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Telecontrol equipment and systems - Part 1: General considerations - Section 2: Guide for specifications

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Matériels et systèmes de téléconduite. Première partie: Considérations générales. Section deux: Guide pour les spécifications

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Part 1:
General considerations
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TELECONTROL EQUIPMENT AND SYSTEMS

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FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This report has been prepared by IEC Technical Committee No. 57: Telecontrol, teleprotection and associated telecommunications for electric power systems.

The text of this report is based upon the following documents:

Six Months' Rule	Report on Voting
57(CO)44	57(CO)51

Full information on the voting for the approval of this report can be found in the Voting Report indicated in the above table.

The following IEC publications are quoted in this report:

Publications Nos. 495 (1974): Recommended values for characteristic input and output quantities of single sideband power line carrier systems.

870-1-1 (1988): Telecontrol equipment and systems, Part 1: General considerations - Section One: General principles.

870-2-1 (1987): Part 2: Operating conditions - Section One: Environmental conditions and power supplies.

870-3 (1989): Part 3: Interfaces (electrical characteristics).

870-4 (19..): Part 4: Performance requirements.

870-5 (19..): Part 5: Transmission protocols.

870-6: Part 6: Telecontrol protocols compatible with ISO standards and CCITT recommendations.

TELECONTROL EQUIPMENT AND SYSTEMS

Part 1: General considerations

Section Two - Guide for specifications

INTRODUCTION

Planning of telecontrol systems and defining the specifications of a system and of its equipment are complex and demand a large amount of detailed information. There are not only application functions of the system to be defined but also the operational parameters, the local environmental conditions and the data transmission paths available as well as their characteristics. The interfaces between the components of the system and other equipment facilities such as power supply requirements shall also be specified.

Many aspects of this field are covered by standards within the IEC 870 series on telecontrol equipment and s,stems but many decisions are still left to the engineers who have to plan a system and establish the specifications.

1. **Scope**

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

2. **Object**

This section presents guidelines but not standards for establishing specifications for telecontrol systems and equipment following the other IEC standards on telecontrol systems and other relevant international standards and recommendations such as CCITT recommendations. It also facilitates the comparison of equipment of different manufacturers.

The planning of telecontrol systems should be subdivided into clearly defined steps:

- The first step involves a consideration of the operational requirements of telecontrol systems (clause 3 of this section).
- In the second step, the conditions and limitations of the data transmission network are considered and the most suitable utilization is specified (clause 4 of this section).

- Thirdly, the required facilities for the telecontrol equipment and other equipment of telecontrol systems are specified. This includes considerations of whether it is useful to include existing local control equipment (clause 5 of this section).

The guidelines given in this section are applicable also if only parts of telecontrol systems are needed. In this case only the relevant clauses need be considered.

3. Description of the telecontrol system and its functions

Design aim of the system, for example:

- "Main (or regional) control system..." (name of the power company or of the region), or
- "District telecontrol system..." (name of the district itself or of the district control centre), or
- "Telecontrol system for power station..." (name of the controlled station).

3.1 *Description of the telecontrolled (or telemonitored) process*

3.1.1 *Purpose of process to be controlled*

(Short explanation only as far as necessary for planning telecontrol systems.)

3.1.2 *Name of master stations and control centres*

Description of the function, e.g. dispatching centre, regional control centre, etc.

3.1.3 *Number and names of outstations*

Description of their functions, e.g. "Power station...", "Transformer station...", etc.

3.1.4 *Geographical configuration of the system*

System block diagram and site description.

3.1.5 *Location and distances between interconnected stations*

3.2 *Functions of telecontrol systems*

3.2.1 *Survey of application functions*

3.2.1.1 *Basic functions*

- Telemetering of the transfer power flow, generated power, summation of the power consumption, line voltage, frequency, temperature, water-levels, etc.;
- telecounting of the generated energy, energy consumption, energy transfer, etc.;

- teleindication of the circuit-breaker, protection functions, alarms, etc;
- telecommand of the circuit-breaker, etc.;
- time synchronization between outstations and master station;
- time tagging of information.

3.2.1.2 *Extended processing functions*

- Teleregulation of the generated power (manually or automatically controlled);
- automatic power/frequency regulation;
- state estimation;
- automatic load shedding;
- switching programmes;
- operator interface (such as system operation, information display);
- information logging and reporting;
- data storage (short term/long term);
- etc.

3.2.2 *Requirements for operational parameters*

The following operational parameters are specified within Publication 870-4:

- reliability;
- availability;
- maintainability;
- security;
- data integrity;
- time parameters;
- accuracy.

In specifying the time parameters, particular consideration should be given to the:

- overall transfer time (sum of the times taken by the information passing through the individual sections of telecontrol systems, but also influenced by the network configuration, priority, accumulation of events, etc.);
- parameters for state information, such as separating capability, time resolution, suppression time, etc.;
- updating time for measured values and set point commands;
- etc.

It should be emphasized that in specifying the above-mentioned parameters the requirements of the process should be considered.

3.2.3 *Detailed specification*

The facilities required should be listed and briefly described.

Below is a list of the standard facilities found in telecontrol systems.

3.2.3.1 *Input and acquisition of monitored information*

- Single point information;
  for alarms, state information, faulty state information, etc.
  (fleeting information or persistent information);
- double point information with or without acquisition of the intermediate state
  for circuit-breakers, isolators, etc.;
- integrated values
  for telecounting of energy values, etc.;
- incremental information
  for flow values, etc.;
- measured values (analog or digital) with cyclic or periodic transmission or transmission on demand
  for telemetering of electric values, hydraulic values, etc.;
- time tagging requirements;
- group alarms or common alarms derived from digital or analog information;
- information related to the telecontrol system itself, e.g. transmission error alarms, equipment failure alarms, etc.;
- other types of information.

3.2.3.2 *Output and presentation of information*

- State information;
- double point information with or without indicating the intermediate state;
- alarms, group alarms, common alarms;
- pulse output or persistent indication of integrated values;
- analog or digital display or measured values;
- information logging;
- data storage functions.

3.2.3.3 *Command input*

- Switching commands, single commands
  to change the state of an operational equipment in one direction
  (pulse commands or persistent commands);
- switching commands, double commands
  for circuit-breakers, isolators, etc.
  (pulse commands or maintained commands);

- set point commands
  values which are transmitted to the controlled equipment;
- adjusting commands
  for changing the state of operational equipment having more than two states;
- regulating commands (analog or digital)
  for closed loop telemonitoring and telecommand
  (regulating step commands or persistent regulating commands);
- select and execute commands;
- instruction commands
  for indicating a standard instruction to operators in the control room of a manually operated remote station,
  e.g. "Start generators";
- command sequences;
- group commands
  addressed to several items of equipment at an outstation;
- broadcast commands
  addressed to operational equipment at several or all outstations of a telecontrol system;
- commands related to the telecontrol system itself;
- interrogation commands;
- check commands
  e.g. for the purpose of ensuring that the telecontrol equipment is functioning correctly;
- other types of information.

3.2.3.4 *Command output*

- Single commands;
- double commands with or without supervision of faulty states;
- set point commands with or without validity indication and with or without storage;
- adjusting commands;
- command sequences;
- indication of the instruction commands.

3.3 *Data quantities*

The data quantities can be expressed by the number of input and output points. The number of points can be given in lists or tables, drawn up to reflect functions required as well as the different locations of telecontrol systems, for example: