

Specification for

Time and control codes for video tape recorders —

(Implementation of CENELEC HD 507
S1)

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Committees responsible for this British Standard

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- Association of Sound and Communications Engineers Limited
- British Broadcasting Corporation
- British Kinematograph, Sound and Television Society
- Council for Educational Technology for the United Kingdom
- Electronic Engineering Association
- Independent Television Companies' Association
- Training and Educational Systems Testing Bureau

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National foreword

This British Standard has been prepared under the direction of the Electronic Equipment Standards Committee and is identical with Publication 461:1986 “*Time and control code for video tape recorders*,” published by the International Electrotechnical Commission (IEC). This British Standard is also in agreement with Harmonization Document HD 507 S1 published by the European Committee for Electrotechnical Standardization (CENELEC).

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards.

Cross-references

International Standard	Corresponding British Standard
ISO 646:1983	BS 4730:1985 <i>Specification for UK 7-bit coded character set</i> (Identical exercising national options)

The Technical Committee has reviewed the provisions of ISO 2022 and CCIR Report 624-2, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A British Standard identical with ISO 2022 is in preparation.

Copies of CCIR documents can be obtained from:

International Telecommunications Union

Places des Nations

CH 1211

Geneva 20

Switzerland.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 26, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

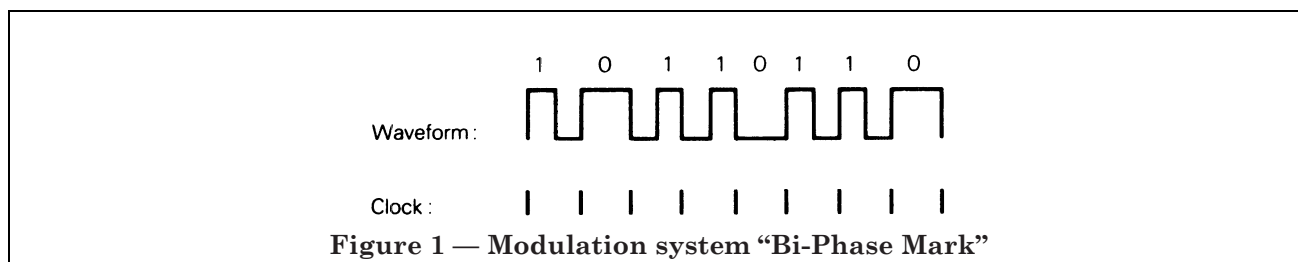
Chapter I. Longitudinal time code (LTC)

1 Scope

This chapter 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.

2 Modulation method

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 Figure 1).



3 Code format

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

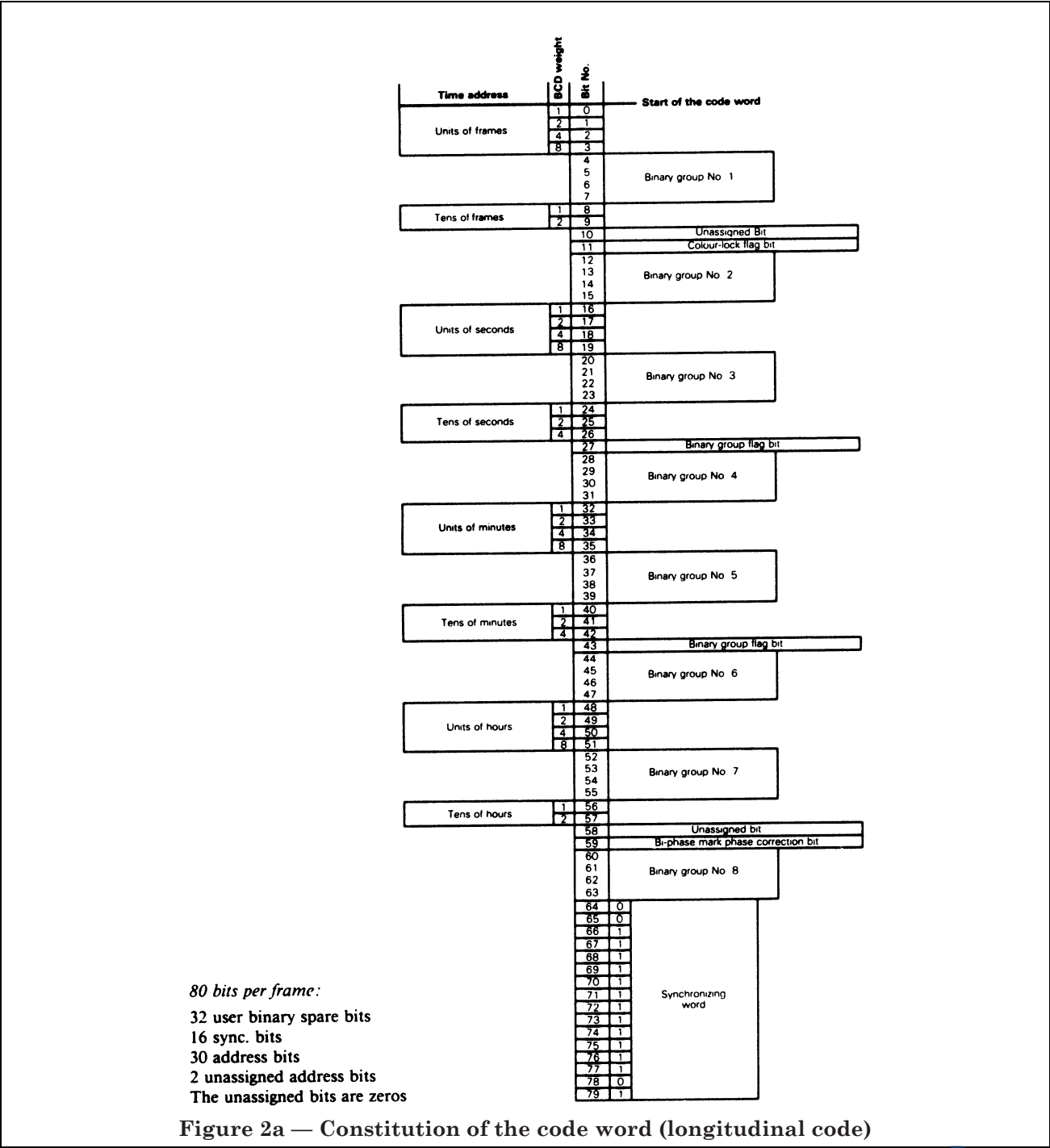
3.2 Each code word shall consist of 80 bits numbered from 0 to 79, inclusive.

3.3 The bits shall be assigned as shown in Figure 2a (625/50), page 2 and Figure 2b (525/60) and as described hereinafter:

	625/50	525/60
0–3	Units of frames	Units of frames
4–7	First binary group	First binary group
8–9	Tens of frames	Tens of frames
10	Unassigned address bit	Drop frame flag bit
11	Colour-lock flag bit	Colour-lock flag bit
12–15	Binary group No. 2	Binary group No. 2
16–19	Units of seconds	Units of seconds
20–23	Binary group No. 3	Binary group No. 3
24–26	Tens of seconds	Tens of seconds
27	Binary group flag bit	Bi-phase mark phase-correction bit
28–31	Binary group No. 4	Binary group No. 4
32–35	Units of minutes	Units of minutes
36–39	Binary group No. 5	Binary group No. 5
40–42	Tens of minutes	Tens of minutes
43	Binary group flag bit	Binary group flag bit
44–47	Binary group No. 6	Binary group No. 6
48–51	Units of hours	Units of hours
52–55	Binary group No. 7	Binary group No. 7
58	Unassigned bit	Unassigned bit
59	Bi-phase mark phase correction bit	Binary group flag bit

60–63	Binary group No. 8	Binary group No. 8
64–79	Synchronizing word	Synchronizing word
64–65	Fixed zero	Fixed zero
66–77	Fixed one	Fixed one
78	Fixed zero	Fixed zero
79	Fixed one	Fixed one

3.3.1 625/50 systems



3.3.2 525/60 systems

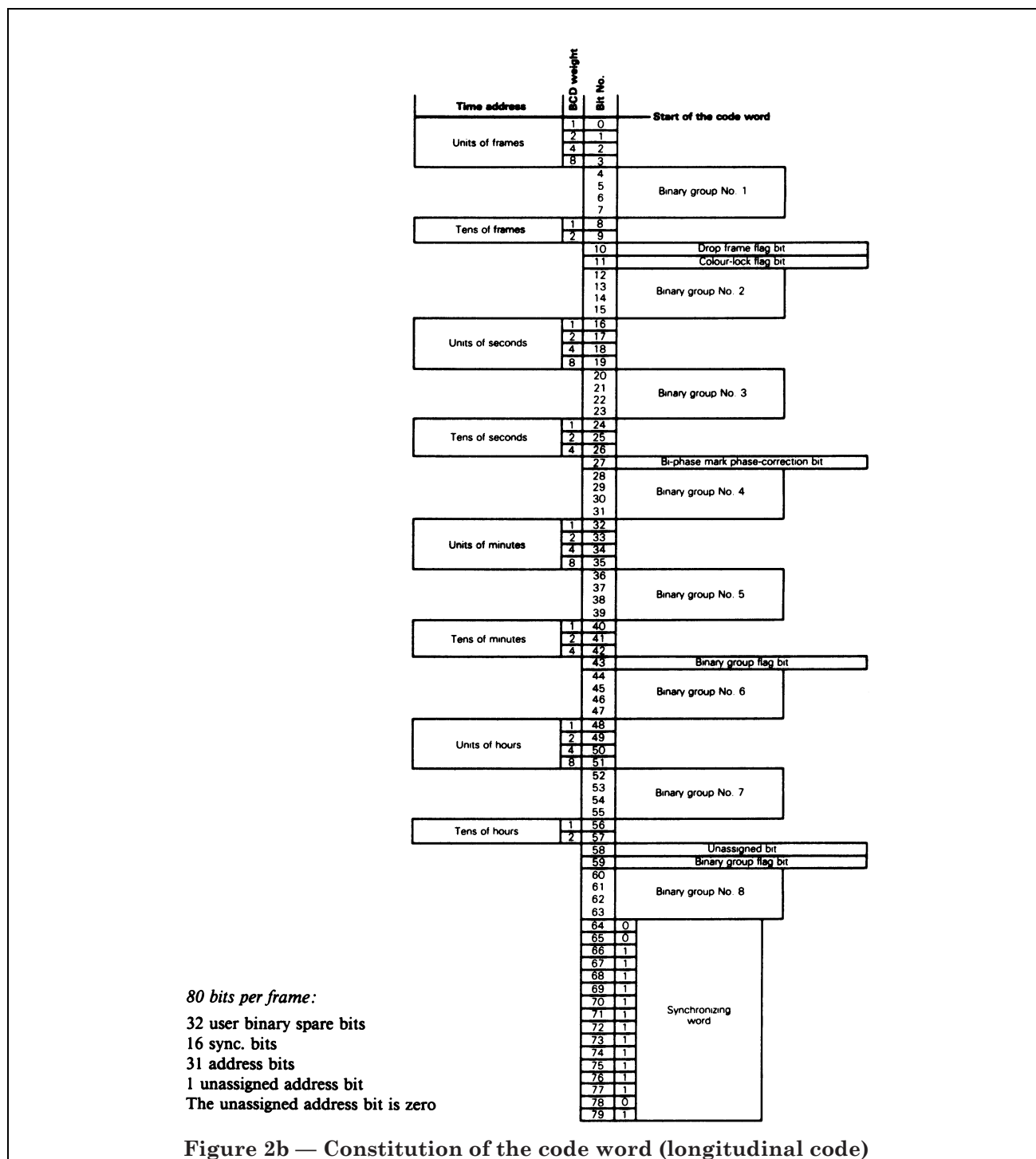


Figure 2b — Constitution of the code word (longitudinal code)

3.4 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.

3.5 Use of binary groups 625/50 (525/60)

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 Nos. 27 and 43 both are zero (525/60 systems: bit positions 43 and 59).

If an eight-bit character set conforming to ISO Standard 646¹⁾ and ISO Standard 2022²⁾ is signalled by the binary group flag bits Nos. 27 and 43 (525/60 systems: bit positions 43 and 59) the characters should be inserted in accordance with Figure 3, page 4. The information carried by the user bits is not subjected to any regulation.

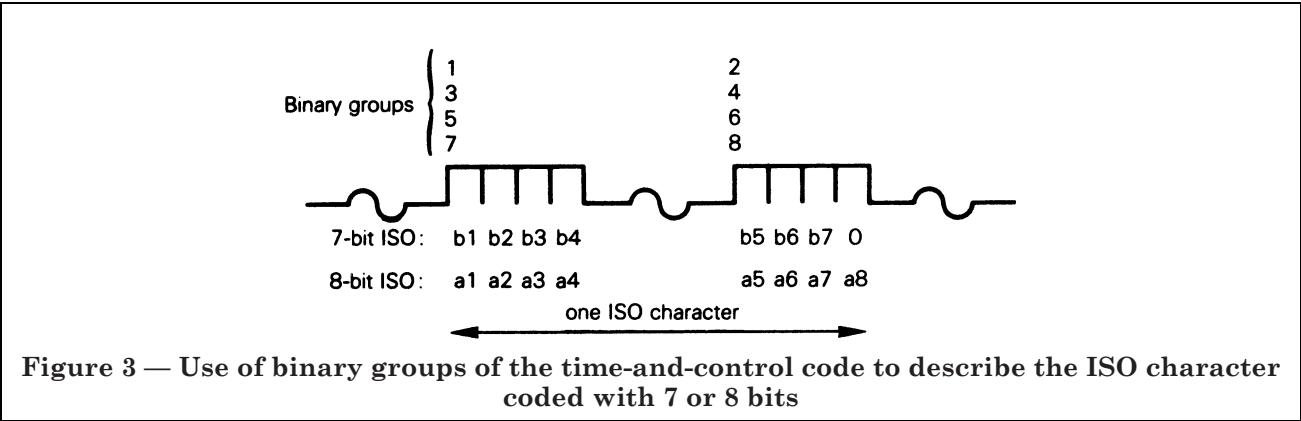
At present, the following truth-table applies:

	Bit No. 27 (43)	Bit No. 43 (59)
Character set not specified	0	0
Eight-bit character set conforming to ISO Standards 646 and 2022	1	0
Unassigned	0	1
Unassigned	1	1

The unassigned states of the truth-table cannot be used and their assignment is reserved for the IEC. If it becomes clear that no use is to be expected for them, it is possible that bit No. 43 (59) can again become unassigned and thus available for other applications, while still retaining bit No. 27 (43) to signal the presence of eight-bit ISO characters.

It should be noted that, in each time code word, some user bits will be decoded before bits Nos. 27 (43) and 43 (59) are encountered. The data in these earlier user-bit locations must not be lost.

If the time code is locked to the four-field sequence in NTSC or the eight-field sequence in PAL, as defined in Sub-clause 5.2, bit No. 11 shall be set to “1”.



3.6 Assigned and unassigned bits

3.6.1 625/50 systems

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 subcarrier-to-line-sync, phase”.

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 Nos. 0 to 63, bit No. 59 excluded.

¹⁾ ISO Standard 646: Information Processing — ISO 7-Bit Coded Character Set for Information Interchange.
²⁾ ISO Standard 2022: Information Processing — ISO 7-Bit and 8-Bit Coded Character Sets — Code Extension Techniques

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.

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

<i>Number of logic zeros in bits Nos. 0 to 63 (59 excluded)</i>	<i>Bit 59</i>
Odd	1
Even	0

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.

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 IEC.

Unassigned bits

Bits Nos. 10 and 58 are reserved for future assignment and shall be zeros until specified by the IEC.

3.6.2 525/60 systems

Six bits are reserved within the address group, 4 for identifying operational modes, 1 for bi-phase correction, and 1 unassigned, but reserved for future assignment and defined as zero until further specified by the IEC:

- Bit No. 10 — Drop Frame Flag. If certain numbers are being dropped to resolve the difference between real time and colour time, as defined in Sub-clause 5.1, a “1” shall be recorded.
- Bit No. 11 — Colour Frame Flag. If colour frame identification has been intentionally applied, as defined in Sub-clause 5.2, a “1” shall be recorded.
- Bit No. 27 — “Bi-phase Mark” Phase Correction. Shall be put in a state so that every 80-bit word will contain an even number of logic zeros. This requirement results in the following table for bit 27:

<i>Number of logic zeros in bits Nos 0 to 63 (27 excluded)</i>	<i>Bit No. 27</i>
Odd	1
Even	0

Bits Nos. 43 and 59 — Binary Group Flag Bits. These 2 bits shall be set in accordance with the truth-table as specified in Sub-clause 3.5.

Bit No. 58 — Unassigned Address Bit. “0” until assigned by the IEC.

4 Structure of the time address

4.1 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.

4.2 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).

5 Additional colour television requirements

5.1 System M colour television requirements

Because the vertical frame rate of a System M colour signal is 29.97 frames/second, counting of frames will yield approximately a 4-second timing error in one hour. Therefore, two modes of operation are allowed:

5.1.1 Mode “1”

5.1.1.1 M/NTSC System

To resolve the colour time error, the first two frame numbers (0 and 1) at the start of each minute shall be omitted from the count except for minutes 0, 10, 20, 30, 40 and 50. When this mode is used, bit No. 10 shall be “1”.

5.1.1.2 M/PAL System

To resolve the colour time error, the first four frame numbers (1 to 4) at the start of every second minute (even minute numbers) shall be omitted from the count except for minutes 0, 20 and 40. When this mode is used, bit No. 10 shall be a “1”.

5.1.2 Mode “0”

For every frame, the frame number shall be increased by one from 0 to 29. When this mode is used, bit No. 10 shall be a “0”.

5.2 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 two-field sequence in NTSC or a four-field sequence in PAL. The SECAM four-field sequence does not lead to picture disturbance at editing points.

Sophisticated editing operations where disturbance must be held to a minimum shall take into account a four-field NTSC and 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.

5.2.1 NTSC Signals

NTSC frames that contain fields 1 and 2 of the sequence of four fields shall be even numbered, and NTSC frames that contain fields 3 and 4 shall be odd numbered.

This relationship can also be defined in the following way:

The content of bit No. 0 is:

“0” for fields 1 and 2

“1” for fields 3 and 4

5.2.2 PAL Signals

5.2.2.1 System M

PAL frames that contain fields 1 and 2 of the sequence of four fields shall be odd numbered, and PAL frames that contain fields 3 and 4 shall be even numbered.