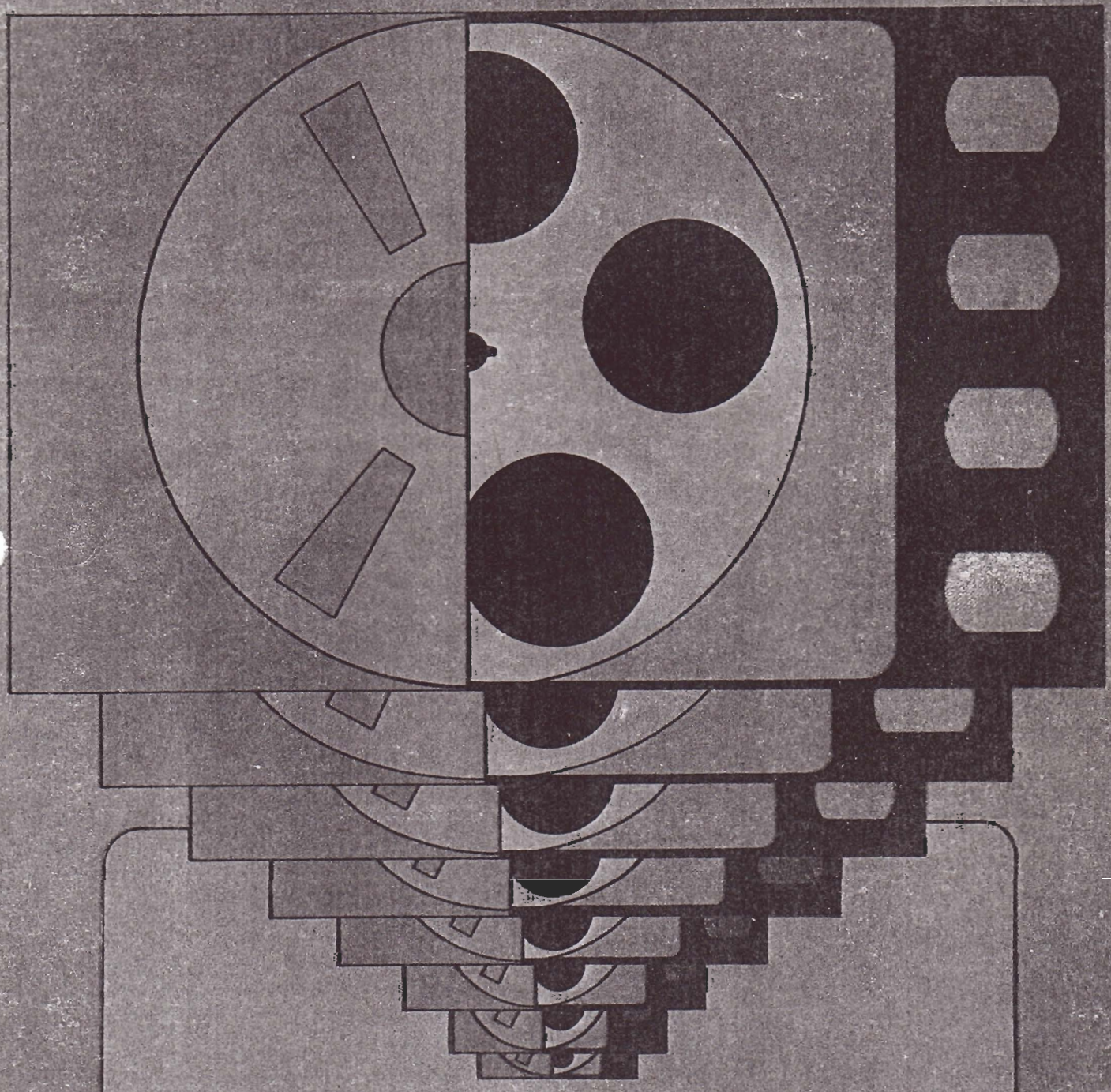
American Cinematographer

OCTOBER 1972 / 75 cents



SPECIAL ISSUE:

VIDEOTAPE & FILM

"VIDEOGRAPHY" WHAT DOES IT ALL MEAN?

A state-of-the-art report on the methods for making "film-type productions using electronic image recording and electronic post-production techniques"

By BOB KIGER

This is not an article about television. It's not about film either. It's about a newly emerging production medium which draws from the film aesthetic and the television technology. It has no official name but it might be defined as "film-type productions using electronic image recording and electronic post-production techniques." For our purposes we'll call it VIDEOGRAPHY.

The first productions utilizing videography were TV series and commercials. In 1972, *videography* is no longer confined to the broadcast medium. Within the next year a minimum of 20 theatrical features will be produced electronically. This can hardly be called a humble beginning.

Videography is viewed by some filmmakers with fear and the threat of lost jobs. Others see it as a panacea that will increase production and create new jobs. Many TV people scorn it as a bastardization of their medium; yet television engineers developed the technology that is making it all possible.

Whatever the point of view, it is an area worth investigating, for, as Marshall McLuhan has written, "There is absolutely no inevitability as long as there is a willingness to contemplate what is happening."

Television itself became a reality in 1928 when the first dramatic program was broadcast over WGM in Schenectady, N.Y. Commercial television did not become a popular medium, however, until after World War II.

During World War II magnetic tape recording was developed by German engineers. After the war magnetic technology was "imported" into the United States. It was to become the basis of modern audio and video recording.

In 1951 black and white videotape was first demonstrated by the electronic division of Bing Crosby Enterprises. Color videotape recordings were demonstrated in 1953 by RCA. Both these demonstrations were experimental.

The first commercial use of videotape was by CBS in 1956. They used an Ampex VR-1000X to delay "Douglas Edwards and the News", so that both East and West coasts could watch it at a civilized hour.

Then someone got the idea that other shows could be produced on tape and stored for airing at a later date. There was a great deal of initial excitement and production people in Hollywood heard cries that tape was going to replace film.

CINEMATOGRAPHER: "But can it shoot a man riding on a horse?"

Tape Man: "Well, no!"

CINEMATOGRAPHER: "Then forget it!"

And that's exactly what Hollywood did. Tape manufacturers didn't however. In 1959 Ampex reconverted a Greyhound bus, making one of the first mobile video units, and toured the country ballyhooing their video tape recorders: VTR's. Incidentally, this mobile unit is rumored to have taped an old swayback horse loping through Griffith Park.

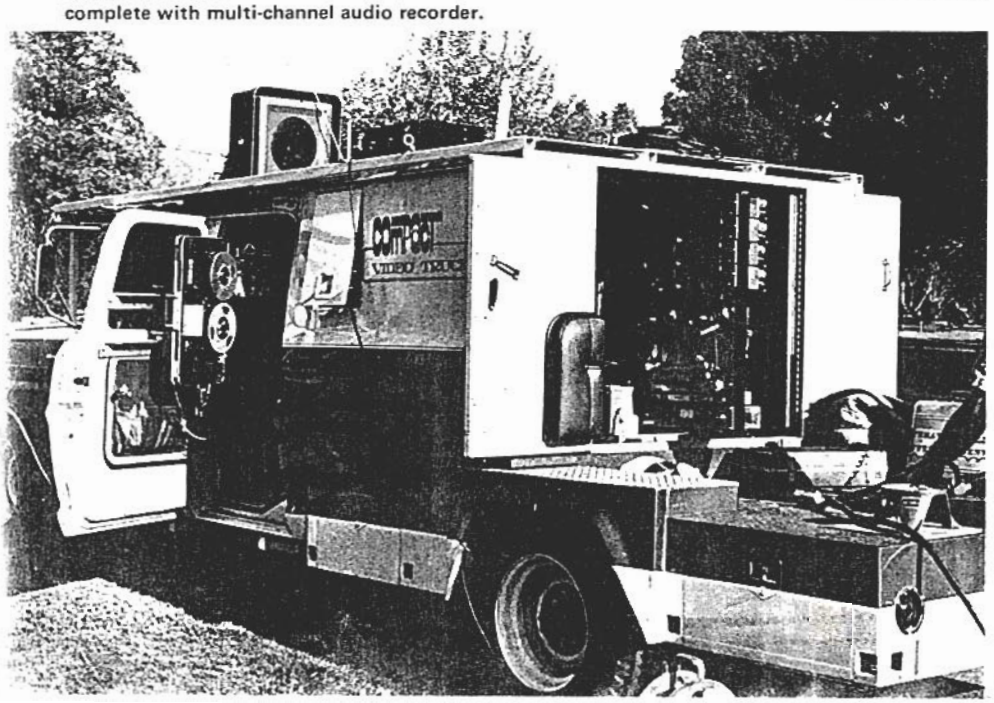
The first editing had come in 1958 through the technology of the razor blade and splicing tape. In the early 1960's electronic editing replaced the blade, but its creative use was quite limited until later in the decade. Up until this time, VTR sound had been confined to a single channel. An important step in the formation of a complete editing system was made when the Jackie Gleason Show first used double-system sound editing.

By the mid-1960's, electronics were in a "solid state" of affairs. Transistorized portable color cameras were first used for news and sports events.

In 1965 CBS and NBC both announced that they were planning full color programming. Coincidentally, high-band, solid-state, color video tape recorders were introduced. These VTR's were a great deal more stable, and of higher quality than earlier low-band units. This quality and stability opened new thresholds of electronic editing.

Electronic editing became a creative function—not just a way of joining two program segments. As tighter and more finely-timed edits were required, it became apparent that a way was needed to identify individual frames. In 1967 the first electronic time code, called EECO, was introduced by the Electronic Engineering Company. This code enabled an editor to preset the exact frame on which an edit was to occur. It met with such great success that several other companies developed similiar coding systems. In 1971 the Society of Motion Picture and Television Engineers wisely standardized one form of electronic time code which was fittingly called SMPTE Edit Code.

Side view of Compact Video Trucks' Mobile Unit #1. On the open door (left) can be seen the portable Ampex VR-3000 videotape recorder. In the rear is located the audio control center, complete with multi-channel audio recorder.



This kind of standardization has been the key to technical advances in television throughout its history—with one exception. Tape-to-film transfers were the direct result of non-standardization (between European and U.S. television systems). U.S. tape producers needed a method of syndicating their programs abroad. This was accomplished by Kinescoping, or photographing a TV monitor with a film camera.

The Kinescoped film did provide a syndication format but at a great loss in quality. Later systems such as Vidtronics silver transfers and Image Transform's recent proprietary system have increased quality to the point where it is difficult to tell whether the projected image was originally recorded on tape or on film.

In this capsule history, I have tried to point out the major breakthroughs in television technology leading to state-of-the-art *videography*. They are:

(1) Portable cameras and recording equipment, resulting from solid-state electronics

(2) Hi-band color videotape machines

(3) Increased precision in electronic editing

(4) Double-system sound editing

(5) Quality tape-to-film transferring

By putting them in a historical perspective we see that they came as a natural outgrowth of television's production needs. Slowly, almost imperceptibly, videotape production capabilities became applicable to the needs of the modern film producer.

VIDEOTAPE FORMATS

There are two types of videotape recording formats currently in widespread use: Transverse (quadhead) and Helical (slant track). Both of these formats operate on a 30-frame-per-second time-base, as opposed to film's 24 fps.

TRANSVERSE: This is the broadcast industry standard. Four rotating record heads (14,400 rpm) put the video signal on two-inch-wide tape, hence the nickname "quadhead" or "quad." These heads rotate on an axis almost perpendicular to the direction of tape transport, creating an "effective" head-to-tape speed of 1500" per second. This is the head-to-tape velocity necessary to achieve satisfactory picture quality with or without rotating heads. Without rotating heads, however, 450,000 feet of tape would be needed for a one-hour recording.

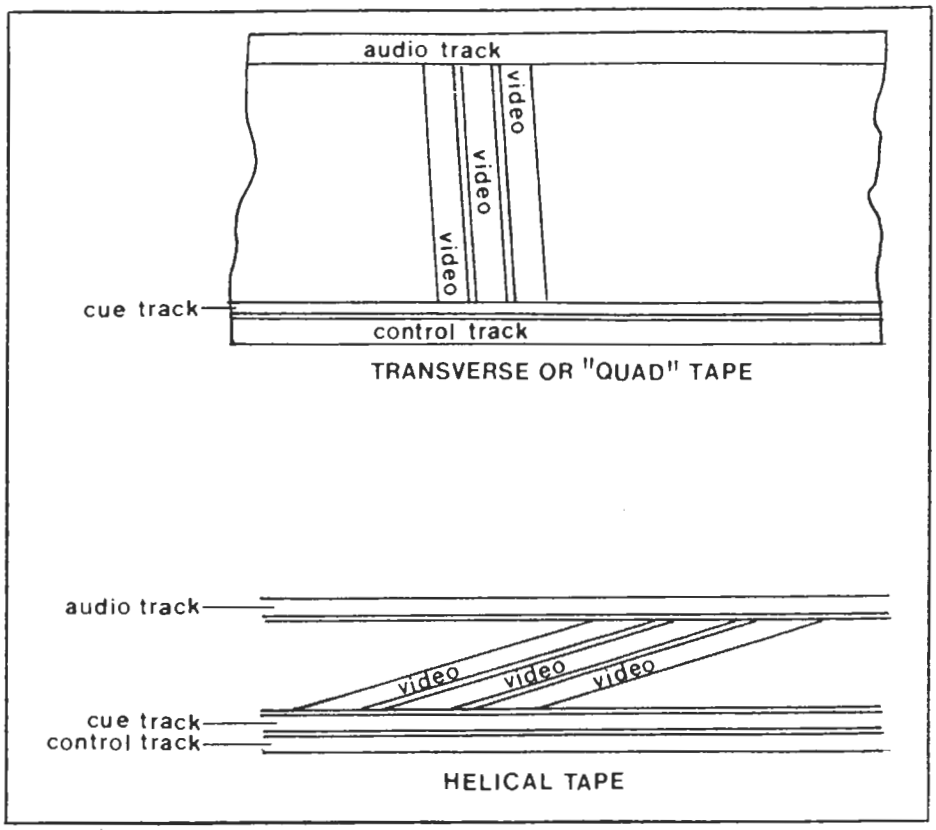
In addition to the transverse video tracks, three tracks are laid longitudinally on the tape. They are the audio track, the control track, and the cue track.

The audio track is the production sound and occupies the space at the top of the tape. The control track is a 240-cps signal used similarly to *pilotone* in audio recordings, (electronic equivalent of sprocket holes). The cue track is a second audio channel usually containing verbal cuing information, an electronic time code, or a second audio production track.

HELICAL: This family of videotape formats is commonly used for closed-circuit industrial and educational purposes. The video tracks are laid diagonally on the tape by two rotating heads, hence the nickname "slant track."

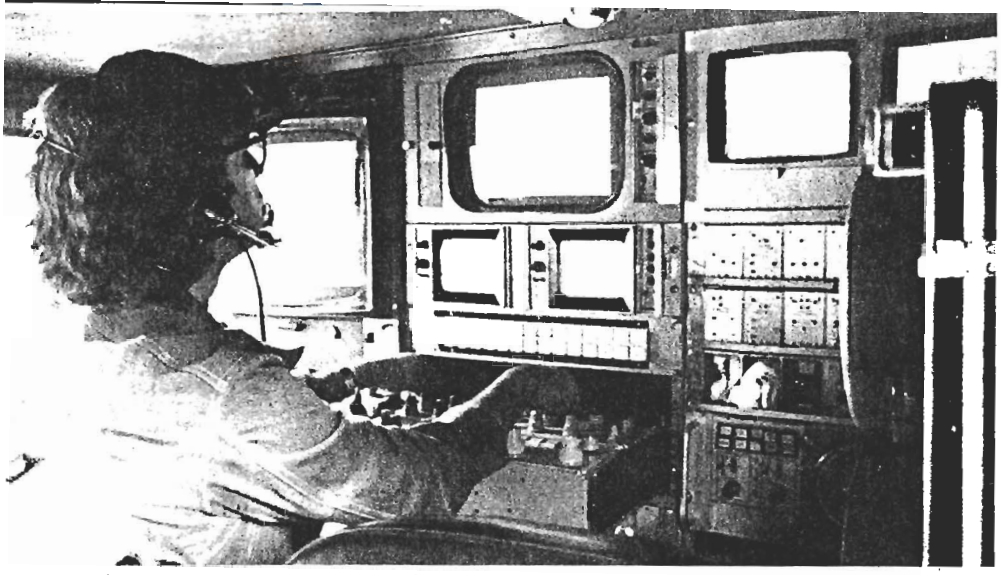
Helical equipment is relatively portable and inexpensive. Many machines have a still-frame capability, which is not available on quad machines. Both of these factors make it attractive for post-production.

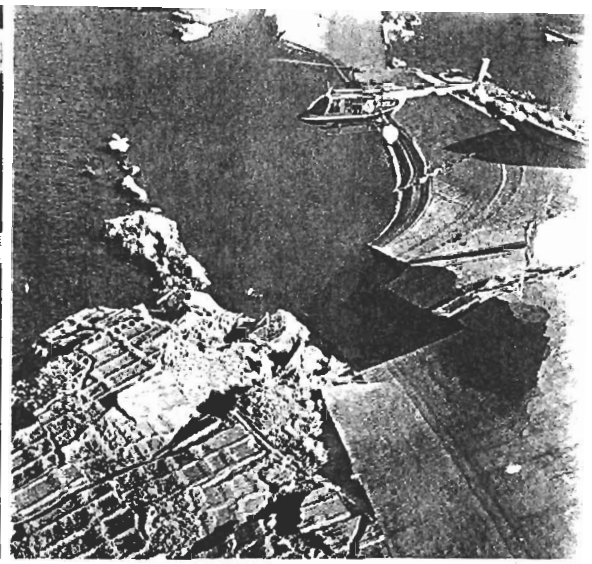
Helical "worktapes" are now being used by many producers to aid in the editing of quad shows. The actual edit-



HEAD-TRACKING CONFIGURATIONS FOR TRANSVERSE (QUAD) AND HELICAL VIDEOTAPE

(LEFT) Hand-held cameras are quite common in videography. Here a Norelco PCP-70 is used to record one of the "IMAGINATION" specials in Grand Canyon. (CENTER) Video operator shoots camera from boom arm of miniature mobile crane. (RIGHT) A cameraman's-eye-view through the PCP-70 electronic viewfinder. While the PCP-70 is hand-holdable with a harness, the author reports that he found it to be "at least twice as front-heavy as an Eclair NPR."





(LEFT) Inside mobile video unit's cab is the mini-control room which contains all video, switching, communications and test equipment. (RIGHT) A Golden West Broadcasters (KTLA) Telecopter hovers above the Van Norman Dam, which came near to collapsing after the 1971 San Fernando earthquake in California.

ing is done on the quad tape, but the *edit decisions* are made on helical.

Despite its low cost, helical suffers one major stigma. It is not standardized; tape widths vary from two inches down to ¼-inch, with a wide variety of head-tracking configurations.

For this reason, production on helical has generally been confined to situations where shooting, editing and release are done on the same equipment.

The quality of helical tape recordings has improved greatly in the past two or three years. At least two manufacturers claim their equipment meets FCC and EIA broadcast specifications.

The engineers whom I have questioned doubt that the tapes would hold these specs through the multiple transfer stages necessary for extensive post-production.

In summary, helical tapes are ideal for "in plant" use, as a production tool for quad tape editing, and as a release format for closed-circuit TV, cable TV, and some small broadcast stations. As a production medium for general release, they are not yet practical.

One last word of caution . . . Nothing in *videography* is constant. As these words are being written, helical equipment is being developed that meets quad standards completely, at one-third the price of quad equipment.

PRE-PRODUCTION:

The 1969 edition of the Focal Encyclopedia states, "Videotape recording should be used for time-delay purposes of any sort, but is inconvenient when much modification of the original program is contemplated."

This time-delay idea is the philosophical basis upon which TV tape production grew.

The director called shots from the control booth while cameramen, who were more engineers than artists, choreographed their 250-lb. cameras around the talent. Lighting was flat and hot, but the picture was acceptable *technically* from any angle.

The Technical Director punched up one camera after another at the director's command. If a cut wasn't perfectly timed, it was too late to worry about—make the next one better.

When the director finally faded to black the show was finished, and ready to be broadcast at a later time. This is *not* state-of-the-art *videography*.

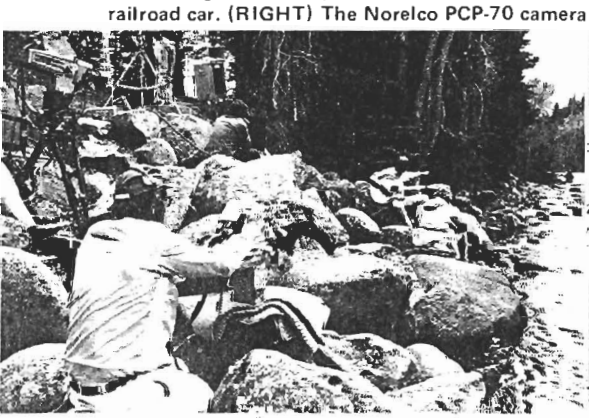
Today's tape producer can choose from a large variety of camera, switching, special effects and recording configurations to achieve the desired results with minimum expenditure in time and dollars. Some common setups are:

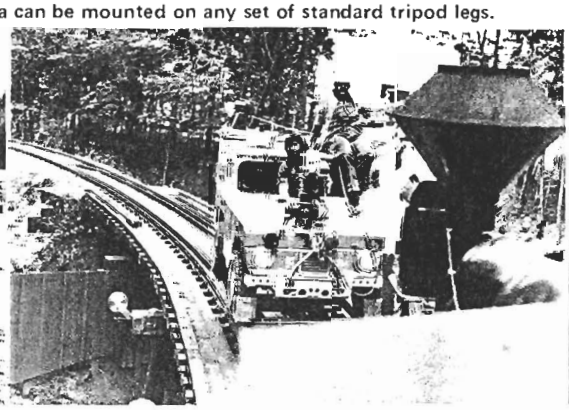
Single camera and recorder: Commonly used for film-style *videography*, this setup allows careful attention to lighting, dramatics and camera blocking.

Multiple camera/Multiple recorders: Two or more cameras are used. Each camera is recorded by a separate VTR. This is especially useful in scenes where above-the-line production costs are high (e.g. fights, chase scenes, high-priced talent).

Multiple camera/single recorder and slave: To save post-production time a multiple camera setup may be cut in camera, while the master shot is also recorded raw on a slave VTR. Cut-

Scenes which heretofore could be shot only with film cameras are now being recorded by videographers. (LEFT) Shooting a sequence of folksingers performing on a rocky riverbank. (CENTER) Compact Video Trucks' "10½" mobile unit records a scene while piggy-backed on a narrow-gauge railroad car. (RIGHT) The Norelco PCP-70 camera can be mounted on any set of standard tripod legs.





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All takes are slated and clapped when Nagras are used. This provides an easy sync reference. Many video units are now converting to stereo Nagras. One channel records the protection sound track, the second channel is fed the SMPTE code from the videotape. This provides electronic sync reference in the event dialog replacement is necessary. If a line is lost during production these stereo Nagras can be used to loop dialog on location. The talent recites his lines while watching a playback from the VTR. These lines are recorded along with the SMPTE code from the VTR until the desired reading is obtained. They are edited in later. All Nagra recordings for video are made with pilotone. The frequency recorded is 59.9 cps—not the 60 cycles familiar to film makers. Nagras will accept 59.9 without modification. In addition to protection tracks, the Nagras are used to record wild lines and sound tracks.

An optional 4, 8, 16, or 24-track recorder may be used in musicals when talent is singing or performing to playback. This technique, called Sel-sync, has been quite popular in TV variety production. Pre-recorded music tracks are played back through one or more channels of the recorder while, at the same time, the performer is being recorded in sync with this music on other channels.

The SMPTE code can be of great value in Sel-sync recording. One channel of the multi-channel audio tape recorder contains its own SMPTE code. This code is recorded on the production audio channel of the VTR's during playback. The Sel-sync recordings are mixed down in post-production and the mixed track is laid back on the VTR audio channel.

If this sounds very complicated, it is—to write or talk about. Its application, however, becomes quite simple once basic videographic principles are learned.

The two-camera unit we have discussed cost in excess of $600,000 to develop and build. Fitting all that equipment into a truck 20 feet long and 6½ feet high may sound a bit cramped. Not true. It is very efficiently engineered and quite comfortable. One feels like an astronaut sitting in the tiny control-room cab surrounded by electronic gadgetry. And the feeling is definitely "cool". Four custom-built portable air conditioners keep the unit at 68 degrees, even on a desert location.

Compact Video recently introduced a single-camera unit. It is 10½ feet long, has four-wheel-drive and can go anywhere, according to Bob Seidenglanz, the company's 27-year-old president. It already has taped while piggybacked on a narrow-gauge railroad car, forded streams and crossed desert dunes. These units are typical of the present trend towards mobility, coupled with increased production capability in location *videography*.

There is no question that videotape is getting off the ground as a competitive production format. A case in point is KTLA's Telecopter. Proven in news since 1958, it has covered many of Southern California's inaccessible mountain fires as well as last year's earthquake.

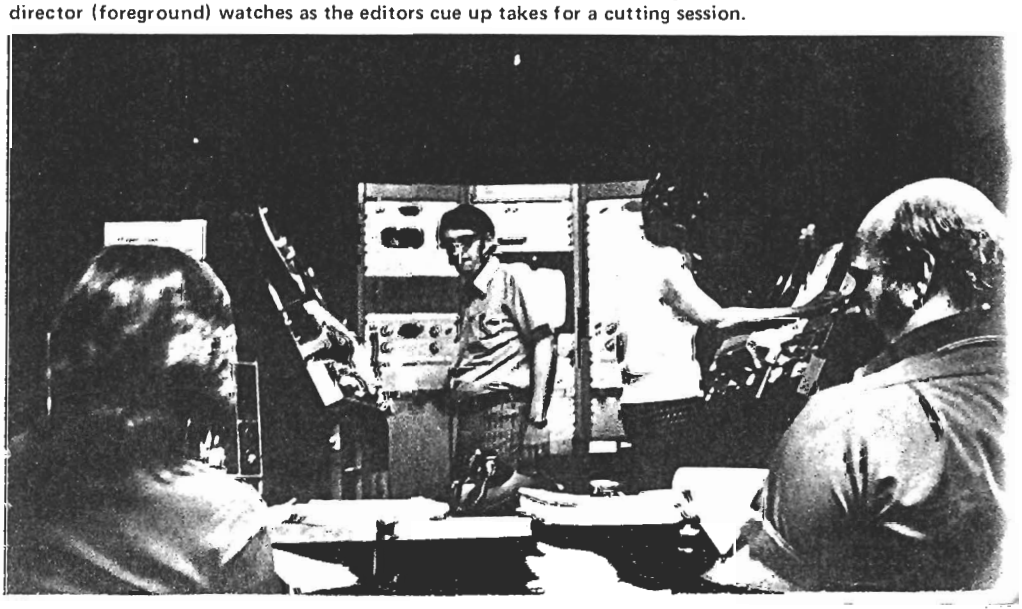
The telecopter is a Bell 206A Jet Ranger capable of speeds up to 110 mph. The camera, a Norelco PCP-90 Minicam, is mounted on a specially-modified Wesscam gyrostabilizer providing vibration-free pictures, even on long-lens closeups.

The video signal is fed via microwave antenna (located in a smaller outboard ball) to KTLA's video control, where it can be taped or fed live onto the air. In cases where distant locations are needed, an Ampex VR-3000 can be installed in the chopper to tape on location. The Telecopter is available to independent producers on an hourly or daily rental basis.

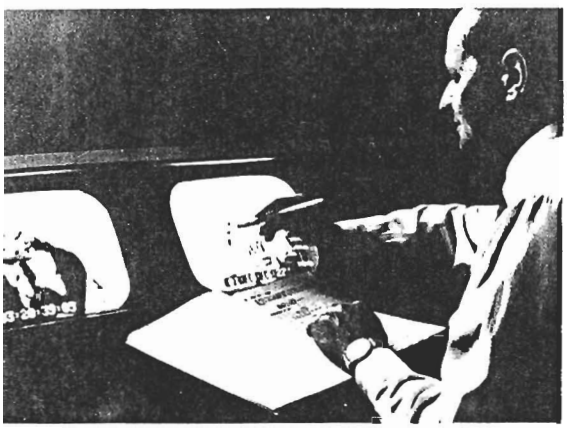
Videography's appeal is not confined to independent producers. Major studios are committing to tape production in varying degrees, from experimental pilots to full-scale productions. Vanguard in this conversion is the newly-formed Burbank Studio, housing Warner Bros. and Columbia Pictures.

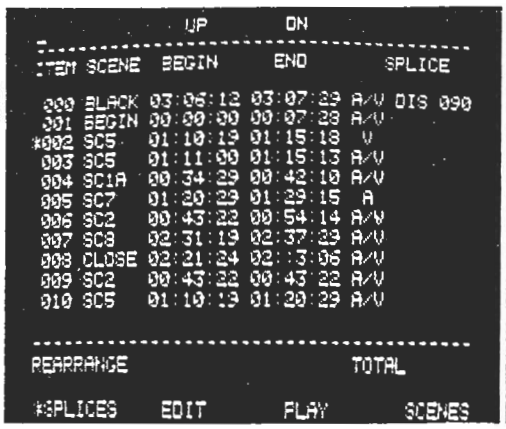
Burbank Studios are presently "tooling up" in a big way for *videography.* Sound Stages One and Two are being converted solely for tape production. Special epoxy-base floors are being laid for smooth camera dollying without tracks. Grid lighting is replacing the traditional scaffolding, and both stages are being "rounded off" by three-sided white cycs. Stage Three will also be used for tape, but it will retain the scaffolding. It is designed to house the more permanent sets.

No permanent video control facilities are being installed on these stages. The idea behind this is that large mobile units with any video facilities desired can be rented on a project basis. This



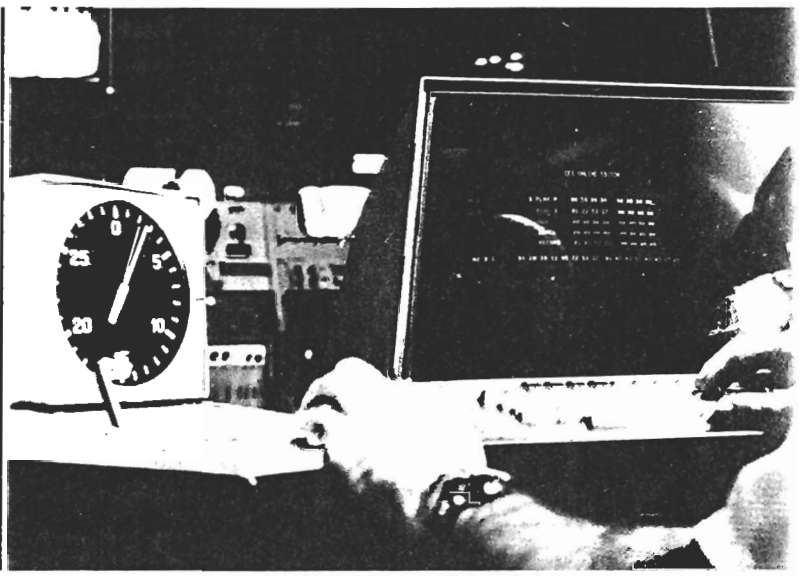
(LEFT) Dan Bergman, head audio mixer at Vidtronics, has been "sweetening" video production sound for many years. The sound editing is done double-system by interlocking a multi-channel ATR (in background) with quad videotape machine (not shown). In the foreground is a ¼-inch tape machine which automatically starts on a pre-set time code. All audio levels are controlled via the audio console. Systems are now available which use a helical video recorder to interlock with this audio equipment, at a great reduction in cost. (BELOW) Editing on-line at Vidtronics, the director (foreground) watches as the editors cue up takes for a cutting session.





(LEFT) Editing off-line with the CMX computer. Art Schneider of Consolidated Film Industries uses the electronic light pencil, ordering the computer to make an edit. A millisecond later, the cut scene will appear on the left-hand monitor. (CENTER) The CMX off-line editor will display, upon command, a complete scene list with start and stop times for all scenes in the production. The cut show can then be recut by touching the light pencil against the appropriate scenes and edit modes. (RIGHT) The CMX "menu" consists of different commands which the computer will implement. The operator need only touch the appropriate "entree" with the light pencil.

(LEFT) Master Control at CFI includes complete special effects, as well as computerized on-line editing. (RIGHT) An operator punches in a pre-program for the computerized on-line editor at CFI. At left is an Ampex HS-100 "slo-mo" recorder/reproducer. The computer will soon conform the quad tape originals automatically, including all dissolves and special effects.



provides maximum production capabilities with minimum capital outlay.

Companies such as Trans American Video, Golden West Videotape Division, the Vidtronics Co., and many more, can provide mobile units with varying production capabilities to fit the needs of virtually any project.

Many local television stations have mobile units which can be rented by tape producers. If a VTR is not available on board, the signal can be relayed back to the station via a prearranged TELCO hookup (telephone company lines are used). At the station the tapes are recorded. This system is somewhat less convenient than taping in the mobile unit, but it does provide an option for producers outside the major production centers. One word of caution: technicians at local stations are not as familiar with videographic techniques as crews that work with it every day. Make sure your production procedures are well understood before attempting such a project.

POST-PRODUCTION

V.I. Pudovkin, the great Russian director and film philosopher, once wrote, "The expression that the film is 'shot' is entirely false and should disappear from the language. The film is not shot but *built,* built up from the separate strips of celluloid that are its raw material . . ."

This timeless statement applies equally well to tape production. Not until tape had developed a solid editing capability could it compete in the production marketplace.

Editing videotape can be viewed as a chain of precision-made transfers. Unlike film, the original is not physically cut. Scenes are electronically "placed" in the desired order on a new reel of tape.

Modern videotape editing equipment has made accurate "placement" a reality. If desired, single frames can be assembled into a Kinestasis sequence. This is not to say that such an assembly is *practical,* but it is *possible*.

In its simplest form, electronic editing requires two VTR's—one to playback and one to record/edit. These machines must both be powered by a common sync generator and be "in phase" to assure a clean edit.

There are two basic editing modes:

ASSEMBLE:

Scene A is transferred. Scene B is then added to Scene A. Scene C is added to Scene B, etc. The entire program can be built in this way.

INSERT:

This mode inserts close-ups or

cutaways into the longer master shot at the desired points.

In either mode, the edits can be audio only, video only or audio and video.

Other picture sources besides tape can be edited into the show:

1) Film through a film-chain
2) Color, or "super" slides thru a film-chain
3) Live camera
4) Matte camera shooting titles

If dissolves are desired, the scenes are checkerboarded electronically into A & B rolls. Three VTR's are then used to make the final master (two playback—one record/edit).

There are two principal drawbacks to this basic editing system when viewed by the film-maker:

1) Editing points must be chosen at sound speed; the tape cannot be still-framed.
2) It is difficult to manually sync up the edit points so they are exactly opposite one another when the edit occurs. One scene may be slightly advanced or retarded.

Editing in the manner described above is commonly called *on-line* editing. The use of quad equipment is very expensive, and does not lend itself to creative playing and periods of extended deliberation. In order to minimize the cost of the creative-editing time needed in *videography,* methods had to be found which allowed editing off-line (on non-quad equipment).

An important breakthrough came with the development of the electronic time code which has now been standardized by the Society of Motion Picture and Television Engineers. This SMPTE code is in binary form and can be recorded on any open audio channel, representing real or elapsed time in hours, minutes, seconds and frames. We have already seen the code used in pre-production. Its use in editing is even more extensive.

This code can be thought of as "electronic edge numbers" for every frame. They are read by either an edit code reader, which is similiar in appearance to a digital clock, or they can be displayed in the picture monitor (without permanently affecting the picture).

Utilizing this edit time code, several methods of off-line editing have been developed. One method is to make a kinescoped workprint of the quad originals on 16mm or 35mm film. Picture and sound tracks can be cut and mixed conventionally and the original tapes can be conformed exactly to the cut workprint. This method allows great flexibility, but it is extremely slow (no

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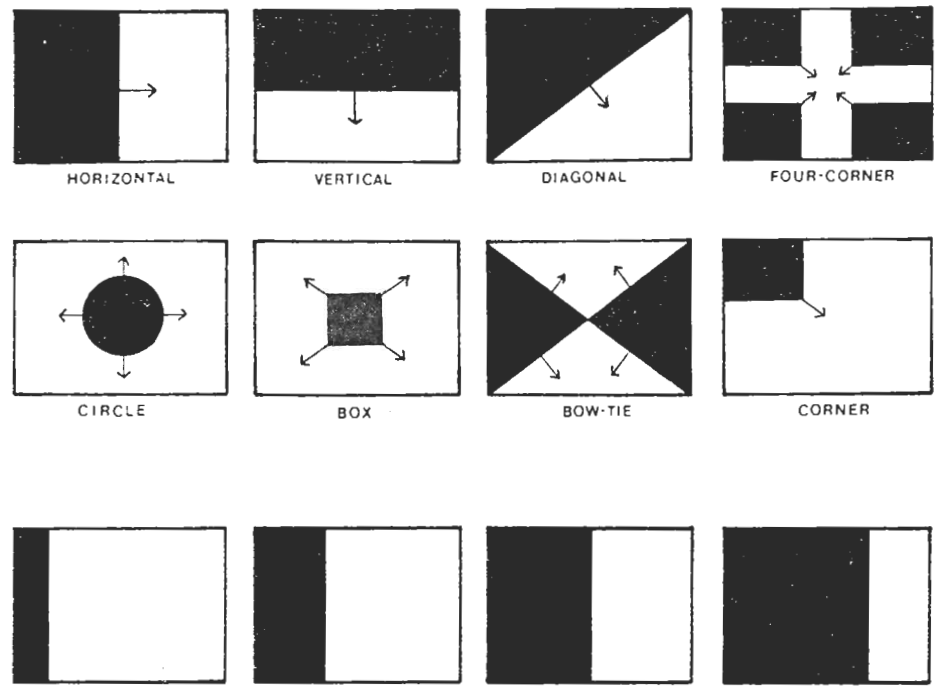
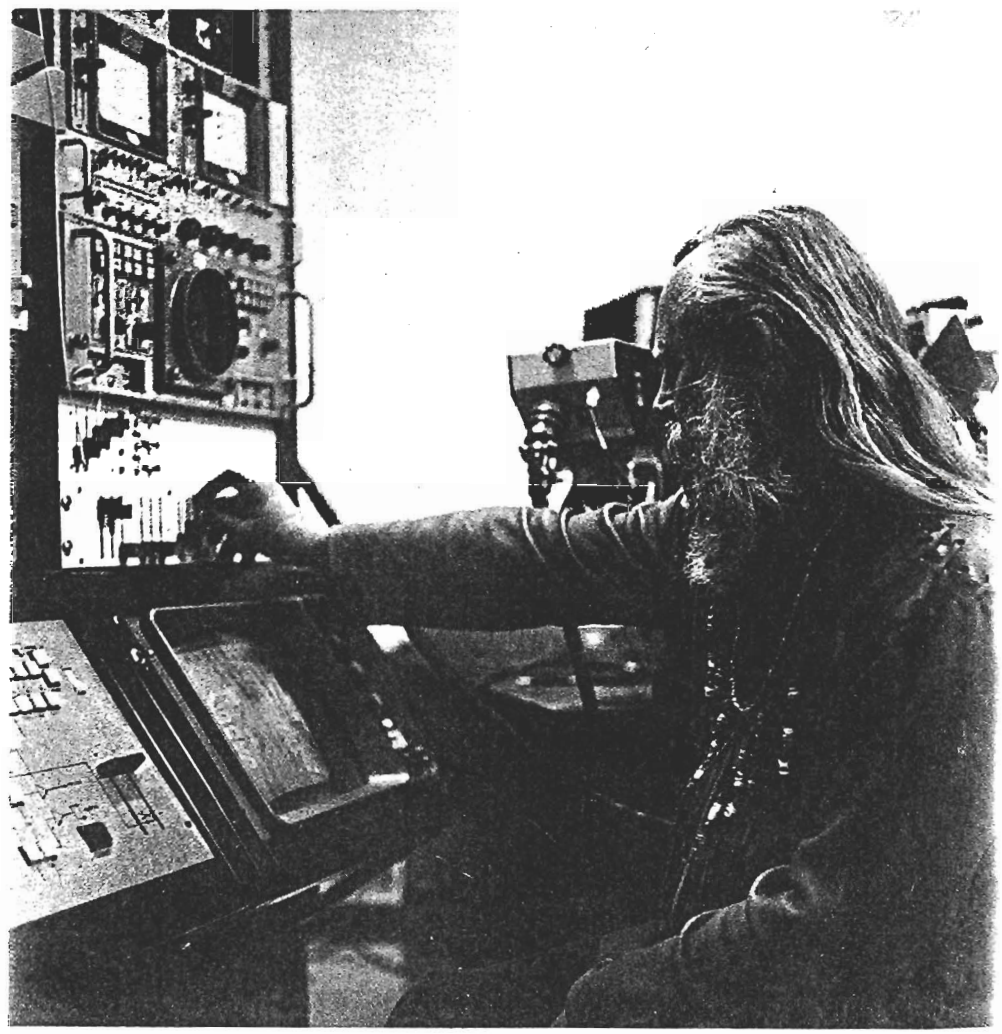


Shown at the top are eight of the most common wipes. By spilt-screening (stopping) in the middle of a wipe, an infinite variety of graphic mattes can be achieved. Shown below is a standard horizontal wipe that has been split-screened four different ways.

An art director manipulates a graphic image electronically, using equipment available at Computer Image Corporation. A growing number of firms are now offering computer graphics and animation services.



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faster than conventional film cutting) and the kinescoped workprints are rather expensive.

A second method is to make a low-cost *helical* work tape with the edit code displayed in the picture. This tape is reviewed and a shot list is developed showing the start and stop times of selected scenes. The helical recorder used to review the tapes is relatively inexpensive (bought or rented) and most can be still-framed. One hour of production editing time saved by this method will easily pay a week's rental for the helical recorder. The only disadvantage to this system is that the edits are not seen until they are actually made on quad tape.

This brings us to the most advanced off-line editing system to date: the CMX computer. A joint venture of CBS and Memorex Corp, the CMX utilizes disc memory capabilities to provide complete and instant editing.

Typical post-production on a CMX would go as follows:

1) All camera originals are transferred, with SMPTE code, to ½-inch helical tape.
2) The helical tapes are viewed and all good takes are logged. This is the equivalent of a rough assembly on film.
3) The logged takes are then loaded into the CMX memory-packs. (total memory is 27 minutes—which is usually adequate to cut a 10-minute reel)
4) Creative cutting on the CMX is done at a simple console with two monitors and an electronic pencil. The left monitor is for the cut picture, the right monitor displays the uncut scenes. The right monitor also has a complete scene list. By pressing the electronic pencil against any take on the screened list, we instantly call it up on the monitor. Supered over the scene will be the "menu" (editing modes that we can utilize by pressing the pencil against the screen). See illustration for the "menu"

In effect, the computer is splicing, rolling up trims, and storing them in microseconds. If a recut is desired, simply punch up the scene again and view it, press-edit and the new cut is made. No trims, no splicing and very little time involved. When the cutting is complete, the CMX gives a print-out of the scene list, with SMPTE code numbers to the frame. The CMX also makes a helical tape of the cut show and a paper-punch tape which is used to provide information for the assembly stage of the computer.

The on-line assembler searches thru the original quad tapes and transfers the selected takes onto A & B rolls automatically and with frame accuracy.

When the A & B rolls are complete they are dubbed onto a finished picture master with production sound track, and are ready for sound-track assembly.

The CMX provides the greatest amount of creative freedom in the least time of any system to date. Again, it should be mentioned that it is not the end but the beginning of computer-automated editing. The future promises even more advanced editing systems.

SOUND

Early sound effects and music cutting for tape shows were crude at best. Tracks were mixed in while the show was taping and consisted mainly of audience applause, presence tracks and other effects that did not require precise cuing.

Double-system sound editing greatly improved tape sound quality. A multi-channel audio tape recorder (ATR) was electronically interlocked with a quad videotape recorder. Effects and music tracks were cued in and recorded on an open channel of the ATR.

The main drawback of this system was that the picture was on quad tape. Since quad can't be still-framed, it was difficult to locate the exact frame where a precise sound effect should hit. (i.e., a bottle cork)

In the past six months, systems have been developed which *do* allow precision cuing. The basis of these systems is the same SMPTE code that is used for picture editing. A field-rate output can be used to lock a multi-channel audio recorder in sync with any video recorder that has a second audio channel.

Let us assume that our show has been cut and that picture and production (sync) sound track have been conformed on broadcast tape. The show is in need of extensive sound effects, several lines need dialog replacement and it must be scored.

First we transfer the entire show, with SMPTE code, to helical tape. Our composer sits down with this helical tape and gets his timings. He can still-frame just as he does presently on a Moviola, but with the added advantage that he is working with real time, not footages. He can then score the picture using either click-track or simple timings.

The sound editor works with this same helical tape and a multi-channel audio recorder, (4, 8, 16, 24 tracks). They are interlocked electronically by the SMPTE code. When these recorders are started together (not necessarily in sync) the audio recorder slaves itself to the video recorder and will "hunt" until it locks up.

Since the video is on helical tape, it is possible for the editor to still-frame or "rock and roll", just as with film, to find the precise frame where the sound effect should hit.

A ¼-inch recorder, or other sound source, is then slaved into the system. It can be preset to start up on any given time code. When the multichannel ATR hits the preset time code, the slave activates and its sound is transferred to one channel of the ATR.

All sound FX, music and dialog replacement tracks are built in this manner. Quality tape sound cutting is becoming a one-man/one-room operation.

Upon completion, the tracks are mixed onto the broadcast tapes, replacing the original production track (this track being transferred to one channel of the ATR for protection).

The system described above is relatively new, but a similar double-system sound operation has been used by Vidtronics of Hollywood for several years with remarkable results.

SPECIAL EFFECTS

Electronic special effects can be produced during production, during post-production and, to a more limited degree, while dubbing the A & B rolls.

The most common effects that are easily obtainable are:

1) *superimpositions*—A form of double exposure. A picture or graphic from one source is electronically superimposed over the picture from a second source.
2) *wipes and split-scenes*—Graphically apportioning the total format between two or more picture sources. By combining a wipe and a split-screen effect, we can achieve an infinite variety of graphic "mattes".
3) *electronic matting or chromakey*—One picture is cut into another picture in any area where the chromakey is "seen" by the second picture source. This is the equivalent of an "instant" traveling matte.
4) *sweep and polarity reversals*—The picture is reversed or flipped upside down, or converted to a negative image. These effects are accomplished by flipping a switch.

There are other less common effects,

but these four comprise the majority of special effects normally used. Any combination of picture sources (camera, VTR's, film, graphics, slides) can be used as the raw material for electronic special effects.

If an Ampex HS-100 Recorder/Reproducer or an HS-200 Teleproduction system is available, even greater varieties of special effects are obtainable. These units utilize memory-disc technology to obtain slow or fast motion, freeze-frames and single-frame assemblies, such as animation or Kinestasis.

Titles can be matted with an appearance similar to burn-in titles on film. The advantage of tape is that the matted title can be colorized by simply turning a knob. It can also have an electronic drop-shadow, if desired.

Electronic technology is providing completely new horizons for the field of animated graphics. An original is videographed; and the signal is sent into a computer. This computerized image is displayed on a color monitor. By turning dials on the control panel, the graphic image can than be electronically manipulated in an infinite number of ways. It can be moved in any direction, shrunk, expanded, twisted, contorted, fragmented—the list of effects is limitless.

In this section, I have simply attempted to overview electronic special effects. There can be no question that they greatly enhance *videography's* appeal as a total production medium. The cost of achieving most effects is relatively inexpensive, compared with film opticals. The time needed is minutes or perhaps hours—not days. Like all panaceas, however, they can be abused, but when used with taste and moderation, they are an exciting tool.

BUDGET AND SUMMARY

This article has attempted to give filmmakers a basic understanding of videographic processes and techniques. It would fall short, however, if it did not discuss the economic state-of-the-art.

The best way to evaluate tape production costs is in direct comparison with the industry standard: 35mm film. What follows are separate budgets (2-inch quad tape/35mm film) for a one-day location shoot in Southern California. These budgets are presented within the following parameters:

1) All equipment, both film and tape, is rented. Both crews are comparably equipped, with a single-camera mobile unit, and audio, lighting and grip packages.
2) The crews are the minimum number necessary to efficiently operate the equipment and are paid prevailing union scale in the Hollywood studio area, based on a 10-hour day.
3) Only basic production crews are considered (camera, sound, electrical and grip). Directors, and other production personnel requirements, are presumed common for tape or film.
4) On this one-day location shoot, both crews bring back ONE hour of sync-sound dailies in Budget #1 and TWO hours of sync-sound dailies in Budget #2.

There are those who will argue that not all takes are printed in film. Selective workprinting is not being considered in this budget because it is offset by the videotape's capability of being erased and reused in subsequent productions.

Tape reusability and film selective workprinting are both factors to be considered in the final analysis, but for our purposes, they would needlessly complicate the budgets.

Our production day ends when the director and producer sit at a Moviola or a TV monitor, watching the entire day's principal photography with sync-sound.

TAPE vs 35mm FILM
BUDGET BREAKDOWN

EQUIPMENT	TAPE	FILM
Mobile unit utility vehicle w/driver, all lighting and grip and sound equipment	$1500	$750
CREW		
Cameraman/D.P.	145	230
Ass't Cameraman	–	77
Grip	109	100
Gaffer	109	100
Best Boy	87	60
Video Operator	127	–
Soundmixer	180	138
Boom Operator	104	83
TOTAL CREW	$ 861	$ 788

STOCK	(1) Hour of Orig.	(2) Hours of Orig.	(1) Hour of Orig.	(2) Hours of Orig.
Original & Proc.	$245	$490	$1332	$2664
Film Workprint	–	–	712	424
Worktape (½ helical)	100	200	–	–
¼" tape	7	14	7	14
35mm sound	–	–	160	320
Ass't Editor	–	–	50	100
TOTAL	$2720	$3065	$3784	$6045

Editing and post-production costs of tape vs. film are not as simply compared as principal photography costs. This is due to the vastly different time-base of the processes.

The tape producer allots hours or days for editing. The film producer thinks in terms of weeks or even months. It is no wonder that electronic editing costs ($150-200 per hour) cause coronary palpitations among the uninitiated.

The key to economical tape editing is to keep experimenting and creative playing away from quad equipment (off-line).

If you're building the great American montage sequence, plan it completely on paper with the aid of a helical machine or kinescope a film workprint and cut it conventionally, or use the CMX computer, but whatever choice you make, have it well planned out before editing the quad tapes.

The one hour of tape original should be cut into a finished 10-minute show with all titles, special effects and sound tracks in approximately one week. Below the line post-production costs would be a minimum of $3000 and a maximum of $5000.

This is more expensive than film editing costs, but in light of the time saved in post-production, combined with the dollars saved in shooting, *videography* is certainly economically competitive with 35mm film. Tape cannot compete on a dollar basis with 16mm film at this time.

Will tape be the major production medium of the future?

As I sit here at my desk 10 minutes from many of the world's best-equipped video production facilities, it is easy to say, "Yes!" But suddenly I am imagining myself in Oregon or Delaware or Oklahoma and I've got to qualify this answer.

The cost of a modern tape facility is very high. It requires a major urban area with substantial production to justify these costs. The established production centers (Los Angeles, New York and Chicago) are already doing more and more tape production for television programming and commercials. In addition to TV products, a growing number of features are being produced on tape. Even some industrial fil . . . (I keep wanting to say *film*) projects have been successfully done on tape.

As production volume has increased, so has the number of technical facilities. The economics of a competitive system have begun to reduce video production costs. In the past two years, film processing costs have increased approximately 20%, while video post-production costs have decreased 10-15%.

Because of the reduced costs, more productions are being done on tape, requiring additional technical facilities and more competitive pricing . . . a cycle has begun. The relevant question may not really be, "Will tape become . . . ?", but rather, "*How soon* will tape become . . . ?" ■