

**ECSS Secretariat**

**ESA-ESTEC**

**Requirements & Standards Division**

**Noordwijk, The Netherlands**

Adoption Notice of CCSDS 132.0-B-2, TM Space Data Link Protocol

**Foreword**

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

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Change log

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

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# Scope

This document identifies the clauses and requirements modified with respect to the standard CCSDS 132.0-B-2, *TM Space Data Link Protocol*, Issue 2, September 2015, for application in ECSS.

# Context information

In the standard CCSDS 132.0-B-2, *TM 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.

With this Adoption Notice ECSS is adopting and applying CCSDS 132.0-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 TM Transfer Frame specified in CCSDS 132.0-B-2 is similar to the TM Transfer Frame specified in the ECSS standard ECSS-E-ST-50-03C *Space data links – Telemetry transfer frame protocol* (31 July 2008), that is superseded by the following two Adoption Notices: ECSS-E-AS-50-22C and ECSS-E-AS-50-23C.

Differences between these two standards 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Overview of superseded ECSS-E-50-xx Standards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| Superseded ECSS | ECSS Adopted Notice | Based on CCSDS |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) |

# Abbreviated terms

|  |  |
| --- | --- |
| Abbreviation | Meaning |
| AOS | Advanced Orbiting Systems |
| SDLS | Space Data Link Security |

# Application requirements

CCSDS 132.0-B-2, TM Space Data Link Protocol, Issue 2, September 2015 shall apply with the following modifications listed in Table 4‑1.

Table ‑: Applicability table for CCSDS 132.0-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) |
| --- | --- | --- | --- | --- |
| 4.1.3.1.7 | New requirement | The Transfer Frame Secondary Header may be used to provide an extended virtual channel frame count as specified in 4.1.3.4. | New requirement added: the extended virtual channel frame count added |  |
| 4.1.3.4 | New section | Extended virtual channel frame count | New section added |  |
| 4.1.3.4.1 | New section | General  The following requirements apply if the Transfer Frame Secondary Header is used to provide an extended virtual channel frame count, see 4.1.3.1.7. |  |  |
| 4.1.3.4.2 | New section | Using the extended virtual channel frame count |  |  |
| 4.1.3.4.2.1 | New requirement | The length of the Transfer Frame Secondary Header shall be 32 bits.  NOTE The Transfer Frame Secondary Header has a length of 4 octets, so the Transfer Frame Secondary Header Length contains the value 3. |  |  |
| 4.1.3.4.2.2 | New requirement | The Transfer Frame Secondary Header Data Field shall contain the 24-bit extension to the virtual channel frame count. |  |  |
| 4.1.3.4.2.3 | New requirement | The extension to the virtual channel frame count shall be a binary count of the roll-overs of the 8-bit value contained in the Virtual Channel Frame Count in the Transfer Frame Primary Header.  NOTE This provides a 32-bit count, with the most significant 24 bits in the Transfer Frame Secondary Header Data Field and the least significant 8 bits in the Virtual Channel Frame Count. |  |  |
| 4.1.3.4.2.4 | New requirement | The use of the extended virtual channel frame count shall be associated with either a master channel or a virtual channel.  NOTE 1 If the extended virtual channel frame count is associated with a master channel, then the Transfer Frame Secondary Header of every frame on the master channel contains the extended count. However, the value of the extended count in a given frame is the value for the virtual channel to which the frame belongs.  NOTE 2 If the extended virtual channel frame count is associated with a virtual channel, then the Transfer Frame Secondary Headers of other virtual channels can be absent or used for other purposes. |  |  |
| 4.1.3.4.2.5 | New requirement | The use of the extended virtual channel frame count shall be static in the associated master channel or in the associated virtual channel throughout a mission phase. |  |  |

1. (informative)  
   Differences from ECSS-E-ST-50-03C
   1. General

Clause 4 of this document contains normative additions and modifications concerning some of the differences between CCSDS 132.0-B-2 and the ECSS-E-ST-50-03 (superseded by this Adoption Notice). 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.

* 1. Differences
     1. Specification of service interfaces

Section 3 of CCSDS 132.0-B-2 provides a formal abstract specification of a set of service interfaces, including service primitives and parameters, provided by the TM Space Data Link Protocol. There was no equivalent in ECSS-E-ST-50-03.

* + 1. Specification of protocol procedures

Sections 4.2 and 4.3 of CCSDS 132.0-B-2 specify protocol procedures at the sending and receiving ends. ECSS-E-ST-50-03 specified only the packet processing and extraction functions.

* + 1. Interfaces for Space Data Link Security (SDLS)

CCSDS 132.0-B-2 specifies the optional interfaces for using the Space Data Link Security (SDLS) protocol with TM Transfer Frames. ECSS-E-ST-50-03 did not include support for interfacing to SDLS. Therefore, this Adoption Notice – unlike the ECSS-E-ST-50-03 - offers to ECSS users the option of using the Space Data Link Security (SDLS) protocol with TM and AOS Transfer Frames.A.2.4 Resetting a frame count.

A TM Transfer Frame has a Master Channel Frame Count and a Virtual Channel Frame Count. They are 8-bit fields, each containing a sequential binary count (modulo 256). Both standards have requirements about not resetting one of these counts before it reaches 255. In CCSDS 132.0-B-2 the wording is “*not … unless it is unavoidable”*. In ECSS-E-ST-50-03 the wording was “*not … unless there is a major system reset”*.

* + 1. Synchronization Flag and asynchronously inserted data

In CCSDS 132.0-B-2, if the Synchronization Flag is ‘1’ then the frame carries a VCA-SDU: this relates to the formal definition of the Virtual Channel Access Service (see A.2.1 above). ECSS-E-ST-50-03 specified that the Synchronization Flag is ‘1’ whenever the frame does not satisfy the conditions for the flag to be ‘0’. For legacy reasons, ECSS-E-ST-50-03 included the specification of frames with Synchronization Flag ‘1’ to carry asynchronously inserted data.

* + 1. Managed parameters

Sections 5 and 6.6 of CCSDS 132.0-B-2 have a normative specification of the managed parameters used by the TM Space Data Link Protocol. Annex D of ECSS-E-ST-50-03 had an informative specification, and referred to the parameters as mission configuration parameters.

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 |