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Telecontrol equipment and systems –
Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles

Matériels et systèmes de téléconduite –
Partie 5-104: Protocoles de transmission – Accès aux réseaux utilisant des profils de transport normalisés pour l'IEC 60870-5-101

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TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles

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IEC 60870-5-104 edition 2.1 contains the second edition (2006-06) [documents 57/812/FDIS and 57/819/RVD] and its amendment 1 (2016-06) [documents 57/1613/CDV and 57/1667/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60870-5-104 Ed.2 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This publication has been drafted in accordance with the ISO/IEC directives, Part 2.

IEC 60870-5 consists of the following parts, under the general title *Telecontrol equipment and systems – Part 5: Transmission protocols*

Part 5:	Transmission protocols – Section One: Transmission frame formats
Part 5:	Transmission protocols – Section 2: Link transmission procedures
Part 5:	Transmission protocols – Section 3: General structure of application data
Part 5:	Transmission protocols – Section 4: Definition and coding of application information elements
Part 5:	Transmission protocols – Section 5: Basic application functions
Part 5-6:	Guidelines for conformance testing for the IEC 60870-5 companion standards
Part 5-101:	Transmission protocols – Companion standard for basic telecontrol tasks
Part 5:	Transmission protocols – Section 102: Companion standard for the transmission of integrated totals in electric power systems
Part 5-103:	Transmission protocols – Companion standard for the informative interface of protection equipment
Part 5-104:	Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles
Part 5-601:	Conformance test cases for the IEC 60870-5-101 companion standard

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The contents of the corrigendum 1 (2023-08) have been included in this copy.

INTRODUCTION

IEC 60870-5-101 provides a communication profile for sending basic telecontrol messages between a central telecontrol station and telecontrol outstations, which uses permanent directly connected data circuits between the central station and individual outstations.

In some applications, it may be required to send the same types of application messages between telecontrol stations using a data network containing relay stations which store and forward the messages and provide only a virtual circuit between the telecontrol stations. This type of network delays messages by varying amounts of time depending on the network traffic load.

In general, the variable message delay times mean that it is not possible to use the link layer as defined in IEC 60870-5-101 between telecontrol stations. However, in some cases it is possible to connect telecontrol stations having all three layers of the companion standard IEC 60870-5-101 to suitable data networks using Packet Assembler Disassembler (PAD) type stations to provide access for balanced communication.

In all other cases this companion standard, which does not use the link functions of IEC 60870-5-101, may be used to provide balanced access via a suitable transport profile.

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TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles

1 Scope and object

This part of IEC 60870 applies to telecontrol equipment and systems with coded bit serial data transmission for monitoring and controlling geographically widespread processes. It defines a telecontrol companion standard that enables interoperability among compatible telecontrol equipment. The defined telecontrol companion standard utilizes standards of the IEC 60870-5 series. The specifications of this part present a combination of the application layer of IEC 60870-5-101 and the transport functions provided by a TCP/IP (Transmission Control Protocol/Internet Protocol). Within TCP/IP, various network types can be utilized, including X.25, FR (Frame Relay), ATM (Asynchronous Transfer Mode) and ISDN (Integrated Service Data Network). Using the same definitions, alternative ASDUs (Application Service Data Unit) as specified in other IEC 60870-5 companion standards (for example, IEC 60870-5-102) may be combined with TCP/IP, but this is not described further in this part.

NOTE Security mechanisms are outside the scope of this standard.

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2 Normative references

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IEC 60870-5-3:1992, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 3: General structure of application data*

IEC 60870-5-4:1993, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 4: Definition and coding of application information elements*

IEC 60870-5-5:1995, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

IEC 60870-5-101:2003, *Telecontrol equipment and systems – Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks*

IEC 60870-5-102:1996, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 102: Companion standard for the transmission of integrated totals in electric power systems*

ITU-T Recommendation X.25:1996, *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit*

IEEE 802.3:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

RFC 791, *Internet Protocol, Request for Comments 791 (MILSTD 1777) (September, 1981)*

RFC 793, *Transmission Control Protocol, Request for Comments 793 (MILSTD 1778) (September, 1981)*

RFC 894, *Internet Protocol on Ethernet Networks*

RFC 1661, *Point-to-Point Protocol (PPP)*

RFC 1662, *PPP in HDLC Framing*

RFC 1700, *Assigned Numbers, Request for Comments 1700 (STD 2) (October, 1994)*

RFC 2200, *Internet Official Protocol Standards, Request for Comments 2200 (June, 1997)*

3 General architecture

This standard defines the use of an open TCP/IP-interface to a network, containing for example a LAN for telecontrol equipment, which transports IEC 60870-5-101 ASDUs. Routers which include the different WAN-types (for example, X.25, Frame Relay, ISDN, etc.) may be connected via a common TCP/IP-LAN-interface (see figure 1). Figure 1 shows a redundant configuration in the central station in addition to a non-redundant system.

Motivations:

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The use of separate routers offers the following advantages.

– There is no need for network-specific software in end systems.

– There is no need for routing functionality in end systems.

– There is no need for network management in end systems.

– It facilitates obtaining end systems from manufacturers that specialize in telecontrol equipment.

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– It facilitates obtaining individual separate routers, to suit a variety of networks from manufacturers specializing in this non-telecontrol specific field.

– It is possible to change the network type by replacing only the router type, without affecting the end systems.

– It is particularly suitable for converting existing end systems that conform to IEC 60870-5-101.

– It is suitable for present and future implementations.

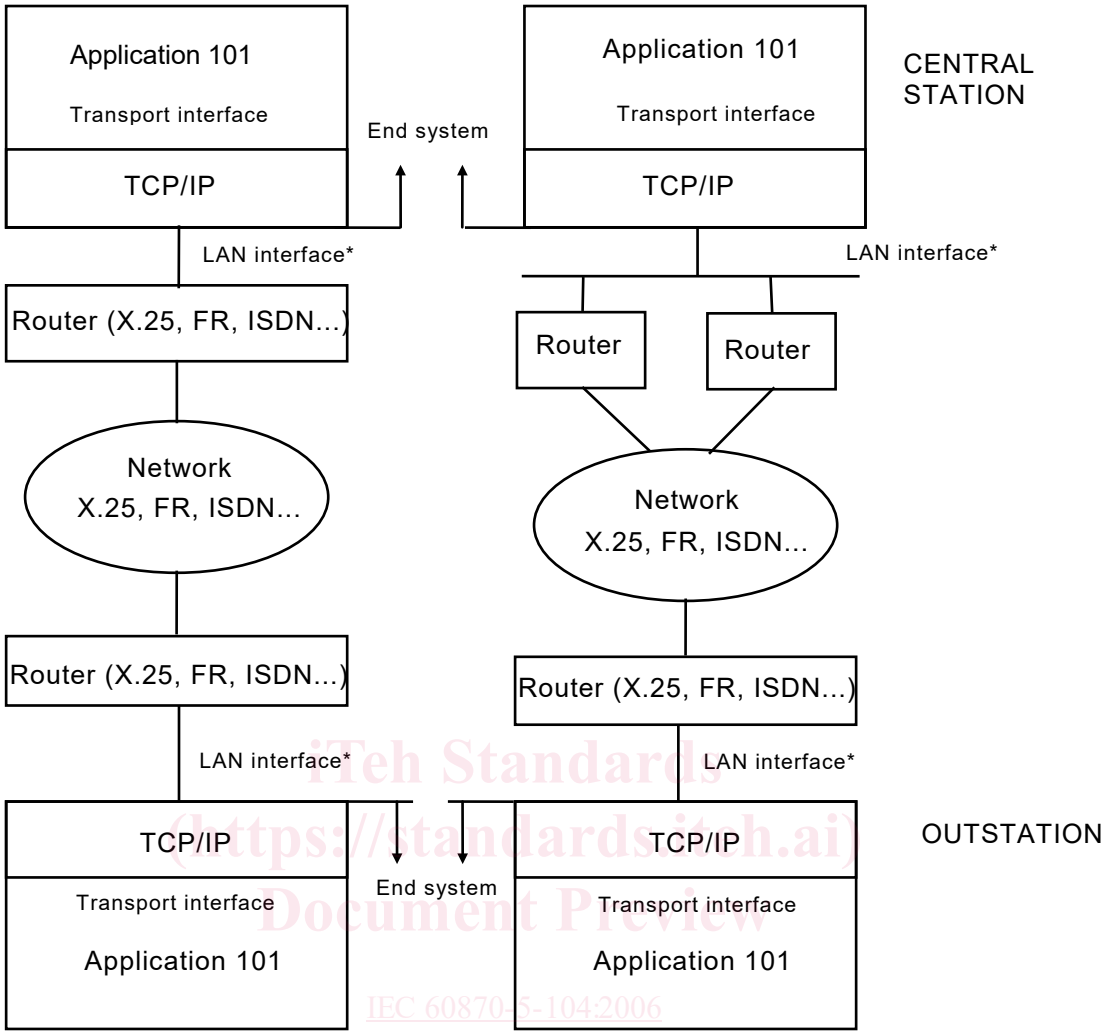

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Figure 1 – General architecture (example)