
**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

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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.

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.

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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.

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

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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:

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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 **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:

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- 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.
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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.

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

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- 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: <ul style="list-style-type: none"> - 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).

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

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1 INTRODUCTION

1.1 PURPOSE

The purpose of this Recommendation is to specify the Telecommand (TC) Space Data Link Protocol. This protocol is a Data Link Layer protocol (see reference [1]) to be used over ground-to-space or space-to-space communications links by space missions.

1.2 SCOPE

This Recommendation 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.

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.

1.3 APPLICABILITY

This Recommendation applies to the creation of Agency standards and to future data communications over space links between CCSDS Agencies in cross-support situations. The Recommendation includes comprehensive specification of the services and protocol for inter-Agency cross support. It is neither a specification of, nor a design for, real systems that may be implemented for existing or future missions.

The Recommendation specified in this document is to be invoked through the normal standards programs of each CCSDS Agency and is applicable to those missions for which cross support based on capabilities described in this Recommendation is anticipated. Where mandatory capabilities are clearly indicated in sections of the Recommendation, they must be implemented when this document is used as a basis for cross support. Where options are allowed or implied, implementation of these options is subject to specific bilateral cross support agreements between the Agencies involved.