SONY

HANDYCAM

HDV TECHNOLOGY HANDBOOK

HDV

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Contents

The Next Generation Television: HDTV

Would you like to enjoy television images in your home that are so clear and powerful they make you feel like you are actually there? In order to achieve this dream, high-definition television (HDTV) technology has been developed. HDTV is a new television broadcast standard that is a complete departure from the existing broadcast formats of NTSC, PAL, and SECAM.

The debut of HDTV is the biggest revolution in the history of television broadcasting since 1954 when the first color TV broadcasts were made in the US. The greatest attraction of HDTV is the high definition image that does not lose its intensity even on a screen larger than 40 inches. These high definition images can also be enjoyed on a 16:9 ratio wide screen for greater impact and enjoyment.

Advantages of HDTV

Sharper images with high definition

With 1,080 effective scanning lines, which is more than twice the number in conventional formats (480 lines in the NTSC format or 576 lines in the PAL and SECAM formats), clear and beautiful images are realized. These sharp images really bring out the impact of the subject matter.

* For the 1080i HDTV standard, which is currently the mainstream

Wide screen to put you in the picture

Using an aspect ratio based on the human field of vision, the wide screen format brings you more powerful and lifelike images. The wider 16:9 screen size approximates the shape of the human visual field, making you feel like you are actually in the picture.

Comparison of HDTV and SDTV

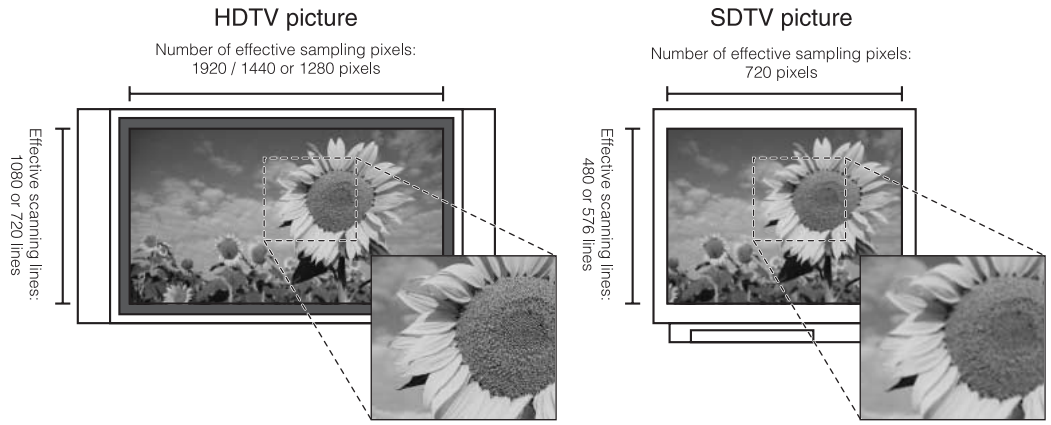
The difference between HDTV picture quality and conventional standard definition (SDTV) quality is immediately noticeable. HDTV comes in two standards: 1,080 or 720 effective scanning lines with a picture aspect ratio of 16:9. With SDTV, the aspect ratio is 4:3, and the NTSC format used in North America and Japan has 480 scanning lines compared to 576 for the PAL and SECAM formats used in Europe and elsewhere. When compared with NTSC-format SDTV, it is clear that the vertical resolution of HDTV is twice as sharp.

	HDTV		SDTV	
	1080i	720p	NTSC	PAL/SECAM
Total scanning lines	1125	750	525	625
Effective scanning lines	1080	720	480	576
Effective pixels	1920/1440	1280	720	
Scanning format	Interlace	Progressive	Interlace	
Aspect ratio	16 : 9		4 : 3	

Total scanning lines : All scanning lines that make up the video signal
Effective scanning lines : Actual number of scanning lines that make up the picture
Effective pixels : Actual number of horizontal pixels that make up the picture
Scanning format : Either the interlace or progressive scanning format, which produce the picture.
Aspect ratio : The ratio of the picture width and height.

HDTV and SDTV picture quality

With the 480 effective scanning lines of NTSC-format SDTV, the graininess of the picture becomes more evident as the screen is enlarged. However, with the 1,080 or 720 effective scanning lines of HDTV, a sharp high-resolution image can be enjoyed.



HDTV and SDTV picture quality

The grandeur of nature has evolved over eons. A wide screen HDTV can make you feel like you are right in the middle of this beauty. The 4:3 picture aspect of SDTV means the scenery will be cut-off on both sides, but with a 16:9 HDTV screen you get the whole panorama.

History of HDTV

Research for HDTV started in the 1960's at the NHK Science and Technical Research Laboratories (NHK STRL) in Japan. The research began with the viewing angles and aspect ratios that enhance realism, and eventually the screen size, the number of scanning lines, and the standard distance between viewers and the screen were determined to provide maximum realism. The NHK STRL established the MUSE system in 1984, which is a method of analog HDTV based on this research. Moreover, NHK STRL suggested the term "Hi-Vision," as a popular name for HDTV.

Movement towards unification of an HDTV standard for studio production

The conventional systems of TV broadcasting include the NTSC system adopted by North America and Japan, the PAL system adopted by the UK, Germany, and China, and the SECAM system adopted by France, Eastern Europe, and Russia. They differ in the number of scanning lines, which define the resolution of the images. Naturally, TV content had to be produced using the standard of the corresponding regional broadcasting system. This required scanning line conversion in order to distribute TV content between countries with different broadcasting systems.

Japan was afraid that such a situation could be repeated when HDTV became mainstream, and so it suggested to the CCIR [Comité Consultatif International Radiophonique, currently the ITU-R (International Telecommunications Union – Radiocommunication Sector)] that a studio standard for HDTV content production should be developed to facilitate easy international distribution. Although the HDTV standard for studio production was established in 1990, major issues such as the number of scanning lines were not agreed upon. After three versions, the number of scanning lines was unified in the fourth revision approved in 2000.

Currently major broadcasting formats for HDTV include ISDB, DVB, and ATSC, to be described later, and all of them have adopted the number of scanning lines determined in the studio standard. Therefore, we can say that the approval of the HDTV studio standard provided the foundation for HDTV.

Development and convergence of digital broadcasting and HDTV

The digitalization of broadcasting originated with a concept put forward by the NHK Science and Technical Laboratories in Japan in 1982. This concept was ISDB (Integrated Services Digital Broadcasting), which combines moving images, sound, text, and still pictures into a digital broadcast signal.

In the late 1980's, the basic technologies about digitalization of broadcasting like data compressing, and error correcting were ready. Today, the broadcast technology became digital leading the way for satellite broadcasting, terrestrial broadcasting, and cable broadcasting services.

HDTV technology is also digital. Currently major digital HDTV broadcasting systems include the ISDB format developed in Japan, the DVB (Digital Video Broadcasting) format developed in Europe, and the ATSC (Advanced Television Systems Committee) format developed in the US. Even terrestrial digital broadcasts adopting these formats have begun in 12 countries including Japan, and the development of digital HDTV has become global.

HDTV in movie production

Filmmaking companies in Hollywood and the rest of the world have been focusing their energy on producing movies using high-definition digital videotape recorders.

The HD 1080/24p production system, which is a recording format in the movie industry using a professional digital videotape recorder that can shoot 24 images per second, was introduced in 1999. The making of "Star Wars Episode2" made use of this technology. Current movie production has been shifting from the conventional method of using mainly film, to digital data methods that offer high resolution and editing flexibility, while being highly compatible for computer graphics.

History of HDTV

1964	NHK Science and Technical Laboratories in Japan (NHK STRL) began research into high definition television.
1982	NHK STRL put forward Integrated Services Digital Broadcasting (ISDB)
1984	NHK STRL established the Multiple Sub-Nyquist-Sampling Encoding (MUSE), a system of analog HDTV
1985	NHK STRL announced "Hi-Vision" as its name for HDTV
1987	The Federal Communications Commission (FCC) of the US invited public applications for terrestrial broadcasting systems of HDTV
1990	The International Telecommunications Union - Radiocommunication Sector (ITU-R) approved the broadcasting studio standard for HDTV
1993	The Digital Video Broadcasting (DVB) project was established
1994	The European Telecommunications Standards Institute (ETSI) approved DVB-S, a standard for satellite digital broadcasting
1994	The ETSI approved DVB-C, which is a standard for digital cable television
1996	BskyB launched satellite broadcasting with the DVB system in the UK
1996	Canal+ started satellite broadcasting with the DVB system in France
1997	The ETSI approved DVB-T, a standard for terrestrial digital broadcasting
1997	The FCC approved ATSC (Advanced Television Systems Committee), a standard for terrestrial digital broadcasting
1998	The Telecommunications Technology Council (TTC) in Japan approved ISDB-S, a standard for satellite digital broadcasting
1998	Terrestrial digital broadcasting with the DVB system started in the UK
1998	Terrestrial digital broadcasting with the ATSC system started in the US
1999	Terrestrial broadcasting system with the DVB system started in Sweden
2000	The fourth edition of the broadcasting studio standard for HDTV, which unified the number of scanning lines, was approved
2000	The ITU-R recommended ISDB-T as the standard for terrestrial digital broadcasting
2000	Satellite digital broadcasting with the ISDB-S system started in Japan
2000	Terrestrial digital broadcasting with the DVB system started in Spain
2001	Terrestrial digital broadcasting with the DVB system started in Australia
2001	Terrestrial digital broadcasting with the DVB system started in Singapore
2001	Terrestrial digital broadcasting with the ATSC system started in South Korea
2003	Terrestrial digital broadcasting with the ISDB-T system started in Japan
2003	Terrestrial digital broadcasting with the ATSC system started in Canada

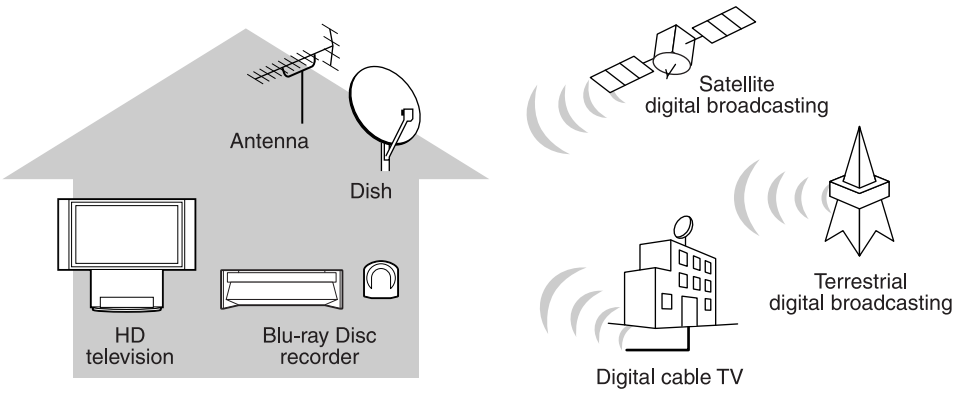
Arrival of the HDV standard

After high definition (HD) broadcasts began in various countries, the popularity of HD equipment such as HDTVs and Blu-ray Discs that can record high definition images, has been increasing.

As home video equipment becomes increasingly high definition, the next stage will be personal content HD technology, or high-definition home video making. The HDV standard was created to make HD home videos possible.

Conversion to HD broadcast and audiovisual environments

The move to HD began with HD broadcasts. Along with the development of terrestrial and satellite digital broadcasting, and digital cable TV, a whole array of HD equipment has appeared including HDTVs and Blu-ray Disc recorders.



Conversion to personal HD content

With the arrival of the HDV standard, making HD home videos is now possible. This will allow people to capture precious memories such as the activities of their kids or their holiday destinations with HDV quality and enjoy on a big screen.

Main Advantages of HDV

On September 30, 2003, the HDV standard was agreed on by four companies: Canon Inc., Sharp Corporation, Sony Corporation, and the Victor Company of Japan, Limited.

The concept of the HDV standard is to develop a home camcorder, which can record easily high quality HD movies. The HDV standard can be used with existing DV tape as the recording media. Thus, by using the mechanisms of a DV camcorder, mitigation of development costs and development efficiency is realized.

Feature No. 1: Recording HD images on DV tapes

The same videotapes used for DV recordings can also be used for HD recordings, and the recording time is also equivalent. Furthermore, the main recording mechanisms are also the same as for the DV standard.

Feature No. 2: MPEG-2 is used as the compression format.

The same MPEG-2 compression format that is used for digital broadcasts and DVDs is also used for HDV. Efficient compression is possible while maintaining the high quality of HD images. Therefore, using the same bit rate as for the DV standard, the recording and playing back of high-resolution HD images has been realized. In order to use MPEG-2 to compress the large quantity of HD image data, which is much more than for the SD format, an extremely large signal processing circuit is required. However, due to the advancement of semiconductors and signal processing technology, it is now possible to use this format as a standard for personal devices.

Feature No. 3: Powerful error correction capability

With the MPEG-2 format, which uses interframe compression, the impact of missing data is much greater than for the DV standard where intraframe compression is used. For this reason, the amount of correction coding has increased with the HDV standard. Moreover, by turning the DV correction method that only operates within tracks into a correction method between multiple tracks, error correction capability has been drastically improved, and the tolerance for data loss in tracks caused by dropouts is greatly enhanced.

Feature No. 4: Same sound quality as a CD

MPEG-1 Audio Layer II is used for the audio compression format, allowing you to enjoy the same sound quality as from a CD.

Feature No. 5: Two kinds of recording systems

The HDV standard has two types of recording systems: the 720p (progressive) method and the 1080i (interlace) method.

HDV Specifications

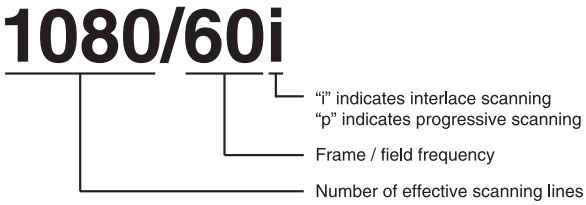
Under the HDV standard, there are two types of HD recording systems. The first is the 720p system featuring 720 effective scanning lines (progressive scanning) and 1,280 horizontal pixels. The other system is the 1080i method with 1,080 effective scanning lines and 1,440 horizontal pixels. Therefore, the necessary high-resolution recording and playback system has been established for the true Hi-Vision age.

	HDV (1080i format)	HDV (720p format)	DV
Media	DV tape		
Video signal	1080/50i and 1080/60i	720/25p, 720/50p, 720/30p, and 720/60p	576/50i (PAL) and 480/60i (NTSC)
Number of pixels	1440 x 1080	1280 x 720	720 x 576 (PAL) and 720 x 480 (NTSC)
Aspect ratio	16:9		4:3 (16:9)
Compression (video)	MPEG-2 Video (Profile & level: MP@H-14)		DV
Sampling frequency for luminance	55.6875 MHz	74.25 MHz	13.5 MHz
Sampling format	4:2:0		4:2:0 (PAL) / 4:1:1 (NTSC)
Quantization	8 bit		
Bit rate after compression (video)	25 Mbps	19 Mbps	25 Mbps
Compression (audio)	MPEG-1 Audio Layer II		-
Sampling frequency	48 kHz		48 kHz / 44.1 kHz (2-ch mode) 32 kHz (4-ch mode)
Quantization	16 bit		16 bit (2-ch mode) 12 bit non-linear (4-ch mode)
Bit rate after compression (audio)	384 kbps		1.5 Mbps
Audio mode	Stereo (2-ch)		Stereo (2-ch) / Stereo x 2 (4-ch)
Data format	MPEG-2 system		-
Stream type	Packetized elementary stream	Transport stream	-
Stream interface	IEEE 1394 (MPEG-2-TS)		IEEE 1394 (DV)

Aspect ratio : Width and height ratio of the picture
Sampling frequency : The unit for measuring the number of times a data sample can be output in a second, when converting analog signals to digital data.
Sampling format : This indicates the frequency ratio allotted to three chrominance difference signals: Y (luminance signal), R-Y (signal of red signal minus luminance signal), and B-Y (signal of blue signal minus luminance signal), when converting analog video to digital data.
Quantization : This indicates what level value to express the data sample with (16 bit is expressed with 216 = 65,536 level)
Bit rate : This means the amount of data used in one second (1 Mbps means 1 megabit of data is used in one second)
Data format : This is the standard used when recording video and audio as digital data.
Stream type : This is the system for combining video and audio data into a single set of data in the MPEG-2 system.
Stream interface : Data transmission standard

Picture format notation

When describing the picture format, it may be written in a form such as "1080/60i."
Here is meaning of this notation.



Frame / field frequency basically indicates how many images are produced in one second. If this frequency is 60, then that means 60 images are produced in one second.

Progressive and interlace scanning

TV pictures are produced by the movement of points of light, which create afterimages. The points of light move from the left to the right side of the screen's top row, and then repeat this movement in the next row from left to right. Once the right side of the bottom row is reached, one image has been completed. This is called scanning, and the rows where the points of light move from left to right are called scanning lines.

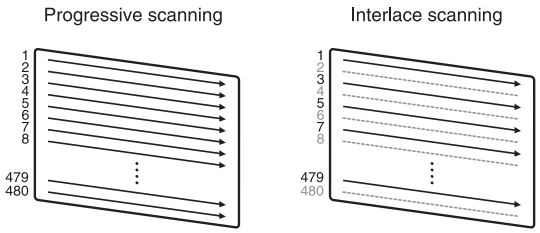
■ Progressive scanning

Progressive scanning is a method of scanning in order from the first to the last row, and one scan produces one image. It is also called non-interlace scanning. For example, if there are 480 scanning lines, the scanning progresses in order from the first to the 480th scanning line. The advantage of progressive scanning is that flickering is eliminated.

■ Interlace scanning

Interlace scanning is a display method that produces two images with one scan, by skipping every other row during the scan. For example, if there are 480 scanning lines, for the first image only the odd-numbered rows are scanned (1, 3, 5, ... 479), and for the second image only the even-numbered rows are scanned (2, 4, 6, ... 480). With interlace scanning there is the advantage of producing smooth movement. However, the drawback is that strictly speaking the resolution is reduced for each image

Interlace scanning is primarily used for television broadcasts. Originally, progressive scanning was used, but the signal bandwidth was too large, and so the interlace format with its narrower signal bandwidth was developed in order to allow room for more TV stations. If the image continuity is high and interlace scanning can provide smoother movement as mentioned previously, while the frequency range is limited, it is adopted since the reduced resolution is not very noticeable.

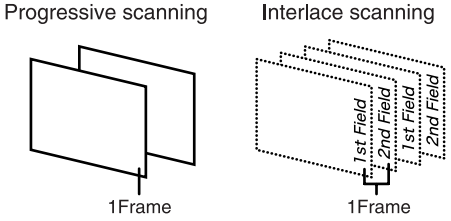


The arrows show the movement of the light beam along the scanning lines

Frames and fields

With interlace scanning, the scanning occurs on every other line, and half the lines are used to form one image. This image is counted as one field. Then, once two images have been produced and all the scanning lines have been used, and then this is counted as one frame. In other words, one frame is made up of two images or fields.

On the other hand, since all the scanning lines are used to produce one image with progressive scanning, one image makes up one frame. For progressive scanning, the guideline of frame frequency, or the number of images produced per second, is used, while the guideline of field frequency is used for interlace scanning.



HDV Compression

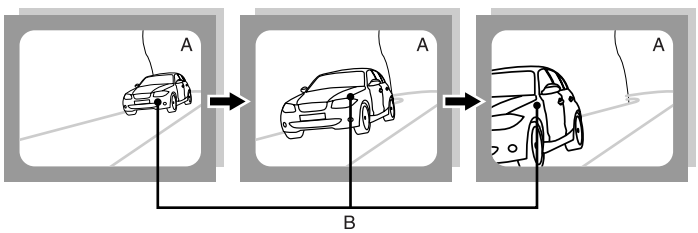
Under the HDV standard, the MPEG-2 format has been adopted as the method for recording onto DV tapes. The MPEG-2 format is a standard compression method used for video media including DVDs as well as satellite and terrestrial digital broadcasts. Since the MPEG-2 format has a compression method that can realize high resolution even at a low bit rate by using information on differences between the frames, HD video signals, which have 4.5 times* the data quantity of regular video signals, can be recorded on the same DV tapes. Moreover, the recording time is exactly the same as for the DV format.

*) When comparing regular NTSC video signals to 1080/60i Hi-Vision signals

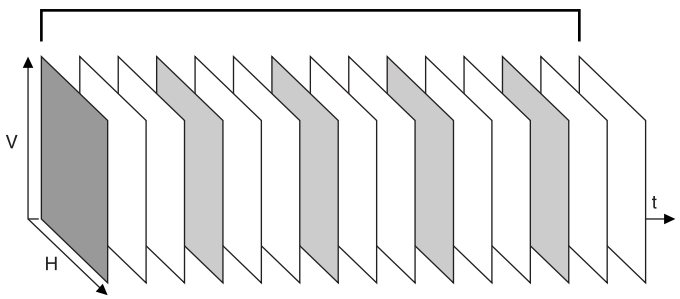
Data compression

As is shown in the diagram below, when you take out one image and look at it, you can see that there are relatively simple portions like the sky (A) and complicated portions like a car (B). When converting analog information into digital data, if the information is simple, it is possible to reduce the data amount during the digital conversion. In other words, the data quantity for simple portions like A in the diagram below can be reduced.

With the DV format, in one part of the frame such as a blue sky for example, if the areas that are difficult for the human eye to see are omitted and the data quantity is reduced, each frame can be efficiently compressed. This is called intraframe compression. In contrast to this, with the MPEG-2 format, in addition to the DV intraframe compression another type of compression is used. Image areas in frame sequences with no changes are detected, and the redundant data for the subsequent frames in the sequence are eliminated and just the initial frame is used. This is called interframe compression. For example, since there are no changes in the background area of A in the diagram below, the same data for this area can be used for the whole sequence of frames. However, since there are a lot of changes in the moving car portion of B below, the same data cannot be used for the sequence. In this way, the MPEG-2 format provides more efficient data compression than the DV format.



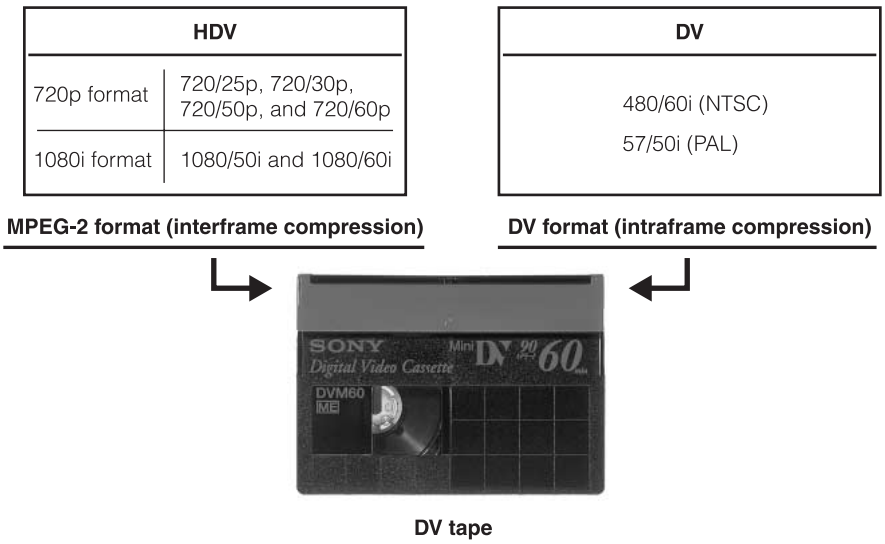
GOP (Group of Picture)**



**) The number of GOP frames is not fixed. Different settings are possible depending on the device.

HDV Recording

DV tapes are used for recording with the HDV standard. Since DV tapes are already widely available, they serve as a media that is affordable and easily obtainable.



DV tape

HDV recording method

With the HDV standard, the tape speed and track pitch is the same as for the DV format, and the main DV mechanisms, such as the data-reading drum and the cassette compartment housing the tape, can be adopted without any changes. Moreover, the ITI sector and subcode sector structures are also equivalent to the DV standard, and this has made it possible to record HD video and audio signals in the same running time as for the DV standard.

ITI sector : The region where the tape is recorded including the tract structure and width
Subcode sector : The region where the index flags and time codes are recorded on the tape

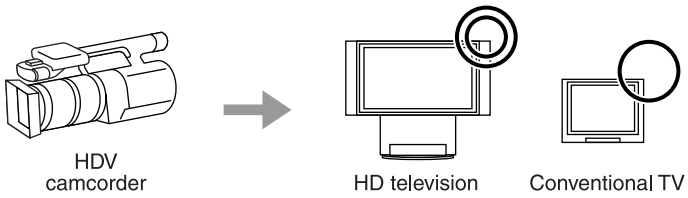
Powerful error correction capability

With the MPEG-2 format, which uses interframe compression, the impact of missing data is much greater than for the DV format where intraframe compression is used. For this reason, the amount of correction coding has increased with the HDV standard. Moreover, by turning the DV correction method that only operates within tracks into a correction method between multiple tracks, error correction capability has been drastically improved, and the tolerance for missing data in tracks caused by dropouts is greatly enhanced.

Using Recorded HDV Images

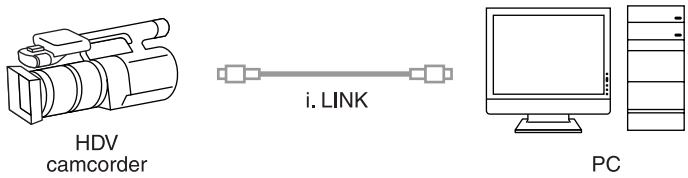
The HD quality of HDV camcorder recordings can be enjoyed in the following ways.
* The methods will vary by country or region

In order to benefit from HDV quality, an HD television is required.



To enjoy the full quality of images filmed in HDV, the HDV camcorder needs to be connected to an HD television.
The connection methods include both analog and digital connections. In the case of analog connection the camcorder is connected with the TV's component terminal (3 RCA pins for HD) or the D3 terminal (D3 or higher). For a digital connection, the connection is made by i.LINK.
It is also possible to connect to a conventional TV and use a conventional video connection terminal (RCA pins) or S terminal. However, in this case the video quality will be reduced to that of a conventional TV.

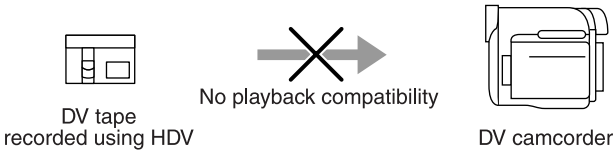
HDV video can be edited and enjoyed on a PC



By connecting an HDV device to a (HDV compatible) PC by i.LINK, the HDV data can be uploaded to the PC, and then written back to an HDV compatible device. In order to upload video to a PC, edit it, and then record it onto DV tape, a application software for the HDV standard, which will be available from various companies in the future, will be required.*

*) For a list of the latest HDV support companies visit: http://www.hdv-info.org

Videotapes recorded using HDV cannot be played back on conventional DV devices.



DV tapes recorded with HDV images cannot be played back on conventional DV camcorders or video walkmans. If you do try to do this, either the video and sound will not play back, or depending on the model, it will determine that it is an HDV tape and warn you not to record over it. Please play HDV recordings on HDV compatible products.

Logo and Trademark

We ask for your cooperation in using the trademark "HDV" logo properly, and maintaining the consistency of the HDV visual identity (VI), according to the HDV logo handling guidelines.

(Usage example)

HDV 720p

HDV 1080i

HDV 720p·1080i

(Here are excerpts from the guidelines)

1-1 Definition of the HDV logo

The HDV logo indicates the standard (HDV standard) that allows the recording and playback of high-definition images using DV tape. This standard belongs to the Sony Corporation and the Victor Company of Japan, Limited.

1-2 Applicable users

The following may use the HDV logo.

- Sony Corporation
- Victor Company of Japan, Limited
- Those parties that have obtained permission from the Sony Corporation based on a licensing agreement.

1-3 Applicable products

The HDV logo may used for products with tape drives based on the HDV standard, product packaging (including packing materials), users' manuals, advertising and publicity (catalogs, posters and other print media, as well as TV commercials, the Internet, and other image media), sales promotion materials (displays, point of purchase advertising, etc.), and events.

1-4 Applicable regions

The HDV logo may be used worldwide, except for regions where it cannot be used legally as a trademark.

2-7 Considerations for trademark rights protection

When using the HDV logo in print material or on Web sites, an explanation that HDV is a trademark must be included in at least one location. It is recommended that the "TM" symbol be added to the lower right corner of the HDV logo to indicate that it is a trademark.

E.g.

- "HDV" and the HDV logo are trademarks of the Sony Corporation and the Victor Company of Japan, Limited.
- HDV™

Q&A

Formats

Q Give me an overview of the HDV formats.

A The HDV format includes the 720p and 1080i formats. The 720p format employs progressive scanning with 720 vertical scanning lines (effective scanning lines). The 1080i format employs interlace scanning with 1,080 lines.

Q What companies support the HDV standard?

A The HDV standard was established by four companies: Canon Inc., Sharp Corporation, Sony Corporation, and the Victor Company of Japan, Limited. Many companies including most of the non-linear software manufacturers have expressed their support for the HDV standard. For the latest list of companies that support this format visit http://www.hdv-info.org

Q Why are there so many companies supporting HDV?

A This is because it is a based on the global DV standard, and the same DV mechanisms can be used for HDV. Moreover, since it employs the broadcast standard for image compression, MPEG-2, it is possible to connect HDV devices with TVs and personal computers.

Q What kind of media is used for HDV?

A Conventional DV tapes are used for recording in HDV.

Q How long is the HDV recording time?

A It is the same as DV recording time. Also, with the HDV 1080i format, there is no long-playing mode.

Q How is it possible that the large HD video data quantity of HDV can be recorded in the same running time as the DV standard on DV tape?

A Recording is possible in the same running time because MPEG-2 is used. MPEG-2 is a compression system that can realize high resolution even at a low bit rate by using information on differences between frames.

Q What is the difference between HDV and DV? Which has better picture quality?

A HDV and DV have different image compression and tape recording methods. Since HDV was developed in order to record and play back high resolution HDTV video, HDV has higher resolution from the standpoint of the number of pixels.

Q What is the HDV video compression method?

A HDV uses MPEG-2 compression, and the bit rate after compression for the 1080i format is 25 Mbps.

Q Isn't picture quality deterioration such as block noise and errors usually a concern with MPEG-2?

A Since a bit rate after compression of 25 Mbps has been achieved, the format allows very good picture quality for recording and playback.

Q What is the audio compression method for HDV?

A The audio compression format is MPEG-1 Audio Layer II. This format can compress and record a signal with a sampling frequency of 48 kHz and quantization of 16 bits, at a bit rate of 384 Kbps

Q Which has better sound quality, HDV or DV?

A With DV's 16-bit 2-ch mode sound and HDV's audio recording, DV has better quality sound for the parts where compression is not carried out. However, since HDV uses a very high bit rate (384 Kbps) for sound compression, the sound quality is almost on par with uncompressed audio.

Q Is the HDV sound quality comparable to a music CD?

A Since HDV audio is compressed, theoretically it is inferior to CD sound quality. However, as mentioned above, by securing a high bit rate after compression, the sound quality is almost on par with that of a CD.

Q In the future, will the DV standard disappear and the HDV standard become mainstream?

A Along with the widespread adoption of HD broadcasting and HDTVs, it is expected that the HDV standard will soon become the norm. However, DV is currently the mainstream as far as price and the popularity of DV displays are concerned. Nevertheless, there will soon be more models of HDV camcorders on the market, and when the prices come down, HDV will likely replace DV as the main standard.

Q What is the difference between 1080i and 720p?

A The 720p format employs progressive scanning with 720 vertical scanning lines (effective scanning lines), and the 1080i format employs interlace scanning with 1,080 lines.

Q Why are there two formats (1080i and 720p) for the HDV standard?

A This is to enable the development of products that meet different HD infrastructures around the world.

Q Which has better picture quality, HDV 1080i or HDV 720p?

A The picture quality depends on the specifications of the product. Select the format that best meets your needs.

Q How does the HDV error correction method differ between 1080i and 720p?

A The main difference is the correction coding ratio, and the mechanism for error correction over multiple tracks.

Q Is it possible to record HDV and DV alternately on the same DV tape?

A It is possible under the standard, but it depends on whether the manufactures will develop their products to allow mixed recording on the same tape.

Q Can an HDV camcorder also record in DV?

A This depends on the product specifications.

Playback and editing

Q If I play a DV tape containing an HDV recording on a regular DV camcorder rather than an HDV camcorder, and then output the signal to a TV, will it still be HD output?

A Tapes with HDV recordings are only guaranteed for playback on HDV camcorders. If you do try to do this anyway, either the video and sound will not play back, or depending on the model, it will determine that it is an HDV recording and warn you not to record over it.

Q Can tapes recorded with the 1080i format be played back on a 720p-format camcorder? Or vice versa?

A It may not always be possible for a 720p camcorder to play back a tape recorded in the 1080i format, and vice versa. Compatibility depends on the actual specifications of the product.

Q If I play an HDV recorded tape on an HDV camcorder, and then connect it to a non-HD TV and output the signal, will it provide better or worse picture quality than playing a DV recorded tape?

A This depends on the product specifications.

Q If I connect an HDV camcorder to a TV for playback, which terminal should I connect to for the best picture quality?

A This depends on the product specifications.

Q Is it possible to store the data from a HDV recorded DV tape on my PC hard drive? What format would the file be?

A This is possible using an HDV application software on your PC. The file format will depend on your software.

Q Can I upload HDV data to my computer and edit it? Is it possible to edit both the video and audio just like with DV data?

A This is possible if you have an HDV application software on your computer. The type of editing will depend on your software.

Q Can I upload HDV data to my computer and then save it on a DVD disc?

A If your HDV application software allows you to convert the data to SD, you can save it as a DVD video. Also, you can save it on a DVD data disk, which is the same concept as data backup. However, in this case it will not be compatible for use on a DVD player.

Q After uploading HDV data to my PC and editing it, can I then write the data to a DV tape using the HDV or DV standard?

A Either is possible if your HDV application software permits it.

Q What are the necessary PC specs to allow for uploading and editing of HDV data?

A Pentium 4 3.06 GHz or higher
RAM: 256 MB or higher (1 GB or more is recommended)
HDD: UltraATA100
i.LINK terminal as standard equipment
Display: XGA or higher
Video memory: 32 MB or higher
Software: Windows XP SP2 or higher
* The above specifications are provided as a guideline. Be sure to also check the specs required by the application software.

Q How big is a HDV file when it is uploaded to a computer?

A If the data is uploaded in MPEG-2 format without conversion, the file will be about the same size as a DV file of the same running time. A ten-minute video is about 2 GB.

Glossary

☐720p
The number "720" indicates the number of scanning lines, and "p" indicates progressive scanning.

☐1080i
The number "1080" indicates the number of scanning lines, and "i" indicates interlace scanning.

☐ATSC
This stands for "Advanced Television Systems Committee," a committee composed of private companies that make digital TV policies in the US. ATSC is also used to indicate the digital TV broadcast format set by the same committee. There are standards for both terrestrial and cable TV broadcasting.

MPEG-2 is the video standard, and Dolby AC-3 is the audio standard.

☐DVB
This stands for Digital Video Broadcasting, and is the digital TV broadcast format developed by the DVB project established jointly by European manufacturers. It includes standards for terrestrial, satellite and other forms of transmission, and the main standards include DVB-T for terrestrial digital, DVB-S for satellite digital, and DVB-C for cable digital broadcasting.

MPEG-2 is used as the standard for video coding, and MPEG-2 Layer I and II are used for the audio coding standard. DVB is not just for HDTV, but also provides a lot of services that use the data reduction benefits of digitalization to create multiple channels.

☐DV standard
This is the standard for videocassette recorders, which can record images and sound in the digital format on special compact tapes. It has the advantages of good quality through recording in the digital format, and high compatibility with computers.

☐D terminal
This is a terminal that can transmit the three chrominance difference signals that make up the video signal: Y (luminance signal), R-Y (signal of red signal minus luminance signal), and B-Y (signal of blue signal minus luminance signal), in one cable. Its name comes from the fact that the shape of the terminal looks like the letter "D." The types of terminals include the D1 terminal for 480i, the D2 terminal for 480p and 480i, the D3 terminal for 1080i, 480p, and 480i, and the D4 terminal for 720p, 1080i, 480p, and 480i. In order to transmit the HDTV video signal, the devices at both ends need to have D3 or D4 terminals

☐HDTV
HDTV stands for High-definition Television, which is a new TV technology that provides more realistic images than conventional televisions. In order to increase the feeling of realism, a high level of resolution needed for larger screen TVs has been achieved, along with the adoption of a 16:9 aspect ratio. Furthermore, HDTV is a next-generation television broadcast standard that is a complete departure from the existing broadcast formats of NTSC, PAL, and SECAM.

☐HDV standard
This is the videocassette recorder standard that can record and play back HD (aspect ratio of 16:9) video and audio using widely available DV tapes. Since it employs the MPEG-2 compression system, it can record in the same running time as the DV standard, despite the higher resolution involved. HDV includes the 1080i format using 1,080 effective scanning lines (interlace), and the 720p format with 720 lines (progressive).

☐i.LINK
This is a standard for connecting computers to peripheral equipment. The name i.LINK is a nickname for IEEE 1394 developed by Sony. It allows up to 63 devices to be linked together, and has a maximum transmission speed of 400 Mbps. It has the advantage of providing power through the connection cable, as well as a hot plug (able to connect or disconnect without cutting the power to the device). It is used to connect with DV camcorders. In the DV standard i.LINK is called a DV terminal.

☐ISDB
This stands for Integrated Services Digital Broadcasting, which is an HDTV broadcasting system based on a digital format developed by the NHK Science & Technical Research Laboratories (NHK STRL) in Japan. It includes terrestrial and satellite transmission standards, and the main types are ISDB-T for terrestrial digital, ISDB-S for satellite digital, and ISDB-C for cable digital broadcasting.

For all of these standards MPEG-2 is used as the video coding, while MPEG-2 Advanced Audio Codec (AAC) is used for the audio coding. It has the advantage of allowing the use of common receivers regardless of the transmission format, as it is offered together with services such as EPG and data broadcasting.

☐MPEG-2
MPEG means Moving Picture Expert Group, and is the name of the organization that developed the standard for recording video and audio as digital data. It also indicates the video and audio digitalization standard created by the same organization. MPEG-2 is one of the standards developed by this organization, and is used in various fields including DVDs and digital broadcasting.

☐MUSE
This stands for Multiple Sub-Nyquist-Sampling Encoding, which is an HDTV broadcasting system based on an analog format developed by the NHK Science & Technical Research Laboratories (NHK STRL) in Japan. This format was a precursor to today's HDTV system.

☐NTSC
This is the SDTV broadcasting format established by the National Television Systems Committee in the US. It uses interlace scanning with 525 scanning lines and a frame frequency of 30 Hz.

☐PAL
PAL is an abbreviation for Phase Alternation by Line, which is an SDTV broadcasting format developed in the former West Germany. It uses interlace scanning with 625 scanning lines and a phase frequency of 25 Hz.

☐RCA pin
This is the connector used for composite video / audio, and component terminals. It was developed by RCA in the US.

☐SDTV
SDTV stands for Standard-definition Television, indicating the usual TV picture quality before the development of HDTV. It is a TV broadcasting standard with an aspect ratio of 4:3.

☐SECAM
This is the SDTV broadcasting format developed in France called Sequential Couleur A Memoire (Sequential Color with Memory). It uses interlace scanning with 625 scanning lines and a frame frequency of 25 Hz.

☐S terminal
This is a terminal that can separate the video signal into luminance and color signals before transmitting them.

☐Aspect ratio
The aspect ratio is the ratio of the screen width to height. Conventional TVs have an aspect ratio of 4:3, while HDTV has a wider ratio of 16:9.

☐Interlace scanning
Interlace scanning is a method that can produce two images in a single scan, by scanning every other line. For example, if there are 480 scanning lines, only the odd-numbered lines are scanned for the first image (1, 3, 5, ... 479), and all the even-numbered lines are then scanned for the next image (2, 4, 6, ... 480). Interlace scanning has the advantage of displaying smooth movement. However, the disadvantage is that strictly speaking the resolution for each image is lower.

Interlace scanning is mainly used for TV broadcasts. The reason for this is that if the image continuity is high and interlace scanning can provide smoother movement as mentioned previously, while the frequency range is limited, it is adopted since the reduced resolution is not very noticeable.

☐Digital satellite broadcasting
This indicates digital broadcasting from man-made satellites orbiting the earth. The digital satellite broadcasting standards include ISDB and DVB.

☐Resolution
Resolution indicates the level of the picture quality. When the resolution is high, then the picture clarity is also high.

☐Component terminals
These terminals transmit each of the three video chrominance difference signals: Y (luminance signal), R-Y (signal of red signal minus luminance), and B-Y (signal of blue signal minus luminance), through separate cables. Since three cables are used, the terminals are also divided into three.

☐HDTV standard for studio production
This is the standard for studio production to allow easy international exchange of HDTV content. It establishes standards for the HDTV video signal including the number of scanning lines. All the HDTV broadcasting formats follow the studio standard so that video content can be easily exchanged from one region to another, even though the broadcasting formats differ.

☐Scanning
Scanning involves the movement of light points to produce TV images. TV pictures are produced by the movement of points of light, which create afterimages. The points of light move from the left to the right side of the screen's top row, and then repeat this movement in the next row from left to right. Once the right side of the bottom row is reached, one image has been completed.

☐Scanning lines
This is the line created by the points of light moving from left to right across the TV screen. The larger the number of scanning lines, the sharper the picture.

☐Terrestrial digital broadcasting
This is digital broadcasting from TV towers built on the ground. The terrestrial digital broadcasting standards include ISDB, DVB, and ATSC.

☐Digital cable television
This is broadcasting through digitized cable signals. The digital cable TV standard includes ISDB and DVB.

☐Hi-Vision
This is the name of the HDTV service developed by Japan's NHK. Digital HDTV is also called Digital Hi-Vision in Japan.

☐Field
A field indicates one image under the interlace system. With interlace scanning, one image is one field, that is to say, there are two fields in one frame.

☐Field frequency
Field frequency indicates the number of fields produced in one second.

☐Blu-ray Disc
This is the optical disk developed by Sony, Panasonic, and Phillips. On a disk the size of a regular DVD, 27 GB of data or six times the data of a DVD can be stored. Using this technology for recording, it is possible to maintain the quality of HDTV content.

☐Frame
A frame is an image unit where all the scanning lines are scanned. Since one image is produced with one scan under progressive scanning, one frame equals one image. However, with interlace scanning, one frame equals two images, as two images are produced with a single scan.

☐Frame frequency
Frame frequency is the number of frames produced in one second.

☐Progressive scanning
Progressive scanning is a display method where lines are scanned in order from the first to the last, and one image is produced with one scan. It is also called non-interlace scanning. For example if there are 480 scanning lines, the lines are scanned in order from the first to the 480th line. The advantage of progressive scanning is that a picture without flickering can be achieved.

☐Number of effective scanning lines
This is the number of scanning lines that actually produce the image on the screen.

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