

INTERNATIONAL STANDARD

IEC 61834-3

First edition
1999-11

**Recording – Helical-scan digital video cassette
recording system using 6,35 mm magnetic tape for
consumer use
(525-60, 625-50, 1125-60 and 1250-50 systems)**

**Part 3:
HD format for 1125-60 and 1250-50 systems**

*Système de magnétoscope numérique à cassette à balayage
hélicoïdal sur bande magnétique de 6,35 mm pour usage
grand public
(systèmes 525-60, 625-50, 1125-60 et 1250-50) –*

*Partie 3:
Format HD pour les systèmes 1125-60 et 1250-50*



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* See web site address on title page.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RECORDING – HELICAL-SCAN DIGITAL VIDEO CASSETTE RECORDING
SYSTEM USING 6,35 mm MAGNETIC TAPE FOR CONSUMER USE
(525-60, 625-50, 1125-60 and 1250-50 systems) –**

Part 3: HD format for 1125-60 and 1250-50 systems

FOREWORD

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International Standard IEC 61834-3 has been prepared by subcommittee 100B: Audio, video and multimedia information storage systems, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100B/233/FDIS	100B/245/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

IEC 61834 consists of the following parts, under the general title *Recording – Helical-scan digital video cassette recording system using 6,35 mm magnetic tape for consumer use (525-60, 625-50, 1125-60 and 1250-50 systems)*

- Part 1: General specifications;
- Part 2: SD format for 525-60 and 625-50 systems;
- Part 3: HD format for 1125-60 and 1250-50 systems;
- Part 4: The pack header table and the contents;
- Part 5: The character information system.

The basic principles and rules of this part 3 are based on the set of specifications to be adopted by the HD Digital VCR Conference.

This part 3 describes the helical-scan digital video cassette recording system using 6,35 mm magnetic tape for consumer use.

Part 1 describes the common specifications for the helical-scan digital video cassette recording system using 6,35 mm magnetic tape.

Part 2 describes the specifications for 525-60 and 625-50 systems which are not included in part 1.

Part 4 describes the pack header table and the contents of packs which are applicable to the whole recording system of helical-scan digital video cassette.

Part 5 describes the character information system which is applicable to the whole recording system of helical-scan digital video cassette.

For manufacturing SD digital video cassette recording systems, parts 1, 2, 4 and 5 are referred to.

For manufacturing HD digital video cassette recording systems, parts 1, 2, 3, 4 and 5 are referred to.

Annex A forms an integral part of this standard.

Annex B is for information only.

The committee has decided that this publication remains valid until 2004. At this date, in accordance with the committee's decision, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this standard may be issued at a later date.

RECORDING – HELICAL-SCAN DIGITAL VIDEO CASSETTE RECORDING SYSTEM USING 6,35 mm MAGNETIC TAPE FOR CONSUMER USE (525-60, 625-50, 1125-60 and 1250-50 systems) –

Part 3: HD format for 1125-60 and 1250-50 systems

1 General

1.1 Scope

The main object of this part of IEC 61834 is to establish basic principles applicable to the next generation of digital video cassette recording systems for consumer use for the interest of both users and manufacturers.

This part of IEC 61834 specifies the content, format and recording method of the data blocks forming the helical records on the tape containing audio, video, and system data. It describes the specifications for the 1125-line system with a frame frequency of 30,00 Hz (hereinafter referred to as the "1125-60 system") and the 1250-line system with a frame frequency of 25,00 Hz (hereinafter referred to as the "1250-50 system") which are not included in parts 1 and 2. One video channel and four independent audio channels are recorded in the digital format. Each of these channels is designed to be capable of independent editing. The video channel records and reproduces a component television signal in the 1125-60 and 1250-50 systems.

In part 3, the data structure of a track is defined by $APT = 000b$ which consists of four areas as described in 4.3.2 in part 1 and $AP1 = AP2 = AP3 = 000b$. The data structure of MIC is the same as clause 10 in IEC 61834-2.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61834. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61834 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61834-2:1998, *Recording – Helical-scan digital video cassette recording system using 6,35 mm magnetic tape for consumer use (525-60, 625-50, 1125-60 and 1250-50 systems) – Part 2: SD format for 525-60 and 625-50 systems*

ITU-R Recommendation BT.709-3:1998, *Parameter values for the HDTV standards for production and international programme exchange*

ITU-R Recommendation BS.775-1:1993, *Multi-channel stereophonic sound systems with and without accompanying picture*

1.3 Definitions, symbols and abbreviations

None

1.4 Environment and test conditions

Tests and measurements made on the system to check the requirements of this standard shall be carried out under the following conditions.

- Temperature: 20 °C ± 1 °C;
- Relative humidity: (50 ± 2) %;
- Barometric pressure: from 86 kPa to 106 kPa;
- Tape conditioning: not less than 24 h.

1.5 Reference tape

Blank tape to be used for calibration recordings may be purchased from the manufacturers given in annex B.

1.6 Calibration tape

Manufacturers of video tape recorders designed for this format specification may sell calibration tapes meeting the following requirements.

1.6.1 Record locations and dimensions

Tolerances shown in tables 1 and 2 should be reduced by 50 %.

1.6.2 Calibration signals

Test signals should be recorded on the calibration tapes:

- Video: 100 % colour bars;
- Audio: 1 kHz tone at –20 dB below full level.

1.6.3 Purchase

The calibration tape may be purchased from the manufacturers given in annex B.

2 Helical recordings

2.1 Tape speed

The tape speed is 37,594 mm/s for both 1125-60 and 1250-50 systems.

The tape speed tolerance is ±0,5 %.

2.2 Record location and dimensions

Record location and dimensions for continuous recording shall be as specified in figure 1 of IEC 61834-2. Each value is described in table 1. For recording, helical tracks shall be contained within the tolerance specified in table 1.

Each sector location from the start of the SSA shall be as specified in figure 2 and table 2 of IEC 61834-2. The physical tape pattern shall be specified by the centre line of each track.

The effective area upper edge, record and playback guarantee, overwrite margin (OM) and switching margin for recording amplifiers are the same as in IEC 61834-2.

2.2.1 Scanner example

Scanner dimensions in table 3 are one possible configuration. Other mechanical configurations are permitted, if the same footprint of recorded information is produced on tape.

3 Programme track data arrangement

3.1 Introduction

Each television frame is recorded on 20 tracks for the 1125-60 system and 24 tracks for the 1250-50 system.

The helical tracks are recorded with video, audio and system data the same as the SD format in IEC 61834-2. Figure 1 shows the arrangement of a track for both systems.

Each track is numbered from the beginning track of the television frame in order. A track which has track number i ($i = 0$ to 19 for 1125-60 system or $i = 0$ to 23 for 1250-50 system) is referred to as track i .

Placement of F0, F1 and F2 tracks is shown in figure 2 for the 1125-60 system and figure 3 for the 1250-50 systems. In both systems, pilot frame 0 repeats.

3.2 Labelling convention

The most significant bit is written on the left and is the first recorded on the tape. The lowest numbered byte is shown on the top left and is the first encountered in the input data stream. Byte values are expressed in binary coded decimal notation unless otherwise noted.

An "h" subscript indicates hexadecimal value. A "b" subscript indicates binary value.

3.3 Audio sector

Same as IEC 61834-2 except for sequence number (see table 4) and track pair number (see tables 5 and 6).

3.4 Video sector

Same as IEC 61834-2 except for sequence number (see table 4) and track pair number (see tables 5 and 6)

3.5 Subcode sector

Same as IEC 61834-2 except for subcode postamble which begins with run-up of modulated 1 200 bits for the 1125-60 and 1250-50 systems.

4 Audio interface

Same as IEC 61834-2.

5 Video interface

Same as IEC 61834-2.

6 Audio signal processing

6.1 Introduction

The audio signal is recorded on four audio blocks. Each audio block is processed independently and identically. The audio block is composed of five audio sectors in five consecutive tracks for the 1125-60 system and six audio sectors in six consecutive tracks for the 1250-50 system. Audio signal processing in each audio block is the same as in IEC 61834-2.

Option:

In this standard, 20 bits audio for professional use is prepared. Details are described in annex A.

6.2 Error correction code

Same as IEC 61834-2.

6.3 Randomization pattern

Same as IEC 61834-2.

6.4 Audio encoding

Same as IEC 61834-2.

6.5 Audio channel allocation

6.5.1 Audio block

The audio block is the physical recording channel for audio signal on tape. In this standard, four audio blocks named CH1, CH2, CH3 and CH4 are provided. The construction of these audio blocks is shown in table 7. In each audio block, one of four encoding modes prescribed in table 13 in IEC 61834-2 is applied. Audio signals with the same encoding mode shall be recorded in CH1 and CH2, and in CH3 and CH4. CH1 and CH3 may be recorded with a different encoding mode from each other, but the quantization in CH1 to CH4 shall be the same except for HD-6ch audio described later.

6.5.2 Audio channel mode

For the assignment of encoding mode in four audio blocks, three types of audio channel modes are prepared, that is HD-4ch audio, HD-8ch audio and HD-6ch audio.

In 48k mode, 44,1k mode and 32k mode, a signal of one audio channel is recorded in an audio block. Since four audio channels are available, these modes are called HD-4ch audio.

In 32k-2ch mode, signals of two audio channels are recorded in an audio block. Since eight audio channels are available, this mode is called HD-8ch audio.

In the combination of 48k mode and 32k-2ch mode, signals of two audio channels are recorded in CH1 and CH2, and signals of four audio channels are recorded in CH3 and CH4. Since six audio channels are available, this mode is called HD-6ch audio. HD-6ch audio is available only for lumped audio described in 6.5.3.

6.5.3 Channel allocation rule

A channel allocation is classified into two kinds of rules by the attribute of source contents, that is, multi-stereo audio and lumped audio.

6.5.3.1 Multi-stereo audio

Multi-stereo audio is defined as multiple sets of stereo audio. Each stereo audio signal may be recorded independently. Multi-stereo audio contains HD-4ch audio and HD-8ch audio.

Basic channel allocation rule for HD-4ch audio is described in table 8. Encoded data in CH1 to CH4 correspond to encoded data X in figure 17 in IEC 61834-2. The audio signals which are recorded simultaneously with the video signal shall be recorded in CH1 and CH2.

Basic channel allocation rule for HD-8ch audio is described in table 8. Each audio channel in HD-8ch audio is named as CHa, CHb, CHc, CHd, CHe, CHf, CHg and CHh. CHa and CHb shall be recorded in CH1, CHc and CHd shall be recorded in CH2, CHe and CHf shall be recorded in CH3, and CHg and CHh shall be recorded in CH4. Encoded data in CHa, CHc, CHe and CHg correspond to encoded data Y, and encoded data in CHb, CHd, CHf and CHh correspond to encoded data Z in figure 18 in IEC 61834-2. For the channel described as "No information" in CHb, CHd, CHf or CHh, all zero data or the same data as CHa, CHc, CHe or CHg may be recorded. The audio signals which are recorded simultaneously with the video signal shall be recorded in CH1.

6.5.3.2 Lumped audio

Lumped audio is defined so that all channels of audio blocks shall be recorded simultaneously. Lumped audio contains HD-4ch audio, HD-6ch audio and HD-8ch audio which are called lumped-4ch audio, lumped-6ch audio and lumped-8ch audio respectively. The channel allocation rule of lumped audio is shown in table 9. Lumped-6ch audio and lumped-8ch audio are prepared for pre-recorded tapes. If the woofer channel is not used, all zero data as audio data shall be recorded into the channel. Other channel allocations are reserved.

For lumped audio, SM of AAUX SOURCE pack shall be set to "1". For playback, each SM of AAUX SOURCE pack in all audio blocks should be checked.

Mixing levels of Lmix, Rmix, T, Q1 and Q2 in table 9 are referred to in ITU-R Recommendation 775.

6.6 Frame structure

6.6.1 Relative audio-video timing

Audio signals are recorded separately by the video frame period, and the duration of one audio frame is defined as one video frame. An audio frame begins with the audio sample acquired within the duration of minus 50 samples to zero sample from the beginning of the first line in the first field of the input video signal.

6.6.2 Audio frame processing

This standard provides the same audio frame processing modes as IEC 61834-2.

6.6.2.1 Unlocked mode

Unlocked mode is applied to 48k, 44,1k, 32k and 32k-2ch modes when sampling frequency of the audio signal is not synchronous with the video frame frequency. The number of audio samples per frame is variable within the range between the maximum and the minimum, as shown in table 10. The number of audio samples per frame is rounded to integer. The recording capacity of audio data for each audio block corresponds with the maximum in 48k mode. For the lack of samples for filling the audio block, undefined values, "1" or "0", which mean "don't-care data", shall be recorded.

6.6.2.2 Locked mode

Locked mode is applied to 48k, 32k and 32k-2ch modes when sampling frequency of the audio signal is synchronous with the video frequency. The audio sampling frequency (f_s) is related to the line frequency (f_h) by the following equations.

48k mode:	$f_s = f_h \times 64 / 45$	for 1125-60 system
	$f_s = f_h \times 192 / 125$	for 1250-50 system
32k mode and 32k-2ch mode:	$f_s = f_h \times 128 / 135$	for 1125-60 system
	$f_s = f_h \times 128 / 125$	for 1250-50 system

The number of audio samples per frame keeps a regular sequence or fixed value as shown in table 12.

6.7 Shuffling method

Audio samples and undefined values are shuffled over tracks and data-sync blocks within a frame. Firstly audio data are shuffled then undefined values are set. Data D_n that is sampled at n -th order ($n = 0, 1, 2, \dots$) within a frame is located at the position derived from the following equations.

Audio shuffling patterns are the same as figure 19 and figure 21 in IEC 61834-2 for 1125-60 system, and figure 20 and figure 22 in IEC 61834-2 for 1250-50 system. The following description of track number is added in each figure.

a) 1125-60 system

"Track 10 or Track 15" is added to "Track 0 or Track 5".

"Track 11 or Track 16" is added to "Track 1 or Track 6".

"Track 12 or Track 17" is added to "Track 2 or Track 7".

"Track 13 or Track 18" is added to "Track 3 or Track 8".

"Track 14 or Track 19" is added to "Track 4 or Track 9".

b) 1250-50 system

"Track 12 or Track 18" is added to "Track 0 or Track 6".

"Track 13 or Track 19" is added to "Track 1 or Track 7".

"Track 14 or Track 20" is added to "Track 2 or Track 8".

"Track 15 or Track 21" is added to "Track 3 or Track 9".

"Track 16 or Track 22" is added to "Track 4 or Track 10".

"Track 17 or Track 23" is added to "Track 5 or Track 11".