

First edition  
2012-07-15

Corrected version  
2012-11-01

---

---

## Space data and information transfer systems — Orbit data messages

*Systèmes de transfert des informations et données spatiales —  
Messages pour données d'orbites*

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

ISO 26900:2012

<https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012>



Reference number  
ISO 26900:2012(E)

© ISO 2012

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

ISO 26900:2012

<https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## 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 26900 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 502.0-B-2, November 2009) 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 14, *Space systems and operations*, in collaboration with SC 13, *Space data and information transfer systems*.

ISO 26900 cancels and replaces ISO 22644:2006, which has been technically revised.

This corrected version of ISO 26900:2012 also incorporates the corrections of Technical Corrigendum CCSDS 502.0-B-2 Cor. 1, May 2012. Corrections are identified in the enclosed CCSDS publication by a bar in the margin and the designation "Cor. 1". In addition, the list of equivalent references in Clause 2 of this International Standard has been updated.



# Space data and information transfer systems — Orbit data messages

## 1 Scope

This International Standard specifies three standard message formats for use in transferring spacecraft orbit information between space agencies and commercial or governmental spacecraft operators: the Orbit Parameter Message (OPM), the Orbit Mean-Elements Message (OMM), and the Orbit Ephemeris Message (OEM). Such exchanges are used for

- a) pre-flight planning for tracking or navigation support,
- b) scheduling tracking support,
- c) carrying out tracking operations (sometimes called metric predicts),
- d) performing orbit comparisons,
- e) carrying out navigation operations such as orbit propagation and orbit reconstruction,
- f) assessing mutual physical and electromagnetic interference among satellites orbiting the same celestial body (currently primarily Earth, Moon, and Mars),
- g) performing orbit conjunction (collision avoidance) studies, and
- h) developing and executing collaborative manoeuvres to mitigate interference or enhance mutual operations.

This International Standard includes sets of requirements and criteria that the message formats have been designed to meet.

**NOTE** For exchanges where these requirements do not capture the needs of the participating agencies and satellite operators, another mechanism can be selected.

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 502.0-B-2, November 2009, *Orbit data messages*.

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 502.0-B-2.

*Pages i to v*

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 301.0-B-4, November 2010, is equivalent to ISO 11104:2011.

[4] Document CCSDS 505.0-B-1, December 2010, is equivalent to ISO 17107:2011

*Page G-1*

Add the following information to the reference indicated:

[G5] Document CCSDS 504.0-B-1, May 2008, is equivalent to ISO 13541:2010.

### **3 Revision of publication CCSDS 502.0-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 502.0-B-2. To this end, NASA will act as a liaison body between CCSDS and ISO.

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO 26900:2012](https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012)

<https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012>



## Recommendation for Space Data System Standards

# ORBIT DATA MESSAGES

[ISO 26900:2012](https://standards.iteh.ai/ISO/8B6cd18-8355-4a14-8959-891a48dc29d4/ISO-26900-2012)

<https://standards.iteh.ai/catalog/standards/iso/8B6cd18-8355-4a14-8959-891a48dc29d4/ISO-26900-2012>

## RECOMMENDED STANDARD

**CCSDS 502.0-B-2**

**Note:**  
This current  
issue includes  
all updates through  
Technical Corrigendum 1,  
dated May 2012.

**BLUE BOOK**  
**November 2009**

iTeh Standards  
(<https://standards.iteh.ai>)  
(Blank page)  
Document Preview

ISO 26900:2012

<https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012>



## CCSDS RECOMMENDED STANDARD FOR ORBIT DATA MESSAGES

**AUTHORITY**

Issue:	Recommended Standard, Issue 2
Date:	November 2009
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  
Space Operations Mission Directorate  
NASA Headquarters  
Washington, DC 20546-0001, USA

<https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012>

## 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.

## CCSDS RECOMMENDED STANDARD FOR ORBIT DATA MESSAGES

**FOREWORD**

This document is a Recommended Standard for Orbit Data Messages (ODMs) and has been prepared by the Consultative Committee for Space Data Systems (CCSDS). The set of orbit data messages described in this Recommended Standard is the baseline concept for trajectory representation in data interchange applications that are cross-supported between Agencies of the CCSDS.

This Recommended Standard establishes a common framework and provides a common basis for the interchange of orbit data. It allows implementing organizations within each Agency to proceed coherently with the development of compatible derived standards for the flight and ground systems that are within their cognizance. Derived Agency standards may implement only a subset of the optional features allowed by the Recommended Standard and may incorporate features not addressed by this Recommended Standard.

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.

<https://standards.iteh.ai/>

<https://standards.iteh.ai/catalog/standards/iso/8f38edf8-8355-4af4-8959-89fa48de29d4/iso-26900-2012>

CCSDS RECOMMENDED STANDARD FOR ORBIT DATA MESSAGES

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

Member Agencies

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

Observer Agencies

- Austrian Space Agency (ASA)/Austria.
- Belgian Federal Science Policy Office (BFSPPO)/Belgium.
- Central Research Institute of Machine Building (TsNIIMash)/Russian Federation.
- Centro Tecnico Aeroespacial (CTA)/Brazil.
- 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.
- 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 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.

## CCSDS RECOMMENDED STANDARD FOR ORBIT DATA MESSAGES

## DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 502.0-B-1	Orbit Data Messages, Issue 1	September 2004	Original issue, superseded
CCSDS 502.0-B-2	Orbit Data Messages, Recommended Standard, Issue 2	November 2009	Current issue: – changes from the original issue are documented in annex E
EC 1	Editorial Change 1	April 2012	Corrects erroneous cross references and table of contents entries; corrects typographical anomaly in annex B; updates informative references [G1] and [G2] to current issues in annex G.
CCSDS 502.0-B-2 Cor. 1	Technical Corrigendum 1	May 2012	Corrects/clarifies text; updates references [1] and [4] to current issues in 1.7.

## CONTENTS

<u>Section</u>	<u>Page</u>
<b>1 INTRODUCTION</b>	<b>1-1</b>
1.1 PURPOSE AND SCOPE	1-1
1.2 APPLICABILITY	1-1
1.3 RATIONALE	1-2
1.4 DOCUMENT STRUCTURE	1-2
1.5 DEFINITIONS	1-3
1.6 NOMENCLATURE	1-3
1.7 REFERENCES	1-3
<b>2 OVERVIEW</b>	<b>2-1</b>
2.1 ORBIT DATA MESSAGE TYPES	2-1
2.2 ORBIT PARAMETER MESSAGE (OPM)	2-1
2.3 ORBIT MEAN-ELEMENTS MESSAGE (OMM)	2-1
2.4 ORBIT EPHEMERIS MESSAGE (OEM)	2-2
2.5 EXCHANGE OF MULTIPLE MESSAGES	2-2
2.6 DEFINITIONS	2-2
<b>3 ORBIT PARAMETER MESSAGE (OPM)</b>	<b>3-1</b>
3.1 GENERAL	3-1
3.2 OPM CONTENT/STRUCTURE	3-1
3.3 OPM EXAMPLES	3-7
<b>4 ORBIT MEAN-ELEMENTS MESSAGE (OMM)</b>	<b>4-1</b>
4.1 GENERAL	4-1
4.2 OMM CONTENT/STRUCTURE	4-2
4.3 OMM EXAMPLES	4-8
<b>5 ORBIT EPHEMERIS MESSAGE (OEM)</b>	<b>5-1</b>
5.1 GENERAL	5-1
5.2 OEM CONTENT/STRUCTURE	5-1
5.3 OEM EXAMPLES	5-7
<b>6 ORBIT DATA MESSAGE SYNTAX</b>	<b>6-1</b>
6.1 OVERVIEW	6-1
6.2 GENERAL	6-1
6.3 ODM LINES	6-1