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D7 – Protocol Implementation Conformance Statement

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GLOSSARY

ACRONYM	MEANING
CCSDS	Consulting Committee for Space Data System
PICS	Protocol Implementation Conformance Statement

1 INTRODUCTION

1.1 Document scope

This document corresponds to deliverable D13 Protocol Implementation Conformance Statement of the ESA Contract No. 4000113182/15/NL/LF entitled CCSDS Lossless Compression IP-Core Space applications.

1.2 Applicable documents

[AD-1]   *Lossless Multispectral & Hyperspectral Image Compression*.   Recommendation for Space Data System Standards, CCSDS 123.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, May 2012.

1.3 Document description

This document presents the Protocol Implementation Conformance Statement (PICS) for the CCSDS123 IP and CCSDS121 IP implementations of the CCSDS-123.0-B-1 standard , as determined in Annex A of [AD-1], following its abbreviations and conventions.

ANNEX A PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT

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ANNEX A

PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT PROFORMA

(NORMATIVE)

A1   INTRODUCTION

A1.1   OVERVIEW

This annex provides the Protocol Implementation Conformance Statement (PICS) Requirements List (PRL) for an implementation of a compressor or decompressor for *Lossless Multispectral & Hyperspectral Image Compression*, CCSDS 123.0-B-1, May 2012. The PICS for an implementation is generated by completing the PRL in accordance with the instructions below. An implementation shall satisfy the mandatory conformance requirements referenced in the PRL.

The PRL in this annex is blank. An implementation's completed PRL is called the PICS. The PICS states which capabilities and options have been implemented. The following can use the PICS:

− the implementer of a compressor or decompressor, as a checklist to reduce the risk of failure to conform to the standard through oversight;

− the supplier and acquirer or potential acquirer of a compressor or decompressor implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma;

− the user or potential user of a compressor or decompressor implementation, as a basis for initially checking the possibility of interoperability between compressor and decompressor implementations;

− a compressor or decompressor implementation tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A1.2   ABBREVIATIONS AND CONVENTIONS

The PRL consists of information in tabular form. The status of features is indicated using the abbreviations and conventions described below.

Item Column

The number in the item column identifies the item in the table.

Description Column

The description column contains a brief description of the item. It implicitly means 'is <item description> supported by the implementation?'

Reference Column

The reference column indicates the relevant subsection of *Lossless Multispectral & Hyperspectral Image Compression*, CCSDS 123.0-B-1 (this document).

Status Column

The status column uses the following notations:

M   mandatory.

O   optional.

N/A   not applicable.

O.i qualified optional—for a group of related optional items labeled by the same numeral i, the logic of their selection is defined immediately following the table.

C.j conditional—the requirement on the capability ('M', 'O', or 'N/A') depends on the support of another optional item. The numeral j identifies a unique conditional status expression defined immediately following the table.

Values Allowed Column

The values allowed column contains the list or range of values allowed. The following notations are used:

range of values: <min value> .. <max value>
example: 2 .. 16

list of values: <value1>, <value2>, ..., <valueN>
example: 3, 6, 9, …, 21

N/A   not applicable

Item Support or Values Supported Column

In the item support or values supported column, the support of every item as claimed by the implementer shall be stated by entering the appropriate answer ('Y', 'N', or 'N/A') or the values supported:

Y   yes, item supported by the implementation.

N   no, item not supported by the implementation.

range or list of values supported.

N/A   not applicable.

<u>References to Items</u>

The support of an item in the PICS proforma can be referred to by indicating the table and item number separated by a solidus character '/'. For example, 'A-2/8' refers to the support for the 8th item in table A-2.

<u>Prerequisite Line</u>

A prerequisite line takes the form: Prerequisite: <predicate>. A prerequisite line at the top of a table indicates that the table need not be completed if the predicate is FALSE.

A1.3   INSTRUCTIONS FOR COMPLETING THE PRL

An implementer shows the extent of compliance to the Recommended Standard by completing the PRL; that is, the state of compliance with all mandatory requirements and the options supported are shown. The resulting completed PRL is called a PICS. The implementer shall complete the PRL by entering appropriate responses in the support or values supported column, using the notation described in A1.2. If a conditional requirement is inapplicable, N/A should be used. If a mandatory requirement is not satisfied, exception information must be supplied by entering a reference Xi, where i is a unique identifier, to an accompanying rationale for the noncompliance.

A2   PICS PROFORMA FOR LOSSLESS MULTISPECTRAL & HYPERSPECTRAL IMAGE COMPRESSION

A2.1   GENERAL INFORMATION

A2.1.1   Identification of PICS

Date of Statement (DD/MM/YYYY)	
PICS serial number	
System Conformance statement cross-reference	

A2.1.2   Identification of Implementation Under Test (IUT)

Implementation name	
Implementation version	
Function implemented	Compression_____ Decompression_____
Special Configuration	
Other Information	

A2.1.3   Identification

Supplier	
Contact Point for Queries	
Implementation Name(s) and Versions	
Other information necessary for full identification, e.g., name(s) and version(s) for machines and/or operating systems; System Name(s)	

A2.1.4   Document Version Summary

CCSDS 123 Document Version	
Addenda Implemented	
Amendments Implemented	
Have any exceptions been required? (Note: A YES answer means that the implementation does not conform to the Recommended Standard. Non-supported mandatory capabilities are to be identified in the PICS, with an explanation of why the implementation is non-conforming.	Yes _____ No_____

A2.2   CAPABILITIES

A2.2.1   Image

Table A-1: Image Properties

Item	Description	Reference	Status	Values Allowed	Item Support or Values Supported
1	Signed Samples	3.2.1	O.1	N/A	
2	Unsigned Samples	3.2.1	O.1	N/A	
3	X Size, N_X	3.2.2	M	$1 .. 2^{16}$	
4	Y Size, N_Y	3.2.2	M	$1 .. 2^{16}$	
5	Z Size, N_Z	3.2.2	M	$1 .. 2^{16}$	
6	Dynamic Range, D	3.3.1	M	$2 .. 16$	

O.1:   It is mandatory to support at least one of these items.

A2.2.2   Predictor

Table A-2: Predictor Features

Item	Description	Reference	Status	Values Allowed	Item Support or Values Supported
1	Number of Prediction Bands, P	4.2	M	0 .. 15	
2	Full Prediction Mode	4.3	O.2	N/A	
3	Reduced Prediction Mode	4.3	O.2	N/A	
4	Neighbor-Oriented Local Sums	4.4	O.3	N/A	
5	Column-Oriented Local Sums	4.4	O.3	N/A	
6	Weight Component Resolution, Ω	4.6.1.2	M	4 .. 19	
7	Default Weight Initialization	4.6.3.2	O.4	N/A	
8	Custom Weight Initialization	4.6.3.3	O.4	N/A	
9	Weight Initialization Resolution, Q	4.6.3.3	C.21	3 .. Ω+3	
10	Register Size, R	4.7.1	M	$\max\{32, D+\Omega+2\}$ .. 64	
11	Weight Update Scaling Exponent Initial Parameter, v_{min}	4.8.2	M	−6 .. v_{max}	
12	Weight Update Scaling Exponent Final Parameter, v_{max}	4.8.2	M	v_{min} .. 9	
13	Weight Update Scaling Exponent Change Interval, t_{inc}	4.8.2	M	$2^4, 2^5, ..., 2^{11}$	

O.2:   When N_X=1, support is mandatory for Reduced Prediction Mode and not applicable for Full Prediction Mode. Otherwise, it is mandatory to support at least one of these items.

O.3:   When N_X=1, support is mandatory for Column-Oriented Local Sums and not applicable for Neighbor-Oriented Local Sums. Otherwise, it is mandatory to support at least one of these items.

O.4:   It is mandatory to support at least one of these items.

C.21: IF A-2/8   – If Custom Weight Initialization supported
          THEN M   – then mandatory
          ELSE N/A

A2.2.3 Encoder

Table A-3: Encoder Features

Item	Description	Reference	Status	Values Allowed	Item Support or Values Supported
1	Compressed Image	5.2.1	M	N/A	
2	Output Word Size, B	5.2.2	M	1 .. 8	
3	Header	5.3	M	N/A	
4	Weight Initialization Table Encoding	5.3.3.2	C.31	N/A	
5	Compressed Image Body	5.4.1	M	N/A	
6	BI Encoding Order	5.4.2.2	O.5	N/A	
7	BSQ Encoding Order	5.4.2.3	O.5	N/A	
8	Sub-frame Interleaving Depth, M	5.4.2.2	C.32	1 .. N_Z	
9	Sample-Adaptive Entropy Coder	5.4.3.2	O.6	N/A	
10	Block-Adaptive Entropy Coder	5.4.3.3	O.6	N/A	

C.31: IF A-2/8   − If Custom Weight Initialization supported
        THEN O   − then optional
        ELSE N/A

O.5: It is mandatory to support at least one of these items.

C.32: IF A-3/6   − If BI Encoding Order supported
        THEN M   − then mandatory
        ELSE N/A

O.6: It is mandatory to support at least one of these items.

Table A-4: Sample-Adaptive Entropy Coder Features

Item	Description	Reference	Status	Values Allowed	Item Support or Values Supported
Prerequisite: A-3/9 – Sample-Adaptive Entropy Coder supported					
1	Accumulator Initialization Table Encoding	5.3.4.2.2	O	N/A	
2	Initial Count Exponent, γ_0	5.4.3.2.2.2	M	1 .. 8	
3	Accumulator Initialization Constant, K	5.4.3.2.2.3	O	0 .. D-2	
4	Rescaling Counter Size, γ^*	5.4.3.2.2.4	M	$\max\{4, \gamma_0 + 1\}$ .. 9	
5	Unary Length Limit, U_{max}	5.4.3.2.3.1	M	8 .. 32	

Table A-5: Block-Adaptive Entropy Coder Features

Item	Description	Reference	Status	Values Allowed	Item Support or Values Supported
Prerequisite: A-3/10 – Block-Adaptive Entropy Coder supported					
1	Block Size, J	5.4.3.3.2.4	M	8, 16, 32, 64	
2	Reference Sample Interval, r	5.4.3.3.2.5	M	1 .. 4096	
3	Basic Code Options	5.4.3.3.2.6	O.7	N/A	
4	Restricted Code Options	5.4.3.3.2.6	O.7	N/A	

O.7:   It is mandatory to support at least one of these items.