SIEMENS

SINEC

CP 1430 TF with NCM COM 1430 TF

Volume 1 of 2

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Contents in Volume 2 of 2

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Abbiamo verificato la corrispondenza del contenuto di questo manuale con l’hardware ed il software descritti. Tuttavia, non potendo escludere con certezza eventuali divergenze, non siamo in grado di garantire la completa corrispondenza. Le indicazioni contenute in questo manuale vengono comunque controllate regolarmente. Le correzioni necessarie sono contenute nelle edizioni successive. Sono graditi eventuali suggerimenti.

Ci riserviamo di apportare modifiche tecniche.

We have checked the contents of this manual for agreement with the hardware described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcome.

Technical data subject to change.

Nous avons vérifié la conformité du contenu du présent manuel avec le matériel et le logiciel qui y sont décrits. Or, des divergences n’étant pas exclues, nous ne pouvons pas nous porter garants pour la conformité intégrale. Si l’usage du manuel devait révéler des erreurs, nous en tiendrons compte et apporterons les corrections nécessaires dès la prochaine édition. Veuillez nous faire part de vos suggestions.
Nous nous réservons le droit de modifier les caractéristiques techniques.

Siemens Aktiengesellschaft

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Notes

1 Introduction

1.1 How to Use the Manual

1.1.1 Recommendations

The manual consists of two volumes and a supplement.

Read the following chapters if...

... you want an overview of the areas of application of the CP 1430 TF and how it functions.	➡	Chapters 1, 2 and 4: performance and technical data
... you want to create PLC programs and require communication services.	➡	Chapter 2: what types of communication are available? Chapter 3: principles of the HDB interface
... you want to configure the CP for transport services.	➡	Chapter 5: working with NCM COM 1430 TF Chapter 6: basic CP configuration and load functions Chapter 7: configuring jobs and test functions Appendix A: example
...you want to configure the CP for TF services.	➡	Chapter 5: working with NCM COM 1430 TF Chapter 6: basic CP configuration and load functions in Volume 2: Chapter 7: configuring jobs and test functions Appendix A: example
...you want to install and start up the CP.	➡	Chapter 4: installation, start-stop, connecting a PG, addressing.

1.1.2 Text Conventions, Extra Information

General symbols used in the text:

✓ This character indicates an activity or operation for you to perform.

☞ **This symbol highlights special features and dangers.**

M xx

This reference in the margin indicates the dialog number of the dialog in the supplement.

Prior knowledge:
To able to understand the complete examples, you require:

➢ knowledge of programming with STEP 5

➢ basic knowledge about using handling blocks (HDBs). The HDBs are described in the manual for your programmable logic controller or in separate descriptions.

Training Courses:
Siemens provides SINEC users with a comprehensive range of training opportunities.

For more detailed information contact your local Siemens office.

Order numbers of the products mentioned in this manual can be found in the appropriate catalogs.

1.2 Area of Application of the CP 1430 TF

SINEC H1/H1FO - the Siemens cell and area network - has proved itself as a reliable bus system in production automation.

The SINEC CP 1430 TF communications processor is the network card for connection of SIMATIC S5 programmable logic controllers to the SINEC H1/H1FO cell and area network. (see Fig. 1.1).

The SINEC CP 1430 TF communications processor is available in two versions with different ranges of performance:

➢ Basic version

➢ Extended version

Both versions provide the complete range of functions for transport and TF services. The extended version has a greater memory capacity allowing more communications connections and its integrated clock is more accurate. The differences between the two versions are explained in detail in Section 4.6.

The SINEC NCM COM 1430 TF (abbreviated to COM 1430) is used to configure the communications connections of the CP 1430 TF communications processor.

The COM 1430 configuration software can be operated on

➢ PGs of the 7xx series with the S5 DOS-ST operating system and the STEP 5 basic package from version 6.3 and higher

➢ AT-compatible PCs with the MS-DOS operating system and the STEP 5 basic package for PCs from version 6.3 and higher.

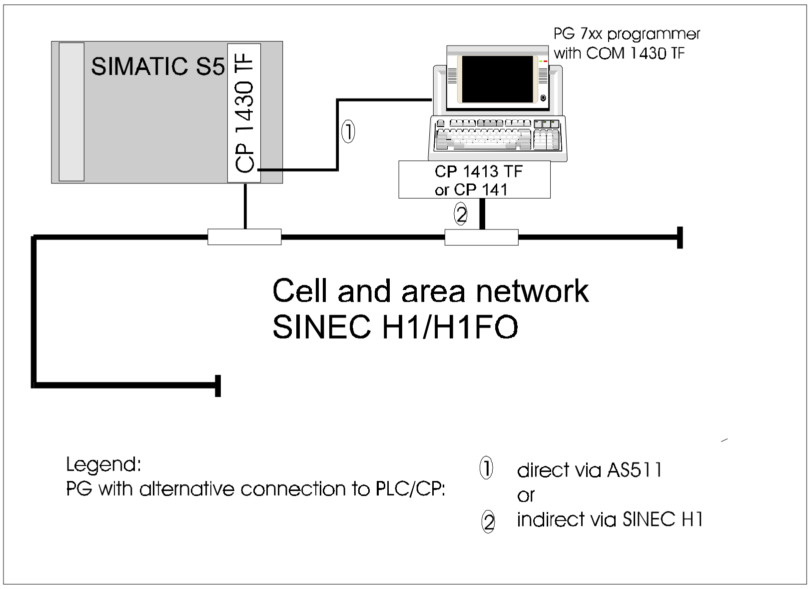

Fig. 1.1: Integration of the CP 1430 TF and COM 1430 TF Configuration Software

Communications Protocol with SINEC H1/H1FO
Automation programs communicate in SINEC H1/H1FO using uniform protocol profiles.

The SINEC H1-TF protocol profile is oriented on the reference model for open communication according to ISO/OSI (International Standards Organization / open system interconnection). Table 1.1 shows the seven layers and their tasks.

7	**Application layer**	Uniform access to application-specific services
6	**Presentation layer**	Linguistic conventions
5	**Session layer**	Establish, maintain and terminate communications sessions
4	**Transport layer**	Transfer raw information reliably
3	**Network layer**	Provide network links
2	**Data link layer**	Establish, terminate data links
1	**Physical layer**	Operate a physical link for bit transfer

Table 1.1: Reference Model According to ISO/OSI and the Tasks of the Individual Layers

Open communication between different types of devices (heterogeneous) is only possible when the communications protocol of the device interfaces implements all seven layers of the reference model.

The SINEC H1-TF protocol profile on the CP 1430 TF therefore implements the functions of all seven layers. It has two points of access for communication between automation programs on the various S5 devices, the TF interface application layer) and the transport interface (see Table 1.1 and Fig. 1.2).

Homogeneous Communication using the Transport Layer
For homogeneous communication between SIMATIC S5 devices, the protocol services of layers 1 to 4 are adequate. The transport layer transfers raw information reliably from S5 device to S5 device. Since the representation and meaning of the information exchanged is known to the S5 devices involved due to their programming, the services of layers 5 to 7 are not required. This reduces the protocol runtime per data exchange and the communications protocol is able to transfer messages more quickly.

Heterogeneous Communication using the Application Layer
For heterogeneous communication between SIMATIC S5 devices and automation components of other types, the protocol services of layers 1 to 7 are necessary. This allows open communication between heterogeneous automation devices provided they use the TF protocol.

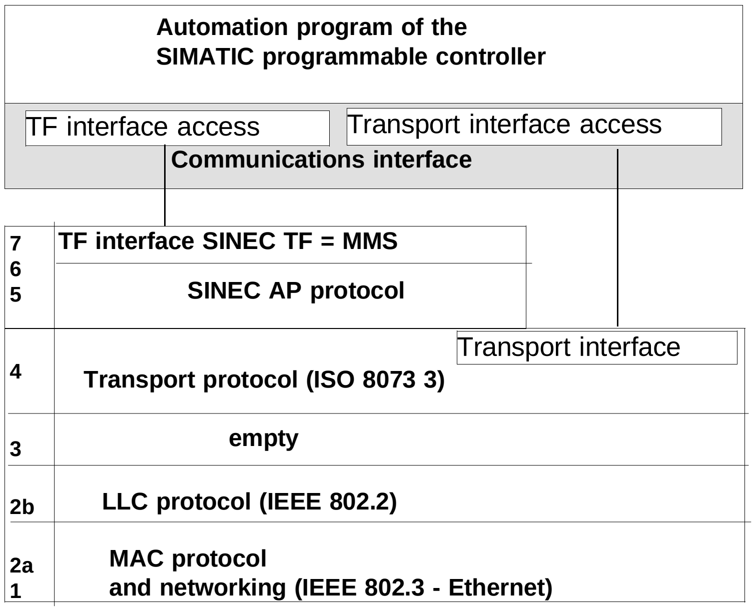

Fig. 1.2: Protocol Profile of the SINEC CP 1430 TF Communications Processor

The communications protocol of the CP 1430 TF (see Figure 1.2) implements protocols according to ISO and IEEE in the transport-oriented layers 1 to 4. The user interface to the transport protocol is used for homogeneous communication between two S5 devices.

In the application-oriented layers 5 to 7, the communications protocol of the CP 1430 TF implements the SINEC AP protocol with the SINEC technological functions user interface (SINEC TF). This protocol implements open communication between automation devices of different types.

The TF interface SINEC TF is based on the specifications of the international standard ISO 9506, Manufacturing Message Specification (MMS).

Advantages of using the CP 1430 TF on SINEC H1/H1FO

Using the cell and area network SINEC H1/H1FO and the CP 1430 TF communications processor has the following advantages for the user:

➢ The CP 1430 TF allows efficient communication between your automation programs on S5 devices using the transport layer (transport interface).

➢ The CP 1430 allows open communication via the application layer (TF interface) between the automation programs on S5 devices and on devices of other types.

➢ SINEC H1/H1FO networks your automation components on a shielded coaxial cable (SINEC H1) and on fiber optic cables (SINEC H1FO).

➢ You have the reliability and expandability of an industrial bus system.

➢ The investments you make in your SINEC H1/H1FO network are safe for the future, since the network corresponds to the widespread standard IEEE 802.3 (Ethernet).

➢ You have the reassurance that you are using a system that has proved itself in several thousand SINEC H1 network installations with thousands and thousands of SINEC connections.

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I Basic Information

2 Overview of the CP's Performance and Mode of Operation

Topics in this Chapter

To make the best use of your CP 1430 TF, you should be aware of the alternatives available to you with the various functions implemented on the CP. The introduction pointed out these alternatives particularly in terms of the transport and TF interfaces.

This chapter contains the basic information you will require to understand how the CP functions. This will help you to better understand what is required when configuring the CP and writing the PLC programs. The chapter will also help you to select the CP functions suitable for your particular task.

The individual topics in the chapter are as follows:

➢ What is involved in SINEC H1/H1FO networking and the functions provided by the CP 1430 TF.

➢ How the CP 1430 TF implements the connection between the PLCs and the network.

➢ How the connection between the PLC program and CP functions.

➢ How send and receive jobs are handled.

➢ What is provided by transport connections and how these are defined.

➢ How application associations are defined and what they provide over and above transport connections.

On page 2-6 of this chapter, you will find a table comparing the reasons for using the transport and TF interfaces.

2.1 Networking with SINEC H1/H1FO in an Industrial Environment

The cell and area network SINEC H1/SINEC H1FO is an industrial communications network for use in manufacturing and in industrial systems.

SINEC networks are, for example, used in the following areas of application:

- The automobile industry
- The chemical industry
- Power stations
- Food industry
- Paper and printing industry
- Traffic control systems
- Water supply and sewage disposal systems
- Mechanical engineering

The SINEC H1/H1FO cell and area network is based on the specification in the IEEE 802.3 (Ethernet) standard. This standard defines a bus system. It describes the physical networking on layer 1 of the ISO/OSI reference model and the bus access technique CSMA/CD (carrier sense multiple access with collision detect) on layer 2.

SINEC H1/H1FO is an industrial implementation of the specifications in this standard.

The customer can select the cable routing and connection points for the stations to be networked using the SINEC H1/H1FO network. The customer’s network can be designed with both electrical and optical network segments.

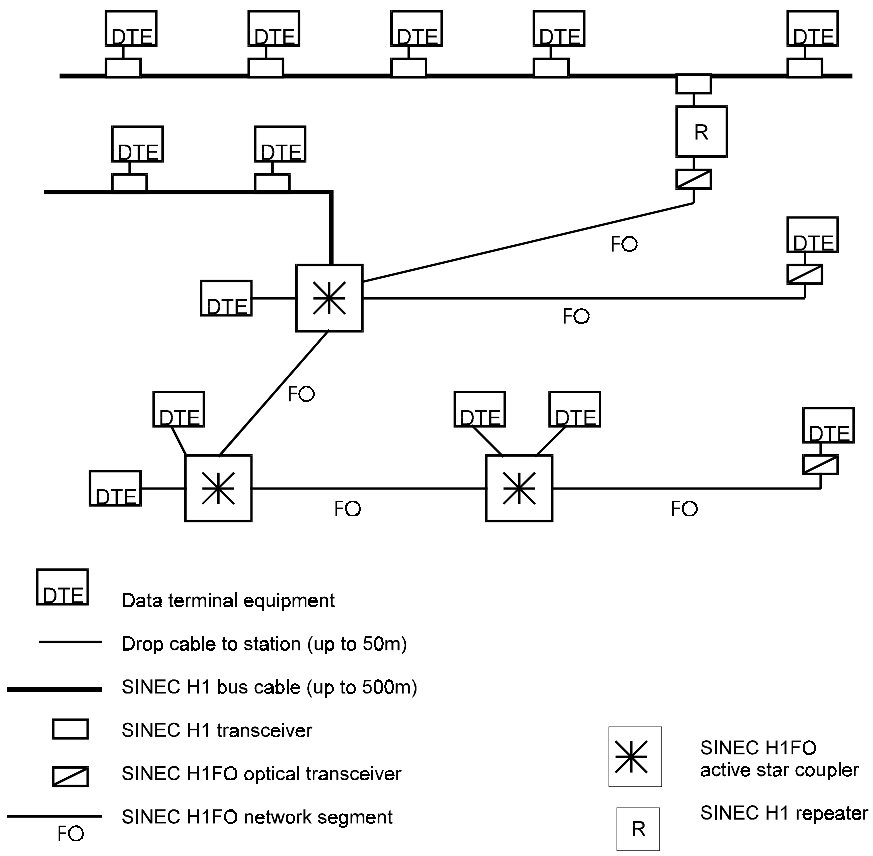


Fig. 2.1: Example of a SINEC H1/ H1FO Cell and Area Network

Fig. 2.1 shows the basic structure of a SINEC H1/H1FO network.

For more detailed information about the structure of SINEC H1/H1FO networks refer to /8/ and /9/.

2.2 CP 1430 TF Communications Processor for SIMATIC S5

System Integration
The CP 1430 TF communications processor is the communications interface to the SINEC H1/H1FO cell and area network for the following types of SIMATIC S5 programmable logic controllers:

➢ SIMATIC S5-115 U/H
➢ SIMATIC S5-135 U
➢ SIMATIC S5-155 U/H

The CP 1430 TF is designed specifically for the programmable logic controllers listed above. It is inserted as a module in the S5 rack.

Functions
The CP 1430 TF provides communication via the following:

➢ A transport interface for homogeneous (S5-S5) networks with

- data transfer services in the expedited and normal modes
- data transfer in the connection-oriented (transport connections) and connectionless (datagram services) modes.

➢ A SINEC TF interface for open communication with services for the following:

– non-language oriented transfer	-> variable services.
– device monitoring	-> VMD services.
– supplying data and programs to the PLC	-> domain services.
– device control	-> program invocation services
– time synchronization	-> clock services.

➢ PG online functions using bus paths
- to all PLCs (CPUs) via the AS511 interface
- to the S5-155U/H using backplane bus communication

Comparison of the Interfaces

For direct communication links, the CP 1430 TF provides data transfer on the transport layer 4 and the application layer 7. The following sections illustrate the differences and the table below summarizes these differences. Based on the table, you can decide which interface is suitable for your application. For more detailed information, refer to the documentation indicated in the table.

Interface	**Transport Interface**	**TF Interface**
Characteristics	Byte-oriented Communication	Message-oriented communication with services for controlling devices and transferring variables
	SIMATIC S5-specific Communication	Communication standardized in compliance with MMS
Area of Application	**Homogeneous Network** of SIMATIC controllers Communication possible with existing CP 535 and CP 143 systems	**Open Network** SIMATIC controllers with connections to host computers or systems of other vendors Migration to SIMATIC S7/M7
Documentation	CP 1430 TF manual Volume 1 Chapters 1 and 2 introduction Chapters 3 and 7	CP 1430 TF manual Volume 1, Chapters 1 and 2 introduction Volume 2, TF interface

Table 2.1: Comparison of the Interfaces

How the CP 1430 TF Operates

The CP 1430 TF operates as a slave processor system of the programmable logic controller and exchanges messages with the CPU of the programmable logic controller via a dual-port RAM and the S5 backplane bus. Communication is triggered by the application program on the S5 PLC using handling blocks (HDBs).

When the S5 PLC wants to send data to a partner system, the CP 1430 TF packs the data in one or more protocol data units (PDUs) and sends the PDU or PDUs to the partner system via the SINEC H1/H1FO cell and area network.

The CP 1430 TF receives the PDUs addressed to it from the SINEC H1/H1FO network and decodes these PDUs so that they can be understood by the application program of the S5 PLC (see Fig. 2.2).

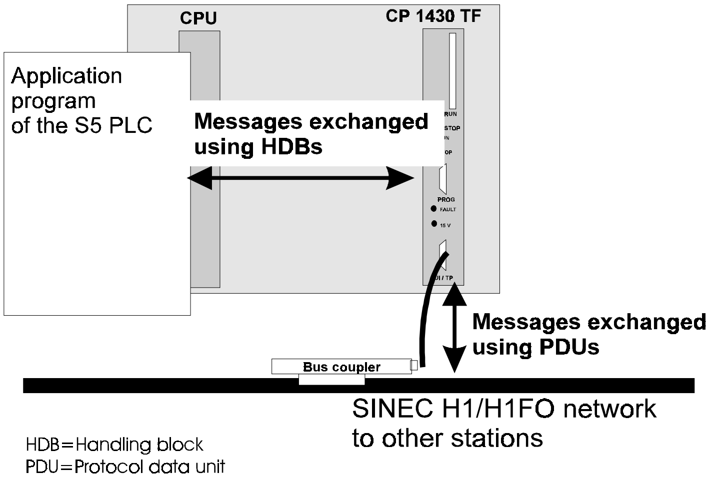


Fig. 2.2: Message Exchange between the S5 PLC, CP 1430 TF and SINEC H1 Network

2.3 Transport Connections and the Transport Interface of the CP 1430 TF

Meaning

Messages are exchanged between the communications program of the CP 1430 TF and the partner station using protocol data units (PDUs) transmitted via transport connections.

A transport connection is a logical connection between two access points for transport services on different stations. The transport connection is based on address information that uniquely identifies the transport route between the two access points.

The principle of connection and program addressing is explained briefly on the following pages based on the diagram below.

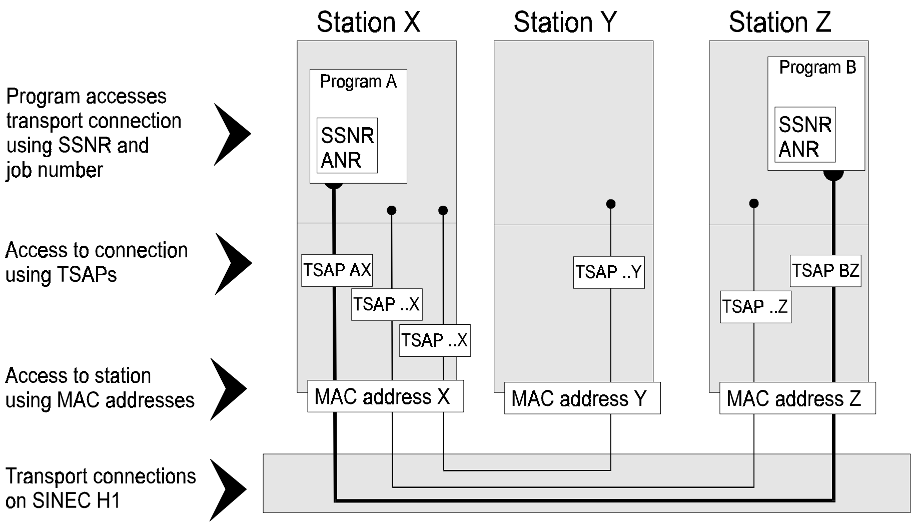


Fig. 2.3: Transport Connections and Addressing

Description of the Connection

From Table 1.1, it is clear that the task of a transport connection is to transfer raw information reliably. Fig. 1.2 illustrates the protocols implemented by the CP 1430 TF. Each of the three protocols up to layer 4 of the ISO/OSI reference model has specific address information.

Station Access Using the MAC Address (= Station Address)
The MAC protocol according to IEEE 802.3 (Ethernet) manages and uses MAC addresses also known as station addresses or Ethernet addresses. The station addresses uniquely identify the access to the stations connected via the SINEC H1/H1FO cell and area network.

The LLC protocol complying with IEEE 802.2 defines the logical connection between the MAC protocol and the protocols of the higher layers. For the ISO protocols of the higher layers, the LLC address (LSAP) has the hexadecimal value FE. Since on the CP 1430 TF, the ISO transport protocol is above the LLC protocol, the value of the LLC address is always FE. The LLC address is therefore not an individual parameter for transport connections on the CP 1430 TF.

Access Using TSAPs
The transport protocol according to ISO 8073 manages and uses the address information of transport service access points (abbreviated to TSAP). The TSAPs of the transport protocol identify the access points for services of the transport protocol on the individual stations. Two access points form the start and end of a transport connection via which the PDUs can be transferred reliably in both directions.

A transport connection between two CP 1430 TF communications processors in Stations X and Z with access points AX and BZ (see Figs. 2.3 and 2.4) is described in both stations using the following parameters:

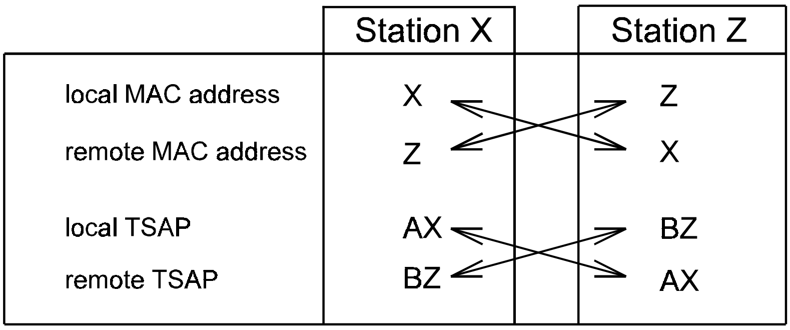


Fig. 2.4: Parameters for Transport Connection

Configuring the Connection on the CP 1430 TF
You specify these parameters using the COM 1430 configuration tool and save them on stations X and Z in the basic initialization information and in connection blocks.

On each station there is only one entry containing the local station address and one connection block for each transport connection containing the connection parameters and the local parameters, as follows:

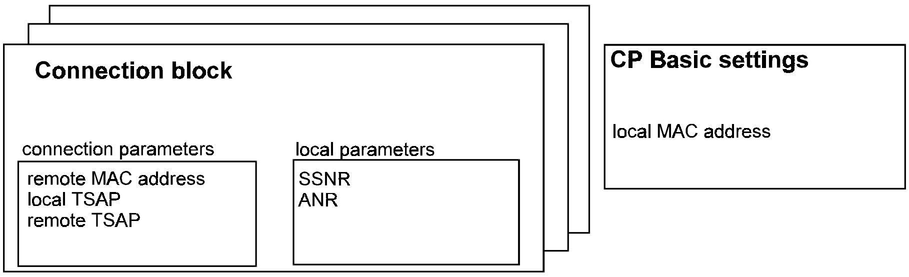


Fig. 2.5: Connection Block and SYSID Block with Transport Parameters

Understanding the Content of a Message
When the automation programs are written, declarations are necessary so that the S5 PLCs understand the representation (syntax) and the meaning (semantics) of the messages.

PLC-CP Link Using Handling Blocks

Information is exchanged between the S5 PLC and the CP 1430 TF using SIMATIC S5 handling blocks (HDBs). The handling blocks SEND and RECEIVE are available for transmitting and receiving messages.

When there is a send job to be executed, the automation program supplies the SEND handling block with parameter values and transfers the send job via the dual-port RAM to the communications program of the CP 1430 TF. The communications program executes the send job and reports the status of the job back to the automation program.

When there is a receive job, the automation program supplies the RECEIVE handling block with parameter values and transfers this receive job via the dual-port RAM to the communications program of the CP 1430 TF. The communications program then executes the receive job and reports the status of the job back to the automation program (see Fig. 2.6).

As described above, the communications program receives the jobs from the PLC program via the dual-port RAM. To allow these jobs to be passed on, the background communication must be activated. In this case, the SEND-ALL handling block is called in the user program to trigger send jobs and the RECEIVE-ALL handling block to trigger receive jobs.

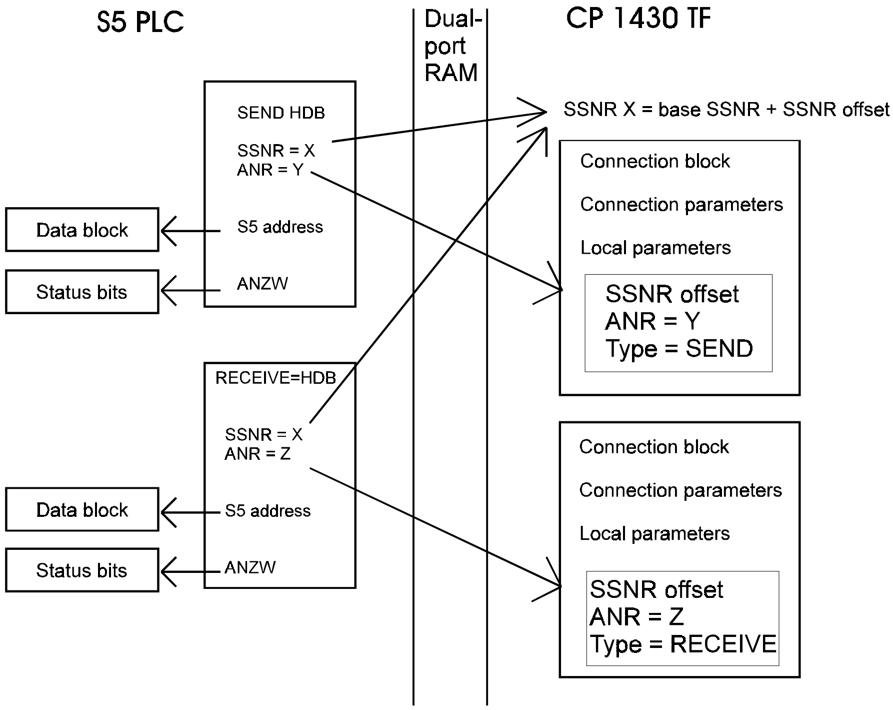


Fig. 2.6: SEND and RECEIVE Handling Blocks

Meaning of the Parameters

Fig. 2.6 illustrates the SEND and RECEIVE handling blocks with actual parameter values.

The following parameters define an HDB call:

➢ SEND and RECEIVE indicate the type of job.

➢ The interface number (SSNR) identifies the base address (base SSNR) of the CP 1430 TF and the transfer area (page=SSNR offset) in the dual-port RAM for the exchange of messages between the S5 PLC and the CP 1430 TF.

➢ The CP 1430 TF identifies the individual job based on the combination of ANR and SSNR. This combination must be **unique**.

➢ The S5 address indicates the start address and the length of a data buffer on the S5 PLC. With send jobs, these data buffers contain the information to be transferred; with receive jobs, the received information is located in this data buffer when the job is complete.

➢ The status word (ANZW) identifies the address of a status word on the S5 PLC. The status of the job is indicated to the automation program using the status word.

The job number (A-NR) parameter allows the communication job to be assigned to a connection block. This contains the parameters which describe the connection to a partner station.

The communication programs of the CP 1430 TF and the partner station communicate by means of protocol data units (PDUs). These allow the transfer of user data and data flow checks with the receive enable and receive acknowledgment messages.

Sequence of Job Processing

The chronological sequence of a send job is as follows:
The SEND HDB call starts a send job on the CP 1430 TF and transfers the S5 address of the information to be sent and the address of the status word assigned to the job to the communications program of the CP 1430 TF.

The CP 1430 TF makes a data buffer available and transfers all the data to be sent to the data buffer via the background communication (SEND-ALL). When the receive enable is set on the partner station, the PDU is transferred via the network to the partner station.

After the PDU has been received in the partner station, the CP 1430 TF receives an acknowledgment via the network and transfers the status of the send job to the assigned status word (see Fig. 2.7) using the background communication (RECEIVE-ALL).

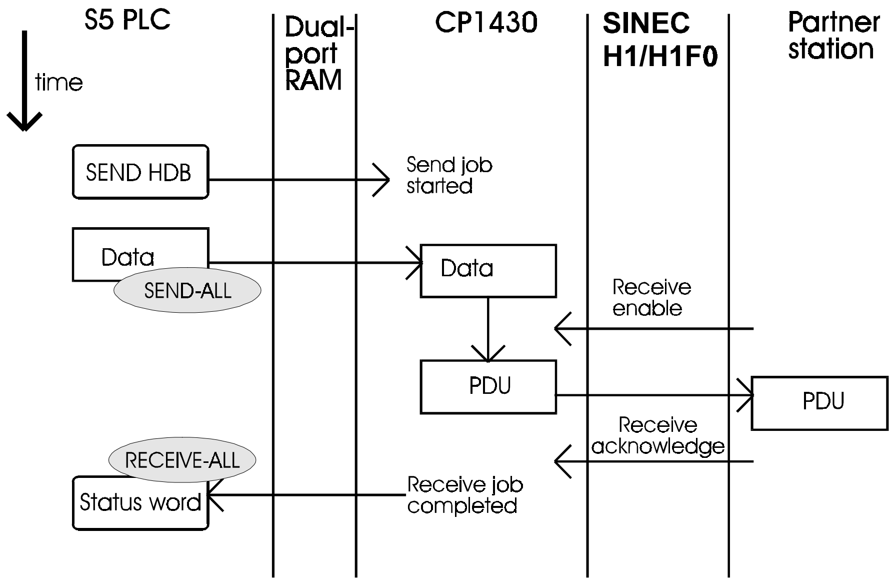


Fig. 2.7: Chronological Sequence of a Send Job

The chronological sequence of a receive job is as follows:

The RECEIVE HDB starts a receive job on the CP 1430 TF and transfers the S5 address for the data to be received and the address of the status word assigned to the job to the communications program of the CP 1430 TF.

The CP 1430 TF makes a data buffer available and sends a receive enable to the partner station for this connection.

Following this, the partner sends the PDU for this connection. The CP 1430 TF receives the PDU and extracts the data to be received. With the help of the background communication (RECEIVE-ALL), the communications program transfers the data to the data buffer for the S5 address and terminates the receive job by updating the status word.

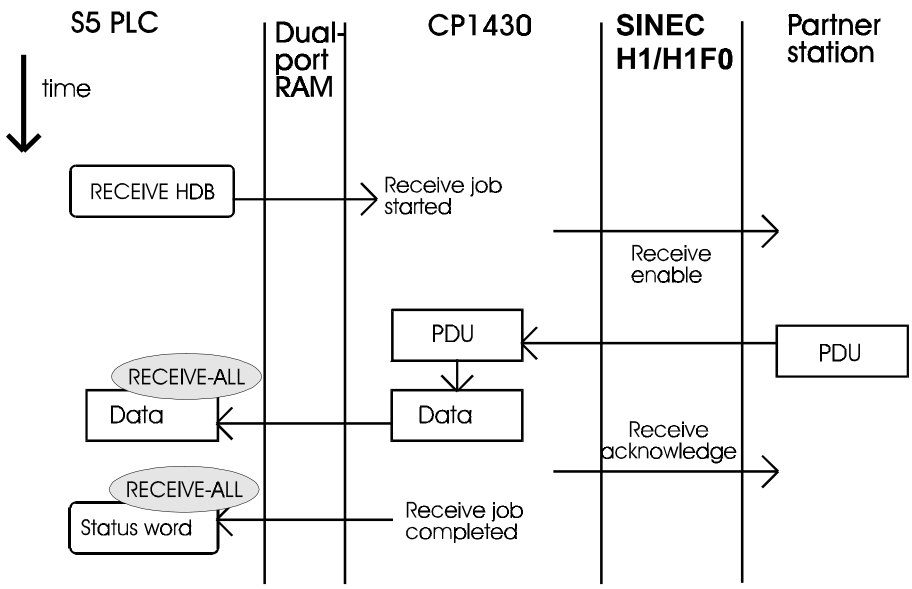


Fig. 2.8: Chronological Sequence of a Receive Job

2.4 Application Associations and the TF Interface of the CP 1430 TF

Overview

With transport connections between S5 devices and devices of other vendors, the syntax and semantics of the exchanged data structures are not known on the transport layer. With communication between heterogeneous devices, additional parameters are therefore required and a protocol to manage these parameters to allow the messages to be understood.

Fig. 1.2 illustrates the performance required in layers 5 to 7 above the transport layer. As the diagram shows, the protocol implemented on the CP 1430 TF for these tasks is the SINEC AP protocol with the interface to the SINEC technological functions (SINEC TF).

The application associations of the CP 1430 TF are managed using this protocol. Application associations allow communication between different types of devices.

How does this work? The following simple example illustrates the most important aspects of application associations and TF services.

☞ **The TF interface of the CP 1430 TF is described in detail in Volume 2 of this manual.**

Example of a Task

A host station wants to read process values belonging to a particular control task on an S5 station.

The Problem is the Language Barrier
The host processes the process variables in its own syntax (for example the high level language C syntax). The data presentation on the programmable logic controller, on the other hand, conforms to the S5 conventions. There is therefore a barrier to communication between the devices (cf. Fig. 2.9).

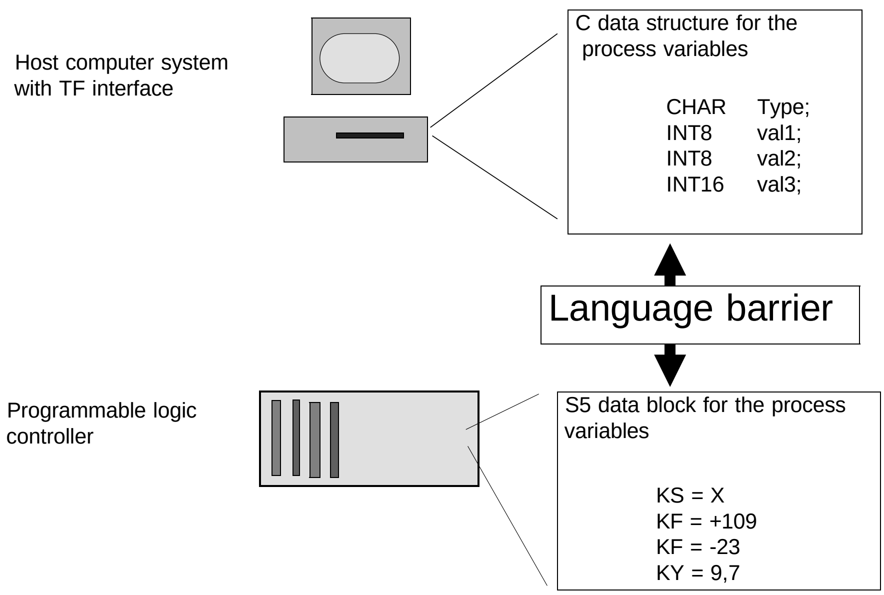


Fig. 2.9: Language Barriers in Communication Between Heterogeneous Devices

The standardized TF interface provides the solution.
The TF interface available on the CP 1430 TF provides a flexible solution that can be implemented simply using COM 1430 TF. The decisive factor is that the specific characteristics of the S5 device are hidden by the CP 1430 TF with its TF services. In the example, the specific data presentation within an S5 data block, on the one hand, and the C data structure on the other hand must be disguised. The S5 device appears to the host as a virtual device (VMD = Virtual Manufacturing Device) with standardized programs and data.

The following diagram illustrates access to the SINEC H1 network via the TF interfaces at both ends. The language barrier then no longer exists.

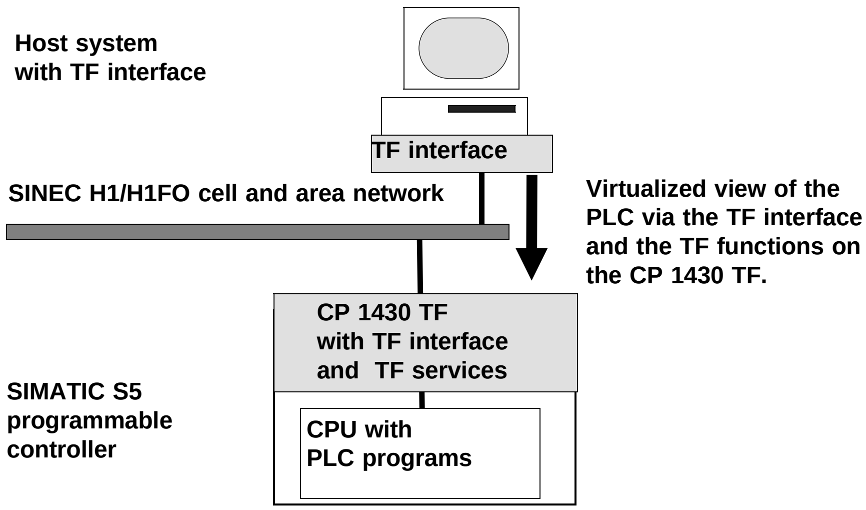


Fig. 2.10: TF Interface of the CP 1430 TF for Attachment to Other Systems

The TF Services
By using the TF interface instead of the transport interface, the host has access to a variety of services required to control and monitor the PLC.

In the example, these are the TF variable services which break down the language barrier. An overview of the services and their performance can be found below.

Overview of the TF Services

The following services can be implemented using application associations on the CP 1430 TF:

- ➢ Variable services

  Variable services are services for writing and reading the values of variables. This data can range from simple (integer) to complex (structures). A uniform syntax is defined to describe the data structure removing language barriers occurring in the data type description (in the example: the S5 data block can be read by the host computer).

- ➢ VMD services

  With the VMD services, information about the characteristics and status of a virtual manufacturing device (VMD) can be obtained (which services can be executed by the device, which objects exist etc.).

- ➢ Domain services

  Programs and data can be transferred with the services. The transfer can also be initiated by a third device, for example uploading a program from a file server to a PLC.

- ➢ Program invocation services

  The program invocation models an executable program section. The defined services include create, start, stop and delete program invocations.

Using the TF Interface

What needs to be done by the user to implement a communications task with the TF services? A somewhat simplified procedure is outlined below.

➢ Configuring application associations

Application associations are configured on the CP using COM 1430 TF. The parameters configured here include the station address and local and remote connection parameters just as for the transport connections. The transport connections continue to be used at a lower level for data transfer.

➢ Configuring variables

Information about configured structures is stored on the CP. This information describes the data areas that can be addressed via the TF interface. Depending on the task in hand, this information is stored in the connection blocks for specific application associations or is stored globally for all CP connections. The global use of information with the assignment of variables to a scope is explained in detail in the TF description.

➢ Programming the S5 PLC

The data to be read are generated or updated by the PLC programs and saved in data blocks on the PLC.

Client TF jobs such as read variable or write variable are formulated using the REQUEST EDITOR configuration tool in the form of job buffers and transferred to the CP for processing during the running of the program. These buffers are transferred in much the same way as with the transport services using the SEND-direct handling block.

It is possible to write the program in such a way that the PLC can check whether a partner has read a local variable. It could, for example, be possible to update values based on the result of such a check.

The TF Interface in the Example

Steps Required for the Application

Based on the example “reading process variables”, the following steps must be taken on the SIMATIC S5 side (PLC):

➢ Configuring the application association

One application association between the host and PLC must be configured with COM 1430 TF.

➢ Configuring variables

The data structures of the process variables to be read must be specified as a variable description when configuring the application association with COM 1430 TF. The COM makes sure that the entries are syntactically correct.

➢ S5 programming

The process variables are generated and updated by the PLC program. By evaluating status bits, read access can be detected and can lead to a defined reaction in the PLC program.

On the host side:

➢ Configuring the application association and variables

Application associations are also configured on the CP of the host computer. The way in which these are configured depends on the particular system being used. Transport connections continue to be used for data transfer.

➢ Host computer programming

In our example, the TF services are called on the host computer to read variables. How the call is made depends on the TF interface used on the host.

The following diagram illustrates the storage of the information resulting from the configuration steps at the SIMATIC S5 end on the CP 1430 TF.

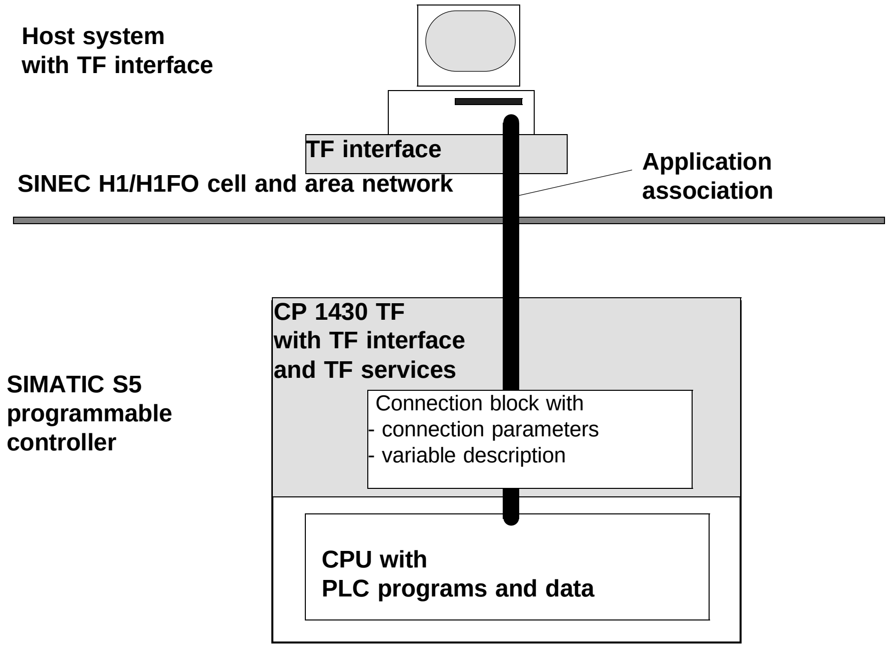


Fig. 2.11: TF Interface of the CP 1430 TF for Attachment to Other Systems

Using Other Facilities of the TF Services

Based on a simple read procedure, the example shows how the TF interface is used. The overview of the TF services is simply an outline of the broad spectrum of all the available services.

At the TF interface level, you have a powerful instrument for controlling the programmable logic controller and adapting it flexibly to the process. These TF services are all used according to the same principles outlined in the example.

❑

3 Configuring and Programming Communication with the CP 1430 TF

Topics in this Chapter

This chapter will familiarize you with the way in which the CP 1430 TF functions. It explains the steps required to supply the CP 1430 TF with configuration data and the user program with communication calls. You will learn the basics necessary to understand the interaction between the PLC and CP and the connections required between the CPs.

The aspects involving the TF interface are described in Volume 2. The topics dealt with here, however, apply in the main to the use of both the transport interface and the TF interface.

At the end of this chapter you will have learnt about the following topics:

➢ The possibilities of transmitting via transport connections and using datagram, multicast or broadcast services.

➢ How transport connections are established on the SINEC H1 bus.

➢ The significance of the software blocks on the CP.

➢ The principle of the PLC-CP connection using handling blocks.

➢ The principle of job processing.

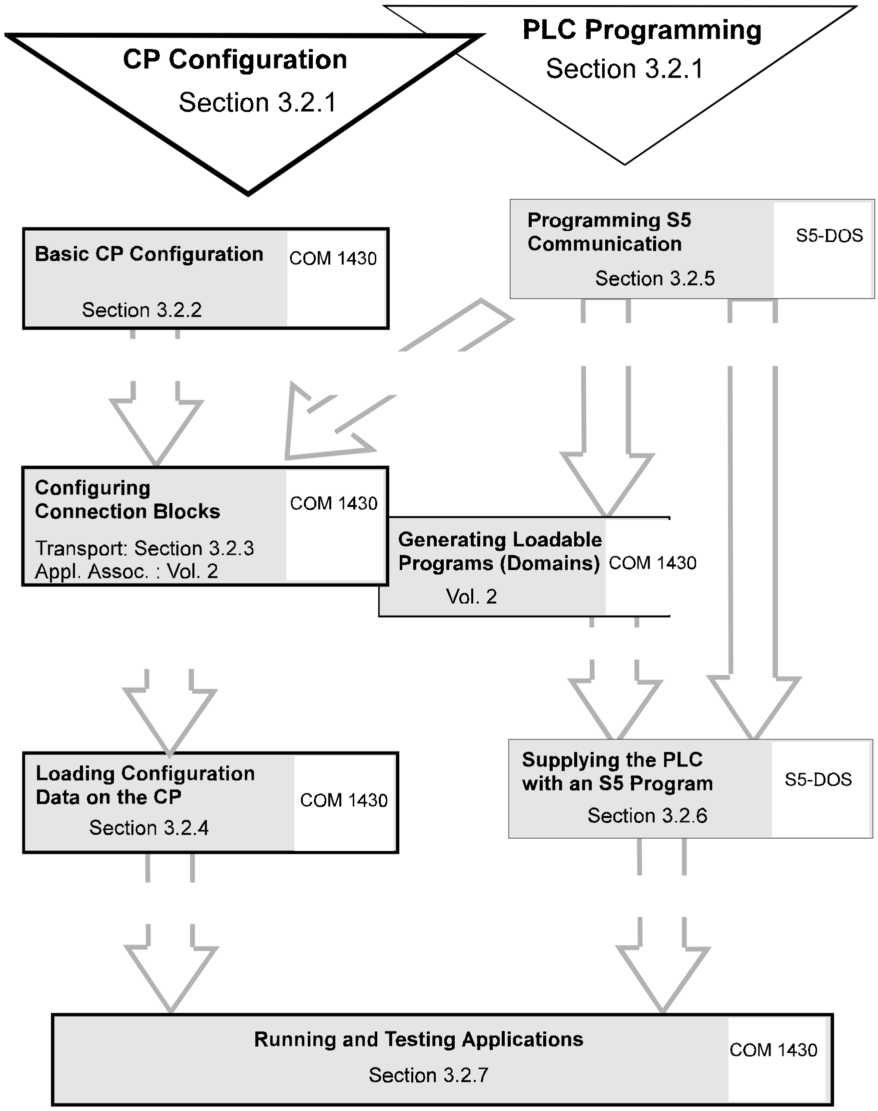
➢ The steps required to configure the CP and program the PLC.

A separate section is devoted to the topic of clock services.

In this chapter, note the references in the margin to the accompanying supplement COM 1430 TF Configuration Tool.

3.1 Overview of the Configuration and Programming Steps

The following sections explain the configuration and programming steps as illustrated below.



3.2 Explanation of Configuration and Programming

This chapter explains the steps necessary to configure the CP and program the PLC as illustrated in Section 3.1. The titles of the sections reflect the steps shown in the diagram.

Please remember that Volume 1 only deals in detail with communication on the transport interface. You will recognize the alternative steps available when using the TF interface. These steps are described in detail in Volume 2.

3.2.1 Getting Started

PLC Programming
The PLC programs contain the functions for the automation task. The communications requirements are decided by these tasks. The following information must be specified:

➢ which partners are involved in the communication

➢ which data must be exchanged

➢ which services will be used.

Once this has been decided, the basic requirements of the communication and CP configuration are implicitly already fixed.

CP Configuration
The COM 1430 TF configuration tool provides you with a flexible instrument for implementing communication according to the requirements (communications jobs) specified in the PLC programming.

➢ Connections can be stipulated or modified without affecting the programming.

➢ Programs can be assigned flexibly to the PLCs.

➢ If you also use the TF interface, PLCs can be adapted online to the requirements of the process using the domain services.

Deciding Between Transport and TF Services

Chapter 2.2 explained the main differences between the interfaces available on the CP 1430 TF. Based on Table 2.1 “Comparison of the Interfaces”, you can decide which communication interface is suitable for your task.

The following services are available on the transport interface:

Service	Priority	Meaning/Handling	Data Length
Expedited Data	PRIO 0	Data transfer - **with** hardware interrupt on the receiving PLC - via static connection	16 bytes max.
	PRIO 1	Data transfer - **without** hardware interrupt on the receiving PLC - via static connection	16 bytes max.
Normal Servi-ce	PRIO 2	Data transfer via **static** connection (used implicitly with TF services)	2043 words max.
	PRIO 3	Data transfer via **explicit dynamic** connection (connection established when required; connection terminated controlled by the user program with a RESET job)	2043 words max.
	PRIO 4	Data transfer via **implicit dynamic** connection (connection established when required; controlled by the user program. Connection terminated implicitly after data transmission)	2043 words max.

Service	Priority	Meaning/Handling	Data Length
Datagram	PRIO 0/1	Connectionless data transfer (PRIO 0 with hardware interrupt on the receiving PLC/PRIO 1 without hardware interrupt on the receiving PLC) with the alternatives: - Single address (transmission to a selected receiver, i.e. its MAC address matches the MAC address in the frame) - Multicast (transmission to several selected receivers, i.e. receivers whose MC group matches the MC address in the frame) -Broadcast (transmission to all stations whose MC group matches the broadcast setting).	16 bytes max.

Table 3.1: Services of the Transport Interface

Key: Static connections are established when the CP starts up.

Dynamic connections are established when they are required, in other words, when a job is issued for a configured connection.

3.2.2 Basic CP Configuration

3.2.2.1 Overview

CP Database

Configuration parameters are created with COM 1430 and

➢ saved as a database file on the PG

➢ loaded as a database on the CP either
  * using the COM 1430 TF transfer function
  * or by inserting a memory card programmed on the PG (Flash EPROM)

Organization of the Parameters in Blocks

The configuration parameters saved in the database are stored in individual blocks. These blocks can also be transferred singly using the transfer functions.

Basic initialization data	Basic initialization data: Identify the CP uniquely in the S5 system. **The block is specified in the basic configuration.**
OB 1	Clock master block: Specifies the clock master functions **The block is specified in the basic configuration.**
CONN 1	Connection block 1: Parameters of a transport connection or application association x
. . .	
CONN n	Connection block n: Parameters of a transport connection or application association y **Connection blocks are specified along with the configuration of the connections of the transport or TF interface.**

Fig. 3.1: Structure of the CP Database

3.2.2.2 The Parameters of the Basic Initialization

Function of the Block

The block is used for the following:

➢ Setting the MAC address

➢ Detecting the firmware version

➢ Recording the date on which the database was created and the plant designation.

➢ The interface parameter settings.

Configuring

M 2-1

The block parameters are configured with the COM 1430 TF configuration tool in the **Basic Settings** dialog. The configuration parameters themselves (ranges of values etc.) are described in detail in Chapter 6 Configuration Steps and Basic Configuration.

The CP adopts the values following a restart (CP transition from STOP to RUN).

3.2.2.3 The Parameters in the Clock Master Block (OB1)

Function of the Clock Master Block
The clock master block (OB1) contains initialization parameters for the clock master function of the CP 1430 TF.

Overview of the Block Parameters

➢ CP 1430 TF is clock master (Yes/No)
This entry decides whether or not the CP 1430 TF performs clock master functions (see Section 3.3 “Clock Services” and Section 6.3.3 “Edit/Clock Init”).

➢ Cycle time for SYNC frames (sec)
If the CP 1430 TF is the clock master, the transmission interval for clock synchronization frames is entered here in seconds (see also Section 3.3 “Clock Services” and Section 6.3.3 “Edit/Clock Init”).

➢ Destination address if clock master
Here you specify the destination address with which the clock “slaves” can be obtained.

Configuring
M 2-2
The block parameters are configured using the COM 1430 TF configuration tool in the **’Clock Master’** dialog. The configuration parameters themselves (ranges of values etc.) are described in detail in Chapter 6 Configuration Steps and Basic Configuration.

3.2.3 Configuring Transport Connections and Jobs

3.2.3.1 The Connection Block

Function of the Connection Block

The connection block contains the remote (oriented towards the partner in the network) and local (oriented towards the user program on the local station) parameters of a connection. Each connection block describes a transport connection, a datagram declaration or an application association.

With the parameters in the connection block, you specify the following:

➢ **The service**

A distinction is made between connection-oriented services and the datagram services (point-to-point/multicast/broadcast).

The services are described briefly in Table 3.1.

➢ **The addresses**

The global address parameters of a connection are as follows:

- The local TSAP-ID (transport service access point identifier)
- The remote TSAP-ID

The local address parameters of a connection are as follows:

- The local interface number (SSNR)
- The local job number (A-NR)

➢ **The service types**

The following service types are possible:

- SEND / RECEIVE
  Send and receive frames:
  The user program of the sending station supplies the source address of the data. The program of the receiving station specifies where the data will be saved.

- WRITE ACTIVE/PASSIVE
  Like SEND/RECEIVE however with parameter transfer:
  Activity is initiated by the sending station that supplies both the source and destination address of the data.

- READ ACTIVE/PASSIVE
  Like SEND/RECEIVE however with parameter transfer:
  The activity is initiated by the receiving station, that supplies both the source and destination address of the data.

➢ **Optional parameters for the transport connection**
- Indirect addressing
  Instead of using the information in the HDB call, in this case the source/destination address and the ANZW address can be configu-red.
- Transport parameters
  Instead of the default values, parameters can be set for a specific connection.

Configuring

M 2-4-1...

The block parameters are configured with the COM 1430 TF configuration tool using the function **Edit | Connections | Transport Connections**. Configuring itself is described in detail in Chapter 7 "Configuring the Transport Interface".

3.2.3.2 Assigning Addresses

The Global Address Parameters

A transport connection is uniquely identified by the address information. The address information includes the station address (Ethernet address or MAC address) and the service access point for the transport layer TSAP (**T**ransport **S**ervice **A**ccess **P**oint).

The Local Address Parameters

A communications job on the S5 side is identified by the combination:

➢ Local interface number (SSNR)

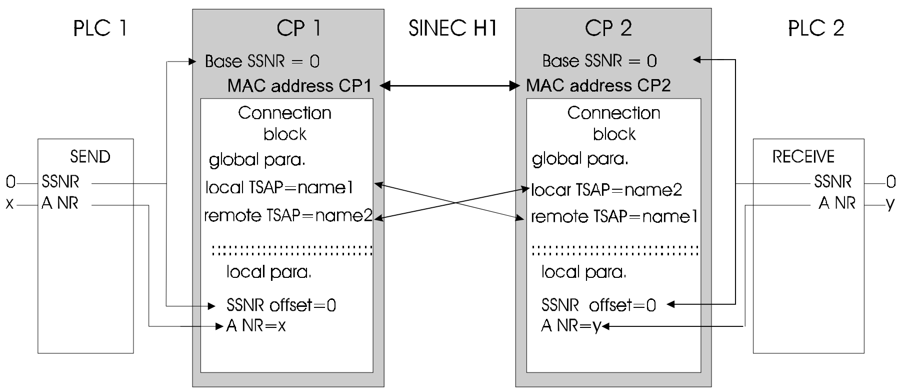
➢ Local job number (ANR)

In the PLC program, you must supply the handling blocks with the interfaces and job numbers specified here (see Section 3.2.5.2).

Assigning Global Parameters to Local Parameters by Configuring

The connection block on the CP 1430 TF works like a conversion table between the TSAP on one side and the interface and job numbers on the other.

The following diagram illustrates the assignment of a connection to a PLC job (HDB) using the configuration in the connection block.



where X, Y = 1 to 199

Fig. 3.2: Address Assignment

3.2.3.3 SSNR in the Single and Multiprocessor Modes

The following diagrams illustrate the assignment of the SSNR formed from the base SSNR and the page address (SSNR offset) in:

➢ A single processor PLC, i.e. when using one CPU and one or more CP 1430 TF modules.

Single processor PLC

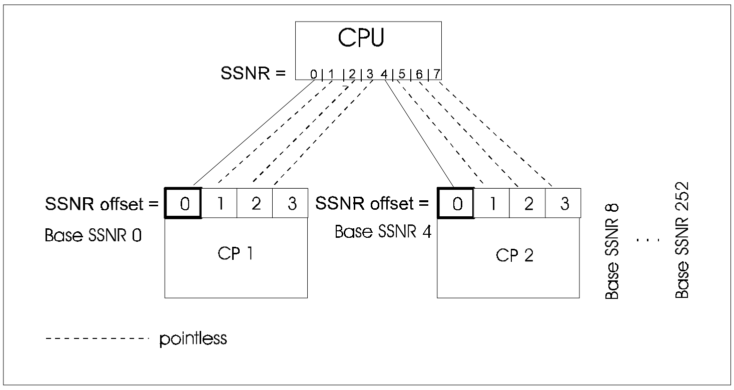


Fig. 3.3: Interface Addressing - Single Processor PLC

➢ A multiprocessor PLC, i.e. when using several CPUs and one or more CP 1430 TF modules.

Multiprocessor PLC

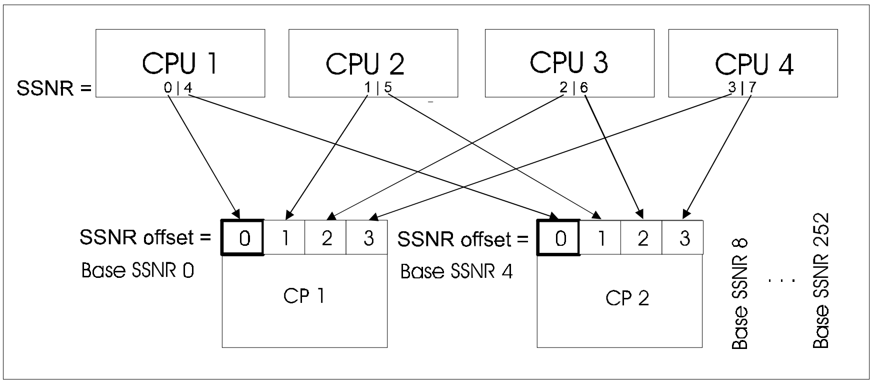


Fig. 3.4: Interface Addressing - Multiprocessor PLC

3.2.3.4 SEND/RECEIVE Service Types

Principle of Sending and Receiving
Communication connections between parts of the program in two different programmable controllers or manufacturing devices can be compared to a postal system. A SEND job on the CP 1430 TF represents the postbox, a RECEIVE job (on another CP) represents the PO box. Using the SEND handling block, messages can be put into the postbox and then transported by the CP 1430 TF transport system to the PO box of the addressee. Then, using the RECEIVE block, the message can be collected. The transport system ensures that neither the postboxes nor the PO boxes can be overfilled.

Possible Priority Classes for SEND/RECEIVE

➢ PRIO 0 and 1 as expedited data service

➢ PRIO 2 as normal service

➢ PRIO 3 and 4 for messages that are not urgent (connection established only when required).

Configuring SEND/RECEIVE
You select the SEND/RECEIVE service type with COM 1430 by configuring the following:

➢ a SEND with the identifier
READ/WRITE = N on one side,

➢ a RECEIVE with the identifier
READ/WRITE = N on the other side.

3.2.3.5 WRITE ACTIVE/PASSIVE Service Type

Meaning and Differences Compared with SEND/RECEIVE

The WRITE function allows a data record to be transferred from a programmable logic controller (ACTIVE side), to a remote device (PASSIVE side). In contrast to SEND/RECEIVE, with WRITE, the parameter data record that defines the data sink (data destination) is also transmitted on the bus. The active side of the WRITE service can therefore force data on to the passive side (similar to a DOWNLOAD function).

WRITE Requires a Fixed Priority

Since any data can be exchanged with the WRITE function, and the receiver must always be ready to accept the data (PASSIVE side), the WRITE function can only be used in the normal priority class PRIO 2. The WRITE function requires static connections on which data can be transmitted using the normal service.

Configuring WRITE

You select the WRITE ACTIVE/PASSIVE service with COM 1430 by configuring the following:

➢ a SEND with the identifier
  READ/WRITE = YES on the active side,

➢ a RECEIVE with the identifier
  READ/WRITE = YES on the passive side.

3.2.3.6 READ ACTIVE/PASSIVE Service Type

Meaning
The READ function allows a data record to be read from a remote programmable controller (PASSIVE side). With the READ function, the parameter data record that describes the data source is also transmitted on the bus. The ACTIVE end of the READ service can therefore read a data record from the PASSIVE side directly (similar to an UPLOAD function).

READ Requires a Fixed Priority
Since any data can be exchanged with the READ function, and the PASSIVE side must always be ready to have data read from it, the READ function can only be used with the normal priority class PRIO 2. The READ function requires static connections for the exchange of data using the normal data service.

Configuring READ
You select the READ ACTIVE/PASSIVE service type with COM 1430 by configuring the following:

➢ a FETCH-ACTIVE with the identifier
READ/WRITE = YES on the active side,

➢ a FETCH-PASSIVE with the identifier
READ/WRITE = YES on the passive side.

3.2.3.7 Using the Transport Connections

The transport connections can be used as follows:

➢ SIMPLEX (either transmitting or receiving via one TSAP)

➢ SIMPLEX with additional "expedited data service”

➢ HALF DUPLEX (write/read jobs)

➢ FULL DUPLEX (transmitting and receiving via one TSAP)

➢ FULL DUPLEX with additional "expedited data service”

The following sections describe how to use the transport connections.

SIMPLEX for the SEND/RECEIVE Service Type

In the simplex mode, data can only be transmitted in one direction. This transmission mode results from the assignment of only one SEND or only one RECEIVE in the connection blocks.

The simplex mode is possible on connections with priority 0 to 4.

The diagram below illustrates the following:

➢ The job type to be specified when configuring the CP (SEND for PLC1, RECEIVE for PLC2).

➢ The handling block to be used in the PLC program (SEND HDB for PLC1, RECEIVE HDB for PLC2).

➢ The handling blocks required for background communication (SEND-ALL and RECEIVE-ALL.

➢ The direction of data flow

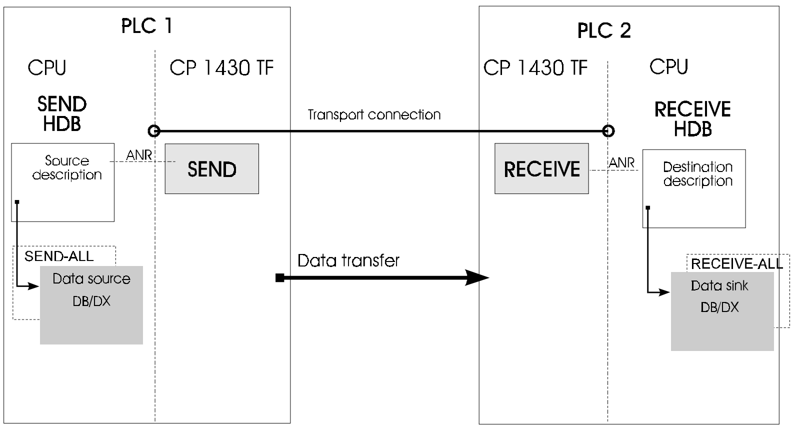


Fig. 3.5: Simplex Transmission

Note:
With priority 0 and 1 jobs, no ALL HDBs are required.

HALF DUPLEX for the READ and WRITE Service Types

The half duplex mode is used with READ and WRITE jobs. The initiator of the READ job sends a negotiated data frame which is replied to by the station addressed (FETCH-PASSIVE) with FETCH jobs, only one job can be assigned per connection block.

The half duplex mode is only possible for priority 2 connections.

The diagrams below illustrate the following aspects of READ and WRITE jobs

- ➢ The job type to be specified when configuring the CP (for example FETCH active R/W=Y for PLC1).
- ➢ The handling block to be used in the PLC program (FETCH HDB and RECEIVE-ALL HDB for PLC1, SEND-ALL HDB for PLC2).
- ➢ The direction of data flow.

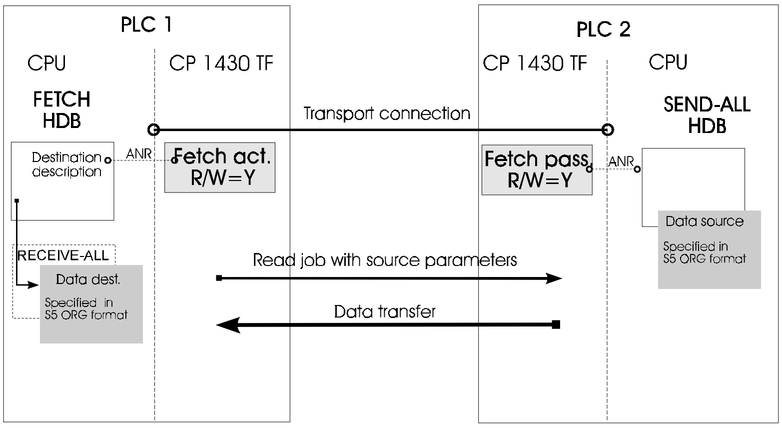


Fig. 3.6: Half Duplex Transmission READ Job

Note:
The ORG format is the brief description of a data source or data destination in the S5 environment. The S5 ORG formats are listed in Appendix B of this manual in Tables B.1 to B.3.

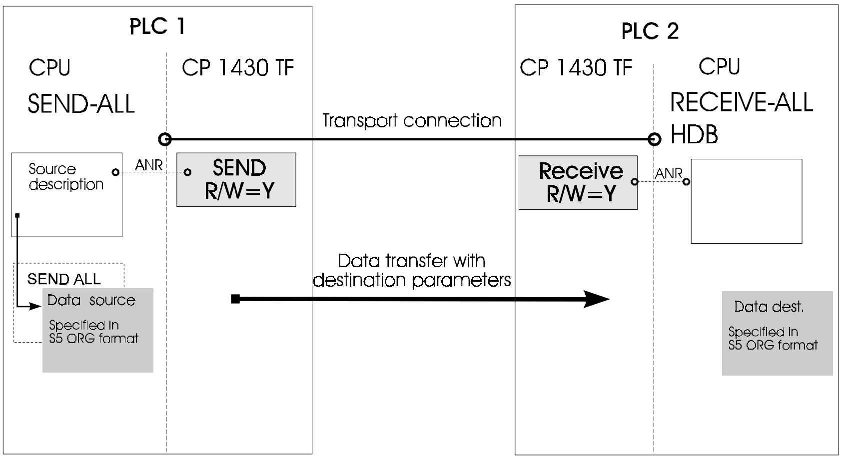


Fig. 3.7: Half Duplex Transmission WRITE Job

Note:
The ORG format is the brief description of a data source or data destination in the S5 environment. The S5 ORG formats are listed in Appendix B of this manual in Tables B.1 to B.3.

FULL DUPLEX Mode for the SEND/RECEIVE Service Types

In the full duplex mode, both ends of a connection can be active simultaneously and can transmit data. The full duplex mode is obtained when a SEND and RECEIVE job are defined in a connection block.

The full duplex mode is possible on connections with priority 0 to 4. The diagram below illustratesn the following:

➢ The job type to be specified when configuring the CP(for example SEND for PLC1).

➢ The handling blocks used in the PLC program (SEND-HDB and RECEIVE-HDB and SEND-ALL-HDB and RECEIVE-ALL-HDB on both PLCs).

➢ The direction of data flow

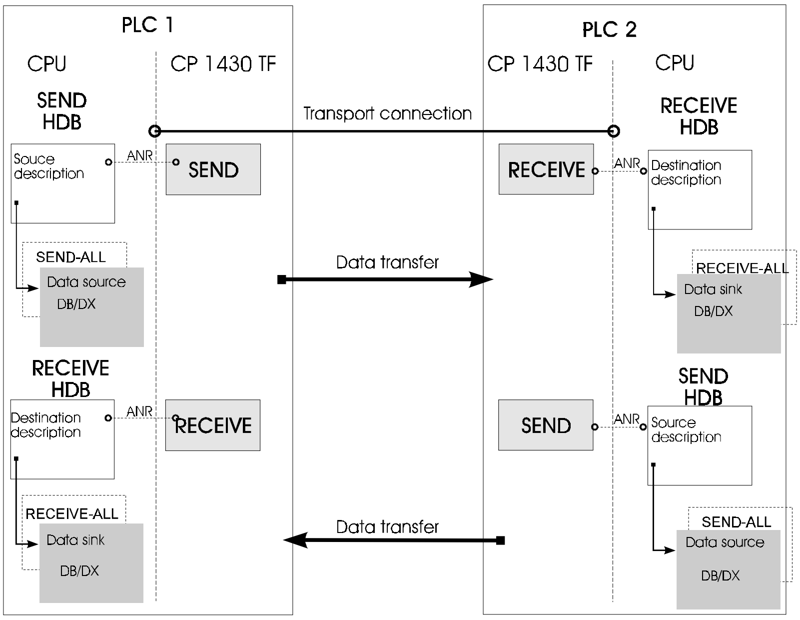


Fig. 3.8: Full Duplex Transmission

Note:
Jobs with priority 0 and 1 do not require ALL HDBs.

The following table provides you with an overview of the possible combinations of jobs on a transport connection. Depending on how the connection is used, there are 9 possible variations.

Transmission Type		1st Job	2nd Job	3rd Job	4th Job
1	PLC1	SEND PR2			
	PLC2	RECV PR2			
2	PLC1	SEND PR2	SEND PR0/1		
	PLC2	RECV PR2	RECV PR0/1		
3	PLC1	SEND PR2	SEND PR0/1	RECV PR0/1	
	PLC2	RECV PR2	RECV PR0/1	SEND PR0/1	
4	PLC1	READ A			
	PLC2	READ P			
5	PLC1	WRITE A			
	PLC2	WRITE P			
6	PLC1	SEND PR2	RECV PR2		
	PLC2	RECV PR2	SEND PR2		
7	PLC1	SEND PR2	RECV PR2	SEND PR0/1	RECV PR0/1
	PLC2	RECV PR2	SEND PR2	RECV PR0/1	SEND PR0/1
8	PLC1	SEND PR0/1			
	PLC2	RECV PR0/1			
9	PLC1	SEND PR0/1	RECV PR0/1		
	PLC2	RECV PR0/1	SEND PR0/1		

Table 3.2: Job Combinations

= Simplex   = Half duplex   = Full duplex

Key to Table 3.2:

A = ACTIVE
P = PASSIVE

PR0/1	= Expedited Data	PRIO 0 or PRIO 1	(see page 3- 5)
PR2	= Normal service	PRIO 2	(see page 3-5)
SEND	= job type SEND		(see page 3-14)
RECV	= job type RECEIVE		(see page 3-14)
WRITE	= job type WRITE		(see page 3-15)
READ	= job type READ		(see page 3-16)

The SEND job is “active” when the connection is established and the RECEIVE job is “passive”. If there are several jobs per TSAP, the first job in the connection block decides whether the connection establishment is active or passive.

Example:
The standard application corresponds to transmission type 6. In this situation the table demonstrates the following:

In one connection block and with the full duplex mode, one SEND and then one RECV with PRIO2 or one RECV and then one SEND with PRIO2 can be sent. The opposite combination must be configured on the partner.

The table also shows that a maximum of four jobs per connection (SEND/RECEIVE PRIO 2 and SEND/RECEIVE PRIO 0/1) can be configured (transmission type 7).

3.2.3.8 Connection Establishment

When is the Connection Established?
The time at which the connection is established depends on the service (priority class) selected for the connection.

After the CP has started up, the connections for the following priority classes are established or attempted:

➢ PRIO 0, expedited data service with interrupt.

➢ PRIO 1, expedited data service without interrupt

➢ PRIO 2, normal service

Connections of the following priority classes are only established after a handling block (SEND/RECEIVE/FETCH) has been processed:

➢ PRIO 3, dynamic establishment, explicit termination

➢ PRIO 4, dynamic establishment, implicit termination

Conditions for Connection Establishment
The CP 1430 TF establishes a transport connection in the following situations:

➢ The identifiers describing this connection match, in other words the local TSAP is the same as the transferred remote TSAP and the remote TSAP is the same as the transferred local TSAP of the partner.

➢ The local MAC address matches that transferred by the partner where it is entered as the remote MAC address.

Initiative for Connection Establishment

Depending on the configuration, the connection is initiated by the active side. The active side is either the sender of a message (with full duplex the side with the first SEND or the side configured as being active).

The passive side confirms the connection establishment. The passive side is the receiver of a message (RECEIVE HDB or FETCH-PASSIVE HDB)

Monitoring Connection Establishment

A distinction must be made between the following:

Static connections

With static connections, connection establishment is attempted until the connection is established.

Dynamic connections

In dynamic connections, the connection establishment is attempted until the configured retry time has elapsed.

Due to the different establishment philosophies, it is not possible to have high priority jobs (PRIO 0/1/2) combined with low priority jobs (PRIO 3/4) in one connection block.

Monitoring Established Connections

Established connections are checked by the CP 1430 TF at the intervals selected for the connection (inactivity acknowledge time). An IDLE frame is sent that must be acknowledged by the receiving station within the monitoring time. If the idle acknowledgment is not received three consecutive times, the connection is terminated. Depending on the job type and job priority, the user is informed of this error immediately or with the next trigger by means of the job status (status word of the handling block).

How a PRIO 2 Transport Connection is Terminated

A PRIO 2 transport connection can respond in two ways:

1. Assumption: The send side receives a disconnect request.

   If the active end (connection end point configured with SEND) receives a disconnect request PDU, it replies with disconnect confirm and the connection is and remains terminated until a SEND is triggered with the job number of the connection. This SEND job is completed with “job ended with error" but the connection is immediately re-established).

2. Assumption: Receive side after breakdown on the partner.

   If the send side breaks down (for example a brief loss of power on the PLC), the transport timer of the partner (passive side, connection end point configured with RECEIVE block) expires and the connection is terminated. A renewed connect request is replied to with a disconnect request until a RECEIVE direct is triggered with the job number of the connection. This receive job is completed with “job ended with error” but the connect request of the partner is accepted and the connection is re-established.

3.2.3.9 Datagram Service

Overview

Apart from virtual connections, the CP 1430 TF also provides services for sending messages without an explicit connection and without an acknowledgment.

- ➢ Single address:
  Send to **one** particular station
- ➢ Multicast service:
  Send to a particular **group** of stations
- ➢ Broadcast service:
  Send to **all** stations.

Single Address

The single address datagram service can be used for direct frames (data exchange between two partners), for example for fast frames that do not require acknowledgment.

Connections are not negotiated. Reception of the data is not confirmed to the sender.

The CP 1430 TF cannot report the loss of frames to the user, for example if the receiver does not have sufficient receive buffer space available.

Multicast and Broadcast

The multicast and broadcast services allow a message to be sent on the SINEC H1 bus to all stations (broadcast) or to a specific set of stations (multicast).

Broadcast and multicast messages are possible since the CP 1430 TF not only recognizes a particular address on the bus (its own MAC address) but also the broadcast address (FF FF FF FF FF FF_H) and all multicast addresses (multicast groups, that have been configured).

The number of receive multicast groups (including the time-of-day) is limited to 10.

The diagram below illustrates the following aspects:

➢ The job type to be specified when configuring the CP (SEND Datagr.=Y for PLC1).

➢ The handling block to be used in the PLC program (SEND HDB for PLC1).

➢ The direction of data flow

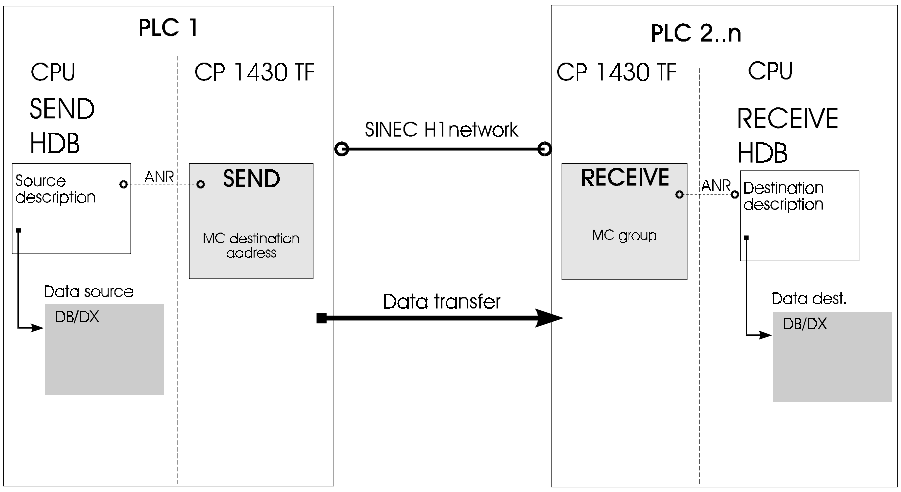


Fig. 3.9: Datagram Service

Priority and Data Length

The datagram service can only be handled by the CP 1430 TF at priority levels 0 and 1, in other words the net data field is limited to 16 bytes.

3.2.4 Supplying the CP with Configuration Data

There are two different ways of configuring or entering/changing the parameters in the basic initialization data, clock and connection blocks, as follows:

➢ Online CP
The CP is connected to the PG via the AS511 interface or on a bus path so that the entries can be saved directly on the CP. You can save the configuration data at any time by transferring the CP data to a database file on the PG.

To be able to do this, the “node initialization” is necessary (see Chapter 4)

➢ Offline FD
The configuration data are saved in a database file on the PG.

You only require a PG-CP connection when you want to put the CP into operation so that you can load the configured database on the CP.

You can also load the configured database on a memory card inserted in the PG and then insert this memory card into the CP. In this case, you do not need a PG-CP connection except for diagnostic or test purposes.

3.2.5 Programming SIMATIC S5 Communication

3.2.5.1 Handling Blocks (HDBs)

The creation of the PLC programs is largely independent of the configuration and is therefore shown as a parallel path in the figure on page 3-3. The PLC programs must contain the communication calls for the particular task.

Dual-Port RAM as PLC-CP Interface
The interface between the PLC and CP is a dual-port RAM (DPR) which has the same organization on all S5 CPs. The CP 1430 TF has four such DPR interfaces so that every CPU in a multiprocessor PLC can communicate independently with the CP 1430 TF.

Handling Blocks as Program Interface
CP user programs control the CPs using handling blocks (HDBs). The following system calls, in other words HDBs, are available:

- **SEND HDB**
  The SEND block is used to transfer a job (with or without the user data for transfer) to the CP. The send HDB is used for the configurable job types SEND and WRITE.

- **RECEIVE HDB**
  The RECEIVE block is used to accept a job (with or without received user data) from the CP.

- **FETCH HDB**
  The FETCH block is used to fetch data (with the READ job type).

- **CONTROL HDB**
  The CONTROL block is used to query the status of a job.

- **RESET HDB**
  The RESET is used to reset a connection or reset all connections (RESET_ALL).

- **SYNCHRON HDB**
  The SYNCHRON block establishes the synchronization between the PLC and CP during startup. At the same time, the transfer area of the interface is cleared and the field length negotiated between the CP and PLC, in other words the synchron block proposes the field length to be used.

- **SEND_ALL HDB**
  The SEND_ALL-HDB is used to trigger the data transfer from the PLC and CP (see Table 3-3).

- **RECEIVE_ALL HDB**
  The RECEIVE_ALL HDB is used to trigger data acceptance between the PLC and CP (see Table 3-3).

➢ The handling blocks are contained in special function blocks belonging to the SIMATIC S5 PLCs. The following table shows which FBs belong to which PLC.

. PLC / HDB	S5-115U/H	. S5-135U/155U/H	
	CPU: 941, 942, 942R 943, 944, 945	CPU: 922, 928, 948, 948R	CPU: 946/47, 946/47R
SEND	FB244	FB120	FB120
RECEIVE	FB245	FB121	FB121
FETCH	FB246	FB122	FB122
CONTROL	FB247	FB123	FB123
RESET	FB248	FB124	FB124
SYNCHRON	FB249	FB125	FB125
SEND_ALL	FB244 (ANR=0)	FB126	FB126
RECEIVE_ALL	FB245 (ANR=0)	FB127	FB127

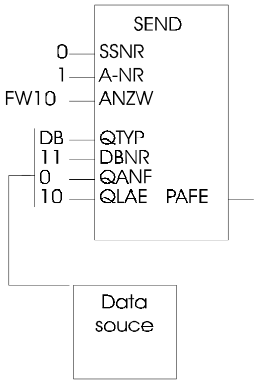
Table 3.3: HDB Numbers in the Various PLCs

☞ **Note:**

Detailed information about the handling blocks of the individual PLCs, particularly when the blocks are integrated in the operating system can be found in the descriptions of the PLCs and in /7/.

3.2.5.2 Supplying Parameters for HDBs

The HDBs must be supplied with the following interface parameters (example SEND HDB):



where:

SSNR = interface number

ANR = job number

ANZW = status word

QTYP / ZTYP = type of data source/destination

DBNR = data block number

QANF / ZANF = relative start address within the type

QLAE / ZLAE = number (length) of source/destination data

PAFE = parameter assignment error byte

SSNR and ANR: Identification of the Connection and Job
All the handling blocks require and interface number and a job number (the SYNCRHON HDB only requires the interface number).

➢ Interface number

The interface number is formed as follows:

SSNR = base SSNR + SSNR offset

➢ The job number identifies the connection and the job.

The job number (A-NR) identifies a sub-task on the CP.

Addressing the CP using the base SSNR and addressing the data transfer page using the SSNR are described in detail in Section 3.2.3.3.

For the meaning of the other HDB parameters, refer to /7/

3.2.5.3 PLC Job for the SEND/RECEIVE Service

The Principle of Sending and Receiving

With the handling blocks of the PLCs, a function is initiated on the CP 1430 in the same way for PRIO 0/1 and PRIO 2/3/4 jobs. The only difference is the time at which the data is transferred or accepted. With PRIO 0/1 this is directly during the processing of the block and with PRIO 2/3 and 4 using the background communication.

Description of Job Triggering According to the Priority Classes

➢ Expedited Data Service (Priority Classes 0/1)

With the expedited data service, the user data are transferred directly (SEND) and received directly (RECEIVE) when the handling block is run through. The RECEIVE block is ready to receive immediately following the connection establishment or immediately after a frame has been accepted by the PLC.

When a message is received, this is indicated in the status bits so that the RECEIVE block can accept the data immediately. With PRIO 0 jobs, not only the status bits are set but an interrupt is also triggered on the PLC.

As already mentioned above, the expedited data service is restricted to net data with a maximum length of 16 bytes.

☞ **The expedited data service should not be used for cyclic transmission (triggered in each user cycle), since services with lower priority can be forced into the background.**

Repetition of expedited data service frames (for example when the receiver has not made a receive buffer available) would result in delays and unnecessary load on the network.

When using the expedited data service with interrupt (PRIO 0), the receive HDB on the receiver side must be implemented in the interrupt OB (the exact designation of the block depends on the particular device). The CP only resets the interrupt signal when the job that triggered the interrupt signal is processed (handling block processed).

➢ Normal Service (Priority Classes 2-4)
In the normal service, the PLC transfers the SEND or RECEIVE job to the CP 1430 TF with the handling blocks (in other words it informs the CP 1430 TF that it wishes to send a data record or is ready to receive a message and indicates the memory area in which the received data will be stored). The transport management then makes data buffers available. Dynamic connections are now established if they do not already exist (PRIO 3 and 4).

With a SEND job, the data for transmission are requested from the PLC via the background communication (SEND-ALL) and with the RECEIVE job, the organized data buffers (length depending on the length of data to be received) are made available.

Here, background communication means that the CP 1430 TF requests the PLC to transfer or receive data. The background communication is implemented by the handling blocks SEND-ALL or RECEIVE-ALL that must be called at least once per active CP 1430 TF interface in the PLC cycle. With RECEIVE, the data to be received are also transferred (if they have arrived) to the PLC via the background communication (in this case RECEIVE ALL).

3.2.5.4 PLC Job for the WRITE ACTIVE/PASSIVE Service

A WRITE service is triggered on the ACTIVE side by a SEND block with QTYP = RW. The description of the data source (i.e. the data source in the local PLC) and the description of the data destination (i.e. data destination in the remote PLC) is written into a data block and the operating system (SEND block) is informed of the location with the parameters DBNR and QANF.

On the PASSIVE side, the CP 1430 TF sets itself automatically to receive, in other words, reception does **not** need to be triggered by the RECEIVE block. The RECEIVE-ALL block must be called at least once in the PLC cycle to transfer data to the PLC.

The destination descriptions that can be assigned as parameters for the WRITE PASSIVE service on the CP 1430 TF serve as default parameters if no parameter descriptions are sent by the ACTIVE side. Just as the destination description, the specification of a status word on the PASSIVE side is advisable; if no status word is specified in the connection block, the PASSIVE side operates without setting status bits for the user program in the PLC.

3.2.5.5 PLC Job for the READ ACTIVE/PASSIVE Service

A READ service is triggered on the ACTIVE side by a FETCH handling block with the parameter ZTYP = RW. The description of the data source (i.e. the data source in the remote PLC) and the description of the data destination (i.e. the data destination in the local PLC) is written to a data block and the FETCH block is informed of this with the parameters DBNR and ZANF.

One the PASSIVE side, the CP 1430 TF sets itself automatically to receive the READ request frame, in other words it does not need to be triggered by a handling block. To read out the requested data from the PLC, however, the SEND-ALL block must be called at least once in the PLC cycle.

The source descriptions, that can be assigned as parameters for the READ-PASSIVE service on the CP 1430 TF, serve as default parameters if no parameter description is sent from the ACTIVE side. Just as with the source description, it is advisable to specify a status word; if no status word is specified in the connection block, the PASSIVE side of the READ service operates without setting status bits for the user program in the PLC.

3.2.5.6 Blocks for Synchronizing the PLC and CP

During the start up of a PLC, each CP interface used must be synchronized by the synchron handling block. Since this applies to all types of PLC restart, the necessary number of SYNCHRON blocks is required in

OB20 for a cold restart

OB21 for a manual warm restart

OB22 for a warm restart after power down.

The SYNC-HDB also requires a value for the parameter BLGR (field size). The CP understands the value in BLGR as a proposal for the size of the data fields transferred between the CPU and CP.

☞ **Recommendation:**

The field size BLGR in the SYNCHRON block should be selected as <=6 for the READ and WRITE services.

To improve performance, BLGR should be selected as high as possible.

Special case 1
The value BLGR =6 (512 bytes) means that the CP 1430 negotiates 496 bytes, the remaining 16 bytes are required for the header information.

Special case 2
If you require a field length of 512 bytes, the BLGR parameter must be assigned the value 255.

3.2.5.7 Handling the RESET

Meaning of RESET

A job that has started on the CP 1430 TF can be reset using the RESET block. The RESET function is useful in the following situations:

➢ With SEND/RECEIVE PRIO 0/1/2 or with READ/WRITE if the job is not completed within a certain time (for example the sender does not transfer or the receiver does not accept any data). The CP 1430 TF itself does not monitor the times of jobs on the transport interface.

➢ With SEND/RECEIVE PRIO 3, to terminate an established connection again.

➢ With SEND/RECEIVE PRIO 3/4, when a connection was not established within a certain time. The monitoring time for establishing PRIO 3/4 connections is set with the "retransmission time" parameter on the CP 1430 TF.

M 2-4-2.3 (See ’**Transport Parameters’** dialog)

RESET Job on the PLC

The RESET function is triggered by the RESET handling block which is supplied with the appropriate interface and job number. The RESET-ALL function, in other words a RESET with the job number 0 triggers a CP restart.

Starting the RESET block only depends on the RLO, in other words, the RESET function can be started regardless of the status of the job on the communications processor.

How RESET Functions

The following flow diagram shows that the RESET interrupts an established connection. If several jobs are defined for a connection in one connection block, resetting one job will also reset any other jobs on this connection. You should bear this in mind when you use a RESET function or when you plan multiple use of a connection.

The following diagram illustrates the entire sequence of the RESET block.

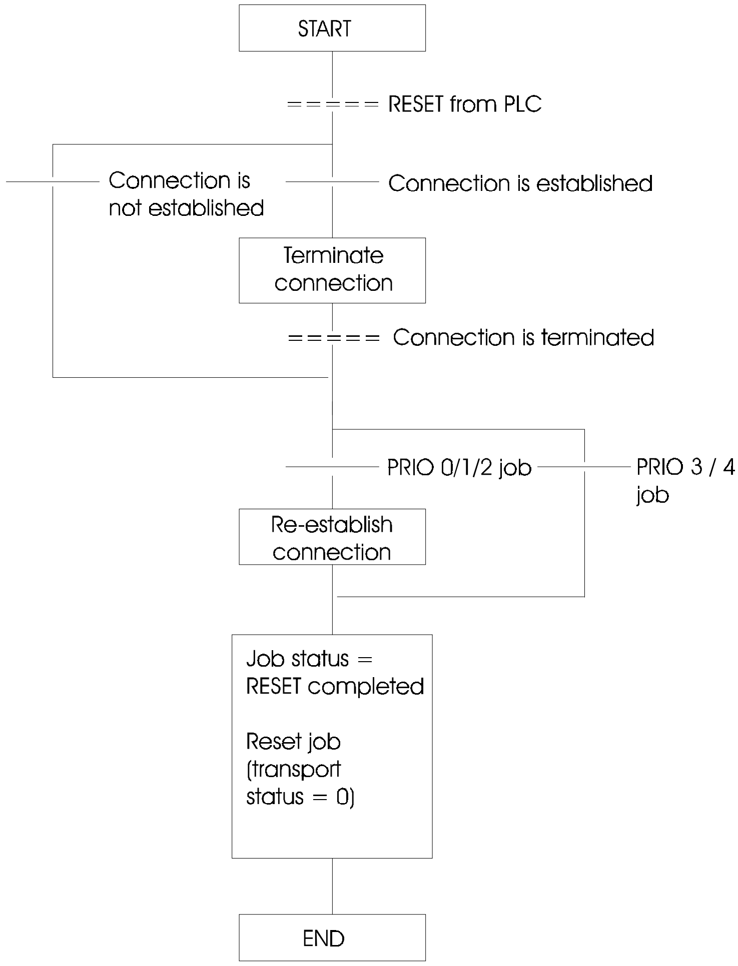


Fig. 3.10: Processing RESET

Note:
The use of the RESET handling block is pointless with datagram services (including broadcast and multicast).

3.2.6 Supplying the PLC with S5 Programs

If you only use the transport interface of the CP 1430 TF, PLC blocks are transferred to the PLC with communication calls using the transfer functions of S5-DOS KOMI.

When using the TF interface, there are further possibilities. For more detailed information on this topic, refer to the domain services and the introduction to the PG LOAD tool in Volume 2 of this manual.

3.2.7 Operating and Testing Applications

To operate the communications interface via the CP 1430 TF, the following conditions must be met:

➢ PLC and CP are synchronized (see also Chapter4)

➢ The PLC has been supplied with the program and data blocks containing the communication calls.

➢ The CP 1430 TF has a completely configured database (for example basic initialization data, communication blocks).

Depending on the configuration, the application associations are established during startup or as required, in other words according to the configuration when a send job is issued.

The test functions of the COM 1430 TF configuration tool allow you to monitor the communication and to check the status of the CP and the connections.

3.3 Clock Services

The clock functions of the CP 1430 TF provide three basic services:

1. The clock keeps the time on the CP 1430 TF within the absolute limits of accuracy described in the technical data. This clock continues to run during a power down as long as the battery voltage is present.

2. The time can also be synchronized by synchronization frames so that all the CP 1430 TF modules connected to the SINEC H1 network that receive these frames have a maximum relative deviation of 20 ms from each other (see Section 4.4 “Technical Data”). The transmitter of the real-time frame must be a CP 1430 TF, a CP 143 TF or, for example, the SINEC real-time transmitter.

3. The CP can contend for the clock master role in the SINEC H1 network and can transmit synchronization frames as the clock master.

The real-time frame has a fixed format for SINEC which corresponds to the SINEC TF standard. To transmit the real-time frame, the transmitter uses a special multicast group (Ethernet address 09 00 06 01 FF EF_H) or a broadcast frame (broadcast address FF FF FF FF FF FF_H).

The time is provided for the PLC in the S5-155U data format (see page 3-46).

3.3.1 Network Topology, Clock Master/Slave Functions

Within a SINEC H1 network, all the CP 1430 TF modules can execute clock functions.

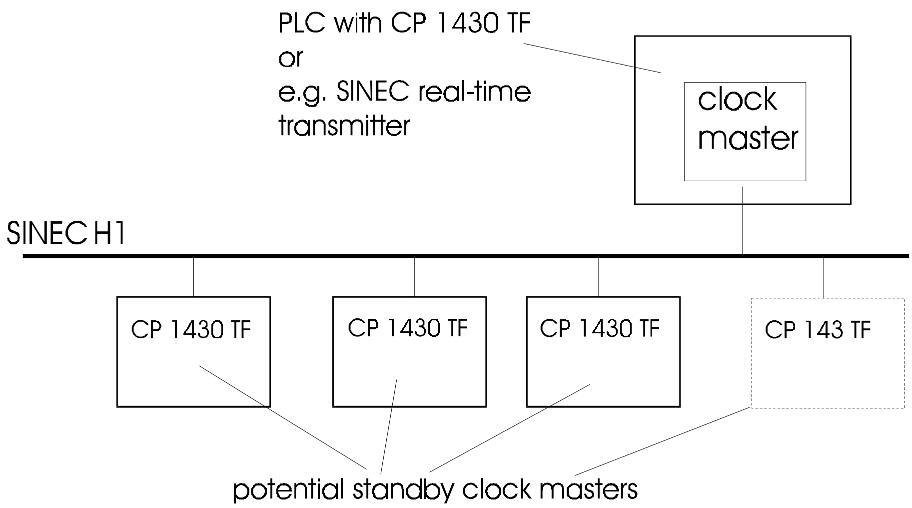


Fig. 3.11 Network Topology with Clock Master and Standby Clock Masters

The real-time can be synchronized throughout the whole network by a SINEC real-time transmitter or a selected CP 1430 TF module.

The station that transmits the real-time synchronization frames is known as the “clock master”.

All other stations that receive the real-time synchronization frames are “clock slaves” and if they have been configured as clock masters they are also standby clock masters.

If the synchronization is performed by a SINEC real-time transmitter, all the CP 1430 TF modules are clock slaves and also standby clock masters if they have been configured for this function.

M 2-2

The real-time transmitter can transmit at intervals of 1 s, 10 s and 60 s. The value set as a default by COM 1430 TF is 10 seconds. This means that all slaves expect a synchronization frame from the clock master after a maximum of 10 seconds. Otherwise the standby clock masters attempt to take over the role of clock master (only the highest priority standby clock master will succeed).

Specifying the Clock Master Using the MAC Address

Based on byte 6 of the Ethernet address, a time is specified after which a station attempts to become clock master. The higher the value selected in byte 6, the longer the delay after which the station attempts to take over the master function.

Example:

The following table shows which station takes over the clock master function and if this fails, which station will replace it.

	Status	Configured as master	Priority (byte 6 in the MAC address
	Master	Y	03
Standby master	Slave	Y	07
	Slave	Y	08
	Slave	Y	10
Cannot be master	Slave	N	21
	Slave	N	01
	etc.		

☞ **The station priorities (byte 6 in the MAC address) must be different. If this is not the case, the stations with the same delay time will never attempt to take over the clock master function.**

This concept ensures that there is always real-time synchronization within the network.

3.3.2 CP 1430 TF on a SINEC H1 Bus with a SINEC Real-Time Transmitter

The SINEC real-time transmitter has the highest priority when adopting the role of clock master. If there is a SINEC real-time transmitter integrated in a bus structure, the CP 1430 TF modules connected to the SINEC H1 bus and which receive a real-time frame from the SINEC real-time transmitter, assume the status of clock slaves and adopt the current time of the real-time transmitter.

If a SINEC real-time transmitter is disconnected from an existing bus structure, the CP 1430 TF with the highest priority (byte 6 of the Ethernet address) takes over the role of clock master.

3.3.3 Setting and Reading the Time on the Programmable Logic Controller

On a SIMATIC S5 programmable logic controller, the job number 218 is available for processing the time.

A SEND with this job number writes the time, a RECEIVE reads the time of the CP.

These services are possible on the synchronized CP interfaces using the standard HDBs for the PLC.

Data Format of the Time in a Data Block of the PLC

	15 12	11 8	7 4	3 0
DW n:	10s sec	1s sec	1/10 sec	1/100 sec
DW n+1:	10s hr	1s hr	10s min	1s min
DW n+2:	10s day	1s day	weekday	
DW n+3:	10s year	1s year	10s mon	1s mon
DW n+4:		1/1000 sec	time shift	

Sign of time shift

(S5-155 U format)

Range of values (hexadecimal):

1/1000	seconds	0...9
1/100	seconds:	0...9
1/10	seconds	0...9
1s	seconds	0...9
10s	seconds	0...5
1s	minutes	0...9
10s	minutes	0...5
1s	hours	0...9
10s	hours	0...1 / 0...2 Bit 15 = 1: 24-hour format Bit 15 = 0: 12-hour format *) Bit 14 = 0: AM Bit 14 = 1: PM
Weekday		Mo...Su = 0...6
1s	days	0...9
10s	days	0...3
1s	months	0...9
10s	months	0...1
1s	years	0...9
10s	years	0...9

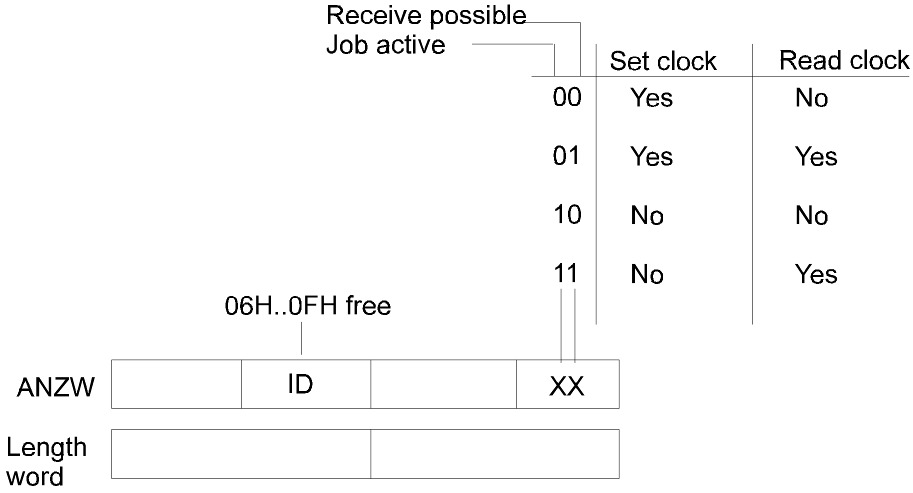
Time shift: +/- 0 to 24 in 1/2 hrs.

(Example: KH: 18 -> +24h
KH: 98 -> -24h

Sign of time shift: 0 = positive; 1 = negative

*) Time always set in 24 hour format

Identifiers in the Status Word of the Handling Blocks (HDBs) SEND or RECEIVE with ANR 218 for clock services.



When the CP 1430 TF is starting up, the lower two bits of the status word are set to “Set Clock” and “Read Clock” not possible. During normal operation, these bits are set according to the CP clock status.

The coding of the ID is explained in the following tables.

Response to the Set Clock Job

The following identifiers are possible as responses to the PLC set clock job.

Response (decoded IDs)	Identifier	Meaning
OK, no error	00H	Command was executed without error
Protocol error	01H	Time not valid (not set etc.)
System error	0EH	System error (e.g. invalid command)
Hardware clock	0FH	Hardware clock failed

Tab. 3.4: Response Set Clock Job

Response to the Read Clock Job

The following identifiers are possible as response to a PLC read clock job.

Response	Identifier	Meaning
System error	0EH	System error (e.g. invalid command)
Hardware clock	0FH	Hardware clock failed
Clock_master	06H	CP is clock master and is executing this function
Clock_slave	07H	CP is clock slave (SINEC real-time transmitter on bus)
Clock_slave, + invalid	08H	Station has an invalid clock chip
Clock_slave, + asynchronous	09H	Station does not receive a real-time frame
Slave, >master or Master,>slave	0AH	CP is clock slave; prepare for master function CP is clock master; prepare for slave function
Transmitter, asynchronous	0BH	Transmitter itself does not receive synchronization frame
Substitute synchron	0CH	Substitute synchronization

Tab. 3.5: Response Read Clock Job

3.3.4 Accuracy

Definition

➢ **Absolute Accuracy**
The absolute accuracy of the clock chip of the CP 1430 TF in the worst case is +/- 12 sec per day.

➢ **Relative Accuracy**
Relative accuracy is the possible deviation of the time kept in the PLCs throughout a system.

If a synchronization frame is sent every 10 seconds (calculated from the absolute accuracy), depending on the CP version, the following relative accuracies can be achieved:
* **20 ms** for the basic version
* **2 ms** for the extended version and CP 1430 TF as clock master
* **1 ms** for the extended version with a SINEC real-time transmitter

Absolute Accuracy
The hardware clock of the CP 1430 TF has a maximum deviation of 12 $_{\text{s/day}}$ or 8.3 $_{\text{ms/min}}$. This deviation is based on a calculation involving the quartz inaccuracies and temperature fluctuations.

To calculate the accuracy, twice the clock deviation must be assumed since a clock can be fast or slow. This produces a time of 24 $_{\text{s/day}}$ or 16.6 $_{\text{ms/min}}$.

For this reason it is necessary to compensate for this deviation in the hardware clock by receiving synchronization frames.

The resolution of the time kept by the hardware clock of the CP 1430 TF depends on the version being used:

➢ 10 ms for the basic version

➢ 1 ms for the extended version

3.3.5 Restrictions / Tips

The time should not be queried cyclically by the programmable logic controller but event-driven as necessary. Otherwise, other functions of the CP can be forced into the background and delayed.

To ensure that the system functions perfectly when no SINEC real-time transmitter is connected to the SINEC H1 bus, you should keep to the following rules:

➢ Make sure that byte 6 of the Ethernet address of the modules configured as clock master (including standby masters) is different for each module.

➢ Set the cycle time for synchronization frames to the same value on every CP 1430 TF.
The default cycle time is 10 seconds (can be modified in the “Clock Master” dialog; to avoid overloading the H1 bus unnecessarily with real-time frames, you should not select a shorter synchronization time).

➢ Make sure you configure at least one CP 1430 TF as the clock master.

❑

II Description

4 Technical Description and Guide to Installing the CP 1430 TF

Topics in this Chapter.

The CP 1430 TF communications processor is used to attach programmable logic controllers belonging to the SIMATIC S5 family to the SINEC H1/H1FO serial bus system. It can be used in all the programmable logic controllers of the U and H series.

This chapter provides you with an overview of the following:

➢ The construction of the CP.

➢ How the interface between the PLC and CP functions.

➢ The steps required for installation.

➢ The technical data of the CP.

➢ The pinouts of the connectors.

➢ Synchronization and startup of the CP.

Note the references in the margin to the dialogs in the accompanying supplement.

4.1 CP 1430 TF Hardware

4.1.1 Overview

Purpose

The CP 1430 TF communications processor connects the SIMATIC programmable logic controllers S5-115 U/H, S5-135 U and S5-155 U/H to the SINEC H1/H1FO network.

Versions

The CP 1430 TF is available in two versions with the following characteristics:

➢ Basic Version

– DRAM memory configuration:	512 Kbytes
– Internal configuration memory:	32 Kbytes max. available
– Clock accuracy:	+/- 10 ms

➢ Extended Version

– DRAM memory configuration:	2 Mbytes
– Configuration memory, internal:	128 Kbytes max. available
– Clock accuracy:	+/- 1 ms

The internal configuration memory is backed up by the PLC battery if there is a power failure so that the loaded data are retained.

The CP 1430 TF has a slot for a memory card. Either memory cards with RAM or FLASH EPROM can be used. Memory cards extend the memory area for configuration data.

Use, Handling

The CP 1430 TF can be installed in any PLC slot that is intended for CP operation (slot label: “CP”). If you are using jobs with a hardware interrupt (jobs with priority 0), please refer to the PLC manual for the slots that can be used.

- ➢ The connection to SINEC H1 is via a transceiver cable to a SINEC H1 transceiver or via an industrial twisted pair to a twisted pair module of a star coupler.
- ➢ The connection to SINEC H1FO is via a transceiver cable to a SINEC H1FO optical transceiver.

Caution When Working on the CP 1430 TF

The CP 1430 TF contains electrostatically sensitive devices (ESD). Please keep to the ESD guidelines when working with the CP 1430 TF.

☞ **Never remove or insert the CP 1430 TF module with the power supply switched on.**

☞ **Never insert or remove memory cards from the CP when the power supply to the CP is on.**

4.1.2 Design

The CP 1430 TF is mounted on a double Eurocard format board. The width of the front panel is 1 1/3 standard slots.

The CP 1430 TF is equipped with the following:

➢ Two 48-pin backplane connectors (ES902 Row 2).

➢ One 15-pin socket connector on the front panel with securing screws for connecting a programming device.

➢ One 15-pin socket connector with securing screws on the front panel

– for connecting an Ethernet transceiver via a transceiver cable

or

– for connecting a star coupler via an industrial twisted pair cable.

➢ The front panel of the module has a rectangular slot for a memory card.

➢ Operator controls and displays.

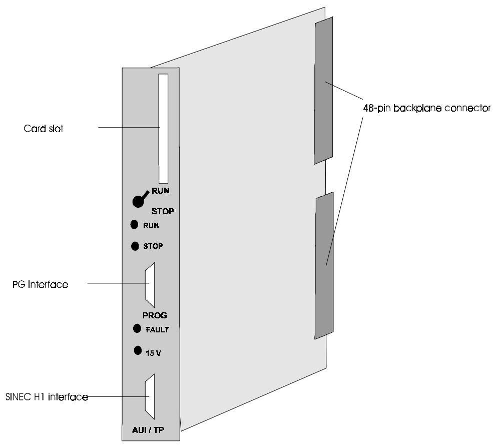


Fig. 4.1: CP 1430 TF Module

4.1.3 Displays and Controls

The CP 1430 TF has the following displays and controls (Fig. 4.2:)

Controls:

RUN/STOP mode selector:
Using the mode selector, you can switch the CP 1430 TF from the RUN to the STOP mode (see above). If no other STOP condition exists, you can also switch the CP from the STOP to RUN mode using the mode selector.

Displays:

RUN
Signals the “interface to SINEC H1/H1FO in operation" status.
The green RUN LED can only light up when the mode selector is set to RUN.

STOP
Signals the “interface to SINEC H1/H1FO not operational" status.
The red STOP LED can also be lit when the mode selector is set to RUN.

FAULT
Indicates that the available memory area has been exceeded (flashing) or a hardware fault (lit permanently).

15V
Indicates that the 15V power supply for the transceiver is functioning correctly.

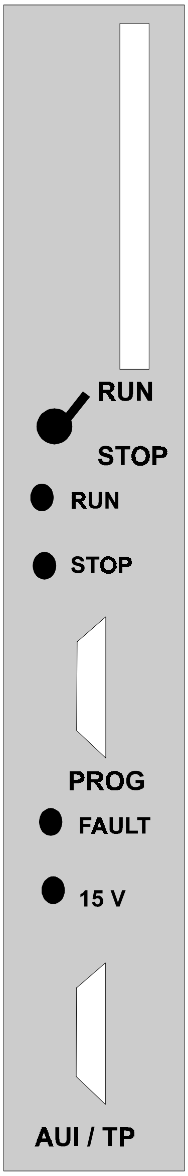


Fig. 4.2: Front Panel

4.1.4 Memory Card Slot

Memory cards can be inserted in the CP 1430 TF slot. These memory cards are used to save a CP database created with the NCM COM 1430 TF configuration tool. The following memory cards are available:

➢ RAM Cards:
- 256 Kbytes order no.: 6ES5 374-2AH21
- 512 Kbytes, order no.: 6ES5 374-2AJ21[*1]
- 1 Mbyte, order no.: 6ES5 374-2AK21[*1]
- 2 Mbytes, order no.: 6ES5 374-2AL21[*1]

[*1]= up to 256 Kbytes can be used for configuration data. The remainder is available as DRAM memory expansion.

➢ Flash EPROM Card:
- 128 Kbytes, Order no.: 6ES5 374-2FG21
- 256 Kbytes, Order no.: 6ES5 374-2FH21
- 512 Kbytes, Order no.: 6ES5 374-2FJ21[*2]
- 1 Mbyte, Order no.: 6ES5 374-2FK21[*2]
- 2 Mbytes, Order no.: 6ES5 374-2FL21[*2]
- 4 Mbytes, Order no.: 6ES5 374-2FM21[*2]

[*2]= up to 256 Kbytes can be used for configuration data. EPROM cards with more memory than 256 Kbytes bring no advantage.

4.1.5 Settings on the CP 1430 TF

In contrast to the previous CPs (CP 535 and CP 143 TF) no DIP switch or jumper settings are necessary on the CP 1430 TF.

The type of connection to SINEC H1/H1FO (AUI connection or industrial twisted pair) is recognized by the CP 1430 TF automatically.

4.1.6 Installing the CP 1430 TF in the PLC Rack

The CP 1430 TF can be installed in any PLC slot that is allowed for CP operation (slot label: CP). With PRIO 0 jobs, the CP 1430 TF triggers an interrupt to the CPU of the PLC at the receiving side. Since not all CP slots have interrupt lines, you must select a slot with an interrupt line if you intend to use jobs with priority PRIO 0.

For more information about PLC slots, please refer to the PLC manual.

4.1.7 Connecting the CP 1430 TF to the SINEC H1/H1FO Network

The CP 1430 TF can be connected to the SINEC H1 network as follows:

➢ With a transceiver using an AUI connection

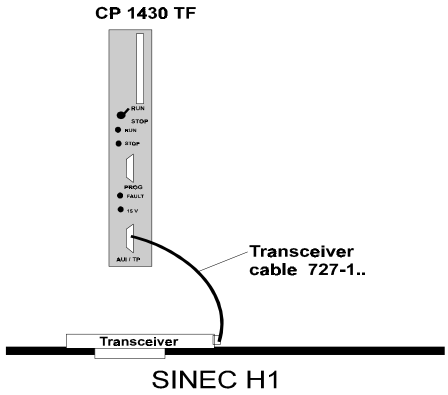


Fig. 4.3: Connecting a CP 1430 TF to SINEC H1 with AUI / Transceiver

The CP 1430 TF generates and supplies the 15 V power required by the transceiver.

➢ Industrial twisted pair connection for example via a transceiver or hub.

When using the SINEC H1 twisted pair as shown in the diagram, the CP 1430 TF automatically recognizes and adjusts itself to the twisted pair. Information about the pinouts can be found at the end of this chapter.

Using industrial twisted pairs, cable lengths of up to 100 m can be implemented.

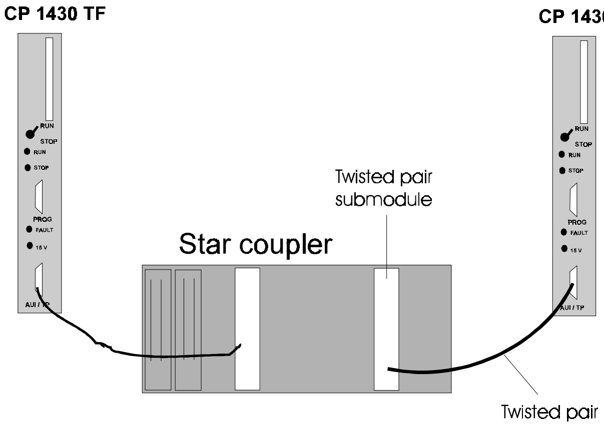


Fig. 4.4: Connecting the CP 1430 TF to SINEC H1 with TP/Star Coupler or Hub

➢ The CP 1430 TF can be connected to the SINEC H1FO network using a SINEC H1FO optical transceiver and AUI connector.

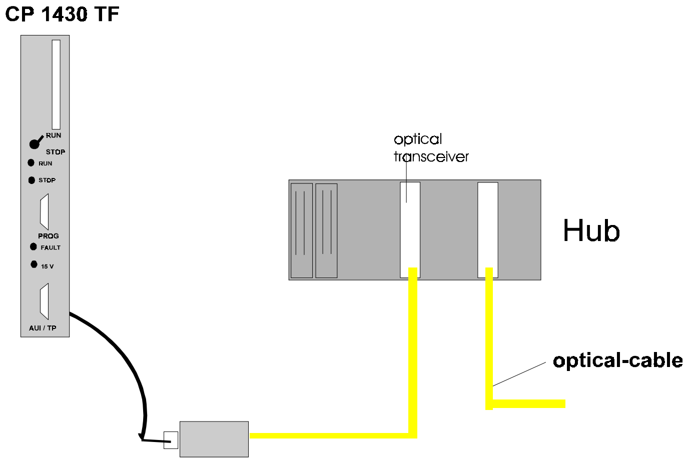


Fig. 4.5: Connecting the CP 1430 TF to SINEC H1FO with AUI / Optical Transceiver

4.1.8 Connecting Cable 725-0 (“Swing Cable”)

The CP 1430 TF can be connected to the PLC using a 725-0 connecting cable (swing cable). Signals are sent on this cable when PLC functions are used on a bus path or when domain or PI services are used.

The + 24 V power supply must be present on the PLC to allow the AS511 interface to the CPU to function.

At both ends, the signal cable has 15-pin sub D male connectors. Please make sure that the cable is connected correctly as explained in the description of the connectors.

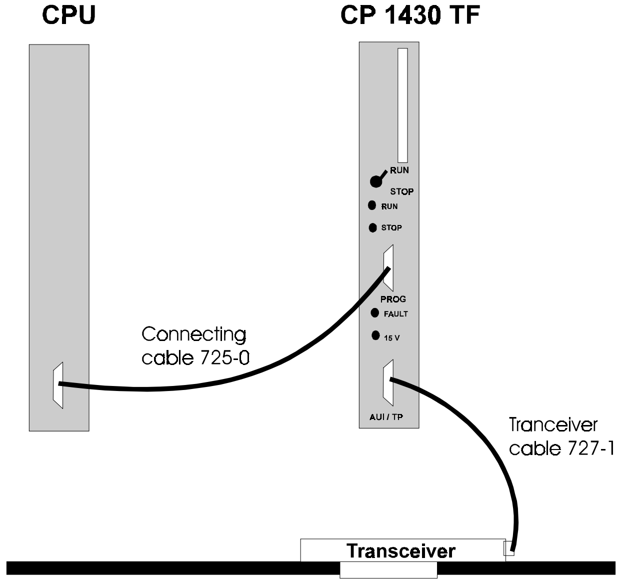


Fig. 4.6: Connecting the PLC with a Swing Cable

4.1.9 Dual-Port RAM Interface Between the CPU and CP

The CP 1430 TF communicates with the SIMATIC PLC using handling blocks via a dual-port RAM. The dual-Port RAM allows simultaneous access by both modules.

How the addressing works, is explained based on the diagram below.

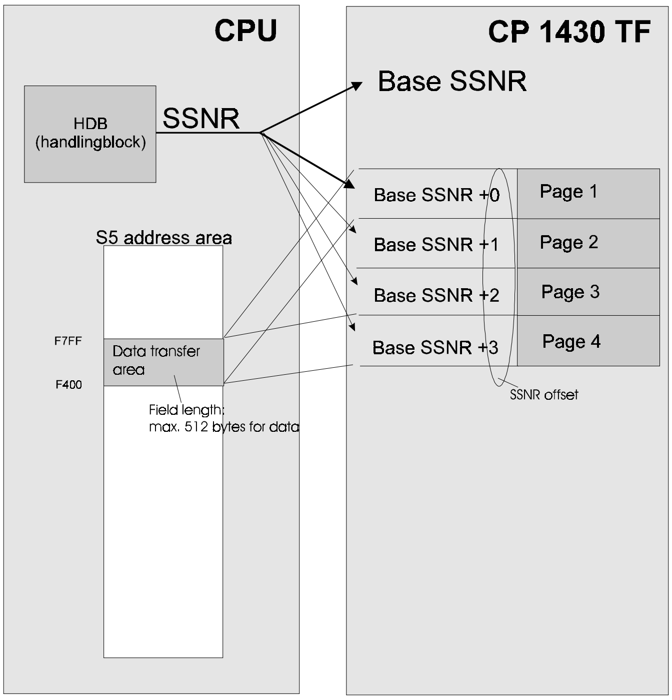


Fig. 4.7: Addressing on the Dual-Port-RAM Interface

In the handling block of the PLC program, you use the interface number (SSNR) to address the CP 1430 TF communications module. The interface number contains the following:

Base interface number (base SSNR):	Using the base SSNR, the PLC selects the CP and its 4 Kbyte dual-port RAM.

The page address (SSNR offset): A CPU addresses the four pages using the 1 Kbyte address window F400 H to F7FF H. The page is determined by the SSNR specified in the handling block.

M 2-1

The base SSNR and the page (SSNR offset) used for communication is configured in the ’**CP Basic Initialization**’ dialog with the COM 1430 TF configuration tool.

Example: The base interface number 16 and the page address 2 are configured as shown below.

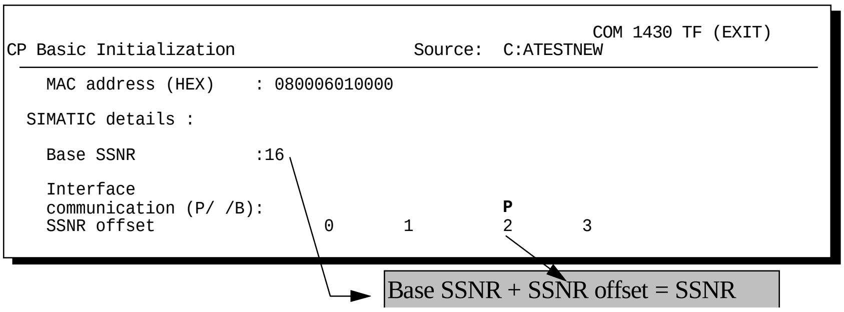


Fig. 4.8: Configuring the SSNR using the Base SSNR and Page Address

This configuration produces SSNR=18. A CP 1430 TF configured in this way, can communicate with CPU number 3 in the multiprocessor mode.

If several communication processors are being used in a programmable logic controller, make sure that there is no double addressing. This means that a base SSNR must be unique in the PLC. If, for example, a CP 5430 (Order Number: 6GK1543-0AA00) exists in the PLC, remember that its dual-port RAM occupies 8 Kbytes of memory (note: The new CP 5430 TF, Order Number:6GK1543-0AA01) occupies only 4 Kbytes of memory.

➢ Special features of addressing using backplane bus communication are explained in Section 4.2.4 .

➢ Special features of the multiprocessor mode are explained in Section 4.2.3 .

4.2 Configuration and Installation

4.2.1 Overview

To configure the module, you require a PG with the NCM COM 1430 TF tool described in this manual. You can enter the configuration data using one of the two following methods:

➢ Online CP
The CP is connected via the AS511 interface or via a bus path so that the data you input is transferred directly on the CP. You can save the configuration data at any time by transferring the data from the CP to a database file on the PG.

➢ Offline FD
The configuration data are saved in a database file on the PG.

A PG-CP connection is only necessary when you want to load the configured database on the CP.

You can, however, load the configured database on a memory card inserted in the PG and then insert this memory card into the CP. In this case, you do not need a PG-CP connection except for diagnostic and test purposes.

Connecting the PG and CP
A connection between the PG and CP is required in the following situations:

➢ To configure the CP ONLINE.

➢ To transfer a database from the PG to the CP and vice versa.

➢ For diagnostic and test functions.

➢ For programming the PLC and using the PLC test via SINEC H1 (see also PI and domain services described in Volume 2 of this manual).

The PG and CP can be connected in two different ways:

1. Direct connection of the PG to the CP 1430 TF via the serial interface (AS511/connecting cable 734-2).

2. Bus path: The PG is operated on the network, for example using a CP 1413 connected to SINEC H1.

PG Connection Using the AS511 Interface

The following diagram illustrates a possible configuration via the AS511 interface.

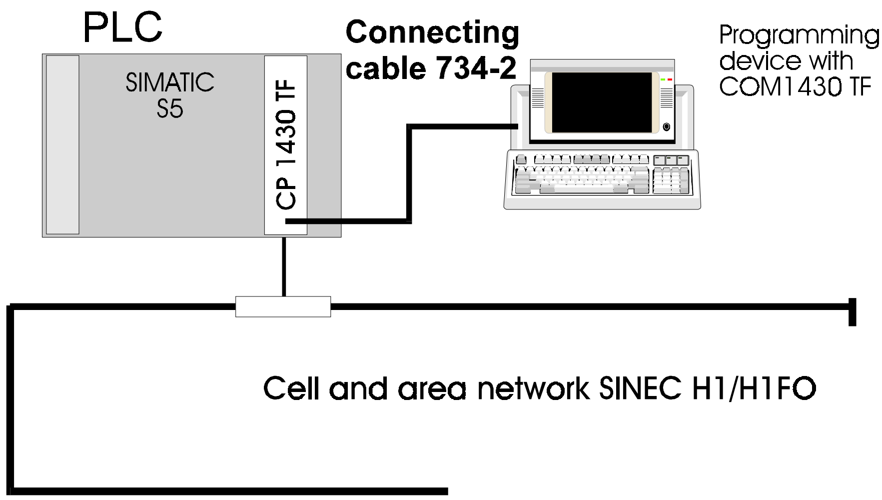


Fig. 4.9 PG Connection using the AS511 Interface

In this configuration, the CP 1430 TF in PLC 1 is connected directly to the PG via the AS511 interface.

PG Connection Using a Bus Path

The following diagram illustrates possible configurations using a bus path.

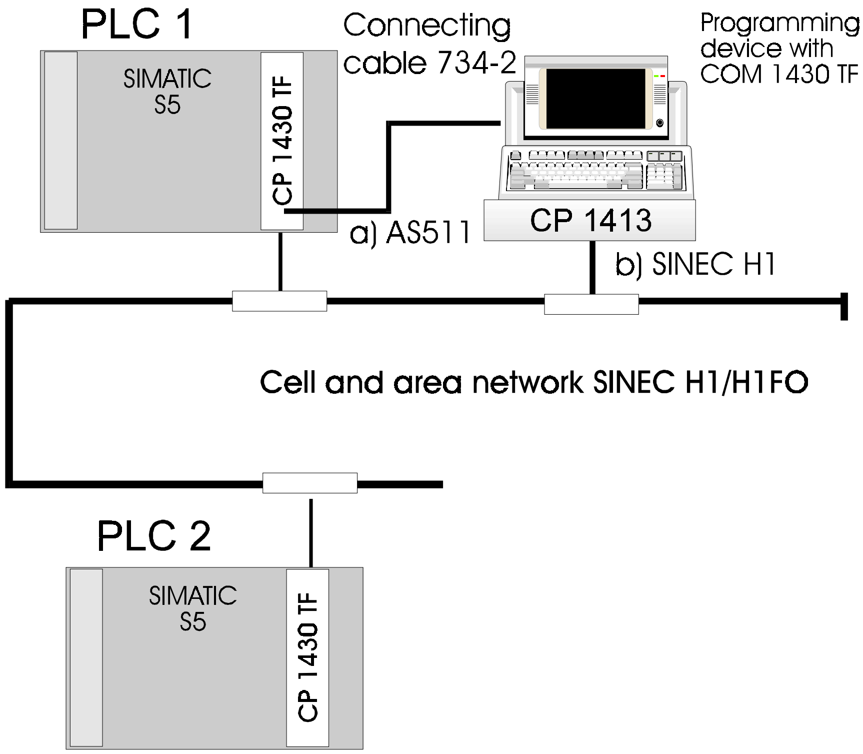


Fig. 4.10: PG Connection using SINEC H1

a) In this configuration, the CP in PLC 1 is connected directly to the PG via the AS511 interface. The CP 1430 TF in PLC 2 can also be reached via the CP 1430 TF in PLC 1.

b) In this configuration, the CPs in PLC 1 and PLC 2 can also be reached via the SINEC H1 network providing

➢ The SINEC H1 interface was selected in the STEP 5 basic package. This configuration is only possible when there is a SINEC H1 communications processor (CP 1413 or CP 141) in the PG.

➢ A node initialization has been performed for the CPs (see below).

You configure and select the bus path on the PG using COM 1430 TF (function **Utilities>Bus Selection**).

Node Initialization of the CP in PLC 2

M 2-1

To be able to address the CP in PLC 2 via the SINEC H1 network, you must enter the Ethernet address in the **’CP Basic Initialization’** dialog ONLINE (via the AS511 interface) and then restart the CP 1430 TF (“Node Initialization”). Following this, the CP can be configured ONLINE or the database created OFFLINE can be loaded.

☞ **The Ethernet address must be unique in the SINEC H1 network.**

The node initialization is **not** necessary if you create the configuration data offline and then use a memory card (Flash EPROM).

Addressing the PLC CPU

For PLC functions using bus selection (path: PG->H1-> CP 1430-> CPU or PG->H1->CP 1430->KORC->CPU), you require a 725-0 connecting cable (swing cable) or you can work using the backplane bus communication.
For domain and program invocation services, you always require a 725 connecting cable (swing cable).

4.2.2 Starting Up in the Single Processor Mode

This section explains how to start up the CP if you decide to use the internal RAM to store the configuration data.

✓ With the PLC power switched off, insert the CP into the rack. Switch the PLC on.

✓ After switching on (mode selector RUN/STOP to RUN) and starting up the CP, it displays the IDLE status (red and green LED lit).

✓ Connect the 724-2 connecting cable to the AS511 socket of the CP and start STEP 5. Select the AS511 interface and start the COM 1430 TF configuration tool on the PG.

M 1-1

✓ Set the status of the PG to online in the **'Basic Settings'** dialog.

✓ Set the CP to STOP; to do this, select the menu item **CP Functions | Stop** or use the mode selector RUN/STOP on the CP.

M 2-1

✓ Select the required Ethernet address, the base SSNR and the interface required for productive communication under SSNR offset in the **'CP Basic Initialization'** dialog. You enter the settings with the F7 key.

✓ Restart the CP by selecting the menu item **CP Functions | Start** in COM 1430 TF, or change the mode selector RUN/STOP to RUN on the CP.
After the CP has started up, it has the Ethernet address and base SSNR you selected. Following this, a database can also be loaded via the SINEC H1 interface.

✓ Synchronize the CP with the base SSNR by calling the SYNCHRON HDB on the PLC.

After successful synchronization, the green RUN LED is lit.

4.2.3 Starting Up in the Multiprocessor Mode

Overview
If you are using more than one CPU, you require the multiprocessor mode. In the multiprocessor mode, there is a fixed assignment of CPU to CP page (interface), as follows:

➢ CPU 1 communicates via page 1 (base SSNR+SSNR offset 0)

➢ CPU 2 communicates via page 2 (base SSNR+SSNR offset 1)

➢ CPU 3 communicates via page 3 (base SSNR+SSNR offset 2)

➢ CPU 4 communicates via page 4 (base SSNR+SSNR offset 3)

Refer to the diagram on page 3-13.

Starting Up
In the multiprocessor mode, follow the same steps as for the single processor mode.

In the multiprocessor mode, note the following differences:

➢ Setting the Interface
You must select productive communication for each CPU-CP interface (SSNR offset) in the **'CP Basic Initialization'** dialog.

M 2-1

➢ Expedited Data (priority class 0)
If you use jobs with interrupt servicing (RECEIVE jobs with PRIO 0), the CP 1430 TF sets the interrupt (IR) line of the interface that was defined for the job (IR line A goes to CPU 1, IR line B goes to CPU 2 etc.).

➢ Unique Job Assignment
When using a multiprocessor system, make sure that a job is only handled by **one** CPU.

➢ Synchronization

In the multiprocessor mode, the interfaces of each CPU-CP combination must be synchronized. The interfaces must first be configured in the '**CP Basic Initialization**' dialog using the COM 1430 TF configuration tool.

Refer to the notes in Section 3.2.5.6 about synchronization.

☞ **If, during installation, less interfaces are synchronized than were configured, the CP 1430 TF does not change to the RUN mode (RUN and STOP LEDs lit).**

After this, the CP can only be synchronized in one of the ways shown below:

- Arrange for the missing SYNCHRON HDBs to be sent.

or if you want to re-synchronize all the interfaces:

- First set the CP 1430 TF to STOP using the mode selector.
- Make sure that the correct number of SYNCHRON HDBs are triggered on the PLC.
- Set the CP 1430 TF to RUN using the mode selector.

or

- Arrange the order of the SYNCHRON HDBs to be triggered so that the missing SYNCHRON HDB (or HDBs) is run last.

4.2.4 Backplane Bus Communication for the S5-155U/H

Introduction:
With the CP 1430 TF, it is possible to use the PG functions online via the path PG->SINEC H1->CP 1430->parallel PLC backplane bus-> CPU. With this improved communication, you can, for example, load user software in the STOP mode far more quickly than would be possible using the AS511 interface (“swing cable”).

Requirements:
The following CPUs support backplane bus communication:

S5-155H	**CPU 946R**	from order no. 6ES5 946-3UR21,	version = 3
	CPU 947R	from order no. 6ES5 947-3UR21,	version = 6
	CPU 948R	from order no. 6ES5 948-3UR11,	version = 1
	CPU 948R	from order no. 6ES5 948-3UR21,	version = 1
S5-155U	**CPU 948**	from order no. 6ES5 948-3UA11,	version = 1
	CPU 948	from order no. 6ES5 948-3UA21,	version = 1

PG Software V6.3

Improved Speed
The improvements in terms of speed depend on the size of the blocks to be loaded. With larger blocks, the following factors can be achieved:

- ➢ With the S5-155H : 3 times faster than via the swing cable
- ➢ With the S5-155U : 10 times faster than via the swing cable

With small blocks, the time required for disk access on the PG cancels out any speed improvements.

For a more detailed description, refer to the manual for the S5-155H or S5-155U/CPU 948.

Mode of Operation:
M 2-1 The backplane bus communication function becomes active only when one of the base interface numbers (base SSNR) 232, 236 or 244 is configured (refer to Chapter 7 for configuration).

When the PLC is restarted, the backplane bus communication is activated via the corresponding interface.

Assigning Interface Numbers

Depending on the base interface number (SSNR = base SSNR + SSNR offset 0..3), the four pages of the CP 1430 TF can be assigned for productive communication (HDB page for productive communication) or bus communication (system page for backplane bus communication), as follows:

➢ Base SSNR 232:

+0 = SSNR 232: HDB page for prod. comm. to CPU 1
+1 = SSNR 233: HDB page for prod. comm. to CPU 2
+2 = SSNR 234: System page for back. bus comm. to CPU 1
+3 = SSNR 235: System page for back. bus comm. to CPU 2

➢ Base SSNR 236:

+0 = SSNR 236: HDB page for prod. comm. to CPU 1
+1 = SSNR 237: HDB page for prod. comm. to CPU 2
+2 = SSNR 238: System page for back. bus comm. to CPU 3 or 1
+3 = SSNR 239: System page for back. bus comm. to CPU 4 or 2

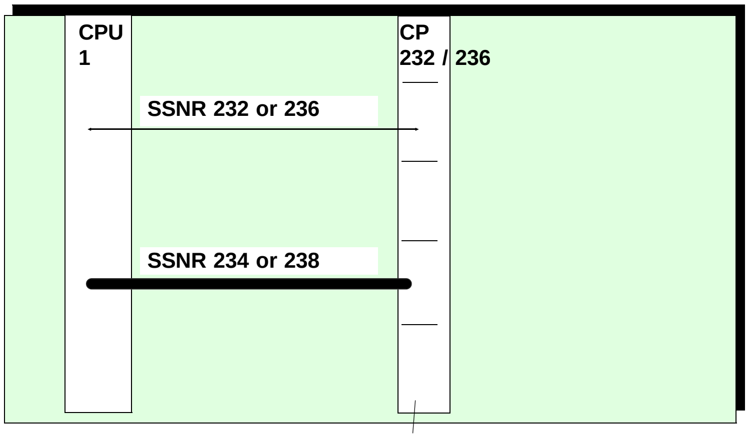
➢ Base SSNR 244:

+0 = SSNR 244: System page for back. bus comm. to CPU 1
+1 = SSNR 245: System page for back. bus comm. to CPU 2
+2 = SSNR 246: System page for back. bus comm. to CPU 3
+3 = SSNR 247: System page for back. bus comm. to CPU 4

Recommendations

M 2-1 The following examples illustrate the effects of these assignments and how you can set the base SSNR and the SSNR offset in the **’CP Basic Initialization’** configuration dialog.

Example 1: Single processor with one CP on one H1 segment



Key: Backplane bus communication
Productive communication

Fig. 4.11 Example of Interface Numbers with a Single Processor

M 2-1

For this configuration, the following settings must be made in the “CP Basic Initialization” dialog using base SSNR 232:

```
                                                       COM 1430 TF (EXIT)
CP Basic Initialization                          Source:  C:ATESTNEW

    MAC address (HEX)     : 080006010000

  SIMATIC details :

    Base SSNR             :232

    Interface
    communication (P/ /B):    P                 B
    SSNR offset              SSNR 0   SSNR 1   SSNR 2   SSNR 3
```

Fig. 4.12: Example: Configuring Base SSNR 232

Example 2: single processor with two CPs on two H1 segments

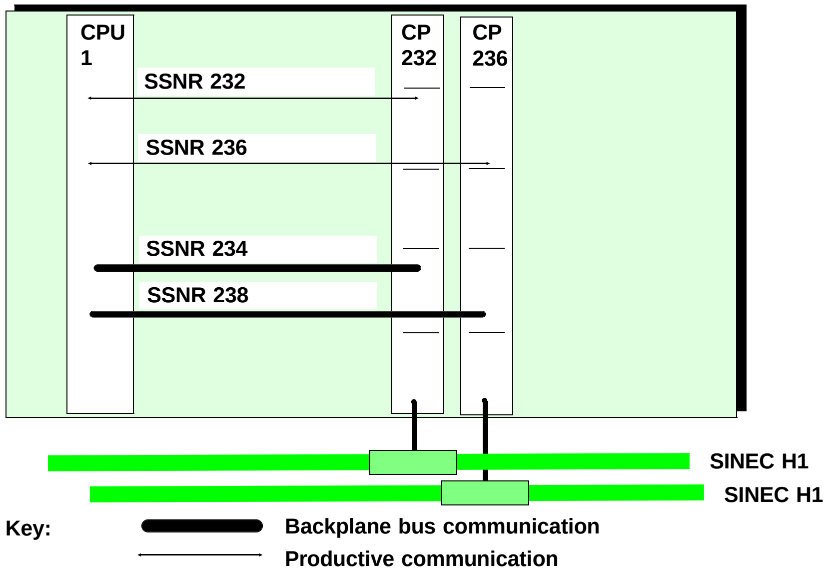


Fig. 4.13 Example of Interface Numbers with a Single Processor

M 2-1 Configuration settings in the 'CP Basic Initialization' dialog

```
                                                          COM 1430 TF (EXIT)
CP Basic Initialization                          Source:  C:ATESTNEW1
   MAC address (HEX)     : 080006010000
 SIMATIC details :
   Base SSNR             :232
   Interface
   communication (P/ /B):     P                B
   SSNR offset              SSNR 0    SSNR 1    SSNR 2    SSNR 3
```

```
                                                          COM 1430 TF (EXIT)
CP Basic Initialization                          Source:  C:ATESTNEW2
   MAC address (HEX)     : 080006010000
 SIMATIC details :
   Base SSNR             :236
   Interface
   communication (P/ /B):     P                B
   SSNR offset              SSNR 0    SSNR 1    SSNR 2    SSNR 3
```

Fig. 4.14: Example: Configuring Base SSNR 232 and 236

Example 3: Multiprocessor (2 CPUs) with one CP on one H1 segment

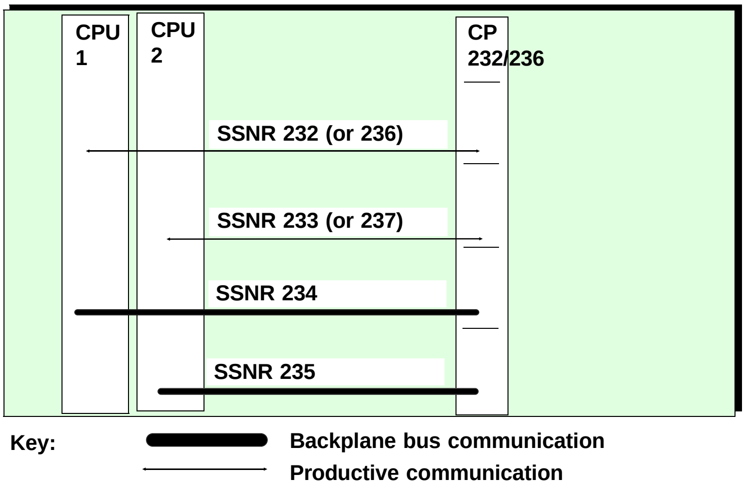


Fig. 4.15 Example of Interface Numbers with Two Processors

M 2-1 For this configuration, the following settings must be made in the “CP Basic Initialization” dialog using base SSNR 232.:

```
                                                               COM 1430 TF (EXIT)
CP Basic Initialization                   Source:  C:ACP232
    MAC address (HEX)    : 080006010000
  SIMATIC details :
    Base SSNR            :232
    Interface
    communication (P/ /B):   P        P        B        B
    SSNR offset            SSNR 0   SSNR 1   SSNR 2   SSNR 3
```

Fig. 4.16: Example: Configuring Base SSNR 232

Example 4: Multiprocessor (3 or 4 CPUs) with two CPs on one H1 segment

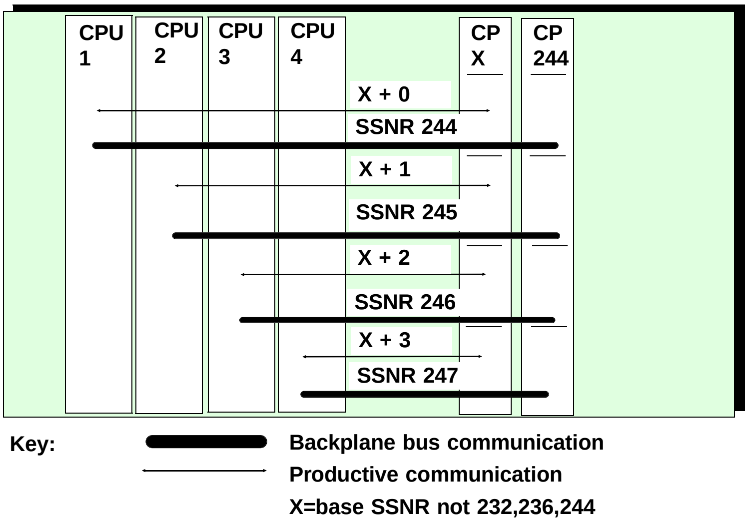


Fig. 4.17 Example of Interface Numbers with Three or More Processors

M 2-1

For this configuration, the following settings must be made in the “CP Basic Initialization” dialog using base SSNR 244 for backplane bus communication and any other base SSNR for productive communication:

```
                                                          COM 1430 TF (EXIT)
CP Basic Initialization                   Source:  C:ACP244
   MAC address (HEX)    : 080006010000

 SIMATIC details :

   Base SSNR            :244

   Interface
   communication (P/ /B):   B        B        B        B
   SSNR offset            SSNR 0   SSNR 1   SSNR 2   SSNR 3
```

```
                                                          COM 1430 TF (EXIT)
CP Basic Initialization                   Source:  C:ACP32
   MAC address (HEX)    : 080006010000

 SIMATIC details :

   Base SSNR            :32

   Interface
   communication (P/ /B):   P        P        P        P
   SSNR offset            SSNR 0   SSNR 1   SSNR 2   SSNR 3
```

Fig. 4.18: Example: Configuring Base SSNR 244 and 32

Example 5: Multiprocessor (4 CPUs) with five CPs on two H1 segments

The configuration shown below is required to make both backplane bus communication and productive communication possible on both H1 segments.

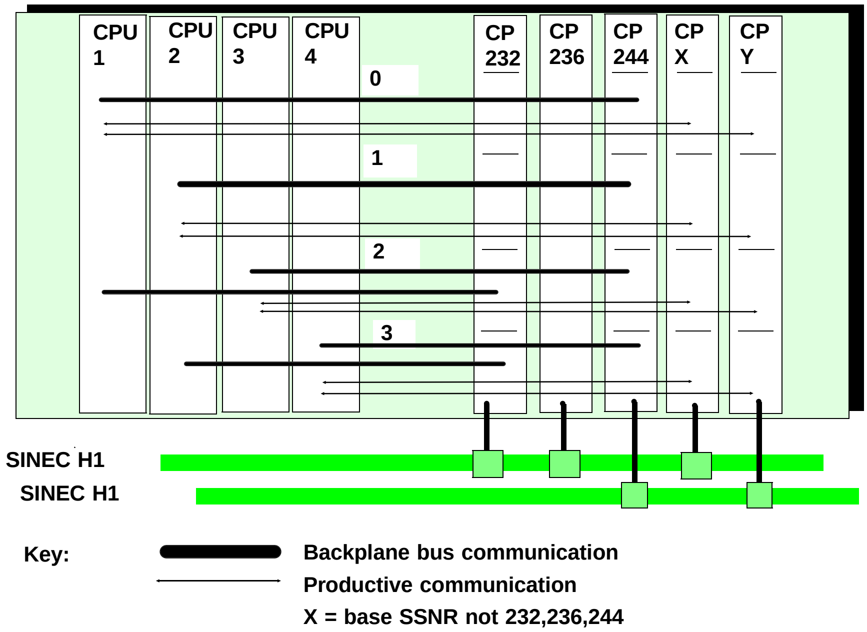


Fig. 4.19 Example of Interface Numbers with a Single Processor

In the example, the CPs with base SSNR 232, 236 and 244 are required for backplane bus communication.

Two CPs each with a base SSNR other than 232, 236 or 244 are required for productive communication.

Follow the procedure shown below to configure backplane bus communication (assumption: CP-PG connection online, CP in the STOP mode):

✓ Select the base interface number for the CP 1430 TF in your system configuration based on Figures 4.11 to 4.19.

✓ Select the **Edit | CP Init** function to enter your configuration data in the CP database file belonging to the CP. The CP must be in the STOP mode. Set the MAC address, the base SSNR and the required type of communication (productive communication, backplane bus communication or no communication) for each interface number (page 1 to 4) in the CP Basic Initialization dialog.

✓ Start the CP 1430 TF with **CP Functions | Start**.

Once the CPU has started up, it synchronizes the system pages and the backplane bus communication can be used.

For further information on configuring, refer to Chapter 7.

4.3 Modes and the START/STOP Procedure

The CP is a Slave of the PLC
The CP 1430 TF is a slave processor system in the S5 rack and must therefore follow the same START/STOP procedure as the master (here the CPU).

Startup
After power up, the CP 1430 TF runs through a hardware test program. Following this, it establishes a management field in the unbuffered RAM area for each defined job. It then waits for the synchronization from the PLC. In this idle state (IDLE, RUN and STOP LEDs lit), all the programs that process system jobs or operate the PG interface are enabled, however, the data traffic to and from the PLC or the bus system is disabled and can only be enabled after synchronization.

Startup After Power Outage
Since the CP 1430 TF is only equipped with dynamic RAM memory without battery backup, a “warm” restart following a power outage is not available on the CP 1430 TF. Following a power outage, the module reacts as described above. Data traffic with the PLC or with the bus system remains disabled until it is enabled by the synchronization.

Status After Startup
Depending on the setting of the mode selector, the CP 1430 TF changes to one of the following modes after synchronization:

➢ To the STOP mode when the mode selector is set to STOP, or

➢ to the RUN mode, when the mode selector is set to RUN.

The STOP mode is defined as follows:

➢ The system programs and the PG interface are enabled.

➢ The virtual circuits remain established or the module continues to establish them.

➢ Data transfer via the bus system and the interfaces to the PLC is disabled.

The RUN mode is defined as follows:

➢ All CP 1430 TF programs and all interfaces to the PLC are enabled.

➢ The PG interface is enabled and all online PG functions can be executed (exception: modifying the database).

➢ Data transfer is enabled and can be monitored using the test functions of COM 1430.

Warm Restart with the RUN/STOP Mode Selector

Whenever the mode changes from STOP to RUN or from RUN to STOP and back to RUN (re-synchronization by repeatedly switching the RUN/STOP mode selector on the PLC), the CP 1430 TF goes through a warm restart. All the previously established connections are cleared and then re-established. All the data buffered on the CP 1430 TF is lost during this mode change.

RUN/STOP Request from the PG

Using the **CP Functions | Start** and **CP Functions | Stop** functions of the NCM COM 1430 TF configuration tool, you can set the START or STOP request at the programming device.

☞ **The STOP mode resulting from switching the RUN/STOP mode selector, can only be exited again using the RUN/STOP mode selector.**

The reactions of the CP to START/STOP instructions from the PG and to mode selector settings are illustrated in the following table:

Mode Selector	Request from PG	CP 1430 TF Status
RUN	RUN	RUN
RUN or STOP	STOP	STOP
STOP	RUN or STOP	STOP

Table 4.1: CP Modes and the Mode Selector

If RUN is set at the PG or using the mode selector and the CP is in the IDLE mode (NOT SYNCHRONIZED), this does not affect the status of the CP 1430 TF and is only evaluated after the PG exits this status. The following table and figure illustrate the CP 1430 TF statuses.

Status	Displays	Activity
1. Hardware test	RUN LED off STOP LED on FAULT LED off	Testing the CP 1430 TF hardware.
2. CP Error	RUN LED off STOP LED on FAULT LED on	Inactivity loop after error detected; all programs and interfaces are disabled.
3. "Over" Configuration	RUN LED off STOP LED on FAULT LED flashes	Configuration error; for example too many connections configured.
4. Not SYNCHRON (IDLE)	RUN LED on STOP LED on FAULT LED off	Waiting for completion of synchronization; all active PLC interfaces must be synchronized by the PLC; PG interface is enabled.
5. RUN	RUN LED on STOP LED off CP-F LED off	Data exchange on the connection is enabled, also the PG and PLC interface; COM test functions are possible.
6. STOP	RUN LED off STOP LED on FAULT LED off	The connections remain established or continue to be established; the PLC interfaces are disabled; the PG interface is enabled (however no test possible).

Table 4.2: Status Displays on the CP Front Panel

Also: The +15 V LED indicates that the +15 V supply voltage for the transceiver is present.

Status transitions on the CP are achieved as follows:

FROM	ACTIONS	TO
STOP	- Set STOP/RUN switch on the front panel of the CP 1430 TF to RUN. - Trigger the PG function "START CP" (only when the mode selector is set to RUN). With the change STOP -> RUN, all pending jobs are deleted.	RUN
IDLE	Call the SYNCHRON HDB in a startup OB of the programmable controller; STOP/RUN switch on the front panel of the CP 143 set to RUN.	RUN
RUN	- Change START/STOP switch on the front panel of the CP 1430 TF from RUN to STOP. - Trigger the PG function "STOP CP"	STOP
IDLE	- Change START/STOP switch on the front panel of the CP 1430 TF from RUN to STOP. - Trigger the PG function "STOP CP"	STOP
RUN or STOP	Only after power outage: - Programmable controller is in the STOP mode or - No SYNCHRON HDB in the startup OB	IDLE

Fig. 4.20: Status Transitions and Actions

4.4 Technical Data

Operating and Environmental Conditions

Degree of protection	IP 00
Permitted ambient temperature in operation	0 to 60 ^{o}C operation without fan
Transport and storage temperature	-40 to +70 ^{o}C
Humidity class	95% humidity at 25 ^{o}C, no condensation
Operating altitude	up to 3000 m above sea level

Table 4.3: Operating and Environmental Conditions

Components and Transmission Rates

Microprocessor	80386 SX 20 MHz
Ethernet controller	82596 SX 20 MHz
Ethernet serial interface:	82503
Transmission rates	- AS511 TTY interface, 9600 bps - AUI interface, 10 Mbps - TP interface, 10 Mbps

Table 4.4: Components and Transmission Rates

Mechanical and Electrical Data

Weight	Approx. 0.6 kg
Board format	Double Eurocard (160 x 233.4 mm)
Front panel width	20.3 mm (= 1 1/3 standard slots)
Backplane connector	ES 902, 2 x Row 2, 48-pin
Front connectors - PG connector - AUI/TP connector	 15-pin D SUB with securing screws 15-pin D SUB with securing slide
Supply voltages	+ 5 V, + 5%, - 5% +24 V, +25%, -15%
Current consumption	+ 5 V: 2.7 A max. At rated load 0.5A by transceiver +24 V: max. 70 mA UBATT (battery backup) : 110 µA max. 20 µA typical.

Table 4.5: Mechanical and Electrical Data

Other Data Depend on the Version

CP Type / Characteristic	Basic Version	Extended Version
Dynamic RAM	512 Kbytes	2048 Kbytes
Internal capacity for configuration data	32 Kbytes	128 Kbytes
Memory reserved for dynamic configuration data (domain and PI services)	16 Kbytes	32 Kbytes
Size of the dual-port RAM for the CPU-CP interface	4 Kbytes	4 Kbytes
Memory capacity of the memory cards - Flash EPROM - RAM	 128/256 Kbytes 256 Kbytes - 2 Mbytes	
Clock accuracy - Resolution - Relative	 10 msec 20 msec	 1 msec 2 msec

Table 4.6 : Characteristics of the CP 1430 TF Dependent on the Version

4.5 Pinouts

Backplane Connector

The CP 1430 TF has two 48-pin Row 2 backplane connectors with which the module is connected to the bus board of a SIMATIC PLC rack. The pinouts of these backplane connectors is shown in the following tables.

Backplane connector 1

	d	b	z
2	-	Ground	+ 5 V
4	UBATT	-	-
6	ADB 12	ADB 0	CPKL
8	ADB 13	ADB 1	/MEMR
10	ADB 14	ADB 2	/MEMW
12	ADB 15	ADB 3	/RDY
14	/IR A	ADB 4	DB 0
16	/IR B	ADB 5	DB 1
18	/IR C	ADB 6	DB 2
20	/IR D	ADB 7	DB 3
22	-	ADB 8	DB 4
24	-	ADB 9	DB 5
26	-	ADB 10	DB 6
28	/DSI	ADB 11	DB 7
30	-	-	-
32	-	Ground	-

Backplane connector 2

	d	b	z
2	-	Ground	+ 5 V
4	-	-	-
6	-	-	-
8	-	-	-
10	-	-	-
12	-	-	-
14	-	-	-
16	-	-	-
18	-	-	-
20	-	-	-
22	TxDs	/STOPPA	-
24	-	-	-
26	-	/RxDs	-
28	-	-	-
30	-	-	Ground for 24 V
32	-	Ground	+ 24 V

Connector of the Serial Interface (AS 511 Interface)

On the front panel, there is a 15-pin D SUB female connector with screw securing mechanism for connecting a programming device. The pinout of this interface is shown in the following table.

Serial interface

1	MEXT (external ground)
2	TTY IN - (current output)
3	-
4	+ 24 V
5	Ground (internal ground)
6	TTY OUT + (current input)
7	TTY OUT - (current output)
8	MEXT (external ground)
9	TTY IN + (current input)
10	Ground for 24 V
11	20 mA current source of sender
12	Ground (internal ground)
13	20 mA current source of receiver
14	Master query
15	Ground (internal ground)

Connector for H1/H1FO (AUI/TP Female Connector)

On the front panel of the CP 1430 TF, there is a 15-pin D SUB female socket (pinout complying with Ethernet standard IEEE 802.3) with a slide securing mechanism for connection of a transceiver cable. The pinout of the connectors is shown below for the AUI connection and the twisted pair connection.

	AUI	TP
1	Electronic ground	-
2	CLSN (collision +)	-
3	RMT (transmit +)	RMT (transmit +)
4	Electronic ground	-
5	RCV (receive +)	RCV (receive +)
6	Ground for 15 V	(Jumper to 7)
7	Not used	(Jumper to 6)
8	Electronic ground	-
9	CLSN (collision -)	-
10	TRMT (transmit -)	TRMT (transmit -)
11	Electronic ground	-
12	/RCV (receive -)	/RCV (receive -)
13	+ 15 V	-
14	Electronic ground	-
15	Not used	Not used

4.6 Basic Data For Connections

4.6.1 Resources Required for the DRAM Memory

Overview

The following table shows the limit values for configuring connections. Check the resources you will require for your application based on the formulas on the following page.

. CP Version / Characteristic	Basic Version	Extended Version
Maximum total no. of active connections	64	100
Maximum no. of active transport connections	64	100
Maximum no. of active application associations (n_{TFzmax})	16 (guaranteed with PDU size = 1024 and no additional active transport connection)	100 (guaranteed with PDU size = 1024 and no additional active transport connection)
Maximum no. of multicast groups	10	10
Resources available for active connections (R_a)	16 384 bytes	102 400 bytes

Table4.7: Basic Data

Note:
Remember that the data above refer to the number of active connections. In principle, it is therefore possible to configure more dynamic connections as long as the number of active connections does not exceed the limit value R_a.

The possible number of active connections depends on the resources required. Using application associations, the total number of active connections may be reduced depending on the PDU size.

Use the formula below to determine your requirements in resources R_r (for example see below):

$$R_r = \left(\sum_{PDU\text{–}size\,128}^{65535} n_{PDUsize} * PDUsize \right) + n_{TR} * 256 \leq \boldsymbol{R_a}$$

where:

$n_{PDU\ size}$ =	Number of application associations with the configured PDU size
n_{TR} =	Number of transport connections
$n_{TF\text{-}zmax}$	Maximum number of guaranteed application associations active on no other transport connection

Examples

Example 1:

Configured:	5 applic. associations with TF-PDU size 1024 bytes 2 applic. associations with TF-PDU size 256 bytes 47 transport connections

Rr = 5 * 1024 bytes + 2 * 256 bytes + 47 * 256 bytes = 17 664 bytes

-> Basic version not adequate, since Rr > 16 384 bytes
-> Extended version adequate, since Rr < 102 400 bytes

Example 2:

Configured:	16 applic. associations with TF-PDU size 1024 bytes

Rr = 16 * 1024 bytes = 16 384 bytes

-> Basic version adequate, since Rr < 16 384 bytes
-> Extended version adequate, since Rr < 102 400 bytes

Example 3:

Configured: 100 applic. associations with TF-PDU size 1024 bytes

Rr = 100 * 1024 bytes = 102 400 bytes

-> Basic version not adequate, since Rr > 16 384 bytes
-> Extended version adequate, since Rr = 102 400 bytes

4.6.2 Resources Required for the Configuration Data

Overview

You can calculate the memory requirements for the configuration memory by adding the individual components in the following table.

Component	**Memory Requirement**
Basic configuration	4 Kbytes
Connection blocks	256 bytes per connection
Local variables max. 800 lines can be entered per connection in COM 1430 TF	approx 80 bytes per line
Remote variables max. 800 lines can be entered per connection in COM 1430 TF	approx 80 bytes per line
VMD-specific variables max. 800 lines can be entered per connection in COM 1430 TF	approx 80 bytes per line
Type definitions max. 800 lines can be entered per connection in COM 1430 TF	approx 80 bytes per line

Table 4.8: Resources Required for the Configuration Data

❑

Notes

5 SINEC NCM COM 1430 TF Configuration Software

Topics in this Chapter

The CP 1430 communications processor provides a graduated range of performance for your communication tasks. By configuring the module, you adapt the CP for your specific tasks using the SINEC NCM COM 1430 TF configuration tool (abbreviated to COM 1430). COM 1430 under the SINEC **NCM** (**N**etwork and **C**ommunication **M**anagement) user interface, allows menu-guided configuration of all parameters for the CP.

After working through this chapter, you will be familiar with the following topics:

➢ The concept underlying the COM 1430 configuration tool.

➢ How to install and start COM 1430.

➢ How to operate COM 1430.

➢ Which files are set up and managed under COM 1430.

➢ How to transfer and archive configuration data.

5.1 Convenient Configuration with the NCM COM Software

SINEC NCM

SINEC NCM is the name of a family of network management products within the SINEC range. The following products belong to the NCM family:

➢ SINEC COM and SINEC NML
  Software packages for configuring the communication functions of SINEC communications processors. The software packages contain functions for configuration, test and diagnostics, and for downloading databases onto the CP modules.

➢ SINEC CHECK and SINEC SCOPE
  Software test packages for protocol analysis, generating and analyzing loads and network monitoring.

Operating Philosophy

The COM software is operated solely using screen dialogs. The function key menus indicate the possible options in a given context. The mouse is supported.

Menu guidance is based on the SAA standard.

Advantages

➢ The standardized user interface makes it easier to use the various configuration and test tools. Switching from one configuration tool to another is also easier.

➢ With this presentation, configuration steps can be clearly followed, the “flat” menu hierarchy provides a better overview.

➢ Using the mouse further increases convenience and allows you to work faster.

A First Impression

Have a look at the “SINEC NCM COM 1430 TF Configuration Tool” supplement to gain a first impression of the possible selections and available dialogs.

5.2 Conditions for Using COM 1430

The Package

The SINEC NCM COM 1430 TF software package contains the following:

- Software on a 3.5" diskette (1.44 Mbytes):
  The diskette contains the software in compressed format. The following files are important:
  - READ1430.ME -> Up-to-date information about the package
  - INSTALL.EXE -> Installation program

  The diskette also contains the function block FB 103 for the program invocation services and several example programs. For a full list of the files, refer to the product information.

- This manual CP 1430 with COM 1430.

- A product information with up-to-date information.

Environment

The COM 1430 configuration software can be run on the following systems:

- PGs of the 7xx series with the S5 DOS-ST operating system and STEP5 basic package, version 6.3 and higher

- PC-ATs with the MS-DOS operating system and STEP 5 basic package for PCs, version 6.3 and higher.

Note:
A detailed list of the permitted system configurations can be found in the READ1430.ME file on the diskette.

Conditions for Running the COM

To run SINEC NCM, you must have the following:

➢ At least 570 Kbytes of free working memory at the MS-DOS 5.0 operating system level to be able to load the required drivers, STEP5/ST and COM 1430 in the working memory.

➢ Sufficient space on your hard disk. Per COM, you should have approximately 2 Mbytes available. When you install under MS-DOS, the installation tool checks that there is enough space.

➢ The device driver EMM386 must be started.

Requirement for programming memory cards (flash EPROMs):

➢ To program memory cards for the PG730, PG750 and PG770, you require the following programming adapter:
Order No. 6 ES 5985-2M1C11
If you are using a PG740, the programming adapter for SIMATIC memory cards is already installed.

5.3 Installing and Starting COM 1430

The Next Step
The next step should be to install the configuration software. Install the software as described in the following sections. After installation, you should also have a look at the dialogs.

☞ **Before installing the software, please read the "read1430.me" file on the diskette and read the latest information in the product information for NCM COM 1430 TF.**

Notes on Directory and File Organization
Under S5-DOS/ST version 6.x, COM 1430 uses the S5-DOS/ST directory structure.

COM 1430 accesses the following directories and the files they contain:

➢ SIMATIC system directory
  – Printer file
  – Path file

➢ Working directory (file storage for a specific project)
  – Footer file
  – S5 program files (PG Load, Request Editor)
  – CP database files

  etc.

After you install COM 1430, the following directory is also created:

➢ NCM directory (for example SIN_COM, see next page)
  – COM 1430 system files

Installing COM 1430

✓ Insert the COM diskette in the floppy disk drive and start installation from the root directory:
e.g. **A:INSTALL**

Once you have invoked the installation program, you are guided through a dialog. You can specify the destination drive and select an existing directory in a pull-down menu. You can also set up a new directory.

Install COM 1430 in an NCM directory. You can select any suitable directory name, for example SIN_COM.

☞ **COM 1430 must not be installed in the SIMATIC system directory.**

✓ Once the required path is set (as displayed in the dialog), you can start the actual installation by pressing the F7 key.

The installation program checks the space available on the hard disk. If there is not enough space, a message is displayed and you can stop the installation.

Before copying the files, the installation program checks whether or not there is also COM software installed on the selected directory. If the same software has already been installed, the release of the software is checked. If the release is older than that on the installation diskette, a new installation is carried out. If the version is not older, installation is only continued at your specific request.

Following installation, the following settings are recommended:
If the working directory and the NCM directory are on the same drive, it is advisable to create a virtual drive for the NCM directory (for example, you can enter "Subst i: c:\sin_com" in autoexec.bat and reboot). You should then enter this virtual drive in the operating system dialog using **Settings-> Start Directory**.

This has the advantage that "SINEC NCM V4.8" is displayed immediately when you use the function **Change->Others.**

Starting COM 1430

✓ Start the S5-DOS command interpreter KOMI by typing in S5.

✓ Select your working directory in S5 KOMI.

✓ Select the required interface in S5-KOMI (AS511 or SINEC H1).

✓ Start NCM with the Change->Others command.

M 2-1 ✓ Select the CP type "CP 1430" in the **'Basic Settings'** dialog.

Further help is provided by the help texts.

Recommendation:

If you continue to use the CP 143 alongside the CP 1430, install NCM COM 1430 TF in the same directory as NCM COM 143 TF. The advantage of this is that you can select the required configuration functions using the selection in the **'Basic Settings'** dialog.

5.4 Using the Keyboard and Mouse

General Information

The keyboard assignment of the COM software is based on the same principles as found in all SIMATIC S5 packages. For this reason, there are a few differences compared with the input using common PC software products.

Basic Functions

Functions are executed using standard keys or a combination of them.

The following list shows the assignment of the most commonly required COM functions to the keys of the PG/PC keyboard.

COM Functions	Keyboard
Page, search backwards for files	<Arrow up> or line & page function key "Page-1""Line-1"
Page, search forwards for files	<Arrow down> or line & page function key "Page+1""Line+1"
Move to next input field	Enter key or <arrow right>
Back or cancel	<ESC> or cancel key
Enter	<F7> or insert key
Selection, i.e. possible parameters are displayed for selection	<F8>
Help, i.e. help texts about the current input field are displayed	<HELP> (PG) and SHIFT F8
Delete the information on the screen	<DEL>

Note:
Depending on the PCs/PG, other key assignments are possible.

Using the Mouse

The mouse allows flexible positioning of the cursor on all input fields and function keys on the screen. The function keys can be triggered using the left mouse button. Input of data within an input field is, however, made solely using the keyboard.

5.5 Menu Structure and Operation

5.5.1 The Menu Bar for Selecting Functions

COM 1430 After Startup

The startup dialog has a menu bar in which all the function groups provided by the COM for configuration and testing are displayed as menu items. At the lower edge of the screen there is a help bar in which a help text is displayed whenever you select a menu item (see Supplement). The area between the menu bar and the help bar is available for the user dialog. Here, pull-down menus, help texts, special windows etc. are displayed.

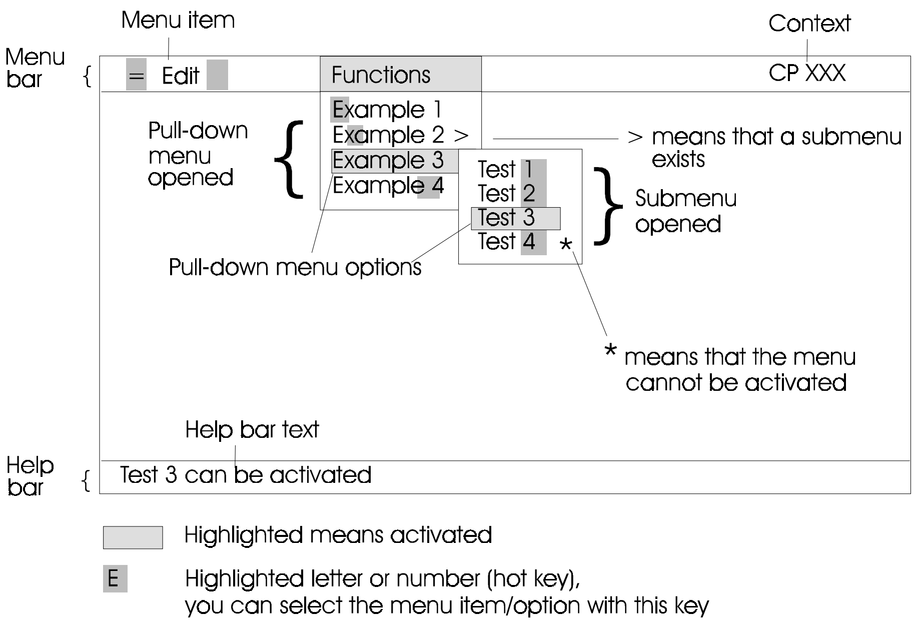


Fig. 5.1: Layout of the SINEC NCM Screen

Structure of the Menu Bar and Pull-Down Menus

You can obtain all the menu options using the menu bar. The menu items in the menu bar each represent a group of functions. The pull-down menu items represent commands for activating the COM function dialogs. The NCM selection dialog disappears once a COM function dialog is activated with a pull-down menu item.

If you select a menu option marked with an "arrow head" (>), you obtain a second pull-down menu in which further functions can be selected.

Pull-down menu items marked with an asterisk (*) are disabled.

Selecting Pull-Down Menu Items (i.e. Commands)

There are three ways of selecting a menu item:

➢ Selection with the arrow keys and the <Insert> key.

➢ Selection with the mouse and pressing the left mouse button.

➢ Selection by pressing a highlighted key, i.e. the highlighted character in the name of the menu command.

You can cancel any action and return to the previous menu by pressing the <ESC> key. When you activate a menu item, the corresponding COM dialog is displayed. Once you have completed your entries in a dialog, you return to the main menu.

5.5.2 COM 1430 Screen Layout and Operation

Overview

You operate the COM software exclusively using the dialogs and the function key menus. The function key menus indicated the functions available with the function keys F1 to F8.

The cancel or ESC key returns you to the previous dialog or cancels the currently active function.

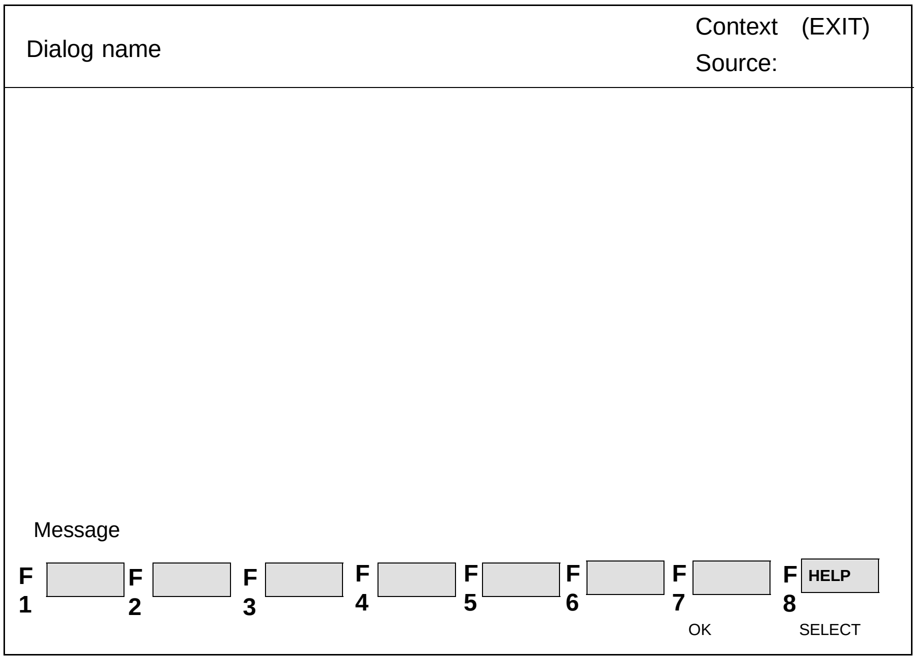


Fig. 5.2: Screen Layout and Arrangement of the Function Keys

Title Bar

Dialog Name: Brief description of the selected function, for example "Transport Connections"

Context: CP-specific dialogs: CP name otherwise SINEC NCM

Source: Display of the database file/path name or AS511 direct.

Message Line

This line above the function keys, is used for messages (warnings, errors, instructions etc.). A message remains displayed until you press a key.

Function keys

Function keys are displayed for each dialog at the lower edge of the monitor. They are assigned to the function keys F1 to F8. The function keys may have a further function that is activated by pressing the SHIFT key. The display of the function keys with a second function is therefore divided into an upper (SHIFT function) and a lower field.

General Notes on Input

Field highlighted: If an input field is highlighted, you can make changes or input in this field.

Field not highlighted: This field is purely a display field.

General Notes on Operation

➢ You can only make changes or input in highlighted fields selected with the cursor keys (current field).

➢ If you want information about the possible entries in a field, press the F8 key (Select). The possible entries displayed in the list box can be selected with the cursor keys or mouse and entered in the current field with <CR> or the insert key.

➢ You enter the input you have made or selected in the list box in the current input field by pressing <CR>. If the input is correct, the cursor automatically jumps to the next input field.

Help

➢ The help function displays a help text referring to the current input field.

Entering Data

➢ Once you have completed the input in a dialog and want to enter the data, press the F7 key or the insert key to enter the data in the current database file. Before data is entered in the database file, the system asks you to confirm that you want to do this. If you decide not to enter the data, press <ESC>.

5.5.3 General Description of the Function Keys

While you are working with the configuration dialog, the functions available in the present context are displayed in a bar at the bottom edge of the screen. Some of the function keys always have the same significance regardless of the currently displayed dialog. These general functions are outlined below.

Page Forwards

+1	Select the next parameter data record.
PAGE +1	Select the next page.
LINE +1	Scroll the display when data is displayed in lines.

Pack Backwards

-1	Select the previous parameter data record.
PAGE -1	Select the previous page.
LINE -1	Scroll the display when data is displayed in lines.

Empty Screen for Data Input

INPUT	A new parameter data record is created. The input fields are reset to the default values.

Delete Screen Content

DELETE	Depending on the context, individual input fields or whole parameter data records are deleted.

Insert a Line

INSERT	Insert a line: An empty line is inserted in the current dialog.

Further Parameters in the Next Dialog

NEXT SCR	The displayed parameter record is extended by other parameters in the next dialog.

Complete Input and Enter Data

OK	The data you have input will be saved in the database. You may be asked to confirm that this is what you want to do.
RETURN	You exit the dialog without saving your input: Input is canceled and you exit the dialog without saving the changes you have made.

List Box for the Current Input Field

F8 SELECT	If the range of possible values is limited, the valid input values are displayed when you press this function key. The displayed values can be selected with the mouse or arrow keys and entered in the input field with the INSERT key.

Help Texts

<Shift>F8 HELP	You can display help text about input fields.

5.6 File Concept

The Database File

M 1-1

When you are configuring a CP 1430, the configuration data for a module (the database) are saved in a database file. This file was also known as a module file in previous configuration tools. You specify the database file in the dialog M1-1 (in the Supplement).

Name Conventions

You can use any text string for the name of the database of a CP (module file) except for the first character. A separate database file is created on the data diskette for every CP module. This contains all the parameters for operating the CP.

You can change a file name proposed by the COM software using alphanumeric characters and the period, however, the first character must be an "A".

Example: **A**TSTPLC1.CP1

Storage and Transfer

The database file is created with the COM 1430 functions, managed on the PG or PC and loaded on the CP. The file can be loaded using one of the possible interfaces (AS511 interface or SINEC H1 bus interface).

❑

6 Basic Configuration

Topics in this Chapter

When using the CP 1430 TF communications processor, you must decide which of the two supported types of communication you require for your task:

- ➢ Communication on the transport interface
- ➢ Communication on the TF interface

This chapter describes the steps for initialization and basic configuration required to operate the CP regardless of the type of communication you select.

This chapter also describes the functions for loading and documenting configuration data that are the same for all services.

Further Information

Information on this topic is also available from the following sources:

- ➢ Chapter 3 in this volume tells you about the functions and modes of the transfer services on the transport interface.
- ➢ Chapter 5, COM 1430 TF configuration software, tells you how to use the configuration tool.
- ➢ Chapter 7 in this volume tells you about the functions specifically intended for configuring communication on the transport layer. This chapter deals with transport connections and datagram services.
- ➢ The online help functions of NCM COM 1430 TF provide you with additional information when you are configuring the module and explain the meaning of the input fields.
- ➢ In this chapter, remember that the dialog references in the margin refer to the dialogs in the “COM 1430 TF Configuration Tool” supplement. You can open this supplement to the appropriate dialog and follow the explanation with it in front of you.

6.1 Overview of the Configuration Steps

The following overview shows the steps necessary for configuring the communication. The entries in the black boxes are menu options of the COM 1430 user interface. They are shown when relevant to this chapter.

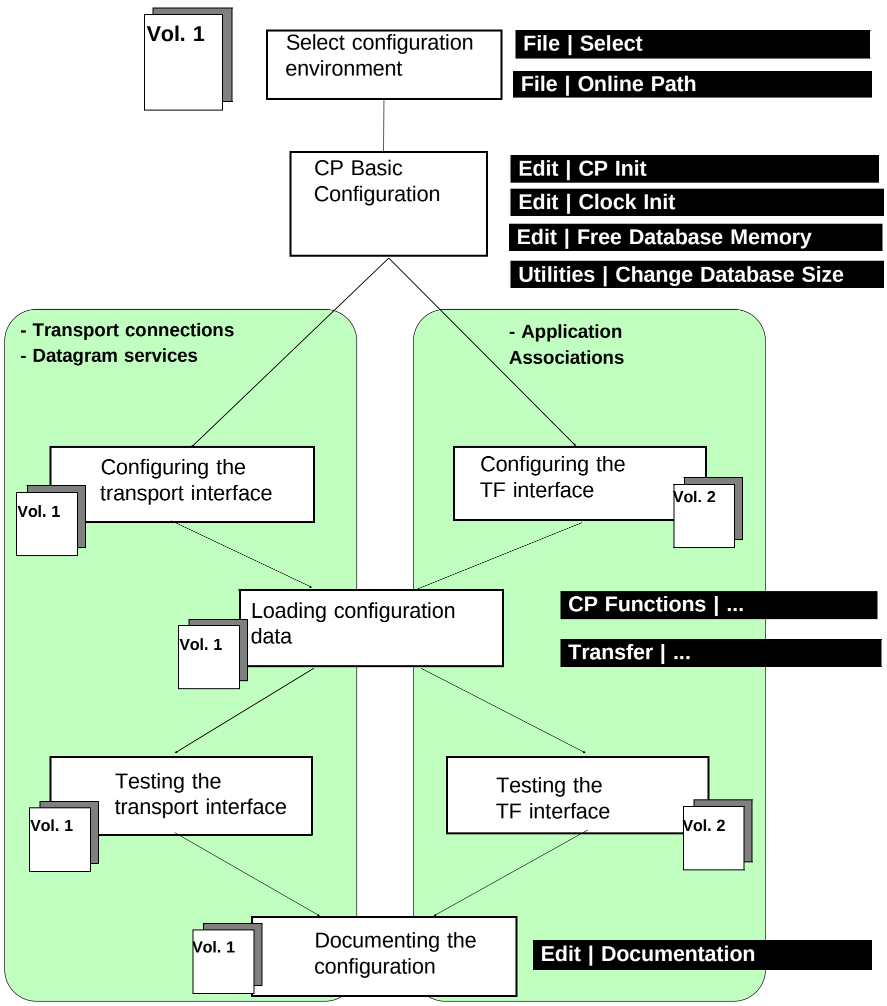


Fig. 6.1: Configuration Steps

Explanation of the Configuration Steps

Specifying the Configuration Environment
The first step is to make the preparations for configuring the CP. You decide where data will be stored and how the connection between the PG and CP is established.

Basic CP Configuration
You supply the CP with basic information required regardless of the type of communication you decide to use.

Example: Address of the CP in the network.

Transport Connections/Datagram Services
You configure transport connections or datagram services for simple, byte-oriented data transfer. You have direct access via the transport interface.
These steps are explained in the next chapter in this volume.

Application Associations / File Server Application Associations
When you configure the TF interface, you use the wide range of options provided by communication conforming with the MMS standard.
These steps are explained in Volume 2.

6.2 Specifying the Configuration Environment

6.2.1 File | Select

M 1-1

The **File | Select** function displays the **'Basic Settings'** dialog.

Meaning
A database file is created for each CP module (communications processor). This contains all the parameters for operating a CP. The functions in this dialog are used to create a database file for the communications processor.

When SINEC NCM is called for the first time, you are requested to select the CP type in the **'Basic Settings'** dialog. You can select the type from a list if you have more than one CP configuration tool installed in your NCM directory. The name of the module then appears in the title bar.

You can only exit this dialog when you have set all the required parameters or when you press the <ESC> key. The settings made in the dialog for the CP are stored in a database file and read in again when you next call SINEC NCM.

M 1-1 Input/Output Fields

CP type: Here you can choose one of the CPs designed for use with SINEC NCM provided its COM is installed in the NCM directory.

Status: The status decides where the values and parameters you select with the following functions will be stored. (Possible values: online CP, offline FD).

Database file: Drive:
Here you specify the drive on which you want to work.
The directory is the working directory set in the S5 KOMI dialog

Database:
Apart from the first letter, you can specify any name (text string) as the name of a CP database file. A database file is set up for each CP module on the data diskette. This contains all the parameters for operating the CP.

If a name is proposed, you can change it, however, the first letter must be “A” (Possible entries: alphanumeric characters and the period).

M 1-1

Documentation:

Footer:	This entry activates and deactivates the printing of a footer at the end of the page. If you want to use a footer, you must specify the footer file (see below footer file). (Possible entries: ON/OFF")
Printer output:	This decides whether output is only on the screen or on a printer and screen. (Possible entries: ON/OFF)
Printer file:	Drive: Here, you specify the drive where the printer file that you want to use is stored. Ideally, you should specify the S5 DOS system drive. Printer file: This entry identifies a file containing the printer parameters. Printer files for common printers exist in S5-DOS. You can, however, create your own printer file. (Possible entries: alphanumeric characters)
Footer file:	Drive: You select the drive on which the footer file will be stored. Footer file: This is the name of the footer file. You create the footer file with the “Footer Editor” STEP 5 utility. (Possible entries: alphanumeric characters)

6.2.2 File | Online Path

M 1-2

When you select the **File | Online Path** function, the **'Online Path Setting'** dialog is displayed.

Meaning

To be able to configure a CP using the online path or to transfer a database to this CP, a path is necessary. The path entry refers to a path file that you have already created with the **Utilities | Bus Selection** function.

Naming the Path

The following entries define the path on which you can access the CP using the PG.

Dr: This is the drive on which the CP path file is stored. Use the select key to display possible drives.

Path file: Here, you specify the name of the path file you set previously with the bus selection utility. This defines the communications path via a SIMATIC module to the CP. The path file is in the SIMATIC\S5_ST directory on the system drive.

You can also select a file using the select key (F8).

Possible entries: xxxxxxAP.INI

Path name: A path file can contain several paths. These paths are identified by a path name.

You can also select a path name using the select key (F8).

Possible entries: maximum 19 characters

☞ **If you want to configure the CP directly using the AS511 interface, do not enter a path name for the CP connection in this dialog and if a path name is already displayed, overwrite it with blanks.**

6.2.3 File | Copy

M 1-3

With this function, you can create a copy of the current database file. If the destination file already exists, a message is displayed asking you whether or not you want to overwrite the file on the specified destination station.

Input/Output Fields:

Source file: The input field for the data source displays the currently set database file. You can, if required, change this entry.

Destination file: The input field for the destination of the copy database file function displays the current drive of the data source.

The source file and destination file have the following format:
1. First input field:
Drive (for example A: for floppy disk drive or C: for a hard disk)
Possible entries: "A" to "P"

2. Second Input Field:
Name of the source or destination file
Possible entries: alphanumeric characters and the period

Function Keys (with an additional or context-specific meaning):

F1 SINGLE	The blocks are copied singly to the destination file. For the meaning of the individual blocks, refer to the following table.

Block Type	Block
VB1..n	Communication block(s)
OB1	Initialization block
OB5	VMD specific variables
OB6	CPU configuration
OB13	Third party association
OB14	Variable type block

F2 TOTAL	All the blocks are transferred to the destination file.

6.2.4 File | Delete

With this function, you can delete a database file. To avoid accidentally deleting a file, you must confirm the command.

In the message file, you are asked "Drive: database file: delete file?", and you can answer with the function keys.

Function Keys (with an additional or context-specific meaning):

F1 YES	The database file is deleted
F3 NO	The database file is retained.

6.3 Basic CP Configuration

6.3.1 General Recommendations

Basic Procedure
When designing your bus system, follow the procedure below:

✓ Find out how many PLCs are required for your application. Assign the station (Ethernet/MAC) addresses carefully, since subsequent modification of the addresses after configuration can be laborious.

✓ All the configuration data should be stored in files, in other words, whenever possible work “OFFLINE FD”, with the hard disk of the PG or PC (see below).

M 1-1 **Creating the CP Database**

In the **’Basic Settings’** dialog, there are two ways of making entries or modifying them when you are configuring:

➢ **OFFLINE FD:**
You create the database using COM 1430 TF on the PG and save the data initially in a database file. Following this, you transfer the database directly to the CP using the transfer functions or you make use of a memory card.

➢ **ONLINE CP:**
You create the database using COM 1430 TF directly on the connected CP 1430. You can only modify or transfer blocks when the CP in the STOP mode (**CP Functions | Start / Stop** or set the selector on the CP to STOP).

If you select ONLINE CP, the PG must be connected directly to the CP 1430 TF via the AS511 interface or via a bus path (bus selection utility; only possible following a “node initialization”, see below).

Transferring the Database

If you have created a parameter data record OFFLINE, you can transfer it to the CP 1430 TF using the **Transfer | FD->CP** transfer function. The transfer function can only be used in the CP STOP mode (**CP Functions | Stop** or set the selector on the CP to STOP).

You can also transfer the parameter data record to a memory card using the **Transfer | FD->Memory Card** transfer function. To do this, you must first insert a memory card in the PG memory card slot.

Node Initialization of the CP 1430 TF

M 2-1

If you want to address the CP 1430 TF on a bus path, you must enter the Ethernet address in the SYSID block (CP Basic Initialization dialog) ONLINE (via the AS511 interface) and then restart the CP 1430 (“node initialization”). Following this, the CP can be configured online or the database created offline can be loaded.

The node initialization is **not** necessary if you create the configuration data OFFLINE and then use a memory card.

Modifying Blocks

If you want to modify existing blocks you have already saved on a CP memory card, follow the procedure outlined below:

✓ Transfer the block from the CP/memory card to the database file on the PG (**Transfer | CP->FD** or **Transfer | Memory Card->FD**).

✓ Modify the block

✓ Transfer the block or CP database back to the CP using **Transfer | FD->CP** . If you use a memory card, you must delete it and then re-program it using **Transfer | FD->Memory Card.**

☞ **The newly transferred data are effective after the CP is restarted.**

6.3.2 Edit | CP Init

M 2-1

If you select the **Edit | CP Init** function, the **’CP Basic Initialization’** dialog is displayed.

Meaning

The data of the basic initialization involve the following aspects:

➢ Uniform identification and assignment of the module within the SIMATIC S5 system and SINEC H1 by means of the base SSNR and the MAC address.

➢ Storage or display of informative parameters such as the firmware release of the module or a plant designation.

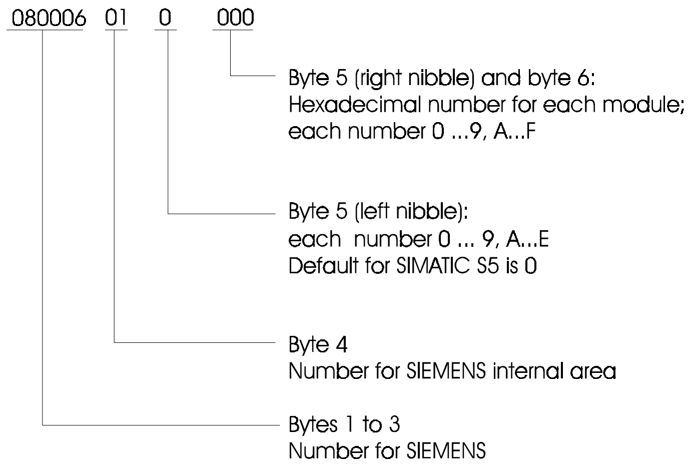
If you have already created and saved the database file, the existing values are displayed here. Otherwise default values are displayed.

M 2-1 Identifying the CP Within SINEC H1

MAC Address:

The MAC address is the physical address of the CP 1430 module on the SINEC H1 local area network.

The address must be unique throughout the whole network and is assigned by COM 1430 using 12 hexadecimal characters in 6 address bytes, as follows:



Possible entries: Maximum 12 characters

Note that addresses that have an odd hexadecimal number in the second position from the left are automatically multicast addresses.
Example: 09...

The Priority for the Clock Master Function
If you use the CP as a clock master, remember that the MAC address is used for this function. The value of the last byte (byte 6) specifies the priority of the CP as clock master. The current clock master is always the active CP with the highest priority.
Highest priority: 00 (Byte 6)
Lowest priority: FF

M 2-1 Basic Settings for the Interface Between the CP and CPU (SIMATIC Details)

Base SSNR: The base interface number (base page) of the CP 1430 TF module must be a number divisible by 4. The default is 0.

When you set the base interface number, make sure it is unique in the S5 programmable logic controller if you are using more than one CP.

Possible entries: 0,4,8,...248,252

Interface Communication (P/ /B) SSNR offset: You specify which type of communication can be operated on the interfaces identified by the SSNR offset 0 to 3.

Which type of communication is possible depends on the base SSNR you have selected.

Possible selections:	Possible with base SSNR:
- Productive communication	0,4,8,...252 (exception 244)
- Backplane bus communication	232, 236, 244
- No communication	- any base SSNR -

With multiprocessor PLCs, the CP 1430 TF can process up to 4 interfaces.

☞ **Refer to Chapter 4 for more information about backplane bus communication and the base SSNR.**

Card type: This parameter is updated in the online mode and is used to display the card type detected. The following card types are possible: “RAM”, “Flash” (memory card). The PG completes this field automatically.

In the offline mode, the field is empty.

Database size: Length of the memory space available in Kbytes for the database.
The default display in this field is 32 Kbytes and this can only be changed here before the file is created. It is possible to adapt the size using the **Utilities | Change Database Size** function.

Possible entries: 32, 64, 128, 256

Note: You can also obtain information about the current database area using the **Utilities | Change Database Size** or **Edit | Free Database Memory** functions.

Module ID: COM 1430 enters the module identifier CP1430 based on the configuration.

Firmware version: In the ONLINE mode, the firmware version is displayed here. In all other cases, this field remains empty.

Date created: A free-format field for entering a date; for example the date on which the parameter data record was created.

Possible entries: maximum 8 characters

Plant designation: Free-format field for entering a text to identify the plant or system in which the PLC is being operated.

6.3.3 Edit | Clock Init

M 2-2

If you select the **Edit | Clock Init** function, the **'Clock Master'** dialog is displayed.

Input/Output Fields

CP 1430 TF is clock master (Yes/No):	This parameter specifies whether the CP 1430 module will transmit real-time synchronization frames. The current clock master is the CP 1430 TF in the network that is identified as having the highest priority in byte 6 of the MAC address. Refer to Section 3.3 for setting the MAC address and Section 6.3.2 **Edit | CP Init**. The default is N (No). Possible entries: (Y/N)
Cycle time for SYNC frames:	If the CP 1430 TF has taken over the role of clock master, it sends real-time synchronization frames. This parameter sets the interval (1 sec......60 sec) at which the CP sends real-time synchronization frames. The default is 10 seconds.
Destination address if clock master:	If the CP is configured as the clock master, you select the type of destination address here: You can select the following: M: Multicast address (default setting=09 00 06 01 FF EF_H) B: Broadcast address (= FF FF FF FF FF FF_H)

6.3.4 Edit | Free Database Memory

M 2-7

With this function, you can display the amount of memory still free for configuration data.

The size depends on the currently selected database size. The database size can be selected, as follows:

➢ when creating the database file in the **'Basic Settings'** dialog,

➢ in an existing database file using the **Utilities | Change Database Size** function

Input/Output Fields

Free database memory:	Display of the memory still available for configuration data.

6.3.5 Utilities | Change Database Size

This function is used to adapt the memory available for the database.

When you create the database file in the **’CP Basic Settings’** dialog, you specify the database size. You can change the size you selected using this function.

Input/Output Fields

Database file:	The current database file is displayed as the default. You can, however, select any database file.
Currently selected database size:	Currently valid database size. This entry is updated only after you have confirmed a new entry with the F7 key (OK).
Currently required memory:	Displays the memory requirement based on the configuration.
New database size:	Input for the new database size adapted to the “currently required memory”.

Function Keys (with an additional or context-specific meaning):

F1 UNDO	You can undo the last confirmed change.

6.4 Transferring Configuration Data

M4-1...
M4-4

Function

With the transfer commands, you can transfer a database between the CP and PG.

Modes

In the online mode you transfer blocks between the hard disk (= FD) and the database of the CP. If you are using a memory card of the type FLASH-EPROM in the CP, you can only transfer from the memory card to diskette online.

Controlling the Status of the CP

The commands **CP Functions | Start**, **CP Functions | Stop**, **CP Functions | Status** and **CP Functions | Delete CP Database** are used to control the CP when transferring a database or during the installation and startup phase.

There are three modes on the CP: RUN, STOP and IDLE.

➢ The RUN mode is the normal operating status of the CP 1430 TF in which it is synchronized with the CPU. In this mode, it is not possible to change the database online. Only read access to the CP is possible.

➢ In the STOP mode, in contrast, data can be written to the CP (when operating the CP with RAM; not with a memory card). For this reason, the CP must be changed to the STOP mode before the functions **Transfer |FD->CP** or **CP Functions | Delete** can be used. You can change the CP to the STOP mode simply by switching the CP START/STOP switch to STOP or using the COM function **CP Functions | Stop** described here.

➢ In the IDLE mode, the CP is not synchronized with the PLC. Changes to the CP database cannot be made in this status.

☞ **The menu items CP Functions, Transfer and Test can always be used regardless of the setting in the basic settings dialog (online or offline mode) if the CP is connected (and in the STOP mode).**

6.4.1 CP Functions | Start

This function changes the CP to the RUN mode. A dialog box informs you when the frame is sent. You can exit the dialog box by pressing a key or clicking with the mouse. You can find out whether the function was executed successfully using the **CP Functions | Status** command.

6.4.2 CP Functions | Stop

This function changes the CP to the STOP mode. A dialog box informs you when the frame is sent. You can exit the dialog box by pressing a key or clicking with the mouse. You can find out whether the function was executed successfully using the **CP Functions | Status** command.

6.4.3 CP Functions | Status

With this function, you can check the CP status. The CP status or any error that may have occurred is displayed in a dialog box that you can exit by pressing a key or clicking with the mouse.

The possible status displays are as follows:

CP is in the IDLE state ('NOT SYNCHRONIZED')
CP is in the 'RUN' state
CP is in the 'STOP' state
CP is in the 'SWITCH STOP' STATE

6.4.4 CP Functions | Delete CP Database

With the delete CP database command, you can delete a database (except for a memory card of the type Flash EPROM) on the CP. To avoid deleting a database accidentally, you must confirm this command.

☞ **The data of the CP basic initialization are retained.**

Function Keys (with an additional or context-specific meaning):

F1 YES	The CP database is deleted.
F3 NO	The CP database is retained.

6.4.5 Transfer | FD->CP

M 4-1 You transfer a database file created offline to the CP.

The COM asks whether you want to transfer single blocks or the entire database file. You can cancel the function by pressing ESC.

Function Keys (with an additional or context-specific meaning):

F1 SINGLE	The blocks are transferred singly to the CP. For the meaning of the individual blocks, refer to the table on page 6-10.
F2 TOTAL	All the blocks of the database file are transferred to the CP.

6.4.6 Transfer | CP->FD

M 4-2 The database is transferred from the connected CP to FD.

If the file already exists, a message appears in the message line asking whether you want to overwrite the file on the specified destination station.

Input/Output Field

Destination file: This is the database file in which the CP database will be saved. As default, the database file specified in the **'Basic Settings'** dialog is displayed as the destination file.

You can make a selection using the F8 key if other database files exist.

Function Keys (with an additional or context-specific meaning):

F1 SINGLE	The blocks are transferred singly to the destination file. For the meaning of the individual blocks, refer to the table on page 6-10.
F2 TOTAL	All the blocks are transferred to the destination file.

6.4.7 Transfer | FD->Memory Card

M 4-3 The database is written directly from the database file to the memory card inserted in the PG (Flash EPROM). If the memory card has already been used, it must first be deleted using the **Transfer | Delete Memory Card** function.

Input/Output Field

Programming number: The programming number 500 is used for the memory card types listed on page 4-7. You can display a section of programming numbers using the NCM selection menu.

6.4.8 Transfer | Memory Card->FD

M 4-3

The database on the memory card is copied to a database file on the PG.

If the file you select as the destination file already exists, you will be asked to confirm your intention before the file is copied.

Input/Output Field

Destination file: This is the file in which the database of the memory card will be saved.

6.4.9 Transfer | Delete Memory Card

M 4-4

With this function, you can delete a memory card to which you had previously written data.

Memory cards must be deleted using this function, before you can transfer a new database to the memory card using the **Transfer | FD->Memory Card** function.

6.4.10 Transfer | CP 143 Data Converter | ...

These functions are used to convert an existing CP 143 database into a CP 1430 database.

M 4-6 While the destination file must always be a database file on the PG, you can select 3 different sources for the transfer as follows:

- FD:
  The CP 143 database to be read is on the PG.

- CP 143:
  The CP 143 database to be read in is on the CP.

- EPROM
  The CP 143 database to be read in on is an EPROM inserted in the PG.

The database is converted as soon as you press the F7 key (OK).

Input/Output Fields

Source file:	Can only be specified for FD->FD
Destination file:	The currently selected database file is displayed in the destination file input field as default.

6.5 Documenting Configuration Data

To document the configured communication parameters, there are a number of functions available for outputting lists. The lists are structured to reflect the configuration steps. All lists are displayed on the screen and can be printed out if required.

To activate documentation functions, select the **Edit | Documentation | ..** command.

M 2-8... You will find an overview of the selectable printouts in the table in Section 3 of the supplement to this manual.

M 1-1 **Controlling Output**

In the **'Basic Settings'** dialog, you can control the printer output and the use of a footer. You can enable or disable printing in the printer output field. You can enable or disable the printing of a footer in the footer selection field in this dialog. If you want a footer to be printed out, you must specify the footer file. You create the footer using the “Footer Editor” utility.

6.6 Setting and Reading the Time

M 6-3

Meaning

Using COM 1430 TF you can both set the hardware clock of the CP 1430 TF and read the current time-of-day.

If you select the **Utilities | Clock Functions** command, the clock functions dialog is displayed. When this function is called, a read real-time frame is sent to the currently selected CP 1430 TF.

The data received are displayed in the dialog and function key functions are available depending on the status of the CP clock.

Setting the Hardware Clock

When setting the hardware clock, keep in mind the mode you have selected in your network:

➢ Operation **with** Clock Master

The time in the network is set by the clock master. In this case, only set the time on the CP 1430 TF that is acting as clock master in the network. The CPs in the network will be synchronized to the time set on the clock master by the synchronization frame.
The current clock master is the active CP in the network with the highest priority MAC address.

➢ Operation **without** Clock Master ("clock slave + no synchronization via H1)

You can set the time for every CP 1430 TF described in the dialog. The time is kept independently within the range of accuracy of the hardware clock on the CP.

You can set the hardware clock on the CP 1430 TF, when the CP is either “Clock Master” or “Clock Slave + no synchronization via the SINEC H1 network”.

Representation in the COM 1430 TF "Clock Function" Dialog

Weekday: MONDAY - SUNDAY

Date today: e.g. 15. 11. 1991
The date can be set starting from 01.03.1984 to 21.12 2083.

Current Time: e.g. 15:23:43

Time difference (1/2 H): "+" or "-" and range between 0 and 24

Clock master (Y/N): Displays whether the current CP 1430 TF is clock master or clock slave.

CP clock status:

CLOCK MASTER	Clock sends synchronization frames
CLOCK SLAVE	Clock receives synchronization frames
CLOCK SLAVE + INVALID	Clock must be set
CLOCK SLAVE + ASYNCHRON	Clock does not receive synchronization frames
CLOCK SLAVE <--> CLOCK MASTER	Clock status change
TRANSMITTER SYNCHRON	Real-time transmitter itself is asynchronous
SUBSTITUTE ASYNCHRON	Clock synchronized by a CP 1430 TF or CP 143 TF
SYSTEM ERROR	Internal error occurred
HARDWARE CLOCK	Hardware clock failure

Function Keys (with an additional or context-specific meaning):

F2 READ	Single request from the PG to read the time.
F3 SET	The set clock function is possible when the CP status is “Clock_Master” or “Clock_Slave + no synchronization via the SINEC H1 network”, or the clock chip of the CP 1430 TF is indicated as invalid.
F5 UPD ON/OFF	The PG requests the times cyclically. The CP clock status is also updated.
F7 OK	The data that were edited in the dialog are adopted as the current data.

❑

Notes

7 Configuring the Transport Interface

Topics in this Chapter

This chapter describes the functions, dialogs and parameters of the NCM COM 1430 tool for configuring and testing transport connections and datagram services.

You can use this chapter as a reference section when configuring and testing your connections.

It is advisable to follow the order in the overview on the following page when configuring.

Further Information

Further information can be obtained from the following sources:

➢ Chapter 3 in this volume tells you about the functions and modes of the services on the transport interface.

➢ Chapter 6 in this volume tells you about the general steps you need to take to create a database file.

➢ The NCM COM 1430 TF online help functions explain the meaning of the individual input fields while you are configuring your system.

➢ In this chapter, note the references in the margin to the “COM 1430 TF Configuration Tool” supplement. These refer to the dialogs currently being described and it is helpful to open the supplement to these dialogs.

7.1 Overview

The diagram is an overview of the steps and functions available for configuring and operating a transport interface.

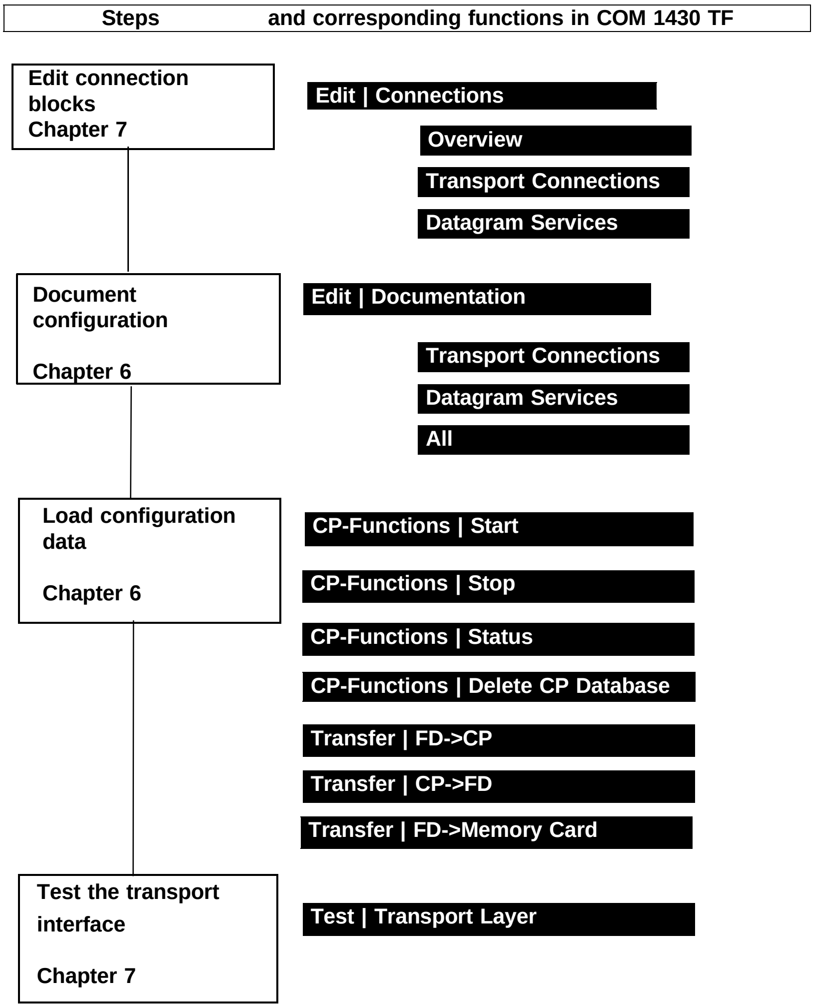


Fig. 7.1: Configuration Steps

7.2 Editing Connection Blocks

7.2.1 Edit | ...| Overview

M2-4-1 You can obtain information about existing connection blocks using the **Edit | Connections | Overview** function. The following types are displayed:

- ➢ Transport
- ➢ Datagram
- ➢ Application association
- ➢ File server application association

To display or modify the configuration data of a connection block displayed in the list:

✓ Select the entry with the cursor.

✓ Press the F7 key (OK)

To edit the connection blocks, you can, however, also use the NCM COM 1430 TF menu **Edit | Connections | ...** to call the input dialogs for the types listed above.

7.2.2 Edit |...| Transport Connections

M2-4-2.1
M2-4-2.3

Overview

If you select the **Edit | Connections | Transport Connections** function or select a connection block as described in the previous section, you display the **'Transport Connection'** dialog. In this dialog, you assign parameters for transport connections in the connection blocks.

If connection blocks have already been created for the database file, when you select the **Edit | Connections | Transport Connections** function, the first block of the database file is displayed.

Requirements

A connection block cannot be defined until the basic initialization is completed (**Edit | CP Init** function).

Consistent Input

A connection is only possible when a connection block is entered both in the local and in the remote CP database. Make sure that the parameters match each other. This affects the following:

➢ The address parameters: the local and remote TSAPs and the remote MAC address.

➢ The job type: for example consistent assignment of SEND and RECEIVE.

➢ The transport parameters.

Defaults

The defaults for a simple transport connection are as follows:

➢ Simplex

➢ Priority = 2

M2-4-2.1 Input Fields for Assigning Parameters for the Interface to the PLC

SSNR offset: This parameter specifies the page number with which the communication channel can be addressed.

Possible entries: 0..3

The SSNR offset specified here and the base interface number are combined to form the interface number that must be specified in the handling block.

ANR: Along with the local interface number, the job number identifies the connection block uniquely. The same job number cannot be assigned more than once per SSNR of a CP 1430 module.

In the control program, the job number and the interface number must be transferred to the handling block to identify the connection and the job.

Possible entries: 1..199

M2-4-2.1 The principle of a simple transport connection SEND - RECEIVE from the local PLC to the remote PLC and the meaning of SSNR and ANR can be seen in the following diagram.

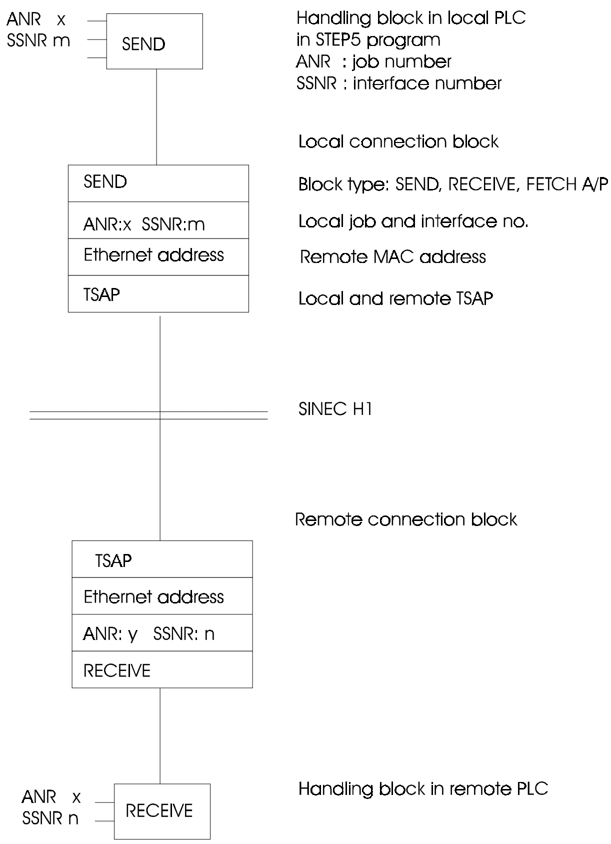


Fig. 7.2: Principle of Transport Connections

M2-4-2.1 Input Fields for Assigning the Parameters to the Job

Job Type: The entry specifies whether a SEND, RECEIVE or FETCH job is involved. The same type must be entered here as in the corresponding HDB call in the PLC program.

The following table shows the job types that can be used on transport connections. It indicates which job types must be configured so that they match each other in the connection blocks of the partner station (refer also to the information in Chapter 3 of this volume).

active side			passive side		
Job type	PLC handling block	CP connection block	CP connection block	PLC handling block	Job type
Send (SEND)	SEND	SEND	RECEIVE	RECEIVE	RECEIVE
Read (READ acti-ve)	FETCH QTYP=RW	FETCH ACTIVE/PASSIVE =A READ/WRITE =Y	FETCH ACTIVE/PASSIVE =P READ/WRITE =Y	*)	(READ passive)
Write (WRITE ac-tive)	SEND QTYP=RW	SEND READ/WRITE =Y	RECEIVE READ/WRITE =Y	**)	(WRITE passive)

Table 7.1 Parameter Assignment for Jobs

*) at least one SEND-ALL call in the S5 PLC program
**) at least one RECEIVE-ALL call in the S5 PLC program

Active/Passive (A/P): With the FETCH block type, you must specify whether the block is active (initiates establishment of the connection) or passive. The default is “passive”.

M2-4-2.1 Input Fields for Assigning Parameters for Job Processing

Priority: This parameter specifies the priority of the frame and the type of connection. The following 5 priority classes are permitted:

Possible entries: 0..4

PRIO 0 (expedited service with hardware interrupt):
Short frame with a maximum data field length of 16 bytes. With RECEIVE, an interrupt is triggered on the PLC. With SEND, this priority has no effect and the procedure is as for PRIO = 1. The frame is always of the type “expedited”. The frame is transferred directly via the dual-port RAM interface and not with a RECEIVE-ALL or SEND-ALL.

PRIO 1 (expedited service without hardware interrupt):
This is the same as PRIO 0, however there is no interrupt on the PLC.

PRIO 2 (normal service - static connection):
Normal frame with any data field length. A virtual circuit is established for the data exchange between two CP 1430/143/535 bus partners. The connection is established following the CP startup and is generally maintained permanently. Data transfer is triggered by a SEND/RECEIVE (direct) or FETCH at both ends of the connection on the PLC. The data is then transferred using SEND-ALL and RECEIVE-ALL.

PRIO 3 (normal service - dynamic connection):
As priority 2, however, the transport connection is only established after the first SEND/RECEIVE handling block pair has been called. From this point onwards, the connection is maintained until one of the partners terminates it with a RESET.

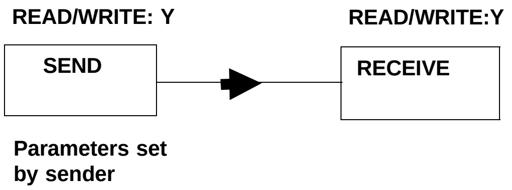
PRIO 4 (normal service - dynamic connection):
As priority 3, however, the connection is terminated again automatically on completion of the data exchange.

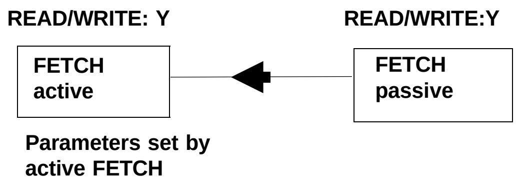
M 2-4-2.1 Input Fields for Assigning Parameters for Job Processing (continued)

Read/Write: For PRIO = 2 (normal operation), you can specify for the block types SEND, RECEIVE and FETCH whether the data description (source/destination) is supplied via the cable (for example by the process computer). The parameters are set by the sender or by the active FETCH.

Possible entries: 1 character (Y/N)

Examples:





- Assigning Parameters for a "WRITE" function:

-Assigning Parameters for a “READ” function:

M2-4-2.1 Configuring Several Jobs Per Transport Connection

Number of Jobs Per TSAP:

If you want to change the default connection mode from simplex to full duplex, or if normal and expedited data services are required using one connection, then at least one further job must be entered for the TSAP. You must then also increase the number of jobs. A maximum of four jobs per TSAP are possible. The job type of the first job in the connection block determines the type of connection establishment (active, passive).

Possible entries: 1 to 4

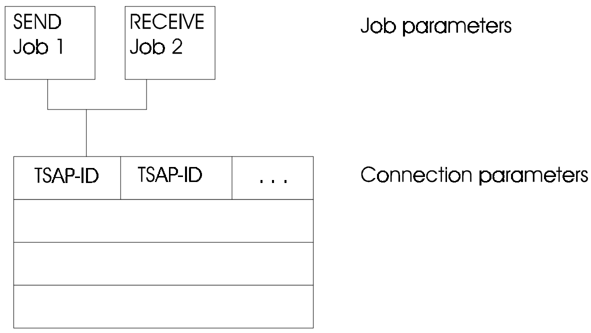
If you increase the number of jobs, you must enter the next job as follows:

✓ Press the "+1" key

✓ Enter the job:
SSNR, ANR, Job Type, Priority, Read/Write (as described above)

The address information is only displayed in these follow-on dialogs and cannot be changed.

Example : Duplex mode --> 2 jobs per TSAP



M 2-4-2.1 Transport Addresses - Local Parameters

In these input fields, you plan parameters for the communications path in the local PLC.

TSAP (ASC): The TSAP for the local PLC can be specified here in ASCII characters.

Possible entries: maximum of 8 ASCII characters

TSAP (HEX): You can enter the individual bytes of the TSAP-ID in hexadecimal notation as groups of two (values from 00 to FF).

Possible entries: maximum of 8 bytes

Default:
The TSAP from the previous dialog is displayed if you selected the dialog with the F3 key INPUT.

TSAP Length: This specifies the number of TSAP characters and has the default “8”. If you have a connection to non-SIMATIC S5 stations, it may be necessary to specify a shorter length.

If you specify length = 0, the TSAP counts as being unspecified (only permitted with the RECEIVE job).

M2-4-2.1 Transport Addresses - Remote Parameters

In these input fields, you assign parameters for addressing the communication partner.

MAC Address (HEX): Physical module address of the remote PLC.

If you enter the MAC address = 0000 0000 0000 for the RECEIVE job, this address counts as being unspecified. When the connection is established, any partner will be accepted regardless of its address.

TSAP (ASC): The TSAP for the remote PLC can be specified here in ASCII characters.

Possible entries: maximum of 8 ASCII characters

TSAP (HEX): You can enter the individual bytes of the TSAP-ID here in hexadecimal notation as groups of two (values from 0 to FF).

Possible entries: maximum of 8 bytes

Defaults:
The TSAP from the previous dialog is displayed if the dialog was selected with the F3 key INPUT.

TSAP Length: Specifies the number of TSAP characters and has the default “8”. If you have a connection to non-SIMATIC S5 stations, it may be necessary to specify shorter lengths.

You specify length=0, the TSAP counts as unspecified.

M2-4-2.1 Function Keys (Additional or With a Context-Specific Meaning):

Key	Description
F2/F2 +1/-1	The “+1” key displays the next connection block, the function key “-1” the previous. At the end of the line, you come back to the first element.
F3 INPUT	With the “INPUT” function key, you can enter a new block. An empty dialog is then displayed.
F4 DELETE	With the “DELETE” function key, you delete a connection block. The PG prompts you to confirm that you want to delete the block.
^F6 IND ADR	This key selects the next dialog **’Indirect Addressing’** M 2-4-2.2.
F7 OK	The “OK” function key, saves all the parameter settings in the database file or in ONLINE mode directly on the CP 1430 module. If the OFFLINE mode, it is advisable to save the created parameters using this function key when editing.
^F7 TR PARA	The next dialog **’Transport Parameters’** M 2-4-2.3 is selected.

M 2-4-2.2 Follow-on Dialog - Indirect Addressing

Indirect addressing means the possibility of specifying the data source or data destination “statically” when configuring. This information is then used when there is no source or destination specified in the HDB call. If both addresses exist, the (dynamic) information in the HDB always has priority.

Parameters for the data source and data destination on the PLC:

Source/Destination: This specifies the data source or data destination in the local PLC for SEND and RECEIVE if this is not included in the handling block (HDB) call in the PLC.

The information uses the same organizational format as the handling blocks. The entries in the field must be separated by blanks. The length is specified in a separate field.

Possible entries: 12 characters

Examples:

DB 110 45
DB 6 8
FY 114

Length: Specifies the message length. The maximum length depends on the selected operand (block type on the PLC) as shown in the table on the following page.

Possible entries: 5 characters

M 2-4-2.2 Follow-on Dialog - Indirect Addressing (continued)

The following table contains the possible sources and destinations of the data to be transferred.

Operand	DB no.	Address	Length	
DB	1-255	0- 2047	1-2048 words	* Data block
FY	-----	0- 255	1- 256 words	* Flag byte
IB	-----	0- 127	1- 128 words	* Input byte
QB	-----	0- 127	1- 128 words	* Output byte
PY	-----	0- 255	1- 256 words	* Peripheral byte
C	-----	0- 255	1- 256 words	* Counter
T	-----	0- 255	1-256 words	* Timer
RS	-----	0- 511	1- 512 words	* System data
AS	-----	0-32767	1-32768 words	* Absolute address
DX	1-255	0-2047	1- 2048 words	* Extended data block
DE	1-255	0-2047	1- 2048 words	* Data block extended memory
OY	-----	0- 255	1- 256 words	* Extended peripheral byte

Table 7.2 Addressing Options for Data Source and Destination

M 2-4-2.2 Follow-on Dialog - Indirect Addressing (continued)

Status word: Specifies a data word in the PLC address area in which the status bits are saved for SEND, RECEIVE and FETCH active. The status word specified by the PLC in the HDB has priority over a configured value.

Possible entries: 10 characters

Entries must be separated by blanks.

Example: DB 100 45

The following table contains the possible entries for the status word field.

Operand	DB no.	Address	
DB	1-255	0- 2040	* Data block
DX	1-255	0-2040	* Extended data block
FW	----	0- 252	* Flag word

Table 7.3 Configurable Locations for the Status Word

M2-4-2.3 Follow-on Dialog - Transport Parameters

In this dialog, you can specify transport parameters for a specific connection.

Connection establishment:

Retransmission time and maximum count for the establishment of the connection on the transport layer.

Possible values : 1...255

Default values: Repetition time: 5 sec
Maximum count: 2

Data transfer:

Retransmission time and maximum count for renewed transmission attempts.

Possible entries : 1...255

Default values : Retransmission time: 600 msec
Maximum count: 5

Inactivity ACK time

The inactivity time specifies the waiting time when nothing is received from the other station before the connection is terminated.
The window time specifies the interval at which an inactivity ACK frame is sent.

The value for the window time is obtained implicitly from the specified inactivity time, as follows:
Window time = 1/3 inactivity time.

The range of values is 1 to 255.
Default values: Inactivity timer: 30 sec
Window timer: 10 sec

7.2.3 Edit |...| Datagram Services

M2-4-3.1 Datagram services allow connectionless transmission of single frames to:

➢ One station (single address)

➢ Several stations (multicast)

➢ All stations (broadcast).

Input Fields for Assigning Parameters to the Interface to the PLC

SSNR Offset: This parameter specifies the page number with which the communication channel is addressed.

Possible entries: 0..3

The SSNR offset and the base interface number combined form the interface number to be specified in the handling block.

ANR: In conjunction with the local interface number, the job number identifies the connection block uniquely. Multiple assignment of an ANR per SSNR of a CP 1430 module is therefore not possible.

In the control program, the job number and the interface number must be transferred to the handling block to identify the connection and the job.

Possible entries: 1..199

Input Fields for Assigning Parameters to the Job

Job Type: This entry specifies whether a SEND or RECEIVE block is used. The same type must be entered here as in the HDB call in the PLC program.

M2-4-3.1 Input Fields for Assigning Parameters for Job Processing

Priority: This parameter specifies the priority of the frame on the CP 1430. Two priority classes are permitted for datagram services, as follows:

Possible entries: 0 and 1

PRIO 0:
Short frame with a maximum 16 bytes of user data that triggers an interrupt on the PLC with RECEIVE. With SEND, this priority has no effect; it is no different from PRIO = 1. The data are transferred directly by the dual-port interface and a RECEIVE-ALL or SEND-ALL is not required.

PRIO 1:
Like PRIO 0, however with an interrupt to the PLC.

Type: Here, you select one of the following alternatives for datagram services:

Single Address:
Connectionless transmission or reception of single frames to or from a partner.

Multicast:
Connectionless transmission of single frames to all connected stations with the specified multicast address or reception of single frames from partners transmitting using the specified multicast address.

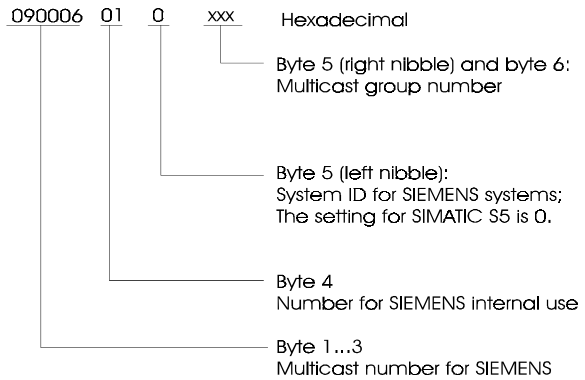
Broadcast
Connectionless transmission of single frames to all connected stations that recognize the fixed broadcast address or reception of single frames from partners transmitting with the fixed broadcast address.

2-4-3.1 Transport Addresses - Local Parameters

MAC address (HEX): Physical module address of the local PLC.

The MAC address can be set with:
Type 'single address' job type 'RECEIVE'
Default: 080006010000_H

Type 'multicast' job type 'RECEIVE'
Default as follows:



With 'broadcast' and job type 'RECEIVE' the fixed broadcast address FF FF FF FF FF FF_H is displayed.

TSAP (ASC): Here, you can specify the TSAP for the local PLC in ASCII characters.

TSAP (HEX): You can enter the individual bytes of the TSAP ID here in hexadecimal notation in groups of 2 (values from 0 to FF). If only zeros are entered here, the TSAP counts as unspecified.
Possible entries: 8 bytes

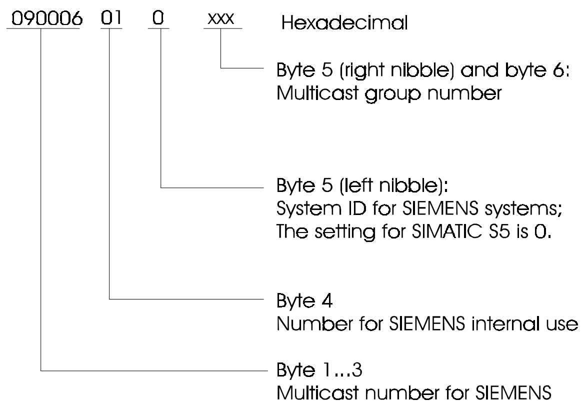
Length: This specifies the number of TSAP characters and has the default “8”. With connections to non-SIMATIC S5 stations, it may be necessary to use smaller lengths.

2-4-3.1 Transport Addresses - Remote Parameters

MAC address (HEX): Physical module address of the remote PLC.
If you enter 0000 0000 0000 with a RECEIVE job, this address counts as being unspecified. When receiving data, any partner regardless of its address is accepted.

You can set the MAC address here for:

Type ’single address’ job type ’SEND’
Default: 080006010000_H



Type ’multicast’ job type ’SEND’
Default as follows:

With the type ’broadcast’ and ’SEND’, the fixed broadcast address FF FF FF FF FF FF_H is displayed.

TSAP (ASC): You can specify the TSAP for the remote PLC in ASCII characters in this field.

2-4-3.1 Transport Addresses - Remote Parameters (continued)

TSAP (HEX): You can enter the individual bytes for the TSAP ID in hexadecimal notation in groups of 2 (values from 00 to FF).

If you enter only zeros here, the TSAP counts as unspecified.
Possible entries: 8 bytes

Length: This specifies the number of TSAP characters and has the default “8”. With a connection to a non-SIMATIC S5 station, it may be necessary to specify smaller lengths.

2-4-3.1 Function Keys (Additional or With a Context-Specific Meaning):

F2 +1	The “+1” key displays the next connection block, the function key “-1” the previous. At the end of the row, you come back to the first element.
F3 INPUT	With the “INPUT” function key, you can enter a new block. An empty dialog is then displayed.
F4 DELETE	With the “DELETE” function key, you delete a connection block. The PG prompts you to confirm that you want to delete the block.
^F6 IND ADR	This key selects the next dialog **’Indirect Addressing’**. The possible entries and meaning are explained in Section 7.2.2 and are analogous here.
F7 OK	The “OK” function key, saves all the parameter settings in the database file or in ONLINE mode directly on the CP 1430 module. If the OFFLINE mode, it is advisable to save the created parameters using this function key when editing.

7.3 Testing the Transport Interface

M 5-1.1..
M 5-1.3

The following functions are available for testing the transport interface:

Total Status Transport Layer
This provides you with an overview of the current status of all the configured connection blocks of the transport layer. This includes transport connections and datagram jobs.

Single Status Transport Layer
This provides you with diagnostic information about a transport connection or a datagram job that you selected previously in the total status transport layer dialog.

You obtain the following additional information:

➢ Display of a connection error

➢ HEX codings are decoded in plain text

➢ Complete address information

Single Trace Transport Layer
This provides you with diagnostic information about a transport connection or a datagram job you selected previously in the total status transport layer dialog. Each status change causes a new entry in the displayed trace list.

You obtain the following extra information compared with the total status:

➢ Display of a connection error

➢ Registration of the job history

This allows you to check how the data and job were transferred to the CPU-CP interface and to SINEC H1.

7.3.1 Test | Transport Layer

M 5-1.1

Meaning and Functions

Using the **Test | Transport Layer** function, you select the **’Total Status Transport Layer’** dialog.

The PG fetches information from the CP 1430 about all the configured connections and datagrams and displays this information along with the current statuses in the form of a table. A maximum of 13 single statuses can be represented on one display page.

Updating the Display

To update the status display, follow the procedure below:

✓ Select a job you want to update using the cursor.

✓ Press the F4 key SELECT. The job is then marked with ’x’ in the Sel column.

✓ Repeat this for all other jobs you want to have updated.

✓ Press the F1 key to activate updating. You will then only see the selected jobs. All jobs whose status changes during the updating are marked with ’x’ in the Chge column.

Output Fields

Sel:	The entries you have selected for updating are marked in this column. The updating of the display can be activated or deactivated with the F1 key.
Pos:	Consecutive number of the job in the dialog.
SSNR offset:	Interface number offset of the job.
ANR:	Job number.

M 5-1.1 Output Fields (continued)

C status: Displays the status of the connection. The displays are as follows:

Transport connection:
Hexadecimal code according to the table (see page 7-33).

Datagram job:
'----'

J type : Job type:

SEND
RECEIVE
FETCH A (fetch active)
FETCH P (fetch passive)

J status Displays the status of job processing (see the table on page 7-35).

J error Errors that have occurred during job processing (see the table on page 7-36).

Chge: This column indicates that the status of a job has changed since the last status check. The status check starts at the time at which the updating was activated for the job display.

M 5-1.1 Output Fields (continued)

Function keys (additional or with a specific meaning):

F1 UPD ON	Activates or deactivates updating of the job selected with the SELECT key.
F2 SINGLE	Selects the **’Single Status Transport Connection’** dialog, M 5-1.2.
F3 TRACE	Selects the **’Single Trace Transport Connection’** dialog, M 5-1.3.
F4 SELECT	The job selected with the cursor is marked as ’selected’.
F5 DESELECT	A job entered in the ’selected’ column and marked by the cursor is deselected.

7.3.2 Follow-on Dialog ’Single Status Transport Layer’

M 5-1.2

Meaning and Functions

The PG fetches information from the CP 1430 about a configured connection or a datagram job and displays detailed information along with the current statuses.

You can identify the connection or the datagram job uniquely (also in terms of its addresses).

Updating the Display

As with the total status, you can also update the status display continuously.

✓ Press the F7 key to switch over between a static and an updated display.

Output Fields:

C type:	The selected job is one of the following types: - Transport - Datagram
Local MAC address:	Physical module address of the local PLC.
SSNR offset:	Interface number offset of the job.
ANR:	Job number.
Prio:	Specifies the priority of the frame on the CP 1430. Five priority classes are permitted: Possible entries: 0..4
C status:	Displays the status of the connection. The display is as follows:

	Transport connection: Hexadecimal code according to the table (see page 7-33).

M 5-1.2 Output Fields (continued)

	Datagram job: '----'
J type :	Job type: SEND RECEIVE FETCH A (fetch active) FETCH P (fetch passive)
J status	Displays the status of job processing (see the table on page 7-35).
J error	Errors that have occurred during job processing (see the table on page 7-36).
C error	Errors that have occurred during connection establishment or while operating the connection (see page 7-34).

Function keys (additional or with a context-specific meaning):

F1 UPD ON	Activates or deactivates the updating of jobs selected with SELECT.

7.3.3 Second Dialog 'Single Trace Transport Layer'

M 5-1.3

Meaning and Functions

The PG fetches information from the CP 1430 about a configured connection or a datagram job and displays detailed information in a list.

Updating the Display

As with the total status, you can also update the status display continuously.

✓ Press the F7 key to switch over between a static and an updated display.

Output Fields:

C type	The selected job is one of the following types: - Transport - Datagram
Local MAC address:	Physical module address of the local PLC.
SSNR offset:	Interface number offset of the job.
ANR:	Job number.
Prio:	Specifies the priority of the frame on the CP 1430. Five priority classes are permitted: Possible entries: 0..4
C status:	Displays the status of the connection as follows: Transport connection: Hexadecimal code according to the table (see page 7-33). Datagram job: '----'

M 5-1.3 Output Fields (continued)

C error	Errors that have occurred during connection establishment or while operating the connection (see page 7-34).
J status	Displays the status of job processing (see the table on page 7-35)
Job error	Errors that have occurred during job processing (see the table on page 7-36)

Function keys (additional or with a context-specific meaning):

F1 UPD ON	Activates or deactivates the updating of jobs selected with SELECT
F4 MANUAL	With this key you can stop the automatic processing of a job on the CP. Pressing the key again moves the job on the step. To reactivate the automatic processing, press the ESC key.

7.3.4 Status and Error Messages from the Test Functions

C status

Code	Meaning
0000_H	Initialization phase active
0100_H	T. conn. establishment active
0101_H	T. conn. establishment active (again)
0300_H	Connection established
0500_H	T. conn. aborted after timeout
0501_H	T. conn. aborted after bus problem
0502_H	T. conn. aborted after protocol error
0503_H	T. conn. aborted by partner
$0F00_H$	Database defective or no memory
1000_H	Initialization phase active
1100_H	T. conn. establishment active
1101_H	T. conn. establishment active (again)
1300_H	Connection established
1500_H	T. conn. aborted after timeout
1501_H	T. conn. aborted after bus problem
1502_H	T. conn. aborted after protocol error
1503_H	T. conn. aborted by partner
$1F00_H$	Database defective or no memory
2000_H	Initialization phase active
2100_H	T. conn.. establishment active dyn
2101_H	T. conn. establishment active (again)
2102_H	T. conn. establishment active dyn
2300_H	Connection established
2500_H	T. conn. aborted after timeout
2501_H	T. conn. aborted after bus problem
2502_H	T. conn. aborted after protocol error
2503_H	T. conn. aborted by partner
$2F00_H$	Database defective or no memory
$F000_H$	Unknown initialization
$FF00_H$	Connection type not defined

Table 7.4 Codes for C Status

C error

Code	Meaning
0100_H	OK
0200_H	Invalid job
0300_H	An EOM was received
0400_H	Successful datagram
0500_H	Successful expedited data
0600_H	Invalid connection reference
0800_H	Buffer too small
0900_H	Buffer return with disconnect
$0A00_H$	No more resources available
$0C00_H$	Invalid job
$0E00_H$	Connection aborted by remote system
1000_H	Timeout
1600_H	Connection establishment request rejected
$1A00_H$	Invalid address
$1C00_H$	Network error
$1E00_H$	Protocol error

Table 7.5 Codes for C Error

J status

Code	Meaning
0000_H	No job exists
0001_H	No job processing at present
0008_H	Job to remote station
0009_H	Reply to job from remote station
0010_H	Waiting for job from remote station
0011_H	Job received from remote station
0012_H	Acknowledgment received
0040_H	Send direct received from PLC
0048_H	Waiting for send all trigger
0049_H	Send all active
$004A_H$	Data received from send all
0050_H	Waiting for receive direct trigger
0051_H	Receive direct active
0052_H	Acknowledgment of receive direct received
0058_H	Waiting for receive all trigger
0059_H	Receive all active
$005A_H$	Acknowledgment of receive all received
0060_H	Initiate error output
0061_H	Error output active
0062_H	Acknowledgment of error output received
0070_H	Fetch job received from PLC

Table 7.6 Codes for J Status

J error

Code	Meaning
00_H	No error
01_H	Wrong type specified in block (Q/ZTYP)
02_H	Memory area does not exist on the PLC
03_H	Memory area too small
04_H	Timeout on PLC
05_H	Error in status word (ANZW)
06_H	Data too long or too short
07_H	No local resources (only PLC internal)
08_H	No remote resources (only PLC internal)
09_H	Error remote station
$0A_H$	Connection error
$0B_H$	CP firmware error
$0C_H$	System error
$0D_H$	Abort after reset
$0E_H$	PLC internal
$0F_H$	PLC internal

Table 7.7 Codes for J Errors

❑

III Appendix

A Example to Introduce the Transport Interface

Topics in this Chapter

Aims

This chapter is intended to introduce the first-time user of the CP 1430 to the transport interface for the SINEC H1 bus system. Particular emphasis is placed on assigning parameters to the CP 1430 using the COM 1430 software package.

Task

The aim of this chapter is to construct a small communications system which will enable communication procedures between two PLCs as simply as possible.

The following elementary tasks are introduced by the example:

➢ Connecting the CP to the CPU and synchronizing them.

➢ Preparing data in the CPU for transmission.

➢ Formulating calls in the PLC program for sending and receiving.

➢ Configuring, starting up and testing transport connections.

Support

Example programs for the SIMATIC S5 programmable logic controllers and examples of parameter assignments for communications processors are provided to support you.

☞ **Please note that the lists of function and data blocks in this chapter are intended to illustrate the text. The actual values are in the example files on the diskette. Please use these files to program the PLC!**

☞ **The diskettes supplied with the package also contain the database files for the configuration examples described here. We recommend that you use these files to allow you to make a quick start. To become really familiar with configuration procedures, you should create the database files yourself using COM 1430 as explained in Section A.4.**

A.1 Requirements

A.1.1 Experience

The example is restricted to simple situations and avoids dealing with all the possible aspects and alternatives of configuring a CP. More detailed information and more complicated parameter assignment options can be found in the other chapters of this volume.

To implement the example, you must be able to program programmable logic controllers in the STEP 5 statement list (STL) representation and to assign parameters to CP 1430 TF communications processors.

You should therefore be familiar with using handling blocks. These provide the interface between the user program and the CP. Handling blocks are standard function blocks that allow the communication functions to be used by the programmable logic controller programs.

A.1.2 Software and Hardware

Hardware Requirements

➢ 2 programmable logic controllers (for example S5-155 U) with memory

➢ 2 CP 1430 communications processors (the basic version is adequate)

➢ A small communications network consisting of the following:
2 transceivers,
2 transceiver cables,
2 terminators,
1 bus cable with coaxial connectors

➢ 1 programming device (for example, PG 730 / PG 750)

- To program memory cards (not absolutely necessary for the example), you require the programming adapter order number 6 ES 5985-2M1C11 when using the PG 730, 750 and 770.

- Cable for the PG connection: drop cable 734-2

- For remote control via the SINEC H1 bus, a CP 1413 module is required. For remote programming of the CPU, you also require the 725-0 cable (swing cable).

The following software packages are also necessary:

- COM 1430 TF

- STEP 5 basic package, Version 6.3 or higher.

- Handling blocks for the PLCs you are using.

- The example files supplied on the COM 1430 diskette.

A.2 Task

Communications Task
One programmable logic controller, PLC 1, sends data every second to another programmable controller, PLC 2. The data sent by PLC 1 are received in PLC 2 and saved in a data block for further processing.

Implementation in PLC 1
In data block DB10, data words DW0 and DW49 are incremented at one second intervals.

After these data words have been incremented, the area DW0 to DW49 of data block DB10 is transferred to PLC 2 by the SEND handling block.

The SEND handling block has the job number ANR=1 and the interface number SSNR=0.

The specification of the source parameters is stored in data block DB9 from data word DW15 onwards.

Implementation in PLC 2
The data sent by PLC 1 is received at PLC 2 and stored in data block DB12.

The RECEIVE handling block is used for this. It has job number ANR=1 and interface number SSNR=0.

The destination parameters are stored in data block DB11 from data word DW16 onwards.

The CP 1430 must be configured to suit the specified interface number SSNR=0. In the example, the configuration is identical to that of the CP 1430 in PLC 1.

The following figure illustrates the required system structure with the components listed above.

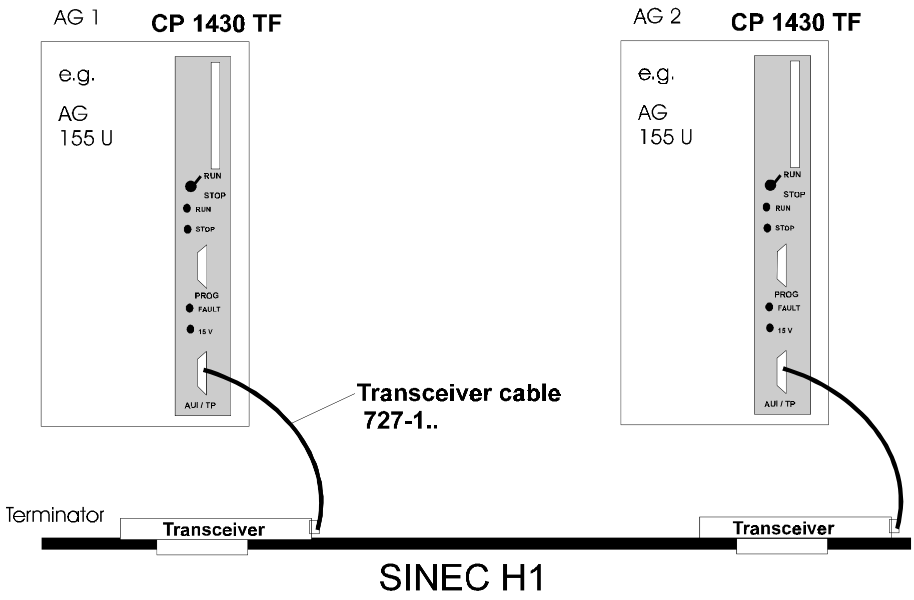


Fig. A.1: System Structure in the Example of Transport Connections

The tasks and implementation are now known. Further details of the assignment of parameters to the handling blocks can be found in the programs in Section A.3. The parameter assignment for the CP 1430 is described in detail in Section A.4.

A.3 Programming S5 Communication

The following program example can be used unmodified for the S5-155 U, and for the S5 -135 U and S5-115 U after changing the handling blocks required for the specific PLC.

A.3.1 Blocks for Synchronizing the PLC and CP

When a PLC is started up, each CP interface to be used must be synchronized by the SYNCHRON handling block. Since this applies to every type of startup with the PLC, the required number of SYNCHRON blocks must be programmed in

OB20 for a cold restart

OB21 for a manual warm restart

OB22 for a warm restart following power outage.

In the current example, the manual warm restart has been omitted and OB21 was therefore not programmed (Fig. A.2).

In function block FB210 (not a standard FB), a check is made to ensure that the synchronization was carried out without errors. If an error occurred, the program is stopped by the STOP command (STP).

The programs in Figure A.2 are appropriate for both PLC 1 and PLC 2 in this example.

```
OB20                                                        LEN= 14    ABS
                                                            PAGE 1
SEGMENT 1
0000          :JU FB125             SYNCHRON IN STARTUP
0001 NAME     :SYNCHRON
0002 SSNR     :        KY0,0
0003 BLGR     :        KY0,0
0004 PAFE     :        FY15
0005          :
0006          :JU FB210             JUMP TO EVALUATION
0007 NAME     :SYNERR?
0008          :BE                   RETURN FROM PAFE
```

```
OB22                                                        LEN= 14    ABS
                                                            PAGE 1
SEGMENT 1
0000          :JU FB125             SYNCHRON IN RESTART
0001 NAME     :SYNCHRON
0002 SSNR     :        KY0,0
0003 BLGR     :        KY0,0
0004 PAFE     :        FY15
0005          :
0006          :JU FB210             JUMP TO EVALUATION
0007 NAME     :SYNERR?
0008          :BE                   RETURN FROM PAFE
```

```
FB210                                                       LEN= 14    ABS
                                                            PAGE 1
SEGMENT 1
NAME          :SYNERR?
0005          :AN  F 15.0           EVALUATION OF PAFE, BIT 0
0006          :JC = SYOK
0007          :STP                  STOP IF SYNCHRON ERROR
0008 SYOK     :BE                   SYNCHR. O.K., RETURN.
```

Fig. A.2: OB20, OB22 and FB210 for PLC 1 and PLC 2

A.3.2 Programs for PLC 1

The control program in PLC 1 is structured as follows:

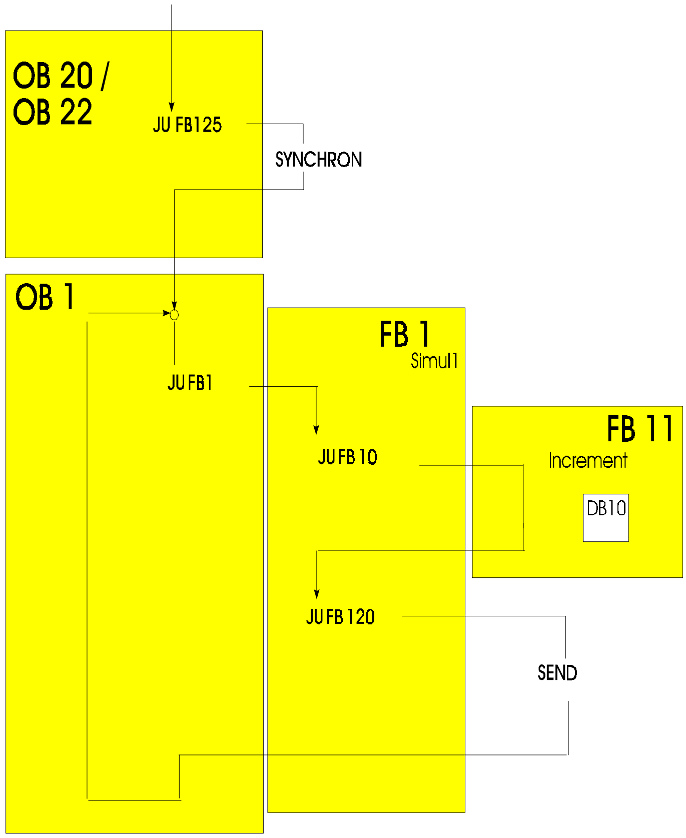


Fig. A.3: Program Structure in PLC 1

The transmission is triggered in PLC 1 by a SEND handling block. This is called in the function block FB1. The send job has parameters assigned as follows (see Figures A.4 to A.6):

Job number ANR = 1.

```
DB1                                                          LEN=34    ABS
                                                             PAGE 1
SEGMENT 1
NAME          :SEND
0005          :A   F 100.0            SET = 1 TO  SEND
0006          :AN  T 10               TIMER 10 IS  2ND CONDITION
0007          :L   KT100.0            TO TRIGGER THE SEND
0009          :SE  T 10
000A          :JC = SEND              SEND, IF RLO=1
000B          :JU = AKTU              RLO= 0 -->  DO NOT SEND,
000C          :                       ONLY UPDATE ANZW
000D SEND     :JU FB10                      INCREMENT DW0 AND DW49
000E NAME     :COUNTER
000F          :A   F 100.0            SET RLO= 1 --> SEND.
0010          :
0011  AKTU    :JU FB120               CALL SEND
0012 NAME     :SEND
0013 SSNR     :        KY0,0
0014 ANR      :        KY0,1
0015 ANZW     :        FW8
0016 QTYP     :        KSXX
0017 DBNR     :        KY0,9
0018 QANF     :        KF+  15
0019 QLAE     :        KF+  0
001A PAFE     :        FY14
001B          :
001C          :BE                     RETURN
```

```
FB10                                                           LEN=17    ABS
                                                                    PAGE 1
SEGMENT 1
NAME          :COUNTER
0005          :C   DB10               INCREMENT DW0 AND DW49
0006          :L   DW0                OF DB10
0007          :ADD KF+1
0009          :T   DW0
000A          :T   DW49
000B          :BE                     RETURN.
```

```
DB9                                                          LEN=24    ABS
                                                             PAGE 1
 0            :   KS= SEND-PARAMETER FOR ANR 1
14            :   KH= 0000;
15            :   KS= DB
16            :   KY= 000,010;
17            :   KF= + 00000;
18            :   KF= + 00050;
```

Fig. A.4: FB1, FB10 and DB9 for PLC 1

```
DB10                    LEN=55    ABS
                                        PAGE 1
 0     :   KH= 0000;
 1     :   KH= 0001;
 2     :   KH= 0002;
 3     :   KH= 0003;
 4     :   KH= 0004;
 5     :   KH= 0005;
 6     :   KH= 0006;
 7     :   KH= 0007;
 8     :   KH= 0008;
 9     :   KH= 0009;
10     :   KH= 5C5C;
11     :   KH= 5C5C;
12     :   KH= 5C5C;
13     :   KH= 5C5C;
14     :   KH= 5C5C;
15     :   KH= 5C5C;
16     :   KH= 5C5C;
17     :   KH= 5C5C;
18     :   KH= 5C5C;
19     :   KH= 5C5C;
20     :   KH= A3A3;
21     :   KH= A3A3;
22     :   KH= A3A3;
23     :   KH= A3A3;
24     :   KH= A3A3;
25     :   KH= A3A3;
26     :   KH= A3A3;
27     :   KH= A3A3;
28     :   KH= A3A3;
29     :   KH= A3A3;
30     :   KH= 3355;
31     :   KH= 3355;
32     :   KH= 3355;
33     :   KH= 3355;
34     :   KH= 3355;
35     :   KH= 3355;
36     :   KH= 3355;
37     :   KH= 3355;
38     :   KH= 3355;
39     :   KH= 3355;
40     :   KH= CCAA;
41     :   KH= CCAA;
42     :   KH= CCAA;
43     :   KH= CCAA;
44     :   KH= CCAA;
45     :   KH= CCAA;
46     :   KH= CCAA;
47     :   KH= CCAA;
48     :   KH= CCAA;
49     :   KH= 0000;
50     :
```

Fig. A.5: DB10 for PLC 1

Source type QTYP = XX means that the actual parameters for describing the source data are in a data block. Here, data block DB9 starting from data word DW15 is used.

The data to be transmitted are in data block DB10. According to the information in DB9, the first 50 words starting at DW0 are sent.

Further Notes on the Program in PLC 1
To trigger a SEND job in this example, two conditions are decisive:

You must set the flag bit F 100.0 to 1.(for example with FORCE VAR).

Timer 10 in this example is programmed to 1 second, so that a SEND job is initiated at one second intervals.

Before every SEND call that actually sends a message, data words, DW0 and DW49 of data block DB10 are incremented. This takes place in function block FB10. A SEND call only results in the actual transfer of a message when RLO = 1 before the call. Calls when RLO = 0 only bring about the updating of the status word. In the current example, the SEND handling block is only called at one second intervals to actually transfer data.

```
OB1                                                    LEN=20    ABS
                                                       PAGE 1
SEGMENT 1
0000          :JU FB1                  JUMP TO SEND
0001 NAME     :SEND
0002          :
0003          :JU FB126                CALL SEND ALL
0004 NAME     :SND-A
0005 SSNR     :         KY0,0
0006 ANR      :         KY0,0
0007 ANZW     :         FW4
0008 PAFE     :         FY13
0009          :
000A          :BE
```

Fig. A.6: OB1 for PLC 1

A.3.3 Programs for PLC 2

The control program in PLC 2 is structured as follows:

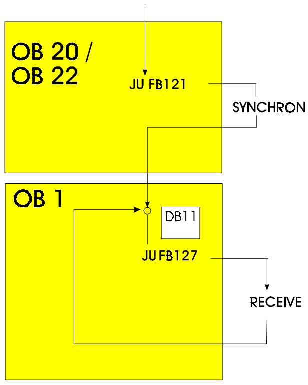


Fig. A.7: Program Structure in PLC 2

The data sent by PLC 1 are received in PLC 2 by the RECEIVE handling block. The call is entered in organization block OB1. The following parameters are assigned:

Job number ANR = 1

Destination type ZTYP = XX means that the actual definition of the destination parameters is in a data block. In this case, data block DB11 starting at data word DW16 is used.

The received data are stored in data block DB12.

The RECEIVE handling block call as described here only triggers the reception of data. The actual transportation of the data from the CP 1430 to the CPU of the PLC requires the RECEIVE-ALL call. This is the normal RECEIVE with the special job number ANR = 0.

```
DB12                                    LEN=55     ABS
                                        PAGE 1
  0      :    KH= 0000;
  1      :    KH= 0001;
  2      :    KH= 0002;
  3      :    KH= 0003;
  4      :    KH= 0004;
  5      :    KH= 0005;
  6      :    KH= 0006;
  7      :    KH= 0007;
  8      :    KH= 0008;
  9      :    KH= 0009;
 10      :    KH= 5C5C;
 11      :    KH= 5C5C;
 12      :    KH= 5C5C;
 13      :    KH= 5C5C;
 14      :    KH= 5C5C;
 15      :    KH= 5C5C;
 16      :    KH= 5C5C;
 17      :    KH= 5C5C;
 18      :    KH= 5C5C;
 19      :    KH= 5C5C;
 20      :    KH= A3A3;
 21      :    KH= A3A3;
 22      :    KH= A3A3;
 23      :    KH= A3A3;
 24      :    KH= A3A3;
 25      :    KH= A3A3;
 26      :    KH= A3A3;
 27      :    KH= A3A3;
 28      :    KH= A3A3;
 29      :    KH= A3A3;
 30      :    KH= 3355;
 31      :    KH= 3355;
 32      :    KH= 3355;
 33      :    KH= 3355;
 34      :    KH= 3355;
 35      :    KH= 3355;
 36      :    KH= 3355;
 37      :    KH= 3355;
 38      :    KH= 3355;
 39      :    KH= 3355;
 40      :    KH= CCAA;
 41      :    KH= CCAA;
 42      :    KH= CCAA;
 43      :    KH= CCAA;
 44      :    KH= CCAA;
 45      :    KH= CCAA;
 46      :    KH= CCAA;
 47      :    KH= CCAA;
 48      :    KH= CCAA;
 49      :    KH= 0000;
 50      :
```

Fig. A.8: DB12 for PLC 2

```
OB1                                                        LEN=28    ABS
                                                                     PAGE 1
SEGMENT 1
0000          :JU FB121                 CALL RECEIVE
0001 NAME     :RECEIVE
0002 SSNR     :   KY0,0
0003 ANR      :   KY0,1
0004 ANZW     :   FW8
0005 ZTYP     :   KSXX
0006 DBNR     :   KY0,11
0007 ZANF     :   KF+16
0008 ZLAE     :   KF+0
0009 PAFE     :   FY14
000A          :
000B          :JU FB127                 CALL RECEIVE ALL
000C NAME     :REC-A
000D SSNR     :   KY0,0
000E ANR      :   KY0,0
000F ANZW     :   FW4
0010 PAFE     :   FY13
0011          :
0012          :BE
```

```
DB11                                                       LEN=25    ABS
                                                           PAGE 1
SEGMENT 1
  0           :    KS= PARAMETERS FOR RECEIVE IN OB1
 15           :    KH= 0000;
 16           :    KS= DB
 17           :    KY= 000,012;
 18           :    KF= + 00000;
 19           :    KF= + 00050;
 20           :
```

Fig. A.9: OB1 and DB11 for PLC 2

A.4 Configuring the CP 1430 with COM 1430 TF

A.4.1 Assigning Parameters to the CP 1430 in PLC 1

✓ Start COM 1430 as described in Chapter 5, the introduction to the NCM COM 1430 TF configuration software.

☞ **The database file Axxxxxxx.CP1 is supplied on the diskette.**

The following sections describe the procedure when you configure a module for the first time. To make things easier, you can, however, simply select the supplied database file and confirm the entries.

Specifying the Configuration Environment

M 1-1 Select the **File | Select** function to specify the configuration environment. Make the following entries or simply confirm the proposed entries in the **"Basic Settings"** dialog:

CP type:	CP1430
Status:	OFFLINE FD
Database file:	Axxxxxxx.CP1

Complete the dialog with F7.

CP Basic Configuration - CP Basic Initialization Dialog

M 2-1

The next step is to create the SYSID block.

✓ Select the **Edit | CP Init**function. In the **CP Basic Initialization** dialog, the title bar displays the CP type and name of the selected database file.

Some of the fields in the dialog already have values entered or are purely display fields.

✓ Make the following entries:

➢ For addressing the PLC on SINEC H1:

MAC address:	080006010001

➢ Select the “productive” type of communication on interface number 0 with the following settings:

Base SSNR:	0
Interface communication:	P for SSNR 0

➢ The “database size” is already correctly set at 32 Kbytes.

➢ The “firmware version” is simply a display field.

➢ To identify the PLC in the system, select a name, for example:

Plant designation:	TestPLC

➢ Enter the current date in the “Date created” field (free format).

✓ Complete your entries by pressing the "OK" key (F7). The file AB1PLC.CP1 is created on the hard disk. This completes entry of the data specific to the CP 1430. The last step is to assign parameters for the connection block.

✓ Answer the prompt about overwriting the module file with YES. The basic configuration data are now saved on the hard disk.

✓ To configure the connection block for the transport connection, select the **Edit | Connections | Transport Connections** function.

Configuring the Transport Interface

M2-4-2.1 After you have selected **Edit | Connections | Transport Connections**, the **Transport Connections** dialog is displayed.

✓ Set the interface and connection parameters as follows:

SSNR offset:	0
ANR :	1
Job type :	SEND
Active/passive :	P
Priority:	2
Read/write:	N
Number of jobs per TSAP:	**1** of 1

Transport addresses - local parameters:

TSAP (ASC):	TEST_PLC1

Transport addresses - remote parameters:

MAC address:	080006010002
TSAP (ASC):	TEST_PLC2

Explanation:
Establishing the connection between the PLC-CPU and CP:
The job numbers ANR in the local and in the remote PLC are the same as those used in the PLC program under the ANR parameter. The interface, via which the communication is handled, is the base interface (= page 0).

Selecting the Job Type:
Station 1 (=PLC 1) is to transfer a counted value to station 2 (=PLC 2); the job types are therefore a SEND in PLC 1 (and a RECEIVE in PLC 2). The parameter “ACTIVE/PASSIVE” is irrelevant for SEND and RECEIVE.

✓ Enter the values:
You complete the connection block with the “OK” key (F7) and the following prompt appears on the PG: “Overwrite module file?”. If you answer “YES” (F1), the “old” file AB1PLC1.CP1 that did not contain the connection block is overwritten with the “new” file AB1PLC1.CP1 that now contains the connection block. The database file for module 1 is now complete.

A.4.2 Assigning Parameters to the CP 1430 in PLC 2

You now create the module file for module 2.

Specifying the Configuration Environment
Select the **File | Select** function to specify the new database. The procedure is analogous to PLC 1.

M 1-1

✓ Make the following entries or simply confirm the proposed entries:

CP type:	CP1430
Status:	OFFLINE FD
Database file:	Axxxxxxx.CP2

✓ Complete the dialog with F7.

M 2-1

CP Basic Configuration - CP Basic Initialization Dialog
The next step is to create SYSID block for CP2.

✓ Select the **Edit | CP Init** function. In the **CP Basic Initialization** dialog, the title bar displays the CP type and name of the selected database file.

Some of the fields in the dialog already have values entered or are purely display fields.

✓ Make the following entries:

➢ For addressing the PLC on SINEC H1:

MAC address: 080006010002

➢ Select the “productive” type of communication on interface number 0 with the following settings:

Base SSNR:	0
Interface communication:	P for SSNR 0

➢ The “database size” is already correctly set at 64 Kbytes.

➢ The “firmware version” is simply a display field.

➢ To identify the PLC in the system, select a name, for example:

Plant designation:	TestPLC

➢ Enter the current date in the “Date created” field (free format).

✓ Complete your entries by pressing the "OK" key (F7). The file AB1PLC2.CP2 is created on the hard disk. This completes entry of the data specific to the CP 1430. The last step is to assign parameters for the connection block.

✓ Answer the prompt about overwriting the module file with YES. The basic configuration data are now saved on the hard disk.

✓ To configure the connection block for the transport connection, select the **Edit | Connections | Transport Connections** function.

M 2-4-2.1 Configuring the Transport Interface

✓ After you have selected **Edit | Connections | Transport Connections**, the **Transport Connections** dialog is displayed.

Set the interface and connection parameters

SSNR offset:	0
ANR:	1
Job type:	RECEIVE
Active/passive:	P
Priority:	2
Read/write:	N
Number of jobs per TSAP:	**1** of 1

Transport addresses - local parameters:

TSAP (ASC):	TEST_PLC2

Transport addresses - remote parameters:

MAC address:	080006010001
TSAP (ASC):	TEST_PLC1

Explanation:
Establishing the connection between the PLC-CPU and CP:
The job numbers ANR in the local and in the remote PLC are the same as those used in the PLC program under the ANR parameter. The interface, via which the communication is handled, is the base interface (= page 0).

Selecting the Job Type:
Station 1 (=PLC 1) is to transfer a counted value to Station 2 (=PLC 2); the job types are therefore a SEND in PLC 1 (and a RECEIVE in PLC 2). The parameter “ACTIVE/PASSIVE” is irrelevant for SEND and RECEIVE.

✓ Enter the values:
You complete the connection block with the “OK” key (F7) and the following prompt appears on the PG: “Overwrite Module File?”. If you answer “YES” (F1), the “old” file AB1PLC2.CP2 that did not contain the connection block is overwritten with the “new” file AB1PLC2.CP2 that now contains the connection block. The database file for module 2 is now complete.

M 3-6.3 Programming Memory Cards

Preparations:
Insert an empty memory card into the slot on the PG. Then select the database file for the CP in PLC 1 using the **File | Select** function.

✓ Start the transfer
To select the transfer function, go to the menu bar and select **Transfer | FD->Memory Card**.

✓ The programming number for the permitted flash EPROM types is 500. Confirm the entry with the “OK” key (F7); the transfer is then started.

✓ Once you have programmed the first memory card, you can program the memory card for module 2. Replace the programmed card with an empty card.

✓ Select the **Transfer | FD->Memory Card** function. Enter the database file as the source file and confirm your input.

Memory card not changed
If you forget to change the memory card, the message “Memory Card NOT EMPTY” appears on the dialog. In this case, simply replace the programmed memory card with an empty one and start the transfer again with the “OK” key (F7).

Note:
You do not need to use memory cards and can transfer the databases to the internal parameter memory area.

Starting up the CP

The programming of the memory cards is now completed and the memory card can be inserted in the slots on the CP 1430 modules with the **power supply to the PLC switched off!** Following this, both CP 1430 modules in the PLCs have a complete set of parameters for the example.

☞ **You must now perform a cold restart on the CP 1430 to make sure that the data are adopted completely.**

A.5 Starting and Monitoring the Transmission

This section describes how you start the STEP 5 programs and how you monitor the communication. There are different ways of monitoring the communication, as follows:

PG online with the PLC:
Monitoring of status and data words using the standard PG software package.

PG online with the CP 1430:
Monitoring the status of transport connections using COM 1430.

Section A.5.1 deals with the first option, monitoring via the PLC. As an example, we have assumed that the STEP 5 programs were created for an S5-155 U. Section A.5.2 describes the monitoring of the transport connections directly on the CP 1430.

A.5.1 Starting and Monitoring the Transmission at the Programmable Logic Controller

Before starting, an overall reset is necessary on the programmable controllers and their RUN/STOP switches must be set to STOP.

✓ Now load the STEP 5 programs described in the earlier part of this chapter on both PLCs and then start both CP 1430 modules by changing the RUN/STOP switch to the RUN setting.

✓ Now carry out a cold restart on the PLCs. If everything is correct, only the green RUN LEDs are lit on the PLCs and CPs.

✓ Connect the transmitting PLC (PLC 1) to the PG and call the “FORCE VAR” function.

✓ Set bit 0 in flag byte FY100 to 1. Transmission is then enabled.

By monitoring the following flag words or bytes specified in the STEP 5 program, the transmission can be monitored from the transmitter end:

FW4 : Status word for SEND (ANR = 0, "SEND ALL")

FW8 : Status word for SEND (ANR = 1)

FY13: Parameter assignment error byte for SEND (ANR = 0)

FY14: Parameter assignment error byte for SEND (ANR = 1)

FY15: Parameter assignment error byte for SYNCHRON

✓ Interpret the status words and parameter assignment error bytes according to the description of the handling blocks.

Flag word FW8 = 0022 means, for example, job active, data transfer successful, no error.

✓ In addition to the flag words in PLC 1, select the data block DB10 and observe changes in it, particularly data words DW0 and DW49.

If the STEP 5 program is running correctly, these two data words should be the same and should be incremented at one second intervals. These two data words are, however, not conclusive evidence that the SEND job has been correctly executed. Data word DW30, that is also shown in Figure A.10, has the default value seen in Figure A.5.

✓ Now connect the PLC 2 to the PG and check the following flag words and bytes:

FW4 : Status word for RECEIVE (ANR = 0, "RECEIVE ALL")

FW8 : Status word for RECEIVE (ANR = 1)

FY13: Parameter assignment error byte for RECEIVE (ANR = 0)

FY14: Parameter assignment error byte for RECEIVE (ANR = 1)

FY15: Parameter assignment error byte for SYNCHRON

✓ In addition to these words and bytes, select data block DB12 in PLC 2 and observe the two data words DW0 and DW49.

Data block DB12 is the destination of the transmission and if the program is running correctly, both data words should be the same once again and should be incremented at one second intervals. Data word DW30 is also displayed as a check. It must always contain the value from data block DB10 in PLC 1 as shown in Figure A.5.

Once again, you can interpret the flag words based on the description of the handling blocks. Flag word FW8 = 0042 means, for example, job active, data received, no error.

If two programming devices are available, you can monitor both PLCs at the same time. If the programming was correct, data words DW0 and DW49 in data blocks DB10 and DB12 should also be the same and incremented practically simultaneously (there is a time lag caused by the time required for transmission).

```
OPERANDS:    FORCE PROCESS IMAGE:        PLC IN CYCLE
FY100        KH=01
FW4          KH=0000
FW8          KH=0022

FY13         KH=00
FY14         KH=00
FY15         KH=00

DB10
DW0          KH=0799
DW30         KH=3355
DW49         KH=0799
FORCE VAR
```

Fig. A.10: Monitoring the Transmission (Sender Side)

OPERANDS:	FORCE PROCESS IMAGE:	PLC IN CYCLE
FW4	KH=0000	
FW8	KH=0042	
FY13	KH=00	
FY14	KH=00	
FY15	KH=00	
DB12		
DW0	KH=0799	
DW30	KH=3355	
DW49	KH=0799	

Fig. A.11: Monitoring the Transmission (Receiver Side)

A.5.2 Monitoring the Transport Connection at the CP 1430

Using COM 1430, you can monitor the transport connection between the two CP 1430 communications processors, either from the transmitter or from the receiver end.

Preparing for Monitoring at PLC 1
Connect you PG to the PG interface of the CP 1430 in PLC 1. Then load COM 1430 in the PG and proceed as follows:

Establish the Link to the CP

M 1-1 Select the “**Basic Settings**” dialog with **File | Select** and switch the status to ONLINE.

Testing the Transport Interface
Go back to the menu selection and select the **Test | Transport Layer**. function. The **’Total Status Transport Layer’** dialog is then displayed.

Follow the procedure described in Section 7.3 to obtain detailed information about the status and correct functioning of the transport connection you have configured.

The **’Single Trace Transport Layer’** dialog displays the current status of the selected job.

Monitoring at PLC 2
You can also monitor the transition in the same way at the receiving end. To do this, connect the PG to the CP 1430 in PLC 2 and monitor the transmission in the same way as for CP 1.

❑

B Further Information about the CP 1430 TF

Topics in this Chapter

This chapter contains more detailed information about operating the CP 1430 TF. This information is particularly important for connecting to non-SIMATIC components and should help you to install such connections.

The sequences of the jobs are shown in Section B.2 as status diagrams. Section B.3 shows you the chronological sequence of the jobs in the form of sequence diagrams.

A more convenient connection between SIMATIC components and non-SIMATIC components can be achieved using the TF interface that is available on the CP 1430 TF. This is, however, only possible when the non-SIMATIC device has access to the SINEC TF MMS protocol level. The TF interface for the CP 1430 TF is explained in Volume 2 of this manual.

B.1 The CP 1430 TF in a Non-SIMATIC Environment, Connecting to Other Systems

In a homogeneous network, in other words when only CP 1430 TF modules are connected to the network, the user interface of the system is more important to the user. The way in which frames are exchanged between two (or more) systems gains in importance when working with a heterogeneous network.

Whenever modules different from the CP 1430 TF are connected to SINEC H1, the network can be considered as heterogeneous since different systems must then be able to communicate via the bus medium. Since the SINEC H1 bus is an open communication system, the connection of a CP 1430 TF (of an S5 PLC) to other systems is clearly possible. “Open” in this context means the following:

➢ Transmission protocols that have been standardized or are being standardized can be used,

➢ The communications interfaces are open, which means they can be described.

To keep in line with the concept of standardization, the communications protocol of the CP 1430 TF was structured according to the ISO/OSI 7-layer communications model.

	ISO/OSI Model	Implementation on CP 1430 TF
7	Application Layer	ISO IS 9506 T.1 (MMS) or for READ/WRITE a simple application protocol is used on the CP 1430 TF
6	Presentation Layer	SINEC AP/TF or not used
5	Session Layer	SINEC AP/TF or connection establishment active for SEND passive for RECEIVE
4	Transport Layer	ISO IS 8073 CLASS 4 with additional datagram service complying with ISO 8602
3	Network Layer	not implemented (empty) NSAP only absolute
2b 2a	Data Link Layer)	Logical Link Control complying with IEEE 802.2 MAC (Media Access Control) complying with IEEE 802.3 (CSMA/CD)
1	Physical Layer	complying with IEEE 802.3

Fig. B.1: ISO/OSI Communications Model

Layers 1 and 2 (2A), in other words the physical and the data link layers operate using the CSMA/CD medium access method complying with IEEE 802.3. Layer 2B (LC) complies with IEEE 802.2.

Layer 3 (the network layer) is not required for SINEC H1, in other words the option “inactive network layer” is used.

Layer 4 (the transport layer) is implemented on the CP 1430 TF (in SINEC H1) according to the following specifications:

- ISO IS 8073

- ISO 8602

and includes:

- virtual circuits in CLASS 4

- expedited data

- datagram service

The structure of the connections is such that:

- Connections assigned an active job (SEND and READ, WRITE ACTIVE) open the connection establishment with:

  * CONNECTION REQUEST

- Connections assigned a passive job (RECEIVE and READ, WRITE PASSIVE) process the connection establishment phase passively with:
  * CONNECTION AWAIT or
  * CONNECTION CONFIRM

If more than one job is defined for a connection, the first job listed in the connection block controls the connection establishment.

For layers 5 to 7, the CP 1430 TF implements the protocols complying with SINEC AP and SINEC TF (AP: Automation Protocol, TF: Technological Functions). The interface to layer 7 is described in Volume 2.

A simple protocol is used in layer 7 (the application layer) only for special S5 jobs. Normal SEND and RECEIVE jobs use the transport layer directly, in other words, the CP 1430 TF does not generate an additional header for SEND/RECEIVE. If, while data are being transferred to the PLC, an error occurs, the side on which the error occurs terminates the transport connection. The communications partner is therefore informed that an error has occurred and the system does not become jammed. The CP 1430 TF immediately re-establishes the interrupted connections. With READ and WRITE, the CP 1430 TF does generate S5-specific headers for request and acknowledgment frames. These standard headers are 16 bytes long and have the following structure:

a) with WRITE

WRITE request frame

0	System ID.................	="S"
1	....	="5"
2	..Length header........	=16d.
3	..ID OP code.............	=01..
4	..Length OP code......	=03..
5	..OP code..................	=03..
6	..ORG field.............	=03..
7	..Length ORG field....	=08..
8	ORG. D....................	
9	..DBNR................................	
A	Start	H
B	..address..................	L..
C	Length...........	H
D	....	L..
E	..Empty field.................	=FFh.
F	Length e field	=02
	Data up to 64 K	

WRITE acknowledgment frame

0	System ID.................	="S"
1	....	="5"
2	..Length header........	=16d.
3	..ID OP code.............	=01..
4	..Length OP code.....	=03..
5	..OP code..................	=04..
6	..Ack field............	=0Fh
7	..Length S field.........	=03..
8	..Error no.................	=No...
9	..Empty field.................	=FFh
A	..Length empty field.......	=07
B–F	free	

b) with READ

READ request frame

0	System ID................	="S"
1	....	="5"
2	..Length header.......	=16d.
3	..ID OP code............	=01..
4	..Length OP code.....	=03..
5	..OP code.................	=05..
6	..ORG field...............	=03..
7	..Length ORG field..	=08..
8	ORG ID...............................	
9	..DBNR.................................	
A	Start	H
B	..address..................	L..
C	Length...........	H
D	....................................L..	
E	..Empty field.................	=FFh.
F	Length e field	=02

READ request frame

0	System ID...............	="S"
1	....	="5"
2	..Length header........	=16d.
3	..ID OP code.............	=01..
4	..Length OP code......	=03..
5	..OP code..................	=06..
6	..Ack field.................	=0Fh
7	..Length S field..........	=03..
8	..Error no...................	=No...
9	..Empty field...............	=FFh
A	..Length empty field....	=07
B		
C		
D		
E	free	
F		

Data up to 64 K but only if error no. =0

If the ORG format is absent in the request frame, the CP 1430 TF uses the source or destination descriptions configured in the corresponding connection block (the ORG format is the short description of a data source or a data destination in the S5 environment). The ORG formats that can be used are listed in the following tables; the possible error messages (error numbers) are described in Section C.2 “Status and Error Messages”.

S5 area	DB	FY	IB	QB
ORG ID	01_H	02_H	03_H	04_H
Description	Source/dest. data from/to data block in main memory	Source/dest. data from/to flag area	Source/dest. data from/to process image of the inputs (PII)	Source/dest. data from/to process image of the outputs (PIQ)
DBNR permitted range	DB, from which the source data are taken or to which the dest data are transferred 1...255	irrelevant	irrelevant	irrelevant
Start address meaning permitted range	DW number, from which the data are taken or written to 0...2047	Flag byte no., from which the data are taken or written to 0...255	Input byte no., from which the data are taken or written to 0...127	Output byte no., from which the data are taken or written to 0...127
Number meaning permitted range	Length of the source/dest. data field in words 1...2048	Length of the source/dest. data field in bytes 1...256	Length of the source/dest. data field in bytes 1...128	Length of the source/dest. data field in bytes 1...128

The “length” can also be specified as -1 (=$FFFF_H$). With READ, the CP 1430 TF then supplies the “remaining length” of the area read. With WRITE, the CP 1430 TF accepts as much data as contained in the user data frame.

Table B.1: Organization Formats for S5 PLCs, Part 1

S5 area	PB	CB	TB	RS
ORG ID	05_H	06_H	07_H	08_H
Description	Source/dest. data from/to in I/O modules. With source data input , with dest	data output modules	Source/dest. data from/to counter cells	Source/dest. data from/to times cells
DBNR permitted range	irrelevant	irrelevant	irrelevant	irrelevant
Start address meaning permitted range	I/O byte no., from which the data are taken or written to 0...127 digital I/Os 128...255 analog I/Os	Number of the counter cell from which the data are taken or written to 0...255	Number of the timer cell from which the data are taken or written to 0...255	Number of the RS word from which the data are taken or written to 0...511
Number meaning permitted range	Length of the source/dest. data field in bytes 1...256	Length of the source/dest. data field in words (counter cell = 1 word) 1...256	Length of the source/dest. data field in words (timer cell = 1 word) 1...256	Length of the source/dest. data field in words 1...128

The “length” can also be specified as -1 (=$FFFF_H$). With READ, the CP 1430 TF then supplies the “remaining length” of the area read. With WRITE, the CP 1430 TF accepts as much data as contained in the user data frame

Table B.2: Organization Formats for S5 PLCs, Part 2

S5 area	AS	DX	DE	QB
ORG ID	09_H	$0A_H$	10_H	11_H
Description	Source/dest. data from/to memory cells addressed in absolute form	Source/dest. data from/to extended data block (for S5-135U)	Source/dest. data from/to data block in external memory (only for S5-150U)	Source/dest. data from/to I/O modules in the extended I/O area. for source data input module, for dest. data output module. (only with S5-150U)
DBNR permitted range	irrelevant	DX from which the source data are taken or in which the destination data are saved 1...255	DB, from which the source data are taken or in which the destination data are saved 1...255	irrelevant
Start address meaning permitted range	absolute Start address from which the data are taken or written to 0...FFFFH	DW number from which the data are taken or written to 0...2047	DW number from which the data are taken or written to 0...255	peripheral byte no. from which the data are taken or written to 0...511
Number meaning permitted range	Length of the source/dest. data field in words 1...32767	Length of the source/dest. data field in words 1...2048	Length of the source/dest. data field in words 1...2048	Length of the source/dest. data field in bytes 1...256

The “length” can also be specified as -1 (=$FFFF_H$). With READ, the CP 1430 TF then supplies the “remaining length” of the area read. With WRITE, the CP 1430 TF accepts as much data as contained in the user data frame

Table B.3: Organization Formats for S5 PLCs, Part 3

B.2 Chronological Sequence of the Jobs

The following diagrams illustrate the chronological sequence of the following jobs

SEND/RECEIVE PRIO 0/1

SEND/RECEIVE PRIO 2

SEND/RECEIVE PRIO 3

SEND/RECEIVE PRIO 4

WRITE ACTIVE/PASSIVE

READ ACTIVE/PASSIVE

The terms and abbreviations have the following meanings:

PLC1,PLC2	= Programmable logic controller 1 or 2
CP1,CP2	= Communications processor CP 1430 1 or 2
RTS	= Part of the CP 1430 firmware that processes protocols in the bus system (transport protocol complying with ISO IS 8073)
Cable	= Frames on SINEC H1
OPEN	= Open a connection
CONNEC. REQUEST	= Establish connection, request
CONNEC. AWAIT	= Establish connection, await
CONNEC. CONFIRM	= Establish connection, confirm
CLOSE	= Terminate connection, initiate
DISCON. REQUEST	= Terminate connection, request
DISCON. CONFIRM	= Terminate connection, confirm
RETURN	= Reply to request
CREDIT = 0	= Connection not free to send
CREDIT = 1	= Connection free to send one frame

SEND DIR	= SEND HDB in "direct" mode (A-NR<> 0)
SEND ALL	= SEND-HDB in "ALL" mode (A-NR = 0)
RECEIVE DIR	= RECEIVE-HDB in "direct" mode
RECEIVE ALL	= RECEIVE-HDB in "ALL" mode
SEND	= Send data
RECEIVE	= Switch to receive (prepare receive buffer)

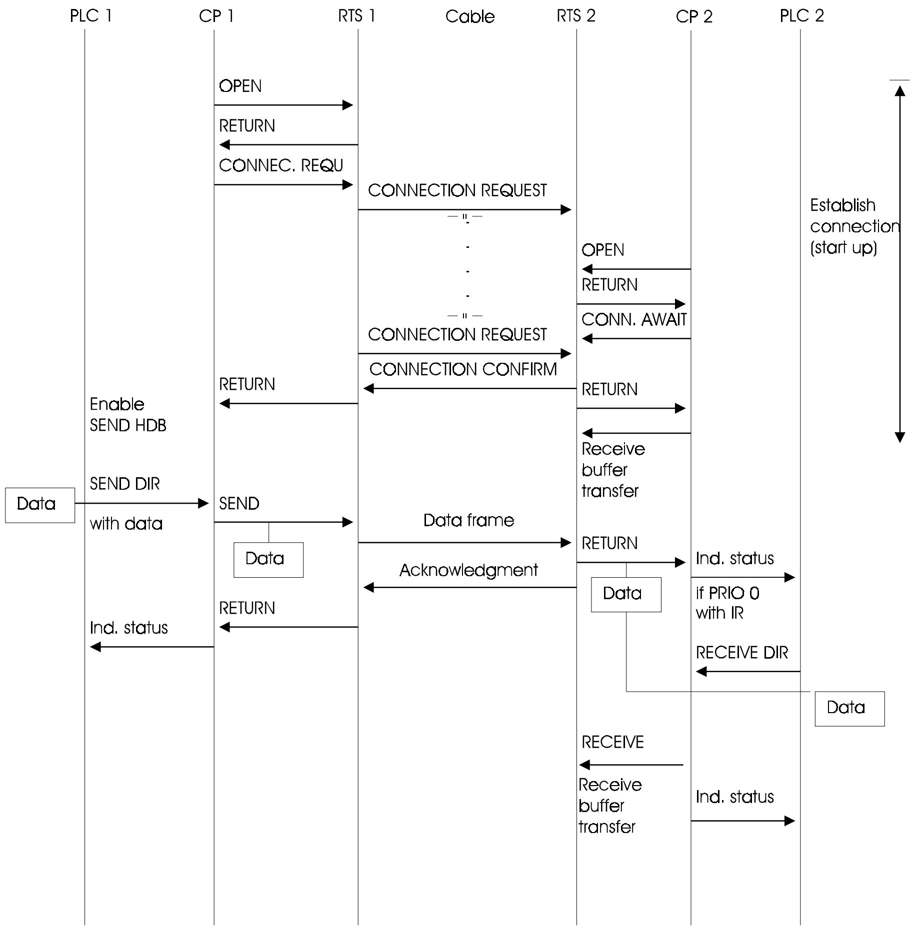


Fig. B.2: Chronological Sequence of SEND/RECEIVE PRIO 0/1

* If the receive buffers are not available in time at the receiver side, the data frame is repeated after the retransmission time has expired.

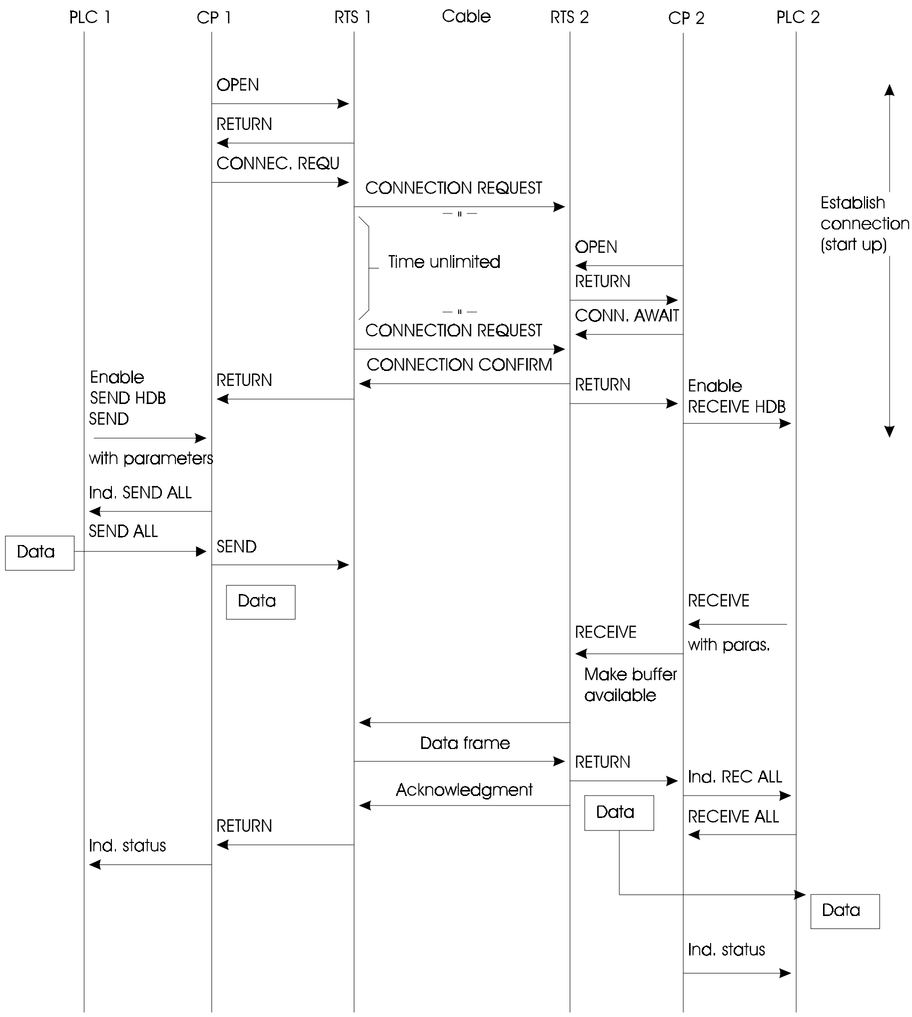


Fig. B.3: Chronological Sequence of SEND/RECEIVE PRIO 2

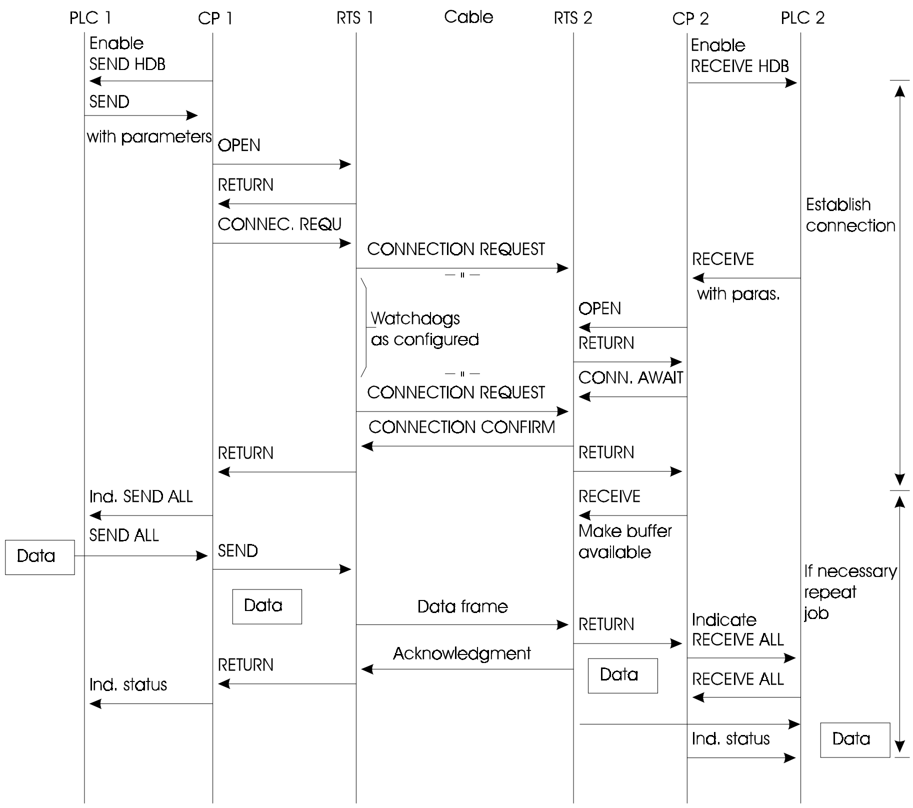
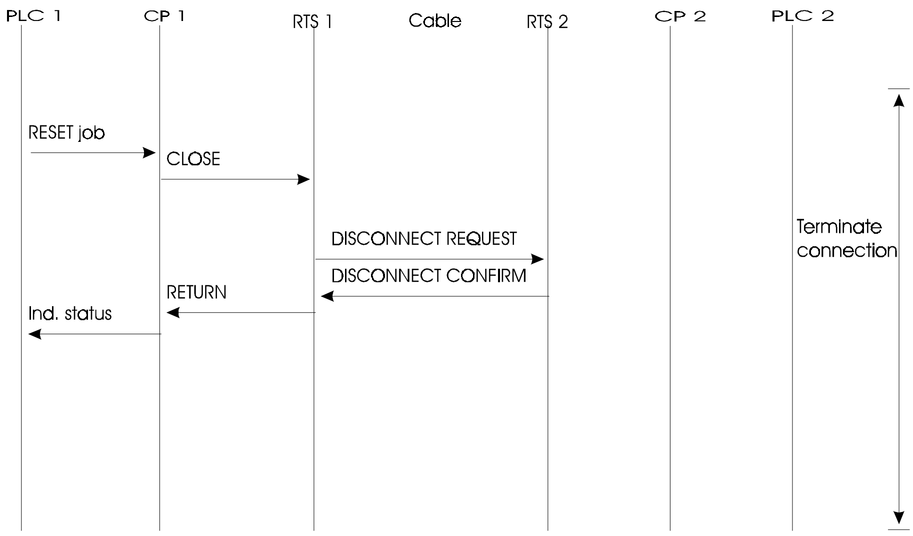


Fig. B.4: Chronological Sequence of SEND/RECEIVE PRIO 3



B B.5: Chronological Sequence Connection Termination

The connection termination can also be initiated on the passive side with a RESET-HDB.

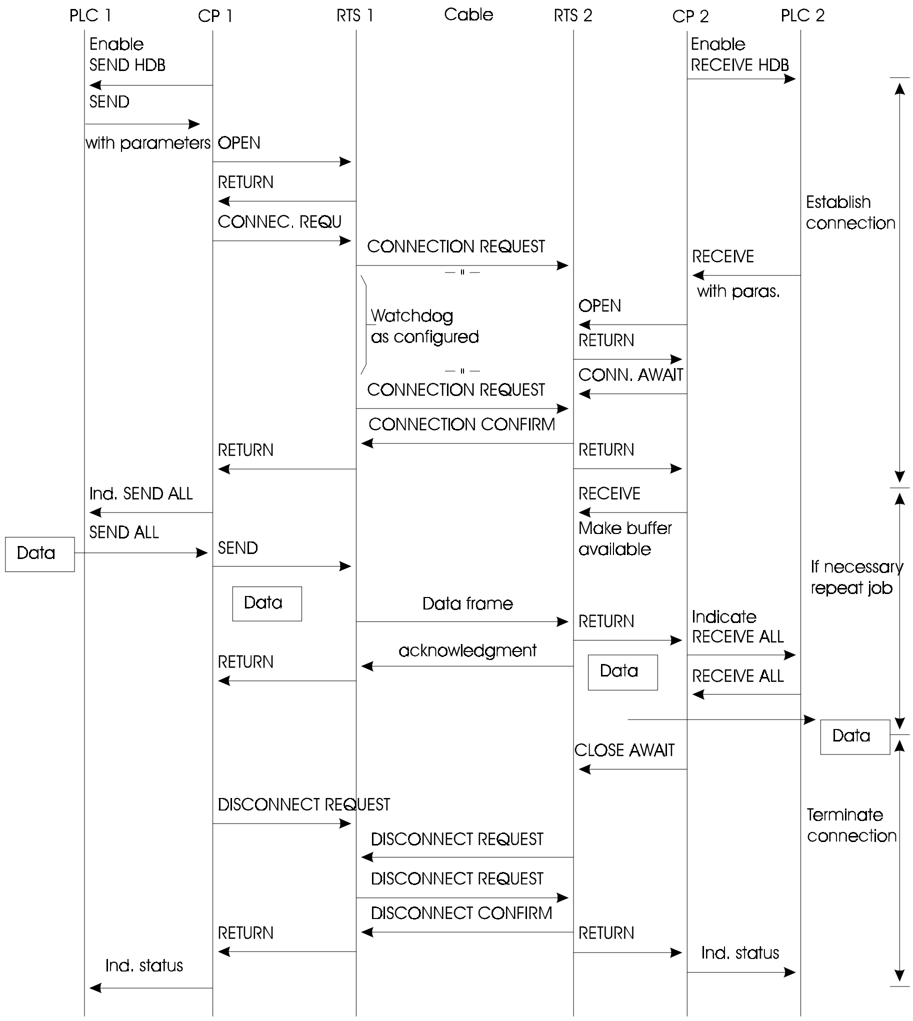


Fig. B.6: Chronological Sequence of SEND/RECEIVE PRIO 4

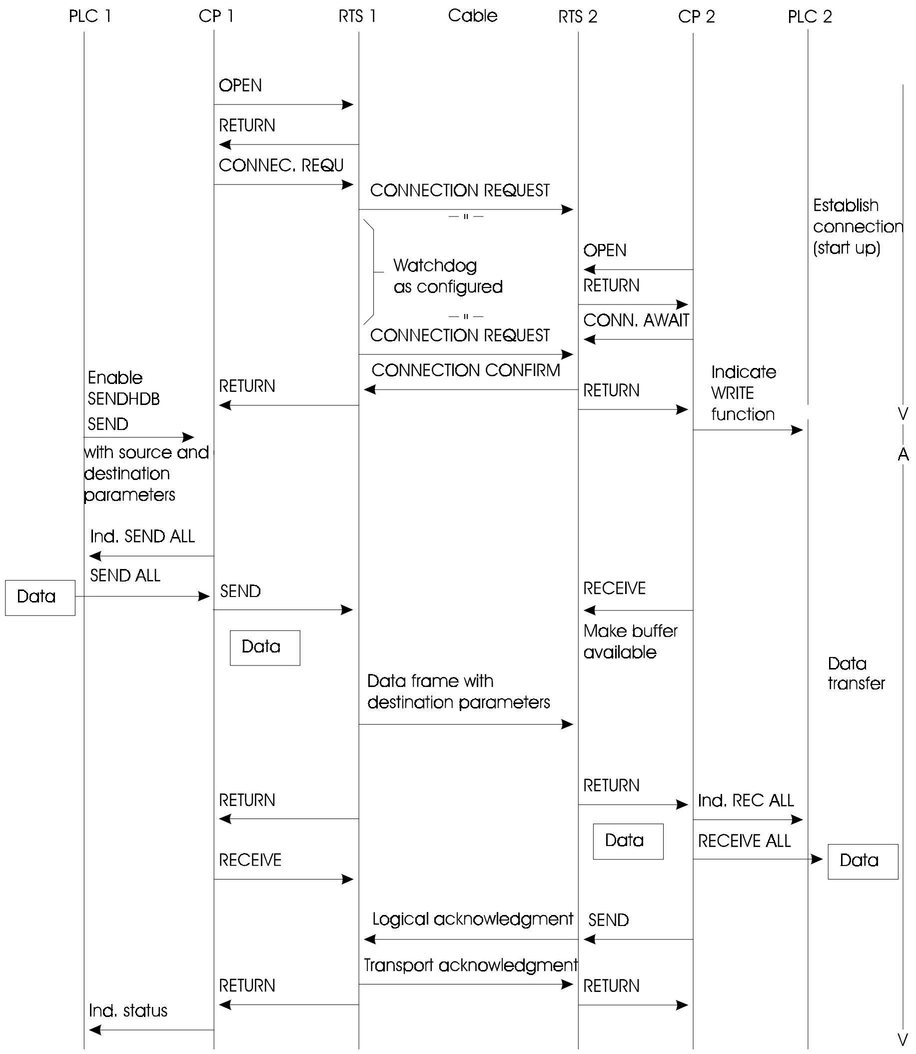


Fig. B.7: Chronological Sequence of READ-ACTIVE/PASSIVE❑

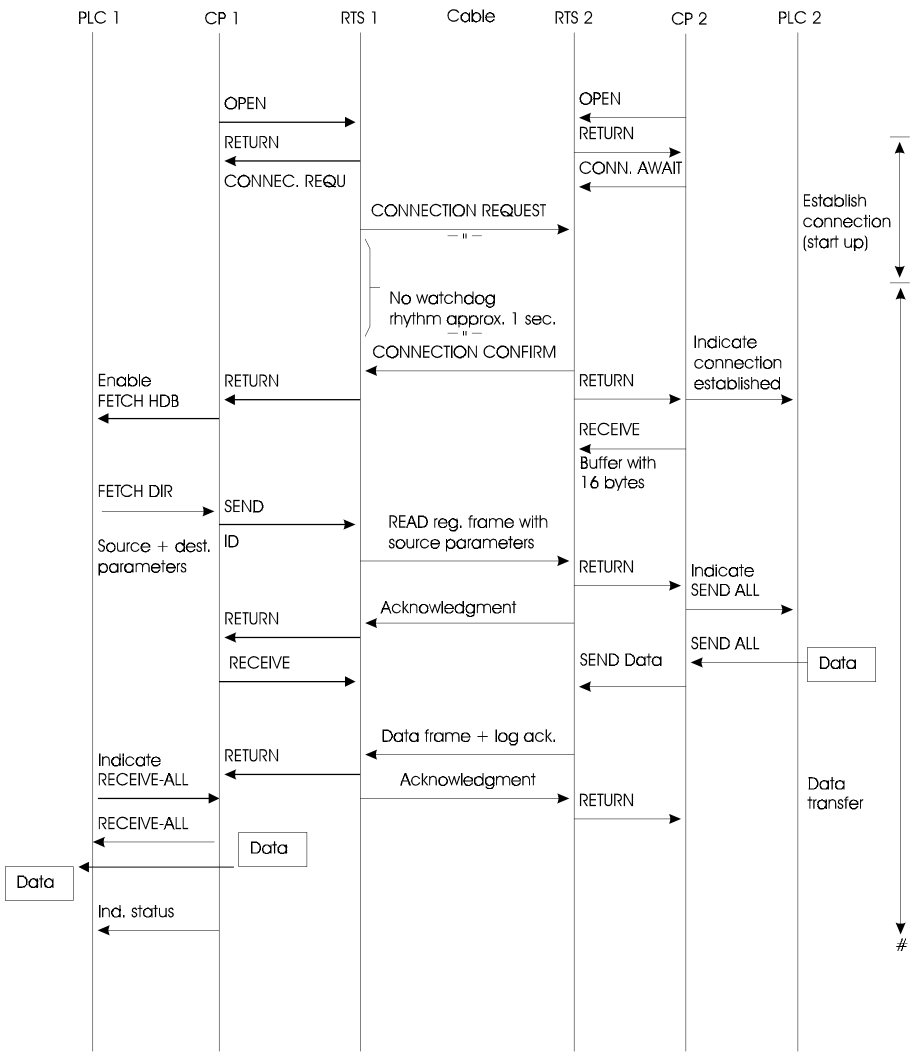


Fig. B.8: Chronological Sequence of WRITE-ACTIVE/PASSIVE

B.3 Format of the Real-Time Frame

For service purposes, the format of the real-time frame sent via SINEC H1 is shown decoded:

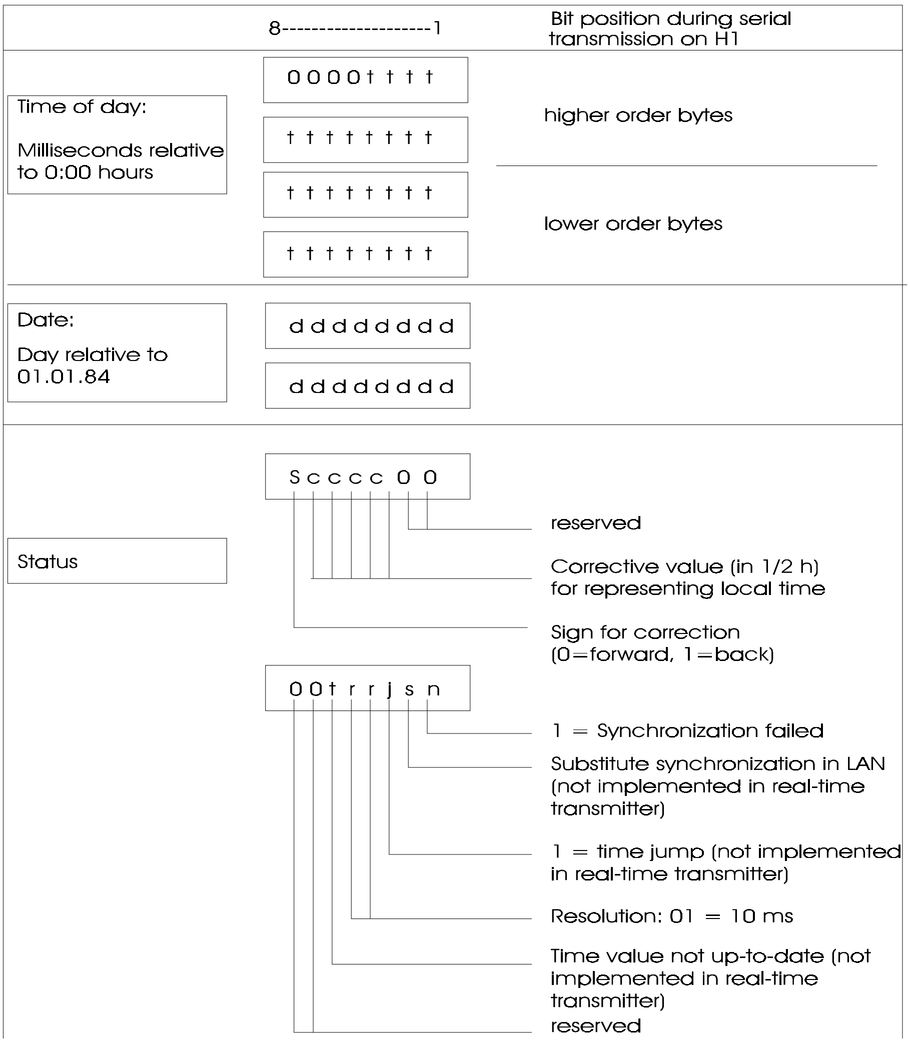


Fig. B.9: Time of Day and Status

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Notizen

C Status Word ANZW and Parameter Assignment Error Byte PAFE

Overview

The HDB interface to the CP 1430 TF supplies status and error information as follows:

➢ Using the status word ANZW (information about job processing).

➢ Using the parameter assignment error byte PAFE (indicates an incorrect parameter assignment for a job).

➢ Using the “status of a connection”, “status/trace of all connections” and “overview of all connections” test functions on the PG.

C.1 Meaning and Structure of the ANZW

Output in HEX format

While the error and status display in COM 1430 TF is to some extent explained by text, the S5 user only receives error information in hexadecimal format. Since the messages of COM 1430 TF are explained in detail along with the test functions in the section “Testing the Transport Interface”, at this point only the messages in the status word are explained.

Handling the ANZW

The status word contains the reply to a particular job. The program structure in the S5 program must be selected so that each defined job on a CP 1430 TF also has its own status word.

The status word must be evaluated immediately after the handling block has been run through.

Structure of the ANZW

The status word has the following basic structure:

	15			0
1st word	free	Error management	Data management	Status management
2nd word	**Length word**			
3rd word	**TF errors (ERRCLS/ERRCOD**)			

The third word (TF error) is only valid for TF jobs (refer to Volume 2).

Meaning of the length word

The handling blocks (SEND, RECEIVE) enter the data that have already been transferred in the length word, in other words for receive jobs the data that have already been received and for send jobs the data that have already been sent.

Explanation

The following pages contain information about how the bits of the status word are handled. In each case you can see how a bit is set, how it is reset and which evaluation is useful. The status word must be handled as individual bits. The assignment of the bits was explained along with the explanation of the nibbles.

Special feature with READ/WRITE PASSIVE jobs

READ and WRITE PASSIVE jobs cannot be started by the handling blocks. The status cell of the READ or WRITE job can however be read with the CONTROL block. If a status word is specified in the connection block of the CP 1430 TF for this function, the SEND or RECEIVE-ALL block can also process the length word and the data nibble in the status word. The error identifier is always “E” (boot job) and the job status is set to “A”. Apart from the RESET, the CP 1430 TF does not accept any further triggers for READ/WRITE jobs on the PASSIVE side.

C.2 Content of the Status Word

The status word itself (first word in the illustration on page B-2) is divided into four nibbles:

- Nibble 1, bits 0 to 3, status bits of the job:
  This nibble contains the information about whether a job has already started, whether errors have occurred or whether the job is disabled, for example because a virtual circuit does not exist. The status display with COM 1430 TF displays the status of a job in far greater detail. Here interim statuses such as “waiting for sub-field” or “connection establishment active” are displayed.

- Nibble 2, bits 4 to 7, data management of the job:
  This nibble contains codes indicating whether the data transfer for the job is still active, or whether data transfer or data reception is already completed. The data transfer can also be disabled for the job with the “enable/disable” bit (disable = 1: enable =0). The data management nibble is not represented in COM 1430 TF.

- Nibble 3, bits 8 to 11, error bits of the job:
  The error bits of the job are set in this nibble. These error bits are only valid when the bit “job completed with error” is also set at the same time in the status nibble. The error numbers shown here also appear in COM 1430 TF as transport errors, however in plain language.

- Nibble 4, bits 12 to 15
  These bits are reserved for expansions.

Meaning of the bits in the status word

a) Bit 0: handshake useful

Set: By the handling blocks dependent on the "delete" bit in the job status. Handshake useful (=1) is used with the RECEIVE block.
(Frame exists in PRIO 0/1 or receive trigger possible in PRIO 2/3/4.)

Evaluated: By the RECEIVE block; the RECEIVE block only starts the handshake with the CP when this bit is set.
By the application for RECEIVE queries (query whether frame exists in PRIO 0/1).

b) Bit 1: Job active

Set: By the handling blocks when a job is allocated to the CP.

Cleared: By the handling blocks when a job has been processed by the CP (e.g. acknowledgment received).

Evaluated: By the handling blocks. A new job is only issued when the "old" job has been processed.

By the application. To find out whether a new job can be triggered.

c) Bit 2: job completed without error

Set: By the handling blocks when a job was completed without errors.

Cleared: By the handling blocks when the job is triggered again.

Evaluated: By the application to check whether the job was completed without errors.

d) Bit 3: job completed with error

Set: By the handling blocks when the job was completed with errors. The cause of the error is then encoded in the high byte of the status word.

Cleared: By the handling blocks when the job is triggered again.

Evaluated: By the user to check whether the job was completed with errors. If the identifier "job completed with error" is set, the cause of the error is written to the high byte of the status word.

e) Bit 4: Data acceptance/data transfer active

Set: By the handling blocks SEND and RECEIVE when the transfer or acceptance of data for a job has begun, e.g. when data are being transferred via the ALL function (instead of DMA) although the job was triggered with SEND DIRECT.

Cleared: By the handling blocks SEND and RECEIVE when the data exchange for a job is complete (last frame transferred).

Evaluated: By the user: During the data transfer CP-PLC, the user must not change the data record of a job. In PRIO 0/1 jobs, this is of no great importance, since the data exchange can be completed by a single handling block call. Larger amounts of data can, however, only be transferred in data units and the fragmentation of the total data is distributed over several PLC cycles. To ensure the consistency of the data, the user must first check whether the data unit has just been transferred before changing the data of a job.

f) Bit 5: data transfer completed

Set:	By the SEND handling block, when the data transfer for a job is completed.
Cleared:	By the SEND handling block when the transfer of data is begun for a new job (data transfer for new job triggered). By the user, following evaluation (signal edge).
Evaluated:	By the user: With this bit, the user can determine whether the data record for a job has already been transferred to the CP or when a new data record for a currently active job can be prepared (e.g. cyclic transfer).

g) Bit 6: data acceptance complete

Set:	By the RECEIVE handling block when the acceptance of data for a job has been completed.
Cleared:	By the RECEIVE handling block, when the transfer of data to the PLC for a new job has begun. By the user following evaluation (signal edge).
Evaluated:	With this bit, the user can determine whether the data record of a job has already been transferred to the PLC or when a new data record for a currently active job was transferred to the PLC.

h) Bit 7: Disable/enable data field

Set: By the user to prevent an area being written to by the RECEIVE block or an area being read from by the SEND block (only with 1st data field).

Cleared: By the user to release the data area.

Evaluated: By the SEND and RECEIVE handling blocks. If bit 7 is set, the blocks do not exchange data but signal the error to the CP.

i) Bits 8 to 11: error byte

If the CP signals an error identifier for a job in the job status, the handling blocks enter this identifier in the high byte of the status word.
Refer also to the following list of important status and error messages.

Length word

Written: By the SEND and RECEIVE blocks during the data exchange. The length word is calculated from the following: number of data currently being transmitted + number of data already transmitted.

Cleared: Overwritten by each new SEND, RECEIVE, FETCH.

When the "job completed without error" or "data transfer/acceptance completed" bit is set, the current source or destination length is indicated in the length word.

When the "job completed with error" bit is set, the length word contains the number of data transferred before the error.

Important Status and Error Messages of the CP 1430 TF

Explanation

The important status and error messages which can occur in the status word are listed below. These messages are coded in hexadecimal patterns in the same way as they can be monitored in the PC using the status/force var test function of the PG 685. The character X stands for "not defined" or for "irrelevant"; No. is the error number.

Possible status words

X F X A	The error identifier "F" indicates that the corresponding job is not defined on the CP 1430. The status identifier A disables the job (for SEND/FETCH and RECEIVE).
X A X A	The error identifier "A" indicates that the connection for the communication job has not or has not yet been established. The status identifier "A" disables SEND, RECEIVE and FETCH.
X 0 X 8	The connection has been re-established (e.g. following a CP cold restart) SEND is enabled (SEND communication job).
X 0 X 9	The connection has been re-established, RECEIVE is enabled (RECEIVE communication job).
X 0 2 4	SEND was processed without error, the data has been transferred.
X 0 4 5	RECEIVE was processed without error, the data has arrived at the PLC.
X 0 X 2	SEND, RECEIVE, READ or WRITE job is active. With SEND, the partner has not yet set itself to RECEIVE. With RECEIVE, the partner has not yet issued a SEND. The CP 1430 TF does not monitor the times of SEND, RECEIVE, READ or WRITE jobs

The following table lists the most important statuses in the status word for the various job types.

1. Codes for SEND

Status	PRIO 0+1	PRIO 2	PRIO 3+4
after cold restart	0 A 0 A	0 A 0 A	0 0 0 8
after connection established	X 0 X 8	X 0 X8	------
after trigger	X 0 X 2	X 0 X 2	X 0 X 2
complete without error	X 0 2 4	X 0 2 4	X 0 2 4
complete with error	X NoX 8	X NoX 8	X NoX 8
after RESET	X D X A	X D X A	X D X 8

2. For RECEIVE

Status	PRIO 0+1	PRIO 2	PRIO 3+4
after cold restart	0 A 0 A	0 A 0 A	0 0 0 1
after connection established	X 0 X 4	X 0 0 9	------
after trigger	X 0 X 2	X 0 X 2	X 0 X 2
frame there	X 0 X 1	------	------
complete without error	X 0 4 1	X 0 4 5	X 0 4 5
complete with error	X NoX 8	X NoX 9	X NoX 9
after RESET	X D X A	X D X A	X D X 9

Key: No = error identifier

3. For READ/WRITE ACTIVE

Status	PRIO 0+1	PRIO 2	PRIO 3+4
after cold restart		0 A 0 A	
after connection established		X 0 0 8	
after trigger		X 0 X 2	
READ complete		X 0 4 4	
WRITE complete		X 0 2 4	
complete with error		X NoX 8	
after RESET		X D X A	

ANZW with HDB identifier "NN" (no source/destination parameter transfer)

4. For SEND

Status	PRIO 0+1	PRIO 2	PRIO 3+4
complete without error	x004	x004	x004

5. For RECEIVE

Status	PRIO 0+1	PRIO 2	PRIO 3+4
complete without error	x004	x005	x005

Table C.1 Important Statuses in the Status Word

☞ **The status and error codes described here are only valid when using the layer 4 interface (SEND, RECEIVE, FETCH jobs). If the TF interface is used, the status and error codes must be evaluated as described in Volume 2. Remember to reserve three words for the status word. For more detailed information, refer to Volume 2.**

The following codes can occur in nibble 3:

0: no error
If the bit "job completed with error" is nevertheless set, this indicates that the CP 1430 TF has set up a connection following a cold restart or RESET.

1: Incorrect Q/ZTYP in handling block
When the job was triggered, the handling block had an invalid TYPE identifier assigned to it.

Remedy:
Supply blocks with the type IDs intended for the PLC.

2: Area does not exist in PLC
When the job was triggered, a DB (DBNR) was specified which did not exist in the PLC at the time of the data transfer.

Remedy:
Enter the DB in the PLC or assign the correct DB number.

3: Area in PLC too small
The sum of Q/ZANF and Q/ZLAE exceeds the limits of the area. With data blocks, the limits of the area are the size of the block, with flags, timers, counters etc. the size of the area depends on the particular PLC.
(Flags = 256 bytes, counters, timers = 256 words etc.). With the Z/QTYP AS "absolute storage address" no check is performed.

Remedy:
Lengthen the data block or match the Q/ZANF and Q/ZLAE to the area.

4: Timeout on the PLC
The source or destination parameters specify an area in the PLC which is either not equipped with memory or where the memory is defect. The TO error (timeout) can only occur with Q/ZTYP AS (absolute storage), PB (peripheral area), OB (extended peripheral area) or with memory faults.

Remedy:
Correct the source/destination parameters or replace the memory module.

5: Status word error
The assigned status word (ANZW) cannot be processed. This error can occur if a "data word" or "data double word" was defined with ANZW and does not exist or no longer exists in the specified data block (DB too short) or the specified data block does not exist.
Remedy:
Use a different ANZW or enter/lengthen the DB.

6: No valid ORG format
The data destination/data source for a job is specified neither in the handling block (Q/ZTYP = "NN") nor in the data length block.

Remedy: Supply the destination/source description in the data link block or in the PLC.

7: No free data buffer
In PRIO 2/3/4, the CP 1430 TF operates with a "dynamic" data buffer. If, during operation, the data buffer capacity is exhausted (48 data buffers each with 128 bytes) the CP signals "buffer overflow".

Remedy: Start the job again, with READ/WRITE jobs using RESET.

8: No free transport connections
Exceeding the maximum transport connection capacity (e.g. by starting too many PRIO 3/4 jobs) leads to this error.

Remedy: Terminate connections which are not being used (ideally PRIO 3) with RESET or select more PRIO 3/4 jobs).

9: Remote error
on a transport connection (layer 4):
An error has occurred in the communication partner during a READ/WRITE job.
on an application association:
An error has occurred in an TF job
The TF error number is coded in the third word (see Volume 2 "Sequence on the client interface)

Remedy: Identify and correct the error in the communication partner.

A: Connection error
The connection for the job is not or not yet established or could not be established. With PRIO 0/1/2 jobs, the CP attempts to establish the connection indefinitely; with PRIO 3+4 jobs, the establishment phase is monitored.

Remedy:
With PRIO 0/1/2 connections, the error status disappears automatically once the connection is established. This occurs only on condition that the communication partner has recognized the interruption and also attempts to establish the connection (if necessary, try a cold restart). If all the CP connections are interrupted, this is probably caused by a fault on the module or on the bus cable. It is also possible that the parameters assigned to the data link blocks do not match up. (Local address incorrect or the parameters "from local PLC" or "to remote PLC" do not make a feasible combination.)

B: Handshake error
Either the data field is too long in PRIO 0/1 or a system error has occurred.

Remedy: Reduce the length of the data field (PRIO 0/1).

C: Trigger error
An incorrect HDB type was used to trigger the job or the data unit transferred with PRIO 0 and 1 jobs was too long (PRIO 0/1 maximum 16 bytes)

Remedy: Use the correct HDB type

* SEND job - SEND handling block
* RECEIVE job - RECEIVE handling block
* WRITE ACTIVE - SEND-HDB with QTYP="RW"
* READ ACTIVE - FETCH-HDB with ZTYP="RW"

D: Termination after RESET
This is in fact a status message rather than an error message. In PRIO 0/1/2, the connection is interrupted and established again as soon as the communication partner is ready (in the meantime, the jobs are disabled). In PRIO 3/4, the connection is terminated, it is possible to trigger a re-establishment phase.

Remedy:
As soon as the connection is re-established, the status message disappears.

E: Job with boot function
This is also a status message rather than an error message. The job is a READ/WRITE PASSIVE and cannot be started from the PLC.

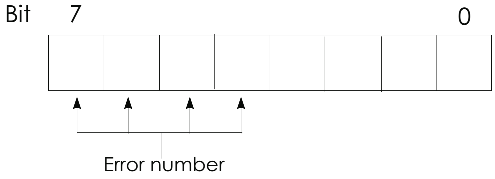
F: Job does not exist
The specified job is not defined on the CP 1430 TF.

Remedy:
Enter the connection block or use a correct SSNR/A-NR combination in the handling block.

C.3 The Parameter Assignment Byte PAFE

PAFE is set when the handling block recognizes a parameter assignment error.

Nibble 4, bit 12 to 15
These bits are reserved for expansions.



Meaning of the bits:

Bit 0	0 = no error 1 = error
Bit 1..3	not used
Bit 4..7	output of the error number:

Meaning of the error numbers:

0	no error
1	wrong ORG format
2	area does not exist (DB)
3	area too small
4	QVZ error (timeout)
5	wrong status word
6	no source/destination parameter SEND / •RECEIVE-ALL
7	interface does not exist
8	interface not ready
9	interface overload
A	free
B	illegal job number ANR
C	interface not acknowledged or not enabled
D	not used
E	not used
F	not used

❑

D Abbreviations

A

ANR	Job number (for handling blocks)
ANZW	Status word
AP	Automation protocol layers 5 to 7 of the ISO/OSI reference model
AS 511	511 interface, protocol for the communication between PLC and PG
ASCII	American Standard Code of Information Interchange

B

B	Block; unit of a CP database; e.g. connection block
BCD	Binary coded decimal
BE	Block end

C

CC	Central controller
CIM	Computer Integrated Manufacturing
COM	Abbreviation for programming software for SIMATIC S5 CPs
COR	Coordination module
CP	Communications Processor
CPU	Central Processing Unit
CSF	Control System Flowchart, graphical representation of automation tasks with symbols

CSMA/CD	Carrier sense multiple access with collision detect

D

DA	Destination Address
DB	Data block
DCE	Data Communication Equipment
DIN	Deutsches Institut für Normung (German Standards Institute)
DIR	Directory of data medium and files
DMA	Direct Memory Access
DOS	Operating system
DP	Distributed peripherals
DPRAM	Dual Port RAM
DTE	Data Terminal Equipment
DW	Data word (16 bits)
DX	Extended data block

E

EG/EU	Expansion unit
EIA	Electronic Industries Association
EPROM	Erasable Programmable Read Only Memory

F

F	Flag bit
FB	Function block
FD	Floppy Disk (data medium)

FD	Flag double word
FDDI	Fiber Distributed Data Interface
FO	Fibre Optic
FW	Flag word
FY	Flag byte

G

GRAPH 5	Software package for planning and programming sequence controllers

H

HDB	Handling blocks

I

IB	Input byte
IEC	International Electronics Commission
IEEE	Institution of Electrical and Electronic Engineers
ISO	International Standardization Organization
IW	Input word

K

KOMI	Command interpreter

L

LAD	Ladder Diagram, graphical representation of the automation task with symbols of a circuit diagram
LAN	Local Area Network
LED	Light Emitting Diode

LEN	Length of a block
LLC	Logical Link Control
LLI	Lower Layer Interface
LSB	Least Significant Bit

M

MAC	Medium Access Control
MAP	Manufacturing Automation Protocol
MMS	Manufacturing Message Specification
MSB	Most significant bit

N

NCM	Network and Communication Management

O

OB	Organization block
OSI	Open System Interconnection
OW	Word from the extended peripherals
OY	Byte from the extended peripherals

P

PAFE	Parameter assignment error
PB	Program block
PC	Personal Computer
PCI	Protocol Control Information (for coordinating a protocol)
PDU	Protocol Data Unit (frames consisting of PCI and SDU)
PG	Programming device

PI	Program invocation
PI	Process image
PII	Process image of the inputs
PIQ	Process image of the outputs
PLC	Programmable controller
PRIO	Priority
PROFIBUS	PROcess Field BUS
PW	Peripheral word
PY	Peripheral byte

Q

QB	Output byte
QW	Output word

R

RAM	Random Access Memory
RLO	Result of logic operation (code bits)

S

SA	Source Address
SAA	System Application Architecture
SAP	Service Access Point. Logical interface points on the interface between the layers via which the PDUs are exchanged between service users.
SB	Sequence block
SDU	Service Data Unit. Information about the service used and the user data contained within it.

SINEC	Siemens network architecture for coordination and engineering
SINEC AP	SINEC automation protocol
SINEC H1	SINEC bus system for industrial applications based on CSMA/CD
SINEC H1FO	SINEC bus system for industrial applications based on CSMA/CD with fiber optics
SINEC TF	SINEC technological functions
SSNR	Interface number
STEP 5	Programming language for programming programmable controllers of the SIMATIC S5 range
STL	Statement List, STEP 5 method of representation as a series of mnemonics of PLC commands (complying with DIN 19239)
Sub-D	Subminiature D (connector)
SYM	Symbolic addressing
SYSID	Block for system identification
S5-KOMI	S5 command interpreter
S5-DOS/MT	S5 operating system based on FlexOS

T

TF	Technological functions
TSAP	Transport Service Access Point
TSAP-ID	Transport Service Access Point Identifier

TPDU Transport Protocol Data Unit (size of the block of data transferred by the transport system)

TSDU Transport Service Data Unit (size of the block of data transferred to the transport system with a job for transportation via a transport relation)

TSEL Transport selector, term used as an alternative for TSAP-ID

V

VMD Virtual Manufacturing Device

❑

Notes

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F Further Reading

/1/ Wege zur offenen Kommunikation
Das ISO-Referenzmodell im Umfeld der Kommunikation
Siemens AG DÖA PM Order no.: U 1474-J-Z72-11984

/2/ [ISO/IEC 9506-1] Information Processing Systems Open Systems Interconnection - Manufacturing Message Specification, Part 1: Service Definition

/3/ Kerner H. Rechnernetze nach OSI
ADDISON-WESLEY 1992
ISBN 3-89319-408-8

/4/ Guidelines for installing the SINEC H1 bus system
SIEMENS AG, Order no.: AR 463-220

/5/ Guidelines for installing theSINEC H1FO bus system
SIEMENS AG, Order no.: AR 464-220

/6/ SINEC TF user interface
User Interface for the SINEC Technological Functions
SIEMENS AG, Order no.: 6GK1971-1AB00-0AA0 Release 02

/7/ Handling blocks are described in the following:

For S5-115 part of the device manual
Order no.: 6 ES 5998-3-UFX 1 for CPU 945
Order no.: 6 ES 5998-0-UFX 3 for CPU 941 - CPU 944

For S5-135 can be ordered as package: HDB software + description
Order no.: 6 ES 5842-7-CB 01 for CPU 928A/B - CPU 948

For S5-155 can be ordered as package: HDB software + description
Order no.: 6 ES 5846-7-CA 01 for CPU 946 / 947

/8/ Manual for SINEC H1 Triaxial Networks
Siemens AG, Order no.:6GK1 970-1AA20-0AA1 Release 03

/9/ SINEC H1FO Network Manual
Siemens AG, Order no.: HIR: 943 320-011

❑

G Compatibility with the CP 143 TF / NCM COM 143 TF

Topics in this Chapter

The CP 1430 TF is designed so that it is largely compatible with the CP 143 TF module. This means the following:

➢ Applications written for the CP 143 can continue to be used without modification with the CP 1430.

➢ The CP 1430 provides improved performance and configuration is simpler with the NCM COM 1430 TF configuration tool.

➢ Databases created with NCM COM 143 can be converted easily with the converter supplied with NCM COM 1430 TF.

The following sections provide detailed information about the improvements and changes.

G.1 The CP 143/1430CP

G.1.1 Structure and Functions of the Module

DIL Switch and Jumpers

In contrast to the previous communications processors, the CP 535 and CP 143 TF, no DIL or jumper settings are necessary with the CP 1430 TF.

Automatic Detection of the Medium

The selected type of attachment, SINEC H!/H1FO or industrial twisted pair is recognized automatically by the CP 1430 TF.

Memory Expansion Memory Cards

In contrast to the EPROMs used with the CP 143, S5 memory cards are inserted into the CP 1430 TF.

Parameter Limits

The CP 1430 TF is available as a basic and an extended version. Compared with the basic version and the CP 143 TF, the extended version has different parameter limits in terms of transport connections and application associations. For more detailed information, refer to Volume 1, Chapter 4 of the manual.

G.1.2 Maximum 2 CPs Required for Backplane Bus Communication in the Multiprocessor Mode

CP 143 TF: 3 CPs are required for 4 CPUs

Using the CP 143, three CPs were required for this configuration. Backplane communication was only possible using interface numbers 232 and 236. An extra CP was necessary to handle the productive communication.

CP 1430 TF: 2 CPs are enough for 4 CPUs

The backplane bus communication and the productive communication in multiprocessor operation can be handled by two CP 1430 modules. This is achieved using the additional base interface number 244 that is reserved for backplane communication of up to 4 CPUs.

A higher number of CPs is only necessary when several H1 bus segments are being used.

G.1.3 Other Changes

Accuracy of the Hardware Clock

The accuracy of the integrated hardware clock of the extended version of the CP 1430 TF is 1 ms compared with 10 ms for the CP 143 TF.

'Node Initialization' Still Exists After Deleting

After the database has been deleted, the CP 1430 TF still retains the previously loaded/configured initialization data. After a restart, the CP changes to the RUN state and can also be reached using bus selection and the MAC address. On the CP 143 TF, a node initialization was necessary whenever the database was deleted.

Type Check

With variables of the type visible string (VS), the CP checks that the values of the bytes are valid. The range of validity is ASCII and corresponds fully to the range that can be represented with the S5 format KS. Values outside this range cause conversion errors (TF error 826A/826B or 306A/306B).

Checking the Value and Converting Time Variables

Any values can be specified for the variable types TI (time of day) and TD (time and date) (for example values higher than 23 for hours and values greater than 59 for seconds and minutes).

If the value exceeds the range, the program attempts a carry, incrementing the next higher unit. If no carry is possible, an error message is generated (TF error 3062).

On the CP 143, time variable values are not converted and must be specified correctly.

System PI and System Domain

The system PI and domain PI are connected. In contrast to the CP 143 TF, this is indicated when the PI/domain attributes are read.

To allow a user PI to use the system domain, its parameter ’multiple use’ was set to TRUE.

G.2 NCM COM 143/1430 TF

G.2.1 Configuring Several Jobs on One Transport Connection

Several Jobs per TSAP

Depending on the mode of the transport connection, up to 4 jobs can be assigned per TSAP.

On a full duplex connection, for example, one SEND and one RECEIVE job can be assigned.

NCM COM 143 TF

In NCM COM 143 TF, you can select the number of jobs in a follow-on dialog of the **Edit | S5-S5 Links** function. To configure further jobs, you then return to the basic dialog to configure the next jobs.

Simplified Procedure in NCM COM 1430 TF

In NCM COM 1430 TF, you can select the number of jobs in the Transport Connection dialog. You configure other jobs for the same TSAP in the same dialog.

G.2.2 Avoiding Inconsistencies: No Automatic Generation of TSAPs

CP 1430 TF

When configuring connections on the CP 1430 TF, you only need to specify the transport address (MAC address and TSAP).

CP 143 TF

With the CP 143, you also had to specify the job and interface number. This meant that inconsistencies were possible in the local and remote database files.

No Generation of TSAPs

It is, however, no longer possible for the program to propose an automatically generated, default remote TSAP during configuration of the CP 1430 TF.

To make editing easier, the values of the MAC address and the TSAPs from the last configuration are retained in the dialog when you create a new job.

G.2.3 Configuring Multicast Groups

Definition

The Multicast mode, allows connectionless transmission of single frames to all the stations with the selected multicast address and reception of frames from partners sending with this multicast address.

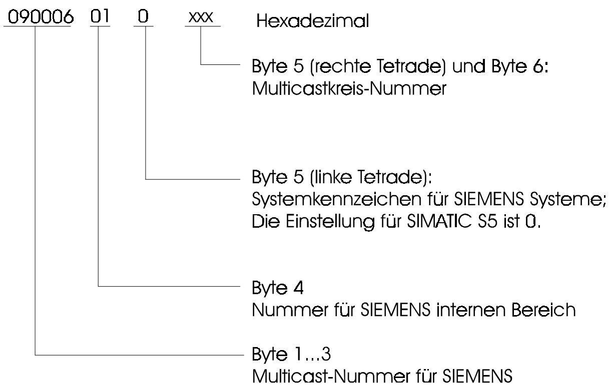
Stations with the same multicast address are known as a multicast group.

Configuring with NCM COM 143 TF

Multicast groups were defined explicitly in NCM COM 143 by specifying a multicast group number. This multicast group was used locally to form the MAC address.

Configuring with NCM COM 1430 TF

Multicast groups are now defined using the menu option **Edit | Connections | Datagram Services**. No additional multicast group numbers are assigned. A station is assigned to a multicast group by the entry in its MAC address, as follows:



G.2.4 Other Changes in NCM COM 1430 TF

The CP 143 Database can be Converted

The database of the CP 1430 is not compatible with that of CP 143. A converter is available with which CP 143 databases can be converted to the CP 1430 format.

No Password

There is no password on the CP 1430.

Transport Parameter Defaults in Configuration Dialogs

The default values are selected so that communication with CP 143 or CP 1413 TF modules configured with the default values of their COMs (NCM COM 143 or COML 1413 TF) is possible.

TF-PDU Size

Values between 128 and 65536 can be selected as the TF-PDU size.

Size of the Database

Functions are available for querying and adapting the size of the database.

Converting Domains

To allow use of the TF domain services, domains created with COM 143 TF can be converted to the format of COM 1430 TF.

Name of the Database File

The names of the database files created with COM 1430 TF begin with the letter A.

Variables Type Editor

You can create a library in the database for the TF variable types you require for your automation tasks.

NCM COM 1430 TF provides a TF variable type editor, with which you can define TF variable types. The library is saved in the CP block OB 14.

Test Functions

The error messages of COM 1430 TF differ from those of COM 143 TF.

The TF error messages are identical, however, several new ones have been added.

G.2.5 Terms

Previously used term	New term
S5-S5 link	Transport connection
Module (file)	Database (file)

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H Glossary

Application association
An application association is a connection for communication using TF services.

Application layer
The application layer is layer 7 in the ISO/OSI reference model for open systems interconnection. The task of the application layer is to provide uniform access to the services of the lower layers.

Backplane bus communication
Backplane bus communication allows Pg functions to be executed online on the path "PG - SINEC H1 - CP - parallel PLC backplane bus - CPU".

COM
Configuration software for SINEC CPs.

Configuration data
Parameters that can be set and loaded on the CP with the NCM COM 1430 configuration software and that control the way in which the CP operates.

CP
Communications processor (network interface card).

CP block
A CP block is a software block belonging to the CP database. CP blocks contain the configuration data required for a CP mode. CP blocks are managed in the CP database file on the PG. They can be loaded singly or with the entire CP database file (transfer functions) and can be copied (file functions).

CP database
The complete set of configuration data of the CP 1430 is known as the CP database. On the PG, the CP database is maintained in the database file.

CSMA/CD
Bus access technique complying with IEEE 802.3.

Datagram
A datagram is a data frame sent to

- ➢ one partner (datagram to a single address)
- ➢ several partners (multicast datagram)
- ➢ all partners (broadcast datagram)

without a connection being established in advance. On the CP 1430 TF, datagram jobs must be configured on the transport interface.

Datagram services
Datagram services allow a connectionless transmission of single frames to

- ➢ one partner (datagram to a single address)
- ➢ several partners (multicast datagram)
- ➢ all partners (broadcast datagram)

Database file
The CP database is managed in the database file on the PG.

Domain
This is a communications object consisting of a continuous memory area with a fixed length that can contain both data and program. Domains are used to supply devices with the required data and programs.

Domain services
Application service group providing services for uploading and downloading domains.

File server application association
Identifies an application association between a PLC and a file server on which PLC programs are stored.

File server application associations are configured with NCM COM 1430 TF.

Handling block (HDB)
HDBs are standard function blocks that allow the data exchange with modules capable of page addressing (dual-port RAM).

Job buffer
Job buffers are used in the TF services on the PLC to describe a communication service requested in the PLC program.

MAC address
Address to distinguish stations connected to a common medium (SINEC H1).

Medium access control
Controls to coordinate the access to a common transmission medium.

Memory Card
Simatic memory card for the CP 1430 complying with the PCMCIA specification.

NCM
SINEC management products.

PG Load
Tool belonging to the NCM COM 1430 TF configuration software for addressing and controlling PLCs via the TF interface.

Program invocation (PI)
Communication object with which a program in a programmable logic controller can be addressed.

Request editor
Tool belonging to the NCM COM 1430 TF configuration software for creating job buffers.

SINEC
Product name for networks and network components from Siemens.

SINEC TF
MMS-compatible application services in SINEC.

Station
A station is identified by a MAC address on SINEC H1.

TF interface
The TF interface is the access to the SINEC TF services of the application layer conforming with MMS. The TF interface presents itself to the control program in the form of handling blocks (HDBs).

TF variable type
Variable types are structure descriptions of variables that can be used as often as required. There are standard variable types such as INTEGER or BOOLEAN and self-defined variable types (structures).

In NCM COM 1430 TF, you can use the varaibale type editor to define the variable types you require.

Transport layer
The transport layer is layer 4 of the ISO/OSI refernce modue for open system interconnection. The task of the transport layer is the reliable transfer of data (raw information) from device to device. Both transport connections and connectionless services (datagram serivices) can be used.

Transport interface
The transport interface on the CP provides access to the connection-oriented and connectionless services of the transport layer. The transport interface presents itself to the control program in the form of handling blocks (HDBs).

Transport connection (in CP/COM 143 previously S5-S5 link)

Variable
Variables are unstructured or structures data objects of the application system with which can be written or read with the variable services.

Variable services
Application service group for transferring (reading or writing) variables.

Virtual manufacturing device (VMD)
A standardized image of a programmable logic controller in the form of a model. It is described by the objects it contains and the characteristics of the physical device. The practical use of such a model is that it allows a standardized interface to query the device status and device properties (VMD services).

VMD services
Standardized interface for querying device status and properties.

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