DRAFT AMENDMENT

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Information technology — MPEG systems technologies —

Part 8:
Coding-independent code points

AMENDMENT 1: Additional code points for colour description

Technologies de l'information — Technologies des systèmes MPEG —

Partie 8: Points de code indépendants du codage

AMENDEMENT 1: .

ICS: 35.040

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Amendment 1 to ISO/IEC 23001-8:2016 was prepared by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 29, Coding of audio, picture, multimedia and hypermedia information.

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Information technology — MPEG systems technologies —

Part 8:
Coding-independent code points

AMENDMENT 1: Additional code points for colour description

In subclause 4.4 (Mathematical functions), add a definition for Ln(x) after Formula (5), i.e. after the definition of Floor(x), as follows, and renumber the subsequent existing formulae (6) through (9) to become numbered as formulae (7) through (10):

Ln(x) returns the natural logarithm of x. (6)

In clause 7, replace subclauses 7.1, 7.2, and 7.3, which specify the semantics of ColourPrimaries, TransferCharacteristics, VideoFullRangeFlag, and MatrixCoefficients, including Tables 3, 4, and 5, with the following:

7.1 Colour primaries

Type: Unsigned integer, enumeration

Range: 0 – 255

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ColourPrimaries indicates the chromaticity coordinates of the source colour primaries as specified in Table 2 in terms of the CIE 1931 definition of x and y as specified in ISO 11664-1.

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An 8-bit field should be adequate for representation of the ColourPrimaries code point.

Table 2 — Interpretation of the colour primaries (ColourPrimaries) value

Value	Colour primaries			Informative remarks
0	Reserved			For future use by ISO/IEC
1	primary	x	y	Rec. ITU-R BT.709-6
	green	0.300	0.600	Rec. ITU-R BT.1361-0 conventional colour gamut system and extended colour gamut system (historical)
	blue	0.150	0.060	IEC 61966-2-1 sRGB or sYCC
	red	0.640	0.330	IEC 61966-2-4 xvYCC
	white D65	0.312 7	0.329 0	Society of Motion Picture and Television Engineers RP 177 (1993) Annex B
2	Unspecified			Image characteristics are unknown or are determined by the application.
3	Reserved			For future use by ISO/IEC
4	primary	x	y	Rec. ITU-R BT.470-6 System M (historical)
	green	0.21	0.71	United States National Television System Committee 1953 Recommendation for transmission standards for colour television
	blue	0.14	0.08	United States Federal Communications Commission Title 47 Code of Federal Regulations (2003) 73.682 (a) (20)
	red	0.67	0.33	
	white C	0.310	0.316	

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Table 2 *(continued)*

Value	Colour primaries			Informative remarks
5	primary	x	y	Rec. ITU-R BT.470-6 System B, G (historical)
	green	0.29	0.60	Rec. ITU-R BT.601-6 625
	blue	0.15	0.06	Rec. ITU-R BT.1358-1 625 (historical)
	red	0.64	0.33	Rec. ITU-R BT.1700-0 625 PAL and 625 SECAM
	white D65	0.312 7	0.329 0	
6	primary	x	y	Rec. ITU-R BT.601-6 525
	green	0.310	0.595	Rec. ITU-R BT.1358-1 525 (historical)
	blue	0.155	0.070	Rec. ITU-R BT.1700-0 NTSC
	red	0.630	0.340	Society of Motion Picture and Television Engineers 170M (2004)
	white D65	0.312 7	0.329 0	(functionally the same as the value 7)
7	primary	x	y	Society of Motion Picture and Television Engineers 240M (1999)
	green	0.310	0.595	(functionally the same as the value 6)
	blue	0.155	0.070	
	red	0.630	0.340	
	white D65	0.312 7	0.329 0	
8	primary	x	y	Generic film (colour filters using Illuminant C)
	green	0.243	0.692 (Wratten 58)	
	blue	0.145	0.049 (Wratten 47)	
	red	0.681	0.319 (Wratten 25)	
	white C	0.310	0.316	
9	primary	x	y	Rec. ITU-R BT.2020-2
	green	0.170	0.797	Rec. ITU-R BT.2100-0
	blue	0.131	0.046	
	red	0.708	0.292	
	white D65	0.312 7	0.329 0	
10	primary	x	y	Society of Motion Picture and Television Engineers ST 428-1
	green (Y)	0.0	1.0	(CIE 1931 XYZ)
	blue (Z)	0.0	0.0	
	red (X)	1.0	0.0	
	centre white	1 ÷ 3	1 ÷ 3	
11	primary	x	y	Society of Motion Picture and Television Engineers RP 431-2 (2011)
	green	0.265	0.690	
	blue	0.150	0.060	
	red	0.680	0.320	
	white	0.314	0.351	
12	primary	x	y	Society of Motion Picture and Television Engineers EG 432-1 (2010)
	green	0.265	0.690	
	blue	0.150	0.060	
	red	0.680	0.320	
	white D65	0.312 7	0.329 0	

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Table 2 *(continued)*

Value	Colour primaries			Informative remarks
13..21	Reserved			For future use by ISO/IEC
22	primary	x	y	EBU Tech. 3213-E (1975)
	green	0.295	0.605	
	blue	0.155	0.077	
	red	0.630	0.340	
	white D65	0.312 7	0.329 0	
23..255	Reserved			For future use by ISO/IEC

7.2 Transfer characteristics

Type: Unsigned integer, enumeration

Range: 0 – 255

TransferCharacteristics, as specified in Table 3, either indicates the reference opto-electronic transfer characteristic function of the source picture as a function of a source input linear optical intensity input Lc with a nominal real-valued range of 0 to 1 or indicates the inverse of the reference electro-optical transfer characteristic function as a function of an output linear optical intensity Lo with a nominal real-valued range of 0 to 1. For interpretation of entries in Table 3 that are expressed in terms of multiple curve segments parameterized by the variable α over a region bounded by the variable β or by the variables β and γ, the values of α and β are defined to be the positive constants necessary for the curve segments that meet at the value β to have continuity of both value and slope at the value β. The value of γ, when applicable, is defined to be the positive constant necessary for the associated curve segments to meet at the value γ. For example, for TransferCharacteristics equal to 1, 6, 14, or 15, α has the value 1 + 5.5 * β = 1.099 296 826 809 442... and β has the value 0.018 053 968 510 807....

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An 8-bit field should be adequate for representation of the TransferCharacteristics code point.

NOTE 1 As indicated in Table 3, some values of TransferCharacteristics are defined in terms of a reference opto-electronic transfer characteristic function and others are defined in terms of a reference electro-optical transfer characteristic function, according to the convention that has been applied in other Specifications. In the cases of Rec. ITU-R BT.709-6 and Rec. ITU-R BT.2020-2 (which may be indicated by TransferCharacteristics equal to 1, 6, 14, or 15), although the value is defined in terms of a reference opto-electronic transfer characteristic function, a suggested corresponding reference electro-optical transfer characteristic function for flat panel displays used in HDTV studio production has been specified in Rec. ITU-R BT.1886-0.

NOTE 2 Certain combinations of TransferCharacteristics, VideoFullRangeFlag, BitDepthY, and BitDepthC may not be permitted.

Table 3 — Interpretation of the transfer characteristics (TransferCharacteristics) value

Value	Transfer characteristics	Informative remarks
0	Reserved	For future use by ISO/IEC
1	$V = \alpha * L_c 0.45 - (\alpha - 1)$ for $1 >= L_c >= \beta$ $V = 4.500 * L_c$ for $\beta > L_c >= 0$	Rec. ITU-R BT.709-6 Rec. ITU-R BT.1361-0 conventional colour gamut system (historical) (functionally the same as the values 6, 14, and 15; the value 1 is preferred)
2	Unspecified	Image characteristics are unknown or are determined by the application.
3	Reserved	For future use by ISO/IEC

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Table 3 *(continued)*

Value	Transfer characteristics	Informative remarks
4	Assumed display gamma 2.2	Rec. ITU-R BT.470-6 System M (historical) United States National Television System Committee 1953 Recommendation for transmission standards for colour television United States Federal Communications Commission Title 47 Code of Federal Regulations (2003) 73.682 (a) (20) Rec. ITU-R BT.1700-0 (2007 revision) 625 PAL and 625 SECAM
5	Assumed display gamma 2.8	Rec. ITU-R BT.470-6 System B, G (historical)
6	$V = \alpha * L_c 0.45 - (\alpha - 1)$ for $1 >= L_c >= \beta$ $V = 4.500 * L_c$ for $\beta > L_c >= 0$	Rec. ITU-R BT.601-6 525 or 625 Rec. ITU-R BT.1358-1 525 or 625 (historical) Rec. ITU-R BT.1700-0 NTSC Society of Motion Picture and Television Engineers 170M (2004) (functionally the same as the values 1, 14, and 15; the value 1 is preferred)
7	$V = \alpha * L_c 0.45 - (\alpha - 1)$ for $1 >= L_c >= \beta$ $V = 4.0 * L_c$ for $\beta > L_c >= 0$	Society of Motion Picture and Television Engineers 240M (1999)
8	$V = L_c$ for all values of L_c	Linear transfer characteristics
9	$V = 1.0 + \text{Log10}(L_c) \div 2$ for $1 >= L_c >= 0.01$ $V = 0.0$ for $0.01 > L_c >= 0$	Logarithmic transfer characteristic (100:1 range)
10	$V = 1.0 + \text{Log10}(L_c) \div 2.5$ for $1 >= L_c >= \text{Sqrt}(10) \div 1\,000$ $V = 0.0$ for $\text{Sqrt}(10) \div 1\,000 > L_c >= 0$	Logarithmic transfer characteristic (100 * Sqrt(10) : 1 range)
11	$V = \alpha * L_c 0.45 - (\alpha - 1)$ for $L_c >= \beta$ $V = 4.500 * L_c$ for $\beta > L_c > -\beta$ $V = -\alpha * (-L_c)0.45 + (\alpha - 1)$ for $-\beta >= L_c$	IEC 61966-2-4 xvYCC
12	$V = \alpha * L_c 0.45 - (\alpha - 1)$ for $1.33 > L_c >= \beta$ $V = 4.500 * L_c$ for $\beta > L_c >= -\gamma$ $V = -(\alpha * (-4 * L_c)0.45 - (\alpha - 1)) \div 4$ for $-\gamma > L_c >= -0.25$	Rec. ITU-R BT.1361-0 extended colour gamut system (historical)
13	$V = \alpha * L_c(1 \div 2.4) - (\alpha - 1)$ for $1 >= L_c >= \beta$ $V = 12.92 * L_c$ for $\beta > L_c >= 0$	IEC 61966-2-1 sRGB or sYCC
14	$V = \alpha * L_c 0.45 - (\alpha - 1)$ for $1 >= L_c >= \beta$ $V = 4.500 * L_c$ for $\beta > L_c >= 0$	Rec. ITU-R BT.2020-2 (10-bit system) (functionally the same as the values 1, 6, and 15; the value 1 is preferred)

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Table 3 *(continued)*

Value	Transfer characteristics	Informative remarks
15	V =α * L_c0.45 − (α − 1) for 1 >= L_c >= β V = 4.500 * L_c for β > L_c >= 0	Rec. ITU-R BT.2020-2 (12-bit system) (functionally the same as the values 1, 6, and 14; the value 1 is preferred)
16	V = ((c_1 + c_2 * Lon) ÷ (1 + c_3 * L_{on}))m for all values of L_o c_1 = c_3 − c_2 + 1 = 3424 ÷ 4096 = 0.835 937 5 c_2 = 32 * 2413 ÷ 4096 = 18.851 562 5 c_3 = 32 * 2392 ÷ 4096 = 18.687 5 m = 128 * 2523 ÷ 4096 = 78.843 75 n = 0.25 * 2610 ÷ 4096 = 0.159 301 757 812 5 for which L_o equal to 1 for peak white is ordinarily intended to correspond to a display luminance level of 10 000 candelas per square metre	Society of Motion Picture and Television Engineers ST 2084 for 10, 12, 14, and 16-bit systems Rec. ITU-R BT.2100-0 perceptual quantization (PQ) system
17	V = (48 * L_o ÷ 52.37)(1 ÷ 2.6) for all values of L_o for which Lo equal to 1 for peak white is ordinarily intended to correspond to a display luminance level of 48 candelas per square metre	Society of Motion Picture and Television Engineers ST 428-1
18	V = a * Ln(12 * L_c − b) + c for 1 >= L_c > 1 ÷ 12 V = Sqrt(3) * L_c0.5 for 1 ÷ 12 >= L_c >= 0 a = 0.178 832 77 b = 0.284 668 92 c = 0.559 910 73	Association of Radio Industries and Businesses (ARIB) STD-B67 Rec. ITU-R BT.2100-0 hybrid log-gamma (HLG) system
19..255	Reserved	For future use by ISO/IEC

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NOTE 3 For TransferCharacteristics equal to 18, the Formulae given in Table 3 are normalized for a source input linear optical intensity Lc with a nominal real-valued range of 0 to 1. An alternative scaling that is mathematically equivalent is used in ARIB STD-B67 with the source input linear optical intensity having a nominal real-valued range of 0 to 12.

7.3 Matrix coefficients

Type: Unsigned integer, enumeration

Range: 0 – 255, plus associated flag

MatrixCoefficients describes the matrix coefficients used in deriving luma and chroma signals from the green, blue, and red, or X, Y, and Z primaries, as specified in Table 4 and the Formulae below.

A flag, VideoFullRangeFlag, may be supplied with this code point (see below).

VideoFullRangeFlag specifies the scaling and offset values applied in association with the MatrixCoefficients. When not present or not specified, the value 0 for VideoFullRangeFlag would ordinarily be inferred as the default value for video imagery.

An 8-bit field should be adequate for representation of the MatrixCoefficients code point.

NOTE 1 Certain values of MatrixCoefficients may be disallowed depending on the application and the characteristics and format of the signal, e.g. the chroma format sampling structure and the values of BitDepthY and BitDepthC.

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