VIPA System 300S

VIPA®
art of automation

Note

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- 2006/95/EC Low Voltage Directive

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Contents

About this manual

This manual describes the CP 343S-NET of the System 300S from VIPA. Here you may find besides of a product overview a detailed description of the modules.

Overview   **Chapter 1:   Basics**

This Basics contain hints for the usage and information about the project engineering of a SPEED7 system from VIPA. General information about the System 300S like dimensions and environment conditions will also be found.

Chapter 2:   Assembly and installation guidelines

In this chapter you will find all information, required for the installation and the cabling of a process control with the components of the System 300.

Chapter 3:   Hardware description

Here the hardware components of the CP 343S-NET are more described. The technical data are to be found at the end of the chapter.

Chapter 4:   Deployment CP

Content of this chapter is the functionality of the CP 343S-NET for SPEED-Bus from VIPA. The module may only be used at a SPEED-Bus slot at the left side of the CPU.

Objective and contents

The manual describes the CP 343S-NET from VIPA. It contains a description of the construction, project implementation and usage.

This manual is part of the documentation package with order number HB140E_CP and relevant for:

Product	Order number	as of state: CP HW	CP FW
CP 343S-NET	VIPA 343-1EX71	01	V217

Target audience

The manual is targeted at users who have a background in automation technology.

Structure of the manual

The manual consists of chapters. Every chapter provides a self-contained description of a specific topic.

Guide to the document

The following guides are available in the manual:

- an overall table of contents at the beginning of the manual
- an overview of the topics for every chapter
- an index at the end of the manual.

Availability

The manual is available in:

- printed form, on paper
- in electronic form as PDF-file (Adobe Acrobat Reader)

Icons Headings

Important passages in the text are highlighted by following icons and headings:

Danger!
Immediate or likely danger.
Personal injury is possible.

Attention!
Damages to property is likely if these warnings are not heeded.

Note!
Supplementary information and useful tips.

Safety information

Applications conforming with specifications	The CP is constructed and produced for: • for the deployment with VIPA SPEED-Bus • communication and process control • general control and automation applications • industrial applications • operation within the environmental conditions specified in the technical data • installation into a cubicle

Danger!
This device is not certified for applications in
• in explosive environments (EX-zone)

Documentation	The manual must be available to all personnel in the • project design department • installation department • commissioning • operation

The following conditions must be met before using or commissioning the components described in this manual:

• Modification to the process control system should only be carried out when the system has been disconnected from power!

• Installation and modifications only by properly trained personnel

• The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal	**National rules and regulations apply to the disposal of the unit!**

Chapter 1   Basics

Overview   This Basics contain hints for the usage and information about the project engineering of a SPEED7 system from VIPA.

General information about the System 300S like dimensions and environment conditions will also be found.

Safety Information for Users

Handling of electrostatic sensitive modules

VIPA modules make use of highly integrated components in MOS-Technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges.

The following symbol is attached to modules that can be destroyed by electrostatic discharges.

The Symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatic sensitive equipment.

It is possible that electrostatic sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatic sensitive modules and they can damage components thereby, causing the module to become inoperable or unusable.

Modules that have been damaged by electrostatic discharges can fail after a temperature change, mechanical shock or changes in the electrical load.

Only the consequent implementation of protection devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatic sensitive modules.

Shipping of modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

When you are conducting measurements on electrostatic sensitive modules you should take the following precautions:

- Floating instruments must be discharged before use.
- Instruments must be grounded.

Modifying electrostatic sensitive modules you should only use soldering irons with grounded tips.

Attention!

Personnel and instruments should be grounded when working on electrostatic sensitive modules.

General description of the System 300

The System 300   The System 300 is a modular automation system for middle and high performance needs, which you can use either centralized or decentralized. The single modules are directly clipped to the profile rail and are connected together with the help of bus clips at the backside.

The CPUs of the System 300 are instruction set compatible to S7-300 from Siemens.

System 300V
System 300S

VIPA differentiates between System 300V and System 300S.

- System 300V

  The System 300V allows you to resolve automation tasks centralized and decentralized. The single modules of the System 300V from VIPA are similar in construction to Siemens. Due to the compatible backplane bus, the modules from VIPA and Siemens can be mixed.

- System 300S

  The System 300S extends the central area with high-speed CPUs that have the integrated SPEED7 chip. Additionally some CPU's have got a parallel SPEED-Bus that allows the modular connection of fast peripheral modules like IOs or bus master.
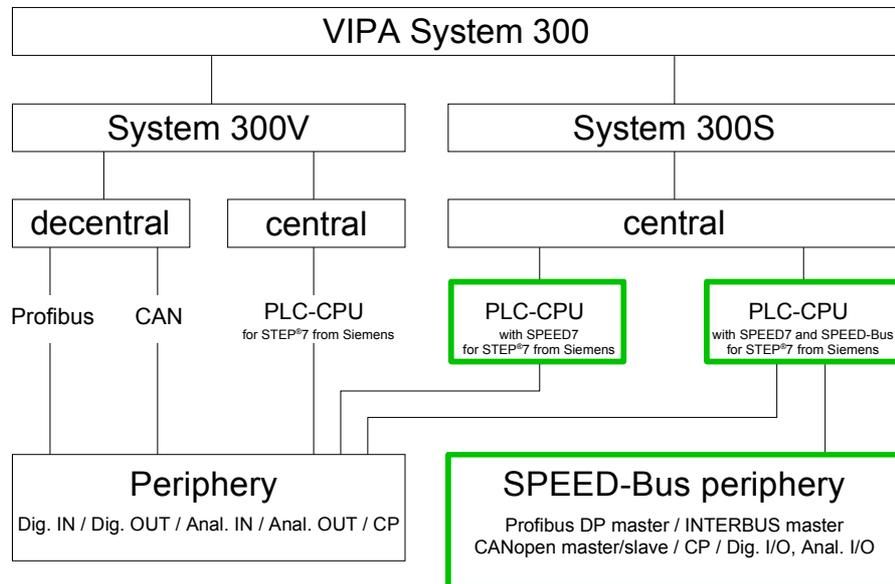
System 300S

Overview

The CPUs 31xS are based upon the SPEED7 technology. This supports the CPU at programming and communication by means of co-processors that causes a power improvement for highest needs.

Except of the basic variant, all SPEED7-CPUs are provided with a parallel SPEED-Bus that enables the additional connection of up to 10 modules from the SPEED-Bus periphery. While the standard peripheral modules are plugged-in at the right side of the CPU, the SPEED bus peripheral modules are connected via a SPEED-Bus bus connector at the left side of the CPU.

SPEED-Bus (parallel)   Standard bus (serial)
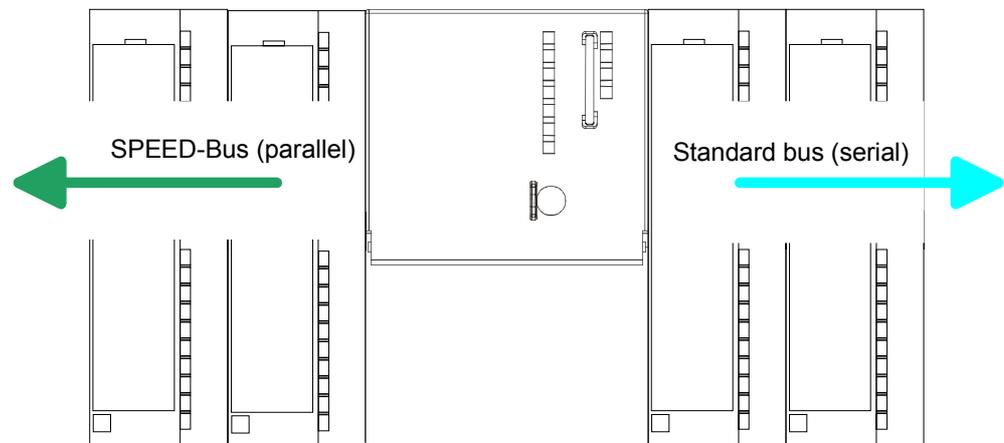
CPU 31xS

The System 300S series consists of a number of CPUs. These are programmed in STEP®7 from Siemens. For this you may use WinPLC7 from VIPA or the Siemens SIMATIC manager.

CPUs with integrated Ethernet interfaces or additional serial interfaces simplify the integration of the CPU into an existing network or the connection of additional peripheral equipment.

The user application is stored in the battery buffered RAM or on an additionally pluggable MMC storage module.

Due to the automatic address allocation, the deployment of the CPUs 31xS allows to address 32 peripheral modules.

Additionally some SPEED7-CPUs have got a parallel SPEED-Bus that allows the modular connection of fast peripheral modules like IOs or bus master.

SPEED-Bus

The SPEED-Bus is a 32Bit parallel bus developed from VIPA with a maximum data rate of 40MByte/s. Via the SPEED-Bus you may connect up to 10 SPEED-Bus modules to your CPU 31xS.

In opposite to the "standard" backplane bus where the modules are plugged-in at the right side of the CPU by means of single bus connectors, the modules at the SPEED-Bus are plugged-in at the left side of the CPU via a special SPEED-Bus rail.

VIPA delivers profile rails with integrated SPEED-Bus for 2, 6 or 10 SPEED-Bus peripheral modules with different lengths.

SPEED-Bus peripheral modules

The SPEED-Bus peripheral modules may exclusively plugged at the SPEED-Bus slots at the left side of the CPU. The following SPEED-Bus modules are in preparation:

- Fast fieldbus modules like Profibus DP, Interbus, CANopen master and CANopen slave
- Fast CP 343 (CP 343 Communication processor for Ethernet)
- Fast CP 341 with double RS 422/485 interface
- Fast digital input-/output modules (Fast Digital IN/OUT)

Memory management

Every CPU 31xS has an integrated work memory. During program run the total memory is divided into 50% for program code and 50% for data.

Starting with CPU firmware 3.0.0 there is the possibility to extend the total memory to its maximum by means of a MCC memory extension card.

Integrated Profibus DP master

The CPUs of the System 300S series with SPEED-Bus have an integrated Profibus DP master. Via the DP master with a data range of 1kByte for in- and output you may address up to 124 DP slaves.

The project engineering takes place in WinPLC7 from VIPA or in the hardware configurator from Siemens.

Integrated Ethernet PG/OP channel

Every CPU 31xS has an Ethernet interface for PG/OP communication. Via the "PLC" functions you may directly access the Ethernet PG/OP channel and program res. remote control your CPU. A max. of 2 PG/OP connections is available.

You may also access the CPU with a visualization software via these connections.

Operation Security
- Wiring by means of spring pressure connections (CageClamps) at the front connector
- Core cross-section 0.08...2.5mm^2
- Total isolation of the wiring at module change
- Potential separation of all modules to the backplane bus
- ESD/Burst acc. IEC 61000-4-2/IEC 61000-4-4 (up to level 3)
- Shock resistance acc. IEC 60068-2-6 / IEC 60068-2-27 (1G/12G)

Environmental conditions
- Operating temperature: 0 ... +60°C
- Storage temperature: -25 ... +70°C
- Relative humidity: 5 ... 95% without condensation
- Ventilation by means of a fan is not required

Dimensions/ Weight
- Available lengths of the profile rail in mm: 160, 482, 530, 830 and 2000
- Dimensions of the basic enclosure:
  1tier width: (HxWxD) in mm: 40x125x120
  2tier width: (HxWxD) in mm: 80x125x120

Compatibility

Modules and CPUs of the System 300 from VIPA and Siemens may be used at the "Standard" bus as a mixed configuration.

The project engineering takes place in WinPLC7 from VIPA or in the hardware configurator from Siemens.

The SPEED7 CPUs from VIPA are instruction compatible to the programming language STEP®7 from Siemens and may be programmed via WinPLC7 from VIPA or via the Siemens SIMATIC manager.

Here the instruction set of the S7-400 from Siemens is used.

Note!

Please do always use the **CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)** from Siemens of the hardware catalog to project a SPEED7-CPU with SPEED-Bus from VIPA.   For the project engineering, a thorough knowledge of the Siemens SIMATIC manager and the hardware configurator from Siemens is required!

Integrated power supply

Every CPU res. bus coupler comes with an integrated power supply. The power supply has to be supplied with DC 24V. By means of the supply voltage, the bus coupler electronic is supplied as well as the connected modules via backplane bus. Please regard that the integrated power supply may supply the backplane bus the backplane bus (SPEED-Bus and Standard-Bus) depending on the CPU with a sum with max. 5A.

The power supply is protected against inverse polarity and overcurrent.

Every SPEED-Bus rail has a plug-in option for an external power supply. This allows you to raise the maximum current at the backplane bus for 5.5A.

Hints for the project engineering

Overview

For the project engineering of a SPEED7 system please follow this approach:

- Project engineering of the SPEED7-CPU and the internal DP master (if existing) as CPU 318-2DP (318-2AJ00-0AB00)
- Project engineering of the real plugged modules at the standard bus
- Project engineering of the internal Ethernet PG/OP channel after the real plugged modules as virtual CP 343-1 (Setting of IP address, subnet mask and gateway for online project engineering)
- Project engineering of an internal CP343 (if existing) as 2. CP 343-1
- Project engineering and connection of the SPEED-Bus-CPs res. -DP master as CP 343-1 (343-1EX11) res. CP 342-5 (342-5DA02 V5.0)
- Project engineering of all SPEED-Bus modules as single DP slaves in a virtual DP master module (speedbus.gsd required)

Note!

Please do always use the **CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0)** from Siemens in the hardware catalog to configure a CPU 31xS from VIPA.

For the project engineering, a thorough knowledge of the SIMATIC manager and the hardware configurator from Siemens is required!

Requirements

The hardware configurator is part of the Siemens SIMATIC manager. It serves the project engineering. Please look at the hardware catalog for the modules that may be configured.

For the deployment of the System 300S modules at the SPEED-Bus the inclusion of the System 300S modules into the hardware catalog via the GSD-file speedbus.gsd from VIPA is necessary.

Approach   The project engineering of the SPEED7-CPU has the following components:

To be compatible with the Siemens SIMATIC manager, the following steps are required:

Standard bus

| Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	

real modules
at the standard bus

343-1EX11 (internal PG/OP)

343-1EX11 (internal CP343)

CPs res. DP master
at the SPEED-Bus as
343-1EX11 res. 342-5DA02

	342-5DA02 V5.0

virtual DP master for CPU
and all SPEED-Bus modules

(n) VIPA   (100) VIPA
SPEEDbus   SPEEDbus

VIPA_SPEEDBUS

Slot	Order number
0	CPU at Slot 100

VIPA_SPEEDBUS

Slot	Order number
0	Module at slot n
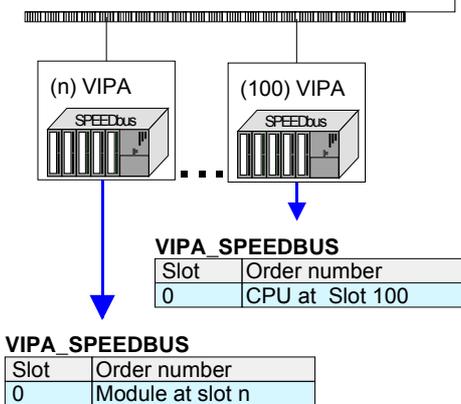
- *Preparation*
  Start the hardware configurator from Siemens and include the speedbus.gsd for the SPEED-Bus from VIPA.

- *Project engineering of the CPU*
  Project a CPU 318-2DP (318-2AJ00-0AB00 V3.0). If your SPEED7-CPU contains a DP master, you may now connect it with Profibus and configure your DP slaves.

- *Project engineering of the real plugged modules at the standard bus*
  Set the modules that are at the right side of the CPU at the standard bus starting with slot 4.

- *Project engineering of the integrated CPs*
  For the internal Ethernet PG/OP channel you have to set a CP 343-1 (343-1EX11) as 1. module at the real plugged modules. If your SPEED7-CPU has additionally an integrated CP 343, this is also configured as CP 343-1 but always below the former placed CP 343-1.

- *Project engineering of the SPEED-Bus-CPs and -DP master*
  Plug and connect all CPs as 343-1EX11 and DP master as 342-5DA02 V5.0 at the SPEED-Bus below the former configured internal CPU components.
  Please regard that the sequence within a function group (CP res. DP master) corresponds the sequence at the SPEED-Bus from right to left.

- *Project engineering of the CPU and all SPEED-Bus modules in a virtual master system*
  The slot assignment of the SPEED-Bus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place a DP master (342-5DA02 V5.0) with master system as last module. The Profibus address must be <100!
  Now include the slave "vipa_speedbus" for the CPU and every module at the SPEED-Bus. After the installation of the speedbus.gsd you may find this under Profibus-DP / Additional field devices / I/O / VIPA_SPEEDbus. Set the slot number of the module (100...110) as Profibus address and plug the according module at slot 0 of the slave system.

Bus extension with IM 360 and IM 361   To extend the bus you may use the IM 360 from Siemens, where 3 further extensions racks can be connected via the IM 361. Bus extensions must be placed at slot 3.

More detailed information is to be found in the chapter "Deployment CPU 31xS" at "Addressing".

Summary   The following illustration summarizes all project engineering steps:
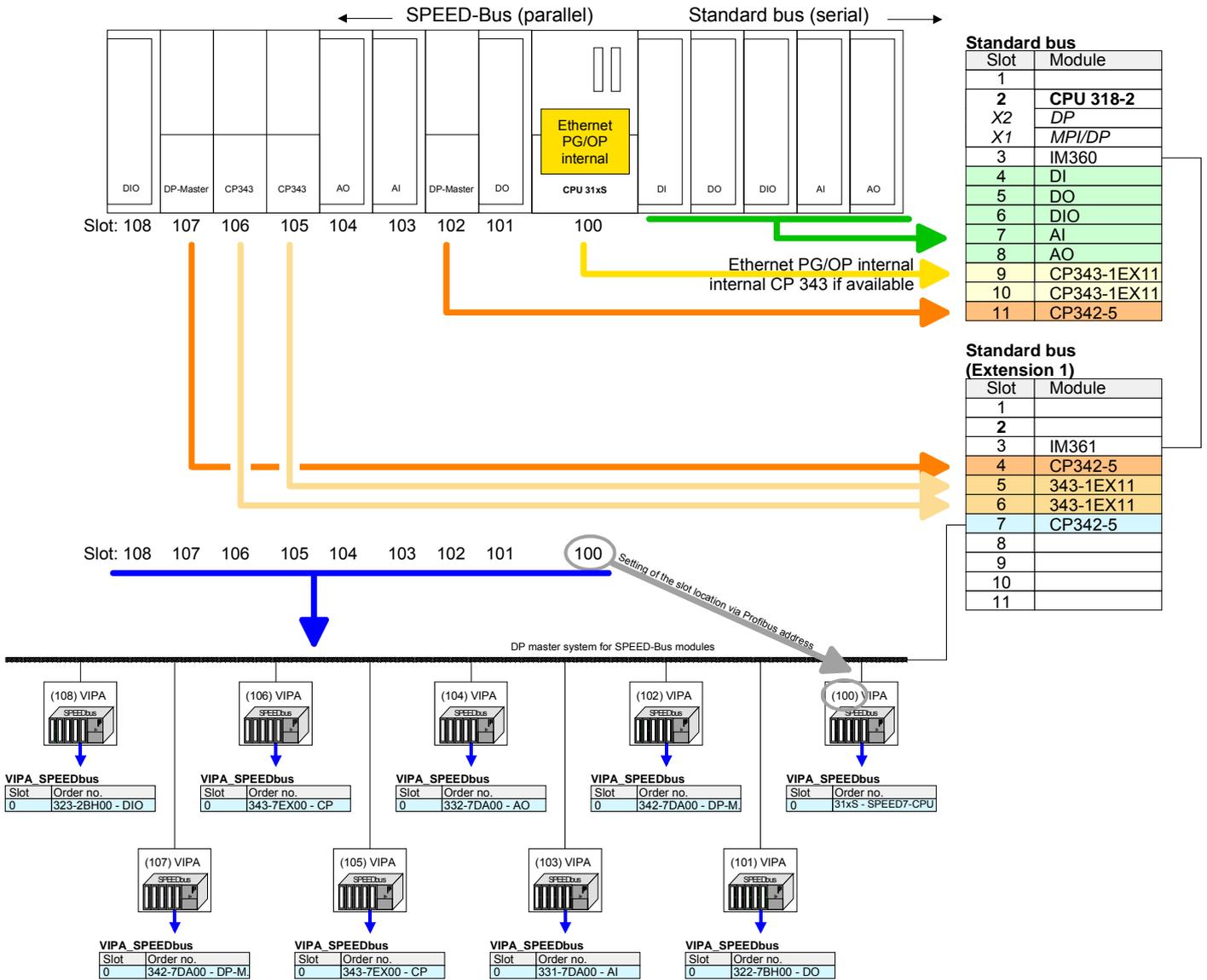
The according module is to be taken over from the HW catalog of vipa_speedbus on slot 0.

Note!

The sequence of the DPM- and CP function groups is insignificant. You only have to take care to regard the sequence within a function group (DP1, DP2... res. CP1, CP2 ...).

Hint, valid for all SPEED-Bus modules!

The SPEED-Bus always requires the Siemens DP master CP 342-5 (342-5DA02 V5.0) as last module to be included, connected and parameterized to the *operation mode* DP master. Every SPEED-Bus module has to be connected as VIPA_SPEEDbus slave into this master system.

By setting the SPEED-Bus slot number via the Profibus address and by including the according SPEED-Bus module at slot 0, the SIMATIC manager receives information about the modules at the SPEED-Bus.

Additionally the following configurations are required depending on the module.

Project engineering of the DP master at the SPEED-Bus

The hardware configuration and Profibus project engineering happens in the SIMATIC manager from Siemens. You have to parameterize a virtual CP 342-5 (342-5DA02 V5.0) for every SPEED-Bus-DP master at the standard bus following the real modules and connect it with the depending DP slaves.

Project engineering CP 343 at the SPEED-Bus

SPEED-Bus-CPs have to be configured in the Siemens SIMATIC manager at the standard bus behind the real modules as virtual CP 343 (343-1EX11) and are then connected with the according Ethernet components. For the connection, the Siemens project engineering tool NetPro is required.

Project engineering of the CAN master at the SPEED-Bus

The project engineering of the CANopen master at the SPEED-Bus happens in WinCoCT (**Win**dows **C**AN**o**pen **C**onfiguration **T**ool) from VIPA.

You export your project from WinCoCT as wld-file. This wld-file can be imported into the hardware configurator from Siemens.

An additional inclusion at the standard bus is not necessary.

Project engineering of the Interbus master at the SPEED-Bus

The project engineering of the IBS master system takes place in your CPU user application using the VIPA FCs.

An additional inclusion at the standard bus is not necessary.

Chapter 2   Assembly and installation guidelines

Overview   In this chapter you will find all information, required for the installation and the cabling of a process control with the components of the System 300.

Overview

General

While the standard peripheral modules are plugged-in at the right side of the CPU, the SPEED-Bus peripheral modules are connected via a SPEED-Bus bus connector at the left side of the CPU.

VIPA delivers profile rails with integrated SPEED-Bus for 2, 6 or 10 SPEED-Bus peripheral modules with different lengths.

SPEED-Bus (parallel)   Standard bus (serial)
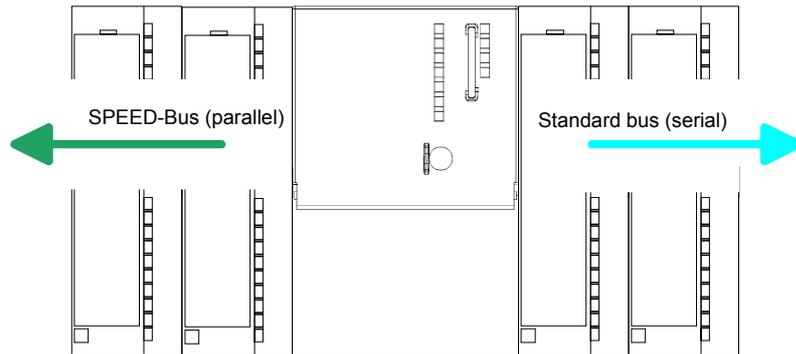
Serial Standard bus

The single modules are directly installed on a profile rail and connected via the backplane bus coupler. Before installing the modules you have to clip the backplane bus coupler to the module from the backside.

The backplane bus coupler is included in the delivery of the peripheral modules.

Parallel SPEED-Bus

With SPEED-Bus the bus connection happens via a SPEED-Bus rail integrated in the profile rail at the left side of the CPU. Due to the parallel SPEED-Bus not all slots must be occupied in sequence.

SLOT 1 for additional power supply

At SLOT 1 DCDC) you may plug either a SPEED-Bus module or an additional power supply.

Assembly possibilities

You may assemble the System 300 horizontally, vertically or lying.
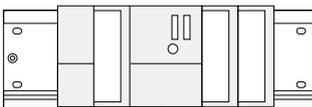
horizontal assembly

lying assembly
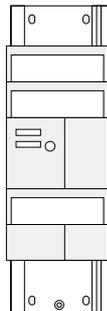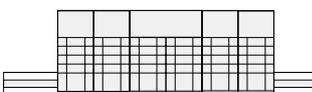
vertical assembly

Please regard the allowed environment temperatures:

- horizontal assembly: from 0 to 60°C
- vertical assembly: from 0 to 40°C
- lying assembly: from 0 to 40°C

Installation dimensions

**Dimensions
Basic enclosure**

1tier width (WxHxD) in mm: 40 x 125 x 120
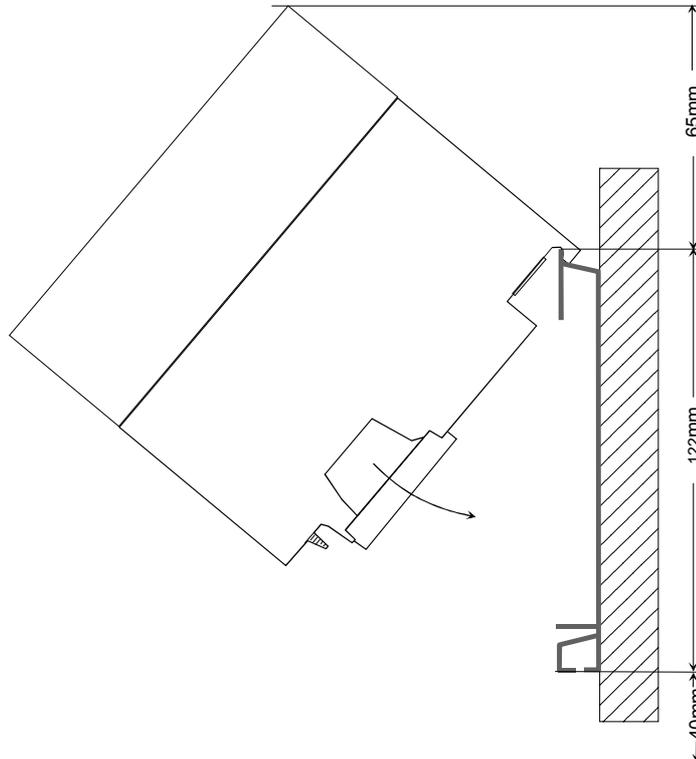
Dimensions

**Installation
dimensions**
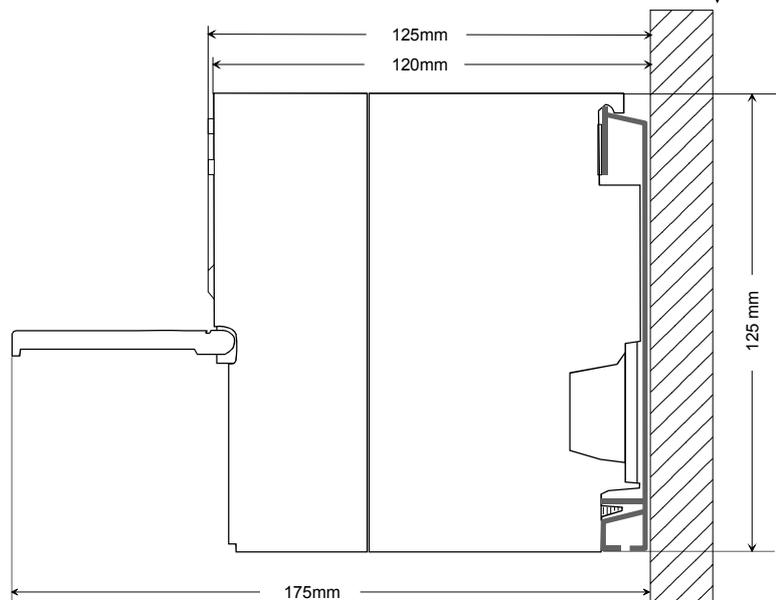
Installation Standard-Bus

Approach   If you do not deploy SPEED-Bus modules, the assembly at the standard bus happens at the right side of the CPU with the following approach:
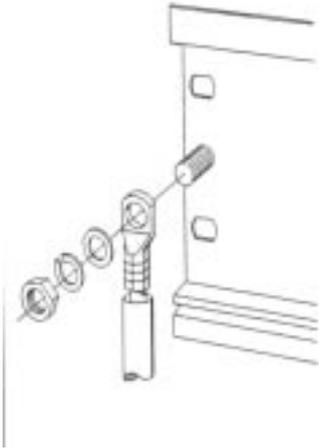
- Bolt the profile rail with the background (screw size: M6), so that you still have minimum 65mm space above and 40mm below the profile rail.

- If the background is a grounded metal or device plate, please look for a low-impedance connection between profile rail and background.

- Connect the profile rail with the protected earth conductor. For this purpose there is a bolt with M6-thread.

- The minimum cross-section of the cable to the protected earth conductor has to be 10mm^2.
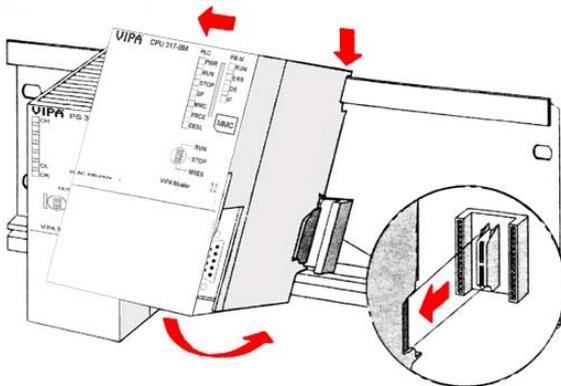
- Stick the power supply to the profile rail and pull it to the left side up to 5mm to the grounding bolt of the profile rail.

- Take a bus coupler and click it at the CPU from behind like shown in the picture.

- Stick the CPU to the profile rail right from the power supply and pull it to the power supply.
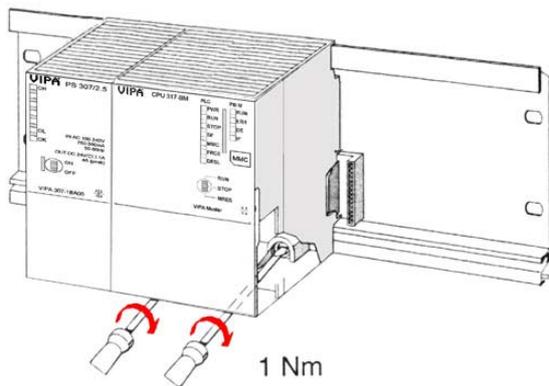
- Click the CPU downwards and bolt it like shown.

- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.

Danger!

- Before installing or overhauling the System 300, the power supplies must be disconnected from voltage (pull the plug or remove the fuse)!

- Installation and modifications only by properly trained personnel!

Assembly SPEED-Bus

Pre-manufactured SPEED-Bus profile rail

For the deployment of SPEED-Bus modules, a pre-manufactured SPEED-Bus rail is required. This is available mounted on a profile rail with 2, 6 or 10 extension plug-in locations.
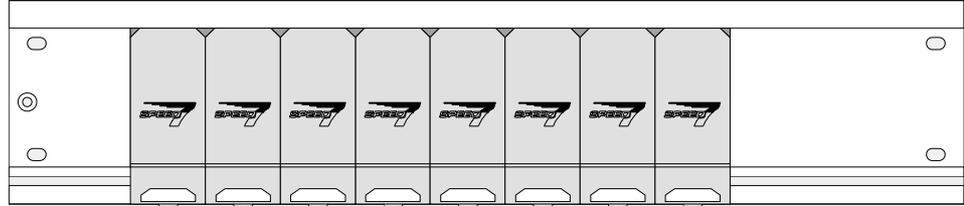
Installation of the profile rail
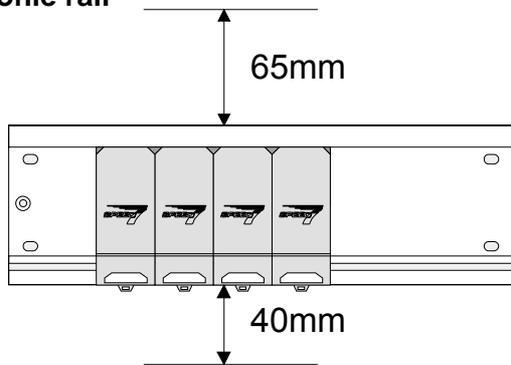
65mm

40mm

- Bolt the profile rail with the background (screw size: M6), so that you still have minimum 65mm space above and 40mm below the profile rail.

- Please look for a low-impedance connection between profile rail and background
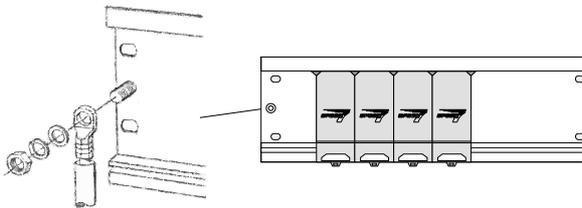
- Connect the profile rail with the protected earth conductor.

  The minimum cross-section of the cable to the protected earth conductor has to be 10mm^2.

Profile rail
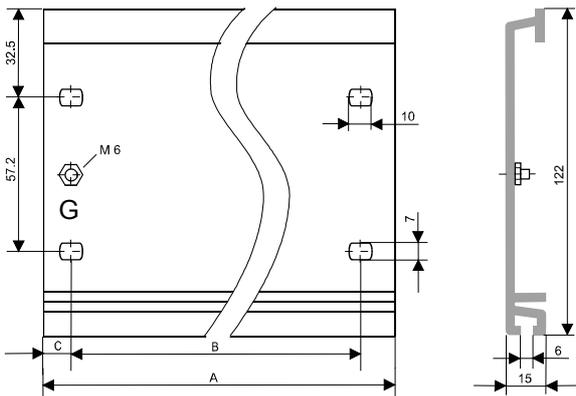
Order number	SPEED-Bus slots	A	B	C
VIPA 390-1AB60	-	160mm	140mm	10mm
VIPA 390-1AE80	-	482mm	466mm	8,3mm
VIPA 390-1AF30	-	530mm	500mm	15mm
VIPA 390-1AJ30	-	830mm	800mm	15mm
VIPA 390-9BC00*	-	2000mm	-	15mm
VIPA 391-1AF10	2	530mm	500mm	15mm
VIPA 391-1AF30	6	530mm	500mm	15mm
VIPA 391-1AF50	10	530mm	500mm	15mm

* Unit pack 10 pieces

**Installation
SPEED-Bus-
Module**
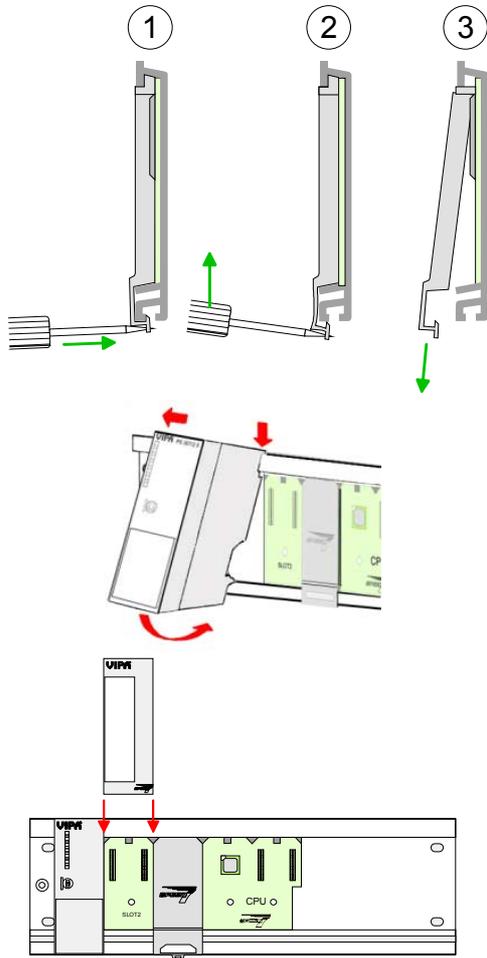
- Dismantle the according protection flaps of the SPEED-Bus plug-in locations with a screw driver (open and pull down).

  For the SPEED-Bus is a parallel bus, not all SPEED-Bus plug-in locations must be used in series. Leave the protection flap installed at an unused SPEED-Bus plug-in location.

- At deployment of a DC 24V power supply, install it at the shown position at the profile rail at the left side of the SPEED-Bus and push it to the left to the isolation bolt of the profile rail.

- Fix the power supply by screwing.

- To connect the SPEED-Bus modules, plug it between the triangular positioning helps to a plug-in location marked with "SLOT ..." and pull it down.

- Only the "SLOT1 DCDC" allows you to plug-in either a SPEED-Bus module or an additional power supply.

- Fix the modules by screwing.

Installation CPU
without Standard-
Bus-Modules
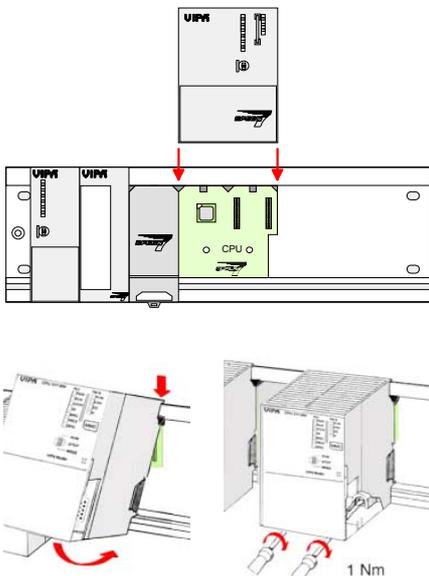
- To deploy the SPEED7-CPU exclusively at the SPEED-Bus, plug it between the triangular positioning helps to the plug-in location marked with "CPU SPEED7" and pull it down.

- Fix the CPU by screwing.

Please regard that not all CPU 31xS may be deployed at the SPEED-Bus!

Installation CPU
with Standard-Bus-
Modules
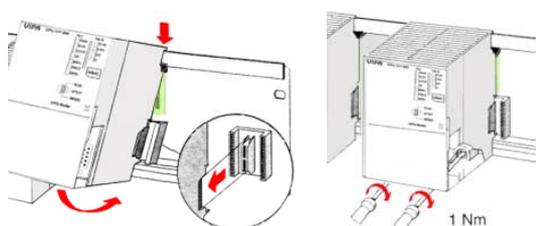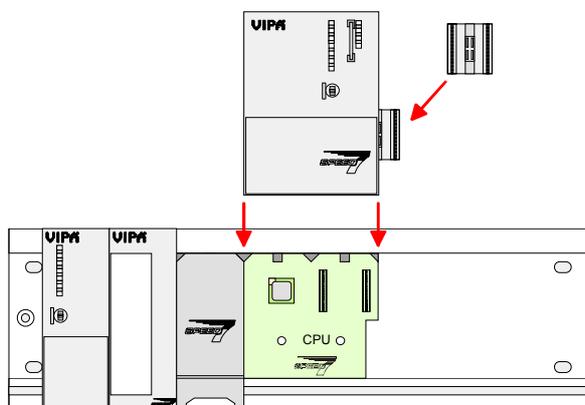
- If also standard modules shall be plugged, take a bus coupler and click it at the CPU from behind like shown in the picture.
- Plug the CPU between the triangular positioning helps to the plug-in location marked with "CPU SPEED7" and pull it down.
- Fix the CPU by screwing.

**Installation
Standard-Bus-
Modules**
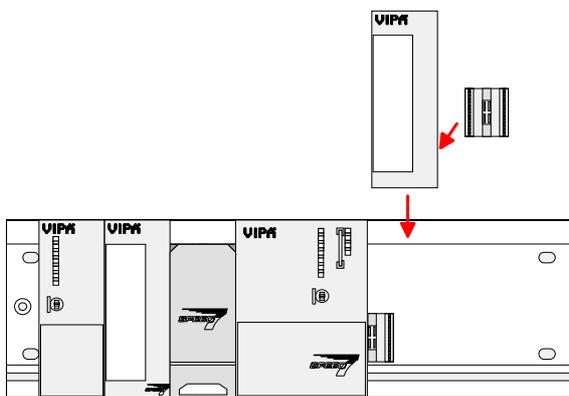
- Repeat this procedure with the peripheral modules, by clicking a backplane bus coupler, stick the module right from the modules you've already fixed, click it downwards and connect it with the backplane bus coupler of the last module and bolt it.

Danger!
- Before installing or overhauling the System 300V, the power supplies must be disconnected from voltage (pull the plug or remove the fuse)!
- Installation and modifications only by properly trained personnel!

Cabling

Overview

The power supplies and CPUs are exclusively delivered with CageClamp contacts. For the signal modules the front connectors are available from VIPA with screw contacts. In the following all connecting types of the power supplies, CPUs and input/output modules are described.

Danger!
- Before installation or overhauling, the power supplies must be disconnected from voltage (pull the plug or remove the fuse)!
- Installation and modifications only by properly trained personnel!

CageClamp technology (gray)

For the cabling of power supplies, bus couplers and parts of the CPU, gray connectors with CageClamp technology are used.
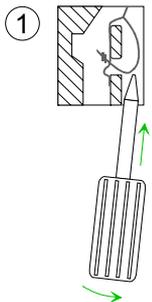
You may connect wires with a cross-section of 0.08mm^2 to 2.5mm^2. You can use flexible wires without end case as well as stiff wires.
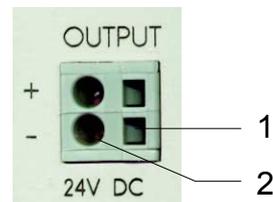
[1]   Rectangular opening for screwdriver
[2]   Round opening for wires
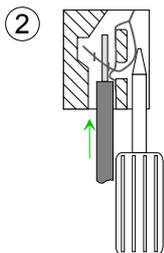
The picture on the left side shows the cabling step by step from top view.

- To conduct a wire you plug a fitting screwdriver obliquely into the rectangular opening like shown in the picture.
- To open the contact spring you have to push the screwdriver in the opposite direction and hold it.
- Insert the insulation striped wire into the round opening. You may use wires with a cross-section from 0.08mm^2 to 2.5mm^2.
- By removing the screwdriver the wire is connected safely with the plug connector via a spring.
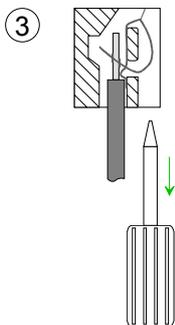
CageClamp technology (green)

For the cabling of e.g. the power supply of a CPU, green plugs with CageClamp technology are deployed.
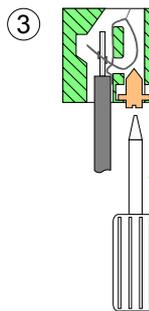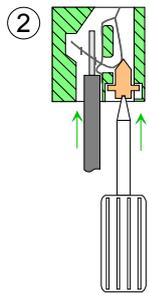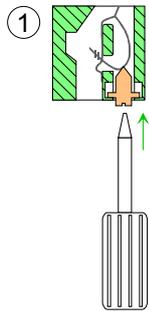
Here also you may connect wires with a cross-section of 0.08mm^2 to 2.5mm^2. You can use flexible wires without end case as well as stiff wires.

①
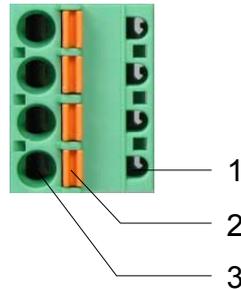
[1]   Test point for 2mm test tip
[2]   Locking (orange) for screwdriver
[3]   Round opening for wires

1
2
3

②

The picture on the left side shows the cabling step by step from top view.

- For cabling you push the locking vertical to the inside with a suiting screwdriver and hold the screwdriver in this position.
- Insert the insulation striped wire into the round opening. You may use wires with a cross-section from 0.08mm^2 to 2.5mm^2.
- By removing the screwdriver the wire is connected safely with the plug connector via a spring.

③

Note!

In opposite to the gray connection clamp from above, the green connection clamp is realized as plug that can be clipped off carefully even if it is still cabled.

Front connectors of the in-/output modules

In the following the cabling of the three variants of the front-facing connector is shown:

For the I/O modules the following plugs are available at VIPA:

20pole screw connection VIPA 392-1AJ00	40pole screw connection VIPA 392-1AM00
Open the front flap of your I/O module.	
Bring the front connector in cabling position. Here fore you plug the front connector on the module until it locks. In this position the front connector juts out of the module and has no contact yet.	
Strip the insulation of your wires. If needed, use core end cases.	
Thread the included cable binder into the front connector.	
If you want to lead out your cables from the bottom of the module, start with the cabling from bottom to top, res. from top to bottom, if the cables should be led out at the top.	
Bolt also the connection screws of not cabled screw clamps.	
	Put the included cable binder around the cable bundle and the front connector.
Fix the cable binder for the cable bundle.	
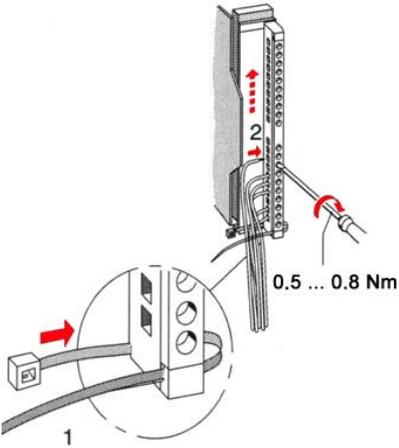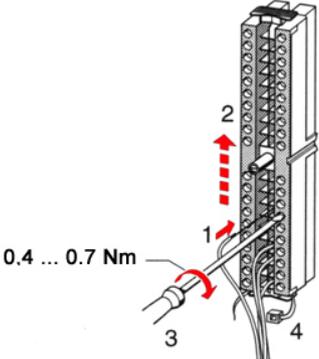
continued ...

... continue

20pole screw connection VIPA 392-1AJ00	40pole screw connection VIPA 392-1AM00
Push the release key at the front connector on the upper side of the module and at the same time push the front connector into the module until it locks. 	Bolt the fixing screw of the front connector.
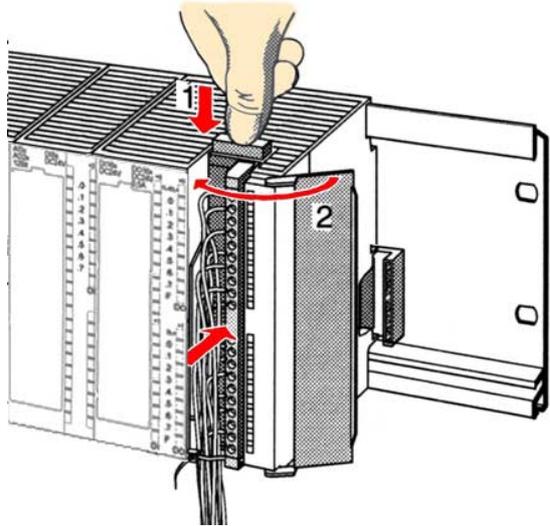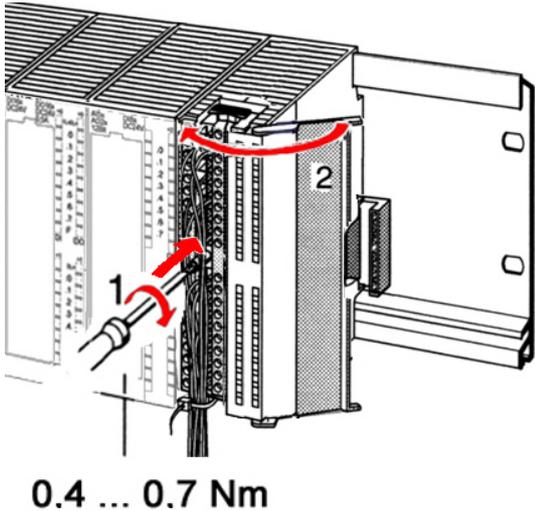
Now the front connector is electrically connected with your module.
Close the front flap.
Fill out the labeling strip to mark the single channels and push the strip into the front flap.

Installation Guidelines

General

The installation guidelines contain information about the interference free deployment of System 300 systems. There is the description of the ways, interference may occur in your control, how you can make sure the electromagnetic digestibility (EMC), and how you manage the isolation.

What means EMC?

Electromagnetic digestibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interferenced res. without interferencing the environment.

All System 300 components are developed for the deployment in hard industrial environments and fulfill high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

- Fields
- I/O signal conductors
- Bus system
- Current supply
- Protected earth conductor

Depending on the spreading medium (lead bound or lead free) and the distance to the interference cause, interferences to your control occur by means of different coupling mechanisms.

One differs:

- galvanic coupling
- capacitive coupling
- inductive coupling
- radiant coupling

Basic rules for EMC

In the most times it is enough to take care of some elementary rules to guarantee the EMC. Please regard the following basic rules when installing your PLC.

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
  - Install a central connection between the ground and the protected earth conductor system.
  - Connect all inactive metal extensive and impedance-low.
  - Please try not to use aluminum parts. Aluminum is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
  - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
  - Always lay your high voltage lines and signal res. data lines in separate channels or bundles.
  - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- Proof the correct fixing of the lead isolation.
  - Data lines must be laid isolated.
  - Analog lines must be laid isolated. When transmitting signals with small amplitudes the one sided lying of the isolation may be favorable.
  - Lay the line isolation extensively on an isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
  - Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
  - Use metallic or metalized plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
  - Wire all inductivities with erase links that are not addressed by the System 300V modules.
  - For lightening cabinets you should prefer incandescent lamps and avoid luminescent lamps.
- Create an homogeneous reference potential and ground all electrical operating supplies when possible.
  - Please take care for the targeted employment of the grounding actions. The grounding of the PLC is a protection and functionality activity.
  - Connect installation parts and cabinets with the System 300V in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
  - If potential differences between installation parts and cabinets occur, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

Electrical, magnetic and electromagnetic interference fields are weakened by means of an isolation, one talks of absorption.

Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Hereby you have to make sure, that the connection to the protected earth conductor is impedance-low, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve a high quality interference suppression in the higher frequency area.

  Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
  - the conduction of a potential compensating line is not possible
  - analog signals (some mV res. µA) are transferred
  - foil isolations (static isolations) are used.
- With data lines always use metallic or metalized plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to the System 300V module and **don't** lay it on there again!

Please regard at installation!

At potential differences between the grounding points, there may be a compensation current via the isolation connected at both sides.

Remedy: Potential compensation line

Chapter 3   Hardware description

Overview   Here the hardware components of the CP 343S-NET are more described. The technical data are to be found at the end of the chapter.

Properties

General   The CP 343S-NET in the following may only be used at the SPEED-Bus.
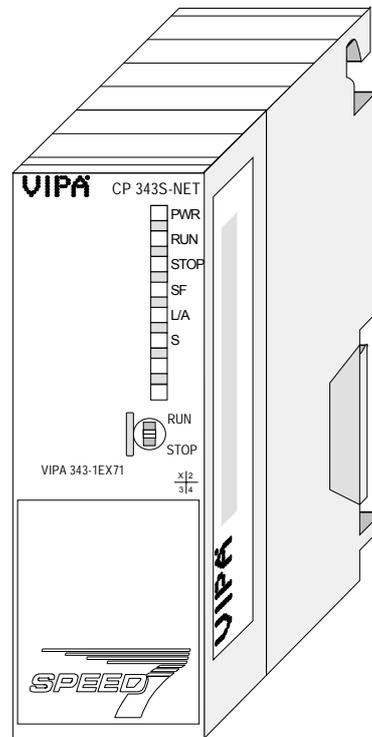
CP 343S-NET
- Ethernet CP 343S-NET for SPEED-Bus, order no. VIPA 343-1EX71
- With NetPro of Siemens SIMATIC manager configurable
- Siemens SIMATIC manager searching is supported
- NCM-Diagnostics via Ethernet is supported
- 16 configurable connections via Siemens NetPro
- 64 configurable connections via user program
- 32 PG/OP connections

Order data

Type	Order No	Description
CP 343S-NET	VIPA 343-1EX71	Ethernet CP 343S-NET for SPEED-Bus

Structure

Front view
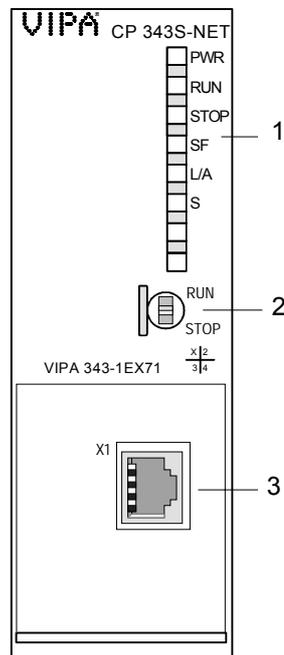
[1]   LED status indicators
[2]   Operating mode switch

The following components are under the front flap

[3]   Twisted pair interface
for Ethernet

Components

RJ45 jack

Via the RJ45 jack you may connect the CP 343S-NET - SPEED-Bus to Ethernet. The slot has the following pin assignment:

8pin RJ45 jack:
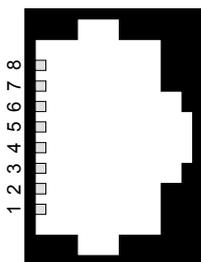
Pin	Signal
1	Transmit +
2	Transmit -
3	Receive +
4	-
5	-
6	Receive -
7	-
8	-

LEDs

The CP 343S-NET carries a number of LEDs that are available for diagnostic purposes on the bus and for displaying the local status. These give information according to the following pattern over the operating condition of the CP:

PWR green	RUN green	STOP yellow	SF red	L/A green	S green	Meaning
○	○	○	○	○	○	CP is not power supplied, or there may be a defect.
●	●	○	●	X	X	Start-up (Communication via SPEED-Bus)
●	●	○	○	X	X	The CP is in RUN with a loaded project. The communication by configured connections is enabled.
●	○	●	○	X	X	CP is in STOP, the communication by configured connections is disabled or CP has no project and may exclusively be accessed by the MAC address.
●	X	X	X	●	X	CP is physically connected to Ethernet.
●	X	X	X	☼	X	Shows communication via Ethernet (activity)
●	X	X	X	○	○	There is no physically connection to Ethernet.
●	X	X	X	X	●	Speed: 100MBit
●	X	X	X	X	○	Speed: 10MBit

on: ●   off: ○   flashing: ☼   irrelevant: **X**

Operating mode switch

The following operating modes can be set at the Ethernet CP 343S-NET by means of the operating switch:

RUN
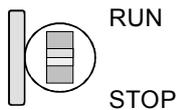
STOP

- RUN
  The CP is switched to RUN with the following behavior:
  - State RUN is indicated by LED
  - Configured connections are established
- STOP
  The CP is switched to STOP with the following behavior:
  - State STOP is indicated by LED
  - Established connections are blocked
  - Project engineering and diagnostics are possible
  - PG channel routing remains exist

Power supply   The Ethernet CP 343S-NET - SPEED-Bus receives power via the backplane. Here the max. current consumption amounts to max. 550mA.

Firmware update   There is the possibility to execute a firmware update of the CP 343S-NET among others via the SPPED7 CPU by means of a MMC.

So a firmware files may be recognized and assigned with startup, a pkg file name is reserved for each updateable component and hardware release, which begins with "px" and differs in a number with six digits.

The pkg file name may be found at a label right down the front flap of the module.

Details to the firmware update may be found in manual HB140_CPU at chapter "Deployment CPU 31xS" at "firmware update".

Project engineering   The project engineering of the Ethernet CP 343S-NET - SPEED-Bus takes place in the hardware configurator from Siemens as CP 343-1 (343-1EX11). To configure connections Siemens NetPro should be used.

Technical data

Electrical data	VIPA 343-1EX71
Power supply	via back plane bus
Current consumption	max. 550mA
Power dissipation	2.75W
Isolation	≥ AC 500V
Status indicator	LEDs at the front
Connectors/interfaces	RJ45 jack Ethernet link
Ethernet interface	
RJ45	
Baud rate	10/100MBit (automatic switch)
Overall length	max. 100m each segment
Configurable connections	
Maximum number of productive connections by Siemens NetPro	16
Maximum Number of productive connections by user program	64 (starting with CP firmware version V2.2.8 for ISO transport connections as well)
Siemens S7 connections	USEND, URCV, BSEND, BRCV, GET, PUT, remote-CPU functions. Connection establishment active and passive, supports unspecified connection partner
TCP connections	SEND, RECEIVE, FETCH PASSIVE, WRITE PASSIVE Connection establishment active and passive, supports unspecified connection partner
ISO-on-TCP connections (RFC1006)	SEND, RECEIVE, FETCH PASSIVE, WRITE PASSIVE Connection establishment active and passive, supports unspecified connection partner
UDP connections	SEND and RECEIVE The transfer of the telegrams is not acknowledged, i.e. the loss of messages is not recognized by the send block.
UDP Broadcast connection	SEND
UDP Multicast connection	SEND and RECEIVE (max. 16 multicast circles)
Data block length	max. 64kByte (max. 2KByte at UDP)
VIPA handling blocks	
Siemens S7 connection	FB/SFB VIPA handling blocks USEND, URCV, BSEND, BRCV, GET, PUT, remote CPU functions; any call without lock in all OBs.
Send/Receive connections	FC VIPA handling blocks AG_SEND, AG_RECEIVE; any call without lock in all OBs
PG/OP connections	
Maximum number of PG/OP connections	32 (each 1 connection is reserved for PG and OP)
Diagnostic	supports NCM diagnostic via Ethernet
Search within network	supports Siemens SIMATIC manager search
Dimensions and weight	
Dimensions (WxHxD) in mm	40x125x120
Weight	165g

Chapter 4   Deployment

Overview   Content of this chapter is the functionality of the CP 343S-NET for SPEED-Bus from VIPA. The module may only be used at a SPEED-Bus slot at the left side of the CPU.

Basics - Industrial Ethernet in automation

Overview   The flow of information in a company presents a vast spectrum of requirements that must be met by the communication systems. Depending on the area of business the bus system or LAN must support a different number of users, different volumes of data must be transferred and the intervals between transfers may vary, etc.

It is for this reason that different bus systems are employed depending on the respective task. These may be subdivided into different classes. The following model depicts the relationship between the different bus systems and the hierarchical structures of a company:

Operational layer	Plant computer PPS CAD	**Industrial Ethernet**
Management layer	Plant-oriented control computer manufacturing, stock, production data PPS CAD	**H1**
System layer	Machine and control computer	
Prozess layer	Peripheral systems. machines, CNC, NC, controllers (PLC), measuring systems	**Field bus**
Sensor / actuator layer	Peripheral components sensor, actuator, regulator, multiplexer, operating consoles	**Sensor / actuator Bus**

Industrial Ethernet   Industrial Ethernet supports operation to sensor layer. It is an electrical net based on shielded twisted pair cabling or optical net based on optical fiber.

Ethernet supports the principle of random bus accesses: every station on the network accesses the bus independently as and when required. These accesses are coordinated by a CSMA/CD (Carrier Sense Multiple Access/Collision Detection) scheme: every station "listens" on the bus cable and receives communication messages that are addressed to it.

Industrial Ethernet is defined by the international standard IEEE 802.3. The net access of Industrial Ethernet corresponds to IEEE 802.3 - CSMA/CD (**C**arrier **S**ense **M**ultiple **A**ccess/**C**ollision **D**etection) scheme: every station "listens" on the bus cable and receives communication messages that are addressed to it.

Stations will only initiate a transmission when the line is unoccupied. In the event that two participants should start transmitting simultaneously, they will detect this and stop transmitting to restart after a random delay time has expired.

Using switches there is the possibility for communication without collisions.

Basics - ISO/OSI reference model

Overview   The ISO/OSI reference model is based on a proposal that was developed by the International Standards Organization (ISO). This represents the first step towards an international standard for the different protocols. It is referred to as the ISO-OSI layer model. OSI is the abbreviation for **O**pen **S**ystem **I**nterconnection, the communication between open systems. The ISO/OSI reference model does not represent network architecture, as it does not define the services and protocols used by the different layers. The model simply specifies the tasks that the different layers must perform.

All current communication systems are based on the ISO/OSI reference model, which is defined by the ISO 7498 standard. The reference model structures communication systems into 7 layers that cover different communication tasks. In this manner the complexity of the communication between different systems is divided amongst different layers to simplify the task.
The following layers have been defined:

Layer	Function
Layer 7	Application Layer
Layer 6	Presentation Layer
Layer 5	Session Layer
Layer 4	Transport Layer
Layer 3	Network Layer
Layer 2	Data Link Layer
Layer 1	Physical Layer

Depending on the complexity and the requirements of the communication mechanisms a communication system may use a subset of these layers.

Layers

Layer 1   Bit communication layer (physical layer)

The bit communication layer (physical layer) is concerned with the transfer of data bits via the communication channel. This layer is therefore responsible for the mechanical, electrical and the procedural interfaces and the physical communication medium located below the bit communication layer:

- Which voltage represents a logical 0 or a 1?
- The minimum time the voltage is present to be recognized as a bit.
- The pin assignment of the respective interface.

Layer 2   Security layer (data link layer)

This layer performs error-checking functions for bit strings transferred between two communicating partners. This includes the recognition and correction or flagging of communication errors and flow control functions.

The security layer (data link layer) converts raw communication data into a sequence of frames. This is where frame limits are inserted on the transmitting side and where the receiving side detects them. These limits consist of special bit patterns that are inserted at the beginning and at the end of every frame. The security layer often also incorporates flow control and error detection functions.

The data security layer is divided into two sub-levels, the LLC and the MAC level.

The MAC (**M**edia **A**ccess **C**ontrol) is the lower level and controls how senders are sharing a single transmit channel.

The LLC (**L**ogical **L**ink **C**ontrol) is the upper level that establishes the connection for transferring the data frames from one device into the other.

Layer 3   Network layer

The network layer is an agency layer.

Business of this layer is to control the exchange of binary data between stations that are not directly connected. It is responsible for the logical connections of layer 2 communications. Layer 3 supports the identification of the single network addresses and the establishing and disconnecting of logical communication channels.

Additionally, layer 3 manages the prior transfer of data and the error processing of data packets. IP (**I**nternet **P**rotocol) is based on Layer 3.

Layer 4   Transport layer

Layer 4 connects the network structures with the structures of the higher levels by dividing the messages of higher layers into segments and passes them on to the network layer. Hereby, the transport layer converts the transport addresses into network addresses.

Common transport protocols are: TCP, SPX, NWLink and NetBEUI.

Layers continued...

Layer 5   Session layer

The session layer is also called the communication control layer. It relieves the communication between service deliverer and the requestor by establishing and holding the connection if the transport system has a short time fail out.

At this layer, logical users may communicate via several connections at the same time. If the transport system fails, a new connection is established if needed.

Additionally this layer provides methods for control and synchronization tasks.

Layer 6   Presentation layer

This layer manages the presentation of the messages, when different network systems are using different representations of data.

Layer 6 converts the data into a format that is acceptable for both communication partners.

Here compression/decompression and encrypting/decrypting tasks are processed.

This layer is also called interpreter. A typical use of this layer is the terminal emulation.

Layer 7   Application layer

The application layer is the link between the user application and the network. The tasks of the application layer include the network services like file, print, message, data base and application services as well as the according rules.

This layer is composed from a series of protocols that are permanently expanded following the increasing needs of the user.

Basics - Terms

Network (LAN)   A network res. LAN (**l**ocal **a**rea **n**etwork) provides a link between different stations that enables them to communicate with each other.

Network stations consist of PCs, IPCs, TCP/IP adapters, etc.

Network stations are separated by a minimum distance and connected by means of a network cable. The combination of network stations and the network cable represent a complete segment.

All the segments of a network form the Ethernet (physics of a network).

Twisted Pair   In the early days of networking the Triaxial- (yellow cable) or thin Ethernet cable (Cheapernet) was used as communication medium. This has been superseded by the twisted-pair network cable due to its immunity to interference. The Ethernet CP 343S-NET - SPEED-Bus has a twisted-pair connector.

The twisted-pair cable consists of 8 cores that are twisted together in pairs. Due to these twists this system is provides an increased level of immunity to electrical interference. For linking please use twisted pair cable which at least corresponds to the category 5.

Where the coaxial Ethernet networks are based on a bus topology the twisted-pair network is based on a point-to-point scheme.

The network that may be established by means of this cable has a star topology. Every station is connected to the star coupler (hub/switch) by means of a separate cable. The hub/switch provides the interface to the Ethernet.

Hub (repeater)   The hub is the central element that is required to implement a twisted-pair Ethernet network.

It is the job of the hub to regenerate and to amplify the signals in both directions. At the same time it must have the facility to detect and process segment wide collisions and to relay this information. The hub is not accessible by means of a separate network address since it is not visible to the stations on the network. A hub has provisions to interface to Ethernet or to another hub res. switch.

Switch   A switch also is a central element for realizing Ethernet on Twisted Pair. Several stations res. hubs are connected via a switch. Afterwards they are able to communicate with each other via the switch without interfering the network. An intelligent hardware analyzes the incoming telegrams of every port of the switch and passes them collision free on to the destination stations of the switch. A switch optimizes the bandwidth in every connected segment of a network. Switches enable exclusive connections between the segments of a network changing at request.

Basics - Protocols

Overview

Protocols define a set of instructions or standards that enable computer to establish communication connections and exchange information as error free as possible.

A commonly established protocol for the standardization of the complete computer communication is the so-called ISO/OSI layer model, a model based upon seven layers with rules for the usage of hardware and software (see ISO/OSI reference model above).

The Ethernet CP 343S-NET - SPEED-Bus uses the following protocols:

- Siemens S7 connection
- TCP/IP
- UDP
- RFC1006 (ISO on TCP)
- ISO transport (once H1)

The protocols are described in the following:

Siemens S7 connections

With the Siemens S7 connection large data sets may be transferred between PLC systems based on Siemens STEP®7. Here the stations are connected via Ethernet.

Besides the communication connection a CPU may be controlled by an other CPU by means of the remote functions with the appropriate function block to set these e.g. to STOP.

Precondition for the Siemens S7 communication is a configured connection table, which contains the defined connections for communication.

Here WinPLC7 from VIPA or NetPro from Siemens may be used.

Properties

- A communication connection is specified by a connection ID for each connection partner.
- The acknowledgement of the data transfer is established from the partner station at level 7 of the ISO/OSI reference model.
- At the PLC side FB/SFB VIPA handling blocks are necessary for data transfer for the Siemens S7 connections.

Note!

More about the usage of the FB/SFB VIPA handling blocks concerning the S7 connections may be found in the manual "Operation list" of the CPU.

TCP/IP

TCP/IP protocols are available on all major systems. At the bottom end this applies to simple PCs, through to the typical mini-computer up to mainframes.

For the wide spread of Internet accesses and connections, TCP/IP is often used to assemble heterogeneous system pools.

TCP/IP, standing for **T**ransmission **C**ontrol **P**rotocol and **I**nternet **P**rotocol, collects a various range of protocols and functions.

TCP and IP are only two of the protocols required for the assembly of a complete architecture. The application layer provides programs like "FTP" and "Telnet" for the PC.

The application layer of the Ethernet CP 343S-NET - SPEED-Bus is defined with the user application using the standard handling blocks.

These user applications use the transport layer with the protocols TCP and UDP for the data transfer which themselves communicate via the IP protocol with the Internet layer.

IP

The Internet protocol covers the network layer (Layer 3) of the ISO/OSI layer model.

The purpose of IP is to send data packages from on PC to another passing several other PCs. These data packages are referred to as datagrams. The IP doesn't neither guarantee the correct sequence of the datagrams nor the delivery at the receiver.

For the unambiguous identification between sender and receiver 32Bit addresses (IP addresses) are used that are normally written as four octets (exactly 8Bit), e.g. 172.16.192.11.

These Internet addresses are defined and assigned worldwide from the DDN network (Defense Department Network), thus every user may communicate with all other TCP/IP users.

One part of the address specifies the network; the rest serves the identification of the participants inside the network. The boarder between the network and the host part is variable and depends on the size of the network.

To save IP addresses, so called *NAT router* are used that have one official IP address and cover the network. Then the network can use any IP address.

TCP

The TCP (**T**ransmission **C**ontrol **P**rotocol) bases directly on the IP and thus covers the transport layer (layer 4) of the ISO/OSI layer model. TCP is a connection orientated end-to-end protocol and serves the logic connection between two partners.

TCP guarantees the correct sequence and reliability of the data transfer. Therefore you need a relatively large protocol overhead that slows down the transfer speed.

Every datagram gets a header of at least 20Byte. This header also contains a sequence number identifying the series. This has the consequence that the single datagrams may reach the destination on different ways through the network.

Using TCP connections, the telegram length is not transmitted. This means that the recipient has to know how many bytes belong to a message. To transfer data with variable length you may begin the user data with the length information and evaluate this at the counter station.

Properties
TCP/IP

- Besides of the IP address ports are used for the addressing. A port address should be within the range of 2000...65535. Partner and local ports may only be identical at one connection.

- Not depending on the used protocol, the PLC needs the VIPA handling blocks AG_SEND (FC 5) and AG_RECV (FC 6) for data transfer.

UDP

The UDP (**U**ser **D**atagram **P**rotocol) is a connection free transport protocol. It has been defined in the RFC768 (**R**equest **f**or **C**omment). Compared to TCP, it has much fewer characteristics.

The addressing happens via port numbers.

UDP is a fast unsafe protocol for it doesn't neither care about missing data packages nor about their sequence.

ISO-on-TCP
RFC1006

The TCP transport service works stream orientated. This means that data packages assembled by the user not necessarily have to receive the partner in the same packaging. Depending on the data amount, packages may though come in the correct sequence but differently packed. This causes that the recipient may not recognize the package borders anymore. For example you may send 2x 10Byte packages but the counter station receives them as 20Byte package. But for most of the applications the correct packaging is important.

Due to this you need another protocol above TCP. This purpose is defined in the protocol RFC1006. The protocol definition describes the function of an ISO transport interface (ISO 8072) basing upon the transport interface TCP (RFC793).

The basic protocol of RFC1006 is nearly identical to TP0 (Transport Protocol, Class 0) in ISO 8073.

For RFC1006 is run as protocol for TCP, the decoding takes place in the data section of the TCP package.

Properties

- The receipt of data is confirmed by a TCP layer.

- Instead of ports TSAPs are used for the addressing besides of the IP address. The TSAP length may be 1 ... 16 characters. The entry may happen in ASCII or Hex format. Remote and local TSAPs may only be identical at 1 connection.

- Not depending on the used protocol, the PLC needs the VIPA handling blocks AG_SEND (FC 5) and AG_RECV (FC 6) for data transfer.

- Contrary to TCP different telegram lengths can be received using RFC1006.

ISO transport (once H1)

The ISO transport service (ISO 8073 class 4) corresponds to the transport layer (Layer 4) of the ISO/OSI reference model. With ISO transport connections there is the possibility for program and event controlled communication via Industrial Ethernet. Here data blocks may be exchanged bi-directional.

The ISO transport connection offers services for a safety transfer of data by means of configured connections. Large data blocks may be transferred by means of blocking.

The transmission reliability is very high by the automatic repetition, by additional block test mechanisms and by the receipt acknowledgement at the receiver side. ISO transport connections are exclusively transferred via Industrial Ethernet and they are optimized for the deployment in a closed manufacturing area.

Properties

- ISO transport connections are only suited for Industrial Ethernet
- The receipt of data is acknowledged by the partner station. Here different telegram lengths may be processed.
- The addressing happens by MAC address (Ethernet address) and TSAPs (**T**ransport **S**ervice **A**ccess **P**oint).
- The data transfer is made by the services SEND/RECEIVE and FETCH/WRITE.
- Independent on the used protocol, the PLC needs the VIPA handling blocks AG_SEND (FC 5) and AG_RECV (FC 6) for data transfer.

Basics - IP address and subnet

**IP address
structure**

Industrial Ethernet exclusively supports IPv4. At IPv4 the IP address is a 32Bit address that must be unique within the network and consists of 4 numbers that are separated by a dot.

Every IP address is a combination of a **Net-ID** and a **Host-ID** and its structure is as follows: **XXX.XXX.XXX.XXX**

Range: 000.000.000.000 to 255.255.255.255

The network administrator also defines IP addresses.

**Net-ID
Host-ID**

The **Net**work-ID identifies a network res. a network controller that administrates the network.

The Host-ID marks the network connections of a participant (host) to this network.

Subnet mask

The Host-ID can be further divided into a **Subnet-ID** and a *new* **Host-ID** by using a bit for bit AND assignment with the **Subnet mask**.

The area of the original Host-ID that is overwritten by 1 of the Subnet mask becomes the Subnet-ID, the rest is the new Host-ID.

Subnet mask	binary all "1"		binary all "0"
IPv4 address	Net-ID	Host-ID	
Subnet mask and IPv4 address	Net-ID	Subnet-ID	*new* Host-ID

Subnet

A TCP-based communication via point-to-point, hub or switch connection is only possible between stations with identical Network-ID and Subnet-ID! Different area must be connected with a router.

The subnet mask allows you to sort the resources following your needs. This means e.g. that every department gets an own subnet and thus does not interfere another department.

**Address at first
start-up**

At the first start-up the Ethernet CP 343S-NET - SPEED-Bus <u>does not have</u> an IP address. The are following possibilities for address assignment:

The assignment takes place with the following directly via the hardware configuration.

- Set the PG/PC interface of the Siemens SIMATIC manager to "TCP/IP...RFC1006" and search and assign address by means of "Assign Ethernet Address". After the assignment the IP parameters are set immediately without CPU restart.

- At the first start-up you may assign an IP address and a subnet mask to your CP by means of a "minimum project" and transfer this via MMC or MPI into the CPU. After a reboot of the CPU and after switching the PG/PC interface to "TCP/IP... RFC1006" you may now configure your CPU online via the CP.

Address classes   For IPv4 addresses there are five address formats (class A to class E) that are all of a length of 4byte = 32bit.

Class A	0	Network-ID (1+7bit)		Host-ID (24bit)		
Class B	10	Network-ID (2+14bit)			Host-ID (16bit)	
Class C	110	Network-ID (3+21bit)				Host-ID (8bit)
Class D	1110	Multicast group				
Class E	11110	Reserved				

The classes A, B and C are used for individual addresses, class D for multicast addresses and class E is reserved for special purposes.

The address formats of the 3 classes A, B, C are only differing in the length of Network-ID and Host-ID.

Private IP networks   To build up private IP-Networks within the Internet, RFC1597/1918 reserves the following address areas:

Network class	Start IP	End IP	Standard subnet mask
A	10.0.0.0	10.255.255.255	255.0.0.0
B	172.16.0.0	172.31.255.255	255.255.0.0
C	192.168.0.0	192.168.255.255	255.255.255.0

(The Host-ID is underlined.)

These addresses can be used as net-ID by several organizations without causing conflicts, for these IP addresses are neither assigned in the Internet nor are routed in the Internet.

Reserved Host-Ids   Some Host-IDs are reserved for special purposes.

Host-ID = 0	Identifier of this network, reserved!
Host-ID = maximum (binary complete 1)	Broadcast address of this network

Note!

Never choose an IP address with Host-ID=0 or Host-ID=maximum!

(e.g. for class B with subnet mask = 255.255.0.0, the "172.16.0.0" is reserved and the "172.16.255.255" is occupied as local broadcast address for this network.)

Basics - MAC address and TSAP

MAC address

There is a unique MAC address (**M**edia **A**ccess **C**ontrol) necessary for each CP. Usually a module is labeled with its MAC address by the manufacturer. This address should be used for project engineering of the CP. The MAC address has a length of 6 bytes.

On delivery the first three bytes specify the manufacturer. These bytes are assigned by the IEEE committee. The last three bytes may be assigned by the manufacturer.

In a network several stations with the same MAC address may not exist. The MAC address may be changed at any time. You will get a valid MAC address from your network administrator.

Broadcast address

The MAC address, with which all bits are set to 1, is:

FF-FF-FF-FF-FF-FF

This address is used as Broadcast address and addresses all participants in the net.

Address at first start-up

At the first-start-up the Ethernet CP 343S-NET - SPEED-Bus has an unique MAC address. This may be found on a label beneath the front flap.

Note!

Please regard for the configuration of the network in the Siemens SIMATIC manager that it is necessary to activate the ISO protocol and to preset a valid MAC address within the properties dialog of the Ethernet interface of the CP!

TSAP

TSAP means **T**ransport **S**ervice **A**ccess **P**oint. ISO transport connections support TSAP length of 1...16 byte. TSAPs may be entered in ASCII format or hexadecimal.

Address parameters

An ISO transport connection is specified by a local and a remote connection endpoint.

Station A				Station B
remote TSAP	$\rightarrow$	ISO transport-	$\rightarrow$	local TSAP
local TSAP	$\leftarrow$	connection	$\leftarrow$	remote TSAP
MAC address A				MAC address B

The TSAPs of an ISO transport connection must match as follows:

Remote TSAP (in CP) = local TSAP (in destination station)

Local TSAP (in CP) = remote TSAP (in destination station)

Fast introduction

Overview

At the first start-up respectively at an over all reset the Ethernet CP 343S-NET - SPEED-Bus <u>does not have</u> any IP address. The CP may only be contacted by its MAC address. IP address parameters may be assigned to the CP by means of the MAC address, which may be found on a label beneath its front flap. The assignment takes place directly via the hardware configuration of the Siemens SIMATIC manager. For the project engineering of an Ethernet CP 343S-NET - SPEED-Bus please follow this approach:

- **Assembly and commissioning**

- **Hardware configuration** (Inclusion of CP in CPU)

- **CP project engineering** via NetPro (connection to Ethernet)

- **PLC programming** via user application (connection to PLC)

- **Transfer of the complete project to the CPU**

Note

> **To be compatible to the Siemens SIMATIC manager, the CPU 31xS from VIPA has to be configured as**
>
> **CPU 318-2DP (6ES7 318-2AJ00-0AB0)**
>
> **The Ethernet CP 343S-NET - SPEED-Bus is configured and connected as virtual module after the really plugged modules and below the PG/OP channel at the standard bus as Siemens CP 343-1 (343-1EX11). In addition the Ethernet CP 343S-NET - SPEED-Bus is to be placed as single VIPA_SPEEDBUS DP slave at a virtually DP master.**

Assembly and commissioning

- Install your System 300S with a CPU 31xS and an Ethernet CP 343S-NET - SPEED-Bus.

- Wire the system by connecting cables for voltage supply, signals and Ethernet. A detailed description is to be found in the chapter "Assembly and installation guidelines".

- Switch Power ON. → After a short boot time, the CP is in idle mode.
  At the first start-up res. after an overall reset of the CPU the Ethernet CP 343S-NET - SPEED-Bus does not have an IP address. For control purposes you may now reach the CP via the MAC address. The MAC address is to be found beneath the front flap at a small label on the module.

Assign IP parameters

You get valid IP address parameters from your system administrator. For the assignment of the IP address parameters such as IP address, Subnet mask etc. you have the following possibilities:

- Online using Siemens SIMATIC manager via "Assign Ethernet Address" (at least CP-Firmware 1.7.4)

- With a project with IP address and IP parameters transferred via MMC or MPI to the CPU. After a reboot of the CPU and after switching the PG/PC interface to "TCP/IP... RFC1006" you may now configure your CPU online via the CP.

Address assignment with "Assign Ethernet Address"

Please regard this functionality is available with CP firmware version 1.7.4 and up. In the following the proceeding with the Siemens SIMATIC manager starting with version V 5.3 & SP3 is described:

- Start the Siemens SIMATIC manager.

- Switch to "TCP/IP... RFC1006" using **Options** > *Set PG/PC interface*.

- The dialog for initialization of a station opens by **PLC** > *Edit Ethernet Node*.

- To get the stations and their MAC address, use the [Browse] button or type in the MAC Address. The Mac address can be found at a label beneath the front flap of the CP.

- Choose if necessary the known MAC address of the list of found stations.

- Either type in the IP configuration like IP address, subnet mask and gateway. Or your station is automatically provided with IP parameters by means of a DHCP server. Depending of the chosen option the DHCP server is to be supplied with MAC address, equipment name or client ID. The client ID is a numerical order of max. 63 characters. The following characters are allowed: "hyphen", 0-9, a-z, A-Z

- Confirm with [Assign ...].

Directly after the assignment the CP is online reachable using the set IP parameters.

Address assignment with project

- Start Siemens SIMATIC manager with new project.

- Place a new System 300 station with **Insert** > *Station* > *SIMATIC 300 station*

- Activate the station "SIMATIC 300" and open the hardware configurator by clicking on "Hardware".

- Configure a rack (SIMATIC 300 \ Rack-300 \ Profile rail).

- Engineer in deputy of your CPU 31xS the Siemens CPU 318-2DP with the order no. 6ES7 318-2AJ00-0AB0 V3.0 which is to be found at SIMATIC 300 \ CPU 300 \ CPU 318-2 \ 6ES7 318-2AJ00-0AB0. If needed, parameterize the CPU 318-2DP.

- Place the System 300 modules in plugged sequence starting with slot 4.

continued ...

... continue

- Configure the internal PG/OP channel directly under the really plugged modules as virtual **CP 343-1 (343-1EX11)** from Siemens and set IP address, subnet mask and gateway at CP properties.

- If used always configure as 2. CP the internal CP 343 of a CPU 31xSN/NET as **CP 343-1 (343-1EX11)** by setting another IP address, subnet mask and gateway.
  Else configure as 2. CP the Ethernet CP 343S-NET - SPEED-Bus as **CP 343-1 (343-1EX11)** by setting another IP address, subnet mask and gateway.

- Please always assign valid IP parameters when using CPs.

- A Siemens CP 342-5 (342-5DA02 V5.0) operating as DP master should be set and connected as last module.

- To this master system you assign every SPEED-Bus module as VIPA_SPEEDBUS slave. Here the Profibus address corresponds to the slot no. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.

This is the end of the project. After transmission to the CPU the CP can be accessed using the IP address and subnet mask of the project.

Deployment of ISO transport connections

For deployment of the ISO transport connections they must be enabled in the Ethernet properties of the CP at the project above.

Here there is the possibility to assign the CP to a MAC address. With each start-up of the CPU the new MAC address is transferred to the CP.

Configure connections with NetPro

The link-up between the stations happens with the graphical interface NetPro. Start NetPro by clicking on a network in your project res. on connections in the CPU directory.
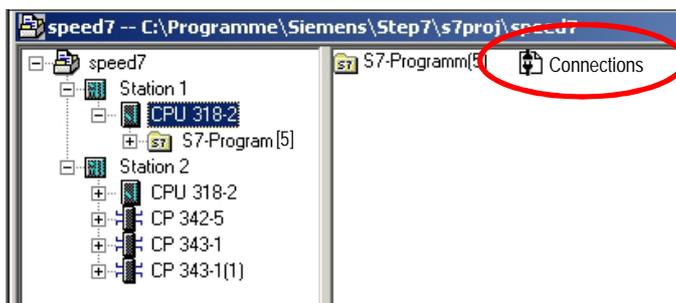
Link-up stations   For the project engineering of connections, connected stations are
                      presumed. To link-up stations, point on the colored net mark of the
                      according CP with the mouse and drag it to the network you want to
                      assign. The connection is displayed graphically by a line.

Configure   For the project engineering of new connections click on the according CPU
connections   and choose "Insert new connection" from the context menu.
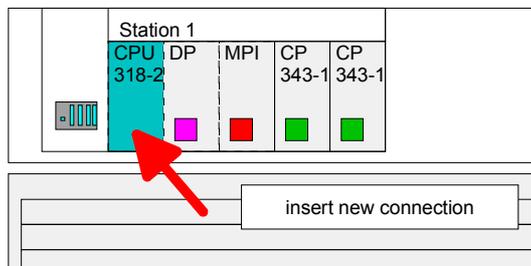
                      Via the dialog window you may set the parameters for a connection. The
                      parameters ID and LADDR are required for the usage on the blocks
                      AG_SEND res. AG_RECV.

                      With deployment of Siemens S7 connections the parameter *ID* is to be
                      passed to the respective FB/SFB VIPA handling blocks.

                      Always use the 2. CP from the route
                      Please take care to always choose the 2. CP from the route for
                      communication. As 1. CP you will always see the Ethernet PG/OP channel
                      that does not support configurable connections.

Save and compile   Save and compile your project and close NetPro.
connections
                      To store the CP project engineering data in the system data, you have to
                      activate the option "Save configuration data on the CPU" (default setting)
                      under *object properties* area *Options* in the hardware configuration of the
                      CP.

PLC user   For the execution of connection commands at the PLC, your CPU requires
application   an user application. For this, exclusively the VIPA handling blocks are
                      used, which you may get from VIPA as a library.

                      More information about the deployment of the blocks may be found in the
                      manual "Operation list" of your CPU.

                      Depending upon the connection type there are function blocks for Siemens
                      S7 connections and Send/Receive connections.

Transfer project There are 3 possibilities to transfer your project into the CPU:

                      • Transfer via MPI

                      • Transfer via MMC using a card reader

                      • Transfer via integrated Ethernet PG/OP channel

                      The following pages provide a more detailed description of the steps of the
                      fast introduction.

Addressing at SPEED-Bus

Overview

To provide specific addressing of the installed peripheral modules, certain addresses must be allocated in the CPU.

With no hardware configuration present, the CPU assigns automatically peripheral I/O addresses during boot procedure depending on the plug-in location amongst others also for plugged modules at the SPEED-Bus.

Maximal pluggable modules

In the hardware configurator from Siemens up to 8 modules per row may be parameterized. At deployment of SPEED7 CPUs up to 32 modules at the standard bus and 10 further modules at the SPEED-Bus may be controlled. CPs and DP masters that are additionally virtual configured at the standard bus are taken into the sum of 32 modules at the standard bus.

For the project engineering of more than 8 modules you may use virtual line interface connections. For this you set in the hardware configurator the module IM 360 from the hardware catalog to slot 3 of your 1. profile rail. Now you may extend your system with up to 3 profile rails by starting each with an IM 361 from Siemens at slot 3.

Define addresses by hardware configuration

You may access the modules with read res. write accesses to the peripheral bytes or the process image.

To define addresses a hardware configuration via a virtual Profibus system by including the SPEEDBUS.GSD may be used. For this, click on the properties of the according module and set the wanted address.

Automatic addressing

If you do not like to use a hardware configuration, an automatic addressing comes into force.

At the automatic address allocation DIOs are mapped depending on the slot location with a distance of 4byte and AIOs, FMs, CPs with a distance of 256byte.

Depending on the slot location the start address from where on the according module is stored in the address range is calculated with the following formulas:

DIOs: Start address = $4 \cdot (\text{slot} -101)+128$

AIOs, FMs, CPs: Start address = $256 \cdot (\text{slot} -101)+2048$
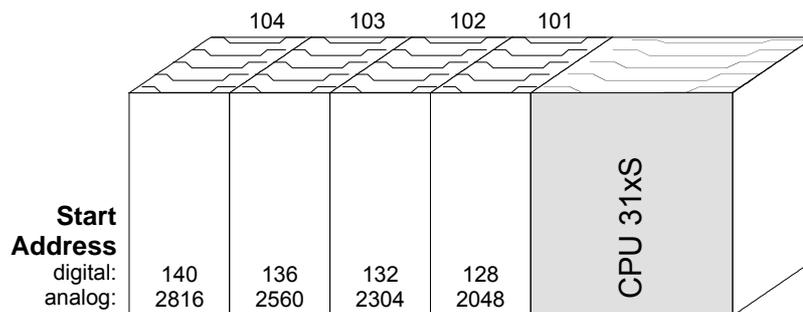
Hardware configuration

Overview

The project engineering of the Ethernet CP 343S-NET - SPEED-Bus takes place at the Siemens hardware configurator and is divided into 2 parts:

- Project engineering and connecting at the standard bus as Siemens CP 343-1 (343-1EX11)

- Project engineering as single VIPA_SPEEDBUS DP slave with CP 343-1EX71 at a virtually DP master (SPEEDBUS.GSD necessary).

Fast introduction

For the deployment of the Ethernet CP 343S-NET at the SPEED-Bus, the inclusion via the GSD-file from VIPA in the hardware catalog is required.

To be compatible with the Siemens SIMATIC manager, you have to execute the following steps:

- Start the hardware configurator from Siemens and include the SPEEDBUS.GSD for SPEED7 from VIPA.

- Configure CPU 318-2DP (6ES7 318-2AJ00-0AB0/V3.0) from Siemens. Configure a possibly existing internal DP master of your SPEED7-CPU via the internal DP master of the CPU 318-2DP. Leave *MPI/DP* of the CPU 318-2DP in MPI mode. The *Profibus* mode is not supported.

- Starting with slot 4, place the System 300 modules in the plugged sequence.

- For the internal Ethernet PG/OP channel that every SPEED7-CPU includes, you have to configure a Siemens CP 343-1 (343-1EX11) <u>always </u>as 1. module below the really plugged modules.

- If exists the integrated CP 343 of the CPU 31xSN/NET is also configured as CP 343-1 (343-1EX11) but always below the before configured PG/OP channel. Else start here to configure and connect every Ethernet CP 343S-NET - SPEED-Bus as Siemens CP 343-1 (343-1EX11).

- For the SPEED-Bus you always include, connect and parameterize to the *operating mode* DP master the DP master CP 342-5 (342-5DA02 V5.0) as last module. To this master system you assign every SPEED-Bus module as VIPA_SPEEDBUS slave. Here the Profibus address corresponds to the slot no. Beginning with 100 for the CPU. Place on slot 0 of every slave the assigned module and alter the parameters if needed.

- Let with the CPs or DP master (also virtual SPEED-Bus master) at *options* the attitude "Save configuration data on the CPU" activated!

Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	

real modules
at the standard bus

343-1EX11
(Ethernet PG/OP)

343-1EX11
(only CPU 31xSN)

CPs resp. DP master
at SPEED-Bus as
343-1EX11 resp. 342-5DA02

342-5DA02 V5.0

virtual DP master for CPU
and every SPEEDbus module

(n) VIPA   (100) VIPA
SPEEDbus   SPEEDbus

VIPA_SPEEDBUS

Slot	Order no.
0	CPU at slot 100

VIPA_SPEEDBUS

Slot	Order no.
0	Module at slot n
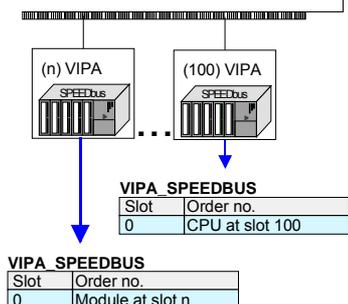
Requirements

The hardware configurator is a part of the Siemens SIMATIC manager. It serves the project engineering. The modules that may be configured here are listed in the hardware catalog.
For the deployment of the System 300S modules at the SPEED-Bus, the inclusion via the GSD-file SPEEDBUS.GSD from VIPA in the hardware catalog is required.

Note!

For the project engineering a thorough knowledge of the SIMATIC manager and the hardware configurator from Siemens are required and assumed!

Include the SPEED7-GSD-file

The GSD (**G**eräte-**S**tamm-**D**atei) is online available in the following language versions. Further language versions are available on inquires.

Name	Language
SPEEDBUS.GSD	german (default)
SPEEDBUS.GSG	german
SPEEDBUS.GSE	english

The GSD files may be found at www.vipa.de at the Service part.

The integration of the SPEEDBUS.GSD takes place with the following proceeding:

- Browse to www.vipa.de.
- Click to *Service > Download > GSD- and EDS-Files > Profibus*.
- Download the file *Cx000023_Vxxx*.
- Extract the file to your work directory. The SPEEDBUS.GSD is stored in the directory *VIPA_System_300S*.
- Start the hardware configurator from Siemens.
- Close every project.
- Select **Options** > *Install new GSD-file.*
- Navigate to the directory *VIPA_System_300S* and select **"SPEEDBUS.GSD"**.

The modules of the System 300S from VIPA are now included in the hardware catalog under *Profibus-DP / Additional field devices / I/O / VIPA_SPEEDBUS*.

Steps of project engineering

The following text describes the approach of the project engineering in the hardware configurator from Siemens at an abstract sample.

The project engineering is separated into the following parts:

- Project engineering of the CPU as CPU 318-2DP (318-2AJ00-0AB00 V3.0)

- Project engineering of the real plugged modules at the standard bus

- Project engineering of the Ethernet PG/OP channel. When using CPU 31xSN/NET project engineering and connecting the CP part as Siemens CP 343-1EX11

- Project engineering and connecting of every Ethernet CP 343S-NET - SPEED-Bus at the standard bus as 343-1EX11 from Siemens

- Project engineering of every SPEED-Bus module as virtual Profibus network. Here the SPEEDBUS.GSD is necessary.

Hardware
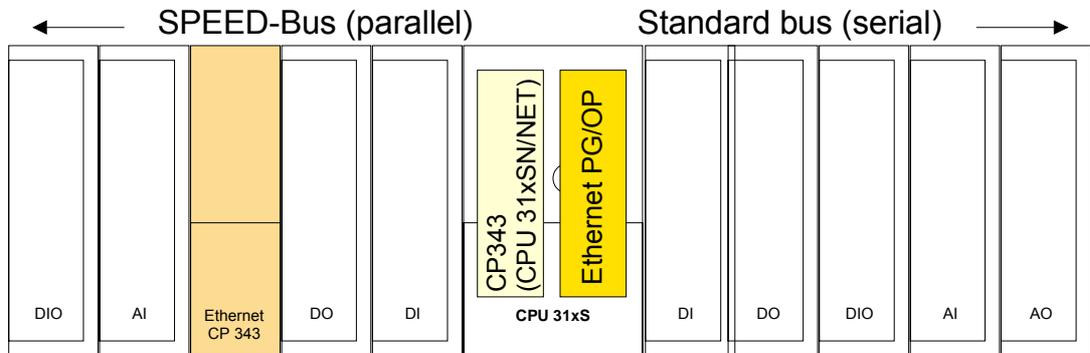
Project engineering CPU as CPU 318-2DP

- Start the hardware configurator from Siemens with a new project and insert a profile rail from the hardware catalog.

- Place the following Siemens CPU at slot 2:
  CPU 318-2DP (6ES7 318-2AJ00-0AB0 V3.0)

- Configure a possibly existing internal DP master of your SPEED7-CPU via the internal DP master of the CPU 318-2DP. Leave *MPI/DP* of the CPU 318-2DP in MPI mode. The *Profibus* mode is not supported.
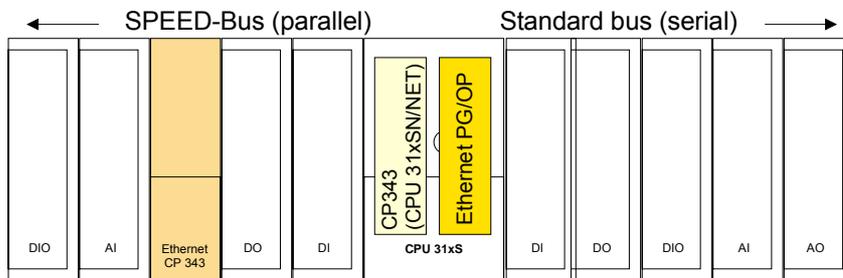
Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	

Project engineering of the real modules at the standard bus

The modules at the right side of the CPU at the standard bus are configured with the following approach:

- Include your System 300 modules at the standard bus in the plugged sequence starting with slot 4.

- Parameterize the CPU res. the modules where appropriate. The parameter window opens by a double click on the according module.

Standard bus	
Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	
10	
11	
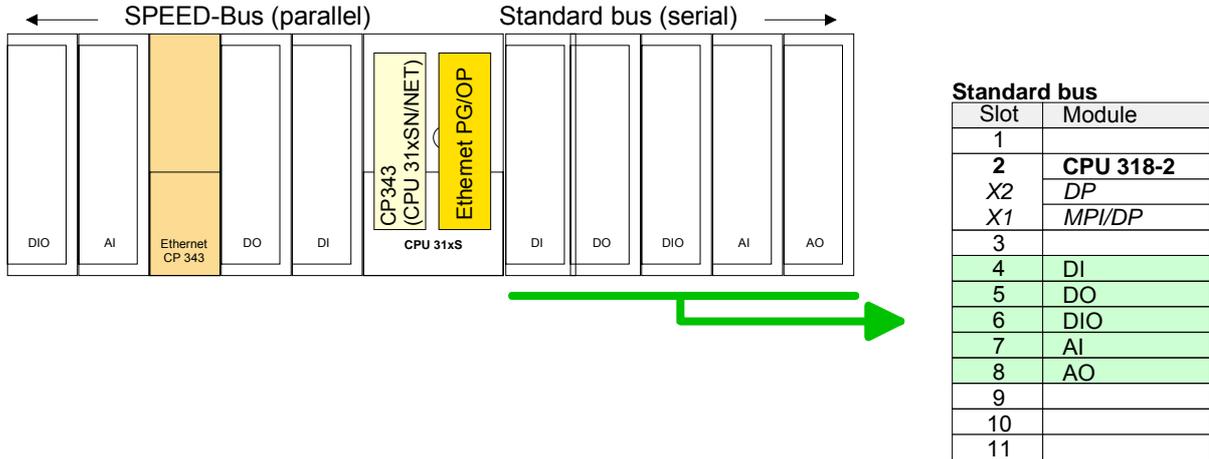
Project engineering of Ethernet PG/OP channel and CP 343 as 343-1EX11

For the internal Ethernet PG/OP channel that every SPEED7-CPU includes, you have to configure a Siemens CP 343-1 (343-1EX11) <u>always</u> as 1. module below the really plugged modules.

If exists the integrated CP 343 of the CPU 31xSN/NET is also configured and connected as CP 343-1 (343-1EX11) but always below the before configured PG/OP channel. Else start here to configure and connect every Ethernet CP 343S-NET - SPEED-Bus as Siemens CP 343-1 (343-1EX11).

Standard bus	
Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	343-1EX11
10	343-1EX11
11	
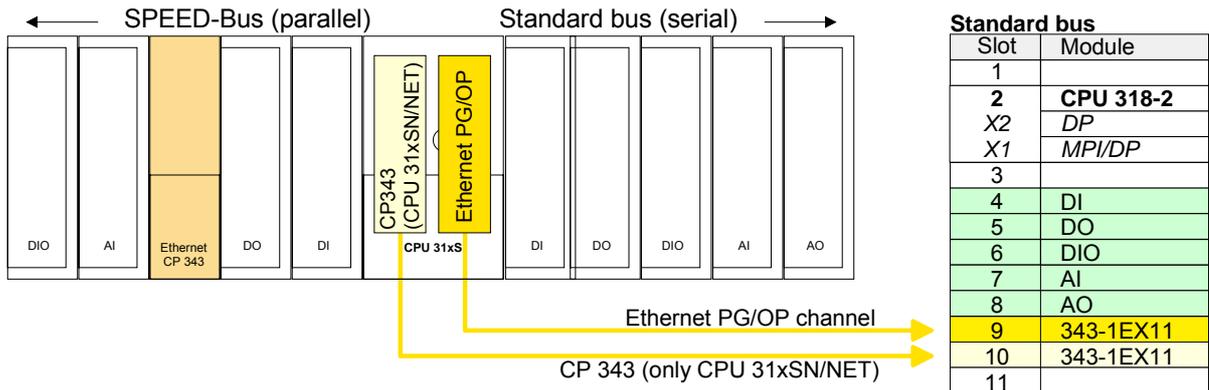
Set IP parameters

Open the property window via double-click on the CP 343-1EX11. Enter "General" and click at [Properties]. Type in the IP address, subnet mask and gateway for the CPs and select the wanted subnet.

Project engineering and connecting every Ethernet CP 343S-NET - SPEED-Bus at the standard bus

Due to the fact that a Ethernet CP 343S-NET - SPEED-Bus is in project engineering and parameterization similar to the CP 343-1 from Siemens, every Ethernet CP 343S-NET - SPEED-Bus is inserted at the standard bus as CP 343-1 (343-1EX11) after the already configured modules. The sequence follows the one at the SPEED-Bus from the right to the left.

Connect the CP 343-1 to the favored Ethernet network by means of Siemens NetPro and assign it with valid IP parameters.

Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	
4	DI
5	DO
6	DIO
7	AI
8	AO
9	343-1EX11
10	343-1EX11
11	343-1EX11
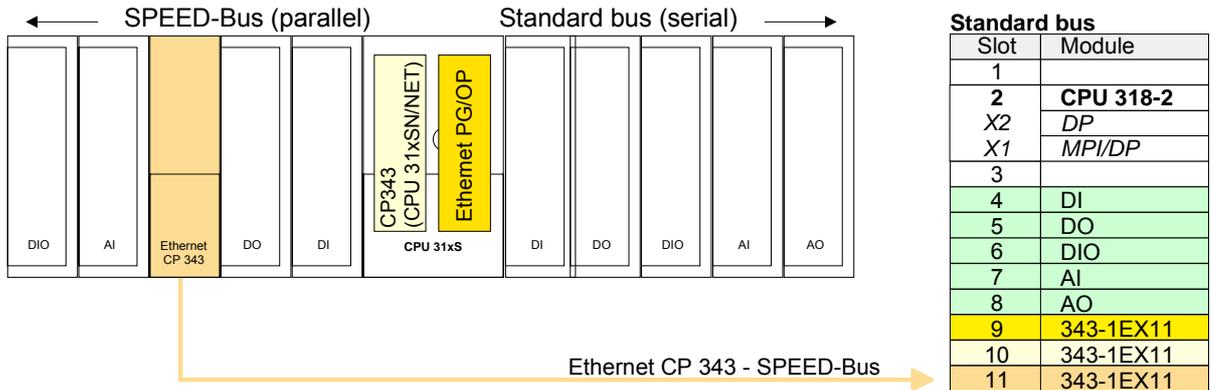
Bus extension with IM 360 and IM 361

Since as many as 32 modules can be addressed by the SPEED7 CPU in one row, but only 8 modules are supported by the Siemens SIMATIC manager, the IM 360 of the hardware catalog can be used as a virtual bus extension during project engineering. Here 3 further extension racks can be virtually connected via the IM 361. Bus extensions are always placed at slot 3.

Standard bus

Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	IM 360
4	DI
5	DO
6	DIO
7	AI
8	AO
9	343-1EX11
10	343-1EX11
11	343-1EX11
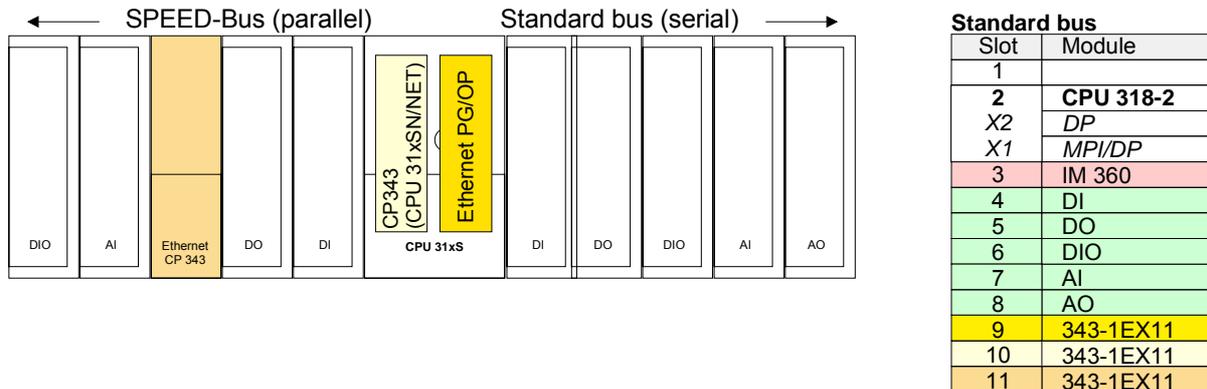
Standard bus

Slot	Module
1	
2	
3	IM 361
4	
5	
6	
7	
8	
9	
10	
11	

Project engineering each SPEED-Bus module in a virtual master system

The slot assignment of the SPEED-Bus modules and the parameterization of the in-/output periphery happens via a virtual Profibus DP master system. For this, place as last module a DP master (342-5DA02 V5.0) with master system.

For the employment of the System 300S modules at the SPEED-Bus the inclusion of the System 300S modules into the hardware catalog via the GSD-file SPEEDBUS.GSD from VIPA is required.

After the installation of the SPEEDBUS.GSD you may locate at
Profibus DP / Additional field devices / I/O / VIPA_SPEEDBUS
the DP slave system VIPA_SPEEDBUS.

Now include for the CPU and <u>every</u> module at the SPEED-Bus a slave system "VIPA_SPEEDBUS".

Set as Profibus address the slot no. (100...116) of the module and place the according module from the hardware catalog of VIPA_SPEEDBUS to slot 0 of the slave system.

SPEED-Bus (parallel) — Standard bus (serial)

Standard bus	
Slot	Module
1	
2	**CPU 318-2**
X2	*DP*
X1	*MPI/DP*
3	IM 360
4	DI
5	DO
6	DIO
7	AI
8	AO
9	343-1EX11
10	343-1EX11
11	343-1EX11

Ethernet-Network with Siemens NetPro

Standard bus	
Slot	Module
1	
2	
3	IM 361
4	CP 342-5
5	
6	
7	
8	
9	
10	
11	

Setting of the slot via Profibus address

DP master system for SPEED-Bus modules

VIPA_SPEEDBUS	
Slot	Order no..
0	331-1DA70 - AI

VIPA_SPEEDBUS	
Slot	Order no.
0	322-1BH70 - DO

VIPA_SPEEDBUS	
Slot	Order no.
0	31xS - SPEED7-CPU

VIPA_SPEEDBUS	
Slot	Order no.
0	323-1BH70 - DIO

VIPA_SPEEDBUS	
Slot	Order no.
0	343-1EX71 - Ethern

VIPA_SPEEDBUS	
Slot	Order no.
0	321-1BH70 - DI

The according module is to be taken from the hardware catalog to slot 0 of VIPA_SPEEDBUS.

Note!

Let with the CPs or DP master (also virtual SPEED-Bus master) at *options* the attitude "Save configuration data on the CPU" activated!

Configure CPU via Ethernet with CP 343 - SPEED-Bus

The following approach requires that the Ethernet CP 343S-NET - SPEED-Bus is available online, i.e. you assigned an IP address and subnet mask via a hardware configuration and the project engineering PC is in the same IP number circle. For more information see "Access to the Ethernet PG/OP channel and website..." above.

- Adjust the following setting in the SIMATIC manager at **Options** > *PG/PC interface*...: TCP/IP -> Network card...Protocol RFC 1006.

- Change to your project in the hardware configurator and start the transfer with **PLC** > *Download to module.*

- Select the favored CP 343-1 and type as "address" the configured IP address.
  Before the transfer takes place you receive an error message that the "Online module" is different from the "Offline module". Ignore this message and start the transfer with [OK].

Now you may access the Ethernet CP 343S-NET - SPEED-Bus via your project and configure the favored connections for the CP 343-1 with NetPro.

Provided that no new hardware configuration is transferred to the CPU, the given Ethernet CP 343S-NET - SPEED-Bus is permanently stored in the project as transfer channel.

Configure communication connections

Overview

The project engineering of connections i.e. the "link-up" between stations happens in NetPro from Siemens. NetPro is a graphical user interface for the link-up of stations.

A communication connection enables the program controlled communication between two participants at the Industrial Ethernet. The communication partners may here be part of the same project or - at multi projects - separated within related part projects.

Communication connections to partners outside of a project are configured via the object "In unknown project" or via deputy objects like "Other stations" or Siemens "SIMATIC S5 Station".

By means of the handling block like FB 55 - IP_CONFIG there is the possibility to establish program controlled communication connections. More may be found in the manual "Operation list" of the CPU.

Properties communication connection

The following properties are characterizing a communication connection:

- One station always executes an active connection establishment.
- Bi-directional data transfer (Send and receive on one connection)
- Both participant have equal rights, i.e. every participant may initialize the send res. receive process event controlled.
- Except of the UDP connection, at a communication connection the address of the communication partner is set via the project engineering. Here the establishment of a connection is always actively be accomplished by one station.
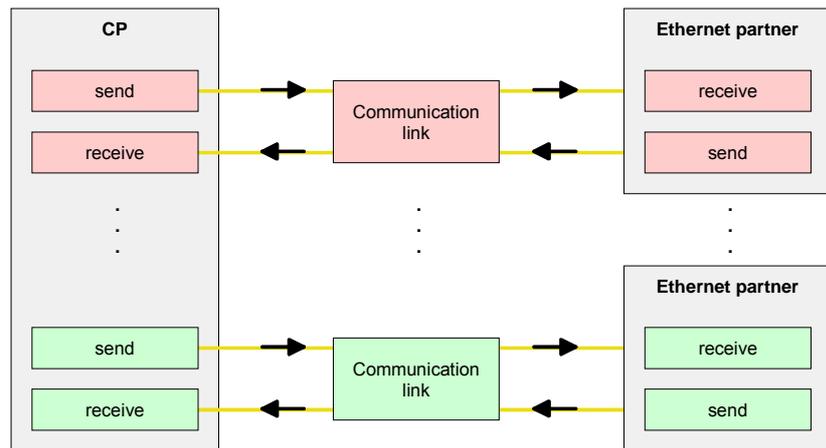
Preconditions

- Siemens SIMATIC manager V. 5.1 or higher and SIMATIC NET is installed.
- The CP has been engineered at the hardware configuration, entered into the hardware configuration and linked-up to the Ethernet subnet.
- The CP as bus participant has an IP address respectively a MAC address for ISO transport connections.

Note!

All stations outside of the recent project must be configured as replacement objects like e.g. Siemens "SIMATIC S5" or "other station" or with the object "In unknown project".

When creating a connection you may also choose the partner type "unspecified" and set the required remote parameter directly in the connection dialog.

Work environment of NetPro

For the project engineering of connections, a thorough knowledge with NetPro from Siemens is required! The following passage only describes the basic usage of NetPro. More detailed information about NetPro is to be found in the according online manual res. documentation.

Start NetPro by clicking on a "net" in the Siemens SIMATIC manager or on "connections" within the CPU.

The environment of NetPro has the following structure:

1   *Graphic net view*

All stations and networks are displayed in a graphic view. By clicking on the according component you may access and alter the concerning properties.

2   *Net objects*

This area displays all available net objects in a directory view. By dragging a wanted object to the net view you may include further net objects and open them in the hardware configurator.

3   *Connection table*

The connection table lists all connections in a table. This list is only shown when you highlighted a connectable module like e.g. a CPU.

You may insert new connections into this table with the according command.
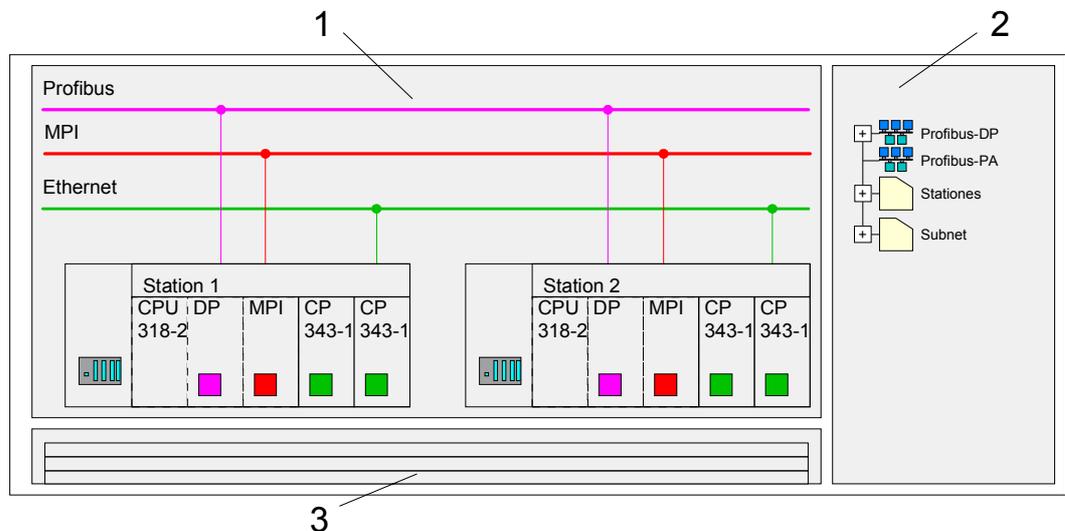
PLC stations

You receive the following graphical display for every PLC station and their component. By selecting the single components, the context menu offers you several functions:
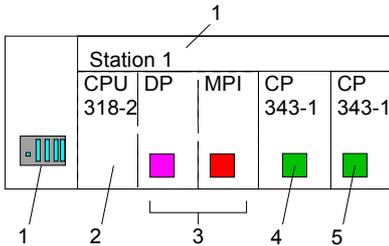
1   *Station*

This includes a PLC station with rack, CPU and communication components. Via the context menu you may configure a station added from the *net objects* and its concerning components in the hardware configurator. After returning to NetPro, the new configured components are shown.

2   *CPU*

A click onto the CPU shows the connection table. The connection table shows all connections that are configured for the CPU.

3   *Internal communication components*

This displays the communication components that are available in your CPU. For the SPEED7-Net-CPUs are configured as CPU 318-2DP the internal components do not show the CP.

Due to this, the CPs that are included in the 31xSN/NET-CPU must be configured as external CPs behind the really plugged modules. The CPs are then also shown in NetPro as external CPs (4, 5) in the station.

4   *Ethernet PG/OP channel*

The internal Ethernet CP must always be configured as 1. CP in the hardware configuration. This CP only serves the PG/OP communication. You may not configure connections.

5   *CP 343*

If exists the internal CP 343 of a *CPU 31xSN/NET* must always be configured as 2. CP in the hardware configuration after the Ethernet PG/OP channel. Else start here to configure and connect every Ethernet CP 343S-NET - SPEED-Bus as Siemens CP 343-1 (343-1EX11). The sequence follows the one at the SPEED-Bus from the right to the left.

Link up stations

NetPro offers you the option to link-up the communicating stations. You may link-up the stations via the properties in the hardware configuration or graphically via NetPro. For this you point the mouse on the colored net mark of the according CP and drag and drop it to the net you want to link. Now the CP is linked up to the wanted net by means of a line.
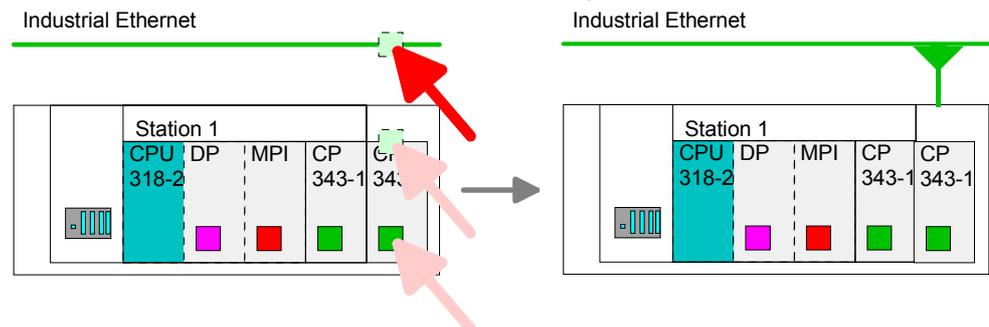
Projecting connections

For the project engineering of connections, open the connection list by selecting the according CPU. Choose *Insert new connection* in the context menu:
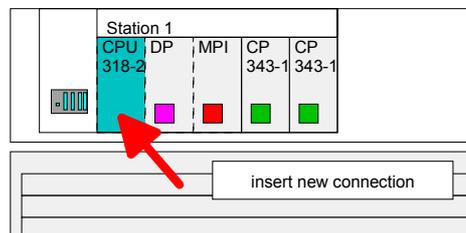
Connection partner (partner station)

A dialog window opens where you may choose the *connection partner* and the *connection type.*

Specified connection partner

Each station configured in the Siemens SIMATIC manager is listed in the table of connection partner. These stations are unique *specified* by an IP address and a subnet mask.

Unspecified connection partner

Here the connection partner may exist in the *current project* or in an *unknown project*. Connection jobs to an unknown project must be defined by an unique connection name, which is to be used in the projects of both stations.

Due to this allocation the connection remains *unspecified.*

All broadcast stations

Exclusive at UDP connections you may send to every reachable participant. The receipt of user data is not possible.

The broadcast participants are specified by <u>one</u> port and <u>one</u> broadcast address at sender and receiver.

Per default, broadcasts that are only serving the Ethernet communication, like e.g. ARP-Requests (Search MAC <> IP address), are received and accordingly processed. For the identification of the broadcast participants within the net, you have to define a valid broadcast address as partner IP during project engineering of a broadcast connection. Additionally to the broadcast address you have to set a common port for sender and receiver.

All multicast stations

By selecting *All Multicast stations* you define that UDP telegrams have to be sent res. received by all participants of a multicast group. In opposite to broadcast here a reception is possible.

For the identification of the multicast participants within the net, you have to define <u>one</u> valid multicast group address and <u>one</u> port for sender and receiver.

The maximum number of multicast circles, which are supported by the CP, is identical to the maximum number of connections.

Connection types   The following connection types are available for communication:

- **Siemens S7 connections, Send/Receive connections (TCP, ISO-on-TCP** and **ISO transport)** for secured data transfer of data blocks between two Ethernet stations

- **UDP** for not secured data transfer of data blocks between two stations.

Open the properties dialog   Choose the connection partner and the type of connection and confirm with [OK].

If activated, a properties dialog for the according connection opens as link to your PLC user program.

At the following pages the relevant parameters of the different connection types are shortly described. More information about this may be found in the online help of Siemens NetPro respectively of VIPA WinPLC7.

Insert New Connection

Connection Partner

- In the current project
  - Connections
    - SIMATIC 300(2)
    - SIMATIC 300(3)
    - SIMATIC 300(4)
    - SIMATIC 300(5)
    - SIMATIC 300(6)
      - CPU 314C-2 DP
    - (Unspecified)
    - All broadcast stations
    - All multicast stations
- In unknown project

Project:	Connections
Station:	SIMATIC 300(6)
Module:	CPU 314C-2 DP

Connection

Type: S7 connection

☑ Display properties before inserting

[OK]   [Apply]   [Cancel]   [Help]

Save and compile connections   After you configured all connections this way, you may save and compile your project and exit NetPro.

To store the CP project engineering data in the system data, you have to activate the option "Store project data in the CPU" (default setting) at *object properties* area *Options* in the hardware configuration of the CP.

Siemens S7 connection

For data transfer with Siemens S7 connections the FB/SFB VIPA handling blocks are necessary; the deployment is described in the manual "Operation list" of your CPU.

At Siemens S7 connections the communication connections are specified by a connection ID for each communication partner.

A connection is specified by the *local* and *partner* connection end point. A link. At Siemens S7 connections the TSAPs must be congruent crosswise.

The following parameters define a connection end point:

Station A		Siemens		Station B
remote TSAP	→	Siemens	→	local TSAP
local TSAP	←	S7 connection	←	remote TSAP
ID A				ID B

Possibilities of combination

The following table shows the combination options with Siemens S7 connections with deployment of the FB/SFB VIPA handling blocks.

The handling blocks are more described in the manual "Operation list" of the CPU.

Connection partner	Connection establishing	Connection
specified in NetPro (in the current project)	active/passive	specified
unspecified in NetPro (in the current project)	active	specified
	passive	unspecified
unspecified in NetPro (in the unknown project)	active/passive	specified (connection name in an other project)

In the following every relevant parameter of a Siemens S7 connection is described:

Local connection end point

Here you may define how the connection is to be established. Since the Siemens SIMATIC manager can identify the communication options by means of the end points, some options are already preset and may not be changed.

Establish an active connection

An established connection is precondition for data transfer. By activating the option *Establish an active connection* the local station establishes the connection.

Please regard not every station is able to establish a connection. Here the job is to be made by the partner station.

One-way

If activated only one-way communication blocks like PUT and GET may be used for communication in the user program. Here the partner station acts as server, which neither may send active nor receive active

Block parameters

Local ID   The ID is the link to your PLC program. The ID must be identical to the ID
                        of the call interface of the FB/SFB VIPA handling block.

[Default]   As soon as you click at [Default], the ID is reset to system generated ID.

Connection path   In this part of the dialog window the connection path between the local and
                        the partner station may be set. Depending on the linking of the modules the
                        possible interfaces for communication are listed in a selection field.

[Address details]   With this button a dialog window is opened, which shows address
                        information about the local and partner station. The parameters may also
                        be changed.

TSAP   With Siemens S7 connections a TSAP is automatically generated of the
                        connection resource (one-way/two-way) and state of place (rack/slot
                        respectively system internal ID at PC stations).

Connection   The connection resource is part of the TSAP of the local station
resource   respectively of the partner. Not every connection resource may be used for
                        every connection type. Depending on the connection partner and the
                        connection type the range of values is limited respectively the connection
                        resource is fix specified.

Operating mode   With deploying of Siemens S7 connections the operating may be
                        determined by deployment of the FB/SFB VIPA handling blocks in the user
                        program. To use this blocks configured communication connections are
                        always necessary in the active station.
                        More about the usage of these blocks may be found in the manual
                        "Operation list" of your CPU.
                        The following blocks may be used with Siemens S7 connections:

FB/SFB	Name	Description
FB/SFB 8	USEND	Uncoordinated data transmission
FB/SFB 9	URCV	Uncoordinated data reception
FB/SFB 12	BSEND	Sending data in blocks
FB/SFB 13	BRCV	Receiving data in blocks
FB/SFB 14	GET	Remote CPU read
FB/SFB 15	PUT	Remote CPU write
FB 55	IP_CONFIG	Programmed communication Connections

Send/Receive connections

At the PLC side for data transfer with these connections the VIPA handling blocks AG_SEND (FC 5) and AG_RECV (FC 6) are to be used.

The following connections are Send/Receive connections:
- TCP (SEND-RECEIVE, FETCH-WRITE PASSIVE)
- ISO-on-TCP (SEND-RECEIVE, FETCH-WRITE PASSIVE)
- ISO transport (SEND-RECEIVE, FETCH-WRITE PASSIVE)
- UDP (SEND-RECEIVE)

Here the following parameters define a connection end point:

remote port local port	→	TCP	→	local port remote port
IP address A	←	connection	←	IP address B

remote TSAP local TSAP	→	ISO-on-TCP	→	local TSAP remote TSAP
IP address A	←	connection	←	IP address B

remote TSAP local TSAP	→	ISO transport	→	local TSAP remote TSAP
MAC address A	←	connection	←	MAC address B

remote port local port	→	UDP-	→	local port remote port
IP address A	←	connection	←	IP address B

Possibilities of combination

The following table shows the combination options with the different operating modes:

Connection partner	Connection type	Conn. establ.	Connection	Operating mode
Specified in NetPro (in recent project)	TCP / ISO-on-TCP / ISO transport	active/passive	specified	SEND/RECEIVE
	UDP	-		
Unspecified in NetPro (in recent project)	TCP / ISO-on-TCP / ISO transport	active	specified	SEND/RECEIVE
		passive	part specified (Port/TSAP)	SEND/RECEIVE FETCH PASSIV WRITE PASSIV
			unspecified	
	UDP	-	specified	SEND/RECEIVE
Unspecified in NetPro (in unknown project)	TCP / ISO-on-TCP / ISO transport	active	specified (connection name in an other project)	SEND/RECEIVE
		passive		SEND/RECEIVE FETCH PASSIV WRITE PASSIV
	UDP	-		SEND/RECEIVE
All Broadcast stations	UDP	-	specified (Port, Broadcast addr.)	SEND
All Multicast stations	UDP	-	specified (Port, Multicast group)	SEND/RECEIVE

In the following each relevant parameters of the different connection types are described.

General information   In this tab the general connection parameters are listed, which identify the local connection end point.

ID   This entry is identical to the entry of the connection table. The value may always be changed. Please also regard to adjust the ID parameter of the call interface of the FC.

Note!
If a CP is exchanged by another one, this must at least provide the same services and must at least have the same version level. Only this can guarantee the connections configured via the CP to remain consistent and useable.

Name   This field contains the name of the connection. The name is generated by the system and may be changed on every time.

Via CP   Here is the CP listed, which should be used for connection. With the button
[Route]   [Route] the appropriate CP may be selected for communication.
                        Do not select the 1. CP of the route for communication connections. The 1. CP is always the Ethernet-PG/OP channel, which <u>does not</u> support configurable connections.

Active connection   If activated the connection to the partner is active established by the local
establishment   station. Here the partner is to be specified in the tab "Addresses".
                        At an unspecified connection the connection is passive established.

Block parameters   Here the parameters *ID* and *LADDR* for your user program are shown. Both are parameters, which are to be preset if you use the FC 5 and FC 6 (AG_SEND, AG_RECEIVE). Please always use the VIPA FCs, which you may receive from VIPA.

Addresses   The Addresses tab displays the relevant local and remote address information as proposed values. Depending on the kind of communication the address information may remain unspecified.

Ports   Ports res. port addresses are defining the access point to the user application within the station/CPU. These must be unambiguous. A port address should be within the range of 2000...65535. Remote and local ports may only be identical with one connection.

TSAP   ISO-on-TCP and ISO transport support TSAP lengths (**T**ransport **S**ervice **A**ccess **P**oint) of 1...16 Byte. You may enter the TSAP in ASCII or hexadecimal format. The calculation of the length happens automatically.

Options   Dependent on the specification of the connecting partner the operating mode may be set respectively displayed.

Mode   *SEND/RECEIVE*

The SEND/RECEIVE interface allows the program-controlled communication to any partner station via a configured connection. Here the data transfer happens by a call from your user application. The FC5 and FC6 that are part of the VIPA block library are serving as interface.

This enables your control to send messages depending on process events.

FETCH/WRITE PASSIVE

With the help of FETCH/WRITE services partner systems have the direct access to memory areas of the CPU. These are "passive" communication connections that have to be configured. The connections are "actively" established by the connection partner (e.g. Siemens-S5).

FETCH PASSIVE (request data)

FETCH allows a partner system to request data.

WRITE PASSIVE (write data)

This allows a partner system to write data in the data area of the CPU.

Overview   Here every configured connections of this station and its partner are displayed. These data are information and may not be changed.

Note!

By appropriate shift respectively delete activities in the Siemens SIMATIC manager connections may lose the allocation to the CP.
These connections are marked with "!" at ID of the overview.

Communication connections in the user program

Overview

For the execution of connection commands at the PLC, your CPU requires an user application. For this, exclusively the VIPA handling blocks are to be used, which you may get as library from VIPA.

More information about the deployment of the blocks may be found in the manual "Operation list" of the CPU.

Depending on the connection type there are blocks for Siemens *S7 connections* and *Send/Receive connections*.

In the following the proceeding with both connection types is described.

User program at Siemens S7 connections

Larger data sets may be transferred between PLC systems based on Siemens STEP®7 by means of Siemens S7 connections. Here the stations are to be linked by Ethernet.

Using remote functions with the appropriate function block you can control a CPU with an other CPU and switch it e.g. to STOP.

The communication connections are static, this means they are to be configured by a connection table.

Communication functions

With the SPEED7 CPUs of VIPA there are two possibilities for the deployment of the communication functions:

- *Siemens S7-300 communication functions*

  By integration of the function blocks FB 8 ... FB 55 from VIPA you may access the Siemens S7-300 communication functions.

- *Siemens S7-400 communication functions*

  For the Siemens S7-400 communication functions the SFB 8 ... SFB 23 are to be used, which were integrated to the operating system of the CPU. Here copy the interface description of the SFBs from the standard library at system function block to the directory container, generate an instance data block for each call and call the SFB with the associated instance data block.

Configuring

Precondition for Siemens S7 communication is a configured connection table in which the communication links are defined. For this e.g. WinPLC7 from VIPA or NetPro from Siemens can be used. A communication link is specified by a connection ID for each communication partner. Use the *local ID* to initialize the FB/SFB in the PLC from which the connection is regarded and the *partner ID* to configure the FB/SFB in the partner PLC.

Function blocks   The following function blocks may be used for Siemens S7 commu-
nications. More information about the deployment of the blocks may be
found in the manual "Operation list" of the CPU.

FB/SFB	Label	Description
FB/SFB 8	USEND	*Uncoordinated data transmission* FB/SFB 8 USEND may be used to transmit data to a remote partner FB/SFB of the type URCV (FB/SFB 9). You must ensure that parameter *R_ID* of both FB/SFBs is identical. The transmission is started by a positive edge at control input *REQ* and proceeds without coordination with the partner FB/SFB.
FB/SFB 9	URCV	*Uncoordinated data reception* FB/SFB 9 URCV can be used to receive data asynchronously from a remote partner FB/SFB of the type USEND (FB/SFB 8). You must ensure that parameter *R_ID* of both FB/SFBs is identical. The block is ready to receive then there is a logical 1 at the *EN_R* input. An active job can be cancelled with *EN_R*=0.
FB/SFB 12	BSEND	*Sending data in blocks* FB/SFB 12 BSEND sends data to a remote partner FB/SFB of the type BRCV (FB/SFB 13). The data area to be transmitted is segmented. Each segment is sent individually to the partner. The last segment is acknowledged by the partner as it is received, independently of the calling up of the corresponding FB/SFB/FB BRCV. With this type of data transfer, more data can be transported between the communications partners than is possible with all other communication FBs/SFBs for configured S7 connections, namely 65534bytes.
FB/SFB 13	BRCV	*Receiving data in blocks* The FB/SFB 13 BRCV can receive data from a remote partner FB/SFB of the type BSEND (FB/SFB 12). The parameter *R_ID* of both FB/SFBs must be identical. After each received data segment an acknowledgement is sent to the partner FB/SFB and the *LEN* parameter is updated.
FB/SFB 14	GET	*Remote CPU read* The FB/SFB 14 GET can be used to read data from a remote CPU. The respective CPU must be in RUN mode or in STOP mode.
FB/SFB 15	PUT	*Remote CPU write* The FB/SFB 15 PUT can be used to write data to a remote CPU. The respective CPU may be in RUN mode or in STOP mode.
FB 55	IP_CONFIG	*Programmed Communication Connections* With this block you may flexible transfer data blocks with configuration data to the CP within the user program.

User program at Send/Receive connections

The following connections are Send/Receive connections:

- TCP (SEND-RECEIVE, FETCH-WRITE PASSIVE)
- ISO-on-TCP (SEND-RECEIVE, FETCH-WRITE PASSIVE)
- ISO Transport (SEND-RECEIVE, FETCH-WRITE PASSIVE)
- UDP (SEND-RECEIVE)

For the communication between CPU and CP, the following FCs are available:

AG_SEND (FC 5)

This block transfers the user data from the data area given in *SEND* to the CP specified via *ID* and *LADDR*. As data area you may set a PA, bit memory or data block area. When the data area has been transferred without errors, "order ready without error" is returned.

AG_RECV (FC 6)

The block transfers the user data from the CP into a data area defined via *RECV*. As data area you may set a PA, bit memory or data block area. When the data area has been transferred without errors, "order ready without error" is returned.

Note!

Please regard that you may only use the SEND/RECV-FCs from VIPA in your user application for the communication with VIPA-CPs. At a change to VIPA-CPs in an already existing project, the present AG_SEND/ AG_LSEND res. AG_RECV/AG_LRECV may be replaced by AG_SEND res. AG_RECV from VIPA without adjustment. Due to the fact that the CP automatically adjusts itself to the length of the data to transfer, the L variant of SEND res. RECV is not required for VIPA CPs.

Status displays

The CP processes send and receive commands independently from the CPU cycle and needs for this transfer time. The interface with the FC blocks to the user application is here synchronized by means of acknowledgements/receipts.

For status evaluation the communication blocks return parameters that may be evaluated directly in the user application.

These status displays are updated at every block call.

Deployment at high communication load

Do not use cyclic calls of the communication blocks in OB 1. This causes a permanent communication between CPU and CP. Program instead the communication blocks within a time OB where the cycle time is higher res. event controlled.

FC call is faster than CP transfer time

If a block is called a second time in the user application before the data of the last time is already completely send res. received, the FC block interface reacts like this:

AG_SEND

No command is accepted until the data transfer has been acknowledged from the partner via the connection. Until this you receive the message "Order running" before the CP is able to receive a new command for this connection.

AG_RECV

The order is acknowledged with the message "No data available yet" as long as the CP has not received the receive data completely.

AG_SEND, AG_RECV in the user application

The following illustration shows a possible sequence for the FC blocks together with the organizations and program blocks in the CPU cycle:
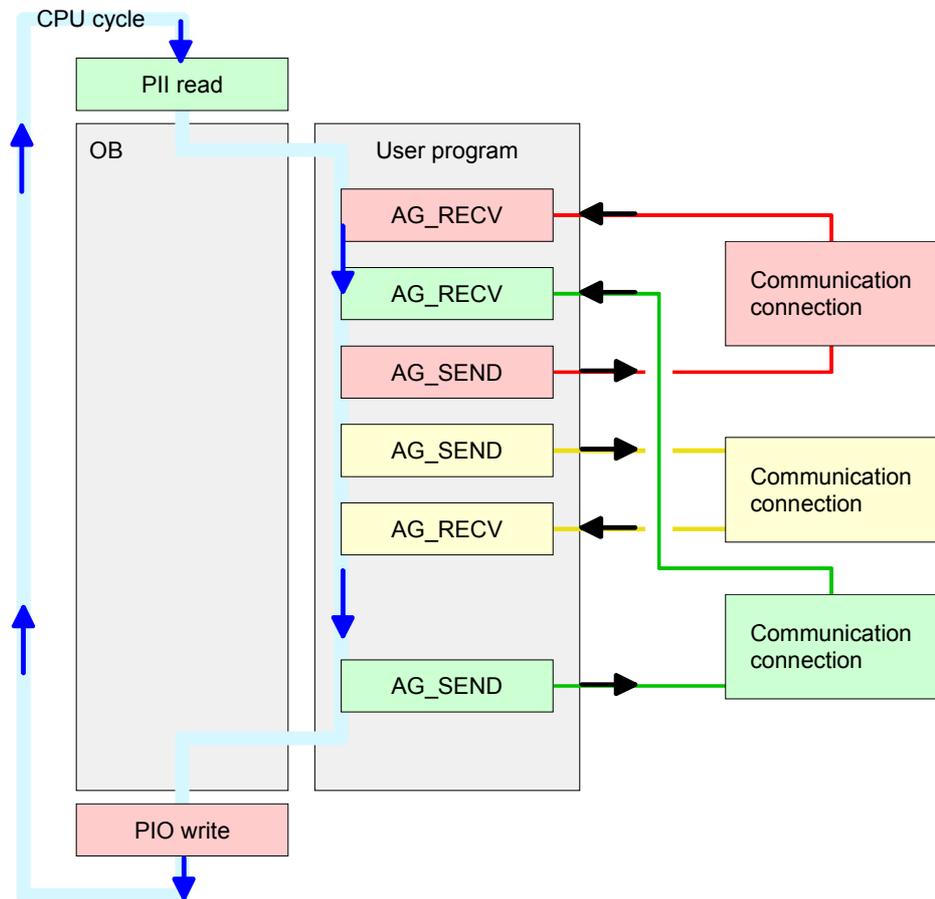
The FC blocks with concerning communication connection are summed up by color. Here you may also see that your user application may consist of any number of blocks. This allows you to send or receive data (with AG_SEND res. AG_RECV) event or program driven at any wanted point within the CPU cycle.

You may also call the blocks for **one** communication connection several times within one cycle.

AG_SEND (FC 5) By means of AG_SEND the data to send are transferred to the CP.

Parameter

Parameter	Declaration	Type	Description
ACT	Input	BOOL	Activation of the sender 0: Updates DONE, ERROR and STATUS 1: The data area defined in SEND with the length LEN is send
ID	Input	INT	Connection number 1 ... 16 (identical with ID of NetPro)
LADDR	Input	WORD	Logical basic address of the CP (identical with LADDR of NetPro)
SEND	Input	ANY	Data area
LEN	Input	INT	Number of bytes from data area to transfer
DONE	Output	BOOL	Status parameter for the order 0: Order running 1: Order ready without error
ERROR	Output	BOOL	Error message 0: Order running (at DONE = 0) 0: Order ready without error (at DONE = 1) 1: Order ready with error
STATUS	Output	WORD	Status message returned with DONE and ERROR. More details are to be found in the following table.

AG_RECV (FC 6) By means of AG_RECV the data received from the CP are transferred to the CPU.

Parameter

Parameter	Declaration	Type	Description
ID	Input	INT	Connection number 1 ... 16 (identical with ID of NetPro)
LADDR	Input	WORD	Logical basic address of the CP (identical with LADDR of NetPro)
RECV	Input	ANY	Data area for the received data
NDR	Output	BOOL	Status parameter for the order 0: Order running 1: Order ready data received without error
ERROR	Output	BOOL	Error message 0: Order running (at NDR = 0) 0: Order ready without error (at NDR = 1) 1: Order ready with error
STATUS	Output	WORD	Status message returned with NDR and ERROR. More details are to be found in the following table.
LEN	Output	INT	Number of bytes that have been received

DONE, ERROR, STATUS

The following table shows all messages that can be returned by the CP after a SEND res. RECV command.

A "-" means that this message is not available for the concerning SEND res. RECV command.

DONE (SEND)	NDR (RECV)	ERROR	STATUS	Description
1	-	0	0000h	Order ready without error
-	1	0	0000h	New data received without error
0	-	0	0000h	No order present
-	0	0	8180h	No data available yet
0	0	0	8181h	Order running
0	0	1	8183h	No CP project engineering for this order
0	-	1	8184h	System error
-	0	1	8184h	System error (destination data area failure)
0	-	1	8185h	Parameter LEN exceeds source area SEND
	0	1	8185h	Destination buffer (RECV) too small
0	0	1	8186h	Parameter ID invalid (not within 1 ...16)
0	-	1	8302h	No receive resources at destination station, receive station is not able to process received data fast enough res. has no receive resources reserved.
0	-	1	8304h	The connection is not established. The send command shouldn't be send again before a delay time of >100ms.
-	0	1	8304h	The connection is not established. The receive command shouldn't be send again after a delay time of >100ms.
0	-	1	8311h	Destination station not available under the defined Ethernet address.
0	-	1	8312h	Ethernet error in the CP
0		1	8F22h	Source area invalid, e.g. when area in DB not present Parameter LEN < 0
-	0	1	8F23h	Source area invalid, e.g. when area in DB not present Parameter LEN < 0
0	-	1	8F24h	Range error at reading a parameter.
-	0	1	8F25h	Range error at writing a parameter.
0	-	1	8F28h	Orientation error at reading a parameter.
-	0	1	8F29h	Orientation error at writing a parameter.
-	0	1	8F30h	Parameter is within write protected 1. recent data block
-	0	1	8F31h	Parameter is within write protected 2. recent data block
0	0	1	8F32h	Parameter contains oversized DB number.
0	0	1	8F33h	DB number error
0	0	1	8F3Ah	Area not loaded (DB)

continued...

... continue

DONE (SEND)	NDR (RECV)	ERROR	STATUS	Description
0	-	1	8F42h	Acknowledgement delay at reading a parameter from peripheral area.
-	0	1	8F43h	Acknowledgement delay at writing a parameter from peripheral area.
0	-	1	8F44h	Address of the parameter to read locked in access track
-	0	1	8F45h	Address of the parameter to write locked in access track
0	0	1	8F7Fh	Internal error e.g. invalid ANY reference e.g. parameter LEN = 0 .
0	0	1	8090h	Module with this module start address not present or CPU in STOP.
0	0	1	8091h	Module start address not within double word grid.
0	0	1	8092h	ANY reference contains type setting unequal BYTE.
-	0	1	80A0h	Negative acknowledgement at reading the module
0	0	1	80A4h	reserved
0	0	1	80B0h	Module doesn't recognize record set.
0	0	1	80B1h	The length setting (in parameter LEN) is invalid.
0	0	1	80B2h	reserved
0	0	1	80C0h	Record set not readable.
0	0	1	80C1h	The set record set is still in process.
0	0	1	80C2h	Order accumulation.
0	0	1	80C3h	The operating sources (memory) of the CPU are temporarily occupied.
0	0	1	80C4h	Communication error (occurs temporarily; a repetition in the user application is reasonable.)
0	0	1	80D2h	Module start address is wrong.

Status parameter at reboot

At a reboot of the CP, the output parameters are reset as follows:

- DONE = 0
- NDR = 0
- ERROR = 8180h (at AG_RECV)
  ERROR = 8181h (at AG_SEND)

NCM diagnostic – Help for error diagnostic

Check list for error search

This page shall help you with the error diagnostic. The following page lists a number of typical problems and their probable causes:

Question	Solution with "no"
CPU in Run?	Control DC 24V voltage supply.
	Set RUN/STOP lever in position RUN.
	Check PLC program and transfer it again.
AG_SEND, AG_RECV in user application?	These 2 blocks are required in the user application for the data transfer between CP and CPU. Both blocks must also be called with a passive connection.
Is CP able to connect?	Check Ethernet cable (at a point-to-point connection a crossed Ethernet cable is to be used).
	Check IP address.
Can data be transferred?	Check Port no. for read and write.
	Check source and destination areas.
	Check if the 2. CP is selected in the route.
	Enlarge the receive res. send buffer defined via the ANY pointer
Is the complete data block sent at ISO-on-TCP?	Check the LEN parameter at AG_SEND.
	Set the receive res. send buffer defined via the ANY pointer to the required size.

Siemens NCM S7 diagnostic

The CP supports the Siemens NCM diagnostic tool. The NCM diagnostic tool is part of the Siemens SIMATIC manager. This tool delivers information about the operating state of the communication functions of the online CPs dynamically.

The following diagnostic functions are available:

- Check operating state at Ethernet
- Read the diagnostic buffer of the CP
- Diagnostic of connections

The following pages contain a short description of the NCM diagnostic. More details about the function range and for the deployment of the Siemens NCM diagnostic tool is to be found in the according online help res. the manual from Siemens.

Start NCM diagnostic

There are two options to start the diagnostic tool:

- Via *Windows-START menu* > *SIMATIC ... NCM S7* > *Diagnostic*
- Within the project engineering res. the hardware configuration via the register "Diagnostic" in the "Property" dialog with [Execute].

Structure

The working surface of the diagnostic tool has the following structure:

The *navigation area* at the left side contains the hierarchical listed diagnostic objects. Depending on CP type and configured connections there is an adjusted object structure in the navigation area.

The *information area* at the right side always shows the result of the navigation function you chose in the *navigation area*.

No diagnostic without connection

A diagnostic always requires an online connection to the CP you want to control. For this click on at the symbol bar. The following dialog window appears:
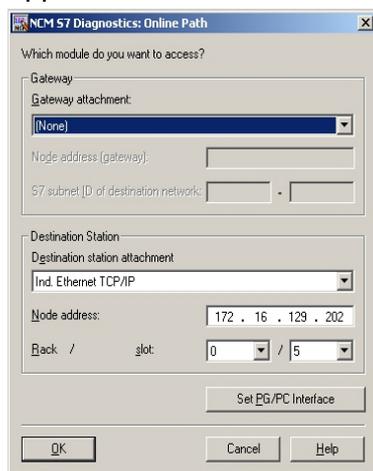
Set the following parameters under *destination station*:

Connection...: Ind. Ethernet TCP/IP

Station addr.: Enter the IP address of the CP

Module rack/slot:

Enter the *module rack* and *slot* of the CP 343 that you've placed at the 2. slot.

Set your PG/PC interface to TCP/IP...RFC1006. Via [OK] you start the online diagnostic.

Read diagnostic buffer

The CP has a diagnostic buffer. This has the architecture of a ring memory and may store up to 100 diagnostic messages. The NCM diagnostic allows you to monitor and evaluate the CP diagnostic messages via the diagnostic object *Diagnostic buffer*.

Via a double click on a diagnostic message the NCM diagnostic shows further information.

Approach for diagnostic

You execute a diagnostic by clicking on a diagnostic object in the navigation area. More functions are available via the menu and the symbol bar.

Note!

Please always control the preconditions for an operative communication using the check at the beginning of this chapter.

For the aimed diagnostic deployment the following approach is convenient:

- Start diagnostic.

- Open the dialog for the online connection with , enter connection parameters and establish the online connection with [OK].

- Identify the CP and check the recent state of the CP via module status.

- Check the connections for particularities like:
  - Connection status
  - Receive status
  - Send status

- Control and evaluate the diagnostic buffer of the CP via *diagnostic buffer*.

- As needed, alter project engineering res. programming and restart diagnostic.

Coupling to other systems

Overview   The operating mode FETCH/WRITE supported at TCP res. ISO-on-TCP can be used for accesses of partner devices to the PLC system memory. To be able to use this access also for example for implementation in PC applications you have to know the telegram structure for orders. The specific headers for request and acknowledgement telegrams have per default a length of 16Byte and are described at the following pages.

ORG format   The organization format is the abbreviated description of a data source or a data destination in a PLC environment. The available ORG formats are listed in the following table.

The ERW-identifier is used for the addressing of data blocks. In this case the data block number is entered into this identifier. The start address and quantity provide the address for the memory area and they are stored in HIGH-/LOW- format (Motorola-formatted addresses)

Description	Type	Range
ORG identifier	BYTE	1..x
ERW identifier	BYTE	1..255
Start address	HILOWORD	0..y
Length	HILOWORD	1..z

The following table contains a list of available ORG-formats. The "length" must not be entered as -1 (FFFFh).

ORG identifier 01h-04h

CPU area	DB	MB	EB	AB
ORG identifier	01h	02h	03h	04h
Description	Source/destination data from/into data Block in main memory.	Source/destination data from/into flag memory area	Source/destination data from/into process image of the inputs (PII).	Source/destination data from/into process image of the outputs (PIO).
ERW identifier (DBNO)	DB, from where the source data is retrieved or to where the destination data is transferred.	irrelevant	irrelevant	irrelevant
Start address significance	DBB-No., from where the data is retrieved or where the data is saved.	MB-No., from where the data is retrieved or where the data is saved.	IB-No., from where the data is retrieved or where the data is saved.	QB-No., from where the data is retrieved or where the data is saved.
Length significance	Length of the source/destination data block in <u>words</u>	Length of the source/destination data block in bytes	Length of the source/destination data block in bytes	Length of the source/destination data block in bytes

Note!

Information about the valid range can be found at the technical data of your CPU.

ORG identifier 05h-07h

CPU area	PB	ZB	TB
ORG identifier	05h	06h	07h
Description	Source/destination data from/into peripheral modules. Input module for source data, output module for destination data.	Source/destination data from/into counter cells.	Source/destination data from/into timer cells.
ERW identifier (DBNO)	irrelevant	irrelevant	irrelevant
Start address Significance	PB-No., from where the data can be retrieved or where it is saved.	ZB-No., from where the data can be retrieved or where it is saved.	TB-No., from where the data can be retrieved or where it is saved.
Length Significance	Length of the source/destination data block in bytes.	Length of the source/destination data block in words (counter cell = 1 word).	Length of the source/destination data block in words (counter cell = 1 word).

Transfer of blocks with numbers >255

ORG identifier 81h-FFh

To transfer data blocks of the number range 256 ... 32768 you may use the ORG identifier 81h-FFh.

For the setting of a DB No. >255 needs a length of one word, the $DBNO_{new}$ is assembled from the content of the ORG identifier and the DBNO.

$DBNO_{new}$ is created as word as follows:

$DBNO_{new}$

High-Byte								Low-Byte							
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

ORG identifier (0XXXXXXX)   DBNO (XXXXXXXX)
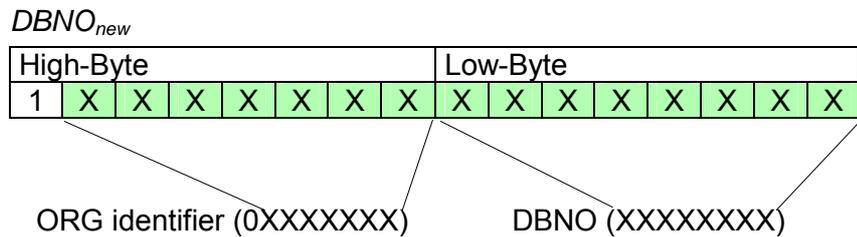
If the highest bit of the ORG identifier is set, the Low-Byte of $DBNO_{new}$ is defined via DBNO and the High-Byte of $DBNO_{new}$ via ORG identifier, where the highest bit of the ORG identifier is eliminated.

The following formula illustrates this:

$DBNO_{new} = 256 \times (\text{ORG-identifier AND 7Fh}) + DBNO$

Structure of PLC-Header

For every READ and WRITE the CP generates PLC header for request and acknowledgment messages. Normally the length of these headers is 16Bytes and have the following structure:

WRITE

Request telegram Remote Station

System ID	="S5"	(Word)
Length Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=03h**	(Byte)
ORG block	=03h	(Byte)
Length ORG block	=08h	(Byte)
*ORG identifier**		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Empty block	=FFh	(Byte)
Length empty block	=02h	(Byte)
Data up to 64kByte (only if error no.=0)		

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=04h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ack. block	=03h	(Byte)
Error no.		(Byte)
Empty block	=FFh	(Byte)
Length empty block	=07h	(Byte)
5 empty bytes attached		

FETCH

Request telegram Remote Station

System ID	="S5"	(Word)
Length Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=05h**	(Byte)
ORG block	=03h	(Byte)
Length ORG block	=08h	(Byte)
*ORG identifier**		*(Byte)*
ERW identifier		*(Byte)*
Start address		*(Word)*
Length		*(Word)*
Empty block	=FFh	(Byte)
Length empty block	=02h	(Byte)

Acknowledgement telegram CP

System ID	="S5"	(Word)
Length Header	=10h	(Byte)
ID OP-Code	=01h	(Byte)
Length OP-Code	=03h	(Byte)
OP-Code	**=06h**	(Byte)
Ackn. block	=0Fh	(Byte)
Length Ackn. block	=03h	(Byte)
Error no.		(Byte)
Empty block	=FFh	(Byte)
Length empty block	=07h	(Byte)
5 empty bytes attached		
Data up to 64kByte (only if error no.=0)		

*) More details to the data area may be found at "ORG-Format" above.

Note!

Please regard that in opposite to Siemens-S5 systems, the block addressing of these CPUs takes the start address as byte number and the length as number of words.

Messages of error no.

The following messages can be returned via *error no.*:

Error no.	Message
00h	No error occurred
01h	The defined area cannot be read res. written

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