect to > Configured CPU menu command to go online.	The CPU "STOP" status is indicated on the bottom right.
3	Select the Variable > Monitor menu command to switch to monitoring.	The "Status value" column shows the actual values of the operands. 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 by setting I0.4 (StartPosition2) • Move the axis into position 1 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

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>

There you will find:

- The newsletter that provides you with latest information relating to your product
- Your appropriate documentation, using our Service & Support search engine
- A bulletin board in which users and specialists worldwide exchange their know-how
- Your local Siemens partner for Automation & Drives in our Partner database
- Information about local service, repairs, and spare parts. You will find much more under "Services".

