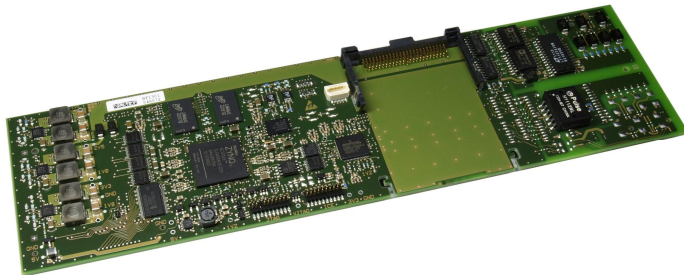


SIEMENS

SICAM AK
SICAM AK 3
SICAM TM
SICAM BC
SM-2558/ETA4

Protocol Elements for Ethernet TCP/IP



Protocol element for LAN/WAN-communication.

- Standard according to IEC 60870-5-104
 - Fast Ethernet 100Mbit/s, IEEE 802.3, 100Base-TX, electrical
 - TCP/IP
 - time synchronisation via network time protocol (NTP)

The protocol element can be attached to master control and communication elements of SICAM RTUs.

Optionally it can be expanded with a serial interface by SM-0551/PROTOCOL

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DOCUMENT HISTORY

Version	Revision	Datum	Änderung
2	00	06.06.13	Erstausgabe
2	01	03.07.13	Update Eigenschaften & Funktionen
2	02	12.02.14	Update Eigenschaften & Funktionen (White List)
2	03	02.02.15	Funktion „Security Logging“ ergänzt
2	04	15.06.15	Security Funktion „IPSec“ ergänzt

ÜBERSETZUNG GEPRÜFT

am: 15.06.15
 von: Schachinger
 EM EA PRO D

ERSTELLT

am: 06.06.03
 von: F. Schachinger
 EM EA PRO D

FORM GEPRÜFT

am: 15.06.15
 von: Schachinger
 EM EA PRO D

LETZTE ÄNDERUNG

am: 15.06.15
 von: F. Schachinger
 EM EA PRO D

INHALT FREIGEgeben

am: 15.06.15
 von: S. Gerdl
 EM EA PRO D

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.

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 Document Label:
 SICRTUs-DSSM2558ETA4-ENG_V2.04
 Issuing date:
 2015.06.15

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Application

The protocol element described herein can be used in several automation units based on SICAM RTUs.

- SICAM AK
- SICAM AK 3
- SICAM TM
- SICAM BC

Protocol elements process specific communication protocols when SICAM RTUs communicate with each other oder with devices of third-party manufacturers, in the field of telecontrol, automation and protection.

Due to its features, protocol element technology has a successful tradition for many years at SIEMENS. A fundamental characteristic is the separation of protocol-bound communication from application tasks of an automation unit.

- Each interface has its own protocol processor
 - communication has no impact on the application, and vice versa
 - each processor runs one communication protocol
 - various different protocols run on one and the same hardware
 - all protocols can be loaded with SICAM TOOLBOX II
- You can change the communication protocol, for instance from serial to LAN, without retroactive effect to the application tasks of an automation unit
- Each automation unit can be equipped with various protocols This allows easy implementation of data nodes and frontends.

Engineering is done using SICAM TOOLBOX II.

Features and Functions

• LAN/WAN Communication over Ethernet TCP/IP - General	
– 10/100 Mbit/s (half duplex/full duplex)	
– 10 Mbit/s (full duplex, auto negotiation)	✓
– 100 Mbit/s (full duplex, auto negotiation)	✓
– Auto-MDIX (Auto Medium Dependent Interface Crossover)	
– Parameters for TCP/IP optimization	✓
• LAN/WAN Communication over Ethernet TCP/IP according to IEC 60870-5-104	
– Controlled station	✓
– Controlling Station	✓
– Max. connections	100 ²⁾
• Supported Ports	
– Port 2404: IEC 60870-5-104	✓
– Port 80: HTTP (Hypertext Transfer Protocol) - "Web server"	
– Port 80: HTTP (Hypertext Transfer Protocol) - "Remote operation for SICAM TOOLBOX II"	✓
– Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - "Web server"	
– Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - "Remote operation for SICAM TOOLBOX II"	✓
– Port 123: NTP V3 (Network Time Protocol)	✓
– Port 123: SNTP V3 (Simple Network Time Protocol)	✓
– Port 2001: "Remote operation for SICAM TOOLBOX II"	
• Interoperability according to the following documents:	
– SICAM RTUs Interoperability IEC 60870-5-101/104 (DC0-013-2)	✓
– Ax 1703 Interoperability IEC 60870-5-101/104 (DA0-046-2)	
• Acquisition of events (transmission of data ready to be sent)	✓
• General interrogation, outstation interrogation	✓
• Clock synchronization according to NTP (Network Time Protocol)	
– NTP server	✓
– NTP client	✓
– SNTP client	✓
• Command transmission	✓
– Supervision of maximum transport delay in control direction Command Transfer Monitoring (Dwell Time Monitoring)	✓
– Set control location	✓
– Check control location	✓
• Transmission of integrated totals	✓

• Protocol element control and return information	
Protocol element control	
– Interface “enable/disable”	✓
– Send (general) interrogation command	✓
– Send (general) interrogation command to GI-group	✓
– Preset control location	✓
Protocol element return information	
– Station failure	
– Protocol-specific return information 0 “Status DATA TRANSFER (BSE)”	
– Protocol-specific return information 1 “Status DATA TRANSFER (104)”	
• Functions for the support of redundant communication routes	
– PSI redundancy (synchronous connections)	
– 104 redundancy according IEC 60870 5 104 Edition 2.0)	
– 104 redundancy “controlling station“	
– 104 redundancy “controlled station“ with 1 Ethernet interface	✓
– 104 redundancy “controlled station“ with 2 Ethernet interfaces	✓
– 1703 redundancy	✓
– Deactivation of interface (with protocol element control message)	✓
– Deactivation of interface (with redundancy control message)	✓
– Dual LAN interface with integrated switch for ring or star configurations (DNIP)	
– RSTP mode (max. 39 devices in ring configuration)	
– Line Mode	
– Switch mode	
– Single mode	
– Single + service mode	
• SICAM TOOLBOX II connection over LAN/WAN (“remote connection”)	
– Remote connection based on HTTP/HTTPS	✓
– User authentication in SICAM RTUs using “Connection Password”	✓
– Remote connection based on integrated terminal server	
– Remote connection based on integrated terminal server (Enable/Disable) option	
– “Warning Remote Connection”	✓
• Web Server	
– Integrated web server to display connection, statistic and developer information	
– Access to the web server with standard web browser via HTTP (Hyper Text Transfer Protocol)	
– Password for web server	
– Web server (enable/disable) option	

• Security	
– IPSec VPN	
– IPSec in tunnel mode: initiator	✓
– Authentication / encryption based on pre-shared key	✓
– Internet Key Exchange protocol: IKEv1	✓
– Authentication algorithms: HMAC-SHA1, HMAC-MD5	✓
– Encryption algorithms: AES-128, 3DES	✓
– Diffie-Hellman group: Group1, Group2	✓
– Security Logging	
– Syslog Client	✓ 5)
• Special functions	
– Summer time bit (SU) = 0 for all messages in transmit direction (time tag)	✓
– Day of week (DOW) = 0 for all messages in transmit direction (time tag)	✓
– Time stamp (IV = 1) in messages in transmit direction	
– Originator address = 0 for all messages in transmit direction	✓
– WhiteList filter	✓
– Data throughput limitation	✓
– Special functions for project DBAG / PSI	
– Breaker delay in transmit direction (<TI = 150>)	✓
– Send originator address with settable value	✓
– Special functions for project RWE	
– Bit by bit marking of the field	✓
– Cyclic measured values	✓
– Address of the return information for selection command 2	✓
– NT-Bit, IV-Bit according to RWE requirements	✓
– Suppress error in case of connection failure	✓
– Suppress error in case of connection failure but with Enabled - NT-Bit simulation by BSE after connection failure - general interrogation after connection is OK	

2) recommendation max. 30 Connections

5) only in combination with CP-2014/CPCX26 in SICAM AK



Hint

The above mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, section *LAN Communication (104)*.

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-2558/ETA4	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2558/ETA4	
SICAM BC	CP-5014/CPCX55	SM-2558/ETA4	
SICAM TM	CP-6014/CPCX65	SM-2558/ETA4	

Remote station

System	System Element	Protocol Element	Note
SICAM AK	CP-2014/CPCX25 CP-2017/PCCX25	SM-2558/ETA4 SM-2556/ET02 SM-2556/ETA2 SM-2557/ET02 SM-2557/ETA2	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2558/ETA4 ET24	
SICAM BC	CP-5014/CPCX55	SM-2558/ETA4 SM-2556/ET02 SM-2556/ETA2 SM-2557/ET02 SM-2557/ETA2	
SICAM TM	CP-6014/CPCX65	SM-2558/ETA4 SM-2556/ET02 SM-2556/ETA2 SM-2557/ET02 SM-2557/ETA2	only IEC 60870-5-104 via Ethernet 10Base-TX
SICAM EMIC	CP-6010/CPC30	ETT0	
SICAM CMIC	CP-8000/CPC80	ET84	
SICAM MIC	CP-6040/CPC60		10Base-TX
Third-party system	---	---	IEC 60870-5-104 according SICAM RTUs Interoperability IEC 60870-5-101/104 (DC0-012-2) or Ax 1703 Interoperability IEC 60870-5-101/104 (DA0-040-2)

Configurations

The following table lists supported configurations. In addition to one or two SM-2558, all parts (SIM, carrier module, connection board, patch plug, etc.) listed for the chosen configuration are needed:

Configuration			Interfaces			
Carrier Module	Connection Board ¹⁾	Patch Plug ¹⁾	SIM0		SIM1	
			SI0	SI1	SI2	SI3
CP-2014	CM-2839	²⁾	✓ ⁴⁾	✓		
CP-2017	CM-2838	²⁾	✓ ⁴⁾	✓	✓ ⁴⁾	✓
CP-5014	one integrated patch module per SIx ³⁾		✓ ⁴⁾	✓		
CP-6014	---	²⁾	✓ ⁴⁾	✓	✓ ⁴⁾	✓

- ¹⁾ one connection board for each carrier module, one patch plug for each interface
- ²⁾ For patch plugs for standard protocols in standard configurations as supported see modes of operation of the respective protocol element; for patch plugs in other than standard configurations see SICAM RTUs Platforms Configuration Automation Units and Automation Networks (DC0-021-2)
- ³⁾ each variant of SICAM BC which can be ordered comes with a determined patch module for each interface
- ⁴⁾ serial interface (V.28) – can be added optionally (SM--0551)



Hint

Details on assembly of SIMs and Patch Plugs can be found in the user manual of the respective SICAM RTU, chapter *Setup of external Communication Connections*.

Modes of Operation

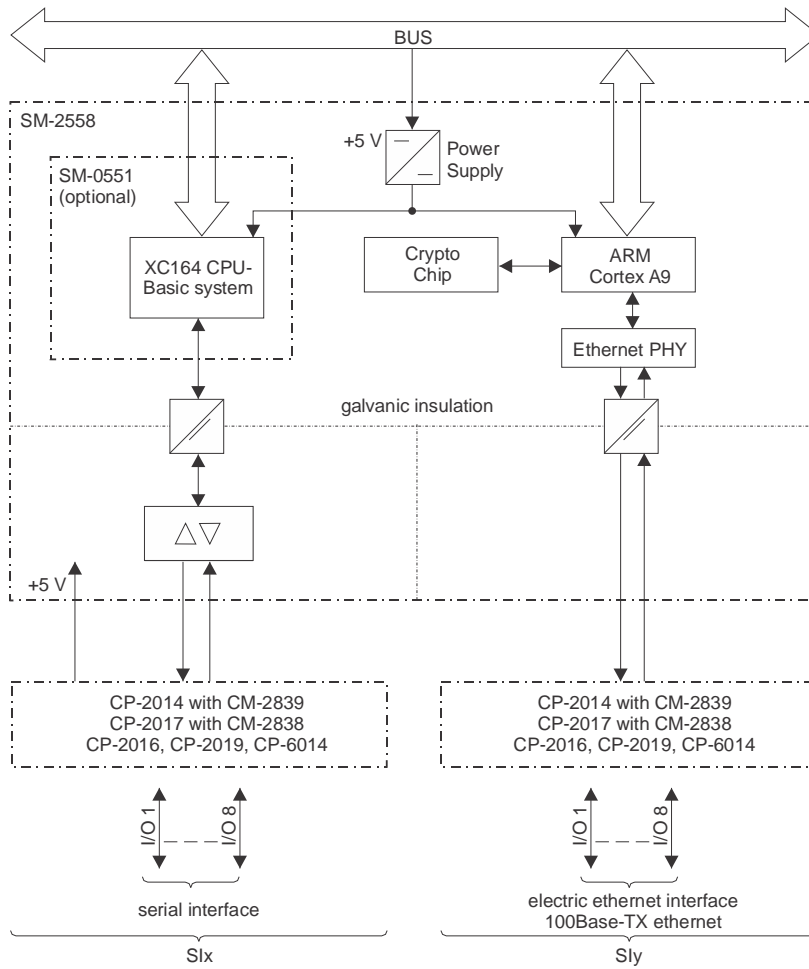
Operating mode	Patch Plug/Modul	Extras ¹⁾	Note
Electrical ethernet-interface (twisted pair)	CM-2860 ²⁾ CM-5860 ³⁾	–	<ul style="list-style-type: none"> • Fast Ethernet acc. IEEE 802.3, 100Base-TX • Transmission rate up to 100 Mbps • RJ45 connector 8-pin according to IEC 603.7
Optical ethernet interface (multimode fibre optic)	CM-2860 ²⁾	Media Converter or Switch ⁴⁾	<ul style="list-style-type: none"> • Fast Ethernet acc. IEEE 802.3, 100Base-TX • Transmission rate up to 100 Mbps

- ¹⁾ Extras are optional equipments
- ²⁾ Patch plug for SICAM AK, SICAM TM
- ³⁾ Patch module for SICAM BC
- ⁴⁾ acc. *SICAM RTUs Platforms • Configuration Automation Units and Automation unit Networks*

Technical Specifications

Communication Circuits	
Electrical LAN interface□ (twisted pair)	Fast Ethernet acc. IEEE 802.3, 100Base-TX Data rate 100 Mbps Line lengths up to 100 m (with CAT 5e cable)
1 serial interface (SM--0551 can be added optional)	Technical Specifications see datasheet <i>SM-x551/PROTOCOL (MC0-003-2.00)</i>
Power Supply	
Operating voltage	4.75 .. 5.25 VDC, typ. 400 mA, max. 500 mA (without SM-0551) 4.75 .. 5.25 VDC, typ. 525 mA, max. 770 mA (with SM-0551) The voltage is supplied by the carrier module.
Mechanics	
Dimensions	227.3 x 63.5 mm
Weight	Approx. 90 g

Block Diagram

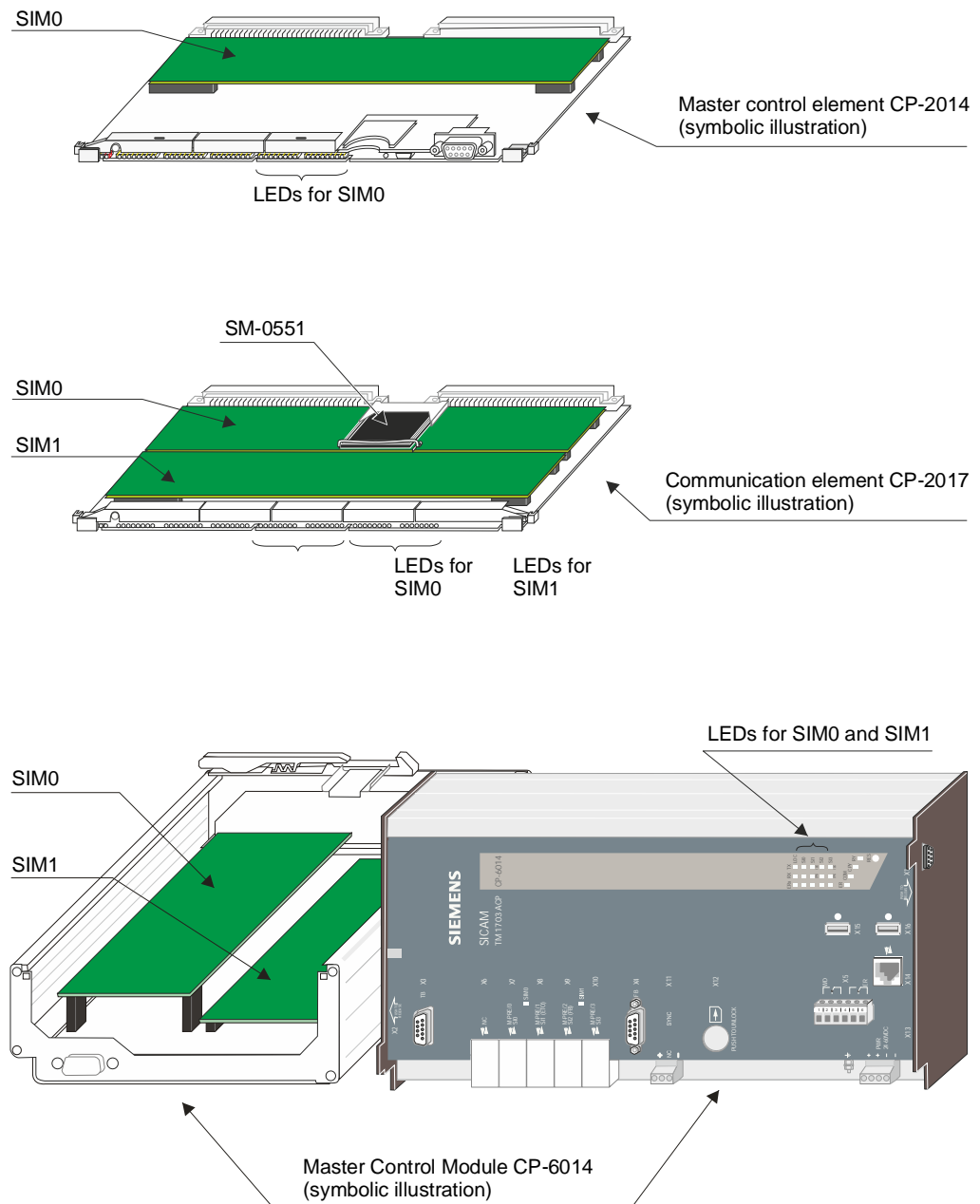


Status and Function display

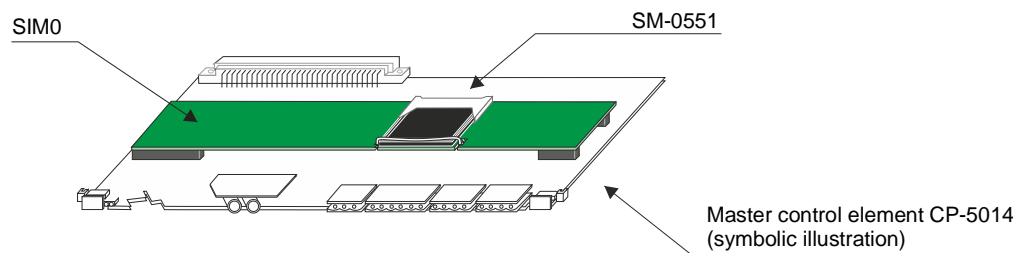
The protocol element SM-2558/ETA4 itself has neither a front panel nor LED displays.

It uses the LEDs of the master control unit or communication elements. 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



Hint

SICAM BC has no LED's for status and function display of protocol elements.

Pin Assignment

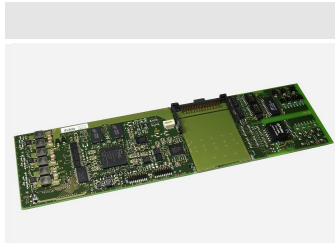
According to its application, the interfaces of a communication element (RJ45 socket connector) are on the carrier module itself (SICAM BC), on the connection board (SICAM AK) or on the housing (SICAM TM).

RJ45 socket connector	
SI1	on CM-2839 with CP-2014
SI1, SI3	on CM-2838 with CP-2017
SI1	on patch module on CP-5014
SI1	on housing of CP-6014

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

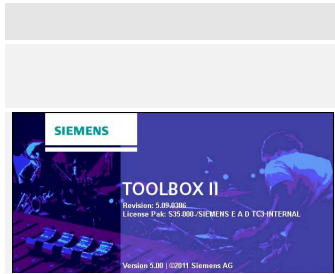
System Components

Hardware



Designation	Item-Number/MLFB
SM-2558 Ethernet-Interface 1x100Base-TX, (+1 ser. interface)	BC2-558 6MF10130CF580AA0

Firmware



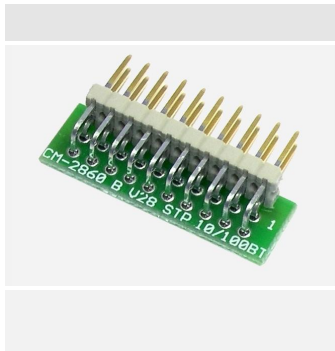
Designation	Item-Number/MLFB
ETA4 Ethernet Interface IEC60870-5-104	SC0-581-1
TU ETA4 TB II-Update	SC0-581-1.XX/53

Can be equipped optional



Designation	Item-Number/MLFB
SM-0551 Serial Interface Processor, 1 serial interface	BC0-551 6MF10130AF510A00

Accessories



Designation	Item-Number/MLFB
CM-2860 Patch Plug Standard V.28, ET, TR	CA2-860 6MF12110CJ600AA0
CM-5860 Patch Module el. V.28/ET	CC5-860 6MF12130FJ600AA0

Placement into the Information Landscape

Document name	Item number
SICAM RTUs • Ax 1703 Common Functions Protocol Elements	DC0-023-2
SICAM RTUs Platforms Configuration Automation Units and Automation Networks	DC0-021-2
SICAM RTUs Interoperability IEC 60870-5-101/104	DC0-013-2
SICAM RTUs SM-xx51/PROTOCOL	MC0-003-2

