SIEMENS

SIMATIC

S7-300
CPU 31xC and CPU 31x: Installation

Operating Instructions

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This manual is part of the documentation package with order number:
6ES7398-8FA10-8BA0

03/2011
A5E00105492-12

7.4 Addressing PROFINET IO

Overview

The corresponding I/O devices must be commissioned for operation on PROFINET in order to enable addressing of distributed peripherals on PROFINET IO in the user program.

This commissioning includes

- the assignment of address ranges to the input/output modules or the slots/subslots in order to enable their addressing in the user program. the assignment of a diagnostic address to slots which do not contain user data.
- The definition of device numbers and names for the IO devices
- the definition of I/O device names in order to enable the assignment of IP addresses and access to the IO devices by the CPU 31x PN/DP operated as IO controller.

Note

Naming IO devices after "Device replacement without removable medium"

If the functionality "Device replacement without removable medium" is configured in HW Config, IO devices can be replaced without the user having to assign a name. To do so, the IO device has to be reset to the state of delivery by using "Reset to factory setting".

Note

Use different method to obtain IP address parameters/device names (PROFINET CPUs)

- IP address parameters/device name via DCP:
  IP address parameters/device name are assigned by means of DCP (**D**iscovery and **C**onfiguration **P**rotocol). This can be achieved in two ways:
  - using a setup tool such as PST or STEP 7, for example, via "Edit Ethernet node"
  - using the higher-level controller, provided the CPU is operated as an I device.
- IP address parameters/device name via user program:
  The IP address parameters and/or device names are assigned in the user program of the CPU (using SFB 104)

For more information about the commissioning of the CPU as IO controller, refer to chapter Commissioning PROFINET IO (Page 180)

User-specific addressing of distributed PROFINET IO

Distributed peripherals on PROFINET IO require user-specific addressing.

For more information, refer to chapter User-specific addressing of modules (Page 129).

Addressing consistent user data areas

The table below shows items to be taken into consideration in terms of communication in a PROFINET IO system when transferring I/O areas with "Total length" consistency.

Rule for 1 to 1024 bytes data consistency on PROFINET IO:
The address range of consistent data in the process image is updated automatically.
You can also use SFC14 "DPRD_DAT" and SFC15 "DPWR_DAT" to read and write consistent data. SFC14 and SFC15 are required to read and write consistent data of address ranges which are not available in the process image.
The length of areas with "Total length" consistency accessed by the SFC must match the programmed range.
Direct access to consistent areas is also possible (L PEW or T PAW, for example).
PROFINET IO supports the transfer of up to 1024 bytes of consistent data.

7.5 Assigning IP address parameters and the device name

IP address parameters/device name

Similar to any other PROFINET device, the CPU (or its PROFINET interface) also needs the IP address parameters and device name for communication via PROFINET.

The IP address parameters consist of three sections:

- IP address
- Subnet mask
- Router address

Retentivity of IP address parameters and device names

The retentivity of IP address parameters and device names depends on the way it is assigned. The non-retentive, temporary assignment means that:

- IP address parameters and device names are valid until the next POWER OFF or memory reset. After POWER OFF/POWER ON or memory reset, the CPU can be reached at its MAC address only.
- Loading a temporary IP address also deletes non-retentive IP address parameters from memory.

Assigning IP address parameters and device names

The following methods are available for the assignment of IP address parameters and device names:

Assigning IP address parameters and device names		Retentivity
Default method: Permanent assignment in STEP 7	IP address parameters/device names are assigned permanently in the *STEP 7* configuration. The IP address parameters/device names are saved to retentive memory on the CPU along with the download of configuration data to the CPU.	Data is retentive: • on POWER OFF/ POWER ON • after memory reset • after the configuration data was deleted (SDBs) • after the MMC was removed
Permanent assignment with the settings "Use different method to obtain IP address parameters/ device names"	IP address parameters/device names are assigned by means of DCP (**D**iscovery and **C**onfiguration **P**rotocol): • Using a setup tool such as PST, or in *STEP 7* , for example, using the "Edit Ethernet nodes" function. • By the higher-level IO controller, provided the CPU is operated as intelligent device with prioritized power up.	
Temporary assignment in STEP 7	IP address parameters/device names are assigned by means of DCP (**D**iscovery and **C**onfiguration **P**rotocol): • For automatic IP address assignments via "Available nodes" in *STEP 7*, if the CPU does not yet have an IP address.	Data is **not** retentive
Temporary assignment with the setting "Use different method to obtain IP address parameters/ device names"	IP address parameters/device names are assigned by means of DCP (**D**iscovery and **C**onfiguration **P**rotocol): • If **not** operated with prioritized power up, an intelligent device is assigned the IP address by the higher-level controller.	
Assignment in the user program	IP address parameters/device names are assigned in the user program using SFB 104. The retentivity of IP address parameters/device names can be specified in a corresponding parameter data record.	Retentivity in accordance with specifications in the parameter data record

Resetting retentive IP address parameters and device names

Retentive IP address parameters and device names can be reset as follows:

- With "Reset to factory settings"
- With a firmware update

NOTICE
• The temporary assignment of IP address parameters/device names resets all retentive IP address parameters/device names in memory. • During the permanent assignment of IP address parameters/device names, the parameters previously saved to retentive memory will be replaced with the new parameters.

NOTICE
Reusing devices Always perform a "Reset to factory settings" before you install a device that contains retentive IP address parameters/device names in other subnets/systems, or before you put it on shelf.

Reference

For more information about IP address assignments for the intelligent device, refer to the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127).

Commissioning 8

8.1 Overview

This section contains important notes on commissioning which you should strictly observe in order to avoid injury or damage to machines.

Note

Your commissioning phase is determined primarily by your application, so we can only offer you general information, without claiming completeness of this topic.

Reference

Note the information about commissioning provided in the descriptions of your system components and devices.

8.2 Commissioning procedure

8.2.1 Procedure: Commissioning the hardware

Hardware requirements

- S7-300 is installed.
- S7-300 is wired.

Prepare the interfaces for a networked S7-300 as follows:

- MPI/ PROFIBUS
  - The MPI/PROFIBUS addresses are set.
  - The terminating resistors at the segment boundaries are enabled.
- PROFINET
  - The integrated PROFINET interface of CPU 31x PN/DP is configured in STEP 7 (IP address and device name are set, for example, in HW Config).
  - The CPU is connected to the subnet.

Recommended procedure: Hardware

The S7-300 system can be very large and extremely complex due to its modular structure and versatile expansion options. It is therefore inappropriate to initially start up an S7-300 with multiple racks and all inserted (installed) modules. Rather, we recommend a step-by-step commissioning procedure.

We recommend the following initial commissioning procedure for an S7-300:

Table 8- 1 Recommended commissioning procedure: Hardware

Tasks	Comments	Information can be found
An installation and wiring check according to checklist	-	*in the chapter: Checklist for commissioning*
Disconnecting drive aggregates and control elements	This prevents negative effects on your system as a result of program errors. Tip: By redirecting data from your outputs to a data block, you can always check the status at the outputs	-
Preparing the CPU	Connecting the PG	*in the chapter: Connecting the programming device (PG).*
Central unit (CU): commission the CPU and power supply, check the LEDs	Commission the CU with inserted power supply module and CPU. First, switch on the expansion devices (EMs) which are equipped with their own power supply module, and then switch on the power supply module of the CU.	*in the chapter: Initial power on*
	Check the LED displays on both modules.	*in the chapter: Debugging functions, diagnostics and troubleshooting*
Reset CPU memory and check the LEDs	-	*in the chapter: CPU memory reset by means of mode selector switch*
CU: commission the remaining modules	Insert additional modules into the CU and commission these, working successively.	in the *Module specifications* Manual
Expansion module (EM): Interconnect	Interconnect the CU with EMs as required: Insert only one send IM into the CU, and insert the matching receive IM into into the EM.	*in the chapter: Installation*
EM: Commissioning	Insert additional modules into the EMs and commission these, working in successively.	See above.

⚠ DANGER

Proceed step-by-step. Do not go to the next step unless you have completed the previous one without error/error message.

Reference

Important notes can also be found in the section *Debugging Functions, Diagnostics and Troubleshooting.*

See also

Procedure: Software commissioning (Page 143)

8.2.2 Procedure: Software commissioning

Requirements

- You must have installed and wired up your S7-300.
- You are using the current programming package of STEP 7 in order to utilize the complete functional scope of your CPU.
- In case of networking of the S7-300 with MPI or PROFIBUS
  - The MPI/PROFIBUS addresses are configured
  - You have switched on the terminating resistors at the segment borders.
- In case of networking of the S7-300 with PROFINET
  - The integrated PROFINET interface of CPU 31x PN/DP is configured in STEP 7 (IP address and device names are set in HW Config)
  - The CPU is connected to the subnet.

Note

Observe the procedure for commissioning the hardware.

Recommended procedure: Software

Table 8- 2 Recommended commissioning procedure - Part II: Software

Tasks	Comments	Information can be found...
• Switch on the PG and run SIMATIC Manager • Download the configuration and the program to the CPU	-	In the *STEP 7* Programming Manual
Debugging the I/Os	Helpful functions are here: • Monitoring and modifying variables • Testing with program status • Forcing • Controlling outputs in STOP mode (PO enable) **Tip:** Test the signals at the inputs and outputs. Use the simulation module SM 374, for example.	In the *STEP 7* Programming Manual *in the chapter: Debugging functions, diagnostics and troubleshooting*
Commissioning PROFIBUS DP or Ethernet	-	*in the chapter: Commissioning PROFIBUS DP* *in the chapter: Configuring PROFINET interface X2*
Commissioning PROFINET IO		in the *PROFINET System Description* System Manual
Connect the outputs	Commissioning the outputs successively.	-

⚠ DANGER

Proceed step-by-step. Do not go to the next step unless you have completed the previous one without error/error message.

Reaction to errors

React to errors as follows:

- Check the system with the help of the check list in the chapter below.
- Check the LED displays on all modules. For information on their meaning, refer to the chapters describing the relevant modules.
- If required, remove individual components to trace the error.

Maintenance 9

9.1 Overview

Maintenance in terms of the S7-300

- refers to the backup of the operating system to a SIMATIC Micro Memory Card
- Updating of the operating system from a SIMATIC Micro Memory Card
- Updating of the firmware online
- Backing up of project data on a SIMATIC Micro Memory Card
- Replacement of modules
- Replacement of fuses in digital output modules

9.2 Backing up firmware on a SIMATIC Micro Memory Card

Situations which require backup of the firmware

It is advisable in certain situation to backup your CPU firmware:

You may want to replace the CPU in your system with a CPU out of storage. In this case you should make sure that the firmware of the shelf CPU and of the system firmware are identical.

It is also advisable to create an emergency backup copy of the firmware.

On which CPUs can you back up the firmware?

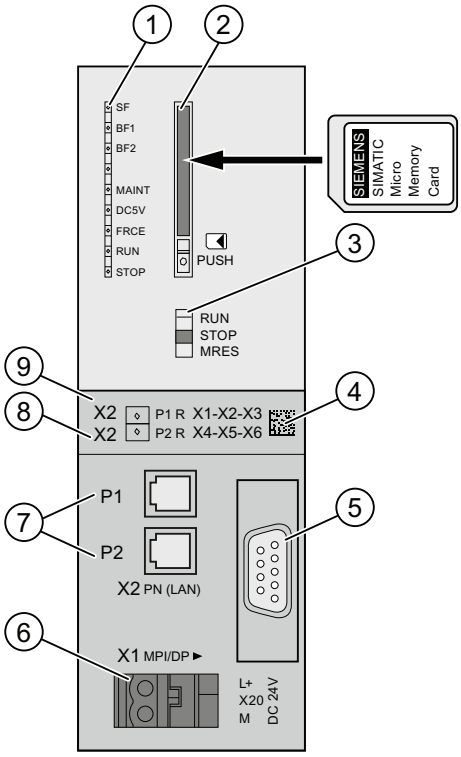
Backup of the firmware is possible as of the following CPU versions:

CPU	Order number	Firmware as of	Required Micro Memory Card ≥ in MByte
312	as of 6ES7312-1AD10-0AB0	V2.0.0	2
	as of 6ES7312-1AE13-0AB0	V2.0.12	
	as of 6ES7312-1AE14-0AB0	V3.0	
312C	as of 6ES7312-5BD00-0AB0	V1.0.0	2
	as of 6ES7312-5BE03-0AB0	V2.0.12	
	as of 6ES7312-5BF04-0AB0	V3.3.1	
313C	as of 6ES7313-5BE00-0AB0	V1.0.0	2
	as of 6ES7313-5BF03-0AB0	V2.0.12	
	as of 6ES7313-5BG04-0AB0	V3.3.1	

CPU	Order number	Firmware as of	Required Micro Memory Card ≥ in MByte
313C-2 PtP	as of 6ES7313-6BE00-0AB0	V1.0.0	2
	as of 6ES7313-6BF03-0AB0	V2.0.12	
	as of 6ES7313-6BG04-0AB0	V3.3.1	
313C-2 DP	as of 6ES7313-6CE00-0AB0	V1.0.0	4
	as of 6ES7313-6CF03-0AB0	V2.0.12	
	as of 6ES7313-6CG04-0AB0	V3.3.1	
314	as of 6ES7314-1AF10-0AB0	V2.0.0	2
	as of 6ES7314-1AG13-0AB0	V2.0.12	
	as of 6ES7314-1AG14-0AB0	V3.0	
314C-2 PtP	as of 6ES7314-6BF00-0AB0	V1.0.0	2
	as of 6ES7314-6BG03-0AB0	V2.0.12	
	as of 6ES7314-6BH04-0AB0	V3.3.1	
314C-2 DP	as of 6ES7314-6CF00-0AB0	V1.0.0	4
	as of 6ES7314-6CG03-0AB0	V2.0.12	
	as of 6ES7314-6CH04-0AB0	V3.3.1	
314C-2 PN/DP	as of 6ES7314-6EH04-0AB0	V3.3	8
315-2 DP	as of 6ES7315-2AG10-0AB0	V2.0.0	4
	as of 6ES7315-2AH14-0AB0	V3.0	
315-2 PN/DP	as of 6ES7315-2EG10-0AB0	V2.3.0	4
	as of 6ES7315-2EH14-0AB0	V3.1	8
317-2 DP	as of 6ES7317-2AJ10-0AB0	V2.1.0	4
	as of 6ES7317-2AK14-0AB0	V3.3.1	
317-2 PN/DP	as of 6ES7317-2EJ10-0AB0	V2.2.0	4
	as of 6ES7317-2EK14-0AB0	V3.1	8
319-3 PN/DP	as of 6ES7318-3EL00-0AB0	V2.4.0	8
	as of 6ES7318-3EL01-0AB0	V3.2	8

2.2.3 Operator controls and indicators: CPU 315-2 PN/DP and CPU 317-2 PN/DP

Operator controls and indicators of CPU 315-2 PN/DP and CPU 317-2 PN/DP



Number	Description
①	Status and error indicators
②	Slot for the SIMATIC Micro Memory Card incl. the ejector
③	Mode selector
④	MAC address and 2D bar code
⑤	1. interface X1 (MPI/DP)
⑥	Power supply connection
⑦	2. Interface X2 (PN), with dual-port switch
⑧	PROFINET Port 2 The Port 2 status is signaled using a dual-color LED (green/yellow): • LED lit green: LINK to a partner is active • LED changes to yellow: active data traffic (RX/TX) R: Ring port for setting up a ring topology with media redundancy
⑨	PROFINET Port 1 The Port 1 status is signaled using a dual-color LED (green/yellow): • LED lit green: LINK to a partner is active • LED changes to yellow: active data traffic (RX/TX) R: Ring port for setting up a ring topology with media redundancy

Status and error indicators

LED designation	Color	Meaning
SF	red	Hardware fault or software error
BF1	red	Bus error at the first interface (X1)
BF2	red	Bus error at the second interface (X2)
LINK/RX/TX	green	Connection is active at the relevant port
	yellow	Receiving/transmitting data at the relevant port
MAINT	yellow	Maintenance demanded
DC5V	green	5 V power supply for the CPU and S7-300 bus
FRCE	yellow	LED is lit: Active force job LED flashes at 2 Hz: Node flash test function
RUN	green	CPU in RUN The LED flashes during start-up at a rate of 2 Hz, and in stop mode at 0.5 Hz
STOP	yellow	CPU in STOP or HOLD, or STARTUP mode The LED flashes at a rate of 0.5 Hz when a memory reset is requested, and at 2 Hz during the reset.

Slot for the SIMATIC Micro Memory Card

A SIMATIC Micro Memory Card is used as memory module. You can use an MMC as a load memory and as a portable data carrier.

Note

Since these CPUs do not have an integrated load memory, they require a SIMATIC Micro Memory Card for operation.

Mode selector

You can use the mode selector switch to set the current operating mode of the CPU.

Table 2- 17 Mode selector settings

Setting	Meaning	Explanations
RUN	RUN mode	The CPU executes the user program.
STOP	STOP mode	The CPU does not execute a user program.
MRES	Memory reset	Mode selector setting with pushbutton function for CPU memory reset. A CPU memory reset by means of the mode selector requires a specific sequence of operation.

Power supply connection

All CPUs are equipped with a 2-pin socket for power supply connection. For delivery, the connector with screw terminals is plugged into this inlet at the factory.

Configurable process image of the CPUs

STEP 7 lets you define a user-specific size of the process image of the inputs/outputs for the following CPUs.

CPU	Firmware
CPU 312	V3.0 or higher
CPU 312C	V3.3 or higher
CPU 313C	V3.3 or higher
CPU 313C-2 DP	V3.3 or higher
CPU 313C-2 PtP	V3.3 or higher
CPU 314	V3.0 or higher
CPU 314C-2 DP	V3.3 or higher
CPU 314C-2 PtP	V3.3 or higher
CPU 314C-2 PN/DP	V3.3 or higher
CPU 315-2 DP	V3.0 or higher
CPU 315-2 PN/DP	V2.5 or higher
CPU 317-2 DP	V2.5 or higher
CPU 317-2 PN/DP	V2.3 or higher
CPU 319-3 PN/DP	V2.4 or higher

For information on the size of the process image of your CPU please refer to the technical specifications.

9.5 CPU 315-2 PN/DP

Technical specifications

Table 9- 6 Technical specifications of the CPU 315-2 PN/DP

Technical specifications	
CPU and version	
• MLFB	6ES7315-2EH14-0AB0
• Hardware version	01
• Firmware version	V3.2.1
• Associated programming package	STEP 7 as of V5.5 + HSP 199
Memory	
Main memory	
• Integrated	384 KB
• Expandable	No
• Maximum size of non-volatile memory for retentive data blocks,	128 KB
Load memory	
• Pluggable (MMC)	Yes
• Pluggable (MMC), max.	8 MB
• Data retention on the Micro Memory Card (after the last programming action), min.	10 years
Backup	
• Available	Yes (ensured with Micro Memory Card - maintenance-free)
• Without battery	Yes (program and data)
Execution times	
• for bit operation, min.	0.05 µs
• for word operations, min.	0.09 µs
• For fixed-point arithmetic, min.	0.12 µs
• For floating-point arithmetic, min.	0.45 µs
Timers/counters and their retentivity	
S7 counters	
• Number	256
Retentivity	
• Configurable	Yes
• Default	Z 0 to Z 7