American Cinematographer

OCTOBER 1972 / 75 cents

SPECIAL ISSUE:

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EXCLUSIVE CSC CONVERSIONS

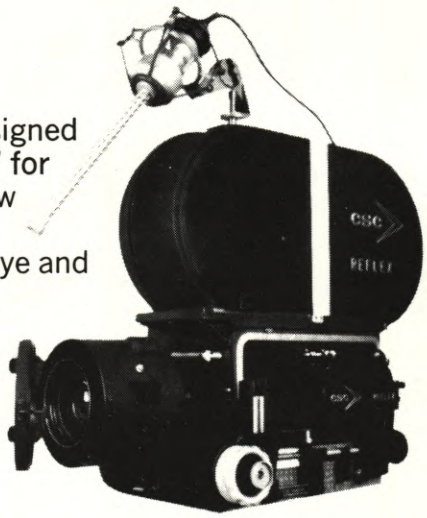
EXCLUSIVE CSC CONVERSIONS

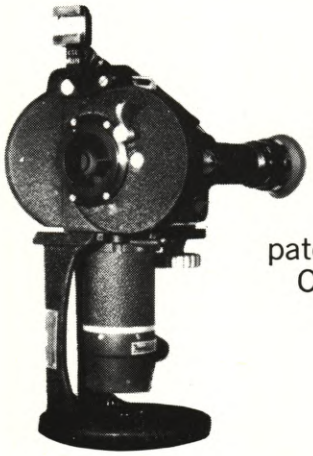
EXCLUSIVE CSC CONVERSIONS

THE CSC/BNCR

The new improved optical system designed especially for use on "The Godfather" for extreme low light level shooting is now standard on all CSC/BNCR cameras. 25% more light reaches the viewing eye and eliminates loss of image on fast pans and tilts.

Note the new lens housing—this permits use of microphones within 12 inches of the camera.





THE CSC ARRIFLEX 2C "HARD FRONT" CAMERA

This is the new CSC Arriflex 2B to 2C conversion featuring the same patented lens locking mechanism as the CSC/BNCR. Now you can interchange lenses between our BNCR, Arriflex and R-35 cameras.

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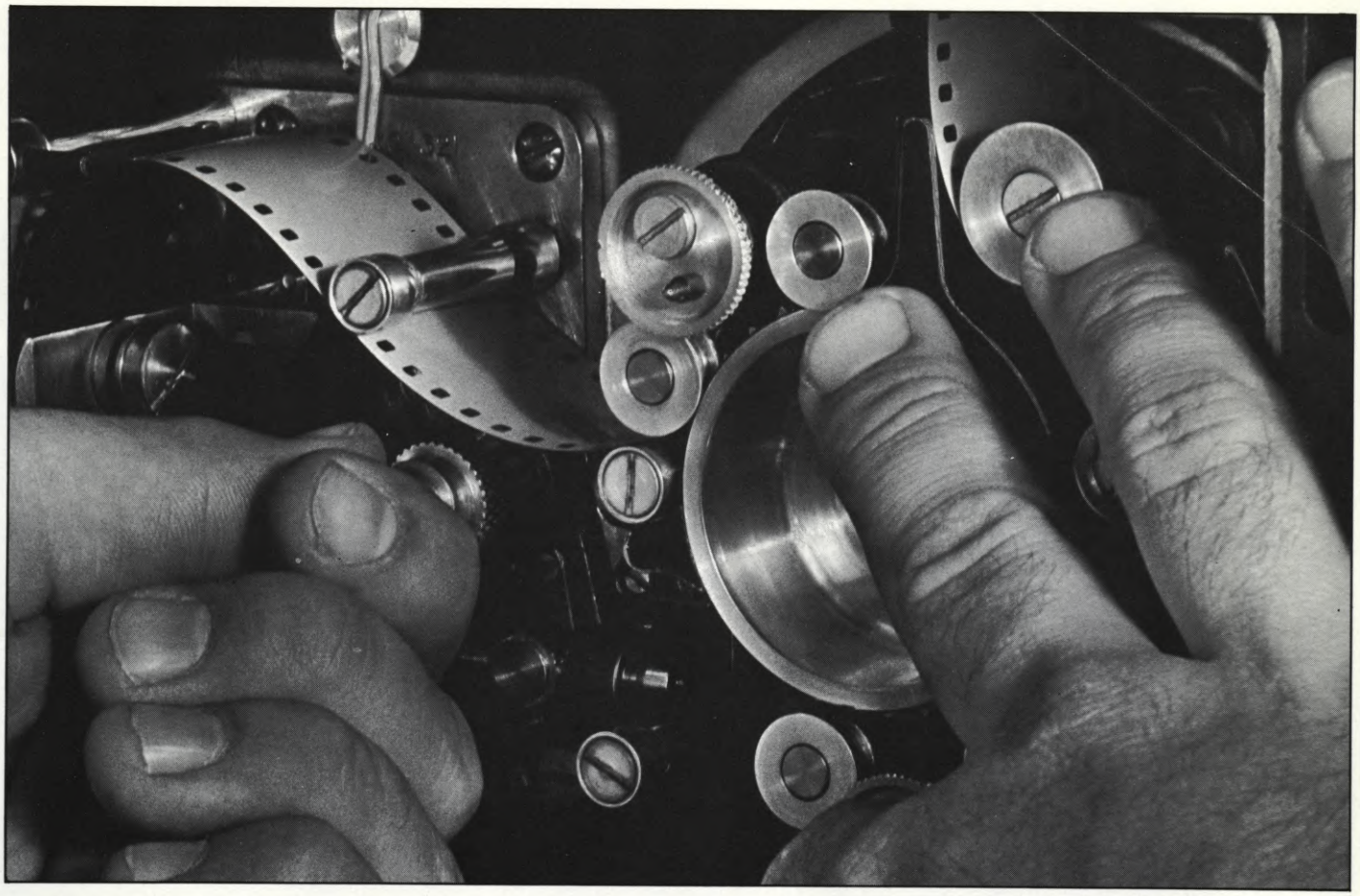
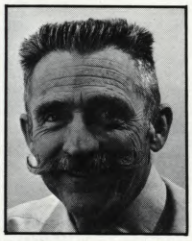


Every time a Duncan camera goes out on rental, we run film through it first. Every time.

Body, lenses, motor and magazines are tested separately *and together.* Reliability means taking pains.



Victor Duncan, A.S.C.

"As a cameraman, I thought: 'At these prices, surely it's possible to deliver rental gear that has really been checked out — and still make an honest profit.' So I tried it, and proved it's true!"

That's Victor Duncan speaking. And that's why he went into the rental business. He knew from vivid personal experience what it's like to have a rented camera break down on the job.

"Cameras need expert attention," *says film maker David Orr.* "Duncan has the people and the facilities—so I rent what I need, and let *them* take care of the maintenance. They know what they're doing."

Cameraman Jerry Callaway has taken Duncan rental cameras on location to South America and to Israel. **He didn't run tests on the cameras before leaving, in either case. "I knew they'd done that at Duncan's," he says.**

Service, Sales, Rentals

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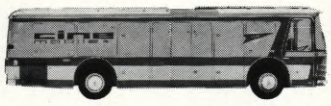

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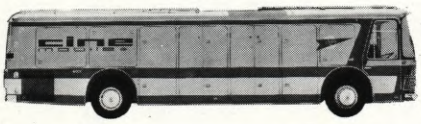
TELEVISION SPECIALS



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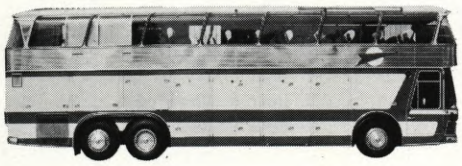
TELEVISION FEATURES



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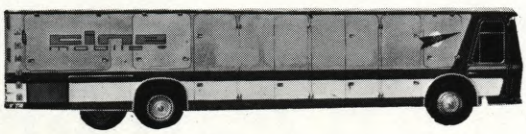
FEATURES



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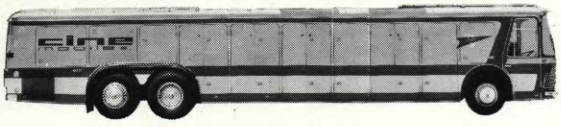
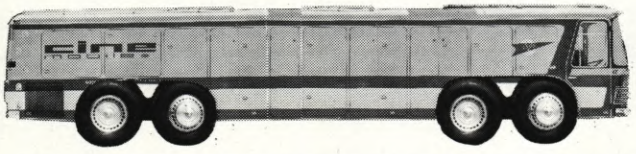
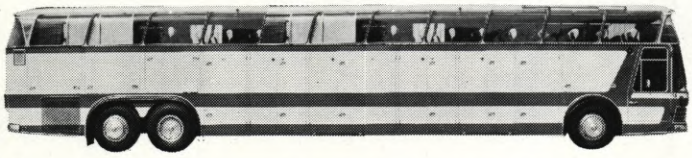


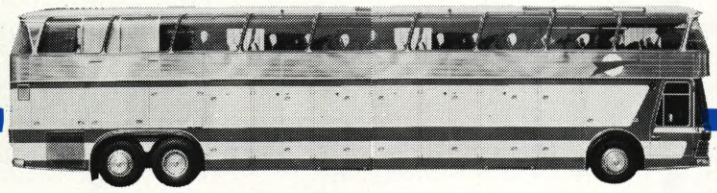
CINEMOBILE MARK 7
6 WHEEL DRIVE



CINEMOBILE MARK 8
8 WHEEL DRIVE



CINEMOBILE MARK 9
TELEVISION SERIES



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OCTOBER, 1972 VOL. 53, NO. 10

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• FEATURE ARTICLES

• DEPARTMENTS

ON THE COVER: Abstract representation symbolizing the growing debate as to whether videotape will seriously challenge film as a medium for the production of theatrical features. Cover design by Perri & Smith.

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Eleven of the thirteen award

Again, for the fourteenth consecutive year —
than all other makes combined! We are proud
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*Eleven of the thirteen winners in the 1972 awards used Arriflex cameras and during the past fourteen years, Arriflex scored in 171 of the total 219 awards .

14 th Annual Film

congratulations to these prize

Addressograph Multigraph Corp.
"BRUNING 875"
Producer/Director — Richard Paradise

American National Red Cross
"MORE THAN COFFEE AND DOUGHNUTS"
Producer/Director — Allan Rettig

Bureau of Mines, U.S. Dept. of Interior
"HAULAGE SAFETY IN LOW COAL MINES"
Producer — Samuel Sappo

Dept. of Travel Industry, Government of British Columbia
"ISLAND EDEN"
Producer/Director — Norman Keziere

General Mills, Inc.
"IT'S A CRIME"
Producer — R. N. Harvey *Director* — G. Lindberg

Los Alamos Scientific Laboratory
"COMPUTER COLOR GENERATIONS"
Producer/Director — Mario Balibrera

winners used Arriflex cameras!

more winners* filmed with Arriflex cameras that Arri motion picture equipment continues professional cinematographers.

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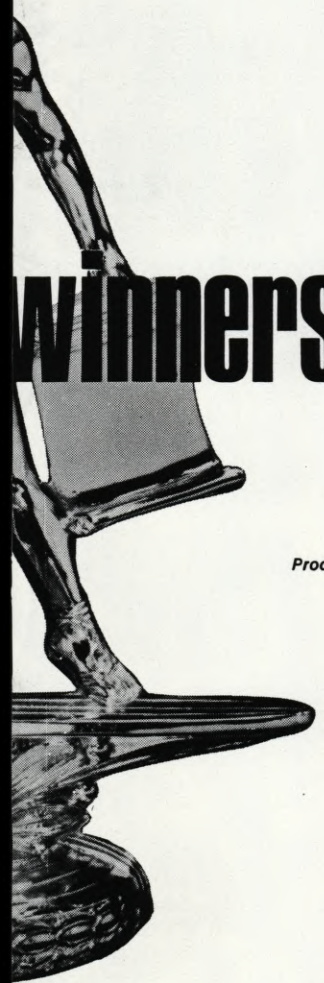
conducted by Industrial Photography Magazine



winners who won with ARRIFLEX®

McDonnell Douglas Corp.
"DIAMOND IN THE SKY"
Producer — Thomas R. Carlisle *Director* — Vincent J. Griffith

Naval Missile Center, Code 5621
"TUFFY, THE SEA TEACHER"
Producer — Wallace Southard *Director* — Leon Rosch

Naval Weapons Center
"MAN FROM LOX"
Producer/Director — S. M. Shelton

Union Pacific Railroad Co.
"AGRICULTURE ON THE MOVE"
Producer/Director — Ralph R. Burrell

United Delco
"LIVE WIRE WORLD"
Producer — J. W. Bostwick *Director* — Robert Senglaub

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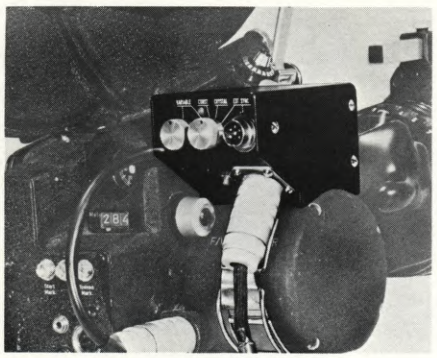
WHAT'S NEW

IN PRODUCTS, SERVICES AND LITERATURE



CRYSTAL SYNC CONTROL FOR 16BL

The time-proved Jensen Model 505 Multisync crystal sync control for Arriflex BL cameras is now available in the United States through Image Devices Incorporated and its dealers in principal cities.

Multisync 505 units clip directly to the Arriflex BL motor housing cover, requiring no tools whatever and utilizing existing cables and batteries.

Pre-wired for radio slating, the unit adds nothing to the camera dimensions and weighs only 12 oz.

Multisync units have a variable speed range from 10 to 50 fps and an accuracy better than 1/6 frame per 400 feet of running film (10PPM). Provisions are included for external sync reference so that equipment can be slaved from any pilot source and an automatic out-of-sync safety stop (having a manual override) warns against loss of synchronization for any external reason without interfering with sound recording or requiring visual observation of "red light".

Available for immediate delivery from stock, the Multisync 505 lists at $750.00. For further details contact Will Williams, Sales Manager, Image Devices Incorporated, 811 Northwest 111 St., Miami, FL 33168; Telephone (305) 754-4141.

•

NEW ULTRASONIC FILM AND TAPE CLEANER

CAI announces a new ultrasonic film and tape cleaner. Designed for the film and tape industry to speed the cleaning of strip material up to 130' per minute, safely, with no harmful effects to film base, color balance, sound tracks, etc., Model FT1000 utilizes a low toxic Freon® solvent which is continually being distilled, removing water and contaminates and eliminating the problems of streaking and dumping. This unit runs quietly and because the built-in recovery system keeps the toxic level so low, it can be installed right in the printing room. Run any standard size strip with quick-change snap-on rollers and controlled variable tension. There's no need to stop this CAI machine except to load or unload strip. Power is supplied by a patented Westinghouse solid state generator. The blower system keeps air filtered down to 5 microns. More information is available from Clean Air, Inc., 124 Hebron Ave., Glastonbury, Conn. 06033; 203/633-5295.

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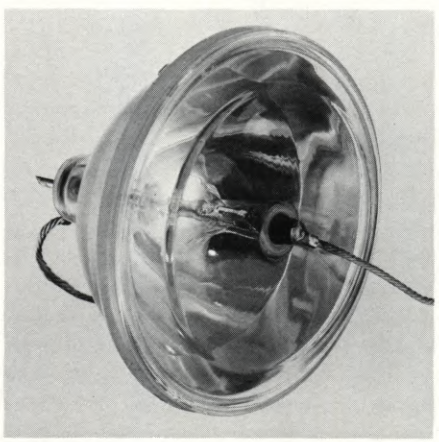


GE INTRODUCES FIRST COMPACT SEALED BEAM XENON ARC LAMP

A compact, 500-watt xenon arc projection lamp which produces as much screen brightness as many higher-wattage arc and incandescent projection lamps has been developed by the General Electric Company.

The first compact, xenon arc lamp to be enclosed in a sealed beam unit, the GE XE-500 is designed for use in projectors in small motion picture theaters and school auditoriums for the projection of 8mm, Super-8, and 16mm movies and slides. It also can be used in "follow" spots.

The xenon arc tube is mounted inside a 5¾-inch diameter sealed beam bulb at the focal point of its elliptical reflector. The reflector has a dichroic filter which reflects the light but transmits much of the lamp's heat back through the reflector; this "cold mirror" reduces the heat through the film.

The arc tube is surrounded by an atmosphere of inert gas. This prevents oxidation which could destroy the arc tube seals, and also is responsible for the lamp's compactness. Xenon arc lamps of comparable wattage which lack this protection of the seals typically have an overall length of seven to eight inches, according to GE.

Used with an optical system featuring an F/1.6 by two-inch lens and a 16mm aperture, the GE projection lamp produces about 1600 screen lumens.

The XE-500 has a color temperature of approximately 6000 degrees Kelvin, and maintains its excellent color quality throughout life. Rated life of the lamp on a 20-minute on-off cycle is 500 hours. Longer life is possible with longer "on" periods.

No warmup is required for the lamp, as it produces almost full light output when turned on. It can be restarted instantly if power is interrupted or if the lamp is turned off.

Several manufacturers make power supplies for the XE-500EAR46.

•

NEW TREISE CLEANER/WAXER

Recently announced by Treise Engineering is their new Cleaner/Waxer designed to handle 8/16mm or 16/35mm film. It is ideal for use in cleaning and lubricating film for use in cassettes, renovating old roll film, or providing deluxe protection for newly processed film.

"Firms find it cheaper to print and process on 35mm," says Tom Treise, General Manager, "and then split the film into 4 strips of 8mm for use in cassettes. Since this method usually results in slits and feathers, it's desirable to clean and lubricate the film prior to use. Otherwise, this extraneous matter will interfere with the cassette operation."

As the film moves through the Cleaner/Waxer, a nylon velveteen-covered head (moving in opposite direction to the film flow) wipes and scrubs the film clean, first on the cell side, and then on the emulsion side. From here, the film goes into two drying loops. Afterwards, it is waxed on one side, then dried, and waxed on the other side, and dried again. Old roll film renovated in this fashion looks and operates practically like new. When used with new film, this is a deluxe service that can establish any processing laboratory as foremost in its area.

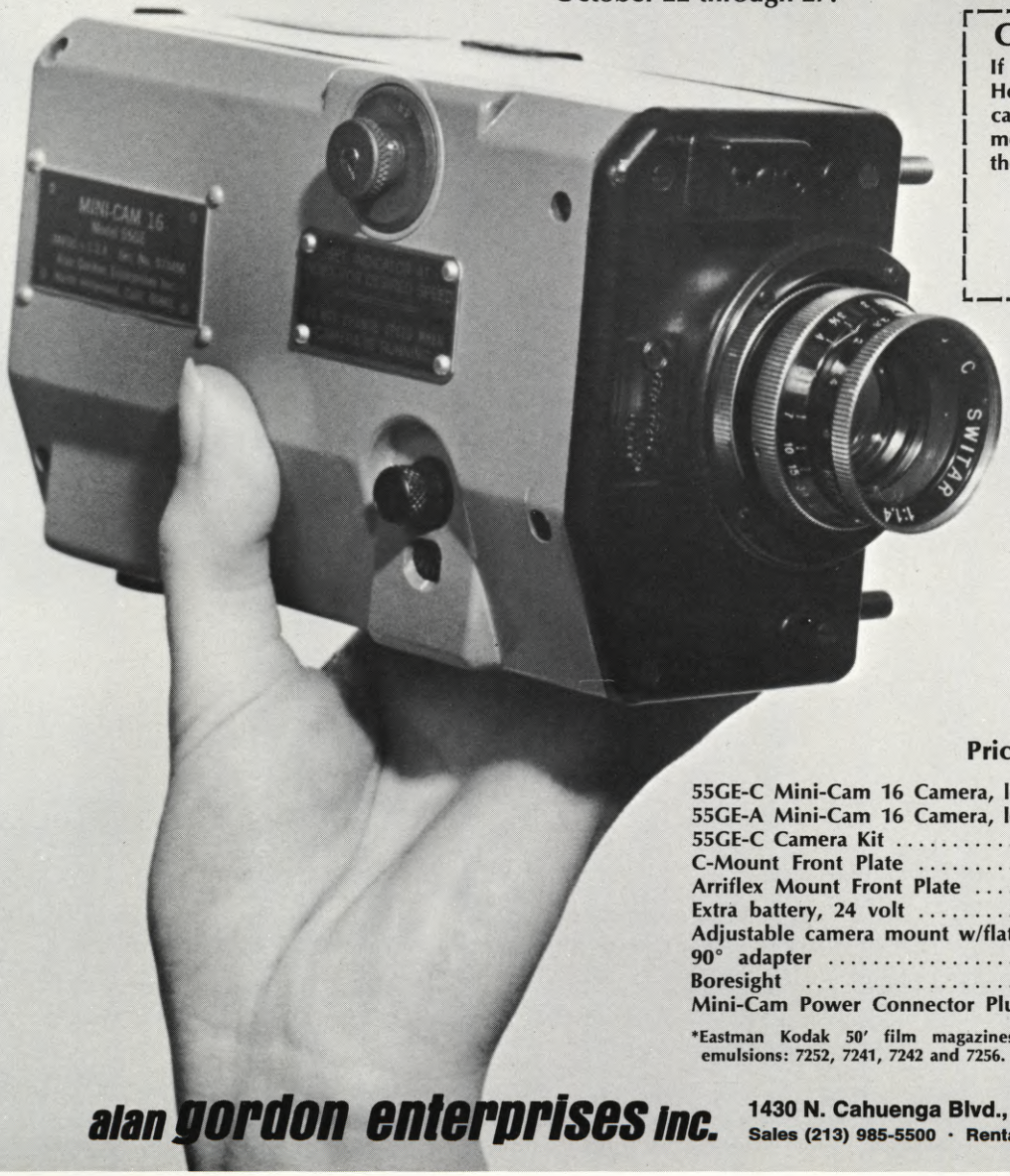
The Treise Cleaner/Waxer handles any size reel up to 2400-foot and operates at speeds up to 250 fpm. It

Continued on Page 1208

INTRODUCING
THE MINI-CAM 16

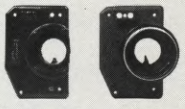
Keep in step with today's fast-moving world with the camera that puts the viewer in the picture, the Alan Gordon Enterprises Mini-Cam 16. This famous Bell & Howell G.S.A.P. camera has been modernized for today's 16mm action photography. It's the sports cinematographer's delight — ideal for filming those unusual angles of skydiving, bike racing, skiing, motorboating and many other action-packed activities. The Mini-Cam 16 is lightweight, portable and uses pre-loaded Eastman Kodak magazines in all popular emulsions.* Frame rates are 24 or 48 fps, special shutter provides sharp photography under adverse vibration conditions. Mini-Cam Model 55GE-C accepts C-mount lenses, while Model 55GE-A is available for Arri lenses. Power is 24V DC and the camera is attractively finished in tough Acrylic red, white and blue paint. Camera weighs less than 2½ pounds. Mini-Cam 16 is available separately or as part of the 55GE Camera Kit, which includes camera, battery, battery charger, camera cable, camera mounts and case.

See us at the 112th SMPTE Technical Conference, Century Plaza Hotel, Los Angeles, October 22 through 27.



Convert Your Camera

If you already own a Bell & Howell G.S.A.P. camera, you can convert it to accept C-mount or Arriflex lenses with the exclusive AGE Front Plates.



Prices:

55GE-C Mini-Cam 16 Camera, less lens	$298.50
55GE-A Mini-Cam 16 Camera, less lens	$354.00
55GE-C Camera Kit	$599.95
C-Mount Front Plate	$ 69.50
Arriflex Mount Front Plate	$125.00
Extra battery, 24 volt	$ 80.00
Adjustable camera mount w/flat camera adapter	$ 79.00
90° adapter	$ 45.00
Boresight	$225.00
Mini-Cam Power Connector Plug	$ 19.95

*Eastman Kodak 50' film magazines available in the following emulsions: 7252, 7241, 7242 and 7256.

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No matter what format you need on location, we've got the *one* machine that can handle it all. Perfectly.

The reason: You can use any one of four interchangeable, plug-in head assemblies in Stellavox's new battery-operated recorder—for stereo sync, mono sync, or the non-sync variations of each.

And there's never any need for re-alignment when you switch heads. Guaranteed. Because the alignment circuitry is in the pre-calibrated head assembly itself.

You've never seen a recorder quite so versatile. Or so simple to operate: there's no clutter of controls or unnecessary operational gimmicks. And despite its compactness (8½"x10½"x3¼"), the Swiss-made Sp 7 is a rugged precision instrument that will outperform any professional portable you're currently using.

The AMI mixer, which handles both stereo and mono, has five mike/line inputs complete with pads, filters, equalizers, and pan pots. Its mike input is switchable for dynamic or internal powering for condenser microphones.

Together, the recorder and mixer weigh only 16 lbs. A small miracle... but not a minor one.

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We do.

Adam Jaros Chuck Prudhomme Clay Odden

Here are three Sound Scoopic 200 users. Eyewitness news photographers at station WDSM-TV, Duluth, Minn. Men who know their job and do it well. Their choice for assignments that keep them on the run is the Sound Scoopic 200. They're in common agreement on the capabilities of their sound camera. It's ideal for nearly 100 percent of all their assignments. Dick Daly, News Director at WDSM, is pleased with its capabilities and heartily agrees that the Sound Scoopic 200 handles fast and easy. . . "it's truly the fastest handling single system camera in the world."

We do too. And here's why.

"The Sound Scoopic 200 is truly designed for one man use . . . its portability and versatility make it just great."
George L. Woolsey, Film Supervisor, WOKR-TV, Rochester, N.Y.

". . . it's more rugged than I had anticipated."
Jim Elrod, Ass't. Dir. of Operations, WMAZ-TV, Macon, Ga.

". . . very pleased with the Sound Scoopic 200 . . . has the best combination of operating features . . . we have also discovered that the Sound Scoopic 200 is far more tough and rugged than we thought . . ."
Bill Manly, Director of Photography, WMAZ-TV, Macon, Ga.

"lightweight, portable . . . really the fastest handling news camera in the industry"
Betty Chadwick, Chief News Photographer, WTHI-TV, Terre Haute, Ind.

"For speed and portability it's just fine . . . has fully automatic exposure and sound systems that really work"
Jim Austin, Ass't News Director, WFTV, Orlando, Florida

". . . and it's the only camera built for sound news when you're in a hurry and on the run . . . we've more on order now"
Jay Beeler, News Director, WBIR-TV, Knoxville, Tenn.

"It's the only camera to shoot the news on the run with . . . great for speed and portability"
Fred Gault, Jr., News Director, WRCB-TV, Chattanooga, Tenn.
Incidentally, Fred was the first owner of a Sound Scoopic 200 in the U.S.A.

". . . zero set-up time, extremely maneuverable . . . rarely use a tripod with this camera"
Robert Stoldal, News Director, KLAS-TV, Las Vegas, Nevada

". . . very versatile, very portable. It's the one camera that handles both set-up sound and grab shots"
Bill Gordon, News Director, WPTV, West Palm Beach, Florida

This is just a brief sampling of the many, many favorable comments we receive by users of our Sound Scoopic 200. Many other TV stations use and enjoy the Sound Scoopic 200 but it's against their station policy to endorse in print any kind of product. A list of all Canon Sound Scoopic owners is available upon request.

And here's a list of authorized Canon Sound Scoopic 200 dealers.

Mackenzie Equipment Co., Ltd.
Saxony Building, 26 Duncan Street, Toronto 2B, Ontario CANADA (416) 364-2266

Mobius Cine, Ltd.
565 5th. Ave., New York, N.Y. 10017 (212) 697-8620

Camera Mart, Inc.
456 W. 55 Street, New York, New York 10019. (212) PL 7-6977

F&B/Ceco, Inc.
315 W. 43 Street, New York, New York 10036. (212) JU 6-1420

Brenner Photo Company
5215 Wisconsin Ave., N.W., Washington, D.C. 20015. (202) 244-3800

Standard Theatre Supply Co.
125 Higgins Street, Greensboro, N.C. 27420. (919) 272-6165

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129 S. Front Ave., Rockwood, Tenn. 37854. (615) 354-0971

Photomart
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Photomart/Orlando
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Victor Duncan, Inc.
11043 Gratiot Ave., Detroit, Michigan 48213. (313) 371-4920

Victor Duncan, Inc.
115 E. Ohio Street, Chicago, Illinois 60611. (312) 321-9406

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Max Gordon
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FASTEST HANDLING SINGLE SYSTEM SOUND CAMERA IN THE WORLD.

Canon Sound Scoopic 200. A single system sound-on magnetic news documentary camera. Designed for the TV news cameraman. Without compromise. And with features long demanded . . .

REFLEX VIEWING through a 135° rotating mirror shutter. No beam splitter. **No loss of light at the film plane.**

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FILTER SLOTTED 12.5-75mm Canon zoom lens. Filter changeable in seconds.

REGISTRATION PIN MOVEMENT. Assures perfect framing.

ELECTRONICALLY GOVERNED MOTOR. Insures accurate sound speed.

MODULAR TWIN SOUND HEADS. Snap in and out in seconds.

LIGHT WEIGHT. 12 lbs. 6 oz. Including body with film chamber, lens, exposure system, sound heads and take-up spools.

LOW PROFILE bottom load design for 200 feet daylight spools. Shoot from cars, doorways . . . anywhere.

AND MORE. A 6 lb. 14 oz. over-the-shoulder amplifier/camera power pack in a single unit. With advanced automatic gain control with manual override. VU meter. Dual mike input. And a fast rechargeable battery that powers the camera, meter and amplifier through 2000 feet of film. Recharges in under 5 hours. Batteries interchange in seconds.

Feature for feature, Canon Sound Scoopic 200 adds up to getting the news faster than ever. See it in action at your Canon dealer. Or write us for more information.

Sound Scoopic 200

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10 Nevada Drive
Lake Success, New York 11040

CINEMA WORKSHOP

By ANTON WILSON

POWER CABLES

What part of the camera system can be more simple than the power cable? It is just a piece of wire between the camera and the battery, right? Wrong! This kind of attitude can get you in a lot of trouble. The power cable is the lifeline of the camera. A faulty power cable can cause a camera to run out of sync, run slow or stop dead. Probably more jobs are ruined or delayed due to faulty power cables than any other single camera malfunction. This is why all rental houses supply every camera with at least two power cables and, in some instances, three or more. There is nothing more exasperating than to be shooting with a $15,000 camera and be held up due to a faulty $15 cable.

There are basically two things you should know about power cables. The first is the physical characteristics: preferred types of insulation, areas of greatest stress, etc. Secondly, there are the electrical characteristics. A poor choice in a power cable can cause the camera to run slow or out of sync due to excessive voltage drop.

The power cable is essentially a conductor of electricity, but it is also a resistance between the camera and the power source. The amount of resistance in a power cable is proportional to its length and cross-section. A long thin cable will offer much greater resistance than a short, large-gauge cable. When the camera is turned on and current begins to flow through the cable, the battery voltage will partially "drop" across the cable.

Therefore, the voltage available to the camera is somewhat less than the battery is actually putting out. The amount of voltage drop across the cable is also directly proportional to the current drain of the particular camera. For example, an Eclair NPR and an Arriflex 16 B1 each draw approximately 2 amps, as opposed to an Eclair ACL or a Bolex MST, which each draw under 1 amp. With identical power cables, the 16B1 and NPR will experience over twice the voltage drop as will the ACL

Continued on Page 1200

INSULATION ON WIRE	Rubber	Neoprene	PVC	Polyethelene	Nylon	Teflon
Property						
Resistance to abrasion	E	E	F	G	E	E
Flexibility	E	E	G	F	P	F
Weatherability	P	E	E	E	E	E
Temperature Range [°C]	−40 +70	−30 +90	−20 +80	−60 +80	−40 +120	−70 +250
Resistance to Solvents:						
Alcohols	P	G	P	G	E	E
Aromatics (Gasoline-Benzene)	P	P	P	G	G	E
Chlorines (Tri-chloro-Ethylene)	P	P	F	G	E	E

E – Excellent G – Good F – Fair P – Poor

FIGURE 2

Wire gauge	wire length	Bolex H-16, Beaulieu Scoopic, etc. (approx. 1 amp)	Arri 16S, Arri 16BL, Eclair NPR, etc. w/conventional motors (approx. 2 amps)	Arri 35 II C	Arri 16 BL, Eclair NPR, etc. w/crystal type motors.
18	6 feet (1 foot coiled)	1/12 V	1/6 V	1/4 V	1/4 V
	12 feet (2 feet coiled)	1/6 V	1/3 V	1/2 V	1 V
	20 feet (3 feet coiled)	1/4 V	1/2 V	3/4 V	1½ V
16	6 feet	1/20 V	1/10 V	1/6 V	1/3 V
	12 feet	1/10 V	1/5 V	1/3 V	2/3 V
	20 feet	1/6 V	1/3 V	1/2 V	1 V
20	12 feet	1/4 V	1/2 V	3/4 V	1½ V

FIGURE 1

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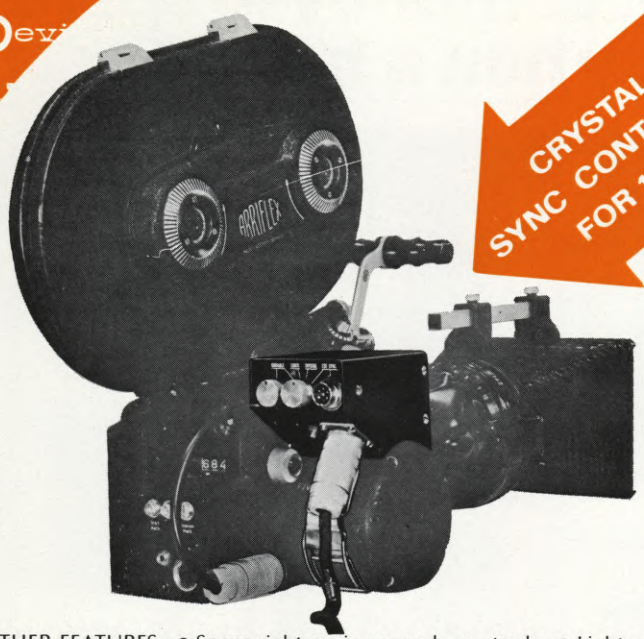

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- ★ *External sync input (slave your BL from any pilot source).*
- ★ *No camera width increase; camera fits in case with unit attached.*
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- ★ *All controls safely recessed.*
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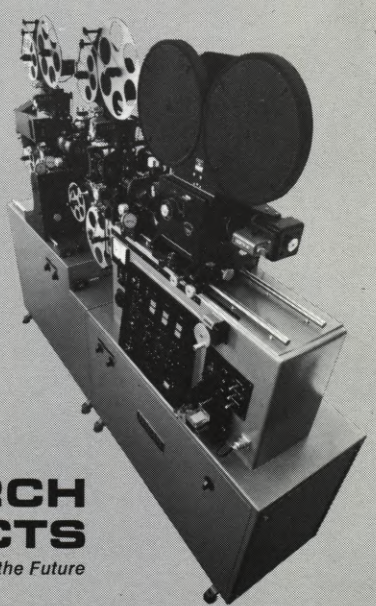

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That's what I tell my directors and all the people who work with me on a feature. After all, film is an art form, but unlike other forms of art, millions of dollars can be tied up in a few pictures. It's hard to get creative people to understand dollars and cents. They don't like to hear about money.

One thing that helps is the medium itself...film. Compared to the guys in television working with videotape, our costs are less. Film equipment is mechanical—easy to fix, less expensive to own or lease. I stick with Eastman films because of their track record and the kind of help they give me. And, as I said, film is where the artists are, and where they like to be.

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THE HONOR ROLL

VICTOR MILNER, ASC

Victor Milner is a Charter Member of the American Society of Cinematographers, his membership dating from April 19, 1919. In about 1911 Vic Milner became interested in motion picture projection apparatus and soon became an operator. On a visit to the German-American Camera Company, of which Eberhard Schneider was the head, he was convinced that film photography offered a better future than projection so he grasped the opportunity to become an employee of Schneider, and here he learned about film camera mechanisms and finally had a chance to actually photograph action when he was sent to Rockaway Beach to "shoot" a storm.

One of Schneider's specialties at that time was the construction of film cameras for private use by individuals. Calvin Coolidge, then governor of Massachusetts, secured one of these cameras and Vic had the privilege of instructing the future president in how to take motion pictures. Bernard Baruch was another of Milner's pupils.

His first important assignment was as cameraman for a Mr. Hyle, a wealthy New Yorker, and they traveled to various countries photographing conditions among the poorer classes.

His first theatrical film production was "Hiawatha" for Frank E. Moore, a six-reel production and the first, probably, of the multiple-reel features made in America.

About this time the Pathe Freres News Reel organization was formed and he worked for them traveling all over the world on assignments and as the official Pathe newsreel man with the Giants and White Sox on their famous round-the-world tour.

On a pleasure trip to California Milner was offered a position as cameraman with the Balboa Film Company and from there to the Wm. S. Hart unit for Thomas H. Ince. He then photographed two pictures with Fred Niblo directing and on to the Constance Talmadge company.

At Paramount he photographed Pola Negri in "East of Suez" and remained with Paramount for seventeen years until his semi-retirement.

While at Paramount he won an Academy Award for the Photography of "Cleopatra" in 1934 which Cecil B. DeMille directed. He also photographed "The Way of All Flesh" with Emil Jannings.

Over the years he has worked with such directors as Jesse D. Hampton, J. P. McCarthy, Fred Niblo, Raoul Walsh, Preston Sturges, Ernst Lubitsch and many times with Cecil B. DeMille. He has worked with such actors and actresses as Jeanette MacDonald, Maurice Chevalier, Constance Talmadge, Blanche Sweet and Barbara Stanwyck.

•

GILBERT WARRENTON, ASC

As the third generation of a theatrical family, Gilbert Warrenton inherited some of their art and tradition. Having learned photography in the theatre as a practical hobby he was sold on motion picture photography and in 1912 was engaged as an Assistant Cameraman with the Universal Film Company, and by the end of the year he had made his first picture as a cameraman.

Until 1918 Gil made one- and two-reel pictures for Universal Film, occasionally being loaned out with Universal directors. His first location out of the continental United States was three months for Universal with Henry McRae in Hawaii.

In 1919 he worked for the Mary Pickford company and then left to go to New York and photograph "a very good story for an ex-leading man" Frank Borzage. The story was "Humoresque".

For the next five years he was with Cosmopolitan New York and alternated between Lasky Studio, Hollywood, and Paramount Lasky, New York. Among the many pictures made at the Lasky New York Studio by Warrenton were some with Dorothy Dalton and a long series of pictures starring Alice Brady.

One of the interesting pictures he made during that period was with a Universal director, Ed LaSaint, "More to be Pitied than Scorned". Harry Cohn was the producer and it was Columbia's first feature. Sometime later he made the first series of "Screen Snapshots" for Columbia.

After five years of traveling between Hollywood and New York, he went with Universal and stayed until 1930.

From 1930 to the end of 1941 he worked with Fox, Warners, Universal, Monogram and several independents.

In 1942 he received a commission as Captain in the U.S.A. Air Corps, graduating from Officer's Training, Miami Beach, Florida, and was assigned to the Motion Picture Section.

After V.J. Day he applied for separation and was home on terminal leave when he was ordered back to active duty and assigned to take over the documentary coverage of the Atomic Project 1.5 (Bikini). After Bikini he was separated and went with Monogram.

Since Warrenton was a reserve officer he found himself suddenly ordered back to active duty for the Atomic Test, "Green House", then a picture on "Blood Banks", followed by covering Atomic Bomb Tests on the Nevada Range.

Finally returning to civilian life he made several pictures, a couple of independents for Columbia release; for the Sutherland Studio two pictures for A.T.&T., "Far Sound", and a picture laying the cable from the Northwest tip of the United States to Ketchikan, Alaska, via way of the ocean; a picture for United States Steel, "United Fund", which showed the use of steel in constructing interstate highways; and a full-length film for the Ford Motor Company.

He did TV commercials with Bill Williams for the "Kit Carson" series, Ronald Reagan for the General Electric lead-ins and Dale Robertson for the "Wells Fargo" series.

Among the TV pictures he photographed were 52 segments of "Sgt. Preston of the Yukon"; several pilots and segments for Four Star; and for Revue many segments for "Pride of the Family", "Chevron Theatre", "State Trooper", "Schlitz Playhouse", "M Squad", "Bachelor Father", and "Wells Fargo", making a total of 378 segments.

The last feature picture Warrenton photographed was in December 1962 titled "Panic in the Hour Zero", with Ray Milland directing and acting for American International Studio. ■

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The new Nizo cameras embody the latest in technological advances—most of these capabilities were developed by Nizo and most remain Nizo exclusives. And when you've had an opportunity to examine the other features of the new Nizo S-560 and S-800, you'll see we haven't stinted anywhere else. To mention only a few: incomparable Schneider Variogon zoom optics with as much as an 11.4 to 1 zoom ratio; automatic metering that works all the way up to ASA 160; built-in sound synch pulse generator; and instant slow motion. The suggested retail price is $595 for the S-560 and $695 for the S-800. See your dealer for a complete demonstration. He'll have some statements of his own to make concerning the amazing new Nizo movie cameras.

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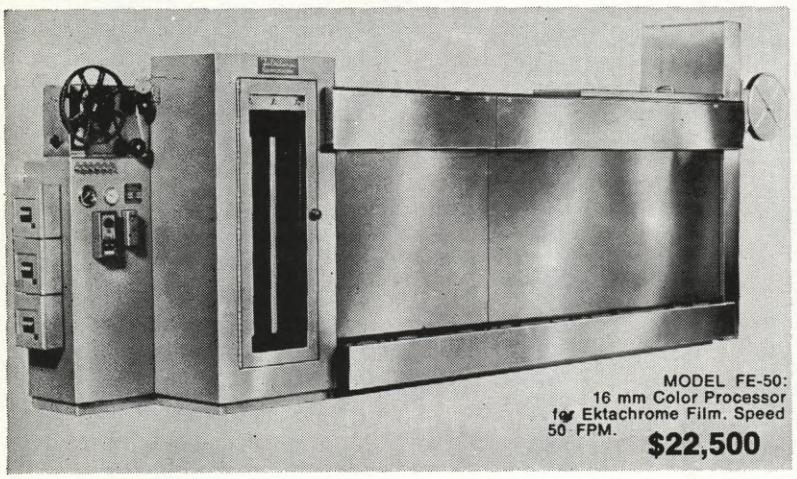
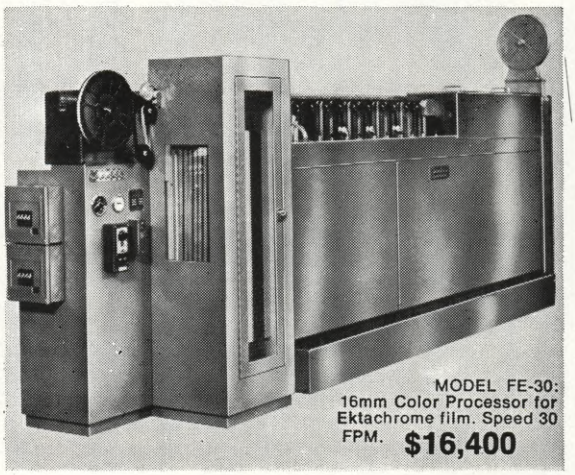


MODEL FE-50: 16 mm Color Processor for Ektachrome Film. Speed 50 FPM. **$22,500**



MODEL FE-30: 16mm Color Processor for Ektachrome film. Speed 30 FPM. **$16,400**

- **"FILMLINE OVERDRIVE FILM TRANSPORT SYSTEM"** This marvel of engineering completely eliminates film breakage, pulled perforations, scratches and operator error. The film can be deliberately stalled in the machine without film breakage or significant change of film footage in solutions. The heart of any film processor is the drive system. No other film drive system such as sprocket drive, bottom drive or simple clutch drives with floating lower assemblies can give you the performance capability of the unique Filmline Overdrive Film Transport System.
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QUESTIONS & ANSWERS

Conducted by CHARLES G. CLARKE, ASC. and WALTER STRENGE, ASC.

(Inquiries are invited relating to cinematographic problems. Address: Q. & A., AMERICAN CINEMATOGRAPHER, P.O. Box 2230, Hollywood, Calif. 90028.)

Q I would like to photograph a television picture screen without the roll-bar effect which occurs when normal cinematography is used. Is there a solution?

A Your camera shutter must be set at precisely 144° opening and the camera run at precisely 24 fps. All bearings in the camera must be tight with no play or variation in the drive mechanism. Any camera meeting these requirements may be used, but you will probably have to install a special 144° shutter.

Q I plan to film a documentary in Super-8 and blow up to 16mm prints. About 20% will be shot under light conditions unsuitable for ECO. Is the difference in granularity between ECO and EF a more important consideration than color uniformity if I mixed emulsions? Or would it be wiser to shoot entirely in EF and avoid printing problems?

A Ektachrome Commercial film is not available in normal Super-8 cartridges. It is sold only in 100 and 400 foot rolls, Double Super-8 perforated in special order to Kodak. For these reasons it might be advisable to film Super-8 Kodachrome under normal lighting conditions and mix this with Ektachrome EF where more film speed is required. The contrasts of these two films match very well. The EF is somewhat more grainy, but this can be tolerated when the two films are intercut. If you obtain ECO in the longer lengths and adapt it to your camera, the major difference will be one of contrast rather than grain. However, because of the different nature of scenes filmed, the variations in grain and contrast are usually accommodated by the viewer.

Q (1) How is the exposure determined when a rear-projected aerial image is filmed in animation? (2) How can you eliminate the "hot spot" resulting from an image rear-projected on a ground-glass screen?

A (1) There is no set formula for determining the correct exposure for a rear-projected image. It is important that the balance between the image and the foreground be correct, but this is a visual concept which can only be gained by experience and will greatly influence the exposure, whether in black and white or color.

(2) The "hot spot" can be subdued by use of a neutral density filter which can be placed in front of the projector lens. The actual density depends on the amount of light to be removed from the center. The gelatin material may be hung on a large mesh wire frame locked in position with a scrim holder attached to a stand. A fringed star pattern should be cut out so that the filter edge is graduated over the screen image.

Q What is the best position for a microphone when shooting sync sound motion pictures?

A The microphone should be about one or two feet in front of and two feet above the head of the person speaking for the best sound pickup. It should not be pointed down, since this results in boominess and a jumble of low frequencies. It should be pointed at the speaker's mouth, or, if this position is too bright or sibilant, it should be pointed at the speaker's chest or to one side of his head. If two or three people are speaking, it is best to compromise with a small movement of the microphone. Do not overdo microphone movement. A boom man or a man handling a "fishpole" (a long rod with a microphone hanging from the end) should learn the scene so that he can anticipate moves and thus avoid placing the microphone in boomy or harsh positions such as equal distance from two walls and the ceiling when working in a corner or in the focal point of a dome or curved wall. Do not place the microphone too far from the speaker or allow the microphone to get directly over or behind the speaker. Ambient noise on exterior shooting, such as that from autos, airplanes, ocean, wind, and off-scene people, can be minimized by operating with the microphone closer than normal. Directional microphones are also an aid but not as much as close operation. Increased bass suppression also helps to eliminate rumble noises. Lapel or chest-type microphones are recommended for noisy locations.

Introducing a movie camera so sophisticated we had to develop the world's first multi-coated zoom lens to go with it.

The movie camera is the Fujica Z-800, the latest and most advanced model in our Single-8 line.

It's the world's first movie camera with a multi-coated lens. And besides that, it's the world's first multi-coated lens developed under a unique new process called Electron Beam Coating. E.B.C. is a vast improvement over the vacuum coating process allowing greater control over the thickness, hardness and clarity of each of the coatings put on the lens. Speaking of the coatings, there are 11 of those on the new Fujica lens. Imagine the advantages that represents to you in just about any shooting situation. Coating each component of our zoom lens assures you of sharper, clearer, brighter pictures even in difficult backlighted and strong sidelighted subjects.

As unique as our lens is, we know it takes a lot more to make a really great movie camera. So we've built into our Z-800 features that are found in no other 8mm movie camera. For example, two special synchronization devices in the Z-800 system allow pulse sync-ing with a tape recorder during actual filming, and electronic flash synchronization to allow single-frame exposure with any electronic flash unit. So if you're interested in doing time-lapse photography, animation, or making titles, you know you've got a movie camera versatile enough to do all three.

Needless to say, we've incorporated into the Z-800 all the features that make our other Single-8 cameras some of the most sophisticated equipment available to the serious movie-maker.

This remarkable camera offers you things like fade-ins and fade-outs, remote control, lap dissolves, power zoom, a reflex viewfinder, a variable shutter for automatic fades and shooting at higher shutter speeds, and a total re-wind capacity for special optical effects. The metering system permits fully automatic metering, full manual overide, and fractional exposure control.

In fact, we think this camera is so special, there's even a special film cartridge to use with it. Its polyester base film is thinner, yet stronger and more durable than what you're used to using. And it will give you brighter, clearer pictures than you're used to getting.

There's one more thing about the Z-800. We've not only designed a camera that's going to give you better footage than you've ever gotten, we've even made it easier to carry around and set up. A convenient carrying grip (optional equipment) on the top converts to a unipod for steady pictures during hand-held camera work. And it also converts to a measuring rod for accurate focusing in close-ups.

If you're as excited about the Z-800 as we are, we'd like you to know even more about it than we've told you here. And, believe us, there's more to tell. For more information on the Fujica Z-800, write Fuji Photo Film, U.S.A., Inc., 350 Fifth Avenue, New York, New York 10001, Room 321.

Fujica Single 8 Z800

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AN OPEN LETTER TO THE MOTION PICTURE AND TV NEWS INDUSTRY:

The new Cinecraft International Inc., of Moonachie, New Jersey, has recently been formed to reflect the vital and growing need within the motion picture industry for faster, better and more reliable equipment sales and service. I was named President of the organization and William "Bill" Allen and Jesus Acosta have been named Vice President Engineering and Vice President Electronic Service Division respectively. As you probably know these most highly experienced officers have, for many years, been closely associated in similar positions with a well-known international supplier of professional motion picture equipment. The export division is headed by Gilda Negron who is also known internationally in import and export circles.

The new and modern facility, located in the Moonachie Industrial Park in Moonachie, New Jersey, in the heart of the new Meadowlands Sports Complex, is only 25 minutes from the midtown Manhattan center of the motion picture industry. In addition to up-to-date offices and showrooms, the new facility will have ample servicing and warehousing space for the handling of a complete line of professional motion picture and related TV equipment.

Revolutionary changes in the motion picture and TV industry have necessitated the emphasis on light weight portable equipment, automation, sophisticated electronic controls, surveillance systems and similar equipment. These changes, together with today's need for speed and production, have guided our new company's planning and philosophy. We intend to assist our customers in selecting products best suited for their needs and to furnish these requirements at competitive prices. Efficient, fast, and reliable service is as important as the selection of the proper equipment, and both Bill Allen and Jesus Acosta are tops in that department. And, we guarantee to service what we sell.

We have a complete range of equipment and services. The next time you need motion picture equipment or service give us a call. We'll be delighted to hear from you. Do contact us soon.

Sincerely yours,

Dom Capano

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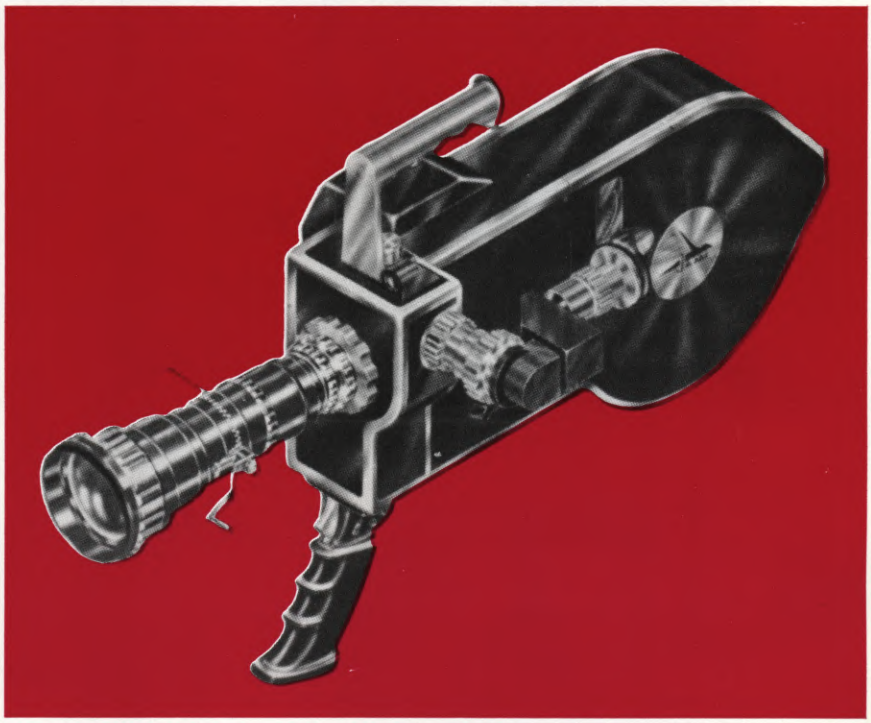

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THE BOOKSHELF

By GEORGE L. GEORGE

Film historians and other admirers of D. W. Griffith will welcome Kemp R. Niver's latest book, THE BATTLE OF ELDERBUSH GULCH ($5.95 from Historical Films, Box 46505, Los Angeles, Cal. 90046). Rated by the old master as his best film after *Birth of A Nation* and *Judith of Bethulia,* its details and circumstances have been thoroughly researched by author Niver, with Bebe Bergsten's expert editorial assistance. Following an informative introduction and numerous contemporary documents (reviews, posters, pamphlets, ads, logos), the book provides a knowledgeably annotated scenario of this action-packed, settlers-vs.-Indians, 1913 film.

A filmography of 75 topnotch cameramen working in the U.S. has been issued in brochure form by FILM COMMENT (214 E. 11 St., N.Y.C. 10003, $1.00). It is an expansion of the listing originally published in that magazine and constitutes a valuable record of cinematographers' achievements.

Cameramen in daring exploits, often taking as many risks as actors, are among the heroes of THE GREAT MOVIE SERIALS (Doubleday $7.95). Jim Harmon and Donald F. Glut have done a thorough job describing, with zest and accuracy, cliffhangers of the 30's to the 50's, including casts and crews, plot outlines, evaluations, some script excerpts and many typical stills. There is enough to please both film buffs and those interested in old-time movie-making techniques.

* * *

In THE ADVENTURES OF ANTOINE DOINEL (Simon & Schuster $9.95), Francois Truffaut gathers together four largely autobiographical scripts *(The 400 Blows, Love at Twenty, Stolen Kisses* and *Bed and Board).* The excellent translation brings out their freshness, charm and poignancy. Photographed, respectively, by Henri Decae, Raoul Coutard, Denys Clerval and Nestor Almendros, the palpable similarities and subtle differences of these films clearly reveal a close director/cameraman relationship.

Alexandro Jodorowsky displays in EL TOPO (Douglas Books $5.95) his various skills as the writer, director, cameraman, actor, designer and composer of this unusual film. The book contains the screenplay, as exciting to read as to watch its surrealist imagery on the screen, and a lengthy interview in

which Jodorowsky articulates his spiritual and esthetic concepts as an all-around movie maker.

Evidence of the collaboration between director and cameraman is a notable feature of Jean Cocteau's *BEAUTY AND THE BEAST:* DIARY OF A FILM (Dover $2.75). His reliance on topnotch French lenser Henri Alekan is a running theme of this fascinating book which relates, in the moving words of the filmmaker-poet-artist, the production's calamity-ridden course before the completed film received its worldwide acclaim.

While books *about* directors are the rule, here are two notable books *by* directors: GODARD ON GODARD (Viking $10.00/3.95) and René Clair's CINEMA YESTERDAY AND TODAY (Dover $3.50). Discussing the multifaceted aspects of the directorial craft and its technical complexities, their comments situate film in the general framework of the arts and the evolving pattern of society. The generation gap that separates them is underlined by their contrasting views on the nature of cinema's influence on social environment.

* * *

Larry Kardish's REEL PLASTIC MAGIC (Little Brown $7.50) ably summarizes the growth of U.S. filmmaking, balancing his historic perspective with an informative section on current trends, both underground and commercial, and including an excellent list of 100 programs that gauge the progress of our cinematic tradition.

Originally a paperback, Edward Pincus' GUIDE TO FILMMAKING has just been issued in hardcover (Regnery $7.95). It is a comprehensive basic manual full of helpful advice both to beginners and more advanced practitioners, itemizing and discussing available equipment, and solving standard film production problems.

As a convenience to movie makers, educational film producer John H. Tyo teamed up with math wizard Dr. Robin Kranz to publish MOTION PICTURE FILM TIMING TABLES. Covering 35 and 16mm, super 8 and regular 8, sound and silent, these tables convert minutes and seconds to feet and frames and vice versa with computer-generated accuracy. ($6.25 from Tyo Prods., 715 Crawford Ave., Syracuse, N.Y. 13224) ■

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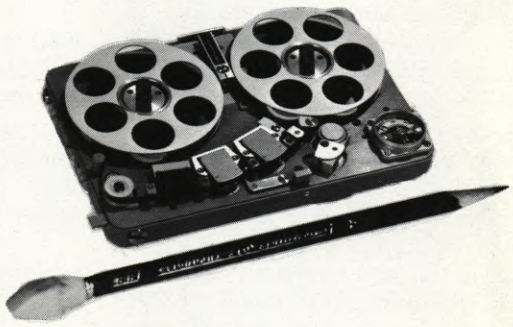

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"VIDEOGRAPHY" WHAT DOES IT ALL MEAN?

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.

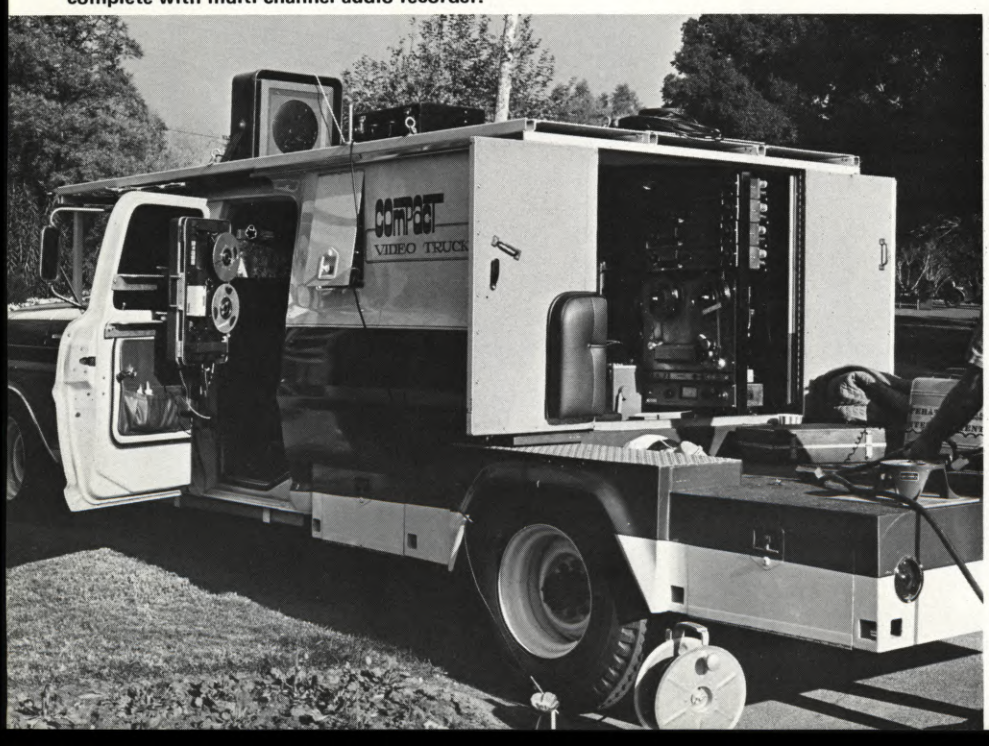
The first editing had come in 1958 through the technology of the razor blade and splicing tape. In the early 1960's electronic editing replaced the blade, but its creative use was quite limited until later in the decade. Up until this time, VTR sound had been confined to a single channel. An important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

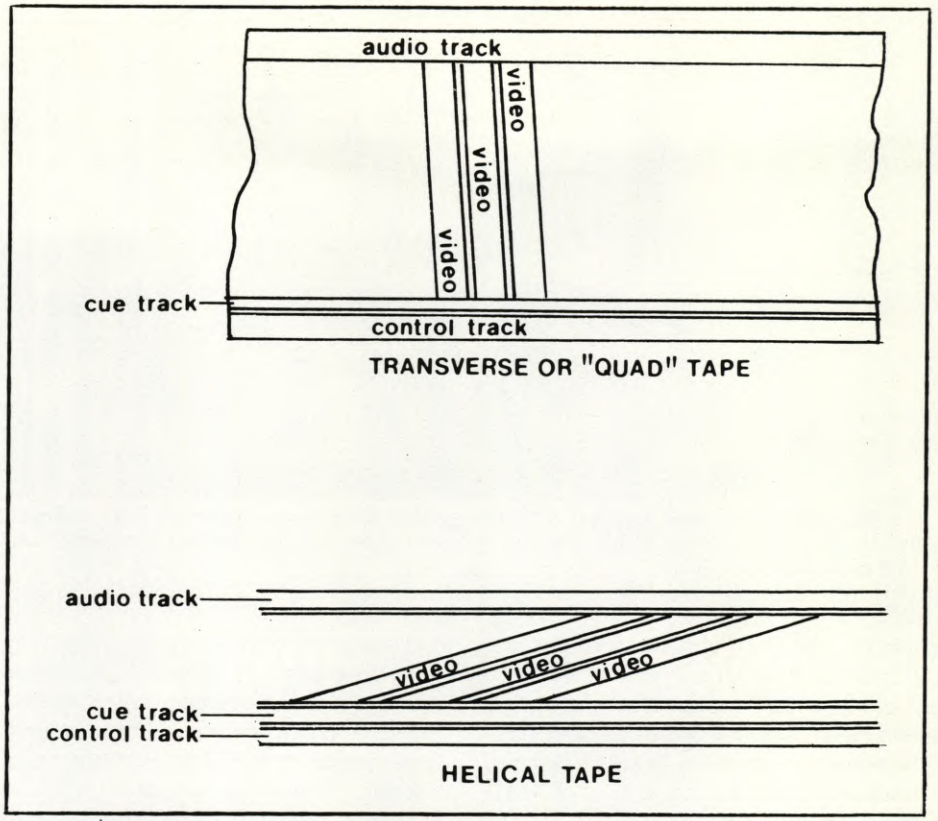
VIDEOTAPE FORMATS

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.



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

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-

(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.*

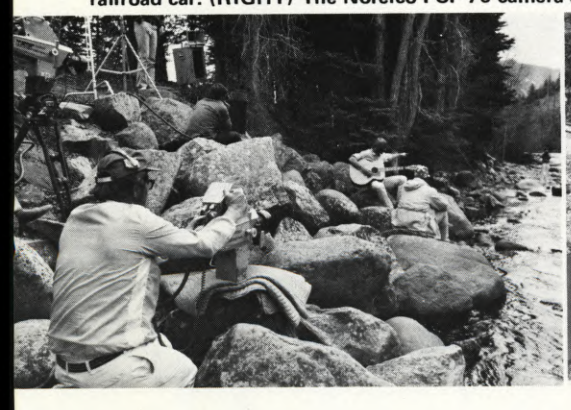
Today's tape producer can choose from a large variety of camera, switching, special effects and recording configurations to achieve the desired results with minimum expenditure in time and dollars. Some common setups are:

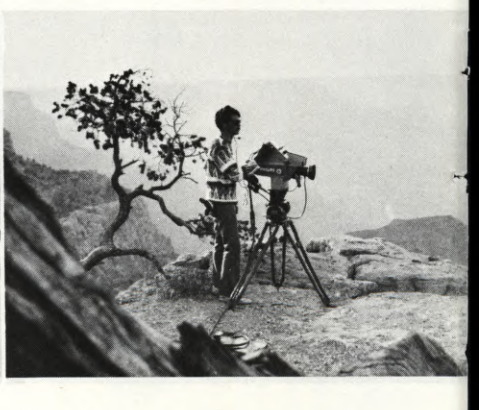
Single camera and recorder: Commonly used for film-style *videography,* this setup allows careful attention to lighting, dramatics and camera blocking.

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.





aways and closeups can then be recorded on the slave to be edited in later.

One or more cameras with VTR playback through special effects generators: A VTR plays back a prerecorded shot in sync with original photography. Special effects (e.g., combined live action and animation, split screens, supers, chromakey) can be precisely composed using this configuration.

These are only a few of the production configurations available with *videography.* The setups mentioned are not confined to studio operations. They are available for isolated location shoots as well. The best way to illustrate tape's versatility is by dissecting the capabilities of various video production services.

Compact Video Trucks Inc. is a small, but rapidly growing, production service in beautiful downtown Burbank. Founded less than a year ago, it has two mobile units and two companion utility vehicles.

The larger two-camera truck is 20 feet long, built on a 4-door custom chassis. Its cameras are modified Norelco PCP-70's, which are hand-holdable with a harness. I tried one without the harness but it is at least twice as front-heavy as an Eclair NPR.

These cameras are mountable via cradle on any standard professional tripod head. They may also be mounted on the sides, top, back, or front of the camera truck for shooting while rolling. The entire unit, including all power, is self-contained.

Crew assignments for video are somewhat different than for film. Since there is no film to be loaded there are no assistants. The cameraman is responsible for all operation of his equipment, including, electronic setup, follow focus, ooming, etc. The signal from his camera is sent to video control where the video man shades the picture (adjusts brightness, contrast and color).

One problem experienced by cinematographers shooting standard dramatic fare on tape was this constant shading of levels by the video man. Subtle lighting variations were destroyed by a well-meaning technician. This problem was easily solved by locking levels for each setup and instructing the video man not to change them unless requested to do so. In documentary situations the opposite is usually the case. Video shading is encouraged, enabling the cameraman to shoot more freely.

Videotape has a much wider color-temperature latitude than film and is capable of recording quality color even

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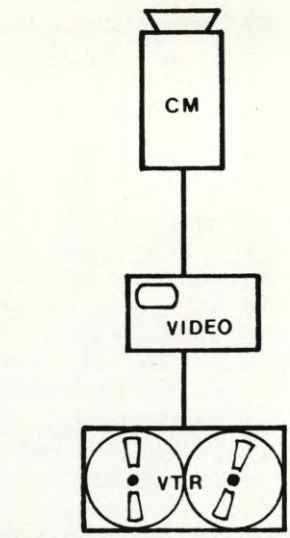
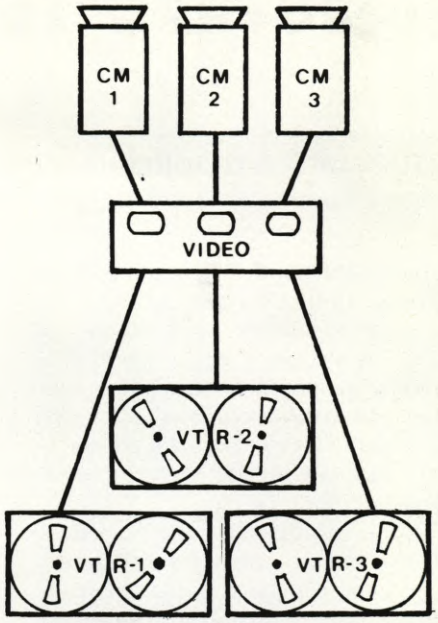
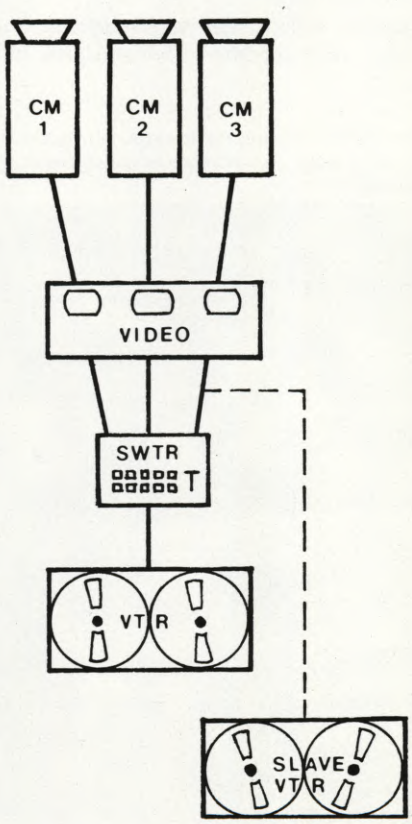


Single camera and recorder: **Commonly used for film-style videography, this set-up permits careful attention to lighting, dramatics and camera blocking.**

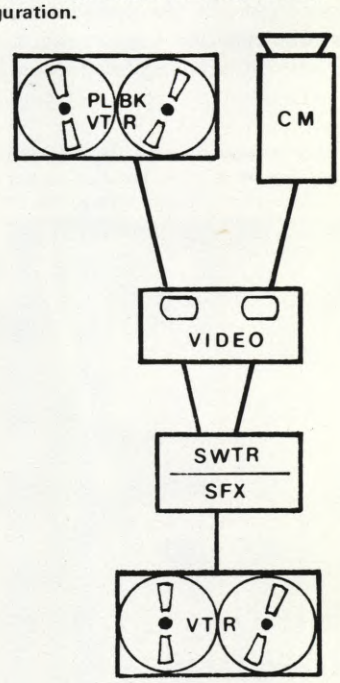


Multiple cameras/Multiple recorders: **Two or more cameras are used. The image from each camera is recorded by a separate VTR. This system is especially useful for scenes where above-the-line production costs are high (e.g. fights, chases, high-priced talent).**

Multiple cameras/Single recorder and slave: **To save post-production time, a multiple camera sequence may be cut in camera, while the master shot is simultaneously recorded raw on a slave VTR. Cutaways and closeups can then be recorded on the slave to be edited in later.**



One or more cameras, with VTR playback through special effects generators: **A VTR plays back a prerecorded shot in sync with original photography. Special effects (e.g. combined live-action and animation, split-screens, supers, chroma-key) can be precisely composed using this configuration.**



VIDEOTAPE-TO-FILM TRANSFERS IN COLOR

The main question is whether systems in the present state-of-the-art can consistently produce tape-to-film transfers of theatrical release quality

By RICHARD B. GLICKMAN
Consulting Engineer

The transfer of information from videotape to film has been an important and growing activity for a number of years. The increasing use of videotape as the original recording medium in television and commercial production and the demand for widespread release of these materials dictate that the releasing medium must be film.

This is mandated by the non-standard character of videotape and broadcast systems compared to the essentially absolute standardization of 16mm film all over the world. It is important to note that nearly all transfers are, and have been, made on the 16mm film format. Other formats are usually done by reduction or enlargement during the printing process.

The broadcast and video format used in the United States is referred to as NTSC and is a 525-line system at 60 cycles per second (60 Hertz). That is to say, the electron beam sweeps a total of 525 lines horizontally to create the television picture. The actual number of lines with picture information is slightly less than this. This grid of 525 lines is called the "raster". The system actually sweeps only half the lines in the raster each 1/60th of a second (alternating between the odd and even lines). The persistence of the phosphor on the face of the tube and the viewer's image-retention combine to yield a flicker-free image. One of the main problems in the transfer of video to film is that the 60 half-fields-per-second do not directly convert to the film rate of 24 frames per second. In most transfer systems, with an NTSC input, every fifth field is discarded. The film movement and exposure is made on the remaining four-fifths of the information by exposing each frame of film to two of the retained television half-fields. (4/5 of 60 is 48 half-fields, and two half-fields per frame is 24 frames per second)

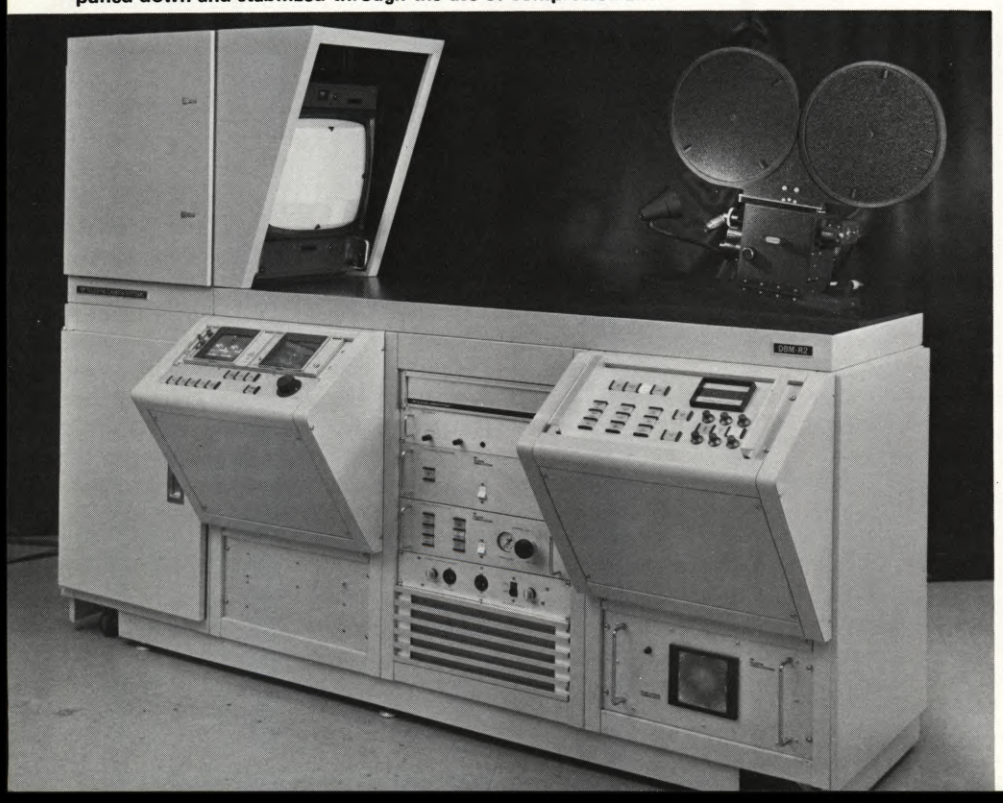
In going to a color television system, the amount of information which must be transferred is at least tripled. The simplified operational scheme described above is still valid, except that there are now three electron guns required. The picture tube for color is called a "shadow mask" tube, because it actually has a finely-perforated mask behind the tube face. The phosphor is actually laid down as three separate sets of dots. The three electron guns scan the same raster as before, except that each gun can only "see" its respective color phosphor dots through the perforated mask.

All tape-to-film transfer is done from video information which is in the form of a broadcast-type signal (in the USA this would be NTSC). This means that the signals stored on the videotape have other data included besides the actual color and picture information. All the video information including color, luminance, horizontal and vertical synchronization, etc., must be included in a bandwidth of about 6 megahertz. The term bandwidth can be regarded as representing an amount of information. The bandwidth of 16mm film (i.e. Eastman Kodak 7252) is approximately 12 to 15 megahertz. This actually represents about four times the information content of the videotape system. The 35mm format has something of the order of 16 times the information of the videotape. These estimates are for camera originals, and it must be noted that there is a significant loss of bandwidth in going to second and third-generation material.

The video bandwidth is the limitation on the quality of the film produced from any of the transfer processes discussed in the following sections. The absolute amount of information available to define the color video picture is limited, and cannot be increased. However, so long as this information is in the form of electronic signals, it is possible to operate on it in many ways. These include amplification, filtering to reduce extraneous signals ("noise"), and otherwise modifying the character of the information. This is done easily and in a highly-controlled and repeatable fashion. Terms such as "image enhancing", and "signal processing" relate to these forms of signal modification, and are commonly encountered in the literature relating to transfers.

The following sections deal with the equipment and services available to accomplish tape-to-film transfers. Both hardware and complete transfer service are presently available. The technology is in great flux at this time, and no clear path to the future is evident.

FIGURE 1—Highly sophisticated Teledyne equipment for shadow mask kinescope conversions of videotape images to film. The film camera used has an unusual film advance in which the film is pulled down and stabilized through the use of compressed air.



KINESCOPE—IN THE BEGINNING

Before videotape recording, there was only one way to record a program produced for television broadcast. This

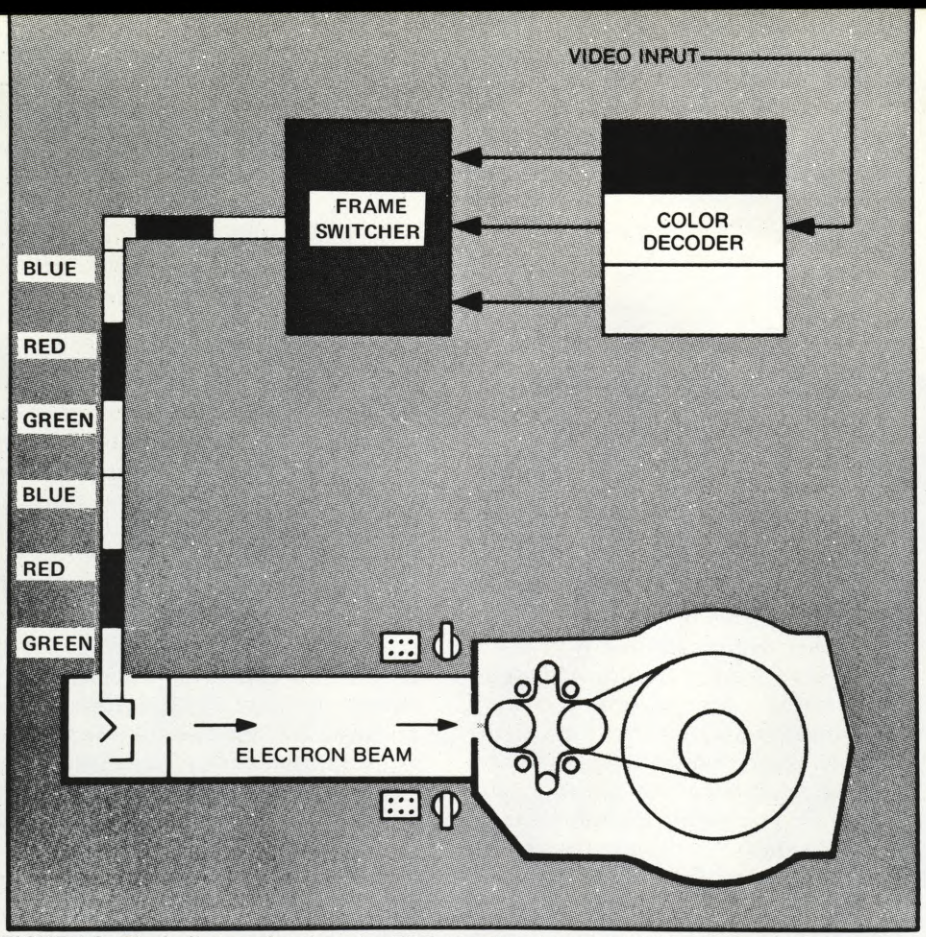


FIGURE 2—Block diagram for the color EBR, showing the sequential input of color information to the electron beam.

was to film the face of a television tube during the broadcast. This is the original kinescope recording. It is, in principle, still being used in some of the very latest and most sophisticated color television transfer processes.

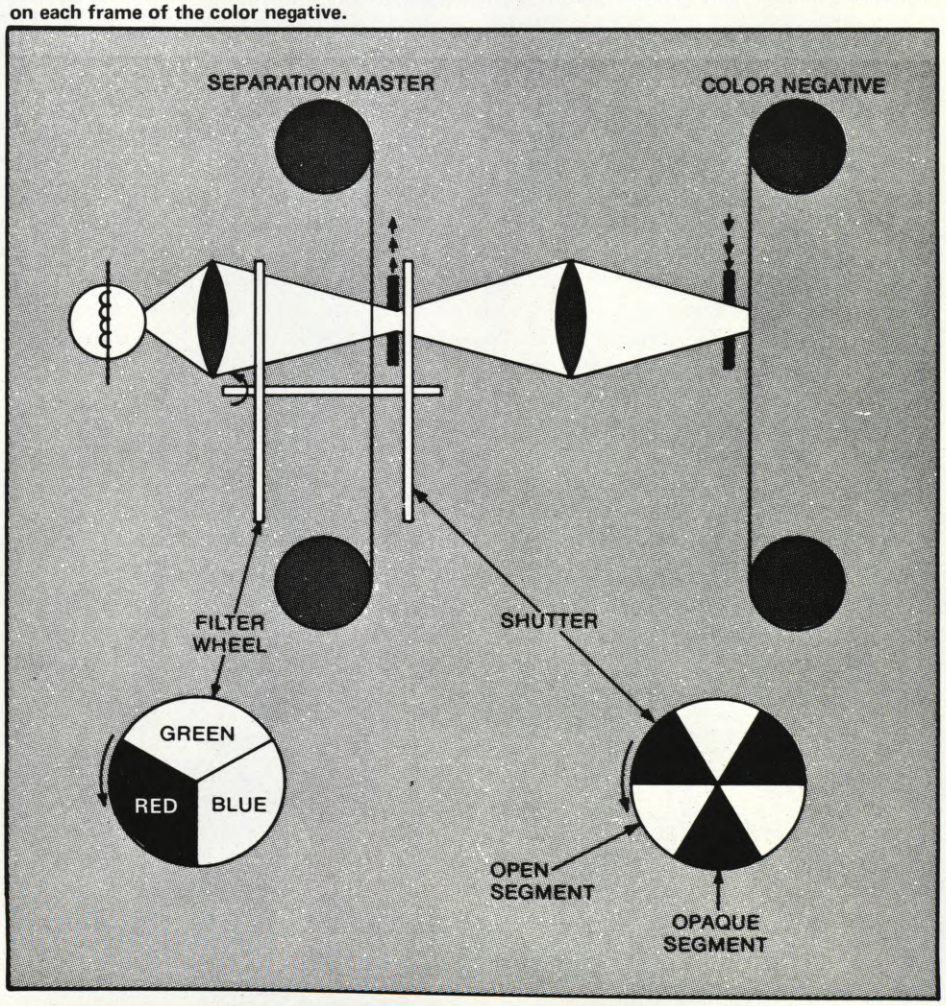
The kinescope process is the most widely-used of the methods for the transfer of video information to film. The advent of videotape has removed the necessity for real-time kinescoping and, most often today, the input to the kinescope system is from videotape. The present-day system is a far-cry from being just a camera with a framing rate suitable for recording the TV image from the face of a black and white tube. Much time and effort has gone into optimizing these systems, and trying to overcome some of the limitations experienced in the early days of the process.

COLOR KINESCOPE— SHADOW MASK PHOTOGRAPHY

The most recent requirement has been the need for color recording, and this has been done, as before, by photographing the face of a shadow-mask tube. This is the type of tube used in the home television receiver. As described earlier, the picture is created by the action of the three electron guns on the dots of color phosphor. The number of color dots is one of the limits of the resolution of the system. One of the other problems with the color kinescope process has been color "crosstalk". This has relationship to the fact that the purity of the color output of the phosphors, designed for viewing by the eye, is such that each of the three phosphors has some spectral energy output outside its own primary range (i.e. the red phosphor may have some green output, etc.). Further, the respective sensitivities of the three primary color film layers are not necessarily a good match to the energy output of the color phosphors. The color registration of the system has also been a limitation for the kinescope process.

Much of the equipment used for this process has been engineered and built by the people who use it, in spite of the availability of commercial systems. An excellent example of a highly sophisticated and operationally proven system is the color kinescope set-up developed and built at Consolidated Film Industries for its own tape-to-film transfer work. This equipment was designed so that a highly-repeatable, high-quality product can be turned out. The system contains a full set of built-in instrumentation for the calibration and monitoring of the entire video system. These include a vectorscope, waveform monitor, test signal generating and monitor-

FIGURE 3—Schematic showing the color EBR separation master being step printed on color negative. Sequential arrangement of separations on the master requires three separate exposures on each frame of the color negative.



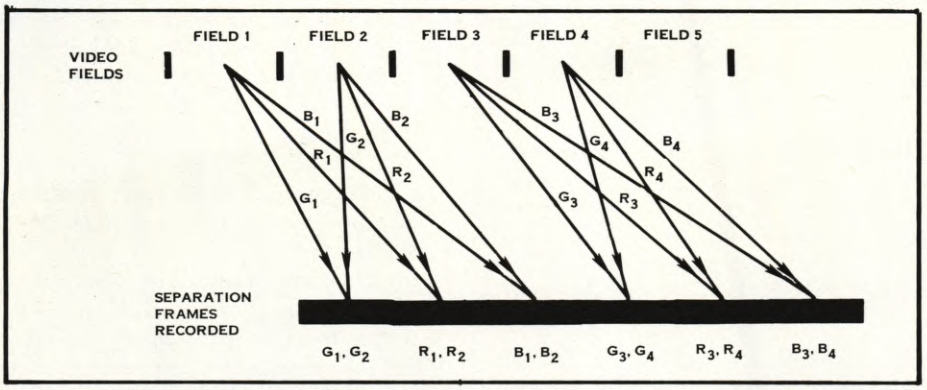


FIGURE 4—Conversion from NTSC video to sequential color separations in the color EBR system.

ing equipment and even an exposure meter for measuring the levels as read on the shadow-mask tube face.

One of the most interesting features of this system is the effort made to overcome the color purity and crosstalk problem. Electronic masks have been created, as plug-in circuit card modules, for each film type used with the machine. These masks act to modify the video color information in each channel by "pre-distorting" it to optimize the color response as recorded on film. The video signals are enhanced in this equipment, and there are separate gamma controls for each color. It is interesting, in this equipment, that the color as viewed on the screen is usually not acceptable to the eye. The reason is that it has been optimized for the film and processing procedures.

Kinescope equipment is being manufactured for the commercial marketplace and supplied as complete systems. The operational features are about the same as the CFI-developed equipment described above. The latest, and probably the most sophisticated of these is the Teledyne CTR-2.[1] See FIGURE 1.

The film camera used in the CTR-2 has an unusual film advance, in which the film is pulled down and stabilized by the use of compressed air. There is no pull-down claw, and no cams. The advance is done during the vertical blanking interval of the TV system. The total time involved in advancing the film and stabilizing it for exposure is not more than .0011 seconds. The camera performs the operation of skipping every fifth TV field in order to record the video at 24 frames as described earlier. The recommended films for the system are Eastman 7252, 7254 and Kodachrome II.

A color kinescope process which does not use the shadow-mask tube is the so-called "triniscope" system. Three separate tubes are used for the three primary colors, and these are usually optically combined and photographed as a single image. The system offers the possibility of optimizing the individual phosphors to be a better match to the sensitivity of the film emulsion color layers, and with greater purity of color. In addition, there is the opportunity to do extensive signal processing and enhancement and to monitor each of the primary colors individually. The problems of registration, and the very basic one of photographing a phosphor-coated glass remain. Eastman Kodak reports that they are conducting some work in this area. Some commercial transfers have been reported from England using this system.

Within the past year the Eastman Kodak Company has published the results of a study which was intended to assist those doing color kinescope work from shadow-mask tubes.

This study, after considering the problems of this type of recording, made recommendations relative to the television equipment, special techniques for optimizing the quality of the television image, as well as the photographic equipment, processes and materials. Efforts continue in many quarters to improve the quality of the color kinescope process. It continues to be the dominant means for accomplishing color videotape-to-film transfers at this time. It is also part of some of the most sophisticated tape-to-film transfer systems in use.

NEW HARDWARE FOR TRANSFERS —ELECTRON BEAM RECORDING

This process does not resemble the kinescope procedure at all. The information is kept in the form of electrical signals right through to the application of the electron beam to the film. The equipment to accomplish this process for black and white has been in the field for about four or five years. It has been used extensively in the transfer of black and white video to film, and has also found wide application in producing computer output on 16mm microfilm. The system is now becoming available for the transfer of color video to film, based on identical principles.

The color EBR system operates on the basic principle of transforming the incoming composite video signal into the separate components of red, blue and green information and putting this information sequentially onto a piece of black and white film to form a separation master. The finished piece of film then has, in three sequential frames, the red, the blue and then the green information for a single frame of the color composite to be made. See FIGURE 2. The film is running at 72 frames per second during this phase of the process. The printing process is carried out on a step printer that exposes each of the three separations through the correct color filter onto a single frame of color stock. See FIGURE 3.

The Electron Beam Recorder (EBR), as designed and manufactured by the Mincom Division of 3M, is based on the principle that the silver halide particles in the film emulsion react to an electron beam very much as they do to photons of visible light energy. The recorder can be thought of as a TV tube without a face. It is arranged so that the scanning electron beam impinges on film instead of on the phosphors on the faceplate of a television tube. Standard film emulsions are used in the process.

A relatively elaborate vacuum system is required for the operation of this system. The entire film and transport system must be in a very low-pressure environment in order to operate. This technology has been established during the last five years of field experience on the black and white equipment.

The high-resolution claimed for the color EBR process is based on the fact that the electron beam is only about 6 microns, or approximately .00024 inches, in diameter. The system scans 1,000 lines on a 16mm frame. The electron beam characteristics of narrow convergence angle, combined with the small spot size, result in great depth of focus. Also, the electron beam does not penetrate the film deeply so there is no halation from the backing. Because of the high efficiency achieved by exposing the emulsion directly with the electron beam, the separation master can be made on relatively slow, extremely fine-grained high-resolution black and white film.

The conversion of the 60-frame TV scanning rate to 24-frame film is done by making use of a video disc recorder as an intermediate storage element. After the broadcast signal is decoded, the three sets of primary color information for each frame are separated into individual fields and stored on the video disc recorder. Through the associated electronics, the system now simultan-

eously puts the color information (example: the blue signal) from two successive fields onto a single frame of the separation master though a switching system. This is performed for four successive video fields which results in six frames of separation being recorded. The system then discards the fifth video frame and repeats the above recording procedure with the next four, and so on. This practice results in discarding roughly the same amount of video information as in the direct kinescope process. See FIGURE 4.

The film drive system in this equipment is also unique, in that the intermittent pull-down used in the black and white EBR has been abandoned in favor of a continuously moving film. The location of the frames in relation to the sprocket holes is closely controlled by the use of an optical sensor which reads the sprocket-hole position. This provides the information for the drive system, through an electronic interconnection, to assure the proper positioning of the images on the film.

The claims made for the color EBR system include: true saturated colors with no crosstalk and no color fringing: inherent color registration, attributed to the fact that the separation images are recorded with the same electron beam on the same film (equal effect on all colors by anything that happens to the film); independent control of the color balance, based on the degree of control inherent in printing from separation masters; low-cost film and processing; archival separation masters not subject to color-dye fading. The first of these color systems is about to go on the line at a commercial service organization.

NEW HARDWARE FOR TRANSFERS —THE LASER COLOR FILM RECORDER

The other of the important non-kinescope processes for transferring information from video to film, and which is in operation, is the Laser Color Film Recorder. This equipment was developed, designed and built by CBS Labs for, and in conjunction with, the CBS Television network.[3] The film in this system is exposed by three primary color laser beams.

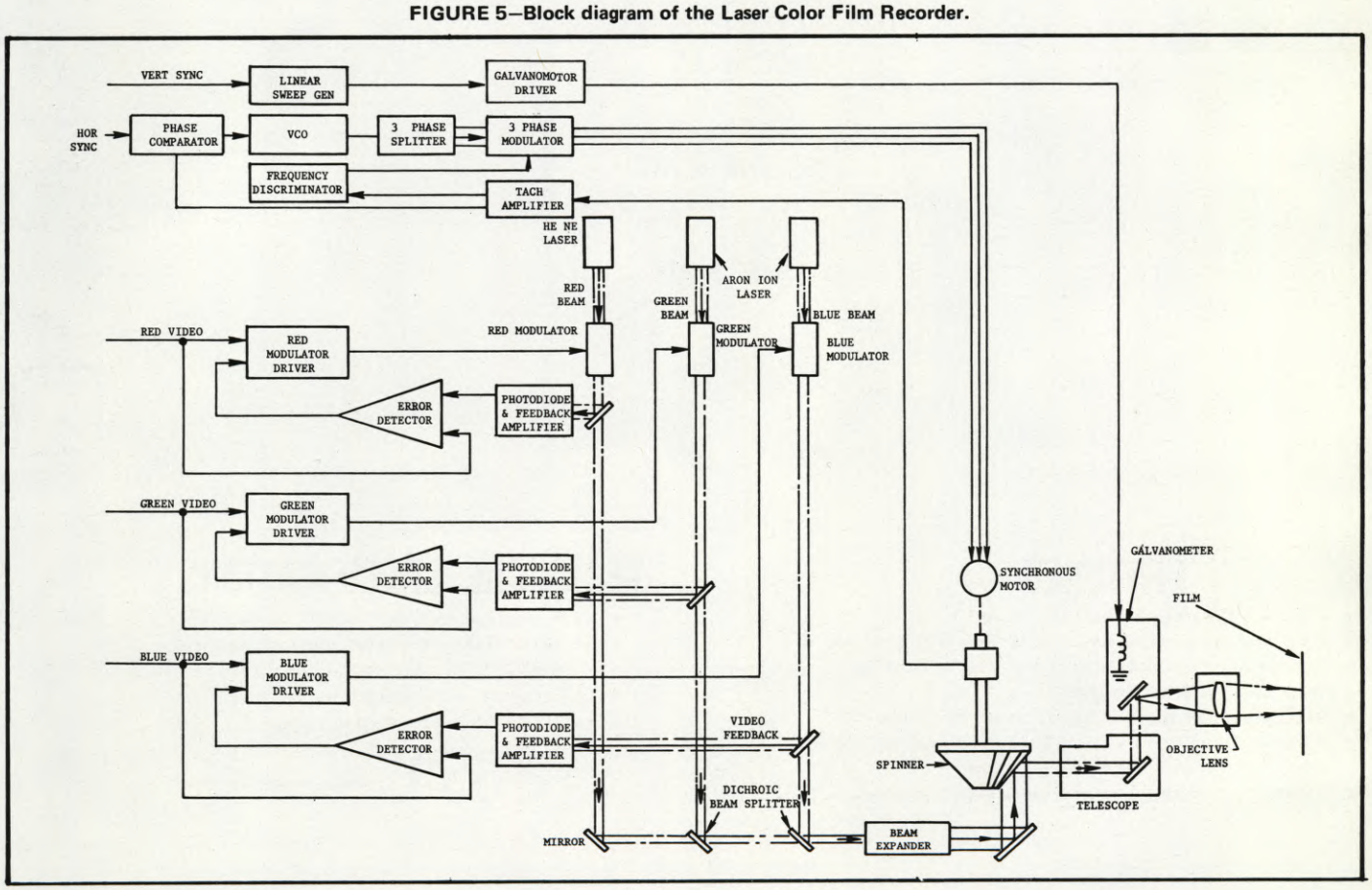
The system, broadly viewed, performs the same series of operations that are typical of some other equipment already described. It takes the NTSC 525-line broadcast-type composite color signal and decodes it. The electronic video information is enhanced, and then processed to optimize it for the transfer to film. Electronic masking is performed in order to compensate for differences between the film sensitivities and the color information generated by the video process. Further processing is carried out to modify the gamma of the video signals. Following all the signal processing, the enhanced and adjusted color video signals are used to operate three modulators. One of these modulators is located before each of the primary color laser beams.

Reference to FIGURE 5 will help to understand the optical and the general system arrangement. The three modulated laser beams are combined into a single beam in this system by the use of dichroic mirrors. The horizontal scanning is accomplished by reflecting the combined laser beams from a rotating 24-faceted mirror. The rotational frequency of this spinning mirror is maintained to within ±3 parts in 15,735. The vertical deflection is accomplished by the use of a mirrored galvanometer. This device must have a linear sweep, and must return to the start position within .001 seconds of the completion of a frame. The final objective lens in the system at the output determines the size of the aerial image. By interchanging lenses, 8mm, 16mm or 35mm formats can be realized.

The characteristics of the gas laser are such that the previously mentioned problem of "cross-talk" and color purity are essentially eliminated. The laser produces very pure monochromatic light which can be focused to a very-

Continued on Page 1197

FIGURE 5—Block diagram of the Laser Color Film Recorder.



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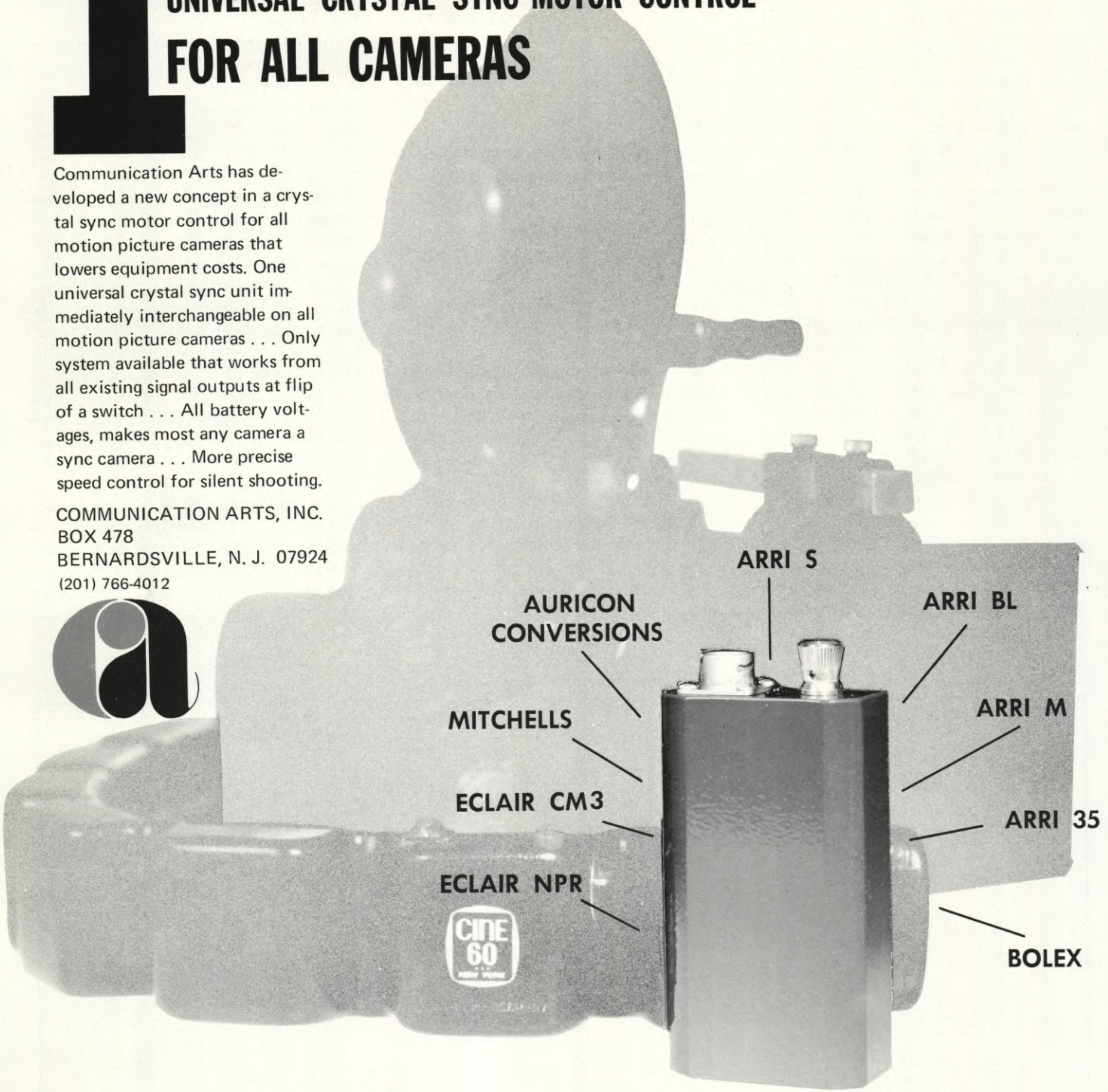

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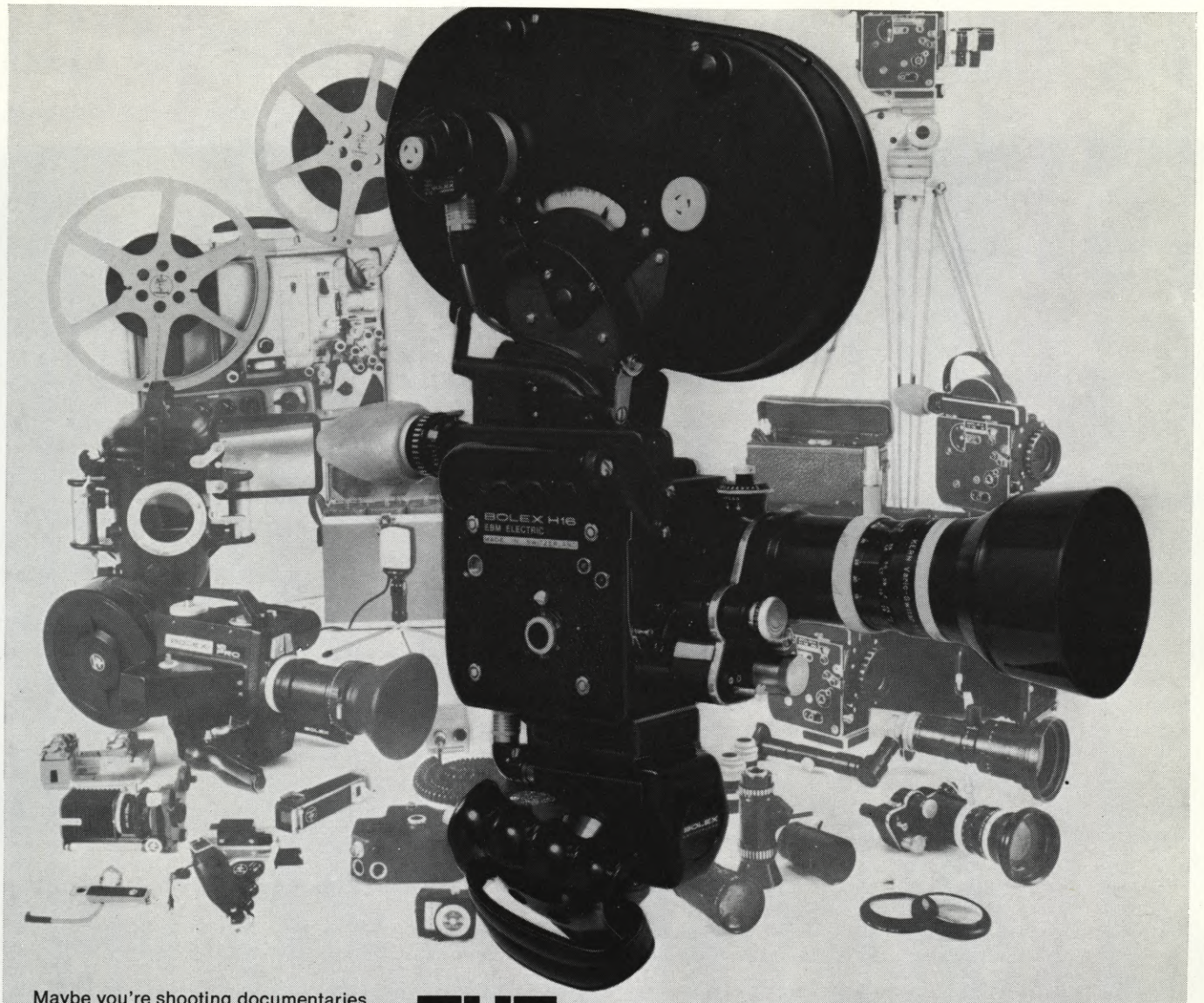

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The works: You can extend your basic equipment almost indefinitely with a wide range of accessories.

For instance: if you choose a spring-wound camera, you can automate easily with any one of four auxiliary motor drives, for time-lapse or animation, for variable speed shooting or for filming with sync pulse generator or crystal. The system offers you tripod; monopod; camera grips; blimps; an automatic fading device; cable releases; matte boxes (complete with masks); an underwater housing; attachable exposure meter; 400′ magazine; closeup lenses; extension tubes; optical magnetic sound projector.

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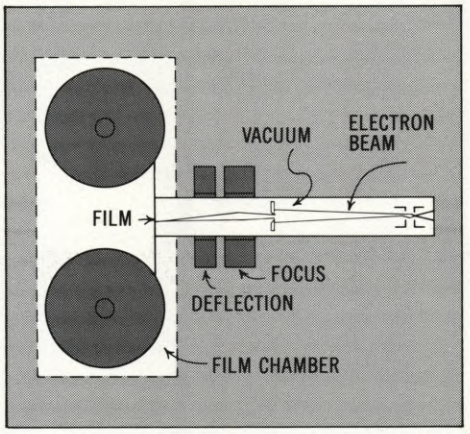

In the color electron beam recording system, the black & white separation master has archival storage life with no possibility of color fading or hue shift. This master is then printed onto 16MM (35MM option) internegative film in an optical step printer.

The internegative film is then used for conventional, high speed contact printing techniques. The resultant release print contains true saturated colors, no color crosstalk or fringing, accurate color convergence and balance, and precise registration and exposure. This film is free from splicing, shutter bars, or similar frame rate conversion anomalies.

The black & white electron beam recorder exhibits analogous performance characteristics in the transfer of black & white video material. The flipping of a switch allows the recording of either positive or negative images without a change in film stock.

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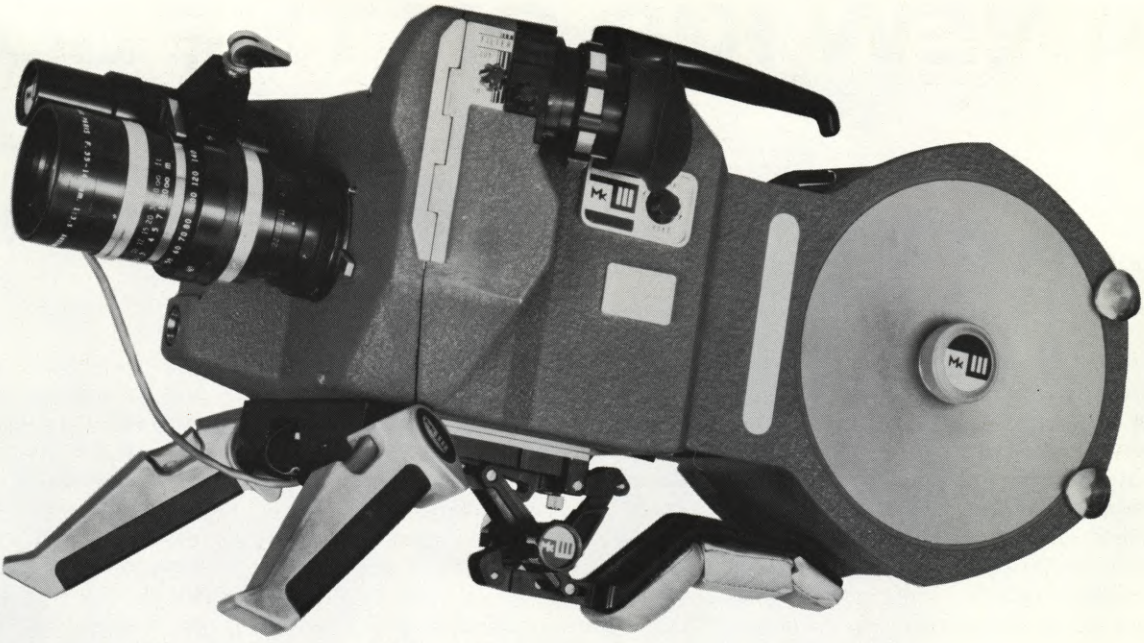

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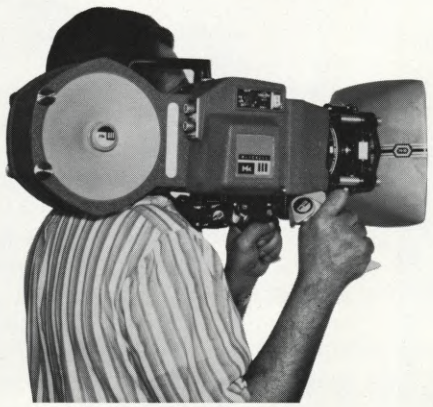

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A NEW KID ON THE BLOCK

An expert maintains that videotape is not at odds with the film industry, but complements it, and the film technician's expertise is irreplaceable in videotape production

By JACK B. McCLENHAN

President, Trans-American Video, Inc.

There's a new kid on the block and somehow everyone is afraid of him. Remember those earlier days when that new family moved into the Smith's house with their gang of brats? There was always Bobby somebody-or-other who, it was alleged, could beat you up 'cause he came from a military school. Invariably, Bobby somebody-or-other became the best shortstop on the neighborhood team.

When videotape moved into the film neighborhood many reputations preceded it: you couldn't edit it; what about sound mixing; limited lenses; lack of mobility. Well, like ol' Bobby Somebody-or-other, videotape is dispelling all those early problems and is fast becoming the best shortstop in the block.

It should be understood that at present videotape is not totally at odds with the film industry, but rather complements it. Almost every facet of the film journeyman's expertise is irreplaceable in videotape production, particularly in the production of features for theatrical release.

When color videotape came on the scene some seven years ago, it was harmless enough. After all, it was developed as a storage medium for its own television programming.

As computers and electronics made incredible strides in capacities and miniaturizations, the video industry tagged along. It wasn't long ago that we wondered if we could put a man on the moon. Now, we watch him walk around by way of a video camera remotely controlled from Earth. These advances are only mentioned here to illustrate man's startling ingenuity with videotape over a period of less than a decade. And now, we are successfully transferring the video image to film, facilitating projection to a theatrical size screen.

All of this has brought us full circle to a question of concern to the entertainment industry. Will the fledgling, videotape, eliminate the crafts and guilds of the film industry? The answer is an emphatic NO! Adjustments will have to be made, but as we view it, videotape will bring the skilled film craftsman back to life. He will have a more creative tool with which to work and work more efficiently and economically. There's just so much money out there. Features have become an exercise in economics. No longer is it fashionable to produce twenty-million-dollar epics. It is rather more prudent to produce twenty features for the same dollar as a "CLEOPATRA". Over the past decade, film has become too great an investment risk for the sophisticated investor; however, videotape will reinstate the enthusiasm in the skeptical investor who expects a reasonable return for his dollar.

There's no magic involved here. Videotape is an instant medium. It goes through all the pains of correct lighting, angles, blocking; it's just that you can see it as you do it, thereby eliminating costly raw stock and the time of high-priced talent.

Many feel you must "composite in the camera" to make tape viable. Certainly, this is advantageous if the scenes are well constructed and it is practical to do so. However, many are using videotape cameras in the single camera "film technique" and realizing great savings in editing and laboratory processing time.

Those of us who advocate videotape do so not with the emphasis on replacing film, but on putting more people to work. We've got a sick industry on our hands and it will take a new shot of adrenalin to bring it back to life.

From a very practical point of view, videotape needs skilled cinematographers. Good dramatic lighting is needed in videotape every bit as much as in film. If videotape has had a production weakness over the years, it has been in the field of lighting. The typical television lighting director tends to light flat. Classically, lighting television shows is done entirely from overhead, thus creating a very flat, soft shadow look. However, for those of us who remember Playhouse 90, Hallmark Hall of Fame and other television dramatic efforts, you will recall a film approach to these award-winning efforts.

It is our hope that through the blending of both film and tape techniques the result will be increased production and employment. The blending is not as difficult as many suspect. There's no question that the technical or electronic side of videotape takes specially trained engineers; however, all other skills are interchangeable. Videotape is a streamlined operation while utilizing cameras that are similar in size to the big Mitchell and the little "Arri". The camera operator must adjust to the

Jack B. McClenahan, President of Trans-American Video, Inc., inspects some of his company's sophisticated new equipment. McClenahan insists that film and videotape are compatible and that a blending of the two techniques will result in increased employment and production within the industry.

disciplines of a video camera without his focus puller and first assistant. There must be an attitude that lets creative people regard videotape equipment as just another way to "take a picture". As the resistance to the electronic era wanes, directors and producers will find an ease to creating effects and editorial control that has been long enjoyed by the television industry, but never experienced by the film devotee. Video cameras place the director back in the driver's seat. He does not relinquish his creative responsibility to anyone. He watches every frame, every density, the color saturation of every scene; the look of the piece is totally his to approve.

The producer and director in videotape work far more closely than in film. If they are two separate men, it requires more of the producer's time during the shooting schedule, but less time overall. Through the instant-replay ability of tape, the director has "instant dailies". He reviews scenes privately or in concert with his creative team. You never leave a location with the trepidation of poor stock, mismatched exposures, scratches or any other quality-control items that cause costly retakes from locations to which it is far too expensive to return.

How does a film veteran get to meet this new kid on the block? Every major Hollywood film studio has done one or more project on videotape. Burbank Studios (Warners and Columbia) have dedicated three sound stages to videotape production. MGM is currently shooting their new "Young Dr. Kildare" series on tape. Universal has a completed pilot on tape. 20th Century-Fox and Paramount have tape product in syndication and are looking at tape projects for prime-time network sale. If none of these can supply your answers, Trans-American Video will be pleased to do so.

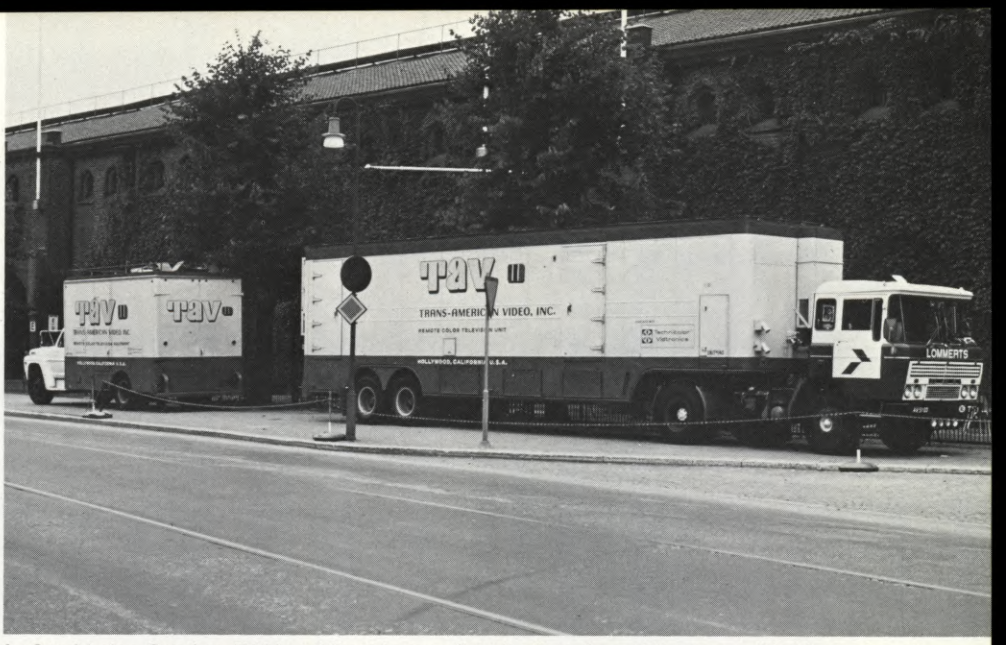
There really is no reason why product produced for television is not shot on tape. With the viability of tape-to-film transferring upon us, many features for theatrical release also lend themselves to tape. There have been several projects attempted. Those that have been unsuccessful were predictably so from the start. Low-budget producers who look to videotape as some kind of cure-all have been sadly disappointed. With care in planning and blocking all of the aforementioned, creative aspects accrue to the producer and make for a lower overall budget. It cannot be shot in a slipshod manner any more than film.

Many feel film and tape are fine in their respective places. It is only when one intrudes on the other's domain that people begin to get uptight. It is ironic that by way of the television medium, more film is consumed than for theatrical release. It is no longer a specialized market addressing itself to a television audience. Features for television are run again in theatrical release, particularly in markets outside of the United States. However, movies of the week are now being shot on tape less expensively with an eye toward transferring to film should a foreign sale be made.

As the major studios continue to use videotape, the unions are training new engineers and re-educating existing old guard. It's pretty sad to look at the once-bustling studio lots and watch them rise and fall at the whim of a television schedule. We want to see more original programming result from the lower costs of videotape. We don't want it to be a cause for higher sales profit unless the intention is to plow it back into new product. Studios need to have a schedule that calls for more than twenty weeks of production on four television properties.

Low-cost features shot with high-budget production values can be a reality on videotape. Two and three-week principal photography schedules can turn out low-budget features after just ten days of editing and effects. That's all it takes. No magic, no mirrors, just straightforward production techniques utilizing videotape.

More product can be turned out and more people can be working if this new kid on the block is accepted for what he can contribute and not rejected for lack of understanding. ■

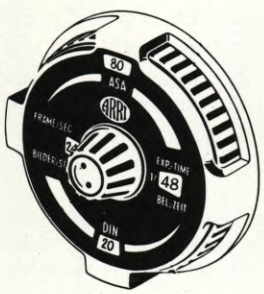


In Stockholm, Sweden, TAV mobile videotape "studios" are in position to record videotaping of the World Invitational T & F Championships. Trans-American Video, Inc. now has in excess of $10,000,000. invested in the latest electronic equipment.

Burbank Studios (Warner Bros. and Columbia) where three large sound stages have been converted for videotape production, with equipment and services provided by TAV. Hollywood craft unions have instituted training programs for film technicians, particularly cameramen, so that they can adapt their expertise to the electronic medium.

Arri 16BL's APEC: Does the pro *need* a built-in meter?

With your eye at the eyepiece, you can frame, focus *and* set the f stop. Accurately — and fast. It could save the shot.



Sceptics were dubious in the beginning. "No substitute for a hand-held incident reading," they said. For lighting a set, we agree. No contest.

But in documentary situations, there's clearly nothing better than a meter set behind the lens. Because it tells you *precisely* how much reflected light is getting to the film.

Does it read the whole frame?

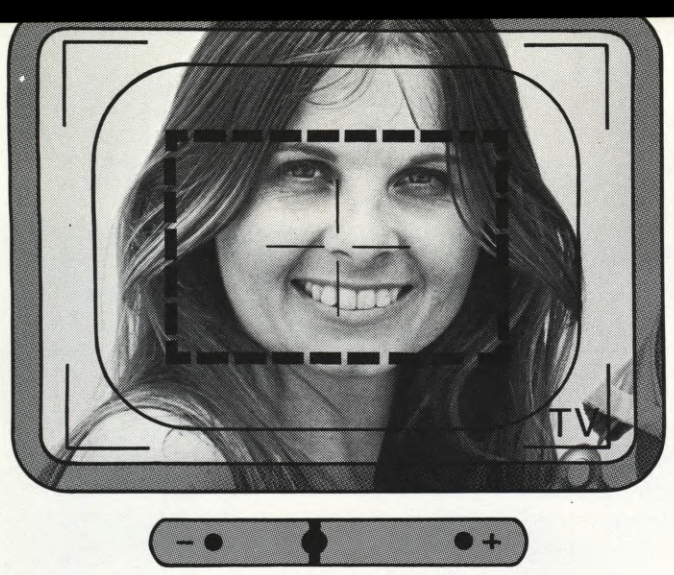
No! APEC reads a central area of the frame — about one-third of the full aperture, regardless of focal length. If you zoom in to 120mm, for example, you get a closeup reading of 3 degrees. (See the photo on the next page: the dotted line shows the measured area.)

How fast is it to operate?

Frame your subject, and focus. Then center the APEC needle, by turning the f stop ring. That's all! And all with your eye at the finder. You take the reading and set the stop *all in one movement.*

Reading inaccessible subjects

Zooming in for an APEC reading is a lot faster than walking onto the set, of course. And sometimes it's not easy to *get* there. Shooting surgery, for example; or wildlife. Or a speaker at the podium.



See the reading during the shot

The needle is visible just below the image area, as you can see above. If the action moves from shade to sunlight, you can ride the f stop. (APEC is manual, of course—not automatic.) And this is a noteworthy fact: Some APEC users have gotten *one-light release prints!*

Arena staff changed lighting without any warning—in mid shot!

Shooting a Jesus Movement rally at the Los Angeles Sports Arena, film-maker Roger Boller arranged the light levels ahead of time with the arena's staff. And before the crowd arrived, he took hand-held readings at various points in the stadium.

But when the rally began, its producers repeatedly lowered the lights for prayers, and raised them at dramatic moments, without warning—often in mid-shot! Mr. Boller just had to follow it from camera position with his APEC meter. *Every foot was perfectly exposed.*

Three cogent facts about APEC

1. Image quality is not affected. APEC takes its reading off the mirror shutter. There's nothing to obstruct the light path to the film.

2. ND wedges keep it consistent. The measured light is always in the center of the cell's response curve. Regardless of the ambient light level, it's always *measured* at the same intensity. Perfect accuracy.

3. Easily installed in most 16BLs. The APEC system is mounted in the 16BL's door. If your serial number is 50701 or higher, you can have a new door fitted, with APEC built in.

For a free APEC color brochure, please write to us at one of the addresses below; or call.

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ELECTRONIC CINEMATOGRAPHY ... A REALITY NOW

The ultimate appears to be an electronic production system, employing videotape and ending up with distribution on film

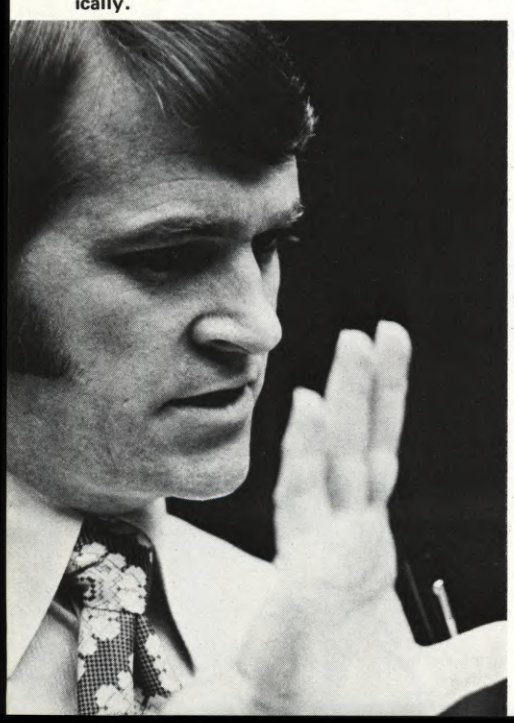
By JOHN D. LOWRY
President, Image Transform Inc.

When you are making your next film, how would you like to use a camera that is absolutely silent, has a brilliant, flicker-free viewfinder, shoots 16mm or 35mm, has servo-controls for zoom focus and iris? It incorporates a beautiful combination of incident and spot light meters, keeping your exposure within a quarter of a stop. It cannot scratch your film. There can never be a hair in the gate. It requires less than half the light, and yet, the prints of the film will be the finest grain you've ever seen on the screen. It works on AC power or batteries and is always in sync. You can shoot the equivalent of six thousand feet of 35mm film without reloading the magazine, and the only moving parts are the elements of the lens. The quality of the film shot with this camera is excellent on a forty-foot theater screen.

And, it's available today. It's called a television camera.

But, maybe for the cinematographer, "television" camera is a bad word. Maybe, we should call it "an electronic motion picture camera." Functionally this electronic camera is different in many respects from the normal film camera. But from the creative point of view of the cinematographer, it is almost identical to a highly sophisticated film camera. Certainly a scene or setting that is well lit for Eastmancolor film will probably be excellent as photographed by a good television camera. Good lighting is good lighting. Lenses, their f-stops, angles of view, depth of field, etc., are strictly governed by the basic laws of physics, and are identical, whether you are working with an electronic camera or a photo-mechanical film camera.

John Lowry, President of Image Transform Inc. feels that we have now entered a new era in the production of images, that of making professional motion picture film electronically.



The major difference between the two has been a trend toward zoom lenses for electronic cameras. The excellence of the zoom lenses manufactured today for professional electronic cameras is such that the fixed lens is totally unnecessary from a photographic quality point of view. In any case, numerous electronic cameras can now easily be adapted to fit virtually any fixed lens of the types used for 35mm motion picture film photography. The viewfinder is, of course, a reflex viewfinder on an electronic camera, showing exactly the image that will be recorded, but with the advantage of high brightness, no flicker, and an ease of distribution to the various parties interested in the picture. Thus, the assistant cameraman, the grip who is pushing the dolly, the continuity girl and the director all have access to the picture to help them do their jobs in a more efficient and precise manner. Besides being able to be used on any standard dolly or crane, an electronic camera can be mounted on a Worrall head, if that degree of precision is required for any given shot. The servo lenses are easily adaptable for operation by the first assistant cameraman, both in zoom and focus. The point being that any good cinematographer can light for this electronic camera, and any good film camera operator can do an excellent precision job of operating it without special training.

The "umbilical cord," or camera cable, that connects the electronic camera to the control unit has, on many of the cameras, now been reduced to the size of normal AC extension cord. And, on some cameras, has been totally eliminated by the use of a wireless link. The normal professional electronic camera weighs between 70 and 100 lbs, but hand-held units are now in common use that weigh about 16 lbs and there is one super-miniature professional color camera with zoom lens and viewfinder that weighs only 2½ lbs, substantially less than a 16mm Arriflex.

But most important of all, you know what you have got in the can. You can see the picture in a large reflex viewfinder and, if you require it, you can see a playback (in your viewfinder, if you like) to double check a camera move or a focus shift or a zoom, etc. But then we are talking about a "television" camera; what does this have to do with the motion picture theater screen?

Technological developments in the last two years have finally made the conversion of video signals into high quality professional color motion picture film a practical reality. Motion picture photography with a totally electronic camera is here . . . . TODAY!

Image Transform, a new company in North Hollywood, California, has been successfully converting videotapes to professional quality motion picture film on a day-to-day basis since last January in Super 8mm, 16mm and 35mm. For the first time, electronically originated film prints are directly comparable to prints from original motion picture film.

Many approaches have been taken to solving the problem of converting video to film over the years, but until now, practical techniques employed the basic concept of photographing a television display with some form of motion picture camera. These kine recording techniques enjoyed varying degrees of success but were severely limited, as are the new electron beam and laser transfer systems, by the input video signal, particularly from videotape. Image Transform has developed a new patented approach to signal processing that, among other things, reduces subjective television noise or graininess by more than 80% before the images are recorded on film. This is a key factor in the substantially improved results on film.

If you viewed the Apollo 16 television pictures from the moon last April you have seen some evidence of this system in operation. The live lunar television signals were routed from Manned Spacecraft Center, Houston,

(LEFT) Image Transform Inc. technicians at work in the firm's Hollywood laboratory. The company provided image enhancement for videotaped material coming back "live" from the moon during the Apollo 16 mission. (RIGHT) A video crew shooting on location. Lowry maintains that film cameramen and assistants can make the switch to electronic equipment with no problem and that the creative elements involved are identical in the two media.

Texas, to the Image Transform plant in North Hollywood where a portion of the Image Transform electronics was used to process the pictures.

More than three-quarters of the video noise or graininess was removed and the images were substantially sharpened and enhanced before sending them back down the micro-wave line to Houston for distribution to the NASA scientists, geologists and to the television networks. The delay in the routing of the live television signals was a small fraction of one second. The work that Image Transform did for NASA on Apollo 16 represents a portion of the total system that we refer to as a "transform." We are not simply making a better video-to-film transfer, we are changing the nature of the electronic information before transferring it to film.

It might readily be argued that improving pictures from the moon for television distribution and making 35mm films for the theater screen are in two different leagues, but the problems are very similar in many ways. When the input is a high-quality color television signal the picture noise is all but totally eliminated, thereby permitting a very substantial pre-emphasis of the high-frequency or fine detail information in the signal prior to clearer detail in the middle of the film frequency spectrum than is possible with normal motion picture photography of the original scene. All the fine detail information that is available in the electronic signal is recorded on the film negative with relatively high contrast. This compensates in part for the printer and print stock losses that will be incurred. The prints originating from the electronic signal may have almost double the depth of modulation of a normal film in the portions of the picture that carry the bulk of the information about the original scene.

If you consider pure resolution in the television and film systems there is, of course, no comparison. 35mm, for example, has much more fine detail information than the standard television system is capable of resolving today, but this fine detail information has a very low depth of modulation or low contrast on the film. By comparison, the television system has very high contrast right to the limit of its resolving capability. The information that is there has a high contrast and a very high accutance or edge sharpness. A theatrical cartoon, for example, has high accutance or sharpness of the information that is available, but when it comes to resolution in the cartoon you might rate it at 20 lines for the entire screen width, and yet this picture is quite acceptable for viewing on the largest theater screen.

The electronic system presents a great advantage to the cinematographer in the area of color correction. In its electronic form, the signals are color-corrected, as would normally be expected on film by varying the red, green and blue content. But, further correction is easily possible electronically by correcting, for example, the light portions of the red image, without affecting the dark red or mid-red areas. Full gamma correction of each color separately, or over-all gamma correction, can be readily introduced. The contrast build-up normally experienced in multiple generations of film, such as with special effects work, can be easily compensated for.

Color saturation can be adjusted with one knob to create the softest of pastel looks, or a brilliant "Kodachrome Look," or any variation in between that the cinematographer may desire. Electronic color masking can be utilized to adjust one color in a scene without affecting any of the other colors. In the hustle and bustle of normal television production these tremendous advantages are rarely used to their full capability. The cinematographer who is able to follow through on his production has unlimited creative scope in dealing with color and mood in his electronically-produced film.

ASA rating and grain structure are, of course, very important to the cinematographer in selecting a film stock, particularly where special applications, such as night scenes, are to be considered. The normal television camera operates quite efficiently in the range from 20 to 200 foot-candles of light, and can operate in the 10-to-15-foot-candles area for night photography. Shooting with lower light levels does increase the video noise, but has no effect on the actual film grain on the final product. The television noise is reduced during the transform process and the final grain structure of the electronic film can be exceedingly small, since a highly sensitive film emulsion is not necessary at any stage of the photographic portion of the process. The print stock grain is the current limitation of the total system. In Super 8mm, 16mm and 35mm the Image Transform film is probably the finest-grain color motion picture print that has ever been made for normal distribution.

The American standard 525-line

Continued on Page 1186

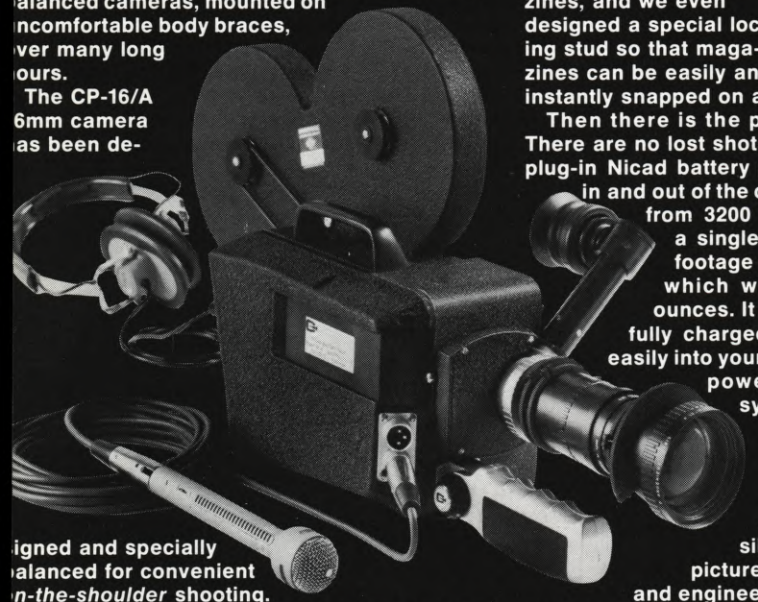
The New CP-16/A (with Crystasound). A Cameraman's Kind of Camera.

Tired of the daily struggle with backbreaking ody braces, unwieldy tripods, and heavy, oorly balanced cameras? Tired of dangling ower and sound cables? Encumbered by uickly exhausted battery packs? Frustrated y a noisy camera movement? Annoyed with tack-on" sound equipment? Feeling crushed nder the weight of it all?

We, at Cinema Products, believe that we have esigned a unified camera and sound system hat will solve all of these problems.

Take backaches, for instance. Backaches ay sound funny to some people. To a TV-ewsfilm cameraman they're no joke. More nd more TV-newsfilm cameramen have been eporting severe and crippling backache con-itions as a result of carrying heavy and poorly alanced cameras, mounted on ncomfortable body braces, ver many long ours.

The CP-16/A 6mm camera as been de-



igned and specially alanced for convenient *n-the-shoulder* shooting.

t weighs a little less than 17 pounds when fully quipped. And "fully equipped" means *fully.* With 400-ft. magazine loaded with 400 feet of ilm. With a 12-120mm Angenieux zoom lens. With a plug-in Nicad battery pack. With a criti-ally accurate crystal-controlled DC servo-notor for single and double system sync ound. Plus the Crystasound recording system ith built-in amplifier. That's right. Less than 7 pounds!

As for noisy camera movement problems, ou've got to "not hear" the CP-16/A to believe ow quietly it runs. Our sound tests show pproximately 31 dB at 3 feet. But the real sound test is your professional ear, and the actual quality of the sound recording.

Out-of-sync problems? Our CP-16/A is crystal-controlled to the extremely critical tolerances required by *cordless* double system recording, with a frame rate accuracy of ±15 parts per million over a temperature range of 0-140° F. And if something should go wrong, the easily visible out-of-sync warning lamp, located at the front of the camera, will instantly light up.

As for magazine capacity, the CP-16/A accepts standard 400-ft. and 1200-ft. Mitchell-type magazines, and we even designed a special locking stud so that magazines can be easily and instantly snapped on and off the camera.

Then there is the power supply problem. There are no lost shots with our rechargeable plug-in Nicad battery pack. It snaps instantly in and out of the camera body, and drives from 3200 to 4000 feet of film on a single charge. That's a lot of footage from a little battery pack which weighs a mere sixteen ounces. It is so compact—a spare, fully charged battery pack will slip easily into your shirt pocket. And it also powers the CP-16/A sound system.

Lately, more and more TV-newsfilm and documentary cameramen have had to "go it alone," with the responsibility of capturing *both* picture and sound. Designed and engineered from an overall total systems approach, our CP-16/A with Crystasound makes it seem almost easy.

The Crystasound amplifier is part of the camera, and it is powered from the same battery pack. Switchable, variable compression Automatic Gain Control let's you concentrate on filming the event. The headphone monitoring channel automatically switches from live mike to playback when the camera is turned on. We've even provided a special line feed to a tape recorder for those instances where the cameraman is recording simultaneously for TV and radio. The built-in amplifier has two microphone inputs and one line input, all with independent volume control. Other features include automatic bias level, with no adjustment required, preview switch, VU meter, and low power consumption.

Our Crystasound recording system features a special record and playback head, encapsulated in the same module to guarantee absolute alignment for its entire life.

Should you need an auxiliary mixer, our Crystasound auxiliary mixer features: four channels of mike input, one channel of line input, and one condenser mike channel. It also features individual and master volume controls as well as switchable AGC.

For the TV-newsfilm cameraman, the name of the game is lightweight, extremely mobile and reliable equipment, so that he can capture the spontaneous *live* feel of a news event as it happens. We are confident that the CP-16/A provides just that.

With no backaches.

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"VIDEOGRAPHY"

Continued from Page 1115

under mixed lighting conditions.

Light levels as low as 16 foot-candles have been used to record night-for-night situations. The cameras are modified electronically in about 20 minutes for these low-light situations. They can also be set up to shoot the wide-screen 1:85-to-1 format in less than one hour.

The PCP-70's are "heated up", including all electronic adjustments, while the unit is moving to location. Setup time is, therefore, cut to a minimum. The crew can be ready to shoot with two cameras, all lighting, and sound in less than 15 minutes. As many as 28 different setups have been recorded in one day.

The "control room" is the truck's cab. This mini-TV studio contains monitors, mixers, video switching and special effects generators, as well as all testing and communications equipment. The director has the option of monitoring and controlling all shooting from this "command post" via intercom to crew members, or he can direct conventional-film-style from the set.

There are two Ampex VR-3000 videotape recorders in the vehicle. These units are built in an attaché case weighing approximately 55 lbs. each. Although they are labeled "back-pack videotape recorders," this is rarely the case. More usually they are shock-mounted in the video unit, so that the signal being recorded can be adjusted by the video control man. Each recorder holds an 8" reel with 22 minutes of recording time.

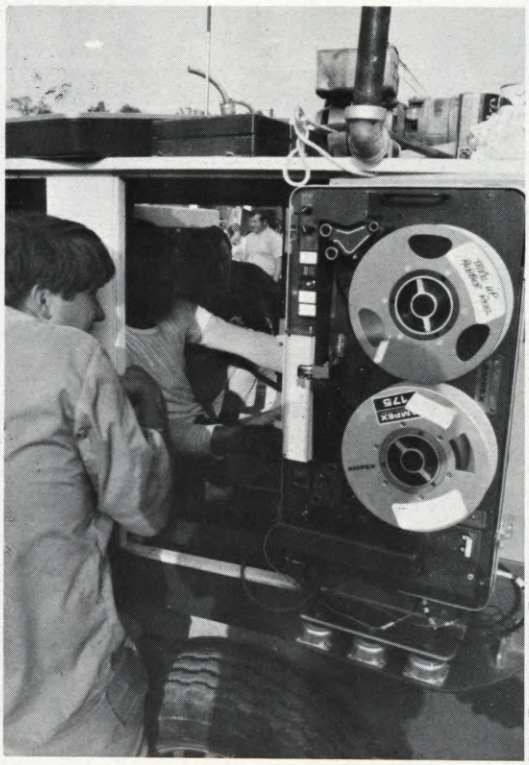
One of the biggest complaints filmmakers voiced about early video equipment was the necessity to cut between cameras while shooting (TV style). This required instant editorial decisions and often a compromise in the timing of cuts. State-of-the-art *videography* requires no such compromise. Each camera can be recorded raw by its own VTR and all editing decisions made in the post-production stage.

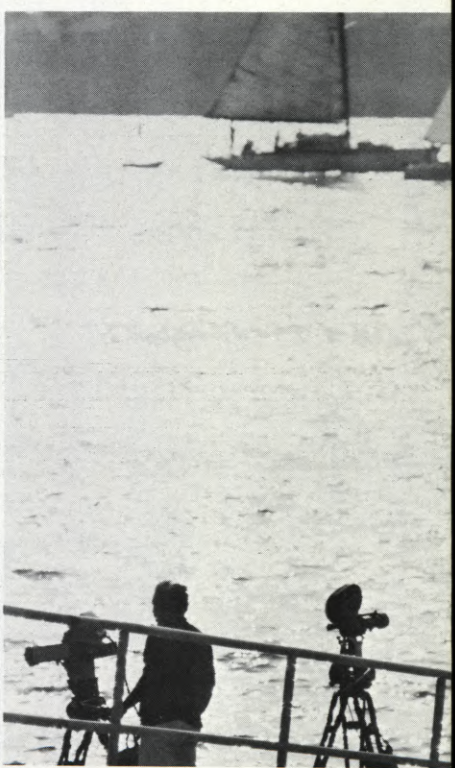
If the director chooses to call shots in the camera (saving expensive editing time), the camera cuts can be recorded on only one of the VTR's. The other VTR can record the master shot raw. If some of the cuts were not perfectly timed, they can be corrected later. He can then pick up reaction shots and cutaways, film style.

The audio booth is located in the rear of the truck. It is usually a one-man operation, using multiple Vega wireless mikes. If shooting is documentary-style and the subjects can't be miked individually, a second audio man uses a shotgun, fishpole or boom microphone. The audio section is equipped with a six-channel mixer feeding into both Videotape recorders, and double-system into two Nagra IV's.

Continued on Page 1172

(LEFT) Ampex VR-3000 video recorders weigh only 55 pounds and hold 22 minutes of broadcast tape on an 8-inch reel. (RIGHT) Testing the quality of tape as compared to that of 16mm film on location. It is generally conceded that the quality of broadcast tape exceeds that of 16mm film.





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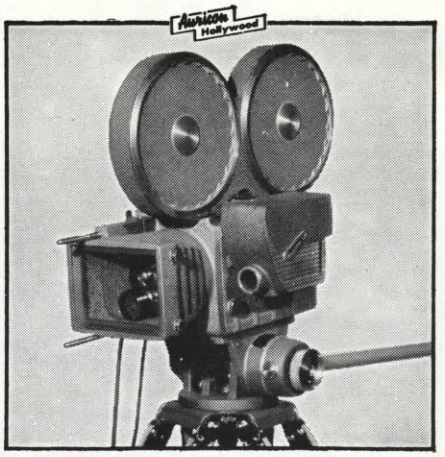

"AURICON PRO-600" 16mm Optical Sound-On-Film Camera.
★ 600 ft. film capacity for 16½ minutes of recording. ★ $1820.00 (and up) with 30 day money-back guarantee.

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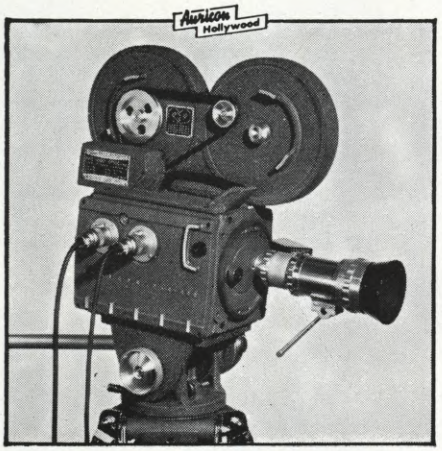
★ 1200 ft. film capacity for 33 minutes of recording. ★ $6425.00 (and up) complete for "High-Fidelity" Talking Pictures.



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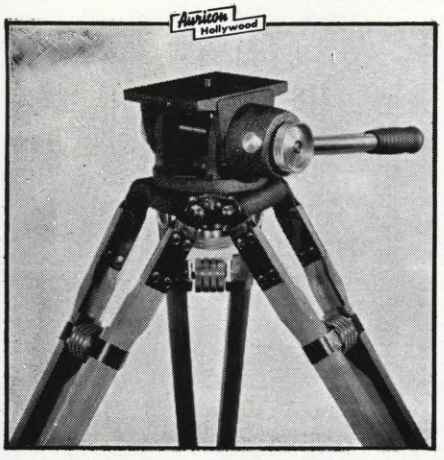

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"WHY?" AND HOW THIS NEW TAPE-TO-FILM FEATURE MOTION PICTURE WAS PRODUCED

One of Hollywood's top cinematographers shoots first project on videotape and becomes converted to the electronic medium

WHY suicide at 18 years old? WHY Woodstock and its intimate instant city of the New Youth? WHY are intelligent, aware young Americans locking themselves into rooms with strangers for sleepless nights of pressing each other to bare their deepest emotions . . . their very souls?

"WHY?" is the New Hollywood's first feature film to be released at colleges across the U.S. before going into general theater bookings. Robert Cohn's production of "WHY?" is unique in just about every way a movie can be unique . . .

"WHY?" is unique in the way its script was created. The first step was six months of first-hand research by director Victor Stoloff, who interviewed over thirty psychotherapists, attended and videotaped scores of group therapy and encounter sessions, visited the Free Clinics of Southern California, Operation Bootstrap in the black community and national representatives of the Gay Liberation and Sports Liberation movements.

Nearly 150 of Hollywood's finest young players auditioned for "WHY?" They were each asked to perform improvisations based on the composite characters Stoloff had put together from his file of over 500 authentic case histories. These auditions were videotaped on the new Akai lightweight video camera system, so there was instant playback availability of these tryout scenes.

But the portable videotape camera was instrumental throughout the making of "WHY?" Once the picture's final cast was picked, the actors and actresses met all day with Stoloff for six weeks of in-depth improvisation sessions and went out into the field to meet with youth organizations the director had researched. Dr. Herb Goldberg, in his role as a psychotherapist, gave the performers psychological exercises which they had to act out within the personalities of their "WHY?" roles. All of these improvisations were videotaped. And then the "WHY?" dialogue was assembled by Stoloff to fit dramatic scenes of the final scenes created during the weeks of group improvisation.

The hand-held videotape system turned out to be an essential prop during the actual filming of "WHY?" too. The therapist in the film videotapes and shows the sessions to make his tormented young patients face the deepest truths about themselves.

The producer of "WHY?", Robert Cohn, decided to make his new movie the first full-length feature shot in Technicolor's brand-new Vidtronics technique, the most advanced method yet of transferring videotape to high-quality color film. The computerized process allows for stunning optical effects not possible when shooting with traditional photographic film . . .

And ultimately, it's the theme and story of "WHY?" that make it a breakthrough motion picture, not the excitingly offbeat casting, the flashy new production technology, the hip, free-form improvisational structure of the script or even the brand-new distribution setup of Robert Cohn's C-Films, which will for the first time bring to college campuses nationwide the chance to see blockbuster new youth films before *these films go into general theater release.*

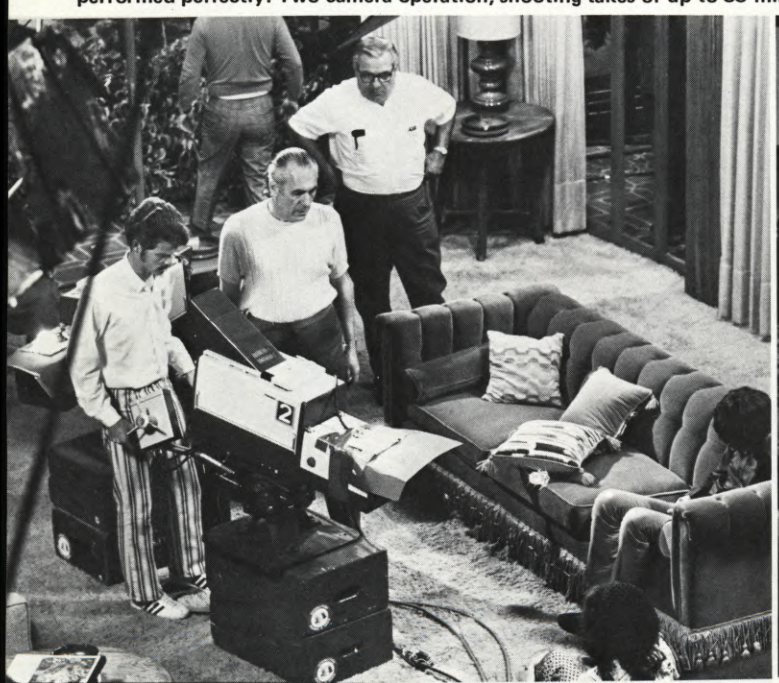
"I was in New York working on a film and I read about that 18-year-old boy and girl in New Jersey who committed suicide as a protest against the injustice in the world today," says director Victor Stoloff, a widely-travelled veteran filmmaker who was running the first Arabic-language newsreel film company by the time he was 21. "I began to wonder why *. . . people today would commit suicide so young? And I was shocked to find out that in some American cities suicide in the age group under 21 is up 300 per cent."*

"WHY?" envolved into an emotionally wrenching portrait of seven young people facing some of today's most searing hangups. During the course of the film the characters force each other to bare their deepest secrets . . .

Together, these strung-out young people confront the torturous realities of their lives. They re-enact scenes from their pasts, answer probing questions from each other. Piece by piece, the truth comes out about each of the characters in "WHY?" Some are able to learn from their past hangups and go on to a more together way of life. For others, is it too late? . . . "WHY?" cannot offer any cure-all, just the drama of reality!

Producer Robert Cohn, whose earlier independent production successes include "THE INTERNS" and "THE NEW INTERNS", says, "'WHY?' is just the kind of strong, relevant picture we hoped to make as the premiere release for C-Films, my new on-campus movie distribution company. I have become convinced that it's high time for Hollywood to get out and bring movies to

(LEFT) Director Victor Stoloff (center) lines up a shot with electronic camera during shooting of feature production, "WHY?" on Vidtronics sound stage in Hollywood. Action was rehearsed for six weeks and recorded on tape in six days. (RIGHT) Two Fernseh electronic cameras, (regarded by Vidtronics President Joe Bluth as being among the best in the world) were brought in from Germany to add top quality to the production and they performed perfectly. Two-camera operation, shooting takes of up to 38-minutes long, provided very full coverage on a short schedule.



where the audiences really are. As we got deeper into the making of 'WHY?', we found that the best way to produce this picture was with new people for the major roles, new videotape and computer technology, a new way of creating a script and even a new way to distribute films. I expect to prove to Hollywood that college first-run is the best route for bringing out honest, youth-oriented movies. And I plan to make many more pictures this way."

While in the throes of assembling the mountain of material to go into this Special Issue devoted to the subject of "VIDEOTAPE AND FILM", *American Cinematographer* Editor Herb Lightman attended a dinner meeting of the American Society of Cinematographers, of which he is an Associate Member.

The after-dinner technical program that evening was devoted to videotape and, during the course of the talks and demonstrations that followed, Lightman —along with the other ASC members— was stunned to hear Lee Garmes, ASC, make the statement that he had just finished photographing a feature produced entirely on videotape and had enjoyed the experience so thoroughly that, to use Garmes' own words: "I hope I never see another piece of film!"

Now, Garmes, as any movie buff knows, is no whippersnapper filmmaker fresh out of Cinema school—the type that might naturally be expected to make such a jolting statement. He is, on the contrary, a veteran of more than a half-century in the film industry, an Academy Award-winner for "Best Achievement in Cinematography" and unanimously considered to be one of the most impeccably artistic cinematographers and directors in the business.

Intrigued—to say the least—by Garmes' mind-boggling statement, Lightman met with him privately to discuss the production of "WHY?", the tape-to-film feature to which Garmes had referred and, as a consequence, requested that a more comprehensive informal rap-session be held that would include Garmes, "WHY?" producer Robert Cohn, and Joseph Bluth, President of the Vidtronics Division of Technicolor, the technical organization which had provided the shooting facilities and tape-to-film transfer technology for "WHY?"

The meeting was held in Bluth's office at Vidtronics, and the following is a transcript of what was said:

LIGHTMAN: Mr. Cohn—as the Producer of "WHY?", would you mind telling me how you happened to choose videotape as the shooting medium for this feature and how you went about selecting your key technicians—most particularly, Lee Garmes as Director of Photography?

COHN: When we started working on "WHY?", there was no Director of Photography position designated as such. We were following the traditional television production procedure, in which there is a director, a lighting director and the working cameramen. Then we decided that—since this feature would end up on film—we really ought to have a regular motion picture Director of Photography. In bringing Lee into it, we made a significant step toward perfecting the image. The fact that it was shot on tape instead of on film is immaterial. The only difference for the cameraman was that he was using a video camera instead of a film camera.

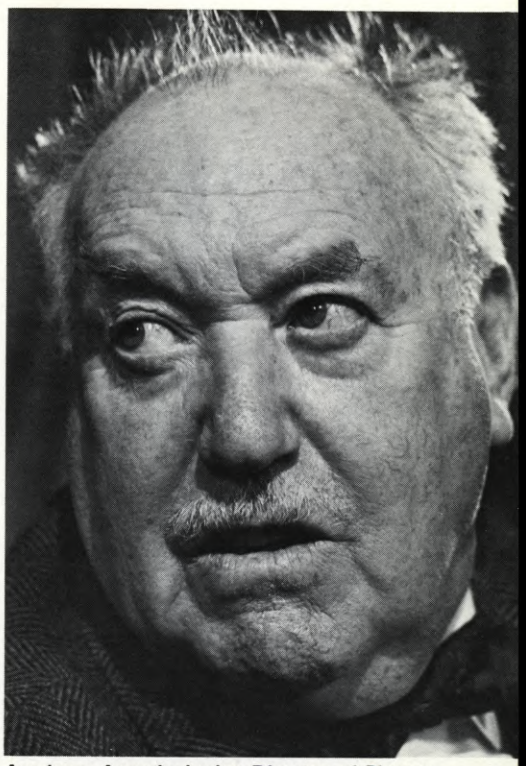
GARMES: Well, I treated it just like a film camera. The lighting and everything else was just like I've always done it in the movies—and I think that was one of the assets. I think the quality is just excellent, myself.

COHN (to Bluth): Joe, am I right in the fact that, in all the work you've done here in-house, you've never before used an actual cinematographer like Lee Garmes?

BLUTH: The only time we did was on the other tape-to-film feature we made, "THE RESURRECTION OF ZACHARY WHEELER"—but there was a differentiation, to a degree. In that case, the cinematographer that we used had come out of broadcasting where he had been a lighting director. But he had also been a cinematographer for a period of time before we used him. However, this is the first time that we've dipped back in and pulled out what I call "a real old-time cinematographer"—and he jumped into the situation and did a hell of a job.

COHN: We've taken a cameraman who's a "pure cinematographer" and put him into videotape. I believe this is the first time that's ever been done. But it was a fortunate coincidence that Lee happened to be interested in the whole videotape process. We just happened to pick an interested man.

GARMES: I was already oriented into the videotape field and loved it—and I still do. On the basis of the results that we were able to get and the nice work that Technicolor has done in printing from tape to film, I can say personally—and I hope I don't hurt anybody's feelings—that I hope I never see another piece of film.



Academy Award-winning Director of Photography Lee Garmes, ASC, after more than a half-century of working with film, embraces the electronic medium with open arms.

LIGHTMAN: You said it again!

COHN: When others begin to feel that way, Lee, you will already have established the importance of the cinematographer in this new technique—whatever name for it is finally adopted. It's a whole new concept.

BLUTH: Yes—this may be the key to the whole thing. With this feature we have begun to use the cinematographers in a new sense and they have moved into a totally new medium—really officially—on the big screen. This has never been done before.

COHN: Working on "WHY?", the director, Victor Stoloff, was able to do what he's supposed to do—direct and work with the actors. He spent his time partly in work on the floor—as he would in making a regular motion picture—and partly in the booth, as he would in live television. Maybe, further on down the line, the conventional motion picture director working in this medium will work like he does on film, while another person will be in the booth.

GARMES: That will depend largely on the property.

COHN: We used two cameras all the way through this feature—and there could have been three on every scene.

We had to go right through very long scenes from beginning to end, because of the nature of the material. The director had the opportunity of freeing himself from the floor and keeping mobile. He was able to direct the cameras into position from the booth as he never would have been able to do from the floor. Yet, he was able to work on the floor because he had a cameraman who was a specialist in getting the image onto the screen.

GARMES: Victor had full confidence in me, because we had worked together for many years—so he could forget about the photographic end of it. Once we got the feeling of what he wanted, and we were able to meet the requirements, from then on it was very simple. I'd like to say, regarding that statement I made a minute ago—that I hope I never see another piece of film—that I didn't mean that literally. Because I feel that, until the videotape people can come up with something better, the long shots and medium-long shots will still have to be done on film. It's possible today—if you are careful in your work—to match film to tape, even though part of the sequence may have been done with tape-to-film transfer. Even in film photography there are many scenes that don't match, so there wouldn't be that much difference. Audiences are accustomed to that. Another reason that this picture came off so smoothly—and correct me, Bobby, if I'm wrong—is that you were able to rehearse the action with the actors for five or six weeks before the shooting started, so it was really like a stage play. You had Act One, Act Two, Act Three and Act Four. I believe the first act was 22 minutes long. But you could put on a nine-hour roll of tape and go straight through. You didn't have to reload, as you do with film, every 1,000 feet. You could run through the whole 22 minutes without a break of any kind.

COHN: The Second Act was 38 minutes long, and it was shot without interruption. Not only did we have six weeks of rehearsal—which is an extraordinary length of time—but it was six weeks of rehearsal and creation of the script, combined. The story was outlined with Stoloff and we created the characters. We then cast people to those characters and gave each character an in-depth book on himself—who he or she was. We then outlined precisely the situations that would come up. During the time we were casting and rehearsing and developing the material, we used ½-inch home-type videotape recording equipment to tape improvisations. Each actor had his character outlined the way it was supposed to be and then he injected his own personality into the character. After six weeks of taping all this with the ½-inch equipment, we edited the tape and brought the feature down to its final hour-and-a-half length and we wrote a finished script based on this taped rehearsal. Then the actors learned this whole script, so that, if we'd wanted to, we could have run the whole thing straight through in two hours. It was a unique situation—and one that you can't use for every vehicle. During the days of shooting, they were able to refine it all—but they were equipped and ready to run through the whole picture at any time. This gave Lee a better opportunity to be creative, too, because we already knew all of the physical moves.

LIGHTMAN: I understand that the whole picture was shot here at Vidtronics—on your own stage.

BLUTH: Here and on one location, an exterior—but all of the interiors, which make up the great bulk of the picture, were shot right here.

LIGHTMAN: Where was that exterior location?

GARMES: It was up at Lake Hollywood, where the Hollywood dam is. We had a lovely home up there that we photographed and we were able to match its windows to the window we had in our set. This was fortunate, because another location had originally been chosen—at a nudist colony in Topanga Canyon—and it didn't match at all. Victor found this house and he simply went up and asked the people if we could use it, and they agreed. There were no problems in shooting on location. I think that wherever a film camera can go, a video camera can go. That is, unless you go into really rugged country where you have to work a half-mile away from your base. Then you might have to be able to bring in the truck that has your equipment on it. But other than that, you can do anything you can do with a film camera.

COHN (to Bluth): Joe, what about the size of those monster video cameras, compared with film cameras that are much smaller and lighter. Do you think the video cameras will evolve so that we can work with lighter equipment?

BLUTH: Yes. There are lighter video cameras available right now and, as time goes by, there will be even smaller and lighter cameras. We did not use, on this picture, the smallest camera that we could have used, because this was basically a studio situation. We could have used a smaller camera—but not the kind that allows you to go up in the cockpit of an airplane and jump out with a parachute. You can't do anything like that with tape yet. There are cameras that you can do that with, but you couldn't get the kind of quality that we were after. Anything like that you would obviously be better off to shoot with a hand-held Arriflex and integrate it. There's no problem in doing that.

LIGHTMAN: Let me ask you a question, Joe. You just said that there's no problem in doing that. Just how successfully could you integrate straight film with a tape-to-film transfer, which has a modified line structure—be it ever so invisible? Wouldn't there be a discernible difference in visual character?

BLUTH: Well, take what I just said. If you shot a movie with a motion picture camera on a set and then you had something to integrate—jumping out of an airplane, for example—when you match those two, you've got problems. You've got focus problems; you've got grain; you've got color imagery problems; you've got all those things—so it's not going to match that well, even with film-to-film. Now, if you take that kind of a thing and match it to tape you don't have that many more problems, really, in matching it. If you shot a scene in a room or on a set and then did another scene on a film camera of the same set—same people, same lighting—and you tried to go through a lot of intercutting where everything was set to perfection, then you might have some matching problems, but you certainly wouldn't have with the jumping out of an airplane, or out on some wide panorama situation, or underwater, or something like that. You've got no more problem in matching than you would have film-to-film.

COHN: I'd like to answer what Joe just said. My feeling is that if you are going to do a Western picture today where you are going on location and you want to get beautiful vistas and lovely clouds and all of that sort of thing, you'd be better off to do it on film. Now, let's say that the next scene is going to be real close and the backgrounds don't mean anything to you, then you can go to tape and you can cut from one to the other and you won't see any difference at all. The only place where you will see a little difference will be in the color saturation because, in my opinion, the color saturation on the tape is far

(LEFT) The camera crew, under Lee Garmes, ASC (in hat) moves to the picture's one exterior location. (RIGHT) On location on terrace of home overlooking Lake Hollywood, the cast rehearses a scene. The entire picture portrays a group encounter and its relatively static action lent itself well to videotape recording with multiple cameras. Improvisations developed by cast members during six weeks of rehearsal were incorporated into the final shooting script.

superior to that of original film. That's my feeling. And, also there is a lot more roundness on the tape. There is more of a third-dimensional quality in the tape-to-film transfer than there is in the film itself. But if you are doing a long shot or a medium-long shot and you move right into a close shot and you cut to tape on the close shots, nobody in the world would ever notice the difference. Nobody. But if you had another long shot or another medium shot from film to tape, then it would be noticeable. You've got to be careful how you plan it and you've got to plan it with some intelligence. You've got the two media to work with and until the tape people can get some kind of a new tape or something that can give us a good sharp long-shot picture, I think we're going to have to go that way, don't you, Joe?

BLUTH: Yes—there are certain areas where long shots can be done on tape and be gotten away with. I think it's a matter of what you are photographing.

COHN: Our so-called exterior long shots, the way they were staged, by having our principals up close and our vistas in the background was a perfect use of it. We couldn't have done better. We had sharp images in front and we had vistas in the background.

BLUTH: That is using it right.

LIGHTMAN: In that case, the vistas were simply the background. The main subject matter was closer shots of the principals. Is that correct?

GARMES: Well, as we know, I think everybody will agree that anywhere from 80 to 90 percent of all pictures consist of closeups anyway, except maybe Westerns or other outdoor pictures where you are going to lean on the beautiful scenery. But in most films, 90% of the pictures are closeups anyway, so the tape camera would function for at least between 80 and 90%, with only 10 or 20% on film.

LIGHTMAN: Alright, then assuming that you could make a direct cut with no difference in quality or visual characteristic, shall we say—in the logistical sense, would it be practical to have both the film crew and video crew out there shooting?

GARMES: You don't need two crews. One crew could function for both types of shooting. It's all I.A. and it's possible to get operators who can operate either a film camera or a video camera. Of course, you've got to get the right people to do it. You can't just assemble a bunch of guys.

COHN: Aren't you running courses here, constantly training people so that they can become double-gaited with film and tape?

GARMES: The film camera operators are now being trained by Technicolor to run the video cameras, also. There are no union problems in interchanging—and certainly none from Local 659. They've been most happy to cooperate. I'd like to say right now that the cinematographers have really picked up on this thing. They're in earnest about setting up training courses to convert people to videotape operation. They are not shunting this aside as a poor second cousin. They are looking at it properly.

BLUTH: This is very encouraging from my point of view—and I'm sure, from Bob's point of view—to have people like Lee who are in the cinematographer's group see it like this.

COHN: As the least technical person here, but the most concerned, I can say that we wanted Lee on this picture because he's a perfectionist. By contract, we could have used a conventional lighting director from television, but having a Lee Garmes do our work is an indication of the perfection we wanted on this picture. We knew that the tape was going to be transferred onto film and we wanted to give the Vidtronics people the best material to work with. I think it's a perfect picture, as far as tape goes. I've never seen anything better on tape—and it was done by a cinematographer.

GARMES: We showed it on the screen at MGM—which is an awfully big screen —and it really held up beautifully. There were a great many technical people there to see it and, with the exception of two or three long shots and medium-long shots, they accepted the quality as being excellent. That was their comment.

COHN: We went to videotape, not because I'm a pioneer—I'll leave that to Joe Bluth—but because it gave us the ability to run extended scenes without having to reload. We could keep the

Continued on Page 1170

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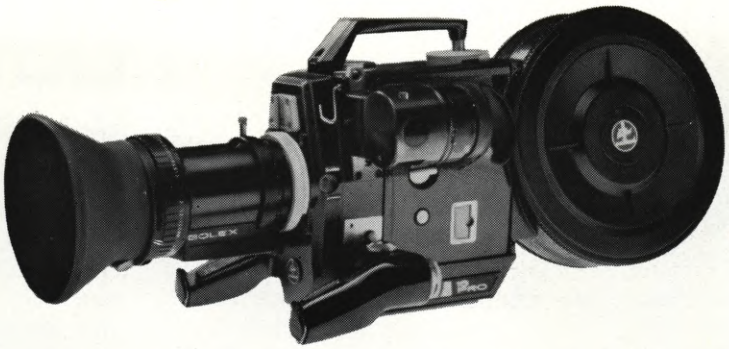

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SHOOTING THEATRICAL FEATURES WITH ELECTRONIC EQUIPMENT

With the development of systems for transforming the image from a videotape recording to film, the feasibility of using electronic cameras for feature production has become a reality

By JAMES WILLCOCKSON

The use of a videotape recorder to preserve the image of a scene which the cinematographer and director have created isn't new in theatrical motion pictures. In 1963, Richard Burton played "HAMLET" before the vidicon cameras. "HARLOW" was produced in 1965. Both of these productions were made in a "sound stage" environment and, when they were screened, had the look of a television kinescope.

The TAMI Show (1965) and The Big TNT Show (1965) were musicals staged before the vidicon cameras and later transferred to film for theatrical release. Evolutionary to these features were "THE COMMITTEE" (1969) and Frank Zappa's "200 MOTELS" (1971). But in the traditional sense of the theatrical feature, these productions were mere exploitations in the music world.

With the development of systems for transforming the image from a videotape recording to film, the technical feasibility of using vidicon cameras for an electronic motion picture became a reality. The picture quality is equal to conventional photography. No longer is a producer forced to rely on videotape exclusively for the production of his feature. The cutting of scenes between action being photographed on film and dialogue scenes photographed with multiple vidicon cameras marries two standard production techniques of two separate mediums. In essence, this system has the efficiency and cost-reducing techniques of television and the "wide-vista" photography and "free-wheeling" portability of film.

The advantages of utilizing videotape as the medium for a feature motion picture are immediately obvious: a great savings in the cost of the production. If for no other reason, there is a savings of well over $25,000 for raw stock and laboratory processing. Once film is exposed and processed, it is not retrievable. This is not the case with magnetic tape. It can be erased and used again.

Cash flow is enhanced for the Executive Producer, and, in the case of some productions, the independent Producer, because of the accelerated time between the initial decisions of pre-production and the first day of exhibition. In using these advanced production techniques, a picture can conceivably be in the theater five weeks after the completion of principal photography.

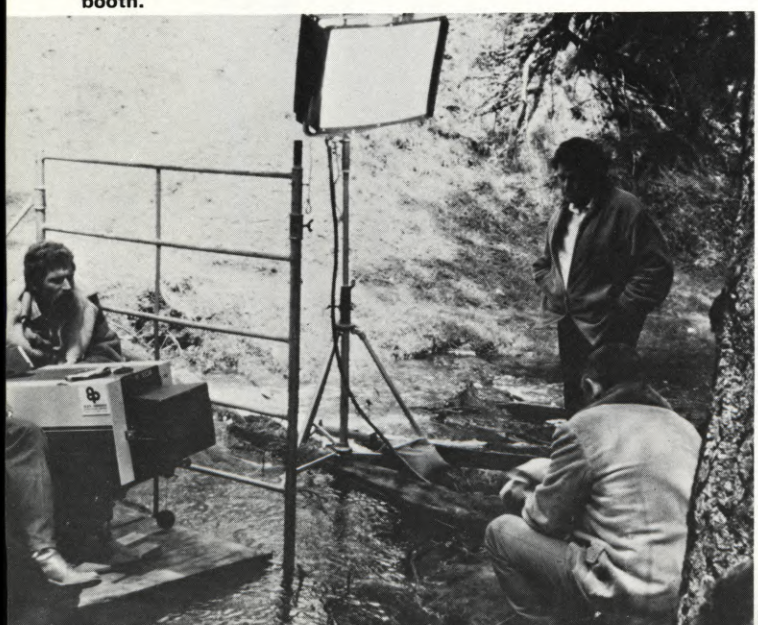
The shooting schedule of a feature utilizing the videotape method is reduced for several reasons. Primarily, with this system, the use of multiple cameras is logical. The director has the option of using any of several angles at the same time whether he records the shot from one camera or many. Secondarily, the cinematographer and director can see exactly what is being recorded on the tape, either from the viewfinder on the camera, the color monitors on the set, or the high-resolution monitor in the recording area. Once the shot is made, and whether it is questionable or not, the tape can be played back immediately for the director, cinematographer, script supervisor or other production personnel to check the acceptability of the scene. The need for a multitude of retakes is eliminated.

Should the producer wish to view the dailies on location at the end of the day, the videotape operator can easily play back the dub of the master tape. Because of the fast forward and rewind capabilities and veeder root counters on the machines, these particular scenes can be screened with minimum of search time should he wish to see selected scenes and takes.

On many productions, there is elimination of excess lighting equipment. No longer are the tenners and brutes required on a normal night location. This reduces the gaffer's inventory of equipment and, consequently, the time required to light a particular setup. With the EMI 2001c studio cameras, acceptable pictures have been recorded at 15 foot-candles, the light from a small campfire.

The cinematographer has less to worry about in terms of light intensity and color balance. With the video operator

(LEFT) On location during the production of "SANTEE", Director Gary Nelson, Production Manager Claude Binyon and star Glenn Ford prepare to shoot a scene with electronic cameras. This feature was one of the first to integrate both film and video shooting. (RIGHT) Registration of the video cameras was accomplished through a cooperative effort of the maintenance man with the cameras and the video operators in the control booth.



"painting" the picture with 3000°K, 50 foot-candle lighting conditions or 8,000 foot-candles at 5,500°K, the picture will be flawless.

If the director decides, after viewing the dailies on location, that he is satisfied with the coverage, there is little chance that any costly reshooting need take place. The producer knows that the scenes are on the tape and he is assured that, once in post-production, the director will have the same scenes as he saw on location the day of shooting.

Post-production costs can be lowered by using electronic videotape editing. The editor can arrive at a rough cut more quickly using a sophisticated one-inch editing bench or comparable electronic editing system. Should the director and editor be more comfortable, they may elect to edit with a 16mm or 35mm kinescope.

The production equipment for an electronic motion picture is basic. The electronic facility house can supply three cameras, two videotape recorders and two trucks filled with monitors, electronic racks, mini-cable and assorted equipment to satisfy the various systems that could be built from the basic equipment. Five pairs of headsets can be provided for the cameramen and the two assistant directors. On occasion, the Director of Photography will use a headset, but this is for the limited time when he is setting a shot.

The EMI 2001c was selected on a recent feature as the basic camera for several reasons. One of the most important properties that it has is that once it is registered at the beginning of the shooting day, it will maintain its registration throughout the day. It is a rugged, reasonably lightweight piece of equipment. There is minimum picture drift and its colors are faithful and alive.

(LEFT) In preparation for a shot from the middle of the Rio Grande River, the EMI 2001c camera has been set on the bed of a truck. (RIGHT) For shooting from a vantage point in the river, a mini-cable is laid from the shore to the camera. For this particular shot, a film camera would have made things much easier.

It is a maintenance-free camera and has proved itself in television production in the studio and on difficult remote locations.

For a hand-held camera, a newly perfected unit was used. Developed by a production company's technicians during the past year from a standard RCA TK-44B, the camera utilizes "large target" Plumbicon tubes in the camera unit with the electronic circuitry in the backpack worn by the cableman. Its compatibility with the EMI was occasionally tricky, especially under extremely low light levels, but, in normal lighting conditions, it performed faultlessly.

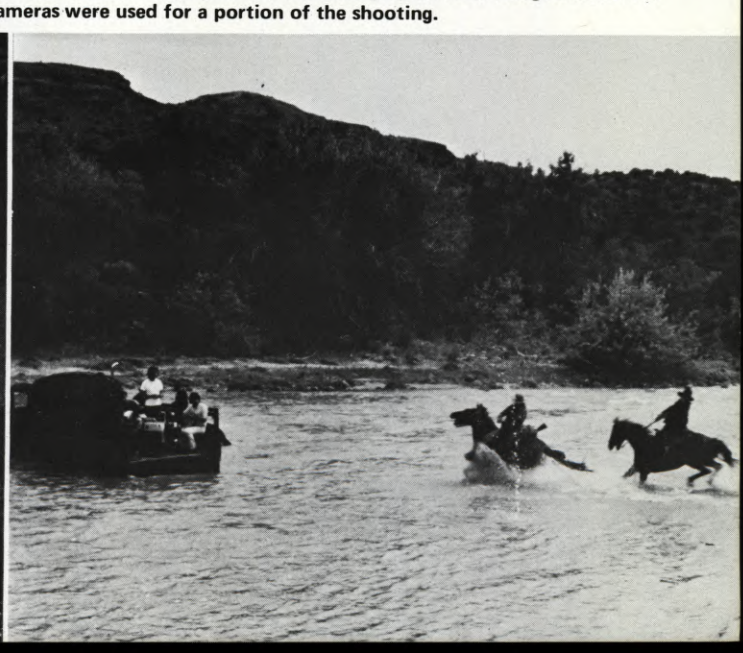
Two Ampex VR-1200 videotape recorders were used to record the scenes. All scenes were shot so that each camera was slaved to a videotape recorder. The maintenance-free operation, color playback capabilities and dubbing facility of the VR-1200 were the major considerations in selecting this machine over the recently developed VR-3000.

This production technique limited the director to the use of only two cameras on each take, but gave him latitude in the post-production phase of the picture. An RCA TS 40 switcher and an RCA TA 60 Mix Amplifier were available if the scene called for switching two different cameras into one videotape recorder.

A requirement beyond normal television remote production was the provi-

Continued on Page 1153

(LEFT) Once the camera is set, two technicians check for picture quality. "SANTEE" was photographed by cinematographer Don Morgan. (RIGHT) Two riders for the Rio Grande River, as the camera "rolls". Back-pack video cameras were used for a portion of the shooting.



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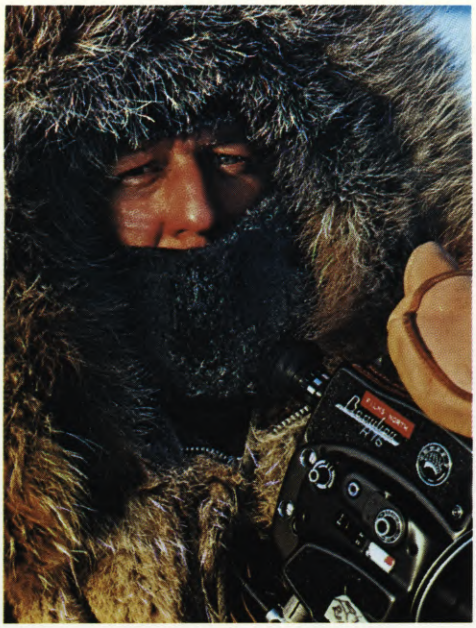

A man, his work, and his camera

ROD THOMPSON—Documentary Filmmaker

☐ Owner/Director, Films North (Anchorage, Alaska) ☐ Producer of educational and industrial films, television documentaries and commercials, and specialist in TV-newsfilm cinematography ☐ Special filming assignments for United Press International; CBS News; Atlantic Richfield Co.; Communications Satellite Corp.; Alyeska Pipeline Service; etc.

"Most of my Arctic filming assignments are not simply a matter of shooting a few scenes and then running into a cozy building to warm up body and camera—because there is simply no place to run! Many times I find myself filming at locations where rudimentary shelter in the warmup tents is some 20 minutes of trudging distance away. Consequently, both I and the camera have been exposed to the severe Polar weather for up to three hours at a time. To add to these generally difficult shooting conditions, strong Arctic winds often pull the chill factor down to about 110 degrees below zero, while the overall temperatures might range as 'high' as 50 degrees below.

In weather like this you've got to have a camera that you can depend upon to work—to get the shots you've got to get and to get them accurately, quickly and without breakdown, and that's why I chose Beaulieu for my winter gear. I can't get over the fact that my Beaulieu 16mm automatic camera was not specially winterized, but was really off-the-shelf (and a 'Southern California shelf' at that!) . . . and the ease of handling and reliable operation of the camera during such extremely cold Arctic weather makes the Beaulieu R16B worth its weight in gold."

"One thing that amazed me was that at these extremely cold temperatures, and with the handgrip ni-cad battery completely exposed to the cold, the Beaulieu R16B kept cranking out the footage—and at the correct running speed. The Hervic Hydrofluid Jr. tripod, by the way, also performed wonderfully. It never froze . . . or even slowed down. Instead, it seemed to 'loosen up' and adapt itself to the severe Arctic weather."

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VIDEOTAPE VS. FILM

A film director joins in a rap session with a videotape director to discuss the relative characteristics of their respective media

By JULIUS D. FEIGELSON

Feigelson, Giertz & Hall, Inc., Houston

As we move deeper into the electronic age, more and more often we hear talk of using videotape where film has been the medium of recording pictures. Certainly tape is in wide use, but most of its capabilities are limited to the television studio—or so it would seem.

Recently, our studio in Houston produced the re-election television campaign for the governor of Texas, Preston Smith. All of the shooting of the governor in the capitol was done on film, because the crew had to move quickly, but director Lars Giertz found that he was doing just about as much on videotape for the same reason . . . . expediency. The thirty-minute interviews in which the governor talked to the public were done much more quickly on tape than they could have been on film.

Since our company is primarily a film studio, we had done little on videotape. But with the production for Governor Smith, we began to take a long, hard look at videotape production. Although my career began in television, I moved to film because, at that time, tape was new and production was severely limited by the then new state-of-the-art.

I have recently moved from Houston to Los Angeles to head our company's operations here, so I found it a good opportunity to investigate the new advances in taking pictures electronically.

Andy Sidaris is one of the few directors who have done as much video production on tape as on film. As chief director, his award-winning shows have taken him from the Olympic Games to the "Indy 500". Andy, who is one of the busiest directors in Hollywood, heads The Sidaris Company, and recently I met with him to discuss tape vs. film. My first question was: how long had videotape been used?

SIDARIS: In 1958 we did a show called Confession *for ABC, and it was the first show on any network that originated on videotape. It was supposed to be on for thirteen weeks as a summer replacement show, but it ran for thirty weeks. The entire show was on videotape, and was delivered to the network in New York for $5000.00 an episode.*

FEIGELSON; But wasn't videotape used before that?

SIDARIS: Up until then, they certainly had videotaped shows, but the shows were actually live like Playhouse 90, *and tapes were made of them for future playback. Our show in the summer of '58 was entirely created on tape. In fact, that's one of the reasons we got on the network, because it was a new entry into tape. Subsequent to that, in 1961, we were out here doing a show for Kellogg's on CBS called* The Magic Land of Alakazam; *it was a kids' show. The first year we did it on videotape. The second year it was the first show that was from black and white Marconi cameras that went directly to TVR 35mm. We found it to be a vast savings.*

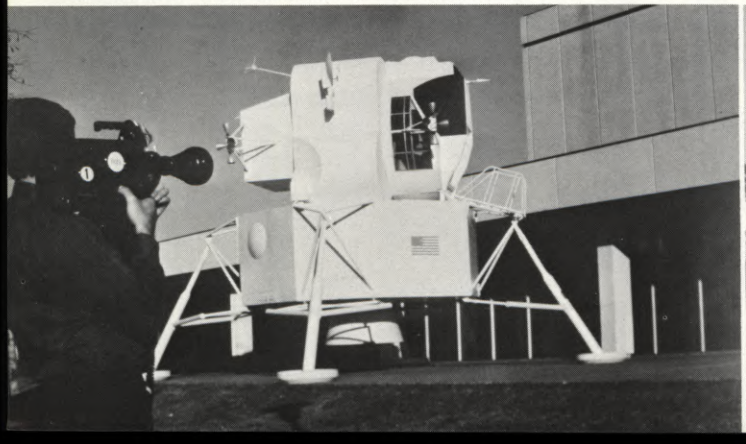
FEIGELSON: What do you mean by 35mm TVR?

SIDARIS: I worked with CBS all one summer, and with their technical people, because in the old days the problem with Kinescope was that there were 24 frames of picture per second on film, and only 20 images per second on the video tube that was being filmed, so that when the film camera shot the video tube, there was a line in it. We worked all summer to match the 24 frames of film to 24 images of video, so that every time there was a video image on the screen, a frame of film would be exposed to it. It's much more complex than that, but that's the simplification of it.

FEIGELSON: You said that this system effected a savings. How so?

SIDARIS: In that particular instance we would shoot three shows a day, and we would shoot segments. The star would do three walk-ons, three goodbyes, three hand tricks, three big magic tricks, and three smaller tricks, and we would shoot all of those segments directly from Marconi cameras to 35mm film. All this time we were rolling on videotape, too, as a back-up in case the film wasn't exposed correctly, or we had some other problem with the film. Then we would get all these segments together and assemble the shows with timings. Then we would come back and the magician would do maybe a hand trick or an introduction to fill out the time for those three shows. So, we assembled three shows in one full day of shooting, and in one more two-hour session we were able to complete three half-hour television shows. The savings was in that editing on videotape with two machines costs $100 a machine-hour, so that costs you $200 an hour. By going to 35mm film we reduced the cost of editing to $7.50 an hour, which it was at that time. So for maybe $100 we could edit three shows.

(LEFT) The author trains his Eclair NPR on a LEM poised outside the NASA headquarters in Houston. (RIGHT) Famed videotape director Andy Sidaris, shown during shooting of the "Indy 500" special. Sidaris, head of his own company, has done as much video production on tape as on film and is one of the busiest directors in Hollywood.



(LEFT) Film crew from the author's studio shoots inside cavernous halls of Texas state capitol during production of re-election television campaign for Governor Preston Smith. (RIGHT) Director Lars Giertz prepares to film sequence in the governor's office. All sequences shot of him in the capitol were made on film, but the thirty-minute interviews in which he talked to the public were made much more quickly on tape.

FEIGELSON: So what you had was the advantage of tape production, combined with that of film editing.

SIDARIS: Precisely. And one of the things we could do is give the pictures a taped look . . . a live *look, even though they were film pictures. There's a live quality which has more depth, more of a 3-D look, if you will, on videotape or the TVR process than on film. And with the advantage of being able to roll three cameras, we were able to bang these shows out. Then the word got around, and other production companies would come into the control room and watch us and, as a result, that year, and I think it was '61, they did about six of the Rod Serling* Twilight Zone's *like that on the stage.*

FEIGELSON: Let me ask you, Andy—getting back to this thing of "the live look", it does have an immediacy, but I have heard complaints that electronic pictures lack that esthetic distance that can be found in film.

SIDARIS: Exactly. I prefer now, if I'm doing something dramatic, to use film. But I can see a great possibility with using the videotape process. There are certain limitations; we know that. We know that there are limitations in that the size of the equipment is vastly larger, heavier, and bulkier. But when you get into a situation where you have a dramatic show happening in, let's say, five or six or eight sets, you have a great advantage in using this process in that you are blocking . . . you're editing as you're going, because you're calling shots out as the director, and with the process of being able to isolate cameras off, like we do in sports, you could isolate three actors, and then put those cutaways in with the Editech machine. Of course, it's better to actually cut your shows; in other words, cut them as you would a live show . . . take one, take two . . . You have a two-shot, a master, closeups . . . therefore you're editing as you go, and you are saving yourself much of the editing process.

FEIGELSON: I can see a couple of more advantages here. If you are shooting with film using 400 or 1000-foot rolls, and on the entire roll you have maybe only one good take you still have to process the whole roll to get it, whereas with tape you could just rewind and retake.

SIDARIS: That's exactly right. You can see what you have while you're doing it, and then immediately replay it. I did a movie last year with James Garner called The Racing Scene. *The movie was done in Techniscope, the half-frame process of 35mm, which gave us an 8-minute run with a 400-foot load instead of 4 minutes, and everything was hand-held so we couldn't have 1000-foot loads and big bulky cameras. But had we done it with videotape we could have been just as successful. There are new Ampexes and new Norelco cameras that are as mobile as Arriflexes, if not more so, and you have the advantage of recording on two or maybe three machines. It's almost like being able to record the same shot three times, so that, if one of the machines is bad, you've got two others to back you up . . . whereas if you are getting the shot on film, and the exposure is not quite right, or you run out of film, or the film gets lost in the lab . . . you'd be in trouble.*

FEIGELSON: Not only that, but with three cameras you'd never have to worry about matching action. I know that many times you are forced to make a cut in a place other than where you want to because the action on film doesn't match from shot to shot.

SIDARIS: That's right. Plus as you're taping, you've got an instant replay, so that you can see in a matter of seconds what you shot. It isn't a matter of having to wait and wonder. The other advantage being that you're in sync. We're shooting a special now on Vel's-Parnelli Jones Race Team with Mario Andretti, Al Unser, and Joe Leonard. We've gone out and filmed at Pocono and Indy, and so far we've shot 16,000 feet of 16mm film, and just syncing all that stuff up is a job. Everything we're doing is in sync, and it's terrifying. It's a day's work in film—but if you did it on videotape, you could run it through, and every segment is already in sync, and you could just cut out the shots that you need. I would love to have been doing this special on videotape, and transfer it to film for theatrical use or as a special. Or keep it on tape, really . . . that wouldn't be bad either.

FEIGELSON: Let's get back to the size of equipment and cameras. Now that the technology of the film industry is putting light, portable, and quiet 35mm cameras on the market, the range of film-making has really widened. What about smaller equipment for videotaping?

SIDARIS: Many, many times we use hand-held cameras. Now there is a new Norelco camera which I just used last Friday night in Chicago. It was as good as our big RCA's and Norelco's large cameras. The quality is every bit as good; it's mobile, a guy can carry it; it's got a one-inch cable, and it can go everywhere, and opposed to a new Arriflex, which is still limited to 400 feet, the hand-held Norelco is always rolling so to speak.

FEIGELSON: Andy, some time back we shot some scenes of surgery in a hospital. We were very limited in our set-up time and lighting was a problem,

Continued on Page 1210

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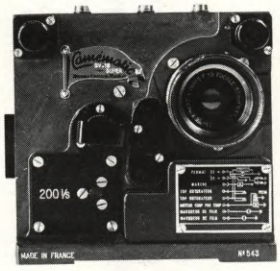

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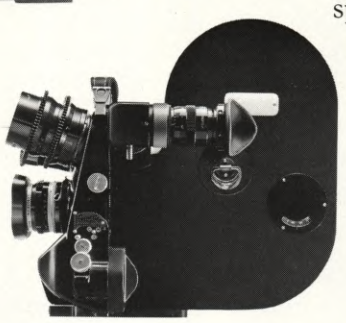

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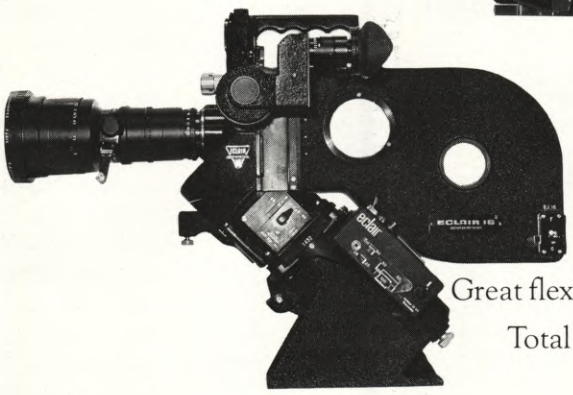

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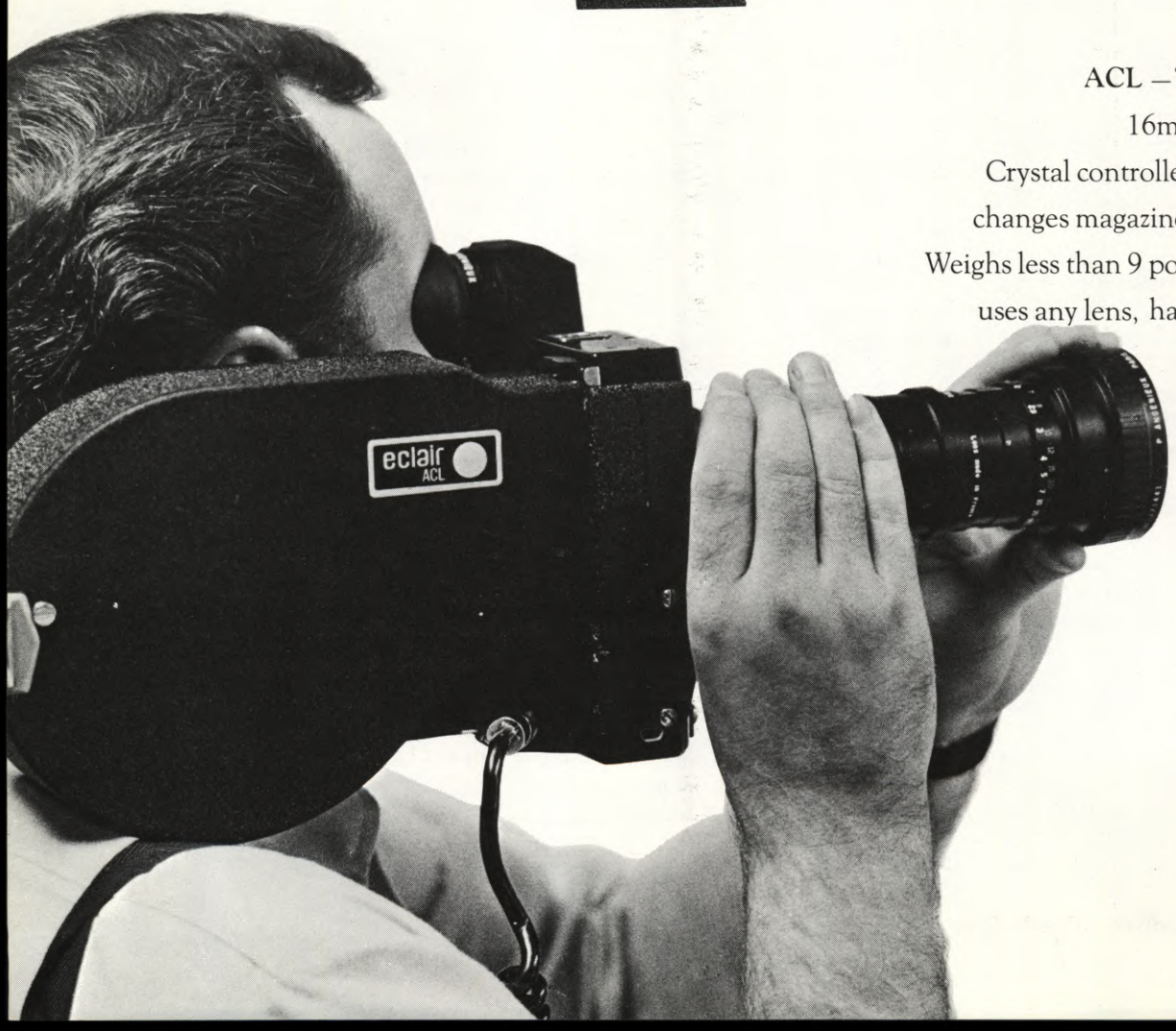

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IF TAPE HAD BEEN FIRST

By JACK A. MAUCK
Vice President, Sales, Trans-American Video, Inc.

A whimsical hypothesis which suggests that the electronic medium may offer fresh opportunities for film-oriented technicians

Pretend with me for a moment. Let's just pretend that, for some inexplicable reason, videotape was invented *before* film. All major production companies are tape houses and they are staffed with experienced, talented and creative tape people. OK, let's get into the following scene:

Scene: The executive office of Wonderful Pictures, Inc., a leading television production and distribution firm.

Seated around the large mahogany table are the Executive Producer, Senior Editor, Director of Photography, and Sound Department Head for Wonderful Pictures. Enter a salesman for Cut-N-Splice Co., a young firm which claims to have a revolutionary new process for making television programs.

"Sit down, Mr. Jones," cordially invites the producer. "We are always interested in new ideas. Tell me, what's your product called and what does it do?"

"It's called film. It's used for recording sound motion pictures for television."

"What does this film do that we can't do now on videotape? Will it give us better pictures, or the same quality at less cost?"

"Well, I can't flatly state that it will produce better pictures, or that it will be cheaper. In some cases, yes, it will be cheaper, but . . ."

"What are its advantages, then, Mr. Jones?"

"Well," Mr. Jones says, pulling a small piece of processed film from his briefcase and handing it to the producer, "you can hold it up to any light source and see what you have shot. And it's easy to edit because there's no guessing about what's on the film."

"Hmm, that could be an advantage. Then you play it back for viewing on the TV monitor to check the color, right?"

"No, I'm afraid not. You see, you first must develop the film. After shooting, you send the exposed film to our processing plant and we get the developed film back to you the next morning to look at."

"The next morning?" gasps the producer. "But our talent, our crew, our sets . . . we can't keep them on call while we wait until the next morning."

"What is this 'developing film' you speak of, Mr. Jones?" asks the editor.

"It's a simple chemical process that readies the exposed film for viewing."

"Chemicals. We con't have any chemists in the television industry, Mr. Jones. Our people know electronics. I'm afraid they would resist trying to be chemists, too."

"Oh, no. We provide the chemicals and the personnel to develop the film."

"You sell us the film, then we have to bring it back to you to see what our pictures look like? A very shrewd business, Mr. Jones. Okay, now that I have my developed film back, can I look at it on my television screen?"

"Not exactly. You thread the developed film through this projector and look at the pictures on a screen or on a wall. In fact, you can have the picture as big as you want it for careful study."

"But, Mr. Jones, you *are* aware that the biggest TV screens are 25-inches. We can't possibly use a picture that takes up a whole wall. How can we squeeze that big picture onto a 25-inch screen?"

"It's played through what we call a film chain. The picture is scanned by a television camera and converted into electronic signals which are relayed to a television set for viewing."

"You mean we get our picture using a chemical process, then must convert it to an electrical picture before we can see it as it will appear on television? That doesn't make much sense."

"But the advantages of film make it worthwhile," Jones insists. "One man can go anywhere in the world and take pictures using a simple lightweight camera. He isn't restricted by cable and the size of your videotape recorders and cameras."

"This does seem like an advantage," admits the producer. "Perhaps we can try some film on a trial basis to see if it can be integrated into one of our shows."

"One more question, Mr. Jones," interrupts the videotape editor. "How do we edit the film we have shot?"

"You simply cut between the frames you want to retain—or those you want to remove—and splice the film into the sequence you want."

"Cut the film? You're kidding! I wouldn't want anybody cutting through one of my scenes."

"And if the executive producer doesn't like the stuff you've shot?" asks the cameraman.

(LEFT) Bill Breshears, Supervising Editor for Trans-American Video, Inc., shown during post-production editing session using the latest AVR-1 and VR-2000 videotape equipment installed in the booth of TAV's post-production center in Hollywood. (RIGHT) Barbara Babcock, said to be the only female videotape operator in America, shown working with the equipment.

"You can easily re-edit the show from the film you have taken."

"What about the film that isn't kept?"

"You throw it away. It can't be re-used."

"You mean, after we expose all of this film and then drag it over to your chemists and wait all night with our hearts pounding in our chests—after we spend whatever it is to buy it and develop it—if we don't like it we *throw it away?*"

Pause. Everybody looks at everybody else.

"I'm sorry, Mr. Jones," says the producer. "That big picture capability of film may have some useful application in education and training. But for making television programs and commercials I don't think we can use it."

Far-fetched? Not really. Similar conversations take place in TV stations right now. Even network promos are done on tape, while using film elements from prime time shows. But it's still a tough job trying to explain—and justify—the advantages of videotape to production people who have worked all their lives with film.

It's natural to resist change. Everyone does it. And men who have carved out successful careers as filmmakers over the years are difficult to convince that—just possibly—there might be some practical application for that mysterious two-inch-wide strip of magnetic tape.

"You hold it up to the light and you can't see a damn thing."

Now I've never claimed that *ALL* television programs and commercials should be produced on videotape. If I have a client who wants his product shown floating down the Colorado River on a raft, perched on Half Dome, or submerged in the Pacific Ocean, I tell him to shoot it on film. We'll transfer it to tape for distribution, and improve the picture quality at the same time. What I'm really saying is that the production team should make a more careful assessment of the objectives of each project and then proceed along the most practical and economical lines.

The big drawback among many filmmakers is that they feel they will have to learn entirely new techniques for shooting on tape. They tend to overlook the fact that the same lighting, the same sound and the same staging and set techniques that apply to film can be used even more effectively with tape. These skills have been developed through the long history of film and are applicable to any type of picture taking known today.

Happily, this resistance among the skilled film technicians is gradually disappearing. Previously, the Hollywood film cameramen's union wouldn't touch a television camera. Today, the Executive Board of Local 659 is urging its members to learn all they can about operating these electronic marvels.

Trans-American Video's electronic cameras move into position for taping of segment of the "DR. KILDARE" television series on MGM Studios sound stage. Several major studios are exploring possibilities of shooting some of their material for TV on tape.

This same trend applies to sound men, editors, stagehands and the rest of the skilled film tradesmen. They are beginning to see that videotape recording isn't a threat, but actually a new avenue for using their experience to obtain more jobs.

What are the other objections to tape?

SIZE: "You can't take that bulky equipment out of the studio for outdoor work," I'm often told.

"Have you ever seen a football game on television?" Answer. "Oh, yeah, I forgot about that," is usually the reply.

As I mentioned earlier, film still is the way to go for extreme location work—and probably always will be. But a lot of fine video work has been done with the Ampex VR-3000 portable color videotape recorder and Norelco handheld camera. And mobile television vans are available for hire practically anywhere in the country. Skilled crews and the latest television cameras and recorders can obtain all but the trickiest remote shots. And if you want to argue about it, I *can* shoot underwater, in a canoe, under a race car, out of a helicopter, up a chimney or down yer Aunt Hattie's well.

EXPENSE: "One hundred thousand for a VTR, 85k for a color camera . . . ."

Hold on. Who makes television commercials and programs? In the case of commercials, it is the ad agencies and the sponsors. Now they don't go out and buy film equipment to shoot a commercial on film. They go to a film house, which already has the equipment, and have it shot for them by professionals. The same applies to producers of full-length programs. Both of these groups can just as easily have their material shot by a qualified tape house. In the case of networks and television stations, they already have the necessary VTRs, cameras, and other equipment in the normal operation of their business.

"Okay, I go to a tape house and it costs me $250 an hour. To have the same script shot on film, it's $25 an hour."

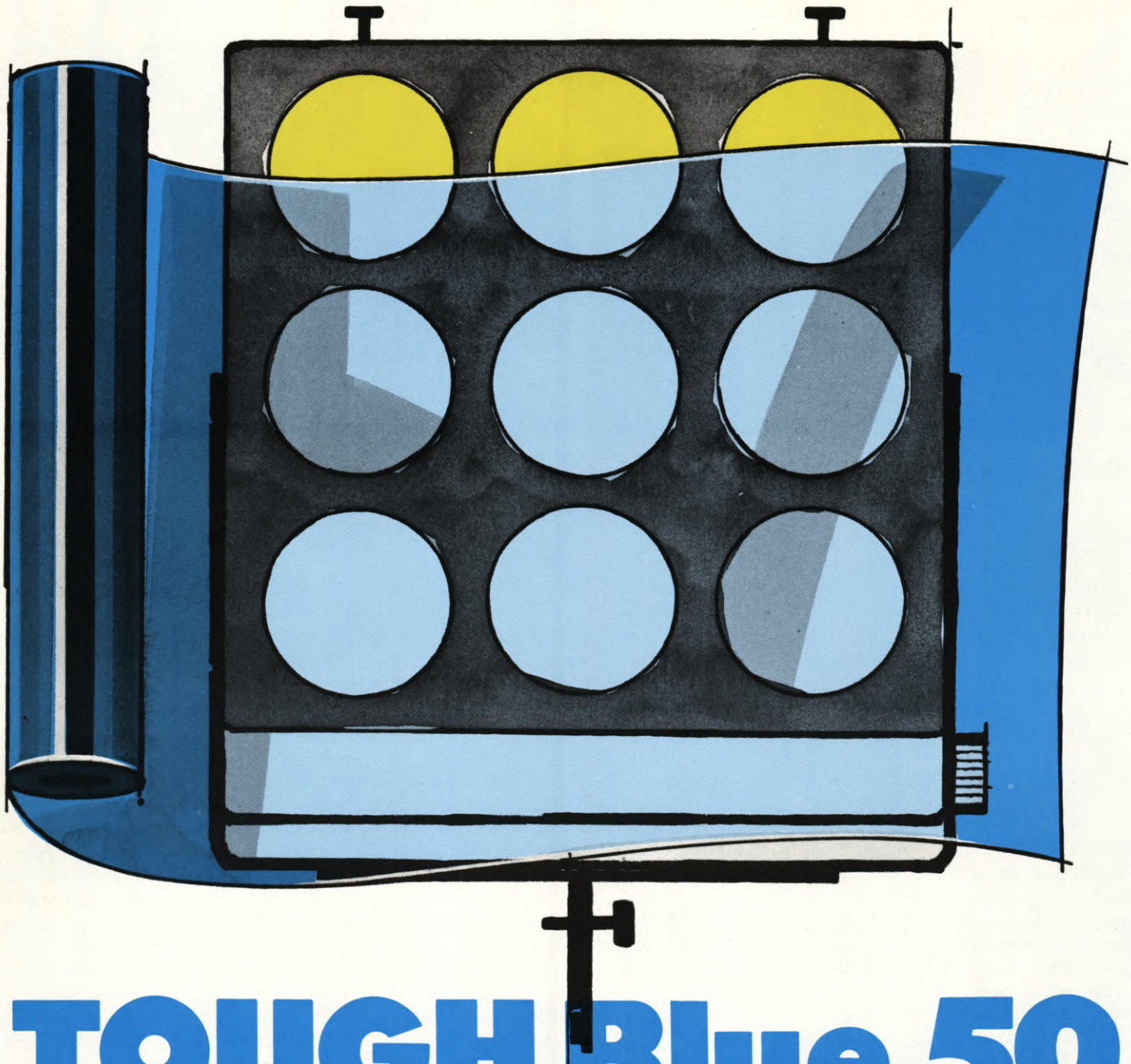
Now they're playing in my court. Those off-the-cuff, uninformed numbers don't really mean anything. Given a good, workable script and a competent tape house, I can save up to one-third the cost of shooting a commercial by using videotape. And the agency will view it on a cassette.

Shooting time is greatly reduced using videotape. I can see my mistakes immediately, and correct them on the spot. My talent and crew can go home. Once I have my basic shots, editing time is just a fraction of what it would be using film.

I've worked on shows which have had thousands of dollars tied up in raw stock and processing costs. You can rent an hour reel of tape for $50 and reuse it

Continued on Page 1176

the "un-dichroic"



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THE GREAT FILM-TAPE DEBATE

While taking no sides and maintaining an open mind, a foremost research authority puts in a good word for film and asserts that videotape still has some distance to go in feature shooting

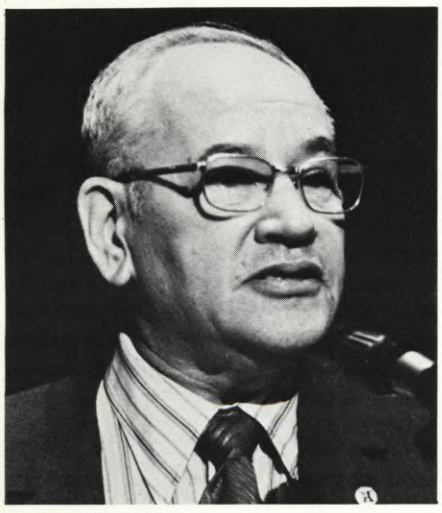
By WILTON R. HOLM
Chairman, AMPTP Research Center

I am frequently asked about the validity of the claims which appear in our trade press concerning tape-to-film transfer techniques. I am also asked about the potential of such techniques, and whether we are seeing the beginning of the end of professional motion picture photography on film.

I suppose I am asked these questions for several reasons. The claims for some of the tape-to-film systems are not overly-modest. Usually they stress advantages, but fail to mention any limitations or disadvantages. And film advocates have been reluctant, for whatever reasons, to present both sides of the question. This has resulted in a more or less one-sided picture being presented to the industry.

Third, the Research Center is neutral. We are neither for or against tape. Nor are we for or against film. We are for both insofar as they satisfactorily fulfill the needs of the motion picture. Motion pictures are motion pictures, regardless of whether they are recorded on photographic film, or magnetic tape, or something else. It is well to remember that a viewer, whether he is in a theatre audience or at home watching TV, cannot tell and does not care whether the action was photographed on film or tape. He just wants the motion picture to satisfy certain of his human wants or needs which cause him to look at it.

Wilton R. Holm, Head of AMPTP Research Center and President of SMPTE, maintains a neutral position in the great debate, but rejects claim that today's tape technology is superior to 35mm film for large-screen viewing.



The human wants and needs which can be satisfied by a dramatic motion picture are, generally speaking, emotional rather than intellectual or physical. The motion picture art form, because of the selectivity of events exercised by the writer and augmented by the director, seems more real than life. The role of technology is two-fold:

(1) To provide the enormous scope of visual and audio experiences which are possible to the motion picture. And

(2) To do this superbly, without ever distracting the viewer, and thereby reminding him that what he is experiencing is only a motion picture.

A flickering or poorly-defined image on the screen or the TV tube, or a hum in the sound is all it takes to destroy the illusion of enhanced reality, and thus prevent the motion picture from satisfying whatever emotional wants and needs it might otherwise have fulfilled.

The question of tape replacing film for motion pictures is not a new one. As far back as 1955, when the first Ampex quad-head VTR machines came into commercial use, tape enthusiasts began proclaiming the early demise of film. Yet film and tape coexisted, and the use of both tape and film steadily increased. True, film lost some of its markets, such as delayed TV broadcasting, because tape, with its immediate playback capability, better fulfilled the needs of delayed broadcasting.

But this is coexistence—tape or film being preferred, one over the other, because one does a particular job better than the other. Cost/value compromises are usually made, so that, for a particular use, the choice frequently becomes an economic one. Price, quality and service are the great common denominators.

Today, 17 years after the successful commercialization of videotape recording, some tape enthusiasts are once again predicting the demise of film for motion picture photography. The most potent argument for a tape take-over has been a promise of radical decreases in production and post-production time and money.

Inherent in this promise has been the necessity of esthetic compromises such as multi-camera shooting, with its limitations in lighting and camera movement, and the inferior image definition of tape as compared with 35mm color film.

But now comes the claim, allegedly, that one tape-to-film system can electronically produce a 16mm motion picture film from tape that's better than the product of a 35mm movie camera—that its videotape-to-film process is ready for movie theatres. Is this claim valid? As requested by the editor of the American Cinematographer, let me offer some facts, and attempt to reach some objective conclusions.

Videotape is newer than film. And its technological roots are different, and perhaps more exotic. But it will replace film only to the extent that it better satisfies specific human wants and needs. In any market, the fortunes of both film and tape depend upon how well each satisfies the needs of that particular market.

Today the small, new videotape machines are penetrating markets which were previously the exclusive domain of 16mm film. But innovation continues to flourish in both film and tape technology. Film has greater information capacity than tape, and tape is striving mightily to find ways of matching the superior image definition of film. Only in this way can it substantially penetrate the large-screen theatre markets, which so far remain the exclusive domain of 35mm film. And work on new, finer-grain films is making it harder for tape to close this definition gap.

I realize that what I am saying is difficult to reconcile with some of the alleged claims for tape. But in this regard, I suggest that some of the current claims be viewed a bit skeptical-

ly. I refer specifically to the alleged claim that, by starting with a 525 or 625-line tape and employing such well-known tricks as compressing the CRT raster and employing a bit of edge enhancement and noise reduction, a better color print can be produced than one made from a 35mm color-film original.

In other words, a 525 or 625-line video recording, as a result of alleged electronic magic, cannot acquire greater image definition than a 35mm film which has definition equivalent to 1200 to 1400 lines. If one wants to prove this for himself, all he has to do is compare medium or long shots printed from 35mm color film with the same medium and long shots derived from videotape. The difference is less noticeable in close-ups, as might be expected, but the difference is still there. It is nonsense to infer that resolution and definition can be created where they did not exist in the original record.

There is no denying that raster compression minimizes scan-line visibility, reducing the need to employ spot-wobble or an over-size electron-beam diameter. And edge enhancement does increase what we call *acutance,* by reducing the edge-gradients of images. But it should also be pointed out that 35mm film, which does have significantly higher definition, can also be translated into video information. And then anything that can be done to enhance a 525 or 625-line image will be that much more spectacular on the 1200-1400-line equivalent-image definition of 35mm film.

Please understand that I am saying, loud and clear, that tape, right today, can and does produce excellent TV-size images. What I must reject is the claim that today's tape technology can produce large-screen images that are superior to, or even equal to 35mm film.

Neither am I saying that tape will *never* be able to record and reproduce, in real time, 1200 to 1400-line images. I am saying that it cannot do it now. Therefore, when someone says he can produce an image from 525-line video tape that is good enough for a large screen, one must ask: "How good is good enough?"

But one must keep an open mind. The tape devotees are hard at work on such exotic techniques as digital recording, pulse-code modulation and others. And film devotees, as I pointed out earlier, are hard at work on higher-definition, finer-grained films to make it ever harder for tape to catch up.

It is an interesting ball-game. But price, quality and service are still the referees. ■

SHOOTING VIDEO FEATURES

Continued from Page 1141

sion for a high resolution color monitor. A Pro West monitor was used throughout the videotaping and proved itself in detecting minute flaws in the picture.

Due to the high reflectance of the Southwestern United States landscape, the color monitor's picture tubes on the location sets had to be adequately shielded. In many scenes the director found that viewing the scene on the monitor during the take was helpful in composing his shot precisely and detailing the action and movement. Minicable for the cameras was used on every location to minimize weight in moving in rough terrain and hiding the long runs in open spaces.

The pre-production planning of an electronic feature is even more critical than that of a conventional motion picture. Some stories and scripts lend themselves better to the portability of the modern motion picture camera than they do to multiple vidicon cameras. And there are portions of a script that can be more creatively treated and more effectively produced with multiple vidicon cameras. The electronic systems for the feature must be decided upon prior to the location survey or final drafts of the studio construction plans.

The facilities for a production are not a matter of picking up a camera several days prior to shooting or having them shipped to the location the night before the first shooting day. As the equipment and systems that are to be used may take several weeks for the facilities company to organize, test and check-out, an early decision by the producer on which company he will contract will aid him in controlling costs, effecting better production efficiency and providing the creative tools for his craftsmen.

In practice, the facility company should be brought into the initial pre-production planning. In breaking down the script for production, the experience and expertise of the production manager can be combined with the systems knowledge and suggestions of the facilities technical manager. The survey of studio space or locations helps both production company and facility house to find solutions to problems prior to the beginning of production. In some cases, the facility company may suggest that the producer use film for particular scenes and sequences and, in other cases, the facility manager may find systems to effect the creative requirement of the production, its various sequences or particularly difficult scenes. The facility house is the best judge of its particular equipment and knowledge of similar problems and the solutions it effected.

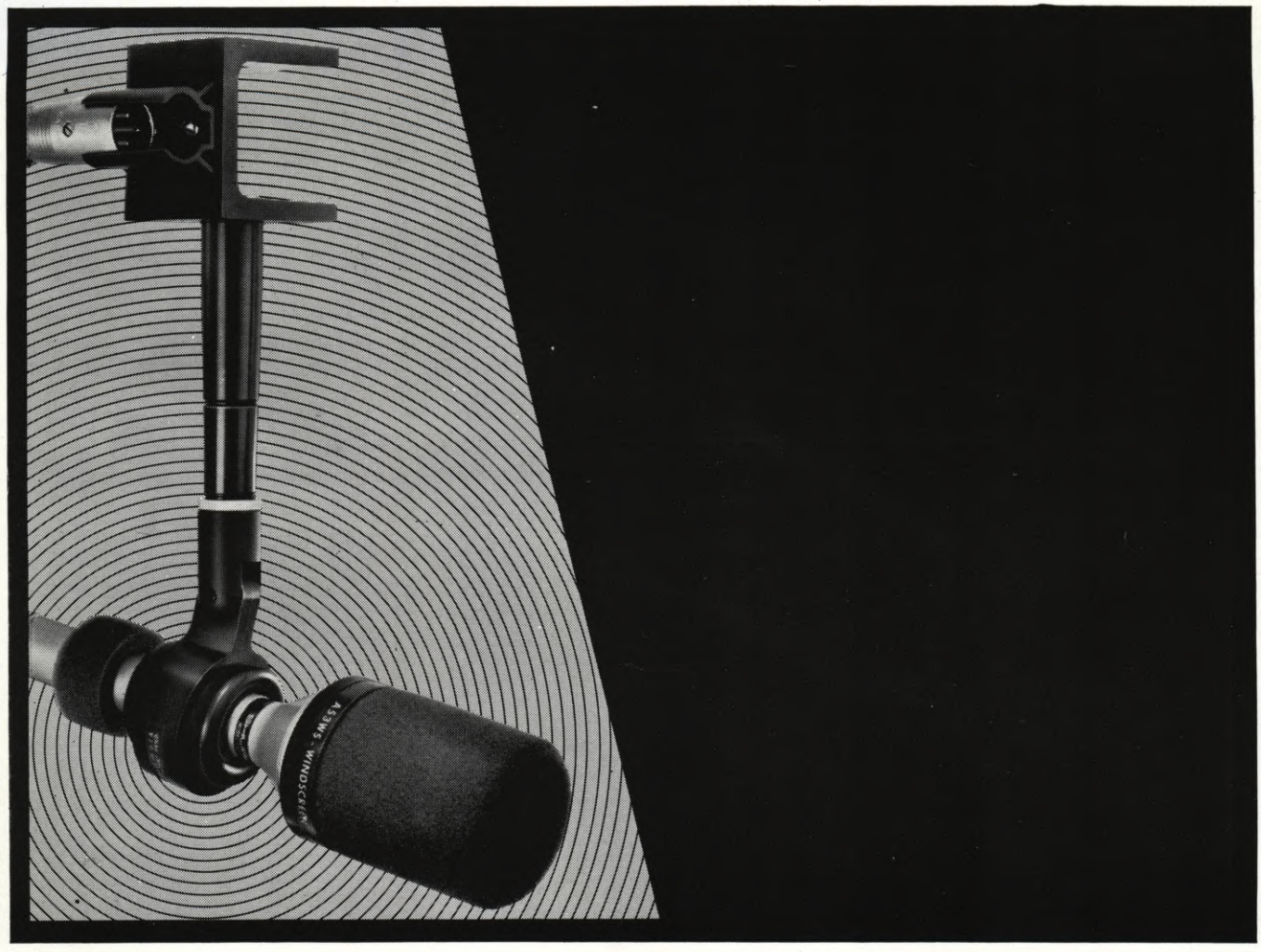
In planning and producing the electronic feature, it is obvious that the production will suffer somewhat if the director and production manager are not completely versed in electronic production techniques and the television medium. Even though the cinematographer can quickly orient himself to the lighting and technical needs of the vidicon cameras, he should have knowledge of television production techniques.

Ideally, a director who "grew up" in television working with dramatic programs and who has gone on to direct features is the ideal director. His mind is accustomed to operating in the medium and considering multiple cameras when he sets his shots and blocks the scene. Whether he uses two cameras for a static dialogue scene or five cameras for a complex action shot, he is considering the overall scene as a complete whole in one take.

A director who has worked in television will know the technical possibilities of the medium. Beside multiple-camera thinking, he will be able to save time in constructing his shooting schedule for the day, planning the logistics of each piece of electronic equipment and effects he may wish to include to take advantage of a particular lighting angle, scenic composition or action of his talent. His ability to communicate with the technical crew, his artistic judgements in "their language" certainly produce a better feeling of crew *esprit de corps* and a better exchange of ideas, should they question the effect of implementing a new set of systems.

The production manager's role in the feature made with the vidicon system is as important, in his own right, as the director. Ideally, he will also have had television production experience in addition to production experience in the traditional method of feature production. His ability to organize the production efficiently and practically dictates that he have a vast knowledge of television production methods. Without knowledge of the capabilities and limitations of the cameras, videotape recorders and what each technician's function is in terms of the equipment he operates, he cannot possibly operate in his job effectively.

This is just the beginning of the revolution in electronic motion pictures. New attitudes are supplanting old traditions that have outlived their usefulness. It is only through the dedication of motion picture craftsmen that this new technique will grow and prosper. ■



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TRENDS IN THE MOTION PICTURE LABORATORY INDUSTRY

A spokesman for the all-important processing arm of the motion picture industry says: "Film is dead? Not a chance! Film is alive and well and growing healthier every day."

Address by Bruce Jamieson, President of Association of Cinema Laboratories to the ACL Spring Meeting April 29, 1972 New York Hilton Hotel

When the Program Planning Committee of the Association of Cinema Laboratories asked that I prepare a talk on "Trends in the Motion Picture Laboratory Industry", I had some misgivings that a topic as large and broad as this could be surveyed by one person whose views might be limited to only those areas of his own activities. I, therefore, immediately initiated an inquiry on this subject to persons and organizations which would represent a cross-section of our industry, and whose geographical locations would cover the many areas served by our industry. In most cases I received replies that were comprehensive and meaningful to the subject, and were of great assistance in preparation of this presentation. I am grateful to these persons for their assistance and extend my thanks for their help.

However, may I note that not all responses were necessarily in agreement on some topics, and on others were somewhat different from my own view. Therefore, I must note that the views expressed herein are my own interpretation of this information, and that I alone must be held accountable for the accuracy and relevance of the statements presented.

OVERVIEW OF THE INDUSTRY

First, let me note that our industry covers a wide spectrum of interests, activities, geographical areas, and size of laboratory operations. Trends that may be relevant to one segment of the industry may not be applicable to another and, in fact, may sometimes be diametrically in opposition. Nevertheless, we are all in the business of dealing with motion picture film, whether it be 70mm wide or 8mm wide, or somewhere in between and, in the final analysis, we are all dealing with customers of one common denominator: they are the producers, distributors, or exhibitors of motion pictures. Whether this be for entertainment, education, sales, training, public relations, or any of a wide variety of purposes, they are communicating something to someone using the visual arts medium. And there is little doubt that visual communication is on the increase. It is a trend that has been continuous for over 50 years, and there is little likelihood *that* trend would change in the foreseeable future. What *will* change are the techniques, the tools, the methods, the technology by which the communication is accomplished, and this is where we as an industry face our greatest challenge. We are the focal point at which art and technology join together to forge the product that communicates the message. To remain viable we must be: both artists and engineers; both businessmen and visionaries; both pragmatists and dreamers. Progress will create problems, of course—it always has. But rather than avoid it, we must embrace it—in fact, we must lead it—we must apply our knowledge and resources to shape our own future, not just react to it. To do any less is to concede defeat.

MARKET TRENDS

Now, let me be more specific. Let's look at some present-day trends, and possibly extrapolate from them some insight of future developments. Let me begin by discussing the traditional markets in which we offer our services. I have divided these into three general categories: (1) Theatrical Films, (2) Television Films, and (3) Business, Industrial and Educational Films.

THEATRICAL FILMS:

The theatrical film market appears to be somewhat improved over previous years, with production in terms of number of titles, number of starts, and number of releases at the highest plateau of the last 12 years. Box office dollars are also increasing, although part of this is due to the inflationary aspect of increased ticket prices. Theater chains are building more hardtop theaters, many of which are smaller, multiple-unit theaters in suburban areas where the people are. These factors, however, do not necessarily translate into production or release print dollars. Theatrical film production involves large sums of money in the initial investment and is a risky, speculative venture. In times of a slow economy and tight money, the necessary investment money is harder to come by. Since 1968 there has been a direct correlation between the prime interest rate and theatrical film production activity. As the prime rate goes up, production starts decrease; but with the return to current more sensible levels, the activity has increased.

One definite trend, obvious to all, is the move to shoot more films on location, rather than on the Hollywood stages as in the past. The key word now is realism, and producers are going to the sites that provide the natural settings that are indigenous to the film's subject. Complete equipment packages available for rental, lightweight cameras and recorders, wireless microphones, and other such developments have given the producer a freedom and mobility to produce wherever he wants to. Production once centered in Hollywood, now is found on the streets of New York, the canyons of New Mexico, in Florida, Texas, Colorado, or almost anywhere. Many States have set up official government bureaus to attract film productions to their areas, and to encourage local filmmakers.

In Canada, the government has appropriated a revolving fund now totalling $20,000,000 to supplement private capital for funding of theatrical film production in the Dominion. This is expected to substantially increase the activity of feature film production there. No such direct subsidization has occurred in the United States and none is seriously anticipated. However, some incentives through tax concessions at the Federal level, and the cooperative efforts at the State level offer some encouragement to the industry in this country.

Another trend in this field is the move by small independent producers toward shooting lower-budget films in 16mm, either in normal aperture or Super-16 formats, for later blow-up to 35mm if the show is considered a potential success. This technique offers the advantage of lower initial production cost, therefore reducing the initial monetary investment, and enabling small independent producers to mount a production effort with modest initial financing.

All the above developments would indicate a market less concentrated geographically and the potential for front-end work by laboratories that heretofore have not considered theatrical productions as a possible market because of their location remote from major production centers.

Another recent pattern that has developed is the cautious approach to release print orders, with only a few prints made on the initial order, and then additional orders placed as and when the acceptance and success of the film is realized.

It has been observed that the smaller quantity print orders have allowed the smaller laboratories to compete for this business with the larger labs that previously dominated this field. Also, prints now remain in the exhibition circuit for a longer period of time, in some cases to the full extent of their physical life. More 16mm prints are now being made of theatrical films for use in 16mm theaters, by in-flight motion pictures, and by government agencies such as overseas military establishments and veterans hospitals.

TELEVISION

Next, let's look at the broadcast television market which includes full-length feature films, one-hour and half-hour programs, and TV commercials.

Approximately 87% of prime time shows last season were on film. This is expected to remain fairly level with only slight incursion by videotaped programs. Theatrical films occupied about 16% of prime time and have received good acceptance by the TV viewing audience. In fact there has been a distinct trend toward production of features for primary television release in the United States, with subsequent domestic and foreign release in theaters.

A recent suit by the Justice Department challenges the involvement of the TV networks in production of program material. This should have little effect on the laboratory industry, since television has only a fixed number of hours for broadcast time, and the product will be supplied through one source or another.

However, the economics of TV production are rapidly becoming a greater problem for producers, and it is expected that 16mm film will play an increasing role in this area. I will add more comment on this aspect later.

Television commercials have long been an area dominated by film, but is now being seriously challenged by videotape. This occurs primarily in the post-production processes, where VTR techniques offer some distinct advantages to the producer. Film is still the predominant medium for the production phases of TV commercials, for a variety of reasons, but with the development of such post-production equipment as disc recorders, the CMX editor, computer-controlled frame numbering and so forth, a current trend is to transfer the selected takes to tape, and complete the TV spot in that medium. Inclusion of all special effects, matte process shots, supers, freeze frames, split screens, etc., by electronic processes, offer to the producer greater flexibility in experimentation, speed of immediate playback and even, in some cases, lower cost.

This method is particularly applicable where a limited number of dubs are required for distribution, but with the development of high-speed tape duplicating systems this procedure will be competitive with film even in large quantity orders.

CABLE TELEVISION

The most talked-about, and least understood, future potential in television is that of Cable TV. This may include lease channels for pay television, as well as free channels covered by the monthly service charge. By the 1980's, six to seven thousand cable systems are projected to be in operation. Broadband cable systems offer the potential of random call-up of entertainment programs as well as instructional and informational programs. This can be a hungry market, for the number of systems is considerably greater than the number of broadcast stations. New programming will be needed, since these systems cannot be expected to subsist on locally produced material only. Thus we have an expanding syndication area, and that means prints. Already we see the growing demand for industrial and promotional film by the present cable systems. It's a whole new area for exposure of these types of films. Add to this the capability for selective regional advertising and you can see that the potential impact of cable systems is tremendous.

At this point, however, let me inject a word of caution. Cable systems on a large scale are still some years away. Future technical developments may alter the picture radically from present methods of programming. Of most serious concern to film laboratories will be the degree to which cable programming originates on film as opposed to videotape. Surely the requirements of operation will dictate automatic programming equipment, which in turn means selective access to packaged cartridge programs. Such equipment is currently being developed for videotape, but I know of no comparable effort now being pursued for film. Whether such equipment, when developed, will accommodate 16mm film or only Super-8, is an open question, but the quality and economic factors of these formats versus tape will decide the outcome.

BUSINESS, INDUSTRIAL AND EDUCATIONAL FILM

Next let's look at films in business and education. The use of film for these purposes is well known and requires no great elaboration other than to note their continued growth and utilization throughout our society. They are the tools for teaching, training, selling, motivating, informing, and even just plain entertaining.

However, what is significant are the developments in the long-heralded field of Super-8. This is the point that received the widest variety of comment from those whose views I solicited. They range from the pessimistic view that its time has passed and will never evolve to the potential forecast for it, to the optimistic view that it is about to break open with a deluge of print requirements. I personally am more inclined to agree with the latter, although some problems still exist that may keep it from reaching its full potential. Some progress has been made toward standardization but it is far from universal acceptance. The consensus seems to indicate magnetic sound with the 18-frame advance will become more common in equipment being brought onto the market. From the laboratory point of view, this should improve the situation immensely, and hopefully so, because all indications are that there is a considerable over-capacity in our industry today. Because of this, competitive pricing has reduced profit margins to the near-zero point, and without volume orders in this product, unit costs are exceptionally high. Recent indications of large-scale use of Super-8 films by government agencies, particularly the military, for training purposes and by major industry in their marketing programs offer some hope for the future. The educational market has yet to develop, but it is predicted that this will occur as film libraries will emerge at the local and regional school district levels.

VIDEO CASSETTES

Perhaps the greatest threat to large-scale use of Super-8 film prints is the recent developments in color video players using magnetic tape, vinyl disc, or vinyl tapes. This field is evolving in much the same manner as Super-8 with

Continued on Page 1194

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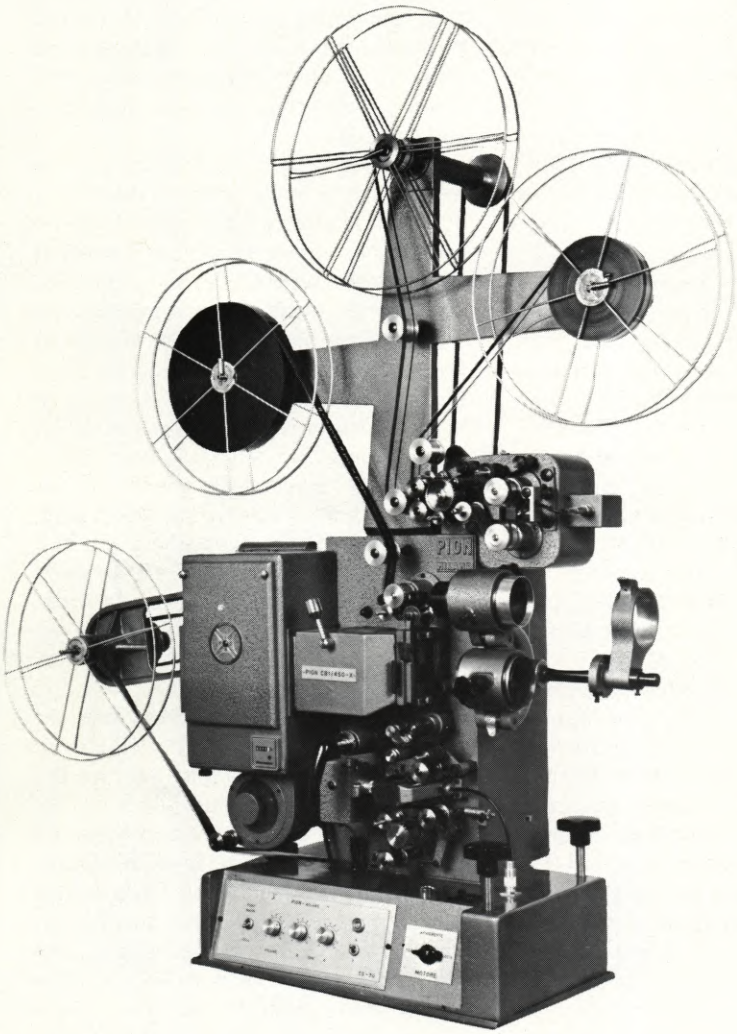

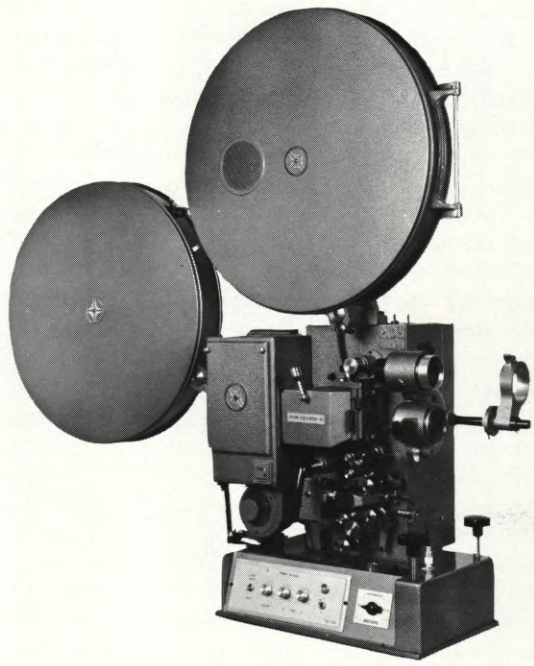

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ELECTRONIC SPECIAL EFFECTS

The low cost, speed and versatility of the electronic medium promises to open a new bag of tricks in the area of visual effects

By RICHARD PATTERSON

One of the most exciting aspects of videotape and television production techniques is the possibility of doing special effects electronically. Most special effects which are done with an optical printer can also be accomplished electronically and, in some cases, they can be done in less time and with more control. If a picture is intended purely for television presentation, electronic equipment probably offers the best means for doing special effects—even if the original photography is on film. For pictures intended for theatrical presentation, however, the image quality currently obtainable with electronic effects equipment may or may not be acceptable, depending on the subject matter, the nature of the effects, and, of course, the standards of the producer. The image quality obtainable with electronic equipment is improving however, and there is no doubt that electronic special effects techniques will be widely adopted in the near future even for theatrical pictures shot and released on film. The purpose of this article is to describe electronic special effects techniques in layman's terms and to evaluate their potential for use in theatrical motion pictures.

FADES, DISSOLVES, & SUPERIMPOSITIONS

As every television viewer knows, the brightness of a television image can be adjusted by turning a knob. Since a television image is essentially a series of electrical impulses, it is a relatively simple matter to modulate the signal systematically in such a way as to change the overall brightness of the image—in much the same way as the volume or loudness of electrically reproduced sound can be adjusted. Electronic fades can be achieved manually by means of a lever on the mixing or "switching" console or, with some equipment, they can be done automatically. Similarly, dissolves and superimpositions can be achieved quite simply, since it is possible to mix video signals together in such a way that the picture information at every point in the final image represents a combination of the picture information at that point in the two original images. Dissolves of any length may be done manually by moving a lever on the switching console, or they can be programmed on computerized consoles. Superimpositions can be achieved by stopping midway in a dissolve.

SPLIT SCREENS & WIPES

Split-screens and wipes are possible electronically, because of the sequential nature of the television scanning process. The picture information at any particular point in the image is rendered as one moment in a series of electrical impulses, and that particular moment can be isolated from others by a high-speed switch. If two television images are to be combined to produce a split-screen with a vertical dividing line down the middle, it is simply necessary to construct a switching device which can switch back and forth between the two signals at the moment when the scan hits the middle and far edge of the image. It is essential, of course, that the signals from the two images be synchronized, so that at any given moment, the output from each represents the same point in the field of the television image. Such a switching device forms the heart of a video special effects console. The switch is triggered by a signal produced by a "pattern generator", and it is easy enough to see that, if the timing of this signal is systematically varied, the result could be a wipe from one side of the screen to the other. Similarly, a screen split horizontally or a vertical wipe could be produced by generating a different kind of signal to trigger the switch. In a video special effects console there is generally a row of buttons indicating about 20 different basic wipe patterns. Pressing one of these buttons activates the pattern generator to produce the kind of signal needed to trigger the switch to produce the wipe pattern. The wipe itself is usually done by moving a lever, so that the speed of the wipe can be controlled manually, and a partial wipe or split-screen can be achieved simply by positioning the lever somewhere between its end points.

KEYING

It is also possible to derive the signal which triggers the switch (called the *keying signal*) from one of the images being combined, rather than from the pattern generator. A circuit is designed which reads the video signal for the image and translates it into a keying signal. For example, the keying signal can be such that it triggers the switch only when the brightness of one of the images exceeds a certain level. If that image consists of white letters on a black field, deriving the keying signal from its brightness level can produce an electronic matting process in which the white letters are positioned within the

(LEFT) Dave Harvey, Director of Production (rear), and Dennis Kolemainen, computer animator, at Computer Image Corporation's Denver production facility, help customers use the company's Scanimate computer to its fullest potential. (RIGHT) Jimmy Murakami, well-known Hollywood animator, recently used the creative capabilities of Computer Image Corporation's Scanimate computer to produce a unique and visually exciting 60-second commercial.

second image, not by burning out the existing picture information, but by replacing it altogether. The keying signal can be modified in such a manner that black letters can be positioned within the second image; or, since a color television image works by an additive process using separate signals for each primary color, the white lettering which is keyed into the second image can be transformed into any color in the spectrum simply by regulating the color components of its signal.

CHROMA KEY (ELECTRONIC BLUE SCREEN)

The keying signal can also be derived from the level of one of the color components in the first image. If a subject is shot against a blue screen, as is done for travelling mattes, the keying signal can be derived from the level of the blue component, and the result is an electronic blue screen process. This process is generally called Chroma Key, and it can be adapted for use with any color background, rather than requiring blue, since any primary color (or specific combination of colors) is equally accessible to monitoring. Blue is usually used, since it is most easily isolated from skin tones and the range of colors normally occurring in the foreground subjects.

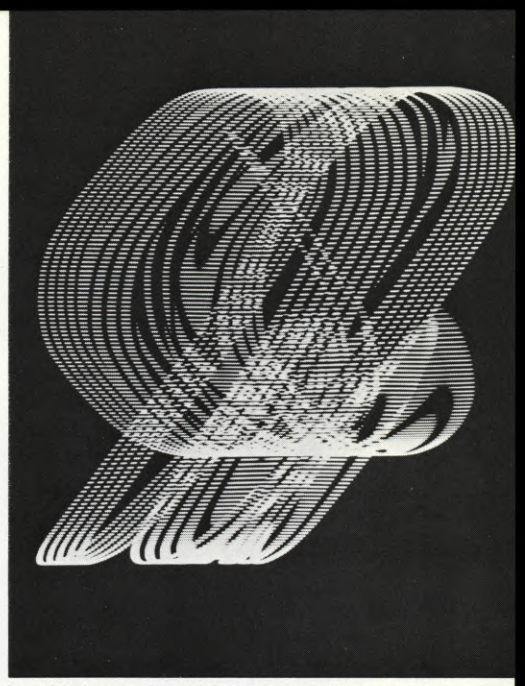
The Chroma Key process compares very favorably with the color separation blue screen travelling matte system used in photography. The fact that it can key off any color gives it an increased flexibility over blue screen photography and, in some cases, it is capable of cleaner separation of subject from the colored background. However, it is limited by the fact that it is a switching operation and depends on the efficiency of the switch. In order for keying to be possible, the switch must be capable of operating in less time than it takes to scan the smallest element of picture information, i.e. about 0.1 microsecond. If the switch can not change over fast enough, there will be a loss of detail in the foreground subject; and this often poses a problem for Chroma Key which is perhaps comparable to the limitations of a color separation blue screen photographic process. Chroma Key, also, can not adequately render a transparent or translucent foreground subject, since it is essentially an off-on switching operation which chooses between the two images at each point and never mixes the two together at any given moment. This is also a limitation which Chroma Key shares with the color separation blue screen travelling matte process, but which was overcome by the sodium vapor and color difference blue screen techniques.

TECHNIMATTE

A completely different kind of electronic blue screen process which is not an off-on switching operation is now available as a replacement for Chroma Key. Developed originally by American Astrionics, it was perfected by Carl Hanseman at Vidtronics and is called Technimatte. Since a patent has not yet been obtained on the process, Hanseman will not discuss the theory behind Technimatte. What he will do, however, is run a demonstration reel of the process and smile like a magician who has just pulled a bird out of your coat pocket.

The Technimatte process is capable of separating extremely fine detail from a blue screen background. The sample reel includes scenes with cigarette smoke and an aerosol spray shot in front of a blue screen and then combined with a background scene. The smoke and the aerosol spray are both rendered perfectly without any distortion of the background scene with which they are combined. Technimatte is also capable of separating transparent or translucent subjects from a blue screen background. The reel includes a scene in which a piece of Saran Wrap is shot against a blue screen and then combined with a background scene. The texture of the Saran Wrap is preserved perfectly. As it is moved around and wrinkled, the slight reflections in it are retained without losing the background behind it.

Similarly a blue screen shot of a glass being filled with beer is combined with another background so that it is possible to see through the beer to the background while still seeing the color and texture of the beer and bubbles. It is also possible to preserve shadows cast on the blue screen if they are desired. The Technimatte demonstration reel includes scenes of a man walking around inside an oven and a freezer compartment. His shadow is cast on the surface where he is standing without affecting the color or texture of that surface. Of course, if his shadow was not wanted, it could have been eliminated, as it is in the Chroma Key process. Another scene on the reel has a man in a chrome-colored costume from which any trace of blue reflection from the blue screen background has been removed. All in all, Technimatte is a remarkable means of combining images and compares quite favorably with the color-difference blue screen or sodium vapor travelling matte systems. Vidtronics has had a working model of the Technimatte apparatus for about a year. It is being used widely in commercials now and is sure to have quite an impact on special effects work.



In addition to its ability to manipulate graphics, the Scanimate can create innumerable abstract patterns for use in commercials, films or stills.

A comparable electronic matting system has been patented by Petro Vlahos of the Association of Motion Picture and Television Producers Research Center. It is logically an electronic extension of his color-difference blue screen photographic technique in that it uses the difference between the blue and green components of the blue screen scene as an indication of how much to attenuate the background scene. His electronic system replaces the off-on switching of the Chroma Key process with a mixing function in which the background scene is mixed in at a level corresponding to the presence of the blue screen in the foreground scene, and the blue screen is removed from the foreground scene by limiting the blue component of its signal to a function of the green component. At points where the foreground subject obscures the blue screen, the level of the background scene will be reduced to zero in the final combined image. Where there is only the blue screen in the foreground scene, the background scene is mixed in at its full level, and the blue of the blue screen is deleted. Where the blue screen is visible through a translucent foreground subject, the background scene is attenuated to the appropriate level and mixed in with the foreground scene so that it replaces the blue of the blue screen. The actual operation of the system will be the subject of a separate article, but the net result is an electronic means of combining images which is

comparable to the most refined travelling matte photographic techniques.

FREEZE-FRAME, SLOW MOTION, REVERSE MOTION, & DOUBLE SPEED

Another tool for electronic special effects is the Ampex HS-100 disc recorder widely used for instant replay in sports broadcasting. The HS-100 is a disc on which 30 seconds of video information can be recorded in such a way that each revolution of the disc delivers one frame of picture to the head as it moves across the disc. By holding the head in one place it is possible to achieve an electronic freeze-frame, and by moving the head slowly across the disc it is possible to achieve slow motion. (It should be noted, however, that the slow motion produced by the disc is comparable to slow motion produced by double-printing conventional film footage and is not the equivalent of slow motion produced by high speed photography. There is, as yet, no electronic equivalent of high-speed photography.) Moving the head back across the disc produces reverse motion. By playing back every other frame, double speed fast motion can be produced. The disc in combination with computerized electronic editing techniques can be used to produce single-frame animation. The Ampex HS-200 is a computerized console which incorporates the HS-100 and extends its capabilities for production work.

SOLARIZATION

The possibility of altering the color of an image electronically is one of the most exciting aspects of electronic special effects work. Even on a home receiver it is possible to modulate or distort color rendition simply by twisting dials, and there is virtually no limit to the kinds of color effects possible with sophisticated video equipment. The key to electronic color effects is the fact that the "chrominance" element of a video signal which represents the hue and saturation of the colors is distinct from the "luminance" element which is a complete black and white image and represents the brightness. The fine detail in a color televison image is reproduced purely by the black and white element of the signal, and the contrast of the image can be modulated separately from the saturation or hue of the colors. Electronically it is possible to drain the color out of an image, convert it to a high-contrast or negative black and white image, and then re-color it synthetically, assigning separate colors to different levels of density in the gray scale.

OTHER ELECTRONIC EFFECTS

It is also possible to produce other effects with conventional video equipment. One of the most important of these is the possibility of reversing the polarity of an image electronically. A negative image can be produced from a positive image or vice versa; and it is possible to generate a negative image from a positive image and cross-fade between the two. Another important effect can be achieved by reversing the scan, so that an image can be inverted or reversed electronically. In this way, mirror shots can be made to read properly, for example. A "ripple effect" in which the image melts into ripples can be achieved by modifying the timing of the camera scan. Another unique effect called "beam and target separation" utilizes a characteristic of the video camera to produce a lag in the highlights of an image, such that a moving image leaves a trail behind it. It is very difficult to describe the effect of beam and target separation, but it was used quite effectively for certain sequences in *200 Motels* where it was combined with bizarre color modulations.

Another special electronic tool is the Video Pulse Delay System available from Video Devices Co., which was designed for use in making multiple-image montages on videotape. It is essentially a means of delaying the sync signal to the tape machine so that one portion of an image can be repositioned anywhere in the frame. Normally, multiple-image frames are composed in the camera, but the Video Pulse Delay System provides an increased flexibility in post-production work.

COMPUTER IMAGERY

Another dimension of electronic special effects is represented by the work being done by Computer Image Corporation. Computer Image has designed analog computers which are used to animate graphics by electronically manipulating a television image. It is also possible to generate images with their computer (in a way similar to the way signals produce images on an oscilloscope), and these images can, in turn, be manipulated by the computer. While the present system can manipulate only a monochromatic image, the image can be colored electronically after it has been fed through the computer, and different colors can be assigned to any five distinct levels in the gray scale of the final image. The kinds of manipulation which can be performed by the computer system are virtually infinite.

The applications of the system to conventional animation, while mundane in comparison to the more abstract and creative possibilities of the system, are nonetheless impressive. The lips of a cartoon character can be animated by spoken or taped dialogue which is fed into the computer. The computer is programmed to convert the audio signals into the appropriate alterations of the part of the image comprising the character's lips. With one of their earlier computers, the movements of a cartoon character could be generated by the movements of a person in a harness wired to the computer. The animation system has since been refined by the development of their new Caesar computer, a combination of a digital and an analog computer, which permits the movements of a cartoon character to be created by an operator sitting at the console. He merely sets the two extremes for a particular movement and indicates the number of frames it should take. The computer does the rest, and it can be programmed to take care of hidden line problems, so that if the character puts his hand behind his back, we no longer see it.

Computer Imagery has been used primarily for making logos and animating graphics, but the potential of the system as a special effects medium when combined with all of the other video effects techniques is absolutely mind-boggling. To top it all off, Computer Image is developing a system which will enable them to manipulate a full color image rather than simply a monochromatic one, and they expect to have it working in about a year.

ADVANTAGES OF ELECTRONIC EFFECTS TECHNIQUES

The most spectacular advantage of electronic effects techniques, of course, is the possibility of monitoring and instant replay. With electronic effects you can see them while you make them, and you can play them back without having to send them to the lab to be processed. This is a nice advantage, even with something as simple as a dissolve, and with elaborate blue screen work, it can mean the difference of weeks or even months in the time required to do special effects work.

In a Vidtronics sample reel there is a Chroma Key effect in which one dancing girl becomes five identical dancing girls who go off in separate directions. The four extra images of the girl emanate simultaneously from the first image and move completely independently of each other. This effect was achieved quite simply in one shooting session since, for each successive take, it was possible to superimpose the new image over a frozen frame of the master take on the monitors and on the camera, and

to position the girl so that she matched exactly her position at that moment in the master take (or any previous take).

The second major advantage of electronic effects is the control over the color which is possible with an electronic image, and the fact that an electronic image does not degenerate in the process of duplication in the way a film image does. A videotape image can go through as many as 10 generations before the loss of quality becomes appreciable.

The key to this is the fact that the black and white components of a color television image can be controlled separately from the color components. This means that the contrast of a color image and the saturation, as well as the hue, of the colors can be controlled at every stage of the process. It is also possible to control the color of certain elements in an image separately from others in certain situations. It can be possible, for example, to darken the sky in a scene without affecting the other color values in the scene.

LIMITATIONS

Just as there are some special effects possible only with electronic techniques, there are a few things which can be done on film but cannot yet be done electronically. The most important of these are image size changes and optical zooms. At present there is no way to convert a medium shot to a closeup or to add a zoom to a shot electronically in color. It can, of course, be done optically using video equipment, i.e. a video camera can be set up in front of a monitor; but the results obtained in this manner are not generally acceptable. The obstacle to electronic image size changes or zooms is the fixed number of scan lines for any given video system. To change an image size means that a new image having the required number of scan lines must be produced from a portion of an image which contains only a fraction of the scan lines constituting the entire image. This means either that scan lines must be repeated or that new scan lines must be synthesized.

The solution to this problem seems to lie in the application of computer processing to electronic images. Using their present equipment, Computer Image can accomplish electronic zooms or image size changes with a monochromatic image. Within a year they expect to be capable of electronic image size changes with full-color images. Also, some of the image processing work being done at Cal Tech's Jet Propulsion Laboratory may be applicable to this area of electronic special effects. The Image Processing System at the Jet Propulsion Laboratory was developed as a means of enhancing pictures from spacecraft, and it involves the use of digital computers to do a variety of things, including geometrical manipulation of an image and the insertion of synthetic picture elements derived from an analysis of the rest of the image.

Another optical effect possible with film but not possible electronically is the flip-frame. A flip-frame is an essentially optical process achieved by rotating a single-element lens in front of the aperture or by putting a single frame of film in a glass holder which is rotated in front of the optical printer lens. Again, the electronic equivalent of this may soon be possible with Computer Image techniques. The same would perhaps be true of an oil dissolve, another effect not presently possible electronically.

The principal limitation of electronic effects as compared with film techniques, however, derives from the fact that almost all of the video equipment in use in this country is designed to have a 525-line scan. This means that the resolution and definition is inherently limited to a degree which many film technicians consider unacceptable. The European standard of 625 lines is better, but still not considered comparable to film. For special effects to be broadcast on television this is no limitation, since the effects will have the same image quality as the rest of the material when it is broadcast. For presentation on a large theater screen, however, it becomes a moot point as to whether the 525-line system can produce acceptable images.

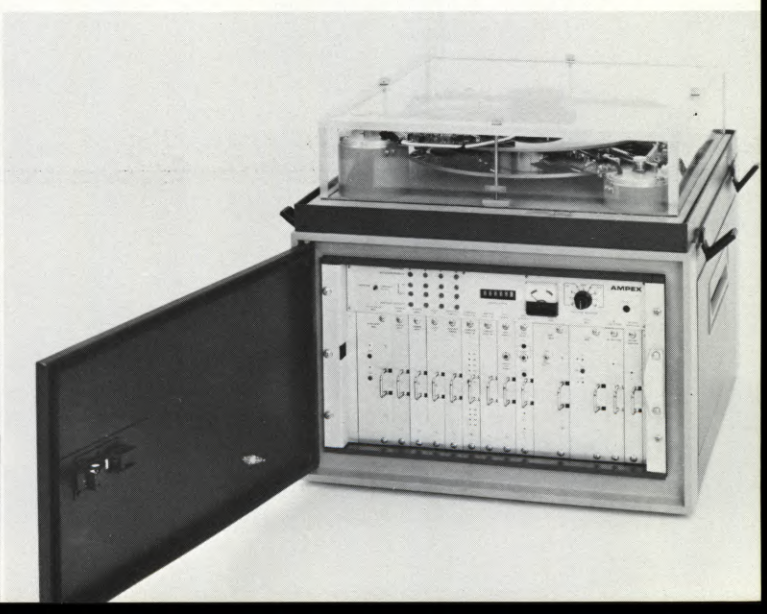
ELECTRONIC EFFECTS FOR THEATRICAL PICTURES

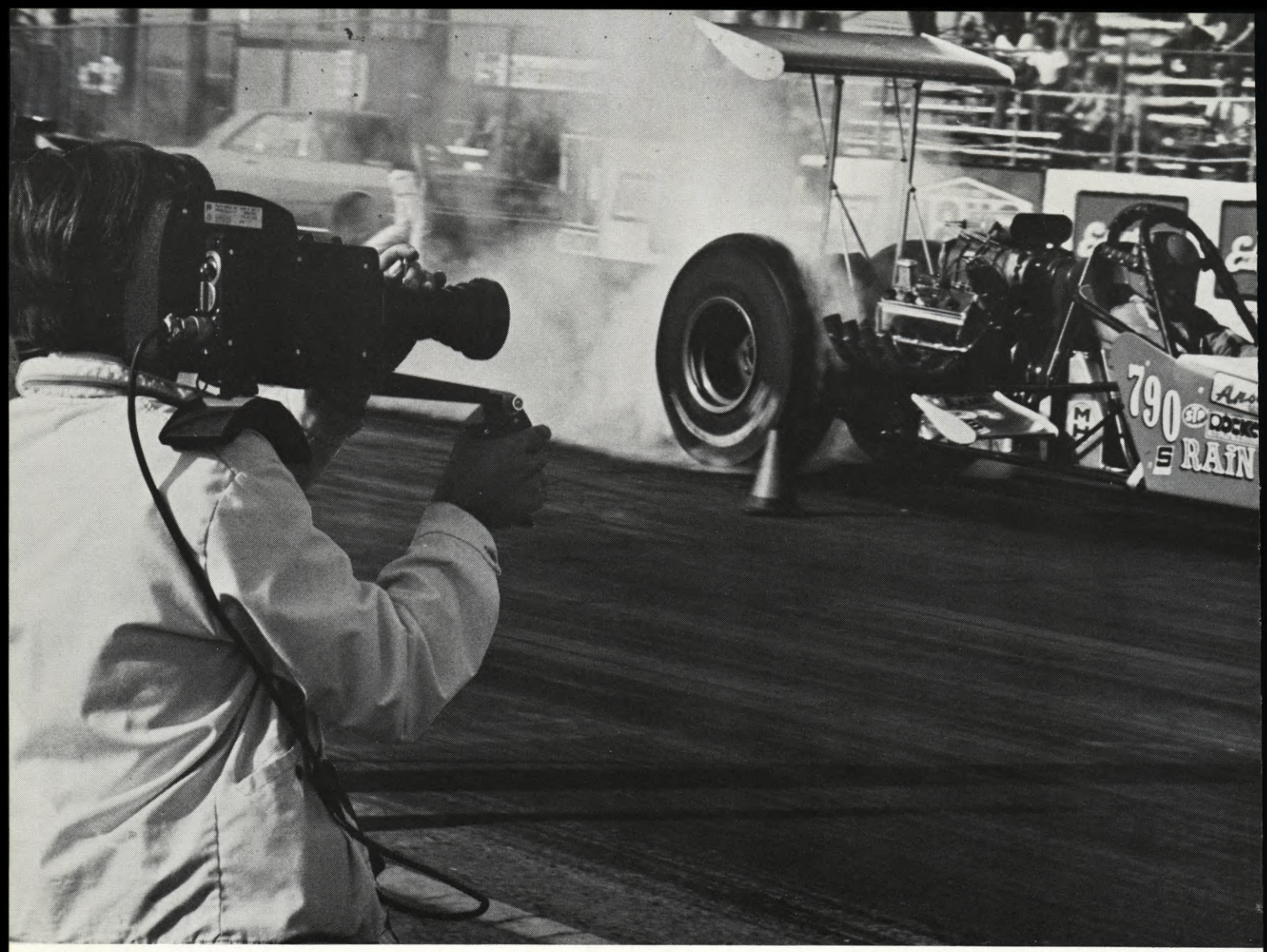
The first thing that should be made clear in considering the application of electronic special effects to theatrical motion pictures is that it is being done and it is obvious that it is commercially acceptable. *200 Motels* was, of course, produced entirely on videotape and contained a number of bizarre electronic special effects. It was produced in England using a 625-line system, and the very nature of the material made the videotape image characteristics more appropriate.

More to the point perhaps is the use of electronic special effects in Jack Cardiff's *Girl On A Motorcycle,* where a dream sequence was shot on film, transferred to videotape while being manipulated electronically, and then re-transferred to film. The results are quite impressive, primarily because of the strange color effects which are possible with electronic equipment. Again, the nature of the visual material is such that the image characteristics of videotape are appropriate, and anyone considering a special effects sequence involving solarization or bizarre color modulations

Continued on Page 1180

(LEFT) The Ampex HS-200 disc recorder, widely used for instant replay in sports telecasting, is also a valuable tool for creating electronic special effects. Its computerized console incorporates the HS-100 and extends its capabilities for production work. (RIGHT) The HS-100 is a disc on which 30 seconds of video information can be recorded in such a way that each revolution of the disc delivers one frame of picture to the head as it moves across the disc. By holding the head in one place it is possible to achieve a freeze-frame, and by moving the head slowly across the disc, it is possible to achieve a slow-motion effect.





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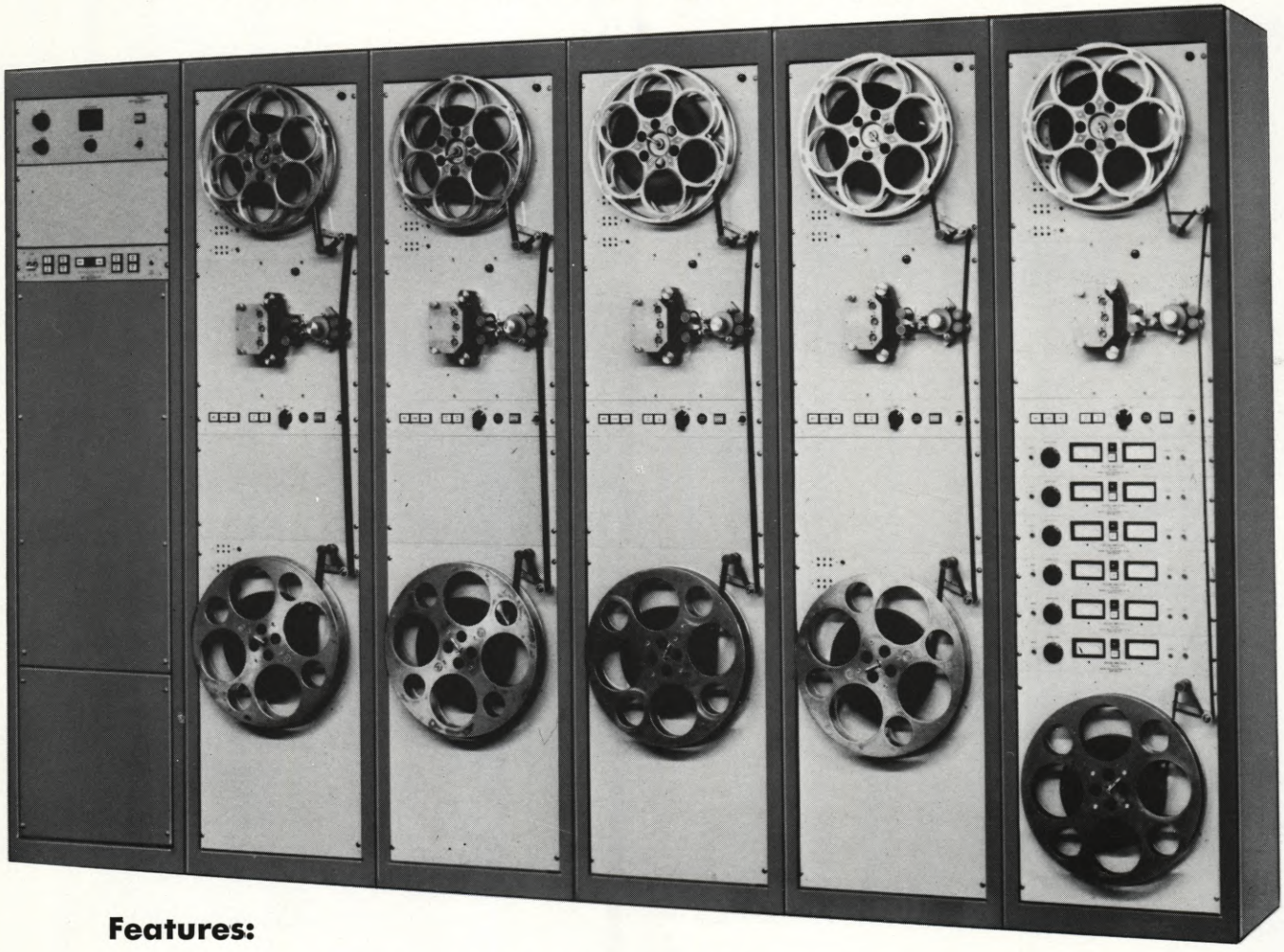

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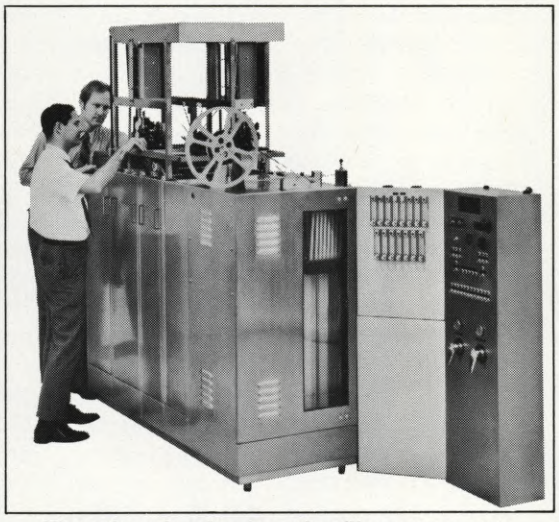

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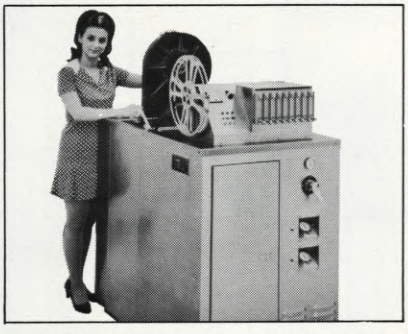

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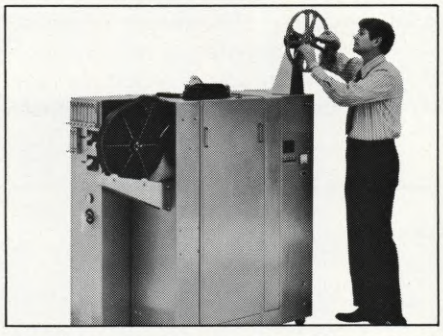

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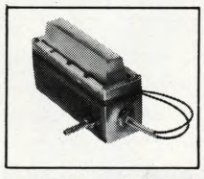

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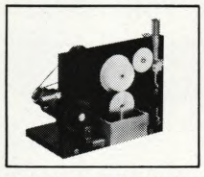

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NEW ELECTRONIC SYNCHRONIZER FOR SPROCKETED AND NON-SPROCKETED MAGNETIC TAPE RECORDERS

A highly sophisticated piece of equipment for the critical process of double-system videotape editing, using the SMPTE code

By G.R. SWETLAND

Product Manager, Broadcast Products,
Electronic Engineering
Company of California

With the introduction of an industry standard serial edit and control code, specifically designed for video and audio tape indexing and editing, it is now possible to synchronize together various magnetic recordings containing related information. Utilizing EECO's most recent development—the Model BE450 Synchronizer—synchronization between any two or more magnetic tape recorders—video or audio—can readily be accomplished automatically. This new product is of particular interest to the television industry in accomplishing "double system" editing. In addition, several applications exist in the film industry where synchronization between sprocketed and non-sprocketed equipment would be most beneficial in the editing process.

Synchronization is made possible by recording identical SMPTE Edit Code information on both magnetic tapes. The BE450 Synchronizer, in conjunction with the BE420 Edit Code Reader, detects the difference in the two codes during playback and generates an error-control signal to either speed-up or slow-down the capstan motor of the slave recorder until synchronization is accomplished automatically.

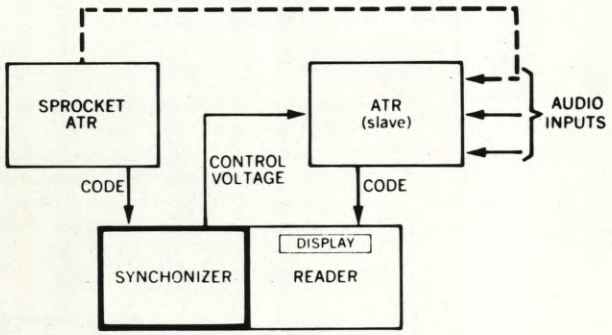
FIGURE 1 illustrates a typical application in synchronizing a multi-track audio tape recorder (ATR) with a sprocketed magnetic tape recorder. In this illustration, the sprocketed device is the "master" and the ATR is the "slave". A control signal derived from the Synchronizer slues the Capstan of the slave ATR until exact sync is obtained. In this application, additional audio channels can be provided by duplicating the SMPTE edit code from the sprocketed magnetic recorder on one channel of the Slave ATR to provide perfect synchronization during recording of additional channels on the new tape.

In a non-sprocketed application, FIGURE 2 illustrates a method of expanding the number of synchronous audio channels by synchronizing two ATR's. For example, if both recorders are 16-channel devices, it is possible to sync-lock the two ATR's together to provide an equivalent of a 32 multi-track ATR. In reality only 30 tracks are usable for recording, since one track of each ATR is used for the edit code.

FIGURES 1 and 2 illustrate a method of expanding the number of audio channels by incorporating two or more ATR's. Applications of this type are useful in the recording industry when providing separate audio channels for various musical instruments, voice and special effects and maintaining perfect synchronization. This same application is also applicable to the television industry, as illustrated in FIGURES 3 and 4.

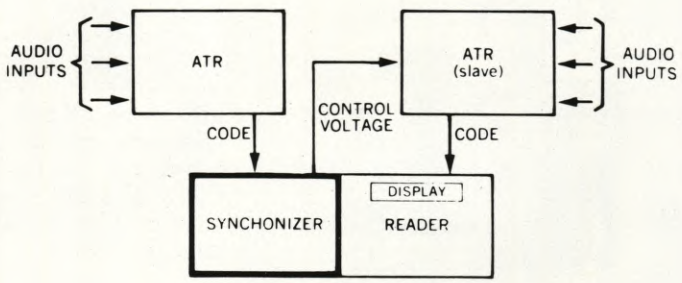
Due to the relative high cost of renting time on large Quadruplex Video Tape Recorders (VTR's). "off-line" editing is very popular in post-production editing of commercials and major network programs.

Utilizing the SMPTE Edit Code as a reference, a dub of the video, audio and edit code is made on a low-cost slant-track VTR. Exact splicing points are then determined at a leisurely pace by the most interested and qualified person or persons—editor, writer, director. Once a scene log has been made, editing of the original material on a Quadruplex recorder can be very rapid and economical, even for very high-quality work. This same technique can also be applied to editing the audio portion of the video tape. After the video, and portions of the audio, have been edited on the quadruplex master, it is often necessary to sweeten the audio to enhance the overall program quality. FIGURE 3 illustrates a method of providing perfect lip sync during "off line" sweetening of



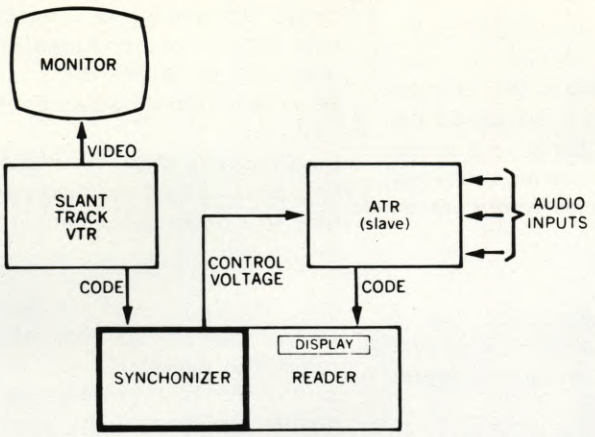
SMPTE Edit Code recorded on one channel of previously recorded sprocketed mag tape has been duplicated on blank tape of slave ATR to provide perfect synchronization during recording of addition channels on the new tape.

FIGURE 1



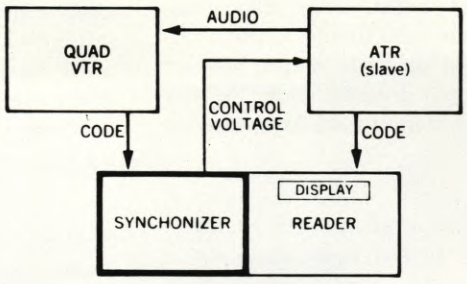
Synchronizer keeps two ATRs in sync. For example, two 16 channel ATRs can be converted into a single 32 channel ATR. SMPTE code recorded on both tapes are identical.

FIGURE 2



ATR is synchronized to slant track VTR while recording for audio sweetening of an original quadruplex master. The slant track duplicate provides low cost visual reference during audio recording. SMPTE Edit Code on slant track and ATR tape was recorded from quad master as the video dub was made.

FIGURE 3



Sweetened Audio is being recorded on quad master with Synchronizer keeping slave ATR in perfect sync with quad VTR. Original SMPTW Edit Code signal on quad master was duplicated on audio tape before the latter was recorded in order to provide sync with the visual reference as audio sweetening was developed (See FIGURE 3 above). Now same code provides for perfect sync with quad master.

FIGURE 4

the original quadruplex master. In this application, several channels of a multitrack ATR are used for dialogue additions, musical scoring, applause and special effects. By observing the video, cuing of the various channels is made at the audio mixer and a mix-down of all channels is recorded on a remaining channel in lip-sync with the video.

Using the same synchronizing equipment, the final sweetened audio is recorded on the quad master, keeping perfect lip sync with the quad VTR (see FIGURE 4).

OPERATION

The relationship between the various units and controls of the Synchronizer can best be summarized by a step-by-step description of a typical synchronization operation with the system as described in the block diagram, FIGURE 3, and front panel control drawings, FIGURE 5.

First, the program material of interest is located on the two tapes. If a program log vs. edit-code is available, this would be a simple search operation. The DISPLAY pushbutton on the Synchronizer is pushed so that the BE420 displays the master code. While watching the master code, the VTR controls are operated to park the videotape just ahead of the program material of interest. The code reader is then switched to the audio tape by pushing the DISPLAY button again to disengage it. The audio tape is then manually parked just ahead of the program segment. Synchronization is achieved within the parking limits of ±30 seconds of tape time between the two tapes.

Next, the ENABLE button is pushed (enable light turns on) to enable the Synchronizer. When the VTR is started, the master code is applied to the Synchronizer (master light turns on). This starts the ATR with the Synchronizer in the "address" mode. The slave code is now applied to the Synchronizer (slave light turns on) and, when both codes are present, the speed control signal is enabled and changes the speed of the audio tape to bring the slave "address" into synchronism with the master "address". The frame offset meter indicates the status of the relation between the tapes and converges on zero as the tapes are synchronized. When absolute "sync" has been achieved the Synchronizer switches to the "flywheel" mode (the flywheel light turns on) and the synchronous condition is maintained. The "sync" light turns on when the slave speed is locked in the "flywheel" mode. When all conditions are proper, all lights are on. The audio program is synchronous with the video program.

It is possible, at this point, to offset the two programs by using the OFFSET buttons and the frame offset meter. If the right hand OFFSET button is pushed, the slave tape will speed up slightly and the frame offset meter will move to the right (leading). The "sync" light will blink off once for each 1/30sec. (frame) of offset introduced. When the button is released, the Synchronizer will lock in the offset that has been created and the "sync" light will turn on. If the MODE button is pushed, the Synchronizer will revert to the "address" mode temporarily, until the "addresses" are again synchronized, and

Continued on Page 1179

FIGURE 5—Front control panels of BE450 Synchronizer (Left) and BE420 Edit Code Reader. These units, working in conjuction, detect the difference in the two codes during playback and generate an error-control signal to either speed-up or slow-down the capstan motor of the slave recorder until synchronization is accomplished automatically.

Continued from Page 1137

quality of the improvisation going without having to stop in the midst of it. But we ended up with images that are better on the creative side, in my opinion, than they would have been on film.

GARMES: There was one technical thing that happened on this picture—something that has been done many times before—but it was much easier to do it on tape than it would have been on film, under the circumstances. Victor said that it would be very nice to have a scene change from dawn to daylight, with maybe the sun just coming up. The scene ran about 20 minutes, so I was able, at a certain point, to give a cue to the guy on the dimmer board and he took 12 minutes to bring the lights up from black to the effect of a dawn sky. Now, we've done this before. It's no big trick. But on film, you have to do a section, and then another section, and you might miss the smooth continuity a little bit. Perhaps a take would end up with the sky a bit darker than on the previous scene. But with the videotape, we made a single take that took 20 minutes and I was able to take 12 of those minutes to bring the lights up gradually. That sort of thing was an asset to me, a big asset.

LIGHTMAN: I'd like to ask about the relative time element in shooting with tape, as compared to shooting with film. Is there any reason to believe that—given the same standards of quality—it would go any faster with tape?

GARMES: It will take the same amount of time to prepare a picture, whether it's shot on film or on tape—but, in my estimation, I think you could cut a third of the shooting time off by going to tape. For example, if you had a forty-five-day schedule using film, I think you could do it in thirty days on tape. This is assuming that you have a director who understands the tape medium and who can edit his script before it goes in front of the tape cameras. And if you have a good technical director—like a film editor who has turned technical director—he can cut the picture as he goes along every day. Within five or six days after shooting is completed, the music and titles are put on and the picture is ready to go out into the theatres. This means that the investor has his money tied up for about a third of the time it would take under the film set-up.

COHN: Is that because one is taped and the other is on film?

GARMES: I think it is.

COHN: I think it's the attitude of the people working on it—because every week a television show is shot on film and within six days it is cut, scored and ready to go. I don't think it's a matter of retooling for tape. You have to retool the heads of the people who work on the pictures.

BLUTH: I think that what Lee is insinuating here is that when it all goes to tape, the tape will retool their heads.

LIGHTMAN: Can you tell me a bit about how this picture was edited?

COHN: We did our editing in a very unique way. We did our shooting on regular 2-inch broadcast tape, but we had a simultaneous ½-inch tape made of everything and that tape was available for editing as soon as a scene was shot. In a room adjacent to the stage we were editing as we were shooting. We edited the ½-inch tape as we went along and later matched the 2-inch tape to that cut. All the editing was done electronically. We never used a piece of film until the very last phase.

BLUTH: We used the basic EECO code system, but the code numbers were "frame-addressed", as we call it. The ½-inch tape was edited in a nice quiet room, just as you would on a Moviola. A log sheet was kept and then, when it was finished, the 2-inch tape was conformed to it. We replaced the Moviola, in essence, with a group of ½-inch tape machines. This gave the director and the editor the flexibility they wanted. Using multiple machines, they could crank up several scenes, play one and then the other and figure out where they wanted to join them. There was an electronic editor on the thing so that they could even make the join-up and look at it.

GARMES: I'd like to ask you a question, Joe. I understand that Sony has a 2,000-line camera right here in Hollywood. If it were possible to do a picture with a 2,000-line camera and transfer it to film, would that hold up on the big Cinerama screens?

BLUTH: Theoretically, yes—assuming that you had what I would call a "real" 2,000-line camera. But nobody has that right now. There are 2,000-line cameras, but they are usually of the vidicon system and in black-and-white. They don't produce the kind of quality that is needed to do the kind of job we're talking about. To do that takes a lot more in a camera. The present camera has 2,000 scanning lines, but it doesn't have the inherent resolution that would make the difference on a big screen, even if you could transfer it to film.

COHN: Joe, I think we ought to mention the fact that we used a particular type of camera equipment in shooting this picture.

BLUTH: We felt that the German-built Fernseh camera was one of the best cameras in the world today, so, in order to do the best possible job on this picture, we delayed the shooting until we could get two of them shipped to us. We used these cameras to do the entire photographic process and we feel that we got some added resolution, finer detail and a nice saturation of colors. This aided in the overall production technically.

LIGHTMAN: (To Garmes) Lee, I'm here as a kind of "devil's advocate" for the film industry, so I'd like to jump on something you've said several times now. You made the statement that—with certain qualifications—you hoped you would never see another piece of film. Just why, exactly, did you say that?

GARMES: I said that because of the results I achieved on this picture. We got better color saturation, better skin tones, better detail and an almost third-dimensional effect without glasses—something that you don't get on film.

LIGHTMAN: Alright—but isn't it true that videotape has less inherent latitude in terms of contrast ratio—than color negative film stock has?

GARMES: I didn't find that to be true. In fact, I found that the tape gave infinitely more detail in the blacks and dark areas than you would ever get on film. I was working with a 200 foot-candle key light and a 50 foot-candle fill. If you did that with film, it would go pretty black on the fill side. But it wasn't so on tape—it was just a beautiful balance.

BLUTH: Let me add something to what he said. Basically, if you take the photographic color film negative and compare it to the TV system, there is inherently a wider contrast range available on the film. But when you make the prints and change the gamma, the contrast range that goes on the screen is theoretically the same from film or tape transfer. What you might be sacrificing

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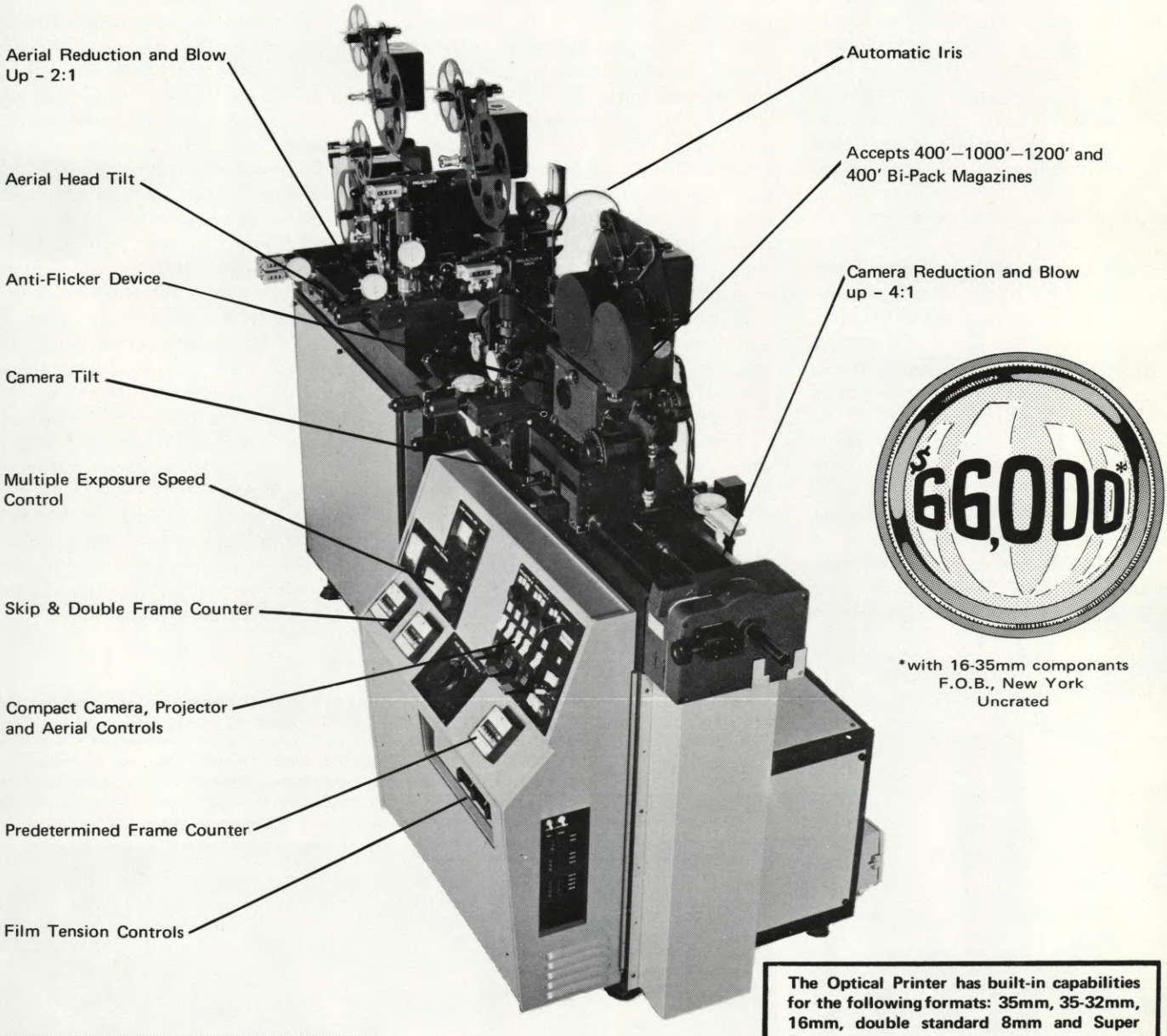

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"VIDEOGRAPHY"

Continued from Page 1131

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.

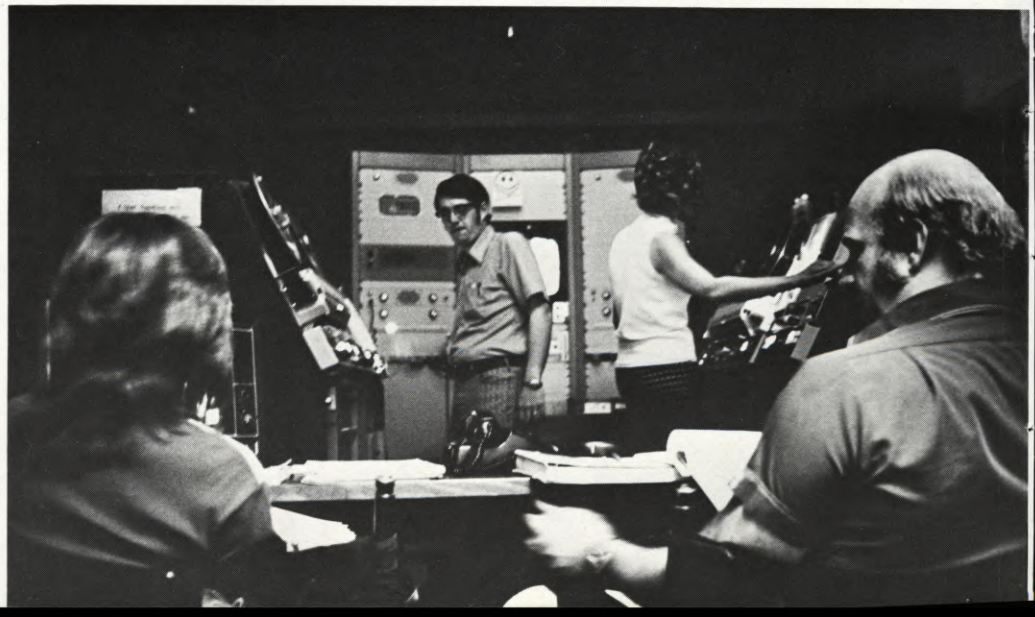
The video signal is fed via microwave antenna (located in a smaller outboard ball) to KTLA's video control, where it can be taped or fed live onto the air. In cases where distant locations are needed, an Ampex VR-3000 can be installed in the chopper to tape on location. The Telecopter is available to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

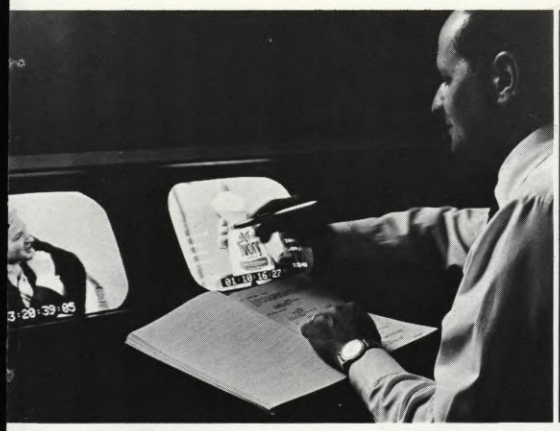
Videography's appeal is not confined to independent producers. Major studios are committing to tape production in varying degrees, from experimental pilots to full-scale productions. Vanguard in this conversion is the newly-formed Burbank Studio, housing Warner Bros. and Columbia Pictures.

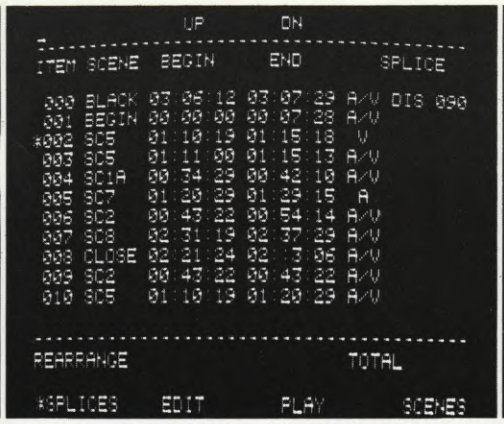
Burbank Studios are presently "tooling up" in a big way for *videography.* Sound Stages One and Two are being converted solely for tape production. Special epoxy-base floors are being laid for smooth camera dollying without tracks. Grid lighting is replacing the traditional scaffolding, and both stages 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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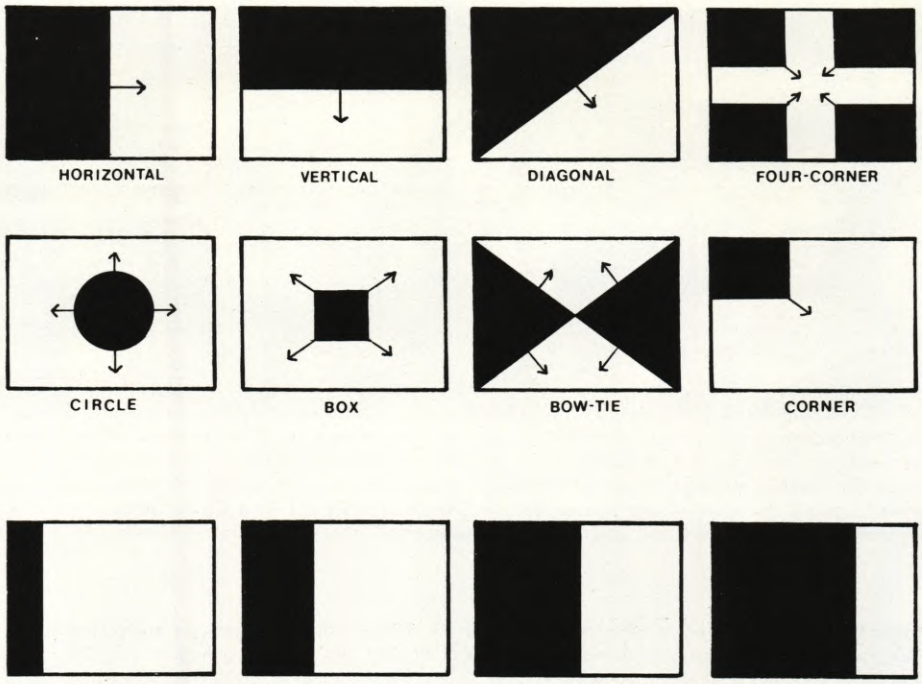

Shown at the top are eight of the most common wipes. By spilt-screening (stopping) in the middle of a wipe, an infinite variety of graphic mattes can be achieved. Shown below is a standard horizontal wipe that has been split-screened four different ways.

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.

IF TAPE HAD BEEN FIRST

Continued from Page 1149

as often as you like.

I'm not saying tape is always cheaper or more appropriate than film. Most of the time it is. It is always faster, and control of the finished product is much tighter. If you don't get what you want on tape, it's your fault, no one else's.

Electronic editing and effects, particularly using frame coding and the Ampex HS-200 teleproduction disk recorder, are unquestionably faster than film's cut-and-mark method. The effects possible with the HS-200 put tape way out in front of film in the matter of special effects creativity. And even though there are some limitations, the savings are around 80-90 percent!

As for color quality (and television today is color), even the most adamant film people will admit that tape has a long lead. The growing number of prime-time sponsors who insist that their commercials be distributed *only* on tape is proof of that. These sponsors are rightly unhappy that that beautiful red package of cake mix they saw and paid for back on Madison Avenue becomes an orange package that looks uncomfortably like their chief competitor's product when the film is shown in San Francisco.

It is important that programs and commercials distributed on tape are seen on television exactly as they were approved by the sponsor. This is frequently not the case with filmed commercials.

The videotape recording industry, while no longer in its infancy, still is learning, innovating, maturing. Improvements in equipment, not as dramatic as in the early years, are making recorders and cameras easier to operate and maintain—and even improving picture quality. Within two years, I believe 80 percent of prime-time television programming and commercials will be on tape. It's roughly 75 percent on film now.

The future? Movies produced on tape. As more and more film people become convinced of tape's quality, speed and versatility, they will want to use the medium to produce full-length features for showing in theaters. The younger picture makers, too, are anxious to break away from traditional film and into a new medium. The answer is videotape. And, of course, hotelvision, CATV, cassettes, video discs, etc. offer distribution and cash flow unheard of in former years.

And all on videotape.

Just try to imagine—what if tape had been first? ■

ELECTRONIC SYNCHRONIZER

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then switch back to the "flywheel" mode.

When the end of the program segment is reached, the VTR is stopped manually. This causes the master light and "sync" to turn off (code not present) and after a delay the ATR is automatically stopped. (The slave light and flywheel light turn off.) The Synchronizer is automatically preset to the "address" mode for the next synchronization.

PACKAGING

The Synchronizer is contained in a small modular case—approximately 5" high by 8" wide by 15" in depth. The case is constructed for mounting as a stand-alone unit on a desk or bench, or for mounting side-by-side with the Edit Code Reader in a convenient rack-mounting adapter. The rack adapter mounts in a standard 19"-wide equipment rack requiring only 5¼" of height. A similar mounting configuration can be made with a mobile cart assembly. This type assembly allows the user complete freedom in moving his synchronizing equipment to various tape recording areas within a studio. ■

ELECTRONIC SPECIAL EFFECTS

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should definitely consider doing the effects electronically.

The possibilities for control in color modulations or distortions are much greater with electronic processes where the color can be manipulated indefinitely and viewed on a monitor until a precise effect is achieved.

TRANSFER TECHNIQUES

Given video equipment designed for a 525- or 625-line system, the key to evaluating electronic effects techniques for a theatrical picture is what happens when the electronic image is transferred to film.

There are currently five methods for translating an electronic image into a film image. The first of these is the traditional kinescope technique in which a camera photographs the screen of a high-quality television monitor.

The second is the Vidtronics method, which is essentially a color separation kine technique. The red, green and blue components of the electronic image are photographed separately from a special monitor onto 35mm black and white film. These color separation elements can then be used to make a color negative for printing or else to produce matrices to be used in the Technicolor imbibition printing process.

A third method is the electron-beam recorder in which the film is exposed directly by the electron-beam rather than having the beam strike the phosphor-lined surface of the television tube. An electron-beam recorder requires that the film be exposed in a vacuum, and it is basically a monochromatic operation, though an experimental color electron-beam recorder operating on a color separation principle has been developed by 3-M.

The fourth method, and one of the most promising, is the laser-beam recorder developed by CBS Laboratories. In a laser-beam recorder the film is directly exposed by a laser beam modulated by the electronic image, and the film does not have to be in a vacuum. Red, green and blue laser beams are modulated separately and then combined into a single beam which scans the frame of the color negative.

The fifth method for transferring an electronic image to film is a technique developed by Image Transform Inc. which they describe as a "complete computer re-construction of the video signal before it gets to film."

Electron-beam and laser-beam recording are not yet widely used techniques, though there is a great deal of

interest in them. The kinescope technique has been refined considerably, and the Vidtronics technique is very highly regarded, but they are both limited by the image characteristics of the television tube. The Image Transform system is discussed in more detail elsewhere in this issue, and it is clearly something every producer and cameraman should see to evaluate for himself. The Image Transform system produces a film image which does not display the scan lines of the electronic image and which has exceptionally good color characteristics. It is, in fact, difficult to tell that it was produced from a videotape image, and it could be possible to cut certain Image Transform footage in with conventional motion picture footage without the audience being any more aware of the difference than they would be aware of the difference between dupe negative and original negative material.

The availability of sophisticated transfer techniques means that a producer or a cameraman should consider the possibility of using electronic effects techniques, even if he is shooting his picture on film for release on film. The film footage to be used in the special effects can be transferred to videotape with the effects being done electronically and then the videotape image converted back to film which can be cut in with his original photography.

In some cases the scenes to be used in the special effects sequences should be recorded originally on videotape to permit more control over the electronic image quality, but for certain effects, it may be better to work from a film image. Each producer or cameraman will have to evaluate the various transfer systems for himself, but my own impression is that the Image Transform system makes electronic effects a viable alternative for special effects work in a theatrical motion picture.

SYSTEMS HAVING MORE SCAN LINES

There is another way of overcoming the limitations of a 525-line video system, and that is through the use of a video system having more scan lines. If a system is used having 1200 or 1400 scan lines, it is possible to obtain an image which is comparable to the images currently possible on 35mm film. Video equipment can be made having as many as 2000 scan lines, and the use of laser beams for scanning can make possible as many as 4000 or 5000 lines. The major obstacle to the development of such video systems is, of course, the fact that video equipment is manufactured to conform to broadcast standards. Equip-

ment having more scan lines than are used in the broadcast industry would be incompatible with all of the existing broadcasting, receiving, and recording equipment. The chances of the national broadcast standards being revised to involve systems with more scan lines are extremely slim for several reasons. The first is, of course, the amount of money that would be required to convert or replace all of the broadcasting equipment. Secondly, all the home receivers would be rendered obsolete unless some way were devised to make the new system compatible with the present one. Furthermore, there are technical and theoretical problems in the fact that the number of scan lines possible is a function of the scanning rate and the frequency band-width. For broadcast purposes the scanning rate is relatively inflexible, since it must be fast enough to provide the illusion of continuous motion, and the band-width is limited, since it determines the number of channels possible in a given locality. It is also not possible, at present, to make videotape recorders capable of accepting wider band-widths without an increase in "noise." High-resolution video cameras and monitors have been made for scientific use but the current trend with such equipment is towards the use of film rather than videotape as a recording medium.

Ironically enough, it is the motion picture industry which is making some of the first commercial uses of television systems with more scan lines.

Computer Image Inc. developed a high-resolution cathode ray tube with a 1890-line capability for use in conjunction with their computers. The tube is used in transferring the computer-manipulated electronic images to film by means of a kinescope technique in which an Acme 35mm camera photographs the image on the high-resolution tube. The present set-up is such that the system utilizes only 945 lines, since the work is done in real time, and the exposure time of the camera allows only one of the two 945-line interlacing fields to register on film. If the process were slowed down so that the camera shutter were open twice as long, there would be time for the full 1890 lines to be scanned; but even the 945-line scan is a substantial increase over the broadcast standard.

Douglas Trumbull also has a 2000-line video system built for him by Lear-Siegler Company as a part of the video processor used in creating the special effects for *The Andromeda Strain.* The 2000-line video system described in the May 1971 issue of *American Cinematographer* is a black and white system used

in conjunction with a 35mm projector and camera. Projected film images are picked up by the video camera, fed through the processor which can alter the image in a variety of ways and then photographed from a monitor. Color is introduced by filters between the monitor and the camera, and most of the work for *The Andromeda Strain* involved building up effects by multiple passes. The video processing unit was primarily used for altering the gray scale of the electronic image (converting a positive image to a negative one or abstracting various elements from the image), though it has the potential for other kinds of image modulations or distortions.

THE ELECTRONIC PRINTER

Trumbull has not developed his video system further since its use on *The Andromeda Strain* because of the cost it would entail, but his work was indicative of things to come. Linwood Dunn of *Film Effects* sees the development of video systems having 2000 or more scan lines as the solution to the question of how to apply electronic techniques to motion picture special effects work. He does not think a 525-line system can ever meet his standards for theatrical special effects, but he is very impressed by the possibilities which electronic equipment offers the special effects cinematographer. He believes that electronic means will soon be available which will do anything that can be done in an optical printer and will do it better, faster, and with more control. The key to this, as he sees it, however, is not the use of videotape but the development of an electronic printer which can transfer directly from film to film through the electronic mode. Such an electronic printer could employ a 4000- or 5000-line laser scanning system which would derive an electronic image directly from the camera negative. The electronic image could then be manipulated and monitored on a video monitor before it is fed into another laser-beam system which would directly expose a color negative.

Such an electronic printer which could incorporate all of the existing electronic tools for special effects will obviously become the standard special effects tool for the motion picture industry in the near future. Since it would require substantial funds to develop and refine a prototype electronic printer, it is not coming as easily or as quickly as many would like; but it is definitely on its way and may be here in a year or so. Once it is perfected, it will make the optical printer look like a clumsy mechanical rig, and it will open the door to a whole new bag of tricks. ■

INDUSTRY

YOUNG WINSTON TO OPEN FILMEX

The West Coast premiere of "Young Winston", a film by Carl Foreman and Richard Attenborough, will open the Second Annual Los Angeles International Film Exposition on November 9, it has been announced by Gary Essert, Filmex Director. The benefit premiere at Grauman's Chinese Theatre will be followed by a black-tie supper-reception.

The Columbia Pictures release, starring Robert Shaw as Lord Randolph Churchill, Anne Bancroft as Lady Jennie, and Simon Ward as young Winston, is based on the book *My Early Life* by Winston Churchill. Produced and written for the screen by Carl Foreman and directed by Richard Attenborough, the film features special appearances by Jack Hawkins, Ian Holm, Anthony Hopkins, Patrick Magee, Edward Woodward, and John Mills. The film's musical score was written by Alfred Ralston.

The Exposition, which will be held November 9-19, is a non-competitive event featuring films and filmmakers from around the world. The entire cinematic spectrum is represented—old and new, feature-length and short subject, non-narrative and spectacle, and documentary and animation. Tickets for the benefit premiere are now available to the public. Please contact Filmex at (213) 461-4348.

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LOUIS B. MAYER FOUNDATION GIVES SECOND GRANT TO THE AMERICAN FILM INSTITUTE FOR FILM RESEARCH PROGRAM

The American Film Institute has commissioned twelve new research projects designed to enlarge and strengthen the body of American film history. These are the first series of commissions made possible by a substantial grant from the Louis B. Mayer Foundation to the AFI—the second such grant by the Mayer Foundation for this purpose.

Announcing the grant of $150,000, AFI Director George Stevens, Jr., said: "This renewed support from the Louis B. Mayer Foundation will assure continuity of the essential historical research which the AFI initiated three years ago." Under the first grant from the L. B. Mayer Foundation, AFI commissioned 35 Oral History projects and named seven historians as Research Associates.

ACTIVITIES

The new AFI projects, totalling $27,000, include studies of the Flying A company, the largest of the Western non-patent companies; and of Universal Studios for the period 1919-30; and Oral Histories with directors Robert Siodmak and Vincent Sherman, composer David Raksin, songwriter Harry Warren and sound executive George Grove.

In addition, the AFI has commissioned autobiographies from silent screen stars Bessie Love, Clive Brook and Joseph Henabery (D. W. Griffith's ABRAHAM LINCOLN); screenwriter Howard Estabrook (CIMARRON and DAVID COPPERFIELD), and film veteran Jack MacEdward.

William Gleason and Robert Birchard will do the project on the Flying A company, whose graduates include such important figures as directors Henry King and Allan Dwan. Gleason and Birchard plan a book on the company, preservation of a large collection of documents and film, and the making of a 16mm film about the Flying A.

Richard Koszarski will study Universal during its rise to prominence, under Hollywood pioneer Carl Laemmle. Koszarski is currently completing a study under AFI/Mayer Foundation auspices on the work of Erich von Stroheim.

Irene Kahn Atkins will do the Oral Histories with Raksin, Warren and Grove; Robert Mundy with Siodmak; and Eric Sherman with his father, director Vincent Sherman.

The Oral History program is administered at the AFI's Center for Advanced Film Studies, Beverly Hills, California, with guidance from AFI's Film History Advisory Committee, composed of David Bradley, film historian; Kevin Brownlow, film historian and author; Charles Champlin, film critic; William K. Everson, film archivist and historian; Arthur Knight, film critic and historian; Casey Robinson, screenwriter, and Andrew Sarris, film critic and historian. Daniel Selznick, the vice president of the Mayer Foundation, who has taken a leading role in the design of this program, serves as honorary member.

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SMPTE INITIATES NON-CREDIT FILM COURSE AT U.S.C.

Screenings of selected features, television programs and specials followed

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ELECTRONIC CINEMATOGRAPHY

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NTSC color television picture, at 30 frames per second, is not ideally suited for making large screen motion picture films, but, nevertheless, quite adequate results have been achieved with this system, particularly when the 1.85-to-1 projection ratio is used in the theater. Rather than just cropping the top and bottom of the frame, as is done in normal motion picture photography, the scanning system in the television camera is altered by a simple electronic adjustment to create the 1.85-to-1 ratio during the shooting. In effect then, all of the information that is being photographed by the electronic system and recorded on videotape is being converted to the projected portion of the final film image. The 625-line PAL system employed in Europe, of course, turns out better pictures, again because of the higher line standard and the 25-frames-per-second television system which is much more compatible with the normal 24-frame film system. Image Transform has devised a new system called "Image 655™" which employs a 655-line television system at 24.02 frames per second. The objective, with the 655-line system, is to match the television standard, which is easily changeable, to the film standard of 24 frames per second. When you squeeze the 655-line picture to a 1.85-to-1 ratio for theatrical display you have an electronic picture which is equivalent to an 838-line standard television picture.

When the end product is to be film, electronic images, from the Plumbicon sensor, on videotape, the storage medium, are strictly used as an intermediate production tool. They are not for broadcast in any way, so we are not restricted to the normal NTSC broadcast standards. We can make our own rules within the capability of the equipment to be used. From a production standpoint, we recommend shooting tape where the efficiency of the electronic system can best be utilized, particularly in studio shooting, or, in any case, where there is the possibility of using two or three cameras at one time. There remain, however, a number of areas where it is definitely easier to shoot on motion picture film; such as, if you are doing a chase scene, or you must climb to the top of a mountain, or get into some very awkward locations. The point being, you can now intercut the film photography and the electronic photography, with completely acceptable results.

35mm film from videotape is, of course, input-limited, both by the sensor (the Plumbicon tube) and by the storage medium (the videotape); nevertheless, electronic films, shot for the theater screen, are of most adequate quality today for the neighborhood theater. There is a great deal of work being done in these areas and we will see substantial changes in both cameras and tape recorders in this coming year, and within one and one half to two years electronic motion picture photography, from a purely qualitative point of view, will be superior to the results achieved in a theater with 35mm motion picture film as we know it today. Camera film emulsions will improve as time goes on, but the potential of electronic enhancement of images will, over the next few years, leave today's normal photographic duplicating techniques behind in terms of pure picture quality.

The Image Transform Super-8 prints,

with electronic pre-emphasis or enhancement, tuned for that format and film stock, are virtually always superior in most respects to Super-8 prints made with any normal film printing system. Here, we are printer and print-stock-limited today. The Image Transform 16mm prints are better in many respects than prints made from original 16mm photography and, in some cases, better than reduction prints from original 35mm photography. Using the electronic production system we can control the contrast build-up and fine detail losses normally associated with multiple generations on film. Videotape generations, of course, have relatively minor degrading effects on the picture information. 16mm films made with the 655-line system in a normal 1.33-to-1 ratio will certainly compare with any 16mm print system known today. When shown on television by a Telecine Chain the Image Transform 16mm film is superior to most 16mm film prints from any normal film source. Again, the relatively high contrast or depth of modulation in the fine detail of this film and its exceedingly fine grain are ideal for projection into the broadcast television system.

The ultimate, then, appears to be an electronic production system, ending up with distribution on film; this presents the best of both worlds with the efficiency in the electronic production with single or multiple cameras, computerized editing, electronic opticals, titles, mattes, instant dailies, and a cost of stock that is remarkably low. If you compare 35mm motion picture film photography with recording of videotape and add the cost of the original camera negative, processing it, and printing it, to get to the point where you can see dailies, one half-hour of 35mm color film costs 10 times that of one half-hour of videotape stock which can be played back immediately and re-used if necessary.

Over the next few months, Super 8 and 16mm electronically originated Image Transform films will be, and in many cases now are, superior, in most respects, to film prints made by any normal photographic process. Today, 35mm Image Transform film will be input-limited but intercuttable with original 35mm photography. Within two years the Image Transform electronic 35mm films will probably surpass the quality of normal photographic film prints made from 35mm camera original negatives.

We have now entered a new era in the reproduction of images, that of making professional motion picture film electronically. ■

"VIDEOGRAPHY"

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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" sync 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 . . . ?" ■

LABORATORY TRENDS

Continued from Page 1157

a lack of standardization that inhibits interchange of program material from one type of unit to another. An early entry, EVR, has already come and gone, while other systems, announced just a year or two ago, have obviously already met an early demise. Surviving at the moment are systems employing magnetic tape in ½" and ¾" formats, and these appear to have the greatest chance of success. It is my personal opinion that the Sony ¾" tape system is the most promising of the field, and will probably be with us long after others have silently folded their tents. The big question for us, however, is what will happen to the Super-8 video player shown by Eastman Kodak last Fall in Montreal. No further announcements that I know of have been made about the manufacture of this unit, and we as an industry are waiting for the other shoe to drop.

LABORATORY OPERATIONS

Well, so much for future market trends. Let's now turn to some present developments and trends in our laboratory operations.

One of my contributors notes that the pattern for the industry will continue the same as in the past with the continuing refinement of emulsions and processes. He looks for shortened process times, and emulsion improvements that offer the possibility of certain markets shifting to smaller-format films: that is from 35mm to 16mm, and 16mm to 8mm.

Adding to that meager information some known facts from other activities, it would seem to me that we might well expect these following developments to occur:

(1) Process times will decrease in some films by virtue of higher processing temperatures made possible by forehardened emulsion.

(2) The recent introduction of a pocket-size still camera was accompanied by a new improved 16mm color negative film. It is reasonable to expect that in time a similar film will be introduced to the motion picture market. This will offer greater potential in filming original productions in 16mm negative with a speed, contrast, and resolution comparable to present 35mm emulsions. The use of such a film by producers should not be underestimated. We, as laboratories, recognize the problem in handling negative in this small format, so we must address ourselves to reducing these problems to a minimum.

(3) Recent introduction of three-

solution chemistry in the still photographic field seems to me an indication of future developments for the motion picture laboratory.

(4) Introduction of intermediate and release print reversal films for processing in solutions common to camera films would indicate an attempt to simplify the laboratory's problems of multiple processes for different films. Further, the new Ektachrome reversal print film would appear to me to be the beginning of the end for Kodachrome print film at some future time.

Another trend, that I believe should now be apparent to all, is the impact on our industry of the environmental protection movement building in this country among citizens at large and at all levels of government. Whether we deserve it or not, we will be pressed to take action to clear up our discharged wastes, and reduce the water consumption of our processes. Politicians are extremely sensitive to any cause that catches the public fancy, and right now, pollution is a subject that gets big coverage in the daily press. Couple that fact with such ominous terms in our industry as "Ferrocyanide", "Formaldehyde", and other names of our process chemistry, and you can see how easily an innocent film laboratory suddenly can be portrayed as a local ogre, no matter how inconsequential his discharge may be. Of course it will be costly, and comes at a time when profits leave little room for additional investment, but we have every good reason to take this action anyway.

In the long run, it should pay for itself in recycling of chemicals, silver recovery, and so forth. But like it or not, it will be with us for some time to come.

LABORATORY SERVICES

Now let me tackle a final topic: the trends in laboratory services. In general the trend is toward complete in-house services, covering every function of post-production from processing original film to final print. Many laboratories have for years offered sound recording services in-house, while others who previously considered this the realm of an outside organization are now installing this service. In fact, some make use of their sound facilities for record publishing activities. In a similar manner, some labs are establishing optical departments in-house; others are now offering editing services which were previously outside functions. These are activities which each management determines are the proper area for him to function in, based on the needs of customers he serves. A more recent trend is the

installation by some major laboratories of in-house television production and videotape recording services.

As noted earlier in this talk, videotape is steadily encroaching into areas previously the sole domain of motion picture film. It is my belief that in the future the functions of these two media will interface to the extent of complete interchangeability; that is, film productions converted to videotape for release, and videotape productions converted to film release. If this is so, what more logical place is there for this interface to occur than the film laboratory? Producers, who are our customers, may work in either film or tape depending on the particular requirements of his show. Release may be on film or tape or *both,* as required for the ultimate uses intended. In between are the functions of editing, transferring, adding special effects, correcting color balance, multiple printing, etc. which we do now on film. Why not also on videotape? The decision to enter this field will be a difficult one for many labs because the dollar investment in equipment and facilities will be quite sizeable. Yet it is a potential new market that must be given a great deal of consideration.

CONCLUSION:

In conclusion, let me summarize that, in the emerging world of tomorrow, we will see a continued growth in the field of visual communication, in which film will continue to be a major factor. However, growth alone will not assure success for us individually or as a collective industry. Those who have read Alvin Toffler's "FUTURE SHOCK" will recognize the accelerating pace of technological progress in our present world, and the consequences which we must be prepared to cope with in the future. We face a challenge on many fronts: from competition within and without the industry; from the demands of technological advance to stay abreast of new developments and shifting markets; from the obligations to our own communities to create a better life for all men. Knowing you, the people who comprise our laboratory industry, I have no doubt the challenges will be met.

A few years ago a popular slogan held that "God is Dead". More recently, we have heard a similar cry: "Film is Dead". Well, the former seems to have been replaced by the so-called "Jesus Movement" and I predict that the latter slogan will be similarly proven false by the events of the future.

"Film is dead?" Not a chance. Film is alive and well and growing healthier every day. ■

VIDEOTAPE-TO-FILM

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high-intensity spot. These properties allow the film recording to be done on low-sensitivity, fine-grain emulsions. Further, the properties of the focused beam permit essentially perfect registration. The results are a high-resolution product, with excellent color rendition and low noise. The lasers chosen for this work are a helium-neon type for the red line (at 6328 Angstrom units) and an argon-ion laser for the green and blue lines (5145 and 4765 Angstroms respectively).

This equipment built by CBS for its own use is presently being utilized for the creation of "archival" film from videotape. CBS has been seeking interest from others in obtaining the laser system. If the interest is sufficient they have indicated that they will make a single production run of machines at a fixed base price plus a royalty on the sale of services from the machines. It is to be hoped that this most promising system will be carried on to the next stage of development.

TRANSFER SERVICES—VIDTRONICS

Vidtronics is a subsidiary of Technicolor Corporation. They are probably the most experienced company in the transfer of theatrical color material from tape to film. They are, in fact, at this writing the only organization to have done transfers for theatrical release films. Between the Hollywood and the London operations, they have transferred five feature-length properties. The best known of the five is the recent "200 MOTELS".

Vidtronics is a service organization, and not a hardware purveyor. They have developed their own equipment and procedures to accomplish the transfer from videotape to film, and they are engaged in constant development work to improve the system and further optimize its performance. They regard the equipment as the means for providing service to the client and, in fact, they are really a total post-production service for videotape production. Tape-to-film transfer is just one of the many services they offer.

The actual operation of the transfer system they use is generally as follows. The video information, as standard NTSC 525-line composite color signal, is decoded and separated into the three primary color channels. The signal information in each channel is processed and enhanced electronically, and fed to a special tube. This is photographed to produce a 16mm black and white separ-

ation master. The videotape is run through this procedure three times to complete three primary color-separation masters.

TRANSFER SERVICES—IMAGE TRANSFORM

This is a relatively new company which entered the field of tape-to-film transfers only within the past year. They are unwilling to discuss the details of the equipment or system which they have created within their own organization. They make some interesting statements about the capabilities of the approach they have chosen.

The system is capable of accepting any of the commercial broadcast TV formats used in the world (i.e. NTSC, PAL or SECAM). They claim to use all the picture information in the video signal in going from the NTSC format to their output, rather than discarding some, as is the case in other systems. It is their feeling that their emphasis on noise reduction prior to signal enhancement is one of the reasons they can produce high quality. They produce a 16mm color negative as the output of the system. This is made on the . . . "finest grain color stock available."

They are experimentally producing equipment (sync generators) for use with the standard broadcast cameras and videotape recorders which changes them to a 655-line format, that increases the vertical resolution significantly (compared to the 525-line NTSC). Since the output does not need to be broadcast, they are doing this at 48 Hertz rather than 60. This eliminates the need to discard any of the information in going to 24-frame film rate, since each successive pair of TV fields comprises a complete raster of 655 lines. When the information in the 655-line, 48-Hertz signal is compressed so that the 1.85:1 format is created, the effect is to conserve the information and provide an even greater apparent vertical resolution.

Image Transform seems to be concentrating considerable energy in the development of methods and equipment compatible for use with the standard broadcast cameras and recorders. They are addressing themselves to approaches which they hope may overcome some of the present input limitations of the system.

TRANSFER SERVICES—COLOR KINESCOPE

There are several organizations which are deeply experienced in accomplishing tape-to-film transfers by shadow-mask photography (color kinescope).

Among the best known of these are

Byron Inc. of Washington, D.C. and Consolidated Film Industries of Hollywood. There are many others doing this work also.

OBSERVATIONS AND CONCLUSIONS

The best-established, and longest-proven system for transferring color videotape to film at the present time is the shadow-mask kinescope. Other new, different and potentially better methods have appeared. As yet, they do not show *qualitative* improvement over the results achieved by shadow-mask photography. This is not to say that they do not produce excellent results in many cases.

It is not certain at the present moment that any of the systems can consistently produce a theatrical release quality transfer. This does not say they never will. There is every likelihood that the means for doing transfers suitable for theater projection is in the cards. It is not in sight at present.

The present transfer processes are finding greater application each day. The advent of the new editing and special effects equipment for use with videotape makes this recording medium more attractive for a wider range of production activities than ever before. This only tends to increase the demand for an increasing amount of transfers to be made for distribution purposes. ■

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PAILLARD LAUNCHES PROFESSIONAL PUBLICATION

The first issue of "Paillard Professional News" has just been published by Paillard Incorporated.

This brand new, eight-page magazine is must reading for professional and semi-professional photographers and cinematographers. The publication's emphasis is on news—what's new in equipment, applications, techniques and literature.

Of special interest to 16mm cinematographers are product reports on the Bolex H-16 EBM camera, the Vario Switar POE-4 lens and comments on the POE lens by Burmese cinematographer James Bu.

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and Bolex MST. As a general rule, it is best to use as short a power cable as the situation will allow. In addition it is best to chose one of 16-gauge as opposed to 18-gauge wire. Be particularly wary of coiled cables. A two-foot coiled cable is actually over 12 feet of wire. If you must use a coiled cable, it is best to use the one-foot length which extends to six feet.

The increasing popularity of crystal and servo-controlled motors has introduced an additional problem to the selection of a power cable. These servo-controlled motors almost exclusively operate on the principle of pulse-width modulation. This means that the motor is powered by quick pulses rather than a continuous current. While the *average* current drain of these servo motors is somewhat less than conventional motors, the *instantaneous* current drain of each pulse can be three times higher. Since the voltage drop in a cable is proportional to instantaneous current, these crystal and servo motors will experience about three times the voltage drop of the same camera with a conventional motor. It is therefore particularly important to use a short cable when using a crystal or servo type motor. In these cases, a coiled cable should be avoided completely.

FIGURE 1 is designed to give the cinematographer some quantitative 'feel' for the voltage drops across various lengths of cable for several popular cameras. Keep in mind, also, that many cameras draw over 10 amps during start-up, which can mean over a two-volt drop on long cables.

Being a resistance, the cable also draws power proportional to the voltage drop. Thus a cable that drops one volt from a twelve-volt battery will also rob one watt of power from every 12 watts delivered by the battery. Essentially, 1/12μ of the power being delivered by the battery is being dissipated by the cable.

The adverse effects of the cable voltage drop in most cases are minimal. It does cause a slight decrease in effective battery power and will also decrease top speed of the camera for slow motion. Probably the most serious effect of the cable voltage drop occurs with cameras that employ sophisticated electronic components such as a behind-the-lens metering system. Excessive voltage drops in the cable have been known to cause these systems to malfunction completely.

Physically there are two things to

look for in a power cable. The type of insulation, and the effectiveness of the strain-relief on each connector. The strain-relief is usually a collar or ring around the wire as it enters the connector at each end. The strain-relief should be tight enough so that if the cable is accidentally yanked, the strain-relief will absorb the shock and not the actual electrical connections inside the plug. An ineffective or loose strain-relief accounts for most cable failures. Always carefully inspect the strain-reliefs on the power cable. If they appear loose or they are missing, do *not* repair the strain-relief. The plug should first be taken apart and the internal solder connections inspected. A loose strain-relief usually indicates that the electrical connections have already been weakened.

The choice of insulation is usually between rubber, neoprene or PVC (Poly Vinyl Chloride). Neoprene is probably the best choice for general use, however. The chart in FIGURE 2 reflects most of the insulations in common use and the various properties that may help in the selection of an insulation for a particular situation. ■

SIDNEY P. SOLOW HONORED

Sidney P. Solow, president of Consolidated Film Industries, was honored recently by friends and colleagues at a surprise dinner at the Beverly Wilshire Hotel. The event commemorated Solow's 40 years of service with CFI and numerous technical contributions to the motion picture industry.

Solow was presented with a silver bowl by Sanford C. Sigoloff, president and chief executive officer of Republic Corporation, parent company of CFI. The bowl was a gift by all the attendees with their names inscribed.

Solow joined CFI in 1932 as an assistant chemist following his graduation from New York University with a Bachelor of Science Degree in Chemistry. He served in various technical and managerial positions prior to being named president of CFI in 1964.

Internationally recognized for his technical contributions to the industry, Solow is the recipient of a Class II Award by the Academy of Motion Picture Arts and Sciences and the Distinguished Service Award of the Department of Cinema at the University of Southern California. He has served as a member of the faculty of the Department of Cinema since 1947. He has served as president of the Association of Cinema Laboratories and is an associate member of the American Society of Cinematographers.

INDUSTRY ACTIVITIES

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by discussions with members of the production teams which made them will highlight the winter non-credit course presented at the University of Southern California by the Society of Motion Picture and Television Engineers.

The course, titled "The Production Team," will run Wednesday evenings, 7:15 to 10:15 from September 20 through January 17, according to Frank P. Clark, chairman of SMPTE's Education Committee, and manager of research engineering for the Research Center of the Association of Motion Picture and Television Producers.

The course, Clark said, "is planned to give management, production personnel, historians and students and insight into the complexities of the varied forms of production."

Speakers include Jim Algar, Wollie Reitherman, Irwin Allen, Bruce Brown and Russ Meyer, producers; Tom Belcher, director of videotape operations, The Burbank Studios; Leon Chooluck, production manager; Christina Friedgen, post production supervisor, Neiman Tillar Associates; Alan Sandler, president, Sandler Film Commercials; William Tuttle, director of makeup; Nick Vanhoff, executive producer, Youngstreet Productions; and David Victor, executive producer, "Marcus Welby, M.D."

Course content includes: The Golden Age of Motion Pictures, screening of MGM's "Hollywood, the Dream Factory", Sept. 20; The Major and the Independent, screening of Russ Meyer's "Vixen", Sept. 27; The Low Budget Features, Oct. 4; The Animated Feature, screening of Walt Disney's "Aristocats"; Oct. 11 and 18; The Commercial, Film and Tape, Oct. 25; 16mm Production for Theatrical Release, screening of Bruce Brown's "On Any Sunday", Nov. 1; The Location Film, screening of Sheldon Leonard's "I Spy", Nov. 8; The Multi-Screen Ultra-Wide Presentation, screening of Disney World's "Hall of Presidents", Nov. 15; The Electronic Theatrical Feature, Nov. 29 and Dec. 6; the Television Special, screening of "The John Wayne Special", Dec. 13; The Television Documentary, screening of a Jacques Cousteau special, Dec. 20; The Television Series, Jan. 3; The Feature Theatrical-1972, screening of Irwin Allen's "The Poseidon Adventure", Jan. 10 and 17.

Enrollment fee for the non-credit course is $82. Further information may be obtained from USC's Division of Cinema, 746-2235.

THE SHOOTING OF "WHY?"

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is shades of color gradation. But what Lee did—and what totally made up for this—was that he lit his scenes properly. When you light the scenes properly, the electronic camera can pick up these gradations better than film can. Also, the cinematographer can see on the monitor, even before he makes a take, whether or not he's getting what he wants. If he isn't, he changes it. I'm sure he made the statement that he did because he was able to light precisely for what he knew he had, and he got out of it more than he would have gotten the other way.

GARMES: In line with what Joe said—by having the color monitors, I could see immediately any defects in lighting or camera position or composition. I didn't have to wait until the next day to see rushes. This makes the job much simpler for the director and the cinematographer. You don't have to wait until tomorrow to see your rushes. You're seeing them right now—as you're making them. Also, in my case, I stayed all day long right in front of the monitor and if there were any lighting changes I wanted to make, I'd simply call the gaffer over and point them out to him on the monitor. It takes the guesswork out of it completely.

LIGHTMAN: (To Cohn) You spoke of the large size of the TV camera before. Would you say that it is also less mobile than the film camera?

COHN: No, not a bit. In the case of the picture we made, we had two excellent camera operators. Each camera is on a three-wheel dolly and the operator himself moves the camera wherever he wants it. He also changes focus, pans and tilts the camera and zooms the lens in and out himself. He can even raise and lower the camera with his little finger—that's how sensitive it is, The one operator handles the whole thing. There is no dolly grip and there is no focus-puller. Personally, I think you need a focus-puller, because the operator has so damned much to do that he can't always keep the picture exactly sharp. If he had an assistant cameraman, he could keep the picture sharp all the time. It's impossible for the operator to do everything himself. Am I right or wrong?

BLUTH: It's very difficult in some kinds of things. However, if you're doing an extemporaneous type of thing,

the man behind the camera sometimes has a better feel for what is going to happen and where the focus is going than a guy standing alongside the camera.

GARMES: If the operator has good coordination and isn't all thumbs, he can do it better because, as Joe says, he knows the minute he wants to move, and so forth. But still, he can't put the camera exactly where he wants it because he can't look down at the floor to hit his marks. He has to guess at it—whereas, a dolly grip knows exactly where to push it.

LIGHTMAN: Let me ask you another question, Lee. You were using two cameras all the way through the shooting. I would assume that if the director wanted more angles of the action you would reset the two cameras and reshoot the scene. Isn't that how it worked?

GARMES: Oh, yes. For example, let's take the first scene that we shot for the picture. It ran 22 minutes in length and we had two cameras set for two different long shot angles to record the whole 22 minutes—which is a total of 44 minutes of tape. Then we moved the cameras in to get two medium-long shots of the same scene—which was 44 minutes more. Then the two cameras moved in for medium shots, over-the-shoulders and things like that—another 44 minutes. The next move was individual closeups of every one of the people who had anything to say of importance—which accounted for at least another 44 minutes of tape. When you add that all up, you've got a hell of a lot of tape—at the very least, eight times 22 minutes. But the director had full coverage and he could do anything he wanted editorially. That's more than you ever do with film, really—and we shot all that tape in one day.

LIGHTMAN: The action in this particular picture, "WHY?" is really very static —basically a group of people sitting around and talking all the way through it. Bob Cohn has told me that the staging was designed for the method of shooting you used and that's why it worked so well. Assuming that's true, would you say that this shooting method could be equally well applied to a very active picture—something like "THE FRENCH CONNECTION" that calls for an entirely different pace, scope and editing style?

GARMES: I think that, other than the automobile chase, it could all have been

done on tape—every bit of it. The long shots wouldn't be as clear as they were on film, but there weren't very many long shots in the picture, really.

BLUTH: There were many shots in "THE FRENCH CONNECTION" that were just fast swipes at things, where you didn't see focus, you didn't see anything. It just created an impression in the mind—but you could have done the same thing on tape. The chase sequence, no. That was done with hand-held cameras.

GARMES: That stuff in the subway car, the elevated, could have been done on tape.

LIGHTMAN: You say it could have been done on tape, but practically that entire sequence was hot hand-held. Are you saying that there is some kind of really cordless video camera that could duplicate those shots?

BLUTH: Not in the sense of being able to get the quality we need. There is not a hand-held video camera that can produce that kind of quality at this time.

LIGHTMAN: Then it seems to me that one of the present drawbacks is that you are tied to the cable—whereas, the whole thrust in film production is toward completely cordless operation—not only crystal-sync, but battery-operated cameras, as well.

GARMES: Well, Herb—up until the last two or three years we were handicapped in the same way with film, too—long cables and generators and that sort of thing. We've just gotten into the cordless cameras and cordless microphones within the last few years.

LIGHTMAN: (To Bluth) What I'm really asking, Joe, is whether you feel that we can expect broadcast-quality, small, hand-held video cameras within the foreseeable future?

GARMES: Well, for instance, there was a man on the set while we were shooting our picture who had a little thing no bigger than a tote bag and he carried it over his shoulder. He had a little camera and a little tiny monitor about an inch square and he taped a lot of stuff while we were shooting. His rig was self-contained—no wires anywhere. He walked all over the place.

BLUTH: Those things don't have the quality yet. But they're going to improve and upgrade themselves to a point where we are going to say that they've

reached the level of acceptability. What is the level of acceptability? It's not what I say. It's what the average guy will sit and watch in a motion picture. That's the level of acceptability.

LIGHTMAN: I'd like to ask Lee a question having to do with lighting for multiple cameras. Now, of course, many of our TV series are shot with multiple film cameras—usually three of them. But all of the Directors of Photography tell me that even though the results are "good enough for TV", as they put it, they are always having to make lighting compromises. The axiom persists that you can only light ideally for one angle at a time. You were using two cameras on this picture. How do you feel about it?

GARMES: I could use three cameras without any problem, and let me tell you how I would use them. I would simultaneously shoot a long shot, a medium-long shot and one over-the-shoulder and I could get that face beautifully. For the other over-the-shoulder I would have to relight.

LIGHTMAN: Do you feel that using multiple cameras is the way to go for tape shooting, or do you feel that ultimately you would have to break down the shots, as is usually done in feature filming—shooting only one angle at a time?

GARMES: I think that all depends upon the director and the subject matter. Normally, it would save a lot of time. He would get better performances and, God knows, better editing, because there would be no matching problems.

BLUTH: Some things will lend themselves to that technique and some will not. I don't think you can make a clear-cut statement and say that all movies should be shot using a three-camera technique. I just don't think you can.

LIGHTMAN: To get to the crux of this, let me ask my devil's advocate question—the same question that American Cinematographer readers will be asking—namely: Let's assume that you would shoot your picture, "WHY?", in the same way that you did. You pre-rehearsed for six weeks. You shot with two cameras. You did everything the same, except that you were using film cameras with electronic viewfinders (in order to have the advantage of the "instant-dailies" situation)—what would be the advantages of shooting it on tape, as opposed to film—other than the cost

of the tape as compared to that of film?

COHN: Well, the first thing I pointed out—the length of the takes we were able to make. We were able to shoot a 38-minute scene without interruption. Now, to relate that to cost is difficult, because we've never really budgeted a picture using two film cameras, as you've described it. Joe might have more figures, because he's been asked this question so many times.

BLUTH: Well if you just substituted film for tape, I think you'd find a considerable savings on the side of tape—mainly because of the length of time it would take you to shoot the thing. The main considerations are the amount of physical production time involved and the amount of editing time involved. If you shot it on film you'd end up with hundreds and hundreds of pieces of film. The guy in the editorial room would be going nuts.

COHN: He went nuts with the tape.

BLUTH: I know he went nuts with the tape, but he had the advantage of 22-minute takes all in one. But let's say that it was shot on film, with many, many loads. He'd go double-nuts . . . triple nuts! ■

WHAT'S NEW

Continued from Page 1086

provides 800-foot film total capacity. Approximately 45 seconds are available for load and take-up change time. Cleaning solution is recirculated and filtered. Waxing solution is recirculated and cooled. Cleaning and waxing heads are removable for cleaning and for easy replacement of nylon velveteen covers.

For additional information and prices, write to Treise Engineering, Inc., 1941 First Street, San Fernando, California 91340.

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NEW 12,000 WATT ALTERNATOR AVAILABLE EXCLUSIVELY FROM AGE INC.

A new 12,000-watt alternator that mounts under the hood of a small truck and provides ample power to operate two 50-amp Colortran Maxi-Brute lights is now available exclusively from Alan Gordon Enterprises Inc., according to Grant Loucks, president.

Developed and built by United States Energy Corporation to AGE Inc.'s specifications, the alternator operates off the main engine at just above idle speed. First to use the new alternator was documentary film producer Keith Merrill, who mounted it on the engine of his Ford F250 truck. Merrill reported the alternator system did an outstanding job in providing him the flexibility for lighting he needs on location.

Other United States Energy-AGE Inc. alternator systems range from 6000 watts to 15,000 watts, 120 volts DC. Three phase, 220 volt systems also are available.

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NEW EDGE-NUMBERING SERVICE INTRODUCED BY DELUXE GENERAL

A 16mm print edge numbering service to salvage dead prints was announced by Robert T. Kreiman, President of DeLuxe General, the Hollywood based motion picture laboratory.

The new service, he explained, was based on edge numbering the DeLuxe 16mm printing negative at 40 frame (one foot) intervals, starting with 0001 at the head end and progressively increasing to the tail end number. Every print made from the negative will have the identical numbers.

"We expect that this new and exclusive edge numbering service will not only simplify for our customers the ordering of repair sections," Mr. Krei-

man said, "but will also speed up print repair. The print user need only provide us with the last edge number before the damaged area and the first number after the damage to assure printing of the correct repair section."

The new service will be available to DeLuxe's customers this fall, as soon as all of the laboratory's 16mm printers have been modified to print the number area. DeLuxe's customers will then be able to order the numbering of new negatives, as well as existing Color by DeLuxe negatives.

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PHOTO-SONICS UNDERWATER CAMERA FOR DSRV PROGRAM

A modified version of Photo-Sonics 16mm-1P camera has been developed for Dillingham Corporation and two such systems are now operational in the DSRV program.

The sophisticated system, designed for high-quality photography to depths of 8000 feet, features automatic exposure control, data chamber for annotation and time recording, heater, remote film advance indicator, selectable frame rates from 6 to 24fps, and 400' magazines that can be interchanged in a few seconds. Routine operation of the camera, adjustments and magazine changing do not require removal of camera from the front bell of the titanium pressure housing.

For further information contact: Richard Freeborg, President, Instrumentation Marketing Corp., 820 South Mariposa Street, Burbank, California 91506; (213) 849-6251.

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NEW MATERIAL REPLACES SPUN GLASS, BUT IS SAFER AND MORE DURABLE

A new soft plastic material called Tough Spun has been introduced by Rosco Laboratories as a replacement for spun glass filters for television, theatre, motion picture and photography lights.

The new material does not shed fragments, thus eliminating the skin irritation and danger of eye injury associated with spun glass.

Tough Spun is more durable than any diffusion now available. It can be roughly handled, even stretched, and it will not tear. This is in sharp contrast to spun glass, which is easily poked through.

The Rosco material provides slightly more diffusion than standard 0.010 spun glass.

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VIDEOTAPE VS. FILM

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so we shot in 16mm with EF film. How could you have done this with tape, doesn't the video camera require more light?

SIDARIS: With the Norelco hand-held, or the big Norelco, or the 44B camera, the lighting requirements are considerably less than for film. In just physically setting up and lighting you have a great deal of range with these cameras. The other day for instance . . . I'm going to give you some examples . . . we were doing a track meet in Eugene, Oregon. We were taping until nine o'clock in the evening . . . no lights. When we stepped out of the truck it was dark. The film guys had been gone about two hours. Because of these new cameras, at 8:15 and 8:30 we taped the world's highest pole vault. The cameras were better able to get good pictures in available light, and here, again, the support equipment might be greater in that you need videotape machines, but bear in mind that the new tape trucks are completely mobile. They have their own generators, and as we know now, you can be in a moving vehicle, you can do running shots, moving shots; you can get shots off the back of a pick-up truck with the new mobile units. You can get every effect you could want, and probably have a great deal more latitude in not having to light as completely.

FEIGELSON: Would you elaborate on this lighting factor? Especially interiors.

SIDARIS: You can light indoors with considerably less light, so you have less set-up time, and you are able to start blocking and taping quicker. The lighting in this room for example would be enough with the two lamps we have on to get a decent picture.

FEIGELSON: Say we want to get a shot from a helicopter; can we do that?

SIDARIS: Oh yes. We used a helicopter over in Grenoble for the opening ceremonies of the Winter Olympics in 1968. The camera was completely mobile; by that I mean we had a Norelco camera with a gyroscope mount in the helicopter, and we had a direct line-of-sight-transmitted picture to our videotape truck. The pictures from that were just unbelievable. We were able to get shots where we followed the torch bearer down the long street for a mile; then right over the stands with over a hundred thousand people, and we took him up the steps, and we circled around the

Olympic Torch as it was being lit at the opening of the ceremonies. We've used the helicopter on ski runs, and so it is every bit as mobile as a film camera.

FEIGELSON: Many producers across the country are doing films and commercials, and can own or rent 16mm equipment relatively inexpensively. What's going to happen if they decide they want to go to tape?

SIDARIS: Well, I think that as you go to the various parts of the country, let's say Texas or Florida, the equipment, and the people involved are considerably less expensive than in the Los Angeles, Chicago, or New York areas. What you are trying to do here, I think, is to get as much done as quickly as possible. If you were going to do a film in Texas, maybe the equipment is a little more than if you were going to shoot it in 16mm, but on the other hand you could shoot an entire half of a movie in one day if you were blocked and set up to go. And you have all your sync, you'd have all your video, you'd know what your shots were, you'd see the playback, and you could do considerably more production in the same length of time. So you might have a film crew going out to shoot something for a week that you could shoot on tape in a day.

FEIGELSON: How does the speed of editing tape compare to that of film?

SIDARIS: Let me say this . . . from the video standpoint, it's just as fast, because with Editech what you are doing is taking pictures off of your master or maybe two masters, and building another master. Unlike film, the quality loss is negligible between the generations, and what you are also doing is transferring sync, which is really terrific. In film as you are editing you have two splices to make instead of one.

Now there is another process. I was over at Consolidated Film Industries, and I've seen their process where they take all their film and transfer it to tape, and then they edit with a computer. The director will go in, decide what he wants, and get a punch card. Then that card goes over to the editor, and he just goes right down the list of his scenes, and is able to edit the film very quickly.

FEIGELSON: When the picture and your sync are on tape and edited the way you want, how do you then mix in a music roll, and maybe several effects rolls as we do in film?

SIDARIS: If we're talking about an

end-result motion picture, essentially what you are going to do is to look at the videotape, and select your best takes . . . probably Editech those off onto one reel. At that point, you transfer to 35mm mag and 35mm workprint. Then you build up your reels of effects and music, and do your mix.

FEIGELSON: Now that the show is done, how do we get a videotaped production onto a theater screen?

SIDARIS: You have transferred from video to 35mm and, at that point, depending on your aspect ratio, you could easily go to straight 35mm with a matte situation to get a 1.85:1 screen ratio, and that's the happiest way to go because you've got a film in 35mm for later television use, or reduction to 16mm prints for syndication. What you do is transfer directly to 35mm off of your master tape if you will, or your Editech tape, and this is probably the better process because, remember, there are dissolves, there are wipes, there are many "opticals" that come electronically that would cost you generations if you were shooting straight film. There are processes of fast cutting that would take hours and hours of editing that you can do very simply electronically.

FEIGELSON: But don't you get lines on the theater screen when you go from tape to 35mm film?

SIDARIS: No, you don't anymore. They have eliminated that. I've seen at Technicolor, and a few other places, the process blown up. I've seen it at the Director's Guild theater screenings, and I've seen this process on large theater screens, and you don't detect lines anymore. They've done a magnificent job of eliminating the lines.

The above was the conversation that I had with Andy Sidaris. Actually, I thought of a hundred more questions for this knowledgeable man, but those will be answered in time.

It would seem that tape has its advantages over film, primarily in the ability to shoot under less light, having video and audio in sync, less expense for opticals, and the incredible facility of seeing your take right after you shoot.

But then again, film, for the small producer especially, will be around until the price and size of videotape equipment comes within his range. And there is still the question of esthetic distance. Film has it . . . tape doesn't, but will the future tell us that this distance is not necessary? The audiences will decide, and let us know. ■

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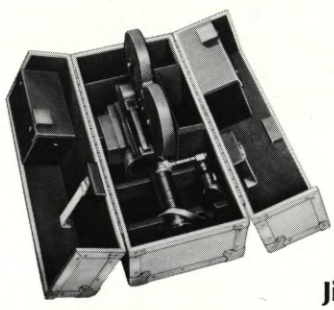

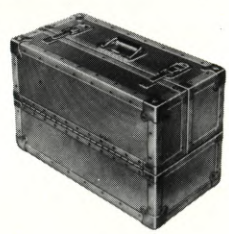

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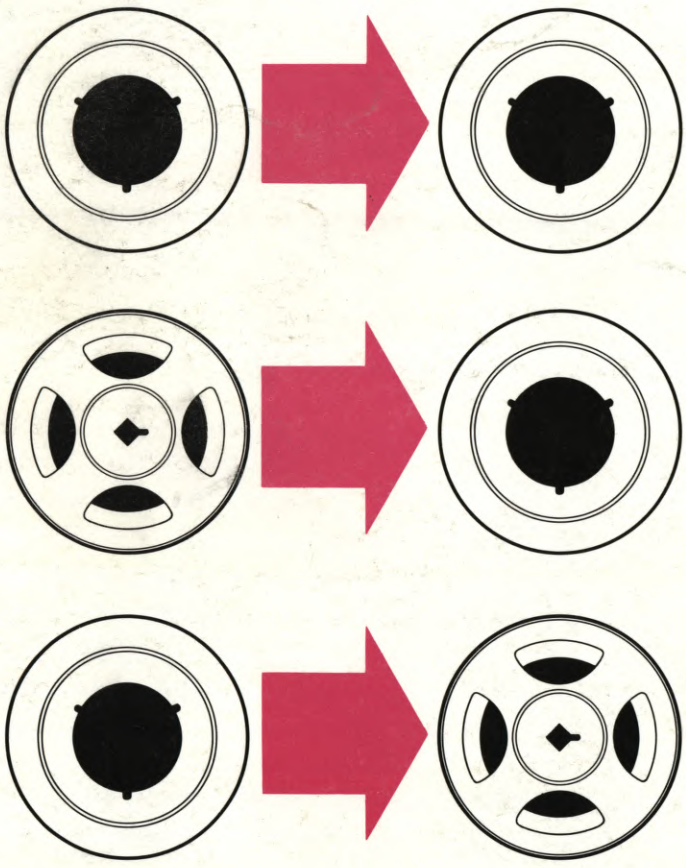

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