The SICAM Protocol Test System

Testing and Simulation according to IEC 60870

Power Transmission and Distribution

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SICAM Protocol Test System: The test system for the standard

Whether you're verifying safety in widely distributed processes for automation of power supply networks, the functioning of new devices, or the interaction of systems from different OEMs, you need to be able to regularly check compliance with international standards such as IEC 60870-5-101 using suitable testing and protocol systems.

A good standard

Standard protocol IEC 60870-5-101 was published in 1995 and soon became the standard for serial telecontrol communication in power supply networks. In addition, IEC 60870-5-103 for serial to protective devices connection and IEC 60870-5-104 for communication over LAN/WAN networks have also become generally established.

These standard protocols are now supported by every major OEM and required by almost all major equipment users. They allow users, for the first time and at a reasonable cost, to create total solutions providing homogeneous communication structures and data formats for automation networks comprised of systems from different OEMs. Siemens, as a long-time contributor to the work of the IEC, actively helped define and develop these standards – and was therefore ideally placed to incorporate these standards into its products fully at an early stage.

Although the standards themselves are long past the development stage, problems still tend to arise during implementation of projects. These are due to slight differences between systems (resulting from varying interpretations of the standard, specific features of the project, etc.) and can have significant cost implications. In addition, in many cases operators will need to test equipment early on in the course of a project although some of the system components or devices are not yet available at that time.

SICAM Protocol Test System: you can rely on it

These imponderables are a thing of the past with the PC-based SICAM Protocol Test System. On the one hand, the system allows you to very easily test and analyze communication between systems that are based on the IEC 60870-5-101, -103 and -104 protocols. On the other hand, with the SICAM Protocol Test System you can also simulate automation devices and thus also test subsystems, even if some devices of the overall system are not in place. For example, the system contains predefined device profiles according to IEC 60870-5-103 for simulating protection devices.
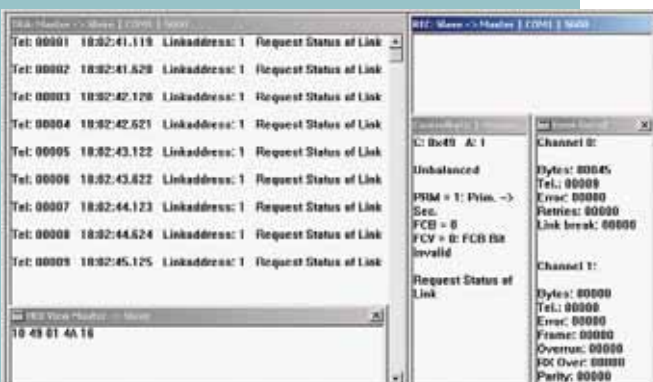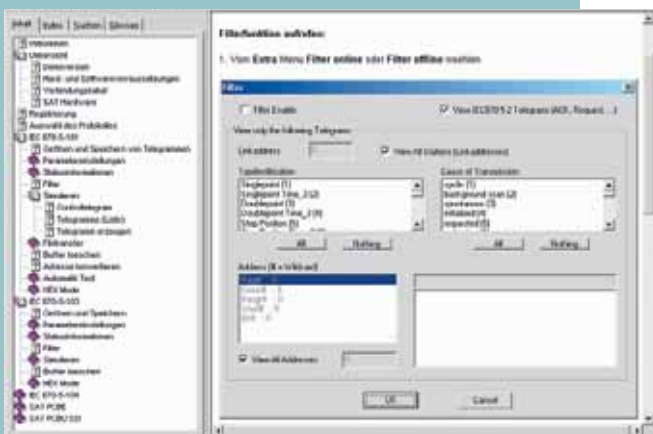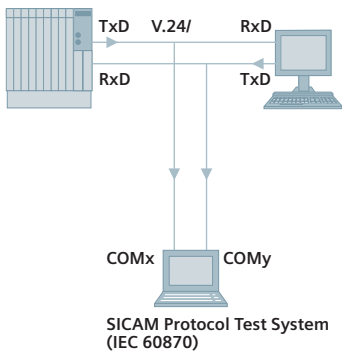
The SICAM Protocol Test System runs on a PC with MS Windows® and is used to record and simulate process interfaces. COM ports (V.24/V.28), the optional external hardware (V.24/V.28, X.24/X.27) or an Ethernet interface is used as the interface.
Recorded data from unsupported protocols can be displayed in HEX mode.

Protocol	Transmission	Simulation/Monitoring
IEC 60870-5-101	balanced, unbalanced	Simulation/Monitoring
IEC 60870-5-103	unbalanced	Simulation/Monitoring
IEC 60870-5-104 (Ethernet, TCP/IP)		Simulation/Monitoring
SAT PCBE end-end protocol	balanced	Monitoring
SAT PCBU SSI end-end protocol	balanced	Monitoring
Logic analyzer		Monitoring

The SICAM Protocol Test System:
The functions at a glance

Monitoring IEC 60870-5-101, -103, PCBE & PCBU

TxD   V.24/   RxD
RxD   TxD

COMx   COMy

SICAM Protocol Test System (IEC 60870)

Monitoring IEC 60870-5-101, -103, PCBE & PCBU with external hardware

TxD   RxD
RxD   TxD

V.24/V.28 or X.24/X.27 CLOCK PULSE INT or EXT

X1 X2

SICAM Protocol Test System (IEC 60870) HW

X3

COMx

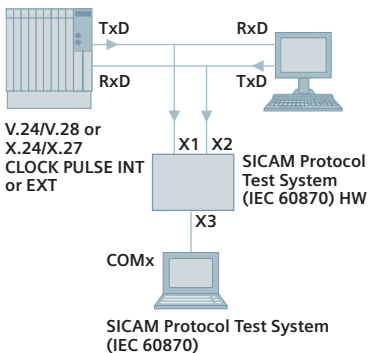SICAM Protocol Test System (IEC 60870)

Monitoring
IEC 60870-5-101, -103, PCBU, PCBE
- Statistics display (number of bytes, number of messages, transmission errors, etc.)
- HEX mode message display option
- Time-tagging of all received messages
- User-definable process technology address to bit level, including definition storage and loading
- Plain-text address import of CSV files (data points displayed with their actual names)
- Online and offline filter tool for IEC 60870-5-2 messages, type identification, cause of transmission, link address, object address (function type, information number)
- Individually tailored display format (type identification, time, structure, etc.)
- Storage of recorded data in binary and ASCII formats
- Loading of stored records for further offline analysis, offline filter included

Additional functions when you use SICAM Protocol Test System (IEC 60870) HW:
- V.24/V.28 or X.24/X.27 interface
- Bit rates up to 64 kbps
- Time tagging accurate to within 1 ms
- Internal or external (isochronic connection) clock pulse
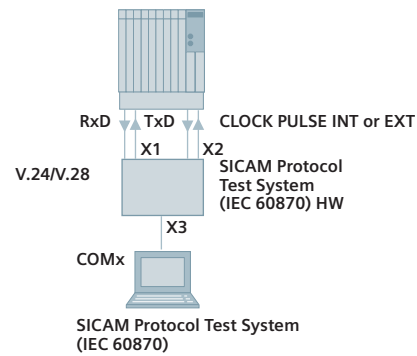
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If your PC has only one serial interface, as is the case for notebooks without an additional serial PC card, the optional SICAM Protocol Test System (IEC 60870) HW external hardware provides the full functionality of two interfaces. It also provides additional functions such as a logic analyzer, 64 kbps, X.24/X.27, etc.
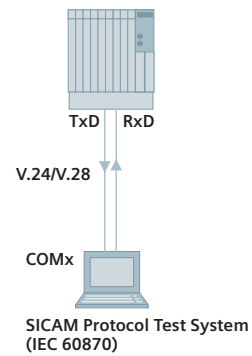
Simulation IEC 60870-5-101, -103

- Message definition via dialog box from existing records and from imported plain text (e.g., data point tests for automatic generation and transmission of messages from a data point list)
- Pre-defined control messages (initialization end, general interrogation, counter interrogation, etc.)
- Saving and loading of message definitions
- Saving and loading of different parameter sets
- Import option for records taken using Frontline's Serialtest application (time tag included)
- IEC 60870-5-101: send/receive file transfer and COMTRADE file generation option from DKE fault records

Simulation IEC 60870-5-101, -103 with external hardware

RxD TxD   CLOCK PULSE INT or EXT

X1   X2

V.24/V.28   SICAM Protocol Test System (IEC 60870) HW

X3

COMx

SICAM Protocol Test System (IEC 60870)

Simulation IEC 60870-5-101, -103

TxD RxD

V.24/V.28

COMx

SICAM Protocol Test System (IEC 60870)

Logic analyzer

To use the logic analyzer, you need the SICAM Protocol Test System (IEC 60870) HW external hardware. It offers the following range of features:

- 4 channels
- V.28 input voltage level
- 10,000 signal changes recorded at time resolution of 40 µs (max. 72 hours)
- Minimum signal pulse duration 20 µs
- Export of recorded data to file

Logic analyzer V.28 with external hardware

TxD   RxD
RxD   TxD
RTS   DCD

DCD   RTS

X1   X2

SICAM Protocol Test System (IEC 60870) HW

X3

COMx

SICAM Protocol Test System (IEC 60870)
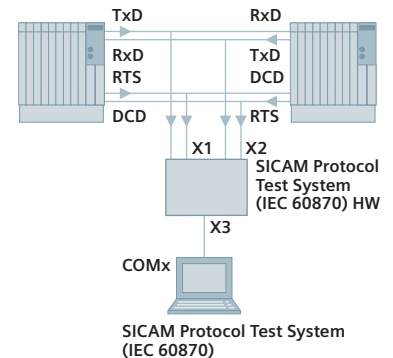
Monitoring and simulation IEC 60870-5-104

The SICAM Protocol Test System can record all data transferred using the TCP/IP protocol, provided that all such data is freely available to it on the Ethernet, for example, via a hub. This means that the SICAM Protocol Test System cannot be isolated from the systems under test via a switch or router. You have the following options:

- Additional filtering options when monitoring on serial interfaces, by protocol, IP address, host name and port number
- Statistics display
- Simulation of a station on the Ethernet

Monitoring and simulation IEC 60870-5-104

SICAM Protocol Test System (IEC 60870)

HUB

Ethernet TCP/IP

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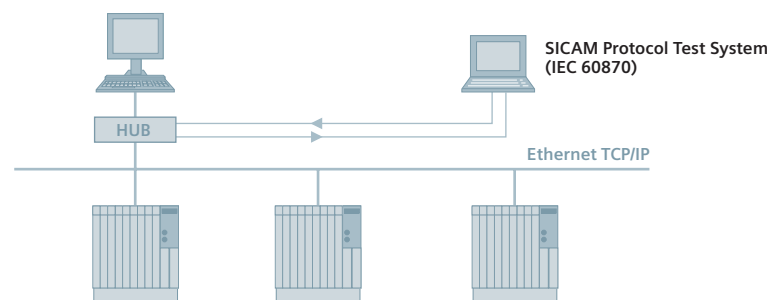
The SICAM Protocol Test System: The benefits at a glance

Tried and tested functionality
- Extensive experience of a wide range of protocols gained through implementation of SICAM 1703 automation systems in systems comprising heterogeneous equipment from different OEMs
- Active participation on various IEC standardization committees
- Pioneering role in implementation of IEC 60870-5-10x standard protocols

Simple operation
- No training required
- User-friendly Windows interface
- Context-sensitive online help
- Plug & Play installation

Plain-text display
- Interpreted message display (addresses and user data separated by link layer and user data)
- Plant name display possible through import of data point lists via CSV import interface

Monitoring und Simulation
- Simultaneous monitoring of send data from both sides
- Single remote station simulation for IEC 60870-4-101 and -104
- Simulation of up to 255 remote stations for IEC 60870-5-103
- Simulation of standard protection device profiles (user can add other protection device profiles)
- Fault record emulation (IEC 60870-5-103 only)
- External hardware for PCs requiring only one serial interface

Updates from the Siemens Website
- New functions
- New protection device profiles

System requirements
- PC with Pentium 133, one or two serial interfaces
- Windows 95 with 16 MB
- Windows 98 with 32 MB
- Windows ME with 64 MB
- Windows NT 4.0 with 64 MB
- Windows 2000 with 128 MB
- Windows XP with 256 MB
- At least 10 MB of free hard disk space

A Pentium II/300 MHz is required for using IEC 60870-5-104. Real-time resolution of 1 ms is possible only with Windows NT 4.0 and Windows 2000/XP; with the other operating systems it is 10 ms.

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The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases.
The required features should therefore be specified in each individual case at the time of closing the contract.

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