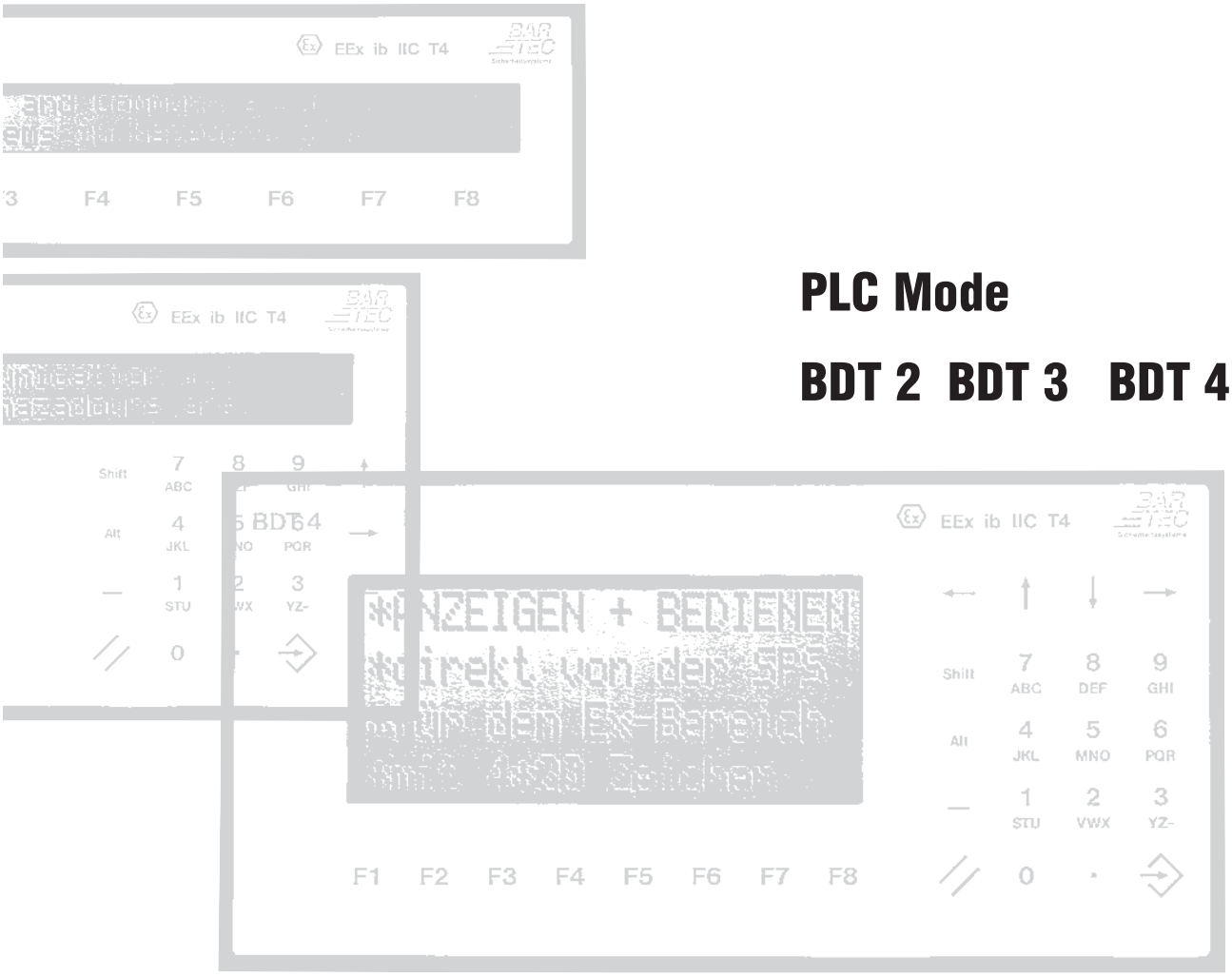


PLC Mode

BDT 2 BDT 3 BDT 4

Text display

Manual

Manual

PLC-Mode Version 2.1

Hardware: BDT 2 / BDT 3 / BDT 4

Firmware: PLC-Mode Version 2.1

Hardware: BDT 2 / BDT 3 / BDT 4

Editor and Copyright

BARTEC Components and Systems Gmbh

Much care has been taken in producing this manual.. However, BARTEC Gmbh does not assume responsibility for errors in this manual nor any resulting consequences. Likewise any liability is rejected, should the product be used incorrectly.

We have taken care to include correctly and completely all the necessary information for the successful installation, configuration, and operation of the displays in this manual. Should you require further information or find errors in this manual, please contact us.

Contents

Contents

Chapter 1 Introduction

1.1 General

The three BDT terminals available range from a simple 8 function Keypad to a 16 function keypad (four fold useable), with full alpha-numeric capability.

The terminals can be connected to a wide variety of PLCs using various standard protocols.

Each of the BDTs are programmed using the same software "PLCPLUS". The configurations for the single devices are exchangeable (ie messages written for a BDT4 can be transferred onto a BDT2).

The devices contain several different languages and standard system messages can be displayed in any one of these, as selected at the keyboard.

The BDT displays are multifunctional devices in a compact construction. They were developed particularly for industrial / hazardous area use and facilitate :

- **fault message display and acknowledgement**
- **operator guidance**
- **system status indication**
- **data collection**
- **system control**

System hardware summary

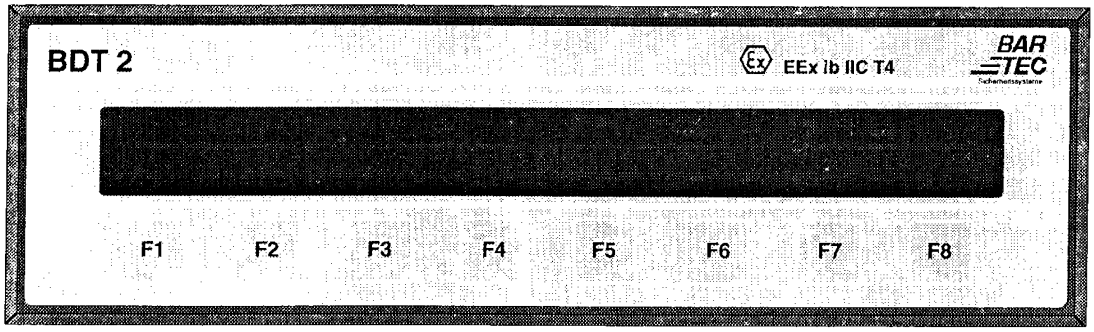
- High quality SMD - Surface Mount Technology
- High EMC (Electro-magnetic compatability)
- Highly legible displays in several dimensions
- Ingress protection IP 65 (frontside)
- Robust metal enclosure
- Simple installation into switchboards or enclosures
- Electrical connections via screw terminals and subminiature D-connectors
- Communication interface with opto coupler potential isolation
- Remote programming with PC via the communication interface
- Non-battery-buffered real time clock, which can be synchronised from the PLC.

1.2 General device specifications

The EExi displays BDT2, BDT3 and BDT4 are designed for use in hazardous areas. The protection method is intrinsically safe.

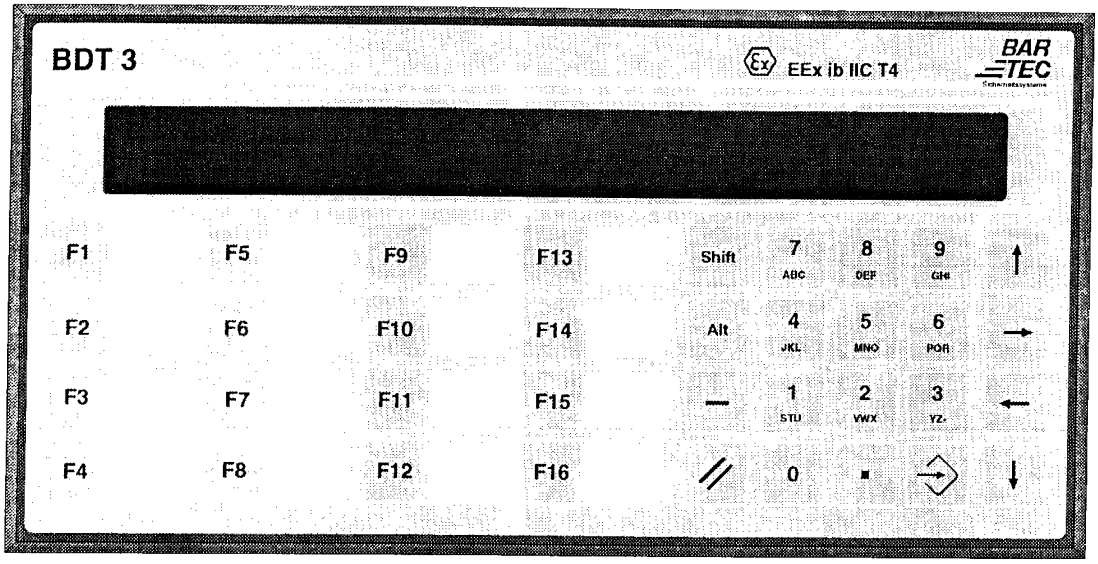
The display is supplied with a 12V DC intrinsically safe supply by the BSG2 interface. The data communication interface between the hazardous and the non hazardous area is via RS-422. When installing the apparatus you must take note of the conditions for safe use detailed on the certificate of conformity.

BDT 2



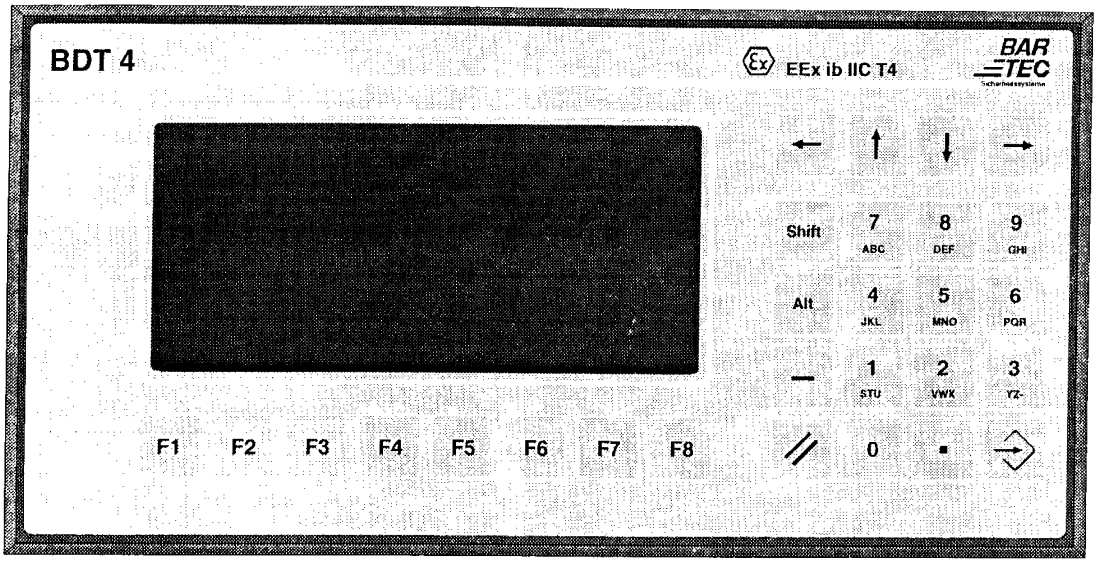
display :	LCD, supertwist, 2 x 40 characters character height 8mm
text memory :	32KByte in EEPROM
dimensions :	288mm x 84mm x 50mm
weight :	1 kg
interfaces :	V.24 or TTY switchable at the BSG2 front panel V.24 for programming with PC TTY for control
Keyboard :	8 function keys

BDT 3



display :	LCD, supertwist, 2 x 40 characters character height 8mm
text memory :	32KByte in EEPROM
dimensions :	288mm x 144mm x 50mm
weight :	1.2 kg
interfaces :	V.24 or TTY switchable at the BSG2 front panel V.24 for programming with PC TTY for control
Keyboard :	16 function keys (four fold useable) alphanumeric keypad with arrow keys

BDT 4



display :	LCD, supertwist, 2 x 40 characters character height 12mm
text memory :	32KByte in EEPROM
dimensions :	288mm x 144mm x 50mm
weight :	1.3 kg
interfaces :	V.24 or TTY switchable at the BSG2 front panel V.24 for programming with PC TTY for control
Keyboard :	8 function keys (four fold useable) alphanumeric keypad with arrow keys

1.3 Technical data

The BDT displays are seperated from the power supply and data lines by the BSG 2 interface. The BSG 2 is located in the safe area.

EEx i-Terminals

Display	:	LCD-Supertwist 80 characters Character height. 8 mm (12 mm on BDT 4)
Text memory	:	32 kByte in EEPROM, 1000 Texts
Dimensions, front side	:	BDT 2: 288 mm x 72 mm x 50 mm BDT 3: 288 mm x 144 mm x 50 mm BDT 4: 288 mm x 144 mm x 50 mm
Minimal assembly depth	:	90 mm
Dimension of panel cut-outs	:	**BDT 2:** Width: 275,5 mm Tolerance 0,5 mm Height: 71,5 mm Tolerance 0,5 mm **BDT 3:** Width 275,5 mm Tolerance 0,5 mm Height: 131,5 mm Tolerance 0,5 mm **BDT 4:** Width: 275,5 mm Tolerance 0,5 mm Height: 131,5 mm Tolerance 0,5 mm
Current consumption	:	max. 160 mA (including BSG 2)
Environment temperatures	:	Storage: -25 °C...+70 °C Operation: 0 °C...+50 °C
Cable length (BDT-BSG)Type RS 422	:	Cable type LiYCY 3 x 2 x 0,75 mm^2 twisted pairs ! Cable length: IIB: 1200 m IIC: 210 m
Cable length BSG 2 - PLC V.24 (upto 19 200 Bd)	:	Cable type: e.g. LiYCY 2 x 2 x 0,25 mm^2 Cable length: 20 m
Cable length BSG 2 - PLC TTY (upto 9600 Bd)	:	Cable type: e.g. LiYCY 2 x 2 x 0,25 mm^2 Cable length: 1000 m

BSG 2 supply and interface card

Dimension	:	Eurocard 100 mm x 160 mm, (3 HE, 8TE)
Operating Voltage	:	DC 24 V Range +20.4V...27.4V

More technical data is listed in the certificates of conformity in the appendix.

1.4 PLC mode programming software

The devices are appointed with an intelligent modular software system, the PLC mode. This software was developed specifically for a direct and fast communication to a PLC and is distinguished by the following:

- You can program up to 999 message texts, which can be called as operating messages, display masks and menus . Additionally included is a freely programmable basic mask.
- Each text can be combined with up to 15 variables of freely definable format.
- Double word processing, alternatively from 1...10 digits, as well as fixed decimal point performance.
- The EEx i display gets the values of the variables from the PLC by itself and converts them into the right format. Readout and editing of the variables is done by declaration of the PLC address and required display format
- Menu supported variable format conversion definition:

  decimal with sign <-> binary (16 bit and 32 bit)
  decimal without sign <-> binary
  hexadecimal <-> binary
  bit performance <-> binary
  ASCII performance
  fixed decimal point performance.

- Specially for SIMATIC S5: timer / time values
  counter / numeric values
- The function keys are handled like digital inputs.
- The storing of the texts is done in the EEPROM.
- Real time clock can be recalled from the PLC.
- Easy programming with a PC.
- Easy error message handling

This mode of operation hardly loads the PLC and needs no special PLC programming or data convertion.

Chapter 2 Fitting and Installation

2.1 Radio shielding / mounting regulations

The EEx i displays are constructed to the latest technical standards. The mechanical construction and electronic components, are specifically designed for industrial use.

Voltage problems originating from the power supply or signal line, as well as electro-static charges, carried over by human contact, will be lead away to the ground connection (screw terminal on the back-of the unit). This ground connection has to be connected with low resistance to Potential Earth which must be connected into PA.??? If this connection is not made the devices immunity to interference will be partly defficient.

When selecting the place of installation, it is important to ensure the greatest possible distance from electromagnetic interference is maintained. This is especially important where there are frequeny transformers. In certain circumstances it is advisable to add screening against interfering radiation by means of metal sheets.

Inductors, installed in the area (e. g. contactor, relay and magnetic valve coils), especially if they are supplied by the same circuit, must be protected with RC-units.

The power supply and data lines should be installed so that interference will be eleminated. This can be achieve. for example, by avoiding lines parallel to each other.

Connection of the screened cable:

Only the use of screened cables, that are **twisted in pairs,** for serial coupling to the control provides security from interference.

Measures for installation of peripherals to your control system should be brought together with the recommendations you find in this manual to ensure interference free data transfer.

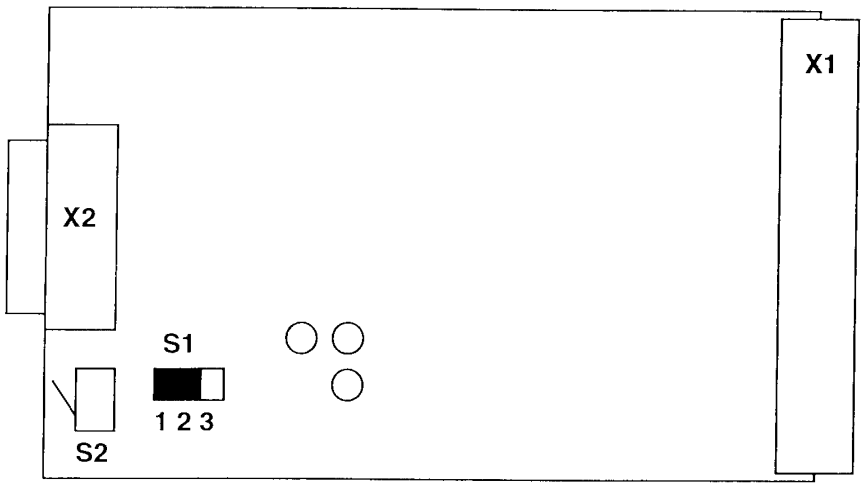
The devices are delivered in a robust metal installation case. The units can be fitted into switch panel doors or into operator panels (cut out dimensions given on page 8) and are supplied with the appropriate mounting screws.

2.2 BSG 2 power supply / interface card

The BSG2 interface provides the intrinsically safe power supply, as well as safe galvanic seperation of the bidirectional serial interface line to the display. The protection method is >>intrinsically safe<< , [EEx ib] IIB : IIC(dependant on circuit lengths), and accredited by the >>Physikalisch Technische Bundesanstalt << with PTB number: Ex-93.C.2008 X .

Note : The enclosure that the BSG 2 is to be installed in, must be earthed

Front view BSG 2 :



Jumper S1 : connection : 1-2 : TTY
2-3 : TTL (external unit)

Position of switch S2 : Position up TTY/TTL (external unit)
Position down V.24

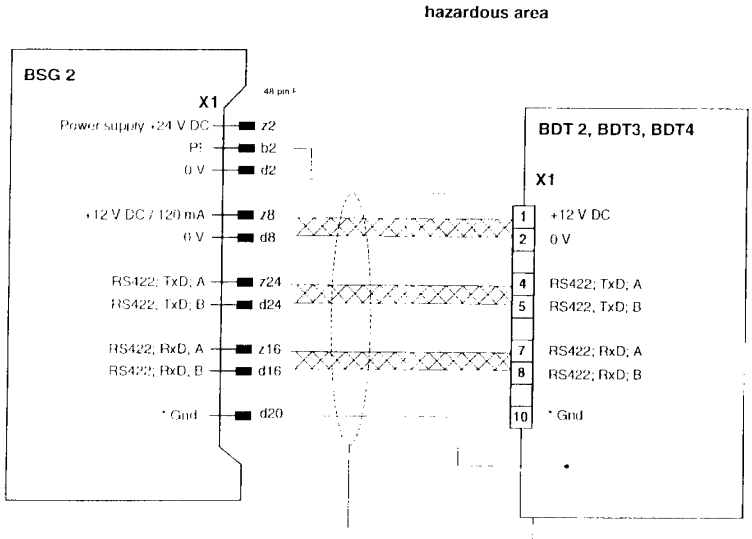
X1 : 48 pole connector male, form F

X2 : 25 pole SUB D connector female

Connection of BSG 2 to BDT 2/4

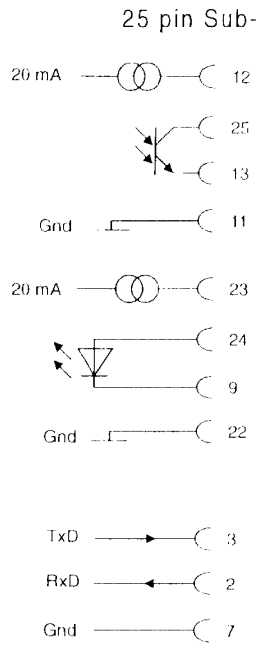
To guarantee the best interference resistance, please take the following measures :

- Connect pin b2 to earth
- Connect the grounding bolt on the rear of the unit to earth
- Earth connection cable screen on both ends
- **Use connection cable twisted in pairs**



*only necessary for partyline

Pin connections for X2 of the BSG 2:



Switch position up (S2)

TTY-interface

Switch position down (S2)

RS 232-interface

2.3 Coupling to the Siemens Simatic S5 PG interface

The BDT is connected to the PLC via the X2 plug (front side). The following Simatic S5 systems are supported :

S5 90U
S5 95U
S5 100U CPU-Models 102 and 103
S5 115U CPU-Models 941, 942, 943 and 944
S5 135U CPU 928a, 928b

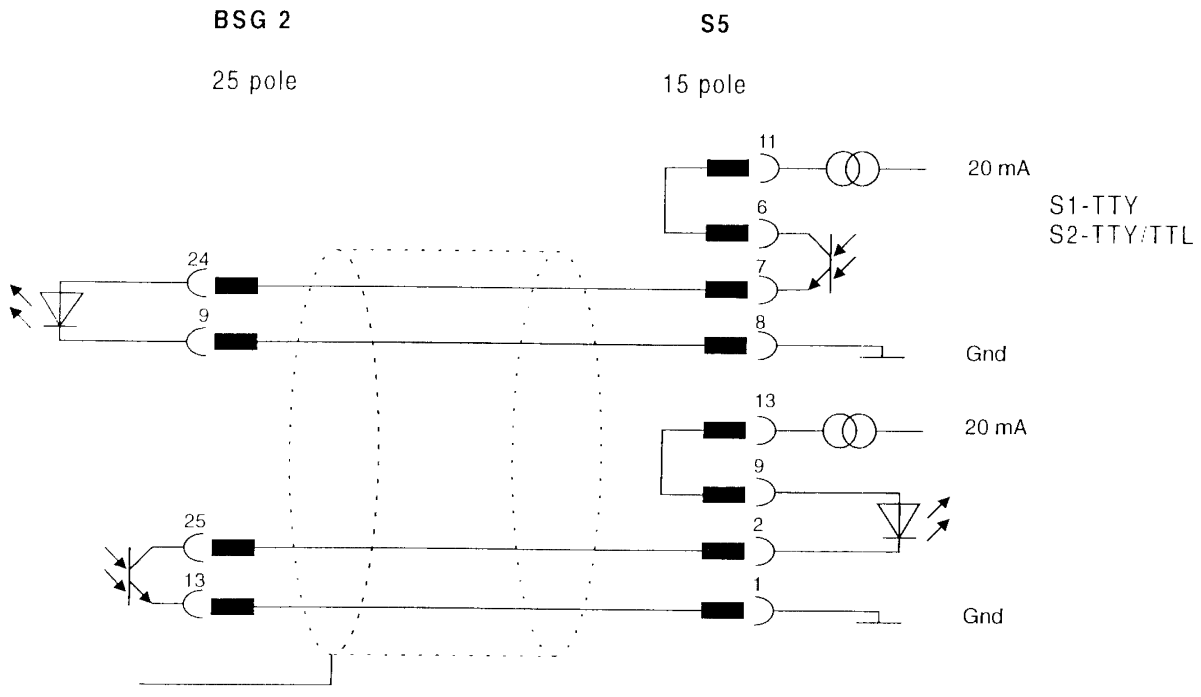
Note:

This coupling is not suited to fast events (reaction times <500ms). In addition, the S5-100 is sensitive to electromagnetic interference through the PG interface. Please take full notice of recommended radio shielding methods. The connection is performed via a TTY (current loop) interface. The connection cable is supplied as a special accessory.

There are no further settings necessary to connect the BDT to the S5. The BDT interface must be parametered as follows :

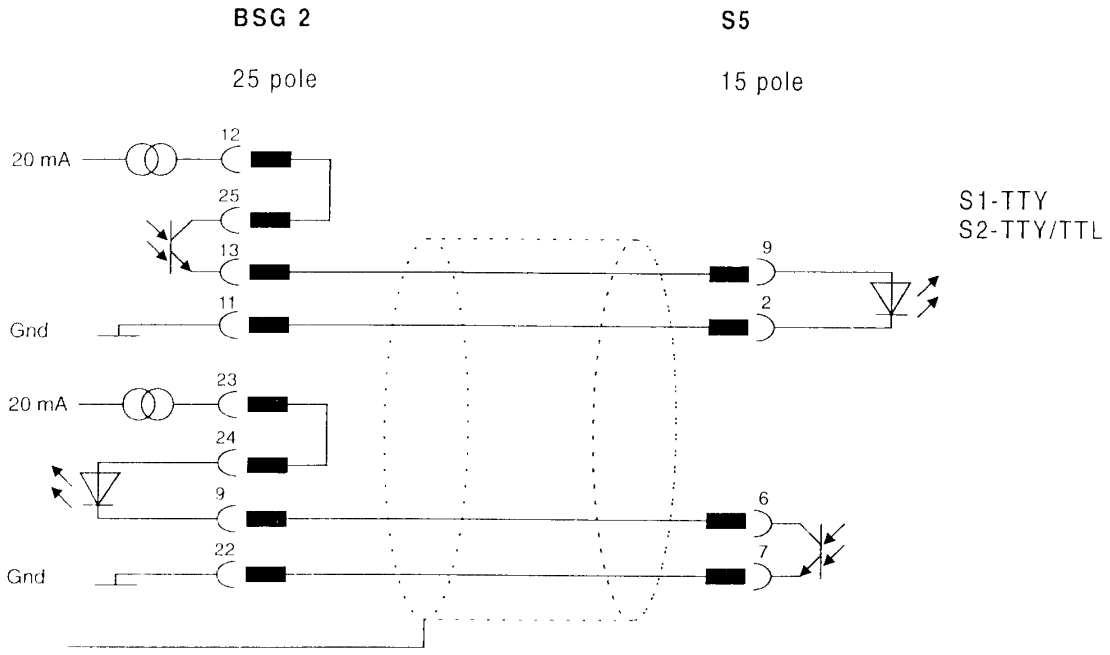
9600 baud, 8 data bit, 1 stop bit, even parity.

Coupling to the Simatic S5 PG interface



Coupling to the Simatic S5 90U PG interface

Setting as described above. As the TTY interface of the 90U is passive the connection cable must be adapted.



In applications where the transmission distance is great, this is the prefferred method of connection for all S5 models.

2.4 Coupling to the Simatic S5 using the 3964R procedure

This fast, safe coupling can be used with the following systems :

- S5 95U for a second interface using 3964R via handling unit BARTEC CPU RK512
- S5 95U/100U with CP521SI via handling unit BARTEC CP521
- Simatic CP524/CP525 (and CP525 compatible versions)
- 115U CPU 944 second interface 3964R via handling unit BARTEC CPU RK512
- 135U CPU 928b second interface (3964R/RK512)

Installation Procedure 3964R at the CP 524/525

The Siemens CP524 / CP525, must be initialised with the Siemens COM525 program, the RK512 interpreter and the procedure P3964R. The default parameters are as follows :

9600 baud, 8 data bits, 1 stop bit, even parity, higher priority

SIEMENS SIMATIC S5 — Page: 1
COM 525 - CP525/524 — 15/03/95

Drive: C	Program: 9600	last edition:	15/03/95
Installation:	coupling 9600	Editor:	Müller

PROGRAM LENGTH 9321 Words

INTERPRETER/PROCEDURE

Component: PC-Coupling

Unit	Name	Version	Parameterization	
Interpreter	RK512	01	-	
Procedure	P3964R	01	Baudrate:	9600
			Character length:	8 Bit
			No. Stopbits:	1
			Priority:	higher
			Parity:	even

When starting the S5 you must synchronize the CP524/525 and the CPU. This is done with a single call of the synchronization unit.

Example for the AG115U with FB249 :

```
FB 100

NETWORK 1          0000
NAME           : CP-SYNCH
0005           :
0006           :
0007           : SPA FB 249
0008   NAME    : SYNCHRON
0009   SSNR    :     KY 0,0          Interface number 0
000A   BLGR    :     KY 0,1
000B   PAFE    :     MB 100
```

To guarantee a permanent data exchange between CPU and the CP524/525, a send-all and receive-all should be called cyclicly.

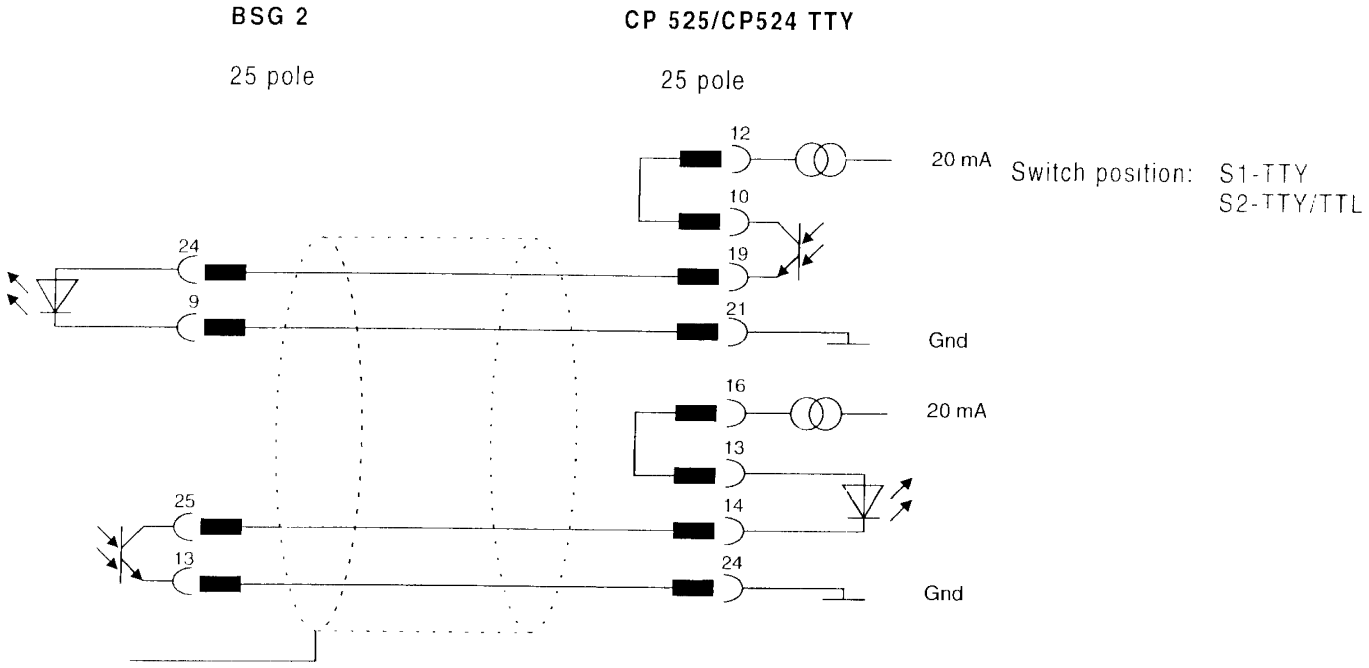
For example :

```
NETWORK 1          0000
NAME           : CP-TRANS
0005           : SEND ALL          interface 0
0006           : SPA FB 244        FB 244 , AG 115U
0007   NAME    : SEND              instruction 0
0008   SSNR    :     KY 0,0        interface number 0
0009   A-NR    :     KY 0,0
000A   ANZW    :     MW 102
000B   QTYP    :     KC DB
000C   DBNR    :     KY 0,0
000D   QANF    :     KF +0
000E   QLAE    :     KF +0
000F   PAFE    :     MB 104
0010           :     RECEIVE ALL   interface 0
0011           :     SPA FB 245    FB 245 , AG 115U
0012   NAME    :     RECEIVE       instruction 0
0013   SSNR    :     KY 0,0        interface number 0
0009   A-NR    :     KY 0,0
000A   ANZW    :     MW 106
000B   ZTYP    :     KC DB
000C   DBNR    :     KY 0,0
000D   ZANF    :     KF +0
000E   ZLAE    :     KF +0
000F   PAFE    :     MB 108
001B           :
001C           :     BE
```

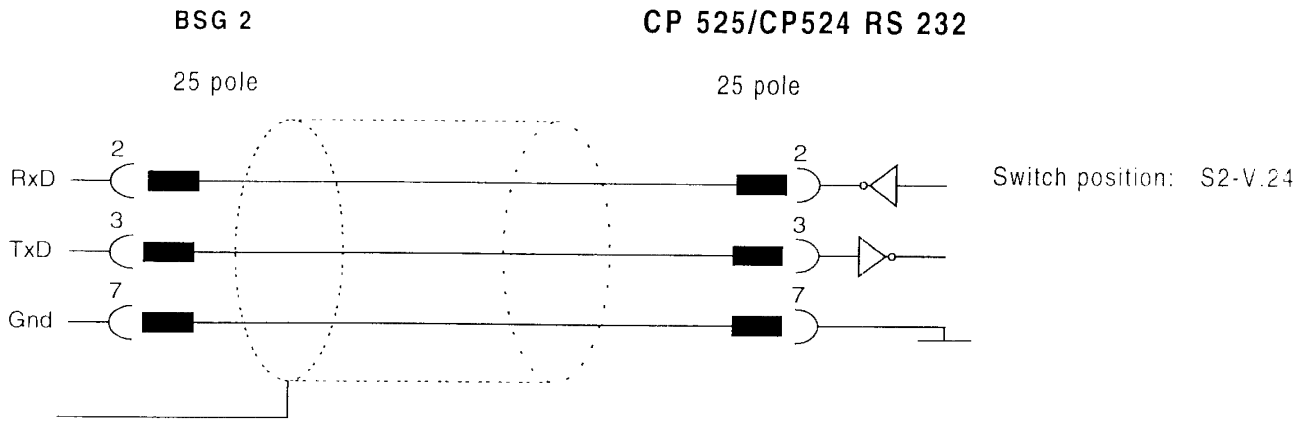
No other send or receive instructions are necessary.

In this example, the communication processor is on interface number 0. This should be replaced by the appropriate number if the processor is located elsewhere.

TTY Connection cable:



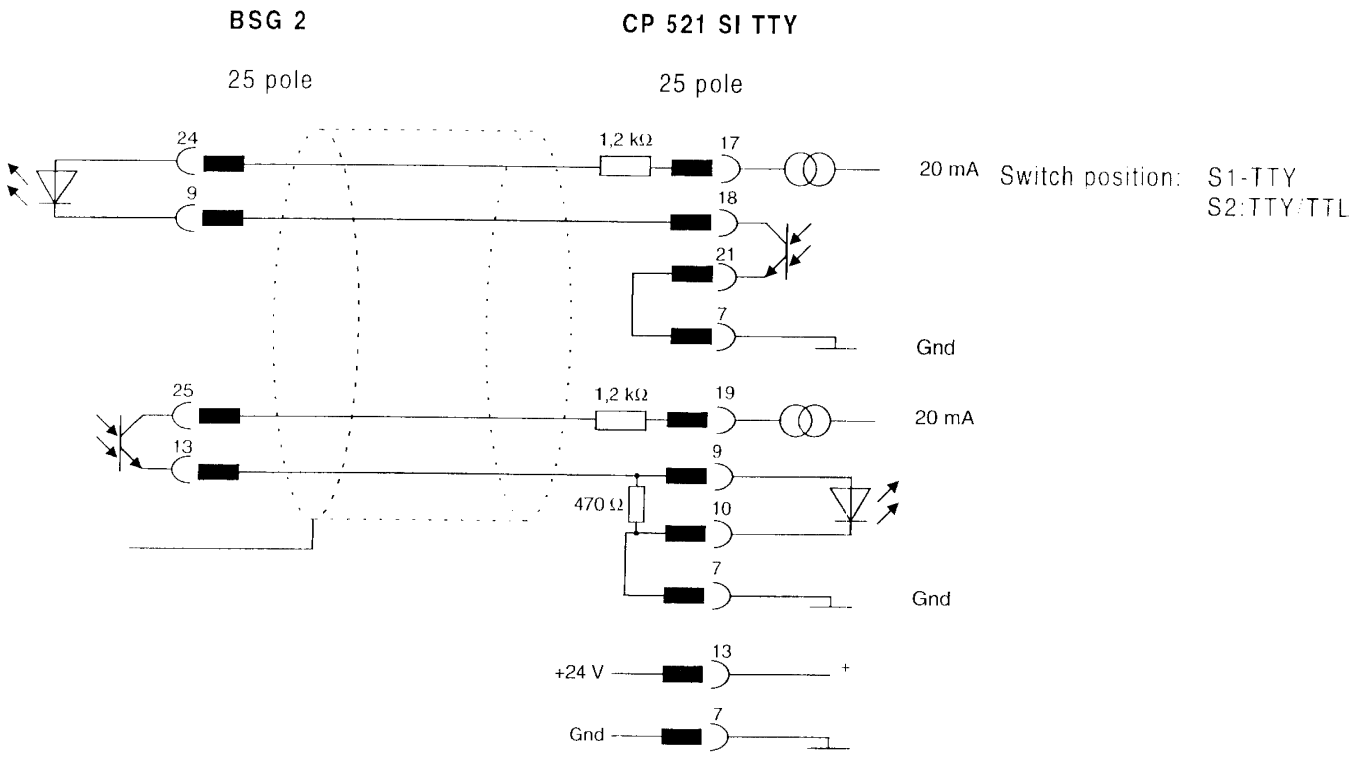
RS 232 Connection cable:



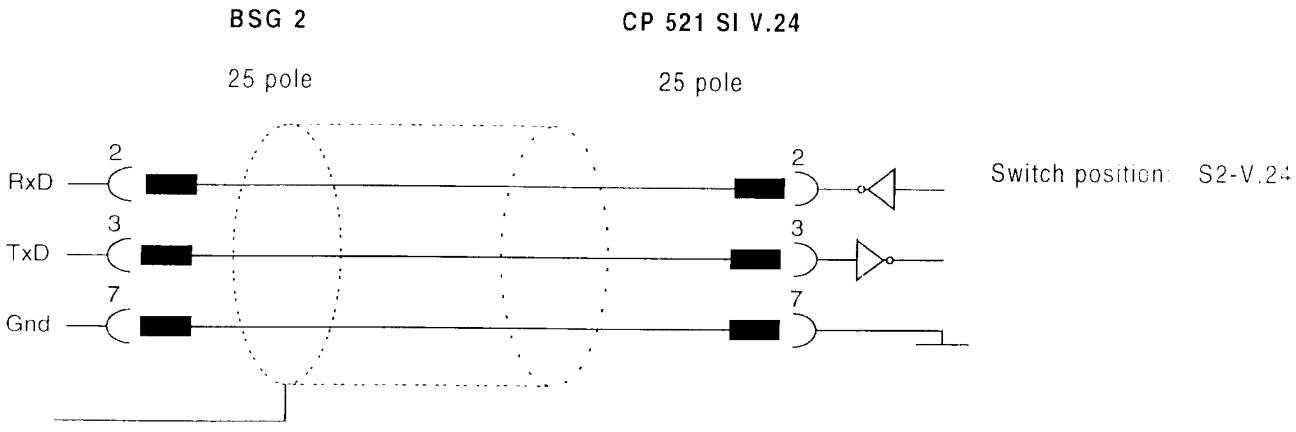
Coupling to the Simatic S5, CP521

Possible only with AG 1000U, CPU 103 or AG 95U.

TTY Connection to Siemens CP521 at BSG2



RS232 Connection to Siemens Cp521 at BSG2



More detailed instructions for installation can be found in the CP521SI manual.

Handling unit for the CP 521 SI

A handling unit that enables BDT - CP521 communication is available from BARTEC.

The handling unit is configured so that the CP521 must be at interface number 0(address 64 PAE/PAA). To set the communication cycle times independantly of the program cycle times the call up of the handling unit is realised by OB13.

General

Using a CP521SI it is possible to connect the AG100 to peripherals using the 3964 R procedure.The CP521SI can transmit 8 bytes on every second cycle of the AG100 bus. The speed of communication is therefore dependant on the cycle time of the AG. To ensure maximum data transfer speed the handling block is arranged so that data exchange between CP and CPU is triggered on TIME OB13. The transfer of data from the receiver compartment is carried out via the FB 193, which is processed in the AG cycle. This ensures that at least one cycles worth of data is kept before being overwritten by the keyboard. Increasing the cycle time of the AG increases the reaction time of the keyboard.

The following software is available from Bartec on disk :

*CPSIRKST.S5D	Processing CP521SI via OB13
*CPSIRKST.S5D	Processing CP521SI in the cycle (without OB13)

If not processing with OB13 please use the CPSIR2ST.S5D program.

Running :

* To insert parameters during start up, memory word 190 of the OB21 and OB22 is set back.

* Eight cycles are required in order to parameter the CP521SI (FB194). When parametering is complete, the OB13 (depending on the application) is released and communication can begin or be called up cyclicly from OB1.

Important

* The program can only be run on AG 95 Us and AG 100Us with CPU 103.

* CP521SI must be put on interface number 0 with address PAE / PAA 64.

* The memory word MW190 may not be used by other programs.

* Memory words MW220..... are used as scrawl memory in the cycle.

Processing from the OB13

The data file CPSIRKST.S5D contains the following function blocks

- FB190: for receiving
- FB191: for transmitting
- FB192: Co-ordination of transmitting and receiving is called up by OB13.
- FB193: Evaluation of the data will be called up in OB1 if data have been received. Requires FB195 and FB196 for the transfer of the data from the transmitting and receiving compartment.
- FB194: Parametering of CP521
- FB195: Data validity check
- FB196: Transfer of data
- DB191: Transmission compartment: preparation of data to be sent
- DB190: Receive compartment : processing of data received
- OB13 : Call up FB190 (transmitting) , FB191 (receiving)

When calling up FB194 the following parameters are handed over

BAUD
1 - 110 Bd
2 - 200 Bd
3 - 300 Bd
4 - 600 Bd
5 - 1200 Bd
6 - 2400 Bd
7 - 4800 Bd
8 - 9600 Bd - Default setting

STYP - Interface type
00 - TTY
01 - V.24

TIME permitted from
KH 0001 -10mS Call up interval of the OB13
KH 000A -100mS

AUST: Entry of the stock level of the CP521SI
KF + 1 Ausgabestand 1
KF + 2 Ausgabestand 2

The set value will be stored in data word 10 of the DB191. Command **AS** will hinder the processing of OB-13. Subsequently, the communication to the terminal will be terminated. Command AF re-activates the OB13.

Processing in the Cycle (without OB13)

The data file CPSIR2ST.S5D contains the following function blocks

- FB190: for receiving
- FB191: for transmitting
- FB192: Co-ordination of transmitting and receiving as called up by OB1
- FB193: Evaluation of the data will be called up from FB192 when data is received. Required for the transfer of data from the transmitting and receiving compartments FB195 and FB196.
- FB194: Parametering of CP521
- FB195: Data validity check
- FB196: Transfer of data
- DB191: Transmission compartment : preperation of data to be sent
- DB190: Receiver compartment : processing of data received.

When calling up FB194, the following parameters are handed over

BAUD
1 - 110 Bd
2 - 200 Bd
3 - 300 Bd
4 - 600 Bd
5 - 1200 Bd
6 - 2400 Bd
7 - 4800 Bd
8 - 9600 Bd - Default setting

STYP - Interface type
00 - TTY
01 - V.24

TIME permitted from
KH 0001-10mS call up interval of the OB13
KH 000A-100mS

AUST: Eintrag des Ausgabestands des CP521SI
KF + 1 stock level 1
KF + 2 stock level 2

Example : Program CPSIRRST.S5D

OB21 / OB22

```
NETWORK 1           0000
0000          : L   KH 0000          Entry of the parameter
0002          : T   MW 190
0003
0004          : BE
```

OB13

```
NETWORK 1     0000
0000          : U   M 191.7
0001          : SPB FB 192
0002   NAME     : MASTER
0003          : BE
```

OB1

```
NETWORK 1     0000
0000
0001          : UN  M 191.7          Parameter
0002          : SPB FB 194
0003   NAME   : PARACP
0004   BAUD   :     KF +8           Baudrate                  8=9600 Baud
0005   STYP   :     KF +1           Interface type            1=V.24
0006   ZEIT   :     KH 0002         Time interval for OB13    2=20ms
0007   AUST   :     KF +2           Stock level of CP 521SI   2 = Stock level 2
0008
0009
000A          : SPA FB 193           Cyclical call up of the data exchange
000B   NAME   : DATEN
000C
000D          : BE
```

Example : Program CPSIR2ST.S5D

OB21 / OB22

```
NETWORK 1          0000
0000          : L   KH 0000          Entry of the parameters
0002          : T   MW 190
0003
0004          : BE
```

OB1

```
NETWORK 1    0000
0000
0001
0002
0003          : UN  M 191.7
0004          : SPB FB 194
0005   NAME   : PARACP
0006   BAUD   :     KF +8           Baudrate
0007   STYP   :     KF +1           Interface Type
0008   AUST   :     KF +2           CP-Stock level
0009
000A          : U   M 191.7
000B          : SPB FB 192          cyclic processing
000C   NAME   : MASTER
000D
000E          : BE
```

Please note:

During run up to net-on it is possible for the CP521SI parameters to be incomplete.

Remedy:

If one equips the CP521SI (stock level 2) with a buffer battery, then the parameter data will be stored in the RAM of the CP521SI. It is then possible for the run up OB22 to switch off the entry of the parameters.

This means removing the commands:

L	KH 0000
T	MW 190

The settings for data transfer are as follows :

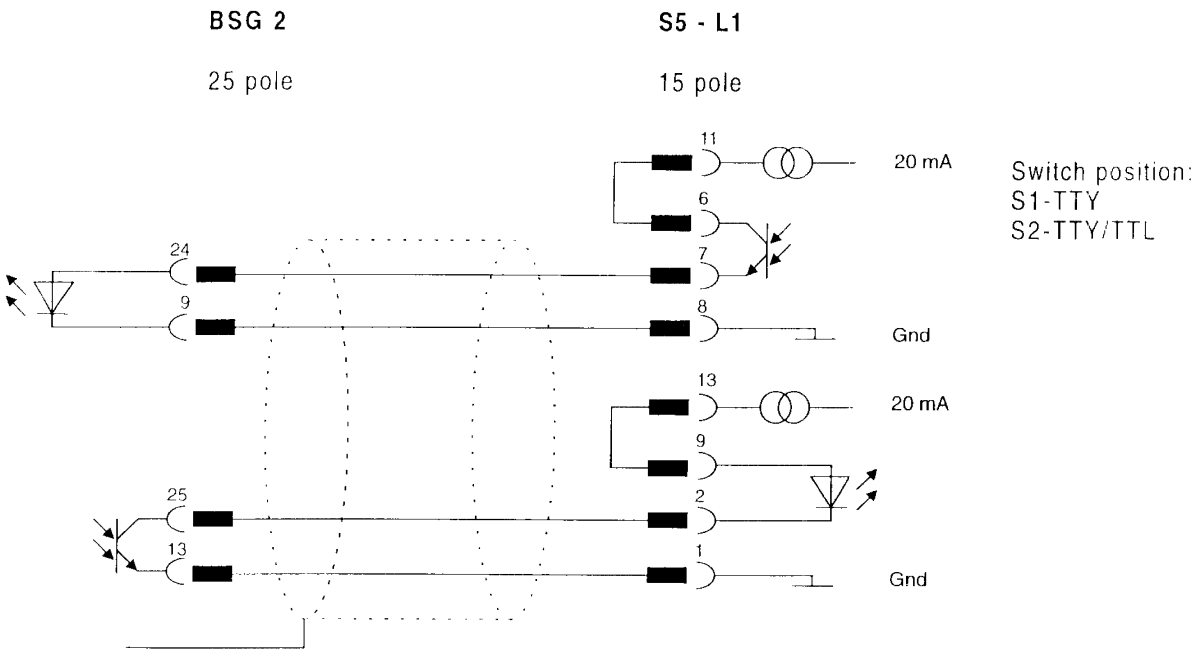
Baud rate :	9600 Baud
Parity:	EVEN
Data format:	8 BIT
Stopbit:	1 STOP

2.5 Coupling to the Simatic S5 L1 Bus

The Sinec-L bus is suitable for coupling small PLCs (100U), and also for saving interface units at larger PLCs. The L1-bus can support upto 15 participators. However, due to the low Baud rate of 9600, there are limits with regard to the number of simoultaneously operating terminals on the bus. We reccmmend a maximum of four terminals on the same controller. For this, Bartec offers a comfortable coupling for al Simatic S5 control units with AG-interface compatible to Sinec-L1 Slave, ie. 95U, 100U(CPU103), 115U etc. The cycle time is reduced by approximately 150ms for each connected terminal.

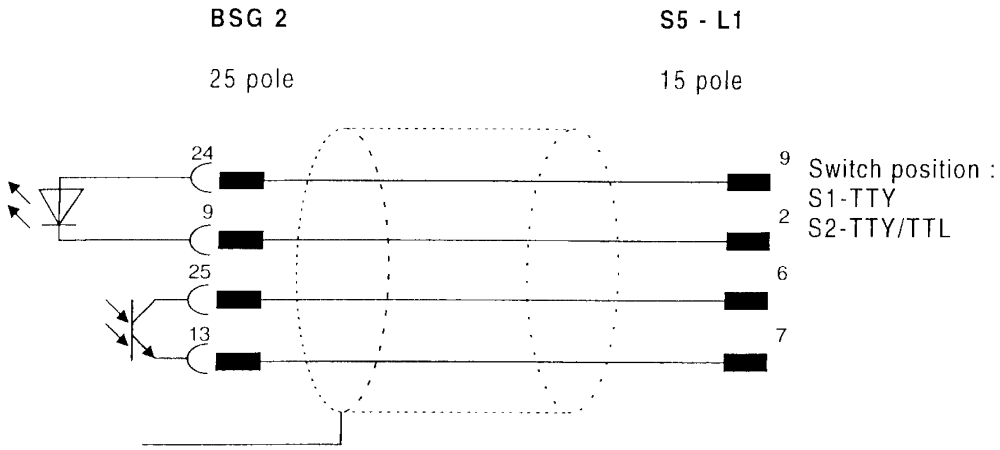
Single display mode:

The connection and function of the single display mode is similar to that of the S5-PG, but with short user programs (upto 200ms) it is about two and a half times as fast as the S5-PG coupling.

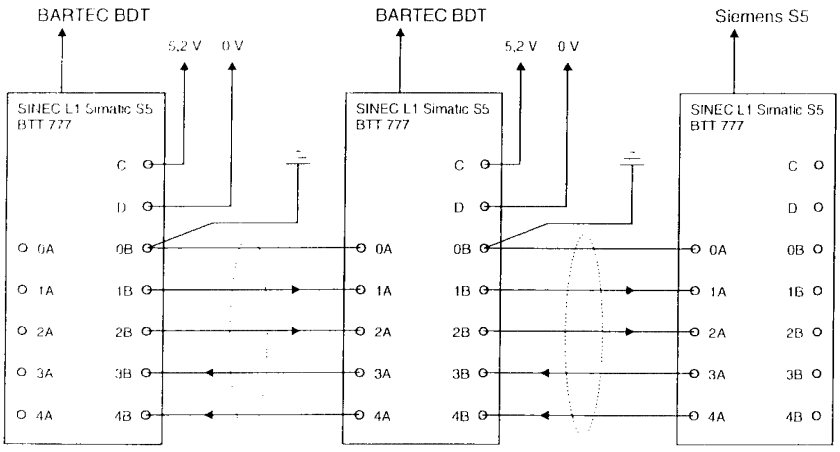


SINEC-L1-Bus mode

In the Sinec-L1 bus mode you can manage upto 15 BDTs set serially at Sinec-L1. For this coupling, a special data structure must be set up in which only BARTEC BDTs may be coupled to the Simatc S5 Sinec-L1 bus. This coupling is achieved with the Siemens BT777.



Connection plan :



Coupling the displays

The displays hold the task of bus master. If there are two or more displays operating on Sinec-L1. each display must be set with a different station number. It is important that the station numbers are set continuously starting at UST1 The station numbers must also be observed when transmitting the configuration from the PC.

At each of the displays, the number of displays coupled to the bus must be entered in the conf.guration menu

ENTER THE UST PLEASE 01 EXIT + - OK	If only one display is connected, it must be set on substation number 01 and the number of stations to1.

Installation of the handling units

The BARTEC handling units FB'INIT' (FB60) and FB'WORK' (FB61), together with auxillary data unit DB'H-DB' (DB6), provide security for the communication with the BARTEC BDT. The specified units are available as standard on floppy disk from BARTEC.

Short description FB „INIT“:

- initializes the SINEC-L1 coupling and the auxillary data unit
- Coupling to 95U, 100U (CPU 103), 115U via PG-Connector
- call of FB ‚INIT" **in OB20-OB22** , The FB ‚INIT" uses MB240-MB245 as a flag
- FB ‚INIT"-Input parameter **‚H-DB"**:

  names a data unit, that may only be used by the BARTEC handling units; as a parameter the number (2 . 255) will be transmitted within a word, the data unit must be available within the AG (at least 100DW)

- FB ‚INIT"-Output parameter **‚FEHL"** :

  names an error byte, to enable the user program to interperet the L1 initialization

error message bit 0 : ‚1"= Initialising O.K.
error message bit 1 : ‚1"= H-DB not available
error message bit 2 : ‚1"= H-DB too short
error message bit 3 : ‚1"= H-DB-Number invalid (0,1,>255)
error message bit 4 : not used
error message bit 5 : not used
error message bit 6 : not used
error message bit 7 : ‚1"= incorrect CPU-Number (z. B. 135U/155U)

In the example, the initialization at a restart is shown, as a sub-DB, the DB 6 is defined and the error message transmission is done in the MB 254.

OB21:

```
        : L    KF +6
        : T    MW200
        : SPA FB60    Single initiallzation of the L1
NAME    : INIT
H-DB    : MW 200
FEHL    : MB 254
        : BE
```

Short description FB ,WORK":

- the FB 'WORK' works off the communication with the BDT
- for cycle times of user programs less than 250 ms the FB ,WORK" **should be called in the OB1 at the beginning.**
- for cycle times of user programs more than 250ms, the FB'WORK' may be called in the time controlled OB13 (100ms) too, but it must be ensured that the interpretation e.g. of the function keys is also done in the OB13.
- The FB ,WORK" uses the **marker MB 240-MB251 as a flag**
- the average cycle time is about 5ms when operating
- FB ,WORK"-output parameter **,FEHL"** names an error byte, to enable the user program to interperet: (MB0-MB255)

  error message bit 0 : ,1"= works correctly
  error message bit 1: ,1"= H-DB invalid (e.g. without INIT)
  error message bit 2 : ,1"= H-DB not initialized(_"__)
  error message bit 3 : not used
  error message bit 4 : address error of BDT (incorrect DB-Adr.)
  error message bit 5 : not used
  error message bit 6 : not used
  error message bit 7 : not used

In the example the cyclic communication with the BDT is done at the begining of the OB1 and the error transmission is realized in the MB 255. Then the actual user program will be used.

OB1 :

```
      : SPA FB61                cyclic processing of L1
NAME  : WORK
FEHL  : MB 254
      :
      : SPA PB1                 user program                :
      : BE
```

Chapter 3 Set up

3.1 Start-up and self test

The BDTs have in-built self test and error diagnostics, e. g. text memory checks and RAM checks, done on start-up of the system. This start-up sequence is reported via the text display. Below is an example of the start up report given for a BDT2/3 coupled to a Siemens S5/3964R.

```
*** SIEMENS      S5/3964R          BDT2 ***
    SELF - TEST
```

Following error free passage of the above routine, the BDT moves onto the information display. This display informs you of the type of display and the chosen operation mode(EPROM version).

```
*** SIEMENS      S5/3964R          BDT2 ***
    EEPROM       V 2.1             NR: 1
```

- type of coupling
- type of display
- software version
- address of the display

After approx. one second this information will be overwritten by the basic menu .

3.2 Error messages after power on

If the following message appears on the display :

```
!!! TEXT MEMORY ERROR                !!!
    REPEAT PROGRAMMING PLEASE
```

...the display has found an incorrectly initialized text and must be re-programmed

The message

```
!!! HISTORY REPORT ERROR             !!!
THE HISTORY REPORT BUFFER IS CLEARED
```

...refers to a structural error in the history report buffer. Because the BDT displays include no data buffers, this message appears after each cold start up.

3.3 Keyboard definitions

Keyboard definition : BDT 2

The BDT 2 has 8 function keys (key inscription possible on the BDT3 only).

Keyboard definition 'system functions'

System functions (history record buffer, configuration) are operated using the following keys :

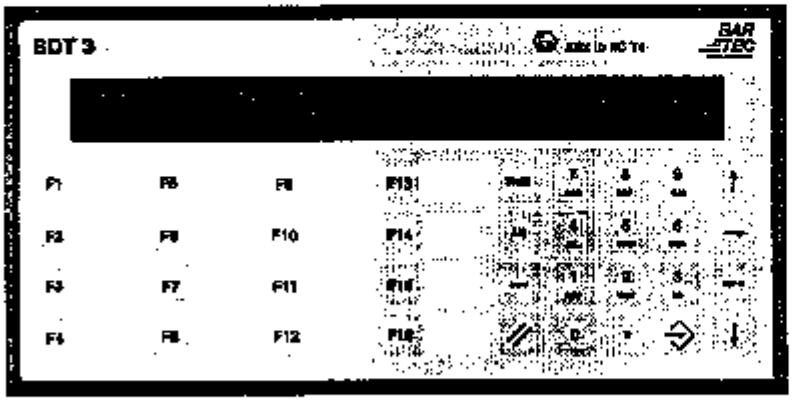
Key	designation	operation
<F1>	<ESC>	Break (only on system functions)
<F3>	<CUP>	Arrow key up (change values)
<F6>	<CUD>	Arrow key down (change values)
<F8>	<CR>	Enter or Return key

To activate the configuration menu the keys <F1> and <F8> must be pressed simoultaneously .

Keyboard definition 'operation'

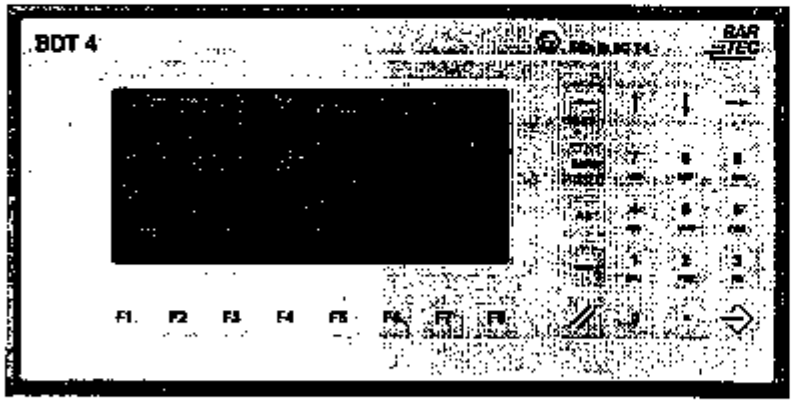
When pressed, the function keys are sent to the PLC as a bit mask (see communication with the PLC), and the function key text, if one has been assigned, is processed.

Keyboard definition : BDT 3



The BDT3 has a key pad with alpha-numeric, arrow and function keys
The function keys are inscribable at the back of the device.

Keyboard definition : BDT 4



The BDT4 has a key pad with alpha-numeric, arrow and function keys
The function keys are not inscribable.

The keys are assigned as follows:

Key	designation	operation
	<ESC>	Escape- / Break key
	<CUP>	Up arrow key
	<CDN>	Down arrow key
	<CUL>	Cursor left
	<CUR>	Cursor right
	<CR>	Enter- / return key

These keys have special system functions (history report buffer, configuration) as described in the relevant sections.

The alphanumeric keys are multi-assigned and have the following operation logic:

- the numbers, the point and the minus sign are selected by a single keypress
- the letters are obtained using key combinations as follows :

<shift> + <number> = left character eg. <shift> + <7> = A

<alt> + <number> = middle character eg. <alt> + <7> = B

<minus> + <number> = right character eg. <minus> + <7> = C

(as the minus key itself results in a key code, this combination must always be pressed simoultaneously)

3.4 Password protected configuration

To gain access to the configuration menu press the keys <ESC> and <CR> simoultaneously.

The configuration of the BDT's is menu-driven and preselected configuration items are marked by a flashing cursor. On the BDT 3 and the BDT 4 configuration selection is cursor-driven:

The cursor can be placed under the required settings using the left and right arrow keys. The <CR> key enters the new setting. Pressing the <ESC> key keeps the old one. On the BDT 2 the keys (<F1>, <F3>, <F6>, <F8>) are used for configuration selection. For editing of determined values, e. g. password, at the BDT 3 and the BDT 4 the alphanumeric keypad is used. On the BDT 2 characters are edited using the keys <F3> and <F6>.

In this way configuration and system control is easily achieved.

Password:

```
ENETR THE PASSWORD PLEASE:  00000
EXIT          +          -          OK
```

Entry to the configuration menus is pass-word protected

Here the correct pass word must be entered.

Password reset :

```
PASSWORD CHANGE ?
GO ON                              YES
```

Reset of the password can be done by pressing the key combination <ESC>+<CR> on the BDT3/4, and F1+F8 on the BDT 2. (All units are supplied with default setting '00000').

To change the password, simply enter the current password and select yes

Should the typed password not correspond to the actual password, then the following message is displayed:

```
!!! PASSWORD NOT VALID                !!!
    AGAIN
```

and the input of the password is demanded once more.

```
NEW VALUE INPUT  00.00.00     00:00:00
EXIT          +          -          OK
```

Setting the clock

After input of the valid password the following screen appears :
The actual time and the date are displayed and offered for change.As the clock has no buffering, it is necessary to set date and clock after each cold boot.

Delete text memory

```
DELETING TEXT MEMORY !
NO                              YES
```

If you have selected „YES", for some 40 sec. the following screen appears:

```
DELETING TEXT MEMORY !
```

Programming

```
PROGRAMMING TEXTS ?
NO                              YES
```

If you have selected "YES" , this screen appears:

```
PROGRAMMING TETXS
EXIT
```

Now you can program the BDT's with help of a PC and the configuration software **PLCPLUS.**

3.5 Configuration of the serial interface (BDT - Control)

Note:

The PG interface can be parametered and works with the default options 9600baud, 8 data bit, 1 stop bit, and even parity. Other set parameters would cause errors.

For parametering the 3964R please see SIEMENS Manuals.

The configuration of the serial interface can be selected at the following menu.

```
SERIAL INTERFACE SETTING ?
NO                                YES
```

Setting the parity

```
PARITY SETTING
GO ON        NONE   EVEN        ODD
```

Setting of the number of data bits

```
NUMBER OF DATA BITS
GO ON                  7 BIT       8 BIT
```

Should the following menu appear :

```
!!! INVALID DATA FORMAT                !!!
    PLEASE ENTER NEW CONFIGURATION
```

Possible cause: For 8 data bits and even parity only 1 stop bit is allowed.
Please press any key and re-enter a valid configuration.

Setting the stop bits

```
NUMBER OF STOP BITS
GO ON              1 BIT      2 BIT
```

Setting the Baud rate:

After the selection 'YES' you can select following baud rates:

```
BAUDRATE CHANGE?
NO                                YES
```

```
BAUD RATE SETTING
GO ON       600 BD  1200 BD 2400 BD
```

```
BAUD RATE SETTING
WEITER      4800 BD 9600 BD  19200 BD
```

Language codes

In the following menu the country code can be set. The config' messages will be displayed in the corresponding language.

```
COUNTRYCODE
GO ON       DEUTSCH  ENGLISH  FRANCAIS
```

Chapter 4 Communication with the PLC unit

4.1 General

The PLC-Mode was especially developed for the displays, to produce a direct and fast communication with a PLC.

The following description covers communication with the Siemens S5 PLC unit. Communication with other manufacturers units is done in a similar way, with differences found in the length of PLC addresses etc.

Because the display is the master in this mode, any PLC memory locations can be written to and read by it. For instance, the variables are actively taken from the data memory of the PLC by the display, are converted to the chosen format and displayed or written back to the PLC

The BDT requires information from the PLC and also enters information into it. The complete communication can now be divided into 4 blocks. The address of the first three function blocks described above can be configured by the PC to ensure the highest possible flexibilty.
These are :

a) 'PLC function key array' address
b) 'PLC control words address
c) 'PLC message register' address

The fourth block 'general register' consists of variables which can be in ary array.

The specification of the addresses is done with the help of data unit (DB002...DB255) and data word (DW000...DW255).

The addresses of the address blocks are now arranged in ascending orde', one after the other. On the following pages, offset addresses are given in tables; the effective address is calculated from the basic address + offset address. In the tables the functions are explained briefly and illustrated with examples

Example:

PLC address function key field:	DB 031 DW 000
Number of function key bits:	64
PLC address control words.	DB 031 DW 010
Address message data words :	DB 031 DW 030
Selection of control character:	#
Text number of error message bits:	500

Note :

- To facilitate successful error message handling, it is necessary to keep a minimum distance of 20 datawords between the 'control words address' and the 'message register address', or to define two different data units for 'control words address' and 'message data words address'.
- When coupling a BDT to the PG interface of the S595 U a distance of 20 data words must be maintained between the PLC control words address and the report data words
- For BDTs with an operating system lower than version 2.1 the text number error message must always be 000.

The following numbers of datawords must be reserved for each block.

Function key field address	5	DW
Control words address	20	DW
Message data words address	7	DW

Note: If you select a distance of 20 datawords between the "PLC control words address" and the "PLC message register address", the communication is faster.

Example: PLC control words address 030
PLC message register address 050

Cycle times

BDT to S5 with PG-procedure

Transmission cycle (worst-case):	710 ms
Transmission cycle with a distance of 20 DW between„PLC Control Words Address“ and „Message register address“:	500 ms
Function key transmission:	250..550 ms

BDT to S5 with 3964R/RK512

Transmission cycle (worst-case):	230 ms
Transmission cycle with adistance of 20 DWs between „PLC Control Words Address“ and „Message Register Address“:	200 ms
Function key transmission:	125 ms

4.2 PLC Function Key Field Address

The transmission of the function keys, as well as the arrow keys, is done beginning with the 'PLC function key field address'. The PLC address must be defined (pass bit etc.).

"PLC function key field address"

+00:	Bit 15	Pass BDT; pass observation of the BDT
	Bit 14	History report buffer full
	Bit 5	Enter key
	Bit 4	Clear / escape key
	Bit 3	Right arrow key
	Bit 2	Left arrow key
	Bit 1	Down arrow key
	Bit 0	Up arrow key
+01:	Bit 15	Function key 16
	...	
	Bit 0	Function key 1
+02:	Bit 15	Shift + function key 16
	...	
	Bit 0	Shift + function key 1
+03:	Bit 15	Alt + function key 16
	...	
	Bit 0	Alt + function key 1
+04:	Bit 15	Minus + function key 16
	...	
	Bit 0	Minus + function key 1

When the user presses one of the above described keys, then the corresponding bit is set within the corresponding data word. After releasing, the bit will be reset again. If the operator presses more than one function key, then all bits are set to zero. The key transmission takes place in order of priority.

In addition a pass bit, used to check communication data for corruption, is transferred cyclicly. This bit is reset by the PLC with the ascending side of the impulse. If the state is still zero after some time (e. g. timeout = 1 sec), then the control can identify, that there is defective communication.

In addition a message bit is set in the case of an overflow of the history report buffer.
In addition to the pure bit transmission a function key text, if programmed, will be sent to the display.
This text can be a simple message text or, instead, cover a whole display / handling menu (look at handling and programming).

Example :
The 'PLC function key field address' in the example is set on DB031 DW000; consequently the function keys F1 up to F16 'PLC Function Key Field Address' +1 will be put into DB031 DW001. If the user now presses the F1 key, the BDT sets the bit DB031 DW001.0. At the same time the function key text stored by F1 will be activated. Here the Text 1 will be built up (~T001).

For simpler handling of the function key bits, you can transfer them into the flag area. For all function keys and the use of flags 10.0 upto 19.7 the following commands exist.

Beispiel:

```
: A    DB 30
:
: L    DR 0          Arrow keys
: T    MB 10         To flag byte 10
: L    DL 0          Passbit
: T    MB 11         To flag 11.7
:
: L    DR 1          Function keys F1-F8
: T    MB 12         To flag byte  12
: L    DL 1          Function key F9-F16
: T    MB 13         To flag byte  13
:
: L    DR 2          Shift F1-F8
: T    MB 14
: L    DL 2          Shift F9-F16
: T    MB 15
:
: L    DR 3          Alt F1-F8
: T    MB 16
: L    DL 3          Alt F9-F16
: T    MB 17
:
: L    DR 4          Minus F1-F8
: T    MB 18
: L    DL 4          Minus F9-F16
: T    MB 18
```

Then the allocation in the flag area is as follows :

M10.0 - Cursor up
...
M10.5 - Enter key
M11.6 - Histogram full
M11.7 - Pass - Bit
...
M12.0 - F1
...
M12.7 - F8
...
M13.0 - F9
...
M13.7 - F16
...
M19.7 - Minus + F16

4.3 PLC Control Words Address

For the BDT displays, the data words basic address + offset address from +00 up to +02 are unused.

"PLC control words address"

+00 Reserved ; here these data words have to be considered as variables

+01 Reserved

+02 Reserved

+03 Static Control Words

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Signification
x	x	x	x	x	x	x	x	x	x	x	x	x	x	**0**	**0**	New value
x	x	x	x	x	x	x	x	x	x	x	x	x	x	**0**	**1**	First value
x	x	x	x	x	x	x	x	x	x	x	x	x	x	**1**	**0**	Priority
x	x	x	x	x	x	x	x	x	x	x	x	x	**1**	x	x	Error list
x	x	x	x	x	x	x	x	x	x	x	x	**1**	x	x	x	Rotation
x	**1**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	ESC/CR ni GM
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	disable editing

+04 Dynamic Control Word (will be quitted with a zero)

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Signification
x	**1**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Time BDT->PLC
x	x	**1**	x	x	x	x	x	x	x	x	x	x	x	x	x	Jump to basicmask
x	x	x	x	**1**	**1**	x	x	x	x	x	x	x	x	x	x	Delete histogram
x	x	x	x	x	x	**1**	x	x	x	x	x	x	x	x	x	Error reset
x	x	x	x	x	x	x	**1**	x	x	x	x	x	x	x	x	Time PLC->BDT

+05 Defective Bit Field (together 15 words)

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Signification
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	**1**	Error 0
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Error 15
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	**1**	Error 16
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Error 31
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	**1**	Error 224
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Error 239

Description:

New value, first value, priority	Configuration of the error message handling.
Error message list	Output of the error messages line by line.
Rotation	Rotation of errors queueing up in a two second clock rate.
<ESC> / <CR> disabled in the basic mask	By setting of these bits the abandonning of a text with <CR> or <ESC> will be prevented. Screen change can only be achieved using a function key or with help of the PLC.
Disable Editing	By setting this bit, all edit fields will take on the character of pure displays. This means the cursor will always be inactive.
Time bit	If this bit is set by the control, then the binary-coded actual time of the unit is sent to the control.The time data words are put after the text number register.
Quit bit (Branch to the basic mask)	On identifying this flag, the unit branches into the basic mask. Corresponds to a user quit.
Delete history report buffer	The history report buffer can be deleted with the help of two bits in the dynamic control word.
Error reset	Initialising of the error message bit buffers and their new build up.
Time PLC -> BDT	The PLC transmits the time to the time register (which follows on from the text number register) in the BDT.
Error bit field	Single bit error designation.

Note : The control bits of the dynamic control word do not queue up staticly and are acknowledged as they arrive by the BDT with a zero.

The memory blocks 'control words' and 'text register' are read by the BDT cyclicly. If a distance of exactly 20 data words is kept, then the BDT can read the information in one cycle. For any other distance, set, it would require two cycles, and therefore slow communication

4.4 PLC message register address

In the third function block, texts can be written by the control into the display or into the history report buffer. The BDT also puts data in this FB, such as the current text number and date / time. The basic address of this function block is the 'PLC message register address'. The other registers are located on the following addresses.

'PLC message register address' :

+00	text message register
+01	error message buffer register
+02	reserved
+03	text number register
+04	time register

DW-Offset	High	Low
+04	day	month
+05	year	hour
+06	minute	second

Text message register

If the controller wishes to write a text into the display, the controller must enter the text number into the 'text message' register as a binary number. This text number is read by the BDT and the programmed text is displayed. After that, the BDT writes the value zero into the 'text message register' as an acknowledgement, and also writes the actual text number into the 'text number register'.

Input and output of variables, format conversion, and, time and date, are controlled from the commands embedded in the texts.

A description of the commands used can be found in chapter 4. As the value zero is used as an acknowladgement, it is not possible to call the basic mask, (ie. text 0), using the message register. therefore the bit "branch to basic mask" (see control data words) must be set in the Dynamic Control Word.

History report buffer register

In this register the control system must enter the text numbers of the error messages to be entered into the error message buffer within the BDT. There is memory space for a maximum of 170 entries. The procedure is the same as for the message register. For messages, which follow on in quick succession, a FIFO-buffer must be created in the control system.

Text number register

The text number being displayed at any time, is written by the BDT into the 'Text number register', thereby informing the control system of the current displayed message / menu sequence.

Time registers

The time registers enable transmission of the real time either from the BDT > Control or from Control > BDT. The transmission is initiated by the control system with one of the time bits of the Dynamic Control Word. The time is transmitted in 24 hour BCD format. The direction of time transmission is dependant on which time bit in the Dynamic Control Word is used.

Example:

Call of a text message from a Siemens S5:

S5 writes to the data word DB031 DW030 with the text number 100, i. e. (KF=100) or (KH=64). Thereupon the text 100 is presented on the display.

```
PRODUCTION RATE:      12345 PIECES/HOUR
```

Immediately following, the text number 100 (KF = 100) is written to DB031 DW033 , and DB031 DW030 is set to zero.

The Text100 is to be displayed with E15.0 and Text301 is to be displayed with E15.1. In addition, the Text301 is to be entered into the history report buffer. To ensure that each report is only called once, the help markers 50.0 and 50.1 are required.

```
        :A      DB      30
        :L      DW      30          if message data word <> 0
        :L      KF+0                no new entry into the message data word
        :><F
        :BEB
        :UN     E       15.0
        :R      M       50.0        reset subflag
        :UN     E       15.1        if termination defect
        :R      M       50.1
        :
        :U      E       15.0
        :UN     M       50.0
        :SPB=TEX1
        :U      E       15.1
        :UN     M       50.1
        :SPB=TEX2
        :
        :SPA=M001
        :
TEX1    :L      KF      +100        load channel number 100
        :T      DW      30          and set into message register
        :S      M       50.0        set subflag
        :BEA
TEX2    :L      KF      +301        load channel number 301
        :T      DW      30
        :T      DW      31          entry into history report register
        :S      M       50.1
        :BEA
        :
M001    :***
```

4.5 Formatted variables / Text programming

Up to 15 format-controlled set / actual values in various formats can be displayed, and edited in a single text. The individual variables are defined (by their address in the control system) ir the text in which they shall be displayed. The BDT then actively gets the values of the variables from the control's memory, converts them into the required format and enters them into the display text. The text programming is done using an IBM-compatible PC with the software package '**PLCPLUS**'. Details of the program handling can be found in the chapter Programming.

Structure:

- Each text is assigned a text number, which is used to call the text from memory for display on the BDT screen.
- A definable control character triggers the special functions (presetting #), should this character be required for display text, it must be entered twice.

Special functions

Insert date / time

Code	Effect
#D	insert date
#U	insert time

ONLINE DISPLAY BDT 3

```
                    +011———110———210———310———410+
text number: 32     ¦ *          Message text Nr.032          * ¦
                    ¦ *      Date : 01.12.92  Time :13:23:56  * ¦
                    +411———510———610———710———810+
```

```
          011     110     210     310     410     510
text:      *     Message text Nr.032     ** Date :
           #D      Time :#U     *
          511     610     710     810     910     1010
```

Call history report buffer

Code	Effect
#H	Call history report buffer, other text is ignored

ONLINE DISPLAY BDT 3

```
                    +011———110———210———310———410+
text number: 200    ¦                             ¦
                    ¦                             ¦
                    +411———510———610———710———810+
```

	011	110	210	310	410	510
text:	#H					
	511	610	710	810	910	1010

When this text is called the history report buffer menu is called and can be paged through using the arrow keys.

Insert text

Code	Effect
#TYYY	text with YYY = 000...999 (maximal 4 levels)

ONLINE DISPLAY BDT 3

```
                    +011———110———210———310———410+
text number: 5      ¦  HEX ___ NUM ___ BIN _____  ¦
                    ¦  HEX ___ NUM ___ BIN _____  ¦
                    +411———510———610———710———810+
```

	011	110	210	310	410	510
text:	#T101	#T102	#T103			
	511	610	710	810	910	1010

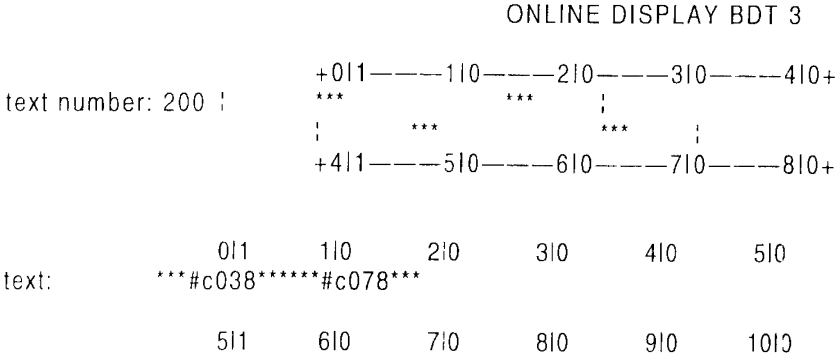
text T101 is defined with „HEX #031040 XXX"

text T102 is defined with „NUM #031041 NNN"

text T103 is defined with „BIN #031044 BBBBBBBB

Cursor setting

Code	Effect
#cYYY	set cursor with YYY = 001...max. (80)
#CYYY	set cursor with YYY = 001...max. (80) last cursor position "cursor on".



With this, blanks will be saved by cursor addressing.

Menu text / handling text

Code	Effect
#F	**Menu text**

As Text message texts are generally operation or error messages, it is not possible to call more texts using the arrow keys.

Where menu guidance is required this command code should be added to the text to make it a menu text. This will enable further texts to be called, and also the screen is refreshed cyclicly to update system parameters.

#f	**Handling text**

Similar to the menu text, a handling text, called by the PLC, must enclose this command sequence or an edit field.

For more explanations and examples refer to the chapter on "Handling".

Display and editing of variables

Code	Effect
#XXXXXX<format>	display value of variables
#EXXXXXX<format>	edit value of variables

with XXXXXX = 3 digit DB and 3 digit DW e. g. for DB031 DW030 XXXXXX = 031030

<format> = Information about the type of the value to display, consisting of a format character, for each digit to display e. g. for displaying of a four digit value, <format> = NNNN

Character:	Designation:	Digits:	Description:
B	Bit	16	For each specified B, a 0 or a 1 is displayed as a bit valence from the LSB to the MSB. The access to the memory is done word for word (16 bit), so that bits, not displayed but belonging to the memory word, will be deleted during writing access.
N	Decimal with sign	5 + sign	For each N a decimal number of a 16 bit memory word is displayed. The first digit is always the sign. The range is -32768...+32767.
D	Decimal with sign	10 + sign	For each D a decimal number of a 32 bit Doubleword is displayed. The range is -1000000000...+1000000000.
U	Decimal without sign	5	For each U a decimal number of a 16 bit memory word is displayed. The range is 0...+65535.
A	ASCII-figures	Max. 20 figures	For each A the corresponding ASCII character, out of a memory byte (8 bit), is displayed. The order is, from left to right, MS-Byte, LS-Byte and from lower to higher addresses.
X	Hexadecimal	4	For each X a hexadecimal figure (0...9, A...F), from a 16 bit memory word, is displayed.
T	Text	1	The value, read out of the memory word, is interpreted as a text number and the text belonging to this value, is entered to the text screen. Within this text no control sequences can be processed.
T (Siemens)	Timer / time values	4	For each t, one digit of a time value (KT-format) is overlayed. The presentation is done in seconds. The time base is defined by the digit after the decimal point: e.g.: 9990 —> KT 999.3 999. —> KT 999.2 99.9 —> KT 999.1 9.99 —> KT 999.0 9.9 —> KT 99.1 9.90 —> KT 990.2
Z (Siemens)	Counting values, Counter	3	For each Z one digit of a counting value (read from the controller in KZ-format) is overlayed.

In formats N, D and U the point '.' is permitted as a seperator for fixed-point presentation. Should the value overshoot the presentation zone, asterisks "*" are displayed to indicate that part of the figure is missing.

Example:

```
                              ONLINE DISPLAY BDT 3

                          +011------110------210------310------410+
text number: 1            ¦  CYCLIC READOUT OF A COUNTER          ¦
menu text                 ¦  DB031 / DW030 12345                  ¦
                          +411------510------610------710------810+


      011       110       210       310       410       510
text:  CYCLIC READOUT OF A COUNTER #F  DB31
      / DW30  #031030UUUUU
      511       610       710       810       910       1010
```

In this example the contents of DB031 DW030 is displayed, as a five-digit-decimal without sign .

For PLCs of other manufacturers eg. with the MODBUS protocol the address format differs, as described in the appropriate appendix.

Value setting

Code	Effect
#SXXXXXX<format><blank><value>	direct setting of values:with <value>: ASCII characters of prescribed <format>

```
                              ONLINE DISPLAY BDT 3

                          +011------110------210------310------410+
text number: 1            ¦                                       ¦
                          ¦                                       ¦
                          +411------510------610------710------810+


      011       110       210       310       410       510
text:  #S031055UUUUU 12345

      511       610       710       810       910       1010
```

This command enters the value 12345 in to the address DB031 DW030. No local echo is given.

4.6 Text Programming / Function keys

In principle, the programming of the function keys is the same as for the texts. But the maximum length of the texts is only 16 characters. If another text is called from a function key text, then this text is automatically a menu text and is updated cyclicly and also permits page turning within text blocks.

In addition to calling texts, the history report buffer can also be called. The following example shows the call of text 9 from function key F9 and the call of the history report buffer from function key F10.

Example:

```
F9 -        #T009
F10         -          #H
F11         -
```

Pressing F9 calls the text 9 and updates it cyclicly, i. e. as long as the text stands on the display, the variables will be refreshed.

4.7 Calling up texts from the PLC

To call a given message from the PLC the text number of the required message must be entered into the message register. The text is presented, but only if it is an 'edit or a menu text', is it refreshed cyclicly (see message texts / function key texts).

4.8 Error message handling in the PLC mode

The error message handling permits comfortable presentation and logging of errors and operation messages. 15 data words(the 'Defective Bit Field') are allocated to errors, permitting a total of 240 (i.e. 15 x 16bits)possible error states. A maximum of 32 out of these 240 errors can queue up simoultaneously within the History Report Buffer. The error selected for presentation can be the latest value, first value or the messages can be sorted and displayed in order of text number.

The '**Defective Bit Field**' words start at "address control words" + 5 and have following allocation:

Address control words +

Base	Bit 15	Bit 14	...	Bit 1	Bit 0
	+5	error 15	error 14	... error 1	error 0
	+6	error 31	error 30	... error 17	error 16
				...	
	+19	error 239	error 238	... error 225	error 224

Once the user has decided at what text number to put the basic error message (error 0), the individual error text numbers can be obtained by addition of the 'basic error message' text number and the error number.

Example:

Say the 'Defective Bit Field' starts at :

DB 031 DW 010,

and the basic error text number is 500.

If now in DB 031 DW 010 the bits 0, 1 and 5 are set, then that indicates the errors 500, 501 and 505 and the corresponding texts are put in the History Report Buffer.

Additional indication :

- Differentiation of static, dynamic and breaking errors.
- Automatic display of defect header (ie. display of old, new, or sorted error message as configured in error configuration menu). Should the History Report Buffer be empty then the configuration menu for error presentation is displayed on selection of the History Report Buffer.

Configuration of error presentation mode

This is done within the Static control word ("control words address" + 3)

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	signification
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0	new value
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1	first value
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0	priority

New value	Pre-scribes the latest error as the default error header. On selecting the History Report Buffer, this is the first value displayed. Using the <up> and <down> arrow keys the operator can move back in time through the error messages which have occurred.
First-value	Pre-scribes the first error to occur as the default error header. On selecting the History Report Buffer, this is the first value displayed. Using the <up> and <down> arrow keys the operator can move forward in time through the error messages which have occurred.
Priority	Pre-scribes the error message with the lowest text number as the default error header. On selecting the History Report Buffer, this is the first value displayed. Using the <up> and <down> arrow keys the operator can move through the errors which have occurred in order of text number.

Error list / Rotation

The parameterization is done in the Static Control Word ('control words address' + 3)

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	signification
	x	x	x	x	x	x	x	x	x	x	x	x	x	1	x	x	error list
	x	x	x	x	x	x	x	x	x	x	x	x	1	x	x	x	rotation

Error list	For non cyclic errors it is possible, to display more than one error, (single line) as an error list. This enables the user to scroll through the errors, viewing several messages at a time.
Rotation	Providing there are two or more error messages within the history report buffer, then setting of this bit will display each of the errors in turn for a period of 2 seconds each, and continue in a loop fashion at the end of the error messages.

Reset of the error handling

- A reset is done by setting of a bit in the Dynamic Control Word "control words address+4".
- The bit is acknowledged by the PLC mode display with a zero.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Signification
	x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	x	Error Reset

Error status parameterization

The text-related parameterization is done during the text programming within the software package PLCPLUS. To this a special command is available:

#RXY with X,Y = 0...2.

and

	X = 0	static error
	X = 1	dynamic error
	X = 2	breaking error
	Y = 0	no entry into the histogram
	Y = 1	Entry only when „Come"
	Y = 2	Entry when „Come" with „+++" and „Go" with „—"

Static errors	The recording of the error into the error buffer occurs following the positive side of the impulse of the corresponding bit. Following the negative side of that bit, the error is removed from the buffer.
Dynamic errors	The recording of the error into the error buffer occurs following the positive side of the impulse of the corresponding bit. Dynamic errors are only removed when the user has quitt the error with <ESC> . Quitt, but still queueing up errors are marked by a '+' character at the last digit.
Breaking errors	Processing is the same as for static errors, but the error is handled like a message in the message register and therefore breaks each display or handling process at the device.

Error menu

The error presentation is active and displays the error header automatically when the unit is at the basic display, i.e the error header corresponding to the selection of presentation and sorting, if there is at least one error. A handling text is not broken, but the error is parameterized as 'breaking'.

The following keys become operable when the error header is displayed :

< CDN >	selection of the next error
< CUP >	selection of the preceding error
< CR >	to the error header
< ESC >	acknowledging of dynamic errors (branching to the error header)

Chapter 5 - Handling

5.1 General behaviour of the display

- Providing no function is selected by the control or the user, the device will display the basic display. This basic display is the text 000 or a non-varying basic mask text, if the text 000 is not programmed.
- If the unit is in the basic display and one or more errors exist, the default error header is displayed.
- If the operator presses a function key, that holds a programmed text, this is presented on the display and refreshed cyclicly. If the current text is a menu text, continuation texts can be displayed using the arrow keys. This makes it possible to program user guidance and display menus providing the continuation texts have consecutive text-numbering. Between the texts of different menus, there must be a text number gap (compare display and edit menus).
- To call a given message from the PLC the text number of the required message must be entered into the message register. The text is presented, but only if it is an 'edit or a menu text', is it refreshed cyclicly (see message texts / function key texts).
- Messages held in the History Report Buffer can be called up for display by the PLC or by pressing a function key.
- The operator can escape any given function using the <ESC> key. This ability can be disabled in the Dynamic Control Word.

5.2 Message texts / function key texts

There are three different types of texts within the PLC mode:

- **'menu text'** Text is refreshed cyclicly and permits page turning between neighbouring texts. The menu text status is given to a text using the #F character. In addition, all function key texts are automatically menu texts.
- **'handling text'** Text is refreshed cyclicly and page turning is locked. The handling text status is given to a text using the #f character. In addition, texts including edit fields are automatically handling texts.
- **'error text'** Single construction(ie. not built from other texts). This status is given to any text entered into the message register and including non of the control characters (#F, #f) or any edit fields.

5.3 Display and edit menus

If the text in the display is a menu text, i. e. it is a function key text or a message text with the code sequence #F, then the keys <CUP> and <CDN> aquire fixed functions, that permit the operator to turn pages to a text number lower or higher than the current displayed menu text. Page turning is limited with the use of a text number gap (ie a blank text number).

Example:

text number	text subject	
...	...	
100	not used	
101	variable text	< called by function key
102	variable text	
103	variable text	
104	variable text	
105	not used	
...	...	

After activating the text 101 the user can browse up to the text 104 and back again.

5.4 Editing of Variables from the BDT

A text, containing variables to be edited, is constructed as follows:

- All variable values to be edited (ie. defined by #E) will be presented for editing, indicated by a flashing cursor. The cursor is set under the first edit field in the text and moves to the next as the values are entered.
- With the exception of the edit field all variables are refreshed cyclicly.

Key:	Effect:
alphanumeric keys	These keys are used for editing system variables. Only keys conforming to the pre-described format of the edit field will be accepted.
<CUL> (left cursor)	This key is used for correction of values within the input field. The values are only change when a new value is entered on top of the existing value.
<CR>	This key verifies an input and sends it to the control system in the prescibed format.In addition the cursor key is moved to the next input field.
<ESC>	ends the editing and leaves the value in the control system unchanged.
<CUR> (right cursor)	With this key the operater can move the cursor to the right within the edit field, and skip values leaving them unchanged.
'Shift' + <CUR>	selects the next edit field and again leaves the values unchanged. If the defined format is numeric with algebraic sign (#N or #D), the operater can enter a "-" sign at the first digit.
'Shift' + <CUL>	branches to the preceding edit field; likewise without changing the value.

All keys which serve to exit an edit field, e. g. <CR> when acknowledging, are transmitted to the control.

Editing is not possible on the BDT2.

Example:

```
                          On-Line-Display BDT 3

                    +011———110———210———310———410+
text number: 8 ¦    INPUT  SET POINT:  XXX.X          ¦
menu text           ¦    ACKNOWLEDGEMENT :  XXX.X     ¦
                    +411———510———610———710———810+


                  011      110      210      310      410      510
      text:         INPUT SET POINT:  #E031051UUU.U
                    ACKNOWLEDGEMENT:    #031051UUU.U
                  511      610      710      810      910     1010
```

5.5 Text variables (indirectly addressed texts)

Editing of an indirectly addressed text

Programming: **#E<address>T**

with <address> compare special function 'edit variables'

If the edit field is selected, the cursor flashes on the first position. With the key '-' (minus) the value now can be incremented one text number at a time. The increment is directly written into the control and the new text is displayed. As with menu texts, there must be a text number gap as a termination. On reaching the gap, the first text is selected again automatically.

Parameterization <Escape> and <Enter>

The default setting of the <Escape> key means that when pressed, the current function is quitted and the basic display shown. This can be prevented using a control bit. The same is valid for display menus and the <Enter> key. Should this bit be set, return to the basic display can be achieved with a function key assigned, #T000.

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	signification <ESC>/CR>
	x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	prevent branch to basic display

5.6 History report buffer

The history report buffer is an area, in which all text and messages are put in chronological sequence. The number of entries is limited to 170. If the buffer is filled, then the oldest message will be deleted and the new one will be enrolled (loop buffer).

By browsing through the history report buffer using the keys <CUP> and <CDN> an analysis of past events can be performed. Likewise the contents of the history report buffer can be printed out and a full or part log kept for later reference.

History report buffer time out

One minute after the last keystroke within the buffer, the display returns automatically into the set operation mode. The error message being displayed flashes for approx. 30 seconds, to indicate the approaching time-out.

Calling the history report buffer

The history report buffer can be activated with a function key or from a message text, using the code sequence #H.

History report main menu

```
HISTORY REPORT  ENTRIES : 0
END       OLDER     NEWER
```

Place the flashing cursor under the required selection. 'Older', selects the first error to occur for viewing first, and subsequent errors can be viewed using the keys <CUP> and <CDN>. 'Newer' selects the latest error to occur for viewing first and previous errors can be viewed as described above. Or even simpler, select the direction through which you wish to page through the messages. <CUP> takes you forward in time through the messages(equivalent to selecting 'older'). <CDN> takes you back in time through the messages (equivalent to selecting 'newer').

Entries indicates the number of messages in the History Report Buffer.

Service menu

When in the history report buffer, a service menu can be called by pressing the keys <CUR>, <CUL>. In this service menu the actual position in the buffer and the number of entries are displayed.

```
ENTRIES: 010      POSITION: 007
END           OLDER     NEWER
```

From the service menu the key <ESC> leads back to the previous history report message.

Abandonning the history report buffer

Selecting 'END from either of the above menus, prompts the following questions, and subsequently quits the history report buffer.

```
CLEAR HISTORY BUFFER ?
NO                              YES
```

Deleting the history report buffer

The buffer can only be deleted after input of a five-digit password.:

```
ENTER THE PASSWORD PLEASE : 00000
EXIT          +          -          OK
```

If the input password was correct, the password can be changed:

```
        PASSWORD CHANGE ?
GO ON                       YES
```

Selecting 'YES' prompts for a new password. Select 'Go On' to leave the pass word unchanged.

If the entered password does not correspond to the actual password, the following message will be sent:

```
!!!  PASSWORD NOT VALID  !!!
AGAIN
```

The input of the password is demanded once more.

Should the password be lost a reset can be achieved by simultaneous pressing the key combination <ESC> + <CR>, or <F1> + <F8> for the BDT 2 immediately after a cold start. The string '00000' is loaded as a default setting.

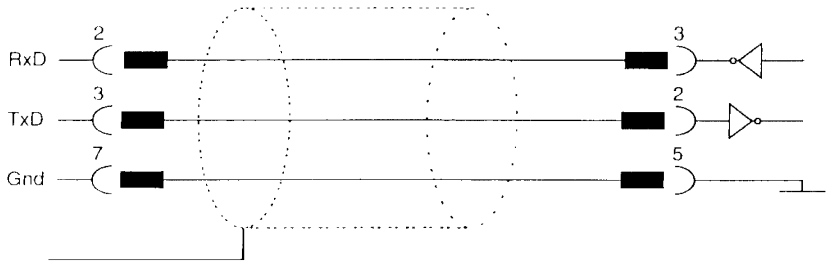
Chapter 6 - Programming

6.1 Coupling your PC to the BDT

The following points must be noted :

Remove the communication cable at X2 (BDT-CONTROL) of the BSG2
Switch BSG2 interface to V.24 operation
Connect the programming cable between X2 and PC.

Programming Cable Type No. 17-28TZ-0005:



Initiating the Programming function:

- The BDT automatically switches to the programming mode when 'transmit configuration' is selected in the PLCPLUS program.
- Should this fail the operator can select 'Text Programming' in the Configuration Menu on the BDT.

  The BDT should automatically switch to the following interface parameters.

  9600 Bd, 8 Data bits, 1 Stop bit and even Parity

The software package is delivered with these parameters.

The BDT now displays the following:

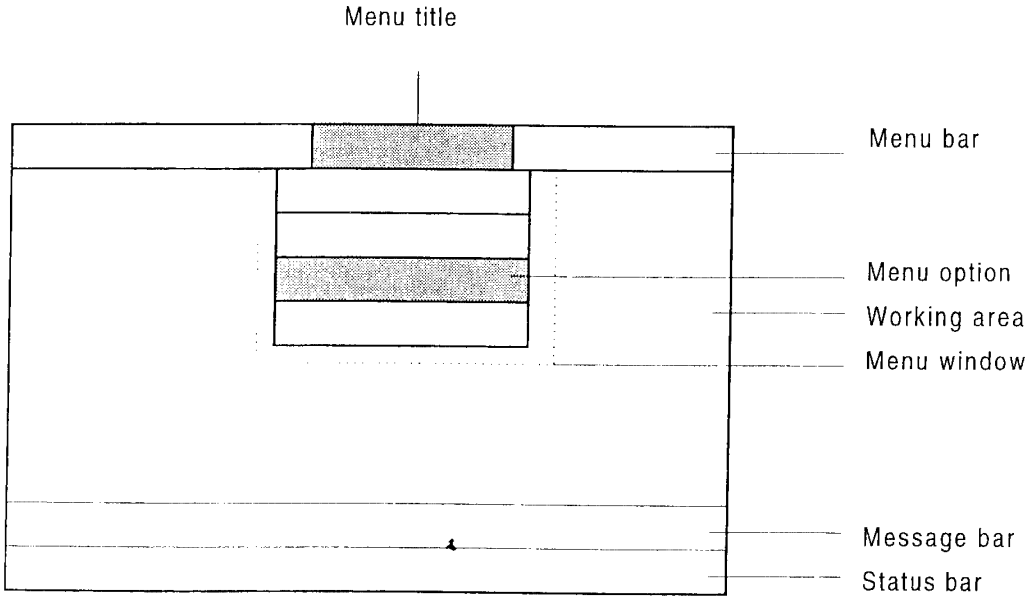
```
PROGRAMMING TEXTS
EXIT
```

6.2 Introduction to the PLCPLUS software

The user interface

The user interface of the present program complies with the SAA specifications. It is beneficial for the handling of the program to use a mouse or a track ball; but handling is also possible, without restrictions, using the keyboard alone.

The SAA screen consists of the following components :



Menu line: The menu line shows all menu titles available to the user. More than one menu line can exist, but only one visible at any one time.

Menu title: Using the menu title the corresponding menu is activated.

Menu window: After selecting an option in the menu line, a pull down menu, that provides a subordinate menu selection is opened.

Desk top: The whole surface below the menu line and above the status line is the desk top. Display and editing takes place in this area.

Message line: In this line, short hints are given regarding the selected menu option.

Status line: Displays time and date and software version.

Selecting and closing menus with the keyboard

Activation of the menu line is done with the <ALT> key, the first menu title is marked by a select cursor which must be placed over the selected function. Or additionally, in each menu title, there is a character, highlighted by colours (Hotkey). With the keys <ESC> or <ALT> the selection is escaped. With the right and left arrow keys the select cursor can be moved back and forth within the menu line.
To activate the selected function, press the particular marked hot key, or place the cursor over selected function as described and press <Return>, or the <Space key>. Thereupon the menu window is displayed and the first option of the menu window is marked by the select cursor.

The selection of the menu option is done in a similar fashion.

Selecting and closing menus with the mouse

Move the mouse cursor to the menu line and point to the menu title. A single click with the left mouse key activates the corresponding menu window. The select cursor marks the first option of the menu window. Move the mouse cursor to the required selection and click with the left mouse key. The selection can be escaped at any time, by clicking with the left mouse key on the screen, outside of a menu title or a menu option.

Interaction boxes

Interaction boxes are used for various inputs. The input fields in these boxes can be moved through using the <arrow keys>. The <Tab> key activates all objects one after the other, <Shift-Tab> activates the objects in the reversed sequence. Alternatively a direct selection is possible with the mouse. In each case the active object is highlighted by an other colour. The input is acknowledged with the <Return> key or can be escaped with the <ESC> key. After pressing either of these keys, the interaction box is closed.

Action Button

The action button contains commands to be performed. With <OK> the commanc is performed, <Escape> exits the command and closes the interaction window. The selection of an action button is done by clicking the required button with the left mouse key. Using the keyboard you can select the required button using the <Tab> key. Activation is achieved by pressing the <Space> key or <Enter> key (Return key).

List fields (vertical or horizontal select box)

In a list field, the available possibilities for selection are given in list format. Using the scroll bar, more possibilities, not currently visible, can be displayed. You can select only one entry from the list in each case. Highlighting is done as previously described. Now click on the selection and then activate the required action button, or double click on the selection to perform the active action button. When using the keyboard use the arrow keys (<Cursor>, <Home>, <End>, <PgUp>, <PgDn>) until the select cursor is placed on the required selection.Then press the <Return> key.

Radio Buttons

Radio buttons contain a group of options, of which only one car be selected at any time. The selected option is highlighted by a mark (_). Options, that are not available are presented inactive. With an active object the selection is done with the space key, or by clicking on the mark with the mouse.

Pop-Up Select box

Pop-Up select boxes are fields, which, when selected, open a window, with a further set of options. To open this window with the mouse, click on the arrow. A double click will select the required item. The pop-up select box can be selected with theTab key, the window is opened using the keys <Space>, <PgUp>, and <PgDn>. By moving the select cursor with the arrow keys you can highlight the required selection. With the <Return> key the item is accepted.

Text fields

Text fields contain an empty space, in which the user can enter text. To place the cursor in the text field, simply click it with the mouse, or press the Tab key. The cursor flashes within the text field to indicate when it is active. With the <Ins> key you can change between the overwrite and the insert mode. It is not necessary, for the whole text to be visible.

Pushbutton

If options are provided with pushbuttons, this means, that the option can be activated or deactivated. The number of activated pushbutton options is not limited. Activated pushbuttons are marked with an [X]. Not available options are presented softened. To activate simply click on the empty pushbutton. To deactivate click once more on the pushbutton. With the keyboard, the pushbutton is selected using the <Tab> key or the arrow keys, the <Space> key is used for activating or deactivating.

File select box

The file select box is used for selecting, loading, and storing files. It contains three interaction fields (two select boxes and an alphanumerical input field), that are intimately attached. i.e. as soon as a selection is made in one field. it is transfered in to the other fields.

Installation

The PLCPLUS software is used to configure the EExi displays. The text programming function is menu driven and operates interactively with the user.

P.C. requirements

To run the PLCPLUS software you will require an IBM-AT or a completely compatible computer. This PC must be equipped with a serial V.24 interface (RS232 C) on COM1/COM2 and have an operating system MS-DOS version 3.1 or higher. A 640 KB central memory, and a video adapter with 25 lines by 80 columns, mode (Hercules, CGA, EGA, VGA), is also required. The capacity of the floppy disk drive must be at least 720 KB to install the software. To operate the program from the floppy disk drive, a capacity of 1,2 MB is required. The file CONFIG.SYS, must contain at least :

FILES = 30
BUFFERS = 30

The automatic installation of MS-DOS 6.0 installs the following entry in the CONFIG.SYS file.

DEVICE = EMM386 noems. please replace „noems“ with "ram"

Installing PLCPlus on your hard drive

Input	comment
A:	select drive A:
install	and simply type 'install'

The installation is performed menu-driven.

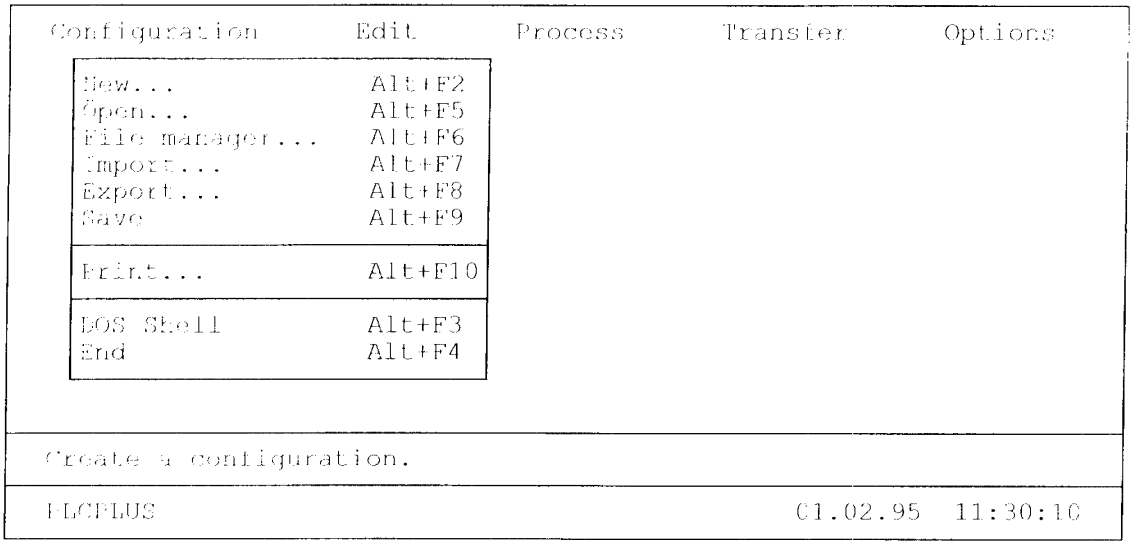
Running the PLCPlus software

Attention: The communication interface to the BSG2 (COM1 or COM2) must not be used by another driver (e. g. mouse).

Input	comment
C:	selection of the fixed disk
cd \PLC	selection of the directory
PLCPLUS	program start
PLCPLUS /L	Program start on a laptop

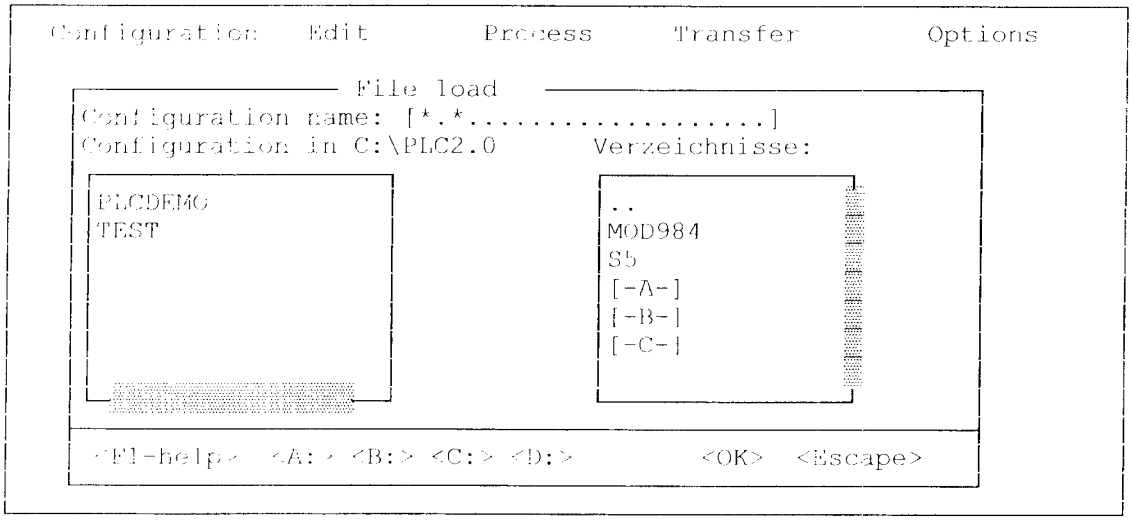
Basic handling of the PC program

On opening the program the follwing display appears:



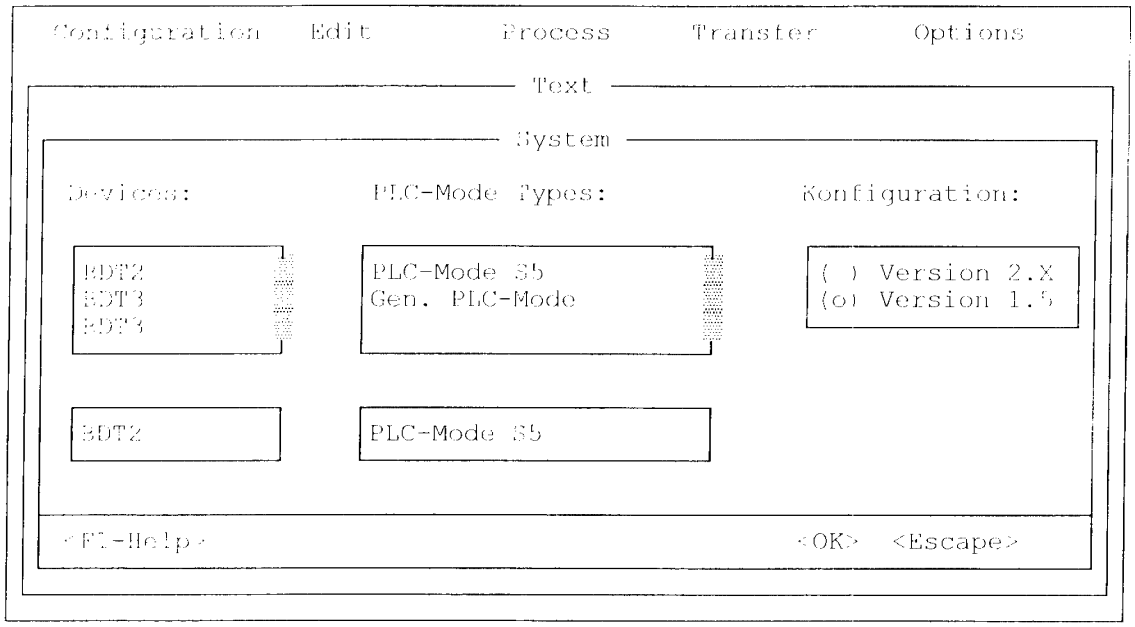
On entry to PLCPlus, the menu window 'Configuration' is opened automatically. Before any programming can be done a 'new' configuration must be created or an existing one (previously created) must be opened.

Create / edit a configuration



In this interaction box you can select an existing configuration, or create a new one. If an existing configuration is selected, the 'Text edit' window is displayed.

If a new name is entered, the interaction box 'System' is displayed:



PLC mode type selection:

PLC-MODE S5: This edit program is specific to a Siemens Simatic S5 PLC. The input of addresses commands and formats are checked for validity.

Gen. PLC-MODE: This edit program can be used for all other firmware types of the PLC mode. Validity checks are run on commands and formats only.

Configuration:

The PLCPLUS V2.X is compatible with configurations created on older versions of the software and also with older versions of the hardware. Thus devices with firmware versions before 2.1 can still be programmed with the current software. For new devices select 'version 2.X'; only with this version can error message handling be set and the text edit field has a dimension of 200 characters.

Editing texts

To edit the texts, select 'Edit' from the menu line and place the cursor on 'texts'. A two-part window with the headline 'Text' is displayed. The editing is done in the lower part of the edit field.

Simply type the required text in the lower box. The text is entered when either the retrieve button is pressed or another menu is selected or when the already entered texts are browsed or by pressing F9. When entered the text is displayed as it will be seen on the BDT screen in the on-line display box.To cancel the last input, press <ESC>.

Text numbers are selected for editing as follows :

keyboard:

- <PgUp>/<PgDn> selection of the previous/next text number
- <Shift>+<PgUp>/<PgDn> 10 text numbers back/forward
- <Strg>+<PgUp>/<PgDn> 100 text numbers back/forward
- <F2> input of the text number

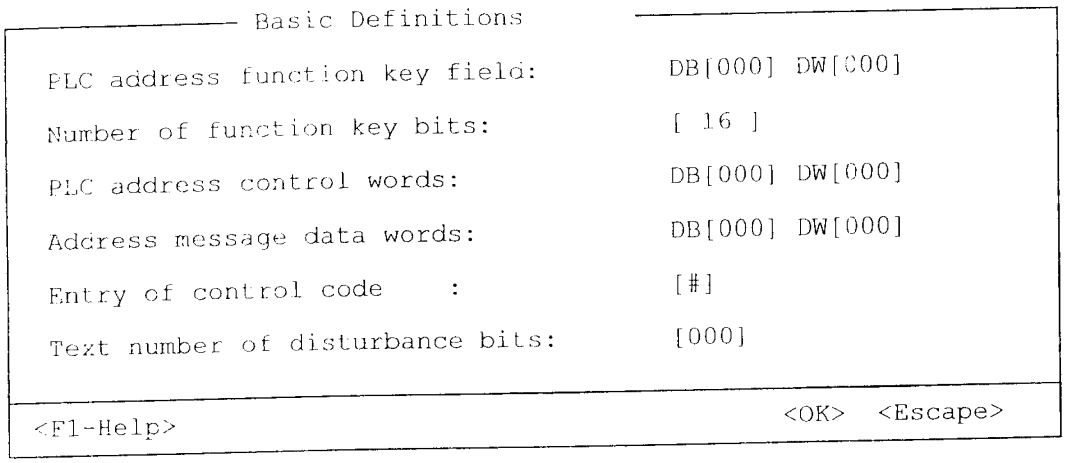
Mouse:

- Simply click the text number arrows to scroll through the texts.

The cursor signals the system's readiness for input.

The entered text is accepted immediately, if an action is prformed outside the edit field. The input is cancelled if the <ESC> key is pressed.

6.3 Basic definitions



In the 'Basic definitions' menu, the following parameters must be input :

PLC address function key field:	This specifies, the address from which the transmission of the function key bits to the control starts. The number of function key bits to be transmitted must be defined.
Number of the function key bits to transmit	To save memory, you can deactivate the number of function key levels. Transmission of the function keys from F1...F16, F1...Shift+F16, F1...Alt+F16, F1..."-"+F16: 64 F1..."-"+F16 48 F1...Alt+F16 32 F1...Shift+F16 16 F1...F16
PLC Address Control Words:	Beginning at this address the control words and error messages are read out of the PLC.
Address of message data words:	Beginning at this address,the text number to be displayed is read out of the PLC.
Declaration of the control character:	The control character (used for format definition) can be defined by the user. It is best to select a character which is unlikely to be used in messages. The default value is #.
Text number of error messages:	This is the text number in the BDT at which the error messages start. If the value zero is entered, the error message handling is inactive.

6.4 Function key texts

```
                Fuction key texts
 1  F1 - [#T001              ]     9  F9 - [#T200              ]
 2  F1 - [#T100              ]     a  F9 - [#T003              ]
 3  F1 - [#T002              ]     b  F9 - [#T030              ]
 4  F1 - [#T004              ]     c  F9 - [#T032              ]
 5  F1 - [#T005              ]     d  F9 - [#T034              ]
 6  F1 - [#T006              ]     e  F9 - [                   ]
 7  F1 - [#T080              ]     f  F9 - [                   ]
 8  F1 - [#T085              ]     g  F9 - [#H                 ]

<F1-Help>       <F2-Alt+Fn>
<F3-Shift+Fn>   <F4-Minus+Fn>                      <OK>  <Escape>
```

The function key texts are divided into several blocks, between which you can switch. The first block contains the function key texts F1...F16; the second block contains the Shift-F1...Shift-F16 etc. The edit fields are 16 characters long. The input format definitions are carried out in the same manner as in normal text programming, with the same validation checks as operates in the PLC General mode.

6.5 Transmission of configurations

Only complete configurations can be transmitted.

a complete configuration consists of:

- **the texts**
- **the basic definitions**
- **the function key texts**

The transmission is now indicated by the message "**Transmit Active**". First the text memory of the connected display is deleted. This lasts upto about 40 seconds. The following transmission of the texts is indicated by the presentation of the texts on the BDT display.

If the transmission was successfull, you will see the following message on the display "**Save text**" and after that the basic menu.

This is indicated by the PC's message "**Successful transmission of data**"

Should there be an error in the configuration, e. g. invalid addresses, the transmission is escaped and the display sends "**The data were not successfully transfered !**". If this occurs check the addresses in the "Basic Definitions". The error message "**Text memory full**" indicates the overflow of the memory. One possible remedy is the use of the command sequence #TXXX (insert Text).

6.6 Extended Handling of PLCPLUS

File Manager

The file manager enables configuration files to be copied, deleted and renamed as required.

Copy	Copying of the selected configuration intc any target directory / drive.
Delete	Deleting of all files using the selected configuration.
Rename	Specification of a new name for a selected configuration

Processing configurations in parts

Conversion of configuration	Conversion of configurations created by SPSPLUS V1.X into the new format. **Attention:** The PLC mode devices must be equipped with firmware Version 2.1. or higher
Copying of text blocks	Copying of specified text blocks into other textblocks, or other configurations. When transfering text blocks you can specify, wether the target text block is to be deleted, and wether the source block should be mapped completely (i.e. with gaps) on to the target block. Overwriting texts in the target block can also be selected. If overwriting is deactivated, yet there are texts in the target area, an interaction box with an error message will be displayed.
Shifting of text blocks	Similar to copying you can shift text blocks in a configuration.
Deleting of text blocks	Deleting of a specified text block.

Export / Import

If it is necessary to process texts in any other ways, you can copy them into ASCII files using the Export function . These have the form

<4 digit text number><100 or 200 digits text><CR><LF>

and the file designation

T<Configuration name>.TXT

This process can be reverted with the "Import" function. For that purpose an ASCII file - i. e. a file, that only contains printable characters and printer control characters; has to be named with the above specified file designation

Saving an up-loaded configuration

After having up-loaded a configuration, simply give it a name and save it in the usual manner.

Printing the configuration

To print out the Basic definititions, Texts or Function key texts simply select print from the configuration menu, and select the required type of print out from the menu.

Text processing

Functions which allow further necessary manipulation of texts are found in the 'processing' menu.

Text number	Simply allows you to select the text number to be edited.
Text Retrieve	Performs the same function as pressing the retrieve button on the edit screen. i.e. enters the text and updates the on-line display.
Load buffers	With this menu item the actual text is written into a buffer.
Buffer after text	This writes whatever is in the buffer, into the actual text edit field.
Delete text	This deletes the contents of the current displayed edit field.
Text-Info	This displays information about the current configuration and available text memory.

Transmission of data to and from the PLC mode display

Transmit configuration	This transmits the selected configuration to the PLC mode display.
Up-load configuration	Providing firmware V.2.1 or higher is used, the PC can up-load the configuration stored on the BDTs EEPROM.
Up-loading history report buffer(histogram) text	Providing firmware V.2.1 or higher is used, the PC can up-load the messages stored in the history report buffer
Delete history report buffer (histogram) entries	With this histogram entries in BDTs with firmware V.2.1 or higher, can be deleted.
Create EEPROM	Creates an EPROM binary file of the selected configuration.Option for additional versions.
Send EEPROM file	This transmits the INTEL hexadecimal file of the actual configuration to the connected EEPROM programming device.

Options menu

Colours	The colour of individual screen elements can be selected to the users liking and are stored on exit of the program.
Set time & date	Sets the time and date of the PC.
Language selection	Sets the preffered language for the connected PLC mode display and the PLCPlus software (user interface).
Interface & formats	Sets the communication parameters between the PC and BDT.
System Option's selection	For selection of BDT type, PLC Mode operation and Firmware version.
Info	Displays the software version number and the date of release.

6.7 Converting a configuration

The PLCPLUS V2.0 software is downward compatible to earlier versions.

To convert a configuration from the format PLCPLUS V1.5x into the new format, select from the configuration menu 'File manager" and select the command <Convert config>.

Editing of V1.X configurations

The software detects these configurations automatically and acts like the older software.

Devices with Firmware before V2.1

To program BDTs with Firmware versions previous to V2.1 select PLC plus version 1.5X.

Attention: In this case only 100 characters of text are down loaded.

Changing the format of a configuration

To convert a configuration from the format PLCPLUS V1.5x into the new format, select from the configuration menu 'File manager" and select the command <Convert config>.

Appendix A Coupling with the Teleperm M

PLC-Mode Teleperm M with procedure 3964R. Coupling to Siemens interface module. Coupling is effected via interface modules 6DS1318 or 6DS1333 (6DS1318 can only be operated actively/passively with TTY).

The IM is not able to process fetches from the terminals. Accordingly, the data must be actively transmitted by the IM. For this purpose 256 data words (16 bits) are available as variable memory. Assignment of memory areas is as follows:

Coupling data terminal => IM:

The terminal automatically sends this data to the IM.

PLC address function key field	· Function keys
PLC address control words + 4	· Acknowledgement of dyn. control word
PLC address message register	· 1 DW message register
	· 1 DW histogram register
	· 1 DW reserve
	· 1 DW reserve
	· 3 DW time register

Coupling data IM => terminal:

This data must be transmitted by the IM to the terminal cyclically and spontaneously.

PLC address control words + 4	3 DW reserve
	2 DW control words
	15 DW fault bit field
PLC address message register	1 DW acknowledgement message register
	1 DW acknowledgement histogram register
	1 DW reserve
	1 DW text number register
	3 DW time register

Variables:

PLC address control words DB + 1	256 DW variables (absolute storage addressing in text)

Example: **"PLC address control words": DB (or) GA 031 000**
The first variable is automatically given the address GA032.000;
e.g. #032000UUU shows the first variable with three positions in U format.

Appendix B Coupling with the MODBUS RTU Protocol

This manual describes the coupling of a terminal to a Siemens PLC. The changes that must be made when coupling with the MODBUS RTU protocol are given below. Coupling with PLC types other than those of the AEG 984 family is basically no problem. The PLC must then be set as slave and accord with the MODBUS RTU protocol function codes. The function codes can be influenced by the address, i.e. the number of the memory type used as a prefix.

B.1 MODBUS RTU Protocol data format

The message format of the MODBUS RTU is in general as follows:

T1	T2	T3	Address	Function	Data	Check sum	T1	T2	T3

with T1 .. T3: Intervals between two messages. The receiver is ready to accept a new address after an interval of at least 3½ character transmission periods.

Address: Substation number of partner in communication. Note: the EExi terminal automatically ascertains the substation after starting up.

Function: Of the numerous functions of the MODBUS RTU protocol, the following are used by the EExi terminals. The function code type is influenced by the address given.

Code	Function
01	Spool and read discrete output flags. This function code is used if the address is prefixed by a "0". For example, read and display the first 16 flags: #00001XXXX
02	Read discrete inputs by putting a "1" as prefix, e.g. read the first 16 input flags: #10001XXXX
03	**Read/write one or more output registers. Prefix is "4", e.g. read the first register with decimal output: # 40001UUUU**
04	Read an input register. "3" as prefix
08	Loop test interpolated cyclically by master
15	Write several flags as code 1
16	Write several registers as code 3

Caution: Memory types "1" (discrete input flags) and "3" (input registers) are read only; i.e. they cannot be used in "general conditions" or "edit variables".

Check sum: Error detection operates with CRC-16 check sum and polynomial $x^{16} + x^{15} + x^2 + 1$

The EExi terminal is the master and actively fetches data from the PLC. No transmission requests must be programmed there for this interface.

B.2 Communication with the MODBUS RTU Protocol

General:

This manual describes communication and coupling of a terminal to a Siemens S5 PLC. The following amendments to the Siemens declaration must be observed when coupling is effected with the MODBUS RTU protocol:

In the PLCPLUS programming package the PLC type "general PLC code" must be selected.

Siemens S5	MODBUS RTU
Data blocks (DB) and data words (DW)	Register
6 position memory address, e.g. #030020UUU	5 position memory address ("4" + 4 position address) e.g. #40001UUU
Addresses DB 000 DW 000 to DB 255 DW 255	Addresses 0000 to 9999 (depending on manufacturer)

The PLC mode was developed for the displays in order to ensure fast and direct communication with the PLC. As the display operates as master in this mode, it is able to read and overwrite any PLC memory areas. It actively fetches variables from the PLC memory, converts them to the desired format and displays them or writes them back.

Summary:

Memory addresses must be given as follows:

BXXXX
- four position address
- memory area
  - 0 - flag bits
  - 1 - input flag (read only)
  - 3 - input registers (read only)
  - 4 - memory registers
  - e.g. memory register 1 = 40001

B.3 Example of Basic Definitions

```
Basic definitions
PLC address function key field:        40001
Number of function key bits:           [ 16 ]
PLC address control words:             40010
Address message data words:            40030
Control character:                     [#]
Text number fault bits:                [500]
<F1-Help>                                    <OK>  <Abort>
```

Important:

- **In order to be able to use the fault bit processing function, it is necessary to keep at least 20 memory registers between the address "PLC address control words" and the address "address message data words".**
- **For terminals using an operating system below Version 2.1 the "text number fault bits" must always be "000".**

The following memory registers must be reserved for the various addresses:

PLC address function key field:	5	memory registers
PLC address control words:	20	memory registers
Address message data words:	7	memory registers

Note: Communication is faster if 20 memory registers are left between the address "PLC address control words" and "address message data words".

B.4 Connection to the AEG Modicon 984

For a terminal to be connected to the MODBUS RTU interface both devices must have the same interface parameters. The "MODBUS RTU protocol" described in the "MODICON MODBUS Protocol Reference Guide" serves as the communication protocol. Interface parameters are resettable. Default settings are as follows:

9600 baud
8 data bits
1 stop bit
even parity

The BSG 2 has an RS 232 and a TTY interface as standard features. External converters are needed to couple the PLC via the RS-422 interface.

B.5 Connection to the GE-FANUC

Coupling to a Series 90-30 GE-FANUC controller is possible with communication co-processor CMM311E.

The co-processor must be parametrised as follows.

Config. Mode: RTU only ----Port 2 --- (Port 2 selected because of the RS232)

RTU enable:	YES
Interface:	RS232
Baud rate:	19200 (variable)
Flow control:	NONE
Parity:	ODD
Station address:	2

All register addresses are prefixed with a "4".

#4XXXX with	**4**	**fixed prefix**
	XXXX	**register address**

Important: The complete address must have 5 positions

B.6 Connection to Honeywell with MODBUS RTU Protocol

Access to all registers with address **4|4096 ... 4|8192** ("4" prefix). Flags cannot be influenced.

Appendix C Coupling to Mitsubishi

General:

The manual describes the coupling of the terminal to a Siemens PLC. The changes that must be carried out for coupling to a Mitsubishi PLC of the MELSEC FX/FXO series are given below (compare Siemens declaration with Mitsubishi).

In the PLCPLUS programming package the PLC type "general PLC code" must be selected.

Siemens S5	Mitsubishi MELSEC FX/FXO PLC series
Data blocks (DB) and data words (DW)	Data register
6 position memory address, e.g. #030020UUU	4 position memory address e.g. #0001UUU
Addresses DB 000 DW 000 to DB 255 DW 255	Data register 0000 to 9999
max. 256 fault messages in fault bit processing	max. 32 faults in fault bit processing

The PLC mode was developed for the displays in order to ensure fast and direct communication with the PLC. As the display operates as master in this mode, it is able to read and overwrite any PLC memory areas. It actively fetches variables from the PLC memory, converts them to the desired format and displays them or writes them back.

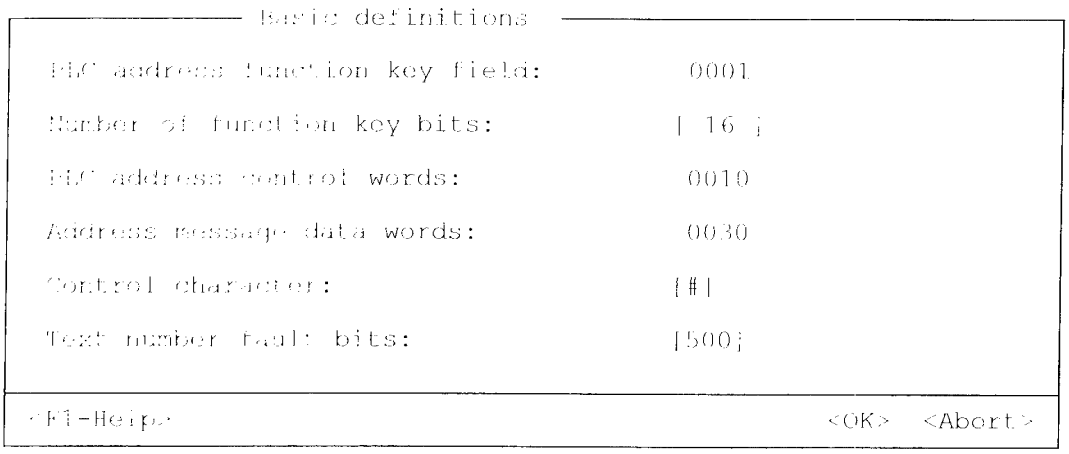
Summary:

Memory addresses must be given as follows:

XXXX
└——— four position address

e.g. Data register 1 = 0001

C.1 Example of 'Basic Definitions'



Important:

The following data registers must be reserved for the various addresses:

PLC address function key field:	5	data registers
PLC address control words:	20	data registers
Address message data words:	7	data registers

This is different from the Siemens PLC in that a maximum of 2 data registers for fault bit processing can be used (maximum 32 faults).

Note: Communication is faster if 20 memory registers are left between the address "PLC address control words" and "address message data words".

C.2 Coupling to the MELSEC FX/FX0 PLC series

Connection is made to the programming interface. Both devices must have the same interface parameters. Interface parameters are resettable. The defaults are as follows:

9600 baud, 7 data bits, 1 stop bit, even parity

Ensure that the interface parameters on both devices are the same.

Appendix D Coupling with the COMLI (Master) Protokoll

General:

The manual describes the coupling of the terminal to a Siemens PLC. The changes that must be carried out for coupling to a COMLI (Master) are given below (compare Siemens declaration with COMLI).

In the PLCPLUS programming package the PLC type "general PLC code" must be selected.

Siemens S5	COMLI protocol (Master)
Data blocks (DB) and data words (DW)	Data register
6 position memory address, e.g. #030020UUU	4 position memory address e.g. #0001UUU
Addresses DB 000 DW 000 to DB 255 DW 255	Data register 0000 to 9999

The PLC mode was developed for the displays in order to ensure fast and direct communication with the PLC. As the display operates as master in this mode, it is able to read and overwrite any PLC memory areas. It actively fetches variables from the PLC memory, converts them to the desired format and displays them or writes them back.

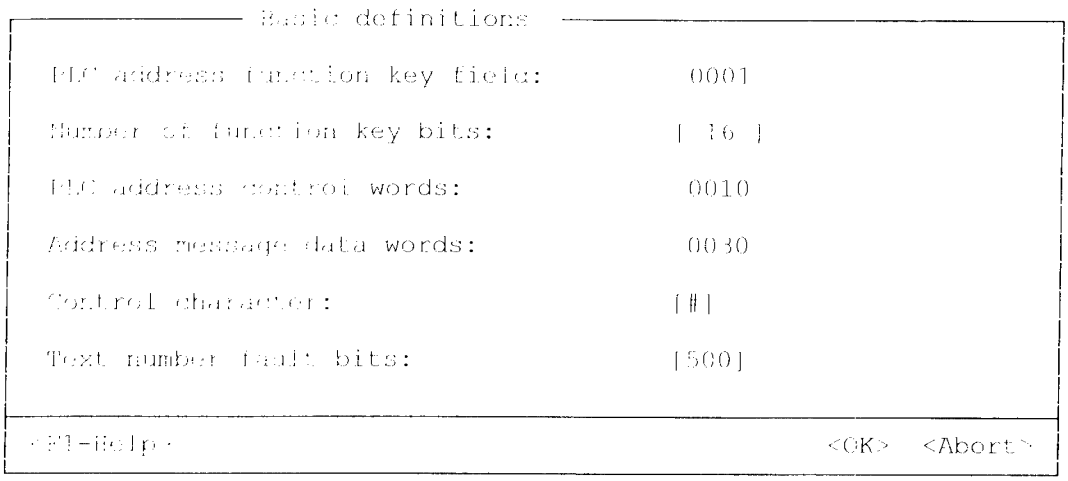
Important:

Memory addresses must be given as follows:

XXXX
└——— four position address

e.g. Data register 1 = 0001

D.1 Example of 'Basic Definitions'



Important: **In order to be able to use the fault bit processing function keep an interval of at least 20 memory registers between the address "PLC address control words" and the address "address message data words".**

The following data registers must be reserved for the various addresses:

PLC address function key field:	5	data registers
PLC address control words:	20	data registers
Address message data words:	7	data registers

Note: Communication is faster if 20 memory registers are left between the address "PLC address control words" and "address message data words".

D.2 Coupling to the SattControl 05-30

Connection is at the RS232 interface. Special attention must be paid to pin assignment (2-3, 3-2, 7-7). Both devices must have the same interface parameters. Defaults are as follows:

9600 baud, 8 data bits, 1 stop bit, odd parity

In SattControl the following parameters must be set for COMLI functions:

COMLI	on
Master / slave	slave
Transmission speed (Baud rate)	9600
Identity	1
Modem delay	0

No further settings or program codes are necessary.

Appendix E Coupling with the COMLI Protocol (Slave)

General:

The manual describes the coupling of the terminal to a Siemens PLC. The changes that must be carried out for coupling to a COMLI (slave) are given below (compare Siemens declaration with COMLI).

In the PLCPLUS programming package the PLC type "general PLC code" must be selected.

Siemens S5	COMLI protocol (master)
Data blocks (DB) and data words (DW)	Data register
6 position memory address, e.g. #030020UUU	4 position memory address e.g. #0001UUU
Addresses DB 000 DW 000 to DB 255 DW 255	300 consecutive data registers (e.g. data register 0050 to data register 0349
Terminal is master and fetches data from PLC	Terminal is slave, PLC must transmit required registers cyclically and interrogate terminal keyboard buffer cyclically.

As the terminal is slaved in this mode, the PLC as master can read out and overwrite data registers via COMLI messages. The data transmitted by the master PLC to the terminal is converted in the terminal from binary to text format and displayed. The data transmitted from the terminal to the PLC must first be converted in the terminal from text to binary format. In order to avoid conflicts in data transfer each value should only be sent in one direction. If data transmission is to be acknowledged or an altered value returned, another register address must be used.

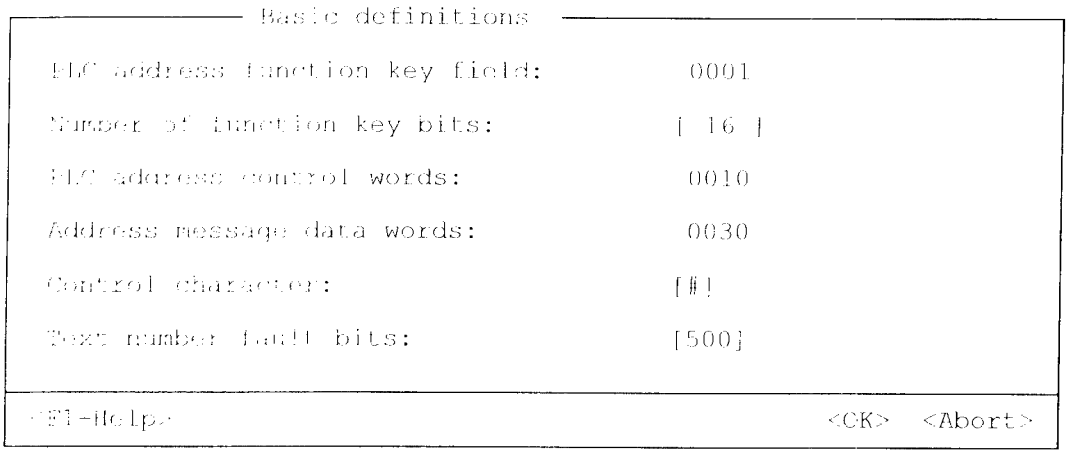
Important:

Memory addresses must be given as follows:

XXXX
└——— four position address

e.g. data register 1 = 0001

E.1 Communication with the PLC (COMLI Slave Protocol)



Important: **In order to be able to use the fault bit processing function keep an interval of at least 20 memory registers between the address "PLC address control words" and the address "address message data words".**

The following data registers must be reserved for the various addresses:

PLC address function key field:	15	data registers
PLC address control words:	20	data registers
Address message data words:	10	data registers

The addresses of each address block are in ascending order. The effective address is calculated from the basic address + offset address.

After the message data words 300 variable registers are available.

Example:

Address message data words = 40, i.e. variable registers from 50 ... 349 can be used in texts.

The PLC must send following messages for coupling data:

- **All register data (type = 2) of "PLC address function key field" (15 registers). This message must be sent permanently in order to interrogate the terminal.**
- **Transfer of register data (type = 0) from PLC address control words (30 registers). This message can be sent spontaneously by the PLC.**

The variables can now be sent and called up spontaneously. However, it must not be forgotten that the registers are behind the time registers.

E.2 Input / confirmation of data into the PLC

Transmission from function keys or cursor keys is from "PLC address function key field".

"PLC address function key field"

+00:	Bit 15	Pass bit BDT
	Bit 14	Histogram complete
	Bit 13	Trigger bit
	Bit 5	Enter key
	Bit 4	Clear or escape key
	Bit 3	Cursor right
	Bit 2	Cursor left
	Bit 1	Cursor down
	Bit 0	Cursor up
+01:	Bit 15	Function key 16
	Bit 0	Function key 1
+02:	Bit 15	Shift + Function key 16
	Bit 0	Shift + Function key 1
+03:	Bit 15	Alt + Function key 16
	Bit 0	Alt + Function key 1
+04	Bit 15	Minus + Function key 16
	Bit 0	Minus + Function key 1
+05		Reserve
+06		Acknowledgements +06 Control word dynamic acknowledgement +07 Message register acknowledgement (text number register) +08 Histogram register acknowledgement
+09:		Text number register
+10:		Time register, binary +10 seconds +11 minutes +12 hours +13 day +14 month +15 year

When a user uses one of the keys referred to above the corresponding bit is reset to the corresponding register. On release the bit is reset. If more than one function key is activated all bits equal zero. A status message bit is transmitted if the histogram overflows.

Example:

In the example the "PLC address key function field" is 0001. Accordingly, function keys F1 to F16 "PLC address function key field" +1 are filed in 0002. When the user presses the key F1 the terminal responds with bit 0 or in the case of F16 bit 15. At the same time the function assigned to F1 is activated, e.g. text is displayed (#T001).

Acknowledgements:

When the PLC sends a control word dynamically to the terminal (cf. "PLC address control words"), the terminal creates a copy of this word. The master reads out this variable from the address "acknowledgement control word dynamic". The same applies to the acknowledgements "message register" and "histogram register".

Important:

- **To avoid data loss, any change in the function key field is made only once. This must be followed by a read only message from the PLC.**
- **The PLC must fetch this value itself. The terminal will wait until the value is fetched.**

PLC address control words:

"PLC address control words"

+00 Reserve; the following data words are wild cards.

+01 Reserve

+02 Reserve

+03 Control word, static

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Meaning
x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0	New value
x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1	First up value
x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0	Priority
x	x	x	x	x	x	x	x	x	x	x	x	x	1	x	x	Fault list
x	x	x	x	x	x	x	x	x	x	x	x	1	x	x	x	Rotating
x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	ESC/CR only in GM
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Do not edit

+04 Control word, dynamic (acknowledged by BDT with zero)

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Meaning
x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Time BDT -> PLC
x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	Branch to basic mask
x	x	x	x	1	1	x	x	x	x	x	x	x	x	x	x	Delete histogram
x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	x	Reset fault
x	x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	Time PLC ->BDT

+05 Fault bit field (total 15 words)

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Meaning
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	Fault 0
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Fault 15

+06

Bit 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Meaning
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	Fault 16
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Fault 31
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	Fault 224
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Fault 239

+19

Text register:

In this function block texts can be written to the display or the histogram by the controller. The basic address of this function block is "message register". The other registers have the following addresses.

"Address message data words"

+00 Message register
+01 Histogram register
+02 Reserve
+03 Reserve
+04 Time register, binary coded (BDT -> PLC)

+04 seconds
+05 minutes
+06 hours
+07 day
+08 month
+09 year

Message register:	If a text is to be written into the display by the controller, it must be entered as a binary number in the message register. This text number is read out by the terminal and the program text is shown on the display. The terminal then writes the current text number into the "acknowledgement message register". A variety of commands can now be written into the text, e.g. variables or date/time. A description of these commands is to be found in the section "text programming". It is not possible to call up the basic mask or text 0 via the message register. The bit "branch to basic mask" (cf. "PLC address control words") must be used for this.
Histogram register:	The PLC must enter a text number here for inclusion in the histogram by the terminal. Procedure is the same as in the case of the message register. A FIFO buffer must be set up in the controller for messages following in quick succession.
Time register:	For transmission of real time. Transmission is activated by the PLC. Time is transferred in binary form to several registers.

Free variables

Up to 15 variables in the most various formats can be displayed or edited in the text. The variables are programmed directly into the texts in which they are to be displayed. The terminal then actively fetches the values corresponding to the variables from its memory. A condition of this is that the variables have been transferred by the PLC.

This area begins with "PLC address message data words" +10. The 300 register addresses are arranged one after the other.

Example: The variables for "PLC address message data words" = 40 are in registers 50 ... 349

E.3 Coupling to the SattControl 05-30

The connection is made to the RS232 interface. Pin assignment of both devices must be observed (2-3, 3-2, 7-7). Both devices must have the same interface parameters. Defaults are as follows:

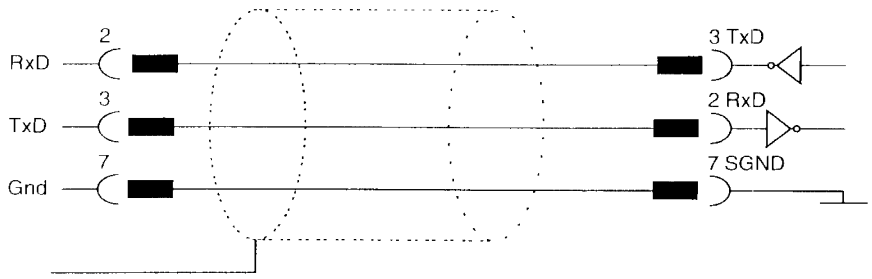
9600 baud, 8 data bits, 1 stop bit, odd parity

In SattControl the following parameters must be set for COMLI functions:

COMLI	on
Master / Slave	master
Transmission speed (baud rate)	9600
Identity	1
Modem delay	0

Each terminal must be assigned its own substation number (1 ... 32).

BSG2 - SattControl 05-30 connection cable



Appendix F Troubleshooting

Fault:	Cause:	Remedy:
After starting up terminal shows "Configuration error".	Terminal contains illegal data and must be reprogrammed.	Program terminal with PLCPLUS
	"Basic definitions" are faulty.	Check data and addresses and enter correct data.
Terminal cannot be programmed.	Terminal is not in programming mode. "Communication fault" appears on display.	Switch terminal manually to programming mode (in Configuration menu).
"Program texts" is displayed but transmission is broken off.	Substation numbers in terminal and PC do not agree.	Enter correct substation number.
	Defective programming cable.	Check wiring.
	"Text memory full" appears on display of terminal.	Use memory with command sequence #TXXX.
PLCPLUS program cannot be started or does not display all functions.	Too many resident drivers in the system. At least 535 KB of memory must be available for program.	Delete all unnecessary drivers from AUTOEXEC.BAT and CONFIG.SYS.
Menu bars in PLCPLUS are not visible.	Graphics card not properly integrated or an LCD display is being used.	Restart program with parameter /L:PLCPLUS/L.

Physikalisch-Technische Bundesanstalt (PTB)
- Federal Institute of Physical Sciences and Engineering -

(1) **CONFORMITY CERTIFICATE**

(2) **PTB No. Ex-93.C.2007 X**

(3) This certificate applies to the following electrical equipment.

Dialogue terminals
BDT 2 Type 17-21TA-1002
BDT 3 Type 17-21TA-1003
BDT 4 Type 17-21TA-1004

(4) Supplied by:
BARTEC BARLIAN-TECHNIK GmbH
D-6990 Bad Mergentheim

(5) Design particulars of this item of electrical equipment together with the various permitted variations are given in the appendix to this conformity certificate.

(6) In its capacity as a testing agency in accordance with Article 14 of the Council of the European Communities regulation dated 18 December 1975 (76/117/EEC) the PTB hereby certifies the conformity of this item of electrical equipment with the harmonized European Standards

Electrical equipment for explosion hazard areas

EN 50 014:1977 + A1...A5 (VDE 0170/0171 Part 1/1.87) General Provisions
EN 50 020:1977 + A1...A2 (VDE 0170/0171 Part 7/1.87) Intrinsic Safety "i"

the said equipment having passed the requisite tests. The results of these tests are set out in a confidential test report.

(7) The equipment is to be marked as follows.

EEx ib IIC T4

(8) The manufacturer shall be responsible for ensuring that every item of equipment thus marked conforms to the test documentation given in the appendix to this certificate and that the prescribed routine tests have been duly carried out.

(9) The equipment may be marked with the group distinguishing mark given here in accordance with Appendix II of the Council regulation dated 06 February 1979 (79/196/EEC).

Braunschweig, 24 February 1993

Signed for the PTB

Dr.-Ing. Johannsmeyer

BDT 2 Type 17-21TA-1005, BDT 3 Type 17-21TA-1006, BDT 4 Type 17-21TA-1007

Feeder circuit I (block X1 terminals 1 and 2)	Protection type intrinsically safe EEx ib IIC or EEx ib IIB. Must be connected to a certified intrinsically safe circuit with the following maximum limits: U_i = 14 V I_i = 120 mA P_i = 1.7 W Effective inner self-inductance and capacitance are negligible *Or* Connection to feeder unit BSG 2 Type 17-25TC-3001 (PTB No. Ex-93.C.2008 X)
Signal circuits I and II (block X1 terminals 4 and 5 or 7 and 8)	Protection type intrinsically safe EEx ib IIC or EEx ib IIB. Maximum limits per circuit: U_o = 7.2 V I_k = 164 mA P = 295 mW Linear characteristic

EEx ib	IIC	IIB
Max. ext. capacitance	21 µF	350 µF
Max. ext. inductance	0.8 mH	5.5 mH

External keyboard circuit (connector X2)	Only for connection to a passive keyboard with max. cable length 1 m.

BDT 3 Type 17-21TA-1008, BDT 4 Type 17-21TA-1009

Feeder circuit I (block X1 terminals 1 and 2)	Protection type intrinsically safe EEx ib IIC. Must be connected to a certified intrinsically safe circuit with the following maximum limits: U_i = 14 V I_i = 120 mA P_i = 1.7 W Effective inner self-inductance and capacitance are negligible
Or	Connection to feeder unit BSG 2 Type 17-25TC-3001 (PTB No. Ex-93.C.2008 X)

Feeder circuit II and signal circuit IV (block X5 terminals 1, 2 and 3 to 8)

Protection type intrinsically safe EEx ib IIC.
Must be connected to a certified intrinsically safe circuit with the following maximum limits:

U_i = 8 V
I_i = 400 mA
P_i = 2 W

Effective inner self-inductance < 10μH.
Effective inner capacitance 460 nF.

Total permissible external self-inductance and capacitance of both circuits taken together.

Signal circuits I and II (block X1 terminals 4 and 5 or 7 and 8)

Protection type intrinsically safe
EEx ib IIC or EEx ib IIB.
Maximum limits per circuit:

U_o = 7.2 V
I_k = 164 mA
P = 295 mW
Linear characteristic

Effective inner self-inductance < 10μH.
Effective inner capacitance is negligible.

EEx ib	IIC	IIB
Max. ext. capacitance	21 μF	350 μF
Max. ext. inductance	0.8 mH	5.5 mH

External keyboard circuit (connector X2)

Only for connection to a passive keyboard with max. cable length 1 m.

BDT 3 Type 17-21TA-1010 and BDT 4 Type 17-21TA-1011

Feeder circuit I (block X1 terminals 1 and 2)

Protection type intrinsically safe
EEx ib IIC. Must be connected to a certified intrinsically safe circuit with the following maximum limits:

U_i = 14 V
I_i = 120 mA
P_i = 1.7 W

Effective inner self-inductance and capacitance are negligible

Or

Connection to feeder unit BSG 2 Type 17-25TC-3001 (PTB No. Ex-93.C.2008 X)

1st SUPPLEMENT TO PARTIAL CONFORMITY CERTIFICATE
PTB No. Ex-93.C.2007 X

Signal circuits I and II
(block X1
terminals 4 and 5 or 7 and 8)

Protection type intrinsically safe
EEx ib IIC or EEx ib IIB.
Maximum limits per circuit:

U_o = 7.2 V
I_k = 164 mA
P = 295 mW
Linear characteristic

Effective inner self-inductance < 10μH.
Effective inner capacitance is negligible.

EEx ib	IIC	IIB
Max. ext. capacitance	21 μF	350 μF
Max. ext. inductance	0.8 mH	5.5 mH

Signal circuit IV
(block X5
terminals 3, 4 and 8)

Protection type intrinsically safe
EEx ib IIC or EEx ib IIB.
Maximum limits per circuit:

U_o = 6.51 V
I_k = 281 mA
P = 447 mW
Linear characteristic

Effective inner self-inductance < 10μH.
Effective inner capacitance 220 nF.

EEx ib	IIC	IIB
Max. ext. capacitance	34.7 μF	620 μF
Max. ext. inductance	0.21 mH	1.9 mH

External keyboard circuit
(connector X2)

Only for connection to a passive keyboard
with max. cable length 1 m.

In dialogue terminals BDT 3 Type 17-21TA-1008 and BDT 4 Type 17-21TA-1009 signal circuit IV is not electrically isolated from feeder circuit II; it is, however, electrically isolated from all other circuits.

Test documentation

1. Conformity certificate PTB No. Ex-92.C.2144 X and 1st supplement
2. Description (3 pages)

Signed on

15 May 1995

1st SUPPLEMENT TO PARTIAL CONFORMITY CERTIFICATE
PTB No. Ex-93.C.2007 X

Notes

1. If more than one dialogue terminal and feeder units are used, the feeder unit BSG 2 Type 17-25TC-3001 must be used. Connection must also be established between feeder units BSG 2 Type 17-25TC-3001, terminal d20, and the dialogue terminals on terminal 10.

2. The dialogue terminal must be electrostatically earthed (leakage resistance $\geq$ 15 kΩ $\leq$ 1 MΩ). If the enclosure in which the dialogue terminal is fitted is not itself earthed the connection point on the back of the dialogue terminal should be used.

Braunschweig, 21 July 1995

Signed for the PTB
Dr.-Ing. Johannsmeyer

Physikalisch-Technische Bundesanstalt (PTB)
- Federal Institute of Physical Sciences and Engineering -

(1) **CONFORMITY CERTIFICATE**

(2) **PTB No. Ex-93.C.2008 X**

(3) This certificate applies to the following electrical equipment.

Power supply unit BSG 2 Type 17-25TC-3001

(4) Supplied by: BARTEC BARLIAN-TECHNIK GmbH
W-6990 Bad Mergentheim

(5) Design particulars of this item of electrical equipment together with the various permitted variations are given in the appendix to this conformity certificate.

(6) In its capacity as a testing agency in accordance with Article 14 of the Council of the European Communities regulation dated 18 December 1975 (76/117/EEC) the PTB hereby certifies the conformity of this item of electrical equipment with the harmonized European Standards

Electrical equipment for explosion hazard areas

EN 50 014:1977 + A1...A5 (VDE 0170/0171 Part 1/1.87) General Provisions
EN 50 020:1977 + A1...A2 (VDE 0170/0171 Part 7/1.87) Intrinsic Safety "i"

the said equipment having passed the requisite tests. The results of these tests are set out in a confidential test report.

(7) The equipment is to be marked as follows.

[EEx ib] IIC

(8) The manufacturer shall be responsible for ensuring that every item of equipment thus marked conforms to the test documentation given in the appendix to this certificate and that the prescribed routine tests have been duly carried out.

(9) The equipment may be marked with the group distinguishing mark given here in accordance with Appendix II of the Council regulation dated 06 February 1979 (79/196/EEC).

Braunschweig, 24 February 1993

Signed for the PTB

Dr.-Ing. Johannsmeyer

APPENDIX

to conformity certificate PTB No. Ex-93.C.2008 X

The power supply unit BSG 2 Type 17-25TC-3001 is for the supply of power to terminals in hazardous areas and for signal isolation and transmission to a non-intrinsically safe output circuit.

Highest permissible ambient temperature is 50°C.

Electrical data

Mains circuit
(connections z2,b2,d2)

U = 24 V DC, -15% / +10%, approx. 160 mA
Rated voltage: U_{rat} = 30 V DC

Signal circuit
(connections z16/d16 or z24/d24)

Protection type intrinsically safe EEx ib IIC or EEx ib IIB
Maximum limits per circuit:

U_o = 7.2 V
I_k = 164 mA
P = 295 W
Linear characteristic

EEx ib	IIC	IIB
Max. external self-inductance	0.8 mH	5.5 mH
Max. external capacity	21 µF	350 µF

Power supply circuit
(connections z16/d16 or z8/d8)

Protection type intrinsically safe EEx ib IIC or EEx ib IIB
Maximum limits per circuit:

U_o = 14 V
I_k = 120 mA
P = 1.7 W
rectangular characteristic

EEx ib	IIC	IIB
Max. external self-inductance	0.15 mH	1 mH
Max. external capacity	250 nF	800 nF

Input circuit
(connections Pin 2/7,
Pin 9/24 and z32/b32)

Per circuit: U ≤ 24 V; I ≤ 20mA

(Connect only to devices with max. operating voltage 250 V)

Output circuit
(connections Pin 11/12, Pin 13/25
Pin 22/23, Pin 3/7 and d32/b32)

Per circuit: U ≤ 24 V; I ≤ 20mA

(Connect only to devices with max. operating voltage 250 V)

The mains circuit and the input and output circuits are electrically isolated from all other circuits to a crest working line voltage of 375 V.

Test documentation

1. Description (4 pages) Signed on 06 November 1992

2. Drawing No. 11-25TC-6501 18 December 1992

Notes

1. The power supply unit BSG 2 Type 17-25TC-3001 is to be installed outside the hazardous area.

2. The power supply unit BSG 2 Type 17-25TC-3001 must be installed so as to conform to, at the least, IP 20 in accordance with IEC publication 529 (144).

3. If several power supply units BSG 2 Type 17-25TC-3001 and dialogue terminals are installed, only dialogue terminals BDT 2 Type 17-21TA-1002, BDT 3 Type 17-21TA-1003 and BDT 4 Type 17-21TA-1004 may be connected. Connection must also be established between power supply units BSG 2 Type 17-25TC-3001, terminal d20, and the dialogue terminals on terminal 10.

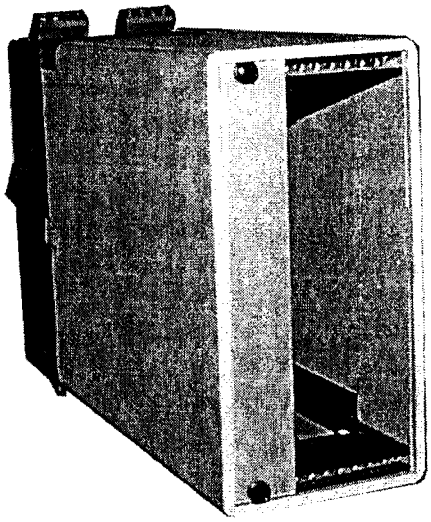
Braunschweig, 24 February 1993

Signed for the PTB

Dr.-Ing. Johannsmeyer

Klemmenplan für Tragschienengehäuse

Typ 17-28TZ-7004 für Speise- und Signaltrennkarte BSG 2



Spannungsversorgung X1 (grün):

1	+ 24 V
2	0 V
3	PE
4	frei
5	frei
6	frei
7	frei
8	frei

Zum Dialogterminal BDT 2, BDT 3 und BDT 4 X2 (blau, eigensicher):

1	-12 V		
2	0 V		
3	RS 422	TxD	LTG A
4	RS 422	TxD	LTG B
5	RS 422	RxD	LTG A
6	RS 422	RxD	LTG B
7	frei		
8	Masseanschluss		

Erklärung der EG-Konformität
Declaration of EC-Conformity
Attestation de conformité CE

BARTEC
BARTEC GmbH
Dieselstraße 6
97980 Bad Mergentheim

Wir/ We/Nous

BARTEC Componenten und Systeme GmbH,

erklären in alleiniger Verantwortung/declare under our sole responsibility/ attestons sous notre seule responsabilité
daß das Produkt/that the product/que le produit

Dialogterminal: Typ 17-21TA-1005, -1006 und -1007

auf das sich diese Erklärung bezieht/to which this declaration relates/se référant à cette attestation
den Bestimmungen der folgenden Richtlinien entspricht/is in accordance with the provision of the following directives/correspond aux dispositions des directives sulvantes

89/336/EWG **EG-EMV-Richtlinie**

und mit folgenden Normen oder normativen Dokumenten übereinstimmt/ and is in conformity with the following standards or other normative documents/et est conforme aux normes ou documents normatifs ci-dessous

EN 50 081; Teil 2 EN 50 082; Teil 2

Angewendete Normen und technische Spezifikationen:
EN 50 014, EN 50 019, EN 50 020 und EN 50 028

Bad Mergentheim, den 26.06.96

BARTEC GmbH
Dieselstraße 6
97980 Bad Mergentheim

Martin Fischle
Geschäftsführer Technik