INTERNATIONAL STANDARD

ISO
22664

Second edition
2013-06-01

Space data and information transfer systems — TC (telecommand) space data link protocol

Systèmes de transfert des données et informations spatiales — Protocole de liaison pour données spatiales TC (télécommande)

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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 22664 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 232.0-B-2, September 2010) 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*.

This second edition cancels and replaces the first edition (ISO 22664:2005), which has been technically revised.

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Space data and information transfer systems — TC (telecommand) space data link protocol

1 Scope

1.1   This International Standard specifies the telecommand (TC) space data link protocol. This protocol is a data link layer protocol (as defined in ISO/IEC 7498-1) intended for use over ground-to-space or space-to-space communications links by space missions.

1.2   This International Standard defines the TC space data link protocol in terms of

a)   the services provided to the users of this protocol,

b)   the protocol data units employed by the protocol, and

c)   the procedures performed by the protocol.

1.3   It does not specify

a)   individual implementations or products,

b)   the implementation of service interfaces within real systems,

c)   the methods or technologies required to perform the procedures, or

d)   the management activities required to configure and control the protocol.

1.4   The scope and field of application are furthermore detailed in subclauses 1.1, 1.2 and 1.3 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 232.0-B-2, September 2010, *TC space data link protocol.*

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 232.0-B-2.

Pages i to v

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

Page 1-5

Add the following information to the reference indicated:

[4]   Document CCSDS 232.1-B-2, September 2010, is equivalent to ISO 22667:2013.

Page B-1

Add the following information to the reference indicated:

[B4]   Document CCSDS 910.4-B-2, October 2005, is equivalent to ISO 15396:2007.

[B5]   Document CCSDS 132.0-B-1, September 2003, is equivalent to ISO 22645:2005.

[B6]   Document CCSDS 732.0-B-2, July 2006, is equivalent to ISO 22666:2007.

3   Revision of publication CCSDS 232.0-B-2

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 232.0-B-2. To this end, NASA will act as a liaison body between CCSDS and ISO.

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CCSDS

The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

TC SPACE DATA LINK PROTOCOL

RECOMMENDED STANDARD

CCSDS 232.0-B-2

BLUE BOOK
September 2010

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AUTHORITY

<table>
<tr><td>Issue:</td><td>Recommended Standard, Issue 2</td></tr>
<tr><td>Date:</td><td>September 2010</td></tr>
<tr><td>Location:</td><td>Washington, DC, USA</td></tr>
</table>

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:

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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 **Recommended Standards** and are not considered binding on any Agency.

This **Recommended Standard** is issued by, and represents the consensus of, the CCSDS members. Endorsement of this **Recommendation** is entirely voluntary. Endorsement, however, indicates the following understandings:

o   Whenever a member establishes a CCSDS-related **standard**, this **standard** will be in accord with the relevant **Recommended Standard**. Establishing such a **standard** does not preclude other provisions which a member may develop.

o   Whenever a member establishes a CCSDS-related **standard**, that member will provide other CCSDS members with the following information:

   --   The **standard** itself.

   --   The anticipated date of initial operational capability.

   --   The anticipated duration of operational service.

o   Specific service arrangements shall be made via memoranda of agreement. Neither this **Recommended Standard** nor any ensuing **standard** is a substitute for a memorandum of agreement.

No later than five years from its date of issuance, this **Recommended Standard** 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 Standard** is issued, existing CCSDS-related member standards and implementations are not negated or deemed to be non-CCSDS compatible. It is the responsibility of each member to determine when such standards or implementations are to be modified. Each member is, however, strongly encouraged to direct planning for its new standards and implementations towards the later version of the Recommended Standard.

FOREWORD

This document is a technical Recommendation 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 TC Space Data Link Protocol described herein is intended for missions that are cross-supported between Agencies of the CCSDS.

This Recommendation specifies a communications protocol to be used by space missions to transfer space application data over ground-to-space or space-to-space communications links. This Recommendation is developed from the specifications of an older CCSDS Recommendation (reference [B2]), which defines essentially the same protocol and services but in a slightly different context.

This Recommendation does not change the major technical contents defined in reference [B2], but the presentation of the specification has been changed so that:

a) this protocol can be used to transfer any data over any space link in either direction;

b) all CCSDS space link protocols are specified in a unified manner;

c) the specification matches the Open Systems Interconnection (OSI) Basic Reference Model (references [1] and [2]).

Together with the change in presentation, a few technical descriptions in reference [B2] have been changed to allow flexibility for future extensions of the CCSDS protocol suite. Also, some technical terms in reference [B2] have been changed in order to unify the terminology used in all the CCSDS Recommendations that define space link. These changes are listed in annex C of this Recommendation.

Through the process of normal evolution, it is expected that expansion, deletion or modification to this document may occur. This Recommendation is therefore subject to CCSDS document management and change control procedures, as defined in reference [B1]. 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.

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CCSDS RECOMMENDED STANDARD FOR TC SPACE DATA LINK PROTOCOL

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

Member Agencies

–   Agenzia Spaziale Italiana (ASI)/Italy.
–   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.
–   Instituto Nacional de Pesquisas Espaciais (INPE)/Brazil.
–   Japan Aerospace Exploration Agency (JAXA)/Japan.
–   National Aeronautics and Space Administration (NASA)/USA.
–   Russian Federal Space Agency (RFSA)/Russian Federation.
–   UK Space Agency/United Kingdom.

Observer Agencies

–   Austrian Space Agency (ASA)/Austria.
–   Belgian Federal Science Policy Office (BFSPO)/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.
–   Chinese Academy of Space Technology (CAST)/China.
–   Commonwealth Scientific and Industrial Research Organization (CSIRO)/Australia.
–   CSIR Satellite Applications Centre (CSIR)/Republic of South Africa.
–   Danish National Space Center (DNSC)/Denmark.
–   Departamento de Ciência e Tecnologia Aeroespacial (DCTA)/Brazil.
–   European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)/Europe.
–   European Telecommunications Satellite Organization (EUTELSAT)/Europe.
–   Geo-Informatics and Space Technology Development Agency (GISTDA)/Thailand.
–   Hellenic National Space Committee (HNSC)/Greece.
–   Indian Space Research Organization (ISRO)/India.
–   Institute of Space Research (IKI)/Russian Federation.
–   KFKI Research Institute for Particle & Nuclear Physics (KFKI)/Hungary.
–   Korea Aerospace Research Institute (KARI)/Korea.
–   Ministry of Communications (MOC)/Israel.
–   National Institute of Information and Communications Technology (NICT)/Japan.
–   National Oceanic and Atmospheric Administration (NOAA)/USA.
–   National Space Agency of the Republic of Kazakhstan (NSARK)/Kazakhstan.
–   National Space Organization (NSPO)/Chinese Taipei.
–   Naval Center for Space Technology (NCST)/USA.
–   Scientific and Technological Research Council of Turkey (TUBITAK)/Turkey.
–   Space and Upper Atmosphere Research Commission (SUPARCO)/Pakistan.
–   Swedish Space Corporation (SSC)/Sweden.
–   United States Geological Survey (USGS)/USA.

DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 232.0-B-1	TC Space Data Link Protocol, Recommended Standard, Issue 1	September 2003	Original Issue
CCSDS 232.0-B-2	TC Space Data Link Protocol, Recommended Standard, Issue 2	September 2010	Current issue: - updates Frame Error Control Field Encoding Procedure to be consistent with other CCSDS Space Data Link Protocol specifications; - adds specifications and parameters to support a systematic retransmission option (note).

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NOTE – Substantive changes from the previous issue are indicated by change bars in the right margin.

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