SIEMENS

TELEPERM M/ME

CS 275 Bus System

Manual

Order No. C79000–G8076–C006–18

Contents

Siemens Aktiengesellschaft

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Order No. C79000–G8076–C006
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Register Contents

"Important Notes, Information, Suggestions/Corrections"

Info	"Notes to the N-AT variants" Notes concerning the field of application of the N-AT variants C79000-D8076-C006
Guidelines	"Instructions and Guidelines for Planning, Installation and Operation of TELEPERM M Systems" Guideline manual for the TELEPERM M range (no part of this CS 275 manual) Order No. C79000-G8076-C417
Safety-Related Guidelines	"Safety-Related Guidelines for the User" Summary of the safety-related aspects during operation of TELEPERM M systems C79000-D8076-C402-04
ESD Guidelines	"Guidelines for Handling Electrostatically Sensitive Devices" Summary of the rules concerning the module handling C79000-D8076-C333-01
Suggestions/ Corrections	"Suggestions/Corrections for Document/Manual" A return sheet for suggestions of improvement is enclosed. C79000-D8075-C404-08

Notes to the N–AT Variants

Order No.: 6DS1 222–8AA
6DS1 222–8AB
6DS1 222–8BA

Field of application: PC applications from TELEPERM M/ME product range

Order No. of the user Description: 6DS1 222–1AA10
6DS1 222–1AB10
6DS1 222–8BA11

> **Note:**
>
> The N–AT variants –8AA and –8AB have a different functionnality so they **cannot** be interchanged!

> **Note:**
>
> The application (e.g. PROGRAF AS) determines the N–AT variant to be used!

TELEPERM M/ME
Safety-Related Guidelines for the User

1 General

This manual provides the information required for the intended use of the particular product. The documentation is written for technically qualified personnel such as engineers, programmers or maintenance specialists who have been specially trained and who have the specialized knowledge required in the field of instrumentation and control., called automation in the following.

A knowledge of the safety instructions and warnings contained in this manual and their appropriate application are prerequisites for safe installation, commissioning and maintenance as well as safe and proper operation of the product described. Only qualified personnel as defined in section 2 have the specialized knowledge that is necessary to correctly interpret the general danger notices and warnings contained in this documentation and implement them in each particular case.

This manual is an inherent part of the scope of supply even if, for logistic reasons, it has to be ordered separately. For the sake of clarity, not all details of all versions of the product are described in the documentation, nor can it cover all conceivable cases regarding installation, operation and maintenance. Should you require further information or face special problems that have not been dealt with in sufficient detail in this documentation, please contact your local Siemens office.

We would also point out that the contents of this product documentation shall not become a part of or modify any prior or existing agreement, commitment or legal relationship. The Purchase Agreement contains the complete and exclusive obligations of Siemens. Any statements contained in this documentation do not create new warranties or restrict the existing warranty.

2 Qualified Personnel

Persons who are **not qualified** should not be allowed to handle the equipment/system. Non-compliance with the warnings contained in this manual or appearing on the equipment itself can result in severe personal injury or damage to property. Only **qualified personnel** should be allowed to work on this equipment/system.

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

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

3 Danger Notices

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

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

Danger

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

Warning

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

Caution

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

Note

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

Important

If in this manual "Important" should appear in bold type, drawing attention to any particularly information, the definition corresponds to that of "Warning", "Caution" or "Note".

4 Proper Usage

- The equipment/system or the system components may only be used for the applications described in the catalog or the manual, and only in combination with the equipment, components and devices of other manufacturers as far as this is recommended or permitted by Siemens.
- The product described has been developed, manufactured, tested and the documentation compiled in keeping with the relevant safety standards. Consequently, if the described handling instructions and safety guidelines described for planning, installation, proper operation and maintenance are adhered to, the product, under normal conditions, will not be a source of danger to property or life.

Warning

- After opening the housing or the protective cover or after opening the system cabinet, certain parts of this equipment/system will be accessible, which could have a dangerously high voltage level.
- Only suitably qualified personnel should be allowed access to this equipment/system.
- These persons must be fully conversant with any potential sources of danger and maintenance measures as set out in the instructions contained in this manual.
- It is assumed that this product be transported, stored and installed as intended, and maintained and operated with care to ensure that the product functions correctly and safely.

5 Guidelines for the Planning and Installation of the Product

The product generally forms a part of larger systems or plants. These guidelines are intended to help integrate the product into its environment without it constituting a source of danger.
The following facts require particular attention:

> **Note**
>
> Even when a high degree of safety-related reliability has been designed into an item of automation equipment by means of multichannel configuration, it is still imperative that the instructions contained in this manual be exactly adhered to. Incorrect handling can render ineffective the preventive measures incorporated into the system to protect it against dangerous process states, and even create new sources of danger.

The following advice regarding installation and commissioning of the product should - in specific cases - also be noted.

> **Warning**
>
> - Follow strictly the safety and accident prevention rules that apply in each particular case.
> - Units which are designed as built-in units may only be operated as such, and table-mounted or portable equipment only with its casing closed.
> - In the case of equipment with a permanent power connection which is not provided with an isolating switch and/or fuses which disconnect all poles, a suitable isolating switch or fuses must be provided in the building wiring system (distribution board). Furthermore, the equipment must be connected to a protective ground (PE) conductor.
> - For equipment or systems with a fixed connecting cable but no isolating switch which disconnects all poles, the power socket with the grounding pin must be installed close to the unit and must be easily accessible.
> - Before switching on the equipment, make sure that the voltage range setting on the equipment corresponds to the local power system voltage.
> - In the case of equipment operating on 24 V DC, use an extra-low voltage with a protective separation with the mains supply. The protective separation has to comply with the following requirements:
>   - VDE 0100 Part 410 ≙ HD 384-4-41 ≙ IEC 364-4-41 (as function extra-low voltage with protective separation) or
>   - VDE 0805 ≙ EN 60950 ≙ IEC 950 (as a safety extra-low voltage SELV) or
>   - VDE 0106 Part 101.
> - The I/O modules are designed for operation with safety extra-low voltage acc. to IEC 950 / EN 60950/VDE 0805. Therefore only components whose connection points are separated in a safe manner (by means of the protective measure "Protective separation") from voltages (e.g. mains) may be connected to the inputs/outputs of these modules.
> - Fluctuations or deviations of the power supply voltage from the rated value should not exceed the tolerances specified in the technical specifications. Otherwise, functional failures or dangerous conditions can occur in the electronic modules/equipment.
> - Suitable measures must be taken to make sure that programs that are interrupted by a voltage dip or power supply failure resume proper operation when the power supply is restored. Care must be taken to ensure that dangerous operating conditions do not occur even momentarily. If necessary, the equipment must be forced into the "emergency off" state.
> - Emergency tripping devices in accordance with EN 60204/IEC 204 (VDE 0113) must be effective in all operating modes of the automation equipment. Resetting the emergency off device must not result in any uncontrolled or undefined restart of the equipment.

> **Caution**
>
> - Install the power supply and signal cables in such a manner as to prevent inductive and capacitive interference voltages from affecting the automation functions.
> - Automation equipment and its operating elements must be installed in such a manner as to prevent unintentional operation.
> - Automation equipment can assume an undefined state in the case of a wire break in the signal lines. To prevent this, suitable hardware and software measures must be taken when interfacing the inputs and outputs of the automation equipment.

6 Active and Passive Faults in Automation Equipment

- Depending on the particular task for which the electronic automation equipment is used, both **active** as well as **passive** faults can result in a **dangerous** situation. For example, in actuator control (e.g. press control), an active fault is generally dangerous because it can result in an unauthorized startup of the actuator. On the other hand, a passive fault in a signalling function (alarm signalling system) can result in a dangerous, command-blocking operating state not being reported to the operator.
- This differentiation of the possible faults and their classification into dangerous and non-dangerous faults, depending on the particular task, is important for all safety considerations in respect of the product supplied and the its interaction with the process to be controlled.

> **Warning**
>
> In all cases where a fault in an automation equipment can result in severe personal injury or substantial damage to property, ie. where a dangerous fault can occur, safety-related and fail-safe systems (in general prototype-tested by the German Technical Inspectorate (TÜV)) must be used or additional external measures be taken or equipment provided to ensure or force safe operating conditions even in the event of a fault (e.g. by means of independent limit monitors, mechanical interlocks etc.).

7 Procedures for Maintenance and Repair

If measurement or testing work is to be carried out on an active unit, the rules and regulations contained in the "VBG 4.0 Accident prevention regulations" of the German employers liability assurance association (Berufsgenossenschaften) must be observed. Particular attention is drawn to paragraph 8 "Permissible exceptions when working on live parts". Use only suitable electrical tools.

> **Warning**
>
> - Repairs to an item of automation equipment may only be carried out by **Siemens service personnel** or **an authorized Siemens repair center.** For replacement purposes, use only parts or components that are contained in the spare parts list or listed in the "Spare parts" section of this manual. Unauthorized opening of equipment and improper repairs can result in loss of life or severe personal injury as well as substantial property damage
> - Before opening the equipment, always remove the power plug or open the disconnecting switch.
> - Only use the fuse types specified in the technical specifications or the maintenance instructions of this manual.
> - Do not throw batteries into an open fire and do not carry out any soldering work on batteries (danger of explosion). Maximum ambient temperature 100°C. Lithium batteries or batteries containing mercury should not be opened or recharged. Make sure that the same type is used when replacing batteries.
> - Batteries and accumulators must be disposed of as classified waste.
> - The following points require attention when using monitors:
>   Improper handling, especially the readjustment of the high voltage or fitting of another tube type can result in excessive X-ray radiation from the unit. The license to operate such a modified unit automatically lapses and the unit must not be operated at all.

Guidelines for Handling Electrostatically Sensitive Devices (ESD)

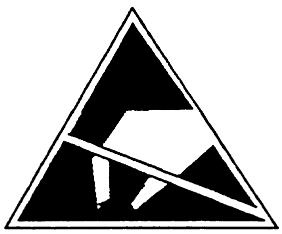
1 What is ESD?

VSLI chips (MOS technology) are used in practically all SIMATIC S5 and TELEPERM M modules. These VLSI components are, by their nature, very sensitive to overvoltages and thus to electrostatic discharge:

They are therefore defined as
"Electrostatically Sensitive Devices"

"ESD" is the abbreviation used internationally.

The following warning label on the cabinets, subracks and packing indicates that electrostatically sensitive components have been used and that the modules concerned are susceptible to touch:



ESDs can be destroyed by voltage and energy levels which are far below the level perceptible to human beings. Such voltages already occur when a component or a module is touched by a person who has not been electrostatically discharged. Components which have been subjected to such overvoltages cannot, in most cases, be immediately detected as faulty; the fault occurs only after a long period in operation.

An electrostatic discharge

- of 3500 V can be felt
- of 4500 V can be heard
- must take place at a minimum of 5000 V to be seen.

But just a fraction of this voltage can already damage or destroy an electronic component.

The typical data of a component can suffer due to damage, overstressing or weakening caused by electrostatic discharge; this can result in temporary fault behavior, e.g. in the case of

- temperature variations,
- mechanical shocks,
- vibrations,
- change of load.

Only the consequent use of protective equipment and careful observance of the precautions for handling such components can effectively prevent functional disturbances and failures of ESD modules.

2 When is a Static Charge Formed?

One can never be sure whether the human body or the material and tools which one is using are not electrostatically charged.

Small charges of 100 V are very common; these can, however, very quickly rise up to 35 000 V.

Examples of static charge:

– Walking on a carpet	up to 35 000 V
– Walking on a PVC flooring	up to 12 000 V
– Sitting on a cushioned chair	up to 18 000 V
– Plastic desoldering unit	up to 8 000 V
– Plastic coffee cup	up to 5 000 V
– Plastic bags	up to 5 000 V
– Books, etc. with a plastic binding	up to 8 000 V

3 Important Protective Measures against Static Charge

- Most plastic materials are highly susceptible to static charge and must therefore be kept as far away as possible from ESDs.
- Personnel who handle ESDs, the work table and the packing must all be carefully grounded.

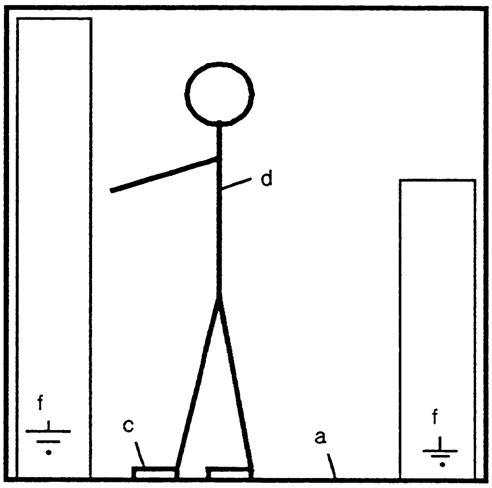
4 Handling of ESD Modules

- One basic rule to be observed is that electronic modules should be touched by hand only if this is necessary for any work required to be done on them. Do not touch the component pins or the conductors.
- Touch components only if
  - the person is grounded at all times by means of a wrist strap

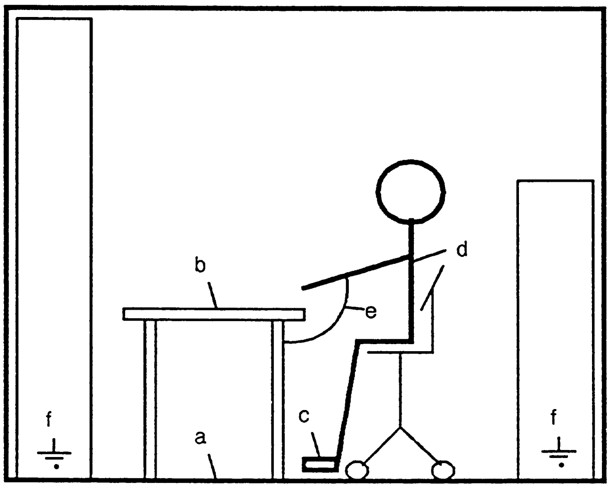
  or

  - the person is wearing special anti-static shoes or shoes with a grounding strip.
- Before touching an electronic module, the person concerned must ensure that (s)he is not carrying any static charge. The simplest way is to touch a conductive, grounded item of equipment (e.g. a blank metallic cabinet part, water pipe, etc.) before touching the module.
- Modules should not be brought into contact with insulating materials or materials which take up a static charge, e.g. plastic foil, insulating table tops, synthetic clothing, etc.
- Modules should only be placed on conductive surfaces (table with anti-static table top, conductive foam material, anti-static plastic bag, anti-static transport container).
- Modules should not be placed in the vicinity of monitors, TV sets (minimum distance from screen > 10 cm).

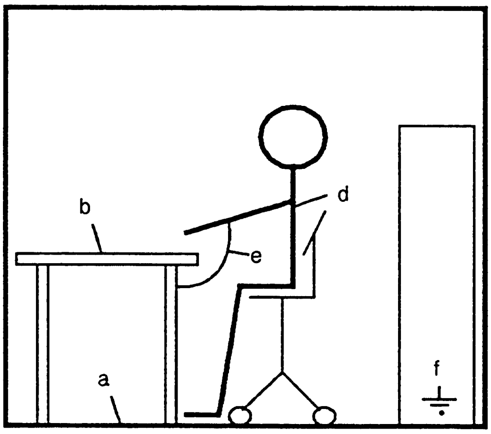
The diagram below shows the required protective measures against electrostatic discharge.



Standing position



Standing/sitting position



Sitting position

a Conductive flooring
b Anti-static table
c Anti-static shoes
d Anti-static coat
e Grounding wrist strap
f Grounding connection of the cabinets

5 Measurements and Modification to ESD Modules

- Measurements on modules may only be carried out under the following conditions:
  - The measuring equipment is grounded (e.g. via the PE conductor of the power supply system) or
  - when electrically isolated measuring equipment is used, the probe must be discharged (e.g. by touching the metallic casing of the equipment) before beginning measurements.
- Only grounded soldering irons may be used.

6 Shipping of ESD Modules

Anti-static packing material must always be used for modules and components, e.g. metalized plastic boxes, metal boxes, etc. for storing and dispatch of modules and components.

If the container itself is not conductive, the modules must be wrapped in a conductive material such as conductive foam, anti-static plastic bag, aluminium foil or paper. Normal plastic bags or foils should not be used under any circumstances.

For modules with built-in batteries ensure that the conductive packing does not touch or short-circuit the battery connections; if necessary cover the connections with insulating tape or material.

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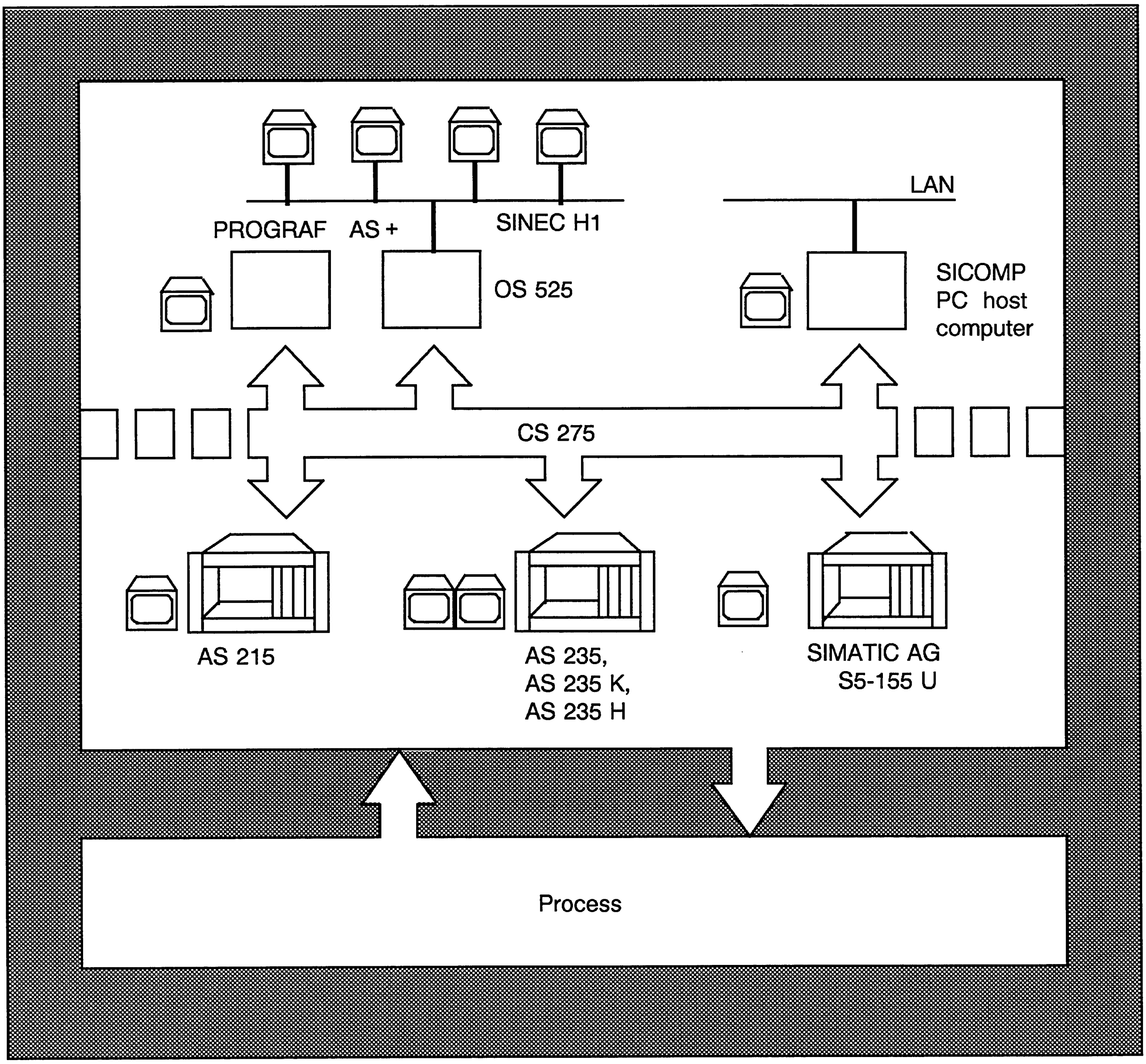
SIEMENS

TELEPERM M

CS 275 Bus System

System Overview

Technical Description C79000-T8076-C301-04



Contents

1 Application

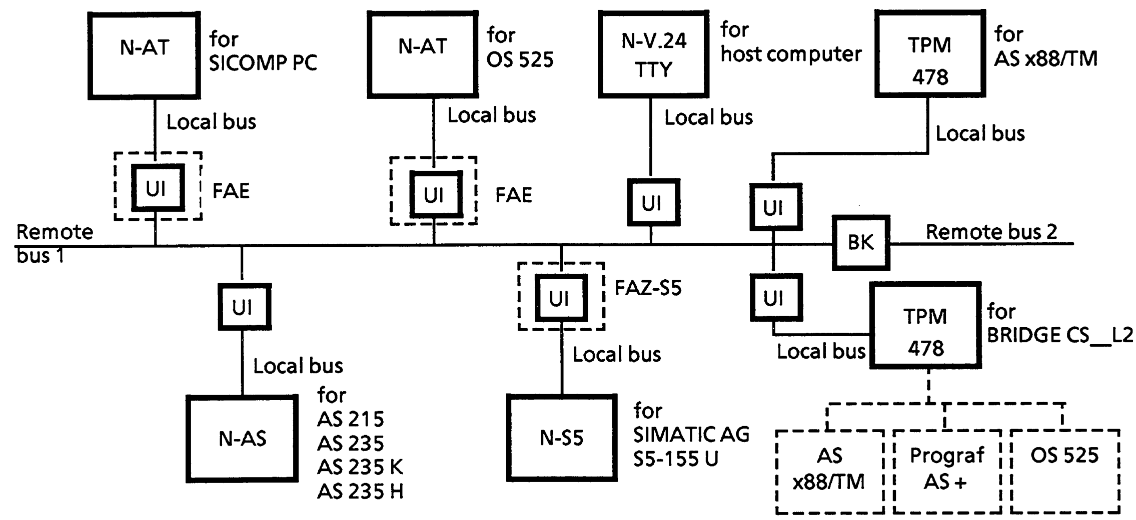
The CS 275 bus system provides the capability to exchange information between the individual devices on the TELEPERM M process control system (Fig. 1). The following system components may be connected to the CS 275 bus system:

- Automation systems
  AS 215
  AS 235
  AS 235 K
  AS 235 H
  AS 388/TM, AS 488/TM
- Operator communication and monitoring systems
  OS 525
- Programmable controllers
  SIMATIC S5-155 U
- Computer
  SICOMP PC
- Configuration systems
  PROGRAF AS +
- Host computers
- The following systems can be connected to SINEC L2 with Bridge CS-L2:
  AS 388/TM, AS 488/TM
  OS 525
  PROGRAF AS +

The bus system solves the communication problems of all devices whether they are distributed over a large area (remote bus) or close together (local bus).

Remote bus: Interconnects locally distributed systems up to a distance of 4 km.

Local bus: Provides interconnection within a cabinet or a cabinet group with a common power distribution tier, up to a distance of 20 meters.



UI	=	Bus converter (inductive)	N-S5	=	SIMATIC S5-155 U local bus interface
N-AS	=	Local bus interface for automation systems	FAZ-S5	=	S5 remote bus connecting tier
N-V.24	=	V.24 local bus interface	FAE	=	Remote bus connecting tier
N-AT	=	Local bus interface for PC-based systems	BK	=	Bus coupler unit

----- Connecting the systems AS x88/TM to the CS bus as well as coupling systems to SINEC-L2 is described in the Manual C79000-G8076-C700.

Fig. 1 CS 275 bus system

Empty Page

2 Design

The CS 275 bus system consists of a local bus and a remote bus. This distinction is expedient due to transmission and functional reasons.

Local range communication uses relatively simple equipment for transmission and reception. The number of line signals is less restricted than in remote operation.

2.1 Local Range

Three lines are used for data and signal transmission. The data is transmitted in serial mode on the data line; the second line carries the clock pulses; the third line is used for synchronization and control purposes. The local bus utilizes wired-or technique. The devices are electrically connected up to a distance of 20 m.

- Restriction: SIMATIC programmable controllers S5-155 U (with N-S5) must not be coupled with TELEPERM M automation systems via local bus, due to a different earthing concept. In this case establish an electrical isolation with a UI bus converter (see Fig. 2).
  Please observe the applicable installation guidelines.

Note: Plugged local connectors have to be screwed to the rack.

2.2 Remote Range

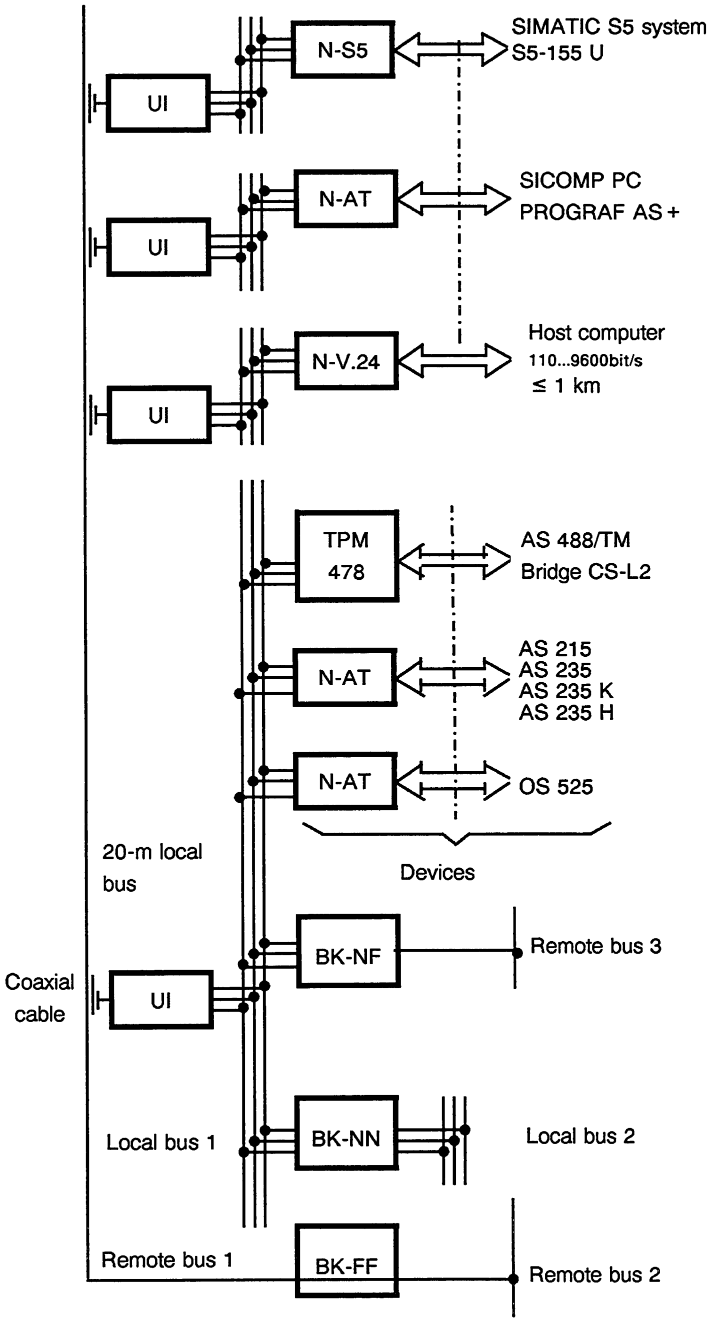
The signals are transmitted as bipolar square-wave pulses on a coaxial cable with a maximum length of 4000 meters. The connection to the remote bus is non-interacting.

Remote bus and local bus are interconnected by UI bus converter units. This enables neighbouring groups of AS or OS systems that are interconnected by a local bus to exchange information with remote groups. The whole bus system carries the same information.

A bus coupler unit, however, interconnects two buses such that only information dedicated to the other bus is transferred. A bus coupler unit interconnects two stand-alone bus systems.

Bus converter and bus coupler unit are two connecting elements which satisfy all requirements of information distribution in an automation system.

2.3 Hardware Components (Fig. 2)



UI	Bus converter (inductive)
BK-FF	Remote bus/remote bus coupler unit
BK-NN	Local bus/local bus coupler unit
BK-NF	Local bus/remote bus coupler unit
N-AS	Local bus interface module for automation systems
N-AT	Local bus interface module for PC-based systems
N-V.24	Local bus interface, V.24/TTY interface
N-S5	Local bus interface, SIMATIC S5 150 U/155 U

Fig. 2 Components of the CS 275 bus system

- Local bus interface N

This bus interface unit is used for connecting individual devices (TLN) to the CS 275 bus system. Four different versions are available which correspond to the various system components:

- N-AS local bus interface module for AS 215, AS 235, AS 235 K and AS 235 H systems
- N-AT local bus interface module for OS 525 system and other PC-based systems
- N-V.24 local bus interface module for host computers via a V.24 or TTY interface
- N-S5 local bus interface module for SIMATIC S5-155 U

Local bus interface modules are used in the basic units of the AS, OS and PR systems. Each module has an output for a redundant 20-m local bus.

- UI bus converter unit (inductive)

An UI bus converter unit is required for connecting individual devices or a local bus with several devices to a remote bus. The unit performs continual signal conversion without buffering between local bus and remote bus.

The remote bus consists of a coaxial cable. The inductive connection is non-interacting. The connecting element is in the power distribution tier of the TELEPERM M cabinet, in the remote bus connecting unit (FAE), or in the S5 remote bus connecting tier (FAZ-S5).

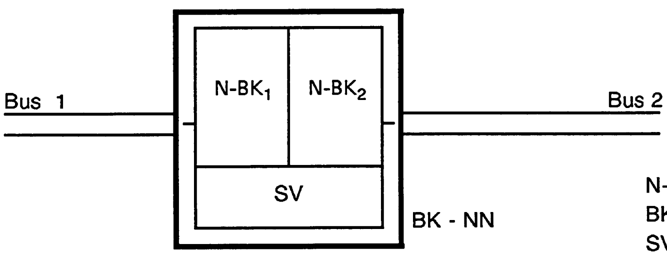
- BK bus coupler unit

A bus coupler unit is required for exchanging information between two stand-alone bus systems. The coupler unit accepts a message from bus 1 for all devices on bus 2, buffers it, and broadcasts it as soon as possible (and vice versa).

A message from one device to another may pass one or two bus coupler units only.

A bus coupler unit consists of two special local bus interface modules and N-BK a separate power supply module (SV).
The local bus interface module N-BK_1 is a device on bus 1.
The local bus interface module N-BK_2 is a device on bus 2.

The individual components are installed in a separate subrack.



N-BK_1, N-BK_2	Local bus interface modules
BK-NN	Local bus/local bus bus coupler unit
SV	Power supply unit

Fig. 3 Bus coupler unit (BK-NN)

Another subrack variant contains additional slots for four UI bus converter units. This subrack is used for interconnecting two (single/redundant) remote buses and/or accepting the TELEPERM M master clock.

- Parallel/redundant bus coupler units

Two bus coupler units can be connected to two stand-alone remote bus systems. The following two applications must be distinguished, however:

Parallel bus coupler units

A second bus coupler unit doubles the transmission performance by approximately 100%. The performance of a parallel connection of two bus coupler units is reduced, however, if one bus coupler module fails (no redundancy).

Redundant bus coupler units

If the transmission performance of one bus coupler unit proves sufficient, a second bus coupler unit can be used as a redundant component. The redundant bus coupler unit automatically assumes the communication function if the first unit fails. Such a system is really redundant.

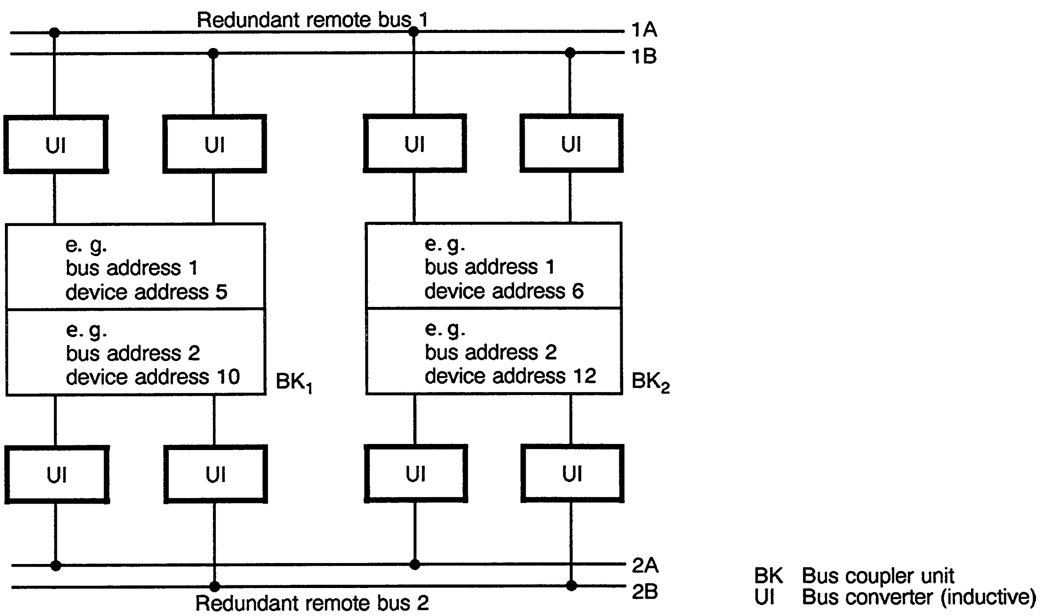


Fig. 4 Parallel bus coupler units (e.g. between redundant remote buses)

- Remote bus connector board

This connector board provides the connections between the remote bus cables and the flexible coaxial cables that are installed in the UI bus converter unit.

The connector board may be fixed to the frame of a TELEPERM M cabinet.

- Bus cables

The CS 275 bus system utilizes different cable types for the local and the remote range.

- Local bus

A multi-core cable is used for 20-m local bus connections.

- Remote bus

Four different coaxial cables can be used in a remote bus connection. These cables which are distinguished by their insulation and sheath are used in different applications:

Standard cable
16.8 mm overall diameter; used for standard applications.

Thin remote bus cable
11.8 mm overall diameter; used for in-house installation.

Bus cable with flat-wire sheathing
This cable is used in applications with increased tensile load.

Bus cable with steel tape armour
This cable is used in applications with additional mechanical stress.

(Section 4 contains a list of the different types.)

- Remote bus connecting unit

The remote bus connecting unit (FAE) is used for connecting OS 525 systems, SICOMP industrial PC. The connecting unit accepts two inductive converter units (UI) and two remote bus connecting boards (AF) for a redundant remote bus connection. The local bus connection (to a SICOMP M computer, for example) is established from the FAE.

- S5 remote bus connecting tier

The S5 remote bus connecting tier connects the SIMATIC S5 150 U/155 U to a single or redundant CS 275 remote bus system. The FAZ-S5 power supply unit can be connected to 230 V a.c., and may be either single or redundant.

2.4 Bus Configuration and Usage

- **20-m local bus**

Application

- Small systems
- Up to 9 devices (local bus interfaces)
- Up to 20 m bus cable
- Standard redundancy

Restrictions

- Can only be used in electronics rooms
- Devices are: N-AS, N-AT, N-S5

AV Connection distribution unit for 20-m local bus
N Local bus interface module

Fig. 5 CS 275 bus system, 20-m local bus

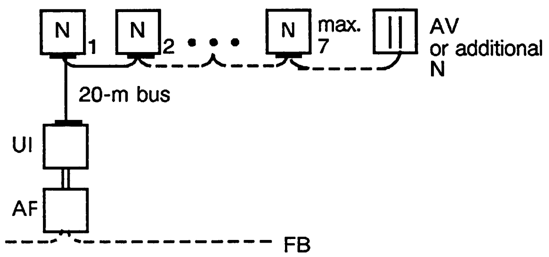
- **20-m local bus/4-km remote bus (not redundant)**

Application

- Large systems
- Up to 100 devices
- Up to 4 km remote bus cable

Restrictions

- Up to 8 devices (local bus interfaces) per local bus island
- Up to 32 bus converter units (UI)



AV Connection distribution unit for 20-m local bus
UI Bus converter (inductive)
AF Remote bus connecting board
N Local bus interface module
FB Remote bus

Fig. 6 CS 275 bus system, 20-m local bus/4-km remote bus

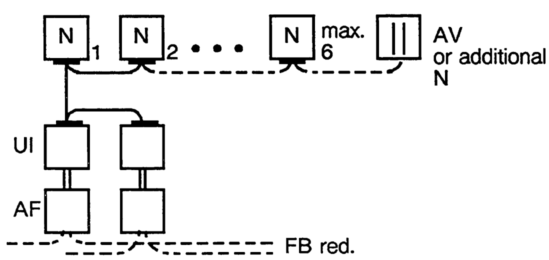
- **20-m local bus/4-km remote bus (redundant)**

Application

- Large systems
- Up to 100 devices
- Up to 4 km remote bus cable

Restrictions

- Up to 7 devices (local bus interfaces) per local bus island
- Up to 32 bus converter units (UI) per partial bus A or B (i.e. max. 32 local bus groups)



AV Connection distribution unit for 20-m local bus
UI Bus converter (inductive)
AF Remote bus connecting board
N Local bus interface module
FB Remote bus

Fig. 7 CS 275 bus system, 20-m local bus/4-km remote bus (redundant)

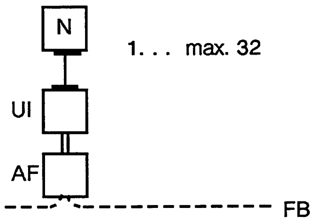
- **Individual devices on a 4-km remote bus (not redundant)**

Application

- Medium-size systems
- Individual devices on a remote bus (large distance between the individual devices)
- Maximum peripheral configuration of the connected AS systems
- Up to 32 devices
- Up to 4 km remote bus cable

Restrictions

- Local bus interface and bus converter unit in the same cabinet



UI Bus converter (inductive)
AF Remote bus connecting board
N Local bus interface module
FB Remote bus

Fig. 8 CS 275 bus system, individual devices on a 4-km remote bus

- **Individual devices on a 4-km remote bus (redundant)**

Application

- Medium-size systems
- Individual devices on a remote bus (large distance between the individual devices)
- Maximum peripheral configuration of the connected AS systems
- Up to 32 devices
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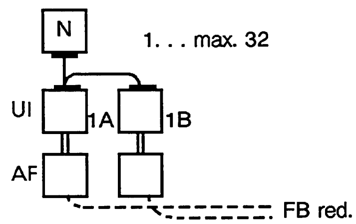
Restrictions

- Local bus interface and bus converter unit in the same cabinet



UI Bus converter (inductive)
AF Remote bus connecting board
N Local bus interface module
FB Remote bus

Fig. 9 CS 275 bus system, individual devices on a redundant 4-km remote bus

Note: Up to nine connections (UI, N-AS, N-BK, N-AT, N-S5, N-V.24) to a local bus island are possible. Please re-member that there is a maximum number of de-energized devices on a 20-m local bus which depends on the total number of devices on this local bus:

Total number of devices	Max. number of de-energized devices
3	1
4	1
5	1
6	2
7	2
8	2
9	3

The device bus connector should be disconnected if a unit remains de-energized for an extended period of time.

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3 Operation

Serial data transmission systems require a transfer control unit to organize data communication on the line. This unit controls and co-ordinates data transfer such that only one device at a time transmits data on the bus. In the CS 275 bus subsystem, this function is implemented in decentralized manner, i.e. each device has a temporary master function. This type of communication control is called flying master mode.

3.1 Flying Master Mode

Only one device of a flying master bus system has master status while the other devices operate as slaves. Changing the master function is called master transfer. There are three master transfer procedures which complement one another and which are defined in the bus protocol:

- Time-out-controlled
  if a master has failed or does not exist;
- Request-controlled
  master transfer within the same local bus;
- Command-controlled
  master transfer to a different local bus, which is connected via remote bus.

3.2 Interfaces and Transfer Methods

There are three interfaces of central significance:

- Local bus interface
- Remote bus interface
- User interface

● Local bus interface

This interface is used for communication between the interface modules of the devices on a local bus. The signals 'clock', 'qualifier' and 'data' are broadcasted to all devices via a screened multi-core SIMATIC cable.

Asymmetrical signal transfer uses a 5-V level with wired-or signal function.

● Remote bus interface

This interface connects the local bus range to the remote bus. The inductive converter (UI) provides the interface. The three signals are converted by bit-serial modulation into a bipolar signal and are transferred to the inductively coupled remote bus.

● User interface

The AS, OS, AG and PC bus devices give the bus subsystem various transfer jobs (read and write jobs). The local bus interfaces perform the transfer-related tasks.

3.3 Message Structure and Data Protection

- Message structure

Message transfer in the CS 275 bus system uses fixed basic elements which are 4x9 bits long and known as transfer elements. A message block consists of transfer elements.

The first byte of a transfer element is used as a control field. Additional fields are required for address, data, command, and protection transfer. Each 8-bit field is protected by a parity bit. An additional checksum is generated from all transfer elements of a message.

All bits of the same significance in the bytes of the message are EXORed and transmitted as protective byte in a field of the message. The protective byte is interpreted by the receiving local bus interface module.

- Data protection

Data protection in the CS 275 bus system is achieved by generating line and column parity values (known as block parity).

Data protection enables the following errors to be detected:

- one-, two- and three-bit errors (Hamming distance $d = 4$)
- odd bit errors, 1-, 3-, 5-, 7-, and 9-fold errors, independent of location
- error bursts < 11 bits in length
- error patterns (except square format).

3.4 Addressing

In order to facilitate communication between several independently operating busses and within one bus, each device is identified by two addresses (bus address and device address). These two addresses are selected by coding switches on the interface module.

3.5 Linking Blocks and their Modes

In the automation subsystem, analog, binary and signal linking blocks are available to the user for data transfer. All three block types are subdivided into receiver and transmitter blocks.

The interface blocks operate in two different modes:

- Direct communication mode (DI)
- Common data mode (CD)

In direct communication mode, up to six receivers can log on with the transmitter module. The receiver module sends an acknowledgement message to the transmitter module. In common data mode, the information is sent to all devices connected to a bus. Up to 99 receivers are possible.

Since a device of the bus normally only requires a small amount of the available CD messages, the local bus interface uses an inhibit list to pre-select those transmitter messages for which a receiver module is available.

Note: A very high device transmission power reduces the receiver power because of the protocol; a message can only be received if the transmitter buffer has enough capacity to eventually transmit a later response to the received message.

3.6 Changeover Criteria of the Redundant Bus

- An image of all converter units (UI) on the bus is generated for each bus line (approximately every 750 ms). If the image of the passive bus contains more entries than the image of the active bus, the system switches over to the passive bus.
- The system also switches over to the passive bus if the image is the same on both bus lines but the master has received a request for transfer on the passive bus. A slave uses the passive bus to transmit a request for transfer if it can no longer perform a transfer on the active bus.
- If the present master fails, the slave with the lowest device address takes over the master function on the bus which has been **passive until now** (if available). The master switches over when both buses are fault-free.

All bus devices are notified of the bus change.

3.7 Bus Messages, Quality of the Transmission Link, Remote Bus Redundancy

3.7.1 Explanation of the Bus Messages 620, 621, 630, 631

Owing to their causes the bus messages are divided in two classes because of their different consequences on the bus redundancy.

- Cause in the end system (linking partner)

  Consequences on the bus redundancy are **not** possible.

  Cause: handling on the linking partner

- AS/CS start, offline/online changeover, use of configuring tools or BANY etc. can trigger the local bus module.

  Cause: AS after loss of the test job

- The AS checks the proper bus module with a test job; when this job is lost, in particular with older ASs, the AS reconfigures the local bus module. This module restart depends on the AS and only occurs in the time range "Second 37" to "Second 43" (second indication of the bus message time in the AS/CS log print).

  Bus signal: start of the concerned local bus module.

  Message displays: "Positive acknowledgment" 620 or 630 only or messages pairs, "Negative acknowledgment" 621 or 631 followed with the associated "Positive acknowledgment".

Notes:

- The device in which the bus module is started indicates the device address of the "Positive acknowledgment".
- Normally the device with the lowest device number generates the "Negative acknowledgment" .

- Cause in the transmission link (bus system, its environment or unknown)

  Consequences on the bus redundancy are possible.

  Causes: module fault, CS component, EMC influence, bus design, plant structure, others.

  The bus system is continuously monitored with approx. 4 millions cyclic organizational messages per day. This monitoring almost triggers with individual disturbances which can always appear with a certain probability on transmission links.

The frequency of these individual disturbances depends on the quality of the transmission link. When a "Positive acknowledgment" 620 or 630 always follows a message 621 or 631, it is normally not a control system or a CS 275 fault but a message that **one** individual disturbance has appeared on the transmission link during a UI check and that the bus system is further operational and **redundant**.

Consequences on the control system and on the process are prevented by the safety mechanism (code safety). The individual disturbances have no influence on the **useful data** due to the repetition mechanisms. The **organizational** messages for the bus system monitoring need no repetition because these messages are transmited cyclically. This leads to display an individual disturbance of the transmission link (621/620 oder 631/630). So the bus system disposes of an very sensitive indicator of the transmission link quality

Bus signal: error during UI check (example).

Message displays: "Negative acknowledgment" alone (redundancy loss) or message pairs.

Notes:

- The device address of the bus message gives the device which determined at first the appearance or disappearance of the fault. A conclusion on an eventually faulty CS component can only be drawn in case of a permanent fault.
- When a bus device reception is used intensively a redundancy state can be repeated by this device if another bus device has signalled this state a short time before
- The master clock is often involved in case of such doucle messages, the local bus of the clock emitting such a "superfluous positive acknowledgment". This "Positive acknowledgment" can led to delays of several minutes (in opposition to other bus devices).

3.7.2 Bus Message Evaluation Concerning the Bus Redundancy

The bus redundancy is not impaired when

- a "Positive acknowledgment" follows a "Negative acknowledgment" within max. 4 seconds,
- the limit of 8 messages is not reached within 30 minutes (see Note),
- not more than 10 bus messages concerning the transmission link appear per day (i.e. only the bus messages with a cause according to 3.7.1 are taken into account).

The bus redundancy is impaired when

- a "Negative acknowledgment" is not immediately followed by a "Positive acknowledgment" and the limit of 8 messages per hour is not reached (see Note).

Notes:

- When the limit of 8 messages per hour is reached the local bus module does not transmit the following messages to the AS/OS (to permit the logging of important process messages in case of a permanent fault). If the last transmitted message is a "Negative acknowledgment" 621 or 631 a following "Positive acknowledgment" is rejected in order to suppose that the bus redundancy is no longer operational
- After IBS measures during which the local bus connector was removed and plugged in the bus redundancy has to be checked with the operation stability of bus A and bus B. To realize that induce a bus changeover with the reset key of the UI power supply. (Cause: since the local bus redundancy is a prerequisite of the bus log a local bus connector removed from UI-bus interface logic does not provoke a "Negative acknowledgment" concerning a remote bus redundancy.
- If the bus redundancy is not checked with the AS/OS logs a redundant remote bus system should be switched over manually regularly (e.g. every month) to recognize a single fault (on a bus switchover) before a double fault occurs which could lead to permanent bus changeover

3.7.3 Improvements

The sensitivity of some bus circuits (e.g. N-AS) was reduced during the CS 275 maintenance (message only in case of repeated fault).

A further reduction of the bus messages will be obtained when the bus interface logic (BIL, 6DS1 212-8AB) release version ≥ 3 will be used. This bus interface logic is improved concerning the telegram synchronization.

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4 Technical Data

Number of devices	≤ 100, depends on bus load
Distance without bus coupler	max. 4000 m
Data format	variable
Bus controller	distributed (flying master function)
Data protection	block parity
Hamming distance	d = 4
Noise immunity	IEC recommendation 255-4

Remote bus

Number of converters (UI)	max. 32
thereof bus coupling units	max. 7, thereof 1 or 2 in series
Cable length	max. 4000 m
Baud rate	250 x 10^3 bits/s
Standard cable	2YC (ms) CY 1.6/10-75 (Z2/5) vs sw
Thin cable	2YC (ms) CY 1.0/6.5-75 (Z2/5) vs
Bus cable with flat-wire sheathing	2YC (ms) CYbY 1.6/10-75 (Z2/5) vs (F 0.8 vzk) sw.
Bus cable with steel tape armour	2YC (ms) CYbY 1.6/10-75 (Z2/5) vs (2B 0.5 vzk) sw.
Signal shape	bipolar current signals
Coupling	inductive, non-interacting
Redundant remote bus	possible

Local bus (20 m local bus)

Number of devices	max. 9 (UI counts as a device)
Baud rate	250 x 10^3 bits/s The baud rate rises to 340 x10^3 bits/s in the case of an autonomous local bus, i.e. without bus converter unit.
Cable length between devices	max. 20 m **devices must be series-connected, a star connection is *not* permissible**
Cable	L-YCY 12 x 2 x 0.22 mm² vzn Si
Signal transfer	asymmetrical
Signal level	$V_{IL} \leq 0.8$ V $V_{IH} \geq 2.0$ V
Coupling	open collector
Floating potential interface modules for local bus	N-AS, N-BK, N-AT
Non-floating potential interface modules for local bus	N-S5, N-V.24, UI
Device isolated	no
Redundant local bus	standard

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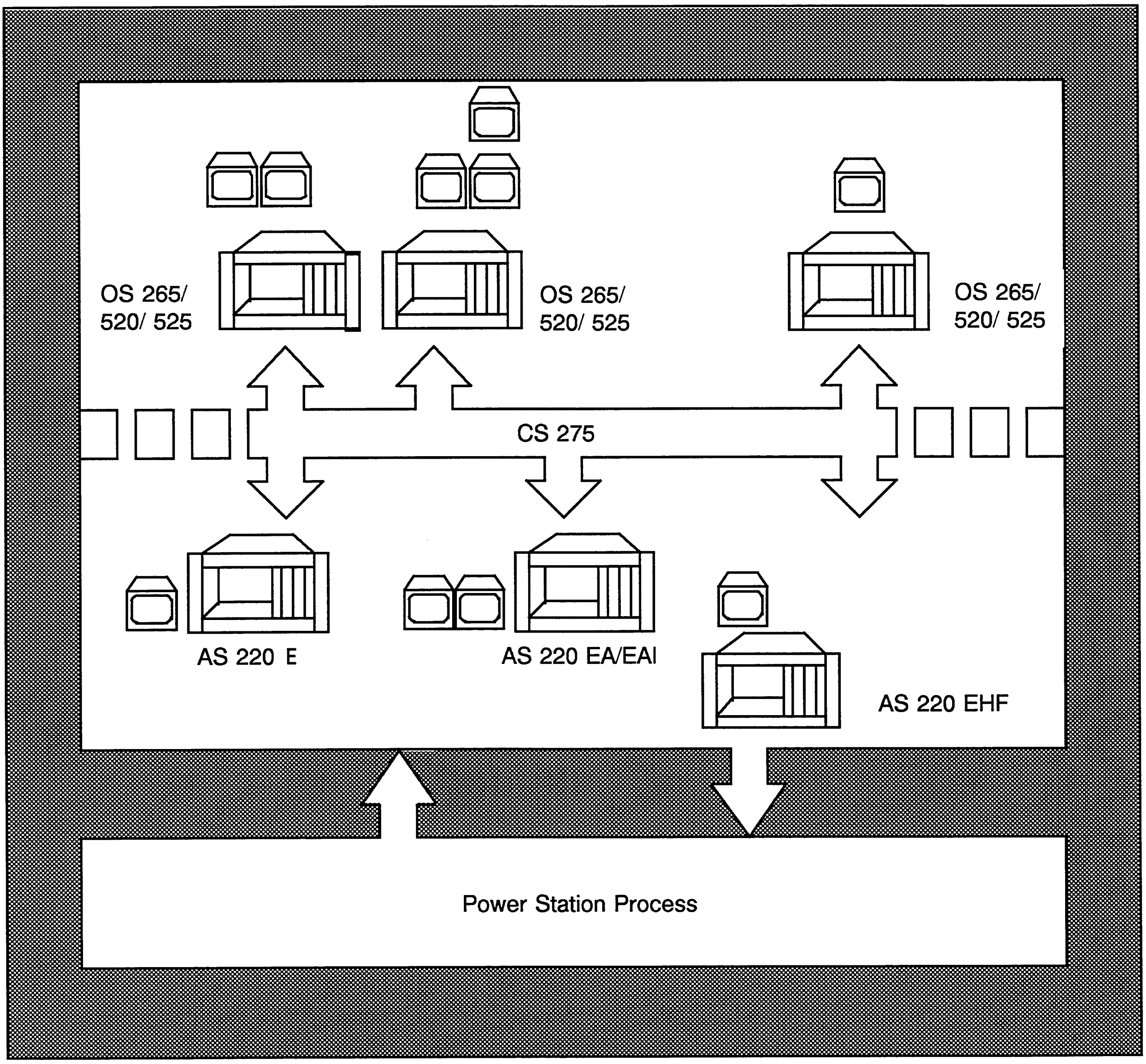
SIEMENS

TELEPERM ME

CS 275 Bus System

System Overview, Operation

Technical Description C79000-T8076-C025-03



Contents

1 Application

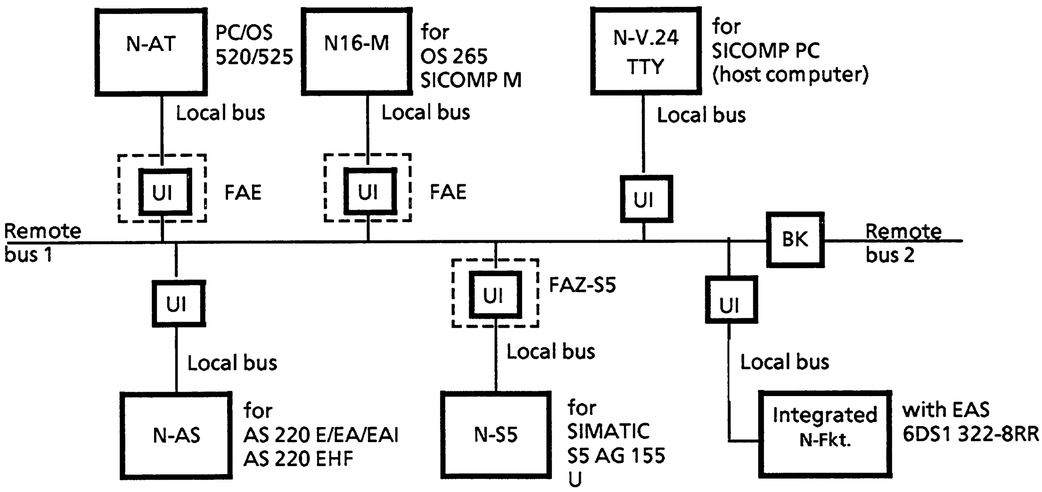
The CS 275 bus system provides the capability to exchange information between the individual devices on the TELEPERM ME process control system (Fig. 1). The following system components may be connected to the CS 275 bus system:

- Automation systems
  AS 220 E/EA/EAI
  AS 220 EHF
- Programmable controllers
  SIMATIC S5 150 U
- Signalling system
  MS 236
- Operator communication and monitoring systems
  OS 265/520/525
- Programming unit PG 750/770, Workstation
  WS 30
- Computer
  SICOMP M
- AT Personal Computer
- Host computers via a V.24 or 20-mA
  current-loop interface

The bus system solves the communication problems of all devices whether they are distributed over a large area (remote bus) or close together (local bus).

Remote bus: Interconnects locally distributed systems up to a distance of 4 km.

Local bus: Provides interconnection within a cabinet or a cabinet group with a common power distribution tier, up to a distance of 20 meters.



UI	=	Bus converter (inductive)
N16-M	=	16-bit local bus interface
N-V.24	=	V.24 local bus interface
N-S5	=	SIMATIC S5 155 U local bus interface
FAZ-S5	=	S5 remote bus connecting tier
FAE	=	Remote bus connecting unit
BK	=	Bus coupler unit
N-AT	=	Local bus interface for PC-based systems

Fig. 1 CS 275 bus system

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2 Design

The CS 275 bus system consists of a local bus and a remote bus. This distinction is expedient due to transmission and functional reasons.

Local range communication uses relatively simple equipment for transmission and reception. The number of line signals is less restricted than in remote operation.

2.1 Local Range

Three lines are used for data and signal transmission. The data is transmitted in serial mode on the data line; the second line carries the clock pulses; the third line is used for synchronization and control purposes. The local bus utilizes wired-or technique. The devices are electrically connected up to a distance of 20 m (used in cabinets and cabinet groups with a common power distribution tier).

- Restriction: Mixing N16-M, N-V.24 and N-S5 interfaces on the same local bus is not permitted. The same applies to their connections to the other bus interface types.UI bus converter and remote bus must be used for separating such systems (Fig. 2).Please observe the applicable installation guidelines.

2.2 Remote Range

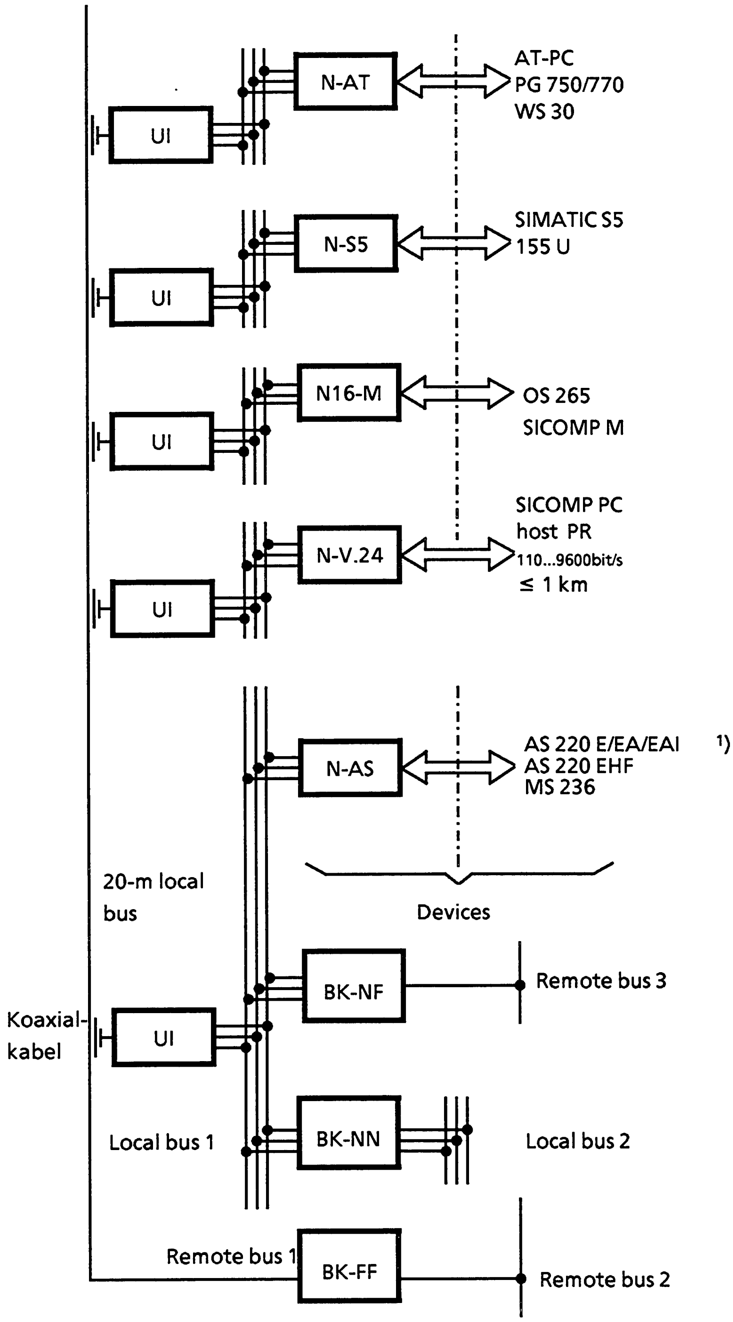
The signals are transmitted as bipolar square-wave pulses on a coaxial cable with a maximum length of 4000 meters. The connection to the remote bus is non-interacting.

Remote bus and local bus are interconnected by UI bus converter units. This enables neighbouring groups of AS or OS systems that are interconnected by a local bus to exchange information with remote groups. The whole bus system carries the same information.

A bus coupler unit, however, interconnects two buses such that only information dedicated to the other bus is transferred. A bus coupler unit interconnects two stand-alone bus systems.

Bus converter and bus coupler unit are two connecting elements which satisfy all requirements of information distribution in an automation system.

2.3 Hardware Components (Fig. 2)



UI	Bus converter, inductive
PR	Process computer
BK-FF	Remote bus/remote bus coupler unit
BK-NN	Local bus/local bus coupler unit
BK-NF	Local bus/remote bus coupler unit
N-AS	AS local bus interface
N16-M	16-bit local bus interface
N-V.24	Local bus interface, V.24 / TTY interface
N-S5	Local bus interface, SIMATIC S5 155 U
N-AT	Local bus interface for PC-based systems

1) In the EAS 6DS1 322-8RR the local bus interface is integrated in the EAS; in this case the N-AS is omitted.

Fig. 2 Components of the CS 275 bus system

- Local bus interfaces

This bus interface unit is used for connecting individual devices (TLN) to the CS 275 bus system. Five different versions are available which correspond to the various system components:

- N-AS local bus interface module for AS 220 E/EA/EAI/EHF and MS 236
- N16-M local bus interface module for OS 265 systems and SICOMP M-16 bit process computers
- N-V.24 local bus interface module for SICOMP PC and host computers via a V.24 or TTY interface
- N-S5 local bus interface module for SIMATIC S5 155 U
- N-AT local bus interface module for AT-PC, PG 750/770 and WS 30

Local bus interface modules are used in the basic units of the AS, OS and PR systems. Each module has an output for a redundant 20-m local bus.

- UI bus converter unit (inductive)

An UI bus converter unit is required for connecting individual devices or a local bus with several devices to a remote bus. The unit performs continual signal conversion without buffering between local bus and remote bus.

The remote bus consists of a coaxial cable. The inductive connection is non-interacting. The connecting element is in the power distribution tier of the TELEPERM ME cabinet, in the remote bus connecting unit (FAE), or in the S5 remote bus connecting tier (FAZ-S5).

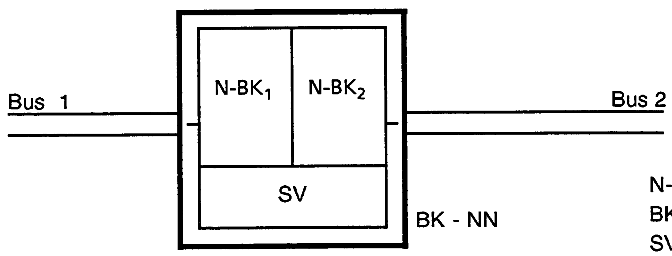
- BK bus coupler unit

A bus coupler unit is required for exchanging information between two stand-alone bus systems. The coupler unit accepts a message from bus 1 for all devices on bus 2, buffers it, and broadcasts it as soon as possible (and vice versa).

A message from one device to another may pass one or two bus coupler units only.

A bus coupler unit consists of two special local bus interface modules and a separate power supply module (SV).
The local bus interface module N-BK_1 is a device on bus 1.
The local bus interface module N-BK_2 is a device on bus 2.

The individual components are installed in a separate subrack.



N-BK_1, N-BK_2 Local bus interface modules
BK-NN Local bus/local bus bus coupler unit
SV Power supply unit

Fig. 3 Bus coupler unit (BK-NN)

- Parallel/redundant bus coupler units

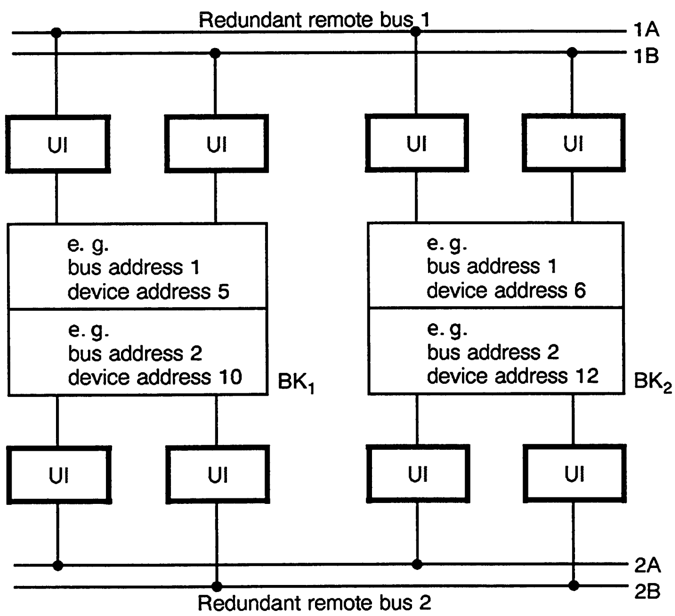
Two bus coupler units can be connected to two stand-alone remote bus systems. The following two applications must be distinguished, however:

Parallel bus coupler units

A second bus coupler unit increases the transmission performance by approximately 100%. The performance of a parallel connection of two bus coupler units is reduced, however, if one bus coupler module fails (no redundancy).

Redundant bus coupler units

If the transmission performance of one bus coupler unit proves sufficient, a second bus coupler unit can be used as a redundant component. The redundant bus coupler unit automatically assumes the communication function if the first unit fails. Such a system is really redundant.



BK Bus coupler unit
UI Bus converter (inductive)

Fig. 4 Parallel bus coupler units (e.g. between redundant remote buses)

- Remote bus connector board

This connector board provides the connections between the remote bus cables and the flexible coaxial cables that are installed in the UI bus converter unit.

The connector board may be fixed to the frame of a TELEPERM ME cabinet.

- Bus cables

The CS 275 bus system utilizes different cable types for the local and the remote range.

- Local bus

A multi-core cable is used for 20-m local bus connections.

- Remote bus

Four different coaxial cables can be used in a remote bus connection. These cables which are distinguished by their insulation and sheath are used in different applications:

Standard cable
16.8 mm overall diameter; used for standard applications.

Thin remote bus cable
11.8 mm overall diameter; used for in-house installation.

Bus cable with flat-wire sheathing
This cable is used in applications with increased tensile load.

Bus cable with steel tape armour
This cable is used in applications with additional mechanical stress.

- Remote bus connecting unit

The remote bus connecting unit (FAE) is used for connecting OS 265 systems, SICOMP M computers, or other components to the CS 275 bus system. The connecting unit accepts two inductive converter units (UI) and two remote bus connecting boards (AF) for a redundant remote bus connection. The local bus connection (to a SICOMP M computer, for example) is established from the FAE.

- S5 remote bus connecting tier

The S5 remote bus connecting tier connects the SIMATIC S5 155 U to a single or redundant CS 275 remote bus system. The FAZ-S5 power supply unit can be connected to 24 V d.c. or 230 V a.c., and may be either single or redundant.

2.4 Bus Configuration and Usage

- **20-m local bus**

Application

- Small systems
- Up to 9 devices (local bus interfaces)
- Up to 20 m bus cable
- Standard redundancy

Restrictions

- Can only be used in electronics rooms
- Devices are: N-AT, N-AS, N-S5, N16
- Fed by a common power distribution tier

AV Connection distribution unit for 20-m local bus
N Local bus interface module

Fig. 5 CS 275 bus system, 20-m local bus

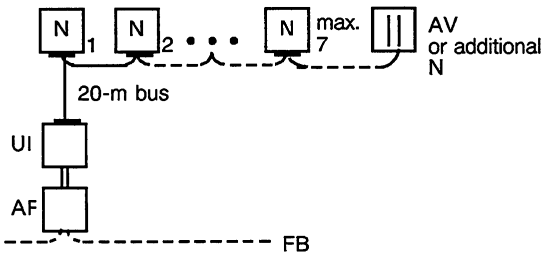
- **20-m local bus/4-km remote bus (not redundant)**

Application

- Large systems
- Up to 100 devices
- Up to 4 km remote bus cable

Restrictions

- Up to 8 devices (local bus interfaces) per local bus island
- Up to 32 bus converter units (UI)



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Application

- Large systems
- Up to 100 devices
- Up to 4 km remote bus cable

Restrictions

- Up to 7 devices (local bus interfaces) per local bus island
- Up to 32 bus converter units UI per partial bus A or B (max. 32 local bus groups)

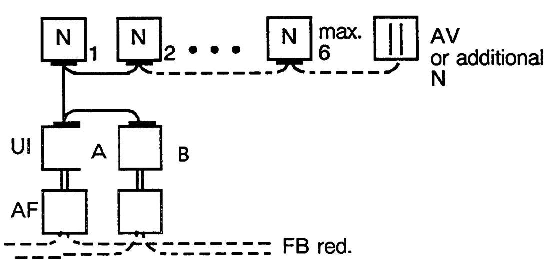

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Fig. 7 CS 275 bus system, 20-m local bus/4-km remote bus (redundant)

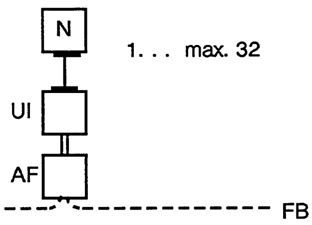
- **Individual devices on a 4-km remote bus (not redundant)**

Application

- Medium-size systems
- Individual devices on a remote bus (large distance between the individual devices)
- Maximum peripheral configuration of the connected AS systems
- Up to 32 devices
- Up to 4 km remote bus cable

Restrictions

- Local bus interface and bus converter unit in the same cabinet



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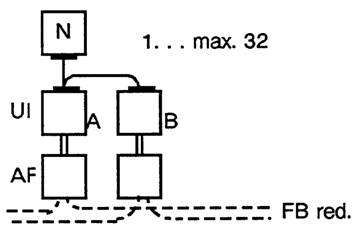

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Fig. 9 CS 275 bus system, individual devices on a redundant 4-km remote bus

Note: Up to nine connections (UI, N-AS, N-AT, N-BK, N-S5, N16-M, N-V.24) to a local bus island are possible. Please re-member that there is a maximum number of de-energized devices on a 20-m local bus which depends on the total number of devices on this local bus:

Total number of devices	Max. number of de-energized devices
3	1
4	1
5	1
6	2
7	2
8	2
9	3

The device bus connector should be disconnected if a unit remains de-energized for an extended period of time.

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3 Operation

Serial data transmission systems require a transfer control unit to organize data communication on the line. This unit controls and co-ordinates data transfer such that only one device at a time transmits data on the bus. In the CS 275 bus subsystem, this function is implemented in decentralized manner, i.e. each device has a temporary master function. This type of communication control is called flying master mode.

3.1 Flying Master Mode

Only one device of a flying master bus system has master status while the other devices operate as slaves. Changing the master function is called master transfer. There are three master transfer procedures which complement one another and which are defined in the bus protocol:

- Time-out-controlled
  if a master has failed or does not exist;
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  master transfer within the same local bus;
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  master transfer to a different local bus, which is connected via remote bus.

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- Remote bus interface
- User interface

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Asymmetrical signal transfer uses a 5-V level with wired-or signal function.

- Remote bus interface

This interface connects the local bus range to the remote bus. The inductive converter (UI) provides the interface. The three signals are converted by bit-serial modulation into a bipolar signal and are transferred to the inductively coupled remote bus.

- User interface

The AS, OS, AG and PC automation subsystem gives the bus subsystem various transfer jobs (read and write jobs). The local bus interfaces perform the transfer-related tasks.

3.3 Message Structure and Data Protection

- Message structure

Message transfer in the CS 275 bus system uses fixed basic elements which are 4x9 bits long and known as transfer elements. A message block consists of transfer elements.

The first byte of a transfer element is used as a control field. Additional fields are required for address, data, command, and protection transfer. Each 8-bit field is protected by a parity bit. An additional checksum is generated from all transfer elements of a message.

All bits of the same significance in the bytes of the message are EXORed and transmitted as protective byte in a field of the message. The protective byte is interpreted by the receiving local bus interface module.

- Data protection

Data protection in the CS 275 bus system is achieved by generating line and column parity values (known as block parity).

Data protection enables the following errors to be detected:

- one-, two- and three-bit errors (Hamming distance d = 4)
- odd bit errors, 1-, 3-, 5-, 7-, and 9-fold errors, independent of location
- error bursts < 11 bits in length
- error patterns (except square format).

3.4 Addressing

In order to facilitate communication between several independently operating buses and within one bus, each device is identified by two addresses (bus address and device address). These two addresses are selected by coding switches on the interface module.

3.5 Linking Blocks and their Modes

In the automation subsystem, analog, binary and signal linking blocks are available to the user for data transfer. All three block types are subdivided into receiver and transmitter blocks.

The interface blocks operate in two different modes:

- Direct communication mode (DI)
- Common data mode (CD)

In direct communication mode, up to six receivers can log on with the transmitter module. The receiver module sends an acknowledgement message to the transmitter module. In common data mode, the information is sent to all devices connected to a bus. Up to 99 receivers are possible.

Since a device of the bus normally only requires a small amount of the available CD messages, the local bus interface uses an inhibit list to pre-select those transmitter messages for which a receiver module is available.

Note: A very high device transmission power reduces the receiver power because of the protocol; a message can only be received if the transmitter buffer has enough capacity to eventually transmit a later response to the received message.

3.6 Changeover Criteria of the Redundant Bus

- An image of all converter units (UI) on the bus is generated for each bus line (approximately every 750 ms). If the image of the passive bus contains more entries than the image of the active bus, the system switches over to the passive bus.
- The system also switches over to the passive bus if the image is the same on both bus lines but the master has received a request for transfer on the passive bus. A slave uses the passive bus to transmit a request for transfer if it can no longer perform a transfer on the active bus.
- If the present master fails, the slave with the lowest device address takes over the master function on the bus which has been **passive until now** (if available).The new master switches even when both buses are recognized as fault-free.

All bus devices are notified of the bus change.

3.7 Bus Messages, Quality of the Transmission Link, Remote Bus Redundancy

3.7.1 Explanation of the Bus Messages 620, 621, 630, 631

Owing to their causes the bus messages are divided in two classes because of their different consequences on the bus redundancy.

- Cause in the end system (linking partner)

  Consequences on the bus redundancy are **not** possible.

  Cause: handling on the linking partner

- AS/CS start, offline/online changeover, use of configuring tools or BANY etc. can trigger the local bus module.

  Cause: AS after loss of the test job

- The AS checks the proper bus module with a test job; when this job is lost, in particular with older ASs, the AS reconfigures the local bus module. This module restart depends on the AS and only occurs in the time range "Second 37" to "Second 43" (second indication of the bus message time in the AS/CS log print).

  Bus signal: start of the concerned local bus module.

  Message displays: "Positive acknowledgment" 620 or 630 only or messages pairs, "Negative acknowledgment" 621 or 631 followed with the associated "Positive acknowledgment".

Notes:

- The device in which the bus module is started indicates the device address of the "Positive acknowledgment".
- Normally the device with the lowest device number generates the "Negative acknowledgment" .

- Cause in the transmission link (bus system, its environment or unknown)

  Consequences on the bus redundancy are possible.

  Causes: module fault, CS component, EMC influence, bus design, plant structure, others.

  The bus system is continuously monitored with approx. 4 millions cyclic organizational messages per day. This monitoring almost triggers with individual disturbances which can always appear with a certain probability on transmission links.

The frequency of these individual disturbances depends on the quality of the transmission link. When a "Positive acknowledgment" 620 or 630 always follows a message 621 or 631, it is normally not a control system or a CS 275 fault but a message that **one** individual disturbance has appeared on the transmission link during a UI check and that the bus system is further operational and **redundant**.

Consequences on the control system and on the process are prevented by the safety mechanism (code safety). The individual disturbances have no influence on the **useful data** due to the repetition mechanisms. The **organizational** messages for the bus system monitoring need no repetition because these messages are transmited cyclically. This leads to display an individual disturbance of the transmission link (621/620 oder 631/630). So the bus system disposes of an very sensitive indicator of the transmission link quality

Bus signal: error during UI check (example).

Message displays: "Negative acknowledgment" alone (redundancy loss) or message pairs.

Notes:

- The device address of the bus message gives the device which determined at first the appearance or disappearance of the fault. A conclusion on an eventually faulty CS component can only be drawn in case of a permanent fault.
- When a bus device reception is used intensively a redundancy state can be repeated by this device if another bus device has signalled this state a short time before
- The master clock is often involved in case of such doucle messages, the local bus of the clock emitting such a "superfluous positive acknowledgment". This "Positive acknowledgment" can led to delays of several minutes (in opposition to other bus devices).

3.7.2 Bus Message Evaluation Concerning the Bus Redundancy

The bus redundancy is not impaired when

- a "Positive acknowledgment" follows a "Negative acknowledgment" within max. 4 seconds,
- the limit of 8 messages is not reached within 30 minutes (see Note),
- not more than 10 bus messages concerning the transmission link appear per day (i.e. only the bus messages with a cause according to 3.7.1 are taken into account).

The bus redundancy is impaired when

- a "Negative acknowledgment" is not immediately followed by a "Positive acknowledgment" and the limit of 8 messages per hour is not reached (see Note).

Notes:

- When the limit of 8 messages per hour is reached the local bus module does not transmit the following messages to the AS/OS (to permit the logging of important process messages in case of a permanent fault). If the last transmitted message is a "Negative acknowledgment" 621 or 631 a following "Positive acknowledgment" is rejected in order to suppose that the bus redundancy is no longer operational
- After IBS measures during which the local bus connector was removed and plugged in the bus redundancy has to be checked with the operation stability of bus A and bus B. To realize that induce a bus changeover with the reset key of the UI power supply. (Cause: since the local bus redundancy is a prerequisite of the bus log a local bus connector removed from UI-bus interface logic does not provoke a "Negative acknowledgment" concerning a remote bus redundancy.
- If the bus redundancy is not checked with the AS/OS logs a redundant remote bus system should be switched over manually regularly (e.g. every month) to recognize a single fault (on a bus switchover) before a double fault occurs which could lead to permanent bus changeover

3.7.3 Improvements

The sensitivity of some bus circuits (e.g. N-AS) was reduced during the CS 275 maintenance (message only in case of repeated fault).

A further reduction of the bus messages will be obtained when the bus interface logic (BIL, 6DS1 212-8AB) release version ≥ 3 will be used. This bus interface logic is improved concerning the telegram synchronization.

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4 Technical Data

Number of devices	≤ 100, depends on bus load
Distance without bus coupler	max. 4000 m
Data format	variable
Bus controller	distributed (flying master function)
Data protection	block parity
Hamming distance	d = 4
Noise immunity	IEC recommendation 255-4

Remote bus

Number of converters (UI)	max. 32
thereof bus coupling units	max. 7, thereof 1 or 2 in series
Cable length	max. 4000 m
Baud rate	250 x 10^3 bits/s
Standard cable	2YC (ms) CY 1.6/10-75 (Z2/5) vs sw
Thin cable	2YC (ms) CY 1.0/6.5-75 (Z2/5) vs
Bus cable with flat-wire sheathing	2YC (ms) CYbY 1.6/10-75 (Z2/5) vs (F 0.8 vzk) sw.
Bus cable with steel tape armour	2YC (ms) CYbY 1.6/10-75 (Z2/5) vs (2B 0.5 vzk) sw.
Signal shape	bipolar current signals
Coupling	inductive, non-interacting
Redundant remote bus	possible

Local bus (20 m local bus)

Number of devices	max. 9 (UI counts as a device)
Baud rate	250 x 10^3 bits/s The baud rate rises to 340 x10^3 bits/s in the case of an autonomous local bus, i.e. without bus converter unit.
Cable length between devices	max. 20 m **devices must be series-connected, a star connection is *not* permissible**
Cable	L-YCY 12 x 2 x 0.22 mm^2 vzn Si
Signal transfer	asymmetrical
Signal level	$V_{IL} \leq 0.8$ V $V_{IH} \geq 2.0$ V
Coupling	open collector
Floating local bus interface module	N-AS, N-AT
Non-floating local bus interface module	N-S5, N-V.24, UI
Redundant local bus	standard

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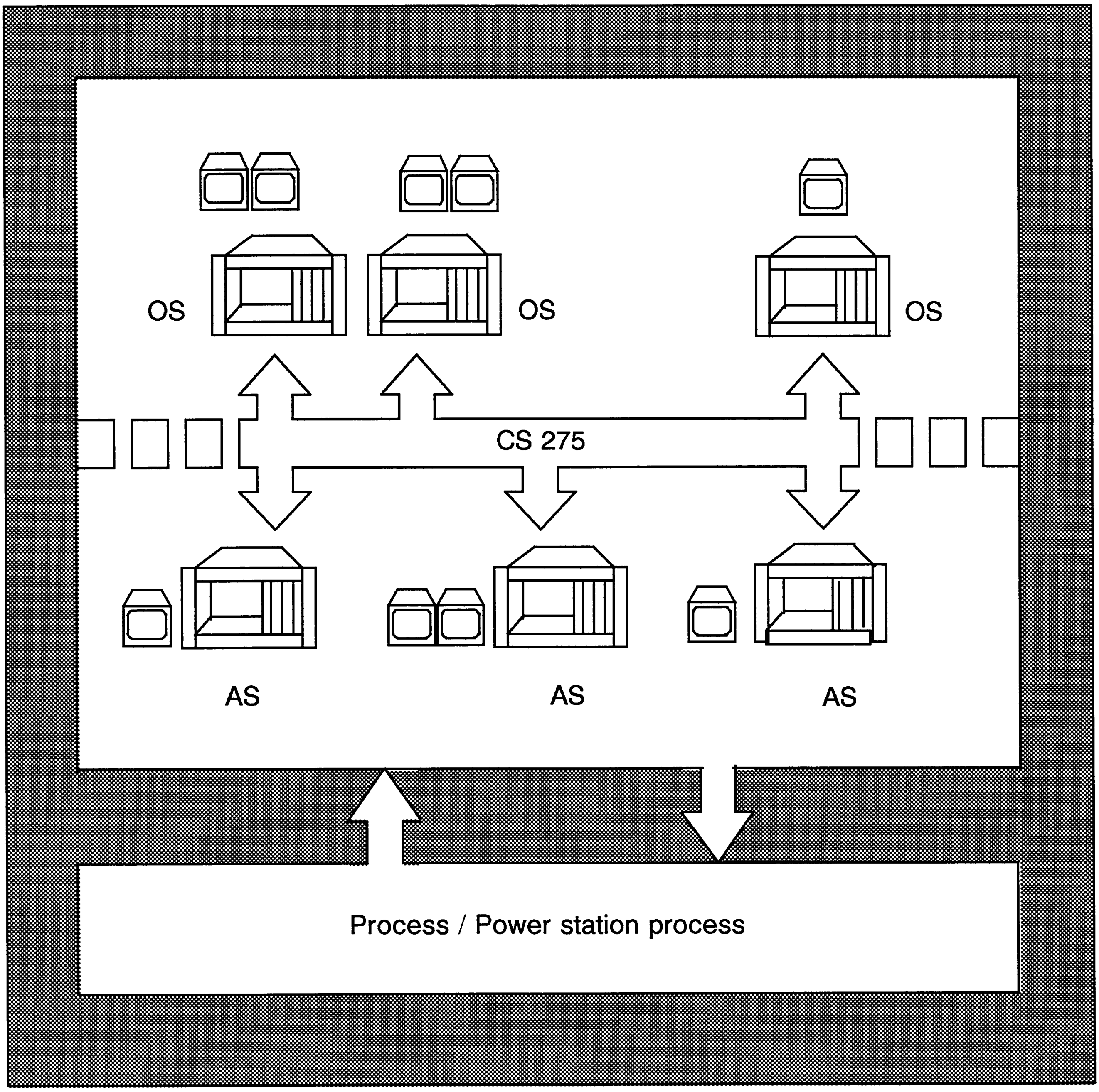
SIEMENS

TELEPERM M/ME

CS 275 Bus System

Planning Guidelines

Technical Description C79000-T8076-C302-04



Contents Page

The SIMATIC AG-S5 150 U and 155 U programmable controllers as well as the AS 215 behave (with few exceptions) as the TELEPERM M/ME AS automation systems when coupled to the bus system.
The indications of this planning guide concerning the AS systems are also correspondingly valid for the above-mentioned AGs and AS 215. The system specific peculiarities of the coupling to the CS 275 are specified in the Manuals to the corresponding coupling software KSN-S%/-S55/-S55E or AS 215.

1 Linking Blocks for Data Exchange via the CS 275 Bus System

The TELEPERM M/ME process control system contains blocks which permit cyclic or acyclic data transfer to other devices on the bus. The BKS, BKE, AKS, AKE, MKS and MKE blocks are used for transmitting data from one AS automation system to another AS system, an OS operator communication and monitoring system or to the process computer.

1.1 Binary Linking Transmitter Block BKS and Binary Linking Receiver Block BKE

The BKS and BKE blocks facilitate cyclic exchange of up to 128 binary values each via the CS 275 bus system.

- Binary linking transmitter block (BKS)

At configuration of the automation system, the user can connect binary outputs of any other block (AS 220) or binary fields to a BKS block using interconnecting statements. When the BKS block is processed in the automation system, it sends a message via the bus system to all devices logged on with it.This message contains the binary values interconnected via configuration instructions. The binary values are then made available in the binary linking receiver block BKE of the devices receiving this message.

The interface software for configured data exchange with a higher-level computer can also accept the bus message. It transfers the data to the user in a buffer.

- Binary linking receiver block (BKE)

The bits received by the BKE block are stored in data arrays of the AS automation system. The BKE block specifies the flag word (AS 220E/220 EHF) or GB/GM area (AS 230, 235) from which onwards the bit sequence is to be stored.

1.2 Analog Linking Transmitter Block AKS and Analog Linking Receiver Block AKE

The AKS and AKE blocks facilitate cyclic exchange of analog values via the CS 275 bus system.

The following data quantities can be exchanged:

- up to 28 analog values per AKS block
- up to 4 analog values per AKE block in the AS 220E/EA 220 H/EHF automation system and up to 28 analog values per AKE block in the AS 230/AS 235 system.

- Analog linking transmitter block (AKS)

The transmission cycle is defined by configuration and depends in each case on the setting of the preceding XB block.

At configuration of the automation system, the user can connect analog outputs from any other block to an AKS block using interconnection statements.

When the AKS block is processed in the automation system, it transmits a message via the bus to the devices that have been logged on with the block. This message contains the analog values interconnected via configuration instructions. These analog values are then made available in the analog linking receiver block AKE of the devices receiving this message.

The interface software for configured data exchange with a higher-level computer can also accept the bus message. It transfers the data to the user in a buffer.

Appropriate AKE functions are also available in the OS operator communication and monitoring systems.

- Analog linking transmitter block (AKE)

28 analog values with an AKE block can be transmitted using an AKS block. Some older AS cannot take all the 28 values with one AKE block. An AKE block in an AS 220 system, however, can only accept 4 values. In order to be able to receive all transmitted values, several additional AKE blocks must be inserted directly below the block which was parameterized first ("head block") in the AS 220 system. The advantage of this is that only the section relevant for the individual devices can then be assessed from the 28 values.

1.3 Signal Linking Transmitter Block MKS and Signal Linking Receiver Block MKE

The MKS and MKE blocks facilitate acyclic exchange of up to 32 binary values per module via the CS 275 bus system.

- Signal linking transmitter block MKS

The MKS block is event-driven, in contrast to the AKS and BKS blocks for cyclic data exchange. Whenever a transition of at least one binary input signal occurs, the MKS block transmits a message via the bus to the devices that have been logged on.

The time when this transition occurred is also transmitted in the message.

The binary outputs of the blocks and binary arrays relevant for the binary statuses to be transferred must be interconnected with the MKS block when the automation system is configured.

The MKS block only functions in direct communication mode (DI); see Section 1.5.

- Signal linking receiver block MKE

At least one MKE block is allocated to each MKS block; up to 6 receiver blocks are permitted.

MKE blocks may exist in the following systems:

- AS 231 automation system (partly)
- OS operator communication and monitoring systems with alarm display
- Higher-level computer

The MKE block makes the 32 status bits available at the receiver end.

1.4 Message Length

- MKS/BKS messages
  The MKS/BKS messages have a fixed length, irrespective of the amount of data to be transferred. It is thus recommended that all the bits of an MKS/BKS block be used, as the load on the bus is constant for each block.

- AKS messages
  The length of the AKS messages depends on the amount of analog values to be transferred. The load on the bus thus also increases with the amount of analog values.

1.5 Transmission Modes

Two transmission modes must be distinguished at configuration and definition of the AKS and BKS transmitter blocks:

- direct communication mode (DI) and
- common data mode (CD).

- Direct communication mode (DI)

The logged-on devices are directly addressed by the transmitter blocks, i.e. each device only receives the data which concerns it. Up to 6 receivers can be logged on with the transmitter block to receive data relevant for each respective receiver at each transmission cycle of this block (analog or binary values).

Any device on the bus can be a receiver. Transmission also takes place across a bus coupler module. The "slow channel" has to be configured in the transmitter for this reason. Devices are logged on as receivers in the transmitter block of the respective automation system. The related configuration instruction is entered into the receiver block during the first-time communication.

This instruction has the following format:

KD, ba, ta, sbs, no; with ba = bus address
ta = device address
sbs = transmitter block
no = block number or name

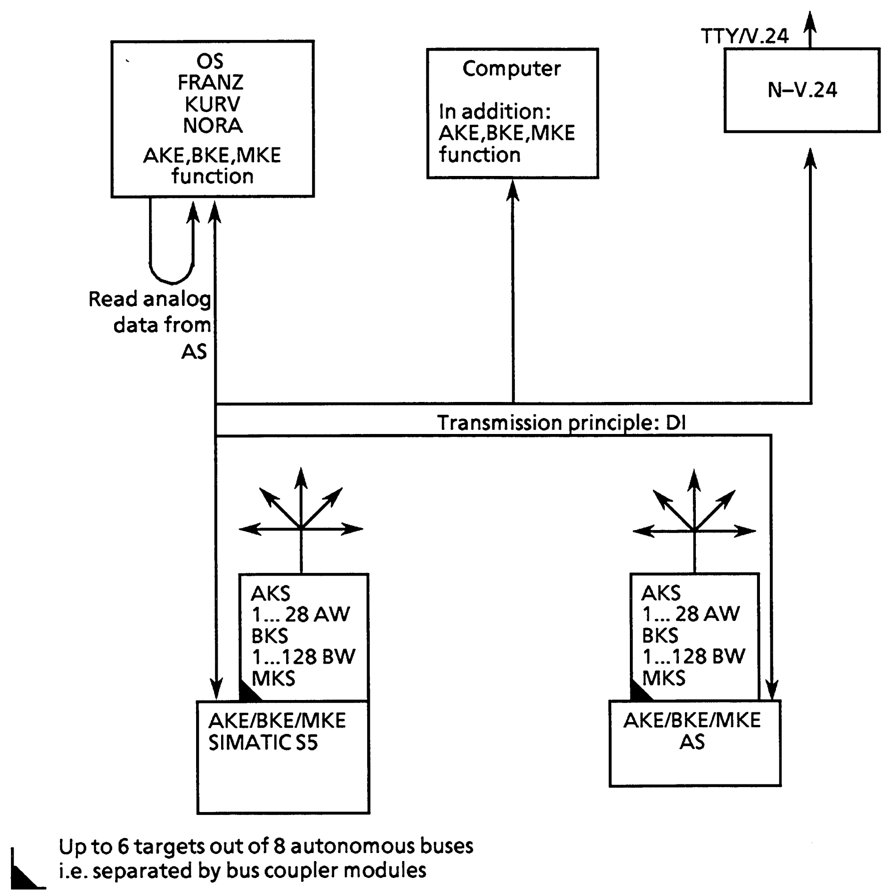


Fig. 1 Direct communication mode (DI link), function diagram

- Common data mode (CD)

The transmitter block transmits the data jointly to all connected devices of a particular bus. Thus, for several devices of a bus, the same data can be configured in one transmitter block, allowing several target addresses to be reached.

The following restrictions must be taken into consideration:

- CD mode can only be used for devices with the same bus address. Addressing across bus coupler modules is not possible.
- AKS and BKS blocks of an automation system which work in CD mode may only contain the block numbers 1 to 16. Wih CD a block number used e.g. for AKS cannot be reused for BKS.
- With respect to a particular bus, CD mode only works with transmitter device addresses (ta) $0 \leq ta \leq 31$.

The transmission cycle of a block working in CD mode depends on the processing sequence set by a higher-level XB block.

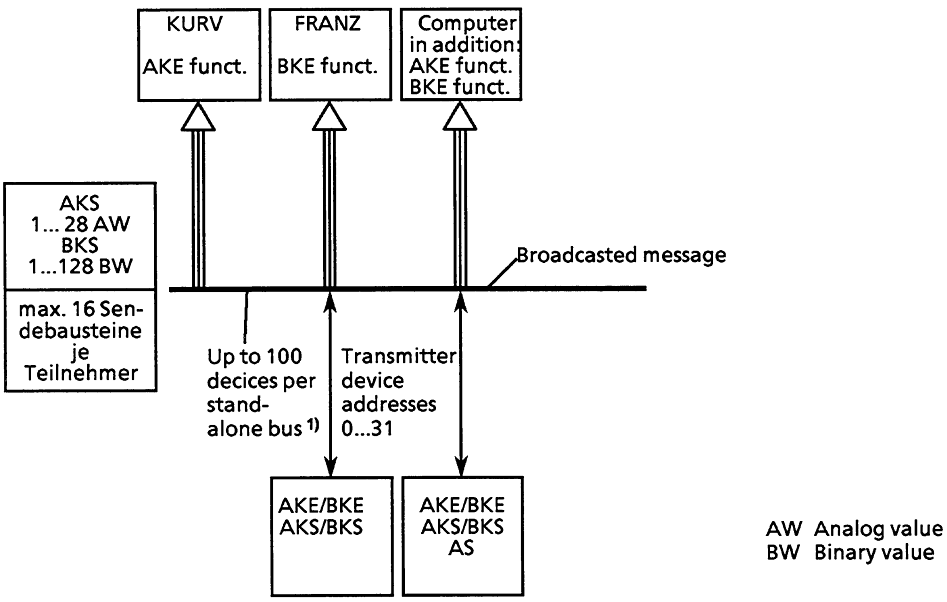
The following configuration instruction must be entered into the receiver block:

KC, ba, ta, sbs, no;

(Enter KL; if you wish to clear the link)

Note:

In direct communication mode (DI), the address section of the receiver must be transmitted in addition to the data record. The address section in common data mode is only a fictitious device address. The load on the bus caused by a given amount of data is therefore smaller in CD mode than in DI mode.



1) Stand-alone means: separated by bus coupler modules (not permitted for bus 0 : ta=0)

Fig. 2 Common data mode (CD link), function diagram

Note:

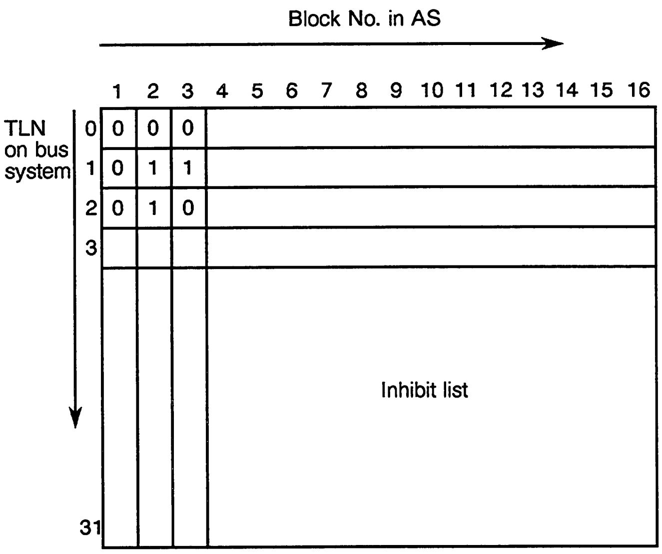
Coupling in CD mode is **not** possible for a SIMATIC S5 programmable controller linked to a CS 275.

1.6 Inhibit List

Since a TLN device on the bus generally only wishes to receive a small part of the CD messages available on the bus, the local bus interface module N only transmits information to AS and OS systems which have appropriate receiver blocks. The local bus interface module of the receiver makes its selection using an inhibit list.

The inhibit list is automatically created and transferred to the local bus interface module when a receiver block is configured in CD mode (structure of bus coupling).

Generally, all 16 transmitter blocks of all devices ($0 \leq n \leq 31$) are inhibited. The message is only released in the local bus interface module of the receiver once a receiver block has been linked for the first time. The advantage of this is that there is no time load on the receivers (central units of the AS and OS systems) with inhibited CD messages.



"0" means: transmitter block X from TLN Y is not received
"1" means: receiver block available; the local bus interface module transfers data to the TLN

Fig. 3 Inhibit list structure

The user does not have access to the inhibit list. This list is only described here for better understanding of the functions.

1.7 Cycle Selection

In CD mode, each transmitter block transmits according to the cycle selected in the XB block. The user of the coupling software of a higher-level computer can specify in the log-on call whether all or only some of the transmitted CD messages are to be received. The user can then receive, for each block or each block group:

- all messages,
- every second,
- every fourth or
- every eighth message,

with respect to the transmission cycle selected in the automation system. Analog value acquisition for the KURV software package is then configured in the OS.

1.8 Selecting the Data Transfer Channel and the Coupling Mode

According to parameterization in the transmitter driver block, data may be transferred with or without acknowledgement (transfer via channel 1 or 2). Channel 1 is the "fast" channel, channel 2 the "slow" channel.

- The sender does not receive any acknowledgement when data is transferred on the **fast** channel .
  In CD mode transfer is only permitted via channel 1. The subsequent message from the transmitter block should be regarded as a reaction to a virtual acknowledgement.
  DI mode transfer can also be performed via the fast channel if acknowledgement is not required.
  Application: Transfers which are configured in a second-based cycle and do not initiate any commands.
- **Slow** channel returns acknowledgement to the sender. This enables the sender to repeat transmission in the event of a failure. DI communication is possible this channel; MKS communication is always performed on this channel.
  Application: Transfers which directly initiate commands or are configured in longer cycles.

Note:

Cyclic communication without commands or messages which is not to be transferred via bus coupler modules is always configured as CD or DI communication in channel 1. Acyclic communication or data releasing commands are normally transferred in DI mode via channel 2.

Messages routed **via bus coupler modules** must always be transferred in DI mode via the slow channel.

Please remember that, due to longer messages (receiver addresses) and/or additional receiver acknowledgement, DI mode puts a higher load on the bus than CD mode.

This load is even higher if a transmitter block transfers data to several devices (see Figs. 14 to 17).

Empty Page

2 Determining the Cyclic Load on the Bus

Since only a limited amount of data can be transferred via the bus. a calculation of the estimated bus load must be carried out. For such a calculation only take the "cyclic" couplings into consideration. Cyclic couplings are AKS, BKS, image updating as well as bus load caused e.g. by AS archiving via bus or bus-coupled configuring tools.

The load of these cyclic couplings must be limited to 70 % (TM) or 50 % (TME) of the bus (or bus coupler) transfer capacity.

So a higher amount of **acyclic** messages can be managed without problems.

2.1 System Configuration

For the example described below a system configuration according to Fig. 4 is selected.

The system consists of

- 2 OS operator communication and monitoring systems with 2 operator input channels each
- 10 AS automation systems.

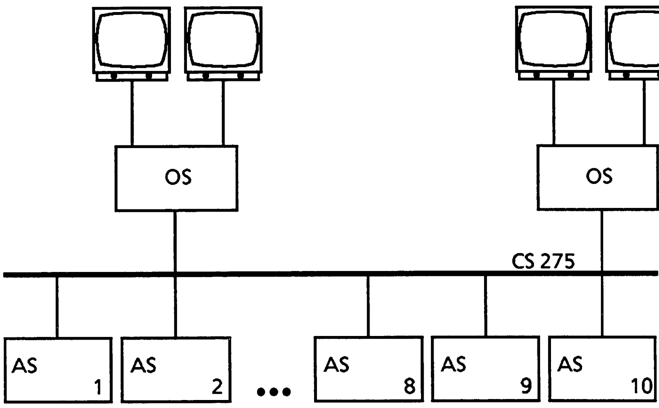


Fig. 4 Example of a system configuration

2.2 Amount of Data to be Transferred

- OS with curve display (KURV) via 2 AKS with a rate of 28 analog values per 4 seconds from each of ten AS automation systems.
- Data exchange between the AS automation systems (28 analog values are transmitted per AKS and 128 binary values per BKS):

1.	AS ⟶ 4. AS =	3 AKS/s + 1 BKS/s
2.	AS ⟶ 3. AS =	1 AKS/s + 1 BKS/s
10.	AS ⟶ 5. AS =	2 AKS/2s + 2 BKS/2s
9.	AS ⟶ 6. AS =	1 AKS/s
8.	AS ⟶ 4. AS =	2 AKS/s + 4 BKS/s
Total		8 AKS/s + 7 BKS/s

2.3 Determining the Load on the Bus Using Tables and Characteristic Curves

- OS 262 with 2 channels

The bus load table (Fig. 19) gives a bus load of 6% (with a 2-channel selection of FRANZ displays).

- Data exchange between AS and OS for KURV (configuring via AKS: bus load does not depend on the selected image type

Amount of data to be transferred:

20 x 28 analog values/4s ≙ 20 AKS/4s ≙ 5 AKS/s

The bus load characteristic curves for CD mode (Fig. 5) show a cyclic bus load of 5% for 5 AKS/s.

- Data exchange between AS automation systems

Amount of data to be transferred (see Section 2.2):
8 AKS/s + 7 BKS/s

The bus load characteristic curves for CD mode (Fig. 5) give the following results:

- a cyclic bus load of 8% for the 8 AKS/s
  (1 AKS ≙ 28 analog values)
- a cyclic bus load of 3% for the 7 BKS/s
  (1 BKS ≙ 128 binary values)

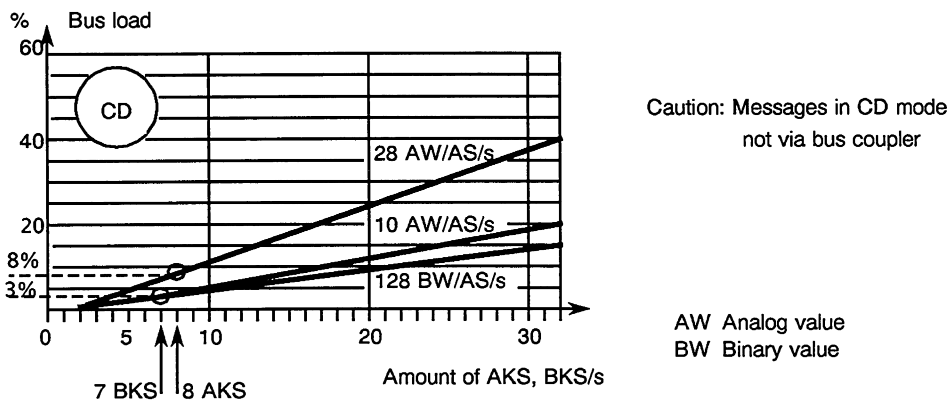


Fig. 5 Bus load characteristic curve for data exchange in CD mode

Caution:

If the AKS blocks were only to be used with 10 analog values, the bus load would only be 5%.

The following amount of data is thus exchanged:

- Data for cyclic image updating for 4 FRANZ displays
- 20 AKS/4s x 28 analog values = 560 analog values/s
- 8 AKS/s x 28 analog values = 224 analog values/s
- 7 BKS/s x 128 binary values = 896 binary values/s

The total cyclic bus load is therefore:

OS oper. input chan. 4 x 3'	=	12%
KURV	=	5%
AKS	=	8%
BKS	=	3%
Total		28%

The total cyclic bus load of 28 % is less than 70% (TM) / 50 % (TME) and thus permissible.

Note:

The bus load generazed e.g. by configuring tools has to be added to the **cyclic** bus load even if the bus load is only temporary.

2.4 Connecting a Higher-Level Computer

It is assumed that the 10 AKS/s and 10 BKS/s have to be additionally coupled to the computer via bus.

The bus load characteristic curves (Fig. 5) show:

10 AKS/s ≙ 10 %
10 BKS/s ≙ 5%

This corresponds to a data quantity of

- 10 AKS/s ≙ 280 analog values/s and
- 10 BKS/s ≙ 1280 binary values/s

for the higher-level computer.

The total cyclic bus load is thus 28 % + 15% = 43%. With suitable planning the bus load could be reduced by making, for example analog values which are held ready for other devices on the bus, also available to the computer in CD mode.

Empty Page

3 Bus Coupler Module (BK)

3.1 Application

In large systems, it is recommended to split up the TELEPERM M bus system into several independent subsystems. This enables a high transmission performance to be achieved in each subsystem.

Bus coupler modules (BK) are used for transferring information between the various autonomous bus subsystems.

Information for a non-system bus is received, buffered and transmitted to another bus by the bus coupler module after the bus has acquired the mastership. Organizational information is not transferred to the other bus.

Two bus coupler modules with different device addresses can be used in parallel to increase transmission performance.

Fig. 6 shows possible bus coupler configurations. A message should not be routed through more than two bus coupler modules in order to avoid a long waiting time for acknowledgement.

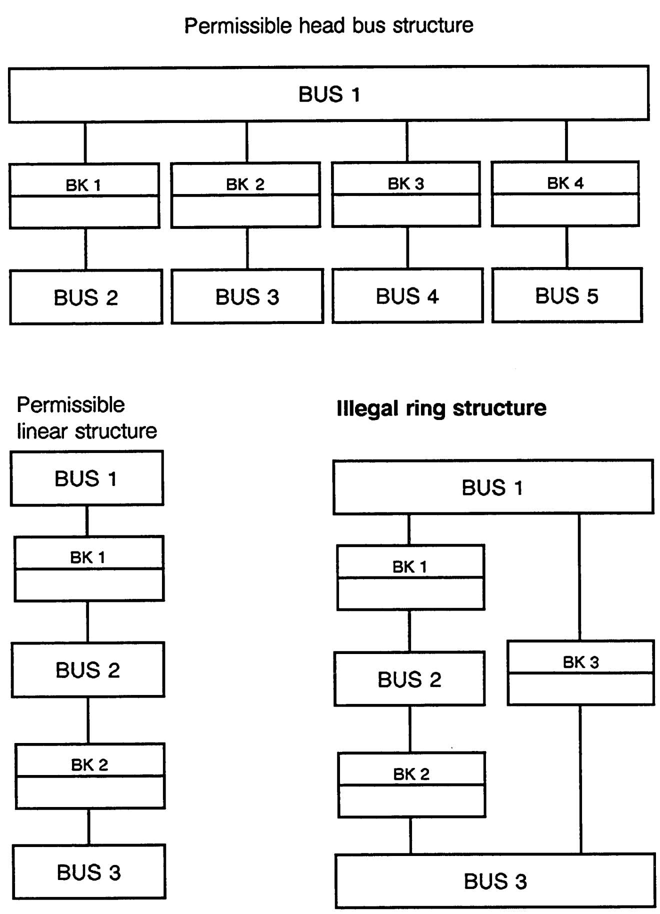


Fig. 6 Examples of bus coupler module configurations

3.2 Design

The bus coupler module consists of two N-BK local bus interface modules (hardware of the N-8), which are connected to each other via the user interface (back-to-back). The local bus interface modules are housed in a two-tier ES 902 subrack together with a 24 V/5 V, 18 A power supply module. The BK-NF requires one additional inductive UI bus converter, the BK-FF requires two.

The main difference between the firmware of the N-BK local bus interface module and the N-AS firmware lies in the special interface protocol handling instead of the communication protocol.

3.3 Method of Operation

Both local bus interface modules function completely independently and asynchronously, as does every other local bus interface module. Data exchange between the two takes place via DMA (Direct Memory Access). Here only one interface module at a time can actively carry out DMA, whilst the other functions as a passive memory unit (RAM).

Coupling always takes place from the DMA interface of an N-BK local bus interface module to the internal memory interface of the other N-BK and vice versa. The memory interface includes the internal data, address and control bus.

Special firmware and hardware priority determination takes control during a collision, where both interface modules wish to perform DMA at the same time.

Note: Transfer across a bus coupler module is only permitted in the "slow" channel.

Two bus coupler modules can be installed between two autonomous remote bus systems. Two different applications are distinguished:

- Parallel bus coupler module
If the communication performance of one bus coupler module proves insufficient, a second bus coupler module increases the transmission performance by about 100%. This parallel connection of bus coupler modules leads to a reduction in power if one bus coupler module fails (no redundancy).

- Redundant bus coupler module
If the coupling power of one bus coupler module is sufficient, redundancy can be planned using a second bus coupler module. If the first bus coupler module fails, the second automatically takes over the coupling function. In this case real redundancy is available.

The only difference between a redundant and a parallel bus coupler is in the data transfer rate, the structure is the same.

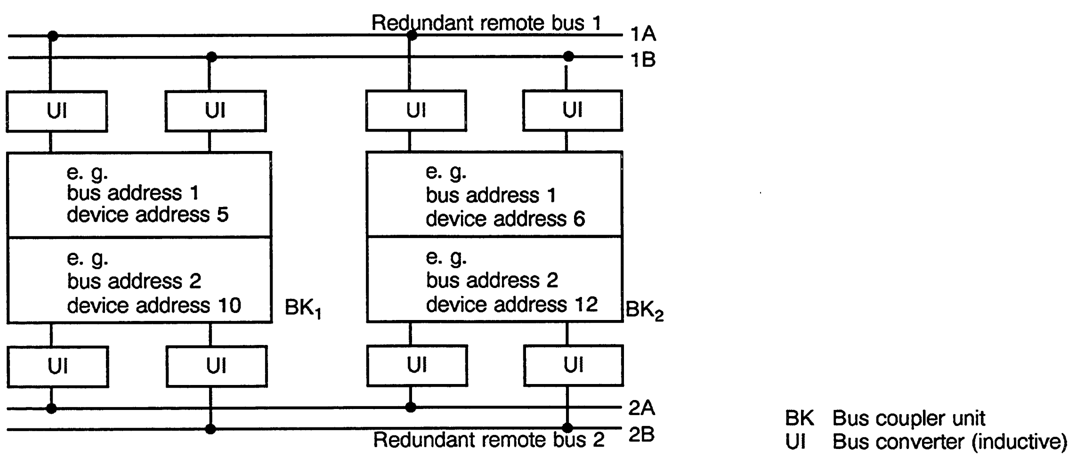


Fig. 7 Parallel bus coupler modules, e.g. between redundant remote buses

Notes:

- If both coupler modules are accomodated in the same cabinet, the parallel bus coupler module BK2 can be connected to BK1 via the local bus.
- The bus coupler redundancy does not depend on the CS 275 line redundancy
- It is recommended to distribute the UI from the bus A and B on both subracks in order to hold the communication of the redundant bus coupler when a DC 24 V power supply fails (in the bus coupler subrack).

3.4 Performance Data

A (single) bus coupler module can transmit a maximum of 28 % of the bus load. The cyclic bus load via BK should not exceed 19 % (TM) / 14 % (TME). The conversion factor from the bus load in bus coupler load is 3.6.

The bus coupler module performance data can be seen in Figs. 8 and 9. It should be noted here that only 70% (TM) / 50 % (TME) of the maximum power of a bus coupler module should be used for **cyclic communication**. It is thus ensured that sufficient reserve capacity is available for controlling load bursts (increased number of acyclic messages, in particular, during a process-related failure, for example).

- Bus coupler module load characteristic curve for a single/redundant BK bus coupler module.The characteristic curve in Fig. 8 shows how many AKS_{28} / MKS / BKS/s can be linked between two remote buses. This limitation applies for transfer in one or both directions with any data quantity ratio.

Example:

- up to 19 AKS_{28}/s in **one** direction or
- up to 10 AKS_{28}/s in **one** direction **and** 9 AKS_{28}/s in the **other** direction or
- up to 18 AKS_{28}/s in **one** direction **and** 1 AKS_{28}/s in the **other** direction.

The characteristic curve also applies for redundant bus coupler modules.

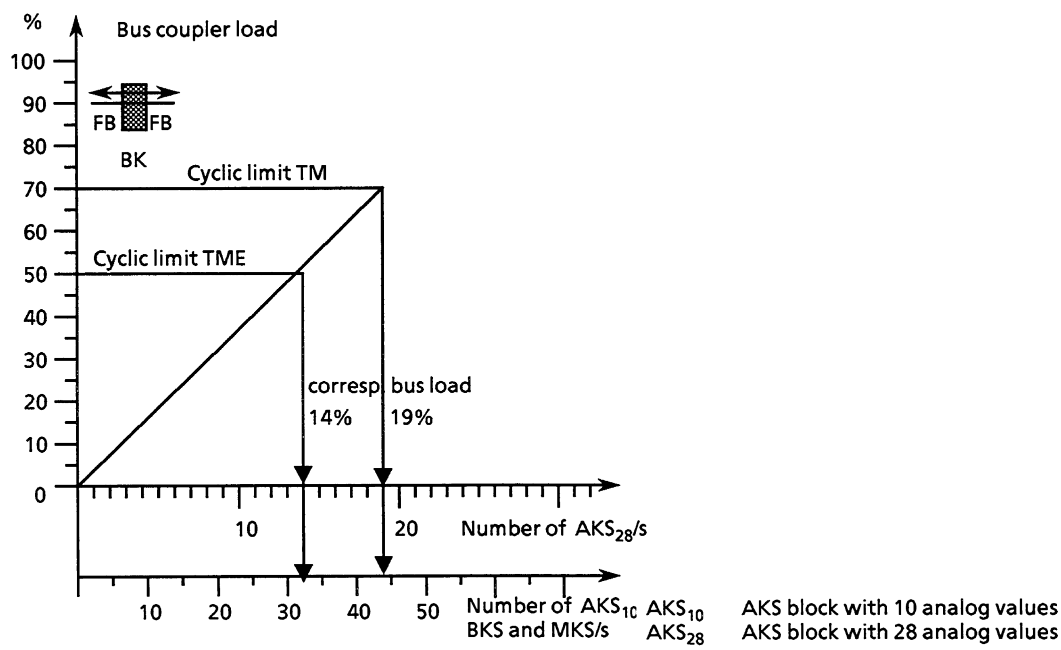


Bild 8 Bus coupler module load characteristic curve for a single bus coupler module

- Bus coupler module load characteristic curve for **parallel** bus coupler modules
  The characteristic curve in Fig. 9 shows how many AKS_{28} / BKS / MKS/s can be coupled between two remote buses. This limitation applies for transmission in one or both directions with any of data quantity ratio.

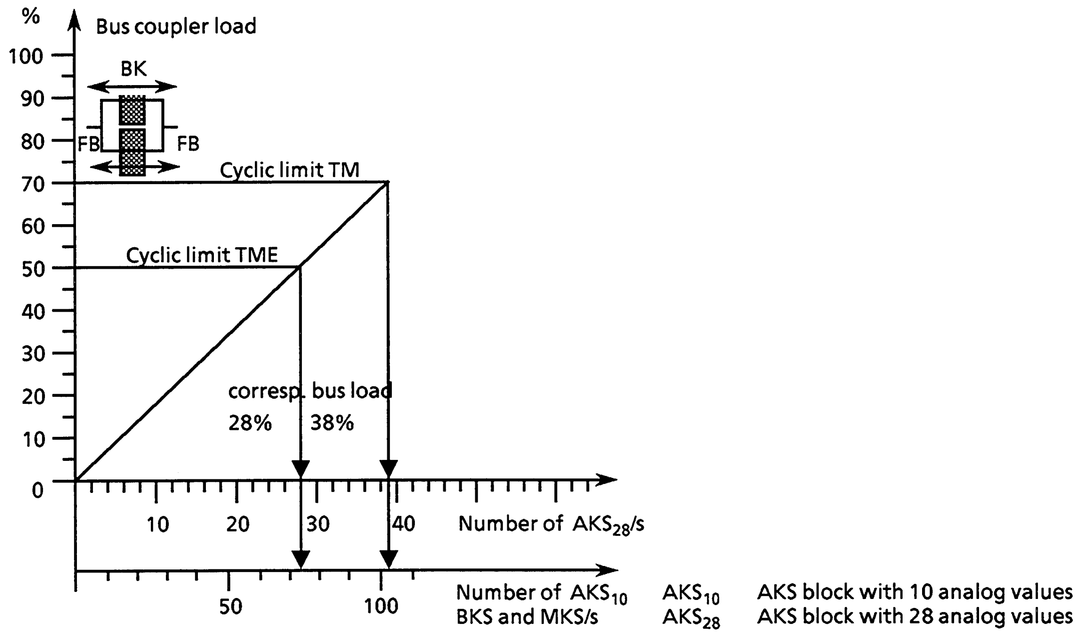


Bild 9 Bus coupler module load characteristic curve for a parallel bus coupler module

- Load of the bus coupler module by an OS operator communication and monitoring system

If an OS operator communication and monitoring system with one channel is used for controlling and monitoring AS systems which are arranged after the bus coupler module, the following bus coupler module utilization values will occur (see also Fig. 9):

Selected OS display	NORA,		FRANZ	
single/red. bus coupler module load	appr. 4 %	(1% x 3.6)	appr. 11 %	(3% x 3.6)
parallel bus coupler module load	appx. 2 %	(1% x 1.8)	appr. 5.5 %	(3% x 1.8)

In this case it is recommended not ot load the bus coupler module to the max. permissible cyclic load to avoid unnecessary time delays during screen updating and operator communication.

- Message time delay by the bus coupler module

Tessage time delay by the bus coupler module is only < 0.5 s when the BK is not overloaded and if htere are no bus faults.

3.5 Determining the Cyclic Bus Coupler Module Load

The following procedure is recommended for determining the cyclic bus load:

- First determine the cyclic bus load values separately for each autonomous bus. Data which is to be transmitted via the bus coupler module in the form of AKS/BKS/MKS messages must also be taken into account.

  Please remember that any message which is transferred from one bus via the bus coupler module to another bus must be included in the bus load calculation of both bus systems (Figs. 10 and 11).

- As the bus coupler module has a lower transmission performance than the bus system, due to the buffering of messages required, the sufficiency of the transmission performance of the bus coupler module must be checked.

  The number of AKS/BKS/MKS messages which alternate in both directions via the bus coupler module is required here (see also Fig. 15-17 DI slow channel).

- Determine the bus coupler module load using bus coupler module performance data (Figs. 8/ 9).
- Include time delays which are caused by the bus coupler module.

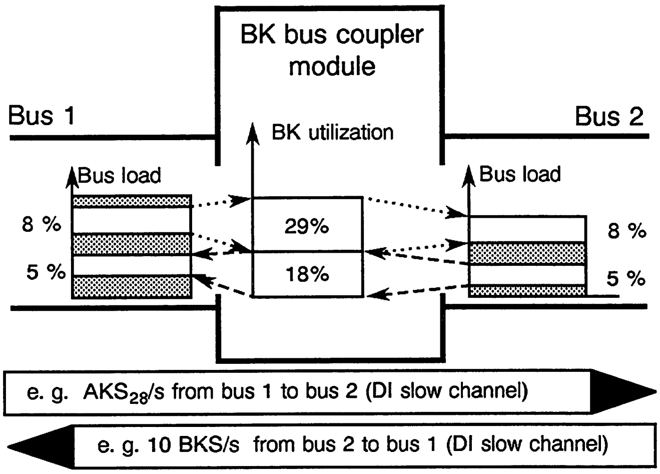


Fig. 10 Data exchange between bus 1 and bus 2 via bus coupler module; ratio of the bus and bus coupler module load (example: single bus coupler)

- The load values from Fig. 10 were converted with the characteristic (Fig. 8/9). Use the same procedure for KURV with analog values.
- Fig. 14 to 17 show: with DI coupling with one target address 1 % bus load corresponds to 1 AKS_{28}/s).

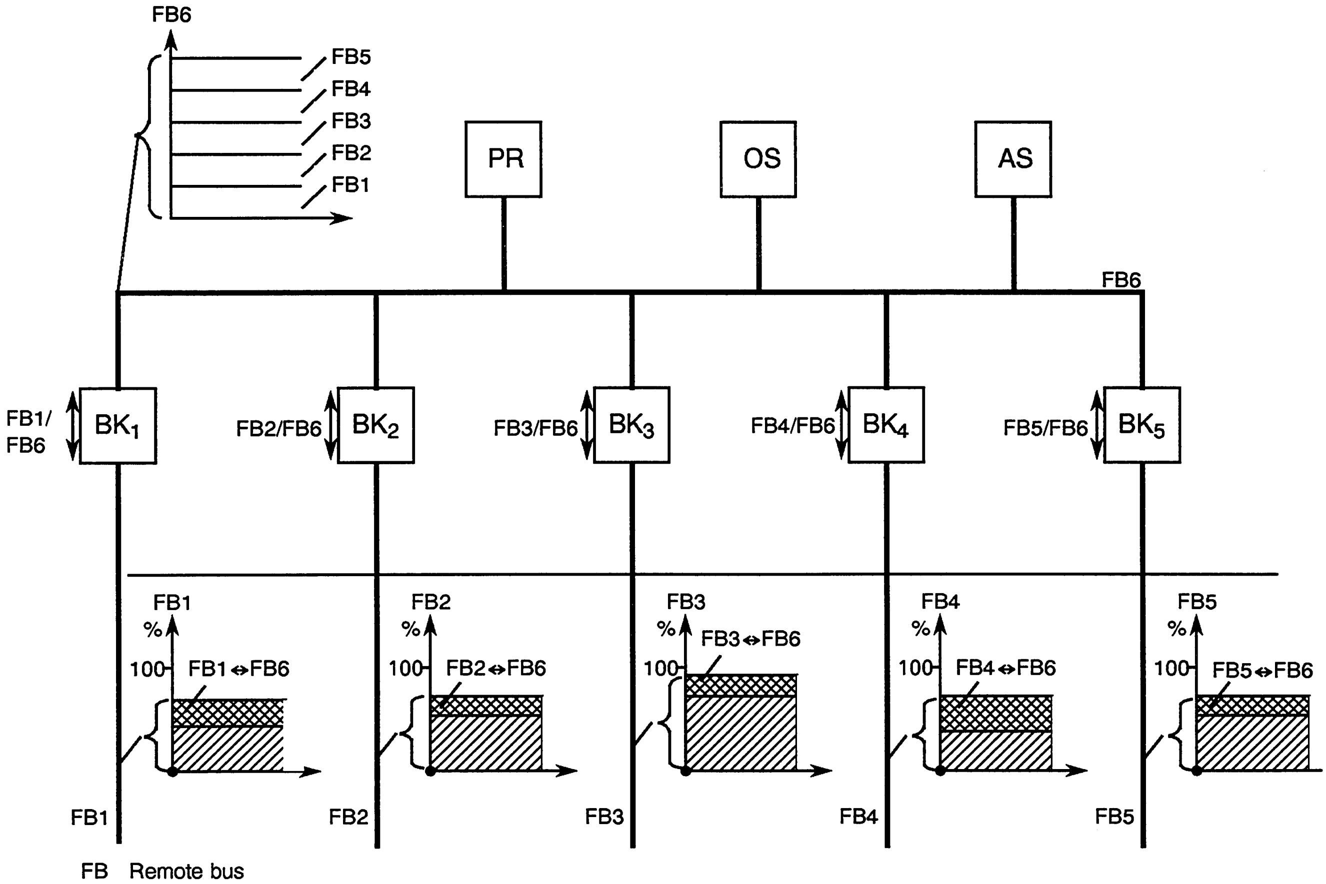
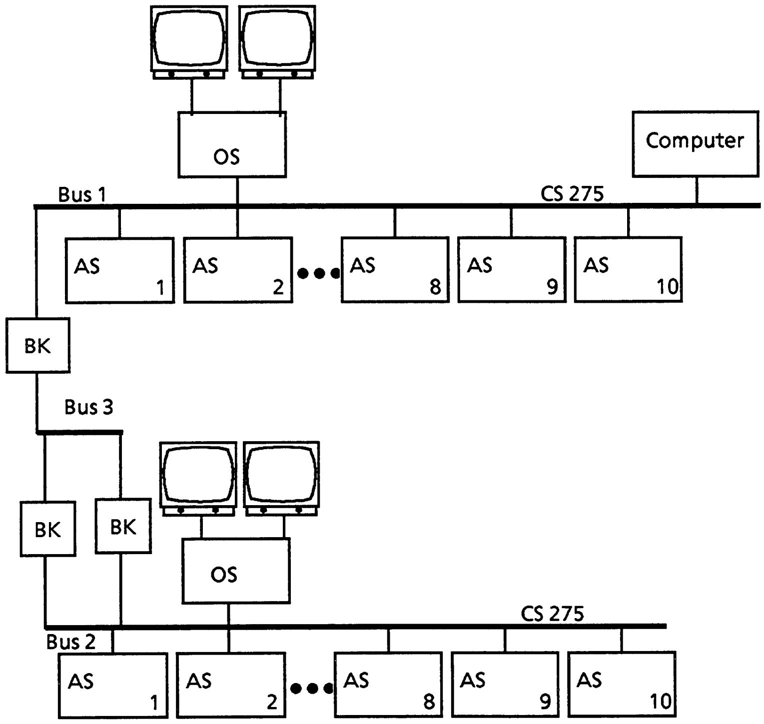


Fig. 11 Determination of the bus load when using BK bus coupler modules



Fif. 12 a Example: System configuration with a single and a parallel bus coupler module

Example:
The system configuration in Section 2.1 will be used as an example. This configuration is coupled twice via bus coupler modules to a higher-level bus. A single parallel bus coupler module is used between bus 1 and bus 3 and a parallel bus coupler module between bus 3 and bus 2.
Proceed as follows:

- Determine the bus load on the autonomous buses 1 and 2. The load on both buses is 25% without bus coupler module (assumption).
- Assumption for data exchange via the bus coupler modules:
  5 AKS/s (= 25 x 28 analog values/s = 700 analog values/s) are to be transferred from bus 2 to bus 1. 20 BKS/s (= 20 x 128 binary values/s = 2560 binary values/s) are to be transferred from bus 1 to bus 2.
- Determine the bus load on the three bus systems:

Bus 1	
Internal data exchange	25 %
Data exchange via bus coupler module 20 BKS/s	10 %
Data exchange via bus coupler module 5 AKS/s	5 %
Total bus load on bus 1	40 %
Bus 2	
Internal data exchange	25 %
Data exchange via bus coupler module 5 AKS/s	5 %
Data exchange via bus coupler 20 BKS/s	10 %
Total bus load on bus 2	40 %
Bus 3	
5 AKS/s	5 %
20 BKS/s	10 %
Total bus load on bus 3	15 %

- Determine the bus coupler module load:
  A **single** bus coupler module is installed between bus 1 and bus 3. The characteristic curve (Fig. 8) shows 32% load for 20 BKS/s, 18 % load for 5 AKS/s, i.e. a total load of 50 %.
  A parallel bus coupler module is installed between bus 2 and bus 3. The characteristic curve (Fig. 9) shows 9% load for 5 AKS_{28}/s and 16 % load for 20 BKS/s, i.e. a total load of 25 %. As the calculated values are less than the max. permissible cyclic load for a bus or a bus coupler, the required data exchange can be carried out.

3.6 Important Note for Coupling 3 and more Buses

When coupling 3 and more buses, the middle bus forms the so-called head bus. In case of a high lateral communication by BK it can arrive that the participants excluded from the head bus (e.g. AS, OS, master computer) do not receive the transmitting authorization on time because the lateral communication protocol of the coupler has priority on this head bus.

To avoid coupling failure it is recommended, in case of extension of the existing plants, to bring in the max. bus load and to check the couplings of the head bus participants (e.g. via the error output FKOP of the AKE and BKE blocks). Keep the head bus free from participants (see above) in case of new planning (see Fig. 12b).

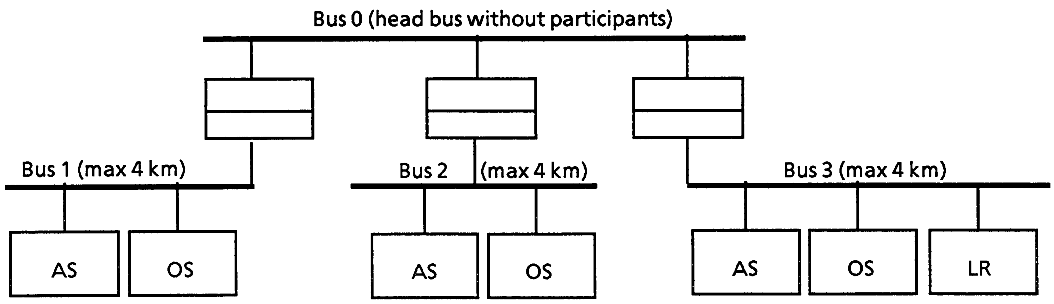


Fig. 12 b Head bus structure for new plannings

The line structure with 3 buses (max. distance between 2 participants: 12 km) is a special case of hierarchical structure.

- If participants (AS, OS...) have to be connected to the middle bus of an up to now planned line structure, another bus is necessary to obtain the required structure without participants at the head bus.
  Note: Compared to up to now authorized structures an additional bus coupler module is necessary in this case.

- If no participants are connected to the middle bus the required participant-free head bus structure is already present.

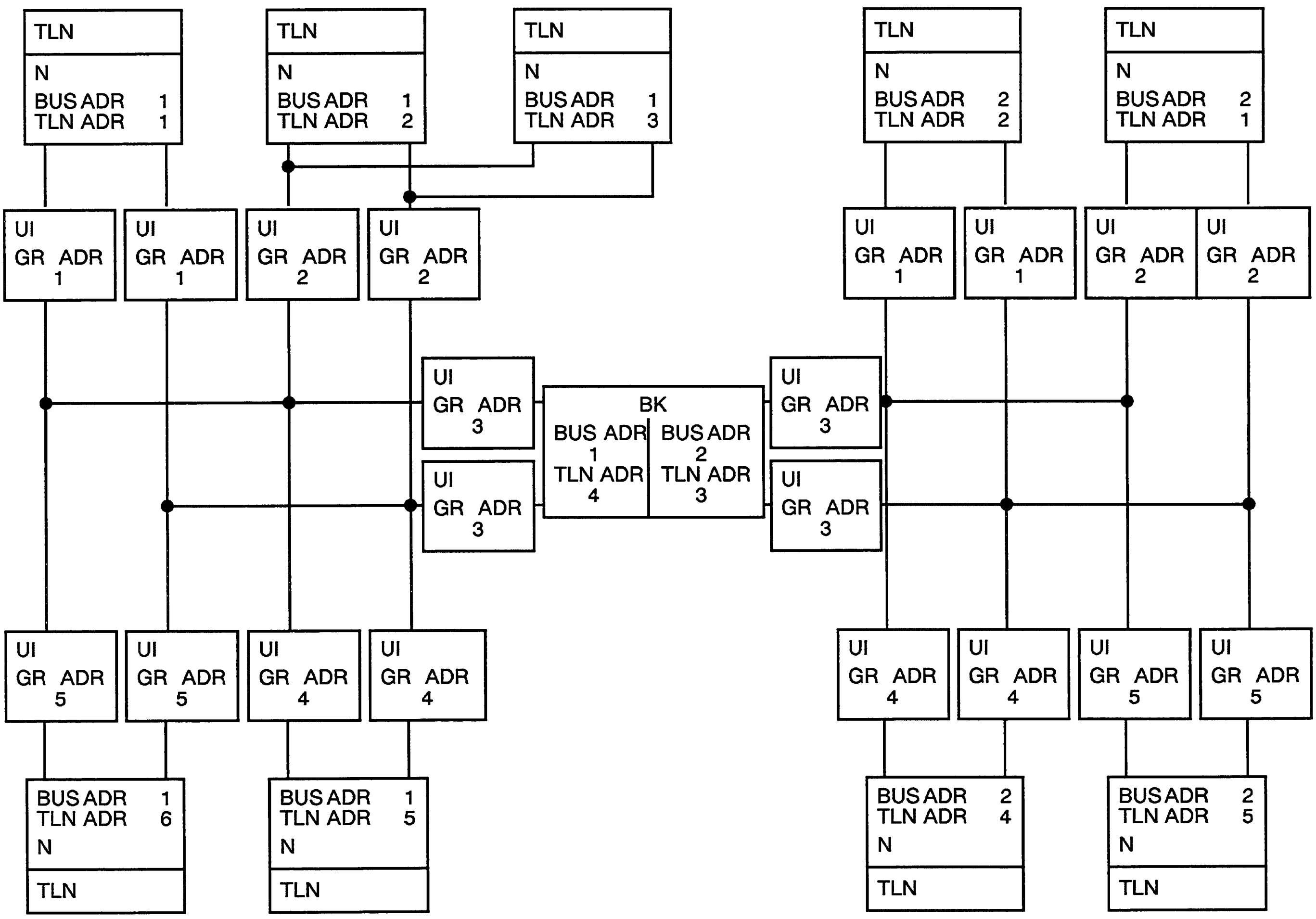
4 Rules for Allocating Bus, Device and Group Addresses

Addresses should always be defined in ascending order without gaps.

- Bus address
  The following bus addresses are possible: 0 to 7.
  An autonomous bus has only one address. Addresses may not be assigned twice.
- Device address
  The following device addresses are possible: 0 to 99. Addresses may not be assigned twice on an autonomous bus. Bus coupler module and local bus interface module N-V.24 should be considered as normal devices.

Note: Device address 0, bus 0 in not permitted.

- Group address
  The following group addresses are possible: 0 to 31. The group address is selected on the UI bus converter module and is required for automatic master transfer, i.e. only for bus organization. It is not specified during configuration.
  The two converters belonging to a local bus must have the same group address in a redundant remote bus system.



BK	Bus coupler module	BUS ADR	Bus address
N	Local bus interface module	TLN ADR	Device address
TLN	Device	GR ADR	Group address
UI	Bus converter (schematic representation of bus links)		

Fig. 13a Addressing of the various components of a TELEPERM M system

Note concerning the bus address:
If, in a bus system, the buses are partially coupled with double bus coupler modules and partially with single bus coupler modules, the double coupled buses must have the smallest bus numbers

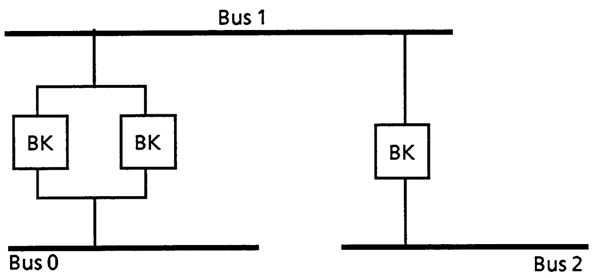
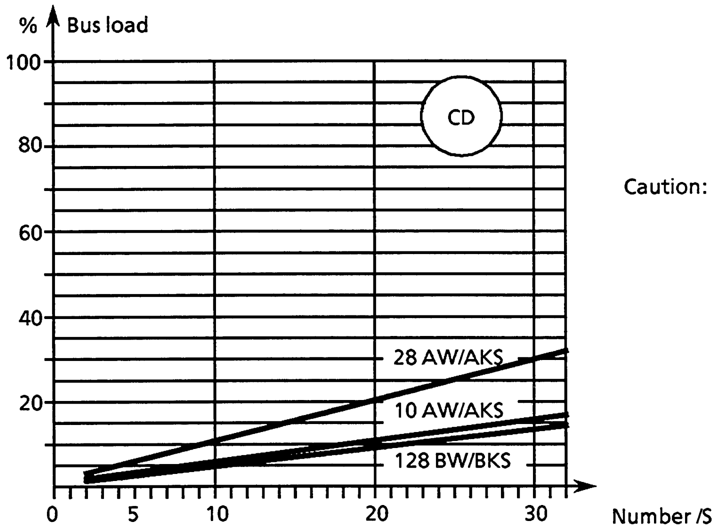


Bild 13 b Example of bus number allocation with mixed coupled buses

5 Bus Load Characteristic Curves and Tables

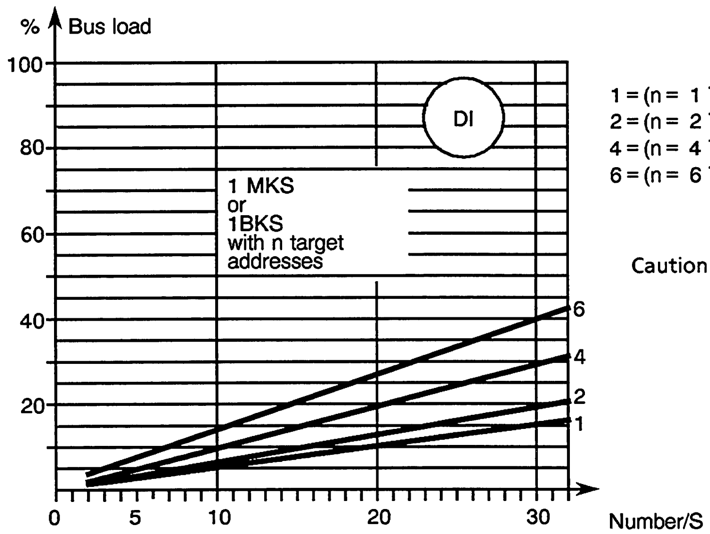
5.1 Cyclic Data Exchange AS - AS



Caution: Messages in CD mode not via bus coupler

AW Analog value
BW Binary value

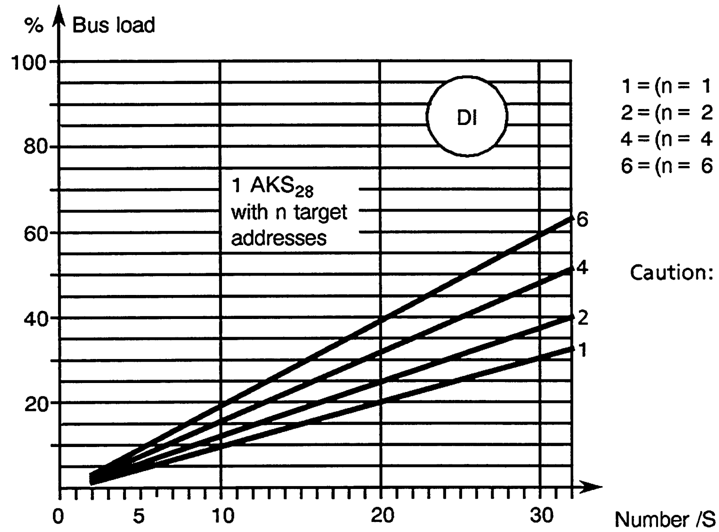
Bild 14 Bus load characteristic curve for cyclic data exchange AS - AS with function blocks AKS and BKS in CD mode



1 = (n = 1 TARGET ADR)
2 = (n = 2 TARGET ADR)
4 = (n = 4 TARGET ADR)
6 = (n = 6 TARGET ADR)

Caution: with bus coupler only in the slow channel

Fig. 15 Bus load characteristic curve for cyclic data exchange AS - AS with function blocks BKS and MKS in DI mode

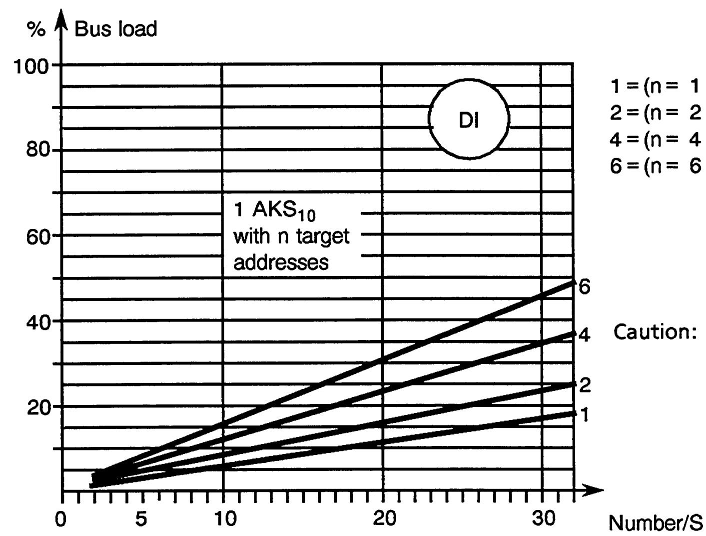


1 = (n = 1 TARGET ADR)
2 = (n = 2 TARGET ADR)
4 = (n = 4 TARGET ADR)
6 = (n = 6 TARGET ADR)

Caution: with bus coupler only in the slow channel

AKS_{28} AKS block with 28 analog values

Fig. 16 Bus load characteristic curve for cyclic data exchange AS - AS with function blocks AKS_{10} in DI mode



1 = (n = 1 TARGET ADR)
2 = (n = 2 TARGET ADR)
4 = (n = 4 TARGET ADR)
6 = (n = 6 TARGET ADR)

Caution: with bus coupler only in the slow channel

AKS_{10} AKS block with 10 analog values

Fig. 17 Bus load characteristic curve for cyclic data exchange AS - AS with function blocks AKS_{10} in DI mode

5.2 Cyclic Data Exchange AS - OS

- Cyclic bus load depending onthe selected type of OS image

OS image type	typ.	max.
NORA image	1 %	2 %
FRANZ image	3 %	5 %
KURV image	3**)	6**)

Fig. 19 Bus load for cyclic data exchange AS-OS (values valid per channel)

*) The cyclic bus load due to MELD is 0 since information to the OS is only transmitted by sporadic status and MKS messages (also not cyclic).

* *) The values for KURV should normally be configured via AKS blocks since a fetch message causes approximately twice as much load on AS, OS and bus system than an AKS block. The values specified here are only valid if KURV values are configured via fetch messages. The bus load of the AS transmitter blocks must be included in the calculation if this is not the case.

Data transfer to an OS system can be performed by transmitter blocks (AKS, BKS, MKS), status messages or fetch messages (read parameter). Only cyclic components (i.e. no MKS or status messages) must be taken into account when the bus load is estimated. Cyclic values that are transferred via transmitter blocks from the AS to the OS must be included in the AS calculation. The specified load values for the individual OS modes (per channel) only refer to the fetch messages used by the OS system.

Example: OS with 2 operator input channels, KURV values via AKS (to be acquired in AS). The bus load is to be included with

NORA configuration:	typically 2 x 1 %
FRANZ configuration:	typically 2 x 3 %
KURV configuration (via fetch message):	typically 2 x 3 %

5.3 Cyclic Data Exchange AS - Computer (see Fig. 14 to 17)

5.4 Data Exchange with further Bus Participants

The **cyclic** bus load must be added to the bus load of further bus participants (e.g. configuring tools on PC), even when the participant only generates this bus load from time to time. Depending on the application, this bus load can amount to about **20 %**.
(The same is valid for loading/archiving AS-AS via bus.)

Special caution must be taken for simultaneous use of several configuring tools (e.g. PROGRAF AS) and for bus coupler use.

Principle: The CS 275 process bus can only be used for transferring **off-line** data without damaging the transfer of **on-line** data (process).

6 Time Synchronization

For time synchronization pay attention that in the CS 275 the synchronization is only carried out by **one participant**; e.g. by the master clock or the process computer. In the last case the time can **only** be emitted via **one local bus interface module.**

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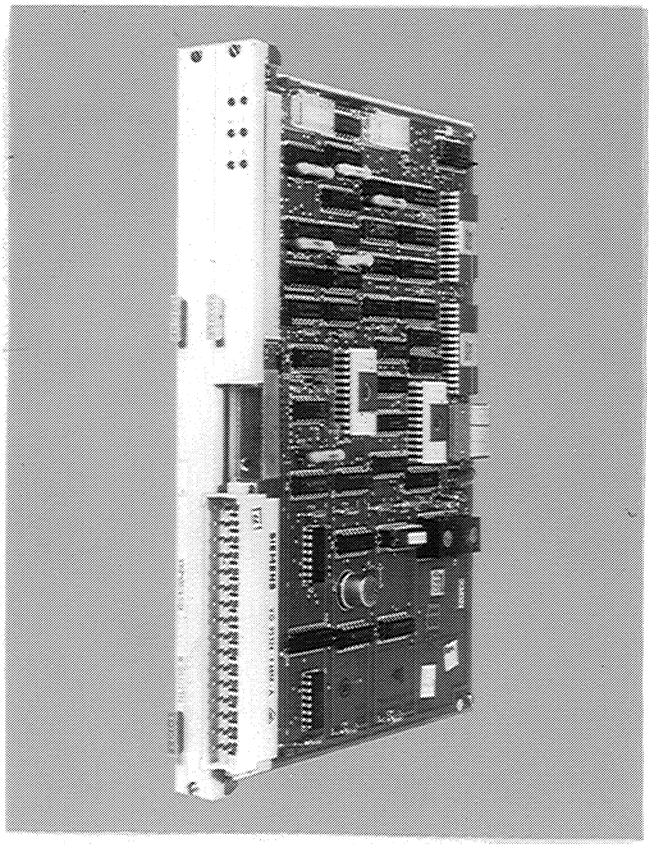
SIEMENS

TELEPERM M

Interface Module for 20-m Local Bus, 8 Bit

6DS1 200-8AA   6DS1 200-8AC   6DS1 200-8BA
6DS1 200-8AB   6DS1 200-8AD

Instructions   C79000-B8076-C001-04



Contents

1 Application

The interface modules for a 20-m local bus 6DS1 200-8AB, 6DS1 200-8AC and 6DS1 200-8AD, 8 bit (N8) are used to connect the AS 220, AS 230, AS 231, AS 235 or OS 250 systems to the CS 275 bus system. Version -8AD can also be used to connect the I/O interface module to the CS 275 bus system. Each of the modules assumes all transmission-specific tasks including the temporary control of data transfer.

The interface module for a 20-m local bus, 8 bit 6DS1 200-8AB (BK-N8) links two autonomous bus systems. It is used in various bus couplers (see instructions "Bus Couplers", Order No. C79000-B8076-C005).

The N-clock interface module, 6DS1 200-8BA (N-clock) is a component of the TELEPERM M master clock (see instructions "TELEPERM M Master Clock", Order No. C79000-B8076-C063). It is used to transmit the time-of-day from the control room to the various process automation units (PAE) via the CS 275 bus system.

2 **Design** (Fig. 1)

The four versions differ only in terms of their software.

These instructions only deal with version 6DS1 200-8AC/-8AD. The functional differences between the BK-N8/N-clock and the N8 are given in the instructions "Bus Couplers" (Order No. C79000-B8076-C005) and "TELEPERM M Master Clock" (Order No. C79000-B8076-C063).
The N8 consists of two double-height modules in sandwich design and has a front panel width of two standard slots (SEPs).

- Bus Processor 8 (BP-8)
  Double-height Eurocard format (233.4 mm x 160 mm)
  1 standard slot (front panel width)
  Special standard front panel with screening panel behind it
  for screwing to the subrack at the top and bottom.
  Two 48-pin backplane connectors, two 16-core ribbon cables for
  connecting the bus interface.

- Bus Interface N (BI-N)
  Double-height Eurocard format (233.4 mm x 160 mm)
  1 standard slot (front panel width)
  Special standard front panel
  6 LEDs and screening panel
  48-pin front connector two 16-pin dual-in-line (DIL) connectors
  for the processor ribbon cable.

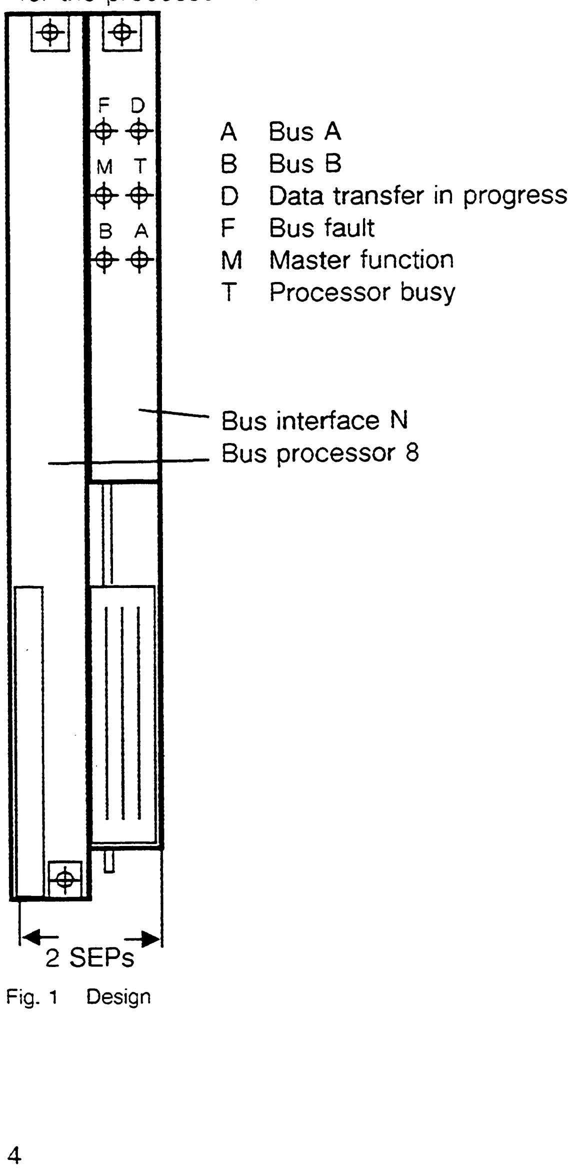


Fig. 1 Design

3 Mode of Operation

The basic mode of operation of the N8 is shown in Fig. 2. Differences between the BK-N8/N-clock and the N8 are listed in the instructions "Bus Couplers" (Order No. C79000-B8076-C005) and "TELEPERM M Master Clock" (Order No. C79000-B8076-C063); in general, however, the mode of operation of the BK-N8/N-clock corresponds to that of the N8.

Bus interface N is located on the local bus interface and bus processor 8 on the I/O interface to the process automation unit. The N8 is equipped with an 8085A microprocessor whose parallel, internal bus links the user memory (3K RAM), program memory (16K EPROM) and bus interface N. The BI-N is treated like a peripheral unit by the microprocessor of the bus processor 8.

Bus interface N is microprogrammed. The operating functions are specified by the control register. Data for transmission are written into the transmit FIFO (first-in first-out memory) by the BP-8 and transmitted on the local bus in bit-serial mode by the line protocol controller and the transmitter.

The received bus messages pass the line protocol controller in bit-serial mode. Serial/parallel conversion takes place in the receive FIFO. The processor reads the bus messages byte-by-byte and passes them on to a buffer memory. Data transmission to the process automation unit only takes place after the complete bus message has been received.

Requests for the master function are entered by the BP-8 into the alarm register and transferred to the local bus alarm channel depending on the line protocol. The status register displays the line protocol statuses. Any format errors are determined by a bit-by-bit comparison in which each message sent is immediately re-received and compared with the transmitted data.

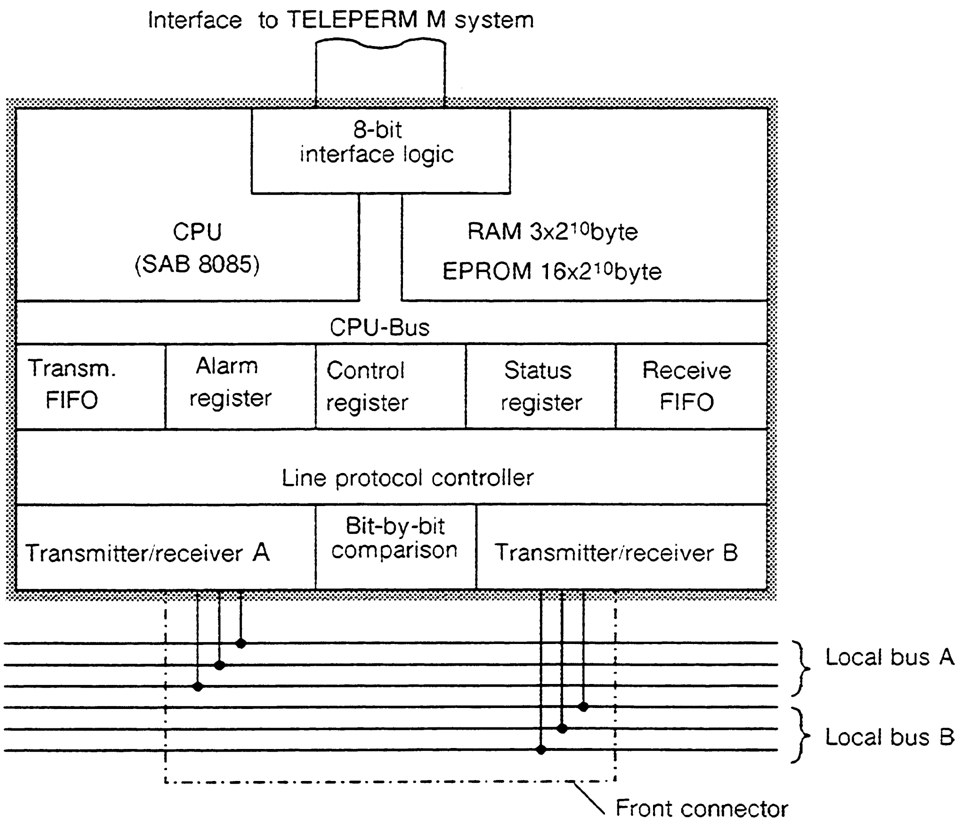


Fig. 2 Mode of operation

4 Technical Data

Order No.	6DS1 200-8AC 6DS1 200-8AD also for I/O coupling module 6DS1 200-8AB for bus coupler 6DS1 200-8BA for TELEPERM M master clock
Design	
Width	2 standard slots, two PCBs, 233.4 mm x 160 mm, fitting into the ES 902 packaging system
Power supply	+5 V
Rated current consumption	2.4 A

Interfaces

I/O interface	SIEMENS 300 system 8-bit interface, DMA compatible
Local bus interface	Redundant 20-m local bus output, wired-OR, asymmetric
Level	TTL level (5 V) for I/O interface $V_{IH} \geq 2.0$ V Input level for local bus interface $V_{OH} \geq 2.7$ V Output level for local bus interface
Transmission rate	340×10^3 bit/s (autonomous local bus) 250×10^3 bit/s (operation via inductive converter)
Participants	20-m local bus: max. 9 (UI is counted as a participant)
Data protection	Block parity (d = 4)
Operating mode	Half-duplex

5 Installation and Commissioning

5.1 Installation

Regulations about handling modules with MOS components must be observed when installing the N8.

The interface module for a 20-m local bus. 8 bit (N8) has a preplanned slot in the basic frame of the AS 220, AS 230/231, AS 235 or OS 250, depending on the application. Version -8AD can also be used in the subrack for the I/O interface module 6DS9 023-8AA (see instructions "I/O Interface Module" 6DS1 324-8AA, Order No. C79000-B8076-C132).

Version 6DS1 200-8AB (BK-N8) is used in the subrack for the bus coupler (see instructions "Bus Couplers", Order No. C79000-B8076-C005).

The N-clock (6DS1 200-8BA) has a fixed slot in the subrack for bus coupler 100/4000 (6DS9 003-8BA), see instructions "TELEPERM M Master Clock". Order No. C79000-B8076-C063.

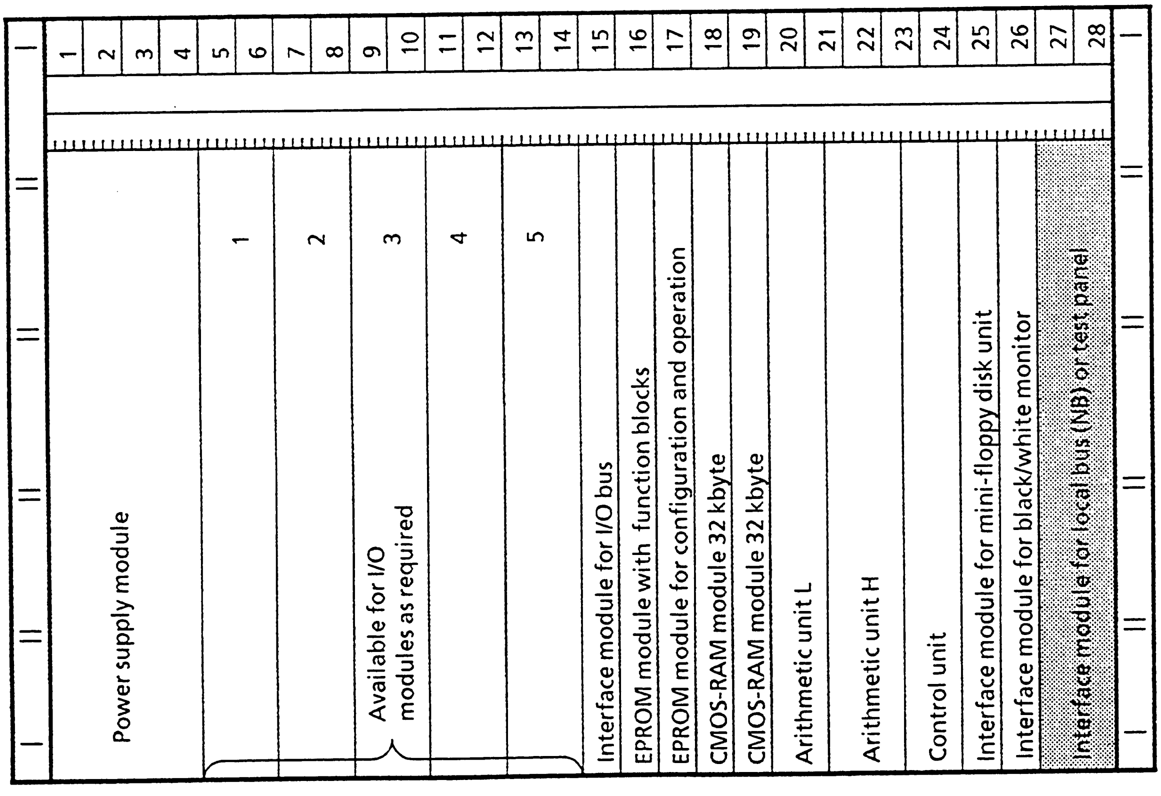


Fig. 3 Location of the N8 in the basic unit of the AS 220 with static RAM

The location of the N8 in the basic frame of the AS 220 with static RAM and in the basic frame of the AS 230/231 can be seen in Figs. 3 and 4. The location of the N8 in the basic frame for the AS 220 with dynamic RAM and the OS 250 corresponds to that in the AS 220 with static RAM.

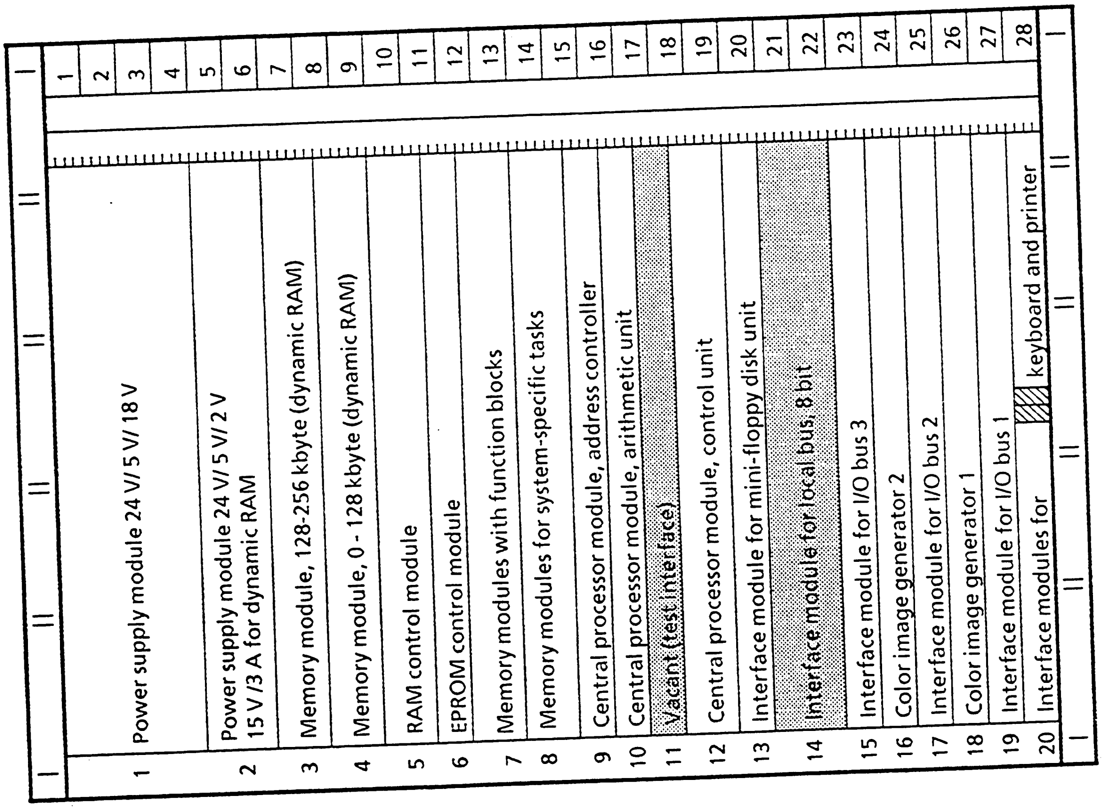


Fig. 4 Location of the N8 in the basic unit of the AS 230/231

The location in the AS 235 is described in the AS 235, Order No. C79000-B8076-C295.

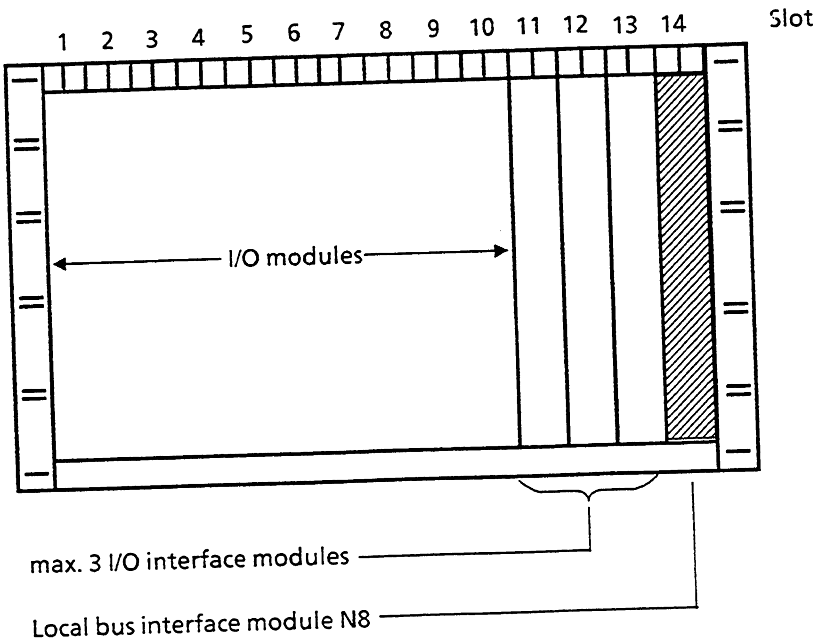


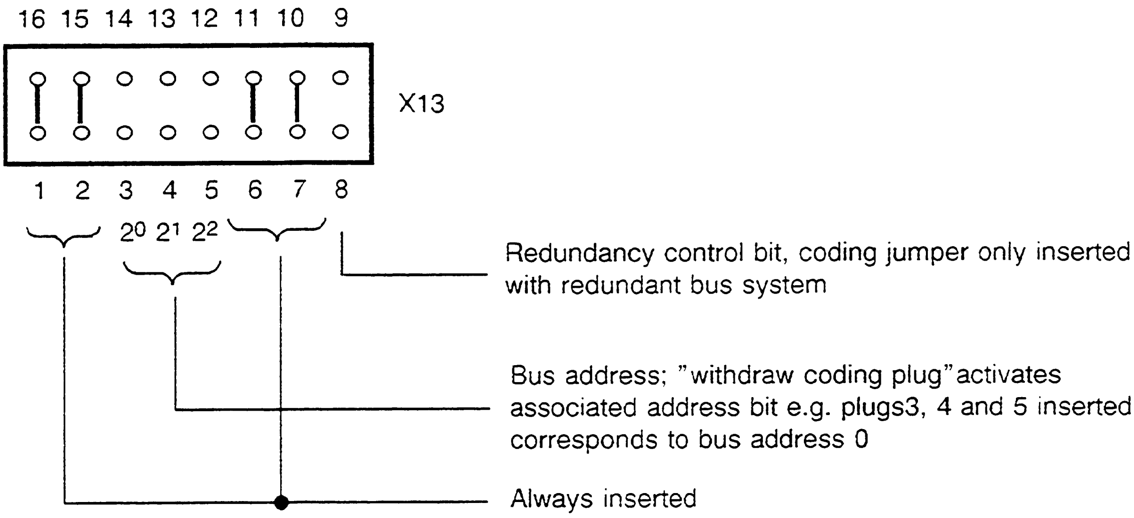
Fig. 5 Location of the I/O interface module subrack

5.2 Commissioning

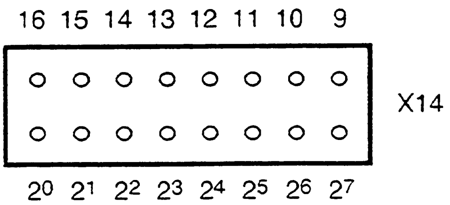
Jumper Settings on the Bus Interface N

The addresses can be set using locations X13 and X14 on the bus interface N.

The bus address is set at location X13. This location is also used to specify whether or not the interface module operates redundantly in the bus system.



The participant address is set at location X14.



Permissible address area: 0-99 (max. 100 addresses permitted in bus system); "withdraw coding plug" activates associated address bit e.g. all plugs inserted corresponds to participant address 0

Note:
Select the lowest possible participant addresses. The participant address must be ≤ 31 with common-data coupling (CD).The address bus 0/participant 0 is not permissible.

All jumpers at locations X13 and X14 are inserted when the N8 is delivered. The user-specific jumper settings can be found in the planning documents and must be carried out before inserting the module.

All other jumpers are used for test purposes and memory modifications. These have already been correctly set by the manufacturer and must not be changed.

6 Maintenance

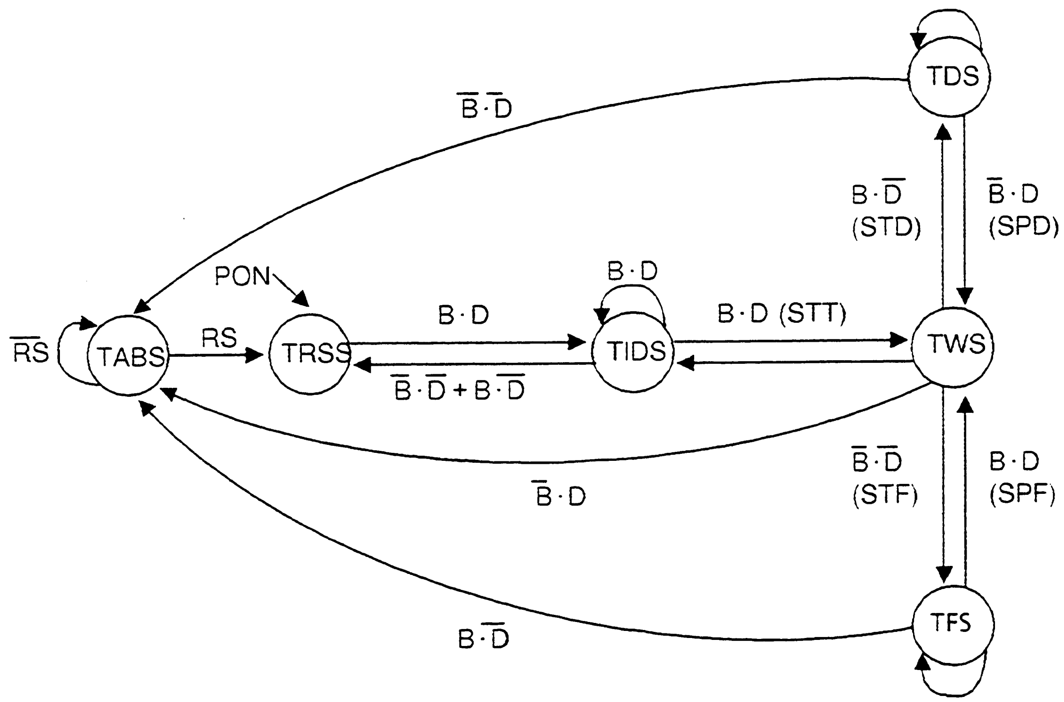
6.1 Method of Operation

The N8 is used to link an automation or operation and monitoring system (AS or OS) with a SIEMENS 300 system 8-bit interface to the 20-m local bus.

The N8 processes the AS/OS messages to other bus participants according to the bus protocol principles, decouples (with respect to time) the AS/OS functions from the data transmission and generates and interprets messages for bus organization. It carries out serial/parallel conversion of the data bits, generates a code protection element and synchronizes the messages into the bus execution sequence.

Conversion of the 20-m local bus signals into those of the SIEMENS 300 system 8-bit interface and vice versa is governed by the local bus line protocol, in which the signal sequences of the clock (T), qualifier (B) and data bus (D) signals are specified.

The statuses of the line protocol together with when these statuses are assumed can be seen in Fig. 6.



TIDS	= Transfer-Idle-State		STT	=	Start-Transfer
TDS	= Transfer-Data-State		SPT	=	Stop-Transfer
TFS	= Transfer-Flag-State		STD	=	Start-Data
TRSS	= Transfer-Reset-State		SPD	=	Stop-Data
TABS	= Transfer-Abort-State		STF	=	Start-Flag
TWS	= Transfer-Wait-State		SPF	=	Stop-Flag
PON	= Power on				
RS	= Reset				
B	= Qualifier				
D	= Data				

Fig. 6 Line protocol status diagram

The transfer reset state (TRSS) is assumed by the line protocol controllers after system start-up until the transfer idle state (TIDS) is detected. The transfer wait state (TWS), initiated by the start transfer cycle (STT), indicates the start of a transfer element. A data or flag transfer element is initiated with the next cycle, the start data (STD) or the start flag (STF). A stop data (SPD) or a stop flag (SPF) cycle to the TWS, followed by a stop transfer cycle to the TIDS, terminates the transfer element. Faulty transfer elements are signalled by the transfer abort state (TABS). This status can only be exited by a reset command.

6.2 Troubleshooting

Attention:
Regulations about modules containing MOS components must be observed when handling the N8.The N8 must not be plugged into the adapter module during troubleshooting as this would be an impermissible extension of the bus.

A fault on the N8 can be detected using the configured programs on the process automation unit side and LEDs on the front panel.

If the fault diode "F" lights up, check the hardware settings of the participant and bus addresses with those entered on the coupling modules and correct them if necessary. If the fault cannot be eliminated in this manner, then the N8 is faulty and must be replaced.

Attention:
The fault diode "F" flashes slightly in a cyclic way also during normal operation.
The flashing does thereby not mean a fault status of the module.

The diode "T" lights up if the bus processor CPU generates read signals. If this diode never lights up, it means that the CPU never leaves the HALT or HOLD state, i.e. that the CPU or a DMA block is faulty; the N8 is defective and must be replaced.

6.3 Connector Pin Assignments

- Bus Processor 8

Backplane connector X1

Pin	d	b	z
2		0 V	+ 5V
4		PESP	
6	ADB12	ADB0	CPKL
8	ADB13	ADB1	MEMR
10	ADB14	ADB2	MEMW
12	ADB15	ADB3	RDV
14		ADB4	DB0
16		ADB5	DB1
18		ADB6	DB2
20		ADB7	DB3
22		ADB8	DB4
24		ADB9	DB5
26		ADB10	DB6
28		ADB11	DB7
30			
32		OV	

Backplane connector X2

Pin	d	b	z
2	BKHLDA	0 V	+5V
4	BKPRI	BKINTE	BKADB0
6	IRPAE	BKHOLD	BKADB1
8	BKRS	BKMEMR	BKADB2
10	INTE	BKMEMW	BKADB3
12		BKDB0	BKADB4
14		BKDB1	BKADB5
16		BKDB2	BKADB6
18		BKDB3	BKADB7
20	HLDA 0	BKDB4	BKADB8
22	BUSEN	BKDB5	BKADB9
24		BKDB6	BKADB10
26		BKDB7	BKADB11
28	HLDA 1	BKPESP	BKADB12
30		BKADB15	BKADB13
32	HOLD	0 V	BKADB14

BK... bus coupler

DB0...DB7	=	Data bus
ADB0...ADB15	=	Address bus
PESP	=	Peripheral memory selection
MEMR	=	Read signal
MEMW	=	Write signal
RDY	=	Ready signal
HOLD	=	Hold request
HLDA0	=	Hold acknowledgement 0 input
HLDA1	=	Hold acknowledgement 1 output
INTE	=	Interrupt enable (DMA inhibit)
BUSEN	=	Data bus enable
CPKL	=	CPU ready
IRPAE	=	Interrupt request for process automation unit

Internal Signals for Bus Coupler (BK)

BKDB0...7	=	Internal data bus	(I, O)
BKADB0...15	=	Internal address bus	(I)
BKMEMR	=	Internal read signal	(I)
BKMEMW	=	Internal write signal	(I))
BKHOLD	=	Hold request	(I)
BKHLDA	=	Hold acknowledgement	(O)
BKINTE	=	DMA enable	(O)
BKPRIO	=	N8 priority scheduling	(I))
BKRS	=	N8 reset	O)

I = Input, O = Output

- Bus Interface N

Front connector X4

	d	b	z
2	0 V	SA0	Screen
4	↑	SA1	↑
6		SB0	
8		SB1	
10		DA0	
12		DA1	
14	↓	DB0	
16	0 V	DB1	
18	* Plug coding	BA0	
20		BA1	
22		BB0	
24		BB1	
26		TA0	
28		TA1	↓
30	*Plug coding	TB0	Screen
32		TB1	

* Contact blade missing

SA0,1 = Control signal, bus A
SB0,1 = Control signal, bus B
DA0,1 = Data signal, bus A
DB0,1 = Data signal, bus B
BA0,1 = Qualifier signal, bus A
BB0,1 = Qualifier signal, bus B
TA0,1 = Clock signal, bus A
TB0,1 = Clock signal, bus B

1 = Forward signal line
0 = Return signal line,
Reference earth OV

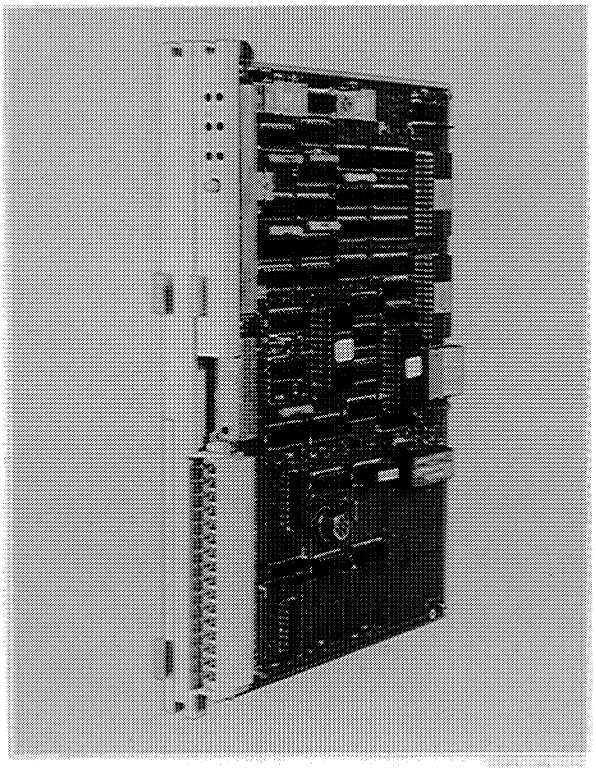
SIEMENS

TELEPERM M

Interface Module for 20-m Local Bus, 16 Bit

6DS1 201-8AB

Instructions C79000-B8076-C002-05



Contents

1 Application

The interface module for 20-m local bus, 16 bit (N16) is used to connect a basic unit of the OS 251, OS 252, OS 253 and OS 254 E systems as well as a SIEMENS 300-16 bit process computer to the CS 275 bus system. The N16 carries out the following data transmission control functions:

- Fetching of initializing parameters and processing I/O jobs on the I/O interface to the CPU
- Conversion of the SIEMENS 300 system multiplexer organization to the bus organization
- Signalling of operating states and faults with defined displays
- Implementation of initial program loading in a multi-computer system via the master computer.

2 Design (Fig. 1)

The N16 consists of two double-height PCBs in sandwich design and has a front panel width of two standard slots (SEPs).

- Bus Processor 16 (BP-16)
  PCB 233.4 mm x 160 mm
  1 standard slot (front panel width)

Modified front panel with screening panel behind it for screwing to the subrack at the top and bottom. Two 48-pin backplane connectors, two 16-core ribbon cables for connecting the bus interface.

- Bus Interface N
  PCB 233.4 mm x 160 mm
  1 standard slot (front panel width)
  Modified front panel
  6 LEDs and screening panel
  48-pin front connector, two 16-pin DIL connectors for the ribbon cable from the processor.

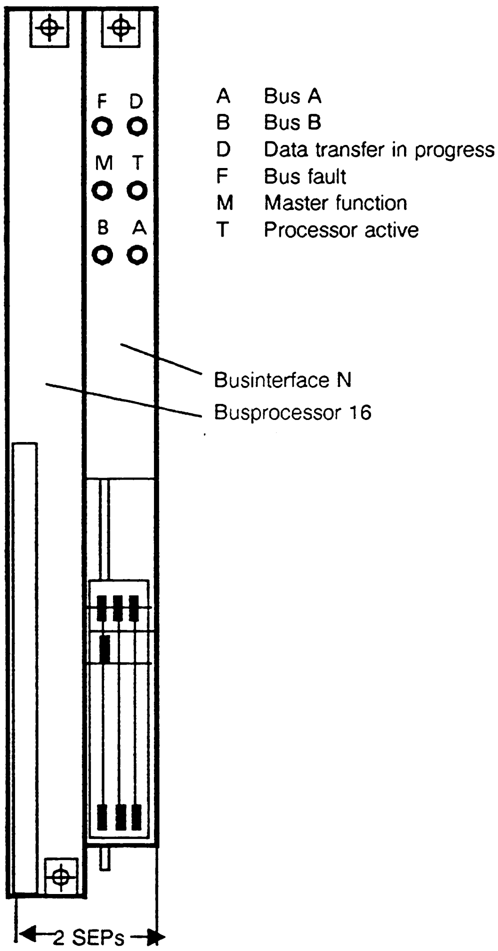


Fig. 1 Design

3 Mode of Operation

The basic mode of operation of the N16 is shown in Fig. 2. Bus interface N is located on the local bus interface and bus processor 16 on the I/O interface to the process automation unit (PAE). Traffic with the PAE is carried out in block transfer mode according to the procedures of the SIEMENS 300 16-bit systems. The transfer is triggered by a central initiative (ZI) with the I/O instruction "Instruction output" (BFA). The N16 subsequently operates with peripheral initiative (PI).

The N16 is equipped with an 8085 microprocessor whose parallel internal bus links the user memory (3K RAM), program memory (10K EPROM) and bus interface N (BI-N). The BI-N is treated like a peripheral unit by the microprocessor on the bus processor 16 (BP-16).

The bus interface N is microprogrammed. The operating functions are specified in the control register. Data for transmission are written into the transmit FIFO (first-in first-out memory) by the BP-16 and transmitted on the local bus in bit-serial mode by the line protocol controller and the transmitter.

The bus messages received by the receiver pass through the line protocol controller in bit-serial mode. Serial/parallel conversion takes place in the receive FIFO. The processor reads the bus message byte-wise and passes it on to a buffer memory. Data transmission to the process automation unit only takes place after the complete bus message has been received.

Requests for the master function are entered by the BP-16 into the alarm register and transferred to the alarm channel of the local bus depending on the line protocol. The status register displays the line protocol states. Any format errors are determined by a bit-by-bit comparison in which each message sent is immediately re-received and compared with the transmitted data.

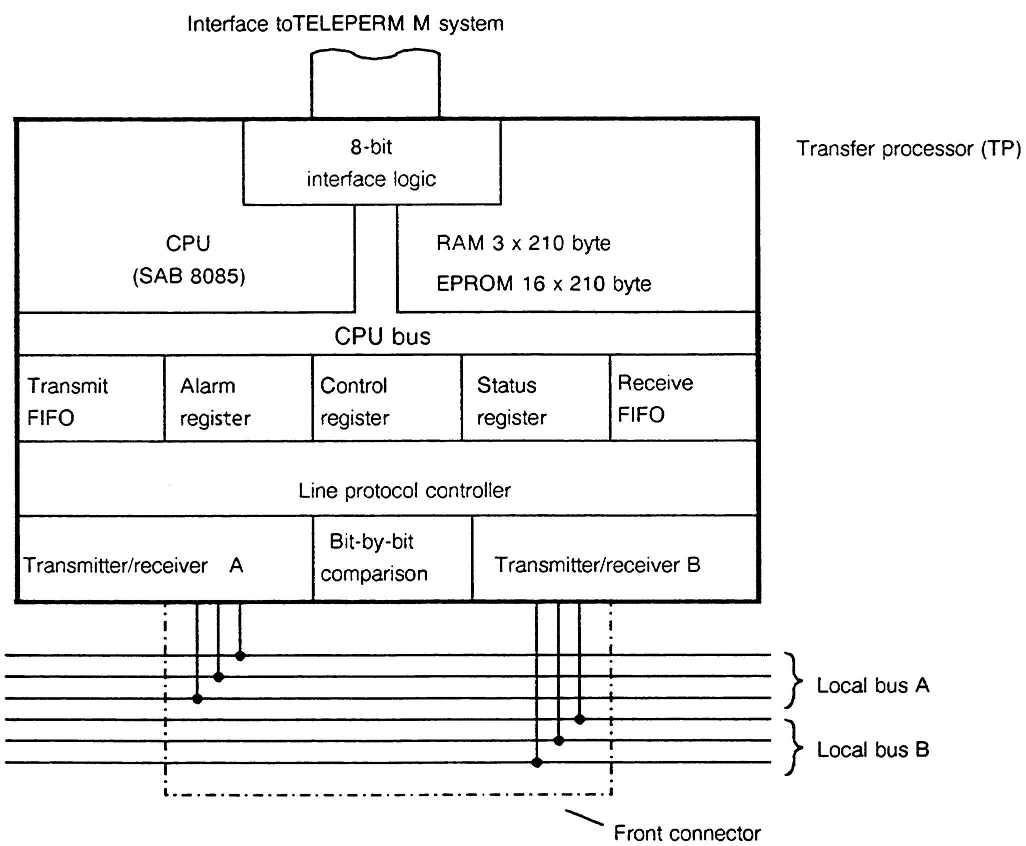


Fig. 2 Mode of operation

4 Technical Data

Order no.	6DS1 201-8AB
Design	Width: two standard slots, two PCBs: 233.4 mm x 160 mm, fitting into the ES 902 packaging system
Power supply	+5 V
Rated current consumption	2.7 A
I/O interface	SIEMENS 300 system 16-bit
Local bus interface	Redundant 20-m local bus output, wired-OR, asymmetric
Level	TTL level (5 V) for I/O interface $V_{IH} \geq 2.0$ V Input level for local bus interface $V_{OH} \geq 2.7$ V Output level for local bus interface
Transmission rates	340×10^3 bit/s (autonomous local bus) 250×10^3 bit/s (remote bus interface module via inductive converter)
Participants	20-m local bus: max. 9 (UI is counted as a participant)
Data protection	Block parity (d = 4)
Operating mode	Half-duplex

5 Installation and Commissioning

Regulations about handling modules with MOS components must be observed during installation and operation of the interface module for 20-m local bus, 16 bit (N16).

5.1 Installation

When used with a PR 300-16 bit process computer, the N16 must be plugged into the slot specified for it in the planning documents. In the case of TELEPERM M, the N16 has a pre-planned slot in the basic frame for the OS 251 and its software versions OS 252.

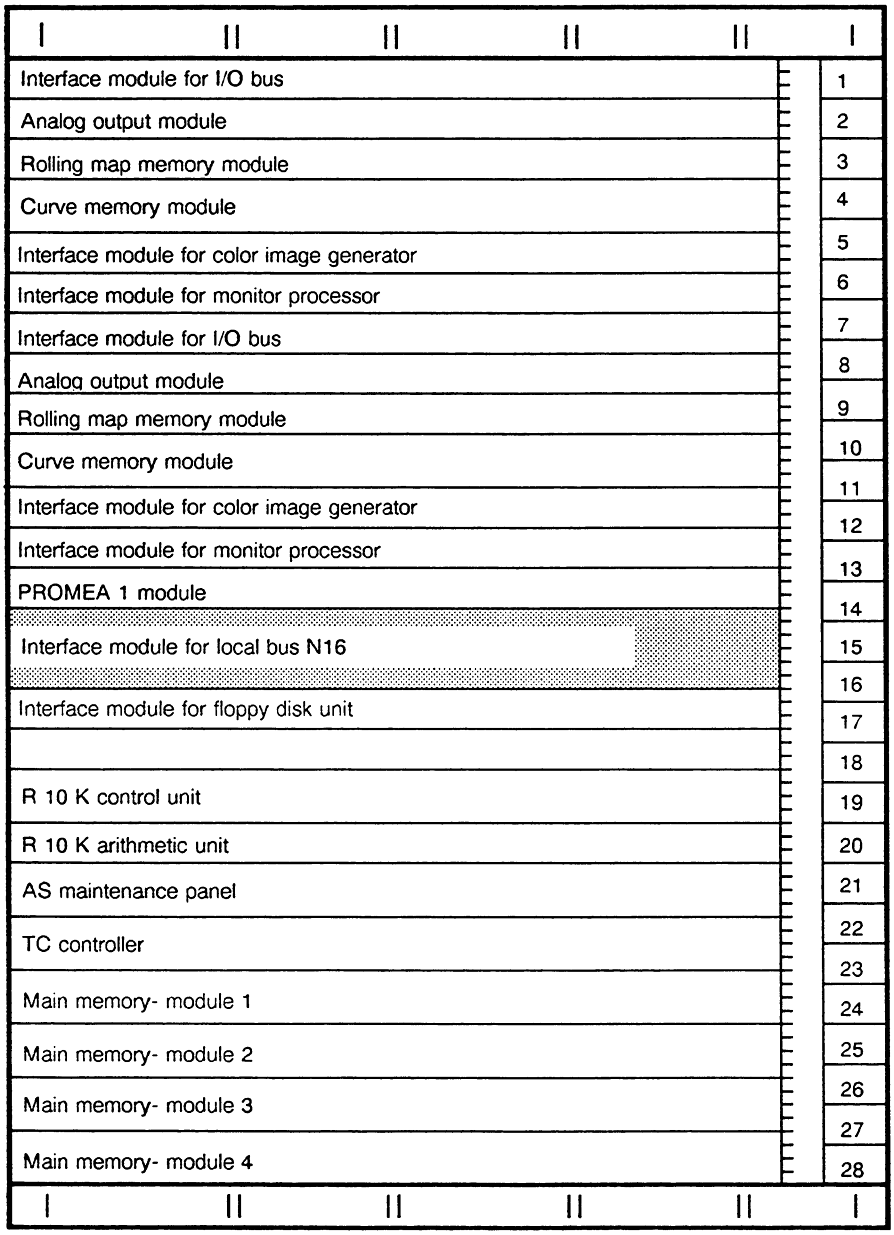


Fig. 3 Location of the N16 in the OS 251/OS 252 basic frame

5.2 Commissioning

Jumper Settings on the Bus Interface N

The address can be set using locations X13 and X14 on the bus interface N. The bus address and the operating mode (redundant or non-redundant bus) are set at location X13. The participant address is set at location 14.

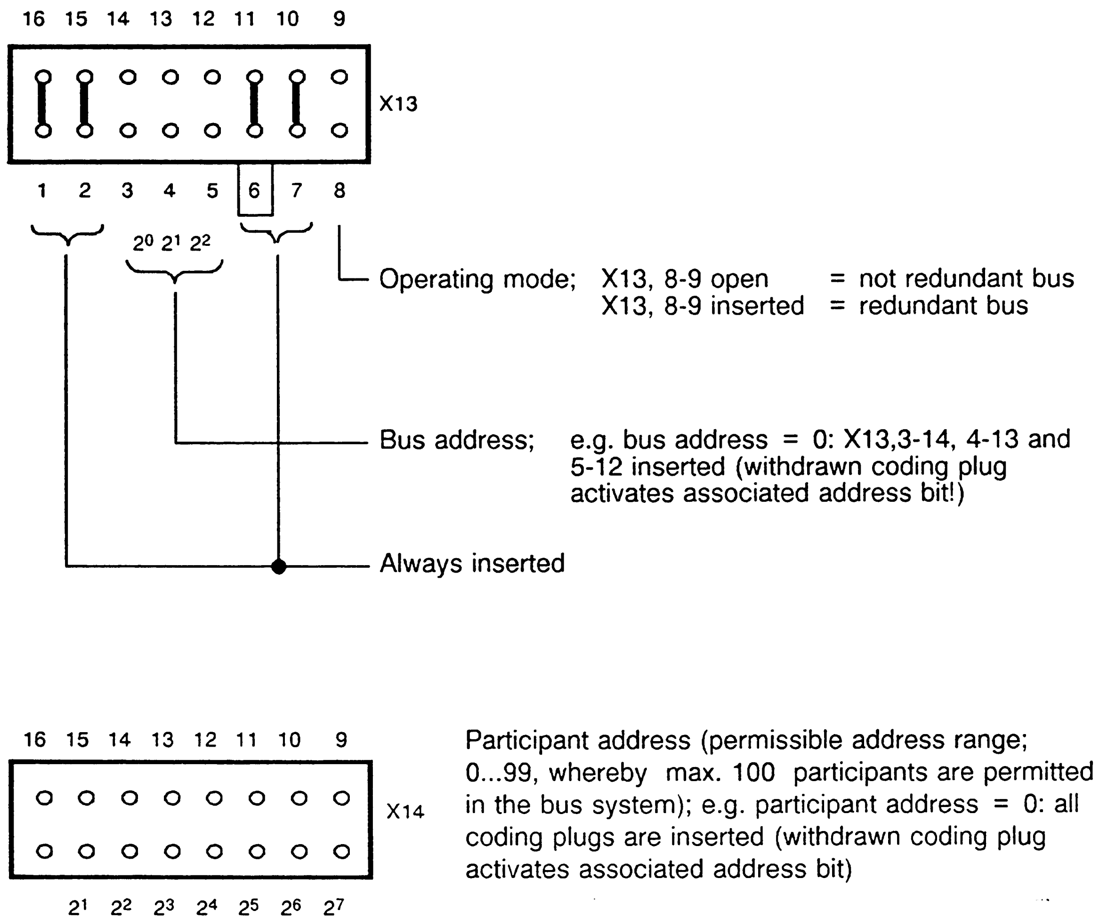


Fig. 4 Jumper settings

Select the lowest possible participant addresses. The address bus 0 / participant 0 is not permitted. The participant address must be $\leq$ 31 with common-data coupling (CD).

All jumpers on locations X13 and X14 are inserted when the N16 is delivered. The user-specific jumper settings can be found in the planning documents and must be carried out before inserting the module. All other jumpers are used for test purposes. They have already been correctly set by the manufacturer and must not be changed.

6 Maintenance

6.1 Method of Operation

The interface module for 20-m local bus is used to link a process automation unit (PAE) to the 20-m local bus using a SIEMENS 300 system 16-bit interface.

Data transfer with the PAE is carried out in block transfer mode. A transfer can be terminated by the PAE or N16.

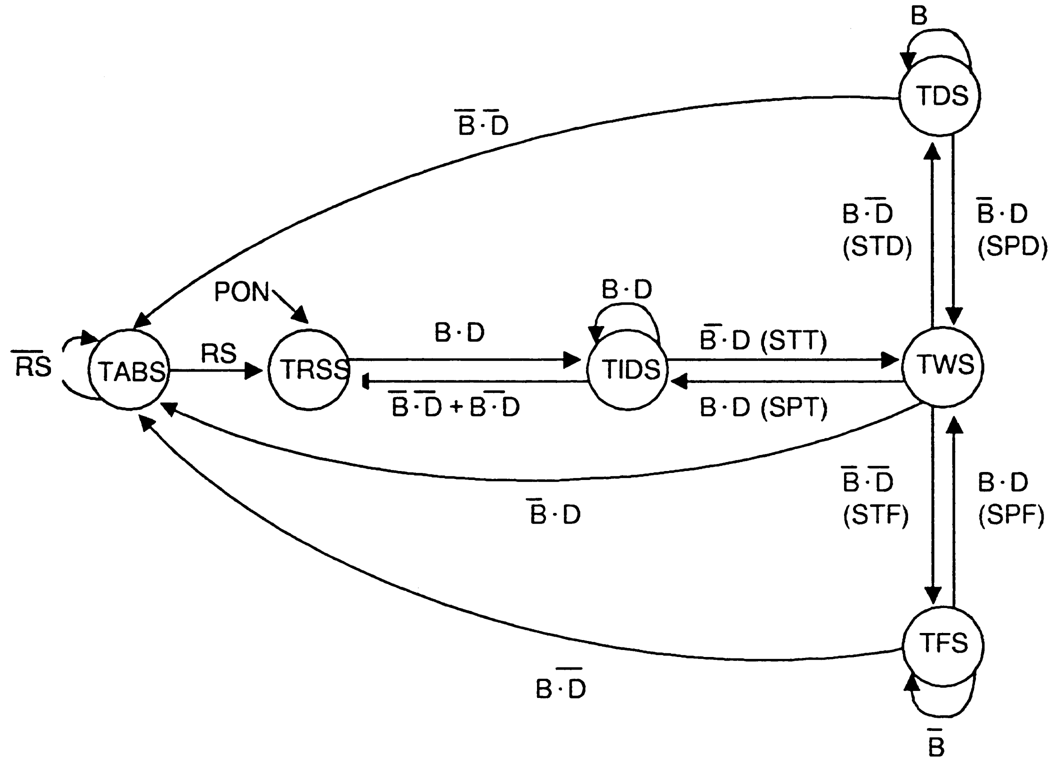
Block transfer is triggered by a central initiative (ZI) with the I/O instruction "Instruction output" (BFA). The instruction code and associated device address are temporarily stored in the instruction buffer (FIFO). It is read from the FIFO under firmware control, checked to see whether it is permissible, and evaluated in the N16 to control the further sequence.

The N16 subsequently operates with peripheral initiative (PI) and places a peripheral data request (PDA) each time it is ready to transfer or accept a byte.

If the N16 detects the end of a block transfer, it will place a program organization request (POA) instead of the PDA and will transfer the operational flags to the PAE. The operational flags signal correct termination of block transfer as well as various faults and operating statuses to the PAE.

The actual conversion of the SIEMENS 300 system 16-bit interface signals into 20-m local bus interface signals and vice versa is governed by the local bus line protocol, which defines the sequences of the clock (T), qualifier (B) and data bus (D) signals.

The statuses of the line protocol and how these are assumed can be seen in Fig. 5.



TIDS	=	Transfer idle state	STT	=	Start transfer
TDS	=	Transfer data state	SPT	=	Stop transfer
TFS	=	Transfer flag state	STD	=	Start data
TRSS	=	Transfer reset state	SPD	=	Stop data
TABS	=	Transfer abort state	STF	=	Start flag
TWS	=	Transfer wait state	SPF	=	Stop flag
PON	=	Power On			
RS	=	Reset			
B	=	Qualifier			
D	=	Data			

Fig. 5 Line protocol - status diagram

The transfer reset state (TRSS) is assumed by the line protocol controllers after system start-up until the transfer idle state (TIDS) is detected. The start of a transfer element is indicated by the bit combination B:D (start transfer cycle) at which point the transfer wait state (TWS) is assumed. The actual data or flag transfer takes place in the next cycle, the start data (STD) or start transfer (STT) cycle. A stop data (SPD) or a stop flag (SPF) cycle to the TWS, followed by the stop transfer to the TIDS, terminates the transfer element. Faulty transfer elements are signalled by the transfer abort state (TABS). This status can only be exited by a reset command generated by the software.

6.2 Troubleshooting

Regulations about handling modules containing MOS components must be observed during troubleshooting.

A fault on the N16 can be detected using LEDs on the front panel.

If the module is operating correctly, then the "T" diode (bus processor busy) must at least light up temporarily. If it does not, the CPU on bus processor 16 cannot exit the HOLD status and the N16 must be replaced.

If the fault diode "F" lights up, even sporadically, check all bus cables and inductive bus converters for correct operation. If no faults are detected or if the "F" diode still lights up, check that the participant addresses accessed via the N16 correspond with those set on the addressed module. If the "F" diode still lights up, then the N16 must be replaced.

Attention:
The fault diode "F" flashes slightly in a cyclic way also during normal operation. The flashing does not mean a fault status of the module.

6.3 Connector Pin Assignments

Bus Processor 16

Backplane connector X1

Pin	d	b	z
02		0 V	+ 5 V
04		PK	
06		FPK	
08		FDE	FB Q
10		DE0	DE1
12		DE2	DE3
14		DE4	DE5
16		DE6	DE7
18	RMU		
20	URLFB		
22		ZA	PA
24			QP
26			
28			
30			
32		0 V	

Backplane connectorX2

Pin	d	b	z
02		0 V	+ 5 V
04		QZ	PB0
06		DE8	DE9
08		DE10	DE11
10		DE12	DE13
12		DE14	DE15
14		ZB0	ZB1
16		ZK	DA0
18		DA1	DA2
20		DA3	DA4
22		DA5	DA6
24		DA7	DA8
26		DA9	DA10
28		DA11	DA12
30		DA13	DA14
32		0 V	DA15

DE... - Data input
DA... - Data output
PA - Peripheral request
ZA - Central request
FBQ - Enable qualifier acknowledgement
QP - Acknowledgement to peripheral unit
PK - Peripheral unit ready
FPK - Enable peripheral ready
FDE - Enable data input
RMU - Feedback after initial program loading
URLF B - Initial program loading, remote control
PB0 - Peripheral qualifier 0
ZB0,1 - Central qualifier
QZ - Acknowledgement to the CPU
ZK - CPU ready

Businterface N

Front connector X4

	d	b	z
2	0 V	SA0	Screen
4	↑	SA1	↑
6		SB0	
8		SB1	
10		DA0	
12		DA1	
14	↓	DB0	
16	0 V	DB1	
18		BA0	
20		BA1	
22		BB0	
24		BB1	
26		TA0	
28		TA1	
30		TB0	↓
32		TB1	Screen

SA 0,1	= Control signal	Bus A
SB 0,1	= Control signal	Bus B
DA 0,1	= Data signal	Bus A
DB 0,1	= Data signal	Bus B
BA 0,1	= Qualifier signal	Bus A
BB 0,1	= Qualifier signal	Bus B
TA 0,1	= Clock signal	Bus A
TB 0,1	= Clock signal	Bus B

1 = Forward signal
0 = Return signal line
0 V Reference earth

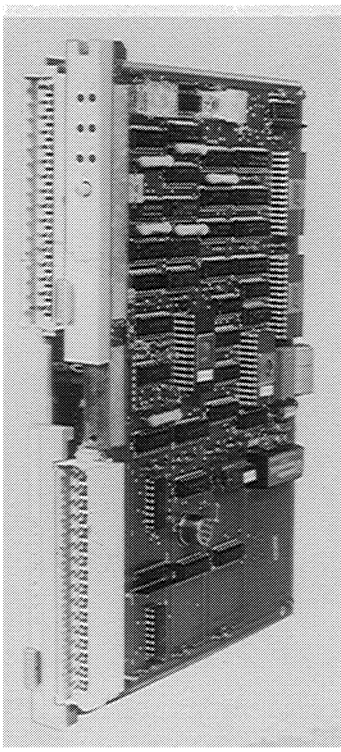
SIEMENS

TELEPERM M

Interface Module for 20-m Local Bus, V.24 or TTY Interface

6DS1 202-8AB

Instructions C79000-B8076-C003-06



Contents Page

1 Application

The interface module for 20-m local bus, V.24 or TTY interface, (N-V.24) is used to couple an external system or computer to the CS 275 system by means of a V.24 or TTY interface.

The transmission path (4-wire line) permits full-duplex operation; the transmission procedure, however, only permits useful data to be transmitted in one direction after the coupling has been established. Modem control and auxiliary signals, together with transmit and receive signal lines, are applied to the 48-pin front connector.

The N-V.24 is responsible for all transfer-specific tasks, including the temporary control of data transfer.

2 Design

The N-V.24 consists of two double-height PCBs in sandwich design and has a front panel width of two standard slots (SEPs).

- Bus Processor V.24 (BP-V.24)
  PCB 233.4 mm x 160 mm
  Front panel width of 1 standard slot
  Modified front panel with screening panel behind it for screwing to the subrack at the bottom and with a serial interface cable in the center
  48-pin backplane connector, 32-pin front connector, two 16-core ribbon cables for connecting the bus interface N.

- Bus Interface N (BI-N)
  PCB 233.4 mm x 160 mm
  Front panel width of 1 standard slot
  Modified front panel with reset key, 6 LEDs and screening panel for screwing to the subrack at the top and with a local bus cable in the center.
  48-pin front connector, two 16-pin DIL connectors for the ribbon cable from the processor.

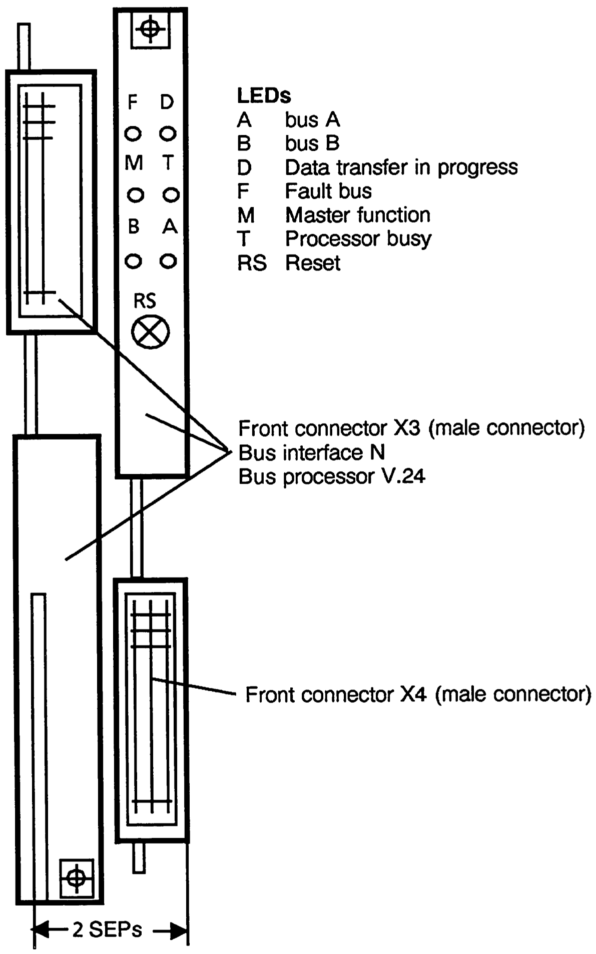


Fig. 1 Design of the N-V.24

3 Mode of Operation

Bus interface N is located on the local bus interface and bus processor V.24 is located on the system interface to the external system. The N-V.24 is equipped with an 8085A microprocessor whose parallel internal bus links the user memory (4k RAM), program memory (12k EPROM), bus interface N and I/O interface block (USART).

The TTL signals from the USART are converted into I/O interface signals for communication with the external system. Operation via the V.24 or TTY interface is manually selected using plug-in jumpers. Bus interface N (BI-N) is treated like a peripheral unit by the microprocessor of the bus processor (BP-V.24).

Bus interface N is microprogrammed. The operating functions are specified by the control register. Data for transmission are written into the transmit FIFO (first-in first-out memory) by the BP-V.24 and transmitted on the local bus in bit-serial mode by the line protocol controller and the transmitter.

The received bus messages pass through the line protocol controller in bit-serial mode. Serial/parallel conversion takes place in the receive FIFO. The processor reads the bus messages byte-wise and passes it on to a buffer memory. Data transmission to the external system only takes place after the complete bus message has been received.

Requests for the master function are entered by the BP-V.24 into the alarm register and transferred to the local bus alarm channel due to the line protocol. The status register displays the line protocol statuses. Any format errors are determined by a bit-by-bit comparison in which each message received is immediately re-received and compared with the transmitted data.

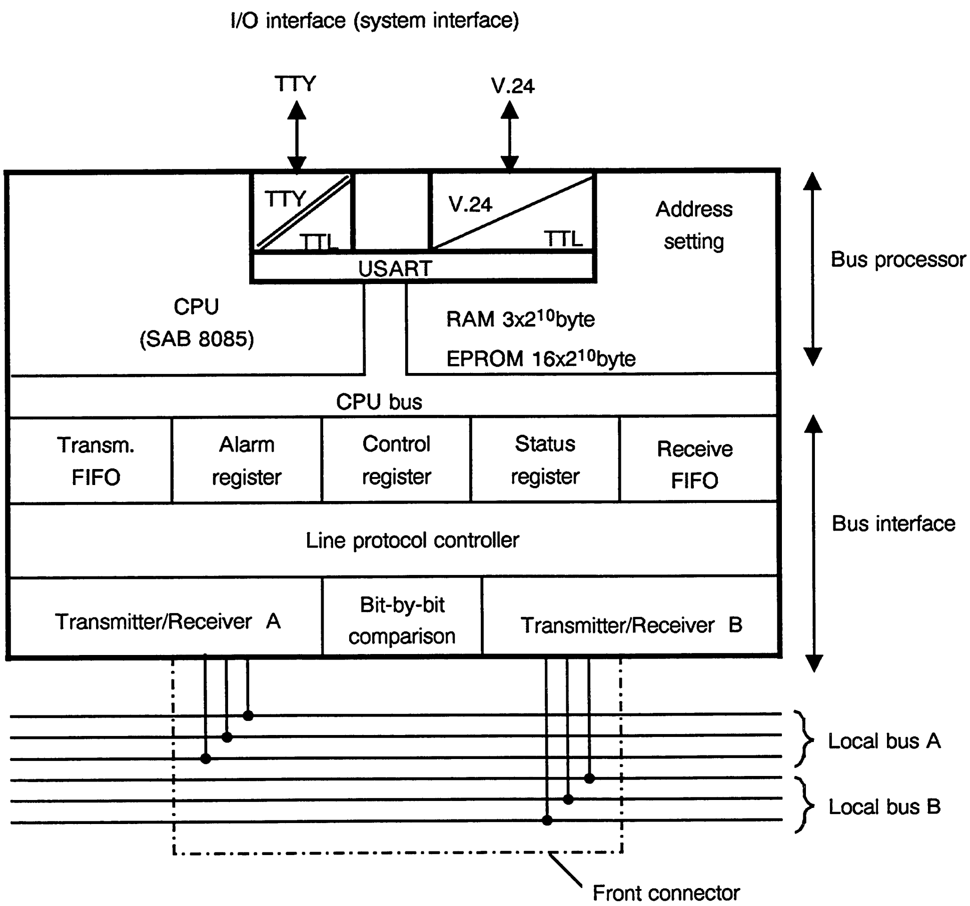


Fig. 2 Block diagram of the N-V.24

4 Technical Data

Order No.	6DS1 202-8AB
Design	Width: 2 standard slots, 2 PCBs 233.4 mm x 160 mm, fitting into the ES 902 packaging system
Power supply	+5 V
Current consumption	2.4 A
I/O interface	V.24 interface with modem control signals or TTY interface
Local bus interface	Redundant 20-m local bus output, wired-OR, asymmetric
Level	
- I/O interface	V.24/V.28 or 20-mA (TTY) interface, selectable
- Local bus interface	V_{IH} ≤ 2.0 V Input level V_{OH} ≤ 2.7 V Output level
Transmission rate	110 to 9600 bit/s via I/O interface, adjustable on BP-V.24. $340 \cdot 10^3$ bit/s (autonomous local bus) or $250 \cdot 10^3$ bit/s (operated by means of inductive converter) via local bus interface
Max. bus length to I/O interface	15 m with V.24/V.28 interface (up to 20 km with local modem) 300 m at 9600 bit/s, with TTY interface 500 m at 4800 bit/s, " " " 1000 m at 2400 bit/s, " " "
Via local bus interface	Max. 20 m (whereby the potential difference between 0 V of the N-V.24 and 0 V of the remaining local bus participants must be ≤ 0.2 V)
Participant	20-m local bus: max. 9 (UI is counted as a participant)
Data protection	Longitudinal parity (d = 2) on I/O interface Block parity (d = 4) on local bus interface
Operating mode	Half-duplex, contention mode via I/O interface. Half-duplex via local bus interface

5 Installation and Commissioning

5.1 Installation

Regulations about handling modules containing MOS components must be observed when installing the N-V.24.

The interface module for 20-m local bus, V.24 or TTY interface (N-V.24) has no pre-planned slot in the TELEPERM M system. The N-V.24 slot can be planned according to each system. To operate the N-V.24, simply apply +5 V via backplane connector pin z2; 0 V is applied to contacts b2 and b32.

Warning

As with all central modules, the N-V.24 may only be removed or inserted after the power supply has been switched off.
Unlike I/O modules, however, the N-V.24 is not supplied with L+ (24 V) but with +5 V which is applied to the I/O bus of the subrack. Switch off the logic voltage during handling (where, depends on the respective AS type).
In case of non-observance of the above, the current surge may - depending on the configuration - corrupt data accesses or reset systems.
See the respective AS device manual for further information.

It must be observed that the potential difference between 0 V of the N-V.24 and 0 V of the coupling partners at the loxal bus must be $\leq$ 0.2 V. This can normally only be achieved if the coupling partners are used in the same cabinet or in one group of cabinets and the supply voltage is supplied via a common power supply line.

The connection of N-V.24 to the local bus is made via front connector X4 (lower front connector). Before plugging-in the module, fixing brackets must be screwed down - as shown below - on the left one of the two intended subrack slots, beside of the lower and upper module guide rail.

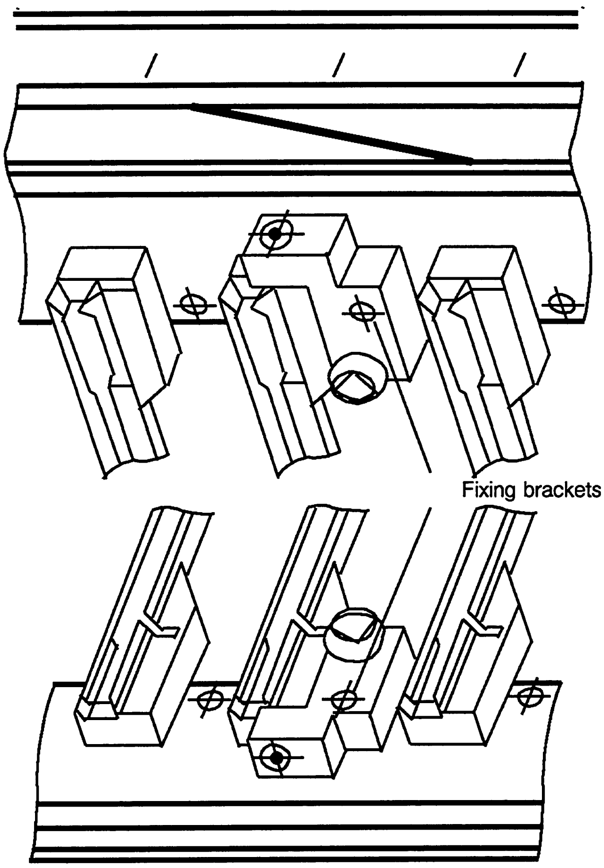


Fig. 3 Fixing brackets

After plugging in the module and inserting the local bus line it is absolutely necessary to fasten the module and connector fixing screws.

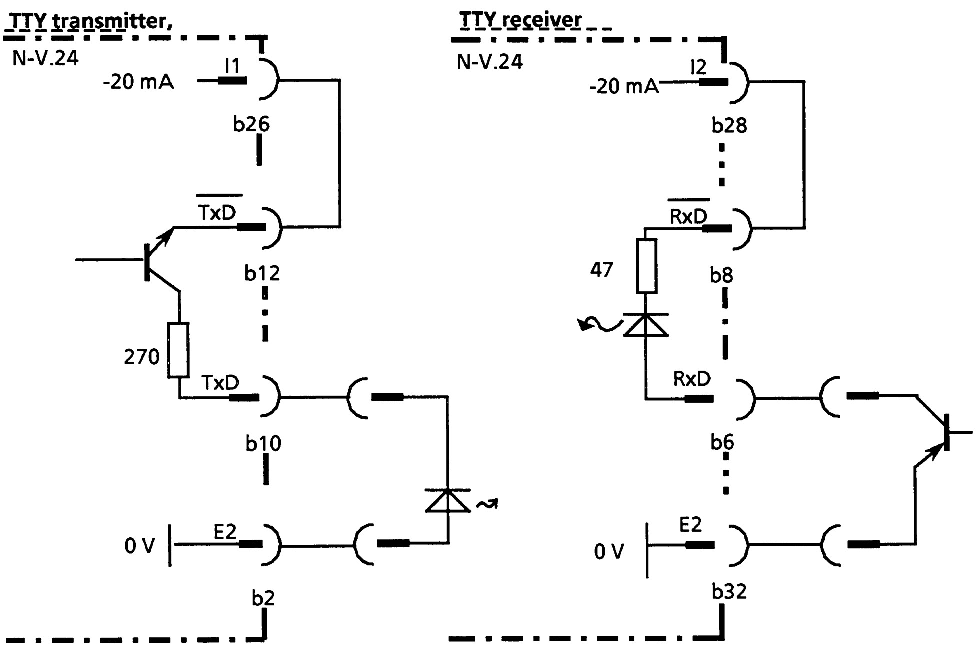


Fig. 4 Connection of the transmitter (left) and receiver (right) to the internal constant-current source

With this connection, however, electrical isolation of the N-V.24 via optical couplers becomes ineffective.

Electrical isolation can be fully retained if an external current loop supply is used. Fig. 5 shows how the transmitter and receiver can be externally connected.

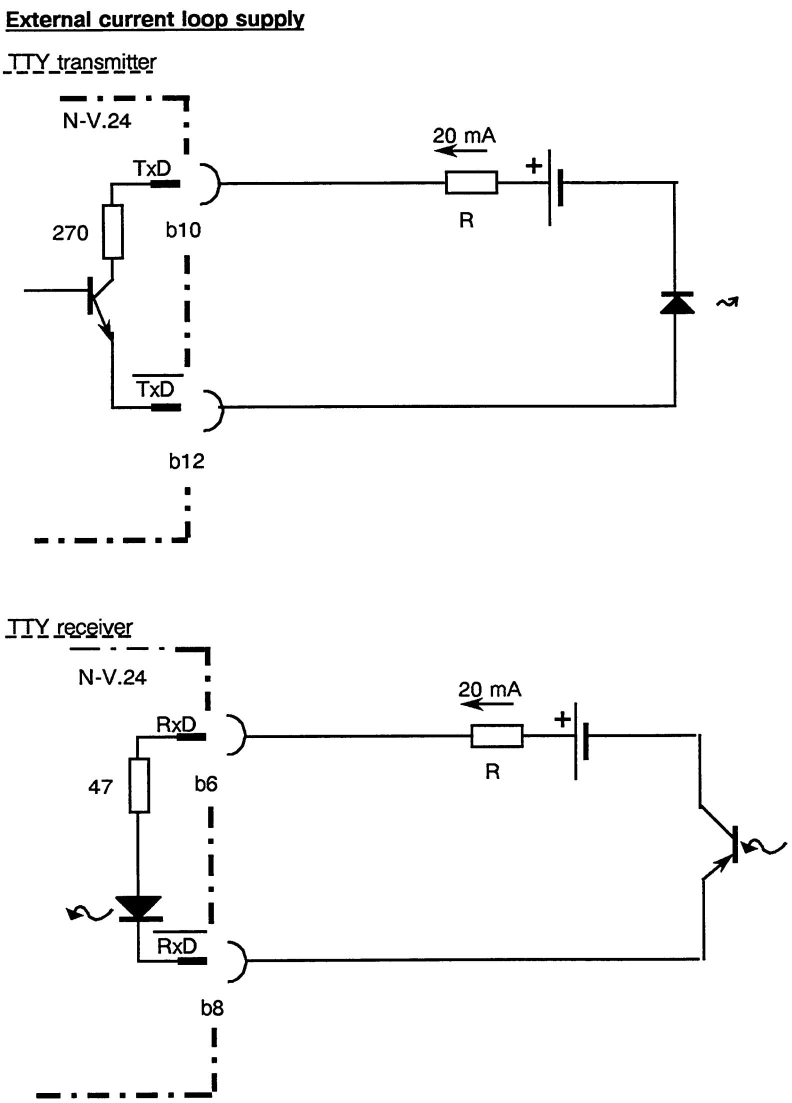


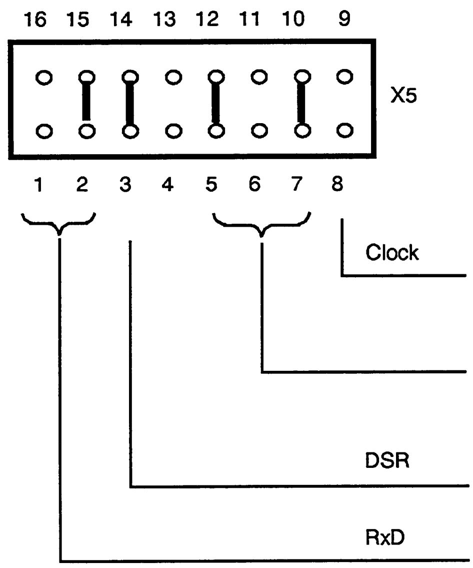
Fig. 5 Connection of the transmitter (top) and receiver (bottom) to an external current loop supply

5.2 Commissioning

Various user-specific jumper settings must be made before starting up the N-V.24.

Bus Processor V.24

The jumper bases for setting the V.24 and the TTY interface are situated on locations X5 and X7. To access the soldering jumpers, remove the upper PCB. Location X5 can be used to select the transmit and receive clocks (TxC, RxC), modify the DSR signal (data set ready) and select transmission and reception via the V.24 or the TTY interface.



Status on delivery: RxC and TxC internal, DSR internal, RxD = TTY

Clock:

1. RxC and TxC internal X5: 5-12, 7-10
2. RxC external, TxC internal X5: 5-12, 6-11
3. RxC and TxC external X5: 6-11, 7-10

DSR:

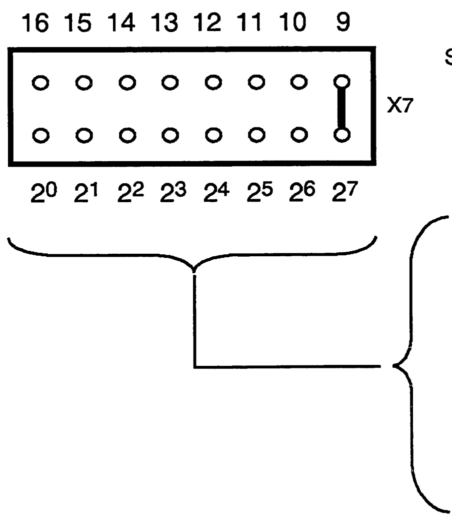
1. $\overline{DSR}$ connected X5: 3-14 open
2. DSR internal X5: 3-14 inserted

RxD:

1. RxD = V.24 X5: 1-16
2. RxD = TTY X5: 2-15

No other combination is permitted; X5: 8-9, 4-13 are unassigned!

Location X7 is used for setting the transmission rate:



Standard setting: 9600 bit/s (X7:8-9)

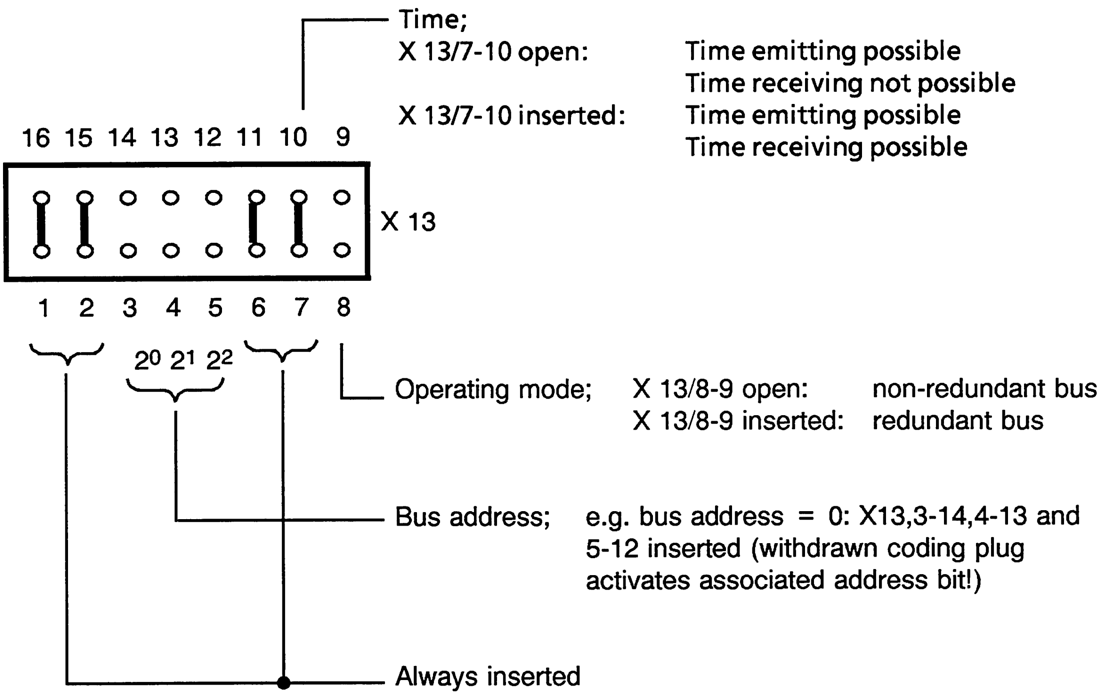
Data transfer rate in bit/s

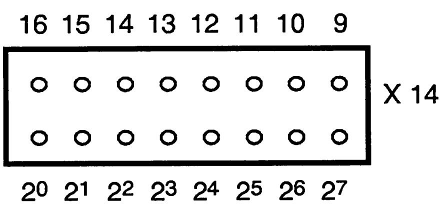
1-16	:	110
2-15	:	200
3-14	:	300
4-13	:	600
5-12	:	1200
6-11	:	2400
7-10	:	4800
8-9	:	9600

All other soldering jumpers on the bus processor PCB are necessary for test purposes and correctly set when delivered.

Bus interface N (upper PCB)

The bus or participant address is set using jumpers on locations X13 and X14. The bus address setting and the operating mode (redundant or non-redundant bus) are made on location X13; the participant address is made on location X14.





Participant address (permissible address range: 0-99, whereby max. 100 participants are permitted in bus system; e.g. participant address = 0: all coding plugs inserted (withdrawn coding plug activates associated address bit)

Select the lowest possible participant addresses. The address bus 0 / participant 0 is not permitted.

All jumpers on locations X13 and X14 are inserted when the N-V.24 is delivered. User-specific jumper settings are given in the planning documents. All other jumpers are for test purposes; they have been correctly set by the manufacturer and must not be changed.

5.3 Connection of devices to the V.24 or TTY interface

(front connector 3 = upper front connector)

- Device with V.24 interfaces
  When connecting devices with V.24 interfaces it must be observed not to exceed the max. permissible line length of 15 ms. Due to the missing electrical isolation only devices must be connected, the 0 V potential of which is identical with the 0 V of the N-V.24.
  If this is not guaranteed, TTY coupling must be used.

- Devices with TTY interface

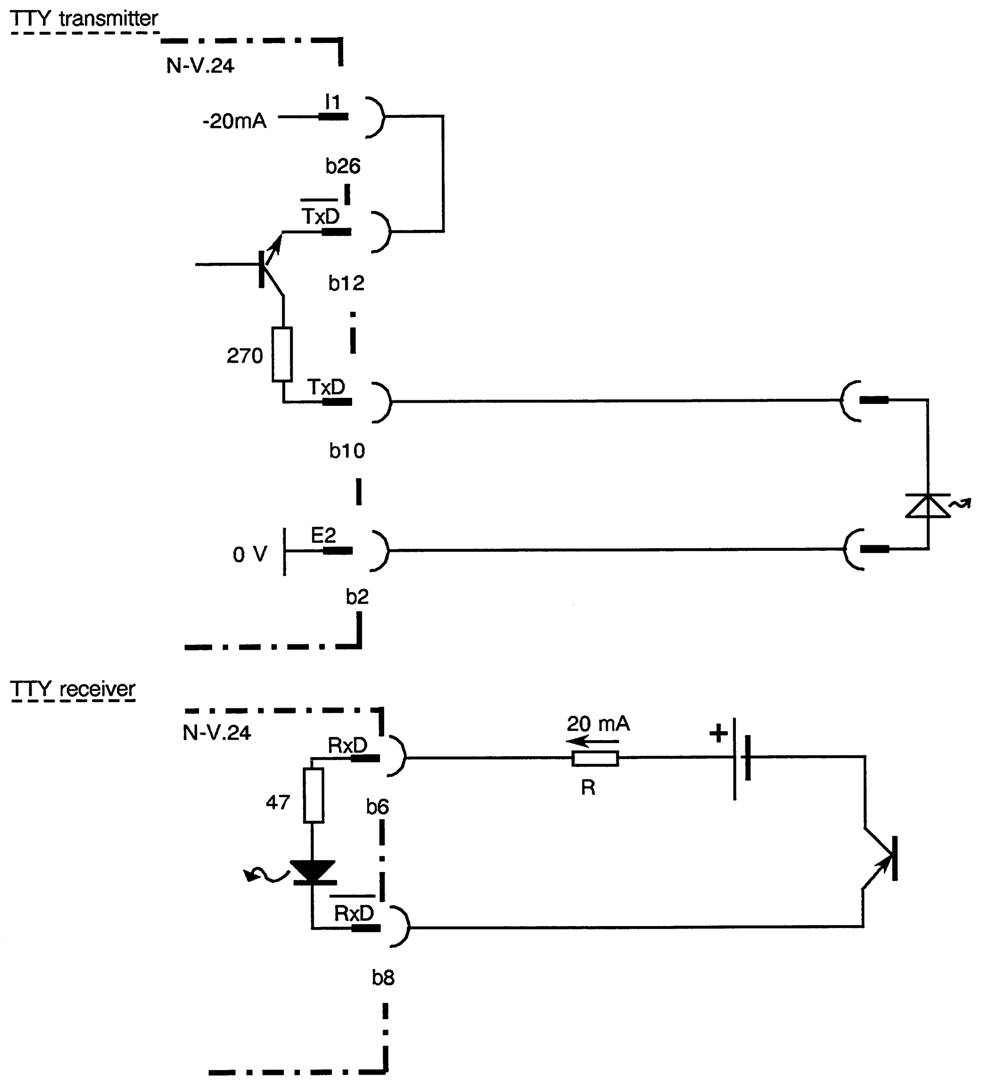


Fig. 6 Transmitter with internal power supply, receiver with external power supply

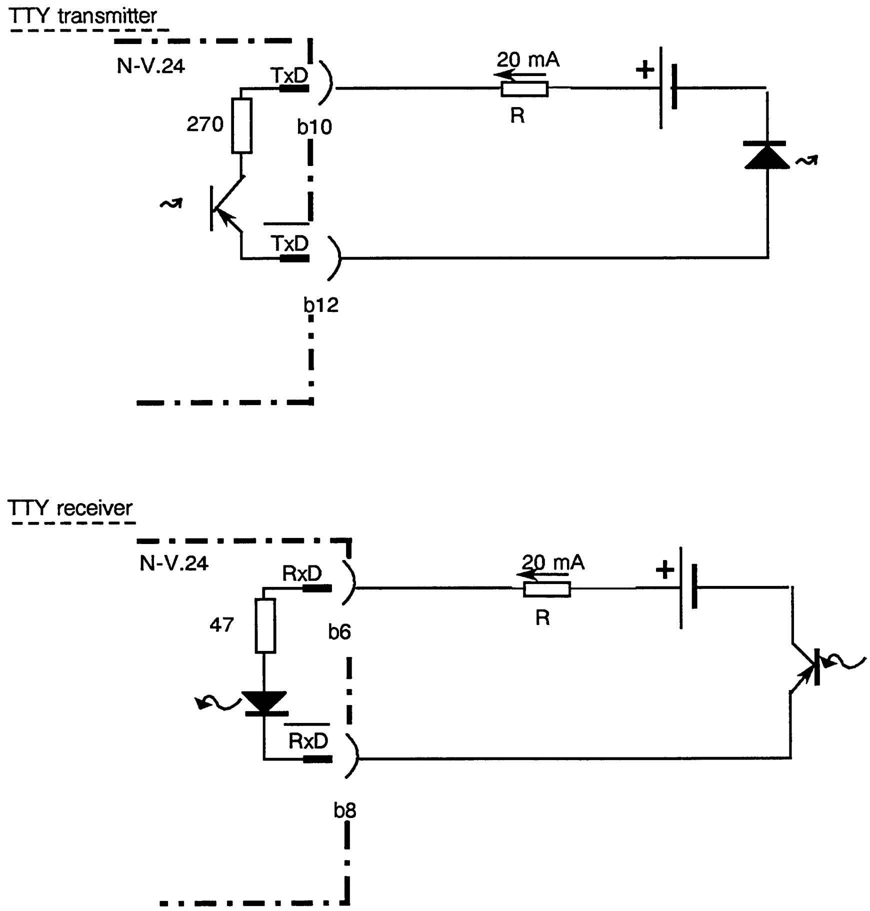


Fig. 7 Transmitter and receiver with external power supply

The connection of a device with TTY interface has to take place according to the connection variants shown in Figs. 6 and 7.

A device connection according to the connection variant of Fig. 8 (transmitter and receiver of the device with internal power supply) is only permissible if transmitter and receiver of the device to be connected are electrically isolated.

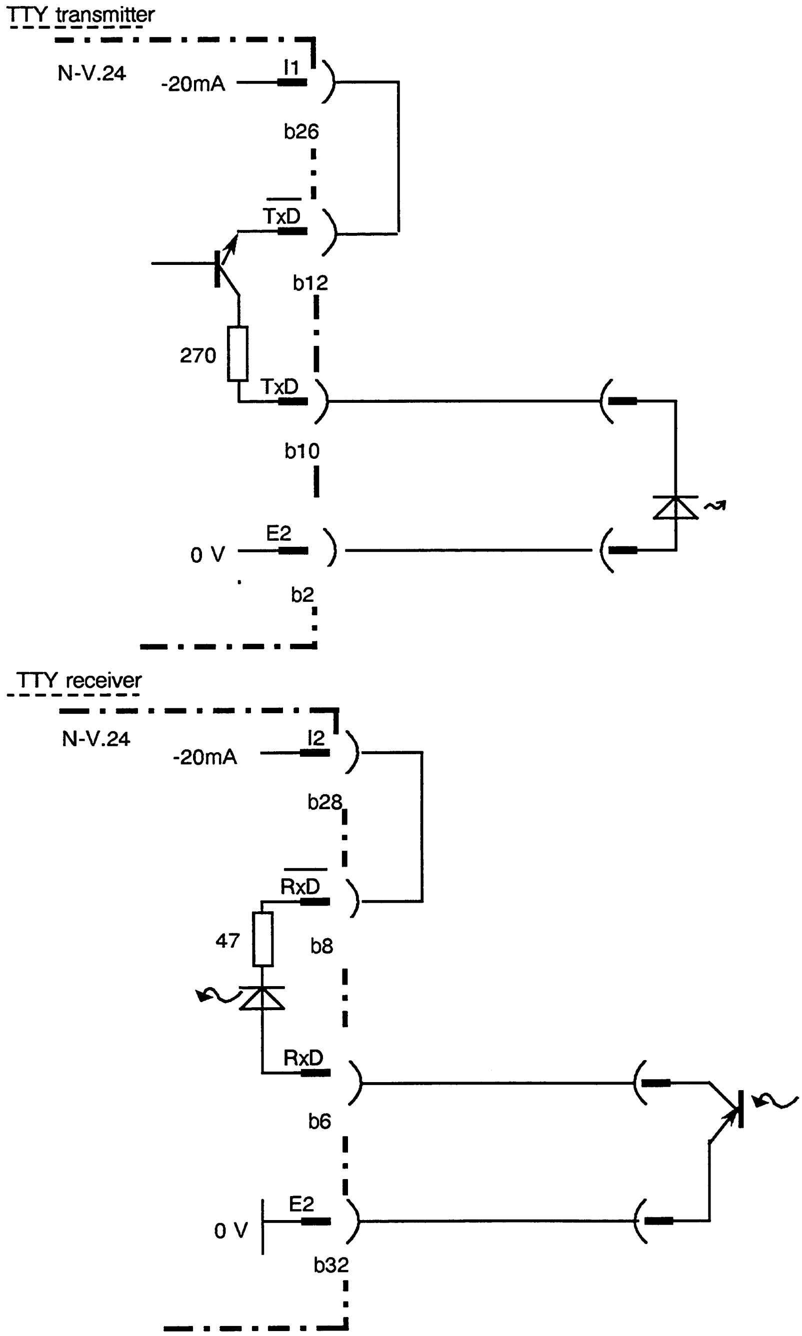


Fig. 8 Transmitter and receiver with internal power supply (only permissible if transmitter and receiver of the connecting device are electrically isolated)

5.4 Operation

A reset key located on the front panel is used for resetting both the microprocessor and complete control logic to the basic state. The key must be pressed after the local bus connector has been inserted and if a fault occurs.

6 Maintenance

6.1 Method of Operation

The interface module for 20-m local bus, V.24 or TTY interface, is used to couple an external system with a V.24 or TTY interface to the 20-m local bus of the TELEPERM M process control system.

The 8085A microprocessor forms the central unit of the bus processor V.24; it controls and monitors all sequences within the N-V.24 and operates with an instruction time of approx. 1.3 µs. The CPU selects the peripheral interrupt, counter or I/O interface (USART) blocks, as required, via address decoders.

The USART, which already forms part of the system interface controller, accepts parallel characters from the CPU and converts them into serial data for transmission. At the same time, it can receive serial data and convert it into parallel data. In the transmission procedure selected for the bus interface module, a character consists of 11 bits (1 start bit, 8 data bits, 1 even parity bit and 1 stop bit).

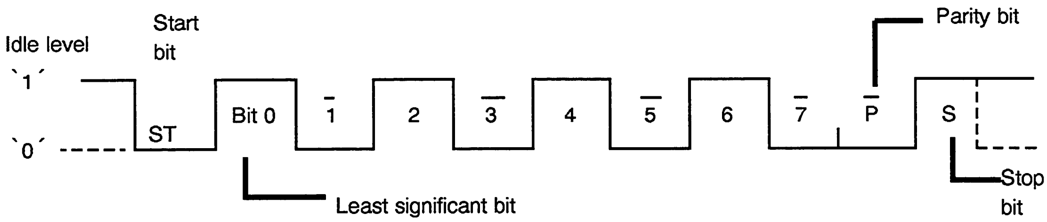


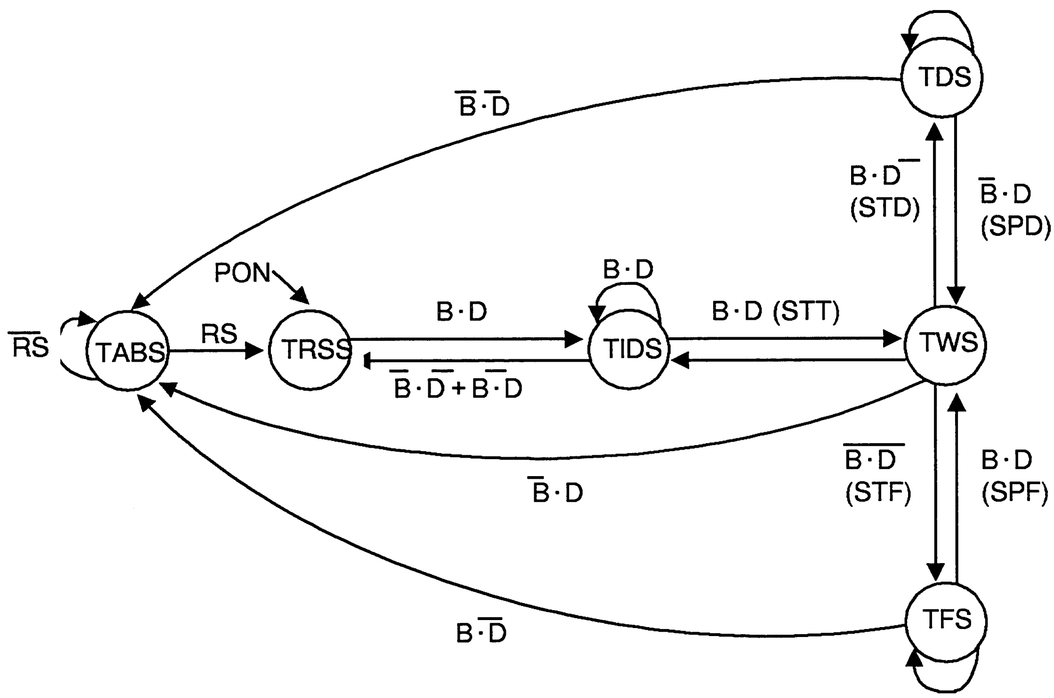
Fig. 9 System interface signal using the ASCII character 'U' (55 H) as an example.

The USART is provided with a 1.5-MHz clock, derived by dividing the 3-MHz clock of the microprocessor.

The 75150 and 75154 line drivers for V.24 interfaces convert the TTL level into the V.24 interface level and vice versa. The ± 12-V voltage needed to operate these blocks is provided by a voltage converter on the BP-V.24. This is a serial-mode converter with a transformer. A Schmitt trigger with RC feedback oscillating at a typical frequency of 40 kHz is used as the clock pulse generator.

The TTY interface signals are fed to the CNY 17/II optical coupler by the USART via a TTL power gate. An external voltage source must be connected during operation (see Fig. 7). Two internal constant-current sources are provided on the module in case an external source is not available (see Fig. 6 for connection). They are of an identical design and consist of a transistor in a common-emitter circuit with large current feedback. A constant base voltage is generated using a 3.3-V Zener diode. The constant- current range is -20 mA ± 10 %.

Bus interface N is also addressed by the CPU like a peripheral component. This converts the three local bus signals clock (T), qualifier (B) and data (D) into bus processor signals. This conversion takes place according to the line protocol. Fig. 10 shows the statuses of the line protocol as well as the signal sequence in which they occur.



TIDS	=	Transfer idle state	STT	=	Start transfer
TDS	=	Transfer data state	SPT	=	Stop transfer
TFS	=	Transfer flag state	STD	=	Start data
TRSS	=	Transfer reset state	SPD	=	Stop data
TABS	=	Transfer abort state	STF	=	Start flag
TWS	=	Transfer wait	SPF	=	Stop flag
PON	=	Power on			
RS	=	Reset			
B	=	Qualifier			
D	=	Data			

Fig. 10 Line protocol status diagram

The transfer reset state (TRSS) is assumed by the line protocol controller after system start-up until the transfer idle state (TIDS) is detected. The transfer wait state (TWS), initiated by the start transfer cycle (STT), indicates the start of a transfer element. The actual data or flag transfer takes place in the next cycle, the start data (STD) or start transfer cycle (STT). A stop data (SPD) or a stop flag (SPF) cycle to the TWS, followed by a stop transfer (SPT) cycle to the TIDS, terminates the transfer element. Faulty transfer elements are signalled by the transfer abort state (TABS). This state can only be exited using a reset command contained in the software or generated by the reset key on the N-V.24 front panel.

6.2 Troubleshooting

Regulations about handling modules containing MOS components must be observed during troubleshooting.

Faults can be detected on the N-V.24 using the LEDs on its front panel.

The "busy" diode "T" must at least light up temporarily if the module is operating correctly. If not, the microprocessor cannot exit the HOLD state and the N-V.24 must be replaced.

If the fault diode "F" lights up, even sporadically, or if diodes "A" and "B" (bus A busy (A), bus B busy (B)) flash alternately and with the same intensity, first check all bus cables, electrical isolation modules and inductive bus converters for correct operation. If no faults are detected, compare the participant addresses accessed via the N-V.24 with those set on the modules. If they correspond and if an address is not used more than once on the autonomous bus, then the N-V.24 must be replaced.

Attention:
The fault diode "F" flashes slightly in a cyclic way also during normal operation. The flashing does not mean a fault status of the module.

6.3 Connector Pin Assignment

Bus Processor V.24

Backplane connector X1

	d	b	z
02		0 V	+5 V
04			
06			
08			
10			
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32		0 V	

Backplane connector X2

	b	z
02	0 V	0 V
04	TxD (V.24)	0 V
06	RxD (+20 mA)	0 V
08	$\overline{\text{RxD}}$ (- 20 mA)	
10	TxD (+20 mA)	
12	$\overline{\text{TxD}}$ (- 20 mA)	+12 V (1 kohm)
14	$\overline{\text{DSR}}$ (V.24)	$\overline{\text{DTR}}$ (V.24)
16	$\overline{\text{CTS}}$ (V.24)	$\overline{\text{RTS}}$ (V.24)
18	Clock on	
20	TxD' (TTL)	
22	RxD (V.24)	
24		
26	I1 (- 20 mA)	
28	I2 (- 20 mA)	
30	Clock off	
32	0 V	

TxD (V.24);	TxD (+20 mA); TxD (-20 mA); TxD' (TTL) - Transmitted data from serial interface block on V.24 or TTL level
RxD (V.24);	RxD (+20 mA); RxD (-20 mA) - Received data to serial interface block on V.24 or TTL level
$\overline{\text{DSR}}$ (V.24)	- Data set ready
$\overline{\text{CTS}}$ (V.24)	- Clear to send
Clock on (V.24)	- Input for external transmitted and received clock (TxC, RxC)
Clock off (V.24)	- Transmission clock off for synchronous operation
$\overline{\text{DTR}}$ (V.24)	- Data terminal ready
$\overline{\text{RTS}}$ (V.24)	- Request to send
I1, I2 1LB(-20mA)	- Two independent constant-current sources of -20 mA against 0 V
+12 V	- Auxiliary voltage connected to +12 V via 1 kohm

Bus Interface N

Front connector X4

	d	b	z
2	0 V	SA0	Screen
4	↑	SA1	↑
6		SB0	
8		SB1	
10		DA0	
12		DA1	
14	↓	DB0	
16	0 V	DB1	
18		BA0	
20		BA1	
22		BB0	
24		BB1	
26		TA0	
28		TA1	
30		TB0	↓
32		TB1	Screen

SA 0, 1 - Control signal bus A
SB 0, 1 - Control signal bus B
DA 0, 1 - Data signal bus A
DB 0, 1 - Data signal bus B
BA 0, 1 - Qualifier signal bus A
BB 0, 1 - Qualifier signal bus B
TA 0,1 - Clock signal bus A
TB 0,1 - Clock signal bus B

1 = Forward signal line
0 = Return signal line
0 V reference earth

SIEMENS

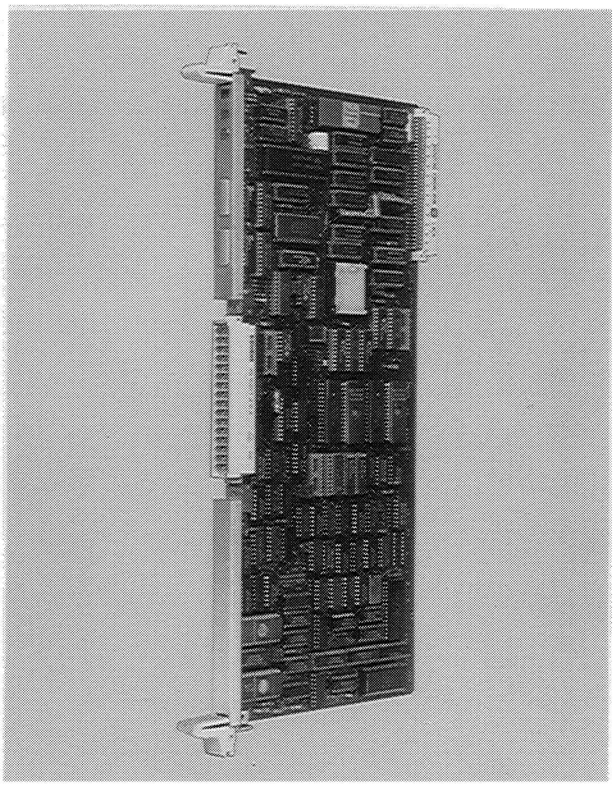
TELEPERM M

Interface Module for 20-m Local Bus, 16 bit
SICOMP M (N16-M)

6DS1 205-8AA

Instructions

C79000-B8076-C128-03



Contents

1 Application

The 20 m local bus, 16-bit SICOMP M (N16-M) interface module is used to connect a basic unit of an OS 262 operator communication and monitoring subsystem or of a SICOMP M process computer to the CS 275 bus subsystem. The N16-M fulfills the following tasks of a data transmission controller:

- Fetching of initializing parameters and processing of input/output jobs at the I/O interface to the central unit.
- Converting the ORG M organization of the SICOMP M system to the bus organization.
- Signalling operating states and faults by means of flags and LEDs.

2 Design

Fig. 1 shows the layout of the N16-M modules. The N16-M is a triple-height PCB and occupies one standard plug-in station in the I/O area of a SICOMP M process computer or of a TELEPERM M OS 262 operator communication and monitoring subsystem.

- Printed-circuit board 366.7 mm x 160 mm
- 1 SPS front plate width (15.24 mm)
- 6 LEDs
- 48-way front connector

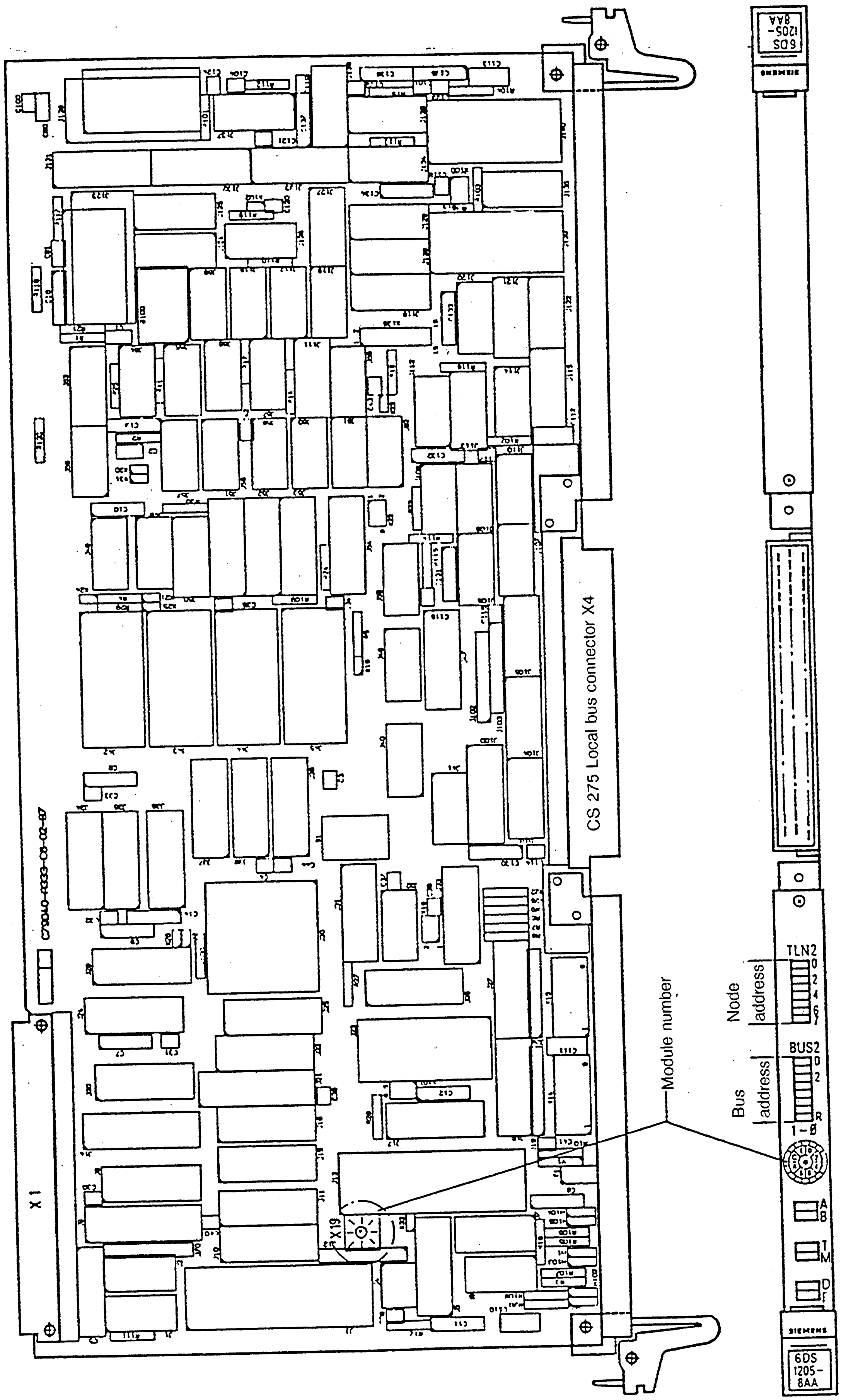


Fig. 1 Layout of the 6DS1205-8AA, N16-M module

3 Mode of operation

The basic mode of operation is shown in Fig. 2. Data transfer with the central unit takes place in the block mode according to the rules of the SICOMP M system. Parameters are assigned to the N16-M and transfer initiated by central initiative (ZI) using EAS (I/O interface) instructions. Thereafter, the N16-M operates with peripheral initiative (PI).

The N16-M is provided with its own SAB80186 microprocessor. Its parallel internal bus interconnects the main memory (16K-RAM), the program memory (32K-EPROM) and the bus interface logic (BIL).

The bus interface logic is microprogrammed. The operating functions are defined by the control register. The SAB80186 microprocessor writes all the data to be transmitted into the transmit FIFO and the line protocol control program converts this into bit serial form and transmits it on to the local bus using the transmitter.

The information on the bus received by the receiver passes through the line protocol control program in bit serial form. The receive FIFO carries out the series to parallel conversion. The processor reads the information from the bus byte by byte and enters them into a buffer memory. Only after the information has been completely received, it is transmitted to the central unit.

Requests to operate as a master and take control of the bus are entered by the SAB80186 microprocessor in the interrupt register and the line protocol transmits this information to the interrupt channel of the local bus. The status register shows the line protocol status. Any format errors which may occur are determined by a bit-by-bit comparison, i.e. the transmitted information is again directly received and compared with the transmitted data.

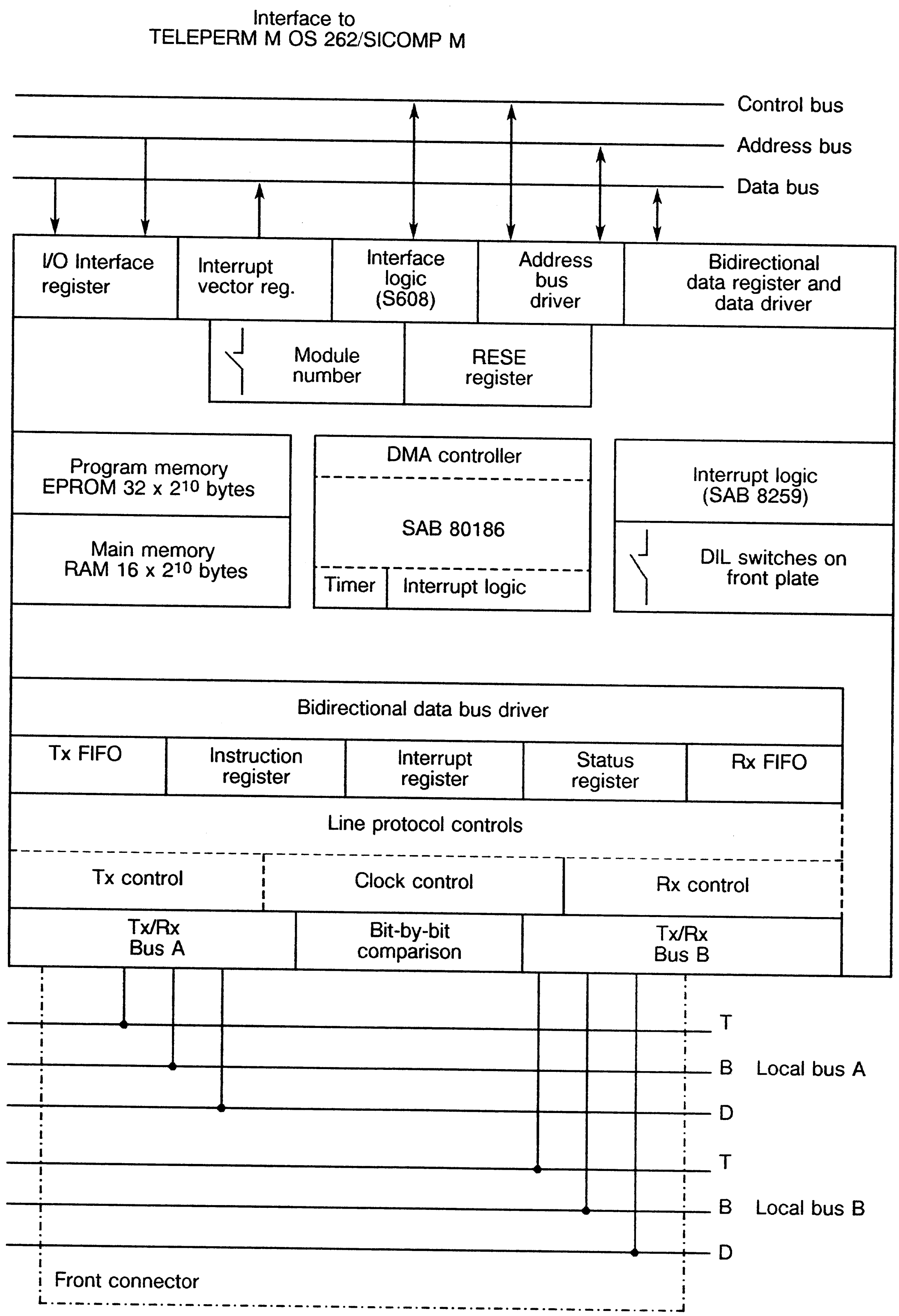


Fig. 2 Mode of operation 6DS1205-8AA

4 Technical data

• Order number	6DS1205-8AA
• Power supply	
Supply voltage	+5 V ± 5 %
Power consumption +5 V -12 V	 2.8 A 0.05 A
• Mechanical design	
Width	1 SPS (= 15.24 mm)
PCB designed to fit into SICOMP M subrack	366.7 mm x 160 mm
• Weight	0.55 kg
• Technology	TTL, MOS
• Ambient conditions	
Temperature range in operation Temperature range during storage	0 °C to 55 °C -40 °C to +70 °C
Relative humidity	≤ 95 % at +25 ° C
• Interfaces	
I/O interface	SICOMP M I/O interface
Signal level at I/O interface	TTL (5 V)
Local bus interface	20 m local bus I/O, redundant, wired OR, asymmetrical
Signal level on 20 m local bus Input	 > 2.0 V ≙ High < 0.8 V ≙ Low
Output	> 2.7 V ≙ High < 0.7 V ≙ Low
Transmission speed independent local bus remote bus interface via inductive converter	 340 x 2^{10} bits/s 250 x 2^{10} bits/s
Nodes (including U/I) on 20 m local bus	≤ 9 (voltage difference between M (zero-voltage reference potential) of the nodes ≤ 0.2 V)
• Data protection	Block parity (d =4)
• Operating mode	half duplex

5 Installation and commissioning

The instructions for handling of modules using MOS components must be observed during installation and commissioning of the 20 m local bus, 16 bit (N16-M) module.

5.1 Installation

To avoid errors during data transfer between N16-M and the main memory (error message PRBERR display A100), the restrictions concerning the installation position in SICOMP M are valid when using the N16-M module.

In **TELEPERM-OS**, the N16-M module must always be plugged in the location of highest priority.

When **used in a process computer** plug the N16-M module into a location with a higher access priority to the computer internal system bus than all other couplings with high data throughput (e.g. disk storage controller).

The front connector X4 for the 20 m local bus must be screwed firmly into position on both sides after it has been plugged on to the module. If this is not done, protection against interference is considerably reduced and sporadic interference on the bus system or in the connected computer can occur.

Note concerning the **time synchronization**
When synchronizing the time via the process computer take care that synchronizing is only carried out by **one** N16-M module. Reason: only **one** bus participant is permitted to synchronize the time.

5.2 Commissioning

5.2.1 Setting the module number

The SICOMP M computer and the central unit of the OS 262 use the module number to address the N16-M interface module.

The rotary switch X19 on the module is used to set the module number. The location of the switch can be seen in Fig. 1. The module number is always the same when the module is plugged into the OS 262 subsystem and must always be set to 3.

In the SICOMP M process computer, the module number is defined when generating the ORG. The module number must then be set accordingly using the rotary switch X19. The ORG generation is described in the SICOMP M documentation.

5.2.2 Setting the CS 275 bus and node addresses

Each interface module must be assigned a node address (TA) to identify it on an autonomous CS 275 bus. Furthermore, a bus address must be assigned to identify the bus when a number of buses are interconnected by bridges (bus coupler BK). These two addresses are set by means of DIP switches on the module. Eight bits are provided for coding the node address and 3 bits for the bus address.

Permissible address range:

$0 \leq BA \leq 7$ $\quad$ $0 \leq TA \leq 99$ $\quad$ (max. 100 nodes permissible)

One more coding bit is provided to identify whether the remote bus is a redundant or non-redundant configuration.

The other four coding bits are utilized by the service routines. They are always set to zero.

The DIP switches are accessible from the frontplate and can be set with the module plugged in.

If the switches are adjusted in normal operation, invalid addresses can occur and lead to disturbances in the complete bus system. For this reason, the interface processor immediately goes into the stop state ("T" LED extinguishes) if any adjustment is carried out on the switches. The module must be restarted after the adjustments have been completed.

The switch settings are shown in Figs. 1 and 3.

Care should be taken that the lowest possible node addresses are selected. In the case of a common data (CD) link, the node address must be ≤ 31. The address bus 0/node 0 is not permissible.

The user-specific settings of addresses and operating states is to be taken from the planning documentation.

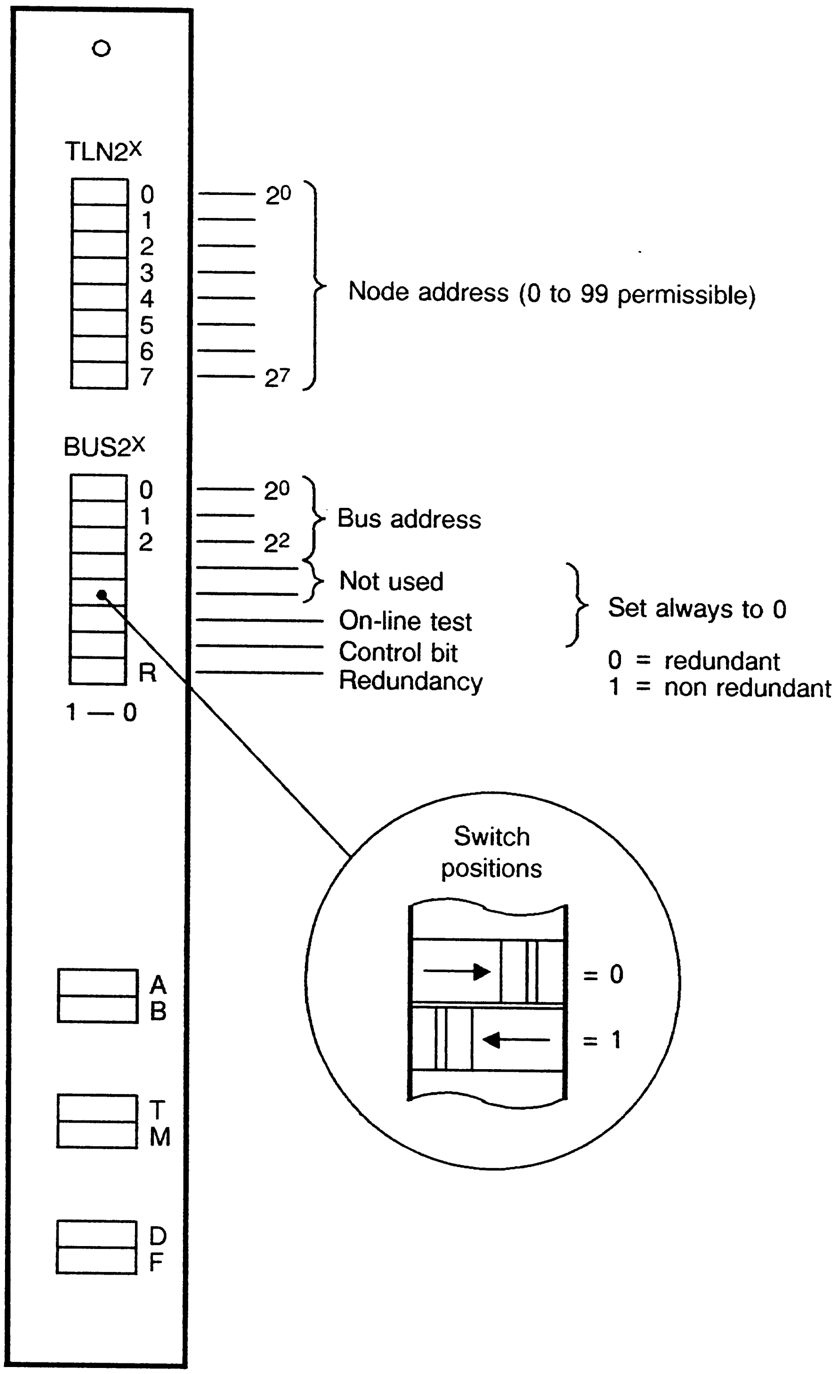


Fig. 3 Settings on the front panel switches

5.2.3 Plug-in jumpers

All the plug-in jumpers are only for test purposes. They are already correctly plugged in at the works and no changes should be made.

All the jumpers listed in the table below should be plugged in; all pins not mentioned in the list should not be plugged in.

Jumper	Pin connections
X 16	1 - 2 / 3 - 4 / 5 - 6
X 22	1 - 2 / 3 - 4 / 5 - 6
X 23	1 - 2
X 24	1 - 2
X 26	1 - 2
X 27	1 - 2
X 33	1 - 2
X 100	1 - 2 / 3 - 4 / 5 - 6
X 102	1 - 2

Jumpers plugged in during operation

6 Maintenance

6.1 Principle of operation

The 20 m local bus, 16-bit (N16-M) interface module is used for connecting a node having a Siemens SICOMP M I/O interface to the CS 275 20 m bus subsystem. Data exchange with the node is carried out in the form of block transfers. The transfer is intiated by the node using I/O interface instructions.

During system start-up, the node assigns the basic parameters to the N16-M. Only thereafter is the N16-M ready for actual data transfer with the node.

The node initiates data output to the N16-M (transmit direction) by means of I/O interface instructions. The N16-M then transfers the data to be transmitted automatically into its internal transmit buffer by DMA

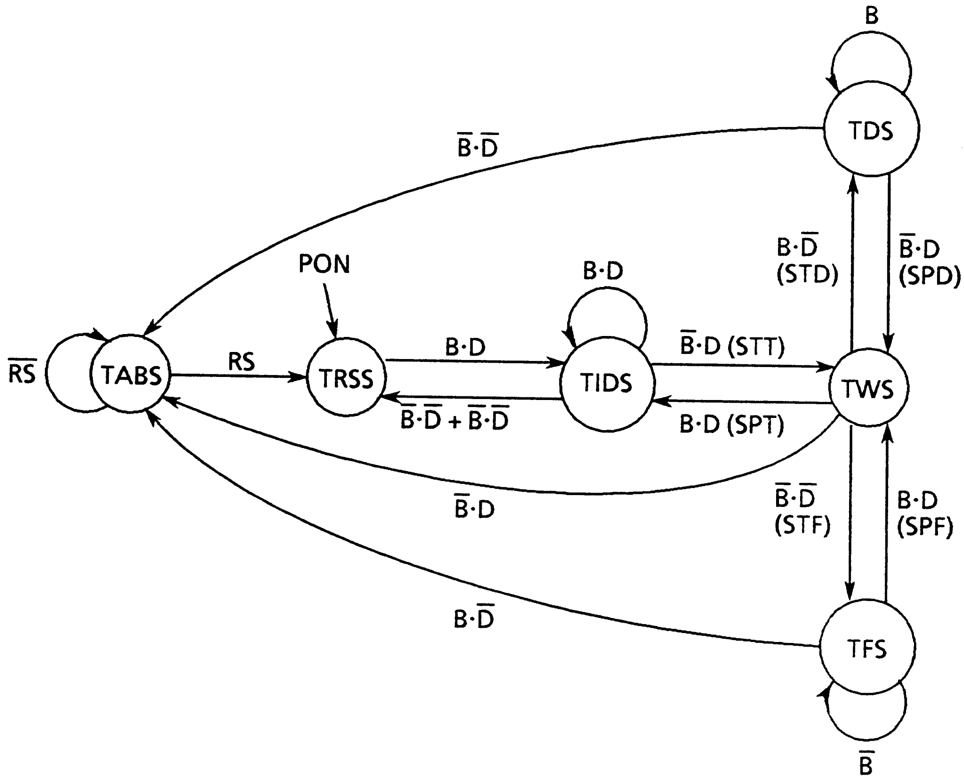
Input to the node (receive direction) is requested by the N16-M by a call; the node responds with an I/O interface instruction and provides an input buffer. The N16-M can now write the received data per DMA into the buffer.

The logical sequence of the transfer is carried out in accordance with the ORG M (operating system of the SICOMP M process computer) guidelines.

The local bus line protocol carries out the actual conversion of the Siemens SICOMP M I/O interface signals into those of the 20 m local bus interface and vice versa. The local bus line protocol also defines the sequence of the three bus signals: clock pulse (T), qualifier (B) and data (D).

Fig. 4 shows the status diagram of the line protocol and how these states are reached.

Upon system start-up, the line protocol controls initially assume the Transfer Reset State (TRSS) until the Transfer Idle State (TIDS) is detected. The start of a transfer element is indicated by the bit combination/B*D (start transfer cycle); the controls then go into the Transfer Wait State (TWS). The actual data or flag transfer is initiated in the next cycle - the Start Data (STD) or Start Transfer Cycle (STT). The transfer element is terminated by a Stop Data (SPD) or a Stop Flag (SPF) cycle to the TWS and, thereafter, a Stop Transfer to the TIDS. Faulty transfer elements are indicated by the transfer abort state (TABS). This state can only be left using a reset instruction. The reset instruction is generated in software.



TIDS	=	Transfer Idle State
TDS	=	Transfer Data State
TFS	=	Transfer Flag State
TRSS	=	Transfer Reset State
TABS	=	Transfer Abort State
TWS	=	Transfer Wait State
PON	=	Power on
RS	=	Reset
B	=	Begleiter = Qualifier
D	=	Data = Date

STT	=	Start Transfer
SPT	=	Stop Transfer
STD	=	Start Data
SPD	=	Stop Data
STF	=	Start Flag
STF	=	Stop Flag

Fig. 4 Line protocol status diagram

6.2 Troubleshooting

The rules for handling modules with MOS components must be observed during troubleshooting.

The LEDs on the frontplate of the N16-M indicate whether there is a fault in the module. When the module is functioning properly, the T (bus processor busy) LED lights up. If this is not the case, the 80186 CPU does not exit the stop state; the N16-M must be replaced.

When the F (Fault) LED lights up sporadically, check all the bus cables and bus converter units for proper functioning. If no defect is found, and the F LED still lights up, compare whether the node addresses which are accessed via the N16-M correspond with the addresses set on the modules themselves. If the F LED still does not extinguish, the N16-M module must be replaced.

Displays on the front panel

The following six LEDs are provided on the frontplate to indicate important operating states:

- "F" (red) = Fault: Fault signal from bus interface logic (BIL)
- "D" (green) = Data: General data transfer on the local bus
- "M" (green) = Master: Module is at the moment operating as the bus master
- "T" (green) = Busy: The SAB 80186 processor is executing read cycles
- "B" (green) = Bus B: Bus B is the active bus
- "A" (green) = Bus A: Bus A is the active bus

The "F" LED lights up continuously only when the transmit/receive control unit is permanently in the abort state. If the LED flashes, this indicates a sporadic fault condition.

Attention: The fault LED "F" flashes slightly in a cyclic way even in normel operation. This indicates that the component is not in fault state.

The intensity with which the "D" LED lights up shows the frequency of data transfer.

The "M" LED lights up when the module is operating as the bus master; the duration of operation as bus master depends on the number of nodes connected and the LED blinks accordingly.

The "T" LED indicates instruction or peripheral read cycles of the CPU; the LED lights up with practically full intensity.

The "A" and "B" LEDs blink to indicate changeover between the two buses. The LED which lights up with a higher intensity indicates the bus which is active at the moment.

6.3 Connector pin assignment

Pin assignment of the base connector X1 (M bus)

Pin	a	b	c
01	CC	+5 V	-12 V
02		+5 V	
03	RSP	0 V	HLD
04	TER	0 V	BL
05	TR	0 V	TA
06	BR	0 V	BB
07	IR	0 V	IL
08	IAO	0 V	IAI
09	BAO	0 V	BAI
10	R/W	0 V	M/IO
11	AC0	0 V	AC1
12	AB0	0 V	AB1
13	AB2	0 V	AB3
14	AB4	0 V	AB5
15	AB6	0 V	AB7
16	AB8	0 V	AB9

Pin	a	b	c
17	AB10	0 V	AB11
18	AB12	0 V	AB13
19	AB14	0 V	AB15
20	AB16	0 V	AB17
21	AB18	0 V	AB19
22	AB20	0 V	AB21
23		0 V	AE0
24	FFA	0 V	FFD
25	DB0	0 V	DB1
26	DB2	0 V	DB3
27	DB4	0 V	DB5
28	DB6	0 V	DB7
29	DB8	0 V	DB9
30	DB10	0 V	DB11
31	DB12	+5 V	DB13
32	DB14	+5 V	DB15

Name	Signal name
DB	Data Bus
AB	Address Bus
R/W M/IO FFA FFD AC0,1 AE 0	Read/Write Memory/IO Fault Flag Address Fault Flag Data Address Control Address Enable
BR BAI BAO BB	Bus Request Bus Acknowledgement Input Bus Acknowledgement Output Bus Busy

Name	Signal name
IR IAI IAO IL	Interrupt Request INT Acknowledgement Input INT Acknowledgement Output Interrupt Lock
RSP TER HLD BL	Reset Peripheral Terminate Hold Bus Lock
CC	Central Clock
TR TA	Transfer Request Transfer Acknowledgement

Pin assignment of the front connector X4 (20 m local bus)

Pin	a	b	z
02	0 V	SA0	Screen
04	0 V	SA1	Screen
06	0 V	SB0	Screen
08	0 V	SB1	Screen
10	0 V	DA0	Screen
12	0 V	DA1	Screen
14	0 V	DB0	Screen
16	0 V	DB1	Screen
18		BA0	Screen
20		BA1	Screen
22		BB0	Screen
24		BB1	Screen
26		TA0	Screen
28		TA1	Screen
30		TB0	Screen
32		TB1	Screen

SA 0,1 = Control bus A
SB 0,1 = Control bus B
DA 0,1 = Data bus A
DB 0,1 = Data bus B
BA 0,1 = Qualifier bus A
BB 0,1 = Qualifier bus B
TA 0,1 = Clock bus A
TB 0,1 = Clock bus B

1 = Signal line
0 = Signal return line
(0 V reference potential)

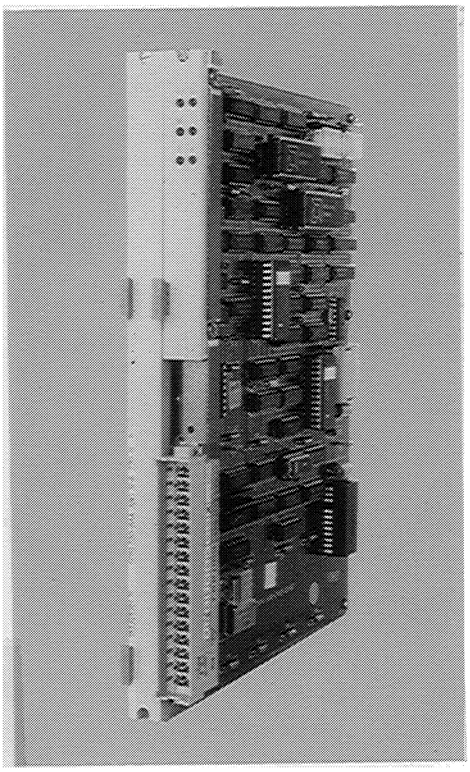
SIEMENS

TELEPERM M / ME

Local Bus Interface Module N8-H

6DS1220-8AA/-8AB

Technical Description C79000-T8076-C281-02



Contents

1 Application

The local bus interface N8-H serves to connect redundant TELEPERM M / ME automation systems to the CS 275 bus system. The bus system enables the transmission of data and commands (e.g. analog values, binary values, alarms and operator inputs) from one system to another system (e.g. AS 220 E or OS 254 E).
To enhance the availability, the local bus interface N8-H can be used with double redundancy. The two modules then operate according to the fault tolerant 1-out-of-2 principle (master-slave principle).

The two module versions (6DS1 220-8AA / -(AB) described below are available. The two module versions differ in so far that the contents of their 4 EPROMs (firmware) and their respective jumper assignment is different.

6DS1 220-8AA can be used in the following automation systems:
AS 220 EHF *highly available and fail-save 2-out-of 3 system*
AS 220 H *highly available 1-out-of-2 system*
AS 235 H *highly available 1-out-of-2 system*

The above automation systems are normally used with two N8-H modules. In case of a failure of one of the two modules or the associated central unit, the communication via the CS 275 bus system is not interrupted.
With AS 220 EHF systems the two N8-H modules are installed in the central units CPU II and CPU III. In all other cases they are installed in CPU I and CPU II.
The above systems can, of course, also be used with one N8-H module. Yet, in case of a failure of either this module or the associated central unit, the system can no longer access the bus system.

6DS1 220-8AB can be used in the following system:
AS 220 EA

This automation system does only operate with this module version. Two N8-H of these N8-H modules are required if the system has a redundant basic unit. Each of them is assigned one of the two I/O bus control modules (EAS).

Line redundancy (medium redundancy) can be planned for the bus system (remote bus) using one or two N8-H modules as the N8-H module has already two local bus connections.
The N8-H modules process in an autonomous manner all tasks necessary for the serial transmission of data and commands via the bus system. The N8-H modules access the RAMs in the central unit via direct memory access (DMA) in order to get or store transmission or receiver data. In AS 220 EHF systems, the RAMs mentioned before are communications RAMs on isolated bus interface modules (RBK), otherwise RAMs on memory modules or the dual-port RAM on the I/O bus control module (EAS) in AS 220 EA systems.

Note:

The descriptions and illustrations in the following chapters emphasize the use of N8-H modules in the AS 220 EHF system as in this special case two N8-H modules cooperate with three central units. Imagine the description with only two central units and two I/O bus control modules and most of the explanations do also apply to the other automation systems mentioned above.

2 Design

The N8-H module consists of two double-height circuit boards screwed together in a sandwich design and requires two standard slots. See Fig. 1.

- Bus processor module BP-8 (left-hand module)
  Double Europa format (233.4 mm x 160 mm)
  Front panel width 1 standard slot (= 15.24 mm)
  Modified standard front panel with shielding plate at rear for screwing to subrack at top and bottom.
  Two 48-pin backplane connectors as interfaces to central unit.
  18-core ribbon cable and 18-pin DIL base at rear for connection of bus interface module.

- Bus interface module BI-N (right-hand module)
  Double Europa format (233.4 mm x 160 mm)
  Front panel width 1 standard slot (= 15.24 mm)
  Modified standard front panel with 6 LEDs and shielding plate.
  48-pin front connector for connection to the 20-m local bus.
  18-core ribbon cable and 18-pin DIL base at rear for connection of bus processor module.

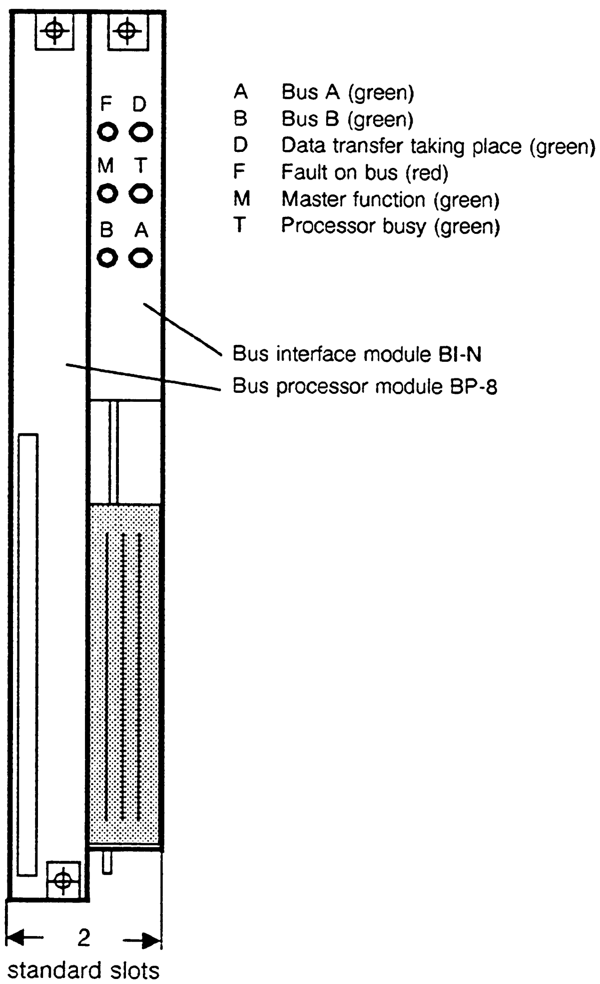


Fig. 1 Front view of local bus interface module N8-H

3 Method of Operation

3.1 General

The method of operation of the N8-H module is shown in the schematic block diagram (Fig. 2).

The N8-H module is connected via the two backplane connectors to the central unit of the AS 220 EHF system via the non-interacting bus coupler module (RBK) or the floppy N8 coupler module (FNK) of the associated central processing unit. The CS 275 bus system is connected via the front connector. The signals to the 20-m local bus are output via this connector. The local bus is always double redundant in one cable (cable connector) and consists of the local buses A and B. This local bus can be connected to the remote bus via one or two inductive converters (UI).

Data transfer with the central unit and data transmission via the CS 275 bus system is controlled by the central processing unit with the 8085 microprocessor on the bus processor module. The associated control program, the so-called bus and communication protocol, is stored in a 16 x 2^{10} byte EPROM. A 3 x 2^{10} byte RAM is available for intermediate storage of data. The microprocessor is monitored by a watchdog timer (WDT).

An interrupt logic with the interrupt IC 8259 records eight interrupt requests with priority and signals these to the CPU. The counter IC 8253 contains three independent, programmable 16-bit counters. These are used to monitor the operating states and to generate time markers for a software counter.

Data transfer with the central unit is carried out using direct memory access (DMA) controlled by the DMA IC 8257. The signals of the address bus, control bus and data bus are routed via drivers and registers which are switched in direction by the DMA interface logic.

The control block address register is the only facility for transmitting information from the central unit to the N8-H module without a DMA transfer.

The various peripheral components are selected using address decoders.

The bus interface module (BI-N) is also handled and addressed like a peripheral component via the address decoder. The BI-N module converts the signals of the local bus interface into signals of the internal CPU bus and vice versa. A bidirectional data bus driver present on the BP-8 is used to decouple the loads between the BP-8 and BI-N.

The transmitted and received data are stored temporarily in the two FIFOs (first-in first-out memory). The FIFOs also handle the serial/parallel conversion between the serial 20-m local bus and the parallel 8-bit data bus in the central unit. The two FIFOs can be deleted by the system software in the central unit:

- Delete receiver FIFO: write under byte address FC07
- Delete transmitter FIFO: read under byte address FC07

The commands for the various operating modes of the BI-N are stored in the command register. In addition, the module is switched to internal coupling by means of the command register if the N8-H module is present as a redundant module in the standby state. The current line protocol and transmitter/receiver FIFO states are stored in the state register.

The transmitter, receiver and clock control units generate the local bus signals: clock (T), qualifier (B), data (D) or evaluate the received local bus signals.

The coupling to the 20-m local bus is made via two redundant transmitter/receiver components to buses A and B. The control bit decoder handles switching over for the transmitter/receiver to bus A or B.

Any format errors are determined by a bit-by-bit comparison. This is achieved by direct returning of all transmitted information and comparison with the transmitted data.

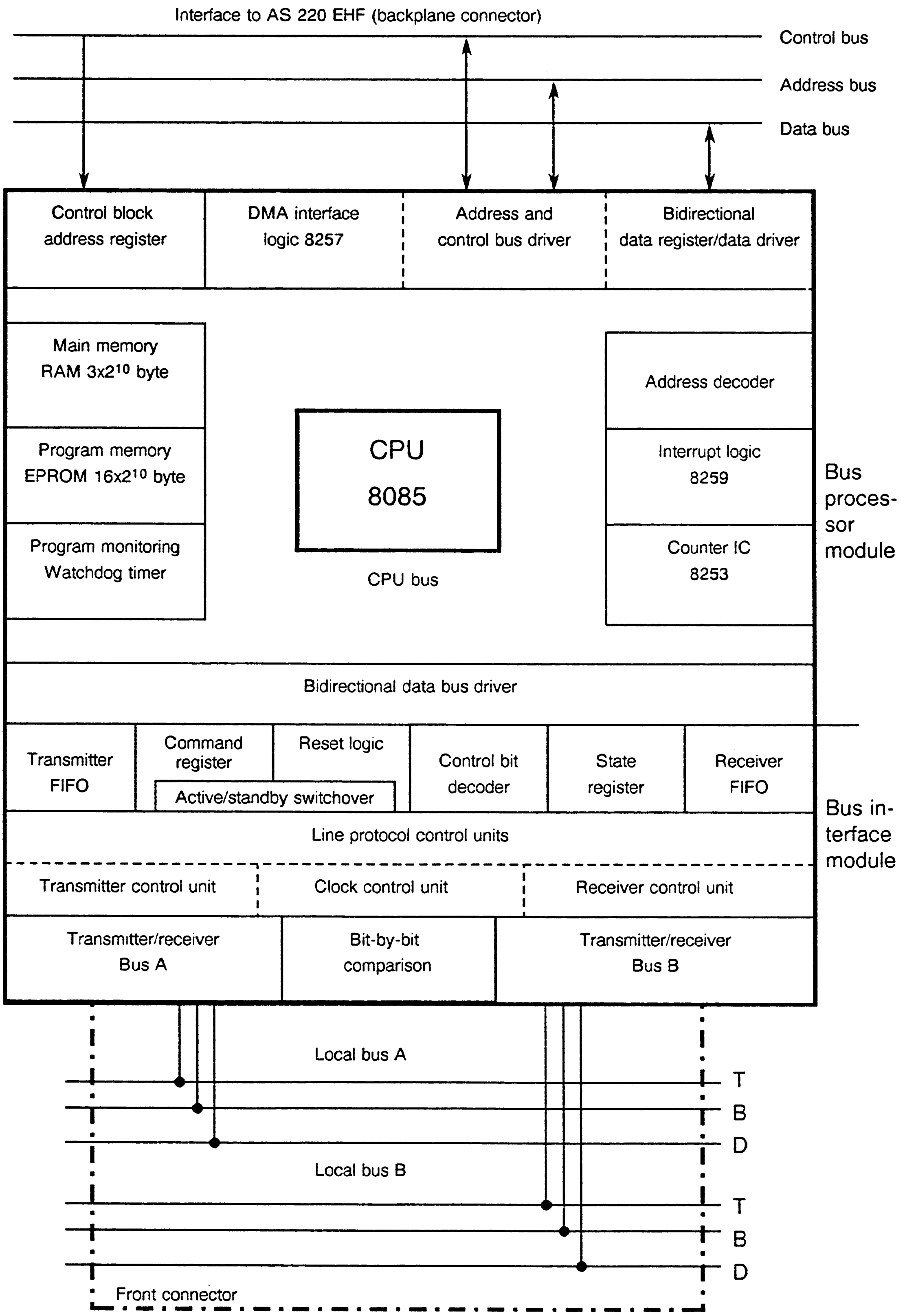
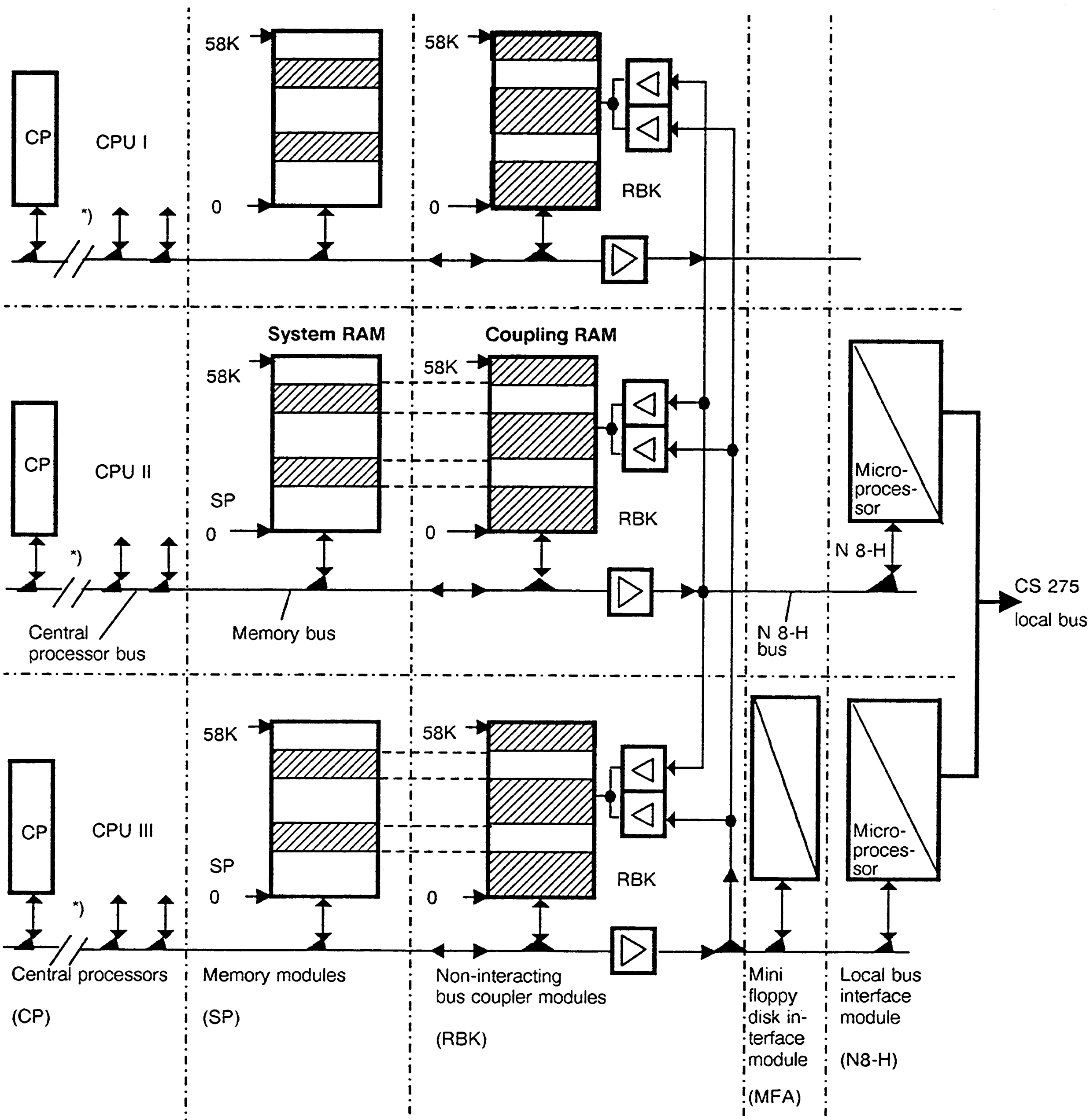


Fig. 2 Block diagram of local bus interface module N8-H

3.2 DMA with Central Unit

Data exchange between the N8-H module and the central unit of the AS 220 EHF system is carried out in fast DMA mode. The N8-H module first sends a HOLD request to the central unit which acknowledges this with the HOLDA signal. The DMA IC on the N8-H module then takes over control of the data, address and control buses on the interface to the central unit.

When reading in DMA mode, the N8-H module reads the data from the so-called coupling RAM of the non-interacting bus coupler module (RBK) 6DS1320-8AA, but only the data of the associated central processing unit are evaluated (see Fig. 3).



*) The bus lines are shown interrupted since a central voter is present between each central processor and the SP and RBK modules. The central voters evaluate the triple-redundant signals according to the 2-out-of-3 principle and monitor these for errors.

Fig. 3 Non-interacting bus coupler modules RBK as interfaces between the N8-H modules and the three central processors CP

When writing in DMA mode, the N8-H module simultaneously writes into the coupling RAM of the three RBK modules. The data are divided by the RBK modules via ribbon cables at the rear. (In the case of systems where three floppy N8 coupler modules (FNK) 6DS1317-8AA are used instead of the three RBK modules, the N8-H module directly accesses the RAMs of the memory modules.)

Two channels of the DMA IC 8257 are used for DMA transfer: channel 0 for reading, channel 1 for writing. A complete data block is read or written without any interruptions in the case of DMA operations (block mode). DMA access operations are acknowledged by the signal RDYS-N from the central processing units for each data byte. The block length is limited and the transmission duration for each data block is monitored by the timer IC on the N8-H module in order to prevent longer blocking of the central processing units. The N8-H module aborts transmission of the data block in the case of a timeout.

The N8-H module can output flags to the central processing units. It generates an interrupt signal IRPAE which is output from the module to the central unit with the trailing edge of the next read signal MEMR-N. This synchronization means that the three central processing units react synchronously to the interrupt request.

The actual triggering for data transfer between the N8-H module and the central unit is carried out by the latter in that this generates the interrupt signal IRSTBA on the N8-H module following updating of the control block address (STBA) in a register of this module (the IRSTBA signal is suppressed on the N8-H module in the standby state so that this is not reparameterized when transferring to the standby state).

The currently relevant address range for the data block in the coupling RAM (and storage RAM) is passed on to the N8-H module by means of the control block address. The N8-H module acknowledges this central write operation by the acknowledgement signal RDY-N. Transfer of the control block address is the only possible data transfer from the central unit to the N8-H module without a DMA transfer.

The 8085 microprocessor carries out parameterization of the DMA IC and the central controller. In addition to the DMA IC, the CPU also contains a timer IC and an interrupt IC. These peripheral components are also monitored by cyclic test programs. The retriggerable watchdog timer (WDT) is activated following each test cycle executed without faults. Triggering of the watchdog timer leads via the highest priority, non-maskable interrupt TRAP to a standstill (HALT) of the microprocessor, the fault signal F-N is set (not identical with fault indication F-N on front panel) and the BUSP signal is generated to disable the output to the 20-m local bus (see Fig. 4). If the N8-H module is the master, the fault signal F-N leads to switching over of the active state from CPU III to CPU II or vice versa.

The watchdog timer is retriggered by the CPU each time the power is switched on or a reset made since otherwise the TRAP interrupt would be set after 10 ms.

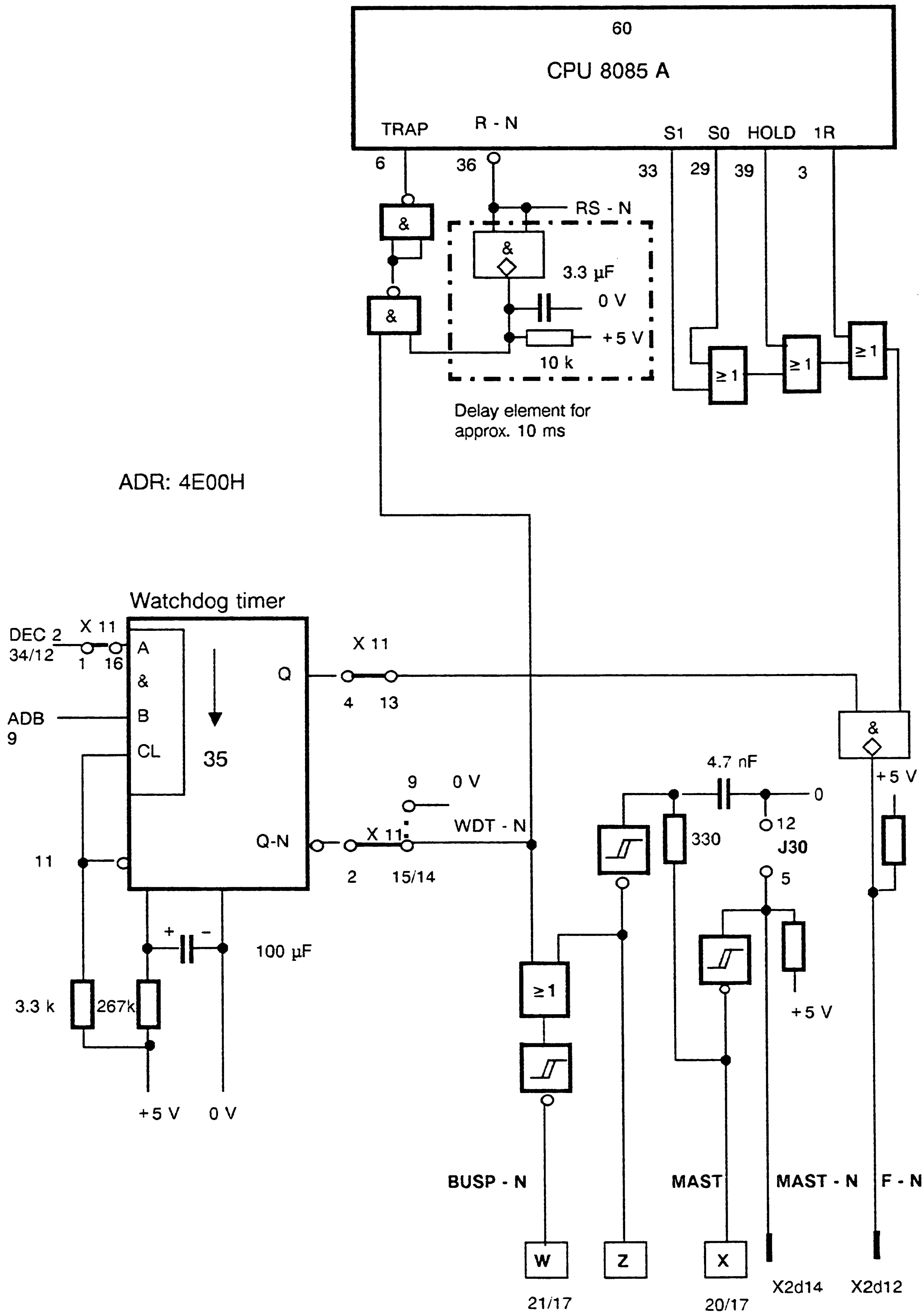


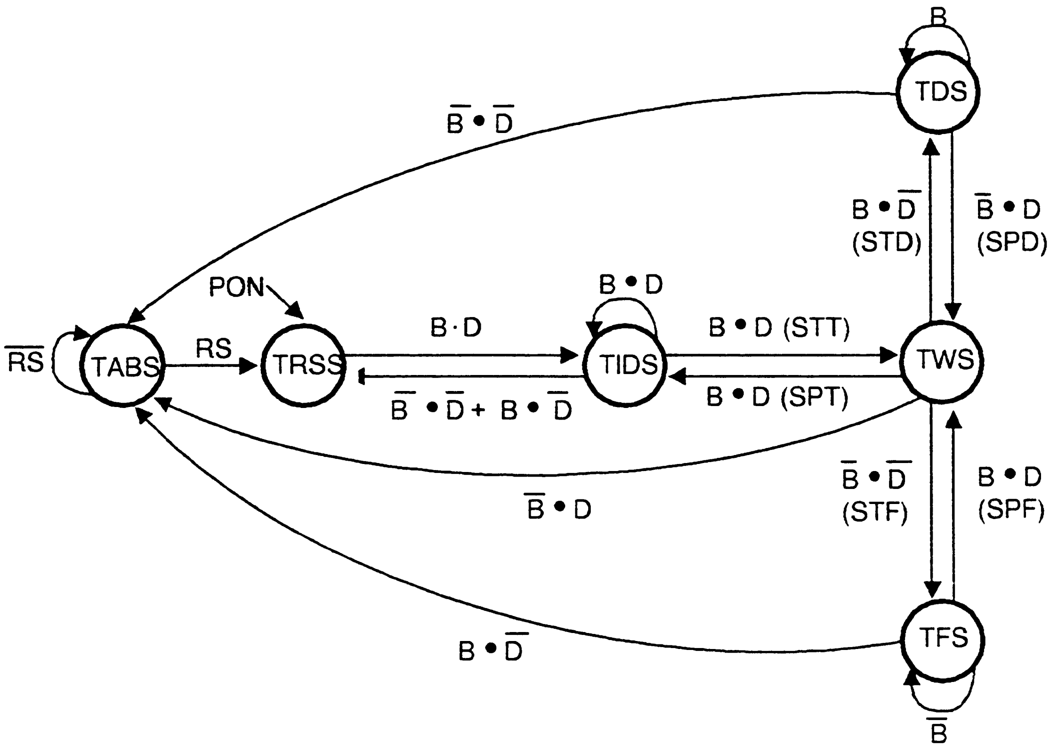
Fig. 4 Watchdog timer with bus disable (BUSP) and generation of fault signal (F)

3.3 Functions of Bus Interface Module

The bus interface module (BI-N) is also handled by the microprocessor like a peripheral component. The data are transferred between the BP-8 and BI-N via a bidirectional driver block. The direction for connection of the data is controlled by the CPU RD-N signal. Data and commands are exchanged via this driver IC.

The data are stored temporarily in FIFOs and are converted into serial data when transmitting and into parallel data when receiving. Conversion into the actual 20-m local bus signals when transmitting or into the signals of the CPU 8086 when receiving is subject to the local bus line protocol. This defines the signal sequences of the clock (T), qualifier (B) and data (D) bus signals. Fig. 5 shows the states of the line protocol and when these states are assumed.

Following the system start-up, the transfer reset state (TRSS) is assumed by the line protocol controllers until the transfer idle state (TIDS) is recognized. The transfer wait state (TWS), initiated by the start transfer cycle (STT), indicates the start of a transfer element. A data or flag transfer element is initiated with the next cycle, the start data (STD) or the start flag (STF). Termination of the transfer element is by means of a stop data cycle (SPD) or a stop flag cycle (SPF) to the TWS and then a stop transfer cycle to the TIDS. Faulty transfer elements are signalled by the transfer abort state (TABS). This state can only be left by means of a reset command.

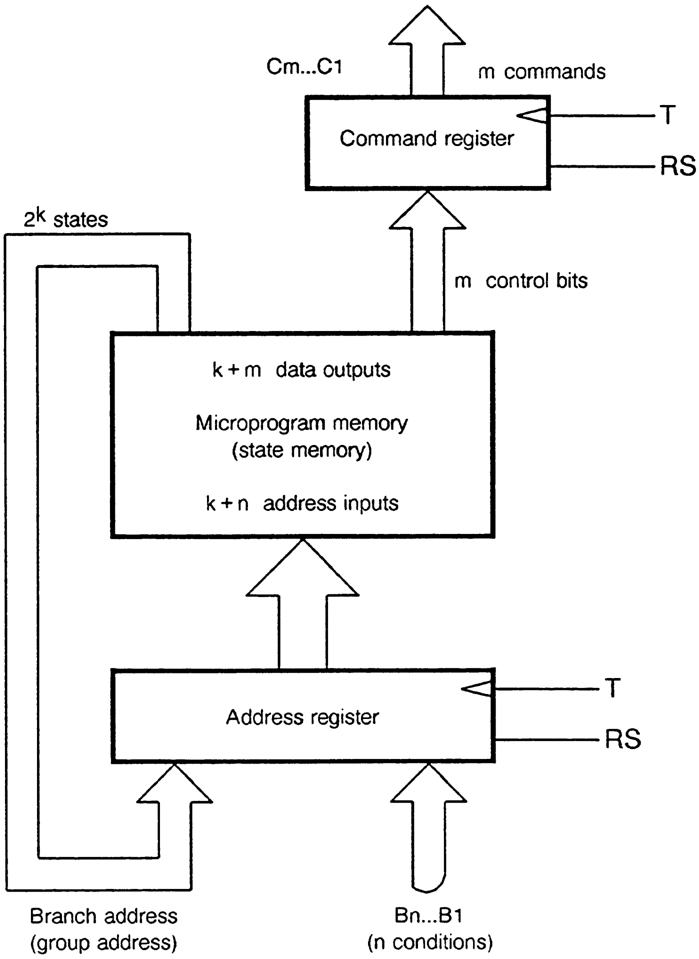


TIDS = Transfer idle state
TDS = Transfer data state
TFS = Transfer flag state
TRSS = Transfer reset state
TABS = Transfer abort state
TWS = Transfer wait state
PON = Power on
RS = Reset
B = Qualifier
D = Data

STT = Start transfer
SPT = Stop transfer
STD = Start data
SPD = Stop data
STF = Start flag
SPF = Stop flag

Fig. 5 Line protocol state diagram

The line protocol is stored in the line protocol control unit. This consists of clock, receiver and transmitter control units. The respective control unit is characterized by its signal processing. Input information (conditions) B1, B2 to Bn at time t result in corresponding output information (commands) C1, C2 to Cm at the time t + 1. The commands are determined not only by the current conditions, but also by preceding conditions (see Fig. 6).



T Clock signal
RS Reset signal

Fig. 6 Structure of a microprogram control unit

The structure of the transmitter control unit is slightly different. A transmitter state does not directly depend on a previous transmitter state but on the state of the receiver control unit. This is made possible by receiving all transmitted data again by the receiver control unit.

Switching over of the data for the receiver control unit is handled by a control bit decoder. This determines whether the transmitted data (in transmitter mode) or the received data (when receiving via the 20-m local bus) are applied to the control unit. A switch is always made to internal coupling via the BUSP-N signal if the N8-H module is in standby mode, i.e. the receiver control unit then receives the internal transmitted data, and the drivers to the 20-m local bus are switched to high impedance.

Two transmitter/receiver components are enabled in active mode by the control bit decoder and their directions switched over. The local bus signals T, B and D are routed via these components. The GT control signals SA and SB, which are also generated by the control bit decoder (adjustable using jumpers) are also applied to the local bus via the transmitter/receiver components.

The N8-H module must automatically assume the basic state following switching on or return of the system voltage (+5 V). In the case of redundant operation, the basic state is additionally assumed when switching over from standby mode to active mode and vice versa. The N8-H module remains in the basic state if the associated central processing unit is not ready (CPKL-N = 1). Three reset signals are generated to assume this state:

RS-N as a switch-on reset for the command registers and the BP-8,
RNF for fast command-controlled FIFO resetting and
RN for resetting of the remaining BI-N logic.

3.4 Redundant Use of the N8-H Module

As already mentioned, two N8-H modules are usually used in the AS 220 EHF system for availability reasons, one in CPU III and one in CPU II. The two modules have the same participant address. One of the modules operates as the master and takes over control of bus communication, the other operates in standby mode. This also applies if the remote bus is redundant.

Which of the two modules is the master is determined by the "Active" display on the RBK or FNK modules. CPU III is active following a cold restart. The "Active" display, and thus also the master function, changes over every four hours from CPU III to CPU II and vice versa if the master switchover is enabled (jumper X10/1-2 inserted on the RBK modules). The switchover is carried out immediately if the fault signal F-N is generated on the current master module or if a single fault is determined by the system software in the currently active central processing unit.

The RBK or FNK module in the "active" central processing unit switches the MAST-N signal (master) to the associated N8-H module to "0" so that this operates as the master. The other N8-H module receives a "1" signal as the MAST signal so that it operates as the standby. The standby module does not exchange any data with the central unit but only processes self-test programs and test protocols. The BUSP signal (bus disable) ensures that the transmitted data are not connected to the local bus but are directly returned to the receiver components for test purposes (internal coupling). In this manner faults on the standby module are rapidly detected.

A reset pulse of approx. 1 µs is generated each time switching is carried out from the master state to the standby state (see Fig. 7). The parameterization of the new standby module is then deleted, thus preventing this module from carrying out DMA access operations. The new master module is also initially reset and then parameterized again so that the transmitted data generated by the test protocols are not applied in an uncontrolled manner to the local bus.

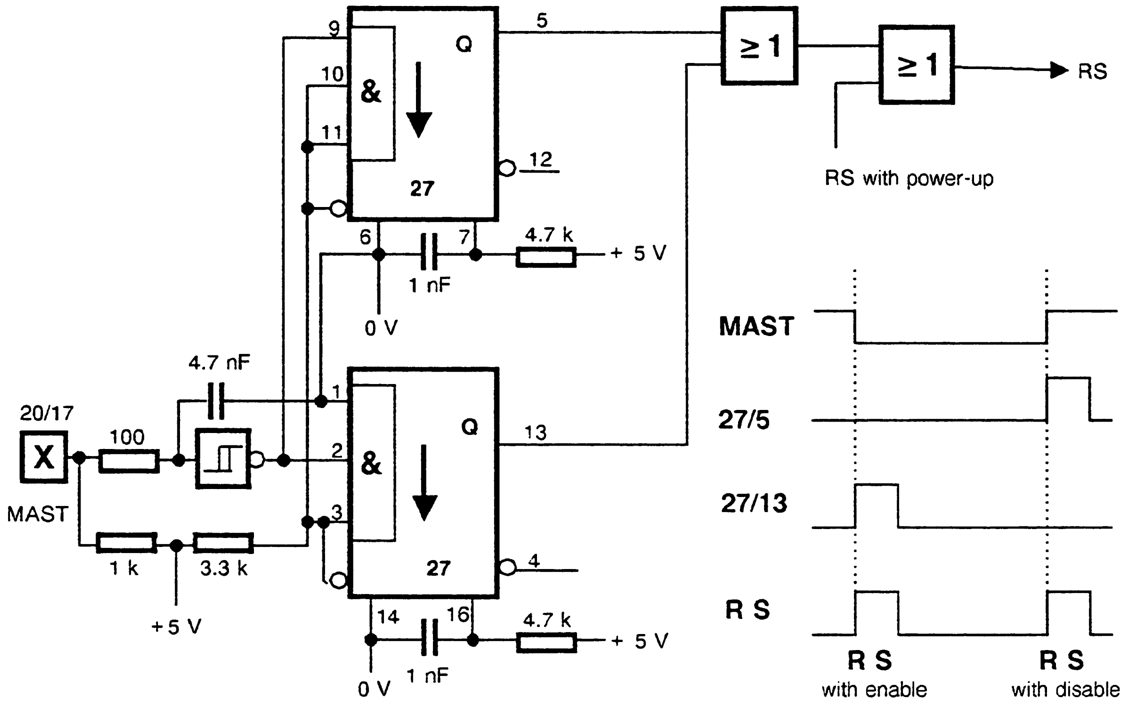


Fig. 7 Resetting with master switchover

Enabling of switchover for automatic master switchover

The following conditions must be satisfied to prevent loss of information during bus communication in the case of the automatic software-controlled master switchover:

- the transmitter and receiver buffers in the main memory (RAM) of the master module must be empty
- the current standby module must be fault-free
- Data transmission must not take place on the CS 275 bus system
- no data must be present in the receiver FIFO of the master module.

If all these conditions are satisfied, the bus protocol outputs the data 01H under address 4D00H which sets the switchover enable flip-flop (UM-FF) and enables the switchover by output of the UMF-N signal (switchover enable).

If at least one of the enable conditions is no longer present, the switchover enable (UMF) is cancelled by output of address 4D00H with the data 00H.

The UMF-N signal is output by the master module via backplane connector X2 and connected to the three RBK or FNK modules. These then switch the master over when the switchover enable is present. If this is already present, the switchover is carried out immediately by the hardware.

Faults on the circuits on the N8-H, RBK or FNK modules responsible for the switchover are detected rapidly by means of the automatic master switchover. If the automatic switchover does not function correctly because of a fault, switching back to the previous master module is carried out immediately and an error message (N8-F) is output.

Self-monitoring of the N8-H modules

Self-test programs are executed both on the master module and on the standby module; their correct processing is monitored by the respective watchdog timer WDT. The associated N8-H module sets all drivers to the local bus to high impedance if the self-test programs detect a fault or if the WDT determines a fault, and sets the fault signal F-N on backplane connector X2 to zero (this signal is not identical to the state of the red LED "F" on the front panel). The F-N signal on the master module immediately leads to switching over of the master or to failure of the bus coupling if a standby module is not inserted. Transmitted or received data of the associated system may be lost in the case of the fault-controlled master switchover. The F-N signal leads only to an error message in the case of the standby module and to blocking of the automatic master switchover if this set.

The fault signal F-N leads in the AS 220 EHF system to triggering of the red LED "N8F" on the associated RBK or FNK module.

4 Technical Data

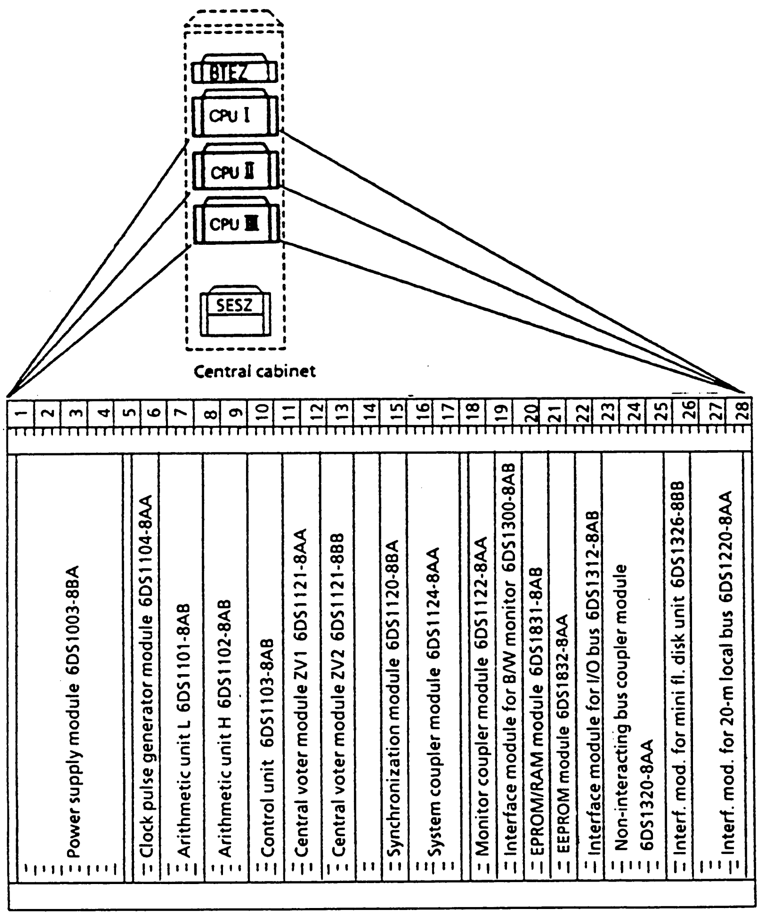
Design	Width: 2 standard slots, 2 circuit boards 233.4 mm x 160 mm, matching the ES 902 packaging system
Power supply	+5 V ± 5 %
Rated current consumption	2.4 A
Interfaces	
Central unit interface	Parallel 8-bit data bus, 16-bit address bus, TTL level, DMA-compatible
Local bus interface	Redundant 20-m local bus output, serial, wired-OR, asymmetric
Level for local bus interface	V_{IH} ≥ 2.0 V input level V_{OH} ≥ 2.7 V output level
Transmission rate	330 kbits/s (autonomous local bus) 250 kbits/s (operation via inductive converter)
Participants	max. 8 N8-H on the 20-m local bus or as local bus module with one UI on the non-redundant remote bus max. 7 N8-H as local bus module with two UI on the redundant remote bus
Data protection	Block parity (d = 4)
Operating mode	Half-duplex

5 Installation and Commissioning

5.1 Installation

The regulations for handling electrostatically sensitive devices (ESD) must be observed when inserting and removing the N8-H module.

The local bus interface module N8-H is inserted in the AS 220 EHF system on the far right in the central processing unit III (see Fig. 8). When used in redundant mode, the second N8-H module is inserted on the far right in CPU II.



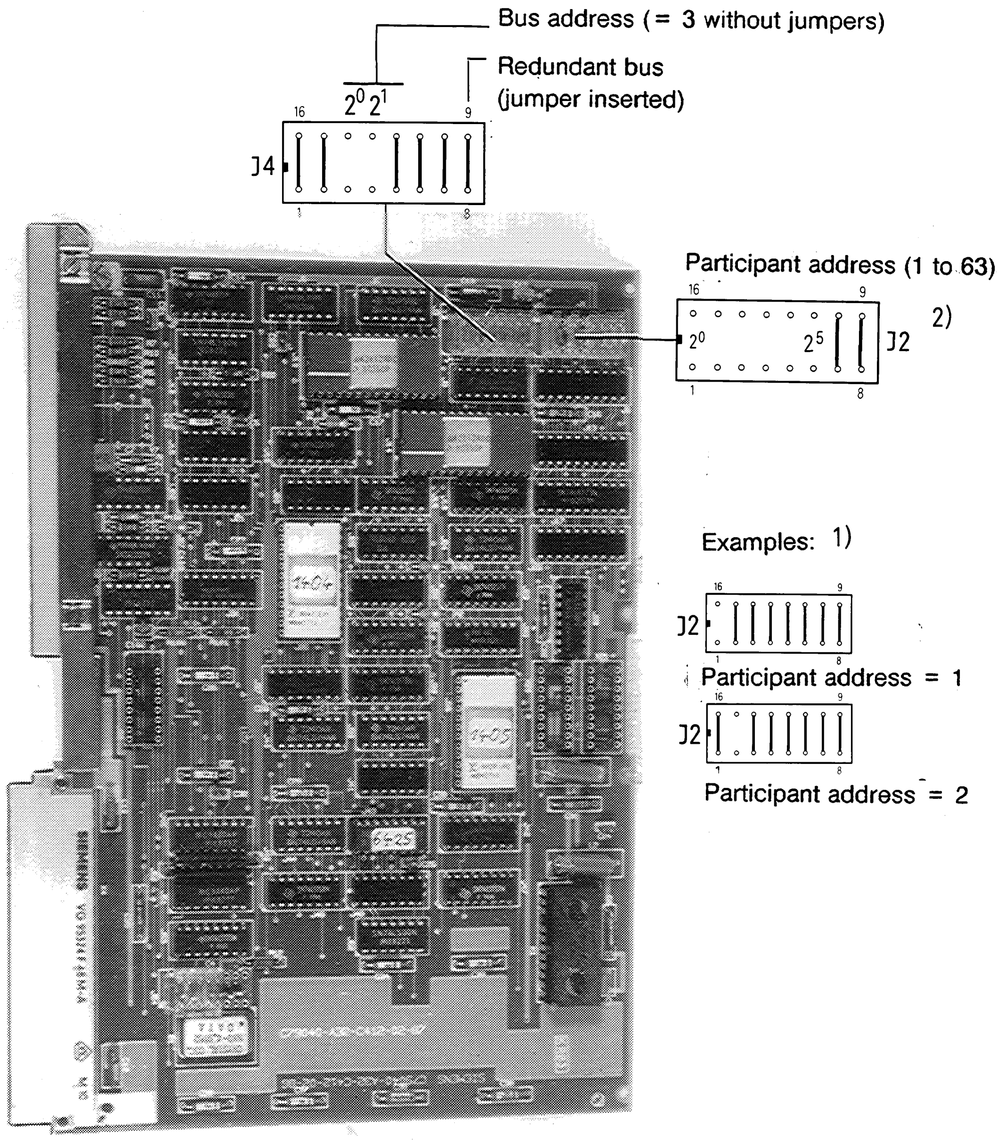
BTEZ Bus driver unit in central cabinet
CPU Central processing unit
SESZ Cabinet power supply unit of central cabinet

Fig. 8 Location of N8-H module in the central processing units III and II of the AS 220 EHF system

5.2 Commissioning

Jumper assignments on the bus interface module (BI-N)

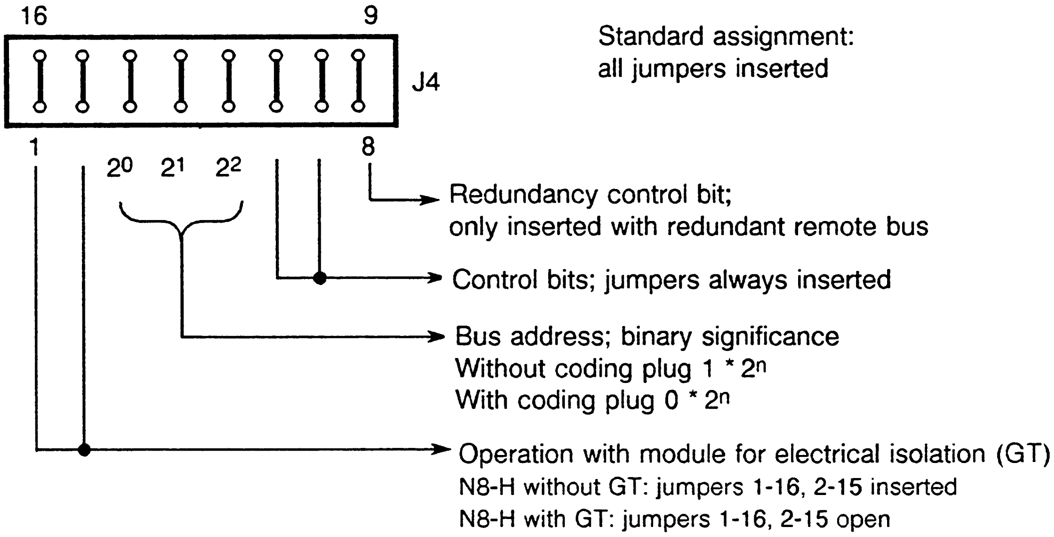
See Fig. 9 for position of jumpers



1) Participant address 0 (all jumpers inserted on J2) must not be used with bus address 0.
2) The bus address and participant address set here must be the same on both N8-H modules when using two modules per AS 220 EHF system and must agree with the addresses set on the three I/O bus interface modules.

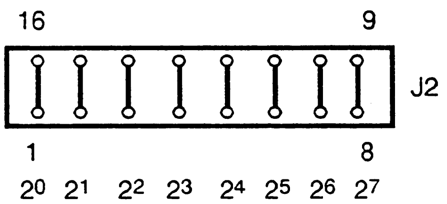
Fig. 9 Bus interface module BI-N, position of plug-in jumpers

Location J4 is used to set the bus address, to define operation with or without the module for electrical isolation (GT) and to define whether redundant mode is present.



All other jumpers are used for test purposes. They are already set in the factory and must not be changed.

The participant address is set at location J2.



Significance without coding plug 1 * 2^n
(factory setting: all jumpers inserted, participant address 0)
Permissible address range 0 to 253
(max. 100 addresses permissible in the bus system)

Ensure that participant address as low as possible are selected. Each participant address must only be used once on an autonomous bus (all participants have the same bus address). The participant address must be $\leq$ 31 in the case of a CD (common data) coupling.

Note: Participant address 0 must not be used with bus address 0. In the case of two redundant N8-H modules, these are both assigned the same participant number.

Jumper settings on the bus processor module (BP-8)

See Fig. 10 for position of jumpers

The jumper settings shown are already made in the factory and remain unchanged when the module 6DS1 220-8AA is used in AS 220 EHF, AS 220 H or AS 235 H systems.

In the the AS 220 EA system, the jumper 8-9 is inserted in addition on the module 6DS1 220-8AB .

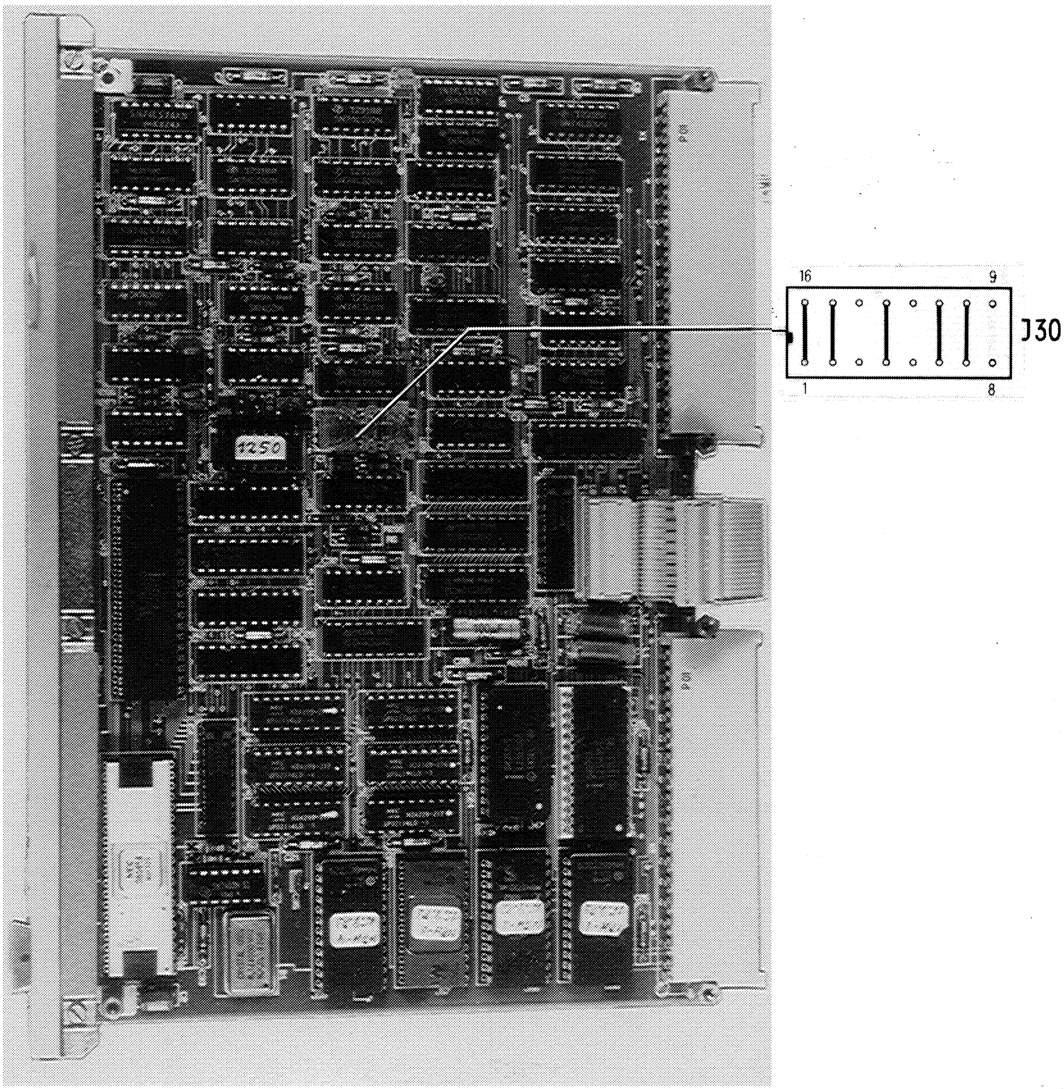


Fig. 10 Bus processor module BP-8, position of plug-in jumpers

6 Maintenance and Troubleshooting

6.1 Troubleshooting

The regulations for handling electrostatically sensitive devices (ESD) must be observed when handling the N8-H module.

The system alarms in the alarm line of the participants connected to the bus or the LEDs on the front panel can be used to determine whether a fault is present on the active N8-H module.

The analog and binary coupling blocks (AKS, BKS, AKE, BKE) can be used to determine whether the coupling between the systems is faulty. If the transmitter job cannot be sent, i.e. the coupling between the central unit and the N8-H module is faulty, then output 3AB of the AKS and BKS blocks is at 1. If the coupling via the bus system has failed (e.g. cable breakage), output 5AB of the AKE block and output 1AB of the BKE block are at 1.

All system alarms affecting the bus system are explained in Chapter 9 (Volume 1/3) of the AS220EHF Manual (Order No. C79000-G8076-C021).

The LEDs on the front panel have the following meaning:

The "A" and "B" LEDs flash at the rhythm of the bus switchover, the brighter LED indicates the currently active bus. In the case of operation with the module for electrical isolation (GT), only the "A" LED must light up.

The "T" LED signals command or peripheral read cycles of the CPU of the N8-H with approximately full brightness. The CPU is in the HALT or HOLD state if the "T" diode goes out, and the watchdog timer has been triggered. This indicates a faulty N8-H module (CPU, timer, interrupt) or faulty DMA transfer.

The "M" LED lights up for the duration of the assigned master function. The brightness and the flashing frequency depend on the number of connected participants.

The "D" display lights up when DMA data transfer takes place with the central unit. The brightness of the flashing LED depends on the frequency of data transfer.

The "F" display only lights up with a static fault state in the control unit (e.g. parity error, code protection, FIFO overflow). A flashing LED indicates a temporary fault state which is immediately acknowledged and reset.

To enable troubleshooting, first reset all modules of the bus system. To do this, press all reset (RS) pushbuttons, in systems with a RAM battery back-up switch the power supply (+ 5 V) off and on again, and in non-buffered systems such as the AS 220 EHF enter the command "TPER".

If the fault cannot be eliminated in this manner, check the hardware settings of the participant and bus addresses. A participant address must not be used more than once on an autonomous bus (exception: the addresses of two redundant N8-H modules are identical). When using coupling blocks, the participant address must be entered in the transmitter block.

If the bus is still faulty, check all bus lines including the terminating resistors, the modules for electrical isolation (GT) and the inductive bus converters (UI) for correct functioning.

If these measures still do not lead to success, determine which N8-H module is faulty using the indication in the alarm line of the system and the LEDs on the front panel and replace.

6.2 Connector Pin Assignments

Bus processor module BP-8

Backplane connector X1

	d	b	z
2		0 V	+ 5 V
4		PESP	2 MHz
6	ADB12	ADB0	CPKL-N
8	ADB13	ADB1	MEMR-N
10	ADB14	ADB2	MEMW-N
12	ADB15	ADB3	RDY-N
14		ADB4	DB0
16		ADB5	DB1
18		ADB6	DB2
20	INT-MFA-N	ADB7	DB3
22		ADB8	DB4
24		ADB9	DB5
26		ADB10	DB6
28		ADB11	DB7
30			
32		0 V	

Backplane connector X2

	d	b	z
2	BKHLDA-N	0 V	+ 5 V
4	BKPRIO	BKINTE	BKADB0
6	IRPAE-N	BKHOLD-N	BKADB1
8	BKRS	BKMEMR-N	BKADB2
10	INTE	BKMEMW-N	BKADB3
12	F-N	BKDB0	BKADB4
14	MAST-N	BKDB1	BKADB5
16	UMF-N	BKDB2	BKADB6
18	RDYS-N	BKDB3	BKADB7
20	HLDA0-N	BKDB4	BKADB8
22	BUSEN	BKDB5	BKADB9
24		BKDB6	BKADB10
26		BKDB7	BKADB11
28	HLDA 1-N	BKPESP	BKADB12
30		BKADB15	BKADB13
32	HOLD-N	0 V	BKADB14

BK . . . Signals for bus coupler

DB0 to DB7	=	Data bus
ADB0 to ADB15	=	Address bus
PESP	=	Peripheral memory area
MEMR-N	=	Read signal
MEMW-N	=	Write signal
RDY-N	=	Acknowledgement signal (output)
RDYS-N	=	Acknowledgement signal (input)
HOLD-N	=	HALT request
HLDA0-N	=	HALT acknowledgement 0 (input)
HLDA1-N	=	HALT acknowledgement 1 (routing on)
INTE	=	Interrupt enable (DMA disabling)
BUSEN	=	Data bus enable
CPKL-N	=	Processor ready
IRPAE	=	Interrupt request for central unit
MAST-N	=	Master function
UMF	=	Switchover enable
F-N	=	Fault signal

Private signals for bus coupler (BK)

BKDB0 to 7	= Internal data bus	(I, O)
BKADB0 to 15	= Internal address bus	(I)
BKMEMR-N	= Internal read signal	(I)
BKMEMW-N	= Internal write signal	(I)
BKHOLD	= HALT request	(I)
BKHLDA	= HALT acknowledgement	(O)
BKINTE	= DMA enable	(O)
BKPRIO	= N8-H priorities	(I)
BKRS	= N8-H reset	(O)

I = input, O = output

Bus interface module BI-N

Front connector X4

	d	b	z
2	0 V	SA0	Screen
4		SA1	
6		SB0	
8		SB1	
10		DA0	
12		DA1	
14		DB0	
16	0 V	DB1	
18		BA0	
20		BA1	
22		BB0	
24		BB1	
26		TA0	
28		TA1	
30		TB0	
32		TB1	Screen

SA0,1 = Control signal, bus A
SB0,1 = Control signal, bus B
DA0,1 = Data signal, bus A
DB0,1 = Data signal, bus B
BA0,1 = Qualifier signal, bus A
BB0,1 = Qualifier signal, bus B
TA0,1 = Clock signal, bus A
TB0,1 = Clock signal, bus B

1 = Forward signal line
0 = Return signal line, reference ground 0 V

6.3 Address Division on Bus Processor Module BP-8

Address	Module area	HEX-ADR	Register	Possible memory commands
64 K-1				
	DMA IC 8257	FFF 8	Status/mode	RD/WR
		7	CH - 3 TC	Channels 2 and 3 disabled
		6	CH - 3 ADR	Channels 2 and 3 disabled
		5	CH - 2 TC	Channels 2 and 3 disabled
		4	CH - 2 ADR	Channels 2 and 3 disabled
		3	CH - 1 TC	WR
		2	CH - 1 ADR	WR
		1	CH - 0 TC	WR
		FFF 0	CH - 0 ADR	WR
	Interrupt IC 8259-A8	FFE 9(B)	ICW 2,3 : OCW1	RD/WR
		FFE 8(A)	ICW 1 : OCW 2,3	RD/WR
	Timer IC 8253	FFE 7	Mode	WR
		6	Z - 2 (- IR3)	RD/WR
		5	Z - 1 (- IR2)	RD/WR
		FFE 4	Z - 0 (- IR0)	RD/WR
	Bus interface-N BI-N	FC0 7	RX-FIFO-RS (TX-FIFO-RS)	WR
		6	AE-FF	WR
		5	KE II (bus address)	RD
		4	KE I (participant address)	RD
		3	Receiver FIFO	RD
		2	Transmitter FIFO	WR
		1	Status register	RD
63 K		FC0 0	Command register	WR
24 K	PAE interrupt FF	5C00	PAE-INT	RD/WR (interrupt to central processor)
	SBADR reg. 1	5800	SBADR 1	RD
	SBADR reg. 0	5400	SBADR 0	RD
20 K	DMA C reg.	5000	DMA com.	WR
	Watchdog timer	4E00	WDT	WR
	Switchover FF	4D00	UM - FF	WR

Address	Module area	HEX-ADR	Area	Type	Possible memory commands
18 K	3K main memory	48FF – 4800	3.K	RAM	RD/WR
17 K		47FF – 4400	2.K	RAM	RD/WR
16 K		43FF – 4000	1.K	RAM	RD/WR
12 K	16K main memory	3FFF – 3000			
8 K		2FFF – 2000	9.+10.+11.+12.K	EPROM	RD
4 K		1FFF – 1000	5.+6.+7.+8.K	EPROM	RD
0 K		0FFF – 0000	1.+2.+3.+4.K	EPROM	RD

RD Read
WR Write

Notes:

Notes:

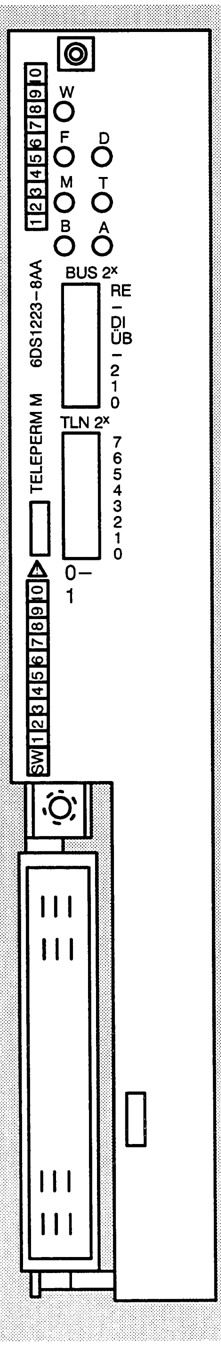
SIEMENS

TELEPERM M/ME

N–AS and N–BK Local Bus Interface Modules

6DS1 223–8AA/–8AB/–8AC

Instructions C79000–B8076–C406–05



Contents

Notes

Please observe the
"Safety–related Guidelines for the User"
and, in particular, the
"Guidelines for Handling Electrostatically Sensitive Devices (ESD)"
that are included in each Manual.

In order to maintain the clarity of this manual, not all product details and operational circumstances are described in these Instructions.
Please contact your local SIEMENS representative if you need any further information or if you are presented with a problem that has not been discussed in this manual.
We also point out that the contents of these Instructions neither form part of any previous or existing agreement, commitment or legal relationship. Any commitments of SIEMENS result from the individual purchase contracts which also contain the complete and only valid warranty agreement. These warranty regulations are neither extended nor restricted by the contents of these Instructions.

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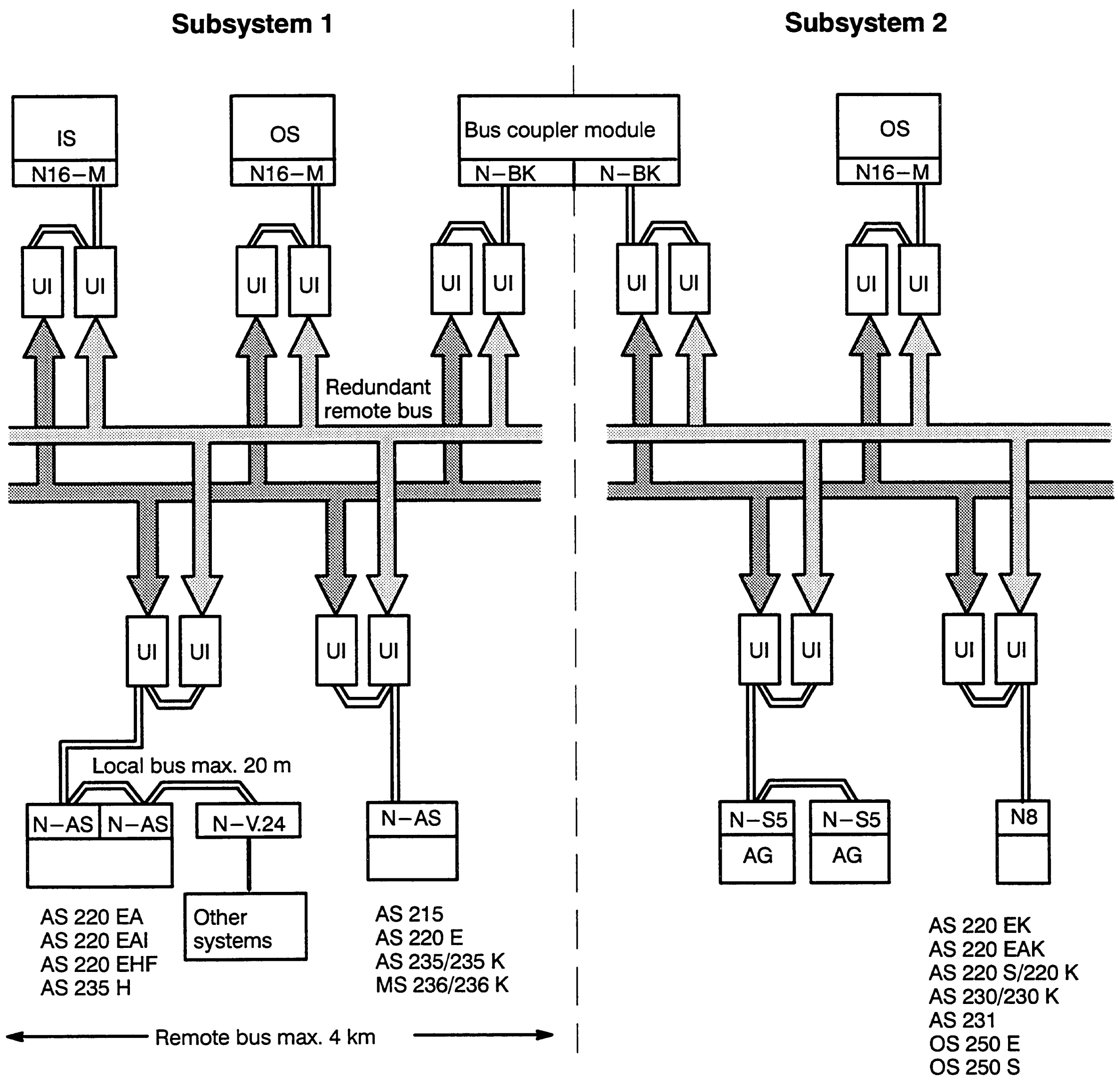
1 Description

1.1 Range of Application

The local bus interface module for automation systems (N–AS), Order Nos. 6DS1 223–8AA and 6DS1 223–8AC, is used for linking the components of the TELEPERM automation systems to the local 20–m bus of the TELEPERM M/ME bus system CS 275. The N–BK local bus interface module, Order No. 6DS1 223–8AB is used in the bus coupler.



AG	Programmable controller (SIMATIC S5 – 150U/155U)
AS	Automation system
IS	Information system
Nxx	Local bus interface module
OS	Operator communication and monitoring system
UI	Bus converter (inductive) (interconnects local bus and remote bus)

Fig. 1.1 CS 275 Bus system

The N–AS module replaces the previously used N8–H and N8 local bus interface modules.
The N–BK module replaces the previously used BK–N8 local bus interface module.

The following table shows the system to be linked and the previous local bus interface module:

System	Previously used local bus interface module	New local bus interface module
AS 220 EHF, AS 235 H	N8–H (6DS1 220–8AA)	N–AS (6DS1 223–8AA)
AS 220 EA, AS 220 EAI **	N8–H (6DS1 220–8AB)	N–AS (6DS1 223–8AA)
AS 215, AS 220 E, AS 235, AS 235 K, MS 236, MS 236 K	N8 (6DS1 200–8AC)	N–AS (6DS1 223–8AC)
Bus coupler	BK–N8 (6DS1 200–8AB)	N–BK (6DS1 223–8AB) *

* Available from April 1994 onwards

** The local bus interface is already integrated in the EAS 6DS1 322–8RR and described in the AS Manual C79000–G8076–C455.

Table 1.1 System allocation of the N–AS, N–BK local bus interface modules

Caution

N–BK revision levels, mixed operation in the bus coupler:

The two N–BK modules installed in one bus coupler must have the same revision level. A mixed operation, i.e. the use of one BK–N and one N–BK module is **not** permitted in the bus coupler.

Caution

Restriction on the range of application:

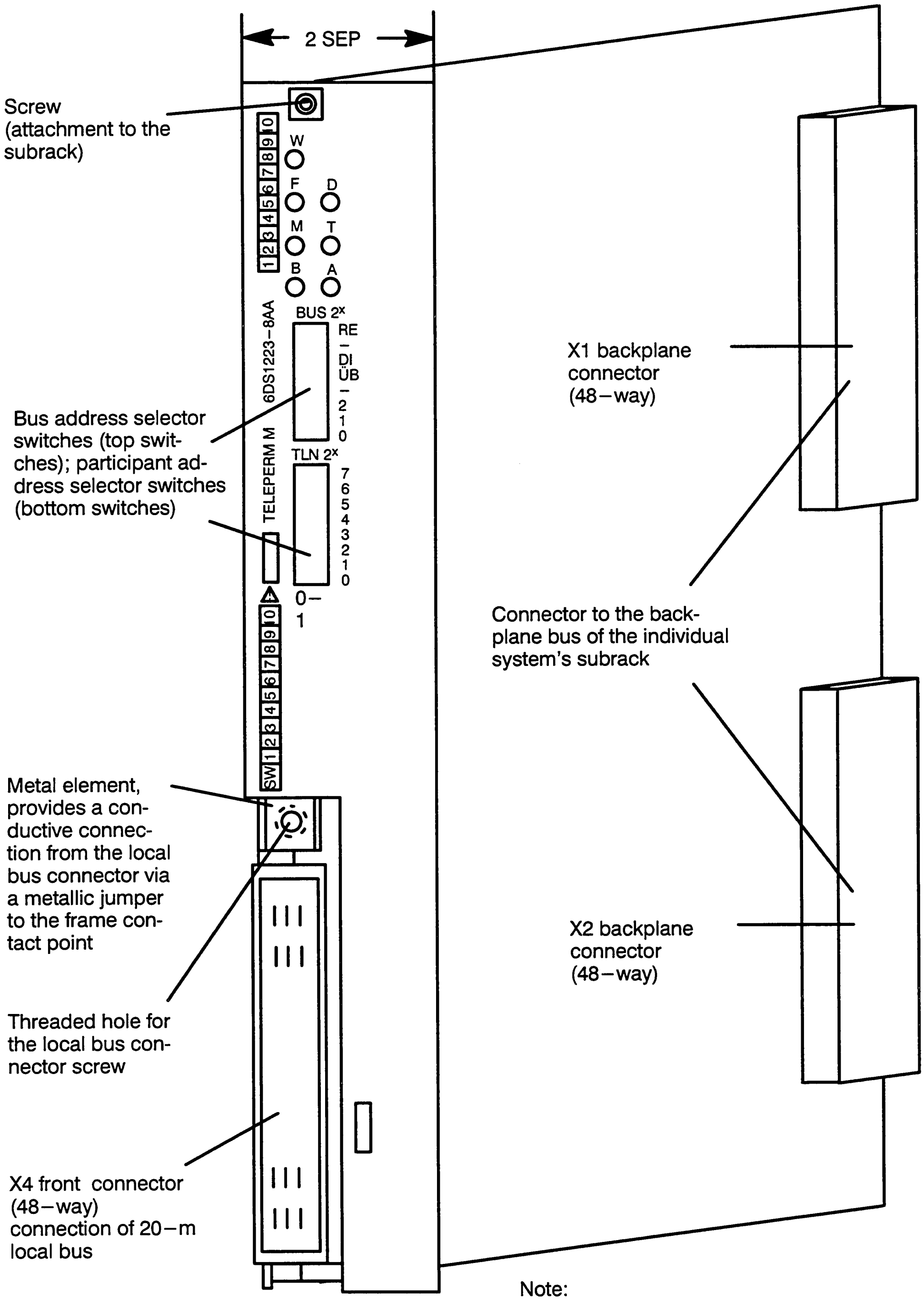
The N–AS and N–BK modules may **not** be used on the local 100–m bus (with electrical isolation).
The previously used local bus interface modules should therefore still be held in the spare parts stock for the local 100–m bus.

Notes on bus coupler documentation:

The design of the various bus coupler variants is described in the Instructions "Bus Couplers":

1.2 Design

The N–AS/N–BK printed circuit board has double Eurocard format (233.4 mm x 160 mm) and occupies 2 standard plug–in locations (SEP).



LED:

W	Service	(yellow)
F	Bus fault	(red)
D	Data transfer active	(green)
M	Master function	(green)
T	Processor active	(green)
B	Bus B	(green)
A	Bus A	(green)

Note:
The N–BK local bus interface module (6DS1 223–8AB) has an additional label on the front panel next to the upper DIP switch (see 2.2.4)

Fig. 1.2 N–AS local bus interface module (6DS1 223–8AA/–8AB/–8AC)

1.3 Operation

1.3.1 Function

The N–AS/N–BK local bus interface module can be subdivided into three function blocks.

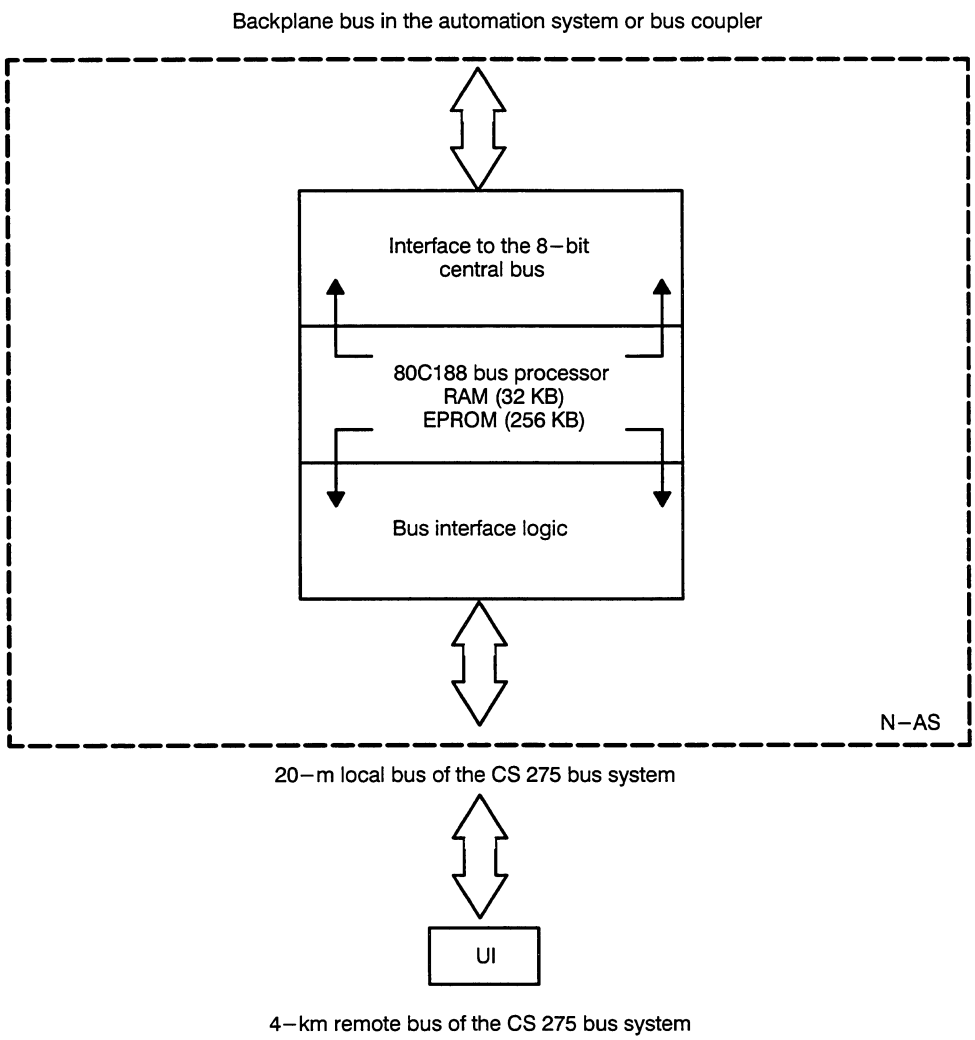


Fig. 1.3 Function blocks and interfaces of the N–AS/N–BK local bus interface module

- Interface to the 8–bit central bus

  This interface contains the interface for DMA data transfer and provides for the connection to the individual systems via the backplane bus.
  The DMA interface logic controls direct memory access (DMA of the N–AS/N–BK module) to the RAM area of the AS or the bus coupler. Any memory access procedure and the parameterization of the N–AS/N–BK are handled via this interface.

- Bus processor

  The bus processor consists of an 80C188 microprocessor, and RAM and EPROM components. It interconnects the two interfaces of the backplane bus and the 20–m local bus.

  Additional tasks of the bus processor include:
  - reading the data that is fetched via DMA logic
  - configuring a bus message
  - transferring the bus message to the bus interface logic
  - processing the received messages from the local bus
  - performing plausibility checks
  - transferring this data to the DMA logic.

  An integrated function monitoring system has been implemented by hardware test routines.

- Bus interface logic (BIL)

  The bus interface logic handles the lower layers of the CS 275 bus protocol and performs line protocol control independently of the bus processor.

  Additional tasks of the bus interface logic include:
  - performing serial/parallel conversion of the received messages
  - performing parity checks
  - performing serial/parallel conversion of the bus processor's transmitted messages
  - transmitting and receiving CS 275 messages
  - isolating the local bus signals

1.3.2 Data Exchange via the CS 275 Bus System

Fig. 1.3 shows the data flow from the automation system to the CS 275 bus.

A message that is to be sent from the automation system or the bus coupler to a participant on the CS 275 bus must consecutively pass the interfaces between AS/bus coupler and N–AS/N–BK, between N–AS/N–BK and local bus, and between local bus and remote bus.

The structure of the CS 275 bus systemis divided in two ranges:

- The **local bus** (20 m maximum length) interconnects the participants inside a cabinet group that have the same electrical earth potential. The interconnection of all bus participants is set up in open collector technique; the outputs of the driver ICs are connected in parallel. An NRZ code with TTL level is used for signal transfer.
- The **remote bus** (4 km maximum length) interconnects individual cabinet groups or system components that are located in different buildings. Conversion between local and remote bus is performed in the "inductive bus coupler unit" (UI), and includes:
  - isolation (electric decoupling) of local bus and remote bus
  - conversion of the local bus signal code into the remote bus bi–phase code. This code is free of mean values (necessary for inductive coupling to the remote bus) and permits re–generation of the clock pulse information at the receiver end.
  - request for obtaining the authorization to transmit from a local bus participant.

In the automation system/bus coupler, **transmit messages** are only set up (message header and user data) and stored for the N–AS/N–BK in the transfer area of the AS/bus coupler RAM. The N–AS/N–BK performs any further tasks. It cyclically checks whether the automation system/bus coupler has built up any transmit messages. Such messages are read by the N–AS/N–BK by DMA and stored in the N–AS/–BK transmit buffer (RAM). The read messages are checked for validity and sent to the CS 275 bus system after the authorization to transmit (mastership) has been obtained.

A **receive message** passes the individual interfaces in reverse sequence. The N–AS permanently remains ready to receive. It checks received messages for validity and sorts them according to the message type (e.g. AKS or operator input message) via DMA into the various RAM areas of the automation system/bus coupler. Subsequently, the N–AS generates an interrupt in order to initiate receive message processing in the system concerned.

Special features:
Receive messages are entered in a contiguous RAM area of the bus coupler irrespective of the message type.

1.3.3 Redundant Use

Two N–AS modules are required in a fault–tolerant AS 235 H system with redundant central unit. One N–AS module can be used for each central processing unit.

In a fault–tolerant and fail–safe AS 220 EHF system, the two N–AS modules should be installed in the central processing units II and III.

Two N–AS modules must also be used in a redundant structure of the AS 220 EA and AS 220 EAI system.

> ⚠ **Caution**
>
> Setting the bus and participant address:
>
> If the N–AS is used redundantly in the AS 220 EA, AS 220 EAI, AS 220 EHF and AS 235 H systems, the same bus and participant address must be set on both N–AS modules.

One module operates as the master and controls bus communications while the second module is in the standby mode, executing self–test programs.
Please refer to the individual Manual of the systems for details regarding the master/standby configuration.

While line redundancy is a permanent feature of the local bus, line redundancy and thus the second UI bus converter unit are options.

Line redundancy of the CS 275 bus system is independent of the N–AS redundancy. This means that line redundancy is preserved even if one central processing unit fails. The master/standby assignment is also independent of the state of the redundant bus (bus A or bus B active).

2 Installation and Commissioning

> **Warning**
>
> Always observe the handling instructions for electrostatically sensitive devices when inserting or removing the N–AS local bus interface module.
>
> Always switch off the central processing unit when you remove or insert a module!
>
> Switch off the power supply to the corresponding subrack of the AS 235 H, AS 220 EHF, AS 215, AS 220 E, AS 235/235 K, MS 236/236 K system and bus coupler.
> In case of the AS 220 EA/AS 220 EAI system, simply unscrew the fuse on the respective I/O bus control module (EAS).

2.1 Installation

The N–AS module has a specific slot in the automation system base unit or in the bus coupler subrack.

The slots of the respective system are shown graphically in the Appendix (Chapter 4.2).

2.2 Commissioning

Various operating parameters must be selected by setting DIP switches on the front panel and jumpers on the module when the N–AS is commissioned in a system. These parameters specify the mode (i.e. the adaptation of the N–AS to the operational environment) and the addresses for the TELEPERM bus.

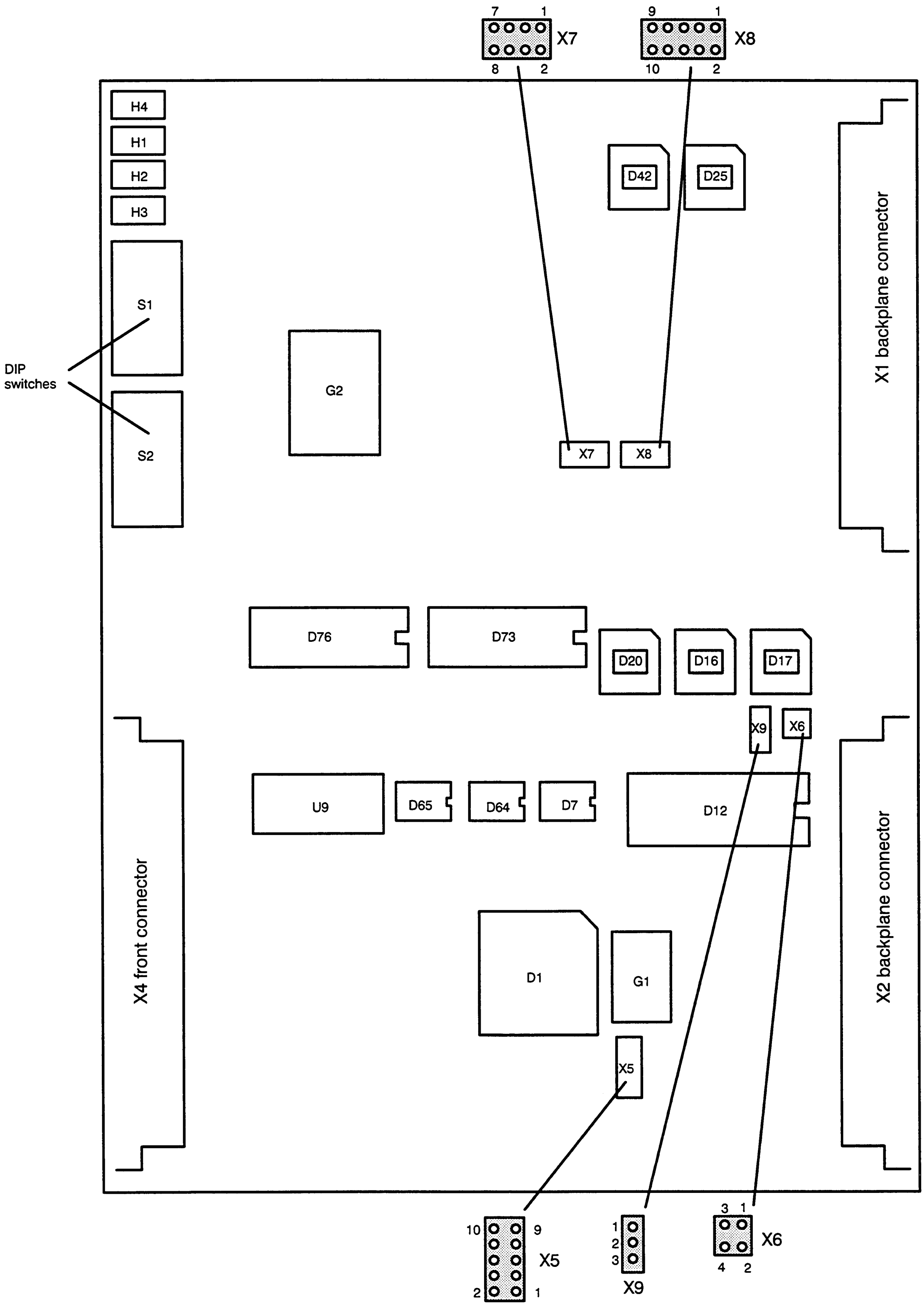


Fig. 2.1 Location of the pin strips for jumper setting

2.2.1 Mode

- Functions

The N−AS module can be used in various systems. Its functions must therefore be adapted to the system in which it is to be used. The mode is defined by the coding jumpers on pin strips X6, X7 and X9 of the N−AS module.

Functions/System	X9 (1, 2)	X9 (2, 3)	X6 (3 1 / 4 2)	X7 (7 1 / 8 2)	Insertion check see table 2.3	Local bus plug pin d16−d18	AS version/ edition
N8−H: AS 220 EA	1	0	1 0	1) 0 0 0 1	with	jumpered	–
AS 220 EAI	1	0	1 0	1) 0 0 0 1	with	jumpered	–
AS 220 EHF	1	0	1 0	0 0 0 1	with	jumpered	C01
AS 235 H	1	0	1 0	0 0 0 1	with	jumpered	F3.02
N8: AS 215	1	0	1 0	0 1 1 0	without	irrelevant	–
AS 220 E	1	0	1 0	0 1 1 0	without	irrelevant	–
AS 235	1	0	1 0	0 1 1 0	without	irrelevant	–
AS 235 K	1	0	1 0	0 1 1 0	without	irrelevant	–
MS 236	1	0	1 0	0 1 1 0	without	irrelevant	–
MS 236 K	1	0	1 0	0 1 1 0	without	irrelevant	–
BK−N8: Bus coupler	1	0	1 0	0 1 1 0	without	irrelevant	–

0 = Jumper not inserted
1 = Jumper inserted
x = Not relevant

1) Jumper setting of X7/7−8: See the Instructions of the I/O bus control module 6DS1 332−8AA (EAS). If the Instructions of previous revision levels do not contain any information on said jumper setting, the standard setting applies (i.e. 0=jumper not inserted)

Table 2.1 Mode selection

- DMA range

The DMA range of the N−AS/N−BK module is selected by jumpers on the X8 pin strip.

Functions / System	X8 (9 1 / 10 2)
N8−H: AS 220 EA	0 x x x x
AS 220 EAI	0 x x x x
AS 220 EHF	0 x x x x
AS 235 H	1 1 1 1 1 1) 1 1 0 0 0 2) 1 0 1 0 0 3)
N8: AS 215	0 x x x x
AS 220 E	0 x x x x
AS 235, AS 235 K	1 1 1 1 1 1) 1 1 0 0 0 2) 1 0 1 0 0 3)
MS 236, MS 236 K	1 1 1 1 1
BK−N8: Bus coupler	0 x x x x

0 = Jumper not inserted
1 = Jumper inserted
x = Not relevant

1) From system software version <F.03
2) From system software versions F.03 to <F.03.02
3) From system software version F.03.02

Table 2.2 Selecting the DMA range

2.2.2 Insertion Check for Local Bus Connector

The N–AS module enables the local bus connector to be monitored, provided that a jumper (d16–d18) in the local bus connector has been retrofitted *). The N–AS module monitors this jumper and activates signal F_N on pin d12 of the X2 backplane connector (see Chapter 3.2) if the local bus connector has not been inserted.
The reaction of the automation system to this signal is discussed in the individual manuals of the systems.

The coding jumper from X5/9–10 pin strip must be inserted when no jumper is plugged in the local bus connector **).

The link d16–d18 of the local bus cable is established on the N–AS with the inserted coding jumper; the monitoring software always recognizes an inserted local bus connector.

Local bus connector insertion check	X5 (pins 9 … 1 / 10 … 2)	Local bus connector pin d16 / pin d18
with insertion check	00000	jumpered
without insertion check	10000	not relevant

0 = jumper not inserted
1 = jumper inserted

Table 2.3 Selecting the insertion check function

*) Since manufacturing date 6.96 the jumper is already inserted.
**) State of delivery from factory.

Caution

The two screws of the local bus connector provide a tight connection between module (see Fig. 1.2) and subrack. EMC reasons require both screws to be tightened. Failure to do so will reduce the signal–to–noise ratio of data transmission.

2.2.3 Address on the CS 275 Bus System

Each local bus interface module must have its own unique participant address (TA) in order to enable the individual participant to be distinguished in an autonomous bus system. It must also have a bus address (BA) that identifies the buses that have been interlinked via bus coupler modules. Both addresses are set by DIP switches on the front panel; they may be changed during operation (see Chapter 3.1). A new address is accepted when the ÜB switch is actuated.

Both N–AS modules have the same bus and participant addresses if they are used in a redundant application of an AS 220 EA, AS 220 EAI, AS 220 EHF or AS 235 H automation system.

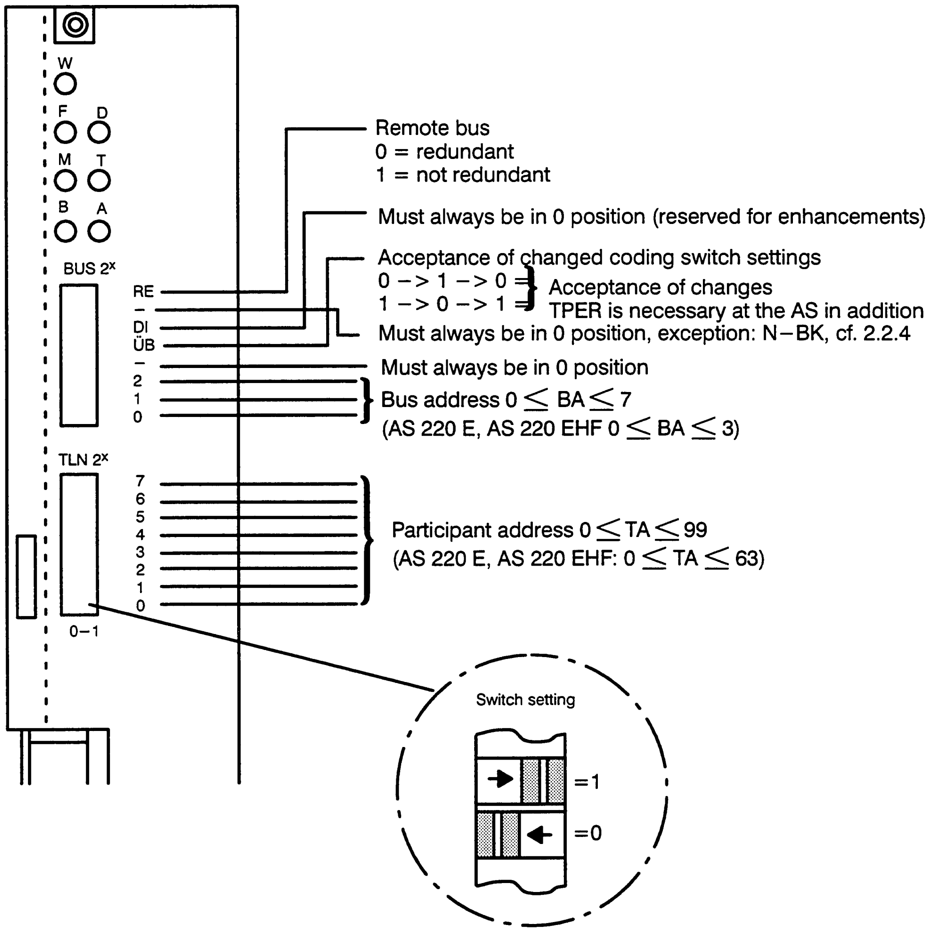


Fig. 2.2 Coding switches

2.2.3.1 Participant Address (TA)

The binary coded participant address is selected by the eight bottom DIP switches (Fig. 2.2).

Setting range: $0 \leq TA \leq 99$ (AS 220 E, AS 220 EHF: $0 \leq TA \leq 63$)

The transmitter participant address must always be ≤ 31 if a common data (CD) link is used.

2.2.3.2 Bus Address (BA)

The binary coded bus address is selected by the three bottom DIP switches of the upper switch row.

Setting range: $0 \leq BA \leq 7$ (AS 220 E, AS 220 EHF: $0 \leq BA \leq 3$)

> ⚠ **Warning**
>
> Setting BA=0 and TA=0 at the same time is **not** permitted.

2.2.3.3 Bus Redundancy (RE)

The CS 275 bus system permits operation on a redundant or a single–structured remote bus. The required mode can be selected by the RE switch (see Fig. 2.2).

Setting: 0 = redundant remote bus
1 = non–redundant remote bus

2.2.3.4 Acceptance (ÜB)

Actuating the ÜB switch (see Fig. 2.2) accepts the switch settings that have been changed (e.g. during running operation).

Acceptance: 0 –> 1 –> 0
or
1 –> 0 –> 1

Then TPER must be entered at the AS (see Note in Chap. 3.1: Modifications via DIP switches).

2.2.4 Redundant/Parallel Bus Coupler

If two bus couplers are used redundantly or in parallel, "redundant/parallel bus coupler mode" must be set on **both** N–BK modules (6DS1 223–8AB) of the **second** bus coupler (see Fig. 2.4, BATA 1/6 and 2/12).

The "simple" bus coupler mode (RP =0) must be set on the two N–BK modules of the other bus coupler (see Fig. 2.4, BATA = 1/5 and 2/10).

To do so, set the DIP switch RP to 1 on the upper DIP switch row (see Fig. 2.3).

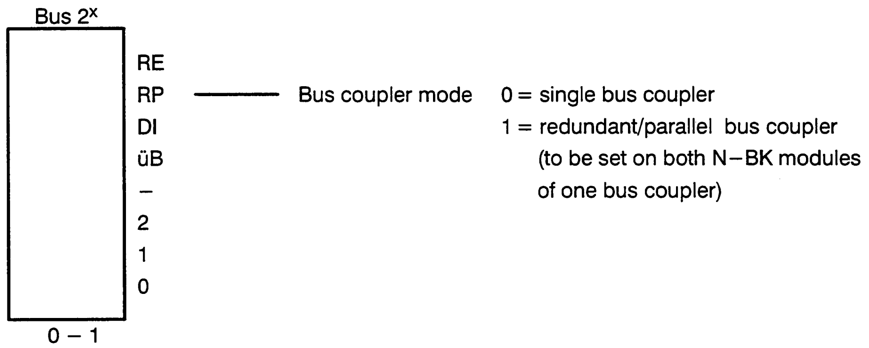


Fig. 2.3 Upper DIP switch row on the front panel of the N–BK

The two bus couplers must have different participant addresses (see Fig. 2.4).

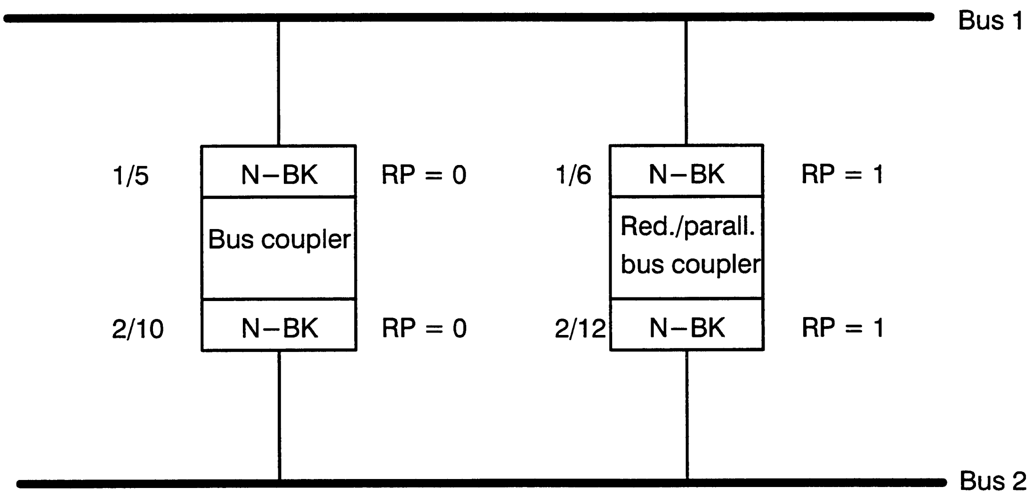


Fig. 2.4 Example for the allocation of bus and participant addresses with a redundant/parallel bus coupler

> ⚠ **Caution**
>
> All the bus coupler modules (N–BK or BK–N8) used to link two buses (e.g. bus 2 and bus 1) of a CS 275 bus system must have the same type and the *same* release version.
> When two bus couplers are used for coupling (redundant/parallel bus coupler) use 4 *identical* bus coupler modules (e.g. 4 N–BK or 4 BK–N8). See also Catalog PLT 130 or Fig. 2.4.
> A mixed mode (e.g. single set coupler with 2 BK–N8 and redundant/parallel set coupler with 2 N–BK) is only permissible for a short time (during upgrading or repair).
> Another module type (e.g. N–BK between bus 2 and bus 1 as well as BK–N8 between bus 2 and bus 3) can be used for coupling with the same bus system.

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3 Operation

During operation, message transmission and reception in the local bus interface module is controlled by program blocks that are executed in the system's central processor module (CPU). Manual control of the N–AS module is usually not necessary.

3.1 Settings during Operation

Any parameters that can be selected on the front panel may be changed during operation (see below for exceptions). In order to avoid malfunctions caused by interim states (e.g. conflicting addresses), the N–AS module enters an idle state after the first switch has been actuated. The operator must actuate the ÜB switch (see Fig. 2.2) to accept the new switch settings.

Setting: 0 –> 1 –> 0 or 1 –> 0 –> 1 } Acceptance of the set parameters

TPER must then be entered at the AS system (see Note below).

> ⚠ Caution
>
> Setting the bus and participant address:
>
> The bus and participant address of the AS 220 E and AS 220 EHF systems may **not** be modified during operation.
>
> It must be ensured prior to commissioning of the AS 220 E and AS 220 EHF systems that the bus and participant address set on the N–AS are identical to the bus and participant address set on the I/O bus control module 6DS1 312–8AB.

> ⚠ Caution
>
> Set the DIP switch DI to 0 before inserting the module; **only** service personnel may modify this setting during operation.

> ⚠ Caution
>
> After modifications have been entered via DIP switches, TPER must be entered at the AS (configuration keyboard). This ensures a smooth communication restart with the new settings.

3.2 Meaning of the LEDs

The seven LEDs on the front panel inform about operation and enable swift fault diagnosis.

The following indications can be expected in normal faultless operation with message exchange:

W	Indicator is OFF	
F	Weak cyclic flashing of indicator (no malfunction)	
T	Indicator is almost permanently ON	
D, M	Indicator is flashing	
A, B	Indicators are statically ON	–> active bus
	Indicators flash briefly	–> passive bus

Note: Not every deviation from these indications results from a malfunction.

Meanings in detail

'W' (yellow) = Service: For service personnel only
Diagnosis information that occurs during normal operation has been stored.

'F' (red) = Fault: Fault indication
The F indicator is permanently ON if there is a fault on the local bus or on the module.
Possible faults are:
- Receive buffer overflow (e.g. defective interface processor)
- Transmitted data does not agree with received data (e.g. defective line driver)
- Incorrect mode selection (see Chapter 2.2.1)

> **Caution**
>
> The F indicator cyclically flashes weakly during normal operation. This is due to internal tests and does not indicate a malfunction.

'D' (green) = Data: General data transfer
The D indicator is ON when useful data messages are transmitted via the bus.

'M' (green) = Master: N–AS module is bus master
The M indicator is ON as long as the N–AS module has mastership assigned.

'T' (green) = Busy: The 80C188 interface processor performs read cycles.

'A' (green) = Bus A: Bus A is the active bus. [1]

'B' (green) = Bus B: Bus B is the active bus. [1]

[1] A or B indicator are permanently ON when they indicate the active bus. Brief flashing identifies the passive bus.

3.3 Maintenance

3.3.1 Preventive Maintenance

Preventive maintenance is not required.

3.3.2 N–AS/N–BK Connector Pin Assignment

	d	b	z
2		0 V	+5 V
4		PESP	
6	ADB12	ADB0	CPKL_N
8	ADB13	ADB1	MEMR_N
10	ADB14	ADB2	MEMW_N
12	ADB15	ADB3	RDY_N
14		ADB4	DB0
16		ADB5	DB1
18		ADB6	DB2
20		ADB7	DB3
22		ADB8	DB4
24		ADB9	DB5
26		ADB10	DB6
28		ADB11	DB7
30			
32		0 V	

Table 3.1 X1 backplane connector

	d	b	z
2	BKHLDA_N	0 V	+5 V
4	BKPRIO	BKINTE	BKADB0
6	IRPAE_N 1)	BKHOLD_N	BKADB1
8	BKRS	BKMEMR_N	BKADB2
10	INTE 1)	BKMEMW_N	BKADB3
12	F_N	BKDB0	BKADB4
14	MAST_N	BKDB1	BKADB5
16	UMF_N	BKDB2	BKADB6
18	RDYS_N	BKDB3	BKADB7
20	HLDA0_N 2)	BKDB4	BKADB8
22	BUSEN 1)	BKDB5	BKADB9
24		BKDB6	BKADB10
26		BKDB7	BKADB11
28	HLDA1_N 3)	BKPESP	BKADB12
30		BKADB15	BKADB13
32	HOLD_N 2)	0 V	BKADB14

Table 3.2 X2 backplane connector

1) and 2) X2 signals in conjunction with an MC 210

2) X2 signals in conjunction with an AS/OS processor

3) signal with priority allocated for additional modules with DMA capability

BK... signals for bus coupler unit

	d		b	z
2	0 V		SA 0	Screen
4	0 V		SA 1	Screen
6	0 V		SB 0	Screen
8	0 V		SB 1	Screen
10	0 V		DA 0	Screen
12	0 V		DA 1	Screen
14	0 V		DB 0	Screen
16	0 V	1)	DB 1	Screen
18	EK_N	1)	BA 0	Screen
20			BA 1	Screen
22			BB 0	Screen
24			BB 1	Screen
26			TA 0	Screen
28			TA 1	Screen
30			TB 0	Screen
32			TB 1	Screen

Table 3.3 X4 front connector

SA 0, 1 = control signal	bus A
SB 0, 1 = control signal	bus B
DA 0, 1 = data	bus A
DB 0, 1 = data	bus B
BA 0, 1 = qualifier	bus A
BB 0, 1 = qualifier	bus B
TA 0, 1 = clock	bus A
TB 0, 1 = clock	bus B

1 = signal forward line

0 = signal return line (0 V reference earth)

1) The connector pins d18 (EK_N) and d16 (0 V) must be linked by a wire jumper in the local bus connector if local bus connector insertion check is to be enabled. Either the jumper must be retrofitted or insertion check must be disabled by inserting jumper X5/9–10 (see Chapter 2.2.2).

3.3.3 Troubleshooting

The alarms may be used for determining whether or not there is a malfunction in the N–AS module (see corresponding AS Manual).

First check the selected mode (Chapter 2.2.1) if the F indicator is permanently ON. If the mode is correct, verify the hardware selection of the bus and participant address. A participant address on an autonomous bus may not be duplicated (exception: the addresses of two redundant N–AS modules are identical). In an AS 220 E and AS 220 EHF system, it must also be guaranteed that the bus and participant addresses that have been selected on the N–AS module are identical to the bus and participant address that have been selected in the I/O bus interface modules 6DS1312–8AB.

There is a hardware fault in the system and the N–AS module should be replaced if the F indicator is permanently ON and the T indicator permanently OFF.

The local bus protocol is disturbed if the F indicators on **all** local bus interface modules flash visibly. Remove the local bus connector from the N–AS module in order to check whether the N–AS module is the cause of the malfunction. The N–AS module is defective and should be replaced if the F indicator continues flashing at the same frequency and brightness after the local bus connector has been removed. Please remember that the F indicator cyclically flashes weakly during normal faultless operation (see Chapter 3.2).

For troubleshooting and fault elimination after a communications malfunction, first enter the command "TPER" from the local operator position in order to reset all local bus interface modules (see Note in Chap. 3.1: Modifications via DIP switches), and reset all inductive bus converter modules (UI) by pressing the individual reset pushbuttons. Check the function of all bus lines and bus converter modules (UI) if the fault persists.

Please refer to the Chapter "System Summary" in the CS 275 Manual if you need additional advice on possible malfunctions in the CS 275 bus system.

In addition thereto, the following applies to the AS 220 EA, AS 220 EAI, AS 220 EHF and AS 235 H systems:
The master N–AS module is de–activated and an I&C alarm issued after a fault has occured (e.g. failure of the master central processing unit or malfunction of the master N–AS module). The standby N–AS module is reset before it is automatically parameterized by the CPU. The standby N–AS module then becomes master N–AS.
The system that is affected by the malfunction may lose received and transmitted messages for a period of one or two seconds when mastership is transferred.

The central unit issues an alarm if a fault occurs during execution of the self–test programs in the passive N–AS module.

3.3.4 Fault Elimination

One of the two N–AS modules may be replaced in on–line operation if the N–AS modules are used in a redundant configuration. The automation system then selects the second faultless N–AS module. The voltage to the associated central processing unit/basic unit should be switched off before the N–AS module is removed (see Chapter 2). Switch on the voltage and re–commission the affected central processing unit/basic unit after the N–AS module has been replaced (see corresponding AS Manuals).

Send the defective modules and a precise description of the malfunction to the factory.

4 Appendix

4.1 Technical Data

Design	
Width	2 standard slots (2 SEP)
P.c.b. format (ES 902 packaging system)	233.4 mm x 160 mm
Processor	SAB 80C188
RAM	32 KB
EPROM	256 KB
Power supply	
Supply voltage	+ 5 V (– 3 % / + 5 %)
Rated current consumption	1.2 A
Interfaces	
Central unit interface	Parallel, 8–bit data bus, 16–bit address bus, TTL level, DMA capability
Local bus interface	Redundant local 20–m bus output, serial, wired–or, asymmetrical, isolated
Level for local bus interface	
Input	$\geq$ 2.0 V corresponds to HIGH $\leq$ 0.8 V corresponds to LOW
Output	$\geq$ 2.7 V corresponds to HIGH $\leq$ 0.7 V corresponds to LOW
Baud rate	340 kbit/s (autonomous local bus) 250 kbit/s (operation via inductive converter module)
Participant on the local 20–m bus	Max. 9 (UI is counted as a participant) The reference potential difference (electronics 0 V) between any two participants on the local bus must not exceed 0.2 V
Data protection	Block parity (hamming distance Hd=4)
Mode	Half–duplex
Weight	Approximately 0.4 kg

4.2 Module Slots

4.2.1 AS 235 H

4.2.1.1 AS 235 H, Redundant Central Unit

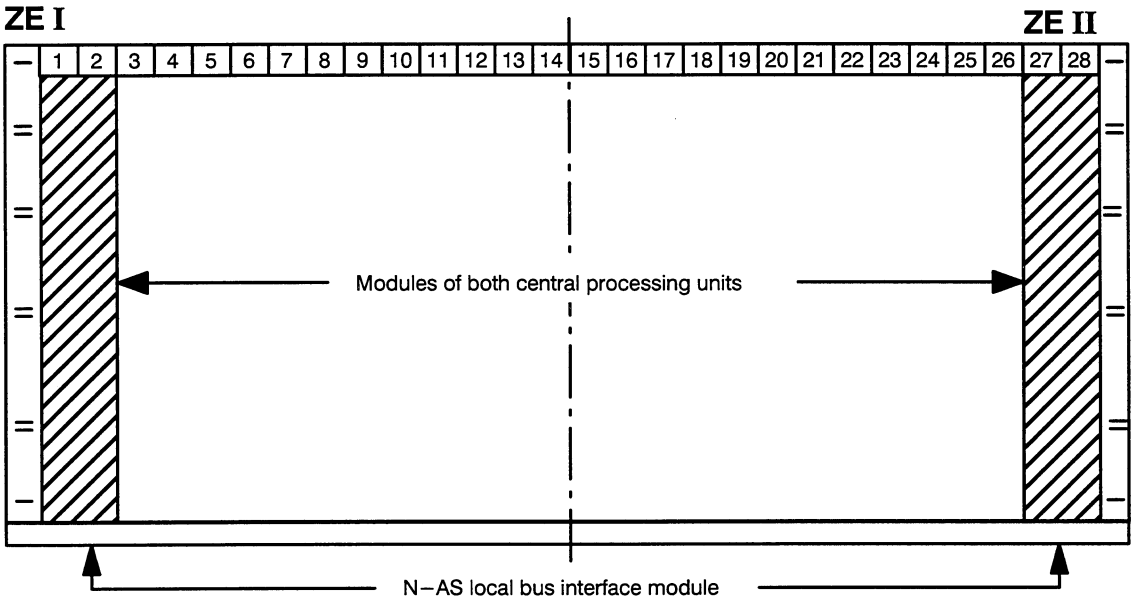


Fig. 4.1 Slots in the basic unit of the AS 235 H system; redundant central unit

4.2.1.2 AS 235 H, Non–redundant Central Unit

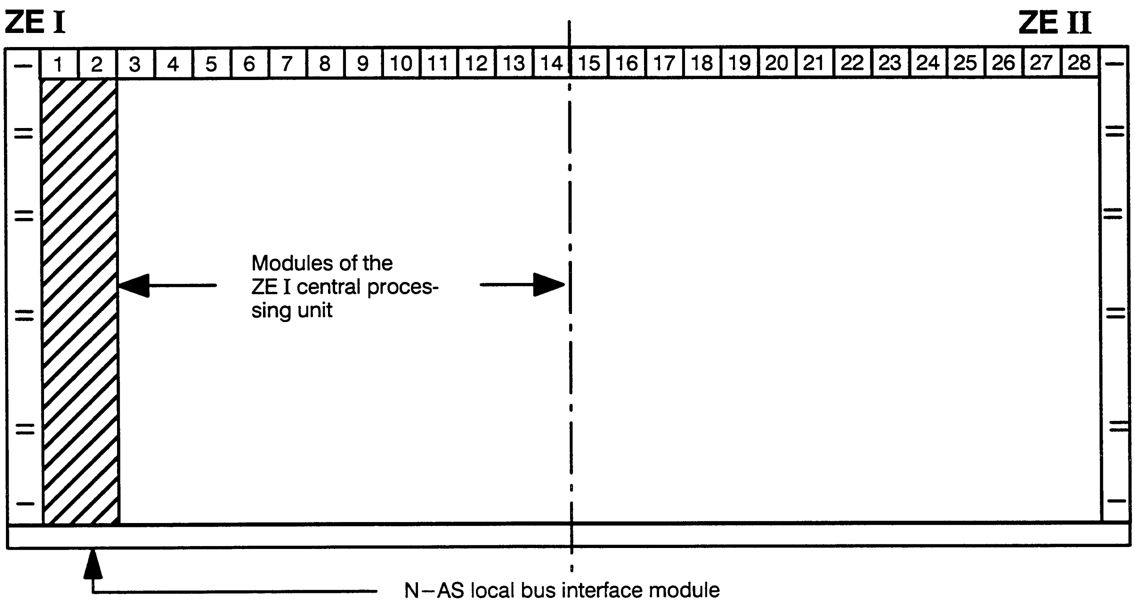


Fig. 4.2 Slots in the basic unit of the AS 235 H system; non–redundant central unit

4.2.2 AS 220 EHF

ZE II and ZE III contain one N–AS module each.

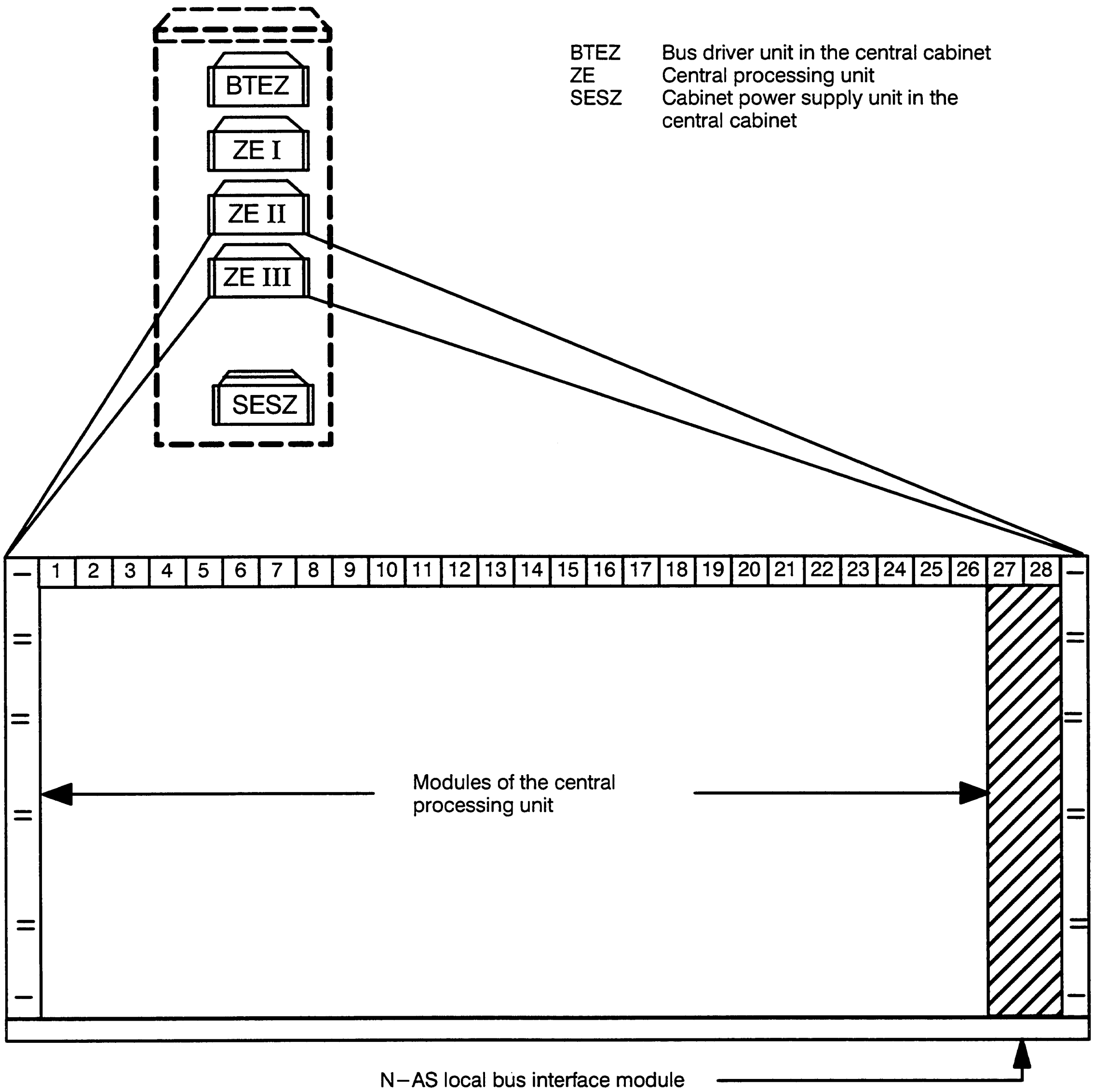


Fig. 4.3 Slot in the central processing units ZE II and ZE III of the AS 220 EHF system

4.2.3 AS 220 EA, AS 220 EAI

In a redundant configuration, one N–AS module is installed in each of the two basic units.

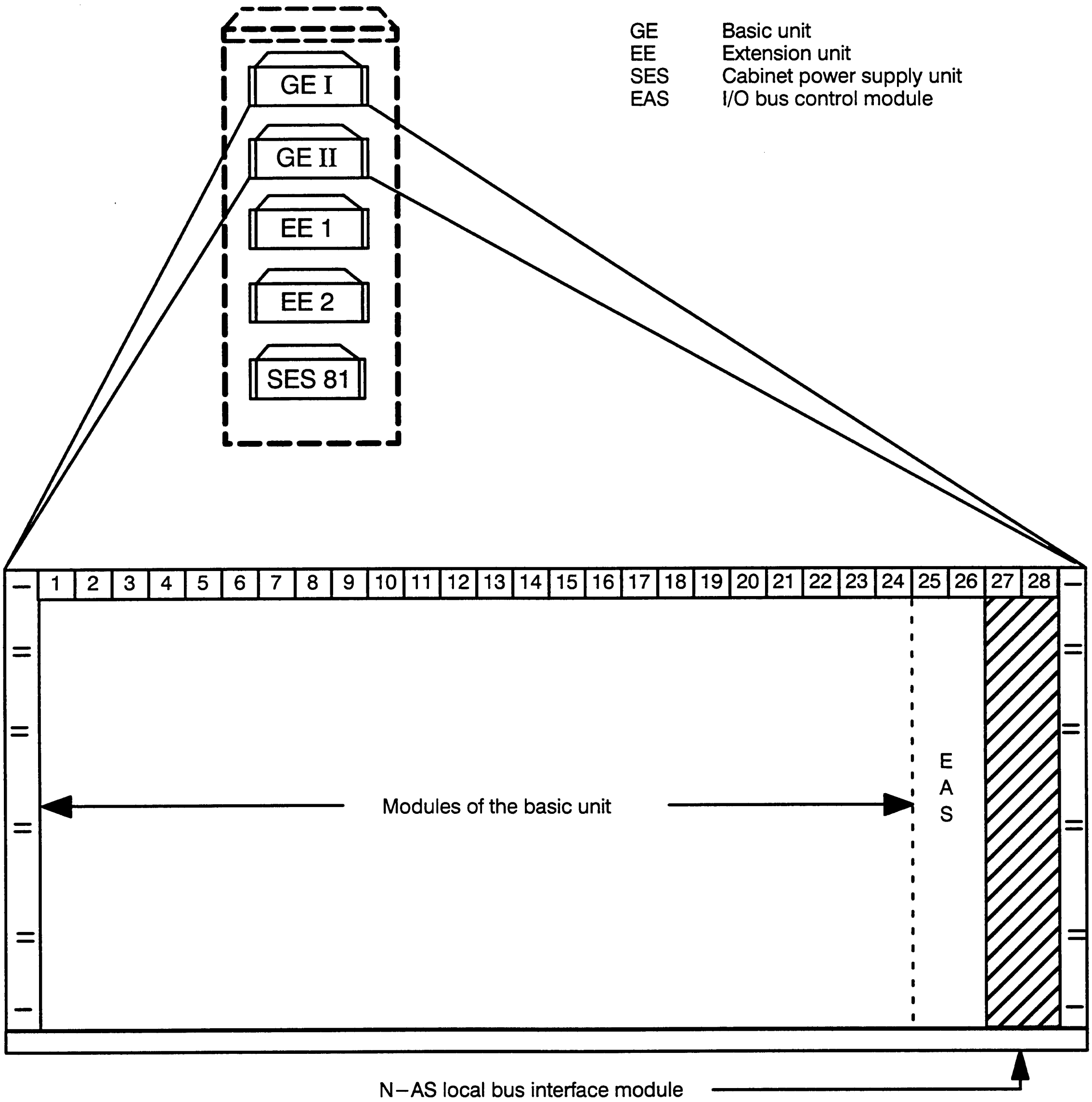


Fig. 4.4 Slot in the AS 220 EA, AS 220 EAI system

Note: With the EAS 6DS1 322 the local bus interface is already integrated and described in the AS Manual C79000–G8076–C455.

4.2.4 AS 215

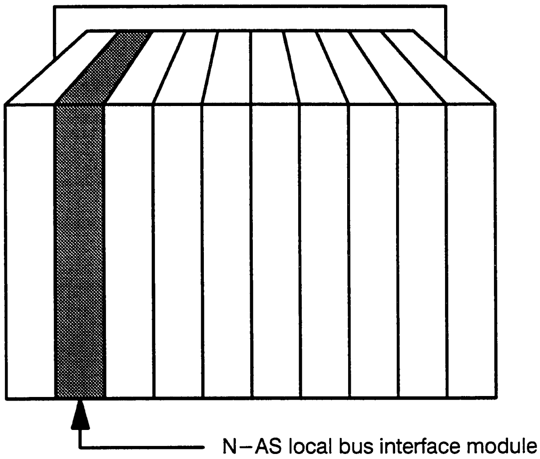


Fig. 4.5 N–AS slot in the central controller of the AS 215

4.2.5 AS 220 E

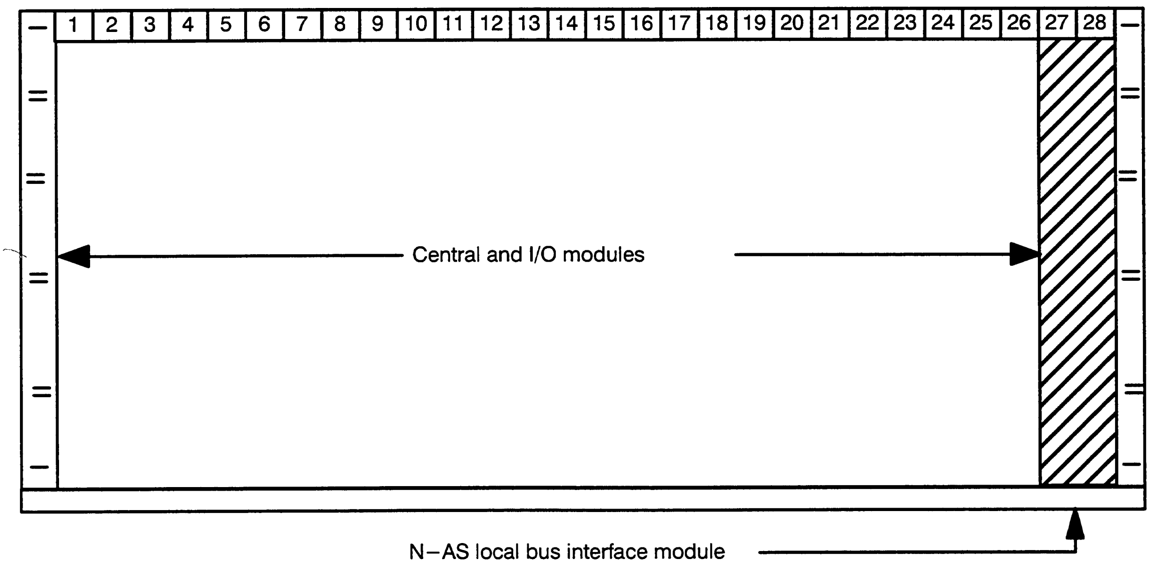


Fig. 4.6 Slot in the basic unit of the AS 220 E system

4.2.6 AS 235, AS 235 K, MS 236, MS 236 K

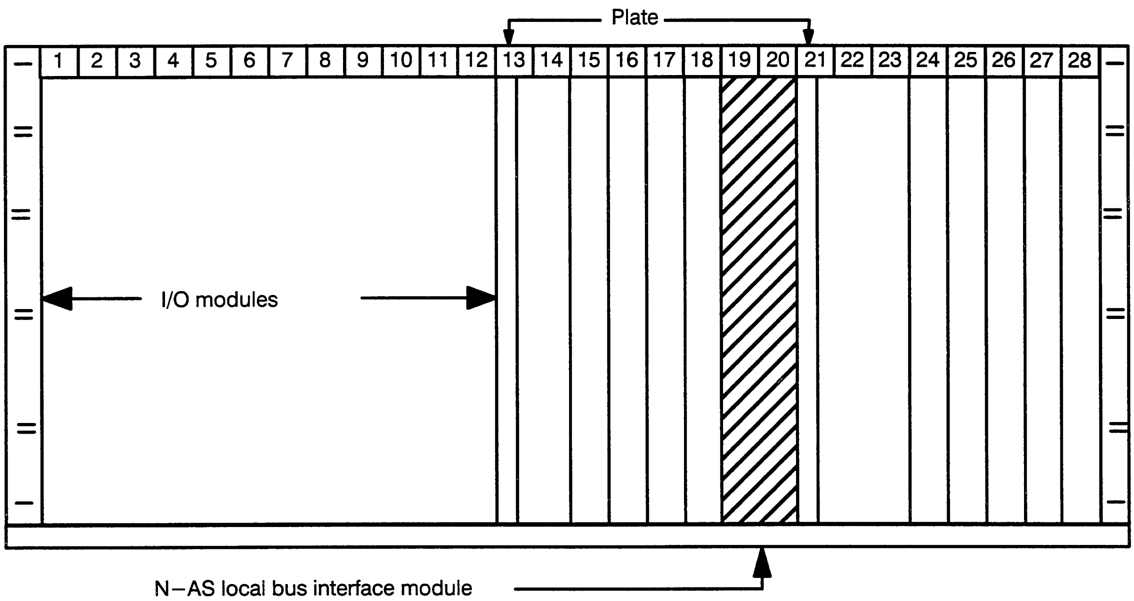


Fig. 4.7 Slot in the basic unit of the AS 235, MS 236 system and in the basic unit of the AS 235 K, MS 236 K (location BC 109)

4.2.7 Bus Coupler

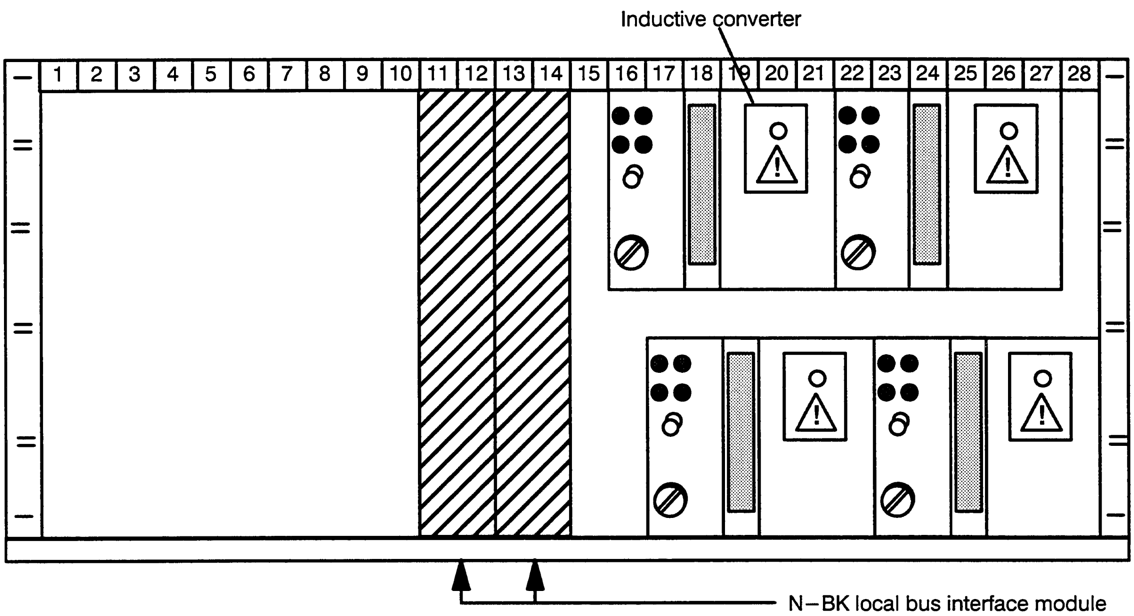


Fig. 4.8 Slots of the N–BK in the bus coupler units local bus/remote bus and remote bus/remote bus

4.3 Abbreviations

AKS	Analog linking transmitter block
AS	Automation system
BA	Bus address
BIL	Bus interface logic
BK	Bus coupler unit
BK–N8	Local bus interface module for bus coupler
BTEZ	Bus driver unit in the central cabinet
CD	Common data
CPU	Central processor module
CS 275	TELEPERM M/ME bus system
DIP	Dual–in–line package (coding switch)
DMA	Direct memory access
EE	Extension unit
EGB	Electrostatically sensitive module
EMV	Electro–magnetic compatibility
EPROM	Erasable programmable read only memory
GE	Basic unit
GT	Isolator
Hd	Hamming distance
H system	Fault–tolerant automation system
LED	Light–emitting diode
N	Local bus interface module (in general)
N–AS	Local bus interface module for AS
N–BK	Local bus interface module for bus coupler
NRZ	Non return to zero (code for binary signals)
N8	Local bus interface for AS
N8–H	Local bus interface for AS
OS	Operator communication and monitoring system
RAM	Random access memory
ROM	Read only memory
SEP	Standard slot (1 SEP = 15.24 mm)
SES	Cabinet power supply unit
SESZ	Cabinet power supply unit in the central cabinet
SMD	Surface–mounted device

TA	Participant address
TPER	Command: reset local bus interface (reset transfer processor unit)
TTL	Transistor–transistor–logic
UI	Inductive converter
ZE	Central processing unit

Please pay attention to the notes concerning the

N–AT Variants

in register ”Warning, Information”

SIEMENS

TELEPERM M/ME

Local Bus Interface Module N–AT

(ISA–Bus, AT Short Format)

Instruction Manual

Warning!
Electrostatic sensitive device!

Issue July 1994

Release 1.0

Warning

Hazardous voltages are present in this electrical equipment during operation.
Failure to property maintain the equipment can result in death, severe personal injury or substantial property damage.
The instructions contained in this manual have to be followed.

- Commissioning shall be performed only by qualified personnel.
- Always de–energize the personal computer before maintenance.

Contents

Note:

These instructions do not purport to cover all details in equipment, nor to provide for every possible contingency to be met in connection with operation.
Should further information be desired or should particular problems arise which are not covered sufficiently for the Purchaser's purposes, the matter should be referred to the local Siemens Sales Office.
The contents of this instruction manual shall not become part or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

☞ We wish to provide you with the best possible documentation. If you have any problems with this instruction manual, please inform us. We welcome any suggestions for improvement. A form can be found at the end of this document. In urgent cases, call our hotline on **49–9131–7–22888 (from outside Germany).

0 Safety-Related Guidelines and ESD Guidelines

0.1 Safety–Related Guidelines for the User

0.1.1 General

This manual provides the information required for the intended use of the particular product. The documentation ist written for technically qualified personal such as engineers, programmers or maintenance specialists who have been specially trained and who have the specialized knowledge required in the field of instrumentation and control.

A knowledge of the safety instructions and warnings contained in this manual and their appropriate application are prerequisites for safe installation and commissioning as well as safety in operation and maintenance of the product described. Only qualified personal as defined in section 0.1.2 have the specialized knowledge that is necessary to correctly interpret the general guidelines relating to the safety instructions and warnings and implement them in each particular case.

This manual is an inherent part of the scope of supply even if, for logistic reasons, it has to be ordered separately. For the sake of clarity, not all details of all versions of the product are described in the documentation, nor can it cover all conceivable cases regarding installation, operation and maintenance. Should you require further information, please contact your local Siemens office.

We would also point out that the contents of this product docmentation shall not become a part or modify any prior or existing agreement, commitment or legal relationship. The Purchase Agreement contains the complete and exclusive obligations of Siemens. Any statements contained in this documentation do not create new warranties or restrict the existing warranty.

0.1.2 Qualified Personnel

Persons who are **not qualified** should not be allowed to handle the equipment/system. Noncompliance with the warnings contained in this manual or appearing on the equipment itself can result in severe personal injury or damage to property. Only **qualified personal** should be allowed to work on this equepment/system.

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

- System planing and design engineers who are familar with the safety concepts of automation equipment;
- Operating personnel who have been trained to work with automation equipment and are conversant with the contents of the manual in as far as it is connected with the actual operation of the plant:
- Commissioning and service personnel who are trained to repair such automation equipment and who are authorized to energize, deenergize, clear, ground and tag circuits, equipment and systems in accordance with established safety practices.

0.1.3 Danger Notices

The notices and guidelines that follow are intended to ensure personal safety, as well as protecting the product and connected equipment against demage.

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

Danger

indicates that death, servere personal injury or substantial property damage <u>will</u> result if proper precautions are not taken.

Warning

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

Caution

indicates that minor personal injury or propety damage <u>can</u> result if proper precautions are not taken.

Note

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

Important

If in this manual "important" should appear in bold type, drawing attention to any particualry information, the definition corresponds to that of "Warning", "Caution" or "Note".

0.1.4 Proper Usage

- The equipment/system or the system components may only be used for the applications described in the catalog or the technical description, and only in combination with the equipment, components and devices of other manufactures as far as this is recommended or permitted by Siemens.
- The product described has been developed, manufactured, tested and the documentation compiled in keeping with the relevant safety standards. Consequently, if the described handling instructions and safety guidelines described for planing, installation, proper operation and maintenance are adhered to, the product, under normal conditions, will not be a source of danger to property or life.

Warning

- After opening the housing or the protective cover or after opening the system cabinet, certain parts of this equipment/system will be accessible, which could have a dangerously high voltage level.
- Only suitably qualified personnel should be allowed access to this equipment system.
- These persons must be fully conversant with any potential sources of danger and maintenance measures as set out in this manual.
- It is assumed that this product be transported, stored and installed as intended, and maintained and operated with care to ensure that the product functions correctly and safely.

0.1.5 Guidelines for the Planing and Installation of the Product

The product generally forms part of larger systems or plants. These guidelines are intended to help integrate the product into its enviroment without constituting a source of danger.

The following facts require particular attention:

Note

Even when a high degree of safety has been designed into an item of automation equipment by means of multichannel configuration, it is still imperative that the instructions contained in this manual be exactly adhered to. Incorrect handling can render ineffective the preventive measures incorporated into the system to protect it against dangerous faults, and even create new sources of danger.

The following advice regarding installation and commissioning of the product should – in specific cases – also be noted.

Warning

- Follow strictly the safety and accident prevention rules that apply in each particular case.
- Units which are designed as built-in units may only be operated as such, and table-mounted or portable equipment only with its casing closed.
- in the case of equipment with a permanent power connection wich is not provided with an isolating switch and/or fuses which disconnect all poles, a suitable isolating switch or fuses must bei provided in the building wring system (distribution board). Furthermore, the equipment must bei connected to a protective ground (PE) conductor.
- For equipment or systems with a fixed connecting cable but no isolating switch which disconnects all poles, the power socket with the grounding pin must be installed close to the unit and must be easily accessible.
- Before switching on the equipment, make sure that the voltage range setting on the equipment corresponds to the local power system voltage.
- In case of equipment operating on 24 V DC, make sure that the proper electrical isolation is provided between the mains supply and the 24 V supply. Only use power supply units to IEC 364–4–41 or HD 384.04.41 (VDE 0100 Part 410).
- Fluctuations or deviations of the power supply voltage from the rated value should not exceed the tolerances specified in the technical specefications. Otherwise, functional failures or dangerous conditions can occur in the electronic modules/equipment.
- Suitable measures must be taken to make sure that programs that are interrupted by a voltage dip or power supply failure resume proper operation when the power supply is restored. Care must be taken to ensure that dangerous operating conditions do not occur even momentarily. If necessary, the equipment must be forced into the "emergency off" state.
- Emergency tripping devices in accordance with EN 60204/IEC204 (VDE 0113) must be effective in all operating modes of the automation equipment. Resetting the emergency off device must not result in any uncontrolled or undefined restart of the equipment.

Caution

- Install the power supply and signal cables in such a manner as to prevent inductive and capacitive interference voltages from affecting the automation functions.
- Automation equipment and its operating elements must be instaled in such a manner as to prevent unintentional operation.
- Automation equipment can assume an undefined state in the case of a wire break in the signal lines. To prevent this, suitable hardware and software measures must be taken when interfacing the inputs and outputs of the automation equipment.

0.1.6 Active and Passive Faults in Automation Equipment

- Depending on the particular task for which the electronic automation equipment is used, both **active** as well as **passive** faults can result in a **dangerous** situation. For example, in drive control, an active fault is generally dangerous because it can result in an unauthorized startup of the drive. On the other hand, a passive fault in a signalling function can result in a dangerous operating state not being reported to the operator.
- This differentiation of the possible faults and their classification into dangerous and nondangerous faults, depending on the particular task, is important for all safety considerations in respect of the product supplied.

Warning

In all cases where a fault in an automation equipment can result in severe personal injury or substntial damage to property, ie. where a dangerous fault can occur, additional external measures must be taken or equipment provided to ensure or force safe operating conditions even in the event of a fault (e. g. by means of independent limit monitors, mechanical interlocks etc.)

0.1.7 Procedures for Maintenance and Repair

If measurement or testing work is to be carried out on an active unit, the rules and regulations contained in the "VBG 4.0 Accident prevention regulations" of the German employers liability assurance association (Berufsgenossenschaften) must be observed. Particular attention is drawn to paragraph 8 "Permissible exceptions when working on live parts". Use only suitable electrical tools.

Warning

- Repairs to an item of automation eqipment may only be carried out by **Siemens service personnel** or an **authorized Siemens repair center**. For replacement purposes, use only parts or components that are contained in the spare parts list or listed in the "Spare parts" section of this manual. Unauthorized opering of equipment and improper repairs can result in loss of life or severe personal injury as well as substantial property damage
- Before opering the equipment, always remove the power plug or open the disconnecting switch.
- Only use the fuse types specified in the technical specifications or the maintenance instructions of this manual.
- Do not throw batteries into an open fire and do not carry out any soldering work on batteries (danger of explosion). Maximum ambient temperature 100°C. Lithium batteries or batteries containing mercury should not be opened or recharged. Make sure that the same type is used when replacing batteries.
- Batteries and accumulators must be disposed of as classfied waste.
- The following points require attention when using monitors:
  Improper handling, especially the readjustment of the high voltage or fitting of another tube type can result in excessive X-ray radiation from the unit. The incense to operate such a modified unit automatically lapses and the unit must not be operated at all.

0.2 Guidelines for Handling Electrostatically Sensitive Divices (ESD)

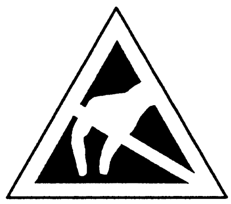
0.2.1 What is ESD?

VSLI chips (MOS technology) are used in practically all of our electronic modules. These VLSI components are, by their nature, very sensitive to overvoltage and thus to electrostatic discharge:

They are therefore defined as
"Electrostatically Sensitive Device".

"ESD" is the abbrevation used internationally.

The following warning label on the cabinets, subracks and packing indicates that electrostatically sensitive components, have been used and that the moduls concerned are susceptible to touch:



ESDs can be destroyed by voltage and energy levels which are far below the level perceptible to human beings. Such voltages already occur when a component or a module is touched by a person who has not been electrostatically discharged. Components which have been subjected to such overvoltages cannot, in most cases, be immediately detected as faulty; the fault occurs only after a long period in operation.

An electrostatic discharge

- of 3500 V can be felt
- of 4500 V can be heard
- must take place at a minimum of 5000 V to be seen.

But just a fraction of this voltage can already damage or destroy an electronic component.

The typical data of a component can suffer due to damage, overstressing or weakening caused by electrostatic discharge; this can result in temporary fault behavior, e.g. in the case of

- temperature variations,
- mechanical shocks,
- vibrations,
- change of load.

Only the consequent use of protective equipment and careful observance of the precautions for handling such components can effectively prevent functional disturbances and failures of ESD modules.

0.2.2 When is a Static Charge Formed?

One can never be sure that the human body or the material and tools which one is using are not electrotatically charged.

Small charges up to 100 V are very common; these can, however, very quickly rise up to 35 000 V!

Examples fo static charge:

– Walking on a carpet	up to	35 000 V
– Walking on a PVC flooring	up to	12 000 V
– Sitting on a cushioned chair	up to	18 000 V
– Plastic desoldering unit	up to	8 000 V
– Books etc. with a plastic binding	up to	8 000 V
– plastic bags	up to	5 000 V
– Plastic coffee cup	up to	5 000 V

0.2.3 Important Protective Measures against Static Charge

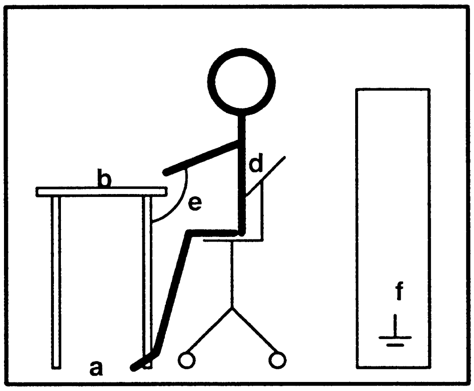
- Most plastic materials are highly susceptible to static charge and must therefore be kept as far away as possible from ESDs!
- Personnel who handle ESDs, the work table and the packing must all be carefully grounded!

0.2.4 Handling of ESD Modules

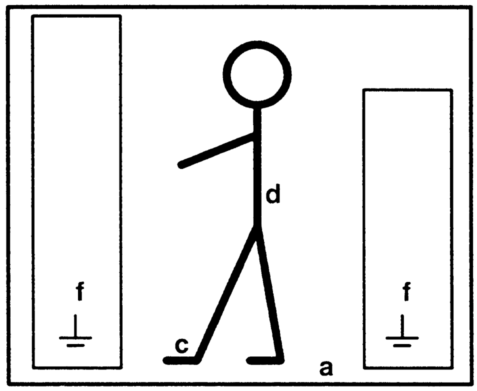
- One basic rule to be observed is that electronic modules should be touched by hand only if this is necessary for any work to be done on them. Do not touch the component pins or the conductors.
- Touch components only if
  - the person is grounded at all times by means of a wrist strap

  or
  - the person is wearing special anti-static shoes or shoes with a grounding strip.
- Before touching an electronic module, the person concerned must ensure that (s)he is not carrying any static chage. The simplest way is to touch a conductive, grounded item of equipment (e.g. a blank metallic cabinet part, water pipe, etc.) before touching the module.
- Modules shoud not be brought into contact with insulating materials or materials which take up a static charge, e.g. plastic foil, insulating table tops, synthetic clothing, etc.
- Modules should only be placed on conductive surfaces (table with anti-static table top, conductive foam material, anti-static plastic bag, anti-static transport container.)
- Modules should not be placed in the vicinity of visual display units, monitors or TV sets (minimum distance from screen > 10 cm).

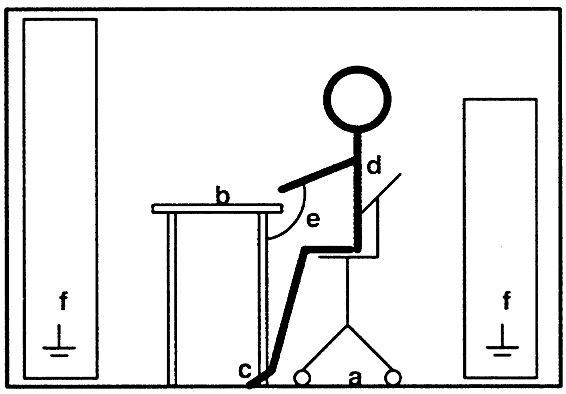
The diagram below shows the required protective measures against electrostatic discharge.



Sitting position



Standing position



Standing/sitting position

a Conductive flooring
b Anti-static table
c Anti-static shoes
d Anti-static coat
e Grounding wrist strap
f Grounding connection of the cabinets

0.2.5 Measurements and Modification to ESD Modules

- Measurements on modules may only be carried out under the following conditions:
  - the measuring equipment is grounded (e.g. via the PE conductor of the power supply system) or
  - when electrically isolated measuring equipment is used, the probe must be discharged (e.g. by touching the metallic casing of the equipment) before beginning measurements.
- Only grounded soldering irons may be used.

0.2.6 Shipping of ESD Modules

Anti-static packing material must always be used for modules and components, e.g. metalized plastic boxes, metal boxes, etc. for storing and dispatch of moduls and components.

If the container itself is not conductive, the modules must be wrapped in a conductive material such as conductive foam, anti-static plastic bag, aluminium foil or paper. Normal plastic bags or foils should not be used under any circumstances.

For modules with built-in batteries ensure that the conductive packing does not touch or short-circuit the battery connections; if necessary cover the connections with unsulating tape or material.

1 Description

1.1 Application

The CS 275 bus subsystem interconnects the individual components of the TELEPERM M/ME process control system. It ensures fast, reliable and noiseproof data transmission between these components. Other connections exist e.g. with the computers of the SICOMP system and with SIMATIC S5 (N–S5 interface module for SIMATIC AG S5–155U).

The N–AT local bus interface module allows connection of AT–compatible personal computers (PCs) to the 20 m local bus of the CS 275 bus subsystem. In this way, the TELEPERM M/ME system can benefit from the computing power and display capabilities of modern PCs.

The N–AT local bus interface module can be plugged in where an AT–compatible extension slot exists according to ISA standard or EISA standard; i.e. in all AT–compatible PCs and, for example, in the SICOMP WS30 work stations.
Always ensure that the electrical specification of the AT extension bus is complied with by the PC (true compatibility) and that the required slot is available.

The N–AT is constructed to the specifications of ISA norm IEEE P996. These specifications concern data access at an AT bus frequency of up to 8.333 MHz.
(Note: do not confuse the CPU frequency with the AT bus or ISA bus frequencies.)
Use of the N–AT at frequencies of up to 10 MHz is possible. As the norm does not specify these data accesses, timing deviations according to type of PC are possible. In this case, the PC in question should be tested with the N–AT first.

1.2 Design

The measurements of the N–AT are 165 mm x 99 mm. The length of 165 mm includes the material thickness of the front plate. The exact measurements are to be found in section 5.1, "Measuring diagram".

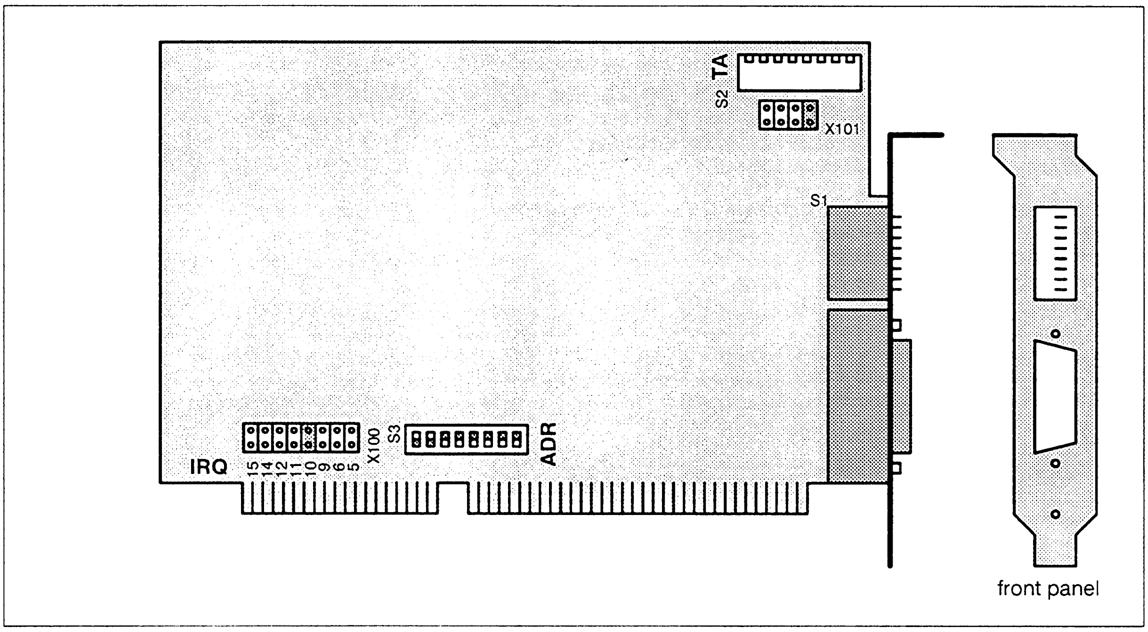


Figure 1.1 Design of the N–AT interface module

1.3 Principle of Operation

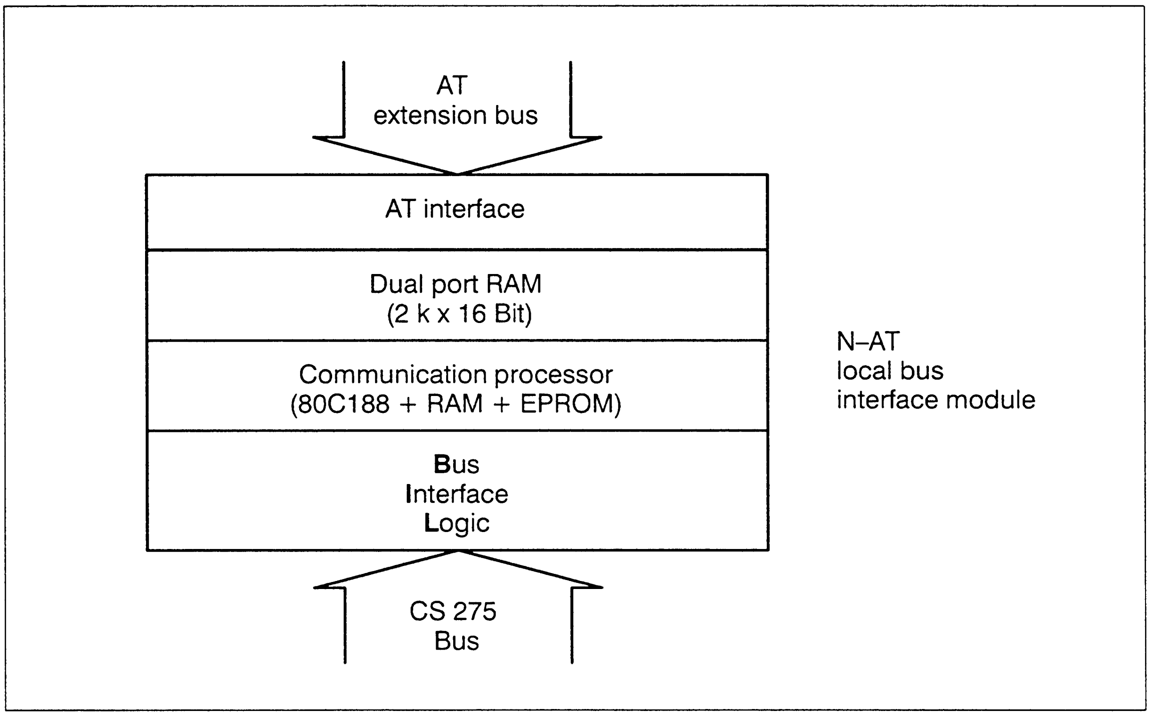


Figure 1.2 Functional elements of the N–AT interface module

The local bus interface module N–AT can be divided roughly into four blocks.

The **Bus Interface Logic** (BIL) contains the functions on the lower layers of the CS 275 bus protocol.
The sequence of operation is controlled by special receive and transmit sequencers. Serial–parallel conversion of the data is performed in two FIFO memories, where separation between the CS 275 bus clock and those of the interface elements also takes place.

The 80C188 **communication processor** transmits data between the BIL and the Dual Port RAM (DPR). It controls the operating of sequence, sets the relevant pointers and flags, monitors all functions of the module and coordinates the PC with the module.

The **Dual Port RAM** is the link between communication processor and PC. Here the transmit and receive buffers with their pointers and flags are stored and are accessible from both sides. The size of the DPR is 4*Kbyte structured as 2 k x 16 bit.

The **AT Interface** establishes connection to the AT extension bus. For the PC, the N–AT is an interface module with two 16 bit registers in the I/O address space. With the aid of the address register a 16 bit word in the DPR is selected. By addressing the virtual data register the selected 16 bit word is readable or writeable in the Dual Port RAM.

1.4 Technical Data

Order number	6DS1 222–8BA
Dimensions	165 mm x 99 mm (length including front panel) ISA short PCB
Weight	approx. 0,5 kg
Power supply	+5 V ±5% +12 V ±10%
Current consumption +5 V +12 V	typ. 0,6 A; max. 0,7 A typ. 110 mA; max. 140 mA

Interfaces

PC interface	ISA AT module location: Interface according to ISA norm IEEE P996 (up to 8.333 MHz). Use of the N–AT at frequencies of up to 10 MHz is possible. As the norm does not specify these data accesses, timing deviations according to type of PC are possible. In this case,the PC in question should be tested with the N–AT first. EISA AT module location: can be driven in ISA–capable EISA module locations.
Local bus interface	20 m–local bus input/output, redundant, wired–OR, asymmetrically floating
Level on 20 m local bus	Input: ≧2 V corresponds to High ≦0.8 V corresponds to Low Output: ≧2.7 V corresponds to High ≦0.7 V corresponds to Low
Transmission rate	340 Kbit/s (local bus) 250 Kbit/s (remote bus interfacing via inductive converter)
Users in 20–m–local bus	max. 9 (The converter inductive UI also counts as a user) (diff. voltage between M (ground lead) of devices ≦0.2 V!)
Data save	Horizontal parity (d = 4)
Mode of operation	Halfduplex

Ambient conditions

Temperature	
– Operation (inlet air)	0 °C to +55 °C
– Storage/transport	–40 °C to +70 °C
Relative humidity	
– Operation	85 % occasionally; no condesation
– Storage/transport	95 %; no condensation
Air pressure	
– Operation	860 hPa to 1080 hPa
– Storage/transport	860 hPa to 1080 hPa

EMV

– R/T interference suppression EN 55022, class B

– The local bus interface module N–AT (order no. 6DS1 222–8BA), according to the EMV law of 12.11.1992, is not an independently–operable device (§ 5, paragraph 5, sentence 3), and is not subject to declaration and labelling requirements (CE marking).

– In order to comply with electromotive compatibility, the local bus interface module N–AT is to be commissioned by correspondingly–trained personnel.

1.5 Engineering

The N–AT local bus interface module is an extension module for AT–compatible PCs. Connecting these computers to the CS 275 TELEPERM bus system, the following must be kept in mind:

Selection of the computer:

- All PCs with ISA–standard AT module locations are suitable, as well as computers with EISA expansion module locations (e.g. work station SICOMP WS30, HP...).
- An available AT extension module location must be available for the attachment of AT short PCBs (format 165 mm x 99 mm). The length of 165 mm includes the material thickness of the front plate. The exact measurements are to be found in section 5.1, "Measuring diagram".
- The N–AT is constructed to the specifications of ISA norm IEEE P996 for bus frequencies of up to 8.333 MHz.
  Use of the N–AT at frequencies of up to 10 MHz is possible. As the norm does not specify these data accesses, timing deviations according to type of PC are possible. In this case, the PC to be used should be tested with the N–AT first.

Criteria for TELEPERM bus CS 275

- N–AT local bus interface module connectable to local bus
- cable N–AT <– – –> TELEPERM bus
- The total length of the local bus cable must not exceed 20 m.
- max. 9 devices (local bus interface modules including inductive converter UI) attached to local bus

Scope of Delivery

Designation	**Order No.**	**Package Local bus interface N–AT German 6DC1222–1BA10**	**Package Local bus interface N–AT English 6DC1222–1BA20**
Interfacemodule for 20 m local bus (N–AT) for AT–compatible PCs	6DS1 222–8BA	1	1
2.5 m long cable for 20 m local bus with 1 ES902 plug and 1 Cannon plug	6DS8 208–8KC	1	1
Instruction Manual for local bus N–AT interface module in German	6DS1 222–8BA11	1	
Instruction Manual for local bus N–AT interface module in English	6DS1 222–8BA21		1

2 Commissioning

Warning

Hazardous voltages are present in this electrical equipment during operation.
Failure to property maintain the equipment can result in death, severe personal injury or substantial property damage.
The instructions contained in this manual have to be followed.

- Commissioning shall be performed only by qualified personnel.
- Always de–energize the personal computer before maintenance.

All warnings and safety instructions by the PC manufacturer have to be strictly observed when opening the Personal Computer!

Note:
Should the casing be opened, the scope of the PC manufacturer's warranty may be limited.

Before the N–AT local bus interface module can be plugged in an AT–compatible personal computer, a number of DIL switches have to be set and, where necessary, two jumpers placed or rearranged. The setting parameters are specific variables of the PC or TELEPERM bus (for location of switches and jumpers see Figure1.1).

2.1 Setting the PC Parameters

2.1.1 Base Address of N–AT in PC I/O Address Space

With two 16–bit registers the N–AT local bus interface module is assigned to exactly 4 addresses in the I/O address space of the PC. The I/O address capacity of the AT–PCs is limited to 1 K*byte (0 ... 3FFH), for extension boards available on the market can not use processor address bits 2^{10} to 2^{15}. IBM specified address spaces for various interfaces (see Figure 2.1). The relevant address assignments to interfaces and controllers depend on the equipment of your PC. Determine the free spaces of your PC and then set the base address on the N–AT accordingly. When selecting the space, take care to consider any address specifications in the user program. The set N–AT address space and that in the user program have to tally.

Warning:
Superimposed addresses between N–AT and other extension boards or mother boards may cause defects!

I/O address space	Component/Module	
000 – 0FF	Mother board PC	
278 – 27F	Parallel interface 2	LPT2
2F8 – 2FF	Serial interface 2	COM2
300 – 31F	Testing board	
378 – 37F	Parallel interface 1	LPT1
3B0 – 3BF	Monochrome interface module	MCA, Hercules
3C0 – 3CF	EGA interface module	EGA
3D0 – 3DF	CGA interface module	CGA
3F8 – 3FF	Serial interface 1	COM1

Figure 2.1 Excerpt from standardized I/O address assignment list

The base address of N–AT is set on DIL switch S3 with "1" meaning OFF or OPEN and "0" meaning ON. DIL switch S3 is marked on the plug–in module by the characters "ADR". Address bits 2^2 to 2^9 can be set as required. The N–AT interface module is supplied with the set base address 300H.

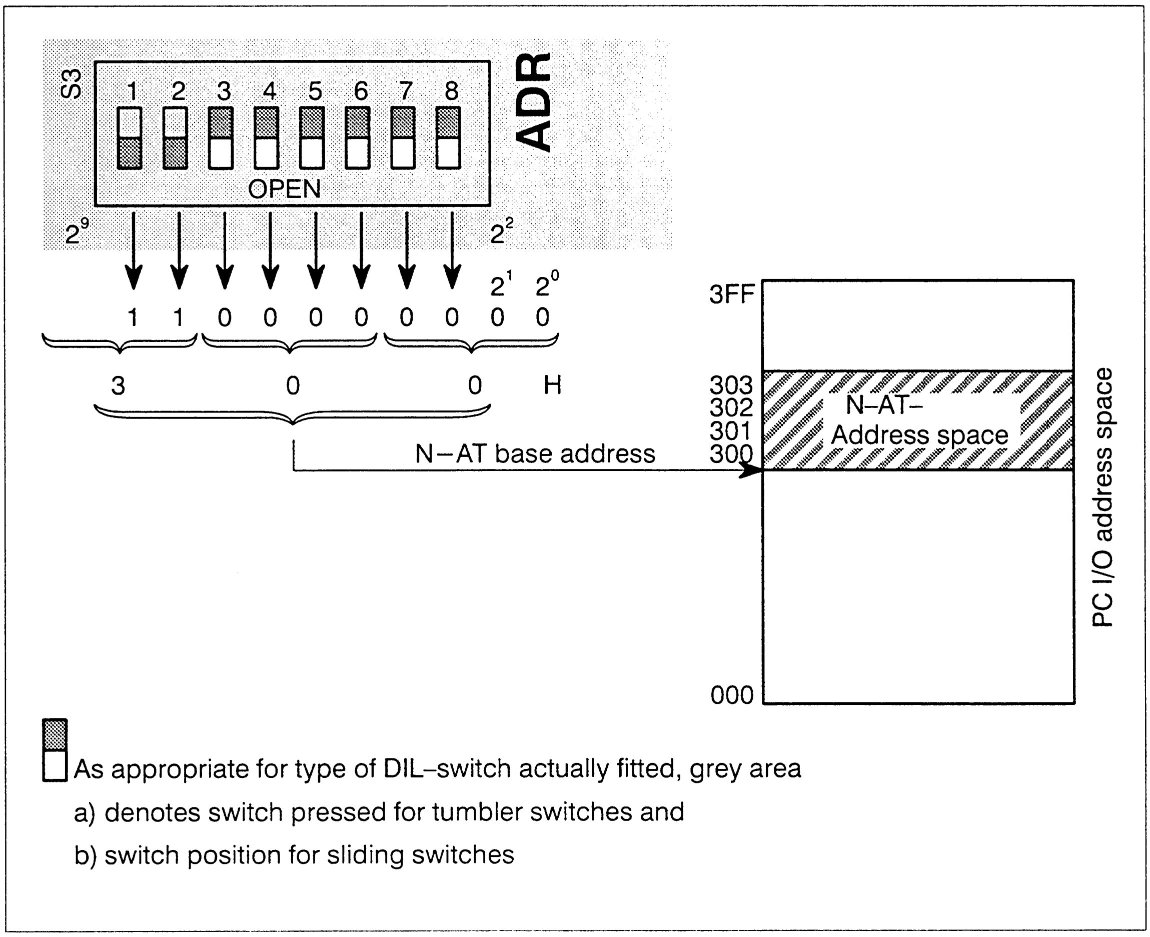


Figure 2.2 I/O Address setting on N–AT; Example: address 300H

2.1.2 N–AT Interrupt Jumper Inputs

The N–AT local bus interface module can initiate interrupts to the personal computer. There are 16 interrupt inputs in the PC, 11 of which can be selected as IRQ (interrupt request) signals for the AT extension bus. As with address assignments, IBM also implemented interrupt assignments as follows:

IRQ Signal	Interrupt Source	
3	Serial interface 2	COM2
4	Serial interface 1	COM1
5	Parallel interface 2	LPT2
6	Floppy controller	
7	Parallel interface 1	LPT1
9	Free (bypassed to IRQ2)	
10	Free	
11	Free	
12	Free	
14	Hard disc controller	
15	Free	

Figure 2.3 Excerpt from the standardized AT–PC interrupt assignment list

Using the PC documentation determine which interrupts are assigned and select an unassigned IRQ signal for N–AT. As with the N–AT base address, the hardware and software settings must tally when selecting the IRQ signal.

On the N–AT module, the interrupt signal can be jumpered to one out of eight IRQ lines (IRQ5, 6, 9, 10, 11, 12, 14 or 15) using jumper X100, marked with "IRQ". Factory adjustment is IRQ10.

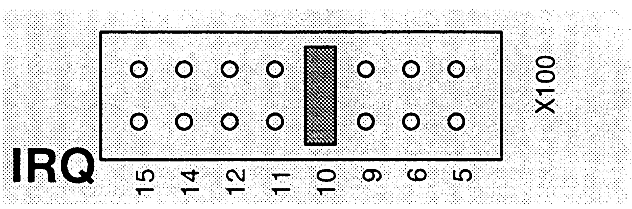


Figure 2.4 Interrupt jumper inputs on the N–AT module; Example: Jumper set to IRQ10

> **Warning:**
> Assignment of an IRQ signal to several interface modules may cause defects!

If the N–AT module shall in no case request an interrupt, e.g., if all IRQ signals are assigned, the jumper can be positioned or completely removed as given in Figure 2.5.

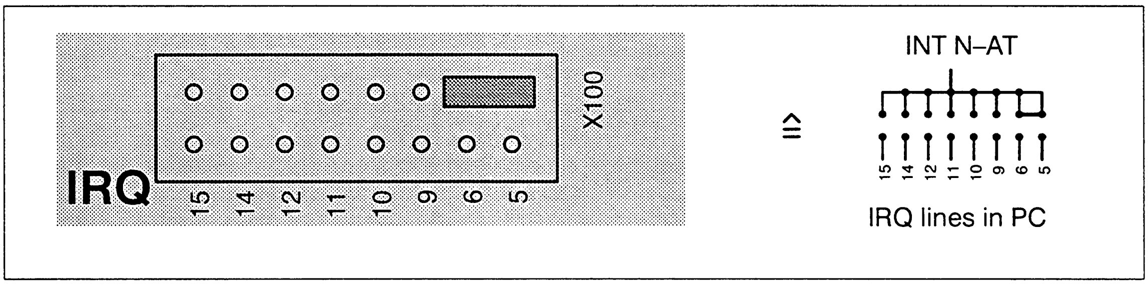


Figure 2.5 Jumper setting "No interrupt from N–AT"

2.2 Setting the TELEPERM Bus Parameters

For connection to the TELEPERM bus system the mode of operation and the address of the bus interface module have to be set. TELEPERM bus CS 275 has a hierarchical structure. Individual devices are connected to the local bus of the CS 275 bus system using the associated interface modules. The electrical design of the local bus limits the number of devices to a maximum of nine and the cable to 20 m. Differential voltage on the M signal line between the individual devices shall not exceed 0.2 V. For this reason, commissioning of the TELEPERM local bus must be performed very carefully. Care shall also be taken to comply with the relevant installation guidelines of the individual devices (see also Section 2.5 "Installation Instructions"). Individual local buses are connected via remote bus.

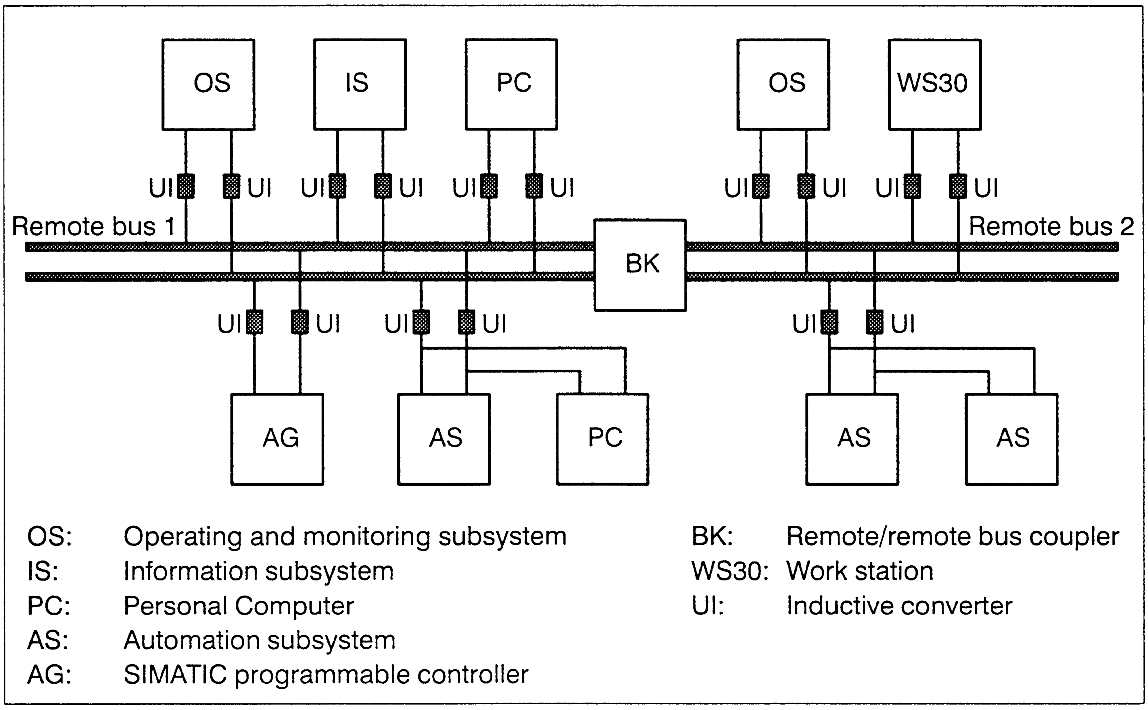


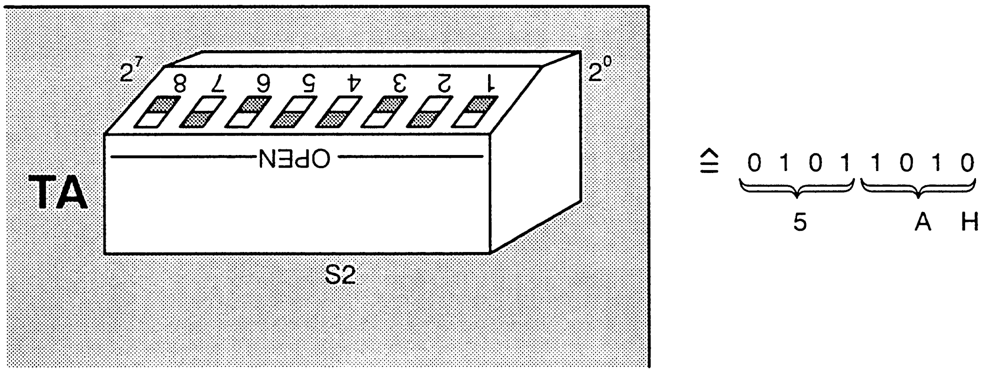
Figure 2.6 CS 275 bus subsystem. Example of configuration

The individual device in a CS 275 bus subsystem can be addressed by an address which consists of the bus address and the device address.
The bus address is the same for all devices attached to an autonomous bus. The individual devices attached to the bus are distinguished by the device address.

2.2.1 N–AT Device Address

The device address of the N–AT local bus interface module is set using DIL switch S2. For easy identification, the switch is additionally marked with the characters "TA". It is well accessible even after the module has been plugged in the PC. The least significant bit (2^0) is to the right and the most significant bit (2^7) is to the left (see also marking on the PCB). "0" means switch position "ON" and "1" means switch position "OPEN".
Factory adjustment of the device address is 90 (5AH).

Setting range for TA: = 0 to 99.



As appropriate for type of DIL–switch actually fitted, grey area
a) denotes switch pressed for tumbler switches and
b) switch position for sliding switches

Figure 2.7 Setting the user addresses of the N–AT, example TA = 90 (5A H)

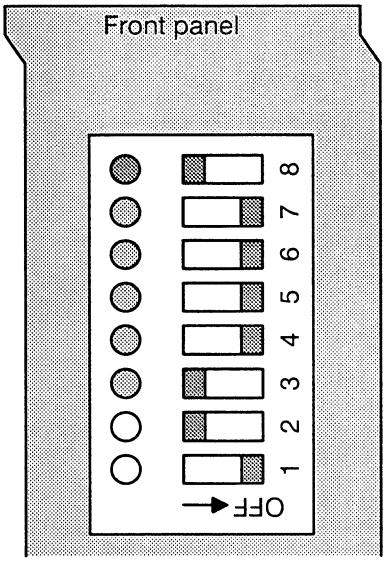
2.2.2 N–AT Bus Address and Redundancy

The N–AT front panel is provided with a combined element consisting of 8 DIL switches and 6 LEDs. In terms of meaning, configuration and color the LEDs are the same as the status indicators of other CS 275 bus interface modules such as N–S5. Not all of the eight DIL switching elements are assigned. Switches 1, 2 and 3 are used to set the bus address, with switch 1 corresponding to bit 2^0 and position OFF corresponding to "1". Valid bus addresses are any combination from 0 to 7.

Note: the setting BA=0 is not permitted with TA=0.

The CS 275 protocol and the bus hardware allow operation on a single and a redundant remote bus subsystem. Switch 5 is used to set the interface module to a single or to a redundant remote bus subsystem (OFF = remote bus not redundant). When the switch positions (1, 2, 3 or 5) on the front panel are changed during operation, N–AT assumes acquiescent mode. After the change has been made, the new parameters have to be transferred to N–AT using the save switch (switch 8). After switching (ON –> OFF –> ON), N–AT returns to normal operating mode.

Factory adjustment of all switches is on "OFF", i.e. the parameters must be set prior to commissioning.



Meaning of the individual switches:

Save switch

– Free

– Free

Bus selection ON = Operation on redundant bus subsystem
OFF = Operation on non–redundant bus subsystem

– Free

2^2, 2^1, 2^0 } Bus address BA: (ON = 0, OFF = 1)
Here: BA = 1

Figure 2.8 Setting of the N–AT bus address

2.2.3 N–AT Two–Address Mode

Usually a device is addressed using one bus/device address on the bus, i.e. one device has one address. In applications with multi–processor systems it may be expedient for a device to be assigned to two addresses. In that case, N–AT operates as two devices with a common PC interface. This mode of operation can be activated using jumper X101.1. In two–address mode, N–AT is assigned to two successive device addresses "BA/TA" and "BA/TA + 1" that are set on DIL switch S2.

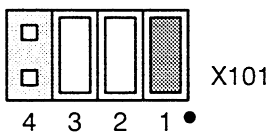


Figure 2.9 Jumper setting: Two–address mode. Example: Jumper closed —> single–address mode

Jumper X101.1 closed: Standard mode (single–address mode)
Jumper X101.1 open: Two–address mode

The jumpers X101.2 and X101.3 must not be removed. The jumper is set to X101.1 on delivery. There is no jumper on X101.4.

Note:
In two–address mode, the N–AT interface module has to be polled by the user software, because no interrupt requests are initiated by the module for address BA/TA +1!

2.3 Non–User–Serviceable Jumpers

For manufacturing reasons and testing purposes there are further jumpers on the N–AT local bus interface module that shall not be changed. To check these positions, the relevant jumpers are listed in the following:

X101 .2	closed (Jumper)
.3	closed (Jumper)
.4	open

2.4 Plugging N–AT Module into PC

⚠ Warning

Disconnect from mains before opening PC!

First of all, disconnect the PC from the mains by pulling the mains plug. Then open the casing. Remove the cover plate of a free AT slot (full–size format). Now carefully insert the N–AT plug–in module. When doing this, take care that no short circuits occur with other extension boards or with the PC mother board (e.g. by SIM storage modules). Screw the N–AT front panel to the PC casing. For reasons of screening always ensure proper metal contact between PC casing and N–AT front panel. After closing the PC casing, reconnect the PC to the mains.

Note:
The ISA bus frequency (also BUSCLOCK or BCLK) can be adjusted on some PCs (e.g. SETUP). In these cases, ensure that the frequency of 10 MHz has not been exceeded.

2.5 Installation Guidelines for Connection to the TELEPERM Bus

Connection of the N–AT local bus interface module to the TELEPERM local bus is made with cable 6DS8208–8KC. The N–AT is provided with a 25–port D–subminiature jack with metal–clad enclosure and screwed locks. The local bus is provided with a TELEPERM ES902 plug with metal enclosure and screwed locks. Carefully screw plug to jack!

⚠ Warning

Improper cabling of the central grounding point and the protective ground conductor of the power supply cable may cause potential differences between the PC casing and the screen/ plug enclosure of the cable.
This will induce touch voltages when the cable is connected!

When installing a CS 275 bus, the installation instructions for the individual components shall be complied with. These instructions deal with cabinet structure, power supply connection and grounding using an central grounding point.

When the N-AT module is commissioned in the PC, always ensure good screening contact between cable and PC!

Additional cables from the PC to the grounding bus bar or central grounding point are not necessary. Connection to ground is made by the protective ground conductor of the power supply cable.
As the N-AT bus interface is electrically isolated, the N-AT frame potential is not coupled with the PC. The cable is used to set the 0 V level of the interface logic to frame potential of the local bus. Thus, the maximum differential voltage of 0.2 V between bus ground and device ground required at the TELEPERM bus is not exceeded.

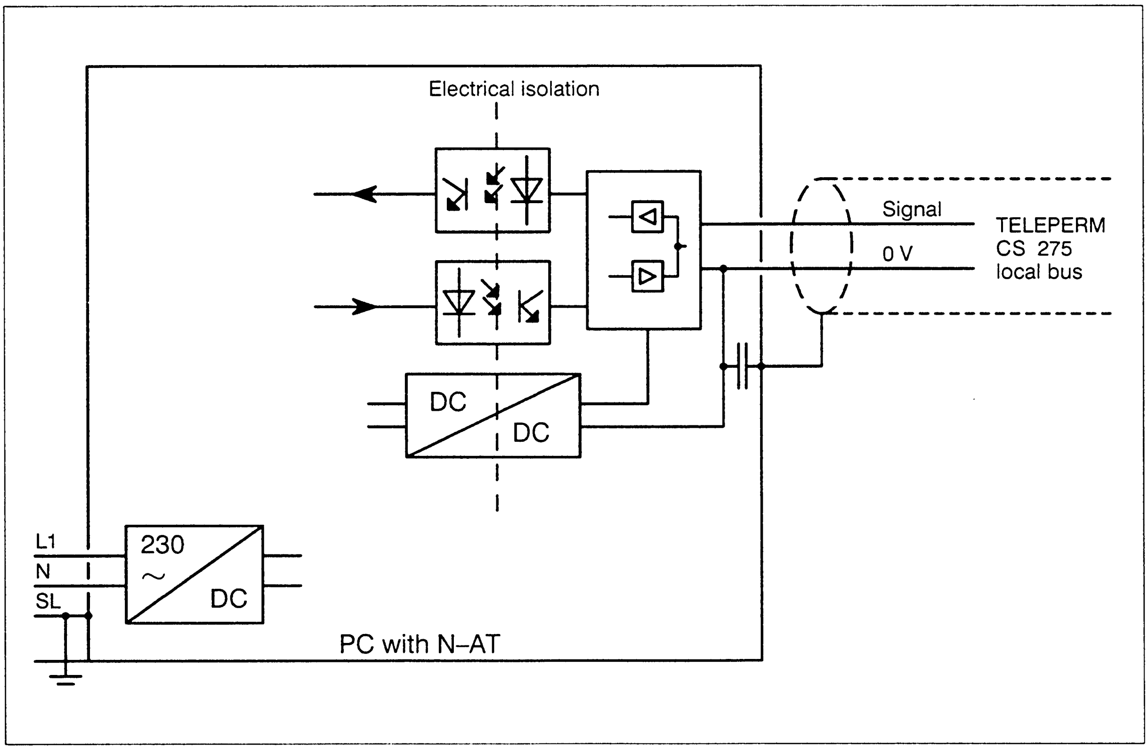


Figure 2.10 Schematic diagram of the electrical isolation and the screening concept

3 Operation

Status Indicators and Setting Parameters

During operation, interface control and transmitting and receiving of telegrams are performed by the user software on the PC. To check proper operation, six LEDs are installed on the N–AT front panel. They have the same meaning, configuration and color as the status indicators of other CS 275 bus interface modules such as N–S5.

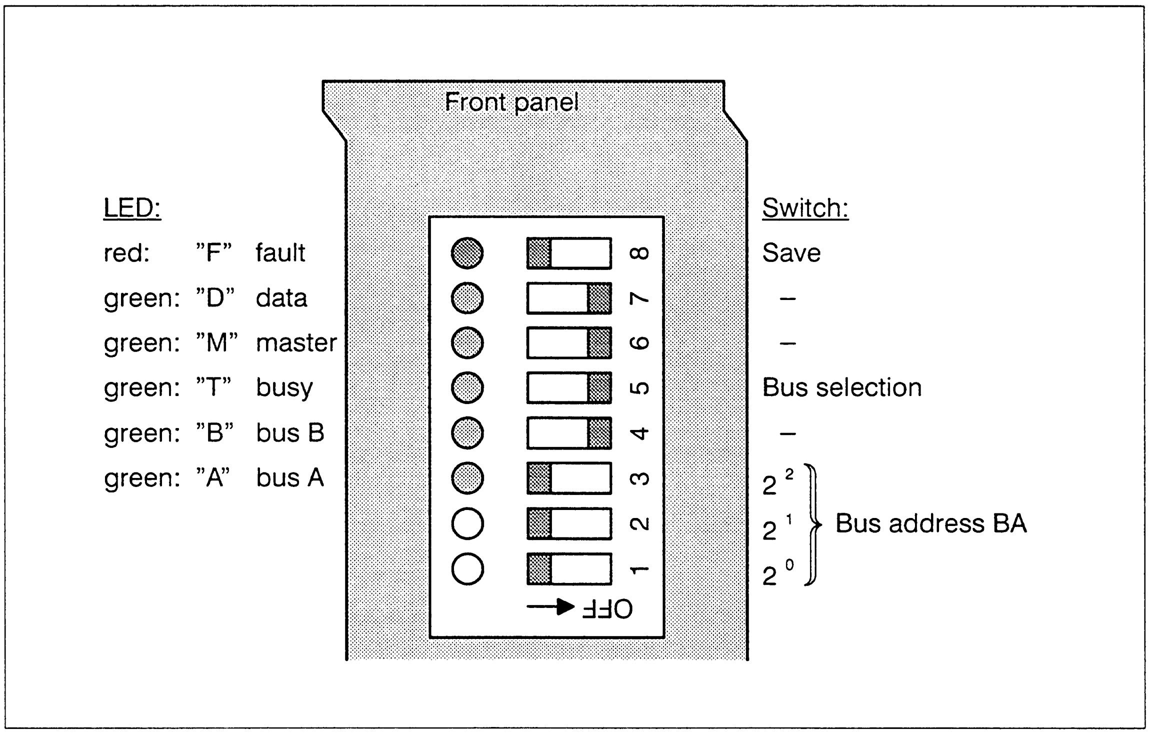


Figure 3.1 LEDs and switch assignment on the N–AT front panel

For lack of space due to the design of AT–compatible PCs, inscription on the front panel is not possible.

Meaning of the LEDs:

The **"F" indicator** lights up continuously, only if the transmit/receive sequencer is at static abort status. If the indicator lights up briefly, it represents a normal operation, e.g. caused by the self–test routine (every 1.1 seconds) of a module.

The **"D" indicator** flashes more or less medium bright depending on the data transfer frequency.

The **"M" indicator** lights up for the duration of the master status which is signalled by more or less frequent flashing depending on the number of the devices connected.

The **"T" indicator** signals command or periphery read cycles of the CPU at almost full brightness.

The **"A" and "B" indicators** display the presently–active bus by remaining lit. Flashing denotes the passive bus.

During operation, the bus address of the interface module and the mode "redundant" or "non–redundant" can be set (see Figure 2.8). When these switches are activated, the N–AT module assumes acquiescent mode. Operating the save switch initiates transfer of the set parameters to N–AT. Then N–AT switches back to normal operation.

The device address (TA) shall not be changed during operation. In the event that you are obliged to do so, open the PC casing. The DIL switch for the device address (TA) is located at the upper edge of the module. Therefore, setting of the TA in the PC can be performed without pulling the module (for further details see Section 2 "Commissioning").

The same applies to the selection of single–address mode and two–address mode. The setting is to be performed during commissioning (see Section 2.2.3).

Meaning of the switches:

Save: Previously set parameters are transferred by switching from ON to OFF and back to ON. N–AT then leaves the previously assumed acquiescent mode.

Bus selection:
ON = Operation on redundant remote bus
OFF = Operation on non–redundant remote bus

Bus address BA: In addition to device address TA (see Section 2.2.1) for the distinction of the interface modules within a bus subsystem, a further bus address BA is to be assigned for the distinction of several buses that are interconnected by bus couplers.

Applicable settings: $0 \leqq BA \leqq 7$
where 2^0 = switch 1,
2^1 = switch 2,
2^2 = switch 3, and
ON = "0"
OFF = "1".
In Figure 3.1 bus address "0" is set.

Note: the setting BA=0 is not permitted with TA=0.

4 Maintenance and Diagnostics

The N–AT local bus bus interface module is maintenance–free.

4.1 N–AT Pin Assignment

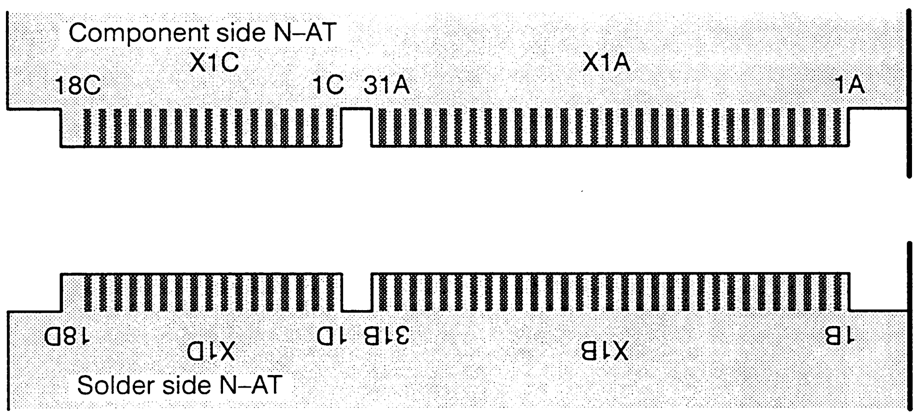


Figure 4.1 Pin assignment on the base connector of the local bus interface module

Pin	Signal Name	Used by N–AT
B1	GND	yes
B2	RESET DRV	yes
B3	+5 V DC	yes
B4	IRQ9	yes
B5	−5 V DC	no
B6	DRQ2	no
B7	−12 V DC	no
B8	0WS	no
B9	+12 V DC	yes
B10	GND	yes
B11	−SMW	no
B12	−SMR	no
B13	−IOW	yes
B14	−IOR	yes
B15	−DACK3	no
B16	DRQ3	no
B17	−DACK1	no
B18	DRQ1	no
B19	−RFSH	no
B20	SYSCLK	no
B21	IRQ7	no
B22	IRQ6	yes
B23	IRQ5	yes
B24	IRQ4	no
B25	IRQ3	no
B26	−DACK2	no
B27	T/C	no
B28	BALE	no
B29	+5 V DC	yes
B30	OSC	no
B31	GND	yes

Pin	Signal Name	Used by N–AT
A1	−I/O CH CK	no
A2	SD7	yes
A3	SD6	yes
A4	SD5	yes
A5	SD4	yes
A6	SD3	yes
A7	SD2	yes
A8	SD1	yes
A9	SD0	yes
A10	−I/O CH RDY	yes
A11	AEN	yes
A12	SA19	no
A13	SA18	no
A14	SA17	no
A15	SA16	no
A16	SA15	no
A17	SA14	no
A18	SA13	no
A19	SA12	no
A20	SA11	no
A21	SA10	no
A22	SA9	yes
A23	SA8	yes
A24	SA7	yes
A25	SA6	yes
A26	SA5	yes
A27	SA4	yes
A28	SA3	yes
A29	SA2	yes
A30	SA1	yes
A31	SA0	no

D1	−M CS16	no
D2	−I/O CS16	yes
D3	IRQ10	yes
D4	IRQ11	yes
D5	IRQ12	yes
D6	IRQ15	yes
D7	IRQ14	yes
D8	−DACK0	no
D9	DRQ0	no
D10	−DACK5	no
D11	DRQ5	no
D12	−DACK6	no
D13	DRQ6	no
D14	−DACK7	no
D15	DRQ7	no
D16	+5 V DC	yes
D17	−MASTER	no
D18	GND	yes

C1	SBHE	no
C2	LA23	no
C3	LA22	no
C4	LA21	no
C5	LA20	no
C6	LA19	no
C7	LA18	no
C8	LA17	no
C9	−MEMR	no
C10	−MEMW	no
C11	SD08	yes
C12	SD09	yes
C13	SD10	yes
C14	SD11	yes
C15	SD12	yes
C16	SD13	yes
C17	SD14	yes
C18	SD15	yes

Figure 4.2 Pin assignment of the AT extension bus

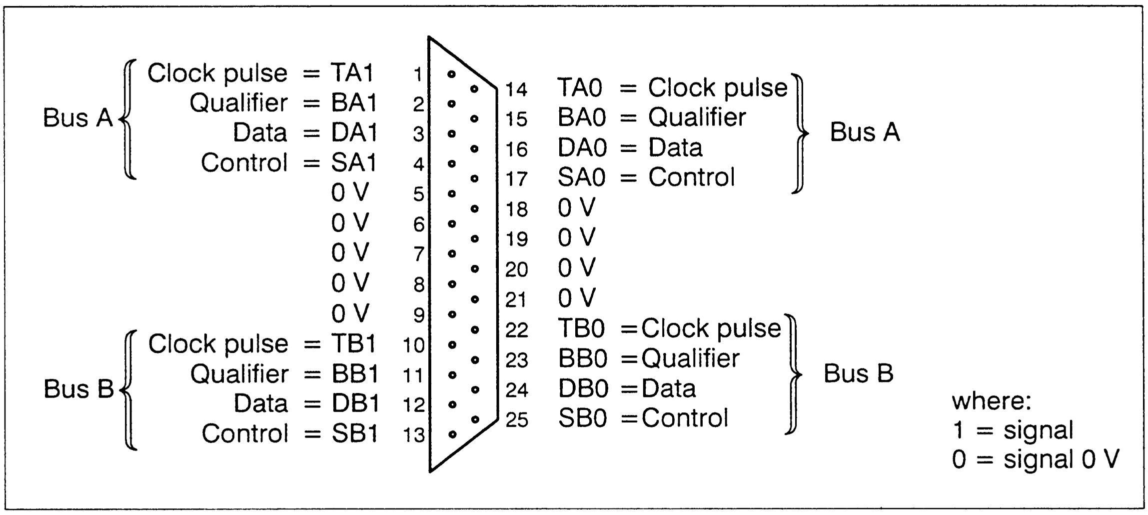


Figure 4.3 Pin assignment of N–AT–TELEPERM interface

4.2 Error Diagnostics

Error diagnostics shall be performed with the aid of LEDs on the module front panel.

Meaning of the diagnostics LEDs:

"F" (rd)	= Fault:	Fault annunciation of bus interface logic (BIL)
"D" (gn)	= Data:	General data transfer on local bus
"M" (gn)	= Master:	Module is currently bus master
"T" (gn)	= Busy:	80C188 processor performs read cycles
"B" (gn)	= Bus B:	Bus B is active
"A" (gn)	= Bus A:	Bus A is active

The **"F" indicator** lights up at local bus or bus interface module faults. The indicator flashes to signal a sporadic fault status (see Section 3).
Possible fault sources:
- faulted telegrams signalled by to defective qualifiers or parity errors
- overflow of receive memory (e.g. bus processor defective)
- transmit information does not match bus information (e.g. line driver defective)

The **"D" indicator** flashes more or less medium–bright depending on the data transfer frequency.

The **"M" indicator** lights up for the duration of the master status which is signalled by more or less frequent flashing depending on the number of the devices connected.

The **"T" indicator** signals command or periphery read cycles of the CPU at almost full brightness.

The **"A" and "B" indicators** display the presently–active bus by remaining lit. Flashing denotes the passive bus.

4.3 Trouble Shooting

Defective modules are to be replaced and sent to the supplier's works for repair together with a detailed fault description (please use the cover note for fault specification). On site repair is not expedient. ESD–packaging shall be used for shipping the modules.

5 Appendix

5.1 Measuring Diagram

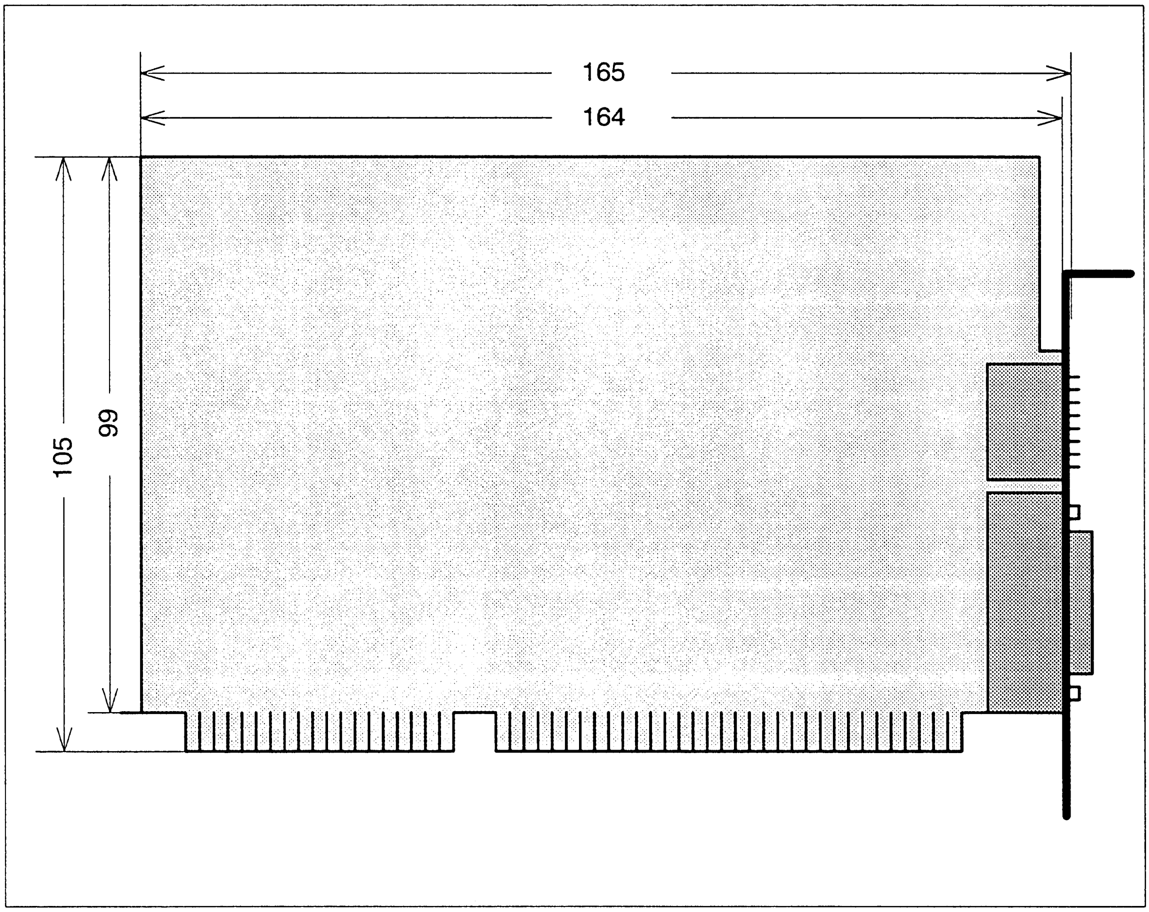


Figure 5.1 Measuring diagram of the N–AT local bus interface modul

An

Siemens AG

ANL A441–EPG
Günther–Scharowsky–Str. 2

D–91058 Erlangen

TELEPERM M/ME

Local Bus Interface Module N–AT

Instruction Manual

Order No: 6DS1222–8BA21
Issue July 1994

Sender:
Name

Company
Department

Address

Telephone /

Should you, while reading this manual, discover any printing errors please use this form and return it.
We would also appreciate any new ideas or suggestions for improvement.

Suggestions/Corrections:

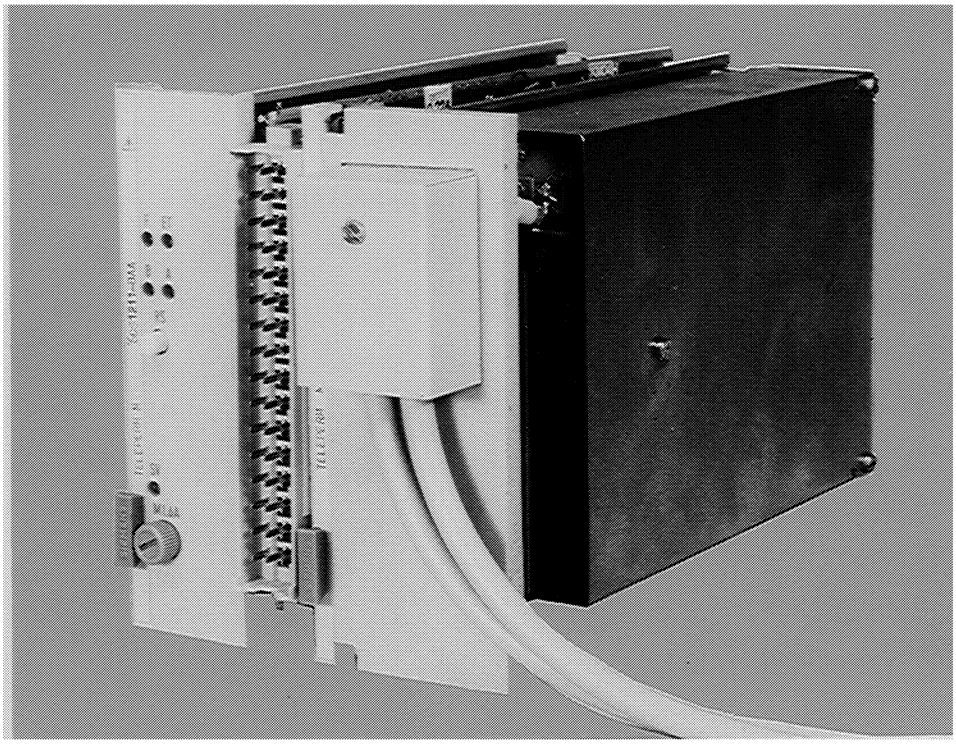
SIEMENS

TELEPERM M

Inductive Bus Converter

6DS4400-8AB

Instructions C79000-B8076-C004-07



Contents

1 Application

The inductive bus converter (UI) is the active element on the remote bus of the CS 275 bus system and is used to connect the remote and local bus lines. It converts the remote bus line protocol into that of the local bus and vice versa.

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2 Design (Fig. 2.1)

- Power supply unit (SV), 6DS1 211-8AA
  PCB 100 mm x 160 mm
  Front panel width of 2 standard slots (SEPs)
  Front panel with reset key, fuse holder and 5 LEDs
  Backplane connector (24-pin + 7-pin)

- Bus interface NF (BIL), 6DS1 212-8AB
  PCB 100 mm x 160 mm
  Front panel width of 1 standard slot
  48-pin front connector, 48-pin backplane connector

- Inductive coupler (KOP), 6DS1 213-8AA
  PCB 100 mm x 160 mm
  Front panel width of 3 standard slots
  Front panel with 2 fixed coaxial cables
  48-pin backplane connector

The modules are connected in the frame via backplane connectors.

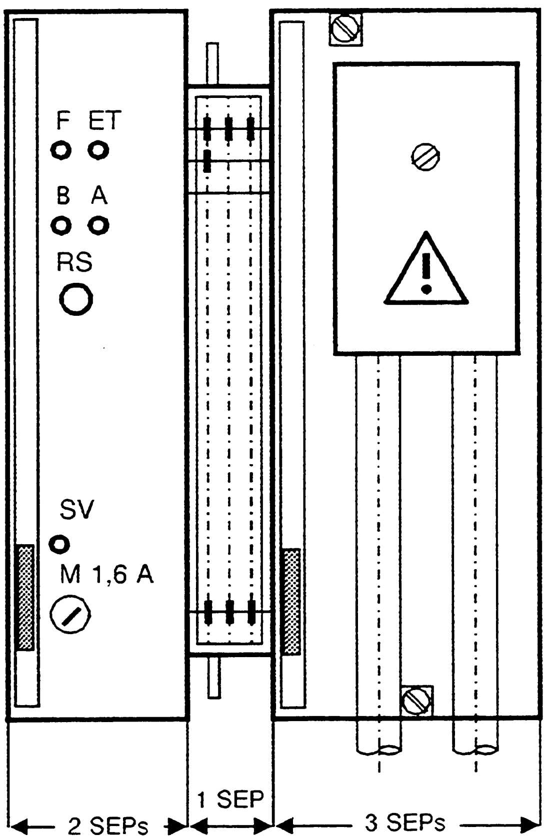

Fig. 2.1 Design

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3 Mode of Operation (Fig. 3.1)

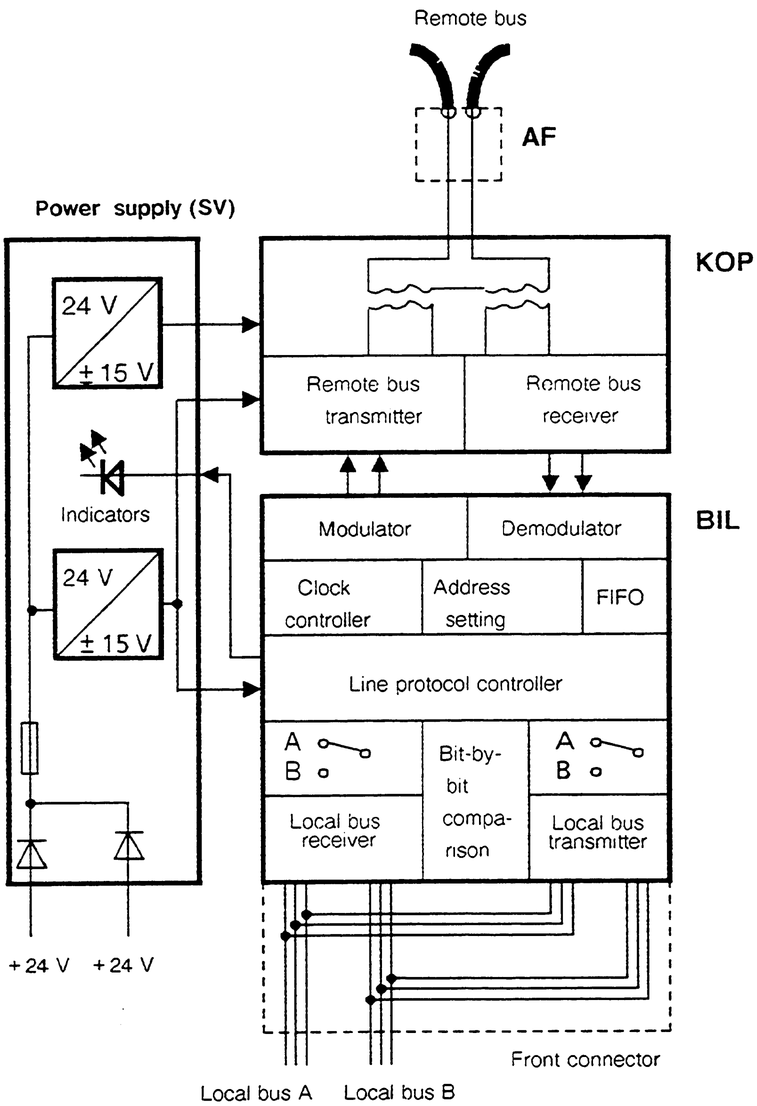

Fig. 3.1 Mode of operation

- Power Supply Unit (6DS1 211-8AA)

The power supply unit (SV) provides the bus interface module NF (BIL) and the inductive coupler (KOP) with +15-V, -15-V and +5-V voltages. The three output voltages are monitored for failure. Their tolerance limits, however, are not given fine monitoring.

The 5-V supply for BIL and KOP is generated from the 24-V DC input voltage by means of a switching regulator. The 15-V output voltage is derived from the input voltage (24 V DC) by means of a series regulator. A 5-V/15-V DC/DC transformer supplies the negative output voltage of -15 V.

The module is decoupled from the cabinet power supply by a diode. Should voltage failure occur, the green LED "SV" on the front panel goes out. This signal is also transferred to the cabinet lamp by two relay contacts.

- Bus Interface NF (6DS1 212-8AB)

The bus interface NF (BIL) represents the digital section of the inductive bus converter (UI). The signals of the 20-m local bus are applied to a quadruple transceiver component via the BIL front connector, as well as to a multiplexer for switching between local bus A and B.

The signal lines are terminated by voltage dividers. The local bus signals are conditioned for further processing in the subsequent line protocol control unit, according to the local bus line protocol.

This also influences the clock control, which in turn modifies the local bus clock and provides the clock for operating the modulator. The clock control itself operates at a frequency of 10.24 MHz.

Local bus data signals are then converted into an intermediate code in the modulator and applied to the inductive coupler via the BIL backplane connector.

The remote bus data are transmitted from the coupler to the demodulator control unit with digital filter via the backplane connector, then converted from the bi-phase code into an intermediate code and temporarily stored in a FIFO (first-in first-out memory). Thereafter, the data are transmitted from the FIFO to the line protocol controller, which passes them on to the local bus transmitter via a demultiplexer and according to the local bus line protocol.

The address adjuster is used to set the converter address which is compared in a comparator with the address received from the remote bus.

In order to carry out a bit-by-bit comparison, each bit transmitted on the local bus is immediately re-received after transmission. If the transmitted and received polarity of a bit do not correspond, a fault signal is given.

- Inductive Coupler (6DS1 213-8AA)

The inductive coupler (KOP) represents the interface to the remote bus. The BIL-coded local bus signals are transmitted to the KOP via the backplane connector. where they are then converted into remote bus signals (see Fig. 3.2 for signal sequences).
The signal of a line ($\overline{Q}_2$) is inverted in the KOP, then added to that of the other line (Q_1). The resulting signal is then inductively coupled via a transmitter on the remote bus.

The remote bus signals are applied to an adjustable amplifier via a transmitter. The control voltage for the amplifier is obtained from its output voltage. The direct component of the amplifier output voltage is subsequently filtered and the bi-phase code signals are converted into two non-overlapping phase-displaced pulses (I_1, I_2) on two separate lines (see Fig. 3.2). The signals on both lines are then fed into the BIL via the backplane connector.

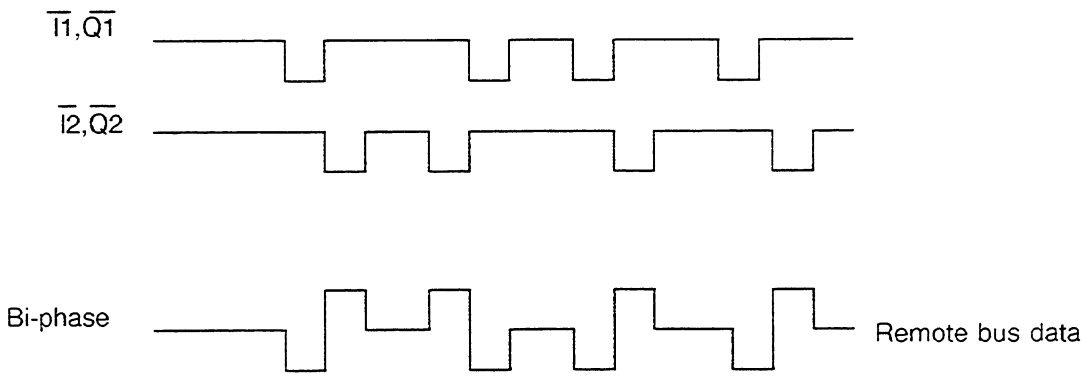

Fig. 3.2 Interface between the BIL and KOP

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4 Technical Data

Order no.	6DS4 400-8AB
Design	Width: 6 standard slots, 3 PCBs, 100 mm x 160 mm matching the ES 902 packaging system
Power supply	+24 V (20 to 33 V)
Permissible ripple	≤ 15 %
Power consumption	450 mA
Fuse	1.6 A; medium delay
Local bus interface	TTL level (V_{IH} ≥ 2.0 V input level V_{OH} ≥ 2.7 V output level)
Bit frequency	
Data frequency	250 x 10^3 bit/s
Flag transfer	340 x 10^3 bit/s
Participants	20-m local bus: max. 9 (UIs and local bus interface modules)
Remote bus interface	Bi-phase signals (level: approx. ±1 V_{SS})
Bit frequency	250 x 10^3 bit/s
Max. no. of converters	32
Max. length of remote bus cable	4 km

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5 Installation and Operation

5.1 Installation

The inductive bus converter has a pre-planned slot in the power supply subrack.

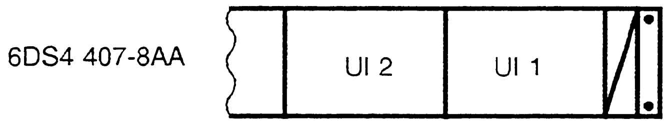


Fig. 5.1 Location of the inductive bus converter (UI)

Fig. 2.1 shows the arrangement of the three independent plug-in modules SV, BIL and KOP, which together form the inductive bus converter.

There are various mounting arrangements for the UI in the CS 275 bus system (see Figs. 5.2 and 5.3). A difference is made between:

- Operation on 20-m local bus, non-redundant (Fig. 5.2)
- Operation on 20-m local bus, redundant (Fig. 5.3)

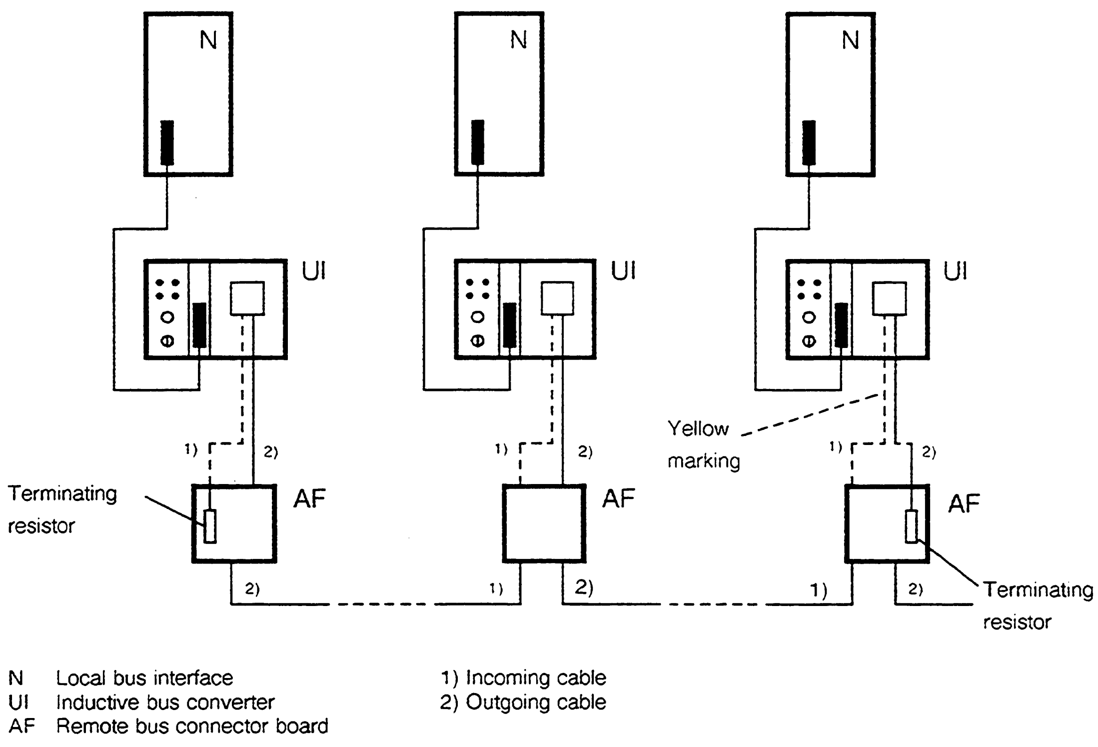
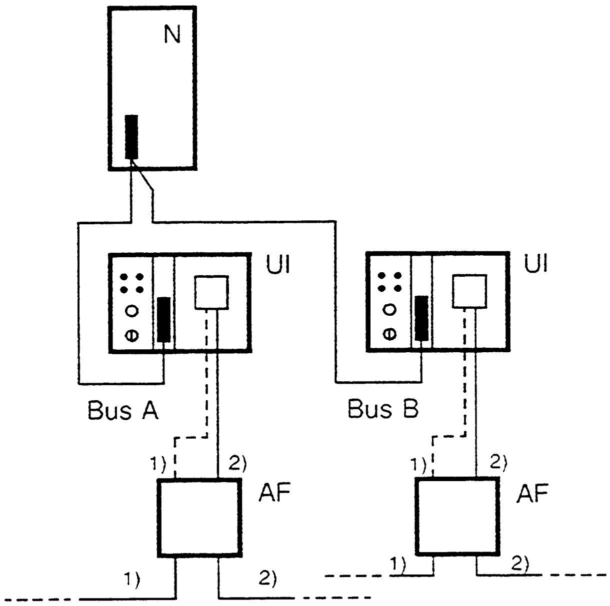


Fig. 5.2 20-m local bus/remote bus, non-redundant

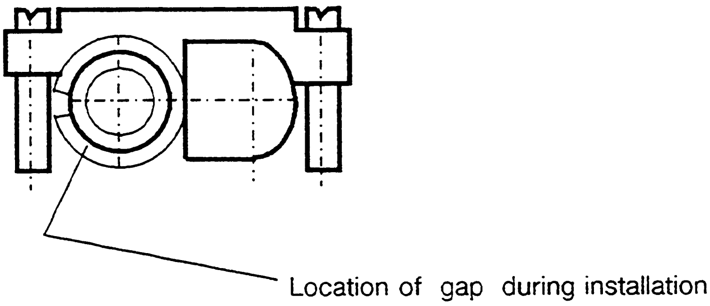


N Local bus interface
UI Inductive bus converter unit
AF Remote bus connector board
1) Incoming cable
2) Outgoing cable

Fig. 5.3 20-m local bus/remote bus, redundant

The inductive bus converter is linked to the local bus interface module via the BIL front connector using the pre-fabricated cable connector 12 x 2 x 0.22 mm² (6DS8 201-8..). The open end of the cable connector is attached to a metal front connector (6DS9 200-8AA). The cores are connected in this connector as shown in Fig. 5.4. The pins of row z are connected to each other and to the cable screen. The pins of row d18 and d30 must be provided with coding pins on both connectors.

The cable inlet into the metal front connector can also be seen in Fig. 5.4.



Pin d	Pin b	Pin z	Core color Bundle I
2			blue
4			red
6			gray
8			yellow
10			green
12			brown
14			white
16			black

Pin d	Pin b	Pin z	Core color Bundle II
	2		blue
	4		red
	6		gray
	8		yellow
	10		green
	12		brown
	14		white
	16		black

Pin d	Pin b	Pin z	Core color Bundle III
*	2		blue
	4		red
	6		gray
	8		yellow
	10		green
	12		brown
*	14		white
	16		black

* Coding pin

Connection to cable screen

Fig. 5.4 Color code of cable connector 6DS9 201-8..

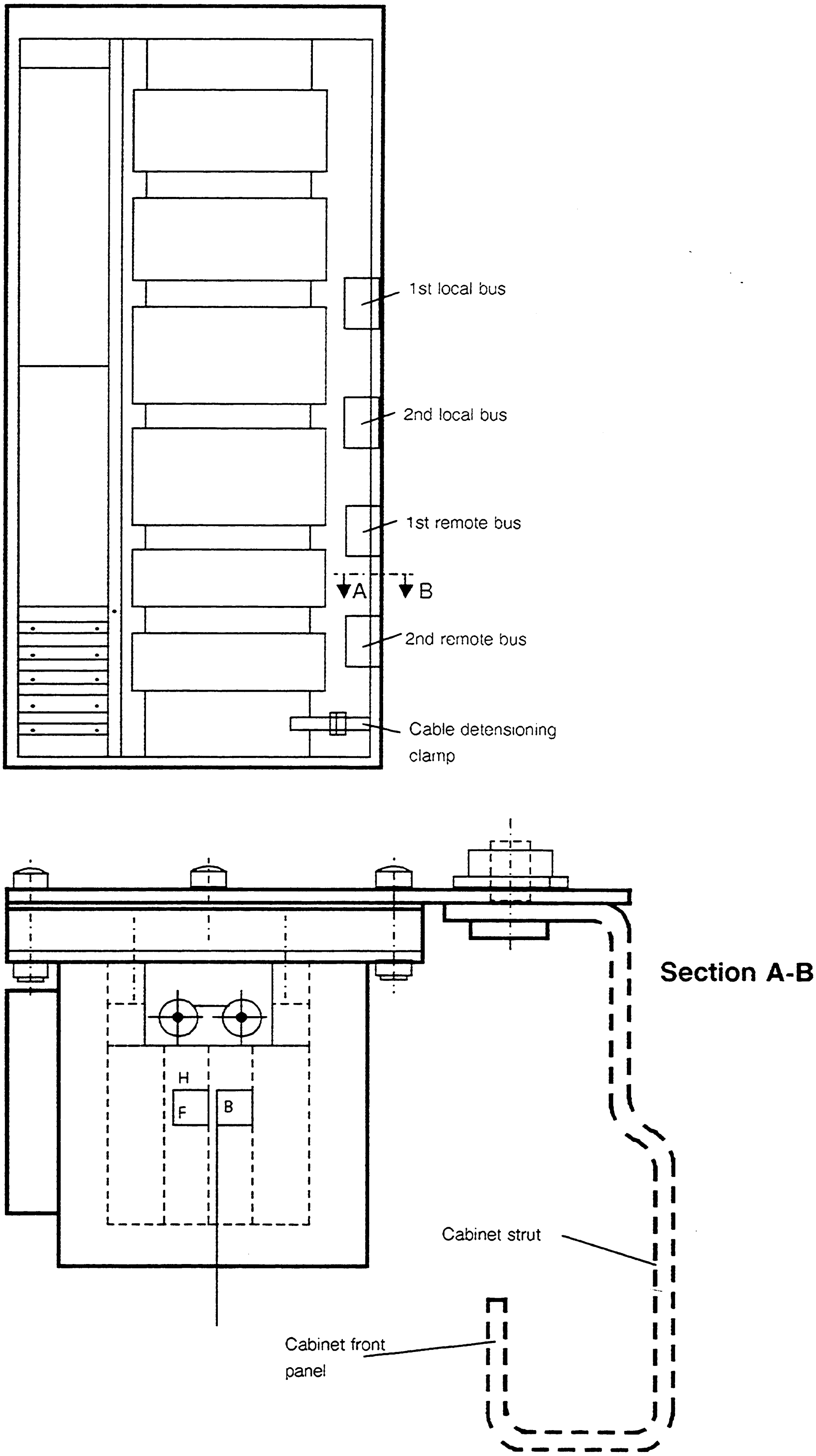
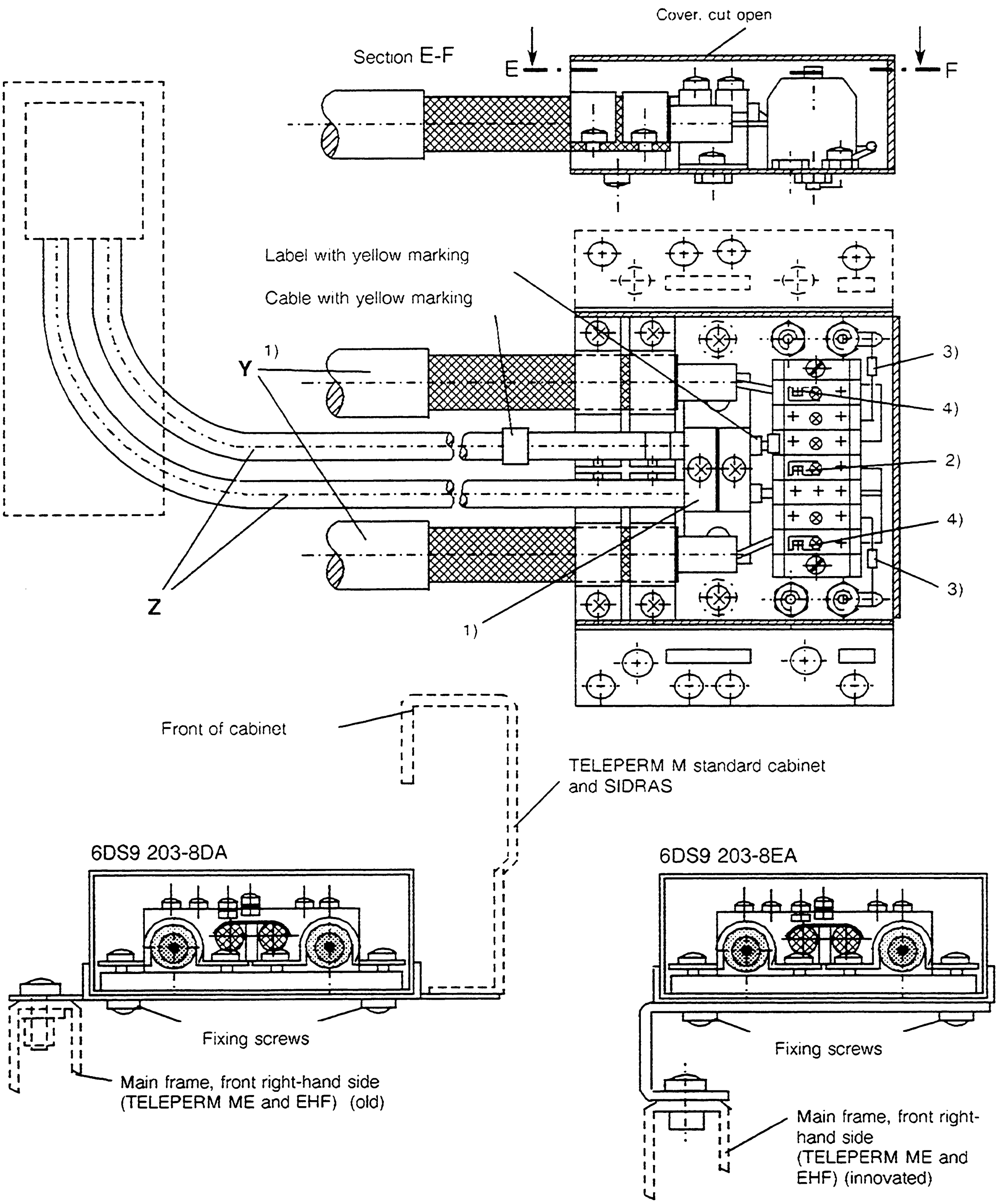


Fig. 5.5 Location of the remote bus connector board



Y Remote bus cable

Z The cable coming from the inductive coupler unit 6DS1 213-8AA must be laid for cabinet installation, rolled up and fixed with cable tape when it is installed in the cabinet.

1) To fix the remote bus cable Y, remove the front cable clamp from the inductive coupler Z. fan out the cable cores and tighten the clamp link underneath.

2) Inserting the switching link causes reflections if the UI is connected. After inserting the switching-link, the UI must therefore be disconnected immediately. If UI is only to be disconnected "logically", it is enough to remove the fuse in UI-SV.

3) Terminating resistor 75 Ω

4) Switching link for connecting the terminating resistor

Fig. 5.6 Remote bus connector board (Order No. 6DS9 203-8DA)

All incoming remote bus cables must be connected to the left of the AF and all outgoing remote bus cables to the right.

An incoming cable is one which leads to the beginning of the line, an outgoing cable is one leading to the end. The terminating resistor is located on the yellow UI cable at the beginning of the line and on the unmarked UI cable at the end of the line.

A terminating resistor R = 75 ohms must be fitted to the beginning and end of the line (see Fig. 5.6). To do this, close the corresponding switching link on the remote bus connector board (see Fig. 5.6).

The flexible coaxial cables permanently installed in the UI, must be connected to the remote bus connector board (AF). For this reason, the flexible coaxial cables must first be equipped with an inner ring (included in the AF) as shown in Fig. 5.7.

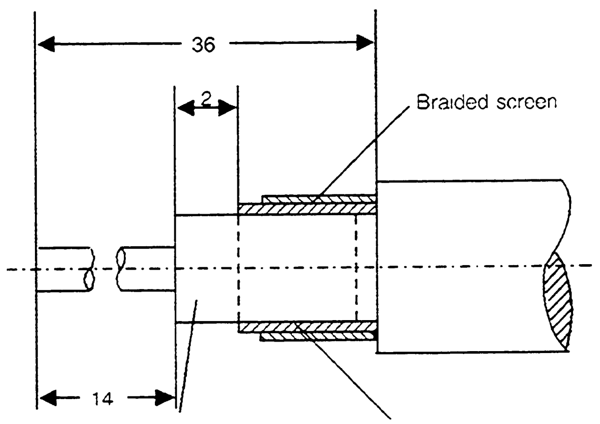
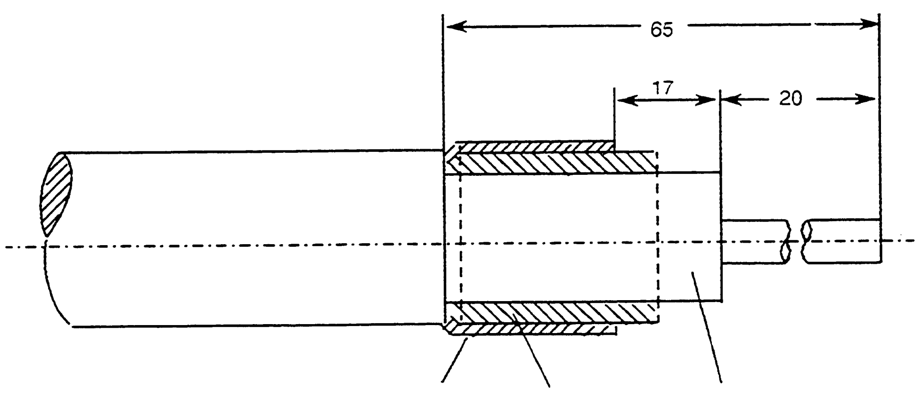


Fig. 5.7 Coaxial cable on inductive coupler

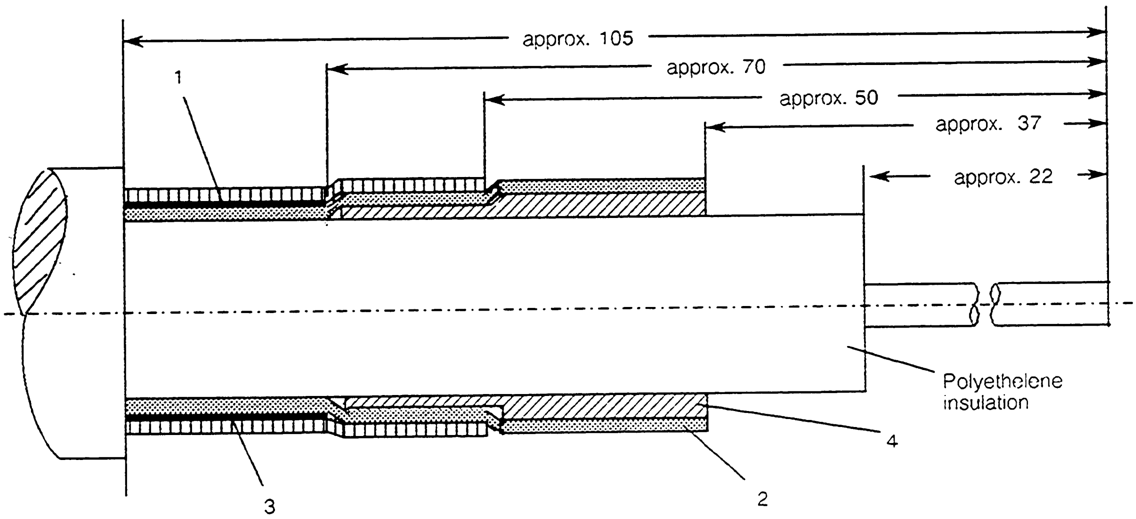
The ends of the incoming and outgoing remote bus cable must be prepared for connection and attached as shown below.



1 Outer braided screen
2 Inner braided screen
3 Insert contact sleeve between polyethelene insulation and inner braided screen
4 Polyethelene insulation

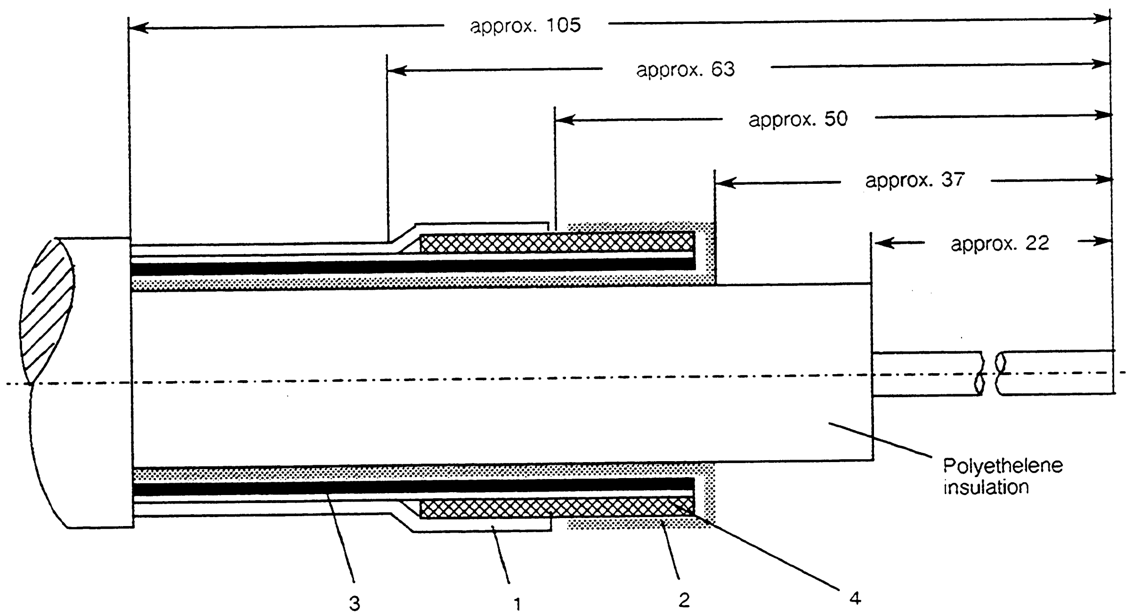
Fig. 5.8 Thin remote bus cable

a) Installation of the old, graded contact sleeve on the remote bus cable



1 Outer braided screen
2 Inner braided screen
3 Metal tape screen
4 Graded contact screen, inserted between polyethelene insulation and braided screen

b) Installation of the new, ungraded contact sleeve on the remote bus cable



1 Outer braided screen
2 Inner braided screen
3 Metal tape screen
4 Ungraded contact screen

Fig. 5.9 Standard remote cable

The UI power supply module signals a supply voltage failure by closing an alarm contact (relay contact).

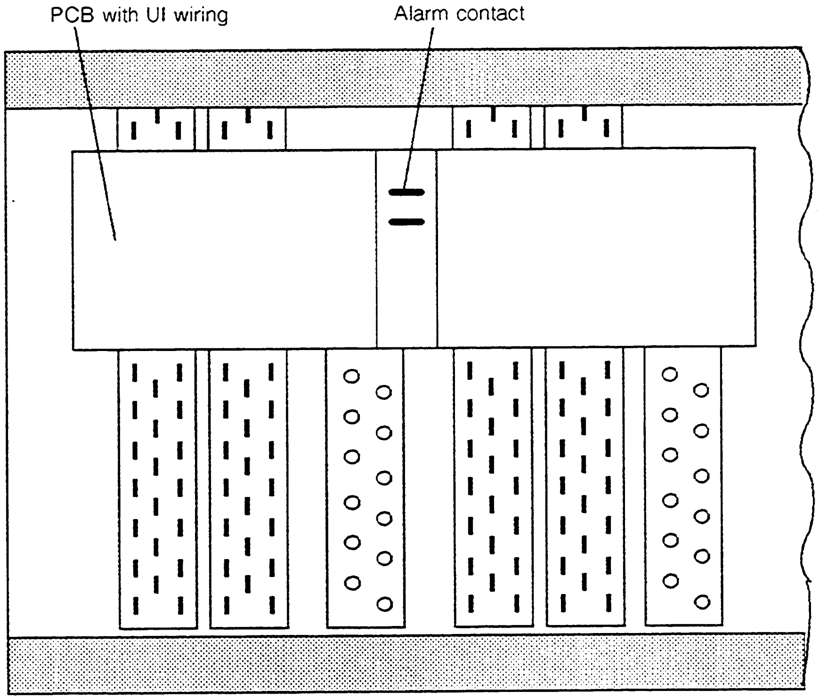


Fig. 5.10 Alarm contact for supply voltage failure on the UI power supply module

The alarm contact, accessible from the rear of the UI subrack, can be used to control a failure indicator. The following contact load limit values must be observed:

IC_{max} = 5 A
UC_{max} = 25 V (AC) or 60 V (DC)

Achtung

Only "voltages which are generated in an electrically safe and separated way" may be used as alarm contact voltages.

5.2 Commissioning

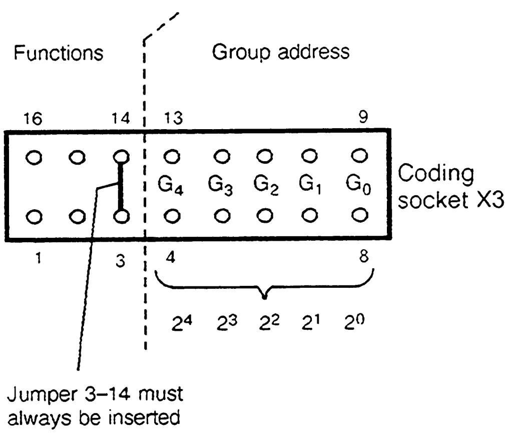
Jumper Settings on the Bus Interface NF (6DS1 212-8AB)

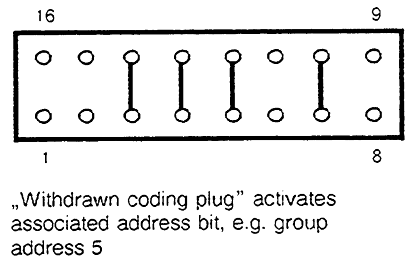
The following functions can be set at location X3 on the bus interface module NF:
- Group address (G0...G4)
- Transmit/receive on bus A
- Transmit/receive on bus B

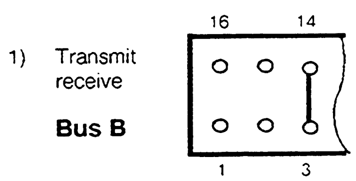
On an autonomous bus (remote bus), a group address (local bus group) may only be used once.

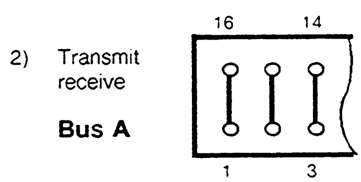
With redundant remote bus design the two UIs working on the same local bus should be set on the same group address in order to facilitate the configuration.

The settings are made using jumper plugs as shown below. An address may not be used twice.









5.3 Operation

A reset key for the complete logic is located on the power supply unit (SV). This key should be pressed after inserting the local bus connector and in the event of a fault.

6 Maintenance

6.1 Mechanical Design

The inductive bus converter (UI) consists of three independent plug-in modules, requires a width of 6 standard slots and is of single-height Eurocard format. Two coaxial cables are fitted on the inductive coupler for connection to the remote bus connector board. The UI is fitted into the power distribution subrack.

6.2 Method of Operation

The serial signals of the local bus interface, consisting of clock, data and qualifier lines, are converted by the UI into a purely bit-serial transmission signal and vice-versa. Transmission is in half-duplex mode.

The bus is in the idle state after switching on, i.e. the qualifier and data lines are always in the "H" state and all participants together generate a clock (T) on the clock line. The start of a message (consisting of 1, 2 or 4-byte elements) is signalled on the local bus by the sequences "STT" (start transfer) and "STD" (start data) at the start of the transfer element as in Fig. 6.1.

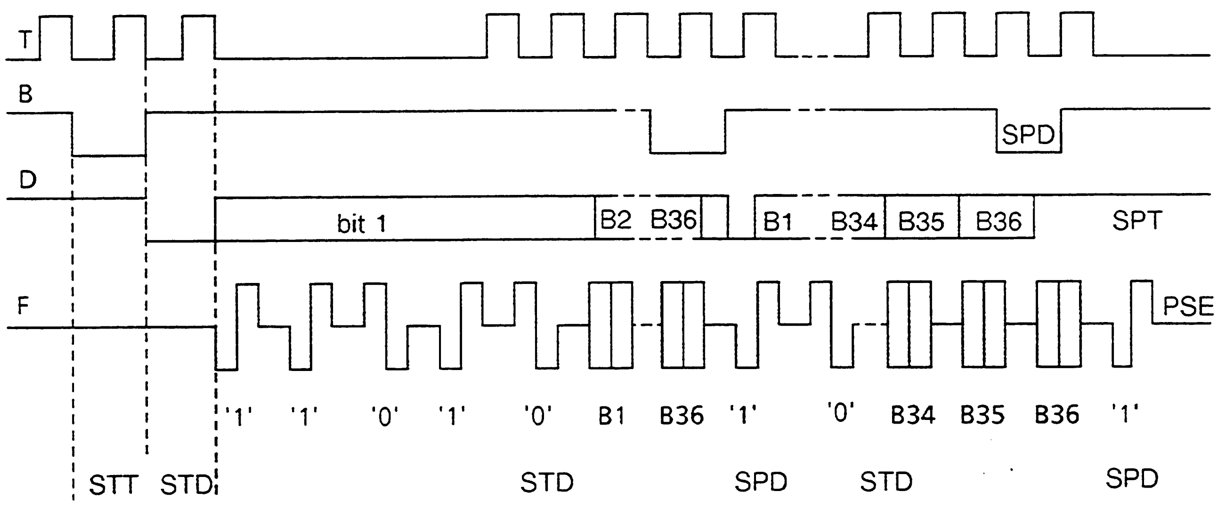


Fig. 6.1 Remote bus line protocol in data transfer (4-byte element)

Once the converter has recognized both signals, it starts transmitting a synchronization character on the remote bus consisting of the bit sequence "1101" (Fig. 6.1). The local bus clock is stopped during this time by the converter.

Once the sync character has been completed, the converter passes the transfer elements arriving from the local bus bit by bit to the remote bus. The local bus data are delayed by one bit when passed on to the remote bus, due to the insertion of the sync character. All transfer elements in a message are transmitted to the remote bus immediately after each other and without interruptions.

The end of a message is signalled on the local bus by the bit combination "stop data" (SPD) and "stop transfer" (SPT), resulting in a minimum pause (PSE) of four bits on the remote bus during which the local bus clock is stopped (Fig. 6.1). If larger intervals exist between the messages (larger than 4 bits + sync time), the pause reverts to the idle state .

The stop data bit following the last bit of the last transfer element (TE) in a message is omitted when transmitting 1- or 2-byte elements; in this case, the pause follows immediately.

The bi-phase coded remote bus signals are converted into an intermediate code by the receiving converter. After testing the sync character, the converter starts transmitting the data received from the remote bus on the local bus, according to the local bus line protocol (delayed by min. 1 or max. 2 bits).

The remote bus format is subjected to a constant plausibility check for:

- Sync character at the start of a message
- Test of the transfer element format
- Monitoring of the minimum pause up to the next message.

6.3 Troubleshooting

A fault on the inductive bus converter can be determined using the LEDs on the power supply module and a dual-channel storage oscilloscope.

The following flow chart should assist fault location at the module level.

The following points must be observed when measuring with the oscilloscope:

- Detection of the remote bus signal and the local bus data signal (Fig. 6.1):
  The remote bus signal can be detected on the yellow cable of the KOP. The data signal can be measured at pin b12 when operating on bus A and pin b16 of the BIL front connector when operating on bus B.

- Detection of the data and qualifier signals on the local bus (Fig. 6.1):
  See above for local bus data signal.
  The qualifier signal can be measured at pin b20 or b24 for bus A or B respectively.

- Measuring the signals Q_1, Q_2. (output 1. 2) and I_1. I_2, (input 1, 2) on the KOP-BIL interface (Fig. 6.2):
  The interface signals can be measured at pins d12 and d14 (output 2 and output 1) and pins z12 and z14 (input 2 and input 1) on the KOP backplane connector.

The local bus signal qualifier should be used as the trigger signal for the above measurements. It is available at pins b20 or b24 on the BIL front connector for bus A or B respectively.

- 24-V supply check:
  The 24-V supply voltage is applied to pin d30 of the power supply module's backplane connector [1].

- ABS (abort state) signal check:
  The ABS signal must be measured at pin b6 of the power supply module's backplane connector.

In order to carry out unequivocal locating of the fault, all participants but one must be switched off: this is done by inserting the switching link on the remote bus connector board.

The coaxial connecting lines to the participant (UI-coupler) must be disconnected in order to ensure that the remote bus signals are not influenced by reflections.

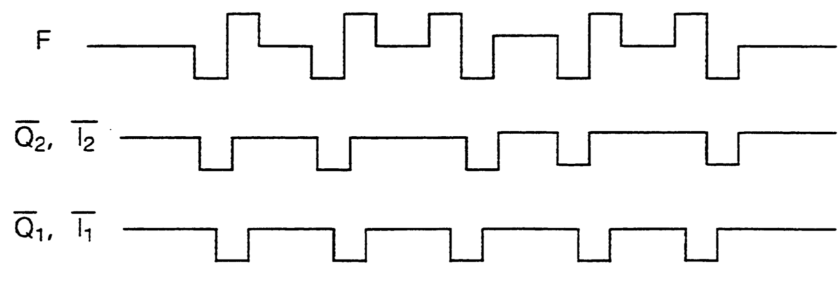
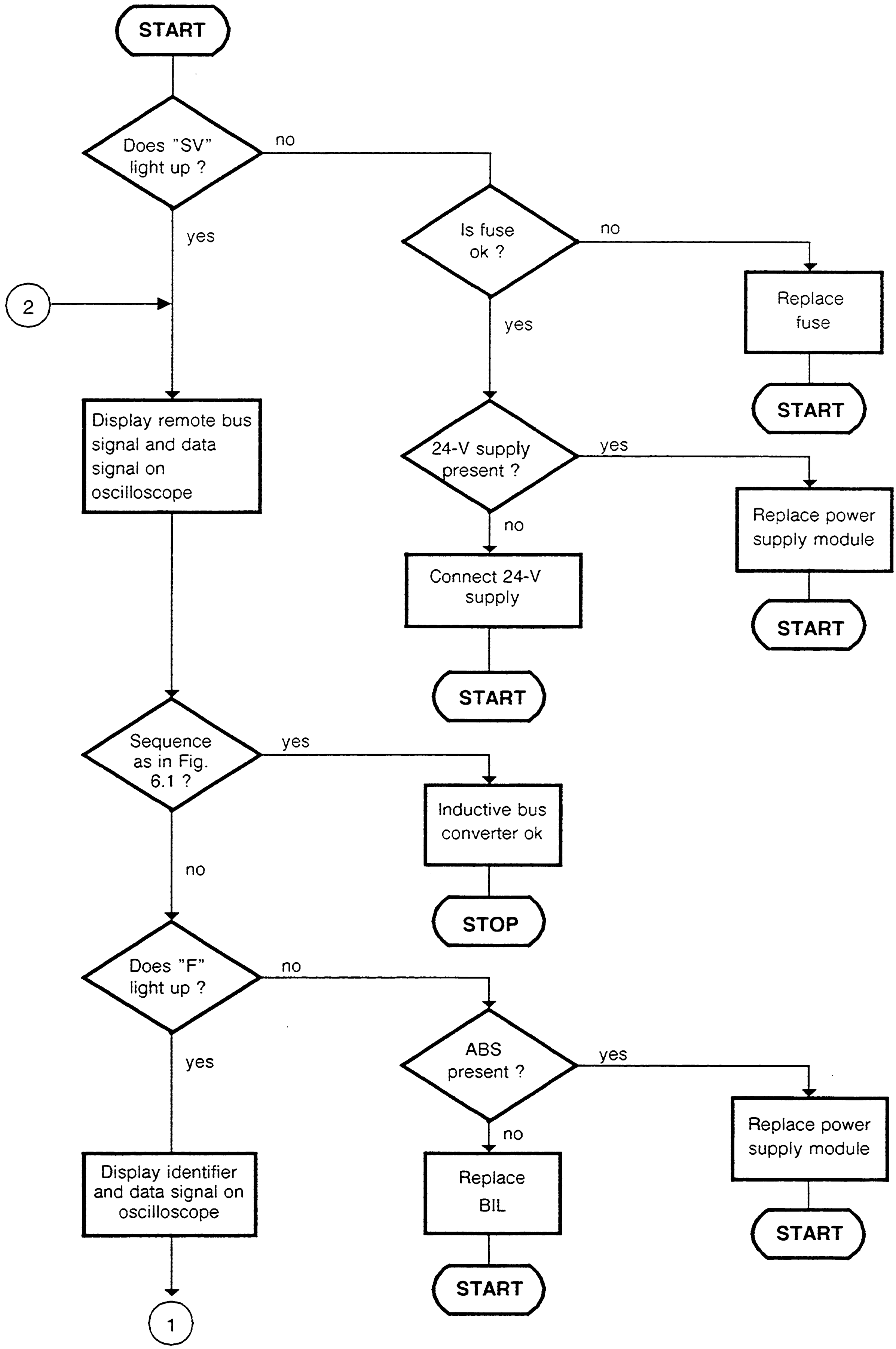
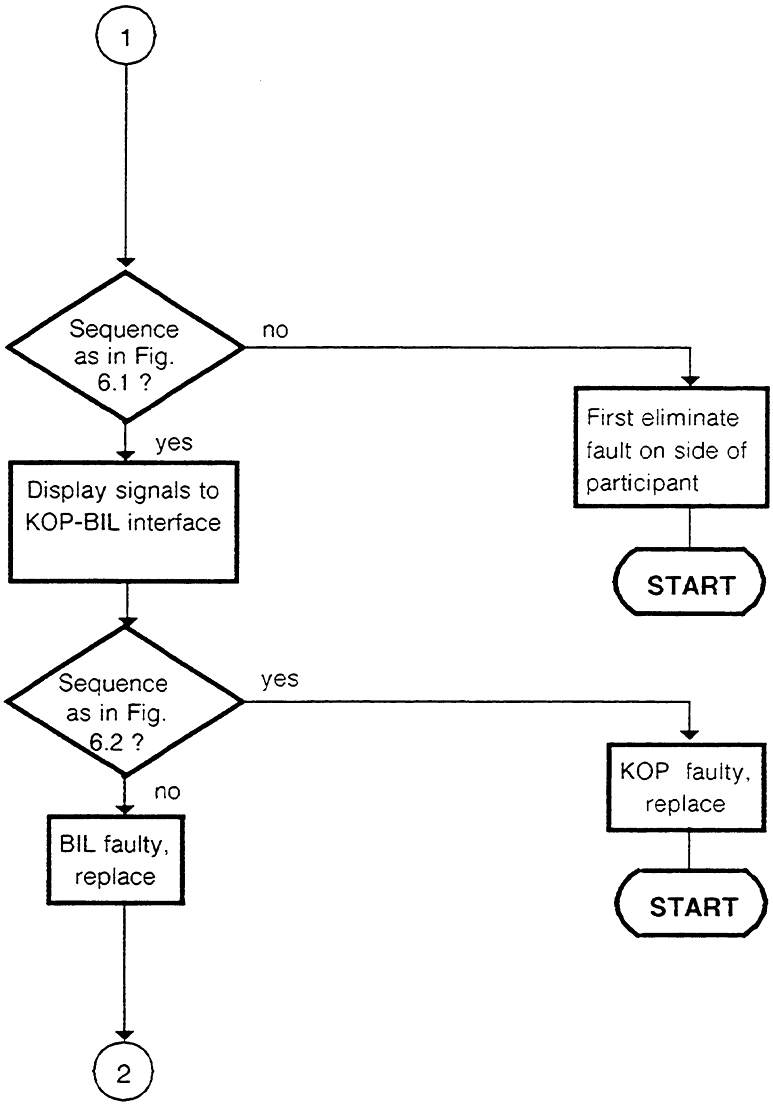


Fig. 6.2 Signal sequence at the KOP-BIL interface (start of message)

1) From revision level 4 of the power supply module (SV) 6DS1 211-8AA


START
Does "SV" light up ?
no
yes
2
Is fuse ok ?
no
yes
Replace fuse
START
Display remote bus signal and data signal on oscilloscope
24-V supply present ?
yes
no
Replace power supply module
Connect 24-V supply
START
START
Sequence as in Fig. 6.1 ?
yes
no
Inductive bus converter ok
STOP
Does "F" light up ?
no
yes
ABS present ?
yes
no
Replace power supply module
Display identifier and data signal on oscilloscope
Replace BIL
START
START
1


1
Sequence as in Fig. 6.1 ?
no
First eliminate fault on side of participant
START
yes
Display signals to KOP-BIL interface
Sequence as in Fig. 6.2 ?
yes
KOP faulty, replace
START
no
BIL faulty, replace
2

6.4 Connector Pin Assignments

Power Supply Module 6DS1 211-8AA

Backplane connector assignment, 24-pin + 7-pin male connector

Pin	d	b	z
2	RK2	0 V	+5 V
4	RK2		
6	RK1	ABS	
8	RK1	ET	
10	+5 V	+15 V	– 15 V
12		Bus A/B	
14		Reset	
16		0 V	
18			
20			
22			
24			
26	+24 V 1)		
28			
30	+24 V		
32			0 V

RK 1	Relay contact 1
RK 2	Relay contact 2
ABS	Abort (fault) signal
Bus A/B	Transmit display, bus A or B
ET	Receive message from remote bus

1) From revision level 4 of the power supply module (SV) 6DS1 211-8AA

Inductive coupler 6DS1 213-8AA

Backplane connector assignment, 48-pin male connector

Pin	d	b	z
2		0 V	
4			
6			
8			
10	+5 V	+15 V	– 15 V
12	$\overline{Q2}$		$\overline{I2}$
14	$\overline{Q1}$		$\overline{I1}$
16		0 V	
18			
20			
22			
24			
26			
28			
30			
32			

Bus Interface NF 6DS1 212-8AA

Front connector assignment, 48-pin male connector

Pin	d	b	z
2	01	SA0	Screen
4	↑	SA1	↑
6		SB0	
8		SB1	
10		DA0	
12		DA1	
14	↓	DB0	
16	01	DB1	
18		BA0	
20		BA1	
22		BB0	
24		BB1	
26		TA0	
28		TA1	
30		TB0	↓
32		TB1	Screen

SA0,1 = Control signal A
SB0,1 = Control signal B
DA0,1 = Data signal A
DB0,1 = Data signal B
BA0,1 = Qualifier signal A
BB0,1 = Qualifier signal B
TA0,1 = Clock signal A
TB0,1 = Clock signal B
01 = Bus earth

Backplane connector assignment, 48-pin male connector

Pin	d	b	z
2		0 V	+5 V
4			
6		ABS	
8		ET	
10	+5 V		
12	Inp2	Bus A/B	Outp2
14	Inp1	Reset	Outp1
16		0 V	
18			
20			
22			
24			
26			
28			
30			
32			

ABS Abort (fault) signal
ET Receive message signal
Bus A/B Parameterizing signal "transmit on bus A or bus B"
Reset Connection of reset key

Input 1,2 ($\overline{I1}$, $\overline{I2}$) Connection lines between bus interface NF
Output 1,2 ($\overline{Q1}$, $\overline{Q2}$) and inductive coupler

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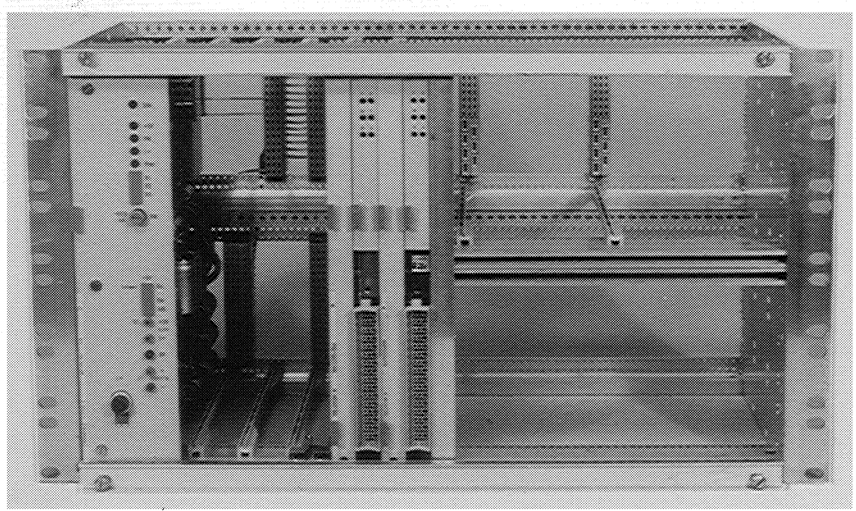
SIEMENS

TELEPERM M

Bus Couplers

Instructions C79000-B8076-C005-08



Contents

Empty Page

1 Application

Bus couplers (BK) are used to couple two autonomous bus systems. Data transfer is carried out independently on both bus systems.

Address-controlled messages are exchanged between the two bus systems via the bus couplers. The messages to be transferred are temporarily stored until the associated bus coupler has assumed the master function; only then does the exchange between the autonomous bus systems take place.

There are three different bus couplers:

Local Bus/Local Bus Coupler (BK-NN)
couples two autonomous 20-m local buses.

Local Bus/Remote Bus Coupler (BK-NF)
couples an autonomous 20-m local bus with an autonomous 4-km remote bus.

Remote Bus/Remote Bus Coupler (BK-FF)
couples two autonomous 4-km remote buses

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2 Design

The following units can be combined to form the various bus couplers:

- Interface module for 20-m local bus, 8 bit (BK-N8, N-BK) 6DS1 200-8AB, 6DS1 223-8AB [1]
- Inductive bus converter (UI) 6DS4 400-8AB
- Power supply module (SV) 6DS1 003-8AA
- Subrack (BGT), 6DS9 003-8CA (for TELEPERM M)
- Subrack (BGT), 6DS9 003-8DB (for TELEPERM ME)

Bus coupler unit Components used	BK-NN 20 m/20 m	BK-NF 20 m/4000 m	BK-FF 4000 m/4000 m
BK-N8, N-BK	2	2	2
SV	1	1	1
UI	-	1	2
BGT	1	1	1

1) **Important**

Simultaneous operation of an N-BK and a BK-N8 in one bus coupler (a so-called mixed operation) is **not** permitted.

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3 Mode of Operation

The bus coupler is treated like a participant by all buses and has an address on each of them. A participant on bus 1 (Fig. 1) transfers a message to a participant on bus 2 by first addressing the bus coupler.
The bus coupler buffers the message irrespective of the message transfer taking place on bus 2 and acknowledges the receipt to the transmitter.

The bus coupler transmits the message on bus 2 after assuming the master function on the latter. The participant which recognizes its address in the message, accepts the message and acknowledges its receipt to the bus coupler.

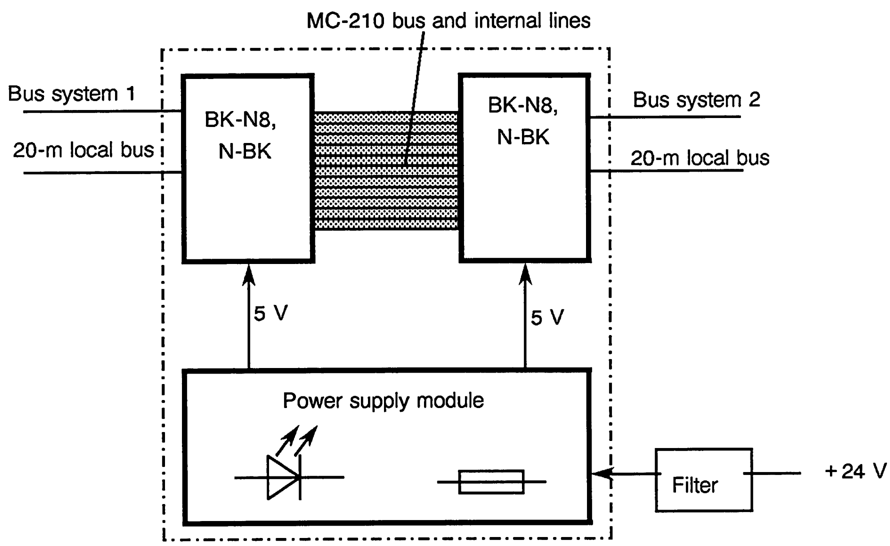

Fig. 1 Local bus/local bus coupler, functional diagram

The exact procedure within the BK-N8 is described in the instructions "Interface Module for 20-m Local Bus, 8 Bit" (Order No. C79000-B8076-C001) and in the instructions "N-AS/N-BK Local Bus Interface Module" (Order No. C79000-B8076-C406).

The modes of operation of the local bus/remote bus (BK-NF) and remote bus/remote bus (BK-FF) couplers are similar to those of the BK-NN. In the BK-NF, signals to and from the BK-N8, N-BK are conditioned in bus system 2 for the remote bus (Fig. 2).

In the BK-FF, the signals of the BK-N8, N-BK are conditioned for the remote bus by the inductive bus converter (UI) (Fig. 3). The conversion of local bus signals into remote bus signals is described in the instructions "Inductive Bus Converter" (Order No. C79000-B8076-C004).

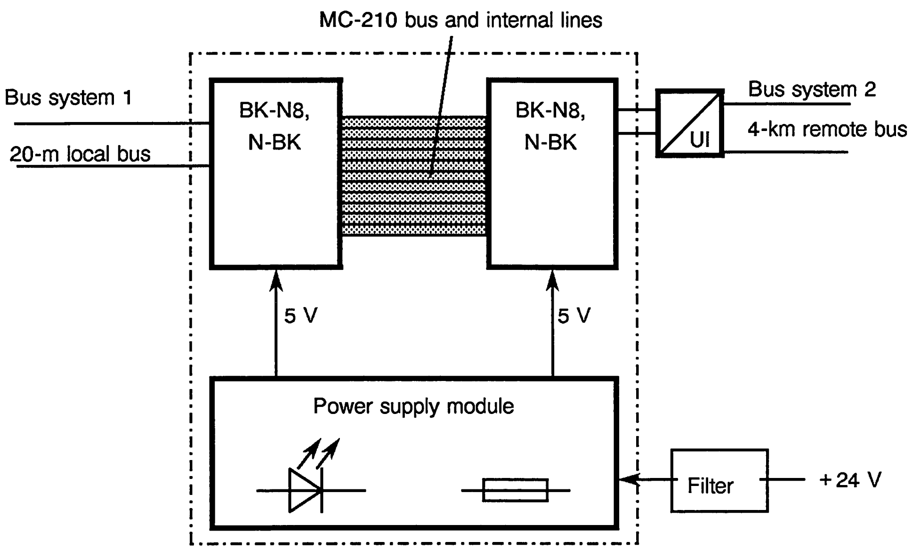

Fig. 2 Local bus/remote bus coupler, functional diagram

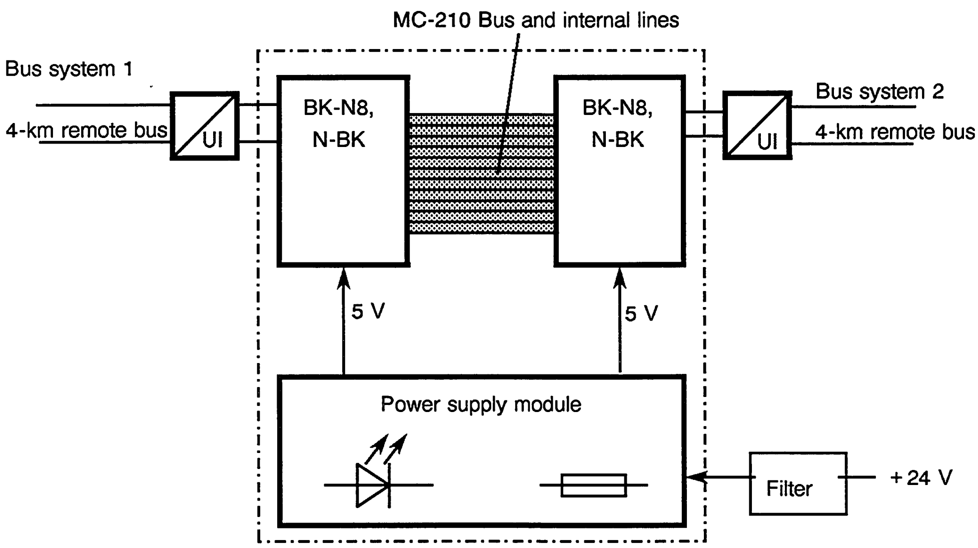

Fig. 3 Remote bus/remote bus coupler, functional diagram

The 5-V voltage necessary for operating the BK-N8, N-BK is obtained from the 24-V supply voltage via a switching regulator on the power supply module 6DS1 000-8AA. The power supply module 6DS1 000-8AA is described in detail in the instructions "Power Supply Module 24 V/5 V, 18 A" (Order No. C79000-B8076-C071).The inductive bus converter used with the BK-NF and BK-FF is directly supplied by the cabinet voltage (+ 24 V).

4 Technical Data

Order No	6DS1 003-8AA (SV) 6DS1 200-8AB (BK-N8) or 6DS1 223-8AB (N-BK) 6DS4 400-8AB (UI) 6DS9 003-8CA (BGT) or 6DS9 003-8DB (BGT)
Design	Two-tier subrack, equipped with three PCBs 233.4 mm x 160 mm, total front panel width of 8 standard slots. With BK-NF and BK-FF: additional bus converter, front panel width of 6 standard slots, three PCBs 100 mm x 160 mm.
Power supply	+24 V DC
Rated current consumption	
- Power supply module	1 A
- Per inductive bus converter	450 mA
Permissible ripple	≤ 15%
Interfaces	
- Local bus interface	Redundant 20-m local bus output, wired-OR, asymmetric V_{IH} ≥ 2.0 V Input level for local bus interface V_{OH} ≥ 2.7 V Output level for local bus interface
- Remote bus interface	Bi-phase signals, approx. level +/- 1 V
Operating mode	Half-duplex
Fuse	1.6 A on inductive bus converter, medium delay

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5 Installation and Commissioning

5.1 Installation

Regulations about handling modules containing MOS components must be observed when installing the bus coupler.

Specific slots are reserved in the bus coupler subrack for the interface module for 20-m local bus, (8 bit) with bus coupler firmware (BK-N8, N-BK), the power supply module 24 V/5 V and inductive bus converter (UI) (see Fig. 4).

The screen bar below the bus coupler subrack is used to connect the cable screens and contains at the rear the filter for the power supply module (SV). The two lines of each bus converter unit (UI) which lead to the remote bus connector board have a stripped insulation in the bar area and are connected with a screen clamp to the screen bar sheet metal.

The supply voltage (+ 24 V) of the bus coupler unit feeds the filter on the screen bar via two lines (M, L +). The two filter output lines are plugged on the connection multiplier at the coupler rear (see Fig. 4c). The power supply module (SV) and the UI power supplies are fed from there.

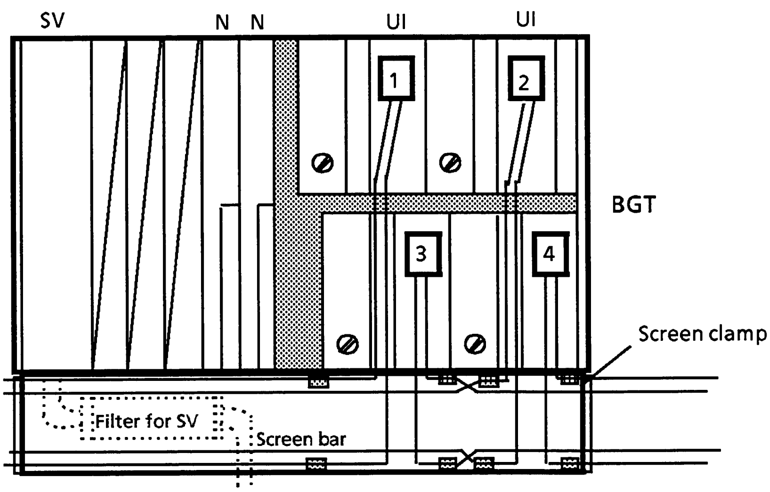


Fig. 4 a Remote bus/remote bus coupler, 6DS9 003-8CA for TELEPERM M

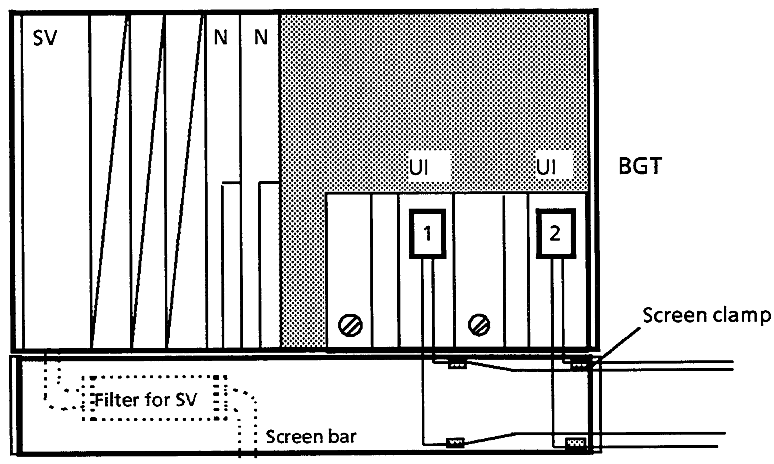


Bild 4 b Remote bus/remote bus coupler, 6DS9 003-8DB for TELEPERM ME

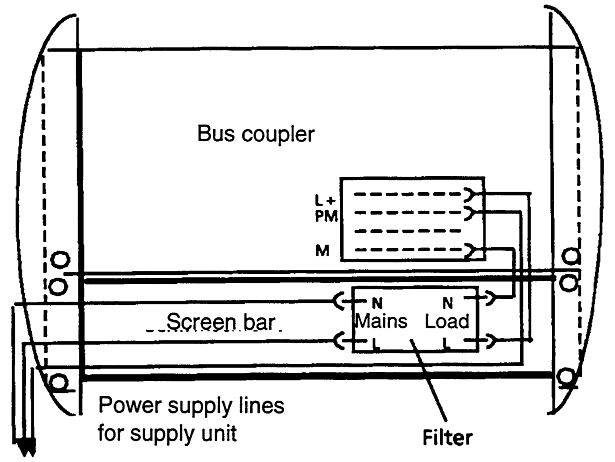


Fig. 4 c Connection of the power supply lines (rear view) for TELEPERM M and TELEPERM ME

Notes to install the bus coupler unit in the cabinet

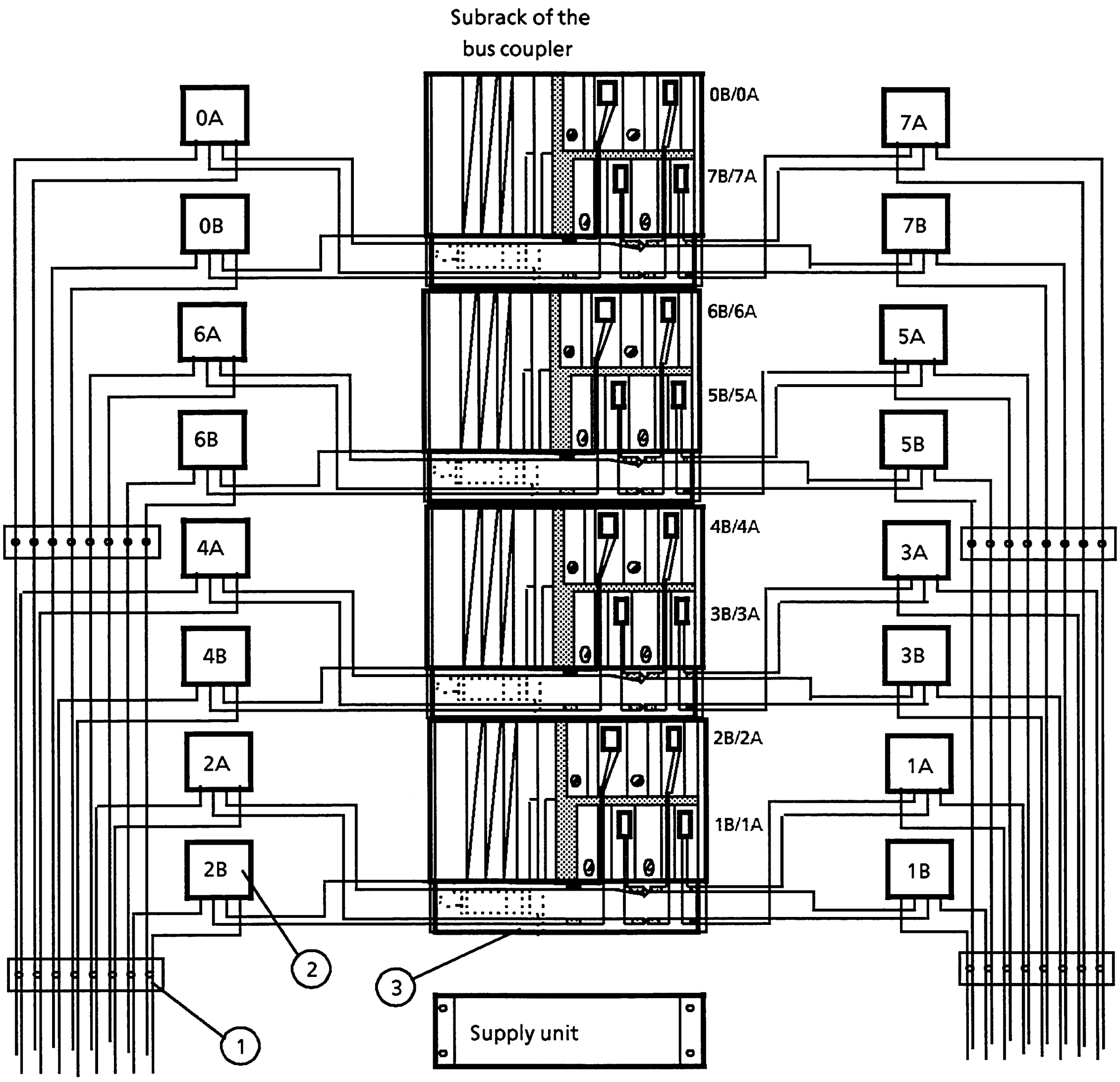
- Each cabinet contains a max. of four bus couplers.
- Use the lower tiers to simplify the remote bus cable routing when less than 4 couplers are installed in a cabinet.
- The insulation of all incoming and outcoming remote bus cables must be removed in the area of the always existing screen bar (for remote bus) and the cables have to be connected to the screen bar metal with screen clamps.
- If some remote bus connection boards (AF) are mounted in the upper cabinet half, then a second screen bar must be mounted in the middle of the cabinet. The remote bus cables are connected as described.
- The mounting set for the additional screen bar comprises 1 screen bar, 2 studs and 2 nuts (Order number C79165-A3022-D543).
- Observe the specified installation prescriptions when connecting the two remote bus cables and the two coaxial cables to the bus converter UI on the connection board (AF).

For the lower screen bars it can arrive, for several remote bus cables, to attach two cables with one clamp. These screen clamps are not comprised in the cabinet delivery , they must be ordered specific to the plant

Clamps for the cable screen contacting and the associated troughs

Designation, type,		Order No. *)	Cable diameter in mm (max)
Cable clamp	K16H	1.199	16
Central trough	LW16/40	014.206	
Cable clamp	K20H	1.200	20
Central trough	LW20/40	014.207	
Cable clamp	K24H	1.201	24
Central trough	LW24/40	014.203	

*) Order address: PUK-Werke KG, Nobelstr. 45-53, 12057 Berlin



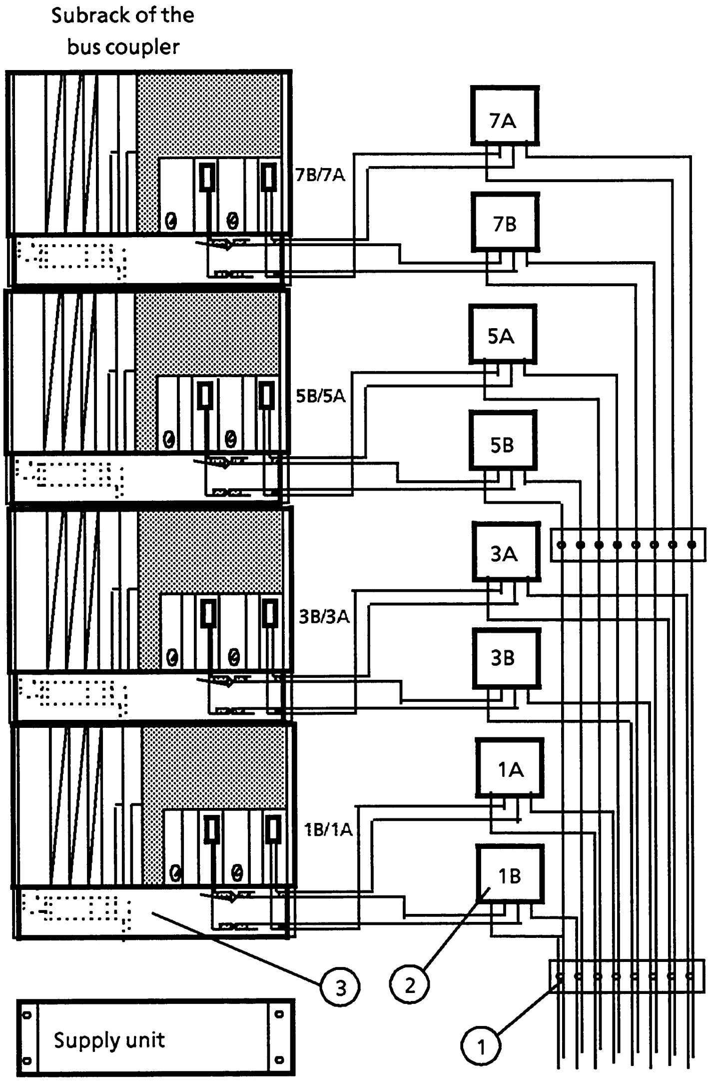
(1) Screen bar for remote bus *) C79165-A3022-C543

(2) Connection board for remote bus (AF)

(3) Screen bar (part of the bus coupler

*) The lower screen bar (s) is (are) included in the standard cabinet, the upper must be ordered separately (Mounting set: C79165-A3022-D543).

Fig. 5a Cabinet with bus couplers forTELEPERM M (maximum configuration)



(1) Screen bar for remote bus *) C79165-A3022-C543

(2) Connection board for remote bus (AF)

(3) Screen bar (part of the bus coupler

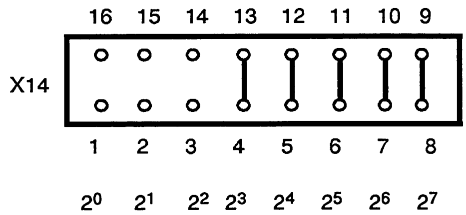
*) The lower screen bar(s) is (are) included in the standard cabinet, the upper must be ordered separately (Mounting set: C79165-A3022-D543).

Fig. 5b Cabinet with bus couplers forTELEPERM ME (maximum configuration)

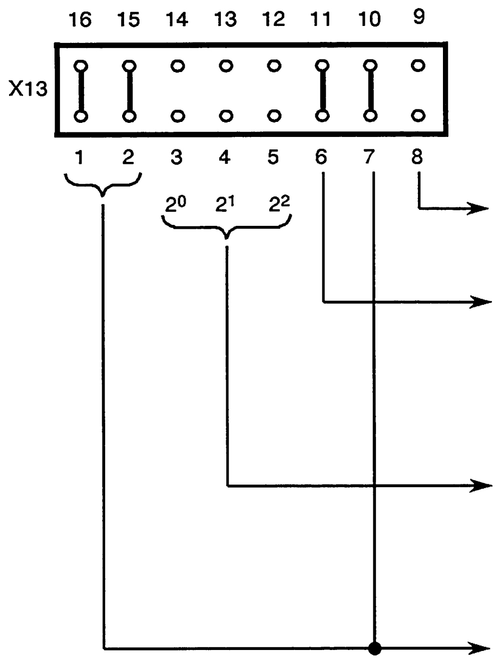
5.2 Commissioning

In order to differentiate between the individual interface modules (BK-N8, N-BK) in the autonomous bus system, each interface module must be allocated a participant address (TA). In order to differentiate between several autonomous buses connected via bus couplers (BK), a bus address (BA) must be assigned. Both of these addresses are set using plug-in jumpers. The address bus 0/ participant 0 is not permitted.

Jumper settings for BK-N8 (6DS1 200-8AB)



Participant address (permissible address range: 0-99, whereby max. 100 participants are permitted in the bus system); e.g. participant address = 7 (Status on delivery): all coding plugs inserted. (withdrawn coding plug activates associated address bit)



Status on delivery: all jumpers plugged in

Operating mode; X13/8-9 open: non-redundant bus
X13/8-9 inserted: redundant bus

Coding plug inserted:
- in a single bus coupler
- in one of the parallel or redundant bus couplers (this jumper may not be inserted in the second bus coupler), see also note on page 15

Bus address; e.g. bus address = 0: X13, 3-4, 4-13 and 5-12 inserted (withdrawn coding plug activates associated address bit)

Always inserted

Jumper settings for N-BK (6DS1 223-8AB):

- Functionality

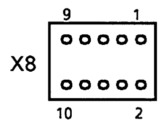
The functionality of the N-BK is set on the pin strips X6, X7 and X9 using coding plugs.

Functionality/System	X9 (1, 2)	X9 (2, 3)	X6 (3 1 / 4 2)	X7 (7 1 / 8 2)
BK-N8: bus coupler	1,0,0	1 1 0	1 0	0 1 1 0

0 = Jumper open
1 = Jumper inserted

- DMA area

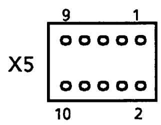
The DMA area of the N-BK is set on the pin strip X8 using coding plugs.

Functionality/System	
BK-N8: bus coupler	0 X X X X

0 = Jumper open
1 = Jumper inserted
x = Not relevant

- Coding plugs on pin strip X5

The coding plug X5/9-10 must be inserted on the pin strip X5. All other jumpers remain open.


1 0 0 0 0

0 = Jumper open
1 = Jumper inserted

> ⚠ **Caution**
>
> The two screws of the local bus connector provide a tight connection between connector, module and subrack. EMC reasons require both screws to be tightened. Failure to do so will reduce the signal-to-noise ratio of data transmission.

- **Address on the CS 275 bus**

In order to differentiate between the individual participants in the autonomous bus system, each local bus interface module must be allocated a participant address (TA). In order to differentiate between several buses connected via bus couplers (BK), a bus address (BA) must be assigned as well.
Both addresses are set on the front panel via DIP switches. They may be modified during operation. A new address is accepted when the ÜB switch is actuated.

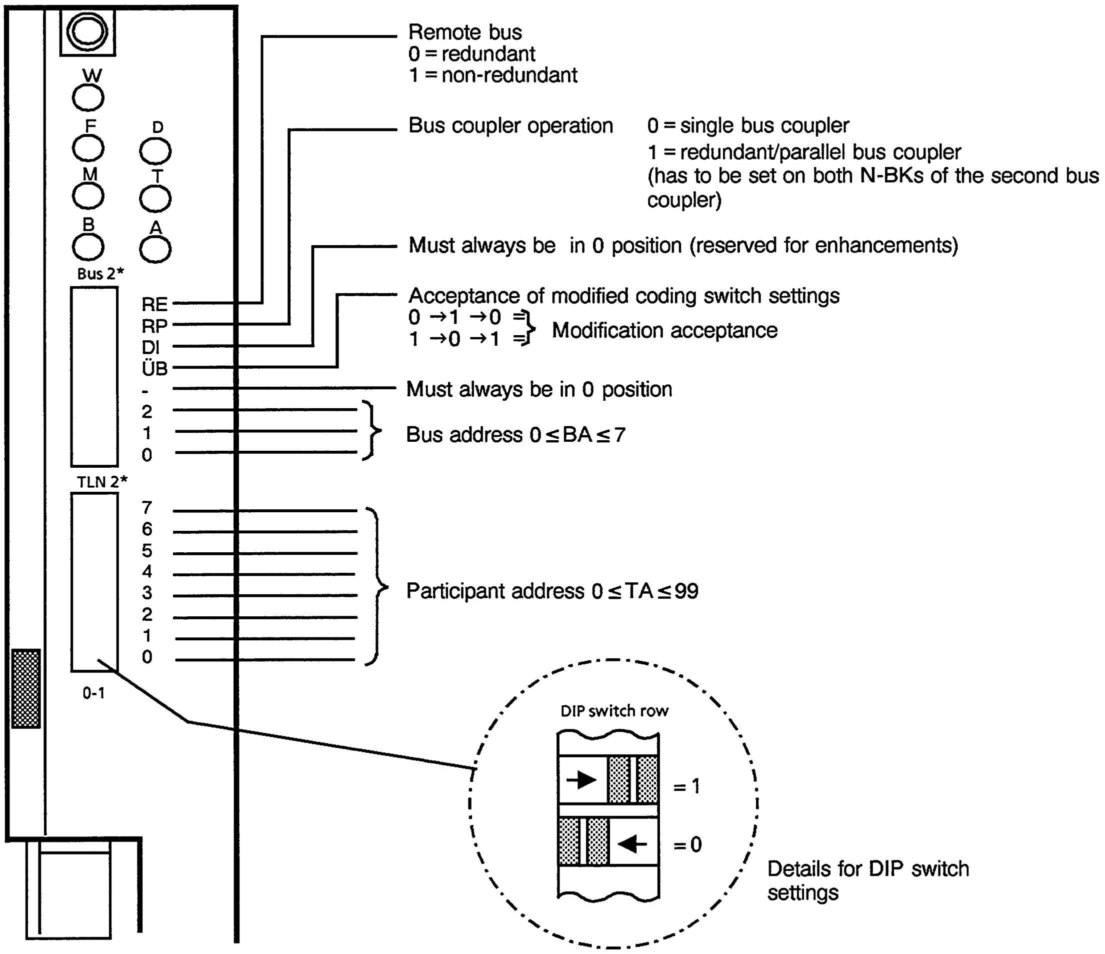


Fig. 6 Coding switch

- **Participant address**

The binary coded participant address is set on the 8 bottom DIP switches.

Setting range $0 \leq TA \leq 99$

- **Redundant/parallel bus coupler**

The following applies to the local bus interface module BK-N8 (6DS1 200-8AB):

If two bus couplers are used redundantly or in parallel, the jumper X13/6-11 must be inserted on both local bus interface modules BK-N8 of one bus coupler but it may not be inserted on the second bus coupler.

The following applies to the local bus interface module N-BK (6DS1 223-8AB):

If two bus couplers are used redundantly or in parallel, "redundant/parallel bus coupler mode" (RP = 1) must be set on **both** N-BKs (6DS 1223-8AB) of the **second** bus coupler (see Fig. 7, BATA 1/6 and 2/12). To do so, set the switch RP to 1 on the DIP switch row (see Fig. 6).

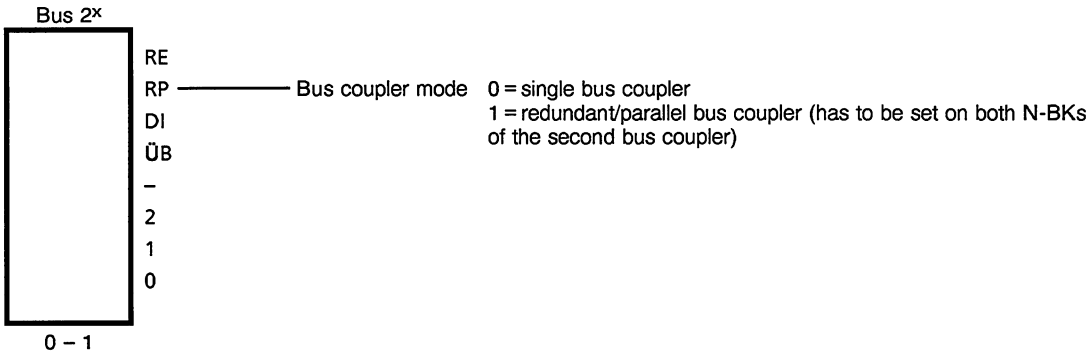
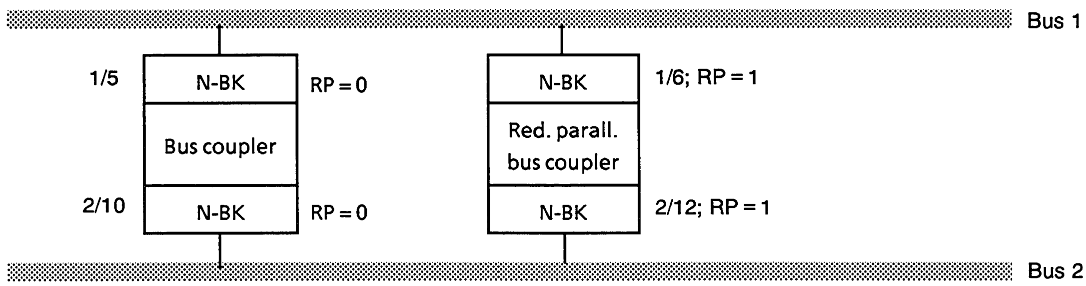


Fig. 7 Upper DIP switch row of the N-BK front panel

The participant addresses of the two bus couplers must be different (see Fig. 7).



All the bus coupler modules (N-BK or BK-N8) used to link two buses (e.g. bus 2 and bus 1) of a CS 275 bus system must have the same type and the same release version.
When two bus couplers are used for coupling two buses (redundant/parallel bus coupler) use 4 identical bus coupler modules (e.g. 4 N-BK or 4 BK-N8). See also Catalog PLT 130 or Fig. 8.
A mixed mode (e.g. single set coupler with 2 BK-N8 and redundant parallel ser coupler with 2 N-BK) is only permissible for a short time (during upgrading or repair.
Another module type (e.g. N-BK between bus 1 and bus 2 as well as BK-N8 between bus 2 and bus 3) can be used for coupling with another bus of the same system.

Fig. 8 Example for assigning bus and participant addresses with a redundant/parallel bus coupler.

The participant addresses of the other modules can be found in the instructions:
- "Inductive Bus Converter",
  Order No. C79000-B8076-C004
- "Power Supply Module 24 V/5 V, 18 A",
  Order No. C79000-B8076-C071.

5.3 Operation

There are two controls on the power supply module 24 V/5 V, 18 A (see Fig. 8) for switching off the 24-V supply (L+) and the 5-V output voltages. The setpoint of the 5-V voltage can be adjusted using potentiometer R4.

Both the switch and the potentiometer are protected by a cover on the front panel. Test jacks are provided on the front panel for checking the output and input voltages, as well as the current.

The alarm threshold of the +5-V output voltage, +24-V alarm voltage (PM) and +24-V power supply can be adjusted using potentiometers R1, R2 and R3.

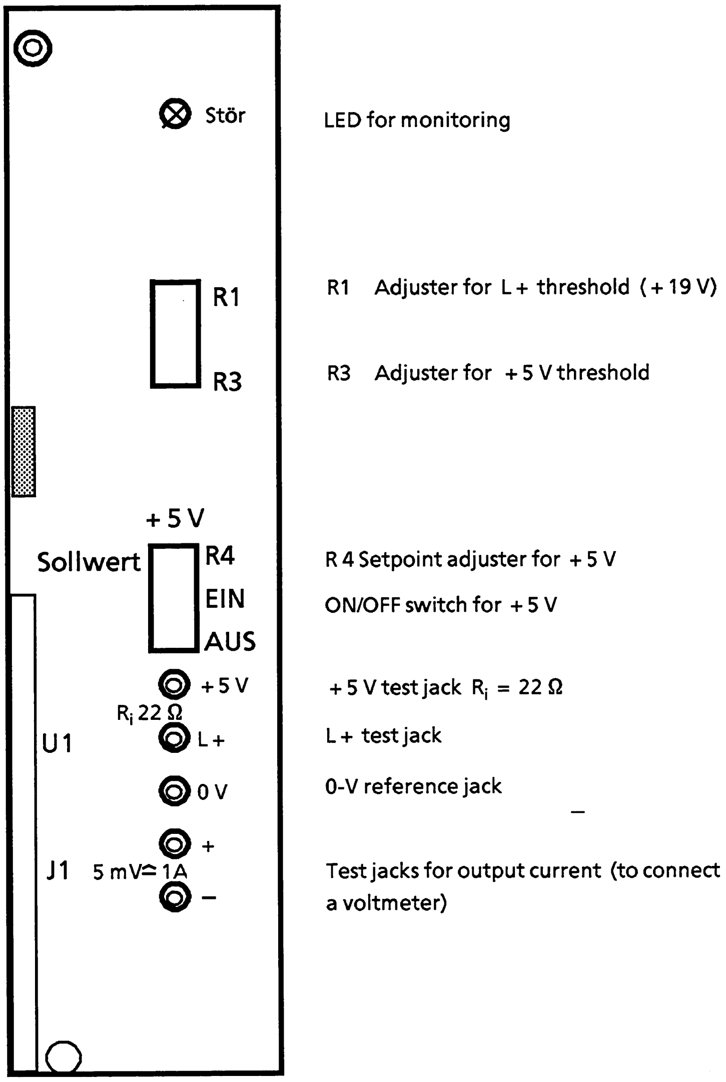


Fig. 9 Operator controls on the power supply module 24 V/5 V, 18 A

With the local bus/remote bus and remote bus/remote bus couplers,operation is also possible via the inductive bus converter. A reset key is located on the power supply unit of the inductive bus converter for resetting the complete logic. The reset key must be pressed after inserting the local bus connector and in the case of a fault.

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6 Maintenance

6.1 Method of Operation

Bus couplers are used to transmit information between two autonomous buses.

A list given on each bus, contains the participant number of the bus coupler. This number is specified under the bus address to which the message is to be transmitted. The list is generated during the system start-up, cyclically monitored and corrected if necessary. In this manner, the originally specified address (bus and participant address) is converted into an intermediate address (participant address of the bus coupler).

In the bus coupler addressed, the message passes a first wait loop (WS 1) within the BK-N8, N-BK on bus 1 before entering the receive buffer (EPU) and passing two further wait loops (WS 2, WS 3). The BK-N8, N-BK on bus 2 accepts the message into its transmit buffer (SPU) in DMA mode. If it is then assigned the master function on bus 2 according to the line protocol, the message passes a further wait loop (WS 4) and is finally transferred to the originally addressed participant on bus 2.

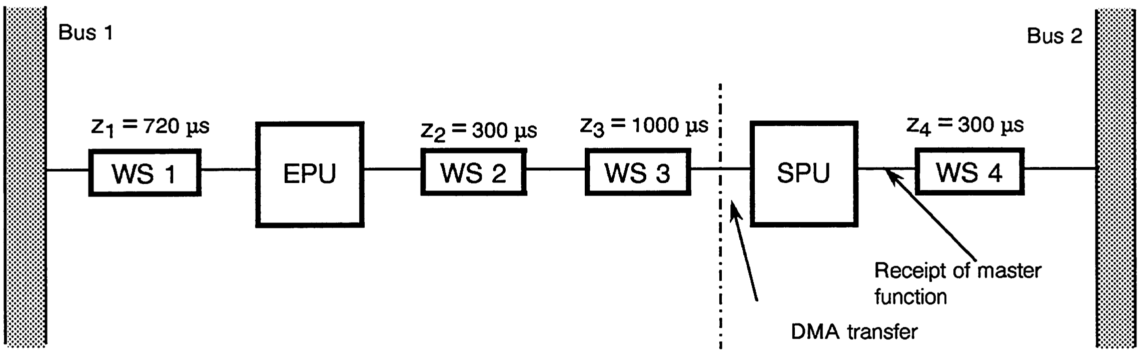


Fig. 10 Message transfer via bus coupler

Two bus couplers can be installed between two autonomous buses (see Fig. 10). A difference is made between two applications:

- Parallel bus coupler:
  If the coupling capacity of the coupler is insufficient, the transmission capacity can be increased using a second bus coupler. This parallel connection will result in decreased capacity if one of the bus couplers fails.

- Redundant bus coupler:
  If the coupling capacity of a bus coupler is sufficient, a redundant system can be established using a second bus coupler.
  Should the first bus coupler fail, the second bus coupler will automatically carry out the coupling function. This is a true redundant system.

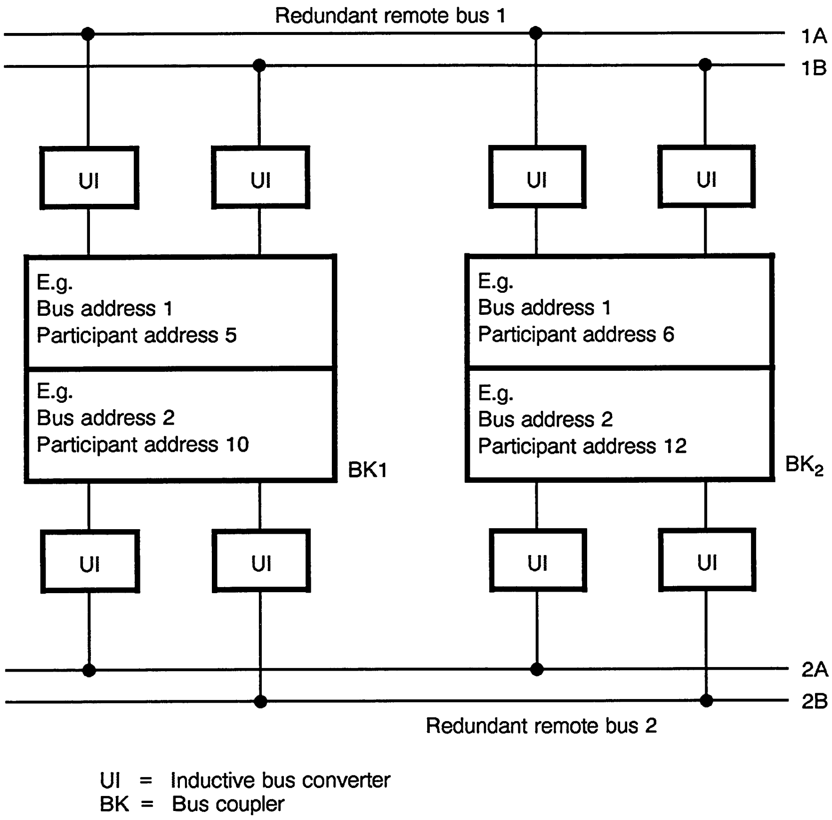


Fig. 11 Parallel bus coupler, e.g. between redundant remote buses

Caution

A visual inspection of the front LED of the bus coupler is recommended every two months to avoid coupling failure via BK due to a multiple fault with the redundant/parallel bus coupler. It is a reliable check to know if one of the two couplers fails (e.g. all front LEDs are alight). The blinking of the front LEDs is explained in the description of the used coupler module. A visual inspection makes no sense for a single bus coupler.

6.2 Troubleshooting

Regulations about modules containing MOS components must be observed when handling the bus couplers modules. The BK-N8 must not be plugged into an adapter module during troubleshooting as this would be an extension of the bus.

If a fault occurs within the bus coupler, first check the power supply module 24 V/5 V, 18 A. LEDs for monitoring the 24-V supply and the 5-V output voltages are located on the front panel (see Fig.8). An LED for a common alarm is also present. The corresponding voltage or output current can be measured via jacks on the front panel if one of these LEDs lights up. The module must be replaced if faulty values cannot be corrected using the potentiometers on the front panel. If the voltage and current values are within the permissible limits, first check for faults on the BK-N8, N-BK and then for faults on the inductive bus converter. Proceed as in Section 6.2 of the instructions "Interface Module for 20-m Local Bus, 8 Bit", Order No. C79000-B8076-C001, or the instruction "N-AS/N-BK Local Bus Interface Module" (Order No. C79000-B8076-C406) and Section 6.3 of the instructions "Inductive Bus Converter", Order No. C79000-B8076-C004.

6.3 Connector Pin Assignments

Interface Module for 20-m Local Bus, 8 Bit (BK-N8, 6DS1 200-8AB)

Backplane connector X1

Pin	d	b	z
2		0 V	+5 V
4		PESP	
6	ADB 12	ADB 0	$\overline{\text{CPKL}}$
8	ADB 13	ADB 1	$\overline{\text{MEMR}}$
10	ADB 14	ADB 2	$\overline{\text{MEMW}}$
12	ADB 15	ADB 3	$\overline{\text{RDY}}$
14		ADB 4	DB 0
16		ADB 5	DB 1
18		ADB 6	DB 2
20		ADB 7	DB 3
22		ADB 8	DB 4
24		ADB 9	DB 5
26		ADB 10	DB 6
28		ADB 11	DB 7
30			
32		0 V	

Backplane connector X2

Pin	d	b	z
2	$\overline{\text{BKHLDA}}$	0 V	+5 V
4	BKPRIO	BKINTE	BKADB 0
6	$\overline{\text{IRPAE}}$	$\overline{\text{BKHOLD}}$	BKADB 1
8	BKRS	$\overline{\text{BKMEMR}}$	BKADB 2
10	INTE	$\overline{\text{BKMEMW}}$	BKADB 3
12		BKDB 0	BKADB 4
14		BKDB 1	BKADB 5
16		BKDB 2	BKADB 6
18		BKDB 3	BKADB 7
20	$\overline{\text{HLDA 0}}$	BKDB 4	BKADB 8
22	BUSEN	BKDB 5	BKADB 9
24		BKDB 6	BKADB 10
26		BKDB 7	BKADB 11
28	$\overline{\text{HLDA 1}}$	BKPE SP	BKADB 12
30		BKADB 15	BKADB 13
32	$\overline{\text{HOLD}}$	0V	BKADB 14

BK... = Signals for the bus coupler

Front connector X4

Pin	d	b	z
2	0 V	SA 0	Screen
4	↑	SA 1	↑
6		SB 0	
8		SB 1	
10		DA 0	
12		DA 1	
14	↓	DB 0	
16	0 V	DB 1	
18		BA 0	
20		BA 1	
22		BB 0	
24		BB 1	
26		TA 0	
28		TA 1	
30		TB 0	↓
32		TB 1	Screen

DB0	DB7	=	Data bus
ADB0	ADB15	=	Address bus
PESP		=	Peripheral memory selection
$\overline{MEMR}$		=	Read signal
$\overline{MEMW}$		=	Write signal
$\overline{RDY}$		=	Ready signal
$\overline{HOLD}$		=	Hold request
$\overline{HLDA0}$		=	Hold acknowledgement 0 input
HLDA1		=	Hold acknowledgement 1 output (pass on)
INTE		=	Interrupt enable (DMA block)
BUSEN		=	Data bus enable
$\overline{CPKL}$		=	Processor ready
IRPAE		=	Interrupt request for process automation unit (PAE)

Internal Signals for Bus Coupler (BK)

BKDB0	7	=	Internal data bus	(I,O)
BKADB0	15	=	Internal address bus	(I)
$\overline{BKMEMR}$		=	Internal read signal	(I)
$\overline{BKMEMW}$		=	Internal write signal	(I)
BKHOLD		=	Hold request	(I)
BKHLDA		=	Hold acknowledgement	(O)
BKINTE		=	DMA enable	(O)
BKPRIO		=	Priority scheduling	(I)
BKRS		=	Reset	(0)

I = Input, O = Output

SA0, 1	=	Control signal, bus A
SB0, 1	=	Control signal, bus B
DA0, 1	=	Data signal, bus A
DB0, 1	=	Data signal, bus B
BA0, 1	=	Qualifier signal, bus A
BB0, 1	=	Qualifier signal, bus B
TA0, 1	=	Clock signal, bus A
TB0, 1	=	Clock signal, bus B

1	=	Forward signal line
0	=	Return signal line
		0 V reference earth

N-BK Local Bus Interface Module (6DS1 223-8AB)

Pin	d	b	z
2		0 V	+5 V
4		PESP	
6	ADB12	ADB0	CPKL_N
8	ADB13	ADB1	MEMR_N
10	ADB14	ADB2	MEMW_N
12	ADB15	ADB3	RDY_N
14		ADB4	DB0
16		ADB5	DB1
18		ADB6	DB2
20		ADB7	DB3
22		ADB8	DB4
24		ADB9	DB5
26		ADB10	DB6
28		ADB11	DB7
30			
32		0 V	

Backplane connector X1

Pin	d	b	z
2	BKHLDA_N	0 V	+5 V
4	BKPRIO	BKINTE	BKADB0
6	IRPAE_N 1)	BKHOLD_N	BKADB1
8	BKRS	BKMEMR_N	BKADB2
10	INTE 1)	BKMEMW_N	BKADB3
12	F_N	BKDB0	BKADB4
14	MAST_N	BKDB1	BKADB5
16	UMF_N	BKDB2	BKADB6
18	RDYS_N	BKDB3	BKADB7
20	HLDA0_N 2)	BKDB4	BKADB8
22	BUSEN 1)	BKDB5	BKADB9
24		BKDB6	BKADB10
26		BKDB7	BKADB11
28	HLDA1_N 3)	BKPESP	BKADB12
30		BKADB15	BKADB13
32	HOLD_N 2)	0 V	BKADB14

Backplane connector X2

1) + 2) Signals of the X2 in connection with an MC 210
2) Signals of the X2 in connection with an AS/OS processor
3) Prioritized signal for further DMA-capable modules
BK... Signals for the bus coupler

Pin	d	b	z
2	0 V	SA 0	screen
4	0 V	SA 1	screen
6	0 V	SB 0	screen
8	0 V	SB 1	screen
10	0 V	DA 0	screen
12	0 V	DA 1	screen
14	0 V	DB 0	screen
16	0 V	DB 1	screen
18		BA 0	screen
20		BA 1	screen
22		BB 0	screen
24		BB 1	screen
26		TA 0	screen
28		TA 1	screen
30		TB 0	screen
32		TB 1	screen

Front connector X4

SA 0, 1 = Control signal BUS A
SB 0, 1 = Control signal BUS B
DA 0, 1 = Data BUS A
DB 0, 1 = Data BUS B
BA 0, 1 = Qualifier BUS A
BB 0, 1 = Qualifier BUS B
TA 0, 1 = Clock BUS A
TB 0, 1 = Clock BUS B

1 = Forward signal line
0 = Return signal line (0-V reference earth)

Power Supply Module 24 V/5 V, 18 A

Terminal blocks (rear view) of backplane connector on alarm logic board

Stift	d	b	z
2		0 V	
4		Cycle	Minutes
6		M19	Sys.St.
8		SRLS	SRLD
10			
12		DS	
14		HOLD	RS
16		$\overline{\text{SVKE}}$	Watchdog
18		$\overline{\text{SVK}}$	SVE
20		Res.	F1
22		Lüfter S3	F2
24		Temp. S2	F3
26		Tür 1	
28		Output blocking II	Output blocking II
30			
32		0 V	

PM	Signalling voltage + 24 V
L+	Supply voltage + 24 V
M	Reference potential
DS, HOLD, RS	Signals for the automatisision system central unit
RES	Standby
Lüfter	Fan ready
Temp.	Overtemperature
Tür	Door closed
$\overline{\text{SVKE}}$	Power supply ready input
$\overline{\text{SVK}}$	Power supply ready
SVE	Power supply ready

Stift	d	b	z
2	PM1	PM2	PM
4	U22	U21	U20
6	M22	M21	M20
8	S13	S14	$\overline{\text{FR}}$
10	M19	Res.	
12	Door S1	Temp. S2	Fan S3
14	Minutes	Minutes	
16	Cycle	Cycle	
18			
20			F1/2
22	F2/3		
24			F3/4
26	PM		
28			L+
30	M		
32			

Busumsetzereinheit, induktiv

Stromversorgungsbaugruppe

Backplane connector, male (24 + 7)-pin

Stift	d	b	z
2	RK 2	0 V	+5 V
4	RK 2		
6	RK 1	AB 5	
8	RK 1	ET	
10	+5V	+15 V	-15 V
12		Bus A/B	
14		Reset	
16		0 V	
18			
20			
22			
24			
26			
28			
30	+ 24 V		
32			0 V

Inductive coupler

Backplane connector

Stift	d	b	z
2		0 V	
4			
6			
8			
10	+5 V	+15 V	-15 V
12	Q 2		I 2
14	Q 1		I 1
16		0 V	
18			
20			
22			
24			
26			
28			
30			
32			

Bus interface NF

Front connector

Pin	d	b	z
2	0 1	SA 0	Screen
4	↑	SA 1	↑
6	│	SB 0	│
8	│	SB 1	│
10	│	DA 0	│
12	│	DA 1	│
14	│	DB 0	│
16	↓	DB 1	│
18	0 1	BA 0	│
20		BA 1	│
22		BB 0	│
24		BB 1	│
26		TA 0	│
28		TA 1	│
30		TB 0	↓
32		TB 1	Screen

Backplane connector

Pin	d	b	z
2		0 V	+ 5 V
4			
6		ABS	
8		ET	
10	+5 V		
12	Inp 2	Bus A/B	Outp 2
14	Inp 1	Reset	Outp 1
16		0 V	
18			
20			
22			
24			
26			
28			
30			
32			

RK 1 - Relay contact 1
RK 2 - Relay contact 2
ABS - Abort (fault) signal
Bus A/B - Transmit indication, bus A or B
Reset - Reset
ET - Receive message from remote bus
SA0, 1 - Control signal A
SB0, 1 - Control signal B
DA0, 1 - Data signal A
DB0, 1 - Data signal B
BA0, 1 - Qualifier signal A
BB0, 1 - Qualifier signal B
TA0, 1 - Clock signal A
TB0, 1 - Clock signal B
01 - Bus earth

Inp 1,2 (I_1, I_2) Connection cables between bus interface NF and inductive coupler

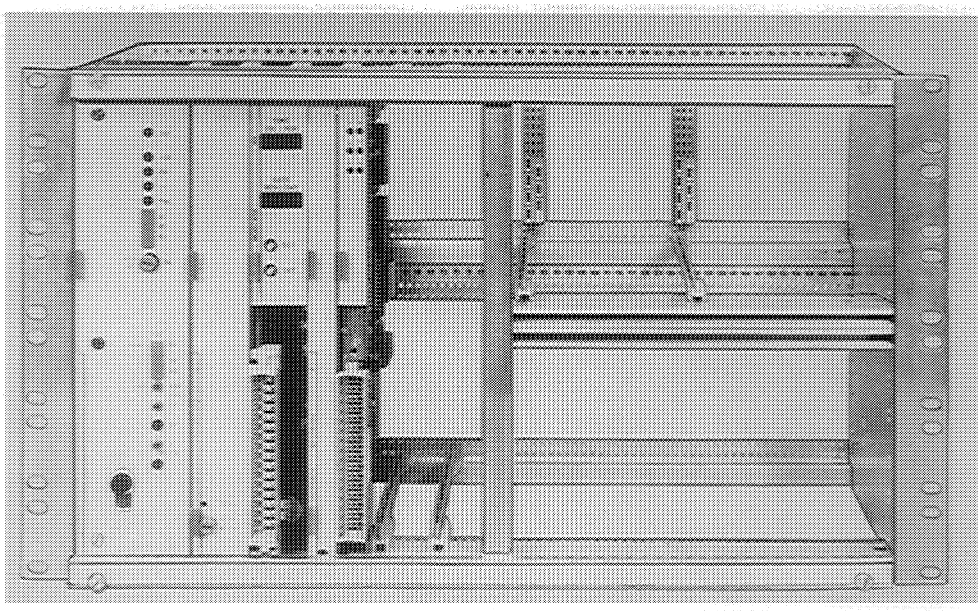
SIEMENS

TELEPERM M

Master Clock

6NG4207-8PS01/-8PS02 and 6DS1200-8BA
6DS1000-8AA and 6DS1002-8AA, 6DS1003-8AA

Instructions C79000-B8076-C063-06



Contents

1 Application

The TELEPERM M master clock is responsible for synchronizing the clocks necessary for real-time logging in the automation systems (AS) and operation and monitoring systems (OS) via the CS 275 bus system.

The individual clocks are synchronized every 10 s by transmitting the complete time and date from milliseconds up to years via the bus system. The delay times occurring during transmission are detected by the bus interface modules of the AS and the time data are corrected accordingly. Due to synchronization, the deviation in cycle time between the clocks of the AS systems is less than 10 ms. Cycle time deviations occurring between the individual TELEPERM M components can be seen in Fig. 1. A power reserve of 9 days is available in case the power supply to the master clock fails. In this case, the time is no longer transmitted.

The CMOS clock can be synchronized with time signal transmitters or factory master clocks using the minutes pulses. Leap years are taken into account during time acquisition. In the case of the CMOS clock 6NG4207-8PS02, summer time can also be selected using a contact on the front connector.

2 Design

The TELEPERM M master clock consists of two PCBs, which are supplied by two power supply modules. The four modules are fitted in a two-tier subrack.

- CMOS clock module, 6NG4207-8PS01/-8PS02 of the SINAUT 8 FW system

PCB 233.4 mm x 160 mm (double Eurocard format)
Front panel width of 2 standard slots (SEP; 1 SEP = 15.24 mm)
Modified front panel with two pushbuttons and two 4-digit displays
8-digit DIP (dual-in-line package) switch
NiCd storage battery
48-pin front connector, bottom
48-pin backplane connector, top

- Interface module for 20-m local bus, N clock, 6DS1200-8BA consisting of two double-height PCBs in sandwich design, total front panel width of 1 standard slot

- Bus processor clock (BP Clock)
PCB 233.4 mm x 160 mm
Front panel width of 1 standard slot
Special front panel with screening panel behind it for screwing to the subrack at the top and the bottom
Two 48-pin backplane connectors

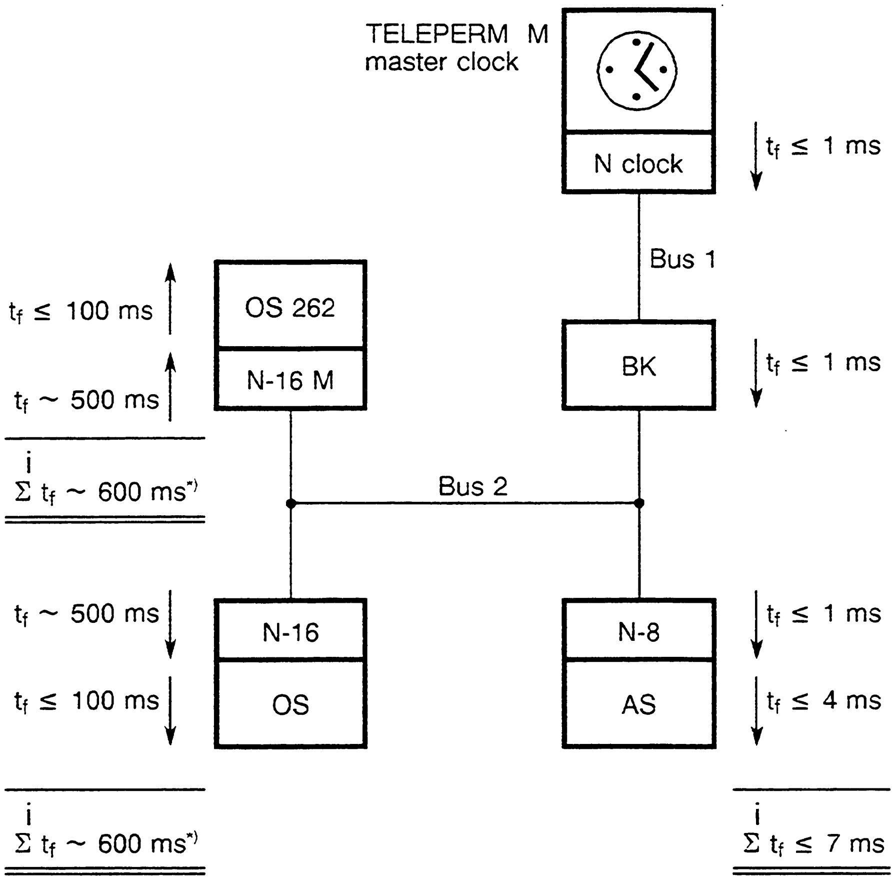
- Bus interface N (BI-N)
PCB 233.4 mm x 160 mm
Front panel width of 1 standard slot
Special front panel with 6 LEDs and screening panel
48-pin front connector at bottom

- Power supply module 24 V/5 V, 18 A, 6DS1000-8AA (SVB 1) consisting of three functional units

- Fusing and distribution unit for the 24-V supply
- Voltage regulator board for generating a +5-V voltage
- Alarm logic board for monitoring and signalling faults

Double-height PCB
Front panel width of 4 standard slots
Standard front panel with potentiometers, LEDs and jacks for adjustment, monitoring and testing
2 front panel fuses for the supply and alarm voltage

- The power supply module 24 V/5 V, 6DS1003-8AA is used in power plants. The configuration data correspond to those of module 6DS1000-8AA.



*)This error is non-critical since OS-international time is only used for display purposes.

Fig. 1 Time errors when time synchronizing with a TELEPERM M master clock.

- Power supply module 24 V/ 5 V/ 15 V, 6DS1 002-8AA (SVB 2)

PCB 233.4 mm x 160 mm
Front panel width of 2 standard slots
Standard front panel with fuse and one LED
64-pin backplane connector at bottom

- Subrack for bus coupler unit or master clock, 6DS9003-8BA

Double-tier subrack, additional space for 2 inductive bus converters and 2 interface modules for bus couplers.

- Signal distribution unit for master clock

- 6DS9 913-8FB(SVE) with summer/winter time selection
  or
- 6DS9 913-8FA(SVE) without summer/winter time selection

Miniature PCB
48-pin front connector with casing

Note: When new or subsequent orders are made, only versions CMOS clock 6NG4207-8PS02 and
signal distribution unit 6DS9913-8FB
will be delivered.

Automatic summer/winter time selection is only possible if both components are used simultaneously. If the input for summer/winter time selection is not used, the CMOS clock will output normal time, i.e. winter time.
Both above components may be combined with the previous versions 6NG4207-8PS01 and 6DS9913-8FA. In this case, however, changeover to summer time does not take place. In each of these combinations, synchronization of the CMOS clock via minutes pulses is ensured.

3 Mode of Operation (Fig. 2)

The CMOS clock module (CMOS clock) is controlled by a crystal oscillator and generates the time and date from milliseconds up to years. These data are transferred to a FIFO (first-in first-out) memory every 10 ms (twice at intervals of 5 ms).

The N clock local bus interface module connects the TELEPERM M master clock to the 20-m local bus of the CS 275 bus system. The bus treats the N clock like any other local bus interface module. It has a specific participant and bus address and also participates in master transfer even if the time is not transmitted.

The N clock reads the current time from the CMOS clock FIFO in DMA mode and prepares it for transmission on the CS 275 bus system. It requests the bus master function every 10 seconds. After assuming the master function, it transfers the current time, together with a collective address, to all bus interface modules. The delay time which occurs between the transfer of the last current time data from the FIFO and the transmission of the time message. is detected by the N clock and added to the stored time.

The CMOS clock can be externally synchronized to full minutes in order to increase the cycle accuracy above + 1 s/day. Triggering occurs via control inputs on the front connector. The signal distribution unit (SVE) is used to adjust the minutes pulses of factory master clocks (standard clocks). The SVE rectifies the received alternating pulses and converts these into signals with TTL level.

The CMOS clock 6NG4207-8PS02 is provided with an additional connector input to change the master clock from winter time to summer time. Selection is either carried out directly via the connector input with TTL level or via the signal distribution unit with 24-V level (only 6DS9913-8FB).

The clock can be advanced (summer time) as long as the associated signal input is on "High" level. Changes in level are only detected by the CMOS clock after each full second. The new status must be present for at least 1 second before it is accepted by the CMOS clock (noise pulse suppression). The signal distribution unit electrically isolates the input and output signals.

The supply voltage (+ 5 V) for the circuits of the signal distribution unit is supplied by the CMOS clock via the front connector.

Power supply module 1 (SV1) generates the supply voltage (+ 5 V) for the CMOS clock and N clock from the + 24-V cabinet voltage. A power failure is signalled to the N clock via the $\overline{\text{SVK}}$ signal and to the CMOS clock via the $\overline{\text{HOLD}}$ signal. An emergency clock within the CMOS clock is supplied by a NiCd storage battery and started by the HOLD signal. The battery is charged at + 15 V using power supply module 2 (SV2).

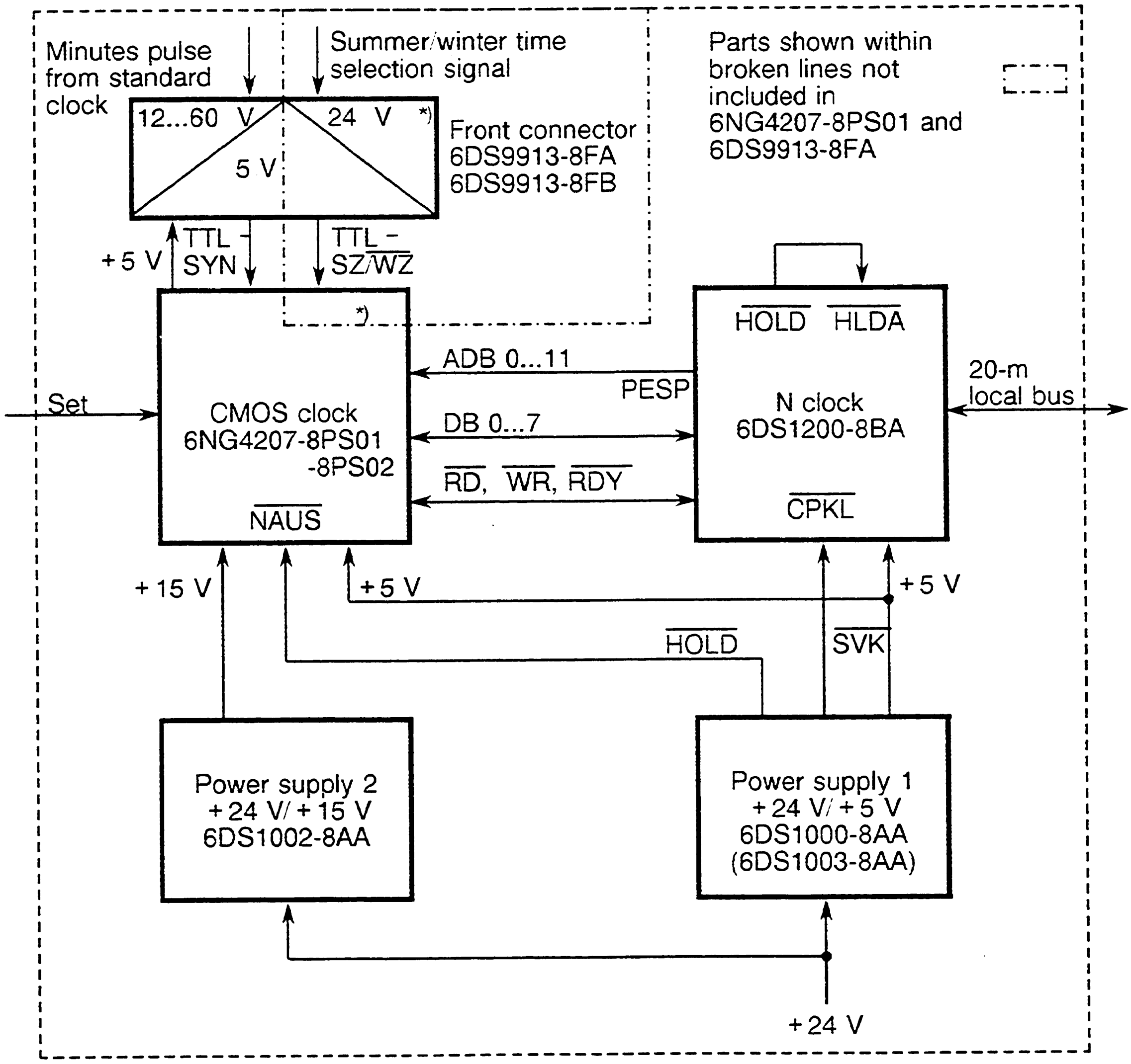


Fig. 2 TELEPERM M Master clock (functional diagram)

4 Technical Data

- Order No.

CMOS clock module	6NG4 207-PS02-1AAx
Interface module for 20-m local bus, N clock	6DS1 200-8BA
Power supply module 24 V/5 V, 18 A	6DS1 000-8AA
Power supply module 24 V/5 V, 18 A	6DS1 003-8AA
Power supply module 24 V/5 V/15 V	6DS1 002-8AA
Signal distribution unit for master clock	6DS9 913-8FB
Subrack for master clock	6DS9 003-8BA
Subrack for master clock	6DS9 003-8CA
Subrack for master clock	6DS9 003-8DA

Note: The order no. for the CMOS clock includes a code for the number of hours by which the clock is advanced when an active signal "Summer time" (+ 24 V) is present, i.e

advanced by 1 hour: - 1AA1
advanced by 2 hours: - 1AA2
.
.
avanced by 9 hours: - 1AA9

- Design

Double-tier subrack, equipped with four PCBs 233.4 mm x 160 mm, total front panel width of 10 standard slots (CMOS clock 2 slots, N clock 2 slots, SV1 4 slots, SV2 2 slots). Signal distribution unit fitted in the standard front connector casing.

- Interfaces

CMOS clock	Backplane connector X1	-MC210 system bus
	Front connector X4	-synchronization
N clock	Backplane connector X1	-MC210 system bus
	Backplane connector X2	-DMA control signals
	Front connector X4	-20-m local bus interface
SV1	Backplane connector X1	-control signals
	Screw terminals	-input/output voltages
SV2	Backplane connector X2	-input/output voltages,
		-control signals

- Time

Milliseconds
Seconds
Minutes
Hours
Days
Months
Years
Leap year adjustment
Automatic summer time/winter time selection

Cycle deviation:	± 1 s/24 h (10ppm) outside the permitted temperature range without external synchronization
Power reserve:	9 days, 23 hours, 59 min etc. Emergency clock supplied by NiCd battery
Display :	On the front panel of the CMOS clock with minute, hour, day and month
Setting:	Manually using the SET and CNT pushbuttons on the front panel of the CMOS clock
Transmission:	Every 10 seconds complete date and time in the bus system to all bus participants, also via bus coupler (BK)
• Bus load:	Every 10 seconds for 3 milliseconds

• Connected loads

CMOS clock	+ 5 V ± 5 %, 0.5 A + 15 V ±10 %, 150 mA
N clock	+ 5 V ± 5 %, 2.4 A
SV 1	+ 24 V/ + 5 V, 0.9 A
SV 2	+ 24 V/ + 15 V, 0.3 A

• Ambient temperature

in operation	CMOS clock	0°C to 50°C
	N clock	0°C to 70°C
in storage		-40°C to + 85°C

• Perm. rel. humidity	max. 85 % at 25°C
• Noise immunity	According to IEC 255.4 for N clock

5 Installation and Commissioning

5.1 Installation

Regulations about handling electrostatically sensitive modules must be observed when installing the TELEPERM M master clock. The CMOS clock module 6NG4207-8PS01/-8PS02, however, must not be placed on a conducting surface as the module is subject to voltage (storage battery may be discharged).

The modules for the TELEPERM M master clock have pre-planned slots in the master clock subracks 6DS9003-8BA, 6DS9003-8CA and 6DS9003-8DA.

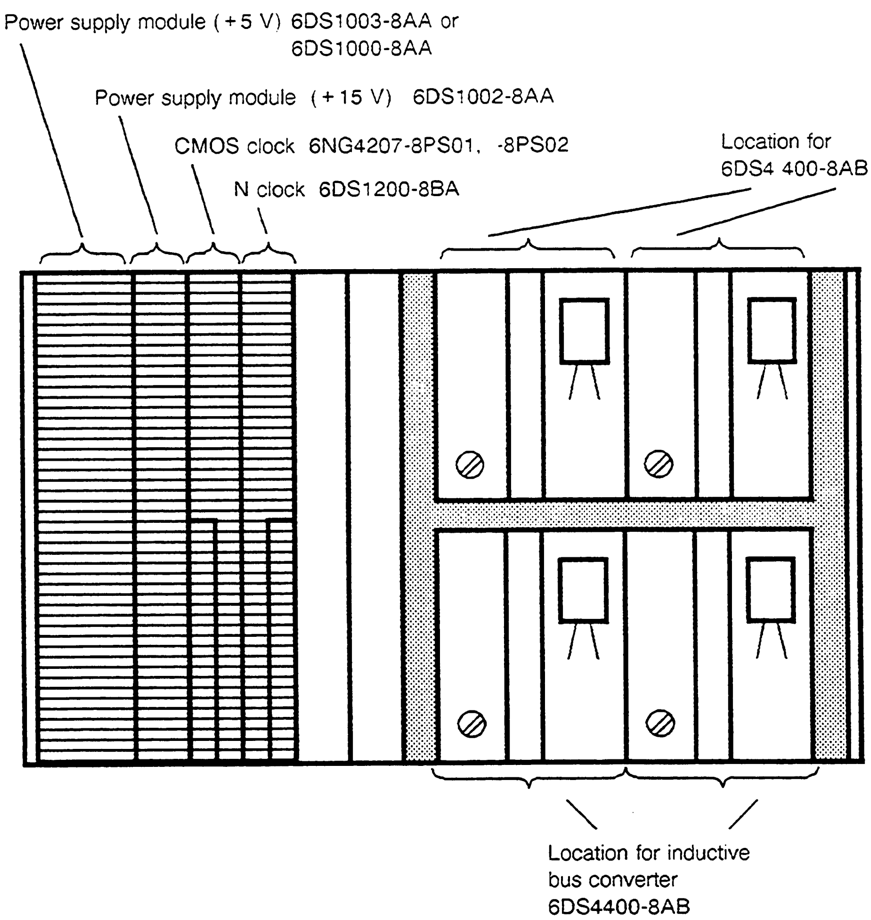


Fig. 3 Positions of the modules in the frame

The N-clock and SV2 modules only need to be plugged in. The fuse must be soldered in between soldering points X12 and X13 before using the CMOS clock. The details for installing the SV1 are described in the instructions "Power Supply Module" 24 V/5 V, 18 A (Order no. C79000-B8076-C011).

If, in the case of a redundant bus configuration, there are insufficient slots for the inductive bus converters (UI) in the X-tier of the standard cabinet. then the UI modules can be fitted in the right-hand section of the clock frame (see Fig. 3 for locations).

These slots are also required for connecting the master clock to the 4-km remote bus. Information on the associated bus cabling can be obtained from the instructions "Inductive Bus Converter" (Order No. C79000-B8076-C004).

The frame is also prepared for accommodating a bus coupler (see instructions "Bus Couplers", Order No. C79000-B8076-C005).

If the TELEPERM M master clock is externally synchronized with alternating pulses by a central mother clock, the synchronization signal must be applied via the signal distribution unit. In this case, the signal conductors of the mother clock are connected to the cabinet connection element. The signal for change from winter to summer time is also fed into the cabinet connection element.

Connection to the cabinet connection element	Terminal in connector	Core color	Signal
XA A24	A	yellow	Minutes pulse
XA B24	B	green	Minutes pulse
XA C24	C	brown	Summer time (+ 24 V)
XA D24	D	white	Summer time (M)

Fig. 4 Connection of the external synchronization signal and summer/winter time selection (signal distribution unit 6DS9913-8FB)

The master clock unit is fitted into the TELEPERM M standard cabinet, preferably in locations FM26 to FM31. The temperature in this installation area must not exceed 50°C.

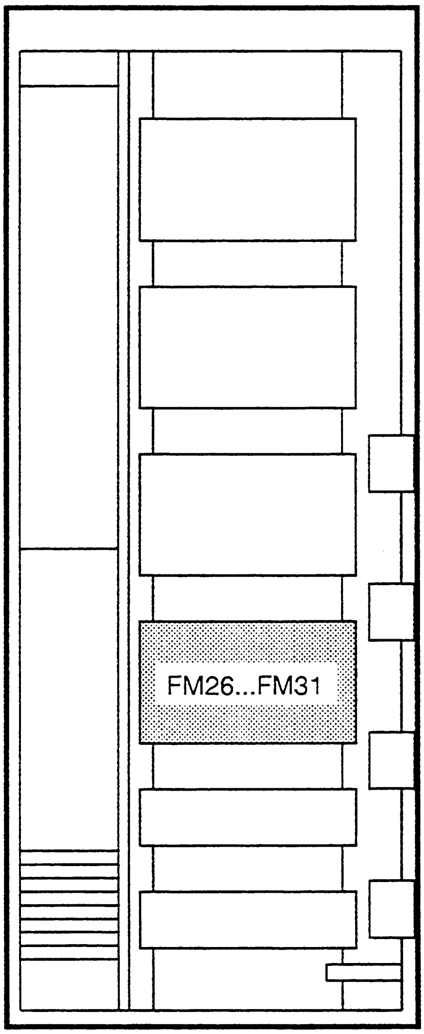


Fig. 5 Location in the standard cabinet

5.2 Commissioning

Several jumper settings must be made on the CMOS clock, N clock and power supply unit SV1 before commissioning the TELEPERM M master clock.

- CMOS clock, 6NG4207-8PS02

- Set all DIP switches S116 to position "OPEN"

- Jumper X3-X4 inserted:	synchronization by signal with 24-V level
- Jumper X4-X5 inserted:	synchronization by signals with TTL level (setting for connection via signal distribution unit 6DS9 913-8FA,-8FB)
- Jumper A-B inserted:	evaluation of NAUS (jumper must be inserted, only valid for release no. 3 of 6NG4 2078PS01)

- CMOS clock, 6NG4207-8PS02

- Set all DIP switches S116 to position "OPEN"

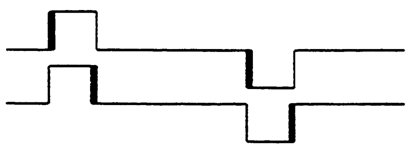
- Jumper X3-X4 open	
- Jumper X4-X5 inserted:	synchronization by signals with TTL level (setting for connection via signal distribution unit 6DS9 913-8FA/-8FB)
- Jumper A-B inserted:	evaluation od NAUAS (jumper must be inserted)

The local bus connector on the N clock must be removed prior to any hardware manipulation on the CMOS clock (e.g. change of jumper settings). It may not be plugged in until all operations, including the initial time setting after hardware manipulation, have been terminated. If the time is set during operation, the local bus connector need not be withdrawn.

- Signal distribution unit 6DS9913-8FA, -8FB

Switch S1 is used to determine whether the positive or negative edge of the external signal will synchronize the TELEPERM M master clock.

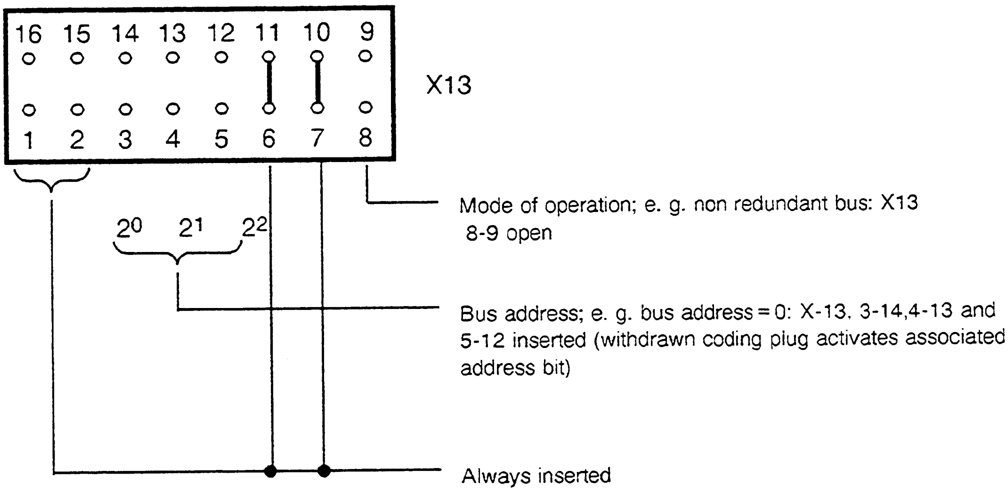
Positive edge:	S1 in position 1
Negative edge:	S2 in position 2



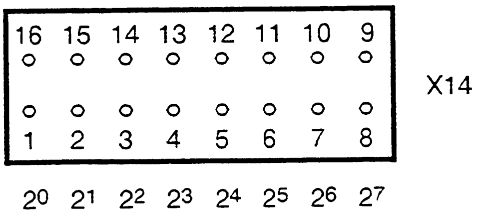
- N clock, 6DS1200-8BA

The bus and participant addresses with which the TELEPERM M master clock is connected to the CS 275 bus system, are set on the N clock.

Location X13 is used to set the bus address and to establish whether the bus system operates in redundant mode or not.



The participant address is set at location X14.



Participant address (permissible address range: 0-253, when max. 100 participants are permissible on the bus system); e. g. participant address = 0: all coding plugs inserted (withdrawn coding plug activates associated address bit).

Use the lowest possible participant addresses throughout the entire bus system.

All jumpers at locations X13 and X14 are inserted when the N clock is delivered. The user-specific jumper settings are listed in the planning documents and must be made before plugging in the module.

All other jumpers are used for test purposes and memory modifications. They have already been set correctly by the manufacturer and must not be changed.

- SV1, 6DS1000-8AA, 6DS1003-8AA

The jumper settings for power supply module 1 are given in Section "Commissioning" in instructions "Power Supply Module 24 V/5 V, 18 A", Order No. C79000-B8076-C011 (see manual "Automation Systems").

5.3 Operation

- Setting the CMOS clock

The clock can be set manually using the SET and CNT (count) pushbuttons on the front panel of the module. The bytes for years, months, days, hours and minutes can be set manually. The bytes for second and millisecond are only set to 0/0/, i.e. the clock must be started on the minute.

Note: The clock can only be set after start-up if the N clock is plugged in.

The clock is set in the following sequence:

Simultaneously press both buttons, SET and CNT. The clock enters the manual setting function, but continues with the old time.
Press CNT pushbutton.
"YEAR" appears in the upper display; decade 0 starts counting from 0 in the lower display and increases every 0.5 s (corresponds to year units)
After releasing the CNT pushbutton, the current display is accepted by pressing the SET push-button.
Press CNT pushbutton.
Decade 1 in the lower display starts counting (corresponds to tens of years)
Release CNT pushbutton, press SET pushbutton.
The displayed decade is accepted.
Press CNT pushbutton.
0 is displayed in all decades in both displays; decade 2 starts counting in the lower display (corresponds to month units).
Press SET pushbutton.
The displayed decade is accepted.
Press CNT pushbutton.
Decade 3 starts counting in the lower display (corresponds to tens of months).
All clock decades can be set by alternately pressing the SET and CNT pushbuttons.
Clock setting is terminated by simultaneously pressing the SET and CNT pushbuttons. The set time is then accepted, the bytes for milliseconds and seconds are set to 0/0/ and the clock is started.

If the manually set time is accepted, it is checked for an impermissible number combination. The complete clock is loaded with 0 0 and stopped if an error occurs, in which case "INPU FAIL" (input failure) appears in the display. The clock must then be reset.

The clock must be set within 2:30 minutes. It continues with the old time after this period has elapsed and those time decades which have been set until then are rejected.

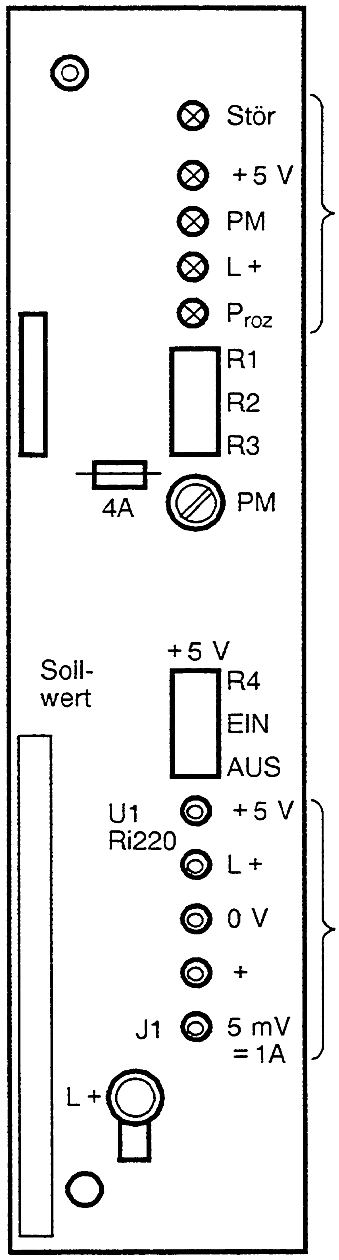
Unintentional pressing of only one pushbutton (SET or CNT) during normal operation will not affect the clock in any manner.

The clock can be changed from winter to summer time via the signal distribution unit. If a 24-V voltage is applied between XA C24 (brown core) and XA D24 (white core, ground), the time will be advanced by one hour (summer time). With the 0-V level, winter time (normal time) will be indicated.

An unconnected input (connector pulled out) has O-V level and results in winter time indication (normal time).

- Operation of the power supply module 24 V/5 V,18 A

Two controls (see Fig. 6) are located on the power supply module 24 V/5 V, 18 A (SV1) for switching off the 24-V power supply (L+) and 5-V output voltage. Furthermore, the 5-V voltage setpoint can be adjusted using potentiometer R4. Both controls (switch and potentiometer) are protected by a cap on the front panel. Test jacks are located on the front panel for testing the voltages (output and input voltages) and the current. Potentiometers R1, R2 and R3 can be used to set the alarm threshold of the +5-V output voltage, +24-V alarm voltage (PM) and +24-V supply voltage.



LEDs for monitoring purposes

R1 Adjuster for 5-V alarm threshold
R2 Adjuster for PM alarm threshold
R3 Adjuster for L+ alarm threshold

Fuse for PM

R4 setpoint adjuster

ON/OFF switch

Test jacks
Current 5 mV = 1 A

Protective breaker 25 A

Fig. 6 Controls on the power supply module 24 V/5 V, 18 A

6 Maintenance

Note on CMOS clock module:

It is advisable to exchange the NiCd storage battery after approx. 5 years.
(Battery by VARTA, no. 36410L04-54)

6.1 Method of Operation

The TELEPERM M master clock is responsible for synchronizing time in the process automation units (PAE) via the CS 275 bus system. The time is generated on the CMOS clock module (CMOS clock) and, using the N clock interface module (N clock), is transmitted to the PAEs every 10 s via the CS 275 bus system.

The time is increased in the CMOS clock every 10 ms and entered into a FIFO (first-in first-out) memory (see Fig. 7 for byte assignment in the FIFO). The same time is re-entered into the FIFO after approx. 5 ms. The FIFO's data bus inputs are at high impedance whilst the FIFO is being cleared and the time rewritten, i.e. only the signal combination FFH will be sent to the data bus if the N clock is reading the time at this moment. The time is subsequently updated.

		7	6	5	4	3	2	1	0
Bit:		7	6	5	4	3	2	1	0
Address:	F000	Hundreds - Milliseconds - Tens							
	F001	Tens - Seconds - Units							
	F002	" - Minutes - "							
	F003	" - Hours - "							
	F004	" - Days - "							
	F005	" - Months - "							
	F006	" - Years - "							
	F007	Status byte							

Fig. 7 Byte assignment in the FIFO (BCD-coded)

The 10-ms pulse is derived from a crystal time base independent of the computer clock. This time base also controls the emergency clock.

As soon as power supply failure occurs, the emergency clock is started by the HOLD signal from the power supply module 24 V/5 V, 18 A (SV1).To ensure perfect starting, the HOLD signal (identical with NAUS) must be present before power supply failure.

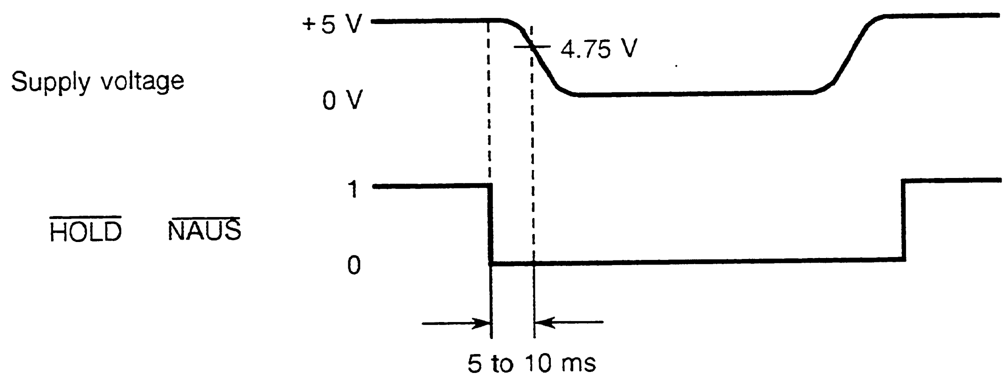


Fig. 8 Emergency clock start

With HOLD = "0", the FIFO is loaded with the last updated time and the emergency clock started. Once the power supply has returned. (HOLD = "1"), the expired time is read from the emergency clock and added to the mains failure time, the emergency clock is stopped and the master clock re-enabled.

If the power supply fails twice without intermediate reading of the N clock time, the last mains failure time is written into the FIFO first, followed by two separator bytes (AAH) (in case of 6NG4207-8PS02: AAH, AxH) and the last updated time.

The failure time remains stored in the FIFO until the N clock has read the time. An * therefore appears on the front display until the FIFO contains the updated time.

The emergency clock is supplied by a battery. The maximum power reserve is 9 days, 23 hours, 59 minutes etc.

The TELEPERM M master clock can be synchronized externally in order to increase the typical cycle stability of +1 second per day. "1" active pulses are required at the input for 24-V level as are "0" active pulses at the input for TTL level (pulse length approx. 100 us). There is no 24-V level input on the CMOS clock 6NG4207-8PS02.

An additional input circuit must be provided to match the minutes pulses from factory master clocks (mother clocks) (Fig. 9).

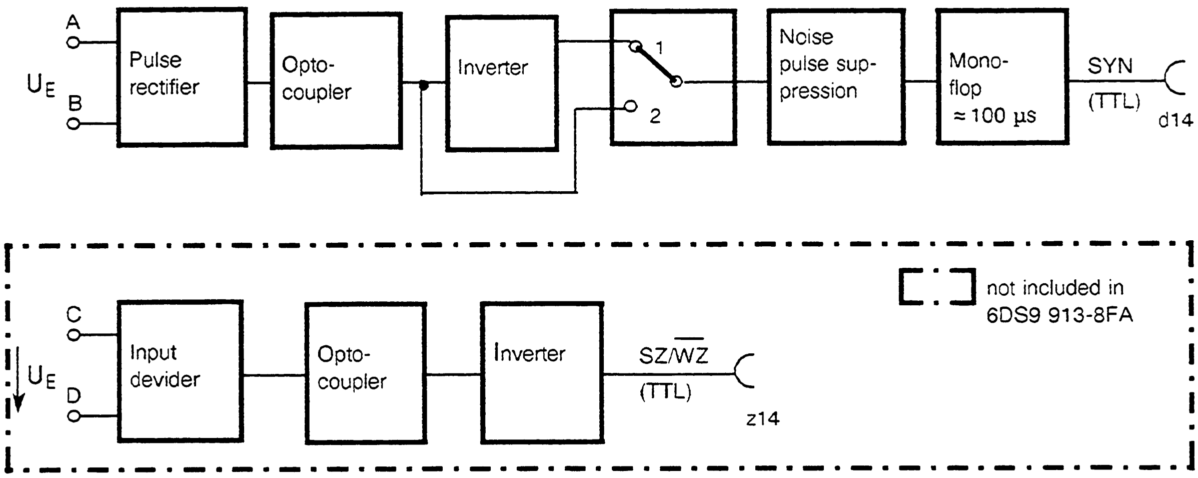


Fig. 9 Matching the factory master clocks
Signal distribution unit (SVE) 6DS9913-8FA/-8FB

This circuit rectifies the alternating pulses generated by the factory master clock. The minutes pulses are connected to a monoflop with a pause time of 100 us via an electrical isolation module and a series-connected RC filter for eliminating noise. The monoflop is started by the positive or negative edge of the signal (adjustable using the switch).

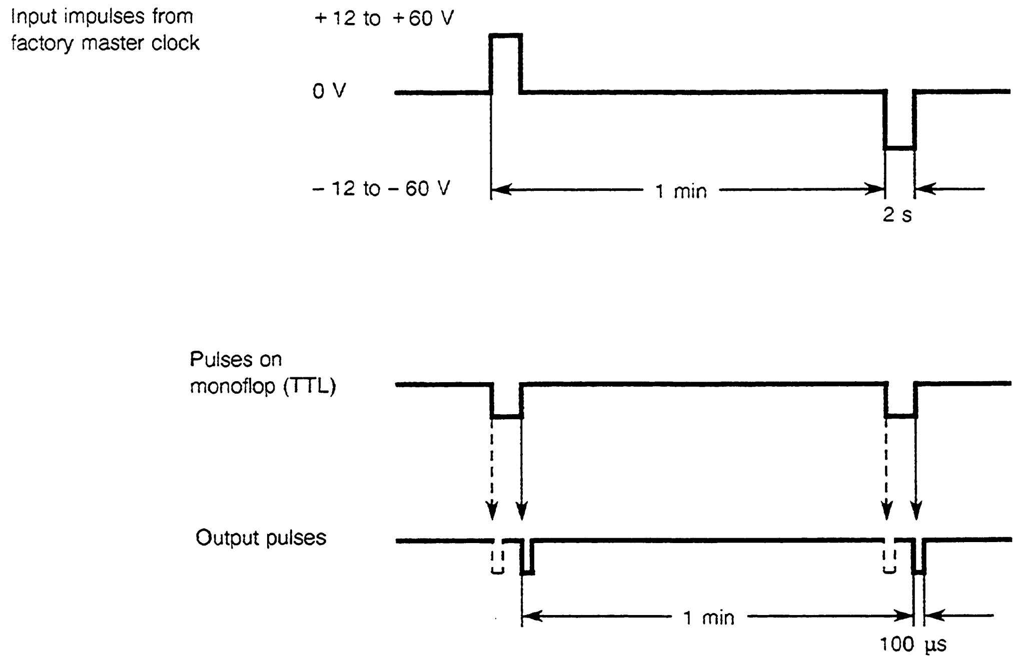


Fig. 10 Pulse sequence of minutes pulses

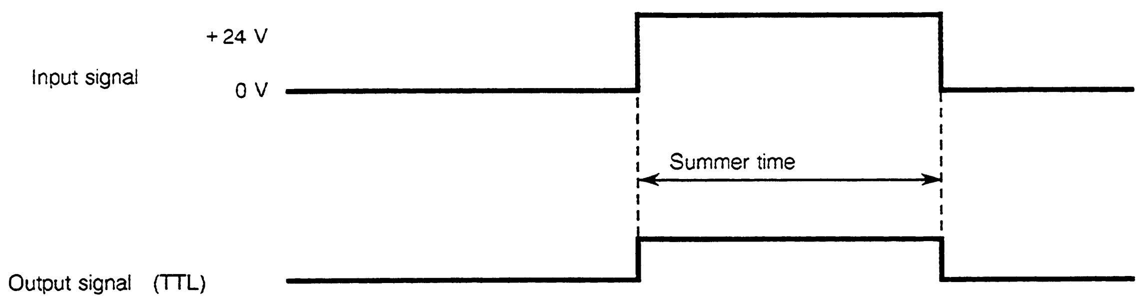


Fig. 11 Signal sequence of summer/winter time selection (only 6DS9913-8FB)

The supply voltage for this circuit is provided by the CMOS clock via the front connector.

The time in the CS 275 bus system is transmitted via the N clock interface module. The hardware is identical with that of the interface module for a 20-m local bus, 8 bit (see instructions, Order No. C79000-B8076-C001). As far as the bus is concerned, the N clock reacts just like any other bus interface module.

The N clock reads the time from the CMOS clock FIFO in DMA mode (see Fig. 7 for byte assignments) and stores it in PR-ORG representation.

7	6	5	4	3	2	1	0
Year				Month			
2^3	2^2	2^1	2^0	2^3	2^2	2^1	2^0
Irrelevant					Year		
					2^6	2^5	2^4
Hour		Minute					
2^1	2^0	2^5	2^4	2^3	2^2	2^1	2^0
Day					Hour		
2^4	2^3	2^2	2^1	2^0	2^4	2^3	2^2
Millisecond							
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
Second						Millisec.	
2^5	2^4	2^3	2^2	2^1	2^0	2^9	2^8

Fig. 12 Time representation in N clock

The time is only transmitted if readiness to read is present (contents of address F007 =/ FFH). The status byte is addressed again at the end of transmission in order to re-enable the FIFO access of the CMOS clock.

If the bit combination AAH is read at address F000 after the power supply has returned, a second time record is read. The record contains the time of the last voltage shut-down. This situation exists if a second power failure has taken place without intermediate reading of the N clock time.

The time message is transmitted on the bus every 10 s. Prior to each transmission, the N clock requests the master status and determines the delay which has occurred between transfer of the last updated time data from the CMOS clock FIFO and receipt of the master function or transmission of the time message. This difference in time is added to the stored time. The time is always transmitted on the bus after a completed 10-second switchover in order to simplify the corrected-time calculation in the receiving interface modules.

The bus is occupied for 3 ms every 10 s by the transmission of the time. The load on the receiving interface modules is approx. 0.1 %.

6.2 Troubleshooting

Regulations about handling electrostatically sensitive modules must be observed during troubleshooting. Contrary to these regulations, the CMOS clock module 6NG4207-8PS01/-8PS02 must not be placed on a conducting surface as the module is subject to voltage (battery may be discharged).

The local bus connector must be removed from the N clock prior to any hardware manipulation on the CMOS clock (e.g. removing or inserting a connector when a voltage is applied). The local bus connector may not be inserted until all operations, including the initial time setting after hardware manipulation, have been terminated. It need not be removed if the time is set during operation.

Troubleshooting is very difficult as far as the TELEPERM M master clock is concerned, since most processes are controlled by the software or firmware. The typical faults listed in the following table will assist maintenance personnel to locate and eliminate faults in the module.

Fault image	Cause	Remedy
No time display on the CMOS clock or undefinable characters or asterisks	- +5-V supply voltage missing	- Check power supply module 6DS1 000-8AA
	- Faulty HOLD or NAUS signal	
	- No data exchange	- Check N clock (DMA transfer), replace the CMOS clock or N clock
	- CMOS clock faulty (display faulty or missing)	- Replace CMOS clock if power supply module and N clock are OK
No time tracking	- NiCd battery not charged	- Check battery fuse between X12-X13 OK?
Power failure	- HOLD signal wrong or missing	- Check power supply module 6DS1000-8AA and replace if necessary
	- CMOS clock faulty (wrong display)	- Replace CMOS clock
No bus transfer (diagnosis via LEDs or N clock)	- Upon data exchange with N clock	- Check CMOS clocks and N clock
	- Faulty N clock	- Check N clock (see instructions C79000-B8076-C001)
+5-V power supply missing (+5-V LED off)	- +24-V power supply missing	- Provide +24-V cabinet voltage
	- +5-V supply beyond tolerance limits	- Correct fault using potentiometer on front panel
	- Module 6DS1000-8AA faulty	- Replace module

Fault image	Cause	Remedy
+15-V power supply missing (measured between 2b10 and 2b16), green LED does not light up	- +24-V power supply missing - Fuse blown on panel - Module 6DS1002-8AA faulty	- Provide +24-V cabinet voltage - Replace fuse - Replace module
External synchronization not possible or faulty	- Wrong jumper settings (X3, X4, X5) - Signal distribution unit faulty or missing	- See Section 5.2 for jumper settings - Connect signal distribution unit - Check switch position S1 (see Section 5.2) - Check optical coupler and monoflop
Display "INPU FAIL"	- Wrong input when setting clock manually	- Enter new value manually
Manually set time is not accepted	- Maximum setting period of 2:30 min exceeded	- Reset time
Summer/winter time selection faulty	- Check Type No. of the CMOS clock and signal distribution unit	- Only use CMOS clock 6NG4207-8PS02 with signal distribution unit 6DS9913-8FB
	- Measure voltage at X4, Z14 of the CMOS clock if a voltage of 24 V is present between C and D on the signal distribution unit	- If a voltage of +5 V is missing, check wiring or replace signal distribution unit - If voltage is present, replace CMOS clock

6.3 Connector Pin Assignments

Interface Module N Clock, 6DS1200-8BA

Pin	d	b	z
02		0 V	+5 V
04			
06		ADB 0	CPKL
08		ADB 1	MFMR
10		ADB 2	MEMW
12		ADB 3	RDY
14		ADB 4	DB0
16		ADB 5	DB1
18		ADB 6	DB2
20		ADB 7	DB3
22		ADB 8	DB4
24		ADB 9	DB5
26		ADB10	DB6
28		ADB11	DB7
30		NAUS	
32		0 V	

Backplane connector X1

Backplane connector X2

Pin	d	b	z
02		0 V	+5 V
04			
06	IRPAE		
08			
10			
12			
14			
16			
18			
20	HLDA0		
22			
24			
26			
28		BKPESP	
30			
32	HOLD		

These connector pin assignments only include those signals required for coupling the N clock to the CMOS clock.

Front connector X4

Pin	d	b	z
02	0 V	SA0	Screen
04	↑	SA1	↑
06		SB0	
08		SB1	
10		DA0	
12		DA1	
14	↓	DB0	
16	0 V	DB1	
18		BA0	
20		BA1	
22		BB0	
24		BB1	
26		TA0	
28		TA1	
30		TB0	↓
32		TB1	Screen

ADB0...ADB11	= Address bus
DB0...DB7	= Data bus
$\overline{\text{CPKL}}$	= Processor ready
$\overline{\text{MEMR}}$	= Read signal
$\overline{\text{MEMW}}$	= Write signal
$\overline{\text{RDY}}$	= Ready signal
$\overline{\text{IRPAE}}$	= Interrupt request for CMOS clock
$\overline{\text{HLDA0}}$	= Hold acknowledgement input
$\overline{\text{HOLD}}$	= Hold request
BKPESP	= Peripheral memory selection
SA0,1	= Control signal, bus A
SB0,1	= Control signal, bus B
DA0,1	= Data signal, bus A
DB0,1	= Data signal, bus B
BA0,1	= Qualifier signal, bus A
BB0,1	= Qualifier signal, bus B
TA0,1	= Clock signal, bus A
TB0,1	= Clock signal, bus B

1 ≙ Forward signal line
0 ≙ Return signal line, 0 V reference earth

- CMOS Clock Module, 6NG4207-8PS01/-8PS02

Backplane connector X1

Pin	d	b	z
02		0 V	+5 V
04		PESP	
06		ADB0	
08		ADB 1	MEMR
10		ADB 2	MEMW
12		ADB 3	RDY
14		ADB 4	DB0
16		ADB 5	DB1
18		ADB 6	DB2
20		ADB 7	DB3
22		ADB 8	DB4
24		ADB 9	DB5
26		ADB10	DB6
28		ADB11	DB7
30			
32		0 V	+15 V

Backplane connector X4

Pin	d	b	z
02		0 V	+5 V
04			
06			
08			
10	NAUS		
12			
14	STTL		XX
16			
18			
20			
22			
24			
26			
28			
30			
32			

ADB0...ADB11 = Address bus

DB0...DB7 = Data bus

MEMR = Read signal

MEMW = Write signal

RDY = Ready signal

STTL = Synchronization signal with TTL level

XX = Different assignment:

6NG4 207-8PS01 Synchronization signal with 24-V level
-8PS02 Summer/winter time selection with TTL level

- Signal Distribution Unit for Level Matching, 6DS9913-8FA/-8FB

Front connector casing

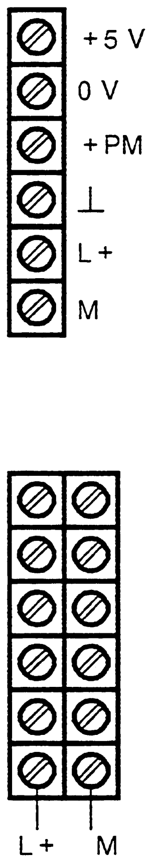
Pin	d	b	z
02		0 V	+5 V
04			
06			
08			
10			
12			
14	STTL		SZ/WZ
16			
18			
20			
22			
24			
26			
28			
30			
32			

STTL = Synchronization signal with TTL level

SZ/$\overline{WZ}$ = Summer/winter time selection with TTL level (not applicable for 6DS9913-8FA)

• Power Supply Module 24 V/5 V, 18 A, 6DS1000-8AA

Terminal blocks
(rear view)



Backplane connector,
alarm logic board

Pin	d	b	z
02		0 V	K
04		K	K
06		K	K
08		K	K
10		K	UPW
12		DS	LKV
14		HOLD	RS
16		SVKE	STÖR
18		SVK	SVE
20		RES	RES
22		LK	LK
24		ÜT	ÜT
26		TRG	TRG
28		PM	PM
30		PM	PM
32		0	UV

PM	+24-V alarm voltage
L+	+24-V supply voltage
M	Signals for the central unit of the AS 220 automation system
DS	" " "
HOLD	" " "
RS	" " "
STÖR	" " "
RES	Standby
LK	Fan ready
ÜT	Excess temperature
TRG	Door closed
UPW	Optional backup voltage
LKV	Delayed fan ready (approx. 1 min after LK or ÜT)
$\overline{\text{SVKE}}$	Power supply ready, input
$\overline{\text{SVK}}$	Power supply ready
$\overline{\text{SVE}}$	Power supply on
U	Supply of the alarm logic module with +24 V
K	Alarm contacts from relay

• Power Supply Module, 6DS1002-8AA

Backplane connector X2

Pin	f	d	b	z
02		0 V	+5 V	
04				
06	IRPAE			
08				
10	+5 V	+5 V	+15 V	
12				
14				
16			0 V	
18			0 V	
20				
22				
24				
26				
28				
30			PM	
32	L+	L+	M	M

L+ = +24-V supply voltage
PM = +24-V alarm voltage
M = Ground

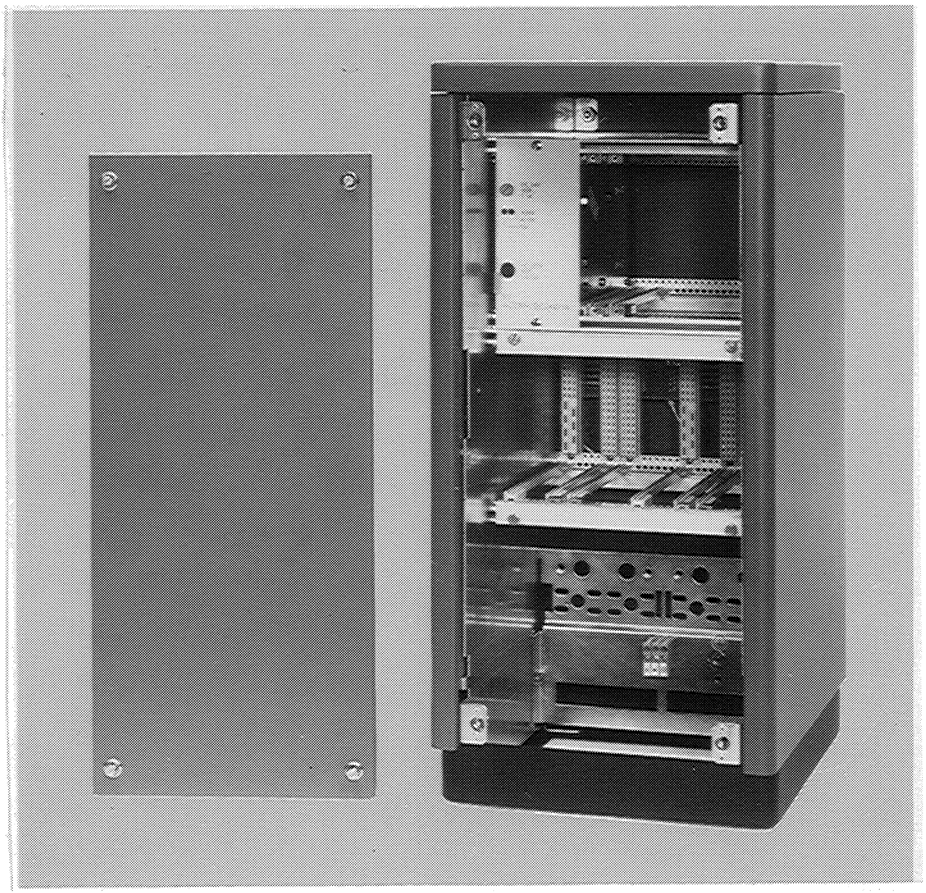
SIEMENS

TELEPERM M

Remote Bus Connection Unit (FAE)

6DS4 425-8AA

Instructions C79000-B8076-C127-04



Contents Page

1 Application

The remote bus connection unit (FAE) can be used to connect SICOMP M computers and TELEPERM M systems equipped with a 20-m local bus interface to a single or redundant remote bus of the TELEPERM M CS 275 bus system.

The 20-m local bus interface of a 0-V island is converted into the remote bus interface by the inductive bus converter unit (UI) in the FAE.

The FAE requires a power supply of 220 V AC, 50 Hz.

The N16-M local bus interface module is plugged into the SICOMP M computer. The inductive bus converter and remote bus connector boards (AF) are integrated in the FAE.

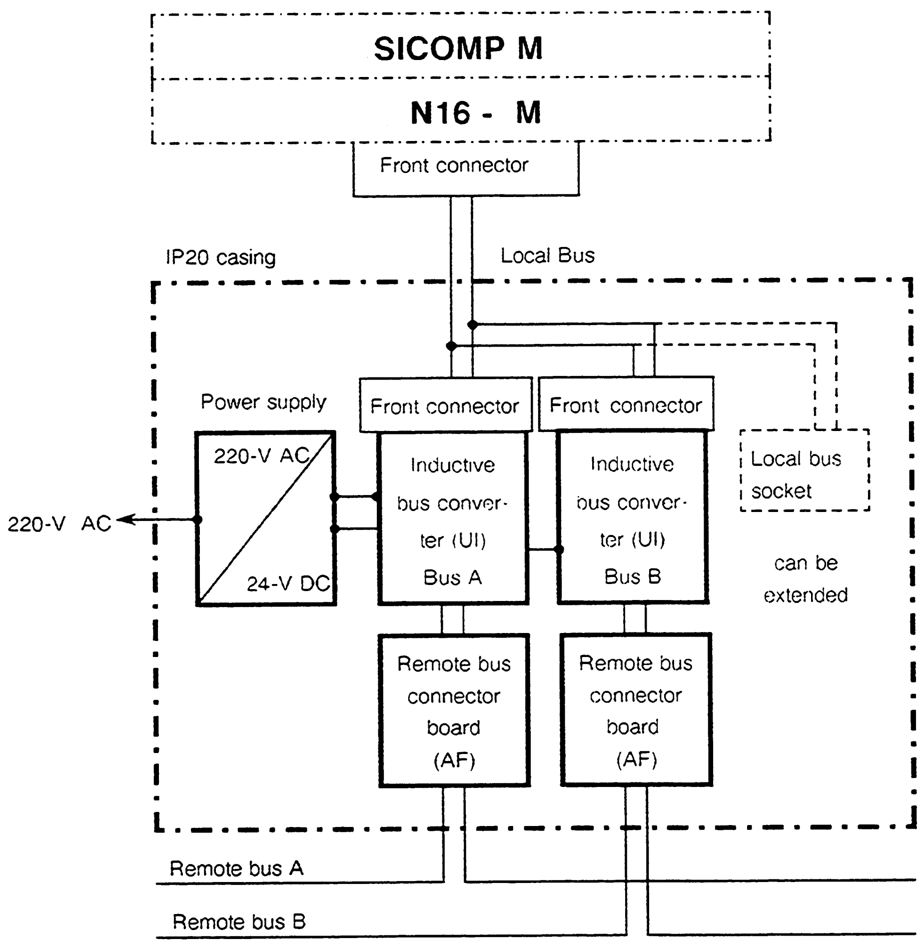
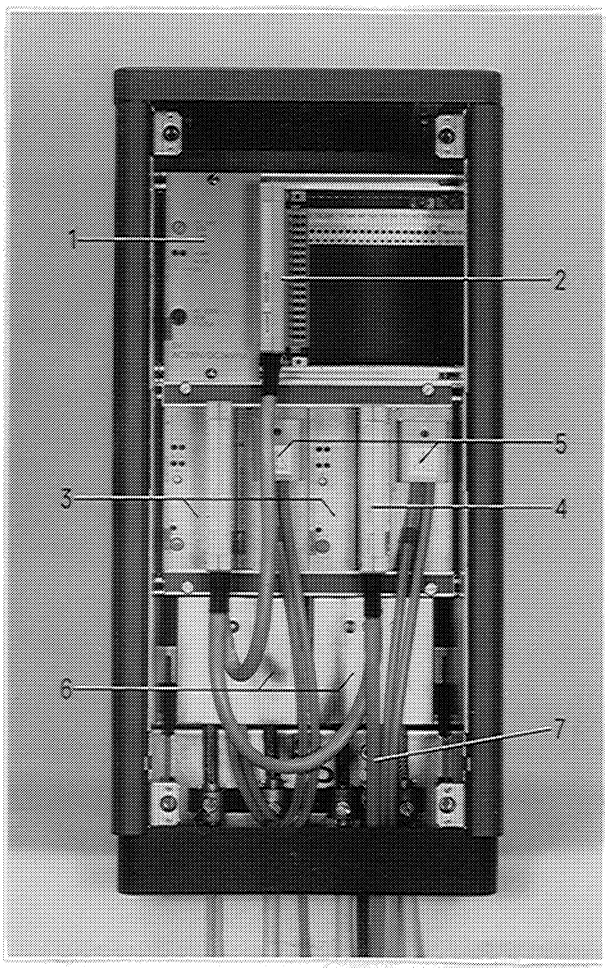


Fig. 1 Block diagram of the remote bus connection unit (FAE)

2 Design



1 Power supply module, 220 V AC/24 V DC
C79451-A3276-A1
2 Distributor block for 20-m local bus (optional)
6DS9 207-8AA
3 Power supply module for UI (optional)
6DS1 211-8AA
4 Bus interface module (optional; with inserted local bus cable)
6DS1 212-8AB
5 Inductive coupler (optional)
6DS1 213-8AA
6 Remote bus connector board (optional)
6DS9 203-8CA
7 Bottom trough

Fig. 2 Design of FAE

3 Technical Data

Order No.	6DS4425-8AA, including power supply module C79451-A3276-A1
Connection to a single remote bus	 1 UI and 1 connector board - 6DS4 400-8AB - 6DS9 203-8CA
redundant remote bus	2 UIs and 2 connector boards
Supply voltage	220 V AC, +10 %, -15 %, 50 Hz
Power consumption, typical with two UIs	approximately 20 VA
Local bus interface	asymmetrical, TTL level $V_{IH} \geq 2.0$ V input level $V_{OH} \geq 2.7$ V output level
Bit frequency Data transfer Flag transfer	 250 kbits/s 340 kbits/s to 400 kbits/s
Participants	max. 9 (redundant UIs counted as two participants)
Remote bus interface Level Bit frequency No. of converters	asymmetrical, bi-phase signal approximately +1 V 250 kbits/s max. 32
Connectable remote bus cables	Standard cable max. 4 km 2YC(ms)CY1.6/10-75 (Z2/5)vs sw or thin cable max. 2 km 2YC(ms) CYV1.0/6.5-75(Z2/5)vs sw
Ambient temperature in operation in storage/transport	 0 °C a +40 °C -40 °C a +70 °C
Degree of protection	IP 20
Dimensions	500 mm x 236 mm x 303 mm
Weight at time of delivery (without options)	 13.5 kg

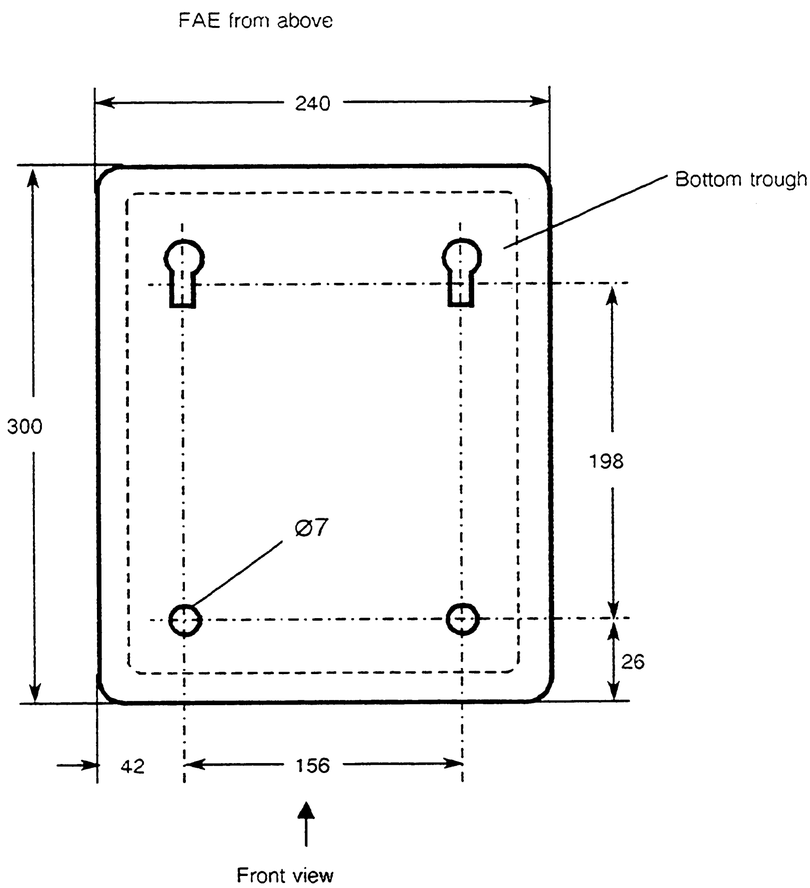
4 Installation and Commissioning

The FAE with its plastic bottom trough is designed for floor-mounting (bottom trough see Fig. 2).

In order to guarantee protection against direct contact with dangerous voltage it is not allowed to mount the FAE without bottom trough.

The front and rear cover of the device as well as the fixing of the bottom trough which is mounted in the factory, have to be removed.

The FAE is screwed to the bottom together with the bottom trough using 4 screws (width of the fixing holes = 7 mm; see Fig. 3).



For interference suppression the bonding screws of the UI coupler and the local bus connector have to be screwed.

Fig. 3 Floor-mounting of FAE

4.1 Connecting the FAE

The power supply cable, local bus cable and remote bus cable must be led in from below.

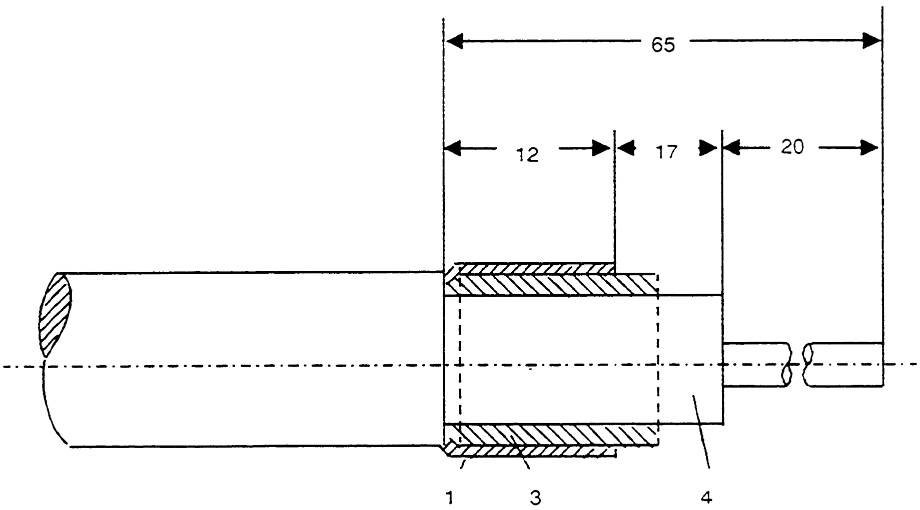
- **Remote Bus Cable**

The standard and/or thin remote bus cables can be attached to the remote bus connector board. For cable types, see "Technical Data". The permissible cable length can be calculated using the following formula

$S + 2 \times D = \leq 4$ km   S = Standard cable
D = Thin cable

The ends of the remote bus cables must be prepared and connected to the remote bus connector board as shown below:

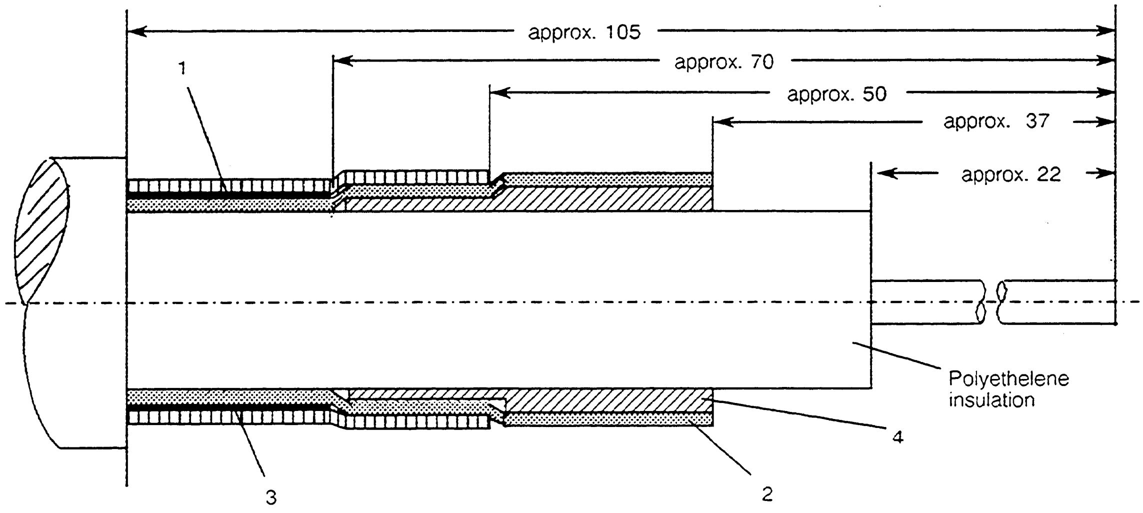
a) Thin remote cable



1 Outer braided screen
3 Insert contact tube between polyethylene insulation and inner braided screen
4 Polyethylene insulation

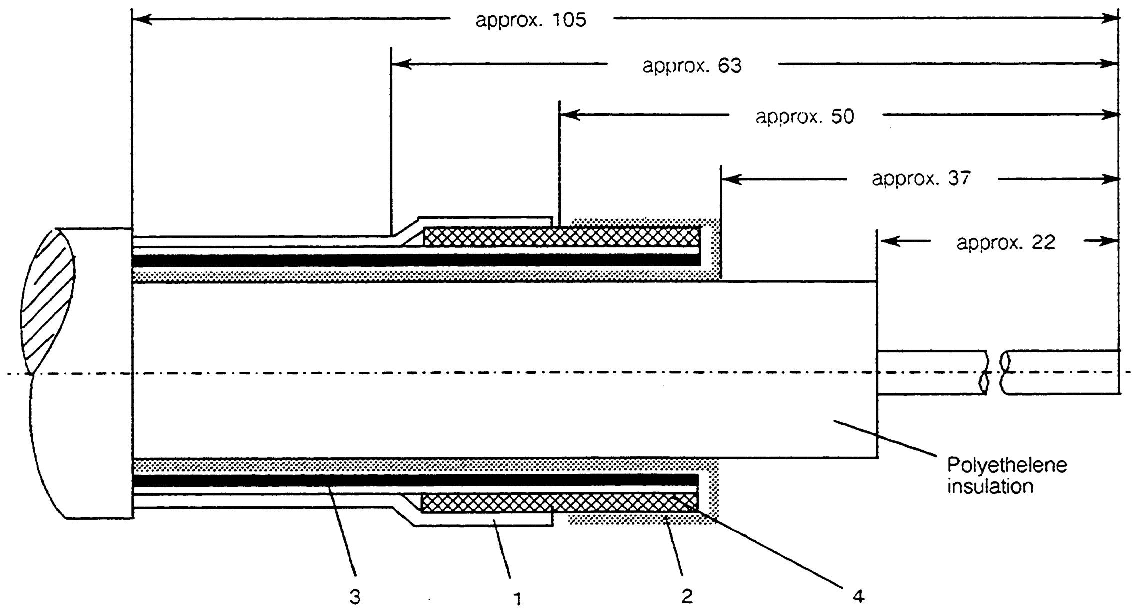
Fig. 4 Connection of different cable types to the remote bus connector board

a) Installation of the old, graded contact sleeve on the remote bus cable



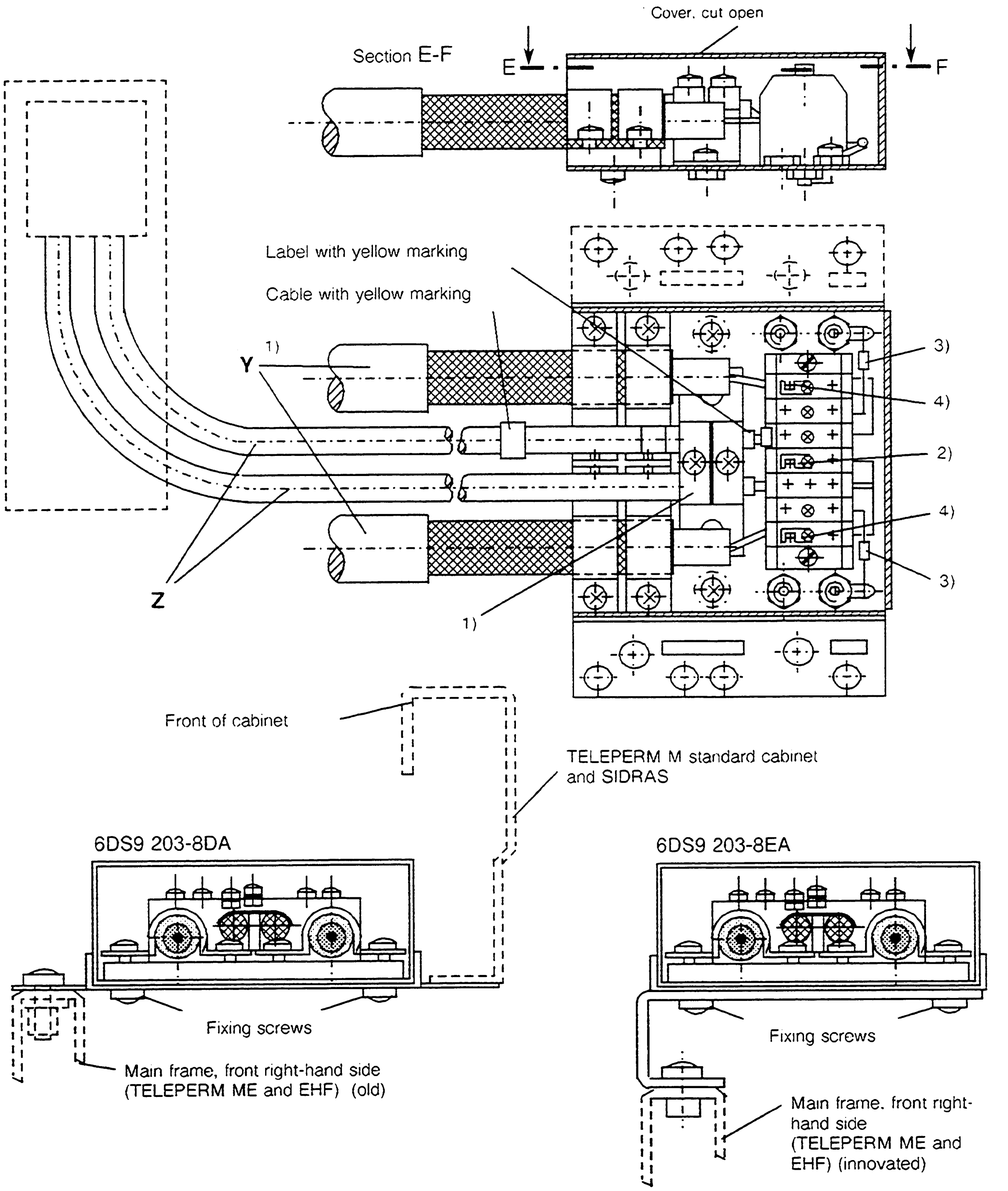
1 Outer braided screen
2 Inner braided screen
3 Metal tape screen
4 Graded contact screen, inserted between polyethelene insulation and braided screen

b) Installation of the new, ungraded contact sleeve on the remote bus cable



1 Outer braided screen
2 Inner braided screen
3 Metal tape screen
4 Ungraded contact screen

Fig. 4 Connection of different cable types to the remote bus connector board (continued)



Y Remote bus cable

Z The cable coming from the inductive coupler unit 6DS1 213-8AA must be laid for cabinet installation, rolled up and fixed with cable tape when it is installed in the cabinet.

1) To fix the remote bus cable Y, remove the front cable clamp from the inductive coupler Z. fan out the cable cores and tighten the clamp link underneath.

2) Inserting the switching link causes reflections if the UI is connected. After inserting the switching-link, the UI must therefore be disconnected immediately. If UI is only to be disconnected "logically", it is enough to remove the fuse in UI-SV.

3) Terminating resistor 75 Ω

4) Switching link for connecting the terminating resistor

Fig. 5 Connection to the remote bus connector board

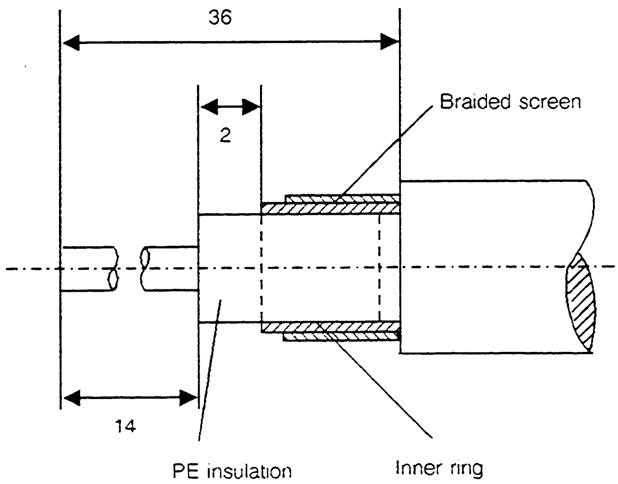


Fig. 6 Coaxial cable of the UI coupler

- Local Bus Cable

The local bus cable is plugged onto the bus interface logic.
The connector must be fixed into position using two screws.

- Power Supply Cable

The power supply cable is connected by means of an inlet connector for non-heating appliances.

- Connecting an Alarm Indicator

An alarm contact (relay contact), accessible at the rear of the subrack, is closed if the UI supply voltage fails. This contact can be used to control the failure indicator, in which case the following limit values must be observed:

IC_{max} = 5 A

UC_{max} = 25 V (AC) or 60 V (DC)

Only voltages which are generated "electrically safe and isolated" must be used as alarm contact voltages.

- Earthing

The housing must be connected to the electronic earth via the electronic earthing terminal.

Earthing cable: ≥ 10 mm^2 Cu

- In the case of the portable OS 250 and OS 262 systems, connect the FAE casing to the local earth.

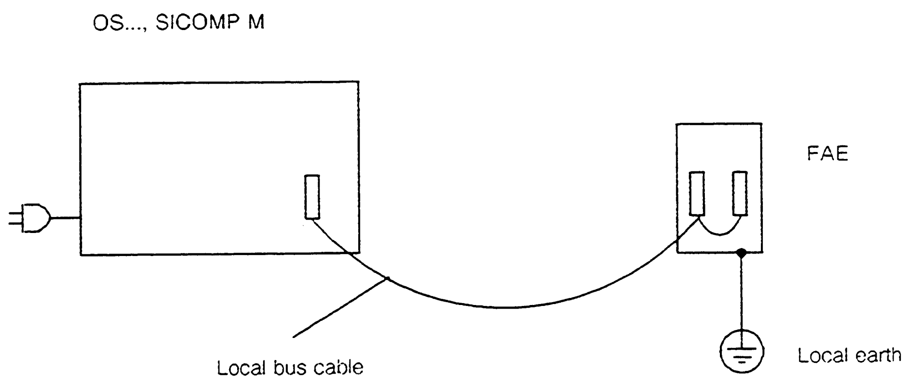


Fig. 7 Earthing the remote bus connection unit (FAE) to an OS 250 portable system. OS 262 (SICOMP M)

- In the case of systems provided with an electronic earth, connect a potential bonding cable (≥ 10mm^2 Cu; < 20 m long) from the casing of the FAE to the earth terminal bolt of the system.

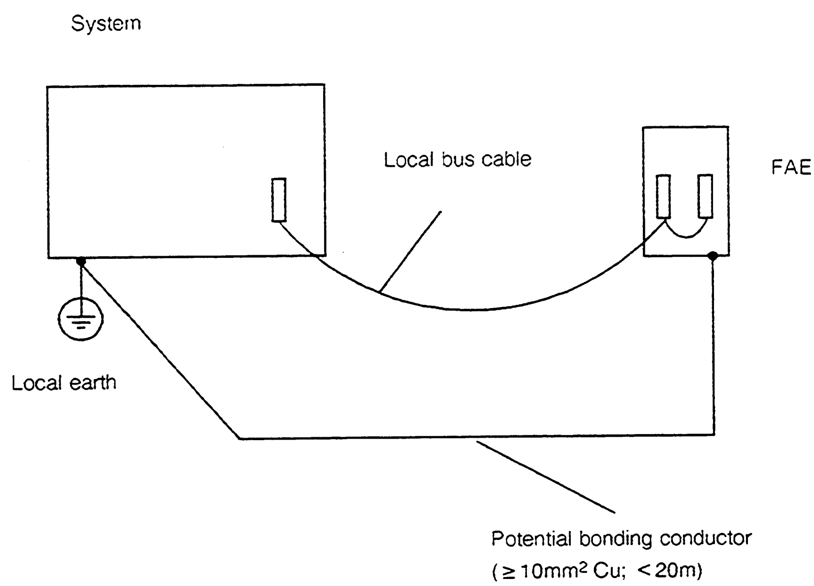


Fig. 8 Earthing the FAE when connected to systems already provided with an electronic earth

4.2 Commissioning

The following settings must be made on jumper base X3 in the bus converter logic module (BIL) 6DS1212-8AB:

- Group address (max. 32 groups)
- Bus A or B

A group address (local bus group) may only be used once on an autonomous bus (remote bus).

To simplify the planning, both UIs which communicate via the same local bus should be set to the same group address in a redundant remote bus configuration.

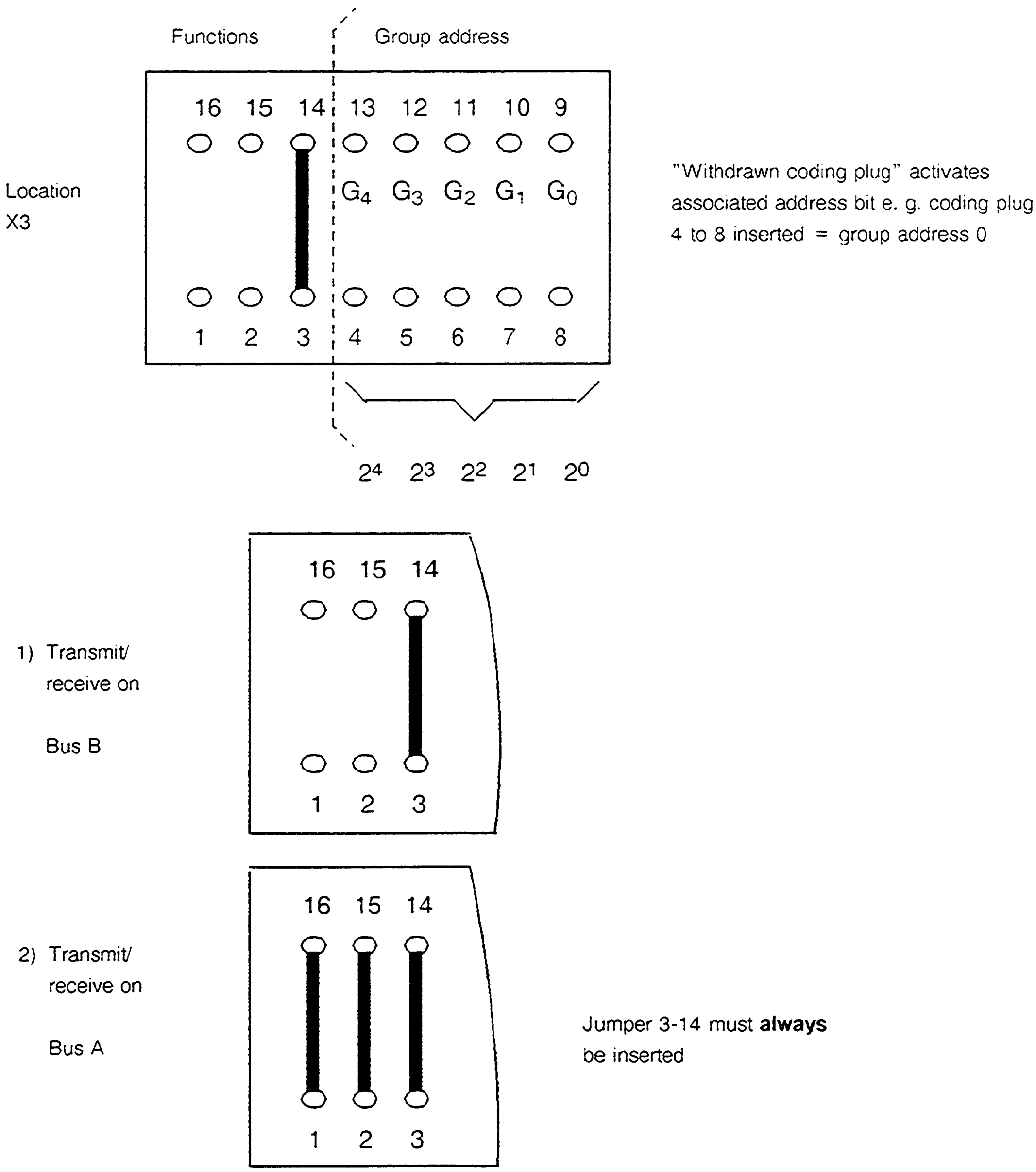


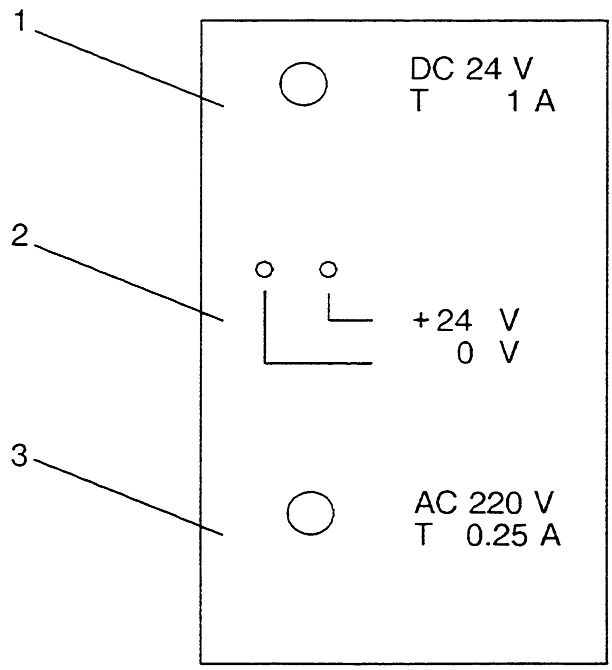
Fig. 9 Jumper settings on the UI module

4.3 Operation

A reset key for the UI is located on the power supply module 6DS1211-8AA. This key should be pressed after inserting the local bus connector and in the event of a fault.

In the case of a redundant bus configuration, pressing the UI reset key results in a changeover to the redundant bus.

Stable operation of the currently active CS 275 bus can be seen by the way in which the LEDs on a remote bus interface module are flashing.



1 Fuse for +24-V secondary voltage
2 Measuring jack for secondary voltage
3 Fuse for primary voltage

Fig. 10 Front view of power supply module C79451-A3276-A1

5 Maintenance

Checking the supply voltages

- Check the +24 V at the front panel jack using a voltmeter.
- The green LED on the power supply module shows that the UI power supply is functioning.

Fuses

T 1.0 A	secondary	
T 0.25 A	primary	> in power supply module C79451-A3276-A1
T 1.6 A		in power supply module 6DS1 211-8AA

Troubleshooting

If a fault occurs, the defective component must be determined by module replacement.

This can be done with the aid of diagnostics LEDs on the UI.

LED	Meaning
SV (green)	Power supply of UI functioning
F (red)	Fault: - bus interface 6DS1 212-8AB - local bus participant - local bus cable
A (green)	Bus A active
B (green)	Bus B active

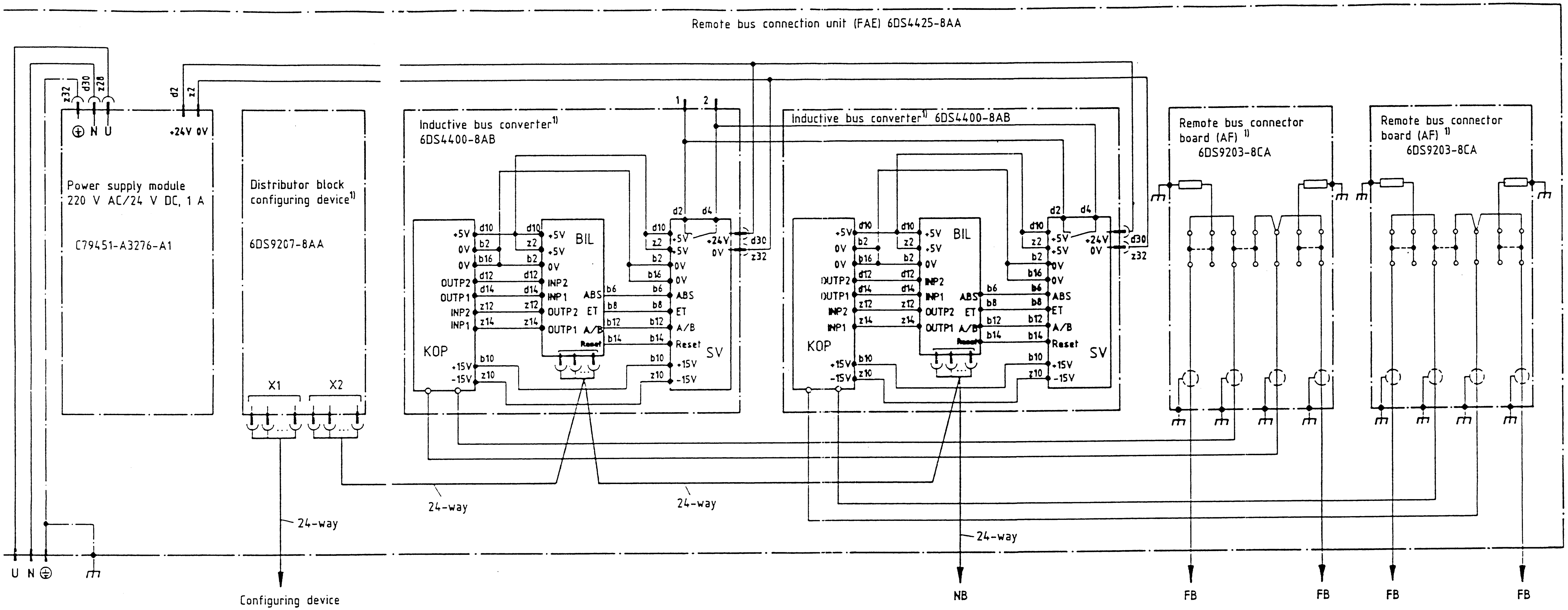


Fig.11 Circuit diagram

1) Optional modules

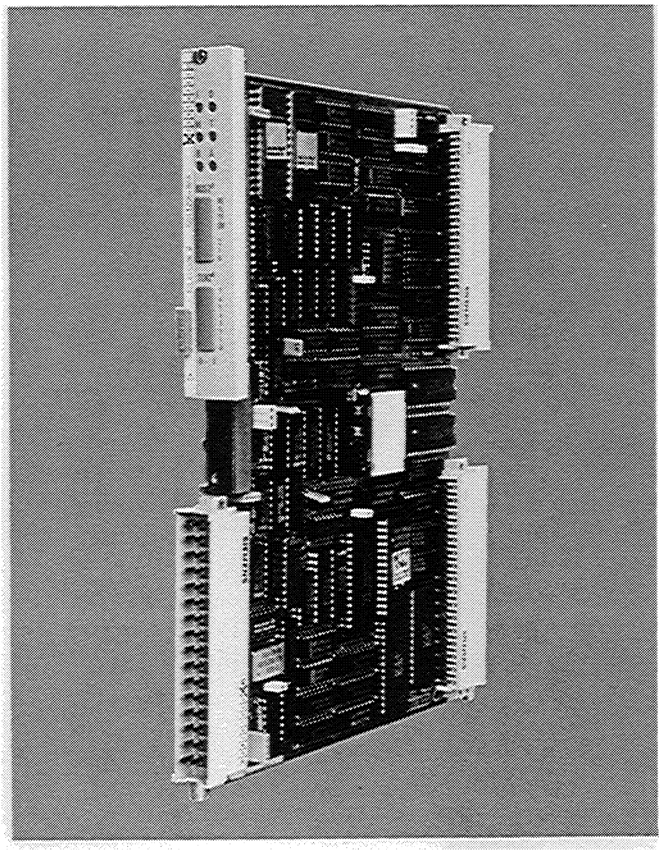
KOP = Inductive coupler
BIL = Bus interface logic
SV = Power supply
FB = Remote bus
NB = Local bus

SIEMENS

TELEPERM M / ME

Interface Module for SIMATIC S5 150U and 155U
Programmable Controllers (with CPU 946/947 and CPU 948)
6DS1206-8AA

Instructions C79000-B8076-C181-07



Contents

Page

1 Application

The interface module 6DS1206-8AA (N-S5) is used to connect the S5 150U and S5 155U programmable controllers with CPU 946/947 and CPU 948 to the TELEPERM M process control system via the CS 275 bus system.

It is plugged into the slot for communications processors (CP slot) of the S5 150U and S5 155U programmable controllers and provides the 20-m local bus interface of the TELEPERM M CS 275 bus system at its front connector.

The programmable controller is coupled to a TELEPERM M automation system via the remote bus using the remote bus connection tier 6DS4426-8xA. Several programmable controllers can be coupled within a SIMATIC S5 cabinet or group of SIMATIC cabinets at the same potential via the local bus.

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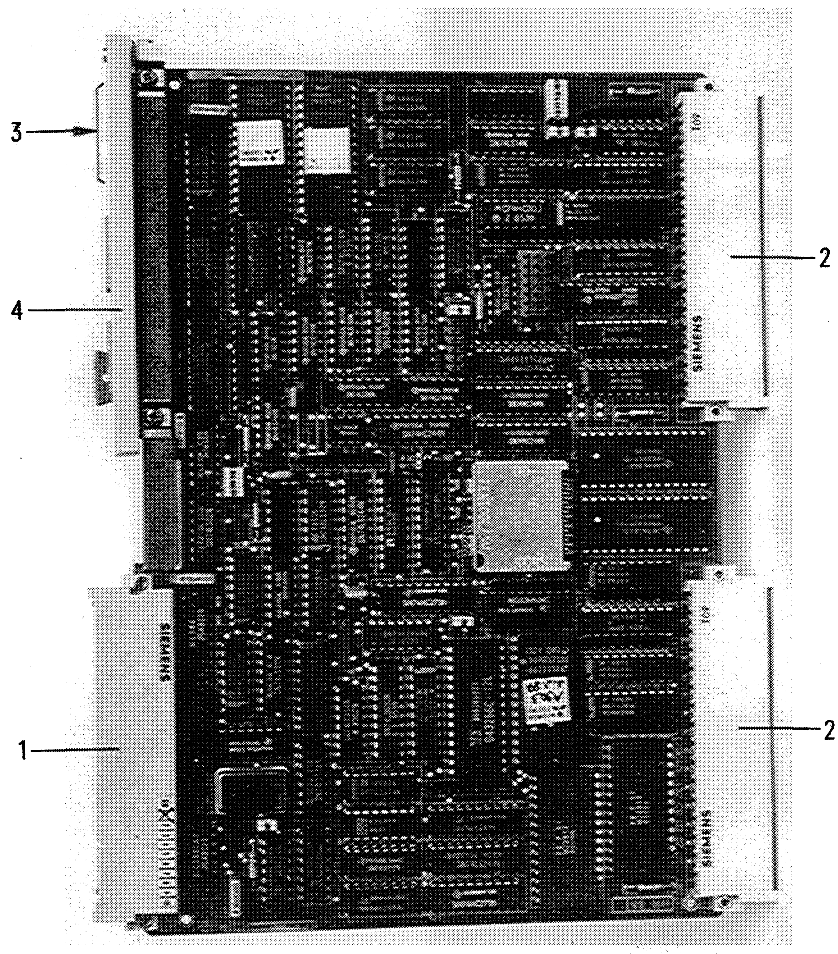
2 Design



1 Front connector, 48-pin
2 Backplane connector
3 Diagnostic LEDs (see Section 6.2)
4 Front panel

Fig. 2/1 Interface module 6DS1 206-8AA

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3 Mode of Operation

3.1 Overview of Functions

The interface module N-S5 links the serial CS 275 bus to the SIMATIC PLC via a dual-port RAM.
In principle, their function can be divided in two blocks (see Fig. 3/1).

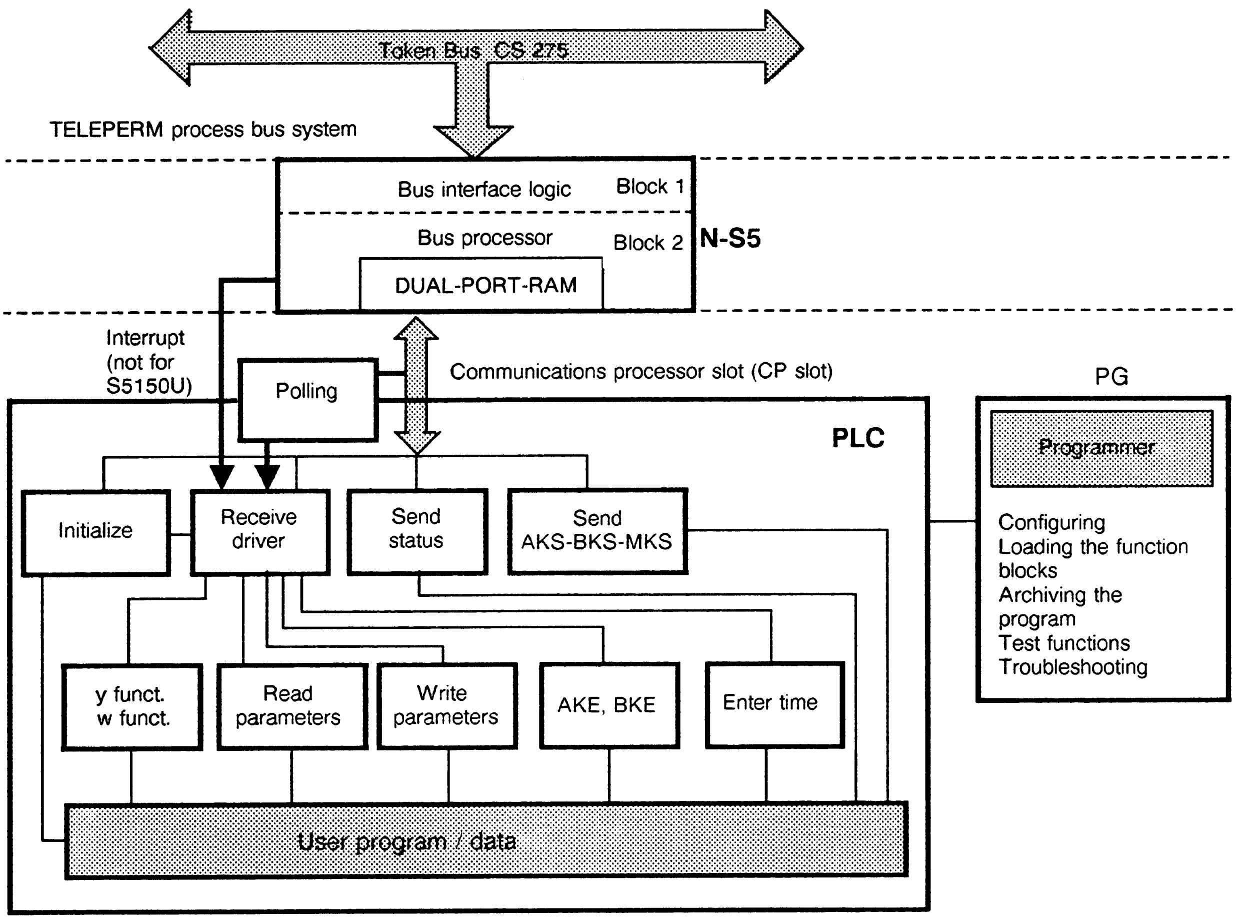

Fig. 3/1 Overview of functions of the N-S5 interface module, 6DS1 206-8AA

Block 1 includes the interface to the SIMATIC S5 programmable controllers, which is implemented by a dual-port RAM (2 kwords). The dual-port RAM ensures decoupling from the internal system bus. An SAB 80188 microprocessor is responsible for sequence controlling and monitoring all module functions. Its internal parallel bus connects the main memory (32-kbyte RAM) and program memory (32-kbyte EPROM) as well as the bus interface logic (BIL).

Block 2 includes the interface to the 20-m local bus of the TELEPERM M process control system and the bus interface logic (BIL). The BIL is an independent control unit which carries out information exchange on the local bus and is operated like a memory location by the SAB 80188 microprocessor. The BIL is microprogrammed and its operational functions are specified by a control register. The data for transmission are first written into the transmit FIFO (first-in first-out memory) in parallel mode by the SAB 80188 microprocessor and output to the local bus in bit-serial mode by the line protocol controller together with the transmitters.

The received bus messages pass the line protocol controller in bit-serial mode. Serial-to-parallel conversion takes place in the receive FIFO. The processor reads the bus messages byte by byte and transfers them to the buffer memory. Data will not be transferred to the central unit until the bus message has been completely received.

The SAB 80188 microprocessor enters requests for the master function into the alarm register. These requests are transferred to the alarm channel of the local bus due to the line protocol. Any format errors are detected during a bit-by-bit comparison, i.e. each transmitted information is immediately re-received and compared with the transmitted data.

3.2 Addressing the N-S5 in the SIMATIC S5 150U Programmable Controller

- Page frame addressing in the 150U programmable controller

The linear address range of 2 kwords in the peripheral area of the SIMATIC programmable controller is multiplexed by page frame addressing in order to enable the processing of several communications modules.

Such a page frame is selected by an "ident register". This register is addressed by the S5 150U handling blocks under the address 0FEFFH.

Before commissioning the interface module, the page frame must be assigned a page frame number which can be selected from a range of 0 to 255. The page frame number is set on the N-S5 module using plug-in jumpers (for jumper settings, see Section 5.1).

When selecting its number in the ident register, the page frame is overlaid in an "address window" of 2 kwords. The standard window start address is set to F400H (61 k in the 150U) in the main memory. Thus the N-S5 page frame address range is between 61 k and 63 k - 1.

- Linear addressing in the 1S5 155U programmable controller (CPU 946/947 and CPU 948)

For linear addresssing the setting of a page frame number and the contents of the ident register is not eminent.

There is a range of 0 to 52 kwords for linear addressing in the N-S5.

The dual-port RAM occupies 2 kwords.

The basic window address of this memory range is set to an integer multiple of 2 kwords using plug-in jumpers.

3.3 Processing Receive Messages

- Polling in the 150U and 155U programmable controllers

The S5 150 U/155 U cyclically scans (polling) the read pointers (LZ) and write pointers (SZ) in the management area of the dual-port RAM, to determine whether a receive order has been written into the dual-port RAMs. If the pointer status of LZ and SZ differs, it means that messages must be fetched.

- Interrupt mode in the S5 155U (CPU 946/947, CPU 948 in "155U mode")

The N-S5 signals via the S5 bus using a hardware interrupt that new receive data has been written into the dual-port RAM which can be read by the coupler software KSN-S55.

The N-S5 module activates the interrupt line INT A in single processing operation and the interrupt lines INT A **and** INT B in multiprocessing operation. The interrupts C, D, E, F, and G must **not** be activated by the N-S5.

The following table shows the assignment of the interrupt lines:

Number of CPUs 946/947 and CPUs 948	No. of N-S5	Mode N-S5	Coding switch TL	Interrupt signal of CPU 946/947 and CPU 948	Bus/participant address	Interrupt routing
1	1	Single processor	0	INTA	BA/TA	INT1→ INTA
2	1	Multiprocessor	1	INTA INTB	BA/TA BA/TA+1	INT1→ INTA INT2→ INTB
2	2	Single processor Single processor	0 0	INTA INTB	BA/TA BA/TA+1	INT1→ INTA INT1→ INTB

Table 1: Possible combinations of N-S5, CPU 946/947, CPU 948 and interrupt lines

In the N-S5 in multiprocessor mode, the interrupt lines INT A and INT B are firmly assigned to the bus/participant addresses BA/TA and BA/TA+1. If the N-S5 is called under BA/TA+1, the corresponding interrupt routing activates INT B and interrupts the program in CPU 946/947 or CPU 948 in slots 51, 59 and 67.

When two CPUs 946/947 (or two CPUs 948) and two N-S5 are combined only **one** interrupt line of **each** N-S5 is assigned. This combination is shown in the last line of the above table.

Note:

An interrupt line activated by N-S5 must not be assigned by another interrupt module.

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4 Technical Data

Dimensions

- PCB .... 233. 4 mm × 160 mm
- Front panel width .... 20. 32 mm (1⅓ standard slots)

Supply voltage .... +5 V ±5 %

Power consumption .... Typ. 1.8 A

Interfaces

Local bus interface .... 20-m local bus, input/output redundant, wired-or, asymmetrically non-floating

Level on 20-m local bus .... Input: ≥2 V corresponds to high
≤ 0.8 V corresponds to low
Output: ≥2.7 V corresponds to high
≤ 0.7 V corresponds to low

Transmission rate .... 340 kbits/s (autonomous local bus)
250 kbits/s (remote bus interface module via inductive converter)

Participants .... 20-m local bus: max. 9 (including inductive converter)
(voltage difference between earth potentials of the participants ≤ 0.2 V)

Data protection .... Block parity (d = 4)

Operating mode .... Half-duplex

Ambient conditions

Temperature

- in operation (inlet temperature) .... 0 to + 55 °C
- in storage/transport .... – 40 °C to + 70 °C

Relative humidity

- in operation .... 75 % annual average
85 % occasionally, no condensation
- in storage/transport .... 95 %, no condensation

Atmospheric pressure

- in operation .... 860 to 1080 hPa
- in storage/transport .... 860 to 1080 hPa

Pollutants

- SO_2 .... 0.5 ppm
  Relative humidity .... 60 %, no condensation
- H_2S .... 0.1 ppm
  Relative humidity .... 60 %, no condensation

Weight .... approx. 0.5 Kg

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5 Installation and Commissioning

> **Note**
>
> Regulations about handling modules containing electrostatically sensitive components must be observed when installing and commissioning the N-S5 interface module.

5.1 Settings on the Interface Module

Before inserting the interface module the coding switches and bases must be set as follows:

5.1.1 Setting the Coding Switches

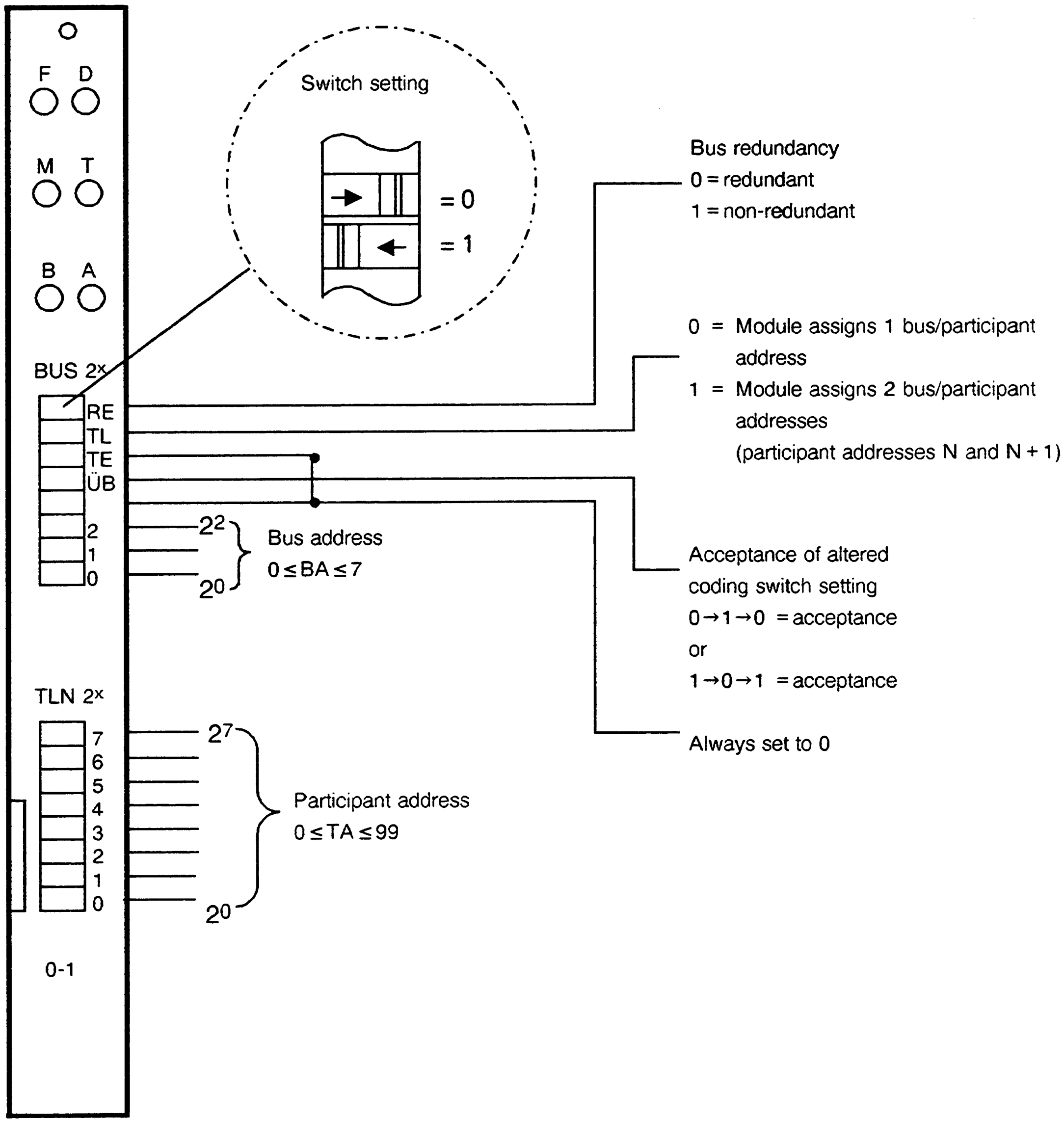


Fig. 5/1 Position of the coding switches

Significance of the Coding Switches (see Fig. 5/1)

- Coding switches "Bus and participant address"

A participant address (TA) must be assigned to each interface module to differentiate between several interface modules within an autonomous CS 275 bus system. A bus address (BA) must be assigned to differentiate between several buses connected via bus couplers.

Permissible address range :	$0 \leq BA \leq 7$	(BA = 0 is not permissible together with TA = 0)
	$0 \leq TA \leq 99$	(max. 100 participants permissible)

- Coding switch "TL"

When operating in the 150U programmable controller and in single processor mode in the 155U programmable controller, set the switch to position 0.

If the interface module communicates with two CPUs 946/947 or two CPUs 948 in the 150U programmable controller set the coding switch TL to position 1 according to the multiprocessor. The interface module then occupies the participant addresses N and N + 1 (N = set participant address). In this case the participant address N is firmly assigned to the module interrupt INT1 and the participant address N + 1 to the module interrupt INT2.

- Coding switch "RE"

The coding switch "RE" is used to inform the interface module whether it is operated on a redundant or non-redundant CS 275 **remote bus**.

0 = Operation on redundant remote bus
1 = Operation on non-redundant remote bus

- Coding switch "ÜB"

If a coding switch setting is altered during operation (e.g. bus or participant address is changed), the new setting must subsequently be accepted by briefly setting the coding switch "ÜB" to position 1.

The new switch setting is thus communicated to the SIMATIC programmable controller, from which a software reset is expected.

Between switch alteration and reset, the interface module does not accept any orders or parameter settings (LEDs assume a static status).

The switch "ÜB" must be set to position 0 during normal operation.

5.1.2 Inserting the Coding Jumpers on Module N-S5

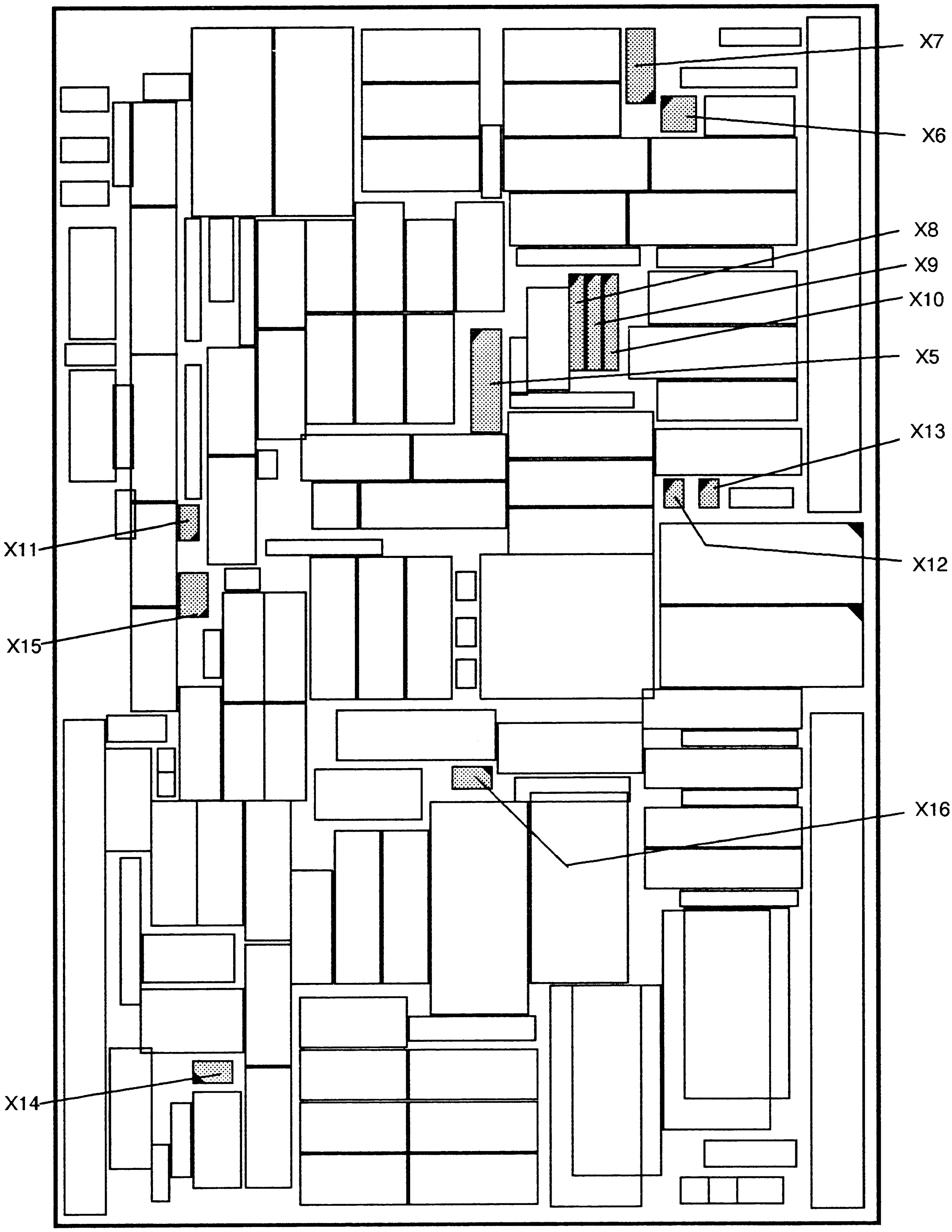
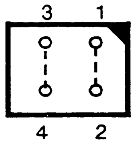


Fig. 5/2 Position of the coding bases on interface module N-S5 (6DS1206-8AA)

The following coding jumpers are factory-set and must be present during operation:
X 14 : Jumper 1 – 2
X 15 : Jumpers 1 – 2, 3 – 4 and 5 – 6
X 16 : Jumper 1 – 2

- Setting the type of addressing (coding base X6)

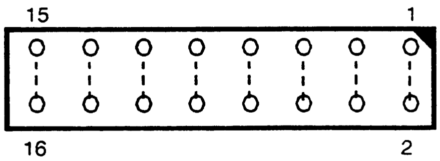


Type of addressing	X6	3–4	1–2	
Page frame addressing (in S5 150U only)		–	X	
Linear addressing (in S5 155U only)		X	–	

X = Coding jumper inserted
– = Coding jumper removed

- Setting the page frame no. for operation in 150U programmable controller (coding base X5)

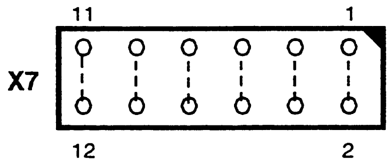
> **Note**
>
> F400H has to be set at jumper base X7.



Page frame No.	X5	15–16							1–2	
0		–	–	–	–	–	–	–	–	
1		–	–	–	–	–	–	–	X	
2		–	–	–	–	–	–	X	–	
3		–	–	–	–	–	–	X	X	
4		–	–	–	–	–	X	–	–	
5		–	–	–	–	–	X	–	X	
:										
254		X	X	X	X	X	X	X	–	
255		X	X	X	X	X	X	X	X	

X = Coding jumper inserted
– = Coding jumper not inserted

- Setting the base window address (coding base X7)



Base window address: Dec. start address	Base window address: Hexadec. start address	X7 11/12					X7 1/2	
0K	0000	–	–	–	–	–	–	Range in **S5 155U**
2K	0800	–	–	–	–	X	–	
4K	1000	–	–	–	X	–	–	
6K	1800	–	–	–	X	X	–	
8K	2000	–	–	X	–	–	–	
10K	2800	–	–	X	–	X	–	
12K	3000	–	–	X	X	–	–	
14K	3800	–	–	X	X	X	–	
16K	4000	–	X	–	–	–	–	
18K	4800	–	X	–	–	X	–	
20K	5000	–	X	–	X	–	–	
22K	5800	–	X	–	X	X	–	
24K	6000	–	X	X	–	–	–	
26K	6800	–	X	X	–	X	–	
28K	7000	–	X	X	X	–	–	
30K	7800	–	X	X	X	X	–	
32K	8000	X	–	–	–	–	–	
34K	8800	X	–	–	–	X	–	
36K	9000	X	–	–	X	–	–	
38K	9800	X	–	–	X	X	–	
40K	A000	X	–	X	–	–	–	
42K	A800	X	–	X	–	X	–	
44K	B000	X	–	X	X	–	–	
46K	B800	X	–	X	X	X	–	
48K	C000	X	X	–	–	–	–	
50K	C800	X	X	–	–	X	–	
61K	F400	X	X	X	X	–	X	Range in **S5 150U**

X = Coding jumper inserted
– = Coding jumper not inserted

The set base window address corresponds to the start address of the 2-k dual-port RAM of the N-S5 interface module.

- **Operation in the S5 150U programmable controller**

  The standard page frame addressing range is between 61 k and 63 k-1. Thus the base window address 61 k (hex = F400) has to be set for page frame addressing. Additionally, the page frame number has to be set at the coding base X5.

- **Operation in the S5 155U programmable controller** (CPU 946/947, CPU 948)

  The start address of the dual-port RAM can be set using the jumpers at an interval of 2 kwords within the F-page in the absolute address F0000H...FC800H.
  The free peripheral address area of address F0000H...FCFFFH (difference = 52 kwords) may have up to 26 different start addresses of the dual-port RAM at an interval of 2 kwords.

- Setting the interrupt jumpers (coding base X8, X9, X10)

The N-S5 module is delivered without jumpers between X8, X9 and X10 (i.e. polling mode).The N-S5 is set to the interrupt mode by inserting a jumper in X9 - X10 (and X8 - X9, in the N-S5 module during multiprocessor operation).

- Operation in the 150U programmable controller (only polling mode possible)

> **Note**
>
> In the 150U programmable controller **no** jumper must be inserted between the jumper bases X8, X9 and X10 during page frame addressing.

- Operation in the 155U programmable controller (polling or interrupt mode possible)

Apart from the polling mode (see above) the interrupt mode is possible when using the N-S5 module in the 155U programmable controller. Therefore the settings of X8, X9 and X10 which are described below are necessary. Additionally, the jumper X49 has to be inserted on the central module ZBG 946, p.c.b. 1 and the plug-in jumper "INTA/B/C/D" on the basic module of the CPU 948.
A N-S5 activates 1 or 2 interrupt lines (INT 1 and INT 2 on the N-S5 module). INT 1 is firmly assigned to the bus/participant address which is set on the front panel. The interrupt INT 2 is generated if a N-S5 set to multiprocessor mode receives telegrams for BA/TA + 1.
The routing from INT 1 and INT 2 to the interrupt lines INT A and INT B of the CPU 946/947 or CPU 948 is shown in Fig. 5/3 which represents the assignment of the interrupt lines INT A and INT B by a NS5 set to multiprocessor mode (using the central controller 155U as an example):

BA/TA → INT 1 → INT A → CPU 946/947 in slot 11, 19, 27
or CPU 948 in slot 11, 19
BA/TA + 1 → INT 2 → INT B → CPU 946/947 in slot 51, 59, 67
or CPU 948 in slot 51, 59

The following applies to the central controllers 135U/155U:
BA/TA → INT 1 → INT A → CPU 948 in slot 11, 19
BA/TA + 1 → INT 2 → INT B → CPU 948 in slot 27, 35

The interrupt routing for all possible combinations of the N-S5 module and CPU 946/947, CPU 948 is described in Section 3.3.

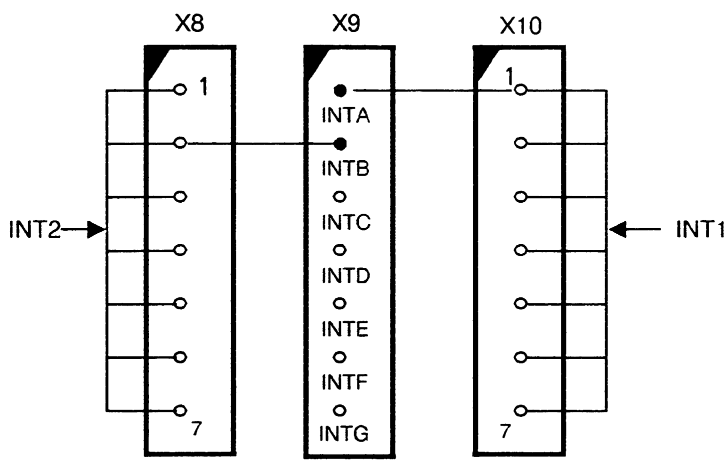


Fig. 5/3 Example for setting the coding base X8, X9 and X10: interrupt routing

5.2 Inserting the Interface Module

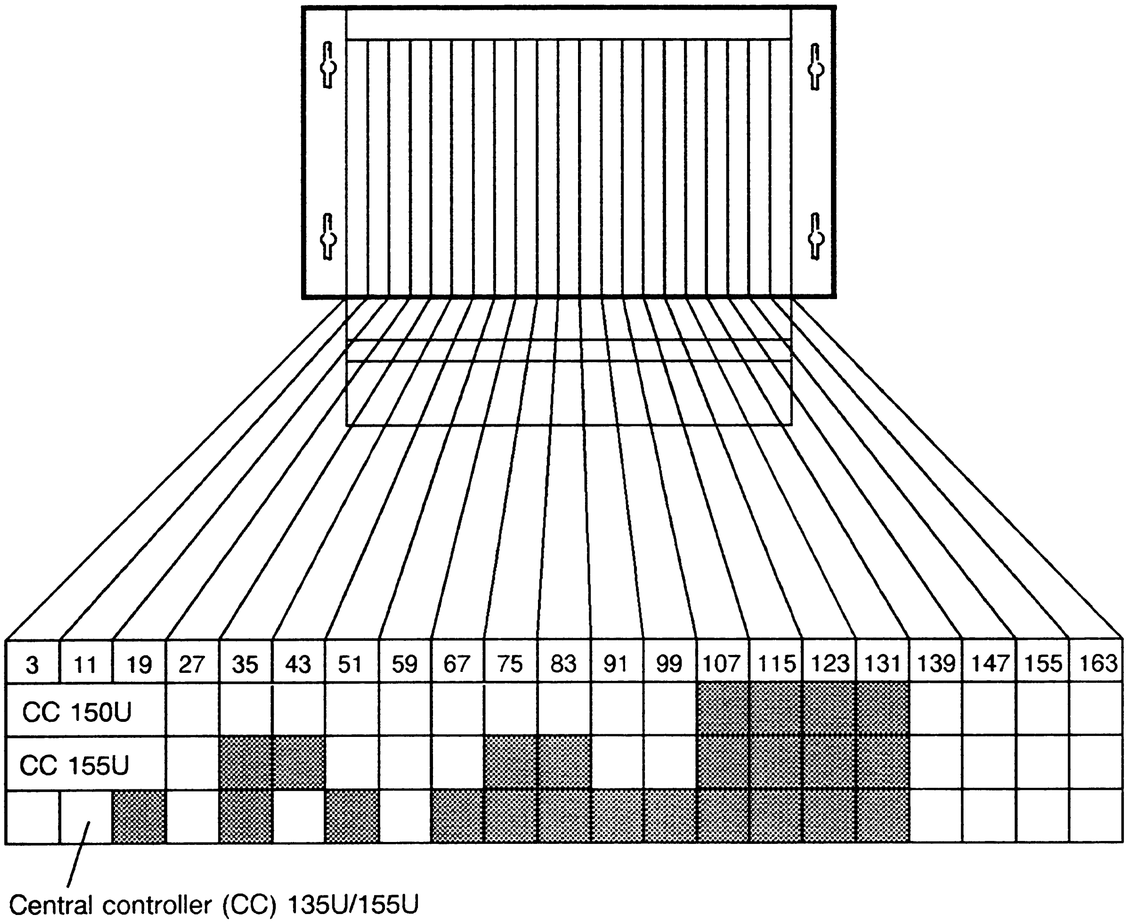


Fig. 5/4 Slots for the N-S5 interface module

The N-S5 interface module can be inserted in the marked CP slots, namely in:

Central controller 150U (slots 107 to 131)
Central controller 155U (slots 35, 43, 75, 83 and 107 to 131) and
Central controller 135U/155U (slots 19, 35, 51, 67, 75 to 131)

> ⚠ **Important**
>
> The interface module may only be inserted and removed when no voltage is applied to the subrack of the programmable controller.

Before inserting the module, screw the fixing brackets supplied to the pre-planned subrack slot beside the lower and upper module guide support, as shown in Fig. 5/5.

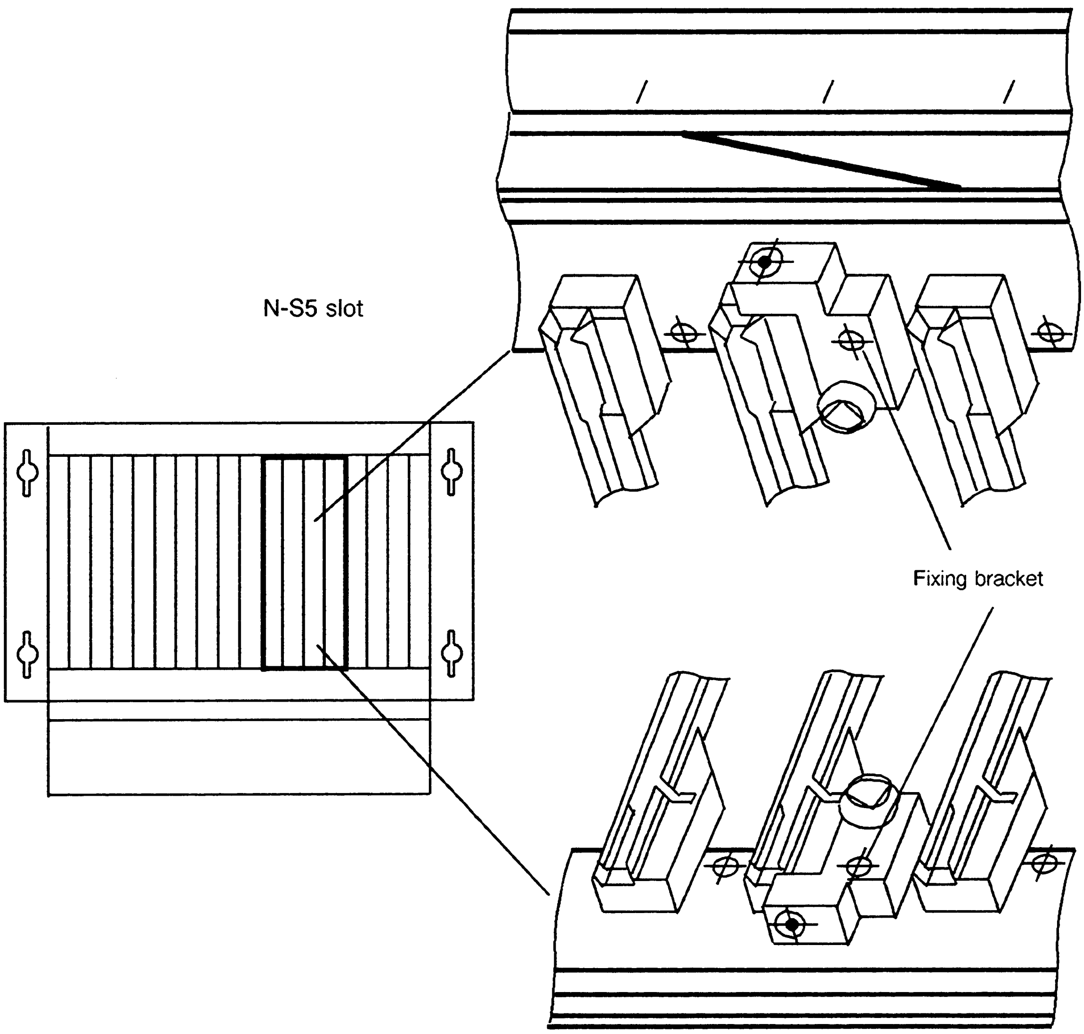


Fig. 5/5 Fixing brackets of the module

Caution

Once the module has been inserted and the local bus cable plugged on, tighten the module and connector fixing screws.

5.3 System Configuration

5.3.1 Design of the SIMATIC Cabinet

The S5 150U and the S5 155U must be installed in an 8MF cabinet in accordance with the installation instructions C79000-B8576-C452. The following items must be observed during installation:

- If the cabinet is supplied by the 230-V AC mains, a mains filter must be fitted where the mains cable enters the cabinet (see Fig. 5/6).
- If the cabinet is supplied by a central 24-V DC supply, care must be taken that no noise voltages are introduced into the cabinet via the supply lines (e.g. using noise suppression capacitors, see Fig. 5/7).
- Local bus cables must be routed separately from power supply and other signal cables in the S5 150 U cabinet.
- Only electrically isolated power supply modules can be used to supply the programmable controller.

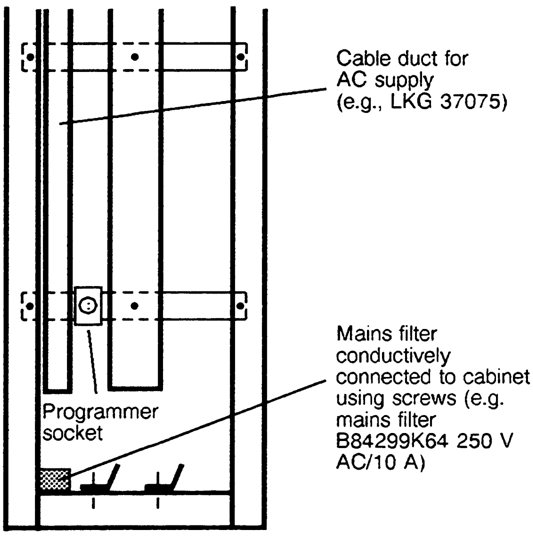


Fig. 5/6 Arrangement of the mains filters

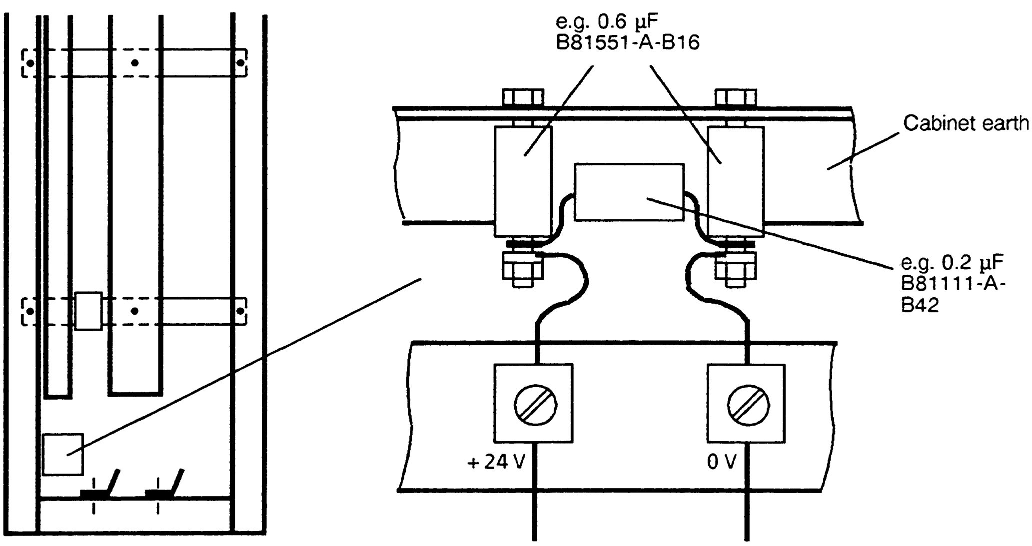


Fig. 5/7 Arrangement of the noise suppression capacitors

5.3.2 Bus Coupling

- Remote bus coupling

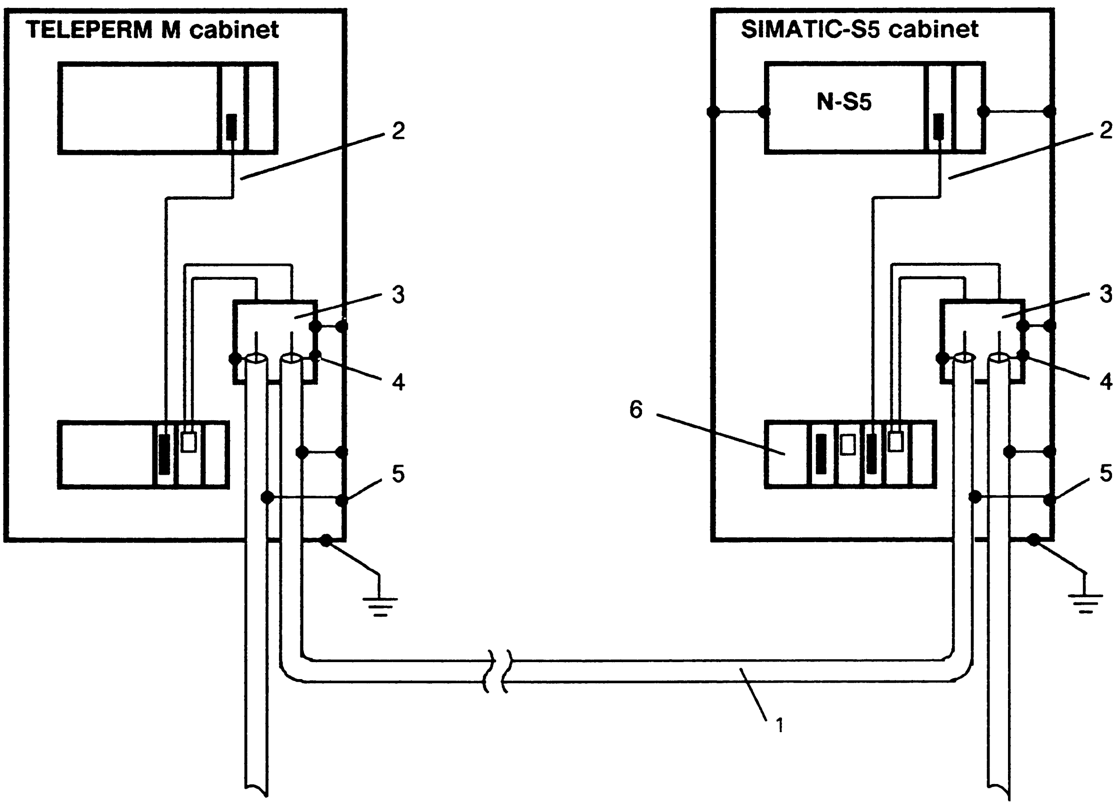
One or several programmable controllers, coupled via local bus, must be connected to the remote bus of the CS 275 bus system via the remote bus connection tier 6DS4426-8xA.
For details on system configuration, installation of the remote bus connection tier 6DS4426-8xA and connection of the remote bus cables, see the instructions "Remote Bus Connection Tier".

- Local bus coupling

Local bus coupling between programmable controllers or between programmable controllers and other devices approved for operation on the CS 275 bus system is only permitted if the following conditions are met:

- The devices to be coupled must be installed close to each other (max. distance 20 m).
- The difference between the 0-V potentials of the coupled partners may **not** exceed 0.2 V.

This condition can only be met if the electronics 0 V and device earth are connected in the coupled partner and the casings of both coupled partners are connected at low impedance (see Section 5.3.3).

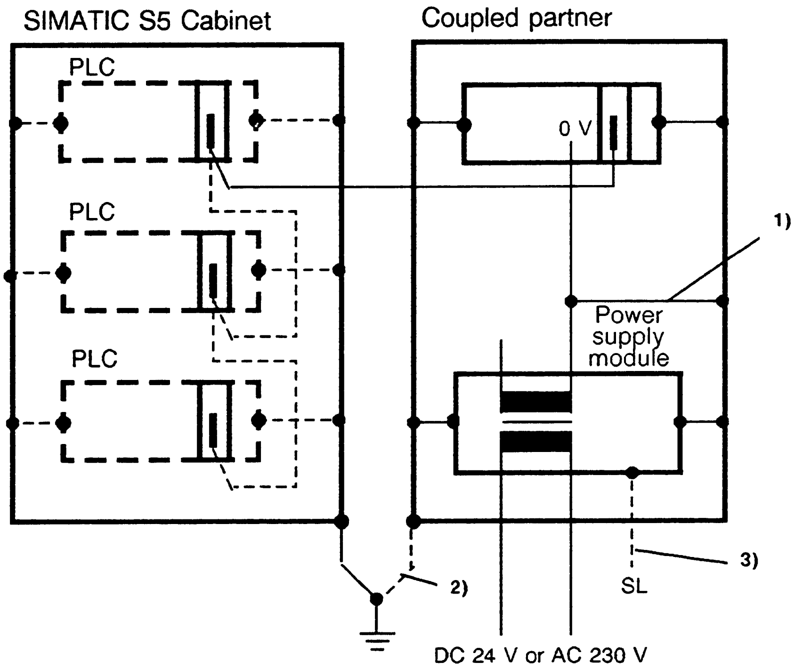


1 Remote bus cable
2 Local bus cable
3 Remote bus connector board 6 DS9 203-8DA
4 Conductively contact remote bus cable screens to cable detensioning clamp
5 On entering cabinet, contact remote bus cable screen to cabinet via terminal clamp with large-area connection
6 Remote bus connection tier 6DS4 426-8xA

Fig. 5/8 Connection of one or several programmable controllers, coupled via local bus, to the TELEPERM M remote bus

5.3.3 Prerequisites for Local Bus Coupling

- Local bus coupling between programmable controller and any coupled partner



1) Local bus coupling is only permitted with a coupled partner if its device earth is connected to the electronics 0 V in the device and the partner is supplied via a floating power supply.

2) To make sure that the max. permissible potential difference between the electronics 0 V (max. 0.2 V) is not exceeded, the device earth of the coupled partners must be connected to each other and to an earthing point at low impedance, i.e. with a large-area connection using the shortest possible route.

Example: Connect the casings of both partners using screws or provide large-area connection via earthing strip and connect via common cable to the building earth.

3) If the coupled partner has only one PE connection and no separate earthing facility, fault-free local bus coupling can only be expected if the design of the PE cabling fulfills the conditions specified in item 2).

Fig. 5/9 Local bus coupling programmable controller / coupled partner

- Local bus coupling between programmable controllers

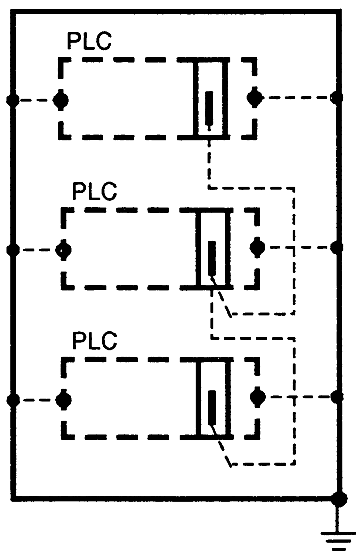


Fig. 5/10 Local bus coupling between programmable controllers

> **Note**
>
> With local bus coupling between programmable controllers, make sure that their subracks are connected to each other at low impedance, e.g. by screwing them to the cabinet structure via toothed lock washers.

5.3.4 Power Supply Circuit and System Earthing of the Remote Bus Coupling

The connection to the remote bus CS 275 is done via the remote bus connection tier 6DS4426-8xA.
Fig. 5/8 shows the principles of configuring the remote bus coupling.

For details on configuration and functioning see the instructions "Remote Bus Connection Tier".

6 Maintenance

6.1 Connector Pin Assignments

Pin	d	b	z
2	0V	SA 0	Screen
4	0 V	SA 1	Screen
6	0 V	SB 0	Screen
8	0 V	SB 1	Screen
10	0 V	DA 0	Screen
12	0 V	DA 1	Screen
14	0 V	DB 0	Screen
16	0 V	DB 1	Screen
18		BA 0	Screen
20		BA 1	Screen
22		BB 0	Screen
24		BB 1	Screen
26		TA 0	Screen
28		TA 1	Screen
30		TB 0	Screen
32		TB 1	Screen

SA 0,1 = Control signal, bus A
SB 0,1 = Control signal, bus B
DA 0,1 = Data signal, bus A
DB 0,1 = Data signal, bus B
BA 0,1 = Qualifier signal, bus A
BB 0,1 = Qualifier signal, bus B
TA 0,1 = Clock signal, bus A
TB 0,1 = Clock signal, bus B

1 = Forward signal line

0 = Return signal line, (0 V reference earth)

Pin assignment of the front connector X4 (20-m local bus)

Pin	d	b	z
2		M1	+5 V
4			
6	GADB 12	GADB 0	/CPKL
8	GADB 13	GADB 1	/GMEMR
10	GADB 14	GADB 2	/GMEMW
12	GADB 15	GADB 3	/GRDY
14	/IR A	GADB 4	GDB 0
16	/IR B	GADB 5	GDB 1
18	/IR C	GADB 6	GDB 2
20	/IR D	GADB 7	GDB 3
22	/IR E	GADB 8	GDB 4
24	/IR F	GADB 9	GDB 5
26	/IR G	GADB 10	GDB 6
28		GADB 11	GDB 7
30			
32		M 1	

Backplane connector X1

Pin	d	b	z
2		M 1	+5 V
4		GDB 8	GDB 12
6		GDB 9	GDB 13
8		GDB 10	GDB 14
10		GDB 11	GDB 15
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			

Backplane connector X2

6.2 Fault Diagnosis

Troubleshooting must be carried out using the LEDs on the front panel.

Significance of the diagnostic LEDs:

'F' (red)	= Fault:	alarm signal of the bus interface logic
'D' (green)	= Data:	general data transfer on the local bus
'M' (green)	= Master:	module is currently bus master
'T' (green)	= Busy:	SAB 80188 processor executes read cycles
'B' (green)	= Bus B:	bus B is active.
'A' (green)	= Bus A:	bus A is active.

The 'F' LED lights up if the local bus or the bus interface module is faulty.
The LED flashes when sporadic faults occur.

Faults may be caused by:

- faulty messages due to faulty qualifiers or parity errors
- an overflow of the receive memory (e.g. defective bus processor)
- transmitted information not being identical to the bus information (e.g. defective line driver).

Important

During normal operation the 'F' LED lights weakly up in a cyclic way. This does not indicate a faulty state.

The 'D' LED lights up at approximately half brightness depending on the data transfer frequency.

The 'M' LED lights up for the duration of the master function which is indicated by more or less frequent flashing depending on the number of the connected participants.

The 'T' LED lights up with almost full brightness to signal CPU command or peripheral read cycles.

The steadily lighting 'A' and 'B' LEDs signalize the currently active bus. A brief flashing signalizes the passive bus.

6.3 Fault Elimination

Defective modules must be replaced and sent to the supplier for repair, along with an exact fault description (please use returned goods form).
On-site repair is not recommended. When sending in, use packing material suitable for electrostatically sensitive modules.

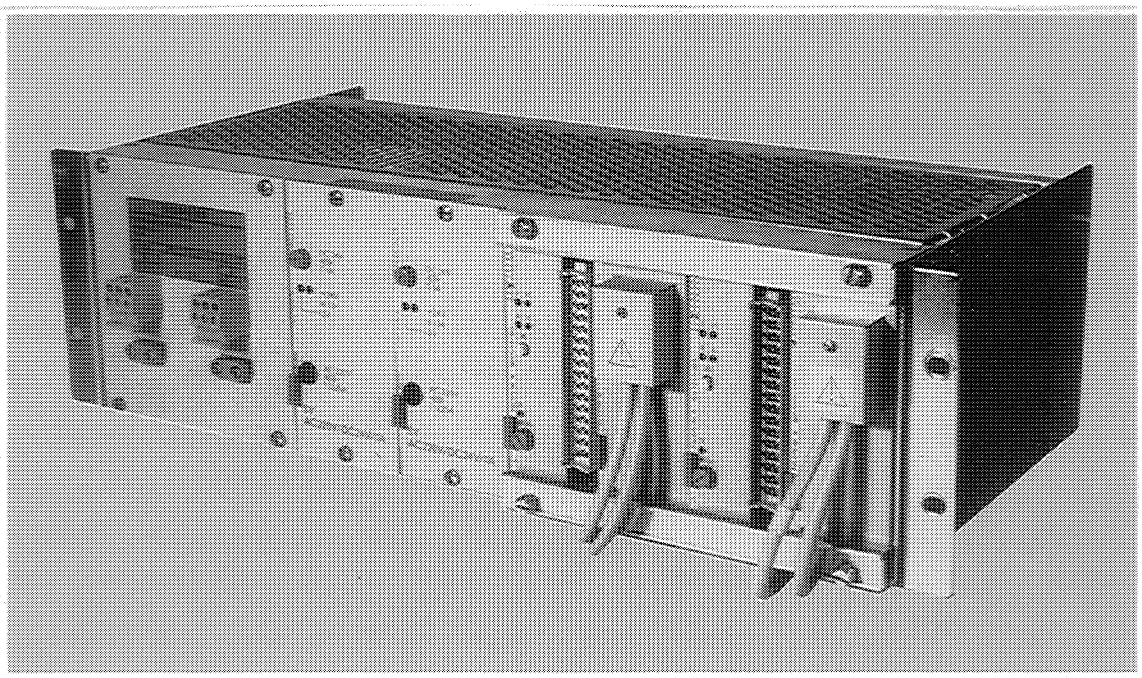
SIEMENS

TELEPERM M

Remote Bus Connection Tier S5

6DS4426-8AA/-8BA/-8CA

Instructions C79000-B8076-C251-05



Contents

Note

Please note the following Guidelines enclosed with this Manual:

„Safety-related Guidelines for the User"

„Guidelines for Handling Electrostatically Sensitive Devices (ESD)"

1 Application

The remote bus connection tier 6DS4 426-8AA/-8BA/-8CA enables the connection of SIMATIC programmable controllers (S5-150 U/S5-155 U) to a single or redundant remote bus of the TELEPERM M CS 275 bus system. It is used for integrating the inductive bus converter unit (UI), necessary for local-remote bus conversion, into an 8MF cabinet and supplying it with a voltage.
The following remote bus connection tier models are available:

Model 1 = Order No. 6DS4 426-8AA
Voltage supply from a single or redundant 24-V DC mains system

Model 2 = Order No. 6DS4 426-8BA
Voltage supply from a 230-V AC mains system

Model 3 = Order No. 6DS4 426-8CA
Voltage supply from a redundant 230-V AC mains system

These models include the subrack and power supply module necessary for feeding the inductive bus converter unit (UI).

The inductive converter itself and the remote bus connector board necessary for attaching the remote bus cable, are not components of the connection tier.

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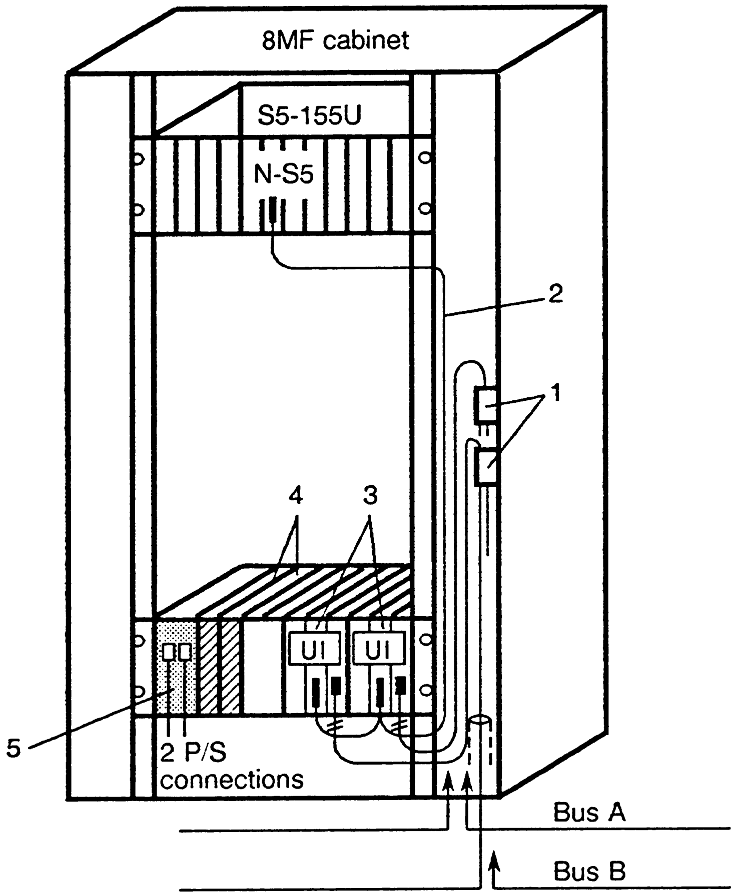
2 Design

The remote bus connection tier is a single 19"-high subrack (3 height units) designed for insertion into a standard 8MF cabinet.



1	Remote bus connector board (redundant x 2)	6DS9 203-8DA *)
2	Local bus connection cable	6DS8 204-8xx *)
3	Inductive bus converter (redundant x 2)	6DS4 400-8AB *)
	each consisting of:	
	a) UI power supply	6DS1 211-8AA
	b) bus interface	6DS1 212-8AB
	c) inductive coupler	6DS1 213-8AA
4	Power supply module 230-V AC/24-V DC	C79451-A3276-A1
	1 x with model	6DS4 426-8BA
	2 x with model	6DS4 426-8CA
5	19" subrack with UI wiring	

*) Not part of the remote bus connection tier 6DS4 426-8xA

Fig. 2.1 Remote bus connection tier in 8MF cabinet

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3 Operation

- Model 6DS4 426-8AA

Once installed, the UIs are directly supplied from a 24-V DC voltage source (the 24-V DC cabinet power supply unit).

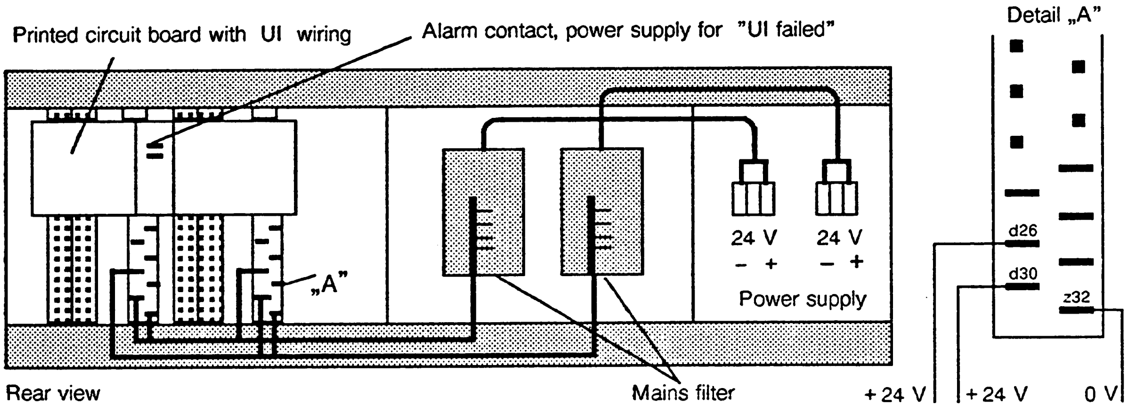

Fig. 3.1 Redundant 24-V mains

The supply lines of a single 24-V DC voltage source must be connected to **both** terminal blocks.
For increased availability, both UIs can also be supplied from a redundant 24-V mains system.
At the rear of the subrack is an alarm contact, which enables the UI voltages (+/- 15 V for the analog section and + 5 V for the digital section) to be monitored. The contact is electrically isolated (relay contact) and is closed when a power failure occurs (see Section 5.4). The contact responds in the case of a blown fuse or a defective UI power supply unit (6DS1211-8AA).
The user is responsible for the external monitoring of the two 24-V mains systems (e.g. central monitoring of the power supply units).
In addition to the module fuses of the UI power supply units, each of the two 24-V mains filters is equipped with two fuses at the rear of the subrack.
Each of these 4 fuses is monitored by one red LED which lights up in case of a blown fuse.
The fuses can be checked and replaced from the rear of the subrack (see Chapter 6).

- Model 6DS4 426-8BA

The subrack is equipped with a 230-V AC/24-V DC power supply module. The inserted UIs are supplied from a common 230-V mains system.

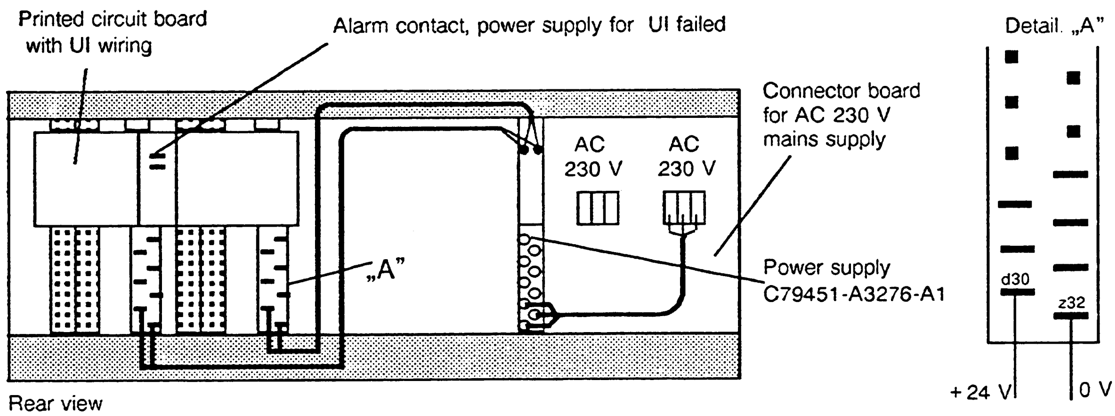

Fig. 3.2 Single 230-Vconnection

At the rear of the subrack is a floating alarm contact, which is closed if the UI power supply fails (see Section 5.4).

- **Model 6DS4 426-8CA**

The subrack is equipped with two 230-V AC/24-V DC power supply modules. The inserted UIs can be supplied from a redundant 230-V mains system.

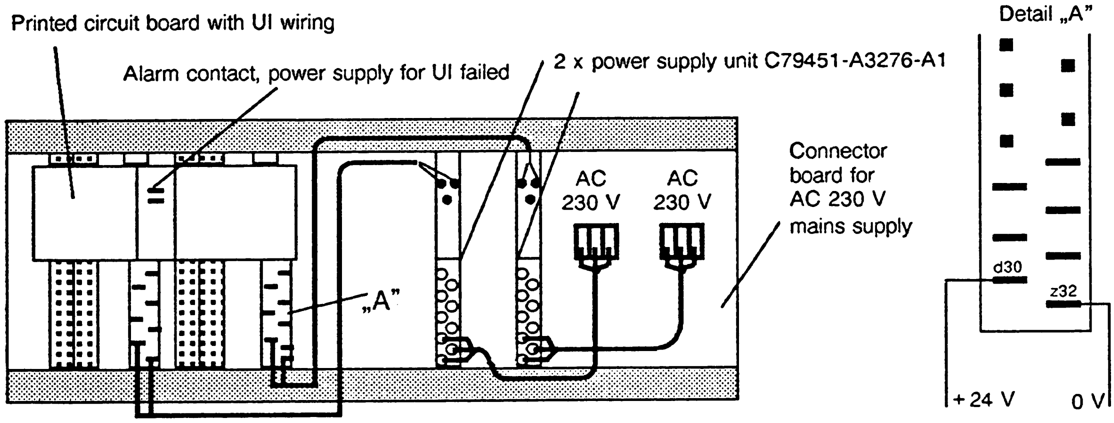

Fig. 3.3 Redundant 230-V connection

At the rear of the subrack is a floating alarm contact, which is closed if the power supply to one of the two UIs fails (see Section 5.4).

Each UI is firmly assigned to one power supply module (230-V AC / 24-V DC).

Due to this fact it is possible to monitor via a single alarm contact both the internal supply voltages of the UI (+/- 15 V and +5 V) and the 24-V output voltages of the power supply modules.

The contact is closed in the case of a defective UI power supply (6DS1211-8AA) or a failure on a power supply module. In addition thereto, the CS 275 bus system generates a redundancy indication (e.g. for a central acquisition by the OS).

The data exchange via the CS 275 bus system is maintained via the single bus until the defect has been corrected.

4 Technical Data

Order Nos.: 6DS4 426-8AA	24-V power supply
6DS4 426-8BA	including a 230-V AC/24-V DC power supply module C79451-A3276-A1
6DS4 426-8AC	including two 230-V AC/24-V DC power supply modules C79451-A3276-A1
Further necessary functional units:	when connected to a single remote bus 1 UI 6DS4 400-8AB 1 remote bus connector board 6DS9 203-8DA
	when connected to a redundant remote bus 2 UIs 6DS4 400-8AB 2 remote bus connector boards 6DS9 203-8DA
Supply voltages:	
6DS4 426-8AA	+24 V DC (20 V to 33 V), permissible ripple ≤ 15 %
6DS4 426-8BA	230-V AC + 6 %,-10 %, 50 Hz/60Hz
6DS4 426-8CA	230-V AC +6 %, -10 %, 50 Hz/60 Hz
Power consumption:	approx. 20 W or 20 VA
Ambient temperature:	
in operation	0 °C to +40 °C
during storage	-40 °C to +70 °C
Max. permissible alarm contact load:	I_C = 5 A, U_C = 60 V DC or 25 V AC
Degree of protection (to DIN 40050):	IP 00
Safety class	I (for models 6DS4 426-8BA and -8CA)
Dimensions (H x W x D):	134 x 485 x 260 mm³
Weight:	
subrack without power supply modules	3 kg
power supply module	1.5 kg
Connectable remote bus cables:	standard cable max. 4 km 2 YC (ms) CY1.6/10 - 75 Z2/5 vs sw or thin cable max. 2 km 2 YC (ms) CYV1.0/6.5 - 75 Z2/5 vs sw

For technical data on bus interface, see UI instructions (C79000-B8076-C004).

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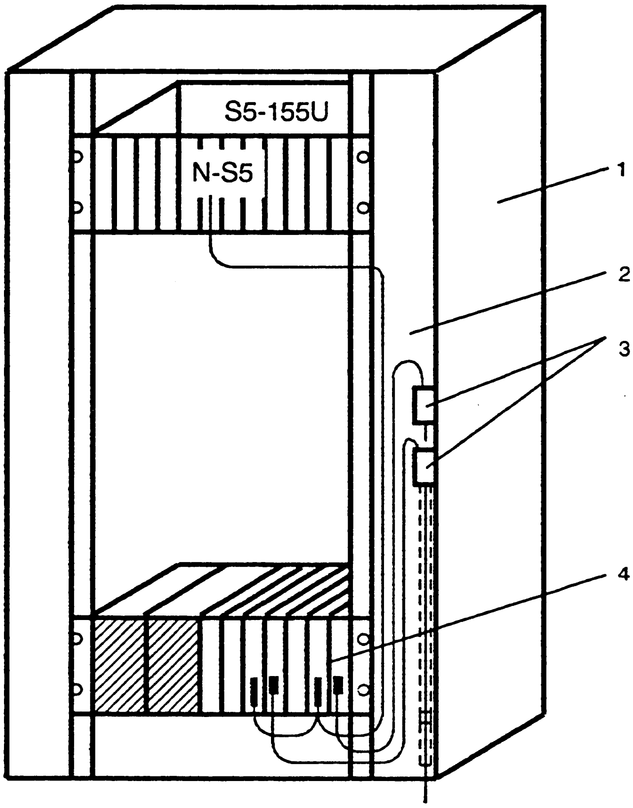
5 Installation and Commissioning

5.1 Installation of Remote Bus Connection Tier



1 8MF cabinet
2 Local bus cable
3 Remote bus connector board 6DS9 203-8DA
4 Remote bus connection tier 6DS4 426-8xA (preferably installed as lowest subrack)

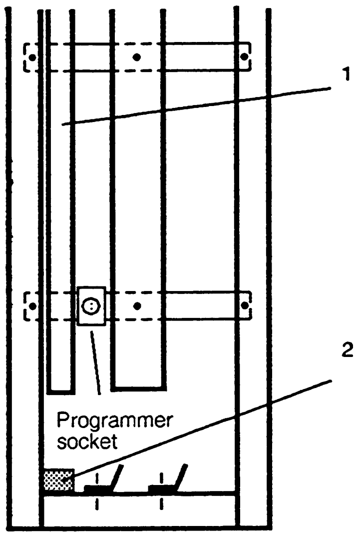
Fig. 5.1 Remote bus connector board in 8MF cabinet

Note the following points during installation:

- Screw the remote bus connection tier and remote bus connector boards through toothed washers to the cabinet bars in such a way as to ensure that there is a low-impedance connection between the subrack and the cabinet housing.
- Lay the local and remote bus cables well away from control and supply cables inside the cabinet.
- Remember to screw the connector plugs of the local bus cable to the N-S5 and the UIs at all costs.
- The remote bus connection tier may only be operated in a closed cabinet for reasons of electromagnetic compatibility.

5.2 Routing the Supply Cable

The cabinet has to be supplied via an appropriate mains filter. This ensures that no interference voltages are led into the cabinet or that no unpermissible device interferences are led into the supply system.



1 Cable duct for AC power supply (e.g. LKG 37075)
2 Mains filter conductively screwed to cabinet (e.g. mains filter B84299-K64 250 V AC/10 A)

Fig. 5.2 Layout of a mains filter with a 230-V supply

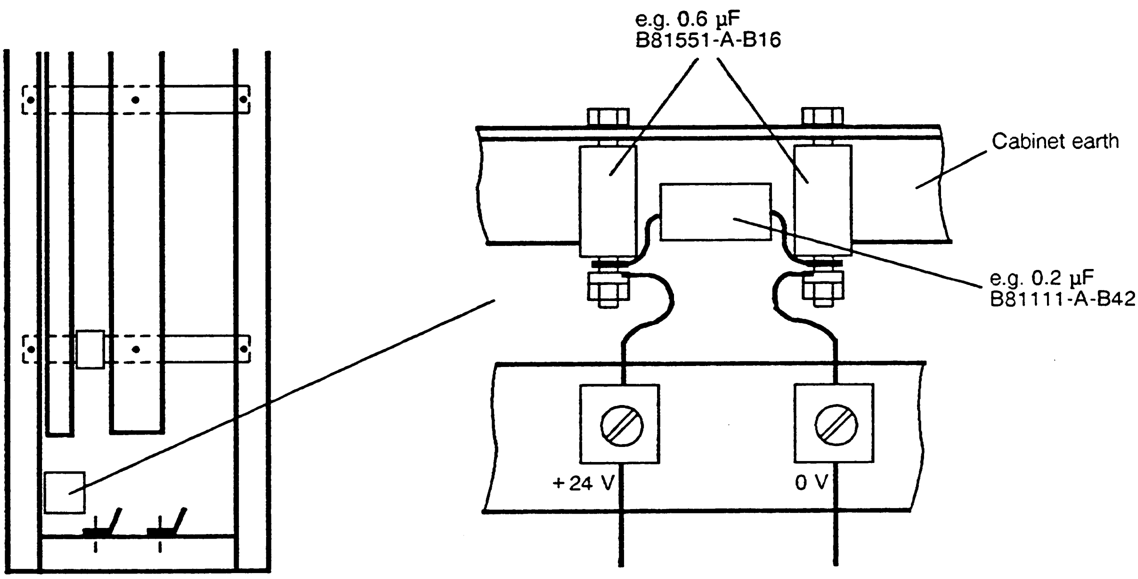
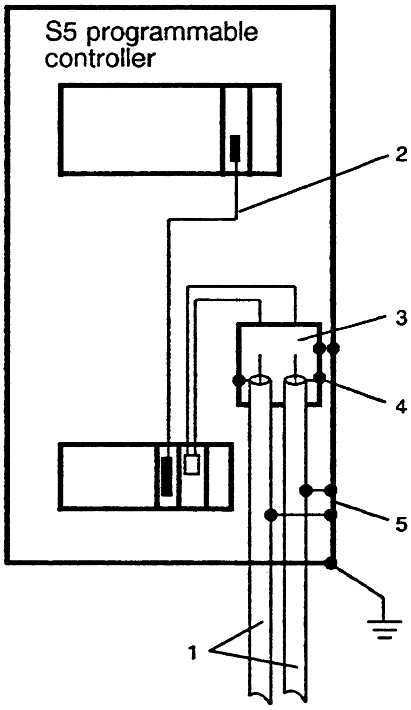


Fig. 5.3 Layout of noise suppression capacitors with 24-V supply

> ⚠ **Important**
>
> Only supply voltage sources coming up to the requirements of DIN/VDE 0805 (IEC 950/EN 60 950) may be used as 24-V supply voltages for the 24-V version 6DS4426-8AA .

5.3 Connection of Remote Bus Cables

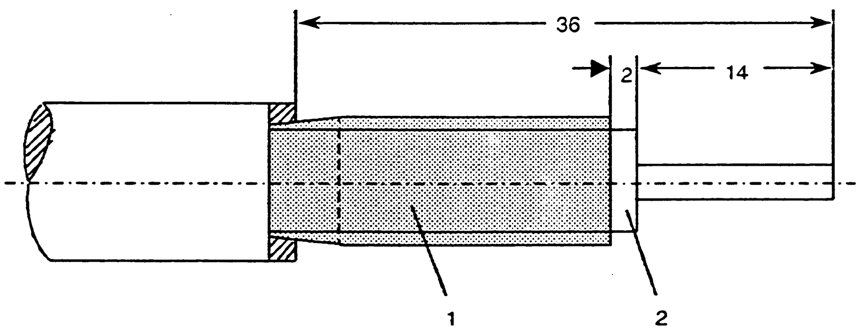


1 Remote bus cable
2 Local bus cable
3 Remote bus connector board 6DS9 203-8DA
4 Conductively attach remote bus cable screens to cable clamp
5 Contact outer screen of remote bus cable at cabinet entrance using a cable clamp (place onto screen bus)

Fig. 5.4 Connection of remote bus cables

The ends of the remote bus cables must be prepared for connection to the remote bus connector board as shown below:

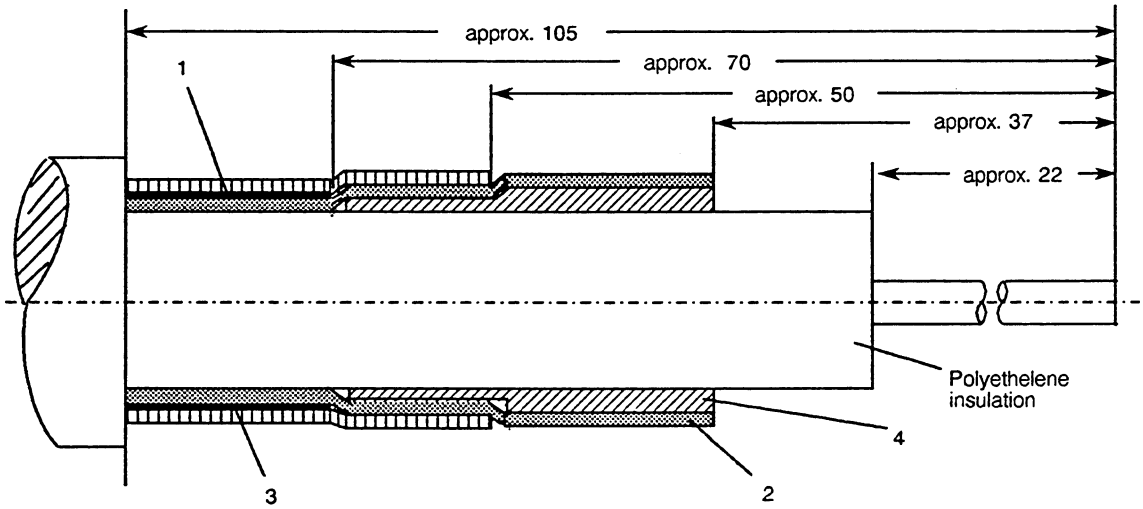
a) Coaxial cable of the UI



1 Braided screen
2 Polyethelene insulation

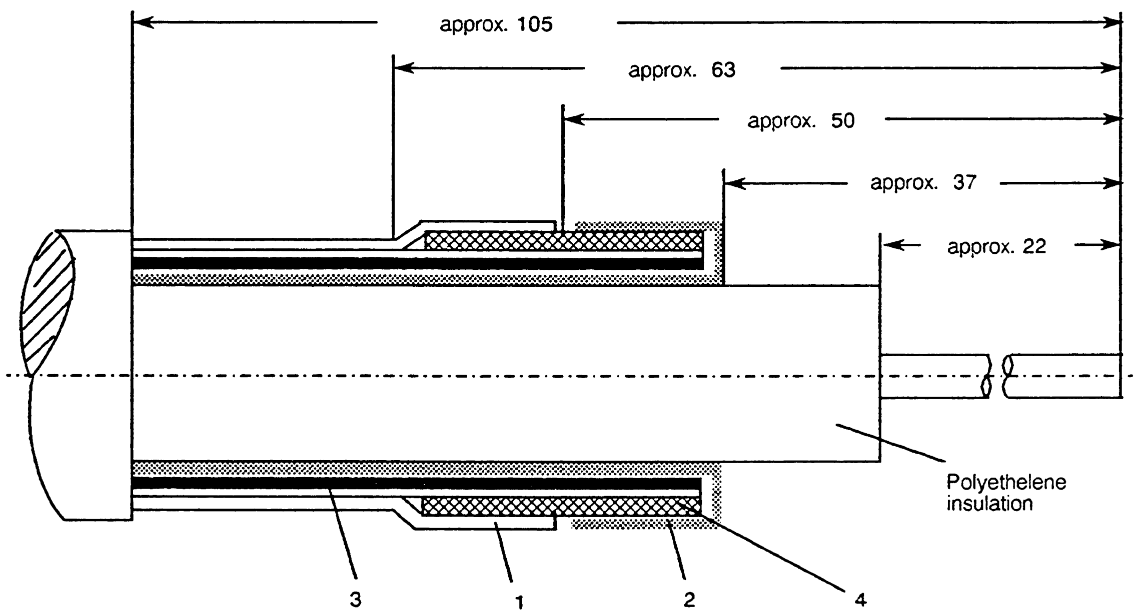
Fig. 5.5 Cable installation (continued on Page 5-4)

b) Installation of the old, graded contact sleeve on the remote bus cable



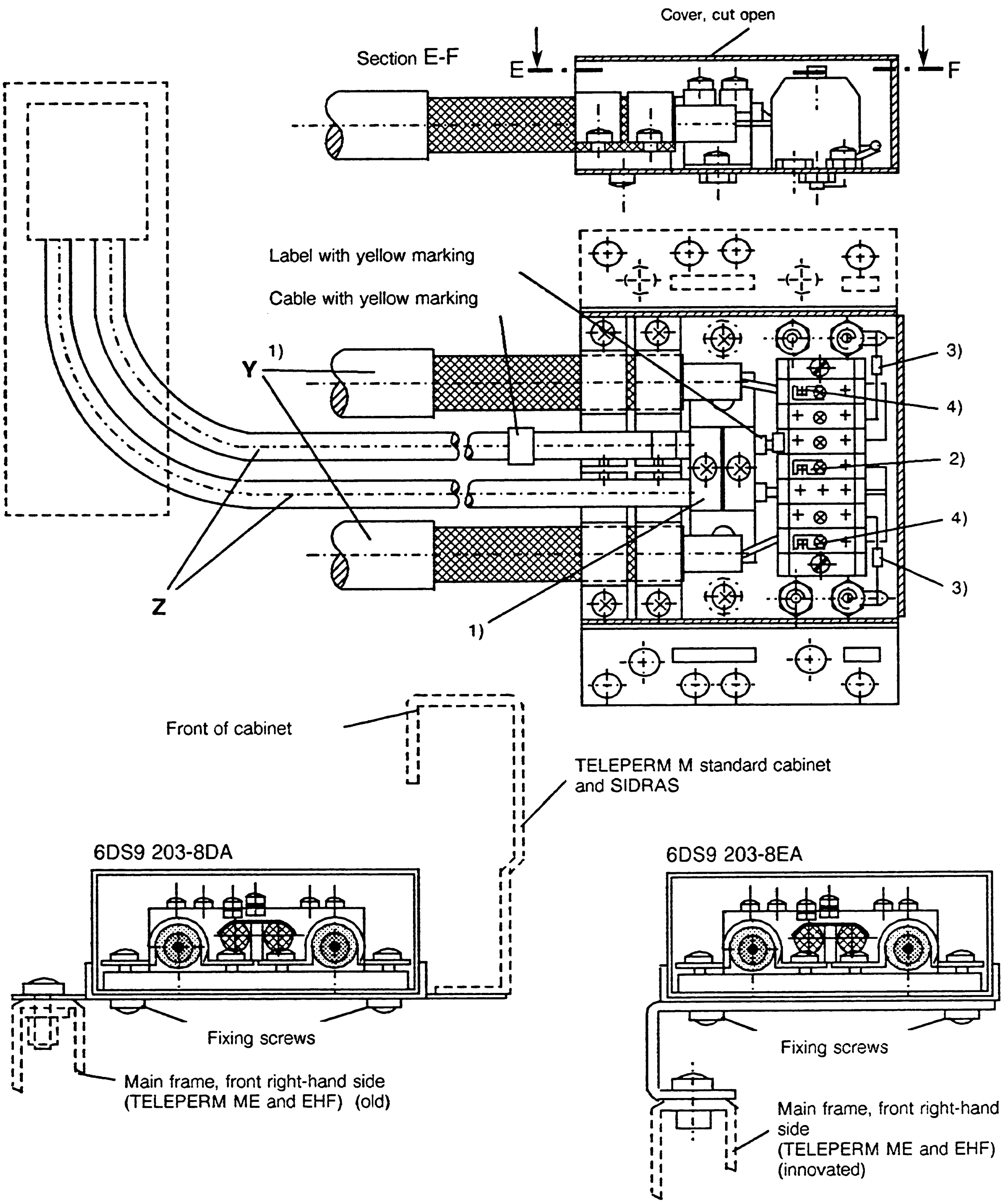
1 Outer braided screen
2 Inner braided screen
3 Metal tape screen
4 Graded contact sleeve inserted between Polyethelene insulation and braided screen

c) Installation of the new, ungraded contact sleeve on the remote bus cable



1 Outer braided screen
2 Inner braided screen
3 Metal tape screen
4 Ungraded contact sleeve

Fig. 5.5 Cable installation



Y Remote bus cable

Z The cable coming from the inductive coupler 6DS1 213-8AA must be laid for cabinet installation, rolled up and fixed with cable tape when it is installed in the cabinet.

1) To fix the remote bus cable Y, remove the front cable clamp from the inductive coupler Z, fan out the cable cores and tighten the clamp link underneath.

2) Inserting the switching link causes reflections if the UI is connected. After inserting the switching link, the UI must therefore be disconnected immediately. If UI is only to be disconnected "logically", it is enough to remove the fuse in UI-SV.

3) Terminating resistor 75 Ω

4) Switching link for connecting the terminating resistor

Fig. 5.6 Remote bus connector board (AF)

5.4 Connection of an Alarm Indicator

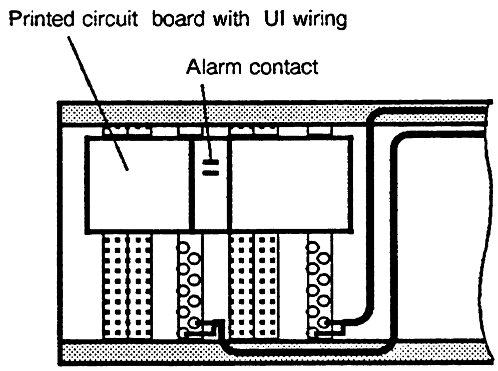


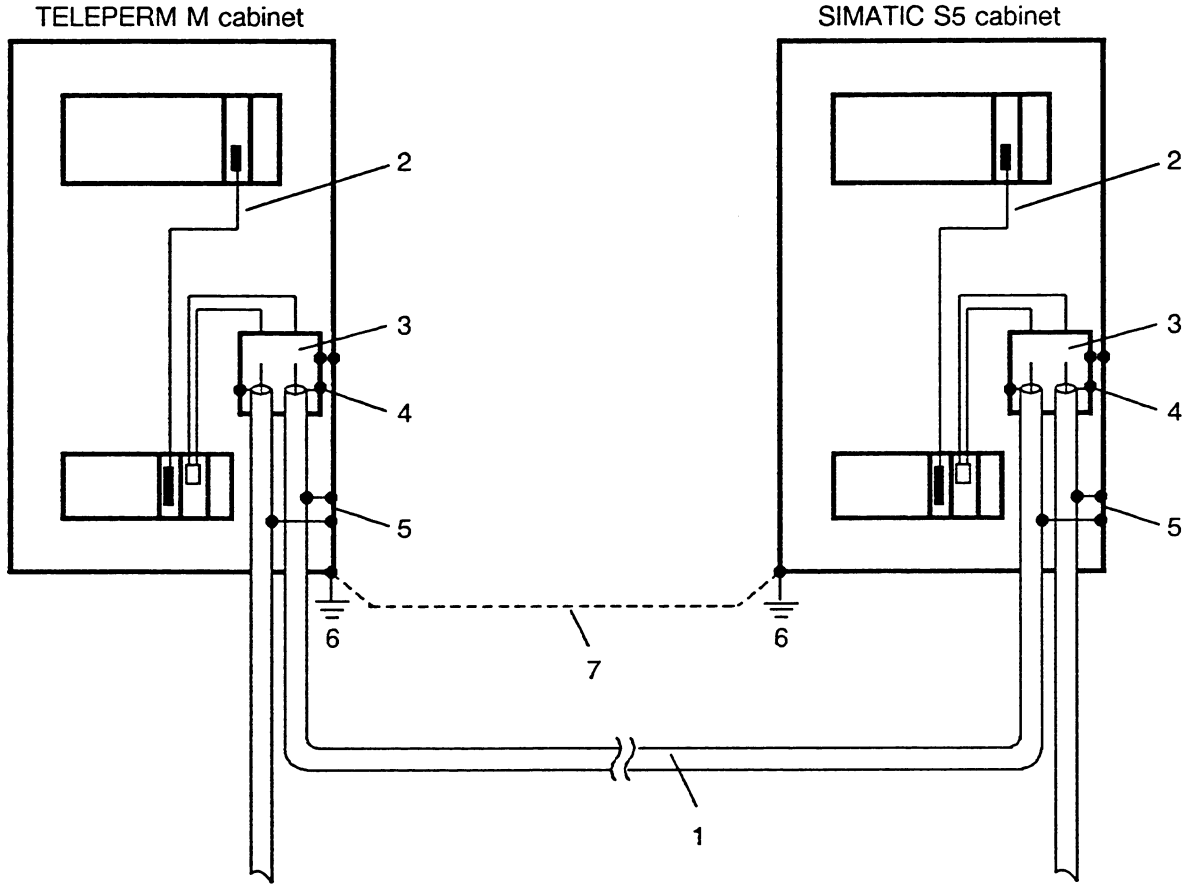
Fig. 5.7 Alarm contact

Should the voltage supply to one of the UIs fail, then the floating alarm contact at the rear of the subrack is closed.This alarm contact (relay contact) can be used to activate a failure signal, for which the following limit values must be noted:

I_C max. = 5 A
U_C max. = 25 V AC or 60 V DC

> **Attention**
>
> Only a voltage which is generated electrically safe and isolated may be used as supply voltage.

5.5 Notes on System Installation



1 Remote bus cable
2 Local bus cable
3 Remote bus connector board
4 Conductively attach remote bus cable screen to remote bus connector board
5 Attach remote bus cable screen to screen bus at entrance of cabinet
6 Connect cabinet to local earth
7 Equipotential bonding conductor (see following details)

Fig. 5.8 System installation, overview

As a result of contacting the remote bus cable screens, an equipotential bonding is established between the cabinets of the linked units during system installation. This can cause impermissible compensating currents on the remote bus cable screen if the earthing system is faulty.

According to VDE 0100, remote bus cables may not be installed between system components without equipotential bonding. An equipotential bonding exclusively achieved via the screen of the remote bus cable is not permissible.

An equipotential bonding conductor must be laid parallel to the remote bus cable (e.g. 70-mm^2 copper wire) to ensure a sufficient equipotential bonding.

5.6 Commissioning

Before commissioning, the coding jumpers on the UI module 6DS1212-8AB must be inserted as shown in the UI instructions.

Commissioning is achieved by switching on the voltage supply. The way in which LEDs A and B are flashing on the UI, indicates whether the currently active bus is functioning correctly or not.

The UI can be restarted using the RS pushbutton on its power supply module. This is essential if the local bus connector plug is removed and inserted during operation or for testing purposes if a bus switchover must be carried out in a redundant bus system.

6 Maintenance

The remote bus connection tier does not require any preventive maintenance. Should a fault occur, the defective component is determined by exchanging modules.

Approximate fault location can be achieved via the diagnostic LEDs on the UI and its associated local bus interface module.

Meaning of the diagnostic LEDs on the UI's power supply module:

LED	Meaning
SV (green) off	- UI voltage supply not available
F (red) on	- Bus interface 6DS1212-8AB defective - Local bus interface module defective - Local bus cable defective
A (green) on	Bus A active
B (green) on	Bus B active

For meaning of diagnostic LEDs on local bus interface module, see associated Instructions (the relevant Instructions are contained in Section 2 of the Manual C79000-G8076-C006) .

- Variant 6DS4 426-8AA

Diagnostic LEDs of the variant 6DS4 426-8AA (single or redundant 24 V DC):

In addition to the module fuses of the UIs, each of the two 24-V mains filters is equipped with 2 fuses at the rear of the subrack.

In case of failure of one mains fuse, both UIs are still operational, i.e. the redundancy of the CS 275 bus is not affected. The alarm contact which monitors the UI supply voltages does not respond in this case.

Therefore, the 4 fuses should be checked at regular intervals in order to prevent the failure of an UI in case of a further error.

When a red LED on the rear of the subrack lights up, there is a defective fuse which must be replaced.

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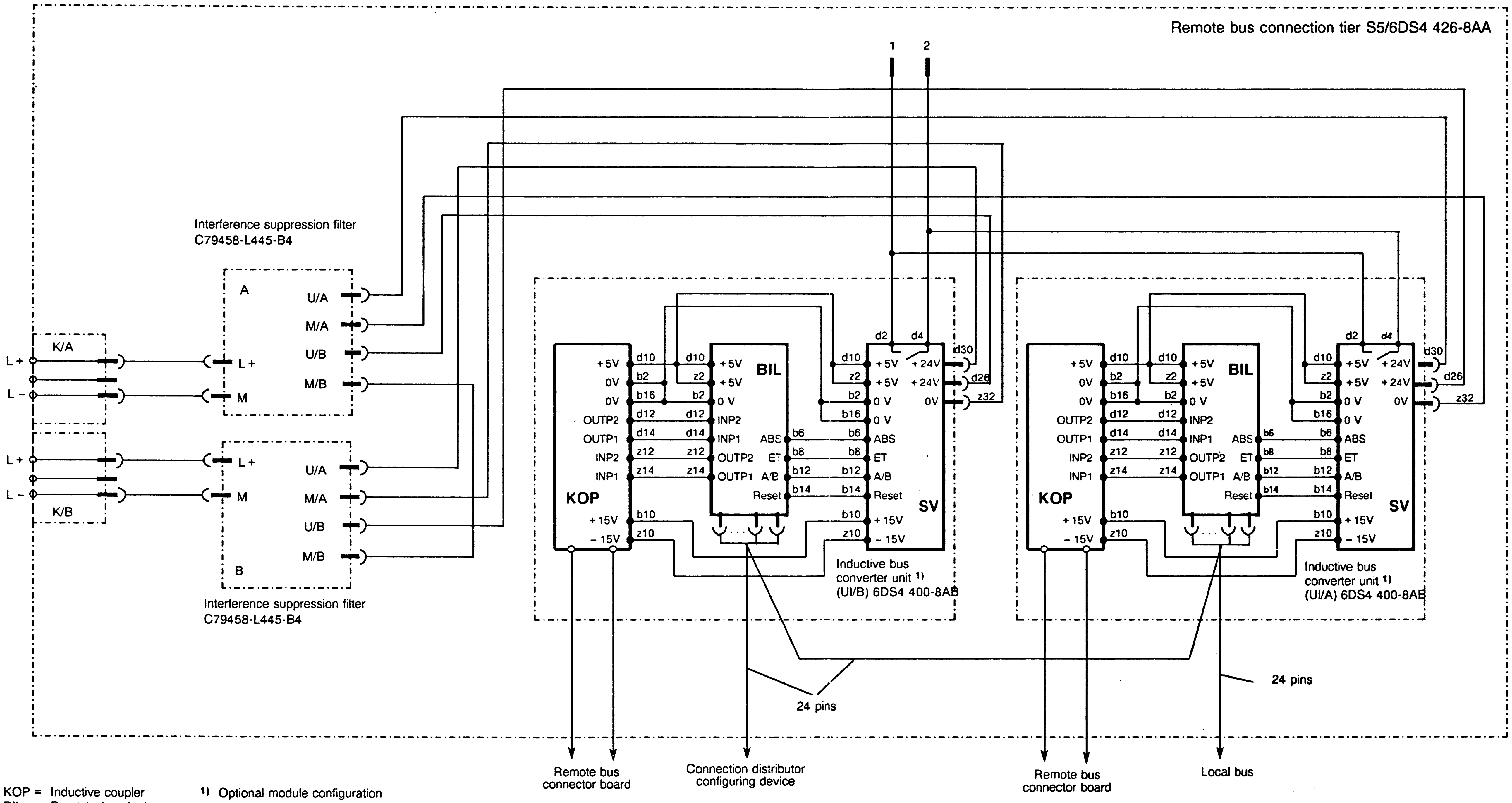
7 Circuit Diagrams

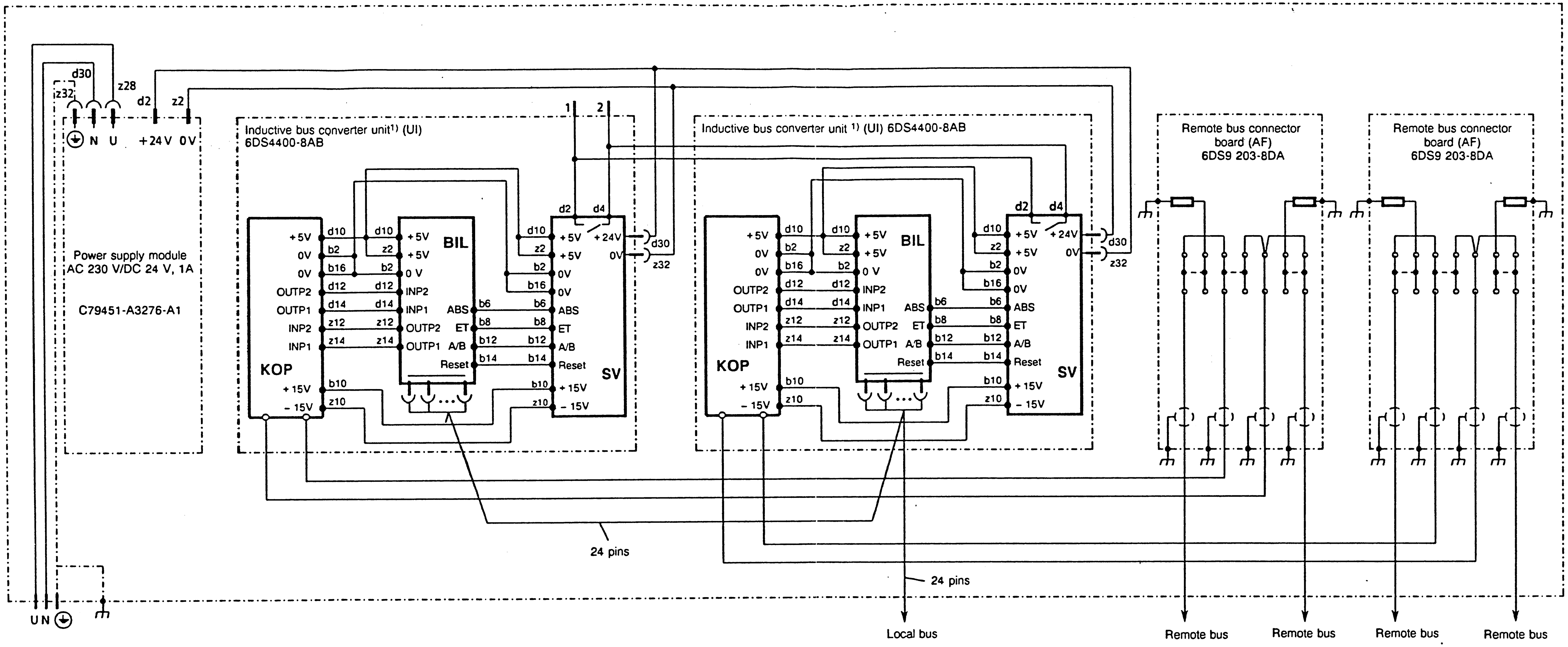
7.1 Wiring of the UI Connection Tier



KOP = Inductive coupler
BIL = Bus interface logic
SV = Power supply

1) Optional module configuration

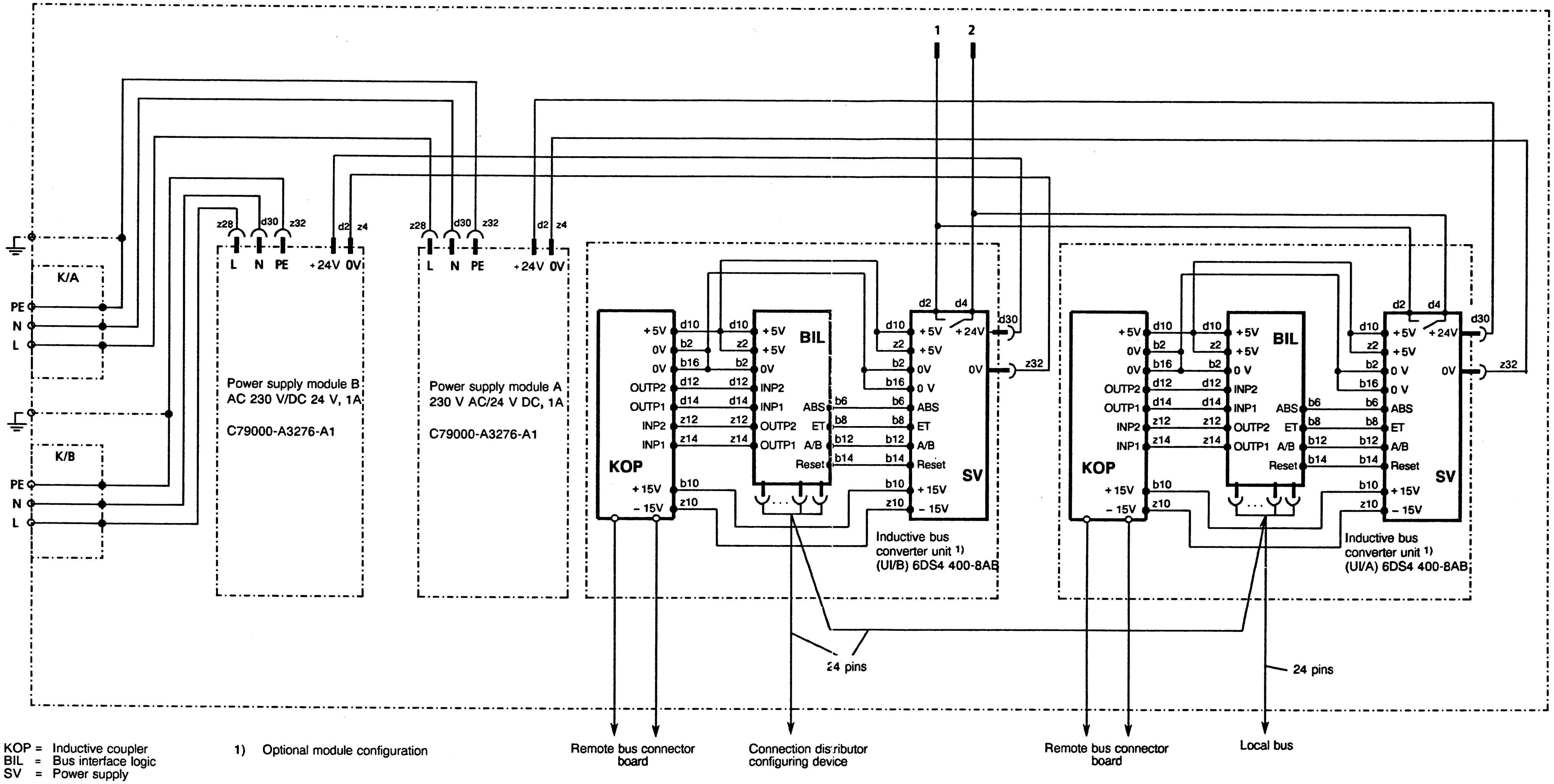
Fig. 7.1 Wiring diagram of remote bus connection tier S5 6DS4 426-8AA



KOP = Inductive coupler
BIL = Bus interface logic
SV = Power supply

1) Optional module configuration

Fig. 7.2 Wiring diagram of remote bus connection tier 6DS4 426-8BA



KOP = Inductive coupler
BIL = Bus interface logic
SV = Power supply

1) Optional module configuration

Fig. 7.3 Wiring diagram of remote bus connection tier S5 6DS4 426-8CA

SIEMENS

TELEPERM M

Surge Protection for the CS 275 Bus System

Coarse Protection 6DS9 208−8AA
Fine Protection 6DS9 210−8AA

Instructions C79000−B8076−C412−03

Contents

1 Description

Two surge protection elements are available for the CS 275 bus system which are intended to protect the TELEPERM M process control system components (bus participants) on the CS 275 bus cable of a large system as far as possible against destruction by lightning. These elements are:

- the coarse protection element 6DS9 208–8AA and
- the fine protection element 6DS9 210–8AA.

Proper operation of these elements chiefly depends on an existing and properly installed earthing system.

> Note
>
> Using the surge protection elements is not prescribed for operatng the CS 275 bus system. The use of the CS 275 surge protection elements does not apply in case of undisturbed system environment if the bus component damage can be avoided with other sceening measures.

> Note
>
> Remember that a lightning protection system cannot prevent a lightning stroke.
>
> The surge protection elements described here cannot provide absolute protection of persons, buildings or system components.
>
> Using these elements, however, greatly reduces the risk of control and instrumentation equipment being damaged by a striking lightning.
>
> The protection elements cannot prevent destruction or corruption of a message by the effect of a lightning.
>
> Setting up a lightning protection schedule according to the valid international IEC and German VDE Standards is indispensable. See for instance:
> - IEC 1024 Protection of structures against lightning
> - VDE 0185 Installation of surge protection systems
> - VDE 0845 Protection of telecommunications systems against lightning....

1.1 Application

Selection of the surge protection elements is determined by the level of overvoltage to be expected between different locations of bus participants.

1.1.1 Coarse Protection

The purpose of the coarse protection element (GS) is to limit high–energy, high–voltage impulses to an arc voltage level. This element can carry transient currents in the kA range.

1.1.2 Fine Protection

The fine protection elements (FS) reduce the voltages that remain after the coarse protection element between cable core and screen to a level which is not harmful to the amplifiers of the inductive coupler unit in the 'inductive bus converter unit' (UI).

1.2 Design

1.2.1 Coarse Protection

The coarse protection element 6DS9 208−8AA is accommodated in an aluminium die−cast housing (see Fig. 1) with a degree of protection IP 54 and the outside dimensions 125 mm x 80 mm x 57 mm (l x w x h). It contains two B1−C90/20 surge arresters and one disconnecting link (screen earthing link). The open link provides a floating connection between the bus cable screen and the safety earth terminal. The housing is suitable for wall mounting. It has an M5 threaded bolt for the connection to earth. All remote bus cable types enter the housing through the cable glands in the side faces.

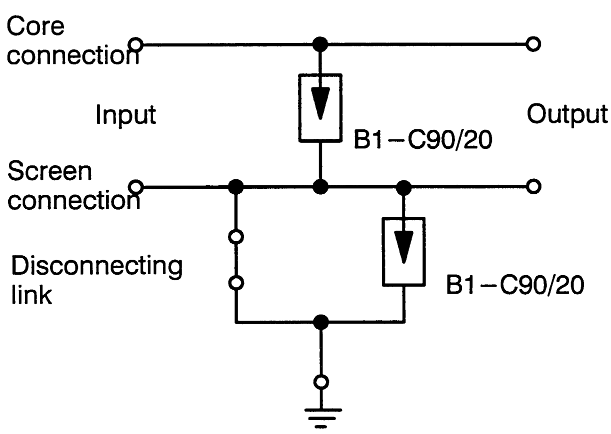


Fig. 1: Coarse protection

1.2.2 Fine Protection

The fine protection element 6DS9 210−8AA is set up on a small printed circuit board which is installed in the remote bus connector board (AF). It contains two Zener diodes (type BZX55 C9V1) in anti−serial arrangement that are connected between core and screen.

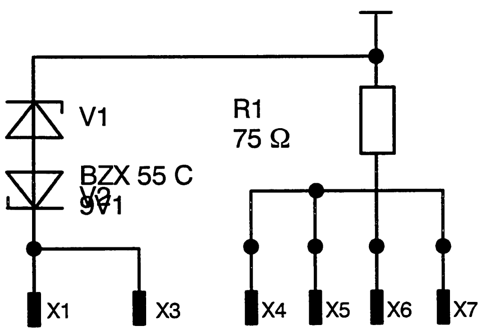


Fig. 2: Fine protection

The symmetrical design of the fine protection element permits **reversed** installation (i.e. rotated by 180^0; X1 pin on the right−hand side).This enables the unit to be installed such that interferences from either bus cable (left and right) to the inductive coupling unit can be suppressed. The existing bus terminator resistance (75 Ω) is installed at the off−side of the Zener diode limiting stage. It can be brought into circuit by the connecting link on the remote bus connector board.

1.3 Method of Operation

Using coarse and fine protection elements together reduces the high–energy high–voltage impulses (surge) produced by a lightning stroke to a small residual voltage level. This excludes destruction of the amplifier in the inductive coupling unit of the 'inductive bus converter module' (UI) to the largest extent possible. Message destruction or corruption of a message contents, however, cannot be prevented.

The screen of the remote bus standard cable is earthed inside the coarse protection housing directly or via a surge arrester (gas arrester).

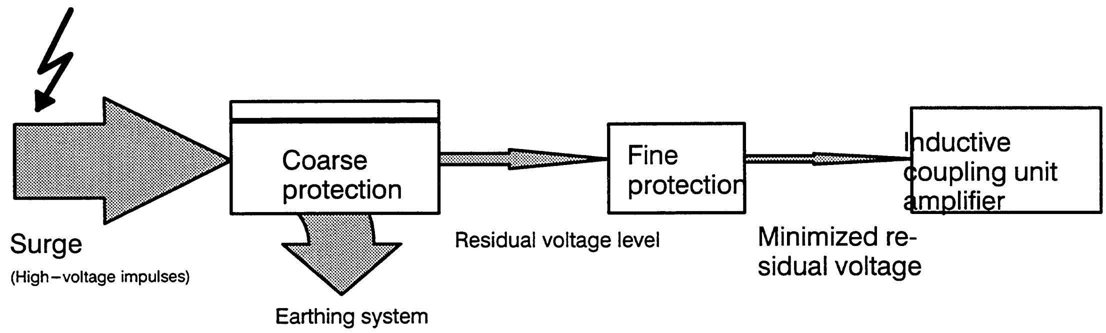
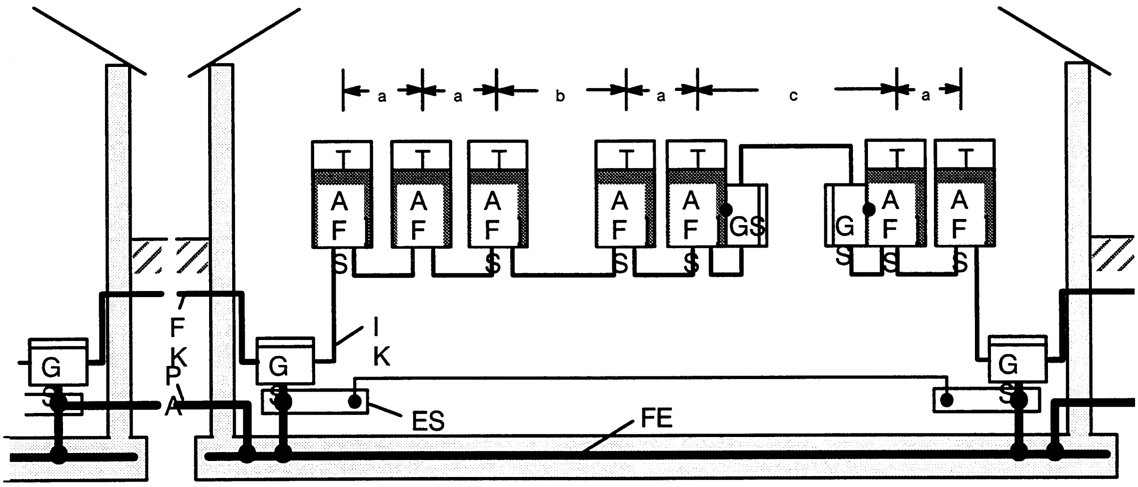


Fig. 3: Surge protection elements, method of operation

> ⚠ Caution
>
> The operability of the surge protection unit chiefly depends on a good screen earthing via a properly installed earthing system and on how closely configuration, installation and test instructions have been observed.

1.4 Configuration Instructions

Selection of the required surge protection elements depends on the overvoltage level to be expected between the different bus participant locations. The distances refer to the lengths of laid bus cables (in–house cable) and are to be considered as reference figures. Surge protecting measures may already be necessary for much shorter distances.



Cable length a: l < 25 m b: 25 m < l < 50 m c: l > 50 m	AF : Remote bus connector board ES : Earth bar FE : Foundation earth FK : Remote bus standard cable FS : Fine protection element	GS: Coarse protection element IK : In–house cable PA : Equipotential bonding T : Participant

Fig. 4: Using coarse and fine protection elements with different cable length

Coarse protection

- Coarse protection elements should be connected to each remote bus cable before the points where the cable leaves the building and immediately next to the foundation earth connector. **The operability of the coarse protection element depends on a low inductivity of the earth cable.** The earthing strap from the foundation should therefore be as short as possible and directly connected to the coarse protection element.
  Ensure that the installation location remains accessible for later inspections.
  Sufficient equipotential bonding between the buildings is absolutely necessary.
- Coarse protection elements should be installed in cabinet groups inside a building if the distance between the groups exceeds 50 m.
  The coarse protection element must be installed immediately next to the last device before the longer in–house cable run. It must be connected to the cabinet's protective earth conductor.

Fine protection

- A fine protection element must be installed when an in–house cable leads to a coarse protection element.
- A fine protection element must be installed if the distance between two participants is greater than 25 m.

2 Installation

2.1 Coarse Protection

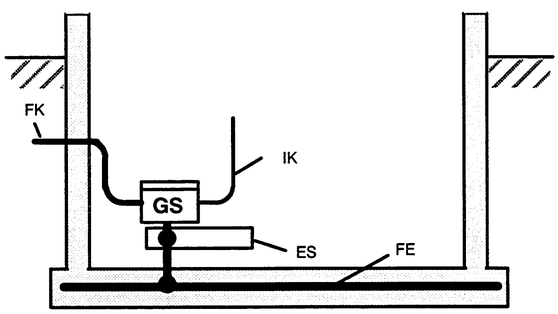
The coarse protection element should be connected to the remote bus cable before the points where the cable leaves the building and immediately next to the foundation earth connector.

Mount the coarse protection element enclosure with two wood screws (3.5 x 45 mm) and wall plugs (6 mm) to the wall. Mark the fixing holes through the bore holes that have become visible after the housing lid has been removed.

Use an earthing strap or a cable with a minimum cross–section of 10 mm² and minimum length to establish the connection between earth and the M5 threaded stud on the aluminium die–cast housing. Floating connection of the bus cable screen to the protective earth connector can be provided either directly or via a built–in arrester.

The required minimum inductivity of the earth connection can be achieved by a short earthing strap from the foundation that is directly connected with the coarse protection element.

> **Note**
>
> As a standard, the screen of the remote bus cable should be directly linked with the M5 threated bolt via the disconnecting link. An earth–free connection with the overvoltage protection is recommended for previous TELEPERM M plants in which the remote bus screen is only earthed at one control point (the older connector board of the remote bus is insulated and connected at the cabinet bar).



FE : Foundation earth
FK : Remote bus standard cable
GS: Coarse protection element
IK : In–house cable
ES : Earth bar

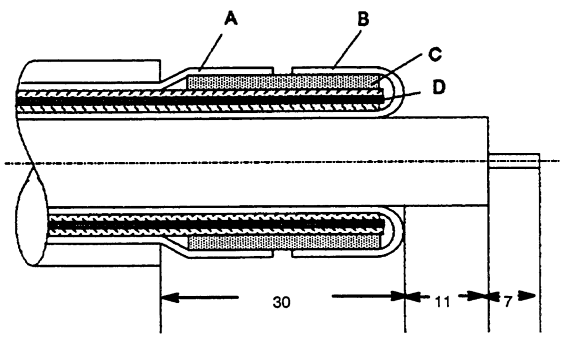
Fig. 5: Installation of the coarse protection element

> **Note**
>
> Do not secure the lid screws with lacquer or adhesive in order to facilitate later inspections!

Tools required:

2 8–mm open–jawed spanner
1 28–mm open–jawed spanner for cable glands
1 30–mm open–jawed spanner
Tx 208 TORX screwdriver
Tx 210 TORX screwdriver
Tx 220 TORX screwdriver

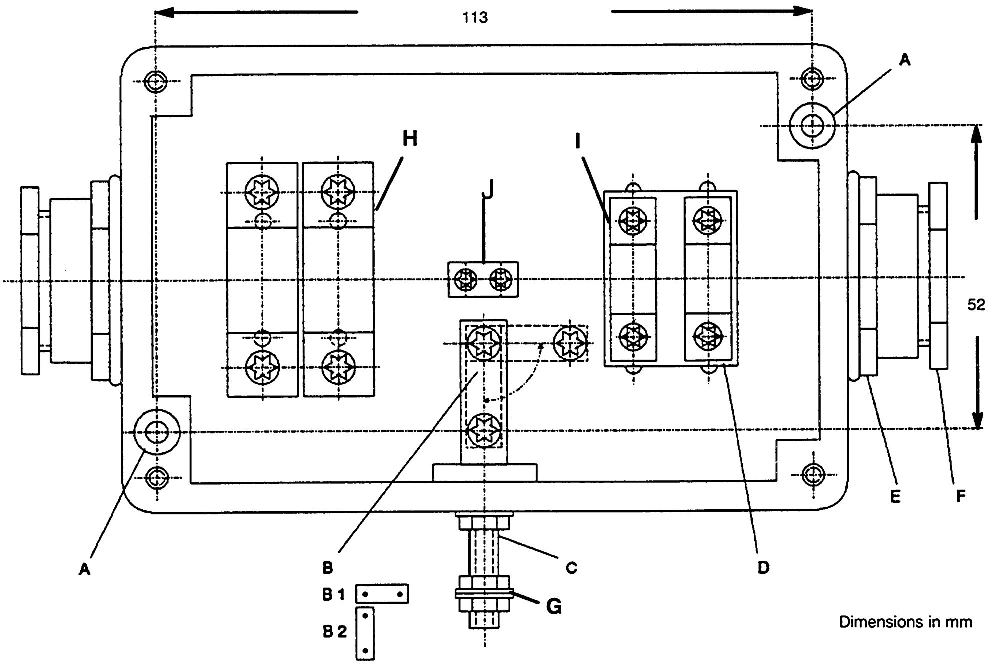
Use the two sleeves provided for supporting the cable screens (the larger sleeve is for the remote bus standard cable, the smaller one for the in–house cable) and prepare the cable ends according to Fig. 6. A steel armour is terminated before the cable enters the coarse protection element housing and is earthed directly.



Dimensions in mm
A: Outside screen
B: Inner screen
C: Sleeve
D: Magnetic screen

Fig. 6: Preparing the cable ends

Remove the pre–cut layers of the rubber seals in the cable glands according to the outside diameter of the un–armoured cable.



A: Holes for fixing screws
B: Clamp for screen earthing
B1: Screen directly earthed
B2: Screen earthed via gas arrester
C: M5 earthing stud
D: Distance plate for in–house cable
E: 30–mm nut (hold when locking)
F: 28–mm nut
G: 8–mm nut
H: Cable clamps, remote bus standard cable
I : Cable clamps, in–house cable
J : Cable connecting element

Fig. 7: Coarse protection element, dimension drawing

Push the prepared cable ends through the cable glands and cable clamps and screw the cable cores to the cable connecting element. Ensure that there is no connection between the cable screens and the housing. When closing the cable glands, use a 30–mm open–jaw spanner for locking the two nuts against each other.
The unit delivered includes large cable clamps for a remote bus standard cable and small cable clamps for in–house cables. These clamps may be replaced by the clamps provided in the accessory kit if necessary. The small clamps provided should be installed on the distance plate. Fitting screws (M3 x 14 mm and M4 x 12 mm) are supplied with the clamps.

2.2 Fine Protection

The fine protection element is installed in the remote bus connector board. First, remove any wire connections and the 75 Ω resistor from the terminal strip.
Connect the fine protection element to the terminal strip such that the X1 pin of the fine protection element is directly connected with the in–house cable which is expected to carry the highest interference level after a lightning stroke. This is normally the cable leading to a coarse protection element or to a cabinet group at a distance of more than 25 m.

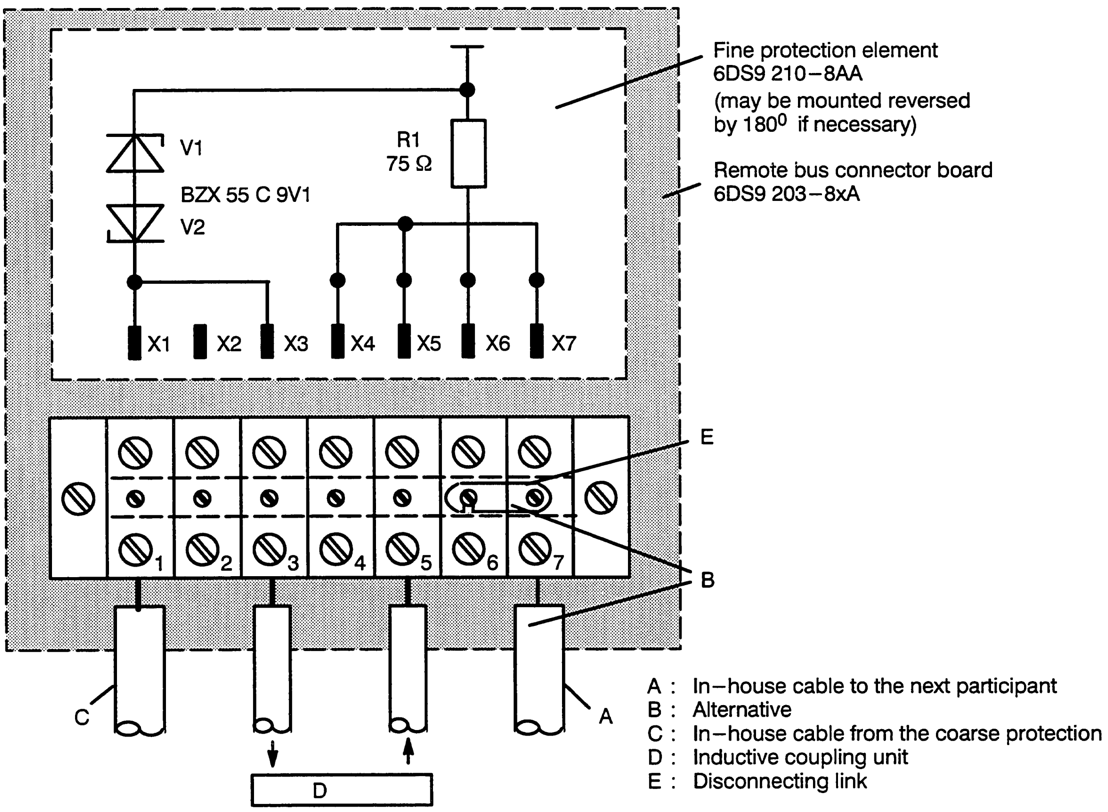


Fig. 8: Fine protection element

If the fine protection element is used in the last station of an in–house cable and if the in–house cable is connected to terminal 1 (see Fig. 8), disconnecting link 'E' must be inserted between terminals 6 and 7. This provides termination of the in–house cable with the R1 resistor on the fine protection element. Has the fine protection element been installed in reverse position (X1 pin on terminal 7), however, this disconnecting link must be inserted between terminals 1 and 2 as the in–house cable is now connected to terminal 7.

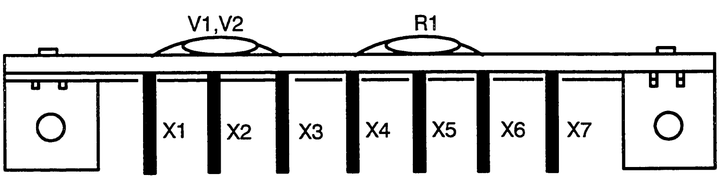


Fig. 9: Installing the fine protection element

The connection with the core of the in–house cable is established via soldered pins and the terminal block in the remote bus connector board. The cable screen is screwed to the earthing angle that is soldered to the printed circuit board.

3 Operation

3.1 Recurring Tests

The surge protecting elements must be checked after each local thunderstorm, at the latest every two years. Defective components must be replaced!

Coarse protection element

Checking the coarse protection element is limited to a visual inspection of the gas arresters. The glass housings should not be damaged.

Fine protection element

Check the function of the voltage limitation:
A voltage between 9 V and 11 V in either polarity must manifest if a measuring current of 5 mA is flowing between pin X1 and the earthing plate.

4 Appendix

4.1 Technical Data

Coarse protection element

Order No.	6DS9 208–8AA
Degree of protection	IP 54
Rated voltage	90 V
Protection level at 1 kV/µs	approximately 600 V
Rated discharge current rush (8/20)	5 kA
Dimensions	125 mm x 80 mm x 57 mm

Fine protection element

Order No.	6DS9 210–8AA
Rated voltage	9 V
Protection level	11 V
Rated discharge current rush (8/20)	7 A
Insertion loss	negligible

SIEMENS

TELEPERM M

CS 275 Bus System

Parts List

C79000-E8076-C002-11

Item	Description	Order No.	Maker's designation	Spares group *)	Number per product	Included in, or applicable from Rev. level	
1	Interface module for 20-m local bus, 8 bit	6DS1200-8AA		R1			
2	Interface module for bus coupler, 8 bit	6DS1200-8AB		R1			
3	Interface module for 20-m local bus, 8 bit	6DS1200-8AC		R1		Replaced by Item 36	
4	Interface module for 20-m local bus, 16 bit	6DS1201-8AA		R1			
5	Interface module for 20-m local bus, 16 bit	6DS1201-8AB		R1			
6	Interface module for 20-m local bus, V.24 or TTY interface	6DS1202-8AA		R1			
7	Interface module for 20-m local bus, V.24 or TTY interface	6DS1202-8AB		R1			
8	Electrical isolation module	6DS1210-8AA		R1			
9	Power supply module	6DS1211-8AA		R1			
10	Bus interface NF	6DS1212-8AA		R1			
11	Bus interface NF	6DS1212-8AB		R1			
12	Inductive coupler	6DS1213-8AA		R1			
13	Power supply module	6DS1000-8AA		R1			
14	Front connector with contact pins	6DS9200-8AA		N			
15	Line terminator for 100-m local bus	6DS9202-8AA		N			
16	Remote bus connector board AF	6DS9203-8AA		N			
17	Terminating resistor F	6DS9204-8AA		N		Replaced by Items 32 + 33	
18	Local bus connector board AN	6DS9205-8AA		N			
19	Local bus connector board AN	6DS9205-8AB		N			
20	Local bus connector board AN	6DS9205-8AC		N			

*) R0 = Repairable, no exchange part
R1 = Repairable
N = Not repairable

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TELEPERM M

CS 275 Bus System

C79000-E8076-C002-09
Issue: 6/92

Sheet: 1 +

2 sh

Item	Description	Order No.	Maker's designation	Spares group *)	Number per product	Included in, or applicable from Rev. level	
21	Contact pins for bus system	6DS9206-8AA		N			
22	N clock interface module for 20-m local bus, 8 bit	6DS1200-8BA		R1			
23	Signal distribution unit for TELEPERM M master clock	6DS9913-8FA		R1		Replaced by Item 30	
24	Date and time-of-day memory module	6NG4207-8PS01		R1		Replaced by Item 29	
25	Power supply module 24 V/5 V, 18 A	6DS1002-8AA		R1			
26	N-8H interface module for AS 220 H, AS 220 EHF, AS 235 H	6DS1220-8AA		R1			
27	N-8H interface module for AS 220 EA	6DS1220-8AB		R1			
28	Power supply module 24 V DC /5 V, 18 A	6DS1003-8AA		R1			
29	Date and time-of-day memory module with summer/winter time changeover	6NG4207-8PS02		R1		Replaces Item 24	
30	Signal distribution unit for TELEPERM M master clock	6DS9913-8FB		R1		Replaces Item 23	
31	N16-M interface module	6DS1205-8AA		R1			
32	Remote bus connector board without mounting plate	6DS9203-8CA		N		Replaces Items 16 + 17	
33	Remote bus connector board with mounting plate	6DS9203-8DA		N		Replaces Items 16 + 17	
34	Power supply module for remote bus connection unit	C79451-A3276-A1		R1			
35	Distributor block for configuring device	6DS9207-8AA		N			
36	Interface module for 20-m local bus + I/O coupling module	6DS1200-8AD		R1		Replaces Item 3	
37	Interface module for SIMATIC S5 150 U programmable controller	6DS1206-8AA		R1			
38	N-AS local bus interface module	6DS1223-8AA		R1			
39	N-BK local bus interface module	6DS 1223-8AB		R1			
40	N-AS local bus interface module	6DS 1223-8AC		R1			
41	Overvoltage diverter for coarse protection B1-C9020	Q69-X184		N			

*) R0 = Repairable, no exchange part
R1 = Repairable
N = Not repairable

Place of delivery: ANL-434 ED Erlangen

TELEPERM M Parts list

CS 275 Bus System

C79000-E8076-C002-11
Issue: 6/94

Sheet: 2-

2 sh.