

INTERNATIONAL STANDARD

IEC 62071-2

First edition
2005-10

Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-7 –

Part 2: Compression format

© IEC 2005 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

XB

For price, see current catalogue

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references.....	7
3 Abbreviations and acronyms	7
4 Interface.....	8
4.1 Introduction	8
4.2 Data structure.....	9
4.3 Header section	12
4.4 Subcode section	15
4.5 VAUX section	20
4.6 Audio section.....	24
4.7 Video section.....	30
5 Video compression	32
5.1 Video structure	32
5.2 DCT processing.....	48
5.3 Quantization	51
5.4 Variable length coding (VLC)	53
5.5 The arrangement of a compressed macro block.....	56
5.6 The arrangement of a video segment.....	59
Annex A (informative) Differences between IEC 61834 and IEC 62071-2.....	64
Annex B (normative) Digital filter for sampling-rate conversion from 4:2:2 to 4:1:1 colour difference signals	65
Annex C (informative) Block diagram of D-7 recorder	66
Bibliography.....	67
Figure 1 – Block diagram on the digital interface.....	8
Figure 2 – Data structure of one video frame for 50 Mb/s structure	10
Figure 3 – Data structure of one video frame for 25 Mb/s structure	10
Figure 4 – Data structure of a DIF sequence.....	11
Figure 5 – Data in the subcode section.....	16
Figure 6 – Pack in SSYB	17
Figure 7 – Data in the VAUX section.....	21
Figure 8 – Data in the audio section	24
Figure 9 – conversion of audio sample to audio data bytes	26
Figure 10 – Arrangement of AAUX packs in audio auxiliary data	26
Figure 11 – Transmitting samples of 525/60 system for 4:2:2 compression	34
Figure 12 – Transmitting samples of 625/50 system for 4:2:2 compression	35
Figure 13 – Transmitting samples of 525/60 system for 4:1:1 compression	36
Figure 14 – Transmitting samples of 625/50 system for 4:1:1 compression	37
Figure 15 – DCT block and the pixel coordinates	38

Figure 16 – The rightmost DCT block in colour difference signal for 4:1:1 compression mode	38
Figure 17 – DCT block arrangement for 4:2:2 compression.....	39
Figure 18 – DCT block arrangement for 4:1:1 compression.....	40
Figure 19 – Macro block and DCT blocks for 4:2:2 compression	40
Figure 20 – Macro block and DCT blocks for 4:1:1 compression	40
Figure 21 – Super blocks and macro blocks in one TV frame for 525/60 system for 4:2:2 compression.....	42
Figure 22 – Super blocks and macro blocks in one TV frame for 525/60 system for 4:1:1 compression.....	43
Figure 23 – Super blocks and macro blocks in one TV frame for 625/50 system for 4:2:2 compression.....	44
Figure 24 – Super blocks and macro blocks in one TV frame for 625/50 system for 4:1:1 compression.....	45
Figure 25 – Macro block order in a super block for 4:2:2 compression	47
Figure 26 – Macro block order in a super block for 4:1:1 compression	47
Figure 27 – The output order of a weighted DCT block	50
Figure 28 – Area numbers	52
Figure 29 – Arrangement of a compressed macro block for 4:2:2 compression	56
Figure 30 – The arrangement of a compressed macro block for 4:1:1 compression.....	57
Figure 31 – The arrangement of a video segment after the bit rate reduction for 4:2:2 compression	62
Figure 32 – The arrangement of a video segment after the bit rate reduction for 4:1:1 compression	63
Figure 33 – The video error code.....	63
Figure B.1 – Template for insertion loss frequency characteristics	65
Figure B.2 – Passband ripple tolerance	65
Figure C.1 – Block diagram of D-7 recorder.....	66
Table 1 – ID data of a DIF block	12
Table 2 – Section type.....	13
Table 3 – DIF sequence number (525/60 system)	13
Table 4 – DIF sequence number (625/50 system)	14
Table 5 – DIF block number	14
Table 6 – Data (payload) in the Header DIF block.....	15
Table 7 – SSYB ID	17
Table 8 – Pack header table.....	18
Table 9 – Mapping of packet in SSYB data	18
Table 10 – Mapping of time code pack	19
Table 11 – Mapping of binary group pack	20
Table 12 – Mapping of VAUX pack in a DIF sequence	21
Table 13 – Mapping of VAUX source pack.....	21
Table 14 – Mapping of VAUX source control pack.....	23
Table 15 – Mapping of AAUX pack in a DIF sequence	26
Table 16 – Mapping of AAUX Source pack	27

Table 17 – Mapping of AAUX Source Control pack	28
Table 18 – Video DIF blocks and compressed macro blocks for 50 Mb/s structure – 4:2:2 compression.....	31
Table 19 – Video DIF blocks and compressed macro block for 25 Mb/s structure – 4:1:1 compression	32
Table 20 – Construction of video signal sampling (4:2:2)	33
Table 21 – Class number and the DCT block	51
Table 22 – An example of the Classification for reference.....	51
Table 23 – Quantization step.....	53
Table 24 – Length of codewords.....	54
Table 25 – Codewords for variable length coding.....	55
Table 26 – Definition of STA.....	57
Table 27 – Codewords of the QNO	58
Table A.1 – Abstract of differences between IEC 61834 and IEC 62071-2.....	64

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM
USING 6,35 mm MAGNETIC TAPE – FORMAT D-7 –**

Part 2: Compression format

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62071-2 has been prepared by technical area 6: Higher data rate storage media, data structures and equipment of IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

CDV	Report on voting
100/901/CDV	100/985/RVC

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 2.

IEC 62071 consists of the following parts, under the general title *Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-7*:

Part 1: VTR specifications

Part 2: Compression format

Part 3: Data stream format

This part 2 describes the specifications for encoding process and data format for 525i and 625i systems.

Part 1 describes the VTR specifications which are tape, magnetization, helical recording, modulation method and basic system data for video compressed data.

Part 3 describes the specifications for transmission of DV-based compressed video and audio data stream over 270Mb/s and 360 Mb/s serial digital interface.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

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

HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-7 –

Part 2: Compression format

1 Scope

This part of IEC 62071 defines the DV-based data structure for the interface of digital audio, subcode data and compressed video with the following parameters:

525/60 system – 4:1:1 image sampling structure, 25 Mb/s data rate;

525/60 system – 4:2:2 image sampling structure, 50 Mb/s data rate;

625/50 system – 4:1:1 image sampling structure, 25 Mb/s data rate;

625/50 system – 4:2:2 image sampling structure, 50 Mb/s data rate.

This standard does not define the DV compliant data structure for interface, of digital audio, subcode data and compressed video with the following parameters:

625/50 system – 4:2:0 image sampling structure, 25 Mb/s data rate

The compression algorithm and the DIF structure conform to the DV data structure as defined in IEC 61834. Differences between the DV-based data structure defined in this standard and IEC 61834 are shown in Annex A.

2 Normative references

The following referenced documents are indispensable for the application 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.

ITU-R BT.601-5: 1995, *Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspect ratios*

AES3-2003: *Serial transmission format for two-channel linearly represented digital audio data*

SMPTE 12M: 1999, *Television, Audio and Film – Time and Control Code*