

SONY

What's DVD Recording?

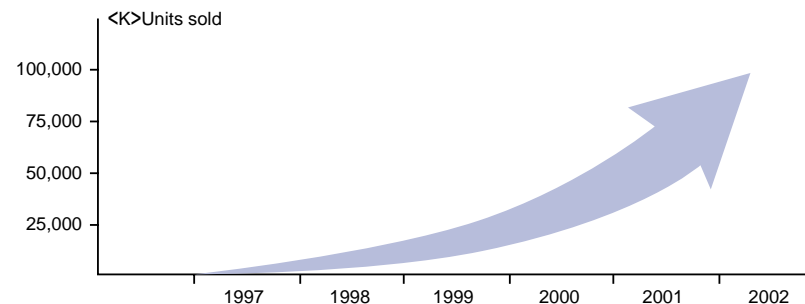


DVD-Video is now the standard. Writable DVD is next.

Since its introduction in 1996, DVD-Video fast became the new world standard for movie and concert video enjoyment, with extremely high quality picture and sound reproduction. Not only have DVD players become commonplace, DVD drives are increasingly employed in computers, game devices and other electronic equipment. DVD is truly a versatile new storage medium across a wide spectrum of applications.

Naturally, the time has come for writable DVD. High picture and sound quality combine with many versatile playback functions to make this the media of choice. The dream of high-quality digital disc recording in the home, not only for audio/video entertainment, but also for computer storage, has now become a reality as a media suitable for the era of broadband communications.

Worldwide DVD player market



The total number of DVD playback units, including PCs and game equipment with DVD drives, is expected to increase greatly in the near future.

Writable DVD comes in several different formats.

There are several different writable DVD format specifications. Let's take a look at the common features and differences of each.

Physical format



Logical format

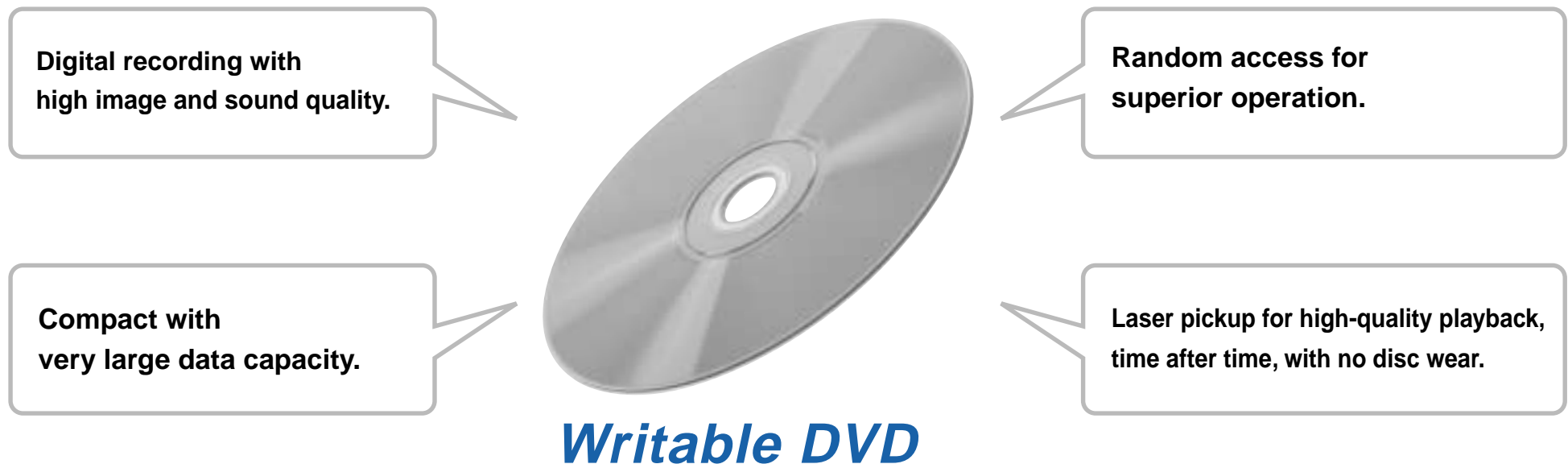
DVD Compatible type

Video Recording (VR) type

Writable DVD formats are a combination of physical and logical formats.

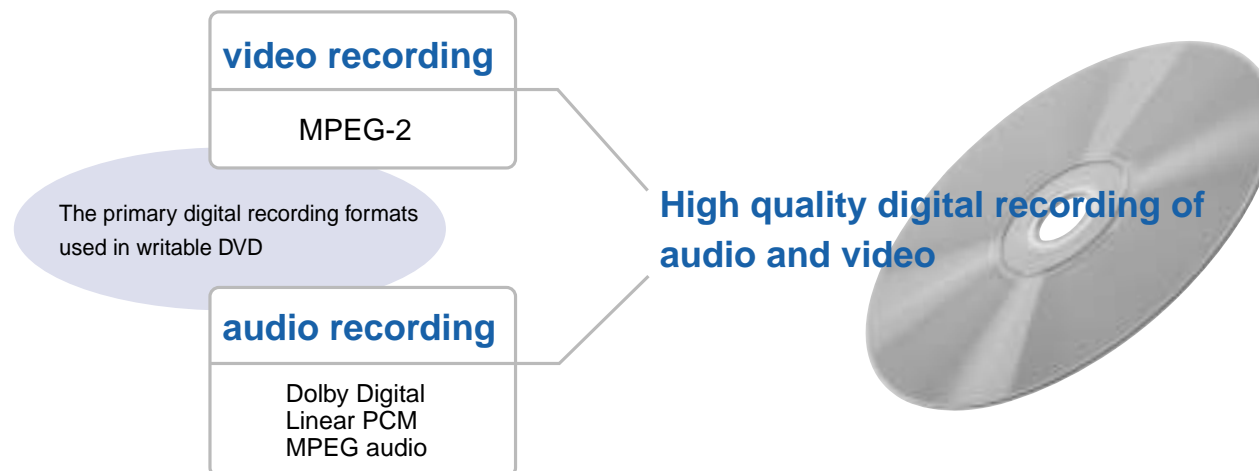
Writable DVD has these superior features.

- Storage and playback of digitally recorded video and audio with superior image and sound quality.
- Up to 4.7 GB of data can be recorded on a CD-sized 12 cm optical disc.
- Quick random access to image and sound without the need for cueing or rewinding.
- Non-contact optical reading system is impervious to wear during repeated playback, and is highly resistant to the effects of dirt and scratches, for superior storage characteristics.

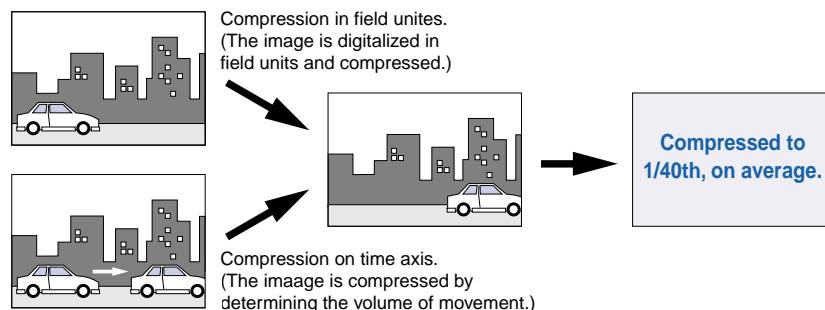


Digital recording of both image and sound.

Just like DVD-Video, writable DVD digitally records video using the MPEG-2 format, and digitally records audio using Dolby Digital and other formats. This assures extremely high quality video and audio recording, while also ensuring playback compatibility on conventional DVD players.

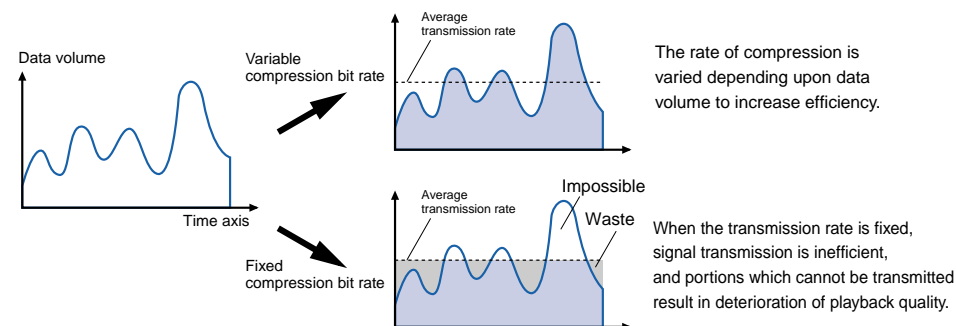


How MPEG-2 video compression works



MPEG-2 is a highly efficient and effective technology for the compression of video signals at variable rates. The areas of movement in each scene are determined, and for areas where there is no change, the volume of data representing those areas can be greatly reduced.

Fixed bit rate compression & variable bit rate compression

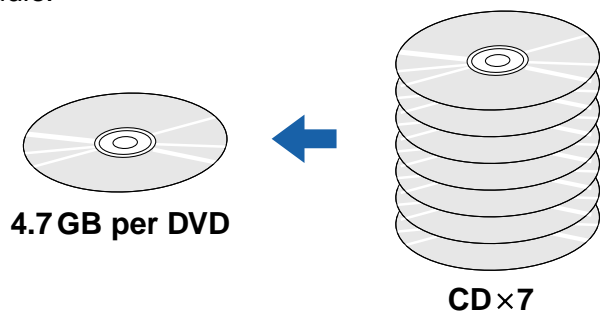


Writable DVD can be recorded at not only fixed transmission rates, but also at variable transmission rates which enable high image quality recording of complex video images at the same average transmission rate.

Compact optical disc with large data capacity.

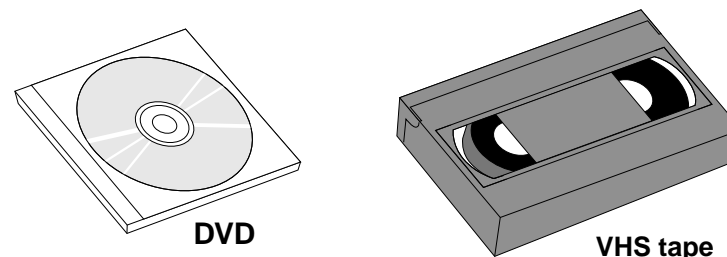
A DVD holds seven times as much data as a CD.

One side of a DVD can hold up to 4.7 GB, about seven times a CD holds. This high data capacity enables longer recording of video and audio.



12 cm discs are easy to handle, easy to store.

DVDs are the same size as CDs, just 12 cm and only 1.2 mm thick. Even a large video collection takes up very little space. Plus, they're easy to carry and send.



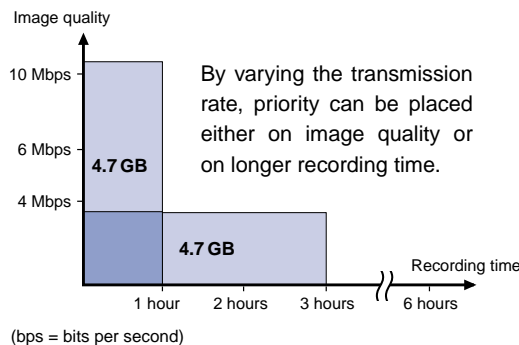
A DVD in its case is still 1/3 the volume of a VHS tape.

Note: There is also a format specification for an 8 cm DVD which holds 1.46 GB of data.

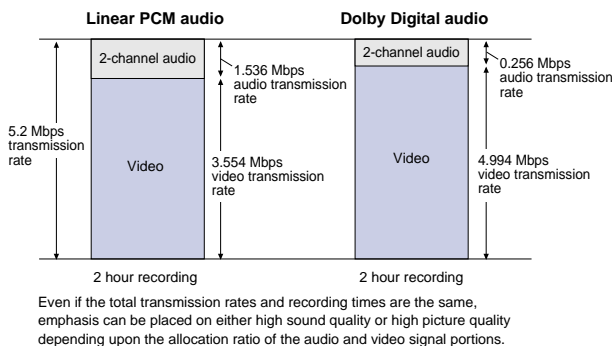
The relationship between image quality and recording time.

Recording time on a given disc varies according to the data transmission rate. If the rate is high, image quality is better, but recording time is shorter. If the rate is lowered, recording time is longer, but at the expense of image quality. Moreover, even with the same recording time, image quality can change depending upon the format for audio recording.

Image quality vs. recording time



High Quality Picture and Sound Recording



Random access for versatile operation

- Confirm recorded content using the menu function to quickly access and play any desired sequence.
- No need to cue to find blank disc space. Just press the REC button to start recording on the remaining blank area. It's quick and easy.

Superior storage characteristics

- Since the signal is read by non-contact laser pickup, there is no wear, even after repeated playback or cueing operations.
- No stretching or print-through as with tape, just high quality images and sound, always.
- Since it is digital, powerful error correction systems can be used to assure greater resistance against dirt and scratches for highly reliable playback.

■ Titles and Chapters in Writable DVD

In DVD, content is organized by titles and chapters. In read-only DVD-Video software, one movie is generally considered one title, and within the title there are several chapters which can be accessed through the menu. In writable DVD, one recording is saved as one title, and within that title different chapters can be specified. Using this chapter and title data, various playback and editing functions can be performed from the menu.

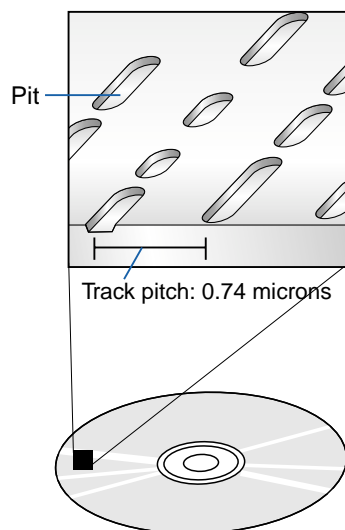
First recording			Second recording		
Title 1			Title 2		
Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 1

There are write-once and rewritable DVDs

Write-once DVDs can only be recorded once, like photographic film. Rewritable DVDs can be recorded and re-recorded many times, like tape. Each type has its own advantages, and is chosen depending upon the type of use.

Read-only

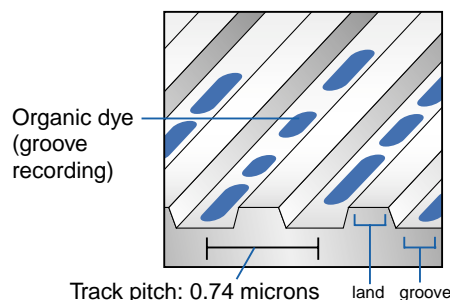
DVD-ROM



This type is used for DVD-video and other playback uses. Data is represented by the presence or absence of a pit in the pit lanes pressed on the disc.

Write-once

DVD-R, DVD+R



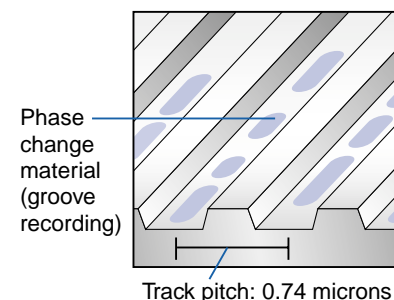
DVD-R and DVD+R are "write once" discs, meaning they can only be recorded once.

Merit

There is no danger or mistakenly erasing or recording over the recorded content.

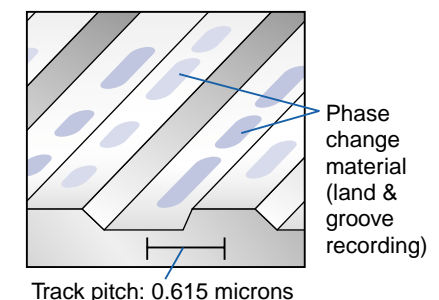
Rewritable

DVD-RW, DVD+RW



Since phase change is not permanent, DVD-RW, DVD+RW and DVD-RAM allow data to be written and rewritten over and over.

DVD-RAM



Merit

The same disc can be used over and over. Unwanted sections of the disc can be erased and rewritten.

What is the difference between DVD-R and DVD+R?

While DVD-R and DVD+R both have the same basic construction as DVD-ROM, there are differences in their rotational control systems and data recording positions.

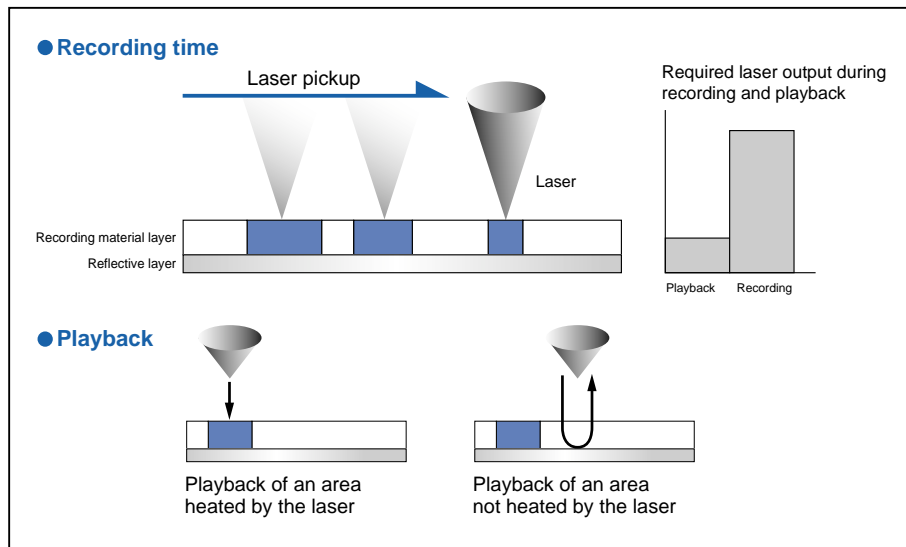
What are the differences between DVD-RW, DVD+RW and DVD-RAM?

While DVD-RW and DVD+RW both have the same basic construction and performance of DVD-ROM, there are differences in the way their disc rotational control systems and data recording positions are configured. DVD-RAM uses a special land and groove recording configuration and specification which enables data to be rewritten up to 100,000 times, compared to 1,000 times for DVD-RW and DVD+RW.

During DVD recording, a powerful laser beam, stronger than that used for playback, heats up the recording material, changing it to represent the data. Write-once DVDs use chemical change, while rewritable DVDs make use of phase change.

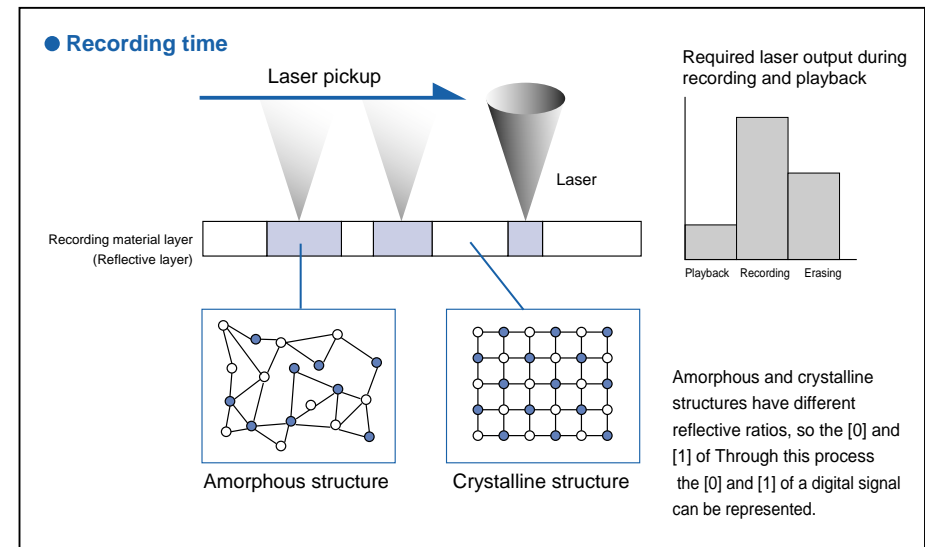
In write-once recording, the organic dye is chemically changed.

During recording, a powerful laser beam is focused on the organic dye recording material, and the heat from the laser changes the chemical structure of the dye. During playback, the playback laser can sense which parts of the dye have been changed by heat and which haven't. Through this process the [0] and [1] of a digital signal can be represented. However, changes in the dye structure are permanent, so the disc cannot be rewritten.



In rewritable recording, the phase of the recording material is changed.

The recording material used is in crystalline form before recording. When it is heated by the powerful laser, it becomes amorphous and loses its crystalline structure. However, weaker laser light can be used to slowly heat it to return it to its original crystalline form. In this way, the disc can be rewritten over and over.



Different recording methods are used.

DVD recording methods can basically be divided into two categories, those which place emphasis on playback equipment compatibility, and those which enable more operation functions. Here, these are referred to as the DVD compatible type and the Video Recording (VR) type. The DVD compatible type is for recording DVDs which can be played on DVD-Video players, while the VR type is for taking advantage of numerous operation functions, playing DVDs primarily with the equipment on which they were recorded.

DVD Compatible type

- Can be played on most DVD-Video players
- Basic recording and playback functions can be used.

Video Recording (VR) type

- Can only be played on compatible players
- Editing and other advanced functions can be used.

The DVD-Compatible type has superior playback compatibility.

Discs recorded as the DVD compatible type can be played on any conventional DVD player. Data is recorded from the center of the disc outwards. Recordings made can be played on other players, and can be given to friends and associates.

● Discs which are the DVD Compatible type.

Discs for DVD-R, DVD+R, DVD-RW, DVD+RW all are the DVD Compatible type. DVD Compatible type discs for DVD+RW have basic editing functions.

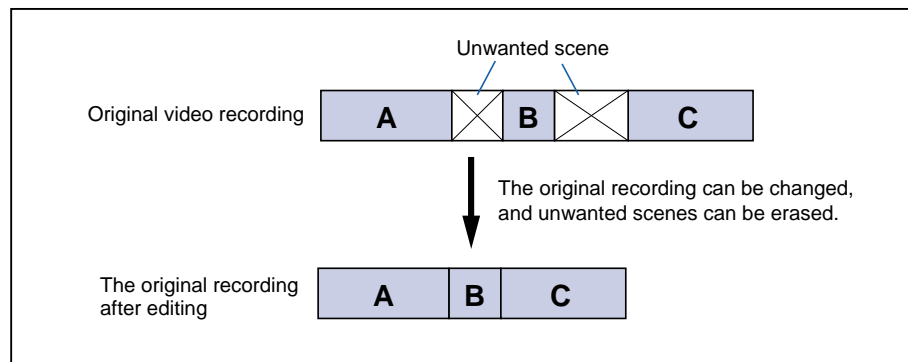
● What is finalization?

This is a form of final-stage processing that enables the data recorded by writable and rewritable formats to be played on a conventional DVD-Video player. During finalization, the menu screen used to operate the convenient playback functions is also created.

The VR type is used for DVD-RW and DVD-RAM. The discs can only be played on compatible players, but they feature quite a number of unique editing functions.

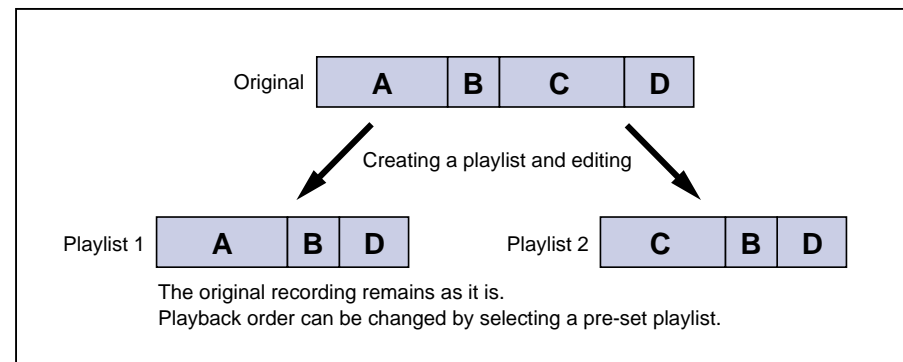
● Recorded video scenes can be edited on the disc itself.

Editing functions such as erasing scenes in an original video recording can be performed on the disc itself. Erased scenes can be replaced with new scenes. In addition, the disc can be “write protected” to prevent editing and erasing of scenes.



● Virtual editing is possible by making a playlist

The original video recording can be left as it is, and in place of erasing scenes and changing the order, a playlist can be created to enable “virtual editing” for different playback order. Best of all, this does not reduce the amount of available recording time on the disc.



● It is possible to record broadcasts which have been specified as “copy once.”

VR type has copy protection system on recording and it is possible to record not only “copy free” broadcasts but also “copy once” broadcasts which allow recording only once.

● Broadcasts with multiplex soundtracks may be recorded.

Stereo and bilingual soundtracks on broadcasts may be recorded, with selection of main, sub or main + sub (stereo) possible during playback.

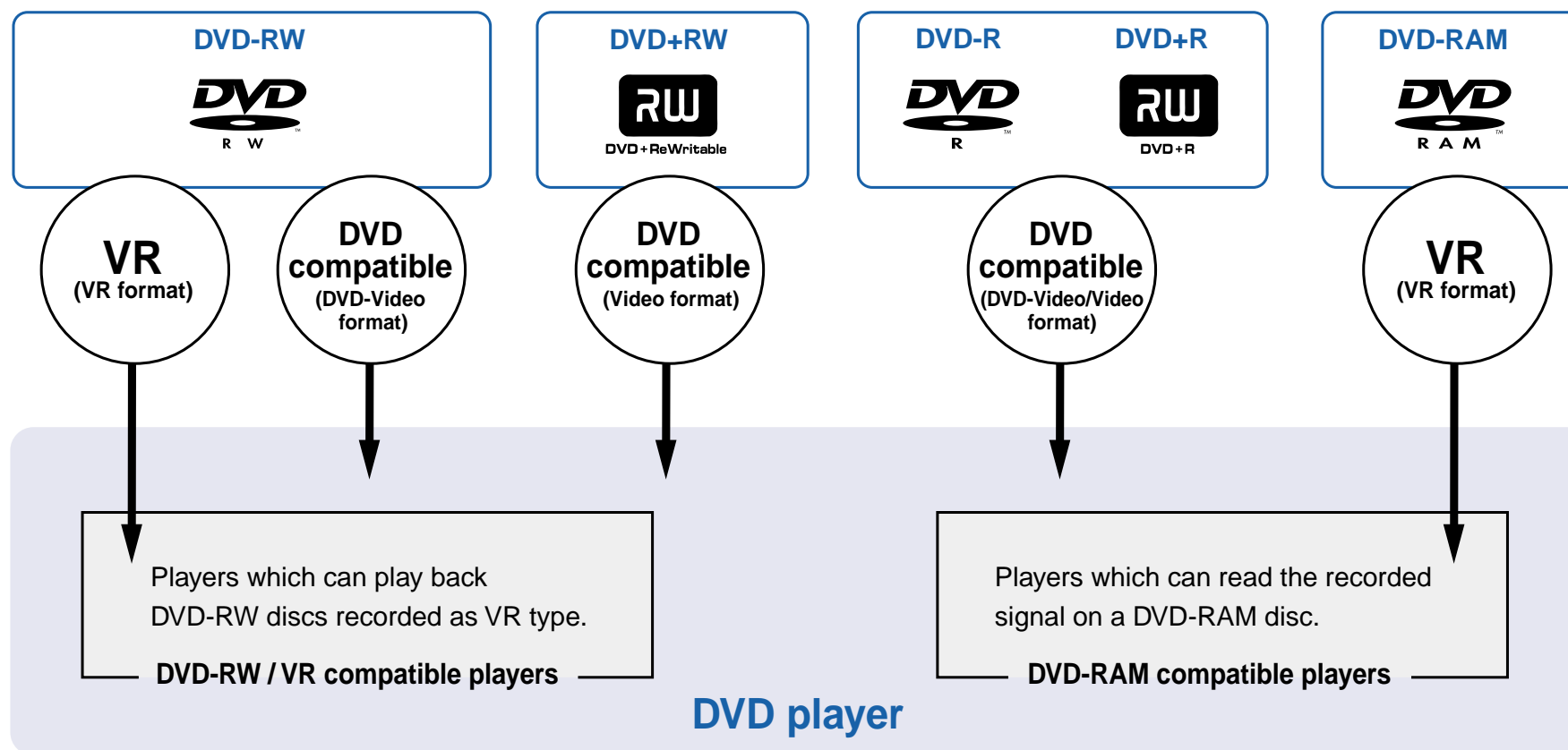
Note1: Although this information is based on format specifications, there may be cases when playback is not possible on actual equipment purchased.

Note2: Broadcasting stations can add copy generation control signal to programs to protect the rights of copyright holders of the contents.

Recording of “copy once” programs is limited to only once, and “copy never” program is not allowed to be recorded, though “copy free” programs can be recorded over multiple generation.

Types of Discs and Compatible DVD Players.

There are cases where a recorded DVD disc can not be played back on certain DVD players due to differences in disc type and recording format. Compatibility by disc type, recording format and type of player is indicated below.



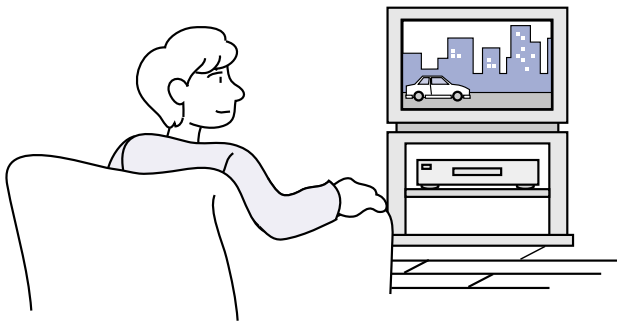
Notes:

1. Although this information is based on format specifications for playback and recording formats, there may be cases when playback is not possible on actual equipment purchased.
2. There may be cases where playback is not possible on DVD drives on personal computers or game equipment due to differences in drive type or recording format of the software.

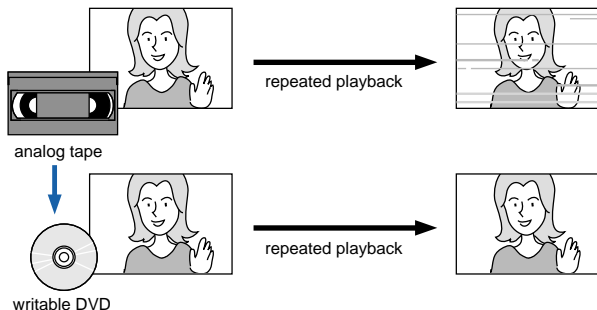
Writable DVD Expands Your Personal Entertainment World.

Writable DVD represents a quantum leap from the world of analog video tape. It can be used to record and store not only broadcast programming, but also personally created movie and still video images. Recorded discs can be played back on a DVD player, a personal computer or even game equipment for an unprecedented level of entertainment versatility.

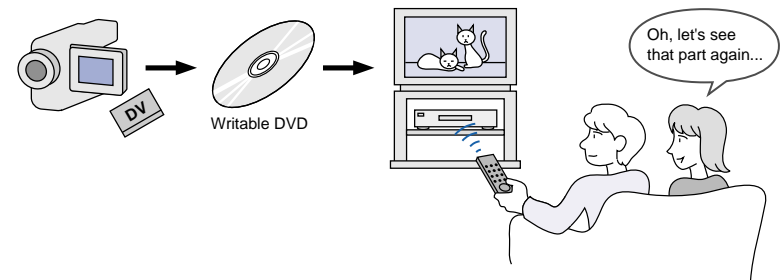
- **High quality recording and playback of your favorite TV programs.**



- **Put your video tape collection on digital DVD for a disc library you can enjoy over and over.**



- **Put your own digitally recorded movies and still photos on Writable DVD for easier enjoyment.**



- **Since recorded DVDs can be played on many DVD players, car DVD systems, PCs and game equipments around the world, they can be enjoyed in many ways. A number of possibilities enable to create a new style of communication through DVDs.**

