

VIDEO-CD

Sept. 1994

# COMPACT disc DIGITAL VIDEO

## Introduction

The Video-CD specification is published by Philips in close cooperation with Matsushita, Sony and JVC. The system is based on MPEG1 motion video technology. It adds new dimension to the film and music video business.

- It offers up to 70 minutes of motion video combined with CD quality stereo sound packed onto a one 5 inch (12 cm) optical disc.
- For music video this allows for the same amount of music material as on a conventional CD-Digital Audio disc, but now also with digital video.
- A full length feature film up to 140 min can be offered in a standard 2 disc package. Surround sound, direct chapter access, single step and other sophisticated playback functions are available.
- The system uses the ISO MPEG1 standard audio/video coding technology to realise the full screen full motion pictures with associated high quality audio.
- The Video-CD format is based on the CD Bridge format, allowing these discs to be played on CD-i, CD-ROM-XA, Video-CD players and other platforms.
- Next to simple linear playback functions also sophisticated functions are available. They include, menus, interactive direct access, still pictures and text info.



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**Standard**

The Video-CD disc is completely described in the Video-CD specification which is published by Philips Consumer Electronics B.V. in close cooperation with Matsushita Electric Industrial Co. Ltd, Sony Corporation and Victor Company of Japan Ltd.

Video-CD is a reproduction system to present full motion pictures with associated audio by using the Compact disc format. Moving pictures and their associated Audio are coded according to the MPEG standard ISO 11172. The results are full screen full motion pictures with high quality audio.

The Video-CD format is based on the CD Bridge format. By using this disc concept, Video-CD discs can be played on CD-i, CD-ROM-XA (with MPEG hardware), Video-CD players and other platforms.

The Motion Pictures Expert group (MPEG) standard for compression and decompression of digital video data is a standard of the International Standards Organisation (ISO)

MPEG is an enabling technology that makes it possible to include full-motion video in consumer, computer and communications products for the first time. Linear decoded real-time video demands a high delivery rate. For example, the data delivery rate for natural pictures, as specified by the international standard CCIR 601, is 165Mbit/sec. For a normal optical disc the delivery rate is 1.4Mbit/sec. The ingenious achievement of full-motion compression lies in compressing such data rates to within 1.4Mbit/sec data delivery capacity. The full motion extension modules can decode full-screen natural pictures together with stereo audio that is equal to CD Digital Audio even to practised ears.

**Market**

Karaoke market

Video-CD started in the Japanese karaoke market in 1993 as Karaoke-CD. The number of establishments with karaoke installations has grown rapidly and expanded into pubs, snack shops and day-use operators of karaoke boxes and karaoke rooms. Over 500 titles with over 7000 Karaoke songs are now available in this market segment.

Next to this business-use entertainment also home use Video-CD systems are announced by all major consumer electronics companies and expected to hit the market by the second half of 1994.

A similar development has now started in other areas around the pacific.



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#### Music video market

Up to 70 minutes of music video can be packed on the well established 5 inch (12 cm) optical disc. The Video-CD system allows the user to operate the discs in the same way as for the well known CD-Digital Audio. The standard play control functions such as play, pause, stop, direct select, next, previous track and introscan are available.

Music video has become an essential element in the popular music industry. It is impossible to introduce a new album without a good music clip.

Music video has reached such a level of user attraction that commercial TV channels with only music video programs are available.

#### Movie market

Video-CD offers the movie industry an easy to handle durable system for the business of sell through video. High audio and video quality on a durable, easy to store software carrier invites the creation of collections.

Low software duplication costs of a standard 2 disc album for a feature film of up to 140 minutes will create sufficient software offered at reasonable prices.

The Movie titles available now on Video-CD have shown that the quality and features are well accepted by the consumers. All the major movie companies have now decided to support the Video-CD system or are currently evaluating their test discs.

#### Professional market

The professional market has accepted Video-CD as a system for training and information purposes as well as for point of sale applications.

The combination low-cost playback equipment and the simple to create, but powerful interactive multi media applications with motion video as well as still images and menus result in an easy recovery of the project costs.

#### Home video market

Owners of CAMCORDERS start to discover the Video-CD market. Transfer of video material from 8mm or VHS-C tape to a Video-CD disc is already offered at prices affordable for consumers. The quality of the encoding is considered quite acceptable for this type of material.

The availability of such services is still on a low scale now, but will become generally available in the course of 1995 when specialised equipment will be offered to these service providers.

The Video-CD system is suitable for all linear video sequences that a viewer can randomly access. Karaoke discs, music video, live concerts, movies, exercise programs, instructional or educational video or any other set of thematically related video sequences.



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**Play back devices**

The Video-CD format is based on the CD Bridge format, allowing these discs to be played on various kinds of platforms.

CD-i

Video-CD's will play on all CD-i players with the full motion extension. All Philips consumer CD-i players in the market can simply be upgraded with the plug-in full motion extension to play these Video-CD's and all other CD-i. By the end of 1994 the installed CD-i player base will exceed one million players.

Video-CD

Video-CD players are introduced by Panasonic, Sony and JVC and others will follow. These low cost players will be available in big quantities by the end of 1994.

Personal Computers

The MPEG decoder boards to allow PC's to play Video-CD titles in a Window and/or on a separate TV are already available from several suppliers. Developments to integrate the MPEG decoder in the video-card or in the video-section of the motherboard and the development of CD-i plug-in boards for the PC will result in a wide acceptance in the PC market.

Professional equipment

Business-use KARAOKE-CD players have been announced by various companies. These are the changer based CD+G karaoke players upgraded with MPEG audio and video encoding. These automatic 60-360 disc changers reduce the labour time to search for a specific tune out of over 3000 songs.

**Broadcasting standards**

Video-CD discs are independent from TV broadcasting standards (NTSC or PAL/SECAM). The Video-CD playback systems will take care of this. This means that you can distribute if you like the same disc without any conversion worldwide. You will no longer be confronted with the broadcasting system barriers. However due to the differences in broadcasting systems the displayed aspect ratio is not identical.

This is a major improvement compared to analogue video systems.



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### Comparison with other systems

#### Analogue video

Compared to tape systems Video CD offers a high image quality also when played repeatedly. Direct access and still picture are additional user functions. The duplication technology results in low cost duplication at high volumes in controlled facilities.

Compared to Laserdisc systems Video CD discs are easy to handle in production, distribution and by the consumer. The duplication costs of video CD are substantially lower as with Laserdisc.

#### CD-i+digital video.

Video CD is a system developed for linear play of AV sequences. The interactivity is restricted to the selection of what you want to see and hear.

This focus allowed an additional level in standardisation so that prices to create discs could become substantially lower resulting in attractive consumer prices. It allowed, also, more platforms to play the same discs.

CD-i with digital video is a very good playback system for Video CD.

### How to make the disc

Services to encode your AV material to MPEG encoded material were offered since early 1993. The number of encoding installations is increasing rapidly showing the universal acceptance of the MPEG standards

Just supply your linear video material on a D1 or Betacam tape or other quality carrier.

The separately encoded MPEG Audio and Video streams are processed by a Video CD disc building system into a disc image with interleaved MPEG streams together with the required file structure.

Also subtitling functions (for CD-i playback only) are available. Just arrange your subtitle data on PC floppies in the format EBU TECH 3264-E.

This means that the software publisher can concentrate its activities to acquiring the rights and searching for good concepts serving market opportunities.



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#### CD-i application program

One of the elements on such a disc is the standardized Video-CD application for CD-i. Such an application must be present on a Video-CD disc.

The CD-i application program features the following functions via an on screen dialogue.

Main functions:

- Play all AV sequences on the disc
- Select one sequence to play/start.
- Introscan to search for a particular sequence on the disc or just to get an impression of the material on the disc.
- Multi-level menu functions for a real interactive Video-CD application on CD-i.
- Autostart and attractor-loop options for POI/POS applications.
- Subtitling function

During playing of an AV sequence:

- Skip to next sequence
- Go to previous sequence
- Play
- Pause (resulting in a still image)
- Fast and slow Forward (including single step)
- Fast and slow Reverse
- Slow motion (multi-speed)

These functions operated via an on screen dialogue can be combined with the following direct control buttons on the player or its remote control. (play, stop, pause, next and previous).

This means that the operation of Video-CD completely matches the users mental model of using music discs.

#### Customizing

The Video CD standard allows for one or more tracks (sequences) and well as for entries within a track (sequences). In this context a track is an AV sequence with one or more entry points and one exit point. This feature allows the publisher to use the same engine for individual sequences (e.g Music video discs and Karaoke applications) which can be selected individually as well as for long sequences (e.g. Live concert or movie) where the user can start at a selected place and continue till the end. Via the CD-i customizing features a multi-level menu structure is offered.



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The standard CD-i application in its basic form does not need any customizing. It can be applied as is. It will dynamically adapt itself to the number of sequences/chapters.

By structuring the AV sequences, adding graphical images and other data the publisher can adapt the look, feel and functioning of the application can be adapted.

This allows you to create simple multimedia applications, adapt the atmosphere of each individual disc, thematical grouping as well as incorporating the image of the publishing company.

**Verifier**

To ensure compatibility, so that all discs play on all players, a Video-CD verifier program was developed. This tool can check the disc lay-out, the Video-CD specific directory structure and the correctness of MPEG encoded data streams. Additionally a simple inspection of the audio/video material on a CD-i player is all you need to test before releasing your Video-CD.

**Video-CD disc requirements**

When you are producing Video-CD discs, you of course want to be sure that the discs meet the requirements of the Video-CD standard so that it will play on all players designed to play Video-CD discs.

MPEG-sequences

The first requirement is that the MPEG sequence does meet the technical requirements of MPEG audio and video together with the restrictions as are described in the Video-CD standard.

Disc layout

The contents of a Video-CD disc is described in the standard. These rules have to be followed to be able to ensure that all Video-CD discs play on Video-CD player, CD-i player and on computers having a CD ROM XA drive and an MPEG decoder.

Examples are:

- Info specific to the Video-CD disc
- Entry point list
- CD-i application program
- CD-i specific customising data.
- Applications for other platforms (optional)
- Audio/Video sequences.

If one of the compulsory files is missing or contains incorrect data the disc will not play on the players which expect this information to be present.



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#### Application program

It is described in the standard that a Video-CD disc has to contain an approved CD-i application to show the AV sequences. Due to this application the CD-i player can play Video-CD disc.

Dedicated Video-CD players have such an application included in the players firmware.

Applications for other platforms can be present. If not an application supplied on another disc might be available to play the disc.

#### How to check

How to be sure you meet the requirements.

#### Playability test

The most elementary way to check: play this disc on each of the various platforms such as Video-CD, CD-i and CD-ROM-XA platforms.

In this way you can check the functioning of the disc and see the AV sequences. This is the only way to inspect the correctness of menus, text screens and the visual quality of the images and Video sequences.

The fact that the disc does play on one player does not automatically mean that the disc will play on all platforms. Each player uses only that part of the information from the disc which it needs.

#### Verifier

There is available software that can be used to verify if a certain disc meets the requirements. It is not the intention that all discs should be checked with this verifier. If the tools used to create the Video-CD discs are correct there is no need to check.

In case of doubt, however, this Video-CD disc verifier is a valuable tool for checking. Verification tools which only analyze the MPEG sequences on a Video-CD disc or check the MPEG files before they are transferred to a Video-CD disc are also available.

#### Test house

If you want to have a Video-CD checked you can make use of an independent test facility.

Such a test facility is able to perform the following tests:

- Check the good performance of application (e.g. quality of the AV sequences, errors in the selection menus)
- Perform playability tests on various platforms.
- Verify the disc structure by the Video-CD verifier.
- Advise you on the correctness of the printed matter and logo use.

For information please contact : Philips Interactive Media Centre, test dept, Hasselt, Belgium. fax# +32-11-242-168



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**Printed matter**

Also the printed matter should be correct. This data tries to help you and is intended to be used as a guideline and checklist.

Video-CD disc label requirements

To have a good recognition by the user of the type of disc, it should contain the correct identification. The following data should be on the disc:

- The Compact disc Digital Video logo.
- Name of the disc.
- Disc contents (track/chapter information)
- Publishers name/logo.
- Volume/album number.
- Reference/order number.
- Copyright holder name and date.
- All rights reserved with copy/reproduction notice.
- Made in statement.
- If applicable the following indications:
  - Parental guidance/minimum age
  - Wide screen
  - Dolby Surround sound
  - Subtitling information with languages
  - Multilingual or background/foreground vocal for Karaoke.

The indication of the disc contents.

On the disc label and on the printed matter that comes with the disc, customers expect to find track/chapter information.

The printing on the disc and other material is to reflect the file ENTRIES.VCD on the Video-CD disc. The ENTRY.VCD file has the same function as the TOC on a CD-DA disc.

The with "1" marked information should describe the first entry of ENTRY.VCD (Start of the first MPEG sequence). "2" should correspond with the second entry in ENTRY.VCD. independent from the situation that it is the next track or the second entry in the first MPEG sequence. etc.

As the combination of track and chapter data is new we expect some different interpretations in the beginning which might give some confusion.



Video-CD packaging requirements

To have a good recognition by the user of the type of disc at point of purchase, the following data should be present on the front:

- The Compact disc Digital Video logo.
- Name of the disc.

The rear side of the packaging should contain:

- Compatibility text  
"This disc is fully compatible with all Video-CD as well as all CD-i players with a digital video extension". The Compact disc Digital Video and the Compact disc Interactive logo to be located next to this text
- PAL TV logo with text "plays also on NTSC TV" (PAL and NTSC can be reversed depending on optimisation of the aspect ratio, TV logo should represent the good aspect ratio system)
- Name of the disc.
- Publishers name/logo.
- Reference/order number.
- Copyright holder name and date.
- All rights reserved with copy/reproduction notice.
- Made in statement.
- If applicable the following indications:
  - Parental guidance/minimum age
  - Wide screen
  - Dolby Surround sound
  - Subtitling information with languages
  - Multilingual or background/foreground vocal (for Karaoke).
- Discs intended for resale need also an EAN or UPC.

The spine (two small sides of the CD packaging) should contain:

- Name of the disc.
- The text "Video CD".



**Technical section**      The Video-CD standard specifies the following MPEG parameters:

Video Compressing (ISO MPEG (2-11172))

- Resolution
  - 352h x 240v x 29.97 Hz (NTSC)
  - 352h x 240v x 23.976 Hz (film)
  - 352h x 288v x 25Hz (PAL)
- Pixel aspect Ratio
  - 1.0950 when resolution is 352 x 240
  - 0.9157 when resolution is 352 x 288
- Compressed bit rate
  - Max 1151929.1 bits/sec

Audio Compressing ISO MPEG (3-11172) layer 2

- Modes
  - Stereo
  - Dual mono
  - Intensity stereo
- Sampling      44.1 kHz
- Emphasis      Off or 50/15usec
- Compressed bit rate      224kBits/s

**License information**

Video-CD specification.

For information on specification of Video-CD please consult:  
Philips Consumer Electronics B.V. Coordination Office Optical & Magnetic Media  
Systems, Bert Gall, Building SWA-1, P.O. box 80002, 5600JB Eindhoven, the  
Netherlands. Fax: +31-40-732113

CD-i application for Video-CD

The CD-i application for Video-CD is available for developers of Video-CD  
authoring packages as well as for users of these packages.

For information on the license conditions of the application please consult the  
supplier of Video CD authoring package.  
For these licenses and for information on the various Video-CD mastering  
software packages you can also contact the below mentioned address.  
Mention the computer platform you are using or intend to use and if applicable the  
MPEG encoding tools and the Video-CD authoring software you have in use.  
Philips Consumer Electronics B.V. Interactive Media Systems, Gerard Smelt,  
Building SFH 629, P.O. box 80002, 5600JB Eindhoven, the Netherlands.  
Fax: +31-40-735932, Unix(internet):SMELTGER@nlevnims.snads.philips.nl



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