
International Standard



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Hydrometric data transmission systems — Part 1: General

Systèmes de transmission de données hydrométriques — Partie 1: Généralités

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6419/1 was prepared by Technical Committee ISO/TC 113, *Measurement of liquid flow in open channels*.

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Hydrometric data transmission systems —

Part 1: General

0 Introduction

A system of hydrometric stations, data transmission and data handling constitutes a hydrometric data acquisition system, the density of which should relate to the scale of both existing and potential objectives.

Collection of hydrometric data may be governed by legal, present and anticipated scientific and operational needs.

If the network is sufficiently dense, generating large quantities of data, or if the time-interval of the necessary reaction to measurement is relatively short, then recourse to modern techniques of fast, concentrated data handling is necessary.

The advances already made and the continuing development in the technology of measurement, data transmission and data handling result in a wide variety of design and operation of data systems. However, with the increasing size and complexity of such systems and the special requirements of hydrometric data systems, it has become evident that standardization of some aspects of hydrometric telemetry would improve the design, specification and operation of systems, as well as delaying equipment obsolescence.

1 Scope and field of application

This part of ISO 6419 specifies the general functional requirements for hydrometric telemetry. It defines characteristics of the system required to transmit field data to a receiving station and the minimum processing for subsequent use.

2 References

ISO 646, *Information processing — ISO 7-bit coded character set for information interchange*.

ISO 772, *Liquid flow measurement in open channels — Vocabulary and symbols*.

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*.

3 Definitions

For the purposes of this part of ISO 6419, and in addition to those given in ISO 772, the following definitions shall apply.

3.1 bit : A binary digit; a digit (1 or 0) used to represent a number in binary notation.

3.2 baud : A unit for measuring data flow on a communication path, equivalent to one bit per second.

3.3 remote station; outstation : All facilities and equipment associated with the sensing and transmission of valid data from a hydrometric station.

4 Units of measurement

The units of measurement used in this part of ISO 6419 are SI units in accordance with ISO 1000.

5 System description

5.1 General

The end-product of hydrometry is data, relating to measurements of relevant parameters.

The common objective in hydrometry is to acquire continuous data in which the acquisition rate will make it possible to understand the phenomena in general and predict its development in time.

It is convenient to examine the data acquisition system by means of each of the distinct stages through which the data shall pass before its ultimate use. Figure 1 illustrates this in block form.

5.2 Data system stages

Six distinct stages may be identified in any data acquisition system, however simple the system may be :

- a) primary measurement;
- b) encoding;
- c) transmission;
- d) decoding;
- e) validation;
- f) use.

The extent of a telemetry system encompasses stages b) to e), as indicated in figure 1.

An interface exists between each of these stages and it is at these interfaces that the greatest opportunity for standardization exists, thus minimizing the adverse effect on the user of technological obsolescence.

5.2.1 Primary measurement

A primary measurement is made with the object of describing a physical process in a form which can be interpreted by human senses, or which enables this objective to be met.

In hydrometric instrumentation this is achieved by sensing energy changes, as reflected by changes in the natural parameter and converting such changes into a form suitable for subsequent processes. The device which performs this function is called a transducer.

The most common outputs are either mechanical or electrical.

5.2.2 Encoding

The measurements taken at the field site will be required at some other place and/or some other time.

This requirement can be met by coding a transducer output, thus making it more convenient for transmission and/or storage.

5.2.3 Transmission

The movement of the information from place of measurement to the place of use.

5.2.4 Decoding

The reversion of the coded information into physical units.

5.2.5 Validation

This is the process of confirming, using some specified means, that the data as received (immediately following the decoding process) are acceptable within the tolerance limits specified.

The validation of data shall be treated as an integral part of any acquisition system and validation is best carried out as soon as possible after reception.

5.2.6 Use

A large proportion of the use made of hydrometric data involves the analysis of time-series data.

The method chosen for storage of, and access to, the data shall recognize this and the fact that data archives tend to grow at an accelerating rate.

6 Principles of operation

6.1 General

In this clause it is necessary to keep in mind the sequential nature of the system, described in clause 5, and especially the concept of a definite interface between each stage.

6.2 Hydrometric telemetry

Hydrometric telemetry is the transmission of data from primary sensors to another location.

The mode of transmission influences many other system design considerations.

6.3 Means of transmission

6.3.1 General

The most readily available, and most widely used, energy form is electrical, and further considerations in this part of ISO 6419 are confined to this form.

Sufficient power shall be generated by the transmitter to guarantee the integrity of the received signal, allowing for energy losses along the transmission path.

In a terrestrial environment these losses can be considerable, whereas outside the Earth's atmosphere they become insignificant.

6.3.2 Transmission by line

6.3.2.1 Lines may be "dedicated" or shared with general purpose communications. In some networks, lines are dedicated to data transmission but shared between users.

6.3.2.2 Advantages :

- a) low probability of atmospheric interference;
- b) high value of mean-time-between-failure (MTBF);
- c) systematic energy loss is predictable;
- d) system commissioning is simplified.

6.3.2.3 Disadvantages :

- a) installation cost increases with distance;
- b) overhead lines are susceptible to failure due to high winds and ice or snow;
- c) underground lines can be damaged by numerous causes, including flooding, earth movement and construction activity;
- d) failure may occur anywhere along the line;
- e) probability of interference increases with line length;

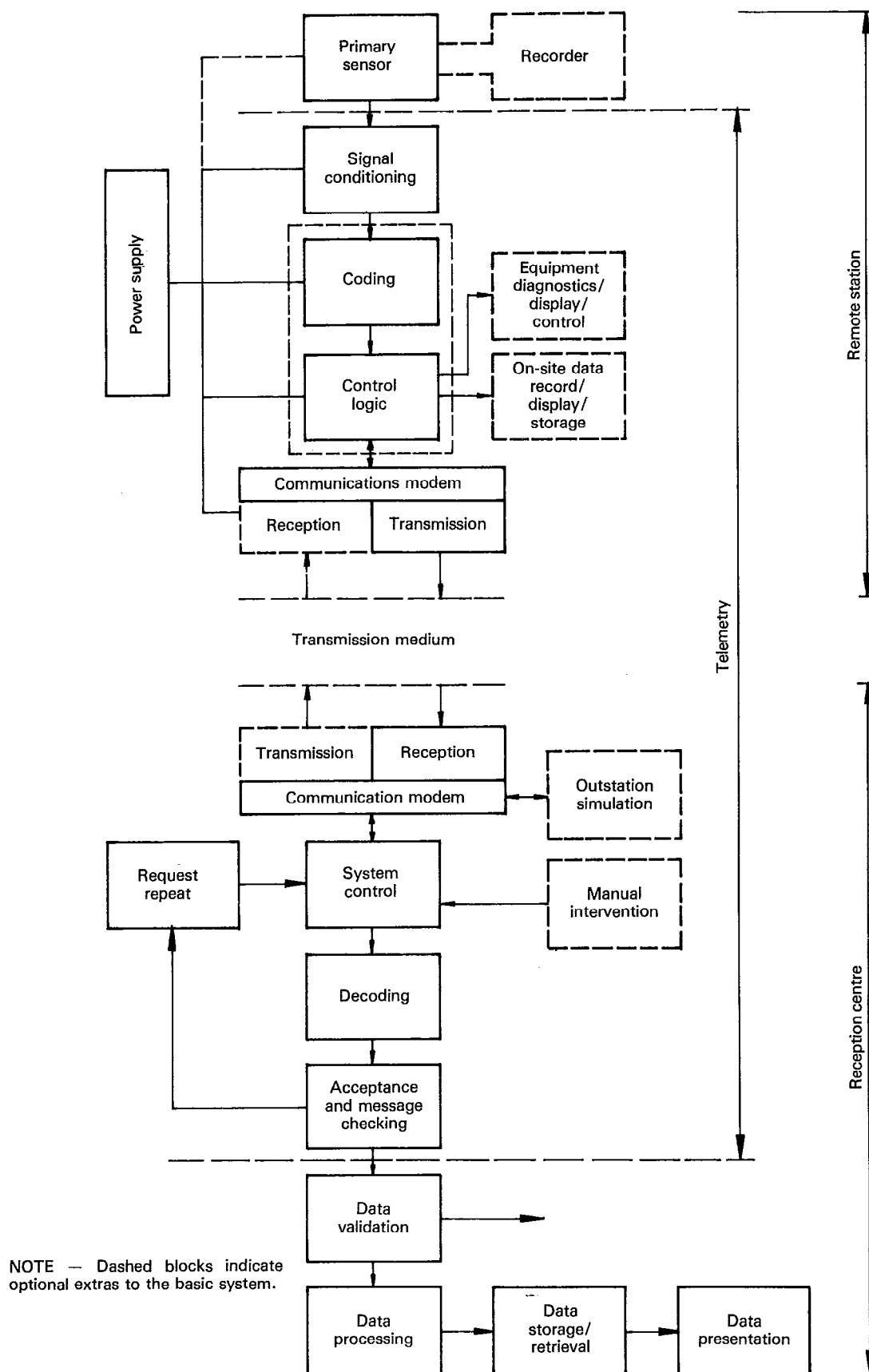


Figure 1 — Data acquisition system — Functional block diagram