

Telecontrol equipment and systems —

Part 1: General considerations —

Section 1.4: Guide for basic aspects of telecontrol data transmission and organization of standards BS 7404-5 and BS 7404-6

Committees responsible for this British Standard

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- Association of Consulting Engineers
- BEAMA Ltd.
- BEAMA Metering Association (BMA)
- Electricity Association
- Federation of the Electronics Industry
- GAMBICA (BEAMA Ltd.)
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National foreword

This Section of BS 7404 has been prepared under the direction of the Electrotechnical Sector Board, and is identical with IEC Publication 870-1-4:1994 *Telecontrol equipment and systems — Part 1: General considerations — Section 4: Basic aspects of telecontrol data transmission and organization of standards IEC 870-5 and IEC 870-6*, published by the International Electrotechnical Commission (IEC).

References in the text to IEC 870-5 and IEC 870-6 should be read as references to BS 7404-5 and BS 7404-6.

In the area of process control, especially in the area of telecontrol and SCADA systems, there is an increasing demand for real-time data transmission. Inherent in this type of application are requirements with respect to data integrity and guaranteed transmission time.

The applicability of a particular type of communication network with its associated protocols depends upon its ability to fulfil these requirements. This is a function of a number of factors, including:

- bandwidth;
- traffic load (normal and avalanche conditions);
- transmission quality;
- coding and encryption schemes;
- computing power of communication front-ends and nodes.

Each candidate system should be evaluated in the light of all of these factors.

In particular, approaches to telecontrol data communication based on the OSI (open-system interconnection) family of protocols (which were conceived originally for application to inter-computer communication and not for telecontrol) should be examined very carefully from this point of view.

BS 7404-1.1:1991 describes the general principles of the layout and the functions of telecontrol systems. Clause 6 of that publication gives already some overviews on the transmission of telecontrol data, but both the complexity of the data transmission systems, as well as their numerous applications need a closer look. Due to this fact, a large number of different publications dealing with standardization of telecontrol protocols will be published. Therefore, it is necessary to give an overview in this report relating to the basic aspects of telecontrol data transmission.

Cross-references

Publication referred to	Corresponding British Standard
	BS 4727 <i>Glossary of electrotechnical, power, telecommunications, electronics, lighting and colour terms</i>
IEC 50(371):1984	Part 2 <i>Terms particular to power engineering</i> Group 12:1990 <i>Telecontrol terminology</i>
IEC 50(721):1991	Part 3 <i>Terms particular to telecommunications and electronics</i> Group 03:1992 <i>Telegraphy, facsimile and data communications</i> BS 7404 <i>Telecontrol equipment and systems</i> Part 1 <i>General considerations</i>
IEC 870-1-1:1988	Section 1.1:1991 <i>General principles</i>
IEC 870-1-2:1989	Section 1.2:1991 <i>Guide for specifications</i>
IEC 870-1-3:1990	Section 1.3:1991 <i>Glossary</i>

Publication referred to	Corresponding British Standard
IEC 870-5-1:1990	BS EN 60870-5-1:1994 <i>Telecontrol equipment and systems — Transmission protocols — Frame formats</i> BS 7404 <i>Telecontrol equipment and systems</i> Part 5 <i>Transmission protocols</i>
IEC 870-5-2:1992	Section 5.2:1992 <i>Link transmission procedures</i>
IEC 870-5-3:1992	BS EN 60870-5 <i>Telecontrol equipment and systems — Transmission protocols</i> BS EN 60870-5-3:1992 <i>Specification for general structure of application data</i>
IEC 870-5-4:1993	BS EN 60870-5-4:1994 <i>Definition and coding of application information elements</i>

The following items are under consideration:

	BS 7404 <i>Telecontrol equipment and systems</i> Part 5 <i>Transmission protocols</i>
IEC 870-5-5:199X	Section 5.5:199X <i>Basic application functions</i> ^a
IEC 870-5-X:199X	Section 5.X:199X <i>Telecontrol companion standards and profiles</i>
IEC 870-6-1:199X	Section 6.1:199X <i>Application context and organization of standards</i> ^b
IEC 870-6-2:19XX	Section 6.2:19XX <i>Use of base standards (OSI layers 1–4)</i> ^c
IEC 870-6-3:19XX	Section 6.3:199X <i>Use of base standards (OSI layers 5–7)</i> ^d
IEC 870-6-4:199X	Section 6.4:199X <i>Network management</i> ^e
IEC 870-6-X:199X	Section 6.X:199X <i>Functional profiles</i>

^a Will be published after IEC 870-5-5.

^b Will be published after IEC 870-6-1.

^c Will be published after IEC 870-6-2.

^d Will be published after IEC 870-6-3.

^e Will be published after IEC 870-6-4.

The Technical Committee has reviewed the provisions of ISO 2382, ISO 7498, ISO 8072, ISO/IEC 8073, ISO 8326, ISO 8327, ISO 8509, ISO 8822, ISO 8823, together with CCITT Recommendations R36, R37, R38, V11, V21, V22, V23, V24, V26, V27, V28, V29, V32, X3, X20, X21, X21bis, X22, X24, X25, X28 and X29, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this British Standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope and object

This technical report applies to telecontrol equipment and systems with coded bit serial data transmission for monitoring and control of geographically widespread processes.

This report is intended as a brief tutorial on transmission techniques, equipment and protocols in view of their use in telecontrol systems. It is thus intended as a guide to orient those using the standards defined in the series of IEC 870-5 and IEC 870-6. More precisely, it gives a frame of reference for evaluating solutions as well as defining and describing the key technical terms. Terms that are defined in IEC 50(371) and in IEC 870-1-3 are complemented by further definitions in clause 3 of this report.

It further provides:

- descriptions of applicable basic communication technologies;
- basic rules as to how different system layers (see clause 3) can be used together (i.e. which combinations of standards in different layers are technically coherent and which are not).

It is not intended to recommend or impose solutions, this being the role of IEC 870-5 and IEC 870-6.

2 Reference documents

IEC 50(371):1984, *International Electrotechnical Vocabulary (IEV) — Chapter 371: Telecontrol*.

IEC 50(721):1991, *International Electrotechnical Vocabulary (IEV) — Chapter 721: Telegraphy, facsimile and data communication*.

IEC 870-1-1:1988, *Telecontrol equipment and systems — Part 1: General considerations — Section 1: General principles*.

IEC 870-1-2:1989, *Telecontrol equipment and systems — Part 1: General considerations — Section 2: Guide for specifications*.

IEC 870-1-3:1990, *Telecontrol equipment and systems — Part 1: General considerations — Section 3: Glossary*.

IEC 870-5-1:1990, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 1: Transmission frame formats*.

IEC 870-5-2:1992, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 2: Link transmission procedures*.

IEC 870-5-3:1992, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 3: General structure of application data*.

IEC 870-5-4:1993, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 4: Definition and coding of application information elements*.

IEC 870-5-5:199x, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 5: Basic application functions*. (under consideration)

IEC 870-5-x:199x, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section x: Telecontrol companion standards and profiles*. (under consideration)

IEC 870-6-1:199x, *Telecontrol equipment and systems — Part 6: Telecontrol protocols compatible with ISO and CCITT standards — Section 1: Application context and organization of standards*. (under consideration)

IEC 870-6-2:199x, *Telecontrol equipment and systems — Part 6: Telecontrol protocols compatible with ISO and CCITT standards — Section 2: Use of base standards (OSI layers 1–4)*. (under consideration)

IEC 870-6-3:199x, *Telecontrol equipment and systems — Part 6: Telecontrol protocols compatible with ISO and CCITT standards — Section 3: Use of base standards (OSI layers 5–7)*. (under consideration)

IEC 870-6-4:199x, *Telecontrol equipment and systems — Part 6: Telecontrol protocols compatible with ISO and CCITT standards — Section 4: Network management*. (under consideration)

IEC 870-6-x:199x, *Telecontrol equipment and systems — Part 6: Telecontrol protocols compatible with ISO and CCITT standards — Section x: Functional profiles*. (under consideration)

ISO 2382, *Information technology — Vocabulary*.

ISO 7498:1984, *Information processing systems — Open Systems Interconnection — Basic reference model*.

ISO 8072:1986, *Information processing systems — Open Systems Interconnection — Transport service definition*.

ISO/IEC 8073:1992, *Information technology — Telecommunications and information exchange between systems — Open Systems Interconnection — Protocol for providing the connection-mode transport service.*

ISO 8326:1987, *Information processing systems — Open Systems Interconnection — Basic connection oriented session service definition.*

ISO 8327:1987, *Information processing systems — Open Systems Interconnection — Basic connection oriented session protocol specification.*

ISO 8509:1987, *Information processing systems — Open Systems Interconnection — Service conventions.*

ISO 8822:1988, *Information processing systems — Open Systems Interconnection — Connection oriented presentation service definition.*

ISO 8823:1988, *Information processing systems — Open Systems Interconnection — Connection oriented presentation protocol specification.*

CCITT Recommendation R 35:1989, Blue Book, Fascicle VII.1, *Standardization of FMVFT systems for a modulation rate of 50 bauds.*

CCITT Recommendation R 36:1989, Blue Book, Fascicle VII.1, *Coexistence of 50-baud/120-Hz channels, 100-baud/240-Hz channels, 200-baud/360-Hz or 480-Hz channels on the same voice-frequency telegraph system.*

CCITT Recommendation R 37:1989, Blue Book, Fascicle VII.1, *Standardization of FMVFT systems for a modulation rate of 100 bauds.*

CCITT Recommendation R 38 A:1989, Blue Book, Fascicle VII.1, *Standardization of FMVFT systems for a modulation rate of 200 bauds with channels spaced at 480 Hz.*

CCITT Recommendation V 11:1989, Blue Book, Fascicle VIII.1, *Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications.*

CCITT Recommendation V 21:1989, Blue Book, Fascicle VIII.1, *300 bits per second duplex modem standardized for use in the general switched telephone network.*

CCITT Recommendation V 22:1989, Blue Book, Fascicle VIII.1, *1 200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits.*

CCITT Recommendation V 23:1989, Blue Book, Fascicle VIII.1, *600/1 200-baud modem standardized for use in the general switched telephone network.*

CCITT Recommendation V 24:1989, Blue Book, Fascicle VIII.1, *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE).*

CCITT Recommendation V 26:1989, Blue Book, Fascicle VIII.1, *2 400 bits per second modem standardized for use on 4-wire leased telephone-type circuits.*

CCITT Recommendation V 27:1989, Blue Book, Fascicle VIII.1, *4 800 bits per second modem with manual equalizer standardized for use on leased telephone-type circuits.*

CCITT Recommendation V 28:1989, Blue Book, Fascicle VIII.1, *Electrical characteristics for unbalanced double-current interchange circuits.*

CCITT Recommendation V 29:1989, Blue Book, Fascicle VIII.1, *9 600 bits per second modem standardized for use on point-to-point 4-wire leased telephone-type circuits.*

CCITT Recommendation V 32:1989, Blue Book, Fascicle VIII.1, *A family of 2-wire, duplex modems operating at data signalling rates of up to 9 600 bits/s for use on the general switched telephone network and on leased telephone-type circuits.*

CCITT Recommendation X 3:1989, Blue Book, Fascicle VIII.2, *Packet assembly/disassembly facility (PAD) in a public data network.*

CCITT Recommendation X 20:1989, Blue Book, Fascicle VIII.2, *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for start-stop transmission services on public data networks.*

CCITT Recommendation X 21:1989, Blue Book, Fascicle VIII.2, *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks.*

CCITT Recommendation X 21bis:1989, Blue Book, Fascicle VIII.2, *Use on public data networks of data terminal equipment (DTE) which is designed for interfacing to asynchronous duplex V-series modems.*