EUROPEAN COOPERATION

ECSS

FOR SPACE STANDARDIZATION

Space engineering

Adoption Notice of CCSDS 732.0-B-3, AOS Space Data Link Protocol

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-50-23C	First issue
1 March 2021	NOTE: This document, together with ECSS-E-AS-50-22C, replace ECSS-E-ST-50-03C.

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1
Scope

This document identifies the clauses and requirements modified with respect to the standard CCSDS 732.0-B-3, *AOS Space Data Link Protocol*, Issue 3, September 2015 for application in ECSS.

2
Context information

In the standard CCSDS 732.0-B-3 "AOS 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 space links. The protocol specified in CCSDS 732.0-B-3 "AOS Space Data Link Protocol" has a similar purpose as CCSDS 132.0-B-2 "TM Space Data Link Protocol" and supports some features not available in the TM Space Data Link Protocol.

With this Adoption Notice ECSS is adopting and applying CCSDS 732.0-B-3 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.

ECSS-E-ST-50-03C (31 July 2008) is superseded by the following two Adoption Notices: ECSS-E-AS-50-22C and ECSS-E-AS-50-23C. The ECSS standard ECSS-E-ST-50-03 was limited to the TM Transfer Frame: it did not include the AOS Transfer Frame.

Overview of superseded ECSS-E-50-xx Standards

Superseded ECSS	ECSS Adopted Notice	Based on CCSDS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)

3
Abbreviated terms

Abbreviation	Meaning
AOS	Advanced Orbiting Systems
SDLS	Space Data Link Security

4
Application requirements

a.   CCSDS 732.0-B-3, AOS Space Data Link Protocol, Issue 3, September 2015 shall apply with the following modifications listed in Table 4-1.

Table 4-1: Applicability table for CCSDS 732.0-B-3

Clause or requirement number	Applicability	Applicable text (the new/added text is underlined)	Comments	Text as in the original document (deleted text with strikethrough)
1.1	Modified (statement scope)	This protocol is a Data Link Layer protocol (see reference [1]) to be used over space-to-ground or space-to-space communications links by space missions.	Text of scope modified: change of scope. Words "ground to space" deleted	This protocol is a Data Link Layer protocol (see reference [1]) to be used over space-to-ground, ~~ground to space,~~ or space-to-space communications links by space missions.

Clause or requirement number	Applicability	Applicable text (the new/added text is underlined)	Comments	Text as in the original document (deleted text with strikethrough)
4.1.2.5.2	Modified	<u>The Replay Flag shall be set to '0'.</u>	CCSDS requirement modified restricted use of the Replay Flag. Sentense "Recognizing the need to store Transfer Frames during periods when the space link is unavailable, and to retrieve them for subsequent replay when the link is restored, this flag shall alert the receiver of the Transfer Frames with respect to its 'realtime' or 'replay' status. Its main purpose is to discriminate between realtime and replay Transfer Frames when they both may use the same Virtual Channel."	~~Recognizing the need to store Transfer Frames during periods when the space link is unavailable, and to retrieve them for subsequent replay when the link is restored, this flag shall alert the receiver of the Transfer Frames with respect to its 'realtime' or 'replay' status. Its main purpose is to discriminate between realtime and replay Transfer Frames when they both may use the same Virtual Channel.~~
4.1.2.5.2	New NOTE	NOTE – When the Replay Flag is '0' it indicates a Realtime Transfer Frame. CCSDS allows also the value '1' for this flag to indicate Replay Transfer Frames. ECSS does not allow this as there are alternative means of replaying Frames and there is an increase of complexity for processing at Receiving End.	New NOTE added.	
4.1.2.5.3	Deleted requirement		CCSDS requirement deleted.	~~The Replay Flag is interpreted as follows:~~ ~~a) '0' = Realtime Transfer Frame;~~ ~~b) '1' = Replay Transfer Frame.~~

Clause or requirement number	Applicability	Applicable text (the new/added text is underlined)	Comments	Text as in the original document (deleted text with strikethrough)
4.1.2.5.3	Deleted NOTES		CCSDS NOTES deleted.	~~NOTES~~ ~~1 Owing to the wide spectrum of onboard storage and retrieval technology options, the exact interpretation of this Flag is necessarily the subject of negotiation between projects and cross support organizations. For instance, it may be interpreted to indicate that the value of the Virtual Channel Frame Count field on the replayed VC decreases, rather than increases, as a function of reverse playback.~~ ~~2 If Transfer Frames are stored after encoding by the Channel Coding Sublayer, they must be re-encoded if the status of the Replay Flag is altered after retrieval.~~
4.1.2.6.1	Modified (renumbered NOTE)	<u>NOTE 1</u>	CCSDS NOTES modified: existing NOTE is given a number – the content of the NOTE is unchanged	~~NOTE~~

Clause or requirement number	Applicability	Applicable text (the new/added text is underlined)	Comments	Text as in the original document (deleted text with strikethrough)
4.1.2.6.1	New NOTE	NOTE 2 – The use of the Frame Header Error Control may be restricted to Physical Channels where the AOS Transfer Frames are not protected by an error-correcting code in the Synchronization and Channel Coding Sublayer. For example, if the frames are protected by e.g. a Reed-Solomon code, the use of the Frame Header Error Control brings no benefit and is strongly discouraged.	New NOTE added.	

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 31 July 2008	Space engineering - Space data links - Telemetry synchronization and channel coding
ECSS-E-ST-50-03C 31 July 2008	Space engineering - Space data links - Telemetry transfer frame protocol
ECSS-E-ST-50-04C 31 July 2008	Space engineering - Space data links - Telecommand protocols 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