

SIEMENS

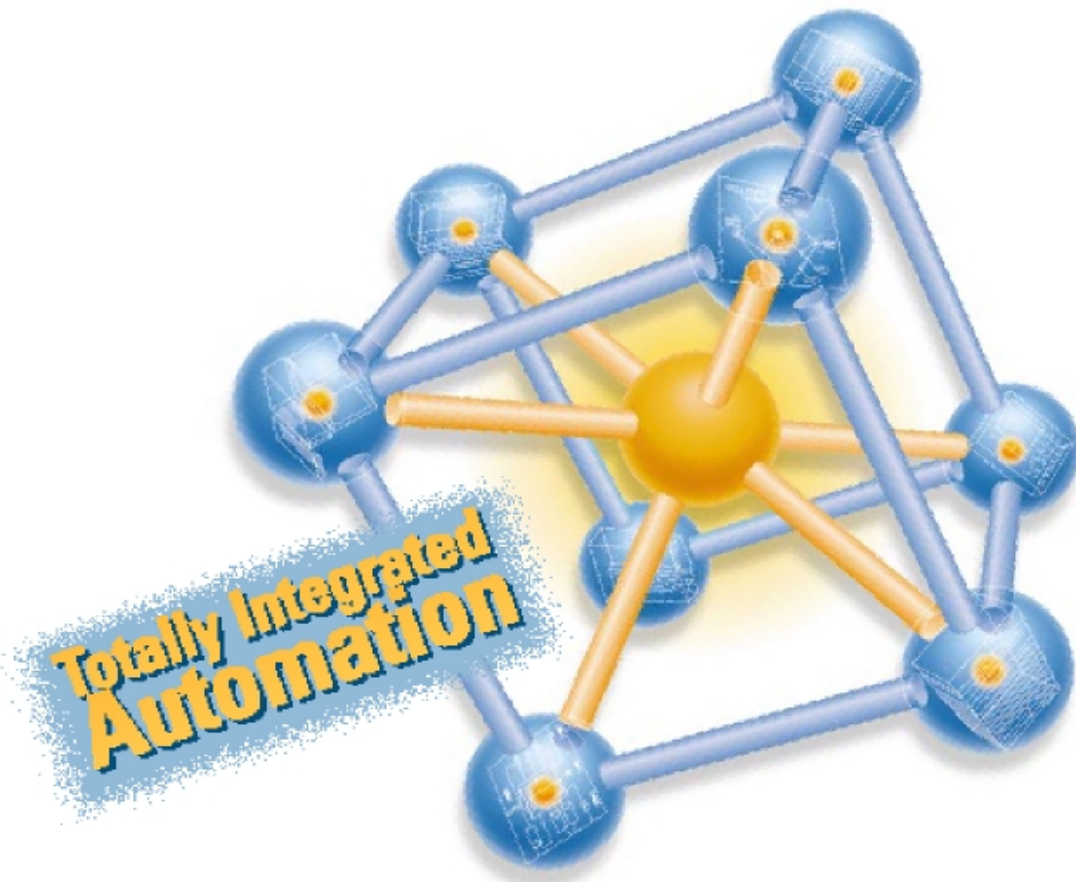
SIMATIC

Automation System S7-300

Getting Started

Edition 10/2001

Commissioning, First Steps CPU 314C: Positioning with Digital Outputs



Introduction

The sample in this manual takes you through five steps, showing you how to commission a fully functional application for running the drive. You are going to get acquainted with the basic hardware and software functions and learn how to determine and verify the application-dependent parameters in this sample. References to the manual should give you an initial overview of the information it contains.

Usually it is going to take no more than one or two hours to work through this sample, depending on experience.

Prerequisites

Condition is that:

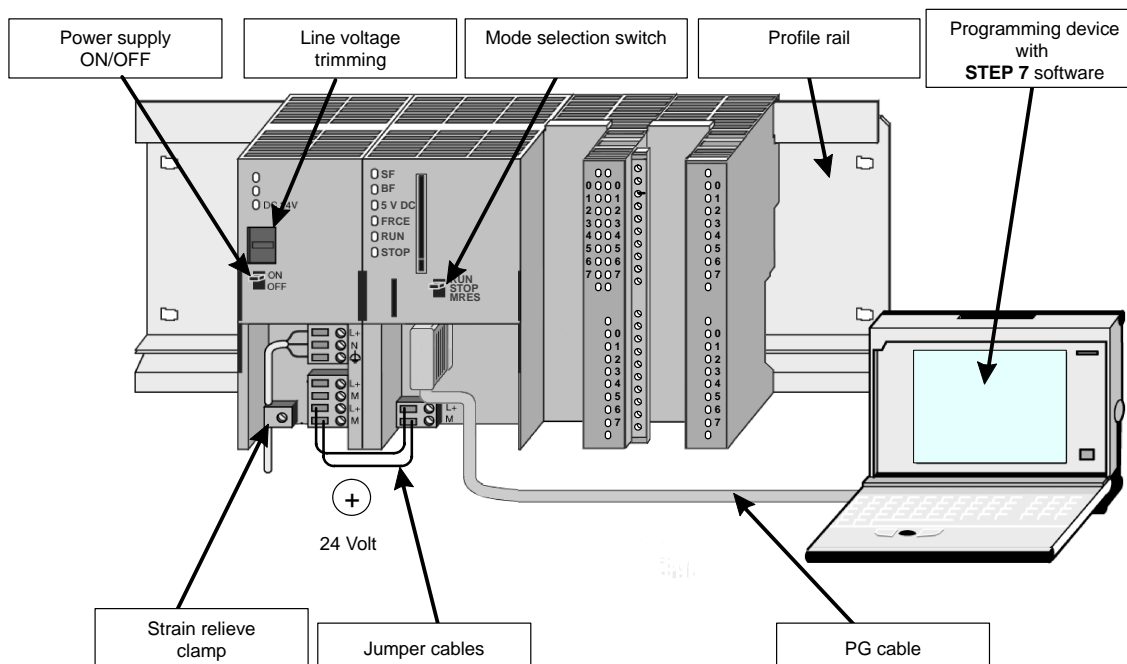
- You have installed an S7-300 station, consisting of a power supply module and a CPU 314C-2 DP/PtP.
- STEP 7 (\geq V5.1 + Servicepack 2) is correctly installed on your PG.
- The sample projects are available, either on your CD or you have downloaded them from the Internet.
- You have created a project for the S7-300 station.
- The PG is connected to the CPU.
- You are set up with an external 24 V DC power supply, an encoder, a drive and the usual required accessories, e.g. front plug and wiring material.
- You have implemented hardware limit switches and EMERGENCY-OFF switches for protecting your operating staff and the system.
- The CPU is correctly connected to a power supply.



Warning

Depending on the field of application, your S7-300 as component in plants and systems requires special attention relating to specific rules and regulations. Please pay attention to current regulations on accident prevention and safety, e. g. IEC 204 (EMERGENC-OFF devices). Serious injury as well as damage to machines and appliances can result if you neglect these regulations.

Structure of the Sample



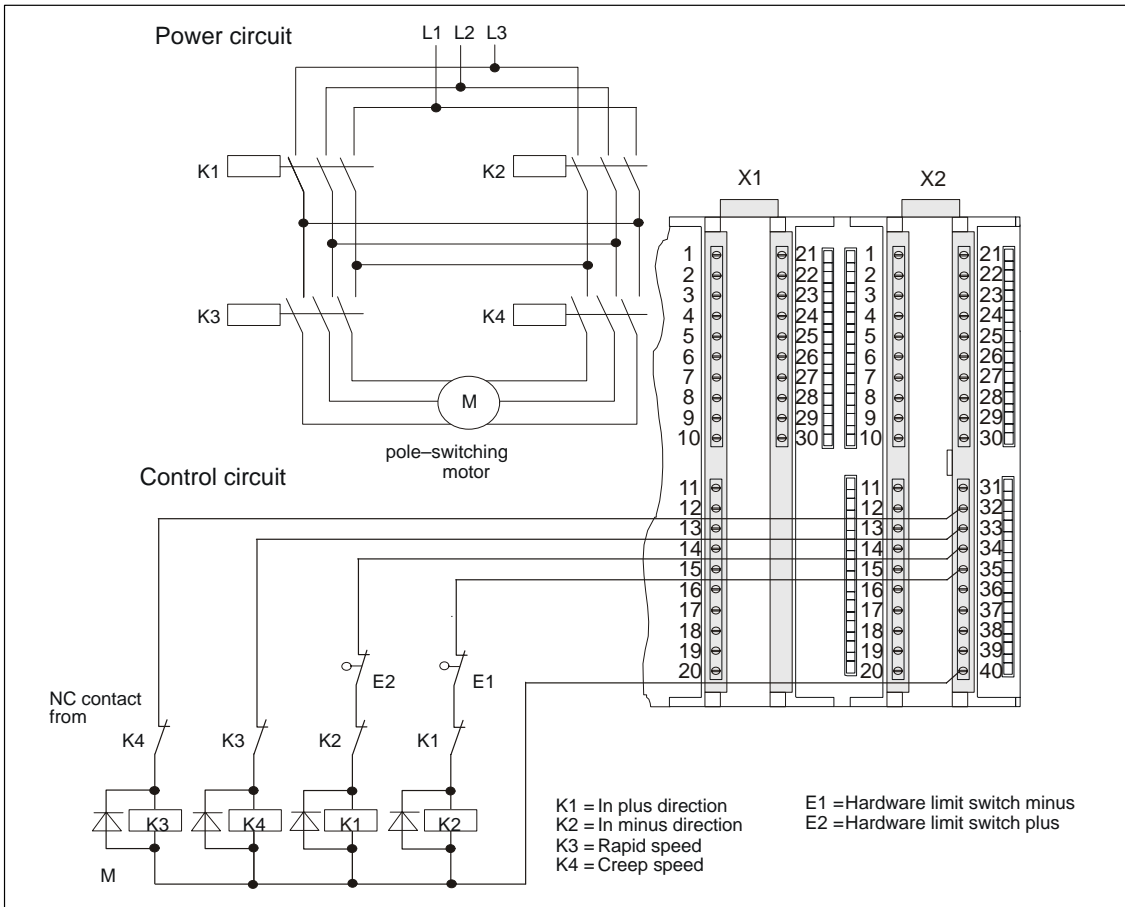
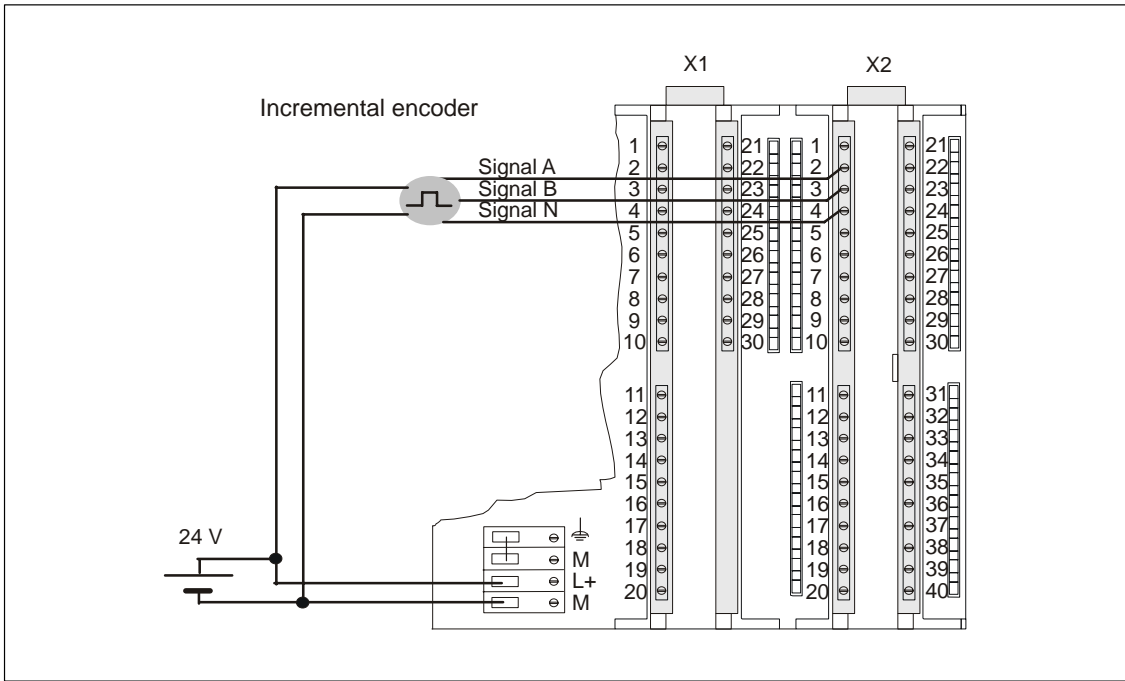
1st step: Wiring



Warning

You risk contacting live wires if the PS 307 power supply module is switched on or if the power supply line of the PS is connected to mains.
Wire the S7-300 only after you have switched off power!

| Step | Wire the power supply to the CPU |
|------|--|
| 1 | Connect the wired front plug to the CPU and screw fasten it. |
| 2 | Connect the voltage supply of the digital I/O: <ul style="list-style-type: none"> • 24 V to X2, pin 1 and 31 • Ground to X2, pin 20 and 40 |
| 3 | Connect the incremental encoder to the 24-V power supply. |
| 4 | Connect the encoder signals (X2, pin 2 ... 4). |
| 5 | Connect the relay circuit to the power supply. |
| 6 | Connect all lines of the relay circuit (X2, pin 32 to 35 and pin 40). |
| 7 | Strip the cable insulation and connect the shielding to the shielding terminator. Use shielding terminals. |



The pin-out below shows only the connections relevant for the respective positioning mode. The other connections are found in the Manual, Chapter "Wiring".

CONNECTOR X2:

| Pin | Name/Address | Function |
|-----|--------------|-------------------------------------|
| 1 | 1 L+ | 24 V supply voltage for the inputs |
| 2 | DI+0.0 | Encoder signal A |
| 3 | DI+0.1 | Encoder signal B |
| 4 | DI+0.2 | Encoder signal N |
| 5 | DI+0.3 | Length measurement |
| 6 | DI+0.4 | Reference-point switch |
| 20 | 1 M | Chassis ground |
| 31 | 3 L+ | 24 V supply voltage for the outputs |
| 32 | DO+1.0 | Digital output Q0 |
| 33 | DO+1.1 | Digital output Q1 |
| 34 | DO+1.2 | Digital output Q2 |
| 35 | DO+1.3 | Digital output Q3 |
| 40 | 3 M | Chassis ground |

2nd step: Installing a sample project

You have two options of installing a sample project:

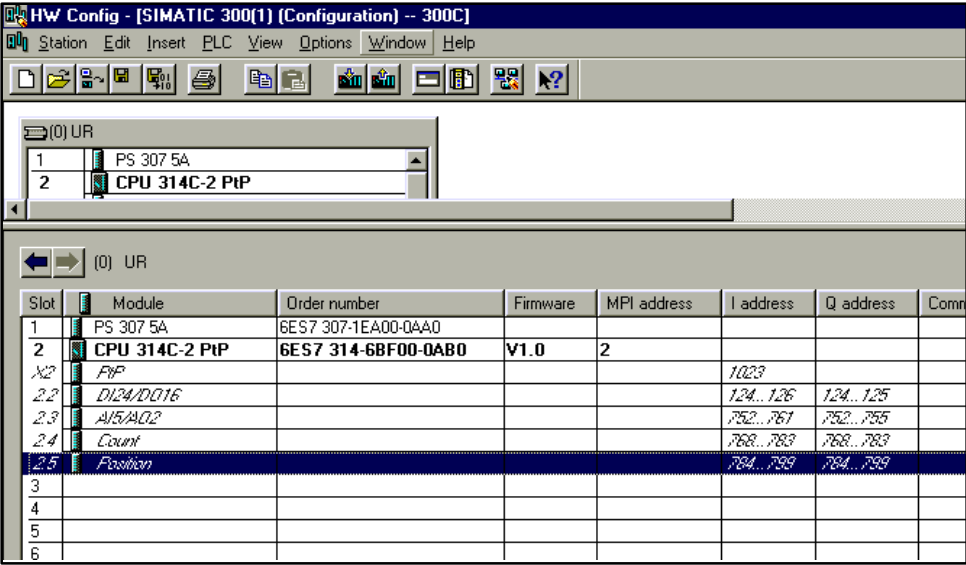
From CD:

| Step | Action | Result |
|------|---|----------------------------------|
| 1 | Double-click on SETUP.EXE in the SETUP folder of your CD. | The installation program starts. |
| 2 | Follow the on-screen instructions. | |

Download from the Internet:

| Step | Action | Result |
|------|---|----------------------------------|
| 1 | Open the sample project directory. Double-click on SETUP.EXE. | The installation program starts. |
| 2 | Follow the on-screen instructions. | |

3rd step: Assigning parameters

| Step | Action | Result |
|------|--|--|
| 1 | Open your project in SIMATIC Manager. | A split window opens, showing in the header your project name. |
| 2 | In your project, call the configuration table HW Config.  | |
| 3 | Double-click on the “Positioning” submodule. | The “Positioning properties” dialog opens. |
| 4 | Select “Positioning with digital outputs”. In the drive, axis and encoder tabs, customize the components according to your system. | |
| 5 | Confirm your entries with OK. | The “Positioning properties” dialog closes. |
| 6 | Save your configuration to your project with Station > Save and compile . | Your changes are now stored in your project. |
| 7 | While the CPU is in STOP state, download this configuration via PLC > Load to module.... | Data are downloaded from the PG to your CPU. |
| 8 | Close HW Config with Station > Close . | You are returned to SIMATIC Manager. |

4th step: Implementation in the user program

| Step | Action | Result | | | | | | | | | | | | | | | | | | | | | |
|----------------|---|--|-----------------------------|-------------|------|-----------|----------------|--------|------------------|--|------|---------|----------------------|--------|---------|-----------------|------|------------|----------------------------|--------------|--------------|----------------|--|
| 1 | In SIMATIC Manager, open the project "ZEn26_03_TF____31xC_Pos" in the catalog \Siemens\STEP7\Examples via File > Open... > Sample projects . | A split window opens, showing your project name in the header. | | | | | | | | | | | | | | | | | | | | | |
| 2 | Double-click the S7 program "Digital 1 First steps". | The right window shows the "Sources", "Function blocks" and "Symbols" folders. | | | | | | | | | | | | | | | | | | | | | |
| 3 | Double-click on the "Function blocks" container. | You are shown all function blocks of the S7 program. | | | | | | | | | | | | | | | | | | | | | |
| 4 | Select all function blocks and copy them to your project directory SIMATIC 300 Station > CPU3xx > S7 Program > Function blocks . <table border="1"> <thead> <tr> <th>Function block</th> <th>Name (in the symbol bar)</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>OB1:</td> <td>CYCLE_EXC</td> <td>Cyclic program</td> </tr> <tr> <td>OB100:</td> <td>COMPLETE RESTART</td> <td>Restart: Resetting the control signals</td> </tr> <tr> <td>FC 1</td> <td>GETST_D</td> <td>DIGITAL, First steps</td> </tr> <tr> <td>SFB46:</td> <td>DIGITAL</td> <td>SFB POS DIGITAL</td> </tr> <tr> <td>DB6:</td> <td>DI_DIGITAL</td> <td>Instance DB to SFB DIGITAL</td> </tr> <tr> <td>VAT_GETST_A:</td> <td>VAT_GETST_A:</td> <td>Variable table</td> </tr> </tbody> </table> <p>Note: In the COMPLETE RESTART (OB 100) function block, customize the values for the changeover/cut-off difference.</p> | Function block | Name (in the symbol bar) | Description | OB1: | CYCLE_EXC | Cyclic program | OB100: | COMPLETE RESTART | Restart: Resetting the control signals | FC 1 | GETST_D | DIGITAL, First steps | SFB46: | DIGITAL | SFB POS DIGITAL | DB6: | DI_DIGITAL | Instance DB to SFB DIGITAL | VAT_GETST_A: | VAT_GETST_A: | Variable table | |
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| FC 1 | GETST_D | DIGITAL, First steps | | | | | | | | | | | | | | | | | | | | | |
| SFB46: | DIGITAL | SFB POS DIGITAL | | | | | | | | | | | | | | | | | | | | | |
| DB6: | DI_DIGITAL | Instance DB to SFB DIGITAL | | | | | | | | | | | | | | | | | | | | | |
| VAT_GETST_A: | VAT_GETST_A: | Variable table | | | | | | | | | | | | | | | | | | | | | |
| 5 | In SIMATIC Manager, select SIMATIC 300 Station > CPU3xx > S7 Program > Function blocks . | You are shown all function blocks of the S7 program. | | | | | | | | | | | | | | | | | | | | | |
| 6 | Download all S7 function blocks contained to your CPU with PLC > Download to CPU (CPU in STOP state). | The program and configuration are downloaded from the PG to the CPU. | | | | | | | | | | | | | | | | | | | | | |

5th step: Test run

| Step | Action | Result |
|------|--|---|
| 1 | In your project directory "Function blocks", double-click on the VAT "VAT_GETST_A". | You are shown the table of variables for monitoring and controlling. |
| 2 | Go Online via PLC > Connect to > Configured CPU . | The "STOP" status of the CPU pops up at the lower right. |
| 3 | Switch to monitoring mode via Variable > Monitoring . | The "Status value" column displays the actual values of the operands. |
| | <p>Caution In the next two steps of your test you are going to start up the drive. You can stop the drive again by:</p> <ul style="list-style-type: none"> • Resetting the direction control value to 0 and enabling it • Resetting the drive enable value to 0 and enabling it • Switch the CPU to STOP | |
| 4 | Switch the CPU to RUN. | The "RUN" status of the CPU pops up at the lower right. |

| Step | Action | Result |
|------|---|---|
| 5 | Make the following tests. Validate the control values via Variable > Enable control values . | |
| | <p>“Jogging” mode Customize as follows:</p> <p>MODE_IN = 1: Select “Jogging” mode</p> <p>DRV_EN = 1: Drive enable</p> <p>SPEED: Speed, 0 = Creep, 1 = Rapid</p> <p>Drive start: DIR_P = 1: Jogging into Plus direction DIR_M = 1: Jogging into Minus direction</p> <p>Note: Positioning mode is impossible if you enable the two variables DIR_P and DIR_M.</p> | <p>In the “Status value” column, you can monitor the following signal states:</p> <p>ST_ENBL = 1: Start enabled</p> <p>MOD_OUT = 1: Current operating mode: “Jogging”</p> <p>WORKING = 1: Running</p> <p>ACT_POS: Actual position value</p> |
| | <p>Operating mode “Relative incremental approach” Make these settings:</p> <p>MODE_IN = 4: Select “Relative incremental approach”</p> <p>DRV_EN = 1: Drive enable</p> <p>TARGET: Distance in pulses</p> <p>SPEED: Speed, 0 = Creep, 1 = Rapid</p> <p>Drive start: DIR_P = 1: Relative incremental approach into Plus direction DIR_M = 1: Relative incremental approach into Minus direction</p> | <p>In the “Status value” column, you can monitor the following signal states:</p> <p>ST_ENBL = 1: Start enabled</p> <p>MOD_OUT = 4: Current operating mode: “Relative incremental approach”</p> <p>WORKING = 1: Running</p> <p>ACT_POS: Actual position value</p> <p>POS_RCD = 1: In position</p> |

Diagnostics/Fault elimination

Errors can occur as a result of operator faults, incorrect wiring or configuration conflicts.

How to diagnose such errors and messages is described in the manual, Chapter “Error handling and interrupts”.

Sample :

The “ZEn26_03_TF_____31xC_Pos” project contains more samples you can use for orientation. You can customize all samples according to your personal applications.