4-4 Editing

Editing slides means selecting slides according to the script. A slide viewer (light box) and a magnifier are needed to examine and sort slides. If a light box is not available on the market, a domestic one can be substituted.

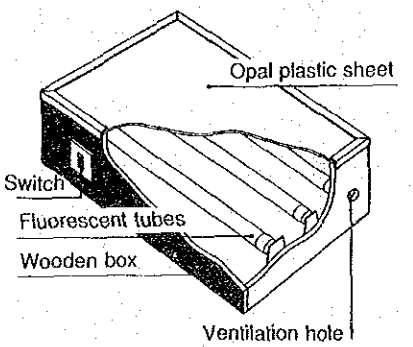
Examine the slides on the viewer carefully with the magnifier. Check focusing and stain, then choose the good ones. Place all the selected slides on the viewer and recheck the slides matching the script. The following checkpoints are considered in editing:

1. Do the slides coincide with the script? If one slide is not enough to convey the narration, divide the narration into two parts by using two corresponding slides.

2. Is each shot (long, medium and upshot) well-balanced? A series of close-up shots gives an unsettling feeling, while a series of long shots tends to lack the dramatic effect, causing boredom.

3. Music and sound effects should be taken into full consideration. Check if the slides are properly synchronized with the narration once again, then commence recording of the narration of a final script. If recording is started before many times, editing is completed, it needs to be redone entirely.

Fig. 4-5 Light box improvisation



The surface of a wooden box is an opal plastic sheet of 40 x 30 x15cm. Place two or three fluorescent tubes of around 15W inside the box. Locate ventilation holes as many as possible on the sides or on the bottom of the box for the generation of heat is rather high.

Fig. 4-6 Check slides on a light box

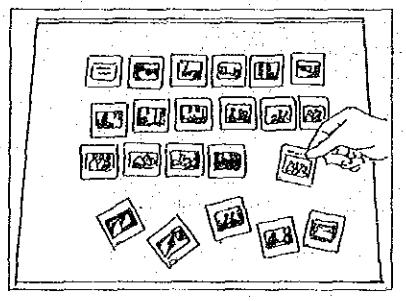


Fig. 4-7 A light box and a magnifier are invaluable to edit slides

4-5 Filing Slides

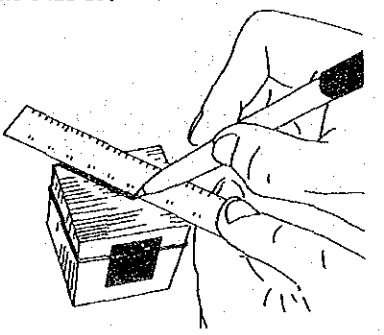
Well-filed and stored slides are highly valuable with the accumulated data of image information. Slides are usually stored in the 20-exposure plastic sheets in a slide box. As quantities of slides are accumulated, many slide boxes will naturally be needed. However, this type is not convenient to find a specific slide. Filing boxes with compartments are recommended.

It is not easy to distinguish the front and the back of the slide. The front side has a smooth surface and the words are read correctly when looking through the light. The back side is "the emulsion side" on which light sensitive material is coated, and an uneven surface can be seen when reflected on the light. The emulsion side can easily be damaged; therefore, it requires careful handling.

In order to identify the right side of the slide, mark a red spot in the bottom right-hand corner of the mount. Also, drawing a diagonal line across the top edge of all properly positioned slide mounts facilitates checking the right order and position of each slide.

Use of the same type of mounts for all the slides in the set is recommended; this will prevent focusing gap during projection, which is caused by the difference in thickness of the mounts. Moreover, it will lighten the work load.

Fig. 4-8
Drawing a diagonal line on the slide set



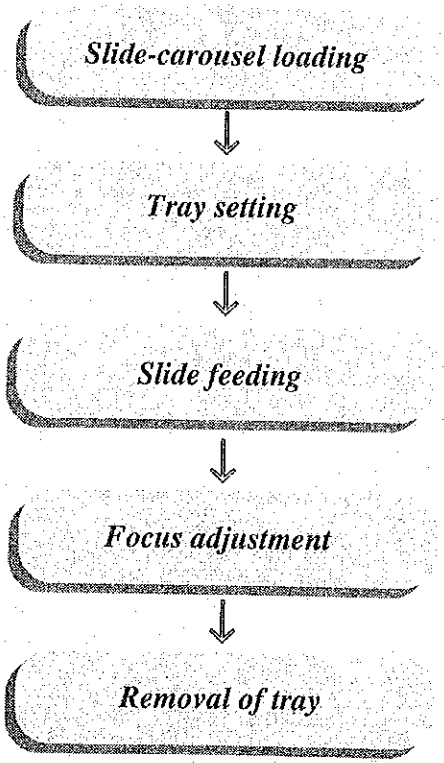
5 Operation of Slide Projector

As mentioned in the Slide Projectors section, the carousel-type projectors are widely used all over the world, including developing countries. One of the advantages of this type is in its simple mechanism, which employs the gate-in slide setting method which utilizes the slide's own weight, thus resulting in less failures. Another advantage is that this type can be used in both sound synchronized and multi-screen projections. The basic operation of the projector is carousel type as an example, and operation of the cube-type projector with a built-in sound synchronizing unit.

5-1 Carousel-type Slide Projector

Table 5-1

Steps before projection



(1) Slide-tray (carousel) loading

If not properly loaded into a tray, the slides will be inconsistent when projected.

There is a cut for tray setting in the "0" slot of the carousel wherein a slide cannot be set. The slides are set by rotating upside down onto a tray in sequence from the "1" slot. Hold the tray with the left hand, and rotate it counterclockwise with the slide inserting part on the right when setting. An arc of marked line on the bottom edge of the slides should be seen when they are fully set. Finally, if a lid is set in the center of the tray, the slides will not fall.

A damaged slide, or a slide in warped or damaged mount causes the projector to stop functioning or become the source of a failure. These should be remounted before loading.

(2) Tray setting

Coincide the "0" slot of the slide-loaded tray with the projection gate index mark which is on the right side from the back of the projector. Fit the tray in the center post of the projector.

If not fully fitted, check if the cut of the slide holding plate on the bottom of the tray is in the "0" slot.

(3) Slide feeding

The fan starts rotating as the power switch is turned on, and the projection begins with the lamp switch on. Nothing will be projected on the screen when the tray is set in the "0" slot, or a slide is not set.

Slide feeding is accomplished by pressing a button (FWD button) on the projector or on a remote control lead. If pressed continuously, the slides will be fed as the same.

When a specific slide is required for projection, press a select button and rotate the tray until the slide is fed into the gate. The tray will not move if the select button is not pressed. Also, the slide gate will close when the select button is pressed so that the slide will not fall into the gate.

(4) Focus adjustment

Focusing of the projected image is conducted by a focusing knob. When a zoom lens is used, adjust the size of the image by controlling a zoom ring first, then focus. However, focusing more or less changes the size of the image, so readjust it with the zoom ring.

Removal of the projection lens is performed by putting down the focusing knob outside. It is attached by aligning the rack of the lens barrel to the focusing pinion screw inside, with the focusing knob down.

An elevation control knob adjusts the height of the image. In order to correct the tilted image, use the leveling knob on the rear of the projector.

(5) Removal of tray

After the projection is finished, rotate the tray by pressing the select button to get the "0" slot matching the gate index mark, then remove the tray out. And this is to be carried out with the power switch on.

If the slides are caught inside the projection gate caused by warped or damaged mounts, follow the procedure below.

1) Press the tray release lever in the center post and remove the tray.
2) Take the slide out of the projection gate.
3) Put the tray upside down, and turn the bottom board until locked.
4) If the slide mount is not damaged, put it back to the tray and restart the projection. If damaged, replace the mount.

5-2 Cube-type Projector

The cube-type projector is a kind of carousel type with a rear screen and equipped with a synchronized sound system. The price is approximately ¥200,000. The handling for the carousel is the same as that for the projector which was explained in the previous section.

(1) Rear projection and front projection

The cube projector alternates a built-in rear screen projection and ordinary projection with a simple lever operation.

The image on the rear screen disappears when the front is projected on the front. The focal length of the built-in projection lens is around 70 to 80mm and its appropriate projection distance is approximately 1 to 4m.

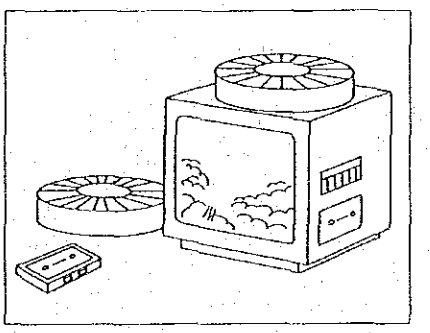


Fig. 5-1 Cube-type slide projector

(2) Recording of sound and synchronized signal

The cube projector's recording method for sound and synchronized signal is basically the same as that for the slide coder with

a separate projector and a tape recorder. Refer to the chapter on Video for typical checkpoints for recording.

A cassette tape for slide use consists of two mono channels: audio and signal channels. The sound from microphones and other audio equipment, such as cassette recorder, amplifier or recording mixer, is recorded on the audio channel, while the signal channel records only the signals from the built-in signal generating apparatus. The most popular type of synchronized signal triggers slide feeling mechanism only, but there is also a type which can record both slide feeding and slide stop signals.

Signals can be recorded with sounds simultaneously or after the sounds have been recorded. Usually, signals are recorded after sounds for presupposed mistakes.

1) Setup for recording

Load the tray with the slides in correct sequence and set it on the projector. Set a new cassette tape or an erased tape into the cassette holder of the projector. Do not use unerased tapes. Run the tape for approximately 10 seconds for the leading part of the tape to pass through.

Connect the switched-off microphone with the micjack.

2) Recording of sound

Have the tape on recording condition with the microphone switched off. When the microphone is switched on, the tape will run to record sounds. If an error is made during recording, stop the tape, rewind it and repeat it. The cube projectors have an automatic recording system so that it is unnecessary to adjust sounds. The microphone should be placed as far away from the projector as possible for good recording. Do not forget to check the sound after recording.

It is typical to read a script when recording but impromptu comments can be made by looking at the projected slides for a simple instructional slide production.

3) Recording of signal

Remove the microphone from the projector to avoid erasing the recorded sound used to signal that the slide must be changed. Make the recording possible by suppressing both the playback lever and the recording lever simultaneously. Listen to the playback sound and press the slide advance button whenever the slide must be changed. The slide is fed and the signal is recorded whenever the button is pressed.

If a signal recording mistake is made, re-record the signal. Rewind until the mistake is spotted and repeat. Do it carefully and don't erase the correct ones. If it is short, start from the beginning.

REFERENCES

1. Hedgecoe, J. "The Photographer's Handbook", Ebery Press, London 1982
This manual is like an illustrated encyclopedia which explains about taking photos and developing them, mainly by using a 35-mm camera. Numerous examples and interesting photos.

2. Kemp, J. E. and D.K. Dayton "Planning & Production Instructional Media" 5th Edition, Harper & Row, N.Y. 1985
This is the newest edition of a typical academic level textbook about producing audio-visual media and its utilization in the U.S.A. It is a good textbook as there are many illustrations in it and its descriptions are practical.

3. KODAK "Slidemaker's Packet", Eastman Kodak, N.Y. 1985
This is a kit which includes all basic articles about producing slides. It consists of nearly 20 volumes of books and pamphlets. Especially, the part on "Effective Planning and Producing Slides" has been revised, having been utilized as a basic textbook of slide production for a long time.

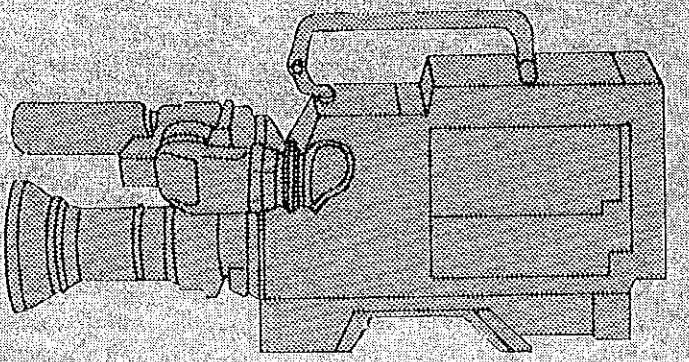
4. KODAK "Multi-Image Production Packet", Eastman Kodak, N.Y. 1985
This is a companion volume to "Slidemaker's Packet." It is perhaps the only educational kit which explains multi-screen projection. Kodak holds various kinds of workshops on slide production. This edition may be considered as being arranged texts about multi-screen projection as utilized in workshops.

5. "Shicho-kaku kyozai o tsukuru (Production of educational AV materials—Slides, OHPs, Recordings, Video tape Recordings—)" Gakugei Tosho, Tokyo, 1980
This is a textbook for teachers which shows utilization and production techniques for the audio-visual media. Both the descriptions and photos in the textbook are old-fashioned, but it conveniently explains the know-how from basics.

6. "Slide no technique (Technique for Slide Production)" Kyoritsu Shuppan, Tokyo, 1979
This is a manual for slide production on one's own. It not only shows producing slides for lectures and announcement meetings at learned societies, but also shows how to take photos in detail.

PART 2

VIDEO PRODUCTION



Technical Cooperation and Video

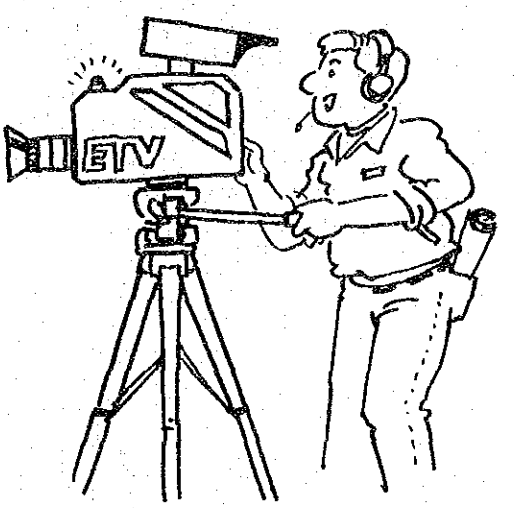
1

1-1 Video Is the Most Popular AV Medium among Others Available

Video is a medium whose use in technical cooperation is ever increasing. It plays an important role in informational, educational, and communicative activities. There are many requests for video and most of the recent grant aid projects include a video system.

In industrially advanced nations like Japan, video was introduced upon the firm establishment of TV broadcasting; at that time, video was used for the recording of broadcast programs. But in developing countries, this was not always the case. Fiji is an example of country where video was started before the introduction of TV broadcasting. In Suva (the capital of Fiji) and other main cities, there are many shops renting out video softwares. It is worth noticing that not only the rich watch video, but ordinary people can also enjoy it by sharing the cost of the rental softwares (about 50 cents each). On weekends, multitudes gather at the village communication centers to watch video presentations. Here, video functions as a player of ready-made entertainment softwares.

In West Germany, a community service institute has established a national video center for the production of programs for community development. The programs are shown to hospital outpatients while they are waiting for appointments and here again, video is used mainly for playback; however, the presentations consist of self-produced informational programs.



In Malaysia, video functions mainly as a player of rental video softwares in spite of the presence of two TV broadcasting channels. This is because broadcast hours are limited and the programs cannot really entertain the viewers.

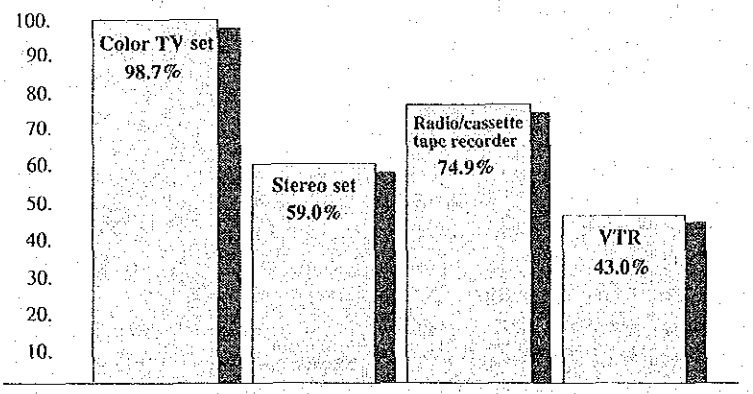
As seen above, video is becoming extremely popular in developing countries. Video is surely expected to be an effective tool of disseminating information, education and communication.

1-2 Japan as "Video Kingdom"

Now, let us look at the situation in Japan. The extension rates of main home-use electrical appliances are shown in Table 1-1. As one can see, the extension rate of video was over 43% in March 1987. This means video is becoming one of the essentials of the daily life in Japan. Every day, newly developed VCRs are advertised on TV and in newspapers. At supermarkets, department stores and electrical shops, VCRs are piled up for sale. Video software rental shops have even invaded the small villages of Japan. Japanese parents who were enthusiastic about recording the growth of their children began using video instead of taking photographs.

VHS and Betamax using 1/2-inch video cassette tape, which are widely accepted video cassette recorders in the world, were developed in Japan. Since then, Japan has been one of the leading countries of the world producing and exporting video cassette recorders. In 1986, Japan had produced 33.89 million VCRs (1,663.1 billion yen); and exported 27.69 million of them (1,249.2 billion yen). Without doubt, Japan is "video kingdom".

Table 1-1 The extended ratio of the main electrical appliances in March 1987 and its change



	Color TV set	Stereo set	Radio/cassette tape recorder	VTR
1987. 3	98.7%	59.0%	74.9%	43.0%
1986. 3	98.9	60.5	74.2	33.5
1985. 3	99.1	59.9	73.6	27.8
1984. 3	99.2	58.0	70.2	18.7
1983. 3	98.8	59.0	70.1	11.8
1982. 3	98.9	61.5	64.7	7.5
1981. 3	98.5	58.5	62.7	5.1
1980. 3	98.2	57.1	61.9	2.4
1979. 3	97.8	56.5	60.5	2.0
1978. 3	97.8	56.7	59.6	1.3
1977. 2	95.4	54.9	56.2	–
1976. 2	93.7	53.8	55.9	–
1975. 2	90.3	52.1	51.6	–
1974. 2	85.9	47.0	47.0	–
1973. 2	75.8	44.4	42.4	–

1-3 Why Video Is Very Popular in the Field of Technical Cooperation

Due to the highly sophisticated technological image of video, both developing countries and Japan are strongly motivated to use it in technical cooperation. In short, everybody is impressed by video. In addition, there are opinions calling on Japan to utilize its strong points, such as video usage, in technical cooperation.

Besides, there are advantages in utilizing video from the educational, instructional and informational aspects of technical cooperation.

Below are advantages provided by video from the AV media standpoint:

- Videotape does not have to be developed and can be viewed right after recording.
- Camera work can be monitored and evaluated immediately while recording.
- Special effects can be easily added on.
- Videotape is lower in cost and can be reused many times.
- Video can withstand long-term continous shooting and recording.
- Video can be viewed without a dark room.
- Video images can be distributed into many monitors.
- The most obvious attribute of video is its ability to show motion when compared with slide as a stable picture.

Video is already an integral part of daily life. Recording with video and watching are no longer unusual.

Advantages of video as educational media are:

(1) Compressing and expanding space and time

Like film, video permits us to view phenomena both at the levels of microcosm and macrocosm. Recordings of natural phenomena and microscopic examination of certain subjects which cannot be observed easily and overseas events which cannot be witnessed can be made. Furthermore, video permits usage of the slow-motion technique to record action that normally takes place too rapidly, and of the rapid-motion technique for action that normally takes place too slowly.

(2) Analyzing and studying skills

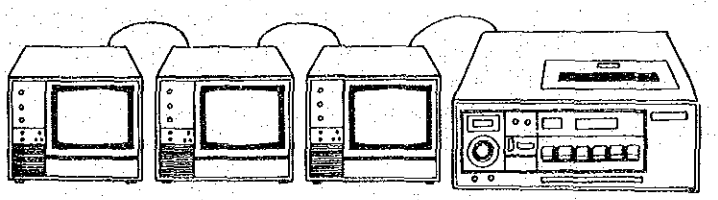
Analysis of a skilled person's work procedure through video recordings is useful for research and training. Likewise recording a roleplay and a micro-teaching permits self-evaluation by objectively analyzing oneself.

(3) Making difficult concept and operation easier to understand

By using animation or illustration, video can present a difficult concept or operation more effectively than can other media. Information, which is difficult to transfer with only words and letters, can be effectively put forward through a carefully produced video presentation.

The above-mentioned advantages provided by video are observed from the viewpoint of the medium. For the specific video functions in the field of technical cooperation, see 1-5.

Fig. 1-1 Video images can be distributed into many monitors



Monitors VTR

1-4 Video Is the Unity of AV Media System

Video, which originally started for the recording of only TV programs, has resulted in videotex and videodisks; although they have not yet been developed into an easily operable system, the picture and sound quality are outstanding. These days people tend to watch video softwares at home instead of going to the movie theaters. Most movies are available in video format. Use of video is growing use of video in conjunction with microcomputers. Many usage possibilities can be expected of video; that is to say, video would unite various types of AV media. In other words, the functions of other AV media can be fully utilized by co-existing with video.

1-5 Technical Transfer and Video

In this section, video will be examined from the standpoint of technical cooperation and transfer. Technical transfer means education and training in the countries where culture, language and custom differ from ours. From the viewpoint of the expert, this can be expressed as "teaching-learning process" under unfamiliar conditions. Besides the language barrier, many misunderstandings may arise among experts, counterparts and participants as since they share very few experiences in common. Under such conditions, video plays an important role in enabling viewers to share common experiences and to understand each others. Video can also help experts when there are difficulties in explaining a concept only by words. Even after the experts had left the project, if there were video recordings for training, counterparts can disseminate the skill to colleagues.

Project like family planning or agricultural extension program needs information, P.R. and education activities use video. In such activities, use of mass-media can be very powerful. Fortunately, our counterparts, that is governmental institutions of developing countries in most cases, are in a position which allows use of TV stations easily. Undoubtedly, video will be a strong means of communications in technical transfer.

1-6 Video Has Many Limitations

We have seen only the positive side of the video. However, does video have any limitations? The answer is "yes". Let us see some limitations of video here.

(1) Costly equipment

The simplest system, such as a combination of a VCR and a TV set or a camcorder and a TV set, is not so expensive (20-30 thousand yen). But if one wants to have a VCR with editing function or a system for educational material production, one may need more than a million yen. If one wants to build a studio, it will cost one more than 10 million yen.

(2) Delicate equipment

A VCR consists of thousands of small parts utilizing the latest high technology. Since it combines mechanical and electrical parts, it could be damaged easily. Especially in the field of technical cooperation, high temperature or humidity may accelerate the damage and create most inhospitable conditions in which to maintain them.

(3) For small group use

The size of a video monitor has more or less been set at 28 inches. But recently, TV monitors of the 37-inch class have become more commonplace. Furthermore, monitors of the 43-inch class have appeared on the market.

A cathode ray tube is so heavy that it cannot be enlarged any further. A video projector is suitable for large audiences, but has less resolution and brightness than a TV monitor. Furthermore, audiences can only appreciate it from a certain direction. In this sense, motion picture is still preferred in presentations for large audiences because of its high resolution and color fidelity. Video still need more improvement.

(4) Incompatibility of video format types

Currently, there are more than five video formats: VHS, Betamax, 8-mm, U-matic, Betacam and 1-inch. Unfortunately, neither the first three widely-extended home use video formats nor other formats for institutional and professional use are compatible.

(5) Incompatibility of color TV systems (NTSC, PAL and SECAM)

Globally, there are basically three different color TV systems, and needless to say, the video system follows each of them (see the table attached at the end of this book). In Latin America, Central America, Japan and the Philippines, NTSC developed by the United States is used. PAL is widely used in Western Europe, most of the Asian countries and in Anglophone African countries. And SECAM is used in Francophone African countries. There is no compatibility among them. Meaning VHS/PAL, VHS/NTSC, and VHS/SECAM. Therefore, one cannot play the VHS software recorded in Japan on the VHS VCR of PAL system. To watch a video cassette software in a different color VCR system, one needs to copy it using a converter or to play it on the VCR which is competent for any color TV system.

(6) Heavy equipment

Except the recent developed portable camcorder system, a video camera/video cassette recorder system is usually heavy. This makes a location under the hot sun even harder.

(7) Experiential require

For any media, it is necessary to have a rich experience for good production. Video, compared with other media such as OHP and slide, requires more varied experiences to have good production since it is a unified art of picture, sound and music.

2 Video Usage in Technical Cooperation

2-1 Various Uses for Video

There are various uses for video in technical cooperation other than producing video programs.

(1) Use as concept video

The concept which is limited to express only by words and letters can be well presented by video. For example, in a case of ecological research in mangroves, using the video will be the best way in distinguishing the ecological system of living things and how carefully one has to prepare for the trip by video. By watching this, the viewers can understand the content of a trip and at the same time they can get peripheral information such as what clothes to wear, what shoes to put on, etc. Like this case, video can cover the minor details which are important to the audience but tends to be forgotten by an instructor. Rare phenomena, complicated and costly experiments, or dangerous work, are some suitable examples for using concept video.

In Thailand, the library of Kasetsart University has a large collection of such concept video tapes.

(2) Recording lectures

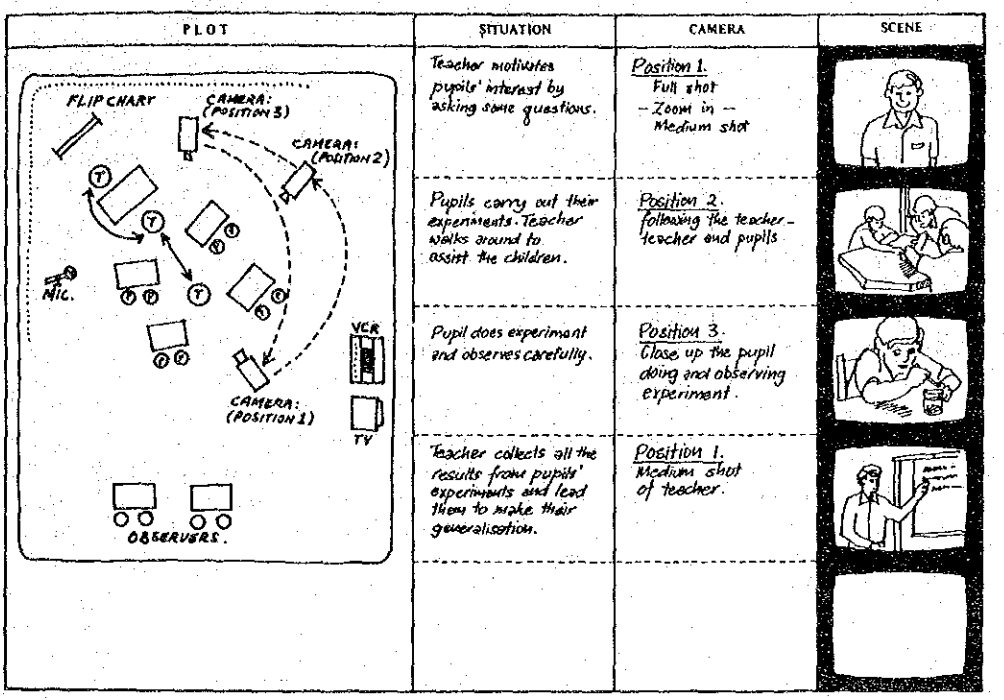
When lecturing and having workshops in field, it is rare to have all the overseas participants from the beginning. If one recorded one's lecture by video, one could show it to those who missed the first half of one's lecture and workshop. If one invited a guest lecturer who might not visit one's institute again, it would be a good idea to record the lecture in video. Record of the lecture can be as valuable as a book. Many

lectures are recorded and utilized in the training in Japan.

(3) As materials of research and study

Video recordings of a research mission and technical transferring activities can make one's presentation and lecture more attractive and efficient. These days, it is no more rare to see a video report or a presentation with video. A camcorder has become more easily operated recently, and in the near future a video camera may replace a still camera. Incidentally, in Malaysia traffic research using video was once held. The video analysis posed a problem. Analyzing video without sound was too tedious for the staff and they could hardly be efficient. Then music was inserted on it. Needless to say, the pace of the analysis picked up. That is, watching TV without sound forces viewers to be patient. Music and sound effects can be of great help to viewers in concentrating on a visual for a long time. Recording sound and visuals

Fig. 2-1 An example of a recording design sheet for micro-teaching



together is essentially important as a means bore one's audience.

(4) Training with video (Micro-teaching and roleplay)

Micro-teaching is one of the teacher training methods developed by a team of Stanford University researchers at Palo Alto, Calif., in 1963. The characteristic of the method is the use of video for model presentations and feedbacks.

Trainees can watch themselves objectively through the eye of a video camera and can have self-evaluation. This is mostly more efficient than being evaluated by others.

Fig. 2-1 shows a sample of a design sheet to write a plot of micro-teaching and camera positions.

(5) Recording events (Opening ceremonies and parties)

Video is now used to record the construction process of a grant aid project. This tendency is becoming common among JICA projects. Video is also appropriate when briefing the activities of a project to visitors. Video can introduce activities efficiently in a limited time. Furthermore, video tape can be duplicated easily.

(6) Various kinds of video materials

Video programs are not only produced for training purpose but also for other cases. For instance, a topic such as "Technical cooperation system of Japan" or "Information training of Japan" can be presented effectively by use of the video. This must be also welcomed by many experts and counterparts. Many movies of technical cooperation were transferred into video and utilized easily. The video softwares transferred from movies are replayed by a portable and easily-operated camcorder.

2-2 History of Video and Recent Trends

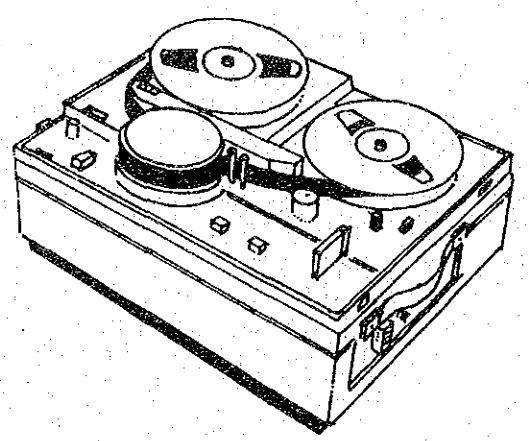
"History of VTR development — born in the U.S. and raised in Japan"

VTR came from AMPEX of U.S.A. in 1956. This very first product used a 2-inch-wide tape, was enormous in size, and could only make presentations in black and white, but could revolutionize things at broadcast stations thruogh such an investment. Until that time, all TV programs were 'live'. Even dramas were on-aired live, using many sets. It was as if a stage relay broadcast were executed in a studio. Not just only picture and sound recordings, but the innovation of VTR enabled us to replay the recording at various speeds and stop them at any place. Then VTR was developed so the editing could be done freely. Nowadays, an insertion of a slow motion in a sport relay broadcast is no longer special, but people who watched it for the first time were very amazed.

From the broadcast use VTRs, Japanese electronic manufacturers have achieved to derive educational and home use VTRs. Diffusion of video in education started after Sony developed the 1/2-inch open reel VTRs. Then other electric manufacturers also followed the development of VTRs for educational use. In the early 1970's, educational use of video became highly popular in schools and companies. Standardization of reel-to-reel VTR by EIAJ (Electric Industry Association of Japan) accelerated the trends. Utilization of video for educational purpose became one of the most frequently discussed topics in those days. But reel-to-reel VTRs had room for more improvement; because it was difficult to operate, it required complicated setting, and was limited in resolution and editing capability. Therefore, developing educational material by reel-to-reel VTRs was relatively difficult at that time.

Further important development in the videorecording field to overcome limitations mentioned previously have led the idea of using video cassettes. The popular formats used in the educational field today are the U-matic system, Betamax, VHS and 8 mm. U-matic system has been used mainly for educational material production in universities, research institutes and

Fig. 2-2 A 1/2 inch reel-to-reel VTR for educational use



companies. This system is also frequently used in technical cooperation fields. VHS, Betamax and 8 mm were originally developed for homeuse, but are now also accepted in schools and industrial field.

Current standard for broadcast use is mainly the 1-inch open-reel VTR, but for news gathering, a combination system of video camera and recorder (camcorder) using the 1/2-inch tape cassette was developed. To achieve high picture quality suitable for broadcast use, tape speed for this type (Betacam and MII) is six times faster than the home use VTR systems. (Fig. 2-4)

The use of video has been improved by the development of other accessories. Editing controller is a unit computerized to enable one to make it record the edit points, to rehearse, then check/review edits. Using programmed digital circuits, many attractive special effects and symbols can be electronically generated by inputting through a standard computer keyboard. With this device, typed and drawn graphics can be stored, recalled and inserted on the video as required.

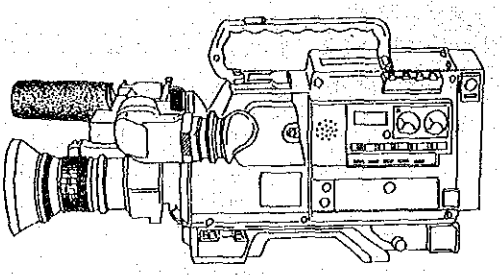
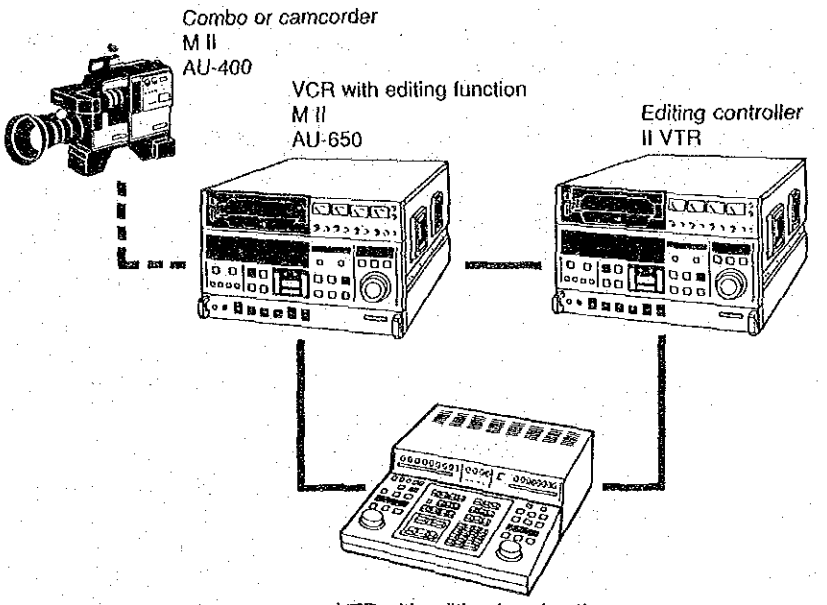


Fig. 2-3 Betacam camera

VTR and other video-related equipment have been improved greatly and the equipment has became and will become increasingly easier for the users to operate.

Fig. 2-4 1/2 inch broadcast use video system (MII)



3 Introduction to Video

3-1 How VCR Records Video

Difference between ACR (Audio Cassette Recorder) and VCR (Video Cassette Recorder)

To understand how VCR can record video on magnetic tape may be well explained from the aspect of comparison with ACR. Sound wave is converted into electrical energy in a microphone; then, the electrical pulses are converted into precise magnetic patterns on the tape surface through recording heads of ACR. Video system is also very similar to this procedure. Picture and sound signals, generated at the camera and microphone, are received by the video recorder through its recording heads. The electrical signals are changed into magnetic signal and stored on the tape.

3-2 How Television Works

The color television system must be understood before studying how video works.

Picture on the color monitor is not a completed picture like the one found on each frame of a film. A color monitor is comprised of dots or stripes that glow red, green, or blue when energized by the respective associated electron beam. The electron beam mentioned above draws 525 parallel horizontal lines, left-to right, top-to-bottom. This electron beam is called scanning line. A set of 525 lines makes up 1 frame, which takes 1/30th of a second to pass from top to bottom (for NTSC, and PAL–625 lines; SECAM–819 lines). This 1 frame is equal to a frame of 16 mm film. A 1 second picture consists of 30 frames. Therefore, if one could look at a TV monitor for 1/30th of a second, one could see a frame of picture; if for 1/(30x525)th of a second, a scanning line; and if for 1/(30x525x700)th a second, a dot or a stripe.

To conserve bandwidth and decrease flicker effects, the odd lines (odd fields) are scanned and then the even lines (even fields) fit in between them. This is called "interlacing". Therefore, each frame is divided into two parts, so that 60 fields of the scene are presented to the eye during each second. The impression made by the lights seen with the eye persist for a small faction of a second after the light sources are removed. Therefore, if 60 views are presented to the eye during this interval of "persistence of vision", the eye will integrate them and the viewer will get the impression of having all the images at the same time. The repetition rate of 60 views is much more than 30 views during a second needed to produce the illusion of motion on the screen.

3-3 System of Video Camera

(1) Video camera

Although the combination type of a camera and VTR (combo, camcorder) is becoming more dominant on the market, the basic function for each has not been changed. Perhaps the biggest recent change in the video camera pickup devices can be the use of CCD (Charge-Coupled Device) instead of camera tubes. CCD is now widely applied to home use video cameras as well as institutional and broadcast ones. In near future, the camera using tubes will be seen only in the broadcasting studios. It has been only seven years since the first camera using CCD appeared. Technical innovation in the field of video camera doubtlessly proceeds fast.

The function of a video camera is converting an image focused on a lens into electric pulses. To do this, a camera must follow the backward procedure of converting electric pulses into an image on the TV monitor. This was done by a camera tube—a kind of vacuum tube.

Various types of camera tubes are made.according to the grade of sensitivity. The main types produced recently are: plumbicon (broadcast use) and saticon (from broadcast use to home use). Both tubes have high sensitivity and can concisely convert an image into electric pulses, but there are some limitations which are as follows:

(1) Relatively large and difficult to use for a portable video camera
(2) Degrade their performance quickly
(3) Expensive since they cannot be mass-produced
(4) Require a large power supply and limited in terms of battery-operations
(5) Get image-burns easily

The CCD does not have the above-mentioned limitations that camera tubes have; however, the picture resolution of CCD camera has yet to beat the resolution of a plumbicon camera and a saticon camera. Therefore, at the moment camera tubes are suitable for cameras for broadcast and institutional usage, and CCD for ENG (Electronic News Gathering) and homeusage.

(2) A video camera changes light into electric signal

An image on the photo film is fixed as you hold it up to the light. When the focused light hits the film, it causes a chemical change in the film's light-sensitive coating. However, in order to see the image on the film, it must be developed. In a video camera, the light is focused and sensed on the photoelectric image plate inside the camera tube or on a CCD instead of the film. The camera tube and a CCD are the converter from the light to electric signal and to video signal.

(3) Camera tube

A camera tube has a photoconductive layer, where the focused image is scanned by the electron beam. The electrical resistance of the layer varies at each surface point with the light and shade of the scene to build up a corresponding charge-pattern. These charging currents constitute the camera's video signal and can be sent to a VTR.

(4) CCD

CCD (Charge-Coupled Device) is a semiconductor which consists of thousands of unit element of MOS (Metal Oxide Semiconductor) capacitor forming regular lines. CCD treats electrons in three functions, as follows:

(1) Produces electrons according to a strength of light (photoelectric conversion function)
(2) Stores electrons to differentiate electric potential (storage function)

(3) Transfer electrons adapting a nature of electrons to move towards higher voltage areas (transferral function)

That is, if a CCD chip were enlarged, next to the photo-sensing area, there is a vertical register which transfers and stores electrons. Electrons on the vertical register were transferred to the horizontal register regularly by applying voltage. This is called "interline transfer".

(5) Single-CCD camera vs. three-CCD camera

CCD cameras are classified into two types: single-CCD camera and three-CCD cameras are mainly for home use, while three-CCD cameras are for institutional or broadcast use.

Three-CCD cameras perform at a higher signal-to -noise ratio (SNR) and resolution than single-CCD cameras, but is also more expensive.

Incoming light from the intake lens is split into three parts by a prism. In front of each CCD up take chip is an optical color filter. These filters are selected to pass a narrow band of wavelengths centered on red, green, and blue primary signals and to block out unwanted light. The blue filter, for example, passes blue but blocks out red and green. The light that passes through the dichronic prism and divided into red, blue and green reaches each CCD, then is converted into electric signals and amplified by a pre-amplifier. The amplified electric signals are corrected in a form suitable to transfer then finally become video signal consisting of three color signals.

(6) Three-tube camera

The only difference between a three-tube camera and a three-CCD camera is the replacement of CCD's with tubes. The system of the three-tube camera is almost the same as the three-CCD camera's, but requires some adjustment before use.

The built-in camera tubes produce video signals from the light by scanning constant electron beams. The tube consists of a coiled glass envelope, so that it creates a magnetic field with high density which affects the beam inside. The camera tubes are supported by a strong magnetic field; however, since divided lights must be unified again, even a subtle move of a tube can impair color unification. Therefore, the three tubes must be registered correctly before use.

Using the black balance to adjust the black level of video signal from each of the three tubes evenly; and using the white balance to adjust the red, green and blue channels to provide for equal output levels are also essential adjustments to precede operation of a video camera. But remember, three-CCD camera do not need black balance adjustment.

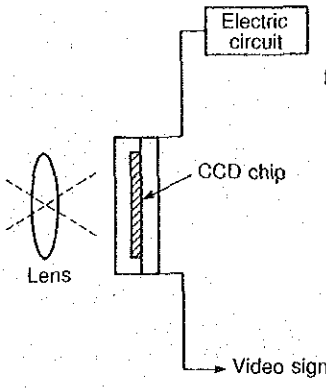


Fig. 3-1 System of CCD camera

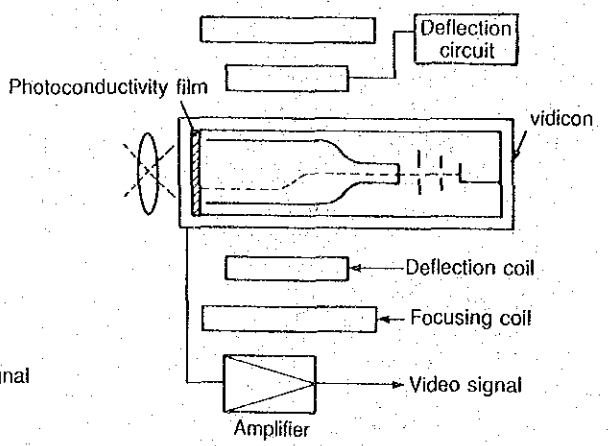


Fig. 3-2 System of camera tube

Fig. 3-3 CCD

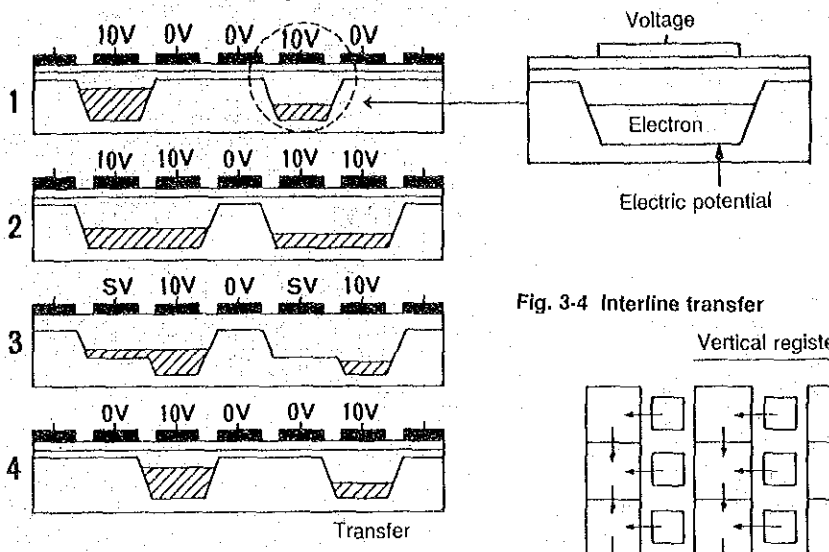
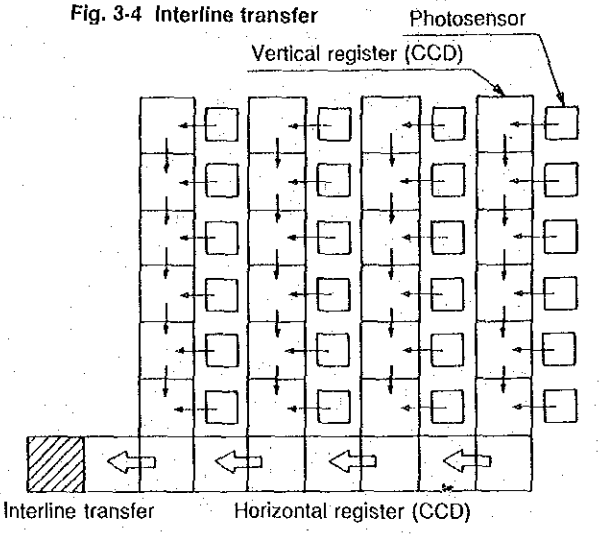


Fig. 3-4 Interline transfer



3-4 Video System

(1) Video signal has high frequencies

Like audio recording, the signal information is stored on the tape through recording heads in video recording. The recording head is an electromagnet. To record, the signal current is fed into the coil to magnetize the tape.

But the problem with video recording is the very wide range of AC signal frequencies, approximately 25 Hz to 5 MHz. It has about a 200 times larger frequency as the frequency of audio baseband signal.

If one was to try recording video signal with an audio recording head, the recording head must move 200 times faster than usual. In other words, the audio tape with a 60 minute recording capacity at a speed of 19.05 cm/sec. would only last for 18 seconds when it is recorded at 200 times the normal speed (38.1 m/sec.) But this is impossible.

This problem is solved by rotating the heads in a video tape recorder, instead of having the tape travel faster for high frequencies.

As in the VCT shown in Fig. 3-4, the tape is pulled around a cylindrical assembly called the head drum. Since the tape is angled downward as it flows around the drum, the video head crosses the width of the tape at a shallow angle. This system is called helical-scan recording, and has been adopted by most VCRs, from home use to broadcast use.

To increase relative tape-to-head speed, home use VCRs first made the tape run in the opposite direction to the direction of rotation. However, the tape also runs in the same direction with the rotary heads in recent VCRs to prevent friction and unstable tape running.

(2) FM Recording

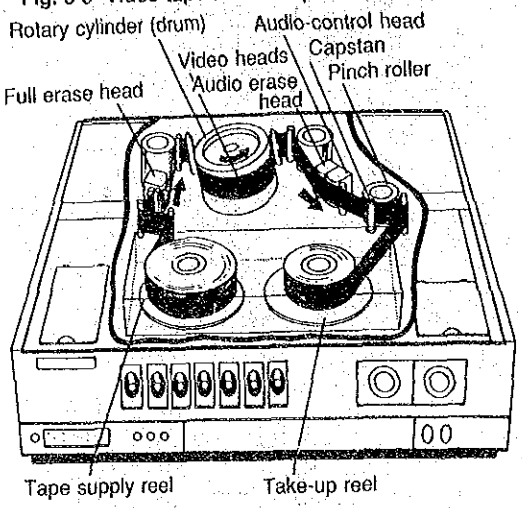
Video frequency range is approximately 18 octave and no system could handle such a tremendous range of signal frequencies. This problem is solved by making the video modulate a higher-frequency carrier signal for the recording signal. In short, frequency modulation is used.

Fig. 3-6 illustrates the diagonal tracks for the video signal on the tape. The audio signal is recorded straight across the top edge of the tape. Along the bottom edge the control track provides timing reference signal for playback.

Each frame of video becomes divided into two fields. That means of each diagonal track, or "swipe," there is a corresponding video signal for a vertical scanning field. Two swipes make a television frame.

Each video head is in contact with the tape for one-half revolution. Thus two fields for a complete television frame are recorded in one complete rotation of the drum assembly. The rotating speed is 30 revolutions per second (rps).

Fig. 3-5 Video tape recorder (VHS format)



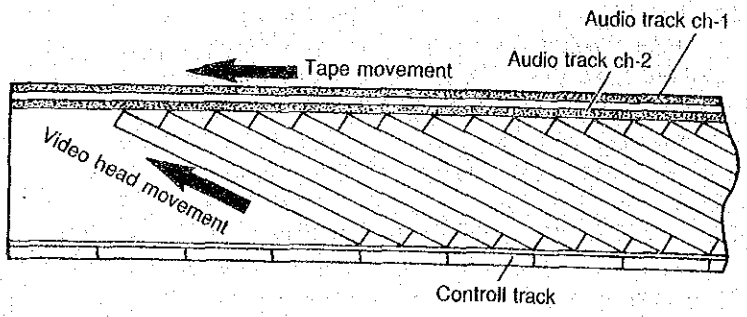
(3) CTL signal

During playback, a tiny skid of contact point between the tape and a head can cause a distortion of the picture. To prevent this, a timing reference must be recorded on the tape. This reference must indicate that a prerecorded track is in position, and the reference head should be sweep over the precise point on the tape track where the timing reference has been recorded. This required timing reference is called the control signal, which functions just like those during a film showing.

(4) VCR with Electronic Editing Function

Instead of stationary erasing head, two flying erase heads corresponding to video heads are used for a VCR with electronic editing functions. This allows immediate

Fig. 3-6 Slant tracks for video signal, with audio and control tracks



recording after prerecorded signal is erased.

Motion-picture film and audio tape are edited mechanically by cutting them and splicing the two ends. Video tape, however, can be edited electronically. Because the video recording is made on diagonal paths, the control signal will be disturbed or picture will be wiped from up to down if it is edited physically.

The video tape is never cut physically; it is edited electronically by erasing and then recording over a particular segment. Two VCRs are necessary to edit electronically: one machine as the player, and the other as the recorder. If possible, it is better to have an editing controller (or automatic editing control unit) because it can search for the editing-in/out point easily and make previewing possible. An editing controller can control a maximum of two VCRs.

Fig. 3-7 Rotary cylinder

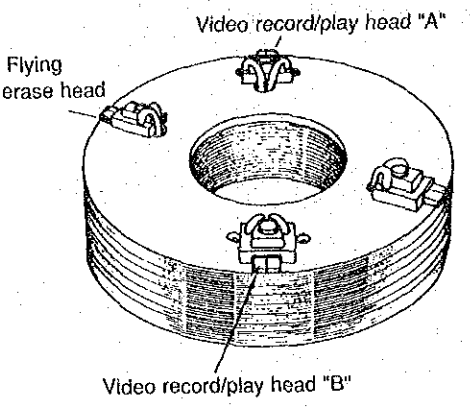
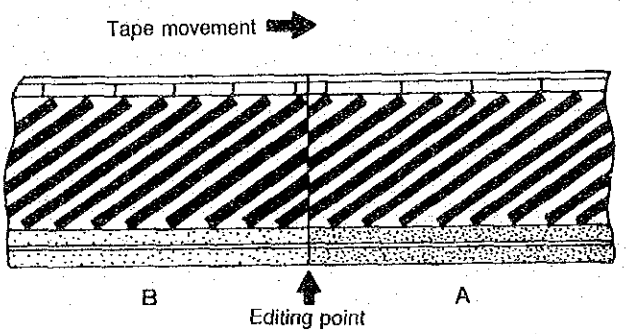
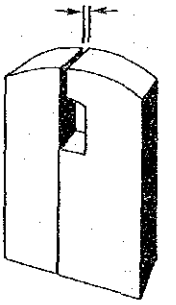


Fig. 3-8



Head gap

The recording head consists of two cores made with a ferrite material. Between the cores is the gap, which is a very thin layer of glass. This gap is kept at a certain distance; as the gap becomes larger, the signal frequency increases and then the recorded wavelength becomes shorter.



4 Video Equipment

4-1 Varieties of Video Equipment

The rapid development of video equipment has led to the emergence of diversity in video from home use to professional use in the market. To make a wise selection of equipment, the most important guide is a set of carefully assessed specifications which meets one's needs. The factors to be considered would be the number and skill level of operating staff, frequency in use, durability, picture quality, cost which meets to one's budget, and compatibility with the equipment ones already has.

(1) Video camera classification by its usage

Cost of video camera ranges from 100 thousand yen to 8 million yen. The video signal through any video camera can be recorded on the tape in any VCR format; however, one must select it according to one's needs since the specifications differ from own to another.

1) Home use video camera

A home use video camera costs between 100 to 300 thousand yen. There are two kinds available: signal tube type and signal CCD type. But most of the home use video cameras are camcorders with a built-in CCD. Both types are limited in resolution, for their recorder part is either low-band 8 mm VCR or low-band 1/2 inch VCR. That is to say, the resolution ability of VCT cannot be improved even if one brought a camera with better resolution.

2) Institutional and broadcast use video camera

"Institutional use" refers to video equipment which is used for research, training and educational purposes. Schools, corporations, and research institutes use institutional equipment in most cases. Compared with the big difference between home use video cameras and institutional video cameras from the aspect of specifications, there are no obvious differences between institutional video cameras and professional video cameras. Perhaps one may call the video cameras which cost between 500 thousand to 3 million yen "institutional".

A wide variety of institutional video cameras exist: signal saticon type, three plumbicon type, 2 CCD type and 3 CCD type. But the mainstream of the institutional video camera is the 3 CCD type, due to its portability and durability.

The video cameras which cost between 2.5 million to 8 million yen are referred to as "broadcast use" or "professional use". Like the institutional video cameras, a wide selection, from single-tube types, three tube types to 3 CCD types, are available. In addition, a 350-line to 650-line resolution is a typical specification for a broadcast use video camera.

Video cameras for broadcast use are usually expensive (from 7 million to 8 million yen), since they use the video tubes which can pass the broadcast standard examination.

(2) Advantages and limitations of video camera

Let us look at the advantages and limitations of video cameras classified according to the difference in the pick-up devices.

1) Single-tube video camera

Signal-tube video cameras are lower in cost and power loss, and convenience of packaging and handling for use are their distinct advantages. On the other hand, they are limited in resolution, color fidelity, and sensitivity. Having been relatively lower in cost, single-tube video cameras covered portions of institutional and broadcast production before the emergence of the 3 CCD type; most single-tube video cameras have been replaced by 3 CCD video cameras. But in the not-so-distant future, single-tube video cameras will be completely replaced by 3 CCD video cameras.

2) Three tube video camera

Three tube video camera has a higher resolution, better color fidelity and greater contrast range than any other type. On the other hand, however, it also has some limitations. It is heavier in weight and is more expensive; furthermore, it has a greater power loss.

But it is still the mainstream video camera for broadcasting. The cost ranges from 1 million to 20 million yen.

3) Three CCD video camera

This type is widely used for ENG and EFP of broadcasting, and for institutional productions.

Three CCD video cameras are lower in cost and power loss, higher in resolution and sensitivity, smaller in size and weight.

The advantage of the light weight for CCD camera enabled us to combine a video camera with a VCR. This type is called combo or camcorder. Unlike a tube, since it does not get image-burns nor require complicated maintenance procedures, it is suitable for outdoor shooting. Although three CCD video camera has less color fidelity than three tube video camera at the moment, it will surely become the mainstream broadcast use video camera in the near future, since CCD technology is being developed day by day.

4-2 Various Types of VCR — From Home Use to Broadcast Use —

In the recent two to three years, newly developed video cameras and VCRs have appeared one after another. The competition among Japanese video manufacturers is cutthroat, but video technology is surely and rapidly being improved for this competition.

Especially in VCR field, newly developed format has been lined up: M-II, Betacam-SP, S-VHS and ED-Beta. This is the result of technological innovation of Japan. Let us compare the characteristics of VCRs according to tape width and specifications.

Classification according to tape width

The VCR formats differ according to the tape width.

(1) One-inch helical scanning systems

One-inch helical scanning systems have undergone a number of radical changes over the past decade, but two major broadcast-quality helical-scan color VTR systems have been accepted as work standards: the 'B' format developed by Bosch and 'C' format developed by Ampex and Sony. Since 1978, when the specifications of the type 'C' recorder was recommended as the standards for SMPTE (Society of Moving

Picture and Television Engineers), 'C' format has come into widespread professional use. Characteristics of 'C' format are: a better resolution obtained from directed video signal recording using frequency modulation and use of one video head which records and playbacks at the same time.

In technical cooperation, the one-inch format VCRs are introduced for projects related to broadcasting. A unit of one-inch format VCR costs approximately 10 million yen; however, as a total system including TBC (Time Base Corrector), a vector scope and a waveform monitor (for adjustment) costs 170 million yen.

(2) 3/4-inch tape format VCR

1) 3/4-inch (U-matic) VCR developed for ENG

U-matic is a standard industry-wide format of auto-loading three-quarter-inch video cassette recorders. It is so named because the tape transportation is in the shape of the letter 'U'.

In U-matic, low frequency modulation is used to record signal and there are two record/replay heads.

The U-matic VCR was first developed as home use format buy Sony in 1970. An American broadcast station CBS began to use this 'lightweight' mobile video recording equipment for ENG (Electronic News Gathering) in 1972. Since then, U-matic has been accepted as worldwide news gathering VCR.

U-matic VCR has been widespread in broadcasting stations in developing countries, for it is less heavier and less expensive than the one-inch VTR.

2) Hi-band U-matic — U-matic SP VCR

The original low-band industrial grade U-matic uses color-under recording process, and picture quality can deteriorate noticeably if a sequence is copied and this dubbing re-recorded in the course of editing (multi-dubs). Design improvements of U-matic (low band) resulted in the hi-band U-matic or U-matic SP, and the limitations were reduced or minimized in this new format by using high-quality tape and applying the latest technology of electric circuit. Furthermore, U-matic SPO uses Dolby noise reduction for sound recording.

(3) 1/2-inch VCR

1) 1/2-inch VCR with smaller size, less weight and better picture quality — Betacam, Betacam-SP, and MII

Since U-matic VCR is not of the camcorder type, a video camera has to be connected to the VCR by a cable. But in a confused situation like news gathering, this fact is often forgotten and a cameraperson may run towards the subject, pulling the cable from VCR by force. To overcome this inconvenience during ENG activities, further important developments in video recording fields have led to the idea of an integrated video camera-recorder assembly.

In 1981 Sony produced Betacam format and Matsushita the MII format. Both types are a combination of the high-grade lightweight camera with the broadcast standard video recorder using 1/2 inch tape cassettes.

Betacam format uses the same tape for Betamax, but the tape speed is 6 times faster than for Betamax. Therefore the tape of 60 minutes on Betamax only lasts 20 minutes on Betacam. Newly developed Betacam-SP VCR developed in 1987 allows for a recording of up to 90 minutes.

M-II was a co-production of Matsushita and NHK and is now being marketed by Matsushita and JVC. Like Betacam, using a metal tape and adopting a faster tape speed are the key to improved picture quality.

These formats will become more widespread and utilized in many fields, for they require only a few people to operate, have a better picture quality, and are easy to operated. Besides, there is not much of a cost differential.

2) Home use VCRs — VHS and Betamax

Betamax was developed in 1975, and the VHS emerged a year later. Both were of the 1/2-inch video cassette format and have been widely accepted as home use VCRs; unfortunately, they are not compatible with each other. This caused confusion when they first appeared on the market, but most countries have adopted the VHS format. In the near future, VHS will surely become the world standard. But, in some countries like China, the Philippines and Indonesia, Betamax is still the mainstay.

• *VHS-VCR*

The visible difference between VHS and Betamax is the size of the cassette tape; the cassette tape for VHS is slightly larger than the cassette for Betamax.

VHS developed by JVC is now being marketed by all the VCR manufacturers. The tape transportation of VHS format is in the shape of letter 'M'; hence, it is known as the M-Loading System. There are two tape speeds available in VHS: normal and three times slower. If one uses 'T-160', the thinnest tape of this format, with the tape speed three times slower; one can record and play for up to 8 hours on a single tape.

• *VHS-C cassette*

VHS-C cassette is about 1/3 of a full VHS cassette. VHS-C cassette can be used in VHS video player/recorder by applying a cassette adapter. With normal tape speed, one can play/record for up to 20 minutes. This cassette is used for a camcorder called 'video movies'.

• *Betamax VCR*

Betamax VCR format is the Sony version of the half-inch video cassette recorder. The size of the cassette tape for this format is slightly smaller than the cassette tape for VHS format. The tape transportation is based on the U-matic system. In Beta II mode, which is the standard operating tape speed for 2 hour; while in Beta III mode, the same tape can last 1.5 times longer (3 hours). The earliest version of Betamax format VCR had only Beta I mode and could not use Beta II or Beta III mode.

• *S-VHS and ED-Beta*

Manufacturers of 1/2-inch VCRs moved to develop hi-fi audio in 1984, then improved its picture quality in 1985. This first group of improved version is namely HQ system in VHS format and hi-band Beta in Beta format. In 1987, S-VHS and ED-Beta were developed as the more improved versions of the HQ system and hi-band Beta. Those two new types have as twice many lines as the previous types thus, their picture quality is almost the same as the picture quality of 3/4-inch U-matic format. But unfortunately, there is no compatibility between the newly developed format and the previous type. Furthermore, the tape is rather expensive.

3) 8 mm VCRs

While the integrated camera and 1/2 inch recorder is in widespread use within Japan, the need to further miniaturize the camcorders resulted in the development of 8 mm camcorders. In 1984, Kodak introduced the first 8 mm home format camera/recorder system.

The size of a 8 mm video cassette tape is almost as small as that for an audio cassette tape. But it can be recorded and played for up to 120 minutes. The quality of the picture and sound has not beaten the quality of NHS and Betamax; however, manufacturers have developed the new version of 8 mm camcorder with better picture quality and will market it within 1989.

VCR classification according to specification and needs

VCR/VTR can be classified into three categories by specifications: 1) home use, 2) institutional use, 3) broadcast use.

(1) Home use VCR

— Various kinds of home use VCRs —

Betamax format and VHS format are very common for school and home. The 1/2 inch video cassette system is rapidly becoming the standard format in both edu-

cation and training, bringing further improvements in affordability and recording quality.

Unlike the institutional use VCRs and professional use VCRs, the home use VCRs do not limit their target users to any specific group; thus, manufacturers produce various kinds of format such as: VHS-C, ED-Beta, S-VHS and 8 mm video cassette format.

Further quality improvements are being implemented on the camcorders, making them easier to carry and operate. The simplicity of the system has made it accessible for non-professionals, just like using a still camera. Various optional equipment to upgrade the video system have been developed, and VCRs of reliable quality with editing function have even emerged for home use.

(2) Institutional VCR

Institutional use VCRs refers to VCRs used for research in schools and companies, and discriminated from home use VCRs in most cases by manufacturers. In technical cooperation, these institutional use VCRs are in widespread.

— U-matic is the mainstay —

U-matic has been the mainstream of institutional use VCRs. There are two types: installed type and portable type.

This U-matic format has been dominant of the market for educational and training material development since it was introduced in 1971. This was because of a variety of accessories and equipment available for making different kinds of systems. Furthermore, picture quality of 3/4-inch U-matic has been less deteriorated than of 1/2-inch VCRs when a sequence was copied and this dubbing re-recorded in the process of editing.

However, the 3/4-inch U-matic VCRs are getting powerful competition due to the latest development in 1/2-inch VCRs, which have an improved picture quality. In 1987, U-matic SP, which is the high-band U-matic type, was developed to meet the needs for better picture quality. This format is suitable for educational and training material development, although it is not economical when the cassette tape costs are considered.

— Institutional VHS and Beta —

The format for institutional VHS and Beta is totally the same as their counterpart in home use; however, the equipment itself is much more reliable and durable than home use equipment. They also have editing functions, a must of institutional use VCRs, and an editing controller especially developed for these VCRs is available. These institutional 1/2-inch formats are and will be playing important roles in technical cooperation.

(3) Broadcast use VTRs

— One-inch VTR is the mainstay in broadcasting —

The first VTRs for broadcast use had a 2-inch format, but the 1-inch has gradually been taking their places due to its smaller size and reduced cost. This type of tape recorder, known as type C and a standard of the SMPTE, has been the mainstay of drama and studio production for broadcasting because of its good picture quality and high cost performance.

There are also camcorders intended for field operations, called ENG (Electronic News Gathering), or basic items such as the studio camera and the VTR, but their emphasis is on probability. Typical setups are items such as U-matic, MII, and Betacam.

4-3 How to Choose Video Equipment

"Video operates only as a system"

Various ways have been developed for using videos. Recorded videos can be used simply by themselves for teaching materials, and also can be the basis of the video program production. However, video materials generally require editing regardless of the differences found in them. Therefore, introduction of a system which enables editing at the first stage is suggested. Related to this, let us look at some points to remember when one chooses equipment.

(1) Camera

First make sure the grade of the camera is compatible with that of the VTR. However, it is better to choose both which are made by the same company. If they are not produced by the same company the connectors may be different, or the power switch may not work even though the connections can be made. Also, batteries are different in each company with size, capacity, voltage, and so on.

Recently, cameras have been automated with a microcomputer, so that a beginner can operate a camera without error, if the person follows the directions of the manual. But video recording requires quick setting and starting of the camera; because of this, it is important to keep the camera close by for easy access and become familiar with its functions through daily use.

Video technology is constantly progressing. Therefore, for our purpose, it is recommended that the latest camera which is easiest to handle be chosen.

The combination of the camera and the VTR (camcorder) is a great convenience, so that once used, one will no longer choose to use the type where the camera and the VTR are apart. At present, the camcorder formats are found in 8mm, Betamax, VHS, MII and Betacam for broadcasting, but not in 3/4. In 1987, S-VHS was put on the market, and the quality of the pictures in home videos have improved. It is said that S-VHS is equivalent to 3/4 in quality. However, the quality of pictures cannot be judged by the VTR itself, but it brings various elements to be counted such as lenses, the grade of the camera, and the stability of the tape movement. It seems unwise to pick up only the specifics of the VTR to be compared.

(2) VTR

The most suitable VTR for news gathering is the type called camcorder which is a combination of the camera and the VTR. This tendency is becoming more and more dominant on the market. That is to say, it is thought that the VTR for news gathering is a part of the camera.

For the purpose of making teaching materials, it is better to choose a VTR which has total electric editing functions and can be connected to the editing controller (automatic editing unit). The home use VTR, which is even functional for editing, is simple, and its editing functions are not totally electric. For this reason, it would be better to choose a VTR of a better grade or one for institutional use. The 3/4-inch has been mainly used to edit VTR. But the 1/2-inch VHS, Betamax, and the 1/2-inch Betacam for broadcasting will bring a variety of editing VTRs in the future.

The criteria when materials being introduced are that:

1) Institutional VHS or Betamax for use in schools and educational centers. 2) Institutional 3/4 (low band) or broadcasting 3/4 (high band) for professional use in studios as the production system. 3) Broadcasting 1/2-inch Betacam or MII for use mainly on location and news gathering. Although the above classification is shared by all, one is encouraged to check the video system section shown next.

(3) Battery

The recording using batteries, either outdoors or indoors, is convenient since that does not make one look for power source or watch out for cords. Even batteries which are made by the same company will turn out to be different, however. As the proper model of the camera is hardly accessible on location, it is therefore suggested that the necessary number of batteries be purchased at the same time as the camera and the VTR. Suppose that about 3-4 hours are used for one day recording, the standard number of batteries needed will have to be enough to cover 120% of the recording time. That is to say, five or six batteries will be needed since the life of the battery is approximately one hour in most batteries. If more hours are required, it would be rather efficient to use the AC power source, the car battery or the generator, if any of these are of easy access.

(4) TV monitor

Latest video cameras have been half automated, with not only the iris (aperture), but also the registration, the white balance and the black balance being automated. Furthermore, automatic focusing has developed in some cameras. This tendency has helped to decrease the need to observe (monitor) with the TV monitor during recording. Needless to say, the professional recording, besides the case of news reporting, cannot leave the quality of pictures entirely to the automatic or electric management of the camera. However, the kind of recording we are aiming at is directed to produce educational materials, and this production is not for an audience of several million; therefore, there should be nothing to be nervous about. In any case, searching for the better picture is the best as desired. Consequently, it is suggested to have a small 6-inch monitor which can be operated by batteries when recording outdoors all day long.

(5) Tripod

It can be considered that the tripod is an art of the video camera. For photographing, the tripod will be required only if it is the case where the self-timer is used with a slow shutter speed in order to catch a glimpse in a moment. Compared with this, the video camera is to record the movement of the subject, and the recording may require more than one hour at a time, or even for a short time, such as 20 to 30 seconds. Therefore, the tripod becomes a matter of necessity.

4-4 Video System

There are various systems with different aims, ranging from the simplest where the recording by a video camera is directly used to the large video studio system for use in a broadcasting station. Here, let us look at three systems applied to technical cooperation.

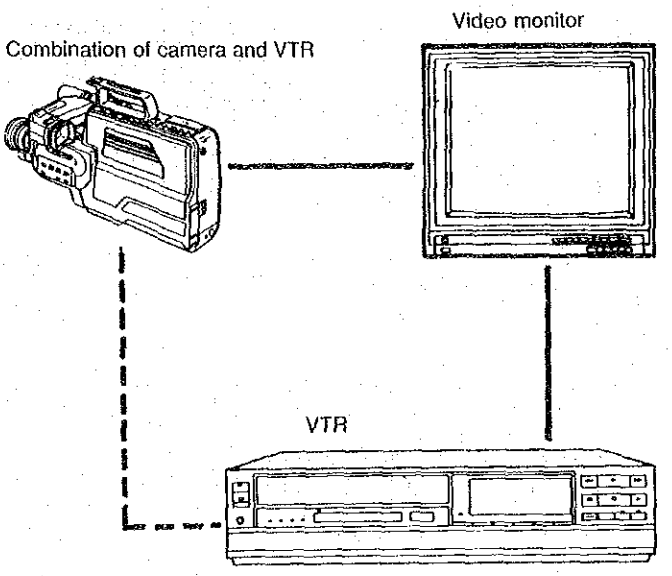
SYSTEM 1 ONE CAMERA, ONE VTR SYSTEM

This system is the simplest and one will find it is being used to record materials for educational training, conduct research, keep the records of events or trainings, record a TV program, play back a package video and so on. Anyone can operate the system without special training.

This system is based on the idea to record the sequence of pictures instead of photographing so that it would be better to use the simple equipment along with the system.

Recording requires a battery pack, a battery charger, and AC adaptor. For recording in insufficient light such as in a factory or a shaft, the battery light is also required.

ONE CAMERA, ONE VTR SYSTEM



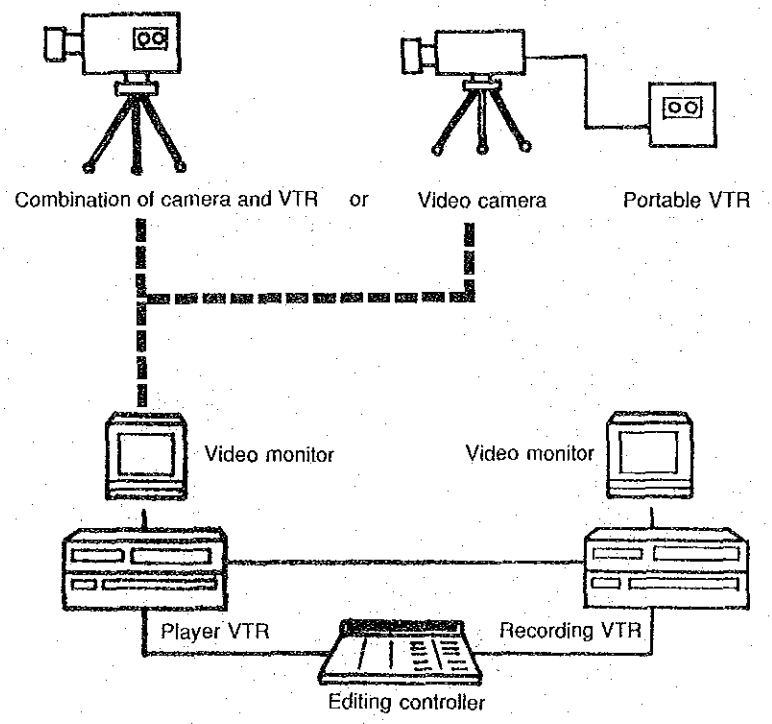
SYSTEM 2 CUT EDITING SYSTEM

This is the system where editing is added to system 1, and expands its use to make simple teaching materials, summarize records or research, make a video report, and cover news. The system can be used with any grades as broadcast, institutional, and home use.

It is possible to edit cut-by-cut with the system. For program production, more possibilities will be pursued if you have the following options:

1) Equipment for title or super impose: color telopper, character generator.
2) Audio equipment: record player, CD player, cassette tape recorder.
3) Lighting equipment: battery light, portable lighting kit.

CUT EDITING SYSTEM

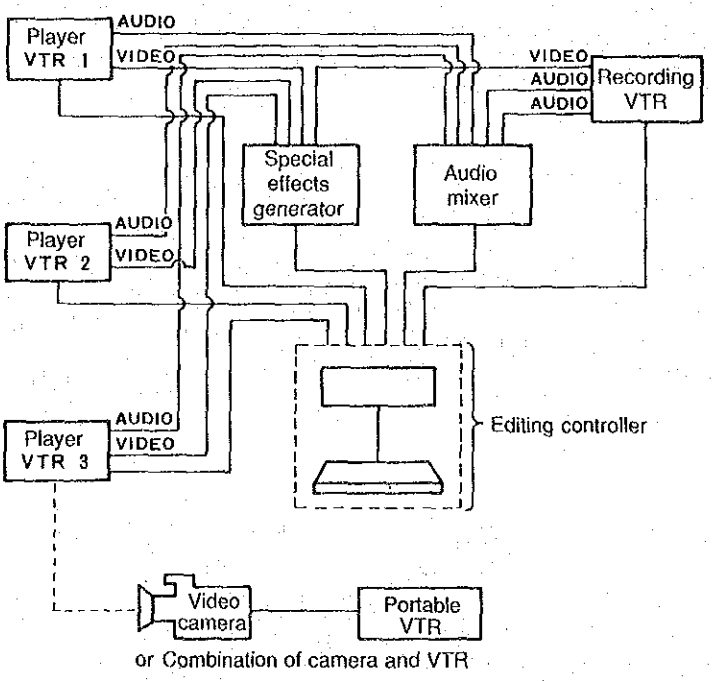


SYSTEM 3 AB-ROLL EDITING SYSTEM

This is the system where more than two VTRs which are used as senders are connected with a special effects generator (SEG) in order to create special effects such as wipe, dissolve and fade while being edited. Furthermore, various picture productions can be achieved by supplying other equipment like a character generator and digital video effector. This system operates on the institutional and broadcasting levels. For home use, it is money-consuming; the video will be poorly qualified in pictures and not be well-balanced with the VTR.

Audio and lighting equipment is also important in the system which will become the studio system if the VTRs are replaced by the video cameras.

MULTI-VTR AB-ROLL EDITING SYSTEM



5 How to Use Video Equipment

5-1 How to Use a Camcorder

There are many kinds of home video cameras available and that makes the selection even harder. However, they fundamentally remain the same when actually being operated.

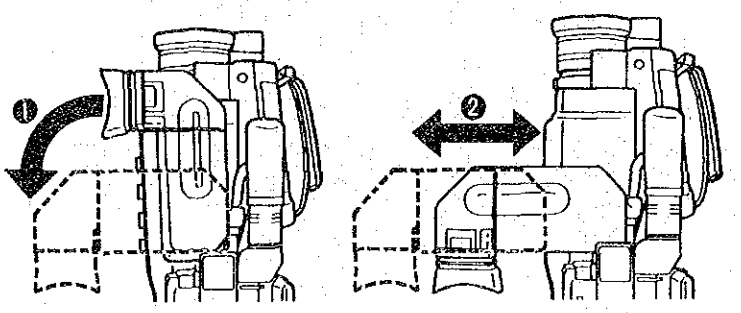
Upon purchasing a video equipment, one should look through the instruction manual carefully. Needless to say, once one begins, one finds it difficult to follow the manual. The important thing is to proceed step by step, without rushing.

"It is of no use purchasing just the camcorder itself."

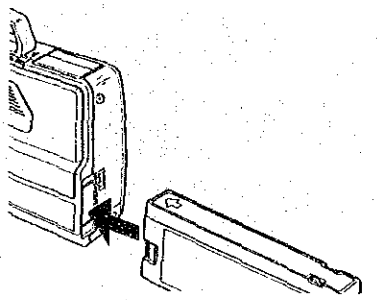
Besides the camcorder itself, the battery pack, the AC adaptor (equipped so as to charge the battery pack), and the cassette tape are the minimum requirements for recording. Other materials related to this matter will be covered later in this book. For now we will move on.

STEP 1 SET UP THE VIEWFINDER

Unfold and set up the viewfinder attached to the camera since it is folded while being carried in the case. Here, make sure that one can see clearly through the finder by turning its sight adjustment knob which is placed at the center of most finders. The finder part of every camera is delicate so that one must handle it gently.



STEP 2 INSERT THE BATTERY PACK



Insert the charged battery pack into the back side of the camcorder. One should hear a click when the pack is firmly attached. The charging of battery packs is done by either the AC adaptor or the battery charger but the former is most commonly used.

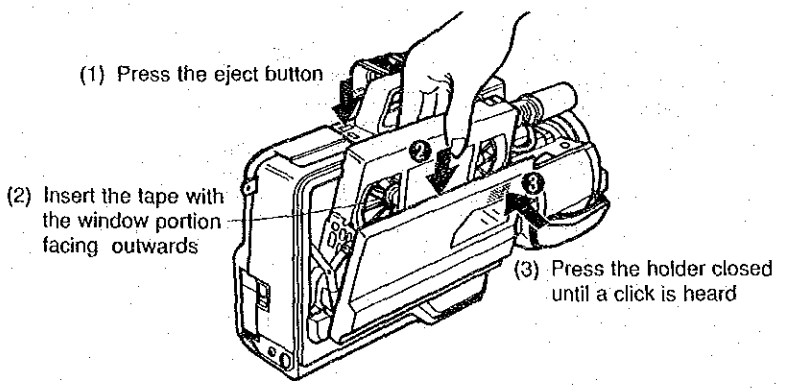
STEP 3 SET THE POWER SWITCH TO ON

Set the power switch to ON, so that the pilot lamp will light up. If it does not, check the battery.

STEP 4 INSERT THE TAPE

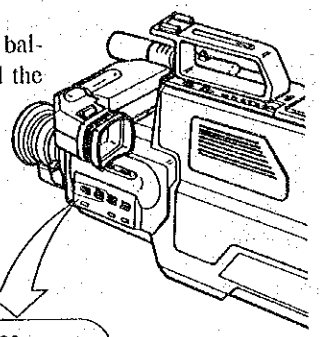
Make sure that the videotape has a tab which prevents accidental erasure of pre-recorded materials (new tapes have the tabs).

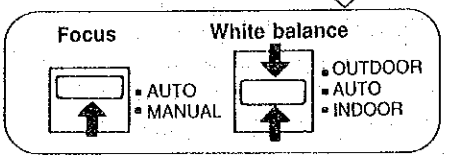
1) Press the eject button (the tape holder will open).
2) Insert the tape with the window portion facing outwards.
3) Press the tape holder back until a click is heard.
4) The tape runs up to the position ready for recording (the standby mode).



STEP 5 AUTO SETTING OF THE FOCUS AND THE WHITE BALANCE

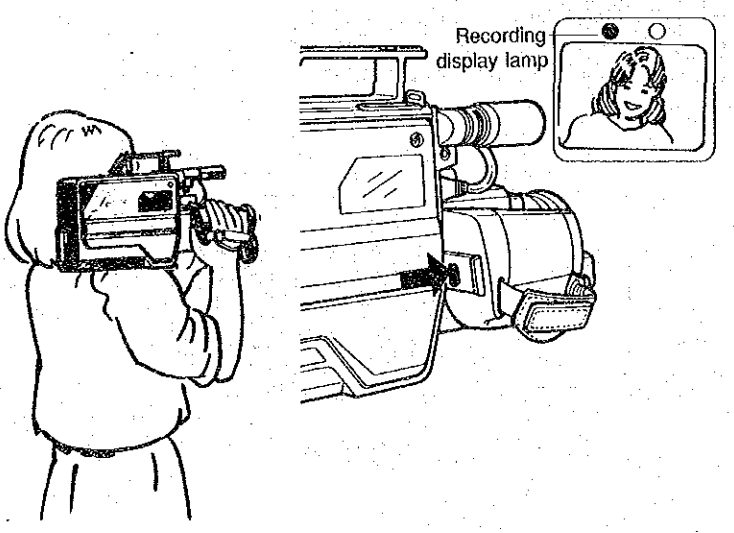
Autosetting of the focus and the white balance for normal use; set the focus and the white balance to AUTO.





STEP 6 SET THE CAMERA IN POSITION AND PRESS THE START/STOP BUTTON

Once one presses the start/stop button, the recording starts. Press the button again upon the finish of the recording.



STEP 7 CHECK THE RECORDING

Rewind and play back the tape after recording to see how well the subject has been recorded.

WHEN ONE FINISHES RECORDING

Upon the finish of the recording,
1) Press the eject button and take the tape out
2) Set the power switch to *OFF*
3) Set the finder back in position
4) Take the battery pack out and have it charged

5-2 How to Use an Institutional Camera

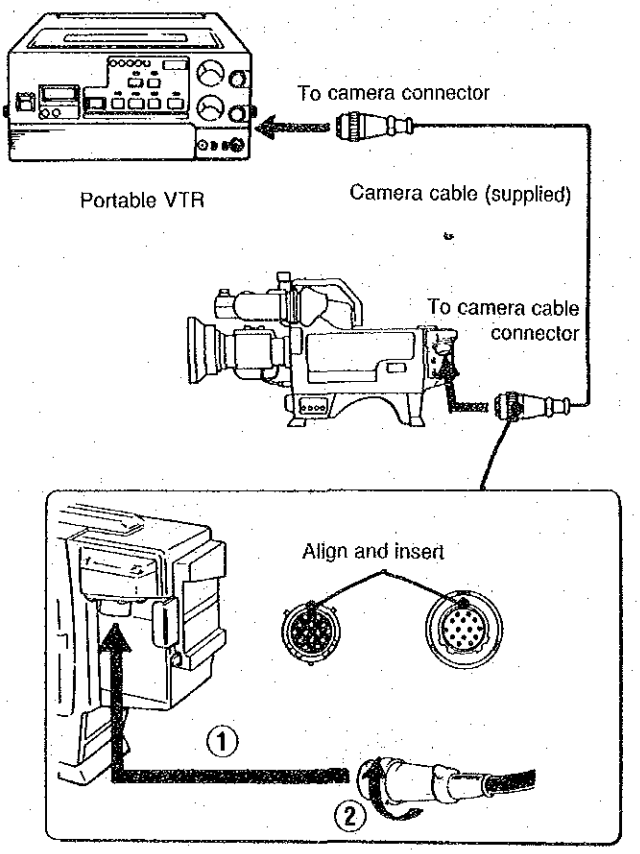
"An institutional camera is highly sophisticated but needs to be adjusted."

In previous paragraphs, use of the camcorder was illustrated. Here, we will learn how to use the institutional camera. Camcorders have almost become automated so that one can operate them easily. However, when it comes to the institutional use, one must be experienced to become skilled in the adjustments of the camera.

STEP 1 CONNECT TO VTR

Camera cables will be supplied as accessories if the camera and VTR are made by the same company. The connection will be possible between both, even if made by different companies, but seeing that this may cause non-operability of the power switch, caution is advised.

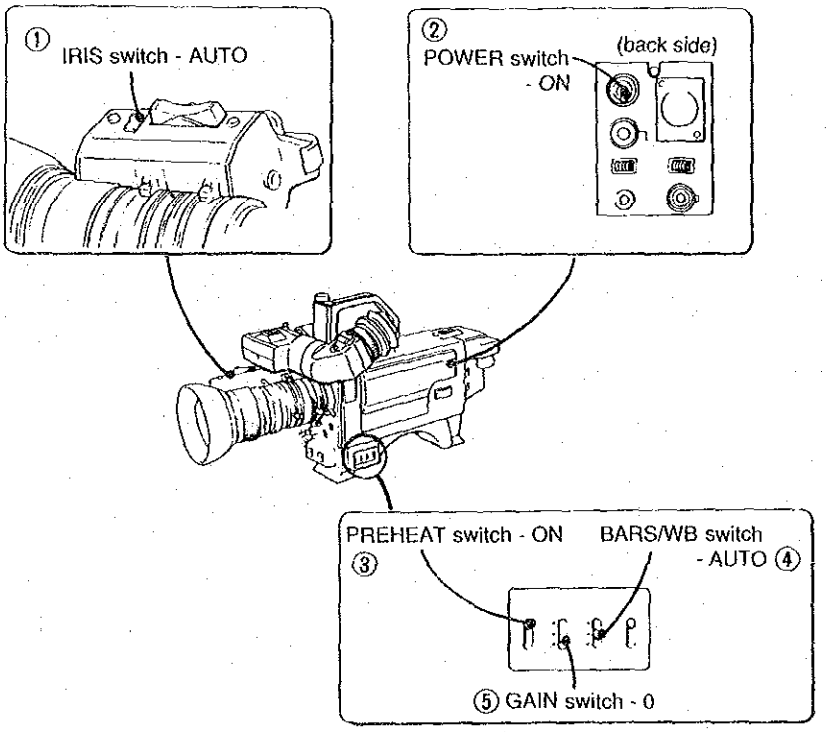
One camera cable carries the power, video signal, audio signal and other control signals so that the connection needs to be firmly completed.



STEP 2 ADJUSTMENTS

Before recording, set the switches as follows:

1) Set the IRIS switch to AUTO. Normally use the AUTO position and it is also required when the white balance and the black balance are adjusted. Manual adjustment will be effective when recording the subject against a bright sky.
2) Set the POWER switch to ON. The POWER switch will not operate unless the PRE-HEAT switch is also set to ON, as in the case of the camera which uses batteries for outdoor recording.
3) Set the PREHEAT switch to ON. To turn the camera on, set to ON. Keep only this switch at the PREHEAT position when the camera is to be used shortly. The camera will be turned back on instantly once the switch is set to ON.
4) Set the BARS/WB switch to AUTO. When the switch is set to BARS, a color bar signal is generated. Set the switch to the AUTO position to adjust the white balance.



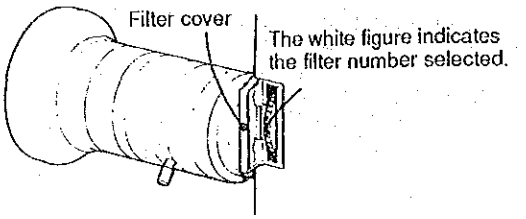
STEP 3 SELECT AN APPROPRIATE FILTER

There are 3-4 filter choices and they are displayed on the side of the camera as indicated in the table on the right.

Filter number	Lighting condition
0	blind
1	iodine lamp, sunrise, sunset
2	bright outdoor
3	cloudy, rainy

[0] CAP
[1] 3200K
[2] 5600K + 1/4ND
[3] 5600K

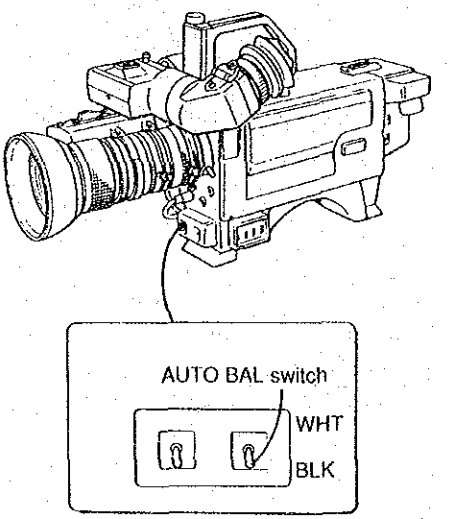
In this case:
1 for indoor
2 for bright outdoor
3 for cloudy outdoor



STEP 4 THE WHITE BALANCE ADJUSTMENT

1) Zoom up on a white pattern with the same lighting conditions as those under which the recording will be made. White objects such as a white cloth or white wall can be used instead of a white pattern.

2) Set the AUTO BAL switch to WHT.

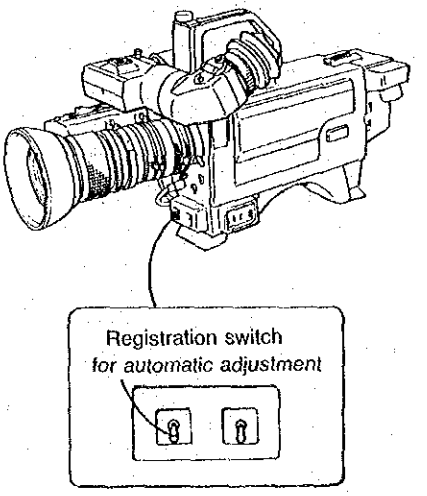


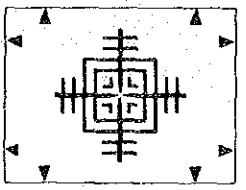
STEP 5 REGISTRATION

The registration of the three tubes (R.G.B.) built into the camera needs to be properly adjusted. The registration may not hold with a change of the temperature or a shock.

1) Set the camera using the registration chart. Be sure that the chart covers the whole screen.

2) Adjust the registration manually or automatically. Conduct the adjustment by checking with a black and white monitor or the finder. A color monitor hardly catches the registration adjustment.

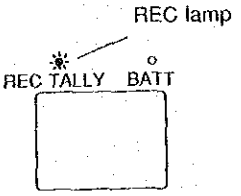


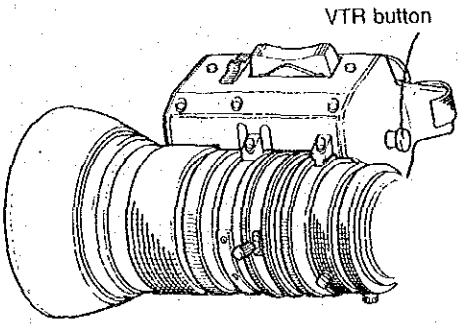


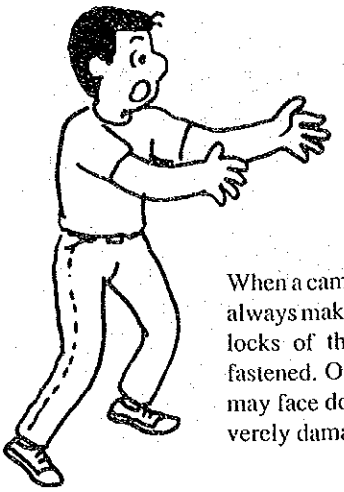
Registration chart

STEP 6 START RECORDING

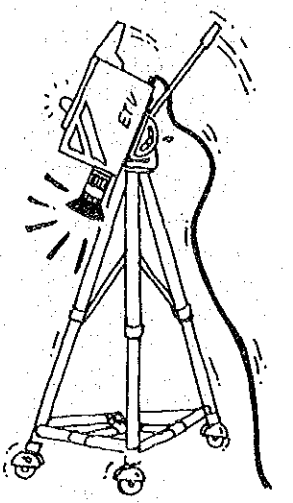
To start recording, press the VTR start button on the camera or the VTR button on the lens. The REC lamp in the viewfinder will light up during recording. To stop recording, press the VTR button once again.







When a camera is left on a tripod, always make sure that the control locks of the tripod are tightly fastened. Otherwise, the camera may face down or up, and be severely damaged.



Care When Using The Camera

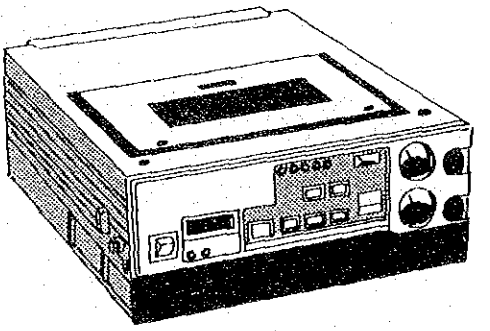
Never shoot directly at the sun or lighting equipment. The vidicon tube is a sensitive instrument. If the strong rays go into the tube, it will easily be burnt and leave a spot in the pictures. Light damage may be recovered by keeping the camera under normal temperature with the lens cap on for at least one day. If the tube is severely damaged and cannot be repaired in this way, replacement of the tube is possible but costly.

5-3 How to Operate a Portable VTR for Institutional Use

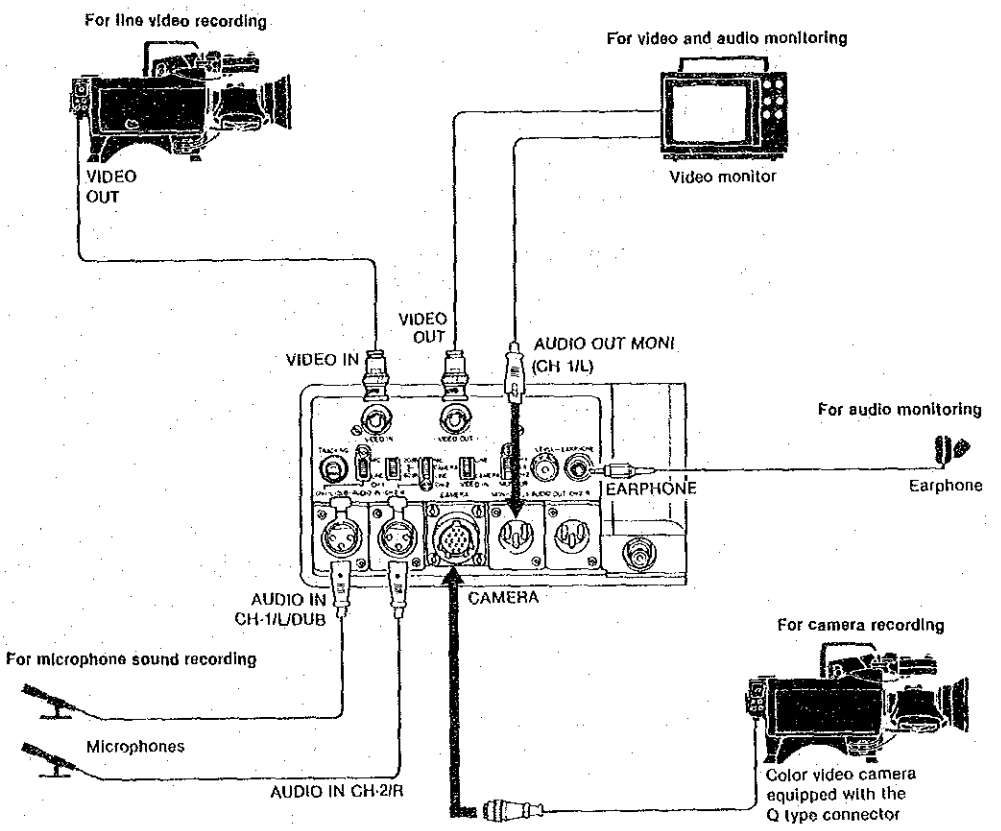
— *Example: 3/4-inch VTR* —

It is important to look through the instruction manual carefully.

Variations may be found among portable VTRs. Here, one will learn how to connect the VTR to the video camera and its operation. The first thing for any equipment is to look through the manual carefully, as it is necessary to learn the functions. The more one becomes aware of the machine in one's hands, the better one becomes at operating it according to one's wishes.



Camera recording connections



Operation

1. Insert a video cassette. Make certain that the red cap is in place on the bottom of the video cassette.

2. Press the REC button so that the E-to-E mode signal is displayed on the monitor screen.

3. Make the necessary adjustments on the camera.

4. Adjust the audio recording level.
To record the sound automatically,
Set the AUDIO LEVEL MANUAL/AUTO selector to AUTO.
To adjust manually,
1) Set the AUDIO LEVEL MANUAL/AUTO selector to MANUAL.
2) For the audio channel 1 adjustment, set the METER SELECT switch to CH-1.
3) Adjust the audio channel 1 or 2 recording level by turning the CH-1 or CH-2 LEVEL control, so that the pointer of the level meter swings up to 0 dB at its maximum deflection.

5. While pressing the REC button, press the PLAY button. The recorder will be in the recording standby mode.
•The recording will start just after the REC and PLAY buttons are pressed if a camera is connected to the VIDEO IN connector.

6. Start recording by pressing the remote control switch on the camera or the PAUSE button on the recorder.

7. To stop recording momentarily, press the remote control switch on the camera again.

8. At the end of the recording, press the STOP button on the recorder.

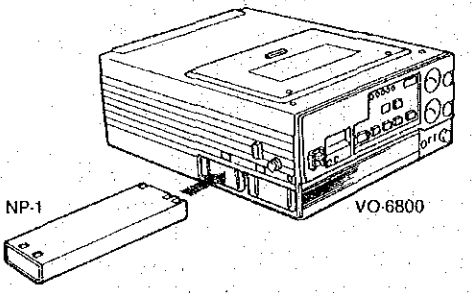
Pause Operation

To stop the tape momentarily during camera recording, press the remote control switch on the camera or the PAUSE button on the recorder. The PAUSE lamp on the recorder will blink during the pause mode. The E-to-E mode signal will remain displayed on the monitor connected to the recorder.
To release the pause mode, press the remote control switch on the camera or the PAUSE button on the recorder again.

Battery

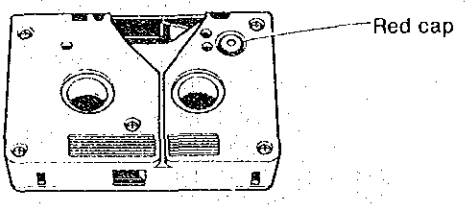
Installation

Insert one or two battery pack(s) as illustrated.

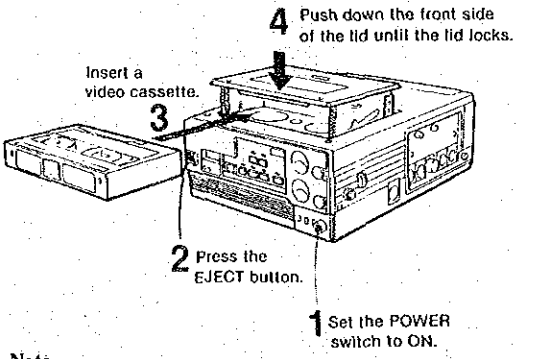


Safety cap on the bottom

Video cassette incorporates a convenient safety device to prevent accidental erasure.
To safeguard the material recorded on a cassette, remove the red cap on the bottom of the cassette. To record on this cassette later, replace the cap.



Video cassette insertion



Note

If the HUMID lamp lights when the POWER switch is set on ON, the moisture has condensed inside the machine. If this happens, do not insert a cassette. Turn off the power and wait until the HUMID lamp not longer alights when the power is turned on.

To remove

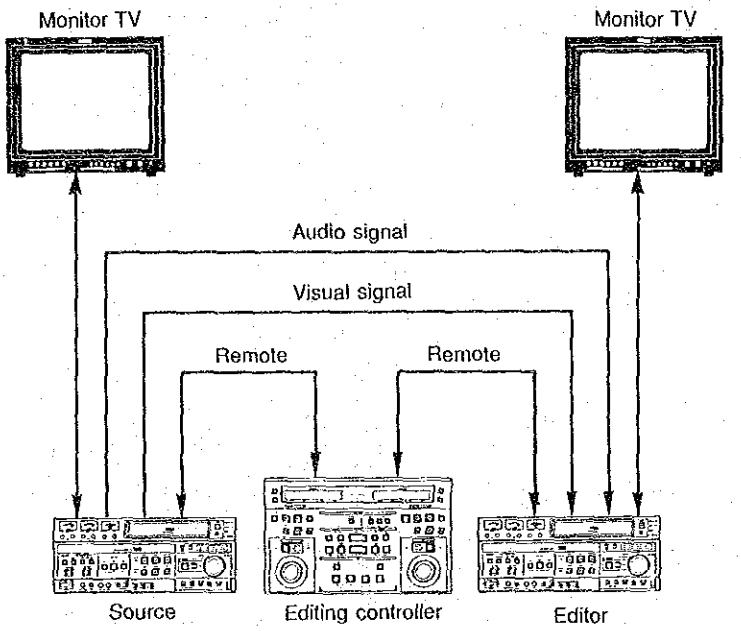
Make certain that the recorder is turned on and press the EJECT button.

5-4 Connection of Editing Controller and VCRs

(1) Automatic tape-to-tape editing

Tape-to-tape editing means editing from one tape (master) to the other tape (slave). In this case, we have to operate both VCRs. Normally the VCR with editing facilities have appropriate Automatic Control Unit.

Fig. 5-1 Preparation (Connections)

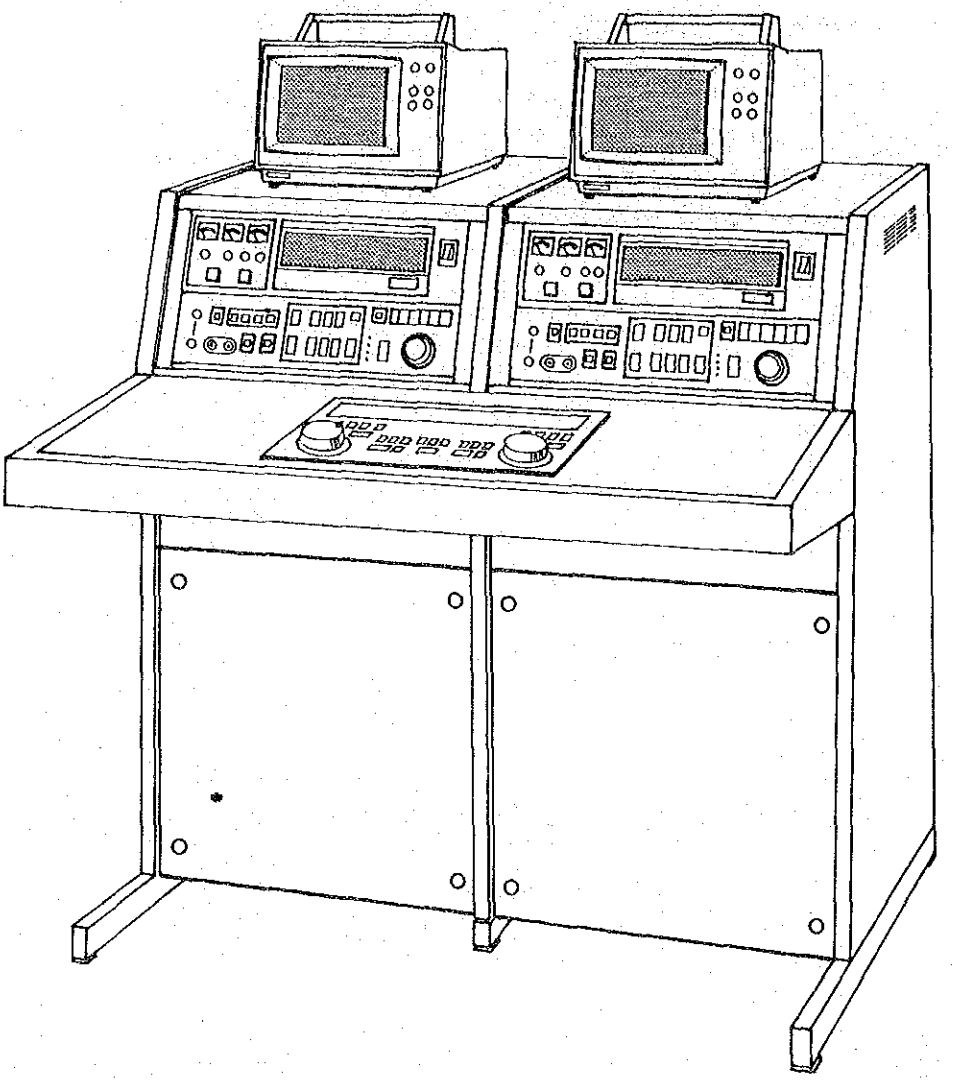


(2) Tape-to-tape editing console

The price of automatic control units are almost US$1,500. The tape-to-tape automatic editing system is priced between US$8,000 to US$12,000. Standard facilities of editing control units are:

- The digital tape time counters indicate elapsed tape time in minutes, seconds and tenths of second (with a minus sign). Counting continues uninterrupted even when the operating mode is switched from play to record.
- Automatic editing buttons permit automatic preroll and start of editing.
- Edit points may be found quickly and easily in both forward and reverse directions, at tape speeds of 5 times normal, and 1/20 normal.
- Editing can be rehearsed by pressing the PREVIEW button to check the editing point (the start of editing).
- The operating mode can be changed without pressing the STOP button between moded.

Fig. 5-2 Tape-to-tape editing console

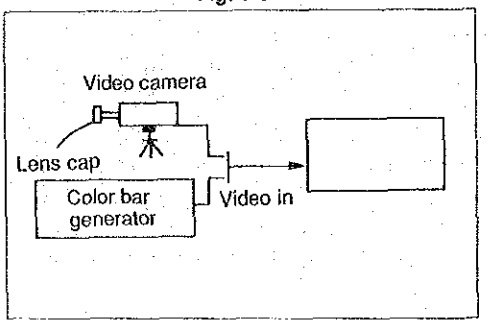


(3) Recording color bar

CTL signals are usually recorded together with the video signals. However, CTL signals can be recorded by themselves in the following ways:

— Record the signals from a camera whose BARS/WB selector is in place of BARS, or
— Record the color bar signal from a color bar generator

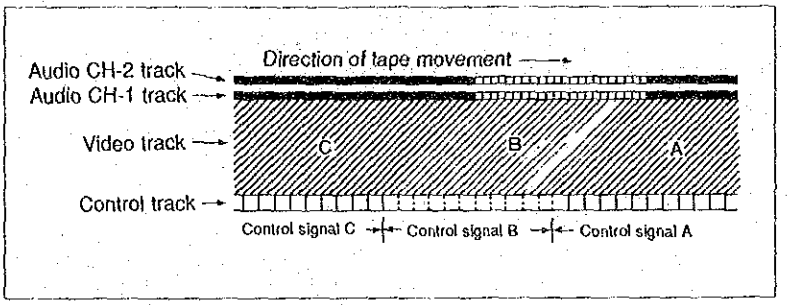
Fig. 5-3



An electronic editing comprised of an assembly editing and an insert editing.

Assembly editing

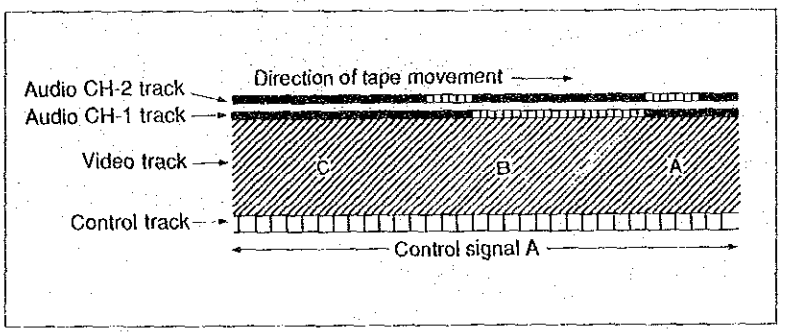
Assembly editing is to add the scenes as they are to be inserted in order. In this editing mode, video, audio, and control track signals (CLT) can be assembled at the end of the pre-recorded portions.



In assembly editing, a picture and a sound are recorded at the same time. Record B and C will be assembled after record A. And the assembly editing is effective for producing a short program such as the news program.

Insert editing

In insert editing, the tape recorded is inserted into the pre-recorded tape.



One can choose the insert channel, for example, to insert video only; audio channels 1 or 2 only; or both video and audio channels 1 or 2; or video and both audio channels.

One can record video and audio at the same time, or record audio after editing video, and vice versa. Control track signals should be recorded continuously beforehand when conducting insert editing.

So, the common way is to record color bar or camera signal on a tape.