EUROPEAN COOPERATION

ECSS

FOR SPACE STANDARDIZATION

Space engineering

Adoption Notice of CCSDS 232.1-B-2, Communications Operation Procedure-1

Foreword

This Adoption Notice is one document of the series of ECSS Standards intended to be applied together for the management, engineering, product assurance and sustainability in space projects and applications. ECSS is a cooperative effort of the European Space Agency, national space agencies and European industry associations for the purpose of developing and maintaining common standards. Requirements in this Standard are defined in terms of what shall be accomplished, rather than in terms of how to organize and perform the necessary work. This allows existing organizational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

This Adoption Notice has been prepared by the ECSS Space Communications Working Group, reviewed by the ECSS Executive Secretariat and approved by the ECSS Technical Authority.

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Change log

ECSS-E-AS-50-26C	First issue
1 March 2021	NOTE: This document, together with ECSS-E-AS-50-24C and ECSS-E-AS-50-25C, replace ECSS-E-ST-50-04C.

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Scope

This document identifies the clauses and requirements modified with respect to the standards CCSDS 232.1-B-2, *Communications Operation Procedure-1*, Issue 2, September 2010 for application in ECSS.

NOTE   The recently published technical corrigendum has modified CCSDS 232.1-B-2. However, the changes are not affecting the AS.

2
Context information

The standard CCSDS 232.1-B-2, *Communications Operation Procedure-1*, Issue 2, has been developed by CCSDS in support of CCSDS 232.0-B-3, *TC Space Data Link Protocol,* adopted by ECSS with ECSS-E-AS-50-25C.

In the standard CCSDS 232.0-B-3, *TC Space Data Link Protocol*, CCSDS specifies a data link layer protocol for the efficient transfer of space application data of various types and characteristics over ground-to-space links. The Communications Operation Procedure-1 (COP-1) specified in CCSDS 232.1-B-2 is used with the TC Space Data Link Protocol: it provides a mechanism for delivery of frames in sequence and without gaps or duplication.

With this Adoption Notice ECSS is adopting and applying CCSDS 232.1-B-2 with a minimum set of modifications, identified in the present document, to allow for reference and for a consistent integration in the ECSS system of standards.

The COP-1 protocol of CCSDS 232.1-B-2 was specified in clause 7 (COP-1) of ECSS-E-ST-50-04 *Space data links – Telecommand protocols synchronization and channel coding*, that is superseded by this Adoption Notice together with the following two Adoption Notices: ECSS-E-ST-50-24C and ECSS-E-AS-50-25C.

Differences between this Adoption Note and the relevant part of ECSS-E-ST-50-04 that are not covered by the normative modifications in clause 4 are described in the informative Annex A.

Overview of superseded ECSS-E-50-xx Standards

Superseded ECSS	ECSS Adopted Notice	Based on CCSDS
ECSS-E-ST-50-01C 31 July 2008	ECSS-E-AS-50-21C	CCSDS 131.0-B-3 (Sept. 2017)
ECSS-E-ST-50-03C 31 July 2008	ECSS-E-AS-50-22C	CCSDS 132.0-B-2 (Sept. 2015)
	ECSS-E-AS-50-23C	CCSDS 732.0-B-3 (August 2016)
ECSS-E-ST-50-04C 31 July 2008	ECSS-E-AS-50-24C	CCSDS 231.0-B-3 (Sept. 2017)
	ECSS-E-AS-50-25C	CCSDS 232.0-B-3 (Sept. 2015)
	ECSS-E-AS-50-26C	CCSDS 232.1-B-2 (Sept. 2010)

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Abbreviated terms

Abbreviation	Meaning
COP	Communications Operation Procedure
FARM	Frame Acceptance and Reporting Mechanism
FDU	Frame Data Unit
GVCID	Global Virtual Channel Identifier
SDLS	Space Data Link Security

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Application requirements

a. CCSDS 232.1-B-2, Communications Operation Procedure-1, Issue 2, September 2010 shall apply with the following modifications listed in Table 4-1.

Table 4-1: Applicability table for CCSDS 232.1-B-2

Clause or requirement number	Applicability	Applicable text (the new/added text is underlined)	Comments	Text as in the original document (deleted text with strikethrough)
3rd and 4th paragraphs of 3.3.2	Modified	When a Type-BD Transfer Frame is accepted by FARM-1, the FDU contained in the Transfer Frame shall be placed in a buffer for delivery to the Higher Procedures even if there is no buffer available, in which case the data in the buffer <u>is erased.</u> When a new FDU is accepted, FARM-1 shall send the following signal to the Higher Procedures to indicate the arrival of the new FDU: FDU Arrived Indication (GVCID<u>, FDU aborted indication</u>).	Requirements in 1st and 2nd paragraphs of 3.3.2 are not shown here and are unchanged. CCSDS requirement modified: words "will be erased and an optional 'Aborted Indication' signal may be sent to the Higher Procedures" deleted and replaced by words "is erased". Words "FDU aborted indication" added.	When a Type-BD Transfer Frame is accepted by FARM-1, the FDU contained in the Transfer Frame shall be placed in a buffer for delivery to the Higher Procedures even if there is no buffer available, in which case the data in the buffer ~~will be erased and an optional 'Aborted Indication' signal may be sent to the Higher Procedures~~. When a new FDU is accepted, FARM-1 shall send the following signal to the Higher Procedures to indicate the arrival of the new FDU: FDU Arrived Indication (GVCID).
new paragraph following 4th paragraph of 3.3.2	New requirement	The FDU aborted indication shall be used as follows: - the indication is set when a Type-BD Transfer Frame is accepted by FARM-1 and there is no buffer available; - the indication is otherwise not set.	New requirement added	

Note 2 in 3.3.2	Modified (NOTE)	When the FDU aborted indication is set, it informs the Higher Procedures that data in the buffer have been erased in favour of the newly arrived Type-BD Transfer Frame.	CCSDS NOTE modified for Type-BD Transfer Frame. New sentence added to replace the sentence "In addition to the 'FDU Arrived Indication', FARM-1 may optionally send a signal called 'Aborted Indication' to the Higher Procedures when data that were previously contained in a buffer have been erased in favour of the newly received FDU. This Recommended Standard does not specify how this signal is delivered." that has been deleted.	~~In addition to the 'FDU Arrived Indication', FARM-1 may optionally send a signal called 'Aborted Indication' to the Higher Procedures when data that were previously contained in a buffer have been erased in favour of the newly received FDU. This Recommended Standard does not specify how this signal is delivered.~~

Annex A (informative)
Differences from ECSS-E-ST-50-04C

A.1 General

Clause 4 of this document contains normative additions and modifications concerning some of the differences between CCSDS 232.1-B-2 and ECSS-E-ST-50-04 (superseded by this AS ECSS-E-AS-50-232.1-B-2). This Annex describes some additional differences that are not covered by Clause 4.

This Annex lists the differences of technical content, but it is not the purpose of this Annex to provide complete details on each item in the list or to describe the consequences of each item in the list.

A.2 Differences

A.2.1 FARM-1 with single back-end buffer

Clause 7 of ECSS-E-ST-50-04 had requirements for a FARM-1 implementation that provides only one back-end buffer for a virtual channel. This special case is not included in CCSDS 232.1-B-2.

Bibliography

ECSS-E-AS-50-21C   Space engineering - Adoption Notice of CCSDS 131.0-B-3,
                         TM Synchronization and Channel Coding

ECSS-E-AS-50-22C   Space engineering - Adoption Notice of CCSDS 132.0-B-2,
                         TM Space Data Link Protocol

ECSS-E-AS-50-23C   Space engineering -Adoption Notice of CCSDS 732.0-B-3,
                         AOS Space Data Link Protocol

ECSS-E-AS-50-24C   Space engineering - Adoption Notice of CCSDS 231.0-B-3,
                         TC Synchronization and Channel Coding

ECSS-E-AS-50-25C   Space engineering - Adoption Notice of CCSDS 232.0-B-3,
                         TC Space Data Link Protocol

ECSS-E-AS-50-26C   Space engineering - Adoption Notice of CCSDS 232.1-B-2,
                         Communications Operation Procedure-1

ECSS-E-ST-50-01C   Space engineering - Space data links - Telemetry synchronization
31 July 2008   and channel coding

ECSS-E-ST-50-03C   Space engineering - Space data links - Telemetry transfer frame
31 July 2008   protocol

ECSS-E-ST-50-04C   Space engineering - Space data links - Telecommand protocols
31 July 2008   synchronization and channel coding

CCSDS 230.1-G-2   TC Synchronization and Channel Coding, Summary of Concept and
                         Rationale – Green Book, Issue 2, November 2012