Re: Everything You want to Know about DVD player

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What is DVD?
DVD is the new generation of optical disc storage technology. DVD is essentially a bigger, faster CD that can hold cinema−like video, better−than−CD audio, still photos, and computer data. DVD aims to encompass home entertainment, computers, and business information with a single digital format. It has replaced laserdisc, is well on the way to replacing videotape and video game cartridges, and could eventually replace audio CD and CD−ROM. DVD has widespread support from all major electronics companies, all major computer hardware companies, and all major movie and music studios. With this unprecedented support, DVD became the most successful consumer electronics product of all time in less than three years of its introduction. In 2003, six years after introduction, there were over 250 million DVD playback devices worldwide, counting DVD players, DVD PCs, and DVD game consoles. This was more than half the numbers of VCRs, setting DVD up to become the new standard for video publishing.
It's important to understand the difference between the physical formats (such as DVD−ROM and DVD−R) and the application formats (such as DVD−Video and DVD−Audio). DVD−ROM is the base format that holds data. DVD−Video (often simply called DVD) defines how video programs such as movies are stored on disc and played in a DVD−Video player or a DVD computer (see 4.1). The difference is similar to that between CD−ROM and Audio CD. DVD−ROM includes recordable variations: DVD−R/RW, DVD−RAM, and DVD+R/RW (see 4.3). The application formats include DVD−Video, DVD−Video Recording (DVD−VR), DVD+RW Video Recording (DVD+VR), DVD−Audio Recording (DVD−AR), DVD Stream Recording (DVD−SR), DVD−Audio (DVD−A), and Super Audio CD (SACD). There are also special application formats for game consoles such as Sony PlayStation 2 and Microsoft Xbox.

What do the letters DVD stand for?
All of the following have been proposed as the words behind the letters DVD.
Delayed, very delayed (referring to the many late releases of DVD formats)
Diversified, very diversified (referring to the proliferation of recordable formats and other spinoffs)
Digital venereal disease (referring to piracy and copying of DVDs)
Dead, very dead (from naysayers who predicted DVD would never take off)
Digital video disc (the original meaning proposed by some of DVD's creators)

Digital versatile disc (a meaning later proposed by some of DVD's creators)
NothingAnd the official answer is? "Nothing." The original acronym came from "digital video disc." Some members of the DVD Forum (see 6.1) tried to express that DVD goes far beyond video by retrofitting the painfully contorted phrase "digital versatile disc," but this has never been officially accepted by the DVD Forum as a whole. The DVD Forum decreed in 1999 that DVD, as an international standard, is simply three letters. After all, how many people ask what VHS stands for? (Guess what, no one agrees on that one either.)
What are the features of DVD−Video?
Over 2 hours of high−quality digital video (a double−sided, dual−layer disc can hold about 8 hours of high−quality video, or 30 hours of VHS quality video).
Support for widescreen movies on standard or widescreen TVs (4:3 and 16:9 aspect ratios).
Up to 8 tracks of digital audio (for multiple languages, commentaries, etc.), each with as many as 8 channels.
Up to 32 subtitle/karaoke tracks.
Automatic seamless branching of video (for multiple story lines or ratings on one disc).
Up to 9 camera angles (different viewpoints can be selected during playback).
On−screen menus and simple interactive features (for games, quizzes, etc.).
Multilingual identifying text for title name, album name, song name, cast, crew, etc.
Instant rewind and fast forward (no "be kind, rewind" stickers and threats on rental discs)
Instant search to title, chapter, music track, and timecode.
Durable (no wear from playing, only from physical damage).
Not susceptible to magnetic fields. Resistant to heat.
Compact size (easy to handle, store, and ship; players can be portable; replication is cheaper than tapes or laserdiscs).
Noncomedogenic.Note: Most discs do not contain all features (multiple audio/subtitle tracks, seamless branching, parental control, etc.), as each feature must be specially authored. Some discs may not allow searching or skipping.
Most players support a standard set of features:
Language choice (for automatic selection of video scenes, audio tracks, subtitle tracks, and menus).*
Special effects playback: freeze, step, slow, fast, and scan.
Parental lock (for denying playback of discs or scenes with objectionable material).*
Programmability (playback of selected sections in a desired sequence).
Random play and repeat play.
Digital audio output (PCM stereo and Dolby Digital).
Recognition and output of DTS Digital Surround audio tracks.
Playback of audio CDs.* Must be supported by additional content on the disc.
Some players include additional features:
Component video output (YUV or RGB) for higher quality picture.
Progressive−scan component output (YUV or RGB) for highest quality analog picture.

Digital video output (SDI, 1394, or DVI/HDMI) for perfect digital picture.
Six−channel analog output from internal audio decoder (Dolby Digital, DTS, or MLP).
Playback of Video CDs or Super Video CDs.
Playback of MP3 CDs.
Playback of MP3 DVDs.
Playback of video files in other formats such as DivX and MPEG−4.
Playback of Picture CDs and Photo CDs.
Playback of laserdiscs and CDVs.
Reverse single frame stepping.
Reverse play (normal speed).
RF output (for TVs with no direct video input).
Multilingual on−screen display.
Multiple disc capacity.
Digital zoom (2x or 4x enlargement of a section of the picture). This is a player feature, not a DVD disc featureWhat's the quality of DVD−Video?
DVD has the capability to produce near−studio−quality video and better−than−CD−quality audio. DVD is vastly superior to consumer videotape and generally better than laserdisc. However, quality depends on many production factors. As compression experience and technology improves we see increasing quality, but as production costs decrease and DVD authoring software becomes widely available we also see more shoddily produced discs. A few low−budget DVDs even use MPEG−1 encoding (which is no better than VHS) instead of higher−quality MPEG−2.
DVD video is usually encoded from digital studio master tapes to MPEG−2 format. The encoding process uses lossy compression that removes redundant information (such as areas of the picture that don't change) and information that's not readily perceptible by the human eye. The resulting video, especially when it is complex or changing quickly, may sometimes contain visual flaws, depending on the processing quality and amount of compression. At average video data rates of 3.5 to 6 Mbps (million bits/second), compression artifacts may be occasionally noticeable. Higher data rates can result in higher quality, with almost no perceptible difference from the master at rates above 6 Mbps. As MPEG compression technology improves, better quality is being achieved at lower rates.
Video from DVD sometimes contains visible artifacts such as color banding, blurriness, blockiness, fuzzy dots, shimmering, missing detail, and even effects such as a face that "floats" behind the rest of the moving picture. It's important to understand that the term "artifact" refers to anything that is not supposed to be in the picture. Artifacts are sometimes caused by poor MPEG encoding, but artifacts are more often caused by a poorly adjusted TV, bad cables, electrical interference, sloppy digital noise reduction, improper picture enhancement, poor film−to−video transfer, film grain, player faults, disc read errors, and so on. Most DVDs exhibit few visible MPEG compression artifacts on a properly configured system.. If you think otherwise, you are misinterpreting what you see.
Some early DVD demos were not very good, but this is simply an indication of how bad DVD can be if not properly processed and correctly reproduced. In−store demos should be viewed with a grain of salt, since most salespeople are incapable of properly adjusting a television set.
Most TVs have the sharpness set too high for the clarity of DVD. This

exaggerates high−frequency video and causes distortion, just as the treble control set too high on a stereo causes the audio to sound harsh. For best quality the sharpness control should be set very low. Brightness should also not be set too high. Some DVD players output video with a black−level setup of 0 IRE (Japanese standard) rather than 7.5 IRE (US standard). On TVs that are not properly adjusted this can cause some blotchiness in dark scenes. There may be an option in the player menu to use standard black level. DVD video has exceptional color fidelity, so muddy or washed−out colors are almost always a problem in the display (or the original source), not in the DVD player or disc.

DVD audio quality is superb. DVD includes the option of PCM (pulse code modulation) digital audio with sampling sizes and rates higher than audio CD. Alternatively, audio for most movies is stored as discrete, multi−channel surround sound using Dolby Digital or DTS audio compression similar to the digital surround sound formats used in theaters. As with video, audio quality depends on how well the processing and encoding was done. In spite of compression, Dolby Digital and DTS can be close to or better than CD quality.

What are the disadvantages of DVD?

Vagueness of the DVD specification and inadequate testing of players and discs has resulted in incompatibilities. Some movie discs don't function fully (or don't play at all) on some players.

DVD recorders are more expensive than VCRs.

DVD has built−in copy protection and regional lockout.

DVD uses digital compression. Poorly compressed audio or video may be blocky, fuzzy, harsh, or vague.

The audio downmix process for stereo/Dolby Surround may reduce dynamic range.

DVD doesn't fully support HDTV.

Some DVD players and drives can't read CD−Rs.

Some DVD players and drives can't read recordable DVDs.

Most DVD players and drives can't read DVD−RAM discs.

Very few players can play in reverse at normal speed.

Variations and options such as DVD−Audio, DVD−VR, and DTS audio tracks are not supported by all players.What DVD players and drives are available?

Some manufacturers originally announced that DVD players would be available as early as the middle of 1996. These predictions were woefully optimistic. Delivery was initially held up for "political" reasons of copy protection demanded by movie studios, but was later delayed by lack of titles. The first players appeared in Japan in November, 1996, followed by U.S. players in March, 1997, with distribution limited to only 7 major cities for the first 6 months. Players slowly trickled in to other regions around the world. Prices for the first players in 1997 were $1000 and up. By the end of 2000, players were available for under $100 at discount retailers. In 2003 players became available for under $50. Six years after the initial launch, close to one thousand models of DVD players were available from over a hundred consumer electronics manufacturers.

Fujitsu supposedly released the first DVD−ROM−equipped computer on Nov. 6 in Japan. Toshiba released a DVD−ROM−equipped computer and a DVD−ROM drive in Japan in early 1997 (moved back from December which was moved back from November). DVD−ROM drives from Toshiba, Pioneer, Panasonic, Hitachi, and

Sony began appearing in sample quantities as early as January 1997, but none were available before May. The first PC upgrade kits (a combination of DVD−ROM drive and hardware decoder card) became available from Creative Labs, Hi−Val, and Diamond Multimedia in April and May of 1997.
Today, every major PC manufacturer has models that include DVD−ROM drives. The price difference from the same system with a CD−ROM drive ranges from $30 to $200 (laptops have more expensive drives). Upgrade kits for older computers have been available over the years for $100 to $700 from companies such as Creative Labs, DynaTek, E4 (Elecede), Hi−Val, Leadtek, Margi Systems (for laptops), Media Forte, Pacific Digital, Sigma Designs, Sony, Toshiba, Utobia, and others. For more information about DVDs on computers, including writable DVD drives, .
Note: If you buy a player or drive from outside your country (e.g., a Japanese player for use in the US) you may not be able to play region−locked discs on it.
The first DVD−Audio players were released in Japan by Pioneer in late 1999, but they did not play copy−protected discs. Matsushita (under the Panasonic and Technics labels) first released full−fledged players in July 2000 for $700 to $1,200. DVD−Audio players are now also made by Aiwa, Denon, JVC, Kenwood, Madrigal, Marantz, Nakamichi, Onkyo, Toshiba, Yamaha, and others.
Sony released the first SACD players in May 1999 for $5,000. Pioneer's first DVD−Audio players released in late 1999 also played SACD. SACD players are now also made by Accuphase, Aiwa, Denon, Kenwood, Marantz, Philips, Sharp, and others. What are "regional codes," "country codes," or "zone locks"?
Motion picture studios want to control the home release of movies in different countries because theater releases aren't simultaneous (a movie may come out on video in the U.S. when it's just hitting screens in Europe). Also, studios sell distribution rights to different foreign distributors and would like to guarantee an exclusive market. Therefore they required that the DVD standard include codes to prevent playback of certain discs in certain geographical regions. Each player is given a code for the region in which it's sold. The player will refuse to play discs that are not coded for its region. This means that a disc bought in one country may not play on a player bought in another country. Some people believe that region codes are an illegal restraint of trade, but no legal cases have established this.
Regional codes are entirely optional for the maker of a disc. Discs without region locks will play on any player in any country. It's not an encryption system, it's just one byte of information on the disc that the player checks. Some studios originally announced that only their new releases would have regional codes, but so far almost all Hollywood releases play in only one region. Region codes are a permanent part of the disc, they won't "unlock" after a period of time. Region codes don't apply to DVD−Audio, DVD−ROM, or recordable DVD (see below for more detail).
Seven regions (also called locales or zones) have been defined, and each one is assigned a number. Players and discs are often identified by their region number superimposed on a world globe. If a disc plays in more than one region it will have more than one number on the globe.1: U.S., Canada, U.S. Territories2: Japan, Europe, South Africa, and Middle East (including Egypt)3: Southeast Asia and East Asia (including Hong Kong)4: Australia, New Zealand, Pacific Islands, Central America, Mexico, South America, and the Caribbean5: Eastern Europe (Former Soviet Union), Indian subcontinent,

Africa, North Korea, and Mongolia6: China7: Reserved8: Special international venues (airplanes, cruise ships, etc.)(See the map at >.)

Technically there is no such thing as a region zero disc or a region zero player. There is such thing as an all−region disc. There are also all−region players. Some players can be "hacked" using special command sequences from the remote control to switch regions or play all regions. Some players can be physically modified ("chipped") to play discs regardless of the regional codes on the disc. This usually voids the warranty, but is not illegal in most countries (since the only thing that requires player manufacturers to region−code their players is the CSS license; Many retailers, especially outside North America, sell players that have already been modified for multiple regions, or in some cases they simply provide instructions on how to access the "secret" region change features already built into the player.

As an interesting side note, on Feb. 7, 2001, NASA sent two multiregion DVD players to the International Space Station.

Extensive information about modifying players and buying region−free players can be found on the Internet.

In addition to region codes, there are also differences in discs for NTSC and PAL TV systems .

Some discs from Fox, Buena Vista/Touchstone/Miramax, MGM/Universal, Polygram, and Columbia TriStar contain program code that checks for the proper region setting in the player. (There's Something About Mary and Psycho are examples.) In late 2000, Warner Bros. began using the same active region code checking that other studios had been using for over a year. They called it "region code enhancement" (RCE, also known as REA), and it received much publicity. RCE was first added to discs such as The Patriot and Charlie's Angels. "Smart discs" with active region checking won't play on code−free players that are set for all regions (FFh), but they can be played on manual code−switchable players that allow you to use the remote control to change the player's region to match the disc. They may not work on auto−switching players that recognize and match the disc region. (It depends on the default region setting of the player. An RCE disc has all its region flags set so that the player doesn't know which one to switch to. The disc queries the player for the region setting and aborts playback if it's the wrong one. A default player setting of region 1 will fool RCE discs from region 1. Playing a region 1 disc for a few seconds sets most auto−switching players to region 1 and thus enables them to play an RCE disc.) When an RCE disc detects the wrong region or an all−region player, it will usually put up a message saying that the player may have been altered and that the disc is not compatible with the player. A serious side effect is that some legitimate players fail the test, such as the Fisher DVDS−1000.

There was much wailing and gnashing of teeth when RCE first appeared, but DVD fans quickly learned that it only affected some players. Makers of player modification kits that didn't work with RCE soon improved their chips to get around it. For every higher wall there is a taller ladder. See DVDTalk's RCE FAQ for more info and workarounds.

In general, region codes don't apply to recordable DVDs. A DVD that you make on a PC with a DVD burner or in a home DVD video recorder will play in all regions (but don't forget NTSC vs. PAL differences, see 1.19). Region codes do not apply to DVD−Audio.

Regional codes apply to game consoles such as PlayStation 2 and Xbox, but

only for DVD−Video (movie) discs (see DVDRegionX for region modifications to PS2). PlayStation has a separate regional lockout scheme for games. Regional codes also apply to DVD−ROM computers, but affect only DVD−Video discs, not DVD−ROM discs containing computer software. Computer playback systems check for regional codes before playing movies from a CSS−protected DVD−Video (see 1.11 for CSS info). Newer RPC2 DVD−ROM drives let you change the region code several times. (RPC stands for region protection control.) Once an RPC2 drive has reached the limit of 5 changes it can't be changed again unless the vendor or manufacturer resets the drive. The Drive Info utility can tell you if you have an RPC2 drive (it will say "This drive has region protection"). See 6.4.2 for links to more information about circumventing DVD−ROM region restrictions. Since December 31, 1999, only RPC2 drives have been manufactured.

Is the packaging different from CD?

Manufacturers were worried about customers assuming DVDs would play in their CD player, so they wanted the packaging to be different. Most DVD packages are as wide as a CD jewel box (about 5−5/8") and as tall as a VHS cassette box (about 7−3/8"), as recommended by the Video Software Dealers Association (VSDA). However, no one is being forced to use a larger package size. Some companies use standard jewel cases or paper and vinyl sleeves. Divx discs came in paperboard and plastic Q−Pack cases the same size as a CD jewel case.

Most movies are packaged in the Amaray "keep case," an all−plastic clamshell with clear vinyl pockets for inserts, that's popular among consumers. Time Warner's "snapper," a paperboard case with a plastic lip, is less popular. There's also a "super jewel box," the stretch−limo version of a CD jewel case, that's common in Europe.

What's a dual−layer disc? Will it work in all players?

A dual−layer disc has two layers of data, one of them semi−transparent so that the laser can focus through it and read the second layer. Since both layers are read from the same side, a dual−layer disc can hold almost twice as much as a single−layer disc, typically 4 hours of video (see 3.3 for more details). Many discs use dual layers. Initially only a few replication plants could make dual−layer discs, but most plants now have the capability. The second layer can use either a PTP (parallel track path) layout where both tracks run in parallel (for independent data or special switching effects), or an OTP (opposite track path) layout where the second track runs in an opposite spiral; that is, the pickup head reads out from the center on the first track then in from the outside on the second track. The OTP layout, also called RSDL (reverse−spiral dual layer), is designed to provide continuous video across both layers. When the laser pickup head reaches the end of the first layer it changes focus to the second layer and starts moving back toward the center of the disc. The layer change can occur anywhere in the video; it doesn't have to be at a chapter point. There's no guarantee that the switch between layers will be seamless. The layer change is invisible on some players, but it can cause the video to freeze for a fraction of a second or as long as 4 seconds on other players. The "seamlessness" depends as much on the way the disc is prepared as on the design of the player. The advantage of two layers is that long movies can use higher data rates for better quality than with a single layer. See 1.27 for more about layer changes.

There are various ways to recognize dual−layer discs: 1) the gold color, 2) a menu on the disc for selecting the widescreen or fullscreen version, 3) two serial numbers on one side.
The DVD specification requires that players and drives read dual−layer discs. There are very few units that have problems with dual−layer discs−−this is a design flaw and should be corrected for free by the manufacturer. Some discs are designed with a "seamless layer change" that technically goes beyond what the DVD spec allows. This causes problems on a few older players.
All players and drives also play double−sided discs if you flip them over. No manufacturer has announced a model that will play both sides, other than a few DVD jukeboxes. The added cost would be hard to justify since discs can hold over 4 hours of video on one side by using two layers. (Early discs used two sides because dual−layer production was not widely supported. This is no longer a problem.) Pioneer LD/DVD players can play both sides of a laserdisc, but not a DVD. (See 2.12 for note on reading both sides simultaneously.)
Is DVD−Video a worldwide standard? Does it work with NTSC, PAL, and SECAM?
Video on a DVD is stored in digital format, but it's formatted for one of two mutually incompatible television systems: 525/60 (NTSC) or 625/50 (PAL/SECAM). Therefore, there are two kinds of DVDs: "NTSC DVDs" and "PAL DVDs." Some players only play NTSC discs, others play PAL and NTSC discs. Discs are also coded for different regions of the world (see 1.10). NTSC is the TV format used in Canada, Japan, Mexico, Philippines, Taiwan, United States, and other countries. PAL is the TV format used in most of Europe, most of Africa, China, India, Australia, New Zealand, Israel, North Korea, and other countries. (See the chart at www.remoteviewing.com for a complete list.)
Almost all DVD players sold in PAL countries play both kinds of discs. These multi−standard players partially convert NTSC to a 60−Hz PAL (4.43 NTSC) signal. The player uses the PAL 4.43−MHz color subcarrier encoding format but keeps the 525/60 NTSC scanning rate. Most modern PAL TVs can handle this "pseudo−PAL" signal. A few multi−standard PAL players output true 3.58 NTSC from NTSC discs, which requires an NTSC TV or a multi−standard TV. Some players have a switch to choose 60−Hz PAL or true NTSC output when playing NTSC discs. There are a few standards−converting PAL players that convert from an NTSC disc to standard PAL output for older PAL TVs. Proper "on the fly" standards conversion requires expensive hardware to handle scaling, temporal conversion, and object motion analysis. Because the quality of conversion in DVD players is poor, using 60−Hz PAL output with a compatible TV provides a better picture than converting from NTSC to PAL. (Sound is not affected by video conversion.)
Most NTSC players can't play PAL discs, and most NTSC TVs don't work with PAL video. A very small number of NTSC players (such as Apex and SMC) can convert PAL to NTSC. External converter boxes are also available, such as the Emerson EVC1595 ($350). High−quality converters are available from companies such as TenLab and Snell and Wilcox.
Beware, some standards−converting players can't convert anamorphic widescreen video for 4:3 displays (see 1.22).
The latest software tools such as Adobe After Effects and Canopus ProCoder do quite a good job of converting between PAL and NTSC at low cost, but they

are only appropriate for the production environment (converting the video before it is encoded and put on the DVD). See Snell and Wilcox's The Engineer's Guide to Standards Conversion and The Engineer's Guide to Motion Compensation for technical details of conversion.

There are three differences between discs intended for playback on different TV systems: picture dimensions and pixel aspect ratio (720x480 vs. 720x576), display frame rate (29.97 vs. 25), and surround audio options (Dolby Digital vs. MPEG audio). (See 3.4 and 3.6 for details.) Video from film is usually encoded at 24 frames/sec but is preformatted for one of the two required display rates. Movies formatted for PAL display are usually sped up by 4% at playback, so the audio must be adjusted accordingly before being encoded.

All PAL DVD players can play Dolby Digital audio tracks, but not all NTSC players can play MPEG audio tracks. PAL and SECAM share the same scanning format, so discs are the same for both systems. The only difference is that SECAM players output the color signal in the format required by SECAM TVs. Note that modern TVs in most SECAM countries can also read PAL signals, so you can use a player that only has PAL output. The only case in which you need a player with SECAM output is for older SECAM−only TVs (and you'll probably need a SECAM RF connection, see 3.1).

A producer can choose to put 525/60 NTSC video on one side of the disc and 625/50 PAL on the other. Most studios put Dolby Digital audio tracks on their PAL discs instead of MPEG audio tracks.

Because of PAL's higher resolution, the video usually takes more space on the disc than the NTSC version. See 3.4 for more details.

There are actually three types of DVD players if you count computers. Most DVD PC software and hardware can play both NTSC and PAL video and both Dolby Digital and MPEG audio. Some PCs can only display the converted video on the computer monitor, but others can output it as a video signal for a TV.

Bottom line: NTSC discs (with Dolby Digital audio) play on over 95% of DVD systems worldwide. PAL discs play on very few players outside of PAL countries. (This is irrespective of regions −− see 1.10.) How should I clean and care for DVDs?

Since DVDs are read by a laser, they are resistant to fingerprints, dust, smudges, and scratches (see 1.15 for more info). However, surface contaminants and scratches can cause data errors. On a video player, the effect of data errors ranges from minor video artifacts to frame skipping to complete unplayability. So it's a good idea to take care of your discs. In general treat them the same way as you would a CD.

Your player can't be harmed by a scratched or dirty disc unless globs of nasty substances on it actually hit the lens. Still, it's best to keep your discs clean, which will also keep the inside of your player clean. Don't attempt to play a cracked disc, as it could shatter and damage the player.

It doesn't hurt to leave the disc in the player, even if it's paused and still spinning, but leaving it running unattended for days on end might not be a good idea.

In general, there's no need to clean the lens on your player, since the air moved by the rotating disc keeps it clean. However, if you use a lens cleaning disc in your CD player, you may want to do the same with your DVD player. It's advisable to use a cleaning disc specifically designed for DVD players, because there are minor differences in lens positioning between DVD and CD players.

Periodic alignment of the pickup head is not necessary. Sometimes the laser can drift out of alignment, especially after rough handling of the player, but this is not a regular maintenance item.

Care and feeding of DVDs

Handle only at the hub or outer edge. Don't touch the shiny surface with your popcorn−greasy fingers.

Store in a protective case when not in use. Don't bend the disc when taking it out of the case, and be careful not to scratch the disc when placing it in the case or in the player tray.

Make certain the disc is properly seated in the player tray before you close it.

Keep discs away from radiators, heaters, hot equipment surfaces, direct sunlight (near a window or in a car during hot weather), pets, small children, and other destructive forces. The DVD specification recommends that discs be stored at a temperature between −20 to 50 ?C (−4 to 122 ?F) with less than 15 ?C (27 ?F) variation per hour, at relative humidity of 5 to 90 percent. Artificial light and indirect sunlight have no effect on replicated DVDs since they are made of polycarbonate, polymer adhesives, and metal (usually aluminum or gold), none of which are significantly affected by exposure to light. Exposure to bright sunlight may affect recordable DVDs, specifically write−once DVDs (DVD−R and DVD+R) that use light−sensitive dyes. Magnetic fields have no effect on DVDs, so it's ok to leave them sitting on your speakers.

Coloring the outside edge of a DVD with a green marker (or any other color) makes no difference in video or audio quality. Data is read based on pit interference at 1/4 of the laser wavelength, a distance of less than 165 nanometers. A bit of dye that on average is more than 3 million times farther away is not going to affect anything.

NIST has prepared a 1−page guide and a 50−page guide to disc care.

Cleaning and repairing DVDs

If you notice problems when playing a disc, you may be able to correct them with a simple cleaning.

Do not use strong cleaners, abrasives, solvents, or acids.

With a soft, lint−free cloth, wipe gently in only a radial direction (a straight line between the hub and the rim). Since the data is arranged circularly on the disc, the micro scratches you create when cleaning the disc (or the nasty gouge you make with the dirt you didn't see on your cleaning cloth) will cross more error correction blocks and be less likely to cause unrecoverable errors.

Don't use canned or compressed air, which can be very cold and may thermally stress the disc.

For stubborn dirt or gummy adhesive, use water, water with mild soap, or isopropyl alcohol. As a last resort, try peanut oil. Let it sit for about a minute before wiping it off.

There are commercial products that clean discs and provide some protection from dust, fingerprints, and scratches. CD cleaning products work as well as DVD cleaning products.If you continue to have problems after cleaning the disc, you may need to attempt to repair one or more scratches. Sometimes even hairline scratches can cause errors if they just happen to cover an entire error correction (ECC) block. Examine the disc to find scratches,

keeping in mind that the laser reads from the bottom. There are essentially two methods of repairing scratches: 1) fill or coat the scratch with an optical material; 2) polish down the scratch. There are many commercial products that do one or both of these, or you may wish to do it yourself with polishing compounds or toothpaste. The trick is to polish out the scratch without causing new ones. A mess of small polishing scratches may cause more damage than a big scratch. As with cleaning, polish only in the radial direction.

Libraries, rental shops, and other venues that need to clean a lot of discs may wish to invest in a commercial polishing machine that can restore a disc to pristine condition after an amazing amount of abuse. Keep in mind that the data layer on a DVD is only half as deep as on a CD, so a DVD can only be repolished about half as many times. What's a MiniDVD?

The term "miniDVD" confusingly refers to 8−cm DVDs and to CDs with DVD−Video content on them, more appropriately called cDVDs. 8−cm DVDs are defined in the DVD specification and will play on almost all DVD players and drives, but they don't work in most slot−loading systems, such as in cars. cDVDs play on most DVD PCs, but only on very few DVD players What are .IFO, .VOB, ..AOB, and .VRO files? How can I play them?

The DVD−Video and DVD−Audio specifications define how audio and video data are stored in specialized files. The .IFO files contain menus and other information about the video and audio. The .BUP files are backup copies of the .IFO files. The .VOB files (for DVD−Video) and .AOB files (for DVD−Audio) are MPEG−2 program streams with additional packets containing navigation and search information.

Since a .VOB file is just a specialized MPEG−2 file, most MPEG−2 decoders and software DVD players can play them. You may need to change the extension from .VOB to .MPG. However, any special features such as angles or branching will cause strange effects. The best way to play a .VOB file is to use a DVD player application to play the entire volume (or to open the VIDEO_TS.IFO file), since this will make sure all the DVD−Video features are used properly.

Many DVDs are encrypted, which means the .VOB files won't play when copied to your hard drive.

If you try to copy the .IFO and .VOB files to a recordable DVD it may not play.

..VRO files are created by DVD video recorders using the DVD−VR format. In some cases you can treat the files just like .VOB files, but in many cases they are fragmented and unplayable. Newer version of Cyberlink PowerDVD, InterVideo WinDVD, and Sonic Cineplayer can play them. Otherwise you'll need a utility such as Heuris Extractor or Panasonic DVD−MovieAlbum to copy them to a hard disk in usable format. Alternatively you can use DVD disc creation software such as InterVideo WinDVD Creator, MedioStream neoDVD, or Sonic MyDVD can import from −VR discs and write out standard DVD−Video discs Where can I get more information about DVD? A few of the top DVD info sites

The Digital Bits > (top DVD news site)

DVDFile > (another good DVD news site)

DVD Review > (DVD news and production information)

DigitalAudioVideo.com > (DVD tech support)

DVDAnswers > (general DVD info site)

Home Theater Forum > (general DVD discussions)

TheDVDPlayer > (immense collection of links to other DVD pages)
Chad Fogg's DVD technical notes > (from 1996)
Quantel Digital Fact Book (digital video info and glossary) >
DVD for not−so−Dummies, from Technicolor >
DVD White Papers, from Sonic Solutions >
Disctronics' (Graham Sharpless's) DVD Technology pages >
Tristan's MPEG Pointers and Resources >
DVD discussion list. Send "subscribe DVD−L " to listserv@xxxxxxxxxxxxxxxxxxx
For details on YUV, RGB, YCbCr, etc., read Charles Poynton's Color FAQ (or
buy his book).
Robert's DVD Info > (the granddaddy DVD link page, not updated recently)

There you go

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