

The Siemens logo is displayed in a bold, teal, sans-serif font.

SIEMENS

Ingenuity for life

A man in a light blue shirt is seen from the side, looking at a tablet. The background is a blurred industrial factory setting. Overlaid on the image are various digital graphics: a '24/7' icon with a circular arrow, a 'NEWS' section with a person icon, a 'Home' button, and a network diagram with three nodes and connecting lines. The overall theme is industrial connectivity and digital support.

Ethernet Communication (ISO on TCP) between SIMATIC S5 and SIMATIC S7-1500 Controllers

CP1543-1, CP1430 TCP

<https://support.industry.siemens.com/cs/ww/en/view/109482475>

Siemens
Industry
Online
Support



Legal information

Use of application examples

Application examples illustrate the solution of automation tasks through an interaction of several components in the form of text, graphics and/or software modules. The application examples are a free service by Siemens AG and/or a subsidiary of Siemens AG ("Siemens"). They are non-binding and make no claim to completeness or functionality regarding configuration and equipment. The application examples merely offer help with typical tasks; they do not constitute customer-specific solutions. You yourself are responsible for the proper and safe operation of the products in accordance with applicable regulations and must also check the function of the respective application example and customize it for your system.

Siemens grants you the non-exclusive, non-sublicensable and non-transferable right to have the application examples used by technically trained personnel. Any change to the application examples is your responsibility. Sharing the application examples with third parties or copying the application examples or excerpts thereof is permitted only in combination with your own products. The application examples are not required to undergo the customary tests and quality inspections of a chargeable product; they may have functional and performance defects as well as errors. It is your responsibility to use them in such a manner that any malfunctions that may occur do not result in property damage or injury to persons.

Disclaimer of liability

Siemens shall not assume any liability, for any legal reason whatsoever, including, without limitation, liability for the usability, availability, completeness and freedom from defects of the application examples as well as for related information, configuration and performance data and any damage caused thereby. This shall not apply in cases of mandatory liability, for example under the German Product Liability Act, or in cases of intent, gross negligence, or culpable loss of life, bodily injury or damage to health, non-compliance with a guarantee, fraudulent non-disclosure of a defect, or culpable breach of material contractual obligations. Claims for damages arising from a breach of material contractual obligations shall however be limited to the foreseeable damage typical of the type of agreement, unless liability arises from intent or gross negligence or is based on loss of life, bodily injury or damage to health. The foregoing provisions do not imply any change in the burden of proof to your detriment. You shall indemnify Siemens against existing or future claims of third parties in this connection except where Siemens is mandatorily liable.

By using the application examples you acknowledge that Siemens cannot be held liable for any damage beyond the liability provisions described.

Other information

Siemens reserves the right to make changes to the application examples at any time without notice. In case of discrepancies between the suggestions in the application examples and other Siemens publications such as catalogs, the content of the other documentation shall have precedence.

The Siemens terms of use (<https://support.industry.siemens.com>) shall also apply.

Security information

Siemens provides products and solutions with Industrial Security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place. For additional information on industrial security measures that may be implemented, please visit <https://www.siemens.com/industrialsecurity>.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at: <https://www.siemens.com/industrialsecurity>.

Table of contents

Legal information	2
1 Introduction	5
1.1 Overview	5
1.2 Mode of operation	7
1.3 Components used	11
2 Engineering	12
2.1 Hardware setup	12
2.1.1 Installing the hardware for the S7-1500 station	14
2.1.2 Installing the hardware for the SIMATIC S5 station	14
2.1.3 Installing the application software	15
2.1.4 S7-1500 application software	15
2.1.5 SIMATIC S5 application software	16
2.2 Scenario 1 – Communication via FETCH/WRITE and CP1543-1	17
2.2.1 Mode of operation	17
2.2.2 Communication program in the SIMATIC S7-1500	18
2.2.3 Communication program SIMATIC S5	21
2.2.4 Connection configuration in the SIMATIC S7-1500	24
2.2.5 Connection configuration in the CP1430 TCP (SIMATIC S5)	27
2.3 Scenario 2a – Communication via parameterized OUC (single instructions) and internal CPU interface	33
2.3.1 Mode of operation	33
2.3.2 Communication program in the SIMATIC S7-1500	34
2.3.3 Communication program SIMATIC S5	36
2.3.4 Connection configuration in the S7-1500 CPU	38
2.3.5 Connection configuration in the CP1430 TCP (SIMATIC S5)	40
2.4 Scenario 2b – Communication via programmed OUC (single instructions) and internal CPU interface	43
2.4.1 Mode of operation	43
2.4.2 Communication program in the SIMATIC S7-1500	44
2.4.3 Communication program SIMATIC S5	46
2.4.4 Connection configuration in the S7-1500 CPU	48
2.4.5 Connection configuration in the CP1430 TCP (SIMATIC S5)	49
2.5 Scenario 3 – Communication via programmed OUC (compact instruction) and CP1543-1 interface	51
2.5.1 Mode of operation	51
2.5.2 Communication program in the SIMATIC S7-1500	52
2.5.3 Communication program SIMATIC S5	54
2.5.4 Connection configuration in the S7-1500 CPU	56
2.5.5 Connection configuration in the CP1430 TCP (SIMATIC S5)	57
2.6 Scenario 4a – Communication via parameterized OUC (single instructions) and CP1543-1	59
2.6.1 Mode of operation	59
2.6.2 Communication program in the SIMATIC S7-1500	60
2.6.3 Communication program SIMATIC S5	61
2.6.4 Connection configuration in the S7-1500 CPU	63
2.6.5 Connection configuration in the CP1430 TCP (SIMATIC S5)	65
2.7 Scenario 4b – Communication via programmed OUC (single instructions) and CP1543-1	67
2.7.1 Mode of operation	67
2.7.2 Communication program in the SIMATIC S7-1500	68
2.7.3 Communication program SIMATIC S5	70
2.7.4 Connection configuration in the S7-1500 CPU	72
2.7.5 Connection configuration in the CP1430 TCP (SIMATIC S5)	73

2.8	Scenario 5 – Communication via programmed OUC (compact instructions) and internal CPU interface	75
2.8.1	Mode of operation	75
2.8.2	Communication program in the SIMATIC S7-1500	76
2.8.3	Communication program SIMATIC S5	78
2.8.4	Connection configuration in the S7-1500 CPU	80
2.8.5	Connection configuration in the CP1430 TCP (SIMATIC S5)	81
2.9	Commissioning	83
2.9.1	Overview of the communication relations	83
2.9.2	Loading the S7-1500 programs	84
2.9.3	Loading the SIMATIC S5 program	86
2.10	Operating the Application	91
2.10.1	Scenario 1 – Communication via FETCH/WRITE and CP1543-1	92
2.10.2	Scenario 2a – Communication via parameterized OUC (single instructions) and internal CPU interface	94
2.10.3	Scenario 2b – Communication via programmed OUC (single instructions) and internal CPU interface	96
2.10.4	Scenario 3 – Communication via programmed OUC (compact instruction) and CP1543-1 interface	98
2.10.5	Scenario 4a – Communication via programmed OUC (single instructions) and CP1543-1	100
2.10.6	Scenario 4b – Communication via parameterized OUC (single instructions) and CP1543-1	102
2.10.7	Scenario 5 – Communication via programmed OUC (compact instructions) and internal CPU interface	104
3	Appendix	106
3.1	Service and support	106
3.2	Links and literature	107
3.3	Change documentation	107

1.1 Overview

In automation technology, more and more old systems have to be upgraded step by step from SIMATIC S5 to SIMATIC S7.

These examples shall demonstrate how to link a SIMATIC S5 station to a modern SIMATIC S7-1500 station via Industrial Ethernet. This example describes the scenarios for ISO on TCP protocol.

The figure below shows a frequently occurring communication structure of existing S5 systems.

The diagram illustrates the migration of a substation from SIMATIC S5 to S7-1500 using a PC control station. At the top, the 'PC control station / SIMATIC S5 head-end' is shown with a laptop and a rack of modules, labeled with IP: 140.140.111.104. Below it, the 'Migration substation from SIMATIC S5 -> S7-1500' is depicted as a rack of modules, with CPU-IP: 140.140.111.102 and CP-IP: 140.140.111.103. An orange arrow labeled 'FETCH/ WRITE' points from the migration substation to the PC control station. A grey arrow labeled 'SEND/ RECV' points from the PC control station to the migration substation. The migration substation is connected to a series of 'SIMATIC S5 substations' (racks of modules) via a bus system, indicated by double-headed arrows. The first substation has IP: xxx.xxx.xxx.xxx, and the second has IP: xxx.xxx.xxx.xxx. The bus system is represented by a series of double-headed arrows connecting the racks, with an ellipsis indicating further substations.

Description of the automation task

One of the standard communication structures for systems is the star topology. A head-end station (PC or SIMATIC head-end station) communicates with several substations. These substations, however, also communicate with each other via cross-communication.

In SIMATIC S5 systems, the communication of a control center/S5 head-end station to its substations is often implemented by means of the **FETCH/WRITE service** (level 7 communication). Cross-communication between S5 substations is done via the **SEND/RECEIVE** service (level 4 communication).

In the course of a partial migration, a SIMATIC S5 station is replaced by a SIMATIC S7-1500 station.

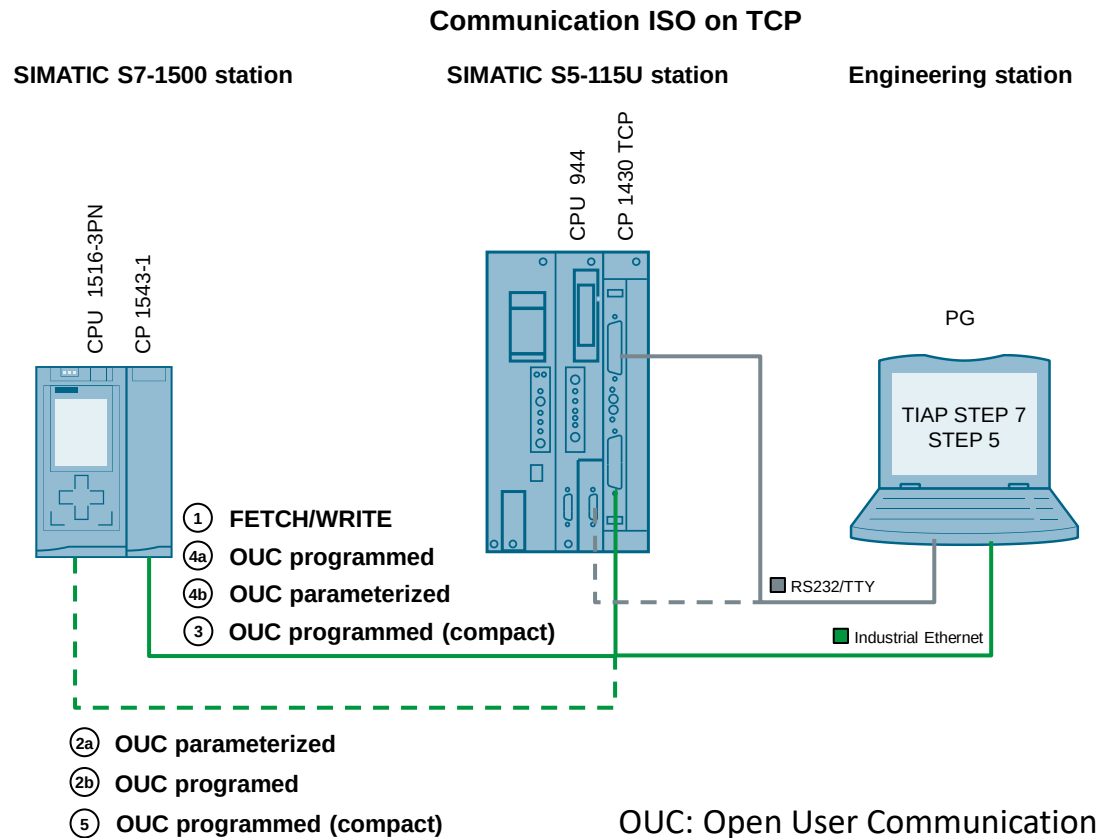
The example projects/scenarios in this document show the **options available** to establish a **communication via Industrial Ethernet** between the existing **SIMATIC S5 controllers** and the **SIMATIC S7-1500** via the available protocols and services.

1.2 Mode of operation

Schematic layout

The figure below shows a schematic overview of the most important components and variants of this solution:

Figure 1-2



Setup

In this example, a SIMATIC S5-115U is used exemplarily on the S5 end. Basically, however, the solutions presented here also work with S5-135U and S5-155U controllers.

For these SIMATIC S5 controller families, the CP1430 TCP communication processor is available which implements the TCP/IP and ISO-on-TCP (RFC 1006) protocols as well as, based on this, the active/passive FETCH/WRITE service.

On the S7-1500 end, the coupling to the CP1430 TCP can be made via the integrated PROFINET interface of the S7-CPU or via the Industrial Ethernet interface of the CP1543-1. This results in various communication variants which will be explained in detail in the following chapters.

Engineering is done for the

- SIMATIC S5 station with STEP 5 and the NCM COM 1430 TCP package
- SIMATIC S7-1500 station with STEP 7 V15.1 (TIA Portal).

Implemented communication functions

The table below shows all communication variants that have been implemented in the different ways illustrated in [Figure 1-2](#). A detailed description of the different functions is available in chapter [2](#).

S5 service	SIMATIC S5 - CP1430 TCP			
	Active FETCH/WRITE	SEND/ RECEIVE bidirectional		
S7-1500 service	Passive FETCH/WRITE	OUC programmed via compact instruction ²	OUC programmed via single instruction ¹	OUC programmed via single instruction ¹
via CP1543-1	 Scen. 1	 Scen. 3	 Scen. 4b	 Scen. 4a
via S7-1500 CPU		 Scen. 5	 Scen. 2b	 Scen. 2a

¹ Single instructions (TCON, TDISCON, TSEND, TRCV...)

² Compact instructions (TSEND_C, TRCV_C)

-  active partner for establishing a connection
-  passive partner for establishing a connection

Scenario	Short description
1	FETCH/WRITE function Via the CP1430 TCP, the SIMATIC S5 actively establishes a FETCH/WRITE connection to the passively responding CP1543-1. The S5 reads the data block areas from the S7-1500 CPU which have been configured in the CP1430 TCP and, vice versa, can write data directly into the S7-1500 data blocks via a WRITE job. The S7-1500 CPU does not contain any communication blocks. The SIMATIC S5 controller uses the handling blocks FETCH and SEND (RW).
2a	Parameterized OUC communication via the integrated PROFINET SS and single instructions – TSEND/TRCV Using the integrated PROFINET interface, the SIMATIC S7 CPU actively establishes an ISO-on-TCP connection to the SIMATIC S5 CPU via the CP1430 TCP. On the S7-1500 CPU end, the connection is established via a parameterized configuration and the data are sent and received via the OUC blocks TSEND and TRCV. In this case, the connection data are configured in offline mode. For this connection, the SIMATIC S5 uses the standard handling blocks SEND/RECEIVE. The connection in the SIMATIC S5 is configured in the CP1430 TCP.

Scenario	Short description
2b	Programmed OUC communication via the integrated PROFINET SS and single instructions – TSEND/TRCV Via the CP1430 TCP, the SIMATIC S5 actively establishes an ISO-on-TCP connection to the S7-1500 CPU using the integrated PROFINET interface. On the S7-1500 CPU end, the connection is established via the OUC blocks TCON in the user program and the data are sent and received via TSEND and TRCV. For this connection, the SIMATIC S5 uses the standard handling blocks SEND/RECEIVE. The connection in the SIMATIC S5 is configured in the CP1430 TCP.
3	Programmed OUC communication via CP1543-1 and compact instructions – TSEND/TRCV_C Via the CP1543-1, the SIMATIC S7 CPU actively establishes an ISO-on-TCP connection to the S5-CPU using the CP1430 TCP. In the S7-1500 CPU, the connection is established via the compact OUC block TSEND_C and the TRCV using the user program and the data are sent and received. For this connection, the SIMATIC S5 uses the standard handling blocks SEND/RECEIVE. The connection in the SIMATIC S5 is configured in the CP1430 TCP.
4a	Parameterized OUC communication via CP1543-1 and single instructions – TSEND/TRCV Via the CP1543-1, the SIMATIC S7 CPU actively establishes an ISO-on-TCP connection to the S5-CPU using the CP1430 TCP. On the S7-1500 CPU end, the connection is established via the OUC blocks TCON and the data are sent and received via TSEND and TRCV. In this case, however, the connection data are configured in offline mode. For this connection, the SIMATIC S5 uses the standard handling blocks SEND/RECEIVE. The connection in the SIMATIC S5 is configured in the CP1430 TCP.
4b	Programmed OUC communication via CP1543-1 and single instructions – TSEND/TRCV Via the CP1543-1, the SIMATIC S7 CPU actively establishes an ISO-on-TCP connection to the S5-CPU using the CP1430 TCP. On the S7-1500 CPU end, the connection is established via the OUC blocks TCON in the user program and the data are sent and received via TSEND and TRCV. For this connection, the SIMATIC S5 uses the standard handling blocks SEND/RECEIVE. The connection in the SIMATIC S5 is configured in the CP1430 TCP.
5	Programmed OUC communication via the integrated PROFINET SS and compact instructions – TSEND_C/TRCV Via the CP1430 TCP, the SIMATIC S5 actively establishes an ISO-on-TCP connection to the S7-1500 CPU using the integrated PROFINET interface. In the S7-1500 CPU, the connection is established via the compact OUC block TSEND_C and the TRCV using the user program and the data are sent and received. For this connection, the SIMATIC S5 uses the standard handling blocks SEND/RECEIVE. The connection in the SIMATIC S5 is configured in the CP1430 TCP.

Advantages

The examples presented here offer the following advantages:

- You will get information on all possible variants of an Ethernet communication between a SIMATIC S5 and S7.
- You will be provided with master copies which can be quickly used and extended in your own migration projects.
- Detailed knowledge on the SIMATIC S5 is not required.

Topics not covered by this application

This example includes

- No detailed explanation of the SIMATIC S5 and SIMATIC S7-1500 and their communication options.
- No introduction to the programming of SIMATIC S5 and SIMATIC S7 controllers.

Basic knowledge of these topics is assumed.

1.3 Components used

This application example has been created with the following hardware and software components:

Table 1-1

Component	Number	Article number	Note
SIMATIC S7-1500			
CPU1516-3PN	1	6ES7 516-3AN01-0AB0 ⁽¹⁾ 6ES7 516-3AN00-0AB0	V 2.6 ⁽¹⁾ V 1.8
CP1543-1	1	6GK7 543-1AX00-0XE0	V 1.1
DI 16x24VDC HF_1	1	6ES7 521-1BH00-0AB0	-
DQ 16x24VDC/0.5A ST_1	1	6ES7 522-1BH00-0AB0	-
PM 190W 120/230VAC	1	6EP1333-4BA00	-
Standard IE cable (RJ45)	1		-
TIA Portal V15.1	1	6ES7822-1AA05-0YE5	optional
SIMATIC S5			-
CPU 944	1	6ES5944-7UA22	-
CP1430 TCP	1	2XV9450-1AU00	V 2.07
PS 7A/15A	1	6ES5 951-7LD12	-
IE TP CORD 15/RJ45 cable	1	6XV1850-2LH60	Wire length 6m
Adaptation capsule	1	6ES5491-0LA12	for CP1430 TCP
STEP 5	1	6ES5894-0MA04	V 7.23
NCM COM1430 TCP		2XV9450-1AU01	V 2.07

^{*1} To do this, perform a device replacement in the hardware configuration.

This application example consists of the following components:

Table 1-2

Component	File name	Note
Documentation	109482475_Comm_S5-S71500_DOC_v12_en.pdf	-
STEP 7 Projekt für S7-1500	109482475_S7-1500_Station_V15.1.zip	-
STEP 5 Project and the NCM project file for CP 1430 TCP	109482475_Comm_S5_PROJ_v10.zip	-

2 Engineering

Overview

The following chapters will give you a detailed overview of all communication variants.

Table 2-1

S5 service	SIMATIC S5 - CP1430 TCP			
	Active FETCH/WRITE	SEND/ RECEIVE Bidirectional		
S7-1500 service	Passive FETCH/WRITE	OUC programmed via compact instruction	OUC programmed via single instructions	OUC parameterized via single instructions
via CP1543-1	Scenario 1	Scenario 3	Scenario 4b	Scenario 4a
via S7-1500 CPU	x	Scenario 5	Scenario 2b	Scenario 2a

2.1 Hardware setup

The description of the hardware installation is divided into setting up the SIMATIC S7-1500 and the SIMATIC S5 hardware. The example setup includes all example scenarios described in chapter [2](#).

Prerequisites

Two programming devices are used for the commissioning of this application example. This is necessary, because the engineering software of the SIMATIC S7 and of the SIMATIC S5 requires a different Windows operating system.

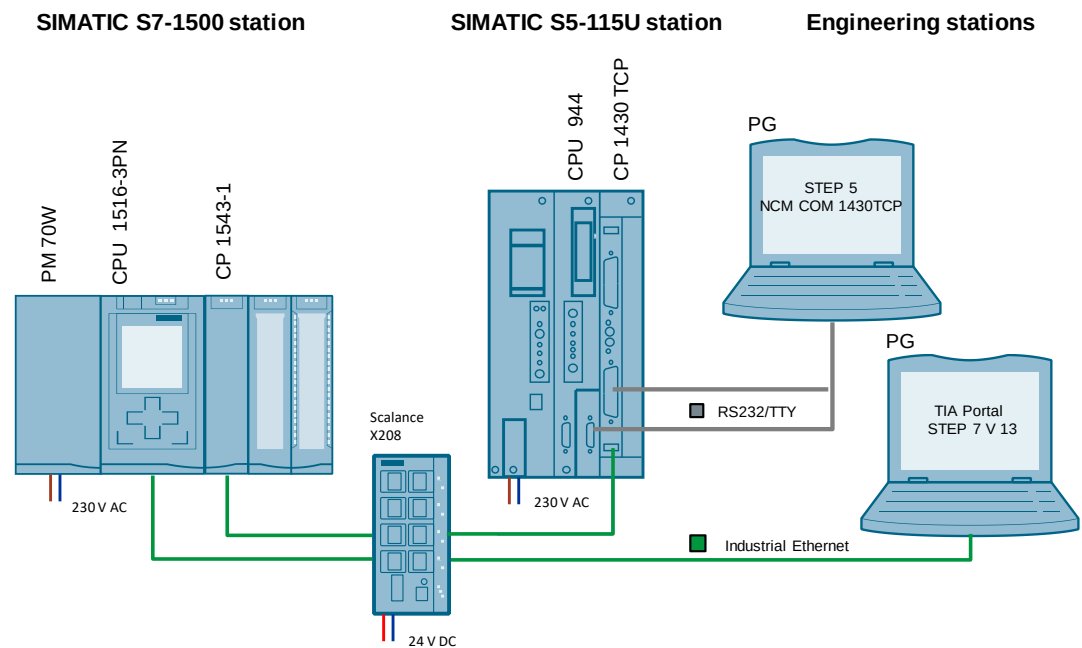
Programming device with STEP 5 V 7: Windows XP

Programming device with TIA Portal STEP 7 V 15.1: Windows 7

Please make sure that the IP addresses used in the project do not overlap with other Ethernet nodes or are used several times.

Hardware setup

The figure below shows the complete hardware setup of the example.



The following table includes the overview of all IP addresses used in this example for the SIMATIC S7-1500 and the SIMATIC S5. A fixed configuration of the IP addresses is required.

The subnet mask is 255.255.0.0 in all network components.

Table 2-2

Device	IP address	Designation
SIMATIC S7		
CPU1516 -3PN	140.140.111.102 (port X1)	SIMATIC S7-1500 CPU
CP1543-1	140.140.111.103 (port X1)	SIMATIC S7 CP1543-1
SIMATIC S5		
CP1430 TCP	140.140.111.104	SIMATIC S5 CP1430 TCP
PG/PC		
PG/PC (WinXP/STEP5)	140.140.111.100	Programming device with STEP5 and NCM COM 1430TCP
PG/PC (TIA Portal)	140.140.111.101	Programming device with TIA Portal

Note

In general, the installation guidelines of all components have to be observed. Please observe the installation and connection guidelines from the corresponding manuals of the components used.

2.1.1 Installing the hardware for the S7-1500 station

For setting up the hardware, please proceed according to the following table:

No.	Action	Remark
1.	PC/PG	Connect the PC/PG to the SCALANCE switch via a standard Ethernet cable (RJ 45).
2.	Install the S7-1500 power supply	- Connect the power module to the power grid (220 / 230 V AC). - The SIMATIC S7 PM module supplies all modules required for the S7-1500 station.
3.	S7 CPU1516-3 PN	- Expand the S7-1500 CPU 1516 with the PM module via backplane bus connectors. - Connect the Ethernet port X1 (RJ 45) to a port of the SCALANCE switch.
4.	CPU 1543-1	- Connect the CP1543-1 to the CPU 1516-3PN via a backplane bus connector. - Connect the Ethernet port X1 (RJ 45) of the CP to the SCALANCE switch via a standard Ethernet cable (RJ 45).
5.	I/O modules	- Connect the I/O modules to the CP1543-1 via backplane bus connectors. - Use an external 24V DC power supply to supply the I/O modules with power.

2.1.2 Installing the hardware for the SIMATIC S5 station

For setting up the hardware, please proceed according to the following table:

Table 2-3

No.	Action	Remark
1.	PC/PG	Connect the PC/PG with STEP 5 being installed to the SIMATIC S5 (CPU 944 and/or CP1430TCP) via the serial interface and the PG-AG cable.
2.	Power supply PS 7A/15A	Plug the power supply PS 7A/15A into the backplane bus UR 1 of the SIMATIC S5 and connect it to the power grid (220 / 230 V AC).
3.	S5-CPU944	Plug RAM modules into the CPU 944 and the CPU into the S5 backplane bus UR1 at the CPU slot.
4.	S5 CP1430 TCP	- Plug the CP1430 TCP into the S5 backplane bus UR 1 via an adaptation capsule. Plug a RAM module into the CP1430 TCP. - Connect the 15-pin Ethernet connection of the CP1430 TCP to the SCALANCE switch via a TP cord cable (15-pin/RJ45).

2.1.3 Installing the application software

Prerequisites

SIMATIC S5 station:

Programming device with

- STEP 5 V7.2
- SINEC NCM COM 1430 TCP V 2.07
- Operating system: Windows XP SP3

SIMATIC S7 station:

- Programming device with TIA Portal
- Operating system: Windows 7

Note

The required SIMATIC S5 software can only be installed with the Windows XP operating system.

2.1.4 S7-1500 application software

Overview of example scenarios in S7-1500 stations

The example project in the S7-1500 is structured in such a way that an own S7 station is available for all example scenarios described in chapter 2 demonstrating only this communication variant in connection with the CP1430 TCP.

Table 2-4

Scen.	Station name	Description
1	PLC_Sz1_F-W_S5-CP1430TCP	Communication via FETCH/WRITE and CP1543-1
2a	PLC_Sz2_S-R_CPU_ID5_ID105	Communication via programmed Open User Communication (single instructions) and internal CPU interface
2b		Communication via parameterized Open User Communication (single instructions) and internal CPU interface
3	PLC_Sz3_S-R_CP_TRCV_C_ID7	Communication via programmed Open User Communication (compact instructions) and CP1543-1
4a	PLC_Sz4_S-R_CP_ID4_ID104	Communication via programmed Open User Communication (single instructions) and CP1543-1
4b		Communication via parameterized Open User Communication (single instructions) and CP1543-1
5	PLC_Sz5_SR_CPU_TSEND_C_ID6	Communication via programmed Open User Communication (compact instructions) and internal CPU interface

2.1.5 SIMATIC S5 application software

STEP 5 project files

The example project for the SIMATIC S5 includes

- the program for the CPU 944 (AG115@ST.s5d)
- the configuration file for the CP1430 TCP (TCP1430A.TCP)

The configuration file TCP1430A.TCP for the CP1430 TCP is structured in such a way that all required connection information is completely configured and functionally available for all example scenarios listed in [Table 2-4](#).

The example program for the SIMATIC S5-CPU contains all user programs for all scenarios. The example scenarios listed in [Table 2-4](#) can be enabled individually in the S5-CPU via the corresponding enable bits.

2.2 Scenario 1 – Communication via FETCH/WRITE and CP1543-1

2.2.1 Mode of operation

Overview

Via the CP1430 TCP, the SIMATIC S5 is configured as an **active** FETCH/WRITE client.

This communication type requires a CP1543-1 in the SIMATIC S7-1500 station which is configured as a passive TECH/WRITE server and which receives the connection and communication requests of the SIMATIC S5. The TSAPs for the ISO-on-TCP communication are defined via an access ID list in the CP1543-1.

With these settings, the SIMATIC S5 can connect to the SIMATIC S7-1500.

Sequence of the FETCH/WRITE communication between S7 and S5

The figure below schematically shows the data flow between SIMATIC S5 and SIMATIC S7-1500 via the FETCH/WRITE mechanism.

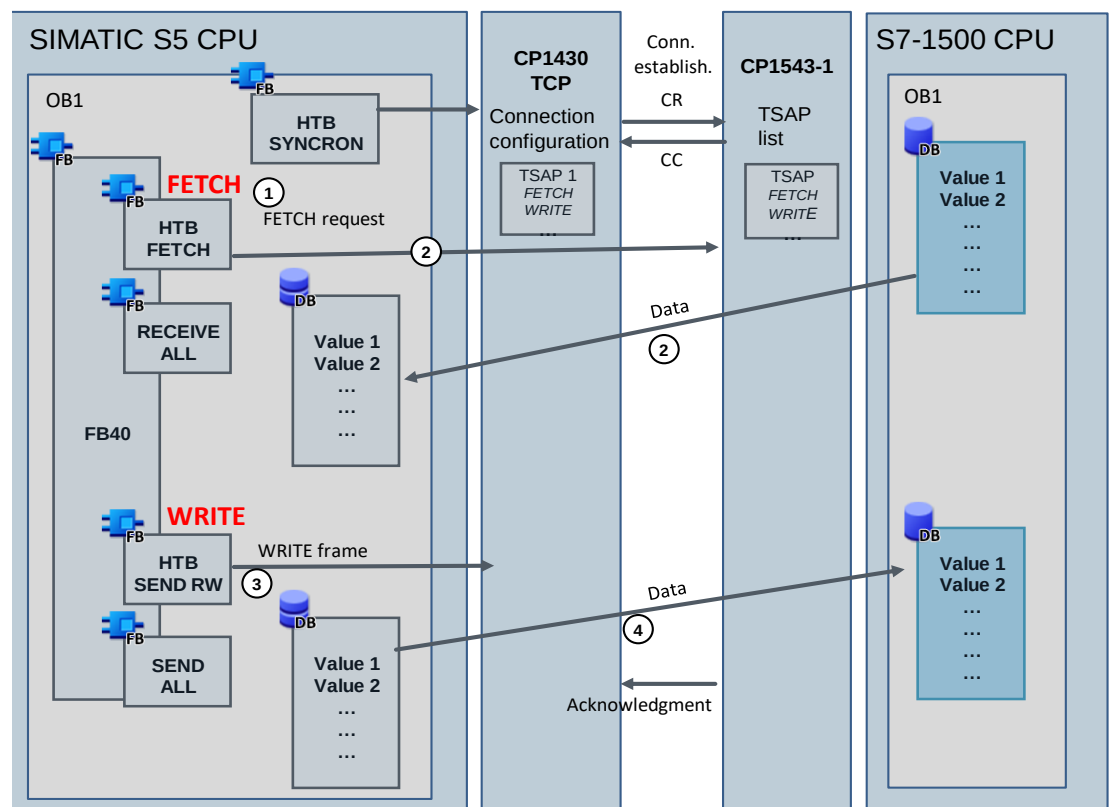


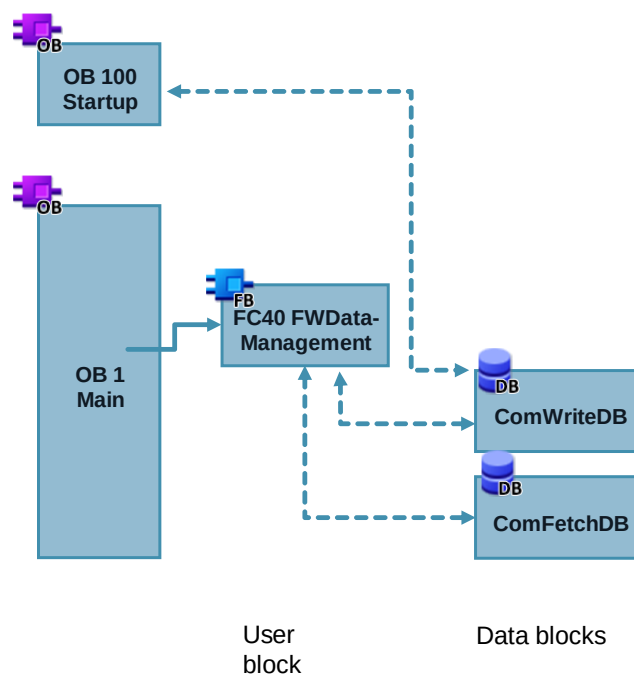
Table 2-5

No.	Process
1	Data are requested from a S7-1500 via the CP1430 TCP by means of a FETCH request of the SIMATIC S5.
2	The S7-1500 /CP1543-1 answers by sending the FETCH request with the requested data including a positive acknowledgment to the CP1430 TCP. Otherwise, the acknowledgment of the FETCH response by the CP1543-1 is negative. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.
3	Via HTB SEND (RW), the SIMATIC S5 sends a WRITE request to the CP1430 TCP with the data to be written to the CP1543-1. This one immediately forwards the data to the corresponding data block. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
4	If the data have been successfully transmitted, the CP1543-1 responds with a positive acknowledgement. Otherwise, the acknowledgment of the WRITE request by the CP1543-1 is negative.

2.2.2 Communication program in the SIMATIC S7-1500

Overview

The following blocks contain the communication program in the S7-1500 CPU. In this communication scenario, the S7-1500 is passive. No active communication blocks are required.



Function

A FETCH and a WRITE connection are established via a communication list in the CP1543-1. Thus, a read and write access to the data areas of the S7-1500 CPU can be set up. To detect the ongoing data access operations in the S7-1500, a count value is written from the SIMATIC S5 to the S7-1500 (WRITE function), incremented by +1 and made available in the FETCH data area. In the next communication cycle, the increased value will be read by the SIMATIC S5 via the FETCH connection.

This process will be repeated by the SIMATIC S5 actively and cyclically every second.

After having restarted the S7-1500 or the SIMATIC S5-CPU, the count values are reset via a generated deletion identifier.

Description of the blocks

Table 2-6

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
FC 40	FWDataManagement	Management of the FETCH/WRITE data management, data verification
DB 113	ComFetchDB	Data area for read access from the SIMATIC S5
DB 114	ComWriteDB	Data area for write access from the SIMATIC S5

OB 100 (startup OB)

After having restarted the S7-1500 CPU, a deletion identifier ("A1A1") is entered into the FETCH data area ComFetchDB (DB113). It has the effect that the count values are reset.

OB 1 (cyclic OB)

The OB1 calls the FC 40 that manages the data management of the passive FETCH and WRITE functions.

FC 40 (FWDataManagement)

The data area of the WRITE DB called ComWriteDB (DB114) is checked cyclically. To visualize the ongoing communication, the count value (WRITE function) written by the SIMATIC S5 is copied to an output area (AB 0) of the S7-1500.

The count value received by the SIMATIC S5 is in the first data word (DW1) of the WRITE data block ComWriteDB, is incremented by +1 and copied to the FETCH data area ComFetchDB. These data now are requested by the SIMATIC S5 via the FETCH connection.

In addition, the written data are checked.

- The data are cyclically checked for a deletion identifier ("A1A1") being available. In case of a match, the count value is reset.
- If a data identifier ("1234") is detected, the received count value will be incremented by +1 and copied to the FETCH data area.
- The ongoing communication of the FETCH and WRITE services can be seen from the output area of the S7-1500.

DB 113 (ComFetchDB)

ComFetchDB									
	Name	Data type	Off...	Start val...	R...	Ac...	Vi...	Se...	Comment
1	Static								
2	fetchData	Array[0..99] ...	0.0			☒	☐	☐	Data area FETCH
3	fetchData[0]	Word	0.0	16#A1A1		☒	☐	☐	
4	fetchData[1]	Word	2.0	16#0235		☒	☐	☐	
5	fetchData[2]	Word	4.0	16#0		☒	☐	☐	
6	fetchData[3]	Word	6.0	16#0		☒	☐	☐	
7	fetchData[4]	Word	8.0	16#0		☒	☐	☐	
8	fetchData[5]	Word	10.0	16#0		☒	☐	☐	

DW0 := "A1A1" deletion identifier or
 := "1234" data identifier
 DW1 := "0235" current count value

DB 114 (ComWriteDB)

ComWriteDB									
	Name	Data type	Offset	Start val...	R...	Ac...	Vi...	Setpoint	Comment
1	Static								
2	writeData	Array[0..99] of Word	0.0			☒	☐	☐	Data area WRITE
3	writeData[0]	Word	0.0	16#A1A1		☒	☐	☐	
4	writeData[1]	Word	2.0	16#0234		☒	☐	☐	
5	writeData[2]	Word	4.0	16#0		☒	☐	☐	
6	writeData[3]	Word	6.0	16#0		☒	☐	☐	
7	writeData[4]	Word	8.0	16#0		☒	☐	☐	
8	writeData[5]	Word	10.0	16#0		☒	☐	☐	

DW0 := "A1A1" deletion identifier or
 := "1234" data identifier
 DW1 := "0234" current count value

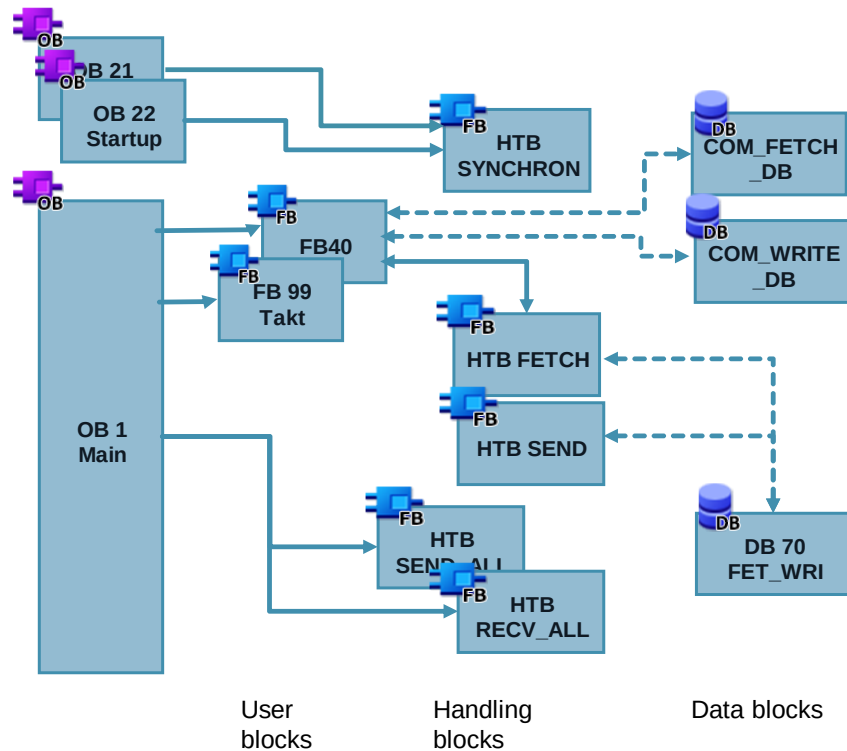
Note

The data blocks for FETCH (**ComFetchDB**) and WRITE (**ComWriteDB**) access operations must not be configured to "Optimized block access" in the S7-1500. (Properties of the data block under Options > "Attributes").

2.2.3 Communication program SIMATIC S5

Overview

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 takes over the active part of the communication.



Function

Via an active WRITE connection, a count value is sent cyclically from the SIMATIC S5 to the S7-1500 every second and then is requested again by the S7-1500 via a FETCH connection.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-7

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program for FETCH/WRITE function
FB 40	FET_WRI	Time-triggered call of the FETCH and WRITE functions via S5 handling blocks (HTBs)
FB 99	Clock (1 sec)	Clock generation 1 sec
FB244	HTB_SEND	Handling block SEND (-All A-NR:= 0)
FB245	HTB_RECEIVE	Handling block RECEIVE (-All A-NR:= 0)
FB246	HTB_FETCH	Handling block FETCH
FB249	HTB_SYNCHRON	Handling block SYNCHRON

Block	Symbol	Description
DB 70	FET_WRI	Parameter for the HTB FETCH/WRITE handling blocks (indirectly addressed)
DB 113	FETCH_DB	Data area for read access (FETCH)
DB 114	WRITE_DB	Data area for write access (WRITE)

In the SIMATIC S5-CPU, the active FETCH and WRITE functions are triggered independently of each other every second.

OB21/OB22 (STARTUP OBs)

The following functions are implemented in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 199.0**) and the initial count value are reset.
- After each restart, a deletion identifier (sample = "A1A1") is set in the FETCH data area (DB113). This deletion identifier has the effect that a count value in the WRITE data area (DB 114) is reset.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- Call of the user communication block FET_WRI (FB 40) containing the active FETCH and WRITE functions. This example scenario 1 is started by setting an enable bit (**M 130.5**).
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB40 (FET_WRI)

The function block FB 40 contains the active FETCH and WRITE communication functions in which a simple simulation program demonstrates the exchange of data.

- A restart of the communication is initiated via the startup bit **M 199.0** (OB21/22).
- Every second (FB99/M 152.0), a count value is written to the target DB of the S7-1500 CPU via a WRITE connection.
- In the S7-1500, this count value is checked, incremented by +1, requested again from the S7-1500 with the next FETCH trigger in the S5-CPU and then stored in the FETCH_DB (DB 114).
- After the value has been checked, it is incremented again by +1 and written to the S7-1500 via the WRITE connection in a new storage cycle.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.
HTB_FETCH block: ANZW: **MW70** PAFE: **MB74**
HTB_WRITE block: ANZW: **MW75** PAFE: **MB79**

FB99 (CLOCK)

The block generates a clock of 1 second for time-controlled triggering of the FETCH and WRITE jobs in the FET_WRI (FB40) block.

DB70 (FET_WRI)

The data block contains the parameters for indirect addressing of the active FETCH and WRITE functions. The data block with the indirect addressing is required in FB 40 for calling the HTB FETCH and SEND (RW).

Table 2-8

Parameter area	Start address	Source parameter	Destination parameter
FETCH parameter	as of DW 0	Area to be read in the S7-1500 CPU (here DB 113, as of byte 0, length of 50 bytes)	Destination data area in the S5-CPU (here DB 113, as of byte 0, length of 50 bytes)
WRITE parameter	as of DW 10	Data area to be read in the S5 (here DB 114, as of byte 0, length of 50 bytes)	Destination data area in the S7-CPU (here DB 114, as of byte 0, length of 50 bytes)

Figure 2-1

0:	KC = 'DB';	Bib =
1:	KY = 000,113;	Sourceparameter FETCH
2:	KF = +00000;	- DBNR
3:	KF = +00050;	- start
4:	KC = 'DB';	- Length
5:	KY = 000,113;	Destinationparameter FETCH
6:	KF = +00000;	- DBNR
7:	KF = +00050;	- start
8:	KH = 0000;	- Length
9:	KH = 0000;	
10:	KC = 'DB';	Sourceparameter Write
11:	KY = 000,114;	- DBNR
12:	KF = +00000;	- start
13:	KF = +00050;	- Length
14:	KC = 'DB';	Destinationparameter Write
15:	KY = 000,114;	- DBNR
16:	KF = +00000;	- start
17:	KF = +00050;	- Length
18:	KH = 0000;	
19:	KH = 0000;	

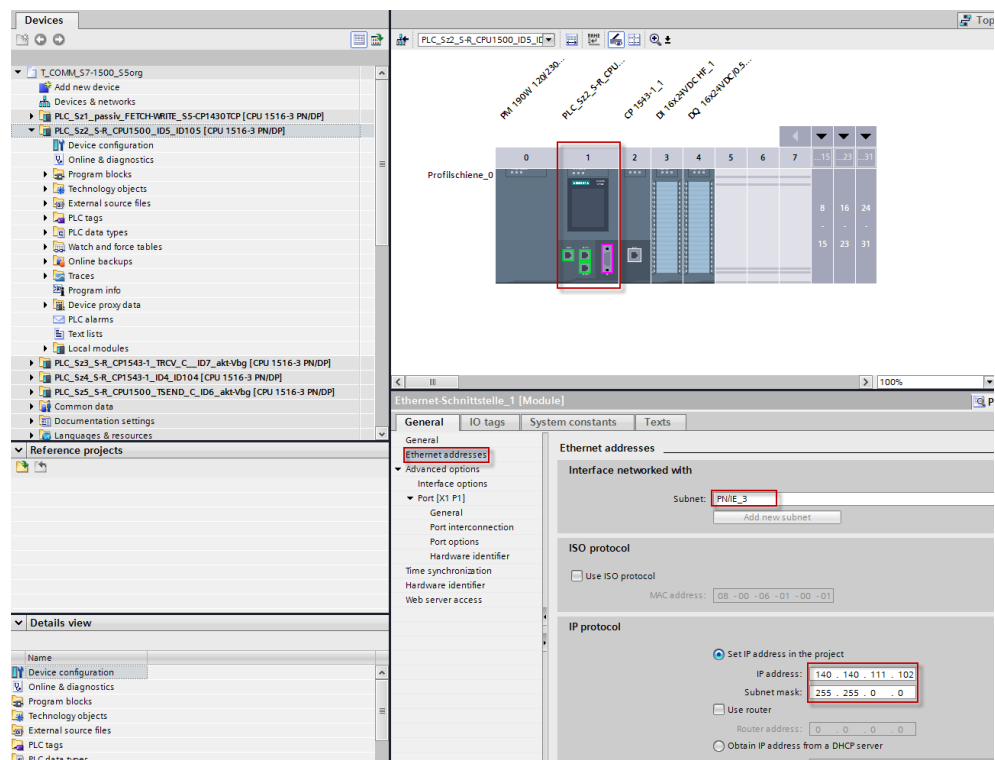
2.2.4 Connection configuration in the SIMATIC S7-1500

Configuration

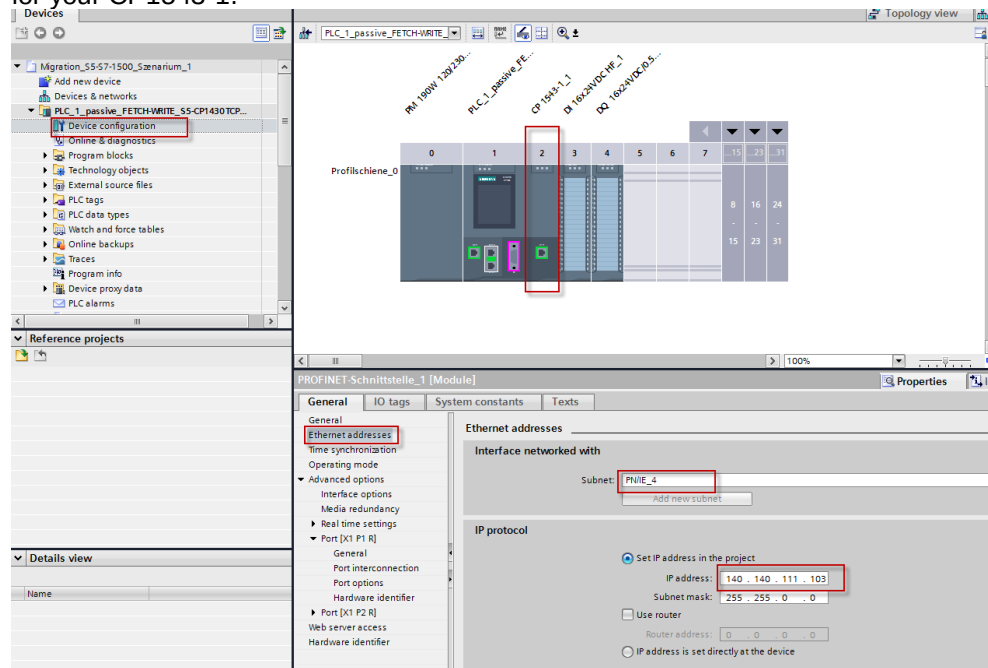
For the passive FETCH and WRITE functions via the CP1543-1, no OUC connection has to be created in the TIA project. The hardware used and the network-side settings of the S7-1500 in TIA Portal are structured identically for all scenarios. This means that both a S7-1500 CPU and a CP1543-1 have to be set up in configured and networked condition.

To do this, proceed as follows:

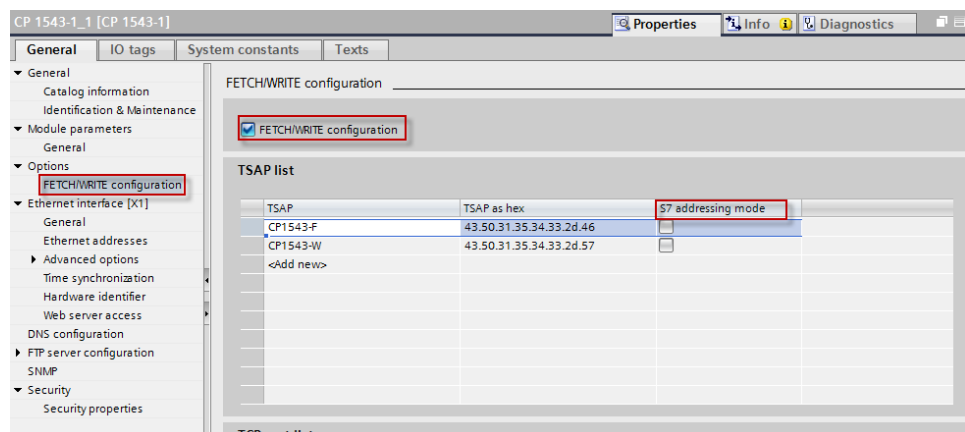
1. In STEP7 Professional V15.1 (TIA Portal), create a S7-1500 station with a CP1543-1. Network the PNIO interface of the S7-1500 CPU with an Industrial Ethernet/subnet. For this, open the "Device overview" in the TIA project and select the PNIO interface of the CPU. Under "General" > "Ethernet addresses", enter the IP address and the subnet mask for your CPU.



2. Network the CP1543-1 with an Industrial Ethernet/subnet. For this, open the "Device overview" in the TIA project and select the CP1543-1. Under "General" > "Ethernet addresses", enter the IP address and the subnet mask for your CP1543-1.



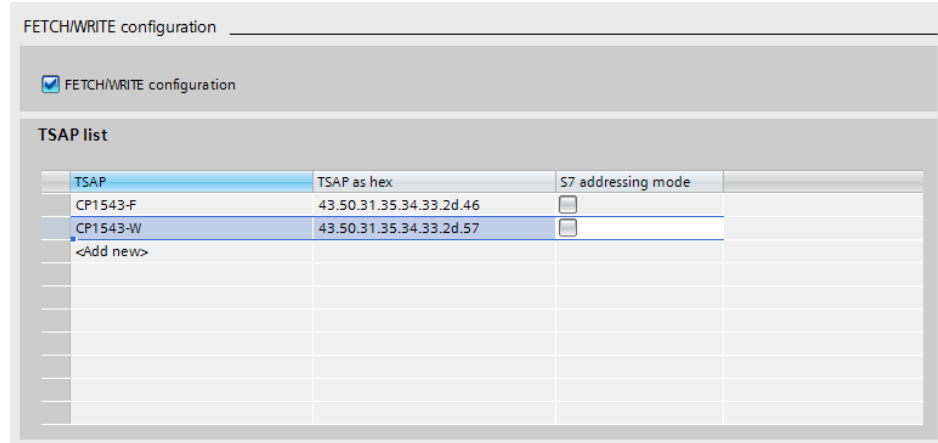
3. In the "General" tab, go to "Options" > "FETCH/WRITE configuration" to enable the "FETCH/WRITE configuration" option and disable the S7 addressing mode [S5 addressing mode] in the TSAP list.



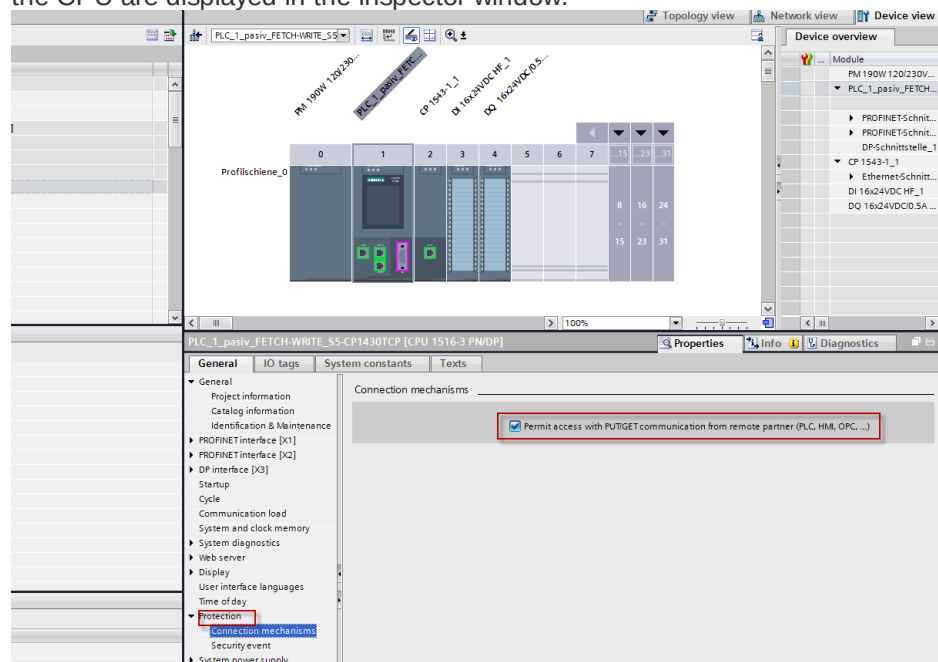
- Enter the local TSAPs for the FETCH and WRITE services respectively via the ISO-on-TCP connection. The TSAPs are available in the configuration of the CP1430 TCP (see chapter [2.2.5](#)).

TSAP "CP1543-F": TSAP for the S5 CP1430 TCP FETCH connection

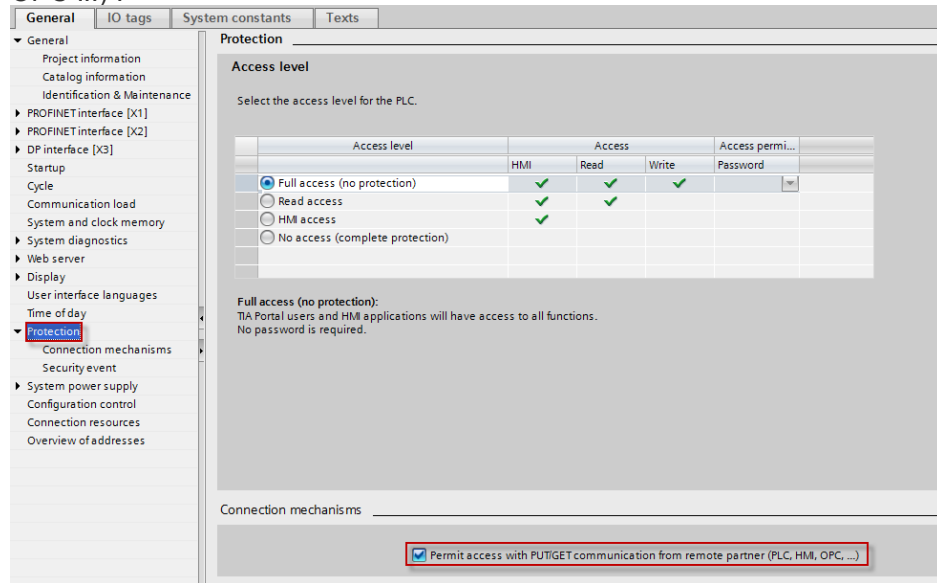
TSAP "CP1543-W": TSAP for the S5 CP1430 TCP SEND (R/W) connection



- In the "Device view" of the S7-1500 station, select the CPU. The properties of the CPU are displayed in the inspector window.



6. In the "General" tab, go to "Protection" and enable under "Access level" the function "Permit with PUT/GET communication from remote partner (PLC, HMI, OPC ...)".



2.2.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

The following settings are used to establish an **"active"** FETCH and WRITE connection to the CP1543-1.

The following explanations regarding the configuration of the CP1430 TCP refer to example scenario 1 (**FETCH/WRITE**).

Note

The CP1430 TCP configuration file "**TCP1430A.TCP**" already contains the complete configurations for all 6 example scenarios. Thus, after loading the CP1430 file, all other connections are also available "offline" in the CP1430 TCP.

Configuration

The FETCH/WRITE connection in the CP1430 TCP is created using the "SINEC NCM COM 1430 TCP" configuration tool.

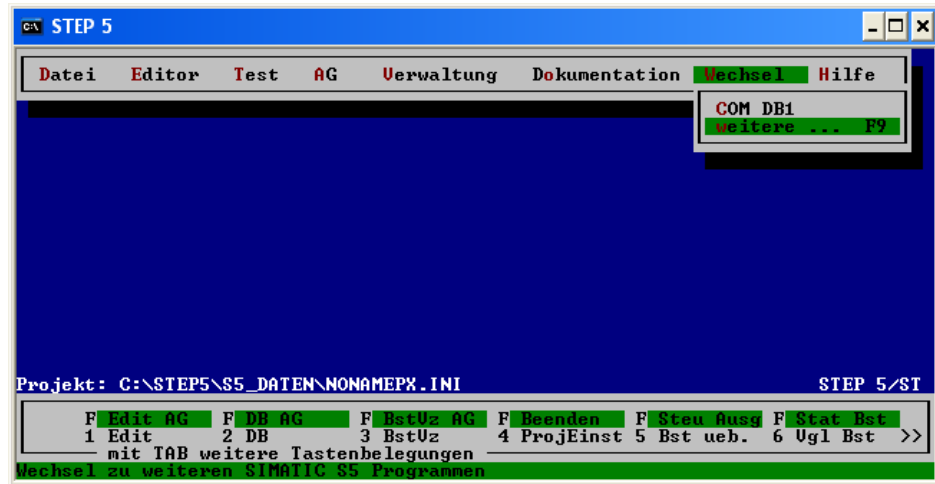
Note

The "SINEC NCM COM 1430" configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

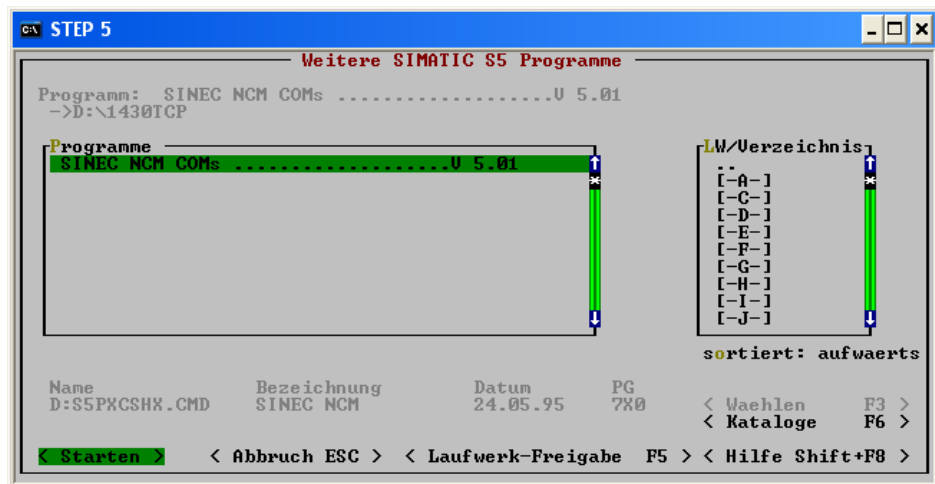
To do this, proceed as follows:

1. Start the STEP 5 V 7 Engineering Software.

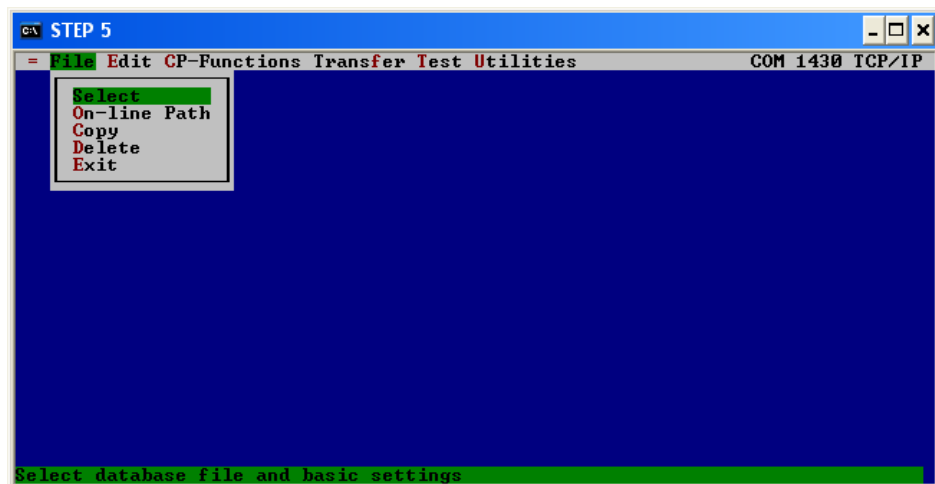
Start the CP1430 TCP software NCM COM 1430 TCP via "Wechsel"
["Change"] > "weitere..." ["Further programs"] or by pressing the F9 key.



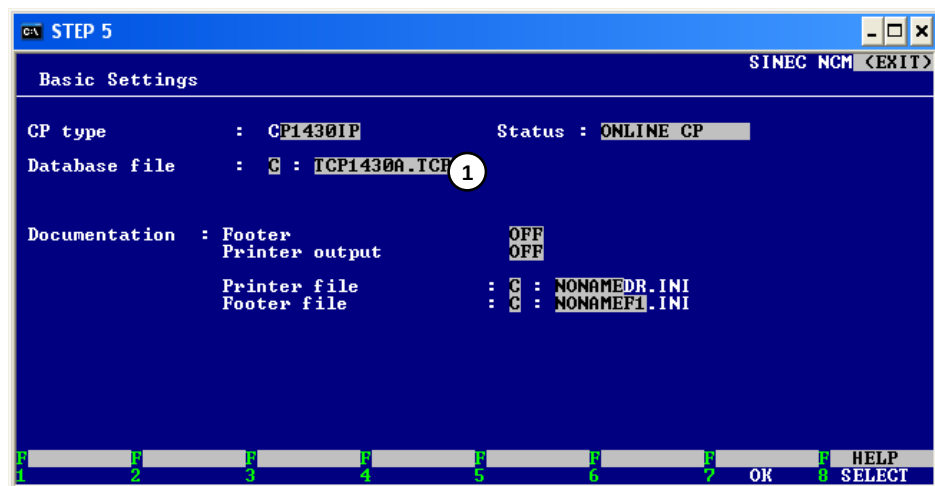
2. Start the configuration tool "NCM package COM 1430 TCP".



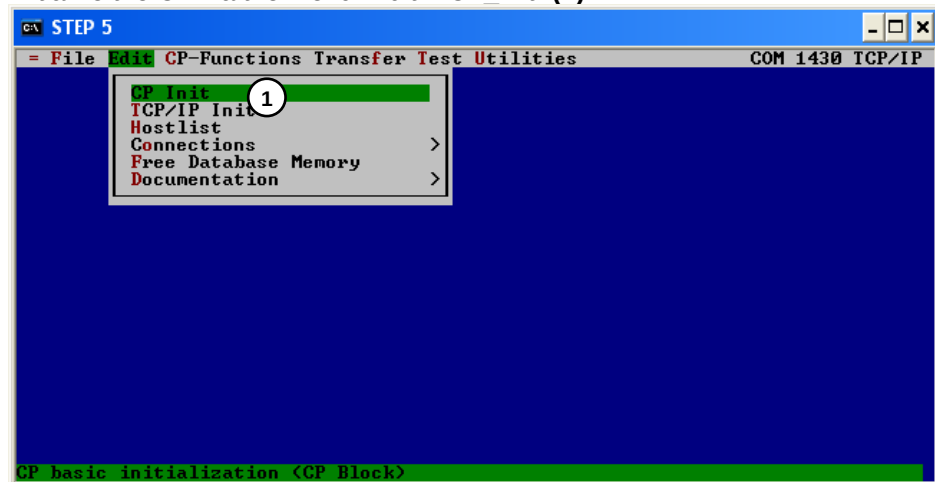
2. Select "File" > "Select" to get to the "Basic Settings".



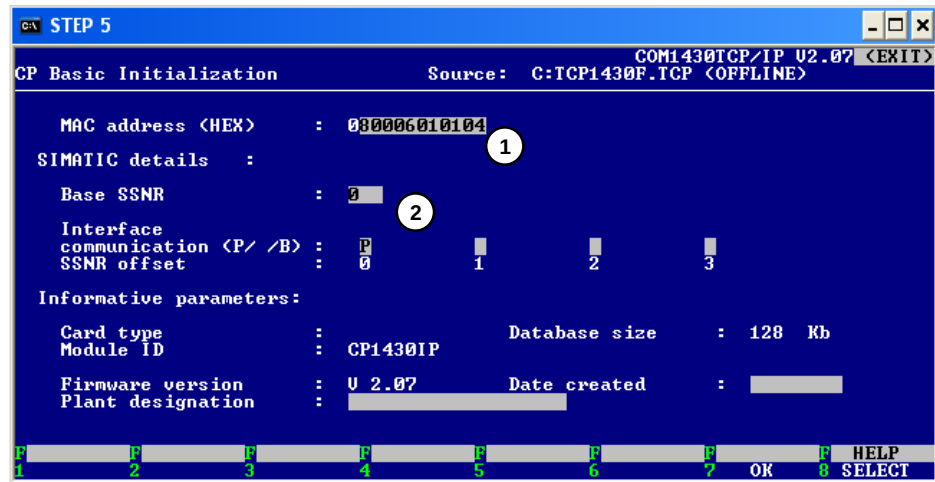
Here, enter the CP1430 TCP project file name "**TCP1430A.TCP**" (1) from the download of this project. Click on "OK" (F7) to confirm the settings.



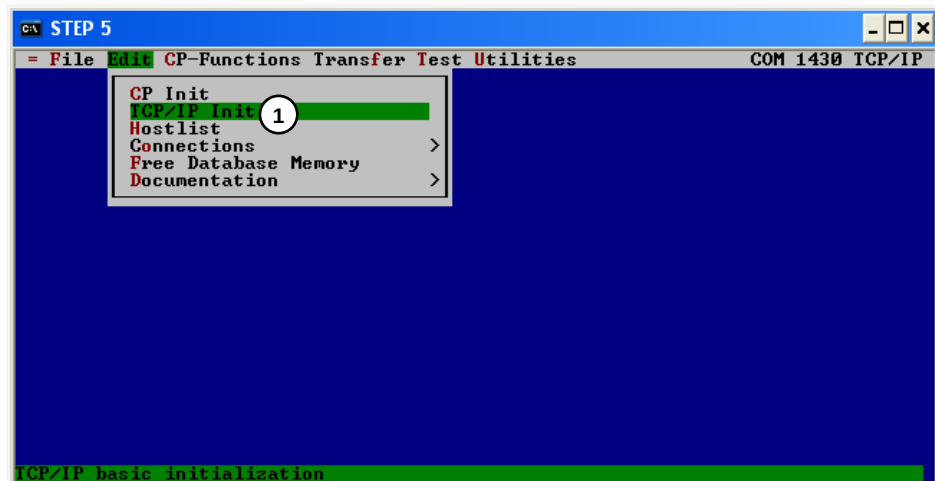
3. Initialize the CP via the menu "Edit > CP_Init" (1)



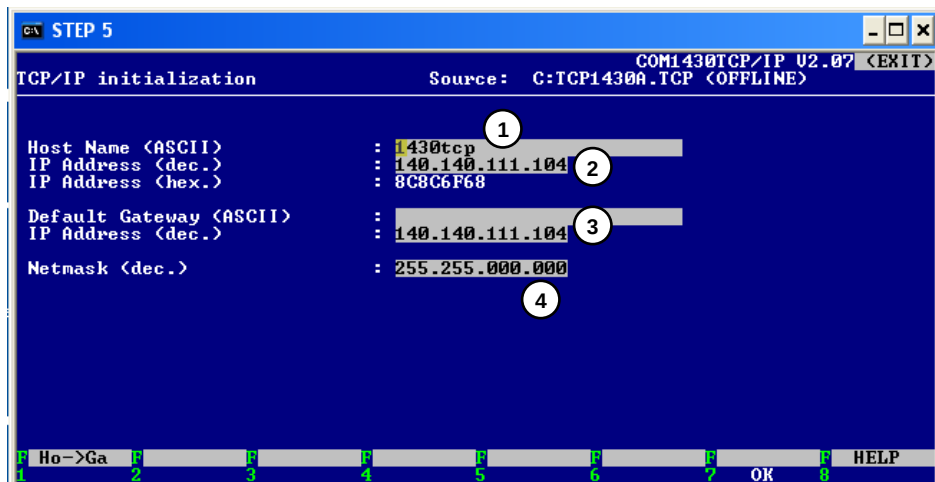
4. As shown in the figure, enter the MAC address of the CP under **(1)** "MAC address (HEX)" and the basic interface no. 0 under **(2)** "Base SSNR". Click on "OK" (F7) to confirm the settings.



5. Now, go to the "TCP/IP Init" screen via "Edit" > "TCP/IP Init" **(1)**.



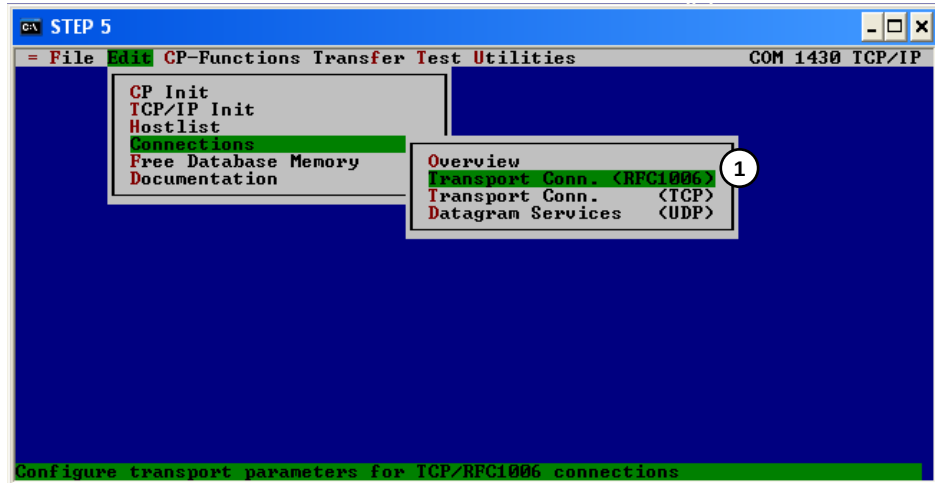
6. Enter the local host name (ASCII) under **(1)**, your own TCP/IP address (dec.) under **(2)**, the default gateway under **(3)** and the netmask (dec.) under **(4)**.



Note

The configured IP address has to be selected according to the connections created for the S7-1500/ CP1543-1.

8. To do this, go to "Edit" > "Connections" and select the option "Transport Connection (TCP/RFC1006)" **(1)**.

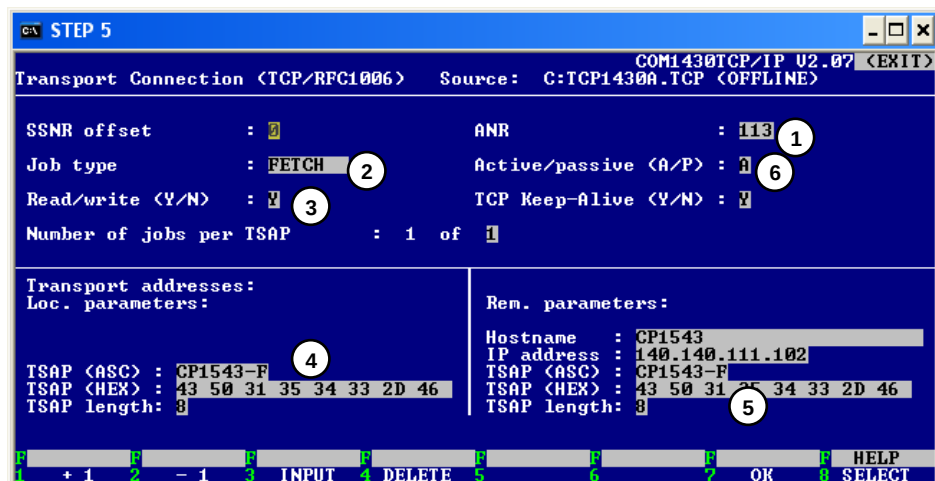


Now, enter the following parameters in the input window.

9. For this example, two ISO-on-TCP connections (transport connections RFC 1006) are required. For each of them, the job types "FETCH" and "WRITE" have to be set respectively. Both connections are configured as active connections.

For the FETCH connection, set the job number ANR "113" under **(1)**, the job type "FETCH" under **(2)** and the R/W identifier to "Y" under **(3)**. Under "Transport addresses" **(4)**, enter the local TSAP "CP1543-F" and under **(5)** the remote TSAP "CP1543-F". Under the "Active/passive" parameter **(6)**, set the way the connection is established to "A" (active).

Click on "OK" (F7) to confirm the settings.



10. Create a second connection as WRITE connection. Set the job number ANR to "114" under (1), the job type to "SEND" under (2) and the read/write identifier to "Y" under (3).

Under "Transport addresses" (4), enter the local TSAP "CP1543-W" and under (5) the remote TSAP "CP1543-W". Under the "Active/passive" parameter (6), set the way the connection is established to "A" (active).

Click on "OK" (F7) to confirm the settings.

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE>

SSNR offset : 0 ANR : 114 (1)

Job type : SEND (2) Active/passive <A/P> : A (6)

Read/write <Y/N> : Y (3) TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 1 of 1

Transport addresses:

Loc. parameters:

TSAP <ASC> : CP1543-W (4)

TSAP <HEX> : 43 50 31 35 34 33 2D 57

TSAP length: 8

Rem. parameters:

Hostname : CP1543

IP address : 140.140.111.102

TSAP <ASC> : CP1543-W

TSAP <HEX> : 43 50 31 35 34 33 2D 57 (5)

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 SELECT

Note

In the transport configuration, a "WRITE" connection is configured as job type "SEND" with the R/W identifier being set to "Y"!

2.3 Scenario 2a – Communication via parameterized OUC (single instructions) and internal CPU interface

2.3.1 Mode of operation

Overview

In this scenario, the SIMATIC S7-1500 CPU **actively** establishes an ISO-on-TCP connection to the S5 via the CP1430 TCP using the integrated PROFINET interface.

On the S7-1500 CPU end, a **parameterized** connection configuration is used. The data are sent and received bidirectionally via the OUC blocks **TSEND** and **TRCV**.

For this connection, the SIMATIC S5 uses the standard handling blocks (HTB) SYNCHRON/SEND/RECEIVE. In the CP1430 TCP, the ISO-on-TCP connection in the SIMATIC S5 is configured as a "passive" duplex connection.

Sequence of the parameterized OUC communication via single instructions

The figure below schematically shows the connection established and the data flow between SIMATIC S5 and SIMATIC S7-1500 using the **parameterized** SEND and RECEIVE mechanism via ISO-on-TCP.

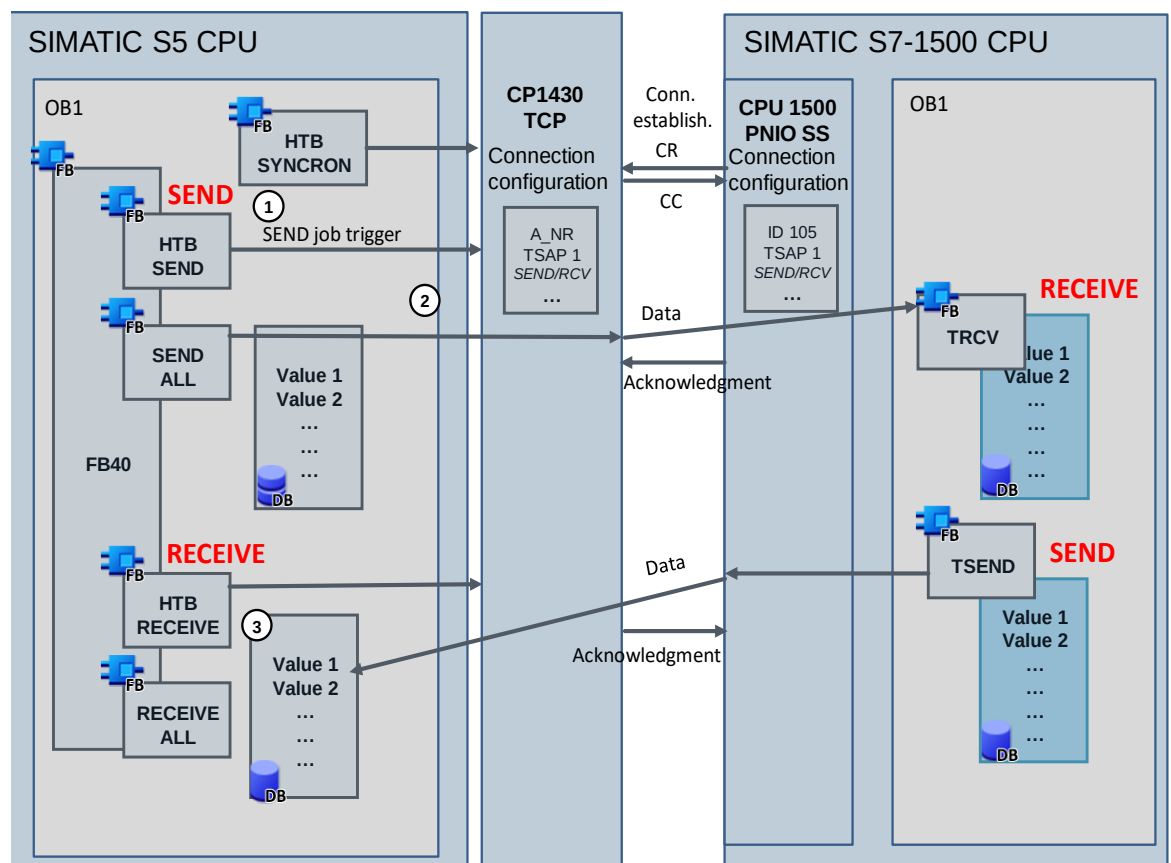


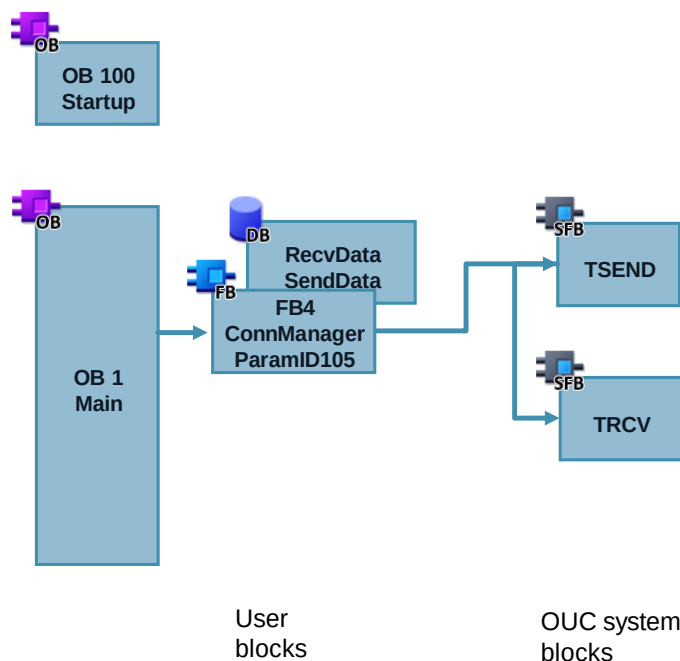
Table 2-9

No.	Process
1	Startup of the SIMATIC S5 and synchronization with the CP1430 TCP.
2	The cyclic processing of the HTB RECEIVE block in the S5-CPU ensures readiness to receive between the CPU and the CP1430 TCP. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.
3	The SIMATIC S5 transfers the SEND job to the CP1430 TCP via HTB SEND. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
4	The received data are transferred to the S7-1500 CPU via the cyclic processing of the OUC block TRCV. If the data have been received successfully, this is shown by a positive acknowledgment and signaled at block parameter NDR. Otherwise, a negative acknowledgment will be sent for the job.
5	A SEND job is sent from the S7-1500 CPU to the SIMATIC S5 via the OUC block TSEND. In this scenario, the block sends a job to the SIMATIC S5 CP1430 TCP every second. In the S5-CPU, the data are transferred via the standard HTBs RECEIVE and RECEIVE ALL.

2.3.2 Communication program in the SIMATIC S7-1500

Overview

The following blocks contain the communication program in the S7-1500 CPU.



Function

The function block FB4 is used to call the OUC communication blocks TSEND and TRCV. In this variant of OUC communication, the connection is established by an "actively" parameterized ISO-on-TCP connection. After having restarted the S7-1500 CPU, the connection will be established automatically.

The data are sent and received bidirectionally via the OUC blocks TSEND and TRCV. The data are sent every 0.5 seconds (via clock memory bit). To detect the ongoing data communication in the S7-1500, a count value is received by the SIMATIC S5, mirrored and sent back. For visualization, the received count value is transferred to the output area AB0.

Description of the blocks

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
FB 4	ConnManagerParamID105	Management of connection ID 105
DB 19	InstConnManagerParamID105	Instance DB of FB 4 (send/receive data area)
DB 16	InstTSENDParamID105	Instance DB TSEND ID 105
DB 17	InstTRCVParamID105	Instance DB TRCV ID 105

OB 100 (startup OB)

After having restarted the S7-1500 CPU, a start identifier is set for automatically establishing a connection to the SIMATIC S5.

OB 1 (cyclic OB)

Via the enable input "E 0.1" (abortReq), the OB1 calls FB 4 which manages the OUC communication.

FB 4 (TSEND/TRCV management)

In FB4, the data are received by the SIMATIC S5 via the cyclically processed OUC block TRCV. To visualize the ongoing communication, a count value is copied to an output area (AB 0) of the S7-1500.

The count value received by the SIMATIC S5 is located in the instance data block of FB4 in the static tag "statRcvData" and is copied to the send area of the instance data block "statSendData" for sending. Via a send enable "E0.1" (abortReq), these data are mirrored and sent back to the SIMATIC S5 every 500 ms.

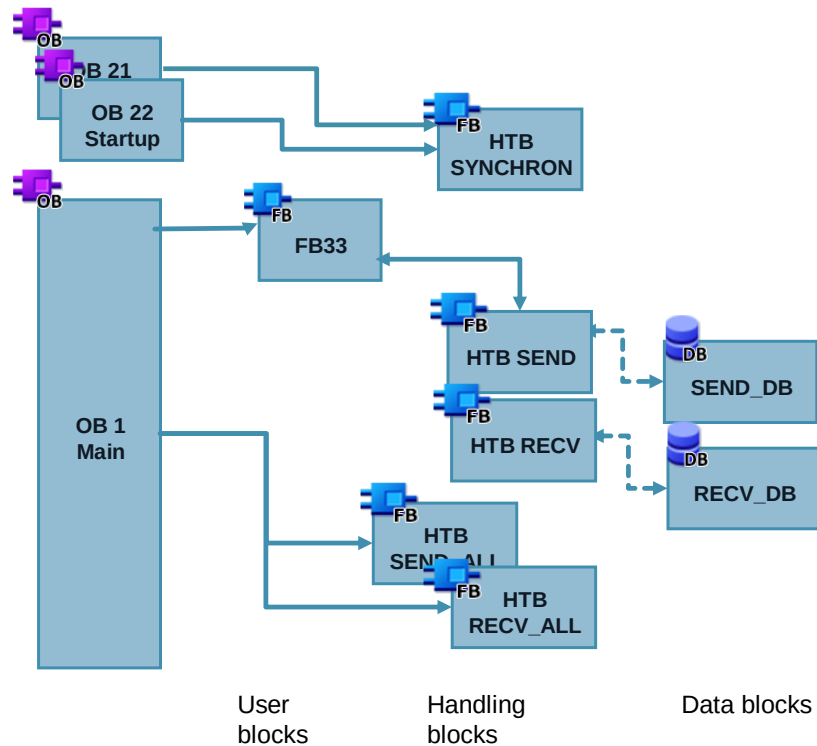
In addition, the received data are checked.

- The data are cyclically checked for a deletion identifier ("A1A1") being available. In case of a match, the count value is reset.
- The ongoing communication of the OUC communication is visualized via the output area of the S7-1500.

2.3.3 Communication program SIMATIC S5

Overview

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 sends and receives data via a **passive** ISO-on-TCP connection. The connection is established from the S7-1500.



Function

Via the connection actively established by the S7-1500 CPU, data are sent bidirectionally with a count value from the SIMATIC S5 to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

In case of the SIMATIC S5 CPU being restarted, a deletion identifier is sent and the count value is reset.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-10

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program call of FB 33 and of the HTBs SEND/RECEIVE ALL
FB 33	ID105_S7	Time-triggered call of the send and receive functions via S5 handling blocks (HTBs). Increase of count value in the data
FB 244	HTB_SEND	Handling block SEND-All (A-NR:= 0)

Block	Symbol	Description
FB 245	HTB_RECEIVE	Handling block RECEIVE-All (A-NR:= 0)
FB 249	HTB_SYNCHRON	Handling block SYNCHRON
DB 90	-	Data area for sending
DB 95	-	Data area for receiving

OB21/OB22 (STARTUP OBs)

The following functions are executed in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 184.5**) resets the initial count value.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- This example scenario 2a is started by setting an enable bit (**M 130.3**).
- Call of the user communication block ID105_S7 (**FB 33**) which uses a time trigger to call the send and receive functions via S5 handling blocks (HTBs) and increments the count values in the data area.
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB33 (ID105_S7)

The function block FB 33 contains the time-triggered call of the send and receive functions in which a simple simulation program demonstrates the exchange of data.

- A restart of the communication is initiated via the startup bit **M 184.5** (OB21/22).
- Every second (clock memory bit), a count value (in DB90) is sent to the S7-1500 CPU via the ISO-on-TCP connection.
- After the data have been received, this count value is checked in the S7-1500, incremented by +1 and sent back to the SIMATIC S5 at the next send trigger of the S7-1500. The data received by the SIMATIC S5 are transferred to DB95.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.
HTB_SEND block: ANZW: **MW90** PAFE: **MB94**
HTB_RECEIVE block: ANZW: **MW95** PAFE: **MB99**

2.3.4 Connection configuration in the S7-1500 CPU

Prerequisite

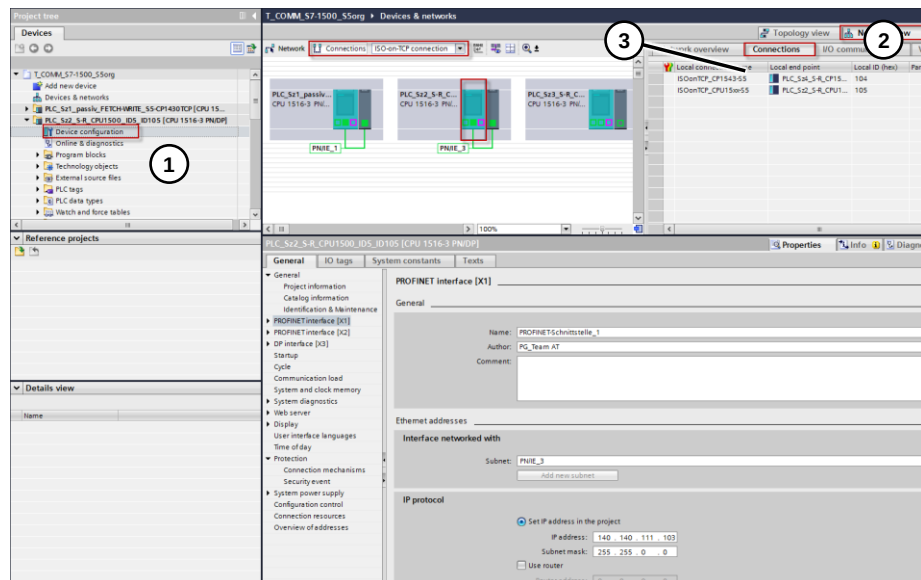
All network-side settings of the S7-1500 CPU and of the CP1543-1 used in TIA Portal are structured identically for all scenarios.

For the corresponding configuration steps, proceed as described in chapter [2.2.4](#) steps 1 and 2 of scenario 1 and complete the configuration following the steps described in the next section.

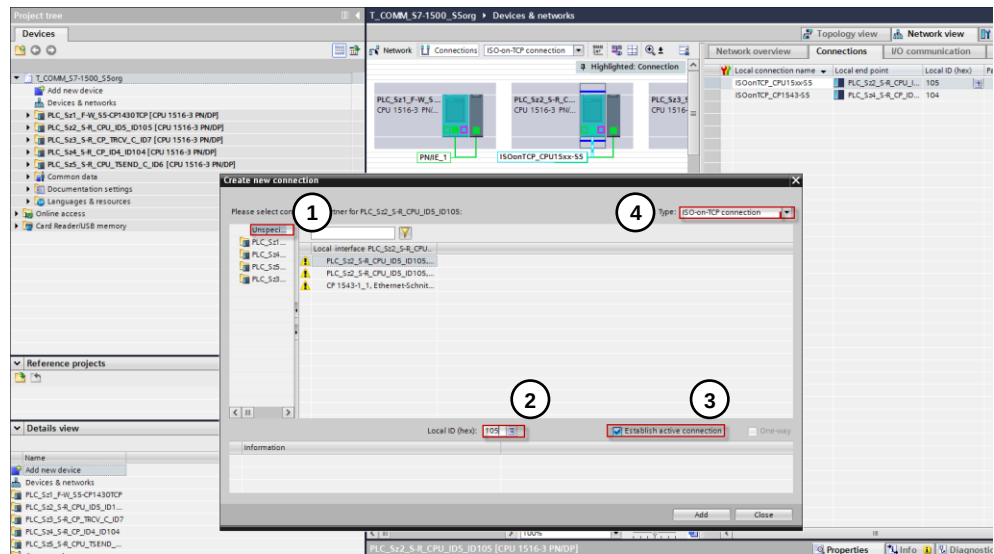
Configuration

In this scenario 2a, the connection is parameterized via a dialog in TIA Portal. The required connection parameter are pre-assigned and set up via a connection table in the S7-1500 CPU.

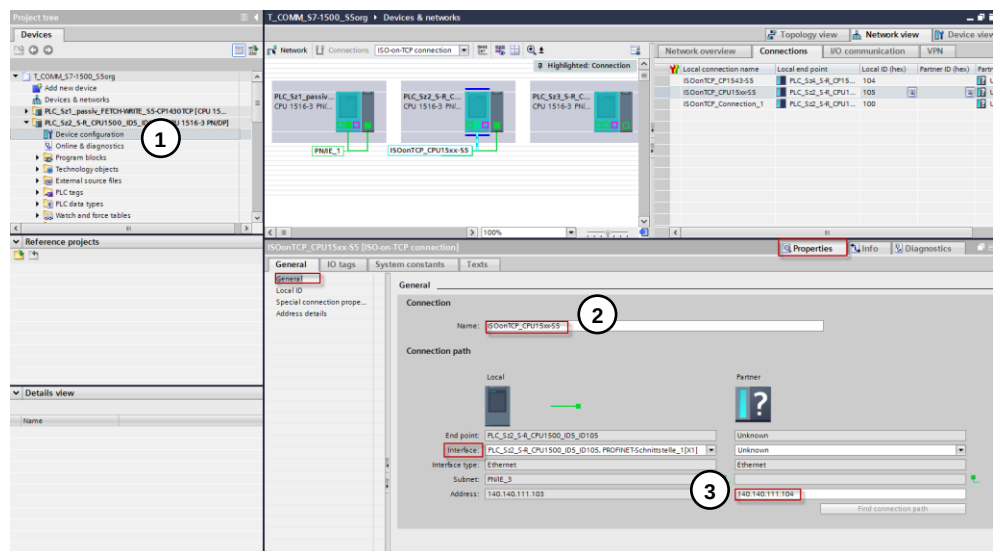
3. In the "Device configuration" (1) of the "PLC_Sz2..", open the "Network view" (2). In the "Connections" tab (3), select your CPU and use the "Insert" menu item or right-click to add a new connection.



11. Now, under "Unspecified" (1), enter "105" as "Local ID" (2). Tick the "Establish active connection" option to enable this connection property. Under "Type" (4), select "ISO-on-TCP connection" and confirm your settings by clicking the "Close" button.

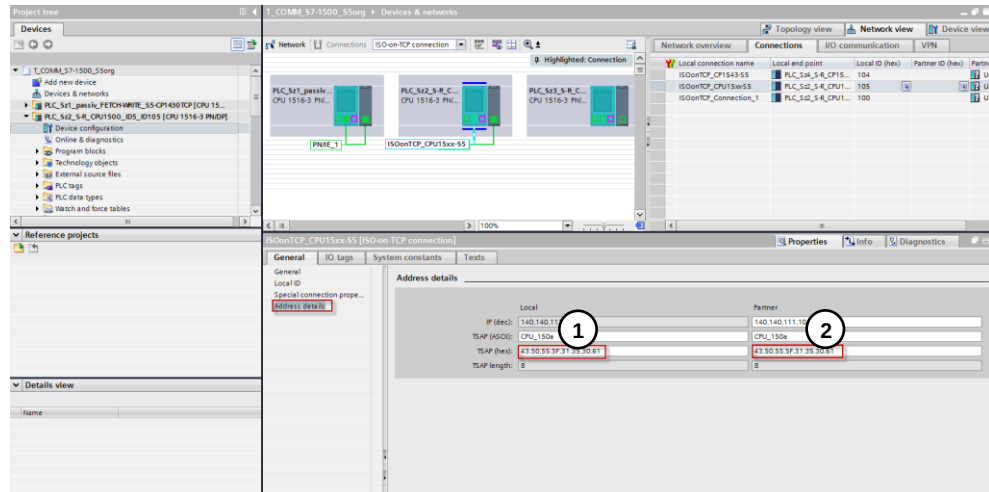


12. In the "Properties" of the ISO-on-TCP connection, go to "General" (1) to assign the name of the connection. In this example, the assigned name is "ISO-on-TCP_CPU15xx-S5" (2). Make sure that the standard PROFINET interface X1 of the S7-1500 CPU is set for the "Interface" parameter. Now, in the "Partner" section, enter the IP address (IP: 140.140.111.104) of the SIMATIC S5 CP1430 TCP (3).



13. Under "Address details", enter the local **(1)** and remote **(2)** TSAPs for the ISO-on-TCP connection. The TSAPs have been taken from the configuration of the CP1430 TCP (see chapter 2.2.5) as follows.

local TSAP: "CPU_150a"
remote TSAP: "CPU_150a"



14. After having completed the settings for this ISO-on-TCP connection, the project has to be compiled again. To do this, select the S7 station, store it and thus compile this S7 station.

2.3.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

Make the following settings to establish a **"passive"** ISO-on-TCP DUPLEX connection to a S7-1500 CPU with an integrated PROFINET interface.

Note The CP1430 TCP configuration file "**TCP1430A.TCP**" already contains the complete configurations for all 6 example scenarios. Thus, after loading the CP1430 file, all other connections are also available "offline" in the CP1430 TCP.

Configuration

The "passive" connection for scenario 2a in the CP1430 TCP is created using the "SINEC NCM COM 1430 TCP" configuration tool.

Note The "SINEC NCM COM 1430" configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

The connection configuration is largely identical to chapter 2.2.5. Follow the steps 1 to 8 described in that chapter and complete the configuration following the steps described below.

9. For this example (scenario 2a), two ISO-on-TCP connections (transport connections RFC 1006) are required.
To set up the "passive" connection, the job "1 of 2" must be parameterized as a RECEIVE type. In the subsequent mask of the job, the TSAP "CPU_150a" is entered. The job "2 of 2" must be set up as a SEND job type.

Enter

- for the passive ISO-on-TCP connection under **(1)** the job number ANR "33",
- under **(2)** the job type: "RECEIVE",
- under "Transport addresses" **(3)** the local TSAP "CPU_150a" and under **(4)** the remote TSAP "CPU_150a",
- under "Number of jobs per TSAP" **(5)** "1 of 2",
- under the "Active/passive" parameter **(6)** the connection establishment "P" (passive).

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE>

SSNR offset : 0 ANR : 33 (1)

Job type : RECEIVE (2) Active/passive <A/P> : P (6)

Read/write <Y/N> : N TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 1 of 2 (5)

Transport addresses:

Loc. parameters:		Rem. parameters:	
TSAP <ASC> :	CPU_150a (3)	Hostname :	CPU1500
TSAP <HEX> :	43 50 55 5F 31 35 30 61	IP address :	140.140.140.103
TSAP length:	8	TSAP <ASC> :	CPU_150a (4)
		TSAP <HEX> :	43 50 55 5F 31 35 30 61
		TSAP length:	8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 SELECT

10. Now, create job 2 of 2 with "+1" (F1).

Enter

- under **(1)** the job number ANR with "**133**",
- under **(2)** the job type: "**SEND**".
- Click on "OK" (**F7**) to confirm the settings.

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE> COM1430TCP/IP U2.07 <EXIT>

SSNR offset : 0 **2** ANR : **133** **1**

Job type : **SEND** Active/passive <A/P> : P

Read/write <Y/N> : N TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 2 of 2

Transport addresses:

Loc. parameters:

TSAP <ASC> : CPU_150a
 TSAP <HEX> : 43 50 55 5F 31 35 30 61
 TSAP length: 8

Rem. parameters:

Hostname : CPU1500
 IP address : 140.140.111.103
 TSAP <ASC> : CPU_150a
 TSAP <HEX> : 43 50 55 5F 31 35 30 61
 TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 SELECT

2.4 Scenario 2b – Communication via programmed OUC (single instructions) and internal CPU interface

2.4.1 Mode of operation

Overview

In this scenario, the SIMATIC S5 **actively** establishes an ISO-on-TCP connection to the S7-1500 CPU via the CP1430 TCP using the internal PROFINET interface.

On the S7-1500 CPU end, the **programmed** connection is set up **passively** via the OUC block **TCON** by the user program and is available for establishing the connection of the partner. The data then are sent and received via the blocks **TSEND** and **TRCV**.

For this connection, the SIMATIC S5 uses the standard handling blocks **SYNCHRON/SEND/RECEIVE**. In the CP1430 TCP, the ISO-on-TCP connection in the SIMATIC S5 is configured as an "active" duplex connection.

Sequence of the programmed OUC communication between S7 and S5 via single instructions

The figure below schematically shows the connection established and the data flow between SIMATIC S5 and SIMATIC S7-1500 using the SEND and RECEIVE mechanism via ISO-on-TCP.

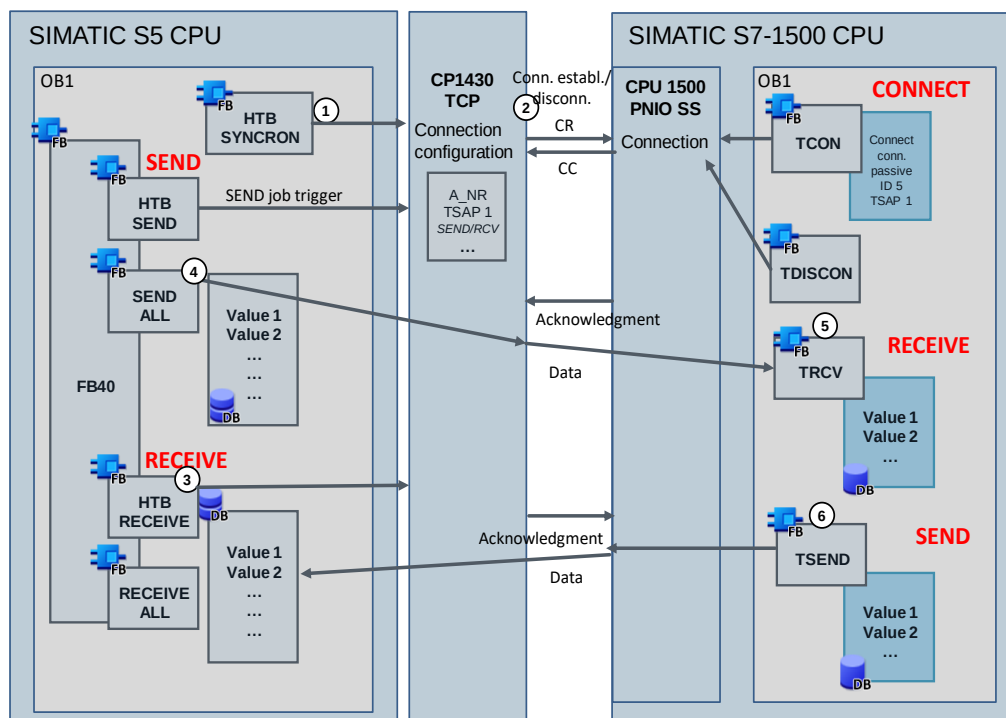


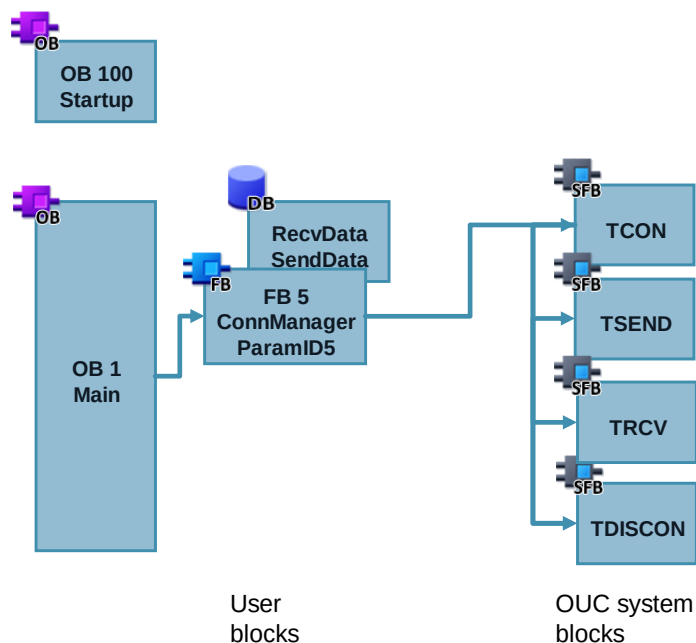
Table 2-11

No.	Process
1	Startup of the SIMATIC S5 and synchronization with the CP1430 TCP.
2	In case of being synchronized with the CP1430 without any errors, the parameterized ISO-on-TCP connection will be established automatically afterwards.
3	The cyclic processing of the HTB RECEIVE block in the S5-CPU ensures readiness to receive between the CPU and the CP1430 TCP. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.
4	The SIMATIC S5 transfers the SEND job to the CP1430 TCP via HTB SEND. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
5	The received data are transferred to the S7-1500 CPU via the cyclic processing of the OUC block TRCV. If the data have been received successfully, this is shown by a positive acknowledgment and signaled at block parameter NDR. Otherwise, a negative acknowledgment will be sent for the job.
6	A SEND job is sent from the S7-1500 CPU to the SIMATIC S5 via the OUC block TSEND. In this scenario, the block sends a job to the SIMATIC S5 CP1430 TCP every second. In the S5-CPU, the data are transferred via the standard HTBs RECEIVE and RECEIVE ALL.

2.4.2 Communication program in the SIMATIC S7-1500

Overview

The following blocks contain the communication program in the S7-1500 CPU.



Function

A programmed OUC communication is set up passively by calling the OUC communication block TCON. In this case, the connection is established actively from the SIMATIC S5. As soon as the connection is established, the data are exchanged via the OUC communication blocks TSEND and TRCV.

To detect the ongoing data communication in the S7-1500, a count value is received by the SIMATIC S5, mirrored and sent back. For visualization, the received count value is transferred to the output area AB0.

Description of the blocks

Table 2-12

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
FB 5	ConnManagerProgID5	Management of connection ID 5
DB 29	InstConnManagerProgID5	Instance DB of FB 4 (+send/receive data area)
DB 25	ConnectParamID5	Connect parameter ID5
DB 24	InstTCONID5	Instance DB TCON ID 5
DB 28	InstTDISCONID5	Instance DB TDISCON ID 5
DB 26	InstTSENDID5	Instance DB TSEND ID 5
DB 27	InstTRCVID5	Instance DB TRCV ID 5

OB 100 (startup OB)

After having restarted the S7-1500 CPU, the connect enable bit "startConnID5" is reset. It has the effect that a passively programmed connection is set up in the cyclic program.

OB 1 (cyclic OB)

Via the enable input "E 0.2" (abortReq), the OB1 calls FB 5 which manages the OUC communication.

FB 5 (TSEND/TRCV management)

In FB 5, it is checked via the connect enable bit whether the CPU is restarted. If this is the case, the passive ISO-on-TCP connection is set up via the OUC block TCON.

If the connection has been established successfully, the data are received by the SIMATIC S5 via the cyclically called OUC communication block TRCV. To visualize the ongoing communication, a count value is copied to an output area (AB 0) of the S7-1500.

The count value received by the SIMATIC S5 is located in the instance data block of FB5 in the static tag "statRcvData" and is copied to the send area of the instance data block "statSendData" for sending.

Via a send enable "E0.1", these data are mirrored and sent back to the SIMATIC S5 every 500 ms.

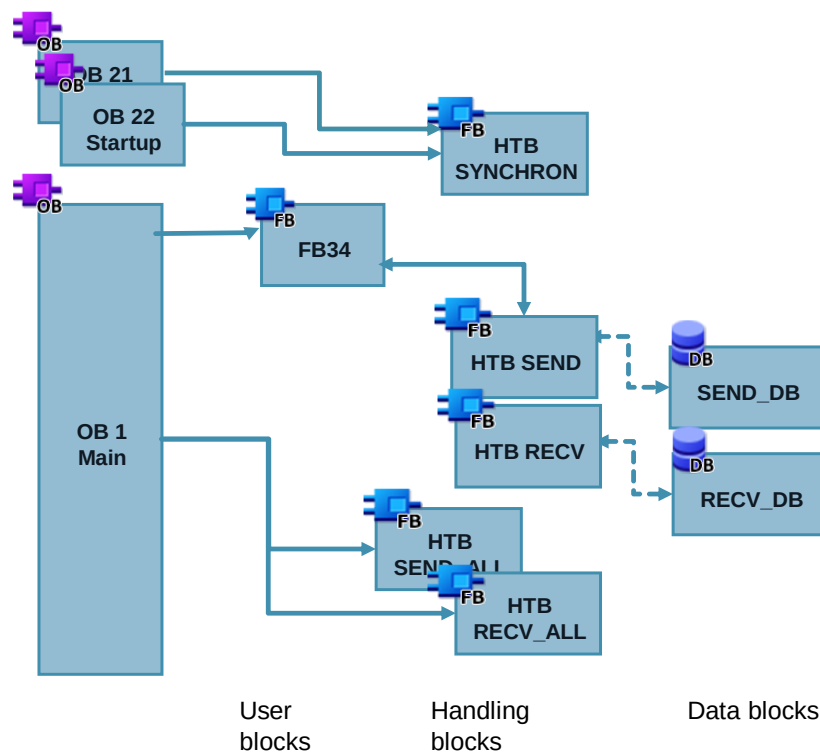
In addition, the received data are checked.

- The data are cyclically checked for a deletion identifier ("A1A1") being available. In case of a match, the count value is reset.
- The ongoing communication of the OUC communication is visualized via the output area of the S7-1500.

2.4.3 Communication program SIMATIC S5

Overview

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 sends and receives data via an **active** ISO-on-TCP connection. The connection is established from the SIMATIC S5.



Function

Via the connection actively established by the SIMATIC S5, data are sent bidirectionally with a count value to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

In case of the SIMATIC S5 CPU being restarted, a deletion identifier is sent to the S7-1500 and the count value is reset.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-13

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program call of FB 34 and of the HTBs SEND/RECEIVE ALL
FB 34	ID5_S7	Time-triggered call of the send and receive functions via S5 handling blocks (HTBs). Increase of count value in the data
FB244	HTB_SEND	Handling block SEND (-All A-NR:= 0)
FB245	HTB_RECEIVE	Handling block RECEIVE (-All A-NR:= 0)
FB249	HTB_SYNCHRON	Handling block SYNCHRON
DB 100	-	Data area for sending
DB 101	-	Data area for receiving

OB21/OB22 (STARTUP OBs)

The following functions are implemented in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 170.5**) resets the initial count value.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- This example scenario 2b is started via the enable bit (**M 130.4**).
- Call of the user communication block ID5_S7 (**FB 34**) which calls the send and receive functions via S5 handling blocks (HTBs) and increments the count values in the data area.
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB34 (ID5_S7)

The function block FB 34 contains the time-triggered call of the send and receive functions in which a simple simulation program demonstrates the exchange of data.

- An enable of the communication is initiated via the startup bit **M 170.5** (OB21/22).
- Every second (clock memory bit), a count value (in DB100) is sent to the S7-1500 CPU via the ISO-on-TCP connection.
- After the data have been received, this count value is checked in the S7-1500, incremented by +1 and sent back to the SIMATIC S5 at the next send trigger of the S7-1500. The data received by the SIMATIC S5 are transferred to DB101.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.
HTB_SEND block: ANZW: **MW100** PAFE: **MB104**
HTB_RECEIVE block: ANZW: **MW105** PAFE: **MB109**

2.4.4 Connection configuration in the S7-1500 CPU

Prerequisite

All network-side settings of the S7-1500 CPU and of the CP1543-1 used in TIA Portal are structured identically for all scenarios.

For the corresponding configuration steps, proceed as described in chapter [2.2.4](#) steps 1 and 2 of scenario 1 and complete the configuration following the steps described in the next section.

Configuration

In this scenario 2b, all required connection parameters of an ISO-on-TCP connection are pre-assigned and set up via the user program.

The CONNECT parameter of the OUC block TCON is used to configure the predefined structure (TCON_IP_RFC) of an ISO-on-TCP connection as follows.

3. Create a data block and add a tag of data type "TCON_IP_RFC". The default settings for scenario 2b have to be parameterized as follows.
 - Enter the module address of the S7-1500 CPU (in this case: 64) for the "Interfaceld" tag **(1)**.
 - Enter the connection number (in this case: 5) for the "ID" tag **(2)**.
 - The value "16#0C" of the "ConnectionType" tag **(3)** defines the connection type "ISO-on-TCP".
 - Enter the value "false" for the "ActiveEstablished" tag **(4)** to define the passive connection establishment of the S7-1500.
 - Enter the IP address of the partner (in this case: of the CP1430 TCP) in the "RemoteAddress" field **(5)**.
 - Enter the remote TSAP (in this case: 43 50 31 35 34 33 2D 31 (hex) "CPU_150b" (ASC)) and the local TSAP (in this case: 43 50 55 5F 31 35 30 62 (hex) "CPU_150b" (ASC)) in the fields "RemoteTSelector" **(6)** and "LocalTSelector" **(7)**, respectively.

CPU15xx_ISOonTCP_conn_program_Verbg_ID5 (snapshot created: 3/7/2016 2:57:37 PM)

	Name	Data type	Start value	Retain	Accessible f...	Visible in ...	Setpoint	Comment
1	Static							
2	Static_1	TCON_IP_RFC						
3	Interfaceld	HW_ANY	64		☒	☒		HW identifier of IE-interface submodule
4	ID	CONN_OUC	5		☒	☒		connection reference / identifier
5	ConnectionType	Byte	16#0C		☒	☒		type of connection: 12= ISO-on-TCP (18=ISO-o...
6	ActiveEstablished	Bool	false		☒	☒		active/passive connection establishment
7	RemoteAddress	IP_V4			☒	☒		remote IP address (IPv4)
8	ADDR	Array[1..4] of Byte			☒	☒		IPv4 address
9	ADDR[1]	Byte	140		☒	☒		IPv4 address
10	ADDR[2]	Byte	140		☒	☒		IPv4 address
11	ADDR[3]	Byte	111		☒	☒		IPv4 address
12	ADDR[4]	Byte	104		☒	☒		IPv4 address
13	RemoteTSelector	TSelector			☒	☒		remote transport selector
14	TselLength	UInt	8		☒	☒		length of TSelector
15	Tsel	Array[1..32] of Byte			☒	☒		Tselector array
16	LocalTSelector	TSelector			☒	☒		local transport selector
17	TselLength	UInt	8		☒	☒		length of TSelector
18	Tsel	Array[1..32] of Byte			☒	☒		Tselector array

7	RemoteAddress	IP_V4		☐	☒	☒	☐	remote IP address (IPv4)
8	RemoteTSelector	TSelector		☐	☒	☒	☐	remote transport selector
9	TselLength	UInt	8	☐	☒	☒	☐	length of TSelector
10	Tsel	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
11	Tsel[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
12	Tsel[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
13	Tsel[3]	Byte	B#16#55	☐	☒	☒	☐	Tselector array
14	Tsel[4]	Byte	B#16#5F	☐	☒	☒	☐	Tselector array
15	Tsel[5]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
16	Tsel[6]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
17	Tsel[7]	Byte	B#16#30	☐	☒	☒	☐	Tselector array
18	Tsel[8]	Byte	B#16#62	☐	☒	☒	☐	Tselector array
19	Tsel[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
20	Tsel[10]	Byte	16#0	☐	☒	☒	☐	Tselector array

9	LocalTSelector	TSelector		☐	☒	☒	☐	local transport selector
10	TselLength	UInt	8	☐	☒	☒	☐	length of TSelector
11	Tsel	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
12	Tsel[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
13	Tsel[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
14	Tsel[3]	Byte	B#16#55	☐	☒	☒	☐	Tselector array
15	Tsel[4]	Byte	B#16#5F	☐	☒	☒	☐	Tselector array
16	Tsel[5]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
17	Tsel[6]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
18	Tsel[7]	Byte	B#16#30	☐	☒	☒	☐	Tselector array
19	Tsel[8]	Byte	B#16#62	☐	☒	☒	☐	Tselector array
20	Tsel[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
21	Tsel[10]	Byte	16#0	☐	☒	☒	☐	Tselector array

2.4.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

Make the following settings to establish an **"active"** ISO-on-TCP DUPLEX connection to a S7-1500 CPU with an integrated PROFINET interface.

Note The CP1430 TCP configuration file **"TCP1430A.TCP"** already contains the complete configurations for all 6 example scenarios. Thus, after loading the CP1430 file, all other connections are also available **"offline"** in the CP1430 TCP.

Configuration

The **"active"** connection for scenario 2b in the CP1430 TCP is created using the **"SINEC NCM COM 1430 TCP"** configuration tool.

Note The **"SINEC NCM COM 1430"** configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

The connection configuration is largely identical to chapter [2.2.5](#). Follow the steps 1 to 8 described in that chapter and complete the configuration following the steps described below.

- For this example (scenario 2b), two ISO-on-TCP connections (transport connections RFC 1006) are required.
To set up the **"active"** connection, the job **"1 of 2"** must be parameterized as a **SEND** type. In the subsequent mask of the job, the TSAP **"CPU_150b"** has to be entered. The job **"2 of 2"** must be set up as a **RECEIVE** job type.

Enter

- for the passive ISO-on-TCP connection under **(1)** the job number ANR "43",
- under **(2)** the job type: "SEND",
- under "Transport addresses" **(3)** the local TSAP "CPU_150b" and under **(4)** the remote TSAP "CPU_150b",
- under "Number of jobs per TSAP" **(5)** "1 of 2",
- under the "Active/passive" parameter **(6)** the connection establishment "A" (active).

10. Now, create job 2 of 2 with "+1" (F1).

Enter

- under **(1)** the job number ANR with "143",
- under **(2)** the job type: "RECEIVE".
- Click on "OK" (F7) to confirm the settings.

2.5 Scenario 3 – Communication via programmed OUC (compact instruction) and CP1543-1 interface

2.5.1 Mode of operation

Overview

This scenario presents a variant of the OUC communication, in which the S7-1500 CPU uses the compact OUC block "**TRCV_C**" to receive data from the SIMATIC S5.

Via the CP1543-1, the SIMATIC S7-1500 CPU **actively** establishes an ISO-on-TCP connection to the SIMATIC S5 using the CP1430 TCP. The data are sent to the SIMATIC S5 via the standard OUC block **TSEND**.

For this connection, the SIMATIC S5 uses the standard handling blocks SYNCHRON/SEND/RECEIVE. In the CP1430 TCP, the ISO-on-TCP connection in the SIMATIC S5 is configured as a "passive" duplex connection.

Sequence of the programmed OUC communication between S7 and S5 via compact instructions

The figure below schematically shows the connection established and the data flow between SIMATIC S5 and SIMATIC S7-1500 using the programmed SEND and RECEIVE mechanism via ISO-on-TCP.

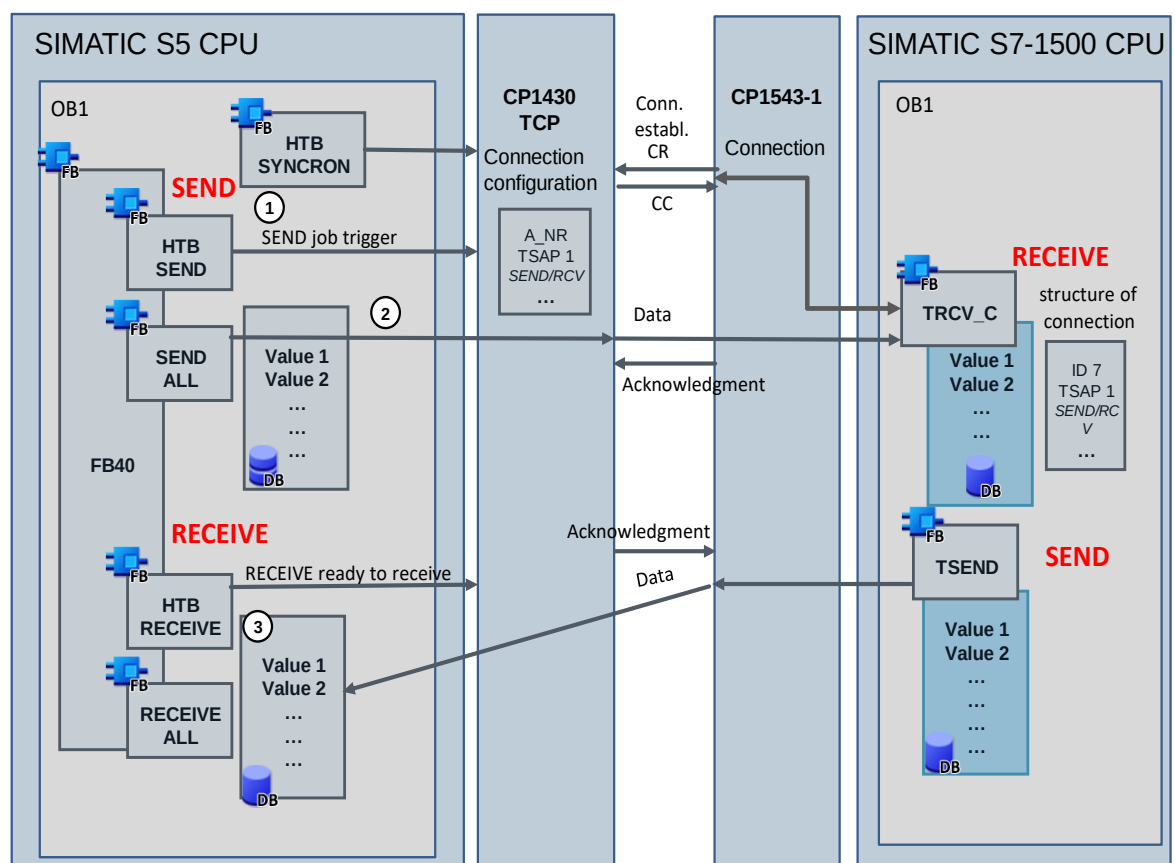


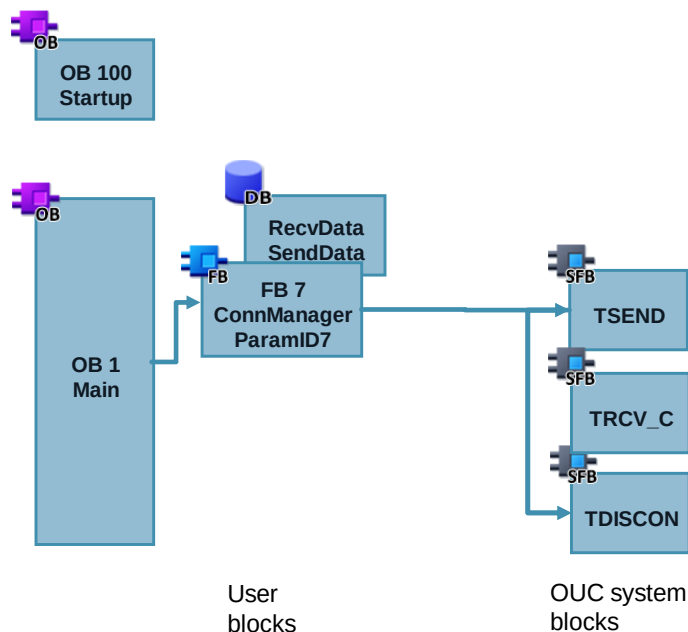
Table 2-14

No.	Process
1	Startup of the SIMATIC S5 and synchronization with the CP1430 TCP.
2	The cyclic processing of the HTB RECEIVE block in the S5-CPU ensures readiness to receive between the CPU and the CP1430 TCP. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.
3	The SIMATIC S5 transfers the SEND job to the CP1430 TCP via HTB SEND. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
4	The connection is established and the received data are transferred to the S7-1500 CPU via the cyclic processing of the OUC block TRCV_C. If the connection has been established successfully, the cyclic processing of the TRCV-C ensures that data can be received. If data are received, this is shown by a positive acknowledgment and signaled at block parameter NDR. Otherwise, a negative acknowledgment will be sent for the job.
5	A SEND job is sent from the S7-1500 CPU to the SIMATIC S5 via the OUC block TSEND. In this scenario, the block sends a job to the SIMATIC S5 CP1430 TCP every second. In the S5-CPU, the data are transferred via the standard HTBs RECEIVE and RECEIVE ALL.

2.5.2 Communication program in the SIMATIC S7-1500

Overview

The following blocks contain the communication program in the S7-1500 CPU.



Function

The OUC block TRCV_C is used to **actively** establish a connection via a CP1543-1 by calling the FB7 (ConnManagerParamID7). As soon as the connection is established, the data are exchanged via the communication blocks TSEND and TRCV_C.

Via the connection, data are sent bidirectionally with a count value from the SIMATIC S5 to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

Note

The mixed variant of the OUC blocks TRCV_C (compact instruction) and TSEND (single instruction) used in this example scenario is recommended, if only one connection ID shall be used for sending and receiving the data. Further details and information concerning this mixed operation are given in the following entry ([109479564](#)).

Description of the blocks

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
F B7	ConnManagerProglD7	Management TRCV_C ID 7
DB 35	InstConnManagerProglD7	Instance DB of FB 4
DB 25	ConnectParamID7	Connect parameter ID 7
DB 3	InstTRCV_CID7	Instance DB TRCV ID 7
DB 4	InstTSENDID7	Instance DB TSEND ID7
DB 100	ParaDbID7_TSEND	Parameter DB TSEND
DB 200	ParaDbID7_TRCV_C	Parameter DB TRCV
DB 110	DataTSEND	Send data area
DB 210	DataTRCV_C	Receive data area

OB 100 (startup OB)

After having restarted the S7-1500 CPU, a start identifier is set for automatically establishing a connection to the SIMATIC S5.

OB 1 (cyclic OB)

Via the enable input "E 0.1" (abortReq), the OB1 calls FB 7 which manages the OUC communication.

FB 7 (TSEND/TRCV_C management)

In FB7, the data are received by the SIMATIC S5 via the cyclically processed OUC block TRCV_C. To visualize the ongoing communication, a count value is copied to an output area (AB 0) of the S7-1500.

The count value received by the SIMATIC S5 is written into DB210 "DataTRCV_C" and copied into DB110 (DataTSEND) to be sent again. Via a send enable "E0.1" (abortReq), these data are mirrored and sent back to the SIMATIC S5 every 500 ms.

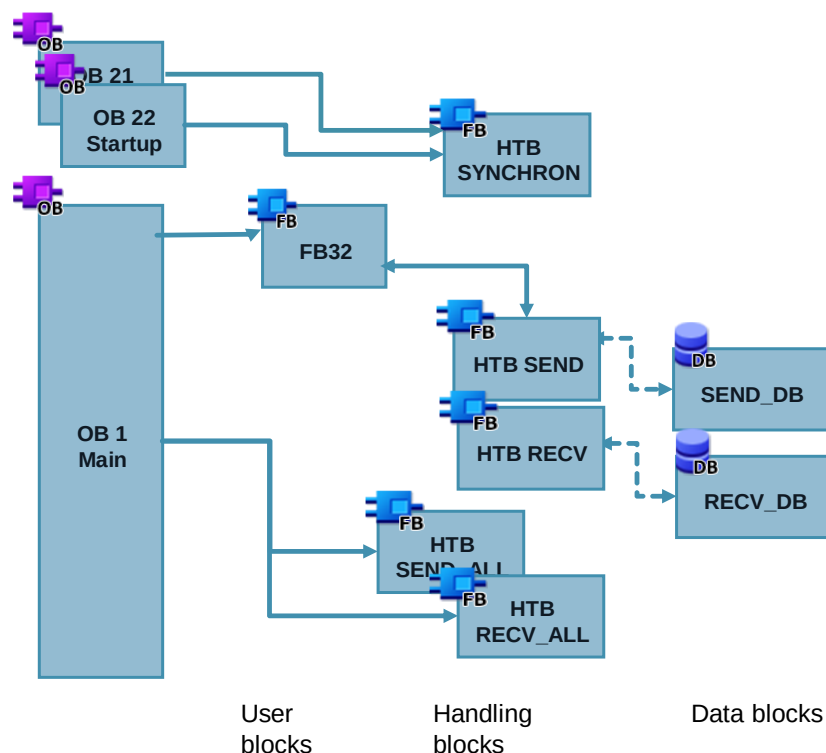
In addition, the received data are checked.

- The data are cyclically checked for a deletion identifier ("A1A1") being available. In case of a match, the count value is reset.
- The ongoing communication of the OUC communication is visualized via the output area of the S7-1500.

2.5.3 Communication program SIMATIC S5

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 sends and receives data via a **passive** ISO-on-TCP connection. The connection is established from the S7-1500 via the CP1543-1.

Overview



Function

Via the connection actively established by the CP1543-1 in the S7-1500 station, data are sent bidirectionally with a count value from the SIMATIC S5 to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again. In case of the SIMATIC S5 CPU being restarted, a deletion identifier is sent and the count value is reset.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-15

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program call of FB 32 and of the HTBs SEND/RECEIVE ALL
FB 32	ID7_S7	Time-triggered call of the send and receive functions via S5 handling blocks (HTBs). Increase of count value in the data
FB244	HTB_SEND	Handling block SEND (-All A-NR:= 0)
FB245	HTB_RECEIVE	Handling block RECEIVE (-All A-NR:= 0)
FB249	HTB_SYNCHRON	Handling block SYNCHRON
DB 85	-	Data area for sending
DB 80	-	Data area for receiving

OB21/OB22 (STARTUP OBs)

The following functions are implemented in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 191.5**) resets the initial count value.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- This example scenario 3 is started via the enable bit (**M 130.2**).
- Call of the user communication block ID7_S7 (**FB 32**) which calls the send and receive functions via S5 handling blocks (HTBs) and increments the count values in the data area.
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB32 (ID7_S7)

The function block FB 32 contains the time-triggered call of the send and receive functions in which a simple simulation program demonstrates the exchange of data.

- Communication is initiated via the startup bit **M 191.5** (OB21/22) and the enable bit (**M 130.2**).
- Every second (clock memory bit), a count value (DB85) is sent to the S7-1500 CP1543-1 via the ISO-on-TCP connection.
- After the data have been received, this count value is checked in the S7-1500, incremented by +1 and sent back to the SIMATIC S5 at the next send trigger of the S7-1500. The data received by the SIMATIC S5 are transferred to DB101.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.

HTB_SEND block: ANZW: **MW85** PAFE: **MB89**

HTB_RECEIVE block: ANZW: **MW80** PAFE: **MB84**

2.5.4 Connection configuration in the S7-1500 CPU

Prerequisite

All network-side settings of the S7-1500 CPU and of the CP1543-1 used in TIA Portal are structured identically for all scenarios.

For the corresponding configuration steps, proceed as described in chapter [2.2.4](#) steps 1 and 2 of scenario 1 and complete the configuration following the steps described in the next section.

Configuration

In this scenario 3, all required connection parameters of an ISO-on-TCP connection are pre-assigned and set up via the user program.

The CONNECT parameter of the OUC block TRCV_C is used to configure the predefined structure (TCON_IP_RFC) of an ISO-on-TCP connection as follows.

3. Create a data block and add a tag of data type "TCON_IP_RFC". The default settings for scenario 3 have to be parameterized as follows.
 - Enter the module address of the CP1543-1 (in this case: 264) for the "Interfaceld" tag **(1)**.
 - Enter the connection number (in this case: 7) for the "ID" tag **(2)**.
 - The value "16#0C" of the "ConnectionType" tag **(3)** defines the connection type "ISO-on-TCP".
 - Enter the value "true" for the "ActiveEstablished" tag **(4)** to define the active connection establishment of the S7-1500 station.
 - Enter the IP address of the partner (in this case: of the CP1430 TCP) in the "RemoteAddress" field **(5)**.
 - Enter the remote TSAP (in this case: 43 50 31 35 34 33 2D 32 (hex) "CP1543-2" (ASC)) and the local TSAP (in this case: 43 50 31 35 34 33 2D 32 (hex) "CP1543-2" (ASC)) in the fields "RemoteTSelector" **(6)** and "LocalTSelector" **(7)**, respectively.

CPU_ISOOnTCP_ConnectDB_progr_Verbg									
	Name	Datentyp	Startwert	Remanenz	Erreichbar a...	Sichtbar i...	Einstellwert	Kommentar	
1	Static								
2	7	TCON_IP_RFC							
3	Interfaceld	HW_ANY	264		☒	☒		HW-identifier of IE-interface submodule	
4	ID	CONN_OUC	7		☒	☒		connection reference / identifier	
5	ConnectionType	Byte	16#0C		☒	☒		type of connection: 12= ISO-on-TCP (18=ISO-o...	
6	ActiveEstablished	Bool	true		☒	☒		active/passive connection establishment	
7	RemoteAddress	IP_V4			☒	☒		remote IP address (IPv4)	
8	ADDR	Array[1..4] of Byte			☒	☒		IPv4 address	
9	ADDR[1]	Byte	140		☒	☒		IPv4 address	
10	ADDR[2]	Byte	140		☒	☒		IPv4 address	
11	ADDR[3]	Byte	111		☒	☒		IPv4 address	
12	ADDR[4]	Byte	104		☒	☒		IPv4 address	
13	RemoteTSelector	TSelector			☒	☒		remote transport selector	
14	TSeLength	UInt	8		☒	☒		length of TSelector	
15	TSeI	Array[1..32] of Byte			☒	☒		Tselector array	
16	LocalTSelector	TSelector			☒	☒		local transport selector	
17	TSeLength	UInt	8		☒	☒		length of TSelector	
18	TSeI	Array[1..32] of Byte			☒	☒		Tselector array	

7	RemoteAddress	IP_V4		☐	☒	☒	☐	remote IP address (IPv4)
8	RemoteTSelector	TSelector		☐	☒	☒	☐	remote transport selector
9	TSELLength	UInt	8	☐	☒	☒	☐	length of TSelector
10	TSEL	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
11	TSEL[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
12	TSEL[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
13	TSEL[3]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
14	TSEL[4]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
15	TSEL[5]	Byte	B#16#34	☐	☒	☒	☐	Tselector array
16	TSEL[6]	Byte	B#16#33	☐	☒	☒	☐	Tselector array
17	TSEL[7]	Byte	B#16#2D	☐	☒	☒	☐	Tselector array
18	TSEL[8]	Byte	B#16#32	☐	☒	☒	☐	Tselector array
19	TSEL[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
20	TSEL[10]	Byte	16#0	☐	☒	☒	☐	Tselector array

9	LocalTSelector	TSelector		☐	☒	☒	☐	local transport selector
10	TSELLength	UInt	8	☐	☒	☒	☐	length of TSelector
11	TSEL	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
12	TSEL[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
13	TSEL[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
14	TSEL[3]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
15	TSEL[4]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
16	TSEL[5]	Byte	B#16#34	☐	☒	☒	☐	Tselector array
17	TSEL[6]	Byte	B#16#33	☐	☒	☒	☐	Tselector array
18	TSEL[7]	Byte	B#16#2D	☐	☒	☒	☐	Tselector array
19	TSEL[8]	Byte	B#16#32	☐	☒	☒	☐	Tselector array
20	TSEL[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
21	TSEL[10]	Byte	16#0	☐	☒	☒	☐	Tselector array

2.5.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

The following settings are used to establish a "**passive**" ISO-on-TCP DUPLEX connection to the CP1543-1.

Note

The CP1430 TCP configuration file "**TCP1430A.TCP**" already contains the complete configurations for all 7 example scenarios. Thus, after loading the CP1430 file, all other connections are also available "offline" in the CP1430 TCP.

Configuration

The "**passive**" connection for scenario 3 in the CP1430 TCP is created using the "SINEC NCM COM 1430 TCP" configuration tool.

Note

The "SINEC NCM COM 1430" configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

The connection configuration is largely identical to chapter [2.2.5](#). Follow the steps 1 to 8 described in that chapter and complete the configuration following the steps described below.

- For this example, two ISO-on-TCP connections (transport connections RFC 1006) are required.
To set up the "passive" connection, the job "1 of 2" must be parameterized as a RECEIVE type. In the subsequent mask of the job, the TSAP "**CP1543-2**" has to be entered. The job "2 of 2" must be set up as a SEND job type.

Enter

- for the passive ISO-on-TCP connection under **(1)** the job number ANR "22",
- under **(2)** the job type: "RECEIVE",
- under "Transport addresses" **(3)** the local TSAP "CP1543-2" and under **(4)** the remote TSAP "CP1543-2",
- under "Number of jobs per TSAP" **(5)** "1 of 2",
- under the "Active/passive" parameter **(6)** the connection establishment "A" (active).

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE> COM1430TCP/IP V2.07 <EXIT>

SSNR offset : 0 ANR : 22 **(1)**

Job type : RECEIVE **(2)** Active/passive (A/P) : P

Read/write (Y/N) : N TCP Keep-Alive (Y/N) : Y

Number of jobs per TSAP : 1 of 2 **(5)**

Transport addresses:

Loc. parameters:

TSAP (ASC) : CP1543-2 **(3)**

TSAP (HEX) : 43 50 31 35 34 33 2D 32

TSAP length: 8

Rem. parameters:

Hostname : CP1543

IP address : 140.140.111.102

TSAP (ASC) : CP1543-2 **(4)**

TSAP (HEX) : 43 50 31 35 34 33 2D 32

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP SELECT

10. Now, create job 2 of 2 with "+1" (F1).

Enter

- under **(1)** the job number ANR with "122",
- under **(2)** the job type: "SEND".
- Click on "OK" (**F7**) to confirm the settings.

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE> COM1430TCP/IP V2.07 <EXIT>

SSNR offset : 0 ANR : 122 **(1)**

Job type : SEND **(2)** Active/passive (A/P) : P

Read/write (Y/N) : N TCP Keep-Alive (Y/N) : Y

Number of jobs per TSAP : 2 of 2

Transport addresses:

Loc. parameters:

TSAP (ASC) : CP1543-2

TSAP (HEX) : 43 50 31 35 34 33 2D 32

TSAP length: 8

Rem. parameters:

Hostname : CP1543

IP address : 140.140.111.102

TSAP (ASC) : CP1543-2

TSAP (HEX) : 43 50 31 35 34 33 2D 32

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP SELECT

2.6 Scenario 4a – Communication via parameterized OUC (single instructions) and CP1543-1

2.6.1 Mode of operation

Overview

In this scenario, the SIMATIC S7-1500 uses the CP1543-1 to **actively** establish a **parameterized** ISO-on-TCP connection to the SIMATIC S5 via the CP1430 TCP. The data then are sent and received bidirectionally via the blocks **TSEND** and **TRCV**.

For this connection, the SIMATIC S5 uses the standard handling blocks (HTB) SYNCHRON/SEND/RECEIVE. In the CP1430 TCP, the ISO-on-TCP connection in the SIMATIC S5 is configured as a "passive" duplex connection.

Note This scenario 4a is almost identical to scenario 2a. For this reason, please refer to the corresponding sections of scenario 2 (chapter 2.3) in case of identical chapters.

Sequence of the programmed OUC communication between S7 and S5 via single instructions and CP1543-1

The figure below schematically shows the connection established and the data flow between SIMATIC S5 and SIMATIC S7-1500 using the programmed SEND and RECEIVE mechanism via ISO-on-TCP.

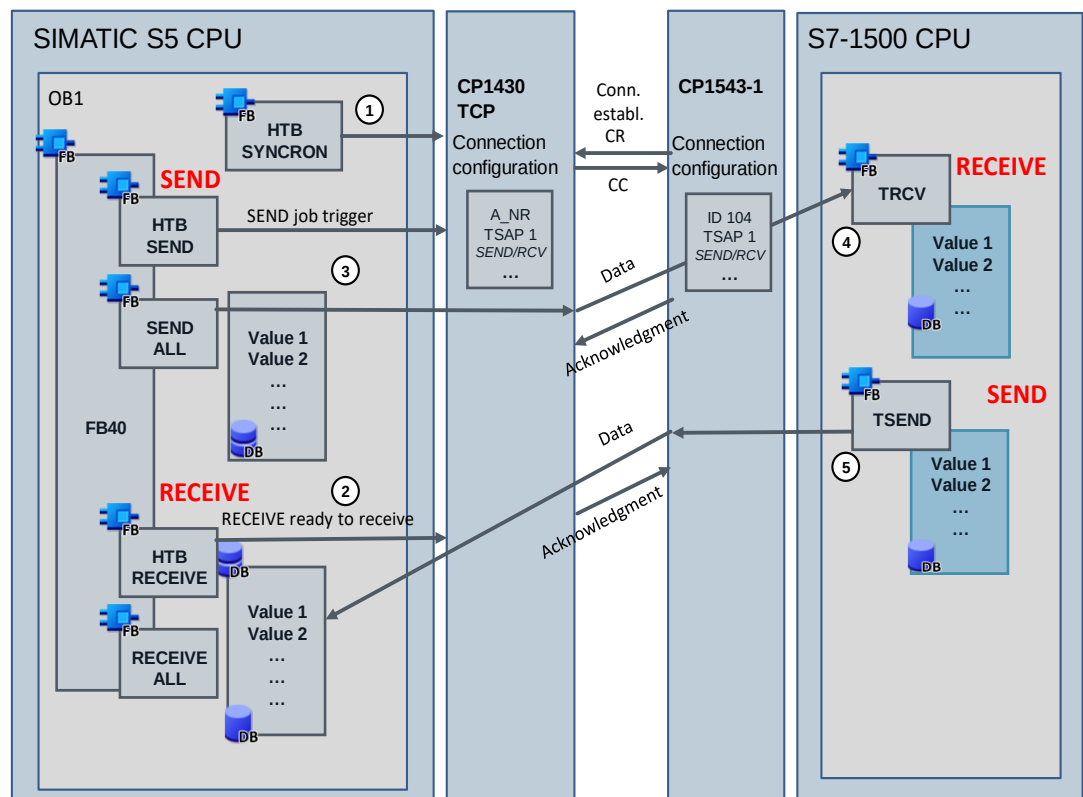


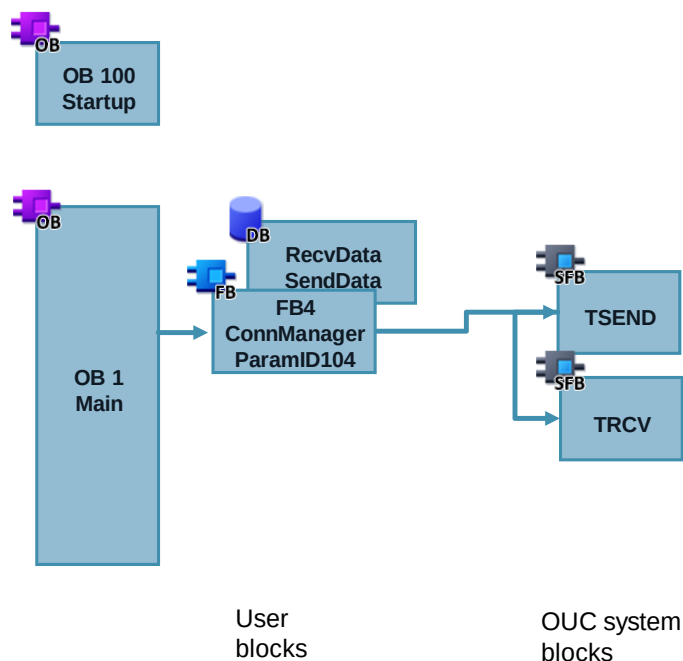
Table 2-16

No.	Process
1	Startup of the SIMATIC S5 and synchronization with the CP1430 TCP.
2	The cyclic processing of the HTB RECEIVE block in the S5-CPU ensures readiness to receive between the CPU and the CP1430 TCP. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.
3	The SIMATIC S5 transfers the SEND job to the CP1430 TCP via HTB SEND. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
4	The received data are transferred to the S7-1500 CPU via the cyclic processing of the OUC block TRCV. If the data have been received successfully, this is shown by a positive acknowledgment and signaled at block parameter NDR. Otherwise, a negative acknowledgment will be sent for the job.
5	A SEND job is sent from the S7-1500 CPU to the SIMATIC S5 via the OUC block TSEND. In this scenario, the block sends a job to the SIMATIC S5 CP1430 TCP every second. In the S5-CPU, the data are transferred via the standard HTBs RECEIVE and RECEIVE ALL.

2.6.2 Communication program in the SIMATIC S7-1500

Overview

The following blocks contain the communication program in the S7-1500 CPU.



Function

The function of the program is completely identical to scenario 2a (see page 34).

Description of the blocks

Table 2-17

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
FB 4	ConnManagerParamID104	Management of connection ID 104
DB 19	InstConnManagerParamID104	Instance DB of FB 4 (send/receive data area)
DB 16	InstTSENDParamID104	Instance DB TSEND ID 104
DB 17	InstTRCVID104	Instance DB TRCV ID 104

OB 100 (startup OB)

OB 1 (cyclic OB)

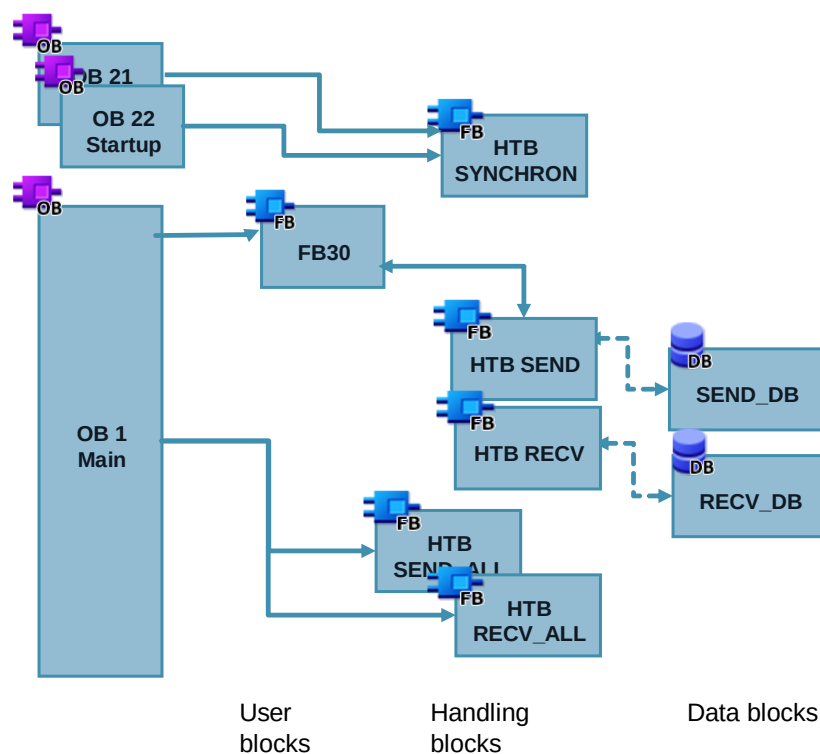
FB 4 (TSEND/TRCV management)

All these blocks of the program are structured identically to scenario 2a.

2.6.3 Communication program SIMATIC S5

Overview

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 sends and receives data via a **passive** ISO-on-TCP connection. The connection is established from the S7-1500.



Function

Via the connection actively established by the CP1543-1, a count value is sent bidirectionally from the SIMATIC S5 to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

In case of the SIMATIC S5 CPU being restarted, a deletion identifier is sent and the count value is reset.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-18

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program call of FB 33 and of the HTBs SEND/RECEIVE ALL
FB 30	ID104_S7	Time-triggered call of the send and receive functions via S5 handling blocks (HTBs)
FB244	HTB_SEND	Handling block SEND (-All A-NR:= 0)
FB245	HTB_RECEIVE	Handling block RECEIVE (-All A-NR:= 0)
FB249	HTB_SYNCHRON	Handling block SYNCHRON
DB 60	-	Data area for sending
DB 50	-	Data area for receiving

OB21/OB22 (STARTUP OBs)

The following functions are implemented in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 180.5**) and the initial count value are reset.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- This example scenario 4a is started by setting an enable bit (**M 130.0**).
- Call of the user communication block ID104_S7 (**FB 30**) which uses a time trigger to call the send and receive functions via S5 handling blocks (HTBs) and increments the count values in the data area.
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB30 (ID104_S7)

The function block FB 30 contains the time-triggered call of the send and receive functions in which a simple simulation program demonstrates the exchange of data.

- An enable of the communication is initiated via the startup bit **M 180.5** (OB21/22). Thus, this communication is enabled.
- Every second (clock memory bit), a count value (DB60) is sent to the S7-1500 via the CP1543-1 using the ISO-on-TCP connection.
- After the data have been received, this count value is checked in the S7-1500 and incremented by +1. At the next send trigger of the S7-1500, it is sent back to the SIMATIC S5. The data received by the SIMATIC S5 are transferred to DB50.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.
HTB_SEND block: ANZW: **MW60** PAFE: **MB64**
HTB_RECEIVE block: ANZW: **MW50** PAFE: **MB54**

2.6.4 Connection configuration in the S7-1500 CPU

Prerequisite

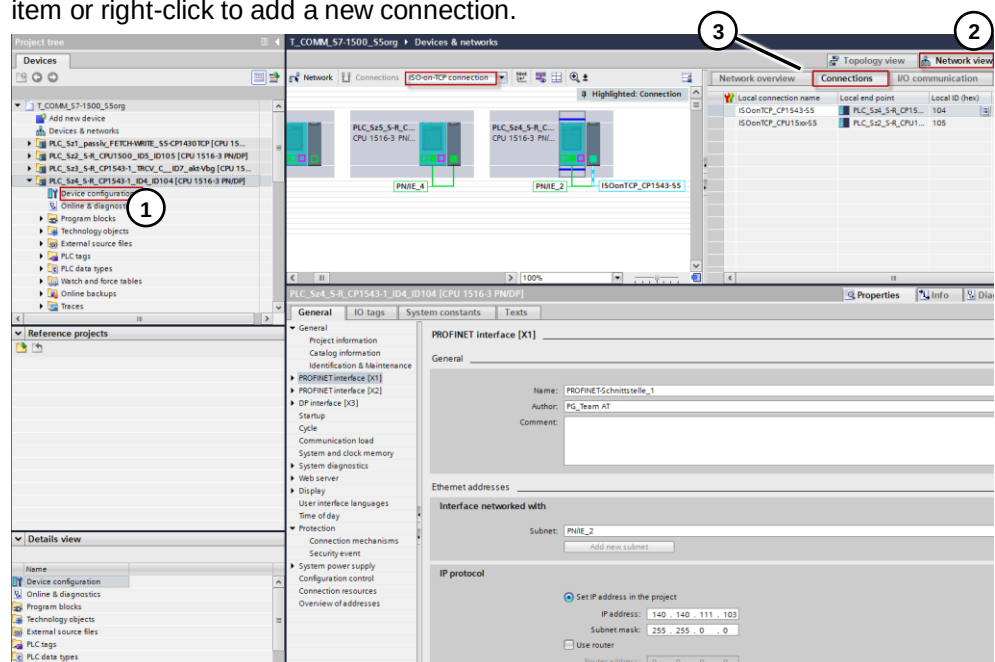
All network-side settings of the S7-1500 CPU and of the CP1543-1 used in TIA Portal are structured identically for all scenarios.

For the corresponding configuration steps, proceed as described in chapter [2.2.4](#) steps 1 and 2 of scenario 1 and complete the configuration following the steps described in the next section.

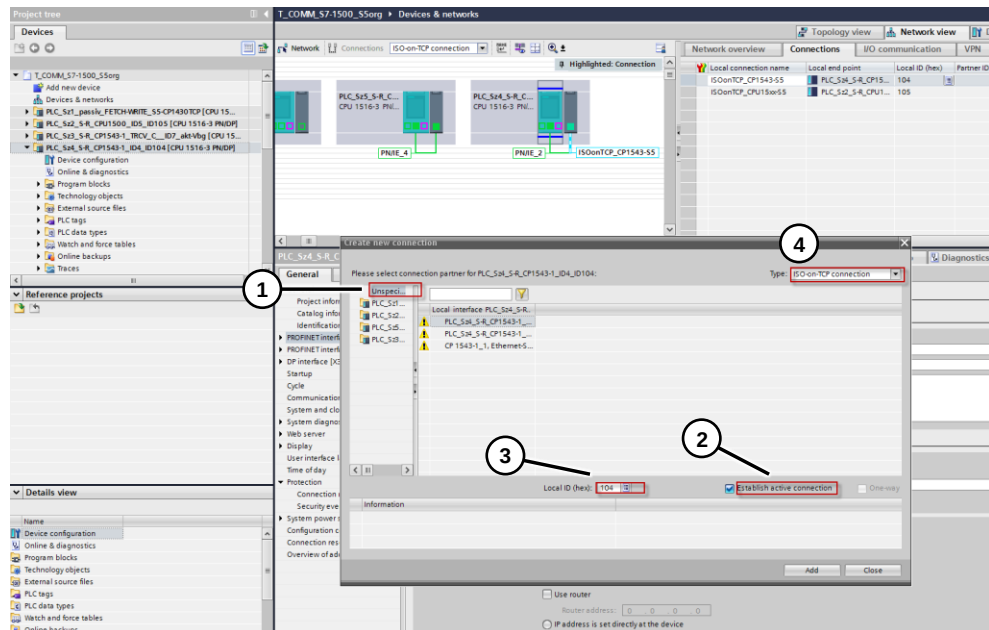
Configuration

In this scenario 4a, the connection is parameterized via a dialog in TIA Portal. The required connection parameter are pre-assigned and set up via a connection table in the S7-1500 CPU.

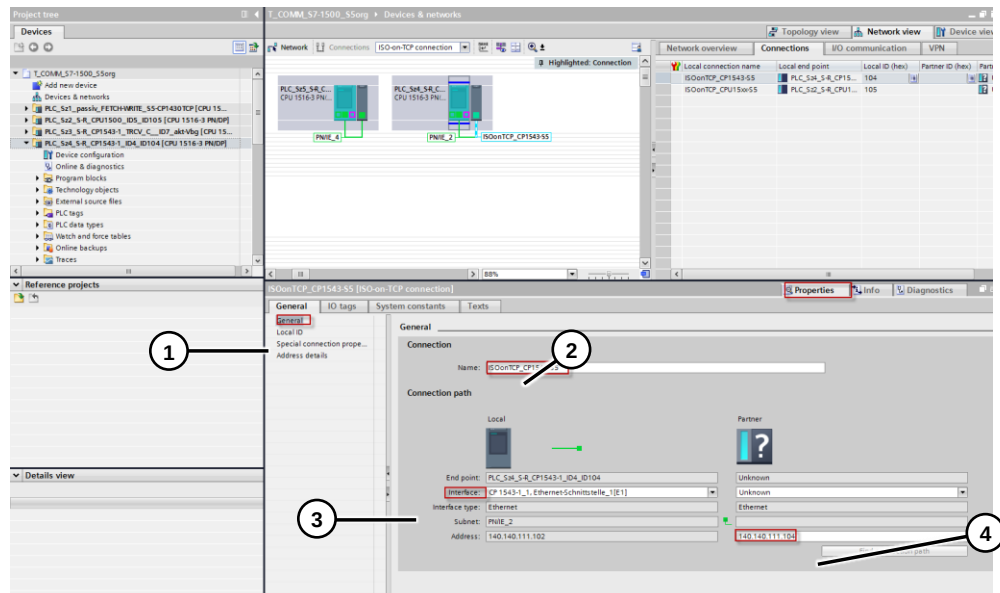
3. In the "Device configuration" **(1)** of the "PLC_Sz4..", open the "Network view" **(2)**. In the "Connections" tab **(3)**, select your CPU and use the "Insert" menu item or right-click to add a new connection.



4. Now, under "Unspecified" (1), enter "104" as "Local ID" (2). Tick the "Establish active connection" option (3) to enable this connection property. Under "Type" (4), select "ISO-on-TCP connection" and confirm your settings by clicking the "Close" button.



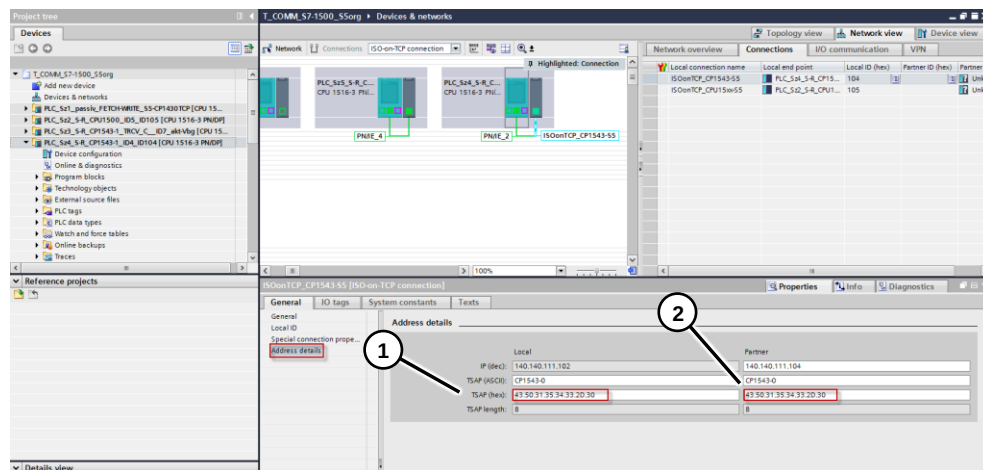
5. In the "Properties" of the ISO-on-TCP connection, go to "General" (1) to assign the name of the connection. In this example, "ISO-on-TCP_CP1543-S5" is set (2). Make sure that the CP1543-1 Ethernet interface E1 of the CP1543-1 is set for the "Interface" parameter (3). Now, in the "Partner" section (4), enter the IP address (IP: 140.140.111.104) of the SIMATIC S5 CP1430 TCP (5).



6. Under "Address details", enter the local **(1)** and "remote" **(2)** TSAPs for the ISO-on-TCP connection. The TSAPs have been taken from the configuration of the CP1430 TCP (see chapter 2.2.5) as follows.

local TSAP : "CP1543-0"

remote TSAP : "CP1543-0"



After having completed the settings for this ISO-on-TCP connection, the project has to be compiled again. To do this, select the S7 station, store it and thus compile this S7 station.

2.6.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

The following settings are used to establish a **"passive"** ISO-on-TCP DUPLEX connection to the CP1543-1.

Note

The CP1430 TCP configuration file "**TCP1430A.TCP**" already contains the complete configurations for all 6 example scenarios. Thus, after loading the CP1430 file, all other connections are also available "offline" in the CP1430 TCP.

Configuration

The "passive" connection for scenario 2a in the CP1430 TCP is created using the "SINEC NCM COM 1430 TCP" configuration tool.

Note

The "SINEC NCM COM 1430" configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

The connection configuration is largely identical to chapter [2.2.5](#). Follow the steps 1 to 8 described in that chapter and complete the configuration following the steps described below.

9. For this example (scenario 4a), two ISO-on-TCP connections (transport connections RFC 1006) are required.
To set up the "passive" connection, the job "1 of 2" must be parameterized as a RECEIVE type. In the subsequent mask of the job, the TSAP "CP1543-0" is entered. The job "2 of 2" must be set up as a SEND job type.

Enter

- for the passive ISO-on-TCP connection under **(1)** the job number ANR "3",
- under **(2)** the job type: "RECEIVE",
- under "Transport addresses" **(3)** the local TSAP "CP1543-0" and under **(4)** the remote TSAP "CP1543-0",
- under "Number of jobs per TSAP" **(5)** "1 of 2".

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE> COM1430TCP/IP U2.07 <EXIT>

SSNR offset : 0 ANR : 3 (1)

Job type : RECEIVE (2) Active/passive <A/P> : P

Read/write <Y/N> : N TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 1 of 2 (5)

Transport addresses:

Loc. parameters:

TSAP <ASC> : CP1543-0 (3)

TSAP <HEX> : 43 50 31 35 34 33 2D 30

TSAP length: 8

Rem. parameters:

Hostname : CPU1500

IP address : 140.140.111.102

TSAP <ASC> : CP1543-0 (4)

TSAP <HEX> : 43 50 31 35 34 33 2D 30

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP SELECT

10. Now, create job 2 of 2 with "+1" (F1).

Enter

- under **(1)** the job number ANR with "103",
- under **(2)** the job type: "SEND".
- Click on "OK" (F7) to confirm the settings.

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE> COM1430TCP/IP U2.07 <EXIT>

SSNR offset : 0 ANR : 103 (1)

Job type : SEND (2) Active/passive <A/P> : P

Read/write <Y/N> : N TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 2 of 2

Transport addresses:

Loc. parameters:

TSAP <ASC> : CP1543-0

TSAP <HEX> : 43 50 31 35 34 33 2D 30

TSAP length: 8

Rem. parameters:

Hostname : CPU1500

IP address : 140.140.111.102

TSAP <ASC> : CP1543-0

TSAP <HEX> : 43 50 31 35 34 33 2D 30

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP SELECT

2.7 Scenario 4b – Communication via programmed OUC (single instructions) and CP1543-1

2.7.1 Mode of operation

Overview

In this scenario, the SIMATIC S5 **actively** establishes an ISO-on-TCP connection to the S7-1500 CPU via the CP1430 TCP using the CP1543-1.

On the S7-1500 CPU end, the **programmed** connection is set up **passively** via the OUC block **TCON** by the user program and is available for establishing the connection of the partner. The data then are sent and received via the blocks **TSEND** and **TRCV**.

For this connection, the SIMATIC S5 uses the standard handling blocks **SYNCHRON/SEND/RECEIVE**. In the CP1430 TCP, the ISO-on-TCP connection in the SIMATIC S5 is configured as an "active" duplex connection.

Note

This scenario 4b is almost identical to scenario 2b. For this reason, please refer to the corresponding sections of scenario 2 (chapter 2.4) in case of identical chapters.

Sequence of the parameterized OUC communication between S7 and S5 via single instructions and CP1543-1

The figure below schematically shows the connection established and the data flow between SIMATIC S5 and SIMATIC S7-1500 using the programmed SEND and RECEIVE mechanism via ISO-on-TCP.

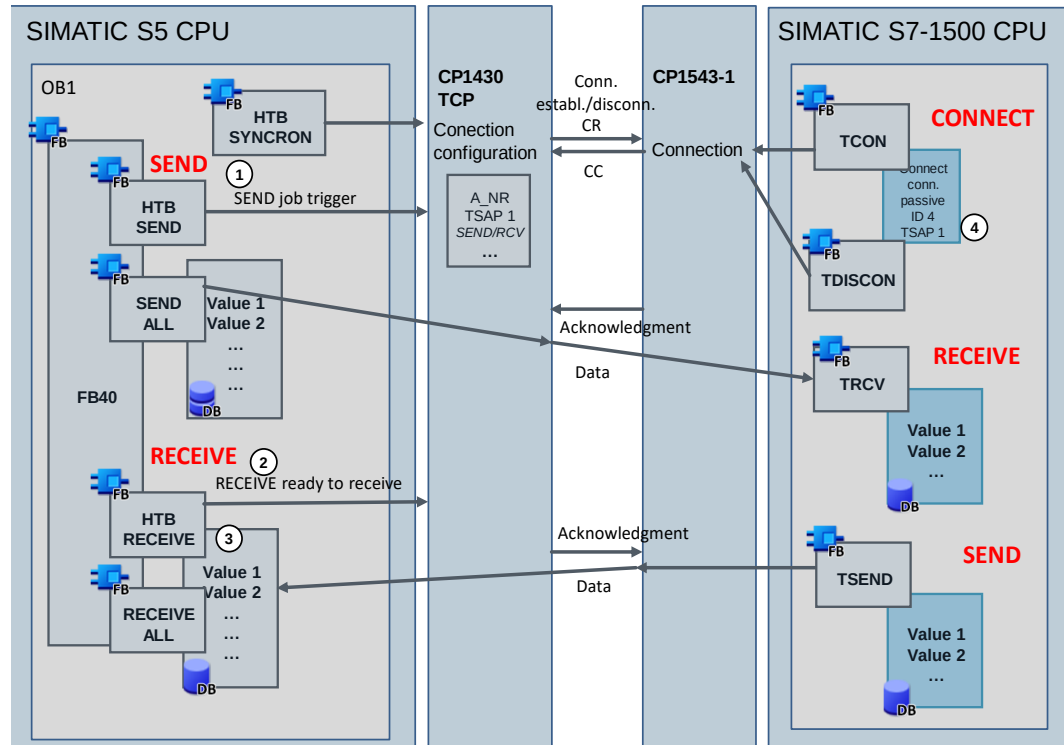


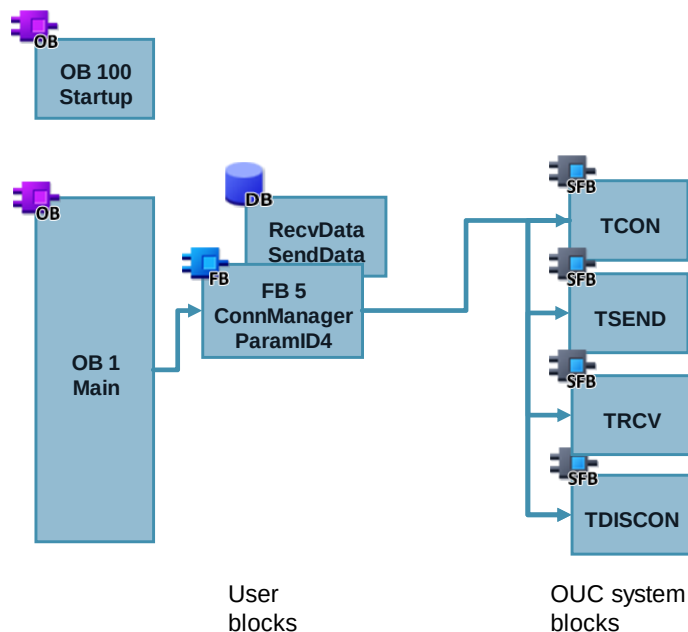
Table 2-19

No.	Process
1	Startup of the SIMATIC S5 and synchronization with the CP1430 TCP.
2	The cyclic processing of the HTB RECEIVE block in the S5-CPU ensures readiness to receive between the CPU and the CP1430 TCP. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.
3	The SIMATIC S5 transfers the SEND job to the CP1430 TCP via HTB SEND. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
4	The received data are transferred to the S7-1500 CPU via the cyclic processing of the OUC block TRCV. If the data have been received successfully, this is shown by a positive acknowledgment and signaled at block parameter NDR. Otherwise, a negative acknowledgment will be sent for the job.
5	A SEND job is sent from the S7-1500 CPU to the SIMATIC S5 via the OUC block TSEND. In this scenario, the block sends a job to the SIMATIC S5 CP1430 TCP every second. In the S5-CPU, the data are transferred via the standard HTBs RECEIVE and RECEIVE ALL.

2.7.2 Communication program in the SIMATIC S7-1500

Overview

The following blocks contain the communication program in the S7-1500 CPU.



Function

A programmed OUC communication is set up passively by calling the OUC communication block TCON. In this case, the connection is established actively from the SIMATIC S5. As soon as the connection is established, the data are exchanged via the OUC communication blocks TSEND and TRCV.

To detect the ongoing data communication in the S7-1500, a count value is received by the SIMATIC S5, mirrored and sent back. For visualization, the received count value is transferred to the output area AB0.

Description of the blocks

Table 2-20

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
FB 5	ConnManagerProglD4	Management of connection ID 4
DB 29	InstConnManagerProglD4	Instance DB of FB 4 (+send/receive data area)
DB 25	ConnectParamID4	Connect parameter ID4
DB 24	InstTCONID4	Instance DB TCON ID 4
DB 28	InstTDISCONID4	Instance DB TDISCON ID 4
DB 26	InstTSENDID4	Instance DB TSEND ID 4
DB 27	InstTRCVID4	Instance DB TRCV ID 4

OB 100 (startup OB)

After having restarted the S7-1500 CPU, the connect enable bit "statConnID4" is reset. It has the effect that a passively programmed connection is set up in the cyclic program.

OB 1 (cyclic OB)

Via the enable input "E 0.2" (abortReq), the OB1 calls FB 5 which manages the OUC communication.

FB 5 (TSEND/TRCV management)

In FB 5, it is checked via the connect enable bit whether the CPU is restarted. If this is the case, the passive ISO-on-TCP connection is set up via the OUC block TCON.

If the connection has been established successfully, the data are received by the SIMATIC S5 via the cyclically called OUC communication block TRCV. To visualize the ongoing communication, a count value is copied to an output area (AB 0) of the S7-1500.

The count value received by the SIMATIC S5 is located in the instance data block of FB5 in the static tag "statRcvData" and is copied to the send area of the instance data block "statSendData" for sending.

Via a send enable "E0.1", these data are mirrored and sent back to the SIMATIC S5 every of 500 ms.

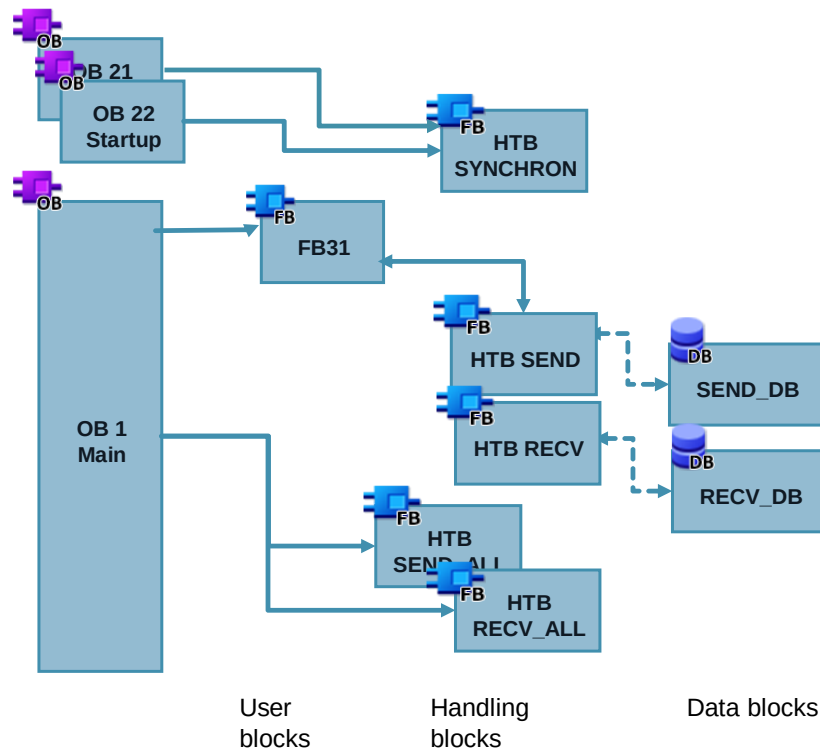
In addition, the received data are checked.

- The data are cyclically checked for a deletion identifier ("A1A1") being available. In case of a match, the count value is reset.
- The ongoing communication of the OUC communication is visualized via the output area of the S7-1500.

2.7.3 Communication program SIMATIC S5

Overview

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 sends and receives data via an **active** ISO-on-TCP connection. The connection is established from the SIMATIC S5.



Function

Via the connection actively established by the SIMATIC S5, data are sent bidirectionally with a count value to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

In case of the SIMATIC S5 CPU being restarted, a deletion identifier is sent to the S7-1500 and the count value is reset.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-21

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program call of FB 33 and of the HTBs SEND/RECEIVE ALL

Block	Symbol	Description
FB 31	ID4_S7	Time-triggered call of the send and receive functions via S5 handling blocks (HTBs). Increase of count value in the data
FB244	HTB_SEND	Handling block SEND (-All A-NR:= 0)
FB245	HTB_RECEIVE	Handling block RECEIVE (-All A-NR:= 0)
FB249	HTB_SYNCHRON	Handling block SYNCHRON
DB 61	-	Data area for sending
DB 51	-	Data area for receiving

OB21/OB22 (STARTUP OBs)

The following functions are implemented in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 190.5**) resets the initial count value.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- This example scenario 4b is started via the enable bit (**M 130.1**).
- Call of the user communication block ID4_S7 (**FB 31**) which calls the send and receive functions via S5 handling blocks (HTBs) and increments the count values in the data area.
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB31 (ID4_S7CP)

The function block FB 31 contains the time-triggered call of the send and receive functions in which a simple simulation program demonstrates the exchange of data.

- An enable of the communication is initiated via the startup bit **M 190.5** (OB21/22).
- After the data have been received, this count value is checked in the S7-1500, incremented by +1 and sent back to the SIMATIC S5 at the next send trigger of the S7-1500. The data received by the SIMATIC S5 are transferred to DB101.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.
HTB_SEND block: ANZW: **MW65** PAFE: **MB69**
HTB_RECEIVE block: ANZW: **MW55** PAFE: **MB59**

2.7.4 Connection configuration in the S7-1500 CPU

Prerequisite

All network-side settings of the S7-1500 CPU and of the CP1543-1 used in TIA Portal are structured identically for all scenarios.

For the corresponding configuration steps, proceed as described in chapter [2.2.4](#) steps 1 and 2 of scenario 1 and complete the configuration following the steps described in the next section.

Configuration

For configuring a "parameterized" ISO-on-TCP connection via a S7-1500 CPU, the following settings in TIA Portal are required. Make corresponding hardware and network settings as described in example scenario 1.

3. Create a data block and add a tag of data type "TCON_IP_RFC". The default settings for scenario 4b have to be parameterized as follows.
 - Enter the module address of the CP1543-1 (in this case: 264) for the "Interfaceld" tag **(1)**.
 - Enter the connection number (in this case: 4) for the "ID" tag **(2)**.
 - The value "16#0C" of the "ConnectionType" tag **(3)** defines the connection type "ISO-on-TCP".
 - Enter the value "false" for the "ActiveEstablished" tag **(4)** to define the passive connection establishment of the S7-1500 station.
 - Enter the IP address of the partner (in this case: of the CP1430 TCP) in the "RemoteAddress" field **(5)**.
 - Enter the remote TSAP (in this case: 43 50 31 35 34 33 2D 31 (hex) "CP1543-1" (ASC)) and the local TSAP (in this case: 43 50 31 35 34 33 2D 31 (hex) "CP1543-1" (ASC)) in the fields "RemoteTSelector" **(6)** and "LocalTSelector" **(7)**, respectively.

Figure 2-2

CP1543_ISOonTCP_conn_program_Verbg_ID4									
	Name	Datentyp	Startwert	Erreichbar a...	Sichtbar i...	Einstellwert	Kommentar		
1	Static								
2	Static_1	TCON_IP_RFC							
3	Interfaceld	HW_ANY	264				HW-identifier of IE-interface submodule		
4	ID	CONN_OUC	4				connection reference / identifier		
5	ConnectionType	Byte	16#0C				type of connection: 12= ISO-on-TCP (18=ISO-o...		
6	ActiveEstablished	Bool	false				active/passive connection establishment		
7	RemoteAddress	IP_V4					remote IP address (IPv4)		
8	ADDR	Array[1..4] of Byte					IPv4 address		
9	ADDR[1]	Byte	140				IPv4 address		
10	ADDR[2]	Byte	140				IPv4 address		
11	ADDR[3]	Byte	111				IPv4 address		
12	ADDR[4]	Byte	104				IPv4 address		
13	RemoteTSelector	TSelector					remote transport selector		
14	TSelectorLength	UInt	8				length of TSelector		
15	TSelector	Array[1..32] of Byte					Tselector array		
16	LocalTSelector	TSelector					local transport selector		
17	TSelectorLength	UInt	8				length of TSelector		
18	TSelector	Array[1..32] of Byte					Tselector array		

7	RemoteAddress	IP_V4		☐	☒	☒	☐	remote IP address (IPv4)
8	RemoteTSelector	TSelector		☐	☒	☒	☐	remote transport selector
9	TSelLength	UInt	8	☐	☒	☒	☐	length of TSelector
10	TSel	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
11	TSel[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
12	TSel[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
13	TSel[3]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
14	TSel[4]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
15	TSel[5]	Byte	B#16#34	☐	☒	☒	☐	Tselector array
16	TSel[6]	Byte	B#16#33	☐	☒	☒	☐	Tselector array
17	TSel[7]	Byte	B#16#20	☐	☒	☒	☐	Tselector array
18	TSel[8]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
19	TSel[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
20	TSel[10]	Byte	16#0	☐	☒	☒	☐	Tselector array

9	LocalTSelector	TSelector		☐	☒	☒	☐	local transport selector
10	TSelLength	UInt	8	☐	☒	☒	☐	length of TSelector
11	TSel	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
12	TSel[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
13	TSel[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
14	TSel[3]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
15	TSel[4]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
16	TSel[5]	Byte	B#16#34	☐	☒	☒	☐	Tselector array
17	TSel[6]	Byte	B#16#33	☐	☒	☒	☐	Tselector array
18	TSel[7]	Byte	B#16#20	☐	☒	☒	☐	Tselector array
19	TSel[8]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
20	TSel[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
21	TSel[10]	Byte	16#0	☐	☒	☒	☐	Tselector array

2.7.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

The following settings are used to establish an **"active"** ISO-on-TCP DUPLEX connection to the CP1543-1.

Note

The CP1430 TCP configuration file **"TCP1430A.TCP"** already contains the complete configurations for all 6 example scenarios. Thus, after loading the CP1430 file, all other connections are also available **"offline"** in the CP1430 TCP.

Configuration

The **"active"** connection for scenario 4b in the CP1430 TCP is created using the **"SINEC NCM COM 1430 TCP"** configuration tool.

Note

The **"SINEC NCM COM 1430"** configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

The connection configuration is largely identical to chapter [2.2.5](#). Follow the steps 1 to 8 described in that chapter and complete the configuration following the steps described below.

- For this example (scenario 4b), two ISO-on-TCP connections (transport connections RFC 1006) are required.
To set up the **"active"** connection, the job **"1 of 2"** must be parameterized as a SEND type. In the subsequent mask of the job, the TSAP **"CP1543-1"** has to be entered. The job **"2 of 2"** must be set up as a RECEIVE job type.

Enter

- for the passive ISO-on-TCP connection under **(1)** the job number ANR "102",
- under **(2)** the job type: "SEND",
- under "Transport addresses" **(3)** the local TSAP "CP1543-1" and under **(4)** the remote TSAP "CP1543-1",
- under "Number of jobs per TSAP" **(5)** "1 of 2".
- under the "Active/passive" parameter **(6)** the connection establishment "A" (active).

STEP 5

COM1430TCP/IP U2.07 <EXIT>

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE>

SSNR offset : 0 ANR : 102 (1)

Job type : SEND (2) Active/passive <A/P> : A

Read/write <Y/N> : N TCP Keep-alive <Y/N> : Y

Number of jobs per TSAP : 1 of 2 (5)

Transport addresses:

Loc. parameters:

TSAP <ASC> : CP1543-1 (3)

TSAP <HEX> : 43 50 31 35 34 33 2D 31

TSAP length: 8

Rem. parameters:

Hostname : CPU1500

IP address : 140.140.111.102 (4)

TSAP <ASC> : CP1543-1

TSAP <HEX> : 43 50 31 35 34 33 2D 31

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP

10. Now, create job 2 of 2 with "+1" (F1).

Enter

- under **(1)** the job number ANR with "2",
- under **(2)** the job type: "RECEIVE".
- Click on "OK" (F7) to confirm the settings.

STEP 5

COM1430TCP/IP U2.07 <EXIT>

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE>

SSNR offset : 0 ANR : 2 (1)

Job type : RECEIVE (2) Active/passive <A/P> : A

Read/write <Y/N> : N TCP Keep-alive <Y/N> : Y

Number of jobs per TSAP : 2 of 2

Transport addresses:

Loc. parameters:

TSAP <ASC> : CP1543-1

TSAP <HEX> : 43 50 31 35 34 33 2D 31

TSAP length: 8

Rem. parameters:

Hostname : CPU1500

IP address : 140.140.111.102

TSAP <ASC> : CP1543-1

TSAP <HEX> : 43 50 31 35 34 33 2D 31

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP

2.8.1 Mode of operation

This scenario presents a variant of the OUC communication, in which the S7-1500 station uses the compact OUC block **"TSEND_C"** to send data to the SIMATIC S5. In this case, the receipt of the data is implemented via the standard OUC block **TRCV**.

For this connection, the SIMATIC S5 uses the standard handling blocks SYNCHRON/SEND/RECEIVE. In the CP1430 TCP, the ISO-on-TCP connection in the SIMATIC S5 is configured as a "passive" duplex connection.

The figure below schematically shows the connection established and the data flow between SIMATIC S5 and SIMATIC S7-1500 using the programmed SEND and RECEIVE mechanism via ISO-on-TCP.

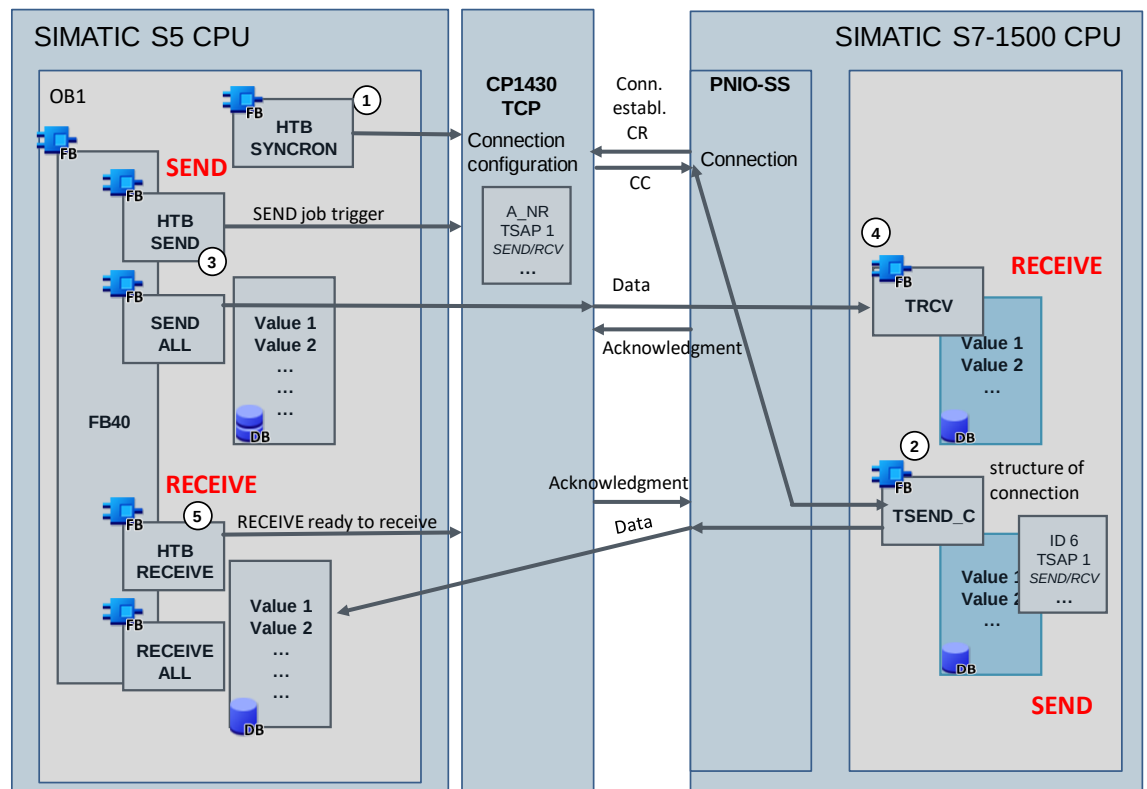


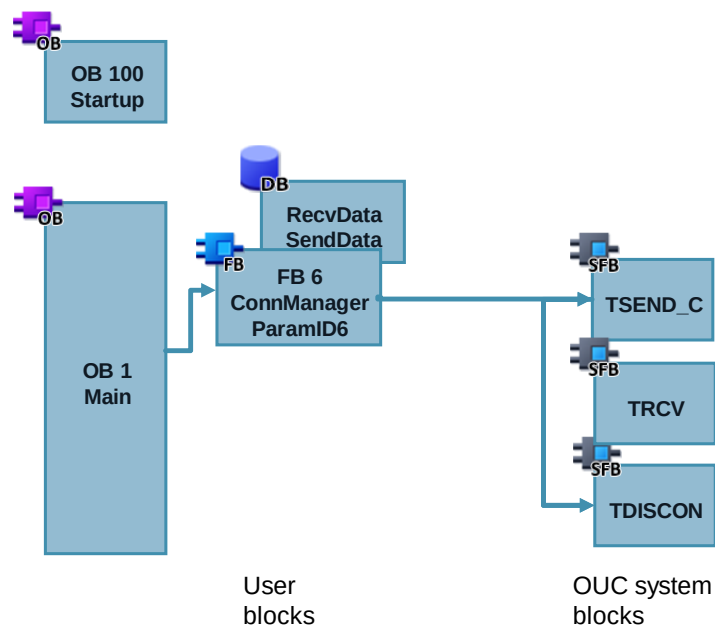
Table 2-22

No.	Process
1	Startup of the SIMATIC S5 and synchronization with the CP1430 TCP.
2	The job trigger of the OUC block TSEND_C is performed every second. With the first triggering, the block establishes an active connection. If the connection has been established successfully, the data are sent to the SIMATIC S5. The connection remains established.
3	The SIMATIC S5 transfers the SEND job to the CP1430 TCP via HTB SEND. The data are transferred from the SIMATIC S5-CPU (data block) to the CP1430 TCP via the SEND ALL handling block.
4	The received data are transferred to the S7-1500 CPU via the cyclic processing of the OUC block TRCV. If the data have been received successfully, this is shown by a positive acknowledgment and signaled at block parameter NDR. Otherwise, a negative acknowledgment will be sent for the job.
5	The cyclic processing of the HTB RECEIVE block in the S5-CPU ensures readiness to receive between the CPU and the CP1430 TCP. The data are transferred from the CP1430 TCP to the data block of the SIMATIC S5-CPU via the RECEIVE ALL handling block.

2.8.2 Communication program in the SIMATIC S7-1500

The following blocks contain the communication program in the S7-1500 CPU.

Overview



Function

The OUC block TSEND_C is used to **actively** establish a connection via the integrated PNIO interface of the CPU by calling the FB 6 (ConnManagerParamID6). As soon as the connection is established, the data are exchanged via the communication blocks TSEND_C and TRCV.

Via the connection, data are sent bidirectionally with a count value from the SIMATIC S5 to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

Note

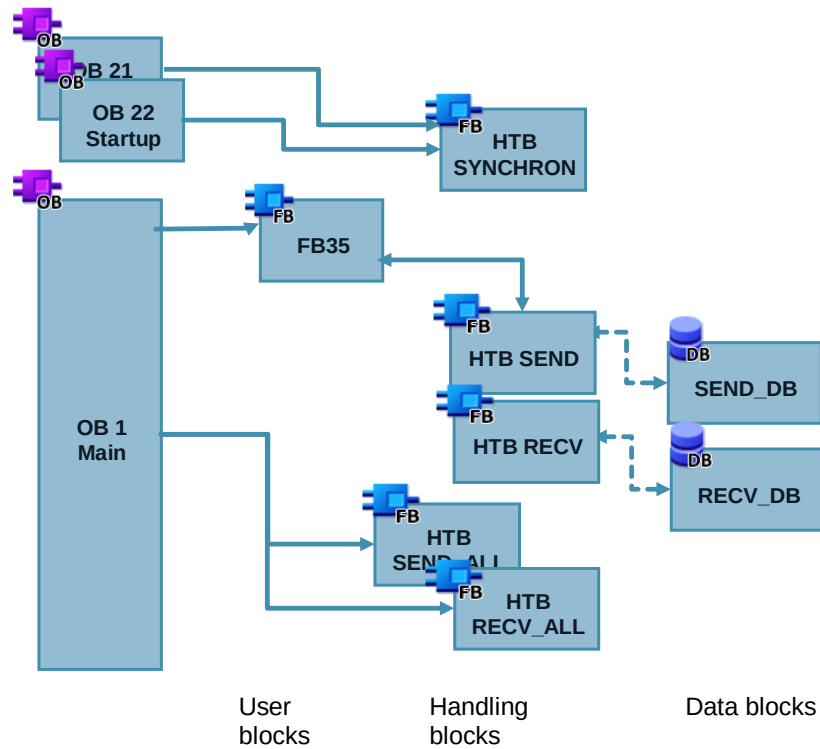
The mixed variant of the OUC blocks TSEND_C (compact instruction) and TRCV (single instruction) used in this example scenario is recommended, if only one connection ID shall be used for sending and receiving the data. Further details and information concerning this mixed operation are given in the following entry ([109479564](#)).

Block	Symbol	Description
OB 100	Startup	Startup OB
OB 1	Main	Cyclic OB
FB 6	ConnManagerProglD6	Management TSEND_C ID 6
DB 35	InstConnManagerProglD6	
DB 25	ConnectParamID6	Connect parameter ID 6
DB 4	InstTSEND_C_ID6	Instance DB TSEND_C ID 6
DB 3	InstTRCV_ID6	Instance DB TRCV ID 6
DB 100	ParaDbID6_TSEND_C	Parameter DB TSEND_C
DB 200	ParaDbID6_TRCV	Parameter DB TRCV
DB 110	DataTSEND_C	Send data area
DB 210	DataTRCV	Receive data area

2.8.3 Communication program SIMATIC S5

Overview

The following blocks contain the communication program of the S5-CPU. In this scenario, the S5 sends and receives data via a **passive** ISO-on-TCP connection. The connection is established from the S7-1500 CPU.



Function

Via the connection actively established by the S7-1500 CPU, data are sent bidirectionally with a count value from the SIMATIC S5 to the S7-1500 every second. From there, this count value is mirrored and sent back. After the data have been received, this count value is increased by +1 and sent again.

In case of the SIMATIC S5 CPU being restarted, a deletion identifier is sent and the count value is reset.

Description of the blocks

The following blocks contain the communication program of the S5-CPU.

Table 2-23

Block	Symbol	Description
OB 21	Startup_OB21	Startup OB (restart/warm start)
OB 22	Startup_OB22	Startup OB (network/cold start)
OB 1	Main	User program call of FB 33 and of the HTBs SEND/RECEIVE ALL
FB 35	ID6_S7	Time-triggered call of the send and receive functions via S5 handling blocks (HTBs). Increase of count value in the data

Block	Symbol	Description
FB244	HTB_SEND	Handling block SEND (-All A-NR:= 0)
FB245	HTB_RECEIVE	Handling block RECEIVE (-All A-NR:= 0)
FB249	HTB_SYNCHRON	Handling block SYNCHRON
DB 110	-	Data area for sending
DB 111	-	Data area for receiving

OB21/OB22 (STARTUP OBs)

The following functions are implemented in the startup of the SIMATIC S5-CPU:

- The set interface (interface no. = 0) of the CP1430 TCP is initialized and synchronized via the handling block "HTB_Synchron" (FB 249).
- An internal startup bit (**M 160.5**) resets the initial count value.

OB1 (cyclic OB)

The following functions are processed in the cyclic OB1 of the SIMATIC S5-CPU:

- This example scenario 5 is started via the enable bit (**M 130.6**).
- Call of the user communication block ID6_S7 (**FB 35**) which calls the send and receive functions via S5 handling blocks (HTBs) and increments the count values in the data area.
- Call of the handling blocks SEND ALL and RECEIVE ALL for data transfer to the CP1430 TCP.

FB35 (ID6_S7)

The function block FB 35 contains the time-triggered call of the send and receive functions in which a simple simulation program demonstrates the exchange of data.

- Communication is initiated via the startup bit **M 160.5** (OB21/22) and the enable bit (**M 130.6**).
- Every second (clock memory bit), a count value (DB110) is sent to the S7-1500 CPU via the ISO-on-TCP connection.
- After the data have been received, this count value is checked in the S7-1500, incremented by +1 and sent back to the SIMATIC S5 at the next send trigger of the S7-1500. The data received by the SIMATIC S5 are transferred to DB101.
- A simple error analysis regarding the connection status is done by storing the indicator words and parameter error bytes.

HTB_SEND block: ANZW: **MW100** PAFE: **MB104**

HTB_RECEIVE block: ANZW: **MW115** PAFE: **MB119**

2.8.4 Connection configuration in the S7-1500 CPU

Prerequisites

All network-side settings of the S7-1500 CPU and of the CP1543-1 used in TIA Portal are structured identically for all scenarios.

For the corresponding configuration steps, proceed as described in chapter [2.2.4](#) steps 1 and 2 of scenario 1 and complete the configuration following the steps described in the next section.

Configuration

In this scenario 5, all required connection parameters of an ISO-on-TCP connection are pre-assigned and set up via the user program.

The CONNECT parameter of the OUC block TSEND_C is used to configure the predefined structure (TCON_IP_RFC) of an ISO-on-TCP connection as follows.

3. Create a data block and add a tag of data type "TCON_IP_RFC". The default settings for scenario 3 have to be parameterized as follows.
 - Enter the module address of the S7-1500 CPU (in this case: 64) for the "Interfaceld" tag **(1)**.
 - Enter the connection number (in this case: 6) for the "ID" tag **(2)**.
 - The value "16#0C" of the "ConnectionType" tag **(3)** defines the connection type "ISO-on-TCP".
 - Enter the value "true" for the "ActiveEstablished" tag **(4)** to define the active connection establishment of the S7-1500 station.
 - Enter the IP address of the partner (in this case: of the CP1430 TCP) in the "RemoteAddress" field **(5)**.
 - Enter the remote TSAP (in this case: 43 50 55 5F 31 35 30 63 (hex) "CPU_150c" (ASC)) and the local TSAP (in this case: 43 50 55 5F 31 35 30 63 (hex) "CPU_150c" (ASC)) in the fields "RemoteTSelector" **(6)** and "LocalTSelector" **(7)**, respectively.

CPU_ISOonTCP_ConDB_prog_Verbg_TSEND_C_ID6									
	Name	Datentyp	Startwert	Remanent	Erreichbar a...	Sichtbar i...	Einstellwert	Kommentar	
1	Static								
2	6	TCON_IP_RFC							
3	Interfaceld	HW_ANY	64					HWIdentifier of IE-interface submodule	
4	ID	CONN_OUC	6					connection reference / identifier	
5	ConnectionType	Byte	16#0C					type of connection: 12= ISO-on-TCP (18=ISO-o...	
6	ActiveEstablished	Bool	true					active/passive connection establishment	
7	RemoteAddress	IP_V4						remote IP address (IPv4)	
8	ADDR	Array[1..4] of Byte						IPv4 address	
9	ADDR[1]	Byte	140					IPv4 address	
10	ADDR[2]	Byte	140					IPv4 address	
11	ADDR[3]	Byte	111					IPv4 address	
12	ADDR[4]	Byte	104					IPv4 address	
13	RemoteTSelector	TSelector						remote transport selector	
14	LocalTSelector	TSelector						local transport selector	
15	RemoteAddress	IP_V4						remote IP address (IPv4)	
16	RemoteTSelector	TSelector						remote transport selector	
17	TSelLength	UInt	8					length of TSelector	
18	TSel	Array[1..32] of Byte						Tselector array	
19	TSel[1]	Byte	B#16#43					Tselector array	
20	TSel[2]	Byte	B#16#50					Tselector array	
21	TSel[3]	Byte	B#16#55					Tselector array	
22	TSel[4]	Byte	B#16#5F					Tselector array	
23	TSel[5]	Byte	B#16#31					Tselector array	
24	TSel[6]	Byte	B#16#35					Tselector array	
25	TSel[7]	Byte	B#16#30					Tselector array	
26	TSel[8]	Byte	B#16#63					Tselector array	
27	TSel[9]	Byte	16#0					Tselector array	
28	TSel[10]	Byte	16#0					Tselector array	

9	LocalTSelector	TSelector		☐	☒	☒	☐	local transport selector
10	TSelectorLength	UInt	8	☐	☒	☒	☐	length of TSelector
7	TSel	Array[1..32] of Byte		☐	☒	☒	☐	Tselector array
11	TSel[1]	Byte	B#16#43	☐	☒	☒	☐	Tselector array
12	TSel[2]	Byte	B#16#50	☐	☒	☒	☐	Tselector array
13	TSel[3]	Byte	B#16#55	☐	☒	☒	☐	Tselector array
14	TSel[4]	Byte	B#16#5F	☐	☒	☒	☐	Tselector array
15	TSel[5]	Byte	B#16#31	☐	☒	☒	☐	Tselector array
16	TSel[6]	Byte	B#16#35	☐	☒	☒	☐	Tselector array
17	TSel[7]	Byte	B#16#30	☐	☒	☒	☐	Tselector array
18	TSel[8]	Byte	B#16#63	☐	☒	☒	☐	Tselector array
19	TSel[9]	Byte	16#0	☐	☒	☒	☐	Tselector array
20	TSel[10]	Byte	16#0	☐	☒	☒	☐	Tselector array
21				☐	☒	☒	☐	

2.8.5 Connection configuration in the CP1430 TCP (SIMATIC S5)

Introduction

Make the following settings to establish a "**passive**" ISO-on-TCP DUPLEX connection to a S7-1500 CPU with an integrated PROFINET interface.

Note The CP1430 TCP configuration file "**TCP1430A.TCP**" already contains the complete configurations for all 7 example scenarios. Thus, after loading the CP1430 file, all other connections are also available "offline" in the CP1430 TCP.

Configuration

The "**passive**" connection for scenario 5 in the CP1430 TCP is created using the "SINEC NCM COM 1430 TCP" configuration tool.

Note The "SINEC NCM COM 1430" configuration tool is an additional software that is integrated in STEP 5 to configure the CP1430 TCP. This software is not included in the standard STEP 5 package and must be installed additionally.

The connection configuration is largely identical to chapter 2.2.5 Connection configuration in the CP1430 TCP (SIMATIC S5)". Follow the steps 1 to 8 described in that chapter and complete the configuration following the steps described below.

- For this example, two ISO-on-TCP connections (transport connections RFC 1006) are required.
To set up the "passive" connection, the job "1 of 2" must be parameterized as a RECEIVE type. In the subsequent mask of the job, the TSAP "**CPU_150c**" has to be entered. The job "2 of 2" must be set up as a SEND job type.

Enter

- for the passive ISO-on-TCP connection under **(1)** the job number ANR "53",
- under **(2)** the job type: "RECEIVE",
- under "Transport addresses" **(3)** the local TSAP "CPU_150c" and under **(4)** the remote TSAP "CPU_150c",
- under "Number of jobs per TSAP" **(5)** "1 of 2".

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE>

SSNR offset : 0 ANR : 53 (1)

Job type : RECEIVE (2) Active/passive <A/P> : P

Read/write <Y/N> : N TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 1 of 2 (5)

Transport addresses:

Loc. parameters:

TSAP <ASC> : CPU_150c (3)

TSAP <HEX> : 43 50 55 5F 31 35 30 63

TSAP length: 8

Rem. parameters:

Hostname : CP1543

IP address : 140.140.111.103

TSAP <ASC> : CPU_150c (4)

TSAP <HEX> : 43 50 55 5F 31 35 30 63

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP/SELECT

10. Now, create job 2 of 2 with "+1" (F1).

Enter

- under **(1)** the job number ANR with "153",
- under **(2)** the job type: "SEND".
- Click on "OK" (F7) to confirm the settings.

STEP 5

Transport Connection <TCP/RFC1006> Source: C:\TCP1430A.TCP <OFFLINE>

SSNR offset : 0 ANR : 153 (1)

Job type : SEND (2) Active/passive <A/P> : P

Read/write <Y/N> : N TCP Keep-Alive <Y/N> : Y

Number of jobs per TSAP : 2 of 2

Transport addresses:

Loc. parameters:

TSAP <ASC> : CPU_150c

TSAP <HEX> : 43 50 55 5F 31 35 30 63

TSAP length: 8

Rem. parameters:

Hostname : CP1543

IP address : 140.140.111.103

TSAP <ASC> : CPU_150c

TSAP <HEX> : 43 50 55 5F 31 35 30 63

TSAP length: 8

1 + 1 2 - 1 3 INPUT 4 DELETE 5 6 7 OK 8 HELP/SELECT

2.9 Commissioning

2.9.1 Overview of the communication relations

The example programs are designed in such a way that **all** example scenarios are completely included in the S5 project. They can be enabled or disabled via enable bits. The following overview shows how all communication resources and the enable bits are assigned to the corresponding scenarios in the SIMATIC S5-CPU.

Table 2-24

Scenario	SIMATIC S5			SIMATIC S7		
	S5 block FB	S5 enable bit	CP1430 TCP A-NR	Local / remote TSAPs	OUC interface	Local connection ID
1	FB 40	M 130.5	FETCH: 113 WRITE: 114	CP1543-F CP1543-W	- -	- -
2a	FB 33	M 130.3	SEND: 133 RCV: 33	CPU_150a CPU_150a	TSEND/ TRCV	105
2b	FB 34	M 130.4	SEND: 143 RCV: 43	CPU_150b CPU_150b	TSEND/ TRCV	5
3	FB 32	M 130.2	SEND: 122 RCV: 22	CP1543-2 CP1543-2	TRCV_C/ TSEND	7
4a	FB 30	M 130.0	SEND: 103 RCV: 3	CP1543-0 CP1543-0	TSEND/ TRCV	104
4b	FB 31	M 130.1	SEND: 102 RCV: 2	CP1543-1 CP1543-1	TSEND/ TRCV	4
5	FB 35	M 130.6	SEND: 153 RCV: 53	CPU_150c CPU_150c	TSEND_C/ TRCV	6

2.9.2 Loading the S7-1500 programs

Prerequisites

The instructions for commissioning always refer to a fully reset S7-1500 station. If another example scenario is already loaded in the S7-1500, some other loading status messages might occur in TIA Portal. These will not be described here. For details, refer to the "Help" of TIA Portal.

In SIMATIC S7-1500, the example scenarios are always assigned to a configured station. For an overview of the assignment of the scenarios to the station names, refer to [Table 2-4](#) or [Table 2-28](#).

This chapter exemplarily describes how to download the S7-1500 station **"PLC_Sz1_F-W_S5-CP1430TCP"** for testing scenario 1 "Communication via FETCH/WRITE and CP1543-1".

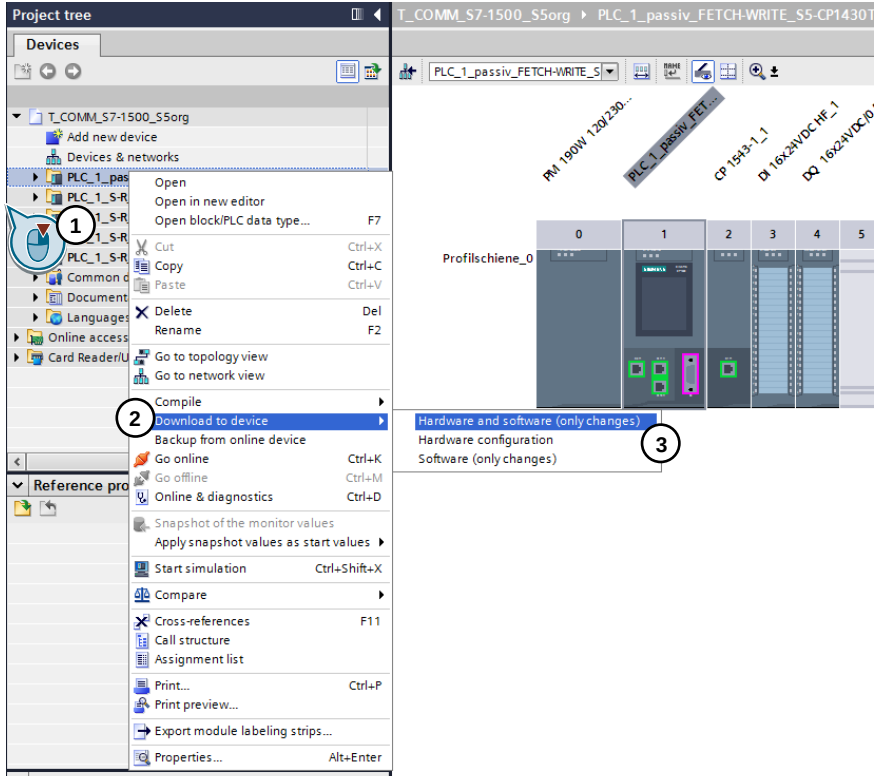
The procedure is completely identical for all other S7-1500 stations.

Commissioning the station

The table below shows how to commission the S7-1500 controller with the test project for scenario 1.

Table 2-25

No.	Action
1.	Unzip the "109482475_Comm_S71500_PROJ_v10.zip" file into a directory of your choice. This folder contains the TIA project for all connection scenarios. A programming device with the TIA Portal software or higher being installed is required.
2.	Open the STEP 7 project "T_COMM_S7-1500_S5org.apXX".
3.	In the overview of the TIA project, select the S7 station the connection scenario of which you want to use (for the overview see Table 2-4).

No	Action
4.	Now, load the respective station into your hardware. Right-click to select (1) the selected S7 station. Select the "Download to device" menu item (2) and then "Hardware and software" (3) to get to the "Transfer" screen.  The screenshot displays the SIMATIC Manager interface. On the left, the 'Project tree' shows a hierarchy with 'T_COMM_S7-1500_S5org' expanded, and 'PLC_1_passiv_FETCH-WRITE_S5-CP1430T' selected. A right-click context menu is open over this selection. Item (1) points to the selected PLC station in the tree. Item (2) points to the 'Download to device' option in the menu. Item (3) points to the 'Hardware and software (only changes)' option in the sub-menu. The background image shows a physical PLC rack with modules labeled: 'PM 190W 120/130...', 'PLC_1_passiv_FETCH-WRITE_S5-CP1430T', 'CP 1543-1_1', 'DI 16x24VDC HE 1', and 'DO 16x24VDC IO'.

No	Action
5.	(1) Set the "Type of the PG/PC interface" to "PNIE". (2) Select the network card of the local PG to which the S7-1500 is connected. (3) Under "Connection to interface/subnet", select the "PNIE_2" interface of the project. (4) Then, start searching for nodes by clicking "Start search". (5) Select the matching S7-1500 CPU that has been found and load the project into the station by clicking "Load".

The screenshot shows the 'Extended download to device' dialog box. It contains the following elements:

- Configured access nodes of "PLC_1_S-R_CP1543-1_ID4_ID104":** A table with columns: Device, Device type, Slot, Type, Address, Subnet.

Device	Device type	Slot	Type	Address	Subnet
PLC_1_S-R_CP1543-1...	CPU 1516-3 PN/DP	1 X3	PROFIBUS	2	
	CPU 1516-3 PN/DP	1 X1	PN/IE	140.140.111.103	PN/IE_2
	CPU 1516-3 PN/DP	1 X2	PN/IE	192.168.1.1	
CP 1543-1_1	CP 1543-1	2 X1	PN/IE	140.140.111.102	PN/IE_2
- Type of the PG/PC interface:** A dropdown menu set to 'PNIE' (circled 1).
- PG/PC interface:** A dropdown menu set to 'ASIX AX88179 USB 3.0 to Gigabit Ether...' (circled 2).
- Connection to interface/subnet:** A dropdown menu set to 'PNIE_2' (circled 3).
- 1st gateway:** A dropdown menu.
- Compatible devices in target subnet:** A table with columns: Device, Device type, Type, Address, Target device.

Device	Device type	Type	Address	Target device
plc_1_passiv_fetch-wri...	S7-1500 CP	PN/IE	140.140.111.102	PLC_1_passiv_FET...
PLC_1_passiv_FETCH-W...	CPU 1516-3 PN/DP	PN/IE	140.140.111.103	PLC_1_passiv_FET...
		PN/IE	Access address	
- Start search:** A button highlighted with a red box and a circled number 4.
- Flash LED:** A checkbox.
- Online status information:** A section with status messages:
 - Scan completed. 2 compatible devices of 4 accessible devices found.
 - Retrieving device information...
 - Scan and information retrieval completed.
 - Display only error messages (checkbox).
- Load:** A button highlighted with a red box and a circled number 5.
- Cancel:** A button.

2.9.3 Loading the SIMATIC S5 program

Prerequisite

The instructions for commissioning always refer to a fully reset S5 station.

A prerequisite for commissioning and loading the SIMATIC S5 is that the STEP 5 V7 software and NCM COM 1430 TCP are installed on the engineering station.

The engineering station has to be connected to the CPU 944 via the RS232 cable. The S5-CPU can be started after the program file has been loaded successfully to the S5-CPU and after the connection configuration of the CP1430 TCP has been made.

After startup of the SIMATIC S5-CPU and synchronization of the CP1430 TCP, the corresponding example scenarios can be enabled or disabled by setting enable signals via the corresponding memory bits (see [Table 2-24](#)).

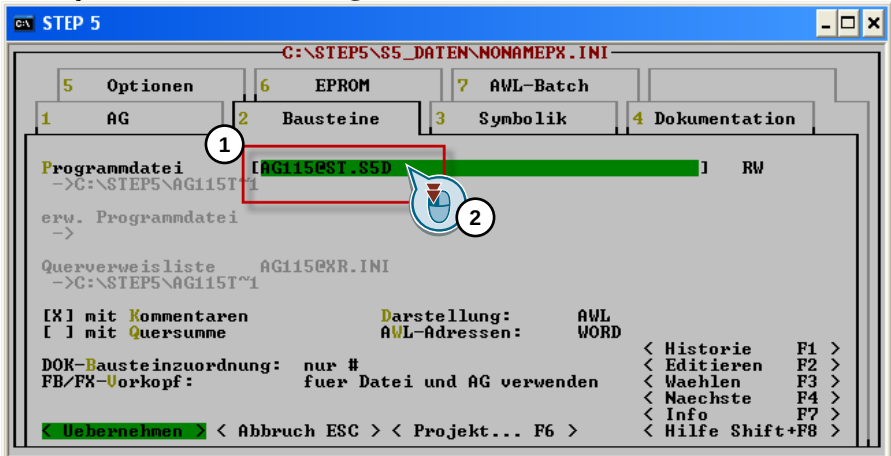
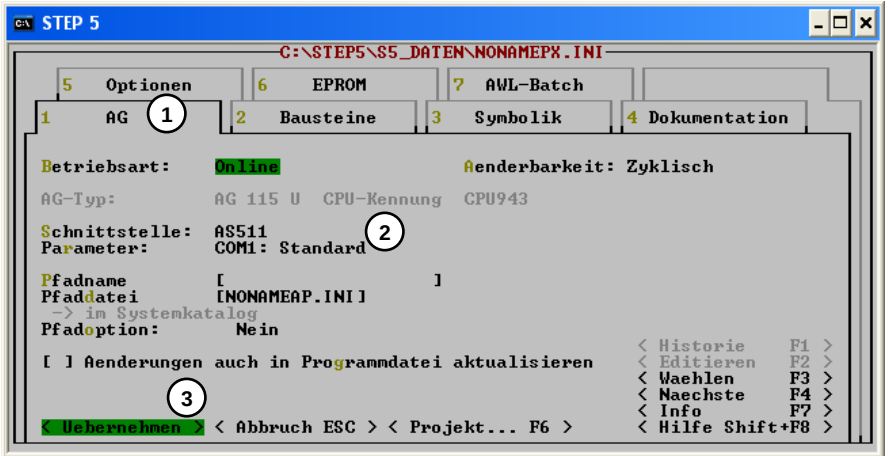
Note

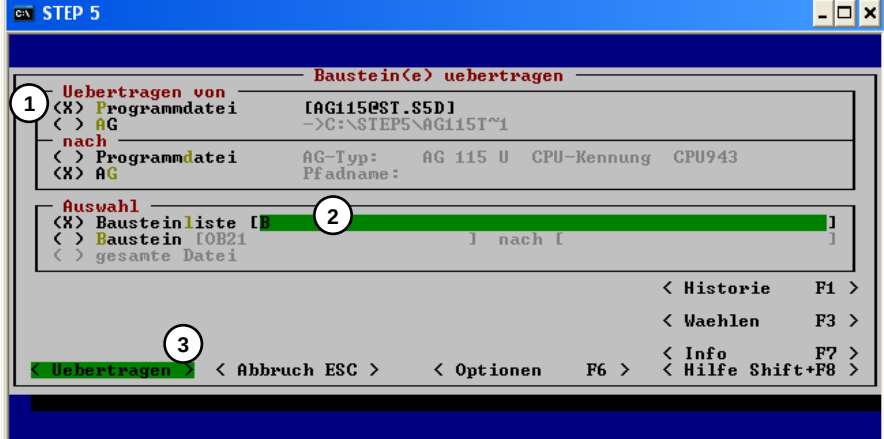
After having restarted the SIMATIC S5-CPU, the CPU and the CP1430 TCP should now change to the RUN mode (LED). If the CPU remains in the STOP mode, the corresponding S5-CPU error messages have to be output (via STEP 5 "online" diagnoses USTACK/BSTACK).

Commissioning the S5-CPU

The table below shows how to commission the S5 station.

Table 2-26

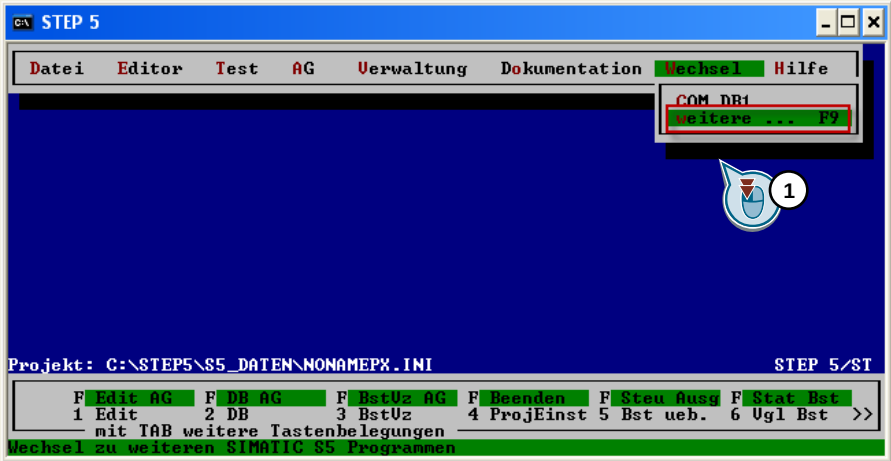
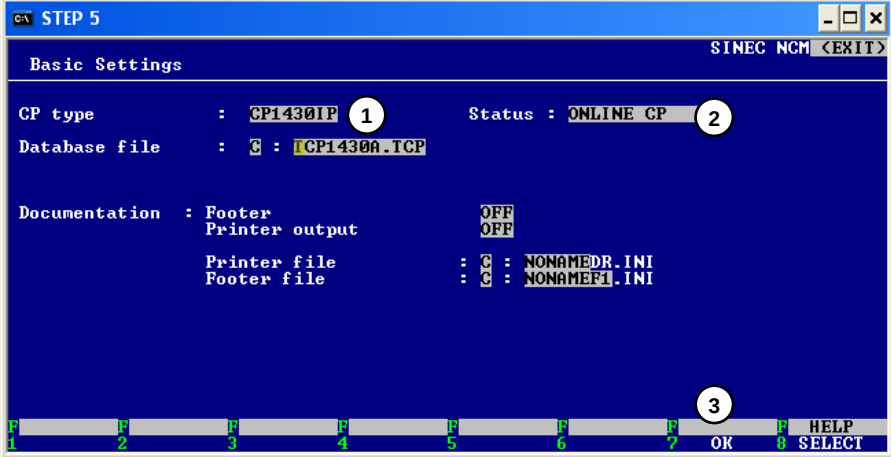
No.	Action
1.	Unzip the "109482475_Comm_S5_PROJ_v10.zip" file into a directory of your choice.
2.	Start your STEP 5 package and select the "Bausteine" ["Blocks"] menu. Under "Programmdatei" ["Program file"] (1), double-click (2) to navigate to your unzipped S5 project folder. Select your S5-CPU file "AG115@ST.s5d". 
3.	Now, go to the "AG" menu (1) and set your interface to "AS511". Under "Parameter" (2), enter the interface you are using. In this case, the standard "COM 1" interface has been used. Then, click "Uebernehmen" ["Apply"] (3) to confirm your settings. 

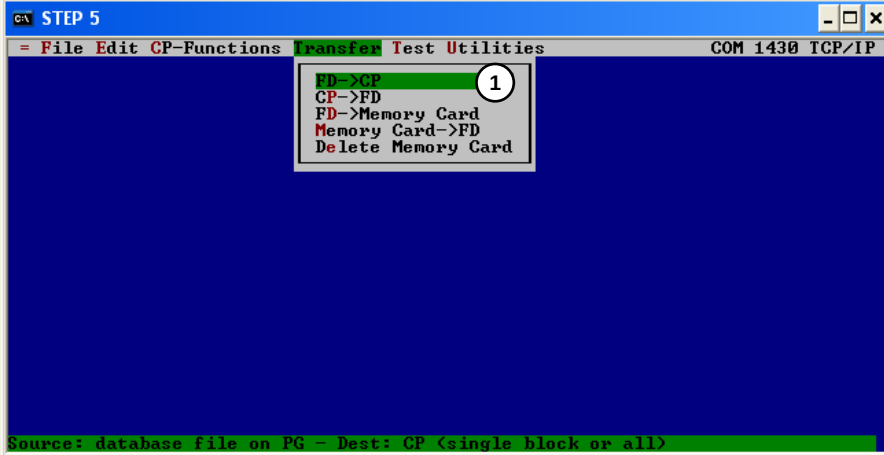
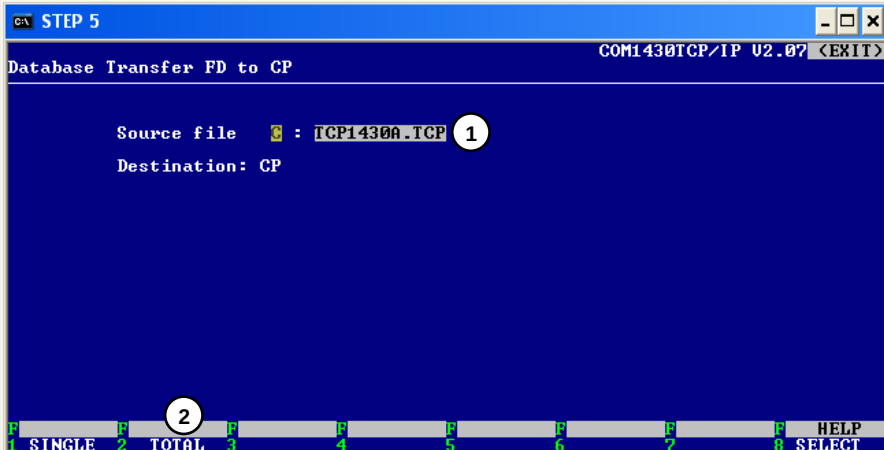
No.	Action
4.	(1) In the STEP 5 main menu, double-click to select the menu items "Datei" ["File"] > "Bausteine" ["Blocks"] > "Uebertragen" ["Transfer"] or press the function key "F5".  Projekt: C:\STEP5\S5_DATEN\NONAMEPX.INI STEP 5/ST F Edit AG F DB AG F BstUz AG F Beenden F Steu Auss F Stat Bst 1 Edit 2 DB 3 BstUz 4 ProjEinst 5 Bst ueb. 6 Ugl Bst >> mit TAB weitere Tastenbelegungen STEP 5 Bausteine kopieren, z.B. von Programmdatei zum AG.
5.	(1) In the transfer screen, select the transfer mode from "Programmdatei" [program file] to "AG". (2) Under "Auswahl" ["Selection"] > "Bausteinliste" ["Block list"], select type "B" (all blocks). (3) Start transfer to the S5-CPU by clicking "Uebertragen" ["Transfer"].  Baustein(e) uebertragen 1 Uebertragen von (X) Programmdatei [AG115EST.S5D] (>) AG ->C:\STEP5\AG115T~1 nach (>) Programmdatei AG-Typ: AG 115 U CPU-Kennung CPU943 (X) AG Pfadname: Auswahl (X) Bausteinliste [B] 2 (>) Baustein IOB21 1 nach I (>) gesamte Datei 3 Uebertragen < Abbruch ESC > < Optionen F6 > < Historie F1 > < Waehlen F3 > < Info F7 > < Hilfe Shift+F8 >

Commissioning the CP1430 TCP

The table below shows how to commission the CP1430 TCP.
First, connect the engineering station with the installed NCM COM 1430 TCP software to the PG interface of the CP1430 TCP.

Table 2-27

No.	Action
1.	(1) In STEP 5, start your additional software NCM COM 1430 TCP by double-clicking the menu item "weitere..." ["Further programs"] or press the F9 key. 
2.	(1) Under "Database file", navigate to your unzipped CP1430 TCP file "TCP1430A.TCP". (2) Set the status to "online". (3) Click "OK" to confirm the settings. 

No.	Action
3.	(1) Under "Transfer", select the transfer option "FD -> CP". Now, switch the RUN/STOP switch of the CP1430 TCP to position "STOP". 
4.	(1) Check whether "TCP1430A.TCP" has been set for "Source file" and start transfer by clicking "Total" (2). 
5.	After having loaded the der CP1430 TCP, switch the RUN/STOP switch to position "RUN" again. The CP will change to the RUN mode (RUN LED) only, if synchronization occurs via a restart of the CPU.

After the CPU and the CP have been loaded, the SIMATIC S5 can be started via the RUN/STOP switch of the CPU. Error-free startup and synchronization of the CP1430 TCP can be recognized from the CPU and the CP1430 TCP being in RUN mode.

2.10 Operating the Application

The following chapter describes the operation as well as the test and diagnostic functions of the different scenarios.

Prerequisites

The SIMATIC S5-CPU program and the CP1430 TCP connection configuration include **all** example scenarios. The required S5 program blocks and the corresponding functions are enabled via enable bits after loading the S5 program.

For successfully testing a scenario,

- the corresponding enable bit in the SIMATIC S5-CPU must be set,
- the corresponding SIMATIC S7-1500 station must be loaded,
- the corresponding enable bit in the SIMATIC S7-CPU must be set where necessary.

Table 2-28

Scen.	S5-CPU enable bit	S7-CPU Enable bit	S7 station name	Description
1	M 130.5	-	PLC_Sz1_F-W_S5-CP1430TCP	Communication via FETCH/WRITE and CP1543-1
2a	M 130.3	E 0.1	PLC_Sz2_S-R_CPU_ID5_ID105	Communication via programmed Open User Communication (single instruction) and internal CPU interface
2b	M 130.4	E 0.2		Communication via parameterized Open User Communication (single instruction) and internal CPU interface
3	M 130.2	E 0.1	PLC_Sz3_S-R_CP_TRCV_C_ID7	Communication via programmed Open User Communication (compact instruction) and CP1543-1
4a	M 130.0	E 0.1	PLC_Sz4_S-R_CP_ID4_ID104	Communication via programmed Open User Communication (single instructions) and CP1543-1
4b	M 130.1	E 0.2		Communication via parameterized Open User Communication (single instructions) and CP1543-1
5	M 130.6	E 0.1	PLC_Sz5_S-R_CPU_TSEND_C_ID6	Communication via programmed Open User Communication (compact instruction) and internal CPU interface

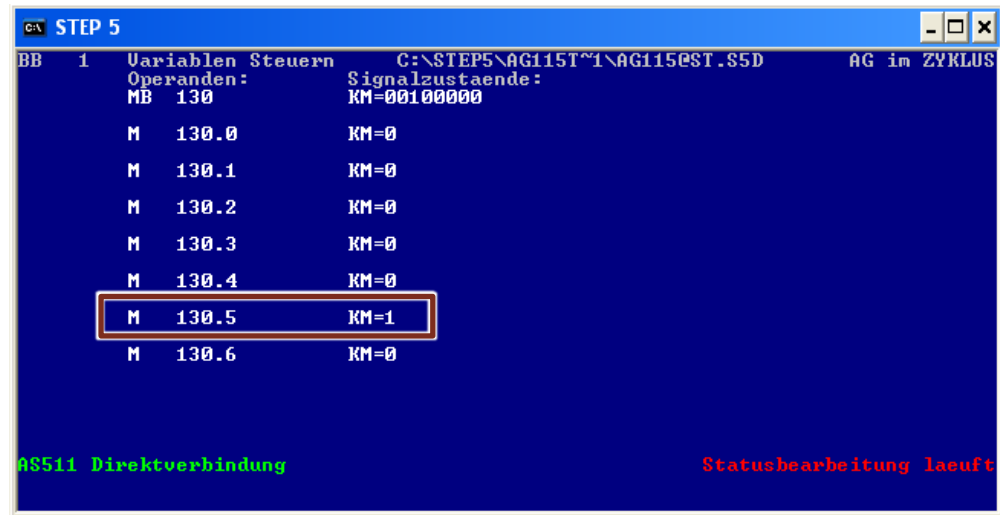
2.10.1 Scenario 1 – Communication via FETCH/WRITE and CP1543-1

Prerequisite

Table 2-29

Loaded S7-1500 station	Activated enable bit in S5-CPU
PLC_Sz1_passive_F-W_S5-CP1430TCP	M 130.5

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.



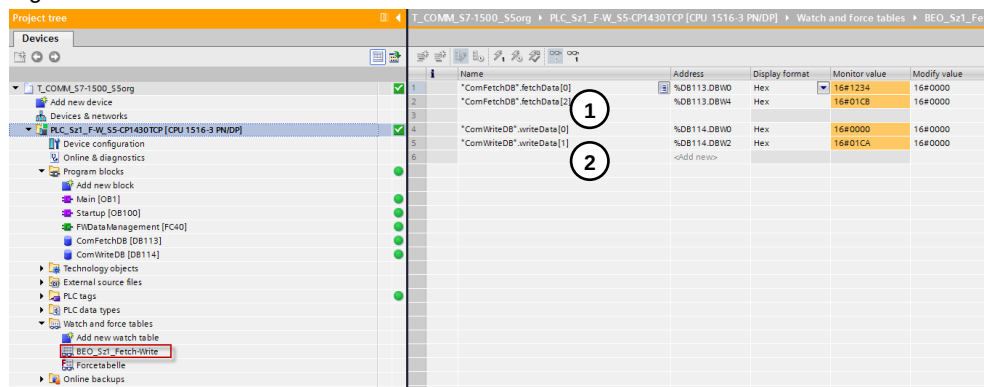
In this case, the SIMATIC S5 sets up the communication automatically. As, in this scenario, the SIMATIC S7-1500 station is absolutely passive, no explicit enable must be set there.

Test and diagnostics of communication in the SIMATIC S7-1500

To monitor the FETCH and WRITE functions in the SIMATIC S7-1500, call the watch table "BEO_Sz1_Fetch-Write" in TIA Portal.

The ongoing communication (continuous count value) can be monitored via the data areas of the FETCH (1) and WRITE areas (2) as well as via the output byte (AB1) of the S7-1500.

Figure 2-3



Test and diagnostics of communication in the SIMATIC S5

To monitor the FETCH and WRITE functions in the SIMATIC S5-CPU, call the watch table "BB4" in STEP 5.

The count value **(4)** is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is read back via the FETCH connection **(1)**.

The communication and connection status of the FETCH **(2)** and WRITE functions **(3)** can be evaluated via the indicator words (ANZW) of the HTBs.

STEP 5			
BB	4	Variablen Steuern	C:\STEP5\AG115T~1\AG1150ST.S5D AG im ZYKLUS
		Operanden:	Steuern Prozessabbild:
		MB 130	KM=00100000
		MW 70	KH=0004
		MW 72	KF=+100 (2)
		DB 113	KH=0000
		DW 0	KH=001E (1)
		DW 2	
		MW 75	KH=0004
		MW 77	KF=+100 (3)
		DB 114	KH=1234
		DW 0	KH=001E (4)
		DW 1	

AS511 Direktverbindung

2.10.2 Scenario 2a – Communication via parameterized OUC (single instructions) and internal CPU interface

Prerequisite

Table 2-30

Loaded S7-1500 station	Enable bit S7-1500 CPU for scenario 2a	Activated enable bit (S5-CPU)
PLC_Sz2_S-R_CPU_ID5_ID105	E 0.1	M 130.3

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.

As, in this case, the S7-1500 program contains the two example scenarios 2a and 2b, you can activate scenario 2a via the enable bit E 0.1.

Now, the connection will be established by the SIMATIC S7 station.

Test and diagnostics of communication in the SIMATIC S7-1500

The bidirectional data exchange (continuous count value) can be monitored via the output byte (AB1) of the S7-1500.

To monitor the ongoing communication and the status of the send and receive blocks in the SIMATIC S7-1500, call the watch table "BEO_Sz2_ID105" in TIA Portal.

T_COMM_S7-1500_S5org ▶ PLC_Sz2_S-R_CPU1500_ID5_ID105 [CPU 1516-3 PN/DP] ▶ Beobachtungs- und Forcetabellen ▶ BEO_Sz2_ID105

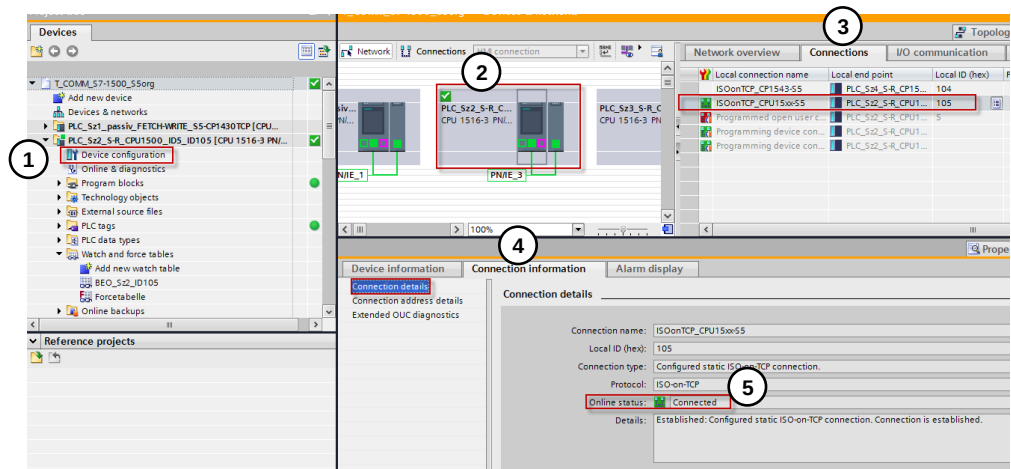
	Name	Adresse	Anzeigeformat	Beobachtungswert
1	"Sendefreigabe_E0.1"	%E0.1	BOOL	TRUE
2	"CPU15xx_para_TSEND_ID105".STATUS		Hex	16#7000
3	"CPU15xx_inst-DB_ISOonTCP_praram_Verbg_ID105".SEND_DATA[5]		Hex	16#96
4				
5	"CPU15xx_para_TRCV_ID105".STATUS		Hex	16#7002
6	"CPU15xx_inst-DB_ISOonTCP_praram_Verbg_ID105".RECV_DATA[5]		Hex	16#96
7	"RESET_ID105"	%E0.7	BOOL	FALSE
8	"CPU15xx_progr_TDISCON_ID105".STATUS		Hex	16#7000
9				
10		<Hinzufügen>		

Please refer to the "online" help for error states or status displays of the OUC blocks.

The status of the connection can also be checked in the S7-1500 station by means of the online functions of TIA Portal.

1. In TIA Portal of the station, call the "Device configuration" of this scenario.
2. Go to the station in "online" mode via the "Go online" option in the menu bar.
3. In the "Network view" (1), select the station "PLC_Sz2_S-R_CPU_ID105" (2) and go to the "Connections" tab (3).
4. In the "Connections" tab (3), select the parameterized ISO-on-TCP connection with the local ID "105".
5. In the "Diagnostics" tab, go to the "Connection information" (4).

6. Under "Connection details", an established connection can be recognized from a green marking in the "Online status" **(5)**. In this section, further details of the connection diagnostics are available.

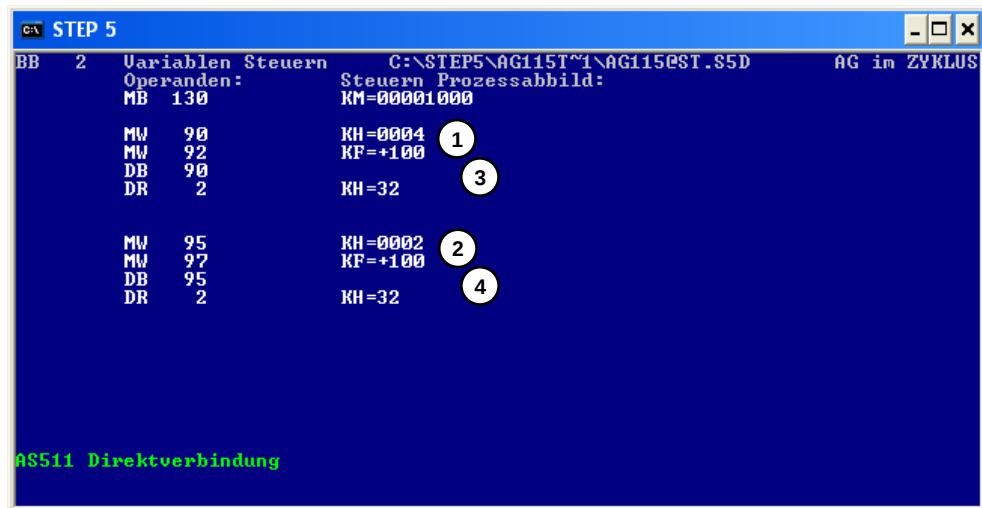


Test and diagnostics of communication in the SIMATIC S5

To monitor the send/receive communication of scenario 2a in the SIMATIC S5-CPU, call the watch table "BB2" in STEP 5.

The count value **(3)** is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is received again **(4)**.

The communication and connection status of the SEND **(1)** and RECEIVE blocks **(2)** can be evaluated via the indicator words (ANZW) of the HTBs.



Note

Meaning of the status display of the handling blocks in the SIMATIC S5:

0A0A: Connection not established

0002: Job running

0004: Job completed without errors

For further details und status displays, refer to the SIMATIC S5 documentation regarding the handling blocks.

2.10.3 Scenario 2b – Communication via programmed OUC (single instructions) and internal CPU interface

Prerequisite

Table 2-31

Loaded S7-1500 station	Enable bit S7-1500 CPU for scenario 2b	Activated enable bit (S5-CPU)
PLC_Sz2_S-R_CPU_ID5_ID105	E 0.2	M 130.4

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.

As, in this case, the S7-1500 program contains the two example scenarios 2a and 2b, activate scenario 2b via the enable bit E 0.2.

Now, the connection will be established by the SIMATIC S5 station.

Test and diagnostics of communication in the SIMATIC S7-1500

The bidirectional data exchange (continuous count value) can be monitored via the output byte (AB0) of the S7-1500.

To monitor the ongoing communication and the status of the send and receive blocks in the SIMATIC S7-1500, call the watch table "BEO_Sz2_ID5" in TIA Portal.

T_COMM_S7-1500_S5org ▶ PLC_Sz2_S-R_CPU1500_ID5_ID105 [CPU 1516-3 PN/DP] ▶ Beobachtungs- und Forcetabellen ▶ BEO_Sz2_ID5

	Name	Adresse	Anzeigeformat	Beobachtungswert
1	*CPU15xx_progr_TCON_ID5*.STATUS		Hex	16#7000
2	*Sendetrigger_E0.2*	%E0.2	BOOL	TRUE
3	*CPU15xx_progr_TSEND_ID5*.STATUS		Hex	16#7000
4	*CPU15xx_Inst-DB_ISOonTCP_program_Verbg_ID5*.SEND_DATA[5]		Hex	16#F3
5				
6	*CPU15xx_progr_TRCV_ID5*.STATUS		Hex	16#7000
7	*CPU15xx_Inst-DB_ISOonTCP_program_Verbg_ID5*.RECV_DATA[5]		Hex	16#F3
8	*RESET_ID5*	%E0.6	BOOL	FALSE
9	*CPU15xx_para_TDISCON_ID5*.STATUS		Hex	16#7000
10		<Hinzufügen>		

Please refer to the "online" help for error states or status displays of the OUC blocks.

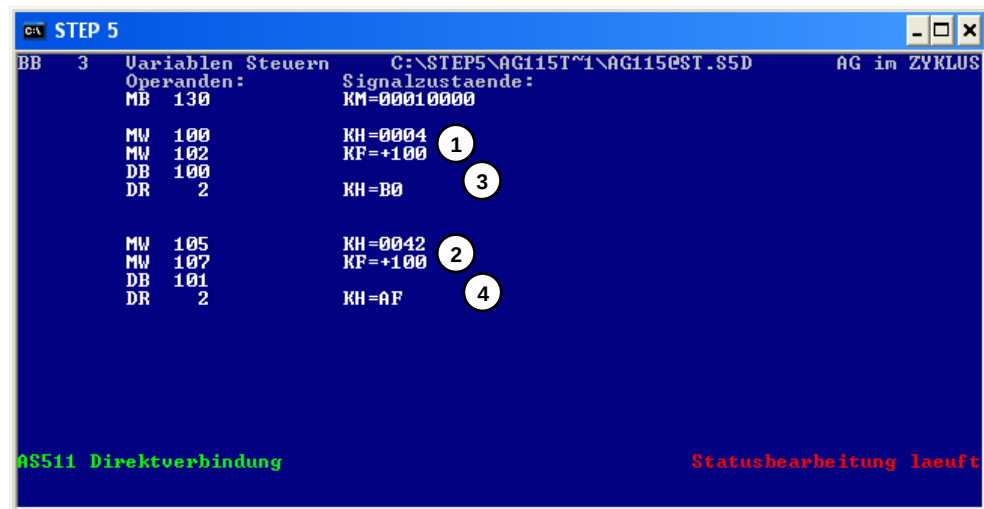
The status of the connection can also be checked in the S7-1500 station by means of the online functions of TIA Portal (see chapter [2.10.2](#)).

Test and diagnostics of communication in the SIMATIC S5

To monitor the send/receive communication of scenario 2b in the SIMATIC S5-CPU, call the watch table "BB3" in STEP 5.

The count value **(3)** is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is received again **(4)**.

The communication and connection status of the handling blocks SEND **(1)** and RECEIVE **(2)** can be evaluated via the indicator words (ANZW) of the HTBs.



2.10.4 Scenario 3 – Communication via programmed OUC (compact instruction) and CP1543-1 interface

Prerequisite

Loaded S7-1500 station	Enable bit S7-1500 CPU for scenario 3	Activated enable bit (S5-CPU)
PLC_Sz3_S-R_CP_TRCV_C_ID7	E 0.1	M 130.2

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.

For scenario 3, the corresponding S7-1500 program can be activated via the enable bit E 0.1.

Now, the connection will be established by the SIMATIC S7 station.

Test and diagnostics of communication in the SIMATIC S7-1500

The bidirectional data exchange (continuous count value) can be monitored via the output byte (AB0) of the S7-1500.

To monitor the ongoing communication and the status of the send and receive blocks in the SIMATIC S7-1500, call the watch table "BEO_Sz3_ID7" in TIA Portal. There, you can monitor the last error status displays of the OUC blocks TSEND (1) and TRCV_C (2).

If the TRCV_C instruction has been executed successfully or with errors, the status of the TRCV_C instruction will be stored in the "DB_FC_RECV".STATUS_SAVE variable. The status provides information on the reason why the data have not been received successfully.

T_COMM_S7-1500_S5org ▶ PLC_Sz3_S-R_CP1543-1_TRCV_C_ID7_akt-Vbg [CPU 1516-3 PN/DP] ▶ Watch and force tables ▶ BEO_Sz3_ID7

	Name	Address	Display format	Monitor value
1	"DB_ID7_TSEND".STATUS	%DB100.DBW6	Hex	16#7000
2	"DB_ID7_TSEND".STATUS_SAVE	%DB100.DBW8	Hex	16#0000
3	"TSEND_DATA".SEND_DATA[5]	%DB110.DBB5	Hex	16#3C
4				
5	"DB_ID7_TRCV_C".STATUS	%DB200.DBW6	Hex	16#7002
6	"DB_ID7_TRCV_C".STATUS_SAVE	%DB200.DBW8	Hex	16#0000
7	"TRCV_DATA".RCV_DATA[5]	%DB210.DBB5	Hex	16#3C
8	"Sendefreigabe_E0.1"	%E0.1	Bool	TRUE
9	"Verbg_Reset_ID7"	%E0.7	Bool	FALSE
10		<Add new>		

Test and diagnostics of communication in the SIMATIC S5

To monitor the send/receive communication of scenario 3 in the SIMATIC S5-CPU, call the watch table "BB33" in STEP 5.

The count value **(3)** is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is received again **(4)**.

The communication and connection status of the handling blocks SEND **(1)** and RECEIVE **(2)** can be evaluated via the indicator words (ANZW) of the HTBs.

STEP 5			
BB 33	Variablen Steuern	C:\STEP5\AG115T~1\AG115EST.S5D	AG im ZYKLUS
	Operanden:	Signalzustände:	
	MB 130	KH=00000100	
	MW 85	KH=0004	1
	MW 87	KF=+10	
	DB 85		
	DW 2	KH=0019	3
	MW 80	KH=0002	2
	MW 82	KF=+10	
	DB 80		
	DW 2	KH=0018	4
AS511 Direktverbindung		Statusbearbeitung läuft	

Note

A programmed OUC communication (via compact instruction) means that the connection is established/disconnected and the data are received using the OUC block TRCV_C via the user program.

However, the data are sent via the standard OUC block TSEND.

2.10.5 Scenario 4a – Communication via programmed OUC (single instructions) and CP1543-1

Prerequisite

Loaded S7-1500 station	Enable bit S7-1500 CPU for scenario 4a	Activated enable bit (S5-CPU)
PLC_Sz4_S-R_CP_ID4_ID104	E 0.1	M 130.0

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.

As, in this case, the S7-1500 program contains the two example scenarios 4a and 4b, activate scenario 4a via the enable bit E 0.1.

Now, the connection will be established by the SIMATIC S5 station.

Test and diagnostics of communication in the SIMATIC S7-1500

The bidirectional data exchange (continuous count value) can be monitored via the output byte (AB1) of the S7-1500.

To monitor the ongoing communication and the status of the send and receive blocks in the SIMATIC S7-1500, call the watch table "BEO_Sz2_ID104" in TIA Portal.

Please refer to the "online" help for error states or status displays of the OUC blocks.

Figure2-4

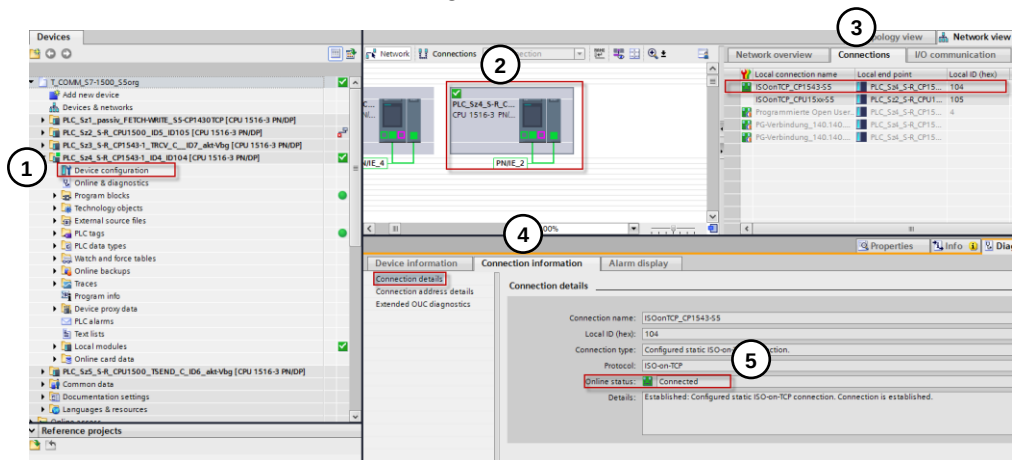
Name	Adresse	Anzeigeformat	Beobachtungswert
Sendefreigabe_E0.1	%E0.1	BOOL	TRUE
CP1543_para_TSEND_ID104.STATUS		Hex	16#7000
CP1543_inst-DB_ISOonTCP_praram_Verbg_ID104.SEND_DATA[5]		Hex	16#00
CP1543_para_TRCV_ID104.STATUS		Hex	16#80A1
CP1543_inst-DB_ISOonTCP_praram_Verbg_ID104.RECV_DATA[5]		Hex	16#00
	<Hinzufügen>		

The status of the connection can also be checked in the S7-1500 station by means of the online functions of TIA Portal.

1. In TIA Portal of the station, call the "Device configuration" of this scenario.
2. Go to the station in "online" mode via the "Go online" option in the menu bar.
3. In the "Network view" (1), select the station "PLC_Sz4_S-R_CPU_ID104" (2) and go to the "Connections" tab (3).
4. In the "Connections" tab (3), select the parameterized ISO-on-TCP connection with the local ID "104".

5. In the "Diagnostics" tab, go to the "Connection information" (4).

Under "Connection details", an established connection via the CP1543-1 can be recognized from a green marking in the "Online status" (5). In this section, further details of the connection diagnostics are available.

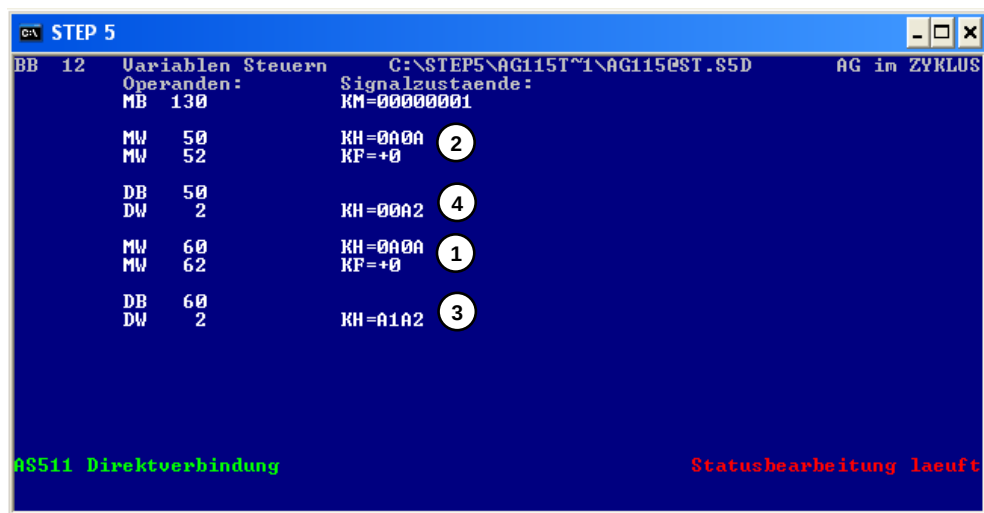


Test and diagnostics of communication in the SIMATIC S5

To monitor the send/receive communication of scenario 2a in the SIMATIC S5-CPU, call the watch table "BB12" in STEP 5.

The count value (3) is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is received again (4).

The communication and connection status of the SEND (1) and RECEIVE blocks (2) can be evaluated via the indicator words (ANZW) of the HTBs.



2.10.6 Scenario 4b – Communication via parameterized OUC (single instructions) and CP1543-1

Prerequisite

Loaded S7-1500 station	Enable bit S7-1500 CPU for scenario 4b	Activated enable bit (S5-CPU)
PLC_Sz4_S-R_CP_ID4_ID104	E 0.2	M 130.1

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.

As, in this case, the S7-1500 program contains the two example scenarios 4a and 4b, activate scenario 4b via the enable bit E 0.2.

Now, the connection will be established by the SIMATIC S5 station.

Test and diagnostics of communication in the SIMATIC S7-1500

The bidirectional data exchange (continuous count value) can be monitored via the output byte (AB0) of the S7-1500.

To monitor the ongoing communication and the status of the send and receive blocks in the SIMATIC S7-1500, call the watch table "BEO_Sz2_ID4" in TIA Portal.

T_COMM_S7-1500_S5org ▶ PLC_Sz4_S-R_CP1543-1_ID4_ID104 [CPU 1516-3 PN/DP] ▶ Beobachtungs- und Forcetabellen ▶ BEO_Sz2_ID4				
	Name	Adresse	Anzeigeformat	Beobachtungswert
1	*CP1543_progr_TCON_ID4*.STATUS		Hex	16#7002
2				
3	*Sendetrigger_E0.2*	%E0.2	BOOL	☐ FALSE
4	*CP1543_progr_TSEND_ID4*.STATUS		Hex	16#7000
5	*CP1543_inst-DB_ISOnTCP_program_Verbg_ID4*.SEND_DATA[5]		Hex	16#00
6				
7	*CP1543_progr_TRCV_ID4*.STATUS		Hex	16#7000
8	*CP1543_inst-DB_ISOnTCP_program_Verbg_ID4*.RECV_DATA[5]		Hex	16#00
9	*Reset_ID4*	%E0.6	BOOL	☐ FALSE
10	*CP1543_progr_TDISCON_ID4*.STATUS		Hex	16#7000
11		<Hinzufügen>		

Test and diagnostics of communication in the SIMATIC S5

To monitor the send/receive communication of scenario 2b in the SIMATIC S5-CPU, call the watch table "BB13" in STEP 5.

The count value **(3)** is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is received again **(4)**.

The communication and connection status of the handling blocks SEND **(1)** and RECEIVE **(2)** can be evaluated via the indicator words (ANZW) of the HTBs.

STEP 5			
BB 13	Variablen Steuern	C:\STEP5\AG115T~1\AG115EST.S5D	AG im ZYKLUS
	Operanden:	Signalzustaende:	
	MB 130	KM=00000010	
	MW 65	KH=0004	1
	MW 67	KF=+100	
	DB 61	KH=A21B	3
	DW 2		
	MW 55	KH=0042	2
	MW 57	KF=+100	
	DB 51	KH=001B	4
	DW 2		
A8511 Direktverbindung		Statusbearbeitung laeuft	

2.10.7 Scenario 5 – Communication via programmed OUC (compact instructions) and internal CPU interface

Prerequisite

Loaded S7-1500 station	Enable bit S7-1500 CPU for scenario 4b	Activated enable bit (S5-CPU)
PLC_Sz5_S-R_CPU_TSEND_C_ID6	E 0.1	M 130.6

Activate the corresponding enable bit in the SIMATIC S5-CPU via the "BB1" watch table.

For scenario 5, the corresponding S7-1500 program can be activated via the enable bit E 0.1.

Now, the connection will be established by the SIMATIC S7 station.

Test and diagnostics of communication in the SIMATIC S7-1500

The bidirectional data exchange (continuous count value) can be monitored via the output byte (AB0) of the S7-1500.

To monitor the ongoing communication and the status of the send and receive blocks in the SIMATIC S7-1500, call the watch table "BEO_Sz5_ID6" in TIA Portal. There, you can monitor the last error status displays of the OUC blocks TSEND_C (1) and TRCV (2).

If the TSEND_C instruction has been executed successfully or with errors, the status of the TSEND_C instruction will be stored in the "DB_FC_SEND".STATUS_SAVE variable. The status provides information on the reason why the send job is not running.

T_COMM_S7-1500_S5org ▶ PLC_Sz5_S-R_CPU1500_TSEND_C_ID6_akt-Vbg [CPU 1516-3 PN/DP] ▶ Watch and force tables ▶ BEO_Sz5_ID6

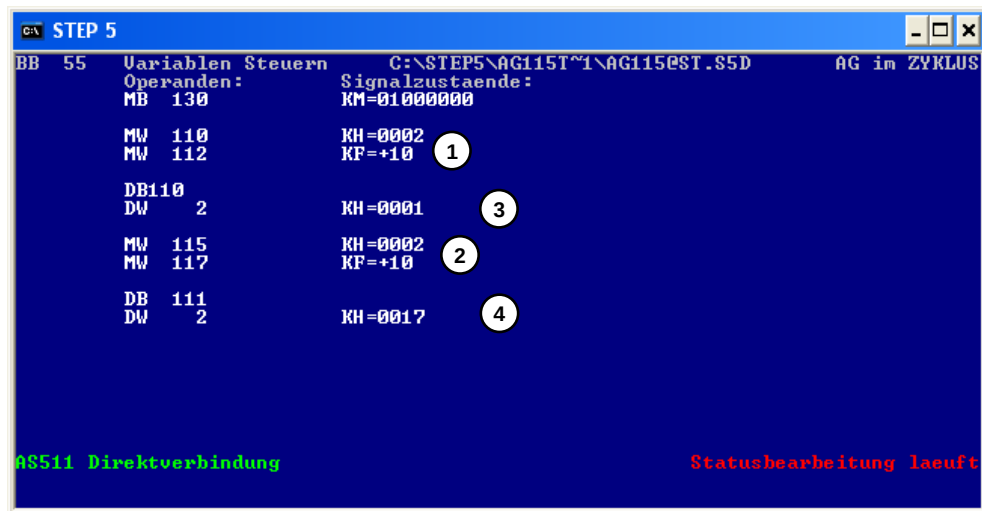
	Name	Address	Display format	Monitor value
1	"DB_FC_TSEND_C".STATUS	%DB100.DBW6	Hex	16#7004
2	"DB_FC_TSEND_C".STATUS_SAVE	%DB100.DBW8	Hex	16#0000
3	"TSEND_DATA".SEND_DATA[5]	%DB110.DBB5	Hex	16#00
4				
5	"DB_FC_TRCV".STATUS	%DB200.DBW6	Hex	16#7002
6	"DB_FC_TRCV".STATUS_SAVE	%DB200.DBW8	Hex	16#80C4
7	"TRCV_DATA".RCV_DATA[5]	%DB210.DBB5	Hex	16#00
8	"Sendefreigabe_E0.1"	%E0.1	Bool	TRUE
9	"Verbg_Reset_ID6"	%E0.7	Bool	FALSE
10				

Test and diagnostics of communication in the SIMATIC S5

To monitor the send/receive communication of scenario 3 in the SIMATIC S5-CPU, call the watch table "BB55" in STEP 5.

The count value **(3)** is cyclically written in the S7-1500 CPU every second and the mirrored incremented value is received again **(4)**.

The communication and connection status of the handling blocks SEND **(1)** and RECEIVE **(2)** can be evaluated via the indicator words (ANZW) of the HTBs.



3 Appendix

3.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:

<https://support.industry.siemens.com>

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:

www.siemens.com/industry/supportrequest

SITRAIN – Training for Industry

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

www.siemens.com/sitrain

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

<https://support.industry.siemens.com/cs/sc>

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:

<https://support.industry.siemens.com/cs/ww/en/sc/2067>

3.2 Links and literature

Table 3-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/109482475
\3\	

3.3 Change documentation

Table 3-2

Version	Date	Modifications
V1.0	07/2016	First version
V1.1	12/2018	Changed title and figure "Overview of the automation task" New Template
V1.2	07/2019	Update TIA Portal V15.1