

TELEPERM M

AS 235 H Automation System

ES 100 K Extension System

Manual

Bestell-Nr. C79000-G8076-C293-07

Contents		
Warning Information Suggestions/Corrections	C79000-R8076-C293-02	
AS 235 H Automation System	C79000-B8076-C293-05	1
ES 100 K Extension System	C79000-B8076-C124-04	2
Comparator Coupler Module 6DS1142-8AA	C79000-T8076-C345-02	3
Synchronization Module 6DS1143-8AA	C79000-T8076-C344-02	4
I/O Comparator and Switchover 6DS1144-8AA	C79000-T8076-C343-02	5
I/O Bus Interface Module 6DS3303-8AA	C79000-T8076-C403-02	6
Mini Floppy Disk Unit 6DS3900-8AC, -8AD	C79000-B8076-C137-05	7
Interface Module for Mini Floppy Disk Unit 6DS1326-8BB	C79000-B8076-C287-04	
Alphanumeric Keyboard 6DS3303-8AA	C79000-B8076-C036-04	8
Process Operation Keyboard 6DS3305-8BA	C79000-B8076-C410-01	
Process Communication Keyboard 6DS3305-8AA	C79000-B8076-C038-05	
		9
Spare Part Lists: AS 235 H Automation System System Cabinets ES 100 K Extension System	C79000-E8076-C293-05 C79000-E8076-C006-10 C79000-E8076-C124-02	10

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

Technical data subject to change.

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Register Contents

"Important Notes, Information, Suggestions/Corrections"

CE Labeling	"Notes on the CE Symbol for TELEPERM M AS" C79000-Q8076-C001-03
Guidelines	"Instructions and Guidelines for Planning, Installation and Operation of TELEPERM M Systems" Reference to the Guidelines Manual (with brief summary) for the TELEPERM M range C79000-D8076-C411-01
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 on the CE Symbol for TELEPERM M AS

EC Directive EMC

The following applies to the TELEPERM M products described in this manual:

89/336/EEC

Products which carry the CE symbol fulfil the requirements for the EC Directive 89/336/EEC.

The EC declaration of conformity and the documentation relating to this are available to the authorities concerned, according to the above-mentioned EC Directive, Article 10 (2), from:



Siemens AG
Automation & Drives Group
A&D SE S21 S
Siemensallee 84
D-76187 Karlsruhe

Products which do not have the CE symbol meet the requirements and standards given in the System Manuals under "General Technical Data".

Fields of Application

For the TELEPERM M System, the following field of application apply according to this CE symbol:

Field of Application	Requirement for	
	Emitted interference	Noise immunity
Industry	EN 50081-2:1993	EN 50082-2:1995

Observing the Setup Guidelines

The setup guidelines and notes on safety given in the System Manuals must be observed during startup and when operating the TELEPERM M System.

Working on Cabinets

To protect the modules from the static electricity, the user must discharge his body's electrostatic charge before opening cabinets.
Observe the general ESD Guidelines.

Notes on the CE Symbol for TELEPERM M AS

Notes on Manual–Auto Stations A filter must be inserted in the power supply lines (SIFI C, B84113–C–B30 or similar).

Updated Technical Data In addition to the specifications in the "General Technical Data" of the System Manuals, the specifications on noise immunity and electromagnetic compatibility given below apply to modules carrying the CE symbol.

The specifications are valid for systems which are assembled according to the above-mentioned setup guidelines.

Electromagnetic Compatibility (EMC)

Radio interference suppression to EN 55011	
Limit value class	A ¹⁾
Interference by conduction on AC and DC supply lines to EN 61000–4–4 / IEC 1000–4–4 (Burst)	2 kV
Interference by conduction on signal lines to EN 61000–4–4 / IEC 1000–4–4 (Burst)	2 kV
Interference by conduction on process lines to EN 61000–4–4 / IEC 1000–4–4 (Burst)	2 kV
Noise immunity to discharges of static electricity to EN 61000–4–2 / IEC 1000–4–2 (ESD)	4 kV ²⁾
Noise immunity to electromagnetic HF field ¹⁾ amplitude modulated to ENV 50140 / IEC 1000–4–3	80 to 1000 MHz 10 V/m 80 % AM (1 kHz)
Noise immunity to electromagnetic HF field ¹⁾ pulse modulated to ENV 50204	900 MHz 10 V/m 50 % c.d.f.
Noise immunity to high frequency (sinusoidal) to ENV 50141	0.15 to 80 MHz 10 V 80 % AM

1) With closed doors for AS 235 and AS 235 H, open for AS 235 K and ES 100 K

2) With AS 235 K and ES 100 K: 6 kV

Instructions and Guidelines for Planning, Installation and Operation of TELEPERM M Systems

Installation/operation

A summary of the basic requirements, ambient conditions and instructions for installing and operating TELEPERM M systems is contained in a separate Manual for the entire TELEPERM M range.

Title of the manual

"TELEPERM M

"Instructions and Guidelines for Planning, Installation, and Operation"

Manual contents

The manual deals with the following topics:

- Safety-related guidelines
 - ESD guidelines
 - Room planning and furnishing
 - Installation instructions
 - Mains and environmental requirements
 - Data carriers
 - Operation licenses
 - Configuration instructions
 - Mounting instructions
 - Thermal load of the cabinet
 - CS 275 bus system
 - Surge protection
 - Standards, directives, regulations
-

Manual directives

The manual is intended to be used by planning and configuring engineers, installation personnel and users of TELEPERM M systems.

It has to be taken into account during planning and commissioning.

Order No.

C79000-G8076-C417

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 "VGB 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.

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Guidelines for Handling Electrostatically Sensitive Devices (ESD)

1 What is ESD?

VLSI 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

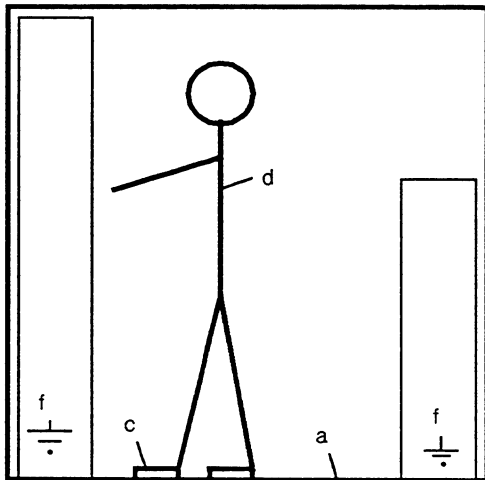
3 Important Protective Measures against Static Charge

- 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.

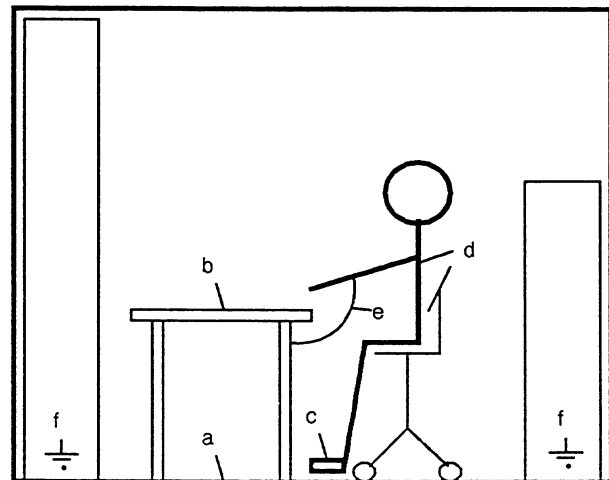
4 Handling of ESD Modules

- 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).

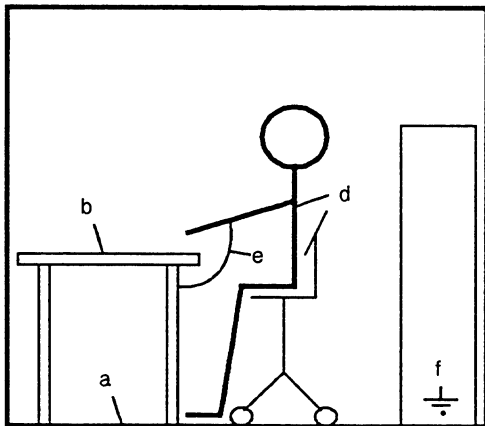
The diagram below shows the required protective measures against electrostatic discharge.



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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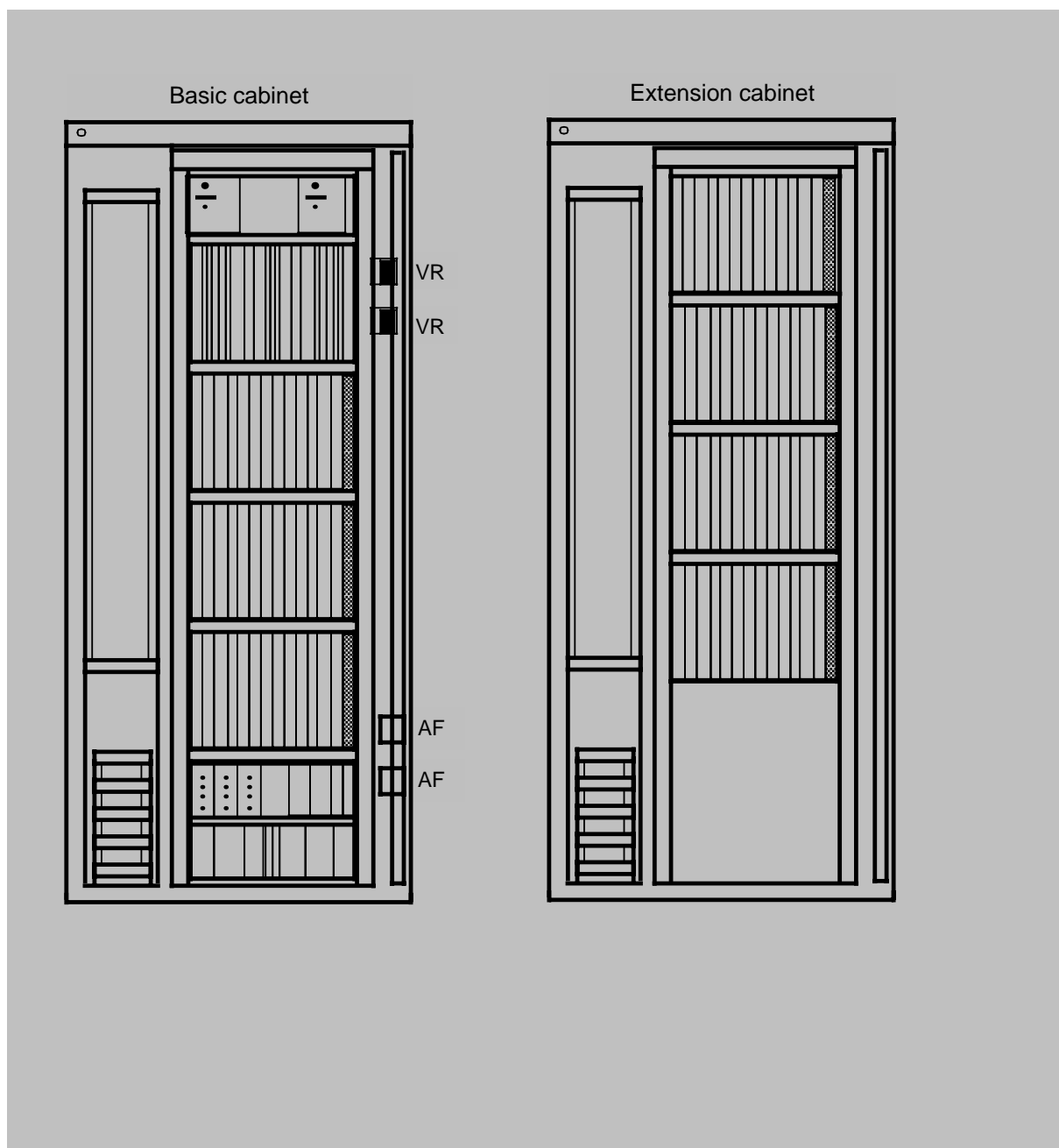
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TELEPERM M

AS 235 H Automation System

Instructions

C79000-B8076-C293-05



Contents	Page
Preface	0-5
Abbreviations	0-6
1 Application	1-1
2 Design	2-1
2.1 Cabinet	2-2
2.2 Power Supply Unit	2-4
2.3 Basic Unit	2-4
2.4 Extension Unit	2-6
2.5 Cabinet Power Supply Unit	2-8
2.6 Cabinet Configuration (Heat Dissipation)	2-9
2.6.1 Power Loss	2-9
2.6.2 AS 235 H Basic Cabinet	2-9
2.6.3 AS 235 H Extension Cabinet	2-10
2.6.4 AS 235 H Cabinet with Forced Ventilation	2-11
2.6.5 AS 235 H Cabinet without Heat Exchanger (WT)	2-11
2.6.6 AS 235 H Cabinet with Heat Exchanger	2-11
2.6.7 Fan Module (Option)	2-12
3 Method of Operation	3-1
3.1 System Configuration	3-1
3.2 Faultless Operation	3-2
3.2.1 Central Unit Functions	3-4
3.2.2 I/O System Functions	3-11
3.2.3 Cabinet Power Supply Unit	3-16
3.2.4 Power Supply	3-19
3.3 Failure	3-21
3.3.1 Fault Delimitation	3-22
3.3.2 System Behaviour	3-23
3.3.3 Cold Restart, Warm Restart	3-31
4 Installation	4-1
4.1 General	4-1
4.2 Connecting the Supply Voltage	4-2
4.3 Grounding	4-3
4.3.1 Central Grounding Point	4-4
4.3.2 Grounding the M Potential	4-7
4.4 Connecting the Process Signal Cables	4-9
4.5 Using the Bus Components	4-14
4.5.1 Local Bus	4-14
4.5.2 Remote Bus	4-15
4.5.3 Computer Connection via N-V.24	4-16
4.6 Connecting the I/O Devices	4-18
4.6.1 Process Monitors	4-18
4.6.2 Keyboards and Printers	4-21
4.6.3 Floppy Disk Unit (MDE) 6DS3900-8AD	4-26
4.7 Jumper Settings	4-29
4.7.1 Central Processing Unit	4-29
4.7.2 I/O Comparator and Switchover Module (EAVU)	4-41
4.7.3 Wire Jumpers at the EAVU X2 Backplane Connector	4-42
4.7.4 SF61 Group Interrupt Module	4-43
4.7.5 Slot Addresses in the I/O Area	4-44
4.7.6 Slot Addresses and Jumper Settings for ES 100 K	4-46
4.7.7 Blinking Clock-Pulse Generator	4-50
4.7.8 SES Cabinet Power Supply Unit	4-52
4.7.9 Setting up the Event Recorder and Logging Printer	4-53
4.7.9.1 PT88/89 Printer	4-53
4.7.9.2 PT90 Printer	4-57
4.7.9.3 SICOMP DR 210-N/DR 211-N Printer	4-60
4.7.9.4 Printer DR 215-N/DR 235-N and DR 236-N	4-67
4.7.9.5 Printer Converter	4-70
4.8 Basic Unit and I/O Bus Cabling	4-74

4.8.1	Central Unit Power Supply Connections	4-74
4.8.2	Ribbon Cables between Basic Unit and Extension Unit	4-75
5	Commissioning	5-1
6	Maintenance	6-1
6.1	Qualified Personnel	6-1
6.2	Fault Elimination	6-2
6.3	Backup Battery	6-3
6.4	Circuit Diagrams	6-5
7	Technical Data	7-1
Annex	Index	A - 1

Preface

The seven chapters of these Instructions provide the information required for safe and smooth operation of the **AS 235 H** automation system.

- Chapter 1 shows possible **applications** and the features of the system.
- Chapter 2 provides an overview of the **design** and possible system extensions.
- Chapter 3 explains the **method of operation** and the system and its components.
- Chapter 4 informs you about **installation** work and installation requirements to be met.
- Chapter 5 specifies **commissioning**.
- Chapter 6 deals with **maintenance**.
- Chapter 7 summarizes the **technical data**.

First of all, read the **Safety-related Guidelines for the User**. You find these Instructions in this Manual in the Section before Register 1.

You also find the **Guidelines for Handling Electrostatically Sensitive Devices** in that Section. Reading these instructions carefully helps you to prevent personal injury and damages to the equipment before and during operation.

Abbreviations

I II	Identification numbers (Roman numerals) of the redundant subsystems (redundancies) within a multi-redundant system.
AA	Analog output module
ABE	Interrupt generating binary signal input module
AE	Analog input module
AF	Remote bus connector board
AS	Automation system
ASG	Interrupt generating signal transmitters
AZR	Flag register of the CPU 235 H
B	Backup (CPU status = synchronization and updating)
BA	Binary output module
B&B	Operator control and monitoring
BE	Binary input module
BGT	Subrack
BKA	Operator input channel interface module
BKU	Operator input channel switchover (video relay and adapter cable with AS 235 H)
BL	Blinking clock-pulse generator module
CS 275	LAN for linking TELEPERM M systems
CPU 235 H	Central processing unit 235 H
DG	Diagnostic unit
DGA	Diagnostic unit interface module
DMA	Direct memory access
DS	Data save (protective signal for memory modules)
E/A	Input and output (I/O)
EABA	I/O bus interface module
EE	Extension unit
EANK	One-out-of-n code; TELEPERM M procedure for detecting I/O addresses with no or multiple assignments
ES	Extension cabinet
EAVU	I/O comparator and switchover module
EPDL	Erasable programmable logic device
EPROM	Ultraviolet erasable programmable read-only memory
F	Failure (CPU mode)
F	Fail-safe (by redundancy)
FDC	Floppy-disk controller
FIFO	First in first out (queuing or handling hierarchy)
GE	Basic unit
GS	Basic cabinet
H	Fault-tolerant (by redundancy)
HF	H and F in compatible combination
LAN	Local area network; mid-range communications bus
L+	Positive supply voltage, 24 V rated value
LBG	Fan module
LED	Light emitting diode
LOES	Clearing the user memory by entering the keyboard command "LOES;"
LTM	I&C alarm

M	Earth, negative pole
M	Master (CPU mode)
MDA	Mini floppy disk interface module
MDE	Mini floppy disk unit
MDR	Event recorder
MDT	Mean downtime (mean time between the occurrence of a failure and operation restart)
ML	Alarm logic module
MTBF	Mean time between failures (mean time between two failure occurrences, i.e. faultless interval)
MtU	Technical document to be supplied with the system
MZ	Off-load earth, reference potential for analog inputs
N-AS	Local bus interface module for AS, new development, replaces N8-H
N8	TELEPERM M local bus interface, 8 bits on CS275 bus system
N8-H	N8 in a fault-tolerant 1-out-of-2 master/reserve configuration of a redundant automation system
NAU	Power failure
NV	Local bus distributor
OS	Operator control and monitoring system
P	Passive (asynchronous CPU status; no N8-H access etc.)
PBE	Testable binary input module
PBT	Process communication keyboard (TELEPERM M AS accessory)
PDR	Logging printer
PE	Protective earth, cabinet potential
PESP	Peripheral memory area
PUM	Buffer module
PRA	Testable relay output module
PROM	Programmable read-only memory
PM	L+ for alarm purposes
PS	L+ for logic "1" of 24-V inputs
PÜ	L+ for monitoring purposes
PU	Process interrupt
PU5	Standard: unassigned process interrupt No. 5 (PU5) which is exclusively used for redundancy-related purposes
QVZ	Time-out during memory or peripheral access
R	Standby (CPU mode)
RAM	Random access memory
RDY	Ready
ROM	Read-only memory
RSOF	Software reset
SAE	Cabinet connection element
SB	Synchronization module
SED31	Cabinet power supply diode
SEP	Standard slot in a subrack, 15.24 mm wide
SES	Cabinet power supply unit
SF	Signal interface module
SF61	Signal interface module in slot address 61 (mnemonic name for a group interrupt module in this slot; 48-bit binary input module)

SP	Memory module
STA	Starting block processing (keyboard input = STA)
STO	Halting block processing (keyboard input = STO)
SV	Power supply module
SVE	Power supply unit
SVME	Power supply unit for extension unit
SW	Software
TM	TELEPERM M
UI	Inductive bus converter unit for CS275
VD 11	Logic diode module for messages
VKB	Comparator coupler module
VR	Video relay
ZE	Central processing unit
ZEP	Central grounding point
ZRS	Central reset
ZT	Central unit (with AS 235 H containing two redundant CPUs)

1 Application

The new AS 235 H automation system is an enhancement of the 235 product family which satisfies particularly high requirements in the field of process control.

The AS 235 standard system is supplemented by a fault-tolerant and highly available variant.

H for "high availability"

The H in AS 235 H signals a higher availability than exists in a normal standard system.

This system has a redundant structure which enables the user to continue process manipulation and control tasks even after a tolerable fault has occurred.

The present system is a "1-out-of-2 system" whose availability is significantly increased by a redundant CPU configuration. Dedicated fault delimitation yields a high degree of non-interaction, this means that a solitary fault cannot be propagated from one subsystem to another. User-specific configuration enables a multiple redundant structure of the I/O system to be established which utilizes the given redundancy and permits easier execution of process tasks.



Warning:

The AS 235 H automation system (H system) is **not** a fail-safe system, despite its higher availability, its fault-tolerance and its non-interacting structure. It may **not** be used in plants where AS faults (e.g. the (unlikely) total failure of both CPUs) could cause hazardous conditions for persons, machinery or environment.

Such safety-relevant automation tasks require the use of either a fail-safe automation system (such as an F or HF system that has been prototype-tested by the German Technical Inspectorate) or an AS 235 H system equipped with suitable interlocking circuits and protective systems which safely prevent the occurrence of hazardous conditions.

Notes

2 Design

The AS 235 H standard configuration consists of the basic cabinet with one 1-tier and up to five 2-tier subracks. These subracks contain the power supply unit for the basic unit, both central processing units, up to three extension units, and the cabinet power supply unit.

One extension cabinet with up to four 2-tier subracks may be connected in addition. The subracks contain extension units.

Two operation units, each with color monitor, keyboards (process communication keyboard and/or configuring keyboard) and two printers (logging printer/event recorder), may be connected to the system.

The ES 100 K extension system provides further extension possibilities.
(Please refer to Chapter 4.7.6 for corresponding configuration suggestions.)

2.1 Cabinet

The AS 235 H automation system is installed in an AS 235 standard cabinet. Like the standard version, this cabinet is available with or without forced ventilation.

- Basic cabinet (GS)

The basic cabinet has the following structure (from top to bottom):

Power supply unit (SVE)

- one 24-V buffer module (internal 2-channel structure)
- two 5-V power supply modules (supply one CPU each)

Basic unit (fully equipped)

- one comparator coupler module (for both CPUs)
- two synchronization modules
- two diagnostic unit interface modules (option) ¹⁾
- two memory modules
- two central processor units (CPU 235 H)
- four I/O bus interface modules (2 as an option)
- four operator input channel interface modules (2 as an option)
- two mini floppy disk interface modules ²⁾
- two N-AS or N8-H local bus interface modules (option) ³⁾

Up to three extension units, each with

- one I/O comparator and switchover module
- up to 13 I/O modules ⁴⁾

Cabinet power supply

- 24 circuit breakers
- three alarm logic modules (ML) (the third module is only required if an ES is connected)
- two VD11 diode modules (option)
- two SED31 power diode modules
- two UI bus converter units (option)
- one blinking clock-pulse generator
- two socket outlet tiers (connectors for up to four keyboards and two MDEs)

- Extension cabinet (ES)

Up to four extension units (EE), each with

- one I/O comparator and switchover module
- up to 13 I/O modules



Caution:

CPU 235 H (6DS1 141-8AA) may **not** be replaced by CPU 235 (6DS1140-8AA).

1) Only one module may be used in normal redundancy mode.

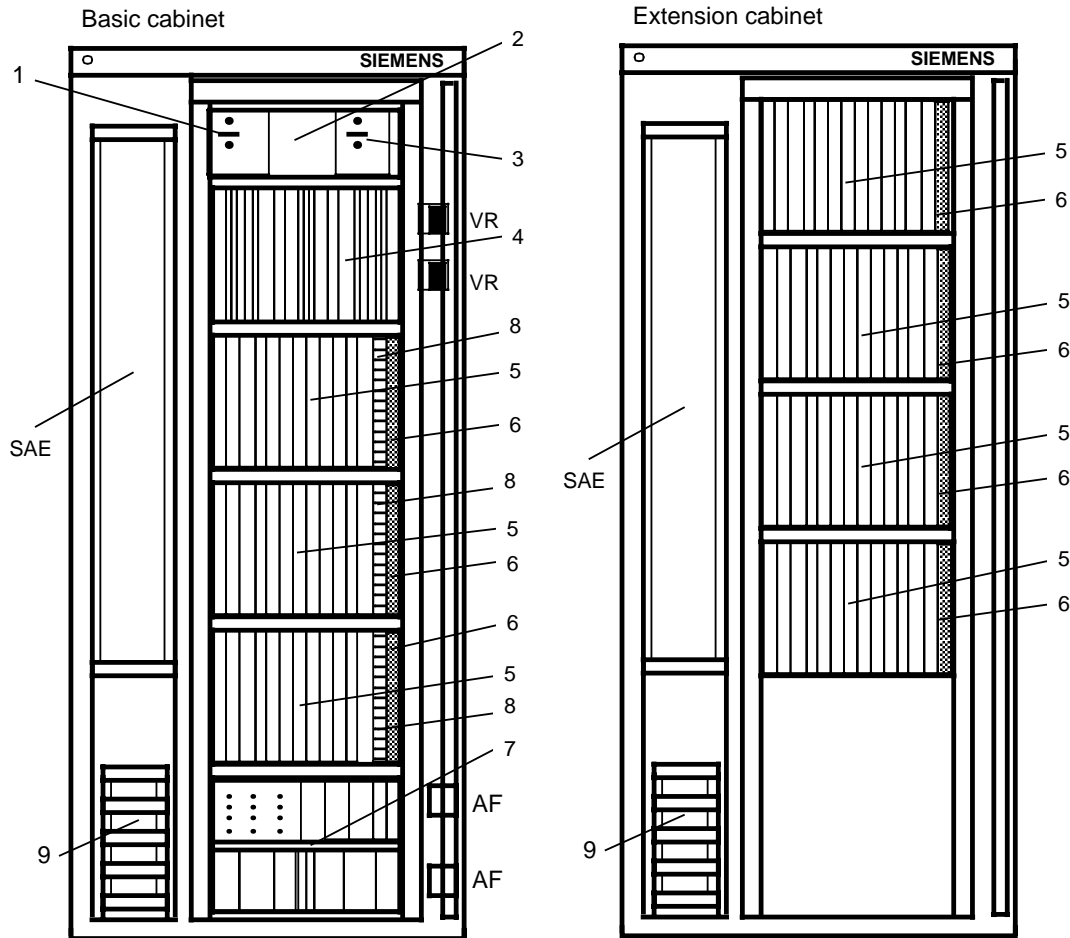
Caution: If there is no diagnostic interface module the module C74951-L445-B20 must be inserted.

2) Redundant installation of the mini floppy disk interface unit is necessary although only one drive is used.

3) Redundant installation is required if the CS275 bus system is used for communication.

4) One I/O module per extension unit in the basic cabinet may be replaced by a group interrupt module 6DS1 601-8BA (or 6DS1615-8AA).

Group interrupt modules in an AS 235 H system can be installed in up to triple-redundant mode in the EE slots 13, immediately next to the EAVU.



- AF Remote bus connector board
- SAE Cabinet connection elements
- VR Video relay
- 1 Power supply unit I (5V)
- 2 Buffer module (24 V)
- 3 Power supply II (5V)
- 4 Basic unit (CPU I+II)
- 5 Extension unit (EE)
- 6 I/O comparator and switchover module (EAVU)
- 7 Cabinet power supply unit with:
Circuit breakers, socket outlets, alarm logic modules, logic diode modules, cabinet power supply diodes,
inductive bus converter unit (option), blinking clock-pulse generator module
- 8 Group interrupt module (option) or I/O module
- 9 Process cable clamping bars

Fig 2.1 Cabinet layout

2.2 Power Supply Unit (SVE)

The power supply unit is installed in the topmost tier of the basic cabinet and provides the basic unit with both supply voltages.

Internally, the 24-V buffer module has a two-channel structure and buffers the DC 24-V voltage twice (for SV I and SV II).

The power supply modules at either side of the buffer module supply both CPUs independently with 5 V.

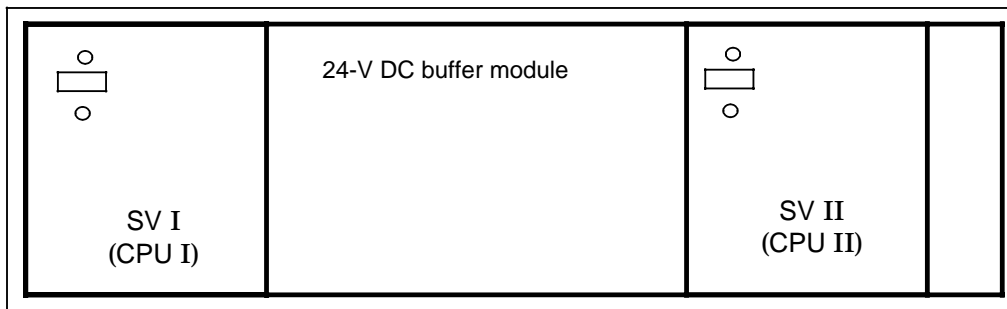
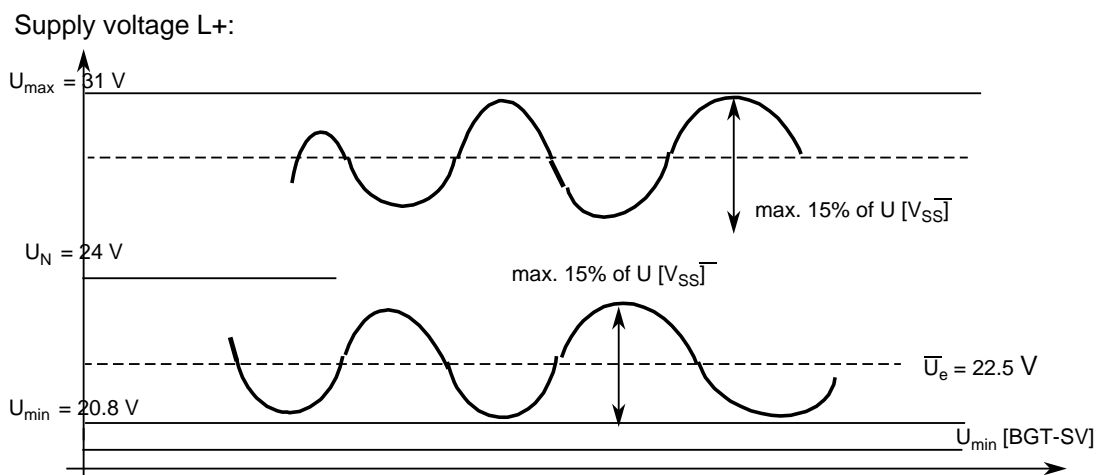


Fig. 2.2 AS 235 H power supply unit



2.3 Basic Unit (GE)

The basic unit consists of two central units (CPU I and CPU II) which are arranged in a mirrored structure in the subrack. The comparator coupler module (VKB), which is redundant in itself, forms the mirror axis of this system.

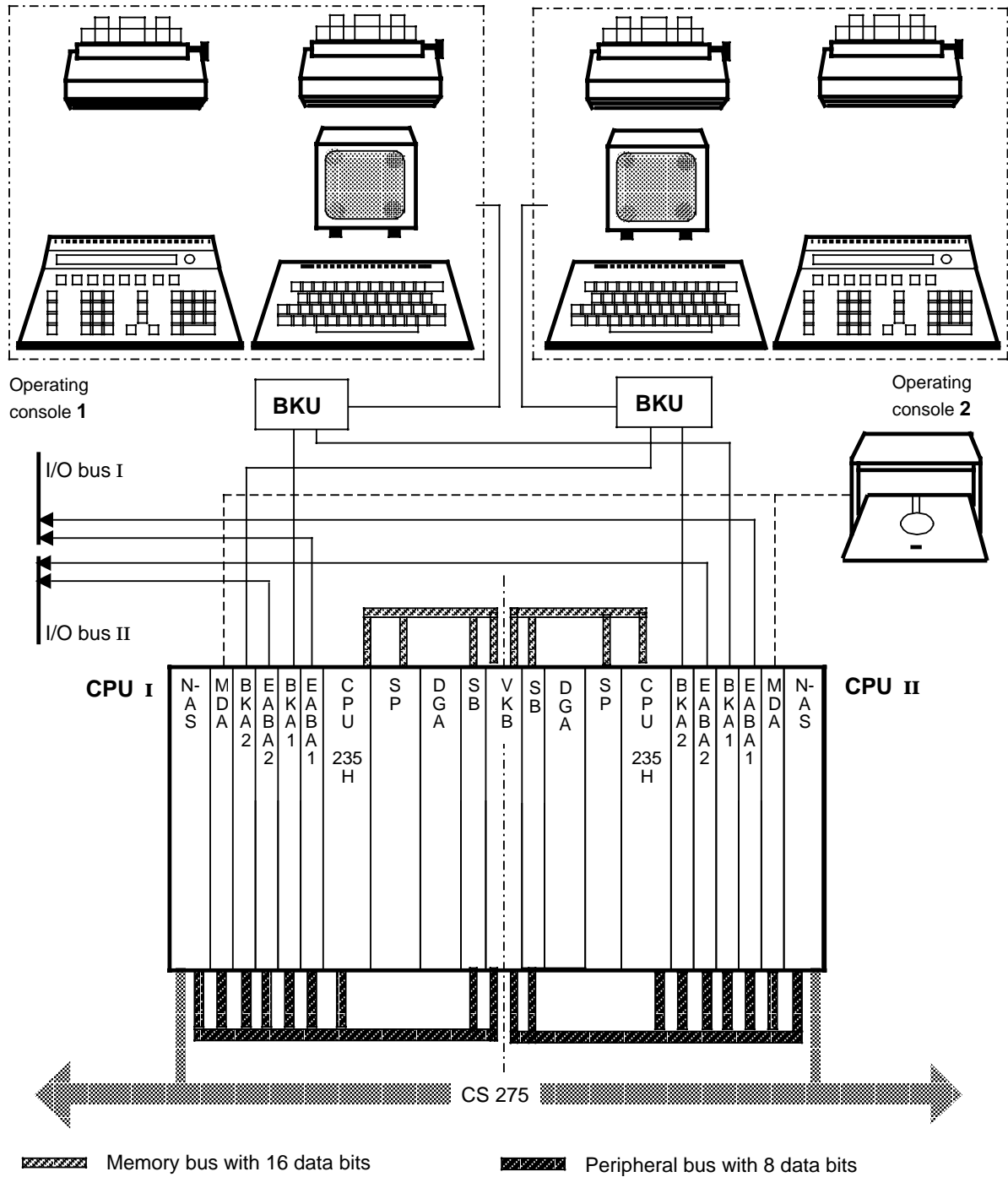
Seen from the front, the left-hand part is defined as CPU I, the right-hand part as CPU II.

Different to the AS 235 system, the backplane of the basic unit is completely structured as a supply and bus board. Yet, a detrimental connection of the two central units is not possible.

The supply voltages are fed to the central units via 2 x 1 cables (DC 24 V) and 2 x 3 cables (5 V).

The connection between operator input channel interface (BKA) and process communication keyboard/configuring keyboard/printer consists of standard cables *and* a special adapter cable. A video relay is used for connecting a monitor to the two redundant BKA modules.

Ribbon cables which are plugged into the back of the basic unit interconnect the I/O bus interface modules and the I/O comparator and switchover modules (EAVU) in the extension units. The ribbon cables are plugged into the EAVU front panels.



- KB Comparator coupler module
- SB Synchronization module
- DGA Diagnostic unit interface module 1)
- SP Memory module
- CPU Central processor unit module
- BKU Operator input channel switchover unit, consisting of video relay and adapter cable
- EABA 1 I/O bus interface module 1
- BKA 1 Operator input channel interface 1
- EABA 2 I/O bus interface module 2
- BKA 2 Operator input channel interface 2
- MDA Mini floppy disk interface module
- N-AS Local bus interface module (N8-H permissible as well)

Fig. 2.3 System configuration

2.4 Extension Unit (EE)

An extension unit consists of a double-height subrack. Up to three extension units can be installed in a basic cabinet; an extension cabinet can accommodate up to four extension units.

Each extension unit features 14 slots. The I/O comparator and switchover module (EAVU) must always be installed in slot 14.

Any mix of I/O modules may be installed in the remaining 13 slots. A group interrupt module ¹⁾ is to be installed in slot 13.

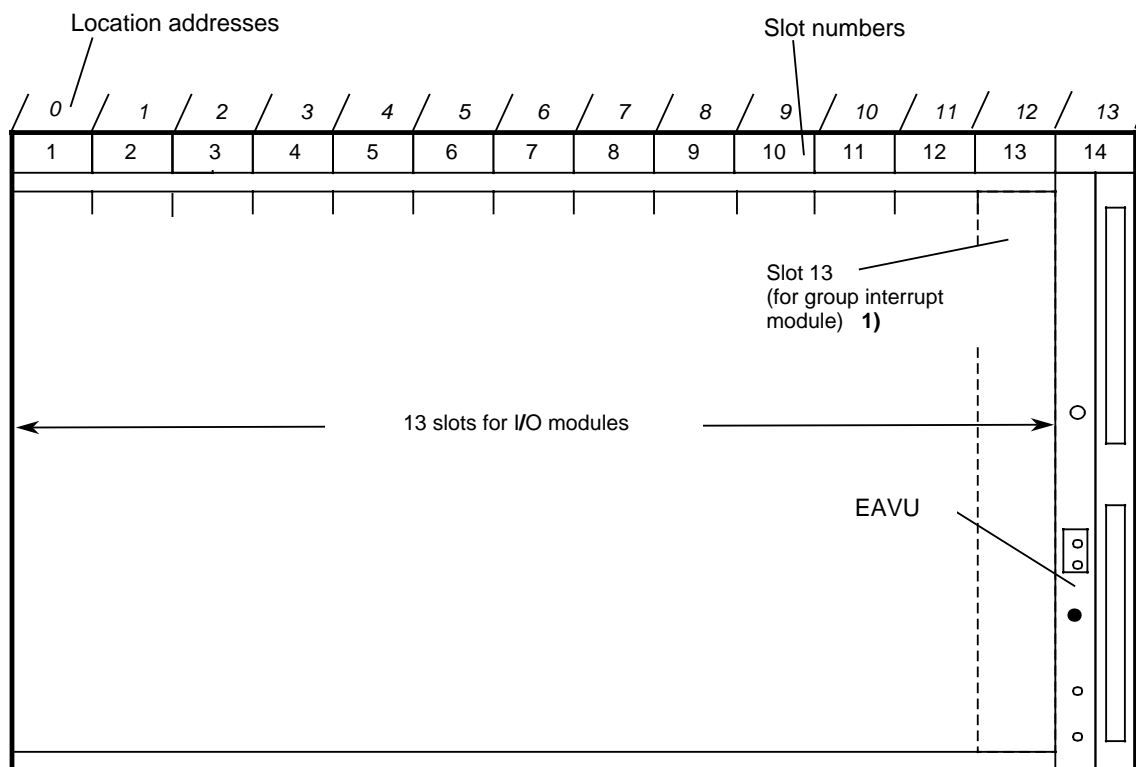


Fig. 2.4 Front of extension unit (EE)

1) Up to three group interrupt modules may be installed in the basic cabinet (one per extension unit).

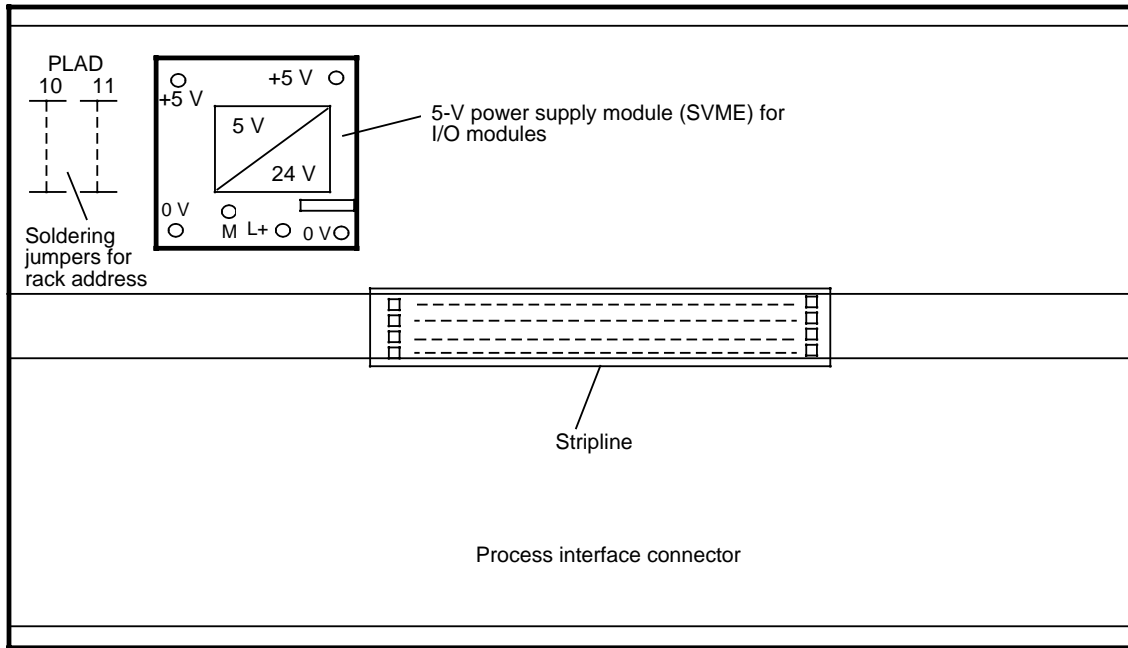
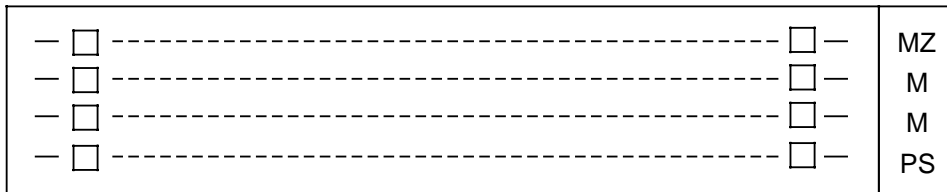


Fig. 2.5 Extension unit (rear)

Stripline:



The stripline may only be used for connecting the process interfaces of the I/O modules in the subrack (e.g. for I/O module input connections).

The stripline may not be used for feeding transducers, contacts etc.

The PS signal (24 V) is supplied by the EAVU. It is fused (1.6 A) on the EAVU module and routed via the X2 backplane connector to the stripline.



Caution:

Signal lines **may not** be routed from pins f32 and d32 (the process interface at the bottom connector of the I/O modules). The fuse ratings of the L+ potentials there are too high.

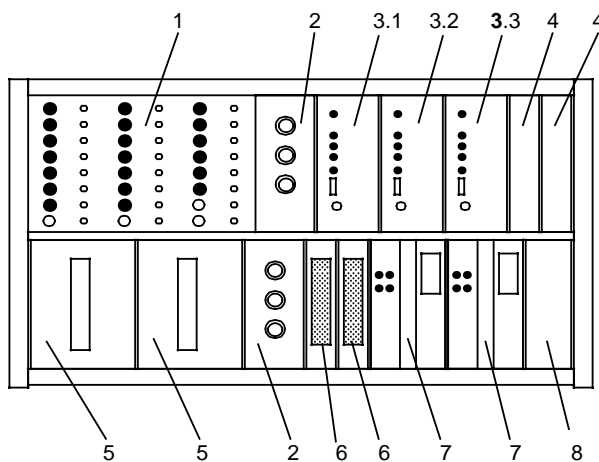
2.5 Cabinet Power Supply Unit (SES)

The cabinet power supply unit is a 2-tier subrack that is installed in the lower part of the main rack (location W) inside the basic cabinet.

The front section of the cabinet power supply unit contains the circuit breakers for the individual system components, the socket outlets for keyboard and mini floppy disk unit connections and the connectors for the cabinet power supply diodes, the cabinet monitoring modules and the remote bus.

The rear part of the cabinet power supply unit accommodates the terminal blocks for distributing the M potential and the individually fused 24-V voltages, and isolating terminals for connecting zener diode blocks (surge diverters) for the 24-V voltages.

A fully equipped cabinet power supply unit has the following structure:



1 Circuit breakers (F) for:

F1	CPU I	F9	EE 1	F17	PÜ 1
F2	CPU II	F10	EE 2	F18	PÜ 2
F3	Process communication keyboard 1	F11	EE 3	F19	Fan 1 for GS
F4	Process communication keyboard 2	F12	EE 4	F20	Fan 2 for ES
F5	Mini floppy disk unit 1	F13	EE 5	F21	Fan 1 for ES
F6	Mini floppy disk unit 2	F14	EE 6	F22	Fan 2 for ES
F7	UI	F15	EE 7	F23	Heat exchanger for GS
F8	Reserve	F16	Reserve	F24	Heat exchanger for ES

- 2 Socket outlets for keyboard and mini floppy disk unit
- 3.1 ML alarm logic module for CPU I
- 3.2 ML alarm logic module for CPU II
- 3.3 ML alarm logic module for ES
- 4 VD11 diode module (option)
- 5 SED 31 cabinet power supply diode
- 6 Local bus connector (connection distribution unit)
- 7 UI bus converter unit (option)
- 8 BL flashing pulse generator module

Fig. 2.6 AS 235 H cabinet power supply unit

2.6 Cabinet Configuration (Power Dissipation)

2.6.1 Power Loss

The power loss must be controlled when the AS cabinets (including the I/O modules) are configured. The AS 235 H automation system may be used without a fan module if the permissible cabinet power loss values are not exceeded.

The following power loss limits P_{Smax} must be taken into account when the cabinets are configured: (ϑ_{in} =cabinet entry temperature)

$\vartheta_{in} = 25\text{ °C}$	$P_{Smax} = 450\text{ W}$	30 °C	$P_{Smax} = 420\text{ W}$
35 °C	$P_{Smax} = 380\text{ W}$	40 °C	$P_{Smax} = 350\text{ W}$

As long as P_{Smax} is not exceeded, the components installed in the basic and extension cabinet may be used without a fan. If the power loss of the cabinet exceeds P_{Smax} due to the use of I/O modules, the air flow rate must be increased. In this case, fan modules or heat exchangers have to be configured (option).

2.6.2 AS 235 H Basic Cabinet

1. If the power loss P_{Smax} is not exceeded in the cabinet and a value of 150 W is not exceeded in any of the extension units of the cabinet either, the cabinet can be used without forced ventilation up to the cabinet entry temperatures specified above.
2. An extension unit without forced ventilation may only be loaded up to a value of 150 W. A forced ventilation must be provided in the cabinet if this value is exceeded.
3. If the cabinet is equipped with a lot of I/O modules with a higher power loss value, the modules should not be installed next to each other but be distributed in the subracks so as to prevent hot spots.

Configuration rules for the AS 235 H basic cabinet

The following values must be used for calculating the thermal load of the cabinet:

Configuration value of base AS configuration:

$$P_{Gmax} = 150\text{ W} + N \times 7\text{ W}; \quad N = \text{number of EAVUs}$$

$$\text{Typical average power loss of an I/O module: } P_{I/O \text{ module}} = 5.4\text{ W}$$

$$\text{Typical maximum power loss of an I/O module: } P_{I/O \text{ module}} = 7\text{ W}$$

Maximum power loss of an I/O module: see PLT 111 Catalog, Edition 1993.

Basic cabinet

$$\text{Formula: } P_{I/O \text{ max}} = P_{Smax} \text{ Power loss I/O}_{\text{max}} \text{ cabinet}$$

Typical permissible number of I/O modules in the cabinet: (at 40°C)

$$A_{I/O \text{ typ}} = \frac{200\text{ W}}{5.4\text{ W/module}} = 37 \text{ modules}_{\text{typ}}$$

Permissible number $_{\text{typ},\text{min}}$ I/O modules in the cabinet: (at 40°C)

$$A_{I/O \text{ min}} = \frac{200\text{ W}}{7\text{ W/module}} = 28.6 \text{ modules}_{\text{typ},\text{min}}$$

The base value P_{Smax} must be adapted according to the table (see above, under item 2.6.1).

This rough calculation can be used to determine whether or not the typical/maximum power loss resulting from I/O modules has been exceeded. (Rule of thumb: 2 completely filled I/O subracks with 13 I/O modules each).

From 28 I/O modules onwards, checking against the power specifications in the PLT 111 Catalog (Edition 1993, Catalog Section 5, "I/O Modules") is recommended. The process signals should be included if necessary (maximum number: 39).

Different distribution (e.g. in an additional extension cabinet) or a fan module is required if the I/O modules exceed the power loss P_{Smax} .

2.6.3 AS 235 H Extension Cabinet

1. With a typical module configuration, the power loss limit of the cabinet is not exceeded if the AS 235 H extension cabinet is used without a fan. (Up to 52 I/O modules, without EAVU modules).
Only in the case of an atypical configuration (many identical I/O modules, modules >8 W) a more detailed checking is recommended.
If the power loss P_{Smax} is not exceeded **and** a value of 150 W is not exceeded in any of the extension units in the cabinet either, the cabinet may be operated up to the specified cabinet entry temperature without forced ventilation (see Chap. 2.6.5) .
2. An extension unit without forced ventilation may only be loaded up to a value of 150 W. A forced ventilation must be provided in the cabinet if this value is exceeded.
3. If the cabinet is equipped with a lot of I/O modules with a higher power loss value, the modules should not be installed next to each other but be distributed in the subracks so as to prevent hot spots.

Configuration rules for the AS 235 H extension cabinet

In maximum configuration, each of the four extension racks in the extension cabinet may be equipped with one EAVU module (power loss 7 W).

A value of 28 W can therefore be assumed as a configuration value of the base configuration P_G of the four extension units.

The maximum number of I/O modules is $4 \times 13 = 52$ (without EAVUs).

The following formula shows that a typical configuration does not cause the power loss of the extension cabinet to be exceeded:

Formula: $P_{I/O \max} = P_{Smax} - 28 \text{ W}$ Power loss I/O \max cabinet

Typical average power loss of an I/O module: $P_{I/O \text{ module}} = 5.4 \text{ W}$

Typical maximum power loss of an I/O module: $P_{I/O \text{ module}} = 7 \text{ W}$

Typical permissible number of I/O modules in the cabinet: (at 40°C)

$$A_{I/O \text{ typ.}} = \frac{322 \text{ W}}{5.4 \text{ W/module}} = 59 \text{ modules}_{\text{typ.}}$$

Permissible number of typ.,min I/O modules in the cabinet: (at 40°C)

$$A_{I/O \text{ min}} = \frac{322 \text{ W}}{7 \text{ W/module}} = 46 \text{ modules}_{\text{typ.,min}}$$

A fan module must be provided or the distribution of the I/O modules in several extension units changed if the power loss of the I/O modules in an extension rack exceeds 150 W.

One or two fan modules must be added according to the above-mentioned configuration rules if the total power loss exceeds P_{Smax} .

The P_{Smax} base value must be adapted in accordance with the table (see 2.6.1 above).

This rough calculation can be used to determine whether or not the typical / maximum power loss resulting from I/O modules has been exceeded.

From three filled extension units onwards or in the case of an atypical configuration, checking against the power specifications in the PLT 111 Catalog (Edition 1993, Catalog Section 5, "I/O modules") is recommended. The process signals should be included if necessary.

A fan module is required if the I/O modules exceed the power loss P_{Smax} .

2.6.4 AS 235 H Cabinet with Forced Ventilation

Depending on the thermal load (power loss) of the I/O modules, up to two fan modules (6DS9 943-8AA) may be required in the TELEPERM M cabinet, basic and/or extension cabinet.

2.6.5 AS 235 H Cabinet without Heat Exchanger (WT)

If the power loss (P_S)

>350 W at a cabinet entry temperature of 40°C

>380 W at a cabinet entry temperature of 35°C

>420 W at a cabinet entry temperature of 30°C

>450 W at a cabinet entry temperature of 25°C

or if a subrack is equipped with modules whose total power loss >150 W, a fan module is required in the basic cabinet at installation location 13 or in the extension cabinet at installation location 9.

If both criteria apply, each cabinet must be equipped with two fan modules.

In the basic cabinet, the second fan module must be fitted in installation location 29 and in the extension cabinet in installation location 25.

The following power loss limits apply in this case:

Ambient temperature	40°C
Power loss of the cabinet	700 W

Cabling and fusing have been laid out for the connection of a maximum of two fans per cabinet.

2.6.6 AS 235 H Cabinet with Heat Exchanger

1. If the total cabinet power loss P_S does not exceed a value between 350 W and 450 W (depending on the ambient temperature) and if the power loss in each individual extension unit (EE) is less than 150 W, the cabinet (with heat exchanger) may be used **without** an additional fan module.
2. Up to a total power loss P_S of 700 W at an ambient temperature of 40°C **and** provided that the power loss in each individual extension unit (EE) is less than 150 W, the cabinet (with heat exchanger) may be used **with one** fan module.
The fan module must be installed in the basic cabinet between the base unit and the 1st EE at installation location 13 and in the extension cabinet between the 4th EE and 5th EE at installation location 9.
3. If the power loss in one of the three or four extension racks exceeds the limit of 150 W **or** the total power loss $P_S > 700$ W, a second fan module must be installed in the base cabinet between the 2nd EE and 3rd EE (installation location 29) or in the extension cabinet between the 6th EE and the 7th EE (installation location 25).

In this case $P_{S_{max}} = 1000$ W can be reached at an ambient temperature of 40°C.

2.6.7 Fan Module (Option)

The fan module 6DS9 943-8AA is used to provide forced-air cooling. A fan module features 3 fan motors each of which is monitored for speed; an electronic short-circuit fuse is integrated.

The fan monitors of the fan modules and the heat exchanger are connected in series and applied to the basic unit as alarm signal LK.

The following cable sets are available (option) :

- C79195-A3831-H220 to connect one fan module (supply and alarm output) in the basic cabinet (L=2.2 m)
- C79195-A3831-H450 as for -H220, but for the extension cabinet (L=4.5 m)
- C79195-A3828-H230 to connect one heat exchanger (alarm output) in the basic cabinet (L=2.3 m)
- C79195-A3828-H390 as for -H220, but for the extension cabinet (L=3.9 m).

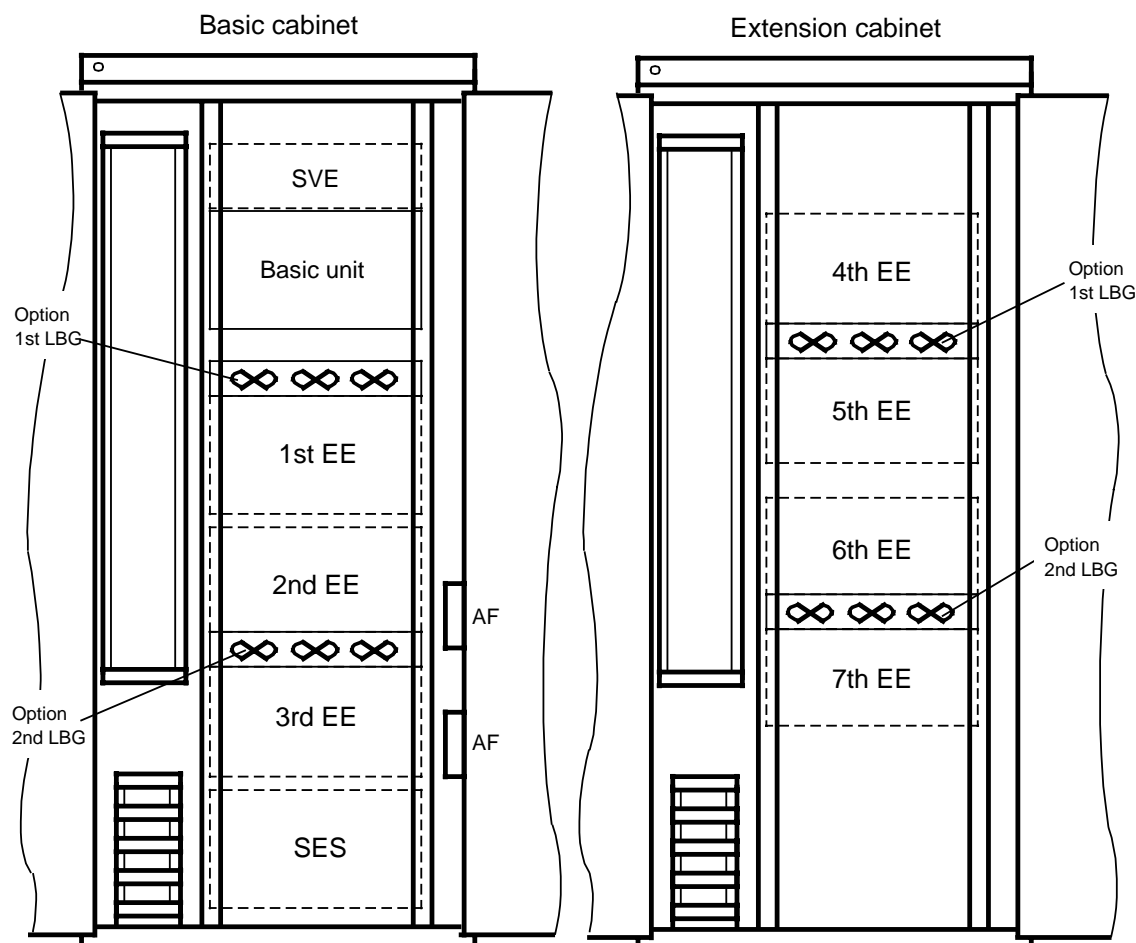
One cable set is required per fan module. It includes the connection of the power supply and the alarm signal; as far as the heat exchanger is concerned, wiring of the series connection of the alarm signal is included.

The operating voltage is supplied via a cable at the rear of the module. The alarm signals from the monitoring circuit also run via the 6-pin connector of this cable.

The fan module is used to provide forced ventilation of module subracks in AS 235 H system cabinets. The fan module unit is designed for operation with DC 24 V.

The module has the same dimensions as an ES 902 subrack and like the latter can be installed in main frames.

The fan motors issue a square wave signal with a frequency that is proportional to the speed. The square wave pulses are fed to the monitoring circuit which monitors the lower frequency (speed) limits of the individual motors. (See Fig. 2.7 for the installation locations of fan modules).



LBG Fan module

Fig. 2.7 Cabinet layout, location of fan modules (options)

A red LED lights up and a floating changeover contact is actuated if the speed of a motor falls below the minimum rate.

- The LED is used for fault location
- The changeover contact can be used for issuing a fault signal via an external signal line or for triggering external signals or switching activities.

Error messages are suppressed during start-up after the supply voltage has been switched on. The changeover contact function can be selected by setting the plug-in jumper X16:

- active non-fault alarm=passive fault alarm
The relay drops in the case of a malfunction (when LED is ON).

Upon delivery, the X16 plug-in jumper is set for active fault alarm.

The fan module connecting cables C79195-A3828-H220 (length 2.20 m) are used for power supply and signal line connection in the basic cabinet (fan module 1 or 2), or 79195-A3828-H450 (length 4.50 m) for fan modules in the extension cabinet.

Warning

Ensure that the fan module is not used without the finger guard!

The fan module is maintenance-free.

Based on the fan service life (approx 40,000 h) specified by the manufacturer, it is recommended to replace the fan or the fan module every 4 years.

Settings to be made after the module has been replaced: jumper setting for alarm signal (see Fig. 2.8).

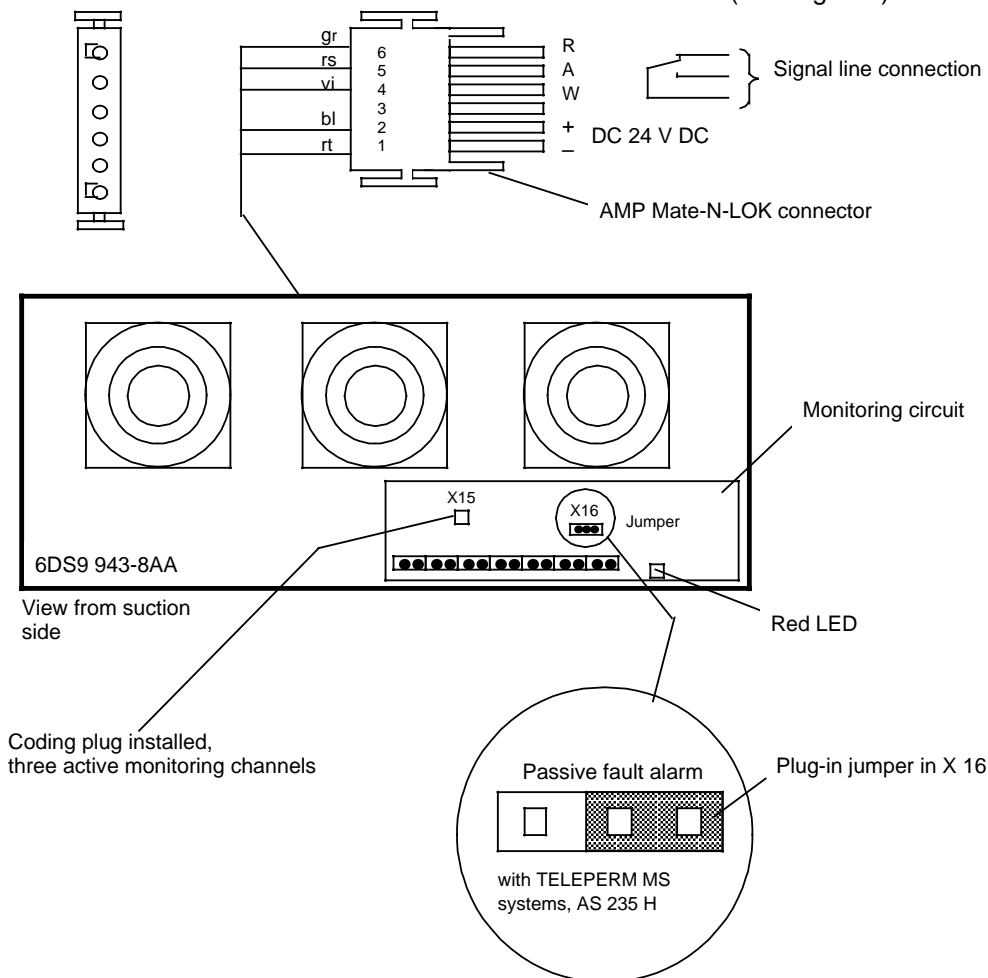


Fig. 2.8 Fan module

Automatic circuit breakers (F) are provided in the SES for the connection of fan modules:

Fan 1 fused via F19 (KL 43) in the basic cabinet and via F21 (KL 49) in the extension cabinet.

Fan 2 fused via F20 (KL 46) in the basic cabinet and via F22 (KL 52) in the extension cabinet.

The alarm signals of the fan(s) and/or the heat exchanger are connected in series via the marshalling rack (RV) in the SES and fed from there to the AS system.

The heat exchanger (230 V AC) is fused externally.

3 Method of Operation

3.1 System Configuration

Method of operation and configuration of the AS 235 H automation system are defined by the requirements of increased availability. This availability is mainly achieved by CPU redundancy where the same data is processed by two CPUs which operate independently at synchronous clock pulses.

Both CPUs are equivalent and have the same priority level, although the I/O comparator and switchover module (EAVU) routes only the signals from one CPU to the I/O modules. Also the communication via the CS 275 bus system does only take place via the N-AS or N8-H module of **one** CPU. This CPU is known as "master CPU".

CPU I assumes master function and thus process control if both CPUs are started simultaneously. CPU II becomes passive and, after updating, automatically assumes the function of the backup CPU which is able to take over mastership at any time. This enables the system to continue process operation without interruption after a tolerable fault has occurred.

Either CPU can assume one of the following states:

Master (M)	Only master mode enables a CPU to actively control the process.
Standby (R)	A CPU in backup mode executes the same instruction sequence as the master CPU.
Passiv (P)	The CPU is separated; the two CPUs operate in asynchronous mode.
Backup (B)	The CPU accepts the memory contents of the master CPU.
Fehler (F)	The system software has located a fault in the CPU.

3.2 Faultless Operation

Both CPUs run synchronously during normal faultless operation.

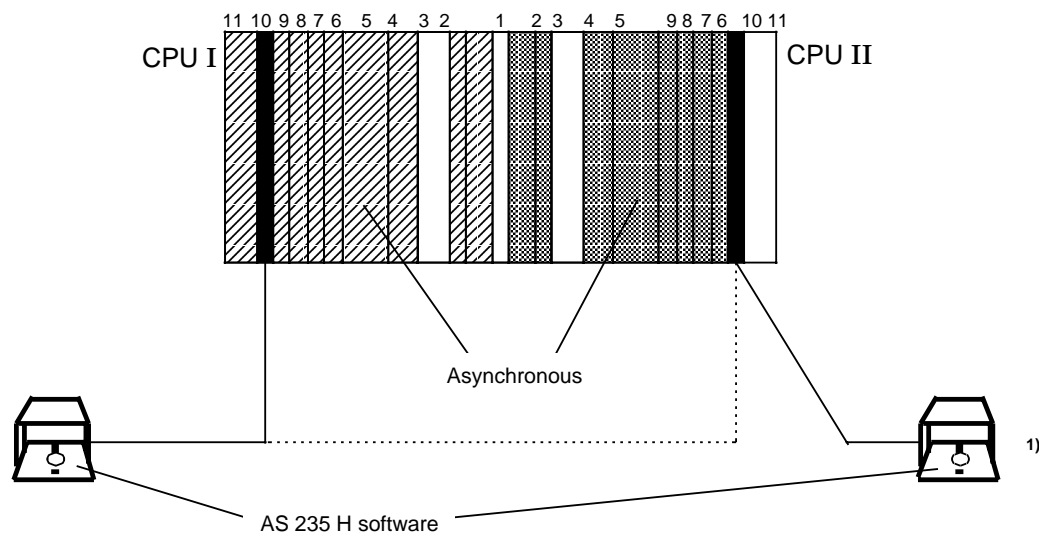
At first, both CPUs start up asynchronously. During commissioning, the same system software is loaded into the memories of the central processing units. This is performed either in succession (with one floppy disk drive) or in parallel (with two floppy disk drives). Subsequently, the system can be synchronized.

The memory contents of both memories are identical in synchronous operation. This means that identical data is read and written. The central processors provide control signals and addresses synchronously. The comparator coupler module (VKB) compares all incoming and outgoing data and signals of the central processing units.

One I/O comparator and switchover module (EAVU) per extension unit performs this comparison on the I/O level.

Each operator terminal possesses two operator input channel interface modules, one in CPU I and one in CPU II.

Although there are two local bus interface modules (N-AS or N8-H), if communication is performed via the CS275 bus system, only the N-AS/N8-H of the master CPU is active. (A single N-AS/N8-H module is not expedient since the connection to the CS 275 bus system would be interrupted if mastership were changed.)



- | | | |
|----|--|--|
| 1 | Comparator coupler module (VKB) | (6DS1 142-8AA) |
| 2 | Synchronization module (SB) | (6DS1 143-8AA) |
| 3 | Diagnostic unit interface module (DGA) | |
| 4 | Memory module (SP) | (6DS1 837-8DA/8EAI-8FA and 6DS1 844-8..) |
| 5 | Central processing unit (CPU) | (6DS1 141-8AA) |
| 6 | I/O bus interface module 1 (EABA1) | (6DS1 312-8BB) |
| 7 | Operator input channel interface module 1 (BKA1) | (6DS1 330-8CA) |
| 8 | I/O bus interface module 2 (EABA 2) | |
| 9 | Operator input channel interface module 2 (BKA2) | |
| 10 | Mini floppy disk interface module (MDA) | (6DS1 326-8BB) |
| 11 | N-AS or N8-H local bus interface module | (6DS1 223-8CA or 6DS1 220-8AA) |

Fig. 3.1 Start-up and loading

1) Although only one mini floppy disk unit is sufficient for loading the system software and the user program, two mini floppy disk interface units are required. For booting, the mini floppy disk unit is connected to CPU I and CPU II in succession. Both interfaces must, however be installed.

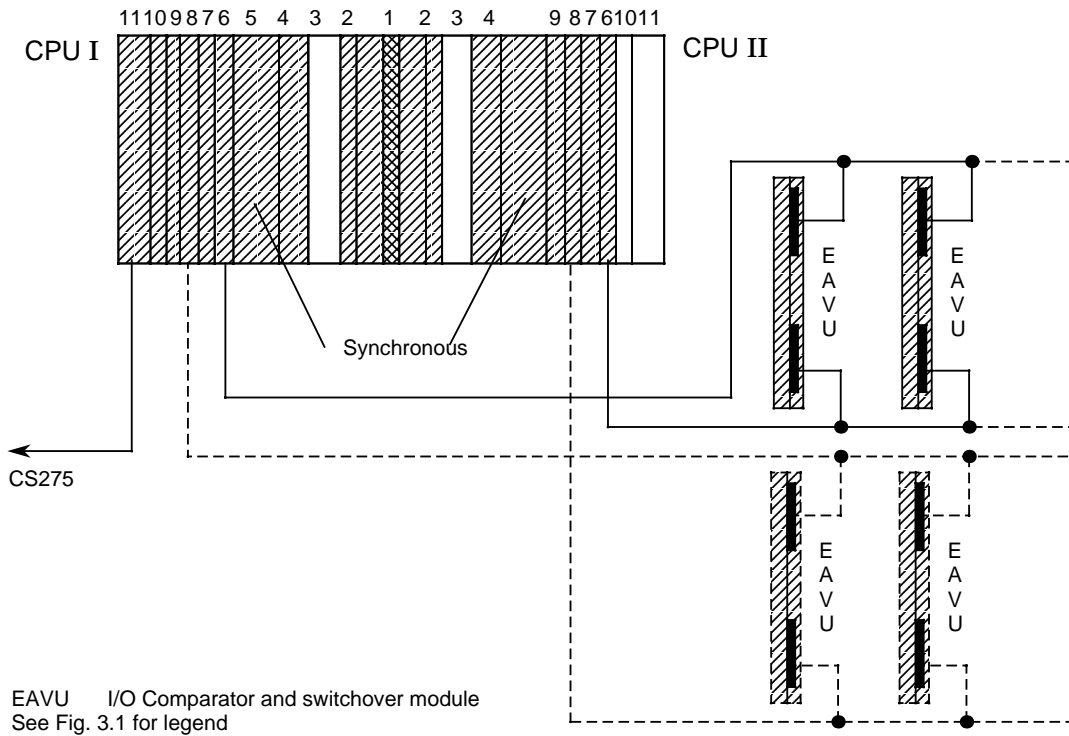


Fig. 3.2 I/O connection via EAVU, synchronous operation, CPU I is master

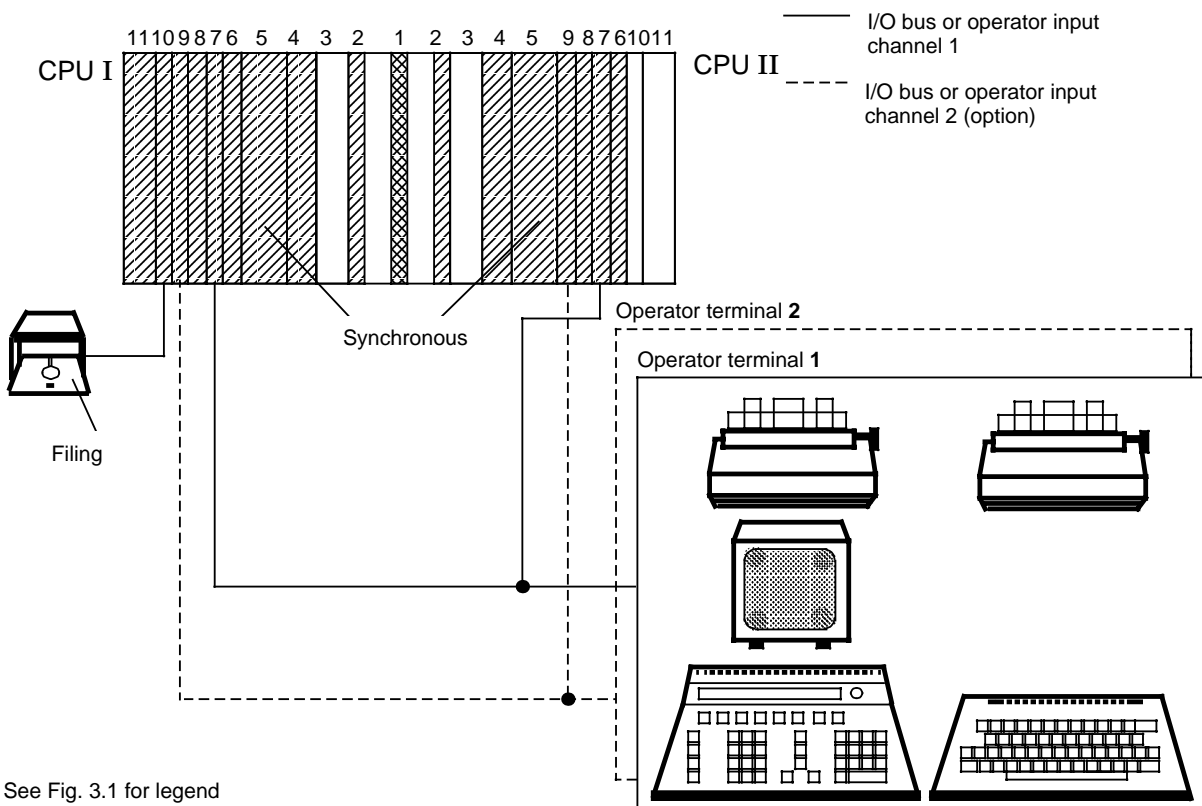


Fig. 3.3 Connection to operator input level, synchronous operation, CPU I or CPU II is master

3.2.1 Central Unit Functions

The fault-tolerant functions of the central unit with its two identical central processing units can only be performed if the specified configuration has been established.

- Comparator coupler module (VKB)

The comparator coupler module (Fig. 3.4)

- compares the bus signals of both CPUs
- interconnects the parallel buses of both CPUs
- branches a single-channel input information to both CPUs
- transfers all read data items during backup operation from the memories/registers of the master CPU to the memories/registers of the second CPU.



Caution

The VBK may not be removed during operation unless the switch on the front is in AUS (OFF) position.
The switch itself may only be actuated during asynchronous operation.

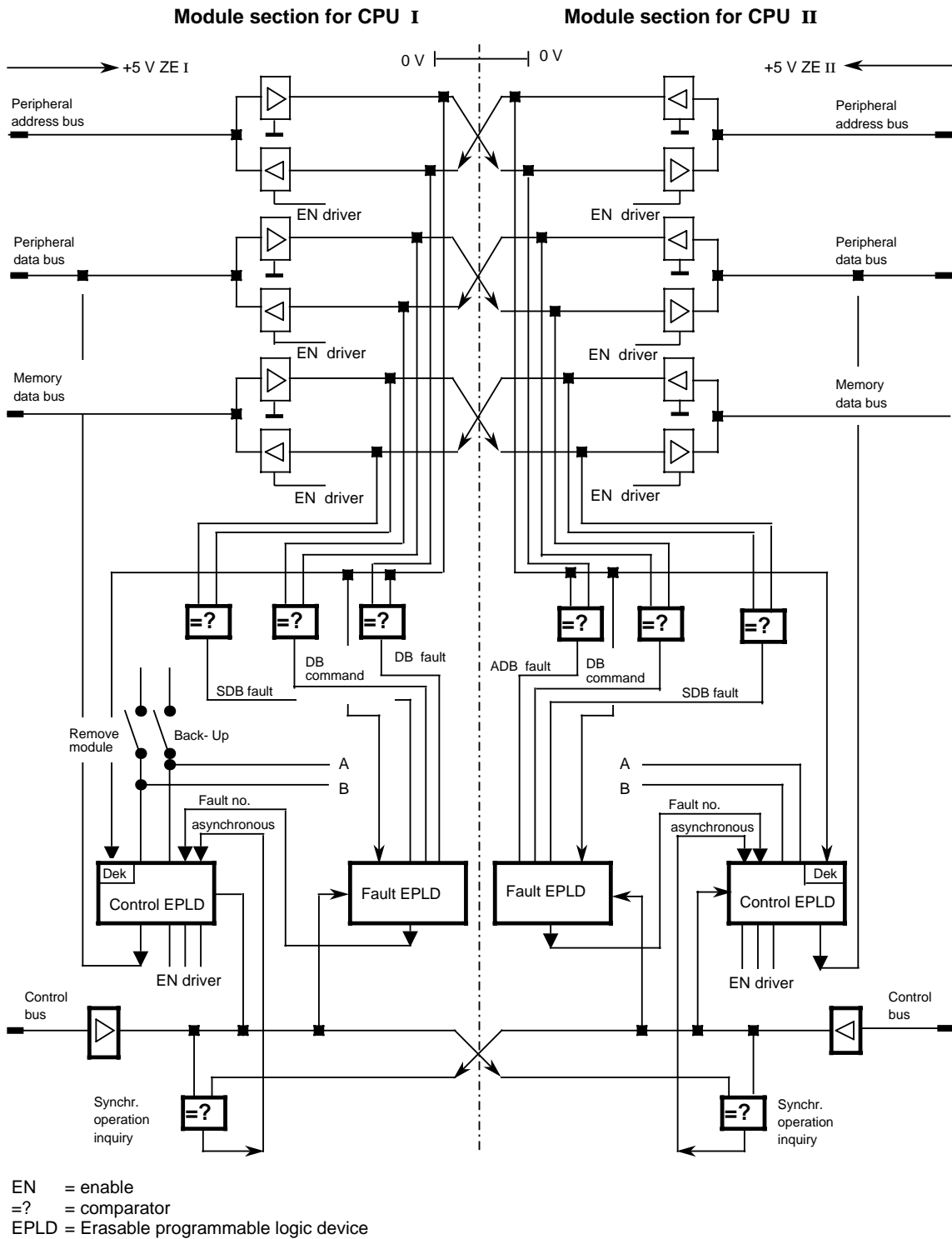


Fig. 3.4 Block diagram of the comparator coupler module (VKB)

• Synchronization module (SB)

The synchronization module (Fig. 3.5) provides the basis for synchronous operation of the two CPUs. It

- generates the processor and system clock pulses,
- synchronizes the CPU base clock pulse,
- synchronizes read and write data,
- synchronizes interrupt signals,
- supplies status messages to the CPU,
- controls synchronization.

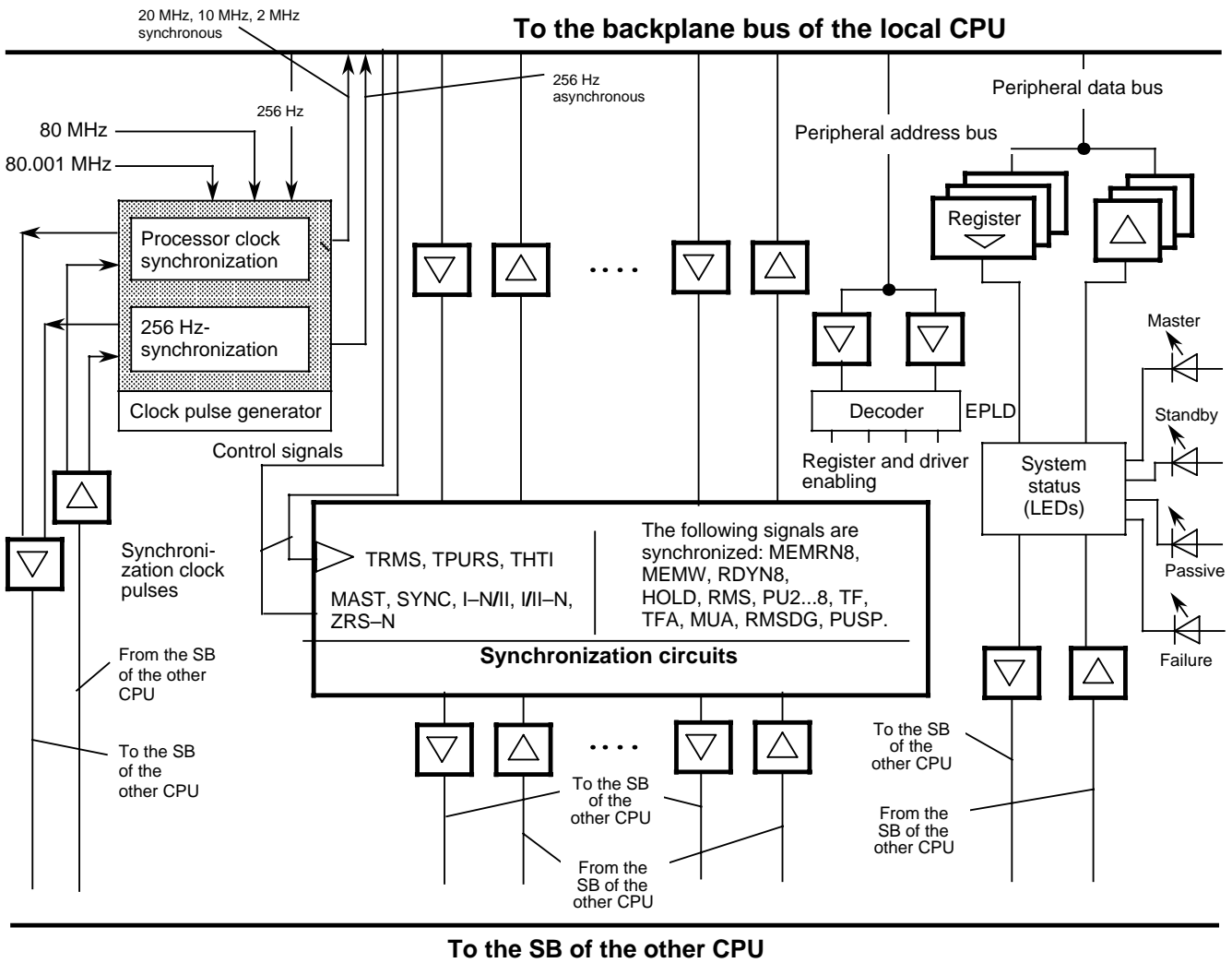


Fig. 3.5 Block diagram of the synchronization module (SB)

Memory Module

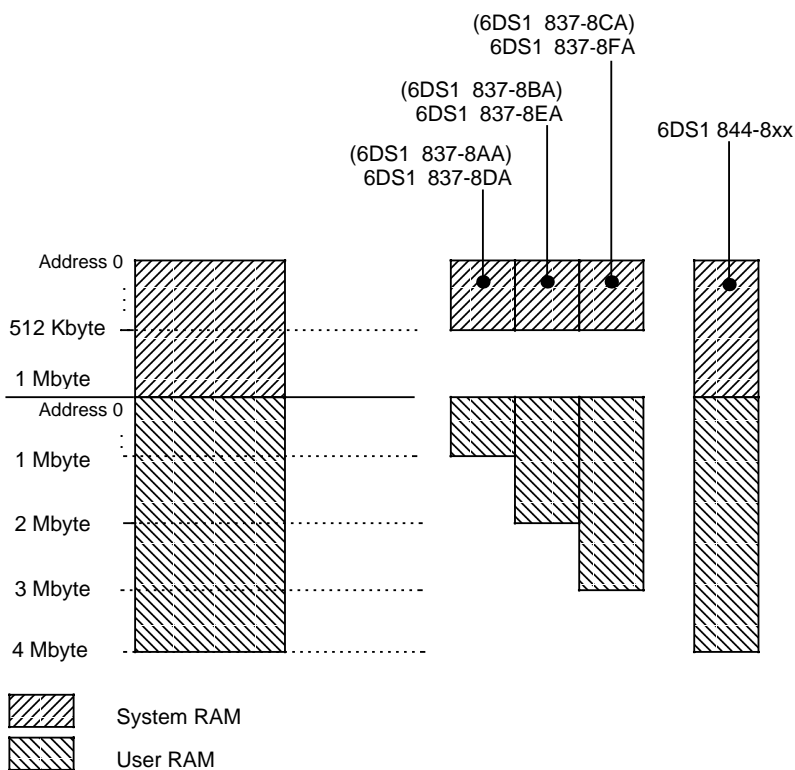
- 512 Kbyte system memory with memory module 6DS1 837-8xA *or*
1 Mbyte system memory with memory module 6DS1 844-8xx
- 1, 2 or 3 Mbyte user RAM with memory module 6DS1 837-8xA *or*
4 Mbyte user RAM with memory module 6DS1 844-8xx
(4000 Kbyte are available for the user from a total of 4 Mbyte)
- Back-up battery
- Battery failure logic circuit
- Parity monitoring (byte per byte)
- Error and control register
- Error display and state display with LED on the front plate
- BOOT logic.

If a parity error is detected when a word is read, then this error is signalled with a PAF signal (parity error) and processed from the system programs.

	6DS1 837-8xA	6DS1 844-8xx
Cycle time	500 ns	500 ns
Access time	300 ns	300 ns

Table 3.1 Memory module cycle time

Memory design



- Central processing unit (CPU 235 H)

The central processing unit

- contains a 16/32-bit processor,
- is responsible for system start-up and microprogram start-up,
- processes the automation functions according to the program in the user memory.



Caution

Some of the backplane connector pin assignments of CPU 235 H (6DS1 141-8AA) and CPU 235 (6DS1 140-8AA) are different due to the following modifications that are required for synchronous CPU operation:

- External supply of the 20-MHz and 10-MHz processor clock pulses via the two SB modules (the G1 and G2 quartz oscillators have not been installed on the CPU 235 H).
- The 1/256-Hz time clock pulse is routed via the SB module for synchronization.
- The TPURS signal is issued to the SB module.

Due to the different connector pin assignments, the CPU module could be destroyed if a CPU 235 H were installed in a standard AS 235 system and vice versa.

- I/O bus interface module (EABA)

The I/O bus interface module

- transfers data and signals from the CPU to the EAVUs,
- receives data and signals from the EAVUs and transfers them to the CPU.

- Operator input channel interface module (BKA)
- The operator input channel interface module (Fig. 3.6)
- establishes the connection to the operator input unit.

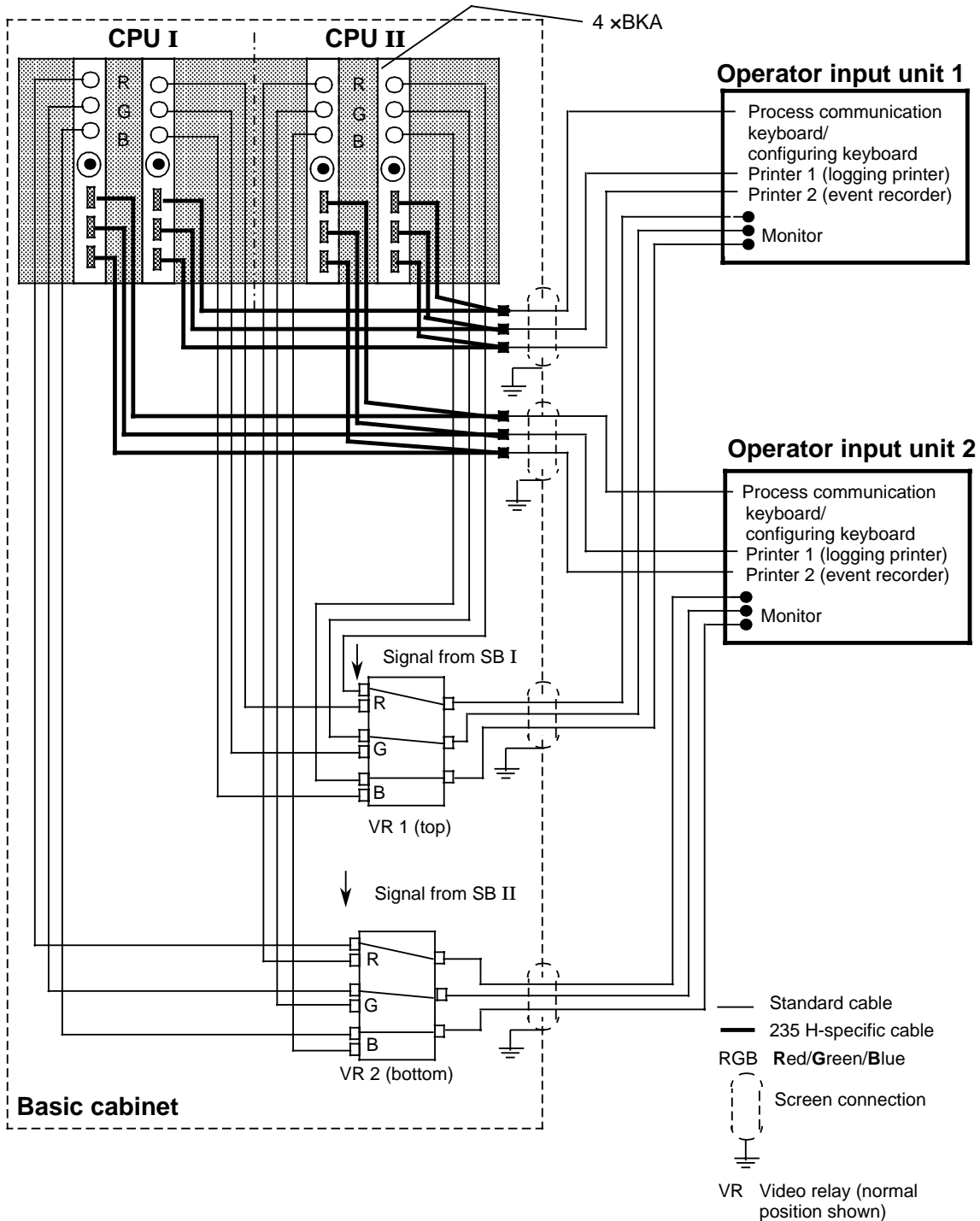


Fig. 3.6 Connecting the operator input units

- Mini floppy disk interface module (MDA)

The mini floppy disk interface module

- controls the mini floppy disk drive which is used for loading and filing.

**Note:**

Both interface units must be installed although only one MDE is required (which is to be connected to the current master CPU).

- Local bus interface module (N-AS)

The N-AS local bus interface module

- provides the connection to other systems via the CS275 bus system. Instead of the N-AS local bus interface module, you can also use the N8-H local bus interface module. The combination of N-AS and N8-H in one AS 235 H system is permissible as well.

- Diagnostic unit interface module (DGA)

The diagnostic unit interface module

- provides the connection to the diagnostic unit.

A diagnostic unit can be:

- PG 685
- PG 750.

The following points must be observed when using a DGA:

In **asynchronous operation**, the DGA must be connected to the CPU in which diagnostic functions are to be performed. The "DG-Betrieb" [DG mode] switch on the front panel of the SB module concerned must be in EIN [ON] position.

In **synchronous operation**, the DGA must always be connected to CPU I since all functions act synchronously on both CPUs. The "DG-Betrieb" [DG mode] switch on both modules must be in EIN [ON] position (the CPUs become asynchronous if the switch position differs on the modules).

**Caution**

The "DG-Betrieb" [DG mode] switch disables important monitoring functions when it is set to EIN [ON]. The switch may therefore only be set to EIN [ON] for service or diagnostic purposes.

The switch must be in AUS [OFF] position during normal operation.

3.2.2 I/O System Functions

The I/O system of the AS 235 H automation system is accommodated in the extension units (EE). The I/O system configuration depends on the user requirements. An exception is the EAVU module which, due to the fact that the redundant I/O buses are connected from the front, must always be installed in slot 14 (right-hand side) of an extension unit.

Another exception is the group interrupt module (binary input module 6DS1 601-8BA or 6DS1615-8AA). This module must always be installed in slot 13 of the extension unit(s) in the basic cabinet.

- I/O comparator and switchover module (EAVU)

The EAVU is the interface of the extension unit to both central processing units. All data and commands to the I/O modules are routed via the EAVU module. It converts the redundant signals from the synchronous CPUs to the single-channel I/O bus of the extension unit and branches the single-channel signals from the I/O modules to both CPUs.

The EAVU (Figs. 3.7 and 3.8)

- verifies the identity of redundant address, data and control signals from and to the central processing units;
- generates an error signal if it detects a discrepancy;
- determines the range concerned by a given I/O command;
- provides information regarding
 - jumper setting
 - last I/O access
 - last register access
 - comparator and status information
 - via internal registers;
- influences
 - the actual mastership
 - checking the local extension unit
 - clearing the error registers
 - via internal registers;
- provides fault finding utilities
- verifies that the supply voltages (24 V and 5 V) are within the tolerance limits
- generates alarm and signal voltages for the local extension unit range (both voltage circuits are provided with a 1.6-A fuse)
- prevents the propagation of faults from one central processing unit to another and among the extension units.

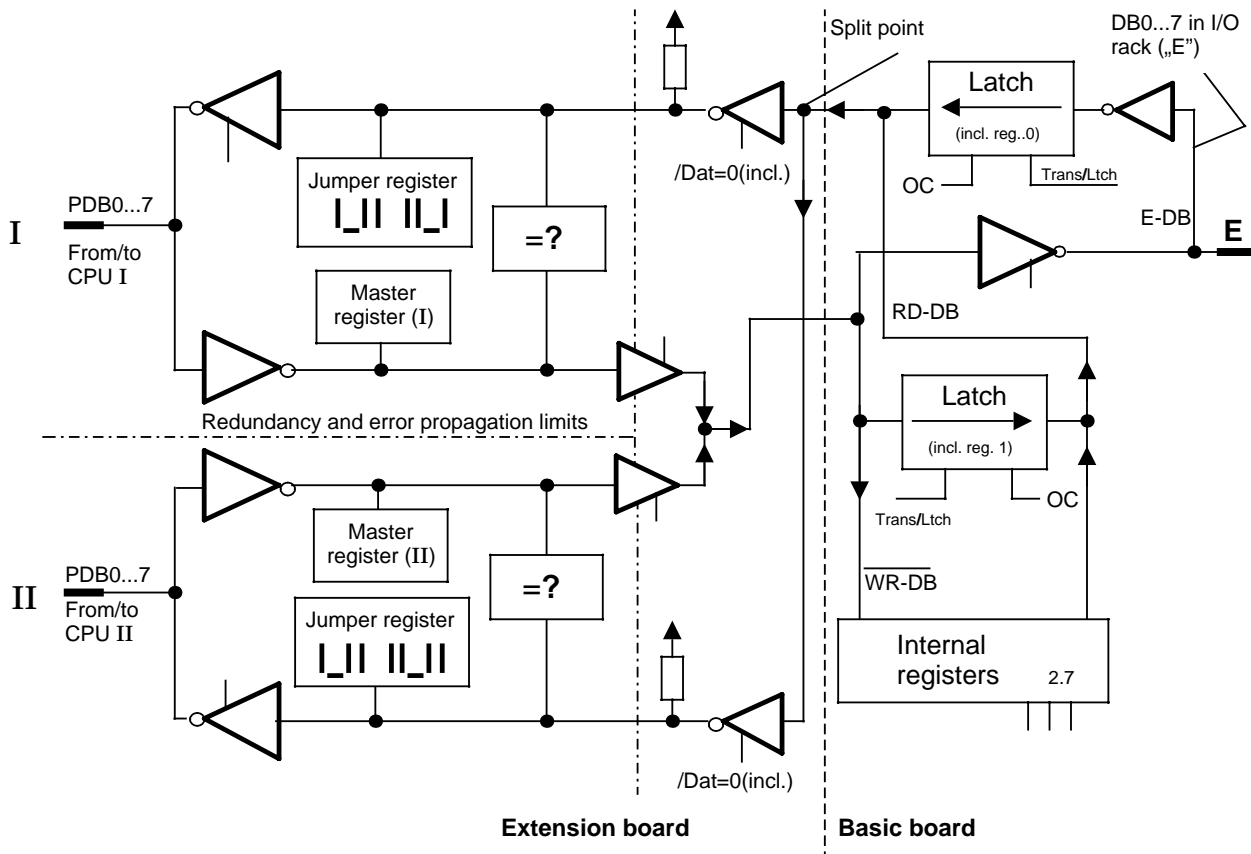


Fig. 3.7 EAVU data path structure

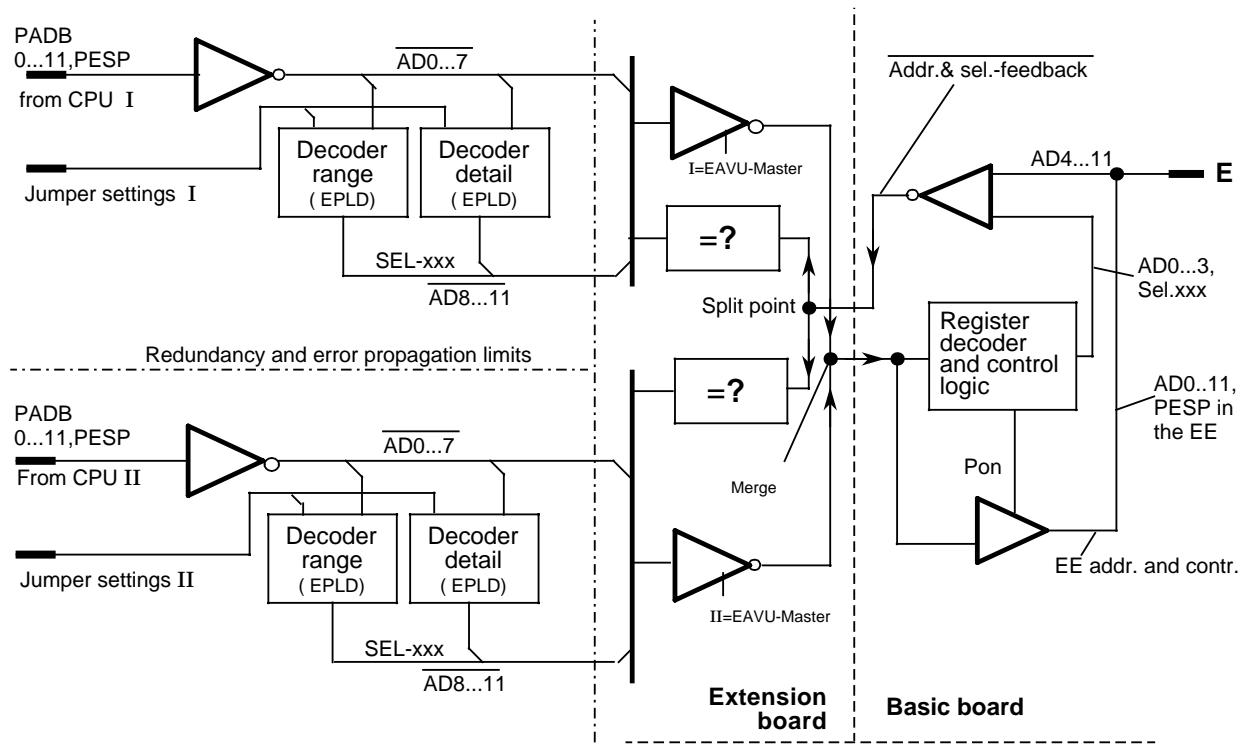


Fig. 3.8 EAVU address path structure

- The group interrupt module

The binary input module 6DS1 601-8BA (or also 6DS1615-8AA) is used as a group interrupt module in the AS 235 H system.¹⁾ Under address SF61 (the I/O range runs from SF00 to SF60), the module provides the system software with the state of up to 48 process alarms (1-active PINT signals) coming from the subordinate group interrupt modules (standby) 6DS1601-8BA or 6DS1615-8AA each with up to 48 process inputs. Further details are given in Chapter 1.10.3 (binary input with interrupt) of the AS 235 Description (Variant F), Order No. C79000-P9076-C088.

To ensure that a failure on the group interrupt module does not interrupt the acquisition of process alarms, two or three group interrupt modules (SF61) can be installed (double/triple redundancy) as shown in Fig. 3.9. Also see the EAVU description (Order No. C79000-T8076-C343) in this Manual.

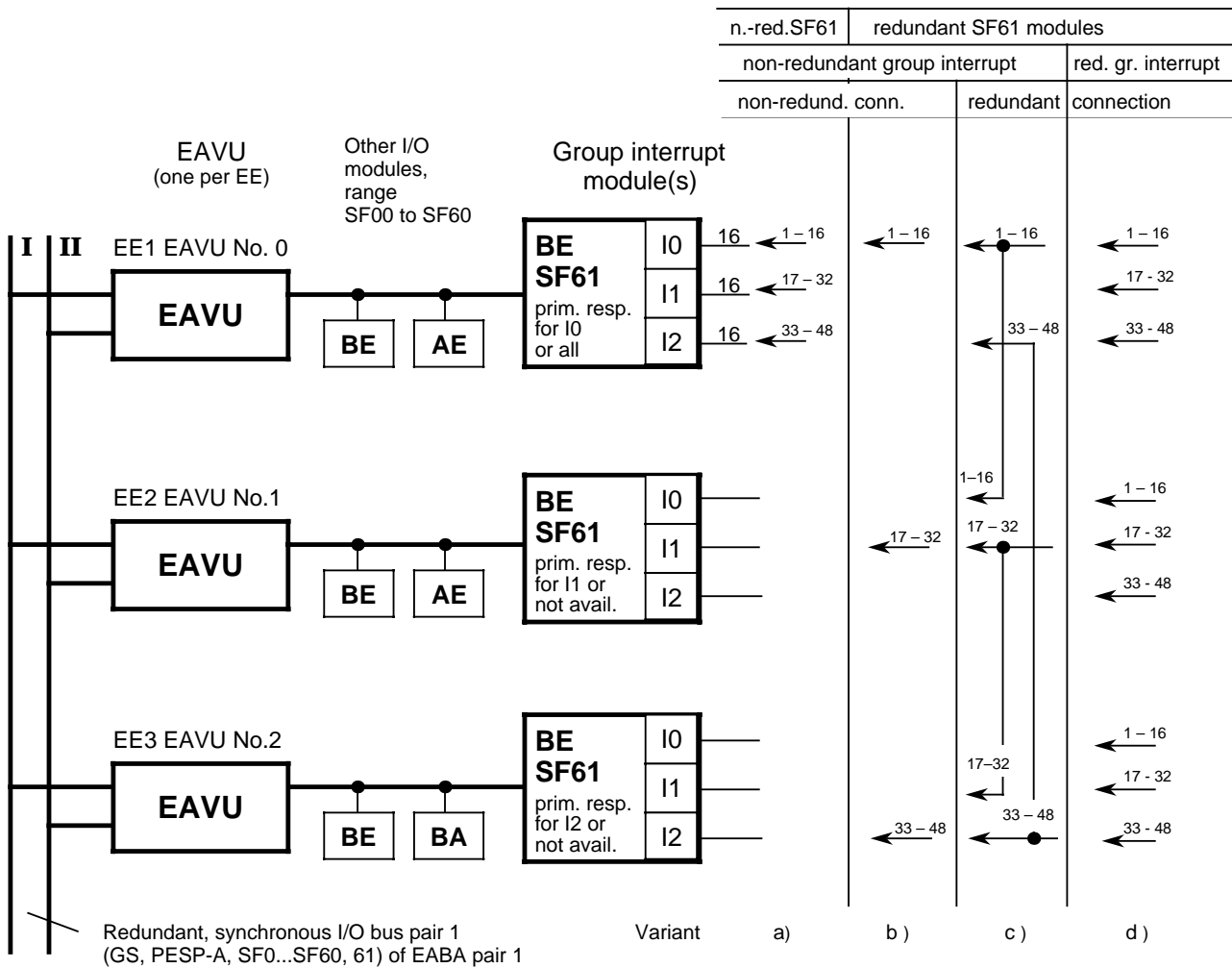


Fig. 3.9 Redundant configuration of group interrupt modules

The EAVU blocks alarm interrupts, as soon as their rate of occurrence exceeds a permissible value (interrupt inhibit due to faults). An alarm which occurs too often by mistake, e.g. due to a "chattering" transmitter, also blocks further alarms which are only routed via the EAVU or SF61 concerned (in a non-redundant manner).

By connecting alarm signals to several SF61 modules which are redundant towards each other, you can not only prevent the loss of this alarm resulting from an SF61 or EAVU failure but also an alarm inhibit resulting from an error. Yet, on the other hand, an alarm signal connected several times would inhibit several SF61 if it occurred too often by mistake.

In this case, you must weigh the importance of the alarm against the probability that it will disturb "chattering" signals.

In case of doubt, provide two (i.e. redundant design) interrupt generating signal transmitters (ASG) and two interrupt generating binary signal input modules (ABE) for important alarms and always route the alarm signals of redundant ABEs to redundant SF61 modules.

Fig. 3.9 shows examples of four variants of group alarm interconnections (PINT signals from interrupt-generating binary input modules) with SF61 group interrupt modules. As with an AS 235 system, up to 48 group alarms can be gathered, irrespective of the number of SF61 modules installed (1 to 3). In this respect there is no difference in the configuration of an AS 235 H system and a standard AS 235 system. Variants b), c), and d) contain double- or triple-redundant SF61 module configurations.

The individual items of the following summary mean:

Redundancy of ABE	:	Redundancy of the interrupt-generating binary input modules.
Redundancy of ASG	:	Redundancy of the interrupt-generating transducers or sensors that are connected to the interrupt-generating binary input modules.
Blocking of alarms	:	The extent of blocked alarms due to an excessive number of alarms that have been caused by a malfunction (e.g. "chattering" interrupt-generating devices). The EAVU blocks alarms if the interrupt frequency exceeds a permissible value (interrupt inhibition due to a malfunction).
Interconnection	:	Group alarm interconnections (PINT signals from interrupt-generating binary input modules) with SF61 inputs.

Variant a):

Number of SF61	:	One, not redundant
Redundancy of ABE	:	None
Redundancy of ASG	:	None
Blocking of alarms	:	All alarms
Interconnection	:	Any SF61 input per group alarm
Disadvantage	:	All alarms will be lost after an interrupt inhibition due to a malfunction or when the SF61 module, its EAVU or its extension unit is switched off.

Variant b):

Number of SF61	:	Two or three, redundant.
Redundancy of ABE	:	None double triple
Redundancy of ASG	:	None none or double triple
Blocking of alarms	:	One out of 2 or 3 SF61 modules.
Interconnection	:	Distributed to the SF61 modules; only to SF61 inputs with primary responsibility.

- Advantage : Up to 2/3 of the alarms remain functional due to the SF61 redundancy, even if one SF61 module (EE, EAVU) fails.
- Disadvantage : The alarm from an interrupt-generating input module will be lost, even if this module, that has been (primarily) assigned to a defective SF61 module is not affected by the failure of this SF61 module (because it is installed in a different extension unit, for example), its extension unit, or its EAVU. Variants c) and d) avoid this advantage.

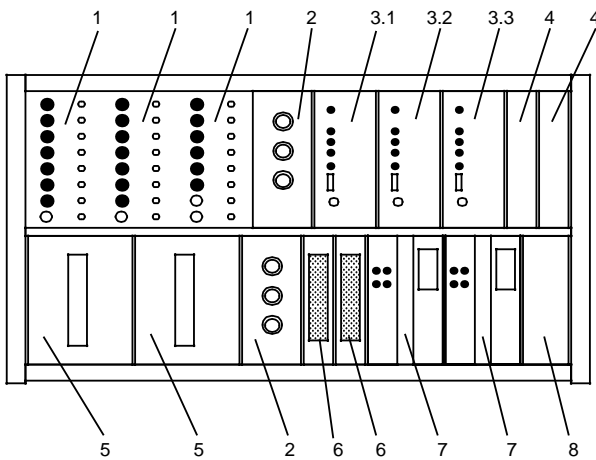
Variant c):

- Number of SF61 : Two or three, redundant.
- Redundancy of ABE : None
- Redundancy of ASG : None
- Blocking of alarms : 2 out of 3 SF61 modules
- Interconnection : Branched to two identical SF61 inputs with primary and secondary responsibility
- Advantage : Due to the multiple connections to the same inputs of several SF61 modules, the interrupt remains effective even if one of these SF61 modules has failed or is blocked.
- Disadvantage : Due to the multiple connections to the same inputs of several SF61 modules, two out of three possible SF61 modules will be blocked if an excessive number of alarms occurs after a fault.

Variant d):

- Number of SF61 : Two or three, redundant.
- Redundancy of ABE : Double | triple
- Redundancy of ASG : Redundant or double | triple
- Blocking alarms : One SF61 module if redundant interrupt-generating sensors have been used.
- Interconnection : The two or three redundant group alarms are individually connected either to all three identical inputs or to the same inputs of the SF61 modules with primary or secondary responsibility.
- Advantages : Only one "logic" alarm (out of 48 possible alarms) is used for redundant group alarms. The user software only sees one single alarm, despite redundant interrupt-generating modules and redundant group alarms. This transparency of the group alarm redundancy simplifies programming in the alarm cycle.

3.2.3 Cabinet Power Supply Unit



1 Circuit breakers (F) for:

F1 CPU I	F9 EE 1	F17 PÜ 1
F2 CPU II	F10 EE 2	F18 PÜ 2
F3 PBT 1	F11 EE 3	F19 Fan 1 for GS
F4 PBT 2	F12 EE 4	F20 Fan 2 for ES
F5 MDE 1	F13 EE 5	F21 Fan 1 for ES
F6 MDE 2	F14 EE 6	F22 Fan 2 for ES
F7 UI	F15 EE7	F23 Heat exchanger for GS
F8 Reserve	F16 Reserve	F24 Heat exchanger for ES

- 2 Socket outlets for keyboard and mini floppy disk unit
- 3.1 ML alarm logic module for CPU I
- 3.2 ML alarm logic module for CPU II
- 3.3 ML alarm logic module for ES
- 4 VD11 diode module (option)
- 5 SED 31 cabinet power supply diode
- 6 Local bus connector (connection distribution unit)
- 7 UI bus converter unit (option)
- 8 BL blinking clock-pulse generator module

Fig. 3.10 AS 235 H cabinet power supply unit

- Circuit breakers

These circuit breakers enable individual areas to be switched on or off.

- Socket outlets

These socket outlets supply the 24-V voltage required for floppy disk drives and keyboards (2 per operator input unit).

- Alarm logic modules (ML)

The alarm logic modules I and II perform redundant processing of the cabinet alarms over-temperature (ÜT), fan contact (LK) and door contact (TK) for CPU I and CPU II. The signals from door and fan contacts are branched to the inputs of both alarm logic modules and are thus available in both CPUs. The two temperature sensor contacts of the basic cabinets are connected individually to ML I and ML II in order to prevent the two CPUs from being switched off due to an overtemperature signal (which might be faulty)

A CPU is shut down one minute after the associated temperature sensor in the basic cabinet has signalled that excess temperature has been reached.

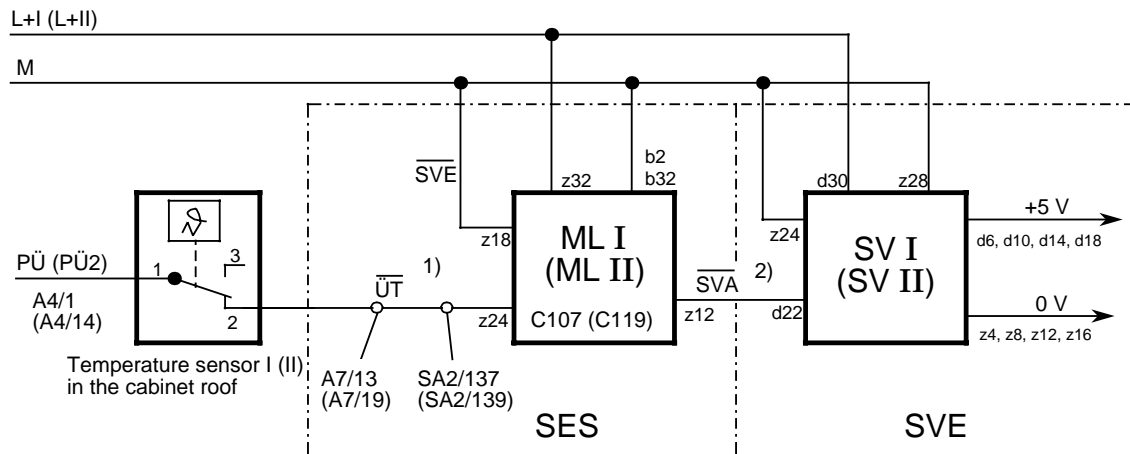
The effect of the separation is that a fault of one ML or of one temperature sensor is tolerated.

In asynchronous mode, an I&C alarm (LTM) (S340) is issued by the associated CPU if a temperature sensor has responded. In synchronous mode, an I&C alarm (S340) is only issued after the temperature sensor of CPU I has responded; an I&C alarm is not issued for CPU II. The 5-V voltage to the CPU concerned is switched off one minute after the associated temperature sensor has responded (see Fig. 3.11).

Since the system has no fan in its standard configuration, the fan signal is connected such that an alarm is not pending. If fan modules are to be used in the system (e.g. heat exchanger contact or rack fans), the LK input can be connected to the alarm signal line of a fan assembly.

Setting the jumper X10/3-14 on the alarm logic modules I and II causes the two central units to be switched off after 1 minute (as for excess temperature). As this jumper setting reduces system availability, it should only be used as an exception. A rack fan or heat exchanger has only one fan contact and can therefore not act selectively upon one CPU. This means that both CPUs would be shut down one minute after one of these contacts had closed.

The third alarm logic module is responsible for monitoring the fuses and the extension cabinet



1) "1" signal (24 V) in faultless operation

2) "1" signal (5 V) in faultless operation

Fig. 3.11 Shutdown of the 5-V voltage for CPU I (CPU II) after an overtemperature state has been detected (the values for CPU II are in parentheses).

- VD11 diode module

This module isolates static and dynamic fault alarms and feeds them individually to an alarm system. The signals may be ORed and used, for example, for triggering a conventional signalling system (KM 17).

- SED cabinet power supply diode

Redundant and isolated 24-V cabinet power supply is performed via two SEDs.

**Note:**

Only really independent external supplies guarantee the desired redundancy.

- Local bus connection distribution unit

This unit is used for connecting the local bus line inside the cabinet with a local bus line from external devices.

- UI bus converter unit

The UI bus converter unit is the remote bus interface which converts the signals of the 20-m local bus into the 4-km remote bus signals. The line redundancy of the CS275 bus system is completely independent of the redundancy selected for the N-AS/N8-H local bus interface module.

- Blinking clock-pulse generator module (BL)

This module has the following functions:

- it provides the blinking clock pulse for the EAVU and I/O modules;
- it performs the lamp test (LT) of the field devices (optional via user wiring);
- it isolates the time synchronization signals (external minute pulses).

Blinking clock pulse

The blinking clock-pulse generator centrally generates two blinking signals (for basic and extension cabinet). This makes the fault LEDs on the I/O modules and EAVUs to blink synchronously in the event of a failure.

The fault LEDs on both cabinets may also be synchronized by a corresponding selection on the blinking clock-pulse generator.

The two blinking signals are protected by the PÜ1 and PÜ2 fuses on the clock-pulse generator module.

The LEDs on the blinking clock-pulse generator module front panel indicate that the voltages for BS, LT and clock synchronization are available.

Lamp test

The LT switch feeds a lamp test signal for cabinet 1 (SK1) and cabinet 2 (SK2) to the I/O subrack. The lamp test signal is protected by the LTV fuse.

Time synchronization

The system time can be synchronized by external minute pulses which must be connected to the blinking clock-pulse generator.

The two external signal lines (signal line + reference potential) are to be connected to the two (floating) inputs d22 and z20 by flat push-on connectors (6.3x0.8 mm).

3.2.4 Power Supply Unit

The SED31 cabinet power supply diodes are used for setting up a fault-tolerant 24-V bus.

The following voltages are derived from this +24 V voltage:

- L+ CPU I (and 5 V for CPU I via SV I)
- L+ CPU II (and 5 V for CPU II via SV II)
- 8 x L+ for extension units (and 5-V bus via SVME)
- L+ for fans, ML and operator interface units
- +24 V supply for directly connected configuring keyboard (without PBT)
- +24 V supply for mini floppy disk unit (MDE) and process communication keyboard (PBT).

The power supply units (SV I and SV II) in the basic unit are fed by +24 V from the cabinet power supply unit (SES). They are protected by the SES circuit breakers which can also be used for switching the power supply units on or off.

Each extension unit is provided with L+ (24 V) and M (0 V) via a circuit breaker in the cabinet power supply unit.

A power supply module at the rear of each extension unit generates the +5 V required for feeding the I/O modules via the bus board from this voltage.

PM and PS are fed to the extension units via fuses on the EAVU.

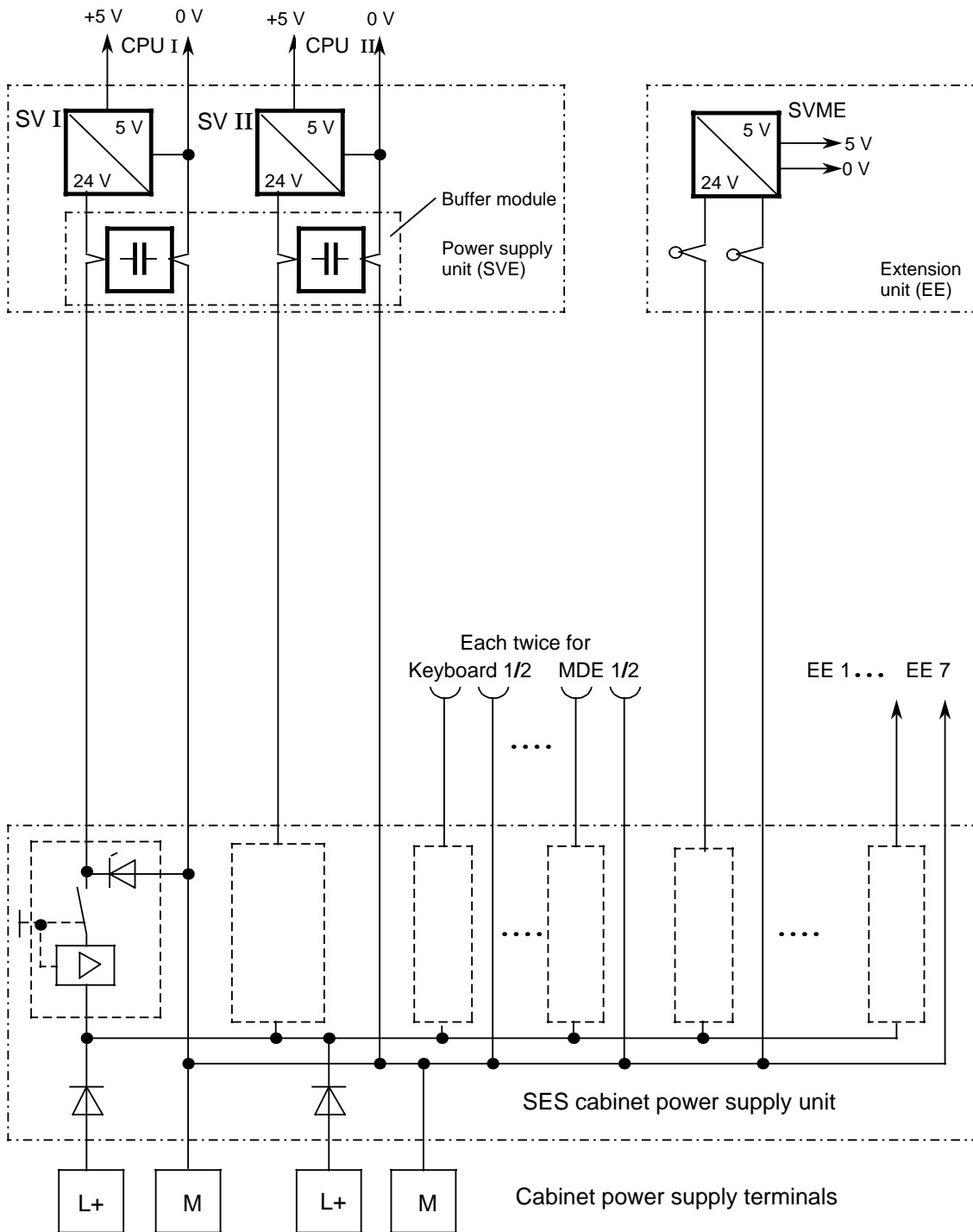


Fig. 3.12 Block diagram of the power distribution system in a cabinet

3.3 Failure

A fault locating diagnostic routine is started by an interrupt in each CPU if, during redundant operation, the system detects a discrepancy in the address, data or control signals of the two CPUs that has been caused by a hardware fault.

The following tests have been implemented in this diagnostic routine:

- CPU test
- test of the 8-bit bus
- test of the operator input channel interface modules
- test of the I/O bus
- test of the I/O bus interface modules
- test of all I/O comparator and switchover modules (EAVU)
- memory test

Fault finding may yield three different results:

- 1) The diagnostic routines cannot find a fault in either of the CPUs.
The master CPU retains mastership; the other CPU transitions to passive mode.
- 2) A diagnostic routine can locate a fault in its local CPU.
The master CPU transitions to failure mode and the standby CPU assumes mastership if the master CPU is faulty and in M/R or R/M state.
The master CPU remains in master mode while the other CPU assumes passive mode if the master CPU is faulty and in M/B or B/M state. (Fault finding cannot be performed in backup mode. The subsequent state is therefore passive mode.)
The backup CPU clears its user memory that contains inconsistent data if the fault has occurred in M/B or B/M state.
The non-master CPU transitions to failure mode if it contains the fault.
- 3) Both diagnostic routines locate a fault in their respective CPU.
The master CPU remains master, and the other CPU assumes failure mode. (This result is very unlikely as it implies a double fault.)

The CPU goes to STOP, and the other CPU assumes mastership at once if the diagnostic routine finds a fatal hardware fault.

A fault in backup mode causes the backup CPU to perform a restart which clears the user memory. Fault finding in the backup CPU is not performed in this case.

Fault finding is not performed either if a fault occurs during loading in synchronous operation. Loading is aborted, and both CPUs clear their memory contents.

The system responds to a fault after approximately 1 to 50 milliseconds (depends on the fault). The user program is not executed during this time which is required for executing fault finding routines (dead time).

Automatic synchronization after unsuccessful fault finding can be parameterized (see Chapter 2.5.1.1 in the AS 235 H Description, C79000-T8076-C484, in the Manual C79000-P9076-C084).

Since, in synchronous operation of CPU I, keyboard inputs are not read from BKA 2 or, in synchronous operation of CPU II, keyboard inputs from BKA 1 (by the USARTs), the following I&C alarms can be issued after both CPUs have entered asynchronous operation:

CPU signals: SYST.E3 * S 331
 SYST.E3 * S 312

CPU signals: SYST.E2 * S 330
 SYST.E2 * S 312

This indicates a character overflow in the USART of the corresponding BKA. It is thus possible that the last keyboard input of the corresponding operator input channel has not been received correctly. Input should then be repeated.

3.3.1 Fault Delimitation

According to the requirements placed on a fault-tolerant system, the AS 235 H has its delimited (comprehensible) fault areas. Due to the fault-tolerance of the system, any hardware fault (provided that it does not occur repeatedly) can only cause a loss of redundancy. This only applies to an individual I/O module in the I/O system if a second redundant I/O module has been configured.

The fault delimitation areas (central processing unit, extension unit) are isolated from one another; a fault in a specific area has therefore no effect on other areas.

Early fault detection has been considered an important point in the implementation concept of fault delimitation and tolerance. It has been made possible by comparing in each cycle the data that has been processed in both CPUs.

Despite swift detection of individual faults, delays in process execution may occur after a fault has occurred (dead time 1 to 50 ms, typical: 5 ms). This dead time can be caused by fault locating software routines which delay input scans or output changes.

3.3.2 System Behaviour

Both CPUs read and write their data synchronously in normal or redundant operation.

Comparator coupler module (VKB) and I/O comparator and switchover modules (EAVU) monitor synchronous operation (data identity). The VKB or an EAVU sends a **PU5 interrupt** to both central processing units if it detects a discrepancy on the monitored system buses. As a result, both CPUs halt process execution.

Initiated by the PU5 alarm, the (identical) software stored in the memories of both CPUs begins a fault locating routine which scans the other CPU for primary fault signals. The faultless CPU assumes (or retains) mastership, and process execution is continued if the fault can be located during this procedure.

If the primary fault location does not yield the expected result, either CPU starts a selftest which includes the CPU itself, the memory module and the data paths to the process level, including the EAVU.

While the primary fault location is terminated after a few milliseconds, the extensive selftest routines may cause long delays in process execution (up to a dead time of 50 ms).

Any fault which is detected by permanent comparison causes asynchronous operation of the two CPUs. The same result can obviously be achieved by direct intervention (e.g. deactivating or resetting one CPU). Asynchronous operation means that all connections between the central processing units (including I/O buses) are cleared. Comparison is not performed either. In order to facilitate fault location, address and control signals are written into dedicated registers on the VKB and EAVU modules at the moment when the fault occurred. These registers are then used as starting points for fault analysis.

Once they operate asynchronously, both subsystems react as two individual systems. The fault tolerance in the CPU has ceased until the next synchronization run is performed.

- The three signals NAU, DS, ZRS

Three signals - NAU, DS, and ZRS - enable the CPU to be started or stopped in a controlled manner:

- NAU = power failure alarm
- D = data save (protective signal for the memory module)
- ZRS = central reset

Once the processor recognizes an active **NAU** signal, it terminates the currently executed instruction and becomes inactive. The next instruction from the memory is not executed. The memory is disabled by the **DS** signal once the last instruction has been terminated. The above signal sequence is maintained when the system is switched on. The CPU cannot access the memory as long as the memory is disabled by an active **DS** signals.

The supply voltage disappears:

- NAU** becomes active: A certain time is left for the central processor to terminate instruction execution.
- DS** becomes active: The memory is disabled. The processor can neither read from the memory nor write into the memory.

The **ZRS** signal causes the central processor to start from a defined basic state or to remain in this state.

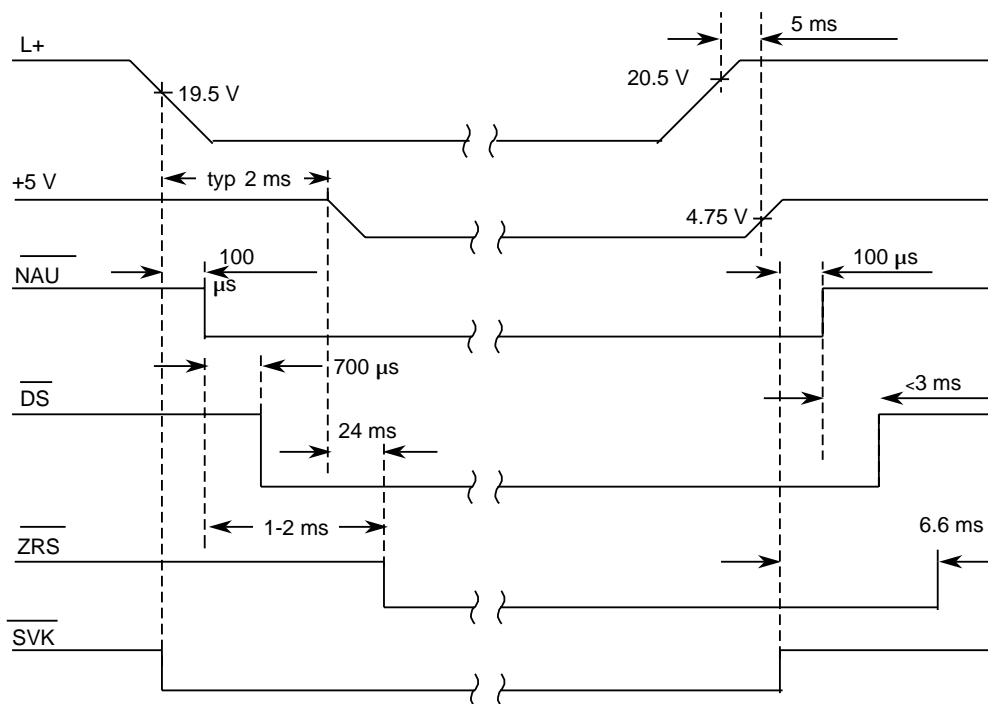


Fig. 3.13 Control signals from the power supply module to the central processor

A minimum delay of 700 µ is necessary between the NAU and DS edges when the power supply unit is switched off.

The central processor first executes an initialization routine after the supply voltage has been switched on or recovered after a failure.

- Indications and messages

A system message can be a status or fault message from the system. In the event of a failure, the cause of the fault is determined and signalled by system routines during operation. A code is displayed on the VDU message line after each fault message. This code can be used for analyzing the fault.

The codes and the associated explanations can be found in the AS 235 Description (AS 235: C79000-G8076-C416).

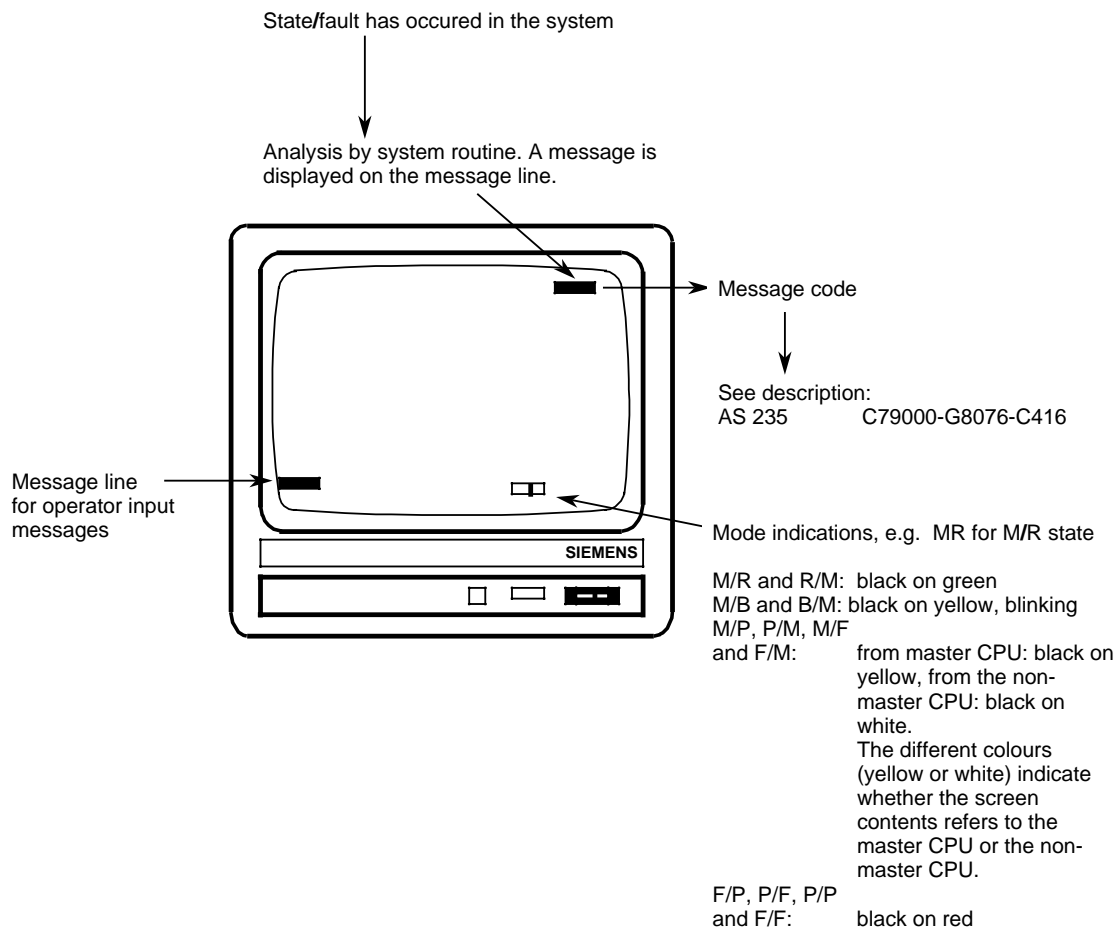


Fig. 3.14 System message on the color monitor

Fault messages as a reaction to command inputs are displayed on the operator input message line.

Example:

An attempt has been made to file the RAM contents on a floppy disk which has not been formatted properly.

The system detects this deficiency and issues the error code F447 on the VDU message line once the filing command has been entered.

In the AS Description, error code F447 is explained as "floppy disk not formatted".

Certain functions and faults are indicated on the EAVU and the central processing unit modules in addition to the system messages on the monitor.

- Memory module (SP)

The mode or faults are only indicated during initial loading.


LED		Function/fault
red	green	
OFF	ON	Initial loading in progress
OFF	OFF	Initial loading terminated without fault
Blinking	OFF	No system floppy disk
ON	OFF	Fault: <ul style="list-style-type: none"> - mini floppy disk interface defective - drive not ready - file 1 defective - backup file defective - label read error - checksum error
ON	ON	Defective RAM module or floppy disk

- CPU 235 H

The STOP lamp indicates a stop of the CPU which has been caused by a memory fault or a hardware fault in the central processing unit.

The CPU can also be stopped after start-up if the user memory structure has been disturbed by illegal interferences.

The CPU is set to a defined stop before an indicated power failure (NAU) occurs.



Caution

The CPU may also be stopped by "Halt" input (in STO mode). ZRS returns the CPU to RUN mode (during service work only).
In "halt" state there is no further processing because there is no redundancy.

– Mini floppy disk interface module (MDA)

The red LED is lit during the start-up phase of the module.

The module is ready when the LED is extinguished. The LED lights up if a fault is detected during initialization.

A defect in the FIFO, RAM or FDC is indicated by the following blinking sequence:

- | | |
|--------------|--|
| 1 x blinking | FIFO defective (queuing hierarchy disturbed) |
| 2 x blinking | RAM defective (write/read memory defective) |
| 3 x blinking | FDC defective (floppy disk controller defective) |

The module is defective in all these cases.

- I/O bus interface module (EABA)

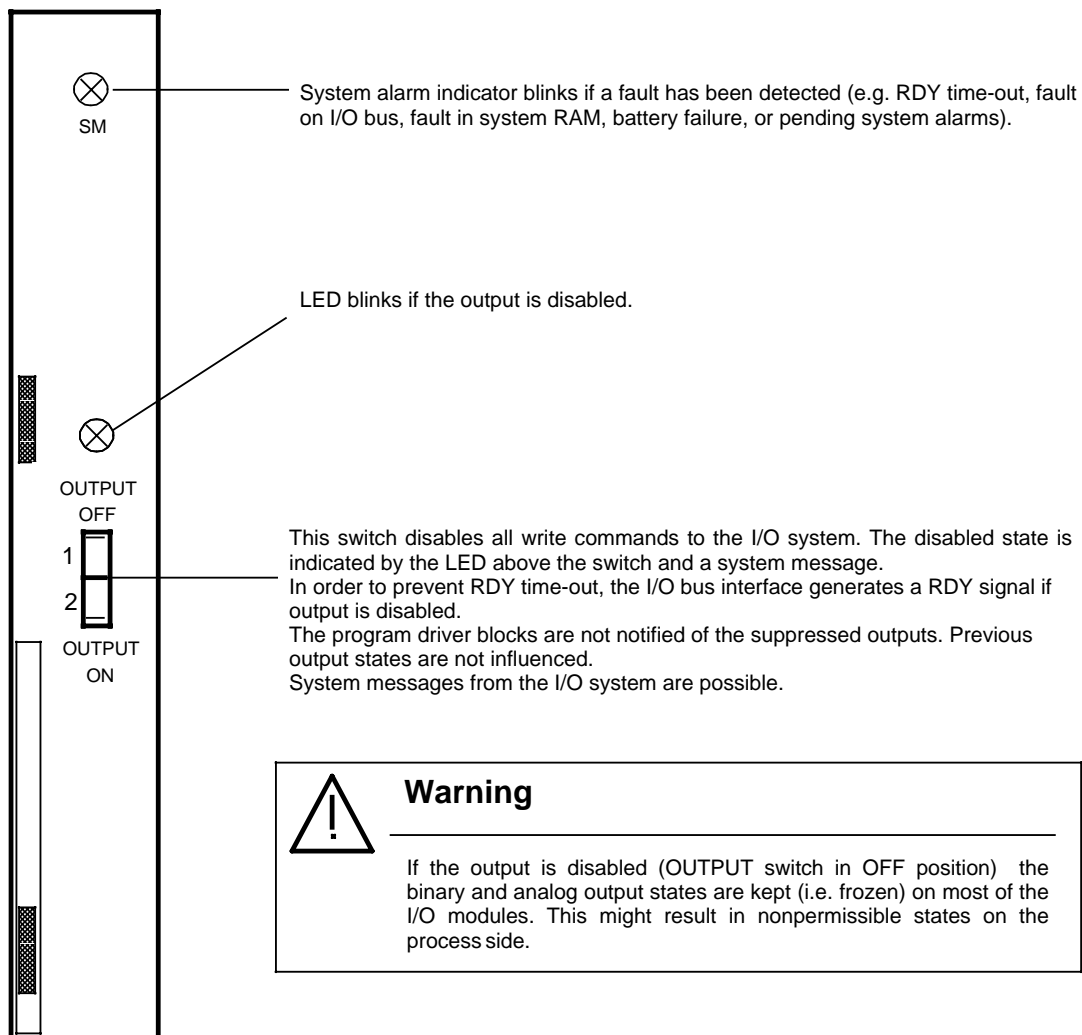


Fig. 3.15 EABA front panel (6DS1 312-8BB)

- Comparator coupler module (VKB)

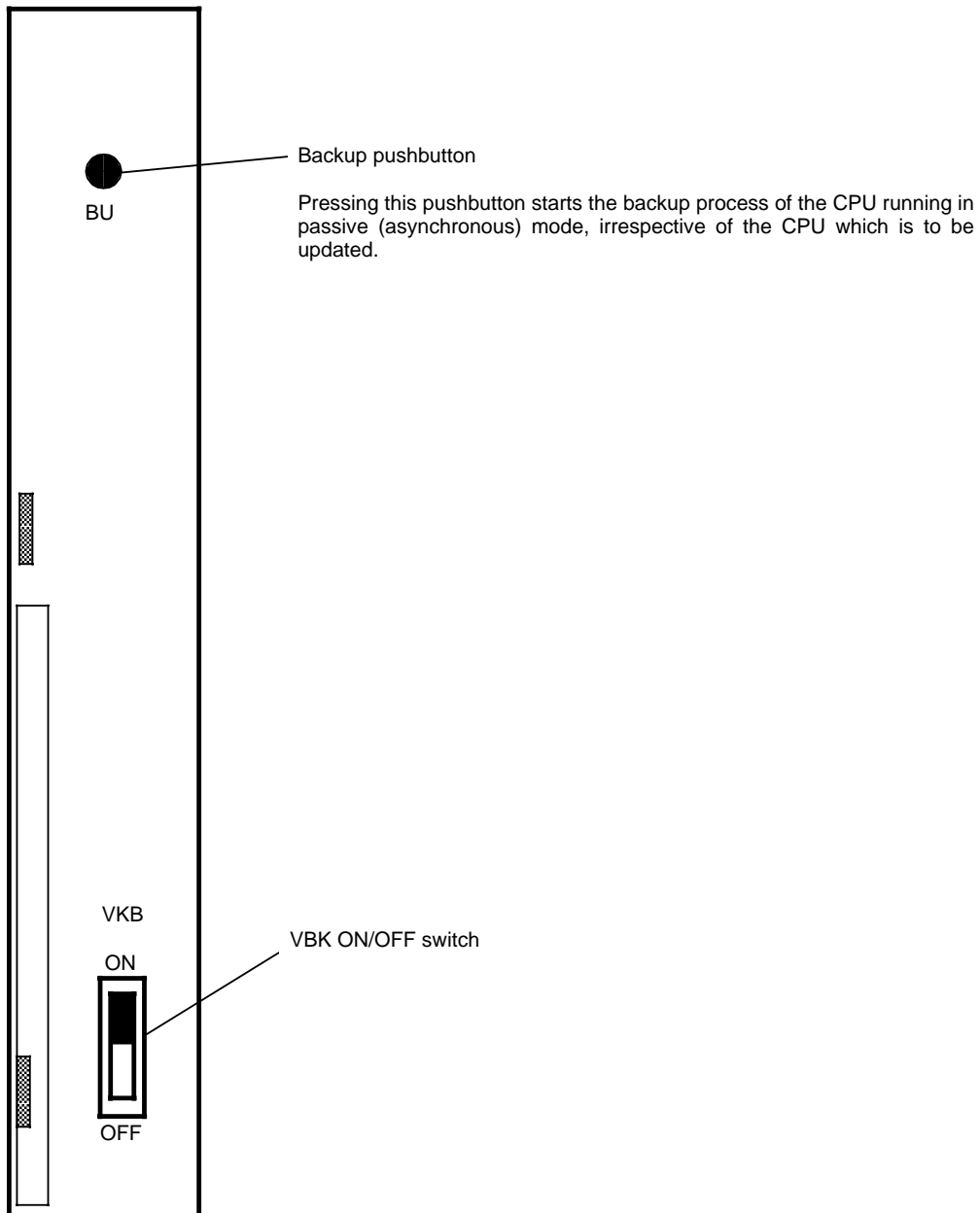


Fig. 3.16 VKB front panel

The states and messages stored on the module are read and may be output via monitor or printer.



Caution

The comparator coupler module (VKB) may only be removed during operation after the front panel switch has been set to AUS [OFF].
The switch may only be actuated in asynchronous operation.

– Synchronization module (SB)

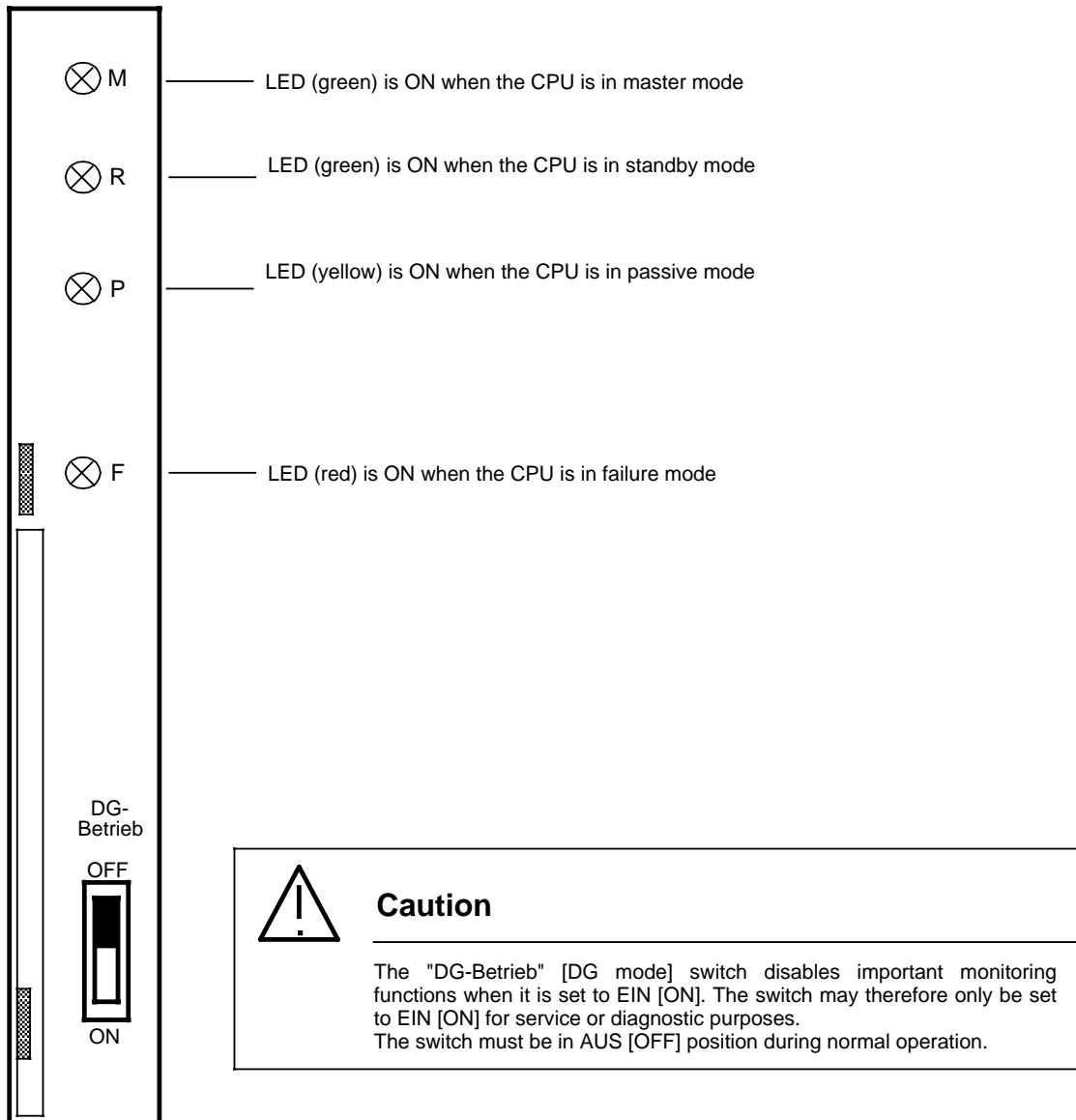


Fig. 3.17 SB front panel

The P and R LEDs light up simultaneously if one of the CPUs is in backup mode. All LEDs are OFF for approximately two seconds during start-up.

An LED failure can be detected by comparing the mode indicators on the SB modules with the mode information on the monitor.

The states and messages stored on the module are read and may be output on the monitor or printer.

- I/O comparator and switchover module (EAVU)

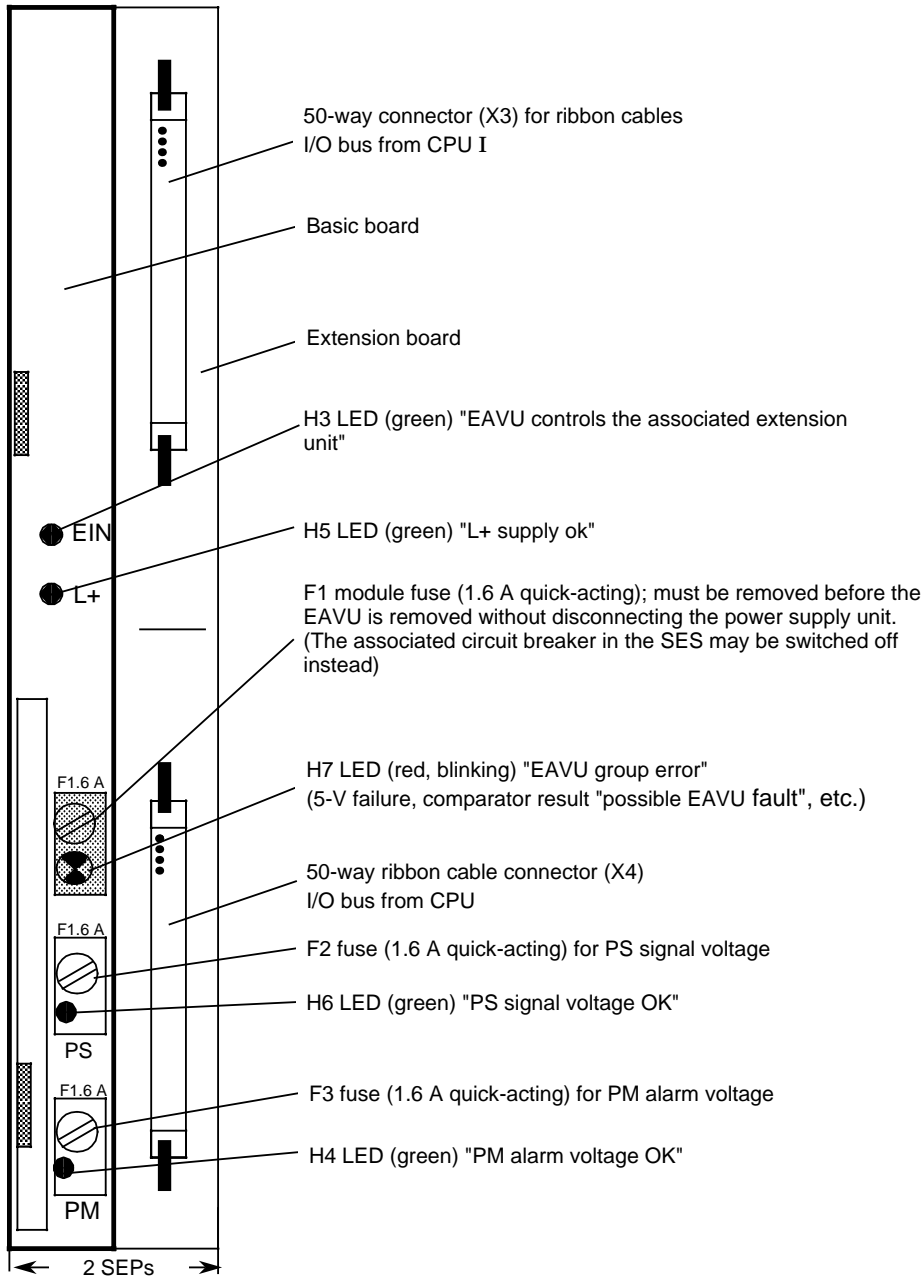


Fig. 3.18 EAVU front panel

3.3.3 Cold Restart, Warm Restart

The following reactions are possible after a CPU restart in the AS 235 H automation system has been performed:

- Restart after a power failure

There are two possibilities for a restart after a power failure:

RAM is battery-backed: The system continues operation with the interrupted user structure once voltage has recovered. The individual cycle levels are restarted for execution. The internal time-of-the-day is cleared with 6DS1837-8.. operation.

RAM is not battery-backed: The system clears the entire RAM area and is ready for loading after voltage recovery. This means that the system software must be loaded.

- Restart after a processor reset (ZRS)

A hardware reset that has been initiated by pressing the ZRS pushbutton on the CPU module has the same effect as a restart after voltage recovery. The mode at the moment when ZRS was pressed is retained (STA or STO mode, i.e. block execution started or stopped). The connected standard and process peripherals are put in their initial states.

- Restart after a system software reset (RSOF)

"RSOF;" input is only accepted by the system after execution has been stopped in the automation system ("STO;" input). RSOF re-organizes the whole main memory. The memory is compressed and any gaps that have been caused by configuration and programming (clearing blocks and instructions) are removed. The system is in STO mode once re-organization has been terminated; the time-of-the-day is retained.

The system starts a **one-time** execution of all specified RESTART programs during each restart. The user must specify his special requirements for such a case in separate RESTART programs in order to prevent difficulties during restart.

The following points must be observed if filing must be performed in STA mode (i.e. in on-line mode):

- I&C alarms may not be pending (enter QF; to check).
- The filed memory contains the latest states of all field devices connected.
- This data is used when such a dump is re-loaded.
- The user must ensure that the field devices of such a system are set to defined states when the system is restarted. This should be implemented in RESTART programs. These include, for example:

- Setting process image default values
- Establishing defined actuator positions
- Setting controller modes, etc.

The mode after start-up may be master, passive or failure. Cf. Manual (C79000-G8076-C416).

4 Installation

4.1 General

TELEPERM M is a distributed system. The cabinets are designed for the ambient temperatures prevailing at the point of installation. They are fitted with modules and are system-tested before shipment. Any transportation damage to the cabinets or their contents must be reported to the sales department without delay.

Rooms intended for the installation of cabinets should be amply dimensioned and should have a clear height of about 3 m for effective removal of the heat loss and to permit top cable entry if required.

The clear openings required for hauling the cabinets into the rooms must be at least 2500 mm x 2000 mm for three-unit cabinet groups (2500 x 1000 mm for individual cabinets).

Cabinet rooms should be air-conditioned if the specified ambient conditions cannot be met.

Anti-dust floor coverings having a discharge resistance of 10^8 must be used. The corresponding value for control rooms with AS 235 H systems should preferably be 10^7 . The indentation hardness should be 80 to 100 N/mm². Free-standing cabinets in large factory areas should be installed at a distance of at least five meters from interference sources (e.g. welding stations, transformers, power converters, or relays).

The installation team verifies before installation whether the required values are met.

Earthing and screening regulations must be met in order to enable a noise-immune function concerning the electromagnetic compatibility (EMC) to be maintained.

When connecting external units, no connection is permitted between the local earth or the protective earth of the units and the signal lines to the cabinet. Exception: isolating inputs or outputs.

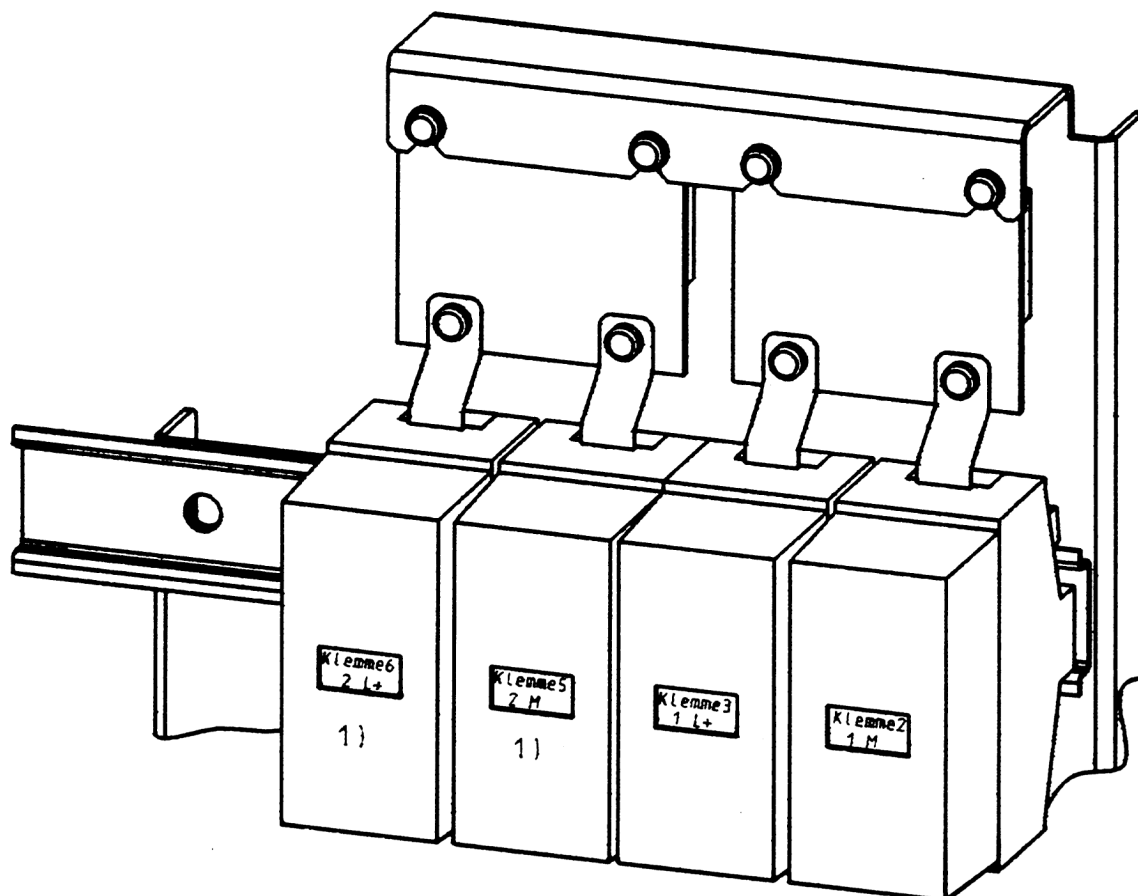
Measuring and signal cables must be laid separately from power or high-voltage cables.

All signal lines must be screened; both ends of the screens must be connected to earth.

The system supply voltages must be switched off when the system is installed.

Rooms intended for the installation of operator control and monitoring units must be adequately ventilated and illuminated.

4.2 Connecting the Supply Voltage



- L+ 24 V cabinet supply voltage
- M Reference potential of the 24 V
- 1) Option

Fig.4.1 Assignment of cabinet supply terminals



Caution

Only voltages "generated in an electrically safe and separated manner" may be used as supply voltages.

The supply terminals are accessible from the rear. They accommodate multi-core conductors with a cross-section between 35 and 120 mm².

4.3 Grounding Concept

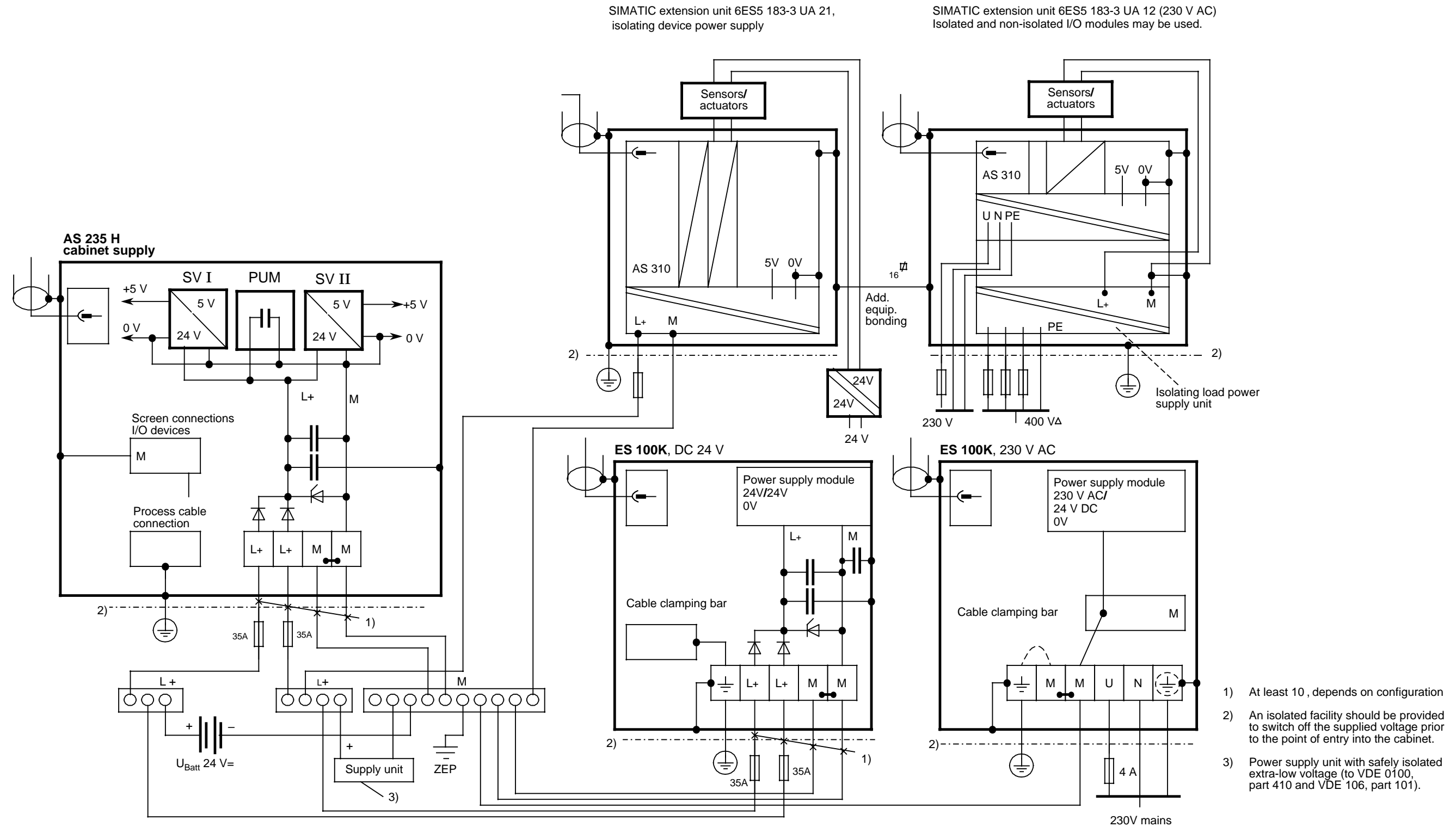


Fig. 4.2 Connecting the AS 235 H system with other systems

4.3.1 Central Grounding Point

The central grounding point consists of two bars for

- M Reference potential of L+
- E Ground

The two bars are connected by removable straps. Switch off the system, remove the straps, and check for ground faults if necessary.

The central grounding point should be installed in the vicinity of the location where most of the cabinets have been installed. A suitable place is, for example, the room that accommodates the 24-V DC power supply.

Connect the central grounding point via several grounding cables (e.g. copper cables of 70mm² each) that have been laid as straight as possible with different points of the grounding network of the internal building grounding system. Star-shaped grounding is preferred, loops should be avoided (see Fig. 4.4).

Choose short ways between the central grounding point, the 24-V system, and the electronics cabinet.

The required minimum conductor cross section of power supply cables is 35 mm² provided that the configuring department does not require larger cross-sections. Screened cables should be used if the distance to the 24-V system is greater than 25 meters or if interference is to be expected. The screen should then be connected to ground at both ends (see Fig. 4.5).

Connect the screens of process cables via incorporated screen bars to the grounding point of the building ground with 4 screw connections (see Fig. 4.3).

The screen connections of bus components and peripherals are directly connected to cabinet earth.

The screens of the measuring and signal cables are only connected inside the same grounding area (central grounding point).

Cabinet mounting frames (e.g. anchoring rails, flat or U-shaped steel bars) must repeatedly and via different paths be connected to the grounding line. The mounting frames for adjacent rows of cabinets must be linked by additional transverse bars (e.g. made from hot-galvanized steel tape, 305 mm; at distances of approx. 2 meters, see Fig. 4.4). Ensure, when installing the cabinets on a false floor, that the supporting structure represents a conductive connection of the cabinet rows.

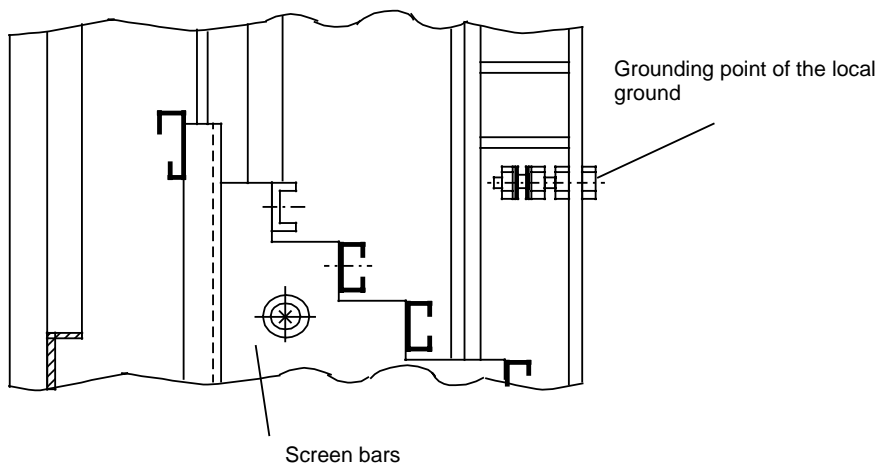


Fig. 4.3 Ground connection of screen bars

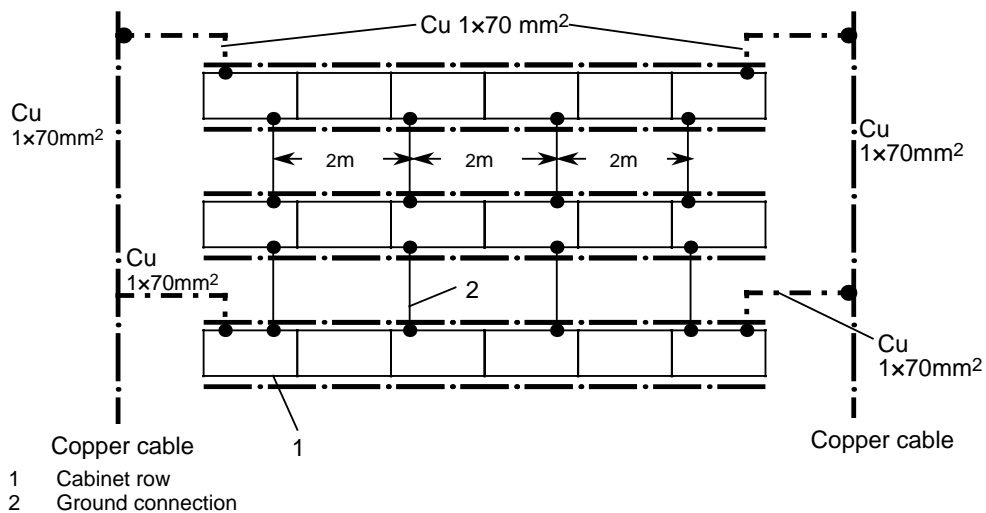


Fig. 4.4 Grounding of cabinet rows

If rectifier units are used for producing the DC 24 V voltage for the components of the TELEPERM M process control system, these supplies must be connected to a TN-C or TN-S mains to VDE 0100 part 310.

Connect the star point of the primary circuit of the supply unit to N or PEN of the mains.

Please contact the configuring department if there is an IT mains without N on site.

In order to guarantee protection against hazardous electric shocks, the DC 24-V voltage and the devices with a metallic enclosure that are fed by the 24-V DC must satisfy the requirements placed upon "functional extra-low voltages" with safe isolation to VDE 0100, part 410.

The cabinet itself must be connected to the protective ground conductor via the ground connection provided:

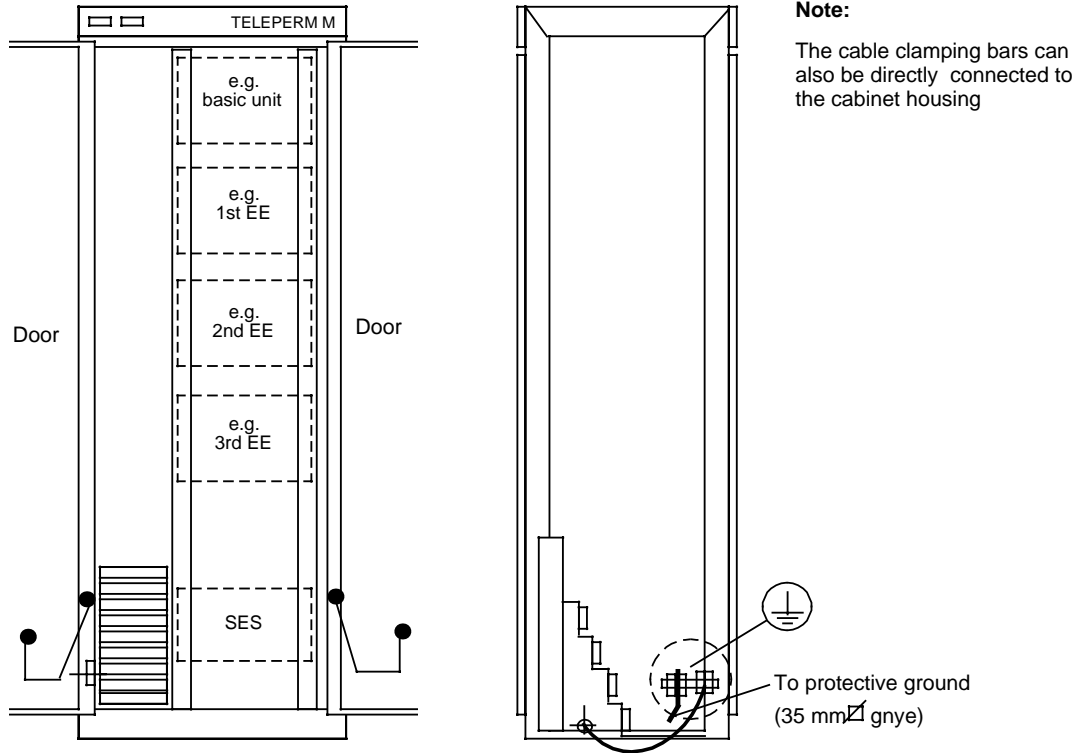


Fig. 4.5 Connecting the cabinet to protective ground

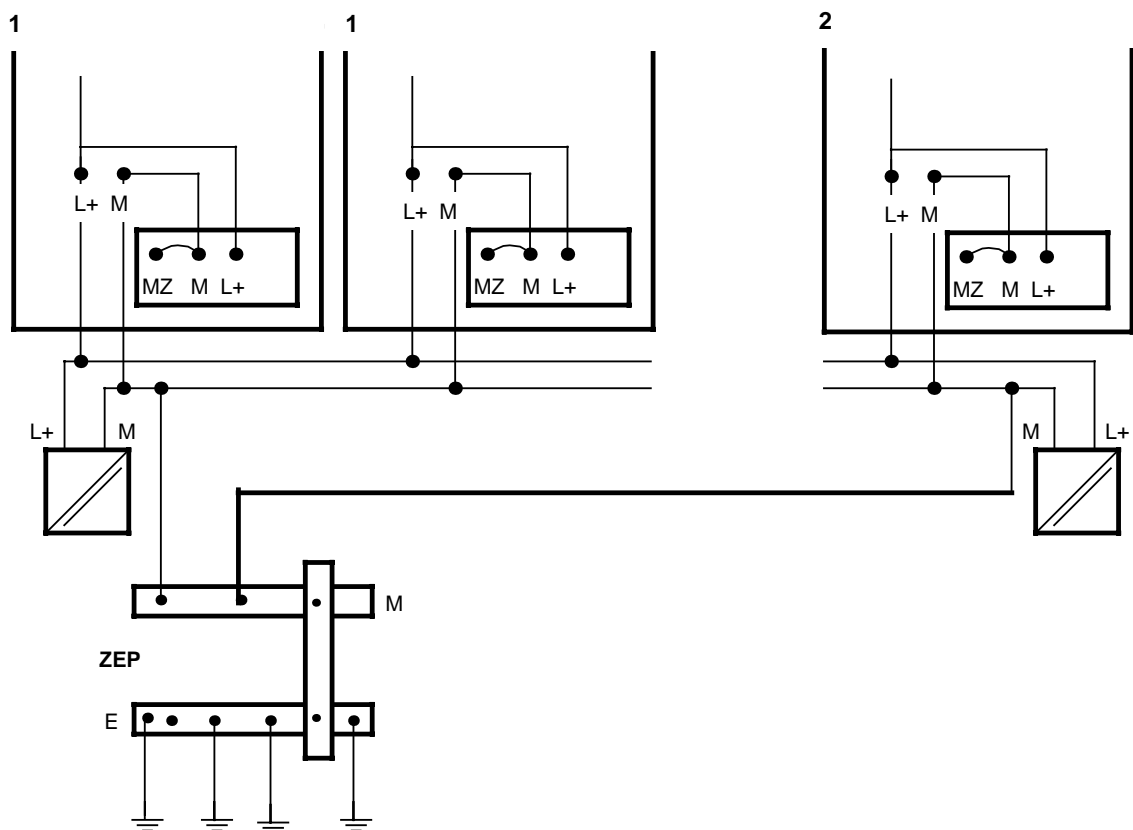
If possible connect each cabinet to the grounding system via a copper cable 16 mm². While cabinet groups up to 3 m require at least one connection, cabinet groups that are longer than 3 m must be grounded at both ends. It is assumed that all metallic enclosures of subracks and modules inside the cabinet be connected with the grounding connection.

4.3.2 Grounding the M Potential

The M bars of all 24-V switchgears are combined at the central grounding point and connected to the grounding bar via a removable strap. The reference potential M has thus only one common point with ground.

A system which is known as "0-V islands" is set up inside the cabinets. A 0-V island consists of one or more electronic unit(s) with a common M or MZ. A 0-V island is always assigned to a power supply unit.

Data communication between the individual devices of a 0-V island takes place via the 20-m local bus. The 0-V islands of a system are interconnected via the 4-km remote bus. Direct connections for analog or binary signals are possible between two 0-V islands. The signal connections must either be of high impedance or electrically isolated in order to avoid equalizing currents on the signal lines.



- 1 Two islands with a common power supply unit
- 2 One island with a separate power supply unit
- M Current-carrying earth
- MZ Dead earth (for voltage measurement only)

Fig. 4.7 Grounding the M potential

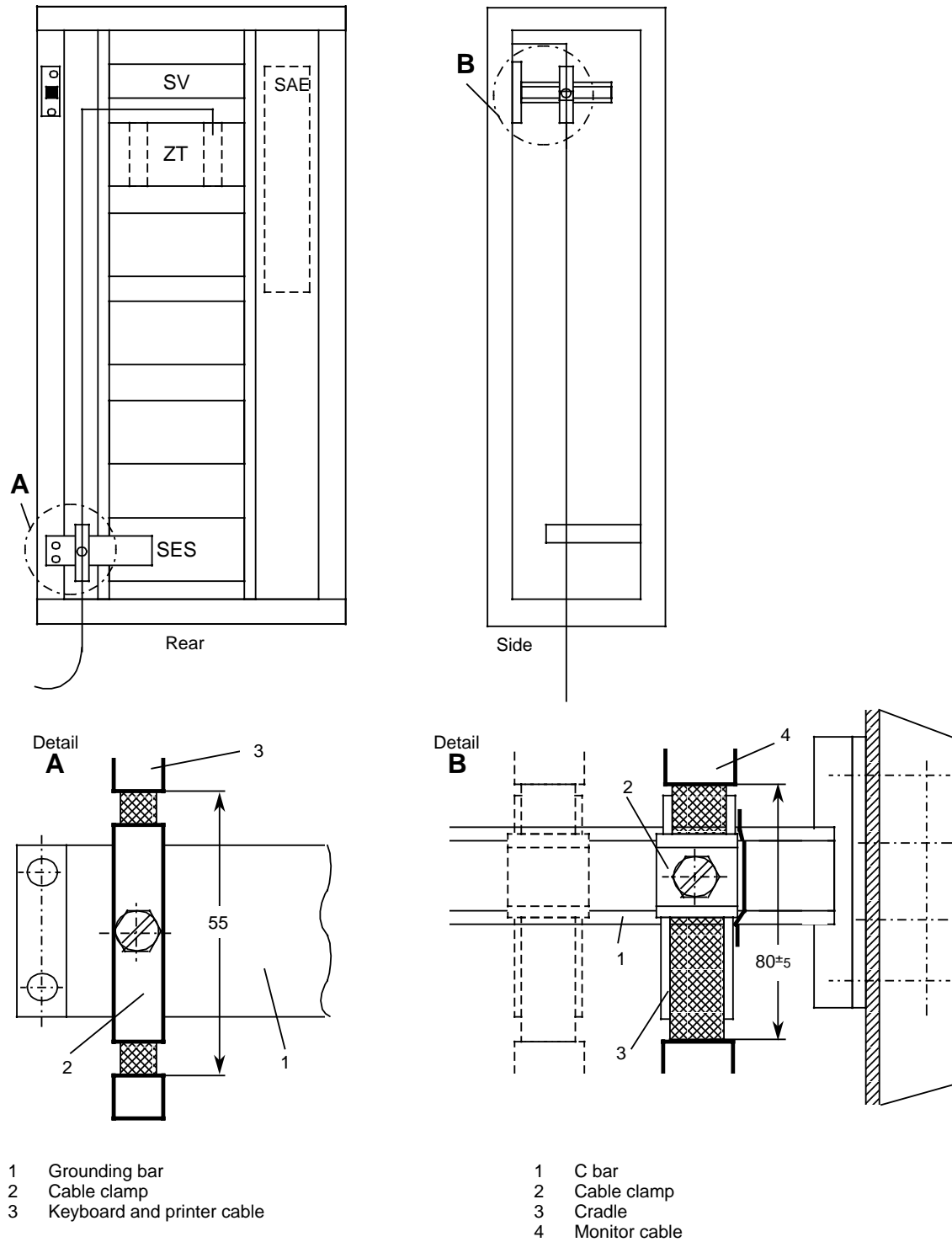


Fig. 4.8 Connecting cable screens of monitor, printer and keyboard cables

The end of the monitor cables inside the cabinet should be long enough that they can either be connected to the video relay output or to the corresponding input of the operator input channel interface module.

4.4 Connecting the Process Signal Cables

Process signals must always be conveyed on screened cables and separated from circuits that carry voltages above 60 V. The cables must consist of twisted pairs; each signal circuit should be connected to one pair. Crosstalk can be avoided if separate cables are used for analog and binary signals. Analog position feedback signals and actuator limit switch signals can be combined in one cable.

The process cables enter the AS cabinet from the top or the bottom. The cable screens must be connected to the cable clamping bars. Distinction must be made between braided screens (Fig. 4.11) and foil screens (Fig. 4.12). The process cables are connected in maxi-termi-point technique to the SAE process connection element or directly to the extension units.

- Cable types

Any installation cables for industrial electronics (SIMATIC cables) with twisted pairs of colour-coded cores grouped in bundles may be used as process signal cables. These cables with stranded or solid core (0.5 mm² cross section, 0.8 mm diameter) have a static screen.

Cable designation	Used for
A-Y (ST) YY n x 2 x 0.8/1.4 BdSi	Underground cable routing ¹⁾
J-Y (ST) Y n x 2 x 0.8/1.4 BdSi	Normal applications
J-LiYY n x 2 x 0.5/1.6 BdSi	Miniaturized control rooms
J-LiYCY n x 2 x 0.5/1.6 BdSi	Vibration and shock, connectors

¹⁾ Underground cable routing is not recommended. If underground routing is absolutely necessary ensure that the transmitted signals are not corrupted.

A	Outdoor cable
C	Braided screen
Bd	Bundling
Si	SIMATIC colors
J	Installation cable
(ST)	Static screen
Li	Stranded conductor
Y	PVC insulation

Table 4.1 Installation cables for industrial electronics

- Core color code

The twisted pairs are identified by the eight basic colors of the insulator.

Core	1	2	3	4	5	6	7	8
Pair	1		2		3		4	
Color	bl	rd	gr	ye	gn	br	wh	bk

bl - blue
 br - brown
 bk - black
 gn - green
 gr - grey
 rd - red
 wh - white
 ye - yellow

Table 4.2 Basic colors of the core insulators in a bundle

One color group consists of four pairs that make up a bundle. The individual cores of a bundle have an additional ring code which helps avoiding confusion of the same color from different bundles. Bundle count starts with the inner layer.

- Laying process cables

Process cables should be laid in earthed cable racks, separate from power cables (200 mm minimum clearance). Outdoor cables should be laid in cable ducts; they must be provided with an additional earthed screen (armour). All cores must be provided with suitable surge protectors (lightning) at the building entry point (see the applicable regulations for lightning protection).

Units which are connected via process cables may not generate any interference voltage. The connections of relays or solenoid valves, for example, which are controlled by binary outputs must therefore be provided with suitable protective circuits (anti-surge diode, VDR) that are directly connected to the units.

- Connections via signal distribution cabinets or directly to the process termination panel

Process cables may be directly connected to the SAE cabinet connection element or to the MTP pins of the extension unit (female multi-point connector with pins 0.8 x 2.4 mm for solderless termi-point connections).

Special signal distribution cabinets are available which provide a clear interface between the process and electronic cabinets. The individual cores may be separated in these cabinets and, using appropriate marshalling facilities, be rearranged such that a dedicated core bundling for the individual cabinets can be achieved.

Bundle No.	Ring color	Ring group / Code	Bundle coil
1 2 3 4	pink		—
5 6 7 8	orange		—
9 10 11 12	violet		—
13 14 15 16	pink		blue
17 18 19 20	orange		red

Fig. 4.9 Core bundle identification

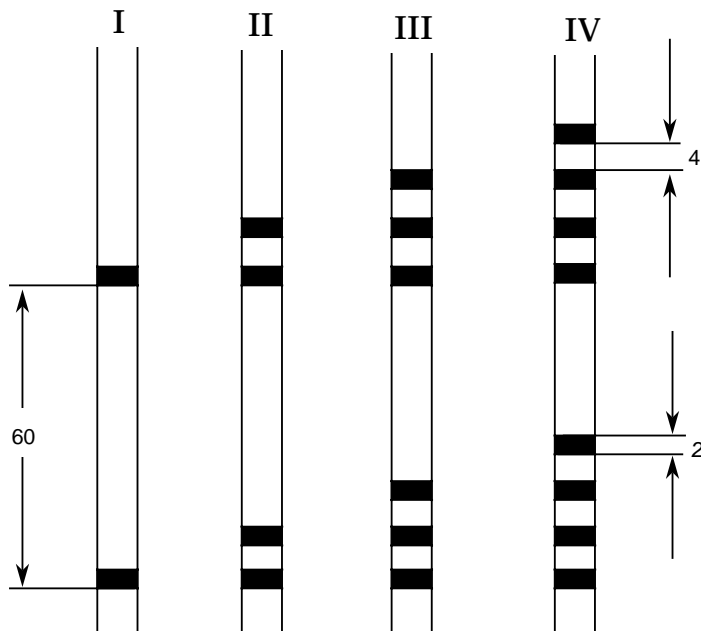


Fig. 4.10 Core identification, ring groups

- Connecting cables with braided screens

Approximately 50 mm of the outer sheath must be removed from the area where the screen is to be connected.

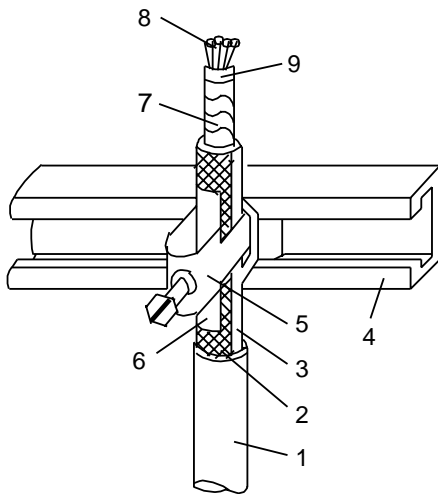
Use a cable clamp and two cradles to attach the cable to the cable clamping bar. One single clamp may also be used for fixing two thin cables. The insulation should possibly not be removed before the process termination panel where the individual cores can be separated.

In order to ensure a large-surface contact, cable clamps with cradle and counter-cradle should be used [e.g. PUK, Köln Werke GmbH, model "H" cable clamp, "K12" (12) to "K20" (20) and cradles "LW12" (12) to "LW20" (20)].

One set of cable clamps and cradles is supplied with the equipment.

Additional installation material must be ordered according to the cable specifications.

Remove the plastic elements from the clamps.



- 1 Signal cable with braided screen
- 2 Braided screen, insulation removed over 50 mm
- 3 Cradle (e.g. PUK,model H, type LW12...LW20), 40 mm long
- 4 Cable clamping bar
- 5 Cable clamp (e.g. PUK, model H, type K12...K20)
- 6 Clamp cover, screw adjustment
- 7 Sheath
- 8 Pairs to the MTP connections
- 9 Adhesive tape or sleeve

Fig. 4.11 Connecting cables with braided screens

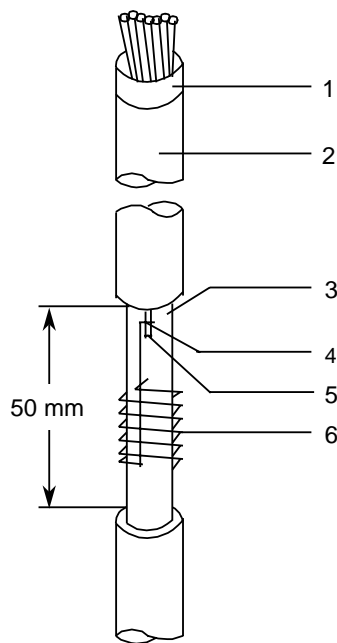
- Connecting cables with foil screen

Approximately 50 mm of the outer sheath must be carefully removed (do not damage the foil screen).

Solder a length of tinned wire (0.8) to the exposed pull wire and wind the tinned wire closely around the exposed foil (see Fig. 4.12).

Use a cable clamp for connecting the foil cable to the screen support (see Fig. 4.11).

Do not overtighten the cable clamp screw, the foil screen might be damaged.



- 1 Adhesive tape or sleeve
- 2 Sheath
- 3 Foil screen
- 4 Soldered connection
- 5 Exposed pull wire
- 6 Wire coil (e.g. tinned wire, 0.8)

Fig. 4.12 Connecting cables with foil screen

4.5 Using the Bus Components

The CS 275 bus system enables information exchange between the devices of the TELEPERM M process control system over a distance of 20 m (local bus) or 4 km (remote bus). The local bus is redundant in its standard version; the remote bus can be made redundant if required.

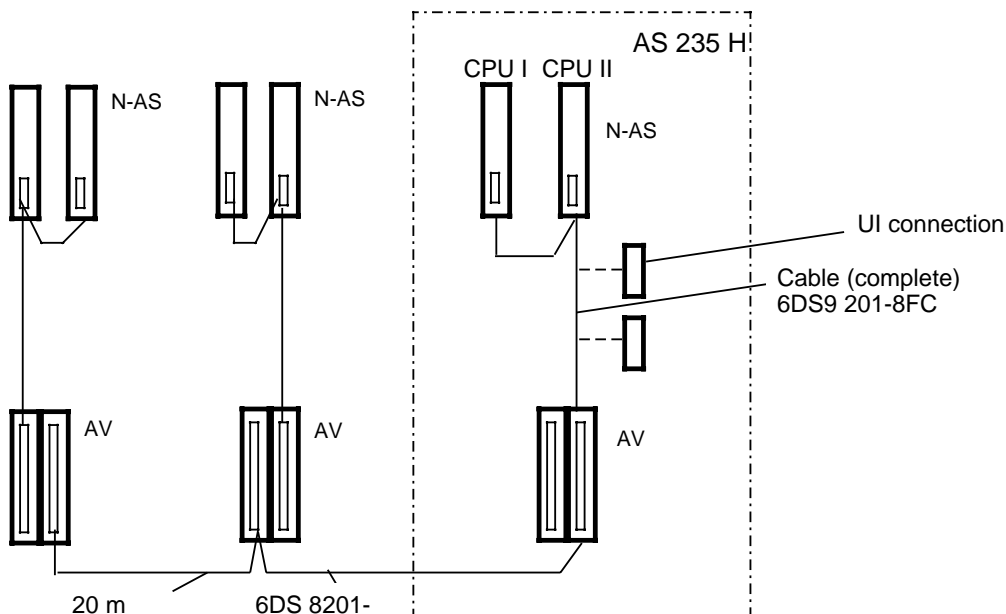


Caution

The maximum distance between devices on the local bus is 20 m; the earth potential difference between the systems may not exceed 0.2 V.

Further remote systems can be interconnected via the 4-km remote bus (inductive connection). Up to 32 local buses with up to 99 participants can communicate with each other. More details concerning the CS 275 bus system in the Manual CS 275, Order No. C79000-G8076-C006.

4.5.1 Local Bus



AV = Connection distribution in the SES

Fig. 4.13 Local bus connection

The AS may be linked with other AS or OS systems via the local bus interface module 6DS1223-8AA (N-AS) or 6DS1220-8AA (N8-H) and the connection distribution unit. The connecting cable between the systems has only a connector at one side; the open end must be connected to the connector of the next connecting cable (1:1 with regard to core color code and number of rings). A single front connector 6DS9 200-8AA must be connected to the open end of the last connecting cable.



Caution

The S11 and S12 switches must be set to EIN [ON] position if N-AS/N8-H is used. Both switches must be set to AUS [OFF] if an N-AS/N8-H module has not been installed.

The S11 and S12 switches on the basic unit backplane are accessible from the front if the N-AS module has not been installed.

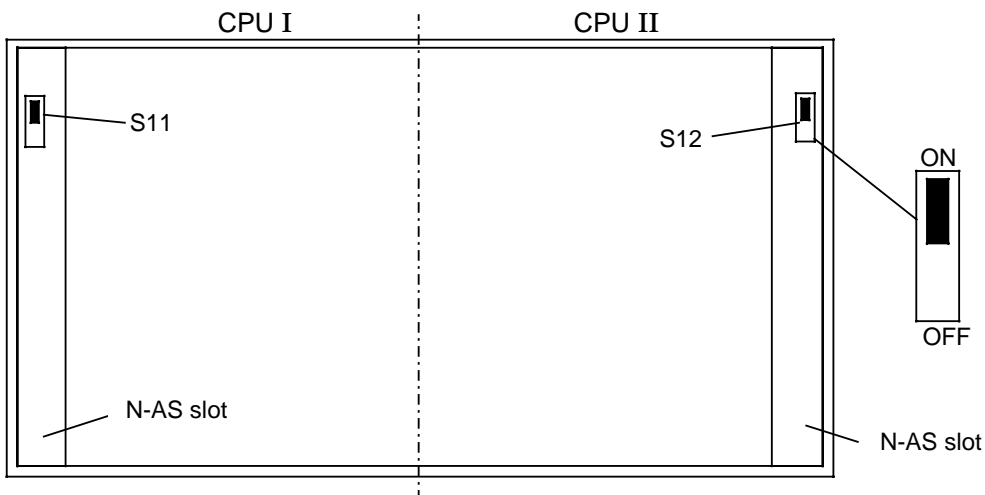


Fig. 4.14 Location of the S11 and S12 switches

4.5.2 Remote Bus

- UI bus converter unit

The inductive bus converter unit (UI) 6DS4400-8AB is the active element on the remote bus of the CS 275 bus system. It is the link between the remote bus and the local bus line which converts the remote bus protocol into the local bus protocol and vice versa.

Up to two inductive bus converter units (and two remote bus connector boards) are possible in an AS 235 H automation system. This enables operation in a redundant bus system.

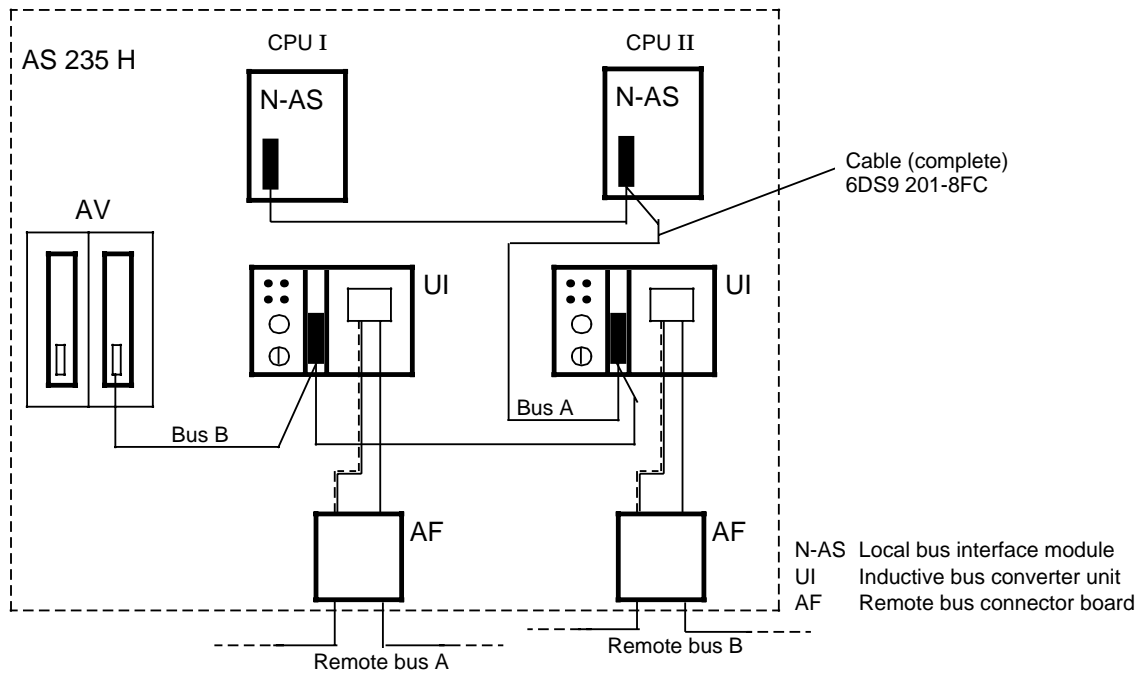


Fig. 4.15 Redundant bus configuration

4.5.3 Computer Connection via N-V.24

- N-V.24 interface 6DS1 202-8AB

The N-V.24 interface module for 20-m local bus, V.24 or TTY interfaces (6DS1 202-8AB) enables SICOMP PC personal computers and host computers to be connected to the CS275 bus system.

SICOMP PC personal computers and host computers may be connected via a V.24 or TTY interface at a selectable baud rate between 110 and 9600 bits/s.

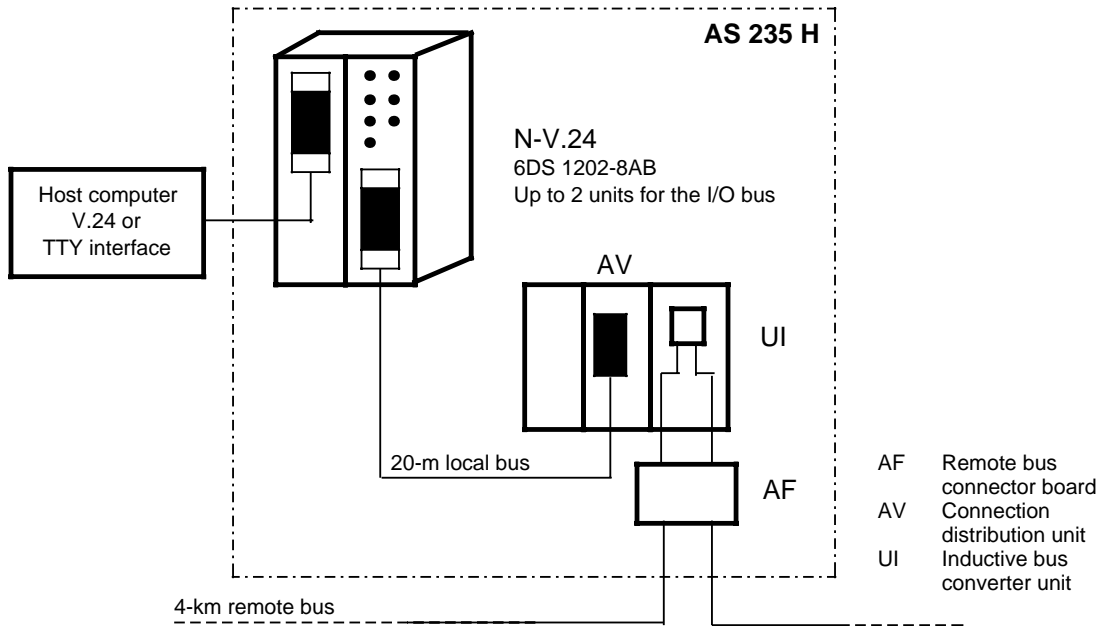


Fig. 4.16 N-V.24 interface

Various data traffic job types for communication between the TELEPERM M units (AS/OS) have been defined in the CS 275 bus system. A host computer that communicates with the TELEPERM M system must also use these jobs (messages)

Detailed specifications of format, coding and acknowledgement mode of the job types for host computer communication are contained in the CS 275/N-V.24 Manual, Order No. C79000-G8076-C087.

- Interface module installation and power supply

There is no pre-configured slot for the 20-m local bus, V.24 or TTY interface (N-V.24) in the TELEPERM M system. It can be installed in any free slot. The N-V.24 interface merely requires a 5-V supply via pin z2 of the X1 backplane connector. Earth contact is provided via the contacts b2 and b32 (2.4 A power consumption).

The module may only be removed or inserted after the 5-V bus has been switched off.

These connections exist in any I/O slot. A maximum of one interface module may be installed in an extension unit. Since an extension unit is also a fault delimitation area, failure of the extension unit also de-activates the interface.

Please refer to the CS 275 Manual, Order No. C79000-G8076-C006 for further information.



Note

As with all central modules, the N-V.24 or CP581-TM may only be removed or inserted after the power supply has been switched off.

Unlike I/O modules, however, there are not supplied with L+ (DC 24 V) but with +5 V which is applied to the I/O bus of the subrack.

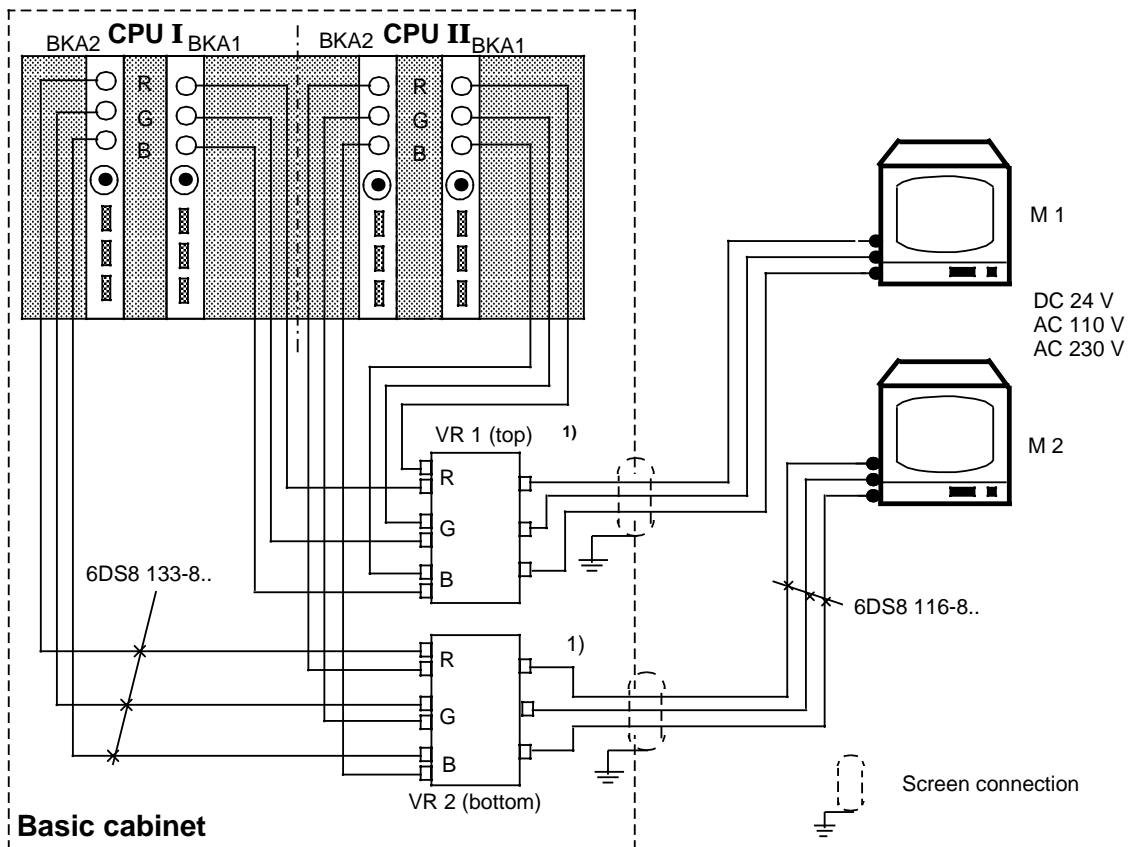
Switch off the logic voltage during handling.

Either use the switch on the power supply unit (SV) of the basic unit (this also switches the L+ of the 6 I/O modules) or use switch S2 of the basic unit (logic voltage of the central processor only).

In case of non-observance of the above, the current surge may - depending on the configuration - corrupt data access or reset systems.

4.6 Connecting the I/O Devices

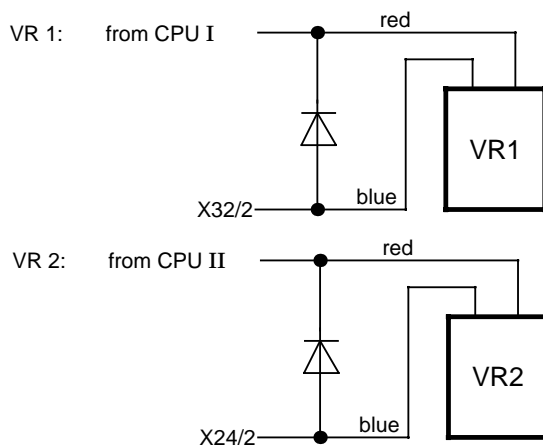
4.6.1 Process Monitors



1) The monitor cables inside the cabinet should be long enough to enable direct connection to the BKAs

BKA Operator input channel interface module
 VR Video relay screen connection
 RGB Red, green, blue

Fig. 4.17 Connection of the color monitors M1 and M2



The VR connecting lugs should point upwards

Fig. 4.18 Video relay control

The color monitors have specifically been designed for process control purposes and are utilized for representation of alphanumeric and graphic information.



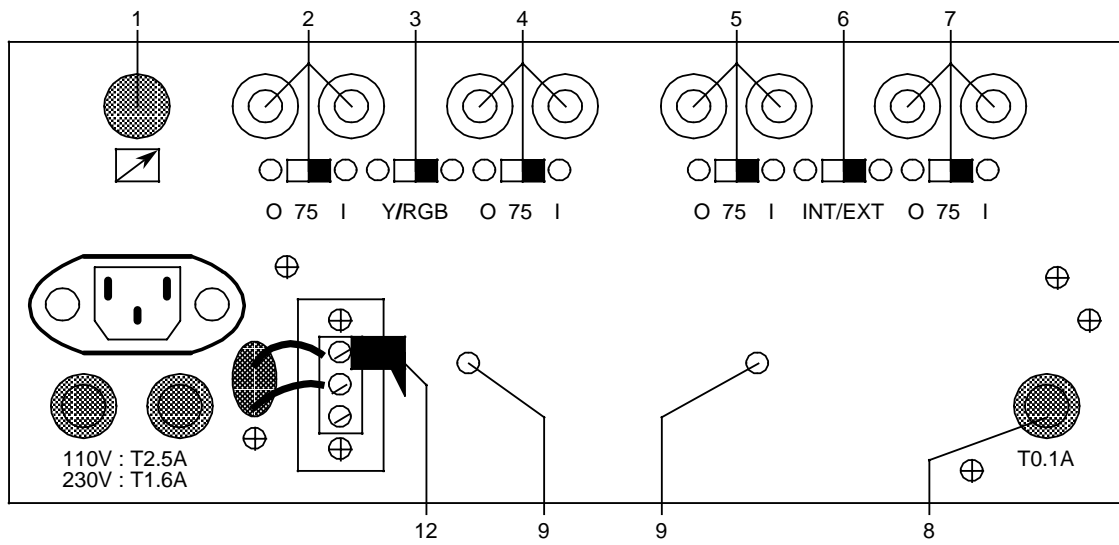
Caution

Since TELEPERM M systems have a central grounding point, video earth must be separated from protective earth. This is done by removing the jumper (video/protective earth separation) from the color monitor connector board.

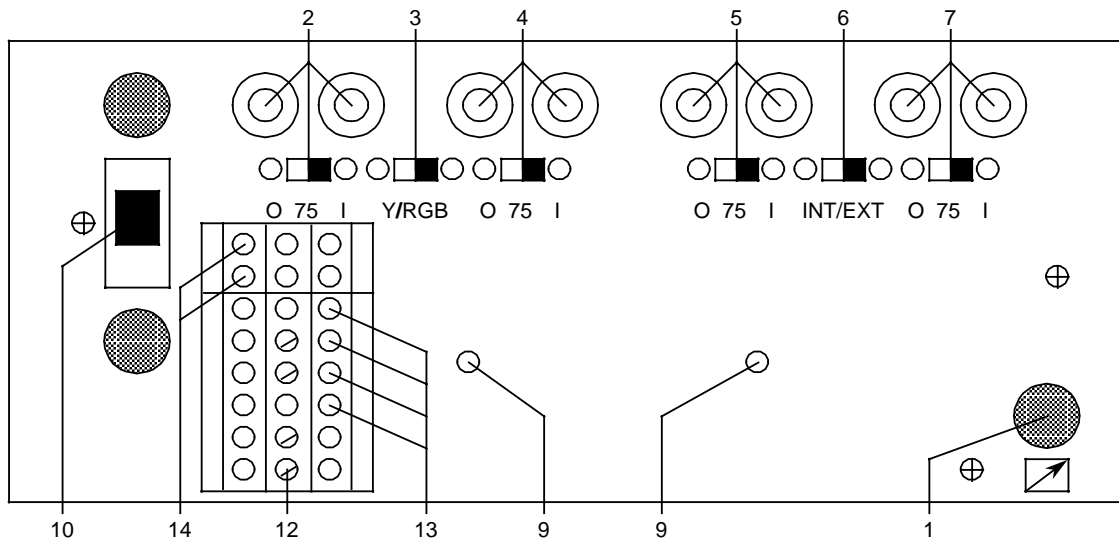
The mains voltage selected (AC 110 V/AC 230 V) must match the voltage available at the mains connections.

Units operating on DC 24 V may only be connected if power and mains switch have been switched off.

A unit is only de-energized after the associated power cable has been removed.



Connector board, AC 110/230 V version of the 6DS3 401-8BK monitor



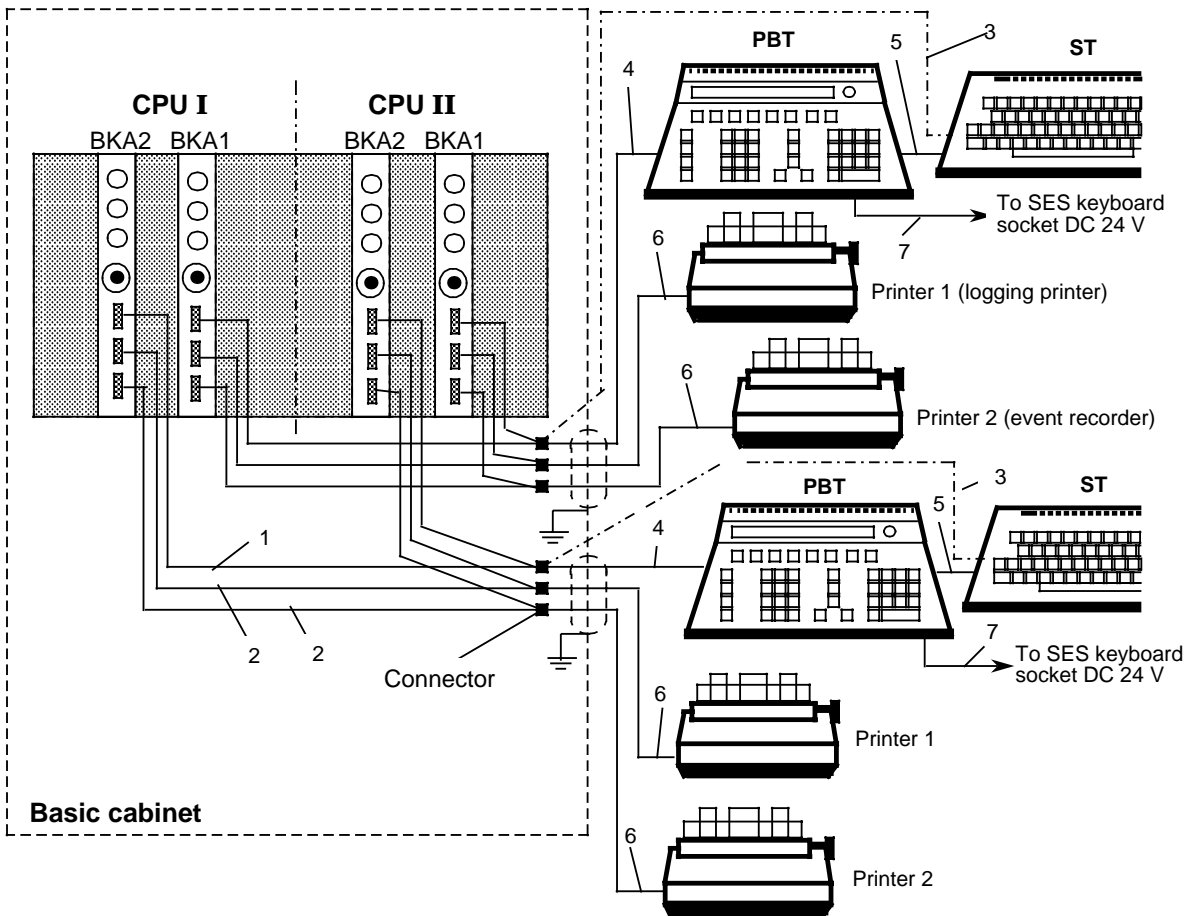
Connector board, DC 24 V version of the 6DS3 401-8BL monitor

- 1 Remote control connection
- 2 Color signal "red" connector with 75 Ω contact terminator resistance via a switch contact
- 3 Selector for color (RGB) or black-and-white mode (Y)
- 4 Color signal "green" or Y connector with 75 Ω terminator resistance via a switch contact
- 5 Color signal "blue" connector with 75 Ω terminator resistance via a switch contact
- 6 Synchronization selector switch
- 7 Connections for synchronization with 75 Ω terminator resistance via a switch contact
- 8 Fuse of remote control relay power supply unit
- 9 Holes for fixing the grounding bar
- 10 Main circuit breaker (AC 110 V/AC 230 V), power switch (24 V)
- 11 Mains cable connection
- 12 Video/protective ground separation point
- 13 24 V connection
- 14 Operation control signal via switch contact (23 V, max. 10 mA)

Fig. 4.19 Monitor connector boards

Please refer to the process monitor descriptions for further information.

4.6.2 Keyboards and Printers



BKA 1/2	Operator input channel interface module 1/2		
PBT	Process communication keyboard		
ST	Configuring keyboard, may also be connected directly		
1	Keyboard distribution cable	(TV)	C79165-A3012-B421
2	Printer distribution cable	(DV)	C79165-A3012-B422
3	Connecting cable	ST-TV	6XV2 167-8BB...8BU
4	Connecting cable	PBT-TV	6XV2 167-8CB...8CU
5	Connecting cable	PBT-ST	6XV8 102-8...
6	Connecting cable	Printer-DV	6XV2 167-8AB...8AU
7	Connecting cable	PBT-SES	6XV8 103-8...

Fig. 4.20 Connection of operator input units

The units are connected in parallel to both CPUs via the keyboard or printer distribution cables.

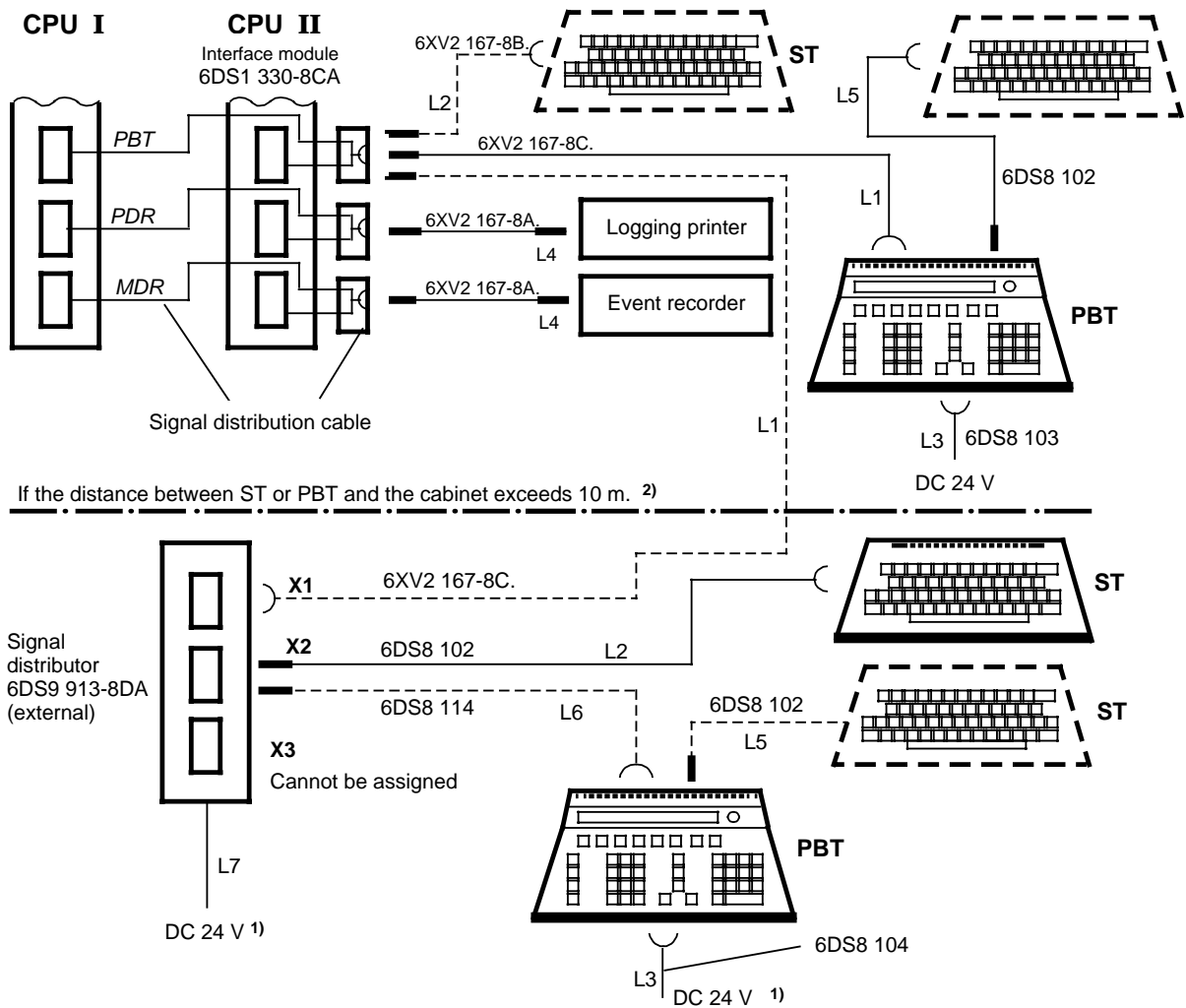
Distances > 10 m require system distribution units to be used between operator input channel interfaces and keyboards.

Connecting cable: 6XV2 167-8CB...-8CU					
BEDI 235			Process communication keyboard		
Signal name	Connector A 15-way male	Core pair	Core color	Connector B 15-way female	Signal name
- TXD1	3	1	bl	3	-E11
+ TXD1	4		rd	4	+E12
- RXD1	1	2	gr	1	-S11
+ RXD1	2		ye	2	+S12
-	Housing	Screen		Housing	

Connecting cable: 6XV2 167-8AB...-8AU					
BEDI 235			Printer		
Signal name	Connector A 9-way male	Core pair	Core color	Connector B 25-way female	Signal name
- TXD2/3	3	1	bl	9	Receive data
+ TXD2/3	4		rd	10	
- RXD2/3	1	2	gr	18	Transmit data (Busy)
+ RXD2/3	2		ye	21	
-	Housing	Screen		Housing	-
-	-	-		-	-

Connecting cable: 6XV2 167-8BB...-8BU				
BEDI 235		Configuring keyboard		
Signal name	Connector A 15-way male	Core color	Connector B 15-way female	Signal name
- RXD1	1	wh	1	-S1
+ RXD1	2	br	2	+S2
- TXD1	3	-	-	-
+ TXD1	4	-	-	-
0V(Earth)	6	gn	6	0V
24V (L+)	8	gr	8	24V
-	Housing	Screen		-
-		Housing		-
0V(Earth)	13	pk	13	0V
24V (L+)	15	rd		24V

Table 4.3 Signal line pin assignments



Cable connector	Length in m	Conditions
6XV2 167-8CB...-8CU	L1 150 L1 10	L3 to DC 24 V external 1) L3 to DC 24 V cabinet (SV tier)
6XV2 167-8BB...-8BU	L2 10 L1+L2 150 L1+L6 150	L3 to DC 24 V external 1)
6DS8 103-8.. 6DS8 104-8..	L3 10 L3 10	
6XV2 167-8AB...-8AU	L4 100	PT 88, 89, 90
6DS8 102-8..	L5 30	
6DS8 114	L6 10 L1 + L6 150 L7 = 2	2) Fixed connection to signal distributor

1) External DC 24-V supply (22...30 V) (supplied by others)

2) External power supply must be provided and the units integrated in the plant grounding system if the distance between the keyboards and the cabinet exceeds 10 m. (Installation in cabinets is not permitted with the specified cable lengths.)

Fig. 4.21 Keyboard printer cable lengths.

- Process communication keyboard 6DS3 305-8AA (PBT)

The connecting cables are plugged into the rear of the PBT unit.

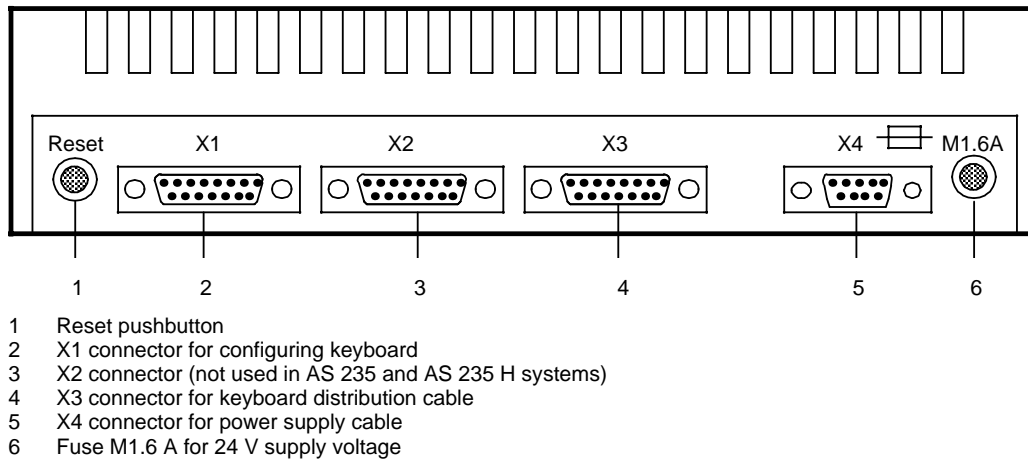


Fig. 4.22 Process communication keyboard, rear panel with connectors

The PBT must be supplied with DC 24 V. The supply voltage is protected by a M 1.6 A fuse. A message is issued to the system if a voltage is out of tolerance.

The PBT has no power switch. The unit is ready once the voltage has been connected via the X4 connector. The green LED at the right-hand side of the display indicates that the unit is ready. The red LED is ON if a failure has been detected in the system or the peripherals.

The PBT features two serial interfaces.

The 20-mA current loop is always supplied by the subordinate device (i.e. from the PBT to the AS and from the configuring keyboard to the PBT).

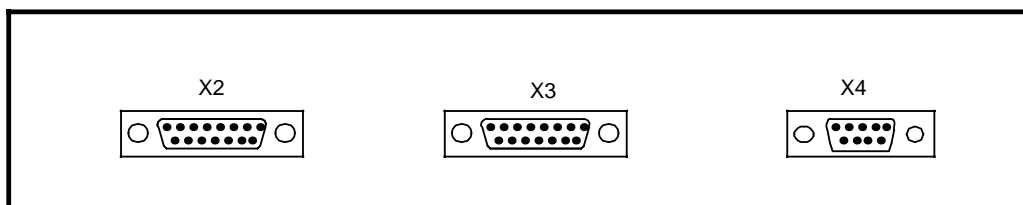
- The baud rate to the higher-order system is 1200 bits/s, and cannot be changed.

- Process communication keyboard 6DS3 305-8BA (PBT)

The process communication keyboard has a dust and splashproof touchpad keyboard and an LCD unit.

Operation and handling is identical to that of the version 6DS3 305-8AA.

There are three connectors at the rear (Fig. 4.23).



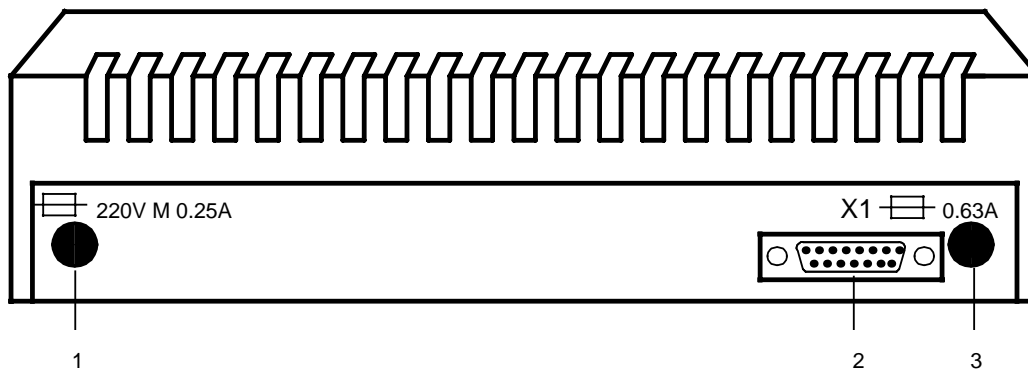
- Connector X2 for: configuring keyboard
- Connector X3 for: higher-level system (e.g. AS 235)
- Connector X4 for: voltage supply cable

Fig. 4.23 Process communication keyboard 6DS3 305-8BA, rear panel with connectors

It is possible to upgrade the process communication keyboard to the degree of protection IP 65 using a kit (Order No. C79372-A3018-D1) in order to protect the rear connectors against environmental influences (dust, splashing and gases).

- Configuring keyboard 6DS3 303-8AA (ST)

The configuring keyboard connects to the PBT via the connecting cable 6DS8 102-8... or directly to the AS keyboard distribution cable via the connecting cable 6XV2 167-8... The connecting cable also carries the DC 24-V supply voltage to the unit.



- 1 Not used
- 2 Connector
- 3 Fuse

Fig. 4.24 Configuring keyboard, rear panel

The DC 24-V supply voltage is protected by a T 0.63 A fuse which is located on the back panel next to the X1 connector.

The label "220 V/0.25 A" has no meaning (the component has not been connected).

The unit is ready once the voltage has been connected. The unit has no power switch.

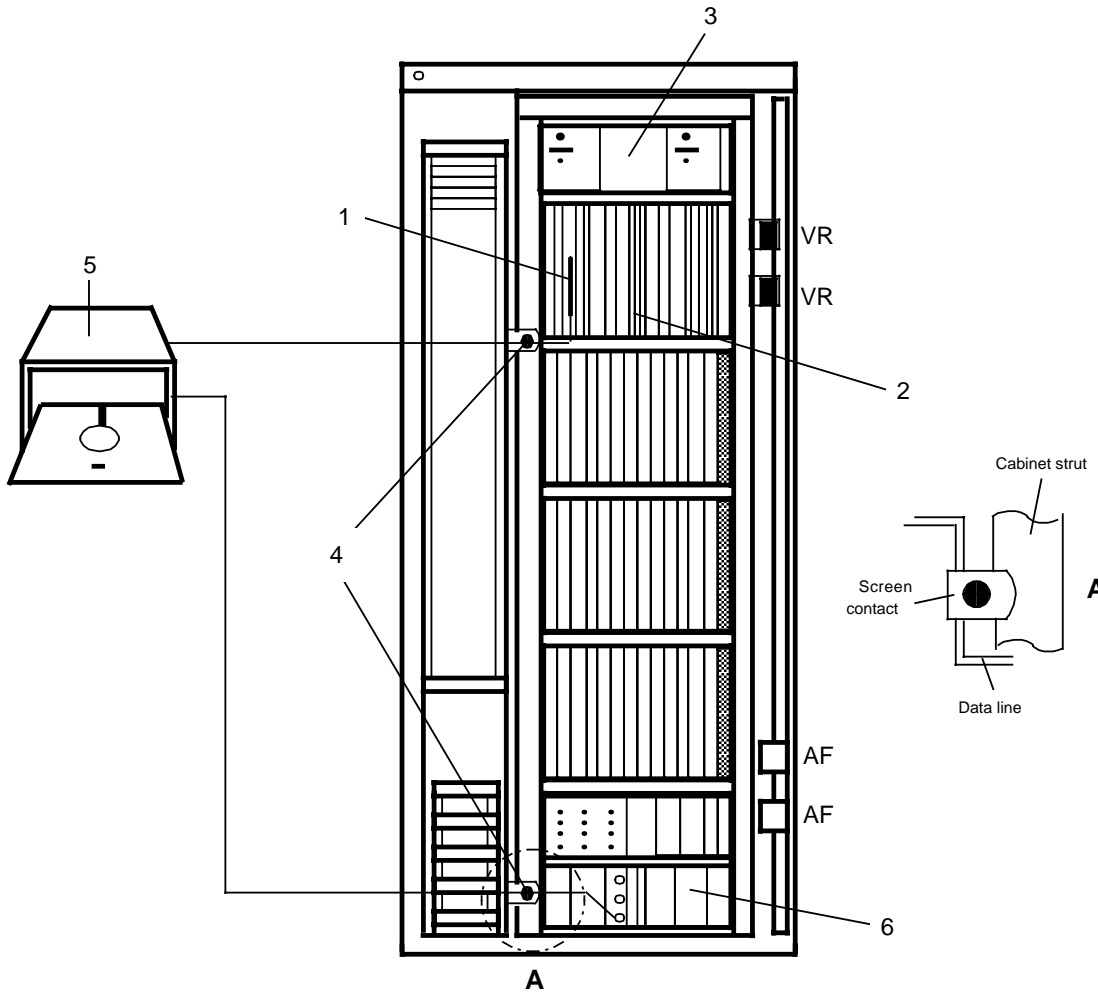
The serial interface is activated by jumper settings (default setting).

4.6.3 Mini Floppy Disk Unit (MDE) 6DS3 900-8AD

The signal cable (rectangular connector) connects the MDE to the 6DS1 326-8BB mini floppy disk interface module (MDA) (1, Fig. 4.25).

The power supply cable (round connector) must be connected to the socket provided in the cabinet power supply unit (SES).

Both screen contacts (4, Fig. 4.25) must be connected to the cabinet frame in order to guarantee faultless operation.



- 1 Mini floppy disk unit interface module (MDA) 6DS1 326-8BB
- 2 Central unit
- 3 Power supply unit (SVE)
- 4 Screen connection to the rack
- 5 Mini floppy disk unit (MDE)
- 6 Cabinet power supply unit (SES)

Fig. 4.25 Connection to standard cabinet

The mini floppy disk units 6DS3 900-8AD with a revision level 4 can be connected to the AS 235 H system. Only one floppy disk format can be used.

- 80 tracks, double-sided, high density, 512 bytes/sector
- 1 MB net capacity
- Floppy disk type: HD, Order No. 6AY2904-0AC00

The following number of floppy disks is used for a complete memory dump:

Memory size	80 tracks DS, HD
1 MB	1
2 MB	2
3 MB	3

DS: double-sided
HD: high density

The format is selected by the GB.ORPA parameters (cf. AS 235 Function Description in the manual C79000-G8076-C416). The "NORM switch" on the mini floppy disk interface module (MDA) **must** be in position "EIN" [ON].

GB.ORPA		Format type
260	261	
0	0	35 tracks, SS, SD
0	1	80 tracks, DS, SD
1	X	80 tracks, DS, HD

= default

The NORM switch on the MDA must be in position "EIN" [ON] if the default setting has been selected. The following or GB.ORPA selections or NORM switch positions on the MDA are required if existing user software from an AS 230 system is to be loaded (imported) into an AS 235 H system:

Floppy disk type	Drive type	GB. ORPA		Comment
		260	261	
35 tracks SS – SD	35 tracks 6DS3 900-8AC	0	0	1) 3)
35 tracks SS – SD	80 tracks 6DS3 900-8AD	0	1	1)
80 tracks DS – SD	80 tracks 6DS3 900-8AD	0	1	2)
80 tracks DS – HD	80 tracks 6DS3 900-8AD	1	X	2) =default

1) For SW D 0.1 (B..., C..., D0.1)
MDA NORM switch="AUS" (OFF)
For SW>D 0.1 (D..., E...,)
MDA NORM switch="EIN" (ON)

2) Always
MDA NORM switch="EIN" (ON)

3) nur in Sonderfällen




Note

When filing note the selected setting on the disk.
In case of setting errors of GB.ORPA and NORM switches some combinations with the directory entry, disk type, drive type on the disk can be in contradiction during loading and led to incompatibility in the AS 235 H (mit F447 error message).
Disks can only be loaded with the settings selected during filing.
The software filed on the 6DS3 900-8AD is **cannot** be loaded with the 6DS3 900-8AC drive.

Handling instructions:

- handle the floppy disk with care
- do not bend the floppy disk
- do not touch the data carrier surface
- protect the floppy disk from dust
- keep the floppy disk away from magnetic fields
- the floppy disk can be write-protected
- the floppy disk must be formatted before data can be filed
- ensure that a sufficient number of formatted floppy disks is available when filing is started. Formatting during filing is not possible.



Warning

Never open the drive lever while the drive is operating (red LED on MDE is ON). Data may be destroyed.

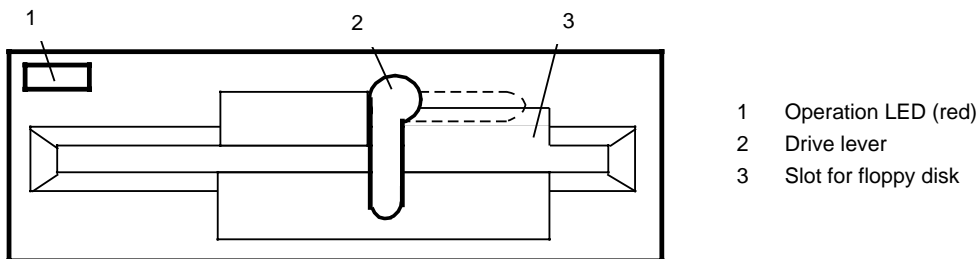


Fig. 4.26 Floppy disk drive, front view

Handling

Insert the floppy disk such that the write protect slot (1) in the protective jacket points to the left-hand side and the read/write slot (3) is directed towards the drive.

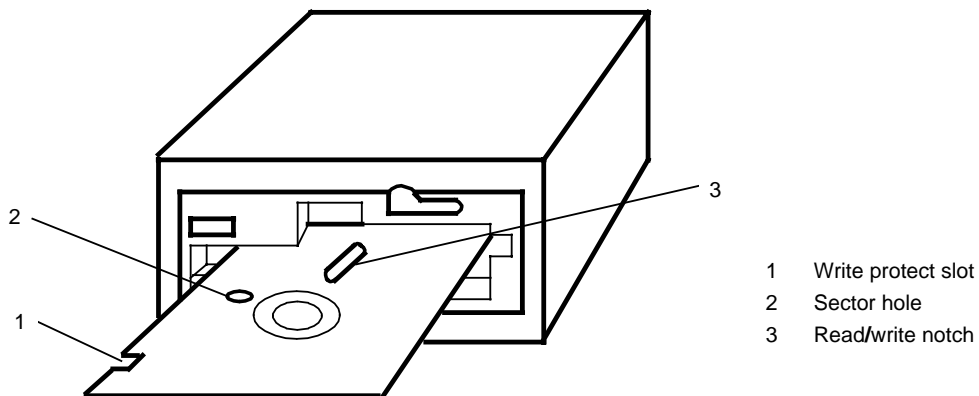


Fig. 4.27 Inserting a floppy disk

4.7 Jumper Settings

Most jumpers are already properly set when the system is delivered and may not be changed by the user.

Warranty claims become void if the user manipulates jumper positions or jumper settings.

4.7.1 Central Processing Unit

- Comparator coupler module 6DS1 142-8AA (VKB)
User-specific jumper setting is not required on the comparator coupler module (VKB).
- Synchronization module 6DS1 143-8AA (SB)
User-specific jumper setting is not required on the synchronization module.
- Diagnostic unit interface module 6DS1 925-8AA (DGA)
The jumper settings and the utilization description for TELEPERM M AS 235 are valid.
The additional items of information in the Technical Description of the SB Synchronization Module (Order No. C79000-T8076-C344) and the VKB Comparator Coupler Module (Order No. C79000-T8076-C345) have to be observed.

- Memory modules

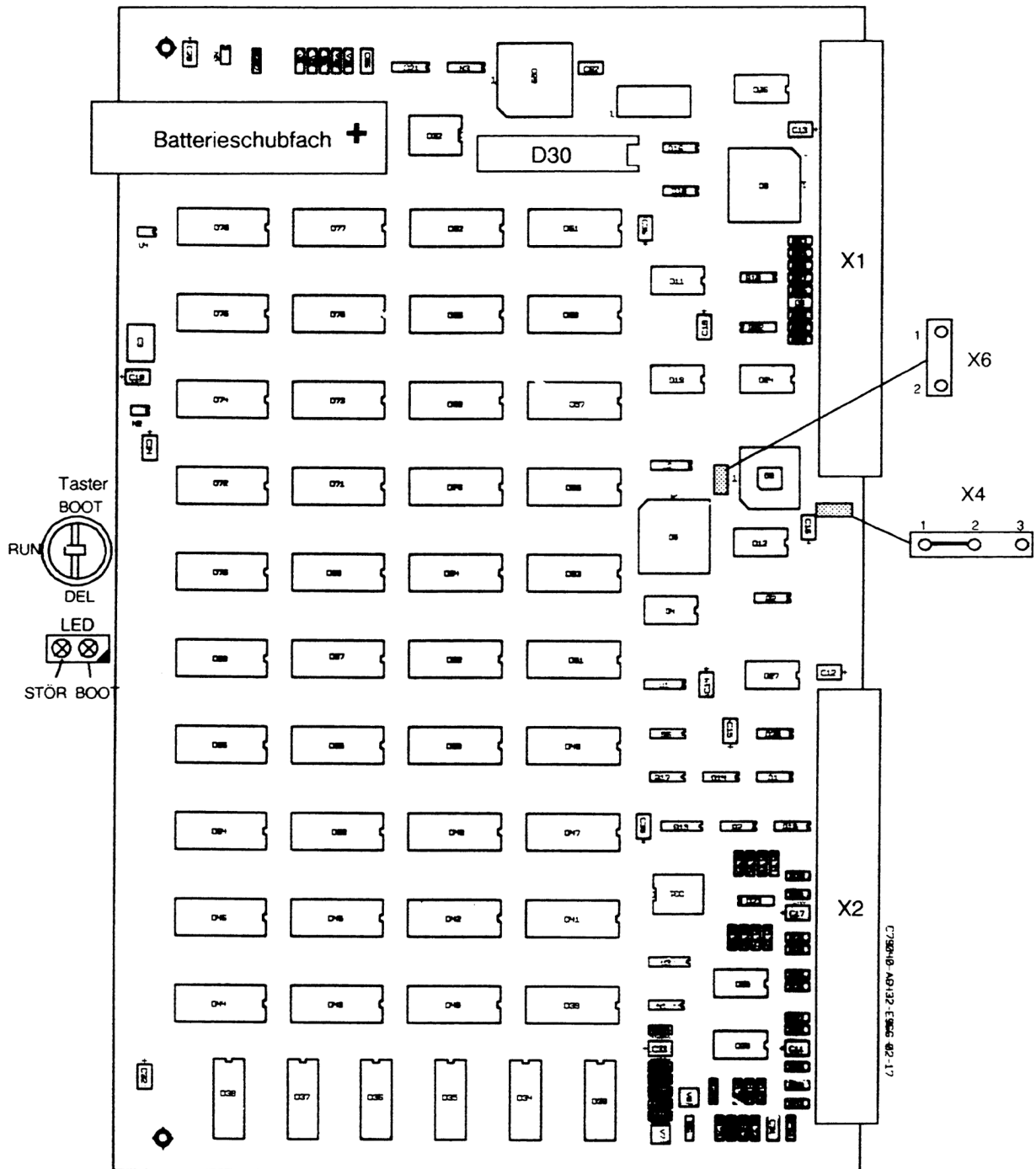
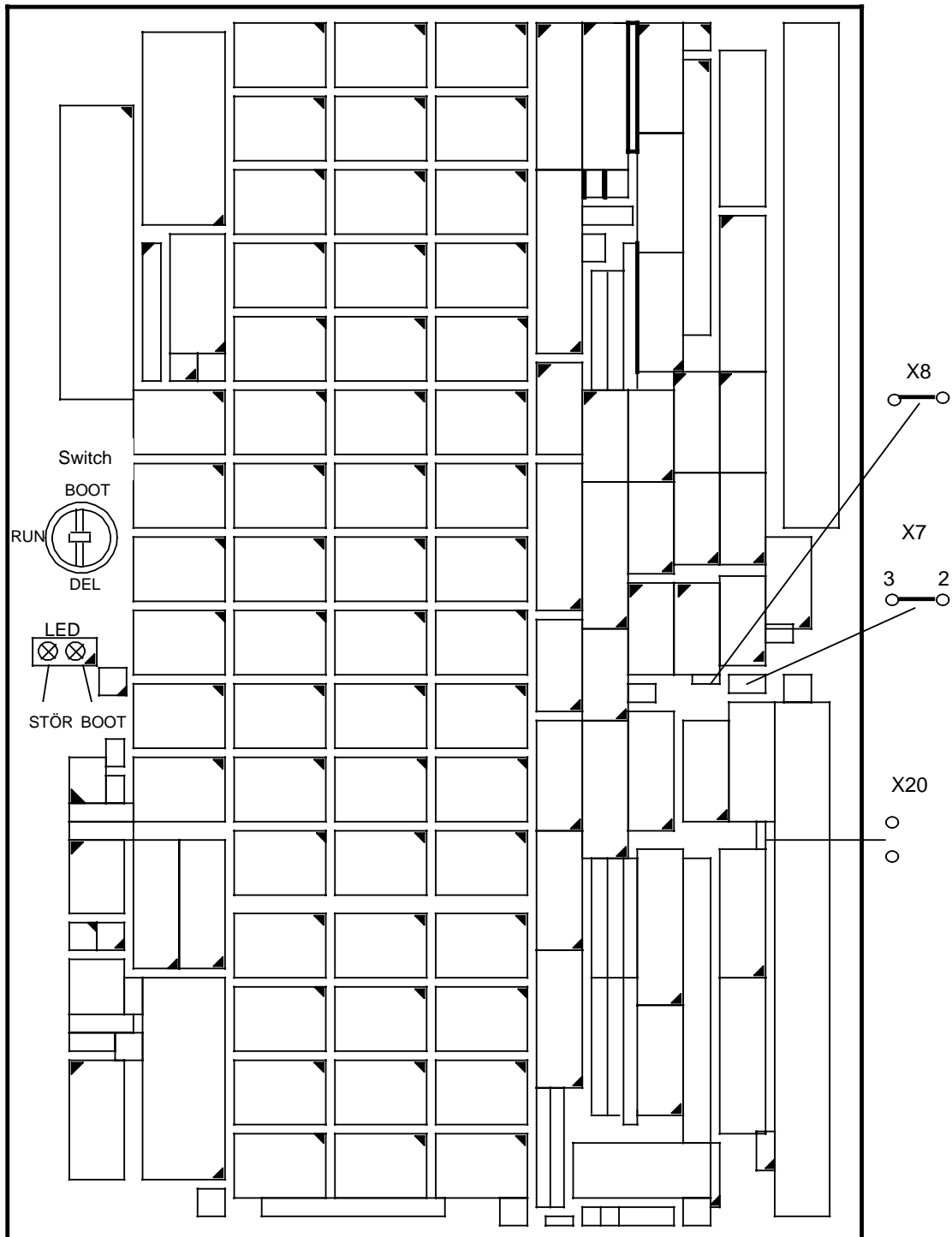


Fig. 4.28 Memory module 6DS1 844-8CA/8DA



- RUN: Normal position
 BOOT: Used for initial loading of new system software. The ZRS pushbutton on the CPU module **must** be pressed when this switch is in BOOT position.
 DEL: Clears the user memory. The supply voltage need not be switched off. DEL must be selected while the ZRS pushbutton is pressed.

Fig. 4.29 Memory module 6DS1 837-8DA/-8EA/-8FA

The jumper settings are the same for all three memory modules. The jumpers are located on the mother board. They are required for test purposes and are put in the right position at the factory, before the module is delivered.

- Central processor module (**bottom board**) (CPU 235 H)

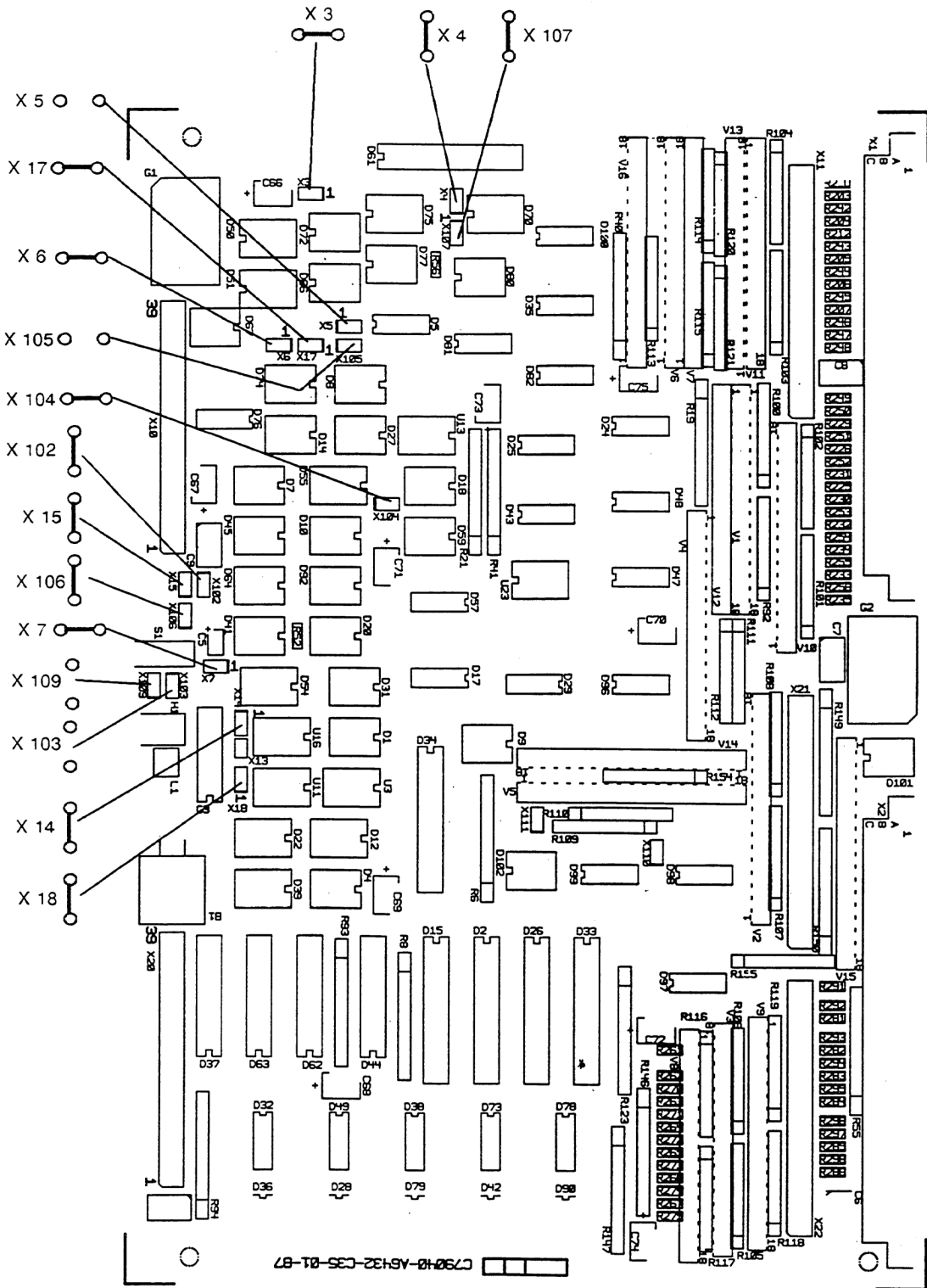


Fig. 4.30 CPU processor module 6DS1 141-8AA, bottom board (control unit)

Central processor module (top board) (CPU 235 H)

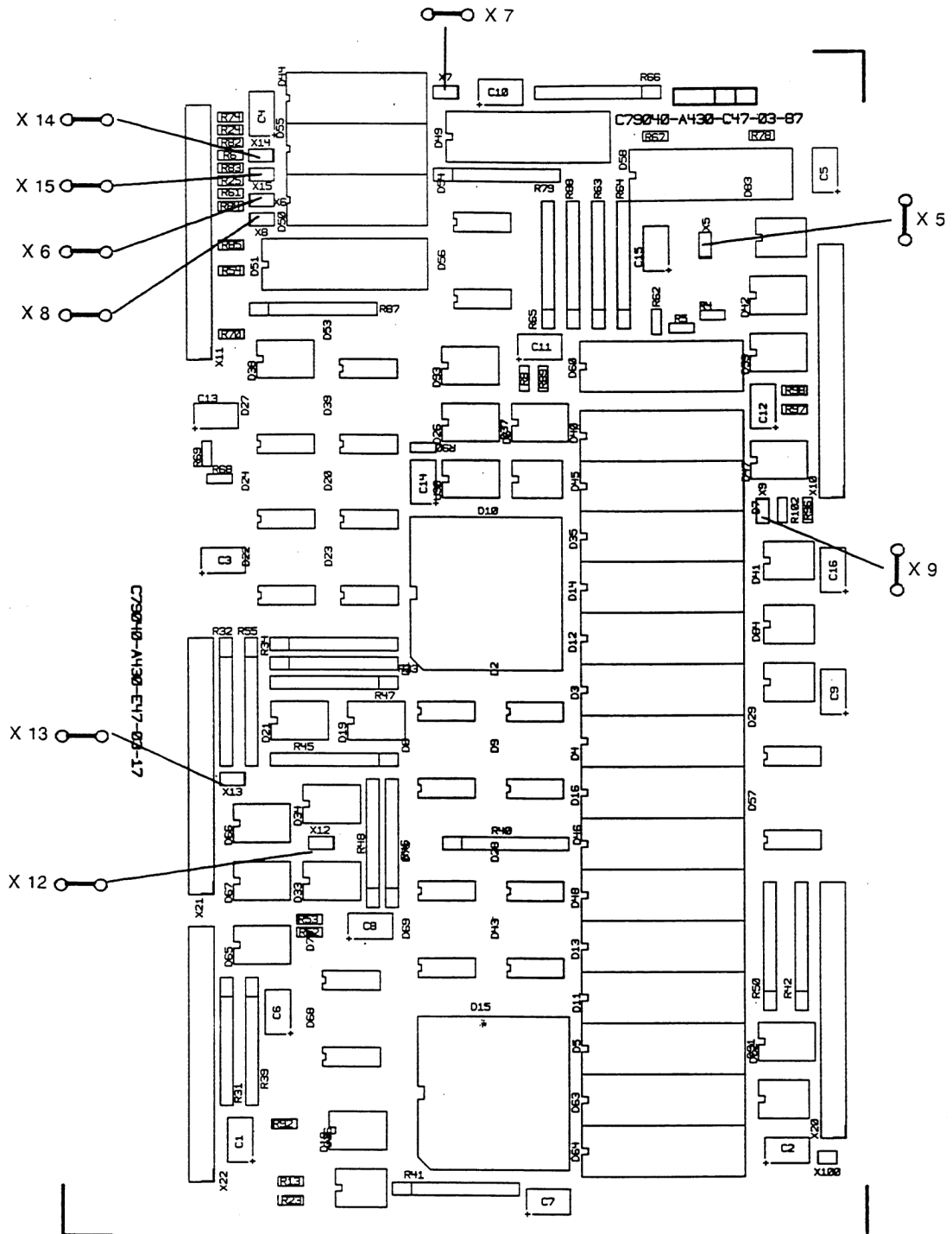
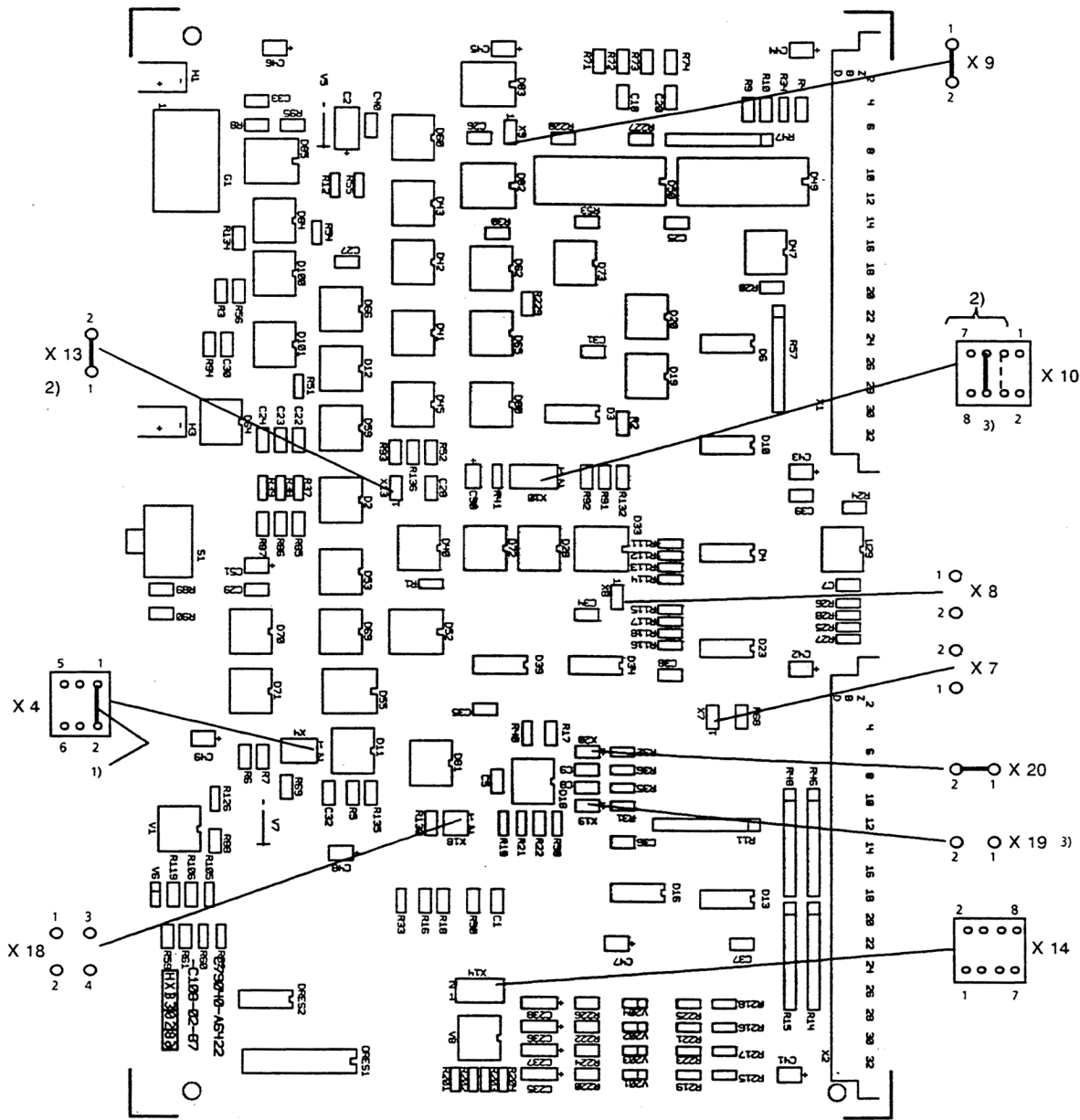


Fig. 4.31 CPU processor module 6DS1 141-8AA, top board (arithmetic unit)

- I/O bus interface units (EABA)
 Jumper assignments for I/O bus 1 and I/O bus 2



- 1) Jumper not inserted for EABA2
- 2) Insert jumpers (option)

3)	X10/ 3 - 4 inserted	Negative edge of external minute impulse is effective	
	X10/ 5 - 6 inserted	Positive edge of external minute impulse is effective	One of the two jumpers must be inserted on EABA1 and EABA2
	X10/ 7 - 8 inserted	Minute impulse triggers PU6 interrupt on EABA1	Remove the jumper X13/1-2 on EABA 1 if the minute impulses are to be used
	X10/ 7 - 8 not inserted	No interrupt by minute impulse	The jumper X13/1-2 may be inserted

Fig. 4.32 I/O bus interface module 6DS1 312-8BB

- Operator input channel interface module (BKA)

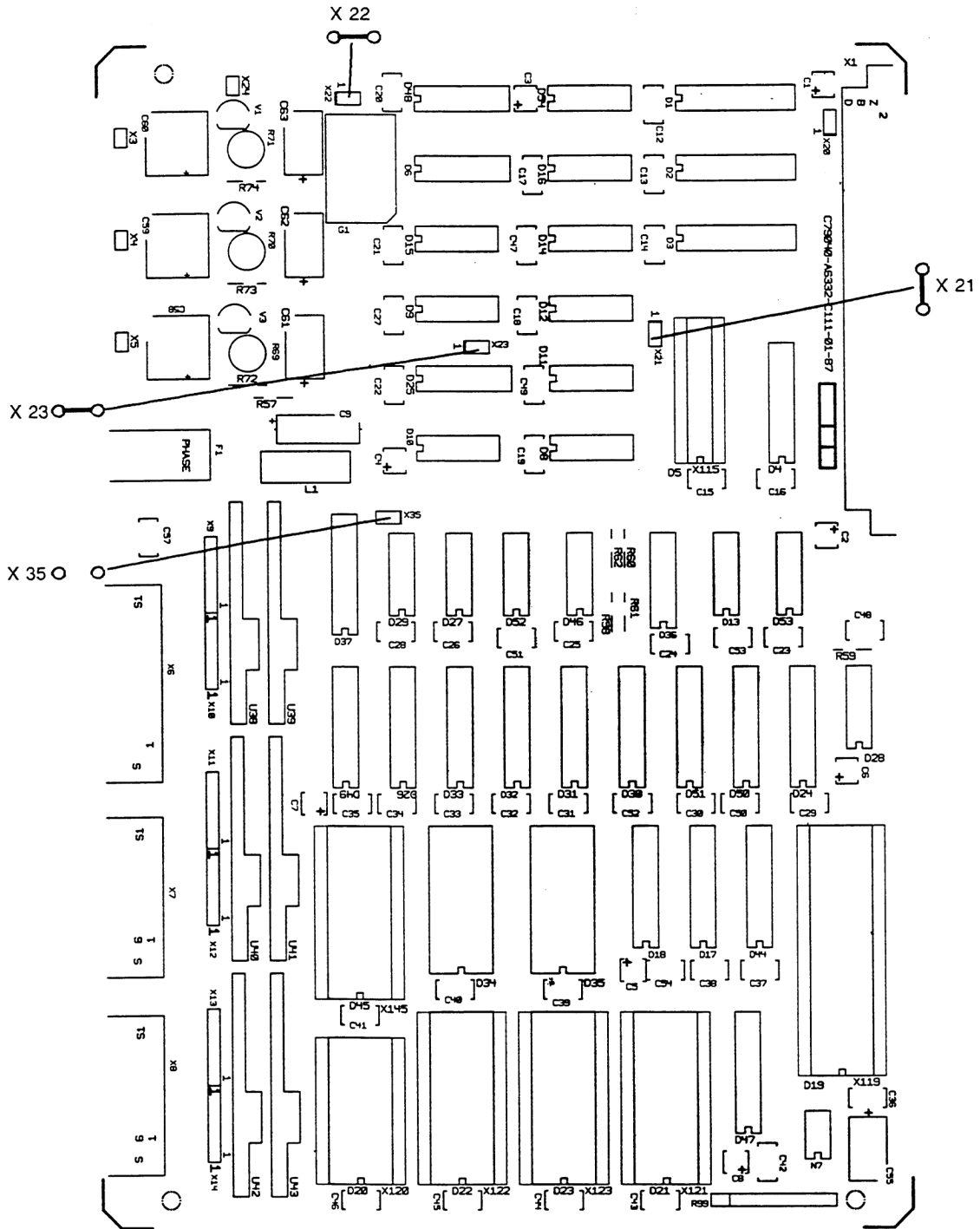
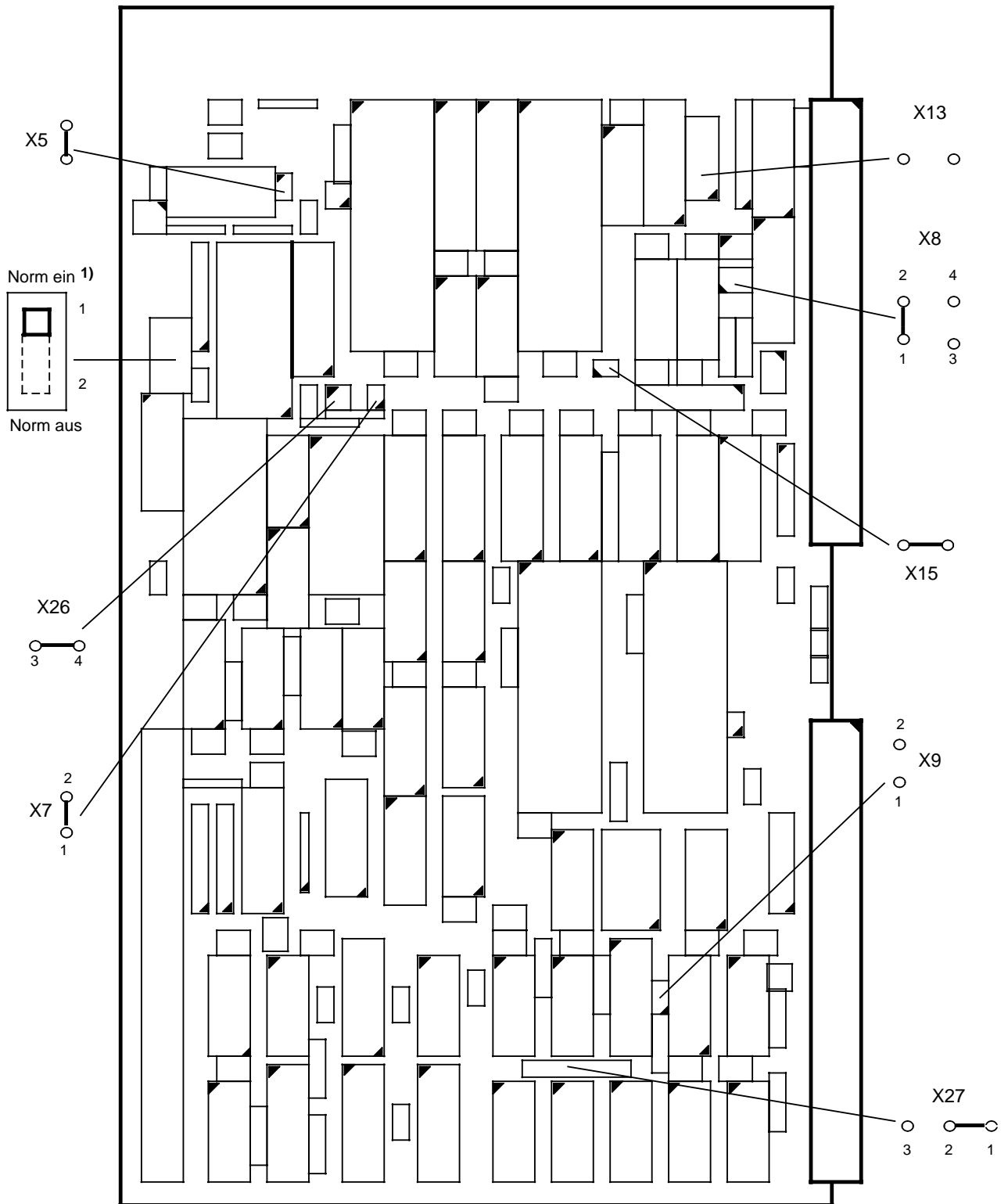


Fig. 4.33 Operator input channel interface module 6DS1 330-8CA

- Mini floppy disk interface module (MDA)

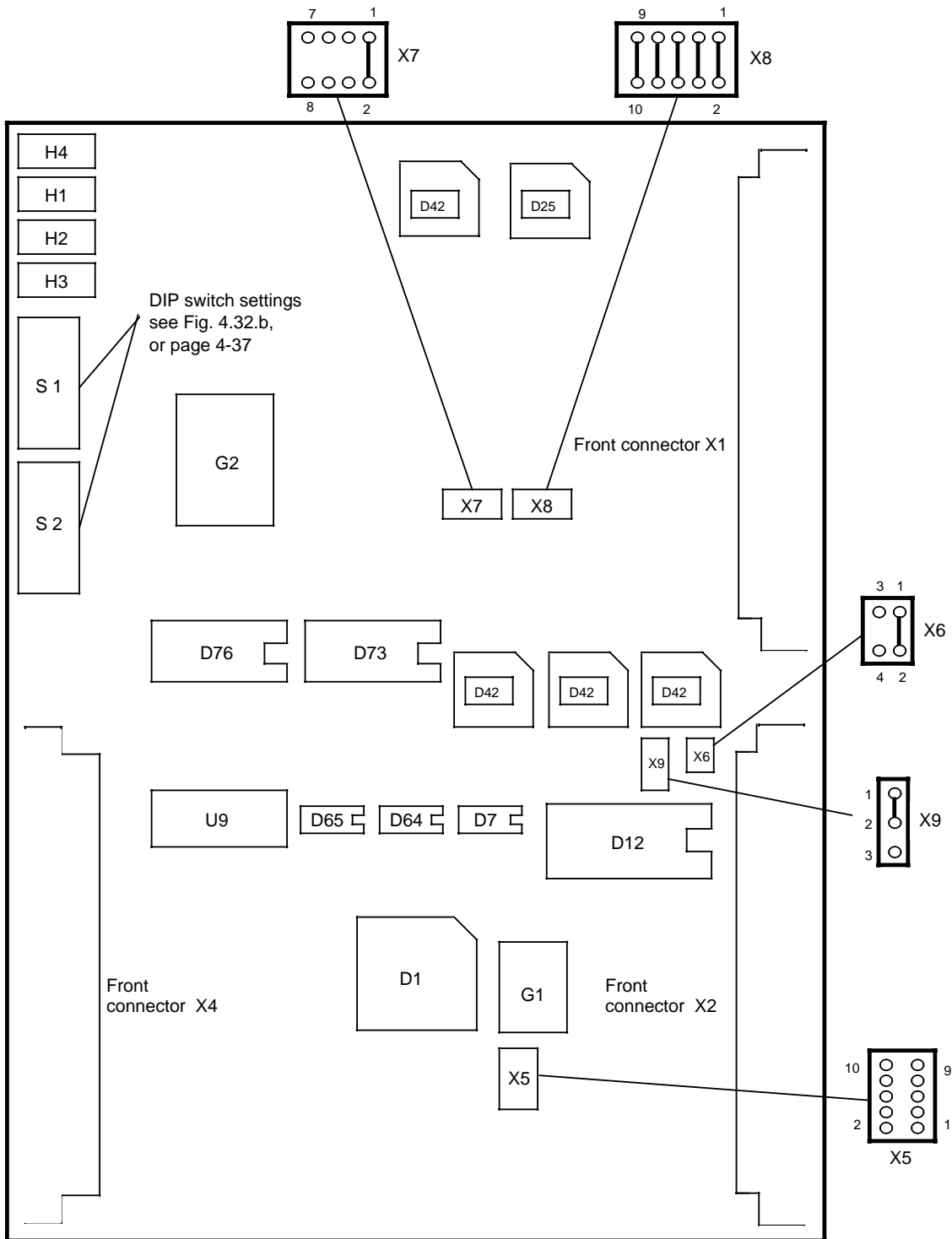


1) Switch position "NORM AUS" for loading of AS 230 floppy disks with software revision <D0.2 only. Position "NORM EIN" for loading and filing of any other system.

The module must be at least of revision level 3 if it is to be used in an AS 235 H system.

Fig. 4.34 Mini floppy disk interface module 6DS1 326-8BB

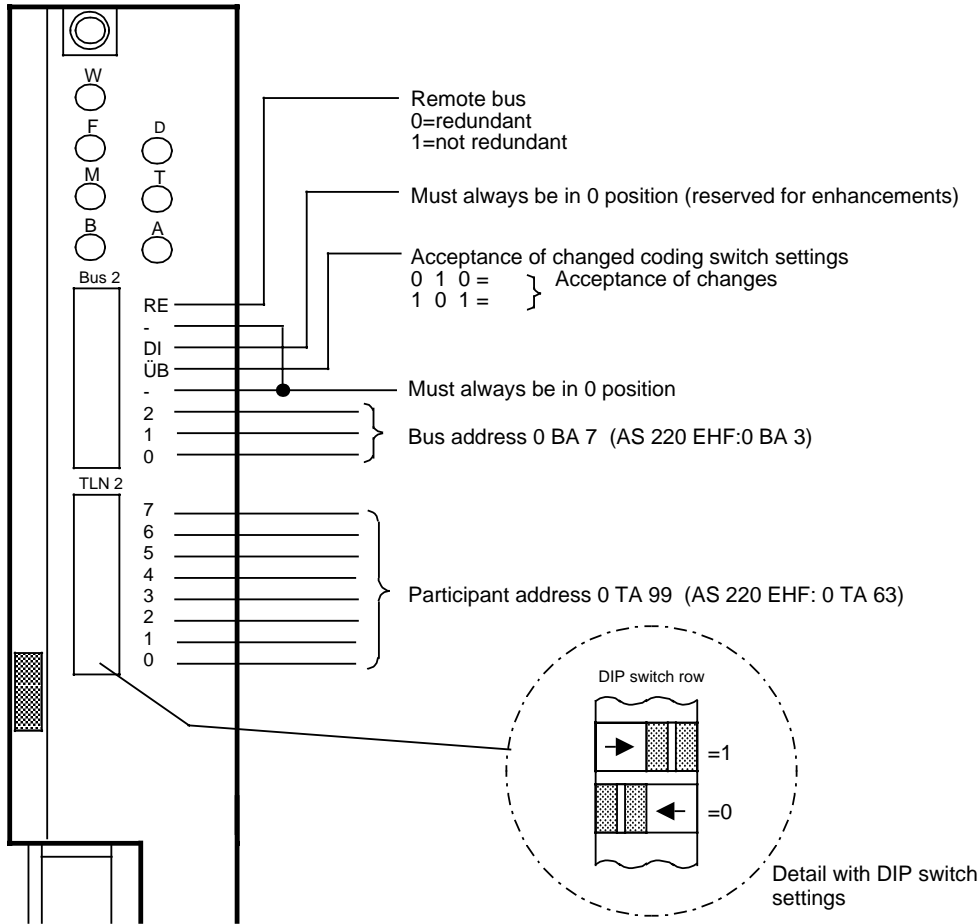
• Local bus interface module N-AS (6DS1 223-8AA)



Plug-in check local bus connector		Local bus pin d18 connector pin d18
With plug-in check	0 0 0 0 0	Jumper inserted
Without plug-in check	1 0 0 0 0	Irrelevant

0=Jumper removed
1=Jumper inserted

Fig. 4.35 Local bus interface module 6DS1 223-8AA



Participant address (TA)

The binary coded participant address is selected by the eight bottom DIP switches
 Setting range: 0 TA 99 (AS 220 EHF: 0 TA 63)
 The transmitter participant address must always be 31 if a common data (CD) link is used.

Bus address (BA)

The binary coded bus address is selected by the three bottom DIP switches of the upper switch row.
 Setting range: 0 BA 7 (AS 220 EHF: 0 BA 3)

Warning

Setting BA=0 **and** TA=0 at the same time is not permitted.
 Jumper setting of CPU I and CPU II must be identical.
 CPU I bus address = CPU II bus address
 CPU I participant address CPU I = CPU II participant address

Bus redundancy (RE)

The CS 275 bus system permits operation on a redundant or single-structured remote bus. The required mode can be selected by the RE switch.

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

Acceptance (ÜB)

Actuating the ÜB switch accepts the switch settings that have been changed (e.g. during the running operation).
 Acceptance: 1 1 0 or 1 0 1

Fig. 4.36 Local bus interface module 6DS1 223-8AA (DIP switch settings)

- **Local bus interface module N8-H (bus processor)**

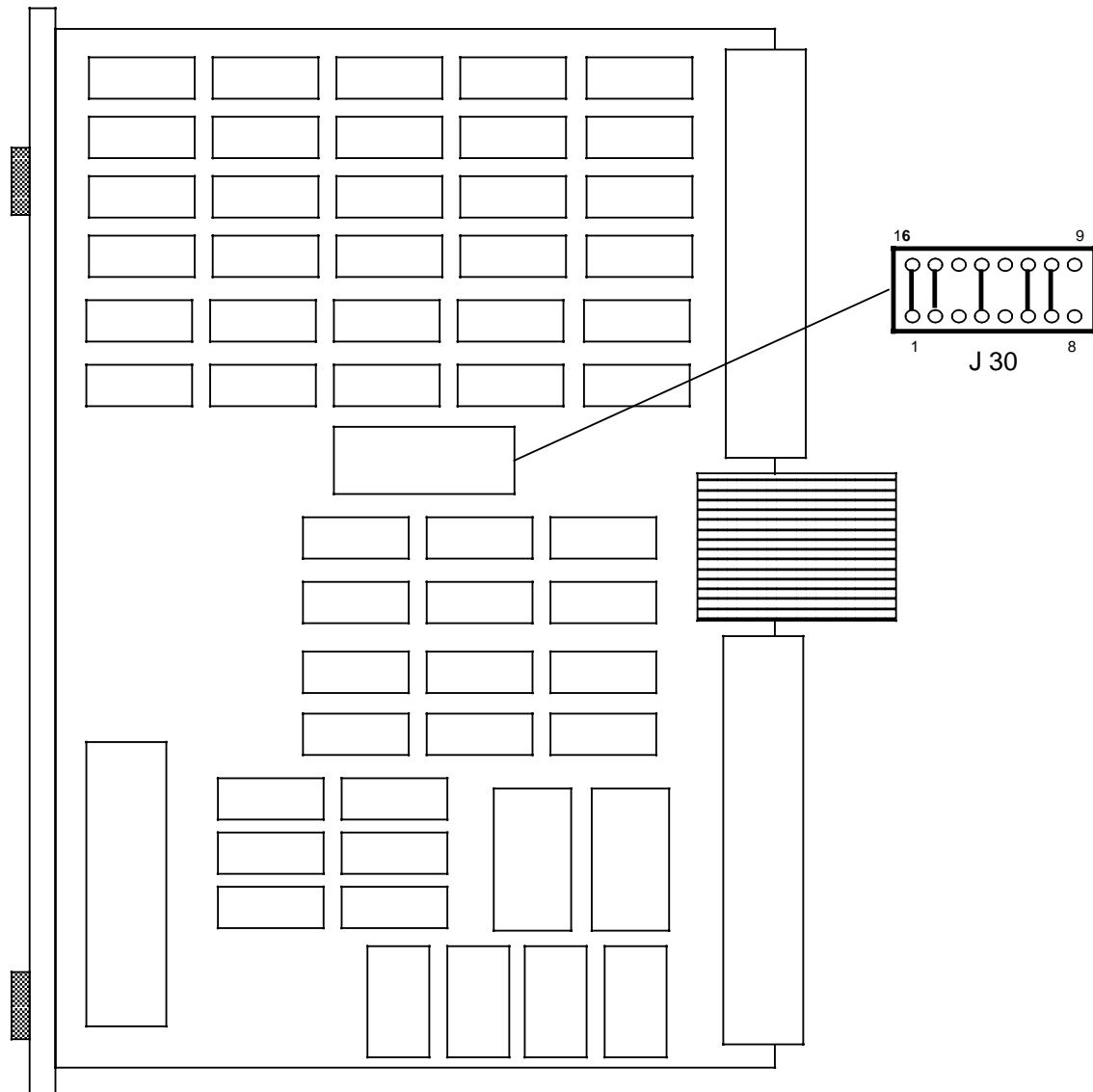
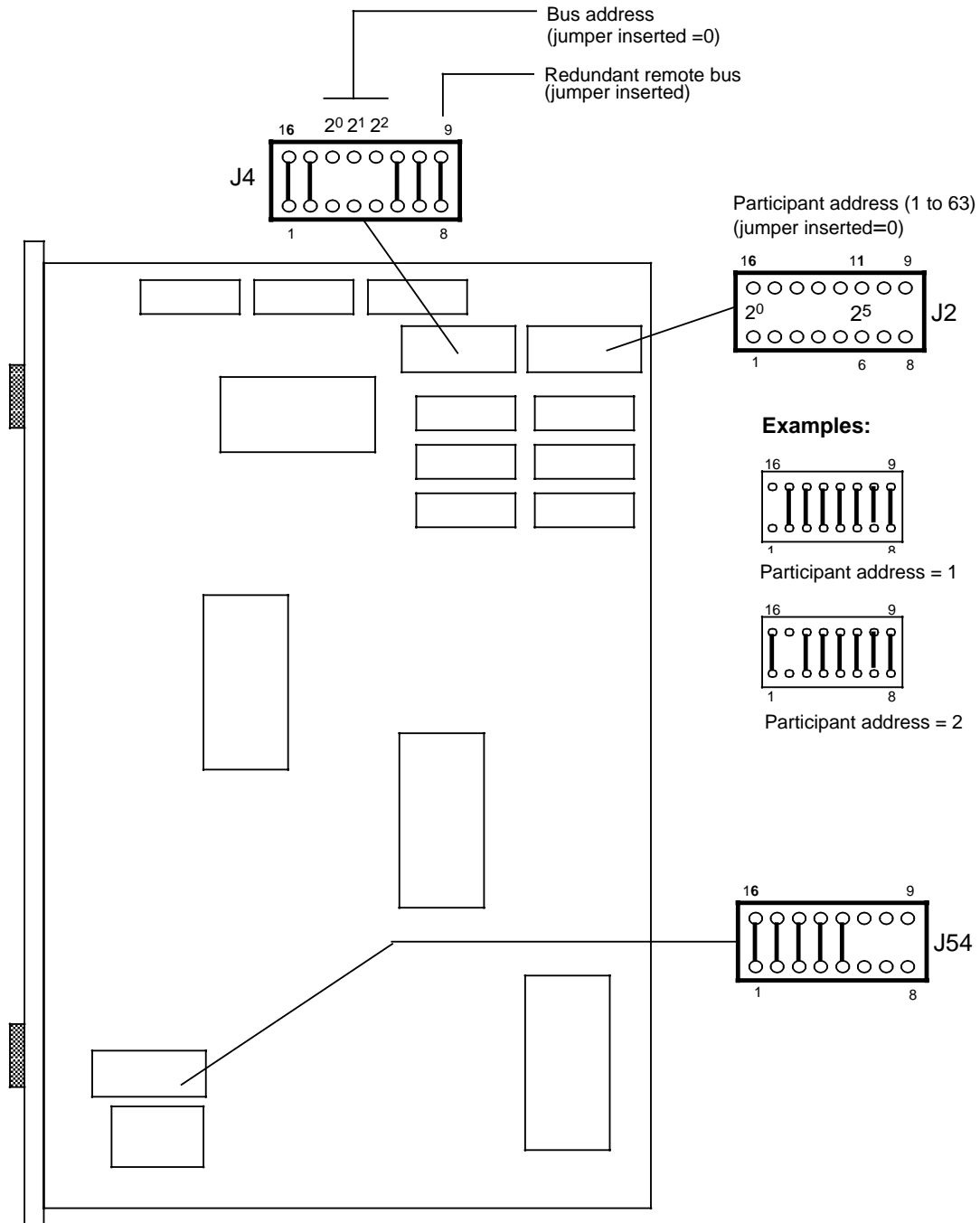


Fig. 4.37 Local bus interface module N8-H, 6DS1 220-8AA (bus processor)


The shown jumper configuration has been set up in the factory and must not be modified. The jumpers can only be accessed after the bus interface module has been removed from the bus processor module.

• Local bus interface module N8-H (bus interface)

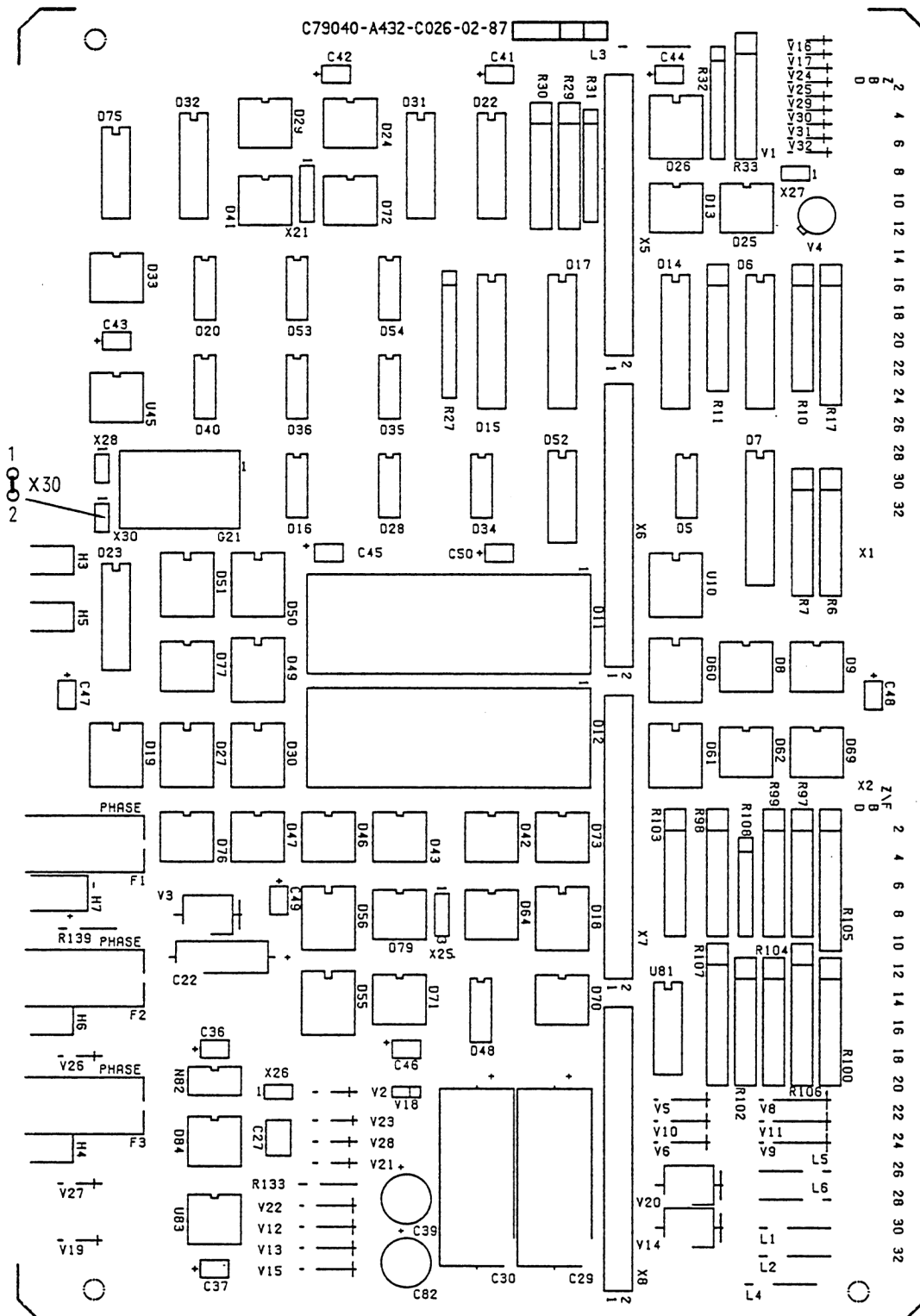


Jumper setting is to be performed in the same manner as if the module were to be used in a TELEPERM M AS 220 EHF or AS 220 H system.

Fig. 4.38 Local bus interface module N8-H 6DS1 220-8AA (bus interface)

	<p>Caution</p> <p>Setting BA=0 and TA=0 (i.e. all jumpers of J2 and J4 inserted) is not permitted. The jumper settings on CPU I and CPU II must be identical.</p> <p>CPU I bus address = CPU II bus address</p> <p>CPU I participant address = CPU II participant address</p>
---	--

4.7.2 I/O Comparator and Switchover Module (EAVU)



The jumper X30 must only be inserted on the basic board of the EAVU module. EE-specific jumper settings (EAVU number, I/O address range, etc.) are made by wire jumpers on the backplane connector X2 of the EAVU slot (see following Chapter 4.7.3)

Fig. 4.38 I/O comparator and switchover module, basic board

4.7.3 Wire Jumpers at the EAVU X2 Backplane Connector

The AS 235 H system can only function properly if the correct wire jumpers have been inserted at the rear of the X2 backplane connectors in the EAVU slots of the individual extension units.

Since these wire jumpers are installed together with the connections to the X2 backplane connector at the factory, they must be (like the PLAD 10 and PLAD 11 soldering jumpers for the extension unit number) specified during configuration. The wire jumpers are either set up as wire-wrap or as maxi-termi-point connections (depends on the extension unit type).

The following parameters are defined by wire jumpers:

- EAVU number (0...3)
- slot numbers of the I/O modules allocated to this EAVU
- SF61 enabling and routing of the 3x16 inputs of this module
- filter enabling for INT1 signals.

The meaning of these wire jumpers of the EAVU is discussed in the Technical Description of the EAVU (Order No. C79000-T8076-C343, Reg. 5 in this Manual). Section 4.4 of that Description explains and illustrates the necessary jumper settings.

Connection of ES 100 K systems

If there is an empty extension unit (EE) in either the basic cabinet (GS) or the extension cabinet (ES) it is possible to connect an ES 100 K system each instead. The interface module required in such a case (i.e. 6DS1322-8AA) has to be installed in one of the existing extension units.

Even if the basic cabinet and the extension cabinet are fully equipped with three or four EEs respectively, another two ES 100 K systems can be connected to the basic cabinet and one more ES 100 K to the extension cabinet.

In order to ensure that the additional I/O modules installed in an ES 100 K are addressable, the slot addresses (SF number) used in the ES 100 K must be enabled for the EAVU concerned by additional jumpers on the EAVU backplane connector (X2).

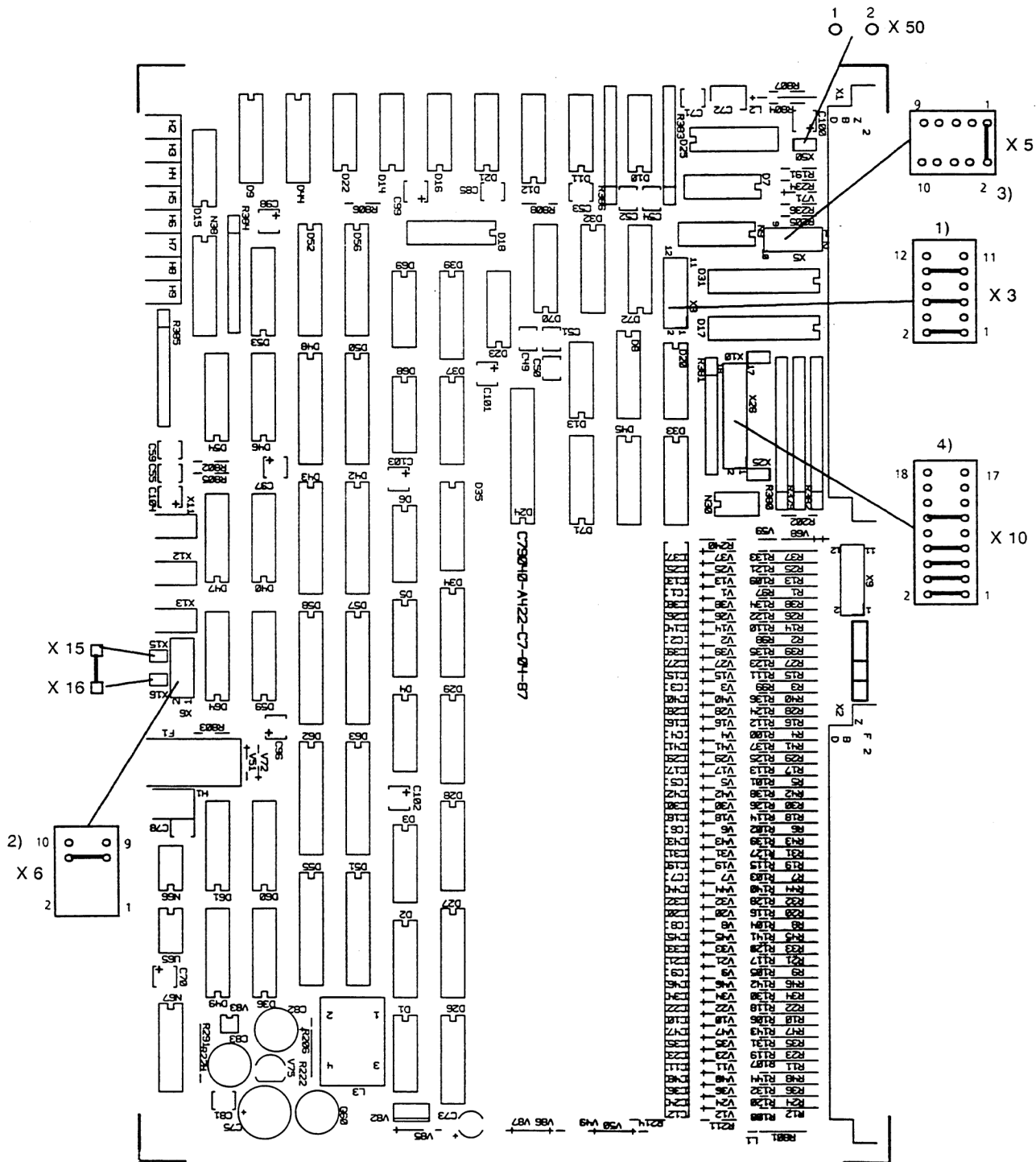
The jumper settings to be made on the backplane connector X2 of the EAVU in respect of ES 100 K systems are described in Chapter 4.7.6.



Caution

The jumper settings on the X2 backplane connector may only be changed during operation if the corresponding EAVU has been switched off.

4.7.4 SF61 Group Interrupt Module (binary input module 6DS1 601-8BA or 6DS1615-8AA)



- 1) An interrupt is triggered by a positive edge on binary inputs 1...48.
- 2) The jumper X6/9-10 remains open if the blinking voltage is supplied from an external source.
- 3) The interrupt is issued on INT1 line (X1/z10).
- 4) The jumper setting corresponds to slot number 61.

Remarks on the use of 6DS 1615-8AA:

The jumpers X6/1-2, X6/3-4 and X6/5-6 for input filtering and interrupt delimitation as well as the jumpers at X9 for the 48-V contact voltage have to be set in addition as described in the instructions.

Fig. 4.40 Group interrupt modules (SF61) 6DS1 601-8BA and 6DS1615-8AA

4.7.5 Slot Addresses in the I/O Area

Notes on slot addresses

Each slot in the extension unit is assigned a firm address (SF number) via the backplane and the soldering jumpers PLAD11 and PLAD10.

I/O modules with automatic slot addressing are automatically assigned their respective slot address upon installation. For reasons listed below the I/O modules **without** automatic slot addressing should also be installed at the slot address planned for them:

- to ensure clarity during maintenance
- to avoid doubly assigned slot addresses
- In contrast to AS 235, an I/O module might not be addressable at a different slot address because the associated EAVU has blocked the address concerned due to its jumper setting.

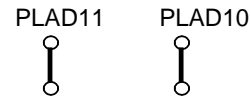
Slot addresses in the central cabinet, EABA 1 (PESPA)

EE no. 1
EAVU no. 0
SF number

0	1	2	3	4	5	6	7	8	9	10	11	61 Int or 12	EA VU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Slot address AD9...6
Slot no.

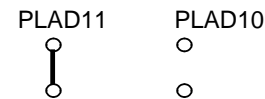
Jumpers at the rear of the extension unit



EE no. 2
EAVU no. 1
SF number

16	17	18	19	20	21	22	23	24	25	26	27	61 Int or 28	EA VU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

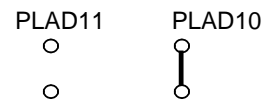
Slot address AD9...6
Slot no.



EE no. 3
EAVU no. 2
SF number

32	33	34	35	36	37	38	39	40	41	42	43	61 Int or 44	EA VU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Slot address AD9...6
Slot no.



Slot addresses in the extension cabinet, EABA 2 (PESP)

EE no. 4
EAVU no. 0
SF number

100	101	102	103	104	105	106	107	108	109	110	111	112	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Slot address AD9...6

Slot no.

Jumpers at the rear of the extension unit

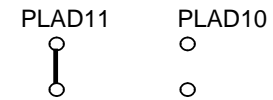


EE no. 5
EAVU no. 1
SF number

116	117	118	119	120	121	122	123	124	125	126	127	128	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Slot address AD9...6

Slot no.

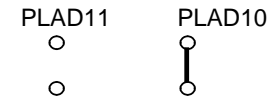


EE no. 7
EAVU no. 2
SF number

132	133	134	135	136	137	138	139	140	141	142	143	144	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Slot address AD9...6

Slot no.

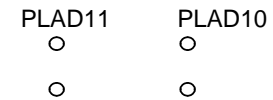


EE no. 7
EAVU no. 3
SF number

148	149	150	151	152	153	154	155	156	157	158	159	160	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Slot address AD9...6

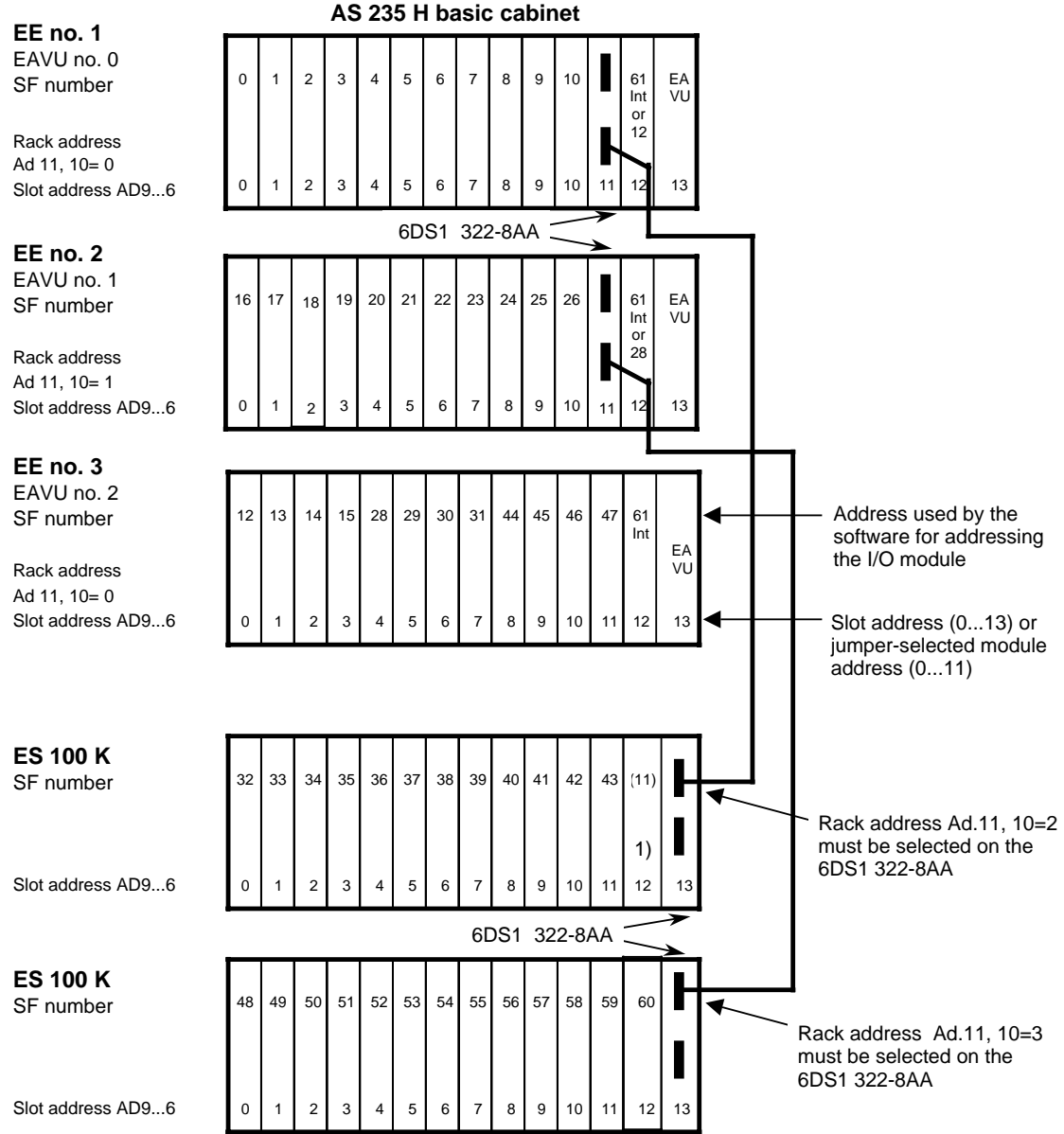
Slot no.



4.7.6 Slot Addresses and Jumper Settings for ES 100 K

The following configurations are suggested if the ES 100 K extension system is to be used as an extension of the AS 235 H system.

Configuration suggestion 1



Jumper, jumper pair	Name	Set (B) on extension unit		
		EE1	EE2	EE3
f12-d12 , f24-d24 f10-d10 , f22-d22	NrLSB NrMSB	B B	- -	B -
f14-d4 , f16-d16 b4-d4 , b16-d16	/Pe0Fg /Pe1Fg	B -	- B	- -
f6-d6 , f18-d18 b6-d6 , b18-d18	/Pe2Fg /Pe3Fg	B -	- B	- -
b10-z10 , b22-z22	/MitL	-	-	B
f8-d8 , f20-d20 b8-d8 , b20-d20 z8-z6 , z20-z18	/I0Fg /I1Fg /I2Fg	B - -	- B -	- - B
Soldering jumper on EE Soldering jumper on EE	PLAD10 PLAD11	B B	- B	B B

1) This slot may only be used for I/O modules without automatic slot addressing.

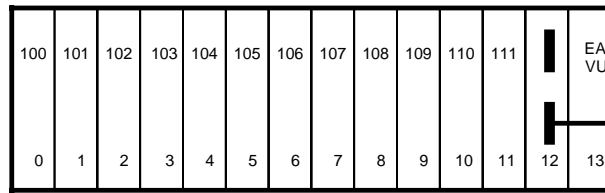
B=Jumper (pair) set

Configuration suggestion 2

AS 235 H extension cabinet

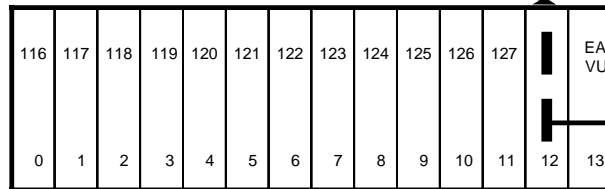
EE no. 4
EAVU no. 100
SF number

Ad 11, 10= 0
Slot address AD9...6



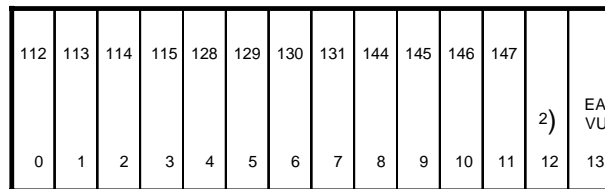
EE no. 5
EAVU no. 101
SF number

Rack address
Ad 11, 10= 1
Slot address AD9...6



EE no. 6
EAVU no. 102
SF number

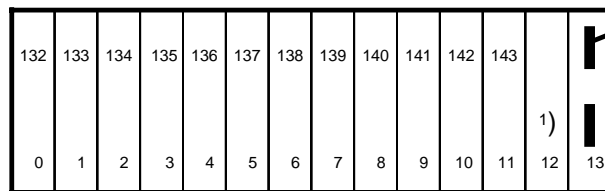
Rack address
Ad 11, 10= 2
Slot address AD9...6



ES 100 K

SF number

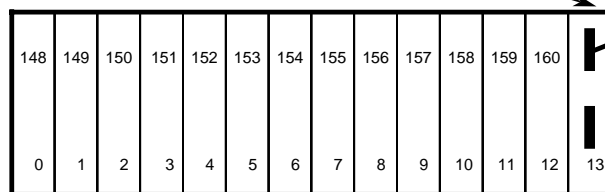
Slot address AD9...6



ES 100 K

SF number

Slot address AD9...6



6DS1 322-8AA

6DS1 322-8AA

Address used by the software for addressing the I/O module
Slot address (0...13) or jumper-selected module address (0...11)

Rack address Ad 11, 10=2 must be selected on the 6DS1 322-8AA

Rack address Ad,11, 10=3 must be selected on the 6DS1 322-8AA

Jumper, jumper pair	Name	Set (B) on extension unit		
		EE 4	EE 5	EE 6
f12-d12 , f24-d24 f10-d10 , f22-d22	NrLSB NrMSB	B B	- B	B -
f14-d4 , f16-d16 b4-d4 , b16-d16	/Pe0Fg /Pe1Fg	B -	- B	- -
f6-d6 , f18-d18 b6-d6 , b18-d18	/Pe2Fg /Pe3Fg	B -	- B	- -
b10-z10 , b22-z22	/MitL	-	-	B
f8-d8 , f20-d20 b8-d8 , b20-d20 z8-z6 , z20-z18	/I0Fg /I1Fg /I2Fg	- - -	- - -	- - -
Soldering jumper on EE	PLAD10	B	-	B
Soldering jumper on EE	PLAD11	B	B	B

1) This slot may only be used for I/O modules without automatic addressing. The slot addresses (100 to 111) set via jumpers may not be used in EE4, i.e. the slot concerned in the EE4 cannot be used then.

2) This slot cannot be used for I/O modules.

B) = Jumper (pair) set

Configuration suggestion 3

AS 235 H extension cabinet

EE no. 4

EAVU no. 100
SF number

Rack address
Ad 11, 10= 0
Slot address AD9...6

100	101	102	103	104	105	106	107	108	109	110	111	2)	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13

EE no. 5

EAVU no. 101
SF number

Rack address
Ad 11, 10= 1
Slot address AD9...6

116	117	118	119	120	121	122	123	124	125	126	127	2)	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13

EE no. 6

EAVU no. 102
SF number

Rack address
Ad 11, 10= 2
Slot address AD9...6

132	133	134	155	136	137	138	139	140	141	142	143		EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13

6DS1 322-8AA

EE no. 7

EAVU no. 103
SF number

Rack address
Ad 11, 10= 3
Slot address AD9...6

112	113	114	115	128	129	130	131	144	145	146	147	2)	EAVU
0	1	2	3	4	5	6	7	8	9	10	11	12	13

Address used by the software for addressing the I/O module

Slot address (0...13) or jumper-selected module address (0...11)

ES 100 K

SF number

Slat address AD9...6

148	149	150	151	152	153	154	155	156	157	158	159	160	
0	1	2	3	4	5	6	7	8	9	10	11	12	13

Rack address Ad.11, 10=3 must be selected on the 6DS1 322-8AA

6DS1 322-8AA

Jumper, jumper pair	Name	set (B) on extension unit			
		EE 4	EE 5	EE 6	EE 7
f12-d12 , f24-d24 f10-d10 , f22-d22	NrLSB NrMSB	B B	- B	B -	- -
f14-d4 , f16-d16 b4-d4 , b16-d16	/Pe0Fg /Pe1Fg	B -	- B	- -	- -
f6-d6 , f18-d18 b6-d6 , b18-d18	/Pe2Fg /Pe3Fg	- -	- -	B B	- -
b10-z10 , b22-z22	/MitL	-	-	-	B
f8-d8 , f20-d20 b8-d8 , b20-d20 z8-z6 , z20-z18	/I0Fg /I1Fg /I2Fg	- - -	- - -	- - -	- - -
Soldering jumper on EE Soldering jumper on EE	PLAD10 PLAD11	B B	- B	B -	B B

B=Jumper (pair) set

2) This slot cannot be used for I/O modules

All I/O slots may be equipped in any order with the permissible modules of the TELEPERM M standard spectrum or a permissible selection of TELEPERM ME modules.



Achtung

Use **all** I/O modules with an address identical to the slot addressing.
Observe the exception below.

In this way, these modules assume in their slot the address preset in the subrack.

Exception:

Individual modules of the TELEPERM M standard spectrum can **only** be operated with jumper settings. Set the associated slot address on these modules.

N-V.24 or CP581-TM interface modules may only be installed in one extension unit (EE) (not in ES 100 K).

Only one N-V.24 or CP581-TM module is permitted per extension unit.

These modules do not occupy a slot address.

4.7.7 Blinking Clock-Pulse Generator 6DS1 922-8AA (BL)

The blinking clock-pulse generator must be inserted in the power supply subrack in slot G165. It has the following functions:

- Central blinking pulse for I/O modules
- Lamp test for process peripherals
- Electrical isolation of time synchronization signals by external minutes pulse.

- Blinking pulse

A blinking signal (BS1 + BS2) is generated centrally by the blinking clock-pulse generator for the I/O subracks of the basic and extension cabinets. The fault LEDs on the I/O modules and the EAVUs then flash synchronously in the event of a fault.

The fault LEDs of the two cabinets can also be synchronized using settings on the blinking clock-pulse generator.

The two blinking signals are fused by PÜ1 + PÜ2 on the blinking clock-pulse generator.

The LEDs on the front panel of the module indicate whether the voltages are present for BS and time synchronization.

- Lamp test

To enable a lamp test, a signal for cabinet 1 (SK1) and cabinet 2 (SK2) can be connected to the I/O subracks by the switch LT.

Like the blinking signals, the lamp test signal is fused by LTV.

The wiring of the signal BS from the blinking clock-pulse generator is shown in the circuit diagram for the basic and extension cabinets. LT must be wired by the user for each I/O module specific to the slot in order to prevent an abrupt overloading of L+ in the extension units.

- Time synchronization

The system can be synchronized by an external timing pulse (minute pulse).

This external pulse must be connected to the blinking clock-pulse generator.

The two external signal lines (signal line + reference potential) can be connected as desired to the two (floating) inputs d22 and z20 using flat tabs (6.3 x 0.8 mm).

The jumper settings have to be modified on the 1st I/O bus interface module accordingly.

- Spare alarm (RES1)

If the input is not required for time synchronization via minute pulses (e.g. with bus-coupled systems), it can also be used for any other externally controllable I&C message (S349).

The external signal (24-V level) is connected to d22 of the blinking clock-pulse generator, z20 is assigned to the ground/reference potential of the alarm signal. Alarm= no current flow.

The jumper settings on the 1st EABG correspond to the default setting. The jumper is removed from the power supply subrack (default = 24 V).

- Blinking clock-pulse generator

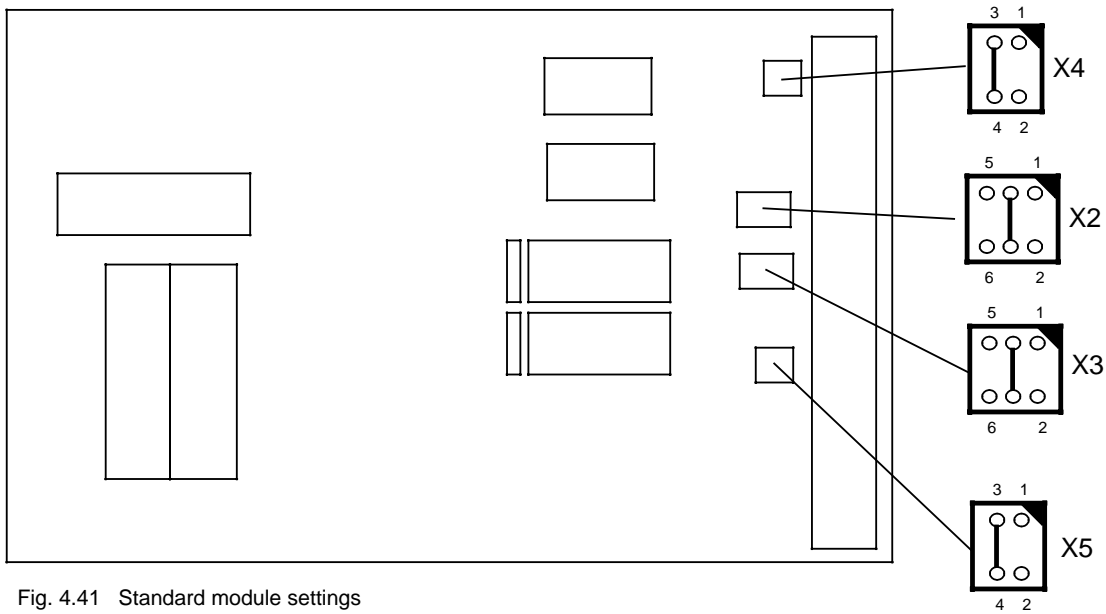


Fig. 4.41 Standard module settings

- Lamp test settings at X2 for SK1 and X3 for SK2

Jumper 1-2: The lamp test outputs are relay outputs

Function of outputs	Outputs for	
	SK1	SK2
W (common point)	b12	b14
A (NO contact)	d12	d14
R (NC contact)	z12	z14

Jumper 3-4: The lamp test outputs are signal outputs. With the switch in the center position, the L+ voltage is applied to z12 and z14. With switch position SK1, L+ is output at d12 and z14. With switch position SK2, L+ is output at z12 and d14.

Jumper 5-6: Function as jumper 3-4 except that the reference potential M is output instead of L+.

- Synchronization of blinking signal X4

Jumper 1-2: BS1 is synchronized by BS2

Jumper 3-4: BS2 is synchronized by BS1

- Synchronization of blinking signal X5

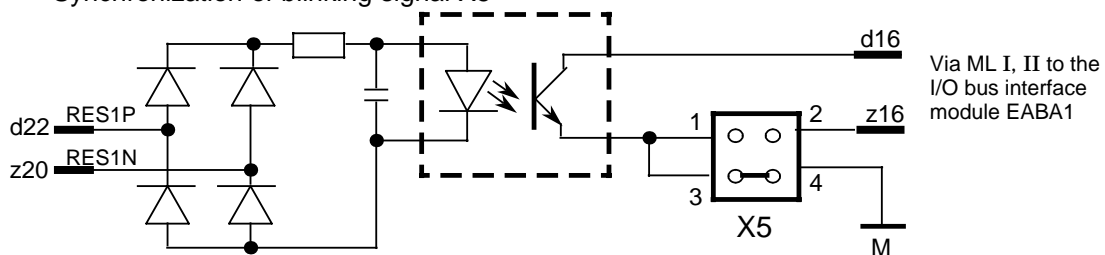
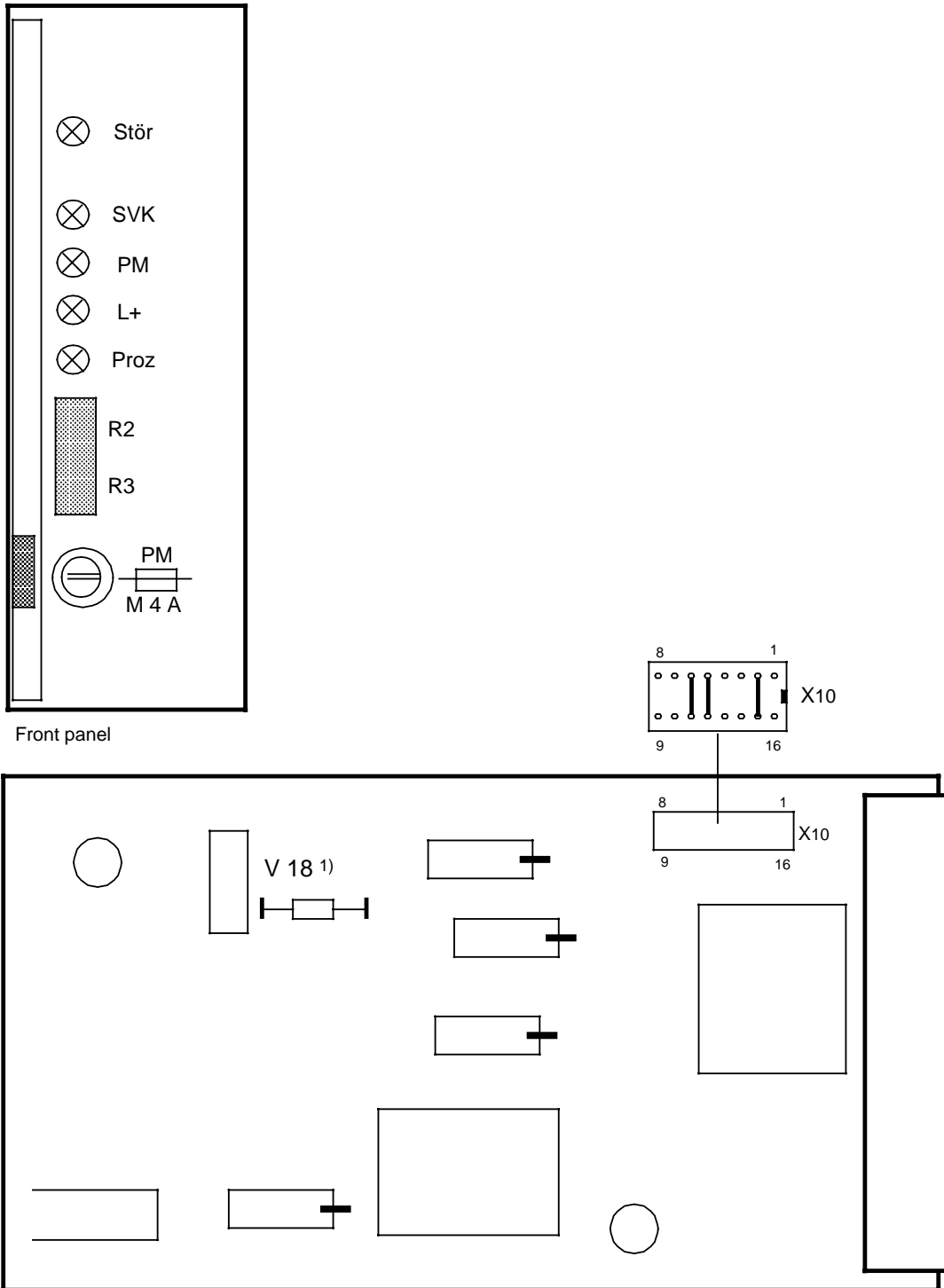


Fig. 4.42 Jumper assignment on the blinking clock-pulse generator (BL) with time synchronization via minutes pulses

4.7.8 Cabinet Power Supply Unit (SES)

- Alarm logic module (ML)



1) V18 must be removed

Fig. 4.43 Alarm logic module 6DS1 901-8AA

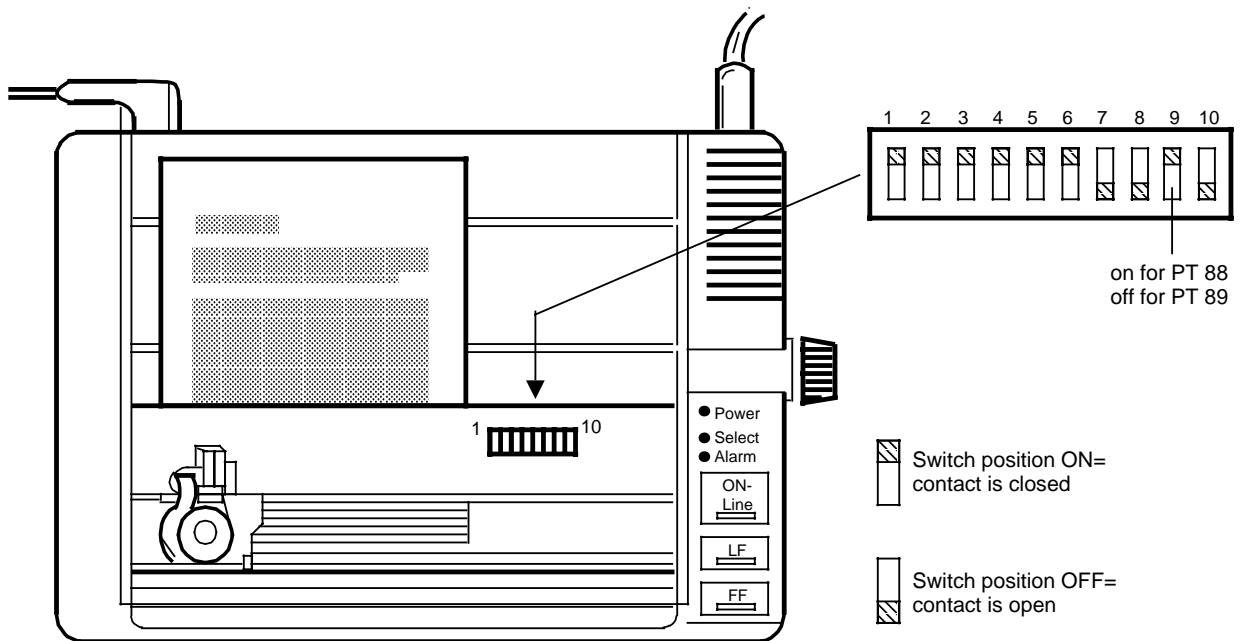
4.7.9 Setting up the Event Recorder and Logging Printer

4.7.9.1 PT88/89 Printer

- Setting the DIP switches

The DIP switches are underneath the cover on the central control unit ZS and may be accessed after the front door of the printer housing has been opened. The state upon delivery is represented Fig. 5.14).

Different standard functions and the desired font are selected with the ZS coding switch. The user-selected switch positions are read by the controller after "Power on" or "input prime". Changing the switch positions has no effect as long as the printer remains switched on. The default selections specified before power has been switched on are accepted once the commands "reset to normal position" or "reset parameters" have been received.



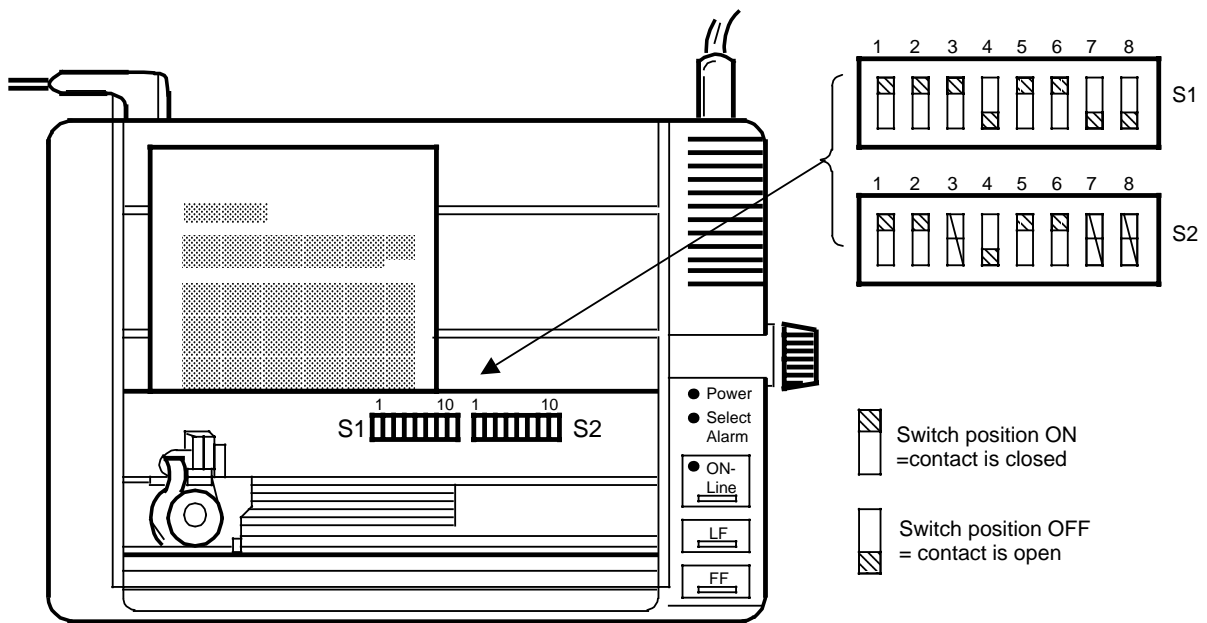
Switch 1 2	Fonts, special characters												
● ● ●	ASCII	#	\$	@	[\]	^ ` { } -							
● ● ○	S/SF	§	⊗	É	Ä	Ö	Å	^	é	ä	ö	å	ü
● ○ ●	GB	£	\$	@	[\]	^ ` { } -							
● ○ ○	E	#	\$	@	i	Ñ	¿	^	^	ç	''''		
○ ● ●	IA Nr. 5	#	⊗	@	[\]	^ ` { } -							
○ ● ○	D	#	\$	§	Ä	Ö	Ü	^	ä	ö	ü	ß	
○ ○ ●	DK/N	#	⊗	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
○ ○ ○	F/B	£	\$	à	°	ç	§	^	é	ù	è	''''	

● ON; ○ OFF

Switch	ON	OFF	Comment
4	LF = LF	LF=CR+LF	Paper feed
5	CR = CR	CR=CR+LF	
6	even (no parity: Bit 8=H during trans.)	odd (no parity: Bit 8=H during trans.)	Parity
7	off	ein	
8	11"	12"	Page length
9	1/6"	1/8"	Line feed
10	PT 88	PT 89	Paper width

[] = Switch position to be performed

Fig. 4.44 PT88/89 settings



All switches are on ON position when delivered.

Coding switch S1

Switch functions		Switch							
		1	2	3	4	5	6	7	8
Font	ASCII	●	●	●					
	Swedish	●	●	○					
	British	●	○	●					
	Spanish	●	○	○					
	IA No.5	○	●	●					
	German	○	●	○					
	Danish	○	○	●					
	French	○	○	○					
Paper feed	with line feed				●				
	without line feed			○					
	LF=CR+LF					●			
	LF=LF					○			
Print mode	Normalschrift						●		
	Schönschrift						○		
Zero	Zero = 0							●	
	Zero = 0							○	
Page length	11 inches								●
	12 inches								○

Coding switch S2

Switch functions		Switch							
		1	2	3	4	5	6	7	8
Line feed	1/6 inch	●							
	1/8 inch	○							
Skip over perforation	1 inch		●						
	off		○						
Parity	none				●				
	even				○	●			
	odd				○	○			
Buzzer	on							●	
	off							○	

Switches 3, 7 and 8 are not used

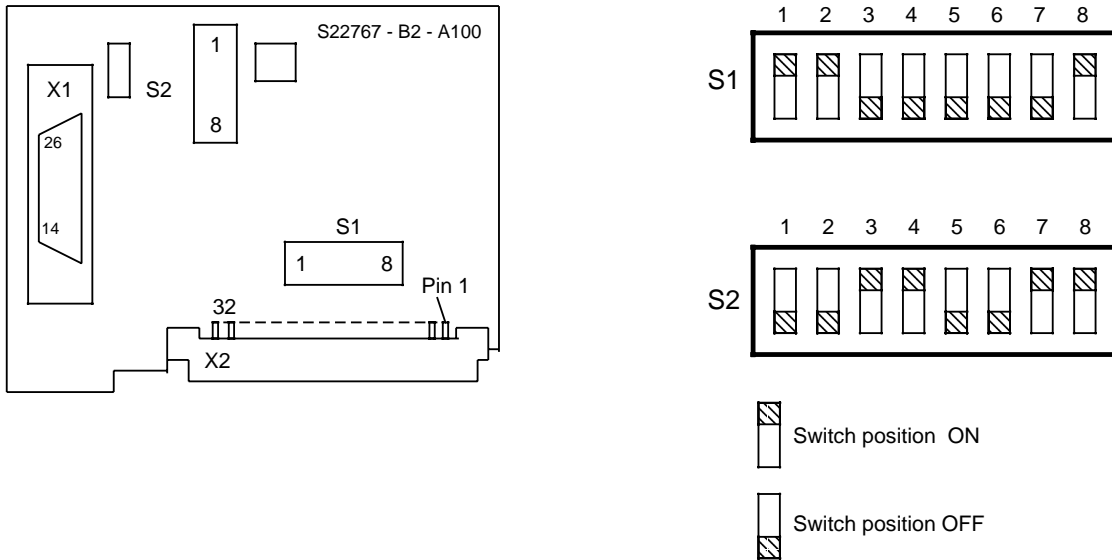
● ON ; ○ OFF

▭ Preferred setting

Fig. 4.45 PT88/89 settings

- Setting the TTY 20 mA mode selector switch (SAP-S2)

The following overview summarizes the settings of the S1 and S2 mode selector switches that are required for the individual modes.



Switch S1 SAP-S1, SAP-S2	Baud rate bit/s							
	110	200	300	600	1200	2400	4800	9600
1	○	●	○	●	○	●	○	●
2	○	○	●	●	○	○	●	●
3	○	○	○	○	●	●	●	●

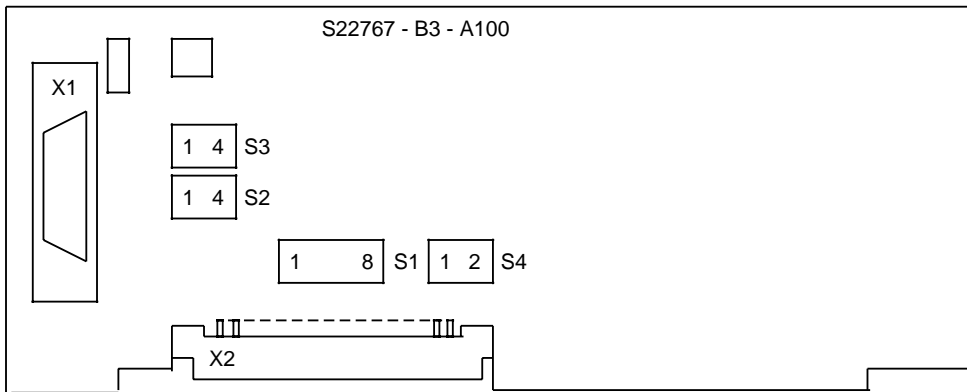
Mode	S1					S2							
	4	5	6	7	8	1	2	3	4	5	6	7	8
X-ON/X-OFF protocol	●	○	●	○									
BUSY	Current	○	○	○	●	○							
	No current	○	○	○	○	●							
Internal supply						○	○	●	●	○	○	●	●
Extern. supply with protective resistor						●	○	○	○	●	○	○	○
Extern. supply without protective resist.						○	●	○	○	○	●	○	○

Required setting ● = ON ○ = OFF

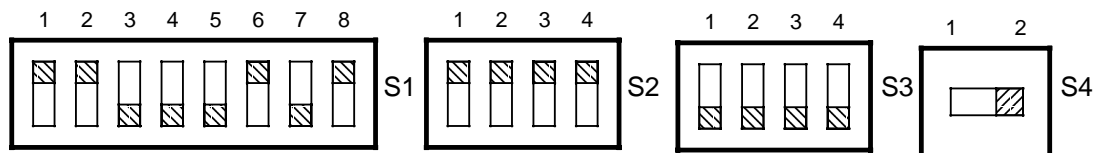
Fig. 4.46 TTY interface mode selection

- Setting the V.24/TTY combination interface mode selector switch

The S1 ... S4 mode selector switches on the combination interface modules are to be set according to the following specifications:

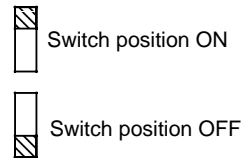


Multiple interface adapter



Baud rate

bit/s	S1		
	1	2	3
110	○	○	○
200	●	○	○
300	○	●	○
600	●	●	



Mode	S1					S2				S3			
	4	5	6	7	8	1	2	3	4	5	6	7	8
X-ON/X-OFF protocol	●	○	○	●									
BUSY	Current												
	No current					○	○	●	○	●			
Internal supply						●	●	●	●	○	○	○	○
Extern. supply with protective resistor						○	○	○	○	●	●	○	○
Extern. supply without protective resist.						○	○	○	○	○	○	●	●

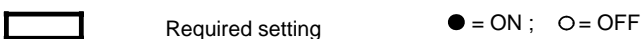


Fig. 4.47 V.24/TTY interface mode selection

Instructions for use:

- The baud rate is 600 bits/s
- The cable length is limited to 100 m (from the cabinet)
- Possible connection with TTY interface only
- 4-kB data buffer for the printer is required
- The printer cannot detect FF control holes
- Italic print is not possible
- The printer may only be used if the control characters for italic print have been removed from the AS 235 user program.

The following components must be installed in order to be able to use the PT88/89 printer:

TTY 20 mA S22767-B2-A100 or

RS-232-C/TTY 20 mA S22767-B3-A100

4 kB data buffer S22761-L301

Connecting cable 6XV2155-8A..

PT88/89 operator input channel interface module

4.7.9.2 PT90 Printer

The following DIP switch settings are required on the interface module:

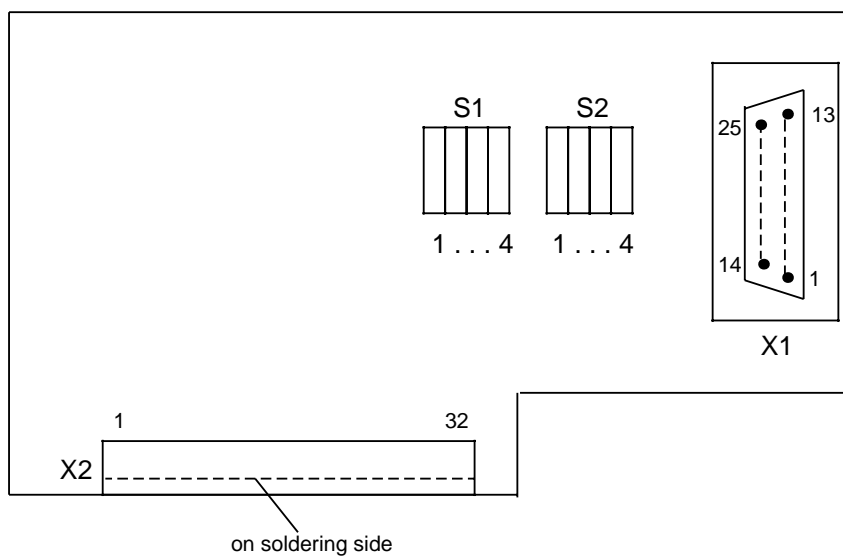


Fig. 4.48 Location of the X1 interface connector and the S1 and S2 mode selector switches on the module

Mode		Mode selector switch							
		S1				S2			
		1	2	3	4	1	2	3	4
Internal supply	Transmitter	<input type="radio"/>	<input type="radio"/>					<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Receiver			<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>		
External supply with protective resistor	Transmitter	<input type="radio"/>	<input checked="" type="radio"/>						
	Receiver			<input type="radio"/>	<input checked="" type="radio"/>				
External supply without protective resistor	Transmitter	<input checked="" type="radio"/>	<input type="radio"/>						
	Receiver			<input checked="" type="radio"/>	<input type="radio"/>				

● On
○ Off

Points a1 and a2 carry positive voltage if internal supply has been selected.

Fig. 4.49 Setting of the S1 and S2 mode selector switches

The other printer parameters are set in menu-driven operation.
Menu selections (also see PT 90 Description)

PT90 menu mode ON
Program version Siemens 2.2.3

1. Print parameters
2. Device parameters
3. Interface parameters
4. Test
5. Service

Keys: On Line = OFF, LF = NO, FF = YES

1. Print parameters

Page length (inch)	12
National character set	USASCII
Uni/bidirectional print	Bidirectional print
Character spacing	10 cpi
Character set	3
Vertical line spacing	6 lpi
Feeder cartridge	1
Graphics, dot group	1

2. Device parameters

Audible alarm	Enabled
Start of print	Variable
New line	LF
Shape of the numeral zero	No oblique
Dollar or asterisk	Dollar
Delete	Ignored
Bold columns	0
Graphic bit assignment	Bit 0 at top
Syntax errors	SMUDGE

3. Interface parameters

Character frame	7 bits, even parity
Baud rate	600 bits/s
Receive buffer	400
Receive buffer hysteresis	256
Transmit data line (serial)	BUSY inverted
Output lines (serial)	TTY/V.11
S1 and BUSY polarity (V.24)	P.20 S1, P.25 BUSY
Active inputs	None
ETX ACK (serial)	Disabled

4. Test

5. Service

PT 90 menu mode OFF

**Note:**

Instructions for setting the logging printer
(see Function Description AS 235 C79000-G8076-C416).

4.7.9.3 SICOMP DR 210-N / DR 211-N Printer

Also SICOMP DR 210-N/DR 211-N printers can be connected to AS 235 systems as event recorder and logging printers. For system reasons, the technical data are subject to limitations then.

The SICOMP DR 210-N and DR 211-N printers are equipped with a 9-needle matrix printing mechanism. Due to the low noise level of less than 52 dB(A) they are also suitable for control rooms.

Select the module with TTY interface and ECMA emulation as interface module.

The printers are operated via 4 function keys and 10 LEDs for displaying the parameter configuration and error messages. If the selected interface module has an ECMA emulation, these error messages can either be in German or English.

The printers offer the following functions for paper transport:

- "Auto view" function

If the printer does, for instance, not receive any data for 1 second, the paper is automatically fed forward until the last printed line becomes visible. If further printing data are received, the printer paper is withdrawn and the new line printed without any gap.

- "Auto tear-off"

The printed printer paper is fed forward to the tear-off edge and withdrawn to the printing position after the paper has been torn off.

- "Auto load"

Automatic adjustment of the first printing line when fan-fold paper is inserted.

The printing speed is 250 characters/s. A 17-Kbyte printing buffer must be selected when connecting the printer to AS 235 systems.

The two printers only differ in their respective form widths:

DR 210-N form width up to 254 mm (DIN A4)

DR 211-N form width up to 406 mm (DIN A3)

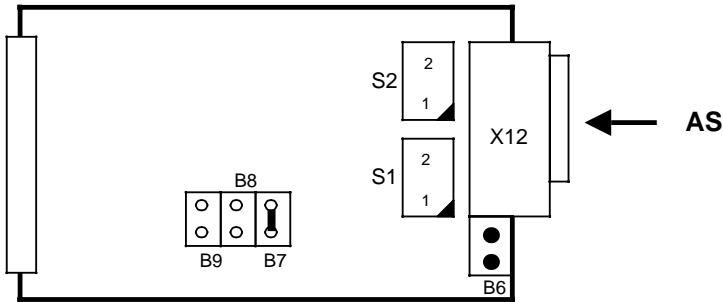
As transmission protocol, the setting takes place with READY/BUSY, the data format is 7 data bits, even parity, 1 stop bit.

The TTY interface has to be set to active mode on the transmitter and during reception.

A transfer rate of 600 bits/s has been configured (=default).

The connection to the AS takes place via the cable connector 6XV2 167-8AB...AU.

The following jumper and switch settings have to be made for AS 235 systems:



These jumper and switch settings have the following meaning:

- B5 separates protective and signal earth
- B7 applies READY-N to transmitter loop (=BUSY)
- S1/2 position 2: active transmitter and receiver loop

Fig. 4.50 AS 235 jumper and switch settings

Operating the printer:

The printer has a control panel with four keys and one LED display matrix:

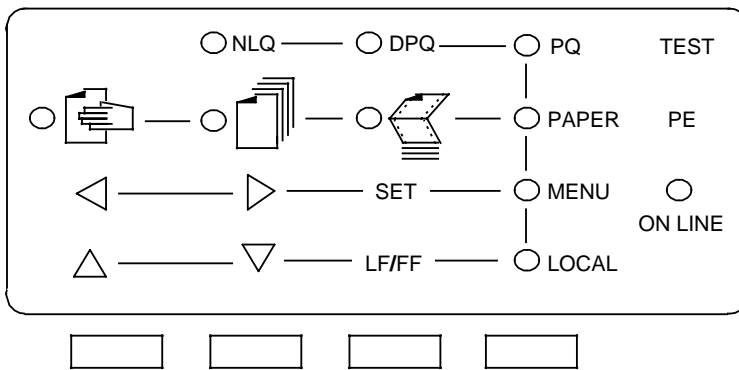


Fig. 4.51 Printer operation

All settings and parameter inputs are made via this control panel.

Printer settings: (parameter input)

MENU mode: (See Chapter 8 of the original Operating Instructions of the printer)

In this mode, the printer parameters are set for the first time or can be modified later on. The settings are made via the control panel.

Proceed as follows to set up the printer:

The current user configuration is activated when the printer is switched on.

- Call the MENU mode:

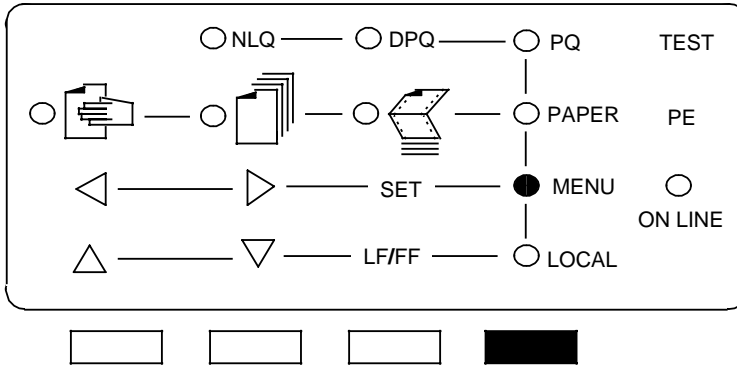


Fig. 4.52 Call the MENU mode

Press the key until the MENU LED lights up.

This is followed by:

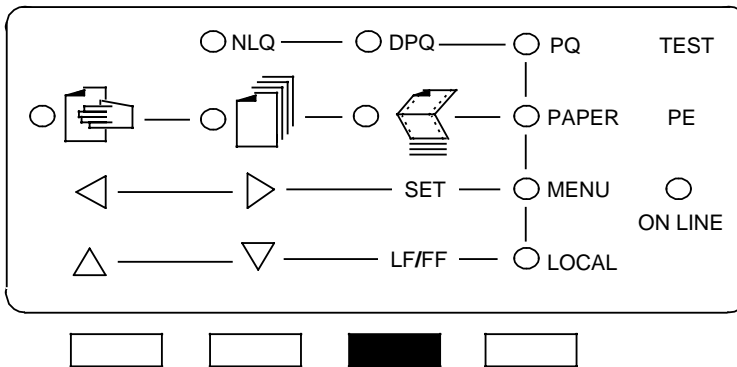


Fig. 4.53 Menu setting

Remove the front cover to set the menu.

The user menu and the technical menu can be configured now.

Print out the technical menu before modifying it.
(See Chapter 8 of the original SICOMP DR 210-N/DR 211-N Operating Instructions for operation and modification).

The following settings have to be made for the use with AS 235 systems:

Basic settings:

Language	German
Character spacing	10 CPI,
Expanded print	no
Character representation	
Italics	no
Proportional	no
Zero with slash	yes or no
Character set	Courier Siemens ECMA
Character font	0= DRAFT
National character set	0= ASCII
Upper half of table	ISO 8859-1
Character features	
Bold type	no
Double impact	no
Double height	no
Line density	6 LPI
Paper format	
Form length	12"
Fold	0
Line length	80 with SICOMP DR210-N
.....	136 with SICOMP DR211-N

Printer options:

Paper	not installed
Paper path	tractor
Ink ribbon	black
Color	black

Technical menu:

Line feed control	
Paper command	+CR
Line overflow	CR+LF
CR	CR
LF	LF
Paper handling	OFF

Interface settings:

Serial interface	
Receiver buffer	17 KB
Data bit	7 bits
Parity	even
Stop bit	1 stop bit
Baud rate	600
Status upon switching on	ON LINE
ESCAPE character	ESC

Technical settings	
Printing offset	0
"Change paper" text	ON
Vertical increment:	1/72 inch
Device code	OFF

- Positioning the first printing line

For AS 235 systems, the setting is made in the user menu and in the technical menu with 20/72". The first printing line is then positioned 1.41 cm below the perforation of the paper.

User menu:

1. Call the menu mode and select the user menu
2. Select "Paper format"
3. Select "Vertical adjustment"
4. Set = 20 for "Setting in 1/72 inch"
5. Select "Close" for storing the setting.

Make further adjustments or leave menu.

Technical menu

1. Print out "Technical menu"
2. Call "Technical menu"
3. Call "Technical settings"
2. Call "Phys. FORM settings"
3. Select "Continuous form"
4. Set = 20 for "Setting in 1/72 inch"
5. Select "Close" for storing the setting.

Make further adjustments or leave menu.

After the first printing line has been adjusted, the perforation of the paper (tear-off line) does no longer correspond to the tear-off edge of the printer. The position of the paper perforation must be set once more afterwards. (Also see original Operating Instructions of the printer and "Operator input mode".

- Operator input mode

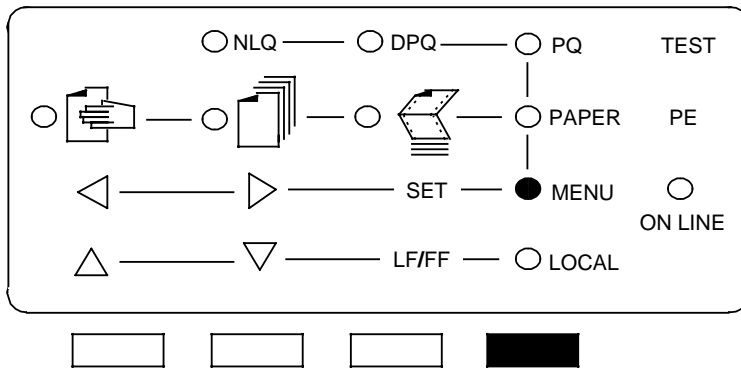


Fig. 4.54 Operator input mode

The operator input mode is switched over using the marked key. The associated LED lights up:

- PQ Set paper quality
- PAPER Paper feed
- MENU Printer configuration
- LOCAL Paper feed forward / backward
- ON-LINE Data communication AS - printer

Inserting the paper:

(See Chapter 4 of the original Operating Instructions of the SICOMP DR 210-N/DR 211-N printer.)

Tear-off function: for fan-fold paper

(See Chapter 7.2 of the original Operating Instructions of the SICOMP DR 210-N/DR 211-N printer.)

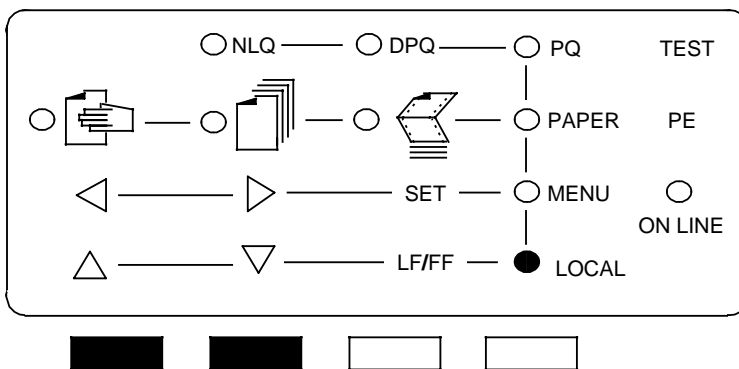


Fig. 4.55 Tear-off function

Bring paper into tear-off position. Press both marked keys simultaneously.

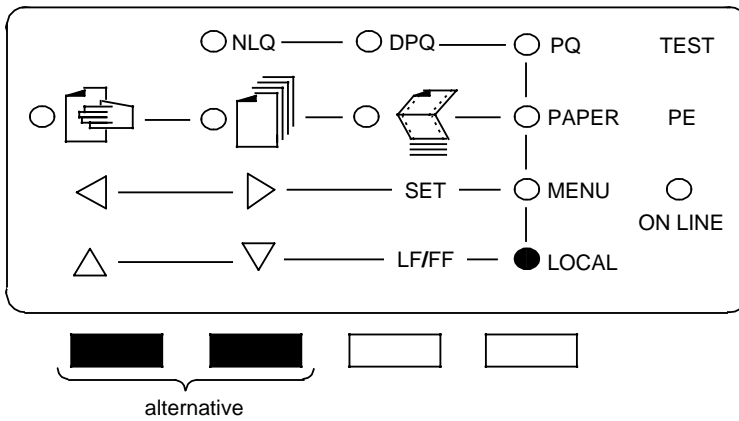


Fig. 4.56 Paper perforation corection

If the tear-off edge does not match the paper perforation, the paper perforation can be corrected by ± 1 cm using the marked keys.

The tear-off function can be called both in ON LINE mode and in LOCAL mode.

This is followed by:

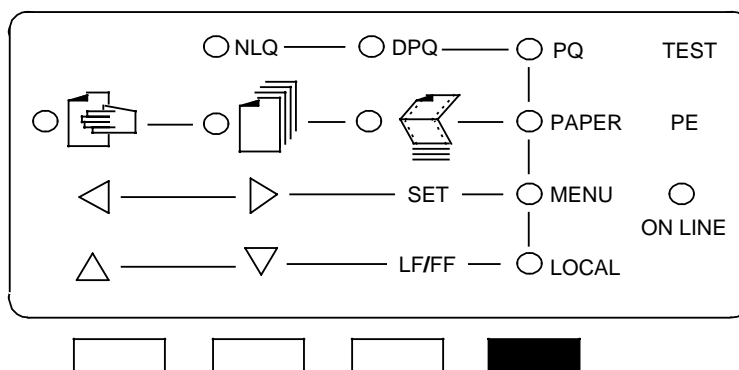


Fig. 4.57 ON LINE mode

This key serves to set the printer ON LINE.
The printer is now ready (moves to the first printing line).

4.7.9.4 DR 215-N/DR 216-N/DR 235-N and DR 236-N Printers (serial)

The DR 215-N, DR 216-N, DR 235-N and DR 236-N needle printers are used to output

- process messages,
- I&C error messages,
- operator input messages(e.g. limit modifications)
- or general logs during operation
- as well as feedback documentation of configuring data.

That is why they are used in the AS 235 automation system as event recorders and logging printers.

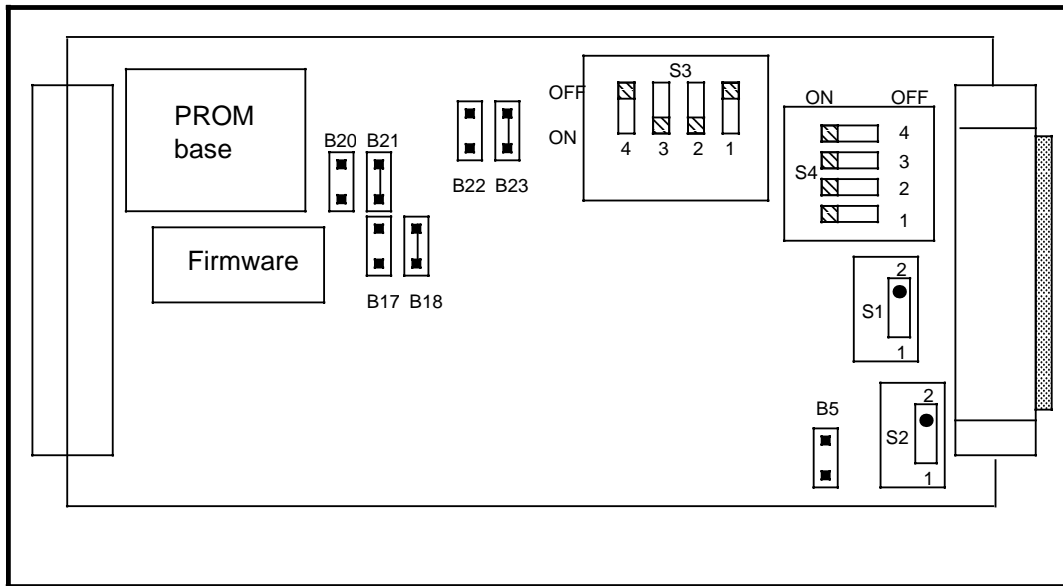
The DR 215-N and DR 216-N printers are equipped with a 9-needle printing mechanism, the DR 235-N and DR 236-N printers with a 24-needle printing mechanism. Due to the low level of less than 53 dB(A) they are also suitable for control rooms. Several carbon copies can be made (see Table 4.4).

Printer	DR 215-N	DR 216-N	DR 235-N	DR 236-N
Printing mechanism	9 needles	9 needles	24 needles	24 needles
Char. position/line	80	136	80	136
Carbon copies	6	6	5	5

Table 4.4 Printer design

Every printer must be equipped with an interface module for V.24/20-mA loop current when used with an AS 235 automation system. The interface module list has standard and ECMA emulation; for operation with AS 235 select the ECMA emulation. To connect to the AS use the connecting cable 6XV2 167-8A.

Carry out the following jumper and switch settings on the interface module:



Jumper	Function
B5 open *)	no connection between GND and chassis
B17 open / B18 zu *)	2 MB PROM (firmware) DR 215-N/216-N
B17 closed / B18 open	4 MB PROM (firmware) DR 235-N/236-N
B20 open / B21 closed *) B22 open / B 23 closed *)	PROM base not equipped or with an additional 2 MB PROM

Switch	Function
S1 in position 2	T-loop active
S2 in position 2	R-loop active
S3.1 in position ON S3.2 in position OFF	
S3.3 in position OFF S3.4 in position ON	connects READY with pin 2
S4.1 in position OFF S4.2 in position OFF	no signal at pin 25
S4.3 in position OFF	
S4.4 in position OFF	with TTY 20 mA operation

*) Factory default setting

Fig. 4.58 Jumper and switch settings of the serial interface module

Note:
The jumpers and switches not mentioned are preset at the factory and must not be modified.

Software settings (see also the Instructions supplied with the printer) have to be matched to the automation system. Use the setup menu according to Table 4.5.

Setup menu	AS
Font	Draft
CPI	10 CPI
LPI	6 LPI
Skip	0,0 Zoll
Emulation	ECMA 9011
Bidir	On
ZG-Tab	8859-1
CharSet	Extended
Land	GERMAN
0-Durch	Off
Auto-CR	On
Auto-LF	Off
Auto-Tear	View = 3s
Width	8 inch
Forml	12.0 inch
FarbOpt	Does not exist
PapOpt	None
Phys.Aj	0/72'
Buffer	64 kB
Interf.	Serial
Serial	
Baud	300/600
Format	7Bit Even 1Stop
Log	XON/XOFF
DevAttr	On
API	Off

Table 4.5 Printer setup menu for the automation system



Caution

Wrong settings/combinations could destroy components or cause erroneous functions (e.g. sporadic transfer errors) hervorrufen!

4.7.9.5 Printer Converter

The printer converter converts the the printer interfaces of the automation system (20-mA current loop/V.24) in a standard Centronics interface. That permits to connect standard printer with Centronics interface and IBM Proprinter font 2.

A parity error on the serial interface is declared as "Smudge" (B"H) on the printer.

A new installation with event recorder/logging printer requires the connecting cable 6DS8316-8xx (see Fig. 4.60) to connect the printer converter.

An adapter connecting cable is required between AS connecting cable (previous) and printer converter when an event recorder/logging printer with Centronics interface is retrofitted to an AS system.

Use a standard Centronics connecting cable to link the printer converter and the printer (paralle interface).

Apart from the printers DR 215-N, DR 216-N, DR 235-N, DR 236-N, DR 240-I and DR 241-I (each with Centronics interface) comparable printers from other competitors are also suitable if they fulfil the following conditions:

- Centronics interface with IBM Proprinter font 2
- Interference suppression Class B according to VDE 0871
- Print capacity: 150characters/s
- Print buffer at least 4 KByte
- Paper end recognition
- Continuous paper, printer setting at least 66 lines/page

An AUTO VIEW function is recommended for a better reading of the last printed lines.

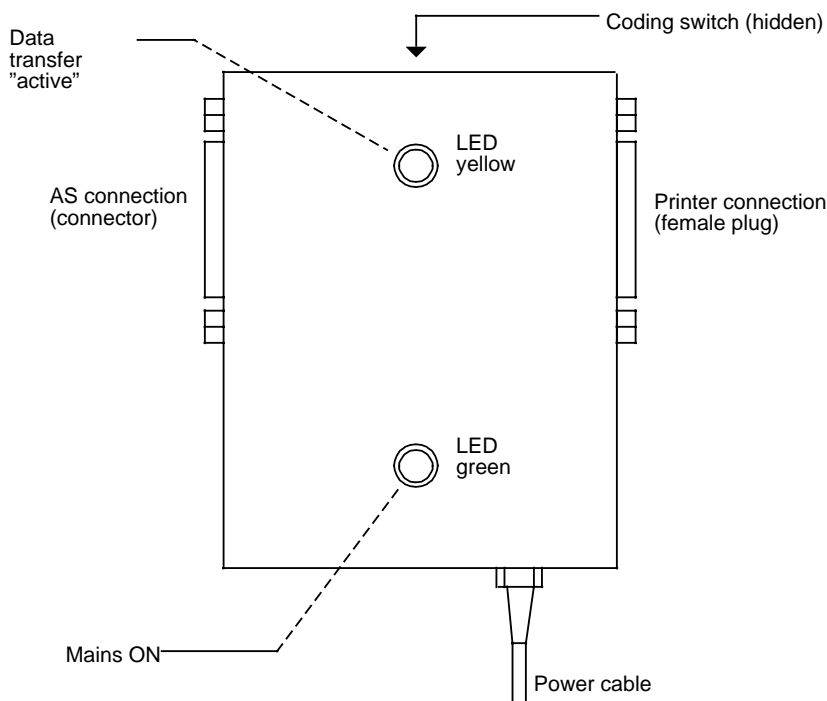
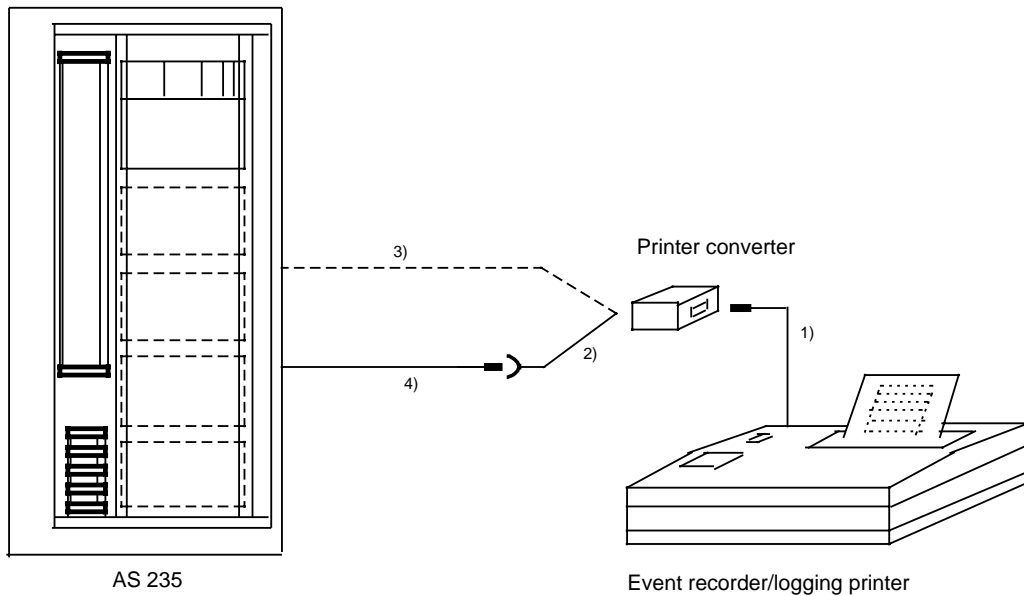


Fig. 4.59 Printer converter (top view)

- Connection

Link the printer converter to the mains (AC 230 V, 50/60 Hz) with a power cable (Fig. 4.60). A green LED indicates the readiness for service. The transfer of the operating condition settings (coding switches, see Fig. 4.62 occurs simultaneously. The links to the AS or to the printer are shown in Fig. 4.60. A yellow blinking LED indicates the data transfer.



- 1) Connecting cable to link the event recorder/logging printer to the printer converter;
Standard Centronics connecting cable (parallel)
- 2) Adapter connecting cable 6DS8317-8AC between the system specific connecting cable (4) and the printer converter
- 3) System specific connecting cable 6DS8316-8xx between AS 235 and printer converter for the printer connection of new systems
- 4) System specific connecting cables for the printer connection of already delivered systems
AS 220 S/K/H, AS 230/230 K: 6DS8126-8xx
AS 235/235 K/H: 6XV2167-8Axxx or 6XV2155-8Axxx

Fig. 4.60 Connection of a printer converter

- Coding switch meaning

The coding switches are disposed on the printer converter and appear after removing a cover. They allow setting the printer converter operating conditions.

Meaning	Switch S1									
	1	2	3	4	5	6	7	8	9	10
TTY (20 mA)	●									
V.24	○									
BUSY		●								
XON/XOFF		○								
BUSY no current			●							
BUSY current			○							
BUSY at pin 25				●						
BUSY at pin 2				○						
Data width 8 bits					●					
Data width 7 bits					○					
No parity						○	○			
Odd parity						○	●			
Even parity						●	○			
300 bauds								○	○	●
600 bauds								○	●	○
1200 bauds								○	●	●
2400 bauds								●	○	○
4800 bauds								●	○	●
9600 bauds								●	●	○
19200 bauds								●	●	●
Maintenance This selection must not be set. wert is only used for test and maintenance.						●	●	○	○	○

- ON
- OFF
- Required setting (state upon delivery)

Fig. 4.61 Setting coding switch S1

Meaning	Switch S2							
	1	2	3	4	5	6	7	8
Receive RX active	●	●	○	○				
Receive RX passive, without protective resistor	○	○	●	○				
Receive RX passive, with protective resistor	○	○	○	●				
Transmit TX active					●	●	○	○
Transmit TX passiv, ohne Schutzwiderstand					○	○	●	○
Transmit TX passive, with protective resistor					○	○	○	●

● ON
○ OFF Required setting (state upon delivery)

Fig. 4.62 Setting coding switch S2

- Coding switch setting for AS 235

When the printer converter is delivered the coding switches are already set for use with an AS 235.

Caution:

Only modify the coding switch position in de-energized state.

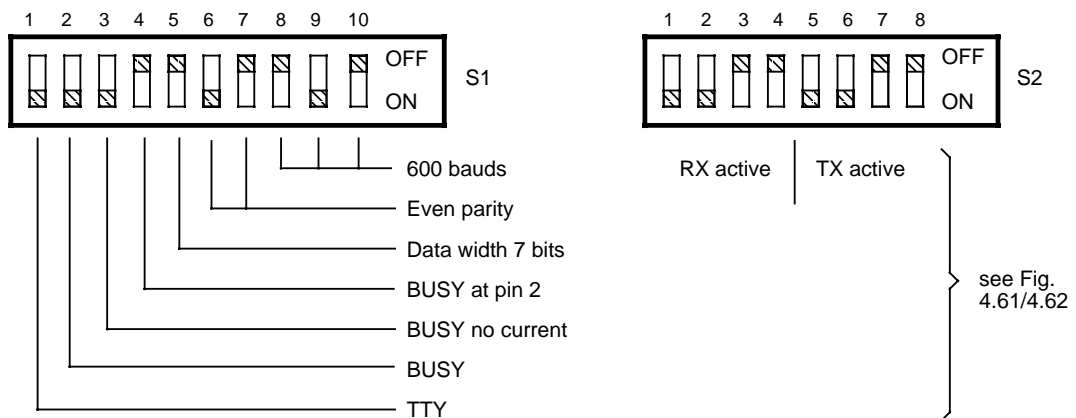
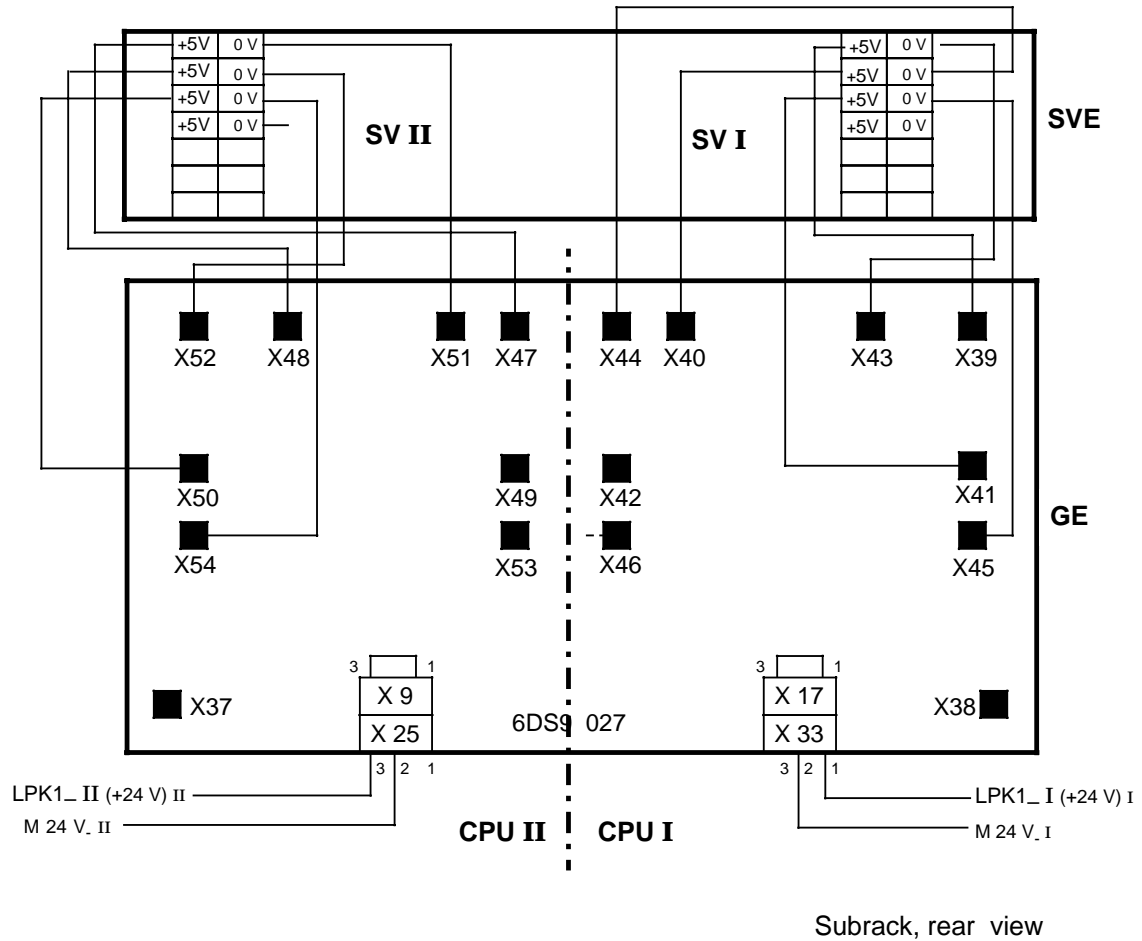


Fig. 4.63 Setting the coding switches with AS 235

4.8 Basic Unit and I/O Bus Cabling

4.8.1 Central Unit Power Supply Connections



- LPK1 I/II
- LPK2 I/II
- M24V I/II
- SVE Power supply assembly
- SV Power supply unit
- GE Basic unit

Fig. 4.64 Power supply lines between SV and GE

4.8.2 Ribbon Cables between Basic Unit and Extension Unit

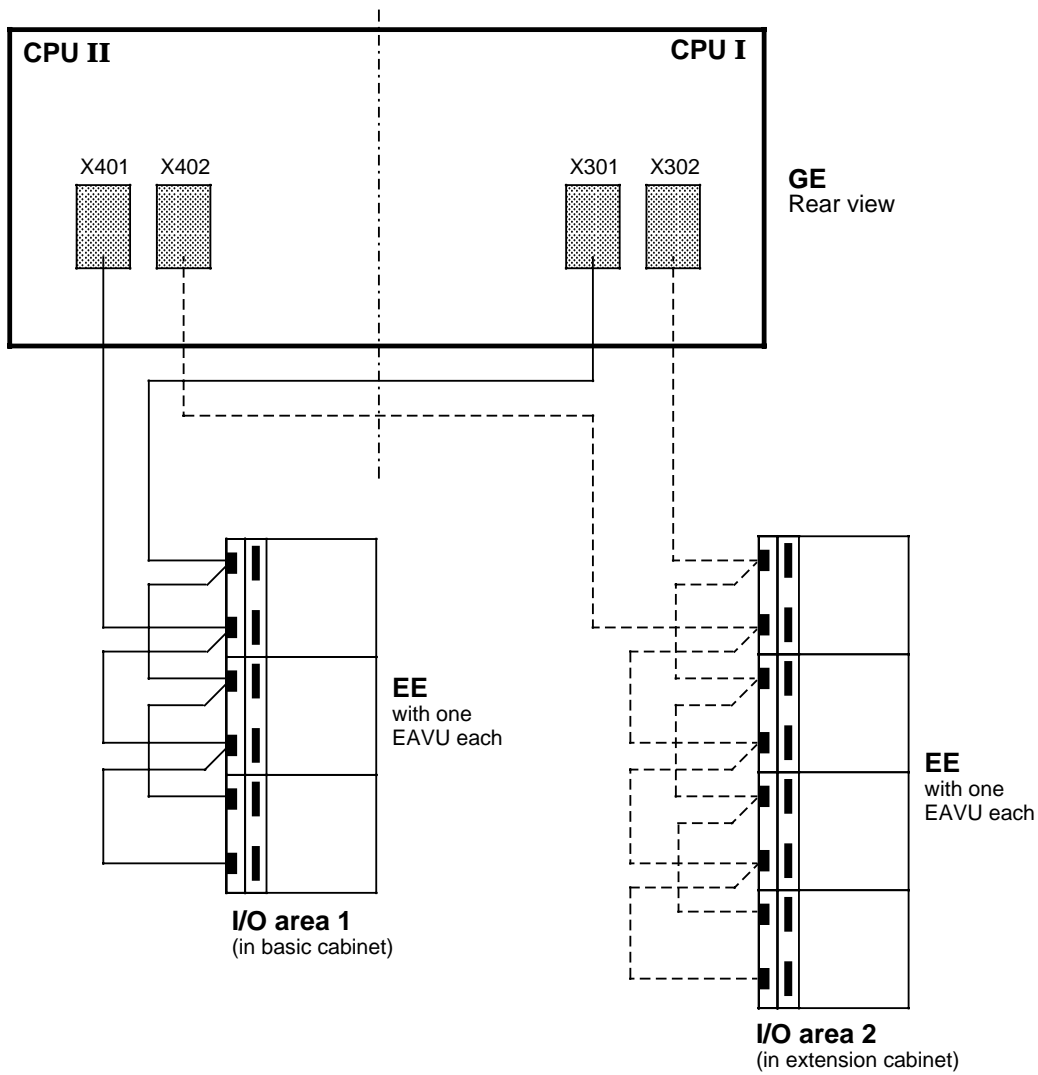


Fig. 4.65 Connecting diagram of the I/O bus ribbon cables

5 Commissioning

Check the cabinet installation before commissioning.

- Are all components available that are necessary for operation?
(Visual check of the subracks)
- Have both central processing units the same configuration?
(The configuration planned for operation)
- Has the power supply unit been connected?
(Cabinet power supply unit operational?)
- Has the N-AS/N8-H local bus interface been installed?
(Correct setting of the S11/S12 switches?)
- Are the operator input units connected and operational?
(Check connections)
- Have the EAVUs been installed?
(Has the connection of the X2 backplane connector been established at the rear of the extension units in accordance with the I/O configuration?)

- Initial system loading

The two central processing units can either be booted from one mini floppy disk unit (MDE) in succession or from two MDEs in parallel.

The system software must be loaded separately into each CPU.

Initial state:

- MDE connected, system disk not inserted.
- Backup battery on RAM module not inserted.
- Switch on RAM module in position "RUN" or "BOOT".

Putting system into operation:

1. Switch on the two CPUs by their protective switches F1 and F2.

CPU assumes STOP mode (red LED ON).

The red LED on the RAM module goes ON.

The red fault LED on the SB is ON.

2. Insert system disk into MDE and press ZRS pushbutton on CPU module.

Red LEDs on CPU and RAM modules go OFF.

Green LED (BOOT) on RAM module goes ON.

The system software is booted from the MDE. The following message texts are displayed on the monitor ¹⁾:

```

URLADER: ANLAUF VERS. 01 ..... Pos. 1
(Initial loader: startup of Vers. 01)
SYSTEMDISKETTE IN LAUFWERK EINLEGEN: OK ..... Pos. 2
(Insert system diskette into drive: OK)
PRÜFUNG SYSTEMDISKETTE: OK ..... Pos. 3
(Checking system diskette: OK)
SYSTEM-DISKETTE: AS 235 H VERS. XXX SYSTEMSOFTWARE .... Pos. 4
(System diskette: AS 235 H, version XXX system software)
SYSTEM-DISKETTE WIRD GELADEN: ..... Pos. 5
(System diskette is being loaded)

```

¹⁾ Initial loading is only displayed for CPU II. CPU II should therefore be loaded first if only one MDE is available.

This display disappears after approximately 5 minutes and system message S300 appears. Initial loading for the respective CPU is terminated.

The first CPU to have been loaded automatically transitions from failure mode to master mode; the second CPU remains in failure mode until the system software has been loaded, then assumes passive mode. This means that the two CPUs are still in asynchronous operation.

Synchronization may now be started by pressing the backup pushbutton on the comparator coupler module (VKB) for approximately one second.

The transition into backup mode is indicated by the standby LED which lights up in addition to the passive LED. Synchronization may also be controlled via the keyboard (cf. the AS 235 H Description C79000-T8076-C416 in the Manual C79000-G8076-C416).

Pressing the backup pushbutton remains without effect for approximately 15 seconds after the CPU has been started.

The synchronization module in the master CPU defines the "meeting point" of the two synchronization modules and initiates a hardware stop of the second CPU. The passive CPU then transitions into backup mode. Both synchronization modules and the comparator coupler module (which had no function in asynchronous operation) now initiate synchronous operation of the two CPUs.

The comparator coupler module (VKB) routes all read data from the master CPU via the bus to the second CPU. The synchronous operation causes all register contents to be verified.

The second CPU cannot assume mastership during updating.

Passive and standby LED are both on during loading. Both CPUs are operating synchronously when the passive LED is extinguished.

Synchronization is only possible in master/passive or passive/master mode if both CPUs have the same module configuration, the same memory configuration, and the same system software level (cf. the AS 235 H Description C79000-T8076-C416 in the Manual C79000-G8076-C416).

- Activating and de-activating the system or the CPU in battery-backed operation

The standby CPU assumes mastership after a maximum of 50 ms after the master CPU has been switched off. The N-AS/N8-H is re-parametrized when mastership is changed.

De-activating the backup CPU does not affect the master CPU.

CPU I always remains master if both CPUs are switched on at the same time ($t < 2$ s).

The first CPU to have been switched on becomes master if the time difference is more than 2 seconds.

- Possible error messages
 - SYS-RAM DEFEKT (Pos. 2): - Defective memory module
 - FLOPPY-ANSCHALTUNG DEFEKT (Pos. 2): - Mini floppy disk interface module is defective or incorrect jumper setting on mini floppy disk interface
 - LAUFWERK NICHT BEREIT (Pos. 2): . . . - Mini floppy disk unit is defective or has not been connected
 - DATEI 1 DEFEKT (Pos. 3): - Parts of the system floppy disk are defective ¹⁾
 - BACKUP-DATEI DEFEKT (Pos. 3): - Parts of the system floppy disk are defective ¹⁾
 - DISKETTE DEFEKT (Pos. 3): - System floppy disk is completely defective or no system floppy disk is in drive.
 - NICHT LESBAR, ERNEUTEN VERSUCH STARTEN (Pos. 3): - No AS floppy disk is in drive or system Floppy disk is completely defective.
 - LESEFEHLER (Pos. 4): - System floppy disk label is defective or switch on MDA is in special mode position.
 - KEINE SYSTEMDISKETTE (Pos. 4): - Inserted floppy disk is a user floppy disk, not a system floppy disk.
 - PRÜFSUMME FALSCH (Pos. 5): - Transmission error from MDA to RAM or system floppy disk is defective.
 - UMSCHALTUNG AUF BACKUP-DATEI . . . - Read error in master file.
 - BEIDE DATEIEN NICHT LESBAR. - Defect on floppy disk which has not been detected during previous checks.
 - NEUE SYSTEMDISKETTE ERFORDERLICH (Pos. 5):
 - SCHREIBFEHLER SYS-RAM (Pos. 5): . . - Fault on memory module which has not been detected during memory test.

If neither of the above messages appears at position 1, the initial program loader cannot be activated at all (i.e. a fatal hardware defect has occurred).

¹⁾ A new system disk should be obtained in these cases so as not to lose the advantage of file redundancy.

Notes

6 Maintenance

6.1 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 personnel 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.

We refer again to the "Safety-related Guidelines for the User". You find these Guidelines in this Manual before Section 1.

6.2 Fault Elimination

The service personnel is guided by fault messages from the system or system components to the cause of the fault.

The AS 235 H Description (C79000-T8076-C484 in the Manual C79000-G8076-C416) contains explanations regarding fault indications. The defect is shown in the fault screen display, provided that it has been located by the software.

In any other case, interpretation of the values displayed in the same screen display using the VKB Operating Instructions (C79000-T8076-C345) helps isolating the fault.

The screen display "EAVU registers" and the EAVU Description (C79000-T8076-C343) may be used for further analysis if the fault has occurred during I/O access.

A fault must be eliminated by modifications if it has been caused by configuration errors.

The following procedure is recommended if a fault is due to a hardware failure:

Replace the printed circuit boards one by one until the faulty module has been located.

Return the defective module and a fault description (using the form provided for products to be returned) to the factory for repair or ask ANL A 434 ED, Erlangen for a replacement.



Caution

Switch off the module supply voltage (switch off the power supply unit or remove the module fuse, for example) before removing or inserting a module. Switch off the system power supply unit before performing any wiring (modification or repair work) on the backplane or in the SAE area. Verify that the system is in an orderly state (e.g. no short-circuits by bent wrap pins or wire bits in the subrack backplane) before the voltage is switched on.



Note

A buffer module may be removed or installed during operation. Since the high charging current may cause a breakdown of the power supply unit, the capacitors on the replacement module must be charged via a 1-K ohm resistor up to approximately DC 24 V before the module is installed. Ensure that the polarity is correct during charging.

6.3 Backup Battery

A lithium battery (AA type) on the memory module 6DS1 837-8.. or 6DS1 844-8.. is used for buffering the memory contents.

The battery is supplied as a separate item together with the module, and is not installed. It may be installed or replaced during operation.

The battery voltage is monitored every 60 s. The fault LED lights up and a system message (S357) is issued if the voltage drops below 2.8 V.

The message only disappears after the battery has been replaced. In operation this I&C message means that the battery is discharged. In this case replace the battery.

This system message only indicates low battery voltage during running operation. Since it cannot be guaranteed that the memory contents have been maintained when the battery voltage drops below the tolerance value during buffer mode.

Battery failure mode (BAU) is assumed when AS operation is continued after voltage recovery.

Logic interpretation of the BAU state is only performed during system start-up. The system reacts as follows:

- The system requests a new initial loading during start-up and clears the user memory if the BAU signal is active (logic "0"), even if the switch on the memory module is in RUN position. The system issues S300.
- The system starts without request for a new initial loading if the BAU signal is logic "1" (the battery has not failed in the meantime). A failure in between (e.g. by battery replacement) cannot be detected by the module 6DS1 837-8..

However the module 6DS1 844-8.. recognizes a battery change in backup mode and reacts automatically with a BOOT requirement at the next system startup.



Caution

When the memory module has been removed during the backup mode, the stored data cannot be guaranteed.

Use only replacement batteries of the same type. The batteries should be replaced at least once a year as a preventive measure.

Depending on the memory configuration, the capacity of a lithium battery lasts for:

- 1 MB at least 500 hours with module 6DS1 837-8..
- 2 MB at least 300 hours with module 6DS1 837-8..
- 3 MB at least 200 hours with module 6DS1 837-8..
- 4 MB at least 480 hours with module 6DS1 844-8..

The backup battery can be tested using a suitable voltmeter (digital voltmeter).

A new battery must have a no-load voltage of 3.6 V.

- Replacing the battery
- Memory module 6DS1 837-8..

First remove the cover from the battery case on the front panel of the memory module. The battery may now be removed or installed.

- Memory module 6DS1 844-8..

Pull out the battery drawer up to the stop, remove the old battery, insert the new battery with the right polarity. push the drawer till the snap position.

The battery drawer may also be completely removed when the lateral locating springs are pressed (see following Fig. 6.1).

Now the battery can be inserted or removed.

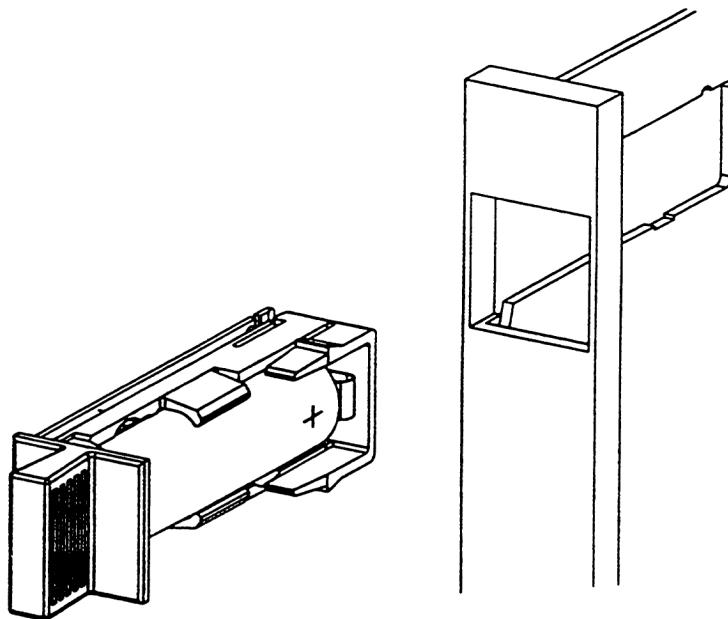


Fig. 6.1 Battery drawer of the memory module 6DS1 844-8..

Clean the surfaces in order to guarantee proper contact.



Warning

Never open a battery, it contains strongly corrosive agents. Do not throw batteries into an open fire.
Protect your environment: Do not include old or used batteries in the normal garbage. Observe the local regulations for discarding special and toxic waste.



Caution

Observe the polarity during installation.
6DS1 837-8..: "POSITIVE POLE must point upwards."
6DS1 844-8..: "NEGATIVE POLE must point to grip side."
Observe the "ESD Guidelines".
(discharge static charges before inserting)

6.4 Circuit Diagrams

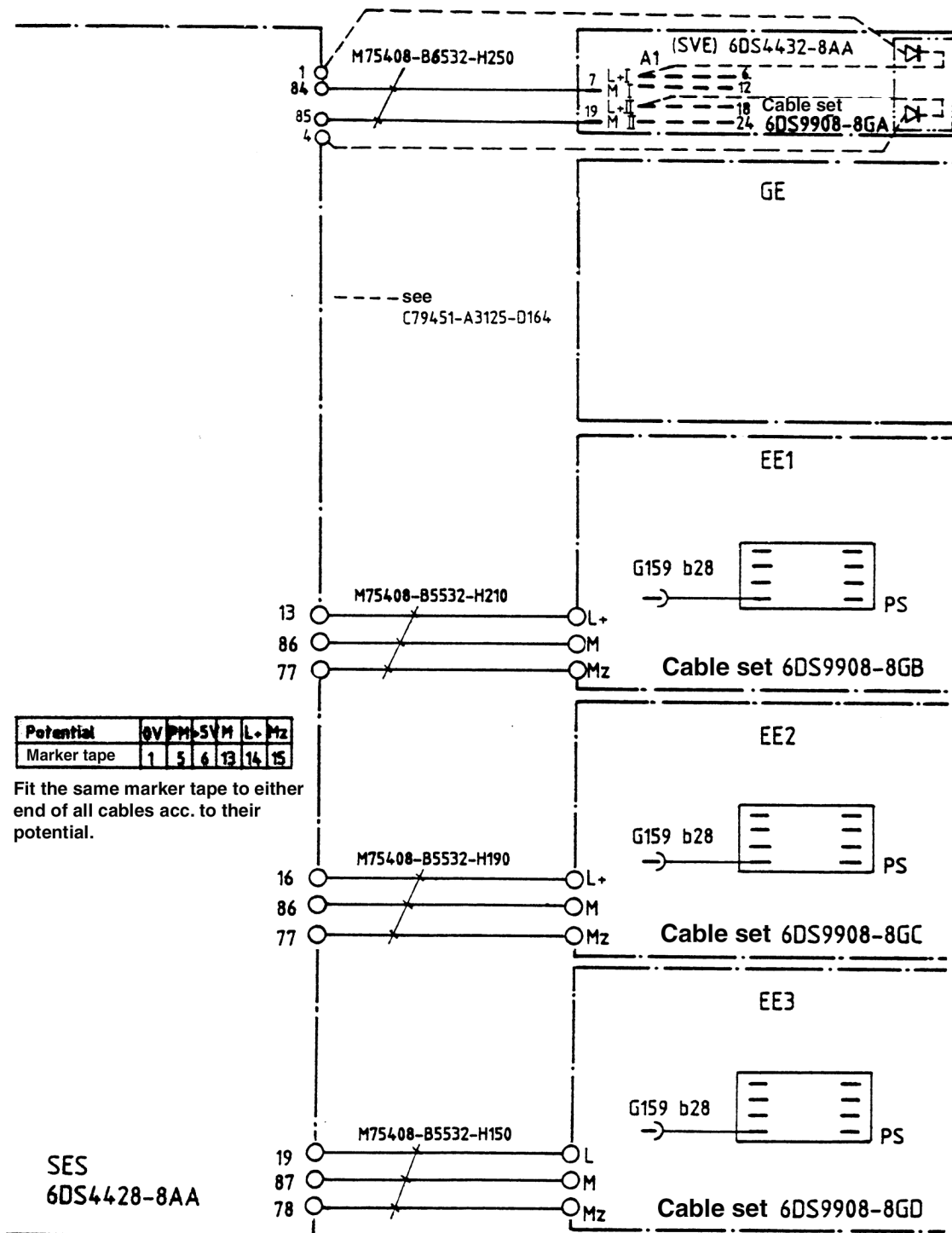


Fig. 6.2 Basic cabinet, connections L+, M, Mz

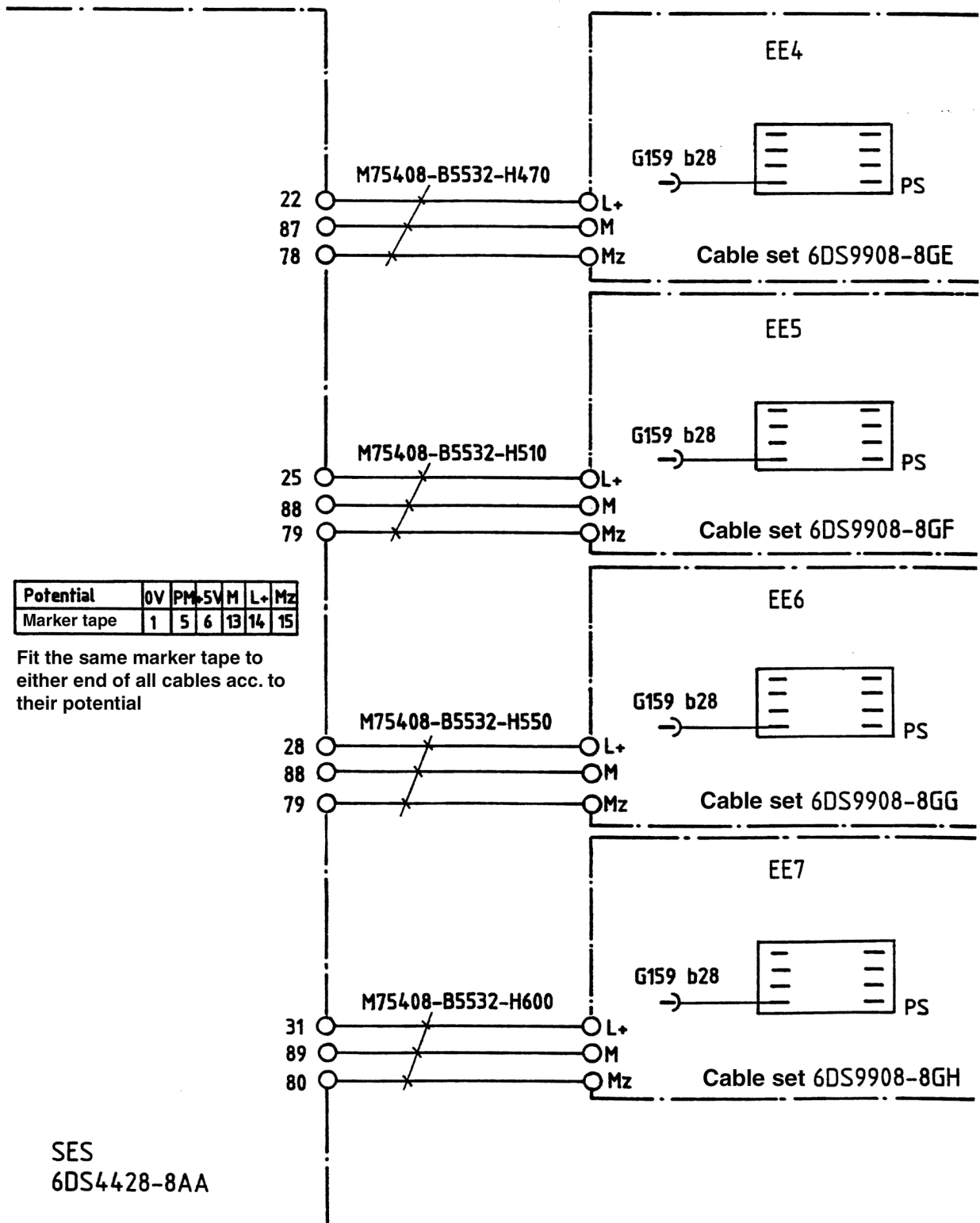


Fig. 6.3 Extension cabinet, connections L+, M, MZ

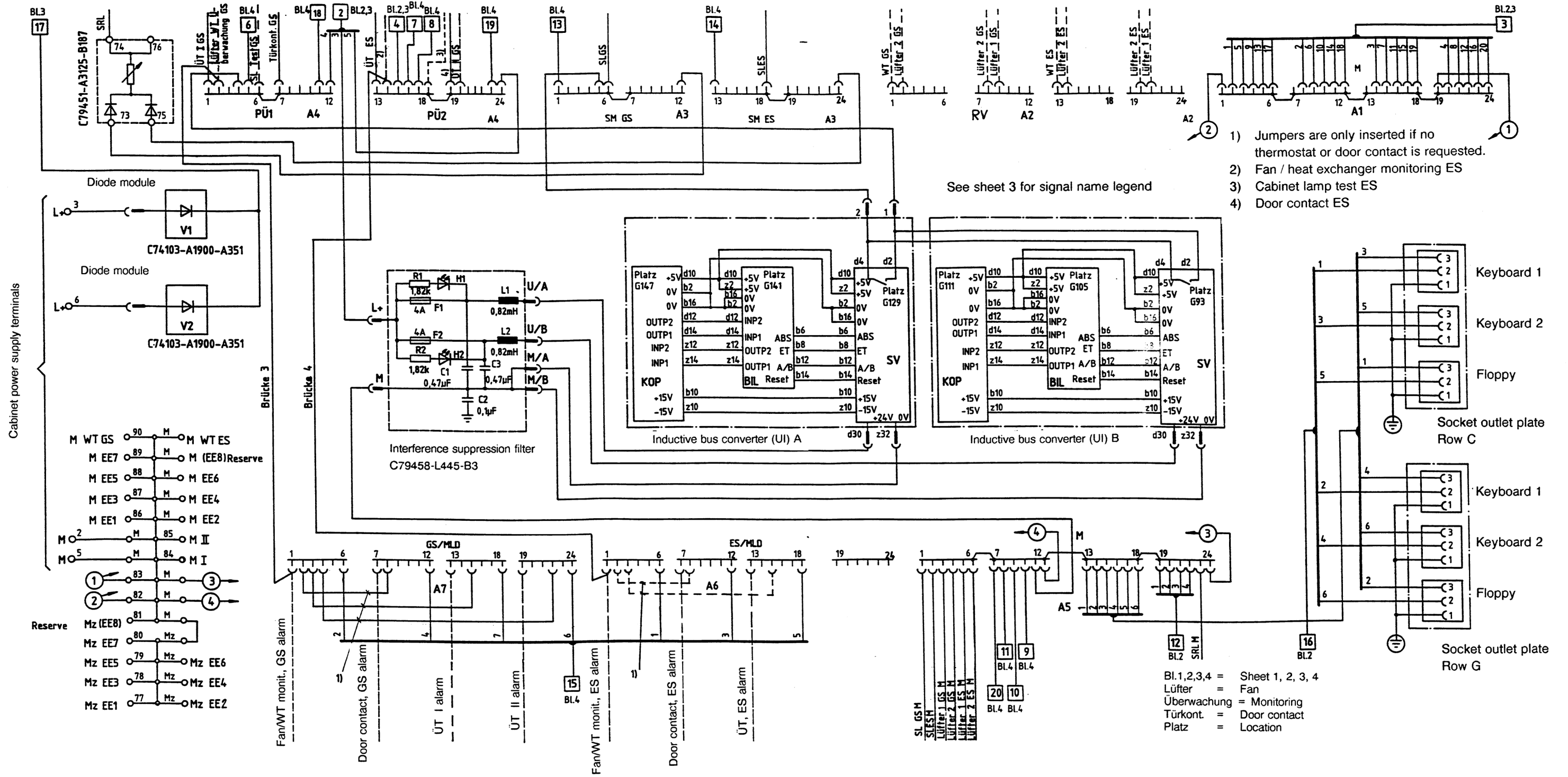


Fig. 6.4.1 AS 235 H cabinet power supply unit, sheet 1

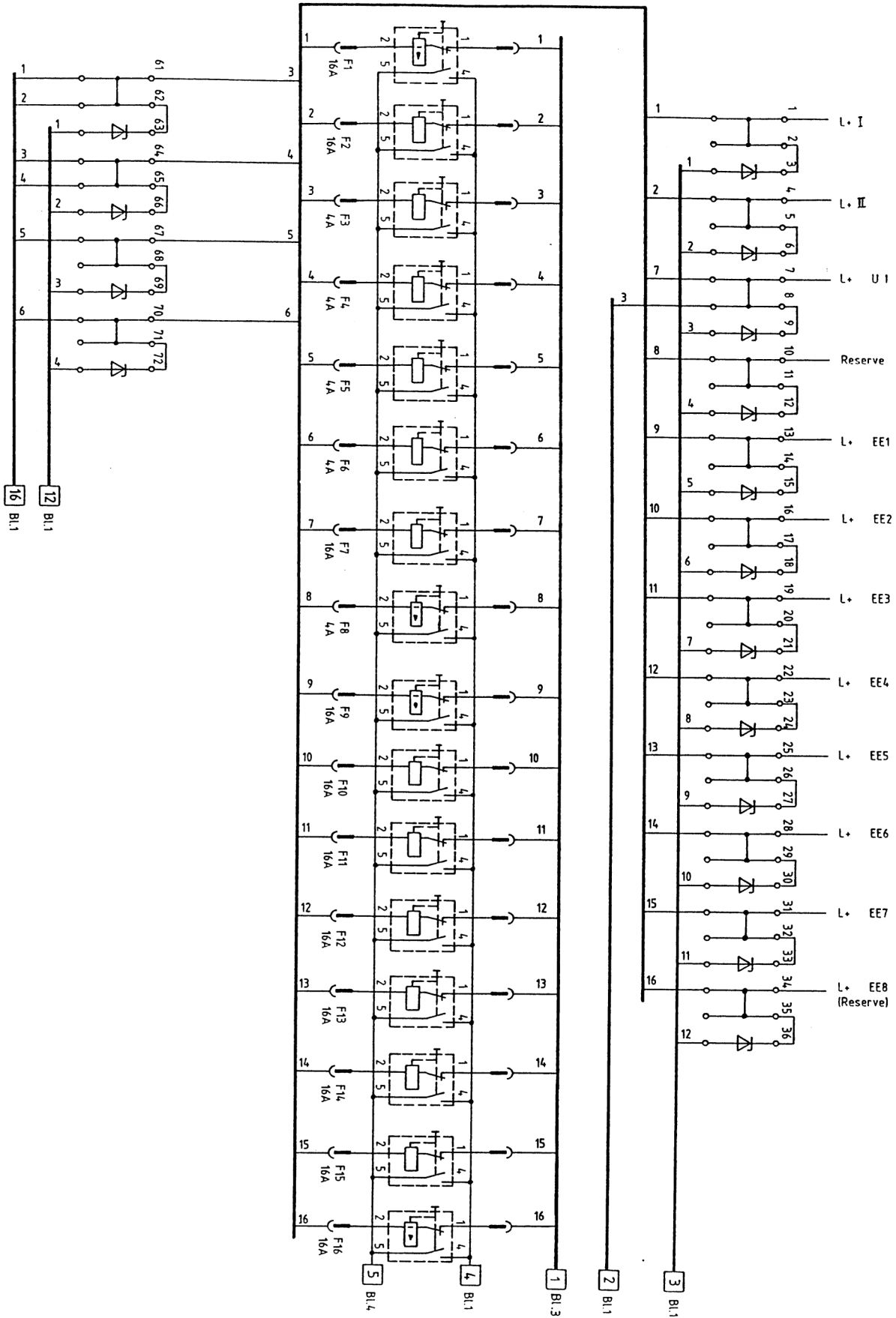


Fig. 6.4.2 AS 235 H cabinet power supply unit (SES), sheet 2

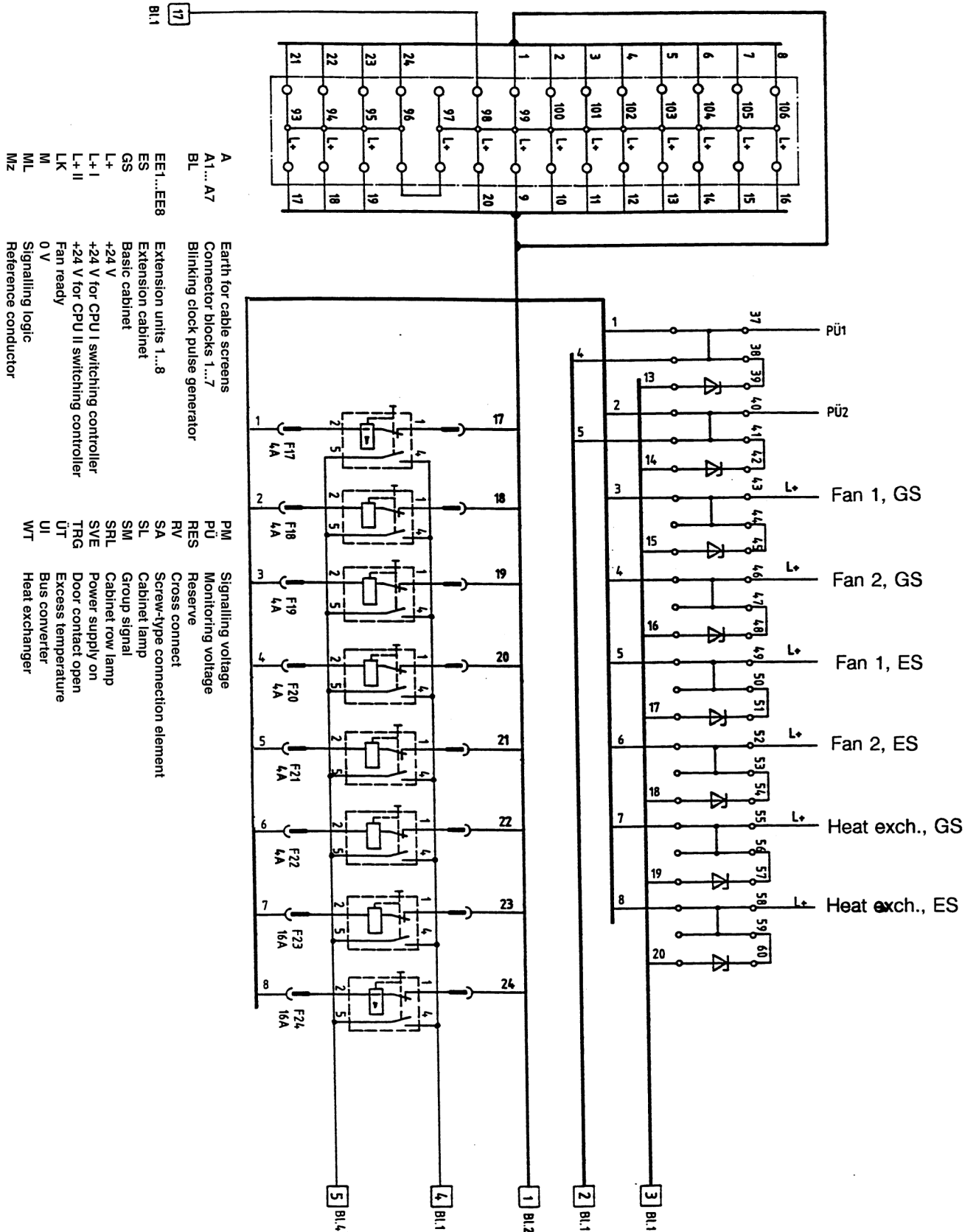


Fig. 6.4.3 AS 235 H cabinet power supply unit (SES), sheet 3

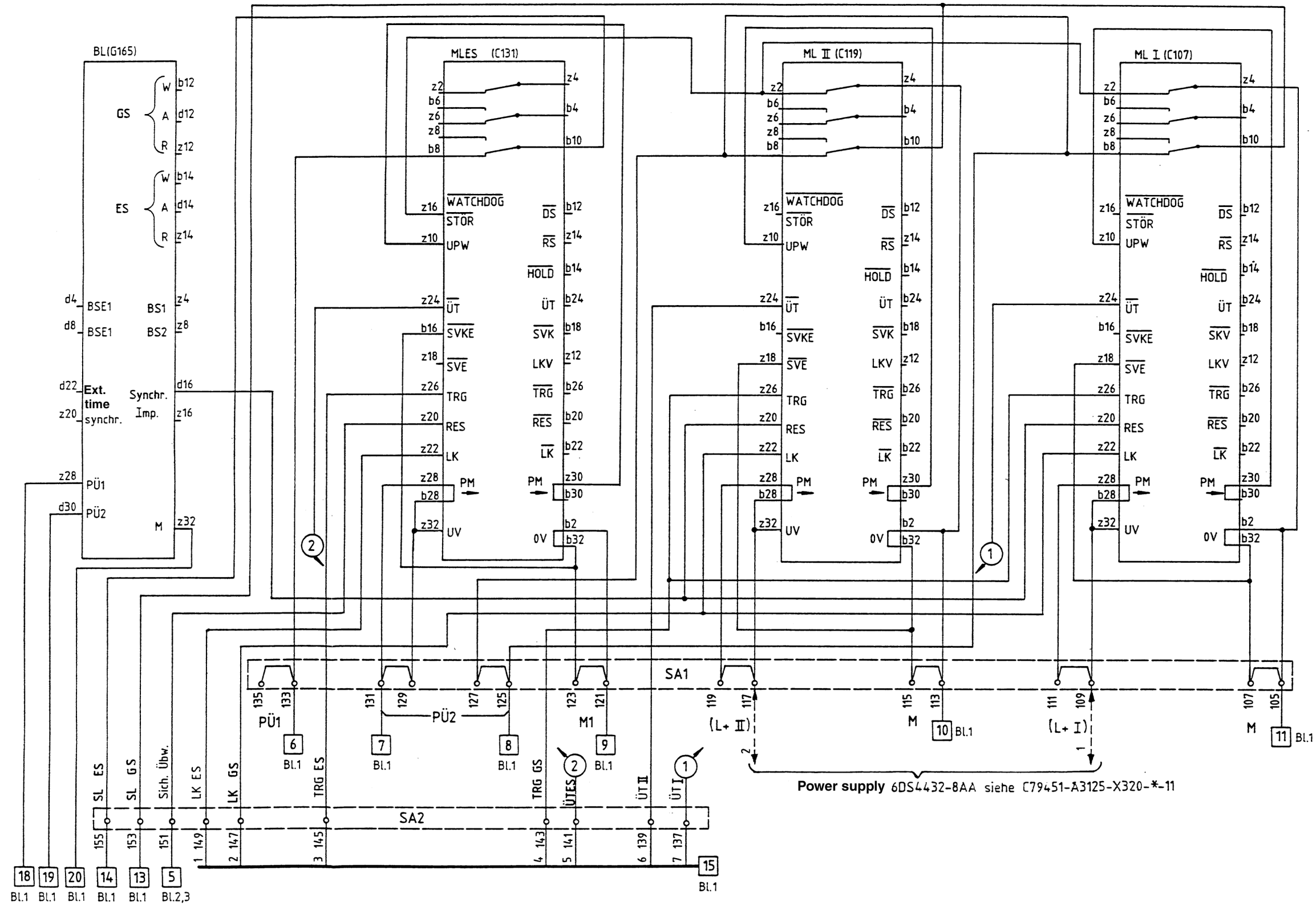


Fig. 6.3.4 AS 235 H cabinet power supply unit (SES), sheet 4

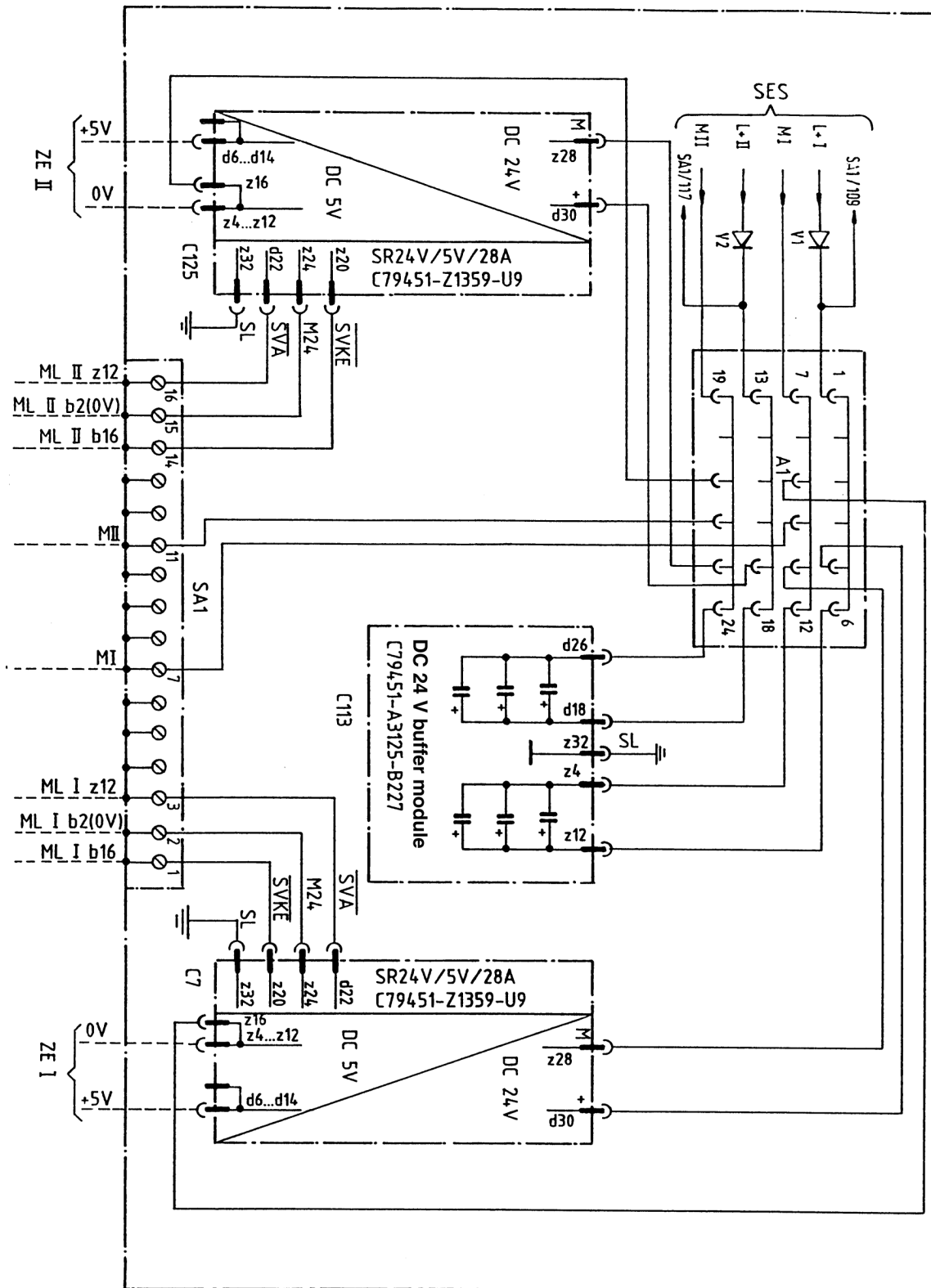


Fig. 6.5 Power supply tier (SV), DC 24 V / DC 5 V

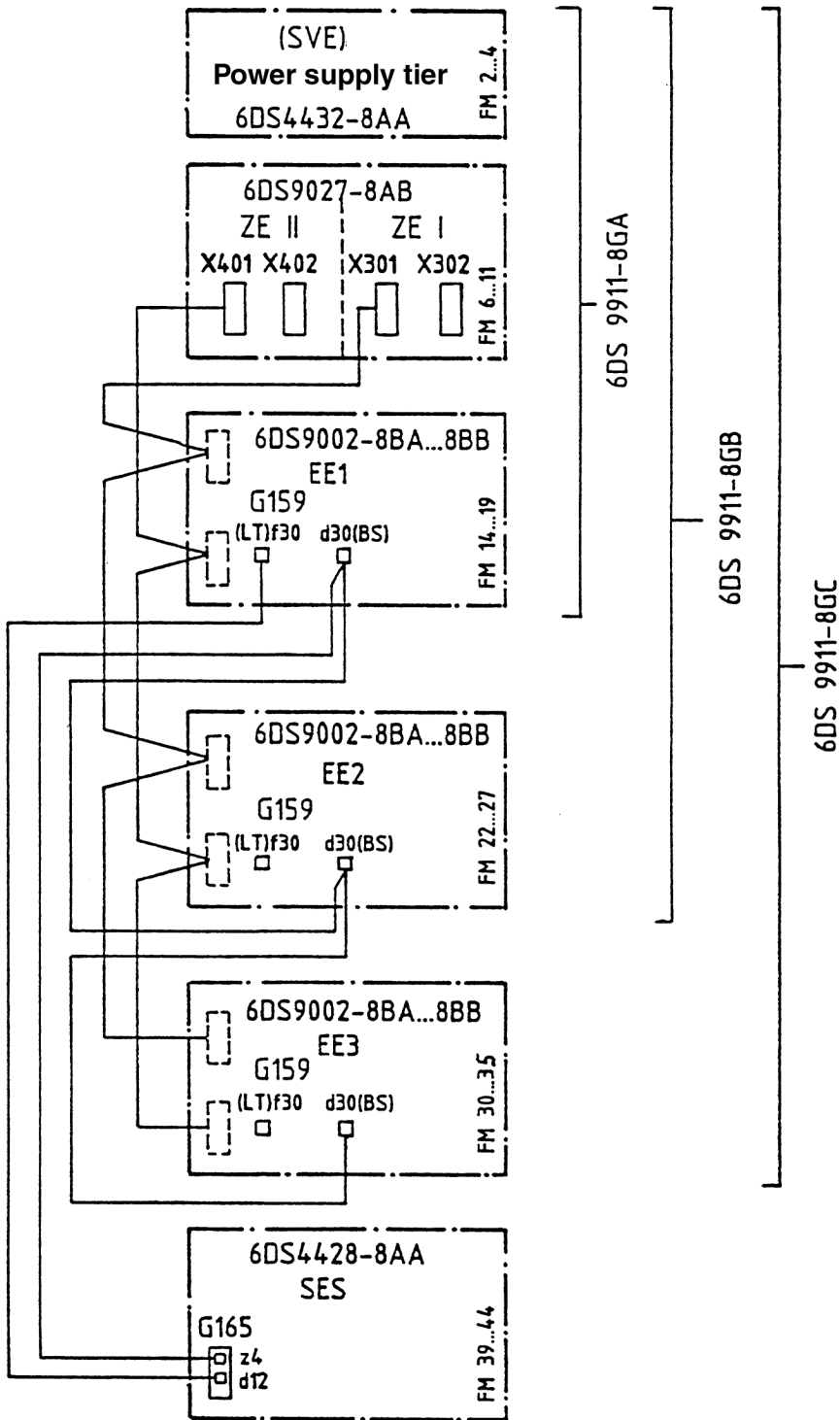


Fig. 6.6.1 I/O bus, basic cabinet

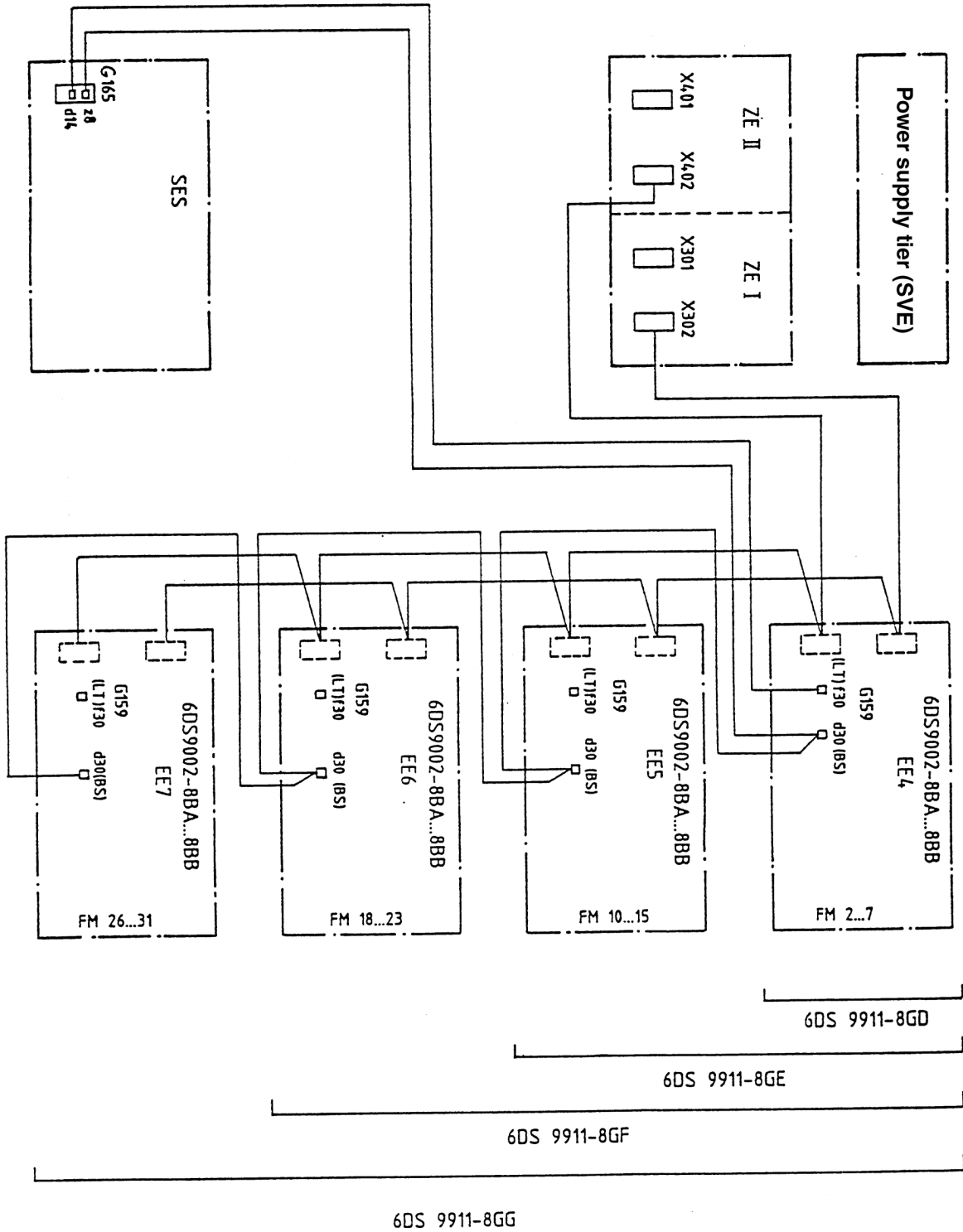


Fig. 6.6.2 I/O bus, extension cabinet

		Wrap connection		Screw terminal: <input type="checkbox"/> =connected <input type="checkbox"/> =not connected		Active signal level		Passive signal level		Signal to central unit =E/Signal from central unit=A	
X13	1 ● 1 ○	+5 V	0 V	E	Overtemperature extension cabinet, 5-V signal				MELD8I		
	2 ● 2 ○	0 V	+24 V	E	Door contact extension cabinet, 24-V signal				TK2I		
	3 ● 3 ○	+5 V	0 V	E	Door contact extension cabinet, 5-V signal				MELD7I		
X14	1 ● 1 ○	+5 V	0 V	E	Fan contact basic cabinet				MELD2I		
	2 ● 2 ○			E	0-V reference potential for +5 V				0 V		
X15	1 ● 1 ○	+5 V	0 V	E	Overtemperature basic cabinet				MELD3I		
	2 ● 2 ○	+5 V	0 V	E	Door contact basic cabinet				MELD4I		
X16	1 ● 1 ○	+24 V	0 V	A	Video relay control signal				RGBI		
	2 ● 2 ○			E	M-reference potential for+24 V				M24I		
X17	1 ● 1 ○			E	+24 V for BED.2 in CPU I				LPK2I		
	2 ● 2 ○			E	M-reference potential for +24 V				M24I		
	3 ● 3 ○			E	+24 V for SB and BED.1 in CPU I				LPK1I		
X18	1 ● 1 ○	0 V	+5 V	A	Common alarm from CPU I				WD_NI		
	2 ● 2 ○	+5 V	0 V	E	Time pulse				MELD1I		
	3 ● 3 ○	0 V	+24 V	E	Reserve input (24 V)				RES2I		
X19	1 ● 1 ○	0 V	+5 V	E	Central reset from power supply unit I				ZRS_NI		
	2 ● 2 ○	0 V	+5 V	E	Data project signal from power supply unit I				DS_NI		
	3 ● 3 ○	0 V	+5 V	E	Power failure alarm from power supply unit I				NAU_NI		
X20	1 ● 1 ○	+5 V	0 V	E	Fan contact extension cabinet, 5-V signal				MELD6I		
	2 ● 2 ○	0 V	+24 V	E	Overtemperature extension cabinet, 24-V signal				UET2I		
	3 ● 3 ○	0 V	+24 V	E	Fan contact extension cabinet, 24-V signal				LKM2I		
X98	1 ● 1 ○	+5 V	0 V	E	Blown-fuse alarm				MELD5I		
	2 ● 2 ○								--		
	3 ● 3 ○								--		

Fig. 6.7 Connections to CPU I (the same sequence as in the rack)

		Wrap connection							
		Screw terminal: <input type="checkbox"/> = connected <input type="checkbox"/> = not connected		Active signal level		Passive signal level		Signal to central unit=E/Signal from central unit=A	
1 ●	1 ○	+5 V	0 V	E	Blown-fuse alarm				MELD 5II
X99 ●	X89 ○								--
3 ●	3 ○								--
1 ●	1 ○	+5 V	0 V	E	Fan contact extension cabinet, 5-V signal				MELD6II
X12 ●	X28 ○	0 V	+24 V	E	Overtemperature extension cabinet, 24-V signal				UET2II
3 ●	3 ○	0 V	+24 V	E	Fan contact extension cabinet, 24-V signal				LKM2II
1 ●	1 ○	0 V	+5 V	E	Central reset from power supply unit II				ZRS_NII
X11 ●	X27 ○	0 V	+5 V	A	Data project signal from power supply unit II				DS_NII
3 ●	3 ○	0 V	+5 V	E	Power failure alarm from power supply unit II				NAU_NII
1 ●	1 ○	0 V	+5 V	A	Common alarm from CPU II				WD_NII
X10 ●	X26 ○	+5 V	0 V	E	Time pulse				MELD1II
3 ●	3 ○	0 V	+24 V	E	Reserve input (24 V)				RES2II
1 ●	1 ○			E	+24 V for BED.2 in CPU II				LPK2II
X9 ●	X25 ○			E	M-reference potential for+24 V				M24II
3 ●	3 ○			E	+24 V for SB und BED.1 in CPU II				LPK1II
1 ●	1 ○	+24 V	0 V	A	Video relay control signal II				RGBII
X8 ●	X24 ○			E	M-reference potential for +24 V				M24II
2 ●	2 ○								
1 ●	1 ○	+5 V	0 V	E	Overtemperature basic cabinet				MELD3I
X7 ●	X23 ○	+5 V	0 V	E	Door contact basic cabinet				MELD4II
2 ●	2 ○								
1 ●	1 ○	+5 V	0 V	E	Fan contact basic cabinet				MELD2II
X6 ●	X22 ○			E	0-V reference potential for+5 V				0 V
2 ●	2 ○								
1 ●	1 ○	+5 V	0 V	E	Overtemperature extension cabinet 5-V signal				MELD8II
X5 ●	X21 ○	0 V	+24 V	E	Door contact extension cabinet, 24-V signal				TK2II
2 ●	2 ○								
3 ●	3 ○	+5 V	0 V	E	Door contact extension cabinet, 5-V signal				MELD7II

Fig. 6.8 Connections to CPU II (the same sequence as in the rack)

7 Technical Data

- System configuration
 - Redundant system
 - Two independent terminals are possible.
 - Integrated programming functions for user programs and user function blocks.
 - 2 I/O areas
 - I/O area 1 1 EE 1 to EE 3 in the basic cabinet and up to two ES 100 K
 - I/O area 2 EE 4 to EE 6 in the extension cabinet and up to two ES 100 K
or EE 4 to EE 7 in the extension cabinet and up to one ES 100 K
 - The AS 235 H can be used as a stand-alone system or as a distributed component.

The TELEPERM CS 275 bus system is used for communication with other automation systems.

- System functions

Function blocks for:	Open and closed-loop control, monitoring, operator input, visualization (processing and standardized representation)
Analog/digital processing	Arithmetic functions, timers
Binary processing and STEP M control language	Logic operations and open-loop control functions
Higher programming language (TML)	Creation of user function blocks, image and log blocks
Signal input/output, bus communication	Analog/binary/BCD input/output, including reading/writing of binary signals/analog values
Output on color monitor/printer	Image/log/alarm output on two printers possible
Data transfer	Link to other bus devices, such as AS, OS, PR
Extension unit subracks	Subracks for extension units which permit installation of certain TELEPERM ME power plant modules
Loadable system software	The software is loaded into a special write-protected system RAM
Data protection	7 code bits for variables (see AS 235 H Description C79000-T8076-C416 in the Manual AS 235 H, C79000-G8076-C416).

- Central function control via bus

Central configuring, loading, and filing of an AS 235 H system (target device) from another AS 230/235/235 H (configuring device).

Using an AS 230/235 configuring device for any AS 230/235 that is connected to the same CS 275 bus system (also via bus coupling units).

AS 235 configuring devices:	Operator terminal 1 = central position Operator terminal 2 = local position Normal process output may be continued. Process control and target device monitoring are not permitted.
Target device:	Local input possible
Loading/filing:	From STRUK device to/from drive of STRUK device

- Local function control from AS 235 H

Distributed configuring, operator control and monitoring of an AS 235 H system (target device) via local operation channel and BKA configuring from a PC (AT-compatible) using PROGRAF PC.

- Central unit

Central processor	microprogrammed 16/32-bit slice processor, CMOS
Processing width of CPU	2×16 bits or 1×32 bits
Execution time (average)	2 μs to 6 μs for instructions with a binary operand 5 μs to 30 μs for instructions with an analog operand
Computing accuracy	10 ⁻⁴ for single-precision analog values 10 ⁻⁹ for double-precision analog values
Priority levels	16
User-accessible priority levels	5
Time required for changing a program level after an interrupt	Approx.. 19.5 μs
Time generation (smallest unit)	4 ms
Fixed basic cycles	125 ms or 1 s
Registers	16 processing levels with 24 registers + 32 arithmetic registers
• Memory	Stat. CMOS-RAM
Interface to central processor	16-bit data bus
Addressable units	Byte, word (1 byte = 8 bits, 1 word = 16 bits)
Data protection	Parity, byte-by-byte

Main memory (user-RAM)	
6DS1 837-8::	1536 K words (16 bits each)
6DS1 844-8::	2000 K words (16 bits each)
System memory	
6DS1 837-8::	256 K (16 bits each), write-protection
6DS1 844-8::	512 K (16 bits each), write-protection
Data buffer	Lithium battery (Type AA)
Memory buffer time	
with 6DS1 837-8AA/-8DA	At least 500 h
with 6DS1 837-8BA/-8EA	At least 300 h
with 6DS1 837-8CA/-8FA	At least 520 h
with 6DS1 844-8::	At least 500 h
Battery must be replaced once a year.	
Data protection, hardware monitoring	RAM parity check and watchdog function, battery monitoring
<ul style="list-style-type: none"> Filing/loading the user memory contents 	
80-track HD floppy disks with 1 MB net capacity in connection with a 6DS3 900-8AD mini floppy disk unit (from version 4 onwards)	
Loading time	Approx. 2 min per 1 MB
Filing time	Approx. 8 min per 1 MB
Formatting	Without operator terminal inhibition
<ul style="list-style-type: none"> I/O devices 	
Two independent operator inputs units	
Number of operator input units that may be used simultaneously	
	2
Operator input unit	1 monitor, 1 process communication keyboard, 1 configuring keyboard
Monitor types	RGB color monitor, D series monitor
Representation	Color, 32 lines with 64 characters each
Alarm line	1
Working area	28 lines/64 characters
Input line	1 line for input via configuring or process communication keyboard
Image frequency	50 Hz (non-interlaced)
Number of alphanumeric characters	64; 7-bit code to DIN 66003 Table 1 or ISO 646 or CCITT-V3, international alphabet No. 5
Symbols, icons	256, according to standard symbol coding set
Blinking frequency on monitor	2 Hz

Configuring unit	Configuring keyboard, mini floppy disk unit, connecting cables
Logging printer	80 characters/line or 132 characters/line, page log
Event recorder	Event recorder only for single line output, due to the AS 235 software
Print speed	600 bits/s for logging printer and event recorder
<ul style="list-style-type: none"> • Serial interface modes <ul style="list-style-type: none"> - TTY, 20-mA current loop, isolated, passive - Asynchronous transmission with start/stop bit - Even parity - 1200 bits/s for process communication keyboard and configuring keyboard - 600 bits/s for printer - 4800 bits/s for PROGRAF AS and KOPAS • Process interface, I/O modules, function modules 	
Number of I/O modules	
per extension unit (total)	13
in basic unit	39
in basic unit + extension unit	91
with ES100K	122
Number of extension units	Up to 7
with ES100 K	Up to 10
Number of cabinets	1 or 2
<ul style="list-style-type: none"> • I/O modules 	
Signal modules	Binary and analog
Function modules	Stand-alone open and closed-loop control modules with integrated microprocessors and directly connectable control stations; can be configured from PG/PC
Interface and arithmetic modules	Interface to SIMATIC, ES100K analog/binary arithmetic modules, others
<ul style="list-style-type: none"> • Blinking clock-pulse generator 	
Blinking signal outputs z4, z8	U = L+ -3 V typ. I = max. 350 mA per output; this corresponds to approx. 55 modules
Time synchronization inputs	U = 12 to 42 V
potentialfrei	I = 10 to 40 mA Pulse width >2ms; perm. pulse bouncing time max. 6 ms minute pulse
Lamp test outputs	U = L+ from system
Alarm input RES 1 (floating)	U = 12 to 42 V I = 10 to 40 mA I < 10 mA alarm

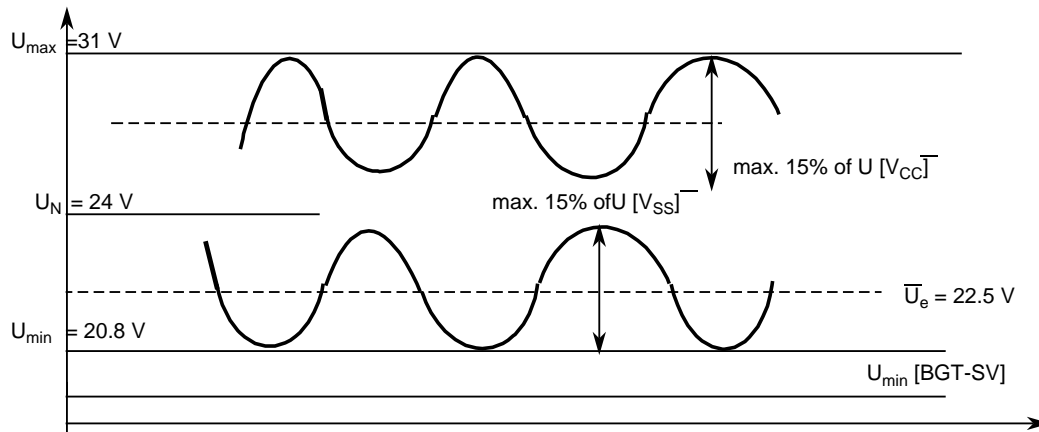
b12, d12, z12, b14, d14, z14 als as signal outputs	$I = 1 \text{ A}$
Lampe test outputs as relay outputs	$U = \text{max. } 40 \text{ V}$ $I = \text{max. } 2.5 \text{ A}$

- AS 235 H DC 24 V

Supply voltage U_V	+24 V
Permissible area of DC 24 V	$\bar{+}22.5 \text{ V to } +28.7 \text{ V}$
Permissible ripple	15 % of DC mean value $[V_{CC}]$ in the permissible area

($U_e=22.5 \text{ V}$; min. U_V with max.ripple)

Supply voltage L+:



Limit conditions of operation	35 V 500 ms, recovery time 50 s 45 V 10 ms
Voltage dip with $U_N=DC 24 \text{ V}$	0 V, 5 ms, recovery time 10 s
Current consumption, DC 24 V incl. all interface modules	<8.5 A from 24 V (without I/O modules) power supply of extension units via 6DS1 006-8AA $U=5 \text{ V}$ $I=\text{max. } 5 \text{ A}$, fuse on DC 24 V side 2.5 A max. 80 A (with I/O modules)
External fusing	(to be carried out by user)
Signal level of $\ddot{U}T$, LK, TK, UZSYN	DC 24 V - no alarm, 0V - I&C alarm
Voltage switch-off after occurrence of $\ddot{U}T$ or $\ddot{U}T$	1 min following $\ddot{U}T$ or $\ddot{U}T$, the 5-V voltage of the central unit concerned is switched off
Current rating of the lamp contact of the alarm logic module	max. 1 A
Insulation to protection class	VDE 0160
Insulation of modules, air and creepage clearances between pins or conductors to VDE 0110.	

- Design

Potential difference of all neutral earth points in distributed systems 7 V

- Mechanical stress (AS 235 H, cabinet)

Stress during operation (full subrack in housing) 10 Hz to 150 Hz with 0.15 mm displacement
150 Hz to 500 Hz with 2 g

Transport Air-suspended lorry required

- Environmental conditions

Permissible ambient temperature of the modules during operation T = 0 °C to 55 °C

T/h 10 K

T/min 0.5 K

for storage T = -40 °C to +70 °C

T/h 20 K

Ventilation Self-ventilation for basic unit and extension units, provided that the permissible thermal load for the individual cabinets is not exceeded

Permissible cabinet entry temperature: 0 °C to 40 °C

Permissible humidity during operation 65 %

for storage 75 %

Condensation not permissible

Standard cabinet, cabinet power loss P_S

Cabinet entry temp.	25 °C	30 °C	35 °C	40 °C
P _{Smax} without LBG	450 W	420 W	380 W	350 W
P _{Smax} with LBG	700 W			
P _{Smax} with WT, without LBG	450 W	420 W	380 W	350 W
P _{Smax} with WT, with 1 LBG	700 W			
P _{Smax} with WT, with 2 LBG	1000 W			

LBG=fan module, WT=heat exchanger

- EMC

EN 50081-2 (Update 93) class A

EN 50082-2 (Update 93) criterion A

• Type of protection	
AS 235 H, system cabinet	IP 10
System cabinet with heat exchanger	IP 54
Gases	Industrial atmosphere is permitted in accessible rooms
• Fan module (LBG)	
Order No.	6DS9 943-8AA
Number of fans	3
Air flow, free-air operation	3×170 m ³ /h
Fan service life	approx. 40,000 h
Fan motor MTBF	85,000 h
ambient temperature 55 ° C and U=DC 30 V	
Monitoring circuit MTBF	1.16×10 ⁶ h
Power supply	to be generated as safety extra-low voltage (SELV)
Rated value	DC 24 V
Upper limit incl. ripple	DC 30 V
Lower limit incl. ripple	DC 19 V
Ripple	up to AC 3.6 V _{pp}
Internal fusing in SES	6.3 A
External fuse required	4 A
Power consumption	16 W
Contact rating of alarm contact	< DC 30 V/100 mA
Permissible ambient temperature during operation	0 °C to +55 °C
Permissible temperature for transport and storage	– 40 °C to +70 °C, high tempera- ture for a short time
Protection class to VDE 0106, p.1 and IEC 536	I
Protection type to IEC 529 and EN 60529	
open	IP 00
built-in with perforated sheet underneath	IP20
Radio interference level to VDE 0871	B
Noise level	45 dBA
Length of flying cable	25 cm
Fan module connecting cable	
Length 2.20 m	C79195-A3732-H220
Dimensions (w x h x d) with brackets	483mm×43.5mm×174mm
Weight	2.32 kg
The fan module is maintenance-free.	
Based on a service life of 40,000 h specified by the manufacturer, it is recommended to replace the fan or the fan module every 4 years.	
Adjustment after the fan has been replaced	Jumper settings for alarm signals

AS 235 H, Standard Configuration with Order Numbers (without I/O modules)

AF	Remote bus connector board	6DS9 203-8DA
BKA	Operator input channel interface module	6DS1 330-8CA
BL	Blinking clock-pulse generator module	6DS1 922-8AA
CPU 235 H	Central processing unit)	6DS1 141-8AA
EABA	I/O bus interface module	6DS1 312-8BB
EAVU	I/O comparator and switchover module	6DS1 144-8AA
EE	Extension unit for maxi-termi-point	6DS9 002-8BA
EE	Extension unit for wire-wrap	6DS9 002-8BB
GE	Basic unit (subrack for CPU I and CPU II)	6DS9 027-8AB
M	(Color) monitor for AC 110/230 V	6DS3 401-8BK
	for DC 24 V	6DS3 401-8BL
MDA	Mini floppy disk interface module	6DS1 326-8BB
MDE	Mini floppy disk unit	6DS3 900-8AD
ML	Alarm logic module	6DS1 901-8AA
N-AS	Local bus interface module	6DS1 223-8AA
PBT	Process communication keyboard	6DS3 305-8BA
PUM	Buffer module	C79451-A3125-B227
SB	Synchronization module	6DS1 143-8AA
SED	Cabinet power supply diode	C74103-A1900-A351
SES	Cabinet power supply unit	6DS4 428-8AA
SP	Memory module	6DS1 837-8DA/-8EA/-8FA
SP	Memory module	6DS1 844-8CA/DA
ST	Configuring keyboard	6DS3 303-8AA
SV	Power supply module	C79451-Z1359-U9
SVE	Power supply unit	6DS4 432-8AA
SVM	Power supply module	C79451-A3117-D29
SVME	Power supply unit for extension unit	6DS1 006-8AA
UI	Inductive bus converter for CS 275	6DS4 400-8AB
VKB	Comparator coupler module	6DS1 142-8AA
VR	Video relay	C79451-Z1399-U910

Note: Each CPU contains one or two EABA and BKA modules. They are identified by the index 1 or 2.

Index	Page
Alarm logic module	3 - 17, 4 - 52
Backup	3 - 1
Backup battery	6 - 3
Basic unit	2 - 4
Basic cabinet	2 - 2, 2 - 3
Blinking clock-pulse generator	4 - 50
Braided screen	4 - 12
Cabinet power supply unit	2 - 8
Cable length	4 - 23
Cable screens	4 - 8
Cable types	4 - 9
Central grounding point (ZEP)	4 - 4
Central processor	3 - 8, 4 - 32, 4 - 33
Central processor module	2 - 5
Circuit breaker	2 - 8
Circuit diagrams	6 - 4
Cold/warm restart	3 - 31, 3 - 32
Commissioning	5 - 1
Comparator coupler module (VKB)	2 - 5, 3 - 4, 3 - 28
Configuring keyboard	4 - 25
Connector boards	4 - 20
CPU	3 - 26
DG mode	3 - 10
Diagnostic unit interface module	2 - 5, 3 - 10
Diagnostic routine	3 - 21
DS	3 - 24
EAVU	4 - 42
EPLD	3 - 5
Error messages	5 - 3
Extension cabinet	2 - 2, 2 - 3
Extension unit	2 - 6, 2 - 7
Fault	3 - 1
Fault elimination	6 - 2
Fault finding	3 - 21, 3 - 22
Floppy disk	4 - 27, 4 - 28
Floppy disk drive	4 - 28
Foil screen	4 - 13
GB.ORPA	4 - 27
Grounding procedure	4 - 6, 4 - 7
Group interrupt module	2 - 2, 3-13, 4 - 42
Highly available	1 - 1

	Page
Initial program loading	5 - 1
I/O bus interface module	4 - 34
I/O bus interface module 1	2 - 5
I/O bus interface module 2	2 - 5
I/O comparator and switchover module (EAVU)	3 - 11, 3 - 30, 4 - 41
Jumper settings	4 - 29, 4 - 31
Keyboards	4 - 21
Local bus	4 - 14
Local bus interface module	4 - 38, 4 - 39
Local bus interface module N-AS (N8-H permissible as well)	2 - 5
Local bus interface module N8-H	4 - 40
Master	3 - 1
Memory module	2 - 5, 3 - 7, 3 - 26, 4 - 30
Mini floppy disk interface module	2-5, 3 - 27, 4 - 36
Mini floppy disk unit	4 - 26
Monitors	4 - 20
NAU	3 - 24
N-V.24	4 - 16
Operator input channel interface module	3 - 9, 4 - 34
Operator input channel interface module 1	2 - 5
Operator input channel interface module 2	2 - 5
Passive	3 - 1
PESPA	4 - 44
PESPB	4 - 45
PLAD	2 - 7
PLAD 11	4 - 44
Power supply unit	3 - 19
Power supply connections	4 - 65
Printer	4 - 21
Process communication keyboard	4 - 24
Process cable	4 - 10
Process monitor	4 - 18
Process signal cable	4 - 9
PT 88/89 printers	4 - 53, 4 - 54
PT 90	4 - 57, 4 - 58, 4 - 59
Rack address	2 - 7
Redundant mode	3 - 1
Remote bus	4 - 15
RSOF	3 - 31

	Page
SB block diagram	3 - 6
Signal line	4 - 22
SF61	3 - 13
Slot 13	2 - 6
Slot addresses	4 - 44, 4 - 45
Standard configuration	2 - 1
Stripline	2 - 7
Supply voltage	4 - 2
Synchronous mode	3 - 2
Synchronization module	2 - 5, 3 - 6, 3 - 29
System configuration	2 - 5
System disk	5 - 1
System message	3 - 25
System response	3 - 23
S11	4 - 15
S12	4 - 15
Time synchronization	4 - 50
TTY	4 - 55
Video relay	4 - 18
VKB block diagram	3 - 5
V.24/TTY	4 - 56
X2 backplane connector	4 - 42
ZEP	4 - 4
ZRS	3 - 24, 3 - 31

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

Technical data subject to change.

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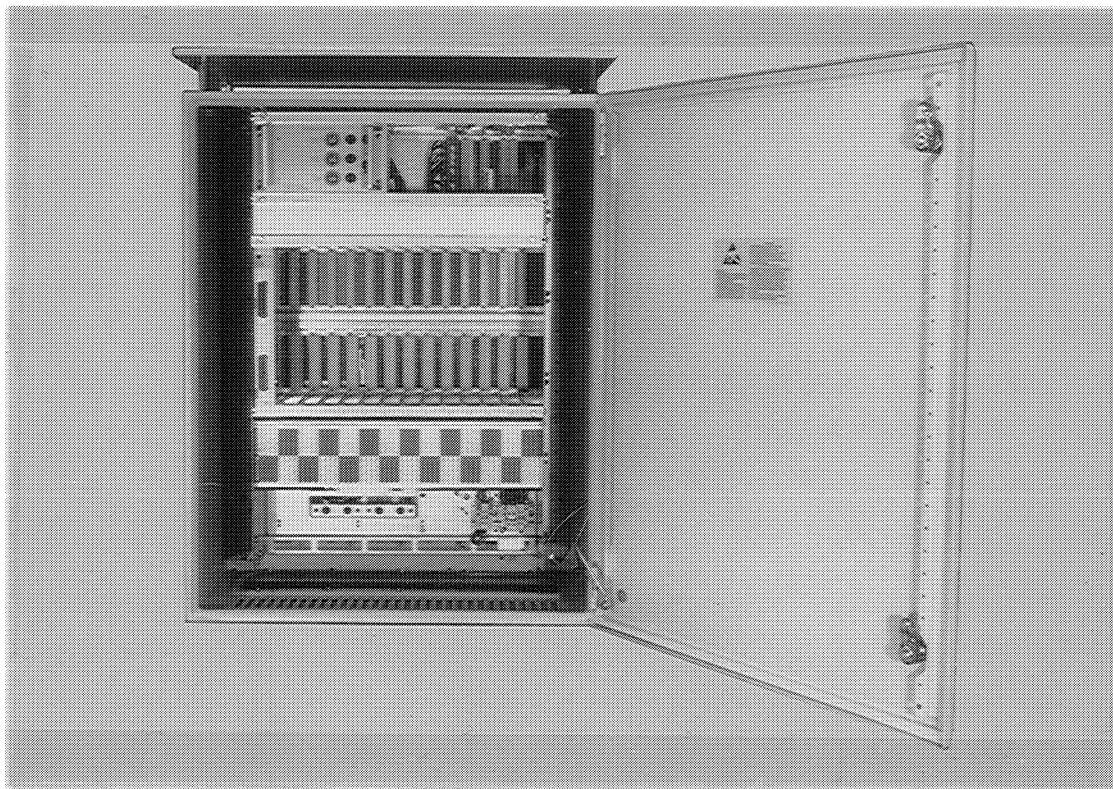
TELEPERM M

ES 100 K Extension System

6DS2103-8..

Instructions

C79000-B8076-C124-04



Contents	Page
1 Description	1-1
1.1 Application	1-1
1.2 Design	1-1
1.2.1 Subrack Assignment	1-2
1.2.2 Connection of Process Signals	1-3
1.2.3 Power Supply	1-3
1.2.4 Housing/Cabinet	1-3
1.2.5 Couplings	1-4
1.2.6 Earthing Conditions	1-5
1.3 Mode of Operation	1-11
1.3.1 Power Supply	1-11
1.3.2 Coupling of ES 100 K in TELEPERM M System	1-11
1.3.3 Coupling of ES 100 K to SIMATIC S5 Programmable Controllers	1-12
1.4 Technical Data	1-13
1.5 Planning and Installing the Subracks when Delivered without Compact Housings	1-16
1.5.1 Installation Instructions for Compact Systems in Other Housing/Cabinet	1-16
2 Installation and Commissioning	2-1
2.1 Mounting and Installation	2-1
2.2 Connection of Process Signal Cables	2-4
2.3 Jumper Settings	2-8
3 Maintenance	3-1

1 Description

1.1 Application

The TELEPERM M ES 100 K extension system supplements the number of I/O bus slots of the AS 220, AS 230, AS 235 and AS 235 H automation systems, especially those of the compact versions AS 220 K, AS 230 K and AS 235 K.

More input/output modules can therefore be used than in the corresponding basic units. In addition, all interface modules can also be operated in the ES 100 K which are permissible for the I/O bus used of the automation system extended by the ES 100 K.



NOTE

The CS 275, N-V.24 and CP581-TM bus components are not permitted in the ES 100 K. Permitted I/O modules are given in the configuration list "Variable Equipment".

Linking of the ES 100 K to a SIMATIC S5 programmable controller also enables TELEPERM M I/O modules to be used in the SIMATIC S5 system.

The ES 100 K extension system is particularly suitable for TELEPERM M automation systems and SIMATIC S5 programmable controllers for the connection of peripheral units with a highly distributed structure since the ES 100 K can be operated up to a distance of 500 m from the basic system/central controller.



Warning:

The ES 100 K extension system is **not** safety-oriented system. It must **not** be used in installations in that an error in the ES or AS could led to dangerous operating states and so be dangerous for men, machines or environment.

Such safety-relevant automation tasks have to use either a safety-oriented AS (e.g. an F or HF system tested by the German Inspectorate TÜV) or an ES 100 K with correspondent locking circuits or protection systems avoiding the appearance of dangerous operating states.

1.2 Design

The ES 100 K is available in AC 220 V and DC 24 V versions.

The subrack contains a slot in the single-height power supply tier for the power supply module AC 220 V/DC 24 V, 18 A or DC 24 V/24 V.

The double-height tier underneath is the actual extension for I/O modules.

The first slot is provided for the interface module for ES 100 K 6DS1322-8AA (slot not essential).

The +5-V voltage for the I/O bus in the ES 100 K is generated by this module.

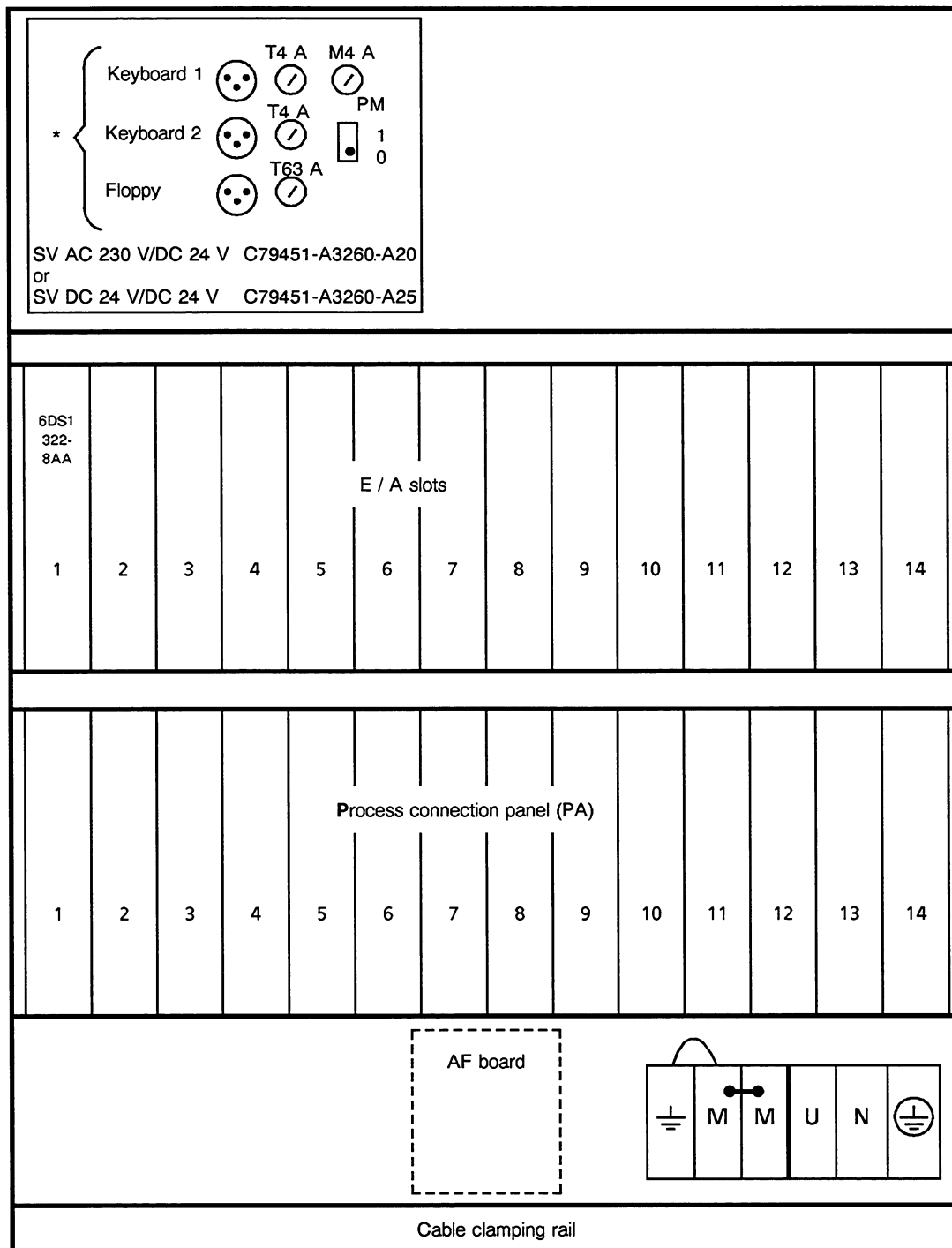
The remaining 13 slots can be equipped with I/O modules.

The module slots with the built-in backplane connectors as well as the outer subrack dimensions have the dimensions of the ES 902 packaging system.

The backplane connectors X1 of the 14 slots of the ES 100 K are connected together via a bus board.

1.2.1 Subrack Assignment

Subrack C79451-A3260-A3 (ES 100 K, AC 230 V)
 Subrack C79451-A3260-A4 (ES 100 K, DC 24 V)



* Not used with ES 100 K

----- Option

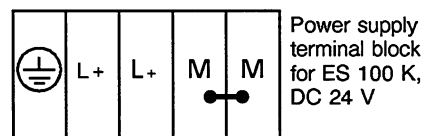


Fig. 1/1 Subrack assignment in ES 100 K, AC 220 V and ES 100 K, DC 24 V

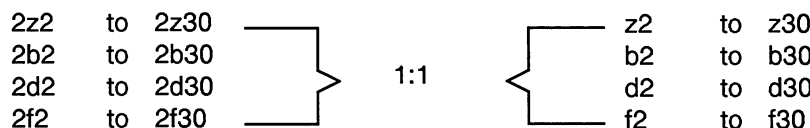
1.2.2 Connection of Process Signals

The backplane connectors X2 of the I/O slots of an ES 100 K are connected as follows to the process connection panel (PA) underneath:

- I/O slots 1 to 4 Process connection panel locations 1 to 4



- I/O slots 5 to 14 Process connection panel locations 5 to 14



PM or M is additionally present at the following locations:

- Process connection panel locations 1 and 2
z32 connected to PM
- Process connection panel locations 5 to 14
z32 to f32 connected to M

Cabinet alarms can be connected to the remaining pins of the process connection panels (see Fig. 1/5). The process connection panel is only accessible from the front. The signal lines are connected using the Maxi-Termi-Point system.

The cable screens are connected to the cable clamping rail which is connected in turn to the subrack in a conducting manner (not insulated design).

All cables are connected via the cable clam-ping rail.

1.2.3 Power Supply

The ES 100 K systems have their own power supplies and are not supplied from the automation system. The 0 V of all power supplies in the AC 220 V versions must be connected together using the power supply terminal block via terminal M (conductor cross-section 10 mm²). The power supply is identical to that of the AS 230 K/235 K.

A mains filter is used to suppress interferences.

A redundant supply of L₊ is provided in the ES 100 K, DC 24 V. A transorb diode protects against overvoltages.

The earthing concept is shown in Figs. 1/3 to 1/10. The permissible difference in potential between all ground star points of the systems is ≤ 7 V.

1.2.4 Housing/Cabinet

The subrack is fitted in a sheet-steel housing.

Installation is possible in standard TELEPERM M cabinets if the design guidelines are observed. The conditions listed in Section 1.5 apply if delivery is without a housing.

1.2.5 Couplings

- **Coupling in TELEPERM M system, a)**

The I/O bus in the ES 100 K is coupled to the I/O bus of the basic unit of a TELEPERM M automation system via the interface module for ES 100 K 6DS1322-8AA and the cable connector 6ES5721-....

One of these modules is inserted in the ES 100 K, e.g. at slot 1, the second in a TELEPERM M AS system. Up to four ES 100 K systems can be connected in series.

- **Coupling of SIMATIC S5 expansion units to TELEPERM M automation systems via ES 100 K, b)**

Coupling is possible with the interface module for S5 expansion units 6DS1321-8AA in the ES 100 K via the non-multiplexed SIMATIC I/O remote bus and the CC/EU interface module 310 6ES5310-3AB11 in the SIMATIC S5 expansion unit (6ES5 183 or 6ES5 186 for I/O modules in compact version, ER 701-2 for I/O modules in block design).

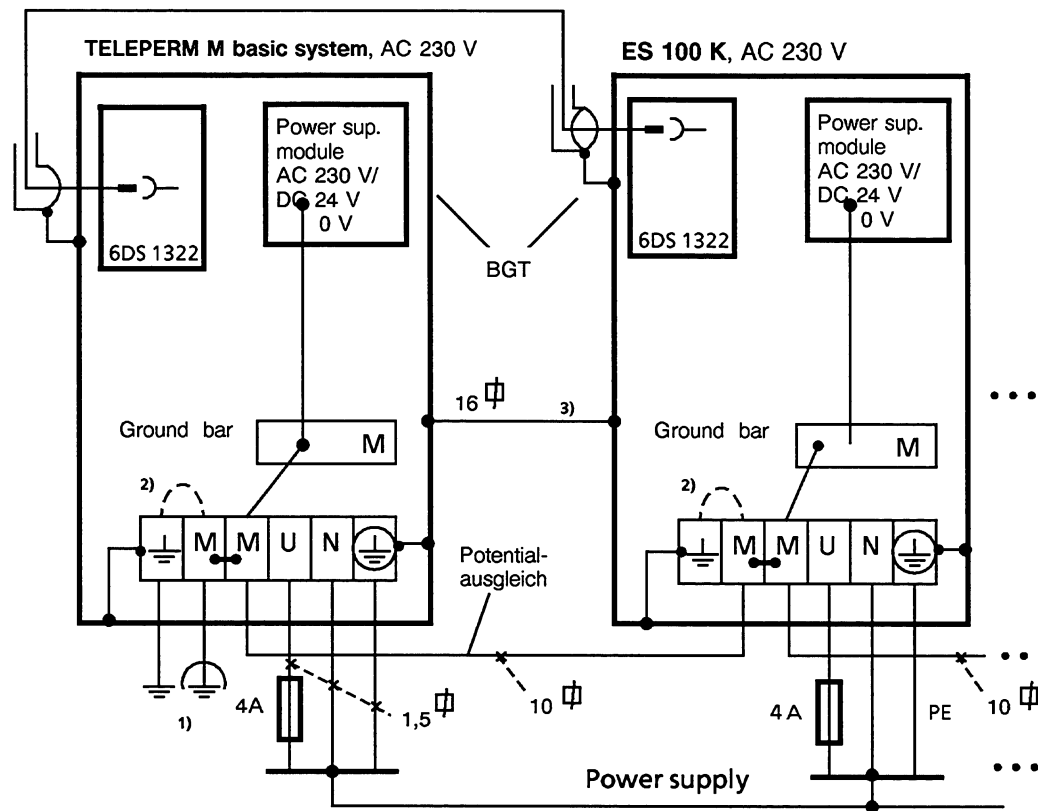
- **Coupling of ES 100 K to SIMATIC S5 programmable controllers, c)**

When coupling to a SIMATIC S5 programmable controller, one module 6DS1322-8AA is present in the ES 100 K and one module 6ES5304-3UA11 in the SIMATIC S5 central controller. Operation of TELEPERM M I/O modules in the SIMATIC S5 system via the multiplexed SIMATIC remote bus is possible via these two modules. ES 100 K systems can also be connected in series in this case.





The cable connectors of the I/O remote bus must be connected in configurations a) and c) to the last interface module in each case using the cable terminating plug 6ES5760-1AA11, in configuration b) using the cable terminating plug 6ES5760-0AA11.

1.2.6 Earthing Conditions

• Coupling in TELEPERM M system



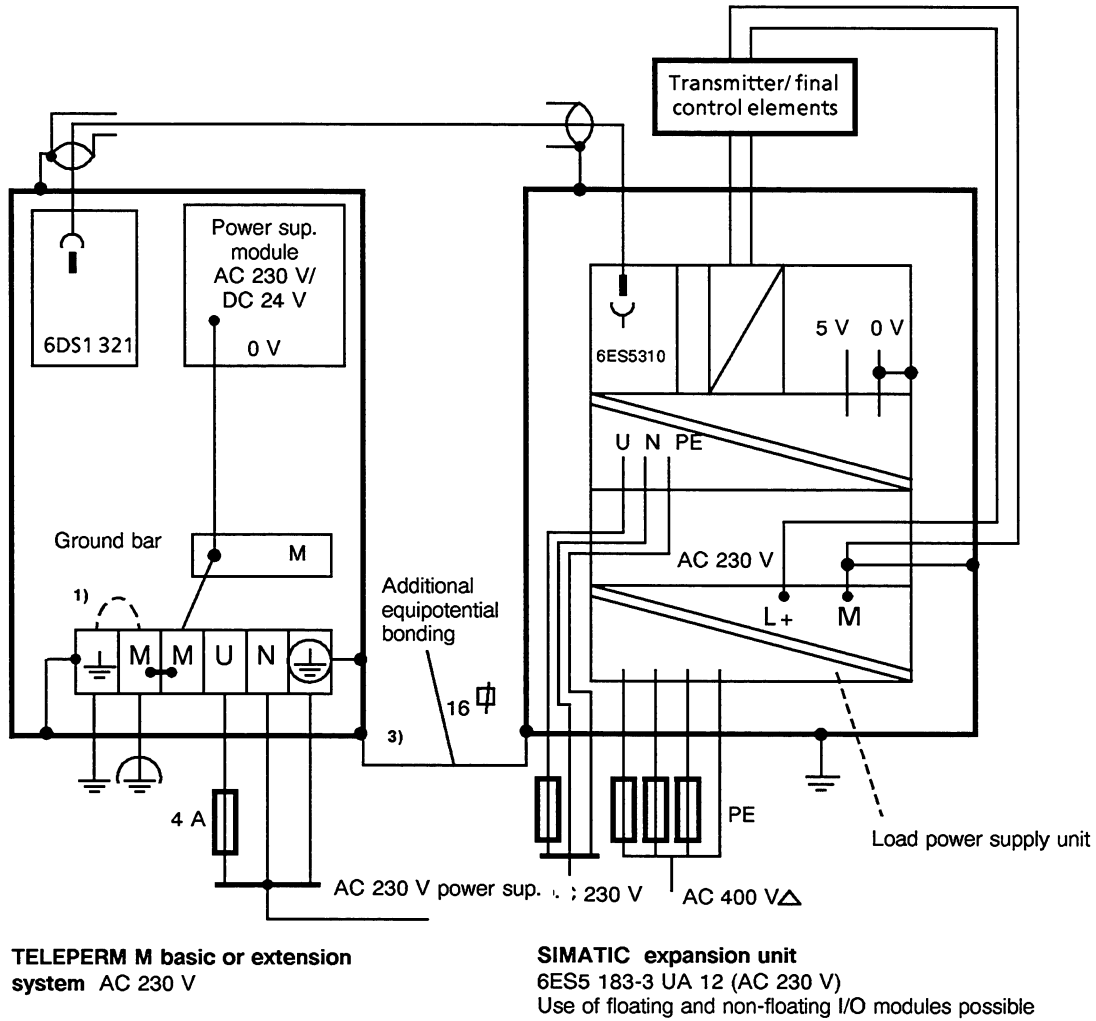
Earth symbols



-  Low-noise earth, electronic earth
-  Local earth (building earth)
-  Local earth or PE
-  PE

- 1) Only contact one device (e.g. between AS 235 K) to electronics earth or separately to building earth
- 2) Remove jumper
- 3) Additional equipotential bonding if necessary, see Instructions 6DS1322-8AA

Fig. 1/2 Earthing of AS 235 K, AC 230 V with ES 100 K, AC 230 V

- Coupling of SIMATIC S5 expansion units to TELEPERM M automation systems via ES 100 K



- 1) Remove jumper, connect M to electronics earth or separately to building earth 
- 3) Additional equipotential bonding if necessary (see Instructions for 6DS1 321-8AA) 

Earth symbols





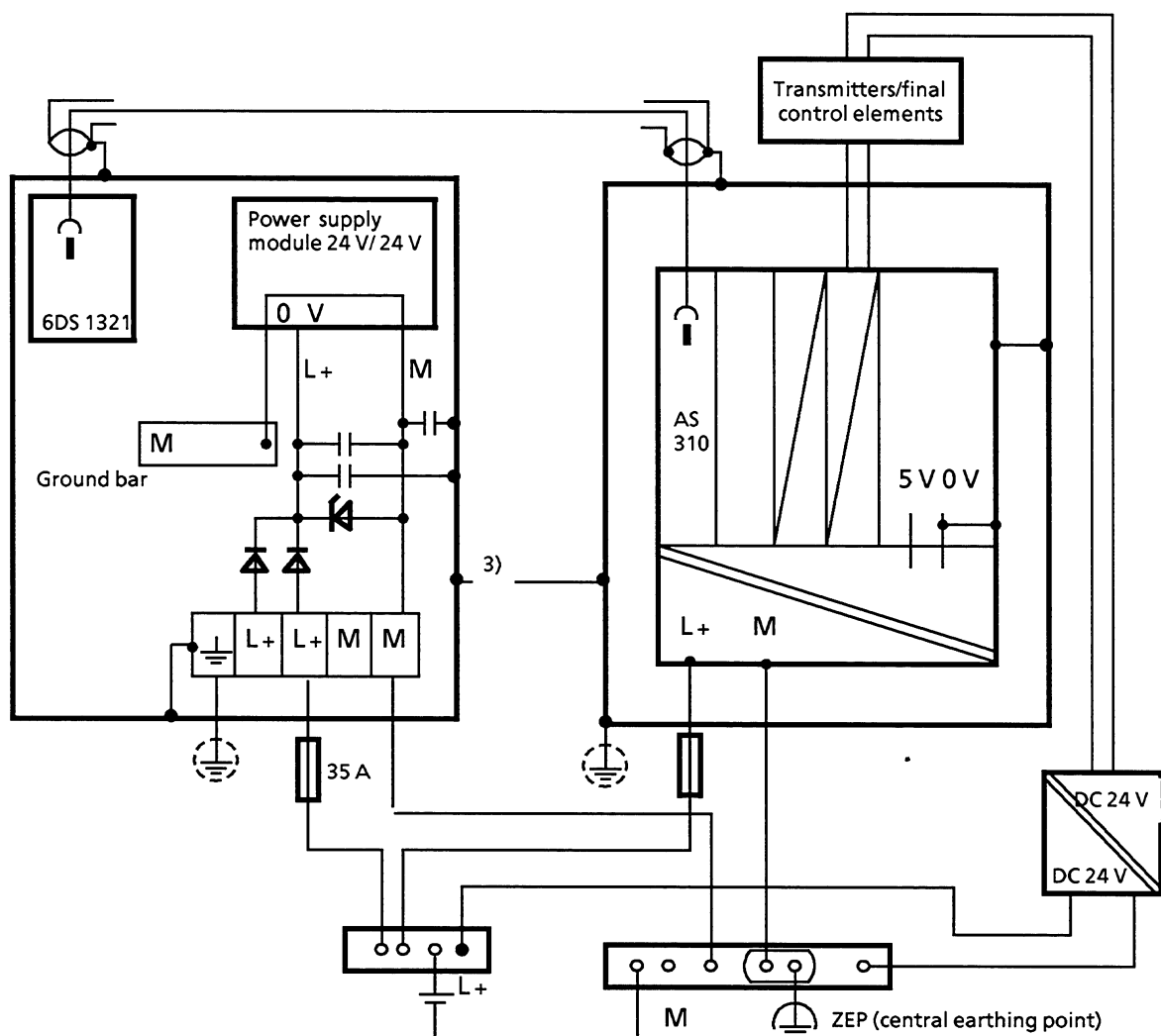
-  Low-noise earth, electronic earth
-  Local earth (building earth)
-  Local earth or PE
-  PE

Fig. 1/3 TELEPERM M earthing concept, AS or ES system AC 230 V, with SIMATIC expansion unit AC 230 V

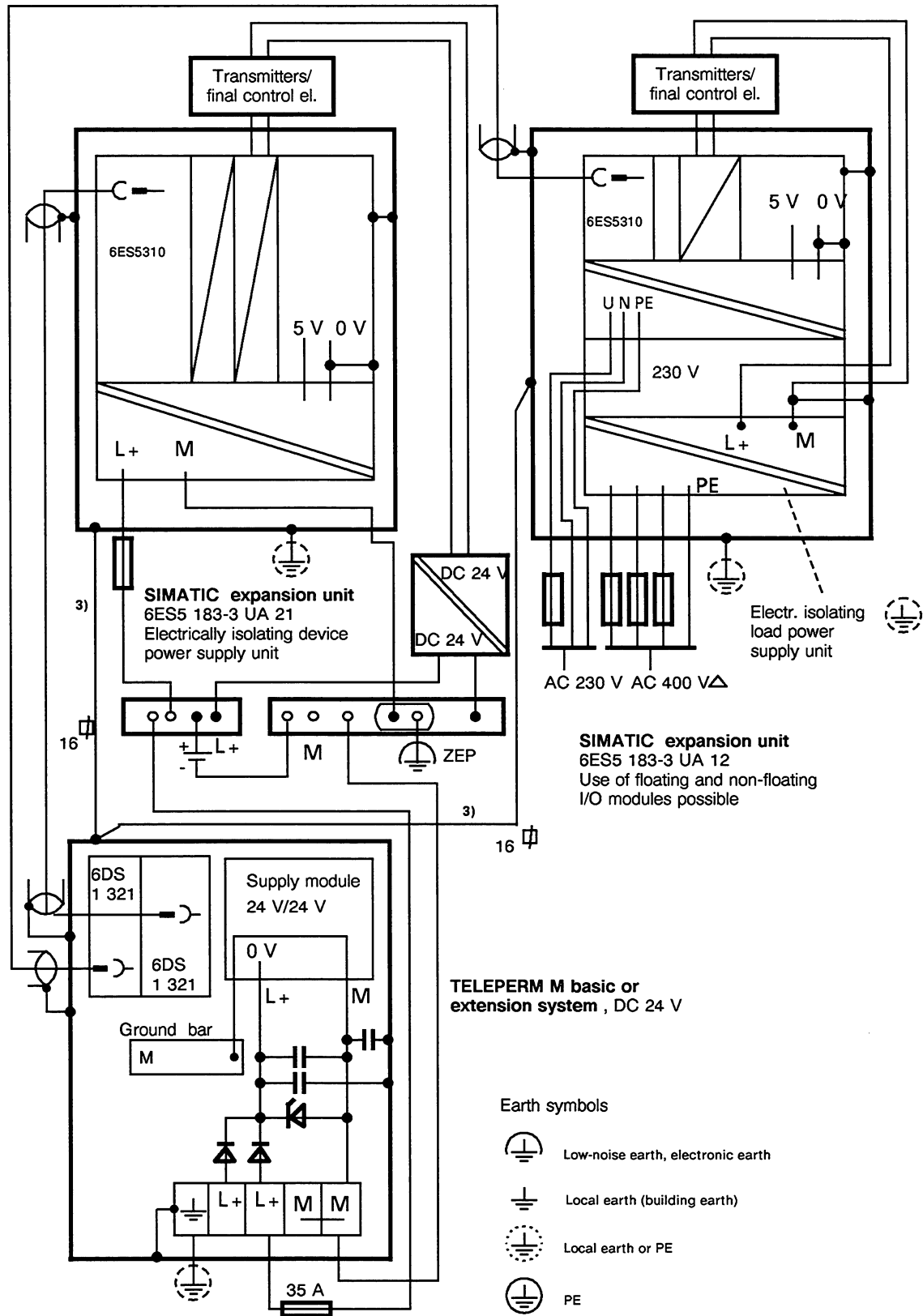


TELEPERM M basic or extension system DC 24 V

SIMATIC expansion unit
 6ES5183-3UA21 (DC 24 V)
 Only use electrically isolating device / load power supply unit

- 3) Additional equipotential bonding if necessary, see instructions for 6DS1321-8AA, interface module for SIMATIC S5 expansion unit DC 24 V and central earthing point

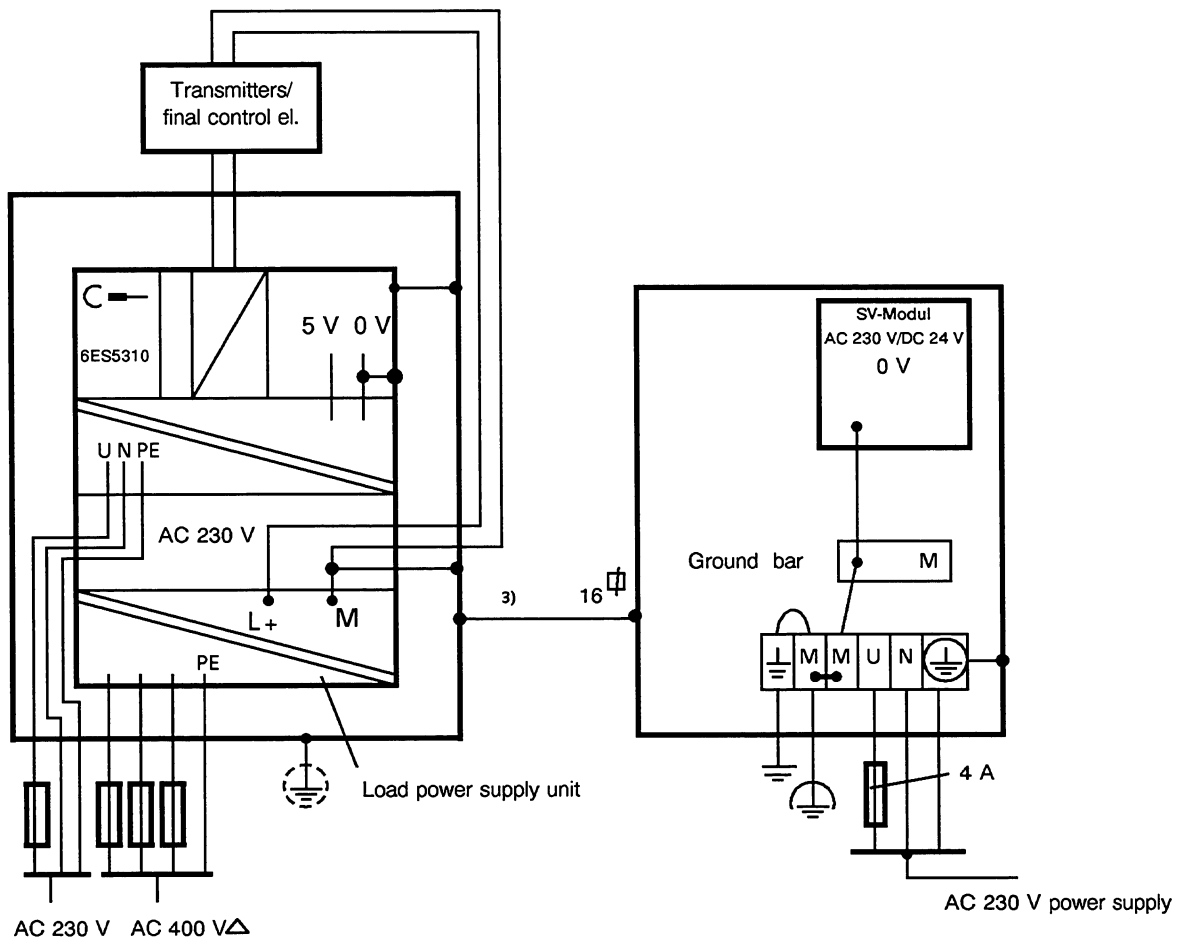
Fig. 1/4 TELEPERM M earthing concept, AS or ES system DC 24 V, with SIMATIC expansion unit DC 24 V and central earthing point



3) Additional equipotential bonding if necessary

Fig. 1/5 TELEPERM M earthing concept, AS or ES system DC 24 V, with SIMATIC S5 expansion units DC 24 V/AC 230 V and central earthing point (ZEP)

- Coupling of ES 100 K to SIMATIC S5 programmable controllers



SIMATIC basic unit

TELEPERM M extension unit (AC 230 V)

3) Additional equipotential bonding if necessary

Earth symbols





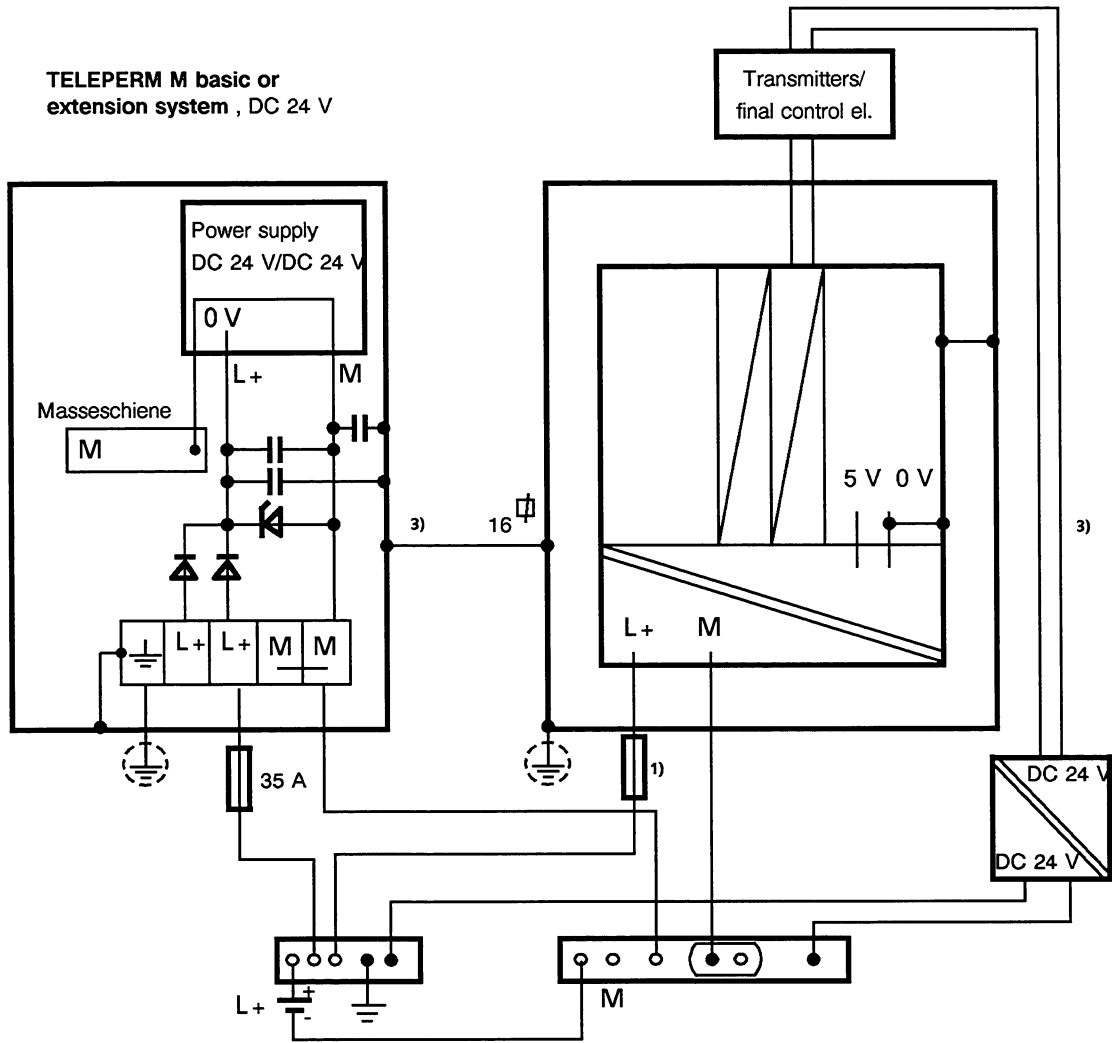
-  Low-noise earth, electronic earth
-  Local earth (building earth)
-  Local earth or PE
-  PE

Fig. 1.6 Earthing concept of TELEPERM M extension unit (AC 230 V) with SIMATIC basic unit (AC 230 V)



- 1) See corresp. SIMATIC description
- 3) Additional equipotential bonding if necessary

Earth symbols





-  Low-noise earth, electronic earth
-  Local earth (building earth)
-  Local earth or PE
-  PE

Fig. 1/7 Earthing concept of TELEPERM M extension unit (DC 24 V) with SIMATIC basic unit (DC 24 V) and central earthing point

1.3 Mode of Operation

1.3.1 Power Supply

The ES 100 K, AC 220 V is powered by the AC 230 V mains voltage. A power supply module (C79451-A3260-A20) generates DC 24 V from this.

The ES 100 K, DC 24 V is powered by a redundant L+ supply and the power supply module DC 24 V/DC 24 V.

The interface module for ES 100 K 6DS1322-8AA provides the 5-V supply for the I/O bus in the ES 100 K (see jumper assignments).

1.3.2 Coupling of ES 100 K in TELEPERM M System

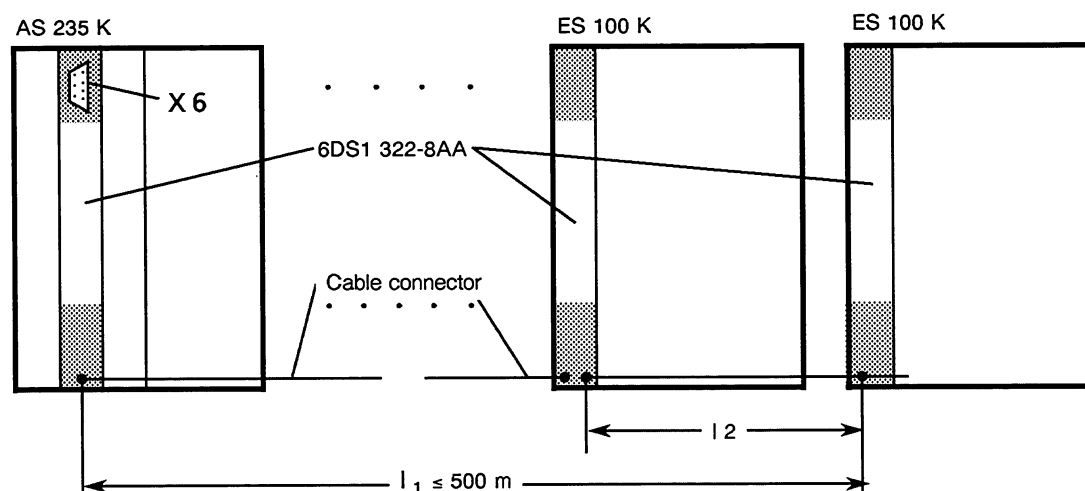
The coupling of the I/O bus of an ES 100 K with the I/O bus of a TELEPERM M automation system is a parallel bus coupling using two interface modules for ES 100 K 6DS1322-8AA (cable connector 6ES5721-0....) with a multiplexed parallel bus (multiplex operation between addresses and data).

Up to four ES 100 K systems can be connected in series to an interface module for ES 100 K. The incoming cable is connected in each case to connector X3, the outgoing cable to connector X4 on the interface module. The end of the cable must be terminated by a cable terminating plug on connector X4.

The bus drivers permit a maximum coupling length of 500 m.

- **Double addressing check (1-out-of-n check, EANK)**

Depending on the cable length **between two ES 100 K interface modules**, the cycle time for access to I/O modules can be increased using a jumper on the interface module in the AS in order to detect and signal double addressing (see Fig. 1/8).



$l_2 \leq 200 \text{ m} \rightarrow$ jumper X6 (11, 12) inserted \rightarrow Double addressing is detected, cycle time for I/O access $\leq 26.5 \mu\text{s}$

$l_2 \leq 500 \text{ m} \rightarrow$ jumper X6 (11, 12) open \rightarrow Double addressing is detected, but cycle time for I/O access extended to $\leq 38 \mu\text{s}$

Fig. 1.8 Coupling of ES 100 K in TELEPERM M system

**Caution**

Double addressing of an I/O module in an AS 235. AS 235 K or AS 235 H and an I/O module in an ES 100 K is not detected.

A power failure in an ES 100 K or on an interface module 6DS1322-8AA (L₊ or +5 V I/O bus) leads to a READY delay with all I/O modules in the associated ES 100 K as well as in the following ES 100 K systems of this branch.

See Section 2.3 for the jumper settings of the interface module for ES 100 K 6DS1322-8AA. Also refer to the instructions "Interface module for ES 100 K extension systems", Order No. C79000-B8076-C125, for pin assignments and further information.

1.3.3 Coupling of ES 100 K to SIMATIC S5 Programmable Controllers

The coupling partners are the module 6ES5304-UA11 in the SIMATIC central controller and the interface module for ES 100 K 6DS1322-8AA in the ES 100 K.

Transmission in the range up to ... m is the same as with a coupling in the TELEPERM M system via a multiplexed parallel bus (multiplex mode between addresses and data, RS 422 interface conditions).

**Caution**

Double addressing is not detected in the SIMATIC system (EANK is not evaluated).

See Section 2.3 for the jumper settings of the interface module for ES 100 K 6DS1322-8AA. Also refer to the instructions "Interface module for ES 100 K extension system", Order No. C79000-B8076-C125, for pin assignments and further information.

- **Delay times on I/O bus for distributed coupling**

100-m cable $t_{\text{delay}} = 2.5 \mu\text{s}$

Conversion from TELEPERM M I/O bus to TELEPERM M I/O remote bus and vice versa $t_{\text{delay}} = 2.5 \mu\text{s}$

Conversion from TELEPERM M I/O bus to RS 422 interface $t_{\text{delay}} = 2.5 \mu\text{s}$

- **Insulation**

Insulation To VDE 0160

Protection class I

Insulation of modules with respect to clearance and creepage distances from pin to pin or from conductor to conductor according to VDE 0110.

- **Design**

Potential difference of all ground star points of distributed systems $\leq 7 \text{ V}$

- **Weight**

ES 100 K, AC 230 V
(without I/O modules, in housing) 68 kg

ES 100 K, DC 24 V
(without I/O modules, in housing) 60 kg

IP 21 housing 39 kg

- **Mechanical stress**

Operational stress (subrack fitted in housing) 10 Hz to 150 Hz with 0.15 mm excursion
150 Hz to 500 Hz with 2 g

Transport Using lorry with air suspension

- **Ambient conditions**

Permissible ambient temperature of modules

- Operation $T = 0 \text{ }^\circ\text{C}$ to $55 \text{ }^\circ\text{C}$
Change in temperature/h $\leq 10 \text{ K}$
Change in temperature/min $\leq 0.5 \text{ K}$

- Storage $T = -40 \text{ }^\circ\text{C}$ to $+70 \text{ }^\circ\text{C}$
Change in temperature/h $\leq 20 \text{ K}$

Ventilation Self-ventilation

Sheet-steel housing/standard cabinet

Permissible cabinet inlet temperature 0 °C to 40 °C

Permissible humidity

- Operation ≤ 75 %
- Storage ≤ 65 %

Condensation not permissible

- EMC
 - to EN 50081/2 (release 93) Limit class A
 - to EN 50082/2 (release 95) Criterion A

- Low voltage guideline EN 60950 (release 96)

• Degree of protection

ES 100 K (with I/O modules) in:

- Subrack IP 00
- Sheet-steel housing IP 21

Impairment of function by gases Industrial atmospheres in occupied rooms are permissible

- Subrack

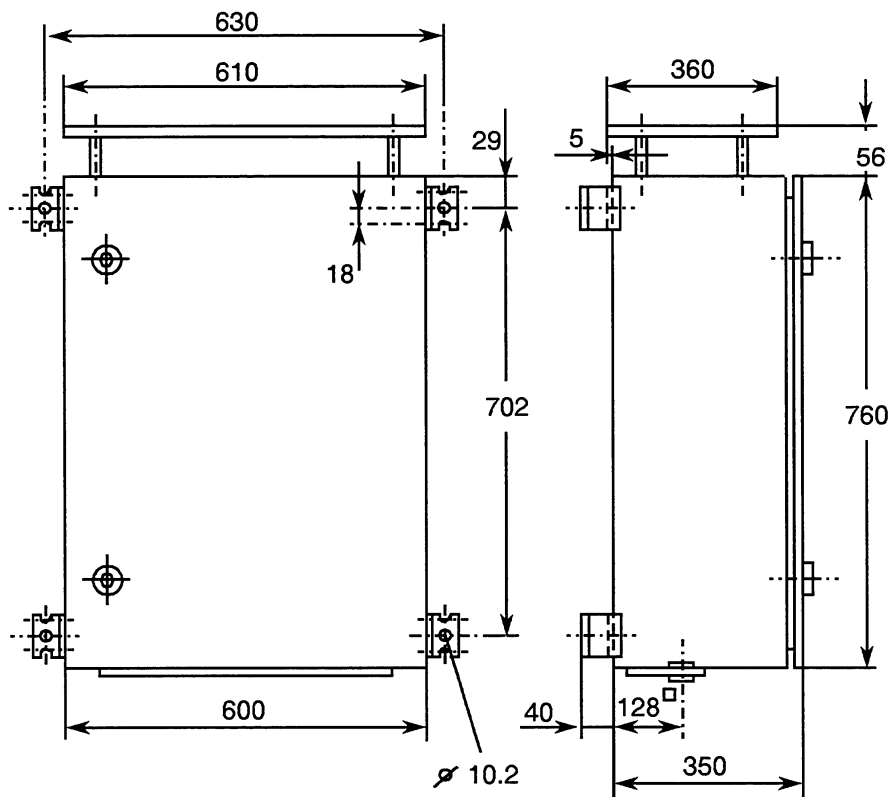


Fig. 1.9 Subrack - IP 21 sheet-steel housing

1.5 Planning and Installing the Subracks when Delivered without Compact Housings

Preliminary Remark

These installation instructions for compact systems without housings take into consideration the specific properties of TELEPERM M and are an extension of the existing guidelines. A deterioration in the electromagnetic compatibility (EMC) and improper operation of the system can be expected if deviations from the installation instructions are made or if individual measures are not observed.

Before installing and operating the automation or extension system, examine the subrack with the circuit boards for transport damage.

Regulations for electrostatically sensitive devices must always be observed when handling electronic modules.

1.5.1 Installation Instructions for Compact Systems in other Housing/Cabinet

- **Dimensions and weights of the compact systems**

The subracks of the compact systems must always be installed in a closed metal housing or cabinet; degree of protection at least IP 10 to VDE 0100; protection against foreign matter must be provided if applicable.

Subracks must not be installed in an open housing or frame.

- Minimum dimensions of metal housing/cabinet:

Width : at least 600 mm
Height : at least 760 mm
Depth : at least 350 mm

The bending radii "R" of the remote bus cable and routing in the cabinet according to TELEPERM M design guidelines must be observed during planning ($R \geq 300$ mm with standard remote bus cable).

- Weight of ES 100 K subrack (AC 220 V) **without** I/O modules:

ES 100 K : 28 kg

8 kg less with DC 24 V supply.

- **Ambient conditions**

Permissible ambient temperature of metal housing/cabinet:
0 °C to 40 °C with 75 % relative humidity.

Permissible ambient temperature of modules in metal housing/cabinet:
0 °C to 55 °C, condensation not permissible.

The metal housing/cabinet must be ventilated from the bottom to the top; the subrack must only be installed vertically.

Removal of dissipated heat from the individual systems must be guaranteed.