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Cinematography — Time and control code for 24, 25 and 30 frames per second motion-picture film systems — Specifications

Cinématographie — Code de chronométrage et de commande pour les systèmes de films cinématographiques à 24, 25 et 30 images par seconde — Spécifications

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 36, *Cinematography*.

This second edition cancels and replaces the first edition (ISO 9642:1993), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

— The title has been modified to include the word "film".

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Cinematography — Time and control code for 24, 25 and 30 frames per second motion-picture film systems — Specifications

1 Scope

This document specifies digital code for mats and modulation methods for motion-picture film to be used for timing, control, editing and synchronization purposes. This document also specifies the relationship of the codes to the motion picture frame.

Two types of code are described in this document. The first type, Type C, is a continuous code which is very similar to the continuous code specified in IEC 60461. This type of code can be used in situations where the film is moving continuously at the time of both recording and reproduction.

The second type of code, Type 8, is a non-continuous, block-type code, composed of blocks of data, each complete in itself, with gaps between the blocks. It is designed so that the code can be recorded and played back on equipment with intermittent film motion but still be decoded with the same type of electronic equipment used to read the Type C or continuous time code.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 2022, *Information technology — Character code structure and extension techniques*

ISO 4241, *Cinematography — Projection film leader (time-based), trailer and cue marks — Specifications*

ISO 8758, *Cinematography — Photographic control and data records on 16 mm and 35 mm motion-picture film and prints — Dimensions and location*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
real time
<NTSC colour recording> time elapsed during the scanning of 60 fields (or any multiple thereof) in an ideal television system at a vertical field rate of exactly 60 fields per second

3.2
colour time
<NTSC colour recording> time elapsed during the scanning of 60 fields (or any multiple thereof) in a colour television system at a vertical field rate of approximately 59,94 fields per second

4   Modulation method

The modulation method shall be such that a transition occurs at the beginning of every bit period. "One" is represented by a second transition half a bit period after the start of the bit. "Zero" is represented when there is no transition within the bit period.

5   Code formats

Two code formats are described: Type C and Type 8. The unique characteristics of the two code types are described in 5.1 and 5.2 respectively. Information which applies to both code types is given in 5.3 and 5.4.

5.1   Type C code format

5.1.1   Each motion-picture frame shall be defined by a unique and complete address.

5.1.2   The frames shall be numbered successively 0 to 23, 24 or 29 inclusive, corresponding to the frame rate being used.

5.1.3   Each address shall consist of 80 bits numbered 0 to 79 inclusive.

5.1.4   The bits shall be assigned as shown in the appropriate columns of Figure 1 and Table 1.

5.1.5   The address shall start at the clock edge before the first address bit (bit zero). The bits shall be evenly spaced throughout the address period and they shall fully occupy the address period, which is one frame. Consequently, the bit rate shall be 80 times the frame rate in frames per second.

5.1.6   The start of the address, i.e. the clock edge before the first bit, shall coincide with the frameline at the beginning of the image to which the address refers. The tolerance of this location is +0 % (in the direction of film travel) and −50 % of a frame length (in the other direction). Thus, the start of the address can lie anywhere in the top half of the frame with the preferred position at the frameline. See Figure 2.

Table 1 — Bit assignment

Bit number		Bit description
Type C code	**Type 8 code**	
a	0-7	Alternating zero, one pattern
a	8-23	Synchronizing word
a	8-9	Fixed zero
a	10-21	Fixed one
a	22	Fixed zero
a	23	Fixed one
0-3	24-27	Units of frame
4-7	28-31	First binary group
8-9	32-33	Tens of frames
10	34	Drop frame flag (see 5.4)
11	35	Colour frame flag (see 5.4)
12-15	36-39	Second binary group
16-19	40-43	Units of seconds
20-23	44-47	Third binary group
a These bits do not exist in the Type C code.		

Table 1 *(continued)*

Bit number		Bit description
Type C code	**Type 8 code**	
24-26	48-50	Tens of seconds
27	51	Bi-phase mark phase correction bit (see 5.4)
28-31	52-55	Fourth binary group
32-35	56-59	Units of minutes
36-39	60-63	Fifth binary group
40-42	64-66	Tens of minutes
43	67	Binary group flag bit {see 5.4)
44-47	68-71	Sixth binary group
48-51	72-75	Units of hours
52-55	76-79	Seventh binary group
56-57	80-81	Tens of hours
58	82	Unassigned address bit (zero until further assignment)
59	83	Binary group flag bit (see 5.4)
60-63	84-87	Eighth binary group
64-79	88-103	Synchronizing word
64-65	88-89	Fixed zero
66-77	90-101	Fixed one
78	102	Fixed zero
79	103	Fixed one
a	104-111	Alternating one, zero pattern
a These bits do not exist in the Type C code.		

BIT NUMBER		BIT		
TYPE C	TYPE 8	VALUE	DESCRIPTION	Notes
	0	0	TIMING BITS	START FOR TYPE 8
	1	1		IS CLOCK EDGE
	2	0		BETWEEN BIT 111
	3	1		AND BIT 0
	4	0		
	5	1		
	6	0		
	7	1		
	8	0	SYNC WORD	
	9	0		
	10	1		
	11	1		
	12	1		
	13	1		
	14	1		
	15	1		
	16	1		
	17	1		
	18	1		
	19	1		
	20	1		START FOR TYPE C
	21	1		IS CLOCK EDGE
	22	0		BETWEEN BIT 79
	23	1		AND BIT 0
0	24		1 FRAMES UNITS	
1	25		2	
2	26		4	
3	27		8	
4	28		1ST BINARY GROUP	

5	29	
6	30	
7	31	
8	32	10 FRAMES TENS
9	33	20
10	34	DROP FRAME FLAG
11	35	COLOUR FRAME FLAG
12	36	2ND BINARY GROUP
13	37	
14	38	
15	39	

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BIT NUMBER		BIT		
TYPE C	TYPE 8	VALUE	DESCRIPTION	Notes
16	40		1 SECONDS UNITS	
17	41		2	
18	42		4	
19	43		8	
20	44		3RD BINARY GROUP	
21	45			
22	46			
23	47			
24	48		10 SECONDS TENS	
25	49		20	
26	50		40	
27	51		BI-PHASE MARK PHASE CORRECTION BIT	
28	52		4TH BINARY GROUP	
29	53			
30	54			
31	55			
32	56		1 MINUTES UNITS	
33	57		2	
34	58		4	
35	59		8	
36	60		5TH BINARY GROUP	
37	61			
38	62			
39	63			
40	64		10 MINUTES TENS	
41	65		20	
42	66		40	
43	67		BINARY GROUP FLAG BIT	
44	68		6TH BINARY GROUP	
45	69			
46	70			
47	71			
48	72		1 HOURS UNITS	

49	73	2
50	74	4
51	75	8
52	76	7TH BINARY GROUP
53	77	
54	78	
55	79	