

# SIEMENS

## SICAM RTUs • Ax 1703

### SM-x551/BPPA0

System Element Manual

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Preface, Table of Contents

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Protocol Element SM-x551/BPPA0

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**Note**

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

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**Disclaimer of Liability**

Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded. The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases. Any suggestions for improvement are welcome.

Subject to change without prior notice.

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# Preface

This document is applicable to the following product:

- SICAM AK
- SICAM TM
- SICAM BC
- AK 1703
- AMC 1703

## Purpose

This manual describes the functioning of the system elements SM-2551/BPPA0 and SM-0551/BPPA0 (Balanced Point to Point) and essentially contains

- Functional descriptions
- Technical specifications
- Descriptions of interfaces to the process and other system elements
- Possible configurations

## Target Group and Safety Instructions

The document you are reading right now is addressed to users, who are in charge of the following engineering tasks:

- Conceptual activities, as for example design and configuration
- Creation of the assembly technical documentation using the designated engineering tools
- System parameterization and system diagnostic, using the designated engineering tools
- Technical system maintenance

## Placement in the Information Landscape

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 Platforms Configuration Automation Units and Automation Networks	DC0-021-2
Ax 1703 Interoperability IEC 60870-5-101/104	DA0-046-2
SICAM RTUs Interoperability IEC 60870-5-101/104	DC0-013-2

## 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.

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### **Danger**

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

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### **Warning**

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

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### **Caution**

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

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### **Note**

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

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### **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.
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# 1 Introduction

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## 1.1 Application

The protocol elements SM-2551/BPPA0 and SM-0551/BPPA0 are used in automation units of the systems SICAM AK, SICAM TM, SICAM BC, AK 1703 and AMC 1703. It is deployed in the field of telecontrol and automation.

A protocol element is used for the exchange of data - and thereby for the transmission of messages - over a communication interface to other automation units or devices of third-party manufacturers, e.g. control systems.

The hardware of a protocol element is a communication interface which - dependent on system and interface - can be available in different ways:

- integrated on a basic system element
- on a serial interface module (SIM), which is installed - directly or cascaded (SIM on SIM) - on the basic system element

<b>System element type</b>	Protocol Element
<b>consists of</b>	Module SM-2551 or SM-0551 with firmware BPPA0
<b>can be used in</b>	SICAM AK, SICAM TM, SICAM BC, AK 1703 and AMC 1703
<b>Engineering</b>	SICAM TOOLBOX II with OPM II



## 1.2 Overview

Protocol elements based on a Serial Interface Module (SIM) with serial interfaces

- SM-2551: two interfaces
- SM-0551: one interface

Protocol element (serial)

- standard protocol according to IEC 60870-5-101 for
  - point-to-point traffic
- with byte-asynchronous or byte-isochronous puls code modulation
- all interface signals (RS-232) and all interfaces are galvanically insulated from each other

SM-2551 can be attached to master control and communication elements of SICAM RTUs and Ax 1703 platforms.

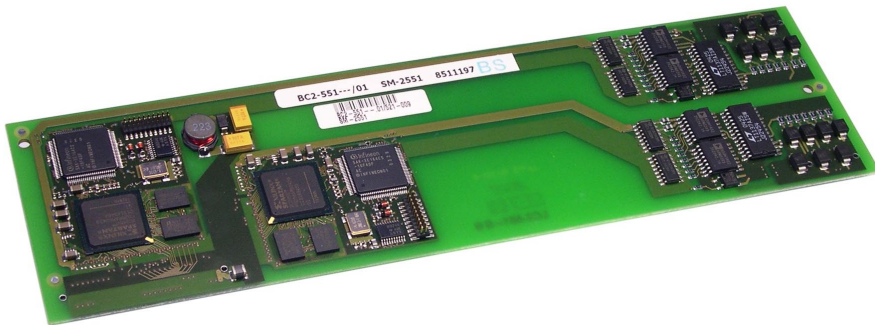
SM-0551 can be attached to selected SIM's SM-25xx.

## 1.3 Mechanics

### 1.3.1 SM-2551

SIM SM-2551 can be attached to master control and communication elements of SICAM RTUs and Ax 1703 platforms.

**View**



### 1.3.2 SM-0551

SIM SM-0551 can be attached to SIM SM-2558 and SIM SM-2546.

SIM SM-2558 can be attached to master control and communication elements of SICAM RTUs and Ax 1703 platforms.

SIM SM-2546 can only be attached to the SICAM BC master control element.

**View**



For further information see section [2.3.2; Hardware](#).

## 2 Protocol Element SM-x551/BPPA0

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## 2.1 Features and Functions

### General Functions

Communication with a remote station.

- Balanced Point-to-Point (point-to-point traffic) according to IEC 60870-5-101
  - Supported functionality according to
    - *SICAM RTUs Interoperability IEC 60870-5-101/104*
    - *Ax 1703 Interoperability IEC 60870-5-101/104*
  - Acquisition of events (transmission of data ready to be sent)
  - General interrogation, outstation interrogation
  - Clock synchronization
    - Cyclic, at least 1 times per minute
  - Command transmission
    - Set control location, control location check
  - Transmission of integrated totals
  - Acquisition of transmission delay (for the correction of time synchronisation)
- Optimized parameters for selected transmission facilities
- Functions for supporting redundant communication routes
- Special functions



#### Note

The above mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions Protocol Elements, section "Point-to-Point Traffic (BPP)"*.

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## 2.2 Modes of Operation

Operating mode	Patch Plug	Extras <sup>1)</sup>	Note
Unbalanced interchange circuit V.24/V.28 V.23 Dedicated line	CM-2860 <sup>a)</sup>	CE-0700	<ul style="list-style-type: none"> <li>• 300/1200 Bit/s</li> <li>• Signals and levels acc. to V.24, V.28, RS-232</li> <li>• RJ45 connector to CE-0700 RXD, TXD, CTS, RTS, DCD, DTR, GND</li> <li>• 4-pin screw terminals on CE-0700 NF-an a, NF-an b, NF-ab a / NF-a, NF-ab b / NF-b</li> </ul>
Unbalanced interchange circuit V.24/V.28 VFT channel	CM-2860 <sup>a)</sup>	CE-0701	<ul style="list-style-type: none"> <li>• 50...2400 bps</li> <li>• Signals and levels acc. to V.24, V.28, RS-232</li> <li>• RJ45 connector to CE-0701 RXD, TXD, CTS, RTS, DCD, SQ, GND</li> <li>• 4-pin screw terminals on CE-0701 NF-an a, NF-an b, NF-ab a / NF-a, NF-ab b / NF-b</li> </ul>
Balanced interchange circuit X.24/X.27 V.11 isochronous	CM-2860 <sup>a)</sup>	CM-0829	<ul style="list-style-type: none"> <li>• 2400...64000 bps</li> <li>• Signals and levels acc. to RS-422</li> <li>• RJ45 connector to CM-0829 RXD, TXD, CTS, TXC, DCD, DTR, DSR/+5 V, GND or RXD, TXD, RTS, RXC, DCD, DTR, DSR/+5 V, GND</li> <li>• 15-pin D-SUB connector on CM-0829 RX<math>\pm</math>, TX<math>\pm</math>, CD<math>\pm</math>, RCTC<math>\pm</math>, CT<math>\pm</math>, RT<math>\pm</math>, GND corresponds with SM-2541 operating mode 2a, V.11 isochronous</li> </ul>
Balanced interface RS-422 V.11 asynchronous	CM-2860 <sup>a)</sup>	CM-0829	<ul style="list-style-type: none"> <li>• 50...115200 bps</li> <li>• Signals and levels acc. to V.11, RS-422</li> <li>• RJ45 connector to CM-0829 RXD, TXD, CTS, RTS, DCD, DTR, DSR/+5 V, GND</li> <li>• 15-pin D-SUB connector on CM-0829 RX<math>\pm</math>, TX<math>\pm</math>, CD<math>\pm</math>, CT<math>\pm</math>, RT<math>\pm</math>, GND corresponds with SM-2541 operating mode 2a, V.11/RS-422 asynchronous</li> </ul>
Optical interface (multimode fibre optic)	CM-2860 <sup>a)</sup> CM-5860 <sup>b)</sup>	CM-0827 CM-0821	<ul style="list-style-type: none"> <li>• 50...115200 bps</li> <li>• RJ45 connector to CM-0827 RXD, TXD, +5 V, GND</li> <li>• 820 nm signals</li> <li>• 50/125 <math>\mu</math> and 62.5/125 <math>\mu</math> fibres</li> <li>• ST compatible connector on CM-0827</li> </ul>
Unbalanced interchange circuit V.24/V.28 V.28 asynchronous	CM-2860 <sup>a)</sup> CM-5860 <sup>b)</sup>	-	<ul style="list-style-type: none"> <li>• 50...115200 bps</li> <li>• Signals and levels acc. to V.24, V.28, RS-232</li> <li>• RJ45 connector RXD, TXD, CTS, RTS, DCD, DTR, DSR/+5 V, GND</li> <li>• RJ45 connector pin assignment corresponds with SM-2541 operating mode 1a, V.28 asynchronous</li> </ul>

<sup>1)</sup> Extras is optional equipment

<sup>a)</sup> Patch Plug for SICAM AK, SICAM TM; AK 1703, AMC 1703, AM 1703, BC 1703

<sup>b)</sup> Patch Module for SICAM BC

## 2.3 Configuration

### 2.3.1 Communication

For the stations to communicate with each other, suitable transmission facilities and/or network components may be needed in addition.

#### Own station

System	System Element	Protocol Element	Note
SICAM AK	CP-2014/CPCX25 CP-2017/PCCX25	SM-2551/BPPA0 SM-0551/BPPA0	
SICAM BC	CP-5014/CPCX55	SM-2551/BPPA0 SM-0551/BPPA0	
SICAM TM	CP-6014/CPCX65	SM-2551/BPPA0	

#### Remote station

System	System Element	Protocol Element	Note
SICAM AK	CP-2014/CPCX25 CP-2017/PCCX25	SM-2551/BPPA0 SM-0551/BPPA0	
SICAM BC	CP-5014/CPCX55	SM-2551/BPPA0 SM-0551/BPPA0	
SICAM TM	CP-6014/CPCX65	SM-2551/BPPA0 SM-0551/BPPA0	
SICAM CMIC	CP-8000/CPC80	BPPT0	
SICAM EMIC	CP-6010/CPC30	BPPT0	
SICAM MIC	CP-6020/CPC60 CP-6040/CPC60	-	
Ax 1703	-	-	acc. to <i>SICAM RTUs Interoperability IEC 60870-5-101/104</i> or <i>Ax 1703 Interoperability IEC 60870-5-101/104</i>

## 2.3.2 Hardware

### 2.3.2.1 SM-2551

The following table lists supported configurations. In addition to one (SI0/SI1 or SI2/SI3) or two (SI0/SI1 and SI2/SI3) SM-2551, all parts (carrier module, connection board, patch plug, etc.) listed for the chosen configuration are needed:

Configuration			Interfaces			
Carrier Module	Connection Board <sup>1)</sup>	Patch Plug <sup>1)</sup>	SI0	SI1	SI2	SI3
CP-2014	CM-2839	<sup>2)</sup>	✓	✓		
CP-2017	CM-2838	<sup>2)</sup>	✓	✓	✓	✓
CP-5014	one integrated patch module per SIx <sup>3)</sup>		✓	✓		
CP-6014	-	<sup>2)</sup>	✓	✓	✓	✓

<sup>1)</sup> One connection board for each carrier module, one patch plug for each interface

<sup>2)</sup> see "Modes of Operation"

<sup>3)</sup> Each variant of the SICAM BC which can be ordered comes with a determined patch module for each interface

### 2.3.2.2 SM-0551

The following table lists supported configurations. In addition SM-0551, all parts (SIM, carrier module, connection board, patch plug, etc.) listed for the chosen configuration are needed:

Configuration				Interfaces			
Carrier Module	SIM	Connection Board <sup>1)</sup>	Patch Plug <sup>2)</sup>	SI0	SI1	SI2	SI3
CP-2014	<sup>4)</sup>	CM-2839	<sup>2)</sup>	✓	<sup>6)</sup>		
CP-2017	<sup>4)</sup>	CM-2838	<sup>2)</sup>	✓	<sup>6)</sup>	✓	<sup>6)</sup>
CP-5014	<sup>5)</sup>	one integrated patch module per SIx <sup>3)</sup>		✓	<sup>6)</sup>		
CP-6014	<sup>4)</sup>	-	<sup>2)</sup>	✓	<sup>6)</sup>	✓	<sup>6)</sup>

<sup>1)</sup> One connection board for each carrier module, one patch plug for each interface

<sup>2)</sup> see "Modes of Operation"

<sup>3)</sup> Each variant of the SICAM BC which can be ordered comes with a determined patch module for each interface

<sup>4)</sup> SM-2558 required, on which SM-0551 can be installed

<sup>5)</sup> SM-2546 or SM-2558 required, on which SM-0551 can be installed

<sup>6)</sup> Interface is not operated by SM-0551 but directly by SM-2546 / SM-2558

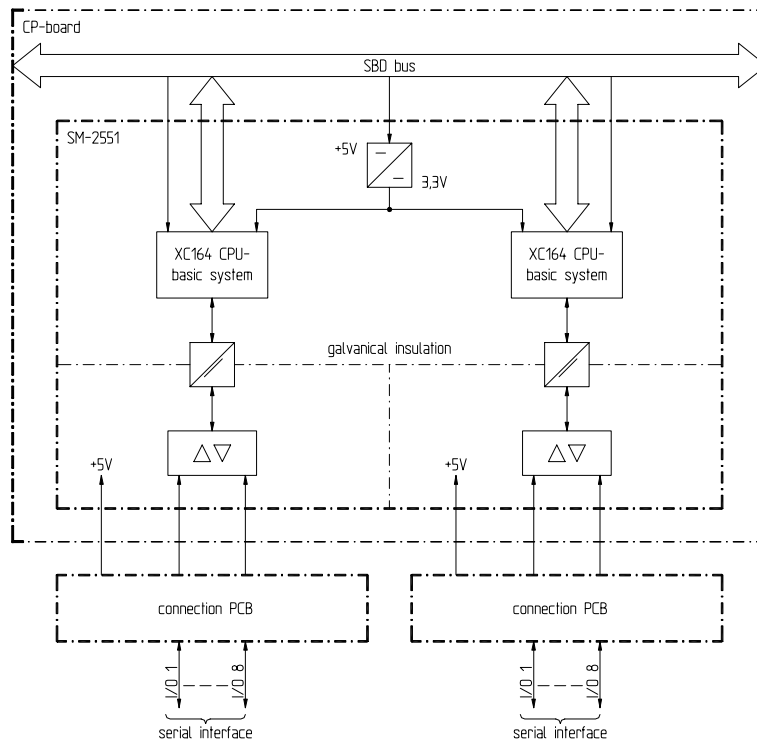
## 2.4 Engineering

For diagnosis, testing, parameter setting or documentation, the system element is supported by the engineering tools of SICAM TOOLBOX II. OPM II is required.

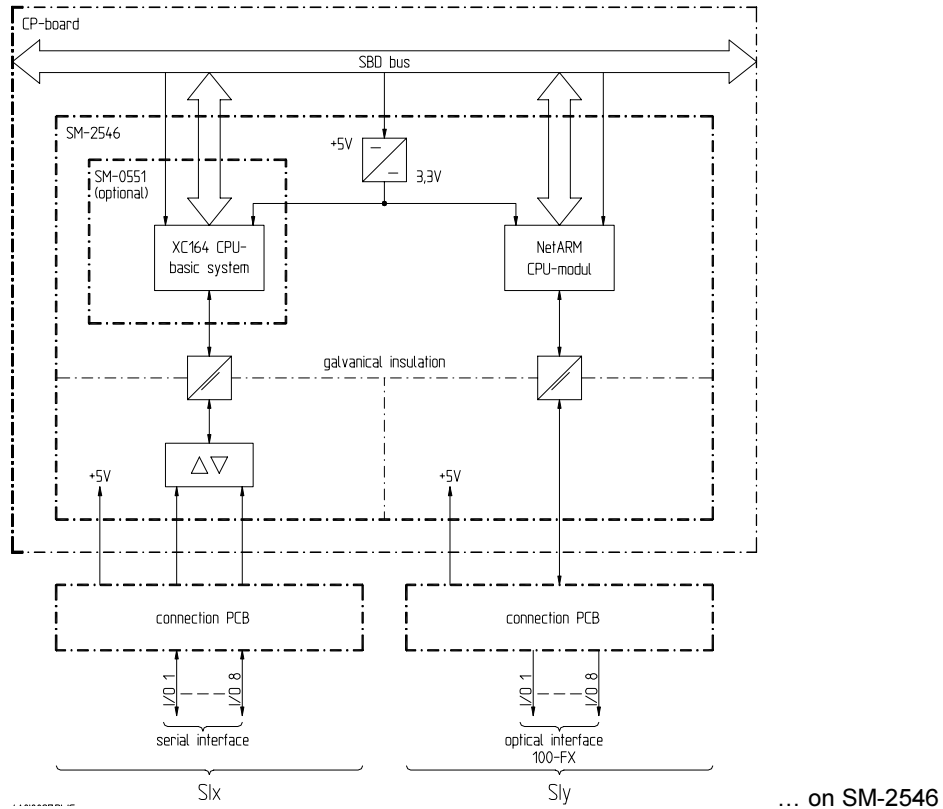
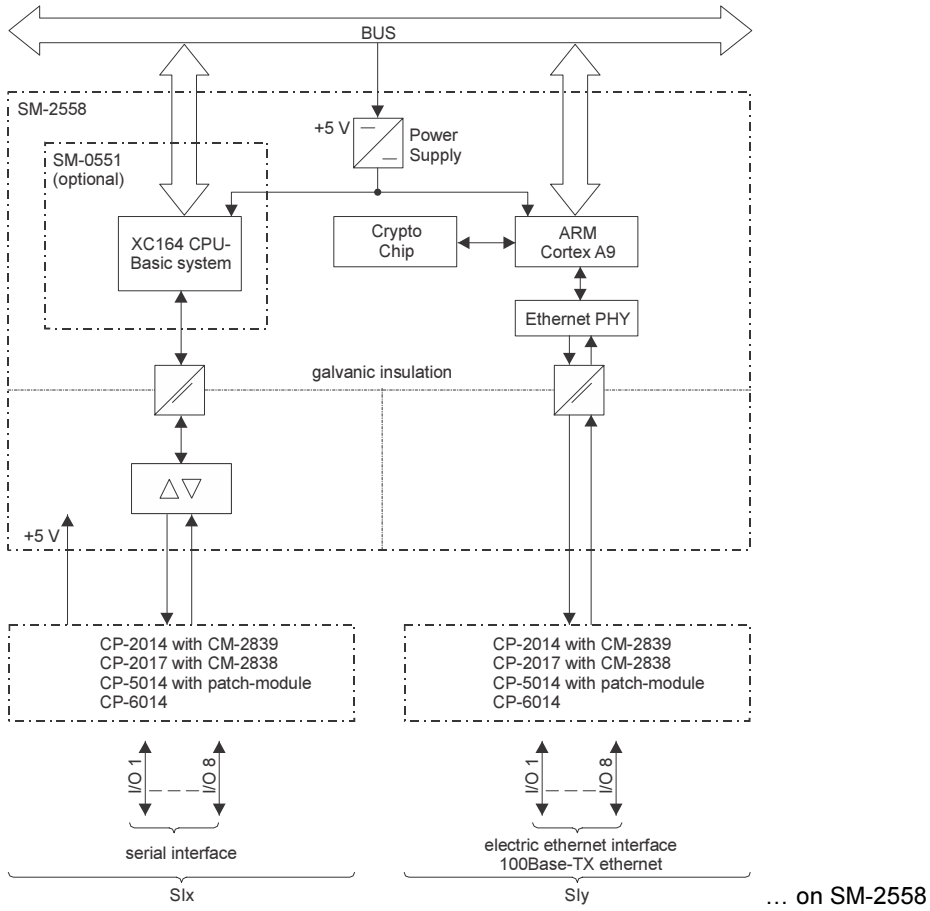


## 2.5 Block Diagrams

### 2.5.1 SM-2551



### 2.5.2 SM-0551



## 2.6 Technical Specifications

### 2.6.1 SM-2551

Communication Circuits	
2 serial interfaces	<ul style="list-style-type: none"> <li>• Interface characteristics, interface signals, modes of operation, transmission rates               <ul style="list-style-type: none"> <li>– see description of the respective protocol, "Modes of operation"</li> </ul> </li> <li>• Instead of the interface signal DSR the gate circuit voltage (+5 VDC) can be provided (settable)</li> <li>• Ability to be connected in parallel               <ul style="list-style-type: none"> <li>– outgoing interface signals in tristate technology</li> <li>– up to 2 interfaces can be connected in parallel</li> <li>– circuits for incoming interface signals always active</li> </ul> </li> <li>• The signals are galvanically insulated from logic circuits</li> <li>• Line lengths V.28               <ul style="list-style-type: none"> <li>– 50 bps <span style="float: right;">up to 25 m</span></li> <li>– 115200 bps <span style="float: right;">up to 5 m</span></li> </ul> </li> </ul>
Power supply	
Operating voltage	4.75...5.25 VDC, typ. 300 mA, max. 540 mA @5 V The voltage is supplied by the carrier module.
Gate circuit voltage +5VDC instead of DSR	<ul style="list-style-type: none"> <li>• Voltage <span style="float: right;">4.7...5.6 VDC</span></li> <li>• Max. output current <span style="float: right;">150 mA at U &gt; 4.75 V</span></li> <li>• Max. output power <span style="float: right;">750 mW</span></li> <li>• Max. idle voltage <span style="float: right;">≤ 5.6 VDC</span></li> <li>• Not short-circuit proof</li> <li>• Not overload proof</li> <li>• Galvanically insulated from logic voltage</li> <li>• The voltage (data circuit voltage) is supplied by the carrier module (galvanically insulated)</li> </ul>
Mechanics	
Dimensions	227.3 x 63.5 mm
Weight	Approx. 200 g

## 2.6.2 SM-0551

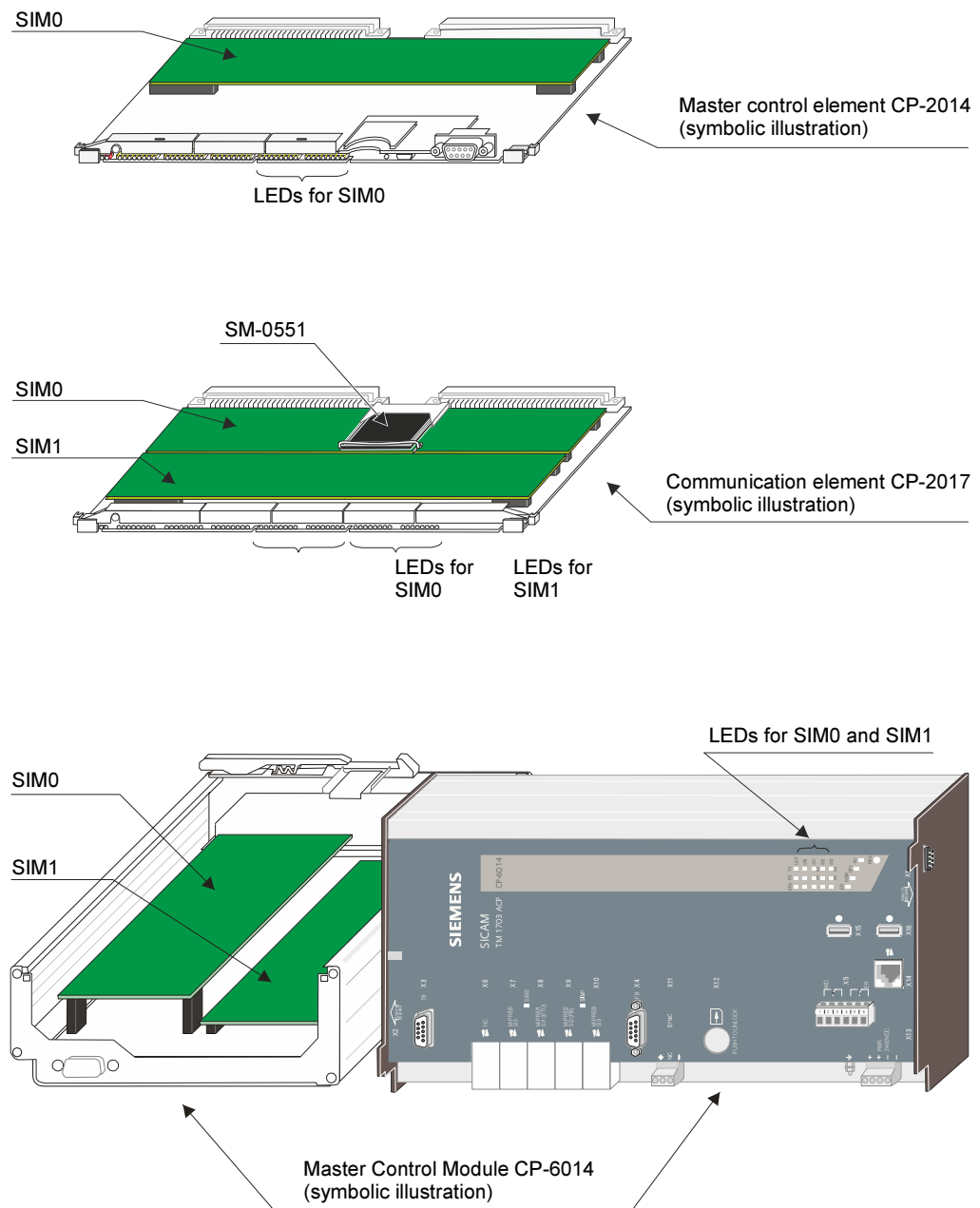
Communication Circuits	
1 serial interface	<ul style="list-style-type: none"> <li>Interface characteristics, interface signals, modes of operation, transmission rates               <ul style="list-style-type: none"> <li>– see description of the respective protocol, "Modes of operation"</li> </ul> </li> <li>Instead of the interface signal DSR the gate circuit voltage (+5 VDC) can be provided (settable)</li> <li>Ability to be connected in parallel               <ul style="list-style-type: none"> <li>– outgoing interface signals in tristate technology</li> <li>– up to 2 interfaces can be connected in parallel</li> <li>– circuits for incoming interface signals always active</li> </ul> </li> <li>The signals are galvanically insulated from logic circuits</li> <li>Line lengths V.28               <ul style="list-style-type: none"> <li>– 50 bps up to 25 m</li> <li>– 115200 bps up to 5 m</li> </ul> </li> </ul>
Power supply	
Operating voltage	4.75...5.25 VDC, typ. 25 mA, max. 50 mA @5 V 3.14...3.47 VDC, typ. 150 mA, max. 330 mA @3.3 V The voltage is supplied by the carrier module.
Gate circuit voltage +5 VDC instead of DSR	<ul style="list-style-type: none"> <li>Voltage 4.7...5.6 VDC</li> <li>Max. output current 150 mA at <math>U &gt; 4.75 V</math></li> <li>Max. output power 750 mW</li> <li>Max. idle voltage <math>\leq 5.6 VDC</math></li> <li>Not short-circuit proof</li> <li>Not overload proof</li> <li>Galvanically insulated from logic voltage</li> <li>The voltage (data circuit voltage) is supplied by the carrier module (galvanically insulated)</li> </ul>
Mechanics	
Dimensions	56 x 43 x 5.5 mm
Weight	Approx. 15 g

## 2.7 Status and Function Display

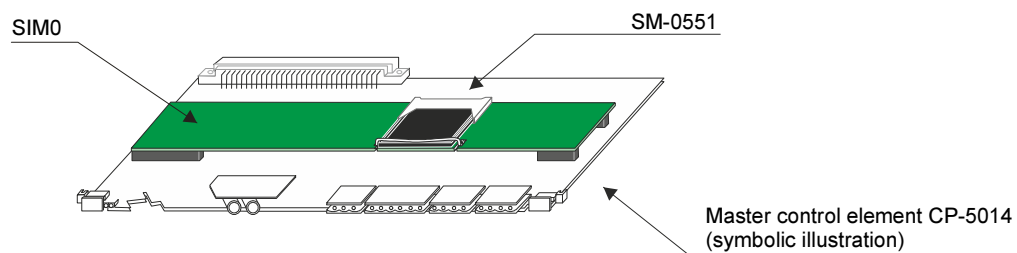
The protocol elements SM-2551/BPPA0 and SM-0551/BPPA0 itself have neither a front panel nor LED displays.

They use the LED displays on the master control- or communication elements, or, in case of SICAM BC, additional the displays on the operating panel. The meaning of these LED displays is described in the manual of the concerning system element.

### Protocol elements – Mounting place and LED display SICAM AK/SICAM TM



### Protocol elements – Mounting place SICAM BC



**Note**

SICAM BC has no LEDs for status and function display of protocol elements.

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## 2.8 Pin Assignment

### Operating Mode

#### Unbalanced interchange circuit V.24/V.28

- V.23 Dedicated line
- VFT channel
- V.28 asynchronous

#### Balanced interchange circuit X.24/X.27

- V.11 isochronous

#### Balanced interface RS-422

- V.11 asynchronous

#### Optische Schnittstelle (Multimode-Lichtwellenleiter)

- Star / Tree

### Pin Assignment (RJ45)

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

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

clock pulse is received

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

clock pulse is generated

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

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

**The abbreviations have the following meaning:**

CTS . . . . serielle Schnittstelle (V.28) - Clear To Send  
RTS . . . . serielle Schnittstelle (V.28) - Request To Send  
DSR . . . . serielle Schnittstelle (V.28) - Data Set Ready  
DCD . . . . serielle Schnittstelle (V.28) - Data Carrier Detect  
DTR . . . . serielle Schnittstelle (V.28) - Data Terminal Ready  
TxD . . . . serielle Schnittstelle (V.28) - Transmit Data  
RxD . . . . serielle Schnittstelle (V.28) - Receive Data  
GND . . . . serielle Schnittstelle (V.28) - Signal Ground  
+5V . . . . serielle Schnittstelle - +5V-Versorgung  
TxC . . . . serielle Schnittstelle (V.28) - Takt wird gesendet  
RxC . . . . serielle Schnittstelle (V.28) - Takt wird empfangen  
RNGERR . . Signalisierung Ringbruch (nur in Verbindung mit CM-0821)  
MODE . . . Betriebsart V.28 am CM-0827

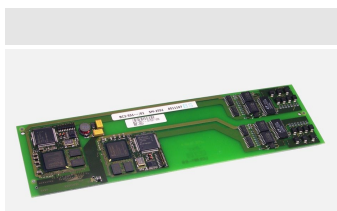


# 3 Order Information

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### 3.1 System Element SM-2551





Designation	Item Number/MLFB
SM-2551 Serial Interface Processor 2 serial interfaces	BC2-551 6MF10130CF510AA0

## 3.2 System Element SM-0551

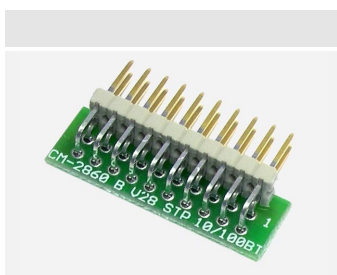
	<b>Designation</b> SM-0551 Serial Interface Processor 1 serial interface	<b>Item Number/MLFB</b> BC0-551 6MF10130AF510AA0
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### 3.2.1 Required for Installation

Prerequisite for the installation of SM-0551 is one of the following SIM:

	<b>Designation</b> SM-2558 Ethernet-Interface 1x100Base-TX +1 ser. interface (optional)	<b>Item Number/MLFB</b> BC2-558 6MF10130CF580AA0
	<b>Designation</b> SM-2546 Ethernet 100FX + 1 serial interface (optional)	<b>Item Number/MLFB</b> BC2-546 6MF10130CF460AA0

### 3.3 Accessories



Designation	Item Number/MLFB
CM-2860 Patch Plug standard V28, ET, TR	CA2-860 6MF12110CJ600AA0