0171-Telecomm-NJPL

JPL created SFDU structures

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Change Log

Revision	Issue Date	Sections Affected	Change Summary
Initial release	July 20, 1988	All	
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Old AMMOS Change Log

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* 09-28-87  *  All      * Draft     *     *           *            *         *
* 11-20-87  *  All      * Draft #2  *     *           *            *         *
* 12-16-87  *  All      * Prelim.   *     *           *            *         *
* 05-09-88  *  All      * Prelim. #2 *    *02-03-92   *App. Docs., *Rev. 08  *
*           *           *           *     *           *Appendix A  *         *
* 07-20-88  *  All      * Final     *     *           *            *         *
*           *           *CR 1837    *     *05-26-92   *App. Docs.  *Rev. 09  *
*           *           *CR 1838    *     *           *Appendices  *CR 3401  *
*           *           *           *     *           *A, B, C, E  *CR 3689  *
* 05-31-89  *Pp.4-4,4-17* Rev. 02   *     *           *    V18 BASELINE      *
*           * 4-18,4-19 * CR 2085   *     *           *            *         *
*           *           *           *     *01-15-92   *            * Rev. 10 *
*           *           *           *     *           * V18 Baseline CR 3779 *
* 06-15-90  *Appendix A * Rev. 03   *     *           *            *         *
*           *           * CR 2567   *     *01-01-93   * Cvr, header* Rev. 11 *
*           *  V14 Baseline         *     *           * Pg. E-2    *         *
*           *           *           *     *           * Mars Observer Only   *
* 08-07-90  *    Review version     *     *           * V17 Baseline         *
*           * V14 Baseline          *     *           *            *         *
*           *           *           *     *03-11-93   * Appendices * Rev. 12 *
* 12-19-90  *All        * Rev. 04   *     *           * A thru E   *         *
*           *           *           *     *           * V18 Baseline         *
* 02-26-91  *All        * Rev. 05   *     *           *            *         *
*           *           * CR 3078   *     *07-21-93   * Appendices * Rev. 13 *
*           * V16 Baseline          *     *           * B and F    *         *
*           *           *           *     *           *            *         *
* 05-22-91  * All       * Rev. 06   *     *01-07-94   * Cover page * Rev. 14 *
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*           *             CR 3093   *   *           * Appendices *          *
*           * V16 Baseline          *   *           * A, B, & F  *          *
*           *             *         *   *           * Pgs. 4-13 and 4-14    *
* 07-10-91  * All         * Rev. 07 *   *           * App. Docs  *          *
*           * V17 Baseline          *   *03-10-94   * CR 4432    * Rev. 15 *
* 08-20-91  * 4.2.2.3.1 * Change    *   *           *           *          *
*           * 4.2.2.3.2 * CR 3221   *   *05-02-94   * Appendix C * Rev. 16 *
*           * Appendix E*           *   *           *           *          *
*           * TBD, pg.ii*           *   *05-24-94   * App.B,F&G  * Rev. 17 *
*           *V17 Baseline           *   *           V19-V20 Baseline        *
*           *           *           *   *11-30-94   * App. B&G   *Rev. 18  *
*           *           *           *   *  T4 SFOC0038-18-00-05 V19/V20     *
*           *           *           *   *           *           *          *
*           *           *           *   *09-11-96   *App.B,G,H   *Rev. 19  *
*           *           *           *   *           * I,J,K,L    *          *
*           *           *           *   *           *4-8,12,13,16*          *
*           *           *           *   *   SFOC0038-19-00-05  V22 BASELINE *
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Contents

Figures

Tables

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Section 1
Introduction

1.1 Purpose, Scope and Usage

The purpose of this document is to control all CCSDS-compliant (Consultative Committee on Space Data Systems) SFDU (Standard Formatted Data Unit) structures created at JPL. The CCSDS reference document [3] describes the rules for constructing SFDUs. This document will not duplicate that description. This document will contain, in separate sub-modules, the DDP identifiers for all SFDUs created by the DSMS (Deep Space Mission Systems) area of JPL. This document should be used to find DDP identifiers for new SFDUs, and given a DDP identifier, to find the corresponding SFDU.

This SIS module is the controlling document for SFDU Data Description Package ID (ddp_id) and CHDO (Compressed Header Data Object) assignment codes in DSN and AMMOS (Advanced Multi-Mission Operations System).

One sub-module, 0171-Telecomm-DDP, contains the DDP identifiers for all non-CHDO-structured SFDUs. The 0171-Telecomm-DDP sub-module is a spreadsheet. The information contained in this spreadsheet is required and identified by the CCSDS Blue Book 630.0-B-1, "Standard Formatted Data Units - Control Authority Procedures".

All other sub-modules of this document contain multiple SFDU identifiers (including DDP) for all CHDO-structured SFDUs for one mission or adaptation, one mission per sub-module. For a description of CHDO structured (binary structure specific to JPL) SFDUs, see reference document [5].

1.2 Applicability of This Release

This is the first release of this document in this form. This release creates this document from the former AMMOS SIS (Software Interface Specification) "SFOC-5-SYS-*DU-NJPL". This release is the first release to incorporate the Excel spreadsheet maintained by the JPL CCSDS Control Authority. That spreadsheet is now provided as a separate sub-module to this module, called 0171-Telecomm-DDP. The spreadsheet provides a current listing of all Data Description Package Identifiers (DDP ID) assignments, by the JPL CCSDS Control Authority, that are not included in the mission-specific CHDO-structured SFDUs. The spreadsheet is maintained on-line, under the 820-013, 0171-Telecomm-NJPL module, from URL http://jaguar.jpl.nasa.gov".

The main module of 0171-Telecomm-NJPL has a signature page separate from each sub-module. Each sub-module has a unique signature page specifically for that mission or adaptation.   Some sub-modules are for retired (obsolete) missions, and these will not have signature pages.

1.3 Revision and Control

Revision or changes to information contained in this module shall be made according to the policies and procedure specified in reference [2]. As described there, any interested person may initiate such revision or changes by consulting with the Document Owner identified on the signature page

of this module. Changes to the mission-specific CHDO list sub-modules shall be made in accordance with the Change request system used in CRMS (Change request Management System) used by DSMS (Deep Space Mission Systems).

The 0171-Telecomm-NJPL module consists of the following components:

(a) 0171-Telecomm-NJPL. This document is controlled in accordance with 813-109. Revisions are indicated by a revision letter designator, such as 0171-Telecomm-NJPL, Revision A.

(b) 0171-Telecomm-XXX. Mission-specific CHDO lists are each separate sub-modules controlled in accordance with 813-109. The 'XXX' in the identifier is an alphanumeric character string indicating the mission abbreviation. Revisions are indicated by a revision letter designator, such as 0171-Telecomm-CAS, Revision D. These sub-modules are updated individually when any mission changes the set of SFDUs used for that missions.

The AMMOS person responsible for generating the sub-modules is responsible for choosing new CHDO numbers and new DDP_IDs that do not conflict with any others. The AMMOS person in charge of creating the AMMOS SFDU table, which may or may not be the same person as the JPL Control Authority, is in charge of updates to these sub-modules.   In AMMOS, all work on the sub-modules of this document is done within the subsystem known as "SYS". Each sub-module is created by software run for every AMMOS delivery. however, unless a specific sub-module has changed, it will not be re-delivered or signed for each delivery. It is the responsibility of the AMMOS SYS CDE (Cognizant Development Engineer) to know which sub-modules change during a delivery.

(c) 0171-Telecomm-DDP. This is a dynamic spreadsheet under control of the JPL CCSDS Control Authority. It is made available on-line and only tracked by version date. This sub-module of this document is updated by the JPL CCSDS Control Authority.

To request a new DDP_ID for a new SFDU, as per CCSDS procedures, the JPL Control Authority is contacted. That person supplies a list of questions that the requestor must answer. The control authority then creates the new DDP_ID, and updates the spreadsheet in 171-Telecomm-DDP, with the new ID and the supplied information about the SFDU.

The JPL Control Authority is known to CCSDS. The CCSDS web site http://www.ccsds.org/ contains several CCSDS documents:

Control Authority Data Structures:
http://www.ccsds.org/documents/632x0b1.pdf

Control Authority Procedures:
http://www.ccsds.org/documents/630x0b1.pdf

Control Authority Procedures Tutorial:
http://www.ccsds.org/documents/631x0g2.pdf

The CCSDS "SANA" (Space Assigned Numbers Authority) controls the list of all Control Authorities. The CCSDS web site should contain a link to the current SANA. The CCSDS web site is in transition as of this writing, and the Control Authority list may or may not be present. If not obvious, questions should be directed to the main CCSDS contact listed.

1.4   Relationship to Other Documents

This SIS controls the identifiers both for standard CCSDS SFDUs, and for the JPL-specific format called CHDO-structured SFDUs. The sub-modules of this document contain a list of all CHDO-structured SFDUs produced by DSMS. The different nature of CHDO-structured SFDUs necessitates another document, reference [5] to describe that structure. The addition of new SFDU or CHDO types will change one or more mission specific CHDO list.

The list of items in 0171-Telecomm-DDP is required and identified by the CCSDS Blue Book 630.0-B-1, "Standard Formatted Data Units - Control Authority Procedures".

1.5   Applicable Documents

[1]	DSMS 820-062	*DSMS Terms and Abbreviations* (DSMS internal document, for reference only.) D18136
[2]	DSMS 813-109	*Preparation Guidelines and Procedures for Deep Space Mission System (DSMS) Interface Specifications* (DSMS internal document, for reference only.) D-17818
[3]	CCSDS 620.0-B-2	*CCSDS Recommendation for Space Data System Standards—Standard Formatted Data Units—Structure and Construction Rules* (Issue 2, May 1992)
[4]	ISO/IEC 646-1991	*Information Technology - ISO 7-bit Coded Character Set for Information Interchange*
[5]	820-013, 0172-Telecomm-CHDO	*Description of JPL-specific binary structured SFDUs D-16765*
[6]	DSMS On-line Interface Library	*http://jaguar.jpl.nasa.gov (valid as of this release)*
[7]	CCSDS On-line Documentation	*http://ccsds.org/document_access.html (valid as of this release)*
[8]	820-013, OPS-6-21A	*DSMS External Interface Specification—Standard Code Assignments*
[9]	CCSDS Blue Book 630.0-B-1	Standard Formatted Data Units - Control Authority Procedures, (June 1993). Online at http://ccsds.org

1.6   Terminology and Conventions

1.6.1   Terminology

Many of the terms used in this module are taken from the literature describing the SFDU concept. The SFDU concept was developed by the Consultative Committee for Space Data Systems (CCSDS) to provide a standardized and internationally recognized methodology for information

interchange. As the SFDU concept evolved over time, the meaning of some terms also has evolved. The definitions provided here are intended to clarify the use of certain terms as they apply to this module:

a) A *label-value-object* (LVO) is a data structure comprising a *label field* and a *value field*. The label field provides for the data structure to be self-identifying and self-delimiting. The value field contains user-defined data in any format. The LVOs themselves may be made up of a sequence of octets, or ASCII or binary data. In this module, LVO is used in a generic sense to refer to any data structure with these attributes.

b) An LVO may be a *simple LVO* or a *compound LVO*. If the value field of the LVO contains purely user data, it is a simple LVO. If the value field of the LVO contains purely LVOs, it is a compound LVO. The value field of a compound LVO consists of a sequence of one or more LVOs, each of which can be a simple or compound LVO itself.

c) A *standard formatted data unit* (SFDU) is an LVO that conforms to a defined set of structure and construction rules, namely the specification in reference [3].

d) The term *type attribute* is used to refer to the subfield(s) of an LVO label field that effects the self-identifying property of the LVO. Within the applicable domain, the type attribute is a unique reference to a description of the format and interpretation of the data contained in the value field of the LVO. For SFDUs, type attributes are assigned by a *control authority*, which is also responsible for maintaining the associated data descriptions. The CCSDS maintains a registry of control authorities.

d) All of the LVOs described in this module contain a *length attribute* in their label field. The length attribute is a subfield of the LVO label field; it contains the length, in octets, of the value field of the LVO. When interpreted in the context of the structure and construction rules specified in reference [3], the length attribute effects the self-delimiting property of the LVO. The use of a length attribute is not the only means by which an LVO can be self-delimiting; reference [3], for example, provides several mechanisms that do not rely on an explicit length.

e) The terms *byte* and *octet* are used interchangeably in this module to refer to an eight-bit quantity. The term *word* is used to refer to a sixteen-bit quantity.

f) Other SFDUs defined in this module may not be LVOs, but may be other types of SFDUs. These include types that do not have a stated length, but are delimited by markers or by files. It is not the intent of this module to re-do the work of the CCSDS SFDU descriptions, so further descriptions are left to that referenced document [3]

1.6.2 Conventions

The following conventions are used in this module and all sub-modules.

(a) All numbers are expressed in decimal unless explicitly indicated otherwise by means of a subscript designating another base (e.g., $4F_{16}$ for hexadecimal).

(b)   All ASCII characters are "restricted ASCII", meaning they may consist only of upper-case characters A-Z and the digits 0-9.

1.7   Abbreviations and Acronyms

Abbreviations and acronyms used in this document are defined where they first occur in the text. A complete list is provided here for the convenience of the reader.

ADID	Authority and Description Identifier
AMMOS	Advanced Multi-Mission Operations System
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
BCD	Binary-Coded Decimal
CCSDS	Consultative Committee for Space Data Systems
CDE	Cognizant Development Engineer
CHDO	Compressed Header Data Object
DSMS	Deep Space Mission System
DSN	Deep Space Network
GDR	Global Data Representation
ID	Identifier
ISO	International Organization for Standardization
JPL	Jet Propulsion Laboratory
LVO	Label-Value-Object
NASA	National Aeronautics and Space Administration
NJPL	NASA/Jet Propulsion Laboratory (control authority identifier)
RA	Restricted ASCII
SFDU	Standard Formatted Data Unit
SIS	Software Interface Specification

Section 2
Functional Overview

All SFDUs consist of a CCSDS-compliant primary label (see section 3.1 for this structure) and additional information, but the additional information may not always be CHDO-structured. They may contain some, but not all, CHDO elements, or the SFDUs may be constructed of CHDOs in a way that conflicts with AMMOS and DSMS rules. AMMOS and DSMS also generate some SFDUs that are not CHDO-structured. Accordingly, the following SFDU categories are distinguished:

- AMMOS and DSMS standard CHDO-structured SFDUs
- non-standard CHDO-structured SFDUs
- non-CHDO-structured SFDUs

As a general rule which applies to all SFDUs, each SFDU that has a unique structure must also be uniquely identified by its primary label.

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Section 3
Detailed Interface Description

3.1   Label Field

This label accompanies all SFDUs, CHDO-structured or not. This is a subset of the label described by the controlling CCSDS document, reproduced here for convenience, and to show the more-restricted JPL structure.
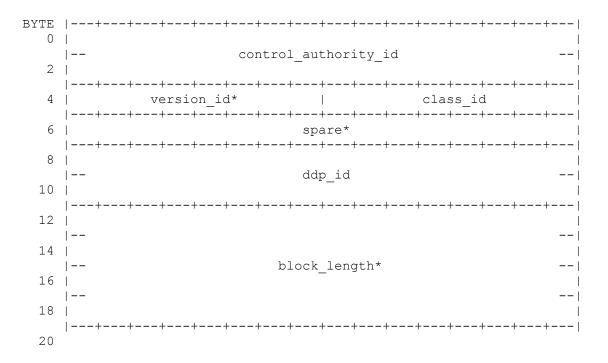
```
BYTE |---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---|
  0 |                                                               |
     |--                   control_authority_id                  --|
  2 |                                                               |
     |---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---|
  4 |          version_id*          |          class_id           |
     |---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---|
  6 |                             spare*                            |
     |---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---|
  8 |                                                               |
     |--                         ddp_id                          --|
 10 |                                                               |
     |---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---|
 12 |                                                               |
     |--                                                         --|
 14 |                                                               |
     |--                      block_length*                      --|
 16 |                                                               |
     |--                                                         --|
 18 |                                                               |
     |---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---|
 20
```

Figure 3-1. CCSDS SFDU Label Structure

Table 3-1. CCSDS SFDU Label Fields

Byte offset	Field ID Description	Format	Units	Range
0-3	*control_authority_id* This will always have a Value = NJPL, for SFDUs generated and registered at JPL. It may also have a value = CCSD for certain other SFDU structures Note: Restricted ASCII consists of uppercase characters A-Z and digits 0-9.	Restricted ASCII (RA),	N/A	"NJPL"
4	*version_id*	Restricted	N/A	0-9

Byte offset	Field ID Description	Format	Units	Range
	Version ID for length field. Value = 2 (RA) indicates that the length field will be a 64-bit unsigned integer field. Value = 1 (RA) indicates an ASCII representation of length. For most AMMOS-internal SFDUs, the value = 2 option will be employed. Value = 3 (RA) differs from a LABEL with Version ID = 1 or 2 only in how octets 6 and 12 to 19 are used. Octet 6 specifies how the VALUE field is delimited (as opposed to being "spare" for the previous Version IDs), and octets 12 to 19 specify a parameter to be used for delimitation.	ASCII		
5	*class_id* Identifies the label class. Value is one restricted ASCII	Restricted ASCII	N/A	A-Z, 0-9
6	*delimiter* For Version ID = 1 or 2 this is a spare, set to ASCII "zero". For Version ID = 3, byte 6 is an ASCII character, see below. ID Delimitation Technique A Length (specified in ASCII) B Length (specified in binary) S Marker Pattern E Sequential End-of-File C Contiguous End-of-File F Shared End-of-File	Restricted ASCII	N/A	A-Z, 0-9
7	*spare* Set to ASCII "zero"	N/A	N/A	N/A
8-11	*ddp_id* Data Description Package Identifier. Value is four restricted ASCII characters. Registered with the JPL Control Authority; identifies the type of data following this label (identifies the document describing data structure and content). The values that the ddp_id can assume (for DSMS-generated SFDUs) are listed in separate sub-modules to this module.	Restricted ASCII	N/A	Any set of 4 restricted ASCII characters
12-19	*block_length or marker* For version_id = 1, this is the length, in ASCII, of the remainder (starting with byte 20) of this SFDU in bytes.	Either restricted ASCII or	octets (bytes)	lowest integer limit is 2, upper

Byte offset	Field ID Description	Format	Units	Range
	For version_id = 2, this is the length, in binary, of the remainder (starting with byte 20) of this SFDU in bytes. The value must be even for both versions. For version_id = 3, this may be a delimiting marker, that is any set of 8 (non-restricted) ASCII characters matching the string at the end of the SFDU. The delimiter has no restrictions other than ASCII	binary unsigned integer		limit for integer is largest 8-byte number, largest ASCII length is "99999999", a delimiting marker is not a length, but an ASCII string of 8 characters.

3.2   CHDOs

CHDO (Compressed Header Data Object) structured SFDUs are completely described in reference document [5], and not further described here. All CHDO-structured SFDUs made by DSMS for a specific mission are listed in one of the separate sub-modules of this module, according to the mission that uses the SFDU. Multi-mission SFDUs are listed in the separate sub-modules to this module for each mission that uses them. Missions that do not use DSMS Data Services should use the DSMS Software Interface Specification document for their mission to get to descriptions of their CHDO-structured SFDUs. This would most likely be one of these three documents: 820-013, TLM 3-29 or 820-013, TLM 3-20, or 820-013, 0161-Telecomm

3.3   The SFDU Component Lists

The sub-module to this module, 0171-Telecomm-DDP, controls the IDs for all non CHDO-structured SFDUs that are created at JPL and registered with the JPL CCSDS Control Authority. A separate document (830-013, 0172-Telecomm-CHDO, Applicable Document [5]) lists all CHDOs.

Sub-modules of this module are provided for each mission and each contains a list of all CHDO-structured SFDUs used by that mission in DSMS. The table below is the guide to interpreting the information in those sub-modules. Additionally, each sub-module has a date and a version at the top. The date is the date that the sub-module was created. All sub-modules (except the DDP sub-module) are created by a script from the AMMOS SFDU table, which will not be further described here as it is not available except to AMMOS programmers and engineers. The version is the first AMMOS version that the sub-

module represents. It is the same version that is put into many secondary CHDOs by the TIS (telemetry input subsystem). Note that while AMMOS versions may change, if that version contains no changes to the list for a mission, then that mission's sub-module is not updated. Therefore, the version at the top of a sub-module may not appear to be the latest, but it will be correct for all later versions, until the information changes and the sub-module is re-delivered.

Note that in an SFDU component list (a sub-module) all items are filled in. However, the tertiary, quaternary, and data CHDOs, not being present in all SFDUs, may have a "null" entry ("---"). All other identifiers are always present.

Table 3-2. SFDU Component Lists

Item	Meaning	Source	Usage
DDP ID	Data Description Package ID	This field is 4 ASCII characters in the SFDU label, as defined in this document.	This field can have any ASCII value, though each mission generally uses only one letter for the first character, for mission unique SFDUs.
Maj Typ	Major Type of the SFDU	This field is defined in CHDO 002, the primary CHDO, as part of the field "record_id". Major Type defines the largest category of data, e.g. "raw" or "packets", etc. Major Type is also discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO.	This field is 8 bits, so can vary from 0 to 255
Min Typ	Minor Type of the SFDU	This field is defined in CHDO 002, the primary CHDO, as part of the field "record_id". Minor Type defines a medium category of data, different for each major type. Minor Type is also discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO.	This field is 8 bits, so can vary from 0 to 255
Mis ID	Mission ID	This field is defined in CHDO 002, the primary CHDO, as part of the field "record_id". Mission ID is a unique number for each mission. Minor Type is also discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO. Currently defined values for	This field is 8 bits, so can vary from 0 to 255

Item	Meaning	Source	Usage
		"mission id" are kept in 820-013, OPS 6-21A	
Fmt ID	Format ID	This field is defined in CHDO 002, the primary CHDO, as part of the field "record_id". Format ID defines the smallest category of data, different for each minor type. Format ID is also discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO.	This field is 8 bits, so can vary from 0 to 255
CHDO Components	Covers the next four fields, each of which is a CHDO. Each number in a CHDO components column represents the number (ID) of the CHDO in that position.	CHDOs are defined in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO. Because all CHDO-structured SFDUs must have a primary CHDO, and only one type exists, it is not specified in this module or sub-modules	CHDO values are 16 bits, and can therefore be from 0 to 65,535
Sec	Secondary CHDO	The secondary CHDO is discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO. Sub-modules of that document contain definitions, or links to a definition of, all CHDOs. As of this writing, all CHDO-structured SFDUs have a secondary CHDO.	0 to 65535
Ter	Tertiary CHDO	The tertiary CHDO is discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO. Sub-modules of that document contain definitions, or links to a definition of, all CHDOs. Not all CHDO-structured SFDUs have a tertiary CHDO, in which case this field is filled with "---". If an SFDU has a quaternary CHDO but no tertiary CHDO, then the null tertiary CHDO must be used as a place-filler, and it is CHDO type 000.	0 to 65535
Qtr	Quaternary CHDO	The Quaternary CHDO is discussed in Applicable Document [5] - 820-013, 0172-Telecomm-	0 to 65535

Item	Meaning	Source	Usage
		CHDO. Sub-modules of that document contain definitions, or links to a definition of, all CHDOs. Not all CHDO-structured SFDUs have a quaternary CHDO, in which case this field is filled with "---". If there is no quaternary CHDO, no null CHDO is used.	
Data	Data CHDO	The Data CHDO is discussed in Applicable Document [5] - 820-013, 0172-Telecomm-CHDO. Sub-modules of that document contain definitions, or links to a definition of, all CHDOs. Not all CHDO-structured SFDUs have a data CHDO, in which case this field is filled with "---". If there is no data CHDO, a null CHDO may be used.	0 to 65535
Description	A short description of the SFDU.	The AMMOS SFDU table, ultimately, the description is created manually by a system engineer.	ASCII characters, no particular limit, but must fit on the one line. If the SFDU is associated with a specific mission, then the abbreviation for that mission is also in the description. This field may also include a reference to a document defining the contents, or the name of the creating subsystem.