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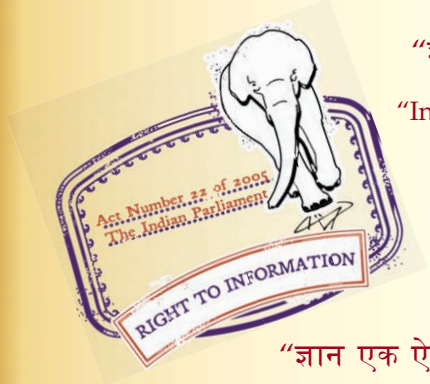
IS 12429-1 (1988): Time and control code for video tape recorders, Part 1: Longitudinal time code (LTC) [LITD 7: Audio, Video and Multimedia Systems and Equipment]



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(Reaffirmed 2002)

Indian Standard

TIME AND CONTROL CODE FOR VIDEO TAPE RECORDERS

PART 1 LONGITUDINAL TIME CODE (LTC)

UDC 621·397·452 : 621-503·52

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NEW DELHI 110002

Gr 3

March 1989

Indian Standard

TIME AND CONTROL CODE FOR VIDEO TAPE RECORDERS

PART 1 LONGITUDINAL TIME CODE (LTC)

0. FOREWORD

0.1 This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards on 22 February 1988 on the recommendations of the Recording Sectional Committee and approved by the Electronics and Telecommunication Division Council.

0.2 While preparing this standard, assistance has been derived from IEC Pub 461 'Time and control code for video tape recorders' issued by the International Electrotechnical Commission (IEC).

0.3 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard (Part 1) specifies a digital code format and modulation method to be used for timing and control purposes of television-tape machines and/or associated separate audio recorders. The encoded signal shall be recorded on the cue track or on an auxiliary longitudinal track. This standard is applicable for 50 Hz-625 lines system.

2. TERMINOLOGY

2.1 For the purpose of this standard, the terms and definitions given in IS : 1885 (Part 48)-1970* shall apply.

3. MODULATION METHOD

3.1 The modulation method shall be such that a transition occurs at the beginning of every bit period. In the case of a 'zero', there is no second transition within the bit period. In the case of a 'one', there is a second transition, a half-bit period after the start of the bit. This method is also known as 'Bi-Phase Mark' (*see* Fig. 1).

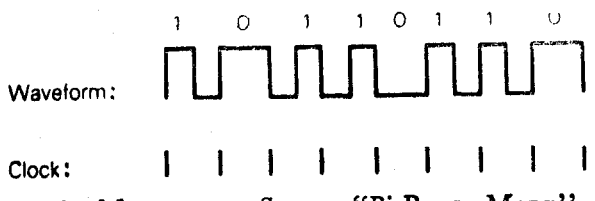


FIG. 1 MODULATION SYSTEM "BI-PHASE MARK"

*Electrotechnical vocabulary: Part 48 Recording.

4. CODE FORMAT

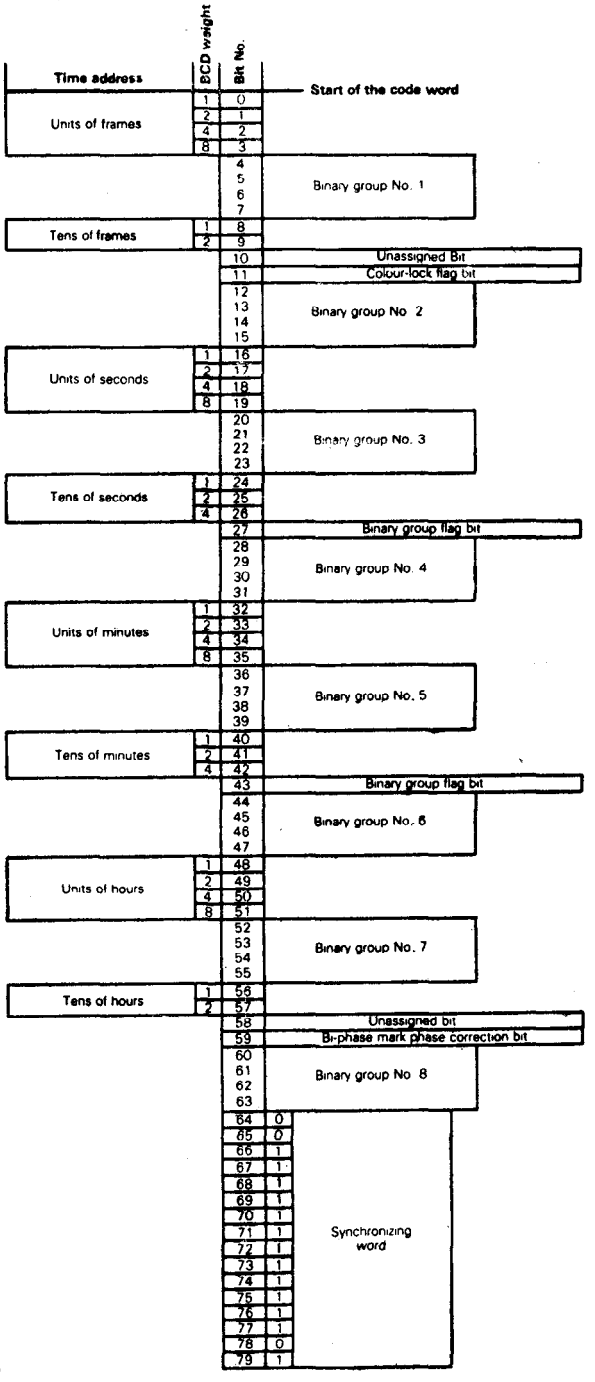
4.1 A unique code word shall be associated with each television frame.

4.2 Each code word shall consist of 80 bits numbered from 0 to 79, inclusive.

4.3 The bits shall be assigned as shown in Fig. 2 and as described hereinafter:

0-3	Units of frames
4-7	First binary group
8-9	Tens of frames
10	Unassigned address bit
11	Colour-lock flag bit
12-15	Binary group No. 2
16-19	Units of seconds
20-23	Binary group No. 3
24-26	Tens of seconds
27	Binary group flag bit
28-31	Binary group No. 4
32-35	Units of minutes
36-39	Binary group No. 5
40-42	Tens of minutes
43	Binary group flag bit
44-47	Binary group No. 6
48-51	Units of hours
52-55	Binary group No. 7
58	Unassigned bit
59	Bi-phase mark phase correction bit

60-63	Binary group No. 8	66-67	Fixed one
64-79	Synchronizing word	78	Fixed zero
64-65	Fixed zero	79	Fixed one



80 bits per frame:

32 user binary spare bits
16 sync. bits
30 address bits
2 unassigned address bits
The unassigned bits are zeros

FIG. 2 CONSTITUTION OF THE CODE WORD (LONGITUDINAL CODE)

4.4 Boundaries of the Code Word — The code word shall start at the clock edge before the first bit (bit zero). The bits shall be evenly spaced in such a way that the code word period shall coincide with the period of one television frame. The bit rate shall be 80 times the frame rate (per second) of the television system used.

4.5 Use of Binary Groups — The binary groups are intended for the storage of supplementary data by the users. The 32 bits within the eight binary groups may be assigned in any way without restrictions, if the character set used for the data insertion is not specified and the binary group flag bits No. 27 and 43, both are zero.

If an eight-bit character set conforming to IS : 10315-1982* and IS : 12326-1987† is signalled by the binary group flag bits No. 27 and 43, the characters should be inserted in accordance with Fig. 3. The information carried by the user bits is not subjected to any regulation.

At present, the following truth-table applies:

	Bit No. 27(43)
Character set not specified	0
Eight-bit character set conforming to ISO standards 646 and 2022	1
Unassgined	0
Unassigned	1

The unassigned states of the truth-table cannot be used and their assignment is reserved for the International Electrotechnical Commission (IEC).

It should be noted that, in each time code word, some user bits will be decoded before bits No. 27 (43) are encountered. The data in these earlier user-bit locations must not be lost.

If the time code is locked to the eight-field sequence in PAL, as defined in **6**, bit No. 11 shall be set to 1.

*7-Bit coded character set for information interchange.
†7-Bit and 8-bit coded character sets — Code extension techniques.

4.6 Assigned and Unassigned Bits

4.6.1 *Colour-Lock Flag Bit* — The colour-lock flag bit No. 11 shall be set to 1 when the time code is locked to the associated PAL colour signal in accordance with the eight-field sequence, and when the video signal has the 'preferred sub-carrier-to-line-sync phase'.

4.6.2 *Bi-Phase Mark Phase-Correction Bit* — The purpose of the phase-correction bit is to compensate for phase reversals in the bi-phase mark modulation that could occur when code inserts are performed. Such compensation may be required when code inserts modify the content of any of bits No. 0 to 63, bit No. 59 excluded.

4.6.2.1 In order that the magnetization transient between bit-cell 79 of one word and bit-cell 0 of the next shall always be in the same direction, bit No. 59 will be put in a state where every 80-bit word will contain an even number of logic zeros.

4.6.2.2 This requirement results in the following truth-table for bit No. 59:

Number of Logic Zeros in Bits No. 0 to 63 (59 Excluded)	*Bit 59*
Odd	1
Even	0

4.6.2.3 In drawing up this specification, the use of time code write/read systems that have equal polarity relations between input/output voltage and the tape magnetization is assumed.

4.6.2.4 This specification should not be understood as a requirement for time code insert capacity in television tape-machines in situations where tapes have to be interchanged, until further notice from the International Electrotechnical Commission (IEC).

4.6.3 *Unassigned Bits* — Bits No. 10 and 58 are reserved for future assignment and shall be zeros until specified by the International Electrotechnical Commission (IEC).

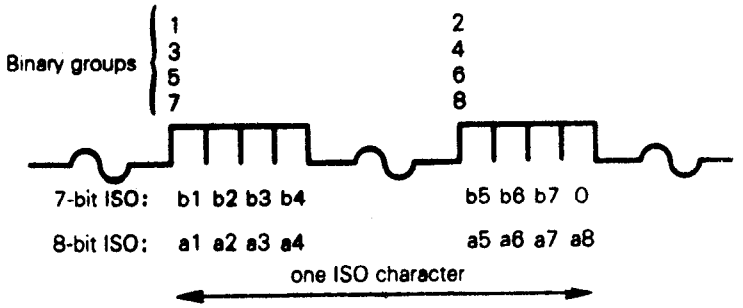


FIG. 3 USE OF BINARY GROUPS OF THE TIME-AND-CONTROL CODE TO DESCRIBE THE ISO CHARACTER CODED WITH 7 OR 8 BITS

5. STRUCTURE OF THE TIME ADDRESS

5.1 The basic structure of the time address is based upon the Binary Coded Decimal (BCD) system. In those cases, when the count does not rise to 9, only two or three bits are required, rather than four bits as is normal in the BCD code.

5.2 Assignment of the Time Bits

Frames

Units Bits 0-3: four bits BCD arranged 1, 2, 4, 8 count 0 to 9.

Tens Bits 8-9: two bits BCD arranged 1, 2 count 0 to 2.

Seconds

Units Bits 16-19: four bits BCD arranged 1, 2, 4, 8 count 0 to 9.

Tens Bits 24-26: three bits BCD arranged 1, 2, 4 count 0 to 5.

Minutes

Units Bits 32-35: four bits BCD arranged 1, 2, 4, 8 count 0 to 9.

Tens Bits 40-42: three bits BCD arranged 1, 2, 4 count 0 to 5.

Hours

Units Bits 48-51: four bits BCD arranged 1, 2, 4, 8 count 0 to 9.

Tens Bits 56-57: two bits BCD arranged 1, 2 count 0 to 2.

(The 24-hour clock system is used).

6. ADDITIONAL COLOUR TELEVISION REQUIREMENTS

6.1 Field Sequence of Colour Recordings — Simple editing of colour signals on television tape machines where a picture timing disturbance of up to half the period of the colour subcarrier can be tolerated need only consider a four field sequency in PAL.

Sophisticated editing operations, where disturbance must be held to a minimum, shall take into account an eight-field PAL sequence. The phase relationship between colour subcarrier and the synchronizing signal should show minimum discontinuity at the edit point.

Recognition of these requirements can be accomplished with the aid of the time and control code, provided that there exists a fixed relationship between time address of the code and the sequence of television fields. This particular relationship is described below.

6.1.1 *PAL Signals Systems B, G, H and I* — During electronic editing of colour signals recording on television tape-machines, it is important that in the case of sophisticated editing operations on PAL signals, the correct eight-field sequence also be maintained in the edited master, and that the 'in-phase' or 'out-of-phase' position of a slave tape can be controlled.

These sequences can be preserved with the aid of the time-and-control code, provided that there exists a fixed relationship between the time addresses of the code and the sequence of television fields.

Therefore, it has been agreed that, when necessary, the on-tape relationship between the time address-numbers of the time and control code and the associated eight fields of the PAL video signal, shall be as follows:

bit No. 0 is A
bit No. 16 is B
bit No. 8 is C
bit No. 8 is D
bit No. 17 is E
bit No. 24 is F

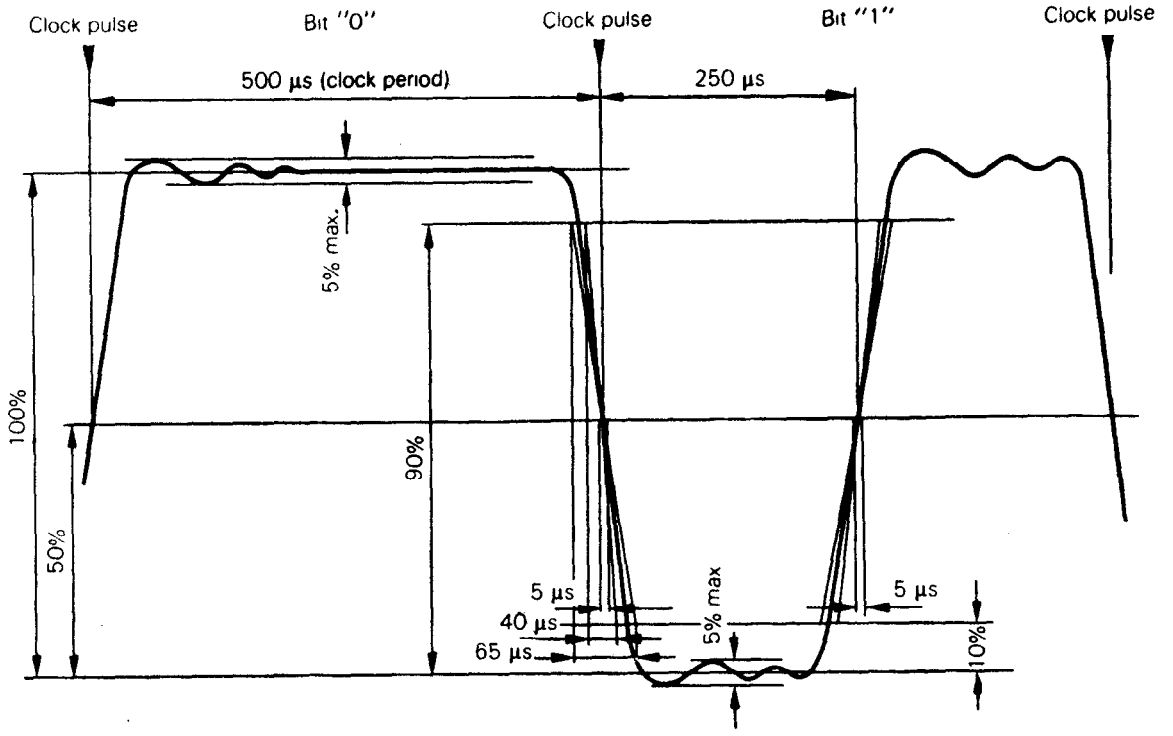
When the time-code is displayed in decimal numbers, S and P designating the numbers of seconds and pictures respectively, the above condition is expressed as:

remainder on dividing $S + P$ by 4 is

0 for fields 7 and 8
1 for fields 1 and 2
2 for fields 3 and 4
3 for fields 5 and 6

6.2 The requirements of **6.1** shall be met at the output of the time and control code generator.

7. WAVEFORM OF THE TIME AND CONTROL CODE SIGNAL (*see* Fig. 4)



Rise and fall time:	$50 \pm \frac{15}{10}$ µs measured between the 10% and 90% amplitude points of the waveform
Shape of transition:	Similar to the edge of a sine squared pulse
Maximum overshoot, undershoot, tilt:	5 % of peak-to-peak amplitude
Clock period:	500 µs (nominal)
Maximum timing error of any clock period:	± 2·5 µs
Maximum timing error of "1" transition:	± 2·5 µs

NOTE — Any distribution equipment is expected to transmit the signal with negligible distortion so that the waveform of the input signal to the recorder meets the same requirements.

FIG. 4 WAVEFORM OF THE TIME AND CONTROL CODE SIGNAL (625/50)

8. TIMING OF THE START OF THE CODE WORD

8.1 625/50 Systems — The start of the code word occurs within the period of the picture with which the code word is associated (Fig. 5).

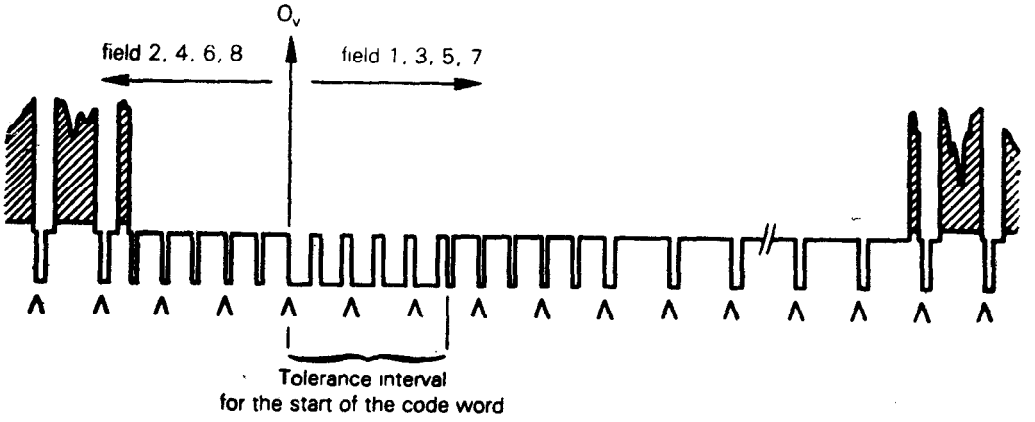


FIG. 5 START OF THE CODE WORD IN THE FIELD-BLANKING INTERVAL (625/50)

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