



Space engineering

Adoption Notice of CCSDS 732.0-B-4, AOS Space Data Link Protocol

ECSS Secretariat
ESA-ESTEC
Requirements & Standards Section
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Foreword

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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 Rev.1 13 January 2023	First issue NOTE: This document, together with ECSS-E-AS-50-22C, replace ECSS-E-ST-50-03C.
ECSS-E-AS-50-23C Rev.1 13 January 2023	First issue, Revision 1 Changes with respect to ECSS-E-AS-50-23C (1 March 2021) are: Update of the ECSS Adoption Notice with respect to the new version of CCSDS Standard. This version: <ul style="list-style-type: none">• adds clarifications and support for Space Data Link Security Protocol Extended Procedures (CCSDS 355.1-B-1);• adds a protocol implementation conformance statement proforma as new normative Annex A;• adds only idle data frame randomization implementation options as new informative Annex D.

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1 Scope

This document identifies the clauses and requirements modified with respect to the standard CCSDS 732.0-B-4, *AOS Space Data Link Protocol, Issue 4, October 2021* for application in ECSS.

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Context information

In the standard CCSDS 732.0-B-4 “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-4 “AOS Space Data Link Protocol” has a similar purpose as CCSDS 132.0-B-3 “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-4 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ECSS-E-ST-50-03C *Space data links – Telemetry transfer frame protocol* (31 July 2008) is superseded by the following two Adoption Notices: ECSS-E-AS-50-22 and ECSS-E-AS-50-23 ([latest versions](#)). The ECSS standard ECSS-E-ST-50-03 was limited to the TM Transfer Frame: it did not include the AOS Transfer Frame.

[Mapping of superseded ECSS-E-50-xx Standards w.r.t. ECSS Adoption Notice versus CCSDS Standards.](#)

Superseded ECSS	ECSS Adopted Notice	Based on CCSDS
ECSS-E-ST-50-01C 31 July 2008	ECSS-E-AS-50-21	CCSDS 131.0-B-x
ECSS-E-ST-50-03C 31 July 2008	ECSS-E-AS-50-22	CCSDS 132.0-B-x
	ECSS-E-AS-50-23	CCSDS 732.0-B-x
ECSS-E-ST-50-04C 31 July 2008	ECSS-E-AS-50-24	CCSDS 231.0-B-x
	ECSS-E-AS-50-25	CCSDS 232.0-B-x
	ECSS-E-AS-50-26	CCSDS 232.1-B-x
NOTE: The applicable CCSDS Standard referred to by the ECSS Adoption Notice is stated per latest version of the ECSS Adoption Notice.		

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Abbreviated terms

Abbreviation	Meaning
AOS	Advanced Orbiting Systems
SDLS	Space Data Link Security

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Application requirements

ECSS-E-AS-50-23_1540001

- a. CCSDS 732.0-B-4, AOS Space Data Link Protocol, [Issue 4, October 2021](#) shall apply with the following [amendments](#) listed in Table 4-1.

ECSS-E-AS-50-23_1540002

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

Clause or requirement number	Applicability	Applicable text for ECSS (the new/added text is underlined)	Comments	Text as in the original CCSDS 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. Sentence "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	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

Clause or requirement number	Applicability	Applicable text for ECSS (the new/added text is underlined)	Comments	Text as in the original CCSDS document (deleted text with strikethrough)
			purpose is to discriminate between realtime and replay Transfer Frames when they both may use the same Virtual Channel."	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.
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;

Clause or requirement number	Applicability	Applicable text for ECSS (the new/added text is underlined)	Comments	Text as in the original CCSDS document (deleted text with strikethrough)
				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
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 Rev.1	Space engineering - Adoption Notice of CCSDS 131.0-B-4, TM Synchronization and Channel Coding
ECSS-E-AS-50-22C Rev.1	Space engineering - Adoption Notice of CCSDS 132.0-B-3, TM Space Data Link Protocol
ECSS-E-AS-50-23C Rev.1	Space engineering - Adoption Notice of CCSDS 732.0-B-4, AOS Space Data Link Protocol
ECSS-E-AS-50-24C Rev.1	Space engineering - Adoption Notice of CCSDS 231.0-B-4, TC Synchronization and Channel Coding
ECSS-E-AS-50-25C Rev.1	Space engineering - Adoption Notice of CCSDS 232.0-B-4, 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 132.0-B-3	TM Space Data Link Protocol – Blue Book, Issue 3, October 2021