

SIEMENS

ACP 1703

SM-25x4/ET02

Protocol Elements for Ethernet TCP/IP



Protocol element for communication via LAN/WAN

- According to IEC 60870-5-104
 - Fast Ethernet 100Mbit/s, IEEE 802.3, 100Base-FX, optical
 - Ethernet / Fast Ethernet 10/100 Mbit/s, IEEE 802.3, 10/100Base-TX, electrical
 - TCP/IP
 - data formats according to IEC 60870-5-104
 - time synchronisation via network time protocol (NTP)
- the protocol element can be attached to master control and communication elements of ACP 1703 platforms

Application

The protocol elements described herein are used in several automation units based on ACP 1703 platforms.

Protocol elements process specific communication protocols when 1703 automation units communicate with each other or 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 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 TOOLBOX II.

The protocol elements described in this document are based on the following hardware:

Module	Designation	Note
SM-2544	Network Interface Ethernet 100FX (optical)	<ul style="list-style-type: none"> • SM-2544/ET02 contains the license for a standard protocol
SM-2554	Network Interface Ethernet 10/100TX (electrical)	<ul style="list-style-type: none"> • SM-2554/ET02 contains the license for a standard protocol

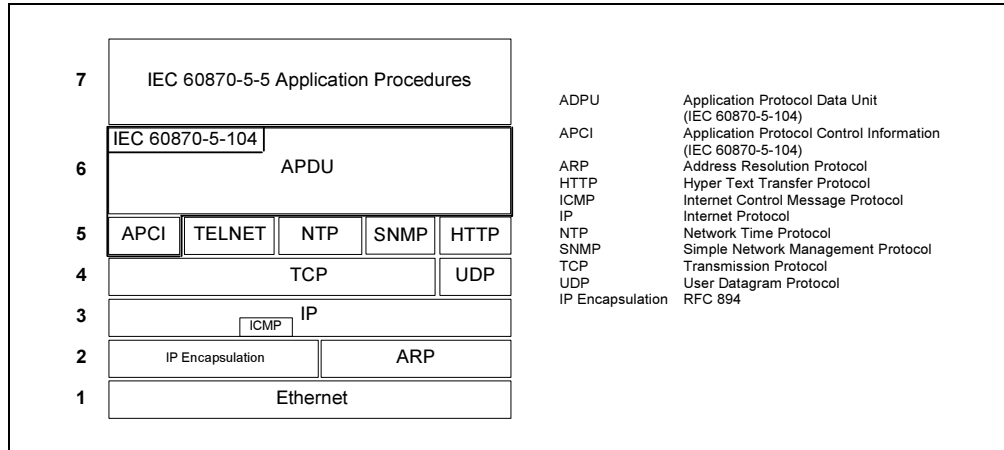
The protocol elements can be used on ACP 1703 platforms.

Standard Protocols	Standard	Protocol Element(s)	Note
Protocol Element for Ethernet TCP/IP	IEC 60870-5-104	SM-2544/ET02	optical
Protocol Element for Ethernet TCP/IP	IEC 60870-5-104	SM-2554/ET02	electrical

Protocol Element for Ethernet TCP/IP

SM-25x4/ET02

Architecture according to the OSI Layer Model



Layer	Task	Functions, Characteristics, Comments
7 - Application	Application	<ul style="list-style-type: none"> • Transmission handling • Reception handling • Management of up to 100 connections
6 - Presentation	Data format	<ul style="list-style-type: none"> • IEC 60870-5-104 APDU's to Ax 1703 / ACP 1703 and compatible systems • In the "private range" according to IEC 60870-5-104, Ax 1703 / ACP 1703-specific system messages and some user data are implemented
5 - Session	Interface between data format and communication protocol	<ul style="list-style-type: none"> • IEC 60870-5-104 APCI • NTP according to RFC 1305 • TELNET according to RFC 854
4 - Transport 3 - Network	Communication protocol	<ul style="list-style-type: none"> • TCP/IP according to RFC 791 and RFC 793 • ICMP according to RFC 792
2 - Data Link 1 - Physical	LAN interface	<ul style="list-style-type: none"> • Ethernet 10/100 Mbps according to IEEE 802.3 • Medium and transmission rate can be selected with TOOLBOX II • Connection technique (on the master control or communication element) RJ45 for copper and MT-RJ connector for FO • ARP according to RFC 826 • IP Encapsulation according to RFC 894

General Functions

Communication with up to 100 remote stations, according to

- IEC 60870-5-104 via Ethernet

with

- Time synchronization via LAN
 - Time synchronization with one or more NTP server via LAN/WAN
 - NTP network time protocol according to RFC 1305
 - The NTP server itself is synchronized via GPS (DCF77 on inquiry)
 - One NTP server can serve several automation units
 - ET02 can poll up to 4 NTP server (redundancy)

Proprietary Functions

- Interfacing the TOOLBOX II in "remote operation" over LAN/WAN
 - Connection to TOOLBOX II is made via TELNET (port 2001) according to RFC 854
 - ET02 can serve exactly one TOOLBOX II at one time

Configuration

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

Own Station (SM-2544, optical)

System	System Element	Protocol Element	Note
BC 1703 ACP	CP-5000/CPC55	SM-2544/ET02	

Own Station (SM-2554, electrical)

System	System Element	Protocol Element	Note
AK 1703 ACP	CP-2010/CPC25 CP-2012/PCCE25	SM-2554/ET02	
BC 1703 ACP	CP-5000/CPC55	SM-2554/ET02	
TM 1703 ACP	CP-6003/CPC65	SM-2554/ET02	

Remote Station (optical or electrical)

System	System Element	Protocol Element	Note
AK 1703 ACP	CP-2010/CPC25 CP-2012/PCCE25	SM-25x4/ET02	
BC 1703 ACP	CP-5000/CPC55	SM-25x4/ET02	
TM 1703 ACP	CP-6003/CPC65	SM-25x4/ET02	
AK 1703	CP-2000/CPC00 CP-2002/PCCE00 CP-2002/CE00 CP-2012/CE20	SM-25x4/ET02 SM-2542/TRET00 SM-2542/ET01	only IEC 60870-5-104 via Ethernet
AMC 1703	CP-4000/CPC4x CP-4003/CCP4x	SM-25x4/ET02 SM-2542/TRET00 SM-2542/ET01	only IEC 60870-5-104 via Ethernet
AM 1703	CP-1001/CPC10	SM-15x4/ET00	
BC 1703	CP-5001/CPC51	SM-15x4/ET00	
TM 1703 mic	CP-6040/CPC60	---	
SICAM 230	---	---	
SAT 250	---	---	
Third-party system	---	---	IEC 60870-5-104, according to "Description IEC 60870-5-101 and -104 Interoperability"

SM-2544 - Network-Interface Ethernet 100FX (optisch)

The following table lists supported configurations. In addition to one (SI0/SI1 or SI2/SI3) or two (SI0/SI1 and SI2/SI3) SM-2544, all parts (carrier module, connection board, patch plug, etc.) listed for the chosen configuration are needed:

Configuration		Interfaces			
Carrier Module	Patch Module ¹⁾	SI0 ²⁾	SI1	SI2	SI3
CP-5000	one integrated patch module per Six ³⁾	✓	✓		

¹⁾ each variant of the BC 1703 ACP (Bay Controller) which can be ordered comes with a determined patch module for each interface

²⁾ serial interface (V.28) - reserved for future use

Technical Specifications

Processor and Memory	
Processor	NET+ARM 50, 33.1776 MHz
Program memory	FLASH-PROM 2 MB
Main memory	RAM 16 MB
Parameter memory	EEPROM 16 kByte

Communication Circuits SM-2544	
Optical LAN interface (multimode fibre optic)	Fast Ethernet according to IEEE 802.3, 100Base-FX Data rate: 100Mbps
	At this interface, SM-2544 provides a TTL signal. The conversion to an optical signal is done by the patch module which is installed for the interface. For Technical Specifications, see <i>BC 1703 User's Guide</i> (DC5-001-1)

Power Supply SM-2544	
Operating voltage	4.75 .. 5.25 VDC typ. 3 W The voltage is supplied by the carrier module.
Auxiliary voltage (serial interface)	1x5 VDC ±10%, max. 50 mA The voltage (data circuit voltage) is supplied by the carrier module (galvanically insulated).

Mechanics	
Dimensions	227.3 x 63.5 mm
Weight	Approx. 75 g

SM-2554 - Network-Interface Ethernet 10/100TX (elektrisch)

The following table lists supported configurations. In addition to one (SI0/SI1 or SI2/SI3) or two (SI0/SI1 and SI2/SI3) SM-2554, all parts (carrier module, connection board, patch plug, etc.) listed for the chosen configuration are needed:

Configuration			Interfaces			
Carrier Module	Connection Board ¹⁾	Patch Plug ¹⁾	SI0 ⁴⁾	SI1	SI2 ⁴⁾	SI3
CP-2010	CM-2837	✓ ²⁾	✓	✓		
CP-2012	CM-2838	✓ ²⁾	✓	✓		
CP-5000	one integrated patch module per SIx ³⁾		✓	✓		
CP-6003		✓ ²⁾	✓	✓		

- 1) one connection board for each carrier module, one patch plug for each interface (CM-2860 for SI1)
 2) different, depending on configuration and operating mode
 3) each variant of the BC 1703 ACP (Bay Controller) which can be ordered comes with a determined patch module for each interface
 4) serial interface (V.28) - reserved for future use

Technical Specifications

Processor and Memory	
Processor	NET+ARM 50, 33.1776 MHz
Program memory	FLASH-PROM 2 MB
Main memory	RAM 16 MB
Parameter memory	EEPROM 16 kByte
Communication Circuits SM-2554	
Electrical LAN interface (twisted pair)	Ethernet / Fast Ethernet according to IEEE 802.3, 10/100Base-TX Data rate: 10Mbps and 100Mbps Line lengths: 0 .. 100m (100MBit/s: 100m with Switched Ethernet only)
Power Supply SM-2554	
Operating voltage	4.75 .. 5.25 VDC typ. 2.5 W The voltage is supplied by the carrier module.
Auxiliary voltage (serial interface)	1x5 VDC ±10%, max. 50 mA The voltage (data circuit voltage) is supplied by the carrier module (galvanically insulated).
Mechanics	
Dimensions	227.3 x 63.5 mm
Weight	Approx. 75 g

Literature

Folder TM 1703 ACP	MC6-003-2
System Data Sheet TM 1703 ACP	MC6-007-2
BC 1703 ACP Functional Description	MC5-006-2
BC 1703 ACP User's Guide	DC5-001-2
Description IEC 60870-5-101 and -104 Interoperability	DA0-046-2