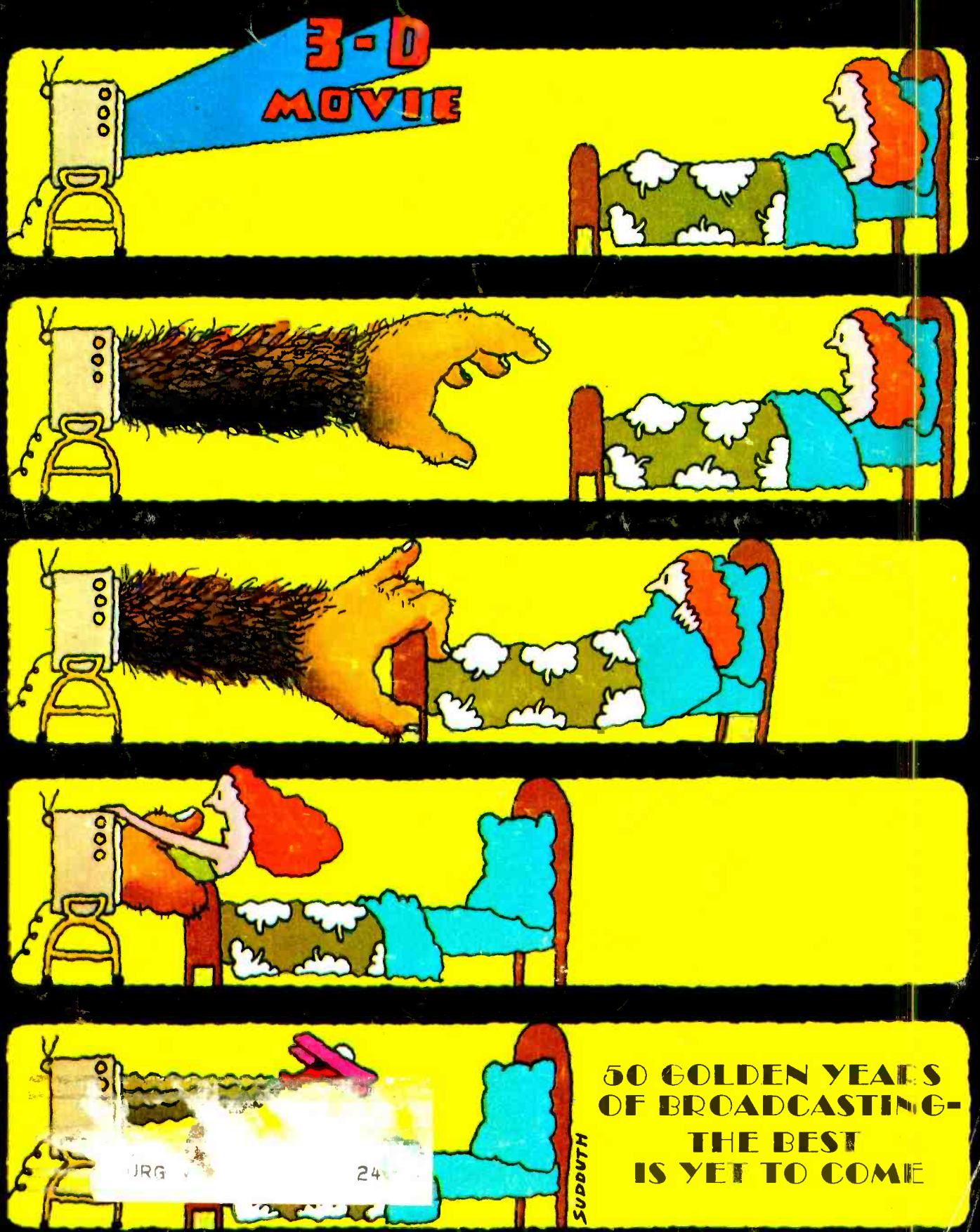
A MACTIER PUBLICATION APRIL 1970

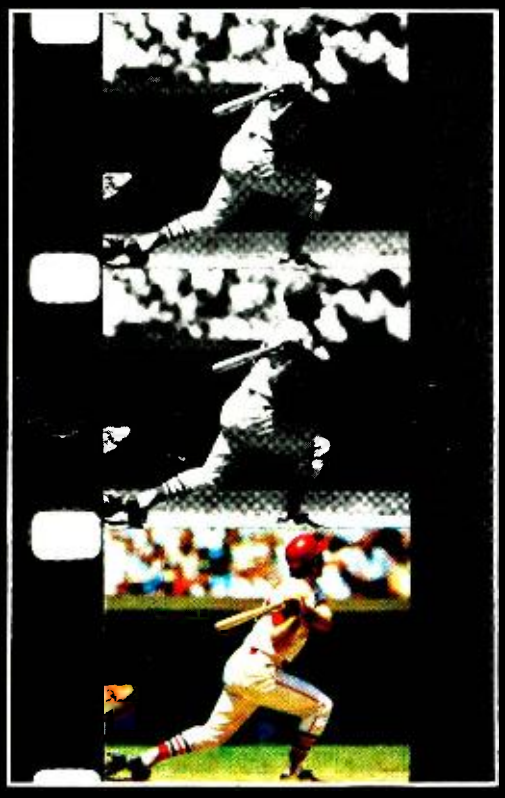
BM/E

BROADCAST MANAGEMENT/ENGINEERING



50 GOLDEN YEARS OF BROADCASTING— THE BEST IS YET TO COME

Color from black & white? You better believe it!



or your costs are double.

The new ABTO process cuts your present color film costs in half. It uses standard Plus-X film and black and white processing attaining high photographic quality and color fidelity.

NOW... SHOOT IN BLACK AND WHITE... SHOW IN COLOR!

Hard to believe? Write for full details. Even better—come to the first public demonstration: NAB Show, Lobby of Essex Inn (just across 8th Street from the Conrad Hilton).

abto INC.

1926 Broadway, New York, N.Y. 10023 (212) 787-5000

Affiliated with: American Broadcasting Companies, Inc. and Technical Operations, Inc.

Circle 100 on Reader Service Card

Circle 101 on Reader Service Card →

Turn on the Ampex AG-440B and listen:

Perfect silence.

Switch to record: no pop.

Hit the stop: no pop.

Go from rewind to stop: no tape shrieking.

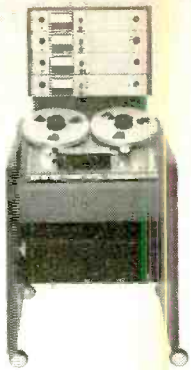
The Ampex AG-440B is so mechanically quiet some engineers use it in the same room with live microphones. It's so electronically quiet you can forget about switching pops.

That's why, in its own quiet way, the AG-440B has become the standard of excellence.

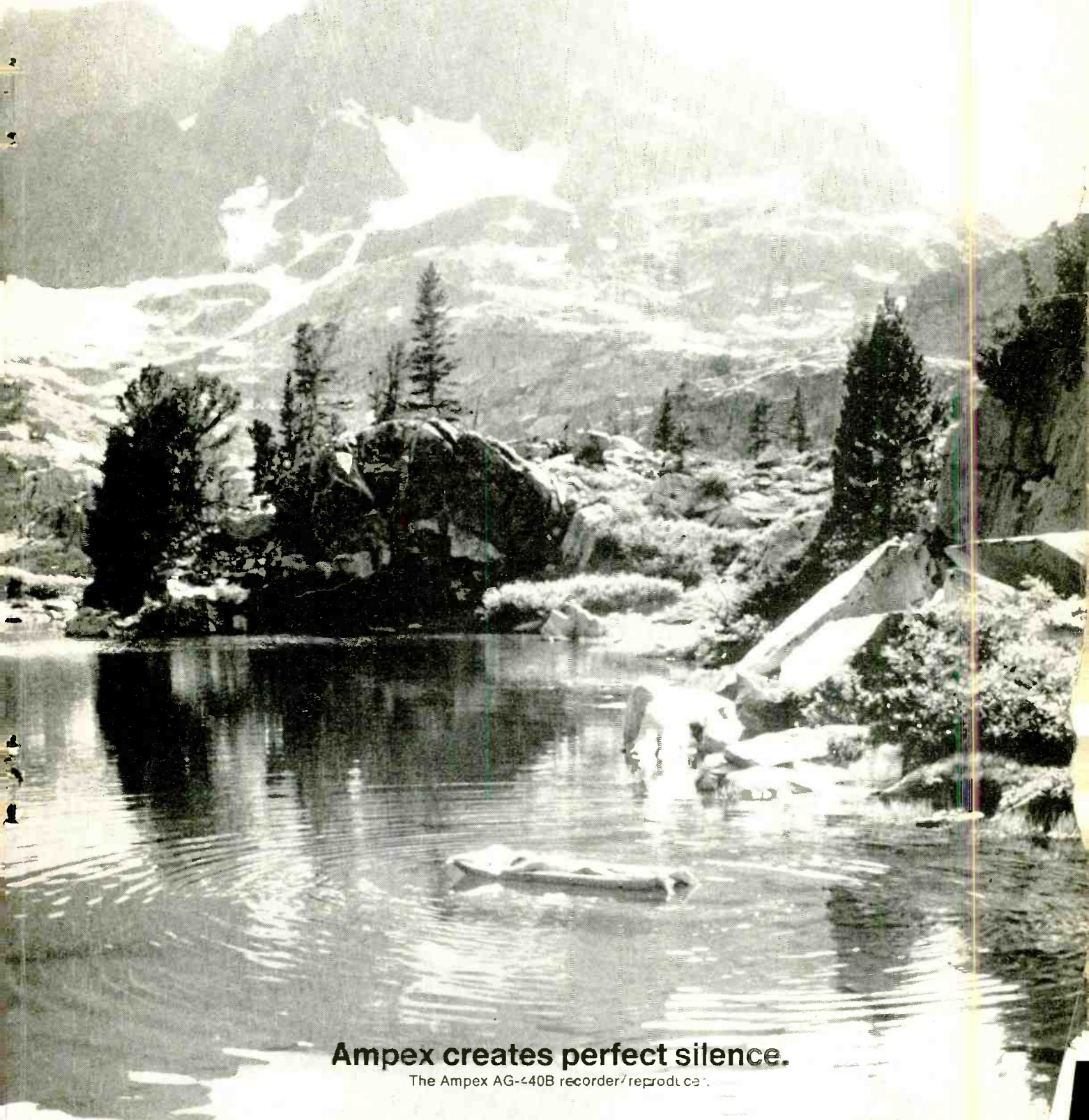
Ampex quality is featured throughout: Rigid die-cast frame. Modular design with front-mounted circuit boards. Individual torque motors control tape tension. Easy changeover from quarter-inch to half-inch tape.

The AG-440B is also one of the most versatile recorders you can buy. Console. Portable. Or rack installation. Start with one channel. Build up to four or more. It's the perfect reproducer for the future four channel stereo.

To hear other quiet reasons why the AG-440B can be your best recorder/reproducer buy, and how you can put it to work for you for as little as $50 a month, give us a call. (415) 367-4400. Or write Ampex Corporation, Professional Audio Division, M.S. 7-13, Redwood City, Calif. 94063.



AMPEX



Ampex creates perfect silence.

The Ampex AG-440B recorder/reproducer.

APRIL 1970/VOLUME 6/NUMBER 4

BM/E

BROADCAST MANAGEMENT/ ENGINEERING

Like King Kong on the cover, future broadcasters can expect plenty of technological help in reaching their audiences. Lifesized 3-D television will certainly make an appearance in the next 50 years. (See page 38 for industry leaders' predictions.) And, if illustrator Sudduth's haruspicy comes true, the medium will be striving for total viewer involvement.

Mactier Publishing Corp.
820 Second Ave., New York, N.Y. 10017, 212 661-0450
Also publishers of:
BROADCAST EQUIPMENT BUYERS GUIDE
EEE
ELECTRO-PROCUREMENT

BPA

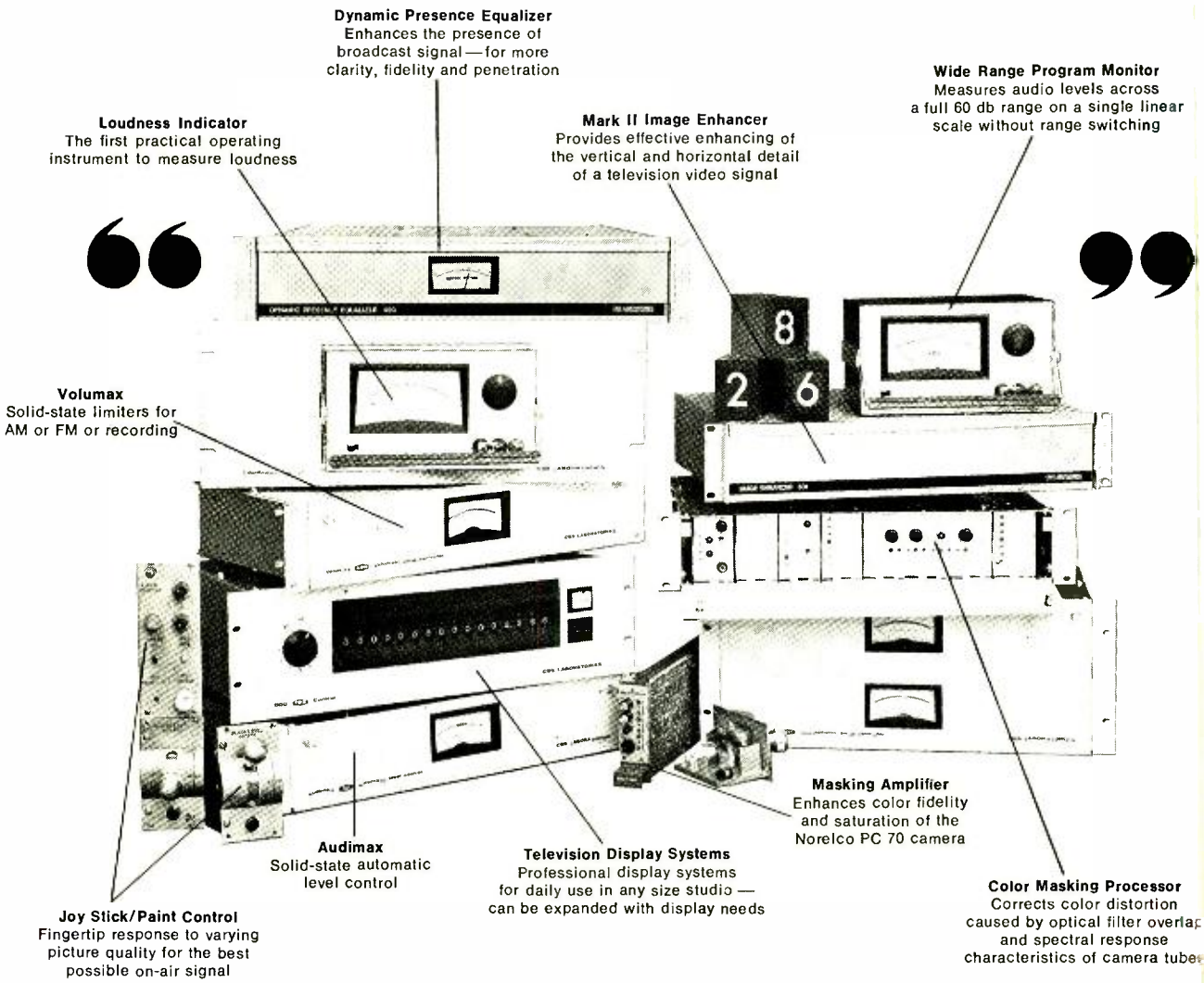
BM/E, Broadcast Management/Engineering, is published monthly by Mactier Publishing Corp. All notices pertaining to undeliverable mail or subscriptions should be addressed to 820 Second Ave., New York, N.Y. 10017.

BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities. These facilities include a-m, fm, and TV broadcast stations; CATV systems; ETV stations, networks and studios; audio and video recording studios; consultants, etc. Subscription prices to others are: U.S., its possessions and Canada—$10.00 one year, $18.00 two years; elsewhere—$15.00 one year, $25.00 two years.

Controlled Circulation postage paid at Duluth, Minn.

We have lots of things to say about broadcasting quality:

Let's talk about them...
and our new Color Corrector
at NAB-Booth 304



Write or call collect for complete catalog.

PROFESSIONAL PRODUCTS

CBS LABORATORIES

A Division of Columbia Broadcasting System, Inc. 227 High Ridge Road, Stamford, Connecticut 06905 (203) 327-2000

Circle 102 on Reader Service Card

BROADCAST INDUSTRY NEWS

Integrated ITV Seen As Increasing Productivity of Schools

Charging that formal education is not responsive to the range of individual differences among students, The Commission On Instructional Technology has asked the President and Congress "to increase the nation's investment in instructional technology thereby upgrading the quality of education and, ultimately, the quality of individual lives and society generally." The commission says it believes that technology could "bring about far more productive use of teacher's and student's time."

The commission, under the chairmanship of Dr. Sterling McMurrin, Dean of the Graduate School, University of Utah, says one-shot injections of a single technological medium are inefficient and at best offer optional enrichment. What's needed is a new all-embracing approach.

ITV, as it is currently being used, was described as in the McGuffey-reader stage. ITV fills less than three per cent of total classroom hours in el-hi schools in the nation's 16 largest cities. In Boston, home of the successful ETV station, WGBH, the city's 148 elementary schools own only 150 TV sets. Fifty are spread among 36 junior and senior high schools. Ohio State University, which helped pioneer the use of radio in schools in the 1930s, was transmitting two programs a week to schools in 1967-68.

Michigan State University was cited as the largest user of CCTV in higher education. At MSU, 13.3% of student-credit hours in freshman and sophomore classes are earned via TV.

The report described TV as being used to enrich but not change traditional education. Although video tape promises the dream of shared resources including master teachers, school TV screens are generally filled with the face of non-specialist studio teachers.

The low status of instructional technology in general was attributed to a lack of practical understanding about the process of human learning. The report said, "Despite recent progress in educational research and development, educators still have few reliable, validated guidelines for choosing one instructional medium over another."

Inadequate monies, under the rigid structure of formal education, "affords scant leeway for substantive, effective change in schools and colleges," the commission said.

Lack of teacher training in instructional technology and exclusion of media specialists from central planning also contribute to ineffective use of ITV.

The picture will look better

Kilo-Camera Sold

One thousand camera heads featuring the Plumbicon image pick-up tube developed by Philips Research Laboratories in The Netherlands have now been sold.

The thousandth is to be found in a camera system bought from Philips Broadcast Equipment Corp. by WCCO-TV, Minneapolis-St. Paul.

The three-Plumbicon camera head was introduced in 1965 at the NAB Convention; 600 such camera systems have since been sold in the United States.

Shown here are (l. to r.) John Sherman and Lawrence Haeg of WCCO-TV, and Philips Broadcast Equipment Corp. president John Auld, congratulating one another on the milestone.

vikoa

See Us At
The N.A.B. Show
April 5 – 8
Booth #321

Printed Circuit

Modular Directional Taps

For more information . . . call collect:
New York, N.Y. (212) 943-5793; Hoboken, N.J. (201) 656-2020; Englewood, Colo. (303) 761-3070; Bellevue, Wash. (206) 454-1446; Garland, Tex. (214) 276-1181; Torrance, Calif. (213) 371-7543; Memphis, Tenn. (901) 274-0032; Montreal, Canada (514) 341-7440.

vikoa
Technically the One!

Circle 103 on Reader Service Card

when a comprehensive approach is tried. The commission calls for a systems approach in which the design and evaluation of the total process of learning proceeds in terms of specific learning objectives.

Instructional technology was viewed as necessary to adapt the learning process to individual students differing in pace, temperament, background and style of learning.

The commission, which was authorized by Title III of the Public Broadcast Act of 1968, stresses that research be done with an eye to making the results of practical value to many schools.

The report, sent to Congress in late February after being reviewed by President Nixon, calls for expenditures of $565 million in research and dissemination of research. To accomplish this, the commission made six recommendations that included first year funds needed:

1. HEW be reorganized to include a National Institute of Education (NIE)—$150 million.

2. Under NIE, a research oriented National Institute of Instructional Technology (NIIT) should be established—$250 million.

3. Under NIIT should be a center of educational resources to distribute and disseminate high quality materials—$25 million.

4. NIIT should undertake significant projects to demonstrate the value of instructional technology—$166 million.

5. Teachers and specialists should be retrained to know how to use instructional technology—$40 million.

6. NIIT should propose a mechanism to bring educators and industry closer together.

In his March 3rd Special Message on Education, President Nixon recommended to Congress immediate formation of the National Institute of Education. He also stressed the importance of research—but made scant mention of instructional technology.

Television *was* singled out and praised by the President but that same week the Administration cut ETV—radio matching funds for fiscal 1971 from $5 million to a pittance—$1.7 million. Applications are in for $27 million.

Sioux City controversy

While others cry for equal time and lament the "good-news-is-no-news" syndrome broadcasters allegedly exhibit, a civic-minded group in Sioux City, Iowa, has demonstrated a quick way to redress wrongs committed over the air.

The "wrong" was a statement by Miss Sharon Farrell on the Johnny Carson Show. She slipped past the censors some derogatory remarks about "pornographic" movies and "perverted" moviegoers in her home town, which she identified in her comments as Sioux City, Iowa.

Responding immediately, a group of viewers negotiated for and purchased at reduced rates a spot commercial to be broadcast over KCAU-TV in the offended city during the subsequent airing of the movie "Quarantined," which starred Miss Farrell.

Delivered by a Mr. Fred Goldblatt, the spot read:

"Sioux City, the All-American city with much more to offer than x-rated movies, does not appreciate false publicity over nationwide television. We, the concerned ninth grade students of Herbert Hoover Junior High, salute Sioux City, Iowa."

Vhf-uhf comparability tuner in production

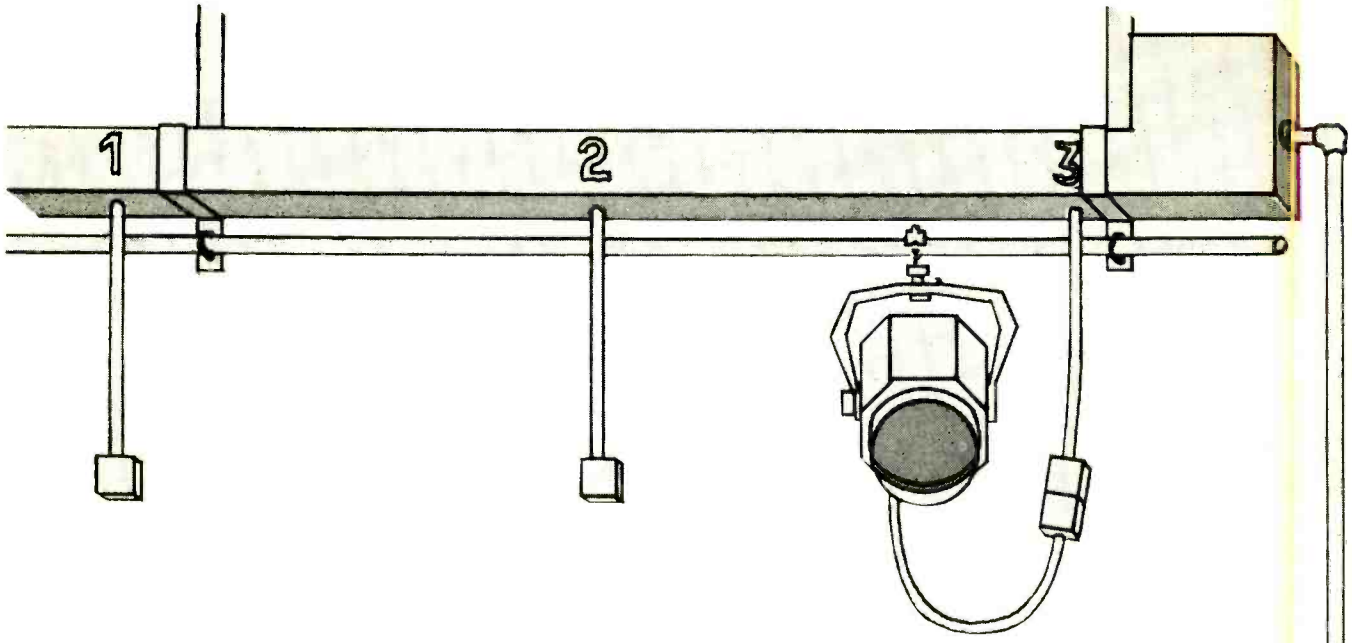
A new vhf-uhf six-position comparability tuner now in production at Sarkes Tarzian Inc. can be set by the owner. Just depress the tuner and turn it to the desired uhf channel. Once set, the channel number can be selected via the same "click-click-click" method as a vhf selector. The selector can be set either in numerical sequence or at random depending on the set owner's wishes, because each position can be tuned.

The new six-position tuner falls well within the recent design requirements of the FCC and meets comparability requirements. See *BM/E,* March, p. 36.

According to Mr. Kevin Joyce, Sarkes Tarzian began tooling the six-position tuner in late 1968 despite a lack of commitments from manufacturers. However, in recent months one of the major set manufacturers in the country has placed large orders for the comparable tuners.

Sarkes Tarzian has developed a capacity to produce approximately four million six-position detent tuners a year, but is geared up to handle any increase in volume that may be required by set makers.

Continued on page 10



PORTA STUDIO Flexible, remote studio lighting system.

"300" Designed to meet the unique requirements of the small cable television studio.

"600" For small educational or professional color/monochrome productions.

"1200" Maximum lighting flexibility for a medium size production facility.

"2400" Complete lighting system for sophisticated production objectives.

ColorTran®
Lighting Systems

A DIVISION OF Berkey Photo Inc

Berkey-ColorTran, Inc.
1015 Chestnut Street, Burbank, California 91502 / Telephone: (213) 843-1200 / Cable: ColorTran / Telex: 67-7252
Circle 105 on Reader Service Card

FCC rate proposal—sizeable and certain

To stop being such a drain on the federal economy, the FCC is going to charge more for its services.

Broadcasters don't like it, but here's a sample of what they will have to pay anyway: $50,000 for a construction permit granted in the top-50 TV market; $10,000 for a 50 kW unlimited AM radio construction permit; 12 times the tab of the highest 30 second spot for a TV license renewal; 24 times the highest one-minute spot for radio.

Videorecord aims at personalized programming

Videorecord Corporation of America is a new entry into the field of electronic communications. But it's a lot more than just that.

According to Chairman of the Board, Dr. William Schuman, the company's goal is a technology "in which the individual can choose his program material when and where he wishes." This, says he the noted composer and president emeritus of Julliard School as well as the Lincoln Center, "will prove to be one of the most important contributions to society since the printing press."

Videorecord intends to provide visual programming as well as electronic publishing and creative production for use in commercial broadcasting and for industrial, educational and home entertainment purposes.

Dr. Schuman joins Dr. Stafford L. Hopwood, Jr., who has been named president and chief executive of the Westport, Conn., corporation. Dr. Hopwood had been vice president of business development and professional products at CBS Labs.

Members appointed to Videorecord's board include William Bernbach, of Doyle, Dane Bernbach; Beardsley Graham, a founder of COMSAT; Eli Jacobs, of White Weld & Co.; Alan R. Novak, former executive director of the President's Task Force on Communications Policy; W. Theodore Pierson, of Pierson Ball & Dowd; and Eugene V. Rostow, former Dean of Yale Law School and chairman of the President's Task Force on Communications Policy.

Dr. Hopwood sees the commercial promise of videorecording as enormous. "More than two-thirds of the U.S. population by 1980 will consist of those persons whose formative years were influenced by video programming," he said.

As the necessary technology is developed, he added, industry will be able to fulfill completely "the needs of producing, packaging and distributing any subject for mass consumption on a personalized basis.

Broadcasters set up Free Television News Bureau

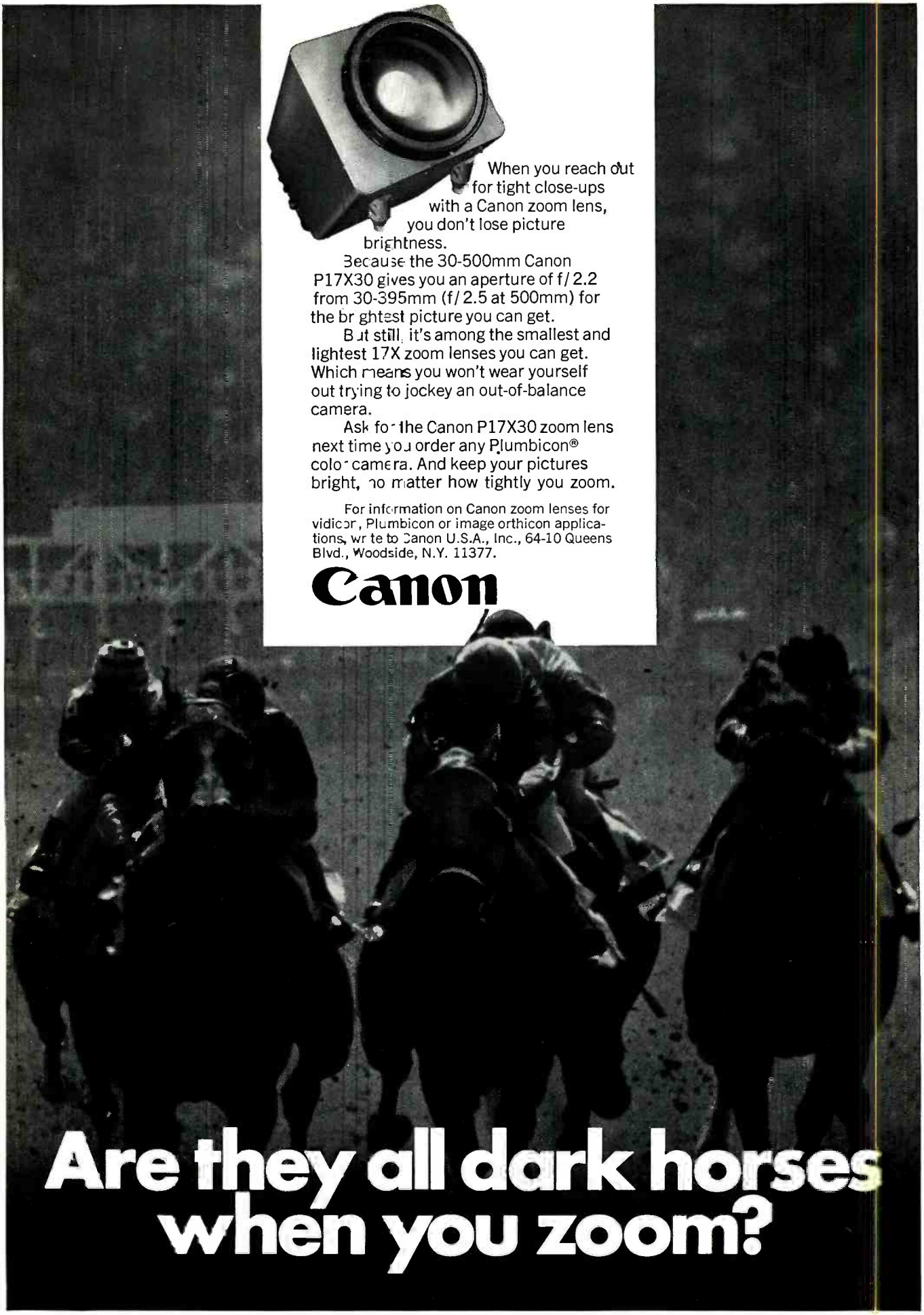
Anti-CATV broadcasters have set up a news bureau to counter some of the publicity that the public is receiving on how wonderful the world of cable TV is. Their battle cry is "save free TV."

The Free Television News Bureau is described as a service of the NAB. It is located in the NAB building but is staffed by Glenn Bayliss who is a member of Phil Dean Associates, Inc., a New York public-relations firm specializing in broadcasting accounts.

One of the first actions of the new news bureau was to send an information kit to all broadcasters with materials that could be used in speeches, and communications with Congressmen and local officials. News releases that can be sent to local newspapers are part of the service. Included also is a brochure entitled Cable Fables.

There is also a FTNB Newsletter. The February issue commenced, "The RAND Report on CATV is full of holes." The news releases are just as punchy. One attacking CATV's approach to community affairs starts out, "Amid the rolling blasts or euphoric propaganda being poured out by the CATV operators is the continuing refrain of what they will do for local government, charities and other community organizations." The release then goes on to ask the prospective fund raiser whether he would rather rely on a free cable channel opposite a major sports attraction or a spot campaign supplemented with one or two program specials on a local TV station to raise $500,000.

Cable Fables lists as a fiction the notion that CATV will supply home services such as shopping, banking, facsimile news and other electronic "wonders." The fact is, the brochure says, engineers agree that no adequate two-way transmitting system has been developed and that there are still major flaws in systems now operating.



When you reach out for tight close-ups with a Canon zoom lens, you don't lose picture brightness.

Because the 30-500mm Canon P17X30 gives you an aperture of f/2.2 from 30-395mm (f/2.5 at 500mm) for the brightest picture you can get.

But still, it's among the smallest and lightest 17X zoom lenses you can get. Which means you won't wear yourself out trying to jockey an out-of-balance camera.

Ask for the Canon P17X30 zoom lens next time you order any Plumbicon® color camera. And keep your pictures bright, no matter how tightly you zoom.

For information on Canon zoom lenses for vidicon, Plumbicon or image orthicon applications, write to Canon U.S.A., Inc., 64-10 Queens Blvd., Woodside, N.Y. 11377.

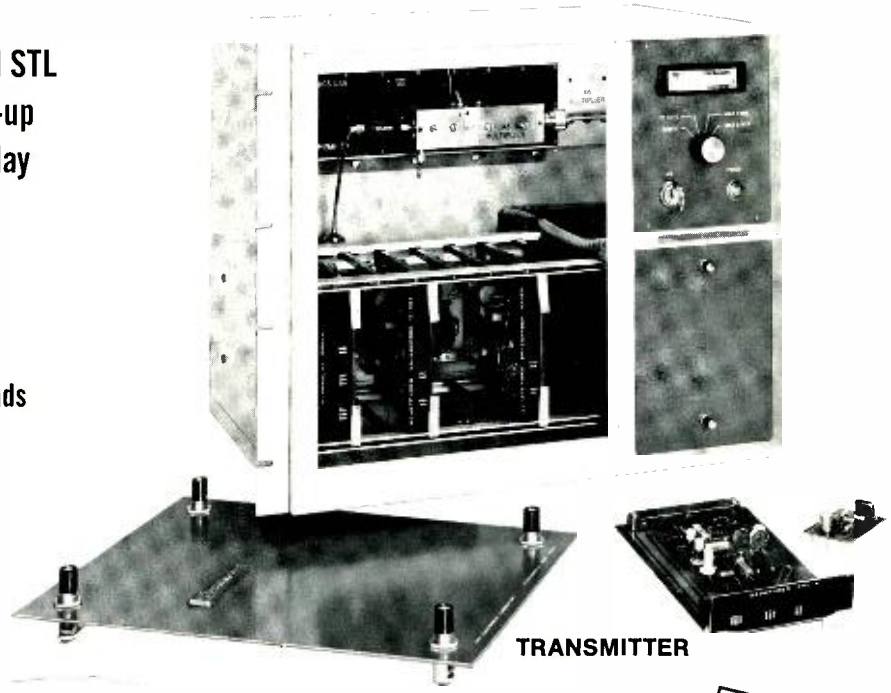
Canon

Circle 107 on Reader Service Card

all solid state TELEVISION MICROWAVE RELAY LINKS for high quality color and monochrome TV systems

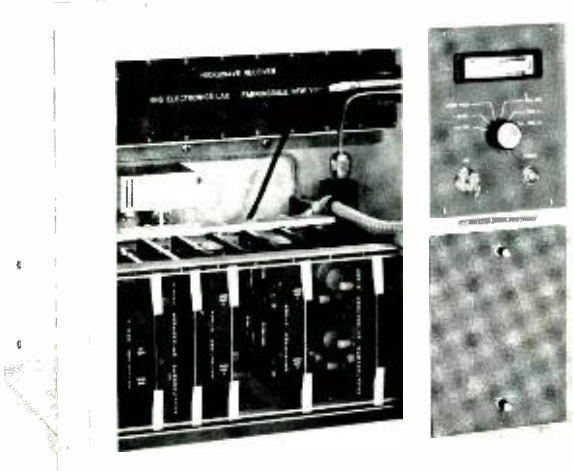
Use as rack mounted STL
or Remote TV Pick-up
or for Intercity Relay

- Meets EIA, CCIR, and FCC standards
- Available in all FCC authorized bands
- High fidelity color



TRANSMITTER

On Display at NAB SHOW – Booth 418 North

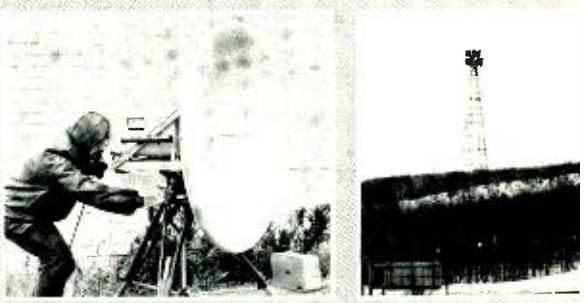


RECEIVER

- Ferrite isolator
- All Solid State RF Module
- Key lock switch
- Removable power supply module
- Plug in pre/de-emphasis
- Plug in printed cards
- Optional audio subcarriers

RHG, a leading supplier of military TV relay links, now offers Series MRS to the broadcast industry. Transmitters and receivers, with advanced field proven designs provide solid state reliability, no warmup, and low power drain.

To improve your color transmission quality and to insure trouble free operation specify RHG equipment fully described in Bulletin 69C. Call for "no obligation" demonstration.



RHG

RHG ELECTRONICS LABORATORY, INC.

94 MILBAR BOULEVARD
FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

Circle 109 on Reader Service Card

FCC Rules

Continued from page 12

The Nevada court also noted that the state may not always be able to regulate CATV systems:

> Nevertheless, in their present mode of operation, they supplement and do not compete with live broadcasts, and the State of Nevada does have the power to protect the monopoly of their local TV service against other incipient CATV companies seeking a share of the market. The possibility has been indicated that CATV may, in the years to come, become destructively competitive with live broadcasting. If this should occur, it may bring about more thorough federal regulation of community antenna companies to the exclusion of state regulatory bodies. As the facts appear . . . there is no reason to conclude that community antenna service is not monopolistic in character and is not affected with the public interest. State supervision of it as a public utility does not conflict with the [Constitution.] [5]

The Nevada court also called CATV systems "parasites on the national network of television broadcasting, dependent on live broadcasts for their existence." However, such systems were declared to be "beneficient parasites," since without CATV "million of viewers" would suffer from poor quality service and reception, or none at all.

With the affirmation of the Nevada court's decision that a state may regulate CATV systems within its boundaries, the way has been opened for states to begin at least some control of CATV systems. Operators may expect to undergo regulation by various states in the near future.

The Nevada court then concluded that CATV companies are not actually competitive with live broadcasters. "Characteristically, they do not produce their own programming." And it is against this observation that we must consider the Federal Communications Commission's recent pronouncement that "local CATV program origination is in the public interest and should be encouraged."[6]

CATV Program Origination

The Commission believes that the Congressional mandate (given when the FCC was created) "to make available . . . to all people of the United States a rapid, efficient, nationwide, and worldwide wire and radio communication service with adequate facilities"[7] would be further fulfilled by requiring the mushrooming CATV industry to originate some local programming.

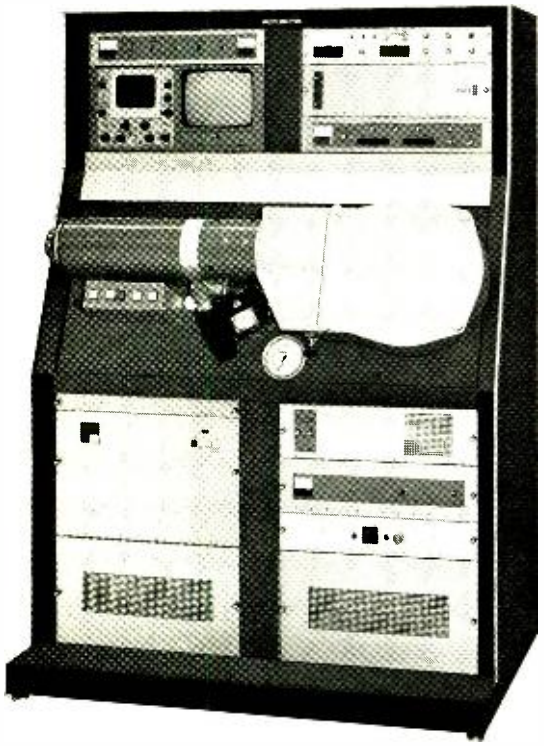
Thus, in its *First Report and Order in Docket 18397,* the Commission amended the CATV rules to provide, in part, as follows:

> (a) Effective January 1, 1971, all CATV systems having 3,500 or more subscribers must operate "to a significant extent" as a local outlet by cablecasting, and having available facilities for local

[5] T.V. Pix, Inc. v Taylor, 304 F. Supp. 459, 463 (1968).
[6] First Report and Order, in Docket 18397, 34 F.R. 17651 (1969).
[7] Id.

Continued on page 85

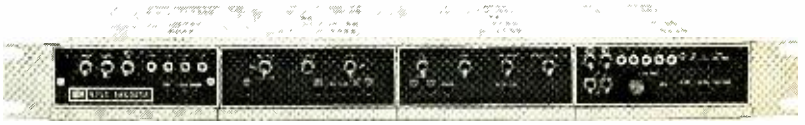
Get a better picture of what's happening.



EBR-100 Electron Beam Recorder — the better way to transfer tape to film. Here's why:

- ☐ Sharper, low-noise picture on standard 16mm film.
- ☐ Complete gamma control.
- ☐ Full electronic control of exposure.
- ☐ Fast start-up—30 seconds from load to record.
- ☐ Full contrast to 1000 line resolution.
- ☐ Electronic shutter.
- ☐ Fine-grain, economical film stock for quality image.

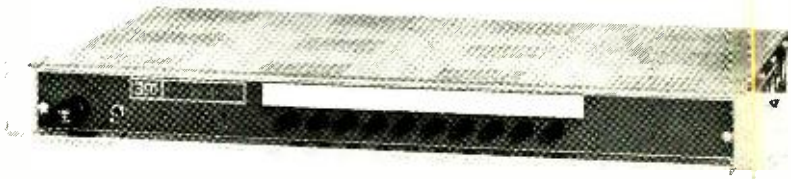
Most advanced tape to film transfer system in the world.

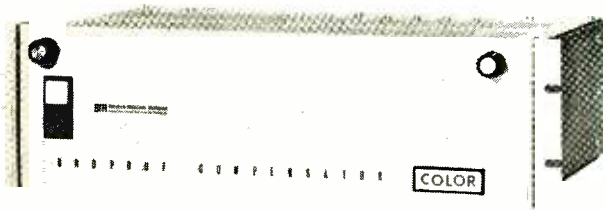


Color Video Encoder has (2) one-of-a-kind unique features. First, the color bar generator is completely digital. You get a signal that's accurate. It needs no adjustments. And it's easier to use and maintain. Second, input clamping of video signals eliminates low frequency hum, noise and other unwanted effects on the matrix. Works with smaller, less expensive cameras as well as large ones. The SMPTE color test will give you the proof. It meets all FCC and EIA specs. And features special monochrome switching.

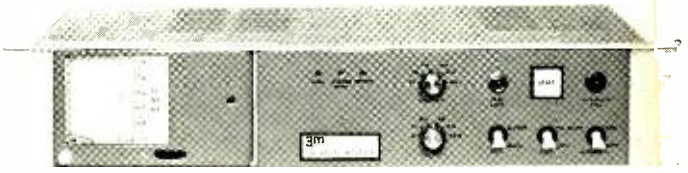
Look to 3M for specialized products for high quality video performance.

The Bridging Video Switcher is a 10 input switching video distribution amplifier with extremely high quality video performance specifications. Audio-follow switching is included as standard equipment. Loop inputs and stacks can make routing switchers up to 10 x 20. Input and output grounds are isolated. The video ground as well as the coax center conductor is switched through to the output. One switching does not cause a visible disturbance to other switchers looped to the same input line. For maximum signal handling performance at minimum cost, rely on the 3M Brand Bridging Video Switcher.





Dropout Compensator (DOC) replaces color dropout on your VTR reproduction with correct color video—all within the signal itself. In fact, the DOC detects dropouts as they occur and replaces the "lost" signal with stored information from the previous scan line of the same field. It provides precise color match and complete freedom from switching transients. The self balancing video switch prevents white flashes. Dropout disturbance to the time correction unit is eliminated.



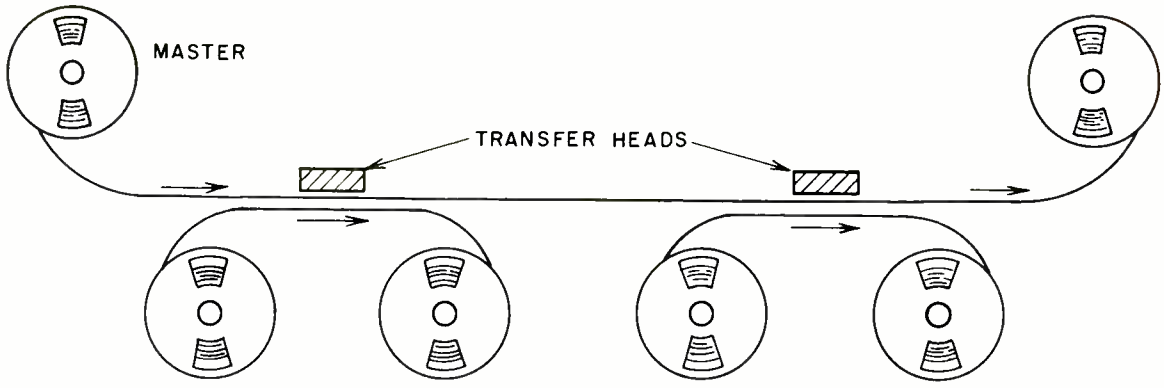
Dropout Profile Recorder (DPR) is the perfect companion to the DOC. DPR produces a permanent strip chart of dropout rate during normal on-line video tape playback. It performs this evaluation electronically while the 3M DOC is compensating dropouts. DPR indicates when a tape is too degraded to use for valuable new recordings. Built-in precision calibrator. Five inches of chart reads one hour. Chart can be torn off and stored with the video tape.

If you're interested in one video product or all, simply phone (805) 482-1911 or write for our brochures.

Mincom Division 3M COMPANY

300 SOUTH LEWIS ROAD • CAMARILLO, CALIFORNIA 93010

Circle 111 on Reader Service Card



Ampex proposes this method of contact printing quadruplex video tapes.

SMPTE Winter TV Conference

First quad tape contact print demonstrated; two VTR panels generate useful how-to info; from JSIC, a proposed color reference signal; film panel talks much, says little new; color still No. 1 problem.

THE SMPTE Winter Television Conference having just finished a successful fourth session, might well be renamed the Workhouse Television Conference. Its two-day effort concentrated on correction of video-tape and telecine malpractices. For good measure other subjects of a topical nature came up, but the most popular sessions were those geared to getting the most out of video tape and telecine equipment.

Contact Printing Speeds Videotape Duplication

The industry's first system of video tape duplication by contact printing for the quadruplex format was described by Charles P. Ginsburg of Ampex. (See opposite for a description of the IBM and Panasonic systems for helical tape contact printing.) Ginsburg described the bifilar method (wherein master and slave tapes are wound onto the same reel past the transfer head) and the dynamic transfer method. In the latter system, the master and slave tapes are wound through separate paths but brought together as they pass the transfer head. Ginsburg said that experiments have shown it's possible to print as many as five slave tapes simultaneously from the same master, by using five separate transfer heads in the tape path. And an hour-long program can be copied in six minutes, not the hour required today.

The master tape is high coercivity (800-1000 oersteds) while the slave is conventional. When the two pass through the magnetic field of the transfer head, the slave receives a mirror image of the pattern on the master. For the slave to be playable on a conventional VTR, the master recorder must be modified to record a reverse image. Ginsburg reported a 3-dB deterioration in S/N ratio on the slave, compared with the master. Because of difficulty in contact-printing audio, cue, and control tracks at the tape speed of 150 ips, these tracks are read off and re-recorded on the slaves by separate heads. Ginsburg played a color demo tape in two parts: The master, and a slave copy which had been duplicated by the bifilar method. Both appeared identical, with good color and resolution. Ginsburg said Ampex was about a year away from marketing the dynamic-transfer system, although his sample wasn't made by that method.

VTR Panels Solve Problems

Saturday was videotape day at the conference, with a high-powered panel of experts digesting questions and providing answers in two separate sessions. The morning affair concerned VTR standardization and consisted of the SMPTE VTR Committee, with Charles E. Anderson of Ampex as moderator. Panel members included Ellis Dahlin of CBS-TV, Frank Haney of Visual Electronics, Bob Hurst of RCA, Fred Remley of the University of Michigan, Norm Ritter of 3M Corp., Cal Strobele of Memorex, and Howard Town of Ampex.

It was reported that Japan's effort (announced

Fast Helical Tape Printing

Ever since the VTR was invented, copying has been done on a real-time basis, tying up two or more conventional machines. That costly and time-consuming process may now be on the way out. Last year both IBM and Panasonic announced fast ways of duplicating helical video tapes by contact printing. (Since then Ampex has demonstrated a contact-printed quadruplex tape, as outlined on page 18.)

The basic process is simple; the program is recorded on high-coercivity tape. This original tape is then placed in close contact with a low-coercivity copy tape, and the two are passed through a magnetic bias field. The result is a mirror image of the original on the copy. High-coercivity tape is necessary so the bias field won't demagnetize the original.

No amplifiers or processing circuits are needed, because the tape is contact printed, not re-recorded. And because of the printing method, there is no need to run the tape at normal playing speed. In fact, the two machines now under development can print a copy of an hour-long tape in only two or three minutes.

Contact printing has several advantages. Copy tapes may be made rapidly; the copy tape is identical to the original, since there are no amplifiers, modulators, or demodulators to distort the recorded signal; and the printing machine is far less complex than a VTR.

IBM Magnetic Transfer

The diagram shows that basic format used in this device. Original and copy tapes pass from reel to reel, brought together by compressed air fed against them. Air pressure keeps the tapes pressed tightly together as they pass the bias transfer head which generates the magnetizing field. There is no need for a capstan and pinch roller: minor speed changes don't effect printing action.

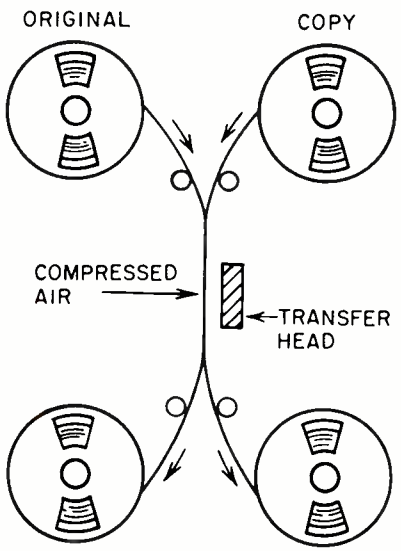
Minimum tape-to-tape slippage is the primary consideration, as slippage causes loss of sync or color burst and a smeared picture can result. IBM tried a pinch roller but found it produced too much friction, requiring more motor torque, which stretches the tape. Also, the pinch-roller system pulls the tape across the transfer head, causing tape and head wear. The compressed-air method places a thin air film between tape and head, practically eliminating wear.

IBM's experimental machine has produced 2000 copies of a one-inch helical-scan video tape originally recorded at 7.5 ips. The original still had good video quality after 2000 passes, although its output had dropped about 3 dB. IBM reports the machine capable of copying a one-hour tape in three minutes, the copy having an S/N ratio of 42 dB. Original tapes were made by Sony and have a coercivity of 700 oersteds, while copy tapes have a coercivity of 300 oersteds.

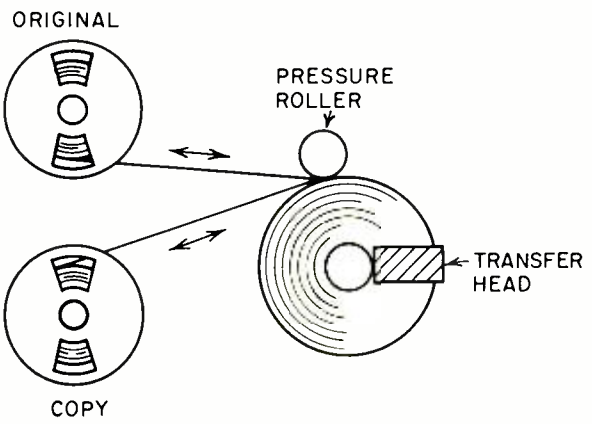
Panasonic Video Tape Printer

Parent company Matsushita Electric chose a different format from IBM's for avoiding tape slippage, as the diagram shows. Both original and copy tapes are wound onto one reel in alternating layers—a system Matsushita calls *bifilar*. A pressure roller eliminates any trapped air between the tapes. After both tapes are fully wound onto the transfer reel (which continues to rotate), bias is applied to the transfer head. The copy is printed, and both tapes are then rewound onto their respective reels.

An hour-long half-inch helical-scan tape can be copied in about two minutes with a video S/N ratio of better than 38 dB, according to Matsushita. At present, the device handles only tapes made on the Panasonic NV-8100 Series VTRs. The company plans to adapt the format to one- and two-inch tapes.



A. IBM SYSTEM



B. PANASONIC SYSTEM

One of the two VTR panels grapples with an audience query. Left to right: C. Strobele, F. Haney, E. Dahlin, N. Ritter, H. Town, F. Remley, and R. Hurst. BME Photo

in early 1969) to standardize on a half-inch helical format is nearing culmination. Several Japanese manufacturers have agreed to two types of half-inch configurations, but no hardware is available yet. Rumor has it that West Germany will reach an arrangement with Japan about a standard helical format. (Three weeks after the conference, Sony adopted the Japan EIA Type I format for helical tape. See page 48 for details.)

Several suggestions were received about changing the standard on quadruplex tip penetration. Someone remarked that the present standard—a tradeoff between dropout activity and head life—was based on much research and wasn't about to be changed without good reason. Blair Benson of CBS, who spearheaded the work which established the standard, said that reducing penetration to obtain greater head life is a myth if you want to retain tape interchangeability, because as the head wears it loses contact with the tape.

The nomenclature subcommittee decided on the term "headwheel" in preference to "drum."

Someone asked what "NTSC-type" color was. Consensus: a euphemism for color that doesn't meet FCC specifications for sync/burst stability. Or as one member put it: a method that takes the strict NTSC formulation and departs therefrom where economically necessary.

Questions were raised about the availability of video test tapes: The committee reported that 7½ and 15 ips lowband mono and 15 ips lowband color tapes were presently available, and that new highband color tapes would soon be.

Keep Your VTR Room Clean

The conference closer was a long-winded Saturday afternoon affair on VTR hardware. The previous panel returned, adding B. F. Melchionni of RCA and Robert Butler of NBC. Running nearly four hours, the session was all nuts-and-bolts. Some Q & A's:

• *Why do high-band tapes stick more than lows?* Because they have smoother surfaces than lows, and tape-path surfaces are also very smooth, said Norm Ritter.

• *What precautions should you take when editing color tapes?* Splices must join successive color frames, not simply TV frames, according to Charles Anderson. Four fields are required for burst to go through one complete cycle, and thus a color frame is four fields. If a splice joins two out-of-phase segments, the picture jumps and the VTR servos get unbalanced.

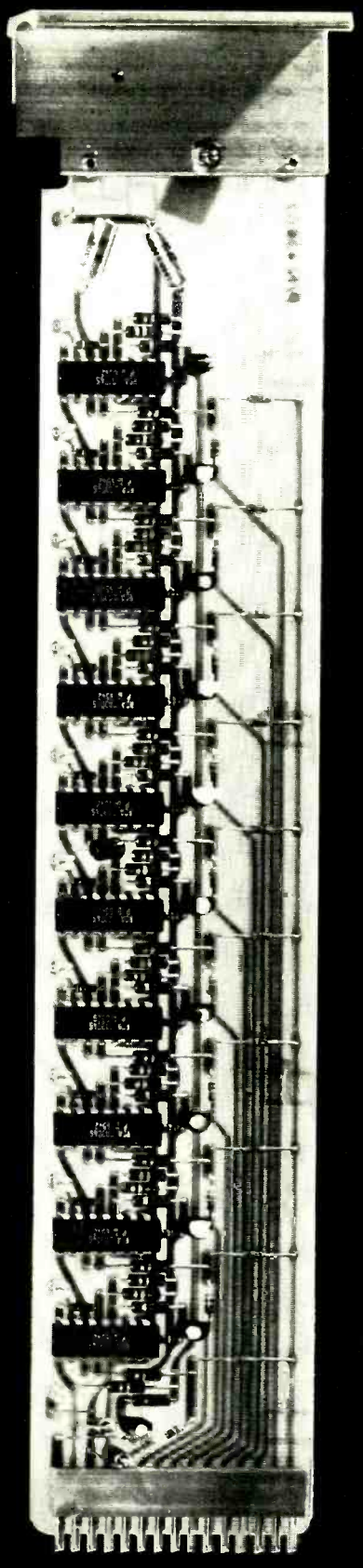
• *When you've dubbed a video tape, which color bars should go on the head—the original (master) or new ones?* Fred Remley said that bars should reflect the condition of the machine making the copy, not that of the master. Robert Butler added that the original bars should be copied, and the new bars phased in with the original and copied, so you have both on the copy tape.

• *What do temperature and humidity do to tapes in storage?* Best storage conditions are 70°F and 50% relative humidity, said Ritter. 100°F and 90% RH is the worst possible condition. Low temperature and humidity don't bother tape, except that at about 40°F the tape wind is loosened on the reel.

• *How can you extend head life?* B. F. Melchionni reported that RCA has six VTRs running 24 hours a day in head-life testing. They have found that a clean room with controlled temperature and humidity extended head life considerably. Field users have reported head life from 100 to 1000 hours, depending on various conditions, chiefly dirt. One station had an average head life of 250 hours. This dropped to *25 hours* during construction of a nearby building. Other advice: Don't line the inside of the air-conditioning duct with insulation—put it on the outside. Insulation particles can be carried by the air flow over the VTR, where they get into the head assembly. Don't tear open a cardboard shipping carton in the VTR room; debris will get in the headwheel. Wear clean, lint-free gloves when splicing or handling tape, except for thread up.

• *Should brushes and commutators in the headwheel be cleaned?* No; they are basically self-cleaning. If you do have trouble, use nothing but solvent, and no cotton. Most common trouble is misalignment of the spring which holds the brush in place. Remove both and realign carefully.

• *How do you keep the floor of the videotape room clean?* If you have a hard floor, mop it daily. A carpet is also useful, but you must vacuum it



N A B
BOOTH 113

THE GRASS VALLEY GROUP, INC.

Circle 167 on Reader Service Card

It's amazing what two bits won't buy these days.
And even more amazing what it will!

A pack of cigarettes, a gallon of gas, and a subway ride. These are among the everyday items for which 25 cents is now only part payment.

But the state-of-the-art ceramic tetrode tube at the heart of the new Emcee 1 KW UHF TV Translator Amplifier is another matter entirely.

Because that very same quarter will buy you a full hour's operation on a use-amortization basis. Add a nickel for the driver, plus whatever the power costs, and you've got the full operating cost for a complete television translator system for Channels 14 through 83.

(For those who like to make meaningful comparisons, the closest the other type of tube can come is $1.50 per hour, plus driver and power.)

If economy is part of your considerations, you just have to go with the new Emcee 1,000-watt UHF unit. The initial cost is lower, the hourly cost is lower, and the tube replacement cost is lower.

The only thing that isn't lower is the quality. Believe it or not, that's higher. The ceramic tetrode's 7 KW plate dissipation allows for inherently low third order intermodulation products — less than 50 dB. So you avoid visual picture degradation even when color is saturated — during commercials, for example.

You can also add in such features as automatic recycle, automatic turn-on, protective circuitry, full metering, and unattended operation.

When we said state-of-the-art, we meant it! All in the new Emcee 1,000 watt TV Translator Amplifier. Use it with your present driver or get the complete 1 KW TV translator from Emcee.

EMCEE TOA-1000A
1000 Watt UHF TV
Translator Amplifier
(Channels 14-83)

EMCEE®

WRITE FOR COMPLETE DATA SHEET

EMCEE BROADCAST PRODUCTS, a division of
ELECTRONICS, MISSILES & COMMUNICATIONS, INC.
White Haven, Pa. 18661 • (717) 443-9575

Circle 168 on Reader Service Card

NAB

INSTANT CONVENTION GUIDE '70

Exhibit Floor Plans
Exhibiting Manufacturers
Equipment Source Guide
Management Program Agenda
Engineering Program Synopsis
Special Events

Prepared to aid your convention coverage by

BM/E

BROADCAST
MANAGEMENT/
ENGINEERING

NAB Exhibit Hours

Sunday—10:00 a.m. to 7:00 p.m.
Monday—9:00 a.m. to 7:00 p.m.
Tuesday—9:00 a.m. to 7:00 p.m.
Wednesday—9:00 a.m. to 5:00 p.m.

Find exhibitors fast with this handy alphabetical listing of manufacturers and their booth numbers, listed in parentheses.

100 series—East Hall
200 series—West Hall
300 series—Continental
400 series—North Hall

1970 NAB EXHIBITORS

ABTO (214)
Addressograph-Multigraph (228)
AEC/Veritas (401)
Alford (207)
Alma (332)
American Electronic Labs (243)
Ampex (Normandy, 108)
Ampro (422)
Andersen Labs (112)
Andrew (225)
Angenieux (218)
Arriflex (318)
Ball Bros. (213)
Bardwell & McAlister (403)
Belar (203)
Berkey-ColorTran (123)
Robert Bosch (419)
Boston Insulated Wire (245)
Boxton-Beel (425)
Broadcast Computer (430)
Broadcast Electronics (307)
Broadcast Prods. (217)
Canon (429)
CBS Labs (304)
CCA (233)
Central Dynamics (103)
Century (331)
Chester Electronics (249)
Chrono-Log (115)
Cintel (114)
Cleveland Electronics (121)
Cohu (324)
Collins (208)
Comfax (413)
Commercial Electronics (317)
Computer Image (417)
Conrac (107)
Continental (200)
Data Memory Inc. (404)
Datatron (423)
Davis & Sanford (118)
Delta Electronics (204)
Dynair (210)
Eastman Kodak (102)
Effective Communications (316)
Envirco (402)
Emcee (309)
Fairchild Sound (306)
Fixtune (424)
Fort Worth Tower (315)
Gates (219)
General Electric (101)
Gotham Audio (237)
Granger (221)
Grass Valley (113)
Gray Research (227)
Harwald Co. (223)
Humphrey Electronics (214)
International Good Music (248)
International Tapetronics (410)
International Video Corp. (239)
Jamieson Film (311)
Jampro (303)
Jerrold (314)
Johnson (241)
Kaiser (319)
Kliegl (111)
Lipsner-Smith (120)
Listec (313)
MaCarTa (211)
Marathon (316)
Marconi (238)
Marti (234)
McCurdy (310)
McMartin (231)
Memorex (322)
Metrotech (408)
Microwave Associates (117)
3M (246)
Mole-Richardson (328)
Moseley (222)
Nortronics (235)
Paillard (426)
Philips Broadcast (327)
Potomac Instruments (205)
Power Optics (312)
QRK Electronics (412)
Q-TV Sales (116)
Quick-Set (206)
RCA (100,119)
Rank (220)
Raytheon (106)
Recortec (427)
RHC (418)
Richmond Hill (202)
Rohde & Schwarz (240)
Rohn Communications (224)
Rust (232)
Sarkes Tarzian (104)
Scantlin Electronics (122)
Schafer (209)
Scully (407)
Seeburg (242)
Semikron (409)
Shibaden (244)
Shure (212)
Skirpan Lighting (320)
Jos. M. Soll (410)
SOS Photo-Cinc-Optics (421)
Sparta (303)
Spindler & Sauppe (325)
Standard (110)
Stanton Magnetics (215)
Sylvania-Chester (249)
Tape-Athon (236)
Tapecaster (216)
Tektronix (109)
Tele-Cine (414)
TeleMation (415-16)
Telemet (247)
TelePro (124)
Telesync (216)
Television Equip. Assoc. (105)
Telex (308)
Thompson Electric (229)
Transface Process (333)
Trompeter (329)
Utility Tower (230)
Varian (330)
Video Facilities (428)
Videometrics (103)
Vikoa (321)
Visual Electronics (301, 302, 305)
Vital Industries (323)
Ward Electronics (202)
Westinghouse (411)
Wilkinson (201)

NAB Registration Hours
(Lower Lobby, Conrad Hilton)

Saturday
9:00 a.m. to 5:00 p.m.

Sunday
8:00 a.m. to 6:00 p.m.

Monday
8:00 a.m to 6:00 p.m.

Tuesday
9:00 a.m. to 5:00 p.m.

Wednesday
9:00 a.m. to 5:00 p.m.

INSTANT CONVENTION GUIDE '70

Note: Unless otherwise noted, all events are conducted by NAB at Conrad Hilton.

Friday, April 3

9:30 a.m.—NAFMB Board of Directors Meeting—Parlor D, Palmer House.
12:30 p.m.—NAFMB Board Luncheon—Parlor B, Palmer House.
1:00 p.m.—NAFMB registration—Grand Foyer, Palmer House.
5:00 p.m.—NAFMB Membership Meeting—Adams Room, Palmer House.
6:00 p.m.—NAFMB Reception (Host: IGM)—Monroe Room, Palmer House.
6:00 to 10:00 p.m.—APBE Board of Directors Meeting—Grant Park Room, Pick Congress.

Saturday, April 4

9:00 a.m. to 4:30 p.m.—APBE Meeting and Luncheon—Gold Room, Pick Congress.
9:00 a.m. to 12:00 noon—NAFMB Session—Adams Room, Palmer House. Audience Measurements and Methods; Bright MOR Radio; Underground and Progressive Radio; Fine Arts Radio.
12:30 p.m.—NAFMB Reception—Grand Foyer, Palmer House.
1:00 p.m.—NAFMB Luncheon—Monroe Room, Palmer House, Armstrong Awards Program.
3:00 to 5:30 p.m.—NAFMB Session—Adams Room, Palmer House. Modern Country Radio; FM Program Guides; Black Radio; Open Mind.
6:00 p.m.—NAFMB Reception (Host: Alto Fonic)—Grand Ballroom, Palmer House.
8:00 to 10:00 p.m.—APBE Workshops—Lincoln Room, Pick Congress.

Sunday, April 5

8:00 a.m.—NAFMB FM Broadcast Pioneers Breakfast—Parlor A, Palmer House. Speaker: Robert E. Lee, FCC.
8:30 a.m.—ABC Radio Affiliates Breakfast—French Room, Drake.
9:00 to 12:00 noon—NAFMB Session—Adams Room, Palmer House. Beautiful Music Radio; Contemporary/Top 40 Radio; Financial Management; Report from All-Radio Committee.
9:00 a.m. to 2:30 p.m.—BMI Board Meeting and Luncheon—Parlors 512, 513.
9:00 a.m.—Assn. on Broadcasting Standards Technical Committee Meeting, Parlor 412.
9:30 a.m.—AMST Technical Committee Meeting—Sheraton Blackstone.
10:00 a.m.—ABC Radio Affiliates Meeting—Gold Coast Room, Drake.
10:00 to 11:30 a.m.—APBE Meeting—Gold Room, Pick Congress.
10:00 a.m. to 12:00 noon—Daytime Broadcasters Assn. Membership Meeting—Williford C Room.
11:00 a.m.—NAB Convention Protestant Worship Service—Orchestra Hall, 216 South Michigan Ave.
12:00 noon to 2:30 p.m.—APBE Luncheon—Florentine Room, Pick Congress.
12:00 noon to 3:30 p.m.—Assn. on Broadcasting Standards Board of Directors Luncheon and Meeting—Parlors 412, 413.
12:15 p.m.—NAFMB Reception—Grand Foyer, Palmer House.
12:45 p.m.—NAFMB Luncheon—Monroe Room, Palmer House. Speaker: Robert Wells, FCC.
2:00 to 5:00 p.m.—AMST special Board of Directors Meeting—Bel Air Room.
2:00 p.m.—Society of Broadcast Engineers Annual Meeting—Upper Tower.
2:15 to 4:30 p.m.—NAFMB Session—Adams Room, Palmer House. News and Editorials as Vital Elements for Successful Broadcasting; Engineering in the '70's.
3:00 to 5:00 p.m.—Management Labor Clinic—Williford Room. Jurisdictional Disputes in the Broadcast Industry; Do's and Don'ts in Union Electioneering and Collective Bargaining.
3:00 to 5:00 p.m.—Secondary Market TV Committee Presentation—Waldorf Room. Panel.
3:00 p.m.—ABC Radio Affiliates Reception—Gold Coast Room, Drake.
4:00 p.m.—Assn. on Broadcasting Standards Membership Meeting—Boulevard Room.
5:00 p.m.—NAB Convention Mass—Old St. Mary's Church, Wabash at Ninth St.
6:00 p.m.—NBC Reception (Invitation only)—Guild Hall, Ambassador West.

Monday, April 6

8:00 to 10:00 a.m.—TV Stations, Inc., Annual Membership Breakfast Meeting—Crystal Ballroom, Sheraton Blackstone.
8:00 a.m.—Mark Century Sales Corp., Breakfast and Programming Seminar—Waldorf Room.
10:30 a.m. to 12:00 noon—General Assembly (Management and Engineering Conference)—Grand Ballroom. Presentation of NAB Distinguished Service Award to Rosel H. Hyde.
11:00 a.m. to 12:00 noon—All-Industry Music Licensing Committee Meeting—Parlor 512.
12:30 to 2:30 p.m.—Management Luncheon—International Ballroom.
12:30 to 2:30 p.m.—Engineering Luncheon—Williford Room. Speaker: Dr. Dennis Gabor, CBS Labs.
2:15 to 5:00 p.m.—Television Conference—Gold Room, Pick Congress. National Academy of Television Arts and Sciences presents Station Award and Special Citation; Conference of Satellites—speaker, Arthur C. Clarke; Speeding up Payments from Agencies; TBA panel.
2:30 to 5:00 p.m.—Management Radio Assembly—Grand Ballroom. Annual RAB Presentation; Broadcasters Unite—Go Forth for Freedom; Radio Programming for the '70's.
2:30 to 5:00 p.m.—Engineering Assembly—Great Hall, Pick Congress. Engineering Advisory Committee Report; Where Do We Go From Here? A Look at the John Hancock Broadcasting Facilities; Planning for Emergency Broadcasting; Color Monitor Matching.
5:00 p.m.—Harvard Business Seminar Smoker—Bel Air Room.
6:00 p.m.—Atwood Richards Telescreen, Inc. Reception—Williford Room.

Tuesday, April 7

7:45 to 9:15 a.m.—Early Bird Workshops. License Renewals—Beverly Room; Minority Group Personnel for Broadcasting—Williford B Room; Training the Local Radio Salesman—Upper Towers; Radio Audience Measurement—Lower Towers; Good News Operation Starts at the Top—Williford A Room; Programming Sources for Commercial Radio—Williford C Room; Promoting Broadcasting's 50th Anniversary—PDR 415; Broadcast Financial Management—Florentine Room, Pick Congress; What Computers Can do for Your Traffic and Sales Operation—Lincoln Room, Pick Congress.
8:30 a.m. to 12:30 p.m.—AMST Breakfast and Membership Meeting—Waldorf Room.
9:00 to 11:00 a.m.—ACTS Breakfast for Members and Guests—Hubbard Room, Sheraton Blackstone.
9:00 a.m. to 12:00 noon—Radio Technical Session—Gold Room, Pick Congress. Compatible Installation, Optimum Termination and Equalization and Debugging of Modern Stereo Phono Pickups; Digital IC's Are Easy; Static Electricity on AM Towers—Causes and Cures; Recommended Procedure for Stereo Proof; Present and Future Utilization of SCA Subcarriers; WNBC Radio Installation; Digital AFC for FM Transmitters.
9:00 a.m. to 12:00 noon—Television Technical Session—Great Hall, Pick Congress. Time and Control Code for Videotape Editing; ABTO Color Film Process; Super 8-mm for News Film; TV Tape for Station Break Automation; I-f Modulation in Solid-State Vhf TV Transmitters; CBS Color Corrector for Encoded Video; VTR in Automated and Computer-Controlled Operations; Engineering Approach to Studio Lighting; JCIC Ad Hoc Committee on Color TV Status Report.
9:30 a.m. to 12:00 noon—Management Radio Assembly—Grand Ballroom. Report of Chairman of Radio Board; Radio from the Catbird Seat; Black Radio—A Positive Profile; Radio's Golden Music.
12:30 to 2:30 p.m.—Management Luncheon—International Ballroom. Annual Business Meeting.
12:30 to 2:00 p.m.—Engineering Luncheon—Williford Room. Presentation of Engineering Award to Philip Whitney. Speaker: Dr. Edward Wenk, Jr.
2:00 p.m.—Young & Rubicam Open House—Tower Suite, Sheraton Chicago.
2:30 to 4:00 p.m.—AMST regular Board of Directors Meeting—Bel Air Room.
2:30 to 2:45 p.m.—Election of All-Industry TV Station Music Licensing Committee—International Ballroom.
7:30 p.m.—Joint NAB/Broadcast Pioneers 50th Anniversary Banquet—Grand Ballroom.

Wednesday, April 8

7:45 to 9:15 a.m.—Early Bird Workshops. Repeat of sessions given Tuesday, April 7.
8:45 to 11:30 a.m.—Engineering Assembly—Great Hall, Pick Congress. Increasing TV Coverage Through Precise Frequency Control; Solving the Operational Problems of Live Color Cameras; A Modular Digital Controlled Routing Switcher; Microwave Economies; A System For Low-Cost Front-Screen Background Projection; FCC/Industry Technical Panel.
9:15 to 11:25 a.m.—Television Assembly—Grand Ballroom. Broadcasters Unite—Go Forth for Freedom; TvB Elections; Realities of Broadcast Self-Regulation; Here They Come Again; Music Licensing Report; Free Television News Bureau.
11:30 a.m. to 1:00 p.m.—General Assembly (Management and Engineering Conference)—Grand Ballroom. The Facts of Life—The Crisis of Our Deteriorating Environment. Speaker: Dr. Barry Commoner.
1:00 to 3:00 p.m.—Joint Management and Engineering Luncheon—International Ballroom. Speaker: Dean Burch, Chairman, FCC.

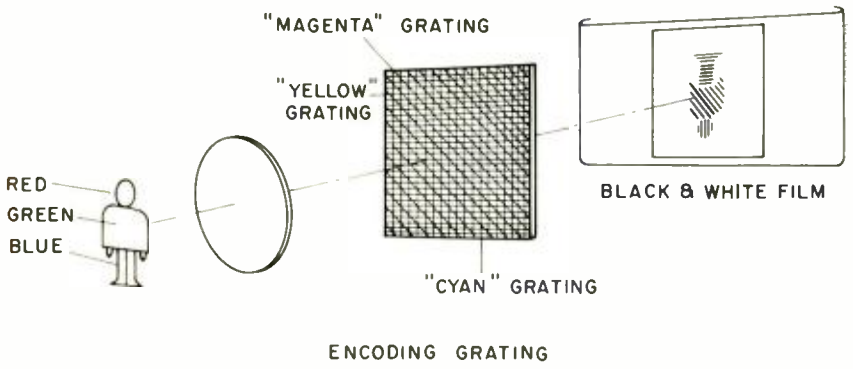
NAB Registration Hours (Lower Lobby, Conrad Hilton)

Saturday—9:00 a.m. to 5:00 p.m.
Sunday—8:00 a.m. to 6:00 p.m.
Monday—800 a.m. to 6:00 p.m.
Tuesday—9:00 a.m. to 5:00 p.m.
Wednesday—9:00 a.m. to 5:00 p.m.

April 1970—BM/E

NAB CONVENTION PRODUCTS

NAB Convention Preview information was obtained from the respective manufacturers. Some Exhibitors are not mentioned, however, either because their booth space was not confirmed at press time, or because they preferred to announce new products at the Convention itself.



ABTO process of encoding color information on black-and-white film.

ABTO Inc. (Booth 214)
How to shoot black and white film and broadcast it in color (The **ABTO Process**) will be shown in the exhibit area and in the lobby of the Essex Inn. Don't miss it.
Circle 285 on Reader Service Card

AEC/Veritas (Booth 401)
Log up to 24 hours of audio on a single 9-in. vinyl disc. Random access any time. Buy or lease. Company is introducing brief-case sized **playback unit** for salesmen. Test it by recording your own voice.
Circle 286 on Reader Service Card

Alma Engineering Inc. (Booth 332)
Alma says assigned booth space is so small it can't show everything but does have ample room for a **mini special effects generator** (see photo). Will also show popular Model 6503 **video production switcher.**
Circle 287 on Reader Service Card

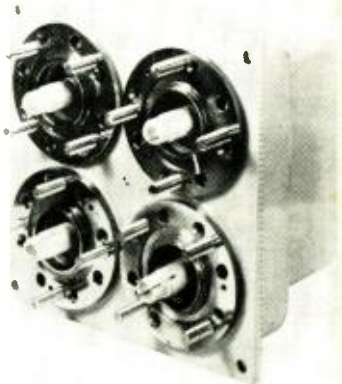
American Electronics Labs (Booth 243)
On display: 3-, 5- and 20-kW **FM transmitters** and a live demo of an improved afc in the model 2202A **FM exciter.**
Circle 288 on Reader Service Card

Ampex (Normandy, 108)
Demonstration of **video tape printer,** low cost **video disc recorder** for CCTV, black and white convertible color **camera,** random access **editor,** automated video **switchers** and thirty or forty other goodies (and lovelies).
Circle 289 on Reader Service Card

Insta-Tape Div. of Ampro Corp. (Booth 422)
See **multi-cart tape** gear here, especially the Mini-Mate automated player, which combines automatic sequencing with manual operator control. Also check out the Insta-Tape Multicart, with random access of up to 12 cart decks.
Circle 363 on Reader Service Card

Andersen Laboratories (Booth 112)
Small fixed **video delay line** to replace cable and equalizers. Delays up to equivalent of 500 feet of cable. Small, stable; prices start at $25. Also new **Borderline** accessory (dark borders around light colored letters and characters) for PAL color system.
Circle 290 on Reader Service Card

Andrew Corporation (Booth 225)
Pick up your brodcast-data package featuring coaxial transfer **switches** and Heliax **coaxial cable.** Coaxial switches permit rerouting rf power



from central control point. Sizes include 1⅝ in., 3⅛ in., 6⅛ in. AM

broadcasters can inspect a variety of air, foam and solid dielectric cables. Foams have low phase and temperature variations.
Circle 291 on Reader Service Card

Angenieux Corp. of America (Booth 218)
Zoom lens (18x27.5) with a combined focal length capability of 18 mm to 1800 mm. With servo. Also **diascope** for registration and color balancing. Brand new for news camera, a 12-120 mm f/22 lens with 7½ in. viewfinder for non reflex cameras.
Circle 292 on Reader Service Card

Bauer Group (Granger Associates) (Booth 221)
See a different high-power FM **transmitter.** Uses Stripline concept with a grounded grid amplifier. Only three operating parts in the finals of 20 kW Model 620—no sliding parts. Stable, can be paralleled for 40 kW. Bauer also has 2.5-kW FM **transmitter** for an economical Class A package.
Circle 293 on Reader Service Card

Belar Electronics Laboratory (Booth 203, West)
You might check on the **adapters** at Chicago stations watch their modulation at Belar's booth. A new **TV modulation monitor** measures positive and negative polarities simultaneously and registers the greater of the two on both the peak meter and the peak flasher. Outstanding feature of AM **frequency** and **modulation monitor** is separate 100% negative peak indicator for absolute indication. **Frequency deviation meter** is digital. You can see all of Belar's FM monitors and a new solid-state **peak limiter.**
Circle 294 on Reader Service Card

Berkey-ColorTran (Booth 123)
See rear screen propection that can't be wiped out by front lighting, anti-gravity hanger and full line of lighting gear.
Circle 368 on Reader Service Card

Boston Insulated Wire (Booth 245)
You might check on the **adaptors** at BIW which mate almost any color camera with any color cable system. New items include miniature color camera **cable** and **connector.** Also new 12-pair **mike assembly.**
Circle 296 on Reader Service Card

Robert Bosch Corp. (Fernseh GmbH) (Booth 419)
Want to buy a German **color camera?** You can at booth 419 and at the Windsor court, Essex Inn. Data is meager but it's a 3-tube job weighing only 70 lb. Said to have high light sensitivity and high S/N ratio. Has separate luminance channel for minimum optical errors.
Circle 295 on Reader Service Card

Boxton-Beel (Booth 425)
Unload your colorimetry problems here. B-B has had 25 years' experience in **beam separators,** is major supplier to color camera manufacturers. They're anxious to talk.
Circle 297 on Reader Service Card

Broadcast Electronics (Booth 307)
Don't overlook the new Spotmaster Ten-70 line of tape **cartridge machines.** Lots of built-in features: fast forward (manual and Auto Cue), mike/line mixer, etc.
Circle 298 on Reader Service Card

Broadcast Products, Inc. (Booth 217)
Learn how to join network "real-time" news while programming with **automation.** AR-1000 series controls 12 or more sources. See also automation system for under $5000, and random access select unit.
Circle 299 on Reader Service Card

CBS Laboratories (Booth 304)
Revolutionary **color corrector** permits TV engineers to adjust color variations after encoding and at any point during transmission to the home. Great for balancing color of various segments. (See *BM/E*, March, 1970, p. 24.) Also on display: **image enhancer, dynamic presence equalizer** (which eliminates frequency distortion), automatic **level** and **peak controllers, loudness controller.** What else would you like controlled? Look and listen to the CBS **loudness indicator** which predicts listeners' reaction to program loudness.
Circle 300 on Reader Service Card

CCA Electronics (Booth 233)
Don't bypass CCA's new 50-kW air-cooled AM **transmitter**—it occupies only 48 sq. ft. And if you want more loudness from a 1 kilowatter, inspect CCA's **super-modulated rig** which is capable of modulation in excess of 125%. Also on display: a three-channel **console** (AM and stereo), and **turntables**—including the industry's only continuously variable speed unit. QRK gear (in booth 412) includes new consoles for small studios.
Circle 301 on Reader Service Card

Central Dynamics Corp. (Booth 103)
Annoyed with those jolly unpleasant transitions (like dissolve to non-sync)? It can't happen on the VSP 840 **production switcher.** But you can do many things you've always wanted to. See an eight-minute video tape that demonstrates its features. If you're thinking of **automating** see an a/v show on the subject. Other items: electronic tape **editors,** transmitter **remote-control systems.**
Circle 302 on Reader Service Card

Century Strand Inc. (Booth 331)
Don't be confused—Century Strand is the new name for Century Lighting, which is now part of the Rank Organization. First-time items include **8-in.** quartz-iodine Fresnel (1000 W) and **10-in.** unit (2000 W). Both on Polestar control which means no ladder. Also new is a 1000-watter that focuses from **spot to flood;** it is said to be highest efficiency open-faced quartz-iodine unit on market.
Circle 303 on Reader Service Card

Chrono-log Corp. (Booth 115)
Feature attraction is an operating all-day **automation** system for controlling **TV switching.** Upcoming

events are shown on standard monitors and can be distributed and superimposed on monitors in all departments. No excuses for foul-ups. Also a low-cost **digital clock system.**
Circle 304 on Reader Service Card

CinTel Corp. (Booth 114)
Houston Fearless is now known as CinTel (after being bought by Technology Inc.). New products are a lightweight **tripod** and **dolly,** LWT-1; **pedestal,** PD-18; and **cradle head,** LWH-1. Also on display: mini-color **processor.**
Circle 305 on Reader Service Card

Conrac Steps Up The Pace

With The Solid-State Color Standard

Well aware of industry demands for improved reliability, we brought out the high quality RHA series of stabilized monitors for rigid studio requirements. All solid-state. Controlled phosphor . . . for the first time, assured color match between all monitors in a series. Today, only a few months after introduction, the RHA models are the color standard of the broadcast industry.

A Color-Matching Display Monitor

At the same time, Conrac introduced a companion series of KHA utility displays for less stringent audience and client room use. Also solid state, broadcast quality, but at lower cost. And, the same controlled color-matching phosphor. For the first time, assured color matching between monitors of different model series became possible.

And a Color-Match Modernization Program

The Conrac CYA17 and CYB17 models, by far the most widely used color monitors in the field, will still out perform anything except the new RHA. But the kinescopes don't match the new ones. You could junk the monitors and buy our new models. Maybe you should. But that might not necessarily serve you best. Conrac has a practical answer. Modernization. Now you can return your CYA17 or CYB17 to Conrac for a complete overhaul. Not only do you get a new 90-degree kinescope but it uses the same controlled color-matched phosphor as our RHA and KHA models. For only $800 total, you also get extensive mechanical and electronic modifications and a full one year warranty. Ask for a return authorization today.

Stick Around. After 21 Years, Were Running Harder Than Ever

CONRAC CORPORATION

600 N. Rimsdale Avenue, Covina, California 91722 • (213) 966-3511

Circle 112 on Reader Service Card

Cintel color film processor

Cohu Electronics (Booth 324, Continental)
You're invited to sit down and do your thing at Cohu's video **production switcher** 9302—which has 14 inputs and 7 outputs. Like C-D unit, you can't do a non-sync dissolve. Burst insertion means no min-fade color drop when going from color to mono. Also displayed: new color **sync generator.**
Circle 306 on Reader Service Card

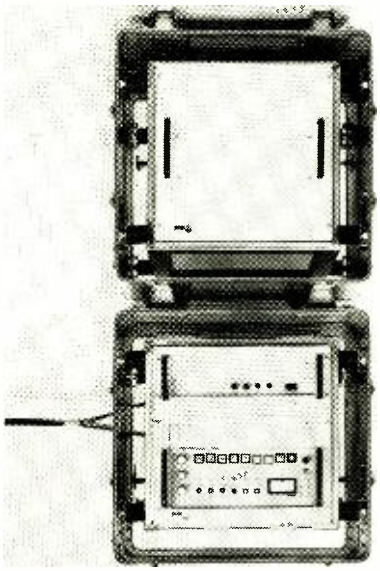
Collins Radio (Booth 208)
Two new **stereo consoles,** the 212L-1 and 212K-1, will be introduced. Said to have more low-level inputs than comparable-priced consoles. Live demo of **twintape** system. Also on display four AM and FM **transmitters, microwave** relay system and **audio controls.**
Circle 307 on Reader Service Card

Comfax Communication Corp. (Booth 413)
Learn how your station can get a Comfax franchise and operate a fast-facsimile data-access terminal in your market. Ask about microfilm retrieval via telco lines.
Circle 308 on Reader Service Card

Commercial Electronics (Booth 317)
How about natural color pictures at *f*/4 with only 5-footcandles of lighting? It's possible with **SEC vidicons** similar to those used in the moon camera. For more info see page 34 of this issue. For the real thing orbit over to booth 317.
Circle 309 on Reader Service Card

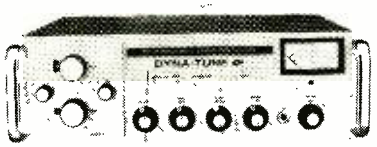
Continental Electronics (Booth 200)
Don't kick this 50 kilowatt **AM transmitter**—it's going to be delivered to WCFL in Chicago right after the show. (It's the type 317 C model.) A new solid-state **10-kW unit** will be on display operating into a dummy load. (Watch out for ambient rf!)
Circle 310 on Reader Service Card

Data Memory Inc. (Booth 404)
Stop the action at DMI's booth, or speed it up. A new line of **video disc recorders** will be on display which feature joy stick control (continuous variable speed) and a simplified head/disc drive that uses a



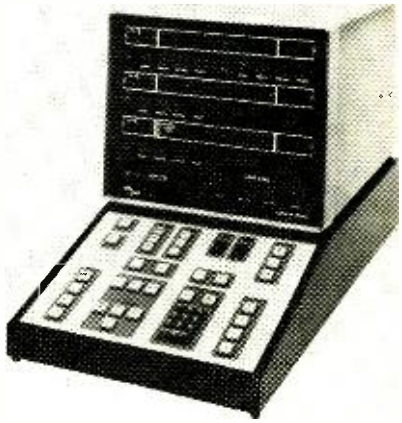
single disc. (Heads and disc are warranted for 500 hours.) Unit is packaged in a rugged case that can be transported easily. DMI says price is about half that of other models on market today.
Circle 311 on Reader Service Card

Dynair Electronics (Booth 210)
Headquarters for sophisticated CCTV production equipment. Complement your Dynair VS-121



switcher fader with a new **special effects generator.** Or pick a low-cost vertical interval mix/effects **switcher** with an automatic preview, no less! CATV operators will be interested in a new **demodulator** for high-quality off-the-air reception. Also a full line of Mini-Series components.
Circle 313 on Reader Service Card

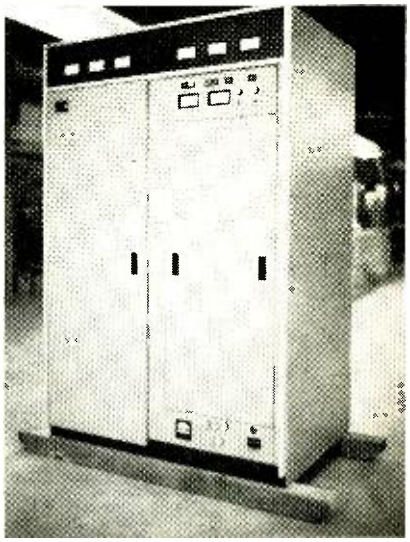
Datatron Inc. (Booth 423)
Veni, vidi, vidicue (we came, we saw, we edited). You've seen the ads, now see the real thing at NAB. The 5000 system **editor** includes a **time code generator** which supplies code to tape, identifying time (down to



seconds) and video frames, and a **control unit** which controls up to three recorders.
Circle 312 on Reader Service Card

Effective Communications Systems (Booth 316)
Effective people will be on hand to discuss **consulting services** (audio, video, rf) available to commercial and educational broadcasters.
Circle 314 on Reader Service Card

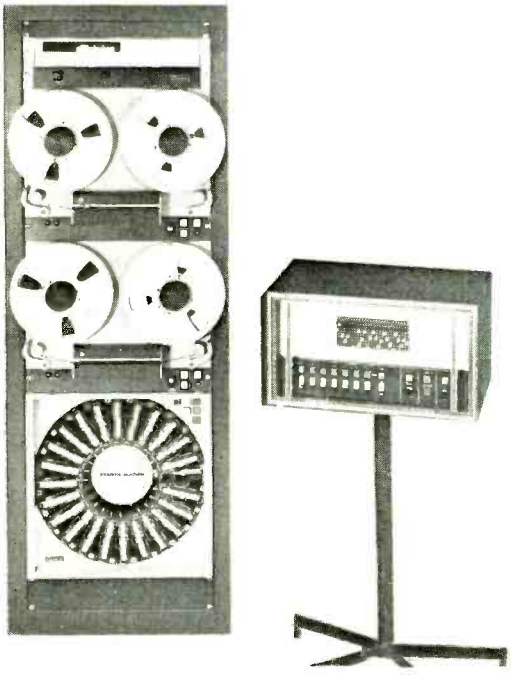
EMCEE Broadcast Products (Booth 309)
Sock-it-to-me **uhf translator.** First high-efficiency 1000-watter. Distortion-free color operation at an operating cost 80% less than other currently available equipment is claimed. The translators will be used



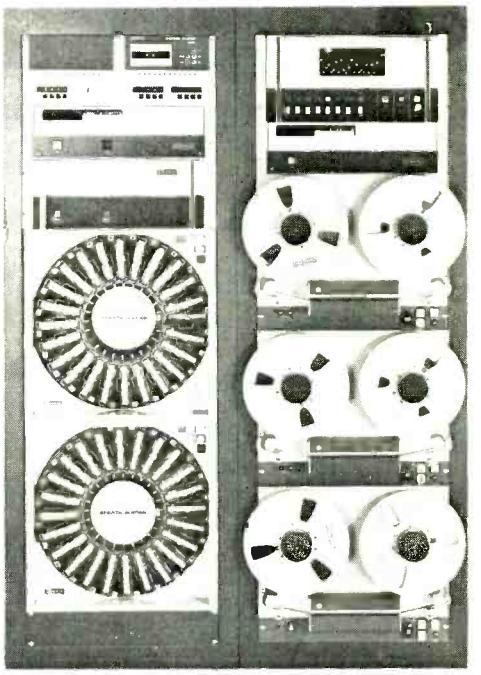
If all these years you thought automation was just for the "big boys"...

we'll bet you've never heard of SPARTA-MATION!

Flexible, versatile, dependable and **profitable** . . . these are the words most Sparta-Mation customers use when they talk about their new equipment. Designed to include features previously found only in the most expensive equipment, Sparta-Mation can be leased for as little as $6.00 per day! Whether you're a small broadcaster who wants to expand but can't afford new personnel or a big broadcaster who simply wants the most for his money, it'll pay you to look into Sparta-Mation. Write us about your needs and problems, we'll send you all the information on new Sparta-Mation that'll fill the bill.



SS-121
A mini-system to increase profits over simulcasting. Unattended part-time operation designed for simple program formats can be complimented with periodic live interruption. **Under $6.00 per day.***



SS-232
A glorious total-sound system for network affiliates. Lots of commercial and music capacity plus time checks and even local news and weather. **Under $11.00 per day.***

*5-year lease rates based on those effective 1/1/70

SPARTA
ELECTRONIC CORPORATION
5851 FLORIN-PERKINS ROAD SACRAMENTO, CALIFORNIA 95828 (916) 383-5353
A DIVISION OF COMPUTER EQUIPMENT CORPORATION

Circle 113 on Reader Service Card

by the networks on the Empire State Building to improve NYC reception. Also a new 2500-MHz **receiving converter.**
Circle 315 on Reader Service Card

Fairchild Sound Equipment (Booth 306)
Note new name for Fairchild Recording. New products include flashlight battery operated **portable console mixer** (16x8 and 12x2), a new **reverb** unit and **custom console components.**
Circle 316 on Reader Service Card

Fort Worth Tower (Booth 315)
Towers (AM, FM, CATV, microwave), equipment **buildings, reflectors** and accessories and Texas good will.
Circle 317 on Reader Service Card

Gates Radio (Booth 219)
See an operating demo of the new BT-1300 vhf **transmitter**—a special theatre has been set up to show i-f modulation. A full line of **AM and FM transmitters** are also on display. And don't miss the working **automated radio station** display. This year a Viatron #21 CRT encoder keeps a print-out log of the programming.
Circle 318 on Reader Service Card

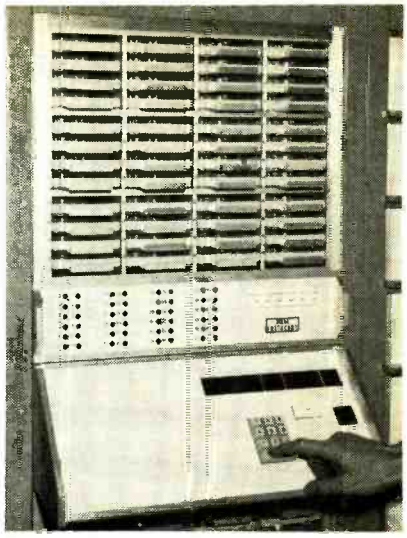
General Electric (Booth 101)
How about a **color camera** which can handle a 120:1 lighting ratio? The new PE-400 ($80,500) picks out the players in the shadows (see photo). An Auto-trast contrast control circuit reproduces "over three times" the 40 to 1 range in the same picture. (We're not sure exactly what that means but the results are impressive.) A new color TV **encoder** (for better S/N figure) will be shown. Also a new **TE-201 color camera.** Major live demo will be new broadcast **automation system** built around new TS-400 **video program switcher.** Color video giant **projector** will be used for electronic staging—and to get your attention.
Circle 319 on Reader Service Card

Gotham Audio Corp. (Booth 237)
Vp Eli Passin has a whole passel of imported Gotham goodies. Leading the list is a computer-controlled **limiter/compressor/expander** by Electromesstechnik (EMT). There's also a **mixing console** (12 inputs) and servo-controlled **tape recorder** from Studer. Also to be shown is a **monitor speaker** with its own built-in amplifier. There's also on display Neumann **mikes** including a new ultraminiature condenser model; **linear motion faders** guaranteed noiseless for five years, a digital read-out **tape timer** that can time a half-hour program within 1½ seconds, a stereo **fault-alarm system** and others.
Circle 320 on Reader Service Card

Gray Research (Booth 227)
Turntables and **pick-up arms** easy on your arms.
Circle 321 on Reader Service Card

Humphrey Electronics (Booth 214)
Digital control center for automatic **transmitter data logging,** transmitter **remote control,** and **clock display.** Other products include a flashmeter **modulation monitor** and a 12-cart tape **cartridge system** which features smooth and immediate random access.
Circle 322 on Reader Service Card

International Good Music (Booth 248)
Twelve carts not enough (Humphrey, above)? How about 48? The Instacart playback unit handling **48 cartridges** can be operated manually or tied into IGM **automation systems.**

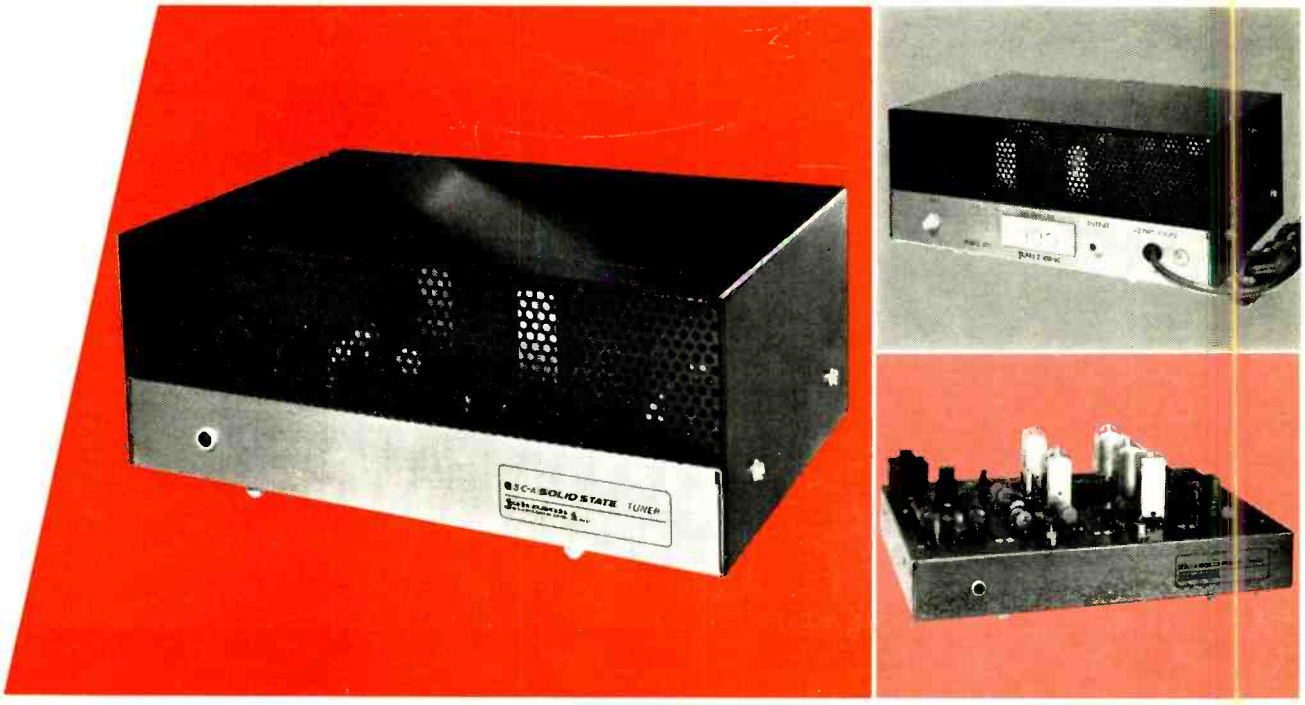


In the later mode you'll want the accompanying **random select memory** which uses latest MOS semiconductor memory. A 10-key keyboard provides 200-step control of up to seven inputs. Also on hand, info on **tape service.**
Circle 323 on Reader Service Card

One of the joys of NAB is all those great-looking cameras and girls you get to see. This is GE's new PE-400 color camera, which this young lady will show you.

NOW! HEAR THIS

NOTHING'S CHANGED—
EXCEPT FOR THE BETTER.
SOLID STATE
SCA MULTIPLEX EQUIPMENT
BY JOHNSON-AIRE.
THE BEST.



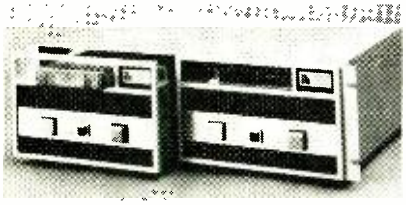
johnson electronics, inc.

CASSELBERRY, FLORIDA 32707 TELEPHONE (305) 838-2111

Circle 114 on Reader Service Card

International Tapetronics Corp. (Booth 410)

If you're in the market for **cartridge players,** you'll want to look over this new company. Multicart units are small in size. An exclusive meter



switching feature reads peak recording levels to reduce distortion. A three-deck unit has all the features of a single deck unit, the company says.

Circle 324 on Reader Service Card

International Video Corporation (Booth 239)

IVC is promoting its low-cost three Plumbicon **color camera** and its IVC 900 color **video tape recorder** for broadcast use. A **film chain** will also be displayed. At the Pick-Congress, an EMI **three-tube color camera** will be demonstrated.

Circle 325 on Reader Service Card

Jampro Antenna Co. (Booth 303)

Feature attraction is a new line of **notch diplexers** with 3-dB couplers for vhf and uhf. A live demo will show the VSWR and bandwidth characteristics of the circularly polarized **FM antenna.** Also on display will be **zig-zags** for uhf and **batwings** for vhf.

Circle 326 on Reader Service Card

Kaiser CATV (Booth 319)

Kaiser will show **CATV equipment** and stress their total assistance: surveys and estimates, field engineering help and turnkey construction.

Circle 327 on Reader Service Card

Kliegl Brothers (Booth 111)

Win a prize. Feature attraction is a completely operating **lighting control system** which boasts the Saf-Patch cold parking cross-connect panel and a solid-state SCR dimmer bank as well as a multi-scene preset control console. Visitors will be invited to play a game on the preset system for a prize. Also on display: **focussing scoops,** a **10-in. quartz Fresnel** and **barn doors.**

Circle 328 on Reader Service Card

3M Company (Booth 246)

See new color electron beam recorder which transfers color video to 16mm film. Separation master is field sequential b&w. Also plenty of specs of new **tapes.** A recent one is a new music mastering tape, Dynarange, which has a 3-dB higher S/N ratio without loss of headroom.

Circle 329 on Reader Service Card

McMartin Industries (Booth 231)

McMartin, long synonymous with FM, is branching out—to AM and vhf. It will show **frequency** and **modulation monitors** for both AM and vhf-aural TV transmitters. Also shown will be a new series of **monitor amplifiers,** and a self-contained solid-state **headphone amplifier.** In the FM area is a new **rf amplifier** for use in remote-control monitoring, and a rf amplifier **preselector** for maximum selectivity. A working demo of both **written and voice data** for transmission on a single SCA carrier.

Circle 330 on Reader Service Card

Highlight of the IVC exhibit will be the model 900 color helical VTR.

Marconi Instruments (Booth 238)

Save time with a programmable FM/AM modulation meter. This and other instruments at Marconi's booth.

Circle 331 on Reader Service Card

McCurdy Radio (Booth 310)

Play with a demo model of the SS4388 **audio consolette** which has eight inputs and space below faders for pushbuttons to start turntables or

tape machines. See also a new **TV intercom system** with a high-reliability reed-relay switching matrix.

Circle 336 on Reader Service Card

Marathon Broadcast Equipment (Booth 316)

Going around in circles with cartridge tape troubles? See Marathon for new **strobe speed tester, torque tester** and **head-cleaner carts.** Also on hand will be a 6-60 Min. **delay cart,** and a 20-min. **duplex-automation cart.**

Circle 332 on Reader Service Card

Marti Electronics (Booth 234)

If you're still keeping that transmitter log by hand, stop by Marti and watch the **automated logger** perform. Marti will also show a **solid-state aural STL,** a new **limiter,** and **SCA gear.**

Circle 333 on Reader Service Card

Metrotech (Booth 408)

See **professional tape recorders, reproducers,** and **slow-speed loggers** in operation.

Circle 334 on Reader Service Card

Moseley Associates (Booth 222)

Big story here is **AM telemetry** or **wireless remote control,** which Moseley pioneered. Now you don't need telco lines to and from your AM transmitter. (For details, see page 46). Also look for an off-air **AM modulation monitor,** a **vhf remote pickup link** and companion **audio mixer STL,** and a **data printer.**

Circle 335 on Reader Service Card

North American Philips (Booth 326)

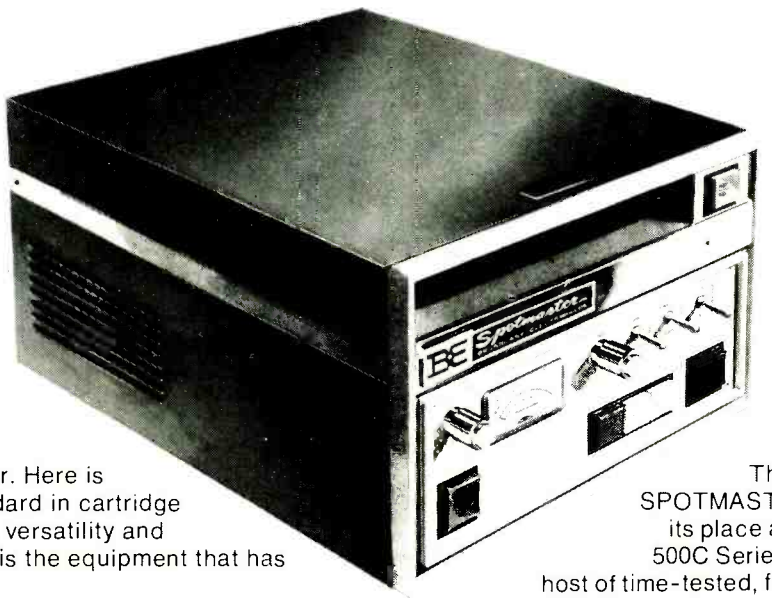
Want several microphones in one? On display at this booth with be the AKG **condenser microphone modular system,** comprising a single FET preamp and several mike elements—cardioid, omni, switchable, etc. If you need a long aural reach, take

Continued on page 76

Spotmaster

Introduces the incomparable

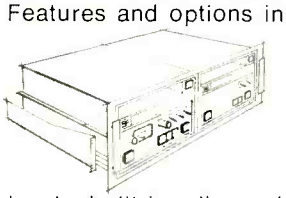
ten70



Your search is over. Here is the bold new standard in cartridge tape performance, versatility and ruggedness. Here is the equipment that has everything.

Five models of the magnificent Ten/70 are offered: mono record-play, mono play, mono delayed programming, stereo record-play, stereo play. All have identical dimensions. Any combination of two will fit in our sleek 19-inch roll-out rack panel, just 7 inches high.

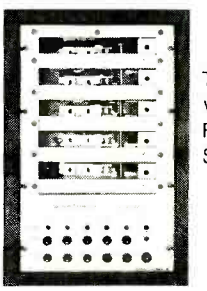
And look at the "Human Engineered" versatility. Features and options include manual high-speed advance, exclusive Auto-Cue with automatic fast-forward, automatic self-cancelling record pre-set, front panel test of cue and bias levels, built-in mike and line level mixer, automatic pressure roller engagement and electrical cartridge release, color-coded design for easiest possible operation.



No-nonsense SPOTMASTER engineering dictates the inside story: a massive U.S.-made hysteresis synchronous "Direct Drive" motor, solid state logic switching, modular construction throughout, premium components, separate heads allowing A-B monitoring, full bias cue recording, transformer input and output, flip-top access to heads and capstan.

This new generation of SPOTMASTER equipment takes its place alongside our classic 500C Series, still offered. With a host of time-tested, field-proven features, the 500C record-play and playback models meet or exceed all NAB specifications. Performance is second only to the Ten/70.

MULTIPLE CARTRIDGE MODELS—SPOTMASTER Five • Spot and Ten • Spot (holding five and ten cartridges respectively) may be operated manually or incorporated into programmed automation systems. And now there are stereo models, a Remote Control Sequencer, and a Five • Spot with full recording capability.



The versatile Five • Spot

Call or write today for information about the new Ten/70 and other SPOTMASTER cartridge tape products and accessories. Remember, Broadcast Electronics is the No. 1 designer/producer of broadcast quality cartridge tape equipment—worldwide!

BROADCAST ELECTRONICS, INC.

A Filmways Company

8810 Brookville Road. Silver Spring, Maryland 20910 · (301) 588-4983

Circle 115 on Reader Service Card

Color TV with Available Light

By Marc Broemmelsiek

What Tri-X did for film cameras, the SEC pickup tube has done for color TV cameras. Would you believe a live candlelight church remote in full color?

FROM THE BEGINNING of television, lighting has been a continuing problem. Camera tubes weren't anywhere near as sensitive as the human eye, so many foot-candles of light had to be produced before scene illumination was sufficient to register a good picture. Just when black-and-white cameras became sensitive enough to work in available light, color came along, increasing the demand for lighting.

Just last year, however, a camera was introduced which makes a full-color picture with scene illumination of only 10 foot-candles, and the lens at *f*/5.6. Commercial Electronics' CEI 270 camera uses three pickup tubes originally developed for military and space applications. Built by Westinghouse, they are WL-31683 SEC (secondary electron conduction) vidicons. These super-sensitive pickup tubes are the heart of the low-light color camera, Fig. 1.

Marc Broemmelsiek is director of engineering at Commercial Electronics, Inc., Mountain View, Calif.

The CEI 270 has been designed to operate at *f*/16 with scene illumination of 100 foot-candles at a color temperature of 2900 K, or what is normally considered black-and-white studio lighting. By opening the lens to *f*/8, you can get a good picture in ordinary room lighting. This makes it possible to televise certain events, such as government hearings, which would be adversely affected by conventional color TV lighting.

The SEC vidicon used in the 270 camera is about as sensitive as the human eye. The tube is also about 100 times more sensitive than both conventional and lead-oxide vidicons, as Fig. 2 shows. Optimum highlight illumination on the faceplate is about 0.01 foot-candles for a signal

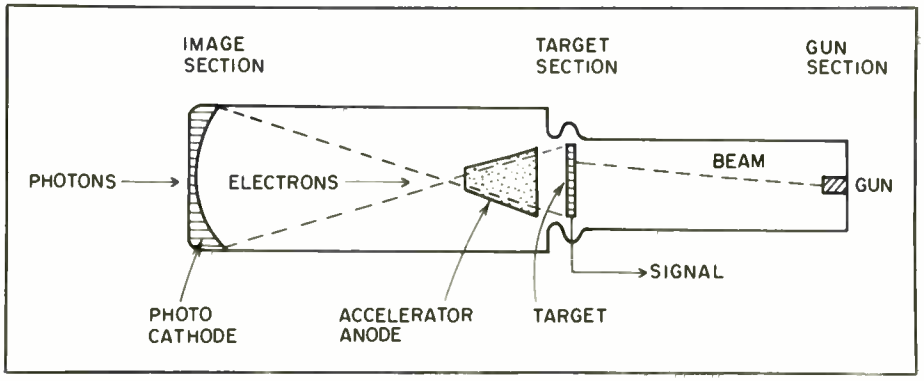


Fig. 1. Curved surface of fiber-optic/photo cathode focuses electrons at megaphone-shaped anode. High velocity electrons produce secondary electrons at target at ratio of 1:100 giving high sensitivity.

Low-Light Camera Tubes

While the CEI 270 seems the first low-light-level broadcast color camera, there are a few super-sensitive black-and-white cameras, and several tube types. Actually, the image orthicon is more sensitive than the conventional or lead-oxide vidicons. But it was the development, around 1960, of the fiber-optic **image intensifier** type tube which opened the door to getting a TV picture in near darkness. The **image intensifier orthicon** (IIO) uses an intensifier mounted in front of the photocathode, and is even more sensitive than the conventional IO.

The IIO has been largely superseded by the **SEC vidicon,** developed by Westinghouse in 1962. The SEC has lower lag, better low contrast performance, wider dynamic range, and less critical adjustments. For still greater sensitivity, an image intensifier is coupled to the front of the SEC, to make the super-sensitive **ISEC,** which can produce a picture with faceplate illumination of only 10^{-6} footcandles.

In the search for TV camera tubes to operate in near-darkness, some companies have modified the classic vidicon, while others have developed new pickup tubes. Amperex/Philips have developed a new vidicon with a target composed of discrete, reverse-biased **silicon diodes.** The tube has high sensitivity in the visible and near-infrared spectrum. It's used in Norelco ITV cameras. GE's senitive variation of the vidicon is called **FPS (focus projection scanning).**

A different kind of pickup tube is the **image isocon.** With an intensifier ahead of its photocathode, the isocon can produce a picture down to 10^{-7} footcandles. English Electric Valve Co. Ltd. makes several isocons, which are distributed in the U.S. by Visual Electronics. EEV isocons are used in ITV cameras made by MTI. Isocons and intensifiers are also made by RCA.

The **image dissector** was first devised in 1934, but it has been recently updated to include an intensifier to work as a low-light pickup device. EMR Photoelectric and ITT both make image dissectors for low-light applications.

Veni, Vidi, Vidicue

(We came, we saw, we edited)

Hail Vidicue!

Our new Vidicue editing and control systems have conquered major VTR problems for both the broadcaster and production facility. The Vidicue features precise, economical control of program and commercial construction . . . while also presenting a highly sophisticated, computerized editing capability.

Moreover, Vidicue gives the broadcaster the flexibility to logically add to his basic system as his requirements inevitably increase. And for the production facility, Vidicue lets the editor perform on tape what he had only been able to do on film in the past due to cost and technical restrictions.

How does Vidicue accomplish this? Vidicue offers automatic search and cue, frame synchronization, and editor control of one, two, or three recorders (or more, if desired, on an optional basis). As a universal editing system, it is designed to interface with any high-band broadcast recorder, quality helical, or servo-controlled, multi-channel audio recorder.

Four basic modes of operation are performed: **Cue/Preview** control of a single machine. **Sequential Edit** enabling the precise assembly of scenes on the record tape from the playback. **Insert Edit** of new material into a prerecorded tape. And a unique **A • B Roll** that eliminates the necessity of prerecording special playback tapes in proper sequence, thus saving a considerable amount of time and money.

Edit point entry is accomplished from three sources — keyboard, tape, or computer. And Vidicue's simplified controls and graphic simultaneous display of all edit points make editing easy and save time.

Want further information? Render unto Datatron your request for a detailed specification brochure today. Or call us directly. We'll gladly lend you our ears.

Datatron Inc.
1562 Reynolds Avenue
Santa Ana, California 92705
(714) 540-9330

DATATRON **Expanding Man's Capabilities With Data** • Timing • Data Acquisition Systems • Microelectronic Testing • Broadcast Control

current of 0.3 μA and an S/N ratio greater than 40 dB.

SEC Operation

In Fig. 1 you see a simplified diagram of a typical SEC vidicon. The image section converts photons (light rays) into electrons; the target section produces 100 secondary electrons for each primary electron from the photocathode; the gun section scans and discharges the target, producing the output video signal.

As photons strike the fiber-optic photocathode, they cause it to emit electrons off its back side. Near the target is the accelerator anode, which is biased 7.5 kV positive. It attracts the electrons and causes them to strike the target with high velocity. On the back of the target is a layer of potassium chloride which permits approximately 100 secondary electrons to be dislodged by each primary electron striking the target. As the secondary electrons are knocked off, a charge remains on the target.

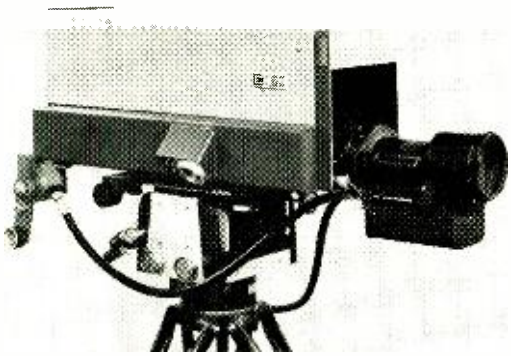
The gun section functions like any vidicon. The electron gun produces a beam which scans the target, neutralizing the charge and causing an output video signal to flow.

After one frame has been scanned, the beam has almost completely erased the target, leaving a residual charge of about 10%. Lag or image smear is therefore low, and SEC performance is equivalent to the best lead-oxide vidicons. The limiting resolution of 700 lines and response of 35% at 400 lines also compares favorably with 30-mm lead-oxide tubes.

Dark current and variations in dark current caused by temperature extremes are both negligible in the SEC tube. Black level is set with the lens capped and remains fixed for the life of the tube.

Other Details

The SEC tube presents a challenge to the camera designer in achieving good preamplifier performance. The shunt capacitance of the signal terminal and a short piece of coaxial cable is about 28 pF. Through careful design and the use of FET-input preamplifiers, the equivalent input noise current has been kept below 2×10^{-9} amperes rms, measured in an 8-MHz bandwidth.



The Commercial Electronics 270 camera.

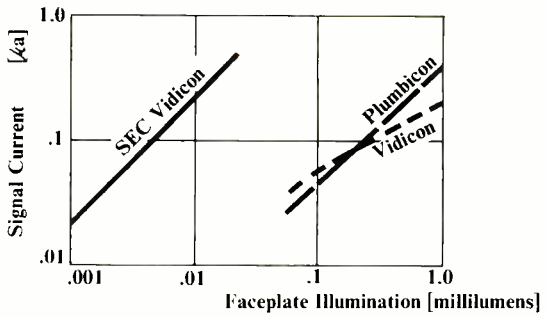


Fig. 2. SEC vidicon a hundred times more sensitive than other camera tubes.

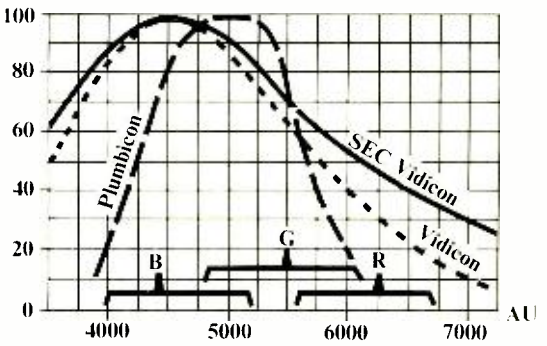


Fig. 3. Spectral response of SEC vidicon broader than human eye.

The SEC vidicon has a broader spectral response than other vidicons, as shown in Fig. 3. Its extended red and blue responses produce more natural colors. SEC filter design requires none of the compromises usually made in lead-oxide camera design, because of the better response. Thus the camera isn't overly sensitive to changes in color temperature of scene illumination between 3800 and 3200 K. And dichroic filters show negligible shift in edge response with polarization and don't exhibit the "green-hair" effect.

Heart of the optical assembly is a single baseplate to which the three SEC tubes are rigidly mounted. Ahead of this plate an $f/4$ relay lens in a focus mount provides carriage focus.

To match the high degree of mechanical stability of the optics, the deflection circuits are direct-coupled linear amplifiers with heavy negative feedback which closely controls sweep amplitudes and centering currents. Once the camera has been registered, it will usually remain so even when transported in the field.

Most camera electronics are plug-in modules, for easy troubleshooting. Test points are accessible without removing cards. The viewfinder kinescope produces a 200 foot-lambert display with 600 line resolution. Picture blooming is minimized by a regulated 10-kV ultor supply.

White clipping in the video shows up on the viewfinder as white flashes in the picture. Thus the cameraman can set his iris properly without a waveform monitor.

Cost of the CEI 270 is around $35,000. During the useful life of the camera, a station should save money on electricity for lighting and air conditioning in the studio, simply because the camera needs less light than other models. **BM/E**

Help celebrate the introduction of the Fernseh 3-tube color camera.

Buy one.

The Fernseh KCU 40 is the camera that revolutionized the European television production technique.
It's the first lightweight model for both studio and field use with all the performance you'd expect from a 3-tube camera. High light sensitivity.

High signal-to-noise ratio.
True color reproduction with optimum focus.
A few of the more special features include 7mm or 11mm camera cables, and a tiltable viewer.
We'll be in Booth 419 at the NAB Convention in April in Chicago. See you there.
Brochures available from Mr. Lothar Amanda, Robert Bosch Corporation, 2800 S. 25th Ave., Broadview, Ill. 60153.

FERNSEH
Member of the Bosch Group

Circle 117 on Reader Service Card

BROADCASTING

A Janus-like ahead

Broadcasting As We Know It Will End . . . Usher in Ion Belts and Light Pipes

NO SINGLE FORCE has had more impact on the character of our society than the Broadcasting Industry. Yet, during the next 50 years we shall see the end of that industry as we know it. Its progeny will more resemble CATV in that home interconnection will be accomplished by flexible light pipe. Broadcast towers will disappear from the scene. Over-the-air transmission will be accomplished by ion towers—which may be flown through by aircraft without harm to either aircraft or transmission.

The concept of local control and dissemination of programming will yield to the concept of universal access to information from all parts of the world at the discretion of the individual. Local sources will compete with international sources—even interplanetary sources—for the viewers' attention.

Three-dimensional wall-size television with photographic resolution in true color will allow one to move about the viewing area obtaining different perspectives.

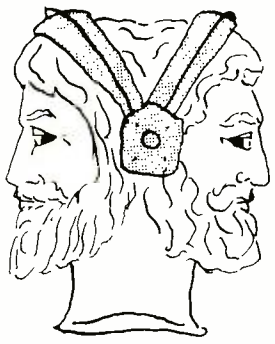
Over-the-air transmission will be limited to private use by individual communication devices, such as personal videophones allowing immediate contact to all parts of the world.

The complex electronic equipment of the year 2000 will result in the demise of service repairmen. Each component element will be self-repairing, or given catastrophic failure, will change color or otherwise reveal itself as the defective component requiring replacement. The owner will simply replace the unit by selection of off-the-shelf equivalents at the local self-service technical equipment center.

The household computer will become the individual's interface to the society. The household computer will connect to large centrally situated computer banks. It will balance bank accounts, order groceries, program cooking chores, receive and record (in 3D sound and video) telephone calls, provide climate control of the living environment, predict future weather conditions, manipulate stock market data, type letters, monitor the nursery, protect the household from fire and burglary, be used as a teaching machine with three dimensional graphic displays employing interactive dialogue and accessing source materials throughout the world, and generally become involved in every facet of human endeavor.

It really doesn't take 20/20 vision for one to foresee the year 2020—let imagination run free and one will underestimate the progress of science and the nature of our world fifty years from today.

—Biagio Presti
Division Manager,
Broadcast Equip. Div.
Sarkes-Tarzian Inc.



LIKE THE ROMAN GOD JANUS, we reveal here the unique ability of seeing ahead and behind simultaneously. The past represents no great difficulty save one—what events to leave out. The future presents a more awesome task. But, fortified with the perspective of forward-looking industry leaders, we confidently peer ahead—to 1984 and beyond a full 50 years to 2020. It's a future filled with satellites and home communication centers as have so often been predicted. But it's more. It's an opportunity to enlarge the scope and quality of our lives.

Expanded communications will not only afford us more personal services, necessary in a more complex society, but will also permit us to

Broadcasting

1919-20: KIKA, KQV Pittsburgh, WWJ Detroit and XWA (now CFCF) Montreal begin regular operation as first radio broadcast stations. In the Radio Act of 1912, Congress had authorized the Secretary of Commerce to issue broadcast station licenses. Birth of broadcasting caps nearly 100 years of experiments: Although Guglielmo Marconi is usually credited with first transmission of wireless telegraphy in 1895, the first voice broadcast may have occurred in Murray, Ky. in 1892 when Nathan B. Stubblefield said "Hello Rainey."

1922: NAB founded. WJZ New York and WGY Schenectady linked by wire as first temporary network; carry World Series. 750, 833 kHz assigned to broadcasting. KUOM Minneapolis-St. Paul and WHA Madison (Wis.) begin operation as first educational (AM) stations.

1923: Vladimir K. Zworykin develops the iconoscope camera tube. Earlier, Paul Nipkow had patented a mechanical scanning disc, and Karl F. Braun had developed a crude cathode-ray tube. Television is a laboratory curiosity.

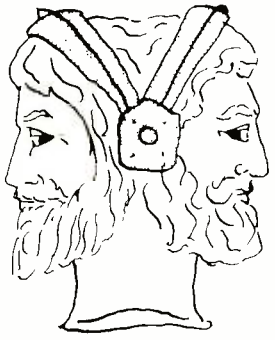
1924: 550-1500 kHz assigned to broadcasting, with 5-kW power limit. The two national political conventions are broadcast for the first time.

1925: RCA introduces the first ac-powered radio receiver. Television by mechanical scanning is publicly demonstrated by Francis Jenkins in the U.S. and by John L. Baird in Great Britain. Inauguration of a U.S. president (Calvin Coolidge) is broadcast for the first time.

AT HALF-CENTURY

and behind look at communications technology.

escape the ant-hill environment of over-populated megalopolises. We can move to rural areas without losing touch.



There are choices to be made. As communicators we can encourage people to retreat to a cocoon-like life in well-defined market areas where they can be satiated with pleasurable sights and sounds while forever consuming more goods. Or we can provoke individualism, the pioneering spirit, the desire to learn how to contribute, instead of laying waste, to our environment. With desire aroused, we can turn to the learning process itself—and thus trade our anger, fears and frustration for fullfillment. The best is yet to come.

Milestones

1926: RCA forms NBC as the first regular radio network, with 24 stations. Period of chaos develops, as radio stations use various frequencies and towers at will, causing much interference.

1927: Congress passes Radio Act of 1927, establishing Federal Radio Commission, with authority to assign frequencies, powers, operating hours, etc. NBC airs first coast-to-coast network broadcast. CBS established. Bell Telephone Labs transmits TV by wire between New York and Washington; Secretary of Commerce Herbert Hoover is star. Bell Labs also transmits TV by radio between New York and Whippany, N.J.

1928: Experimental TV is broadcast by radio stations WGY Schenectady and WRNY New York and by an RCA/NBC experimental station in New York. First transatlantic TV is sent from London to New York, on 6700 kHz.

1929: BBC and Baird Television in London transmit 30-line TV. Two-way TV is demonstrated in Berlin. All-electronic TV (using an iconoscope camera tube and a kinescope receiver tube) is demonstrated at an IRE meeting at Rochester, N.Y.

1931: NBC installs first TV station on Empire State Building, New York City: W2XF (visual), W2XK (aural). Harry F. Olson invents velocity (ribbon) microphone.

1932: In England, J. D. McGee of EMI develops Emitron camera tube. Harry F. Olson invents cardioid microphone.

But Send Technical Advances "Back to the Lab" If Freedom Is Endangered

PERMIT ME to speak to the philosophical and social developments as they might transpire and leave the technical aspects to engineering experts.

The basis of our democratic process and the traditions of individual freedom in our nation are dependent upon the maintenance of a well-informed public. The truly revolutionary development in broadcasting's last 50 years has been ascendancy as the fastest, most used, and most trusted information source. All other accomplishments dwindle into insignificance against this achievement.

I do not believe that this could have taken place if our broadcasting system were other than what it is. The use of the free air for transmission established a cost-of-operation factor which allowed broadcasting entrepreneurs to present entertainment and news and other services at a price which could be shifted to a free advertising industry. The system that has evolved makes sense: the public is served free—using the free air with the aid of the free marketplace.

So, I am inclined to equate 'free' with 'freedom.' I am inclined to say that the operation of the free industry and the free marketplace are inextricably entwined with the freedoms of our people . . .

It is not enough to say that technological changes now allow the urban homes of the nation to be wired up together to get new services as well as those presently offered by broadcasters—all of course, at a price. The question inevitably becomes "What will be the price the public pays in addition to the monthly bill for broadcast services?" Will the broad-scale introduction of wide band common-carrier facilities into our homes feed upon and devour the present broadcast news services? I'd say yes.

And I regard it eerily prophetic that you would single out the date 1984 as one of your milestones for pegging the discussion. In the broad band of services fed into the homes can be several bands of government news—unedited, unevaluated and certainly never subject to instant analysis. That would have gone out years before in the late 70's—and the people's freedom would have gone with it.

So, I would hope that the future of broadcasting remains secure in the hands of those in industry and government who share the wholesome respect for the key role it plays in our democratic society. Technological advances may be sociological retrogressions, and each must be weighed in terms of its impact upon our free society. If it fails the test of compatibility with the full flow of freedom, then it should be relegated back to the labs along with the nerve gases and DDT.

—Willard E. Walbridge
Chairman of the Board, NAB

In the Short Range, Perfected Hardware. In the Long Range, A Better Life

DEVELOPMENTAL WORK and research which has been under way for years will resolve all the more obvious demands upon hardware well ahead of 1984. Reliability is the key characteristic toward which we and other manufacturers are striving today. The old hunt-and-peck methods of trouble-shooting and set-up will be totally mechanized—if, indeed, they are not rendered unnecessary by the sheer operational efficiency of complete audio-video systems.

Color will of course be universal in television, with the means for color production and live color telecasting brought within the bounds of economic feasibility by closed-circuit practitioners.

Without question, the solution to the absolute-flexibility factor in live color video pickup is close at hand. We are already coming within a hair's breadth of television in live, true color from nearly any location in any light level, unencumbered by the masses of hardware and unwieldly cables that have severely hampered any remote television operations in the past. There is little doubt that the broadcaster is the current center of modern communications. His role involves serving all the people, and he serves them both information and entertainment.

Who, then, is in a better position than the broadcaster to raise his sights above the business of television as it is now constituted and look toward the real-life condition that is straight ahead?

I see all forms of modern communications building into a gigantic complex that bring together the learning process with the golf match, the news with the theater, advertising and shopping information with the weather, political information with football, live history-in-the-making with crafts, hobbies and homemaking. That is to say, the idea of *communications* is broadening rapidly to mean information of every description—readily accessible to every home, every person, at the flick of a finger.

So it is my view that the broadcaster is particularly qualified to take a leading role in the creation of the communications bank that will characterize the world of fifty years hence. It means a joining of electronic technologies and human disciplines that stretch from elementary school teaching to an unprecedented understanding by every man of the world he lives in. Somewhere along the way in that long chain you'll find all the elements that we think of today when we think of "television." To be sure, you will have huge-screen video pictures—they will, of course, be three-dimensional. But these are just bricks in the structure.

—John S. Auld, President
Philips Broadcast Equipment Corp.

Agglomeration of Services will Blur Present Distinctions

BY 1984, I would expect 25 million homes to be attached to cable. This growth should be moderate for two to three years, but, as the metropolitan areas open up, growth will be more explosive. The plant investment to provide cable service throughout the nation will exceed one billion dollars.

The first of the new services which will be available within 15 years will be the home video recorder. By 1973 it should be feasible for most Americans to order their favorite play, special event, or sporting contest from an as-yet unformed company which may bear a name similar to "Video Cartridge of the Month Club."

Dual cable installation will develop a vast new range of services which permit customer response, including shopping via television, automatic bank account updating, income tax return preparation and retrieval of information.

Cable growth will bring about a much greater program diversity than is possible today. Several channels will be devoted to local origination. New programming will be much more specialized than presently and will broaden to cultural and educational topics rather than the largely entertainment-oriented programming with which we are confronted today. Within 15 years, at least two national cable networks will evolve which will effectively compete for quality products. Accompanying this change will be a shift to a per-channel or per-program method of charging for cable services.

Broadcasting Milestones *(Continued)*

1933: Edwin H. Armstrong invents FM.

1934: P. T. Farnsworth develops the image dissector camera tube. Congress passes Communications Act of 1934, creating FCC. Mutual Broadcasting System founded.

1935: Martin Block becomes first disc jockey, begins "Make-Believe Ballroom" on WNEW New York.

1936: BBC begins regular television service in London, using 405 lines. In New York, NBC TV station W2XBS uses 343 lines (later 441, finally 525 lines).

1939: H. Iams and A. Rose develop the orthicon camera tube. In London, BBC television goes dark because of war. NBC begins regular public television service in New York City by doing a remote from the World's Fair, at which Franklin D. Roosevelt becomes first U.S. president to appear live on TV. David Sarnoff introduces, saying: "And now we add sight to sound." Radio WNYE New York becomes first high-frequency educational station, operating on 41 MHz AM (later FM).

1940: First national political conventions are seen on television in New York City.

1941: NBC's WNBT New York begins operation as world's first commercial TV station. First commercial: a Bulova time signal. Commercial FM begins in the U.S. (42-50 MHz): WSM-FM Nashville is first licensed station. 5 channels are reserved by FCC for educational stations.

1942: FCC prohibits duopoly; NBC sells Blue Network, which becomes ABC.

1944: First live TV network established on temporary basis: National political conventions are carried by WNBT New York, WPTZ Philadelphia, WRGB Schenectady.

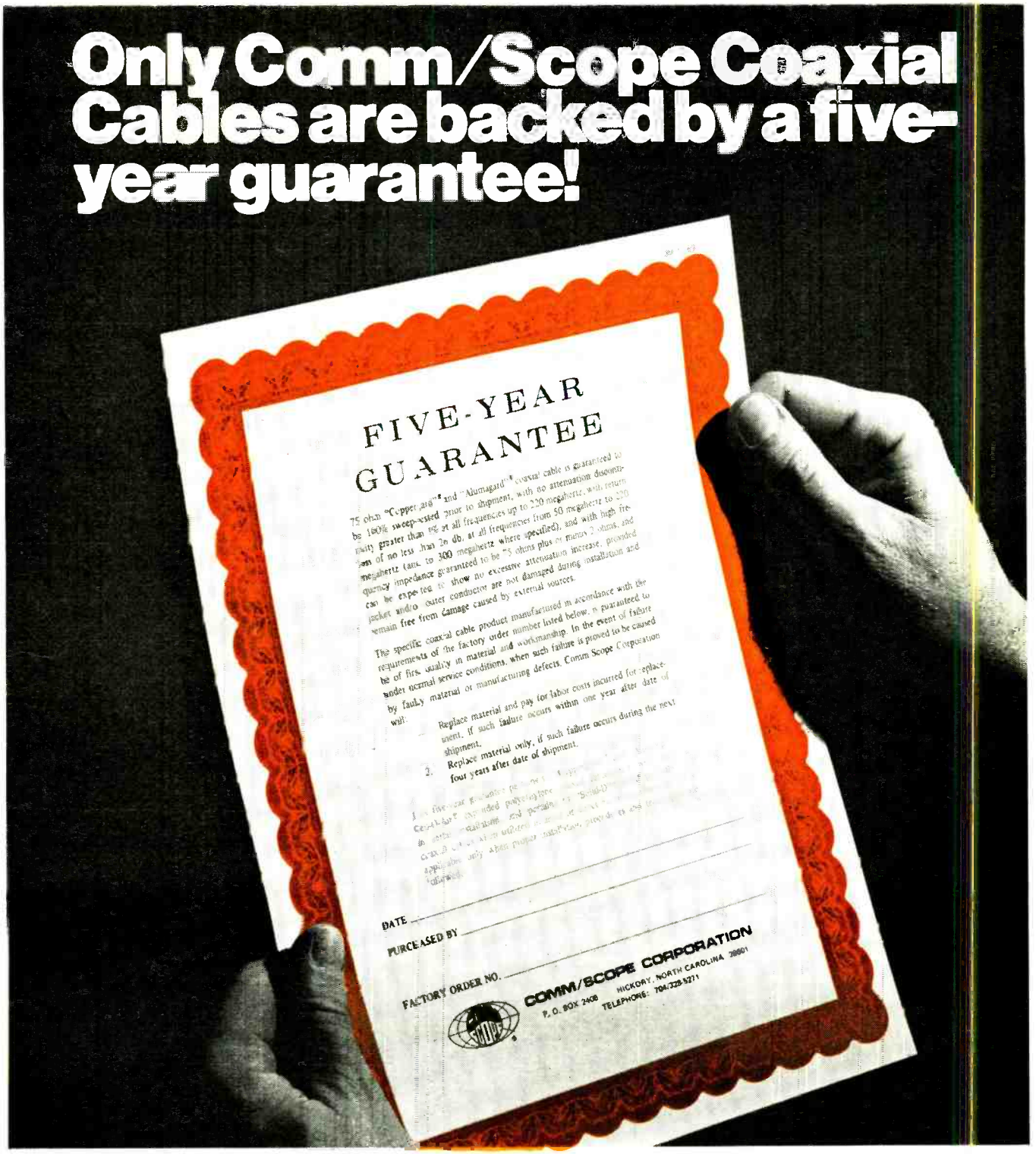
1945: A. Rose, P. K. Weimer, and H. B. Law develop the image orthicon camera tube. FCC reassigns FM to 88-108 MHz, allocates 13 vhf channels. Frank Back invents Zoomar lens.

1946: In London, BBC television resumes following wartime hiatus. RCA introduces classic 630TS television receiver. NBC opens first regular interconnected TV network: WNBT New York, WRGB Schenectady, WPTZ Philadelphia, WNBW Washington.

1947: John Bardeen, Walter Brattain, and William Schockley of Bell Labs invent the transistor.

1948: Magnetic tape enters U.S. broadcasting as Bing Crosby uses Ampex model 200 to delay his ABC

Only Comm/Scope Coaxial Cables are backed by a five-year guarantee!



When we say Comm/Scope Extended Spectrum Coaxials are the best, we mean it. And we back it with this exclusive five-year guarantee.

Comm/Scope Extended Spectrum Coaxials give you an expanded transmission range to 300 MHz and beyond. With total frequency utilization, top to bottom.

Now, you'll have growing room for tomorrow's needs. And they're available in exclusive Alumagard® and Coppergard® constructions for aerial or direct burial installations.

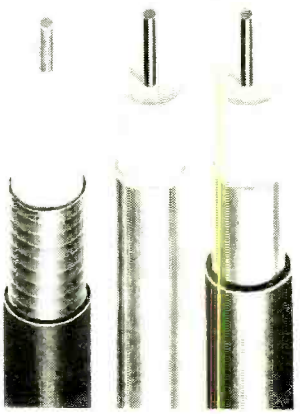
When it comes to coaxial cable performance, specify the ones that are guaranteed. Comm/Scope Extended Spectrum Coaxials.

For information and prices, write or call:

COMM/SCOPE CORPORATION

P. O. Box 2406 Hickory, North Carolina 28601
Phone 704/328-5271

A SUPERIOR CONTINENTAL COMPANY



Circle 118 on Reader Service Card

Broadcasters, too, will substantially increase the variety of services offered over the next 15 years through data distribution during TV's vertical interval as well as the more conventional broadcast activities.

Television over-the-air will expand greatly as the number of multi-set homes increases and as the trend towards more portable sets continues. Broadcasters will increasingly become production centers and will eventually produce specialized programs for wire distribution. By the year 2020 we should see the development of a sophisticated home entertainment communications console with computer capability, visual telephone, television, and closed circuit TV all combined in one unit. The major effect this agglomeration of services will have is to blur the present rather clear distinctions between publishing, broadcasting, cablecasting, computing, and person-to-person communication.

—George C. Hatch, President, KUTV and Senior VP, Tele-Communications

Videofile Information to the Home

IN AN INDUSTRY as dynamic as the broadcast industry it is extremely difficult to predict the technical innovations that will take place in the next fourteen years. As an example, it has been exactly 14 years since the introduction of the first videotape recorder by Ampex in 1956. It certainly would have been impossible to predict the tremendous impact videotape has had on the broadcast industry.

We do expect to see the same magnitude of dramatic changes by 1984. Commercials which are predominantly film at the present time will have switched completely to tape; movie production will have switched from film to tape to reduce costs; and the consumer market will be deeply penetrated by video recorders. Pre-recorded video tapes will be as prominent as present pre-recorded audio tapes.

Perhaps the biggest change will be in the growth of wired (CATV) service greatly augmenting the radiated rf systems now used. This opens up new capabilities of receiving and sending information.

The present information storage and retrieval concepts will be made obsolete by the use of our expanded videofile and pyramid systems since this information can now be brought to the home via cable.

—W. E. Roberts, President Ampex Corporation

Service Rendered will be More Personal

A PREDICTION would be naive indeed if we assume that the discovery of the solid-state device, for example, represents the ultimate contribution to the communications art. But whatever the future sequence of technical breakthroughs may be, they most certainly will contribute to an increasing personal involvement with communications.

It is certainly conceivable that the concept of broadcasting heretofore limited to the general dissemination of information and entertainment will expand to include the notion that individual listener-viewers should be able to respond to, or interrogate, the broadcaster directly and instantly.

Electronic communications will improve and increase—not only on a world-wide and nation-wide basis, but more particularly at a community level.

The demand for specialized, multiple broadcast services will increase. We are all aware of the limited spectrum space to accommodate even current requirements. New techniques will be developed to permit simultaneous transmission of many aural and visual services over a single transmitter per community, operated under a joint tenancy arrangement, with subchannel occupancy devoted to specialized programming, such as news, entertainment, finance, sports, educational courses, and other specific areas. The receiving equipment will be capable of not only instant listening-viewing, but also low cost, automatic program storage for delayed use.

International and national program sources to the broadcaster will be available on a continuous basis from communications satellites. The broadcaster will maintain vast information storage banks with output available to an individual listener by automatic, private interrogation. In short, the service rendered by the broadcaster will be of greater scope

Continued on page 86

Radio program. (BBC had used steel tape in 1936; German radio had used tape during WW II.) FCC deletes TV channel 1, freezes TV grants, authorizes 10-watt educational FM stations. Dr. Peter Goldmark of CBS Labs invents LP record. National political conventions in Philadelphia seen live on 6-city network.

1949: First experimental CATV system is installed at Astoria, Oregon. RCA introduces 45-rpm record.

1950: North American Regional Broadcasting Agreement, governing AM allocations, signed by U.S. and others. FCC authorizes experimental pay TV. First commercial CATV system is installed at Lansford, Penna. TV network coaxial cable reaches Chicago.

1951: Commercial color TV begins, using CBS field-sequential system. TV network coaxial cable reaches coast-to-coast. NCTA formed. First multiple-antenna installation on Empire State Building: 5 TV, 3 FM stations. RCA introduces vidicon camera tube.

1952: FCC lifts TV freeze, assigns uhf channels 14-83; reserves educational TV channels. KPTV Portland, Ore. comes on air as first commercial uhf TV station.

1953: FCC authorizes NTSC compatible color. KUHT Houston comes on air as first educational TV station.

1955: FCC authorizes commercial SCA operation by FM stations; KPEN-FM Philadelphia and WWDC-FM Washington get first grants.

1956: Ampex introduces first videotape recorder, VR-1000.

1957: Paul Schafer installs first broadcast automation system at KGEE Bakersfield, Calif.

1959: Broadcast Electronics and Automatic Tape Control each introduce audio cartridge-tape recorders.

1960: WKRC-TV Cincinnati becomes first fully automated TV station.

1961: FCC authorizes stereo FM, a composite of the GE and Zenith systems. GE's WGFM Schenectady and Zenith's WEFM Chicago are first on air with commercial stereo. Machtronics introduces first helical VTR.

1962: First live telecast via satellite, U.S. to Europe. N. V. Philips develops Plumbicon camera tube.

1964: All-channel TV law takes effect.

1966: FCC asserts jurisdiction over CATV.

1969: First interplanetary telecast: Apollo 11 astronauts Neil Armstrong and Edwin Aldrin do live remote from Moon.

a lens for all reasons

Rank Taylor Hobson lenses make everything look good.

A full range for all purposes: closed circuit, educational, CATV, broadcast and motion pictures.

Take our Zoom lenses, for instance: Monital 5:1 and 8:1 for Vidicon.

Varotal 10:1 and 16:1 with built-in range extenders; the F-22; for utilization on *Plumbicon, image orthicon, monochrome and color cameras, TK-44A, PC-70, GE-350.

And Cintel Products make everything look even better. Film color balance correctors...Film Chains, Flying Spot Slide Scanners...Color Monitors ...Monochrome Monitors...NTSC Decoders...PAL Decoders... NTSC Encoders...PAL Encoders... Single Wire Control Systems.

Rank Taylor Hobson lenses. Cintel Products. They're very good for the image.

*N. V. Philips Trademark

RANK PRECISION INDUSTRIES, INC.
East Coast: 260 North Route 303, West Nyack, New York 10994
West Coast: 4351 Tujunga Avenue, Studio City, California 91604

During the NAB visit BOOTH 220 West Hall

Circle 120 on Reader Service Card

The Shure SM58 *self-windscreened unidirectional* microphone is ideal for broadcast uses such as remote news, sports, interview and vocal recordings because it eliminates or minimizes the irritating "pop" caused by explosive breath sounds. With the SM58 you will have the peace-of-mind assurance that you're delivering the quality audio that goes with pop-free pickup. It's great for studio announcing, too—or wherever the announcer or vocalist has the audio-degrading habit of "mouthing" the microphone. Of course, the same filters that eliminate pop also do away with the necessity for an add-on windscreen in outdoor uses.

On the other hand, the unusually effective unidirectional cardioid pickup pattern (uniform at *all* frequencies, in *all* planes) means that it is a real problem-solver where background noise is high or where the microphone must be operated at some distance from the performer. Incidentally, but very important, the SM58 tends to control the low frequency "boominess" that is usually accented by close-up microphones.

All in all, close up or at a distance, the Shure SM58 solves the kind of ever-present perplexing problems the audio engineer may have felt were necessary evils. The SM58 might well be the finest all-purpose hand-held microphone in manufacture today. And, all things considered, it is moderate in cost.

Other features: the complete pop-proof filter assembly is instantly replaceable in the field, without tools. Filters can be easily cleaned, too. Stand or hand operation. Detachable cable. Rubber-mounted cartridge minimizes handling noise. Special TV-tested non-glare finish.

For additional information, write directly to Shure Brothers Inc., 222 Hartrey Ave., Evanston, Illinois 60204.

SHURE SM58

SELF-WINDSCREENED UNIDIRECTIONAL DYNAMIC MICROPHONE

SHURE PROFESSIONAL MICROPHONES . . . FOR BETTER AUDIO

MODEL SM56
CARDIOID
DYNAMIC

Extremely versatile in studio, control room, and remote use. Also widely acclaimed for rhythm recording. Bright, clean sound. Exceptionally uniform cardioid pattern gives optimum control of environment.

MODEL SM33
UNIDIRECTIONAL
RIBBON

Warm, smooth sound for studio, control room, and scoring stage. Super-cardioid directional pattern. Compact, yet rugged.

MODEL SM76
¾" OMNIDIRECTIONAL
DYNAMIC

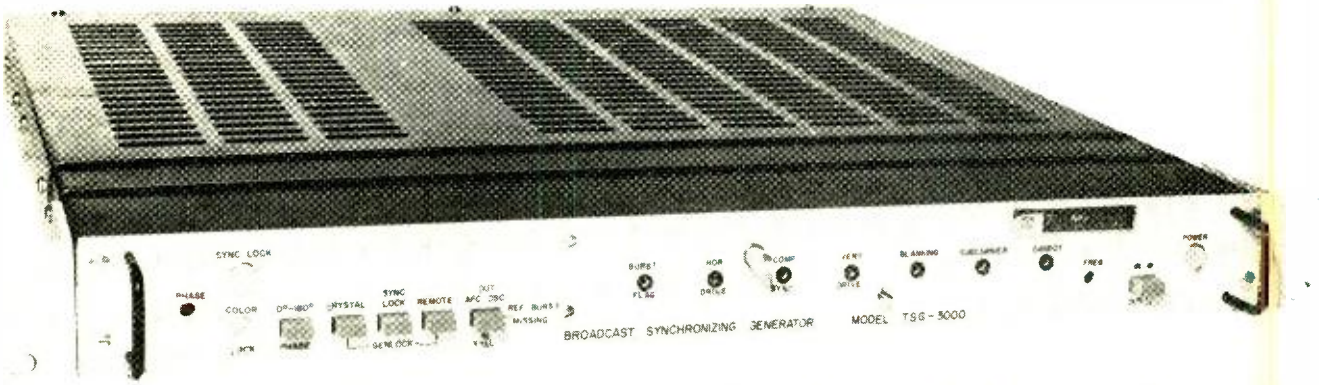
Ideal for interviews and audience participation, yet unusually smooth wide range response (40-20 KC) for critical music reproduction. Instantly detachable from stand. Steel case with Cannon connector.

MODEL SM50
OMNIDIRECTIONAL
DYNAMIC

Self-windscreened and pop-free for news, sports, remotes, and interviews. Also ideal for many studio and control room applications. Comfortably balanced for hand or stand use. Natural response.

Circle 121 on Reader Service Card

TeleMation announces another industry exclusive



The new TSG-3000 all-digital broadcast color synchronizing generator with programmable pulse widths and digital genlock.

In 1966 TeleMation introduced the TSG-2000 Series Broadcast Synchronizing Generators — the industry's first all-digital sync generator that offered near perfect time base stability.

Now, the ***new*** TSG-3000 with all-digital circuitry, the highest time base stability, lowest pulse jitter performance available. Plus, programmable pulse widths and *digital* genlock for *Crashlock* (next-field, operator-controlled lockup) or *Ratelock* (adds or subtracts one line per field until lockup is achieved).

It's another example of how TeleMation's advanced concepts in IC/MSI/LSI technology give you a better product. Find out more.

Talk to TeleMation.

TeleMation

2275 South West Temple
Salt Lake City, Utah 84115
(801) 486-7564

Circle 122 on Reader Service Card

Multiplexing Telemetry Signals at an AM Station

By Thomas R. Haskett, Associate Editor

Now an AM station can remote-control its transmitter by a uhf STL, and telemeter back the log data by multiplexing it onto the main AM carrier.

THE IDEA OF getting rid of the leased telco lines normally used for remote reading of plate voltage and current, etc. is not new. But in 1962 Moseley Associates, Inc. did something with the idea; they filed a formal petition with the FCC to amend the rules and permit telemetry multiplexing at AM broadcast stations. After years of experimenting, the FCC agreed. Since December 8, 1969, it has been legal to telemeter transmitter operating parameters on an AM carrier. (See "Interpreting FCC Rules and Regulations," *BM/E*, February 1970.)

How it Works

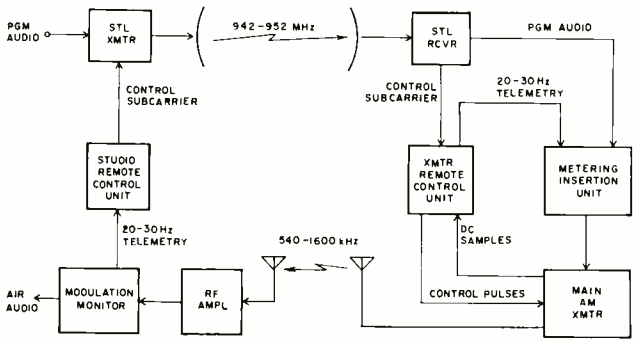
The first system available for AM telemetering was introduced recently by Moseley (who else?).

To operate, control and telemeter a remote transmitter entirely without wire lines, you must establish two paths between the studio (or control point) and the transmitter site. The block diagram shows how this is done. The upper path is a fairly conventional STL which carries program audio and control signals from studio to transmitter. Control signals modulate a 26-kHz subcarrier which is then multiplexed with the program audio on the uhf STL transmitter.

At the AM transmitter, the STL receiver separates program audio and control subcarrier. The transmitter remote-control unit converts the modulation on the 26-kHz subcarrier back to control pulses, which operate the AM transmitter.

Meanwhile sampling points in the AM transmitter convert plate voltage, plate current, etc., into dc voltages, as in all remote-control systems. Within the transmitter control unit, these dc voltages are converted into subaudible tones in the range 20-30 Hz. The dc sample voltage determines the actual frequency of the subaudible metering signal, which is then combined with program audio in the metering insertion unit. Finally, the composite signal is applied to the audio input of the AM transmitter. By FCC rule, the frequency of the subaudible tone may not exceed 30 Hz.

The metering insertion unit is controlled from the studio via the control subcarrier. When the insertion unit is turned on to obtain a meter reading, three actions occur: A high-pass filter is inserted in the program audio circuit to remove any program material in the telemetry region; a pad is inserted in the program audio circuit to back off program modulation and allow room for the 6% telemetry modulation; and the 20-30 Hz telemetry signals are fed into the main transmitter. By FCC rule, the total modulation of both program audio and telemetry must not exceed 100% on negative peaks. Telemetry multiplex modulation is limited to 6%.



Complete wireless remote-control system devised by Moseley looks like this. Radio STL isn't necessary to main-carrier telemetry, but why not go rf all the way and forget about wire lines?

Studio Equipment

One thing cannot be telemetered on the main carrier—total modulation percentage. Thus it's necessary to use an rf amplifier and modulation monitor at the studio or control point. In the monitor, a 40-Hz lowpass filter removes program audio and furnishes the 20-30 Hz telemetry to the studio remote control unit. The telemetry tones are then converted into dc voltages to drive the meters.

Except when actually taking meter readings, no telemetry tones are inserted onto the carrier.

Many existing monitors aren't set up to separate telemetry from program audio and must be modified to do the job. Moseley is in the process of getting FCC type approval on a new modulation monitor which includes an rf amplifier, and which has been designed for the telemetry system. **BM/E**

Multiplexing Teletype Signals at an AM Station

By Larry Peden and John W. McMains.

If multiplex will work in FM, why not in AM? This proposed system phase-modulates the AM carrier below 20 Hz with teletype signals. It could be useful for transmitting hard copy news to subscribers, or as a two-way point-to-point data link.

MULTIPLEXING'S primary advantage is that it shoehorns extra information into a given bandwidth for more efficient spectrum use. FM and TV use multiplexing to transmit stereo, SCA, and color information, but until recently AM has been limited to a single information channel.

In the system described here, teleprinter signals at up to 100 words per minute can be added to an ordinary AM broadcast or shortwave signal without affecting the main program. The process could be used to transmit hard-copy news, stock quotations, or other data to paying subscribers, or as an order wire link between the station and mobile units. It could also be used for internal communications between nearby stations which are under common ownership, affiliated with a regional network, or engaged in civil-defense activity. Anywhere a broadcast AM signal can be received with good S/N ratio, teleprinter signals could be received.

Known as PM * PM, the Barry Research system requires a teleprinter and an encoder at the transmitter, and another teleprinter and a decoder at the receiver. With additional conversion equipment, the PM * PM system will handle other formats of binary data. If the received signal has a good S/N ratio, the character error rate of the PM * PM system is about 1%.

Since PM * PM is an add-on system, it makes use of existing transmitting and receiving facilities and requires no additional antenna construction or transmitter installation. It uses no additional rf spectrum space. And it's probably less expensive than existing common carriers.

The PM * PM system has been successfully tested by the Voice of America using their regular shortwave transmitters to send hard copy overseas. The system has not been used in domestic AM broadcasting and FCC approval has not yet been sought.

How It Works

Teleprinter signals are encoded on a subcarrier below 100 Hz. This subcarrier is then made to phase modulate the main carrier, as shown in Fig. 1. Maximum carrier deviation produced by the phase modulator is less than the 20-Hz frequency tolerance required by the FCC for AM stations. Since phase modulation is used below 20 Hz, ordinary AM receivers don't respond to the teletype signals.

In Fig. 2 you see the frequency distribution at a hypothetical station transmitting both teleprinter data and a normal program. The dark areas are the teleprinter signals, which are lower in amplitude than the main-channel signals. Note also that the teleprinter signals are much closer in frequency to the carrier than to the voice-and-music sidebands.

Synchronous detection is necessary so that the sampling rates used in encoding (at the transmitter) and decoding (at the receiver) rates are identical. Accordingly, crystals are used at each point. At the receiver, limiters and filters remove the main program and any noise, and the tele-

Continued on page 80

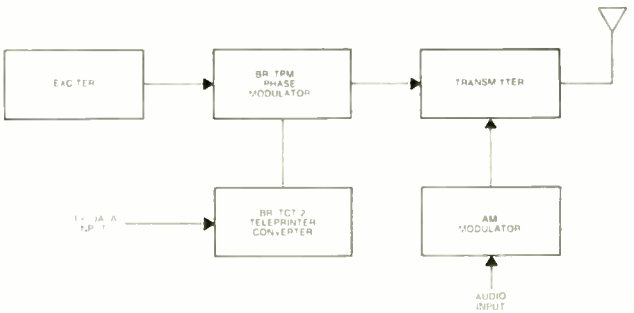


Fig. 1. Here's how an AM transmitter could be modified for PM*PM teletype transmission. The phase modulator goes between the exciter and PA stages.

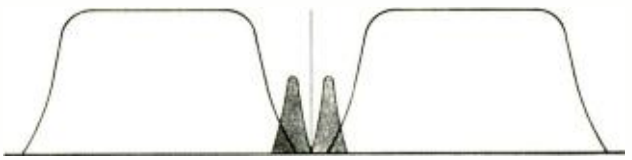


Fig. 2. Typical AM frequency spectrum showing carrier (center), PM*PM signals (dark areas) and AM sidebands (light areas).

Larry Peden is secretary-treasurer and **John W. McMains** project engineer at Barry Research Corp., Palo Alto, Calif.

HELICAL VIDEO
What's Available

Summary of Helical-Scan VJR Formats

Brand	Model	No. of video heads	Tape width inches	Tape speed ips	Tape-drum wrap	Play time mins.	Hor. res. lines	Color or B&W	Price
Ampex	VR-5100, 7000 Series	1	1	9.6	Omega	60	300-350	Color, B&W	$1600-16,500
	VR-660 Series	2	2	3.7	Alpha	300	350	Color, B&W	9000-10,000
Craig	6401, 02, 04	2	½	9.5	Omega	63	250	Color, B&W	850-1200
	6403	2	1	7.5	Omega	96	400	Color, B&W	4000
Diamond	DP-1E	2	½	9.46	Omega	63	230	Color	1195
Power	DP-2, 3	2	1	7.5		96	350		4450-9750
IVC (B&H, GPL, RCA)	600/800 Series	1	1	6.9	Alpha	60	400	Color, B&W	1835-7600
	900 Series	1	1	6.9	Alpha	195	400	Color, B&W	11,000-18,500
Panasonic (Concord)	NV-8100 Series	2	½	12	Omega	40	260	B&W	850-1400
	NV-204/505 Series	2	1	8.57	Omega	67	350	Color, B&W	3750-5000
Philips	LDL-1000	2	½	7.9	Omega	38	220	B&W	650
	EL3401B/54	1	1	9	Alpha	60	250	B&W	995
	EL3403A	1	1	7	Alpha	60	320	B&W	2200
Roberts	1000 Series	2	¼	11.25	Alpha	40	200	B&W	1095-1800
Shibaden	SV-700/800 Series	2	½	7.5	Omega	60	300	B&W	995-1295
Sony	CV Series	2	½	7.5	Omega	60	220	Color, B&W	675-850
(GE)	EV Series	2	1	7.8	Omega	60	240	Color, B&W	3700-5990
	PV-120U	2	2	4.25	Alpha	90	330	Color, B&W	Discontinued
Wollensak	VTR-150	1	½	7.5	Alpha	60	.....	B&W	995

Company names in parentheses indicate additional suppliers of same or similar VTR.

Only three manufacturers make broadcast standard quadruplex VTRs, and most tapes recorded on such machines are interchangeable. The format is standard—two-inch tape and speeds of 7½ and 15 ips. Unfortunately, the helical recorder situation is not this uncomplicated. The various manufacturers use one or two video heads, three tape widths, 15 tape speeds and three methods of tape-drum wrap. At least 16 separate formats are now in use. In general, a tape recorded on one brand of helical machine cannot be played back on another brand.

You get what you pay for. An inexpensive VTR ($650) does not produce a broadcast-quality picture and is usable chiefly in training, education, industry and business. Top-of-the-line VTRs ($16,000-18,000) make an NTSC color picture with broadcast quality. In general, VTRs using half-inch tape are less expensive, but unsuitable for broadcast use. All helicals have stop motion (still framing); some additionally have slow motion. Some have a second audio channel, useful for cueing.

First helical VTR standard

As we go to press, Sony announces a new AV series of VTRs using the Type 1 Standard established by the Japan EIA for half-inch helicals. This could be the first step toward a universal helical format. The Sony AV series format is similar to that of the CV shown above: two video heads; single audio head; tape speed 7.5 ips; 60 minutes play time with seven-inch reel; video bandwidth 2.5 MHz; video S/N ratio more than 40 dB.

TAPE RECORDERS
Operation and Maintenance

By David L. Bower

Low-cost television recorders operate differently from their BC big brothers. Here's a rundown on operation and maintenance of slant-scan VTRs.

SINCE THE HELICAL-SCAN videotape recorder was first developed nearly a decade ago, it has become a widely used CCTV instrument in education, industry and similar fields, and occasionally even in commercial broadcasting. The composite signal produced by most helical recorders isn't broadcast quality, like that of the broadcast-standard quadruplex machine. Bandwidth and sync stability are two major differences. However, helicals cost only from $650 to $17,000, depending on the degree of picture resolution and color or monochrome capability. Broadcast quadruplex machines, by contrast, are priced from $50,000 to $100,000. Thus helicals are popular in less critical applications.

There are several important differences between quadruplex and helical VTRs:

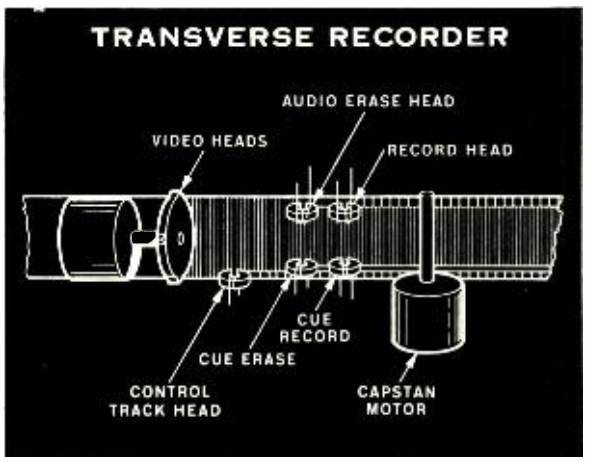
- The quadruplex has four video heads (whence its name); the helical has one or two.
- As shown in Figure 1, the quadruplex tape passes straight by the head wheel, which rotates at a right angle to the tape path. The video tracks are therefore recorded laterally, at approximately a 90° angle to the tape path. In a helical VTR, the tape wraps around the head drum at a slight angle to the direction of drum rotation. The heads thus scan the tape at a 5° angle, which is the approximate angle at which the video tracks are recorded.
- In a quadruplex machine, approximately 16 lateral tracks (or head/tape passes) are required to record a single video field. In a helical, the head drum and tape speeds are such that each recorded track contains a single field. Thus the helical has an advantage over the quadruplex. In a helical, when tape motion is stopped but the head drum continues to rotate, the machine displays a single field, an effect called still-framing. If this were tried on a quadruplex, the result would be an incomplete, unsynced raster.
- Since the quadruplex recorder cuts each field into horizontal strips (as each of the four heads scans the tape laterally), head switching must be done precisely and accurately to reassemble the picture. In the helical, an entire field is recorded at each pass of the head across the tape. Consequently, the complicated head-switching circuits aren't required in a helical, making it less complex and therefore less expensive.

Audio and control tracks are recorded in the conventional longitudinal manner along the tape edges by stationary heads in both quadruplex and helical machines.

David Bower is chief engineer of Television Services at the University of Tennessee in Knoxville.

Basic Helical Operation

As shown on page 48, there are no industry standards for helical formats; at least 13 configurations are used. One important part of the format is the tape-to-drum wrap, and three types



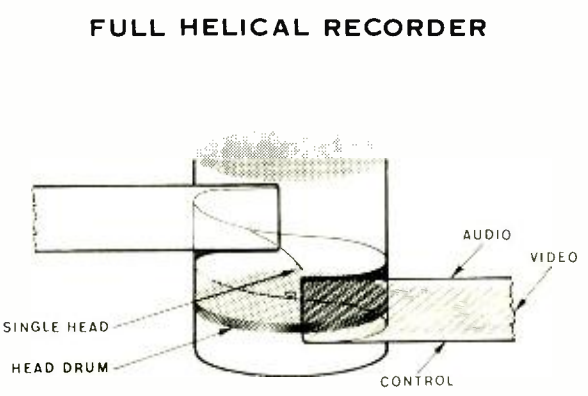
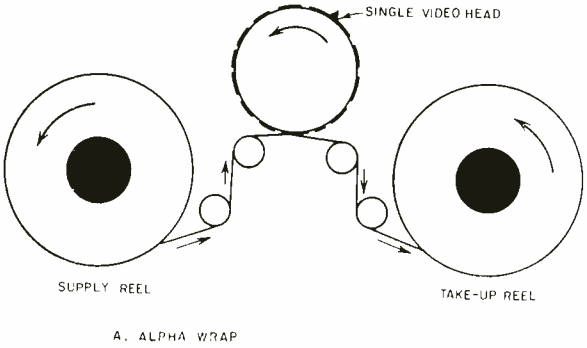
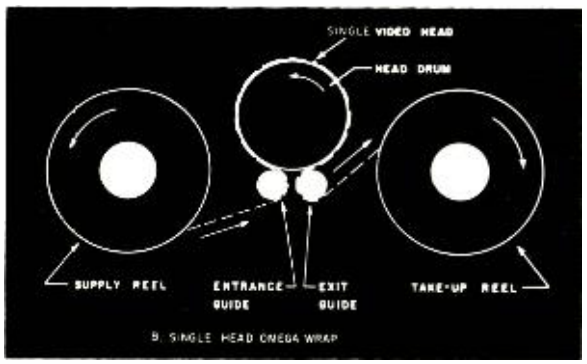


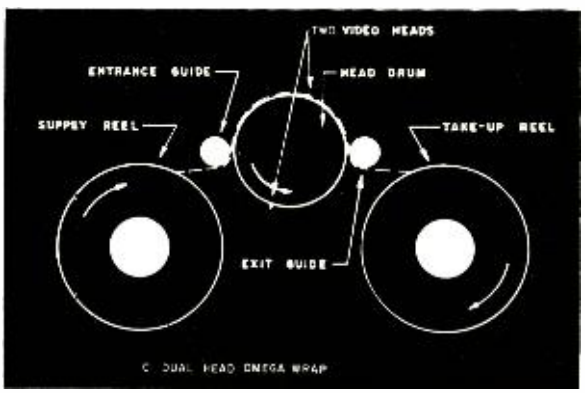
Fig. 1. In the transverse or quadruplex VTR (left) the four video heads scan the tape at approximately a right angle. In the helical recorder (right) the video head(s) scan at a slight angle to the direction of tape travel.



A. ALPHA WRAP



B. SINGLE HEAD OMEGA WRAP



C. DUAL HEAD OMEGA WRAP

Fig. 2. Tape-to-head-drum wrap is called alpha or omega, depending on which Greek letter the tape path resembles.

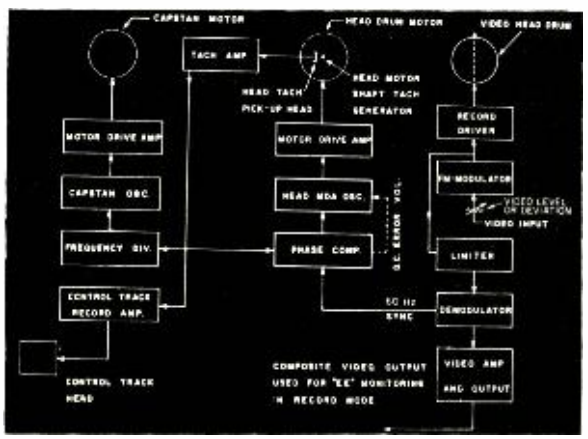


Fig. 3. Typical helical VTR in the record mode. Reference sync is derived from incoming composite video signal

are used, as shown in Fig. 2. In the single-head alpha wrap, the tape passes completely around the head drum, making 360° contact.

In the single-head omega wrap, the tape makes contact for all but a few degrees of the circle. Since the head loses contact with the tape for a small portion of each scan, there is a video dropout once each field. This blank space is positioned near the vertical blanking where it isn't very noticeable.

The double-head omega wrap brings the tape into contact with the head drum for 180°. Since there are two heads, no video is lost, except for the short switching transient, which is placed within or near the vertical blanking interval.

While the single-head helical doesn't require head switching, obviously a double-head type does. However, the circuitry required to switch two full-field helical heads is far less complex than the required to switch the four quadruplex heads.

Aside from format differences, most helical machines are similar in operation. To assure precise synchronization between head drum rotation and tape travel, a servo control loop is used with an error circuit. The arrangement is similar to that used on quadruplex machines, but a bit more critical. For one thing, the helical head drum is usually larger than the quad head wheel, with the result that error correction takes longer to accomplish. Also, the fewer heads of the helical must contact the tape for a longer period than those of the quadruplex, increasing sticktion (tape-to-drum friction), and making the reproduced picture more prone to instability. Constant tape tension minimizes picture jitter, and the entrance and exit tape guide adjustments are therefore quite critical in a helical machine, for they help determine tape tension.

Record Mode

Similar modulation systems are used in both quadruplex and helical VTRs. It is impossible to record video directly on tape because of two facts: video response in the US 525-line system is from near dc to over 4 MHz, a range of about 18 octaves. The output of a tape head during playback rises at the rate of 6 dB per octave; the required dynamic range of a direct video system is therefore 114 dB. But tape noise is only about 60 dB below tape saturation level; hence direct recording can't be used.

What happens is this: incoming video is heterodyned upward to the vicinity of 3-5 MHz with a bandwidth of 3 or 4 MHz, but a range of only a couple of octaves, which is easily handled by tape heads. Further, frequency modulation is used so the signal may be recorded close to the tape saturation point, thereby maintaining the signal-to-noise ratio as high as possible. Also, since no amplitude variations are present, high-frequency bias is not needed.

In the typical helical recorder, incoming com-

posite video goes through a level-set control to the frequency modulator, as shown in Fig. 3. The level control determines the amount of frequency deviation caused by the modulator.

Some manufacturers make blanking level equal to the unmodulated center frequency. In such a system, white peaks cause maximum positive frequency deviation by the modulator, and sync tips cause maximum negative deviation. However, some manufacturers place the sync tips at the center-frequency point. In this system, blanking and video both cause positive frequency deviation and there is no negative deviation.

Within certain limits, an increase in modulator frequency deviation produces a better signal-to-noise ratio in the reproduced video signal. Improper setting of the deviation or level control is a common cause of an inferior picture.

The modulator output is fed to two circuits. It goes to the video record driver, which drives the video head(s) on the head drum. The signal also is fed through a limiter and demodulator to the video output stage. The composite video at this output is monitored during the record mode to assure proper equipment operation. This facility is called EE (electronics-to-electronics) monitoring.

Meanwhile, the demodulator furnishes vertical sync to a phase comparator which drives the head MDA (motor drive amplifier) oscillator. Output from this oscillator is amplified by the motor drive amplifier and furnishes the driving power for the head drum motor.

For black-and-white operation, the head MDA oscillator operates at 60 Hz in a single-head machine, and 30 Hz in a dual-head version. These frequencies mean that the single-head machine records (or plays back) a single field for each head revolution, and a double-head machine records two fields (one per head) for each head revolution.

For color operation, the head servo oscillator frequencies are 59.94 and 29.97 Hz, respectively.

If the head drum motor were simply driven by the motor drive amplifier and head MDA oscillator, mechanical irregularities and tape stickion would produce uncorrectable timing errors and an unstable playback picture. To avoid this, a feedback loop is established. The actual rotation rate of the head drum is monitored by the tachometer amplifier, and this signal is compared with vertical sync in the phase comparator stage. The resultant dc error voltage is applied to the head MDA oscillator, correcting the head drum rotational frequency so that it agrees with incoming vertical sync.

The tach-amplifier output signal is also recorded on one edge of the tape as reference for capstan control during playback. Additionally, the tach signal goes to a frequency divider whose output is fed to the capstan oscillator. Following this oscillator is the capstan motor drive amplifier which actually powers the capstan motor. Thus capstan speed (and consequently tape travel rate) is directly related to head drum rotational speed, and both are derived from incoming vertical sync.

Playback Mode

As shown in Fig. 4, the video head picks up the frequency-modulated rf signal from the tape during playback. First the signal goes through an rf preamplifier to establish a good S/N ratio through the playback circuits. Next the signal is limited to remove any amplitude modulation and noise. It's then demodulated and amplified by the video amplifier, finally appearing at the output as a composite video signal.

During playback, the servo system control circuit must be referenced to an external standard —either house sync or the 60-Hz power line. The servo system cannot use the sync recorded on the tape, because the servo system is a part of the sync-recovery network. Besides, the reproduced video must be sync-compatible with the system it's fed into. For black-and-white operation, power-line 60 Hz may be used as the reference. For color operation, 59.94 Hz from a

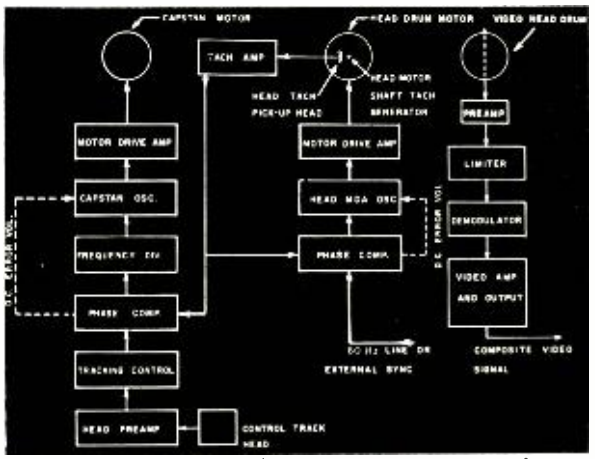


Fig. 4. In the playback mode, the VTR must use external sync, as recorded sync varies with tape speed errors.

crystal-controlled generator is essential.

Tach-amplifier feedback is compared with reference sync to control the frequency of the head oscillator in both playback and recording modes.

Capstan speed, however, is determined by a slightly different method during playback than during record. The recorded tach signal on the tape control track is picked up by the control-track head, amplified and fed to a phase comparator which also receives the signal from the tach amplifier. The comparator then produces a dc error voltage which overrides the capstan oscillator and phase locks the capstan motor with the head motor.

In essence, the recorded control track locks playback time base to record-mode time base. In audio recording, a tape may be played back at a slightly different rate from that at which it was recorded and the reproduced signal will sound perfectly acceptable. Such is not the case in video

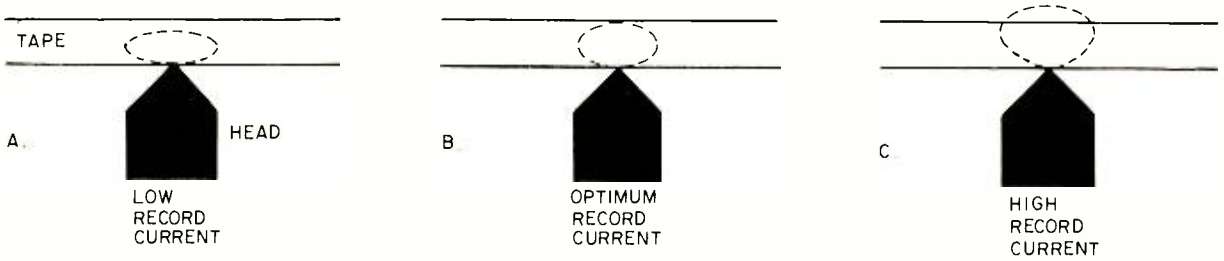


Fig. 5. Head optimization determines the video S/N. You should aim for condition (b), as explained in text.

recording. Playback time base must equal recording time base for picture stability and quality. A broadcast-quality helical in fact, has a tightly controlled servo loop which provides a highly stable picture with precise sync pulses.

Maintenance

As a general rule, before each use of a helical VTR, the reel-to-reel tape path should be cleaned. Use Freon TF spray and a lint-free cloth, or isopropyl alcohol and cotton swabs. Remove all tape from the machine, wet the cloth or cotton, and carefully wipe all parts in the tape path—especially the head drum.

Normally it isn't necessary to degauss a helical used for recording, since the recording process demagnetizes the heads. But weekly degaussing is necessary for a playback machine. And degaussing the reel-to-reel tape path of all machines is a good idea every month or so. You can use a conventional audio tape-head degausser, but if the pole pieces are bare metal, wrap them with plastic tape to prevent their sharp edges from scratching the heads. Plug the degausser into the ac line and bring the pole pieces as close as possible to the heads, idlers and support arms, rotating the degausser slowly and thoroughly. Then remove it to at least five feet from the VTR, and unplug the degausser.

If a VTR is used several hours a day, it's a good idea to align and adjust it weekly. However, your own evaluation of picture quality should be the ultimate guide to frequency of alignment. Unstable pictures, video dropouts and noise, all indicate a need for running through basic setup.

The first section to be aligned is the modulator. From the manufacturer's service manual, determine the correct unmodulated center frequency of the modulator. Next adjust an accurately calibrated rf signal generator to that frequency and loosely couple generator output to the modulator. Place the VTR in the EE mode to observe the signals called for. An oscilloscope with an rf detector probe should be coupled to the modulator output. Finally, adjust the modulator (oscillator) center frequency for zero beat with the generator.

Next, use a low-capacitance probe with the scope, and tie it to the demodulator video output. Feed house sync into the VTR and set the scope controls to display the horizontal sync interval. Minimum rf should be present on the sync tips. If not, readjust the modulator oscillator slightly for the least rf, and check its frequency again.

To adjust the deviation control, a video signal generator is required to furnish a window signal. In lieu of the window signal, a video signal containing white information at 100 IRE units is needed. Leave the scope connected as in the previous step and feed the peak white signal into the video input jack. The signal generator should be adjusted to manufacture the frequency recommended by the VTR manufacturer for peak white deviation—normally higher than the unmodulated center frequency. Next, adjust the input video gain control (deviation control) until zero beat is observed at peak white frequency. The modulator is now capable of producing the best picture with maximum S/N ratio.

Balance Controls

Some VTRs are equipped with an rf balance control, which should be adjusted for minimum rf on the composite video signal at the demodulator output.

Achieving proper level of video record current is known as head optimization, and is best done after the preceding adjustments have been made. Head current determines the amount of field penetration into the tape, which in turn determines the S/N ratio.

In the record mode, an elliptical magnetic field is produced perpendicular to the video head. The field penetrates the tape oxide coating; the greater the head current, the greater the field penetration. Figure 5 indicates head field penetration

In a class by itself

One slant-scan VTR isn't shown in the format table on page 48. Neither fish nor fowl, the Westel WR series is helical with the quality and price tag of a quadruplex. It uses direct color recovery and thus can lock to station sync, letting you do cross-fades, split screens, and electronic editing along with quadruplex machines. Also, Westel uses broadcast standard high-band modulation. Other details: two video heads; one-inch tape; tape speed, 15 ips; modified omega wrap, six scans per field. Prices start at $29,950 for black-and-white and $42,250 for color.

for several values of record current. At (a) the current is too low and the field does not penetrate the tape completely, producing a poor S/N ratio. At (b), head current is correct, as the field cleanly penetrates the oxide all the way through. At (c), current is too high and the field overpenetrates the oxide, saturating the tape and producing a distorted signal.

The only way to determine the proper amount of record current is to try several values and see which one gives the best rf signal. Locate a low-value resistance that's in series with the video head and strap a high-impedance voltmeter across it to read the voltage drop (which is proportional to current). The exact value of the resistance isn't important because you are only going to take comparitive voltage readings, and you don't even have to convert them to amperes.

Feed a window signal into the VTR and start recording. Read the voltmeter indication aloud into the audio channel of the tape. Try different values of record head current. Repeat this process, making small changes in head current using the record current control on the VTR.

Next rewind the tape and play it back, monitoring the rf signal at the limiter input on a scope. Listen to the audio track. You will notice that at one value of head current the rf signal envelope peaks. That is the best setting of the record current control. Identify the voltage value read on the tape at that point, and duplicate it with the machine in the record mode.

Servo Alignment

Without correct servo alignment, the reproduced picture usually has horizontal and/or vertical jitter. As mentioned earlier, the rotational speed of the head drum is determined by constant phase comparison between the input sync and the head tach output. To align the system, first consult the service manual and locate the voltmeter test point for the dc error voltage from the phase comparator, which controls the head MDA oscillator. Monitor this voltage with a VTVM or TVM. Thread a standard alignment tape through the machine; you cannot make this adjustment with a free running drum (tape stopped) for tape sticktion around the drum affects drum speed. You must obtain the alignment tape from the same company that made the VTR since other brands aren't compatible. Now play back the alignment tape and adjust the head MDA oscillator frequency until you read zero volts dc on the voltmeter.

Capstan speed in the playback mode is also controlled by a dc error-correcting voltage from a phase comparator. In this case, the recorded control track is phase-compared by a tracking control with the head tach output. That control positions the rotating video head over the center of the video tracks.

Misadjustment of the tracking control causes cross-tracking, wherein the video head reproduces between-track noise and/or adjacent video-track signals along with the desired picture information. For correct tracking, monitor the rf input to the limiter stage, and adjust the tracking control for a maximum-amplitude rf signal.

The power applied to both motor-drive amplifiers in the servo-loop system should be set with the MDA level controls according to manufacturer's recommendations. In economy machines, the drive level is fixed and cannot be readily varied.

Correct and careful adjustment of the servo loops while using a standard alignment tape will produce a very stable picture. The process also makes it possible to interchange tapes between machines of the same manufacture.

At least one helical VTR is equipped with a tension-servo system, which makes error corrections for dynamic stretching of the tape, and is essential in a broadcast machine to obtain the high stability required.

Some helical VTRS have a drum damping control. It should be adjusted for maximum picture stability while disturbing the drum physically and playing back a standard alignment tape. Drum servo recovery time varies with the adjust- of this control. Severe misadjustment of the control causes horizontal picture jitter.

The various level controls, tension adjustments and miscellaneous controls should be adjusted and aligned according to the manufacturer's instructions. **BM/E**

G.E.'s still in the game

This may come as news to some people, but General Electric never stopped selling helical VTRs. "It's just not our intention to get out of the video tape recorder business," says Paul Hauler, headquarters sales manager for G.E.'s Visual Communications Department.

What happened early last year was that G.E. had a surplus of helical recorders, coupled with the impending introduction of new models. So GBC bought the machines—about 2000 of them. GBC is still selling these Sony-built VTRs at the astounding price of $395. This leads to some speculation about the price paid to G.E. Given the usual 33⅓ percent markup, this places the package price at about $265. That's awfully cheap for a helical recorder, and may indicate low prices for the general market in a couple of years.

In the meantime, G.E. spokesmen have pointed out that the VTR sales program is a mainstay of company production and sales of TV cameras of all types. The rationale is to provide complete packages, thus encouraging sales of Syracuse-made cameras. In view of this, there's every indication that G.E. will remain in the Japanese VTR business for some time to come.

Look what they're saying about reliable Gates automation systems...

"We have Gates automation systems on both our 50 kW AM and our 100 kW FM stations. We've been able to make this commitment because our Gates systems have proven to be highly dependable."

Bob Kent,
KCTA-AM, KCTA-FM, Corpus Christi, Texas

"Our radio plant includes a lot of equipment that must operate flawlessly all the time. I couldn't be more satisfied with our Gates automation system for reliability and easy maintenance."

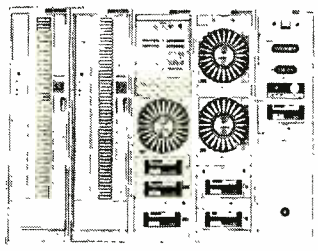
Ned Nolan, WJR & WJR-FM, Detroit, Michigan

"We operate 24 hours a day, seven days a week with a fast-paced, highly variable programming. Our Gates automation system never misses a trick."

Frank Laughlin, KGRC, Hannibal, Missouri

"Our equipment reliability is such that we look for human error first when we have that rare malfunction with our Gates automation system."

Carl Yates, KSIS, Sedalia, Missouri



If you're worried about the reliability of automation systems, forget it. Gates says you can. So do our customers! For more information about dependable automation, call us at (217) 222-8200, or write Gates Radio Company, 123 Hampshire St., Quincy, Illinois 62301.

HARRIS INTERTYPE CORPORATION

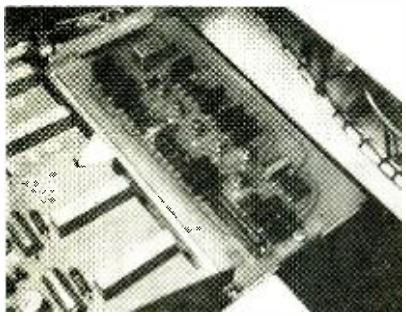
GATES

A DIVISION OF HARRIS-INTERTYPE

Circle 123 on Reader Service Card

BROADCAST EQUIPMENT

VTR accessory



Model BPS-1 remote burst phase shifter, designed for use with both Ampex VR-1200 and VR-2000 series video tape recorders. It puts control of burst phase adjustment on front panel ("where it belongs"). Phase shift ±30° in relation to burst, controlled available gain better than 2% and no more than 3% change in burst amplitude over full shift range with no distortion. B & M Electronics.

Circle 275 on Reader Service Card

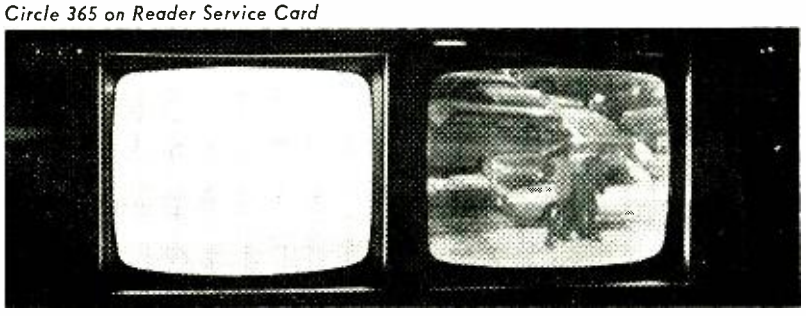
CCTV cameras—one economy, one day/night

A $625 solid-state CCTV camera (shown above) with all components, except vidicon and deflection assembly, on a single snap-out circuit board; 3-in-one lens kit for wide to tight angle viewing; 650 lines horizontal resolution. Motorola.

Circle 364 on Reader Service Card

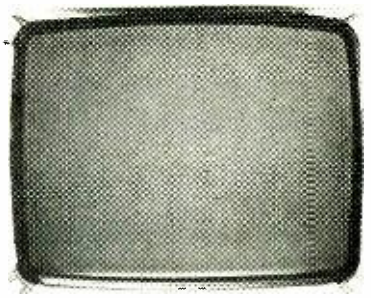
Another low light level CCTV camera provides pictures between 0.05 and 8000 footcandles, adapting automatically to day or night light; 10:1 zoom lens; locked interlace for sharp picture. Benefits from two recent developments: image intensifier is specially bonded to the fiber optics faceplate of the vidicon tube, and new attenuation technique improves reliability by protecting the vidicon in exceptionally bright light. $13,350. Monitors (below) show normal camera (left) and new camera (right). Motorola.

Circle 365 on Reader Service Card



Square monitor CRT

Fifteen-inch display and monitor tube, squared corners on a relatively flat screen. Industrial CRT model M38-100, with 3 × 4 aspect ratio, aluminized screen phosphors with



external conductive coating. Uses 90° deflection on a minimum useful screen size of 12.1 × 9 in. with minimum overall tube length of 15.2 in. Also available is M38-101 with longer neck to accommodate auxiliary "write" or "diddle" coil. Inter-Technical Group, Inc.

Circle 276 on Reader Service Card

High-power rf attenuator

Tenuline Model 8323, 100 W, will dissipate 99.9% of input to make

high-power rf measurements with low-level power meters; does rfi analyses on high-power transmitters when uniform attenuators are needed over a wide band of freq including several harmonics of design fundamental. 30 dB attenuation, range dc—500 MHz ±0.5 dB and input VSWR of 1.10 max. $165. Bird Electronic Corp.
Circle 277 on Reader Service Card

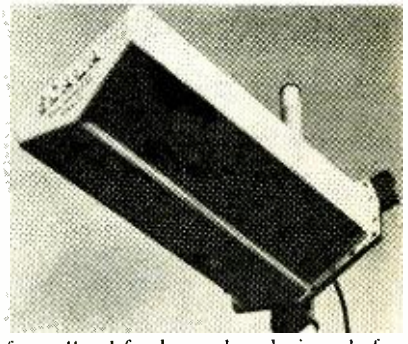
Trenchers

Fleetline 70+4 (65 hp, shown here) and 40+4 (37 hp), both with 4-wheel drive and limited slip differentials to equalize torque (saves

the grass); 4-way articulation for stability and tight maneuverability; one-hand Mono-Stick controls speed, forward and reverse, all turns and braking. Model 70+4 trenches from 6 to 18 in. wide and 86 (at 6 in. width) to 50 in. deep, at "infinitely variable speeds" up to 2200 ft/hr. Model 40+4 digs 4 × 60 to 16 × 24 in. at up to 1800 ft/hr. Davis Mfg. Div. of J. I. Case Company.
Circle 278 on Reader Service Card

Uhf radome

Model RA-450 housing for yagi array in 400—500 MHz region, also available with a frequency independent log above 400 MHz (Model CL-1483); with min. gain of 10 dB over an isotropic source (8 dB over a dipole), VSWR under 1.3 to 1 and gain stability less than 0.5 dB



for all uhf channels; designed for strength and weathering. Scala Radio Corp.
Circle 280 on Reader Service Card

Continued on page 59

WKZO chose a sharp mini ME-4 color processor to round off their color programming.

"In 1968 we wanted to round out our local color programming with color film," says Fred Douglas, News Director for the Kalamazoo station. "So we looked long and hard and decided on a mini ME-4 processor for the Kodak ME-4 Color Process. We chose a mini-machine for several reasons. Obviously the price was attractive, but we were more concerned about space. Those big processors are great, and turn out film real fast, but we just didn't have room for one in our active photo lab without extensive remodeling.

"We went into color film with some trepidation. Everybody said color was tricky. It isn't so. Our machine just sits there and cranks out great color film. And amazingly we've discovered that Kodak Ektachrome films give us even more latitude than black-and-white, while being very forgiving. I can't think of anything more important in the news-film business than using forgiving film because of the wide variety of shooting conditions.

"We've got 30 to 40 news stringers in Western Michigan shooting footage for our four daily news, and our major weekly farm programs. The film comes in all different lengths, exposures, etc., and the processor does it beautifully. In short, we've had real success with color film."

Are you afraid of color film? Re-read the above, then call a Kodak Regional Chief Engineer for more detailed information about color for you. Call Ray Wulf in New York, Dick Potter in Chicago, or John Waner in Hollywood. Call soon, or we're afraid you'll really be behind the times.

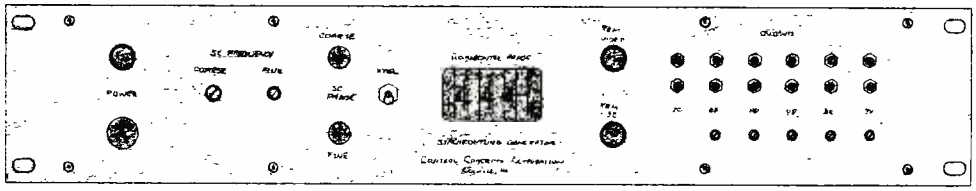
EASTMAN KODAK COMPANY

ATLANTA: 404/351-6510
CHICAGO: 312/654-0200
DALLAS: 214/351-3221
HOLLYWOOD: 213/464-6131
NEW YORK: 212/262-7100
SAN FRANCISCO: 415/776-6055

Kodak

IF YOU NEED A SYNC GENERATOR or PULSE DISTRIBUTION SYSTEM . . . .

. . . here is something Really New and Different



Control Concepts Corporation's Model 601 Sync Generator with Programmed Digital Delay Lines. The most stable, accurate, and flexible clocked digital technique available.

WHO ELSE HAS THESE FEATURES ?

- PRECISION SUBCARRIER STANDARD.
- OUTPUT PULSE STABILITY INDEPENDENT OF REMOTE SIGNAL JITTER.
- PULSE WIDTHS ADJUSTABLE IN 70 ns INCREMENTS.
- DIGITAL H PHASE CONTROL ± 14 µs IN 70 ns INCREMENTS.
- DIGITAL V PHASE CONTROL 0, 1, or 2 LINE ADVANCE.
- LINEAR OUTPUT AMPLIFIERS AND "SINE-SQUARED T" RISE AND FALL SHAPES.

[Price: $1725 f.o.b. Rockville, Md
Available: May 1970]

CONTROL CONCEPTS CORPORATION

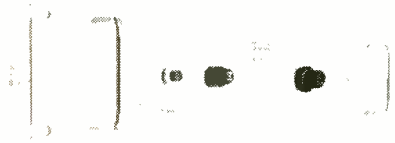
411 N. STONESTREET AVE.
ROCKVILLE, MD 20850
(301) 762-8580

Circle 125 on Reader Service Card

Continued from page 56

Phase lock generator

Model 220 eliminates co-channel interference from local station to increase number of usable CATV

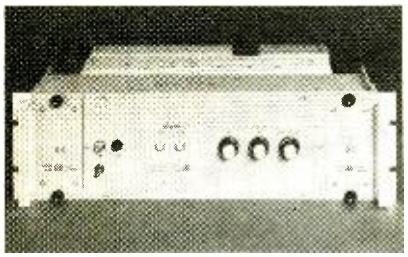


channels by receiving and "locking-on" to local station's freq and preventing co-channel from appearing. Delivery in 6 weeks at $1,000. Phasecom.

Circle 279 on Reader Service Card

Cable converter

Model 6101 (lower-cost version of Model 6100) with FET front-end design, crystal-controlled conversion,

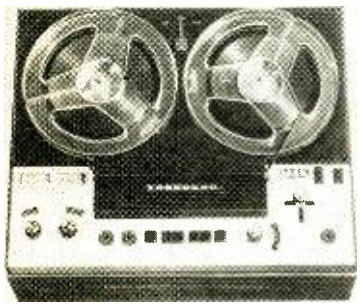


separate video and sound age amplifiers. Will receive any incoming vhf TV channel, down-convert and amplify the signal in high-gain age i-f amplifiers, then up-convert to the same or any other vhf channel for distribution on a cable system. $1100. Scientific-Atlanta.

Circle 282 on Reader Service Card

Audio tape recorder

Model 6000X stereo, 3-speed deck with 57 transistors, promises "professional quality recordings even at slower speeds," available in quarter- and half-track models peak reading VU instruments for record and playback levels, automatic overload protection, independent mike/line record level controls for each channel, push buttons for electrical functions and channel selection, single lever tape

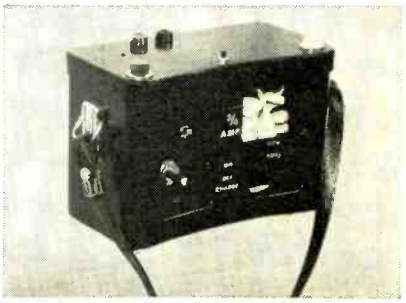


Circle 126 on Reader Service Card →

transport control, hysteresis synchronous motor; stereo mixing, cueing, source vs. tape monitor, sound-on-sound, add-a-track and remote control. Freq. resp. 40—22,000 Hz ±2.5 dB at 7½ ips; S/N ratio 62 dB at 7½ ips quarter-track weighted, 64 dB half-track weighted; wow & flutter 0.1%, 0.2%, 0.4% at the respective speeds; $499. Tandberg.
Circle 281 on Reader Service Card

Battery pack

Portable (3¾ lbs) battery pack for electrically driven movie cameras, will drive up to six 400-ft 16mm



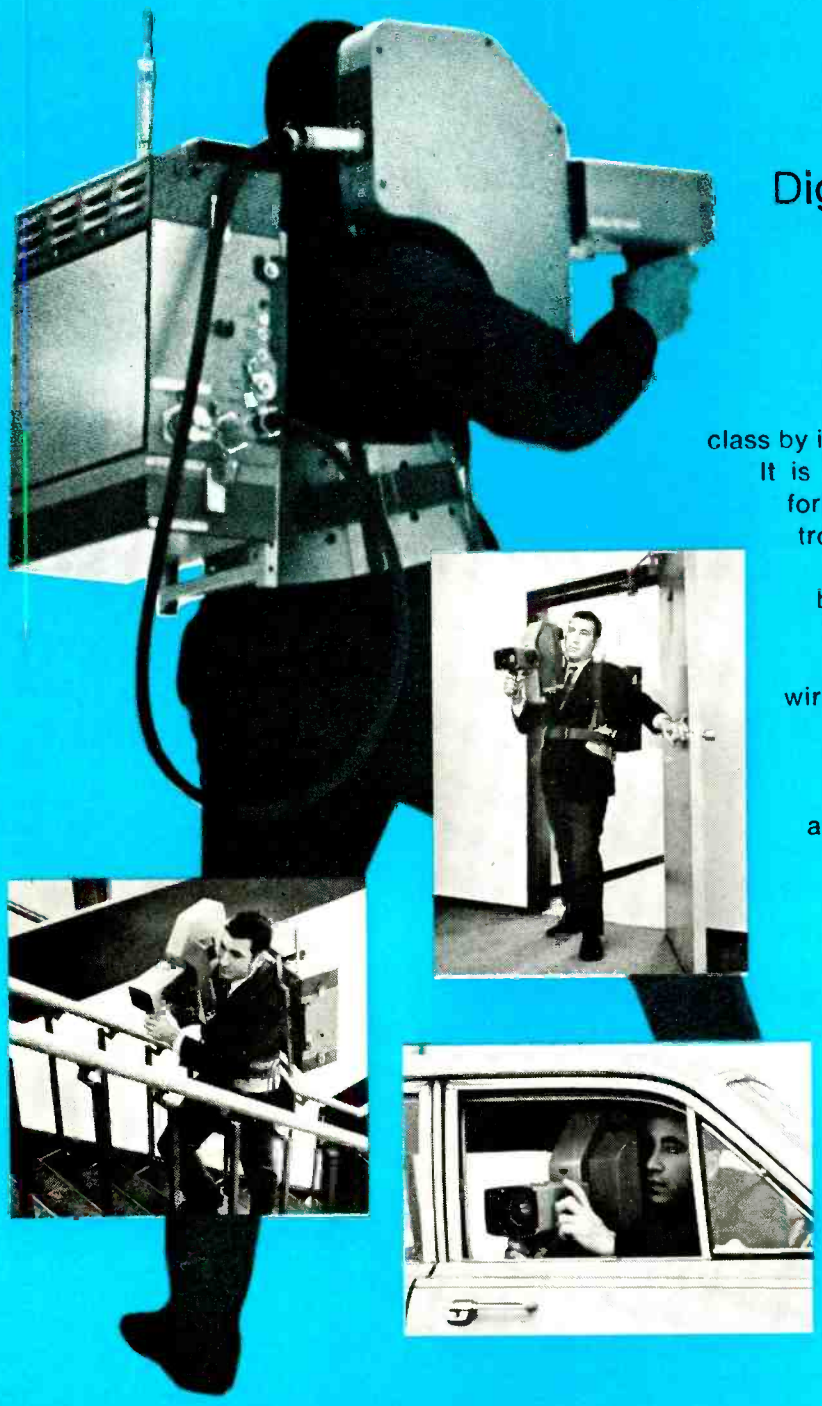
film magazines without recharging its 9 V batteries; recharges in 12 hours from 110 Vac. Built-in undervoltage circuit prolongs battery life by preventing discharge below recommended limits—gives 2 to 3 year life expectancy to batteries; operates +10°F to +120°F. $225. Scientific Systems Div. of Dynasciences.
Circle 283 on Reader Service Card

Low-cost color camera

Model VF-7001, three-vidicon, NTSC color camera with viewfinder, completely automatic and self-contained, with rear-controlled 16.5 to 95 mm *f*/2 zoom lens; operates with 8-min. warmup and no adjustment needed; converts to film chain or multiplex use. Options include line lock industrial sync plug-in

module, subcarrier phase control module, remote control panel for gain, pedestal, position and power. $8000. GBC Closed Circuit TV Corporation.
Circle 284 on Reader Service Card

The Portable PCP-90... direct-broadcast color from the backpack



Digitally-controlled Norelco "Minicam" sends a live color-composite signal by microwave or triax

The Norelco PCP-90 "Minicam"* is in a class by itself as the most mobile of field cameras. It is the go-anywhere, do-anything portable for broadcast quality color television. Controls can be beamed from as far away as 30 miles. Signal processing is done in the backpack. You can broadcast live, or take along a portable recorder and tape the action for playback. Operating wireless or on small, cost-reducing triax, the PCP-90 with its 1" Plumbicon* tubes brings total flexibility to color telecasting. Minicam is making the scene daily in an unprecedented variety of field, airborne and studio events. It's ready to make your scene now.

Norelco®
PHILIPS BROADCAST EQUIPMENT CORP.
A NORTH AMERICAN PHILIPS COMPANY

One Philips Parkway
Montvale, N.J. 07645 (201) 391-1000

*Reg. T.M. N.V. Philips of Holland

Circle 128 on Reader Service Card

NAMES IN THE NEWS

Herbert A. Jolovitz, administrative assistant to Senator Stephen M. Young for the past 11 years, has joined the NCTA staff as director of government relations.

President of the National Cable Television Association Donald Taverner announced the appointment of **Charles S. Walsh,** NCTA legislative counsel for the past two years, to assistant general counsel of NCTA.

International Nuclear Corporation, Nashville, Tennessee, has appointed **Robert H. Hansen** to the position of national sales manager.


Robert Hansen


Sheldon I. Bernstein

Sheldon I. Bernstein has been named president and **Wilfred S. Paul** vice president-operations of International Video Institute, an instructional tape affiliate of International Video Corporation.

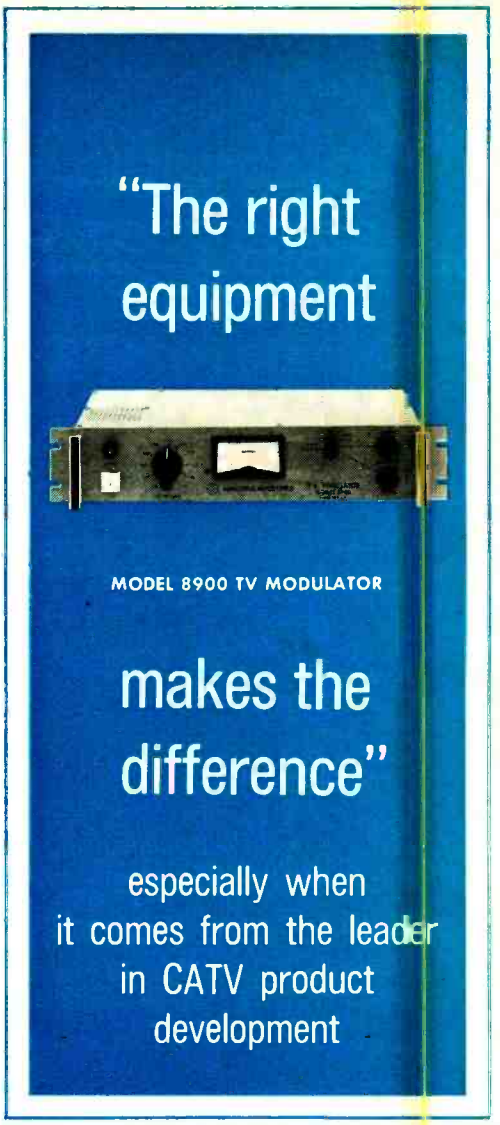
The FCC has named as a Hearing Examiner **Lenore G. Ehrig,** an attorney on the Litigation staff of the General Counsel's office.

Tore B. Nordahl has been appointed to the newly-created position of Chief Engineer, Electronic Division, of the Finney Company, Bedford, Ohio.

Twenty-six year old **Ted W. Scott** has been named Program Director of the Windsor, Colorado station KUAD.

Manager of product engineering M. Wilson Magruder has announced the appointment of **Darrell W. Sigmon** as wire and cable applications engineer for Superior Continental's Cable and Equipment Division, Hickory, N.C.

E. D. "Dave" Steele, Jr., has been named station manager for WJCL-TV, channel 22, Savannah, Ga. which expects to go on the air in late spring.



ANA-31 © 1970 ANACONDA ELECTRONICS COMPANY

In CATV, equipment mistakes can be critical — take Modulators, for example. There are several available on the market, but there is only one which combines all the necessary "right equipment" features to do the whole job efficiently — the Anaconda Electronics' Model 8900 TV Modulator.

The Model 8900 has built-in quality. The reliability of its all solid state circuits is reflected in the unexcelled visual and aural fidelity of either monochromatic or color signals from VHF sources, microwave sources and local origination.

Low distortion-differential gain of ±½ dB and differential phase of ±1 degree insures excellent color transmission. The 8900 Modulator features a built-in metering system for ease of operation and maintenance, that is, no external test equipment is required for instantaneous monitoring of our critical functions: video carrier modulation, sound carrier modulation, external line voltage level, and internal B + power supply level. Another "right equipment" feature is a convenient, front panel control/indicator which will accurately set the output level to any desired setting in incremental steps of 1 dBmV from +50 to +60 dBmV. Because of the extended broadband response of built-in circuitry, the envelope delay difference between the picture carrier and the color sub-carrier frequency is at an absolute minimum, thus assuring true color reproduction.

The FM Modulator employs positive "no drift" circuitry to maintain the 4.5 MHz center frequency within ±1 Khz. Further flexibility is achieved with the provision of audio or 4.5 MHz sub-carrier inputs making the unit ideal and convenient to use for the application of either local origination or direct microwave signal input.

The Sound Modulator employs a unique phase cancellation technique to generate the sound carrier which insures rejection of the lower sideband by as much as 80 dB.

It's the RIGHT EQUIPMENT — It's the Model 8900 TV Modulator, built and backed by Anaconda Electronics.

ANACONDA electronics
305 NORTH MULLER STREET. ANAHEIM. CALIFORNIA 92801 (714) 635-0150

IN CANADA **ANACONDA electronics ltd.**
1915 STAINSBURY AVENUE. VANCOUVER 12, B.C. (604) 876-1213

Circle 130 on Reader Service Card

Metromedia announced that **Ross Barrett,** who has been President of the Foster & Kleiser Division of Metromedia since 1961, has been named a Group Vice President of the corporation. Mr. Barrett will assume direct corporate management responsibility for the Foster & Kleiser Division.

WFBM-TV News Photographer **Dennis Unger** was named News Cameraman of the Year in the annual competition of the Indiana News Photographers Association.

The 1970 Vladimir K. Zworykin Television Prize Award will be presented to **Charles H. Coleman,** senior staff engineer in the video engineering department, Ampex Corporation video products division, for his technical achievements in the field of broadcast videotape recording. The Zworykin award, given annually by IEEE, will be presented at the National Electronics Conference in Chicago December 7, 1970.

Charles Coleman

Denis Smith

JFD Electronics Corp./Systems Division has announced the appointment of **Denis L. Smith** as National Accounts Manager. Mr. Smith was Eastern Regional Manager for Jerrold Electronics before joining JFD.

General manager of WJIB Boston, **Peter Taylor,** has been transferred to San Francisco as general manager of KFOG. He continues his collateral duties as general manager of the FM Division of Kaiser Broadcasting.

Barney Rigney, Director of Marketing for James B. Lansing Sound, Inc., announced that **Walter F. Dick** has joined the JBL sales force as Professional Applications Engineer.

John W. Kluge, Chairman of the Board and President of Metromedia, Inc., announced that **Dean H. Fritchen** has been elected a Vice President. Mr. Fritchen has been Director of Marketing for Metromedia since 1966.

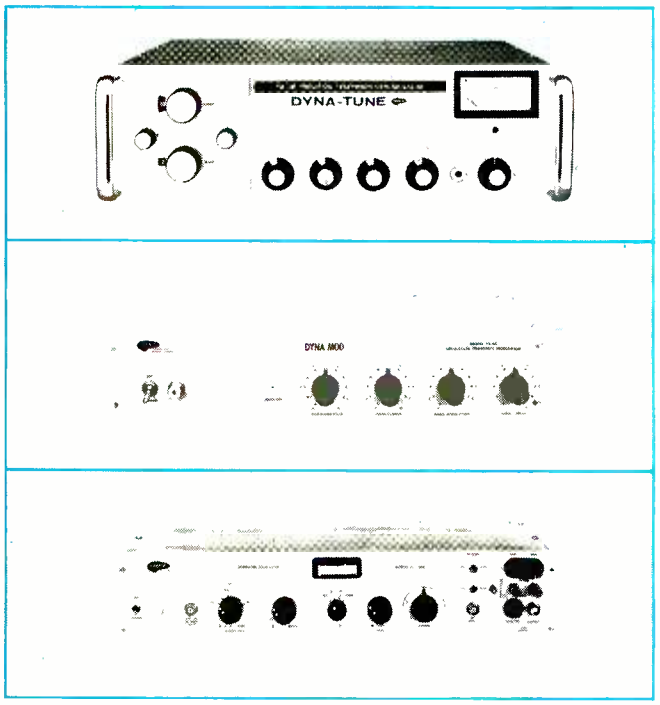
from professional-quality local origination
. . . all the way to testing, switching and distribution

DYNAIR OFFERS MORE THAN 200 DIFFERENT PRODUCTS FOR THE TELEVISION INDUSTRY

DYNAIR concentrates its major effort in one technical area: Equipment for the television industry. More than a decade of pioneering design experience has produced a comprehensive line of equipment that—year after year—sets the pace in video signal distribution, switching, modulation and RF demodulation.

FOR THE HEAD END

DYNAIR's field-proven, solid-state equipment solves CATV head-end problems and assures broadcast-quality pictures. Here are three tried-and-proven units which belong at the head end of every CATV system. . . .



RX-4B DYNA-TUNE for high-fidelity off-air color. Uses completely new filtering and signal-restoration concepts to provide superior adjacent-channel color performance in either microwave-fed or demod-mod systems. Actually improves the color signal in many critical areas over that produced by the broadcast RF transmission system. $1275

TX-4A DYNA-MOD for broadcast quality transmission. Supplies signals approximating FCC specifications. Provides interference-free pictures in a full 12-channel system . . . with crisp, clean color. Available for operation on any standard VHF channel. $950

TS-100B SIDEBAND ANALYZER for broadcast-precision testing. Quickly checks overall alignment of video amplifiers, modulated stage and RF amplifiers of modulators—in normal operation. Provides the same test techniques used by broadcasters and eliminates tedious point-to-point checking. Tunes to all channels for system flexibility. $1750

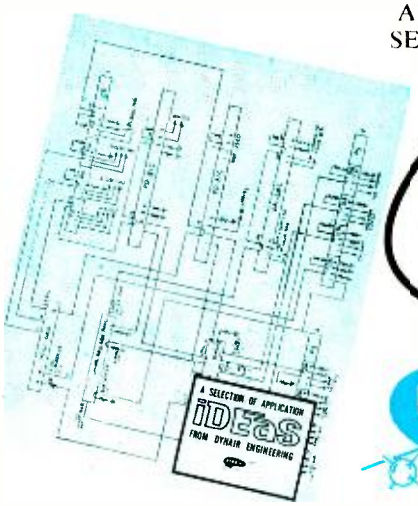
FOR LOCAL ORIGINATION

DYNAIR's complete line of low-cost programming accessories are designed specifically to provide professional results without fancy cabinetry or expensive "frills." You can assemble a system for your particular needs between camera and monitor from dozens of available DYNAIR units, including . . .

- Video Switcher-Faders
- Special-Effects Generators and Switchers
- Sync Generators
- Video Distribution Equipment
- Pulse Distribution Equipment

DYNAIR's new "IDEAS" booklet will prove very helpful in designing your local-origination system. Make sure you add it to your library.

A FREE COPY IS AVAILABLE TO YOU. SEND FOR IT TODAY.



See our new line of low-cost Vertical Interval Switches at NAB—Booth 210

DYNAIR SAN DIEGO

6360 Federal Blvd., San Diego, Calif. 92114, Phone (714) 582-9211

Circle 133 on Reader Service Card

CROSS-TALK

Dear BM/E:

I must say I was shocked by the recent *BM/E* article concerning four-channel broadcasting (February, 1970). Shocked not by the concept, but by the lack of vision on the part of the developers of "quad."

Why must we limit ourselves to four channels when four FM stations could join forces and broadcast 16 channels? This would be ideal in a city such as Harrisburg where there are only four stations. By broadcasting just one program, we could eliminate competition. We could also stimulate a great building boom, since larger houses would be needed for listeners with 16-channel receiver systems.

I think we're on the track of something big . . . just like three-D movies.

Roy J. Humphrey, Jr.
WMSP-FM
Harrisburg, Penna.

Pairing up FM stations is an interim move to demonstrate four-channel stereo, just as AM-FM stations paired up to demonstrate two-channel stereo in the 1950's.

Dear BM/E:

I have no objection whatever to experimentation with four-channel FM stereo by those who have time and inclination and can afford it. Likewise I have no objection to laboratory procedures to grow dogs with three heads. But I don't want one in the house.

In my opinion four-channel stereo has already received too much promotional attention. The relationship of this art to the actual state of FM in this country is on the level of nullity. The conundrum facing FM operators is today the same as it has been for years: How can we make these stations pay?

The going is slow, and the hot-shot promotion of four-channel FM stereo will no more untie this knot than the promotion of color techniques relieved the economic agonies of uhf broadcasters. Those poor devils had color shoved down their throats even before the propagation peculiarities of ordinary black-and-white had been overcome!

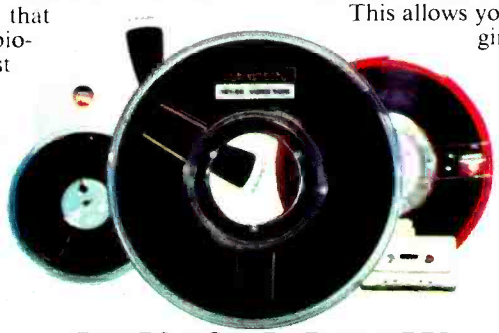
I heard my first FM broadcast on Zenith's station in Chicago in 1940 and I have followed FM avidly ever since, both as listener and operator. I would say that what the talent of the industry ought to be working on right now is a modestly-priced receiver with a really decent front end, plus Federal standards to suppress

Continued on page 69

Picture by courtesy of Mental Research Institute, Palo Alto, California

When psychologist Pat Hewitt is studying recorded interviews on closed-circuit television, she wants to concentrate on the patient, not the tape. It stands to reason that she looks to Ampex, the company that pioneered videotape recording, for the most trouble-free video tape.

Our Ampex helical scan tape is produced in the most modern, surgically clean facility the state-of-the-art permits. Here we give meticulous attention to formulation and tape coating to bring you excellent drop-out performance, high frequency response, unparalleled picture clarity.



To assure continued high performance, Ampex smooths every reel of Ferrosheen® tape with an exclusive finishing process. This allows you to rerun tape many times without head clogging, tape wear or head wear.

So, if you're too busy to bother with tape, come to the people whose number one business is tape recording. Call or write: Ampex Corporation, Magnetic Tape Division, 401 Broadway, Redwood City, Calif. 94063.

AMPEX

TAPES FOR EVERY NEED

INSTRUMENTATION • COMPUTER • AUDIO • CCTV • VIDEO • STEREO

WANTED

If you have a hammer, we have a hand to work with it. Thousands of hands all across the country just waiting to break into business—not to steal, but to work. Work with you, in your business, in your community.

Some are black, some white, some young, some not so young. But all are unemployed or underemployed. They're in real need of your help.

The National Alliance of Businessmen has already started thousands of hard-core people from our nation's large cities on their way to productive citizenship. On their way to the skills, experience, education and social acceptance that some of us take for granted.

The Government is in there helping and big business is out to make this thing work. But without the efforts of local business, we really can't crack the hard-core of unemployment. Get with it.

Call the National Alliance of Businessmen in your community, and help spread the work around.

JOBS WORKS

National Alliance of Businessmen

ADVERTISING COUNCIL

advertising contributed for the public good

the snivvies that flood the market. As for four-channel broadcast stereo and other visions—great stuff if you like to dream, but dangerous if it deludes operators into imagining that equipment alone will ever solve their problems.

Arnold Hartley
Key Broadcast Management Inc.
New York, N.Y.

Four-channel stereo FM is no broadcaster's panacea, certainly. But then, neither is two-channel FM, or color TV, as you've pointed out. Yet two-channel stereo appeared on tape in the mid-fifties, and on disc in 1958. The public came to like two-channel stereo, and in 1961 FM met the demand. Color TV has grown similarly. Would you seriously consider starting a new FM station in mono only, or a TV station in black-and-white only?

Four-channel stereo tape is a reality today, and at least two groups are working on a compatible four-channel disc. If the public receives quad tapes and discs enthusiastically, would you expect FM to continue old-fashioned two-channel broadcasting?

Here's what one manufacturer has to say about four channel stereo. At a January EIA meeting in Chicago, the spokesman is Matthew M. Dorenbosch, executive vice president of North American Philips.

We believe the consumer electronics industry, and we as members of that industry, have an obligation to the public to provide a compatible nonobsolescent [four-channel] system. In order to prevent a chaotic marketing situation from developing, such as would happen if a noncompatible four-channel system were endorsed, North American Philips Corporation urges the industry to do everything possible to promote the adoption of a compatible method. Until we have explored the feasibility of a uniform and compatible system for cassettes, we are firmly opposed to the casual adoption of other and varied methods.

Although it has not been demonstrably proved that four-channel sound is superior to two-channel sound, the Philips companies have been experimenting with the concept, but as yet remain unconvinced that this technique is an improvement in the reproduction of sound and not just a change for the sake of change. If four-channel sound is indeed an improvement, then a compatible system which allows the duplication and playback of four-channel media on conventional stereo and mono equipment is a must. Experimentation has proved the possibility of electronically combining two information channels into one track without marked degradation of the signals. Such a system is compatible, and will not obsolete present mono and stereo equipment.

Mr. Dorenbosch was probably referring to the electronic process developed by Peter Scheiber, which encodes four channels into two. This system seems compatible with present two-channel stereo and mono FM. (A Scheiber-encoded tape was broadcast as a test, without publicity, on New York's WNYC-FM in March.) If the Scheiber method is accepted by the manufacturers of tapes, discs, and reproducers, there will be no problem with compatibility. But Scheiber's process seems to have one serious defect: poor channel-to-channel separation.

Dear BM/E:

"Television in the Inscrutable East" (*BM/E*, November, 1969) was misleading. The article states that there is no domestic wireless broadcasting service in Hong Kong. In fact, Radio Hong Kong has been on the air with Chinese and English radio transmissions on AM since 1928 and on FM since 1960. Hong Kong Commercial Broadcasting Co. Ltd. has been on the air with Chinese and English AM radio transmissions since 1959. Hong Kong Television Broadcasts Ltd. have been on the air with Chinese and English television transmissions on uhf partly in color

(PAL system) since 1967. There are estimated to be in the region of 1.5 million radio receivers and over 200,000 television receivers in use in Hong Kong.

It is also not true to say that receivers are used to pick up television programs from China. Chinese television stations operate on the CCIR "D" system, whilst the Hong Kong station is on the CCIR "I" system and receivers imported into, or made in, Hong Kong are not compatible for both types of transmission.

D. E. Brooks
Radio Hong Kong

Thanks for your corrections.

Dear BM/E:

The December issue discusses deficiencies in present-day TV engineering practices, but no mention is made of a major reason for the poor TV pictures seen in the home. Many TV receivers have no dc restoration; some have only partial dc restoration. Yet dc-restored or clamped monitors are used in studio production to gauge the product.

For example, assume the home viewer has his brightness control set at a good average level for his dc restorer-less receiver. A commercial appears with high background lighting. The detail in the foreground disappears. Had this commercial been viewed on a monitor with dc restoration switched off as well as one with it on, the product would not have been so released.

Elihu T. Brown
Rutherford, N.J.

Most TV receivers have three-inch speakers. Should control rooms have similarly tiny, tinny monitors? Or should the station strive to put out the best possible signal and not be concerned with the type of receiving equipment used by listeners?

Dear BM/E:

I am very puzzled about some information in the January issue. In "Broadcast Industry News" under "Interconnections abound in 1969," you mention WAMU-AM as a member station of the Eastern Educational Radio Network.

The Eastern Educational Radio Network changed its name to the Eastern *Public* Radio Network last summer. The Eastern Public Radio Network is made up of eight FM stations. There are *no* AM station members at all. And the network broadcast of the Washington Moratorium, which you mention, was covered by WRVR(FM). The entire Public Affairs Unit came from New York and with the assistance of three staff members from WGBH-FM of Boston, handled the entire broadcast. The facilities of WETA-TV were used as the anchor position in Washington for the all-day broadcast. WAMU-FM did broadcast the network program, but *did not* originate it.

Martha Thomas
WRVR (FM)
New York City

NO. 400

"Scotch" Brand Color Video Tape guards itself against damage.

Guards against cinching. "Scotch" Brand No. 400 now solves your video tape handling and shipping problems. A new, matte-finish back treatment virtually eliminates cinching, windowing and creasing. Capstan slippage is a thing of the past.

Guards against scratching. The exclusive treatment on "Scotch" Brand No. 400 resists scratching, eliminates polyester redeposits on the oxide surface. Prevents the increase of dropouts and effectively extends tape life.

Guards against dust damage. This highly conductive treatment reduces static attraction of contaminants that can damage tape and VTR heads. New No. 400 gives you built-in protection, plus performance — the finest value in color video tape.

3M COMPANY

"SCOTCH" IS A REGISTERED TRADEMARK OF 3M CO.

Circle 139 on Reader Service Card

NEW LIT

For copies of these literature offerings, circle numbers for appropriate items on Reader Service Card.

"Relamping Guide" SS-3 is a 24-page booklet which lists both old and new stage and studio lighting fixtures manufactured by 21 different companies. Each product listing provides the manufacturer's catalog or model number, describes the unit, gives its wattage limitations, and tells where suitable lamps for the fixture are listed in the companion publication SS-1 **"Quartzline and Incandescent List."** That is the regular GE catalog of stage and studio lamps. **200**

Over 1500 **panel instruments (meters)** are listed in a 32-page catalog. Included are ac and dc voltmeters, ammeters, VU and dB meters, wattmeters, pyrometers, counters, and digital instruments. Bulletin 2081 is from Simpson Electric Co. **201**

"Using the 675A/676A Network Analyzer as an Educational Tool" is a 17-page application note describing the frequency behavior of electrical networks. Demonstrations are used to show how to make frequency-swept transfer and driving-point measurements with an oscilloscope. A plastic overlay of a Nichols chart is included, to fit over the oscilloscope graticule. Application Note 112-2 is from Hewlett-Packard. **202**

Vacuum tubes of all types are listed in the 84-page 1970 Abridged Valve Data Booklet from English Electric Valve Co. Ltd. Includes more than 600 types of power tubes, microwave, light-sensitive, and cold-cathode tubes. **203**

Electric heaters are listed in catalog from Valad Electric Heating Co. Includes portable 12-volt dc models suitable for use in remote/mobile broadcast busses. Other types: forced-air blowers, convection heaters, hot plates, and many others. **211**

A 12-page catalog lists **test equipment,** including five completely new instruments. Examples: portable color generator, FET tester, bias supply. Other gear: combination oscilloscope/vectorscope, CRT tester, sweep and marker generators. From Sencore. **204**

CATV coupon payment books are shown in a catalog from T-C Specialties Co. Publication includes four different styles of coupon books, two-part counter receipts, and other front-office supplies for cable industry. **205**

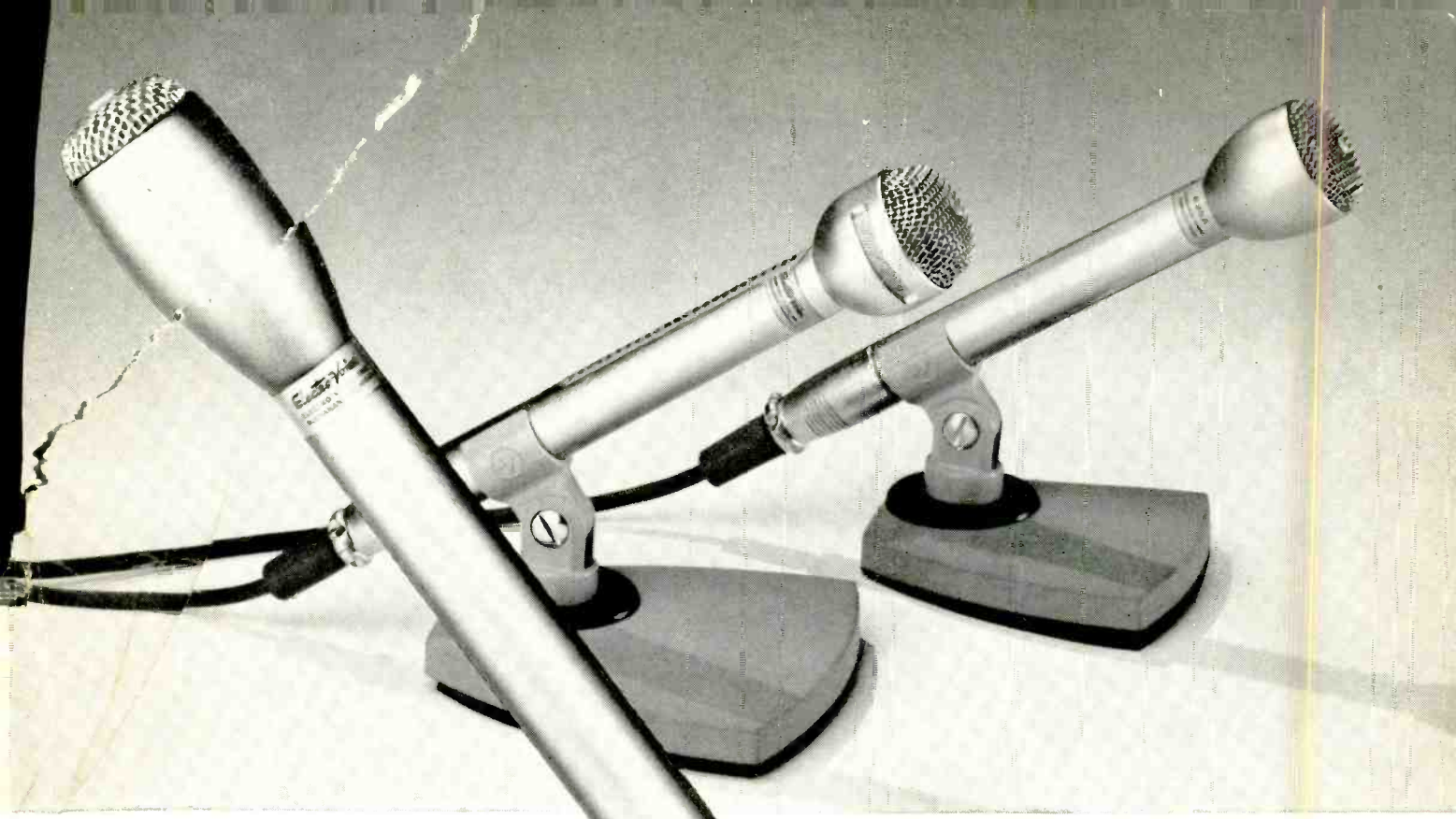
Technical bulletin describes **cassette tape** by TDK. Shows specifications and curves of bias current, dynamic range, and harmonic distortion. **206**

Gasoline ac generators are listed in a bulletin from Onan. 15 models range from 1 to 10 kW output. Selection guide included. **207**

Lamp color filters made of silicone rubber are listed in a data sheet from APM-Hexseal Corp. Called Sili-Kromes, the colored hoods slip over panel and similar lamps, can operate at 500°F for 1000 hours without color fade or degradation. **208**

Switches of all types are shown in a 44-page catalog from Cherry Electrical Products Corp. Examples: thumbwheel, matrix selection, gold crosspoint contact, and snap-action switches. **209**

"Analysis of Structural Return Loss in CATV Coaxial Cables" is a technical paper by H. Lubars and J. A. Olszewski of General Cable Corp. **210**



Further proof... sound has never been in better shape!

RE55 *OMNIDIRECTIONAL DYNAMIC MICROPHONE*

There are plenty of good, functional reasons behind the new look of Electro-Voice professional microphones. Reasons dramatically proved by the rapid success of the Model 635A and the RE15. Now we've added the RE55 to this handsome group.

The RE55, like its predecessor the 655C, is an extremely wide-range omnidirectional dynamic. And in most electrical particulars it is not greatly different. RE55 frequency response is a bit wider, and perhaps a trifle flatter. An impressive achievement when you consider that the 655C has been extensively used as a secondary frequency response standard. Output level is 2 db hotter, and the exclusive E-V Acoustalloy® diaphragm of the RE55 can provide undistorted output in sound fields so intense as to cause ear damage.

The biggest changes in the RE55 are mechanical. For this microphone is even more rugged than the 655... long known as one of the toughest in the business. There's a solid steel case and new, improved internal shock mounting for the RE55. Plus a satin nickel finish that looks great on TV long after most microphones have been scarred and scratched almost beyond recognition.

For convenience we've made the barrel of the RE55 just 3/4″ in diameter. It fits modern 3/4″ accessories. It also fits the hand (and its length makes the RE55 perfect for hand-held interviews). We also provide XLR-3 Cannon-type connectors to help you standardize your audio wiring. Detail refinements that make the RE55 more dependable, easier to use.

Finally, the RE55 has the exclusive Electro-Voice 2-year *unconditional* guarantee. No matter what happens, if an RE55 fails to perform during the first two years — for any reason — we'll repair it at no charge.

Try the Electro-Voice RE55 today. The more you listen, the better it looks!

ELECTRO-VOICE, INC., Dept. 401 EM, 614 Cecil Street, Buchanan, Michigan 49091

• high fidelity speakers and systems • tuners, amplifiers, receivers • public address loudspeakers • microphones • phonograph needles and cartridges • organs • space and defense electronics

Electro-Voice®

A SUBSIDIARY OF GULTON INDUSTRIES, INC.

Circle 142 on Reader Service Card

FROM THE EDITOR

Broadcasting's 50 Golden Years

And the best is yet to come. That's the official NAB Convention theme. Let's hope it becomes so.

We can be certain that there will be fantastic technical advances. Tomorrow's home will be more than a man's castle. It will be 3-D and solid state, an electronic pleasure palace, a newsroom, an a-v library and classroom, an automated shopping mart, and a computer center all in one. The medium will envelop and affect man as never before. It may even spirit him away, as artist Sudduth whimsically suggests on this month's cover.

But will these technological advances improve the quality of life? We might need a communications revolution—just to keep our seething world from exploding. But we can hope for more from broadcasting.

At the close of its first half-century, the industry can pat itself on the back with some justifiable pride. American broadcasting serves nearly every one of some 200 million citizens with not one but a dial-full of channels of entertainment and information. It's a free industry: free of program control and free to the public. It's the principal news medium for the majority. It's a mass media which means it can afford the high cost of bringing the unfinished business of the nation directly to the people.

But this is short of what is really possible as the numerous critics point out. Too much broadcasting is banal, irrelevant and white middle class—it's occasionally racist. It is beginning to ignore the over 45 year olds. It is more self-serving than public serving. As Chief Justice Warren Burger wrote while an Appeals judge, "The broadcasting industry does not seem to have grasped the simple fact that a broadcast license is a public trust subject to termination for breach of duty."

Mass entertainment programming is mediocre and seldom enlightening because the networks can't risk innovating for fear of losing their needed share of the audience. There is not enough local programming. Mr. McGannon of Group W is right when he calls for limits on network programming and a return to an hour of prime time that is socially relevant, innovative and instructional or cultural—from local or nonnetwork sources.

Broadcasters are prone to justifying pap programming by claiming that's what the public wants. But what do broadcasters think of university presidents who yield to every student demand? Broadcasting is a public trust; it should set some standard of quality. The next fifty years can provide more than a few golden moments if an increased number of broadcasters define and bear witness to that trust.

James A. Lippke, Editor

THE BIGGEST

Introducing the mixing console that fills the gap.

Between the expensive, custom-made console that has everything . . . when you finally get it. And the small, rigid-design broadcast mixer that gives you low price . . . but no reverb, no EQ, and only rotary mixers.

The Studer 089 Mixing Console is the happiest possible medium. Made by one of the most famous names in tape recorders, it has *all* the "goodies." Twelve input units, all with EQ, cut-off filters, pan-pots, phase reversing switch, gain vernier and linear attenuator, two or three line outputs, two reverb outputs, and two subgroup buses. Plus visual and acoustical monitoring facilities you usually get only on large scale consoles. Yet it weighs only 144 lbs. and fits into a transport case for field use.

It costs $15,000. And you can have it immediately. Because Gotham has these mass-produced Swiss precision mixing consoles in stock in the U.S.

It would take a book to tell you *all* about it. And Gotham has the book. A 24-page color brochure. Send or call for it now. And if it makes you want the Studer 089 Mixing Console right away . . . that's just when Gotham can give it to you.

Exclusive U.S. and Canadian Representative

GOTHAM AUDIO CORPORATION

2 West 46th Street, New York, N.Y. 10036 (212) CO-5-4111
1710 N. LaBrea Avenue, Hollywood Ca 90046 (213) 874-4444

STUDER 089

THE SMALLEST

Circle 145 on Reader Service Card

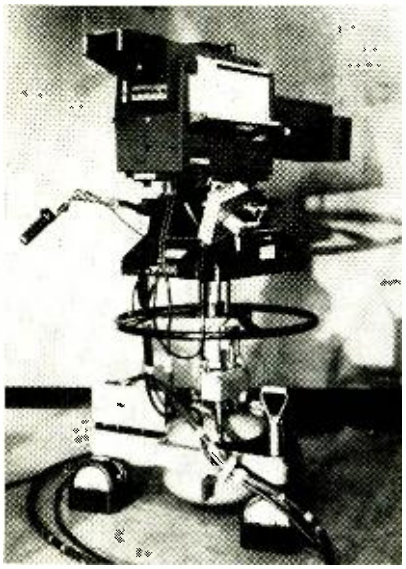
NAB Preview

Continued from page 32

aim with an AKG **shotgun mike.**
Circle 337 on Reader Service Card

Philips Broadcast Equipment (Booth 327)
Watch for a surprise at this booth, among the **color cameras:** PC-70S-2 studio and field live, PCP-90 Minicam portable, LDH-1 compact, and PCF-701 film chain. And investigate the PTU-55A 55-kW **uhf TV transmitter** with i-f modulation, and **audio tape equipment.**
Circle 339 on Reader Service Card

Power Optics (Booth 312)
Here you'll see a completely automated color TV news studio, with



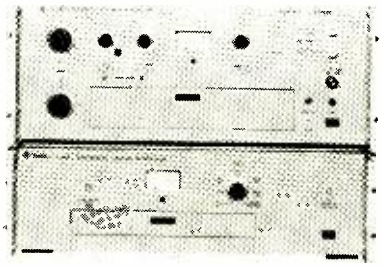
the control room operator **remotely controlling camera** pedestals and tilt heads, zoom and focus.
Circle 338 on Reader Service Card

Quick-Set Inc. (Booth 206)
Head for Quick Set and check out the new Hercules Cam-Link **pan head,** for cameras up to 80 lb. Center of gravity doesn't raise or lower when camera is tilted. Additionally displayed will be **tripods, pedestals, dollies,** and wall and ceiling mounts.
Circle 340 on Reader Service Card

RCA (Booth 100, 119)
Visit a theater within the RCA area and watch a TR-70 VTR cue the pioneering TCR-100 videotape cartridge system to begin an automated station-break sequence. The system, which is scheduled for delivery later this year, plays up to 22 carts, each containing up to three minutes. Be sure to also check out the TK-44A color camera, and the TT-35FH vhf TV transmitter, among the wide array of audio, video, and rf equipment—everything from mike to antenna.
Circle 341 on Reader Service Card

Recortec Inc. (Booth 427)
Bring your dirty video tapes to this booth and the new VTC-2 **video tape conditioner** will clean them up while you watch. Wonder if it'll purify an X-rated movie and make Senator Pastore happy? You can also see the CTS **controlled tension system** for faster, smoother tape handling.
Circle 342 on Reader Service Card

Rohde & Schwarz (Booth 240)
Quality control is the goal here; the model AMF **demodulator and receiver** gives you a window to look at your TV signal as it leaves the transmitter. Promote clean air; stop by and see other **television test equip-**



ment designed for the best quality pictures.
Circle 343 on Reader Service Card

Rohn Communications Facilities Co., Inc. (Booth 224)
A new 1000-foot **TV tower** will be introduced, along with a Rigid-Angle **tower** line. Stop by the booth for full details.
Circle 366 on Reader Service Card

RHG Electronics Lab (Booth 418)
Get that remote on the air with a TV **microwave relay link.** See the MRS-AP series, with power ratings from 0.25 to 4 watts, frequencies from 0.7 to 13.25 GHz. Units are complete and self-contained.
Circle 344 on Reader Service Card

Rust Corp. (Booth 232)
Lots of **remote control** and **automatic logging gear** will be displayed at this booth. Look particularly at the new one-package system of remote control and automatic transmitter logging. With a few additions, it can be tied into a central computer network. Another newie: An **FM carrier-current system,** to pipe background music through a complex.
Circle 345 on Reader Service Card

Sarkes Tarzian (Booth 104)
Say hello to the Hoosiers and see their new Selectec III **video switching/effects** system. Look at their **color cameras,** and learn how to completely automate your TV station.
Circle 346 on Reader Service Card

Schafer International (Booth 209)
See new line of **professional cassette gear,** available in mono or stereo, with control tones, fast forward, frequency response within 3 dB 40-12,000 Hz at 1⅞ ips, even better at 3¾ ips. Handles up to 90 minutes program material.
Circle 348 on Reader Service Card

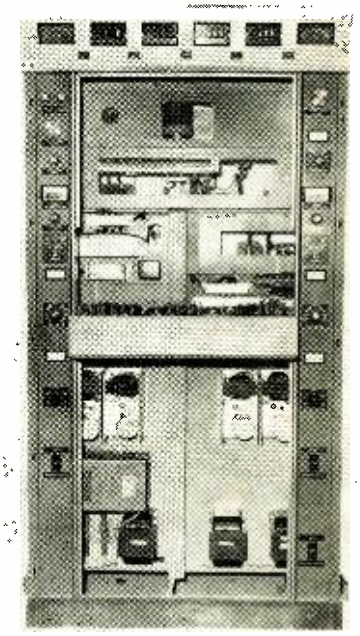
Scully (Booth 407)
Ham Brosious will shake your hand and show you his pride and joy—rugged, dependable **audio tape recorder/reproducers** that have made the Scully name famous for years.
Circle 347 on Reader Service Card

Seeburg Music Library (Booth 242)
A new **background music tape library** will be unveiled, on eight-hour reels at 3¾ ips. Get complete details on lease plans at the booth.
Circle 349 on Reader Service Card

Semikron International (Booth 409)
Still cooking mercury vapor rectifiers to feed your hungry transmitter? Forget them, see Semikron's direct replacement **silicon stacks** for five tube types. There are no balancing networks to go bad.
Circle 350 on Reader Service Card

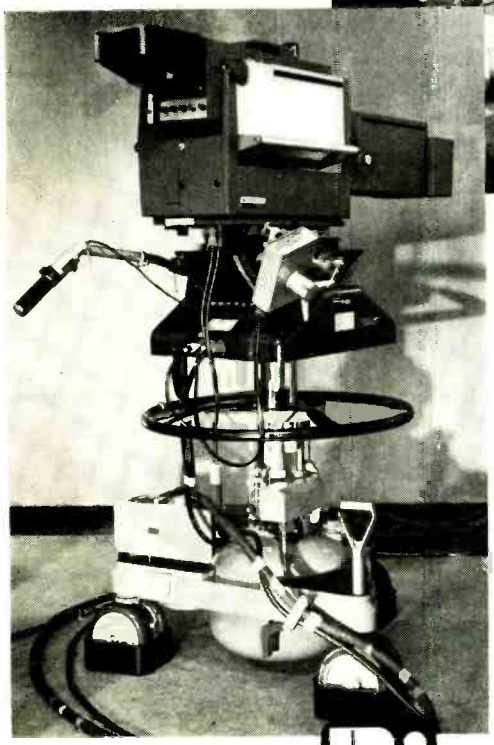
Sparta Electronic Corp. (Booth 303)
You can see a new concept in **BC automation** here, one that tailors a system to your station's individual requirements. Equipment on display will include most studio gear needed for radio operations.
Circle 351 on Reader Service Card

Standard Electronics Corp. (Booth 110)
Inspect a single-cabinet transistorized 5-kW **vhf TV transmitter.** It uses two



REMOTELY CONTROLLED CAMERA SYSTEMS

for: ***News & Weather Presentations***
Workshop & Demonstrations
Interviews & Panel shows
Commercial Video Taping
Special Effects



A completely automated color news studio will be presented in our booth at the N.A.B. Convention Exhibit in Chicago, in April. We will demonstrate how, with this equipment, a variety of programs may be presented with our remotely controlled camera systems from master control.

Zoom, focus, pan, tilt, iris and pedestal height may be controlled from a remote location with a "shot fader" unit to provide smooth transitions from one shot to the next.

New engineering techniques now permit the "storage" of camera controls and video effects, all of which leads up to computer control. Random Access Memory Systems, we call them.

We invite inquiries on this remote control equipment and urge you to write for technical articles and material describing it, together with the names of stations now equipped with it.

VISIT OUR BOOTH 312
at the N.A.B. SHOW
April 5-8, 1970
Hilton Hotel, Chicago

POWER OPTICS, INC.

FAIRVIEW VILLAGE, PA. 19409 • (215) 272-5300 • TELEX 846411

Western Inquiries contact: Television Products, Inc. (213) 678-2388

004

Circle 146 on Reader Service Card

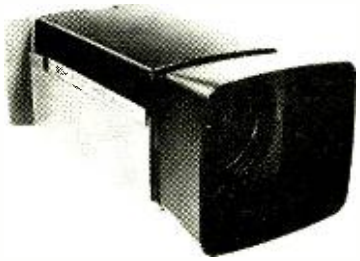
tubes in the visual final and one in the aural. Even the blower's included in the cabinet. Say hello to Betty Zillger. She'll show you their mini-FM transmitters, including a 250-watt all-transistor model.
Circle 352 on Reader Service Card

Sylvania-Chester (Booth 249)
Light up with any one of a wide choice of **tungsten-halogen** lamps for TV studio use. New styles available. Also the latest in **dial-access information retrieval equipment.**
Circle 353 on Reader Service Card

Tape-Athon Corp. (Booth 236)
Great for background music or automation, the new model 1400 **reel-to-reel transport** holds 14-in. reels, for up to 16 hours' unattended playing time. Unit uses a closed loop system with two driving capstans. While you're at the booth, see the other **automation** and **program logging equipment.**
Circle 354 on Reader Service Card

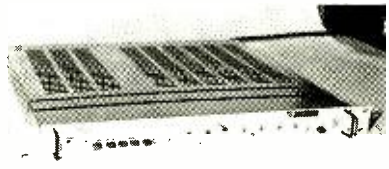
Tektronix Inc. (Booth 109)
Test signal generators, vectorscopes, oscilloscopes, and other **TV test gear** for 525-line, 625-line, NTSC, and PAL color television systems will be demonstrated. There'll also be a few low-cost **scopes** from the Tektronix English subsidiary, Telequipment Ltd.
Circle 358 on Reader Service Card

Tele-Cine Inc. (Booth 414)
Zoom over to Tele-Cine and focus on the Schneider System TV-10, **zoom**



lens with a ratio of 11.2 to 1, *f*/2.1. It will focus down to 28 in. without adaptors. You can also see the Sondor **magnetic film recorder** running interlocked with a VTR.
Circle 356 on Reader Service Card

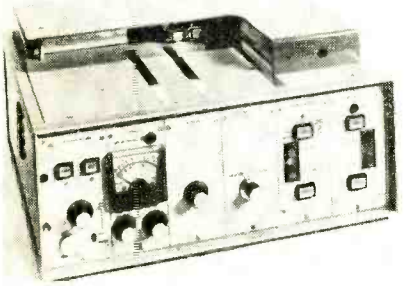
TeleMation Inc. (Booth 415)
Lots of new goodies will be on display: TSG-3000 time-programmable



sync generator uses new counters and has a digital genlock circuit; TCG-

225 **titling generator** displays one or two lines of 25 characters each, costs one-third of a full-page generator; TPS-12X 4 **video switcher** has binary coded decimal control logic for simplified interconnection with rack gear; routing switchers are adaptable to any configuration. TM will also demonstrate **data transmission** on **FM SCA subchannels.**
Circle 355 on Reader Service Card

Television Equipment Associates (Booth 105)
Bill Pegler has a new line of **cartridge tape gear** called Cuemaster



(from Consolidated Electronics of Australia) and will gladly demonstrate them for you. Cuemaster features heavy-duty construction, synchronous motors, high-inertia flywheel, and a single-screw headmount for precise azimuth adjustment. Other products displayed will include the World Video **one-gun color monitor,** the Gardner Colorgard **monitor balancing meter,** and similar TV accessories.
Circle 357 on Reader Service Card

Transface Process Co. (Booth 333)
Big deal here is the Plastalucent **master log form,** which cuts station paper work on logs and invoices. See a demonstration of this labor-saving device which can eliminate many errors in scheduling and billing.
Circle 359 on Reader Service Card

Vikoa Inc. Booth 321)
A new underground miniature **Stripline Directional Coupler** for CATV will be shown. It is housed in a zinc die-cast case, has frequency response beyond 250 MHz, and tap-to-tap isolation of more than 20 dB.
Circle 360 on Reader Service Card

Visual Electronics Corp. (Booth 301)
Step into Visual's studio and watch the VP3 **color camera** make a picture with six-color masking, contours out of green, comb filtering, and crispening. The new **Datavision Display System** for TV titling will be demonstrated; alphanumeric characters can be programmed to roll or crawl horizontally or vertically. Other products in the booth will include the Rapid-Q **tape cart line,** a new **video switching system,** Favag **master clocks,** a **uhf TV transmitter,** and **high-band color VTR.**
Circle 361 on Reader Service Card

Vital Industries (Booth 323)
The spotlight here will be on the low-cost VIX-56 **video switching system.** You can also see other **switching systems, special effects generators,** and **video processors.** Equipment will be operating in the booth, so stop by and inspect it.
Circle 367 on Reader Service Card

Wilkinson Electronics (Booth 201)
Stereo FM is the feature attraction here, and the demonstration will show the new FME10 **FM exciter** and SG1E **stereo generator,** which have up to 60 dB separation and less than 0.25% distortion. A new **3-kW FM transmitter** will also be shown, as well as **monitors, audio consoles,** and **replacement silicon rectifiers.**
Circle 362 on Reader Service Card

daily. Some carpets cause your body to pick up static, which can zap transistors. A member reported that a short-nap Acrilan carpet with antistatic coating minimizes static buildup.

• *How can you get the most out of test tapes?* Never stop or rewind a test tape; let it play all the way out, said Bob Hurst. Then remove it from the normal tape path (through heads) and rewind it direct. When you stop or rewind a tape, you stretch it, and it's no good as a test tape anymore.

• *What's the best head-cleaning material to use?* Worst are xylene and MEK, which dissolve tape binders, according to Cal Strobele. Safest is Freon TF, which leaves no residue. Norm Ritter said a VTR head cleaner should be nontoxic, nonflammable, and incapable of attacking either the tape or head components. DuPont's Freon TF and Miller-Stephenson's MS-200 are both good. Use lint-free tissue. Isopropyl alcohol, widely used in audio, doesn't do well with a video headwheel as it leaves a residue. However it's OK to use for cleaning tape guides. You should use nothing harder than your finger *(not* your fingernail) to clean a video head assembly.

"It's OK leaving here!"

Friday afternoon four men described the quality-control techniques used by the networks and Ma Bell. The panel consisted of Arnold King, Jr. of CBS, John Serafin of ABC, Warren C. Phillips of NBC, and Myles P. McCosker of the AT&T Long Lines Dept.

In 1944, the first commercial intercity TV networking began in monochrome. In 1954, with the advent of NTSC color, it became obvious that the networks and the telephone company would have to work together to assure good quality signals being delivered to affiliates. Two groups were formed to watchdog color video transmissions: VITEAC (Video Transmission Engineering Advisory Committee) and NTC (Network Transmission Committee).

Serafin reported that ABC was not satisfied with the NTC VITS, and had developed its own test signal to check the quality of signals delivered to affiliates.

Phillips said that NBC was still using the NTC VITS, having its affiliates send back Polaroid prints of the pictures they receive.

McCosker described the AT&T control system, with headquarters in New York and division control centers additionally in Washington, Atlanta, Chicago, Dallas, and Los Angeles.

King said that later this year AT&T will initiate the TIDI Sound System (for *ti*me *di*vision) for intercity television transmission in a portion of the southeastern US. TIDI Sound multiplexes audio onto video so both may be routed together, saving the expense of a separate audio pair and making it impossible to lose either without the other. In the TIDI Sound system, audio modulates a 15-kHz rf carrier which is sampled once each horizontal line. The sample is placed on the front porch of the video signal. Before the composite signal is fed to a station, audio is demultiplexed. Someone asked if TIDI Sound audio would have a greater bandwidth than the present 5 kHz of intercity circuits. No, said King, the 5-kHz bandwidth is here to stay, for cost reasons. You get what you pay for, and 15-kHz audio costs more than 5-kHz does. Most of the public accepts 5 kHz TV sound, and the networks simply see no reason to pay more for audio that would be appreciated by few. (TIDI Sound is similar to the BBC Sound-in-Syncs system, which places sampled audio in the horizontal sync pulse.)

JCIC Ad Hoc Committee Report

Blair Benson of CBS delivered a summary of committee activities to date. In 1968 an ad hoc committee was set up by the Joint Committee of Inter-Society Coordination (JCIC) to study the problem of variations in color observed in TV pictures. Member organizations are EIA, IEEE, NAB, and SMPTE. The American networks and CBC are also involved.

Next, Benson showed a proposed color reference signal which was being discussed by member organizations. He also reported suggested color balance temperatures: 6500 K for studio monitors and 9300 K for home receivers. One common cause for color imbalance, he said, was misuse of stabilizing and processing amplifiers, which can alter hue (chrominance to burst phase) and saturation (luminance to chrominance ratio).

Film Color Still Bad

Friday evening's film panel reiterated the gripes heard last year and added a few. Moderator was D. Lisle Conway of GE, and participants were Charles Ahto of Tape-Films, Inc., William Honeycutt of KRLD-TV Dallas, Leigh H. Kelley of Tucker Wayne Co., William Kessell of KTVT Fort Worth, Richard E. Putman of GE, Charles Vaughn, Storer Studios Inc., Ed Warnecke of Eastman Kodak Co., and Daan Zwick of Eastman Kodak Co.

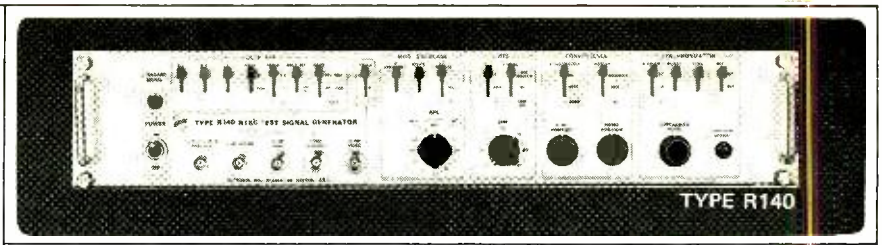
It was established that theatre motion-picture film is excellent, while TV film is poor. One reason for the difference is that 35-mm films are processed carefully by the major studios for theatre distribution under controlled conditions, and the budget is large enough to provide for good quality control. By contrast, 16-mm TV films are often reduction prints of 35-mm originals, perhaps even fourth- or sixth-generation copies, done on a low budget by a processing lab working for an agency. It was also pointed out that TV contains additional elements—the telecine chain, processing amplifier, and monitor. All of these devices must be color balanced and set up properly to obtain optimum color reproduction.

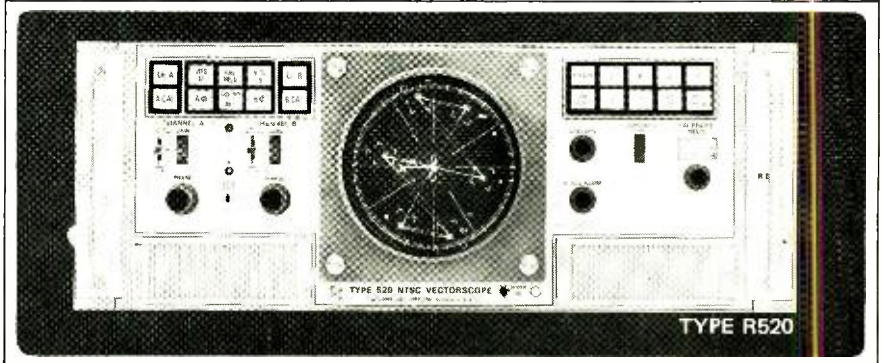
TV film commercial reproduction is bad and ad agencies are concerned, particularly since production costs have increased 46% in the last year.

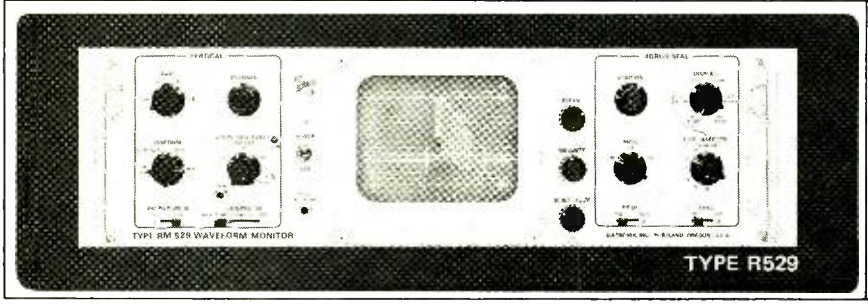
Someone suggested a color test slide which

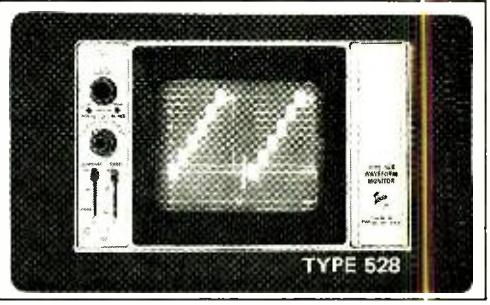
A COMPLETE FAMILY OF TELEVISION TEST INSTRUMENTS FROM TEKTRONIX

From signal source to waveform display Tektronix has an instrument designed to satisfy your video measurement requirement.









THE TYPE 140 NTSC TEST SIGNAL GENERATOR is a solid-state source of high-quality television test signals. Combined in one compact unit are: **NTSC Encoded Color Bars** with 75% and 100% amplitude, full-field or split-field bars at 10%, 7 1/2% or 0% setup level. **Modulated Staircase** providing variable APL, 10% to 90% and fixed APL, 50%. The test signal contains 5 steps plus blanking level with subcarrier phase locked to burst. **Convergence Crosshatch** provided for picture monitor linearity evaluation and convergence adjustment. **Vertical Interval Test Signals,** staircase or color bars, can be applied to lines 15 through 21 of either or both fields. **EIA Color Standard and Sync Generator** include a temperature controlled color standard with excellent frequency stability. Digital integrated circuits are extensively used to achieve stability, accuracy, and reliability. Outputs are provided of subcarrier frequency, composite sync and blanking, vertical and horizontal drive, burst, composite video and the convergence pattern signal. The Type 140 is the source of the waveforms displayed above.

140 NTSC Test Signal Generator $1800
R140 NTSC Test Signal Generator $1800

THE ALL SOLID-STATE TEKTRONIX TYPE 520 VECTORSCOPE is designed to measure luminance, hue and saturation of the NTSC composite color television signal. **Dual inputs** provide time-shared displays for comparison of input-output signal phase and gain distortion. **A chrominance channel** demodulates the chrominance signal for use in Vector Line Sweep, R, G, B, I, Q, Differential Gain (dA) Differential Phase (dϕ) displays. **A luminance channel** separates and displays the luminance (Y) component of the composite color signal. The Y component is combined with the output of the chrominance demodulators for R, G, and B displays at a line rate. **A digital line selector** permits positive selection of Vertical Interval Test Signals from lines 7 through 22 of either field.

Type 520 NTSC Vectorscope ... $2150
Rackmount Type R520 ..... $2175

THE TYPE 528 SOLID-STATE WAVEFORM MONITOR is ideally suited for monitoring waveforms from camera outputs, system output lines, transmitter input lines, closed-circuit and educational TV systems. Requires only 5 1/4 inches x 8 1/2 inches mounting space. **Flat, IRE, Chroma, and Diff Gain** vertical amplifier response positions. Sweep modes are: **2-V Sweep** (two field), **2-V Mag-Sweep** (expanded two field), **2-H Sweep** (two line), and **1-μs/div Sweep** (calibrated sweep with accuracy within 3%). Internal or external sync is selectable. Provision is made for **YRGB and RGB displays.** This **lightweight** waveform monitor converts to a **portable** unit for field service by adding an optional protective cabinet. An optional Rack Adapter permits side-by-side mounting of two Type 528's.

Type 528 Waveform Monitor $890

THE TYPE 529 WAVEFORM MONITOR is a general-purpose video monitor with VITS measurement capability. Vertical response characteristics are **High-Pass, Low-Pass, IEEE** and **Flat** (8 MHz). **A video-output amplifier** supplies video and a brightening pulse to a picture monitor, intensifying the same line(s) displayed on the instrument when using the **Line Selector.** Horizontal selection provides **2-field** or **2-line** displays, plus calibrated sweep rates of **0.125 H/cm** or **0.25 H/cm. Sweep magnification** extends the sweep rate by X5 or X25. **Positive field selection** in the **Line Selector** mode permits detailed study of any desired line(s), and a front-panel switch selects line 16 through 21 for viewing VIT signals.

Type 529 Waveform Monitor $1200
Rackmount Type RM529 ..... $1250

For a demonstration call your local Tektronix field engineer or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.

Tektronix, Inc.
committed to technical excellence

Circle 151 on Reader Service Card

can be put in a projector to set up the telecine chain. Slide dyes change color with heat, so the slide should not be at the projector gate, but at the field lens. However, projectors aren't normally made to provide access to the field lens, and manufacturers should modify them accordingly.

Screening was seen as the major item lacking in many stations. If you don't screen a film ahead of time you won't know if it's bad or not. Also, the screening room needs to be properly set up. There should be a standard screen, standard projector illumination, etc. The CBC has a standard screening room, and it was suggested that the U.S. networks adopt one too.

A spot may screen good but look bad next to adjacent program material. How about painting to cure the problem? Not a 10-second spot, said the panel, or even a chain of back-to-back commercials—there's no time.

There was some discussion of what color temperature to use in projectors. CBS uses 5400 K with a Xenon lamp, and this seemed the consensus, although 3400 K was suggested for a Tungsten lamp. It was suggested that Xenon be standard in production houses—but not as necessary in stations.

Some projected that in 1970 many spots would purposely use psychedelic colors, further confusing the problem of color balance.

Film cleaning was brought up, and William Kessell of KTVT reported that his station, an independent, runs films most of its 18-hour broadcast day. He said KTVT runs all film through a Harwald cleaner after editing. They keep the telecine room under positive air pressure, using filtered air. It was also mentioned that ultrasonic film cleaning is probably the best method, but the most expensive.

Super 8 came up in the discussion, and it was reported that NBC has used that medium on the air for newsfilm. Lack of projectors suitable for TV use was cited as one reason Super 8 hasn't been widely adopted.

Several members agreed that stations ought to reject poor color prints, rather than run them and get blamed for the poor color.

Perhaps the most hopeless note was the comment from the floor that you can't really specify color, as it's subjective. What do you mean by the word *red?*

New Demodulator for Transmitter Monitoring

Lucien Feldt of Rohde & Schwarz described the design and function of his firm's recently developed demodulator. The instrument functions both as a high-quality stand-in for the home receiver to allow the operator to observe what the transmitter is putting out, and as a measuring instrument for checking performance of the transmitting system. The demodulator has been designed with very low linear and nonlinear distortion to enable it to present an accurate picture from the transmitted signal. A switchable sound trap allows measurement of the higher video frequencies when the transmitter sound carrier is switched off for testing. Both rf and i-f inputs are available, so step-by-step checking can be made of the newer transmitters using i-f modulation. And a double sideband modulator has been developed to permit checking the demodulator specifications.

Automation Speeds Tape Editing

One disadvantage of quadruplex video tape is that you can't still-frame it while editing, as you can film and helical tape. Ken Davies of Central Dynamics Ltd. presented a paper describing automation-controlled tape editing. The editor uses work copies of original video tape to assemble his edited package along with the automation code. Then the system assembles an edited master from the original tapes. The system works with quadruplex or helical machines, one record and up to three playback. Frame accuracy and color frame identification are features, and the system may be tied into a computer.

Other Papers

There were a variety of papers at the conference, some of which updated versions of NAB's '69 convention presentations. Among the new papers were these:

Charles M. Eining of NBC's WMAQ-TV Chicago described the design and construction of his station's four color mobile units. Charles Spicer of Visual Electonics explained the operation and use of his firm's system of computerized automation of TV broadcasting, from traffic and scheduling through master control and program log printout. Dr. Richard E. Ottinger of the Georgia Educational TV Network outlined the operations of the 10 stations in the Georgia net. Charles T. N. Paludan of NASA presented some interesting infrared photos taken by satellites and high-flying airplanes. The pictures are useful in crop and land-use study.

No Exhibits, But a Few Products

As in previous years, the conference was a working session, with no exhibit hall. Nevertheless, three manufacturers showed equipment:

- IVC had an EMI 2001C live color camera working in their suite, displaying the smiling face of the traditional pretty girl.
- RCA had a remote bus in front of the hotel, with a lonely TK-44A camera on the sidewalk making a picture of the strikingly modern Atlanta skyline.
- Television Equipment Associates showed several products in their suite: one-gun color monitor, video tape cleaner, test pattern illuminator, Color Gard meter, and Sennheiser mikes. **BM/E**

One-inch video tape applications number in the hundreds.

SONY'S four EV-Series VTRs take care of them all.

The differences between Sony's four, one-inch video tape recorders are quite clear and straightforward.

More important, however, is what the four have in common.

They're all extremely rugged and reliable—able to withstand both desert and sub-freezing temperatures, and a good deal of jarring and shaking.

They're easy to operate—with color-coded push-button controls, automatic end-of-tape shutoff, and absurdly simple tape threading. And they're versatile—all have two-channel audio (one for dubbing previously recorded video), variable slow motion during playback, and stop-action.

And the differences?

Here they are:

SONY®

...the better one

SONY CORPORATION OF AMERICA

47-47 Van Dam St. Long Island City, New York 11101

P.S. Don't forget, Sony makes the best video tape available

Continued from page 47

Barry Research equipment needed to convert AM transmitter for phase modulation: Teleprinter converter TCT-2 (left side) and phase modulator TPM-2 (center of cabinet).

printer signals are then decoded from the recovered subcarrier.

While data flow within the system is synchronous, the input teleprinter data is not, and the teleprinter converter (which accepts the input data) therefore contains storage and re-timing circuit to obtain a synchronous bit stream.

Multipath signals and receiver selectivity inevitably convert some of the phase modulation into AM, so the largest permissible phase modulation is limited by that which would be detectable by the listener. Conventional AM receivers are relatively insensitive to low-frequency PM deviations of 50° peak-to-peak or less. At a 60 wpm data rate, phase deviations in this system are 25° p-p, or ±10 Hz, well within the 20-Hz AM tolerance.

A major portion of the receiving converter is the circuit which derives sampling timing. Optimum sampling times are those at which the noise-free subcarrier signal reaches its maximum amplitude. The sampling rate is crystal-controlled. However the phase of the subcarrier sampling pulses is continuously adjusted to coincide with the maximum amplitude points of the received subcarrier signal. The adjustment is made slowly so that dropouts and noise don't appreciably disturb sampling timing. The converter also includes circuits which sense when sync is lost and quickly restore correct timing. Another circuit senses the absence of the subcarrier and holds the output loop in a steady "mark" condition. This avoids energizing auto-start teleprinters, or printing noise, and makes unattended teleprinter operation possible.

To provide further immunity from noise and signal fading, diversity reception is employed with two receivers and an automatic AGC-controlled selector. This technique was used in the VOA tests. It might be unnecessary if only the stable, ground wave from a medium-frequency broadcast station were used. **BM/E**

FCC Rules

Continued from page 15

production and presentation of programs "other than automated services." The Commission puts teeth in its order by further providing that if the CATV system does not originate local programming, it will not be able to carry the signal "of any television broadcast station."

(b) A CATV system may now cablecast advertising material. Obviously, such a provision will allow the CATV operator to defray costs of his program originations. Initial FCC limits, however, restrict such advertising material to "the beginning and end of each cablecast program" and "at natural breaks or intermissions" in the program itself. Also, the CATV system may not interrupt the presentation of program material to intersperse advertising. In instances where such programming is sponsored, paid for, and the like, an announcement must be made that the commercial matter is sponsored and the name of the sponsor must be included therein.

(c) Legally qualified candidates for public office may use cablecasting facilities and the CATV operator must make equal time available to all other candidates for that office. In addition, a CATV system originating programming shall afford reasonable opportunities for the discussion of conflicting views on issues of public importance.

(d) To promote diversity of control, CATV operations who wish to (or must) engage in cablecasting will be limited to only one channel on their system. This, says the Commission, "accords with the long standing principle in the television broadcast field" that one entity should not have interest in more that one TV channel serving the same area.

Conclusion

Extensive regulation by the FCC may now be expected to be supplemented by limited PUC and PSC regulations in more and more states. Initially, the states will probably concentrate upon (1) imposing technical standards on CATV; (2) regulating installation and monthly charges of CATVs; and (3) requiring the CATVs to file detailed data on many phases of the CATV operation.

While the tri-party regulation of CATV (by the FCC, state public service organs and city governments) will complicate the administration and costs of CATV systems, it also shows that all levels of government are now recognizing the importance of CATV and the potentially great future of the industry. It must be noted that the public utility companies and broadcasters have fared quite well financially under close regulations and, hopefully, so will CATV.

Finally, further evidence of the growth of CATV is the "promotion" of the FCC's CATV Task Force to "Bureau" status. A bureau-in-name-only at this juncture, the FCC's Cable Television Bureau will assume more and more responsibility, regulating cable television systems in the United States. **BM/E**

This section, providing broad interpretation of FCC rules and policies, does not substitute for competent legal counsel. Legal advice on any given problem is predicated on the particular facts of each case. Therefore, when specific problems arise, you would be well advised to consult your own legal counsel.

Next 50 Years

Continued from page 42

and of a much more personal nature than today.

These predictions are based on the conviction that the private enterprise system will survive and grow in the next half-century, operating from a profit-oriented base. I see little change in the role of the broadcaster to serve "the public interest, convenience and necessity." The real changes may be involved in the developing interpretation of what constitutes this public interest, convenience and necessity.

Whatever the interpretation, technology will be able to provide these needs as they are defined and as the demand for them develops.

—Ray B. McMartin, President
McMartin Industries, Inc.

More Deft Electronic Editing, Higher Quality Transmission

THE BURGEONING number of television stations in this country and the expected rapid growth of cable systems, with their multiple channels into the home, will impose pressing demands on the broadcast equipment industry. More channels to feed certainly will mean a tremendous increase in program material, involving a much wider variety of viewer fare than we have today.

Programs are likely to become simpler in execution on the one hand; more complex on the other. Editing may have to be done faster, and more deftly. In other words, the programming people will have their hands full in satisfying these demands. And they will look to the equipment makers for new and improved devices—well beyond the operational and maintenance limitations of present equipment—to help them in program production and recording.

A second demand on the equipment maker, and one apt to become more insistent as programming sources multiply, is improvement in the technical quality of broadcast transmissions. Progress has been made in this area but the level of quality here at home often is compared unfavorably with that seen in Europe. Much more work is needed to upgrade transmission quality if television is to become the pervasive communications medium that we expect it to be.

The next 20 or 50 years undoubtedly will see new concepts and new products for broadcasting that are not now envisioned, but technology must evolve solutions to these immediate problems if our industry is to continue its orderly progression.

—Andrew F. Inglis, Division Vice President
RCA Commercial Electronic Systems

Universal Digital Standards Will Yield Perfect Pictures

WHEN MARCONI demonstrated his wireless transmitter and receiver in 1895 and indeed when regular broadcasting began in 1920, no one could possibly have forecast the tremendous developments in technology which have been achieved and the way in which these have affected the life of almost every human being on this earth by 1970.

During the next fifty years we shall have an even greater number of new technological innovations, which, amongst others, will give us the following: a fully automatic color television camera with a single solid state pick-up tube and no camera cable (and as simple to operate as the present-day movie cameras); a fully color-compatible and non-standards conscious television recording system; the freeing of all of the current VHF and some of the UHF channels for mobile communications purposes.

Television broadcasting will then be effected by means of satellite communications to ground stations. Major concentrations of population will have receive-and-transmit-satellite ground stations, but many large cities will have receive-only stations. All of these ground stations, together with the networking and local studios, will be connected to switching centers from which a single coaxial cable or waveguide will take the signal to the viewer's home. This will also provide the opportunity of pay television.

Obviously, this will make the television receiver as we know it today much cheaper, but by this time it will have many common parts with a TV tape player and a hard copy printer, providing newspapers in the home, etc.

All this will happen within the foreseeable future, but the biggest change in the next half century will come if the various nations and ethnic groups of this globe will allow us to introduce a single worldwide standard using a digital-type of scanning system. The technical advantages that will attend this standard include perfect picture production in the home, ease of recording and better use of bandwidth.

—Thomas Mayer, Managing Director
Marconi Communications Systems Limited

Cable Completely Integrated with Broadcasting by 2020

BY 1984, digital concepts will have taken over all electronic functions except for image tubes, kinescopes, microwave and high-power amplifiers, where analog circuitry will still prevail. Complex functions such as sync pulse generation, video processing and video switching will be accomplished by means of single-chip microcircuits.

Satellites will perform all network distribution for both open-circuit and cable networks. Miniature computers will handle simple functions such as transmitter control, while large, time-shared computers will be used for station programming, billing, and similar functions.

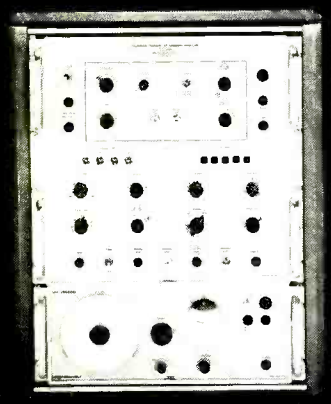
The cable industry will be completely integrated with broadcasting in ownership, programming, production and distribution facilities. In addition to a wide variety of program material made available through satellite-interconnected distribution networks and from local and distant television stations, cable systems will have started to develop libraries from which viewers, through two-way random access devices, will be able to select entertainment and educational fare.

By the year 2020, world-wide television networks will exist, and timing functions for all electronic devices, clocks, etc. will be derived from a single world station through satellite distribution. Film and video tape will have given way to solid-state storage devices and will be accessed from central libraries having many trillions of bit storage capacity. Thermionic high vacuum devices will have completely disappeared.

The cable and broadcast industries as we know them today will have been replaced by a massive telecommunications facility providing up to 100 channels of satellite-to-home programming.

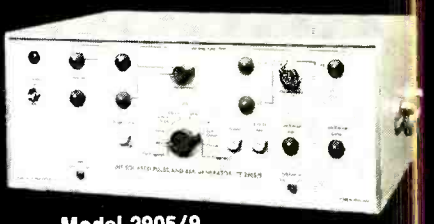
—Lyle O. Keys, President
TeleMation, Inc.

mi first in TV transmission test equipment.



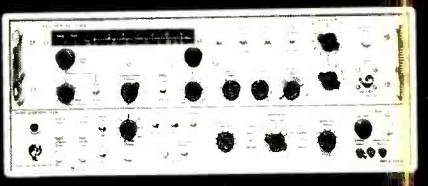
Model TF2360

Model TF2904/1



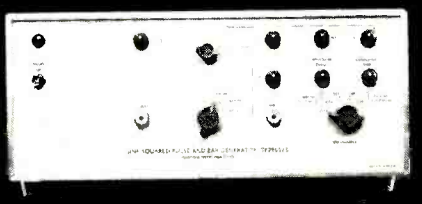
Model 2905/9

Model TF2908



Model 2361

Model 2909/1



Model 2905/5

DESCRIPTION	FREQUENCY	FEATURES
VIDEO AND UHF SWEEPER Model 2361		Main sweep unit has internal rep. rate 0.01Hz to 100Hz with linear, semi log C/W, single shot and manual modes. TV field lock, blanking and phase shift controls and alternate trace separation.
SINE² PULSE AND BAR GENERATOR Model 2905/5		Sine² pulse and bar generator for 525 line systems includes monochrome pulse and bar T/2, T and 2T. Also 10T and 20T with color burst, color sine² pulse and bar and sub-carrier added to staircase or sawtooth. External sub-carrier may be used.
SINE² PULSE AND BAR GENERATOR Model 2905/9		For accurate K factor measurement provides T, 2T, 5T, 10T, and 20T sine² pulse, 25μsec bar, adjustable luminance/chrominance amplitude and delay, color burst, pedestal, asynchronous square wave, 0.05 volt 52μsec set up. Includes inverted sine² pulse for checking quadrature distortion.
LUMINANCE/CHROMINANCE GAIN & DELAY TEST SET Model TF2904/1		Measures gain and delay inequality with gain discrimination 0.5 dB, delay discrimination 2 nanoseconds, visible display of misalignment with scope.
TV SIDEBAND ANALYZER Model TF2360	100KHz to 20MHz 30MHz to 90MHz 170MHz to 230MHz 470MHz to 960MHz	Provides a symmetrical or asymmetrical swept video signal for testing video amplifiers or transmitters using 625, 525 or 405 line systems, positive or negative modulation.
BLANKING AND SYNC MIXER Model TF2908		Reshapes blanking and sync pulses and mixes with video waveform (sine² pulse and bar, sweep, sawtooth, etc.). Permits sweep measurement with clamps or dc restoring circuits in normal operation. Output flat 0.2 dB to 10MHz, 0.3 dB to 20MHz.
GRAY SCALE GENERATOR Model 2909/1		For linearity measurements on color and monochrome systems. 5, 7 or 10 stair step or sawtooth with line sync. selectable every first, fourth or fifth line. Color sub carrier can be added to steps. Features automatic switching between black and white levels. Contains line frequency xtal or may be triggered from external VIT unit.
ASSEMBLY Model 2900		Comprises: Sweeper 2361, Mixer 2908, Differential Probe Unit 2907. Makes swept measurements on TV signals to 0.01dB.

Available Upon Request

Television Transmission Test Equipment which details methods of TV measurements, and presents a new range of TV transmission measuring equipment available from Marconi Instruments.

mi MARCONI INSTRUMENTS
DIVISION OF ENGLISH ELECTRIC CORPORATION

111 CEDAR LANE ☐ ENGLEWOOD, NEW JERSEY 07631
TELEPHONE: (201) 567-0607

Circle 155 on Reader Service Card

Broadcasting Will Become Narrow Casting; Accentuating the personal

STARTING IN THE 70s, radio and television will be completely transformed from "household" media to "personal" media. Programs will be created for audiences of individuals, defined in sociodynamic terms still to be coined—a new language far more descriptive and meaningful to programmers and to advertisers than "household ratings"—a box-car statistic that has dominated the industry.

Increasingly, more emphasis is being placed on the demographics of the individual listeners who comprise the audiences of radio and television programming. This year the national television networks are vigorously contesting their advantages with respect to attracting young adult viewers—and "Jackie Gleason" and "Petticoat Junction" are early casualties. In years to come, we will experience increased attention being placed on the measurement of attitudes, interests and tastes, to the determination of what turns target audiences "on" and what turns them "off."

Technology will play an important role in this "personal revolution." The number of television sets per household will increase as computer technology and integrated circuits will reduce both the size and cost of color television receivers. More television stations—commercial and non-commercial—and cable television will increase program choices. Communication satellites will open new world-wide vistas for live programming, and potential economies could result in expanded domestic network schedules.

Pre-recorded and do-it-yourself video playback units will significantly expand the program choices available to individuals. The audio field is in the midst of a similar revolution today, with 8-track stereo competing with cassettes and the latest innovation, quad-stereo.

Broadcasting will assume many of the characteristics of narrowcasting. Perhaps belatedly, but inevitably, broadcasters (and advertisers) have come to realize that audiences are composed of individuals, each reacting to personal interests and personal needs.

—Allen R. Cooper, V.P. Planning
National Broadcasting Company

Complete Automation, Super-size TV

TYPICAL OF THE ADVANCES over the next 50 years will be the station which operates itself, trouble-shoots itself, and repairs itself, and a "super" television system for wide-screen wall-size pictures with stereo sound.

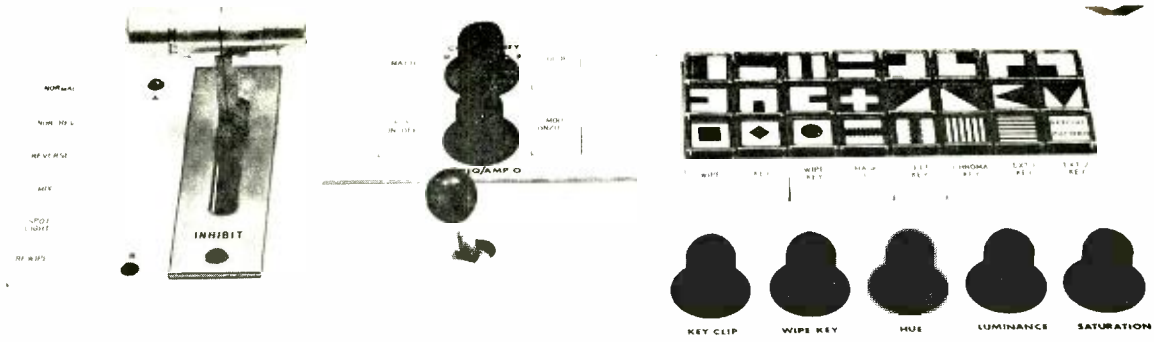
In coming years, most homes in urban areas will be wired for CATV reception. The cable TV industry will supplement basic free television with a variety of programming, time scheduling and special interest programs.

By the year 2020, a full range of personal services—such as individual viewing of programs and instructional material on demand—will be among the specialized entertainment and educational programming available. Shopping by television will be commonplace.

Station automation is essentially here now, with the hardware and technical know-how to automate both operations and business functions. By 1984, a large number of stations will be automated; by 2020 the changeover will be complete.

The "super" television system will be technically fitted to the requirements of wall-size wide-screen television screens whose dimensions are measured in feet. Increased scan lines for better resolution, for example, will provide the technical base for specialized large-screen programming.

—James M. McDonald, General Manager
Visual Communications Products Dept.
General Electric Company



FOR EFFECTIVE PROGRAMING AND COMMERCIALS

check the advantages of the Vital VSE-2000 special effects system

- ☐ Extensive use of linear and digital integrated circuits with rigid power supply regulation for optimum stability.
- ☐ All pattern selection is via momentary illuminated pushbuttons.
- ☐ Built-in effects inhibit on non-synchronous video.
- ☐ Internal (self) key, two external key inputs and chroma key with simultaneous wipe key, mask key.
- ☐ Matting monochrome and color.
- ☐ Spotlight
- ☐ 24 wipes with 8 rewipes with means to generate unlimited number of patterns.
- ☐ NO drives required from local sync. Video from A or B buss furnishes required drives and sub-carrier.
- ☐ Positioner with built-in pattern modulator and outputs for tracking camera drives.
- ☐ First "In-line" chroma key in the industry. Will chroma key on composite signals on any color.
- ☐ Includes NAM mixer amplifier.
- ☐ Full tally logic.

GOOD ENGINEERING IS VITAL

MAIN OFFICE: 3614 S.W. Archer Road
Gainesville, Fla. 32601 904—378-1581

2644 N. Seventh Street
Terre Haute, Ind. 47804 812—466-3212

3620 Ridgewood Rd., N.W.
Atlanta, Ga. 30327 404—233-9459

210 Elder Fields Road
Manhasset L.I., N.Y. 11030 516—627-0351

VITAL INDUSTRIES, INC.

Circle 150 on Reader Service Card

BM/E CLASSIFIED MARKETPLACE

CLASSIFIED ADVERTISING RATES

DISPLAY CLASSIFIED ADVERTISING: $22.50 per inch 1x; $22.00 per inch 3x; $21.00 per inch 6x; $20.00 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 25¢ per word; minimum $3.00. BLIND BOX NUMBER: No extra charge. Replies sent to address below will be forwarded to you. PAYABLE IN ADVANCE; send check with order. CLOSING DATE: 5th of 2nd month preceding issue date.

BM/E, Monterey and Pinola Avenues, Blue Ridge Summit, Pa. 17214 Phone 717/794-2191

HELP WANTED

TELEVISION EQUIPMENT SALES

Immediate openings in television equipment sales organization for aggressive, sales oriented individuals with strong technical knowledge of television equipment primarily transmitting systems A leading broadcast equipment supplier is rapidly expanding into the television market and has the following positions available.

District Sales Managers—TV Products
TV Products Manager
TV Service Manager

For further information call collect or send resume to Robert T. Fluent, Assistant Personnel Manager, 123 Hampshire, (217) 222-8200.

GATES RADIO COMPANY
A Division of Harris-Intertype Corporation
QUINCY, ILLINOIS 62301
An equal opportunity employer (M&F)

CIRCUIT/PRODUCT DESIGN ENGINEERS

The engineers we seek will include their talents in Video, Audio and Computer related circuitry designing products for the Television Broadcasting Equipment market. Send resume to the personnel manager. Vital Industries, Inc., 3614 S.W. Archer Road, Gainesville, Florida 32601.

ENGINEERING

Mississippi ETV Authority seeks experienced maintenance engineers for VR 2000 videotape, UHF transmitter and color studio. First class license required. Ground floor opportunity. Major expansion planned for July. Send complete resume to: **Director of Engineering, MAET, P.O. Drawer 2470, Jackson, Miss. 39205.**

First phone maintenance engineer for expanding CC-ITV system located 1½ hours from New York City in Catskill recreation area. Must be familiar with broadcast quality video, audio, 10 cameras and Ampex VR 1200. Helical scan tape experience helpful. Some operations duties. New facility and equipment. Contact Kenneth Knecht, State University College, New Paltz, N.Y. 12561. AN EQUAL OPPORTUNITY EMPLOYER.

WANTED: Chief engineer for full time station must do some announcing. Desire someone permanent. Pay commensurate with ability. Submit tape and resume to Paul E. Reid, WBHB, Fitzgerald, Ga. Phone 912-423-2077.

Studio Engineer—Capable of installing, maintaining and operating complete cable TV Local Studios, town of 60,000. Write Box 1308, Alexandria, La. 71301.

Immediate opening for full time first phone at midwest station. Some air work. Benefits WCWC Radio, Box 156, Ripon, Wisc. 54971.

POSITIONS WANTED

Available immediately, age 49. 5 years TV, 7 Radio. 1st radiotelephone, George Davenport, Conde, S. Dak. Tel. 382-3183.

POSITION WANTED (cont'd)

Canadian born, trained radio man, 7 years experience, seeks change to Southwestern U.S. preferably Arizona. Top-rated shows, adult news, sports delivery. Play by Play experience. Train for automation (IGM). Country music a specialty, enjoy MOR too. 28, married. Seek position with congenial station. Tape and resume on request. Write D. G. Rutledge, Production manager, P.O. Box 1230, Castlegar, B.C. Canada.

CATV local origination has its problems. We know because we've solved them. We are Consultants, not equipment salesmen. Let us show you how to make it pay both in additional subscribers and revenue. For information write S. A. Associates, Box 139, Penndel, Pa. 19047.

Creative young announcer—some experience—some college, plus just received first phone and willing to work. Will relocate. Send details to Bob Henry, Box 467 RFD #3, Willimantic, Conn. 06226 or call 203-423-3680.

1st phone experienced D.J., News, automation, heavy copy and production, able air personality. Ed Selby, 756 Bon Air St., La Jolla, Calif.

EQUIPMENT FOR SALE

SPECIAL PRICES PAKO EKTACHROME DEVELOPING MACHINES

TWO MODEL 28, 16mm ME-4 PROCESSORS LESS THAN 200,000 FT. OFF EACH MACHINE.

Photo-Pic Systems Inc.
100 Avenue of The Americas
New York, N.Y. 10013
212-925-1600

TRANSLATOR POWER Now put your translator where antenna should be for best coverage not where power line happens to be. Use a TELAN thermoelectric generator. No moving parts, simple to operate, leave unattended 6-12 months. General Instrument Corp., Thermoelectric Division, Dept. BM, 65 Gouverneur St., Newark, N.J. 07104, 201-485-2100 ext. 481, 486.

IMMEDIATELY available used RCA TK-10, TK-30 and TK-31 monochrome cameras. TG-2 sync generators. TS-5A switcher and Mincom monochrome dropout compensators. For these and other bargains in used and surplus equipment, write, wire or phone: Ed Ries and Associates, 414 North Alfred Street, Los Angeles 90048 (213) 651-5080.

SOLID-STATE AUDIO PLUG-IN OCTAL (1" Dia x 2" H) modules. Mic preamps, disc & tape preamp-equalizers, tape bias osc. & record ampl., power amps & power supplies. Send for free catalog and audio applications. Opamp Labs., 172 So. Alta Vista Blvd., Los Angeles, Cal. 90036.

EQUIPMENT FOR SALE (cont'd)

SCULLY TAPE RECORDERS: Mono. 2, 4, 8, 12, & 16 track models plus 270 automatic players. Some models in stock now. W.A.L. custom audio control consoles & console modules. Solid state 120 Watt power Amps. We buy and rebuild Scully lathes. WIEGAND AUDIO LABORATORIES, INC. 3402 Windsor Road, Wall, N.J. 07719. Phone 201/681-6443.

AMERICA'S LARGEST STOCK AND CONSIGNMENT LISTING of new and used broadcast and recording equipment. We trade-sell and buy. THE MAZE CORPORATION, P.O. Box 6636, Birmingham, Ala. 35210.

Jack Panels and patch cords, Audio and Video, new and used. Precision video coax cable and connectors (Belden 8281). Write for catalog. Gulf Electro-Sales, Inc., 6325 Beverly Hill, Houston, Texas 77027. Phone 713-781-3066.

FOR SALE: McMartin TBM-4500A FM stereo monitor completely retuned and calibrated by mfgr. (with new crystal for your frequency) 90 day warranty. $1400. M. Rubin KMPX-FM, San Francisco.

Tower fabrication, erection and maintenance; used tower equipment. Coastal Tower & Welding, Inc., P.O. Box 984, Tallahassee, Florida. Phone 904-877-7456.

Protect your Lps. Heavy poly sleeves for jackets 5¢; paper poly sleeves for records 10¢; min. order $5.00. Record Supplies, Hillburn, N.Y. 10931.

Towers for sale, erection and maintenance, 18 years experience in tower erection. Robinson Tower Company, P.O. Box 143, Greenville, N.C. 27834. Phone 919-758-1453.

RCA 5DX transmitter 990KC. Tip top condition. Exceeds FCC standards. Can be seen in Everyday operation. WEEB, Southern Pines, N.C. 919-692-7440.

The complete and reliable source for new and used broadcast equipment. Request our free listings. Broadcast Equipment and Supply Co., Box 3141, Bristol, Tennessee 37620.

Self-supporting & Guide Towers. Any type ground wires new 68¢ per lb. (919) 752-3040 Box 55, Greenville, N.C. 27834.

EQUIPMENT WANTED

Mono easy listening 45 records, any amount, also 365 ft. used Heliax ⅞" or 1⅝" KETX Livingston, Tex. 713-327-8916.

Putting new UHF station on air. Need everything—No junk. Cash or terms. Jim Searer, Gen. Mgr., Channel 41, Grand Haven, Mich. 616-842-8974.

BUSINESS OPPORTUNITIES

Seeking new ideas for products for the Broadcast Industry. Q-TV Sales & Distributing Corp. New York, N.Y. 10013.

MISCELLANEOUS FOR SALE

SIGNS, NAMEPLATES, LABELS, Decals, Badges, Trophies, Plaques. Seton Corp., Dept. BM/E, New Haven, Conn. 06505.

PROGRAM SERVICES

DEEJAYS! 11,000 classified gag lines. $10.00. Unconditionally guaranteed! Comedy catalog free. Edmund Orrin, Boyer Road, Mariposa, Calif. 95338.

TECHNICAL SERVICES

IN CANADA...

FOR CATV SYSTEM: ENGINEERING — PLANNING — CONSTRUCTION — TECHNICAL SERVICES — MAINTENANCE — SYSTEM SUPPLIES — CLOSED CIRCUIT EQUIPMENT SALES

DEPEND ON EXPERIENCE
DEPEND ON
NORAM

1780 Albion Road ● (416) 741 0566
Rexdale, Ont., Canada

TECHNICAL SERVICES (cont'd.)

INSTRUCTION

BM/E ADVERTISERS' INDEX

NEW ENGLAND
41 Stevens Lane
Cohasset, Massachusetts 02025
617-383-0029
Donald B. Kennedy

MID-ATLANTIC
820 Second Avenue
New York, New York 10017
212-661-0450
H. R. Shanton Granger

SOUTHEAST
Ken Fairleigh Associates
P.O. Box 3956
Charlotte, North Carolina 28203
704-366-1434
Kenneth F. Fairleigh

ADVERTISING SALES OFFICES
MACTIER PUBLISHING CORP.
820 Second Avenue
New York 10017 212-661-0450

Edward F. Clancy, Sales Manager

MIDWEST
612 North Michigan Avenue
Chicago, Illinois 60611
312-642-3774
Thomas F. X. Carter

WEST COAST
1245 East Walnut Street
Pasadena, California 91106
213-795-1528
213-684-0590 (Los Angeles)
Lawrence C. Papp

Thompson & Healey Inc.
1111 Hearst Building
San Francisco, California 94103
415-362-8547
William J. Healey

JAPAN
Nippon Keisoku Inc.
P.O. Box 410
Central Tokyo, Japan
Yoshi Yamamoto

PRODUCT INDEX

A quick reference to products mentioned editorially or in advertisements. Page number is listed first (light face type) followed by reader service number (bold face).

NOW Plumbicon* Quality for your Vidicon Camera

The Amperex line of PLUMBICON® TV camera tubes now includes an entire family of one-inch, separate-mesh retrofits for most Vidicon cameras in use and being manufactured for live broadcast television, telecine, educational and industrial CCTV and X-Ray CCTV applications.

As the comparison chart below clearly indicates, PLUMBICON tubes eliminate all of the well-known drawbacks of conventional Vidicons while retaining most of their own inherent useful features.

CHARACTERISTICS	VIDICON	PLUMBICON
Picture Shading/Dark Current	Uneven and high	Uniform and low (dark current less than 3 nA)
Lag (Picture Smear)	High; 15% to 25% residual signal after 50mSec.	Low; 2% to 5% residual signal after 50mSec.
Sensitivity	200μA/lumen @ 1 ft-cdl target illumination and 20 nA dark current	400 μA/lumen at all light levels
Interdependence Lag/Sensitivity	Compromise between best lag characteristics and optimum sensitivity	Lag and sensitivity independent. Generally PLUMBICON has 1/5 lag and 2 to 3 times sensitivity of Vidicon.
Gamma	0.5-0.7; non-linear	0.95-1.0; linear
Scene and Highlight Retention	Frequently a severe problem	Not a problem
Target Blemishes	Tend to become "spotty"; initial blemishes tend to "grow" with usage time	Less prone to become "spotty"
Temperature Stability	Dark Current, Sensitivity, Lag very temperature dependent	Operating characteristics stable over −30° to +50°C temperature range

For more information on PLUMBICON tubes, particularly on the 16XQ series of one-inch, separate-mesh retrofits for most Vidicon cameras, contact: Electro-Optical Devices Division
Amperex Electronics Corp.
Slatersville, Rhode Island 02876
Telephone: 401-762-3800

Amperex®
TOMORROW'S THINKING IN TODAY'S PRODUCTS
A NORTH AMERICAN PHILIPS COMPANY

* Registered trade Mark N.V. Philips of Holland

Circle 165 on Reader Service Card

Commercial Electronics Incorporated Model 270

SENSITIVITY — The Missing Element in Color Television Cameras! The CEI 270 is an advanced, broadcast, television camera which produces color pictures at f/4 on a 5 footcandle scene. Remotes are a snap! Monochrome studios can be converted to color operation without additional lighting and air conditioning expense.

The Sensitive One . . . the CEI 270 . . . versatility at about half the cost of other professional cameras!

See us at the NAB — Booth 317!

Commercial Electronics Incorporated

880 Maude Avenue
Mountain View
California 94040
(415) 969-1910

Circle 166 on Reader Service Card