

BS ISO 17214:2011



BSI Standards Publication

Space data and information
transfer systems — Spacecraft
onboard interface services —
Time access service

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National foreword

This British Standard is the UK implementation of ISO 17214:2011.

The UK participation in its preparation was entrusted to Technical Committee ACE/68/-/7, Space systems and operations - Space data and information transfer systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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INTERNATIONAL STANDARD

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2011-12-15

Space data and information transfer systems — Spacecraft onboard interface services — Time access service

Systèmes de transfert des informations et données spatiales —
Services d'interfaces à bord des véhicules spatiaux — Service d'accès
au temps



Reference number
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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17214 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 872.0-M-1, January 2011) and was adopted (without modifications except those stated in Clause 2 of this International Standard) by Technical Committee ISO/TC 20, Aircraft and space vehicles, Subcommittee SC 13, Space data and information transfer systems.

Space data and information transfer systems — Spacecraft onboard interface services — Time access service

1 Scope

This International Standard defines services and service interfaces provided by the Spacecraft Onboard Interface Services (SOIS) time access service. It specifies only the service and not the methods of providing the service, although use of the SOIS subnetwork services is assumed.

This International Standard conforms to the principles set out in the SOIS Green Book (CCSDS 850.0-G-1; see Reference A6) and it is intended to be applied together with it.

The scope and field of application are furthermore detailed in subclauses 1.1 and 1.2 of the enclosed CCSDS publication.

2 Requirements

Requirements are the technical recommendations made in the following publication (reproduced on the following pages), which is adopted as an International Standard:

CCSDS 872.0-M-1, January 2011, Spacecraft onboard interface services — Time access service.

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 872.0-M-1.

Pages i to v

This part is information which is relevant to the CCSDS publication only.

Page A-1

Add the following information to the reference indicated:

[A3] Document CCSDS 301.0-B-3, January 2002, is equivalent to ISO 11104:2003.

3 Revision of publication CCSDS 872.0-M-1

It has been agreed with the Consultative Committee for Space Data Systems that Subcommittee ISO/TC 20/SC 13 will be consulted in the event of any revision or amendment of publication CCSDS 872.0-M-1. To this end, NASA will act as a liaison body between CCSDS and ISO.

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Recommendation for Space Data System Practices

SPACECRAFT ONBOARD INTERFACE SERVICES— TIME ACCESS SERVICE

RECOMMENDED PRACTICE

CCSDS 872.0-M-1

MAGENTA BOOK

January 2011

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AUTHORITY

Issue:	Recommended Practice, Issue 1
Date:	January 2011
Location:	Washington, DC, USA

This document has been approved for publication by the Management Council of the Consultative Committee for Space Data Systems (CCSDS) and represents the consensus technical agreement of the participating CCSDS Member Agencies. The procedure for review and authorization of CCSDS documents is detailed in the *Procedures Manual for the Consultative Committee for Space Data Systems*, and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

This document is published and maintained by:

CCSDS Secretariat
Space Communications and Navigation Office, 7L70
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NASA Headquarters
Washington, DC 20546-0001, USA

STATEMENT OF INTENT

The Consultative Committee for Space Data Systems (CCSDS) is an organization officially established by the management of its members. The Committee meets periodically to address data systems problems that are common to all participants, and to formulate sound technical solutions to these problems. Inasmuch as participation in the CCSDS is completely voluntary, the results of Committee actions are termed **Recommendations** and are not in themselves considered binding on any Agency.

CCSDS Recommendations take two forms: **Recommended Standards** that are prescriptive and are the formal vehicles by which CCSDS Agencies create the standards that specify how elements of their space mission support infrastructure shall operate and interoperate with others; and **Recommended Practices** that are more descriptive in nature and are intended to provide general guidance about how to approach a particular problem associated with space mission support. This **Recommended Practice** is issued by, and represents the consensus of, the CCSDS members. Endorsement of this **Recommended Practice** is entirely voluntary and does not imply a commitment by any Agency or organization to implement its recommendations in a prescriptive sense.

No later than five years from its date of issuance, this **Recommended Practice** will be reviewed by the CCSDS to determine whether it should: (1) remain in effect without change; (2) be changed to reflect the impact of new technologies, new requirements, or new directions; or (3) be retired or canceled.

In those instances when a new version of a **Recommended Practice** is issued, existing CCSDS-related member Practices and implementations are not negated or deemed to be non-CCSDS compatible. It is the responsibility of each member to determine when such Practices or implementations are to be modified. Each member is, however, strongly encouraged to direct planning for its new Practices and implementations towards the later version of the Recommended Practice.

FOREWORD

This document is a technical Recommended Practice for use in developing flight and ground systems for space missions and has been prepared by the Consultative Committee for Space Data Systems (CCSDS). The Time Access Service described herein is intended for missions that are cross-supported between Agencies of the CCSDS, in the framework of the Spacecraft Onboard Interface Services (SOIS) CCSDS area.

This Recommended Practice specifies a set of related services to be used by space missions to obtain onboard time. The SOIS Time Access Service provides a common service interface and quality of service regardless of the particular type of data link or protocol being used for communication.

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Practice is therefore subject to CCSDS document management and change control procedures, which are defined in the *Procedures Manual for the Consultative Committee for Space Data Systems*. Current versions of CCSDS documents are maintained at the CCSDS Web site:

<http://www.ccsds.org/>

Questions relating to the contents or status of this document should be addressed to the CCSDS Secretariat at the address indicated on page i.

At time of publication, the active Member and Observer Agencies of the CCSDS were:

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- Canadian Space Agency (CSA)/Canada.
- Centre National d'Etudes Spatiales (CNES)/France.
- China National Space Administration (CNSA)/People's Republic of China.
- Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)/Germany.
- European Space Agency (ESA)/Europe.
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Observer Agencies

- Austrian Space Agency (ASA)/Austria.
- Belgian Federal Science Policy Office (BFSPPO)/Belgium.
- Central Research Institute of Machine Building (TsNIIMash)/Russian Federation.
- China Satellite Launch and Tracking Control General, Beijing Institute of Tracking and Telecommunications Technology (CLTC/BITTT)/China.
- Chinese Academy of Sciences (CAS)/China.
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- Swedish Space Corporation (SSC)/Sweden.
- United States Geological Survey (USGS)/USA.

DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 872.0-M-1	Spacecraft Onboard Interface Services—Time Access Service, Recommended Practice, Issue 1	January 2011	Original issue
EC1 September	Editorial Correction	2011	Corrects typographical elements

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document is one of a family of documents specifying the Spacecraft Onboard Interface Services (SOIS)-compliant services to be provided in support of onboard applications.

The purpose of this document is to define services and service interfaces provided by the SOIS Time Access Service. Its scope is to specify the service only and not to specify methods of providing the service, although use of the SOIS subnetwork services is assumed.

This document conforms to the principles set out in the SOIS Green Book (reference [A6]) and it is intended to be applied together with it.

1.2 APPLICABILITY

This document applies to any mission or equipment claiming to provide a SOIS-compatible Time Access Service.

1.3 RATIONALE

SOIS provides service interface specifications in order to promote interoperability and development reuse via peer-to-peer and vertical standardisation.

1.4 DOCUMENT STRUCTURE

This document has five major sections:

- this section, containing administrative information, definitions, and references;
- section 2, describing general concepts and assumptions, including security issues;
- section 3, containing the Time Access Service specification;
- section 4, containing the Management Information Base (MIB) for this service;
- section 5, comprising a Service Conformance Statement Proforma.

In addition, four informative annexes are provided:

- annex A, containing a list of informative references;
- annex B, describing how local time registers may be implemented and how the master onboard time value is usually distributed in current spacecraft;
- annex C, describing aspects of the POSIX API time functions which might be useful to implementers of the Time Access Service;
- annex D, describing how an implementation of the service may be characterised.

1.5 CONVENTIONS AND DEFINITIONS

1.5.1 BIT NUMBERING CONVENTION AND NOMENCLATURE

In this document, the following convention is used to identify each bit in an N -bit field. The first bit in the field to be transmitted (i.e., the most left justified when drawing a figure) is defined to be 'Bit 0'; the following bit is defined to be 'Bit 1' and so on up to 'Bit $N-1$ '. When the field is used to express a binary value (such as a counter), the Most Significant Bit (MSB) shall be the first transmitted bit of the field, i.e., 'Bit 0' (see figure 1-1).

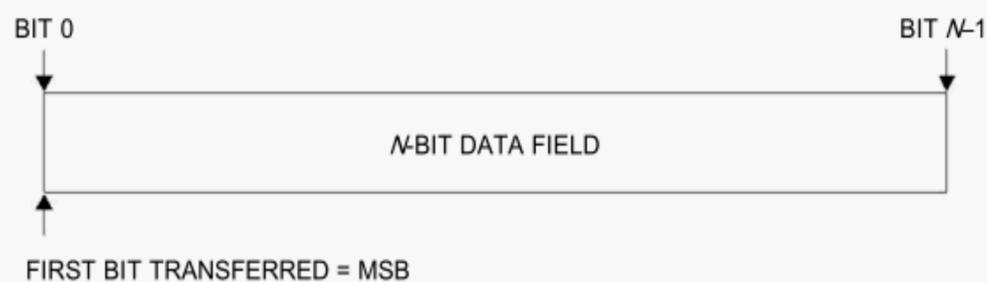


Figure 1-1: Bit Numbering Convention

In accordance with modern data communications practice, spacecraft data fields are often grouped into eight-bit 'words' widely known as bytes. Throughout this Recommended Practice, such an eight-bit word is called an 'octet'.

The numbering for octets within a data structure starts with zero. By CCSDS convention, any 'spare' bits shall be permanently set to '0'.

1.5.2 DEFINITIONS

1.5.2.1 General

For the purpose of this document the following definitions apply.

1.5.2.2 Definitions from the Open Systems Interconnection (OSI) Basic Reference Model

This document is defined using the style established by the Open Systems Interconnection (OSI) Basic Reference Model (reference [A4]). This model provides a common framework for the development of standards in the field of systems interconnection.

The following terms used in this Recommended Practice are adapted from definitions given in reference [A4]:

layer: subdivision of the architecture, constituted by subsystems of the same rank.

protocol data unit (PDU): unit of data specified in a protocol and consisting of Protocol Control Information (PCI) and possibly user data.

service: capability of a layer (service provider) together with the layers beneath it, which is provided to the service users.

Time Access Service Access Point (TASAP): the point at which Time Access Service is provided by a Time Access Service entity to a Time Access Service user entity.

TASAP address: a Time Access Service address that is used to identify a single TASAP.

1.5.2.3 Terms defined in this Recommended Practice

For the purposes of this Recommended Practice, the following definitions also apply.

accuracy: closeness of the agreement between the times reported by a local time source and the master onboard time source of the spacecraft.

application: component of the onboard software that makes use of the Time Access Service.

NOTE – Such components include flight software applications and higher-layer services.

error bound: indication of the theoretical error range of a particular time value.

NOTES

1 This is dependent upon the mechanisms of the time source used to obtain the time value. It may be related to the precision and resolution of the time value but also any associated synchronisation mechanisms.

2 Larger values for the error bound indicate less accuracy in the returned time value.

precision: smallest significant time increment that can be reported by a time source.

NOTE – For example, a time source that reports time as *minutes:seconds:milliseconds* has a precision of 1ms. The precision of a time source is normally less than the resolution of that time source.

resolution: smallest significant time increment that can be measured by a time source.

NOTE – For example, a time source driven by a 1MHz oscillator has a resolution of 1µs.

time correlation: process of maintaining coherence between the master time source and each local time source, such that all time sources provide the same time value within some bounded uncertainty.

NOTE – This maximizes the accuracy of each time source with respect to the master onboard time source.

1.6 DOCUMENT NOMENCLATURE

The following conventions apply throughout this Recommended Practice:

- a) the words 'shall' and 'must' imply a binding and verifiable specification;
- b) the word 'should' implies an optional, but desirable, specification;
- c) the word 'may' implies an optional specification;
- d) the words 'is', 'are', and 'will' imply statements of fact.

1.7 REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Recommended Practice. At the time of publication, the editions indicated were valid. All documents are subject to revision, and users of this Recommended Practice are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. The CCSDS Secretariat maintains a register of currently valid CCSDS Documents.

NOTE – This document contains no normative references. Informative references are contained in annex A.

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