



Video Tape Formats

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Analogue Formats

VHS & VHS-C

VHS-C and full size VHS record at a slightly lower resolution than 8MM. A standard T-120 VHS tape has a recording time of 2 hrs, and the resolution is 250 lines. Their appeal, or course, is the convenience of easy playback. The large VHS camcorders are almost a thing of the past at this point. There are still a few models available, but their substantial size and weight make them a difficult sell against smaller camcorders. VHS/C compact models, on the other hand, remain a popular choice, offering many of the same key features as 8MM camcorders, at an equally affordable price.

Betamax

Betamax tapes were a format originally introduced by Sony in the 80's. It was thought to be a better format at the time. However, the Beta vs VHS wars took place and VHS was the victor. There are still a few Beta fans out there though and you can still get a Betamax machine if you look around.

Beta was the first widely used consumer video recording tape format. It was and is made by Sony. At one time Beta machines were also sold by several other retailers, but today only Sony is still making Beta machines.

Aficionados of Beta believe that the picture and sound quality of Beta is superior to VHS. Eventually VHS overtook Beta in the consumer market, ultimately leading to the almost complete disappearance of Beta machines and pre-recorded Beta tape.

S-VHS

Super VHS, a full-size format with resolution similar to that of HI-8, is virtually out of the consumer camcorder market. The format still is a strong player in the industrial market, but its future may be bleak with the release of newer and better digital formats. This format is used for videographers mostly for shooting and editing. The S stands for super, as the resolution jumps from the VHS standard of 250 lines to around 400 lines. Unfortunately, most VCR's will not play a super VHS tape and has to be transferred to a regular VHS format in order for it to be viewed on non-S-VHS machines.

8MM

8MM camcorders often have many of the best features found in higher priced HI-8 units, including image stabilization, strong optical and digital zooms and innovative special effects. Regular 8mm tapes are the exact size and shape as their HI8 counterparts, but record video at a lower resolution level, and therefore, are less expensive than camcorders which product better image quality. 8mm can record for up to 2 hours and has a resolution of 270 lines.

Hi-8

HI-8 camcorders record their signal at about 400 lines of resolution, slightly less than Mini DV, but substantially higher than 8mm or regular VHS formats. Most often, HI-8 camcorders record sound in hi-fi stereo. Slight quality loss is suffered when copying or editing from HI-8, but a better than average image is maintained.

Tapes from HI-8 camcorders generally must be played using the camera as the source, which means the user often must connect cables to their television or VCR. HI-8 tapes can be bought in 30, 60, and 120-minute lengths.

U-Matic

U-Matic also known as 3/4" video tape. The format was introduced in 1971 but it is still used by some videographers who have been using the format for a long time. It can produce good quality video and 3/4" decks are still commonly available in duplicating houses. However, there is little reason for somebody to peruse this format given the technical advantages of some of the other more recent formats. U-Matic has been used by professionals the world round and found mostly in studios. The format is slowly being replaced with digital equipment such as DV and Mini DV.

MII

MII introduced in 1986, is Panasonic's answer to BetaCam SP. All MII tape is metal. The 90 minute cassette at 4 by 8 inches (11 by 19 cm) is considerably smaller than the 90 minute BetaCam SP cassette. However the dockable decks take only a small 20 minute cassette (3.6 by 5 inches - 9 by 13 cm).

Technically, MII is equal to or superior to Betacam SP. Panasonic MII field equipment includes several small dockable decks usable with a variety of camera heads and some excellent portable decks.

Be aware if you get into MII that at some point repairs may become an issue and that few duplicating facilities or clients are



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likely to have MII. Therefore you will probably have to copy your MII programs to another format at some stage.

Betacam SP

BetaCam was first introduced in 1982. It is currently geared for broadcast use, although there have been some less expensive models destined more for industrial use. Pictures you will get using a BetaCam system (or other component format) will generally be markedly superior to those you would get using any of the preceding formats. Colors in particular come out looking much more vibrant and objects appear three-dimensional. The superiority of BetaCam shots comes partly from the technical aspects of the tape format but also in large part because of the use of superior optics and other camcorder and VTR components (and generally better operators!).

The difference between BetaCam and BetaCam SP, introduced in 1986, is in the tape. BetaCam SP uses a metal tape and is an improvement over BetaCam.

BetaCam cassettes are large. Ninety minute cassettes measures 5.5 by 10 inches (14 by 25 cm). Typically BetaCam field units (camcorders or dockable decks) handle only smaller cassettes with shorter lengths of tape (30 minutes and less). These smaller cassettes are 4 by 6 inches (10 by 16 cm) in size.

BetaCam SP is still the de facto standard for professional broadcast videotaping, partly because of the large number of units out in the professional videotape community. Some authors assume that over 90% of all professional videotaping is done using Betacam and Betacam SP.

Digital Formats

Digital 8

DIGITAL 8 is a format that is far superior to HI-8 or 8MM. Sony was the first to introduce this format and has done a great job. It is backwardly compatible, meaning that the new Digital 8 camcorders and VCR's will also play your 8MM and HI-8 tapes. You do not have to buy special tapes to record in Digital8. A regular 8MM or HI-8 tape will record up to 60 minutes of digital video and audio. Because of the design, using regular tapes is not a problem, but it uses twice as much tape. A 2 hour HI-8 or 8MM tape will record 60 minutes when done in the Digital mode and records up to 500 lines of resolution.

Mini-DV

Mini DV tapes are the smallest of the video formats. They take and maintain crystal clear images because of the nature of a digital format. Editing enthusiasts benefit from Mini DV as well, since copying between two units is done with no quality loss. That means edited or copied video looks and sounds every bit as good as the original footage. Mini DV tapes are available in 30, 60, 63 and 80 minute lengths. Digital camcorders have the highest resolution of all the camcorders, starting at 500 lines.

DV/DVCam/DVCPRO

DV (formerly DVC) is a new format being backed by manufacturers such as Sony, Philips, Thomson, Hitachi, Matsushita (Panasonic) and others. It was the first digital recording format in the reach of consumer markets. DV uses 5:1 compression based on DCT. Depending on the image contents, the encoder adaptively decides whether to compress picture fields separately or combine two fields into a single compression block. As such, DV coding can be thought of as something half-way between Motion JPEG and MPEG.

As a curiosity, the consumer version (DV) sports one of the densest recording techniques based on magnetic tape media - more than 0.4 megabits per square millimeter. Imagine the data from your 3.5" HD floppy recorded on a single-sided 5x6 mm piece of tape. New equipment from Sony will push this even further with the deployment of LP mode, which will reduce the track width to 6.67 um and multiply the recording time by 1.5. Video specifications will remain the same.

DVCPRO is a professional variant of the DV by Panasonic. The only major difference is doubled tape speed, which is needed for better drop-out tolerance and general recording robustness. It is also capable of 4x normal speed playback. This doesn't mean your run-of-the-mill FF with picture, but accelerated transfer of all of the information into for example a non-linear editing system. DVCAM on the other hand is Sony's variation of the theme, sitting somewhere between DV and DVCPRO. Tape speed and track width have been increased, but not as much as for DVCPRO. Furthermore, it uses the same metal evaporated tape as DV, while DVCPRO uses metal particle tape. What exactly Sony expects from this format is quite puzzling, given that they already have two other digital ENG formats - Betacam SX and Digital Betacam.

These similar, but still different digital formats have made some people to fear for another War of the Formats, the players this time being Panasonic and Sony. But because the formats mainly differ in the way they store the data on the tape, the data itself being the same, the situation isn't quite that sad. Actually Panasonic has announced that their upcoming DVCPRO gear will be able to play back DVCAM recordings; according to Panasonic, this will only require reprogramming the capstan servo systems to accommodate for the slightly different track width (15 um in DVCAM vs. 18 um in DVCPRO)



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and therefore different tape speed.

As for the picture quality, all these variants are nearly broadcast quality, DV being available at nearly consumer prices. For newsgathering and other similar uses, the quality is certainly enough, especially considering that typical postproduction will be done digitally, which will not degrade the quality any further. Compression is mild enough to keep artifacts away in all but problem scenes. The 4:1:1/4:2:0 quantization will be visible if you try something like chroma keying, however. As stated before, the picture quality in all three formats is identical - the targeted market segments are differentiated with the features of the equipment and things like available camera quality.

Recently, DVCPRO has been accepted to be standardized as D-7 by SMPTE. Panasonic has also introduced a 4:2:2 version: DVCPRO-50, which is intended to directly rival Digital S in the professional market.

Digital Betacam

Digital successor to the venerable Betacam SP format. Introduced by Sony in 1993, uses physically similar half-inch cassettes. Camcorders with 40-minute capacity are available, making Digital Betacam the first component digital ENG (electronic news gathering) format. Digital Betacam units play back, but do not record analogue Beta SP tapes.

The 2:1 compression is based on DCT (discrete cosine transform), like most modern video compression techniques. Each field is compressed separately.