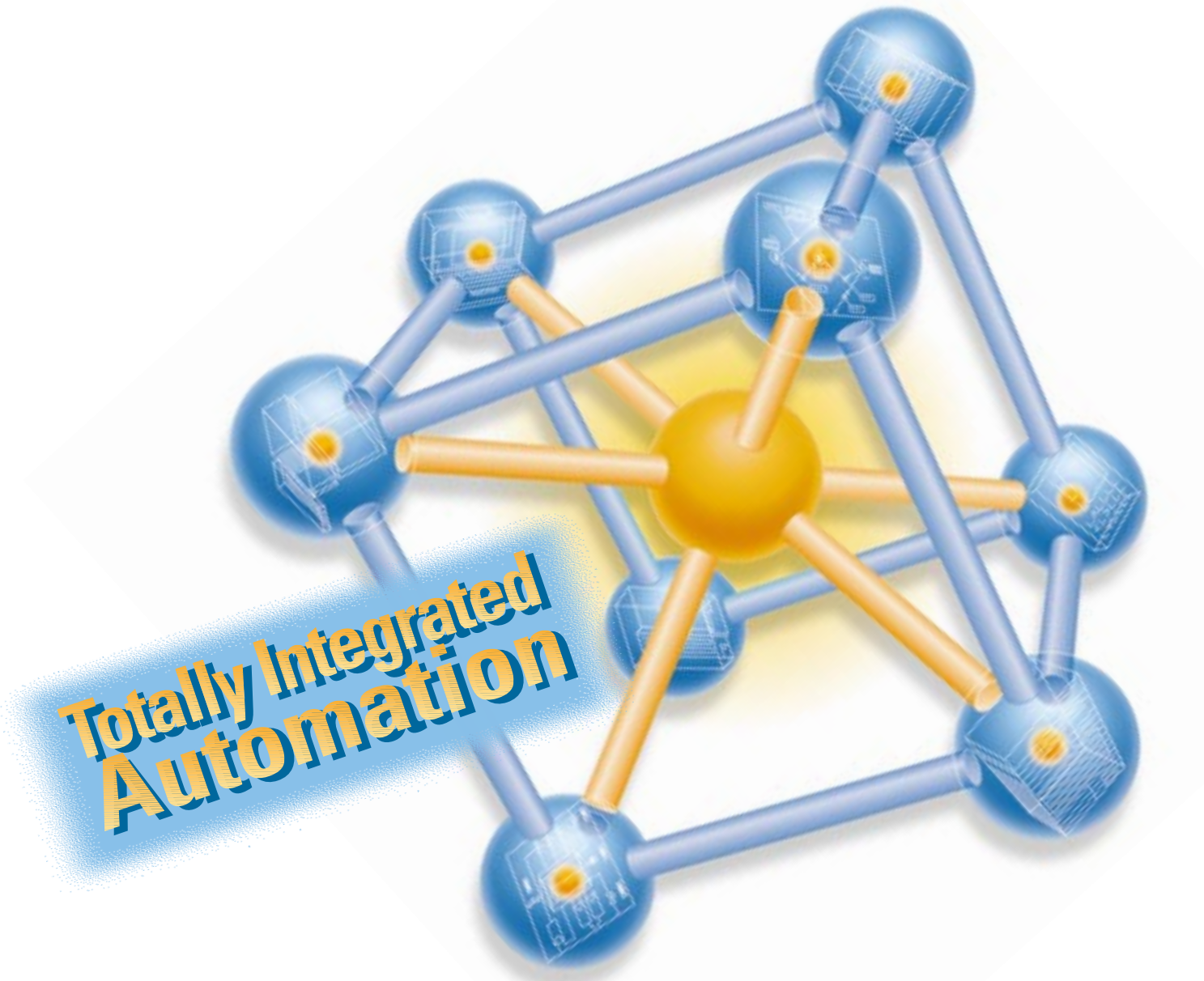
SIEMENS

SIMATIC
S7-300 Programmable Controller

Getting Started Edition 04/2000

First Steps for Installation and Commissioning



Introduction

This guide takes you through 6 commissioning steps to set up a functioning application by running through a concrete example. In this way you will get to know the basic hardware and software functions of your S7-300.
You should expect to spend approximately 1.5 to 2 hours on this example, depending on the level of your experience.

Prerequisites

The following prerequisites must be fulfilled:

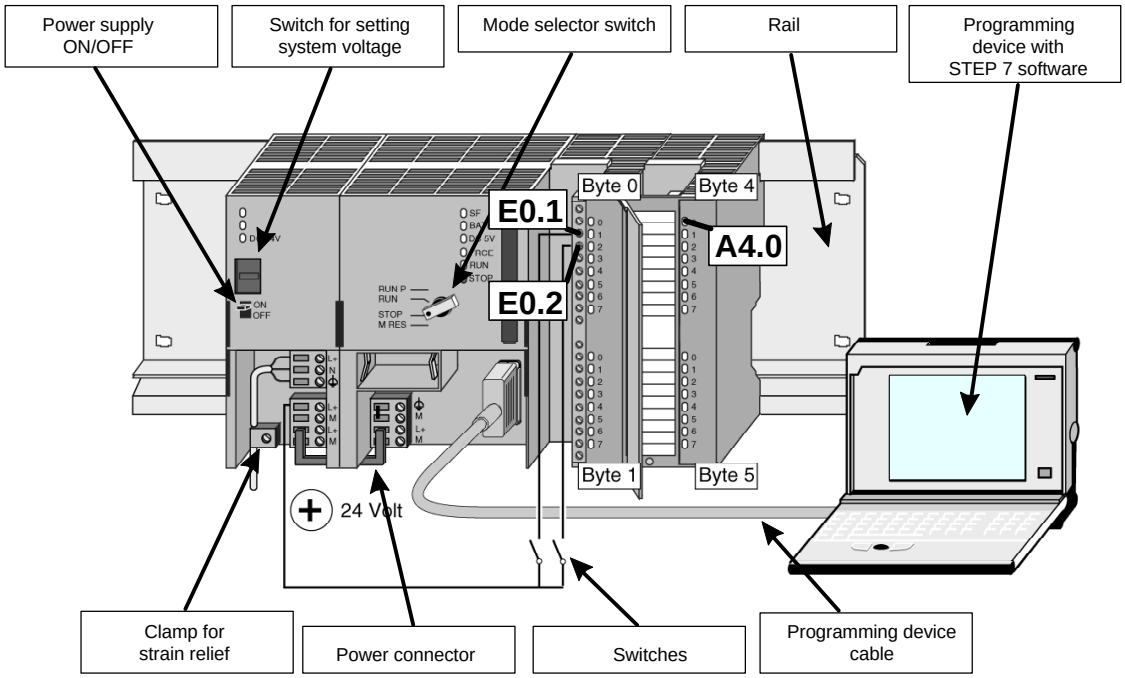
- You must be familiar with the fundamentals of electronic/electrical engineering and have experience of working with computers and Microsoft® Windows™ 95/98/NT.
- The reference potential must be grounded. That means that the bridge between chassis ground and functional ground must be installed (which is how the CPU is shipped).

Warning
The S7-300 is used as a component in installations and systems that require you to comply with specific rules and regulations that vary depending on the application. Please note the relevant safety and accident-prevention regulations, such as IEC 204 (emergency stop systems).
Non-compliance with these regulations can result in serious injury and damage to both machinery and equipment.

Materials and Tools Required

Quantity	Item	Order Number (SIEMENS)
1	Rail	e.g.: 6ES7 390-1AE80-0AA0
1	PS 307 power supply (PS) with power connector (VK)	e.g.: 6ES7 307-1EA00-0AA0
1	CPU 314	e.g.: 6ES7 314-1AE04-0AB0
1	Buffer battery	6ES7 971-1AA00-0AB0
1	Digital input module (DI) with bus connector	e.g.: 6ES7 321-1BH01-0AA0
1	Digital output module (DO) with bus connector	e.g.: 6ES7 322-1BH01-0AA0
2	20-pin front connector with screw-type contacts	6ES7 392-1AJ00-0AA0
1	Programming device (PG) with MPI interface and installed STEP 7 version $\geq$ 5.0 and PG cable	Depends on configuration
X m	PROFIBUS-DP cable with bus connectors	Depends on type
Various	M6 screws and nuts (length depends on installation location) with appropriate screwdriver/wrench	Standard
1	Screwdriver with 3.5 mm blade	Standard
1	Screwdriver with 4.5 mm blade	Standard
1	Diagonal cutter and tool for insulation stripping	Standard
1	Tool for pressing on wire-end ferrules	Standard
X m	Cable for grounding the rail with 10 mm^2 cross-section with cable lug for M6, length dependent on local requirements	Standard
Approx. 2 m	Stranded wire with 1 mm^2 cross-section with appropriate wire-end ferrules (type A, length 6 mm)	Standard
X m	3-core power cable (AC 230/120 V) with shock-proof plug; length dependent on local requirements; correct wire-end	Standard
2	1-pin on switch (24 V)	Standard

Layout of the example



Overview of the layout of the example (without the wiring of the power supply to the SM)

Functionality of the Example

Output A4.0 can only be switched (i.e. the A4.0 diode lights up on the DO), if switches E0.1 **and** E0.2 are pressed.

Step 1: Installation

Installation sequence: from left to right: PS – CPU – DI – DO.
A bus connector (BV) is shipped with each DI and DO. You can get an idea of the overall configuration in the overview figure.

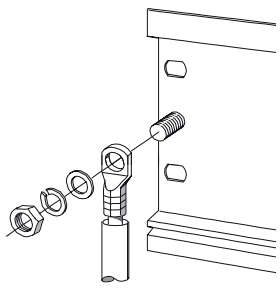
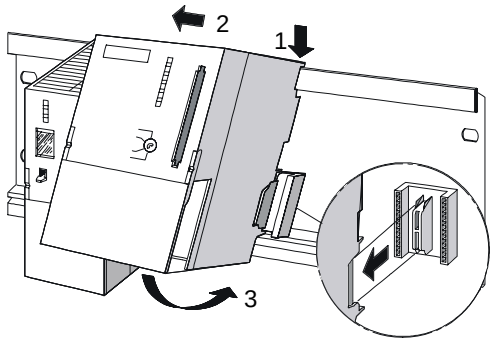
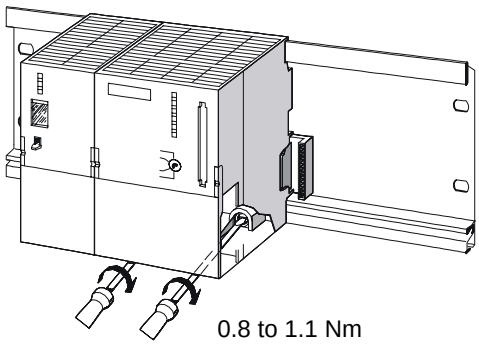
Figure	Installing and Grounding the Rail
	1. Put the rail in position and fasten (screw size: M6) so that there is at least 40 mm above and below the rail. If you fasten the rail to a grounded metal plate or a grounded device support, make sure there is a low-resistance connection between the rail and the base.
	2. Connect the rail to the protective conductor. There is an M6 protective conductor screw on the rail for this purpose. Minimum cross-section of the cable to the protective conductor: 10 mm^2.

Figure	Installing the Modules on the Rail
	1. Remove the bus connector from the ”last” module (=DO) and insert it in the CPU. Do not insert a bus connector on the DO during installation. 2. Attach the PS, push it up to the grounding screw of the rail and tighten it. 3. Attach the CPU (1), push it up to the module on the left (2) and tip it downward (3).
	4. Screw the module on tightly. 5. Insert the second bus connector on the DI. 6. Repeat steps 3 and 4 for the remaining modules.

Step 2: Wiring

Warning

You can come into contact with live wires if the PS 307 is switched on or the PS network cable is connected to the power.
Only wire the S7-300 in a deenergized state!

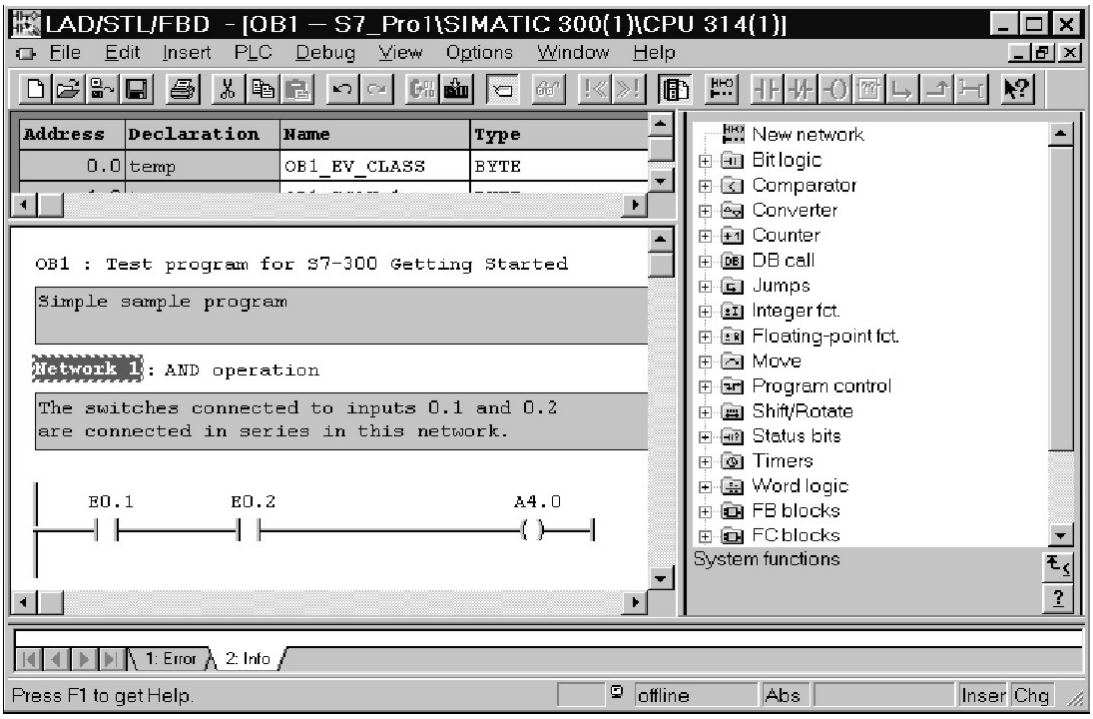
Stage	Wiring the Power Supply and the CPU
1	Open the front doors of the PS and the CPU.
2	Loosen the clamp for the PS strain relief (see the figure on page 3).
3	Strip the power cable, attach wire-end ferrules, if necessary (for multi-wire cables), and attach to the PS.
4	Tighten the clamp for the strain relief.
5	Insert the power connector in the PS and CPU (see the figure on page 3) and tighten.
6	Check that the line voltage selector switch is set to your line voltage. The CPU is set in the factory to a line voltage of AC 230 V. To change the voltage, proceed as follows: Remove the protective cap with a screwdriver, set the switch to the line voltage required and replace the protective cap.

Stage	Wiring the Front Connectors of the DI and DO
1	Open the front doors of the DI and DO.
2	Position the front connectors so that you can wire them: To do this, push a front connector into both the DI and the DO until it snaps into position. The front connector still sticks out of the module in this position. A wired front connector has no contact with the module in the wiring position.
3	Strip 6 mm from the wire ends you want to insert in the front connector and attach appropriate wire-end ferrules.
4	Wire the front connector of the DI as follows: Terminal 1: L+ of the PS; terminal 13: switch 1; terminal 14: switch 2; terminal 20: M of the PS.
5	Wire the front connector of the DO as follows: Terminals 1 and 11: L+ of the PS; terminal 20: M of the PS.
6	Wire the free wire ends of the switches to L+ of the PS.
7	Lead the wires downward out of the front connectors.
8	Press the release button of the front connector on the upper part of the module and at the same time push the front connector into the module until the release button jumps back into its original position.
9	Close the front doors of the DI, DO and PS.

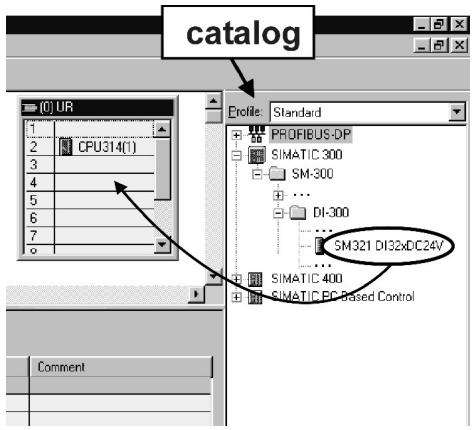
Step 3: Commissioning the Hardware

Stage	What to Do	Result
1	Connect the programming device to the CPU with the programming device cable. Make sure that the terminating resistors are inserted in the connectors. Close the front door of the CPU and put the mode selector switch to *STOP*.	
2	Connect the power cable to the network and switch on the PS 307 power supply module.	The *DC24V* LED lights up on the PS. All the LEDs on the CPU come on briefly; the *SF* LED, the *BATF* LED and the *DC5V* LED remain on. The *STOP* LED flashes rapidly for 3 sec. and then remains on.
3	Insert the buffer battery: – Insert the buffer battery connector into the corresponding socket in the battery compartment of the CPU. The groove on the connector must be facing left. – Insert the buffer battery in the battery compartment of the CPU. – Close the front door of the CPU.	The *BATF* LED goes off followed shortly afterwards by the *SF* LED.
4	Raise the programming device and start SIMATIC Manager on the Windows desktop.	A SIMATIC Manager window appears.
5	Carry out a memory reset in the CPU as follows: – Turn the mode selector switch to *MRES*. Keep the mode selector switch in this position until the *STOP* LED comes on for the second time and stays on (this takes 3 sec.). – Within 3 sec. you must turn the mode selector switch back to *MRES*. The *STOP* LED starts to flash rapidly and the CPU carries out a memory reset. When the *STOP* LED comes on permanently again, the CPU has completed the memory reset.	
6	Activate switch 1.	The E0.1 LED on the DI comes on. No LEDs light up on the DO.
7	Activate switch 2.	Die E0.2 LED on the DI comes on. No LEDs light up on the DO.

Step 4: Commissioning the Hardware

Stage	What to Do	Result
1	Follow the STEP 7 new project assistant on the programming device and create a new project with the following data: • CPU type: *CPU 314*. • Block to be created: *OB1* • Project name: *S7_Pro1*	A two-part window with the title *S7_Pro1 --...* appears.
2	Double-click the *OB1* icon in the right-hand part of the window.	The editor for the OB1 block opens.
3	From the *View* menu, choose the *LAD* command to switch to the LAD programming language.	In the lower-left part of the window, a rung current path is displayed in the network.
4	Click exactly on the horizontal line of the rung current path.	The line is highlighted.
5	Double-click the –||– button (normally open contact) on the toolbar and then click the –( ) button once (coil).	The icons are inserted in the rung current path.
6	Click the red question mark of the normally open contact on the left in the rung current path.	The normally open contact is highlighted, and a text box with a cursor appears at the point of the question mark.
7	Enter *E0.1* and press *Return*.	The normally open contact on the left is assigned the designation *E0.1*.
8	Label the right button in the same way with *E0.2* and the coil with *A4.0*. 	
9	Close the editor and confirm that you want to save with *Yes*.	The editor closes, and the OB1 is saved.

Step 5: Configuring the Hardware

Stage	Procedure	Result
1	In SIMATIC Manager, click SIMATIC 300 Station in the left-hand part of the window.	The buttons *Hardware* and *CPU 314(1)* appear in the right-hand part of the window.
2	Double-click the *Hardware* button in the right-hand part of the window.	The hardware configuration editor opens.
3	• If a catalog is not displayed in the right-hand part of the window, activate the catalog by choosing the *Catalog* command from the *View* menu. • Navigate to DI-300 via SIMATIC 300 and SM-300. • Insert the *SM 321DI16xDC24V* whose order number corresponds to the order number on your DI by dragging and dropping it on slot 4 (the upper or lower left-hand window). **Note:** You can find out the order number if you click a DI in the catalog. The order number of this DI then appears in the text box under the catalog.	
4	Navigate to *DO-300*.	A list containing different DOs appears.
5	Insert the *SM 322 DO16xDC24V/0.5A* whose order number corresponds to the order number on your DO by dragging and dropping it on slot 5.	The module appears on slot 5.
6	Check that the order number displayed for slot 2 in the lower left-hand part of the window corresponds to the order number on your CPU. If necessary, widen the order number column to display the whole order number.	**If yes:** Continue from stage 7. **If not:** Navigate in the catalog via CPU 300 to CPU 314 and replace the CPU on slot 2 with the CPU with the correct order number from the catalog by dragging and dropping it.
7	From the *Station* menu, choose the *Save and Compile* command.	The hardware configuration is compiled and saved.
8	Close the editor.	The editor is closed.

Step 6: Test Run

Stage	Procedure	Result
1	Navigate via SIMATIC 300 Station and CPU 314(1) to S7 Program. In SIMATIC Manager, click Blocks in the right-hand part of the window.	*Blocks* is highlighted.
2	From the *PLC* menu, choose the *Download* command to transfer the program and the hardware configuration to the CPU. Click *Yes* in all the dialog boxes that appear.	The program and configuration are downloaded from the programming device to the CPU.
3	Switch the CPU mode selector to *RUN*.	The *STOP* LED goes out. The *RUN* LED starts flashing and then comes on continuously.
4	Operate the two switches alternately.	The LEDs of the inputs E0.1 and E0.2 light up alternately. The LED of output A4.0 does not light up.
5	Operate the two switches simultaneously.	The LEDs of inputs E0.1 and E0.2 light up together. The LED of output A4.0 comes on. This would switch on a connected actuator or indicator.

Diagnosis/Debugging

Incorrect operation, incorrect wiring or incorrect hardware configuration can result in faults that the CPU indicates after a memory reset with the group error LED *SF*.

You can find out how to evaluate these errors and messages in the manuals: *Hardware and Installation* ; Section 8.3.2 and *Programming with STEP 7 V5.0* ; Chapter 21.

Manuals for Further Information

We recommend that you also read *Getting Started First Steps with STEP 7 V5.0*.

You can download all the manuals free of charge from the Siemens home page (Products & Solutions – Industrial Services – Support – SIMATIC – Customer Support).

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