INTERNATIONAL STANDARD

ISO 15887

Second edition
2013-06-01

Space data and information transfer systems — Lossless data compression

Systèmes de transfert des informations et données spatiales — Compression de données sans perte

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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ISO 15887 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 121.0-B-2, May 2012) 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*.

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This second edition cancels and replaces the first edition (ISO 15887:2000) and ISO 15887:2000/Cor.1:2009, which have been technically revised.

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Space data and information transfer systems — Lossless data compression

1 Scope

This International Standard establishes a source-coding data-compression algorithm applied to digital data and specifies how these compressed data shall be inserted into source packets for retrieval and decoding.

Source coding for data compression is a method utilized in data systems to reduce the volume of digital data to achieve benefits in areas including, but not limited to,

a) reduction of transmission channel bandwidth;

b) reduction of the buffering and storage requirement;

c) reduction of data-transmission time at a given rate.

The characteristics of source codes are specified only to the extent necessary to ensure multi-mission support capabilities. This International Standard does not attempt to quantify the relative bandwidth reduction, the merits of each approach discussed, or the design requirements for coders and associated decoders. Some performance information is included in *Lossless Data Compression,* CCSDS 120.0-G-2.

This International Standard addresses only Lossless source coding, which is applicable to a wide range of digital data, both imaging and non-imaging, where the requirement is for a moderate data-rate reduction constrained to allow no distortion to be added in the data compression/decompression process. The decompression process is not addressed.

The scope and field of application are furthermore detailed in subclause 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 121.0-B-2, May 2012, Data systems — Lossless data compression.

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 121.0-B-2.

Pages i to vi

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

Page 1-3

Add the following information to the reference indicated:

[1] Document CCSDS 131.0-B-2, August 2011, is equivalent to ISO 22641:2012.

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[2] Document CCSDS 133.0-B-1, September 2003, is equivalent to ISO 22646:2005.

[3] Document CCSDS 123.0-B-1, May 2012, is equivalent to ISO 18281:2013.

3 Revision of publication CCSDS 121.0-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 121.0-B-2. To this end, NASA will act as a liaison body between CCSDS and ISO.

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The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

LOSSLESS DATA COMPRESSION

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RECOMMENDED STANDARD

CCSDS 121.0-B-2

BLUE BOOK
May 2012

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DEDICATION

This document is dedicated to the memory of Mr. Warner H. Miller of NASA. Warner had been with the CCSDS since its beginning, and throughout the years he was a major contributor to numerous standards for error control coding, radio frequency modulation, and data architecture. He initiated this data compression standard and saw its publication and use by many space missions. Warner was a superb technologist, a gentleman, and a friend always ready to help, especially young colleagues. Warner and his approach to work and life in general will be deeply missed by his many friends and colleagues in the CCSDS.

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AUTHORITY

Issue:	Recommended Standard, Issue 2
Date:	May 2012
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 *Organization and Processes 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.

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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:

- 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.
- 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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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.

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FOREWORD

This Recommendation establishes a common framework and provides a common basis for a Lossless data compression algorithm applicable to several different types of data.

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Standard 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.

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- 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.
- Federal Space Agency (FSA)/Russian Federation.
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DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 121.0-B-1	Lossless Data Compression, Blue Book, Issue 1	May 1997	Original issue, superseded
CCSDS 121.0-B-2	Lossless Data Compression, Recommended Standard, Issue 2	May 2012	Current issue: (changes affecting backward compatibility) – increases the allowed values of block length *J* from {8, 16} to {8, 16, 32, 64}; – increases the maximum allowed value of the reference sample interval *r* from 256 to 4096; – allows the use of a restricted set of code options; – defines a new subfield of the Source Configuration Field of the optional Compression Identification packet; (changes not affecting backward compatibility) – adds guidance for selection of code option when two or more code options gave the same performance for a block; – clarifies that the ID bits are to be included when selecting the coding option for a block; – clarifies some text; – adds a dedication to Warner Miller.

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