DOCUMENT RESUME

ED 375 825 IR 016 886

AUTHOR Bauch, Werner
TITLE Features of VHS Recorders of Particular Interest for School Use. ICEM Guidelines No. 7.
INSTITUTION International Council for Educational Media, The Hague (Netherlands).
PUB DATE Jun 94
NOTE 12p.
PUB TYPE Reports - Evaluative/Feasibility (142)

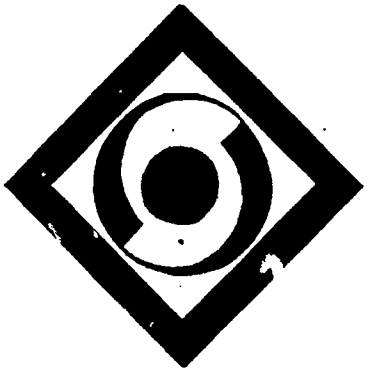
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Educational Media; Elementary Secondary Education; Equipment Evaluation; *Evaluation Criteria; Foreign Countries; *Video Equipment; Videotape Cassettes; *Videotape Recorders; Videotape Recordings
IDENTIFIERS Europe; International Council for Educational Media

ABSTRACT

This discussion of features of VHS video recorders of particular interest to educators uses the Telefunken A 990 N HiFi and C 960 HiFi models as examples. It is reported that both of these models have stereo HiFi sound. This sound has excellent quality which makes it conducive for the teaching of foreign languages. The models are equipped with an electronic device for invisible and inaudible indexing, VISS (Video Index Search System). This indexing is done from the use of synchronizing pulse modulation. With this system, it is possible to add or erase indexes on videocassettes which have already been recorded. Another feature of interest is the "jog-shuttle" function incorporated in the remote control for the Telefunken A 990 N HiFi. This allows precise reverse and advance movement at different rates of slow and fast motion, and even frame by frame. The freeze-frame option is considered to be of special interest to teachers and is discussed in detail. (JLB)

INTERNATIONAL COUNCIL FOR EDUCATIONAL MEDIA
CONSEIL INTERNATIONAL DES MOYENS D'ENSEIGNEMENT

ICEM
GUIDELINES
PUBLICATIONS



FEATURES OF VHS RECORDERS OF PARTICULAR INTEREST FOR SCHOOL USE

ICEM Guideline N° 7
June 1994

by Werner BAUCH

FWU, Institut für Film und Bild in
Wissenschaft und Unterricht
Grünwald, Germany

Issued by

The Subcommittee on
Equipment and Management

FEATURES OF VHS RECORDERS OF PARTICULAR INTEREST

FOR SCHOOL USE

Although the VHS system has now been in existence for more than 10 years - the FWU recommended that it should be used in schools, in the German Federal Republic as early as the summer of 1980 - it is still in perfect health and has not aged at all, in respect of adaptability to new ideas for use and new techniques. According to an enquiry carried out by Panasonic, who were partners in the creation of the VHS, there were already, in 1989, more than 220 million instruments in use throughout the world (87% of the total number of installations).

On numerous occasions the FWU has published data on technical details and on innovations of particular interest to schools, by means of data sheets included in the FWU magazine.

Let us take as an example two video recorders (Telefunken A 990 N HiFi and C 960 HiFi). Both offer a wide range of features which might have been made to measure for teaching use.

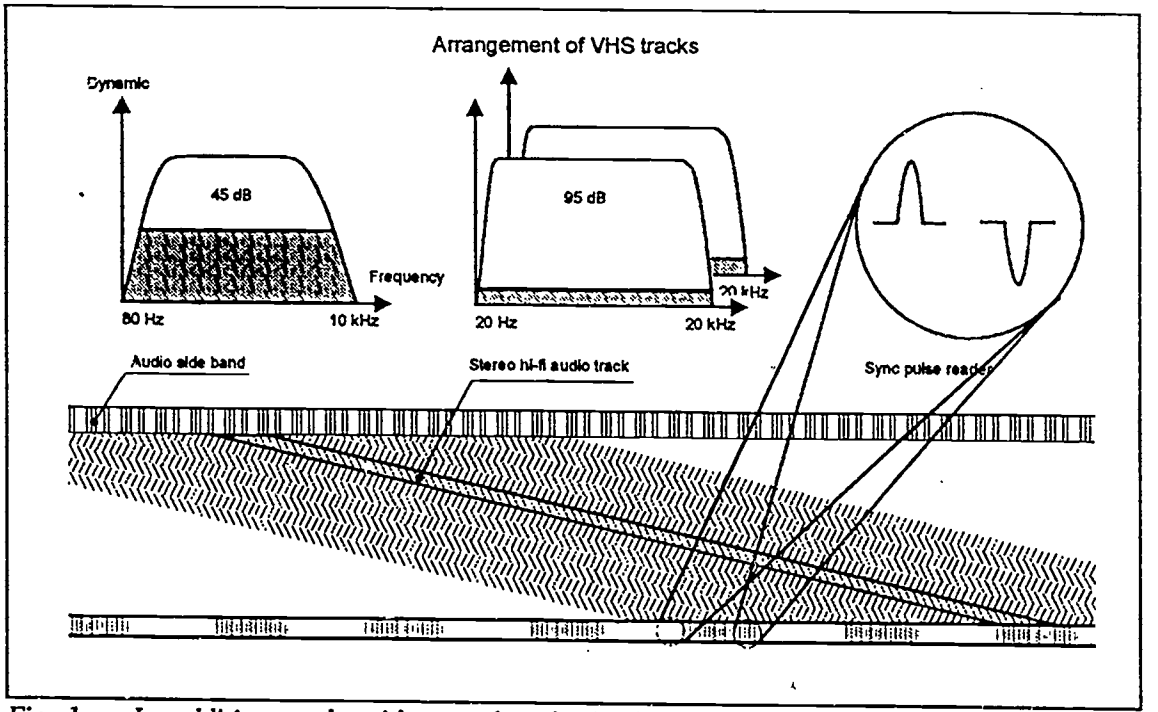


Fig. 1 : In addition to the video tracks, the VHS tape has a "normal" audio side band, HiFi stereo tracks and the control track

The two instruments have stereo HiFi sound. This means that, with the classic sideband, they offer three independent audio channels (fig. 1). The diagram shows that the HiFi audio channels occupy the same position on the tape as the video tracks. Yet, because of the specific physical characteristics of reciprocal magnetic fields, interaction between the two signals is impossible. The magnetic fields are produced and "read" by different magnetic heads whose airgap is differently positioned from that of the video heads, and their zones of action are imprinted to different depths in the sensitive magnetic coating. The magnetic heads are positioned on the rotating drum in such a way that first the HiFi head imprints its signal in the depth of the magnetic stripe. Then the video head inscribes its signal, of a higher frequency (shorter wave length) on the same track but at a lesser depth.

The sound on the sideband may be subject to troublesome variations in pitch because of tape speed variations, which are quite considerable in video recorders. It is virtually impossible to obtain better than about 0.3% for flutter and wow. HiFi recording is totally different : the speed of rotation of the video head drum is very stable and, at about 5 metres per second, it is about 200 times greater than the actual tape speed (2.34 cm/sec). Thus, the variations in the pitch of the HiFi signal are proportionately reduced and are far below the threshold of audibility.

The HiFi sound is of excellent quality - comparable to that of a laser disc - and absolutely free of cross-track interference. This means that each can be used independently of the other, for example for two languages. The passband, which covers the whole spectrum of sounds audible to the human ear, provides not only a very good musical quality but also, and above all, an excellent restitution of the spoken word, which is vital for the teaching of languages.

Some instruments allow for dubbing on the sideband, particularly from the HiFi tracks. They can thus be used for very simple sound editing. By means of a switch, HiFi signals can be reproduced separately or together. Whereas, because of its low dynamics, the sideband requires automatic recording level control, nearly all the VHS HiFi instruments have manual controls and recording level indicators for the two channels.

Another result of the recording technique described above is that the audio HiFi tracks (unlike the audio sideband) can not, in theory, be erased independently of the video signal: dubbing is impossible.

The models quoted are equipped with an electronic device for invisible and inaudible indexing (VISS : Video Index Search System). Trials of such systems have already been carried out in the past. To avoid the use of additional magnetic sensors, the only solution found involved superimposing on the audio signal an inaudible signal, at 50 Hz, which was filtered during the search operation. It proved impossible to adopt this method for a

number of reasons, and principally because of a lack of standards. The new process comes from Japan, which also holds the basic patents for the VHS standard. The consequence is that all manufacturers wishing to propose this device are obliged to use compatible technology, under licence.

The trouble-free nature of this technique results from the use of synchronizing pulse modulation. These pulses are control signals which are used for all VHS recording, and are recorded on a special magnetic stripe on the lower edge of the tape (c.f. figs.1 and 2). These signals (square, 25 Hz) synchronize the tape speed and rotation of the head drums (c.f. also freezeframe, below). The simple structure of this control signal allows additional data to be introduced ; use is made of this possibility, for the indexing function, by modifying the control pulse rhythm (fig. 2). This is in no way detrimental to the video head tracking, which is the main function of the signal, and the index marks can be detected.

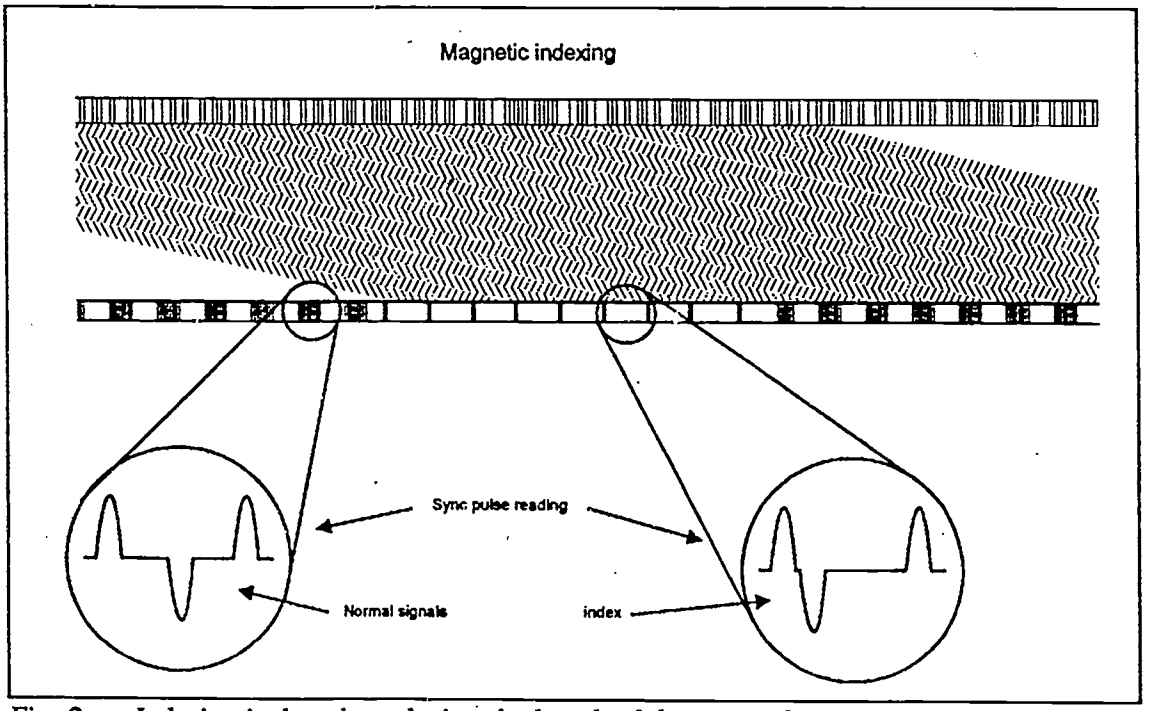


Fig. 2 : Indexing is done by reducing the length of the sync pulses

Video machines with the index function have a device which records an index at each start of recording and locates these indices. The index signal lasts about 2.5 secs., and a considerable number of sync pulses can therefore be influenced by it (about 60). For this reason, the magnetic tape in fig. 2 is shown considerably shortened.

With the instruments mentioned above, it is also possible to add or erase indices on cassettes which have already been recorded. Later indexing and selective erasing make considerable demands on the electronics, since at each modification the pulses must be erased or recorded with an accuracy of at least 1 millisecond.

In some instruments, index search can be carried out only at fast playback speed, which is rather slow. In the more perfected machines, index search can also be carried out on "fast rewind". To achieve this, the tape is not completely inside the cassette - contrary to normal practice - but remains in contact with the sync pulse reader head (half-loading, fig. 3).

Position of the VHS tape during index search

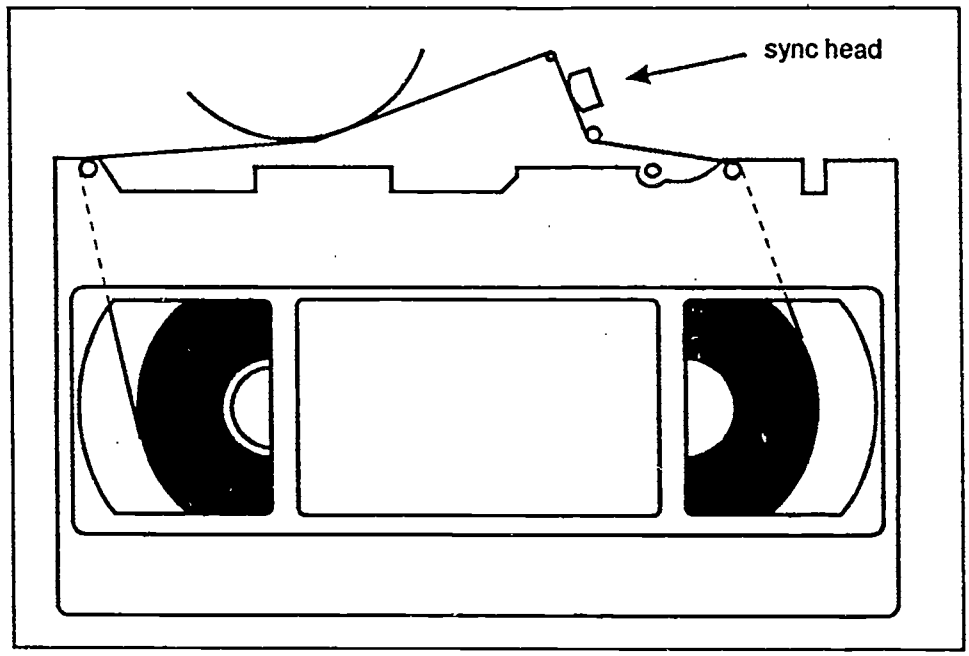


Fig. 3 : The tape must stay in contact with the sync head during rapid winding operation

In general, to carry out index search, a number (1 to 99) must be selected and the forward or reverse control pressed. The tape then passes rapidly over the corresponding number of index marks and stops at the desired point, then switches to "plav".

The sync pulses are also used for modern timers, which display real time in hours, minutes and seconds, the pulses being counted and converted by means of a processor. This is usually linked to the search function, for which a time indication is programmed. The two instruments under consideration have in addition a "differential search" function making it possible to skip forward or back at precise intervals. Since the control track does not yet contain a time code, the counter must be set to 0, corresponding to the beginning of the tape. If this has been omitted, the video recorder "knows" that the procedure must be carried out during the first search operation, and does it automatically.

Since counting is possible only when there are sync pulses, i.e. on recorded sections of tape, the counter is "disconnected" by erased or unrecorded sections of tape, and so it cannot be used for counting on such sections.

In the FWU data sheets, this kind of counting of tape length is called "relative". The term "absolute" is reserved for those instruments which are capable - by means of two electronic tachometers connected to the reels - of calculating the total length of the tape and of the section that has been played. This process functions for any standard cassette, introduced at any point along the recording, with an accuracy of about 1 minute, and comes into operation a few seconds after the "play" control has been pressed. Then the tape length counter operates even during the fast forward phase. The two instruments under consideration use this technique, especially valuable for determining the length of tape left to be played.

One operation control which has been available for some time now on studio equipment, but which is a novelty in amateur recorders, is the "jog-shuttle" function incorporated in the remote control for the Telefunken A990 N HiFi. This allows for precise reverse and advance movement, at different rates of slow and fast motion, and even frame by frame.

It is operated by a device consisting of a double knob, the central part of which is used for frame-by-frame advance. This technique is also based on the use of sync pulses as described above, with complex electronic circuitry and a complicated system of control of the tape and head drum drive motors.

The freeze-frame facility is very useful in teaching. It is for this reason that this function is an important criterion in the selection of VHS instruments recommended for use in teaching, and occupies a central position in the FWU data sheets.

During recent years, advances made in video techniques have brought considerable improvements to the freeze-frame facility. But because of its high cost, not all instruments are equipped with this option.

Unlike the techniques used in cinema, video image recording and reproduction are characterised by the pairing of the 50 half-frames, which in fact gives rise to 25 complete images. This technique must be used because the trace of the luminous spot on the screen disappears in less than 1/50th of a second, and retinal persistance is insufficient to compensate for this disappearance. Therefore a double scanning operation is carried out, which reduces flutter.

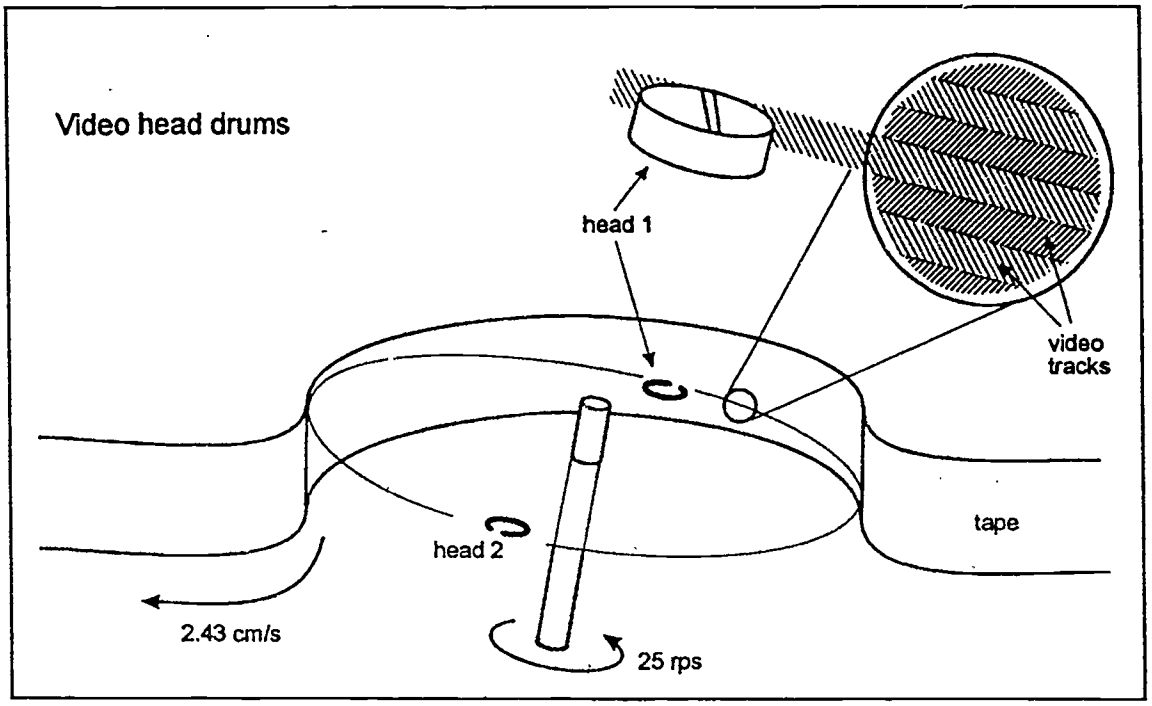


Fig. 4 : The pairs of video tracks corresponding to the two half-frames are recorded and read by two heads whose airgaps are differently angled

Half-frame pairing is also fundamental in the operation of video recorders. To each half-image corresponds one of the two magnetic heads which, by means of a rapidly rotating disc, inscribes tracks diagonally on the video tape, and which also plays them back. The airgaps in the heads are differently oriented, so that each head can read only its own half-image (fig. 4).

Since each half-image transmits an impression of a complete image, though with a considerable loss of definition (about 300 lines instead of 600), it is of relatively little importance whether, for the reproduction of a still picture, the video recorder shows a complete image or a half-image. Half-frame scanning even seems to make the presentation of a complete image inappropriate. This is due to the fact that video cameras also define movements as half-images, at the rate of 50 per sec. Thus, a complete video picture can contain two different images, in the case of rapid movement. This is most desirable for continuous reproduction, for it provides smoother movement than is obtained from film at 24 or 25 frames per second. However, stopping the video tape would cause a blurred image or even a troublesome flickering of the moving parts of the image. To avoid this, only one of the half-images is shown in freeze-frame position, i.e. it is always the same magnetic strip that is read. This requires two video heads with the same orientation. For this reason, more sophisticated video machines have a third video head used only to ensure a clear image on freeze-frame. The head for the other half-image remains out of service.

On such an instrument, when the frame-by-frame control is activated, an electronic device ensures that the correct track of the magnetic tape is always in position under the video heads, by skipping over one half-image. For scanning movement, one thus arrives at 25 phases per second.

A very few instruments have a fourth video head making it possible to play the two half-frames, in freeze-frame and in slow-motion. One such, is the Blaupunkt RTV 635 EGC, a multi-standard for reproducing NTSC signals on ordinary PAL screens.

This concerns neither the additional magnetic heads for other supplementary functions, such as Longplay, HiFi sound, Flying Erase, nor the doubling made necessary by the small size of video recorder head drums.

All these considerations apply to the reproduction of documents originally produced in video. They do not apply to video recordings of films. In this case, the two frames also contain the same phase of the movement : 25 per second. The film "reader" and the video recorder assign the "correct" frames to a complete image (even-odd parity). For this reason, copies of films can be presented satisfactorily with freeze-frame, even on simple machines.

It should be mentioned here that "frozen" images are more or less affected by "random noise". This term, borrowed from electroacoustics, designates a form of interference which was originally inseparable from records and magnetic tapes. The optical equivalent is a "snow-storm", more or less dense, over the whole image. It is caused, among other things, by an insufficiently strong magnetic signal from the tape to the video head; for example, if the video heads are worn or dirty, if the tape is of poor quality, or if the video head is displaced laterally in relation to the track. In the latter case, the tracking control can be adjusted.

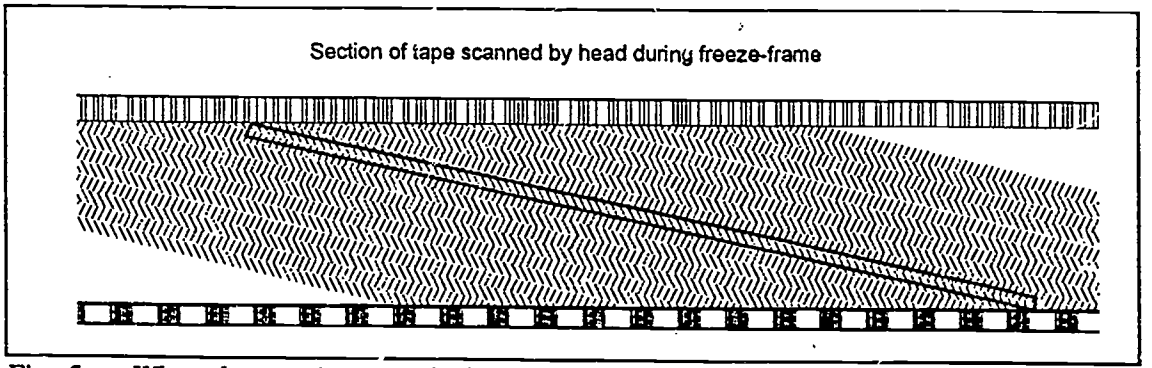


Fig. 5 : When the tape is stopped, the relative movement "head-tape" is modified in such a way that the recorded track is read at an angle.
The head no longer reads in their entirety the signals recorded on the track

In reproduction of still pictures, the noise appears on the upper and lower edges of the image, because the video head is no longer absolutely parallel to the magnetic stripe when the tape is stopped. It cuts the track (fig. 5). On older video recorders, the best position had to be found, i.e. the trajectory of the head had to be centred, by trial and error. Now this is done automatically by an electronic control and the new frame-freeze techniques can be used even with video cassettes of recorded films. In FWU documents, the presence of this characteristic is indicated by the note "no striping".

Provided the instrument is equipped with a "pause" control, the following criteria are important in determining choice :

- Simple instruments without frame repeat (no third video head) and without automatic tracking :

  The quality of the frozen image is irregular.
  There is almost always a horizontal bar on the image, caused by noise. The pause control must be pressed several times in order to obtain the best possible picture, or to pass on to next. Where scanning is being carried out on moving images which do not come from film, some jitter may be observed.

- Simple instruments without frame repeat but with automatic tracking :

  These immediately provide a freeze with virtually no interference. There may be some jitter during scanning of moving images which do not come from film.

- Instruments with the third video head and automatic tracking :

  Freeze-frame with virtually no interference. No jitter. 25 phases of movement per second.

- Instruments with double frame repeat (third and fourth video heads) and automatic tracking :

  Freeze-frame practically without interference, no jitter during scanning of movement. 50 phases per second.

In addition, this latter type of instrument offers a greatly improved accelerated search, with a clear picture, since the horizontal bars are virtually eliminated.

When freeze-frame is subject to jitter on a video machine which has no repeat facility, parity can be re-established by advancing one half-frame.

In instruments with the repeat facility, freeze-frame may be accompanied by vertical instability of the whole picture. This interference may be caused by the viewing machine, in which case it can be eliminated by means of the vertical correction device on the video recorder (see handbook).

Most of the interferences described above do not occur if the video recorder possesses an image digitalizing function, which stores each frame, by successive replacement, in a digital memory which can be consulted at will. This does not require an additional video head, but the tape remains in contact with the heads. Precision of control is not especially good, since the tape must be started and stopped each time. The digital storage is connected to a two-way digital-analog converter.

The cost of the electronic components is high, and these instruments are therefore considerably more expensive, but they do make it possible to obtain interesting special effects.