

SIMATIC S5

**SINEC L2-DP - Interface on the
S5-95U Programmable Controller**

Manual

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Introduction

The S5-95U programmable controller with SINEC L2-DP interface can communicate as DP slave with other devices via the standardized PROFIBUS-DP fieldbus system to DIN E 19245, Part 3 (Siemens product identification: SINEC L2-DP).

You, as user, require detailed information in order to be able to utilize the full range of performance features of which the S5-95U's SINEC L2-DP interface is capable.

This Manual contains a complete description of all functions and special features which the S5-95U's SINEC L2-DP interface has to offer, and is to be regarded as supplement to the S5-90U/S5-95U System Manual.

Information pertaining to the S5-95U with SINEC L2-DP interface as well as to all other variations of the S5-95U, such as "Installation Guidelines", "Integral Clock", and the like, are discussed in detail in the S5-90U/S5-95U System Manual.

In order to put the S5-95U into operation on the SINEC L2-DP, you will also need the manual for the controller that is to serve as SINEC L2-DP master (referred to in the following as DP master).

The IM 308-B DP master and the commissioning procedures for the entire SINEC L2-DP bus system are described in detail in the manual entitled "ET 200 Distributed I/O System".

Possession of and familiarity with the following manuals has been assumed as regards startup procedures for the S5-95U on the SINEC L2-DP:

- "S5-90U/S5-95U Programmable Controller" System Manual
- "ET 200 Distributed I/O System" Manual

Reference is made to the two manuals listed above at appropriate points in this manual.

The information presented on the following pages is intended to simplify use of this manual.

Sequence of steps for including the S5-95U as node on the SINEC L2-DP bus:

1. Configure the S5-95U with COM ET 200 in the DP master
2. Initialize the S5-95U for data interchange over SINEC L2-DP
3. Write the user program for and load it into the S5-95U
4. Put the S5-95U into operation on the SINEC L2-DP and test its operation
5. Perform all necessary diagnostic steps in the event of an S5-95U malfunction

The next section contains a brief description of each section in the manual and what that section covers.

Description of contents

- Chapter 1
This introductory chapter provides an overview of the devices with which the S5-95U can communicate via SINEC L2-DP.
- Chapter 2
Chapter 2 provides information on S5-95U installation and on the operation of the S5-95U with SINEC L2-DP interface. It also contains the connector pin assignments for the SINEC L2-DP interface.
- Chapter 3
This chapter discusses data interchange over the S5-95U's SINEC L2-DP interface and how to transmit and receive data over the SINEC L2-DP bus system.
- Chapter 4
Chapter 4 provides examples of how to configure the S5-95U with COM ET 200 in the DP master.
- Chapter 5
Chapter 5 tells you how to initialize the S5-95U in DB1 for data interchange via the SINEC L2-DP bus system.
- Chapter 6
Chapter 6 provides a detailed sample program for an S5-95U node on the SINEC L2-DP.
- Chapter 7
Chapter 7 provides information needed to put the S5-95U into operation on the SINEC L2-DP bus.
- Chapter 8
This chapter covers all SINEC L2-DP test and diagnostic options available to the DP master for the S5-95U as well as those provided by the S5-95U itself.
- Appendices
In the Appendices you will find various reference lists, in particular for the S5-95U with SINEC L2-DP interface, e.g. DB1 parameters, technical specifications and a communications matrix.

Terms, Definitions and Conventions

The "S5-90U/S5-95U System Manual" and the "SINEC L2-DP Interface on the S5-95U Programmable Controller" Manual have been carefully unitized.

The terms, definitions and conventions listed in the introduction to the System Manual apply for this manual as well. Please refer to the System Manual for details.

Please take the definitions for the terms "Warning", "Danger", "Caution" and "Note" from the "Safety-Related Guidelines for the User" at the end of this Introduction.

Training courses

SIEMENS offers a large number of excellent training courses for SIMATIC and SINEC components. For detailed information, please contact your Siemens branch office.

Reference literature

All reference literature is listed in Appendix F of the S5-90U/S5-95U System Manual.

Information on communications equipment for the S5-95U with SINEC L2-DP interface is presented in the following catalogs:

- ST 52.1 "SIMATIC S5 S5-90U, S5-95U and S5-100U Programmable Controllers"
- ST 52.3 "SIMATIC S5 S5-115U, S5-115H and S5-115F Programmable Controllers"
- ST 54 "SIMATIC S5 S5-135U, S5-155U and S5-155H Programmable Controllers"
- ST 54.2 "SIMATIC S5 ET 200 and ET 100U Distributed I/O System"
- ST 59 "SIMATIC S5 Programmers"
- IK 10 "SINEC Industrial Communications Networks"

Special suggestion/correction sheets have been included at the end of the manual. Please use them to jot down any improvement suggestions, corrections or additions you may have, and return them to us. This will help us improve the next edition of the manual.

Safety-Related Guidelines for the User

This document provides the information required for the intended use of the particular product. The documentation is written for technically qualified personnel.

Qualified personnel as referred to in the safety guidelines in this document as well as on the product itself are defined as follows:

- System planning and design engineers who are familiar with the safety concepts of automation equipment.
- Operating personnel who have been trained to work with automation equipment and are conversant with the contents of the document in as far as it is connected with the actual operation of the plant.
- Commissioning and service personnel who are trained to repair such automation equipment and who are authorized to energize, de-energize, clear, ground, and tag circuits, equipment and systems in accordance with established safety practice.

Danger Notices

The notices and guidelines that follow are intended to ensure personal safety, as well as protect the products and connected equipment against damage.

The safety notices and warnings for protection against loss of life (the users or service personnel) or for protection against damage to property are highlighted in this document by the terms and pictograms defined here. The terms used in this document and marked on the equipment itself have the following significance:

Danger

indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken.

Note

contains important information about the product, its operation or a part of the document to which special attention is drawn.

Proper Usage



Warning

- The equipment/system or the system components may only be used for the applications described in the catalog or the technical description, and only in combination with the equipment, components, and devices of other manufacturers as far as this is recommended or permitted by Siemens.
- The product will function correctly and safely only if it is transported, stored, set up, and installed as intended, and operated and maintained with care.

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1 System Overview

This section provides information on

- SINEC L2-DP in general
- performance characteristics of and advantages offered by the S5-95U's SINEC L2-DP interface and
- devices with which the S5-95U can communicate as SINEC L2-DP bus node

1.1 SINEC L2-DP

A control system's flexibility is one of the most decisive factors in a manufacturing plant's productivity.

In order to attain the highest possible degree of flexibility, complex control tasks can be subdivided and distributed among several devices.

As a result,

- signals can be acquired on-site, thus reducing costs
- units are smaller and easier to keep track of. Configuring, start-up, diagnostics, modifications, and operator control and monitoring are simpler.
- your system has a higher degree of availability, because the failure of one unit does not affect the rest of the system.

When control tasks are distributed among several devices, the information flow between those devices must be ensured to enable

- data interchange between the programmable controllers
- centralized operator control and monitoring and process control
- collection of management information (such as production and warehousing data)

Features of the SINEC L2-DP

- The SINEC L2-DP is a variant of the SINEC L2 ("DP" stands for distributed I/O), and is based on the PROFIBUS-DP standard (DIN 19245, Part 3).
- The SINEC L2-DP is designed for the shortest possible response times during communication with distributed I/Os.
- Data interchange over SINEC L2-DP is the perfect solution for transmitting small amounts of data at high speed.
- Bus nodes which transmit data to and retrieve data from other bus nodes are referred to as **DP masters**.
- Bus nodes which make data available to a DP master and can receive data from that master are referred to as **DP slaves**.

For more detailed information on SINEC L2-DP, please refer to the Manual entitled "ET 200 Distributed I/O System".

1.2 S5-95U with SINEC L2-DP Interface

The S5-95U's SINEC L2-DP interface has the following performance characteristics:

- The S5-95U can function on the SINEC L2-DP bus as slave node only.
- The S5-95U is a DP standard slave, i.e. the SINEC L2-DP interface performs precisely as per the PROFIBUS-DP draft standard (DIN 19245, Part 3).

The S5-95U's SINEC L2-DP interface offers the following advantages:

- Intelligent preprocessing is possible.
- No knowledge of communications mechanisms is necessary in order to interface the S5-95U to the SINEC L2-DP bus.

1.3 Applications for the S5-95U with SINEC L2-DP Interface

The diagram below illustrates a typical SINEC L2-DP configuration.

The DP master is the IM 308-B; DP slaves are the S5-95U, the ET200U distributed I/O system and other field devices.

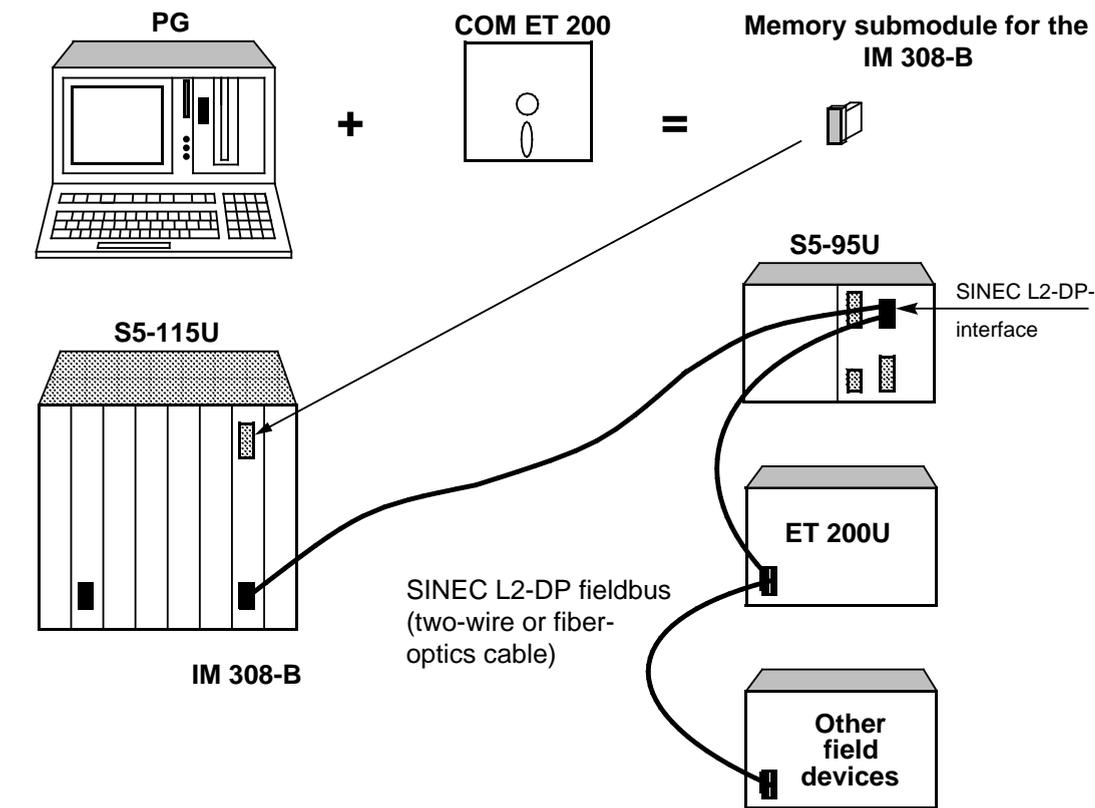


Figure 1-1. Hardware Configuration

The installation guidelines for the SINEC L2-DP can be found in the Manual entitled "ET 200 Distributed I/O System".

The S5-95U can communicate with the following devices over the SINEC L2-DP bus:

Table 1-1. Communications Partners for the S5-95U over SINEC L2-DP

Device/Module	Software needed for startup/testing
IM 308-B master interface module, version 5 (can be used in the S5-115H to S5-155U/H)	COM ET 200 version V 4.0 or higher
Host systems containing a CP 5480-DP with version number V 2.0 or higher	COM ET 200 version V 4.0 or higher
Programmable controllers from other manufacturers with integral DP master interface module	COM ET 200 version V 4.0 or higher
Programmer with CP 5410 communications processor and S5-DOS/ST	COM ET 200 version V 4.0 or higher

2 PLC Installation and Operation

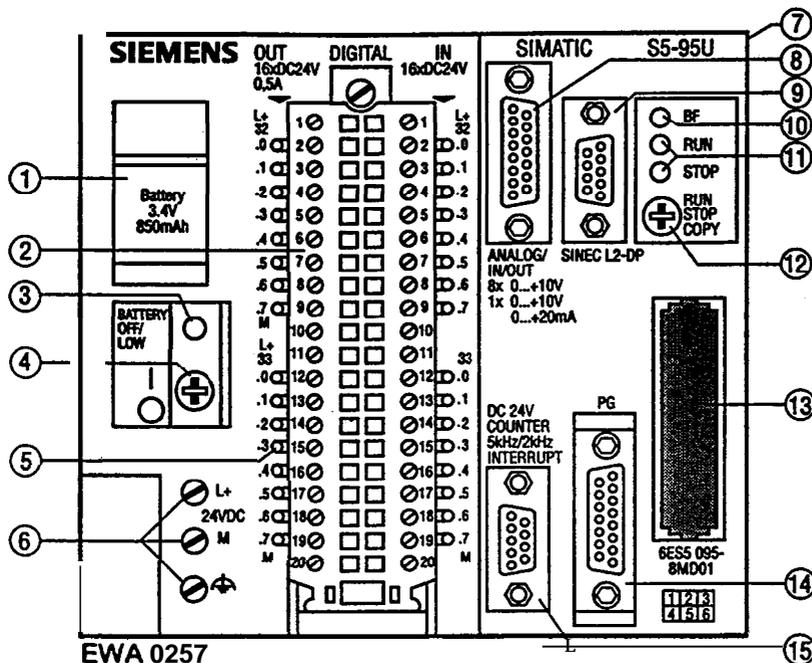
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2 PLC Installation and Operation

This section provides information on installing and operating the S5-95U with SINEC L2-DP interface.

The Figure below shows all display elements, control elements and interface ports on the S5-95U (Order No. 6ES5095-8MDx1).



- ① Battery compartment
- ② Front connector for digital inputs (I 32.0 to I 33.7) and digital outputs (Q 32.0 to Q 33.7)
- ③ Battery failure indicator
- ④ On/Off switch
- ⑤ LEDs for digital inputs and outputs
- ⑥ Terminals for power supply
- ⑦ Connectors for S5-100U modules
- ⑧ Port for analog inputs (IW 40 to IW 54) and for analog output (QW 40)
- ⑨ Interface for SINEC L2-DP fieldbus
- ⑩ SINEC L2-DP bus fault LED
- ⑪ Mode indicator: Green LED for RUN, red LED for STOP
- ⑫ Mode selector switch
- ⑬ Receptacle for E(E) PROM submodule
- ⑭ Port for programmer (PG), personal computer (PC), operator panel (OP) or SINEC L1 bus
- ⑮ Port for interrupt inputs (I 34.0 to I 34.3) and counter inputs (IW 36, IW 38)

Figure 2-1. Indicators, Control Elements and Interface Ports on the S5-95U

Operating principle of the PLC with SINEC L2-DP interface

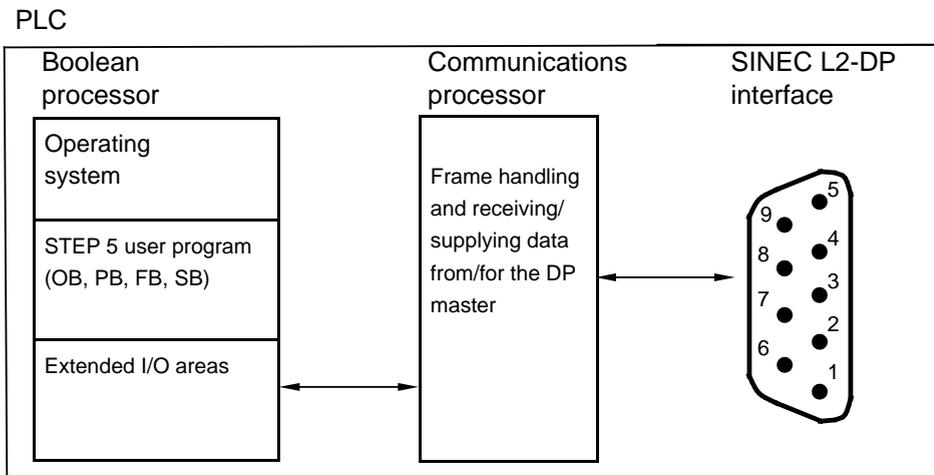


Figure 2-2. Operating Principle of the PLC with SINEC L2-DP Interface

Boolean processor

The boolean processor performs the following tasks for communication via the SINEC L2-DP interface:

- Making Send data from the S5-95U's application program available for transmission over SINEC L2-DP
- Making user-specific diagnostic data from the S5-95U's application program available for transmission over SINEC L2-DP
- Processing data received over SINEC L2-DP in the S5-95U's application program and forwarding the data to the S5-95U's I/Os

Communications processor

The communications processor handles data traffic over the SINEC L2-DP bus, performing its tasks in parallel with those handled by the boolean processor.

Tasks performed by the communications processor:

- Receiving frames over SINEC L2-DP for initializing the DP slave, such as initialization frames containing user-specific parameters.
 - Interpreting of the frame
 - Communications processor initiates suitable response
- Receiving frames containing data over SINEC L2-DP.
 - Copying the data from the communications processor's Receive buffer to the boolean processor's extended I/O area for inputs.
- Loading diagnostic data into the Send buffer for retrieval and evaluation by the DP master, such as diagnostic messages from the S5-95U.
- Copying data from the boolean processor's extended I/O area for outputs to the communications processor's Send buffer for retrieval by the DP master.

SINEC L2-DP interface

The SINEC L2-DP interface was designed as 9-pin Cannon socket connector to the PROFIBUS-DP standard.

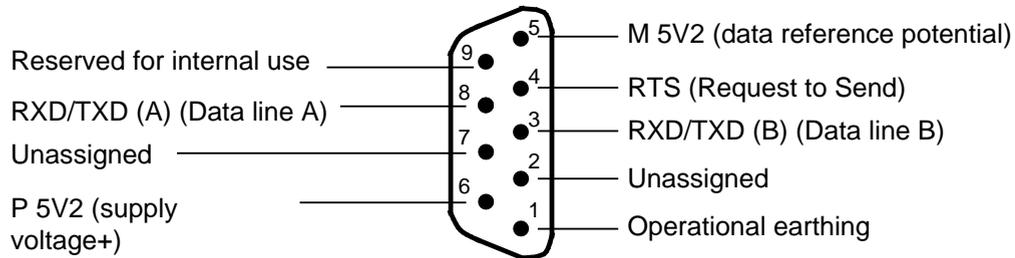


Figure 2-3. Connector Pin Assignments on the S5-95U's SINEC L2-DP Interface

Note

The SINEC L2-DP interface and the programmer interface (e.g. SINEC L1 connected to programmer port) may be operated in parallel.

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3 Data Interchange Over the S5-95U's SINEC L2-DP Interface

This section tells you

- the basics of how the S5-95U transmits data
- how the S5-95U's extended I/O areas are structured and
- how you can access the Send and Receive data in the application program.

3.1 Characteristic Features of Data Interchange with the S5-95U as DP Slave

- The S5-95U can be only a slave node on the SINEC L2-DP bus. The S5-95U makes data available to a DP master, and can receive and post-process data from that master.
- The baud rate is set in the DP master. The S5-95U accepts the following baud rates: 9.6 kbaud, 19.2 kbaud, 93.75 kbaud, 187.5 kbaud, 500 kbaud and 1500 kbaud.
- The S5-95U can make a maximum of 32 bytes of data available for retrieval and can receive a maximum of 32 bytes of data over the SINEC L2-DP.
The S5-95U's communications processor makes the Send and Receive data available automatically, i.e. without the aid of the application program.
- Extended I/O areas (for DP only) are provided for transmitting/receiving data. You, as user, must load data into and retrieve data from these areas by writing the appropriate Load and Transfer operations in your application program.

3.2 Basic Principle of Data Interchange

The interchange of data between the DP master and an S5-95U DP slave is cyclic, and uses Send and Receive buffers. Figure 3.1 shows the basic principle of data transfer as seen from the side of the S5-95U.

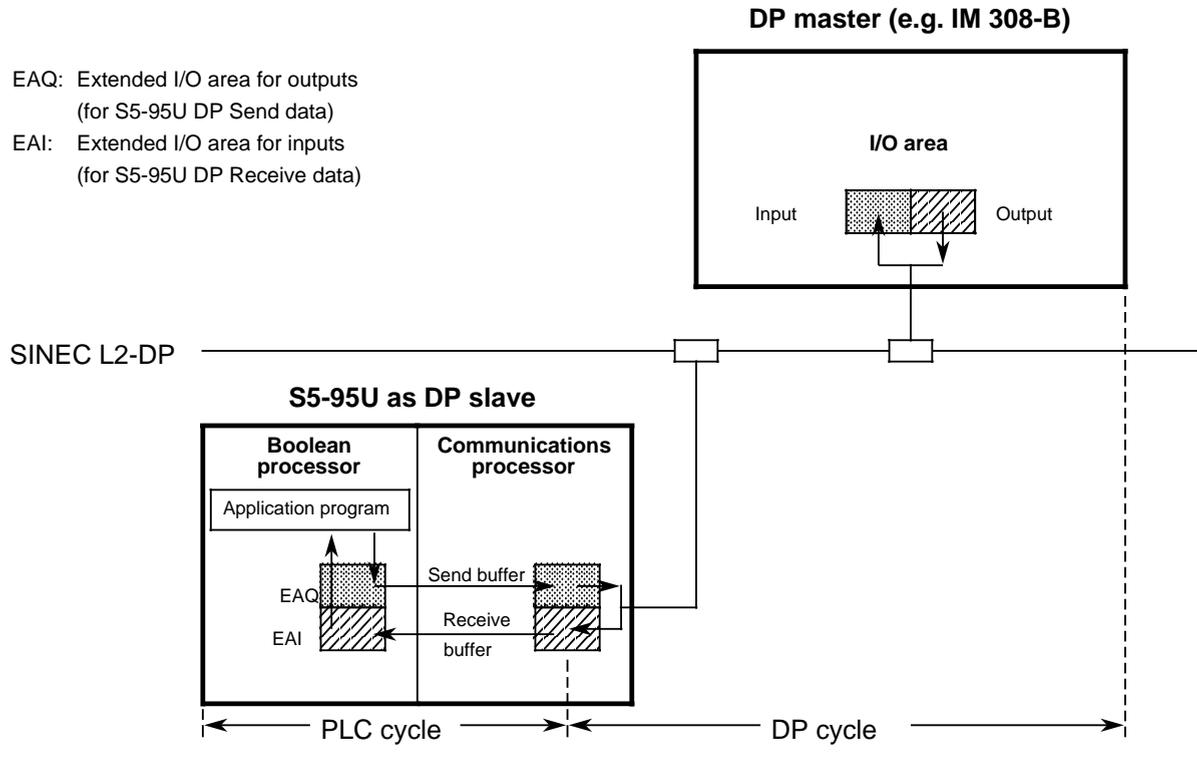


Figure 3-1. Basic Principle of Data Interchange with S5-95U as Slave

Description of terms used in Figure 3.1:

The shaded boxes represent the data areas (the data is the same where the shading is the same). The data transfer takes place in two cycles, i.e. the PLC cycle and the DP cycle.

PLC cycle:

The application program writes the Send data into the S5-95U's extended I/O area for outputs (EAQ) .

At the cycle control point, the communications processor copies the Send data from the EAQ to its own Send buffer . At the same time, the communications processor copies the Receive data to the extended I/O area for inputs (EAI) . The Receive data entered in the EAI can be evaluated by the application program .

The boolean processor and the communications processor exchange their data at the cycle checkpoint.

DP cycle:

The DP master forwards the data entered in the S5-95U communications processor's Receive buffer to the S5-95U . At the same time, the DP master retrieves the S5-95U's Send data . The exchanging of data between DP master and DP slave via the bus is cyclic, and independent of the S5-95U's cycle checkpoint.

3.3 Structure of the S5-95U's Extended I/O Areas

The S5-95U provides extended I/O areas expressly for sending/receiving data over the SINEC L2-DP.

The S5-95U's extended I/O areas immediately follow the process images in the controller's memory:

- The process input image (PII) reserves addresses 0.0 to 127.7
- The extended I/O area for inputs (EAI) reserves addresses 128.0 to 255.7
- The process output image reserves addresses 0.0 to 127.7
- The extended I/O area for outputs (EAQ) reserves addresses 128.0 to 255.7

Note

Please note that only the S5-95U with SINEC L2-DP interface provides **extended** I/O areas.
 Modules cannot be addressed in the S5-95U's extended I/O areas. These areas are only for storing DP data in the S5-95U, and for no other purpose!

Table 3.1 shows the exact structure of the S5-95U's extended I/O areas. The application program can read the extended I/O area for inputs and write to the extended I/O area for outputs.

Table 3-1. Structure of the S5-95U's Extended I/O Areas

Absolute address	Addr. in the EAI	Contents	Absolute address	Addr. in the EAQ	Contents
5700 _H ⋮ 571F _H	128.0 ⋮ 159.7	Receive data (from DP master)	5780 _H ⋮ 579F _H	128.0 ⋮ 159.7	Send data (for DP master)
5720 _H ⋮ 5738 _H	160.0 ⋮ 184.7	User-specific parameter assignment data (from DP master)	57A0 _H ⋮ ⋮	160.0 ⋮ ⋮	None
5739 _H ⋮ 577D _H	185.0 ⋮ 253.7	None	⋮ 57F9 _H ⋮ 57FA _H	⋮ 249.7 ⋮ 250.0	
577E _H ⋮ 577F _H	254.0 ⋮ 255.7	Diagnostic bytes "Status flags" and "Error flags"	⋮ ⋮ 57FF _H	⋮ ⋮ 255.7	User-specific diagnostic bytes

You, as user, can write to and read from the extended I/O areas via Load and Transfer operations in your application program (see Sections 3.4 and 3.5).

3.4 Accessing Send and Receive Data

The Send data must be written to the extended I/O area for outputs (EAQ) by writing the appropriate Transfer operations in the S5-95U's application program.

You may use the following operations, value ranges and data areas for this purpose:

Table 3-2. Accessing Send Data in the Application Program

E.g. Load from application program	Transfer to EAQ	Example	Description
Byte or word operations can be used in the application program to send small amounts of data (approximately 1 to 8 bytes):			
L IB/QB/IW/QW/ PY/PW/FY/FW/ DL/DR/DW	T PY 128 ... 159/ T PW 128 ... 158	L IB 5 T PY 140	Input byte 5 is transferred to I/O byte 140 in the EAQ
The TNB operation¹ can be used to send large amounts of data (max. 32 bytes):			
	TNB 1 ... 32 (bytes) (the start addr. of the EAQ is 5780 _H)	L KH 613F L KH 579C TNB 20	20 bytes, starting with flag byte 63 (FY 63 ... FY 44) are transferred to the EAQ beginning at I/O byte 156 (PY 156 ... PY 137).

¹ Transfer data block byte by byte (refer to the S5-90U/S5-95U System Manual, Section 8.3.2)

Prerequisites for accessing the Receive data:

- Bit 5 of the "Status" byte must be 1, i.e. DP master active (see Section 8.5.1)
- Bit 4 in the "Error" byte must be 0, i.e. Receive data in the S5-95U is valid (see Section 8.5.2)

The Receive data entered in the extended I/O area for inputs (EAI) must be made available for evaluation in the S5-95U's application program via Load operations.

You may use the following operations, value ranges and data areas for this purpose:

Table 3-3. Accessing Receive Data in the Application Program

Load from EAI	E.g. Transfer to application prog.	Example	Description
Byte or word operations can be used in the application program to receive small amounts of data (approximately 1 to 8 bytes):			
L PY 128 ... 159/ L PW 128 ... 158	T IB/QB/IW/QW/ PY/PW/FY/FW/ DL/DR/DW	L PY 130 T MB 200	I/O byte 130 in the EAI is transferred to flag byte 200.
The TNB operation¹ can be used in the application program to receive large amounts of data:			
	TNB 1 ... 32 (bytes)	L KH 571D L KH 61E6 TNB 30	30 bytes are transferred from the EAI, starting with I/O byte 157 (PY 157 ... PY 128), to the flag area, flag bytes FY 230 to FY 201.

¹ Transfer data block byte by byte (refer to the S5-90U/S5-95U System Manual, Chapter 8)

You will find a detailed sample program for an S5-95U DP slave in Chapter 6.

3.5 Accessing User-Specific Parameter Assignment Data

The S5-95U receives a (new) parameter initialization frame from the DP master when

- the SINEC L2-DP is in the runup phase or
- there was a problem with the connection between the DP master and the S5-95U (for example, the bus connector was accidentally pulled).

The parameter initialization frame may contain user-specific parameter assignment data from the DP master for the S5-95U DP slave (see the Example in Section 4.4).

User-specific parameter initialization data is utilized primarily to assign start parameters to the S5-95U (such as software control parameters). User-specific parameter assignment data is stored in the extended I/O area for inputs (EAI).

Prerequisites for accessing the data:

- Bit 5 in the "Status" byte must be 1, i.e. DP master is active and
- Bit 3 in the "Status" byte must be 1, i.e. user-specific parameter assignment data are available (see Section 8.5.1)

User-specific parameter assignment data is accessed in the application program in the same manner as Receive data, i.e. using Load operations.

You may use the following operations, value ranges and data areas for this purpose:

Table 3-4. Accessing User-Specific Parameter Assignment Data in the User Program

Load from EAI	E.g. Transfer to application prog.	Example	Description
Byte or word operations can be used in the application program to receive small amounts of data (approximately 1 to 8 bytes):			
L PY 160 ... 184/ L PW 160 ... 183	T IB/QB/IW/QW/ PY/PW/FY/FW/ DL/DR/DW	L PY 160 T MB 200	I/O byte 160 in the EAI is transferred to flag byte 200.
The TNB operation¹ can be used to receive large amounts of data (max. 25 bytes):			
	TNB 1 ... 25 (bytes)	L KH 572E L KH 61D7 TNB 15	15 bytes, starting with I/O byte 174 (PY 174 ... PY 160), are transferred from the EAI to flag byte 215 (FY 215 ... FY 201).

¹ Transfer data block byte by byte (refer to the S5-90U/S5-95U System Manual, Section 8)

Note

The operating system resets bit 3 of the "Status" byte at the next cycle checkpoint. For this reason, be sure to evaluate bit 3 in your application program in every cycle, as it is possible that new user-specific parameter assignment from the DP master may have arrived!

You will find a detailed sample program, including access to user-specific parameter assignment data for an S5-95U DP slave, in Chapter 6.

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4 Configuring the S5-95U in the DP Master with COM ET 200

This section builds on the "ET 200 Distributed I/O System" Manual. Before continuing with this section, familiarize yourself with the "COM ET 200" by studying the "ET 200 Distributed I/O System" Manual. All necessary information is given below for configuring the S5-95U with COM ET 200.

The "CONFIGURE" form in COM ET 200 is used to define the following in the DP master:

- The station number assigned to the S5-95U as DP slave.
- The number of bytes/words of Send and Receive data which may be interchanged with the S5-95U DP slave.
- The consistency of the DP master's data.

4.1 Assigning the Station Number

To screen the "CONFIGURE" form, press function key <F2> in the "FUNCTION SELECTION" form (Prerequisite: The "ET 200 SYSTEM PARAMETERS" must already have been assigned and confirmed. Refer to the "ET 200 Distributed I/O System" Manual, Chapter 8).

The following screen form is displayed:

Program file: TEST@@ET.200				SIMATIC S5 / COM ET 200			
CONFIGURE							
Station number: 3							
F1	F2	F3	F4	F5	F6	F7	F8
					STORE	HELP	EXIT

Figure 4-1. COM ET 200's "CONFIGURE" Form (1)

The S5-95U must be assigned a station number (node address) between 3 and 125.

Change the station number displayed in the form, if necessary, and press function key <F6> to confirm and store your selection.

If the station whose station number you entered had already been configured, its configuration data is displayed on the monitor once you have confirmed your entries (see Figure 4.3).

4.2 Assigning the Station Type

If the station had not yet been configured, two additional input fields are displayed in the form:

Program file: TEST@@ET.200		SIMATIC S5 / COM ET 200					
CONFIGURE							
Station number: 3		Area: P		Station type: ET 200			
F1	F2	F3	F4	F5	F6	F7	F8
					STORE	HELP	EXIT

Figure 4-2. COM ET 200's "CONFIGURE" Form (2)

If ET 200 system parameter "Paging" was set to "N" (no), enter one of the two areas for linear addressing (P or O) as "Area" in the "CONFIGURE" form.

If the "Paging" parameter was set to "J" (yes), enter the abbreviation for the I/O area and a page number. Permissible page numbers are determined by the base page number.

Example: "P3" for page 3 in the P area
 "O5" for page 5 in the O area

Using the cursor control keys, move to the input field for "Station type".
 Screen a list of all station types by pressing <F7> (HELP).
 Select "PLC95/L2 DP-Slave".
 Press <F6> to confirm and store.
 Press <F6> "STORE" a second time to change screen forms.

Note

Should "PLC95/L2 DP-Slave" fail to appear as one of the station type selections, it is either because you have not loaded the right type file into your programmer or because the type file is in the wrong directory. The type file for S5-95U is called "SI800CT?.200".

The following screen form is displayed:

Program file: TEST@ET.200 SIMATIC S5 / COM ET 200
 CONFIGURE

Station number: 3 Area: P Station type: PLC95/L2 DP slave
 Station identification:
 Next free address: DI: 0 DQ: 0 AI: 0 AQ: 0

Configuration: Area address: I: Q:
 (Shift F6: DP slave parameter initialization frame)

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31

F1	F2	F3	F4	F5	F6	F7	F8
STATION +	STATION -	DELETE STATION	NEW STATION	ADDRESS MAP	STORE	HELP	EXIT

Configuration field

Figure 4-3. COM ET 200's "CONFIGURE" Form (3)

If you wish, you may assign a name to the S5-95U in the "Station identification" field (all keyboard characters allowed).

COM ET 200 automatically fades in the "Next free address". The first time the "CONFIGURE" form is selected in a given program file, the next free addresses are set to "0".

Note

It is not possible to reference module addresses in the S5-95U's extended I/O area. The extended I/O area's only purpose is that of storing DP data in the S5-95U!

The numbers above the input fields in Configuration field are the address identifiers for the Send and Receive data in the S5-95U (see Figure 4.3). You must specify the identifiers as decimal numbers in COM ET 200. In binary, they produce a code for the S5-95UDP slave's Send and Receive data.

Detailed information on assigning the address identifiers for S5-95U in COM ET 200 can be found in Section 4.3.

Confirm and store with <F6>.

"151" is entered automatically in input field "0".

To enter the S5-95U's Receive data characteristics, use the cursor control keys to go to the next input field. Proceed exactly as for the Send data.

Please note that what the S5-95U regards as Receive data, the DP master regards as output data!

Please observe the following carefully when assigning addresses for the S5-95U.

Note

1. Specify only as many bytes as you really need for the data exchange. The more bytes, the longer the DP cycle (see Section 3.2).
2. The S5-95U can make available for transfer over the SINEC L2-DP bus no more than 32 bytes of data, and can receive no more than 32 bytes of data over SINEC L2-DP. Please observe this restriction when making address assignments.
3. The "special identifier" format cannot be used for S5-95U.
4. Version V 4.0 of COM ET 200 restricts the consistency "Total length" to a maximum of 8 bytes. Please observe this restriction when assigning addresses.

After assigning addresses with COM ET 200 for the S5-95U, you must enter the same address identifiers in the S5-95U's DB1. Refer to Chapter 5 for information on making these DB1 entries.

4.3.2 Entering the Characteristics of the Send and Receive Data in Decimal Code in Form of a Configuration Byte

The coding of the Send and Receive data characteristics for the S5-95U as DP slave is described in detail in the following.

You must code these characteristics bit by bit in the Configuration byte.

Structure of the Configuration byte:

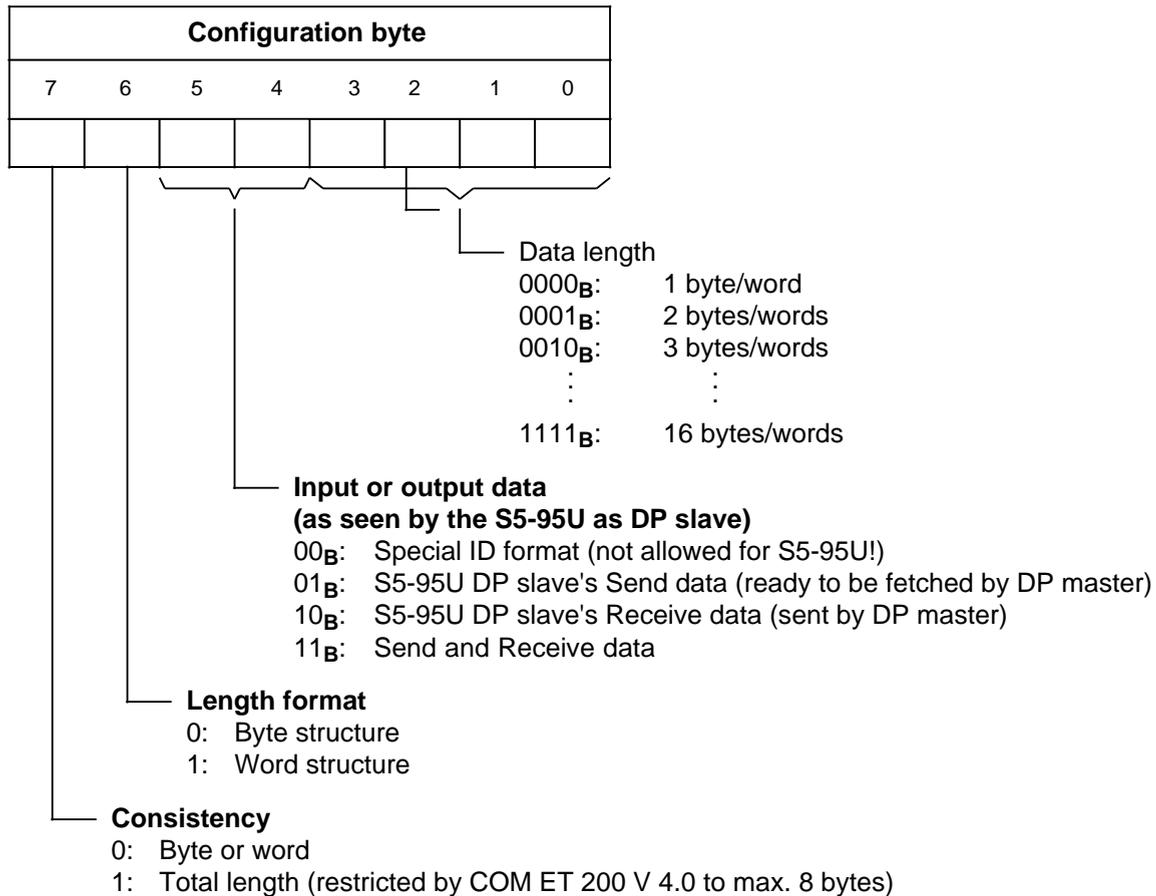


Figure 4-5. Structure of the S5-95U DP Slave's Configuration Byte

Please observe the following when coding the data.

Note

1. Code only as many bytes as you really need for the data exchange. The more bytes, the longer the DP cycle (refer to Section 3.2).
2. The S5-95U can make available for transfer over the SINEC L2-DP bus no more than 32 bytes of data, and can receive no more than 32 bytes of data over SINEC L2-DP. Please observe this restriction when coding.
3. The "special identifier" format (bits 4 + 5 = 00_B) cannot be used for S5-95U.
4. COM ET 200 V 4.0 restricts the consistency "Total length" to a maximum of 8 bytes. Please observe this restriction when coding.

Example for coding the Send and Receive data characteristics

16 bytes of Send data are to be transferred from the S5-95U DP slave to the DP master. The S5-95U DP slave should be capable of receiving 16 bytes of data from the DP master.

The 16 bytes of Send data are divided into:

- 4 words of Send data with the consistency "Total length"
- 8 bytes of Send data with the consistency "Total length"

The 16 bytes of Receive data are divided into:

- 4 words of Receive data with the consistency "Total length"
- 8 bytes of Receive data with the consistency "Total length"

Code the data characteristics listed under numbers ... in binary, as illustrated by Figure 4.5.

Figure 4.6 shows the configuration bytes for ... and its conversion into decimal notation.

Configuration byte								
7	6	5	4	3	2	1	0	
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	
1	1	0	1	0	0	1	1	= 211 _D = 151 _D = 227 _D = 167 _D
1	0	0	1	0	1	1	1	
1	1	1	0	0	0	1	1	
1	0	1	0	0	1	1	1	

Enter address identifiers in the configuration field of COM ET 200's "CONFIGURE" form (see Figure 4.7)

Figure 4-6. Example: Coding Configuration Bytes for the S5-95U as DP Slave

Entering address identifiers in the COM ET 200 screen form

The input fields must be filled in in ascending order, and none of the fields may be skipped.

Enter all address identifiers in the example into input fields 0 to 3.

The screen form appears as follows:

Program file: TEST@ET.200 SIMATIC S5 / COM ET 200
 CONFIGURE

Station number: 3 Area: P Station type: PLC95/L2 DP slave
 Station identification:
 Next free address: DI: 16 DQ: 16 AI: 16 AQ: 16

Configuration: Area address: I: Q:
 (Shift F6: DP slave parameter initialization frame)

0	1	2	3	4	5	6	7
211	151	227	167				
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31

F1	F2	F3	F4	F5	F6	F7	F8
STATION	STATION	DELETE	NEW	ADDRESS			
+	-	STATION	STATION	MAP	STORE	HELP	EXIT

Figure 4-7. COM ET 200's "CONFIGURE" Form (5)

COM ET 200 automatically displays the "Next free address", which is not relevant for the S5-95U.

Press <F5> "ADDRESS MAP" to display the addresses reserved with COM ET 200. Take care not to assign the same address twice in the DP master!

Press <F6> "STORE" to confirm and store your entries.

If you want to define user-specific parameter initialization data for the S5-95U, please read Section 4.4.

Otherwise, you have now completed COM ET 200 address allocation procedures for the S5-95U. The next step is to enter the same address assignments in the S5-95U's DB1. The necessary procedures are described in detail in Chapter 5.

Example: An analog value at the S5-95U's analog output is to be increased from 0 V to the limit value of 8 V (≙ 8000) in increments of 20.
 When the limit value has been reached, the cycle is to begin again at 0 V.

Enter the value for the increment, 20_D = 0014_H (bytes 1 + 2) and the limit value 8000_D = 1F40_H (bytes 3 + 4) in the "DP SLAVE PARAMETER INITIALIZATION FRAME" window.

The "DP SLAVE PARAMETER INITIALIZATION FRAME" window is then as follows:

DP slave parameter initialization frame	
Byte	(Entries in KH format)
0	00 14 1F 40 00 00 00 00 00 00
10	00 00 00 00 00 00 00 00 00 00
20	00 00 00 00 00

Confirm your entries with <F6> "STORE".

The accessing of user-specific parameter assignment data in the S5-95U's application program is discussed in general terms in Section 3.5.

In addition, Chapter 6 contains a sample program for the S5-95U showing the use of user-specific parameter assignment data.

5	Initializing the S5-95U's SINEC L2-DP Interface in DB1	
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5.1 DB1 Parameters for an S5-95U with SINEC L2-DP Interface

Table 5-1. SINEC L2-DP, DB1 Parameters

Parameter	Argument	Description
Block identifier: DPS:		SINEC L2-DP interface
TLN	3 ...125	Station number of the S5-95U as DP slave
DPAE	16 ... 63; 80 ... 127; 144 ... 191; 208 ... 255	Specify the following configuring data in decimal code: <ul style="list-style-type: none"> • Data consistency • Data length format • S5-95U Send or Receive data? • Length of the data (For data coding procedures, see Section 4.3.2)

Example: An S5-95U is to be initialized as DP slave on the SINEC L2-DP bus

Prerequisites for initializing parameters in DB1

You must have assigned the following with COM ET 200 in the DP master (refer to Chapter 4):

- The station number of the S5-95U
- The address identifiers (configuring data) for S5-95U

You must make exactly the same assignment in DB1 as the ones you made with COM ET 200, i.e. in the following sample DB1, enter the same station number and configuring data coded in Section 4.3.2 and forwarded to COM ET 200.

The following assignments were coded in Section 4.3.2 and passed to COM ET 200:

- Station number: 3
- Station type: PLC95/L2 DP slave (is not entered in DB1)
- Address identifiers: 211; 151; 227; 167 (you must enter the address identifiers into DB1 in this exact order)

The "DPS:" parameter block in the same DB1 is thus as follows:

Table 5-2. Sample DB1 for SINEC L2-DP

DB1 parameters for SINEC L2-DP	Description
<pre> . . . 156: KS =' ; # DPS: TLN 3 DPAE ' ; 168: KS ='211 151 227 167 ; END ' ; </pre>	Station no. for the S5-95U for SINEC L2-DP is 3 Decimal-coded configuring data Description see Chapter 4

The sample DB1 in Table 5.2 is used for a detailed sample program in Chapter 6.

5.2 Entering the Parameters in DB1 and in the S5-95U

The S5-95U's operating system contains an integral default DB1. This block also contains default values for data interchange over the SINEC L2-DP bus (see Figure 5.1).

Load the default DB1 into your programmer (load function, Source: PLC, Destination: FD (PG)).

Search for the SINEC L2-DP parameter block in DB1; its block name is "DPS:".

The "DPS:" parameter block is enclosed in commentary characters (#):

```
156:      KS  =' ; # #DPS: TLN 0  DP AE '
168:      KS  =' ; # END  ' ;
```

The PLC will not interpret the parameter block in this format.

For this reason, overwrite the commentary characters directly preceding the block identifier ("DPS:") and the commentary character following the last SINEC L2-DP parameter with blanks:

```
156:      KS  =' ; #  DPS: TLN 0  DP AE '
168:      KS  =' ;   END  ' ;
```

Enter your parameters behind the "DPS:" block identifier.

Note the following:

- Enter an argument from Table 5.1 for the "TLN" parameter.
You have to overwrite the "0" following "TLN"; otherwise the PLC remains at STOP (when it receives default value "TLN 0").
- Be sure to maintain the sequence of the parameters in the parameter block; "TLN" before "DP AE". Also, you must be sure to enter the address identifiers following "DP AE" in the same order as in COM ET 200.
- Observe the rules for initializing DB1 parameters carefully (refer to the S5-90U/S5-95U System Manual, Section 9.4).

Transfer the edited DB1 to the S5-95U; this overwrites (i.e. replaces) the default DB1.

Set the PLC to RUN; the S5-95U then takes over the new parameters.

Note

Information on how to read out and interpret the DB1 parameter assignment error code is presented in Appendix A.

6 Sample Program for the S5-95U as SINEC L2-DP Slave

Figures

6-1	Program Structure	6 - 1
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6 Sample Program for the S5-95U as SINEC L2-DP Slave

This section provides more detailed information on the structure of the application program for an S5-95U used as SINEC L2-DP slave. Data is exchanged cyclically, without the use of Send or Receive requests. The initiative is always taken by the DP master. Data interchange over the SINEC L2-DP is independent of the S5-95U's cycle checkpoint.

Example:

An S5-95U is a DP slave node on the SINEC L2-DP bus. It receives data from and sends data to a DP master.

The Figure below shows the structure of the sample program.

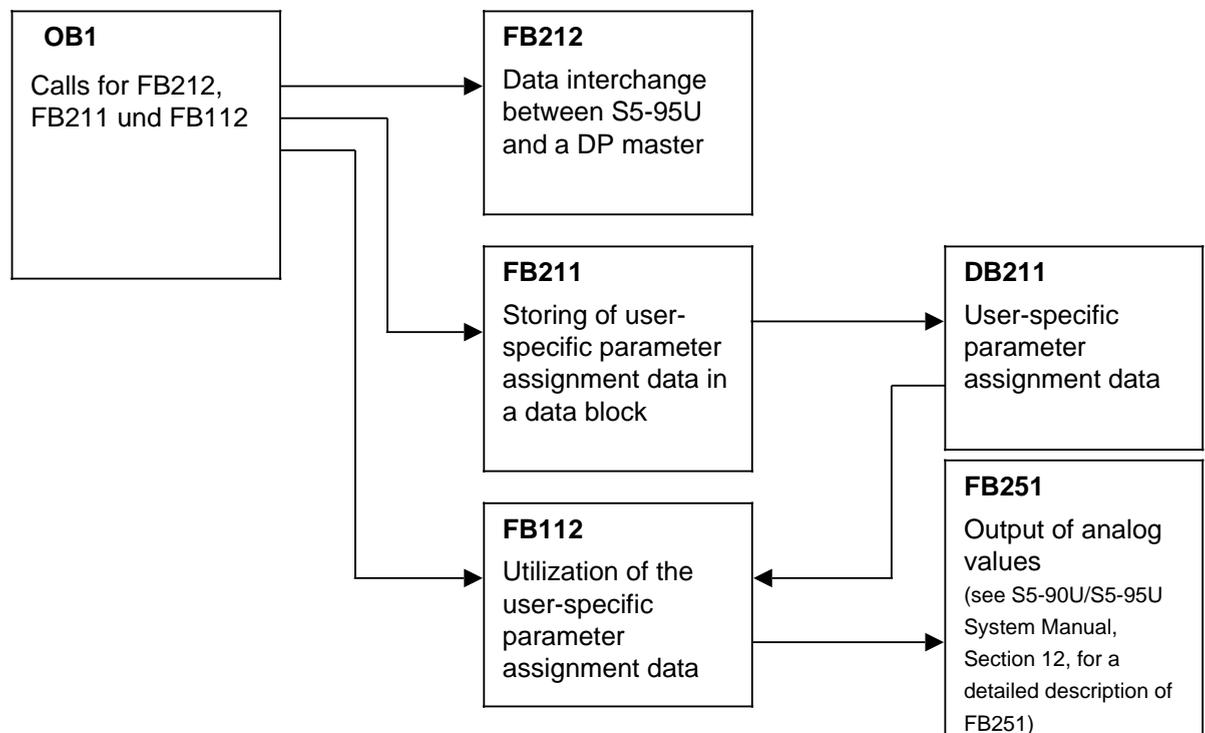


Figure 6-1. Program Structure

Cyclic program for the S5-95U as DP slave

Proceed as follows:

Configure and initialize the S5-95U as SINEC L2-DP slave as described in Chapters 4 and 5.

Generate DB211 with 20 data words.

Program the various blocks as described below.

Transfer blocks OB1, FB112, FB211 and FB212 to the S5-95U.

OB1	Description
<pre> :JU FB 212 Name :DP-TEST : :JU FB 211 Name :PARAM : :JU FB 112 Name :USER :BE </pre>	<pre> Call FB212 - Data interchange - Call FB211 - Store user-specific parameter assignment data - Call FB112 - Utilization of user- specific parameter assignment data - </pre>

FB112	Description
<pre> Name :USER : : : : :C DB 211 :L FW 120 :L DW 1 :+F :T FW 120 : :L DW 2 : :>F :JC =M001 :JU FB 251 Name :RLG:AA XE : FW 120 BG : KF +8 KNKT: KY 0,0 OGR : KF +10000 UGR : KF +0 FEH : F 110.0 BU : F 110.1 :BEA M001:L KH 0000 :T FW 120 :BE </pre>	<pre> Utilization of user-specific param. assignment data Function: Incrementing of an analog output until limit value is reached User-spec. PY: Bytes 1 and 2 = increment; bytes 3 and 4 = limit value Open DB for FB211 Initial value for analog output FW 120 is incremented by the value in DW1 PY 1 and PY 2 (e.g. 0014hex) and stored in FW 120 Load DW 2 (PY 3 and PY 4 = lim.val.) When FW 120 greater DW 2 (limit val., e.g. 1F40hex) then jump else jump to analog output (FB integrated in S5-95U) Initial value Onboard I/Os Channel no. / unipolar rep. Upper limit value (10 volts) Lower limit value (0 volts) Error indicator Overflow indicator END FW 120 is reset to 0000hex </pre>

FB211	Description
<pre>Name :PARAM : : :C DB 211 : : : :L PY 254 :T FY 104 :AN F 104.5 : : :BEC :AN F 104.3 : : :BEC : : :L PW 160 :T DW 1 :L PW 162 :T DW 2 :L PW 164 :T DW 3 :L PW 166 :T DW 4 :L PW 168 :T DW 5 :BE</pre>	<pre>Store user-specific parameter assignment data Function: Store first 10 user-specific parameter assignment bytes in a DB DB_for storing params Test: Startup completed? Parameter init. data available? Load STATUS FLAGS (Section 8.5.1) Store STATUS FLAGS Scan bit 5 of STATUS FLAGS If 0, DP master has not yet initiated startup procedures ==> Abort with BEC Scan bit 3 of STATUS FLAGS If 0, no user-specific parameter initialization data is available ==> Abort with BEC Startup o.k.; user-specific parameter initialization data is available Load user-spec. param. init. bytes 1 and 2 Store in DB 211, DW 1 Load user-spec. param. init. bytes 3 and 4 Store in DW 2 Load user-spec. param. init. bytes 5 and 6 Store in DW 3 Load user-spec. param. init. bytes 7 and 8 Store in DW 4 Load user-spec. param. init. bytes 9 and 10 Store in DW 5</pre>

FB212 (continued)	Description
:	VARIANT 2: Data preparation, e.g. L KH xxxx
:L KH 5566	Value 5566hex is transferred to
:T PW 136	PW 136
:L KH 7788	Value 7788hex is transferred to
:T PW 138	PW 138
:	
:	S5-95U RECEIVES FROM MASTER
:	Pre-scan ERROR FLAGS
:	(validity for Receive data)
:	
:L PY 255	Load ERROR FLAGS
:T FY 105	Store ERROR FLAGS
:A F 105.4	Scan bit 4 of the ERROR FLAGS; if = 1,
:	Receive data is invalid
:BEC	==> Abort with BEC
:	
:	S5-95U is correctly initialized and configured,
:	and the Receive data is valid
:	
:	Evaluate BIT INFO
:L PY 128	Load PY 128 (PY 128 ==> addr. 5700hex)
:T FY 128	Transfer PY 128 to FY 128
:A F 128.7	Status of bit 7 is shown
: = Q 32.7	at ONBOARD output Q 32.7
:	
:	Evaluate BYTE INFO
:L PY 129	Load PY 129
:L FY 128	Load FY 128
: !=F	Compare data and
: = Q 32.6	show result at output Q 32.6
:	
:	Store WORD INFO
:L PW 130	Load PW 130 and
:T FW 130	store in FW 130
:	
:	Save ALL RECEIVE DATA
:L KH 571F	Load source addr. PY 159
:L KH 619F	Load dest. addr. FY 159
:TNB 32	Transfer 32 bytes from the source
:	(PY 159, 158...128) to the dest. (FY 159, 158...128)
:	PY 159 => FY 159; PY 158 => FY 158, and so on
:BE	

After transferring the sample program to the S5-95U, you must put the S5-95U into operation on the SINEC L2-DP bus. The necessary procedures are described in detail in Chapter 7.

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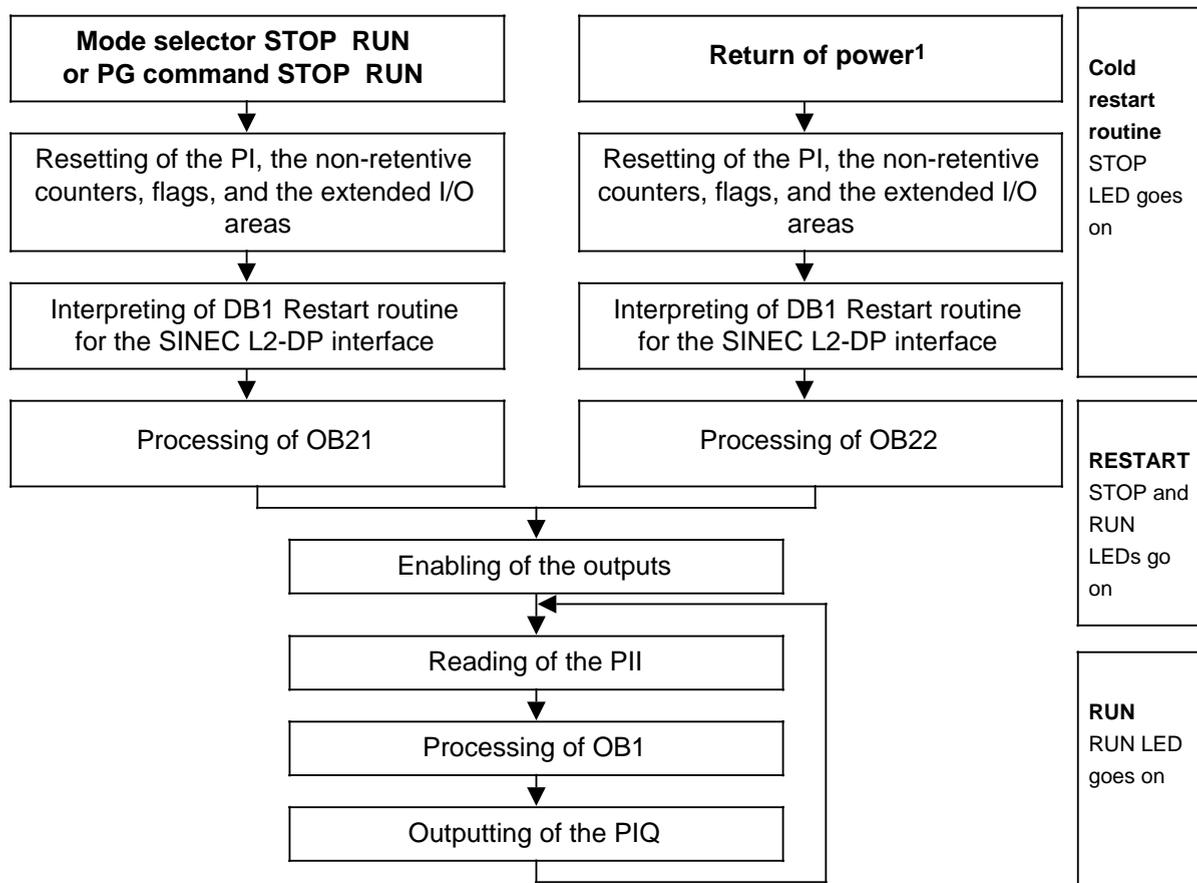
7 Putting the PLC Into Operation

This section covers the following:

- Restart characteristics of the S5-95U with SINEC L2-DP interface
- Putting the S5-95U into operation on the SINEC L2-DP bus

7.1 PLC Restart Characteristics

The diagram below illustrates the S5-95U's Restart routine in schematic form.



1 If the PLC was at RUN at POWER OFF, the mode selector set to RUN on return on power, and the PLC is equipped with a backup battery. If there is no backup battery, the PLC must be equipped with a memory submodule fitted with the proper chip(s).

Figure 7-1. Restart Characteristics of the S5-95U on POWER ON/STOP RUN Transition

In the following, it has been assumed that DB1 has a "DPS:" parameter block, and that this parameter block has been correctly initialized. The SINEC L2-DP interface is then activated at the end of the cold restart routine (see Figure 7.1).

SINEC L2-DP restart or initial start

In the SINEC L2-DP's restart routine, user-specific data may be forwarded to the DP slaves as well as DP slave-specific data (configuring and parameter initialization data) (see Sections 3.5 and 4.4).

S5-95U restart following a switchover from STOP to RUN

The extended I/O area for outputs (EAQ) can be preset in the S5-95U's restart routine. This is done by programming restart OB 21 accordingly.

If not preset, the EAQ defaults to "0".

Note

It cannot automatically be assumed that the DP master will be able to retrieve the default data, as the PLC cycle and the DP cycle are asynchronous (see Section 3.2).

S5-95U STOP-to-RUN transition without editing of DB1 in the "DPS:" parameter block

Data interchange over SINEC L2-DP is possible without a new parameter assignment and configuring frame from the DP master.

S5-95U STOP-to-RUN transition with editing of DB1 in the "DPS:" parameter block

If you modified the "DPAE" parameter in the "DPS:" parameter block, the DP master must send a new, appropriate parameter assignment and configuring frame to the S5-95U.

If the configuring data defined in the DP master with COM ET 200 is identical to the data in the S5-95U's DB1, data can be exchanged with the DP master (refer to Chapter 5).

If you change the station number in DB1, the DP master cannot address the S5-95U. You must therefore change the station number in the DP master with COM ET 200 as well.

Any other parameter changes in DB1 have no bearing on the interchanging of data over the SINEC L2-DP bus.

S5-95U STOP

The DP master can only request all diagnostic info for SINEC L2-DP from the S5-95U.

7.2 Information on Configuring and Installing the Product

The following section contains generally applicable information on configuring and startup procedures for a system which includes programmable controllers.

Since the product and the purpose it serves is normally only a part of a larger system or installation, the information presented here should be regarded as a guideline for the safe integration of the product into the environment in which it is to serve.



Warning

- The applicable safety and accident-prevention regulations for a specific application must be observed.
- When stationary equipment without all-pole disconnect and/or fuses is involved, a disconnect or fuse must be included in the building services and connected to a protective conductor.
- In the case of devices that are to be operated with mains voltage, care must be taken that the rated voltage range coincides with that of the local mains voltage before those devices are put into operation.
- When a 24 V supply is used, care must be taken that there is electrical separation of extra-low voltage. Use only power supply units to IEC 364-4-41 or HD 384.04.41 (VDE 0100 Part 410).
- Fluctuations or deviations of the mains voltage from its rated value must not exceed the tolerance limits given in the Technical Specifications, as otherwise failures and hazardous conditions in the electrical modules/equipment cannot be excluded.
- Precautions must be taken so that a program interrupted by voltage dips or a power failure can be resumed in due order, but without even short-term occurrences of hazardous operating states. If necessary, an "Emergency STOP" must be forced.
- Emergency STOP equipment to EN 60204/IEC 204 (VDE 0113) must remain in force in all programmable controller modes. Deactivation of an Emergency STOP facility must not result in an uncontrolled or undefined restart.
- Connecting cables and signal leads must be installed in such a way that neither inductive nor capacitive interference can impair the automation functions.
- Automation equipment and its control elements must be installed so as to provide sufficient protection against unintentional actuation.
- As regards I/O interfacing, appropriate safety measures must be taken at both the hardware and software level to ensure that a line or wire break on the signal side cannot lead to undefined states in the automation equipment.

7.3 Prerequisites for Putting the S5-95U Into Operation as SINEC L2-DP Bus Node

It has been assumed that an S5-95U will be interfaced to an existing SINEC L2-DP bus system.

Hardware prerequisites

- An S5-95U programmable controller
- An EPROM or EEPROM memory submodule or a backup battery
- A bus connector or bus terminal with SINEC L2 bus cable to a DP master and to other DP slaves, if any
- A programmer with monitor

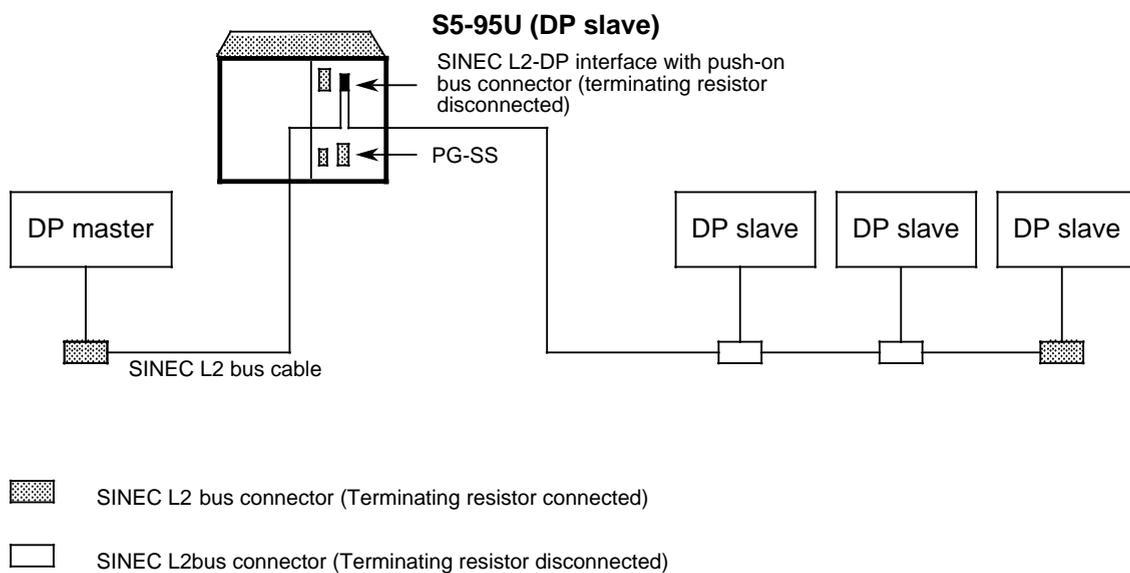


Figure 7-2. Connecting the S5-95U's SINEC L2-DP Interface to the Bus System

Software prerequisites

Assignments which must be made in COM ET 200 (for the DP master):

- S5-95U station number
- S5-95U address identifiers (see Chapter 4)

Parameter assignments which must be made in the S5-95U's DB1:

- S5-95U station number
- S5-95U address identifiers (see Chapter 5)

7.4 Starting Sequence of S5-95Us as SINEC L2-DP Nodes

The following sequence is mandatory when placing S5-95U programmable controllers on the SINEC L2-DP bus:

- Switch on the power supply units of all S5-95Us
- Switch all S5-95Us from STOP to RUN

The DP master or PLC containing the DP master is switched on after the slaves. Startup procedures for the SINEC L2-DP as a whole are covered in detail in the "ET 200 Distributed I/O System" Manual. Please refer to that manual for additional information.

7.5 Steps Needed to Put the S5-95U Into Operation as SINEC L2-DP Bus Node

Proceed as follows for an S5-95U to be used as DP slave on the SINEC L2-DP bus:

- Put the PLC (not the L2-DP interface) into operation (as described in the S5-90U/S5-95U System Manual, Chapter 4).
- Put the SINEC L2-DP interface into operation as per the flowchart on the next page.

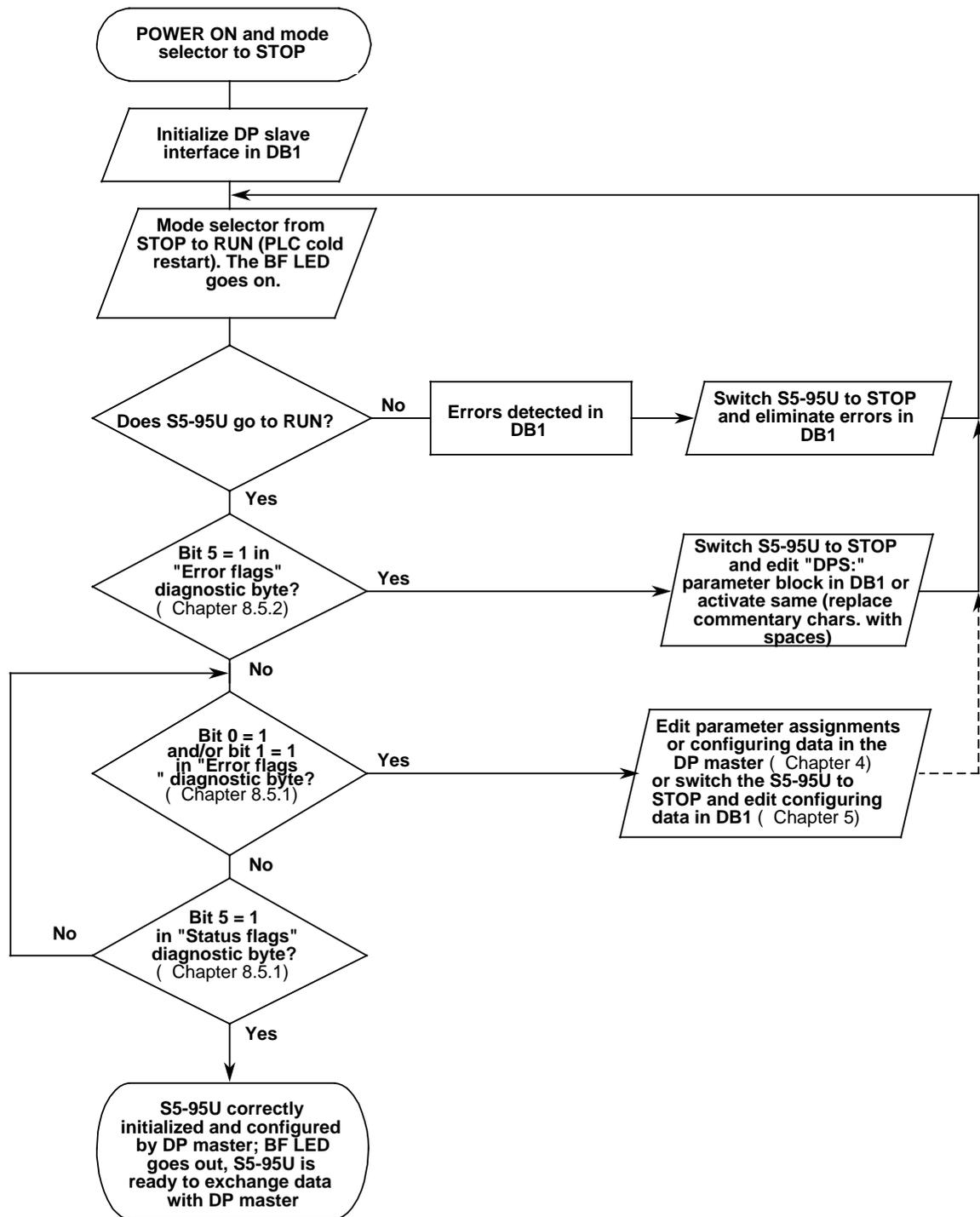


Fig. 7-3. Funct. Sequence for Putting the S5-95U Into Operation on the SINEC L2-DP Bus

As soon as the S5-95U is in RUN mode (see Figure 7.3), we would recommend testing it with COM ET 200. You will find the necessary procedures in Section 8.1.

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8 Testing and Diagnostics

This section covers the following:

- Available testing and diagnostic options
- How to test the S5-95U's SINEC L2-DP interface with COM ET 200
- How to diagnose the S5-95U's SINEC L2-DP interface in the DP master's application program
- What the BF LED on the S5-95U indicates
- How to diagnose the S5-95U's SINEC L2-DP interface in the S5-95U's application program, and
- How the S5-95U responds when the SINEC L2-DP interface fails

Overview of testing and diagnostic options

The table below lists all testing and diagnostic options for the S5-95U that are available to the user.

Table 8-1. Overview: Testing and Diagnostic Options for the S5-95U

Test/Diagnostic option	Description	Described in section
Test with COM ET 200	Current input and output data (from the DP master's viewpoint) are displayed in the COM ET 200 "STATUS/CONTROL" form. You can control the output data (S5-95U Send data).	8.1
Error diagnostics with COM ET 200	Up to four diagnostic messages can be displayed in plaintext per station.	8.2
Error diagnostics in the DP master's application program	The S5-95U provides the DP master with the following diagnostic info: <ul style="list-style-type: none"> • Station status (3 bytes) • Station number of the DP master (1 byte) • Vendor ID (2 bytes) • Sign-of-life from the S5-95U's boolean processor (1 byte) • Cause of STOP in S5-95U (2 bytes) • User-specific diagnostics (6 bytes) 	8.3.2 8.3.2 8.3.4 8.3.4 8.3.5
Function of the BF LED on the S5-95U	The BF (Bus Fault) LED is a group fault indicator	8.4
Error diagnostics in the S5-95U's application program	The following diagnostic info is available to the S5-95U as DP slave: <ul style="list-style-type: none"> • "Status flags" • "Error flags" 	8.5.1 8.5.2

8.1 Testing the S5-95U's SINEC L2-DP Interface with COM ET 200

The sequence of steps needed to test a DP slave S5-995U with COM ET 200 are discussed in detail in the following.

We would recommend that the test be performed when the S5-95U is put into operation on the L2-DP bus.

Prerequisites for the test

- A programmer with a CP 5410 S5-DOS/ST communications processor must be interfaced to the SINEC L2-DP bus system.
- The S5-95U must be in RUN mode and the SINEC L2-DP interface must be activated.
- You have "signed on" the programmer in the "ET 200 SYSTEM PARAMETERS" form ("PG on the bus: Y").

Proceed as follows to test the L2-DP interface with COM ET 200:

Screen COM ET 200's "STARTUP/TEST" form on the programmer's monitor (press function key <F5> in the "FUNCTION SELECTION" form).

Enter the station number (node address) of the S5-95U to be tested in the

Station number:

input field.

Confirm your entry with <F6> "STORE".

After issuing a prompt, COM ET 200 "connects up with" the S5-95U and initializes it.

Set the cursor to an input field and press <F5> "SELECT".

Press <F6> "STORE" to screen the "STARTUP/TEST:STATUS/CONTROL" form.

If it detects any discrepancies, COM ET 200 reports the error on the message line. In this case, you must either

- correct the data for the S5-95U in COM ET 200's "CONFIGURE" form (see Chapter 4) or
- correct the parameters in the "DPS:" parameter block in the S5-95U's DB1 (see Chapter 5).



Caution

If you attempt to put an S5-95U into operation or test it with COM ET 200 while the SINEC L2-DP bus is active, remember this: The station must not be controlled by the DP master as long as the programmer has access to that station. Attempts by the DP master to control the station could result in malfunctions and to dangerous system conditions!

The "STARTUP/TEST:STATUS/CONTROL" screen form is as follows:

```

Program file: TEST@@ET.200                                SIMATIC S5 / COM ET 200
STARTUP / TEST: STATUS / CONTROL
-----
Station number:   3                                     Stationstyp: AG95/L2 DP-Slave
Station ID:
Station status:

Slot:   0   ID: 211

Control -----
Outputs -----

Status -----
Inputs   KH = 0000 0000 0000 0000

-----


| F1 | F2 | F3 | F4 | F5 | F6    | F7   | F8   |
|----|----|----|----|----|-------|------|------|
|    |    |    |    |    | STORE | HELP | EXIT |


```

Figure 8-1. "STARTUP/TEXT:STATUS/CONTROL" Form

Press <F6> "STORE".

The input data for the DP master is requested and displayed in the "Inputs" column , or the output data is transferred cyclically to the S5-95U.

The function key menu changes:

F1	F2	F3	F4	F5	F6	F7	F8
					STOP		EXIT

Press <F6> "STOP" to "freeze" the screen, i.e. to stop updating of the input fields and/or controlling of the output data. The function key menu then reverts to its original form.

Press <F6> "STORE" to resume updating of the input fields and controlling of the output data.

8.2 Diagnosing Errors with COM ET 200

The COM ET 200 provides a "DIAGNOSTICS" screen form for error diagnostics.

Prerequisites for using the diagnostics functions:

- You have interfaced a programmer with CP 5410 S5-DOS/ST communications processor to the SINEC L2-DP bus.
- The S5-95U is in RUN mode and the SINEC L2-DP interface is activated.
- You have "signed on" the programmer in the "ET 200 SYSTEM PARAMETERS" form ("PG on the bus: Y").

Screen the "DIAGNOSTICS:OVERVIEW" form (press <F6> in the "FUNCTION SELECTION" form).

The "DIAGNOSTICS:OVERVIEW" form is displayed.

```

Program file: TEST@@ET.200                                SIMATIC S5 / COM ET 200
DIAGNOSTICS: OVERVIEW
-----
Station number: 1                Station type: DP Master / V 4.0
System ID:

Station number:
3

Aktiv

  F1  F2  F3  F4  F5  F6  F7  F8
-----
STATION INDIVID.                                EXIT
    
```

Figure 8-2. "DIAGNOSTICS:OVERVIEW" Form

COM ET 200 shows:

- The station number of the DP master (1st screen form line) and the DP master's system ID
 - The DP master's firmware version number
 - The station numbers of the DP slaves that have provided diagnostic data (in the center of the screen form)
- Press <F1> "STATION INDIVID."

8.3 Error Diagnostics in the DP Master's Application Program

General remarks regarding diagnostics

You can systematically localize and subsequently evaluate an error in the DP master's application program.

Table 8-2. Diagnostics Options in the Application Program

Diagnostic option	Description
"Overview"	Encompasses all stations from which diagnostic data is available
"Parameterization and contactability"	Encompasses all stations which have been initialized and are addressable
Station status	Provides information on the status of the slave station
Device-related diagnostics	Provides information on a particular slave station

Diagnostic options "Overview" and "Parameterization and contactability" can be used for all slave stations, and are therefore discussed in detail in the "ET 200 Distributed I/O System" Manual. "Station status" and "Device-related diagnostics" are special diagnostic options for the S5-95U, and are thus described in detail in the following sections.

In order to avoid confusion,

- the two diagnostic bytes comprising the diagnostic word are referred to as "diagnostic address" and "diagnostic address + 1", and
- the Load and Transfer operations refer to default diagnostic address 252 on the IM 308-B. (Parameter assignments for the IM 308-B in COM ET 200's "ET 200 SYSTEM PARAMETERS" screen form: Diagnostics: Y; Diagnostic address: 252; Paging: N)

Special features regarding diagnostics requests in "Page mode"

In the case of page addressing, the diagnostic word is located in the "base page". You must first "switch" to the base page number before you can request any diagnostics.

For detailed information on page addressing, please refer to the "ET 200 Distributed I/O System" Manual.

8.3.1 General Structure of the Diagnostics for the S5-95U

The station status and the device-related diagnostics are described in detail below, as these are typical for the S5-95U as DP slave.

Requesting diagnostics:

L KY (station number), (code)

Load station number: 3 to 125 and
code: 0 to 7

T PW 252

The station diagnostics request is then transferred to I/O word "Diagnostic address" (I/O word 252 in this case).

The IM 308-B now writes the diagnostic info into I/O word PW 252 ("Diagnostic address").

In order to evaluate the diagnostic info, you must transfer it to the application program using a Load operation. You will find comparable program examples in the descriptions of the individual diagnostic words in the following sections.

Sixteen bytes are reserved for each slave station for the station status (station status 1 to 3, station number of the DP master, and vendor ID) and the device-related diagnostics. These 16 bytes are combined into 8 words. These words have the following contents:

Table 8-3. Station Status and Device-Related Diagnostics

Code	Diagnostic address	Diagnostic address + 1
0	Station status 1	Station status 2
1	Station status 3	Station number of the DP master
2	Vendor ID	
3	Device-related diagnostics: Header	Device-related diagnostics: Sign-of-life from the S5-95U's boolean processor
4	Device-related diagnostics: Cause of STOP in S5-95U	Device-related diagnostics: Cause of STOP in S5-95U
5	Device-related diagnostics: User-specific diagnostics	Device-related diagnostics: User-specific diagnostics
6	Device-related diagnostics: User-specific diagnostics	Device-related diagnostics: User-specific diagnostics
7	Device-related diagnostics: User-specific diagnostics	Device-related diagnostics: User-specific diagnostics

8.3.2 Station Status and Station Number of the DP Master

The bytes "Station status 1 to 3" provide information on the slave station.

Requesting station status 1 and 2

L KY n, 0 The number of the slave station (n=station
 T PW 252 number) from which the station status is requested must be entered in the
 "Diagnostic address" byte;
 The code for "station status 1 and station status 2" (code = 0) must be entered in
 the "Diagnostic address + 1" byte

The IM 308-B then enters the requested information in I/O word "Diagnostic address".

Reading status 1 and status 2

L KH 0004
 L PW 252 Load diagnostic word
 ! = F No errors?
 BEC
 JC FBx Evaluate error in FBx

Diagnostic word "Station status 1 and 2", Code = 0

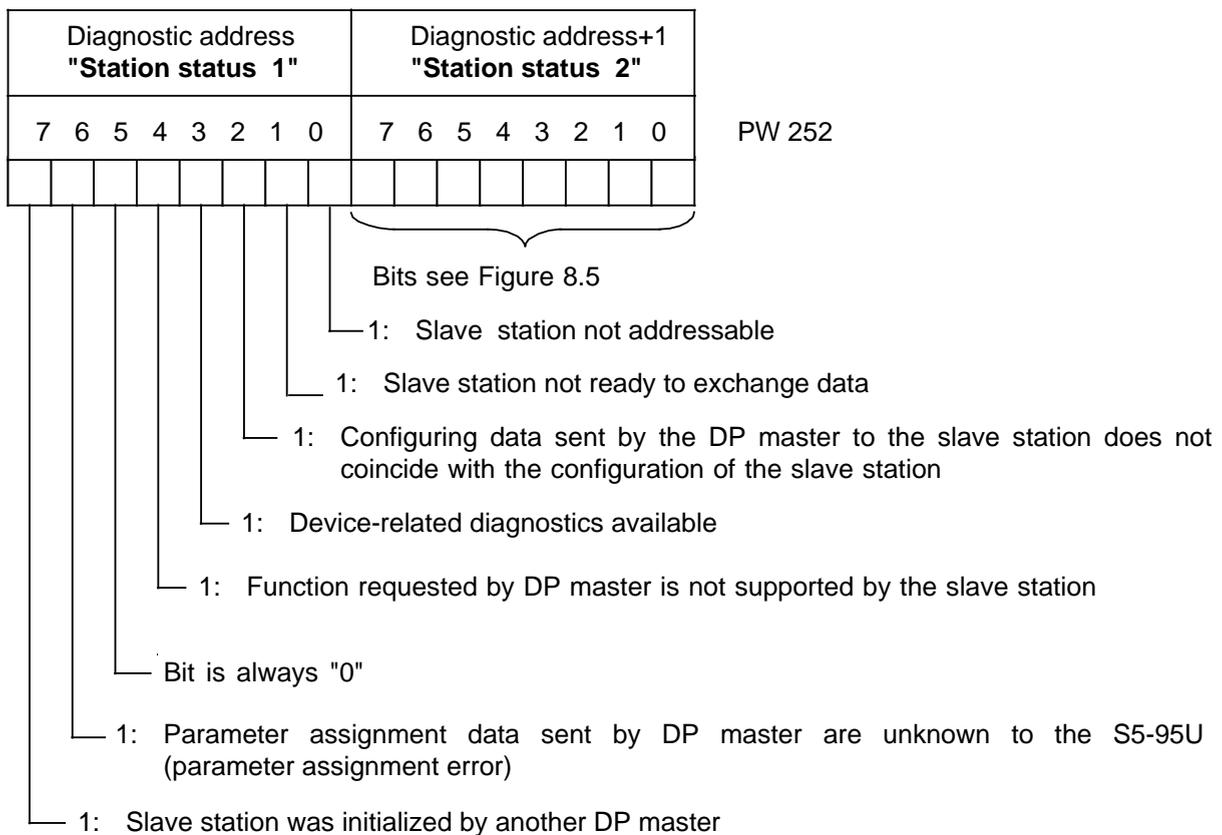


Fig. 8-4. Structure of the Diagn. Word Following a Station Status Request (Station Status 1)

Diagnostic byte "Station status 1 and 2", Code = 0

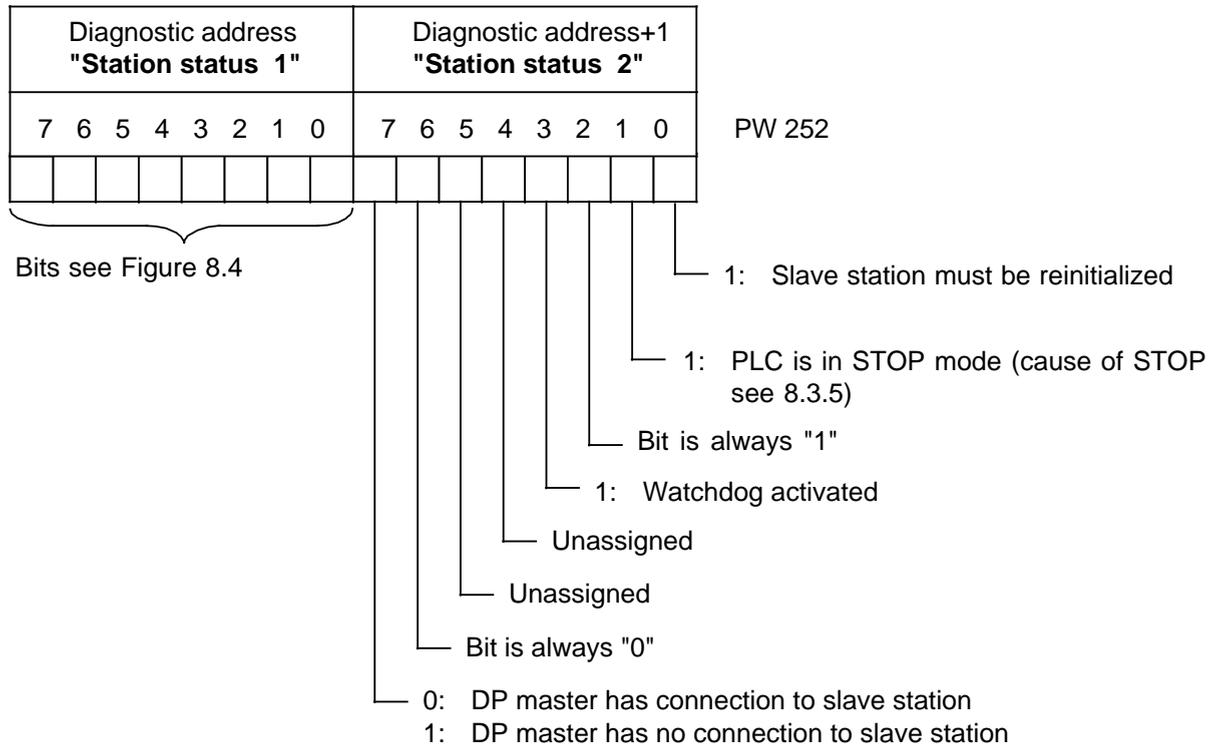


Fig. 8-5. Structure of the Diagn. Word Following a Station Status Request (Station Status 2)

Requesting station status 3 and the station number of the DP master

The byte "Station number of the DP master" contains the station number of the master station which initialized the slave station.

L KY n, 1 The number of the slave station (n=station
 T PW 252 number) from which the station status and the station number of the DP master is
 requested must be entered in the "Diagnostic address" byte;
 the code for "Station status 3 and station number of the DP master" (code = 1)
 must be entered in the "Diagnostic address + 1" byte.

The IM 308-B then enters the diagnostic info into I/O word "Diagnostic address".

Reading station status 3 and the station number of the DP master

L KH 0001 When the DP master's station number is 1
 L PW 252 Load diagnostic word
 ! = F No errors?
 BEC
 JC FBx Evaluate errors in FBx

Diagnostic word "Station status 3 and station number of the DP master", Code = 1

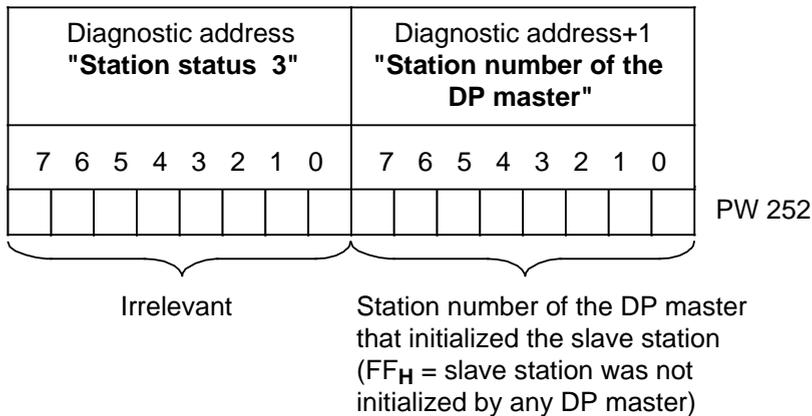


Figure 8-6. Structure of the Diagnostic Word Following a Station Status Request (Station Status 3 and Station Number of the DP Master)

8.3.3 Vendor ID

Requesting the vendor ID

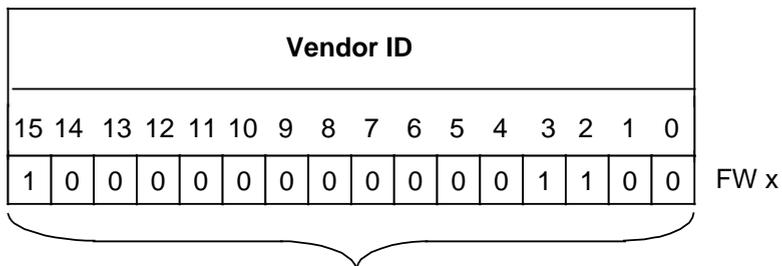
The "Vendor ID" byte contains the type of slave station.

L KY n, 2 Enter the number of the slave station (n= station number) whose vendor ID is being requested in the "Diagnostic address" byte, and the code for "Vendor ID" (code = 2) in "Diagnostic address + 1".
 T PW 252

Reading the vendor ID

L PW 252 The diagnostic word containing the "Vendor ID" is transferred to flag word FW x.
 T FW x

Diagnostic word for "Vendor ID", Code = 2



Vendor ID for S5-95U as DP slave (= 800C_H)

Figure 8-7. Structure of the Diagnostic Word Following a Request for the Vendor ID

8.3.4 Sign-of-Life From the S5-95U's Boolean Processor

Requesting a sign-of-life from the boolean processor

The byte "Sign-of-life from the boolean processor" shows the DP master whether or not the S5-95U's boolean processor has failed (refer to Section 8.6).

```
L KY n, 3      Enter the number of the slave station (n=
T PW 252      station number) from which the device-related diagnostics are requested in the
              "Diagnostic address" byte, and the code for "Sign-of-life" (code = 3) in
              "Diagnostic address + 12".
```

The IM 308-B then enters the diagnostic info in I/O word "Diagnostic address".

Reading the sign-of-life from the boolean processor

```
L KH 0AFF      Load diagnostic word
L PW 252      No errors?
! = F
BEC
JC FBx        Evaluate errors in FBx
```

Diagnostic word "Header" and "Sign-of-life from the boolean processor", Code = 3

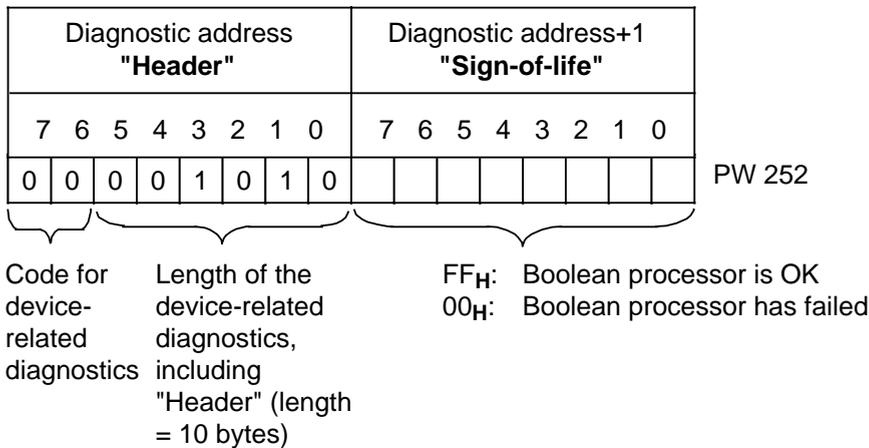


Fig. 8-8. Structure of the Diagn. Word Following a Request for "Header" and "Sign-of-Life"

8.3.5 Cause of STOP in the S5-95U

Requesting the cause of a STOP

The two bytes for "Cause of STOP in the S5-95U" provide information on the reason why the S5-95U went to STOP.

```
L KY n, 4      Enter the number of the slave station (n=
T PW 252      station number) from which the device-related diagnostics are requested in the
              "Diagnostic address" byte, and the code for "Cause of STOP" (code = 4) in
              "Diagnostic address + 1".
```

The IM 308-B then enters the diagnostic info in I/O word "Diagnostic address".

Reading the cause of a STOP

```
L KH 0000
L PW 252      Load diagnostic word
! = F        No errors?
BEC
JC FBx       Evaluate errors in FBx
```

Diagnostic word "Cause of STOP in S5-95U", Code = 4

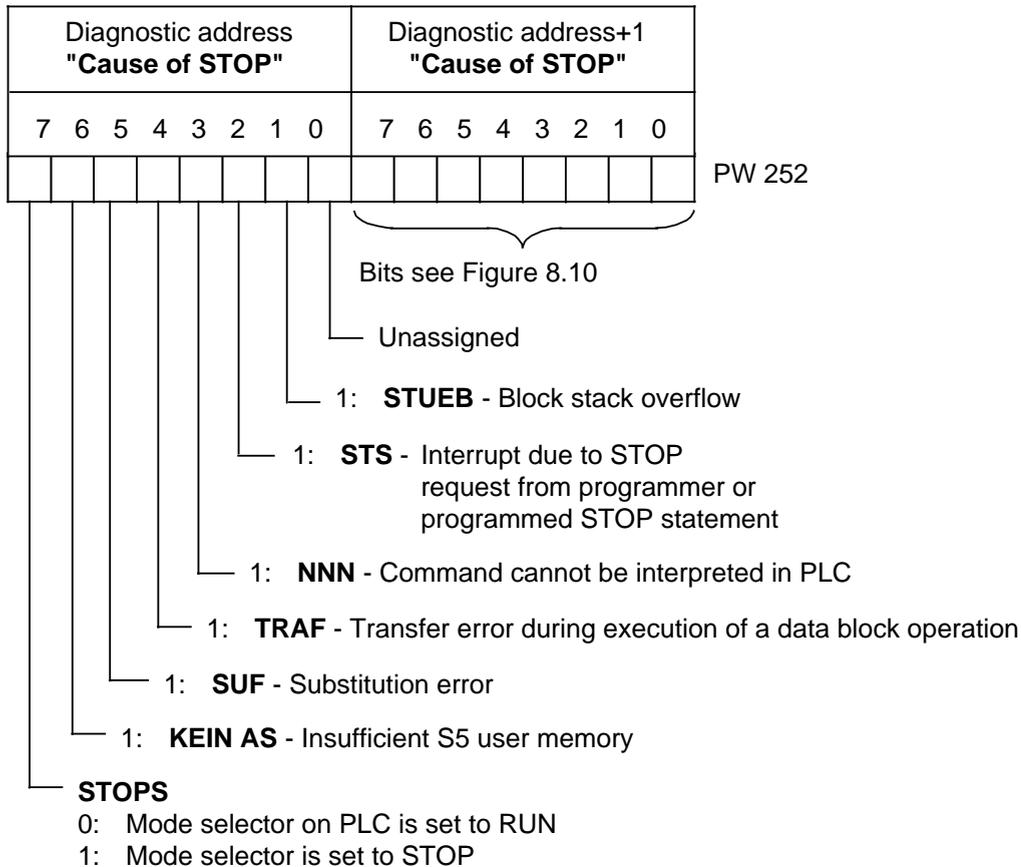


Fig. 8-9. Structure of the Diagn. Word Following a Request for "Cause of STOP" (Byte 1)

Diagnostic word "Cause of STOP in the S5-95U", Code = 4

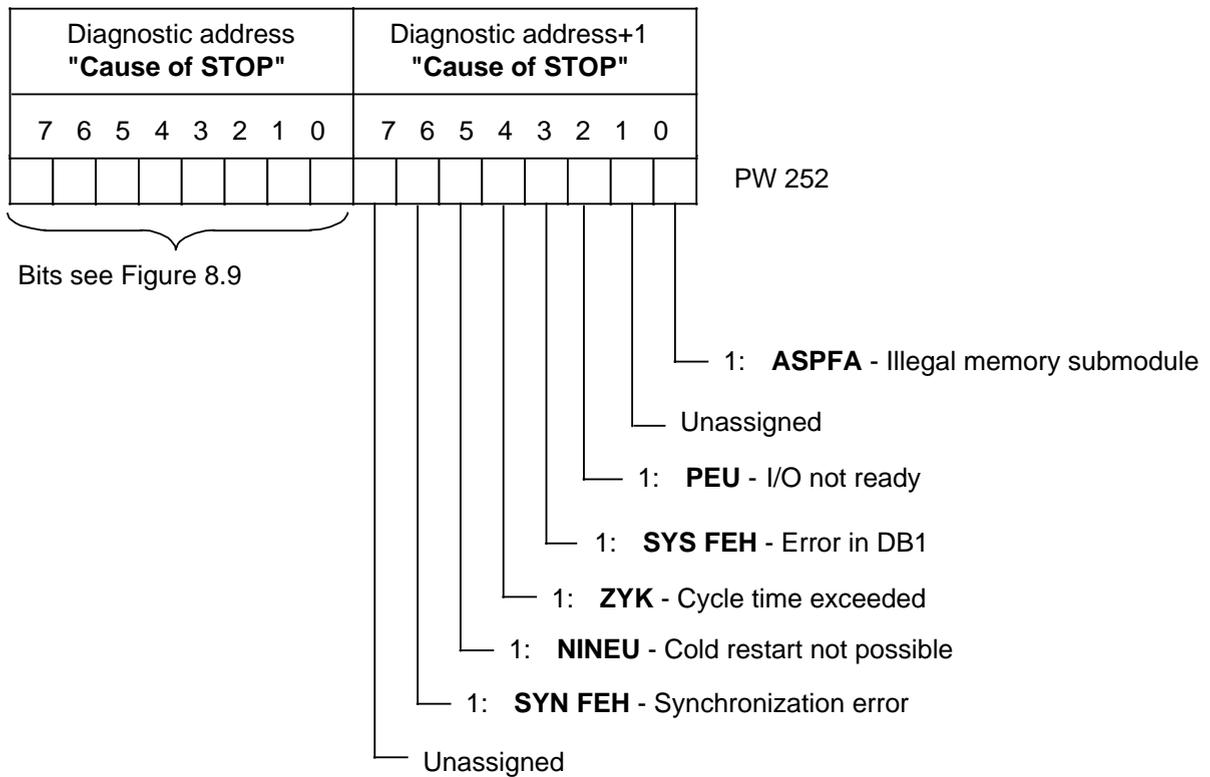


Fig. 8-10. Structure of the Diagn. Word Following a Request for "Cause of STOP" (Byte 2)

You will find detailed information on the various reasons for an S5-95U STOP in Chapter 5 of the "S5-90U/S5-95U Programmable Controller" System Manual.

8.3.6 User-Specific Diagnostics

You can make user-specific diagnostic data available to the DP master via your S5-95U application program.

Six bytes are provided for user-specific diagnostic data as per the PROFIBUS-DP draft standard (DIN 19245, part 3).

Forwarding user-specific diagnostic data to the DP master

The S5-95U's communications processor copies the user-specific diagnostic data, among other things, from the EAQ to its DP Send buffer at the S5-95U's cycle checkpoint (see Section 3.2).

The DP master fetches this data the next time the S5-95U is polled only if there have been changes in it since the last time the S5 was polled.

Evaluating the diagnostic data

The data can be evaluated

- in the application program of the CPU that is interfaced to the DP master or
- with the programmer's "STATUS" function

Requesting user-specific diagnostic data

L KY n, 5 Enter the number of the slave station (n= station number) from which the user-specific diagnostic data is requested in the "Diagnostic address" byte, and the code for "User-specific diagnostics" (code 5, 6 or 7) in "Diagnostic address + 1".

The IM 308-B then loads the diagnostics into I/O word "Diagnostic address".

Reading user-specific diagnostic data

L KH ... Load comparison value as per the user's specifications
 L PW 252 Load diagnostic word
 ! = F No errors?
 BEC
 JC FBx Evaluate errors in FBx

Terminating the user-specific diagnostic data

If the DP master is to receive no further user-specific diagnostic data, you must pad the 6 bytes with "0" in the S5-95U's application program.

L KF 0 Load "0"
 T PW 250 6 bytes of user-specific
 T PW 252 diagnostic data are set
 T PW 254 to "0"

Note

User-specific diagnostic data is automatically erased (i.e. padded with zeroes) when the S5-95U goes from STOP to RUN. For this reason, write your program so that the user-specific diagnostic data will be updated at the cycle checkpoint.

To maintain data consistency, you may never modify the user-specific diagnostic data in OB3.

8.4 Purpose of the BF LED on the S5-95U

The bus fault LED remains on until the DP master has correctly initialized and configured the S5-95U.

The BF LED lights up again if

- the S5-95U receives incorrect parameter initialization or configuring data from the DP master
- the watchdog in the S5-95U has expired or
- the S5-95U's communications processor has failed

The BF LED is described in more detail in the table below. The structure of the "Status" and "Error" diagnostic bytes can be found in Sections 8.5.1 and 8.5.2, respectively.

Table 8-4. The BF LED

BF LED goes on and ...	Description	Corrective measures
Bit 5 = 0 in the "Status" byte	DP master has not yet initiated startup procedures, i.e. no initialization /configuring frame has been received	Wait for DP master to initiate startup procedures
Bit 0 = 1 in the "Error" byte	Parameter assignment error, i.e. error in param. init. frame received from DP master	Change parameter values in the DP master (see the "ET 200 Distributed I/O System" Manual)
Bit 1 = 1 in the "Error" byte	Configuring error, i.e. configuring data sent by DP master does not coincide with "DPAE" parameter in DB1	Change configuring data in DP master (see Chapter 4) or change config. data in DB1 (see Chapter 5)
Bit 2 = 1 in the "Error" byte	Watchdog in S5-95U expired (see Section 8.6)	Check bus cable and DP master for defects
Bit 3 = 1 in the "Error" byte	S5-95U's communications processor has failed	Read system data word 101 (see Appendix D)
Bit 5 = 1 in the "Error" byte	"DPS:" parameter block not activated in DB1	Activate "DPS:" parameter block in DB1 (see Chapter 5)

8.5 Error Diagnostics in the S5-95U Application Program

Two bytes are provided in the S5-95U application program for diagnostics. These bytes are located in the extended I/O area for inputs (EAI).

- Diagnostic byte for "Status" at PY 254
- Diagnostic byte for "Errors" at PY 255

In the application program, you may only read these bytes; you may not modify them. The two diagnostic bytes must be linked into the S5-95U's application program using Load operations.

You may use the following operations, value ranges and data areas to access these bytes:

Table 8-5. Accessing Diagnostic Bytes of the S5-95U in the Application Program

Load from EAI	E.g. transfer to application prog.	Example	Description
L PY 254 ... 255/ L PW 254	T IB/QB/IW/QW/ PY/PW/FY/FW/ DL/DR/DW	L PW 254 T FY 210	I/O word 254 is transferred from the EAI to flag word 210 = diag. byte "Status"; flag byte FY 211 is the diag. byte for "Errors"

After the S5-95U's runup on the SINEC L2-DP, the following default values are set in the diagnostic bytes:

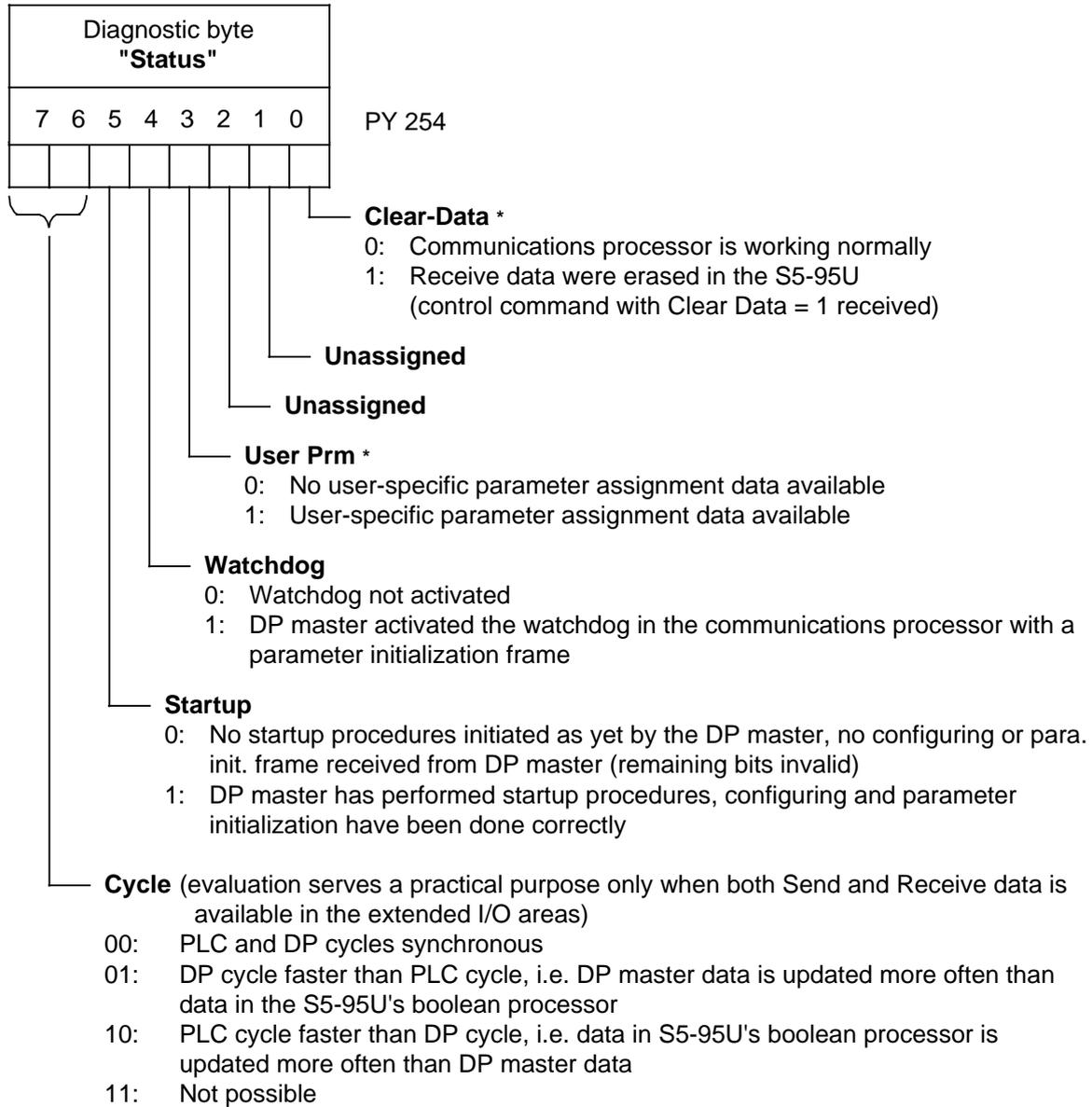
- "Status" byte 00_H= 0000 0000_B
- "Error" byte 10_H= 0001 0000_B

The diagnostic bytes are updated at the S5-95U's cycle checkpoint.

In Chapter 6 you will find a detailed sample program for an S5-95U as DP slave, including evaluation of the diagnostic bytes.

8.5.1 Diagnostic Byte for "Status"

Only when bit 5 = 1 in this diagnostic byte, i.e. when the S5-95U has been put into operation on the SINEC L2-DP, are the other "status" bits valid.



* Bit is reset at the next cycle checkpoint

Figure 8-11. Structure of the "Status" Byte

8.5.2 Diagnostic Byte for "Errors"

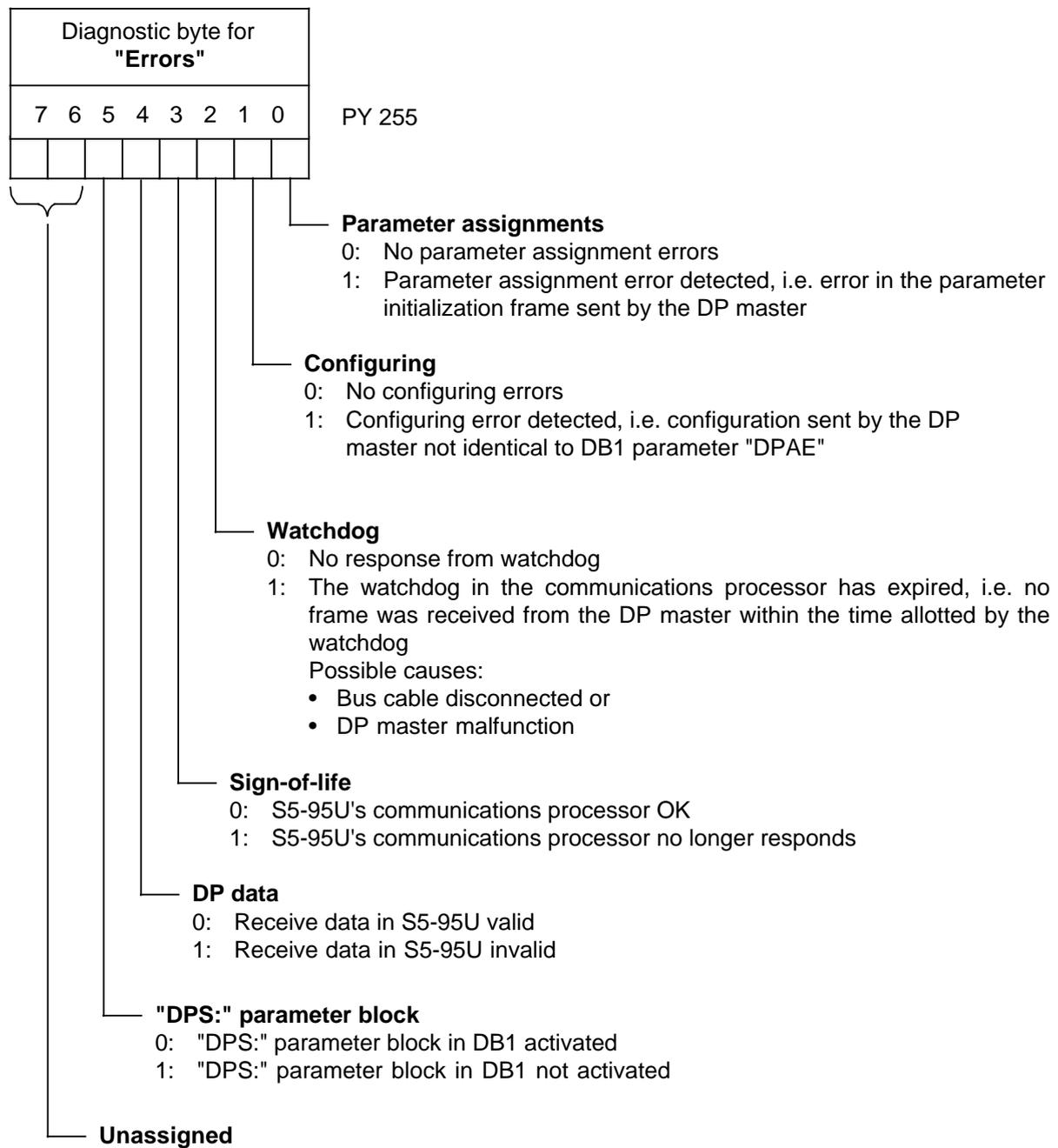


Figure 8-12. Structure of the Diagnostic Byte for "Errors"

8.6 PLC Failure Mode

As DP slave, the S5-95U provides the following failure monitoring mechanisms for evaluation:

- Sign-of-life watchdog for the S5-95U's boolean processor
- DP slave watchdog in the DP master

Sign-of-life watchdog for the S5-95U's boolean processor

Once the SINEC L2-DP interface has been activated, the S5-95U's communications processor starts a watchdog timer with an initial value of 0.5 s.

When 0.5 s have expired, the communications processor detects failure of the boolean processor and reports it to the DP master.

Special features:

- When the S5-95U goes from RUN to STOP, the watchdog timer is reset
- When the S5-95U goes from STOP to RUN, the watchdog timer is restarted
- The timer is retriggered at the cycle checkpoint (and when OB31 is invoked)

DP slave watchdog in the DP master

This watchdog timer is activated in the DP master with COM ET 200 for a SINEC L2-DP bus system (refer to the "ET 200 Distributed I/O System" Manual).

As DP slave, the S5-95U receives a parameter initialization frame from the DP master containing information as to

- whether the watchdog was activated and
- the initial value to be set by the PLC

If the timer was activated, it is started by the PLC.

Every frame sent by the DP master retriggers the watchdog timer.

Each new parameter initialization frame from the DP master can deactivate or modify the watchdog timer.

If the **timer expires**, bit 2 is set to 1 in the diagnostic byte for errors, indicating that no frame was received from the DP master within the allotted time.

Possible causes are:

- An interruption in the bus cable or
- A defect in the master

The Receive data in the S5-95U's extended I/O area is cleared, i.e. set to "0"; the S5-95U remains in RUN mode.

Appendices

- Appendix A DB1 Parameters and DB1 Parameter Assignment Errors
- Appendix B List of Abbreviations, Glossary
- Appendix C Accessories and Order Numbers
- Appendix D Technical Specifications, RAM Address Map and PLC Cycle Load Times
- Appendix E S5-95U Communications Matrix

A

DB1 Parameters and DB1 Parameter Assignment Errors

A DB1 Parameters and DB1 Parameter Assignment Errors

DB1 parameters for the SINEC L2-DP interface

Parameter	Argument	Description
Block identifier: DPS:		SINEC L2-DP interface
TLN	3 to 125	Station number of the S5-95U as DP slave
DPAE	16 to 63; 80 to 127; 144 to 191; 208 to 255	The following configuring data must be decimal-coded: <ul style="list-style-type: none"> • Data consistency • Data length format • S5-95U Send or Receive data? • Length of the data (Data coding procedures see Section 4.3)

DB1 parameter assignment errors for the SINEC L2-DP interface

DB1 parameter assignment errors can be evaluated in the form of an error code. To make this possible, you must specify where the error code is to be stored (i.e. in the flag area or in a data block) in DB1 parameter block "ERT:".

The high-order byte is used for error codes, a list of which is presented in the Table below. "15_H" is always entered in the low-order byte as error location for the DPS:SINEC L2-DP parameter block. Entry of the "ERT:" parameter is described in detail in the S5-90U/S5-95U System Manual.

Error codes from the DB1 interpreter (high-order byte in DW or FY)	Description
17 _H	SINEC L2-DP interface not operational
30 _H	Multiple definition of "DPS:" parameter block
60 _H	No "TLN" parameter, or no "TLN" argument
61 _H	No "DPAE" parameter, or no "DPAE" argument
63 _H	Length specification for Send or Receive data in "DPAE" parameter exceeds permissible range (> 32 bytes)
64 _H	Number of arguments following "DPAE" exceeds permissible maximum (> 32 bytes)
65 _H	Special identification format used (not allowed for S5-95U)

B

List of Abbreviations, Glossary

B List of Abbreviations, Glossary

Abbreviations used in the Manual	Description
BF LED	Bus Fault LED
CP	Communications processor
DP	Distributed I/O
DPAE	DB1 parameter for the SINEC L2-DP interface containing configuring data
DPS	DB1 block identifier for the SINEC L2-DP interface
EAI	Extended I/O area for inputs
EAQ	Extended I/O area for outputs
FO	Fiber optics
PI	Process image
PROFIBUS-DP	PROcess Field BUS (German process and fieldbus standard DIN 19245, Parts 1 and 3)
TLN	DB1 parameter for SINEC L2-DP interface specifying the station number of the S5-95U as DP slave on the SINEC L2-DP bus

Glossary

A

Active nodes When they have permission to send, these nodes can transmit data to and request data from other nodes (= DP master)

B

Baud rate Data signalling rate; defines the number of bits transmitted per second (baud rate = bit rate)

Bit rate The time required to transmit one bit (reciprocal value of the baud rate)

Bit-serial fieldbus system Bus system for use in the field in an automation network in which the information is forwarded in bit-serial mode (bit by bit) over the bus cable

Bus A common transmission path to which all nodes are interfaced

Bus cable Two-wire, twisted-pair, shielded cable for connecting the nodes

Bus connector Physical connection between bus node and bus cable

Bus node A device which can transmit and receive data over the bus

Bus segment The smallest operational unit of a bus system; a bus segment contains from 1 to 32 bus nodes; bus segments can be joined using repeaters

C

Cannon socket 9-pin socket to DIN 41652

Cannon plug 9-pin plug to DIN 41652

Communications processor Part of the programmable controller which handles frame traffic on the bus in parallel to the boolean processor

Configuration byte Byte used as aid for coding the characteristics of an S5-95U DP slave's Send and Receive data

Configuring data Contains the characteristics, in coded form, of the S5-95U's Send/Receive data for/from SINEC L2-DP, such as data consistency, length format, whether input or output data, and data length

Consistent data Data which belongs together and may not be separated

D

Data transmission Transaction on the transmission path (bus cable)

Distributed I/Os Input/output modules used by the CPU in a distributed rather than a centralized configuration; in SIMATIC, distributed I/O is synonymous with the ET 200 Distributed I/O System

E**ET 200**

Bus for interfacing distributed I/Os to the S5-115U to S5-155U programmable controllers or an adequate DP master; ET 200 is distinguished by its fast response times, as only small amounts of data (bytes) are transferred.

ET 200 is based on the PROFIBUS standard (DIN 19245, Part 1) and the PROFIBUS-DP draft standard (DIN 19245, Part 3).

ET 200 functions on the master-slave principle. Masters may be the master interface module IM 308-B or a host equipped with a CP 5480-DP communications processor.

Slaves may be ET 200B, ET 200C or ET 200U distributed I/Os and the S5-95U programmable controller with SINEC L2-DP interface or distributed I/Os equipped with an SPM module.

ET 200 distributed I/O system

In an ET 200 distributed I/O system, the distributed I/Os are

- S5-95U with SINEC L2-DP interface
- ET 200B
- ET 200C
- and
- ET 200U

Extended I/O area for inputs (EAI)

Special I/O area in the S5-95U used exclusively for storing Receive data from SINEC L2-DP. The Receive data in the EAI is linked into the S5-95U's application program using Load operations.

Extended I/O area for outputs (EAQ)

Special I/O area in the S5-95U used exclusively for storing Send data for SINEC L2-DP. Send data is entered in the EAQ via Transfer operations written in the S5-95U's application program.

F**Field level**

Hierarchical level in an automation network; field devices, sensors and actuators make possible the interchanging of information between controller and process

Field technology

All equipment outside the switchroom and within the domain of sensors and actuators

M**Master interface module**

Module for a distributed configuration. The master interface module IM 308-B "connects" the distributed I/Os to the PLC.

Master-slave principle

Bus access method in which only one node is active, while all other nodes are passive. Only the active node has permission to send, whereas the passive nodes may send data to the active node only when the latter requests them to do so.

N**Node address**

See Station number

P

Page addressing	Multiple use of the address space
Passive node	May interchange data with an active node only when the active node requests it to do so (= DP slave)
PROFIBUS	Process and field bus as defined in the PROFIBUS standard (DIN 19245, Part 1). The standard defines functional, electrical and mechanical properties for this bit-serial fieldbus system
PROFIBUS-DP	PROFIBUS-DP draft standard (DIN E 19245, Part 3) upon which the ET 200 distributed I/O system is based

R

Repeater	Resource for amplifying bus signals and for joining bus segments over long distances
Repeater adapter	Resource for hybrid configurations of RS 485 and fiber-optics technology

S

SINEC L2	Joins PROFIBUS-compatible programmable controllers and field devices at the cell and field level to form a local area network (LAN)
SINEC L2-DP	SINEC L2 with DP protocol; DP stands for distributed I/O
Station number	Every bus node is assigned a station number to enable precise allocation of Send and Receive requests. An S5-95U has a station number between 3 and 125, which is entered in DB1.

T

Terminating resistor	A resistance or resistance network for adapting bus cables. Terminating resistors are always needed at the ends of cables or segments.
-----------------------------	--

C

Accessories and Order Numbers

C Accessories and Order Numbers

		Order No.
S5-95U programmable controller with SINEC L2-DP interface		6ES5 095-8MD01
S5-90U/S5-95U System Manual with User's Guide S5-90U and S5-95U	German	6ES5 998-8MA12
	English	6ES5 998-8MA22
	French	6ES5 998-8MA32
	Spanish	6ES5 998-8MA42
	Italian	6ES5 998-8MA52
SINEC L2-DP Interface on the S5-95U Programmable Controller Manual		
	German	6ES5 998-8MD11
	English	6ES5 998-8MD21
	French	6ES5 998-8MD31
	Spanish	6ES5 998-8MD41
	Italian	6ES5 998-8MD51
Bus-specific accessories for RS 485 transmission technology		
SINEC L2/PG connecting cable	1.5 m	6XV1 830-1AH15
SINEC L2/PG connecting cable	3.0 m	6XV1 830-1AH30
SINEC L2 bus connector IP 20		6ES5 762-1AA12
SINEC L2 bus connector IP 20 with PG socket		6ES5 762-1AA21
SINEC L2 bus terminal RS 485	1.5 m	6GK1 500-0AA00
	3.0 m	6GK1 500-0AB00
SINEC L2 bus terminal RS 485 with PG port	1.5 m	6GK1 500-0DA00
SINEC L2 repeater for 24 V rated operational voltage, IP 20		6GK1 510-0AC00
SINEC L2 repeater for 24 V rated operational voltage, IP 65		6GK1 510-0AD00
SINEC L2 LAN cable (indoor)		6XV1 830-0AH10
SINEC L2 LAN cable (inground)		6XV1 830-3AH10
SINEC L2 LAN cable (drum)		6XV1 830-3BH10

		Order No.
Bus-specific accessories for fiber-optics technology		
SINEC L2FO bus terminal PF for plastic FO		6GK1 500-1AA00
SINEC L2FO bus terminal SF for glass FO		6GK1 500-1AB00
Active star coupler AS 501 A		6GK1 501-0AA00
Active star coupler AS 501 B		6GK1 501-0AB00
SINEC L2FO single-channel insert OPM		6GK1 501-1AA00
SINEC L2FO single-channel insert OSM		6GK1 501-1AB00
SINEC L2FO repeater adapter SF for glass FO		6GK1 510-1AA00
SINEC L2FO plastic connecting cable with HP connector	5 m	6XV1 830-4AH50
	10 m	6XV1 830-4AN10
	15 m	6XV1 830-4AN15
	20 m	6XV1 830-4AN20
	25 m	6XV1 830-4AN25

D

Technical Specifications, RAM Address Map and PLC Cycle Load Times

D Technical Specifications, RAM Address Map and PLC Cycle Load Times

Climatic conditions See S5-90U/S5-95U System Manual	Special SINEC L2 data (continued)
Mechanical conditions See S5-90U/S5-95U System Manual	Transmission protocol for layers 1 and 2 of the 7-layer model <p style="text-align: right;">To DIN E 19245, Part 3</p>
Electromagnetic compatibility, interference immunity See S5-90U/S5-95U System Manual	Access method Master slave, to DIN 19245, Part 1
Information on IEC/VDE safety regulations See S5-90U/S5-95U System Manual	Number of S5-95U DP slave nodes on the SINEC L2-DP - Total, max. 122 - For each segment, max. 31
Internal technical specifications See S5-90U/S5-95U System Manual Extension of the interrupt response time 0.75 ms Maximum PLC cycle load time in SINEC L2-DP mode (per program cycle) 0.75 ms	Transmission speed (stipulated by DP master) <p>9.6 kbaud 19.2 kbaud 93.75 kbaud 187.5 kbaud 500 kbaud 1500 kbaud</p>
Power supply (internal)	Data volume - Send data 1 to 32 bytes (made available to DP master) - User-specific diagnostic data 6 bytes (made available to DP master) - Receive data 1 to 32 bytes (from DP master) - User-specific parameter assignment data 1 to 25 bytes (from DP master)
Input voltage - Rated value 24 V DC - Permissible range 20 to 30 V Power consumption from 24 V - For the PLC typ. 280 mA - For full ext. I/O config. typ. 1.2 A Output voltage - V 1 (for external I/Os) +9 V - V 2 (for PG and SINEC L2-DP interf.) +5.2 V Output current - From V 1 1 A - From V 2 total 0.65 A - From V 2 for SINEC L2 interf. 0.1 A Short-circuit protection for V 1, V 2 (PG) Yes, electronic Short-circuit protection/overvoltage protection for V 2 (SINEC L2-DP interf.) Yes, fuse 250 mA, quick-acting Galvanic isolation No Safety class Class I Backup battery See S5-90U/S5-95U System Manual Mains buffering S5-90U/S5-95U System Manual	Integral blocks
Data specifically for onboard I/Os See S5-90U/S5-95U System Manual	Integral organization blocks - OB1 Cyclic program scanning - OB3 Interrupt-driven program scanning - OB13 Time-controlled program scanning - OB21 Restart routine (manual cold restart) - OB22 Restart routine (power recovery) - OB31 Cycle triggering - OB34 Battery failure - OB251 PID control algorithm
Special SINEC L2-DP data	Integral function blocks - FB240 Code conversion from BCD4 to 16-bit fixed-point - FB241 Code conversion from 16-bit fixed-point to BCD4 - FB242 Multiplier for 16-bit fixed-point - FB243 Divider for 16-bit fixed-point - FB250 Read analog value - FB251 Output analog value
Main processor 80C537 Communications processor V25+ with SPC (Siemens PROFIBUS controller) Bus cable Twisted, shielded two-wire cable Interface RS 485 Transmission method Bit-serial	

RAM address map in the S5-95U for the SINEC L2-DP interface

Absolute address	Address in EAI	Contents	Absolute address	Address in EAQ	Contents
5700 _H : : 571F _H	128.0 : : 159.7	Receive data (from DP master)	5780 _H : : 579F _H	128.0 : : 159.7	Send data (for DP master)
5720 _H : : 5738 _H	160.0 : : 184.7	User-specific parameter assignment data (from DP master)	57A0 _H . . .	160.0 . . .	Unassigned
5739 _H : : 577D _H	185.0 : : 253.7	Unassigned	57F9 _H . . 57FA _H	249.7 . . 250.0	
577E _H : : 577F _H	254.0 : : 255.7	Diagnostic bytes for "Status" and "Errors"	57FF _H	255.7	User-specific diagnostic bytes

System data area in the S5-95U for the SINEC L2-DP interface

Operating system data word 101 is relevant only when bit 3 in the diagnostic byte for "Errors" is "1" (see Section 8.5.2).

Address (hex.)	Operating system data	Description
5DCB _H	101	Critical internal operating system error in the S5-95U's communications processor. Please phone the error number through to your Siemens office! (RS 101 is "0" when no operating system error was detected).

Interrupt response time and PLC cycle load

Extension of the interrupt response time:

Because process interrupts cannot interrupt SINEC L2-DP processing, the interrupt response time is extended in a worst-case situation to 0.75 ms.

(For details on how to compute the interrupt response times without SINEC L2-DP, refer to the S5-90U/S5-95U System Manual, Section 10.4).

PLC cycle load:

The PLC cycle load is independent of the data volume transported over SINEC L2-DP, and is max. 0.75 ms per program cycle.

How the S5-95U influences response times in the ET 200 Distributed I/O System

The following is an addition to Appendix C in the "ET 200 Distributed I/O System" Manual. The Table below lists the base values for the S5-95U in dependence on the baud rate, as you require the baud rate to compute the transmission time t_{DP} for the SINEC L2-DP bus. The transmission time, in turn, is needed to compute the distributed I/O system's response time.

Values for computing the transmission time over the SINEC L2-DP bus t_{DP} :

Baud rate in kbaud	Base value I in ms (input data)	Base value Q in ms (output data)	Base value U in ms (input and output data)
9.6	23.67	17.67	28.67
19.2	9.84	8.83	14.33
93.75	2.48	2.21	2.92
187.5	1.47	1.23	1.48
500	0.531	0.403	0.645
1500	0.287	0.185	0.271

You must:

- multiply the number of S5-95Us serving as DP slaves on the SINEC L2-DP with the S5-95U base value
- add the number of bytes transported from/to S5-95U (max. 32 bytes of Send data and 32 bytes of Receive data) to the number of bytes transported in total in one data cycle.

An example for computing the transmission time t_{DP} can be found in Appendix C.2 of the "ET 200 Distributed I/O System" Manual.

Note

Delay times $t_{IM 318}$, $t_{p bus}$ and $t_{I/O}$ in the ET200 distributed I/O system are irrelevant for S5-95U.

E

S5-95U Communications Matrix

E S5-95U Communications Matrix

In the overview below you will find a list of devices with which the S5-95U can communicate over the SINEC L2-DP bus.

As all devices are under constantly continuing development, this list can reflect only the current standing (04/94).

Device/Module	Software required from startup to testing
Master interface module IM 308-B, version 5 (can be used in S5-115U/H to S5-155U/H PLCs)	COM ET 200, V 4.0 or higher
Host systems equipped with a CP 5480-DP, V. 2.0 or higher	COM ET 200, V 4.0 or higher
Non-Siemens programmable controllers with integral DP master interface module	COM ET 200, V 4.0 or higher
Programmiers equipped with a CP 5410 S5-DOS/ST communications processor	COM ET 200, V 4.0 or higher

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Federal Republic of Germany

From:

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Your Title:

Company Name:

Street:

City, Zip Code:

Country:

Phone:

Please check any industry that applies to you:

- | | |
|--|---|
| <input type="checkbox"/> Automotive | <input type="checkbox"/> Pharmaceutical |
| <input type="checkbox"/> Chemical | <input type="checkbox"/> Plastic |
| <input type="checkbox"/> Electrical Machinery | <input type="checkbox"/> Pulp and Paper |
| <input type="checkbox"/> Food | <input type="checkbox"/> Textiles |
| <input type="checkbox"/> Instrument and Control | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Nonelectrical Machinery | <input type="checkbox"/> Other |
| <input type="checkbox"/> Petrochemical | |

