SIEMENS

SIMATIC S5

Special Driver for CP524 / CP525-2 (S5-DOS)

STANDARD DATA LINK (RK512)
WITH PARAMETER ASSIGNMENT FACILITY
with 3964/3964R Procedure

Operating Instructions

Order No: 6ES5-897-2CB21-04

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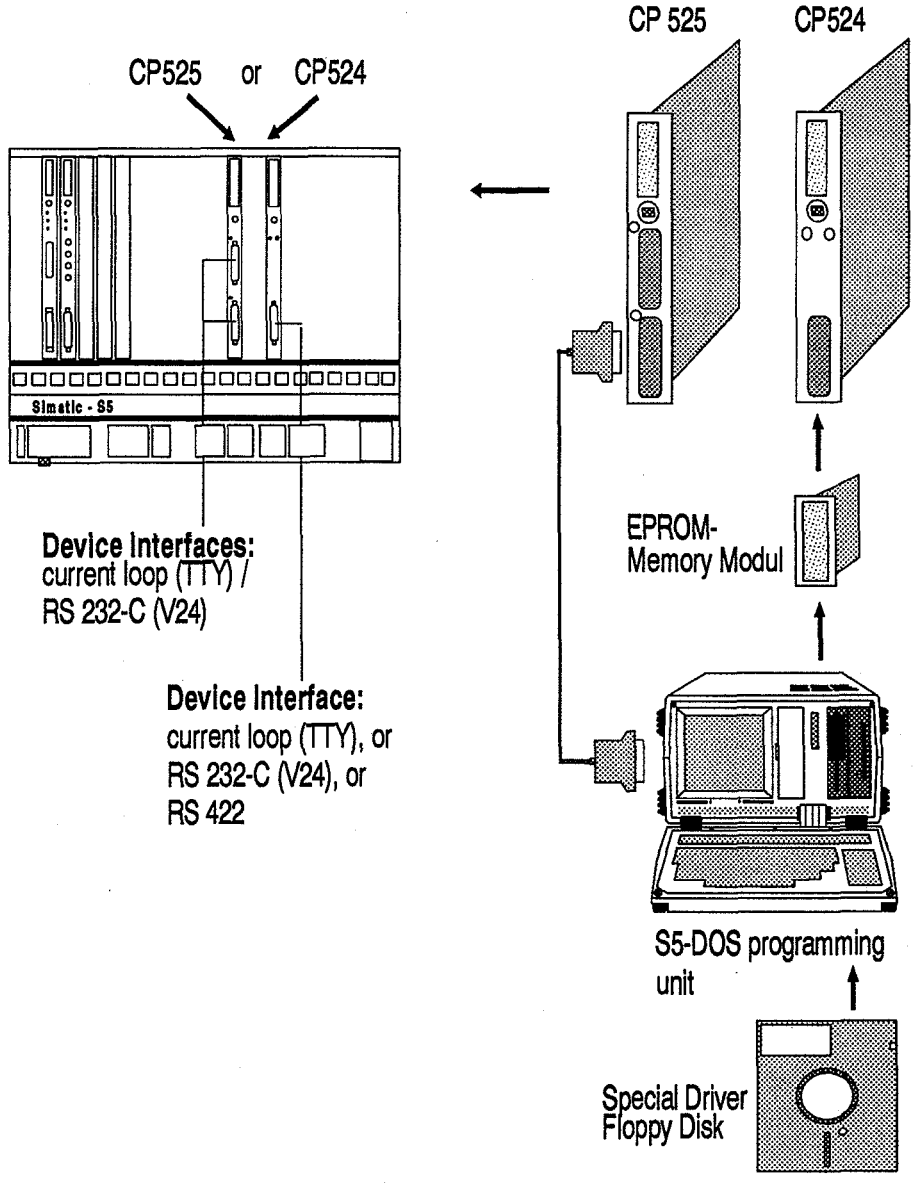
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1. Introduction

The special driver S5R00E is a standard data link with parameter assignment facility. 3964/3964R procedure, monitoring times, control characters and code transparency can be set using Job 189.
CP525-2 and CP524 can be used as communication processors.

Transmission is asynchronous, half duplex and is carried out on an RS232 (= V24), TTY (20 mA, current loop) or RS422 (CP524 only) interface. This driver does not evaluate control signals of the V24 interface.



2. Installation of Special Driver on PG

The library "COMLIBRE.525" is located on the supplied floppy disk which contains the special driver "S5R00E" consisting of interpreter and procedure.

I-S5R00E ⇨ interpreter
P-S5R00E ⇨ procedure

The installation of the driver is carried out on an S5DOS programming unit (e.g. PG685) preceded by the installation of the STEP5 base package as well as COM525 programming software.

Starting from Drive B: user level 0 the library "COMLIBRE.525" is copied on to the winchester drive user level 0 as follows: -

PIP B:=A:COMLIBRE.525[R]

Option R = copy check

To ensure the use of the special driver on all user levels, it is recommended to convert the library into a write protected system file by entering the following command:

SET COMLIBRE.525[SYS RO]

2.1 CP User Programs

Programs for CP525-2 and CP524 can only be created and processed using COM525 (S5-DOS version).

The CP525 module 6ES5 525-3UA11 (CP/M version) cannot be programmed using the S5-DOS-COM525; programs which were created using COM525 (CP/M86 version) cannot be processed by S5-DOS-COM525.

A conversion of the programs is not possible.

3. Creation of CP User Program

After the copying procedure the Simatic programming packages must be called by entering

S5

followed by placing the cursor into the "COM525..." line and selection of the COM525 programming software by using function key F1 "PACKAGE".

The COM525 basic mask appears on the screen.By using F1 "**SELECT PROGRAM**" the next step is to branch into the "PROGRAM SELECTION" mask.
After specifying hard disk "**B**" as the drive and inputting the **program name** enter component "**CL**" which stands for computer link.

3.1 Copy Procedure from Library to User Program

In order to copy from the library to the user program, call the **"TRANSFER" from FD to FD** function by using F1-F2-F5.

The "TRANSFER" mask must be filled in as follows: Source is drive "B" as well as the library name "**COMLIBRE**".
The user program chosen in the "PROGRAM SELECTION" mask is automatically entered as the destination.

3.1.1 Transfer of Interpreter

Use function key F3 in order to obtain the INTERPRETER transfer mask followed by F7 which superimposes the interpreter to be transferred "**I-S5R00E**" (component "CL") into this mask.

Function key F1 starts the transfer; the transfer end is indicated by the following message: "MESS.002": Completed!

F8 "EXIT" leads to the return into the "TRANSFER" mask.

3.1.2 Transfer of Procedure

Use function key F4 to obtain the PROCEDURE transfer mask.

HELP function F7 superimposes the procedure "**P-S5R00E**" to be transferred, F1 initiates the transfer.

After successful completion of the transfer, return to the "SELECTION" mask by pressing F8 "EXIT" twice.

3.2 Parameter Assignment of Procedure

Starting from the "SELECTION" mask, branch into the "PARAMETER ASSIGNMENT OF PROCEDURE" (ASSIGN PROC. PARA.) mask by pressing F6-F2.

The "PARAMETER ASSIGNMENT OF PROCEDURE" mask displays the procedure name "**P-S5R00E**" relating to the chosen program as well as the version number.

The baudrate for the data link can be specified in the input field "Baudrate". The input fields "character length", "parity" etc.may be assigned at random in accordance with the system configuration.

A T T E N T I O N !

When assigning values smaller 8 bit to the character length, please note that not all values can be transmitted completely!

For example, if a character length of 7 bit is selected, 7F H = 127 D is the greatest value that can be transmitted.
In this instance please ensure that there is no value greater 7F H to be transmitted in DB, that no DB greater 127 is used for SEND or FETCH jobs, and that a co-ordination flag (< 128) is always used.

This means that when programming a COM job block the greatest source / destination address and/or DB-No. is 127 D.
A co-ordination flag must be specified explicitly, because when skipping the relevant field in the COM mask the value FF H, FF H is assumed (to all CPU's; without co-ordination flag).
If a co-ordination flag is specified in the COM mask and the "CPU-No." field is skipped, the S5 header displays the identifier "to all CPU's" as CPU-No. 0.

The input field "PRIORITY" can be specified as "HIGHER" or "LOWER" and determines the priority in the event of an initialization conflict.

Use function key F6 to store the information.

3.3 Parameter Assignment of Job Block

It is not required to create a job block for Job 189 which is used for parameter assignment of the procedure. For information on job block programming for other jobs please refer to the detailed description in

COM525 Manual Volume 1
Register 7
Paragraph 2.

4. Loading of Special Driver into CP

The loading procedure of the special driver S5R00E is identical to the procedure used for Computer Link RK512.

The transfer of the user program into the CP525 and/or the programming of an EPROM module is described in detail in

COM525 Manual Volume 2
Register 4
Paragraph 3.2.2.

5. Initial Start of Special Driver

After power failure, warm or cold re-start of the central controller, the CP waits for the "SYNCHRON" handling function which initializes the interface between CPU and CP. This means that the "SYNCHRON" handling function must be called in the relevant organization block. After the synchronization it is required to call SEND-Direkt 189 (see 7. Parameter Assignment).

6. Transmission Procedure

Transmission is asynchronous, half duplex and is carried out either via an RS232 (= V24) or TTY (= 20 mA, current loop) or RS422 (CP524 only) interface. Control signals of the V24 interface are not evaluated.

The special driver S5R00E operates as a standard data link with the 3964 protocol (without BCC-characters) providing the central controller has not triggered special job number 189.

If the 3964R procedure (with BCC-character) is to be used and if the CP receives a message prior to special job 189 (during initial start) from the link partner, this message receives a positive acknowledgement and is replied to in accordance with 3964, which means without BCC-character. In order to avoid this, job 189 must be called immediately after SYNCHRON.

A description on the standard data link can be found in

COM525 Manual Volume 1
Register 7
Paragraph 5

7. Parameter Assignment of Data Link

Using a send job with Job Number 189 it is possible to parameterize **3964/3964R, monitoring times** and **control characters**.

This Send Direkt should be called after synchronization. The length must always be 10 DW, otherwise the job is rejected with error. A cyclically called SEND-ALL is also required for this job.

The job number 189 is reserved for initialization and cannot be used for anything else. It is not required to program a job block for it.

If no Send Direkt with Job Number 189 is triggered, or if value "0" is entered in the fields, the default values for Standard Procedure 3964 are used.

7.1 Structure of Initialization Data Block

DB (X)

Bit 15 ..... Bit 0

DW n	ZVZ		char. delay time in msec
DW n+1	QVZ		ack. delay time in msec
DW n+2	-	RTUZ	reac.mess. monitor. time in s
DW n+3	-	STARTZ	start character
DW n+4	QUIPOS	QUINEG	ack. char. (POS./NEG.)
DW n+5	BCCKEN	ENDKEN	with BCC / amount of end char
DW n+6	ENDZ1	ENDZ2	end characters (1^{st} / 2^{nd})
DW n+7	NAKTIM		time before NAK-ack. in msec
DW n+8	EWTIM		block repetition time in msec
DW n+9	WIEDZM	VERTIM	max. repetition time / delay time in msec

List of Standard Parameter Assignments

ZVZ = 220 ms	DW n	KF + 220
QVZ = 550 ms	DW n+1	KF + 550
RTUZ = 5 sec	DW n+2	KF +5
STARTZ = <STX> 02H	DW n+3	KH 0002
QUIPOS = <DLE> 10H QUINEG = <NAK> 15H 3964 (without BCC) with 2 end characters	DW n+4 DW n+5	KH 1015 KH 0002
ENDZ1 = <DLE> 10H ENDZ2 = <ETX> 03H	DW n+6	KH 1003
NAKTIM = 400 ms	DW n+7	KF +400
EWTIM = 4000 ms	DW n+8	KF +4000
WIEDZM = 5 without delay time VERTIM	DW n+9	KY 5,0

The standard QVZ (acknowledgement delay time) of the 3964R procedure is 2000 ms. The reaction monitoring time is baudrate dependent: 5 sec for baudrates of 19200 Bd to 1200 Bd; 7 sec for 600 Bd; 10 sec for 300 Bd; 20 sec for 110 Bd; 37 sec for 50 Bd.

7.2 Parameter Assignment of Times

The **character delay time "ZVZ"** monitors the arrival of characters on reception. This time is also used to wait for the start of data after the acknowledgement. It can be parameterized in intervals of milliseconds. The smallest value it can be set to, is 4 msec; in the event of a smaller value it reverts to the default value of 220 ms.

The **acknowledgement delay time "QVZ"** specifies the time which elapses whilst waiting for an acknowledgement character. It can also be parameterized in intervals of milliseconds. If a smaller value than 4 msec is entered in the initialization DB, it is set to 550 msec.

The **reaction message monitoring time "RTUZ"** monitors the reception of a reaction message. This time is started after transmission of the job and carries on running even in the event of repetitions or jobs from the opposite direction until a complete and correct reaction message is received. It can be parameterized in intervals of seconds and for values smaller than 3 it is set to 3 seconds.

The **NAK acknowledgement time "NAKTIM"** serves to delay the negative acknowledgement (NAK) to the request (STX) (means: no buffer free); such a delay may serve the purpose of gaining time for the processing of the last message without increasing the amount of repetitions unnecessarily. The time is set in intervals of milliseconds, for values smaller 4 msec the default value of 400 ms is used. This time must be shorter than the acknowledgement delay time of the link partner.

The **block repetition time "EWTIM"** is the time that elapses during reception when waiting for the reptition of the data after a negative acknowledgement. It can be set in intervals of milliseconds and for values smaller 4 msec it is set to the default value of 4000 ms.

The **Delay time "VERTIM"** delays the reactions to received control characters. Such a delay may be necessary for the link partner to convert from transmission of a character to reception. This delay time should only be used when the link partner has problems!
The time is started in the following cases:
- positive acknowledgement to STX,
- positive or negative acknowledgement to data,
- after DLE-reception prior to sending data,
- repetition (STX) after negative acknowledgement.

As a rule the time should be set to 0 (i.e. no delay time). The time can be set in intervals of milliseconds, ranging from 4 msec to 20 msec. In the event of values outside this range, no delay time is used.

7.3 Parameter Assignment of Acknowledgement Characters

The HEX-code for the **positive acknowledgement** is entered into the "**QUIPOS**" field. It is transmitted as the reponse to a start character providing there was no error, or as the response to a received message. The default value is <DLE> 10H.

The "**QUINEG**" field contains the code for the **negative acknowledgement** which is transmitted in the event of an error. The standard value is <NAK> 15H.

7.4 Parameter Assignment of Start and End Characters

The code of the **start character** is located in the "**STARTZ**" field. It is transmitted in order to establish the connection. The default value is <STX> 02H.

The **amount of end characters** is parameterized in the "**ENDKEN**" field. If "0" is entered, the transmission is carried out with both end characters "ENDZ1" = <DLE> 10H and "ENDZ2" = <ETX> 03H. If "1" is entered, only one end character is used. In this instance, only "ENDZ2" is evaluated. All other entries result in two end characters being used.
If the transmission is carried out with only one end character, the procedure is not code transparent !

The **first end character** "**ENDZ1**" is used for code conversion. If it appears in a data record, it is duplicated by the procedure. If the first end character is received twice, it results in the character being entered only once in the receive data block.

The "**ENDZ2**" field contains the **second end character**. The end character(s) are output after the useful data.

7.5 Parameter Assignment of Procedure Type

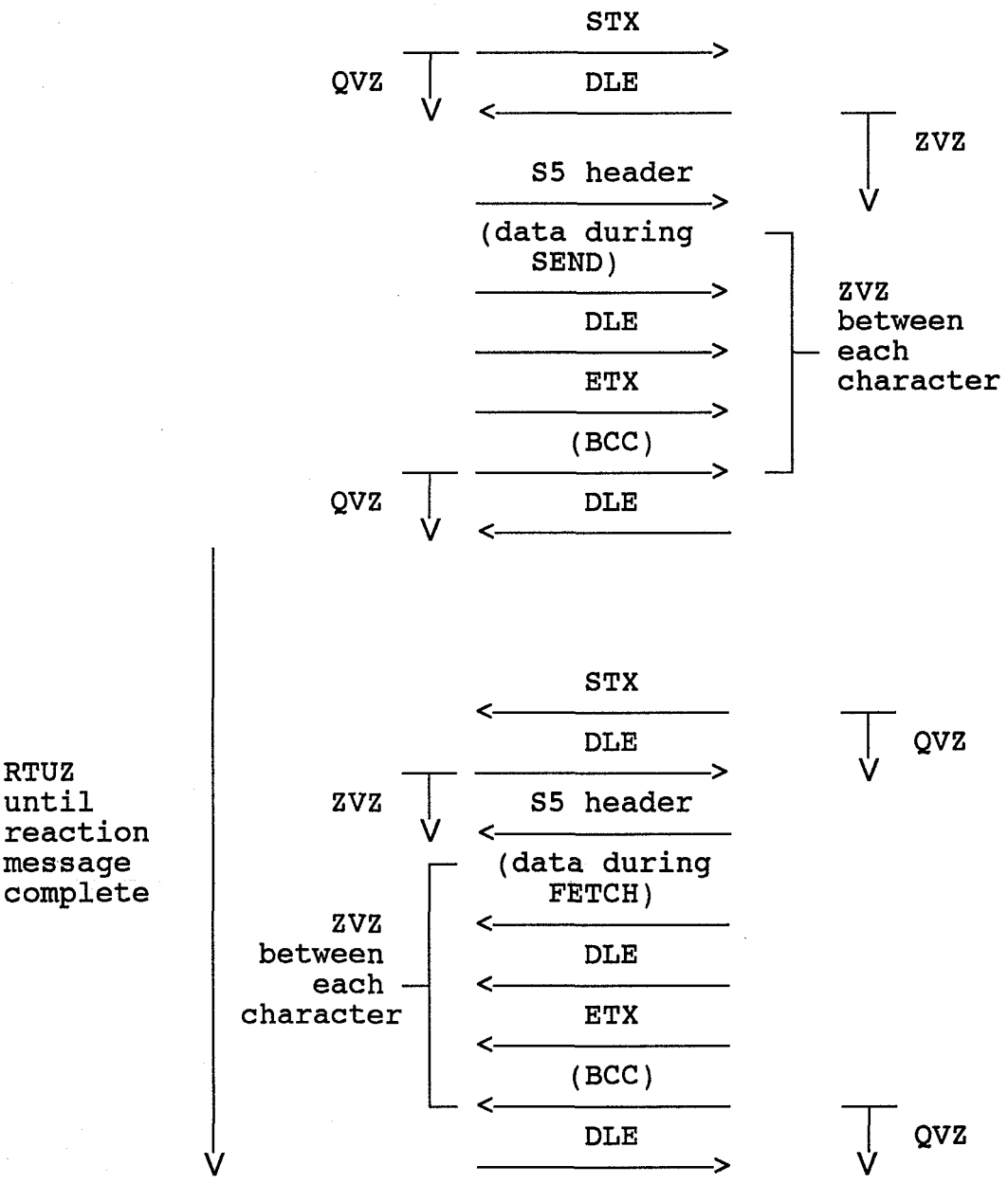
The "**BCCKEN**" field indicates whether the transmission should operate **with (3964R) or without (3964) block check character**.
If "0" is entered in this field, the transmission is carried out without BCC.
All other entries result in the transmission of the BCC after the end characters.
The BCC is generated by means of an XOR logic operation of all characters after the start character, inclusive of the end characters.

7.6 Parameter Assignment of Maximum Amount of Repetitions

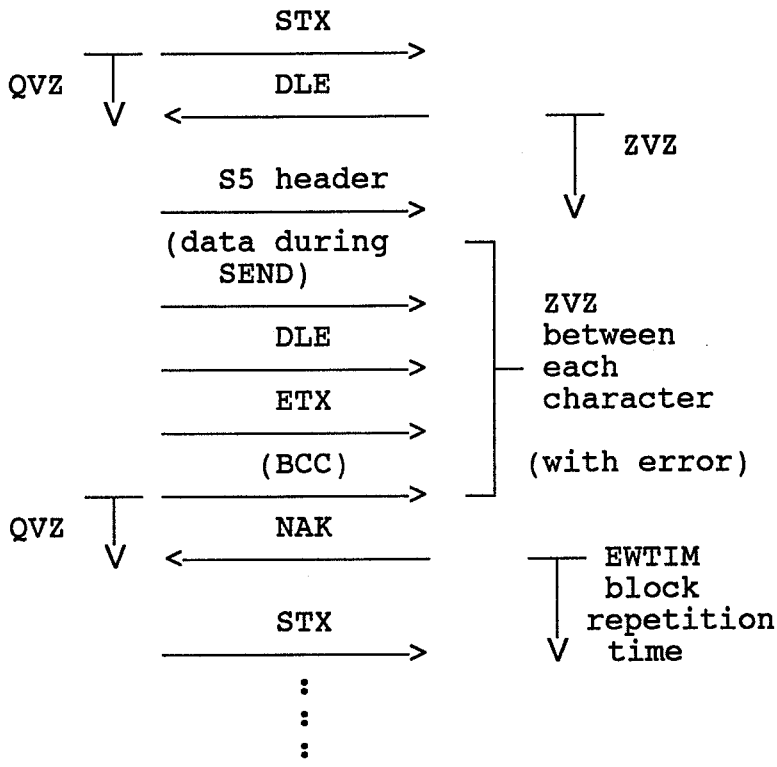
The standard **maximum amount of repetitions** is 5, it must only be changed at both link partners simultaneously. If "0" is entered in the field "**WIEDZM**", the standard value is in use.

7.7 Example of Data Link with Display of all Monitoring Times

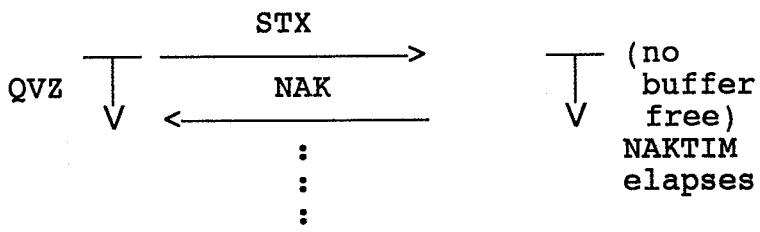
Data Transmission without Error:



Data Transmission with Error:



Data Link established with Error (no buffer free):



8 Error Handling

Errors occuring during operation of the special driver can be caused anywhere in the program.

Once the CP has recognized the errors, the CPU is advised as accurately as possible. The user determines what reaction by the CPU is required by programming the STEP5 user program on the CPU accordingly. For instance the user can have the job repeated or a flag set.

Errors are indicated by:

- the light emitting diode **LED** on the CP

- an error number in the **PAFE**-byte of the handling block

- an error number in the condition code word **ANZW** of the handling block

- an error number in error message area **SYSTAT**

Follow the above sequence when trying to locate an error. You will be able to interpret and correct the error by means of the error descriptions listed on the following pages.

8.1 Error Messages on LED's

The CP has a red light emitting diode for each interface which indicates the CPU status and driver status during the start-up phase.

The LED lights up when the driver has not yet been loaded on the interface, when no cold re-start has been carried out after loading, or when the switch on the CP is in the STOP/PGR position.

After start-up of the driver has been completed without error, the LED is cancelled. Message traffic can now proceed.

If a hardware error is recognized during the start-up phase, the LED is not cancelled. In this instance, and as long as the SYNCHRON has not been processed correctly, the SYSTAT entry can only be read via system commands or "enquiry address" on the PG.

8.2 Error Numbers in PAFE-Byte of Handling Block

The PAFE-byte is a parameter which is specified by the user when calling a handling block. The handling blocks indicate when substantial errors in connection with the CP have occured or parameters have been specified incorrectly. A detailed description of PAFE errors can be found in

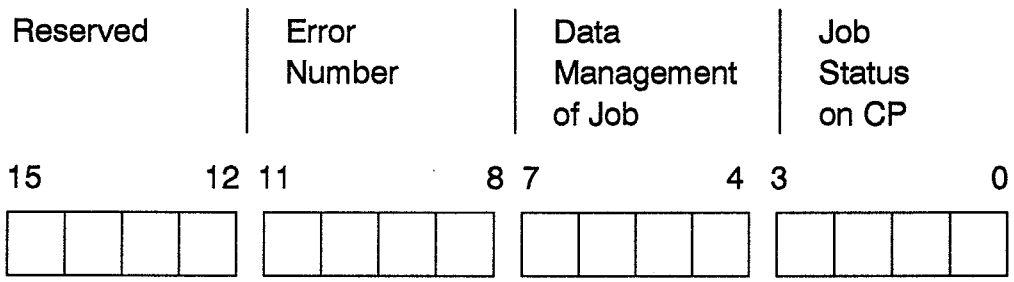
COM525 Manual Volume 2
Register 7
Para. 2.7.1.

8.3 Error Numbers in Condition Code Word ANZW

8.3.1 Assignment of Condition Code Word of Handling Block "SEND DIREKT"

Each job number of a "SEND" job defined in the CPU processor is allocated an individual condition code word (parameter ANZW). Using this condition code word it is possible to monitor processing of a job by the CPU processor and the CP.

Structure of the Condition Code Word



For the handling of bits 0-3, 4-7 and 12-15 please refer to the general description of the condition code word.

Meaning of Bits 0-3 for Job Status Display

Bit 0:		irrelevant for SEND Direkt
Bit 1:	job running	further jobs with the same A-NR are disabled by the CP ⇨ reset trigger flag
Bit 2:	job complete without error	data was sent to the link partner
Bit 3:	job complete with error	data could not be sent to the link partner ⇨ evaluate error number in bits 8 - 11 ; read SYSTAT

If an S5 output message could not be processed correctly, the reason for the error is displayed in **bits 8-11 of ANZW by means of an error number.**

IMPORTANT:
An error number is entered into the ANZW only when the error occured in connection with the processing of a Send-Direkt.

Each Send-Direkt completed with error is also entered into the SYSTAT area where the error situation is specified in more detail.

A detailed description of error numbers 1...F can be found in the

COM525 Manual Volume 1
Register 7
Para.8.

8.4 Error Numbers in SYSTAT Area

The error message area SYSTAT is a data area in the dual port RAM which may be read by the CPU by means of the special jobs **RECEIVE DIREKT 200** or **RECEIVE DIREKT 221**.

The error message area of SYSTAT comprises three error message bytes and one additional status byte for each interface.

For a detailed description please refer to

COM525 Manual Volume 1 (Issue 06)
Register 7
Para. 7.

All errors recognized by the CP are entered into the error message area of SYSTAT.
If the error in question is related to a "SEND DIREKT" job, an additional error number is entered into the condition code word.

Further possible error numbers are described in detail in the COM525 manual.

Error entries in the SYSTAT area are provided in such detail that it is especially useful for accurate fault diagnosis during the commissioning phase.
In the event of link problems during operation, it is highly recommended to read and evaluate the SYSTAT area.

8.4.1 Error Code in ANZW and SYSTAT for Parameter Assignment Errors

ANZW	SYSTAT	Reason for Error
7	25H	the length of the Send-Direct with Job Number 189 is not 10DW

9 Application Example

9.1 Numbers of Handling Blocks

Function		Central Processing Unit 115U	135U R-Proz. 155U	150U
SEND	✔	FB 244	FB 120	FB 180
RECEIVE	✔	FB 245	FB 121	FB 181
FETCH	✔	FB 246	FB 122	FB 182
RESET	✔	FB 248	FB 124	FB 183
CONTROL	✔	FB 247	FB 123	FB 184
SYNCHRON	✔	FB 249	FB 125	FB 185
SEN-A	✔		FB 126	
REC-A	✔		FB 127	

When used with special driver "S5R00E" the handling blocks marked with "✔" can be used in the S5 program in the form previously described.

The handling blocks "SYNCHRON", "SEND-Direkt", "SEND-ALL", "CONTROL" and "RECEIVE-ALL" are absolutely necessary for the operation of the driver. The handling blocks "RECEIVE-Direkt" with A-Nr 200 or 221 and "RESET-Direkt" with A-Nr 200 are absolutely necessary in order to read or delete SYSTAT.

9.2 User Program

The following pages illustrate an S5 user program for the 135U controller with R-processor.
The S5 program is an example only, it is not to be understood as a solution for customer specific problems.

```
OB20                                                    LEN=16
                                                        PAGE 1

SEGMENT   1
0000          :JU   FB 125      SYNCHRONIZE INTERFACE
0001   NAME:SYNCHRON
0002   SSNR:        KY  0,0
0003   BLGR:        KY  0,5      BLOCKING SIZE: 256 BYTE
0004   PAFE:        FY  1
0005          :AN   F   1.0      IF NO PAFE, TRIGGER
0006          :S    F  99.7      SPECIAL JOB "INIT-SEND"
0007          :BE
```

```
OB21                                                    LEN=16
                                                        PAGE 1

SEGMENT   1
0000          :JU   FB 125      SYNCHRONIZE INTERFACE
0001   NAME:SYNCHRON
0002   SSNR:        KY  0,0
0003   BLGR:        KY  0,5      BLOCKING SIZE: 256 BYTE
0004   PAFE:        FY  2
0005          :AN   F   2.0      IF NO PAFE, TRIGGER
0006          :S    F  99.7      SPECIAL JOB "INIT"
0007          :BE
```

```
OB22                                                    LEN=16
                                                        PAGE 1

SEGMENT   1
0000          :JU   FB 125      SYNCHRONIZE INTERFACE
0001   NAME:SYNCHRON
0002   SSNR:        KY  0,0
0003   BLGR:        KY  0,5      BLOCKING SIZE: 256 BYTE
0004   PAFE:        FY  3
0005          :AN   F   3.0      IF NO PAFE, TRIGGER
0006          :S    F  99.7      SPECIAL JOB "INIT"
0007          :BE
```

```
OB1                                                    LEN=50
                                                       PAGE  1

SEGMENT    1          0000
0000           :A     F  99.0      TRIGGER "SEND DIREKT"
0001           :JU    FB 120
0002    NAME:SEND
0003    SSNR:         KY  0,0
0004    A-NR :        KY  0,1
0005    ANZW:         FW  20
0006    QTYP :        KS  DB
0007    DBNR:         KY  0,20     SOURCE-DB = DB20
0008    QANF:         KF  +0       SOURCE-DW = DW0
0009    QLAE :        KF  +9       LENGTH = 9 WORDS
000A    PAFE :        FY  19
000B           :A     F  21.1      REMOVE TRIGGER
000C           :R     F  99.0      WHEN JOB RUNNING
000D           :***


SEGMENT    2          000E
000E           :JU    FB 126       "SEND ALL" - FUNCTION
000F    NAME:SEND-A
0010    SSNR:         KY  0,0
0011    A-NR :        KY  0,0
0012    ANZW:         FW  30
0013    PAFE :        FY  29
0014           :
0015           :JU    FB 127       "RECEIVE ALL" - FUNCTION
0016    NAME:REC-A
0017    SSNR:         KY  0,0
0018    A-NR :        KY  0,0
0019    ANZW:         FW  40
001A    PAFE :        FY  39
001B           :
001C           :***
```

```
OB1                                                          LEN=50
                                                             PAGE 2

SEGMENT    3          001D
001D            :JU    FB 123      CHECK SYSTAT-ENTRY
001E    NAME:CONTROL
001F    SSNR:          KY  0,0
0020    A-NR :         KY  0,200
0021    ANZW:          FW 120
0022    PAFE :         FY 119
0023            :A     F  121.0    IF ENTRY EXISTS
0024            :JC    FB  20      READ SYSTAT
0025    NAME:SYSTAT
0026            :***


SEGMENT    4          0027
0027            :A     F   99.7    TRIGGER "INIT-SEND-DIREKT"
0028            :JU    FB 120
0029    NAME:SEND
002A    SSNR:          KY  0,0
002B    A-NR :         KY  0,189
002C    ANZW:          FW 140
002D    QTYP :         KS DB
002E    DBNR:          KY  0,189   SOURCE-DB = DB189
002F    QANF:          KF  +0      SOURCE-DW = DW0
0030    QLAE :         KF +10      LENGTH = 10 WORDS
0031    PAFE :         FY 139
0032            :A     F  141.1    WHEN JOB RUNNING
0033            :R     F   99.7    REMOVE TRIGGER
0034    :BE
```

```
FB20                                                    LEN=36
                                                        PAGE  1

SEGMENT    1          0000
NAME  :SYSTAT

0005            :C     DB  4
0006            :O     F   0.0
0007            :ON    F   0.0       ABSOLUTE CALL
0008            :JU    FB 121        READ SYSTAT
0009    NAME:RECEIVE
000A    SSNR:          KY  0,0
000B    A-NR :         KY  0,200
000C    ANZW:          FW 120
000D    ZTYP :         KS DB
000E    DBNR:          KY  0,4
000F    ZANF :         KF  +0
0010    ZLAE :         KF  +2
0011    PAFE :         FY 119
0012    :***


SEGMENT    2          0013
0013            :L     KH 0000
0015            :L     DR  1
0016            :I=F                 SYSTAT FULL?
0017            :BEC
0018            :JU    FB 124        YES --> ERASE
0019    NAME:RESET
001A    SSNR:          KY  0,0
001B    A-NR :         KY  0,200
001C    PAFE :         FY 119
001D            :
001E            :BE
```

10 CP Information

Additional information regarding CP525-2 / CP524 and COM525 (connector pin assignment, COM525 handling etc.) may be found in the following manuals:

COM525
Programming Package for Communications Processors
CP524 and CP525 (S5-DOS)
Volumes 1 and 2

11 Notes