

SIEMENS

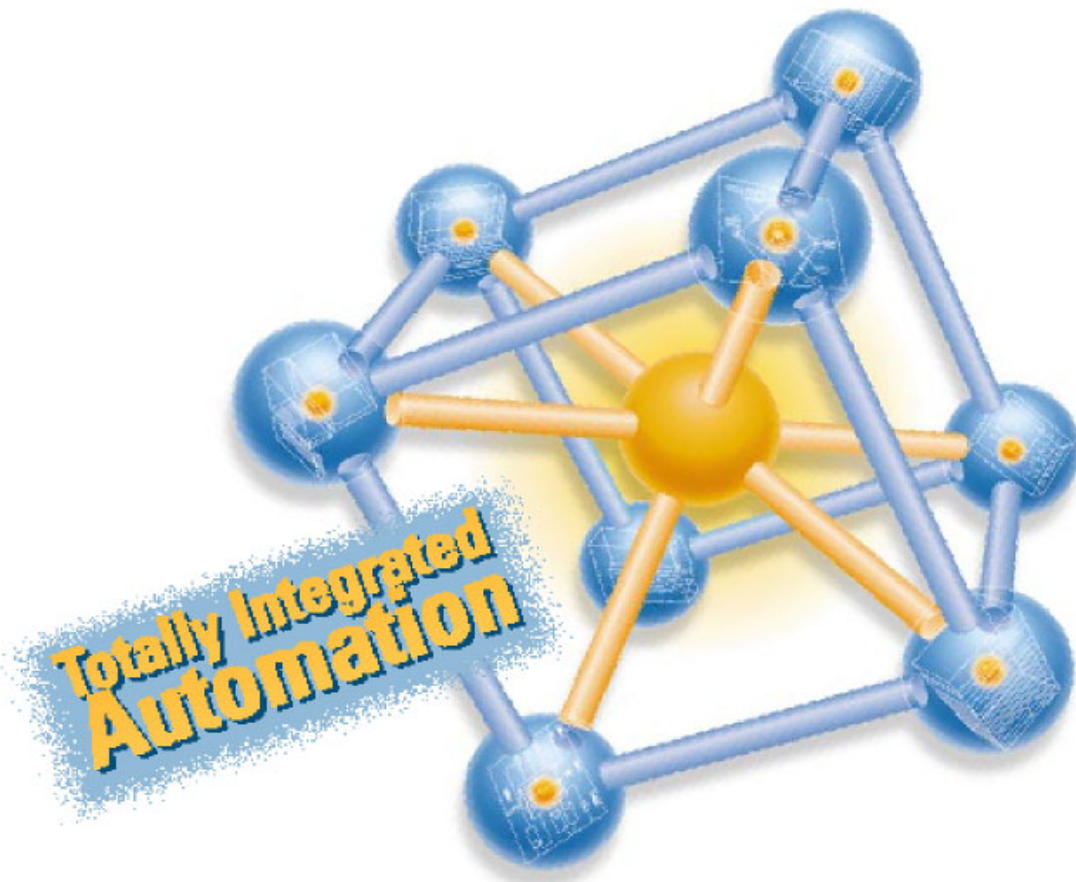
SIMATIC

Automation System S7-300

Getting Started

Edition 09/2002

CPU 31xC: 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 CPU 31xC.

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.



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.

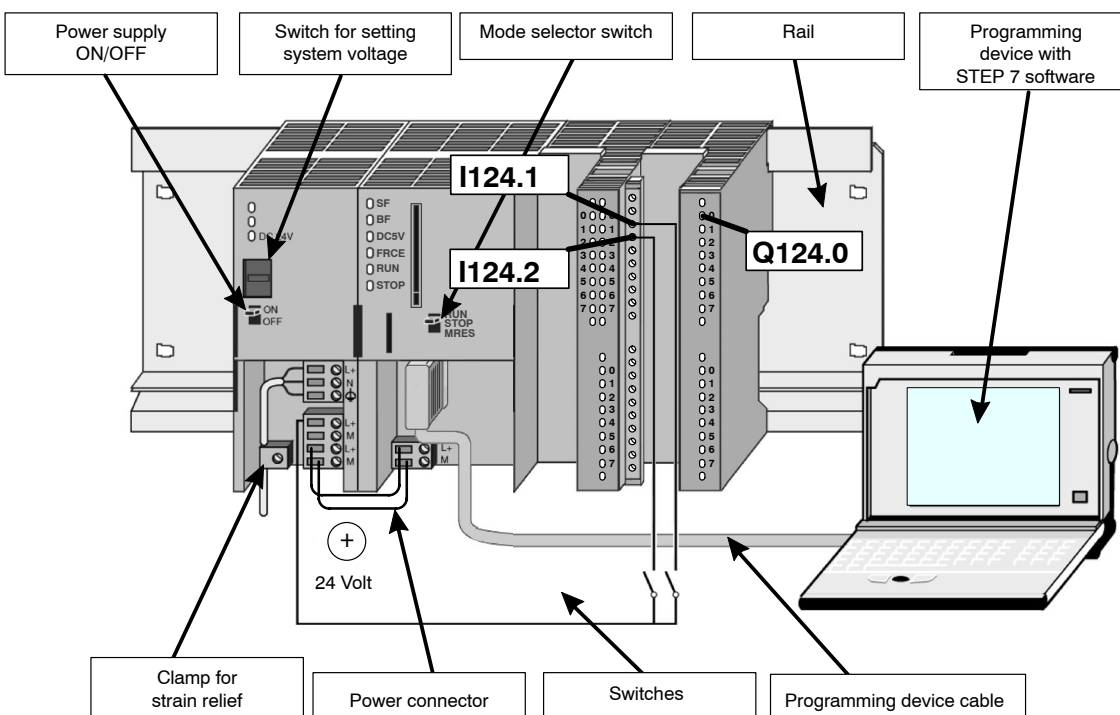
Please note the relevant safety and accident-prevention regulations, such as IEC 204 (emergency stop systems).

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)	e.g. 6ES7 307-1EA00-0AA0
1	CPU 31xC, z. B. CPU 313C	e.g. 6ES7 313-5BE00-0AB0
1	SIMATIC Micro Memory Card (MMC)	e.g. 6ES7 953-8LL00-0AA0
2	40-pin front connector with screw-type contacts	6ES7 392-1AM00-0AA0
1	<ul style="list-style-type: none">• Programming device (PG) with MPI interface and installed STEP 7 version \geq 5.1 + SP 2 and PG cable or• PC with the corresponding interface card	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

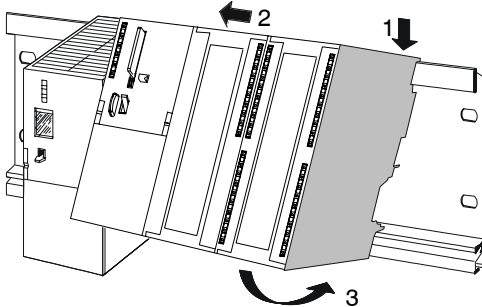
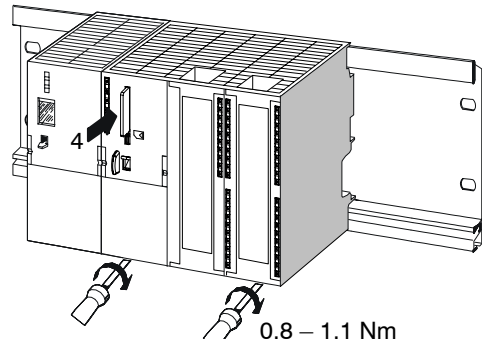
Functionality of the Example

Output Q124.0 can only be switched (i.e. the Q124.0 diode lights up on the DO), if switches I124.1 and I124.2 are pressed.

Step 1: Installation

Installation sequence: from left to right: power module 307 – CPU 313C.
The picture shows the overview of the entire installation.

Figure	Installing and Grounding the Rail
	<ol style="list-style-type: none"> 1. Put the rail in position and fasten (screw size: M6) so that there is at least 40 mm of space above and below the rail. 2. 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. 3. 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 mm².

Figure	Mounting the Module on the Rack
	<ol style="list-style-type: none"> 1. Attach the PS, push it up to the grounding screw of the rail and tighten it. 2. Attach the CPU (1), push it up to the module on the left (2) and tip it downward (3).
	<ol style="list-style-type: none"> 3. Screw the CPU on tightly. 4. Insert the Micro Memory Card in the CPU (4). This is absolutely necessary for operation A Micro Memory Card with unknown content should be first deleted in the programming device.

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!

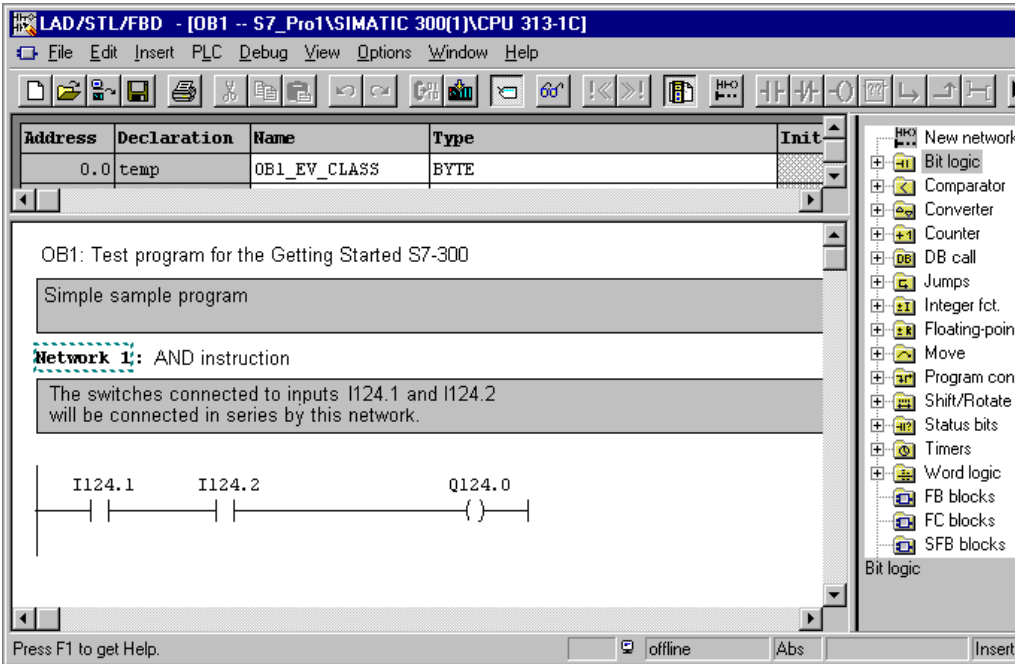
Stage	Wiring the Power Supply and the CPU
1	Open the front doors of the power module and the CPU.
2	Loosen the clamp for the power module strain relief (see the figure on page 3).
3	Strip the power cable, attach wire-end ferrules, if necessary (for multi-wire cables), and attach to the PS.
4	Tighten the clamp for the strain relief.
5	Insert two short connection cables between the power module and the CPU (see picture on page 3) and tighten it.
6	Check that the line voltage selector switch is set to your line voltage. The power module 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 CPU 313C.
2	Position the front connectors so that you can wire them: To do this, push a front connector into the CPU 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 (DI side) as follows: Terminal 1: L+ of the power module; terminal 3: switch 1; terminal 4: switch 2; terminal 20: M of the power module.
5	Wire the front connector (DO side) as follows: Terminals 21 and 31: L+ of the power module; terminal 30: M of the power module.
6	Wire the free wire ends of the switches to L+ of the power module.
7	Lead the wires downward out of the front connectors.
8	Tighten the front connector (this sets the connection to the module).
9	Close the front cover of the power module and the front door of the CPU.

Step 3: Commissioning the Hardware

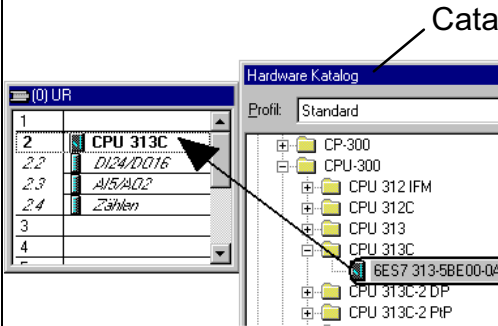
Stage	What to Do	Result
1	Connect the programming device to the CPU with the programming device cable. If you use a cable with PROFIBUS connectors, you will have to turn on the resistors in the connectors. Close the front door of the CPU and put the mode selector switch to <i>STOP</i> .	
2	Connect the power cable to the network and switch on the PS 307 power supply module.	The <i>DC24V</i> LED lights up on the PS. All the LEDs on the CPU come on briefly; the <i>SF</i> LED and the <i>DC5V</i> LED remain on. The <i>STOP</i> LED starts to flash slowly and requires memory reset (see 3).
3	Carry out a memory reset in the CPU as follows: <ul style="list-style-type: none"> – Press the mode selector switch to <i>MRES</i>. Keep the mode selector switch in this position until the <i>STOP</i> LED comes on for the second time and stays on (this takes 3 sec.). You can let go of the mode selector. – Within 3 sec. you must press the mode selector switch back to <i>MRES</i>. The <i>STOP</i> LED starts to flash rapidly and the CPU carries out a memory reset. You can let go of the mode selector. When the <i>STOP</i> LED comes on permanently again, the CPU has completed the memory reset. 	
4	Raise the programming device and start SIMATIC Manager on the Windows desktop.	A SIMATIC Manager window appears.
5	Activate switch 1.	The I124.1 LED on the DI comes on. No LEDs light up on the DO.
6	Activate switch 2.	The I124.2 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: <ul style="list-style-type: none"> • CPU type: <i>CPU 313C</i>. • Block to be created: <i>OB1</i> • Project name: <i>S7_Pro1</i> 	A two-part window with the title <i>S7_Pro1 --...</i> appears.										
2	Double-click the <i>OB1</i> icon in the right-hand part of the window.	The editor for the <i>OB1</i> block opens.										
3	From the <i>View</i> menu, choose the <i>LAD</i> 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 <i>I124.1</i> and press <i>Return</i> .	The normally open contact on the left is assigned the designation <i>I124.1</i> .										
8	Label the right button in the same way with <i>I124.2</i> and the coil with <i>Q124.0</i> .	 <p>The screenshot shows the SIMATIC Manager LAD editor interface. The title bar reads 'LAD/STL/FBD - [OB1 -- S7_Pro1\SIMATIC 300(1)\CPU 313-1C]'. The menu bar includes File, Edit, Insert, PLC, Debug, View, Options, Window, and Help. A toolbar with various icons is visible below the menu. A variable declaration table is shown with the following content:</p> <table border="1"> <thead> <tr> <th>Address</th> <th>Declaration</th> <th>Name</th> <th>Type</th> <th>Init</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td>temp</td> <td>OB1_EV_CLASS</td> <td>BYTE</td> <td></td> </tr> </tbody> </table> <p>The main editor area displays the following text:</p> <pre>OB1: Test program for the Getting Started S7-300 Simple sample program Network 1: AND instruction The switches connected to inputs I124.1 and I124.2 will be connected in series by this network.</pre> <p>Below the text, a ladder logic network is shown with two normally open contacts labeled I124.1 and I124.2 connected in series to a coil labeled Q124.0. The status bar at the bottom indicates 'Press F1 to get Help.', 'offline', 'Abs', and 'Insert'.</p>	Address	Declaration	Name	Type	Init	0.0	temp	OB1_EV_CLASS	BYTE	
Address	Declaration	Name	Type	Init								
0.0	temp	OB1_EV_CLASS	BYTE									

Stage	What to Do	Result
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 <i>Hardware</i> and <i>CPU 313 C</i> appear in the right-hand part of the window.
2	Double-click the <i>Hardware</i> button in the right-hand part of the window.	The hardware configuration editor opens.
3	<ul style="list-style-type: none"> If a catalog is not displayed in the right-hand part of the window, activate the catalog by choosing the <i>Catalog</i> command from the <i>View</i> menu. Navigate to DI-300 via SIMATIC 300 and SM-300. Insert the <i>CPU 313C</i> with drag-and-drop to slot 2 (the upper or lower left-hand window). <p>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.</p>	
4	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	<p>If yes: Continue from stage 5.</p> <p>If no: Navigate in the catalog via CPU 300 to CPU 313C and replace the CPU on slot 2 with the CPU with the correct order number from the catalog by dragging and dropping it.</p>
5	Insert the <i>SM 322 DO16xDC24V/0.5A</i> whose order number corresponds to the order number on your DO by dragging and dropping it on slot 5.	
6	From the <i>Station</i> menu, choose the <i>Save and Compile</i> command.	The hardware configuration is compiled and saved.
7	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.	<i>Blocks</i> is highlighted.
2	From the <i>PLC</i> menu, choose the <i>Download</i> command to transfer the program and the hardware configuration to the CPU. Click <i>Yes</i> in all the dialog boxes that appear.	The program and configuration are downloaded from the programming device to the CPU. The program stored on the Micro Memory Card (in the Load Memory) is now protected against power failure and memory reset.
3	Switch the CPU mode selector to <i>RUN</i> .	The <i>STOP</i> LED goes out. The <i>RUN</i> LED starts flashing and then stays on.
4	Operate the two switches alternately.	The LEDs of the inputs I124.1 and I124.2 light up alternately. The LED of output Q124.0 does not light up.
5	Operate the two switches simultaneously.	The LEDs of inputs I124.1 and I124.2 light up together. The LED of output Q124.0 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 10.4 and *Programming with STEP 7 V5.1* ; Chapter 21.

SIMATIC Documentation on the Internet

You can download all the manuals free of charge from the Siemens home page <http://www.ad.siemens.de/support>

The Knowledge Manager on this page helps you to find the documentation you need faster. You can exchange questions and comments about the documentation with other users on our forum.