

Recommendation for Space Data System Standards

SPACE LINK IDENTIFIERS

RECOMMENDED STANDARD

CCSDS 135.0-B-2

BLUE BOOK
November 2005

AUTHORITY

Issue:	Recommended Standard, Issue 2
Date:	November 2005
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 Recommendations 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 Recommendation is published and maintained by:

CCSDS Secretariat
Office of Space Communication (Code M-3)
National Aeronautics and Space Administration
Washington, DC 20546, USA

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FOREWORD

This document is a technical Recommendation for use in developing flight and ground systems for space missions and has been prepared by the Consultative Committee for Space Data Systems (CCSDS).

This Recommendation documents the identifiers used by the space link protocols developed by CCSDS, shows how these identifiers are managed, and lists the identifiers that are defined or reserved by CCSDS as part of the specification of the space link protocols.

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- Swedish Space Corporation (SSC)/Sweden.
- United States Geological Survey (USGS)/USA.

DOCUMENT CONTROL

Document	Title and Issue	Date	Status
CCSDS 135.0-B-1	Space Link Identifiers, Issue 1	January 2002	Original issue (superseded)
CCSDS 135.0-B-2	Space Link Identifiers, Recommended Standard, Issue 2	November 2005	Current issue

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1 INTRODUCTION

1.1 PURPOSE

The purpose of this Recommendation is to document the identifiers used by the space link protocols developed by CCSDS, to show how these identifiers are managed, and to list the identifiers that are defined or reserved by CCSDS as part of the specification of the space link protocols.

1.2 SCOPE

This Recommendation documents the identifiers currently used by the space link protocols and shows how these identifiers are managed at the CCSDS level. It does not specify how these identifiers are managed in individual data systems of space projects.

1.3 APPLICABILITY

This Recommendation constitutes provisions of the CCSDS Recommendations that refer to this Recommendation as a normative reference, to the extent that is specified in those Recommendations.

1.4 RATIONALE

The goal of this Recommendation is to enable management of identifiers used by the space link protocols independently of management of protocol specifications themselves.

1.5 DOCUMENT STRUCTURE

This document is divided into seven numbered sections and four annexes:

- a) section 1 presents the purpose, scope, applicability and rationale of this Recommendation and lists the definitions and references used throughout the document;
- b) section 2 summarizes the methods used for managing space link identifiers;
- c) sections 3 through 7 list the identifiers used by each of the space link protocols, show how these identifiers are managed, and list the identifiers that are defined or reserved by CCSDS;
- d) annex A lists all acronyms used within this document;
- e) annex B provides a list of informative references;
- f) annex C summarizes the location of the length field of the packets for which Packet Version Numbers are defined by CCSDS.

1.6 DEFINITIONS

For the purposes of this Recommendation, the following definitions apply. Many other terms that pertain to specific items are defined in the appropriate sections.

Assigned by CCSDS: values of the identifier are assigned by CCSDS upon request by Agencies.

Defined by CCSDS: values of the identifier are defined by CCSDS as part of the specification of protocol.

Managed by projects: values of the identifier are managed independently by the projects that use the protocol.

space link: a communications link between a spacecraft and its associated ground system, or between two spacecraft.

space link protocol: a communications protocol designed to be used over a space link (see above). A space link protocol is not necessarily a protocol of the Data Link Layer of the OSI Basic Reference Model (reference [1]).

1.7 REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All documents are subject to revision, and users of this Recommendation are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. The CCSDS Secretariat maintains a register of currently valid CCSDS Recommendations.

- [1] *Information Technology—Open Systems Interconnection—Basic Reference Model: The Basic Model*. International Standard, ISO/IEC 7498-1. 2nd ed. Geneva: ISO, 1994.
- [2] *Lossless Data Compression*. Recommendation for Space Data Systems Standards, CCSDS 121.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, May 1997.
- [3] *Space Communications Protocol Specification—File Protocol (SCPS-FP)*. Recommendation for Space Data Systems Standards, CCSDS 717.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, May 1999.
- [4] *CCSDS File Delivery Protocol (CFDP)*. Recommendation for Space Data System Standards, CCSDS 727.0-B-3. Blue Book. Issue 3. Washington, D.C.: CCSDS, June 2005.
- [5] *Space Communications Protocol Specification—Transport Protocol (SCPS-TP)*. Recommendation for Space Data Systems Standards, CCSDS 714.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, May 1999.

- [6] *Space Packet Protocol*. Recommendation for Space Data System Standards, CCSDS 133.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2003.
- [7] *Space Communications Protocol Specification—Network Protocol (SCPS-NP)*. Recommendation for Space Data Systems Standards, CCSDS 713.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, May 1999.
- [8] *TM Space Data Link Protocol*. Recommendation for Space Data System Standards, CCSDS 132.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2003.
- [9] *TC Space Data Link Protocol*. Recommendation for Space Data System Standards, CCSDS 232.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2003.
- [10] *AOS Space Data Link Protocol*. Recommendation for Space Data System Standards, CCSDS 732.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2003.
- [11] *Proximity-1 Space Link Protocol—Data Link Layer*. Recommendation for Space Data System Standards, CCSDS 211.0-B-3. Blue Book. Issue 3. Washington, D.C.: CCSDS, May 2004.
- [12] *CCSDS Global Spacecraft Identification Field Code Assignment Control Procedures*. Recommendation for Space Data System Standards, CCSDS 320.0-B-3. Blue Book. Issue 3. Washington, D.C.: CCSDS, April 2003.
- [13] *Encapsulation Service*. Draft Recommendation for Space Data System Standards, CCSDS 133.1-R-4. Red Book. Issue 4. Washington, D.C.: CCSDS, September 2005.
- [14] *TM Synchronization and Channel Coding*. Recommendation for Space Data System Standards, CCSDS 131.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2003.
- [15] *TC Synchronization and Channel Coding*. Recommendation for Space Data System Standards, CCSDS 231.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2003.
- [16] *Information Technology—Protocol for Providing the Connectionless-Mode Network Service: Protocol Specification*. International Standard, ISO/IEC 8473-1:1998. 2nd ed. Geneva: ISO, 1998.
- [17] J. Postel. *Internet Protocol*. STD 5, September 1981. [RFC 791, RFC 950, RFC 919, RFC 922, RFC 792, RFC 1112]¹

¹ Internet Request for Comments (RFC) texts are available on line in various locations (e.g., <http://ietf.org/rfc/>); Internet standards are made up of one or more RFCs, which are identified in square brackets following the entry.

- [18] S. Deering and R. Hinden. *Internet Protocol, Version 6 (IPv6) Specification*. Draft Internet Standard, December 1998. [RFC 2460]

NOTE – Informative references are listed in annex B.

2 MANAGEMENT OF SPACE LINK IDENTIFIERS

2.1 GENERAL

The space link protocols developed by CCSDS use identifiers to identify protocols, addresses, and data formats. Even though some of these identifiers are defined in the Recommendations that specify the protocols, management of identifiers should be performed independently of management of protocol specifications so that values of the identifiers can be defined (or re-defined) without changing the protocol specifications themselves.

With the aim described above, this document lists the identifiers currently used by the space link protocols developed by CCSDS, shows how these identifiers are managed, and lists the identifiers that are defined or reserved by CCSDS as part of the specification of the space link protocols.

NOTE – Since no identifier is used by the following CCSDS space link protocols, these protocols are not included in the following sections.

- a) Lossless Data Compression (reference [2]);
- b) SCPS-FP (reference [3]);
- c) TM Synchronization and Channel Coding (reference [14]);
- d) TC Synchronization and Channel Coding (reference [15]).

Each identifier is managed by one of the three methods listed below depending on its characteristics:

- a) defined by CCSDS as part of protocol specification;
- b) assigned by CCSDS upon request by Agencies;
- c) managed by individual projects.

The following subsections briefly describe these management methods.

2.2 IDENTIFIERS DEFINED BY CCSDS

The values of some identifiers are defined by CCSDS as part of the specification of protocols. This method for managing identifiers is denoted ‘Defined by CCSDS’ in this document.

The values of the identifiers of this category that are currently defined by CCSDS are listed in the following sections of this document.

2.3 IDENTIFIERS ASSIGNED BY CCSDS

The values of some identifiers are assigned by CCSDS upon request by Agencies. This method for managing identifiers is denoted 'Assigned by CCSDS' in this document.

The procedure for assigning values of each of the identifiers of this category is defined by a separate CCSDS Recommendation, which is referred to in the following sections of this document.

2.4 IDENTIFIERS MANAGED BY INDIVIDUAL PROJECTS

The values of some identifiers are managed independently by the projects that use the protocols. CCSDS does not specify how to manage these identifiers. This method for managing identifiers is denoted 'Managed by projects' in this document.

Some values of the identifiers in this category may be reserved by CCSDS to be used for some specific purposes across Agencies. The values of the identifiers reserved by CCSDS are listed in the following sections of this document.

3 IDENTIFIERS USED BY CCSDS FILE DELIVERY PROTOCOL (CFDP)

Table 3-1 shows the identifier used by the CCSDS File Delivery Protocol (CFDP) (reference [4]) and how it is managed.

Table 3-1: Identifier Used by CCSDS File Delivery Protocol

Identifier	Management Method	Note
Entity ID	Managed by projects	No value is reserved

4 IDENTIFIERS USED BY SCPS-TP

Table 4-1 shows the identifier used by SCPS-TP (reference [5]) and how it is managed.

Table 4-1: Identifier Used by SCPS-TP

Identifier	Management Method	Note
Connection Identifier	Managed by projects	No value is reserved

5 IDENTIFIERS USED BY SPACE PACKET PROTOCOL

5.1 APPLICATION PROCESS IDENTIFIER

Table 5-1 shows the identifier used by the Space Packet Protocol (reference [6]) and how it is managed.

Table 5-1: Identifier Used by Space Packet Protocol

Identifier	Management Method	Note
Application Process Identifier (APID)	Managed by projects	See 5.2 for reserved values

5.2 RESERVED APPLICATION PROCESS IDENTIFIERS

Some values of the Application Process Identifier (APID) defined by the Space Packet Protocol (reference [6]) are reserved by CCSDS for special uses. Table 5-2 lists the APIDs currently reserved by CCSDS.

Table 5-2: Reserved Application Process Identifiers

APID (decimal)	Utilization	Reference
2040 - 2044	Reserved for possible future use	
2045	CFDP	[4]
2046	ISO 8473	[16]
2047	Idle Packet	[6]

6 IDENTIFIERS USED BY SCPS-NP

Table 6-1 shows the identifiers used by SCPS-NP (reference [7]) and how they are managed.

Table 6-1: Identifiers Used by SCPS-NP

Identifier	Management Method	Note
Domain Identifier (D-ID)	Assigned by CCSDS	See NOTE below the table
End System Identifier (ES-ID)	Managed by projects	No value is reserved
Path Identifier (P-ID)	Managed by projects	No value is reserved
Transport Protocol Identifier (TP-ID)	Defined by CCSDS	See table 3-2 of reference [7] for defined values

NOTE – No procedure is defined for assigning values of the Domain Identifier. If SCPS-NP is intended to be used globally, one must be developed.

7 IDENTIFIERS USED BY SPACE DATA LINK PROTOCOLS

7.1 GENERAL

Table 7-1 shows the identifiers used by the Space Data Link Protocols (references [8]-[10]) and Proximity-1 Space Link Protocol (reference [11]), and how they are managed.

Table 7-1: Identifiers Used by Space Data Link Protocols

Identifier	Used by	Management Method	Note
Transfer Frame Version Number	TM [8], TC [9], AOS [10], Prox [11]	Defined by CCSDS	See 7.2 for defined values
Spacecraft Identifier (SCID)	TM [8], TC [9], AOS [10], Prox [11]	Assigned by CCSDS	See reference [12] for assignment procedure
Virtual Channel Identifier (VCID)	TM [8], TC [9], AOS [10], Prox [11]	Managed by projects	See 7.3 for reserved values
Frame Secondary Header Version Number	TM [8]	Defined by CCSDS	See 7.4 for defined values
MAP Identifier (MAP ID)	TC [9]	Managed by projects	No value is reserved
Port Identifier (Port ID)	Prox [11]	Managed by projects	No value is reserved
CLCW Version Number	TC [9]	Defined by CCSDS	See 7.5 for defined values
Packet Version Number	TM [8], TC [9], AOS [10], Prox [11]	Defined by CCSDS	See 7.6 for defined values
Protocol Identifier	Encapsulation Packet [13]	Defined by CCSDS	See 7.7 for defined values

7.2 DEFINED TRANSFER FRAME VERSION NUMBERS

In the Transfer Frames defined by the Space Data Link Protocols (references [8]-[10]) and Proximity-1 Space Link Protocol (reference [11]), there is a field called the Transfer Frame Version Number to identify the Transfer Frame. This is a two-bit field and its values are defined by CCSDS as part of the protocol specifications.

Table 7-2 lists the Transfer Frame Version Numbers currently defined by CCSDS.

Table 7-2: Defined Transfer Frame Version Numbers

Version Number	Binary Encoded Version Number	Transfer Frame	Reference
1	00	TM Transfer Frame	[8]
1	00	TC Transfer Frame	[9]
2	01	AOS Transfer Frame	[10]
3	10	Version 3 Transfer Frame	[11]

NOTES

- 1 Version Number '1' is assigned to both TM Transfer Frame and TC Transfer Frame. These two Transfer Frames are distinguished by the Attached Sync Marker defined in reference [14] or the Start Sequence defined in reference [15].
- 2 In the field of Transfer Frame Version Number in the Transfer Frames, the Binary Encoded Version Number listed above must be used.

7.3 RESERVED VIRTUAL CHANNEL IDENTIFIERS

A value of the Virtual Channel Identifier (VCID) is reserved by CCSDS for special use in the AOS Space Data Link Protocol (reference [10]). Table 7-3 lists the VCID currently reserved by CCSDS.

No value of VCID is reserved by CCSDS for the other Space Data Link Protocols.

Table 7-3: Reserved Virtual Channel Identifiers (AOS Space Data Link Protocol Only)

VCID (binary)	Utilization	Reference
111111	Idle Transfer Frames	[10]

7.4 DEFINED FRAME SECONDARY HEADER VERSION NUMBERS

In the optional Transfer Frame Secondary Header defined by the TM Space Data Link Protocol (reference [8]), there is a field called the Frame Secondary Header Version Number to identify the Transfer Frame Secondary Header. This is a two-bit field and its values are defined by CCSDS as part of the protocol specification.

Table 7-4 lists the Frame Secondary Header Version Number currently defined by CCSDS.

Table 7-4: Defined Frame Secondary Header Version Numbers

Version Number	Binary Encoded Version Number	Frame Secondary Header	Reference
1	00	Version 1 Frame Secondary Header	[8]

NOTE – In the field of Frame Secondary Header Version Number in the Transfer Frame Secondary Header, the Binary Encoded Version Number listed above must be used.

7.5 DEFINED CLCW VERSION NUMBERS

In the CLCW defined by the TC Space Data Link Protocol (reference [9]), there is a field called the CLCW Version Number to identify the CLCW. This is a two-bit field and its values are defined by CCSDS as part of the protocol specification.

Table 7-5 lists the CLCW Version Number currently defined by CCSDS.

Table 7-5: Defined CLCW Version Numbers

Version Number	Binary Encoded Version Number	CLCW	Reference
1	00	Version 1 CLCW	[9]

NOTE – In the field of CLCW Version Number in the CLCW, the Binary Encoded Version Number listed above must be used.

7.6 DEFINED PACKET VERSION NUMBERS

In the Packets carried by the Space Data Link Protocols, there is a field called the Packet Version Number to identify the Packets. This is a three-bit field (see NOTE 2 below) and its values are defined by CCSDS as part of the protocol specifications.

Table 7-6 lists the Packet Version Numbers currently defined by CCSDS.

Table 7-6: Defined Packet Version Numbers

Version Number	Binary Encoded Version Number	Packet	Reference
1	000	Space Packet	[6]
2	001	SCPS-NP	[7]
3	010 (See NOTE 2 below)	IP Version 4 Datagram	[17]
8	111	Encapsulation Packet	[13]

NOTES

- 1 In the field of Packet Version Number in the Packets, the Binary Encoded Version Number listed above must be used.
- 2 The version number field of the IP version 4 Packet has four bits and contains the binary values of '0100'. However, the CCSDS Space Data Link Protocols recognize only the first three bits of this field as the Packet Version Number.

7.7 DEFINED PROTOCOL IDENTIFIERS

The Encapsulation Packet (reference [13]) is a data structure to encapsulate data units of some protocols so that they can be carried by a CCSDS Space Data Link Protocol. In the Encapsulation Packet, there is a field called the Protocol Identifier to identify the protocol whose data units are encapsulated. This is a three-bit field and its values are defined by CCSDS as part of the specification of the Encapsulation Packet.

Table 7-6 lists the Protocol Identifiers currently defined by CCSDS.

Table 7-7: Defined Protocol Identifiers

Protocol Identifier (binary)	Protocol	Reference
000	Fill (no encapsulation data)	N/A
100	IP Version 6	[18]
111	Arbitrary Aggregations of Octets	N/A

7.8 RESERVED PROXIMITY-1 PORT IDENTIFIERS

The Proximity-1 Port Identifier (reference [11]) provides the means to route user data internally (at the transceiver's output interface) to specific logical ports, such as applications or transport processes, or to physical ports, such as on-board buses or physical connections (including hardware command decoders) on either the forward and/or return proximity links.

Table 7-8a: Proximity-1 Port ID Assignments for the Forward Link for Both Physical Channels

Port Identifier (binary)	Usage	Reference
000	Bitstream	N/A
001	Hardware Commands	N/A
010	Space Packets	[6]
011	Reserved by CCSDS	N/A
100	Reserved by CCSDS	N/A
101	Reserved by CCSDS	N/A
110	Reserved by CCSDS	N/A
111	Reserved by CCSDS	N/A

Table 7-8b: Proximity-1 Port ID Assignments for the Return Link for Both Physical Channels

Port Identifier (binary)	Usage	Reference
000	Bitstream	N/A
001	Reserved by CCSDS	N/A
010	Space Packets	[6]
011	Reserved by CCSDS	N/A
100	Reserved by CCSDS	N/A
101	Reserved by CCSDS	N/A
110	Reserved by CCSDS	N/A
111	Reserved by CCSDS	N/A

ANNEX A

ACRONYMS

(This annex **is not** part of the Recommendation)

This annex lists the acronyms used in this Recommendation.

AOS	Advanced Orbiting Systems
APID	Application Process Identifier
CCSDS	Consultative Committee for Space Data Systems
CFDP	CCSDS File Delivery Protocol
CLCW	Communications Link Control Word
D-ID	Domain Identifier
ES-ID	End System Identifier
ID	Identifier
IP	Internet Protocol
ISO	International Organization for Standardization
MAP	Multiplexer Access Point
N/A	Not Applicable
P-ID	Path Identifier
Prox	Proximity-1 Space Link Protocol
SCID	Spacecraft Identifier
SCPS	Space Communications Protocol Standards
SCPS-FP	Space Communications Protocol Standards File Protocol
SCPS-NP	Space Communications Protocol Standards Network Protocol
SCPS-SP	Space Communications Protocol Standards Security Protocol
SCPS-TP	Space Communications Protocol Standards Transport Protocol
TC	Telecommand
TM	Telemetry
TP-ID	Transport Protocol Identifier
VC	Virtual Channel
VCID	Virtual Channel Identifier

ANNEX B

INFORMATIVE REFERENCES

(This annex **is not** part of the Recommendation)

[B1] *Procedures Manual for the Consultative Committee for Space Data Systems*. CCSDS A00.0-Y-9. Yellow Book. Issue 9. Washington, D.C.: CCSDS, November 2003.

NOTE – Normative references are listed in 1.7.

ANNEX C

LOCATION OF PACKET LENGTH FIELD

(This annex **is not** part of the Recommendation)

Table C-1 summarizes the location of the length field of Packets for which Packet Version Numbers are defined by CCSDS.

NOTE – This information is used by the Space Data Link Protocols (reference [8]-[10]) and Proximity-1 Space Link protocol (reference [11]) to extract Packets from the Data Field of Transfer Frames.

Table C-1: Location of Packet Length Field

Version Number	Binary Encoded Version Number	Packet	Location of Length Field (See NOTE)	Interpretation of Length	Reference
1	000	Space Packet	32-47	Binary count of number of octets in Packet Data Field minus 1. Must add 7 to get full packet length.	[6]
2	001	SCPS-NP	3-16	Binary count of total octets in Packet, including header. Shortest legal length is 4 (= 4 octets).	[7]
3	010	IP version 4	16-31	Binary count of total octets in Packet, including header.	[17]
8	111	Encapsulation Packet	8-15, 8-23, or 8-39	Binary count of total octets in Packet, including header.	[13]

NOTE – Counted in bits, from beginning of packet; first bit is numbered zero.