SIEMENS

SICAM RTUs

SICAM AK 3

User Manual

DC2-028-2.03

Hint

Please observe Notes and Warnings for your own safety in the Preface.

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Order Number: DC2-028-2.03

Preface

Purpose of this manual

This manual and describes the function and the manner of working of the system SICAM AK 3. It is intended for sales and purchase purposes as well as for users.

The manual provides diversely detailed information and overviews:

- Installation of the board racks
- Installation of system components and and accessories
- System components with interface descriptions and external circuitry
- Guideline for the engineering of the system
- Instructions for operation and maintenance

Target Group

This manual is intended for persons who are entrusted with installation, operation and service of SICAM AK 3 systems.

Within this manual there are hints how to obtain information or files via the internet. If you have no access please consult your project manager at Siemens.

Recommendations for Third-Party Products

Siemens does neither receive liability nor warranty for recommendations which are given or implied by this manual. For the correct and intended use of the respective product the associated technical descriptions must be paid attention to in any case.

References to Third-Party Web Sites

Siemens is not responsible for the contents of third-party websites mentioned in this document, as well as the correctness of the publications and links. For all product information the respective manufacturer is responsible.

Placement into the Information Landscape

Document name	Item Number
SICAM AK 3 System Description	MC2-021-2
SICAM RTUs Platforms ▪ Configuration Automation Units and Automation Networks	DC0-021-2
SICAM RTUs ▪ Ax 1703 Common Functions Protocol Elements	DC0-023-2
SICAM RTUs Common Functions System and Basic System Elements	DC0-015-2
SICAM RTUs Common Functions Peripheral Elements according to IEC 60870-5-101/104	DC0-011-2
SICAM RTUs Safety Manual	DC0-117-2
Folder SICAM TOOLBOX II	M30-001-3
SICAM RTUs IEC 60870-5-101/104 Interoperability	DC0-013-2
SICAM RTUs IEC 60870-5-103 Interoperability	DC0-026-2
SICAM RTUs TG800 Interoperability	DC0-041-2
SICAM RTUs DNP3 Interoperability	DC0-046-2
SICAM RTUs MODBUS Interoperability	DC0-073-2
Ax 1703 IEC 60870-5-101/104 Interoperability	DA0-046-2

You find current product information on our website: www.siemens.com/sicam.

Further Support

For more information, please contact our Customer Support Center:
Phone: +49 (0)180 524 70 00 Fax: +49 (0)180 524 24 71
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Notes on Safety

This manual does not constitute a complete catalog of all safety measures required for operating the equipment (module, device) in question because special operating conditions might require additional measures. However, it does contain notes that must be adhered to for your own personal safety and to avoid damage to property. These notes are highlighted with a warning triangle and different keywords indicating different degrees of danger.

Danger

means that death, serious bodily injury or considerable property damage will occur, if the appropriate precautionary measures are not carried out.

Warning

means that death, serious bodily injury or considerable property damage can occur, if the appropriate precautionary measures are not carried out.

Caution

means that minor bodily injury or property damage could occur, if the appropriate precautionary measures are not carried out.

Hint

is important information about the product, the handling of the product or the respective part of the documentation, to which special attention is to be given.

Qualified Personnel

Commissioning and operation of the equipment (module, device) described in this manual must be performed by qualified personnel only. As used in the safety notes contained in this manual, qualified personnel are those persons who are authorized to commission, release, ground, and tag devices, systems, and electrical circuits in accordance with safety standards.

Use as Prescribed

The equipment (device, module) must not be used for any other purposes than those described in the Catalog and the Technical Description. If it is used together with third-party devices and components, these must be recommended or approved by Siemens.

Correct and safe operation of the product requires adequate transportation, storage, installation, and mounting as well as appropriate use and maintenance.

During operation of electrical equipment, it is unavoidable that certain parts of this equipment will carry dangerous voltages. Severe injury or damage to property can occur if the appropriate measures are not taken:

- Before making any connections at all, ground the equipment at the PE terminal.
- Hazardous voltages can be present on all switching components connected to the power supply.
- Even after the supply voltage has been disconnected, hazardous voltages can still be present in the equipment (capacitor storage).
- Equipment with current transformer circuits must not be operated while open.
- The limit values indicated in the manual or the operating instructions must not be exceeded; that also applies to testing and commissioning.

Danger

Consider obligatory the safety rules for the accomplishment of works at electrical plants:

1. Switch off electricity all-pole and on all sides!
2. Ensure that electricity cannot be switched on again!
3. Double check that no electrical current is flowing!
4. Discharge, ground, short circuit!
5. Cover or otherwise isolate components that are still electrically active!

Typographic and Sign Conventions

- Manuals to be referred to are represented in *italics*, such as e.g. *SICAM RTUs Common Functions System and Basic System Elements*.
- For easy reading, certain designations and names are presented *in this font*
- Symbolic names are presented *in this font*

Open Source Software

This product contains, among other things, Open Source Software developed by third parties. The Open Source Software used in this product and the license agreements concerning this software can be found in the Readme_OSS. These Open Source Software files are protected by copyright.

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Table of Contents

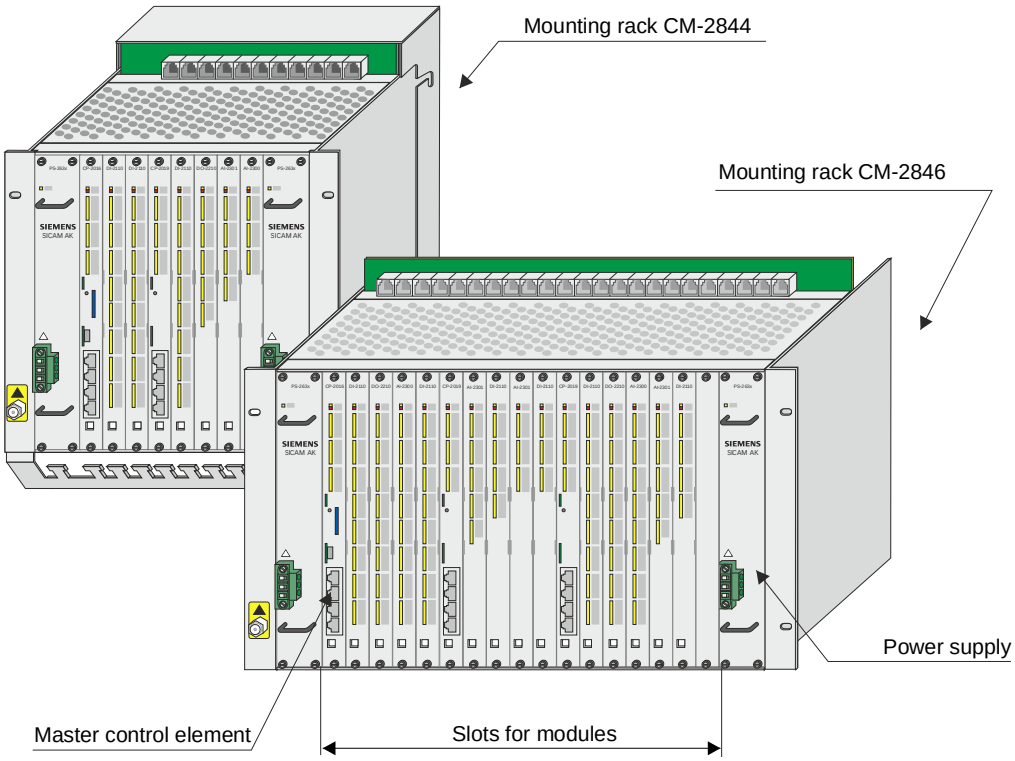
1 Installation

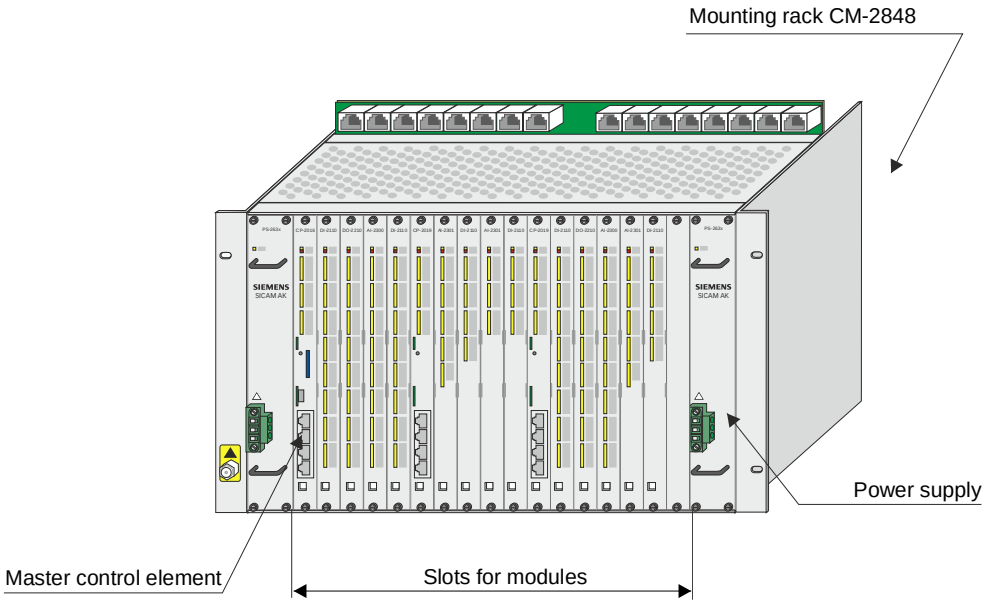
Contents

This chapter describes the structure of the system SICAM AK 3, how and where it may be installed, and how the wirings are to be accomplished.

1.1 Mechanical Design

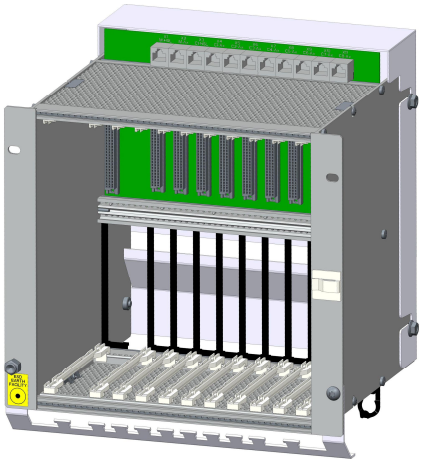
The system SICAM AK 3 consists of a board rack in double euro format with slots for the seating of modules and power supplies.





There are 3 different sized board racks available, as well as 1 expansion board rack.

1.1.1 CM-2844 Basic Board Rack, 9 Slots

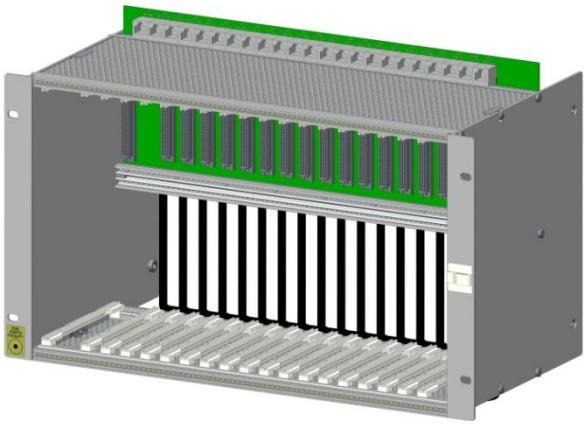


The basic board rack CM-2844 has 9 slots for modules and 2 slots for power supplies in double euro format. It serves for the equipment of basic modules and peripheral modules.

It can be used for rear panel assembly. In section 1.2.2, Space Requirement you can find information on the dimensions.

Further information can be found in the *SICAM AK 3 System Description*.

1.1.2 CM-2846 Basic Board Rack, 17 Slots



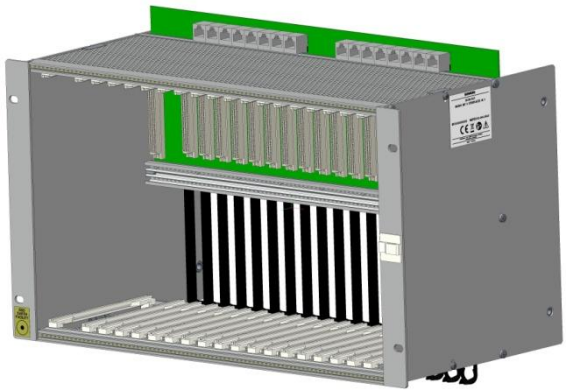
The basic board rack CM-2846 has 17 slots for modules and 2 slots for power supplies in double euro format. It serves for the equipment of basic modules and peripheral modules.

It can be used for 19" (swing-)frame installation and rear panel assembly. This example shows a board rack for the 19" (swing-)frame installation.

In section 1.2.2, Space Requirement you can find information on the dimensions.

Further information can be found in the *SICAM AK 3 System Description*.

1.1.3 CM-2848 Basic Board Rack, 17 Slots



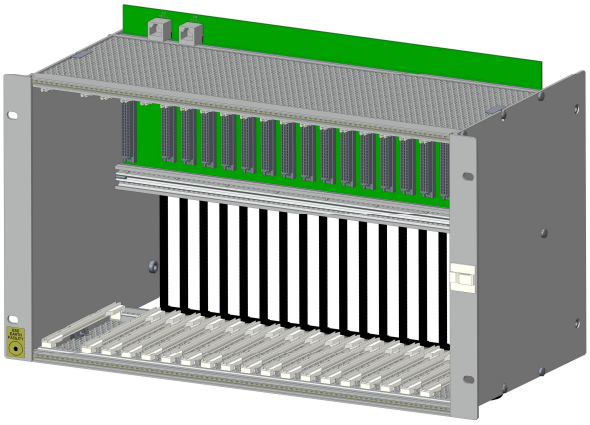
The basic board rack CM-2846 has 17 slots for modules and 2 slots for power supplies in double euro format. It serves for the equipment of basic modules and peripheral modules.

It can be used for 19" (swing-)frame installation and rear panel assembly. This example shows a board rack for the 19" (swing-)frame installation.

In section 1.2.2 Space Requirement you can find information on the dimensions.

Further information can be found in the *SICAM AK 3 System Description*.

1.1.4 CM-2843 Expansion Board Rack, 16 Slots



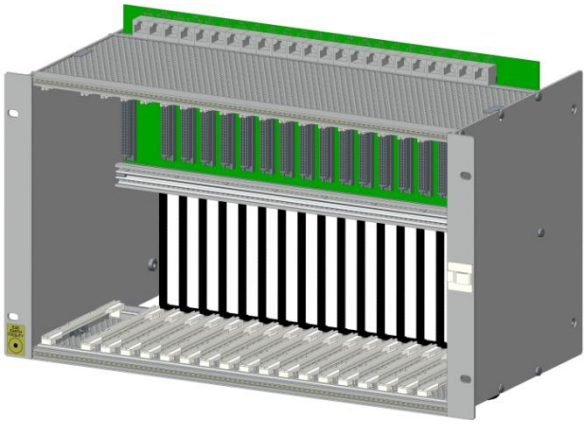
The expansion board rack CM-2843 has 16 slots for modules and 2 slots for power supplies in double euro format. It serves for the equipment of peripheral modules.

It can be used for 19" (swing-)frame installation and rear panel assembly. This example shows a board rack for the 19" (swing-)frame installation.

In section 1.2.2, Space Requirement you can find information on the dimensions.

Further information can be found in the *SICAM AK 3 System Description*.

1.1.5 CM-2847 Migration Board Rack, 17 Slot



The migration board rack CM-2847 has 17 slots for modules and 2 slots for power supplies in double-Europe format. It serves for the equipment of basic modules and peripheral modules.

The board rack is designed for 19“ (swing-) frame installation.

In section 1.2.2, Space Requirement you can find information on the dimensions.

Further information can be found in the *SICAM AK 3 System Description*.

Hint

This board rack was primarily designed for the combined use with the SICAM AK basic system element CP-2017/PCCX25 in SICAM AK 3. It enables the installation of the connection board CM-2838, which is required by the basic system element CP-2017/PCCX25.

1.2 Board Rack Installation

1.2.1 Installation Location

The system SICAM AK 3 can be used for the installation in a cabinet.

Systems, which use a CM-2846 board rack, are primarily designed for the 19" (swing-) frame installation, but can optionally be expanded for rear panel installation.

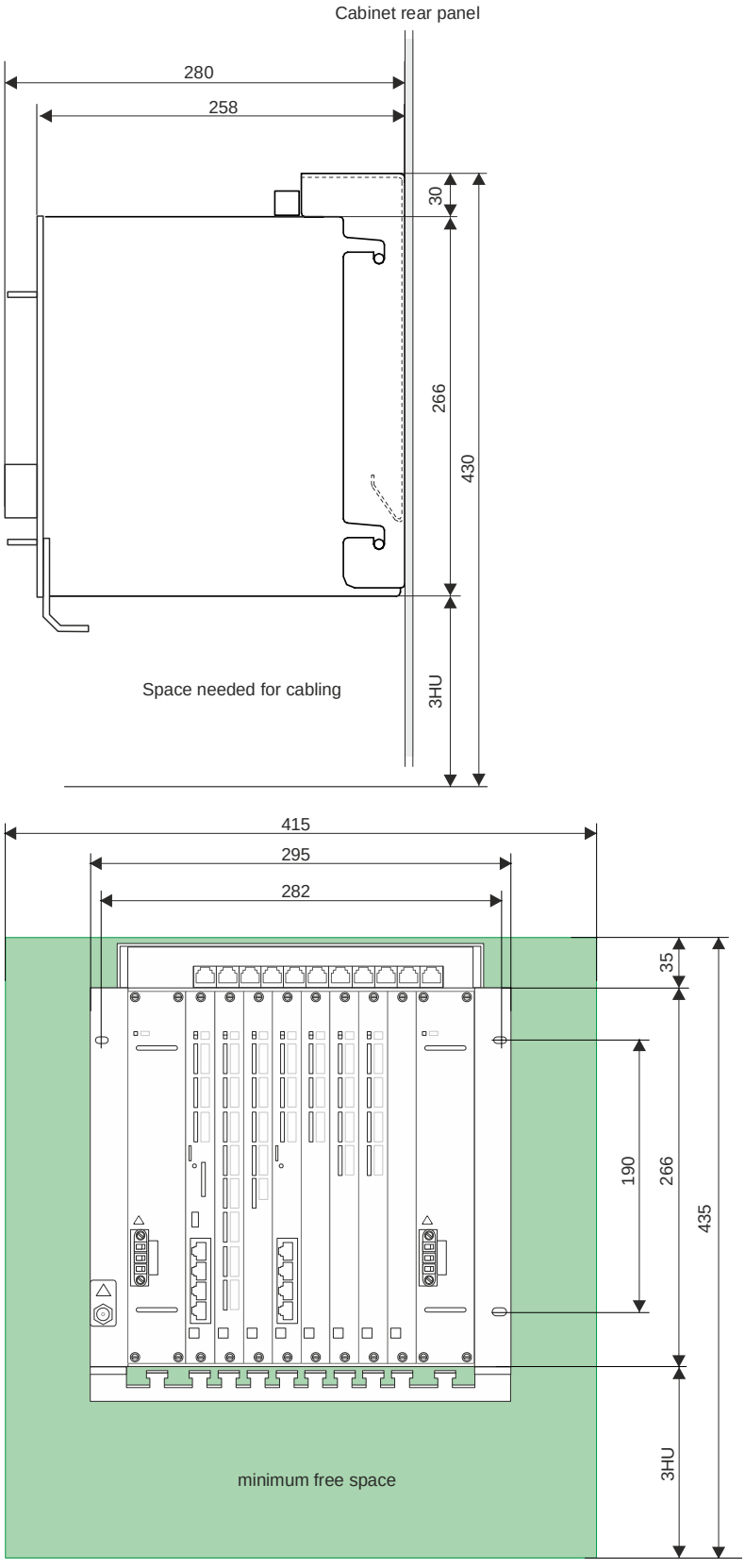
Systems, which use a CM-2844 board rack, are designed for the rear panel installation.

Note:
The system SICAM AK 3 may only be installed horizontally.

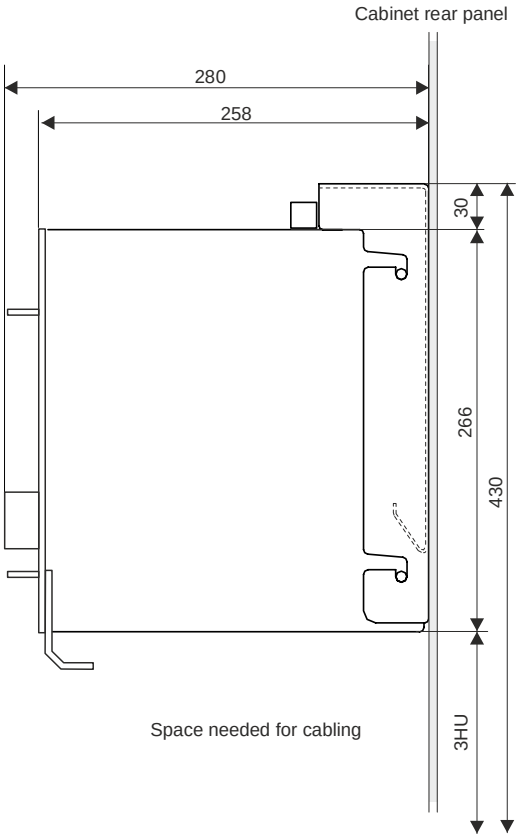
1.2.2 Space Requirement

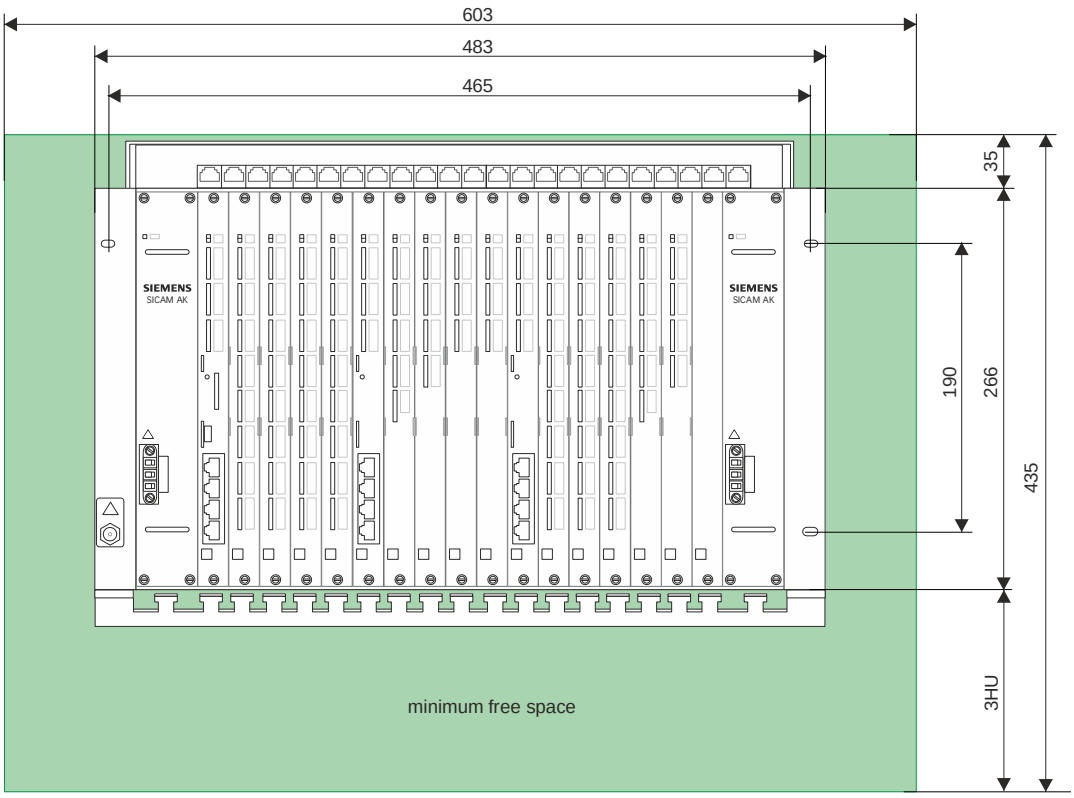
Certain minimum distances must be observed between board rack and adjacent equipment. These minimum distances serve the installation and removal of components, the cabling and the ventilation of the device in operation.

1.2.2.1 CM-2844 - Rear Panel Installation

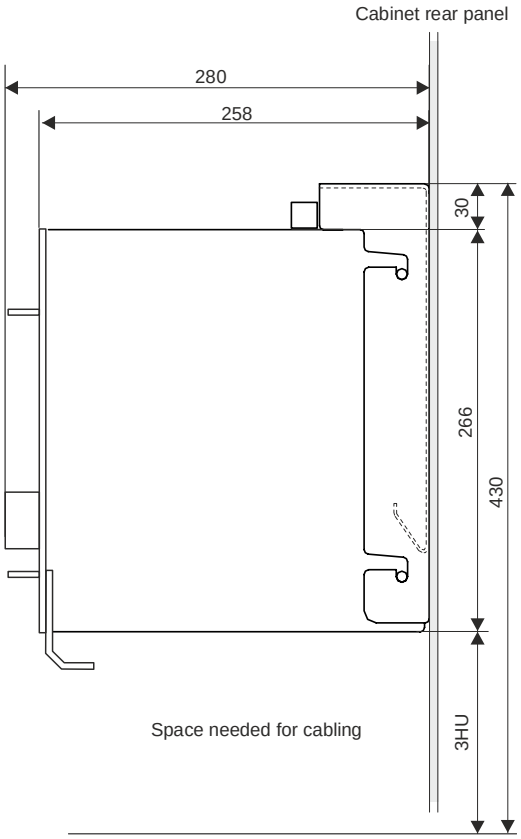


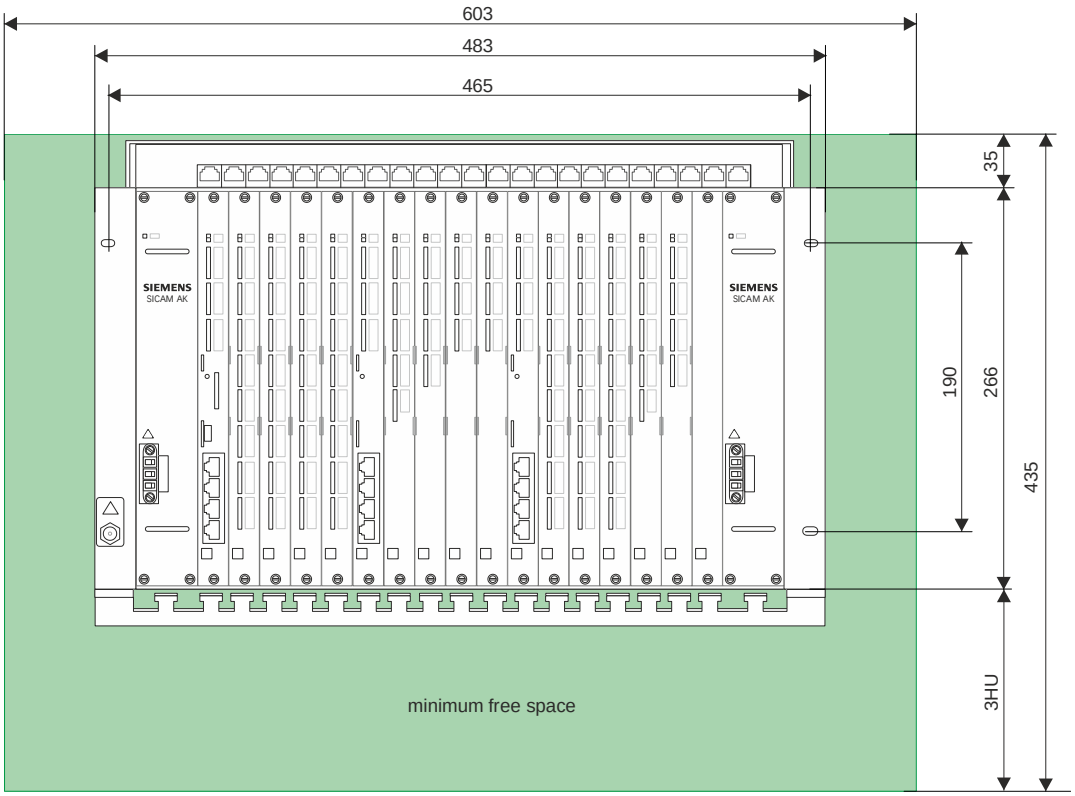
1.2.2.2 CM-2846 - Rear Panel Installation



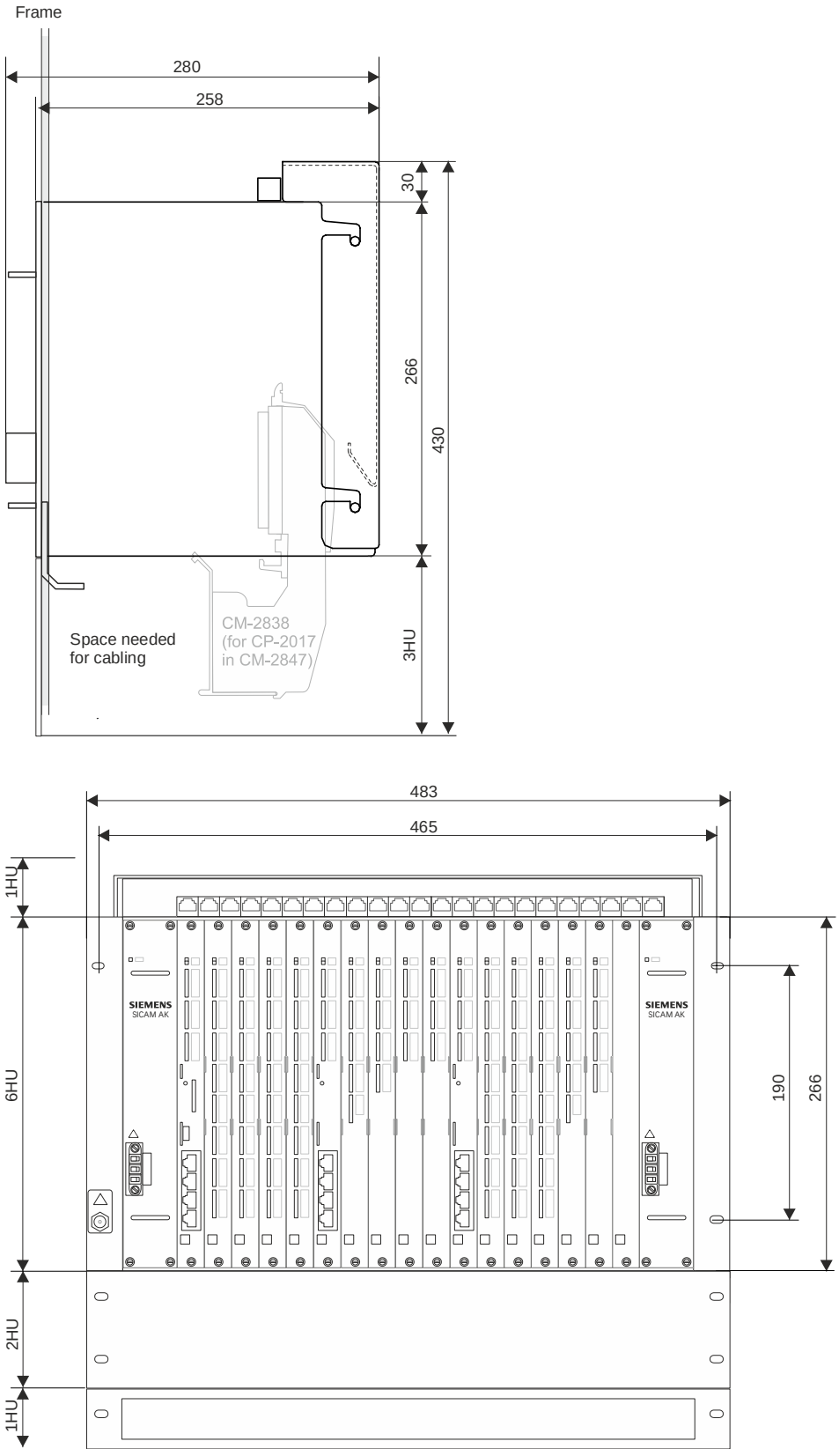


1.2.2.3 CM-2848 – Rear Panel Installation

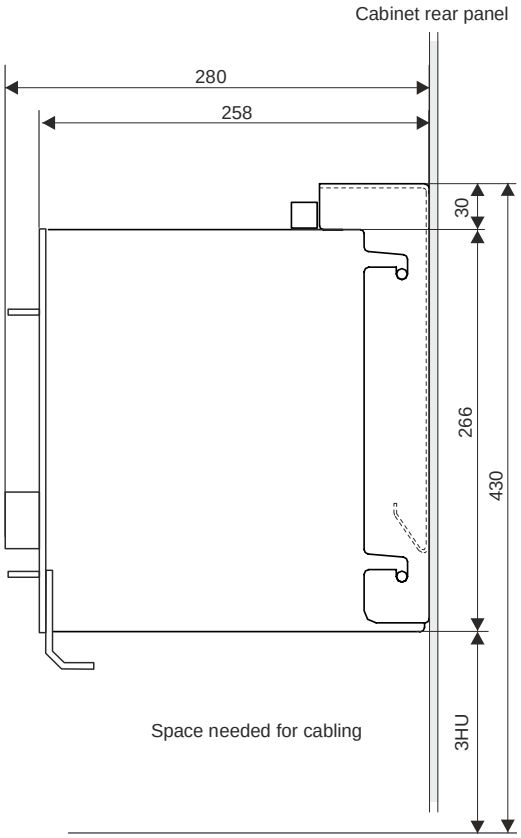


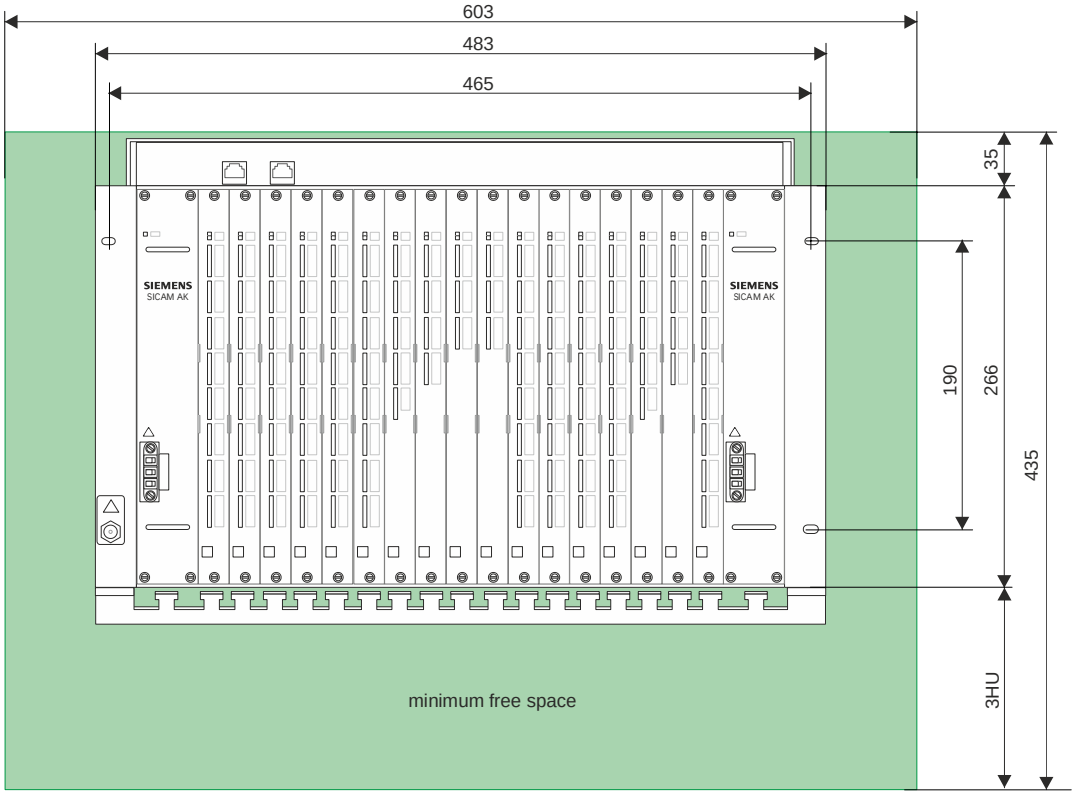


1.2.2.4 CM-2846, CM-2847, CM-2848 - 19" (Swing-) Frame Installation

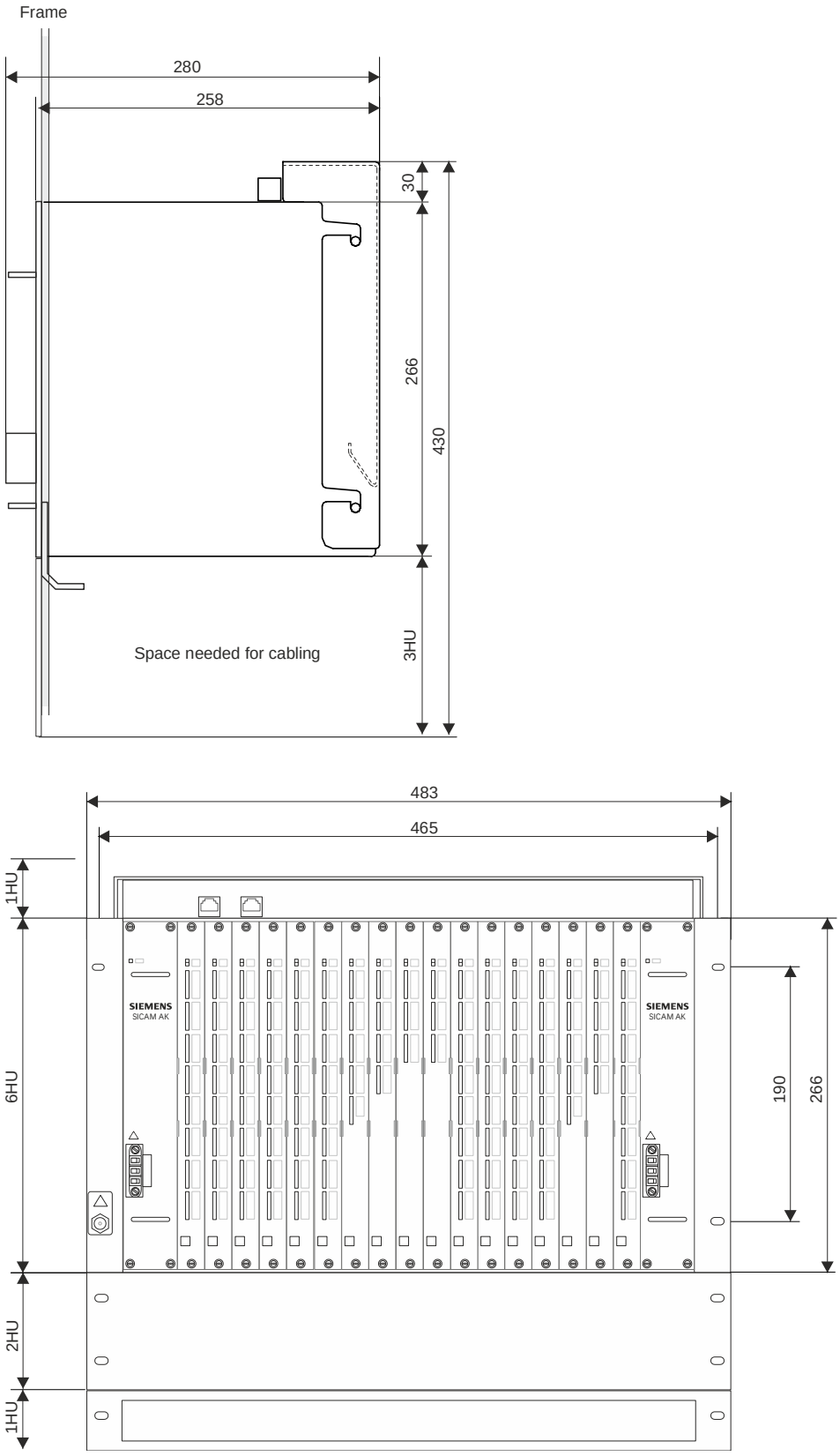


1.2.2.5 CM-2843 - Rear Panel Installation

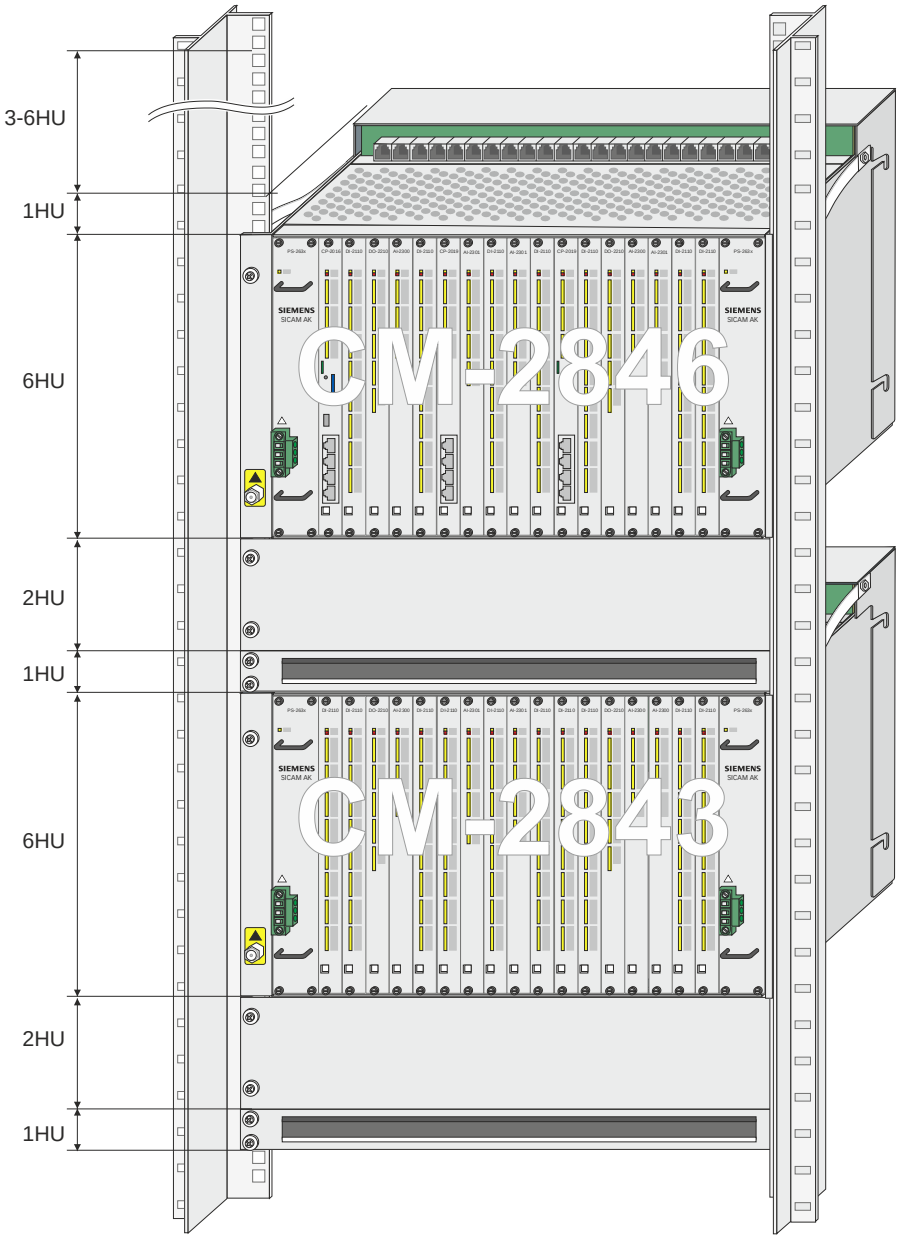




1.2.2.6 CM-2843 - 19" (Swing-) Frame Installation



1.2.2.7 Examples for 19" (Swing-) Frame Installation of 2 Board Racks

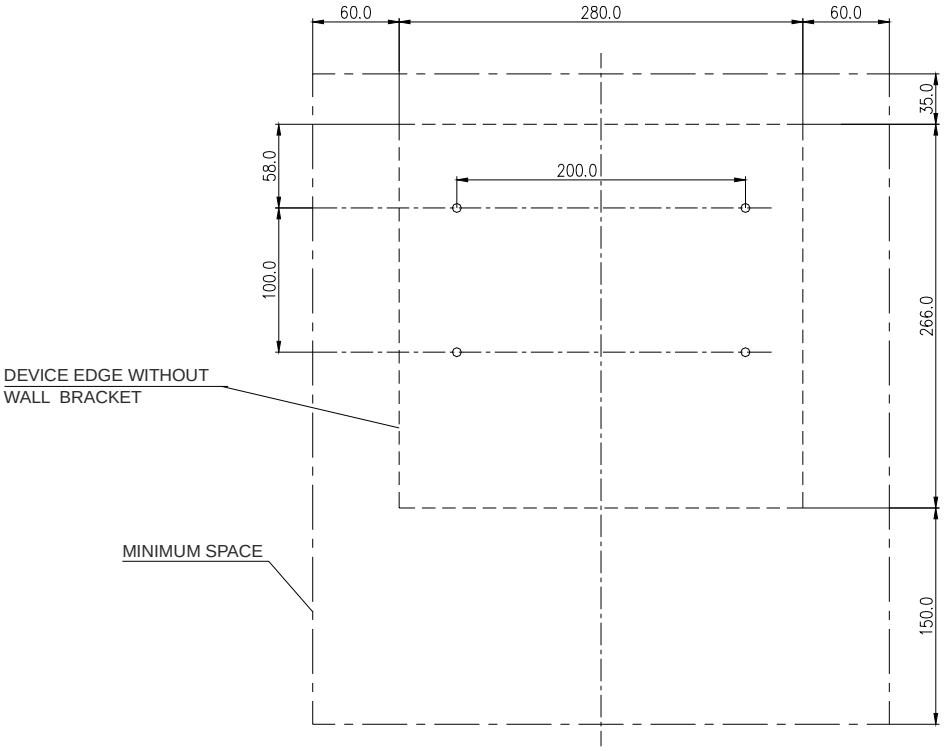


1.2.3 Install Board Rack CM-2844

The board rack CM-2844 is supplied as set with wall bracket and cable strain relief.

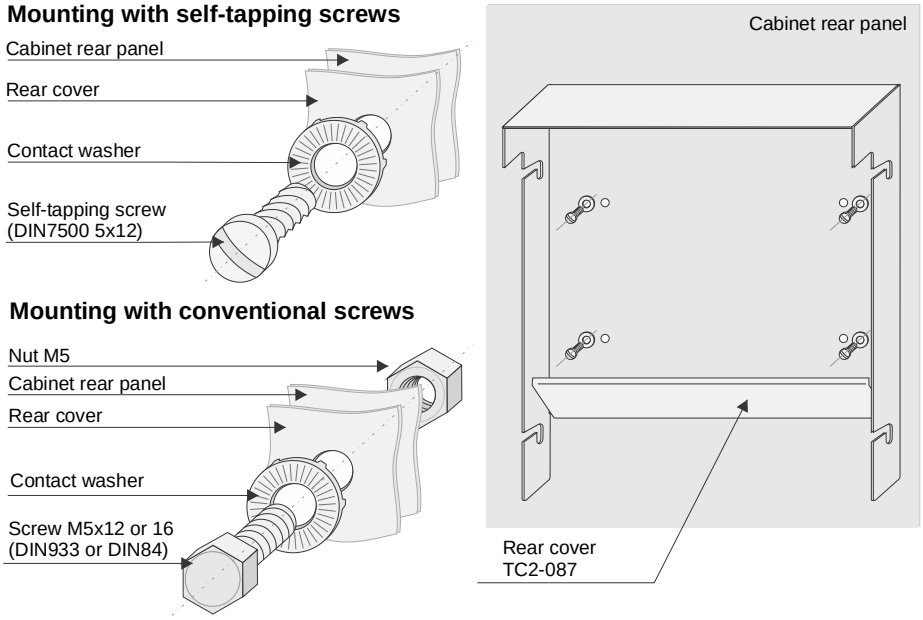
Proceed as follows:

- remove the wall bracket from the board rack
- Mark out the drill holes for the wall bracket on the rear panel of the cabinet according to the enclosed drilling diagram (DC2-000-1)

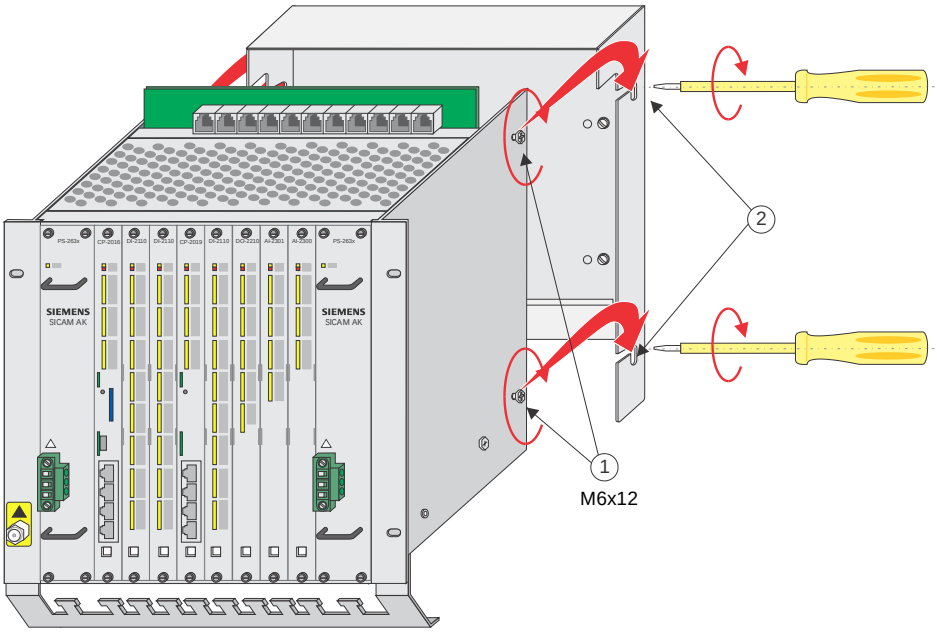


- Drill the holes according to the specifications on the drilling diagram

· fasten the wall bracket



· Screw the supplied screws (M6x12) half way into the board rack j , hang the board rack in the wall bracket and tighten the fastening screws k .



1.2.4 Install Board Rack CM-2846, CM-2843 and CM-2848

The board racks CM-2846, CM-2843 and CM-2848 are primarily designed for 19" (swing-)frame installation.

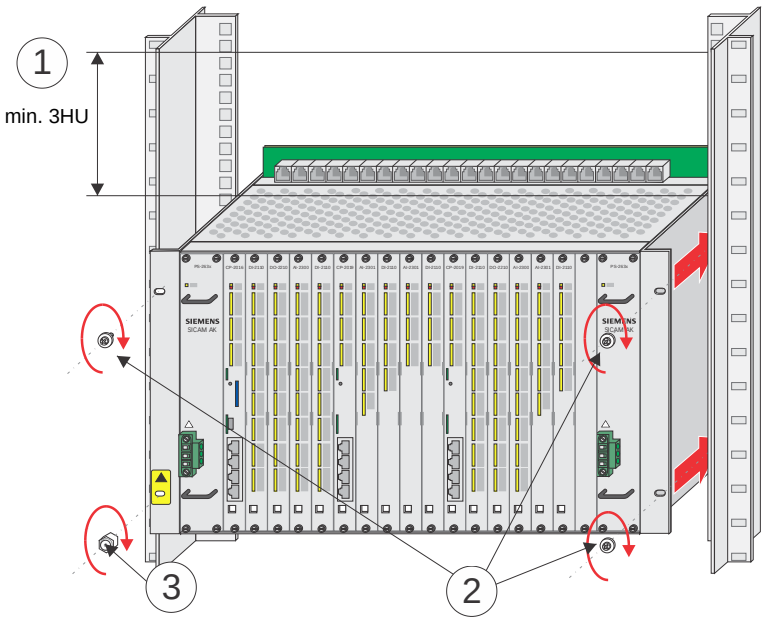
The wall fastening kit (TC2-702 / 6MF13130CH020AA0), which is necessary for rear panel installation, must be ordered separately.

The board rack CM-2847 is only designed for 19" (swing-)frame installation.

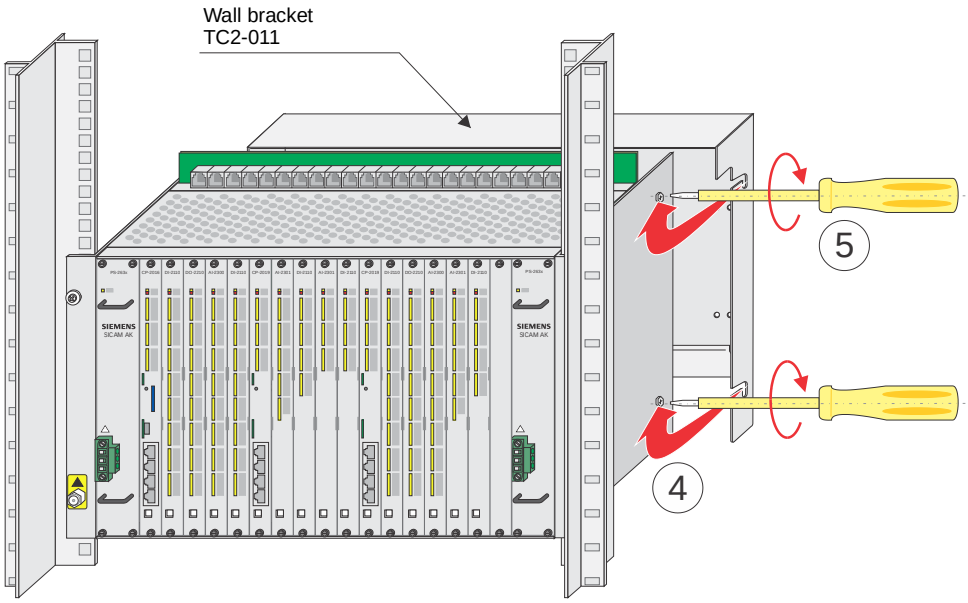
1.2.4.1 19" (Swing) Frame Installation

Proceed as follows:

- Determine the position at which the board rack is to be installed; please note thereby, that a space of 3HU must be maintained above the board rack •
- Screw the board rack to the 19" frame; use therefore the M6x16 (DIN 85) screws and the washers 6,4-KST (DIN 125) at position , , and the ESD-screw M6x14 at position ƒ



· To mount the optional wall bracket you have to screw the supplied screws (M6x12) half way into the board rack, hang the wall bracket on the board rack „ and tighten the fastening screws ….



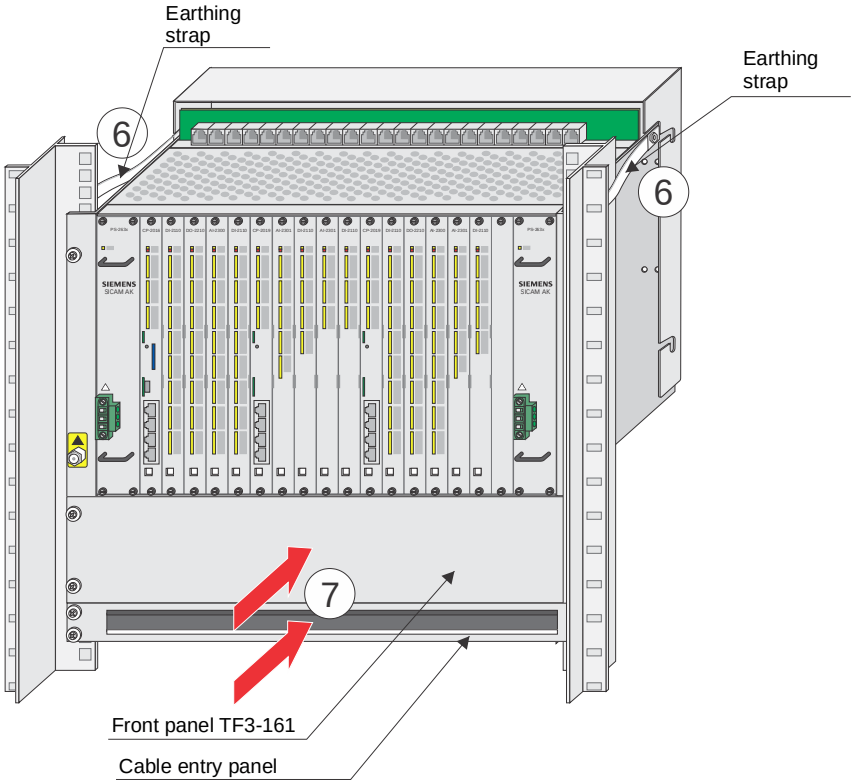
· Attach the earthing straps to the cabinet/frame †

Note

The earthing straps are not part of the board rack. They have to be ordered separately..

EMC earthing strap 140/10/4,5-6,5	TF3-033 / 6MF13140DA330AA1
EMC earthing strap 300/16/6,5-8,5	TF3-031 / 6MF13140DA310AA1

· Tighten front cover and cable entry panel ‡



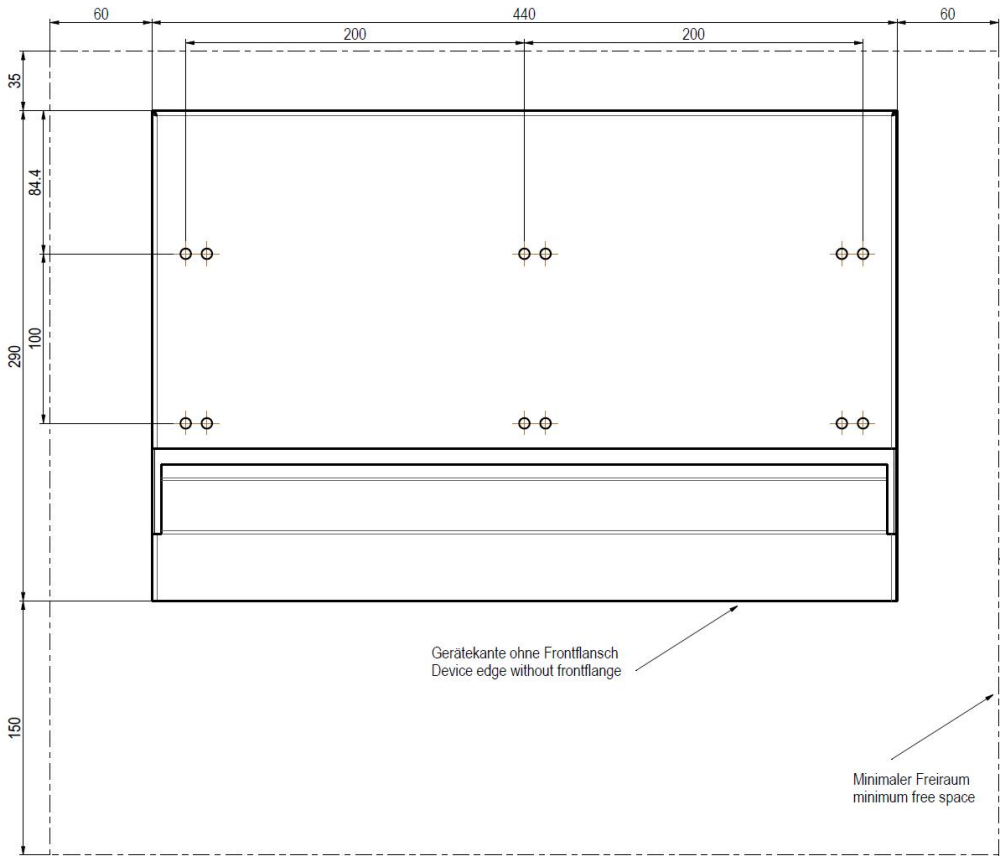
1.2.4.2 Rear Panel Assembly

Note

The wall fastening kit (TC2-702 / 6MF13130CH020AA0) is necessary for rear panel installation of CM-2846 and CM-2843.

Proceed as follows:

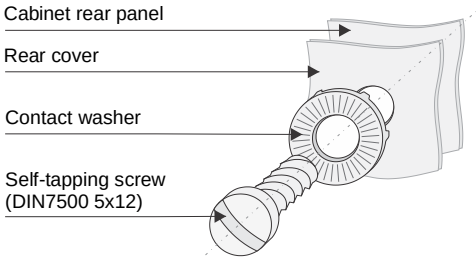
- Mark out the drill holes for the wall bracket on the rear panel of the cabinet according to the enclosed assembly instruction (C53207-A5703-E421-1A-7431)



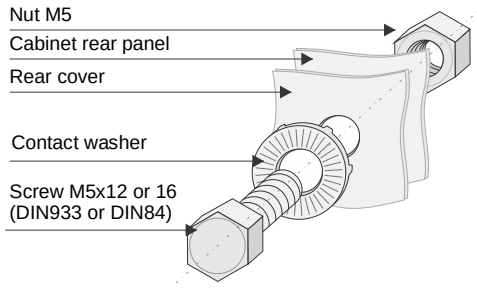
- Drill the holes according to the specifications

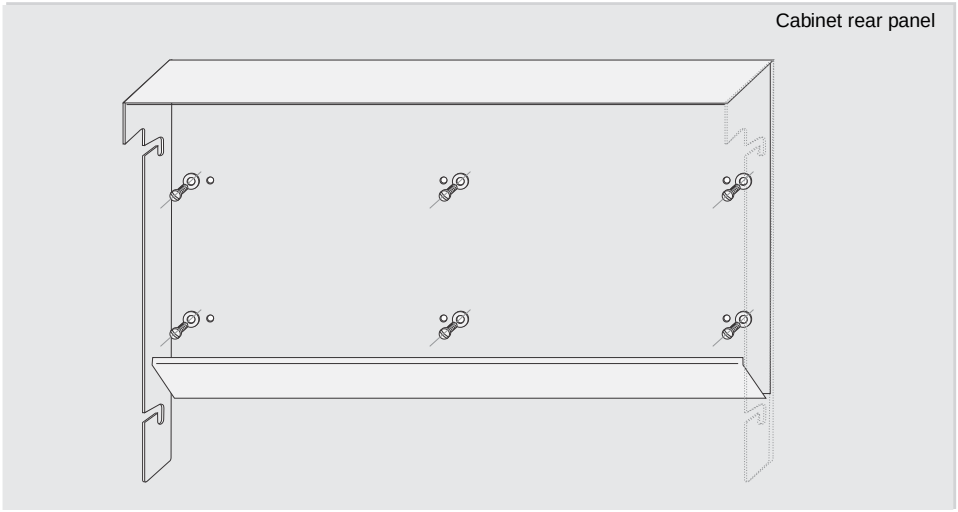
· Fasten the wall bracket

Mounting with self-tapping screws



Mounting with conventional screws

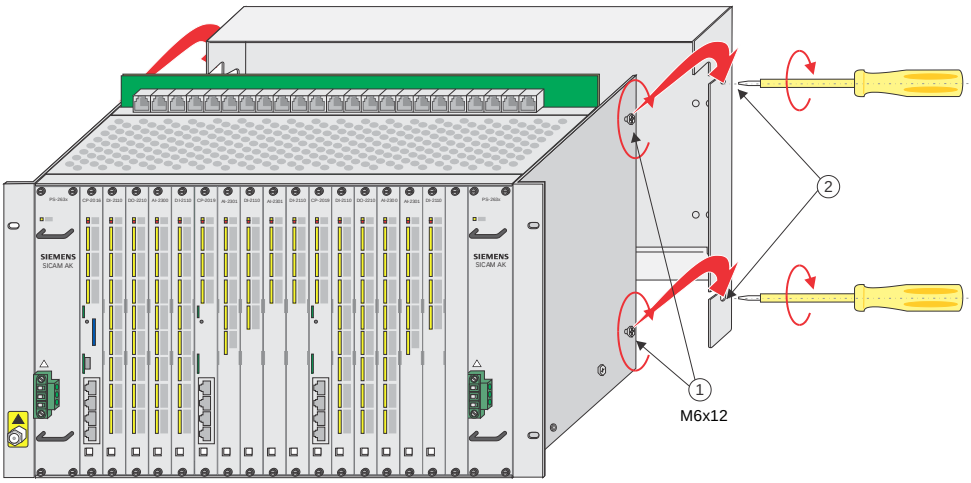




Caution

The board rack must be fastened with at least 6 screws.

· Screw the supplied screws (M6x12) half way into the board rack j , hang the board rack in the wall bracket and tighten the fastening screws k .



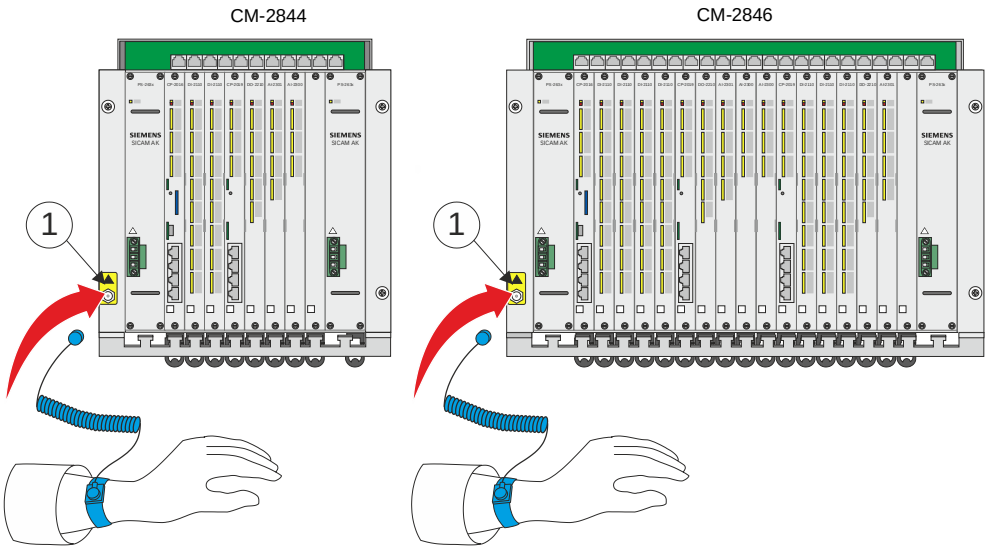
1.3 Installation and Removal of Modules

Warning
The activities described in this section presume that the grounding connection between SICAM AK 3 and cabinet or rack has been properly carried out and that these are earthed.

1.3.1 Preparations

1.3.1.1 Connect and put on Grounding Strap

The grounding strap can be connected directly to the board rack. The connection point is located on the left side panel of the board rack • .

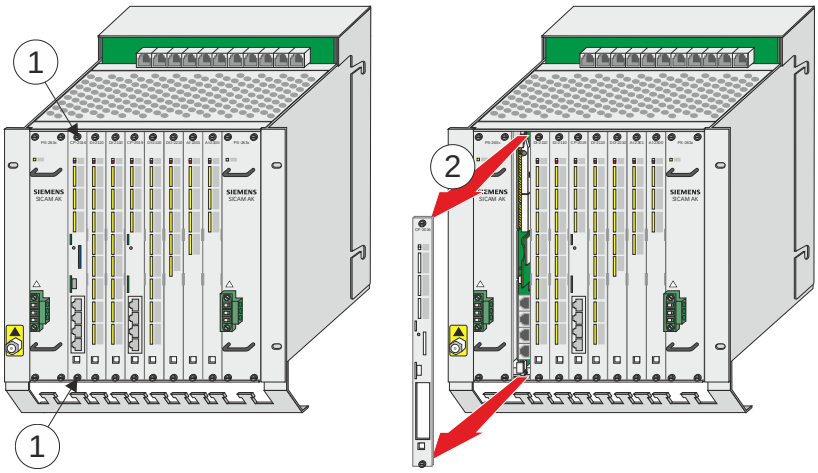


	Designation	Item-Number/MLFB
	Grounding Strap	TF3-133 6MF13140DB330AA0

1.3.1.2 Removing Front Panel

Proceed as follows:

- Open the screws • of the front panel which you want to remove.
- Take hold of the front panel at the screws and remove it , .



1.3.2 Installation

Caution

Before the installation of a module the peripheral cable (CM-2890) must already be fitted.

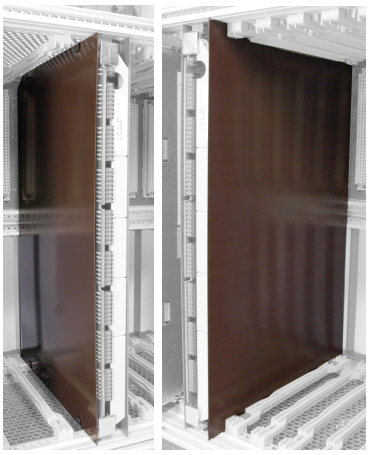
Warning

Left and right of the boards DI-2114, DI-2115 and DO-2211 an insulation plate must be installed.

One insulation plate is included to these boards. Further can be ordered with following number:

Insulation plate, double euro format T12-001
6MF13010CA010AA0

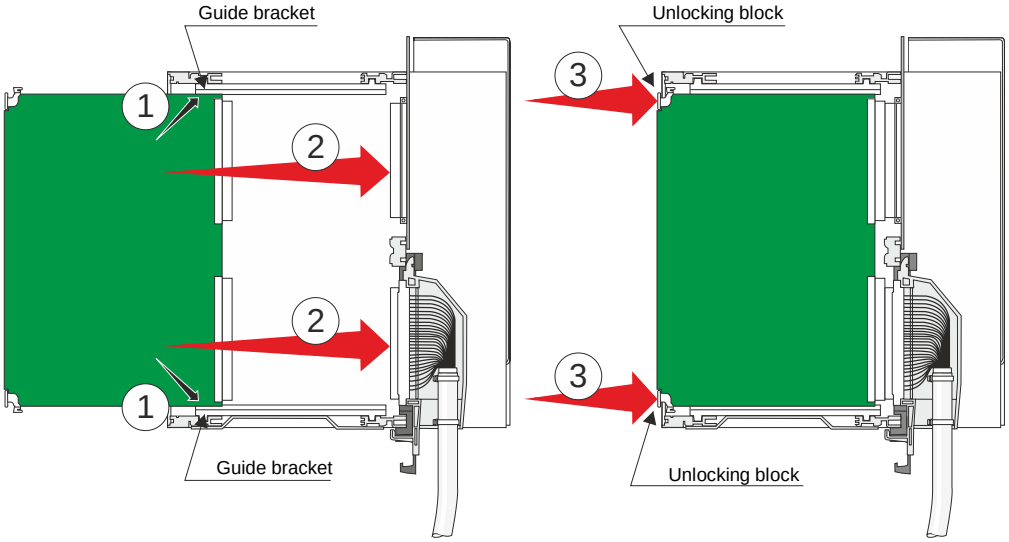
Shielding plate holder..... TC2-099
(4 pcs. per insulation) 6MF13133CA000AA0



There is no reinforced isolation between the peripheral circuits. Therefore, it is not allowed to protect each circuit within one board separately using various fuses.

The installation of modules is carried by hand without any tools. Proceed as follows:

- Connect/put on grounding strap and remove front panel
- Place the module in the guide bracket of the desired slot • and push it carefully up to the connectors located at the bottom , .
- Then apply the same pressure at both unlocking blocks ƒ in order to connect the module with backplane (and peripheral cable).



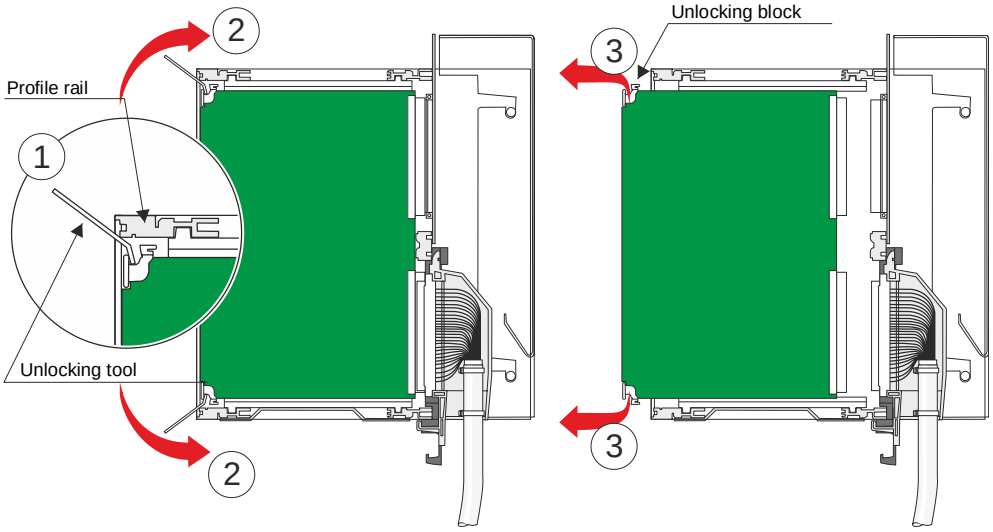
1.3.3 Removal

Caution
When removing the master control element, all the non-autonomous modules fail (processing and communication element, peripheral element).

For the removal of a module, you will need the unlocking tool TA2-105. This is included in the scope of supply of every board rack and must be inserted in the bracket provided on the board rack during installation.

Proceed as follows:

- Connect/put on grounding strap and remove front panel
- Position the unlocking tool between module and profile rail •
- Loosen the plug-in connector by pushing the unlocking clip upwards , , or downwards , .
- Grasp the module at the unlocking blocks and withdraw it from the board rack ƒ



	Designation	Item-Number/MLFB
	Extracting Tool for SICAM RTUs boards	TA2-105 6MF13110CB050AA0

1.3.4 Mounting Front Panel

Proceed as follows:

- Position the front panel
- Tighten the screws

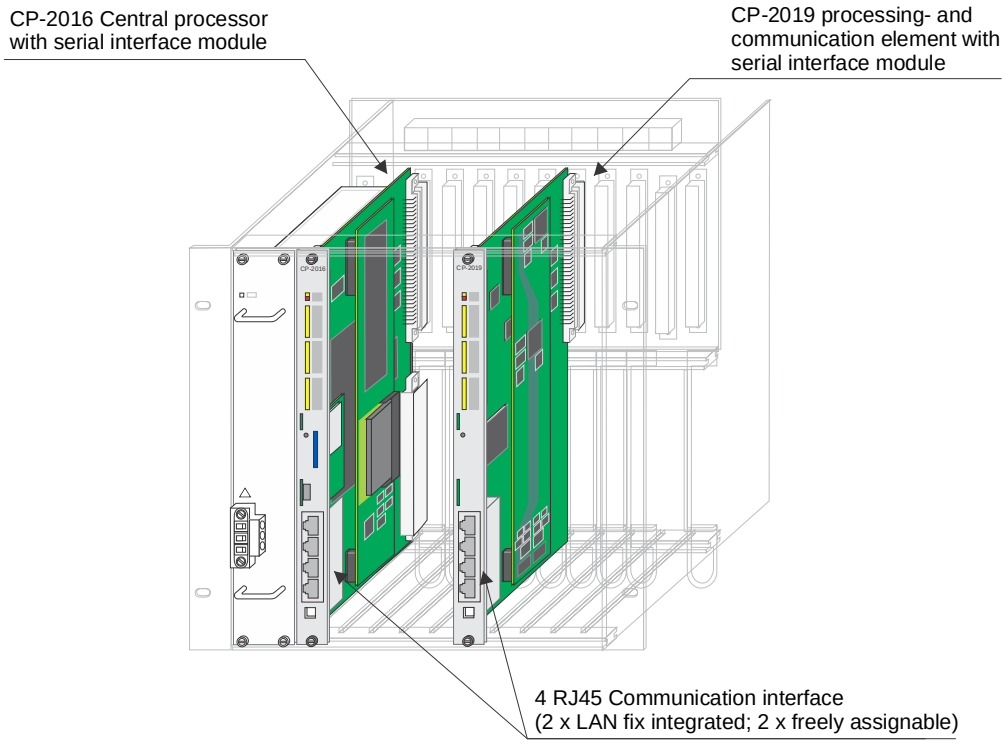
1.4 Setup of external Communication Connections

1.4.1 General

In SICAM AK 3 each BSE supplies up to 4 communication interfaces. While 2 of these are fix integrated LAN-Interfaces, the others can be expanded with corresponding modules for following kind of communication:

- Serial Communication
- LAN Communication (Ethernet TCP/IP)
- Field Bus Communication

For this it is necessary to expand the respective BSE with a serial interface module (SIM) (see following section) and then to connect with the external communication device (Modem) (see section *1.4.5; Communication Cabling*).



Note

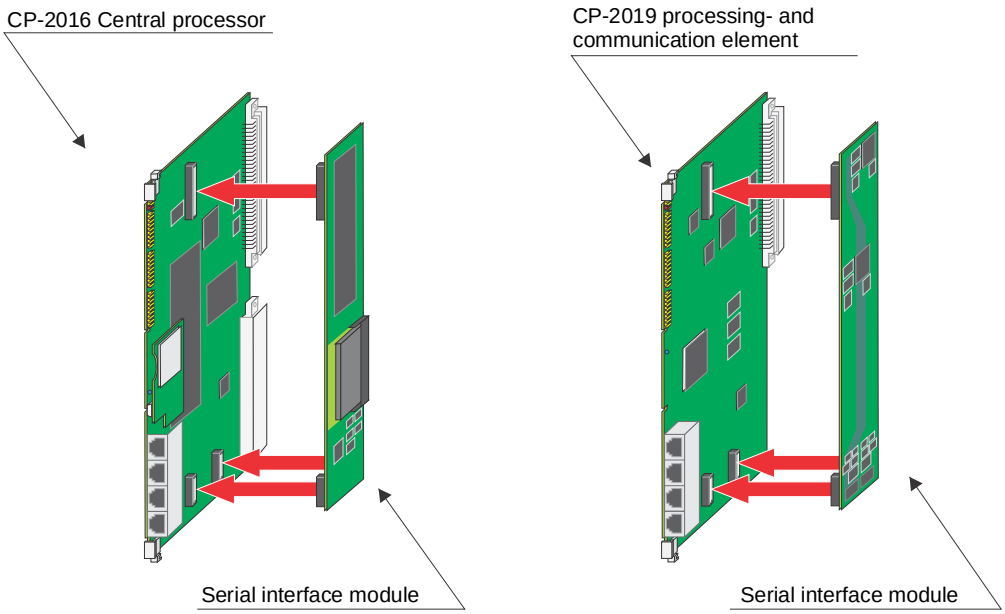
The following sections show how to built up communication connections with the SICAM AK 3 basic system elements CP-2016 and CP-2019.

For examples, how to built up these communication connections with a SICAM AK basic system element CP-2017 in a SICAM AK 3 migration board rack (CM-2847), look into the SICAM AK User Manual (DC2-016-2). This particularly concerns the use of the CM-2838 connection board and the corresponding patch plugs.

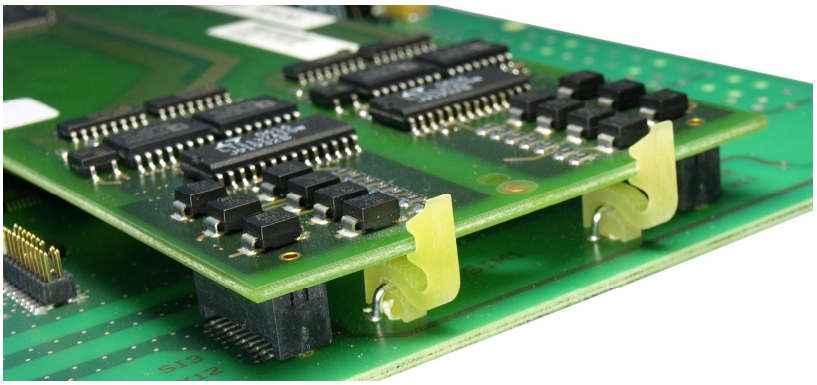
1.4.2 Installation of a Serial Interface Module

One SIM can be installed on a central module or processing- and communication element.

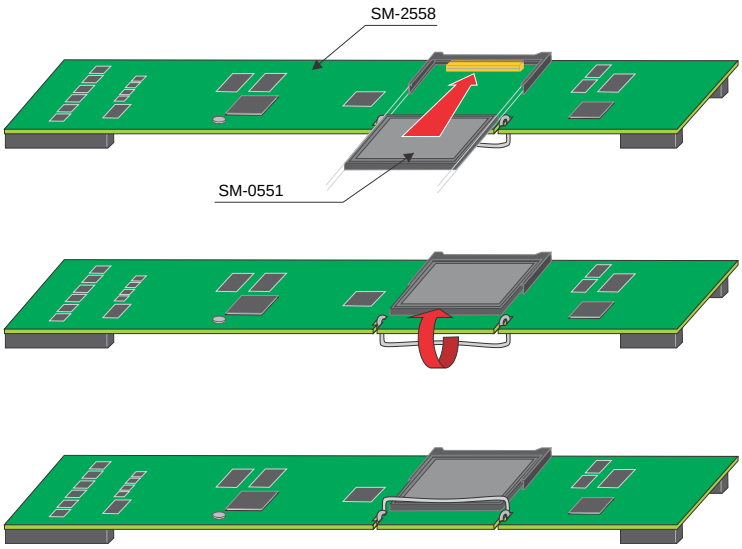
The installation can only take place with the module removed.



SIM and module are connected by means of 3 connectors and 3 retainer clips. The connectors serve the mechanical and electrical connection of both components. The clips provide an additional mechanical hold.

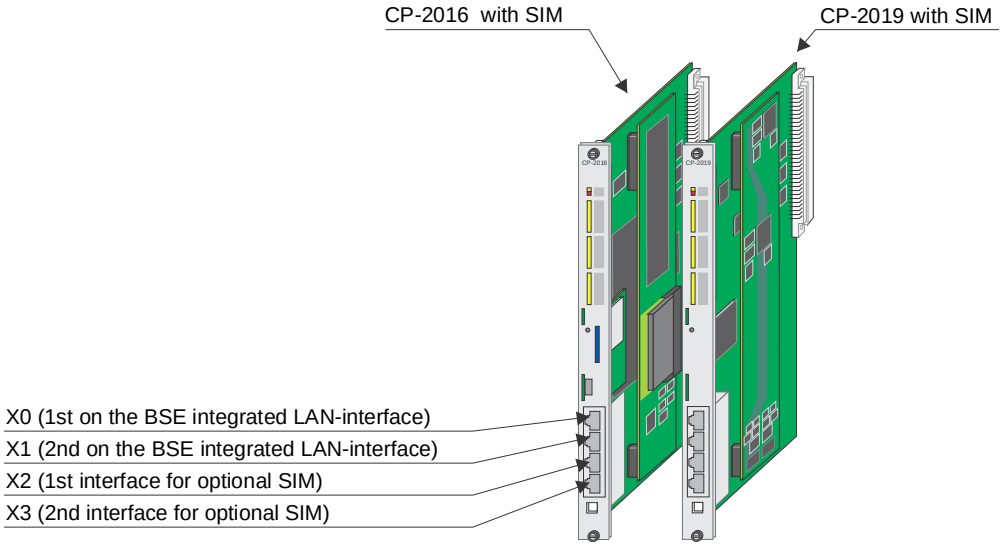


An exception is SM-0551. It is not mounted directly on a basic system element like the other SIM, it must be mounted on a SM-2558 before.



1.4.3 Assignment of the Communication Interfaces

4 interfaces are supplied on a BSE. Their usage and assignment is as follows:



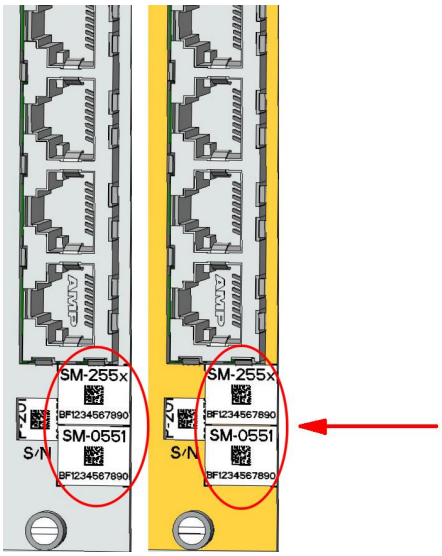
During the engineering with SICAM TOOLBOX II these interfaces are assigned to following protocol elements:

- X0 = PRE0
- X1 = PRE1
- X2 = PRE2
- X3 = PRE3

1.4.4 Glue Serial Number on Front Panel

The serial number of each SIM, which get mounted on a BSE, must be glued on the front panel of the carrier module. A label with the serial number is part of the SIM.

This label must be placed as shown in following example:



1.4.5 Communication Cabling

This section describes how the various methods of communication can be realized by means of standard modems and cables.

The following kinds of communication are shown:

- Serial Communication
  - Point-to-Point Traffic/Multi-Point Traffic
  - Multi-Point Traffic via Glass Fiber Optic and Star Connection
  - Analog Dial-Up Traffic
  - Dial-Up Traffic
  - Dial-Up Traffic GSM
  - Serial communication with DMS (Digital Multiplex System)
- LAN Communication (Ethernet TCP/IP)
- Field bus Communication (PROFIBUS-DP)

The board racks and their configuration shown in the pictures are examples. They are used in order to show which connection options are available with corresponding configuration.

Note:
Communication cables are, if possible, to be installed separately from the supply and peripheral cables.

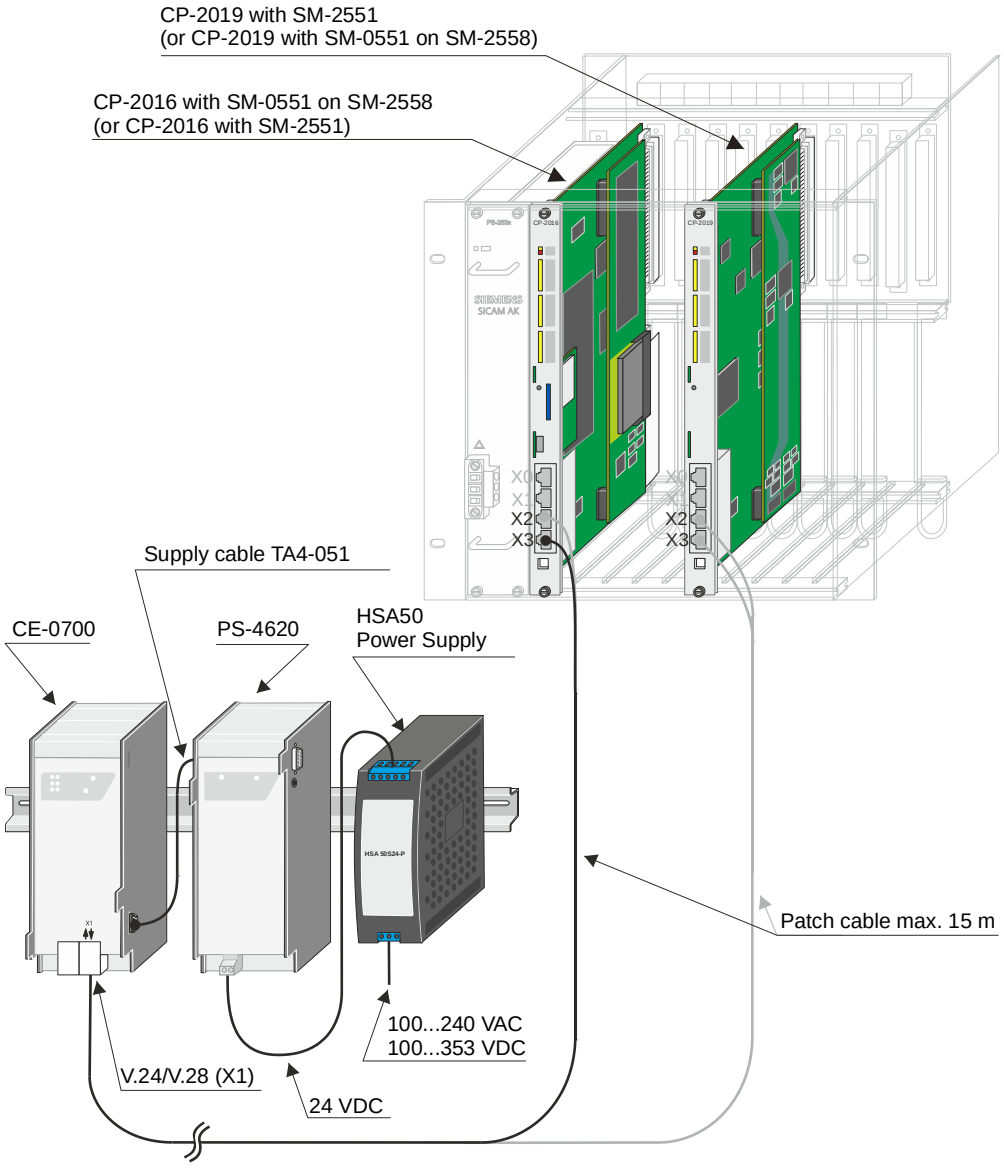
1.4.5.1 Serial Communication

1.4.5.1.1 Point-to-Point Traffic/Multi-Point Traffic

Standard Modem and Cable for Multi-Point- and Point-to-Point Traffic

Designation		Item-Number/MLFB
CE-0700 V.23 dedicated line modem f. SICAM RTUs		G21-200 6MF11020BC000AA0
Patch cable cat.5 (4x2) AWG26/7	1 m	T41-255 6MF13040BC550AA0
	2 m	T41-251 6MF13040BC510AA0
	3 m	T41-252 6MF13040BC520AA0
	5 m	T41-253 6MF13040BC530AA0
	10 m	T41-254 6MF13040BC540AA0
(for cabinet-internal wirings)		

Cabling with External Power Supply of the Modem



With this kind of power supply several modems can be supplied.

The subsequent table shows the possible variants.

Configuration Examples

Comment	• Configuration succession
Maximal number of CE0700 which can be supplied	
1 DCF77 and maximal number of CE-0700 which can be supplied	

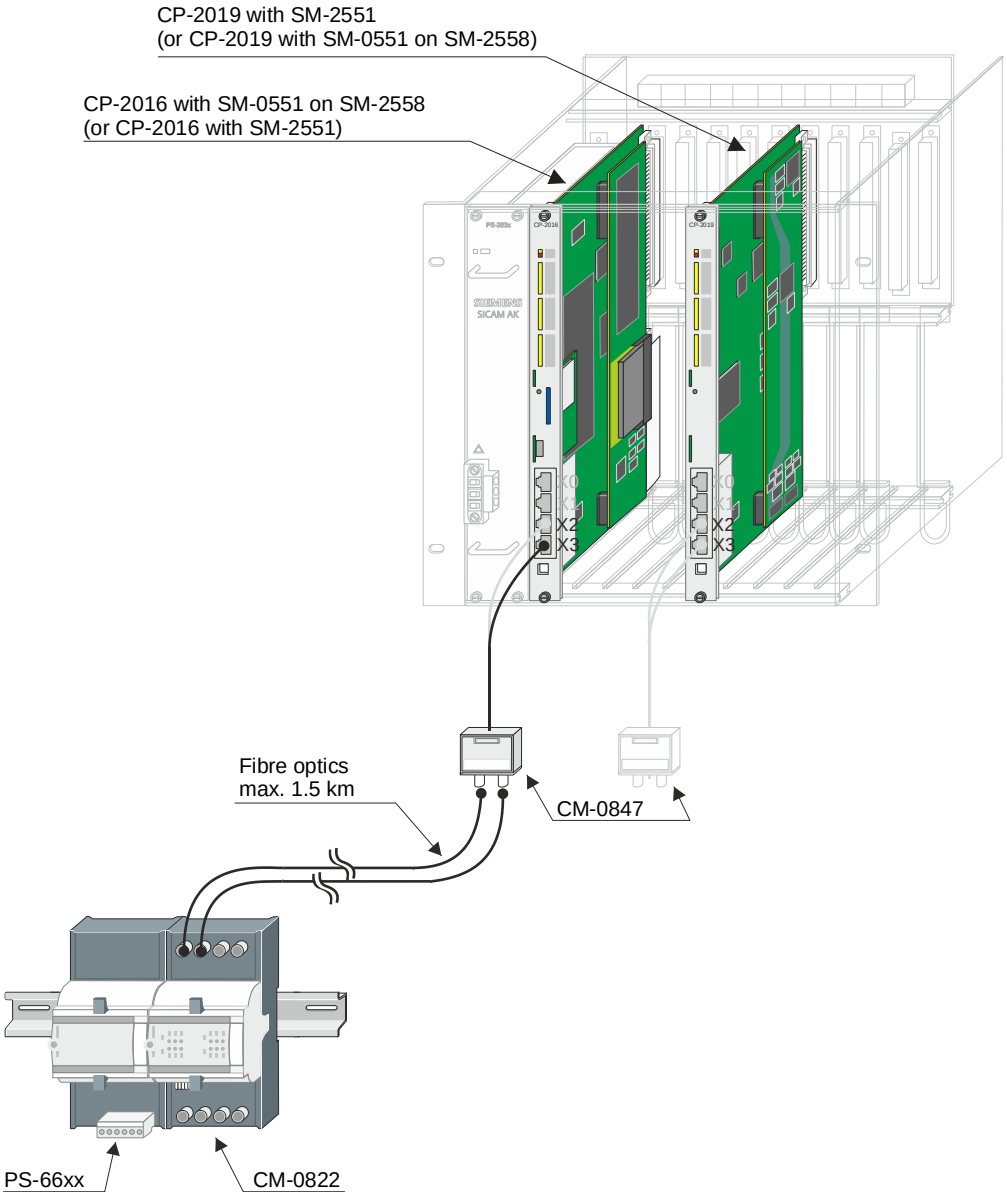
Caution

The succession of the modules, from right to left, must be absolutely followed during configuration. Further, pay attention to the maximal power consumption.

Accessories for External Power Supply of the Receiver

	Designation	Item-Number/MLFB
	PS-4620 Additional power supply 24…60 VDC	GA4-620 6MF11110EG200AA0
	Power supply cable for modem and DCF77 receiver	TA4-051 6MF13110EA510AA0
	Power supply 115/230 VAC, 100…375 VDC, 24 VDC, 50 W	www.mtm-power.de

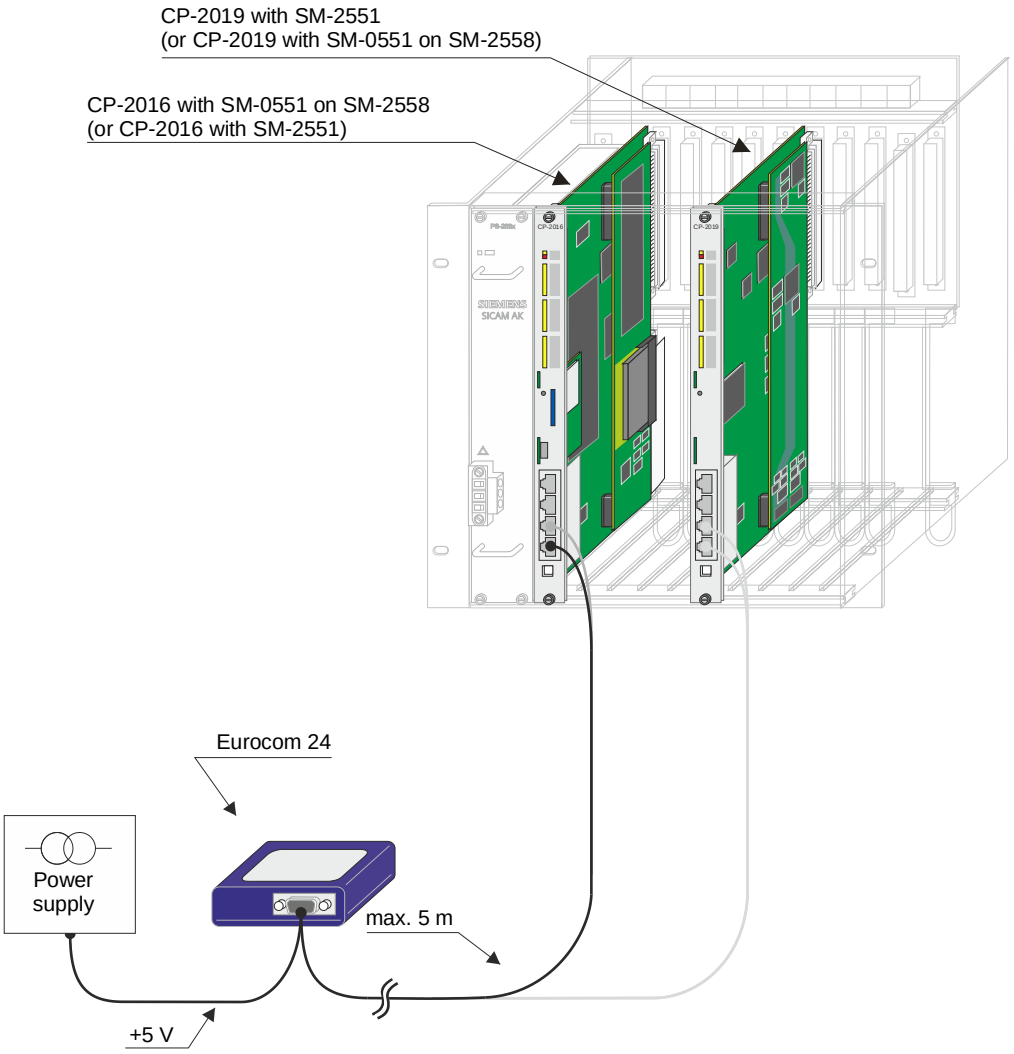
1.4.5.1.2 Multi-Point Traffic via Glass Fiber Optic and Star Connection



Designation	Item-Number/MLFB
CM-0847 Fiber optical interface (el.-FO) AK 3	GC0-847 6MF11130AJ470AA0
Fiber optics length: max. 0.5 km	FO-indoorcable-50-DUP-LSOH FO-outdoorcable-50-2FIB-ARM FO-connector-ST-50/62	TF7-027 TF7-028 TF7-016
Fiber optics length: max. 1.5 km	FO-indoorcable-62-DUP-LSOH FO-outdoorcable-62-2FIB-ARM FO-connector-ST-50/62	TF7-006 TF7-007 TF7-016

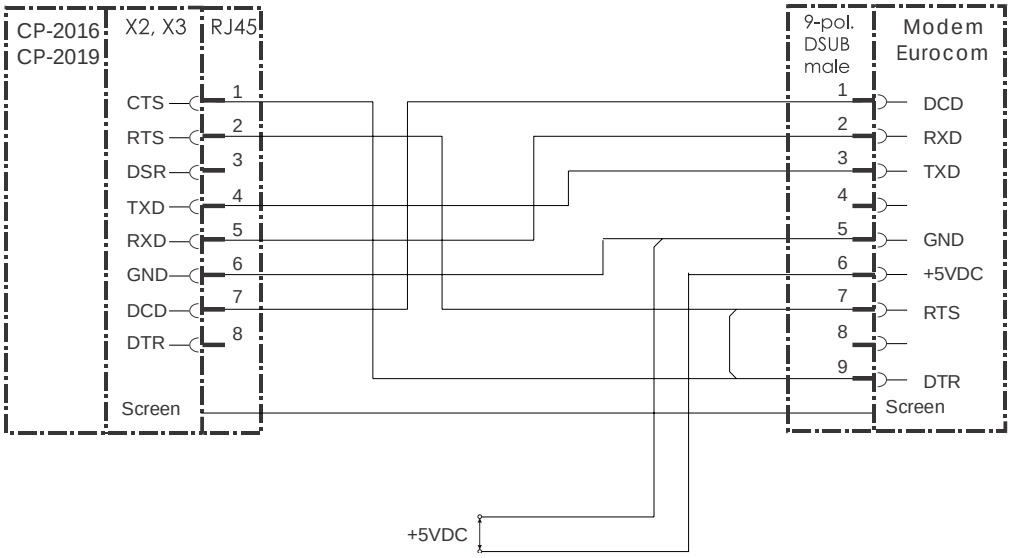
1.4.5.1.3 Analog Dial-Up Traffic

Eurocom 24 Modem with external Power Supply

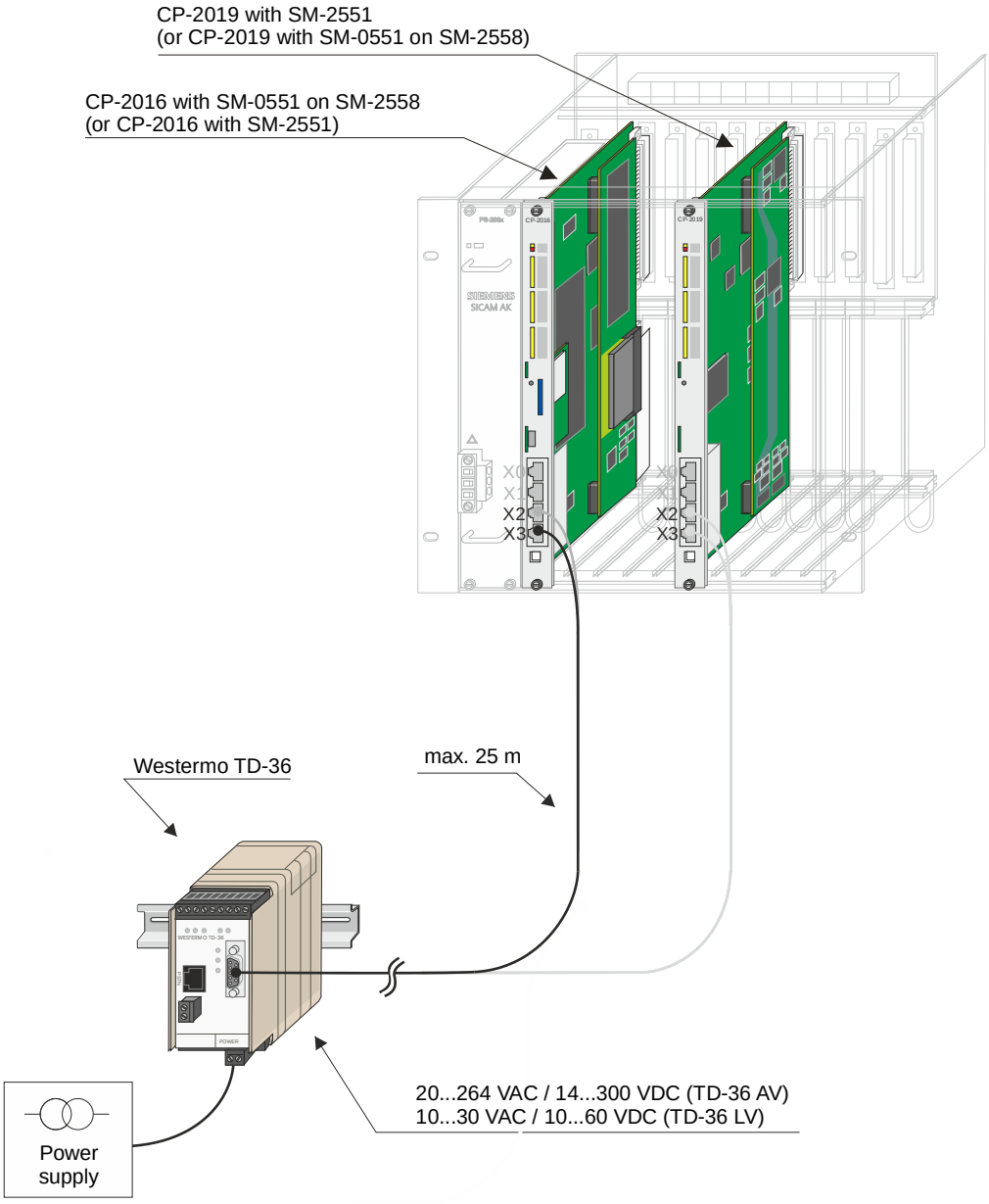


Accessories see *SICAM AK 3 System Description*.

Cable Circuitry: Connection Board – Eurocom 24 Modem

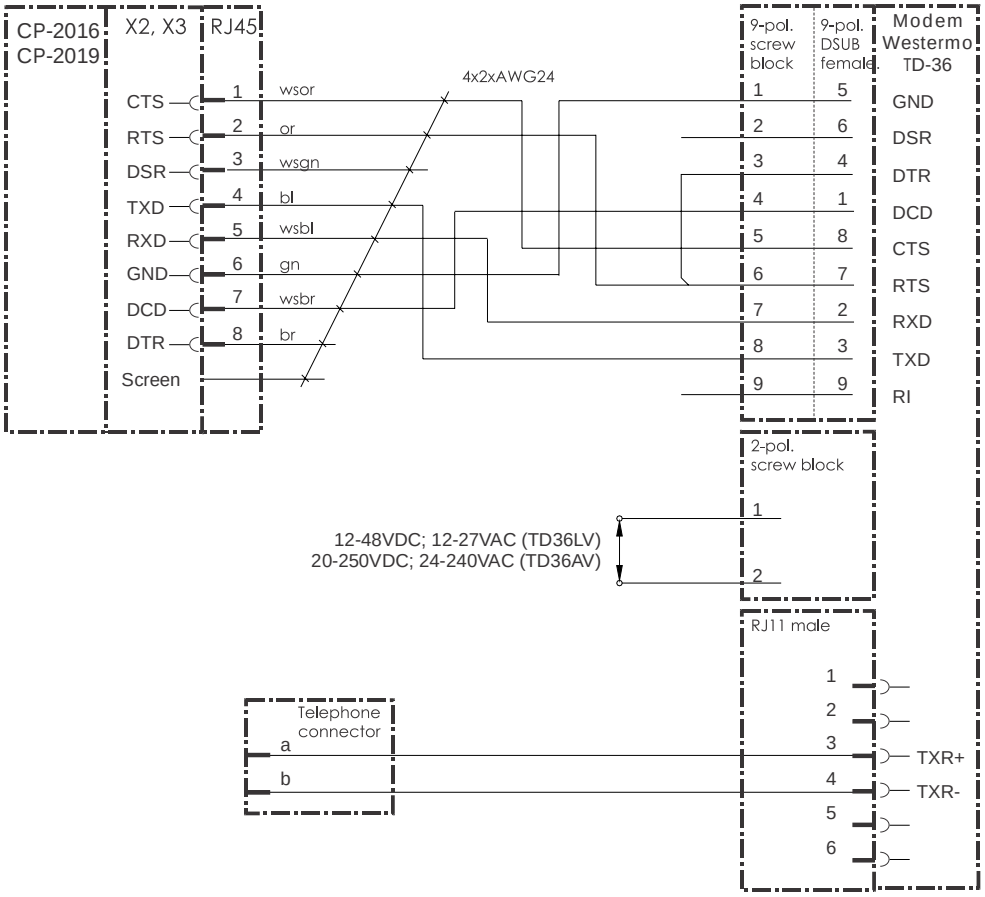


Westermo TD36 Modem with external Power Supply

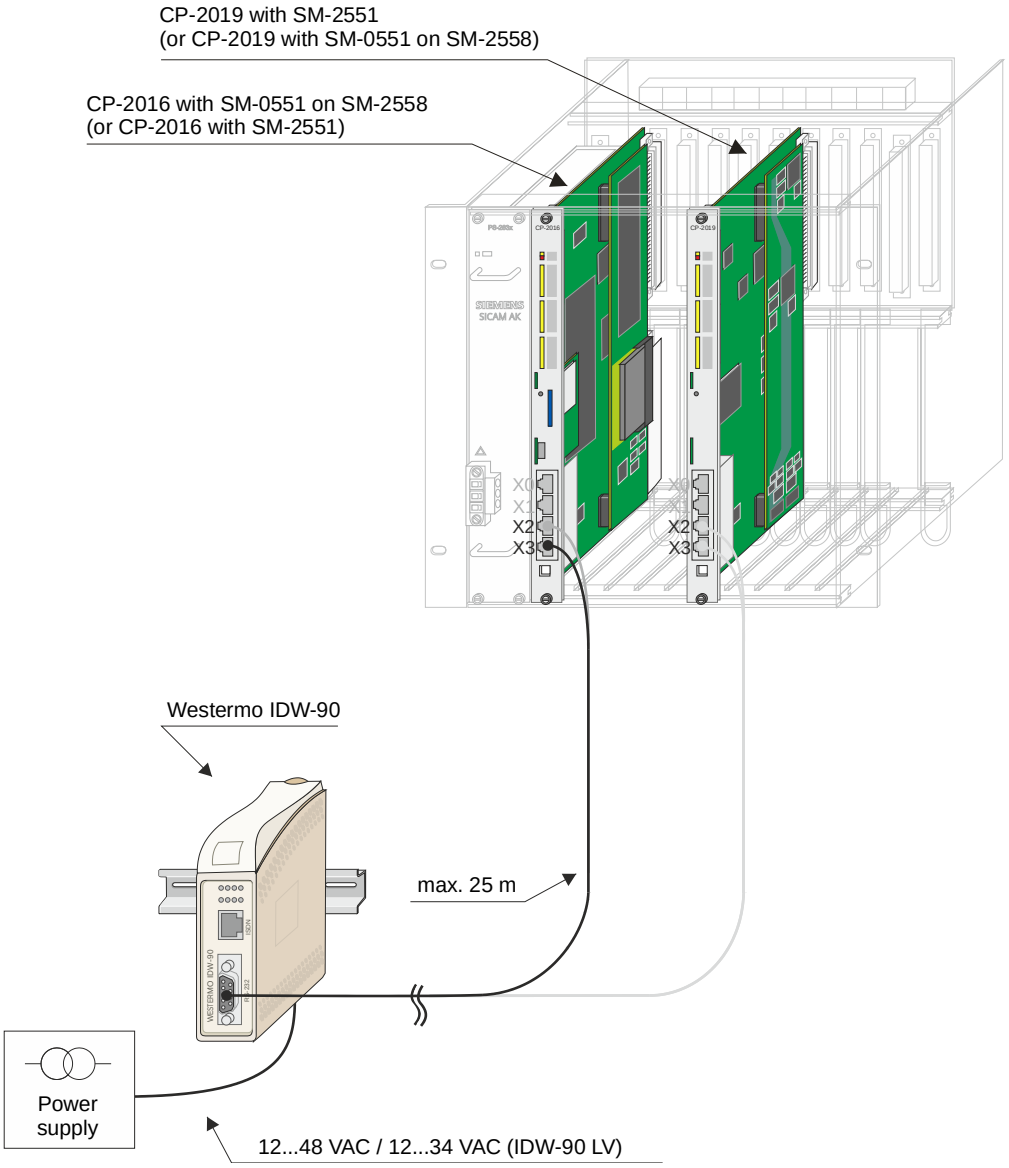


Accessories see *SICAM AK 3 System Description*.

Cable Circuitry: Connection Board – Westermo TD-36

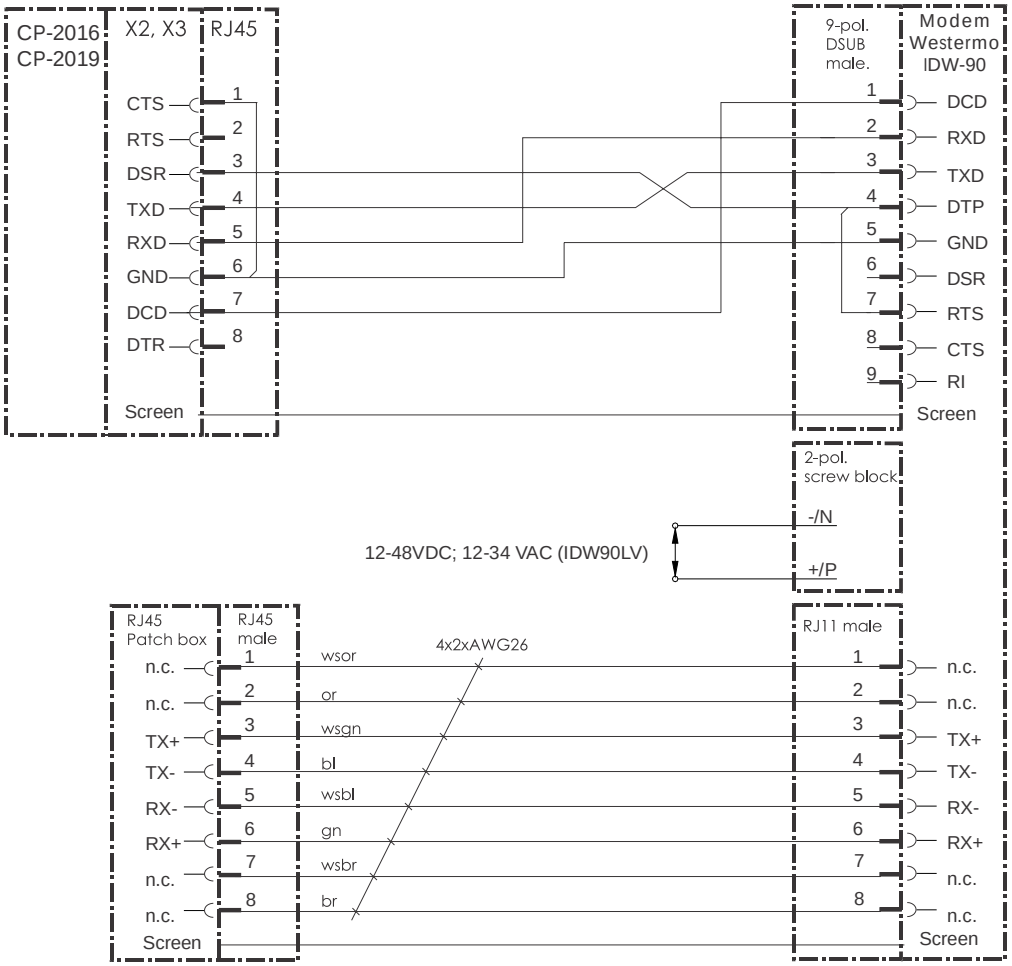


1.4.5.1.4 Dial-up Traffic Analog/GSM/ISDN

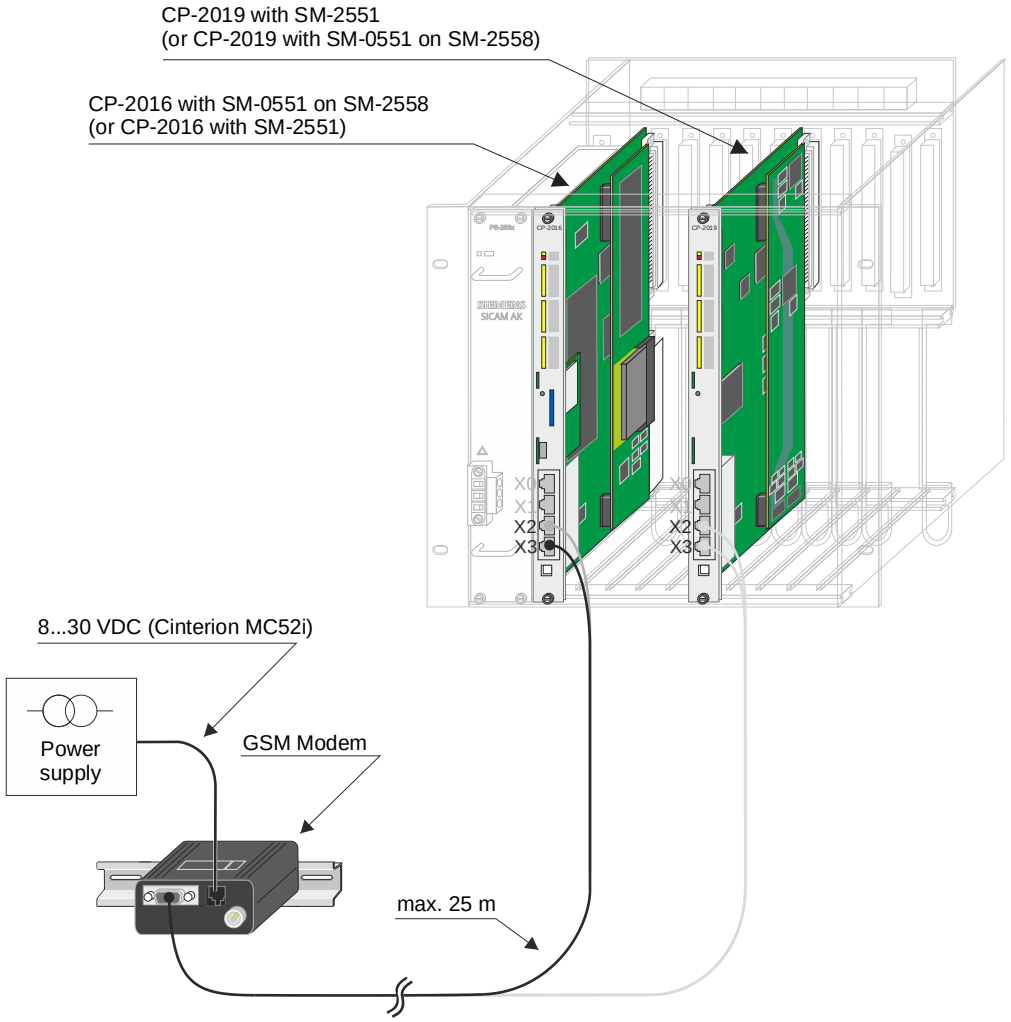


Accessories see *SICAM AK 3 System Description*.

Cable Circuitry Connection Board – ISDN Modem



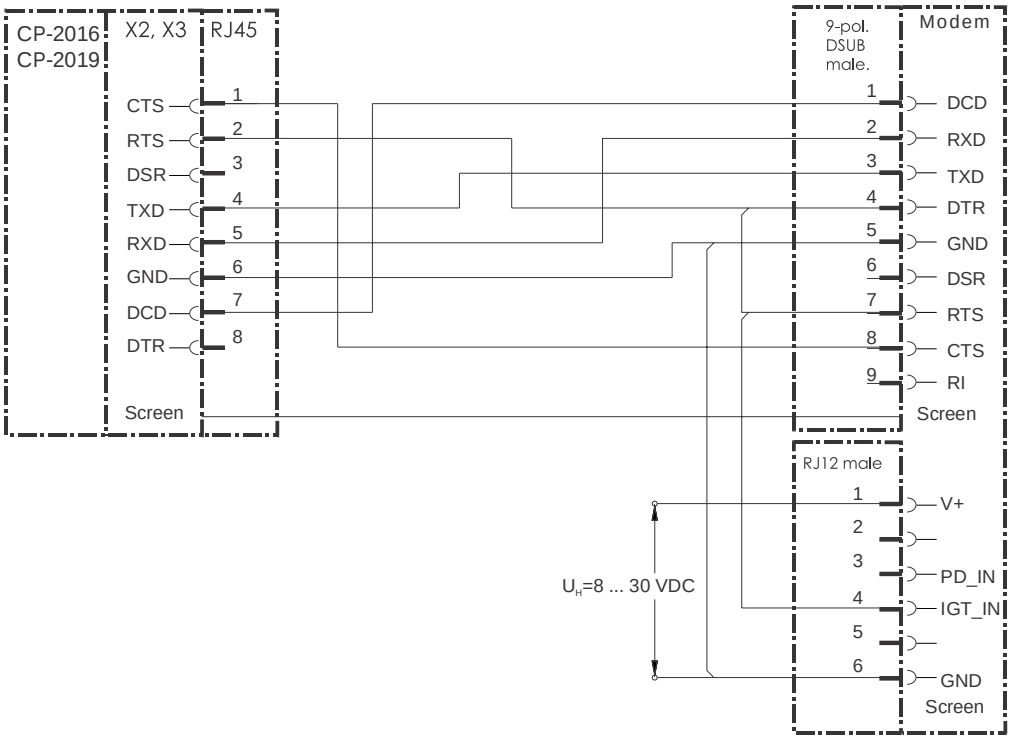
1.4.5.1.5 Dial-Up Traffic GSM



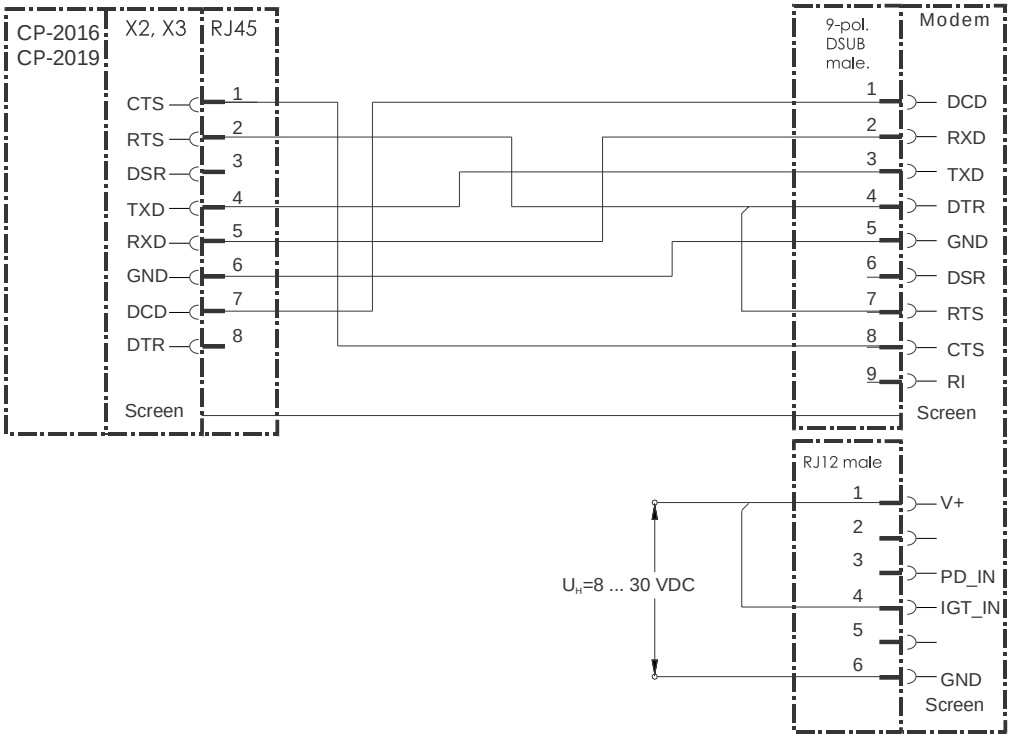
Accessories see *SICAM AK 3 System Description*.

Cable Circuitry Connection Board – GSM Modem

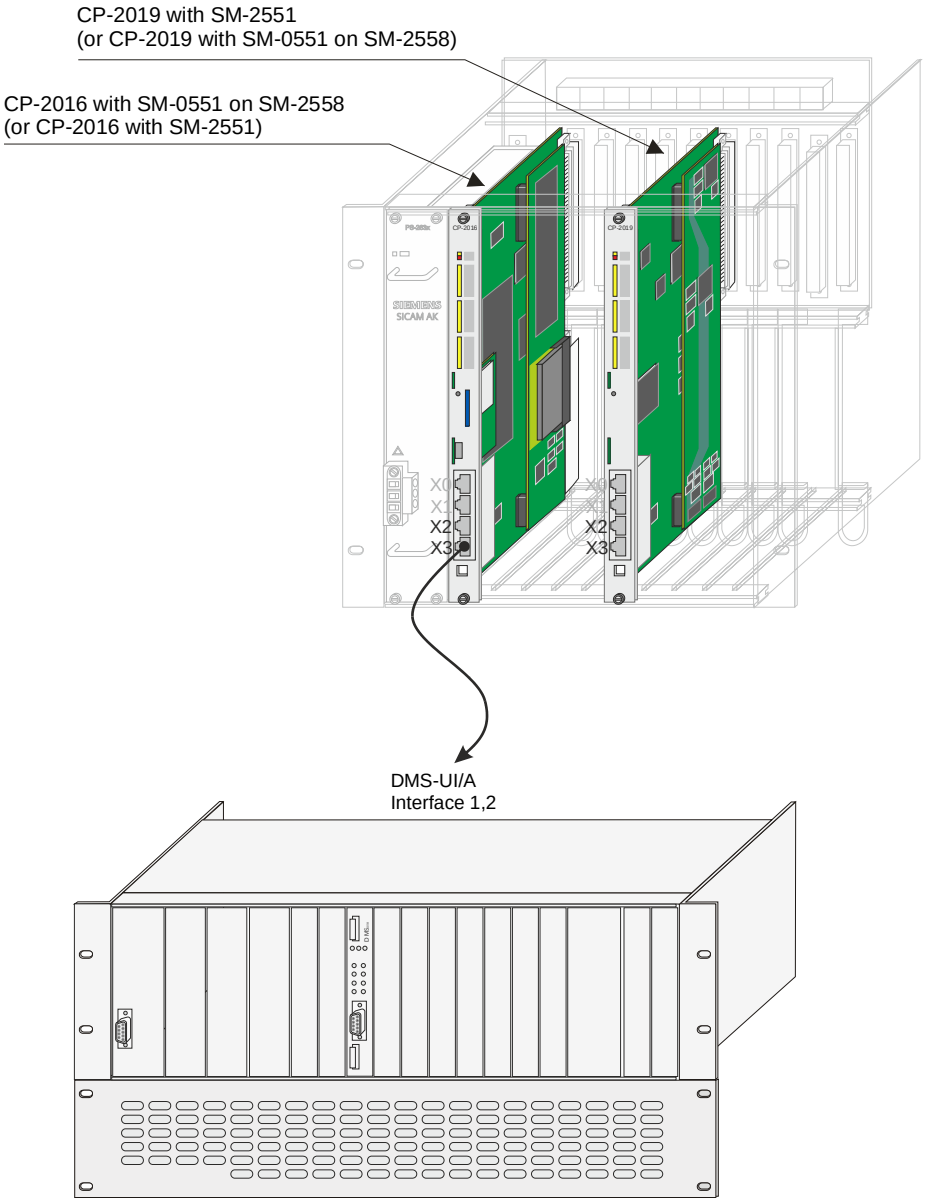
Variant for the deactivation function of the MC52i GSM modem controlled by SICAM RTUs.



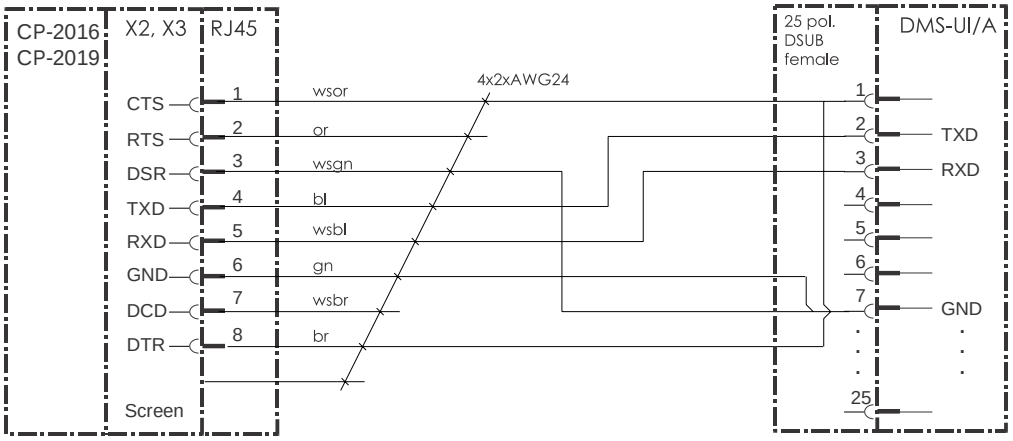
Variant without the deactivation function of the MC52i GSM modem controlled by SICAM RTUs.



1.4.5.1.6 Serial communication with DMS (Digital Multiplex System)



Cable Circuitry Connection Board – DMS

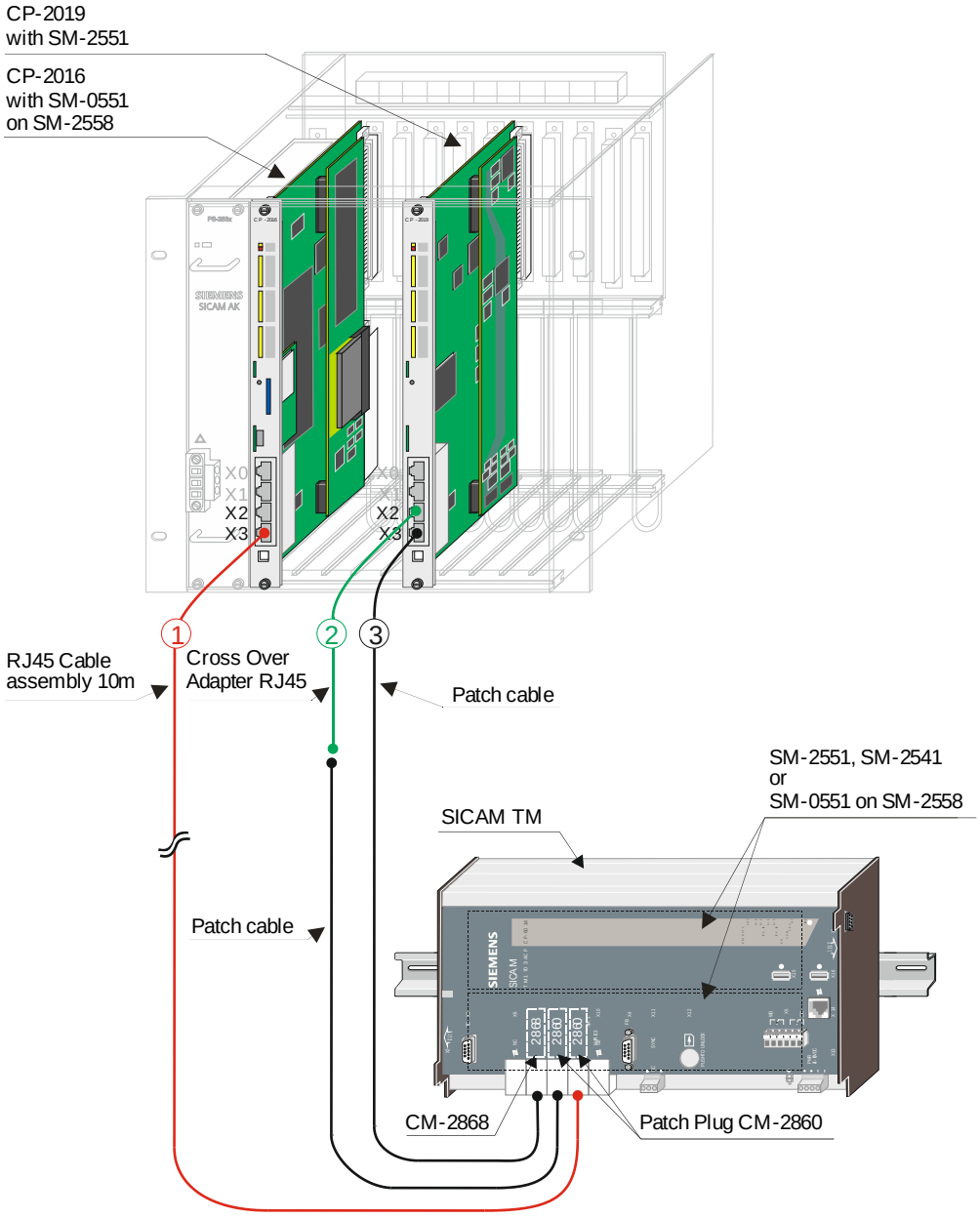


1.4.5.1.7 Serial communication – Direct connection with RS-232

Serial communication connection between SICAM AK 3 and other automation units with a cross-over RS-232 connection cable.

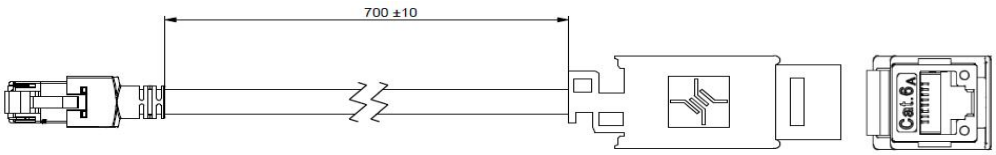
The "cross-over" of the RS-232 interface signals can be made on SICAM AK 3 with the long “RJ45 Cable assembly 10m“ j or the short “Cross Over Adapter RJ45“ k.

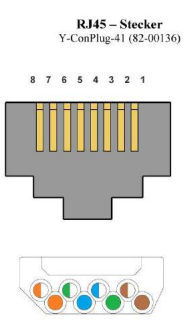
If the "cross-over" of the RS-232 interface signals is made on the remote station (e.g.: on SICAM AK and SICAM TM with CM-2868), then you can connect the connection cable (patch cable) directly l to SICAM AK 3.



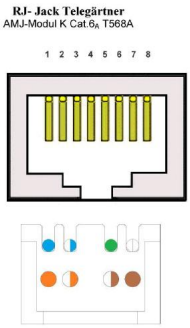
Accessories see *SICAM AK 3 System Description*, chapter „*Order Information*“.

Cross Over Adapter RJ45

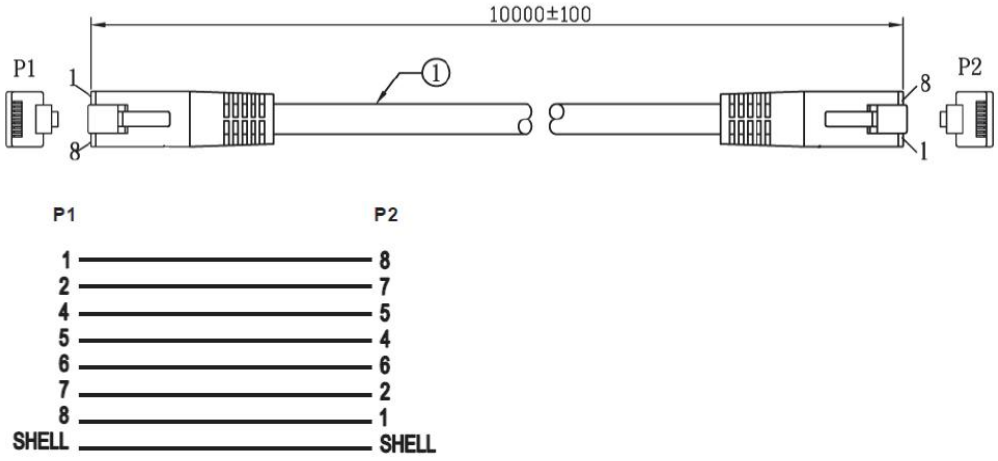




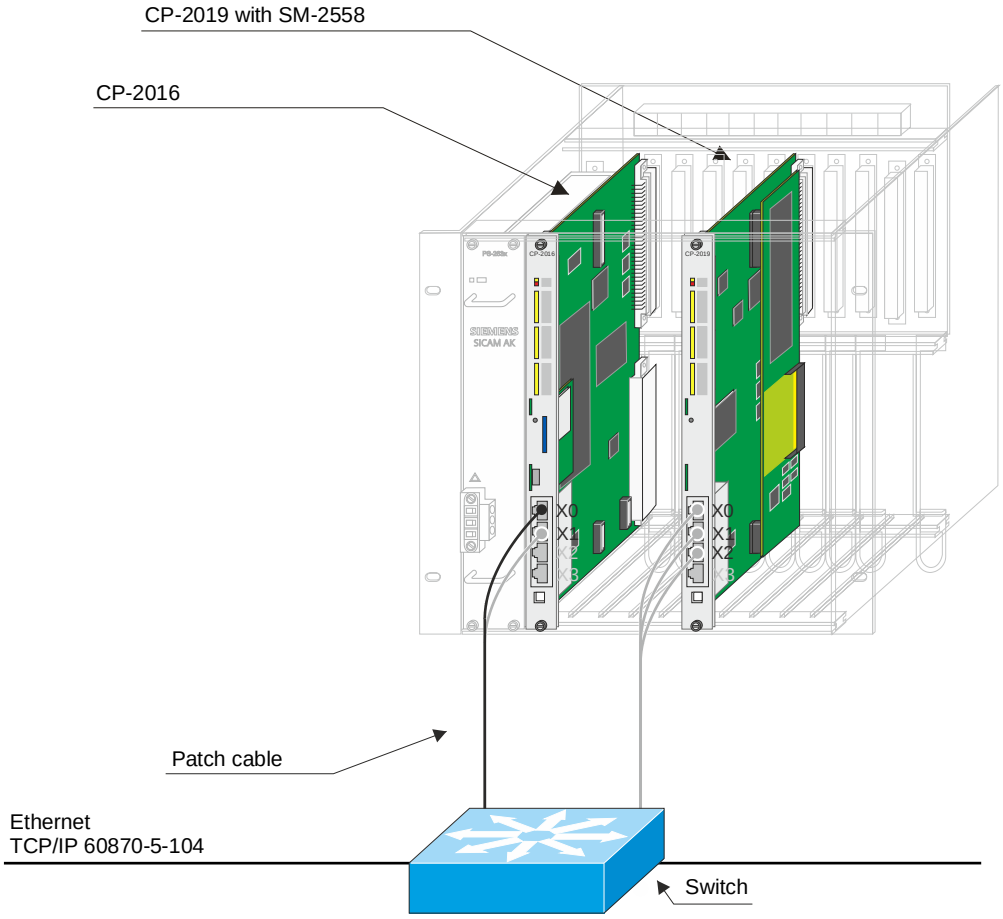
Signal	Pin – Plug	Belegung	Pin-Jack
CTS	1	or ws	8
RTS	2	or	7
DSR	3	gn ws	-
TXD	4	bl	5
RXD	5	bl ws	4
GND	6	gn	6
DCD	7	br ws	2
DTR	8	br	1



RJ45 Cable Assembly 10 m



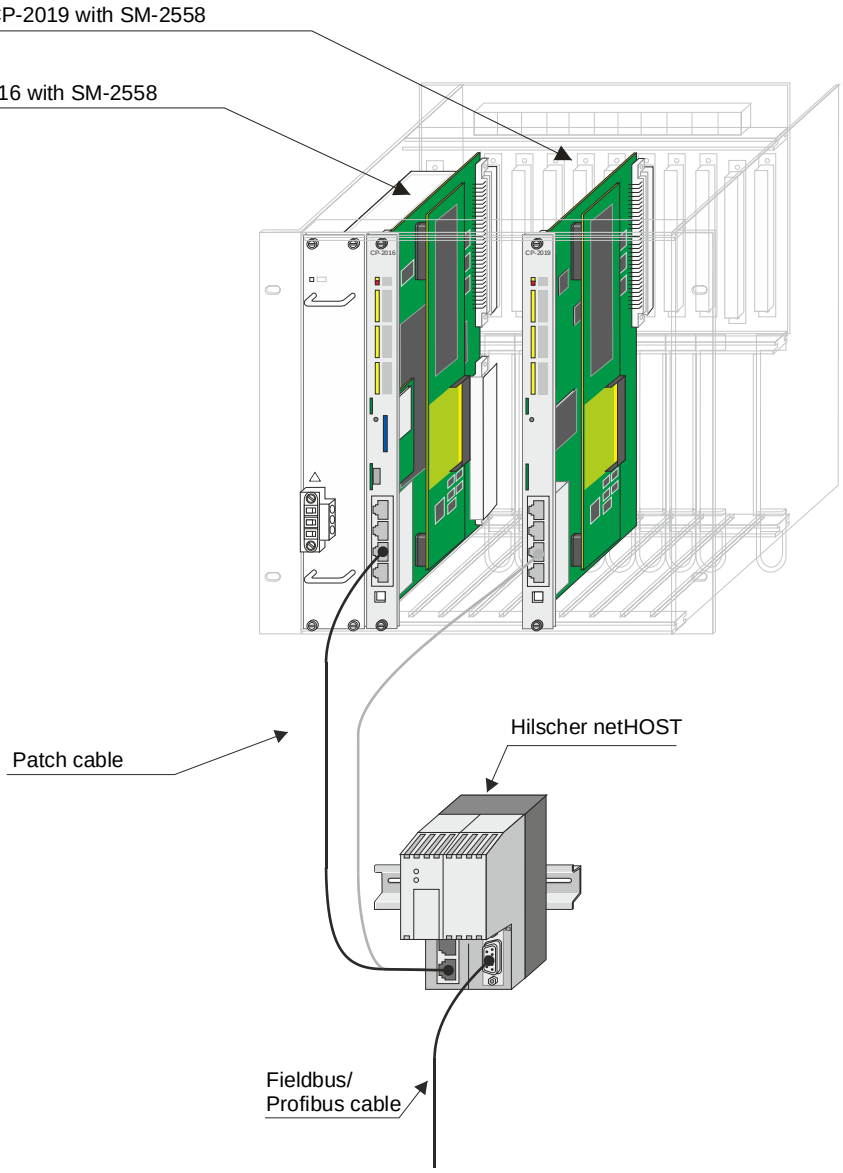
1.4.5.2 LAN Communication (Ethernet TCP/IP)



	Designation		Item-Number/MLFB
	Patch cable Cat.5 (4x2) AWG26/7	1 m 2 m 3 m 5 m 10 m	T41-255 6MF13040BC550AA0 T41-251 6MF13040BC510AA0 T41-252 6MF13040BC520AA0 T41-253 6MF13040BC530AA0 T41-254 6MF13040BC540AA0
	(for cabinet-internal wirings)		
	Patch cable Cat.5 (4x2x0,5) AWG24	1,5 m 3 m 5 m	TF5-200 6MF13140FC000AA0 TF5-201 6MF13140FC010AA0 TF5-202 6MF13140FC020AA0
	(for cabinet-external wirings)		

Details for connections over 10 m can be taken from document: *Configuration Automation Units and Automation Networks, Appendix A, section* “Electrical Connection, Cable longer than 10 m”.

1.4.5.3 Field bus Communication (PROFIBUS-DP)

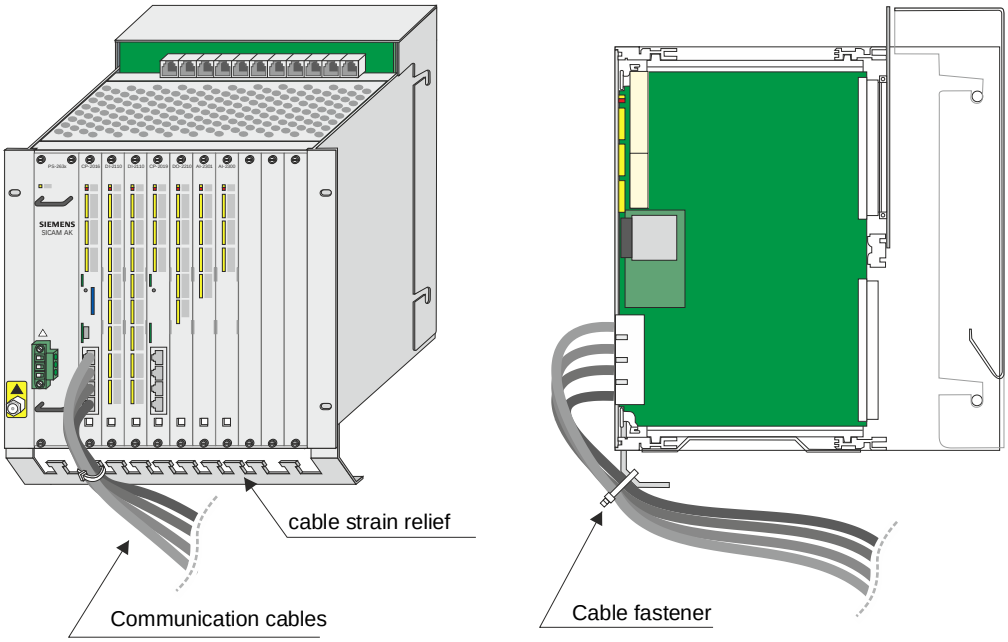


For details about this kind of communication see following document:
SICAM RTUs SM-2558/DPMiA0 PROFIBUS-DP Master with external Fieldbus Gateway netHOST DC0-139-2

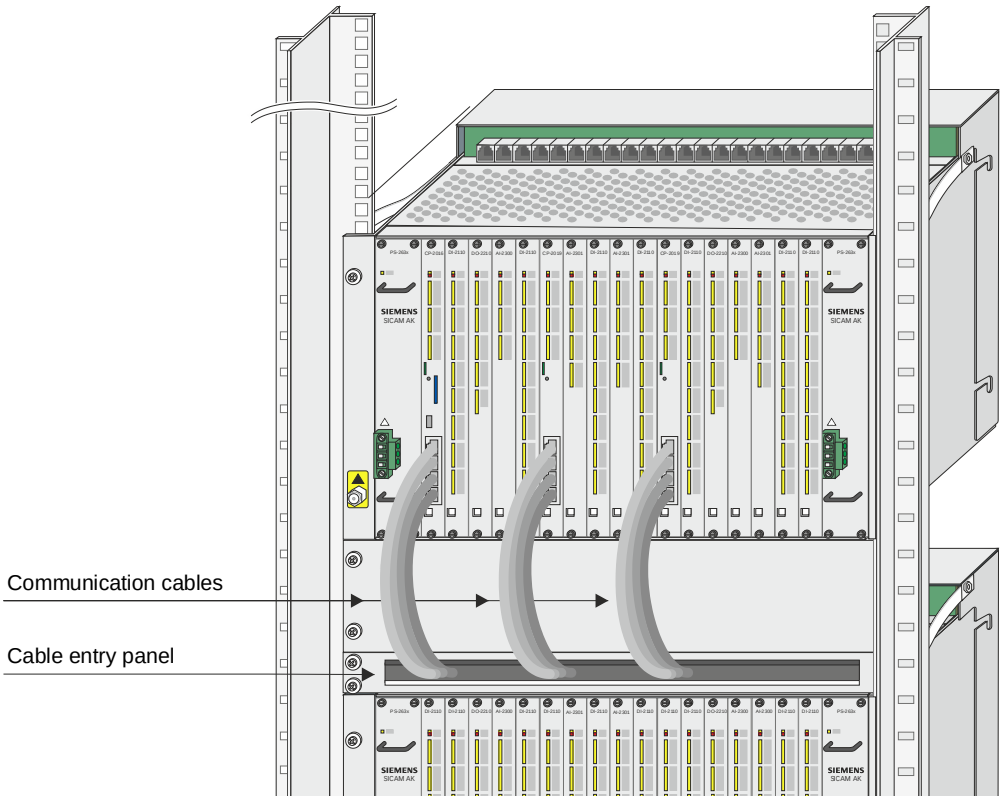
	Designation	Item-Number/MLFB
	Hilscher netHOST PROFIBUS Master NHST-T100-DP/DPM Art.Nr.:1890.410 (red) Art.Nr.:1891.410 (dark gray)	www.hilscher.com
	Patch cable Cat.5 (4x2) AWG26/7 1 m 2 m 3 m 5 m 10 m (for cabinet-internal wirings)	T41-255 6MF13040BC550AA0 T41-251 6MF13040BC510AA0 T41-252 6MF13040BC520AA0 T41-253 6MF13040BC530AA0 T41-254 6MF13040BC540AA0

1.4.6 Cable Routing

It is recommended to fasten the communication cables to the cable strain relief by means of a cable fastener.

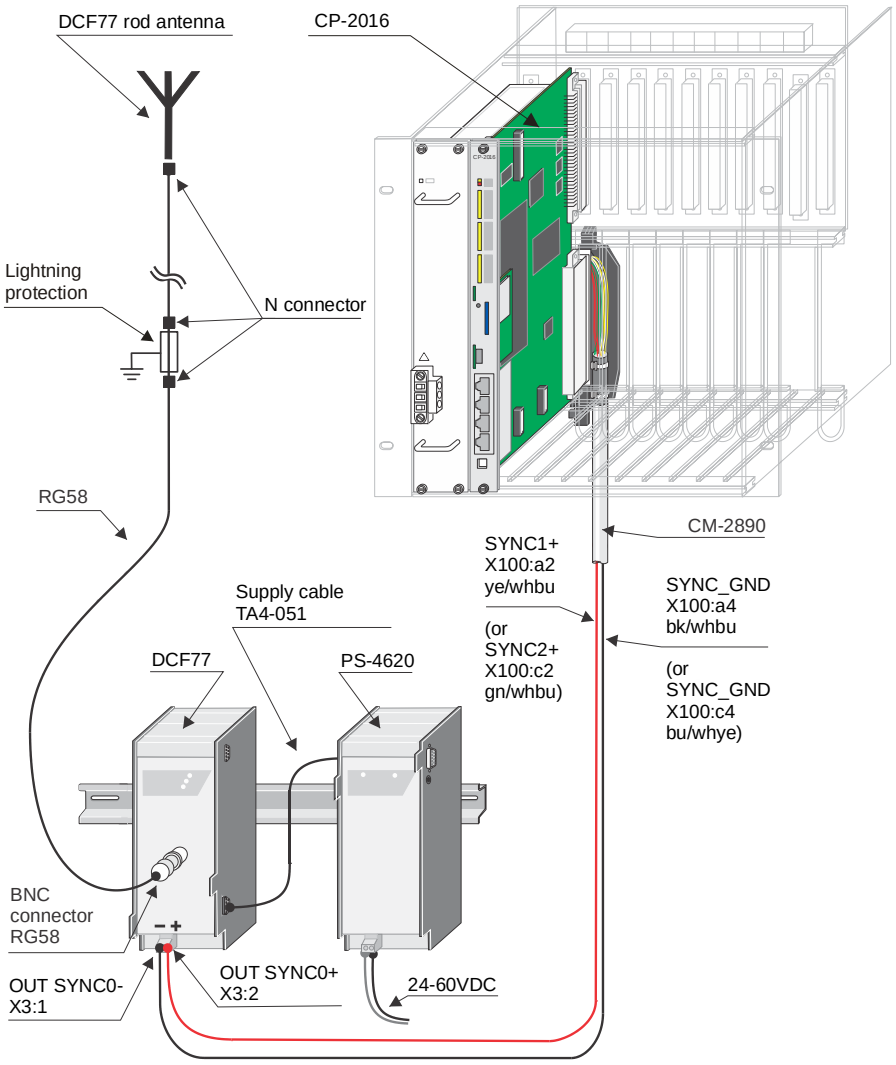


In a (swing-) frame Installation the communication cables must be lead through the cable entry panel and tightened to the cable clamp rail by means of cable fastener.



1.5 Wiring for the Reception of Time Signals

1.5.1 DCF77 Receiver



On the DCF77 receiver there is a 2-pole screw terminal (X11 SYNC) available over which the minute pulse or a serial time signal, adjustable via jumper, can be transmitted.

Standard DCF77 Receiver

Designation	Item-Number/MLFB
DCF77 receiver for DIN rail	GA0-806 6MF11110AJ060AA0

Cable

Designation	Item-Number/MLFB
CM-2890 Periphery cable Crimp 5 m 100 pins	TC2-890 6MF13131CJ000AA0

Accessories for External Power Supply of the Receiver

PS-4620 Additional power supply 24…60 VDC	GA4-620 6MF11110EG200AA0

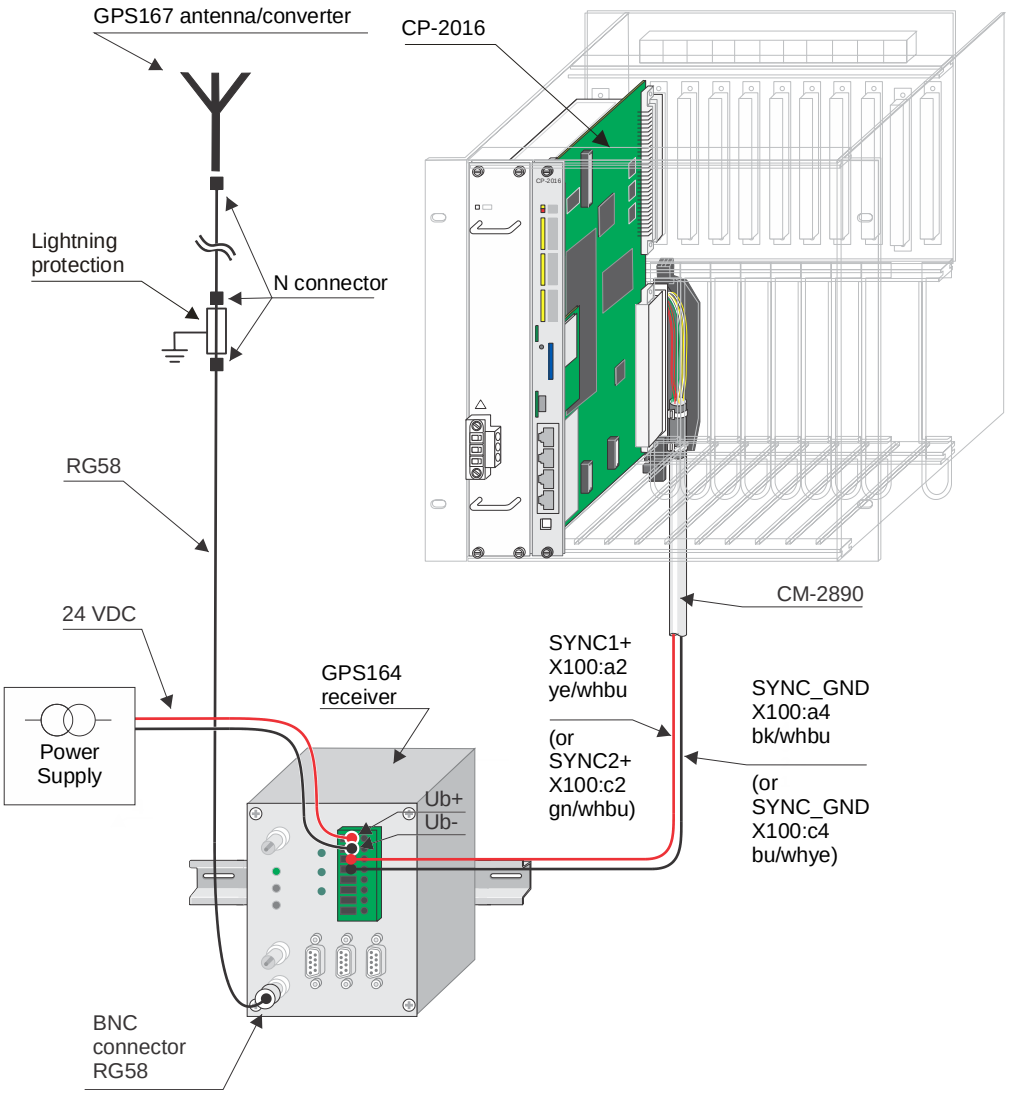
Supply cable for modem	TA4-051 6MF13110EA510AA0

1.5.2 GPS Satellite Receiver

The GPS164 satellite receiver offers a minute pulse and a serial time signal. The settings are made with software GPSMON32. This software is delivered with the GPS164 receiver.

1.5.2.1 Wiring for the Receipt of the Minute Pulse

The minute pulse is supplied on the screw terminal on the front panel of the GPS164 receiver.



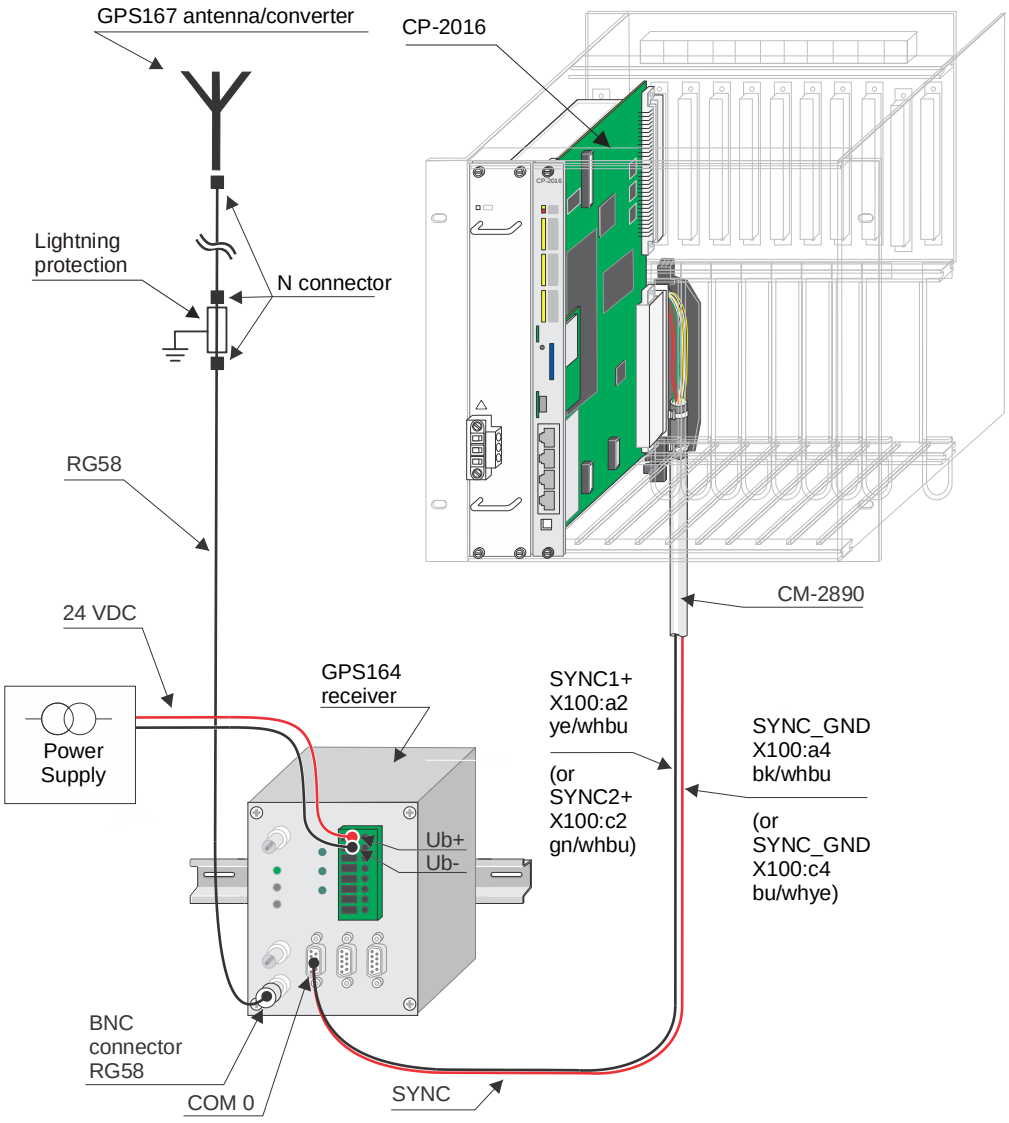
Accessories see *SICAM AK 3 System Description*.

1.5.2.2 Wiring for the Receipt of the Serial Time Signal

The serial time signal is supplied on the COM 0 interface on the front panel of the GPS164 receiver.

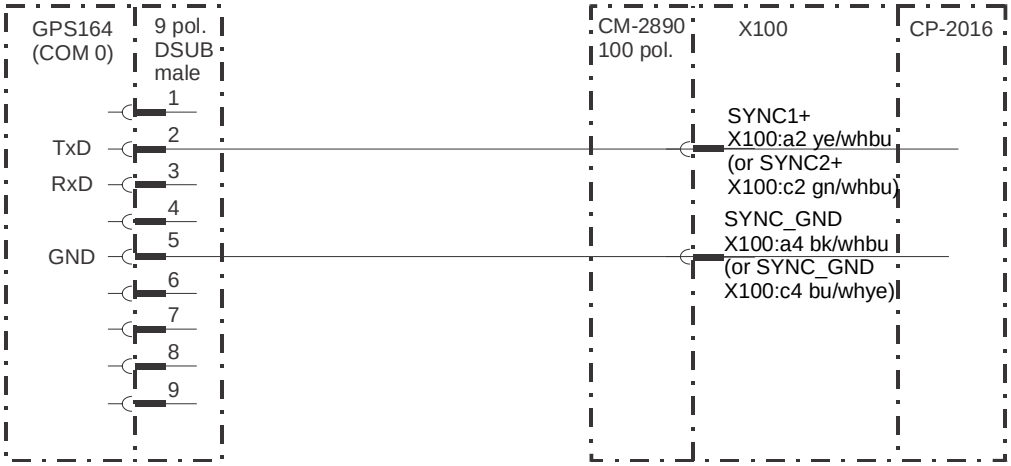
The necessary adjustments for the SAT-STRING must be made with software GPSMON32 as follows:

Format	7E2
Baud Rate	2400
Serial time signal	per second



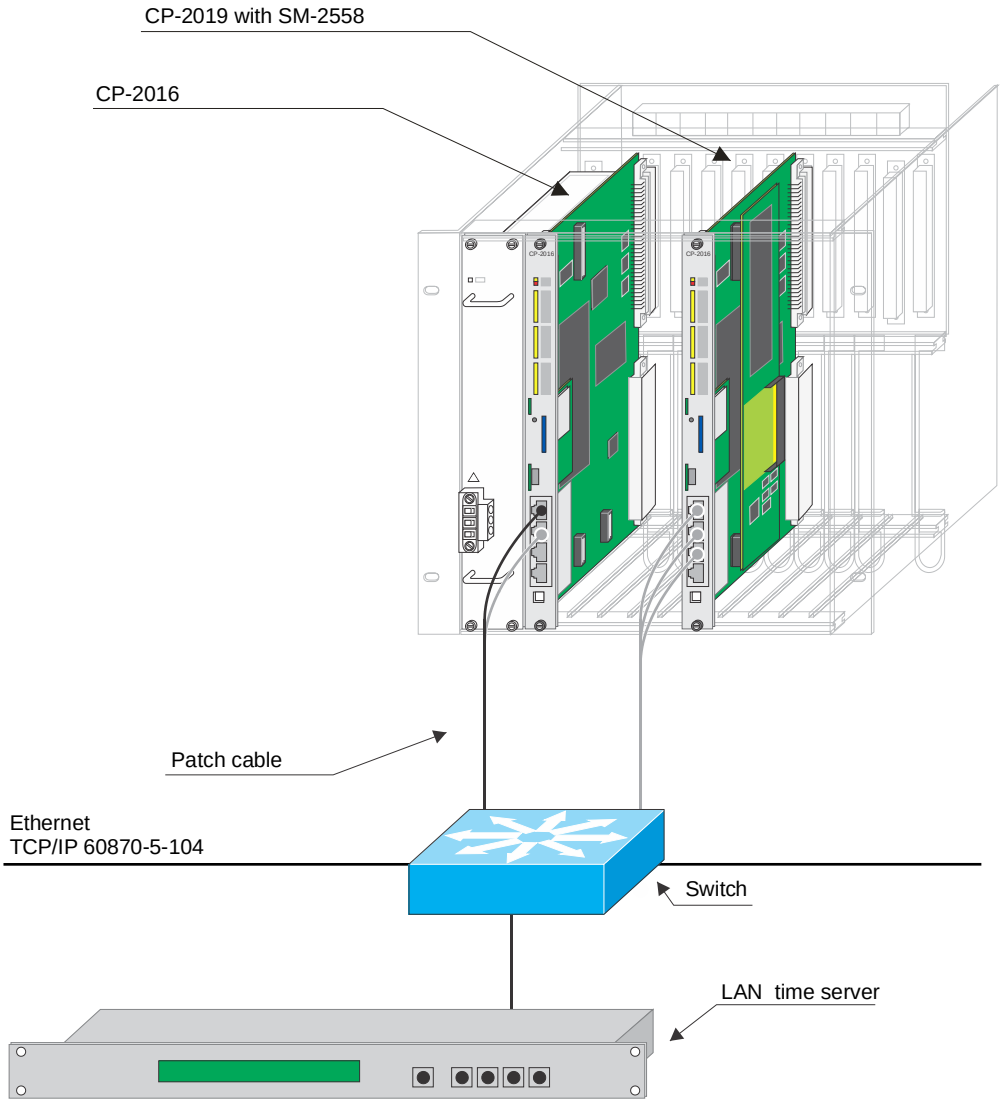
Accessories see *SICAM AK 3 System Description*.

Cable circuitry: GPS164 - CP-2016



1.5.3 LAN Time Server

NTP Server in 19" case for TCP/IP networks with integrated HTTP-Server. The internal reference time is derived from a built-in GPS receiver of the type GPS167.

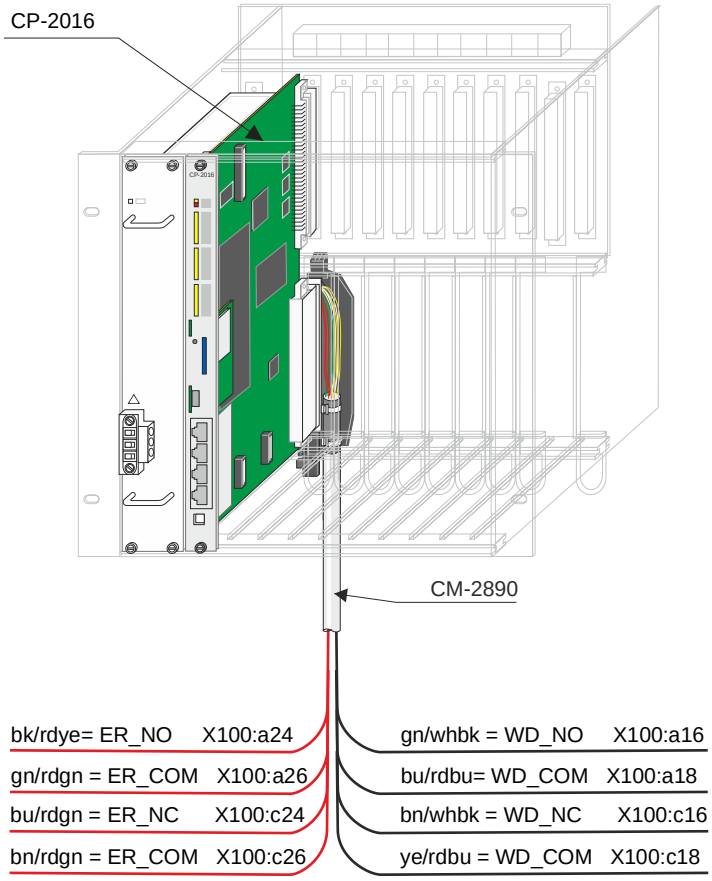


Accessories see *SICAM AK 3 System Description*.

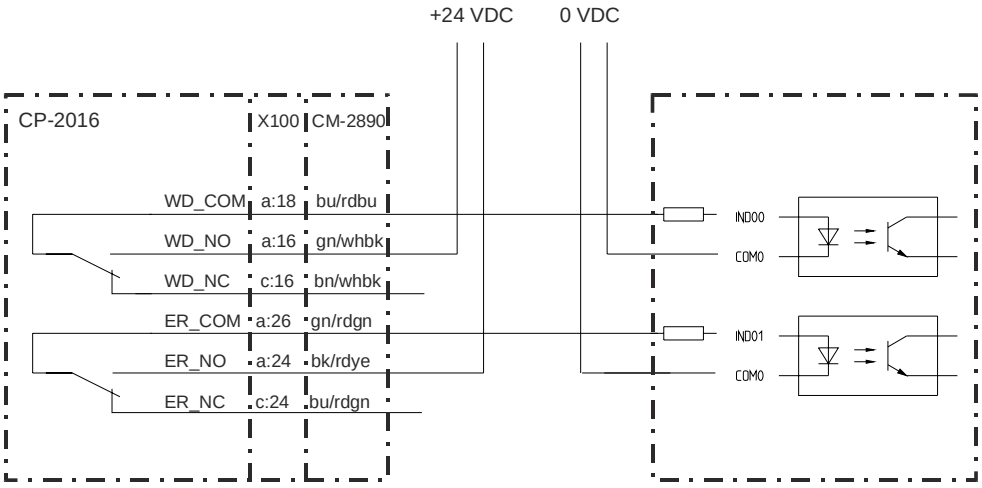
1.6 Wiring Watchdog and Error

1.6.1 General

The relay contacts (open- and closed contact) of watchdog and error are available on the peripheral cable CM-2890.



Example (Circuitry for External Alarm Annunciation System)



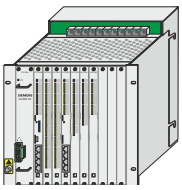
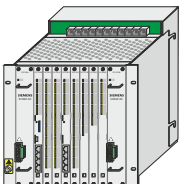
1.7 Power Supply

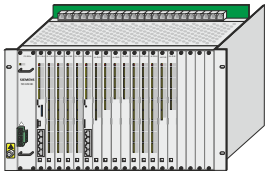
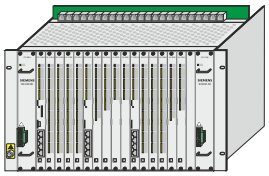
1.7.1 General

SICAM AK 3 can be supplied with the power supplies PS-2630 and PS-2632. Depending on requirements a differing number are used.

	Designation	Item-Number/MLFB
	PS-2630 Power supply 24-60 VDC AK 3	GC2-630 6MF11130CG300AA0
	PS-2632 Power supply 110-220 VDC, 230 VAC AK 3	GC2-632 6MF11130CG320AA0
	(H05 VV-F 3G 2.5 flexible lead)	TF5-002 6MF13140FA020AA0

1.7.2 Possible Configurations

Board Rack CM-2844	
	In the basic configuration the board rack is fitted with one power supply. This is installed in the left slot.
	A second power supply can be used for redundancy. This is installed in the right slot.

Board Rack CM-2846 and CM-2843	
	In the basic configuration the board rack is fitted with one power supply. This is installed in the left slot.
	A second power supply can be used for redundancy. This is installed in the right slot.

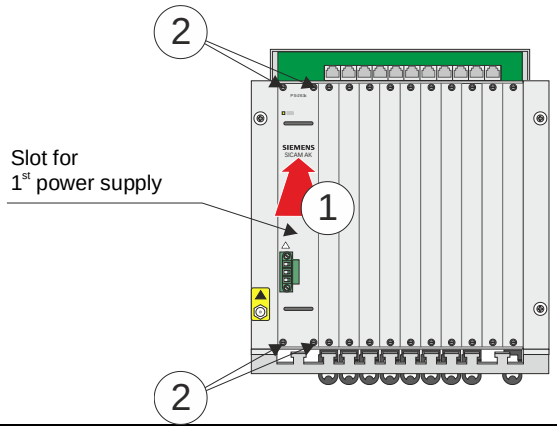
1.7.3 Install Power Supply

The power supplies are slotted into the compartments provided from the front. The cabling is carried out from the front of the board rack.

Note:
All SICAM AK 3 board racks can be equipped with a first power supply on the left side and a second (redundant) powers supply on the right side. The installation procedure is equal for all board racks. Thus it is shown only exemplary with a CM-2844 board rack.

1.7.3.1 Installing First Power Supply

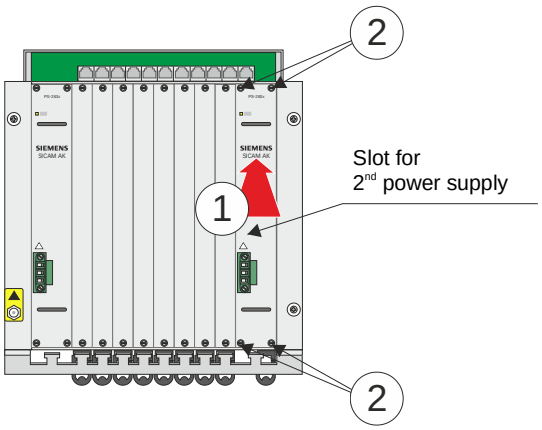
The first power supply is installed in the left slot. It needs to be pushed into the compartment • and fastened with screws , . Then the wiring can be carried out. Please refer also to section *1.7.4, Wiring of the* Power Supply



Note:
In this case it is possible to install another CP-2019 or a peripheral element in slot 9.

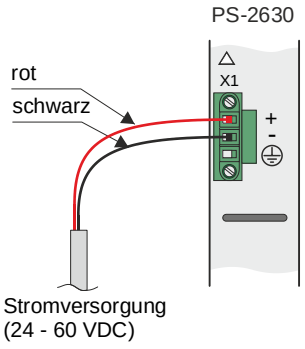
1.7.3.2 Installing Second Power Supply

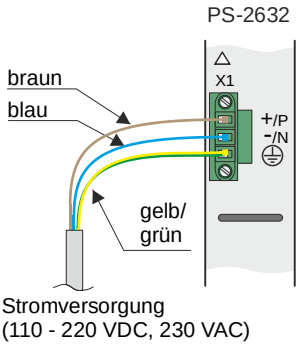
The second power supply is only for redundancy and not for increasing the power. It is installed in the right slot. It needs to be pushed into the compartment • and fastened with screws , . Then the wiring can be carried out. Please refer also to section *1.7.4, Wiring of the* Power Supply



1.7.4 Wiring of the Power Supply

The supply can be carried out with single leads of the type H07V-K (2.5) or a cable of the type H05VV-F3G (2.5).





1.8 Wiring Process Peripherals

1.8.1 General

The process peripherals are connected with the system by means of prefabricated peripheral cables.

Designation	Item-Number/MLFB
CM-2890 Periphery cable Crimp 5 m 100 pins	TC2-890 6MF13131CJ000AA0

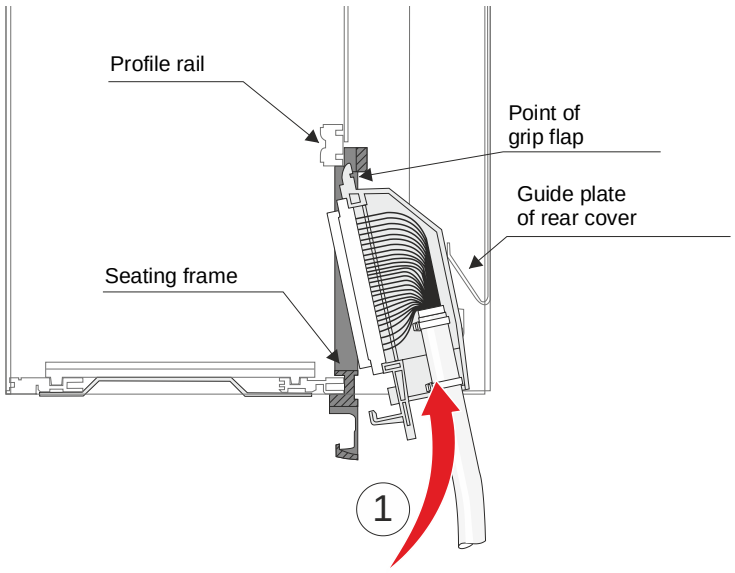
1.8.2 Fitting Peripheral Cable

Caution
The peripheral modules must **NOT** be installed in the board rack during the fitting of the associated peripheral cable.

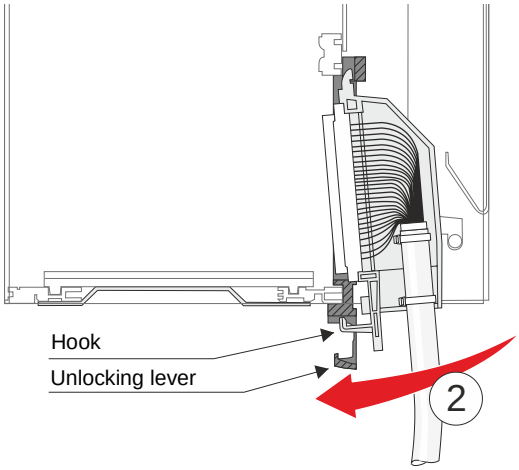
The fitting is carried out by engaging the peripheral cable in the seating frame.

Proceed as follows:

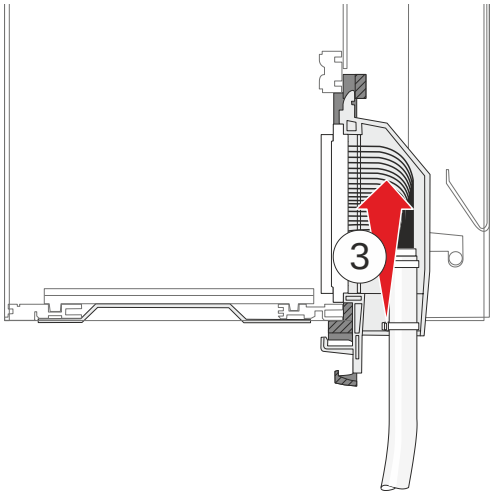
- Insert the peripheral cable into the board rack from below, until the point of the grip flap is fixed between profile rail and seating frame • ; In the case of wall mounting a plate on the wall bracket serves as a guide during installation.



- Then swing the peripheral cable forwards up to the stop , , Thereby the hook of the grip flap must be guided through the unlocking lever.



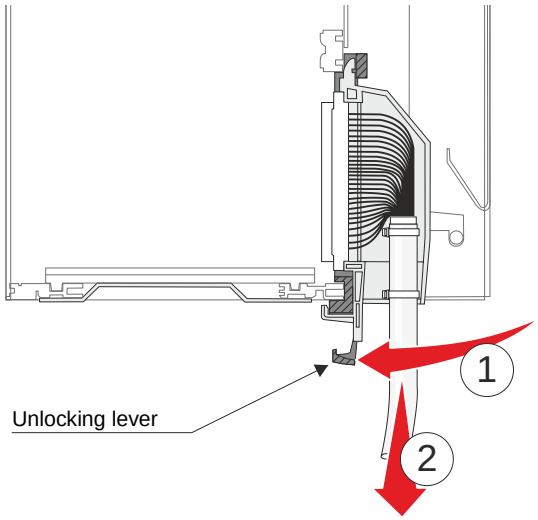
- Now push the peripheral cable upwards. Thereby grip flap and seating frame are finally fixed together *f*



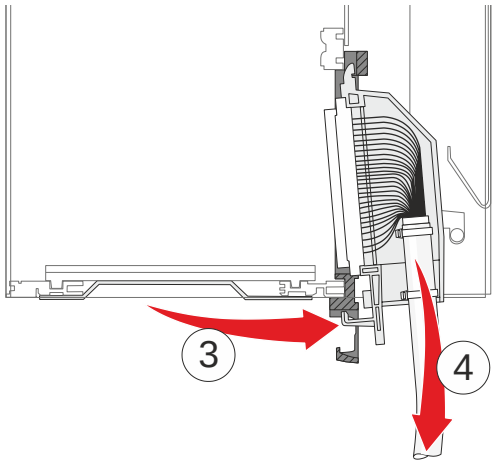
1.8.3 Removing Peripheral Cable

Caution
The peripheral modules must NOT be installed in the board rack during the fitting of the associated peripheral cable.

- Push the unlocking lever of the seating frame slightly forwards and hold it in this position •
- Pull the peripheral cable vertically 4-5mm downwards ,



- Swing the connector of the peripheral cable to the back ƒ (the hook of the grip flap is thereby guided through the unlocking lever) and pull it downwards out of the board rack „ .



1.8.4 PIN Assignment Peripheral Cable

PIN	Farbe	colour	DI-2110/11	Signal	DO-2201	Signal	DO-2210	Signal	AI-2300	Signal AI-2300	Signal SM-0570	Signal SM-0571	Signal SM-0572	Signal SM-0574	AI-2301	Signal	CP-2016	Signal
1	wsbl/bl	whbu/bu	a1	IN D00	a1	OUT D00+	a1	CA00	a1	IN V00+					a1	IN V00+	a1	
2	bl/wsbl	bu/whbu	b1	IN D01	b1	OUT D00-	b1	CA01	b1	IN V00-					b1	IN V00-	b1	
3	wsbl/ge	whbu/ye	c1	IN D02	c1	OUT D01+	c1	CA02	c1	IN V01+					c1	IN V01+	c1	
4	ge/wsbl	ye/whbu	a2	IN D03	a2	OUT D01-	a2	CA03	a2	IN V01-					a2	IN V01-	a2	SYNC1
5	wsbl/gn	whbu/gn	b2	IN D04	b2	OUT D02+	b2	CA04	b2	no con.					b2	IN IREF00+	b2	
6	gn/wsbl	gn/whbu	c2	IN D05	c2	OUT D02-	c2	CA05	c2	no con.					c2	IN IREF00-	c2	SYNC2
7	wsbl/br	whbu/bn	a3	IN D06	a3	OUT D03+	a3	CA06	a3	IN V02+					a3	IN V02+	a3	
8	br/wsbl	bn/whbu	b3	IN D07	b3	OUT D03-	b3	CA07	b3	IN V02-					b3	IN V02-	b3	
9	wsbl/sw	whbu/bk	c3	IN PM0	c3	OUT D04+	c3	COMA	c3	IN V03+					c3	IN V03+	c3	
10	sw/wsbl	bk/whbu	a4	COM0	a4	OUT D04-	a4	GRA	a4	IN V03-					a4	IN V03-	a4	SYNC_GND
11	wsge/bl	whye/bu	b4	no con.	b4	no con.	b4	no con.	b4	no con.					b4	IN IREF01+	b4	
12	bl/wsge	bu/whye	c4	no con.	c4	no con.	c4	no con.	c4	no con.					c4	IN IREF01-	c4	SYNC_GND
13	wsge/ge	whye/ye	a5	IN D08	a5	OUT D05+	a5	CB00	a5	IOM0 I/O 0	IN V0+	IN IREF0-	no con.	IN IC0+	a5	IN V04+	a5	
14	ge/wsge	ye/whye	b5	IN D09	b5	OUT D05-	b5	CB01	b5	IOM0 I/O 1	IN V0-	IN IREF0+	no con.	IN IC0-	b5	IN V04-	b5	
15	wsge/gn	whye/gn	c5	IN D10	c5	OUT D06+	c5	CB02	c5	IOM0 I/O 2	no con.	IN V0-	OUT V0+	no con.	c5	IN V05+	c5	
16	gn/wsge	gn/whye	a6	IN D11	a6	OUT D06-	a6	CB03	a6	IOM0 I/O 3	no con.	IN V0+	OUT V0-	no con.	a6	IN V05-	a6	
17	wsge/br	whye/bn	b6	IN D12	b6	OUT D07+	b6	CB04	b6	no con.					b6	IN IREF02+	b6	
18	br/wsge	bn/whye	c6	IN D13	c6	OUT D07-	c6	CB05	c6	no con.					c6	IN IREF02-	c6	
19	wsge/sw	whye/bk	a7	IN D14	a7	OUT D08+	a7	CB06	a7	IOM0 I/O 4	IN V1+	IN V1-	no con.	IN IC1+	a7	IN V06+	a7	
20	sw/wsge	bk/whye	b7	IN D15	b7	OUT D08-	b7	CB07	b7	IOM0 I/O 5	IN V1-	IN V1+	no con.	IN IC1-	b7	IN V06-	b7	
21	wsgn/bl	whgn/bu	c7	IN PM1	c7	OUT D09+	c7	COMB	c7	IOM0 I/O 6	no con.	IN IREF1-	OUT V1+	no con.	c7	IN V07+	c7	
22	bl/wsgn	bu/whgn	a8	COM1	a8	OUT D09-	a8	GRB	a8	IOM0 I/O 7	no con.	IN IREF1+	OUT V1-	no con.	a8	IN V07-	a8	
23	wsgn/ge	whgn/ye	b8	no con.	b8	no con.	b8	no con.	b8	no con.					b8	IN IREF03+	b8	

PIN	Farbe	colour	DI-2110/11	Signal	DO-2201	Signal	DO-2210	Signal	AI-2300	Signal AI-2300	Signal SM-0570	Signal SM-0571	Signal SM-0572	Signal SM-0574	AI-2301	Signal	CP-2016	Signal
24	ge/wsgn	ye/whgn	c8	no con.	c8	no con.	c8	no con.	c8	no con.					c8	IN IREF03-	c8	
25	wsgn/gn	whgn/gn	a9	IN D16	a9	OUT D10+	a9	CB08	a9	IN V04+					a9	IN V08+	a9	
26	gn/wsgn	gn/whgn	b9	IN D17	b9	OUT D10-	b9	CB09	b9	IN V04-					b9	IN V08-	b9	
27	wsgn/br	whgn/bn	c9	IN D18	c9	OUT D11+	c9	CB10	c9	IN V05+					c9	IN V09+	c9	
28	br/wsgn	bn/whgn	a10	IN D19	a10	OUT D11-	a10	CB11	a10	IN V05-					a10	IN V09-	a10	
29	wsgn/sw	whgn/bk	b10	IN D20	b10	OUT D12+	b10	CB12	b10	no con.					b10	IN IREF04+	b10	
30	sw/wsgn	bk/whgn	c10	IN D21	c10	OUT D12-	c10	CB13	c10	no con.					c10	IN IREF04-	c10	
31	wsbr/bl	whbn/bu	a11	IN D22	a11	OUT D13+	a11	CB14	a11	IN V06+					a11	IN V10+	a11	
32	bl/wsbr	bu/whbn	b11	IN D23	b11	OUT D13-	b11	CB15	b11	IN V06-					b11	IN V10-	b11	
33	wsbr/ge	whbn/ye	c11	IN PM2	c11	OUT D14+	c11	COMB	c11	IN V07+					c11	IN V11+	c11	
34	ge/wsbr	ye/whbn	a12	COM2	a12	OUT D14-	a12	no con.	a12	IN V07-					a12	IN V11-	a12	
35	wsbr/gn	whbn/gn	b12	no con.	b12	no con.	b12	no con.	b12	no con.					b12	IN IREF05+	b12	
36	gn/wsbr	gn/whbn	c12	no con.	c12	no con.	c12	no con.	c12	no con.					c12	IN IREF05-	c12	
37	wsbr/br	whbn/bn	a13	IN D24	a13	OUT D15+	a13	CA08	a13	IOM1 I/O 0	IN V0+	IN IREF0-	no con.	IN IC0+	a13	IN V12+	a13	
38	br/wsbr	bn/whbn	b13	IN D25	b13	OUT D15-	b13	CA09	b13	IOM1 I/O 1	IN V0-	IN IREF0+	no con.	IN IC0-	b13	IN V12-	b13	
39	wsbr/sw	whbn/bk	c13	IN D26	c13	OUT D16+	c13	CA10	c13	IOM1 I/O 2	no con.	IN V0-	OUT V0+	no con.	c13	IN V13+	c13	
40	sw/wsbr	bk/whbn	a14	IN D27	a14	OUT D16-	a14	CA11	a14	IOM1 I/O 3	no con.	IN V0+	OUT V0-	no con.	a14	IN V13-	a14	
41	wssw/bl	whbk/bu	b14	IN D28	b14	OUT D17+	b14	CA12	b14	no con.					b14	IN IREF06+	b14	
42	bl/wssw	bu/whbk	c14	IN D29	c14	OUT D17-	c14	CA13	c14	no con.					c14	IN IREF06-	c14	
43	wssw/ge	whbk/ye	a15	IN D30	a15	OUT D18+	a15	CA14	a15	IOM1 I/O 4	IN V1+	IN V1-	no con.	IN IC1+	a15	IN V14+	a15	
44	ge/wssw	ye/whbk	b15	IN D31	b15	OUT D18-	b15	CA15	b15	IOM1 I/O 5	IN V1-	IN V1+	no con.	IN IC1-	b15	IN V14-	b15	
45	wssw/gn	whbk/gn	c15	IN PM3	c15	OUT D19+	c15	COMA	c15	IOM1 I/O 6	no con.	IN IREF1-	OUT V1+	no con.	c15	IN V15+	c15	
46	gn/wssw	gn/whbk	a16	COM3	a16	OUT D19-	a16	OA3	a16	IOM1 I/O 7	no con.	IN IREF1+	OUT V1-	no con.	a16	IN V15-	a16	WD_NO
47	wssw/br	whbk/bn	b16	no con.	b16	no con.	b16	no con.	b16	no con.					b16	IN IREF07+	b16	
48	br/wssw	bn/whbk	c16	no con.	c16	no con.	c16	no con.	c16	no con.					c16	IN IREF07-	c16	WD_NC
49	wssw/sw	whbk/bk	a17	IN D32	a17	OUT D20+	a17	CA16	a17	IN V08+					a17	IN V16+	a17	
50	sw/wssw	bk/whbk	b17	IN D33	b17	OUT D20-	b17	CA17	b17	IN V08-					b17	IN V16-	b17	

PIN	Farbe	colour	DI-2110/11	Signal	DO-2201	Signal	DO-2210	Signal	AI-2300	Signal AI-2300	Signal SM-0570	Signal SM-0571	Signal SM-0572	Signal SM-0574	AI-2301	Signal	CP-2016	Signal
51	rtbl/bl	rdbu/bu	c17	IN D34	c17	OUT D21+	c17	CA18	c17	IN V09+					c17	IN V17+	c17	
52	bl/rtbl	bu/rdbu	a18	IN D35	a18	OUT D21-	a18	CA19	a18	IN V09-					a18	IN V17-	a18	WD_COM
53	rtbl/ge	rdbu/ye	b18	IN D36	b18	OUT D22+	b18	CA20	b18	no con.					b18	IN IREF08+	b18	
54	ge/rtbl	ye/rdbu	c18	IN D37	c18	OUT D22-	c18	CA21	c18	no con.					c18	IN IREF08-	c18	WD_COM
55	rtbl/gn	rdbu/gn	a19	IN D38	a19	OUT D23+	a19	CA22	a19	IN V10+					a19	IN V18+	a19	
56	gn/rtbl	gn/rdbu	b19	IN D39	b19	OUT D23-	b19	CA23	b19	IN V10-					b19	IN V18-	b19	
57	rtbl/br	rdbu/bn	c19	IN PM4	c19	OUT D24+	c19	COMA	c19	IN V11+					c19	IN V19+	c19	
58	br/rtbl	bn/rdbu	a20	COM4	a20	OUT D24-	a20	OA1	a20	IN V11-					a20	IN V19-	a20	
59	rtbl/sw	rdbu/bk	b20	no con.	b20	no con.	b20	no con.	b20	no con.					b20	IN IREF09+	b20	
60	sw/rtbl	bk/rdbu	c20	no con.	c20	no con.	c20	no con.	c20	no con.					c20	IN IREF09-	c20	
61	rtge/bl	rdye/bu	a21	IN D40	a21	OUT D25+	a21	CB16	a21	IOM2 I/O 0	IN V0+	IN IREF0-	no con.	IN IC0+	a21	IN V20+	a21	
62	bl/rtge	bu/rdye	b21	IN D41	b21	OUT D25-	b21	CB17	b21	IOM2 I/O 1	IN V0-	IN IREF0+	no con.	IN IC0-	b21	IN V20-	b21	
63	rtge/ge	rdye/ye	c21	IN D42	c21	OUT D26+	c21	CB18	c21	IOM2 I/O 2	no con.	IN V0-	OUT V0+	no con.	c21	IN V21+	c21	
64	ge/rtge	ye/rdye	a22	IN D43	a22	OUT D26-	a22	CB19	a22	IOM2 I/O 3	no con.	IN V0+	OUT V0-	no con.	a22	IN V21-	a22	
65	rtge/gn	rdye/gn	b22	IN D44	b22	OUT D27+	b22	CB20	b22	no con.					b22	IN IREF10+	b22	
66	gn/rtge	gn/rdye	c22	IN D45	c22	OUT D27-	c22	CB21	c22	no con.					c22	IN IREF10-	c22	
67	rtge/br	rdye/bn	a23	IN D46	a23	OUT D28+	a23	CB22	a23	IOM2 I/O 4	IN V1+	IN V1-	no con.	IN IC1+	a23	IN V22+	a23	
68	br/rtge	bn/rdye	b23	IN D47	b23	OUT D28-	b23	CB23	b23	IOM2 I/O 5	IN V1-	IN V1+	no con.	IN IC1-	b23	IN V22-	b23	
69	rtge/sw	rdye/bk	c23	IN PM5	c23	OUT D29+	c23	COMB	c23	IOM2 I/O 6	no con.	IN IREF1-	OUT V1+	no con.	c23	IN V23+	c23	
70	sw/rtge	bk/rdye	a24	COM5	a24	OUT D29-	a24	OA2	a24	IOM2 I/O 7	no con.	IN IREF1+	OUT V1-	no con.	a24	IN V23-	a24	ER_NO
71	rtgn/bl	rdgn/bu	b24	no con.	b24	no con.	b24	no con.	b24	no con.					b24	IN IREF11+	b24	
72	bl/rtgn	bu/rdgn	c24	no con.	c24	no con.	c24	no con.	c24	no con.					c24	IN IREF11-	c24	ER_NC
73	rtgn/ge	rdgn/ye	a25	IN D48	a25	OUT D30+	a25	CB24	a25	IN V12+					a25	IN V24+	a25	
74	ge/rtgn	ye/rggn	b25	IN D49	b25	OUT D30-	b25	CB25	b25	IN V12-					b25	IN V24-	b25	
75	rtgn/gn	rdgn/gn	c25	IN D50	c25	OUT D31+	c25	CB26	c25	IN V13+					c25	IN V25+	c25	
76	gn/rtgn	gn/rdgn	a26	IN D51	a26	OUT D31-	a26	CB27	a26	IN V13-					a26	IN V25-	a26	ER_COM
77	rtgn/br	rdgn/bn	b26	IN D52	b26	OUT D32+	b26	CB28	b26	no con.					b26	IN IREF12+	b26	

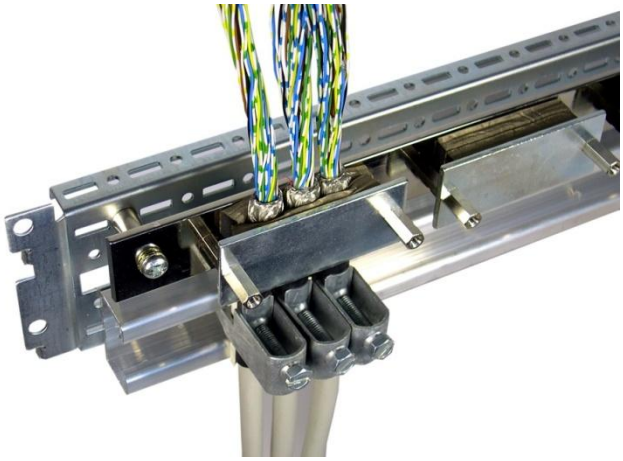
PIN	Farbe	colour	DI-2110/11	Signal	DO-2201	Signal	DO-2210	Signal	AI-2300	Signal AI-2300	Signal SM-0570	Signal SM-0571	Signal SM-0572	Signal SM-0574	AI-2301	Signal	CP-2016	Signal
78	br/rtgn	bn/rdgn	c26	IN D53	c26	OUT D32-	c26	CB29	c26	no con.					c26	IN IREF12-	c26	ER_COM
79	rtgn/sw	rdgn/bk	a27	IN D54	a27	OUT D33+	a27	CB30	a27	IN V14+					a27	IN V26+	a27	
80	sw/rtgn	bk/rdgn	b27	IN D55	b27	OUT D33-	b27	CB31	b27	IN V14-					b27	IN V26-	b27	
81	rtbr/bl	rdbn/bu	c27	IN PM6	c27	OUT D34+	c27	COMB	c27	IN V15+					c27	IN V27+	c27	
82	bl/rtbr	bu/rdbn	a28	COM6	a28	OUT D34-	a28	OA0	a28	IN V15-					a28	IN V27-	a28	
83	rtbr/ge	rdbn/ye	b28	no con.	b28	no con.	b28	VR	b28	no con.					b28	IN IREF13+	b28	
84	ge/rtbr	ye/rdbn	c28	no con.	c28	no con.	c28	no con.	c28	no con.					c28	IN IREF13-	c28	
85	rtbr/gn	rdbn/gn	a29	IN D56	a29	OUT D35+	a29	CA24	a29	IOM3 I/O 0	IN V0+	IN IREF0-	no con.	IN IC0+	a29	IN V28+	a29	
86	gn/rtbr	gn/rdbn	b29	IN D57	b29	OUT D35-	b29	CA25	b29	IOM3 I/O 1	IN V0-	IN IREF0+	no con.	IN IC0-	b29	IN V28-	b29	
87	rtbr/br	rdbn/bn	c29	IN D58	c29	OUT D36+	c29	CA26	c29	IOM3 I/O 2	no con.	IN V0-	OUT V0+	no con.	c29	IN V29+	c29	
88	br/rtbr	bn/rdbn	a30	IN D59	a30	OUT D36-	a30	CA27	a30	IOM3 I/O 3	no con.	IN V0+	OUT V0-	no con.	a30	IN V29-	a30	
89	rtbr/sw	rdbn/bk	b30	IN D60	b30	OUT D37+	b30	CA28	b30	no con.					b30	IN IREF14+	b30	
90	sw/rtbr	bk/rdbn	c30	IN D61	c30	OUT D37-	c30	CA29	c30	no con.					c30	IN IREF14-	c30	
91	rtsw/bl	rdbk/bu	a31	IN D62	a31	OUT D38+	a31	CA30	a31	IOM3 I/O 4	IN V1+	IN V1-	no con.	IN IC1+	a31	IN V30+	a31	
92	bl/rtsw	bu/rdbk	b31	IN D63	b31	OUT D38-	b31	CA31	b31	IOM3 I/O 5	IN V1-	IN V1+	no con.	IN IC1-	b31	IN V30-	b31	
93	rtsw/ge	rdbk/ye	c31	IN PM7	c31	OUT D39+	c31	COMA	c31	IOM3 I/O 6	no con.	IN IREF1-	OUT V1+	no con.	c31	IN V31+	c31	
94	ge/rtsw	ye/rdbk	a32	COM7	a32	OUT D39-	a32	no con.	a32	IOM3 I/O 7	no con.	IN IREF1+	OUT V1-	no con.	a32	IN V31-	a32	
95	rtsw/gn	rdbk/gn	b32	no con.	b32	no con.	b32	no con.	b32	no con.					b32	IN IREF15+	b32	
96	gn/rtsw	gn/rdbk	c32	no con.	c32	no con.	c32	no con.	c32	no con.					c32	IN IREF15-	c32	
97	rtsw/br	rdbk/bn	*)		*)		*)		*)						*)		*)	
98	br/rtsw	bn/rdbk	*)		*)		*)		*)						*)		*)	
99	rtsw/sw	rdbk/bk	*)		*)		*)		*)						*)		*)	
100	sw/rtsw	bk/rdbk	*)		*)		*)		*)						*)		*)	

*) no connection

1.9 Shielding and Protective Earthing

1.9.1 Shielding

Normally, shielded cables are strain-relieved directly after the cabinet/rack entry and then grounded on a large-surface screening rail installed for this purpose.



1.9.2 Protective Earthing / Grounding

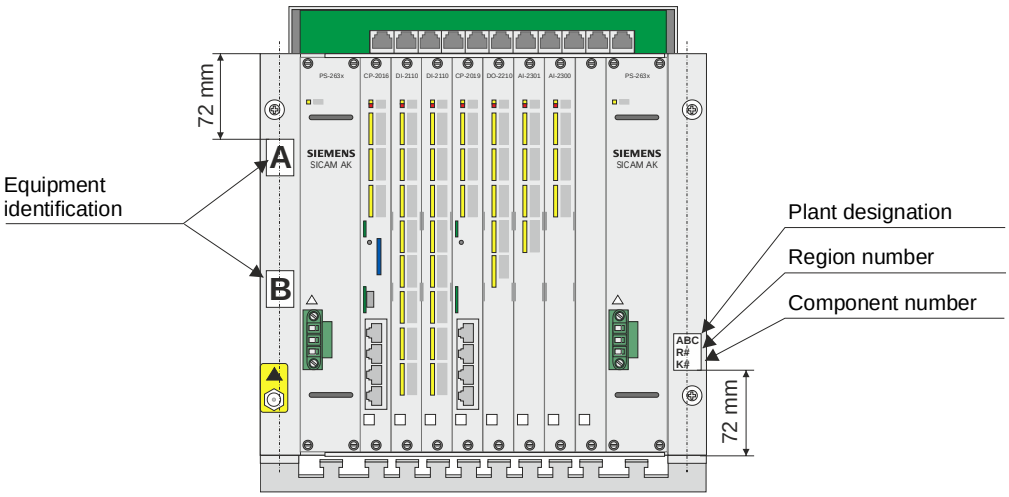
When installing a SICAM AK 3 system, attention is to be paid, that the cabinet or rack used, features a proper protective earthing / grounding. That means, that all electrical conducting parts must be connected large-surface and as short as possible with the existing grounding system.

1.10 Labeling

1.10.1 General

This section shows how an SICAM AK 3 system is to be labeled according to Standard. The following labels are provided:

- Region- and Component Number
- Plant Designation
- Equipment Identification



1.11 Switching the System On and Off

1.11.1 Switching On

Before switching the system on, all system elements must be connected to a power supply. Switching on takes place by connecting the voltage, as for example by switching on a miniature circuit breaker. The system starts up automatically (startup after power-up).

The entire system is operational (without consideration of the error display), as soon as all system elements have concluded the startup (refer to section 5.2, Checks And System Displays). This is also applicable analogously, if only parts of the system are switched off and switched on again.

1.11.2 Switching Off

The switching off of the system takes place by disconnecting the voltage on all system parts. With redundant power supply, pay attention to entire loss of voltage.

Caution

The switching off of the master control element during writing operations to the flash card (load firmware, load parameters) is to be absolutely avoided, since the data on the flash card could be destroyed as a result.

2 System Components

Contents

This chapter describes the mechanical design of the modules of the system SICAM AK 3, connector pin assignments, lighted display, as well as block diagrams and external circuitries.

2.1 Power Supply

2.1.1 PS-2630, PS-2632

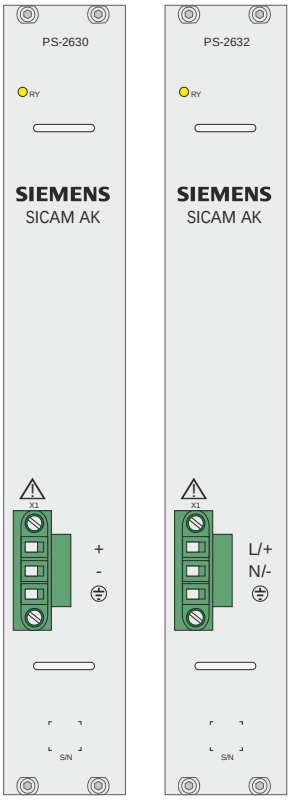
The voltage is supplied on the front side of the housing

The voltage output (5 V) is galvanically insulated and protected against continued short circuit, and is monitored on failure.

The power supplies can be connected in parallel to increase the operation reliability (redundancy).

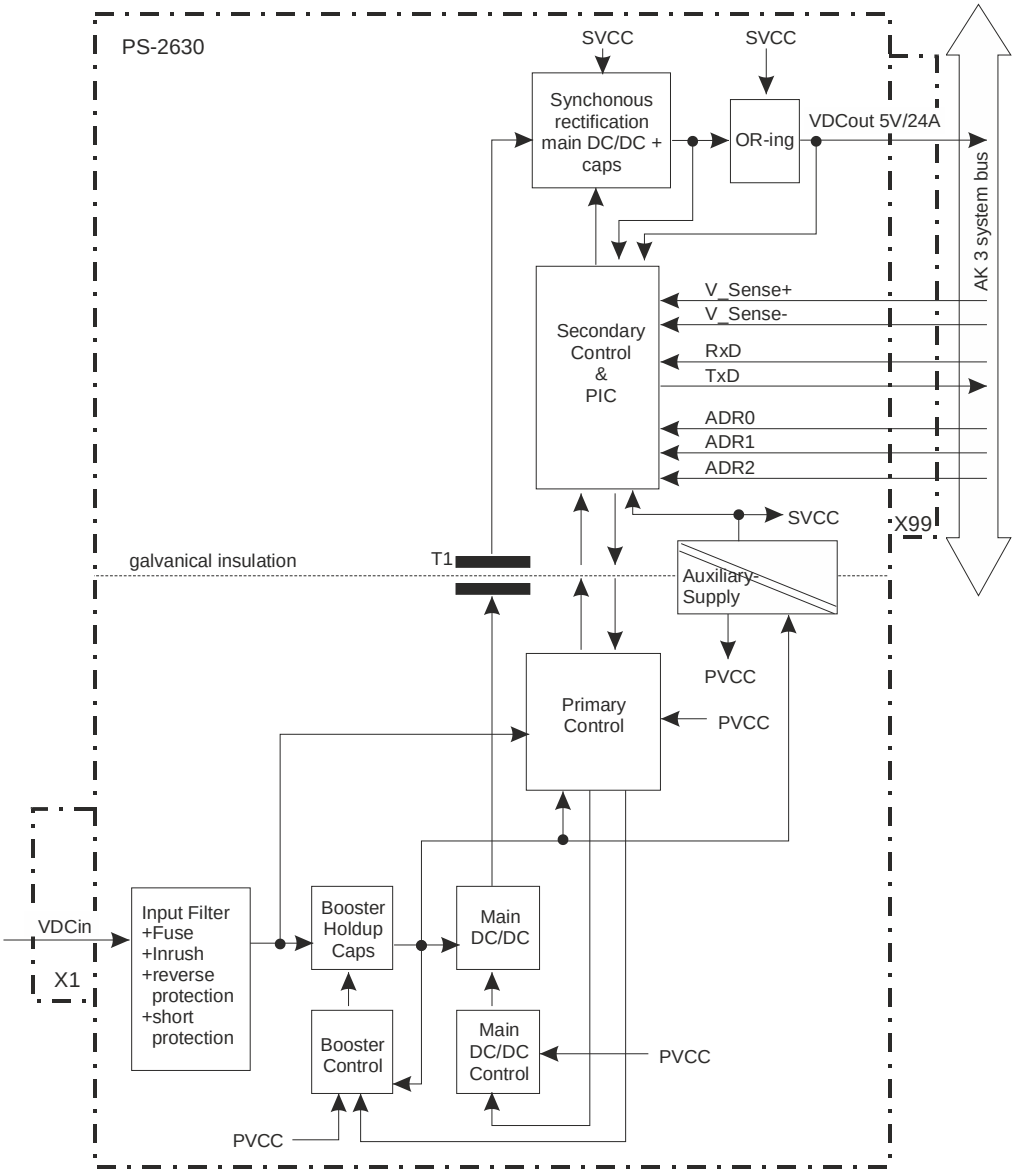
2.1.1.1 Front View

PS-2630 PS-2632

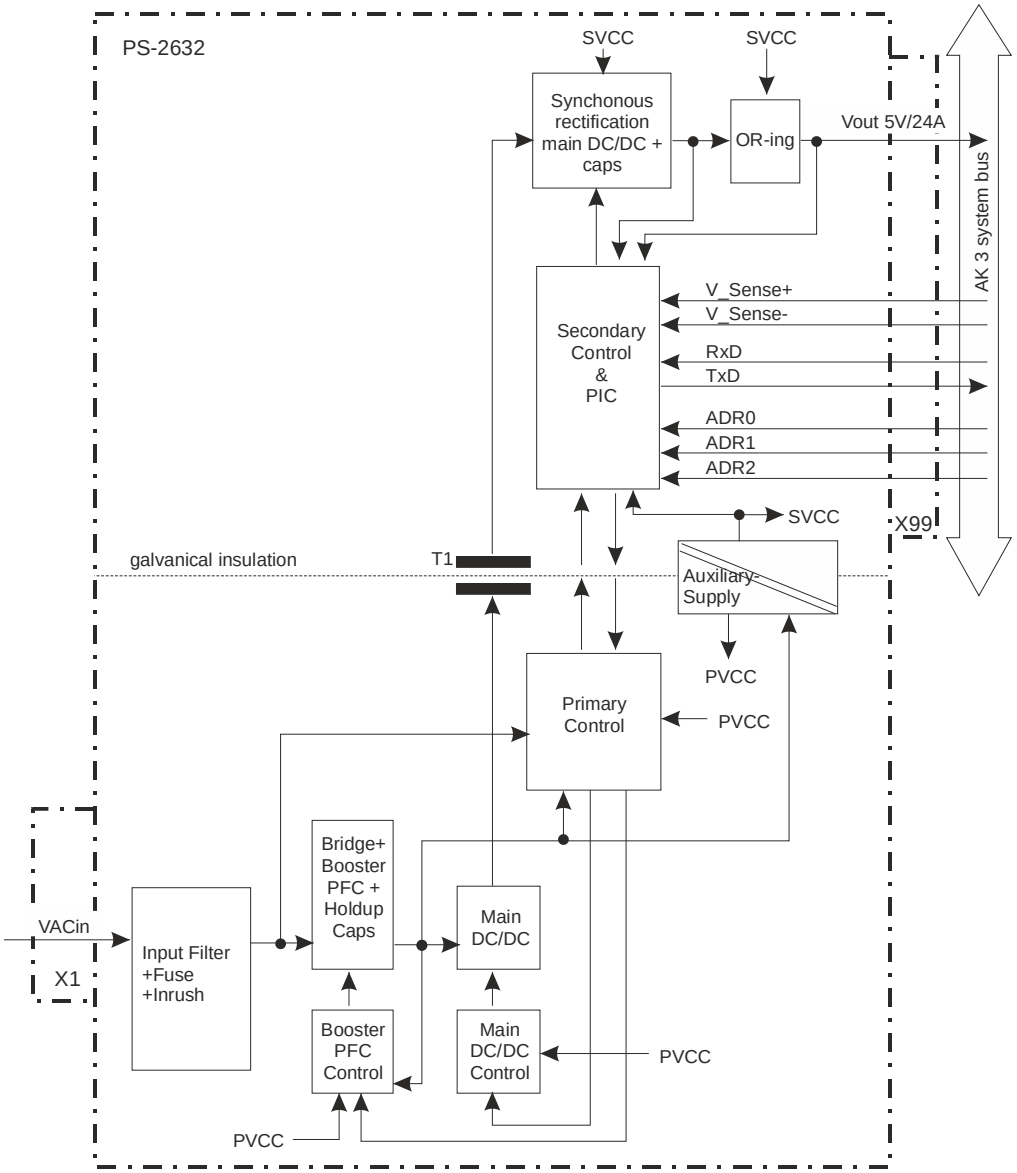


2.1.1.2 Block Diagram

PS-2630



PS-2632


PS-2632
SVCC
SVCC
Synchonous rectification main DC/DC + caps
OR-ing
Vout 5V/24A
AK 3 system bus
Secondary Control & PIC
V_Sense+
V_Sense-
RxD
TxD
ADR0
ADR1
ADR2
SVCC
X99
galvanical insulation
T1
Auxiliary-Supply
PVCC
Primary Control
PVCC
Bridge+ Booster PFC + Holdup Caps
Main DC/DC
VACin
X1
Input Filter +Fuse +Inrush
Booster PFC Control
Main DC/DC Control
PVCC
PVCC

2.1.1.3 Pin Assignment

The power supply connector X1 is assigned according to the following table.

PS-2630		PS-2632	
Pin	**Signal**	**Pin**	**Signal**
1	+	1	L/+
2	-	2	N/-
3	PE	3	PE

The abbreviations have the following meaning:

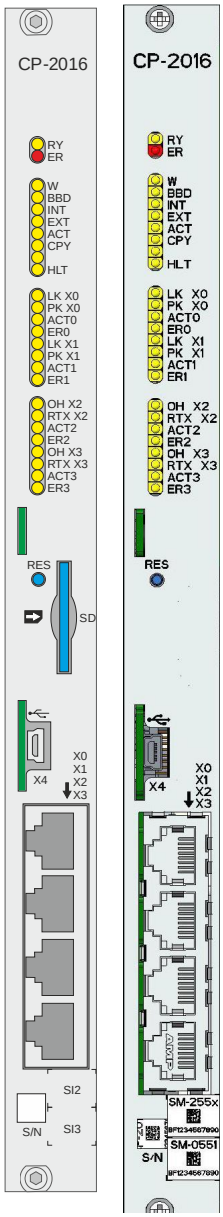
+ ..... Power Supply + (24 to 60 VDC)
- ..... Power Supply- (24 to 60 VDC)
L/+ ..... Power Supply+ (110 to 220 VDC, 230 VAC)
N/- ..... Power Supply- (110 to 220 VDC, 230 VAC)
PE ..... Protective earth

2.2 Basic System Elements

2.2.1 CP-2016/CPCX26

2.2.1.1 Front Panel

CP-2016 Front panel
CP-2016 AK3
Security



RY: Board ready
ER: Error

W: Warning
BBD: Module failure
INT: Internal error
EXT: External error
ACT: CPU active
CPY: Parameter safety operation / Firmware is loaded

HLT: FW shut down / Board shut down

LK X0: \
PK X0: |
ACT0: |
ER0: \ LED display for protocol element 0 and 1
LK X1: / Meaning see chapter „*Service*“, section “Operation And Display Elements”
PK X1: |
ACT1: |
ER1: /

OH X2: \
RTX X2: |
ACT2: |
ER2: \ LED display for protocol element 2 and 3
OH X3: / meaning dependent on the installed protocol element
RTX X3: | see chapter „*Service*“, section “Operation And Display Elements”
ACT3: |
ER3: /

RES: Reset

SD: SD-Card (SD-Card in front panel CP-2016 AK3 Security not visible)

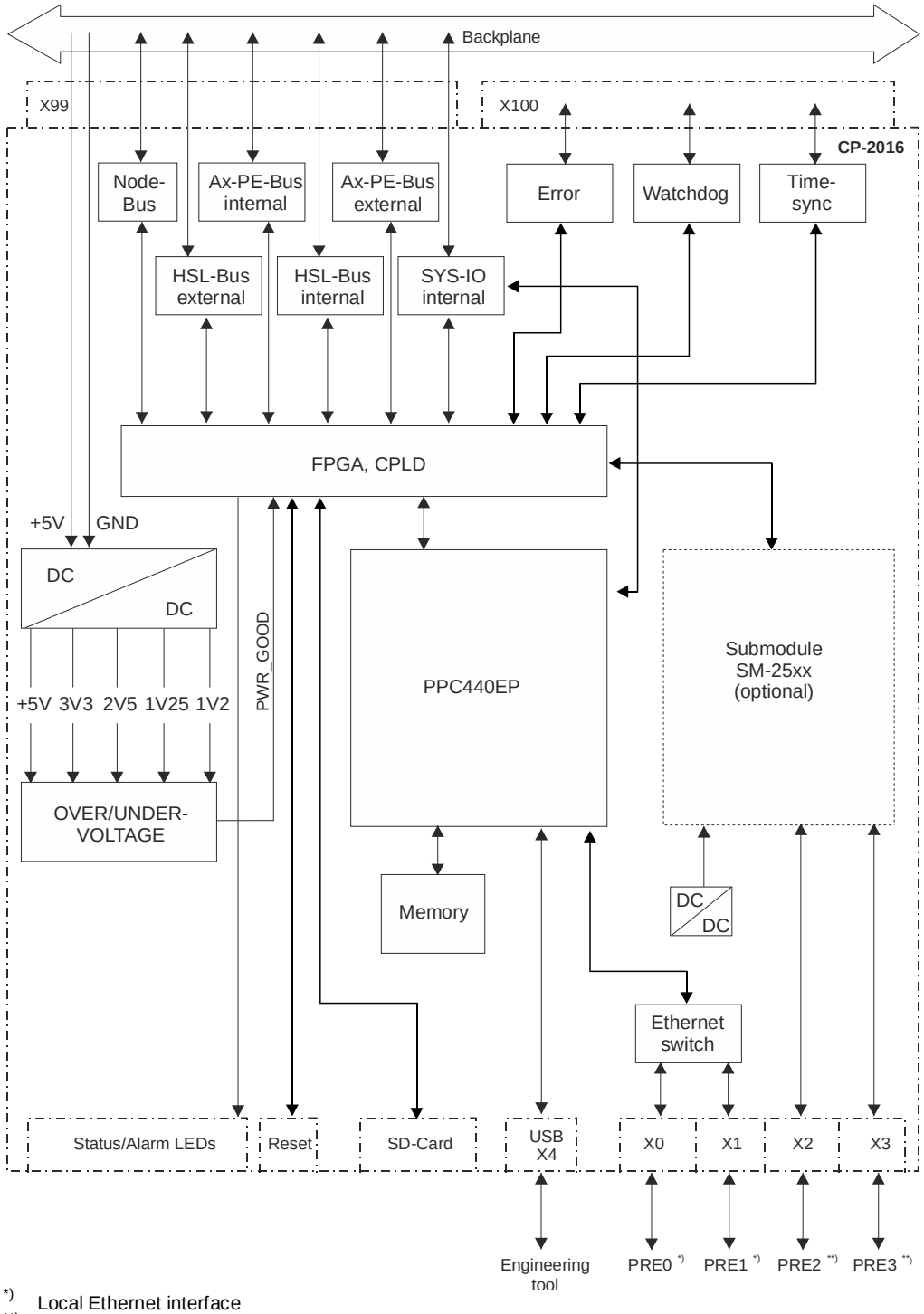
X4: USB interface

X0: Interface protocol element 0
X1: Interface protocol element 1
X2: Interface protocol element 2
X3: Interface protocol element 3

S/N: Serial number

SI2: Position for label with serial number of protocol element 2
SI3: Position for label with serial number of protocol element 3

2.2.1.2 Block Diagram



*) Local Ethernet interface
**) Usage depends on the equipped SM-25xx

2.2.1.3 Pin Assignment

Peripheral connector (X100)

Pin	Signal	Pin	Signal	Pin	Signal
a1	-	b1	-	c1	-
a2	SYNC1+	b2	-	c2	SYNC2+
a3	-	b3	-	c3	-
a4	SYNC_GND	b4	-	c4	SYNC_GND
a5	-	b5	-	c5	-
a6	-	b6	-	c6	-
a7	-	b7	-	c7	-
a8	-	b8	-	c8	-
a9	-	b9	-	c9	-
a10	-	b10	-	c10	-
a11	-	b11	-	c11	-
a12	-	b12	-	c12	-
a13	-	b13	-	c13	-
a14	-	b14	-	c14	-
a15	-	b15	-	c15	-
a16	WD_N/O	b16	-	c16	WD_N/C
a17	-	b17	-	c17	-
a18	WD_COM	b18	-	c18	WD_COM
a19	-	b19	-	c19	-
a20	-	b20	-	c20	-
a21	-	b21	-	c21	-
a22	-	b22	-	c22	-
a23	-	b23	-	c23	-
a24	ER_NO	b24	-	c24	ER_NC
a25	-	b25	-	c25	-
a26	ER_COM	b26	-	c26	ER_COM
a27	-	b27	-	c27	-
a28	-	b28	-	c28	-
a29	-	b29	-	c29	-
a30	-	b30	-	c30	-
a31	-	b31	-	c31	-
a32	-	b32	-	c32	-

The abbreviations have the following meaning:

SYNC1+ ..... Synchronization input for <32 V
SYNC2+ ..... Synchronization input for 33 V to 72 V
SYNC_GND ..... Ground for Synchronization input
WD_NO..... Watchdog operating contact
WD_COM ..... Watchdog root contact
WD_NC..... Watchdog normally closed contact
ER_NO ..... Sum error operating contact
ER_COM..... Sum error root contact
ER_NC..... Sum error idle contact

Communication plug, RJ45 (X0, X1, X2, X3)

Pin	Ethernet	V.28, RS232
1	TX+	CTS
2	TX-	RTS
3	RX+	DSR
4	-	TXD
5	-	RXD
6	RX-	GND
7	-	DCD
8	-	DTR

The abbreviations have the following meaning:

TX ..... Transmit data (differential)
RX ..... Receive data (differential)
CTS ..... Clear to Send
RTS ..... Request to send
DSR ..... Data Set Ready
TXD ..... Transmit data
RXD ..... Receive data
GND ..... Ground
DCD ..... Data Carrier Detect
DTR ..... Data Terminal Ready

Engineering plug, USB mini-B (X4)

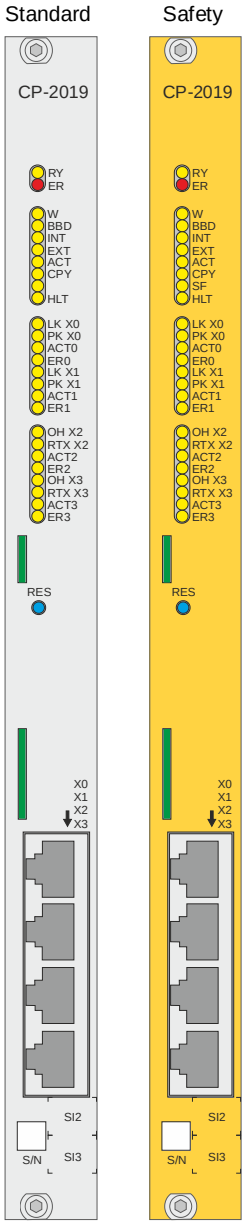
Pin	Signal		
1	VBUS	...	Power Supply Host -> Device
2	D-	...	Data-
3	D+	...	Data+
4	NC	...	not connected
5	GND	...	Ground

2.2.1.4 LED Display

Details about the meaning of the LEDs can be found in chapter Service, section Operation And Display Elements - Basic System Elements.

2.2.2 CP-2019/PCCX26

2.2.2.1 Front Panel



RY: Board ready
ER: Error

W: Warning
BBD: Module failure
INT: Internal error
EXT: External error
ACT: CPU active
CPY: Parameter safety operation / FW is loaded
SF: Safety Function
HLT: FW shut down / Board shut down

LK X0: \
PK X0: |
ACT0: |
ER0: \ LED display for protocol element 0 and 1
LK X1: / Meaning see chapter „*Service*“, section
PK X1: | “Operation And Display Elements”
ACT1: |
ER1: /

OH X2: \
RTX X2: |
ACT2: |
ER2: \ LED display for protocol element 2 and 3
OH X3: / meaning dependent on the installed protocol element
RTX X3: | see chapter „*Service*“, section “Operation And Display Elements”
ACT3: |
ER3: /

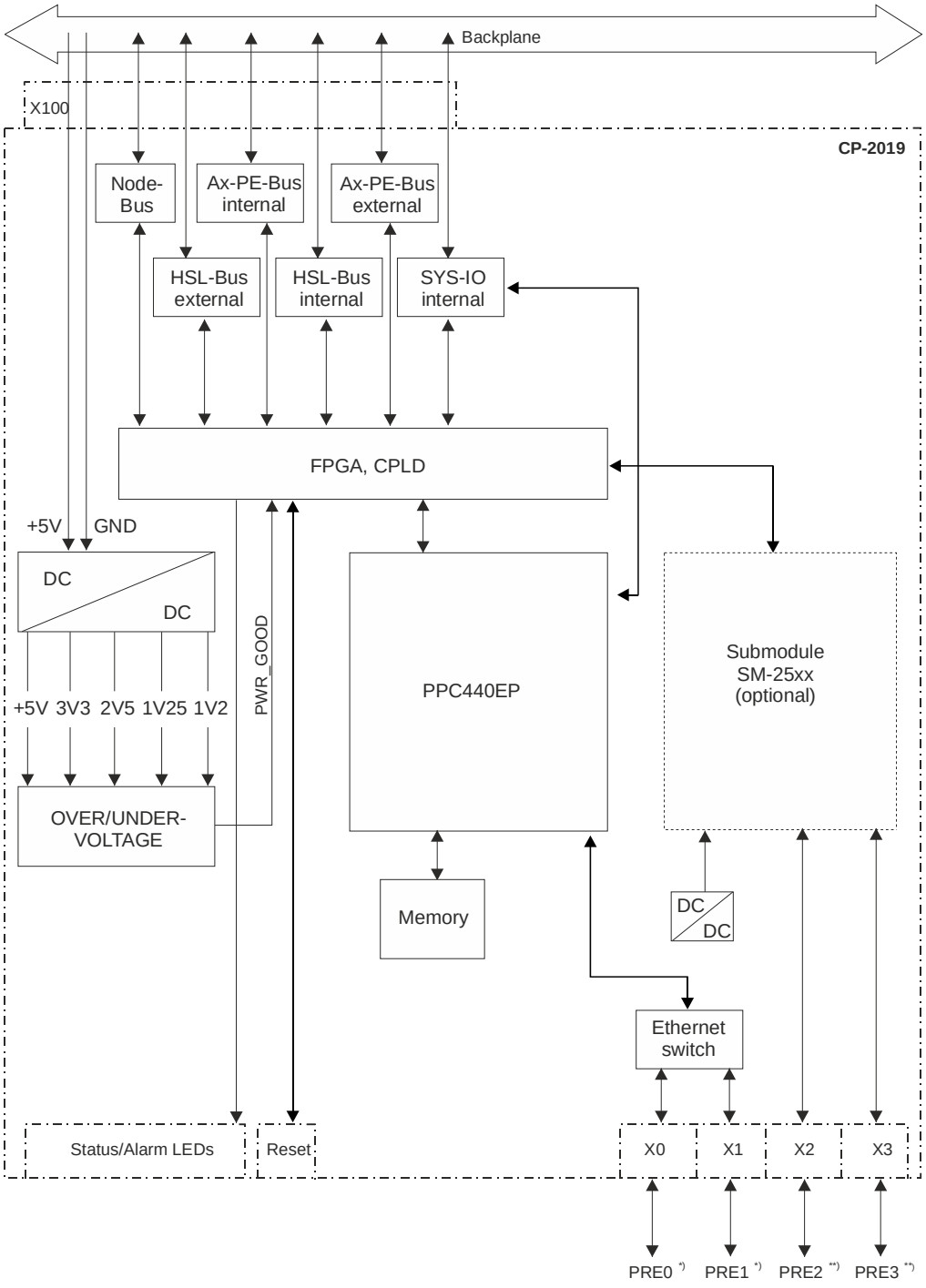
RES: Reset

X0: Interface protocol element 0
X1: Interface protocol element 1
X2: Interface protocol element 2
X3: Interface protocol element 3

S/N: Serial number

SI2: Position for label with serial number of protocol element 2
SI3: Position for label with serial number of protocol element 3

2.2.2.2 Block Diagram



*) Local Ethernet interface
**) Usage depends on the equipped SM-25xx

2.2.2.3 Pin Assignment

Communication plug, RJ45 (X0, X1, X2, X3)

Pin	Ethernet	V.28, RS232
1	TX+	CTS
2	TX-	RTS
3	RX+	DSR
4	-	TXD
5	-	RXD
6	RX-	GND
7	-	DCD
8	-	DTR

The abbreviations have the following meaning:

TX ..... Transmit data (differential)
RX ..... Receive data (differential)
CTS ..... Clear to Send
RTS ..... Request to send
DSR..... Data Set Ready
TXD ..... Transmit data
RXD..... Receive data
GND ..... Ground
DCD..... Data Carrier Detect
DTR ..... Data Terminal Ready

2.2.2.4 LED Displays:

Details about the meaning of the LEDs can be found in chapter Service, section Operation And Display Elements - Basic System Elements.

2.3 Migration-Basic System Element

2.3.1 CP-2017/PCCX25

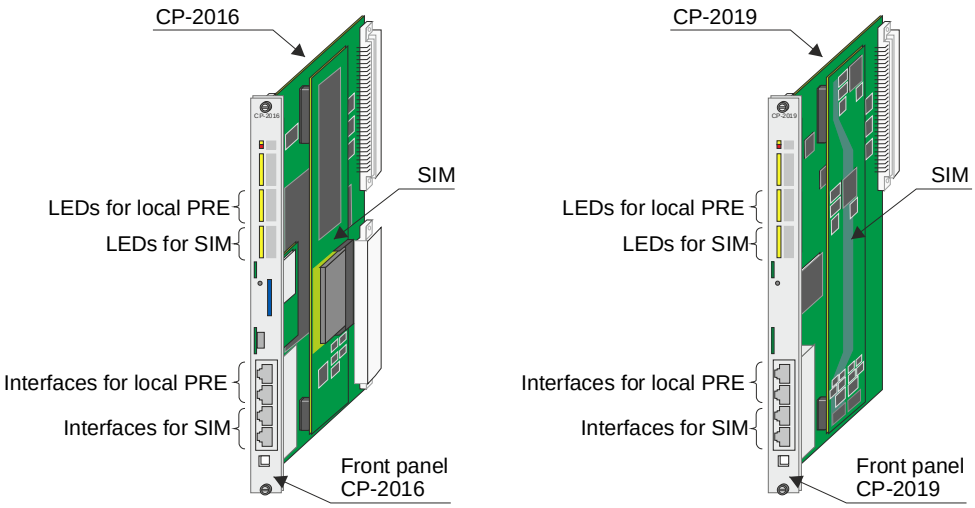
The basic system element CP-2017/PCCX25 is the processing and communication element of the product family SICAM AK. It can be expanded with up to 4 serial interfaces by equipping serial interface modules and the appropriate connection board.

This function can also be used in SICAM AK 3 when the SICAM AK 3 migration board rack CM-2847 is used.

CP-2017 has no RJ45 communication interfaces on the front panel. These interfaces are supplied on the additional required connection board CM-2838. Further it is necessary to mount one patch plug (CM-2860 or CM-2869) for each communication interface on the connection board.

2.4 Protocol Elements

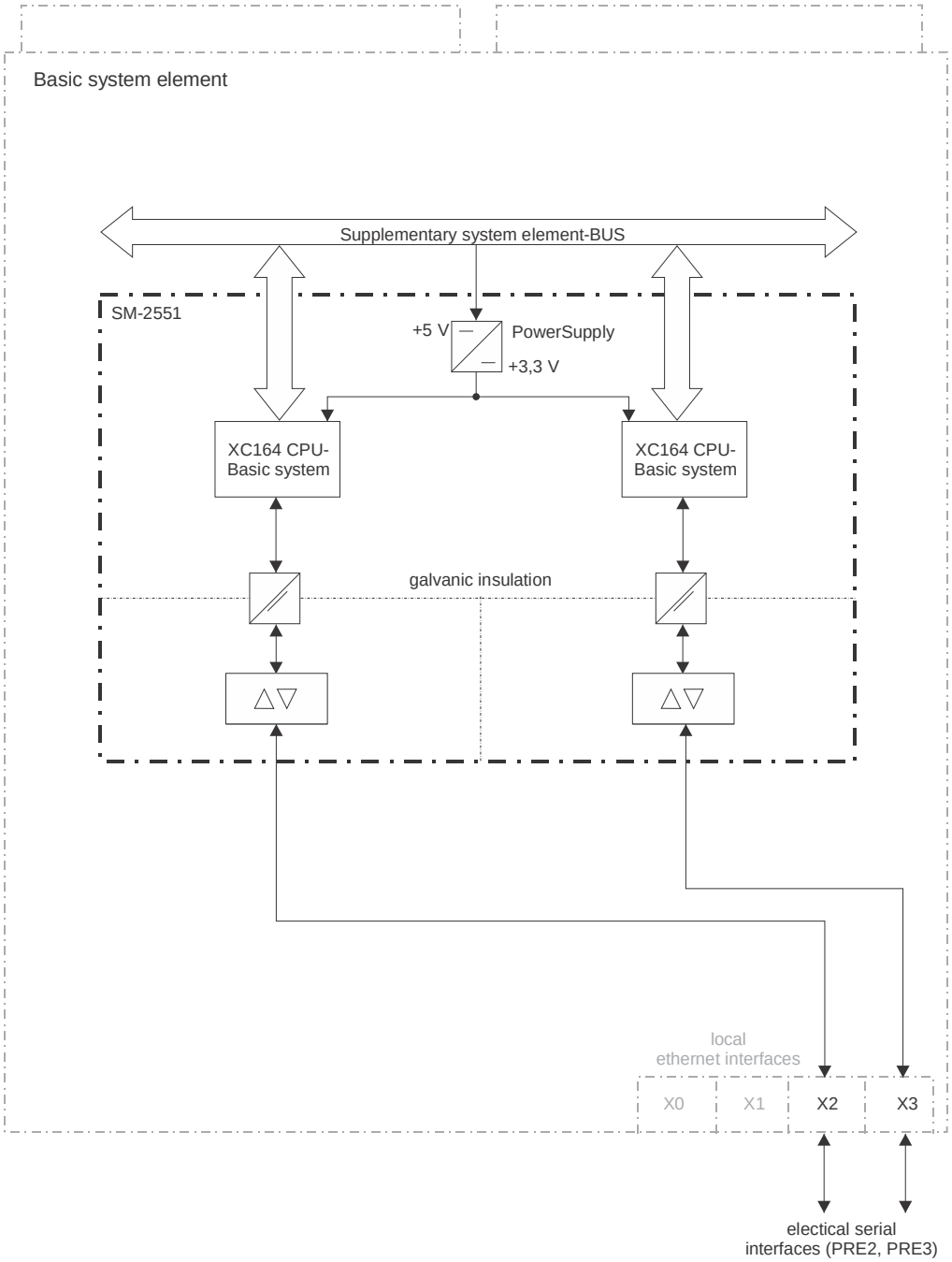
The hardware of the protocol elements, namely serial interface modules (SIM), can be installed on the basic system element. There protocol element itself have neither a front panel nor LEDs to display status and functions. Therefore they use the LEDs and front panel of the basic system elements. The meaning of these LED displays is described there.



2.4.1 SM-2551

Installable serial interface module (SIM) for CP-2016 and CP-2019.

2.4.1.1 Block Diagram



2.4.1.2 Pin Assignment

The serial interface module SM-2551 uses the plugs X2 and X3 of CP-2016 and CP-2019.

The pin assignment depends on the operation mode of the supported protocols. You find the information thereto in the SICAM *AK 3 System Description, chapter "System Components and Technical Data", section "Protocol Elements"*.

2.4.1.2.1 Unbalanced Interchange Circuit V.24/V.28

V.23 dedicated line, VFT channel, V.28 asynchronous

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	RTS
3	I/O 3	DSR/+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

2.4.1.2.2 Balanced Interchange Circuit X.24/X.27

V.11 isochronous

Pulse is transmitted

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	TxC
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

Pulse is received

pin	alias	signal
1	I/O 1	RxC
2	I/O 2	RTS
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

2.4.1.2.3 Balanced Interface EIA-485

V.11 asynchronous

pin	alias	signal
1	I/O 1	
2	I/O 2	RTS
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	
8	I/O 8	

2.4.1.2.4 Balanced Interface EIA-422

V.11 asynchronous

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	RTS
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

2.4.1.2.5 Optical Interface (Multimode Fiber Optics) with CM-0821

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	TxD
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	RNGERR
8	I/O 8	DTR

2.4.1.2.6 Optical Interface (Multimode Fiber Optics) with CM-0847

RJ45 plug (8-pole) RS232 (V.24) electrical interface			
Pin	**Signal**		**Meaning**
1	-	...	not connected
2	-	...	not connected
3	+5V	...	+5V Versorgung
4	RxD-	...	Receive Data -
5	TxD-	...	Transmit Data -
6	GND	...	Ground
7	-	...	not connected
8	-	...	not connected

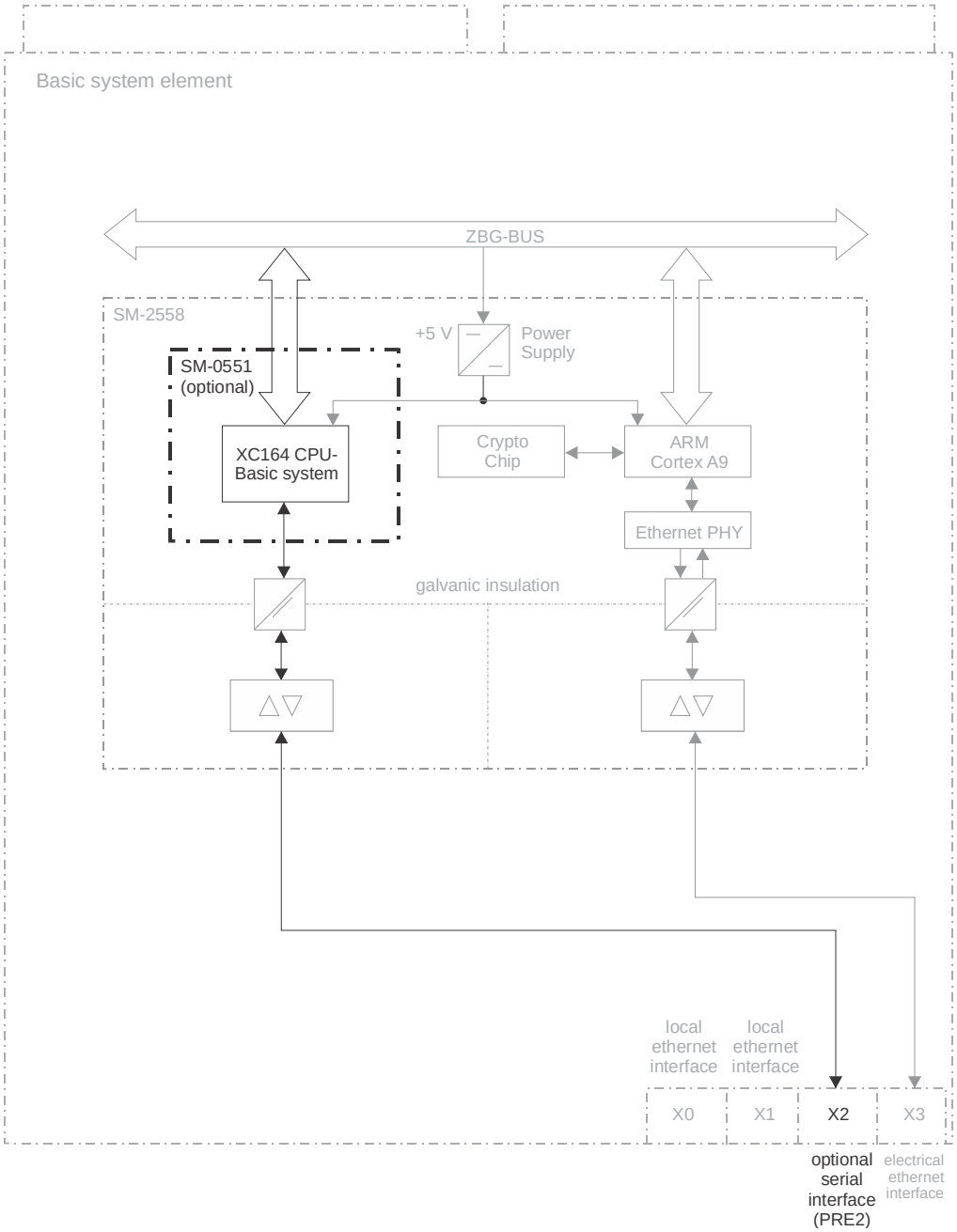
Legend

CTS . . . . serial interface (V.28) - clear to send
RTS . . . . serial interface (V.28) - request to send
DSR . . . . serial interface (V.28) - data set ready
DCD . . . . serial interface (V.28) - data carrier detect
DTR . . . . serial interface (V.28) - data terminal ready
TxD . . . . serial interface (V.28) - transmit data
RxD . . . . serial interface (V.28) - receive data
GND . . . . serial interface (V.28) - signal ground
+5V . . . . serial interface - +5V-supply
TxC . . . . serial interface (V.28) - generated clock pulse
RxC . . . . serial interface (V.28) - received clock pulse
RNGERR . signaling ring failure (in conjunction with CM-0821)
MODE . . . operating mode V.28 on CM-0827

2.4.2 SM-0551

Serial interface module (SIM), installable on SM-2558.

2.4.2.1 Block Diagram



2.4.2.2 Pin Assignment

The serial interface module SM-0551 uses the plug X2 of CP-2016 and CP-2019.

The pin assignment depends on the operation mode of the supported protocols. You find the information thereto in the SICAM *AK 3 System Description, chapter "System Components and Technical Data", section "Protocol Elements"*.

2.4.2.2.1 Unbalanced Interchange Circuit V.24/V.28

V.23 dedicated line, VFT channel, V.28 asynchronous

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	RTS
3	I/O 3	DSR/+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

2.4.2.2.2 Balanced Interchange Circuit X.24/X.27

V.11 isochronous

Pulse is transmitted

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	TxC
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

Pulse is received

pin	alias	signal
1	I/O 1	RxC
2	I/O 2	RTS
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

2.4.2.2.3 Balanced Interface EIA-485

V.11 asynchronous

pin	alias	signal
1	I/O 1	
2	I/O 2	RTS
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	
8	I/O 8	

2.4.2.2.4 Balanced Interface EIA-422

V.11 asynchronous

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	RTS
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	DCD
8	I/O 8	DTR

2.4.2.2.5 Optical Interface (Multimode Fiber Optics) with CM-0821

pin	alias	signal
1	I/O 1	CTS
2	I/O 2	TxD
3	I/O 3	+5V
4	I/O 4	TxD
5	I/O 5	RxD
6	I/O 6	GND
7	I/O 7	RNGERR
8	I/O 8	DTR

2.4.2.2.6 Optical Interface (Multimode Fiber Optics) with CM-0847

RJ45 plug (8-pole) RS232 (V.24) electrical interface			
Pin	**Signal**		**Meaning**
1	-	...	not connected
2	-	...	not connected
3	+5V	...	+5V Versorgung
4	RxD-	...	Receive Data -
5	TxD-	...	Transmit Data -
6	GND	...	Ground
7	-	...	not connected
8	-	...	not connected

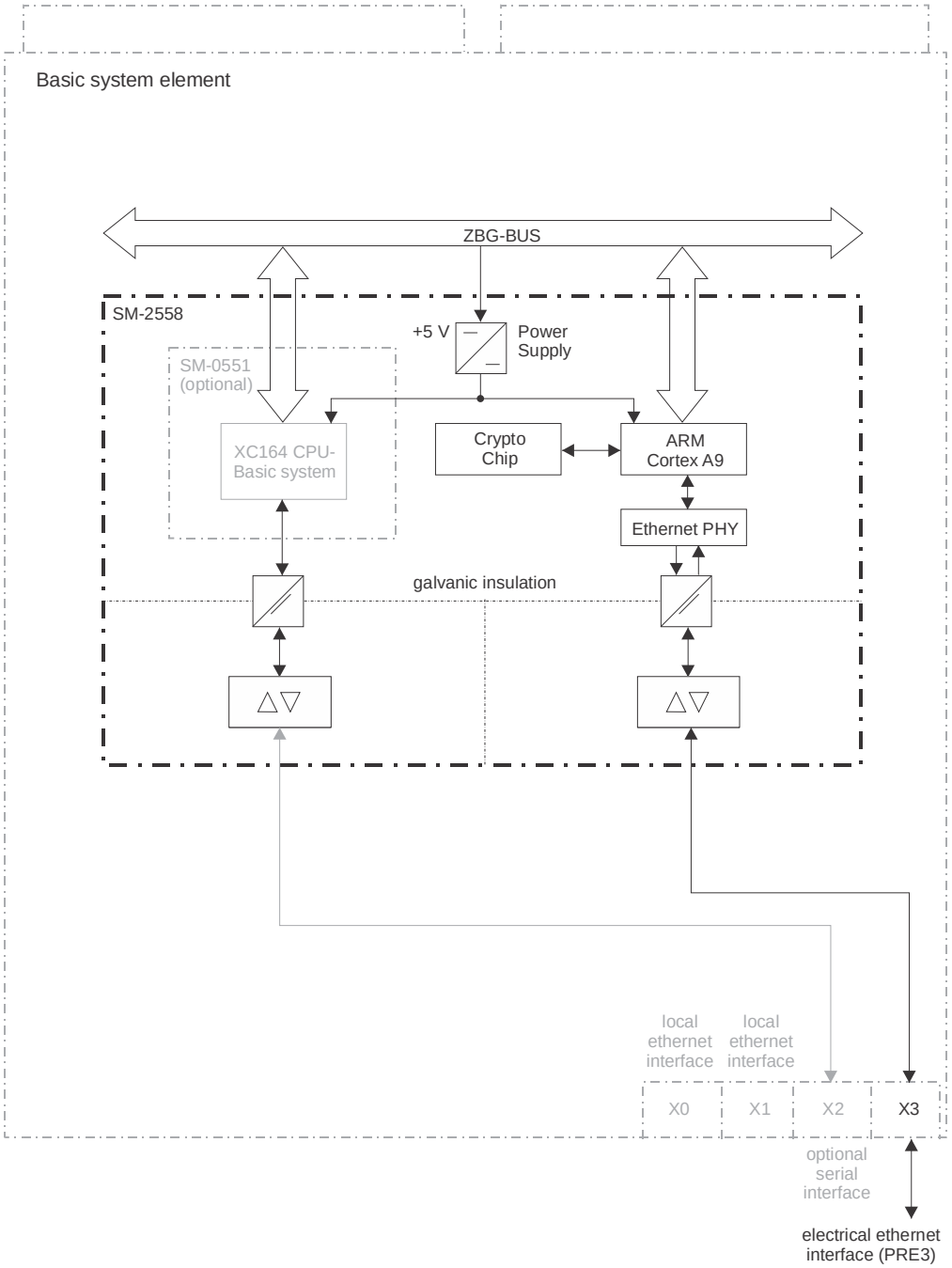
Legend

CTS . . . . serial interface (V.28) - clear to send
RTS . . . . serial interface (V.28) - request to send
DSR . . . . serial interface (V.28) - data set ready
DCD . . . . serial interface (V.28) - data carrier detect
DTR . . . . serial interface (V.28) - data terminal ready
TxD . . . . serial interface (V.28) - transmit data
RxD . . . . serial interface (V.28) - receive data
GND . . . . serial interface (V.28) - signal ground
+5V . . . . serial interface - +5V-supply
TxC . . . . serial interface (V.28) - generated clock pulse
RxC . . . . serial interface (V.28) - received clock pulse
RNGERR . . signaling ring failure (in conjunction with CM-0821)
MODE . . . operating mode V.28 on CM-0827

2.4.3 SM-2558

Installable serial interface module (SIM) for CP-2016 and CP-2019.

2.4.3.1 Block Diagram



2.4.3.2 Pin Assignment

2.4.3.2.1 Ethernet Interface

RJ45 socket connector			
X3	on CP-2016 and CP-2019		
Pin	**Signal**		**Meaning**
1	TxD+	...	Transmit Data +
2	TxD-	...	Transmit Data -
3	RxD+	...	Receive Data +
4	-	...	not used
5	-	...	not used
6	RxD-	...	Receive Data -
7	-	...	not used
8	-	...	not used

2.4.3.2.2 Serial Interface

The serial interface (X2) is provided by means of an attachable SM-0551 (refer to 2.4.2, SM-0551).

2.5 Peripheral Elements

2.5.1 Setting the Module Address

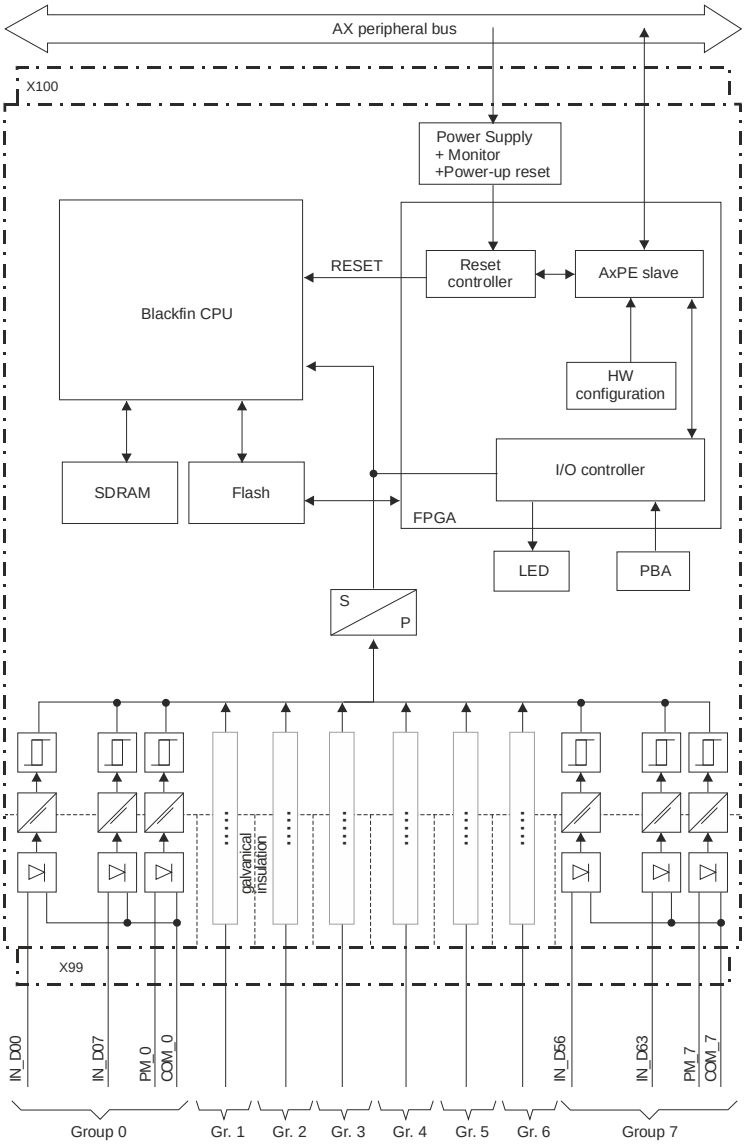
The peripheral element is coupled to the basic system element via the Ax 1703 peripheral bus.

The address of the peripheral element on the Ax 1703 peripheral bus is determined in SICAM TOOLBOX II when defining the Ax 1703 peripheral bus configuration. This address is then set by means of the PBA switch (ñ) on the peripheral element.

2.5.2 DI-211x/BISX26

2.5.2.1 Front Panel

2.5.2.2 Block Diagram



Warning

An insulation plate must be installed left and right of the modules DI-2114 and DI-2115.

One insulation plate is included to these boards. Further can be ordered with following number:

Insulation plate double-Euro format T12-001 / 6MF13010CA010AA0
Insulation plate holder ..... TC2-099 / (4 pieces per insulation plate) 6MF13133CA000AA0

There is no reinforced isolation between the peripheral circuits. Therefore, it is not allowed to protect each circuit within one board separately using various fuses.

2.5.2.3 Pin Assignment

A 96-pin male connector according to DIN 41612 type C is used. The peripheral connector's pin assignment is described in the following table.

DI-211x	peripheral cable		signal	DI-211x	peripheral cable		signal	DI-211x	peripheral cable		signal
X2	wire	colour		X2	wire	colour		X2	wire	colour	
c1	03	whbu/ye	IN D02	b1	02	bu/whbu	IN D01	a1	01	whbu/bu	IN D00
c2	06	gn/whbu	IN D05	b2	05	whbu/gn	IN D04	a2	04	ye/whbu	IN D03
c3	09	whbu/bk	IN PM0	b3	08	bn/whbu	IN D07	a3	07	whbu/bn	IN D06
c4	12	bu/whye		b4	11	whye/bu		a4	10	bk/whbu	COM0
c5	15	whye/gn	IN D10	b5	14	ye/whye	IN D09	a5	13	whye/ye	IN D08
c6	18	bn/whye	IN D13	b6	17	whye/bn	IN D12	a6	16	gn/whye	IN D11
c7	21	whgn/bu	IN PM1	b7	20	bk/whye	IN D15	a7	19	whye/bk	IN D14
c8	24	ye/whgn		b8	23	whgn/ye		a8	22	bu/whgn	COM1
c9	27	whgn/bn	IN D18	b9	26	gn/whgn	IN D17	a9	25	whgn/gn	IN D16
c10	30	bk/whgn	IN D21	b10	29	whgn/bk	IN D20	a10	28	bn/whgn	IN D19
c11	33	whbn/ye	IN PM2	b11	32	bu/whbn	IN D23	a11	31	whbn/bu	IN D22
c12	36	gn/whbn		b12	35	whbn/gn		a12	34	ye/whbn	COM2
c13	39	whbn/bk	IN D26	b13	38	bn/whbn	IN D25	a13	37	whbn/bn	IN D24
c14	42	bu/whbk	IN D29	b14	41	whbk/bu	IN D28	a14	40	bk/whbn	IN D27
c15	45	whbk/gn	IN PM3	b15	44	ye/whbk	IN D31	a15	43	whbk/ye	IN D30
c16	48	bn/whbk		b16	47	whbk/bn		a16	46	gn/whbk	COM3
c17	51	rdbu/bu	IN D34	b17	50	bk/whbk	IN D33	a17	49	whbk/bk	IN D32
c18	54	ye/rdbu	IN D37	b18	53	rdbu/ye	IN D36	a18	52	bu/rdbu	IN D35
c19	57	rdbu/bn	IN PM4	b19	56	gn/rdbu	IN D39	a19	55	rdbu/gn	IN D38
c20	60	bk/rdbu		b20	59	rdbu/bk		a20	58	bn/rdbu	COM4
c21	63	rdye/ye	IN D42	b21	62	bu/rdye	IN D41	a21	61	rdye/bu	IN D40
c22	66	gn/rdye	IN D45	b22	65	rdye/gn	IN D44	a22	64	ye/rdye	IN D43
c23	69	rdye/bk	IN PM5	b23	68	bn/rdye	IN D47	a23	67	rdye/bn	IN D46
c24	72	bu/rdgn		b24	71	rdgn/bu		a24	70	bk/rdye	COM5
c25	75	rdgn/gn	IN D50	b25	74	ye/rdgn	IN D49	a25	73	rggn/ye	IN D48
c26	78	bn/rdgn	IN D53	b26	77	rdgn/bn	IN D52	a26	76	gn/rdgn	IN D51
c27	81	rdbn/bu	IN PM6	b27	80	bk/rdgn	IN D55	a27	79	rdgn/bk	IN D54
c28	84	ye/rdbn		b28	83	rdbn/ye		a28	82	bu/rdbn	COM6
c29	87	rdbn/bn	IN D58	b29	86	gn/rdbn	IN D57	a29	85	rdbn/gn	IN D56
c30	90	bk/rdbn	IN D61	b30	89	rdbn/bk	IN D60	a30	88	bn/rdbn	IN D59
c31	93	rdbk/ye	IN PM7	b31	92	bu/rdbk	IN D63	a31	91	rdbk/bu	IN D62
c32	96	gn/rdbk		b32	95	rdbk/gn		a32	94	ye/rdbk	COM7

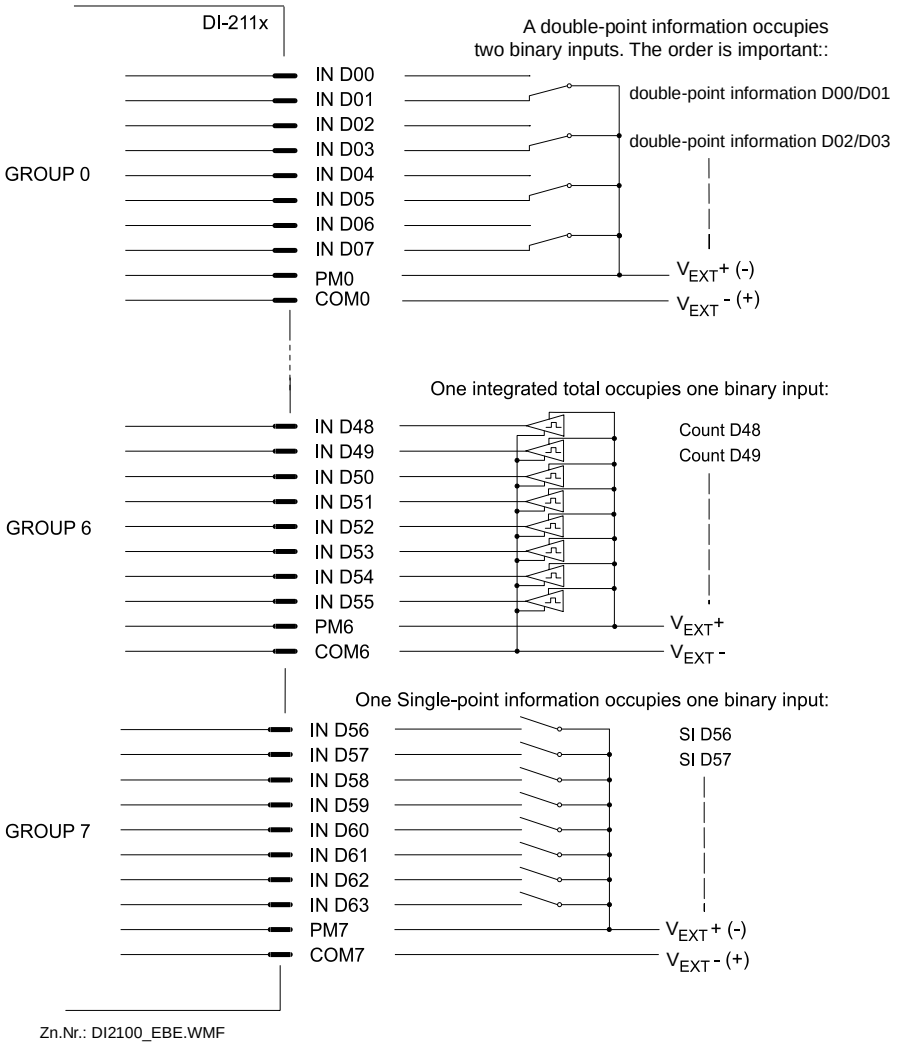
The "DI/X2" column refers to the male connector of the peripheral connectors.

The abbreviations have the following meaning:

IN D00 ... IN D07 . . . . . digital inputs group 0 Bit0 ... Bit7
IN D08 ... IN D15 . . . . . digital inputs group 1 Bit0 ... Bit7
IN D16 ... IN D23 . . . . . digital inputs group 2 Bit0 ... Bit7
IN D24 ... IN D31 . . . . . digital inputs group 3 Bit0 ... Bit7
IN D32 ... IN D39 . . . . . digital inputs group 4 Bit0 ... Bit7
IN D40 ... IN D47 . . . . . digital inputs group 5 Bit0 ... Bit7
IN D48 ... IN D55 . . . . . digital inputs group 6 Bit0 ... Bit7
IN D56 ... IN D63 . . . . . digital inputs group 7 Bit0 ... Bit7
IN PM0 ... IN PM7 . . . . . digital inputs - power monitoring 0 ... 7
COM0 ... COM7 . . . . . common group 0 ... 7

2.5.2.4 External Circuitry

Input with switched plus or minus



Note

The above figure shows one example of the assignment of inputs and/or outputs as well as their external circuitry. Rules, which must be considered for the assignment of the inputs and/or outputs, can be found in the following section.

2.5.2.5 I/O Assignment

The assignment of the HW pins to the data points is done according to the following scheme.

2.5.2.5.1 Inputs

HW pin	Data Point
Single-point information	
IN D00 IN D01 : IN D63	Single-point information D00 Single-point information D01 : Single-point information D63
Double-point information	
IN D00/IN D01 IN D02/IN D03 : IN D62/IN D63	Double-point information D00/D01 Double-point information D02/D03 : Double-point information D62/D63
Integrated totals	
IN D00 IN D01 : IN D63	Integrated total D00 Integrated total D01 : Integrated total D63

2.5.2.6 Return Information to Pulse Command Assignment

Predefined assignment to PCCO26 (assigning commands without building groups)

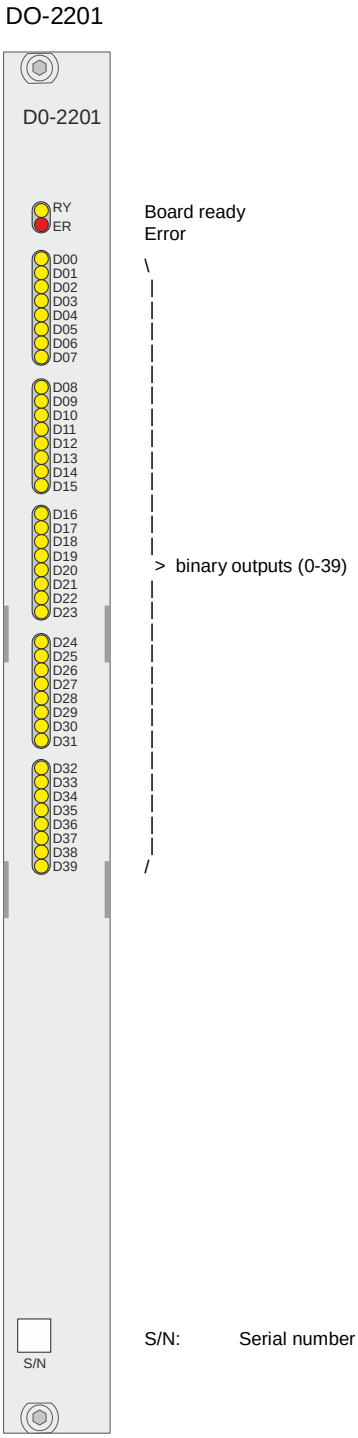
Type	Predefined assignment
Single information to single command (1-pole, 1.5-pole)	SI D00…command CA00 SI D01...command CA01 : SI D31…command CA31 SI D32…command CB00 SI D33…command CB01 : SI D63…command CB31
Single information to single command (2-pole)	SI D00…command CA00/CB00 SI D01…command CA01/CB01 : SI D31…command CA31/CB31
Double information to double command (1-pole, 1.5-pole)	DI D00/D01…command CA00/CA01 DI D02/D03…command CA02/CA03 : DI D30/D31…command CA30/CA31 DI D32/D33…command CB00/CB01 DI D34/D35…command CB02/CB03 : DI D62/D63…command CB30/CB31
Double information to double command (2-pole)	DI D00/D01…command CA00..CB01 DI D02/D03…command CA02..CB03 : DI D30/D31…command CA30..CB31

Predefined assignment to PCCO27 (assigning commands in groups)

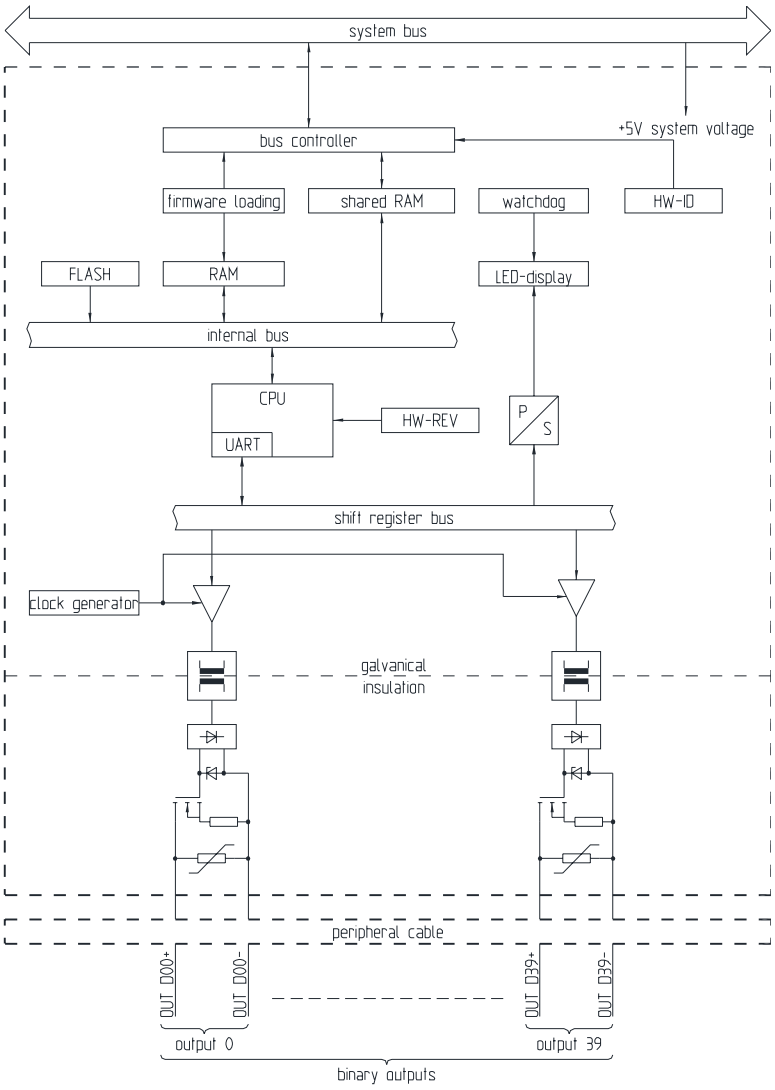
Type	Predefined assignment
Single information to single command (1-pole, 1.5-pole)	SI D00…command CA00 SI D01…command CB00 SI D02…command CA01 SI D03…command CB01 : SI D62…command CA31 SI D63…command CB31
Single information to single command (2-pole)	SI D00…command CA00/CB00 SI D02…command CA01/CB01 : SI D60…command CA30/CB30 SI D62…command CA31/CB31
Double information to double command (1-pole, 1.5-pole)	DI D00/D01…command CA00/CB00 DI D02/D03…command CA01/CB01 : DI D62/D63…command CA31/CB31
Double information to double command (2-pole)	DI D00/D01…command CA00..CB01 DI D04/D05…command CA02..CB03 : DI D56/D57…command CA28..CB29 DI D60/D61…command CA30..CB31

2.5.3 DO-2201/BISO25

2.5.3.1 Front Panel



2.5.3.2 Block Diagram



2.5.3.3 Pin Assignment

A 96-pin male connector according to DIN 41612 type C is used. The peripheral connector's pin assignment is described in the following table.

DO-2201	peripheral cable		signal	DO-2201	peripheral cable		signal	DO-2201	peripheral cable		signal
X2	wire	colour		X2	wire	colour		X2	wire	colour	
c1	03	whbu/ye	OUT D01+	b1	02	bu/whbu	OUT D00-	a1	01	whbu/bu	OUT D00+
c2	06	gn/whbu	OUT D02-	b2	05	whbu/gn	OUT D02+	a2	04	ye/whbu	OUT D01-
c3	09	whbu/bk	OUT D04+	b3	08	bn/whbu	OUT D03-	a3	07	whbu/bn	OUT D03+
c4	12	bu/whye		b4	11	whye/bu		a4	10	bk/whbu	OUT D04-
c5	15	whye/gn	OUT D06+	b5	14	ye/whye	OUT D05-	a5	13	whye/ye	OUT D05+
c6	18	bn/whye	OUT D07-	b6	17	whye/bn	OUT D07+	a6	16	gn/whye	OUT D06-
c7	21	whgn/bu	OUT D09+	b7	20	bk/whye	OUT D08-	a7	19	whye/bk	OUT D08+
c8	24	ye/whgn		b8	23	whgn/ye		a8	22	bu/whgn	OUT D09-
c9	27	whgn/bn	OUT D11+	b9	26	gn/whgn	OUT D10-	a9	25	whgn/gn	OUT D10+
c10	30	bk/whgn	OUT D12-	b10	29	whgn/bk	OUT D12+	a10	28	bn/whgn	OUT D11-
c11	33	whbn/ye	OUT D14+	b11	32	bu/whbn	OUT D13-	a11	31	whbn/bu	OUT D13+
c12	36	gn/whbn		b12	35	whbn/gn		a12	34	ye/whbn	OUT D14-
c13	39	whbn/bk	OUT D16+	b13	38	bn/whbn	OUT D15-	a13	37	whbn/bn	OUT D15+
c14	42	bu/whbk	OUT D17-	b14	41	whbk/bu	OUT D17+	a14	40	bk/whbn	OUT D16-
c15	45	whbk/gn	OUT D19+	b15	44	ye/whbk	OUT D18-	a15	43	whbk/ye	OUT D18+
c16	48	bn/whbk		b16	47	whbk/bn		a16	46	gn/whbk	OUT D19-
c17	51	rdbu/bu	OUT D21+	b17	50	bk/whbk	OUT D20-	a17	49	whbk/bk	OUT D20+
c18	54	ye/rdbu	OUT D22-	b18	53	rdbu/ye	OUT D22+	a18	52	bu/rdbu	OUT D21-
c19	57	rdbu/bn	OUT D24+	b19	56	gn/rdbu	OUT D23-	a19	55	rdbu/gn	OUT D23+
c20	60	bk/rdbu		b20	59	rdbu/bk		a20	58	bn/rdbu	OUT D24-
c21	63	rdye/ye	OUT D26+	b21	62	bu/rdye	OUT D25-	a21	61	rdye/bu	OUT D25+
c22	66	gn/rdye	OUT D27-	b22	65	rdye/gn	OUT D27+	a22	64	ye/rdye	OUT D26-
c23	69	rdye/bk	OUT D29+	b23	68	bn/rdye	OUT D28-	a23	67	rdye/bn	OUT D28+
c24	72	bu/rdgn		b24	71	rdgn/bu		a24	70	bk/rdye	OUT D29-
c25	75	rdgn/gn	OUT D31+	b25	74	ye/rdgn	OUT D30-	a25	73	rggn/ye	OUT D30+
c26	78	bn/rdgn	OUT D32-	b26	77	rdgn/bn	OUT D32+	a26	76	gn/rdgn	OUT D31-
c27	81	rdbn/bu	OUT D34+	b27	80	bk/rdgn	OUT D33-	a27	79	rdgn/bk	OUT D33+
c28	84	ye/rdbn		b28	83	rdbn/ye		a28	82	bu/rdbn	OUT D34-
c29	87	rdbn/bn	OUT D36+	b29	86	gn/rdbn	OUT D35-	a29	85	rdbn/gn	OUT D35+
c30	90	bk/rdbn	OUT D37-	b30	89	rdbn/bk	OUT D37+	a30	88	bn/rdbn	OUT D36-
c31	93	rdbk/ye	OUT D39+	b31	92	bu/rdbk	OUT D38-	a31	91	rdbk/bu	OUT D38+
c32	96	gn/rdbk		b32	95	rdbk/gn		a32	94	ye/rdbk	OUT D39-

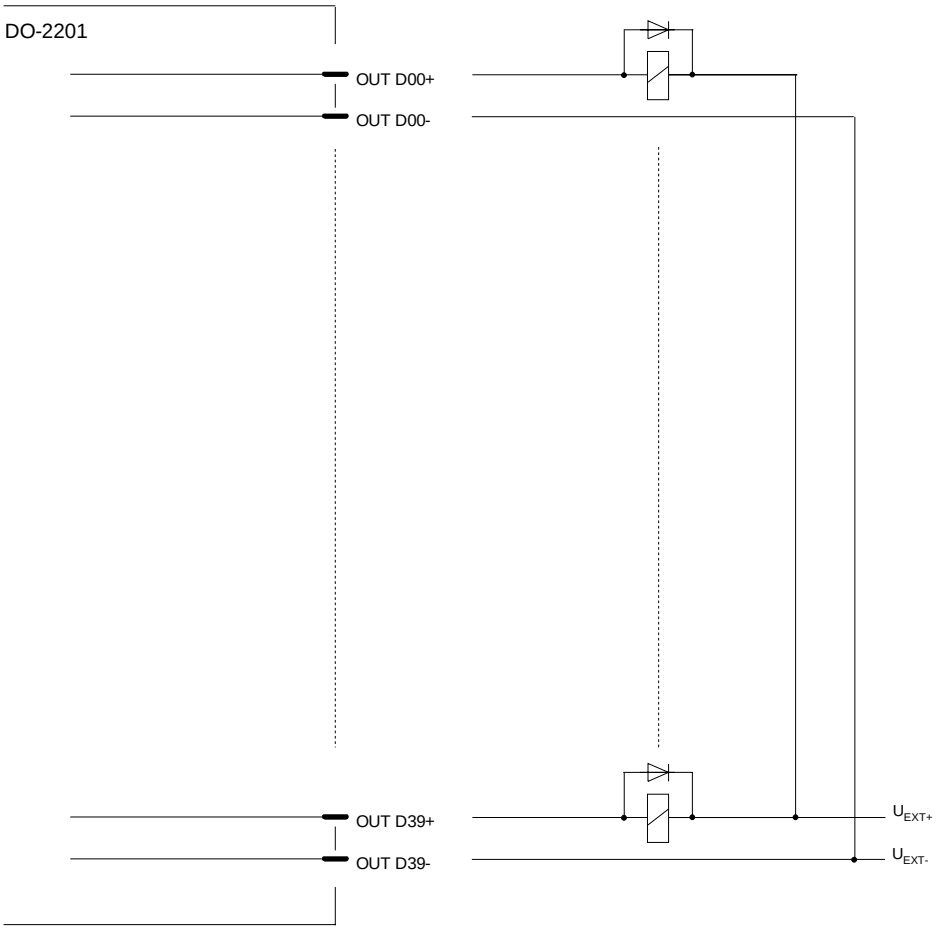
The "DO-2201/X2" column refers to the male connector of the peripheral connectors.

The abbreviations have the following meaning:

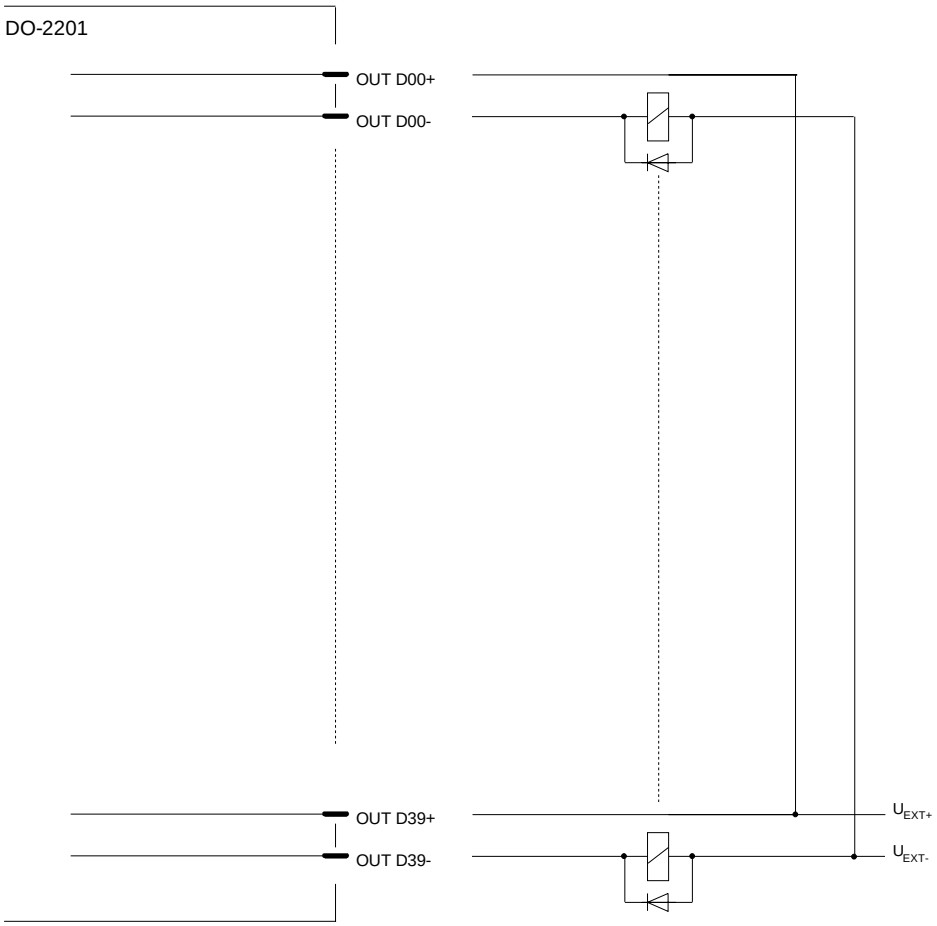
OUT D00+(-) ... OUT D39+(-). . . . . binäre Ausgänge 0 ... 39

2.5.3.4 External Circuitry

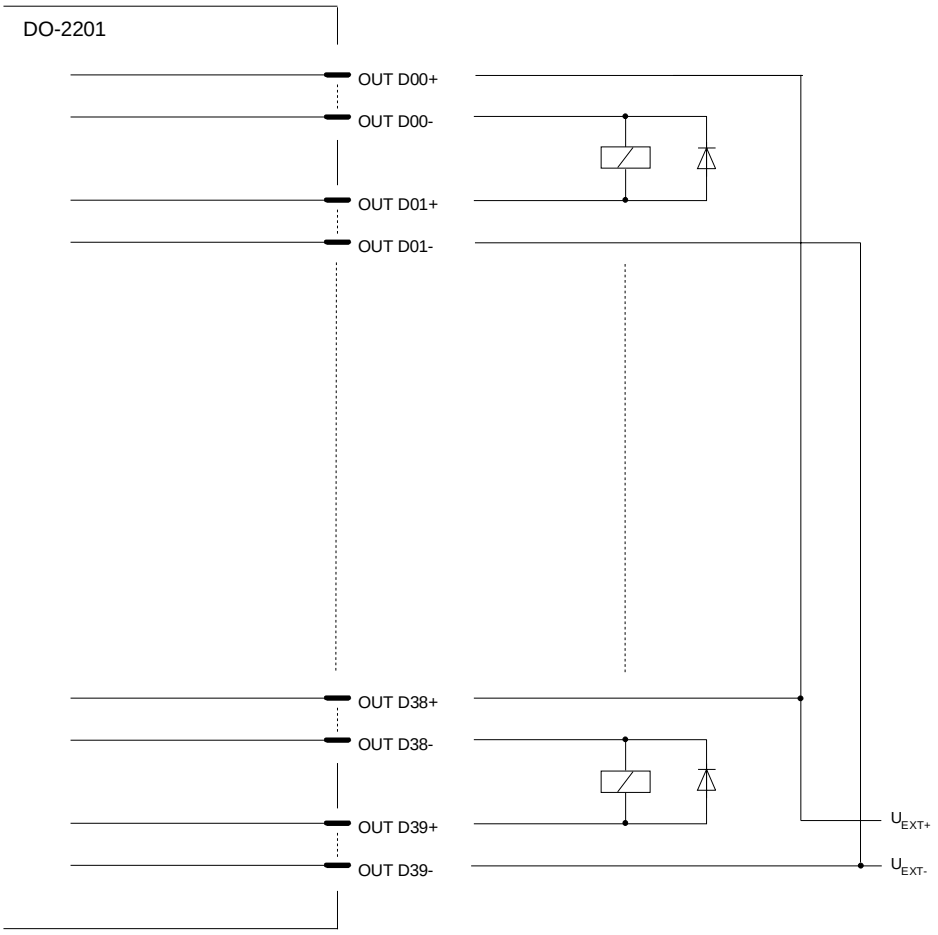
1-pole output, load on the plus pole



1-pole output, load on the minus pole



2-pole output



2.5.3.5 I/O Assignment

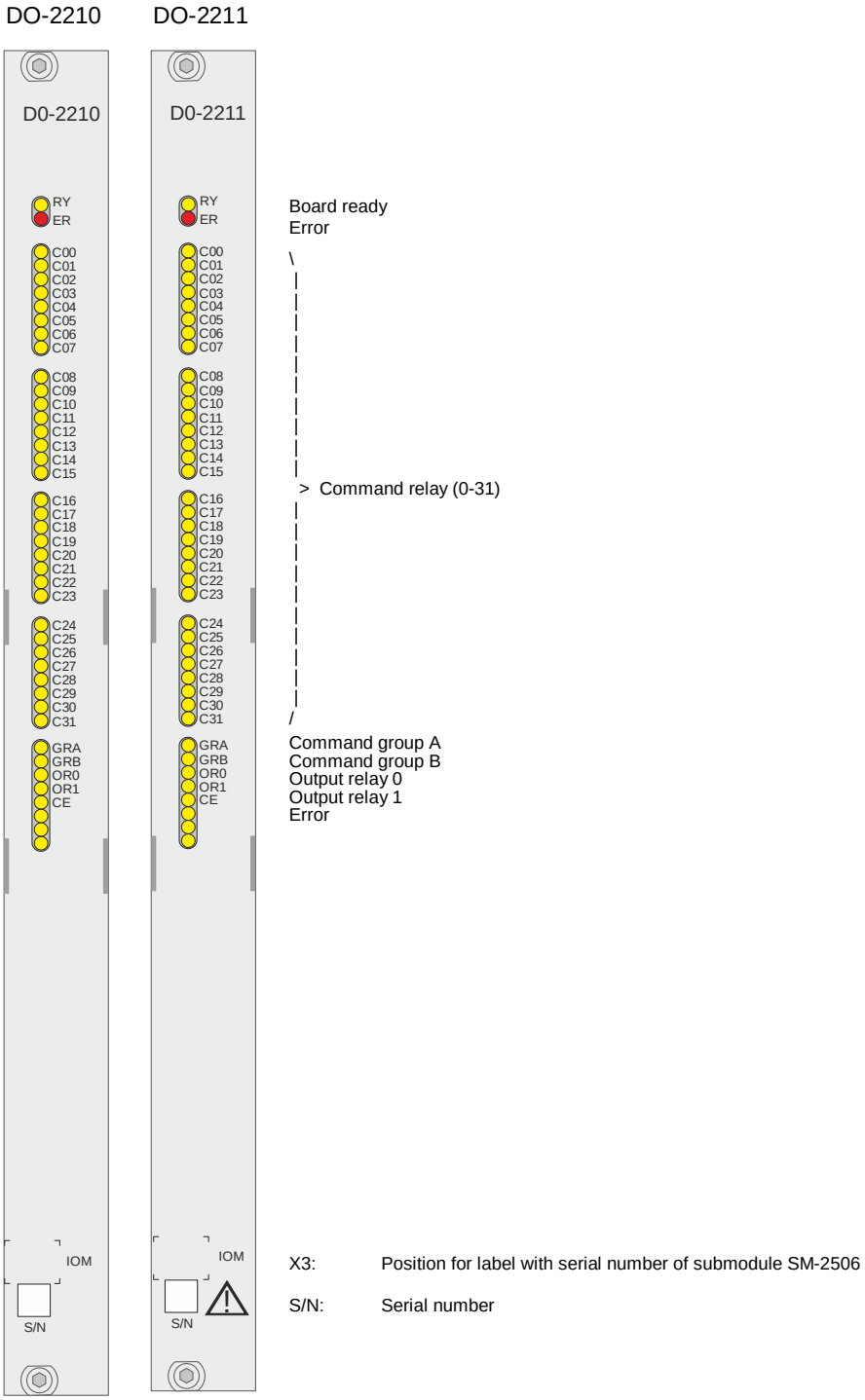
The assignment of the HW pins to the data points and the partitioning into groups is done according to the following scheme.

2.5.3.5.1 Outputs

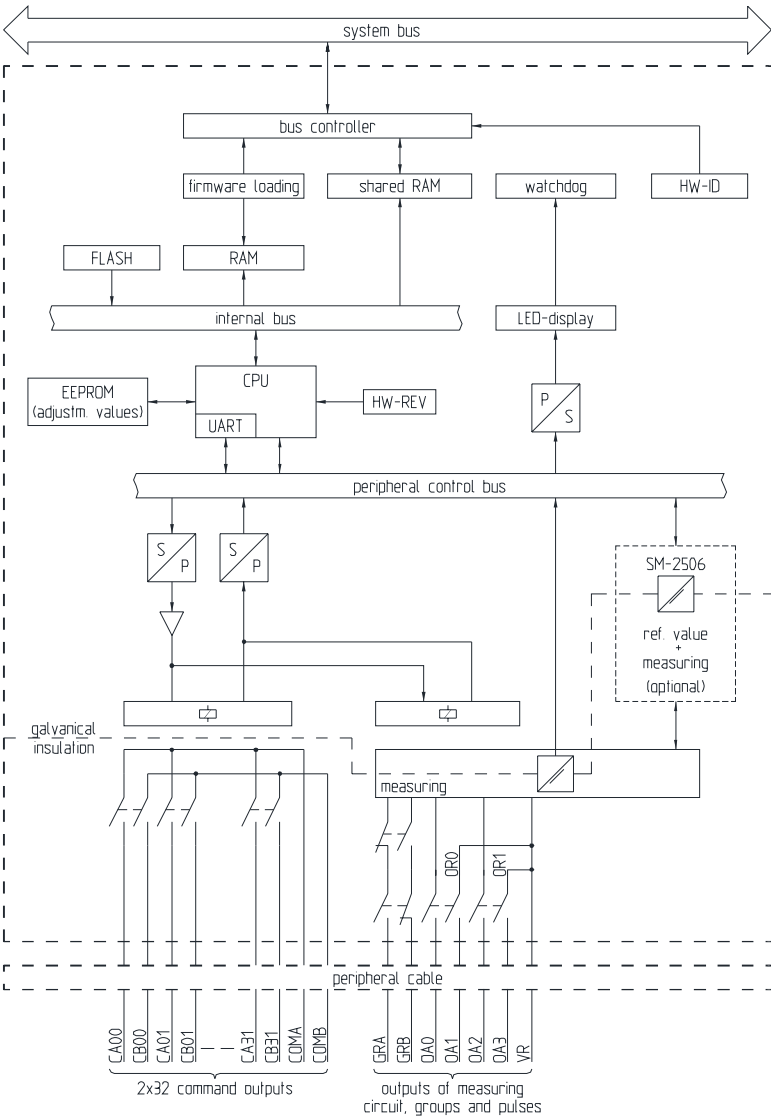
HW Pin	Data Point	Group
OUT D00+ : OUT D02+	Binary information D00 : Binary information D02	0
OUT D03+ OUT D04+	Binary information D03 Binary information D04	1
OUT D05+ : OUT D07+	Binary information D05 : Binary information D07	2
OUT D08+ OUT D09+	Binary information D08 Binary information D09	3
OUT D10+ : OUT D12+	Binary information D10 : Binary information D12	4
OUT D13+ OUT D14+	Binary information D13 Binary information D14	5
OUT D15+ : OUT D17+	Binary information D15 : Binary information D17	6
OUT D18+ OUT D19+	Binary information D18 Binary information D19	7
OUT D20+ : OUT D22+	Binary information D20 : Binary information D22	8
OUT D23+ : OUT D24+	Binary information D23 : Binary information D24	9
OUT D25+ : OUT D27+	Binary information D25 : Binary information D27	10
OUT D28+ OUT D29+	Binary information D28 Binary information D29	11
OUT D30+ : OUT D32+	Binary information D30 : Binary information D32	12
OUT D33+ OUT D34+	Binary information D33 Binary information D34	13
OUT D35+ : OUT D37+	Binary information D35 : Binary information D37	14
OUT D38+ OUT D39+	Binary information D38 Binary information D39	15

2.5.4 DO-2210/PCCO2x, DO-2211/PCCO2x

2.5.4.1 Front Panel



2.5.4.2 Block Diagram



Warning

An insulation plate must be installed left and right of the module DO-2111.

One insulation plate is included to this board. Further can be ordered with following number:

Insulation plate double-Euro format T12-001 / 6MF13010CA010AA0

Insulation plate holder ..... TC2-099 / (4 pieces per insulation plate) 6MF13133CA000AA0

There is no reinforced isolation between the peripheral circuits. Therefore, it is not allowed to protect each circuit within one board separately using various fuses.

2.5.4.3 Pin Assignment

A 96-pin male connector according to DIN 41612 type C is used. The peripheral connector's pin assignment is described in the following table.

DO-221x	peripheral cable		signal	DO-221x	peripheral cable		signal	DO-221x	peripheral cable		signal
X2	wire	colour		X2	wire	colour		X2	wire	colour	
c1	03	whbu/ye	CA02	b1	02	bu/whbu	CA01	a1	01	whbu/bu	CA00
c2	06	gn/whbu	CA05	b2	05	whbu/gn	CA04	a2	04	ye/whbu	CA03
c3	09	whbu/bk	COMA	b3	08	bn/whbu	CA07	a3	07	whbu/bn	CA06
c4	12	bu/whye		b4	11	whye/bu		a4	10	bk/whbu	GRA
c5	15	whye/gn	CB02	b5	14	ye/whye	CB01	a5	13	whye/ye	CB00
c6	18	bn/whye	CB05	b6	17	whye/bn	CB04	a6	16	gn/whye	CB03
c7	21	whgn/bu	COMB	b7	20	bk/whye	CB07	a7	19	whye/bk	CB06
c8	24	ye/whgn		b8	23	whgn/ye		a8	22	bu/whgn	GRB
c9	27	whgn/bn	CB10	b9	26	gn/whgn	CB09	a9	25	whgn/gn	CB08
c10	30	bk/whgn	CB13	b10	29	whgn/bk	CB12	a10	28	bn/whgn	CB11
c11	33	whbn/ye	COMB	b11	32	bu/whbn	CB15	a11	31	whbn/bu	CB14
c12	36	gn/whbn		b12	35	whbn/gn		a12	34	ye/whbn	
c13	39	whbn/bk	CA10	b13	38	bn/whbn	CA09	a13	37	whbn/bn	CA08
c14	42	bu/whbk	CA13	b14	41	whbk/bu	CA12	a14	40	bk/whbn	CA11
c15	45	whbk/gn	COMA	b15	44	ye/whbk	CA15	a15	43	whbk/ye	CA14
c16	48	bn/whbk		b16	47	whbk/bn		a16	46	gn/whbk	OA3
c17	51	rdbu/bu	CA18	b17	50	bk/whbk	CA17	a17	49	whbk/bk	CA16
c18	54	ye/rdbu	CA21	b18	53	rdbu/ye	CA20	a18	52	bu/rdbu	CA19
c19	57	rdbu/bn	COMA	b19	56	gn/rdbu	CA23	a19	55	rdbu/gn	CA22
c20	60	bk/rdbu		b20	59	rdbu/bk		a20	58	bn/rdbu	OA1
c21	63	rdye/ye	CB18	b21	62	bu/rdye	CB17	a21	61	rdye/bu	CB16
c22	66	gn/rdye	CB21	b22	65	rdye/gn	CB20	a22	64	ye/rdye	CB19
c23	69	rdye/bk	COMB	b23	68	bn/rdye	CB23	a23	67	rdye/bn	CB22
c24	72	bu/rdgn		b24	71	rdgn/bu		a24	70	bk/rdye	OA2
c25	75	rdgn/gn	CB26	b25	74	ye/rdgn	CB25	a25	73	rggn/ye	CB24
c26	78	bn/rdgn	CB29	b26	77	rdgn/bn	CB28	a26	76	gn/rdgn	CB27
c27	81	rdbn/bu	COMB	b27	80	bk/rdgn	CB31	a27	79	rdgn/bk	CB30
c28	84	ye/rdbn		b28	83	rdbn/ye	VR	a28	82	bu/rdbn	OA0
c29	87	rdbn/bn	CA26	b29	86	gn/rdbn	CA25	a29	85	rdbn/gn	CA24
c30	90	bk/rdbn	CA29	b30	89	rdbn/bk	CA28	a30	88	bn/rdbn	CA27
c31	93	rdbk/ye	COMA	b31	92	bu/rdbk	CA31	a31	91	rdbk/bu	CA30
c32	96	gn/rdbk		b32	95	rdbk/gn		a32	94	ye/rdbk	

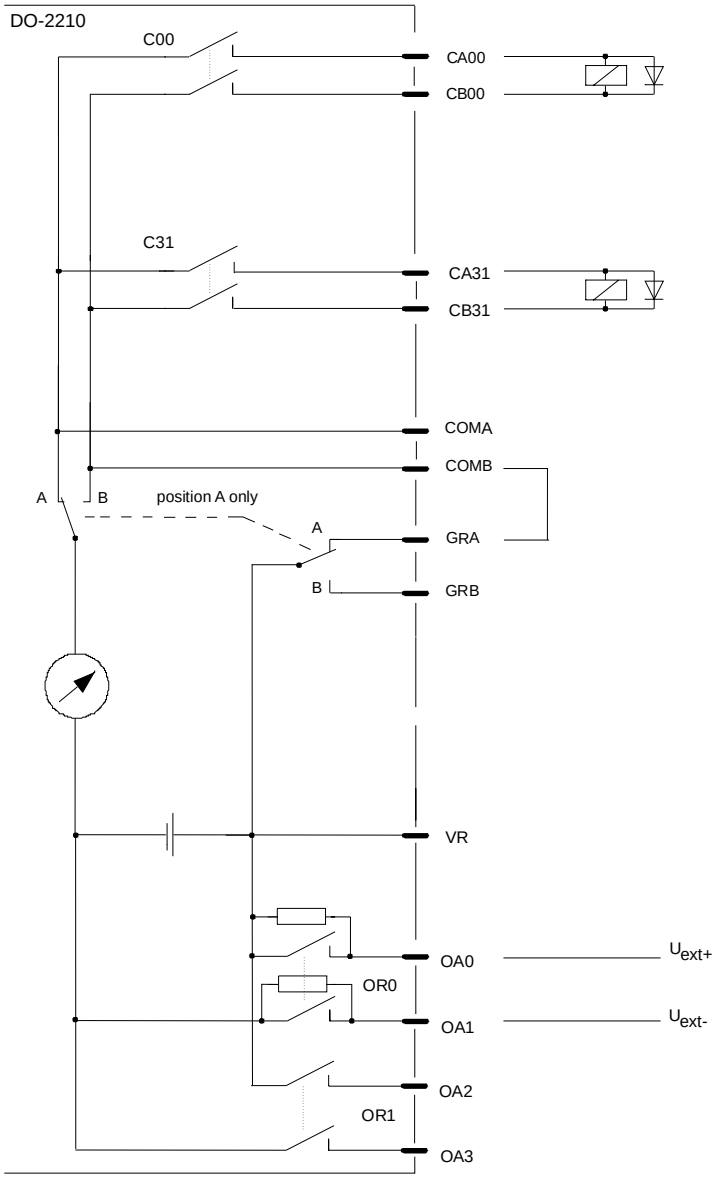
The "DO/X2" column refers to the male connector of the peripheral connectors.

The abbreviations have the following meaning:

CA00 ... CA31 . . . . . command output group A 0 ... 31
CB00 ... CB31 . . . . . command output group B 0 ... 31
COMA, COMB . . . . . common CA, CB
GRA, GRB . . . . . 2 group outputs
OA0 ... OA3 . . . . . 4 pulse outputs
OR0, OR1 . . . . . output relay 0, 1
VR . . . . . measuring circuit for command outp

2.5.4.4 External Circuitry

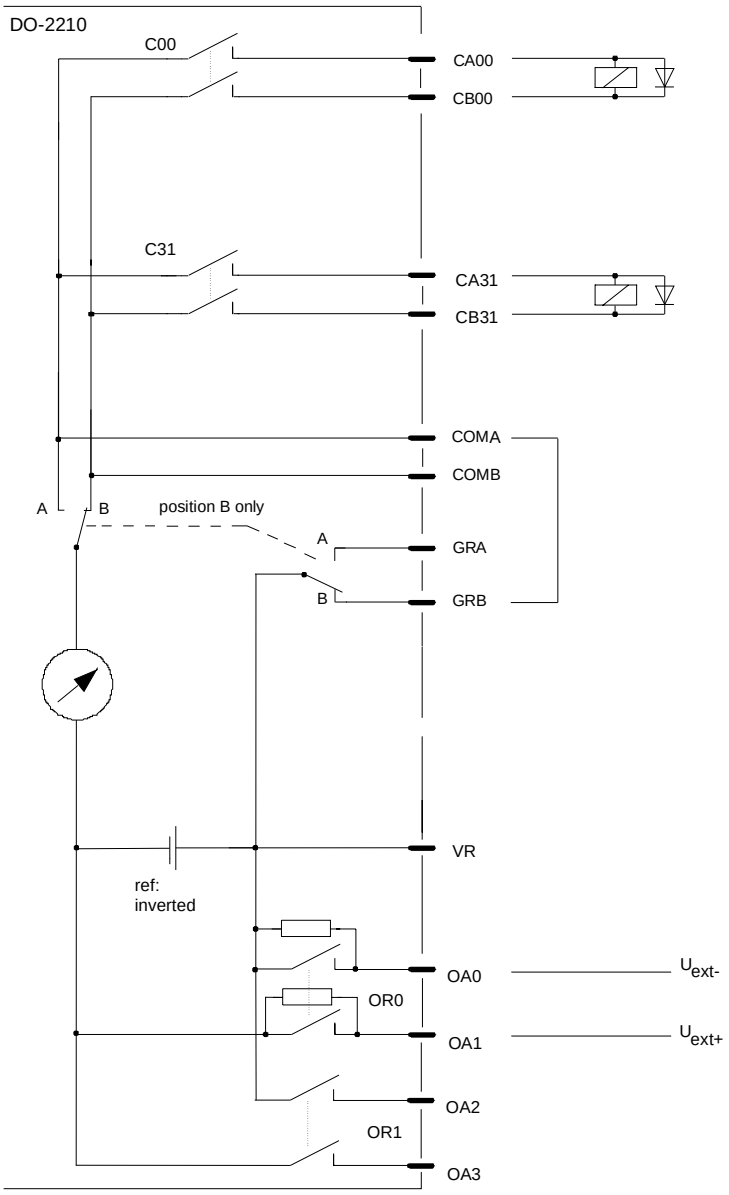
32 2-pole commands, measuring in the minus circuit



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

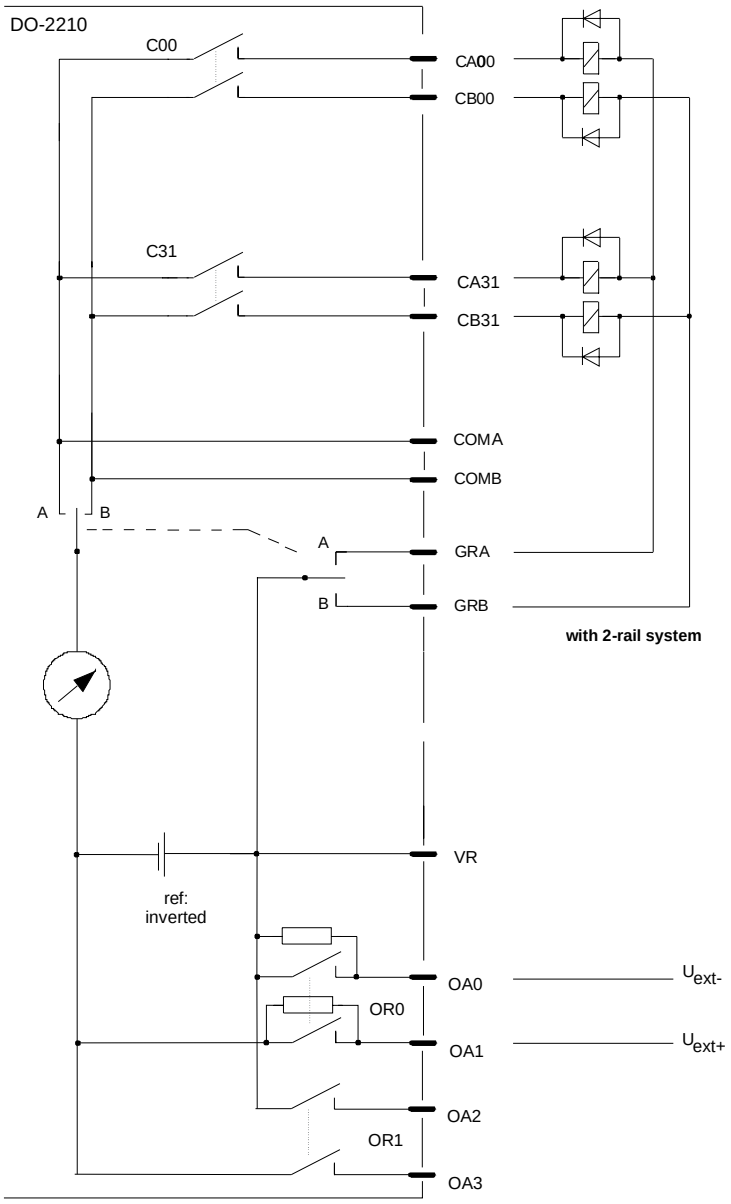
32 2-pole commands, measuring in the plus circuit



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

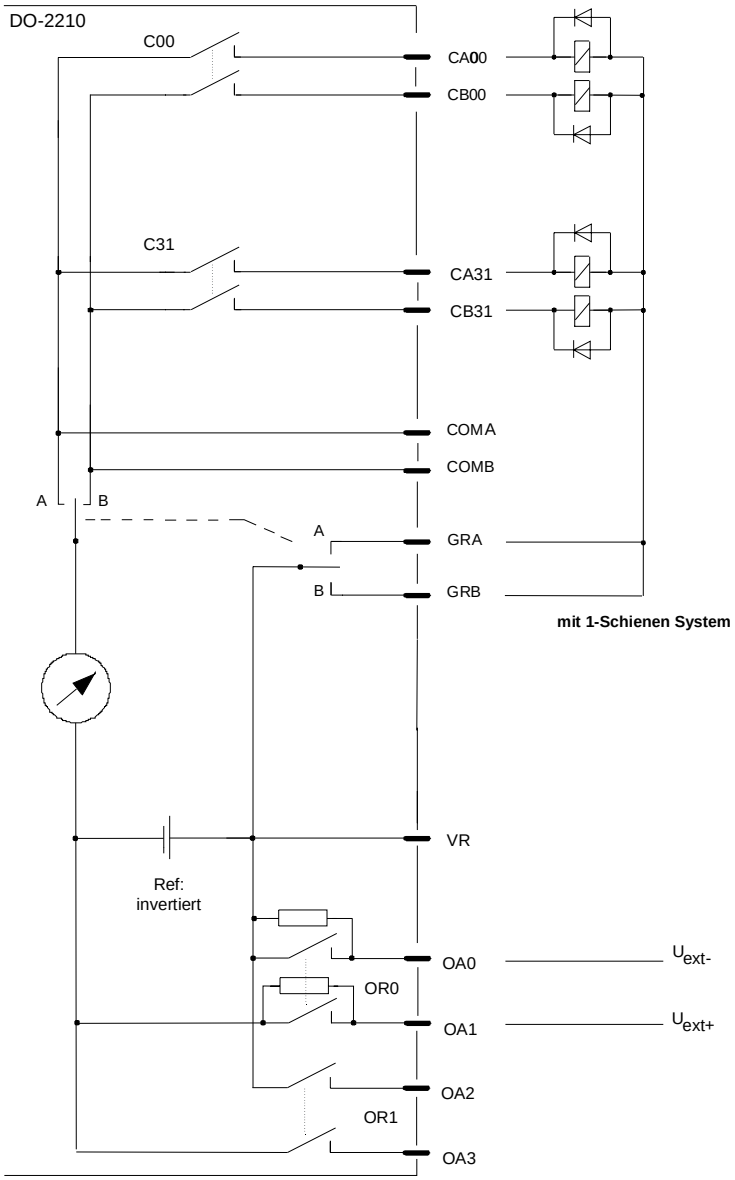
64 1½-pole commands, relay common return on minus pole with 2-rail system



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

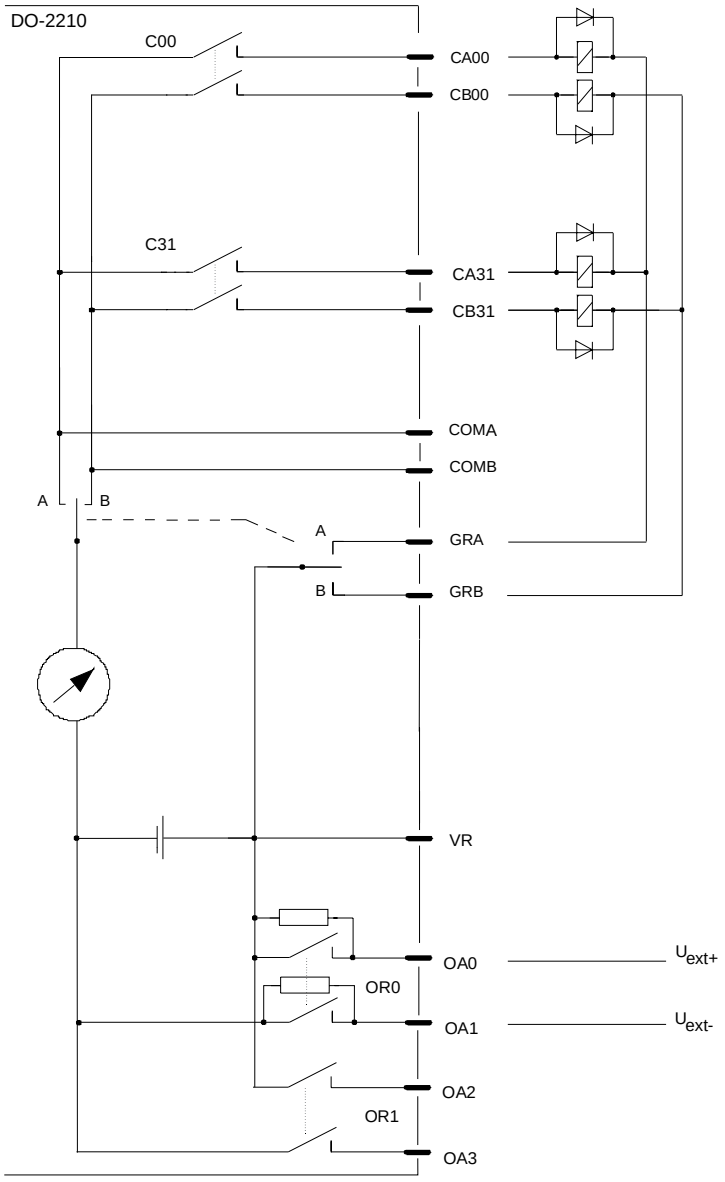
64 1½-pole commands, relay common return on minus pole with 1-rail system



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

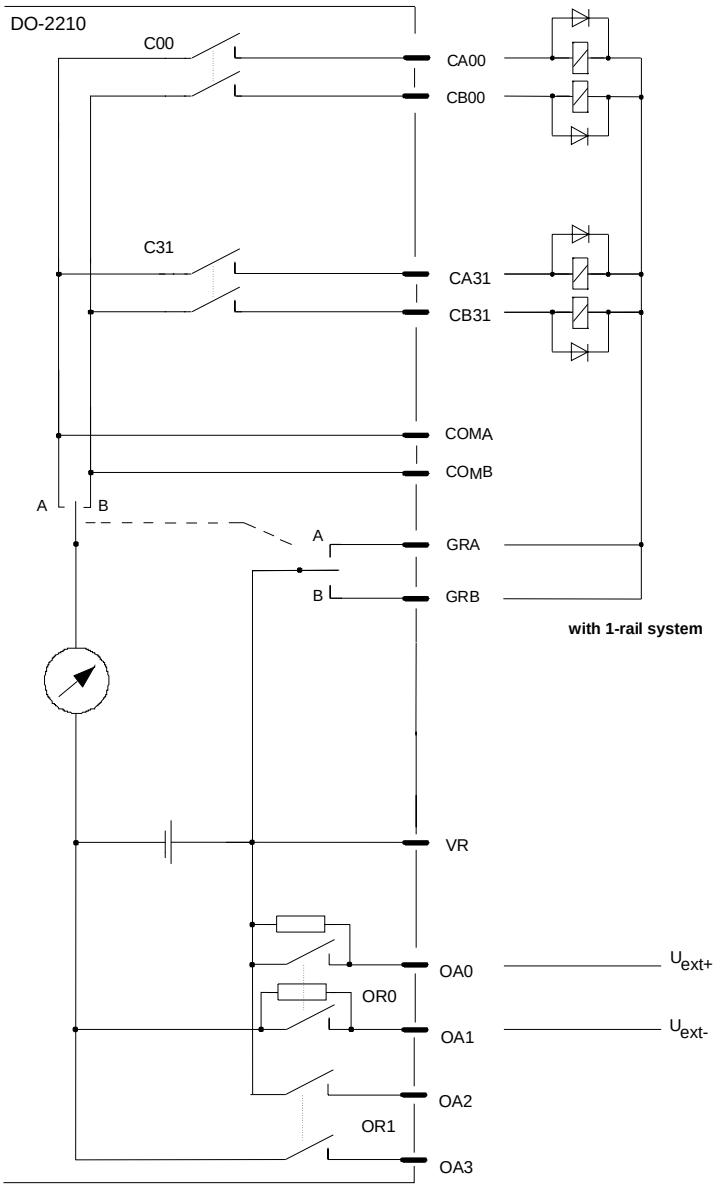
64 1½-pole commands, relay common return on plus pole with 2-rail system



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

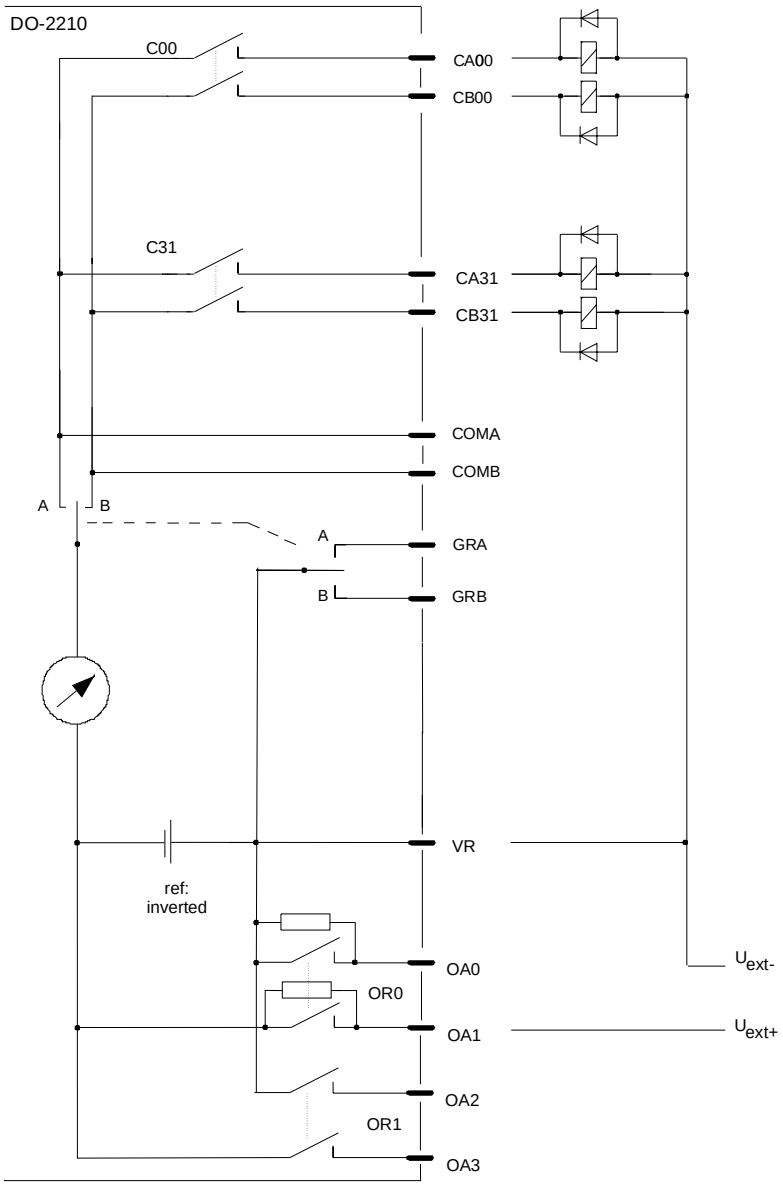
64 1½-pole commands, relay common return on plus pole with 1-rail system



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

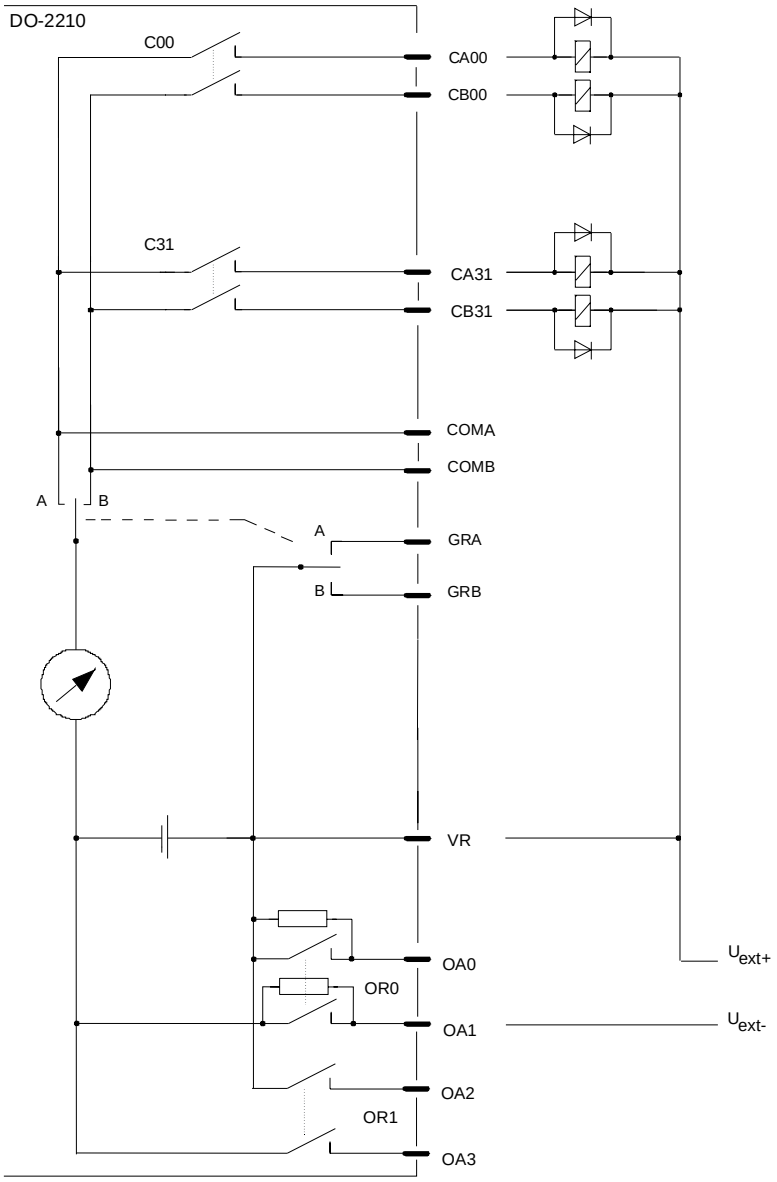
64 1-pole commands, relay common return on minus pole



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

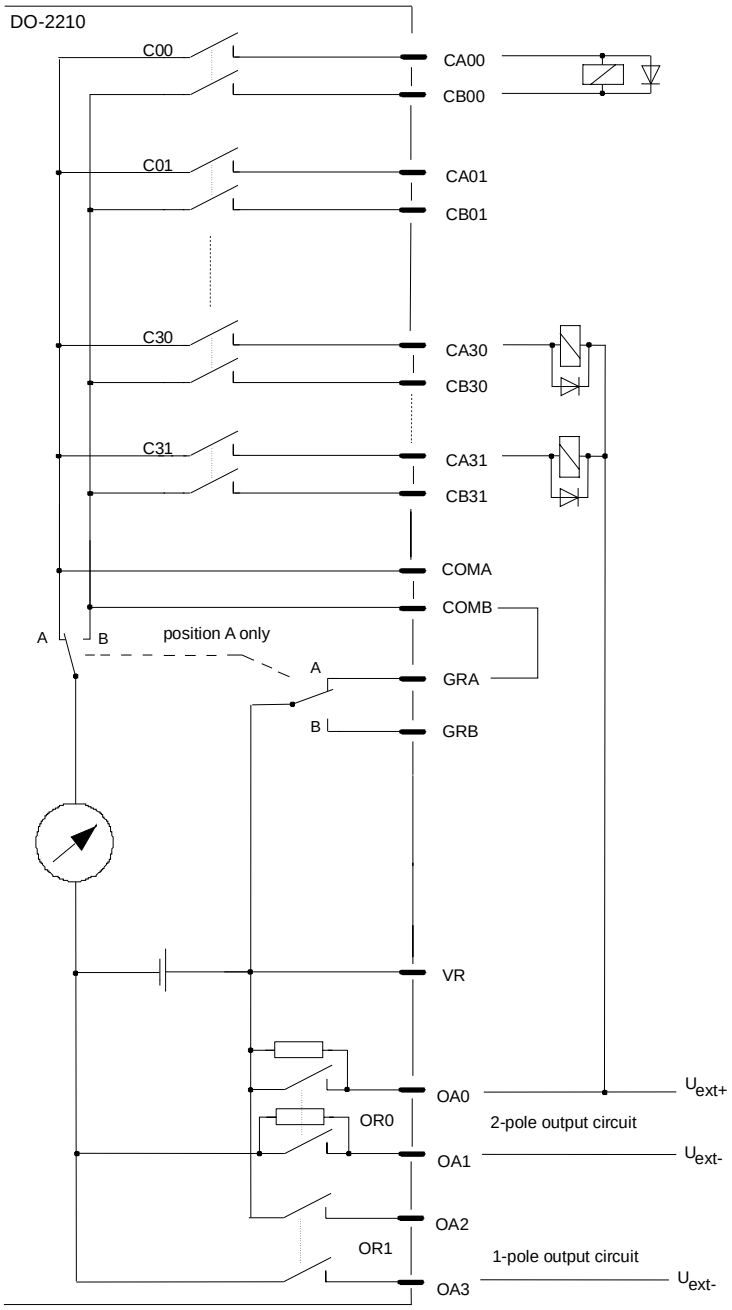
64 1-pole commands, relay common return on plus pole



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

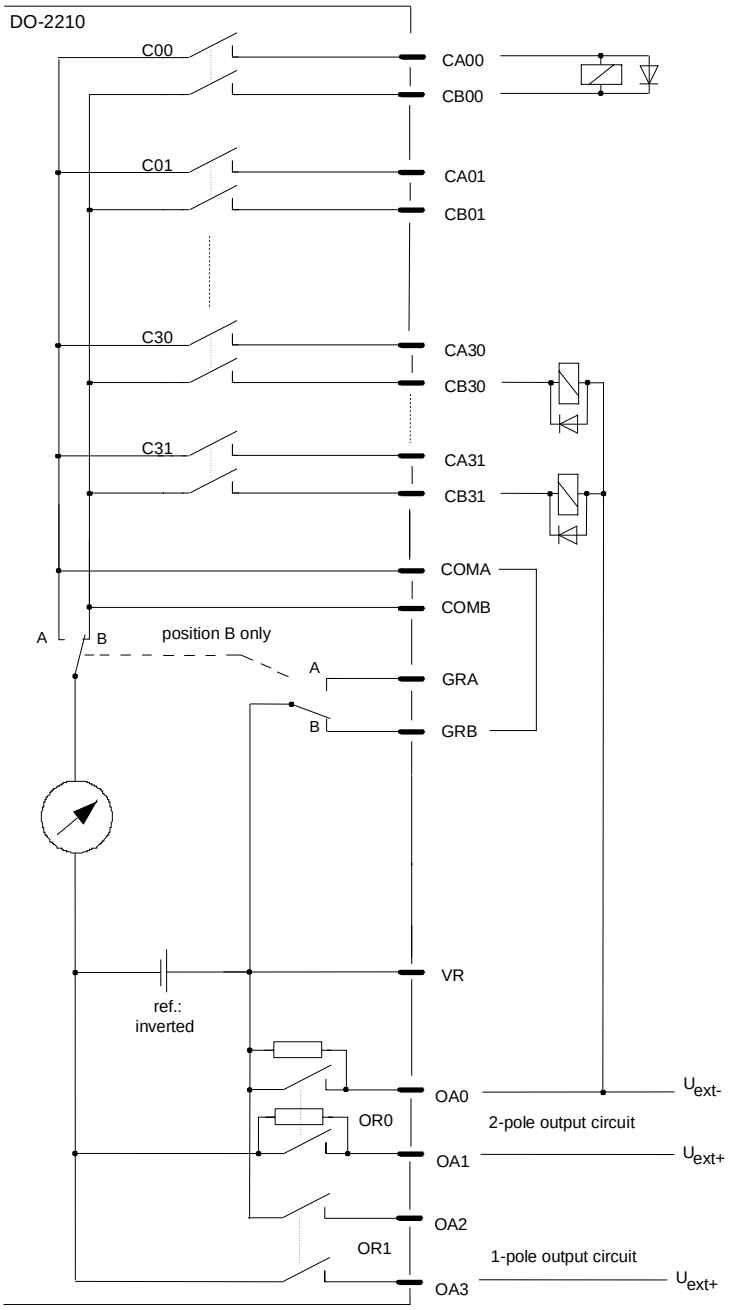
Mixed circuitry: 1-pole and 2-pole commands, with one fused circuit each, and measuring in the minus circuit



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

Mixed circuitry: 1-pole and 2-pole commands, with one fused circuit each, and measuring in the plus circuit



Note

The fused circuit with output relay OR0 must be used before the fused circuit with output relay OR1.

2.5.4.5 I/O Assignment

The assignment of the HW pins to the data points is done according to the following scheme.

2.5.4.5.1 Outputs

Pulse Commands - PCCO26

HW pin	Data point
Single command 1-pole and 1½-pole	
CA00 CA01 CA02 : CA31	Command CA00 (RI:SI D00) Command CA01 (RI:SI D01) Command CA02 (RI:SI D02) : Command CA31 (RI:SI D31)
CB00 CB01 : CB31	Command CB00 (RI:SI D32) Command CB01 (RI:SI D33) : Command CB31 (RI:SI D63)
Single command 2-pole	
CA00 / CB00 CA01 / CB01 : CA30 / CB30 CA31 / CB31	Command CA00/CB00 (RI:SI D00) Command CA01/CB01 (RI:SI D01) : Command CA30/CB30 (RI:SI D30) Command CA31/CB31 (RI:SI D31)
Double command 1-pole and 1½-pole	
CA00, CA01 CA02, CA03 : CA30, CA31	Command CA00/CA01 (RI:DI D00/D01) Command CA02/CA03 (RI:DI D02/D03) : Command CA30/CA31 (RI:DI D30/D31)
CB00, CB01 CB02, CB03 : CB30, CB31	Command CB00/CB01 (RI:DI D32/D33) Command CB02/CB03 (RI:DI D34/D35) : Command CB30/CB31 (RI:DI D62/D63)
Double command 2-pole	
CA00 / CB00, CA01 / CB01 CA02 / CB02, CA03 / CB03 : CA30 / CB30, CA31 / CB31	Command CA00..CB01 (RI:DI D00/D01) Command CA02..CB03 (RI:DI D02/D03) : Command CA30..CB31 (RI:DI D30/D31)

Pulse Commands - PCCO27

Single command 1-pole and 1½-pole	
CA00 CB00 CA01	Command CA00 (CSI:SI D00) Command CB00 (CSI:SI D01) Command CA01 (CSI:SI D02)
CB01 : CA31 CB31	Command CB01 (CSI:SI D03) : Command CA31 (CSI:SI D62) Command CB31 (CSI:SI D63)
Single command 2-pole	
CA00 / CB00 CA01 / CB01 : CA30 / CB30 CA31 / CB31	Command CA00/CB00 (CSI:SI D00) Command CA01/CB01 (CSI:SI D02) : Command CA30/CB30 (CSI:SI D60) Command CA31/CB31 (CSI:SI D62)
Double command 1-pole and 1½-pole	
CA00, CB00 CA01, CB01 : CA30, CB30 CA31, CB31	Command CA00/CB00 (CSI:DI D00/D01) Command CA01/CB01 (CSI:DI D02/D03) : Command CA30/CB30 (CSI:DI D60/D61) Command CA31/CB31 (CSI:DI D62/D63)
Double command 2-pole	
CA00 / CB00, CA01 / CB01 CA02 / CB02, CA03 / CB03 CA04 / CB04, CA05 / CB05 : CA28 / CB28, CA29 / CB29 CA30 / CB30, CA31 / CB31	Command CA00…CB01 (CSI:DI D00/D01) Command CA02…CB03 (CSI:DI D04/D05) Command CA04…CB03 (CSI:DI D08/D09) : Command CA28…CB29 (CSI:DI D56/D57) Command CA30…CB31 (CSI:DI D60/D61)

2.5.4.6 Return Information to Pulse Command Assignment

Assignment BISX26 to PCCO26 (assigning commands without building groups)

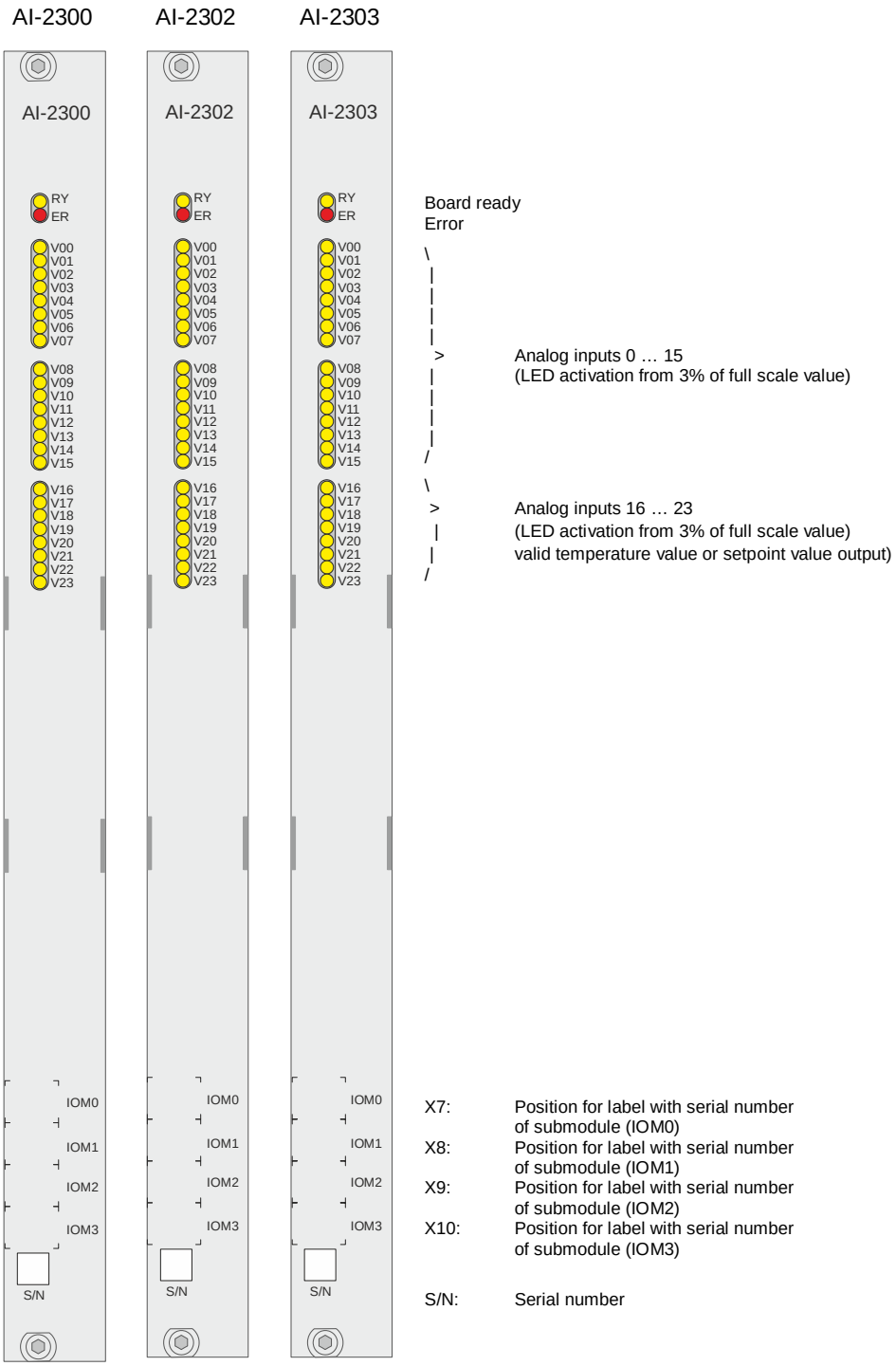
Type	Assignment
Single information to single command (1-pole, 1.5-pole)	SI D00…command CA00 SI D01...command CA01 : SI D31…command CA31 SI D32…command CB00 SI D33…command CB01 : SI D63…command CB31
Single information to single command (2-pole)	SI D00…command CA00/CB00 SI D01…command CA01/CB01 : SI D31…command CA31/CB31
Double information to double command (1-pole, 1.5-pole)	DI D00/D01…command CA00/CA01 DI D02/D03…command CA02/CA03 : DI D30/D31…command CA30/CA31 DI D32/D33…command CB00/CB01 DI D34/D35…command CB02/CB03 : DI D62/D63…command CB30/CB31
Double information to double command (2-pole)	DI D00/D01…command CA00..CB01 DI D02/D03…command CA02..CB03 : DI D30/D31…command CA30..CB31

Assignment BISX26 to PCCO27 (assigning commands in groups)

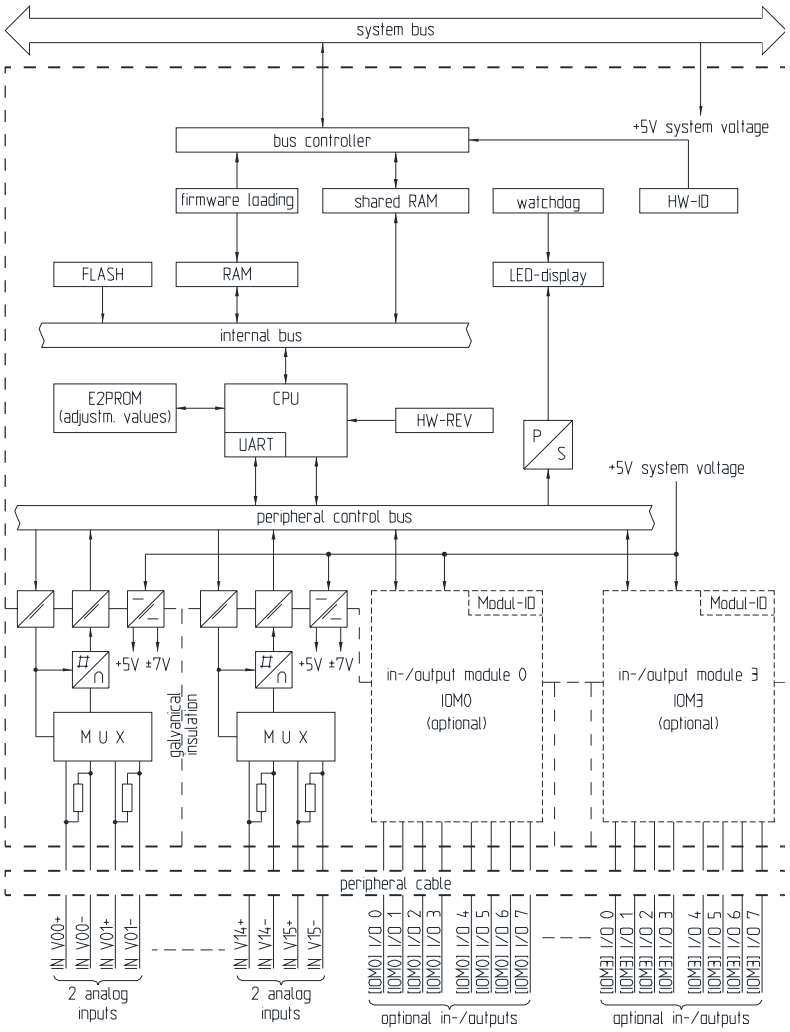
Type	Assignment
Single information to single command (1-pole, 1.5-pole)	SI D00…command CA00 SI D01…command CB00 SI D02…command CA01 SI D03…command CB01 : SI D62…command CA31 SI D63…command CB31
Single information to single command (2-pole)	SI D00…command CA00/CB00 SI D02…command CA01/CB01 : SI D60…command CA30/CB30 SI D62…command CA31/CB31
Double information to double command (1-pole, 1.5-pole)	DI D00/D01…command CA00/CB00 DI D02/D03…command CA01/CB01 : DI D62/D63…command CA31/CB31
Double information to double command (2-pole)	DI D00/D01…command CA00..CB01 DI D04/D05…command CA02..CB03 : DI D56/D57…command CA28..CB29 DI D60/D61…command CA30..CB31

2.5.5 AI-2300/PASI25, AI-2302/PASI25, AI-2303/PASI25

2.5.5.1 Front Panel



2.5.5.2 Block Diagram



2.5.5.3 Pin Assignment

A 96-pin male connector according to DIN 41612 type C is used. The peripheral connector's pin assignment is described in the following table.

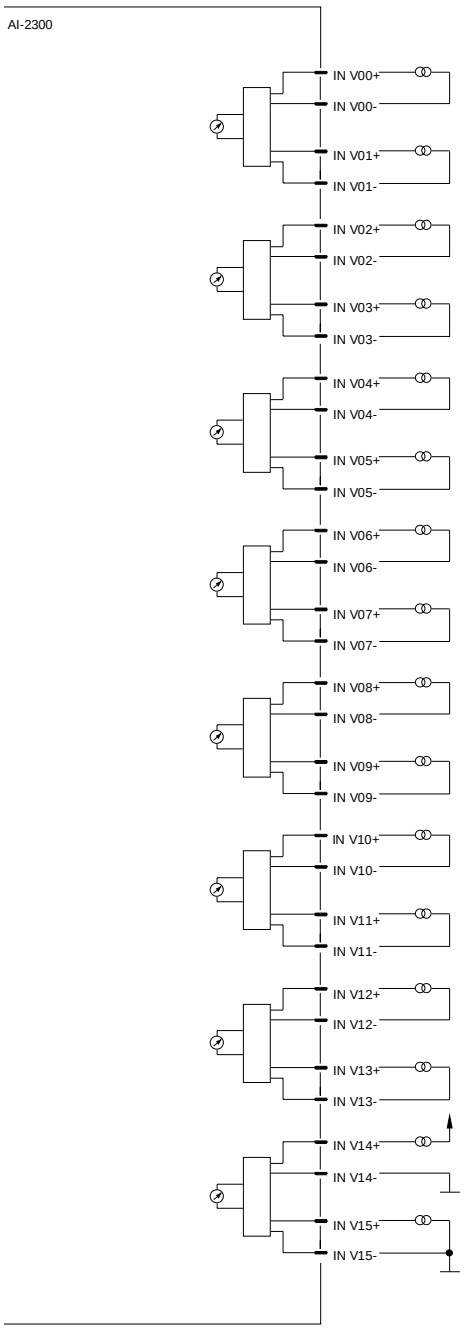
AI-2300	peripheral cable		signal	AI-2300	peripheral cable		signal	AI-2300	peripheral cable		signal
X2	wire	colour		X2	wire	colour		X2	wire	colour	
c1	03	whbu/ye	IN V01+	b1	02	bu/whbu	IN V00-	a1	01	whbu/bu	IN V00+
c2	06	gn/whbu		b2	05	whbu/gn		a2	04	ye/whbu	IN V01-
c3	09	whbu/bk	IN V03+	b3	08	bn/whbu	IN V02-	a3	07	whbu/bn	IN V02+
c4	12	bu/whye		b4	11	whye/bu		a4	10	bk/whbu	IN V03-
c5	15	whye/gn	[IOM0] I/O 2	b5	14	ye/whye	[IOM0] I/O 1	a5	13	whye/ye	[IOM0] I/O 0
c6	18	bn/whye		b6	17	whye/bn		a6	16	gn/whye	[IOM0] I/O 3
c7	21	whgn/bu	[IOM0] I/O 6	b7	20	bk/whye	[IOM0] I/O 5	a7	19	whye/bk	[IOM0] I/O 4
c8	24	ye/whgn		b8	23	whgn/ye		a8	22	bu/whgn	[IOM0] I/O 7
c9	27	whgn/bn	IN V05+	b9	26	gn/whgn	IN V04-	a9	25	whgn/gn	IN V04+
c10	30	bk/whgn		b10	29	whgn/bk		a10	28	bn/whgn	IN V05-
c11	33	whbn/ye	IN V07+	b11	32	bu/whbn	IN V06-	a11	31	whbn/bu	IN V06+
c12	36	gn/whbn		b12	35	whbn/gn		a12	34	ye/whbn	IN V07-
c13	39	whbn/bk	[IOM1] I/O 2	b13	38	bn/whbn	[IOM1] I/O 1	a13	37	whbn/bn	[IOM1] I/O 0
c14	42	bu/whbk		b14	41	whbk/bu		a14	40	bk/whbn	[IOM1] I/O 3
c15	45	whbk/gn	[IOM1] I/O 6	b15	44	ye/whbk	[IOM1] I/O 5	a15	43	whbk/ye	[IOM1] I/O 4
c16	48	bn/whbk		b16	47	whbk/bn		a16	46	gn/whbk	[IOM1] I/O 7
c17	51	rdbu/bu	IN V09+	b17	50	bk/whbk	IN V08-	a17	49	whbk/bk	IN V08+
c18	54	ye/rdbu		b18	53	rdbu/ye		a18	52	bu/rdbu	IN V09-
c19	57	rdbu/bn	IN V11+	b19	56	gn/rdbu	IN V10-	a19	55	rdbu/gn	IN V10+
c20	60	bk/rdbu		b20	59	rdbu/bk		a20	58	bn/rdbu	IN V11-
c21	63	rdye/ye	[IOM2] I/O 2	b21	62	bu/rdye	[IOM2] I/O 1	a21	61	rdye/bu	[IOM2] I/O 0
c22	66	gn/rdye		b22	65	rdye/gn		a22	64	ye/rdye	[IOM2] I/O 3
c23	69	rdye/bk	[IOM2] I/O 6	b23	68	bn/rdye	[IOM2] I/O 5	a23	67	rdye/bn	[IOM2] I/O 4
c24	72	bu/rdgn		b24	71	rdgn/bu		a24	70	bk/rdye	[IOM2] I/O 7
c25	75	rdgn/gn	IN V13+	b25	74	ye/rdgn	IN V12-	a25	73	rggn/ye	IN V12+
c26	78	bn/rdgn		b26	77	rdgn/bn		a26	76	gn/rdgn	IN V13-
c27	81	rdbn/bu	IN V15+	b27	80	bk/rdgn	IN V14-	a27	79	rdgn/bk	IN V14+
c28	84	ye/rdbn		b28	83	rdbn/ye		a28	82	bu/rdbn	IN V15-
c29	87	rdbn/bn	[IOM3] I/O 2	b29	86	gn/rdbn	[IOM3] I/O 1	a29	85	rdbn/gn	[IOM3] I/O 0
c30	90	bk/rdbn		b30	89	rdbn/bk		a30	88	bn/rdbn	[IOM3] I/O 3
c31	93	rdbk/ye	[IOM3] I/O 6	b31	92	bu/rdbk	[IOM3] I/O 5	a31	91	rdbk/bu	[IOM3] I/O 4
c32	96	gn/rdbk		b32	95	rdbk/gn		a32	94	ye/rdbk	[IOM3] I/O 7

The "AI/X2" column refers to the male connector of the peripheral connector.

The abbreviations have the following meaning:

IN V00+(-) ... IN V15+(-) . . . . . analog inputs 0 ... 15 (±20...
[IOM0] I/O 0 ... [IOM0] I/O 7 . . . . . optional in-/outputs (in-/outputmoduls 0)
[IOM1] I/O 0 ... [IOM1] I/O 7 . . . . . optional in-/outputs (in-/outputmoduls 1)
[IOM2] I/O 0 ... [IOM2] I/O 7 . . . . . optional in-/outputs (in-/outputmoduls 2)
[IOM3] I/O 0 ... [IOM3] I/O 7 . . . . . optional in-/outputs (in-/outputmoduls 3)

2.5.5.4 External Circuitry



Circuitry via Optional Submodules

- SM-0570 Analog Input Extension (2x+/-20 mA)
  see section 2.7.2.3, External Circuitry
- SM-0571 Analog Output Extension (2x Pt100)
  see section 2.7.3.3, External Circuitry
- SM-0572 Analog Output Extension (2x ±20 mA/±1 VDC/±10 VDC)
  see section 2.7.4.3, External Circuitry
- SM-0574 Count Pulse Input-Extension (2x 24…60 VDC)
  see section 2.7.5.3, External Circuitry

2.5.5.5 I/O Assignment

The assignment of the HW pins to the data points is done according to the following scheme.

2.5.5.5.1 Inputs

HW pin	Data point
Measured values on AI-2300 (±20 mA), AI-2302 (±6 mA), AI-2303 (±24 mA)	
IN V00+ / IN V00- IN V01+ / IN V01- : IN V15+ / IN V15-	Measured value V00 Measured value V01 : Measured value V15
Optional measured values via SM-0570 (±20 mA)	
[IOMx] I/O 0 / [IOMx] I/O 1 [IOMx] I/O 4 / [IOMx] I/O 5	Measured value [IOMx] I/O 0-1 Measured value [IOMx] I/O 4-5
Optional measured values via SM-0570 (Pt100, Ni100)	
[IOMx] I/O 0 / [IOMx] I/O 1 / [IOMx] I/O 2 / [IOMx] I/O 3 [IOMx] I/O 4 / [IOMx] I/O 5 / [IOMx] I/O 6 / [IOMx] I/O 7	Measured value [IOMx] I/O 0-3 Measured value [IOMx] I/O 4-7
Optional integrated totals via SM-0574 (≤5 kHz, 24…60 VDC)	
[IOMx] I/O 0 / [IOMx] I/O 1 [IOMx] I/O 4 / [IOMx] I/O 5	Measured value [IOMx] I/O 0-1 Measured value [IOMx] I/O 4-5

(x = 0…3)

2.5.5.5.2 Outputs

HW Pin	Data Point
Optional setpoint values via SM-0572 (±20 mA, ±10 mA, ±5 mA; ±1 V, ±10 V)	
[IOMx] I/O 2 / [IOMx] I/O 3 [IOMx] I/O 6 / [IOMx] I/O 7	Measured value [IOMx] I/O 2-3 Measured value [IOMx] I/O 6-7

(x = 0…3)

Note

In the SICAM TOOLBOX II, always AI-2300/PASI25 has to be equipped. The following parameters must be set correspondingly:

	AI-2300	AI-2302	AI-2303
Default-load:	yes	no	no
Bipolar acquisition:	X_100%: 20 mA X_0%: 20 mA	X_100%: 6 mA X_0%: -6 mA	X_100%: 24 mA X_0%: -24 mA
Unipolar acquisition:	X_100%: 20 mA X_0%: 0	X_100%: 6 mA X_0%: 0	X_100%: 24 mA X_0%: 0

2.6 Migration-Peripheral Elements

Following peripheral elements of the product family SICAM AK can be used in SICAM AK 3, if required.

- DI-2100
- DI-2110
- DI-2111
- MX-2400

When using these peripheral elements in SICAM AK 3 you need the belonging front panels:

Designation	Item-Number/MLFB
Front panel MX-2400	TC2-083 / 6MF13130CA830AA0
Front panel DI-2100	TC2-095 / 6MF13131CA050AA0
Front panel DI-2110	TC2-096 / 6MF13131CA060AA0
Front panel DI-2111	TC2-097 / 6MF13131CA070AA0

Note

Details about these boards can be found in following documents:

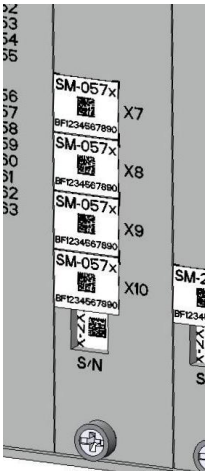
Document name	Item Number
SICAM AK System Description	MC2-021-2
SICAM AK User Manual	DC2-017-2

2.7 Submodules

2.7.1 Glue Serial Number on Front Panel

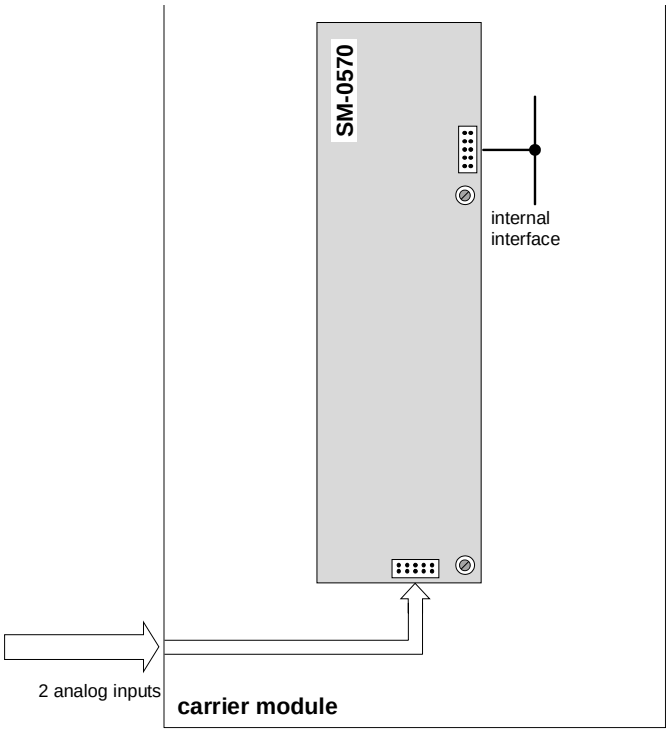
The serial number of each submodule installed on a peripheral element must be glued on the front panel of the carrier module. The label with the serial number is part of the submodule.

The label must be glued as shown in this example.

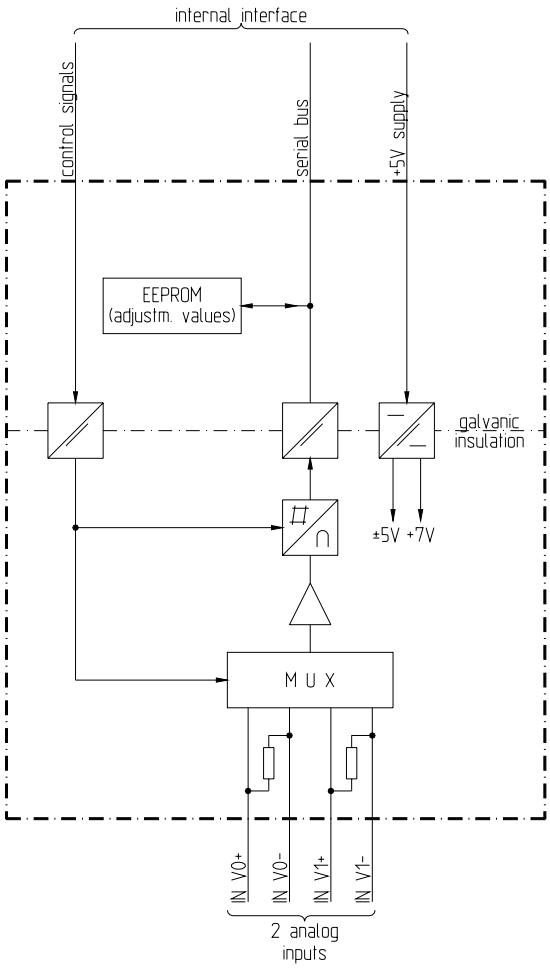


2.7.2 SM-0570

The SM-0570 submodule (analog input extension 2x ±20 mA) provides two analog inputs.



2.7.2.1 Block Diagram



2.7.2.2 Connector to Carrier Module

The pin assignment of the connector is described as follows:

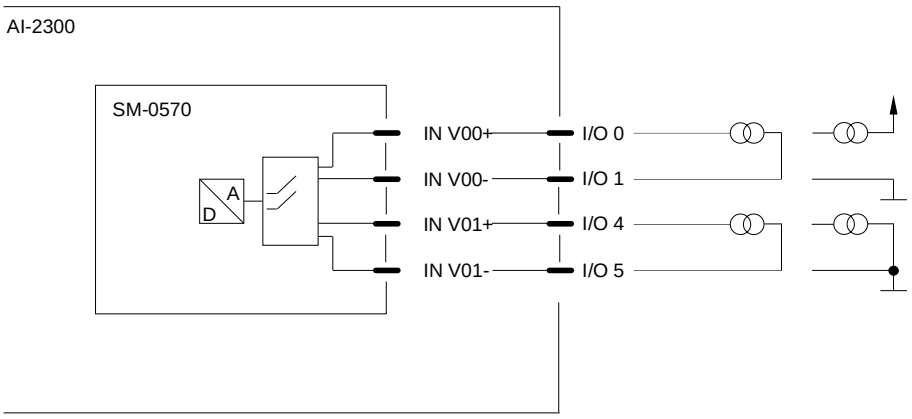
Pin	Alias	Signal	Pin	Alias	Signal
1	I/O 0	IN V0+	2	I/O 1	IN V0-
3	I/O 2		4	I/O 3	
5			6		
7	I/O 4	IN V1+	8	I/O 5	IN V1-
9	I/O 6		10	I/O 7	

The abbreviations have the following meaning:

IN V0+, IN V0- = analog input 0
IN V1+, IN V1- = analog input 1

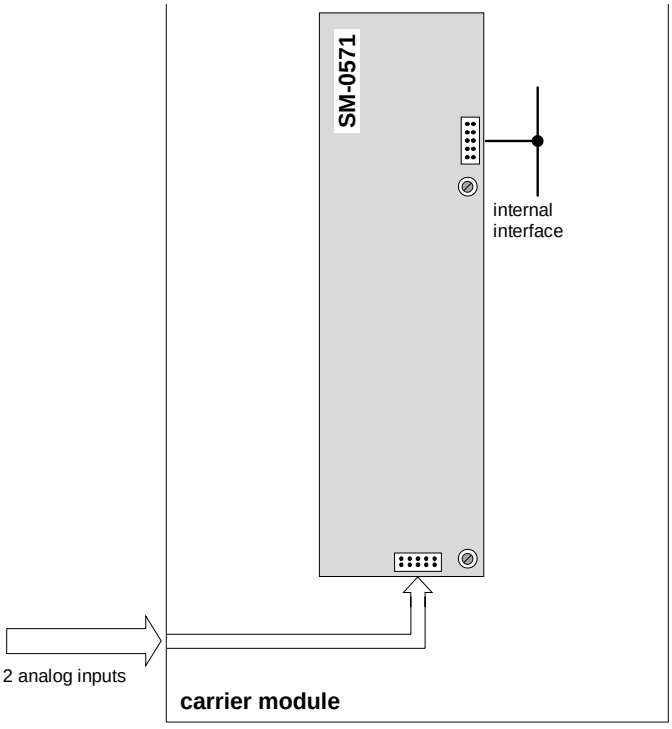
2.7.2.3 External Circuitry

Current Input

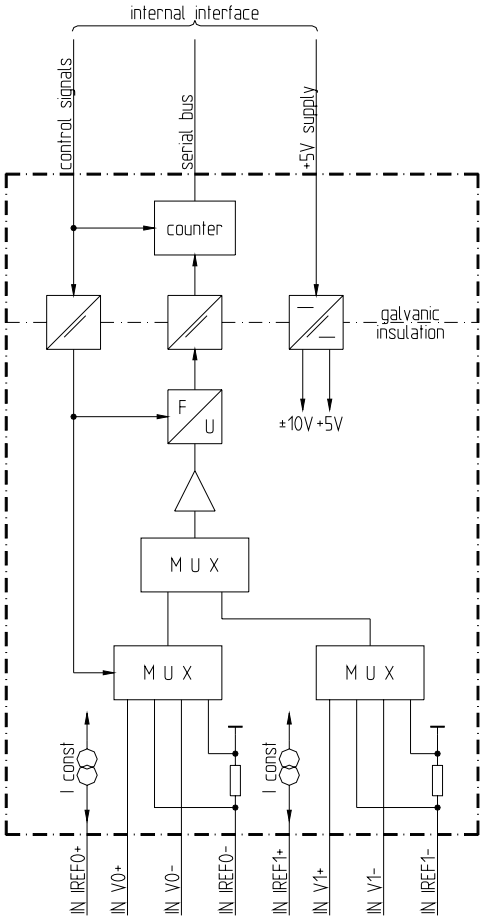


2.7.3 SM-0571

The SM-0571 submodule (analog input extension 2xPt100) provides 2 resistance thermometer inputs for Pt100 or Ni100.



2.7.3.1 Block Diagram



2.7.3.2 Connector to Carrier Module

The pin assignment of the connector is described as follows:

Pin	Alias	Signal	Pin	Alias	Signal
1	I/O 0	IN IREF0-	2	I/O 1	IN IREF0+
3	I/O 2	IN V0-	4	I/O 3	IN V0+
5			6		
7	I/O 4	IN V1-	8	I/O 5	IN V1+
9	I/O 6	IN IREF1-	10	I/O 7	IN IREF1+

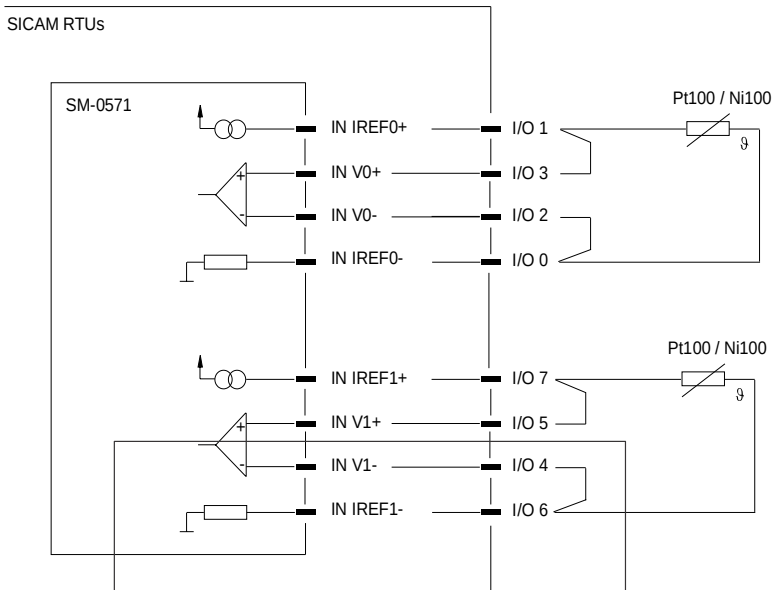
The abbreviations have the following meaning:

IN IREFx = reference current
IN Vx = measuring-circuit voltage

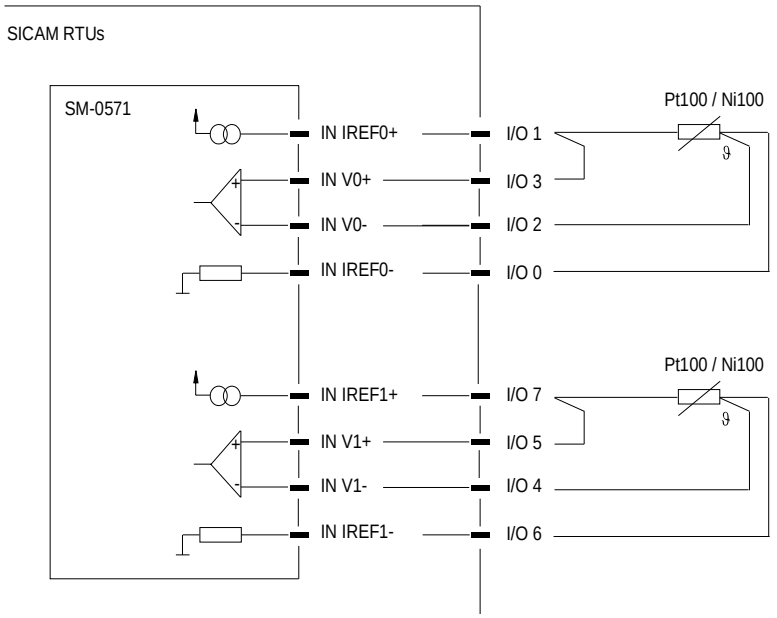
x…number of input 0…1

2.7.3.3 External Circuitry

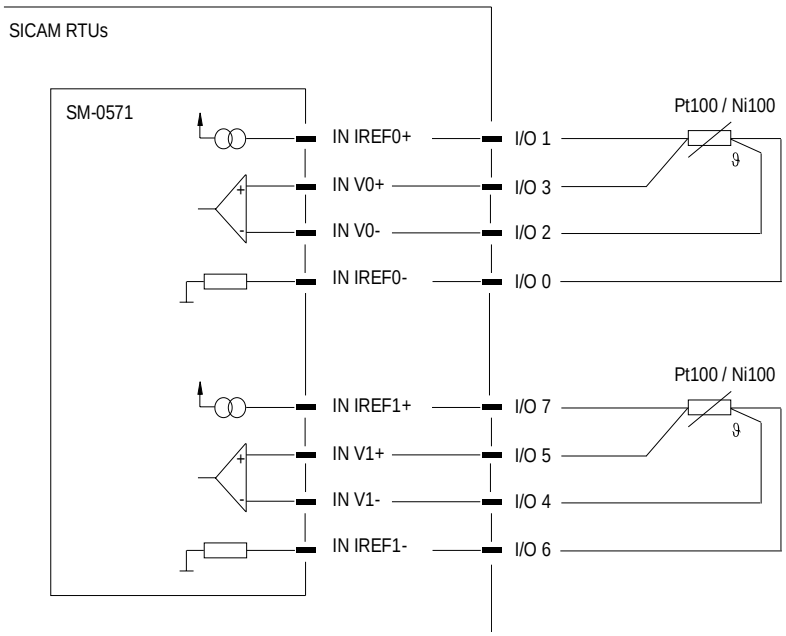
Connecting Resistance Thermometers in 2-Wire Technology



Connecting Resistance Thermometers in 3-Wire Technology

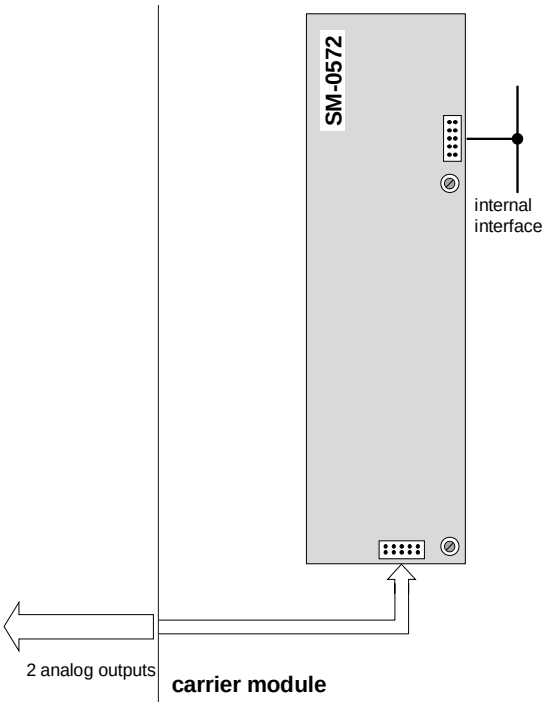


Connecting Resistance Thermometers in 4-Wire Technology

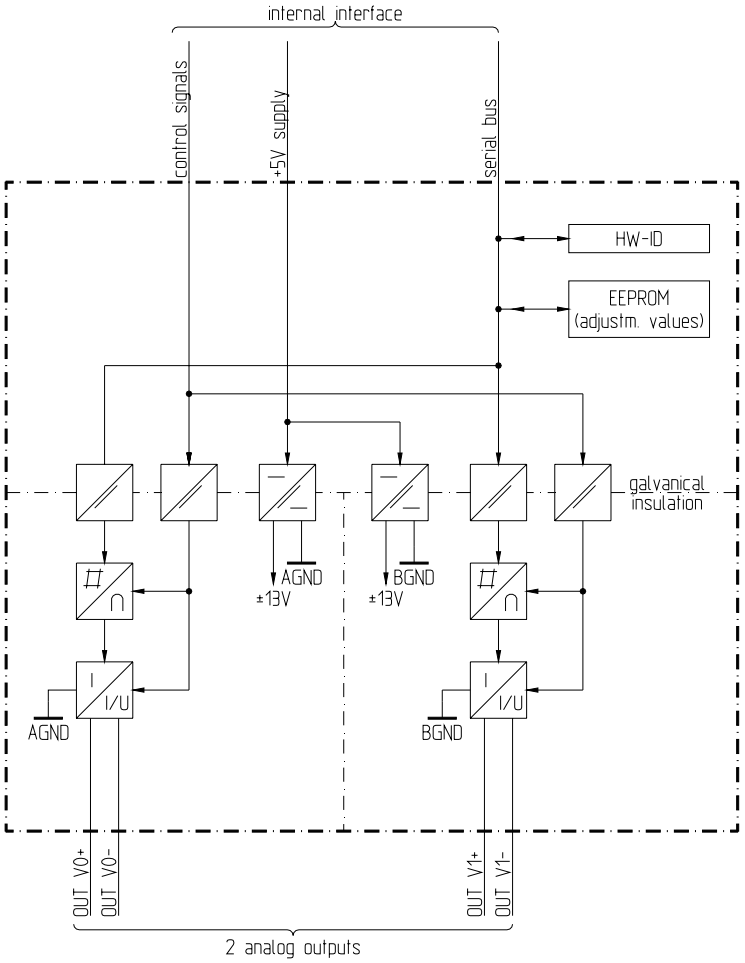


2.7.4 SM-0572

The SM-0572 submodule (analog output extension 2x ±20 mA/±1 V/±10 V) provides two analog outputs.



2.7.4.1 Block Diagram



2.7.4.2 Connector to Carrier Module

The pin assignment of the connector is described as follows:

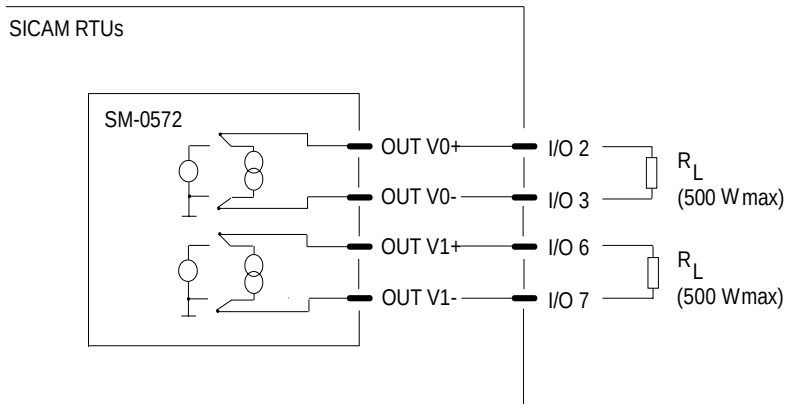
Pin	Alias	Signal	Pin	Alias	Signal
1	I/O 0		2	I/O 1	
3	I/O 2	OUT V0+	4	I/O 3	OUT V0-
5			6		
7	I/O 4		8	I/O 5	
9	I/O 6	OUT V1+	10	I/O 7	OUT V1-

The abbreviations have the following meaning:

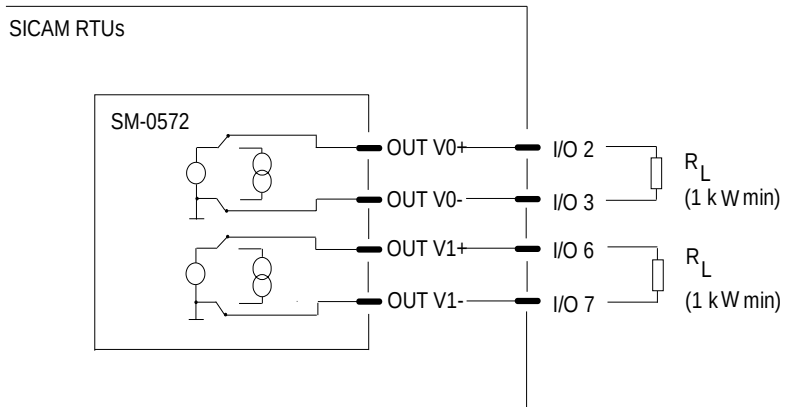
OUT V0+, OUT V0- = analog output 0
OUT V1+, OUT V1- = analog output 1

2.7.4.3 External Circuitry

Current Output

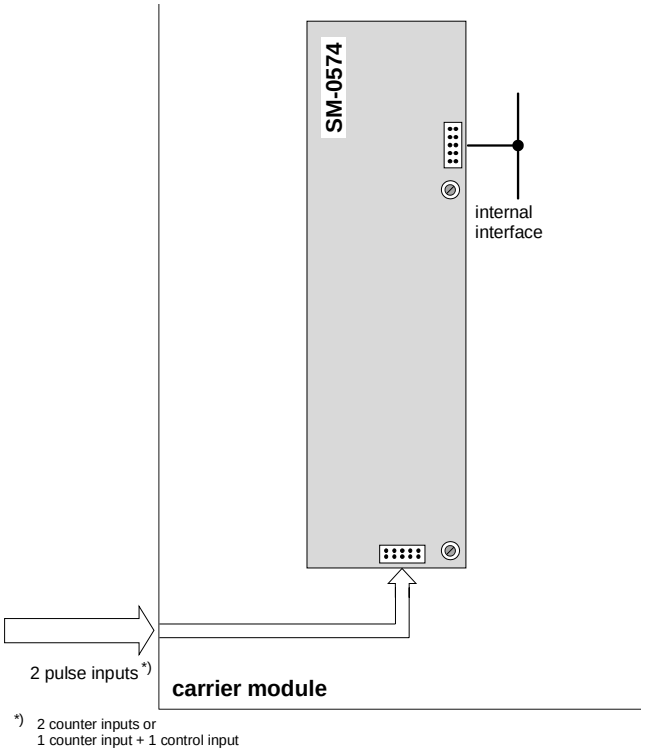


Voltage Output

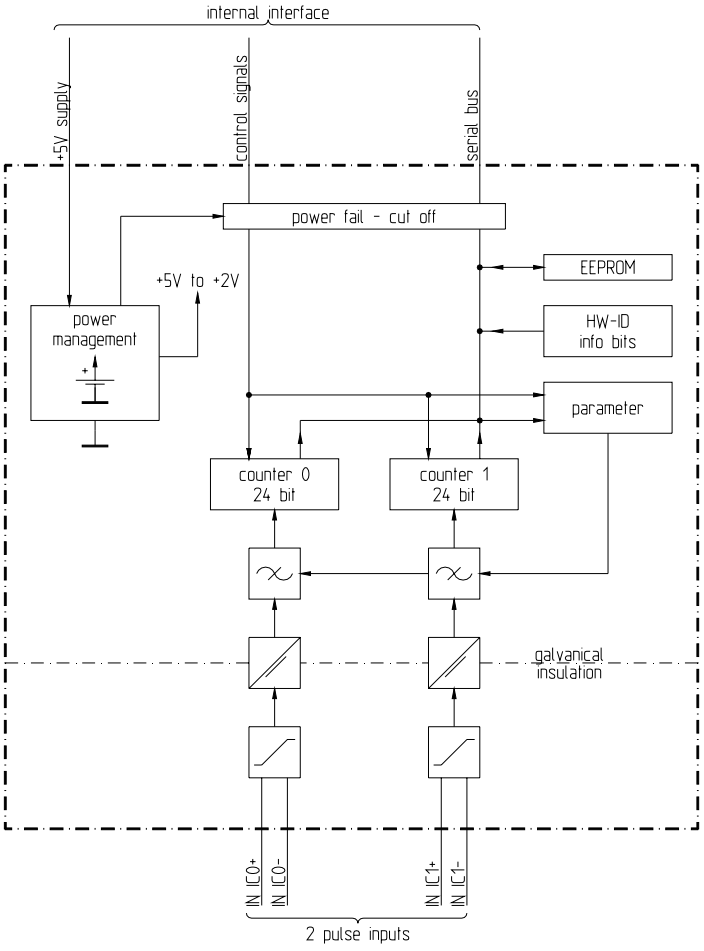


2.7.5 SM-0574

The SM-0574 submodule (count pulse input extension 2x 24…60 VDC) provides 2 pulse inputs (can be used as 2 counter inputs or 1 counter input plus 1 control input) in order to drive up to 2 counters (pulse counting). It is used for modular extension of peripheral modules.



2.7.5.1 Block Diagram



2.7.5.2 Connector to Carrier Module

The pin assignment of the connector is described as follows:

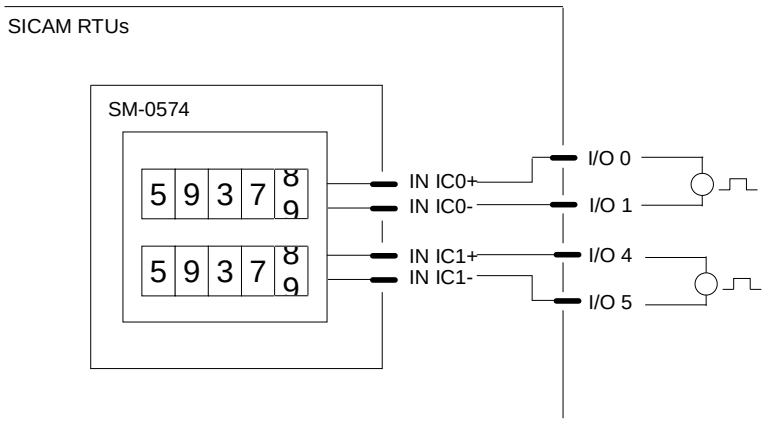
Pin	Alias	Signal	Pin	Alias	Signal
1	I/O 0	IN IC0+	2	I/O 1	IN IC0-
3	I/O 2		4	I/O 3	
5			6		
7	I/O 4	IN IC1+	8	I/O 5	IN IC1-
9	I/O 6		10	I/O 7	

The abbreviations have the following meaning:

IN IC0+, IN IC0- = pulse input 0 (counter input)
IN IC1+, IN IC1- = pulse input 1 (counter input or control input)

2.7.5.3 External Circuitry

Count pulse input

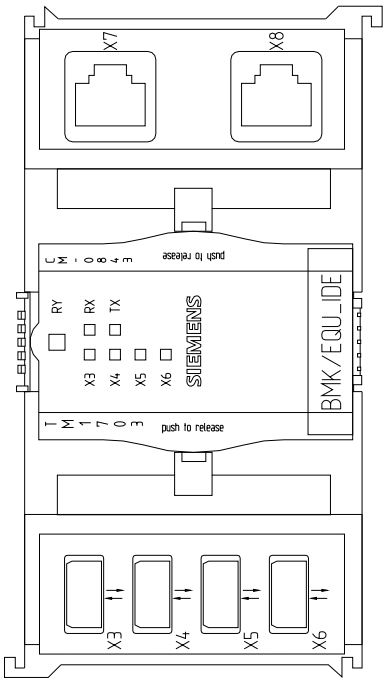


2.8 Bus Interface Modules

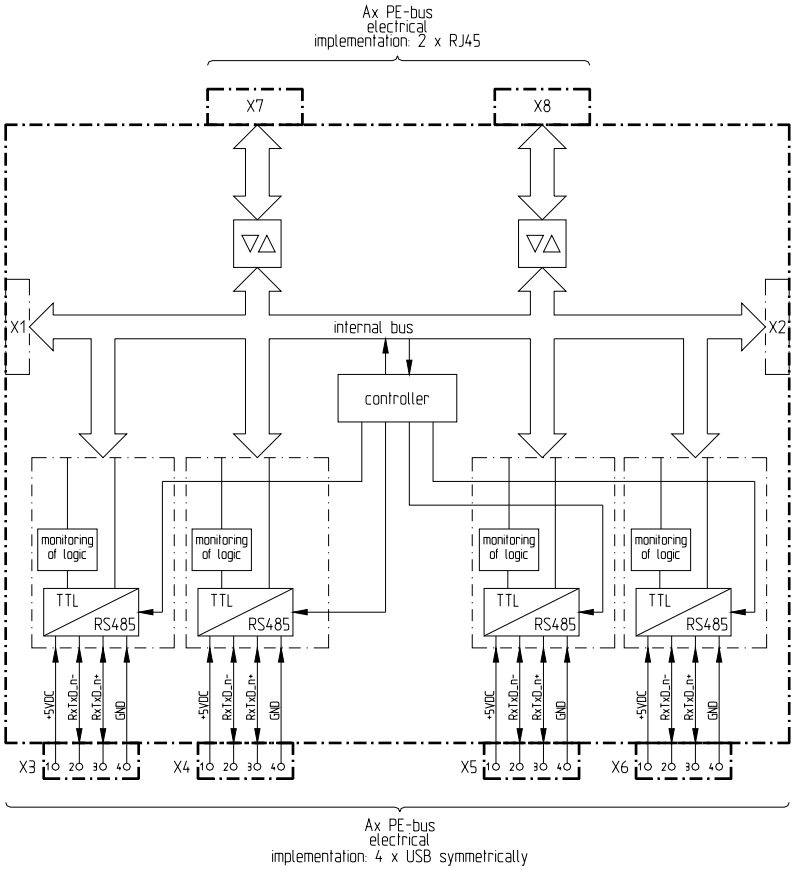
2.8.1 CM-0843

The bus interface module CM-0843 serves for the electrical connection of up to 4 remotely installed SICAM TM peripheral elements.

2.8.1.1 Front Panel



2.8.1.2 Block Diagram



2.8.1.3 Pin Assignment and Display

The pin assignment of the connector is described as follows:

X3 - X6:

pin	signal
1	+5VDC
2	RxTxD_n-
3	RxTxD_n+
4	GND

X7, X8:

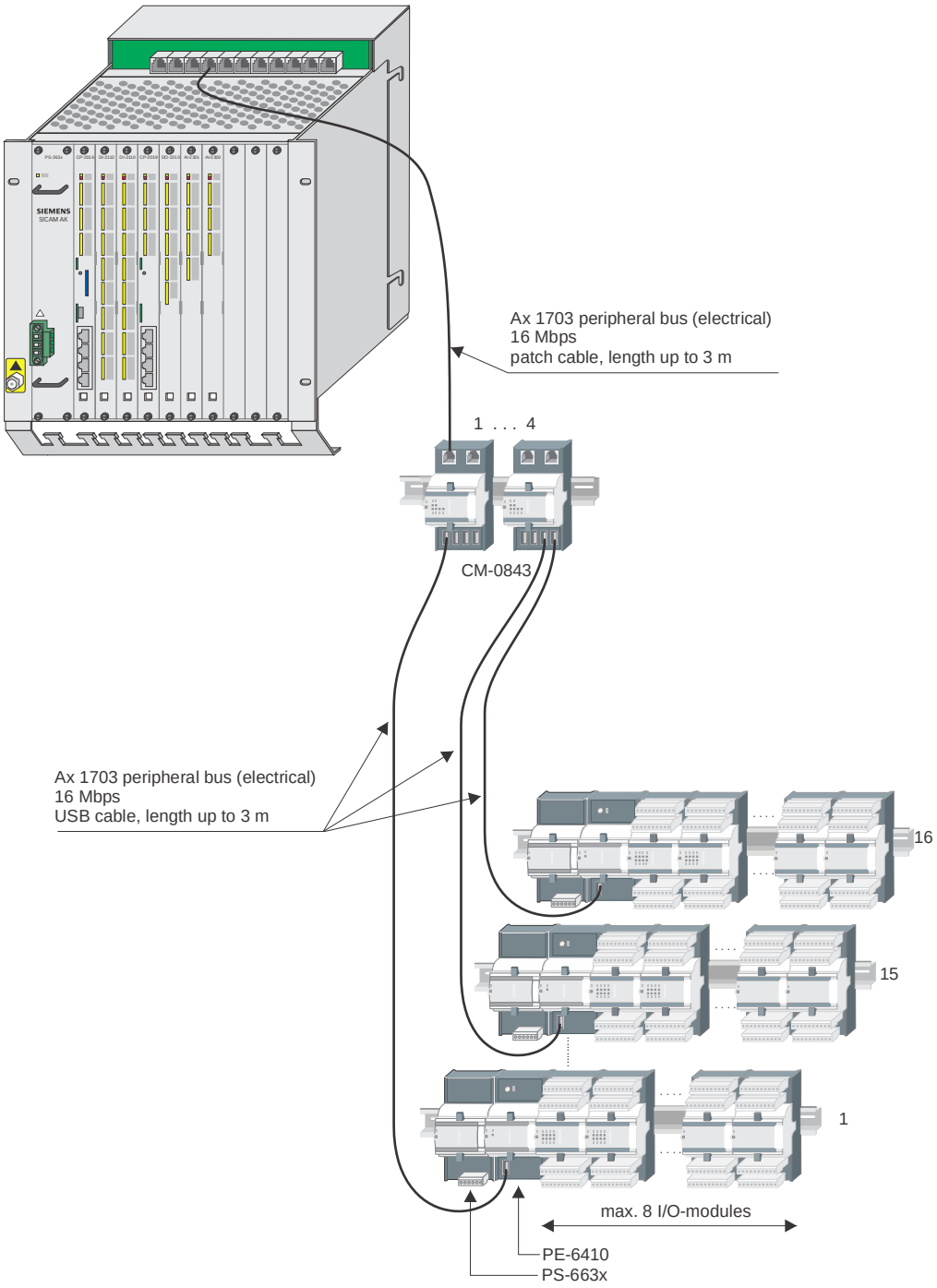
pin	signal
1	TxD1-
2	GND
3	GND
4	nc
5	nc
6	nc
7	GND
8	RxD1-

The abbreviations have the following meaning:

+5VDC . . . . . Versorgung 5V für CM-0843
GND . . . . . Versorgung 0V für CM-0843
RxTxD_n+ . . nicht invertierte Daten, n=3..6 (Bidirektional Ax-PE-Bus)
RxTxD_n- . . invertierte Daten, n=3..6 (Bidirektional Ax-PE-Bus)
TxD1- . . . . . Ausgang der seriellen Daten zu C-CPU
RxD1- . . . . . Eingang der seriellen Daten von C-CPU
nc . . . . . nicht verwendet
RY . . . . . Versorgungsspannung OK
RX . . . . . Empfangsdaten vom Master
TX . . . . . Sendedaten zu Master
X3 . . . . . Anspeisung über Schnittstelle X3 OK
X4 . . . . . Anspeisung über Schnittstelle X4 OK
X5 . . . . . Anspeisung über Schnittstelle X5 OK
X6 . . . . . Anspeisung über Schnittstelle X6 OK

2.8.1.4 Configuration (Example)

16 Peripheral Elements, electrically connected



Note

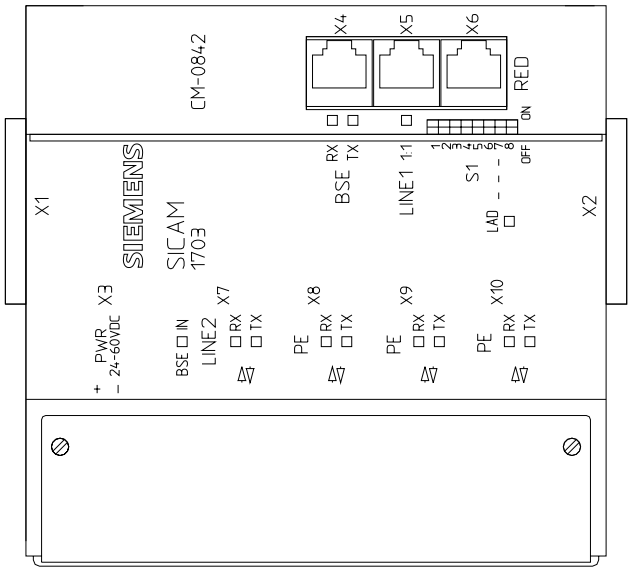
USB cables and patch cables, by means of those the connection between basic system element and bus interfaces or peripheral elements is set up, may be maximum 3 m long each.

The DIN rails of all CM-0843 and all PE-6410 must have the same ground potential.

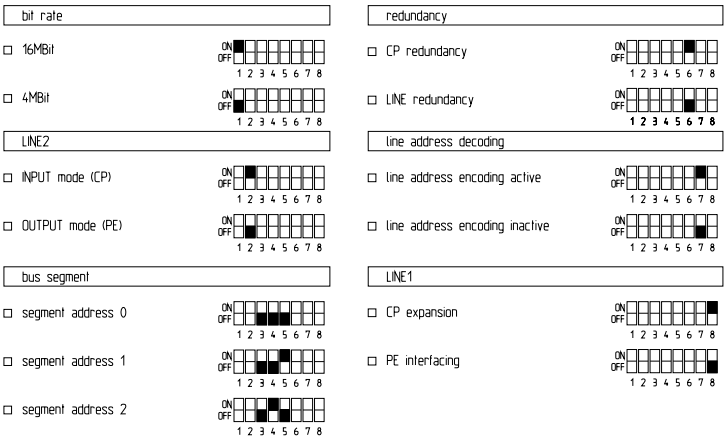
2.8.2 CM-0842

The bus interface module CM-0842 serves for the optical connection of up to 4 remotely installed SICAM TM peripheral elements.

2.8.2.1 Front Panel



2.8.2.2 Configuration Switch S1



Note

In SICAM AK 3, the Ax 1703 peripheral bus is operated exclusively with 16 Mbps. The bit rate must be set accordingly.

2.8.2.3 Pin Assignment and Display

The pin assignment of the connector is described as follows:

X4:

pin	signal
1	TxD1-
2	GND
3	INFO
4	A0_1
5	A1_1
6	A2_1
7	GND
8	RxD1-

X5:

pin	signal ‚PE-EXT'	signal ‚CP-EXT'
1	Rx_ERW-	RxD_LINE-
2	GND	GND
3	TRISTATE	GND
4	TRISTATE	A0
5	TRISTATE	A1
6	TRISTATE	A2
7	GND	GND
8	Tx_ERW-	TxD_LINE

X6:

pin	signal
1	TxD2-
2	GND
3	G_EXTERN-
4	A0_2
5	A1_2
6	A2_2
7	GND
8	RxD2-

X3:

pin	signal
1	PWR+
2	PWR-

The abbreviations have the following meaning:

TxD1- . . . . . Output of the serial data to C-CPU
RxD1- . . . . . Input of the serial data of C-CPU
INFO . . . . . Information bit of C-CPU
A0_1 . . . . . Segment address A0, binary coding
A1_1 . . . . . Segment address A1, binary coding
A2_1 . . . . . Segment address A2, binary coding
GND 0V-supply
Tx_ERW- . . . . . Output of the serial data to PE
Rx_ERW- . . . . . Input of the serial data of PE
TxD_LINE- . . . . . Output of the serial data (C-CPU extension)
RxD_LINE- . . . . . Input of the serial data (C-CPU extension)
A0 . . . . . Output of the address bit (C-CPU extension)
A1 . . . . . Output of the address bit (C-CPU extension)
A2 . . . . . Output of the address bit (C-CPU extension)
TRISTATE . . . . . ‚3-State' status

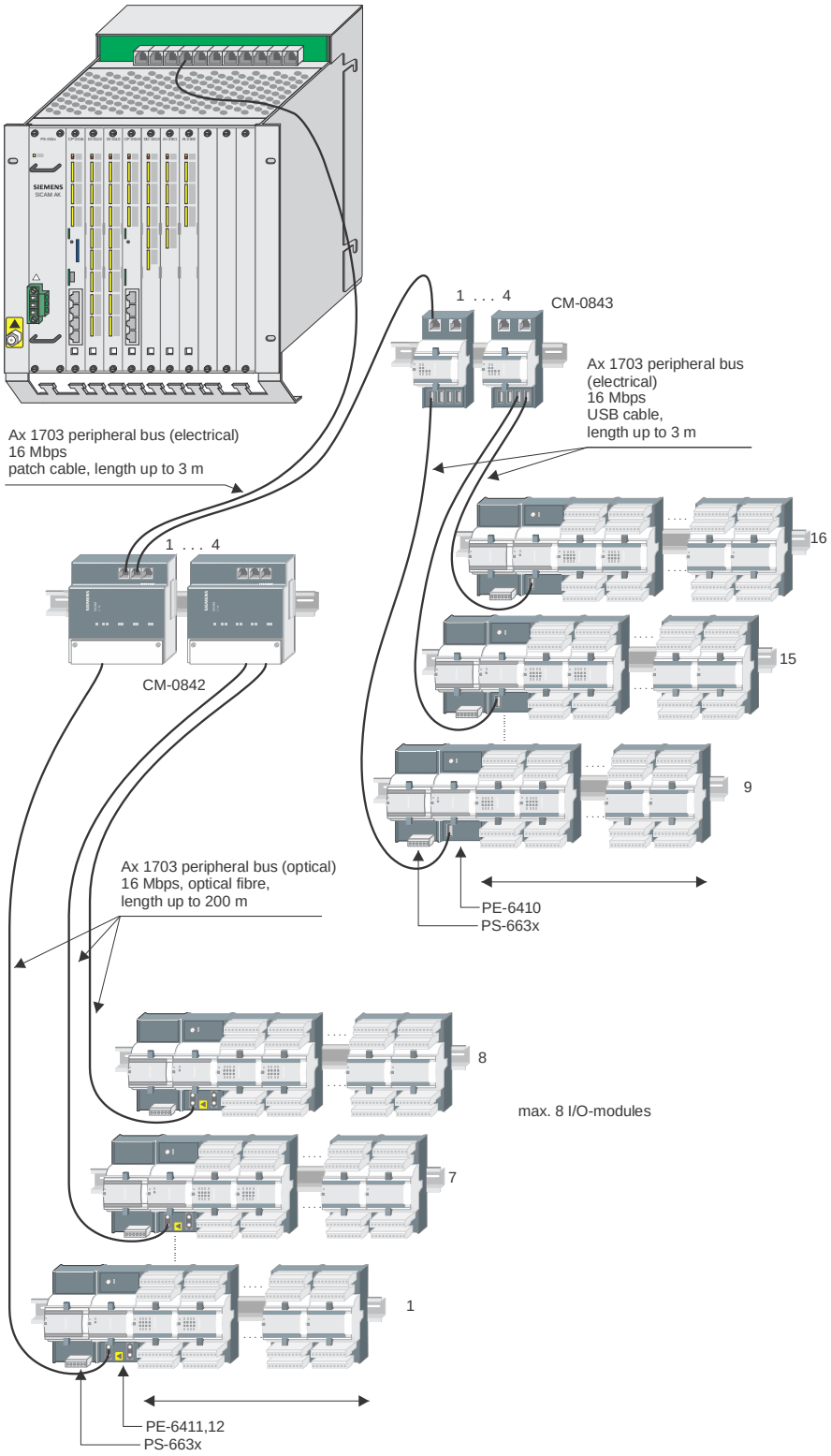
TxD2- . . . . . Output of the serial data to C-CPU
RxD2- . . . . . Input of the serial data (C-CPU extension)
A0_2 . . . . . Segment address A0, binary coding
A1_2 . . . . . Segment address A1, binary coding
A2_2 . . . . . Segment address A2, binary coding
G_EXTERN- . . . . . Information signal for LINE-redundancy operation
PWR+ . . . . . Input voltage (+18..+78VDC)
PWR- . . . . . Input voltage (GND)
■ . . . . . current configuration

Note

- The address bits of the segments A0_2, A1_2 and A2_2 are not used in SICAM AK 3
- The settings of A0, A1 and A2 are not effective in SICAM AK 3

2.8.2.4 Configuration (Examples)

16 Peripheral Elements, electrically and optically connected



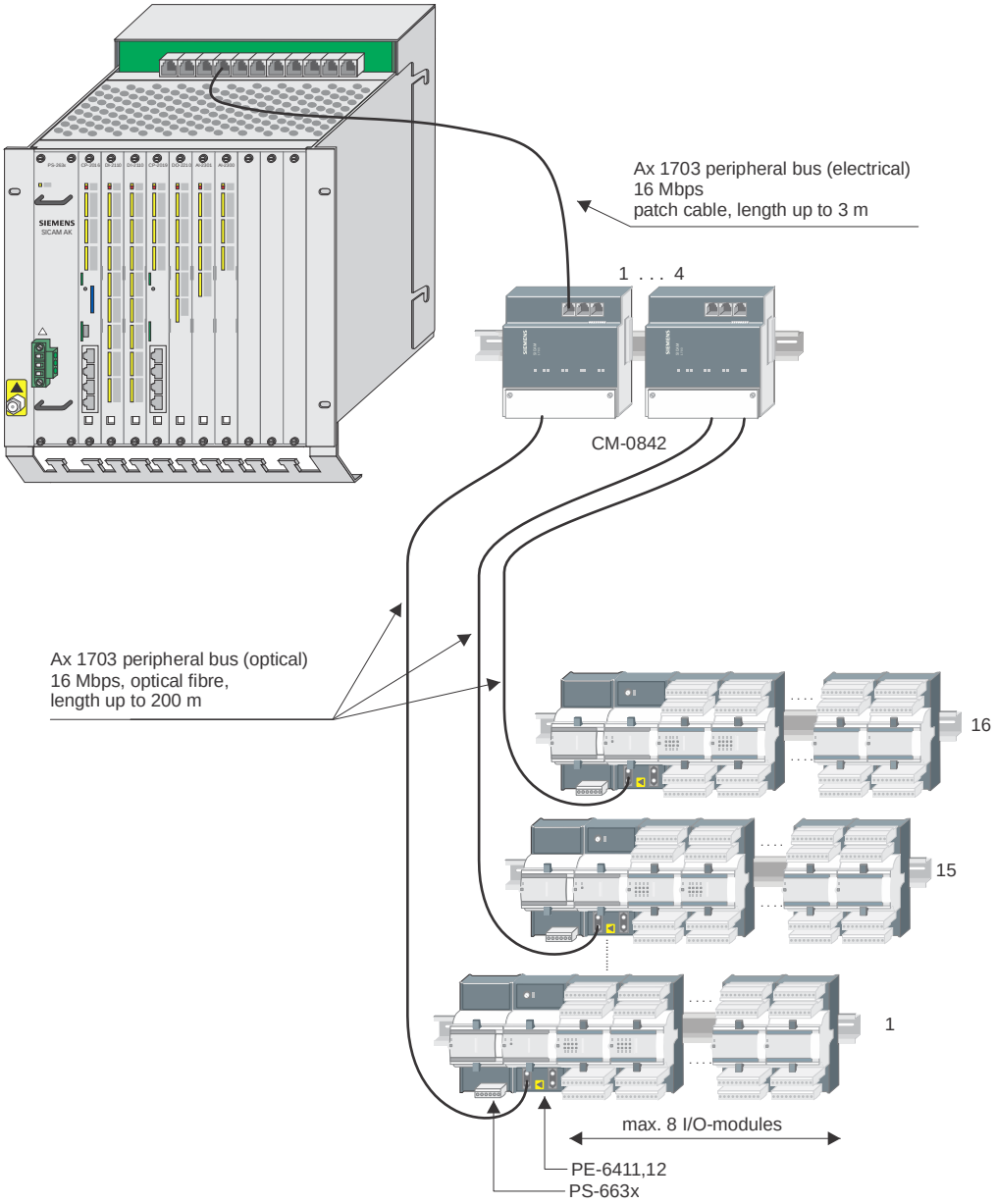
Note

Fiber optics, by means of those the connection between bus interfaces and peripheral elements is set up, must be between 20 and 200 m long.

Patch cables, by means of those the connection between basic system element and bus interfaces or peripheral elements is set up, may be maximum 3 m long each.

The DIN rails of all CM-0842 must have the same ground potential.

16 Peripheral Elements, optically connected



3 Prepare Engineering

Contents

This chapter describes with which methods the system SICAM AK 3 can be parameterized and programmed, and which tools are designed for that.

3.1 Engineering Tool SICAM TOOLBOX II

SICAM AK 3 is parameterized with a PC on which the SICAM TOOLBOX II software is installed. For this, the SICAM TOOLBOX II PC and automation unit must be connected with each other and a SD card installed on the master control element (CP-2014).

3.1.1 Software for the Engineering

The SICAM TOOLBOX II is available on DVD ROM and consists of the following toolsets:

- EM II
  Engineering Manager (base package)
- PSR II
  Engineering and Maintenance Computer
- OPM II
  Object Oriented Process Data Manager
- CAEx *plus*
  Tool for the creation of an application program as function diagram (FUD), structured text (ST), sequential function chart (SF)
  Alternatively, an existing and compatible instruction list (IL) can be stored in the SICAM TOOLBOX II.

The toolsets are also available as “Light” version. With this version, the engineering is limited to maximal 100 system elements and 2000 data points.

The toolsets are available individually. You find information and updates for the individual toolsets, as well as numerous licenses, in the Internet under *www.siemens.com/sicam*.

Document	Designation	Item Number
Licences, variants and order form	SICAM TOOLBOX II V5 license catalog, license demand	D30-017-5

3.1.2 Prerequisites

Prerequisite for the operation of the SICAM TOOLBOX II is the usage of an appropriate PC, that must fulfill certain hardware requirements, depending on the license package you purchased.

Information thereto reside in the internet under www.siemens.com/sicam in the *PC Products Preference List (D95-003)*. Should that be not at your disposal, please consult your contact person at Siemens.

For the installation of the SICAM TOOLBOX II the following preconditions are required:

- DVD or BlueRay drive must be existing
- C:\ drive must exist
- Administrator rights for operating system *Windows* ® (read and write rights to the file system and the Windows Registry)
- No other SICAM TOOLBOX II version may be installed
- NTFS partition
- Minimum 5 GB free hard disk memory
- Minimum 2 GB installed main memory

Supported Operating Systems and Hardware Requirements

You find the exact information on supported operating systems and hardware in the following document:

Document	Designation	Item Number
Brochure with information on installation and performance of updates	SICAM TOOLBOX II DVD Booklet V5.00	D3E-017-1

3.2 Connect Engineering PC with a Target System

For the transmission of engineering data to a system SICAM AK 3 the engineering PC must be connected with the target system, and a SD card must be equipped on the master control element.

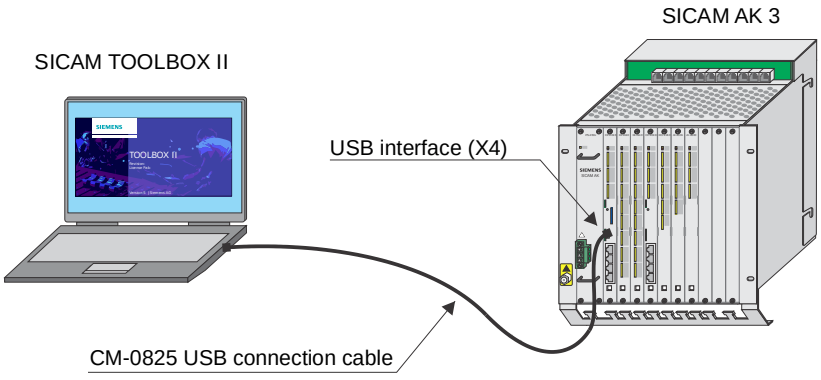
3.2.1 Physical Connection

The following connection options are available:

- Directly via the USB interface on the master control element
- Remote operation, LAN/WAN via Ethernet (TCP/IP)

3.2.1.1 Directly via the USB Interface

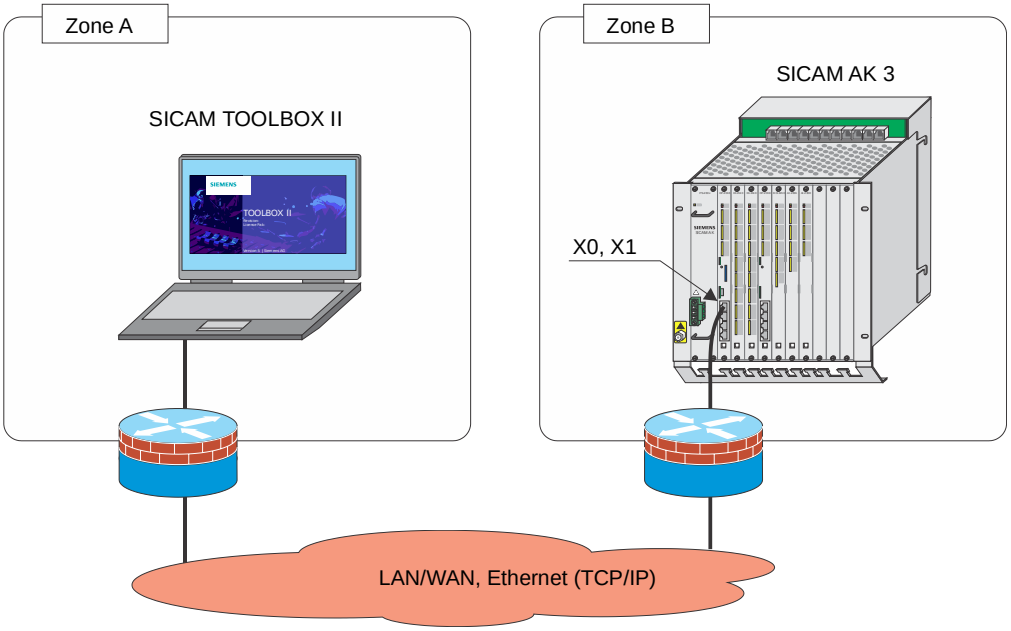
SICAM TOOLBOX II PC and SICAM AK 3 are connected direct via the USB cable.



Designation	Item-Number/MLFB
CM-0825	TC0-825 6MF13130AJ250AA0

3.2.1.2 Remote operation, LAN/WAN via Ethernet (TCP/IP)

In remote operation the SICAM TOOLBOX II is not connected directly to SICAM AK 3 with a local connection, but with TCP/IP over a network interface.



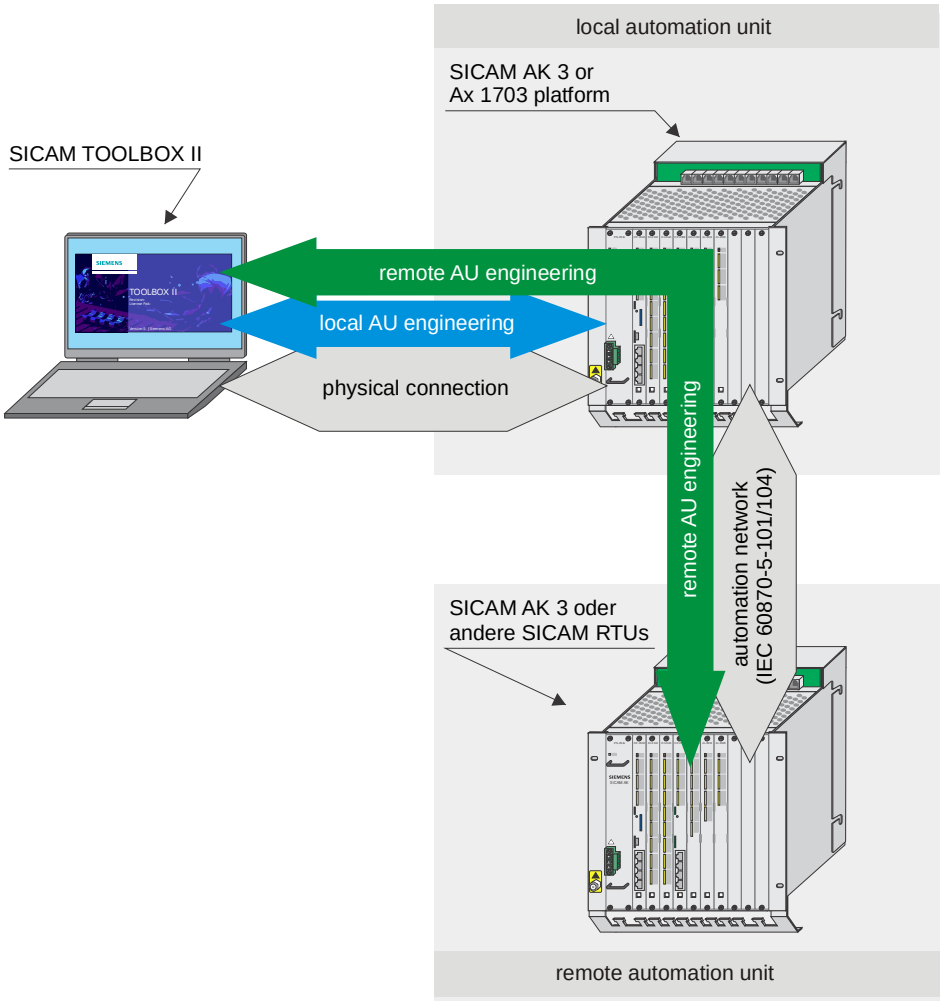
3.2.2 Logical Connection

For engineering there must be a logical connection to that automation unit, which is subject of the engineering task. The both following cases are differentiated:

- Connection with a local automation unit (that one, to which a physical connection exists)

Note
A first initialization of the automation unit is only possible in this way.

- Connection with a remote automation unit that one, which can be accessed via a local automation unit; thereby, a continuous remote communication according to IEC 60870-5-101 or -104 is required)



3.3 Integrated Protocol SNMPv3

For the Engineering oft he SNMPv3 Agent you need to get MIB files and a MIB browser.

3.3.1 Download of the SICAM RTUs MIB-Files

The MIB-files for SICAM AK 3 can be downloaded from the website http://www.siemens.com/sicam.

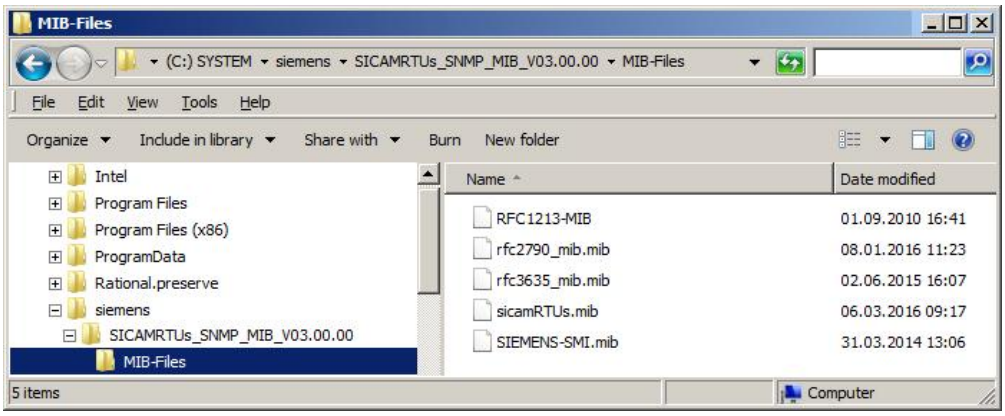
Select > Home > Products, Systems & Solutions > Products for Substation Automation > Substation Control Systems and Remote Terminal Units > SICAM AK 3.

Under SICAM AK 3 click on `Downloads` and open `Manuals`.

In the result list click on `SICAM RTUs SNMP MIB File` to start the download.

After the download you get the file *SICAMRTUs_SNMP_MIB_V03.00.00.zip*.
Save this file on the computer where the MIB-browser is installed.
Then open the file and start the therein contained file *SICAMRTUs_SNMP_MIB_V03.00.00.exe* by means of double-click.

Now the SICAM CMIC MIB files will be stored automatically on your computer. The default path is *C:/siemens/SICAMRTUs_SNMB_MIB_V03.00.00/MIB-Files*.



3.3.2 Import of the MIB-Files in MIB-Browser

The import of the MIB-files (`C:/siemens/SICAMRTUS_SNMB_MIB_V03.00.00/MIB-Files`) into your MIB-browser must be done in following order:

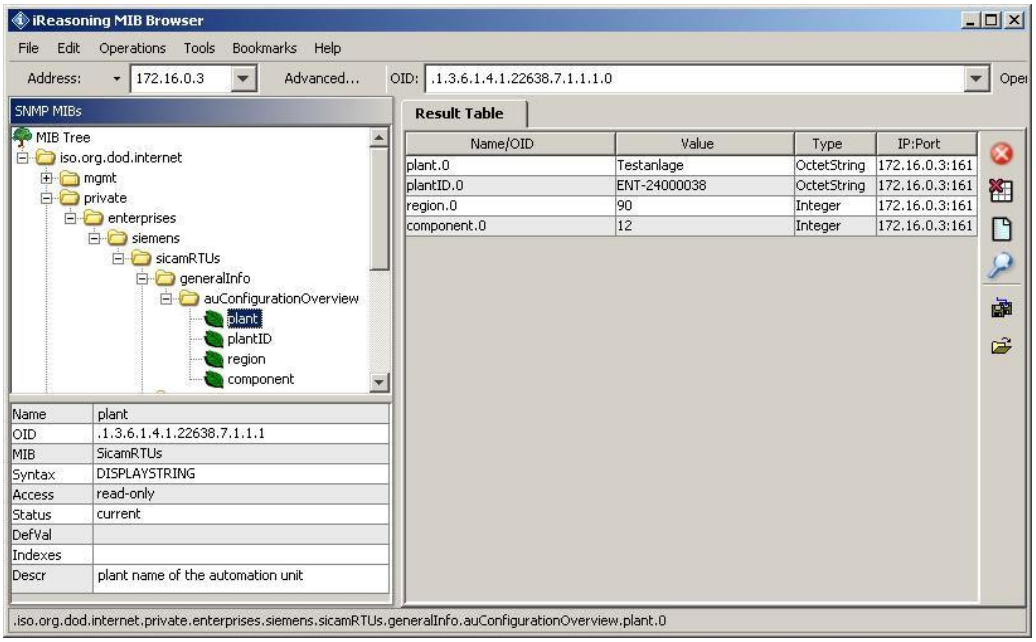
1. Import of `SIEMENS-SMI.mib`
2. Import of `sicamRTUs.mib`
3. Import of `RFC1213.mib` (optional)
4. Import of `rfc2790.mib` (optional)
5. Import of `rfc3635.mib` (optional)

Beside a standard MIB-browser you can load the MIB-files also with following Siemens products:

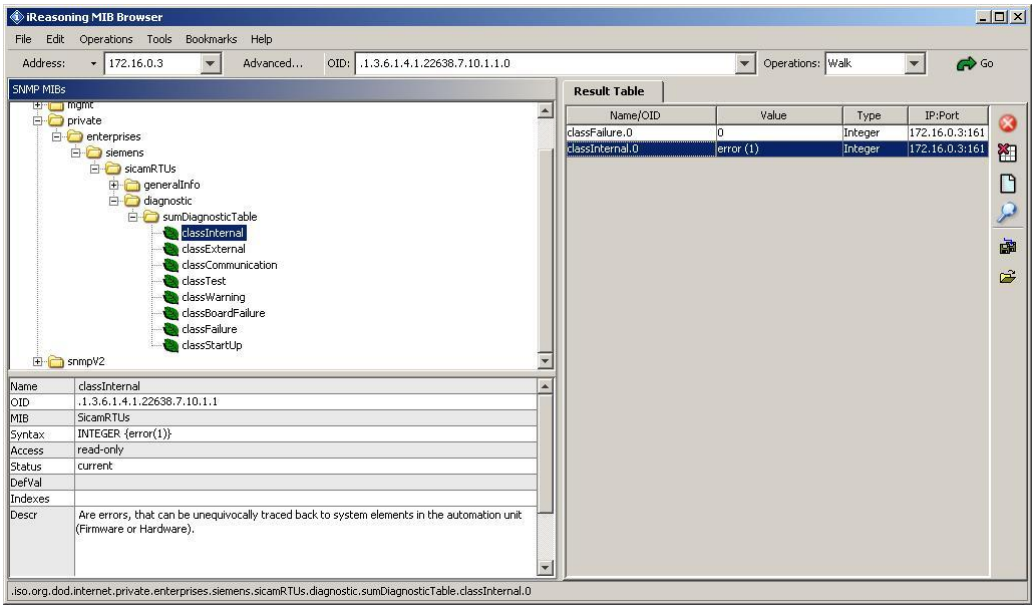
- SICAM 230
- 250 SCALA

3.3.3 Display of SNMP-Variables in MIB-Browser

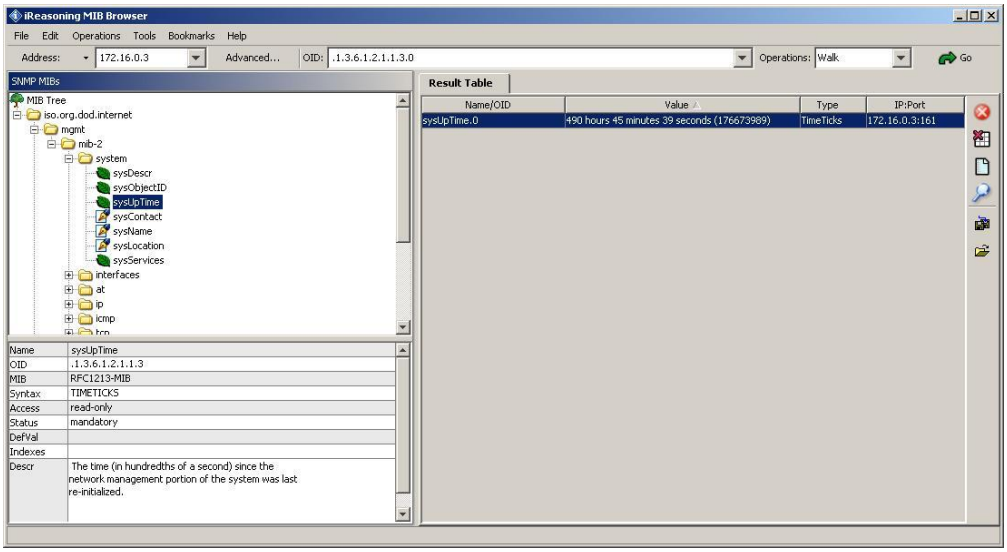
Example 1: SNMP-Variable `plant`



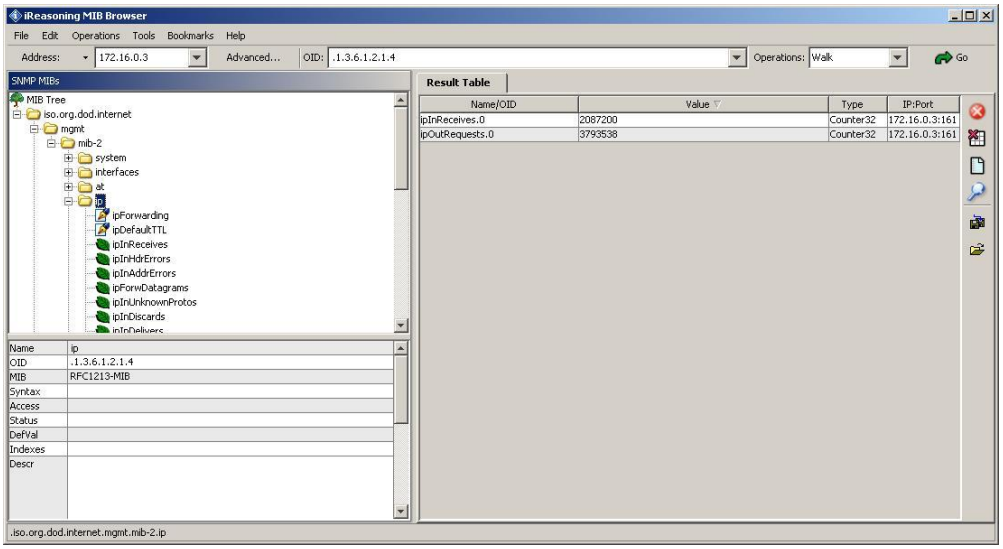
Example 2: SNMP-Variable `classInternal`.



Example 3: SNMP-Variable `sysUpTime`.

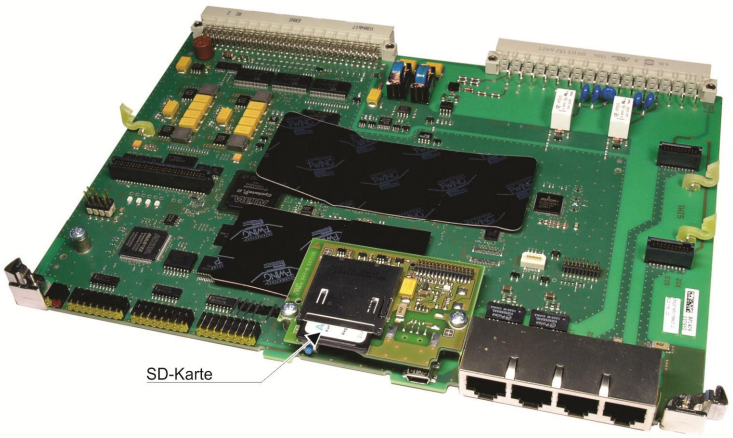


Example 4: SNMP-Variable `ipInReceives`.



3.4 SD Card

SICAM AK 3 uses a SD card for the storage of engineering data and firmware codes for the used system elements (e.g. master control element, protocol elements). This is located on the master control element.



Designation	Item-Number/MLFB
SD Card	CC6-095 6MF12131GA050AA0

3.4.1 SD Card Reader/Writer

For archiving purposes, the engineering data and firmwares stored on the SD card can be read with a standard commercial chip card reader and be stored on a PC. On the other hand, in particular for the initialization of a target system, the data can be written from a PC to the SD card.

The driver software required for the use of the chip card reader must be installed previously on the PC. Follow thereto the instructions of the manufacturer.

The SD card must be formatted with the file system FAT16.

3.5 Loadable Firmwares

The modular system SICAM AK 3 consists of system elements, that are designed for specific functions:

- Master control element
  Central processing and coordination
- Processing and communication element(s)
  Expansion of peripheral elements and protocol elements
- Peripheral element(s)
  Acquisition and output of process signals
- Protocol element(s)
  Communication with control center and further automation units

For the implementation of the respective functions, special firmwares are provided. The functionality of each system element is adjustable by means of parameters.

As a partner of Siemens you are able to download all the current firmware revisions for your system via the internet under www.siemens.com/sicam.

Examples:

System Element	Item Number	Designation
CPCX26 Central processing/communication	SC2-016-1	CPCX26 Revision history
	SC2-016-1.XX/53	CPCX26 TB II update
PCCX26 Periphery interfacing, control, communication	SC2-019-1	PCCX26 Revision history
	SC2-019-1.XX/53	PCCX26 TB II update
ETA4 Ethernet interface IEC 60870-5-104	SC0-581-1	ETA4 Revision history
	SC0-581-1.XX/53	ETA4 TB II update
BISX26 Binary signal input 8x8 IEC	SC2-112-1	BISX26 Revision history
	SC2-112-1.XX/53	BISX26 TB II update

In order that the corresponding system elements work and can be parameterized, the respective

- Firmware codes must exist in the target system
- Toolbox update must be stored in the SICAM TOOLBOX II

The respective TB II update contains the firmware code for the relevant system element, as well as the master data for the SICAM TOOLBOX II.

How to load firmwares into a target system, you find in section 5.5.1, Procedure.

3.6 Working with the SICAM TOOLBOX II

For the engineering of SICAM AK 3 serves the SICAM TOOLBOX II installed on the engineering PC.

Before you start with the engineering, the predefined configuration parameters of the SICAM TOOLBOX II must be checked and changed, if necessary (see section 4.1.1, Presets).

The system-technical and process-technical parameterization is performed with the tool "OPM II". An application program can be created with the tool "CAEx *plus*" as function diagram, or alternatively as instruction list with a text editor in ASCII format.

3.6.1 Engineering Procedure

The setting of parameters is only possible independent from the target system (offline). Firmwares for the system elements and application programs must be imported into the SICAM TOOLBOX II.

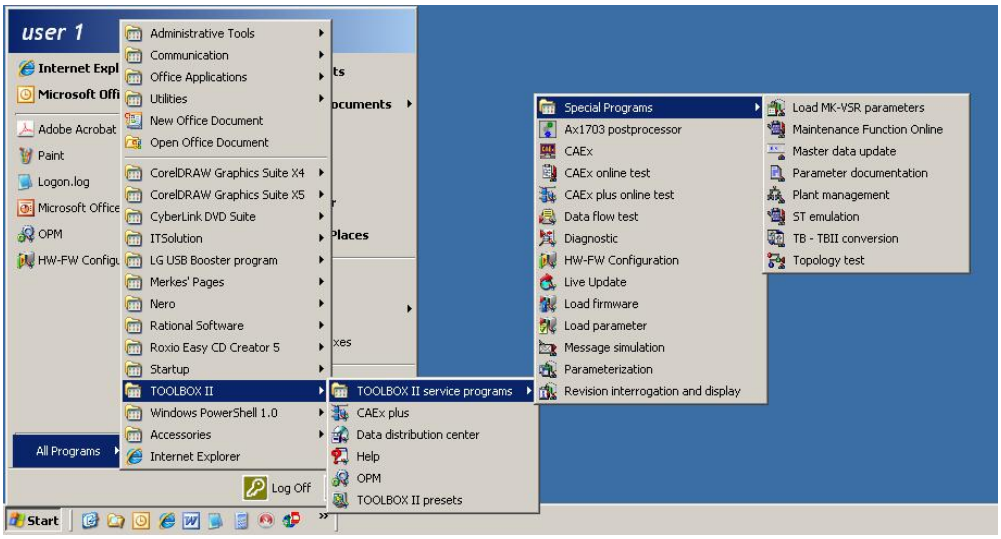
Engineering data maintained with the SICAM TOOLBOX II is stored in a data base on the hard disk of the engineering PC. By means of loading processes, the engineering data can be transferred from the hard disk of the engineering PC to a target system. Thereto the target system must be connected with the engineering PC and switched on, and a SD card must be equipped in the master control module of the target system.

The engineering data is stored during a load procedure on the SD card of the target system. With startup of the target system, all new or changed data is transferred into the main memory.

3.6.2 Structure of the User Interface

The single tools of the SICAM TOOLBOX II have a design oriented according to *Microsoft Windows* ®. After successful installation they can be started from the Windows start menu Start | All Programs | SICAM TOOLBOX II , or via the Toolbox shortcut on the desktop.

The tools most frequently needed (Load Parameters, CAEx *plus*, etc.) can be started also directly from the central engineering tool "OPM II".



The detailed instructions for the work with the tools of the SICAM TOOLBOX II reside in the *SICAM* TOOLBOX II Online Help and in the *CAEx plus Online Help*.

Note

The *SICAM* TOOLBOX II Online Help can be started either directly via the start menu of your PC, or from each single tool via the menu Help .

4 Engineering via SICAM TOOLBOX II

Contents

This chapter is a guideline for the work with the SICAM TOOLBOX II. You find the details for the engineering in the *SICAM* TOOLBOX II Online Help.

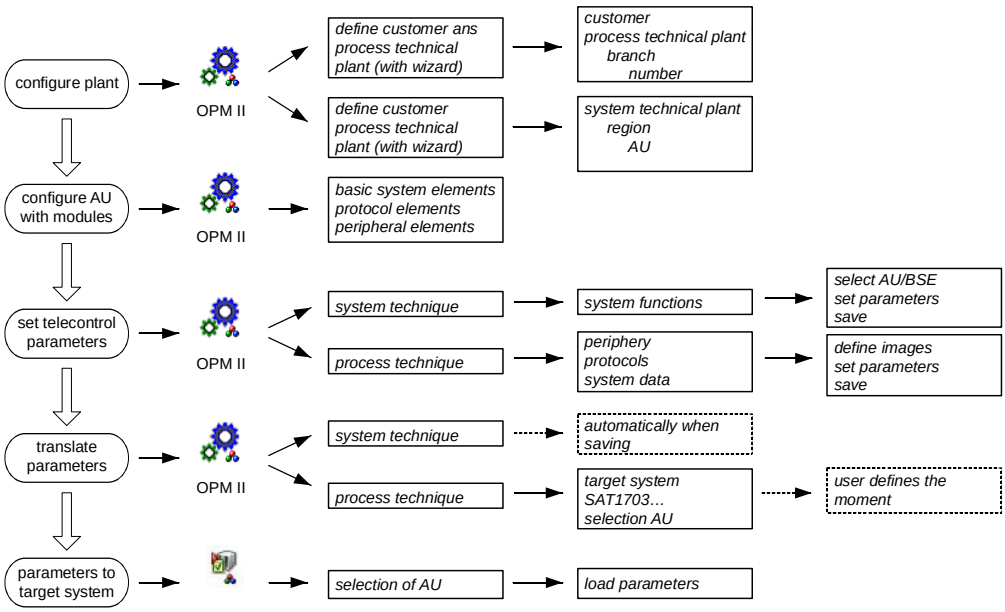
4.1 Telecontrol

The acquisition parameter setting and documentation of the process-technical process and its associated data points is enabled in the SICAM TOOLBOX II mainly with the help of the tool "OPM II" (Object Orientated Process Data Manager).

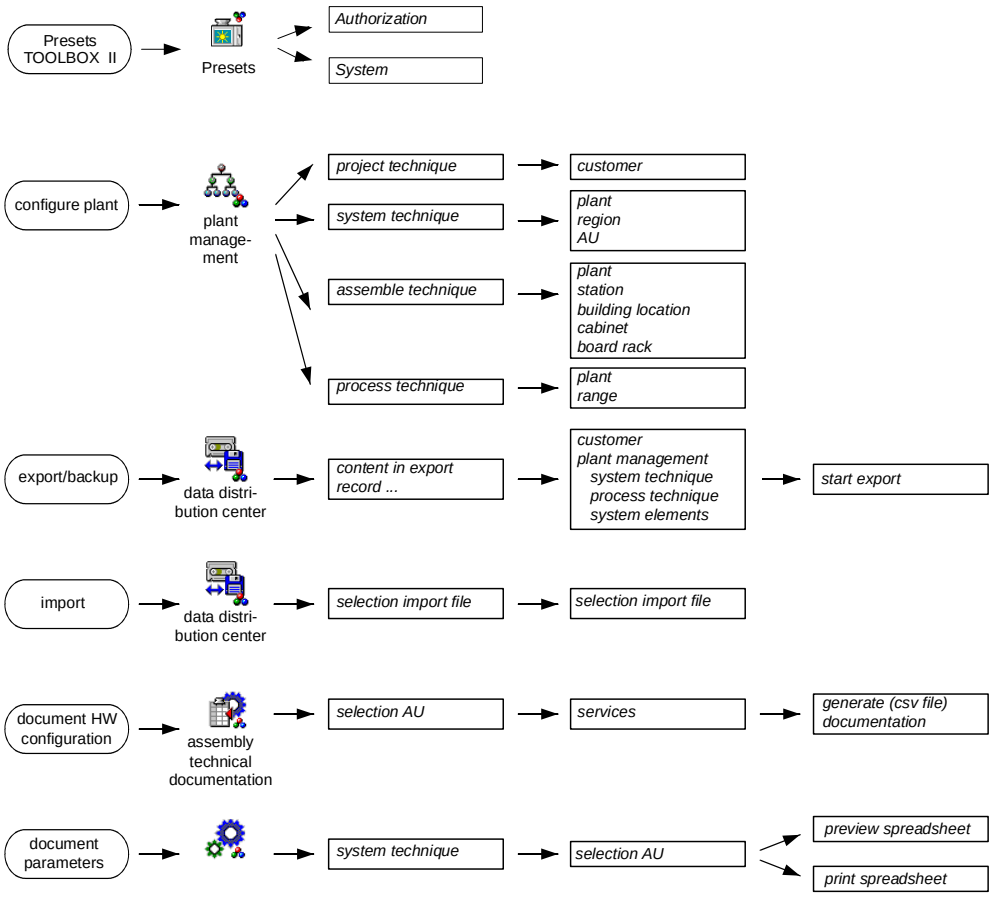
Overview of the Tasks

Task	Meaning
Presets	Define user and rights; language
Initialization of the plant data	Configure plant and automation unit
Import firmware	Load firmware into the SICAM TOOLBOX II
HW configuration	Select installed system elements
Parameterization of the system technique	· Time management · Communication common · Protocol Elements · Redundancy · Representation of data points assigned to hardware I/Os · Decentral archive
Parameterization of the process technique	· Create images · Assign process images to data points · Settings for configured process signals · Routing of send data and receive data
Bulk edit	Edit great amounts of image parameters
Transfer parameters	Translate parameters for the target system
SD Card	Write and read application data
Import/Export	Generate and read backups of the application data
Documentation	Formatted spreadsheets for printing · Hardware (configuration, pin assignment) · Parameter
Load Parameters	Transfer parameters and function diagram to the target system
Parameter comparison	Compare settings between current project and target system
Data flow test	Record and store dataflow in the target system
Message simulation	Send messages from the SICAM TOOLBOX II to a target system
Service function online	Read and set time of target system
ST emulation	Execute system-internal functions (only for authorized users)
Topology test	Acquisition of physically connected automation units in a SICAM RTUs automation network
Diagnosis	Read detailed information generated by the self monitoring

Fundamental Procedure of the Parameterization



Essential Administrative Functions



4.1.1 Presets

Before you begin with the engineering of SICAM AK 3, several basic settings are to be performed for the work with the SICAM TOOLBOX II:

- User and rights
  - User-specific settings
- Password
- Workplace-specific settings
- Organization of the SICAM TOOLBOX II
- Language

For the access to the SICAM TOOLBOX II a logon with username and password is required.

The parameterization with the SICAM TOOLBOX II happens exclusively offline. Only the transfer of data (firmware, application data), as well as test and diagnosis are performed online via a communication connection.

The globally valid configuration parameters in the SICAM TOOLBOX II are displayed and set with the tool "SICAM TOOLBOX II Presets". They can - dependent on the access rights - be changed at any optional time.

You find the details thereto in the SICAM TOOLBOX *II Online Help, chapter "SICAM* TOOLBOX II Presets" and *chapter "Administration of SICAM* TOOLBOX II".

4.1.1.1 Users and Rights

The following user types are predefined and can be selected:

- Type `admin`
- Type `profi`
- Type `standard`

For each user type different rights are predefined.

As user type `admin` you can freely assign new user names (max. 8 characters). For each user a special role (max. 20 characters) can be assigned.

For each role certain rights can be freely selected and assigned from a list. Depending on which role a user has been assigned, he may control determined functions. An exception are the unchangeable roles, that are reserved for the specialists for maintenance purposes.

You find the details thereto in the SICAM TOOLBOX II Online Help, chapter "SICAM TOOLBOX *II Presets", section "User/Role Administration"*.

Note

All operation functions of SICAM EMIC described in this manual are generally applicable for the "Administrator" role available in the SICAM TOOLBOX II.

Note

From SICAM TOOLBOX II V5.11 it is possible to create domain users. Such a domain user does not use a specific SICAM TOOLBOX II user role to start SICAM TOOLBOX II, but he uses the user account for the logon on his workstation..

4.1.1.2 Password

The entrance into the SICAM TOOLBOX II is protected for each user by means of an individual password.

The preset password is equal to the predefined user type.

Hints

The preset password must be changed after the first login.

4.1.1.3 Language

The language `Deutsch` or `English` can be selected.

4.1.2 Entrance into the Project

4.1.2.1 Logon

With the initial start of a tool of the SICAM TOOLBOX II you must enter a user name and a password. After that you are able to begin the parametrization.

A user change is possible with the tool "SICAM TOOLBOX II Presets" (menu `Authorization | Login`).

4.1.2.2 Logoff

A user logoff is possible with the tool "SICAM TOOLBOX II Presets" (menu `Authorization` | `Logout`). You can continue to operate tools that are still active, but the activation of tools requires another login.

If all tools are quit without logout, the user will remain logged in unless a logout from the SICAM TOOLBOX II PC or Toolbox Server takes place.

4.1.2.3 Change Password

As user type `admin` you can define a password for each newly added user.

Guidelines for the Assignment of Passwords

- The password may consist of up to 8 characters
- No differentiation between upper case and lower case
- Special characters can be used
- Empty password possible (logon to the project without password)

Hints

The preset password must be changed after the first login.

4.1.3 Plant Configuration

A plant is configured according to different views:

- Project technique
- System technique
- Process technique

The configuration data is in each case specifically parameterized for the different views.

With the initial creation of a plant you must enter the configuration data into the SICAM TOOLBOX II with the tool "OPM II". The entry of the parameters is thereby supported by "Wizards". The plant topology is determined based on the parameter setting of the configuration data.

After the initialization, the administration of the plant configuration can be carried out with the tool "Plant Management". With this tool the configuration data can be changed or deleted at any time.

You find the details thereto in the SICAM TOOLBOX *II Online Help, chapter "Plant Management"*.

4.1.4 Import firmware

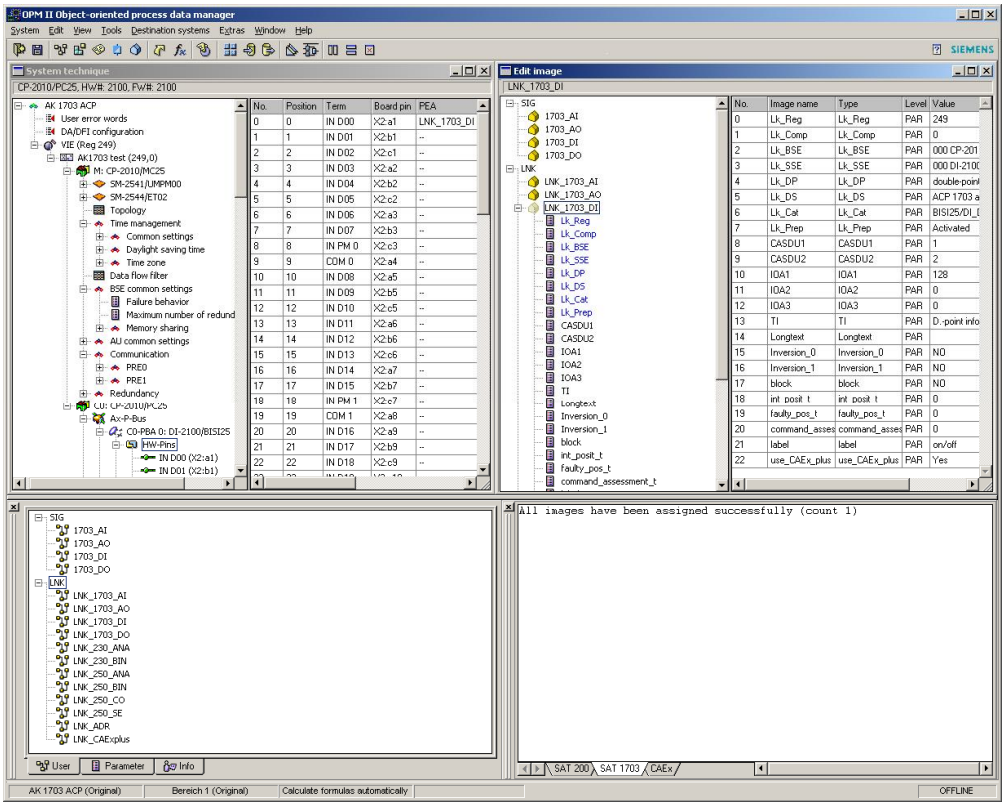
For the parameterization of the functionality of a target system, the firmware codes of the required system elements must be present in the SICAM TOOLBOX II.

You can import the required firmwares - if not yet present - into the data base of the SICAM TOOLBOX II with the tool "Master Data Update". You find the corresponding files in the internet under www.siemens.com/sicam (see section 3.5, Loadable Firmwares). Further information about this can be found in section 5.5.1.2, Import of Firmware into the SICAM TOOLBOX II.

4.1.5 Parameterization of the Telecontrol Functionality

The entire parameterization for the telecontrol function can be performed in the SICAM TOOLBOX II with the tool "OPM II". You find the detailed instruction thereto in the SICAM TOOLBOX *II Online Help, chapter "OPM* II".

The description of the system-technical and process-technical settings can be found in the manual SICAM *RTUs Common Functions System and Basic System Elements, chapter "Telecontrol"*.



Note

In the *SICAM* TOOLBOX II Online Help resides a video demonstration for the parameterization of SICAM EMIC (section "System Technique", "SICAM *RTUs", "*SICAM EMIC").

4.1.5.1 Hardware Configuration

Before the parameterization of the functionality, the target system must be configured with the required system elements:

- Master control element
- Processing and communication elements
- Protocol elements
- Peripheral elements

Note

The firmware codes of the corresponding system elements must exist in the target system

You find an overview of the available system elements and their technical specification in the *SICAM AK 3* System Description.

The configuration takes place with the tool "OPM II" via the menu items `Tools` | `System technique` and `Tools` | Templates Overview .

By dragging the system elements of the system SICAM AK 3 from the Template Overview onto the respective target system in the system technique, the corresponding system elements are added with default parameters.

When deleting a system element, all the corresponding settings are rejected in the system technique.

The changed hardware configuration must be converted with the tool "OPM II", menu `Destination systems` | `SICAM RTUs transformer` , and subsequently transmitted to the target system with the tool "Load parameters", to become effective.

During startup the target system checks if the mechanically installed I/O modules match the parameterization.

Exceptions with Usage of SICAM TM I/O Modules

With usage of I/O modules first of all the higher-level peripheral element (USIO66, TCIO66) must be equipped. Afterwards I/O modules can be dragged onto the peripheral element.

When deleting an I/O module, all the corresponding settings are rejected in the system technique.

Note

The configuration in the "OPM II" must match the mechanically installed I/O modules.
If you remove an I/O module mechanically, you must delete it also in the "OPM II". If you do not adapt the configuration in the "OPM II", the target system detects this I/O module as failed (error indication).
If you add an I/O module mechanically without adapting the configuration in the "OPM II", this has no effects. In this case, the added I/O module is ignored.

4.1.5.2 System-Technical Settings

The system-technical configuration of the system elements can be opened via the menu item Tools | System technique .

The parameter setting is carried out in the menu tree, respectively below the selected basic system element:

- Common settings
- Time management
- Communication protocols
- Network settings
- Topology
- Dataflow filter
- Periphery
- Decentralized archiving
- Redundancy

4.1.5.2.1 Communication

The protocol is determined by configuring a protocol element suitable for the existing application and its parameterization.

4.1.5.2.2 Periphery

The peripheral functions are defined by means of configuring the peripheral element, the I/O modules suitable for the present application, as well as their parameters.

Below the level *Ax peripheral bus* the configured peripheral element with the configurable signals is displayed:

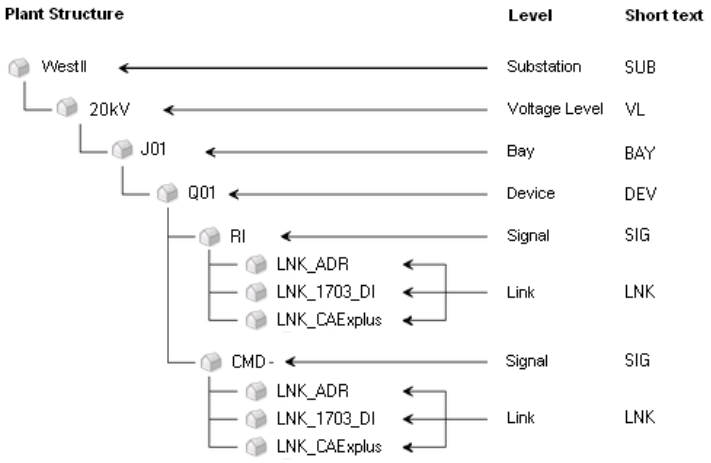
- Hardware pins
- Software data points

By means of the context menu of a hardware pin or software data point, selection Edit image , you get directly to the process-technical settings of the respective signal.

4.1.5.3 Process-Technical Settings

4.1.5.3.1 Levels

The process-technical plant can be structured in freely-definable hierarchy levels. The following graphic shows an example:



You find the instruction to create levels in the *SICAM TOOLBOX II Online Help*, chapter "OPM *II", section "Levels"*.

The process-technical settings of the system elements can be opened centrally via the menu item `Tools` | `Images`.

4.1.5.3.2 Types

Types form the template for the structure of a process-technical plant. They serve for the simplification with engineering of large quantities of objects, parameters and values.

Types of the following type categories can be defined below the levels:

- User types
- Link types
- Info types
- Parameter types

A type is defined respectively for objects, that have the same features (examples: feeder, circuit breaker, disconnector).

You find the instruction to define the different types in the *SICAM TOOLBOX II Online Help*, chapter "OPM *II", section "Types"*.

4.1.5.3.3 Images

Images are real objects of the plant with parameters and signals (examples: feeder north, circuit breaker Q00, disconnector Q10).

- Typified images

  Typified images can be created from the defined types, that means, each images is assigned to a type. The assigned type defines thereby the structure for the image. The structure defines which link types include a signal and which parameter includes a link. This structure can be changed only in the type of the belonging image. All images that are assigned to that type, adopt automatically the structure change (inheritance). The same behavior applies for default input.

  The usage of typified images is the more efficient, the more identical images are present.

- Typeless images

  Typeless images do not have a reference to the types, that means, no inheritance takes place. Typeless images are also created by structural changes of a typified image (since the image does not have the same structure as the type).

  Typeless images are advantageous, if images are only uniquely existing.

  Below typless images, typified images can be used (example: voltage level “20 kV“ is typeless since it is only uniquely existing, all feeders thereunder are typified images).

- Link images

  In the link images the parameters of the single target systems can be set.

  The signals of the libraries include as first link a so-called common link (LNK_ADR). There reside parameters (example: longtext, LAN station...) that include “references” to other links of the same signal or are source of “formulas”.

  A reference causes that upon changes of an entry in the common link the change takes place automatically in the link of the specific target system. Message address CASDU(1,2), IOA(1,2,3) and TI are generated automatically with filling of the 1703 link address (Lk_Reg, Lk_Komp, Lk_BSE, Lk_ZSE, Lk_DP) by means of formulas and references and do not have to be entered.

You find the instruction for the creation of images in the *SICAM TOOLBOX II Online Help*, chapter "OPM *II", section "Images"*.

Parameterization of the Process Signals and Assignment to the System Technique

The parameters for the technological processing of process signals reside in the menu tree below the link images:

- Addressing
- Signal preprocessing
- Signal postprocessing

You find the description of the parameters in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation"*.

You find the description of the technological processing of inputs and outputs of the process periphery in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC* 60870-5-101/104.

The assignment of a process signal to a hardware pin or software data point in the system technique takes place by means of assignment (alternatively automatically or manual). You find the instruction thereto in the *SICAM TOOLBOX II Online Help*, chapter "Parameter Documentation", section “Assign”.

4.1.5.4 Decentralized Archiving (DEAR)

The Decentralized Archive serves for the archiving of events during a communication fault. Here all the data points used in an automation unit can be acquired.

You can configure the archive in the system technique of the "OPM II" (parameter group `Decentralized archiving` of the respective automation unit). In the images you can define the process-technical settings of the data points to be acquired. During operation, these data points are archived chronologically upon status change. This applies for all commands and binary information items of the send and receive direction.

You find the detailed information on the settings in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Telecontrol", section "Decentralized Archiving"*.

4.1.6 Transform Parameters

Before loading into the target system, the process-technical parameters of the plant must be transformed. This can be carried out with the tool "OPM II" through selection of the menu `Destination systems` | `SICAM RTUs...` | `SICAM RTUs Transformer` .

System-technical parameters are automatically transformed when saved.

You find the details thereto in the *SICAM TOOLBOX II Online Help*, chapter "OPM *II", section "Transform and Load", "SICAM* RTUs".

4.1.7 Import, Export and Backup of Engineering Data

The tool "Data Distribution Center" enables the importing and exporting of parameters, as well as the creation of backup files.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "Data Distribution Center"*.

4.1.8 Documentation

With the tool "OPM II" you can generate and print the documentation of the engineering data:

- Hardware Configuration
- Assembly Technique
- Interface to Elcad
- Telecontrol Function
  - System-technical configuration
  - Process-technical settings

You find the details thereto in the *SICAM TOOLBOX II Online Help*, chapter "OPM *II", section "System Technique", section "Documentation"*.

4.1.8.1 Hardware Configuration

You can initiate the documentation of the system elements in the plant tree of the menu System technique , via the context menu of the automation unit.

The output takes place as a table in a file (format *.csv*) or to a printer.

With the tool "HW-FW Configuration" you can assign the required assembly-technical information to the system elements.

4.1.8.2 Assembly Technique

You can initiate the documentation of the assembly-technical configuration in the plant tree of the menu System technique , via the context menus of the peripheral elements.

The output takes place as a table with adjustable layout, optionally as preview on the screen or to a printer.

The documentation extends over the HW pins of the respective peripheral elements and contains:

- Slot and module type
- System-technical address of each pins within the message
- Process-technical address of each pins within the message
- Common information of a pin (long text)
- Assignment of the pins to a link image in the "OPM II"

4.1.8.3 Interface to ELCAD

For the coupling with the design tool ELCAD, it is possible to transfer images that are assigned to a system element via this defined interface.

The output takes place to a text file (format *asc*).

The generation of the file takes place via selection of the menu Destination systems | SICAM RTUs... | SICAM RTUs Transformer.

You find the details thereto in the *SICAM TOOLBOX II Online Help*, chapter "OPM *II", section "Elcad"*.

4.1.8.4 Telecontrol Function

4.1.8.4.1 System-technical Parameter

You can initiate the documentation of the system-technical configuration in the menu System technique , via the context menu of an automation unit or of a specific system element.

The output takes place as a spreadsheet, optionally as preview on the screen or to a printer.

4.1.8.4.2 Process-Technical Settings

You can initiate the documentation of the process-technical settings in the tree of the menu Edit image , via the context menu of a selected hierarchical level.

The output takes place as a spreadsheet, optionally as preview on the screen or to a printer.

4.1.9 Commissioning an Test

For commissioning and test of the projected settings the following functions are available (online):

- Load engineering data
- Parameter comparison
- Test functions
- Diagnosis (see section 5.3, Diagnosis)

For these functions the engineering PC must be connected with the target system (see 3.2, Connect Engineering PC with a Target System).

4.1.9.1 Loading Engineering Data

The loading of the parameters of a process-technical plant from the PC into the target system takes place with the tool "Load Parameters". You can launch it from the "OPM II" via the menu Target systems | SICAM RTUs | Parameter loader , or directly via the start menu of your PC.

With the tool "Parameter Loader" you can add and select automation units, and initiate the loading via the menu Load | Selected AUs .

All settings that have been performed in the SICAM TOOLBOX II are thereby saved jointly on the SD card of the target system:

- Configuration parameters
- System-technical parameters
- Process-technical parameters (if they have been transformed previously)
- Application program (if code has been generated previously)

After the loading of the parameters an automatic startup of the target system is performed. For each selected automation unit a corresponding notification appears subsequently.

For the loading of the parameters there are different variants available:

- Load intelligent
  - only the changed parameters are loaded into the target system
  - can be applied locally or remotely
- Load unconditional
  - all parameters are loaded into the target system
  - can be applied locally or remotely
- Initialize
  - all parameters are deleted in the target system, and all parameters newly transferred
  - can be applied only with the locally connected automation unit
  - is used for the first loading of an automation unit or of a basic system element

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Parameter Loader"*.

Caution

During a loading operation, a power down off of the master control element is to be absolutely avoided, since the data on the flash card could be destroyed as a result.

4.1.9.2 Parameter Comparison

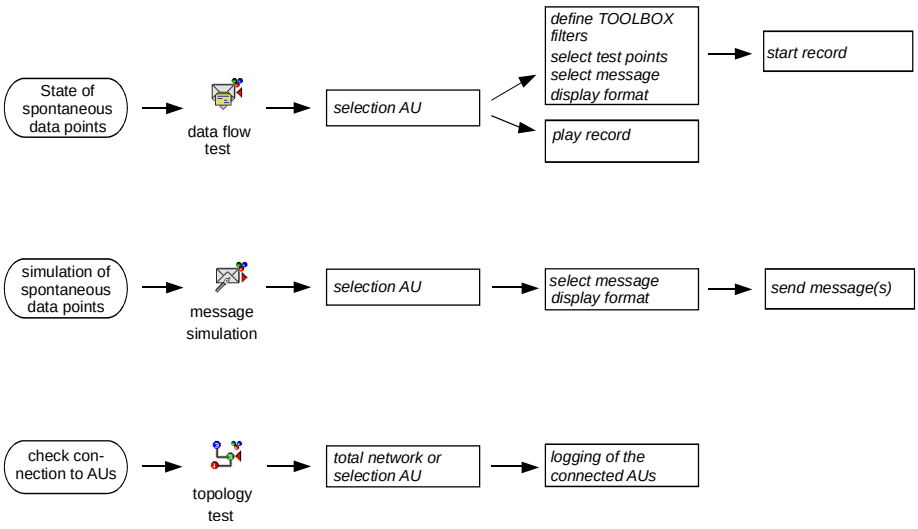
With tool "Parameter Loader" you can check whether the parameter status in the destination system is current. You can select an automation unit and start the comparison via the menu `Parameter | Comparison Aus <-> Toolbox`.

For each selected automation unit appears the indication whether the parameters are current or not current.

4.1.9.3 Test Functions

For the examination of the parameterized automation units and their data flows, the following test functions are available:

- Data flow test
- Message simulation
- Topology test



4.1.9.3.1 Status Of Spontaneous Data Points

With the tool "Data Flow Test" data streams (flow of messages) can be simultaneously logged and visualized. For a subsequent analysis - also at another location - a recording can take place with the Interface Recorder.

The function Simultaneous log serves for the recording of messages within the internal data flow of an automation unit. In protocol elements, the data flow from and to other automation units can also be acquired.

The following data can (with change of the spontaneous data) be simultaneously logged:

- Change of state of inputs/outputs
- Communication from and to protocol elements
- Data traffic from and to the application program
- Data traffic from and to special functions (for example set counters, set time)

By means of triggering a General Interrogation all spontaneous input signals can be simultaneously logged at any arbitrary time.

You find the instruction for this test function in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Data Flow Test"*.

You find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements*, chapter "System Services", section "Data Flow Test".

4.1.9.3.2 Simulation of Spontaneous Data Points

With the tool "Message Simulation", messages can be transmitted from the SICAM TOOLBOX II to automation units. Just one message or up to 100 messages in succession can be transmitted; in addition sequential delays and message repetitions can be defined.

The messages can be passed in at defined points of the system. With this function the following possibilities exist:

- Setting of outputs
- Simulation of the communication from and to protocol elements
- Data traffic from and to the application program
- Data traffic from and to special functions (for example set counters, set time)

Pay attention that due to the simulation the plant state can change.

Warning

The manual controlling of outputs with the plant running can lead to damage to persons and machines. Ensure that aggregates in the control area of the command output and those subsequent aggregates in the process chain are protected and that persons in the vicinity are warned.

You find the instruction for this test function in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Message Simulation"*.

You find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements*, chapter "System Services", section "Message Simulation".

4.1.9.3.3 Check The Connection To Automation Units

The tool "Topology Test" is used for the acquisition of all automation units in a SICAM RTUs automation network that are reachable or non-reachable from the automation unit momentarily physically connected.

You find the instruction for this test function in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Service Programs" | "Message Simulation"*.

4.1.9.4 Displaying Decentral Archive (DEAR)

The current contents of DEAR can be displayed with the tool "OPM II".

Via the context menu of the automation unit, submenu Display decentral archiving... , you get to the file directory.
Then select a file and click on the button Display archives to display the respective records.

Note

The data records of the decentral archive are registered in configurable files. The files are stored on the SD card. The record of data points is therefore only possible with equipped SD card.

You can save the displayed records of DEAR in a file (Format *.csv*) on the engineering PC.

You find the information thereto in the *SICAM TOOLBOX II Online Help*, chapter "OPM II", section "System Technique", "General", "SICAM *RTUs", "Decentral Archive Display"*.

4.2 Automation

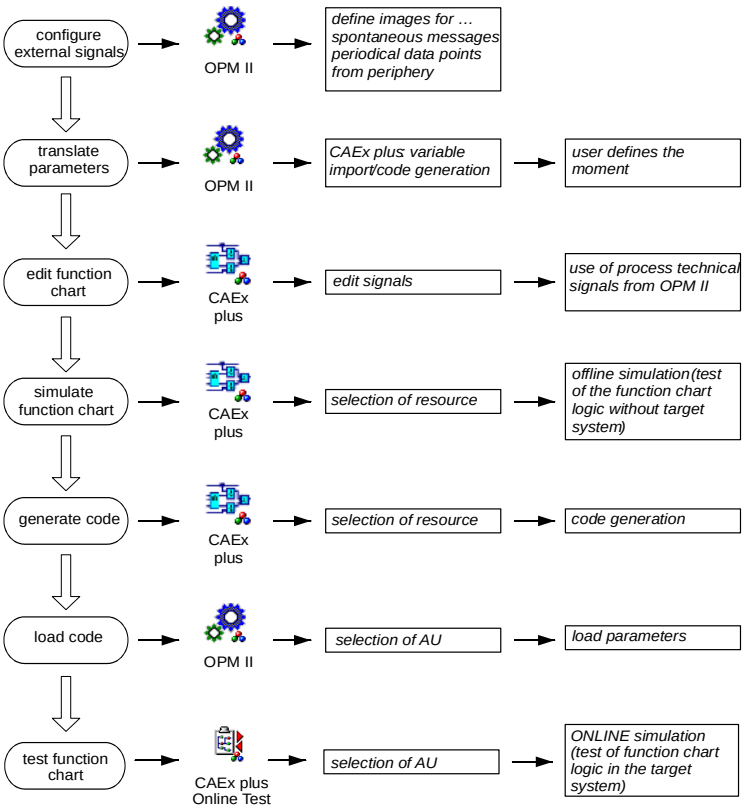
For the implementation of freely definable open-/closed-loop control functions you can optionally create an application program as function diagram (FUD).

The application program processes process information from the peripheral elements connected to the basic system element and/or from other system elements in the automation network of the specific process-technical plant.

Overview of the Tasks

Task	Meaning
Configure external signals	Create images for spontaneous and periodical data points
Create function diagram	Edit the application program
Simulate function diagram	Test application program offline
Generate program code	Compile application program
Load program code	Transfer application program into the target system
Perform startup	Initialize application program in the target system
Test function diagram	Test application program online
Documentation	Prepare application program for printing

Fundamental Procedure of the Programming



4.2.1 Create Function Diagram (FUD)

For the creation of a function diagram the tool "CAEx *plus*" is required.

4.2.1.1 Configuring External Signals

The I/O's are integrated into the Function Diagram via the Signal List. Dependent from the fact, whether the target system is engineered via the SICAM TOOLBOX II or via the web browser, the Signal List can be alternatively

- generated with the tool "OPM II"
- imported from a local parameterization (see thereto section 4.1.7, Import, Export and Backup of Engineering Data)

The signals of the process-technical plant can be used by CAEx *plus* after the transformation (refer to section 4.1.6, Transform Parameters). The structure of the project tree automatically adapts to the structure from the OPM II.

An introduction how to create a project can be found in the *TOOLBOX II CAEx plus Online Help* chapter "First Steps" and chapter "*Additional Products*", section "*Signal List (Optional)*".

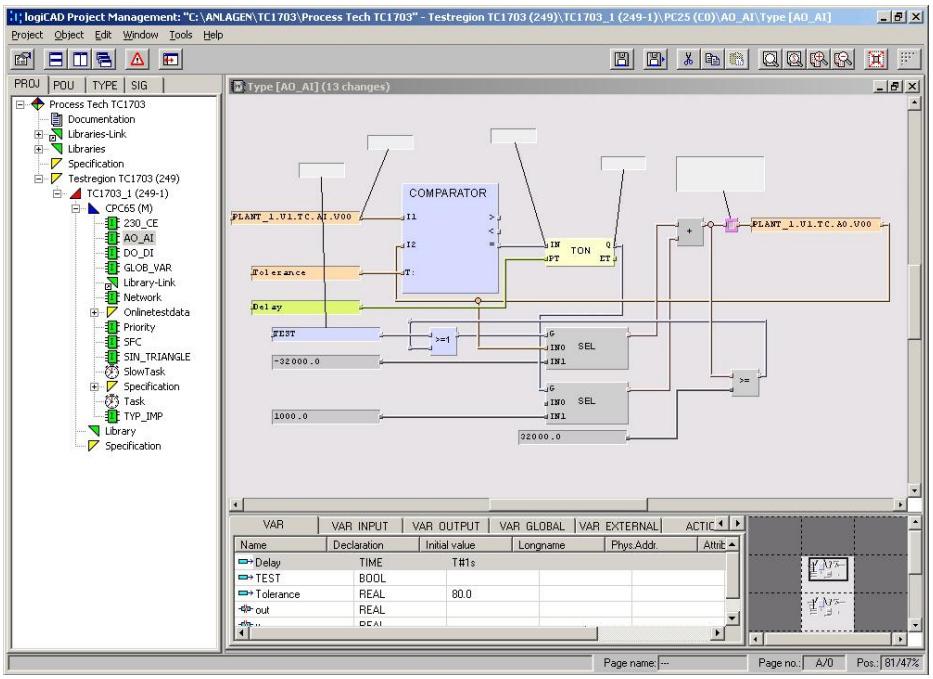
4.2.1.2 Tool CAEx *plus*

The tool "CAEx *plus*" provides various editors and standard libraries for the creation of the open-/closed-loop control functions.

The process-technical functions of a plant are created with the function diagram editor (FBD-Editor). A function diagram is thereby created by the interconnection of

- predefined functions and function blocks ("CAEx plus" standard library)
- functions and function blocks defined by the user

Function Diagram Editor (Example)



You find the description of the editor in the CAEx *plus Online Help, chapter "Editors"*. Additional Information can be found in the *SICAM TOOLBOX II Online Help, chapter "CAEx* plus".

You find the most important characteristic values (limits) for the creation of the open-/closed-loop control function in the SICAM *AK 3 System Description, chapter "Technical Specifications of the Modules", section "Master Control Modules"*.

You find the technical details for the processing of the open-/closed-loop control function and its partial functions in the manual SICAM *RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Restricted Open-/Closed-Loop Control Function", "Application Program", "Function Diagram"*.

4.2.1.3 Generate Code

Before the loading of the open-/closed-loop control functions into the target system, the application program code must be generated.

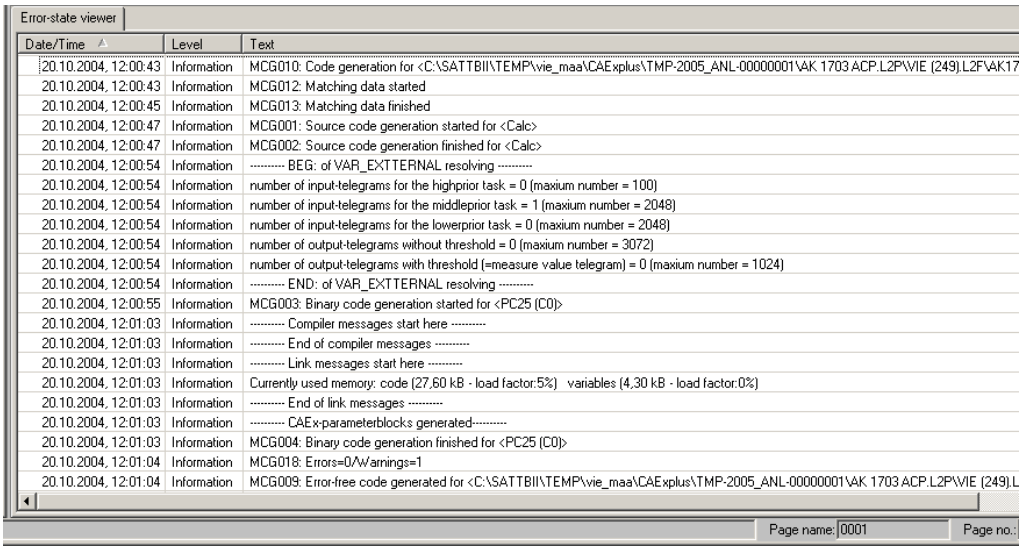
The code generation can be started via the CAEx *plus* Transformer or from "CAEx *plus*" via the context menu of the basic system element (right mouse button).

The function diagram is now translated and checked by a compiler. Simultaneously the program code is generated as instruction list (IL) in the folder “Specification”.

Vice versa, an already existing and compatible instruction list may be imported with the tool “OPM II” (context menu of the CPU, Instruction List | Import).

Via the menu Tools | Error state viewer the indication display of the code generation can be activated. There, common indications (as for instance information on occupied memory space for code and variables), as well as detected errors are recorded in detail.

Error State Viewer (Example)



The exact description of this tool is included in the *SICAM TOOLBOX II CAEx plus Online Help, chapter "Target-System Connection", section "Functions for Target-System Connection", section "Code Generation"*.

The code generation can be started independently from "CAEx *plus*" with the tool "OPM II" through selection of the function Destination systems | CAEx plus... | signal list/generate code. Thereby a signal list is created for the processing of the parameterized signals in the open-/closed loop control function and read into CAEx *plus*.

Further details can be found in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "Transform and Load", "CAEx plus"*.

4.2.2 Documentation

4.2.2.1 Cross Reference List

With the tool "CAEx *plus*" a cross reference list over the project hierarchy can be generated, displayed on the screen, or printed.

The cross reference list extends alternatively over a

- Basic system element
- Program organization unit

It is executed via the respective context menu Cross-references .

You find the instruction thereto in the CAEx *plus Online Help, chapter "Basics", section "Default Operating Elements", section "Commands of the Pop-Up Menus"*.

4.2.2.2 Open/Closed-Loop Control Function

In the project hierarchy of the tool "CAEx *plus*", by selecting each level the function Print can be executed, by means of pop-up menu. The print operation is started on the default printer of the PC.

You find the instruction thereto in the CAEx *plus Online Help, chapter "Basics", section "Default Operating Elements", section "Commands of the Pop-Up Menus", section "Print in Project Management"*.

Additional information can be found in the CAEx *plus Online Help, chapter "Basics", section "Default Properties" as well as chapter "Lists and References", section "Designing Printouts with DXF"*.

Further extensive possibilities for the documentation are provided by the optional function Document Management (additional product for CAEx *plus*).

You find the details thereto in the CAEx *plus Online Help, chapter "Additional Products", section "Documents Management (Optional)"*.

4.2.3 Commissioning and Test

4.2.3.1 Loading Program Code

To load the program code (compiled FUD) into the target system, the engineering PC must be connected with the target system (see 3.2, Connect Engineering PC with a Target System).

The loading of the program code into the target system takes place jointly with the parameters set in the "OPM II". Thereto the tool "Parameter Loader" must be used (see also section 4.1.9.1, Loading Engineering Data).

Caution

During a loading operation, a power down of the master control element is to be absolutely avoided, since the data on the flash card could be destroyed as a result.

You find the technical description thereto in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Open-/Closed-Loop Control Function", "Loading of Application Program (Reload)"*.

You find the instruction for the operation in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Parameter Loader"*.

Note

Instead of a function diagram an instruction list (ASCII format) can be imported in "CAEx *plus*".

4.2.3.2 Test Functions

4.2.3.2.1 Simulate Function Diagram Offline

The logic operations of a function diagram can be tested in "CAEx *plus*" with the offline Simulation.

This function can be called via the context menu of the basic system element, program instance or type instance (right mouse button). You can find the details thereto in the *CAEx plus User Manual, chapter "Additional Products", section "Offline Simulation"*.

4.2.3.2.2 CAEx *plus* Online Test

With the tool "CAEx *plus*", all open- and closed-loop technical tasks in processing elements of the SICAM AK 3 system can be tested online (selection of the basic system element, context menu ONLINE Test).

The following test functions are available:

- Display and force values
- Test switch input/output messages, input/output process images of the peripheral elements
- Changing the execution status of the open-/closed-loop control function
  - Stop controller
  - Start controller
  - Perform cold start of the resource
  - Perform warm start of the resource
  - Halt task
  - Continue task
  - Perform cold start of a task
  - Perform warm start of a task
  - Halt program
  - Continue program
- Setting breakpoints
- Real time archive
- Display status information
- Read and write (simulate) variables
- Oscilloscope

Oscilloscope functions serve for the chronological representation of analog values and binary values during the “Offline Simulation” of the function diagram.

You find exact details thereto in the *CAEx plus Online Help, chapter "Additional Products", section "Logic Analysis with Oscilloscope Functions"*.

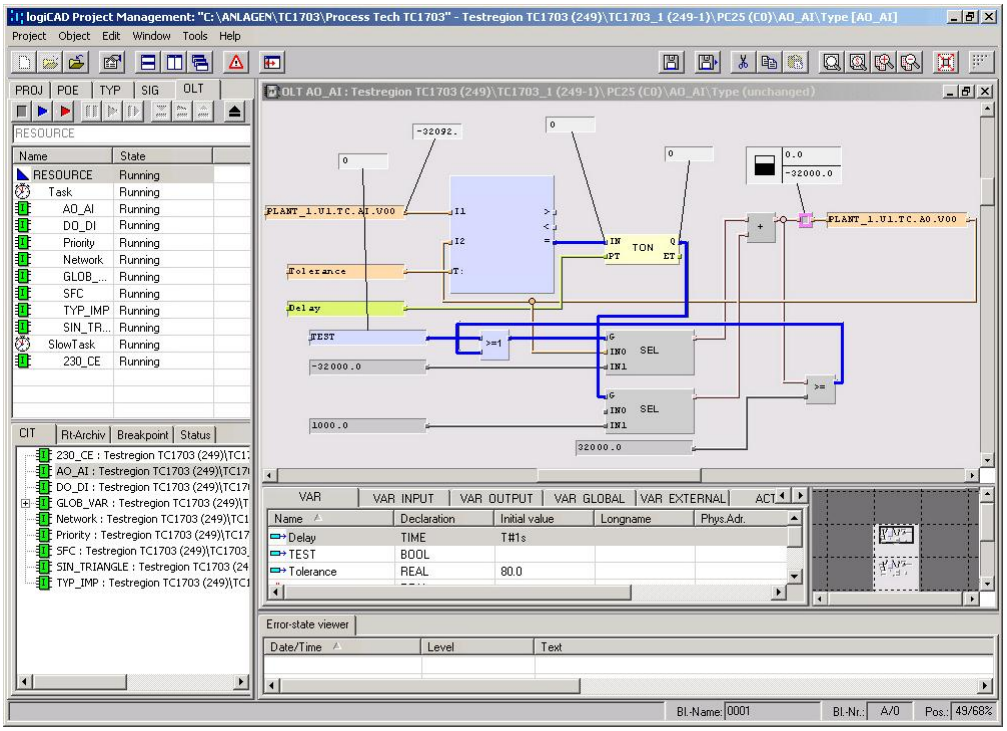
The technical description of the online test function can be found in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Online Test"*.

The details for operation can be found in the *SICAM TOOLBOX II CAEx plus User Manual, chapter "Target-System Connection", section "Functions for Target-System Connection"*.

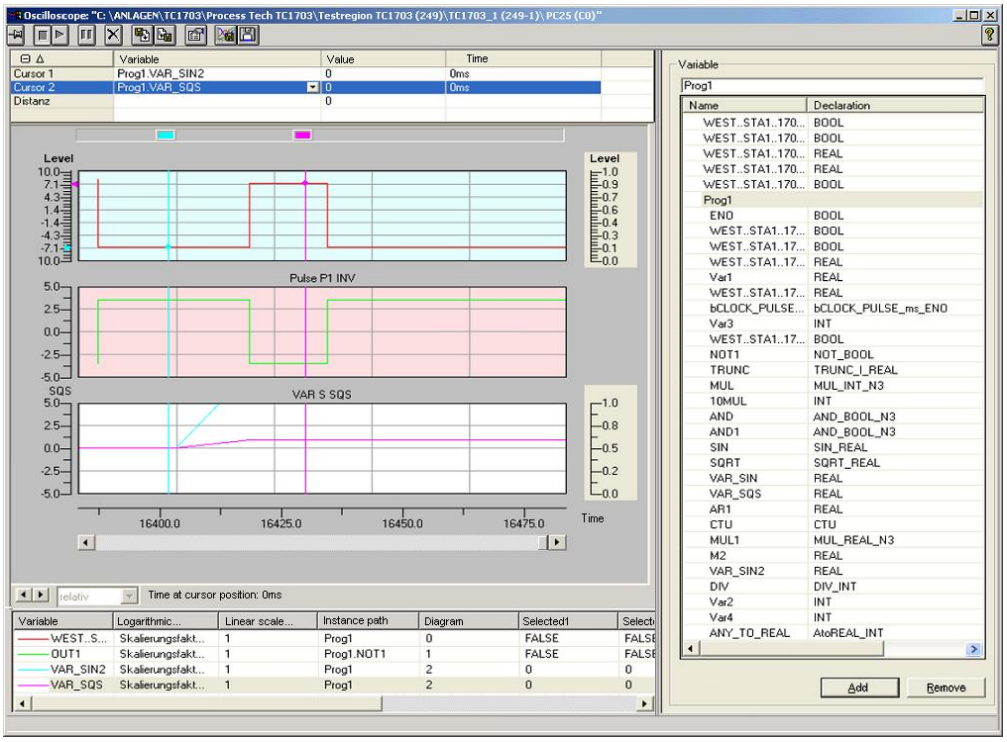
Note

With user program running, the simulated value of a variable is statically overwritten. In contrast to this, inputs/outputs are not statically overwritten, rather only with a change to their process image (edge-triggered).
With user program stopped, simulated values are retained.

CAEx *plus* Online Test (Example)



CAEx *plus* Oscilloscope (Example)



5 Service

Contents

This chapter describes the internal checks and displays of the system SICAM AK 3, which diagnosis options are available, what is to be considered with the exchange of modules, and how functional updates can be loaded into the system.

5.1 Operation And Display Elements

Meaning of the LED Symbols

Symbol	State	Symbol	State
~	lights up	§	flash pulse regularly
™	dark	V	flash pulse irregularly
ž	flickering (data transfer)	x	not relevant

5.1.1 Power Supply

The LED “RY” on the front panel displays the operating state (see 2.1.1, PS-2630, PS-2632).

System Display Elements

Name	Color	Function	LED	Meaning
RY	yellow	Ready	~	Power supply ready
			§	· Temperature > 95°C · Temperature sensor defective
			V	Call timeout (module not called by the master control unit)

5.1.2 Basic System Elements

LEDs on the front panel (refer to 2.2, Basic System Elements) display various states. The arrangement of the LEDs comprises

- System display elements Display of operating- and error states of the system
- Function display elements Display of the readiness of the protocol elements
- Communication display elements Display of the operating- and error states of the protocol elements

Which states are displayed, is determined by

- the firmware implemented
- the protocol elements used

System Display Elements

Name	Color	Function	LED	Meaning
RY	yellow	Ready	~	Master control element ready
ER	red	Error	~	· Sum error (internal error, external error, warning, module failure, failure; including peripheral elements) · Startup
W	yellow	Warning	~	Warning
BBD	yellow	Board breakdown	~	Module failure
INT	yellow	Internal error	~	Internal error
EXT	yellow	External error	~	External error
ACT	yellow	CPU active	~	CPU active
CPY	yellow	Copy	§	Parameters being loaded into the flash PROM
			~	firmware being loaded
			V	Check checksum of parameter and firmware files on the flash card
SF *)			~	RUN
			™	STOP
			§	TEST
			™	KILL
			™	Startup
HLT	yellow	Halt	§	Firmware shut down
			~	Module shut down

*) only valid for CP-2019 with Safety-Firmware

Display elements of the local Ethernet protocol elements

Name	Color	Function	LED	Meaning
LK X0	yellow	PRE0 Link	~	Protocol element 0, physical connection to switch/remote station
PK X0	yellow	PRE0 Packet	~	Protocol element 0, activity on transmit/receive direction
ACT0	yellow	PRE0 Active	~	Protocol element 0, interface active - redundancy
ER0	yellow	PRE0 Error	~	Protocol element 0, Error on interface
LK X1	yellow	PRE1 Link	~	Protocol element 1, physical connection to switch/remote station
PK X1	yellow	PRE1 Packet	~	Protocol element 1, activity on transmit/receive direction
ACT1	yellow	PRE1 Active	~	Protocol element 1, interface active - redundancy
ER1	yellow	PRE1 Error	~	Protocol element 1, Error on interface

Display elements of the protocol element equipped with submodule SM-2558 without SM-0551

Name	Color	Function	LED	Meaning
OH X2	yellow	-	-	-
RTX X2	yellow	-	-	-
ACT2	yellow	-	-	-
ER2	yellow	-	-	-
OH X3	yellow	PRE3 Link	˜	Protocol element 3, physical connection to switch/remote station
RTX X3	yellow	PRE3 Packet	˜	Protocol element 3, activity on transmit/receive direction
ACT3	yellow	PRE3 Active	˜	Protocol element 3, interface active - redundancy
ER3	yellow	PRE3 Error	˜	Protocol element 3, Error on interface

Display elements of the protocol elements equipped with submodule SM-2558 with SM-0551

Name	Color	Function	LED	Meaning
OH X2	yellow	PRE2 request to send	˜	Protocol element 2, Send request to transmission facility
RTX X2	yellow	PRE2 Receive	˜	Protocol element 2, activity on transmit/receive direction
ACT2	yellow	PRE2 Active	˜	Protocol element 2, interface active - redundancy
ER2	yellow	PRE2 Error	 ˜ §	Protocol element 2, Error on interface Communication failure (all connections faulty) Communication fault (at least one connection faulty)
OH X3	yellow	PRE3 Link	˜	Protocol element 3, message is sent to switch/remote station
RTX X3	yellow	PRE3 Packet	˜	Protocol element 3, activity on transmit/receive direction
ACT3	yellow	PRE3 Active	˜	Protocol element 3, interface active - redundancy
ER3	yellow	PRE3 Error	˜	Protocol element 3, Error on interface

Display elements of the protocol elements equipped with submodule SM-2551

Name	Color	Function	LED	Meaning
OH X2	yellow	PRE2 request to send	˜	Protocol element 2, Send request to transmission facility
RTX X2	yellow	PRE2 TXD/RXD	˜	Protocol element 2, activity on transmit/receive direction
ACT2	yellow	PRE2 Active	˜	Protocol element 2, interface active - redundancy
ER2	yellow	PRE2 Error	 ˜ §	Protocol element 2, Error on interface Communication failure (all connections faulty) Communication fault (at least one connection faulty)

OH X3	yellow	PRE3 request to send	˜	Protocol element 3, Send request to transmission facility
RTX X3	yellow	PRE3 TXD/RXD	˜	Protocol element 3, activity on transmit/receive direction
ACT3	yellow	PRE3 Active	˜	Protocol element 3, interface active - redundancy
ER3	yellow	PRE3 Error		Protocol element 3, Error on interface
			˜	Communication failure (all connections faulty)
			§	Communication fault (at least one connection faulty)

Display elements of the protocol elements equipped with submodule SM-2547 or SM-2557

Name	Color	Function	LED	Meaning
OH X2	yellow	PRE2/Port-0 Link	˜	Protocol element 2, physical connection to switch/remote station
RTX X2	yellow	PRE2/Port-0 Packet	˜	Protocol element 2, activity on transmit/receive direction
ACT2	yellow	PRE2/Port-0 Active	˜	Protocol element 2, interface active - redundancy
ER2	yellow	PRE2/Port-0 Error	˜	Protocol element 2, Error on interface
OH X3	yellow	PRE3/Port-1 Link	˜	Protocol element 3, physical connection to switch/remote station
RTX X3	yellow	PRE3/Port-1 Packet	˜	Protocol element 3, activity on transmit/receive direction
ACT3	yellow	PRE3/Port-1 Active	˜	Protocol element 3, interface active - redundancy
ER3	yellow	PRE3/Port-1 Error	˜	Protocol element 3, Error on interface

Operating Elements

Name	Color	Function	Meaning
RES	-	Reset	Reset of the subordinate system elements

The reset signal of the master control element affects the entire automation unit, this means also the

- Processing and communication elements
- Protocol elements
- Peripheral elements

The reset signal of a processing and communication element affects only its belonging subordinate protocol elements and peripheral elements

5.1.3 Peripheral Elements

LEDs on the front panel (refer to 2.5, Peripheral Elements) display various states.
The arrangement of the LEDs comprises

- System display elements Display of operating- and error states
- Function display elements Display of the state of the I/Os

Which states are displayed, is determined by

- the firmware implemented
- the peripheral control module used

System Display Elements

Name	Color	Function	LED	Meaning
RY	yellow	Ready	~	Module ready
ER	red	Error	~	· Sum error (internal error, external error, warning, module failure, failure) · Startup

Function Display Elements

Name	Color	Function	LED	Meaning
D00…D63	yellow	Digital inputs Digital outputs	~	I/O activated
C00…C31	yellow	Digital outputs (command relay)	~	I/O activated
I00… I31	yellow	Digital inputs	~	I/O activated
V00…V23	yellow	Analog inputs Analog outputs	~	I/O activated
GRA	yellow	Group A	~	Command group A activated
GRB	yellow	Group B	~	Command group B activated
OA0	yellow	Output A	~	Output relay 0 activated
OA1	yellow	Output B	~	Output relay 1 activated
CE	yellow	Command error	~	Sum error command output

Operating Elements

Name	Color	Function	Meaning
PBA switch	-	Address peripheral element	Setting of the peripheral board address (PBA) parameterized in the SICAM TOOLBOX II

5.2 Checks And System Displays

During startup of the SICAM AK 3 system, checks of the hardware and the software are performed by the individual system elements.

If an error is detected, this leads

- to a signaling via the LED-displays
  (an overview can be found below)
- depending on the seriousness of the error, possibly to an abortion of the startup

After error-free startup of a system element, further checks are performed.

5.2.1 Basic System Elements

Startup (step)	RY	ER	W	BBD	INT	ACT	EXT	CPY	HLT	Error
Power up or Reset	™	~	™	™	™	™	™	™	~	Module defect
Check code memory (flash PROM)	™	~	™	™	™	™	™	™	~	PROM error (code) · Module is shutdown · Startup is aborted
Check data memory (RAM) with address error check	™	~	™	™	™	™	™	™	~	RAM error (data) · Module is shutdown · Startup is aborted
Check of checksums of all parameter and firmware files on the flash card	™	~	™	™	™	™	™	V	™	Checksum error on the flash card · Diagnosis information is set
Check whether all parameters of the main processor (M-CPU) are present on the flash card [1)]	™	~	™	™	™	™	™	V	™	Parameter files incomplete · Firmware is shutdown · Startup is aborted
Check whether all firmware files are present on the flash card [1)]	™	~	™	™	™	™	™	V	™	Firmware code incomplete

Startup (step)	RY	ER	W	BBD	INT	ACT	EXT	CPY	HLT	Error
Check, whether firmware code of the lower-level system elements (processing and communication elements [1], protocol elements, peripheral elements) is current	™	~	™	™	™	™	™	™	™	If not, the load firmware is loaded at a later time
Revision check of the parameters in the parameter memory of the M-CPU	™	~	™	™	™	™	™	~ 1)	™	If the parameters are not current, they are loaded from the flash card
Check parameter memory (flash PROM)	™	~	™	™	™	™	™	™	V	Checksum error of the parameters · Firmware is shutdown · Startup is aborted
Check whether the parameterized configuration corresponds with the physical configuration (processing and communication elements [1], protocol elements, peripheral elements)	™	~	™	™	™	™	™	™	™	Configuration error · The incorrectly configured or defective system element is not operational
Loading of the parameters to the lower-level protocol- and peripheral elements	™	~	™	™	™	™	™	™	™	Too little memory on the protocol element or peripheral element · Firmware on the protocol element or peripheral element is shutdown
Check of the parameter contents	™	~	™	™	™	™	™	™	™	Parameter error · Diagnosis information is set
Startup concluded without error	~	™	™	™	™	x	™	™2)	™	
Startup concluded with error	~	~	™	™	™	x	™	™	™	

1) applies for the main processor (M-CPU) on the master control element

2) flashes for approx. 20s after replacement of the master control element resp. of a processing and communication element

Error (startup canceled)	RY	ER	W	BBD	INT	ACT	EXT	CPY	HLT	Note
Module defect	™	~	™	™	™	™	™	™	~	Exchange system element
PROM error (code)	™	~	™	™	™	™	™	™	™	Exchange system element
RAM error (data)	™	~	™	™	™	™	™	™	™	Exchange system element
Parameter files incomplete *)	™	~	™	™	~	™	™	™	§	SICAM TOOLBOX II diagnostic (initialize automation unit)
Checksum error of the parameters	™	~	™	™	~	™	™	™	§	SICAM TOOLBOX II diagnostic (initialize automation unit)
Parameter error	™	~	™	™	~	™	™	™	§	SICAM TOOLBOX II diagnosis

*) applies for the main processor (M-CPU) on the master control element

Error (startup continued)	RY	ER	W	BBD	INT	ACT	EXT	CPY	HLT	Note
No flash card present 1)	~	~	x	x	~	x	x	™	™	SICAM TOOLBOX II diagnosis (install flash card, initialize automation unit)
Checksum error on the flash card	~	~	x	x	~	x	x	™	™	SICAM TOOLBOX II diagnosis (initialize automation unit or load firmware, acc. to diagnosis)
Firmware code incomplete 1)	~	~	x	x	~	x	x	™	™	SICAM TOOLBOX II diagnosis (load firmware automation unit)
Configuration error	~	~	x	~	x	x	x	™	™	SICAM TOOLBOX II diagnosis
Too little memory on the protocol element or peripheral element	~	~	x	~	x	x	x	™	™	SICAM TOOLBOX II diagnosis
Parameter error	~	~	~ 2)	x	~ 2)	x	x	™	™	SICAM TOOLBOX II diagnosis

1) applies for the main processor (M-CPU) on the master control element

2) depending on type of error

System element load firmware code	RY	ER	W	BBD	INT	ACT	EXT	CPY	HLT	Note
System element is shutdown and the firmware code is loaded from flash card	~	~	~	~	x	x	x	~ *) ™	™	
Initiation of the startup of the newly loaded system elements (basic system elements [1)], protocol elements, peripheral elements)	~	~	~	~	x	x	x	™	™	
Startup of the system elements concluded (OK)	~	x	x	x	x	x	x	™	™	
Startup of the system elements concluded (error)	~	~	x	x	x	x	x	™	™	

*) applies for the main processor (M-CPU) on the master control element

Note

Firmware shut down means that all functions with exception of those, which are necessary for the communication with the engineering tool (via direct connection), are stopped. In this state the watchdog of the modules terminates, and all outputs are terminated.

By means of the lighted display this state can not be identified clearly. This state can be finished by means of power-on or startup via the engineering tool.

Module shut down means that all functions of hardware und firmware are stopped. In this state the watchdog of the modules terminates, and all outputs are terminated.

By means of the lighted display this state can not be identified clearly. This state can be finished only by means of power-on.

5.2.2 Protocol Elements

Startup (step)	ERx	Error
Reset, power up or startup initiated by the higher-level system element	~ *)	Module defect
Check code memory (flash PROM)	~ *)	PROM error (code) · Module is shutdown · Startup is aborted
Check data memory (RAM)	~ *)	RAM error (data) · Module is shutdown · Startup is aborted
Reception of the parameters from the higher-level system element	~ *)	Too little memory · Firmware is shutdown · Startup is aborted
Check of the parameter contents	~ *)	Parameter error · Diagnosis information is set
Startup concluded without error	™	
Startup concluded with error	~ *)	

*) in addition the system-LED "ER" lights up on the basic system element

Action after startup	ERx	Error
Setup of the communication connection	~ *)	communication failure communication fault
Communication established	™	

*) in addition the system-LED "ER" lights up on the basic system element

Error (startup aborted)	ERx	Note
Module defect	~ *)	Exchange system element
PROM error (code)	~ *)	Exchange system element
RAM error (data)	~ *)	Exchange system element
Too little memory	~ *)	SICAM TOOLBOX II diagnosis
Parameter error	~ *)	SICAM TOOLBOX II diagnosis

*) in addition the system-LED "ER" lights up on the basic system element

Error (startup continued)	ERx	Note
Parameter error	~ *)	SICAM TOOLBOX II diagnosis
Communication failure	~ *)	SICAM TOOLBOX II diagnosis
Communication fault	§ *)	SICAM TOOLBOX II diagnosis

*) in addition the system-LED "ER" lights up on the basic system element

5.2.3 Peripheral Elements

Startup (step)	RY	ER	Error
Reset, power up or startup initiated by the higher-level system element	™	~ *)	Module defect
Check code memory (flash PROM)	™	~ *)	PROM error (code) · Module is shutdown · Startup is aborted
Check data memory (RAM)	™	~ *)	RAM error (data) · Module is shutdown · Startup is aborted
Reception of the parameters from the higher-level system element	™	™*)	Too little memory · Firmware is shutdown · Startup is aborted
Check of the parameter contents	™	™*)	Parameter error · Diagnosis information is set
Startup concluded without error	~	™	
Startup concluded with error	~	~	

*) in addition the system-LED "ER" lights up on the basic system element

Error (startup aborted)	RY	ER	Note
Module defect	™	~ *)	Exchange system element
PROM error (code)	™	~ *)	Exchange system element
RAM error (data)	™	~ *)	Exchange system element
Too little memory	™	§ *)	SICAM TOOLBOX II diagnosis
Parameter error	™	~ *)	SICAM TOOLBOX II diagnosis

*) in addition the system-LED "ER" lights up on the basic system element

Error (startup continued)	RY	ER	Note
Parameter error	~	~ *)	SICAM TOOLBOX II diagnosis

*) in addition the system-LED "ER" lights up on the basic system element

5.3 Diagnosis

5.3.1 Distinction of the Error Types

The following listing explains the different error types and how errors are recorded.

- System errors
  - Supervision of the system, communication, time synchronization by the firmware of the configured system elements
    - Logging in the online diagnosis
    - Activation of the red Error LED on the master control element
- Parameterization errors (telecontrol function)
  - Supervision by the engineering tool
    - Specific conventions or plausibility checks
    - Indication upon entry or prevention of the transfer
  - Supervision online by the firmwares of the configured system elements
    - Logging in the online diagnosis
    - Activation of the red Error LED on the master control element
- Program errors (open-/closed-loop control function)
  - Supervision by CAEx *plus* (engineering via SICAM TOOLBOX II)
    - Specific conventions or plausibility checks
    - Indication upon entry or prevention of the transfer
  - Supervision by the CAEx *plus* compiler (engineering via SICAM TOOLBOX II)
    - Logging in the "Error state viewer"
  - Supervision by the ASCII-Compiler during startup (engineering via web browser)
    - Logging in the PLC diagnosis
  - Supervision online by the firmware of the master control element
    - Logging in the online diagnosis
- Operator errors
  Are largely limited due to plausibility checks or queries by the SICAM TOOLBOX II.

Note

Naturally, all operator inputs, such as for example the loading of parameters or the online testing, are subject to the responsibility of the user.
Profound knowledge of the automation technique in general, as well as the documents mentioned in the Preface is presumed.

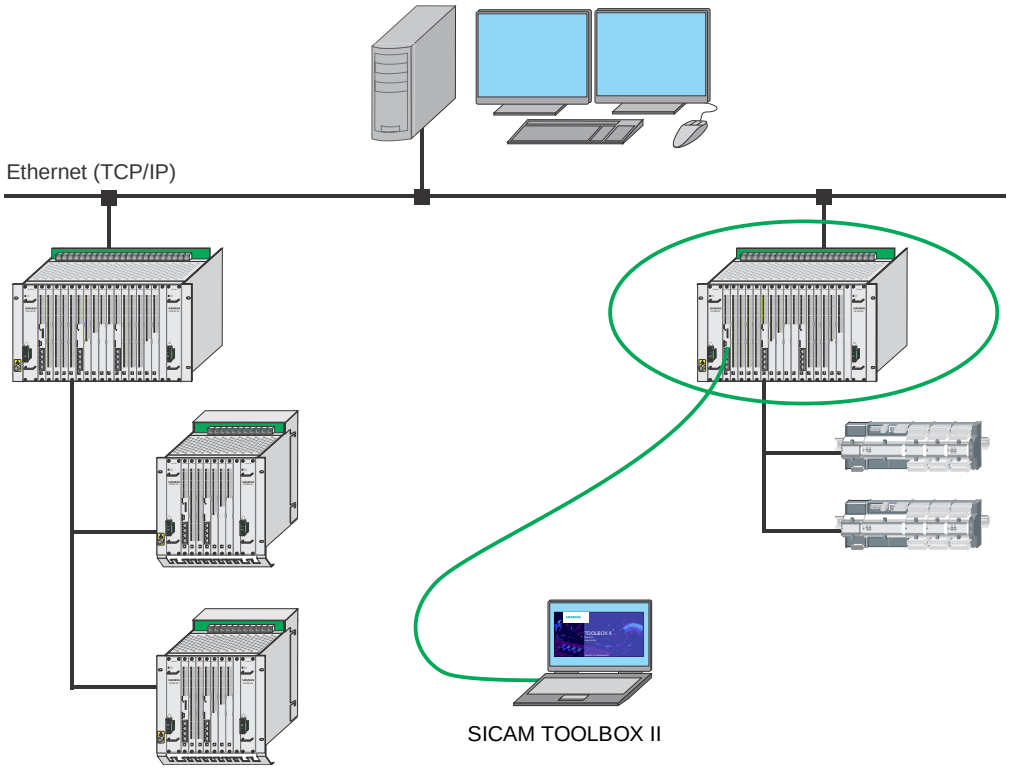
You find the error indications recorded in the diagnosis in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation and Diagnosis Info", section "Diagnosis Information"*, under the respective firmware.

5.3.2 Connection Possibilities for the Service

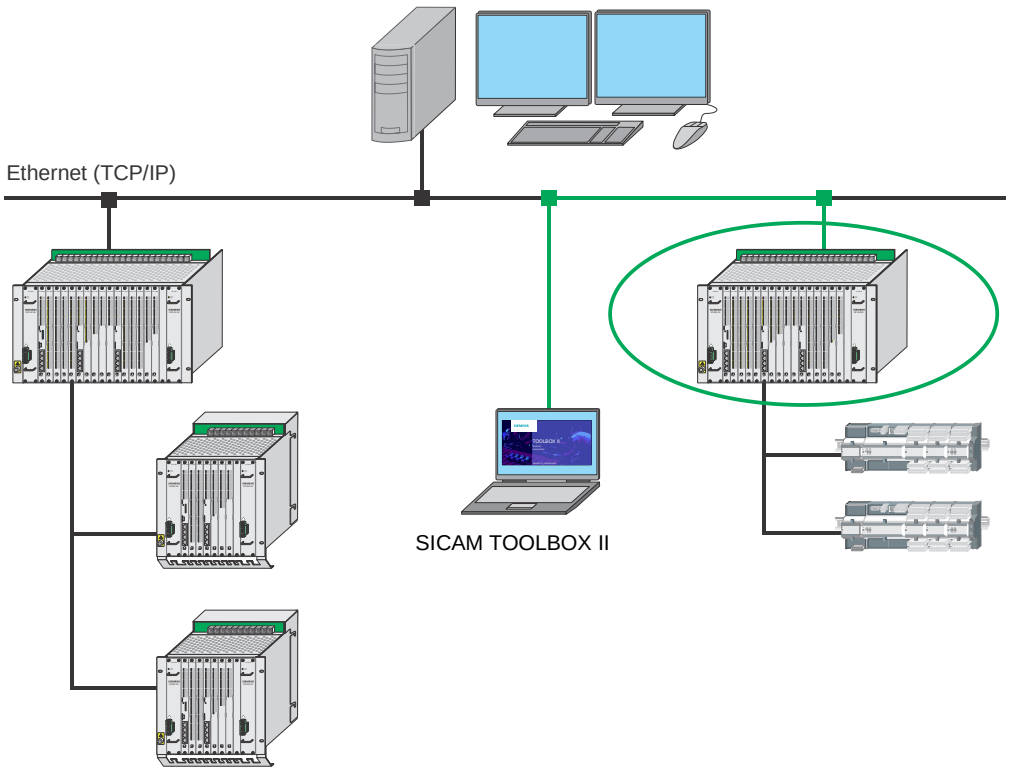
For the access to the diagnosis data of SICAM AK 3, an online connection of the SICAM TOOLBOX II PC to the target system is required. Reading access is at the same time possible locally and from the distance. Writing access (example: startup request to the target system) is only exclusively possible.

You find the basic connection possibilities in section 3.2, Connect Engineering PC with a Target System. Following you find some application examples.

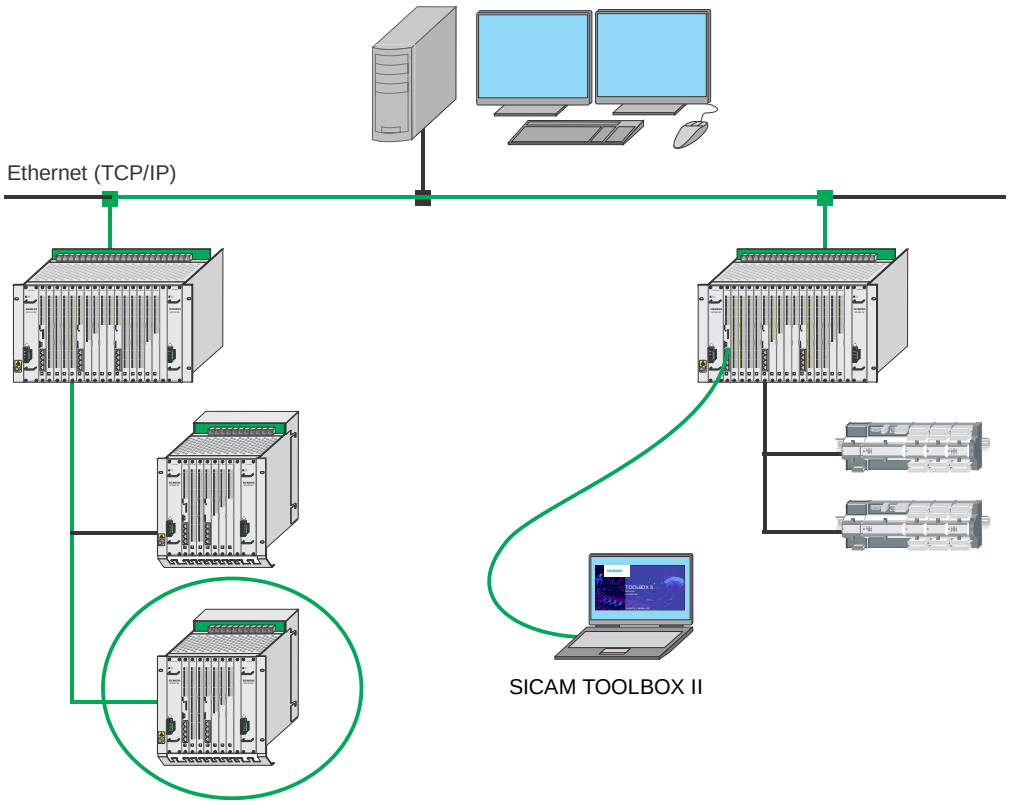
Local Connection Directly



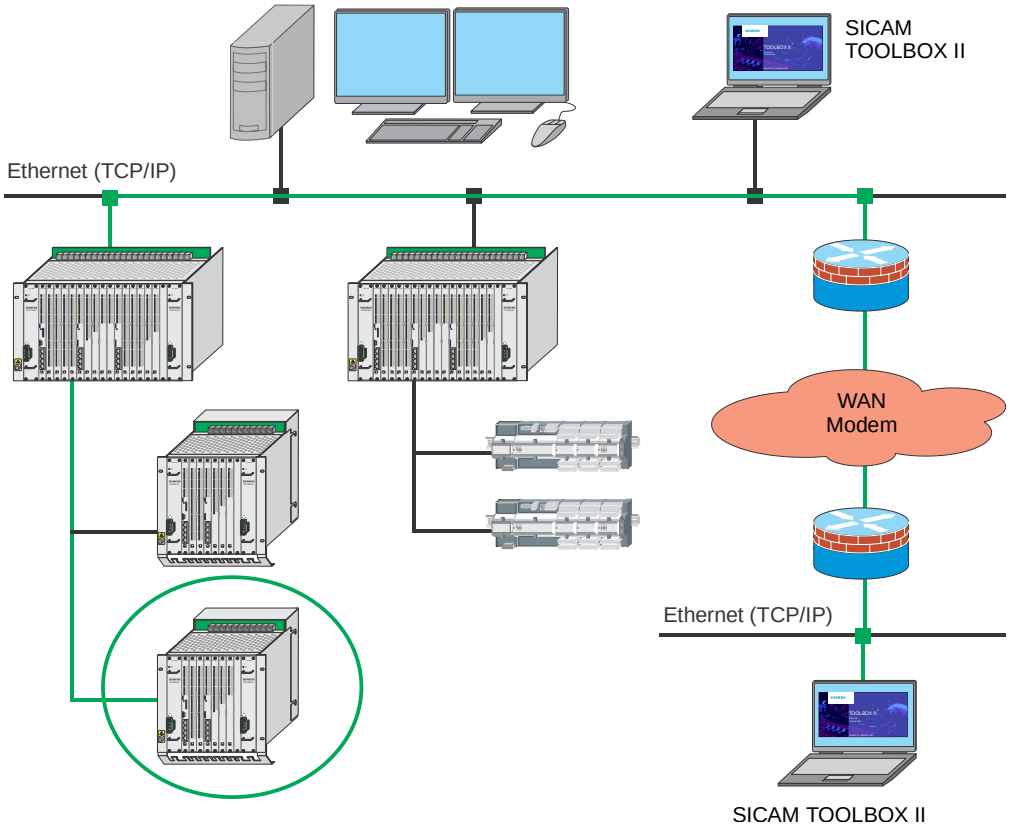
Local Connection via Ethernet



Remote Connection via Ethernet/LAN

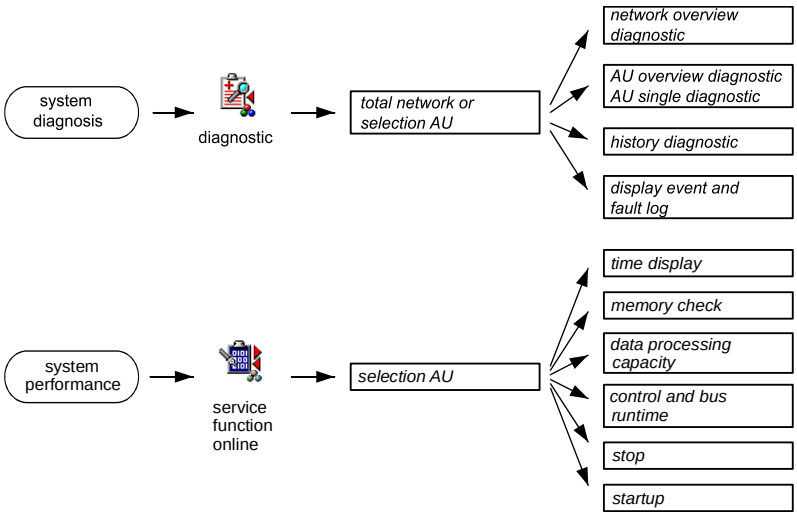


Remote Connection via Ethernet/WAN



5.3.3 System Diagnosis

SICAM AK 3 contains extensive diagnostic functions for monitoring the system. Since the firmware automatically executes the appropriate error monitoring routines, for this no settings of any kind by the user are necessary.

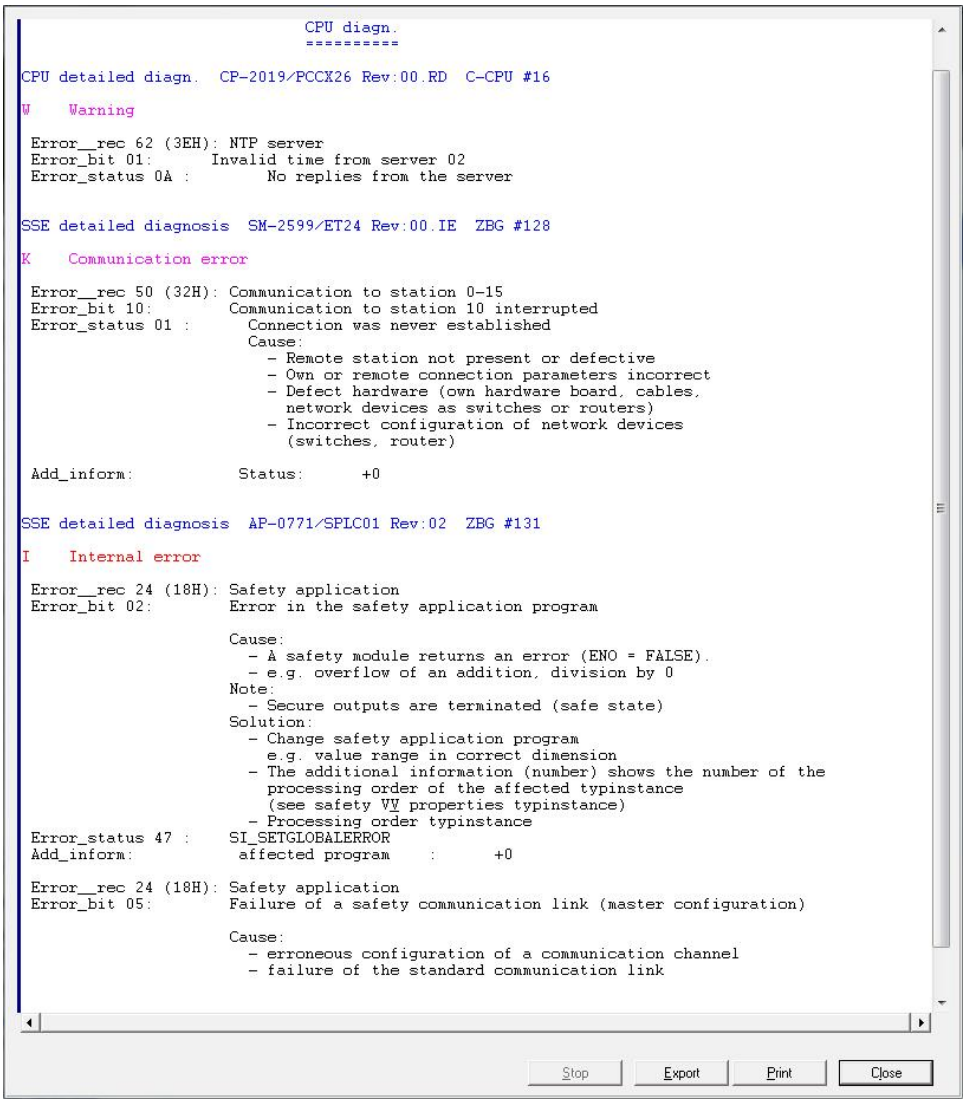


With the tool "Diagnostic", system states and errors can be displayed. Thereby, the local error tables of the selected automation units and the global error table are read and checked for error records. The check result is represented in plain text on the monitor and can be printed in need.

The following functions are available:

- Acknowledge network
  With the function `Acknowledge network`, the signals of all automation units located in the network are reset, insofar as they are no longer present.
- Network overview diagnostic
  The error messages of all automation units in the network are output in a report window with the function `Network overview diagnostic` (sum information).
- AU overview diagnostic
  The error messages of all automation units in the network are output in a report window with the function `AU overview diagnostic` (sum information for each system element able to report).
- History
  The history of error messages is output in a report window with the function `History Diagnostic`.
- Automatic diagnostic
  An overview of the error messages of all automation units in a network as well as their system elements is output in a report window with the function `Automatic diagnostic`. The outputs are structured hierarchically in
  - Network overview diagnostic
  - AU overview diagnostic
  - AU single diagnostic
  - History (if preset)

Automatic Diagnosis (Example)



Errors that are recorded in the diagnosis table contain details about the possible error cause, as well as indications for the error solution (“cause”, “solution”).

The indication in the diagnosis table distinguishes the following classes:

- A...failure
  Signals that an automation unit is no longer available
- B...module failure
  Signals that the internal communication with a module is no longer possible
- I...internal error
  Error that is unambiguously allocatable to the respective module in hardware or firmware (e.g. checksum error in the parameter memory)
- E...external error
  Is detected by means of supervision of sensors and actuators (e.g. live zero, outage minute pulse longer than tolerable)
- K...communication
  Is detected due to the supervision of the communication connection

- W...warning
  Signals that the system features restricted functionality or availability (e.g. outage of minute pulse, but quartz accuracy still sufficient)
- T...test
  Signals that a function for test purposes has been affected specifically (e.g. block of input information items in the function diagram)

You find further details on the diagnosis functions in the *SICAM TOOLBOX II Online Help, chapter "Diagnosis"*.

You find the technical description of the diagnosis functions in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Diagnosis"*.

5.3.4 System Performance

Information about the system performance of a selected automation unit can be interrogated (online) with the tool "Service Function Online":

- Display equipped system elements
- Read serial numbers
- Display/delete data flow routing
- Shut down selected system elements
- Shut down selected automation unit
- Startup selected system elements
- Startup automation unit
- Display time
- Memory check
- Data processing capacity
- Control- and bus runtime

You find further details on the maintenance functions in the *SICAM TOOLBOX II Online Help, chapter "Maintenance Function Online"*.

5.3.5 Diagnosis of the Open-/Closed-Loop Control Function

With the tool "CAEx *plus*" the following status information can be displayed for each task with the function ONLINE-Test:

- Parameterized cycle time
- Current runtime
- Minimum/maximum runtime
- Number of runtime time-outs
- Bus runtime

You find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Open-/Closed-loop Control Function", section "Display Status Information".*

Errors that can occur with the creation of the function diagram (for example the linking of a binary signal to an analog input of a function) are displayed in a separate report window ("POU error check"):

- Automatically with the incorrect input
- Manually via the pop-up menu Early error detection in the function diagram All editing errors can be displayed at any time

You find the exact details in the CAEx *plus Online Help, chapter "Editors", section "FBD Editor", section "Operation in FBD Editor"*.

Errors with Engineering

Errors that can occur on the function diagram engineering are displayed centrally in the "Error-state viewer" of "CAEx *plus*". It essentially concerns thereby

- Indications of the installation
- Indications of the export/import
- Indications of the project management
- Indications of the FBD editor
- Indications of the code generation
- Object-related indications
- Indications of the object assistant
- Indications of the typical import
- Indications of the signal list
- Indications of hardware signal data bases

The indications are created after the initiation of a function (for instance "code generation").

You find the exact details in the CAEx *plus Online Help, chapter "Additional Products", section "Error-State Viewer"*.

Errors with the Target System Connection

Errors that can occur with the target system connection are displayed centrally in the "Error-state viewer" of "CAEx *plus*". It concerns thereby notifications of

- the target system connection
- the code generator
- the control panel
- the online applications
- the "Open Operating System"
- the target-system integration into the project management
- the "openPLC"

You find the exact details in the CAEx *plus Online Help, chapter "Target-System Connection", section "Program Messages for Target-System Connection"*.

5.4 Maintenance of the Hardware

5.4.1 Recognition of Hardware Errors

5.4.1.1 Modules

With startup and during the operation SICAM AK 3 supervises the equipped hardware. A faulty or failed system element is signaled as follows:

- Red ER-LED on the master control element
- Tool Diagnostic | Automatic Diagnostic
- Tool Diagnostic | AU Overview Diagnostic

If a hardware error is present, a replacement of the respective system element is required.

Note

If the corresponding module type is no longer deliverable, the appropriate successor product with the corresponding firmware is to be used. In this case, the system element must be parameterized anew after loading the firmware.

5.4.1.2 SD Card

SICAM AK 3 accesses with each startup the SD card and checks it. The following cases lead to errors with the SD card:

- SD card not available
- SD card defective
- Wrong type of SD card
- SD card empty
- SD card not formatted
- Checksum error with firmware codes
- Checksum error with parameter files

Upon startup with erroneous SD card the supplementary system elements are not started, hence for instance no remote communication is possible.

SICAM AK 3 accesses also during operation the SD card due to operator control actions or loading processes. If the SD card is detached during operation from a target system, this notifies an error in the diagnosis and activates the ER LED. With missing SD card loading processes are blocked.

Possible causes for a checksum error are power failure or write error during a loading processes on the SD card.

5.4.2 Guideline for the Replacement of Modules

By means of the modular design of SICAM AK 3 the replacement of a faulty module is achievable in an easy manner. The user data (parameters and application program) are stored non-volatile on the flash card. The flash card can be withdrawn from the removed master control module.

For the commissioning of a new module the SICAM TOOLBOX II is not needed, since after the exchange of a module (by the same type) a loading of data is not required. The engineering data and firmware codes already stored on the SD card of the master control element are applied automatically by the new module.

Note

For the replacement of modules a shutoff of the power supply is not required. By means of that, the function of the subsystems which are not affected by the replacement is maintained.

Warning

For peripheral modules that operate with voltages > 60 V (e.g. DI-2114) care must be taken that manipulation on the peripheral connectors may only be carried out in a de-energized state.

You find the detailed instruction for the replacement of modules in section "*Installation and Removal of Modules*".

You find further technical information on module replacement in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Data Storage on Flash Card"*.

5.4.2.1 Master control element

After removing the master control element from the board rack, the function of the system is naturally not present. An exception forms an "autarchic" subsystem, whose function independently of the master control element is running in a processing and communication element.

The SD card can be removed from the removed master control element, and be inserted into the new master control element. After inserting the new master control element, this performs a startup.

New SD cards can be ordered at Siemens (see "*SICAM AK 3 System Description", chapter "Order Information"*).

Caution

Insert or remove the SD card only in the de-energized master control module. The contents of a SD card can become invalid if it is removed during a running write procedure. If occasion arises, the contents of the SD card must be deleted and written newly.

After inserting the SD card a startup of the target system must be carried out.

5.4.2.2 Processing and Communication Element(s)

After removing the processing and communication element from the board rack, the function of the affected subsystem is naturally not present.

Since for the replacement of a processing and communication element a shutoff of the power supply is not required, the function of other basic system elements and their subordinate system elements is maintained.

After the insertion of the new processing and communication element, this performs a startup.

5.4.2.3 Serial Interface Module

For the replacement of a serial interface module first the basic system element (carrier module) must be removed from the board rack. For this, please consider the previously mentioned consequences for the system.

After the insertion of the basic system element, this performs a startup.

5.4.2.4 Peripheral Elements

After the removal of a peripheral element the belonging function is naturally no more present. In the diagnosis the corresponding module is signaled as failed.

Since for the replacement of a peripheral element a shutoff of the power supply is not required, the function of the basic system elements and their subordinate system elements is maintained.

5.5 Firmware Update

In SICAM AK 3, new system elements or new revisions of system elements can be integrated, if required.

For each system element an individual loadable firmware is provided. You find information thereto in section 3.5, Loadable Firmwares.

5.5.1 Procedure

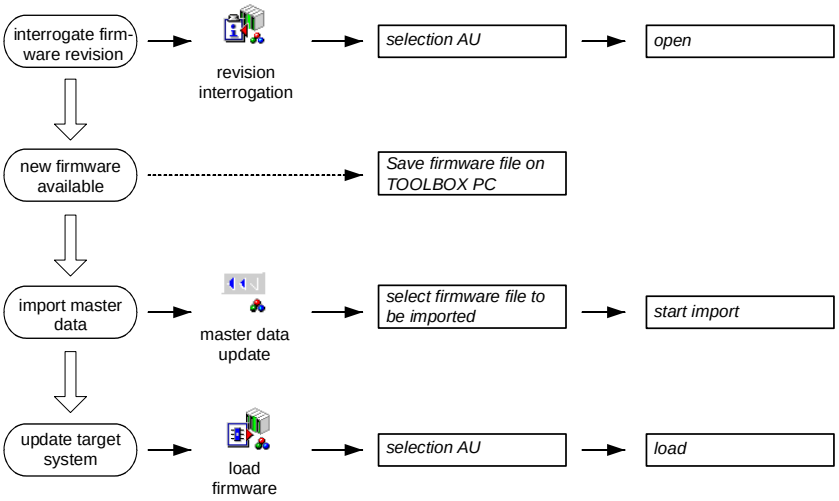
The updating of a system takes place in the following steps:

1. Download firmware code(s) and Toolbox update(s) from internet under www.siemens.com/sicam

2. Import firmware code(s) and Toolbox update(s) into the SICAM TOOLBOX II

3. Load firmware(s) into the target system

Procedure for the Update of System Elements



The SICAM TOOLBOX II contains after its installation all current firmware revisions (based on the date of issue of the installed version).

5.5.1.1 Interrogation of Firmware Revision

The firmware revisions of all configured system elements (basic system element, peripheral element, protocol elements) can be displayed and printed with the tool "Revision Interrogation and Display" for a selected automation unit.

You find further details on the tool in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Revision Interrogation and Display"*.

5.5.1.2 Import of Firmware into the SICAM TOOLBOX II

New firmware codes can be loaded into the SICAM TOOLBOX II with the tool "Master Data Update". Thereto belong

- Libraries for the tool OPM II
- Firmwares of SICAM RTUs system elements

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "OPM* II", section "Master Data Update".

An additional option provides the tool "Live Update". You find the information thereto in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Live Update"*.

5.5.1.3 Loading of Firmware into the Target System

Firmware codes that are existing in the SICAM TOOLBOX II can be loaded with the tool "Load Firmware" into the connected target systems.

The loading of the firmware is related to all loadable system elements of the automation unit:

- Master control element
- Processing and communication element
- Peripheral elements
- Protocol element

For the loading of firmware the corresponding modules must be installed and configured. After the loading procedure the target system performs a startup. Depending on the size and number of loaded files a startup can take up to 10 minutes.

With loading of firmwares the target system checks, whether the corresponding system elements are already configured. If this is the case, the firmware is updated for all configured system elements.

5.5.1.3.1 Load Firmware Online

Thereto the SICAM TOOLBOX II PC must be connected with the target system. For the execution, the configuration possibilities listed under section 3.2, Connect Engineering PC with a Target System are applicable.

With the tool "Load Firmware" (SICAM TOOLBOX II | Service Programs) you can load firmware codes into the target system. The following options are available:

- Load intelligent
  The latest firmware revision available in the SICAM TOOLBOX II is loaded, if it is more current than that one on the corresponding system element
- Load unconditional
  The latest firmware revision available in the SICAM TOOLBOX II is loaded

After startup, the target system loads the respective firmware on the corresponding system element. Additionally it stores the firmware on the SD card.

Note

For the online loading the SD card and a running firmware must be present on the master control element of the target system. Further, you need the appropriate access right for the engineering tool.

You find the instructions for the tool "Load Firmware" in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Load Firmware"*.

5.5.1.3.2 Load Firmware Offline

Thereto a SD card reader/writer must be connected on the SICAM TOOLBOX II PC, and a suitable SD card must be inserted.

With the tool "OPM II" you can select the corresponding AE via the menu Tools | System technique . Via the context menu of the automation unit Flashcard | create files... you can transfer firmware files on a SD card.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "System technique | SICAM RTUs | Load Flashcard"*.

After that, insert the SD card into the master control module, and insert that into the target system. The target system performs a startup, and loads thereby the firmwares on the corresponding system elements.

Note

The first loading of the firmware (initialization) of the master control element is only offline possible.

5.5.2 Errors with Loading of Firmware

For a perfect functioning of the master control element, it is absolutely necessary that the loading procedure completes without errors.

If the tool "Load Firmware" terminates with an error indication, cancel it. Afterwards start the loading procedure again and attempt to complete without error. If an error occurs again, check the record in the diagnosis and the lighted display on the master control element.

The following reasons lead to a malfunction of the master control element:

- Voltage failure during loading procedure
- Premature abortion by the user during loading procedure
- Failure (defect, shutdown) of the engineering PC
- Abortion due to hardware error
- Abortion or excessively long fault of the communication connection between engineering PC and SICAM AK

Further technical information can be found in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", sections "Loading Operation" and "Firmware Shutdown"*.

Note

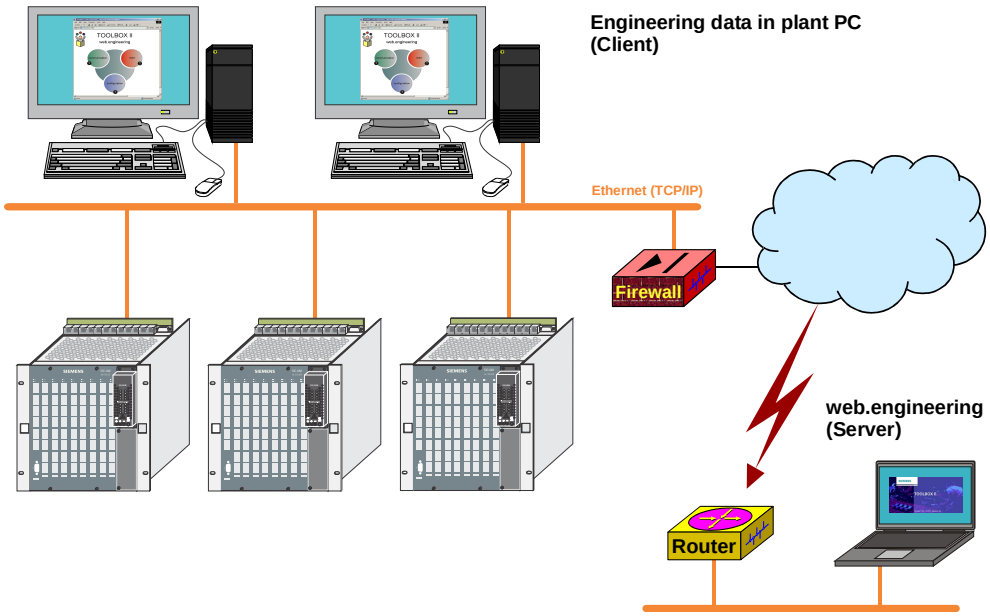
A master control element that is no longer capable of functioning can be recognized by the fact, that after a restart of the SICAM AK 3 the yellow RDY LED does not light up and the red ER LED and the yellow HLT LED do not turn off any more. An access with the SICAM TOOLBOX II is no longer possible in this case.

In this case please consult:

SIEMENS AG
Energy Customer Support Center
Phone: + 49 180 524 70 00
Fax:+ 49 180 524 24 71
mailto:support.ic@siemens.com
http://www.siemens.com/energy-support/de

5.6 Remote Maintenance

By means of the option "web.engineering", you can remotely operate (remote maintenance session) a remote SICAM TOOLBOX II that can be reached via a data connection (modem, ISDN, LAN/WAN) with a controlling PC (remote maintenance center).



With "web.engineering" all SICAM TOOLBOX II clients work with a central web server which is running the SICAM TOOLBOX II. Thereby, the SICAM TOOLBOX II is operated in the web browser.

5.6.1 Configuration of Server and Clients

Install on the webserver *Microsoft Windows* ® with "Terminal Services-Web Access". Afterwards install on this server the SICAM TOOLBOX II.

On the clients an installation is not required, the access to the webserver takes place via the *Microsoft Internet Explorer* ® (as of version 5.0).

You find a detailed description of the configuration in the *SICAM TOOLBOX II Online Help, chapter "web.engineering"*.

6 Automation Units and Automation Networks

Contents

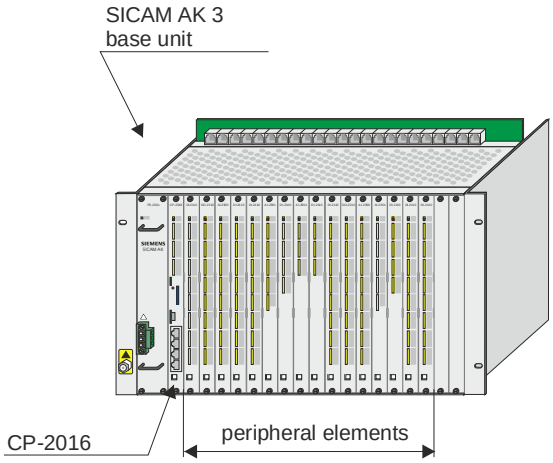
This chapter describes the recommended configurations for the system SICAM AK 3.
It shows illustrations of configurations, information about used cable types and cable length and lists the used modules and cables with order numbers.

6.1 Configuration of Automation Units

6.1.1 SICAM AK3 Basic Unit with Peripheral Elements

6.1.1.1 SICAM AK 3, local PE

Local peripheral elements in an SICAM AK 3 base unit



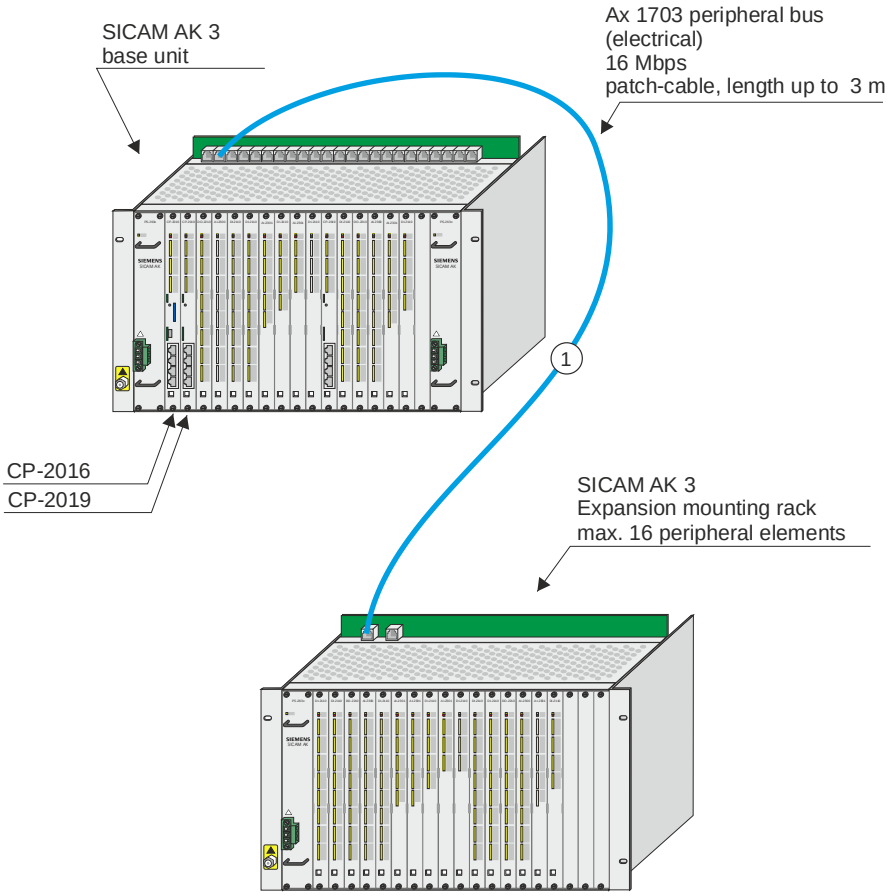
- To one basic system element CP-2016/CPCX26 or CP-2019/PCCX26 one bus line with max. 16 peripheral elements can be connected.
- The Ax-PE bus can be driven by one of the CPUs (M-CPU, C1 -C16 CPU).
  Default: M-CPU

Necessary modules and cables

	Designation	Item-Number/MLFB
Basic unit SICAM AK 3	CP-2016 Master control element CP-2016/CPCX26	BC2-016 / 6MF10130CA160AA0
	CP-2019 Processing and communication element CP-2019/PCCX26	BC2-019 / 6MF10132CA100AA0

6.1.1.2 SICAM AK 3 - SICAM AK 3 PE, electrically connected

Basic unit SICAM AK 3 to peripheral elements in SICAM AK 3 expansion board rack; electrically connected



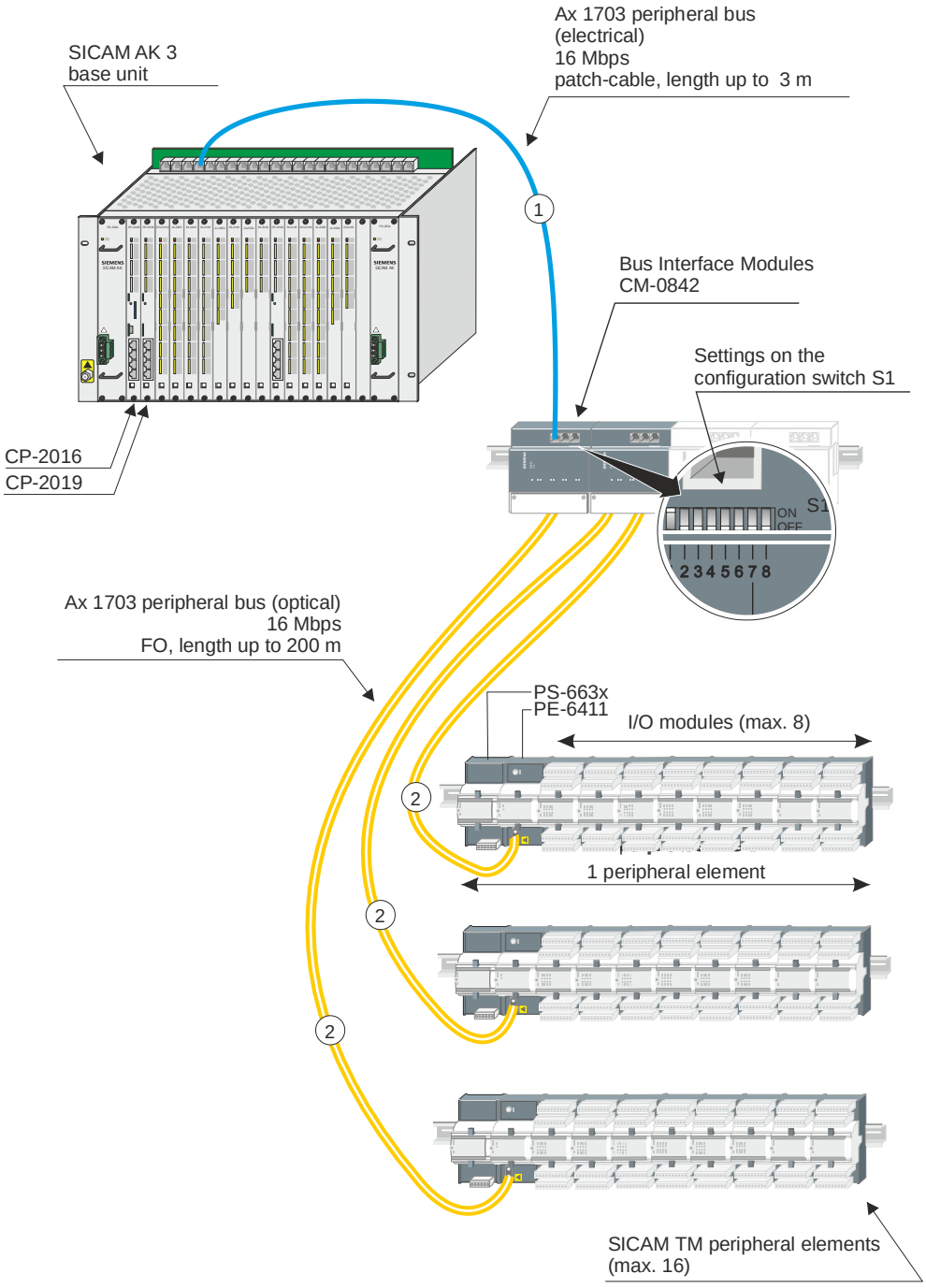
- To one basic system element CP-2016/CPCX26 or CP-2019/PCCX26 one bus line with max. 16 peripheral elements can be connected.
- Depending on the slot of the basic system element the socket connector for the electrical Ax 1703 peripheral bus has to be selected.
  (Examples: Slot 0 ð socket connector X2/M-Ax
  Slot 1 ð socket connector X4/C1-Ax)

Necessary modules and cables

	Designation	Item-Number/MLFB
Basic unit SICAM AK 3	CP-2016 Master control element CP-2016/CPCX26	BC2-016 / 6MF10130CA160AA0
	CP-2019 Processing and communication element CP-2019/PCCX26	BC2-019 / 6MF10132CA100AA0
Cable •	Patch cable CAT5 (4x2) AWG26/7	T41-255 (1m) / 6MF13040BC550AA0 T41-251 (2m) / 6MF13040BC510AA0 T41-252 (3m) / 6MF13040BC520AA0
Peripheral elements SICAM AK 3	CM-2843 SICAM AK 3 expansion board rack	GC2-843 / 6MF11130CJ430AA0

6.1.1.3 SICAM AK 3 - SICAM TM PE, optically connected

Basic unit SICAM AK 3 to SICAM TM peripheral elements, optically connected



- To one basic system element CP-2016/CPCX26 or CP-2019/PCCX26 one bus line with max. 16 peripheral elements can be connected.
- Depending on the slot of the basic system element the socket connector for the electrical Ax 1703 peripheral bus has to be selected.
  (for example: Slot 1 ð socket connector X4/C1-Ax)
- In configurations with optical remoted SICAM TM peripheral elements, PE 1000µm-fiber cables cannot be used!

- Each bus interface module CM-0842 has to be supplied separately.
  (18 VDC ... 78 VDC)
- Configuration switch CM-0842

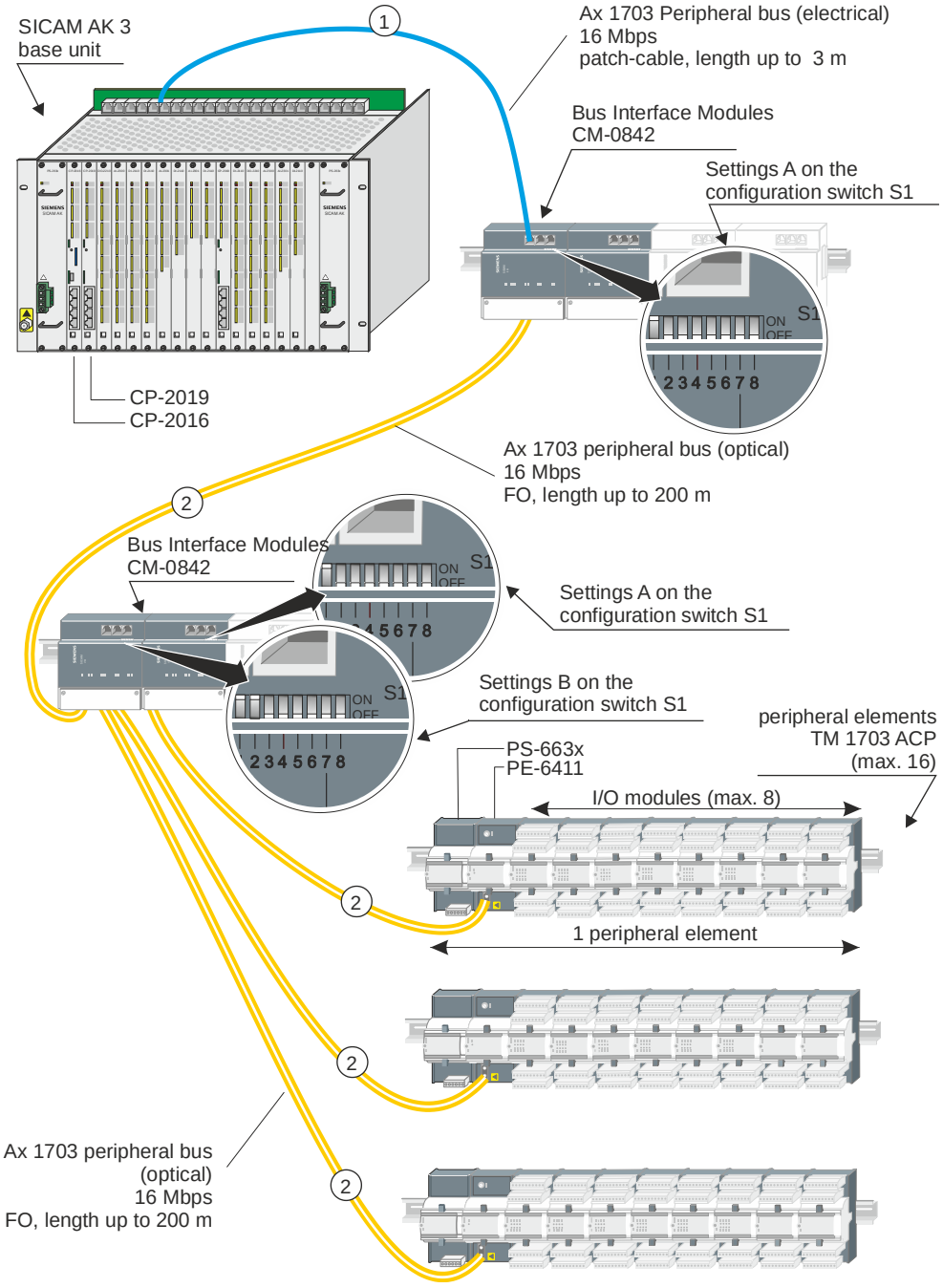
1	F1/F2	ON	16 MBit
2	LINE2	OFF	PE(A)
3	AS2	OFF	0
4	AS1	OFF	0
5	AS0	OFF	0
6	RED	OFF	CM-0842
7	LAD	OFF	inactive
8	LINE1	OFF	PE

Necessary modules and cables

	Designation	Item-Number/MLFB
Basic unit SICAM AK 3	CP-2016 Master control element CP-2016/CPCX26	BC2-016 / 6MF10130CA160AA0
	CP-2019 Processing and communication element CP-2019/PCCX26	BC2-019 / 6MF10132CA100AA0
Cable •	Patch cable CAT5 (4x2) AWG26/7	T41-255 (1m) / 6MF13040BC550AA0 T41-251 (2m) / 6MF13040BC510AA0 T41-252 (3m) / 6MF13040BC520AA0
Bus Interface Modules	CM-0842 Ax 1703-bus interface 4x FO	GA0-842 / 6MF11110AJ420AA0
Cable ,	FO-INDOORCABLE-200-DUP-BREAK-ROUND FO-CONNECTOR-ODLP-200 (2 pcs. per connection)	TF7-035□TF7-015
	FO-OUTDOORCABLE-200-2FIB-ARM FO-CONNECTOR-ODLP-200 (2 pcs. per connection) FO-PIPE SPLITTER 2Y-LR1 (2 pcs. per connection) (only for outdoorcableTF7-036)	TF7-036□TF7-015□TF7-066
Peripheral elements SICAM TM	PE-6411 peripheral coupling Ax-bus 1x optical	GC6-411 / 6MF11130GE110AA0

6.1.1.4 SICAM AK 3 - SICAM TM PE, optical, multi-hierarchical

Basic unit SICAM AK 3 to SICAM TM peripheral elements, optically, multi-hierarchical connected



- To one basic system element CP-2016/CPCX26 or CP-2019/PCCX26 one bus line with max. 16 peripheral elements can be connected.
- Depending on the slot of the basic system element the socket connector for the electrical Ax 1703 peripheral bus has to be selected.
  (for example: Slot 1 ð socket connector X4/C1-Ax)
- In configurations with optical remoted SICAM TM peripheral elements, PE 1000µm-fiber cables cannot be used!

- Each bus interface module CM-0842 has to be supplied separately.
  (18 VDC ... 78 VDC)
- Settings A on the Configuration switch CM-0842

1	F1/F2	ON	16 MBit
2	LINE2	OFF	PE(A)
3	AS2	OFF	0
4	AS1	OFF	0
5	AS0	OFF	0
6	RED	OFF	CM-0842
7	LAD	OFF	inactive
8	LINE1	OFF	PE

- Settings B on the Configuration switch CM-0842

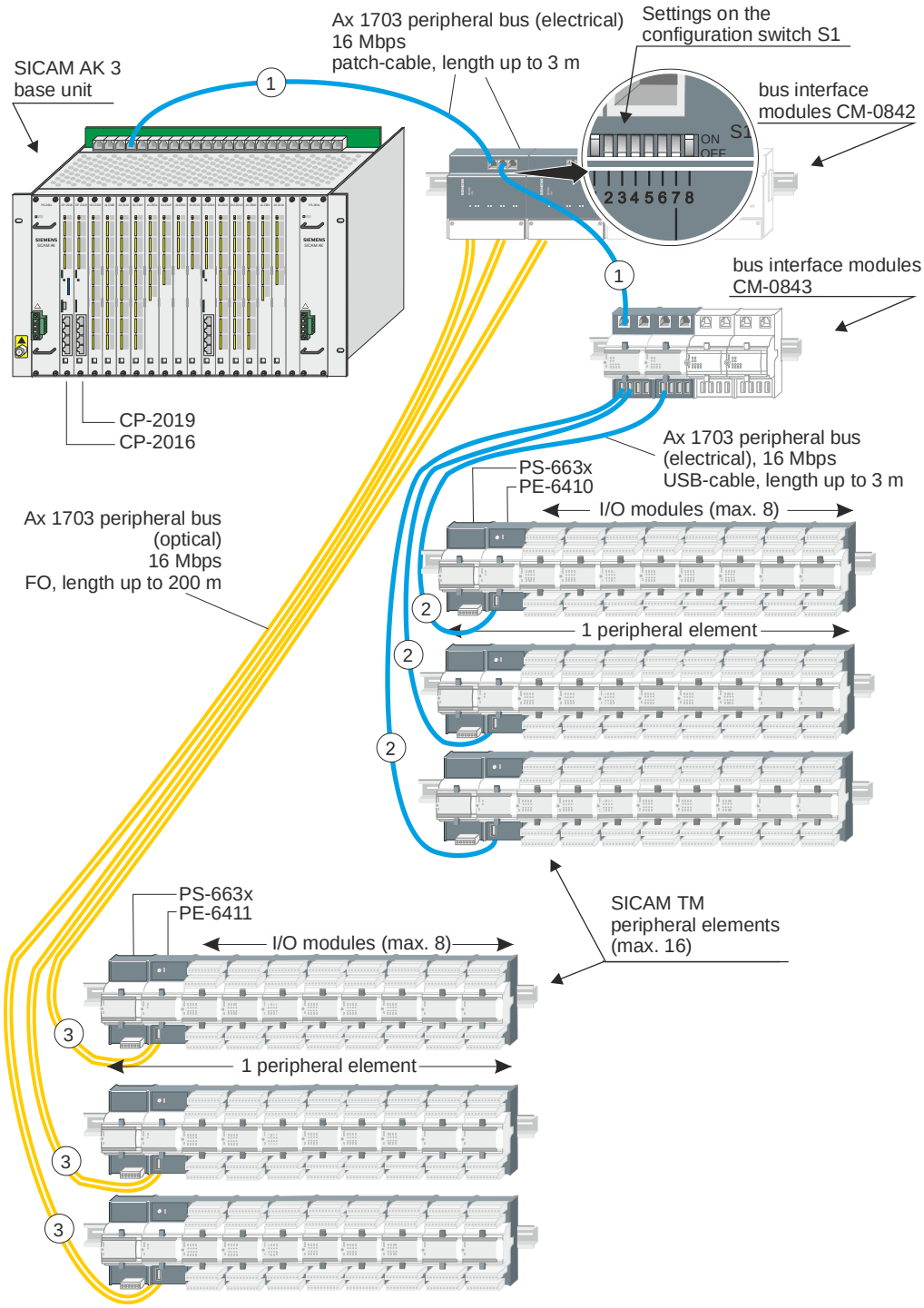
1	F1/F2	ON	16 MBit
2	LINE2	ON	BSE(E)
3	AS2	OFF	0
4	AS1	OFF	0
5	AS0	OFF	0
6	RED	OFF	CM-0842
7	LAD	OFF	inactive
8	LINE1	OFF	PE

Necessary modules and cables

	Designation	Item-Number/MLFB
SICAM AK 3 Basic unit	CP-2016 Master control element CP-2016/CPCX26	BC2-016 / 6MF10130CA160AA0
	CP-2019 Processing and communication element CP-2019/PCCX26	BC2-019 / 6MF10132CA100AA0
Cable •	Patch cable CAT5 (4x2) AWG26/7	T41-255 (1m) / 6MF13040BC550AA0 T41-251 (2m) / 6MF13040BC510AA0 T41-252 (3m) / 6MF13040BC520AA0
Bus Interface Module	CM-0842 Ax 1703-bus interface 4x FO	GA0-842 / 6MF11110AJ420AA0
Cable ,	FO-INDOORCABLE-200-DUP-BREAK-ROUND FO-CONNECTOR-ODLP-200 (2 pcs. per connection)	TF7-035□TF7-015
	FO-OUTDOORCABLE-200-2FIB-ARM FO-CONNECTOR-ODLP-200 (2 pcs. per connection) FO-PIPE SPLITTER 2Y-LR1 (2 pcs. per connection) (only for outdoorcableTF7-036)	TF7-036□TF7-015□TF7-066
Peripheral elements SICAM TM	PE-6411 peripheral coupling Ax-bus 1x optical	GC6-411 / 6MF11130GE110AA0

6.1.1.5 SICAM AK 3 - SICAM AK 3 PE, electrical and optical

Basic unit SICAM AK 3 to SICAM TM peripheral elements, electrically and optically connected



- To one basic system element CP-2016/CPCX26 or CP-2019/PCCX26 one bus line with max. 16 peripheral elements can be connected.
- Depending on the slot of the basic system element the socket connector for the electrical Ax 1703 peripheral bus has to be selected.
  (for example: Slot 1 ð socket connector X4/C1-Ax)

- In configurations with optical remoted SICAM TM peripheral elements, PE 1000µm-fiber cables cannot be used!
- The bus interface modules CM-0843 are supplied by the power supplies PS-663x. The power consumption of the CM-0843 (see technical data in data sheet) has to be considered on the PS-663x.
- Each bus interface module CM-0842 has to be supplied separately.
  (18 VDC ... 78 VDC)
- Configuration switch CM-0842

1	F1/F2	ON	16 MBit
2	LINE2	OFF	PE(A)
3	AS2	OFF	0
4	AS1	OFF	0
5	AS0	OFF	0
6	RED	OFF	CM-0842
7	LAD	OFF	inactive
8	LINE1	ON	1:1

Necessary modules and cables

	Designation	Item-Number/MLFB
Basic unit SICAM AK 3	CP-2016 Master control element CP-2016/CPCX26	BC2-016 / 6MF10130CA160AA0
	CP-2019 Processing and communication element CP-2019/PCCX26	BC2-019 / 6MF10132CA100AA0
Cable •	Patch cable CAT5 (4x2) AWG26/7	T41-255 (1m) / 6MF13040BC550AA0 T41-251 (2m) / 6MF13040BC510AA0 T41-252 (3m) / 6MF13040BC520AA0
Bus Interface Modules	CM-0843 Ax 1703-Businterface electrical	GA0-843 / 6MF11110AJ430AA0
	CM-0842 Ax 1703-bus interface 4x FO	GA0-842 / 6MF11110AJ420AA0
Cable ,	USB cables	TC6-201 (1,5m) / 6MF13130GC010AA0 TC6-202 (2m) / 6MF13130GC020AA0 TC6-203 (3m) / 6MF13130GC030AA0
Cable ƒ	FO-INDOORCABLE-200-DUP-BREAK-ROUND FO-CONNECTOR-ODLP-200 (2 pcs. per connection)	TF7-035□TF7-015
	FO-OUTDOORCABLE-200-2FIB-ARM FO-CONNECTOR-ODLP-200 (2 pcs. per connection) FO-PIPE SPLITTER 2Y-LR1 (2 pcs. per connection) (only for outdoorcableTF7-036)	TF7-036□TF7-015□TF7-066
Peripheral elements SICAM TM	PE-6410 peripheral coupling Ax-bus electrical	GC6-410 / 6MF11130GE100AA0
	PE-6411 peripheral coupling Ax-bus 1x optical	GC6-411 / 6MF11130GE110AA0

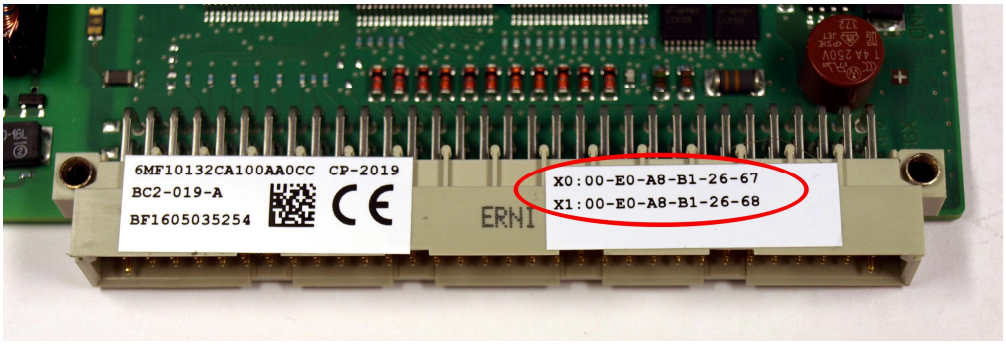
6.2 Application/Configuration of the local Ethernet Interfaces

MAC addresses of the Ethernet Interfaces

The local ethernet interfaces X0 and X1 of CP-2016 and CP-2019 have, depending on the version of the module, either 1 or 2 MAC addresses.

Description	Item number	MLFB	MAC addresses
CP-2016	from BC2-016-A	from 6MF10130CA160AA0CC	2
CP-2019	from BC2-019-A	from 6MF10132CA100AA0CC	2
CP-2016	BC2-016-	6MF10130CA160AA0BB	1
CP-2019	BC2-019-	6MF10132CA100AA0BB	1

You can find the MAC addresses, form module version CC upwards, on a separate label on plug X99.



If parameter `Network settings | IP addresses | Mode of Ethernet ports` is set to value **1 IP address (connected ports in switch mode)**, then the first MAC address (X0) is used on both local ethernet interfaces.

If parameter `Network settings | IP addresses | Mode of Ethernet ports` is set to value **2 IP addresses (independent ports)**, then both MAC addresses are used.

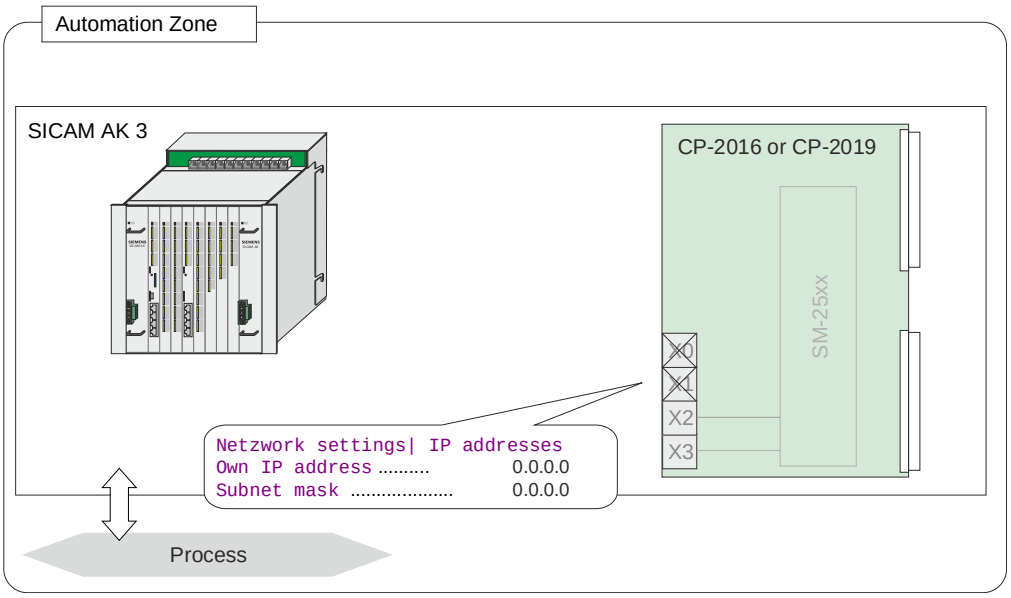
6.2.1 SICAM AK 3 „Stand-alone“ Telecontrol Station

The communication to the process takes place with local peripherals or serial communications protocols (e.g.: MODBUS, …)

The local ethernet ports on CP-2016 or CP-2019 are not used in this application and thus must be deactivated for security reasons.

The required parameter can be set on the BSE under `Netzwork settings | IP adresses`

- `Mode of Ethernet ports` = **1 IP address (connected ports in switch mode)**
- `Own IP address` = **0.0.0.0**
- `Subnet mask` = **0.0.0.0**



6.2.2 SICAM AK 3 as Telecontrol Substation

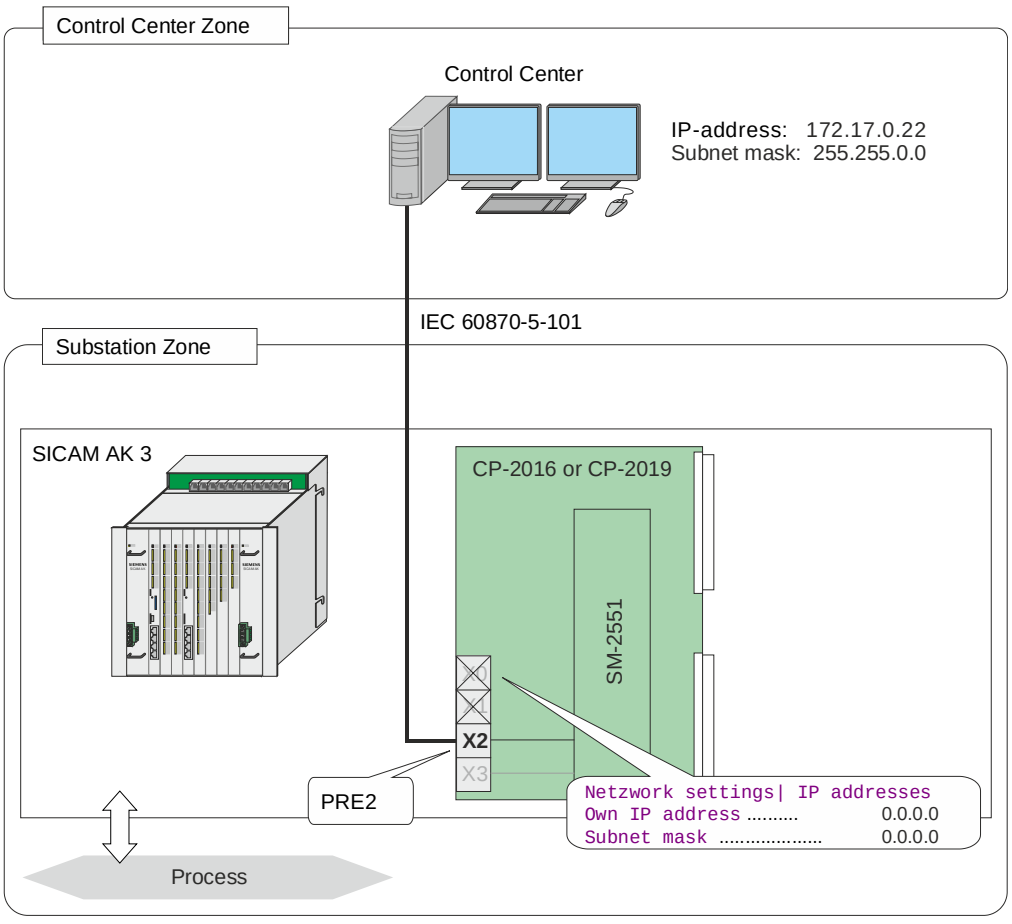
- Serial communication with the control system via IEC 60870-5-101
- The communication to the process takes place with local peripherals or serial communications protocols (e.g.: MODBUS, …)

The local ethernet ports on CP-2016 or CP-2019 are not used in this application and thus must be deactivated for security reasons.

The required parameter can be set on the BSE under `Network settings | IP addresses`

- `Mode of Ethernet ports` = **1 IP address (connected ports in switch mode)**
- `Own IP address` = **0.0.0.0**
- `Subnet mask` = **0.0.0.0**

In this configuration both local ethernet interfaces are deactivated.



6.2.3 SICAM AK 3 as Telecontrol Substation with Node Function (Protocol Converter)

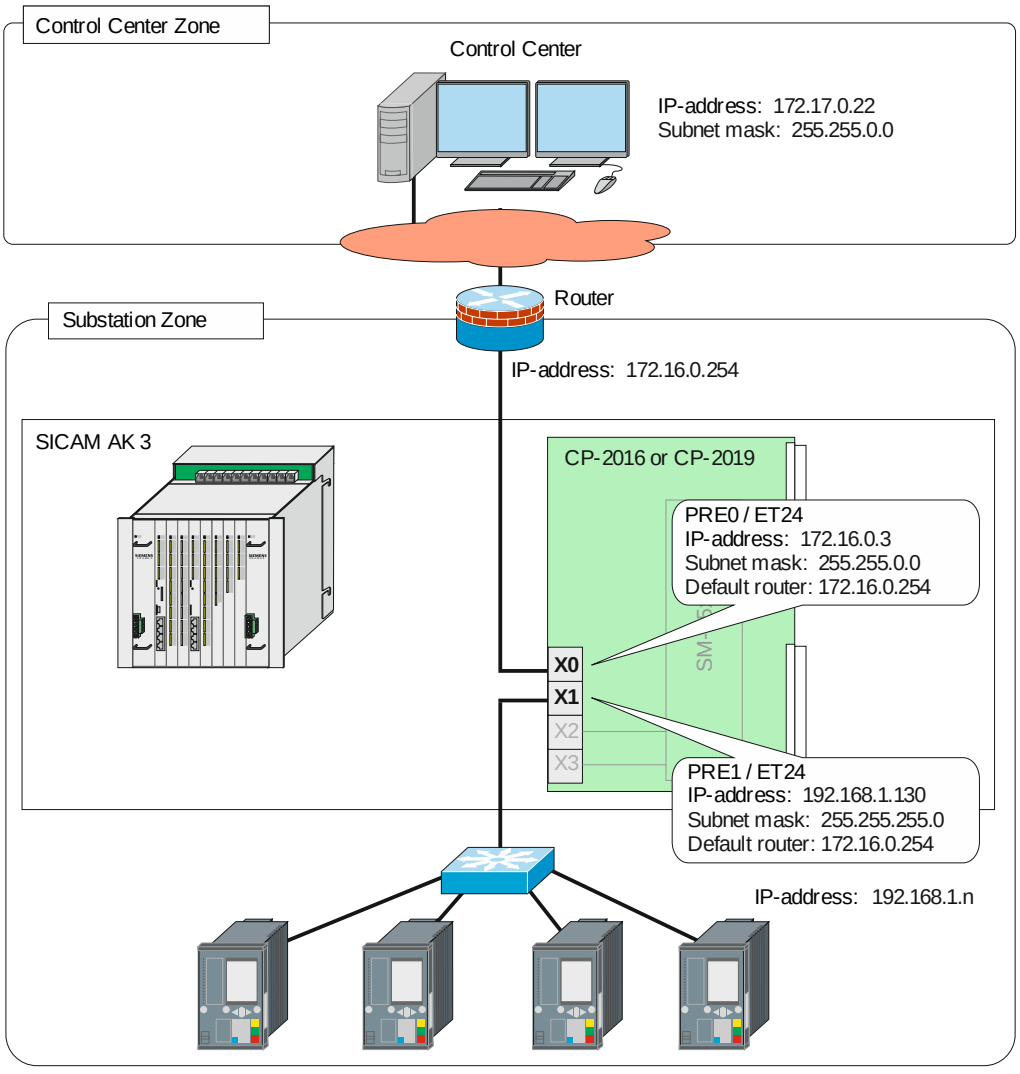
- Communication with the control system via IEC 60870-104 (Ethernet-Interface, X0 or X1, can be set with parameter)
- Communication with the protective devices via IEC 61850 (Ethernet-Interface, X0 or X1, can be set with parameter)

Features of the Ethernet Ports:

- 2 IP addresses
- 2 logically separated subnets
  - Communication only visible on the LAN within the subnet
  - data exchange between subnets only via SICAM AK 3 application function
- 1 default router
- Parameter `Network settings | IP address | Mode of Ethernet ports`
  - **2 IP addresses (independent ports)**

Note
In case of IP address = 0.0.0.0, the corresponding port is deactivated.

- Both Ethernet interfaces (X0, X1) have the same MAC address

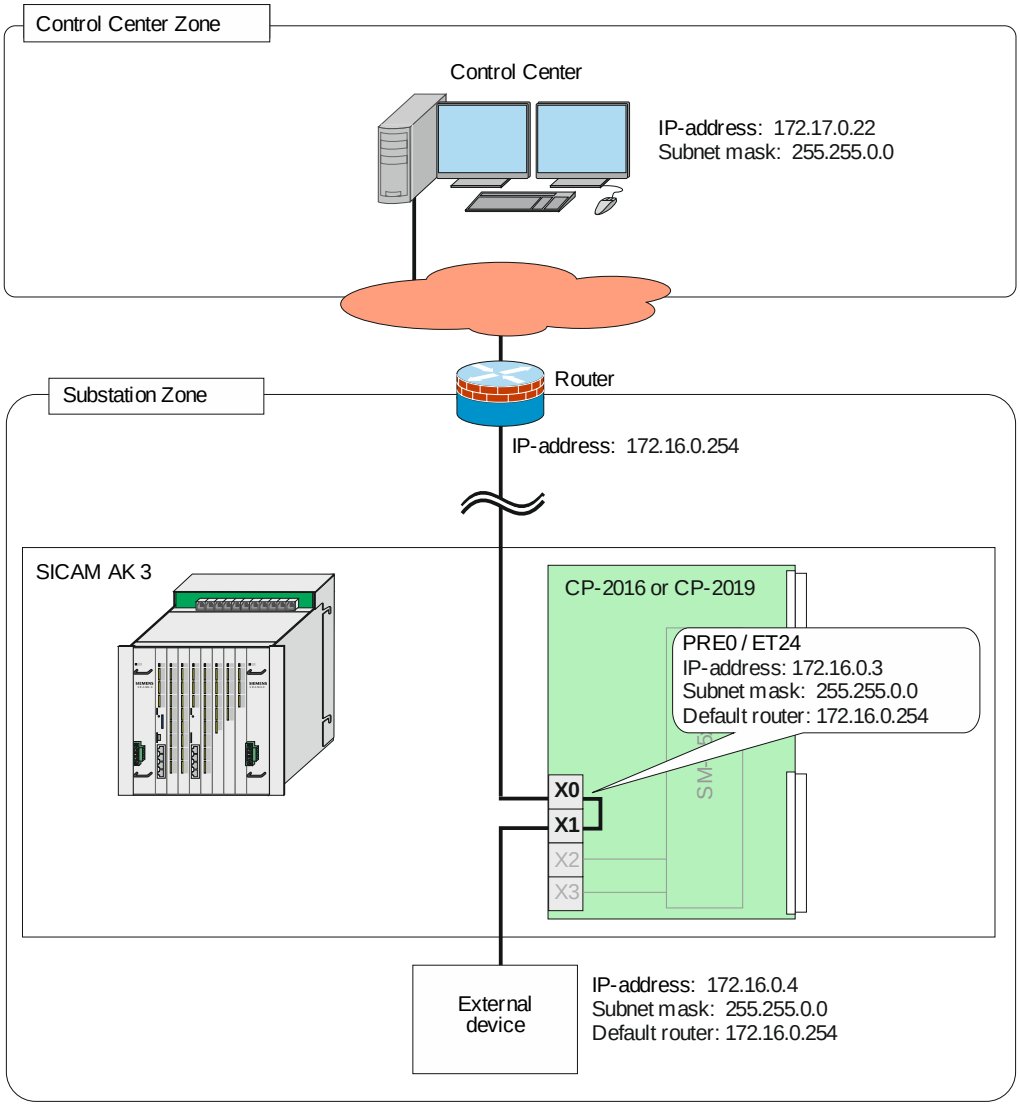


6.2.4 SICAM AK 3 as Telecontrol Substation with integrated Switch for External System connection

- Communication with the control system via IEC 60870-104
  (Ethernet-Interface, X0 or X1, can be set with parameter)
- Communication with the external system via IEC 60870-104
  (Ethernet-Interface, X0 or X1, can be set with parameter)
- SICAM AK 3 is used as switch between control system and external system

Features of the Ethernet Ports:

- 1 IP address
- 1 subnet mask
- 1 default router
- Parameter `Network settings | IP address | Mode of Ethernet ports`
  - **1 IP address (connected ports in switch mode)**

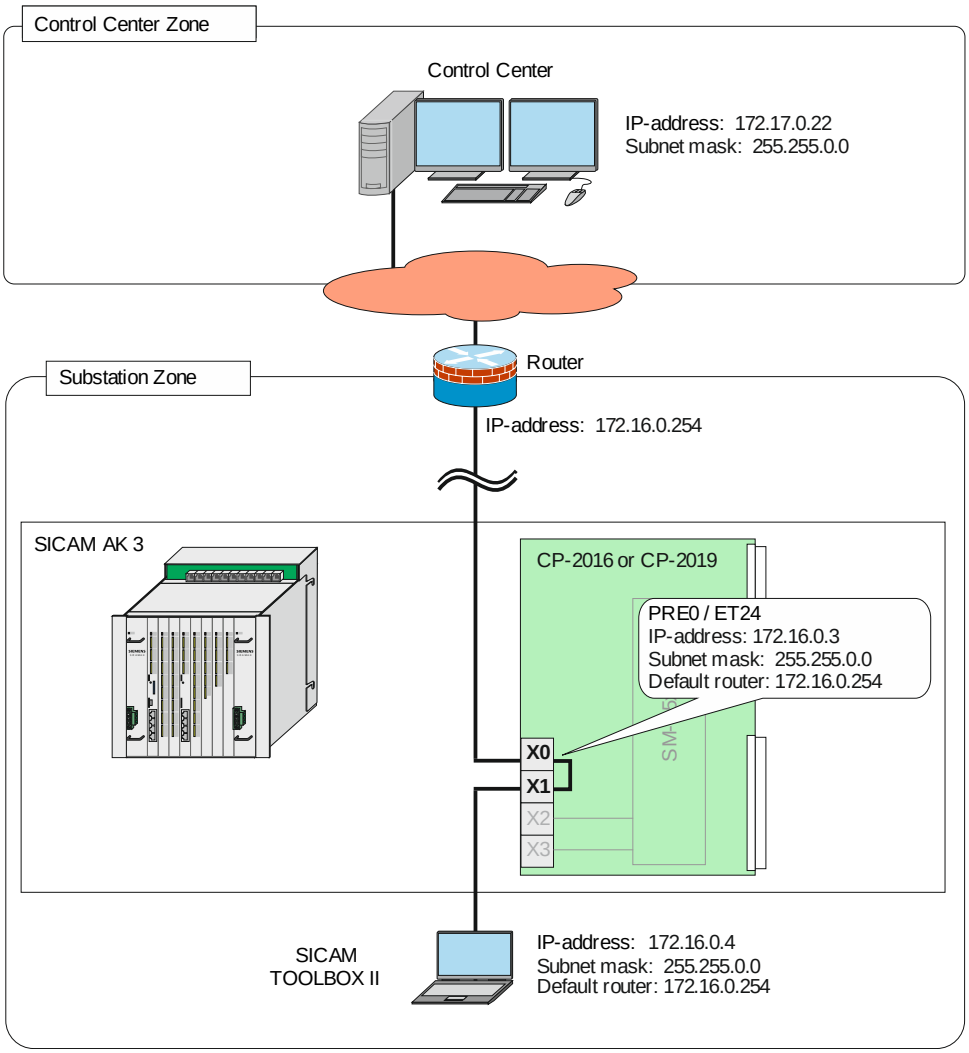


6.2.5 SICAM AK 3 as Telecontrol Substation with integrated Switch for SICAM TOOLBOX II connection

- Communication with the control system via IEC 60870-104 (Ethernet-Interface, X0 or X1, can be set with parameter)
- Communication with SICAM TOOLBOX II via http/https (Ethernet-Interface, X0 or X1, can be set with parameter)
- SICAM AK 3 is used as switch between control system and SICAM TOOLBOX II
- By means of SICAM TOOLBOX II, which is connected via the integrated switch, it is possible to reach the local SICAM AK 3 and further SICAM RTUs components via the „Control Center Zone“. It depends on the network configuration which can be reached.

Features of the Ethernet Ports:

- 1 IP address
- 1 subnet mask
- 1 default router
- Parameter `Network settings | IP address | Mode of Ethernet ports`
  - **1 IP address (connected ports in switch mode)**



6.3 Application/Configuration of Static Routes

6.3.1 General

Static routing is based on a fixed definition of the path of data packages between two end systems. This definition is written down by administrators in a routing table. This kind of routing serves for security, respectively is used in network configurations, if several default gateways are used. Because of the big effort for the manual maintaining of the tables the number of routes is restricted.

	CP-2016	CP-2019
· Number of static routes	10	10
· Parameter of static routes		
– Source IP address	P	P
– Destination IP address	P	P
– Gateway IP address	P	P
– Subnet mask	P	P
· Interfaces	X0, X1	X0, X1

6.3.2 Configuration

Activation of the „static routes“

- Parameter `Network settings | IP address | advanced parameters | Enable static routes` = **YES**

Definition of the routing table

- Parameter `Network settings | IP address | advanced parameters | static routes` = **Number of lines x** (max. 10)

Mode of the Ethernet Ports

- Parameter `Network settings | IP address | Mode of ethernet ports` = **1 IP address (connected ports in switch mode)**

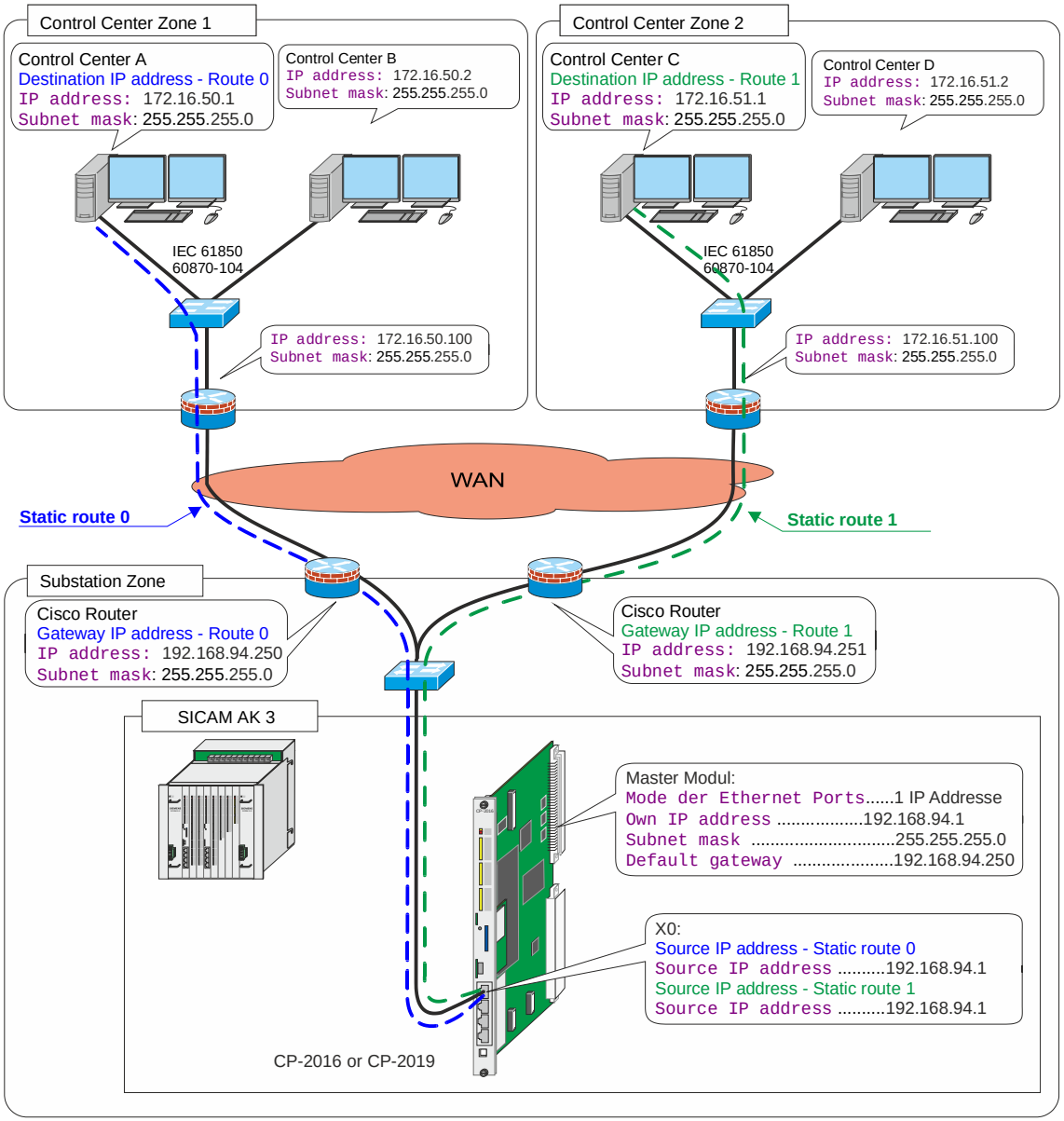
  The data packages are sent via the interfaces X0 and X1.

- Parameter `Network settings | IP address | Mode of ethernet ports` = **2 IP addresses (independent ports)**

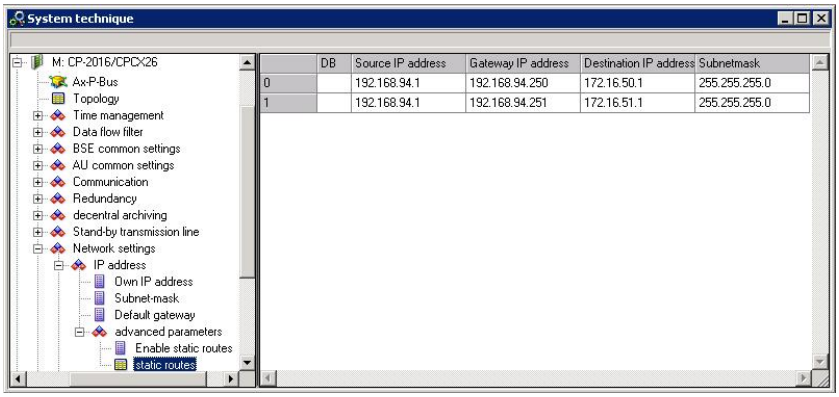
  The data packages are sent via that interface (X0 or X1) to which the respective source IP address (`Own IP address X0` or `Own IP address X1`) is assigned.

6.3.3 Example A

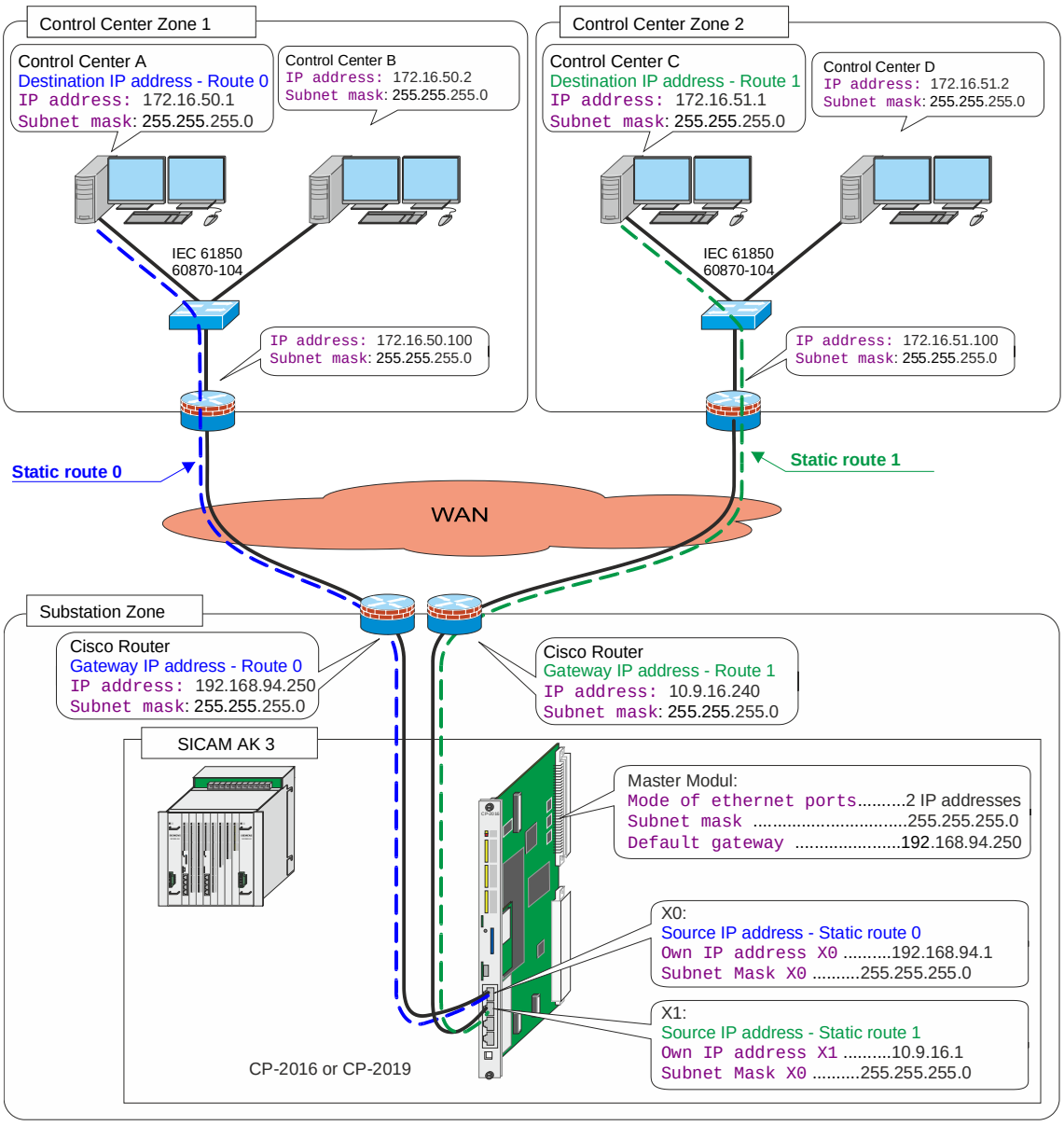
This example shows the usage of 2 static routes from a SICAM AK 3 via 2 gateways to control center in different IP networks.



Routing table from SICAM TOOLBOX II



6.3.4 Example B



6.4 Application/Configuration of IPSEC VPN

IPSec VPN (Internet Protocol Security – Virtual Private Network) is an extension of the Internet Protocol (IP) for encryption and authentication mechanisms. IPSec actively establishes a VPN tunnel (initiator), which guarantees the required confidentiality, authenticity and integrity of data transmission in IP networks. The termination of the IPSec VPN tunnel takes place in a CISCO router. SICAM AK 3 supports only a single IPSec VPN tunnel. It is used as remote terminal unit.

Thus, it is e.g. possible, to secure the IEC 60870-104 communication completely between a SICAM CMIC and a higher-level control center, even if the connection is running over a public network .

SICAM AK 3 uses the IKE-protocol (Internet key exchange) and the PSK-authentication process (pre-shared key). The used key (pre-shared key) can be set by means of an engineering tool (e.g. SICAM TOOLBOX II). It is securely stored in SICAM TOOLBOX II and SICAM AK 3.

Hint

IPSec can only be used in SICAM AK 3 when engineering is done by means of SICAM TOOLBOX II.

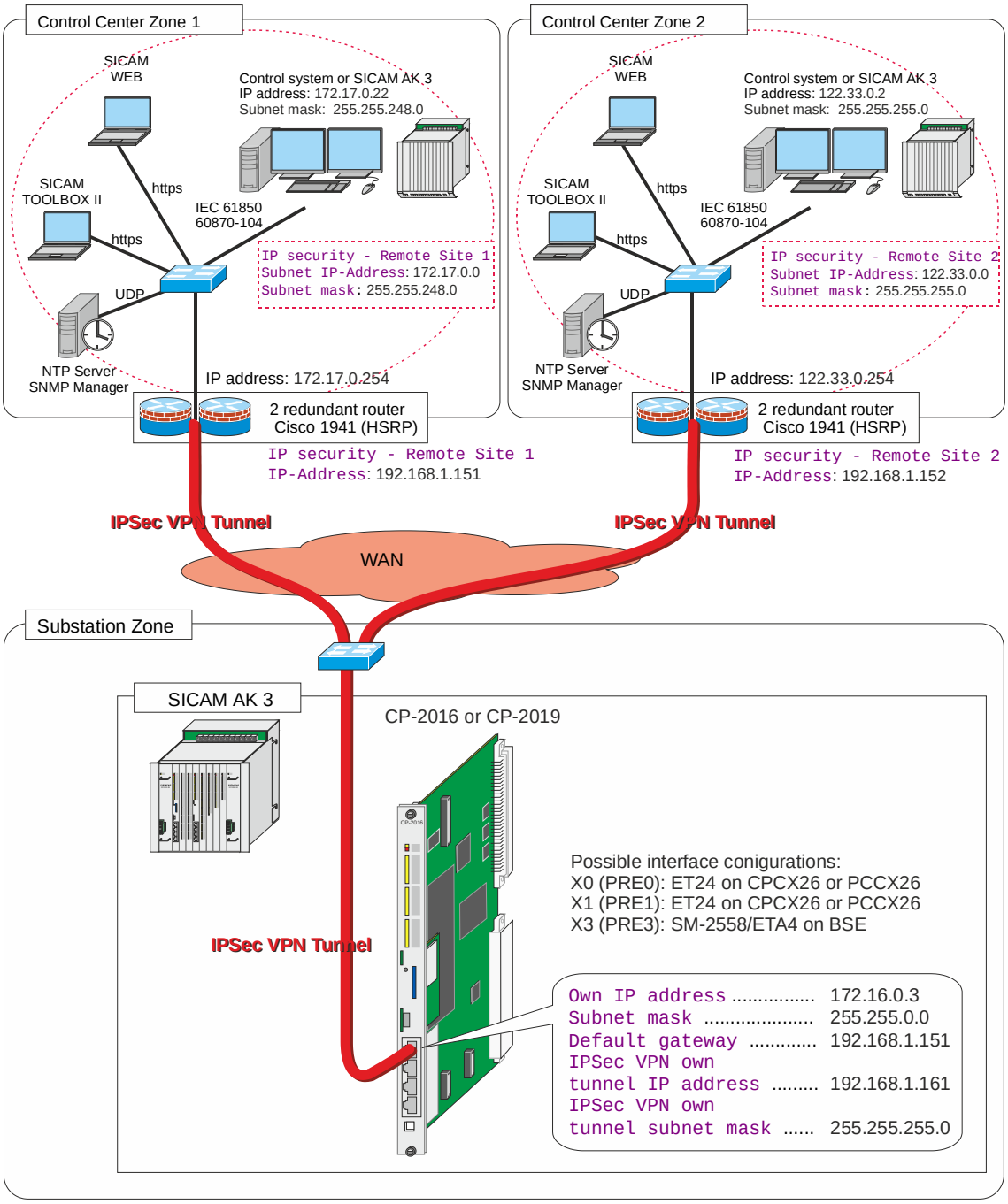
Features:

- Communication with the control system via IEC 60870-104 (Ethernet-Interface, X0 or X1, can be set with parameter)
- 1 IP address
- 1 subnet mask
- 1 default router
- Parameter `Network settings | IP adress | Mode of Ethernet Ports` = 1 IP address (connected ports in switch mode with IPSec VPN)
- IPSec VPN own tunnel IP address
- IPSec VPN own tunnel subnet mask
- IPSec VPN tunnel remote gateway IP address
- IPSec VPN tunnel remote PEER subnet
- IPSec VPN tunnel remote PEER subnet
- The unused Ethernet interface is deactivated due to security reasons

Hint for network configurations

- SICAM AK 3 and the remote station must be in different networks when using IPSec VPN
- The parameter `IPSec VPN Tunnel Remote Router PEER Subnet` and `IPSec VPN Tunnel Remote Router PEER Subnet Mask` are used for SICAM AK 3 internal router functions.

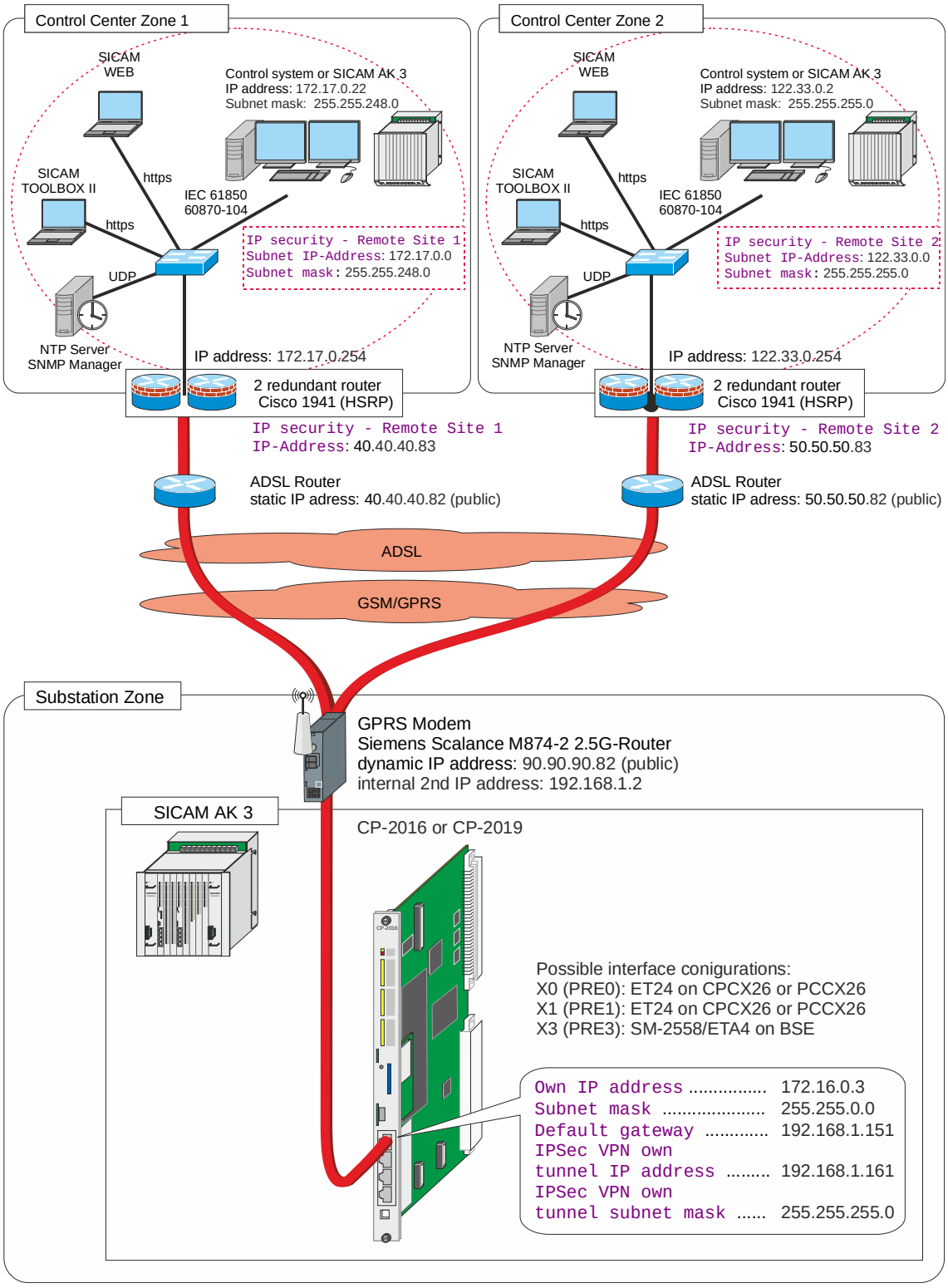
6.4.1 SICAM AK 3 as Telecontrol Substation with IPSec VPN via fixed Network



Hint

You must enter the extern visible IP-address of the router as default gateway in parameter `Network settings| IP address` , in this example 192.168.1.151

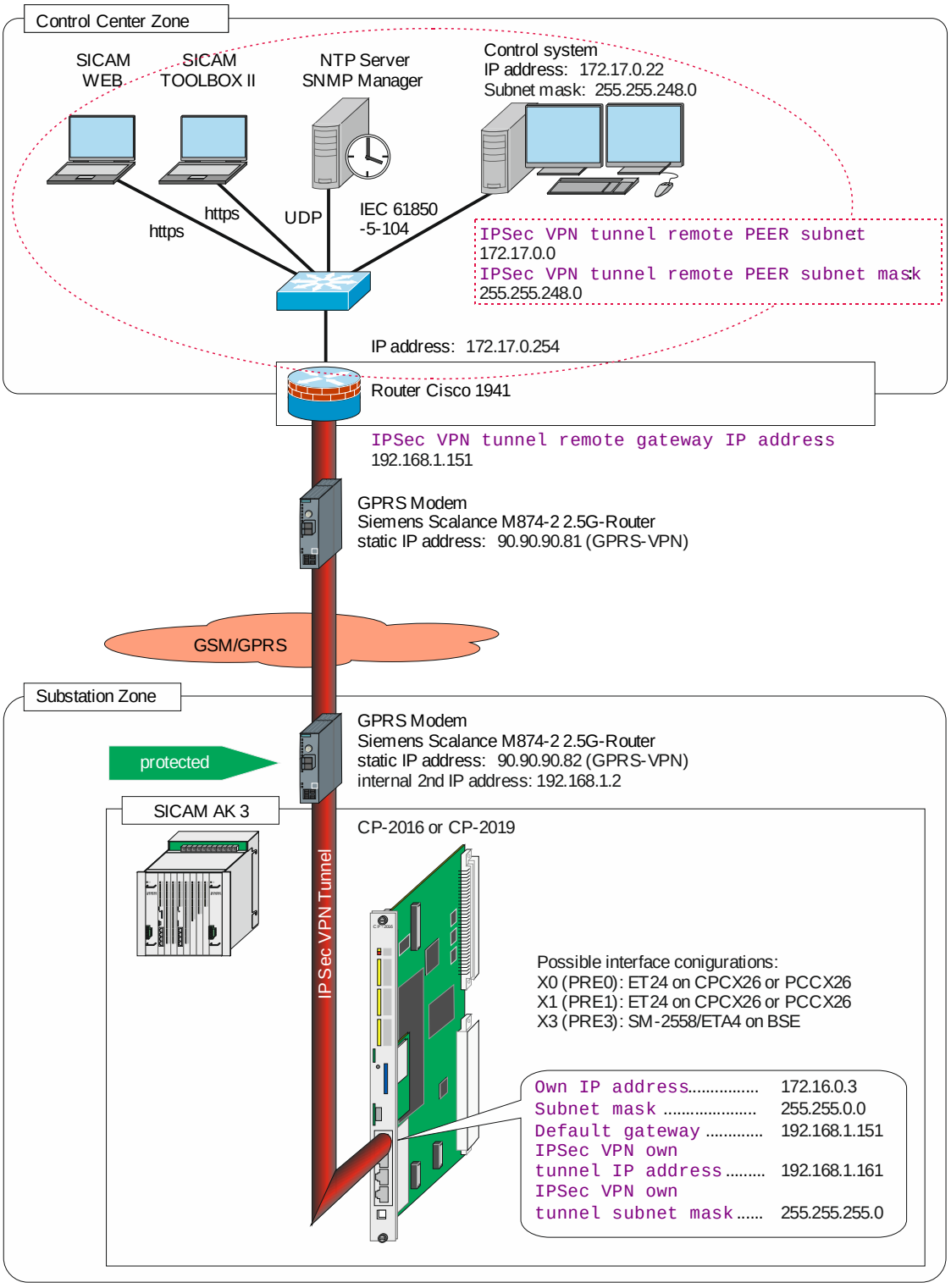
6.4.2 SICAM AK 3 as Telecontrol Substation with IPSec VPN via GPRS Router and ADSL network



Hint

You must enter the extern visible IP-address of the GPRS router as default gateway in parameter `Network settings| IP address` , in this example 192.168.1.2

6.4.3 SICAM AK 3 as Telecontrol Substation with IPSec VPN via GPRS Network



Hint

You must enter the extern visible IP-address of the GPRS router as default gateway in parameter `Network settings| IP address` , in this example 192.168.1.2

A Licensing Agreement

A.1 Open Source Software used in SICAM AK 3

This product contains, among other things, Open Source Software developed by third parties. The Open Source Software used in this product and the license agreements concerning this software can be found in the Readme_OSS. These Open Source Software files are protected by copyright.

Your compliance with those license conditions will entitle you to use the Open Source Software as foreseen in the relevant license. In the event of conflicts between Siemens license conditions and the Open Source Software license conditions, the Open Source Software conditions shall prevail with respect to the Open Source Software portions of the software. The Open Source Software is licensed royalty-free.

Insofar as the applicable Open Source Software License Conditions provide for it you can order the source code of the Open Source Software from your Siemens sales contact - against payment of the shipping and handling charges - for a period of at least 3 years since purchase of the Product.

We are liable for this Product including the Open Source Software contained in it pursuant to the license conditions applicable to the Product. Any liability for the Open Source Software beyond the program flow intended for this Product is explicitly excluded. Furthermore any liability for defects resulting from modifications to the Open Source Software by you or third parties is excluded. We do not provide any technical support for this Product if it has been modified.

The Open Source Software used in this product and the license agreements concerning this software can be found on the SICAM RTUs SD card in the file ReadmOSS.htm.

To readout this file, you need an application that you can download from the Internet. You can find details for the download and the use of the application in the following chapter.

A.1.1 Readout of ReadmOSS.htm

Note

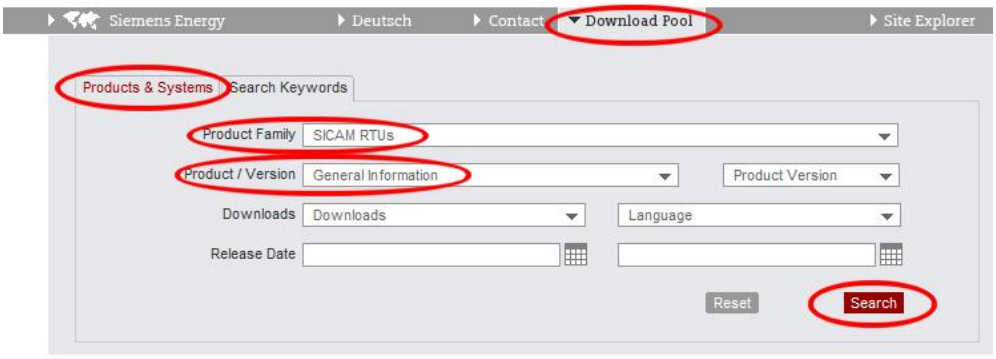
You need a SD card reader and a web browser to read the htm file.

The application for the readout of the ReadmOSS-data from the SD-card can be downloaded from following web page: http://www.energy.siemens.com/

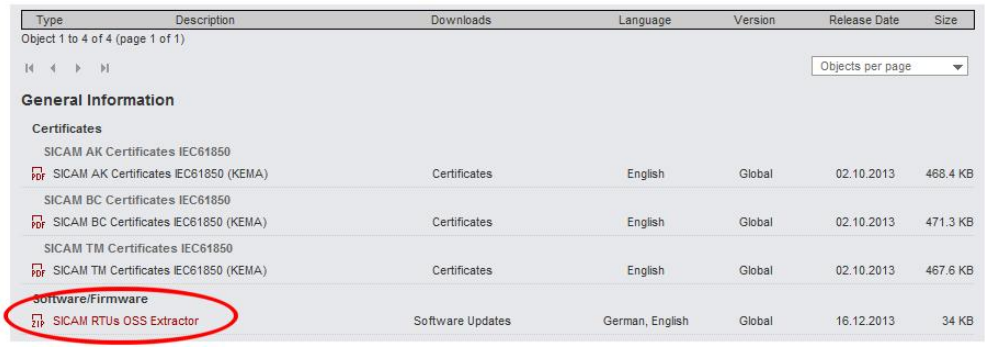
Click in the menu bar on Download Pool and choose on tab Products & Systems following options:

- Product Family: SICAM RTUs
- Product / Version: General Infomation

Click on Search



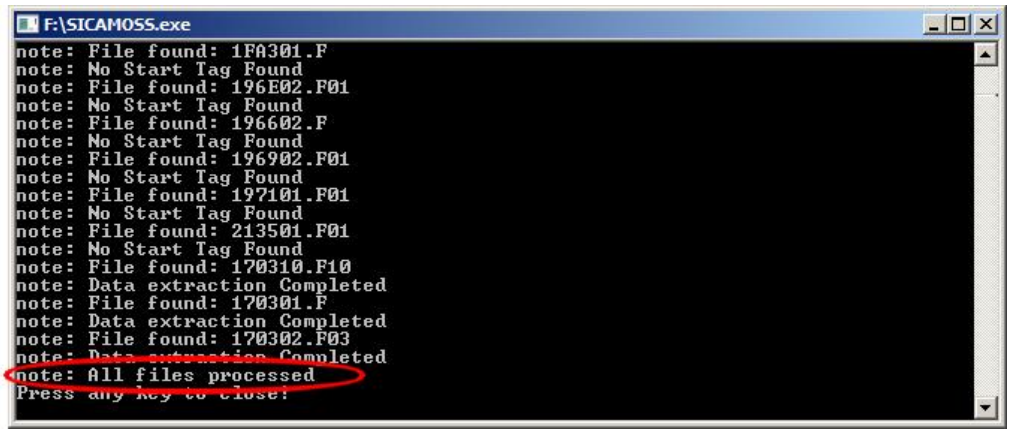
Click on SICAM RTUs OSS Extractor in the result list to start the download.



When the download is finished you will get the file SICAMOSS.zip.

Unzip this file and save the therein contained file (*SICAMOSS.exe*) in the root path of the SD-card from which you want to readout the license agreement.

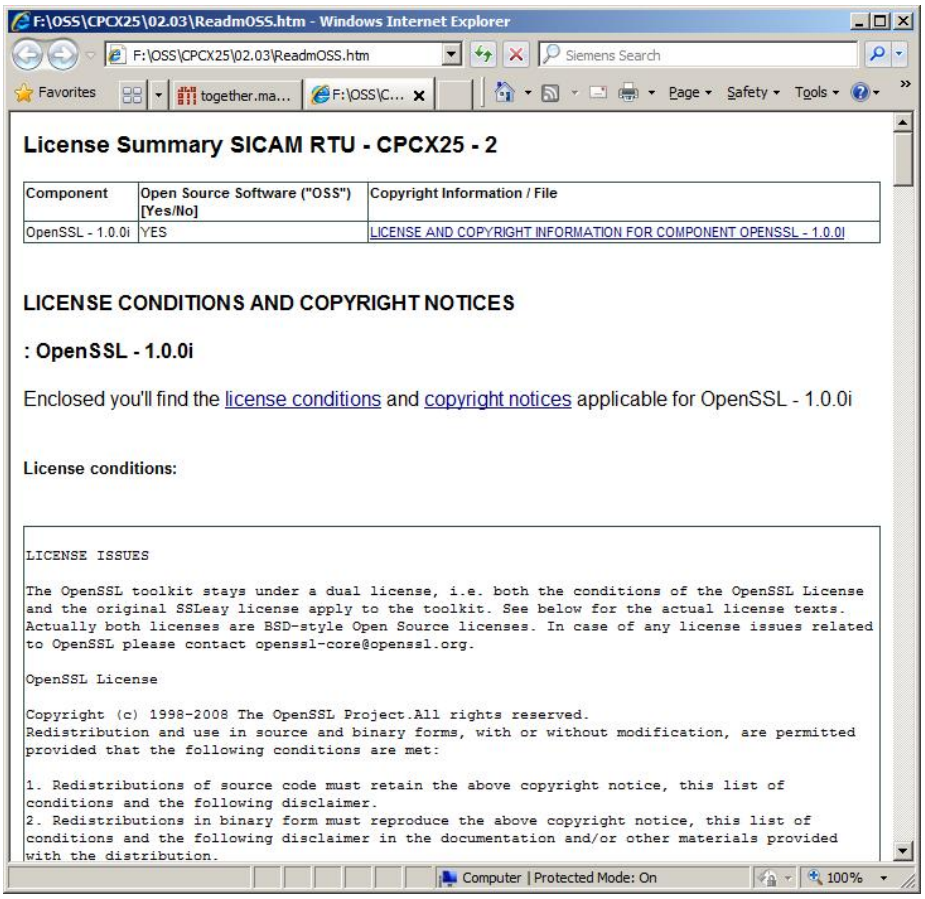
Start now *SICAMRTUS.exe*. During the readout process you can see a DOS-window. If the line `note: All files processed` is displayed you can close the DOS-window by pressing any key.



Now you can find on the SD-card the folder *OSS* with several subfolders. One single folder for each firmware which uses open source components. Within these subfolders are again folders for each used firmware revision. These folders contain the corresponding license data.

Path for ReadmeOSS:
SD-Card:\OSS \<Firmwarename>\<Firmwarenumber>\<Revision>\ReadmOSS .htm.
E.g.: *SD-Card:\OSS\ETA4\02.01\ReadmOSS .htm*

Example of a ReadmOSS.htm:



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