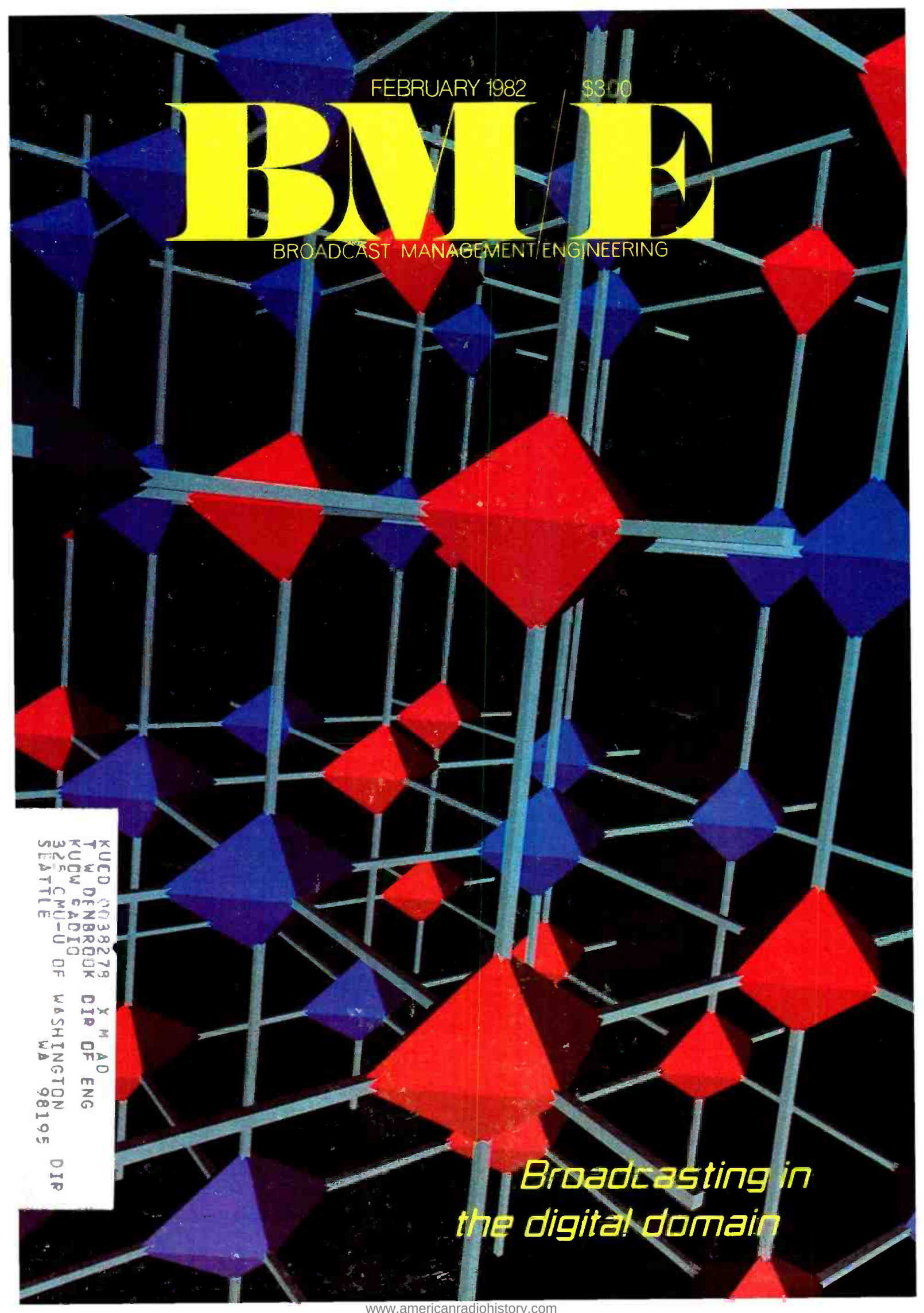

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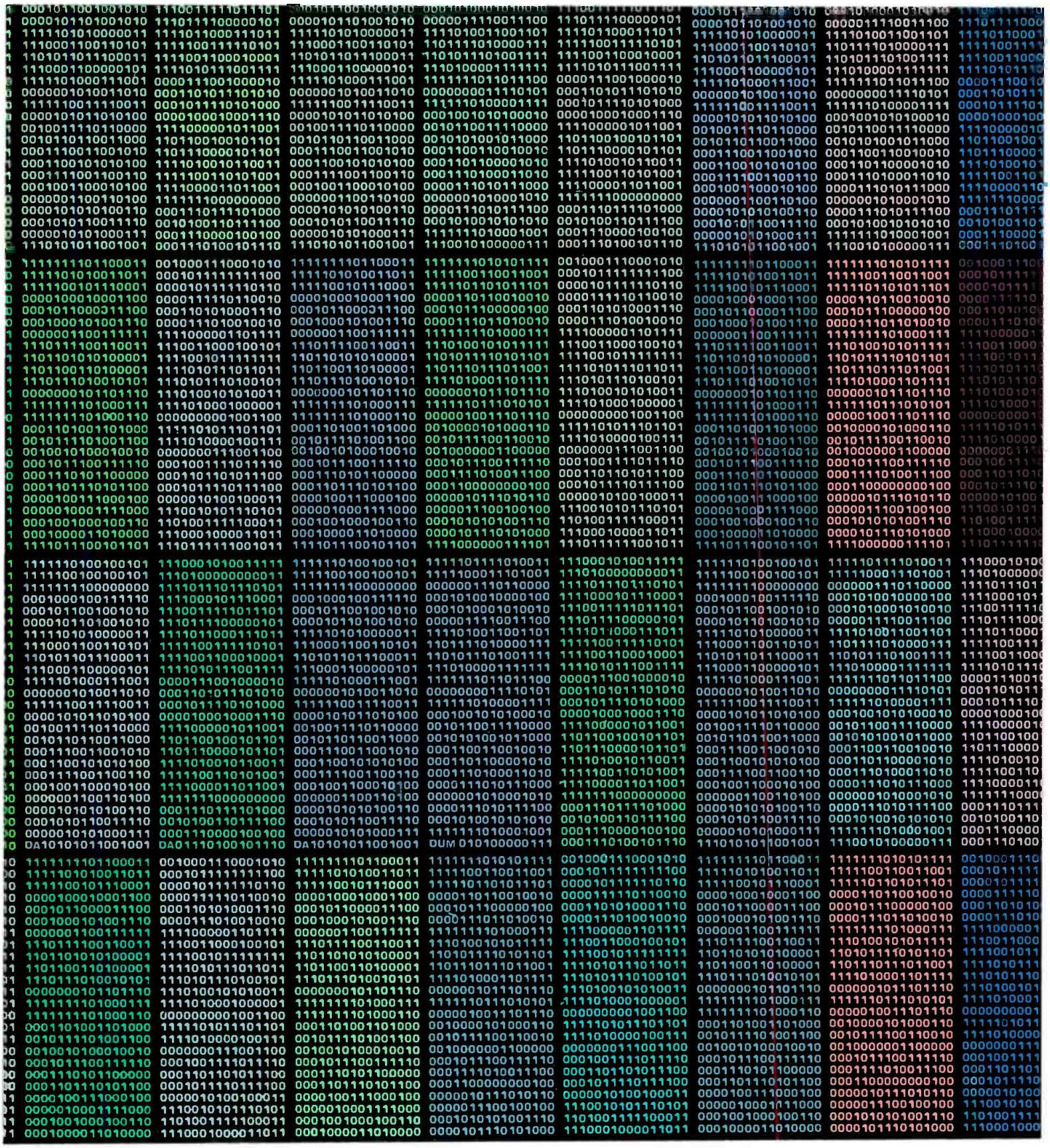
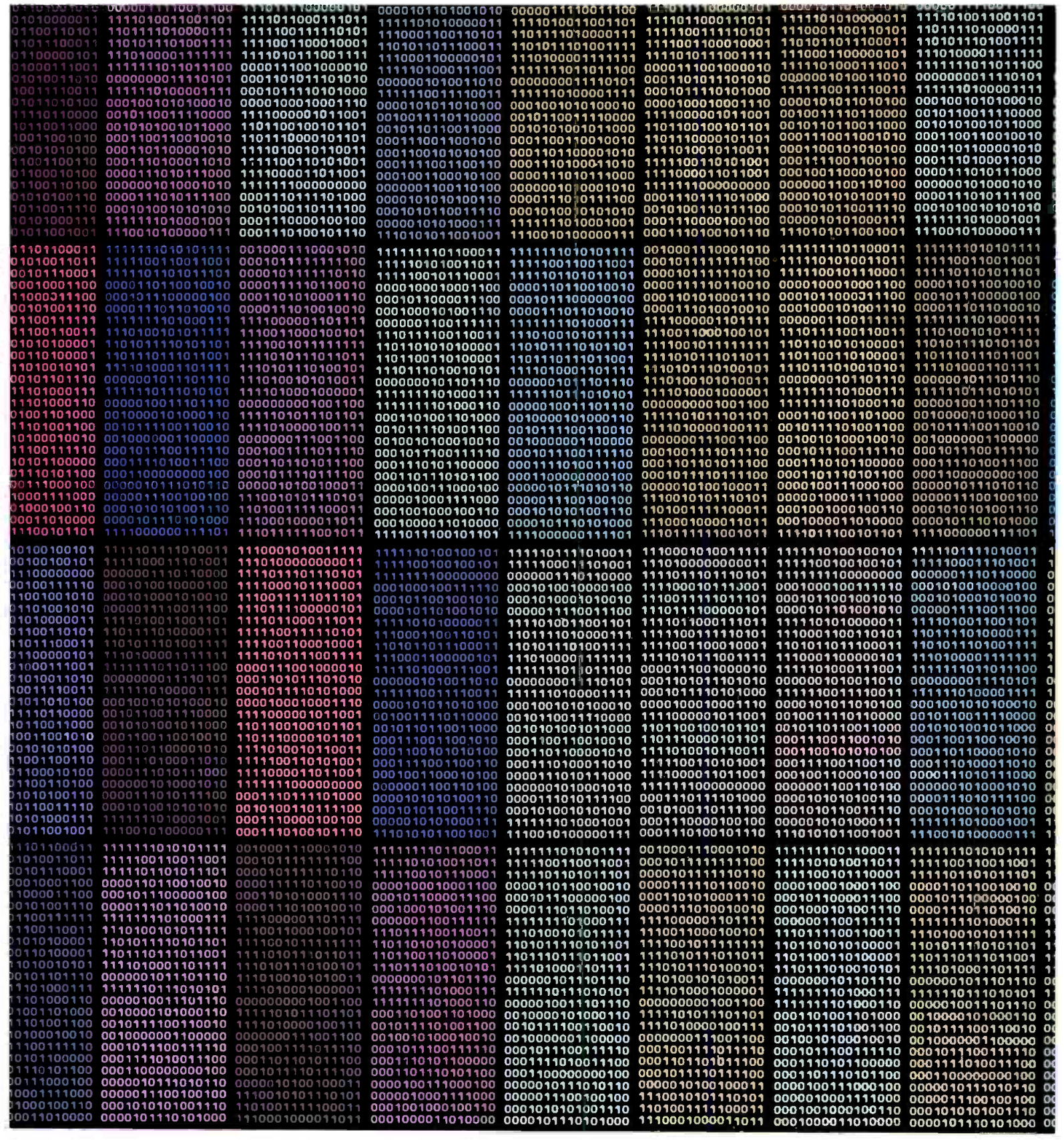


These are the first four notes of Beethoven's Fifth Symphony.



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BM/E
BROADCAST MANAGEMENT/ENGINEERING

This month's cover depicts the theme our Special Report, Broadcasting in the Digital Domain. The representation of a digital matrix such as might be found in a framestore was created by Digital Effects, Inc., NY, on a computer system with nearly 16,000,000 pixels. The designer was Donald Leich.

FEBRUARY 1982/VOLUME 18/NUMBER 2

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M205 photo taken during air operations at KRON, San Francisco. Lori Gunn, operator.

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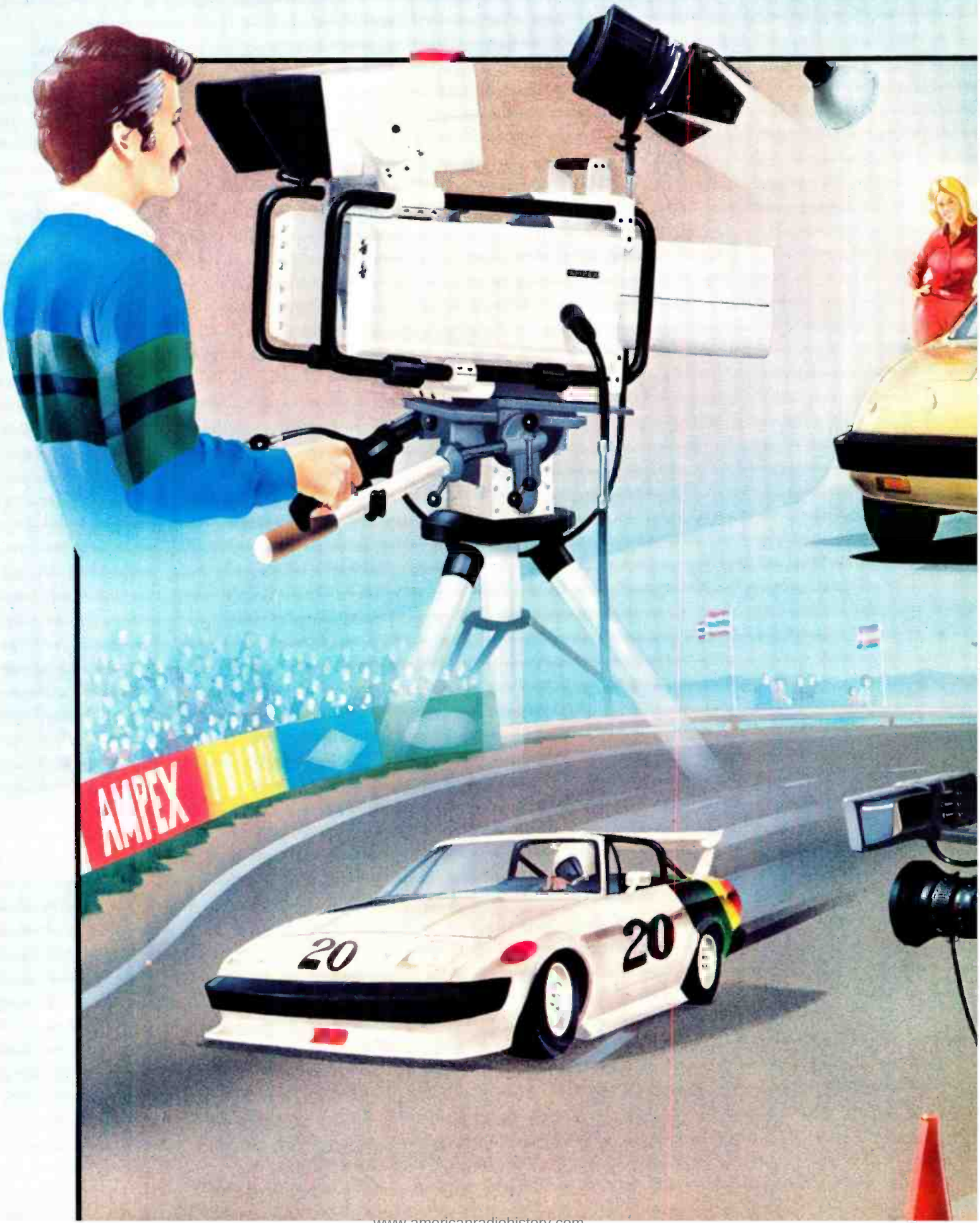

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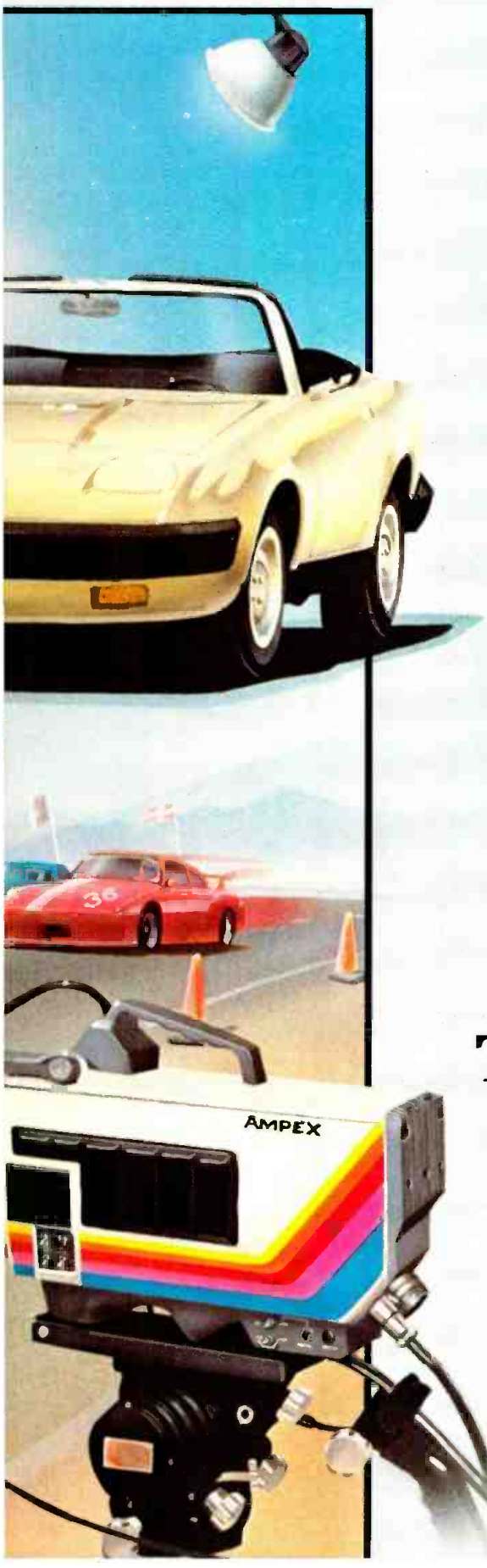

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EDITORIAL

Time to bury the digital hatchet

WHEN, IN THE YEAR 2016, the Society of Motion Picture and Television Engineers reflects on the one-hundredth anniversary of its service to the industry, we are certain its accomplishments last year toward worldwide digital standards setting will be among its most significant achievements.

The story of SMPTE's efforts—first shifting American broadcasters' thinking away from composite digital coding and toward the more widely accepted component sampling, and then convincing the rest of the world to wait for America—are by now well-known.

That SMPTE ended by recommending a 4:2:2, 13.5 MHz sampling rate to the CCIR (see *BM/E,* January, 1982, pg. 97) which will almost certainly adopt the standard at its February Plenary Session, is not pleasing to some American broadcasters and equipment manufacturers. It is argued that the 13.5 MHz sampling will end up being an expensive burden for U.S. broadcasters. The cost of converting the 14.3 MHz sampling rate of four times subcarrier into the new 13.5 format, it is claimed, will more than offset whatever cost savings might be achieved by allowing manufacturers to produce single worldwide models of their equipment.

"Sell-out" argument

Another argument is that SMPTE somehow violated its time-honored role of simply providing an industry forum and instead rushed into recommending a standard since the next Plenary Session of CCIR would not have been for another three years.

Those who state that SMPTE has "betrayed" American broadcasters to European interests should look again. PAL and SECAM countries were on the verge of adopting a standard without any U.S. input at all. Through SMPTE's efforts the rest of the world reconsidered adopting a standard that would have been ideal for 625-line systems and decided to compromise. No standard would have suited both sides perfectly; now there is a standard that can be achieved with a sacrifice on both sides of the Atlantic. The debate went on for over a year and all viewpoints were expressed; SMPTE felt it had a consensus for the 13.5 MHz frequency—albeit not a unanimous voice, but a clear majority.

We feel the long-term benefits to be gained from setting a worldwide standard far outweigh the objections to potential short-term cost increases. We urge manufacturers to put aside their differences and look to the future possibilities that the worldwide digital standards open. Picture a worldwide marketplace with the opportunity to share programs without the need for standards conversion. It's a picture of a world linked by a common TV standard for the first time.

Superior video results. Automatically. Or not.

The choice is yours. The Hitachi FP-22 and the Hitachi FP-21 are both professional, high-quality portable color cameras that provide superior video performance and operational simplicity.

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The FP-22 and the FP-21 both feature Hitachi's Automatic Beam Optimizer circuit. Both are built to take a beating, with rugged construction that withstands rough handling and environmental extremes.

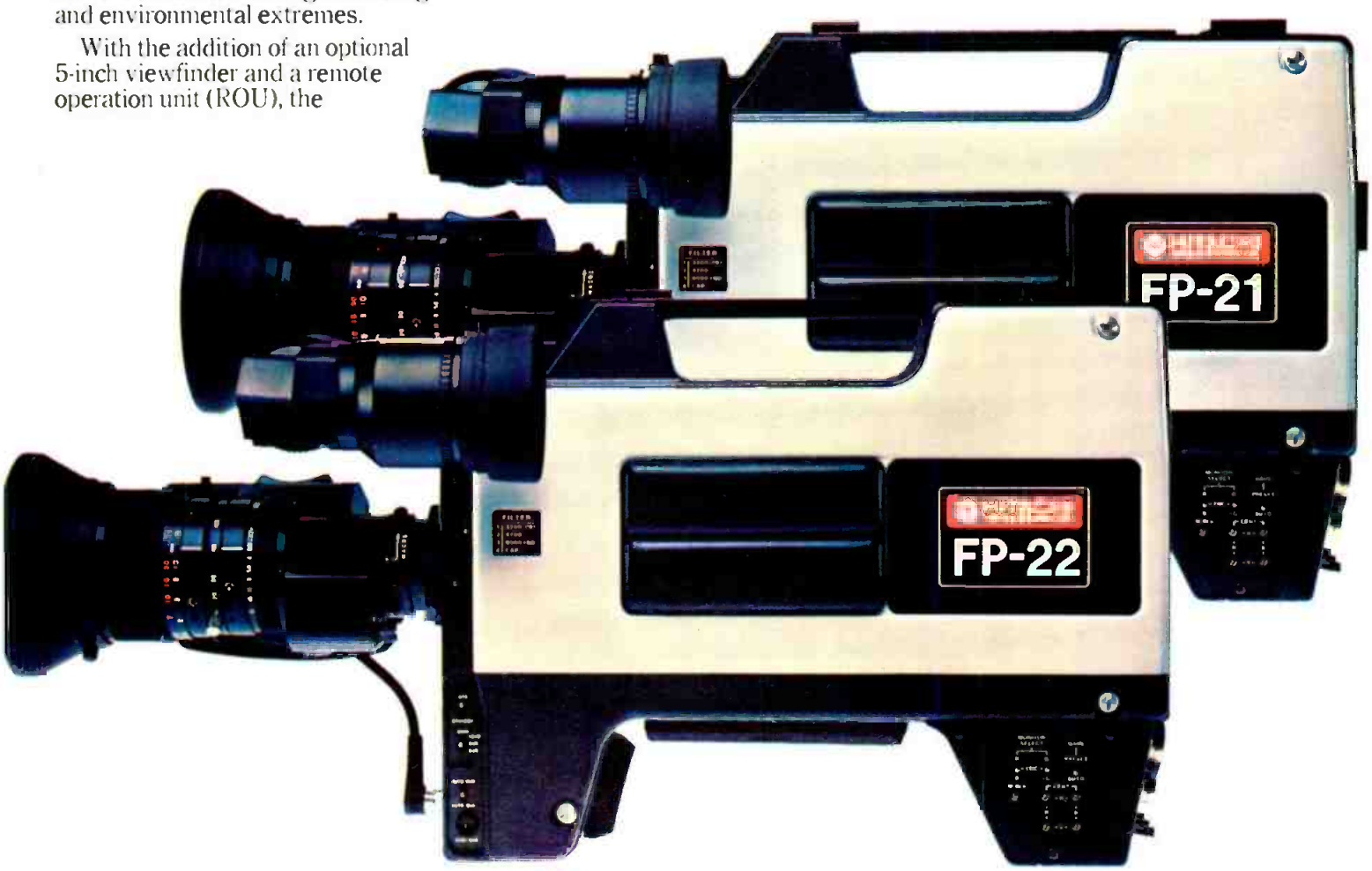
With the addition of an optional 5-inch viewfinder and a remote operation unit (ROU), the FP-22 and the FP-21 become high-quality studio cameras. Each has low-power consumption and RGB outputs for chroma key. Additionally, a two-line image enhancer is included.

Auto set-up makes it simple.

The big difference between the two is the 'Auto Set-Up' function found only in the FP-22. This computerized capability makes registration set-up simple and convenient, by eliminating troublesome centering adjustments, white balance and black balance. The previous set-up information is digitally processed and held in memory—even when the power is turned off—an unheard-of feature for this comparatively low-priced camera.

If you desire the ultimate in automatic registration control, the FP-22 is the only camera you should consider. For those who presently need only the capabilities of the FP-21, the unit can be upgraded to FP-22 standards later.

Whichever way you go, you can be assured that the high standards of quality and uncompromising performance for which Hitachi has become famous, will deliver superior color video results. Automatically. Or not.



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BROADCAST INDUSTRY NEWS

3M Acquires ITC; Utah Sci, CGE Broadcast Sold

Three important manufacturers of broadcast equipment have changed hands as the result of recent negotiations.

International Tapetronics Corp., major supplier of tape cartridge equipment, has been purchased by 3M for undisclosed cash terms. ITC, which had been operating as a privately held firm, will remain at its Bloomington, IL, home with product line and staff intact. John E. Povolny of 3M predicted that ITC would introduce new products during 1982, but a 3M spokesman was unable to say if any would be ready for NAB.

Utah Scientific, Salt Lake City manufacturer of video and audio switching equipment, has become a subsidiary of Dynatech Corp. of Burlington, MA. The merger agreement gave Dynatech a toehold in the communications industry; Dynatech president J.P. Barger called the move "a forerunner to a broader involvement by Dynatech in broadcast communications specifically." Utah Scientific will continue under present management, with no changes planned in the company's operations or marketing.

A newly formed company, Broadcast Ultronic, Inc., has purchased the Broadcast Equipment business of Canadian General Electric. Making up the new company are Canadian communications tower maker LeBlanc and Royle Communications Inc., and the managers and employees of the Broadcast Equipment operation. The new company will operate from the old Broadcast Equipment headquarters in Rexdale, Ontario.

NAB, House Leaders Duel at DBS, Dereg Hearings. . .

Questioning the NAB's motives in opposing interim authorization of direct broadcasting satellites, two influential House of Representatives members did their best to make NAB president Vincent Wasilewski uncomfortable during recent hearings in the House on DBS and broadcast deregulation.

The fight was particularly heated during the DBS hearings, when Rep. Timothy D. Wirth (D-CO), a chairman of the House Telecommunications Subcommittee, suggested that broadcasters' opposition to DBS was thinly veiled fear of competition. Wasilewski disagreed, saying, "The issue is not marketplace, free competition philosophy. It is the FCC's duty to allocate spectrum among various uses . . . on the basis of spectrum efficiency and public benefit."

Wirth countered by pointing out what he saw as a contradiction in NAB's position: the association, he said, supports deregulation by arguing that the government should not interfere in programming but opposes DBS by saying, "if there is duplicative programming the government should step in." Wasilewski held his ground, calling the FCC's DBS moves "an unprecedented rush to judgement to get DBS applicants through the regulatory turnstile before any national DBS policy has been determined."

NAB is on record as opposing interim authorization of DBS, which the association fears will become permanent by default. Satellite Television Corp., the Comsat subsidiary that was the first to file a DBS plan, has called an NAB petition seeking FCC investigation of STC's proposal devoid of "a single public interest benefit." STC said, "Plainly, there is only one purpose to be served by the NAB petition: delay."

House deregulation hearings a week earlier had foreshadowed the DBS showdown as Rep. John Dingell (D-MI), chairman of the House Committee on Energy and Commerce (parent of the Telecommunications Subcommittee), joined Wirth in opposition to deregulation proposals. Wirth took the opportunity to assert his strong support for competition in the "audio and video information markets" and particularly for the fairness doctrine, which he termed "the primary vehicle for assuring the public will receive diversity of information among its information sources."

Dingell was especially sharp-word-

WFMT "Lives" it up in New Studios

It was a big occasion—the thirtieth anniversary of WFMT, Chicago's celebrated commercial fine arts radio station—and the station went all-out to make the day memorable. Known already for its heavy schedule of live programming, WFMT pulled out all the stops with a full 24 hours of live music, all from its spanking new $2 million home.

The showpiece of the new facility is its music performance studio which is big enough to hold a small chamber orchestra. To inaugurate the state of the art studio, the station's nightly show, *The Midnight Special*, broadcast a special six-hour edition featuring over 40 folksingers. Live classical music performances followed, starting at 6:00 a.m. and continuing until the following midnight. Not a single record or tape went on the air for the entire period.

The Vermeer Quartet was one of many groups and soloists broadcast live from WFMT's new studio.

Listeners across the country shared the treat since WFMT is a satellite-distributed superstation. The station has produced live music broadcast for years, but finally will be able to do so from its own studio.

Chicago Mayor Jane Byrne proclaimed the day of the broadcast "WFMT Day in Chicago"—just another in a long series of honors and awards for the station, which has garnered 17 Major Armstrong Awards, eight Ohio State Awards, four Peabody Awards, and a host of others, both national and international.

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3.

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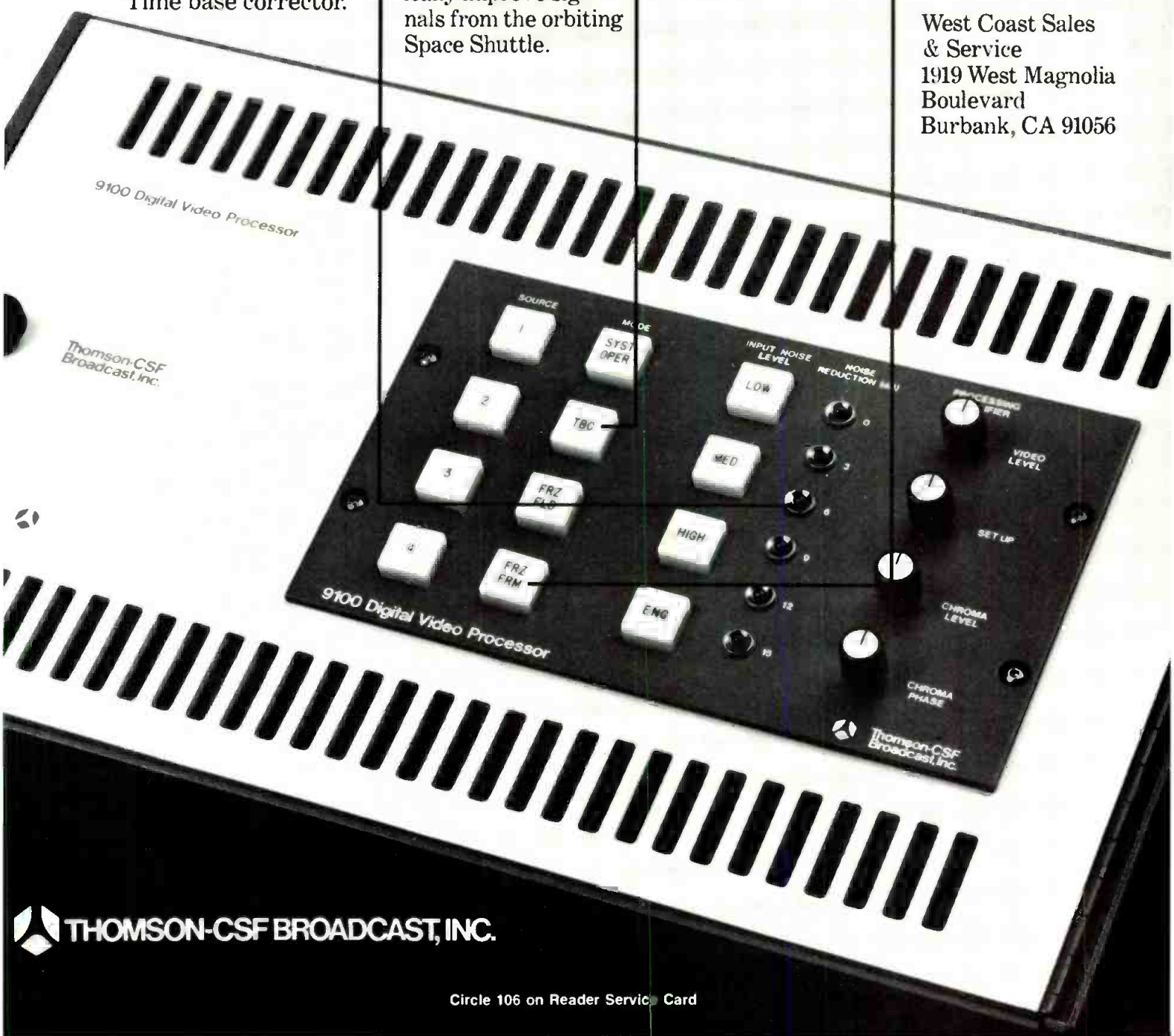

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ed, however, telling broadcasters deregulation would hand over to them "exclusive and highly profitable use of a scarce and valuable resource in perpetuity without any accountability. Where is the *quid pro quo* for the public in that arrangement?" It is ironic, he said, that broadcasters point to the diversity brought by new technologies as an argument for deregulation, but oppose DBS.

NAB's Erwin Krasnow, VP and general counsel for the association, rebutted by saying the idea that the public owns the airwaves is "a dangerous notion" with no basis in law.

Meanwhile, the Senate Commerce Committee gave its approval to a deregulation bill that would end the comparative renewal process and lighten radio's regulatory burden. Opposition from House leaders, however, makes passage of a deregulation bill seem unlikely at this time.

. . . and Krasnow Ripostes

Erwin Krasnow lost no time in backing up his recent testimony before the House of Representatives (see previous story) with a detailed letter to Rep. Wirth, one of the chief opponents of deregulation. The letter, signed by Krasnow and NAB Assistant General Counsel Barry D. Umansky, analyzes the question of who owns the airwaves, concluding that "ownership" of the spectrum is impossible.

The "mischievous notion" of public ownership of the air "has been misused as a rationalization for government regulation," Krasnow and Umansky wrote, but this concept has no legal basis and was actually refuted by the writers of the Radio Act of 1927 and the Communications Act of 1934. They quote Sen. Dill, coauthor of the 1927 act, as saying, "The government does not own the frequencies, as we call them, or the use of the frequencies. It only possesses the right to regulate the apparatus."

Krasnow and Umansky went on to cite a study by the Congressional Research Service that concluded: "Under past or present legal authority the notion that the public or that the government 'owns' the airways is without precedent. We find no case which so holds."

"If the fallacy of public ownership of the airwaves is so obvious," Krasnow and Umansky asked, "how did this notion become so widespread?" They agreed with Louis Jaffe of the Harvard Law School that the confusion resulted from the technological necessity to regulate early broadcasters to avoid interference.

AP, 11 Papers Extend Electronic News Test

A year-and-a-half-old videotex experiment, slated to conclude last December, has been extended through the middle of this year by the Associated Press and 11 newspapers around the country.

The papers and AP, in an effort to gauge the market for electronic newspapers, began the trial in July, 1980, producing a daily electronic edition in each city with the help of CompuServe Information Service, a subsidiary of CompuServe, Inc., of Columbus, OH. The CompuServe computers receive news from the papers and format it for access by the home consumer. Users in 260 cities have personal computers equipped with telephone modems; they call in to the local computer, which then answers their inquiries.

Users pay five dollars an hour for the service (billed in one-minute increments). Besides news, they have access to current and historical financial information, entertainment, electronic mail, home banking, and

Picture shows Model 5462/16 TV Audio Console.

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personal computing services. New services to be added include an electronic classified advertising section.

Participating newspapers include the Columbus (OH) *Dispatch*, the Washington *Post*, the Los Angeles *Times*, the New York *Times*, The St. Louis *Post-Dispatch*, the Minneapolis *Star & Tribune*, the Atlanta *Journal and Constitution*, the Norfolk (VA) *Virginian-Pilot* and *Ledger-Star*; the San Francisco *Chronicle*, the San Francisco *Examiner*, and the *Middlesex News*, Framingham, MA.

Those involved in videotex and teletext were pleased by a recent tentative decision by the FCC to exclude these technologies from Fairness Doctrine and equal time requirements. The rule exemptions were included in the Commission's recent rulemaking on teletext (see *BM/E*, December, 1981, p. 12).

Group W News Channel Outfits with Ampex Gear

Group W Satellite Communications has placed an order for over $1 million in equipment—including the first four BCC-21 convertible studio/field production cameras—with Ampex Corp. The advanced gear, which also includes an Ampex Digital Optics (ADO) system, will be assigned to Satellite NewsChannels, the new cable news service that is a joint venture of Group W and ABC Video Enterprises (see *BM/E*, October, 1981, p. 12). The new net is scheduled to go into distribution this spring.

Spot Distribution Moving To Tape, Says 3M Study

According to a recent survey, the average television station now receives only 16 percent of its national spot commercials on film—as opposed to 40 percent in 1977. Sixty-eight percent of the 200 chief engineers queried for 3M by independent testing firm Plasman Associates said that less than 20 percent of their national spots arrived on film.

One sign of this trend is the updated video transfer center installed in the brand-new headqurters of the J. Walter Thompson advertising agency in New York City. The facility includes an RCA telecine for 16 and 35 mm transfers to one-inch, two-inch, and 3/4-inch masters. An in-house microwave/satellite link to go directly to air may also be set up. A JWT spokesman says the agency is also contemplating installing a duplicating center.

These findings in no way conflict with figures recently released by Kodak that show 75 percent of national and regional commercials still being produced on film, with just 25 percent produced on tape. 3M, of course, questioned chief engineers about the form in which they received the spots, not how the spots were produced.

The 3M survey revealed a strong preference for tape as a distribution medium, with 84 percent of the CEs saying they'd rather get spots on tape; and 92 percent of the stations said they transferred them to tape before airing. Reasons for preferring tape included better quality at final airing and convenience.

STC Will Preview DBS with New Pay TV Service

If all goes as planned, Satellite Television Corp., the Comsat subsidiary that proposed the first plan for direct-to-home satellite broadcasting, will jump the gun on DBS with a new satellite pay service late next year.

The proposal calls for two channels of satellite TV programming, to be

beamed to multiple-family dwellings equipped with five- or six-foot dish antennas. STC says it has not yet determined which satellite will carry the service; eligible candidates must cover at least the northeastern states and be powerful enough to broadcast to the small dishes. The service will be aimed at areas without access to cable.

Neither of the two channels will carry advertising. The first, to operate 24 hours a day, will offer major motion pictures; the second, 15 hours a day, will feature a varied schedule including films, sports, variety, family entertainment, children's shows, and special interest programming. Scrambled signals will be fed by a master antenna system to a vacant channel on individual subscribers' receivers.

Subscribers to the two-channel service will be switched to STC's three-channel plan when that goes into operation in late 1985 or early 1986. Both plans are subject to FCC approval, and STC says the launch of the earlier service is contingent upon a Commission okay for the DBS proposal. STC will build its own satellites for DBS, which will be received on two- to three-foot dishes.

New York City audio/video production house Soundworks recently installed the 3M 32-track digital audio recorder (far right). Soundworks owner Charles Benanty (center) discusses a recording project with engineers Roger Nichols (left) and Jerry Garszva.

Matsushita, Sony Restructure U.S. Firms

Two of Japan's largest suppliers of equipment for the broadcast industry have reshaped their U.S. organizations.

Sony Corporation of America, under the new plan, has been divided into five operating groups: marketing and sales, manufacturing, service, engineering, laboratories, and diversified operations. A new division in the marketing and sales group is the Sony Broadcast Products Co., which will handle sales of all broadcast equipment under president and chief executive officer Neil R. Vander Dussen, who comes to Sony from RCA Corp.

Other divisions in marketing and sales include Sony Consumer Products Co. (Joseph Legore, president and CEO); Sony Communications Products Co., specializing in industrial video, office products, data products, professional audio, and special products and headed by Kiochi Tsunoda, president and CEO (formerly president of Sony Video Products Co.); and Sony Tape Sales Co. (Eiji Tanaka, vice president and general manager).

In addition, Kenji Tamiya has been promoted to president and chief operating officer of Sony Corporation of America—a post he filled in function, if not in name, since the death in 1978 of Ray Steiner.

The shift at Matsushita appears to put that company's broadcast products under the aegis of the new Panasonic Industrial Co., headed by Ken Kurahashi, president. Some observers believe that the reorganization, with separate sales forces for Panasonic's consumer and industrial operations, will give the broadcast/industrial section a boost toward a stronger position in the industry.

News

ABC Buys UPITN Share

ABC news has solidified its long-standing relationship with United Press Independent Television News (UPITN) by purchasing a 30 percent interest in the company, a joint venture of United Press International and Britain's Independent Television News. The ABC shares were bought from ITN, which now owns 45 percent of the international news service. UPI owns 25 percent.

ABC for some time has had an exchange agreement with UPITN, supplying the service with U.S. news while airing UPITN's international reports. UPITN serves numerous television stations in Europe, Africa, and Asia, with offices in New York, London, and Hong Kong. The news reports go to over 150 stations in 77 countries. Four daily satellite services originate in London and New York.

In a separate development, E.W. Scripps Co., parent company of UPI, announced the discontinuance negotiations with Reuters about the possibility of Reuters acquiring UPI. Scripps president Edward W. Estlow stated that exploratory talks were continuing with other prospective purchasers.

Telemation Goes Mobile With Remote Video Van

No more renting remote production facilities for Telemation Productions, the Chicago-based production house with branches in Denver and Seattle. Telemation has just purchased a 32-foot remote van, which is serving as the basis for the company's newest division, Telemation Mobile Productions.

The van, built to Telemation specs by Roscor Corp. of Morton Grove, IL, made its debut taping the Grambling v. Alcorn State NCAA football game for Black Entertainment Television. It is equipped with Ikegami cameras (three studio models and one handheld), two Ampex VPR-2B one-inch VTRs with slow motion controller, a Sony BVH-500 portable one-inch VTR, equalized audio mixing capability, an RTS three-channel intercom system, and an RTS four-station IFB system.

Switching is by a Ross 505 multi-level effects production switcher. A Chyron character generator provides the electronic graphics.

The van is not the only attraction of the new division, however. Division head Steve Ullman emphasizes that the company can provide experienced crew members along with the sophisticated truck.

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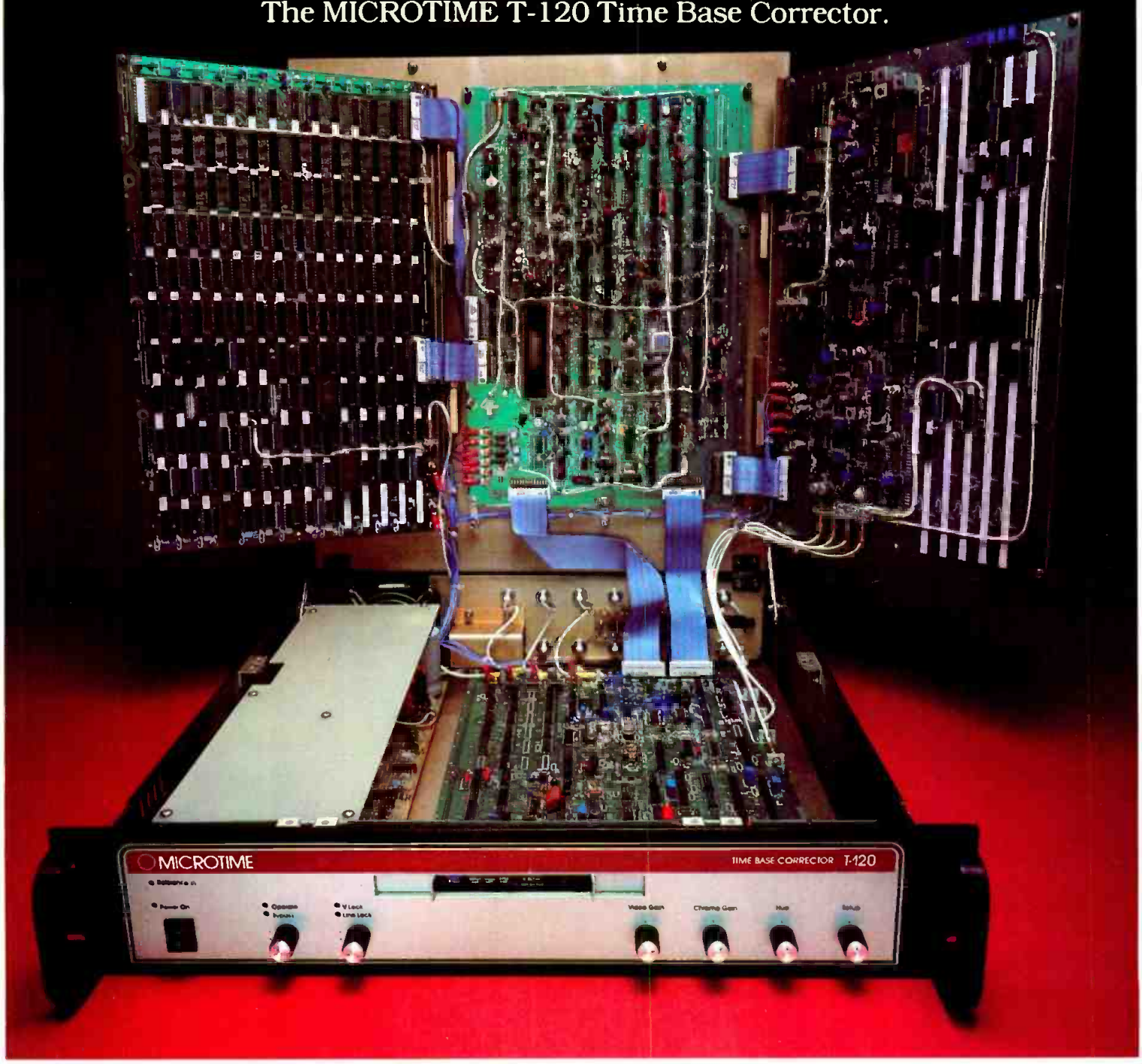

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Broadway Video is both a production and post-production facility in New York City. Its recent credits include "The Best of Saturday Night Live," major political campaigns, promos for the cable network Showtime, and a variety of industrial shows.

"The BVE-5000 worked right out of the box and has been performing flawlessly ever since. With no problems of any kind. Unlike some other systems, whose manufacturers wait for customer complaints to get the bugs out, instead of thoroughly testing their equipment *before* it's sold.

"With its simplified keyboard, the BVE-5000 is

HUMAN EDITORS MAY HAVE BUT NOT OUR SONY."

Randy Cohen, Broadway Video

easier to use, too. It has saved me 25% to 50% of the time other systems require. And since you don't have to be mechanically oriented to use it, the editors can be artists rather than technicians.

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I/2/82

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RADIO
PROGRAMMING & PRODUCTION FOR PROFIT

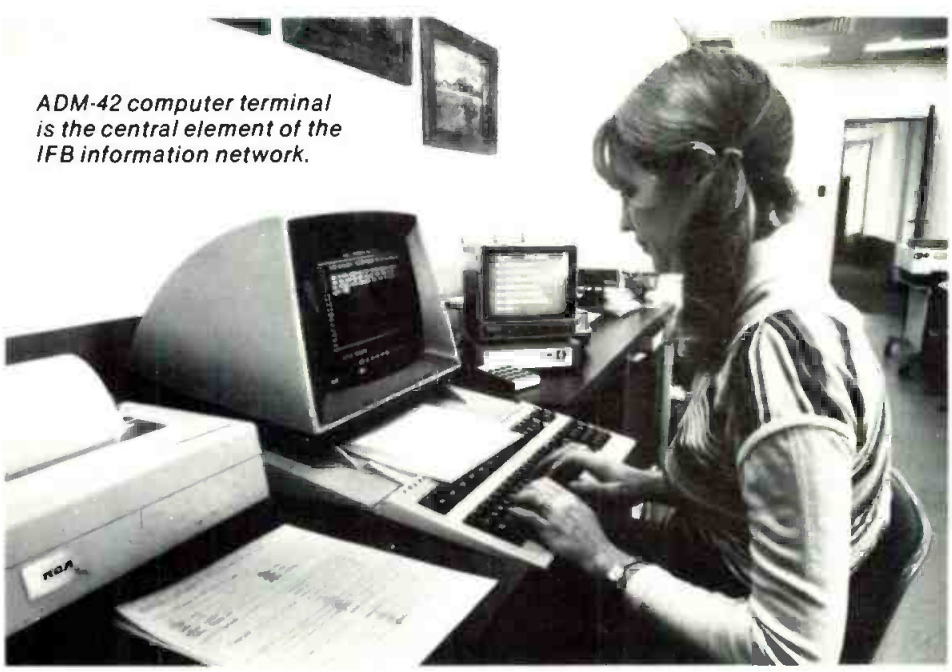
Farm Bureau Feeds a Hungry Network

DISSEMINATING vital information about economic and agricultural developments to an anxious farm community on a daily basis has made the Illinois Farm Bureau's Radio Network a pioneering service operation. Since the early 1960s, the network has grown rapidly, now encompassing 46 local markets—over 80 stations—and supplying information from several sources, including UPI and Reuters.

Alan Jarand, director of radio for the network, explains, "We employ three full-time staff members just to monitor UPI, Commodity News Service, and Reuters received on a six-meter Scientific-Atlanta satellite antenna. The information is then prepared for production by Lou Hansen, our broadcast editor, or myself." The network also makes use of the Finkle weather service in Chicago, which provides complete weather information and forecasts.

An example of the network's sophistication is its employment of a private teletype interconnect with the American Farm Bureaus in every state, as well as with its staff members in the state capital and in Washington D.C. With such an extensive information web, the Farm Bureau can provide instant news on state, national, and global events that affect agriculture and the economy.

Gates and ITC cart decks feed the different information services provided by the Farm Bureau.



ADM-42 computer terminal is the central element of the IFB information network.

Radio Programming

Both AM and FM stations receive any or all of the five programs offered by the network, covering a wide range of agricultural and economic information. In addition, an advice service helps listeners interpret marketing trends as they develop on a national or international scale.

The network started in the early 1950s with *RFD Roundup,* a weekly tape service that was mailed to approximately 50 stations throughout the state. "In 1965," says Jarand, "we added other stations and began a live broadcast of daily farm news." As interest began to grow within a farming community hungry for relevant news, the network produced *RFD Illinois,* a live show programmed each morning. It is still broadcast during two time slots: 5:30 to 6:00 and 6:06 to 6:30.

Three other shows include *Latest News in Agriculture, Farm News at Noon* (picked up by 43 AM and FM stations), and *Market Report*, featuring expert advice on stocks and commodity price updates.

The *Market Report* is sold on a cash basis, while the other programs operate on a trade-out arrangement. The network retains 30 seconds of commercial time for providing a free five minutes of programming. "The bulk of our funding, however, comes from the Illinois Farm Bureau itself," states Jarand.

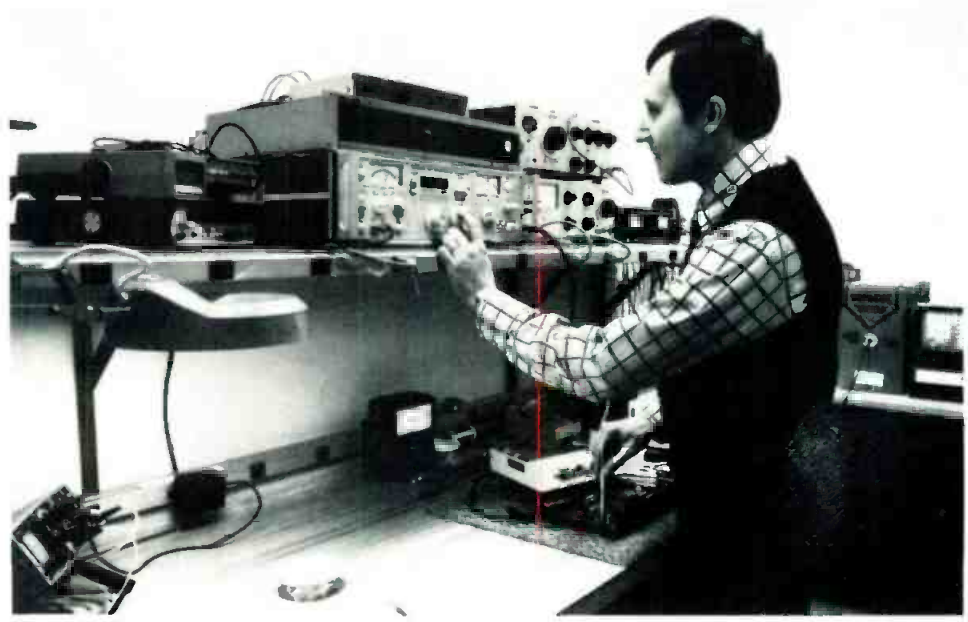
To keep pace with the current demands and projected rapid growth of the network, an extensive distribution system was worked out by a representative of McMartin Industries. The network is presently leasing subcarrier channels on seven FM stations. Most affiliates get the live programming via SCA receivers. The use of SCA began in 1979, and Jarand says, "The system performs very well at a cost far below that of installing land lines to all of our affiliates."

To accommodate the burgeoning size of the network, the Farm Bureau built a new complex in 1980. Located at the Farm Bureau's home offices in Bloomington, IL, the building contains two studios and a main control room and newsroom. The heart of the new complex is a McCurdy 8600 two-channel console. Also in the studio are an Ampex and two ITC 850 tape decks. Four of the nine ITC cart machines are dedicated to a dial-up service that the Farm Bureau provides for those with no access to an SCA receiver. The market advice service utilizes three more of the ITC carts.

In addition to the previously mentioned programs, the network produces a private SCA subscription service, which originates from the new studios, that provides a mix of data and voice transmission. The farmers buy their own SCA equipment and install it at home. The network supplies the data transmission by purchasing market information from Omaha, NE, which has land lines to a satellite uplink in California. The farmers receive the data on screens provided (for a fee) by the Farm Bureau.

The source of the advice is a collection of state and nationally known experts in many areas of agricultural interest, including commodity analysis, governmental affairs, farm management, and taxes. The service reaches approximately 3000 farmers in a four-state area.

The Illinois Farm Bureau Radio Network, though currently the only such operation in the country, has proved itself a model operation worthy of close study. **BM/E**



A McMartin TR-55D SCA receiver being fine tuned and checked by technician Ron Giller.

MAGNECORD MC-II
Modern Performance with Traditional Quality

The Magnecord MC-II is a rugged, precision tool for the broadcast control room—be it fully automated or D.J. assisted. The MC-II is made that way, by design, in the Magnecord tradition. Of course, it meets or exceeds NAB standards with IEC equalization on request.

Superior dc Servo Drive
The dc servo, Hall effect motor with flutter-filter belt drive, provides exceptional speed stability (to 0.05%), totally unaffected by line voltage or frequency fluctuations. And it runs so cool, no ventilation is required.

Full Broadcasting Features
Unlike some other cart machines, the Magnecord MC-II comes with the extra features broadcasters desire at no added cost. Built-in full remote control capability. Automation compatible cue tones (stop, secondary, tertiary) with LED indicators and contacts for external cue switching. Cue track input and output access for FSK logging. A universal mic/line input and front panel headphone jack to "preview" or time new carts and for servicing convenience.

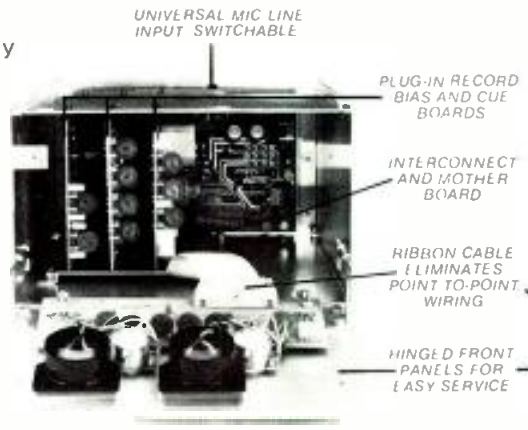
Flexible Broadcast Use
The MC-II is so flexible it virtually defies obsolescence. You can choose mono or stereo models, play only, or with record capability. Best of all, play models are field-convertible to record/play. The record electronics come in a separate housing for convenient, space-saving installations.

Rugged Magnecord Design
As with all Magnecords, the MC-II is designed to work long and reliably. For example, the woven polyester drive belt and polyurethane pressure roller are virtually indestructible. The regulated dc power supply has universal line capability (100-140V, 200-280V, 45-65Hz), consumes nominal power and is brown-out proof. Computer grade push buttons are rated at 10 million operations. A single piece chassis and machined base plate assure positive alignment of all tape transport parts. Hard core, long life heads are mounted on unique, glass-filled Lexan* head brackets with precision, phase-locked tape guides. Carefully designed circuit boards and a Mu-metal shield make the MC-II immune to RFI, even when operated directly under a transmitting tower.

Convenient Service Access
When a Magnecord MC-II needs service, downtime is minimized. The covers and front panels are hinged for convenient access. All solid state circuitry is on plug-in epoxy boards. Plug-in ribbon cables eliminate point-to-point wiring. And, of course, the Magnecord MC-II is made in the U.S.A. so parts are readily available.

HEAD ASSEMBLY

When you compare performance, reliability, and cost, the MC-II is indeed a modern tool worthy of the name Magnecord, because it's made in the tradition of rugged excellence.



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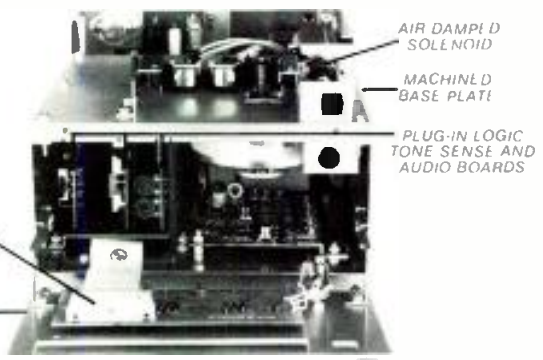

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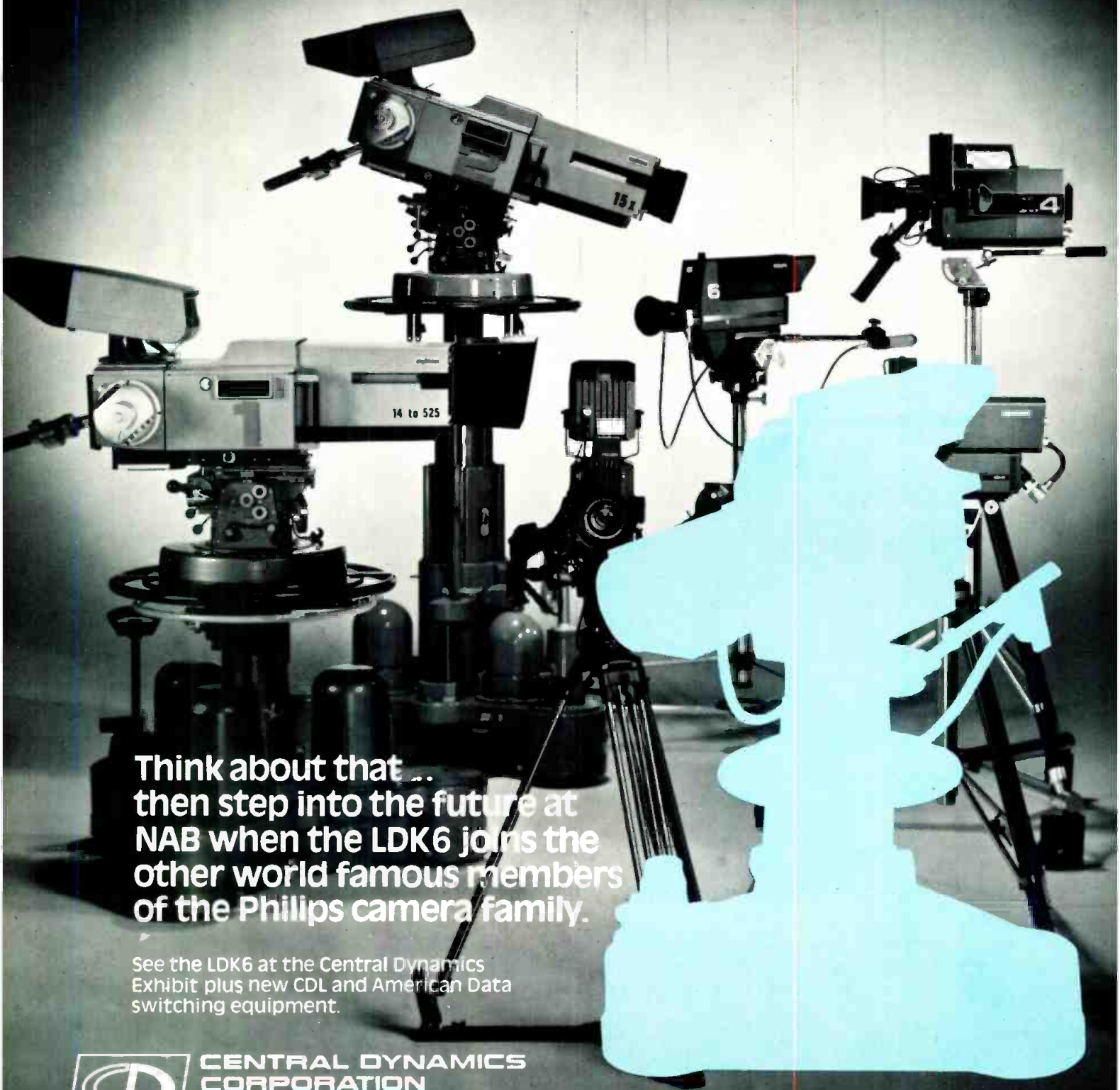

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WPIX Christmas Eve Telecast a Gift to Country

THE CHALLENGE faced by every independent TV station is to provide original and competitive programming on a budget tiny compared with those of networks and network affiliates. For WPIX-TV, New York, that challenge is greatly amplified. The station broadcasts in the country's largest market, where it competes against three network flagship stations, PBS affiliate WNET, two other independents, and a spreading cable system. Like other independents, WPIX depends upon its share of kidvid cartoons, off-network syndicated sitcoms, and vintage movies to fill its programming schedule. However, WPIX has long occupied a special place in New Yorkers' hearts for running one of the city's meatiest news operations, and for its crisp coverage of Yankee baseball.

In June, 1980, the station gained added stature within the broadcasting community when it started offering Independent Network News (see *BM/E*, April, 1981, p. 25 for a profile of INN.) Further evidence of the station management's ability to capitalize on its special role as program provider came this past Christmas Eve, when, as a public service, the station offered without charge to the INN network—and any independent station able to receive signals from Westar 2—WPIX's live coverage of the midnight mass from St. Patrick's Cathedral.

The station has broadcast the mass live from St. Patrick's since 1976, when NBC dropped the show in order to cover the mass celebrated at the Vatican. This year's production, like the first, was produced by Don Carney, in charge of sports and special events broadcasts.

"We changed the broadcast greatly from what NBC did," he commented. "They did a straight ceremonial kind of coverage. I took a lot more liberties with the video than they did, and I incorporated special effects."

Translating the centuries-old religious celebration into a TV event involved two challenges: that of decorous production, and that of lighting and cabling the well-known New York landmark. Already familiar with the cathedral's layout and power availability from previous productions,

Using Hitachi SK 96s with 22:1 Fujinon zoom lenses. supplied by NEP, WPIX-TV, NY, provided free public service broadcast of St. Patrick's Christmas Eve Mass to 33 INN affiliates. CSI lights were used to provide 250 fc illumination to selected areas of the gloomy interior.

WPIX began erecting scaffolding and cabling the church on December 23. The job of illuminating the imposing Gothic structure belonged to WPIX's lighting director, Marvin Silver. Lee Lighting America and its shop foreman, Cliff Stahl, acted as lighting consultants to the broadcast for the sixth consecutive year.

Despite the overall impression of darkness in the cathedral, there is a great deal of shiny white marble inside—a contrast in light and dark that is the anathema of any video engineer or lighting director. "It's almost like lighting an arena," notes Silver, even though the lighting director made no attempt to light the entire cathedral evenly. Rather, Silver's lighting plan was to throw an average of 250 footcandles on three primary areas of interest: (1) the altar, and the beautiful white marble statuary, carvings, and small chapels behind and to the side of it; (2) the part of the audience closest to the altar; and (3) the choir loft in back of the cathedral, housing the choir, orchestra, and vocal soloist.

Based on experience it had gained lighting well-known European landmarks for the BBC and others—including the recent Royal Wedding in St. Paul's Cathedral—Lee Lighting recommended the use of Lee Compact Source Iodide Discharge (CSI) lamps. Manufactured by Lee Electric, England, the lights provide all the advantages of HMIs—high efficiency, low power consumption, and low running temperatures—with two additional features: longer throw and warmer color temperature.

Confirms Silver, "The HMI just doesn't give you the punch for long distances. I had to throw some lights 200 feet, and the Lee CSI has tremendous punch." They are capable of longer throw than HMIs, according to Lee Lighting's Cliff Stahl, both because of the shape of the PAR bulb the lamp uses, and also because the lights are available with spot and narrow-angle lenses, rather than fresnel lenses commonly used with HMIs.

Silver also found that the added warmth of the CSI lights (4200°K as compared wth 5600°K for typical HMI lights) was more appropriate for the cathedral's interior. (HMIs could also be gelled to this warmer temperature, but there would be a resulting loss of intensity.)

The lighting scheme for the cathedral (no exterior shots were used) accommodated four camera positions. One Hitachi SK-96, equipped with a Fujinon 22:1 lens, was situated in the choir loft in the rear of the church, approximately 200 feet from the altar. This camera provided wide shots of the mass, including the audience, altar, and space behind it. Swiveled around on its pedastal, this camera also took shots of the choir and soloist. Two more SK-96s with 22:1 lenses sat atop scaffolds near the altar, erected in front of two broad pillars that hid the cameras and cameramen during wide shots of the cathedral, concealing them from most of the people in the pews. A fourth camera—a Hitachi SK-96 in its handheld configuration with a Fujinon 17:1 zoom—was operated from

a tripod atop a scaffold on the side of the altar (hidden from view by a wooden screen encircling the altar), and also handheld in front of the altar. This camera provided close-ups of the clergy conducting the service, the altar on which the mass was celebrated, the taking of communion, and some of the statuary located behind the altar.

One twin CSI 2 kW light, mounted up in the choir loft with a wide-angle lens, was aimed at the woodwork above the loft to light the choir and soloist. Two twin 2 kW CSIs outfitted with narrow-angle lenses were aimed at the front of the altar, and the remaining four 2Ks were focused on the audience. A total of nine single 1 kW CSI lamps were hung from pipes rigged onto the tops of the camera scaffolds, focused on the podium, lectern, pulpit, and other areas around the altar. And nine more 1Ks were placed on tripods to the sides and in back of the altar. Hidden by the wooden railing and other marble structures, these lights threw additional footcandles on the altar and provided fill in back so that the altar would not appear floating in the master shot.

Remote production facilities were provided by Northeast Productions, an autonomous division of WNEP-TV, Wilkes-Barre/Scranton, PA. Under the direction of Joseph Balkin and John Leland, NEP sent its 27-foot truck, outfitted with a Sony BVH-1100 one-in. VTR, Grass Valley 1600 switcher, Vidifont Mark IVA character generator, 20 × 4 Quantum audio console, and a two-channel RTS intercom, in addition to the Hitachi cameras. The technical crew members were all WPIX staffers.

Because of the cathedral's vast size, laying video, audio, and communications cables throughout it took almost two days. Under the direction of WPIX engineering supervisor Earl Arbuckle and assistant chief engineer John Neeck, all cables were made as unobtrusive as possible. In the case of some video cables, this meant running them up a narrow spiral staircase into the Cathedral's triforium and around its sides, so they would be hidden from cameras and the parishioners.

Audio was a major component of the St. Patrick's Cathedral broadcast. In addition to prayers and sermons offered from the altar, viewers heard two choirs, the leader of psalms singing solo from the lectern, a small orchestra, a soloist from the Metropolitan Opera, and the Cathedral's immense organ. The organ's deepest notes, made by 32-foot long pipes, are never sounded for fear of creating destructive resonances.

Robert Gross, WPIX's audio man, was responsible for miking Monsignor James F. Rigney (substituting for Cardinal Cooke, who had laryngitis) with two Electro-Voice CO90 lavaliere mics, one as a backup. The mics were used with a Vega diversity wireless system, with the transmitter placed in an extra pocket pinned inside the priest's vestments and the receiver kept in the Bride's Room. The cathedral's own public address mics were used elsewhere on the altar. However, the audio from the choir loft, a second choir seated alongside the altar, and the organ was provided by WABC Radio, under the direction of Bob Deitch, who provided a feed to WOR Radio and WABC Radio, as well as to WPIX-TV.

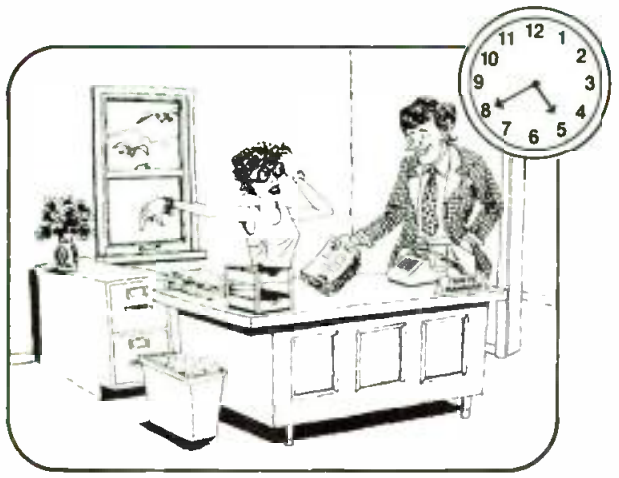
In the upstairs choir loft, Deitch used several D24Es and RE20s to mic the singers and orchestra. In addition, two AKG condenser mics attached to a 50-foot steel cable were suspended midair between the cathedral's triforium arches in order to capture the sound of the organ pipes running vertically in back of the choir loft. A 16-channel Interface Electronics console was used to mix the audio in the loft; downstairs, the mix was done with an eight-channel Neve console.

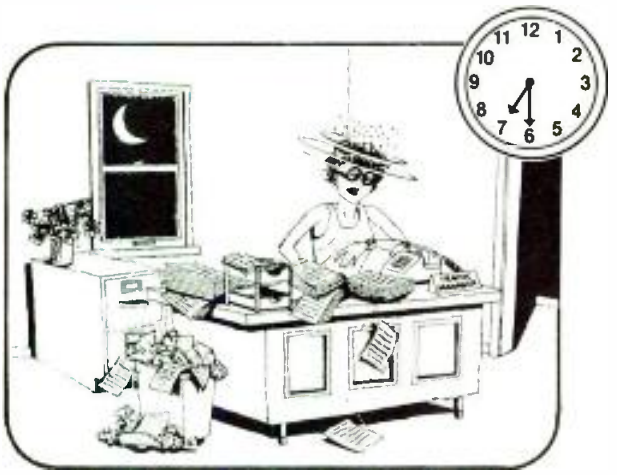
Audio and video signals were fed from the NEP van to a diplexer housed safely within a smaller NEP vehicle parked behind it, and then back inside the cathedral to a basement utility room, where a permanent telco loop is situated. A 15 kHz diplexed telco loop carried audio and video back to WPIX's master control, located on 42 Street in Manhattan. In turn, the signal was relayed to WPIX's Independent Network News switcher, permanently wired to Western Union, which relayed the signal up to its Westar 2 satellite. Neeck also ordered a backup 5 kHz non-equalized audio loop. "You can loose the picture for a little while," he observes, "but if you loose audio, you're going to loose your audience real fast."

Running for about one hour and 25 minutes, until the concluding Hallelujah Chorus, the midnight mass was a generous Christmas gift from WPIX and its hard-working crew. The crew worked until 6:00 a.m. Christmas morning, wrapping up cameras, lights, and cables. But the ultimate success of the WPIX effort can be judged on the basis that for a budget of only roughly $15,000, some 32 stations around the country, in addition to WPIX, were able to enjoy the Christmas Mass. **BM/E**

How two Traffic Managers handled the five o'clock order

without Autotron





with Autotron

The salesman in the cartoon will have dinner on time tonight. The Traffic Manager won't. Manual processing of late orders is terribly time consuming. Especially when the log was already locked up for tomorrow.

At the station with Harris Autotron Star business automation, the salesman and Traffic Manager are having dinner together. At 5:15. She's simply entering the raw information; the computer will do the rest.

Traffic is one of several functions standard on the Autotron Star System. Think about that next time you have a late, cold meal. Then write Harris Corporation, Broadcast Products Division, P.O. Box 4290, Quincy, Illinois 62305-4290. 217-222-8200.

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Introducing the *New* CHYRON® IV.

The New CHYRON Adds True Graphic Capabilities To The World's Leading Character Generator.

The latest Chyron is the system that the broadcast industry has been waiting for. You have known the Chyron IV as a powerful character generator that's easy to use. Now, utilizing advanced computer graphics, it has become a flexible graphics tool, as well. The result: a truly versatile graphics generator that provides virtually all of the electronic functions you need. And, it's still easy to use!

More Artistic Freedom

CHYRON IV's digitizing tablet provides full flexibility for the artist to draw, change select colors and fill. He has, in effect, a true electronic paint system. *Background graphics* can be created and displayed or stored for later use. In addition to the digitizing tablet, graphic information can be entered with a black and white camera in the font compose mode.

This new background graphics capability gets the artist away from plain text into the generation of "pictures": graphic images, representations, vignettes with as many as 16 colors or gray scale values, etc.

Multicolor characters are available, too. Full color or halftone artwork is digitized and displayed with up to seven different color values per character. The display can be changed from *gray scale values* to psuedo-color for ease of trim and area identification. This means that multicolor logos or other artwork can be displayed and treated as a single character to take advantage of all the CHYRON IV animation and character manipulation features.

New Board is the Key

A state-of-the-art multimode graphics module is the heart of the new capabilities. It replaces the existing font compose module and operates in several differing modes.

In its basic operation, the new module provides an advanced means of camera font compose. A built in A/D convertor samples incoming camera video at 10 times subcarrier and digitizes each sample with four-bit accuracy (thus, the 16-level gray scale). Software then analyzes the data to produce extremely smooth curves and slopes for virtually perfect capture and the elimination of trimming in most cases.

Many Other Features

Other CHYRON IV features provide even more flexibility. Up to four "vignettes" may be created and independently positioned or animated. Text can be moved out of the safe title area, the color palette has been expanded to 512 choices, character edging can be any color and diagonal typing has been provided. The roll and crawl modes have been improved to allow smooth motion through horizontal and vertical blanking. And there's more. Call or write for all the details.

The CHYRON® COURIER

An Occasional Newsletter Dedicated to the Latest Chyron Developments.

Vol. I, No. 1

Earlier CHYRON IV's Can Be Retrofitted for New Features

The new CHYRON still carries the model number IV. It will not obsolete the many earlier CHYRON IV's still serving nobly out in the field.

Your current CHYRON IV can be retrofitted to provide all of the newly-developed features. Return your IV to the factory, *and we will replace the unit's present font compose module with the new multimode graphics module* and add the necessary systems modifications to accept the new features. It will convert your old CHYRON IV into a true graphics generator, with all of the many advantages of the new model.

Updated training sessions will be available, too. Classes for operators may be scheduled at Chyron headquarters in Melville, N.Y. or at your place of business.

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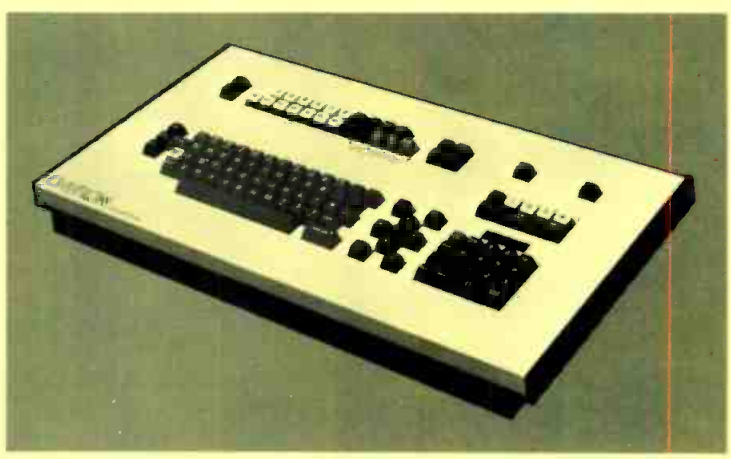

Highlights of the New System

In brief review, these are the main features of the new CHYRON IV.

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- Winchester disc
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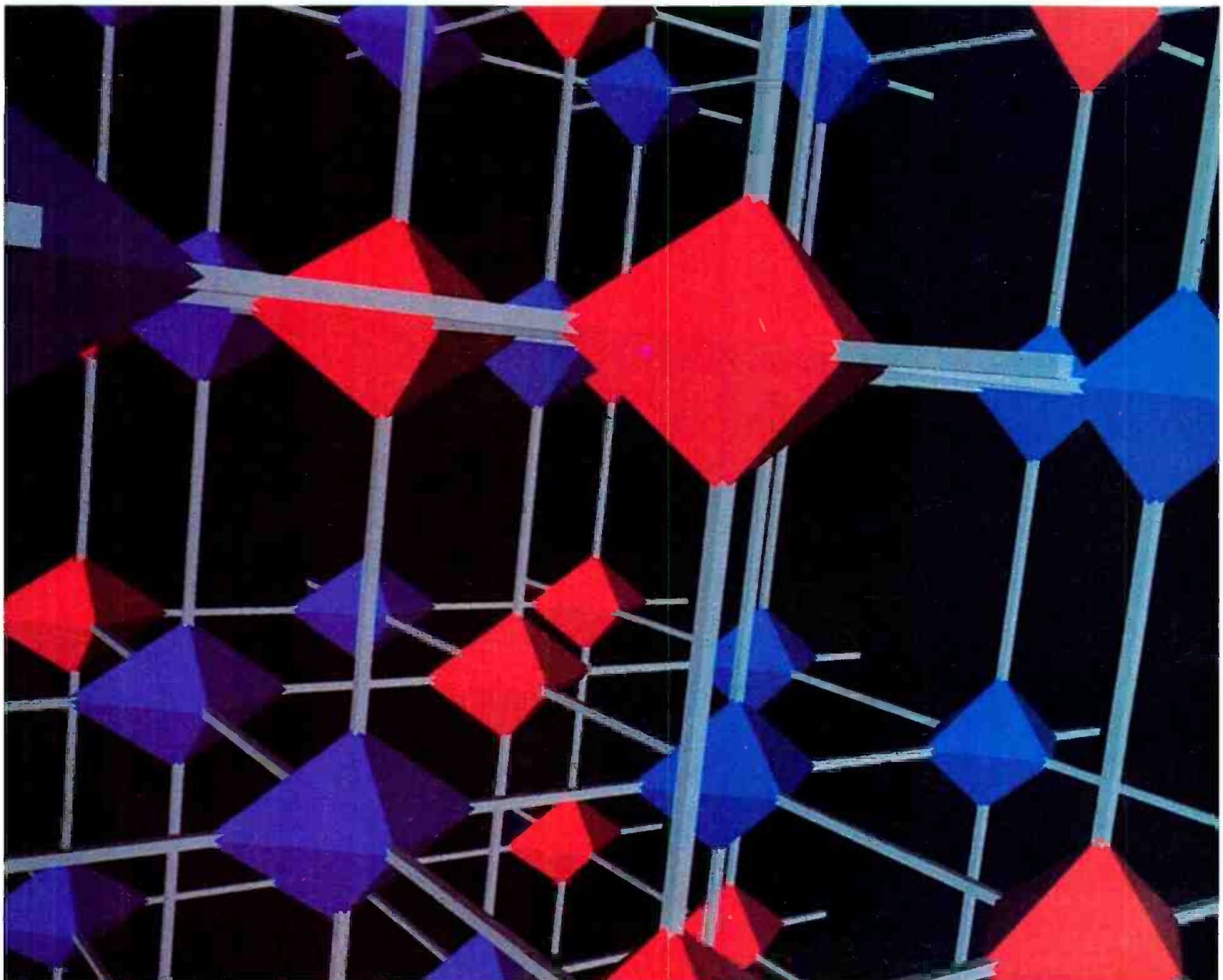
SPECIAL REPORT

BROADCASTING IN THE DIGITAL DOMAIN



COMPUTER GRAPHICS:

Computer graphic created by Digital Effects for Merck. Peter Crown, director; Stan Cohen, animator; George Parker, designer.

AT SIGGRAPH 1981, the annual conference of the computer graphics world, Alvy Ray Smith and Ed Catmull described some of the research they had done at the New York Institute of Technology in the late 1970s in the development of the software programs that were eventually sold to Ampex and turned into AVA. Stars of the computer graphics community, they are currently heading up a project at George Lucas's production studio to see how computer graphics can be incorporated in future *Star Wars* episodes. Specifically, they are seeking to program a computer to digitally blend film images of actors in the foreground and digitally created artwork in the background, then output the result onto motion picture film.

Computers and the production of images for the entertainment media have apparently never been closer. And yet, at the very same conference, Chris Odgers pointed out that despite television's increasing need for computer graphics at all levels of sophistication, there wasn't a single exhibitor at Siggraph among over 130 major manufacturers who had an off-the-shelf digital framestore with the 486 vertical pixel structure best suited for television applications. Odgers, along with Bruce Wallace and Marc Levoy, have been experimenting for the past year at Hanna-Barbera Productions with the possibility of animating Saturday morning children's cartoons using a computer graphics generator, a digital art/paint program, and an Ampex ESS.

Computer graphics and television production are so close, and yet so distant. Indeed, Odgers's observation about the lack of understanding of television's needs by the computer graphics industry, despite the similarity of their goals, reveals a distressing waste of energies. It is as if two groups of scientists, one working in Russia and the other in the U.S., had simultaneously developed a cure for cancer which might have been found years earlier if they had been working together. On the one hand, TV equipment manufacturers have been working for years to improve the capabilities of digital framestore, first transforming them into effects generators of incredible power and now into the digital art systems just coming onto the market. But manufacturers of computer graphics systems for applications such as computer-aided drafting, electronic circuit mapping, digital scanning and sensing, and even "lowly" business graphics have had a no less fruitful development period. Many feel the time has finally come to share ideas.

Business graphics

To our knowledge, there exists currently no commercially available computer program that would allow a station operator to display a bar graph of commercial avails, or a computer-generated pie chart of share of market, or a three-dimensional graph of projected revenue growth. But it is only a matter of time, for the information necessary to produce this level of computer graphics is probably already stored in the station's business system with output on hardcopy printouts.

According to Computer Pictures Corp., a Boston-based company specializing in implementing business graphics hardware, approximately 1000 pages of computer printouts are currently generated per year for every man, woman, and child among us. CPC's point is that any material that can be tabulated can also be presented immediately in the form of a simple graphic.

Graphics display terminals to create this type of information are not necessarily either high resolution or high cost since they are designed for internal use; in fact, graphics programs are available for personal com-

THE BROADCAST PERSPECTIVE

Illustrations and animation produced by computers are found everywhere, from programs for personal computers to large-scale motion picture projects. But what does it all mean for broadcasters, and where do the specifically broadcast-oriented products such as digital art/paint systems fit into the picture?

puters such as the PET, Apple, and TRS models, which have an effective resolution of around 280 × 192 pixels; this roughly mirrors the basic architecture of the microprocessors, which produce displays up to 80 characters wide. The business graphics prepared on a personal computer can be printed on an ordinary line printer using various characters and symbols to achieve more or less solid forms such as pie chart shapes. For those who would rather use packaged software rather than writing their own, programs called VisiPlot and VisiCalc allow data to be entered on the personal computer for display in line, bar, area, pie, hi/lo, and scatter charts.

Better hardcopy printouts than are attainable with the alphanumeric character set of a printer are also available, either with a Polaroid-type camera that shoots a high-resolution CRT display of the graphic, or by connecting the computer to a plotter which uses a series of pens, modulated by the digital signal, to create the charts. All of this is based on the software's ability to take data and automatically format it as a graphic.

Also available recently have been several graphics tablets that can be interfaced with small business and personal computers. The graphics tablet is a magnetically encoded device in which the movement of a stylus over the drawing area is translated into a bit stream by the tablet.

The limiting factor of all these systems, obviously, is the rather low resolution. The ideal frame buffer for televison, for instance, is considered to have a pixel matrix of 512 H by 485 V, yielding a total pixel count of 248,320. The graphics program for the Apple, on the other hand is a 280 × 192 matrix yielding only 53,760 pixels. With this resolution almost always come the characteristic "jaggies"—spacial errors that appear particularly on diagonal lines and curves, indicating that the information being displayed actually exceeds the system's ability to represent it smoothly.

The same problems with resolution hold true for graphics created with teletext—both the French Antiope and the British Ceefax and Oracle systems; indeed, personal computer companies such as Radio Shack offer their terminals as teletext-compatible for the day when teletext and viewdata become widespread. Because these systems were primarily developed as a means of displaying text, graphics are formed by transmitting and displaying solid blocks of color that correspond to the character matrix. Both systems are therefore limited to approximately 70 × 80 picture elements.

Computer graphics display systems

The next step up from basic business graphics systems is into the world of computer graphics *per se*—systems that were designed to work with and display actual graphics databases rather than business figures. Generally, when a company announces itself to be in the computer graphics field, this is the type of system it manufactures.

These larger systems—from companies such as Cromemco, Ramtek, Tektronix, Megatek, Grinnell, Lexidata, Intecolor, DeAnza, Chromatics, and others, with resolutions from 512 × 512 to 1024 × 1024 pixels and more (and with pricetags to match of $10,000 to $150,000)—evolved primarily to suit the needs of the CAD/CAM (computer-aided design/computer-aided manufacturing) market.

In CAD/CAM applications, the computer and the graphics display are used to simulate various industrial processes before ever leaving the drawing board—for example, creating a three-dimensional "wire frame" model of a building to see where pipes can be laid, or

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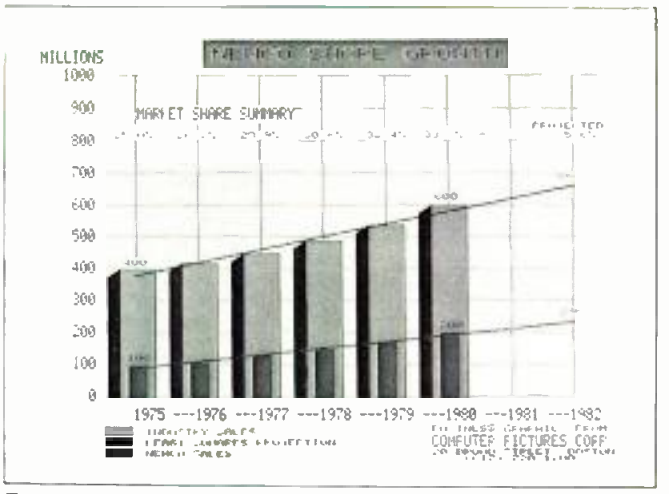
creating an LSI chip and tracking the flow of electrons throught it. The draftsman, generally using a lightpen, sketches into the database the outline of an object to be manipulated—a new automobile, for instance. The wire frame-like sketch is a perfectly accurate scale model of the car, and the computer can now be used to manipulate the database in various ways—rotating it in any direction, for instance, or allowing the designer to view it from any angle, or taking it apart piece by piece (if the data was entered correctly) to specify the construction costs for each element.

Programs can even be written that will automatically apply various stress conditions to the computer model—a wind tunnel-like effect, for instance. The computer can plot and display the effects of wind on the automobile, coming from any direction the engineer wants to specify and at any velocity.

A further extension of this type of computer work is seen in the various programs for flight simulation—especially from Evans & Sutherland on its E&S system, for which computer animation company Robert Abel & Associates has written special software making it more applicable for other types of computer graphics applications. Rather than risk a multi-million-dollar aircraft for flight testing and training, companies such as Boeing put pilots in control of a cockpit simulator. The completely realistic controls in the simulation cockpit affect not only hydraulic pistons that position the cockpit according to the direction the pilot is flying, but also interface with an uncannily real display of the E&S simulation program. Based on completely digital data, the program displays a landscape through which the pilot must fly. As the pilot gets closer to certain objects, details and colors become more obvious. As he moves the flight controls left or right, up or down, the screen display behaves accordingly. It is even possible to introduce various environmental conditions into the program—a snowstorm blowing in from three o'clock, for example—and have the display show the pilot a blinding snowstorm coming in from precisely the correct coordinate.

All of these computer graphics systems can also, of course, produce extremely high-quality illustrations and simple animated movements of the kind that would be suitable for television display. A word of caution however: not all the systems are compatible with NTSC

Teletext graphics are extremely low resolution, dependent on the alphanumeric character base.



Typical business graphics presentation, from Computer Pictures Corp. produced on an HP plotter.

video. For although almost all computer systems use TV monitors of one kind or another, only those specifically going after the television market have NTSC-encoded outputs; the rest are line-locked to a strict 60 cycles. The lack of an NTSC encoder is not an insurmountable problem; both Adwar Video and Video Associates Labs, for instance, make encoder cards for the Apple II computer, and cards are doubtless available for the larger systems. But the lack of an encoder may also indicate the company's lack of interest.

Large-scale character generators are much like these computer graphics systems, and are beginning to exploit their own graphics and animation capabilities. With a digitizer and a font compose program, systems such as the Fernseh Compositor, Chyron IV, 3M D-8800, and Thomson-CSF Vidifont can enter external artwork into the digital memory, then manipulate it by interpolating the data. Elements can be moved from place to place on the screen to produce animation-like effects, and images can be moved together so they overlap and form a single, complex art element.

Digital art/paint systems

Framestore-based systems represent computer graphics technology that has been specifically designed for television applications. They produce "short burst/short turnaround" images—a term Peter Black of Xiphias Systems coined to describe television graphics that are produced quickly in the environment of a busy station and are designed to be seen perhaps only for seconds. For although the output of the digital framestore or the disk on which the images are stored could be fed to a plotter or line printer or Polaroid camera for a permanent hardcopy record, this is not the primary purpose of TV graphics.

Digital art/paint systems are dealt with in detail in Peter Black's story, elsewhere in this Special Report. Suffice it to say that among the chief criteria are the resolution and the selection of colors available, with more of each getting higher and higher price tags.

The framestores used in these systems are almost always around 512 × 512 pixel matrices—a resolution imposed by the resolution of the medium itself; a few, however, because they evolved from other applications or because they are also used for the creation of high-resolution graphics for print media, have more pixels available. The bit depth on almost all of them is eight bits, since this is the minimum number of bits per pixel

necessary to define the 256 levels of a color the human eye can perceive. The 256 numbers can correspond directly to levels of R, G, and B, in which case the system can display a total of 256 colors. Alternatively, the framestore can be colormapped, in which case the pixel bit information is used merely as an index number to look up a color map. Since the user can set the various colors on the color lookup table, it is possible to work with several thousand colors, defined frm RGB components, though only 256 will ever be viewable at one time. In some of the very sophisticated systems a 32-bit framestore is used, with eight bits each for R, G and B.

The actual programming of the framestore used in television has followed a unique course for broadcast-related products. The first eight-bit framestore system was implemented by Richard Shoup at the Xerox Palo Alto Research Center, where it simulated spacecraft maneuvers during the Jupiter missions in the early 1970s. Alvy Ray Smith was influenced by Shoup's work, and wrote programs for an Evans & Sutherland eight-bit framestore at New York Institute of Technology in 1975–76. The programs were sold to Ampex and CBS in 1977 and were used by Leroy Niemann during the Super Bowl of1978 to give nationwide television viewers a sample of what digital art could do. Since then Ampex has released the programs as its AVA video art system while Shoup has developed his programs into the Aurora Digital Videographics system.

Images produced on the Ampex Digital Opticals system are representative of digital effects processor capabilities.

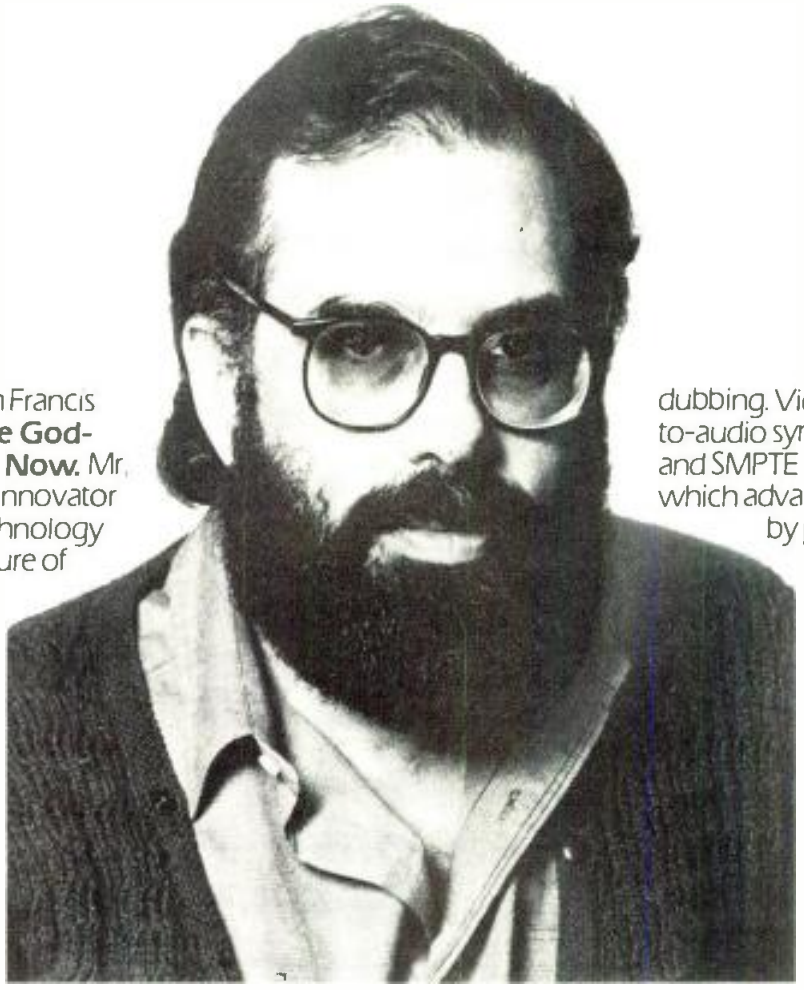
Other companies have been entering the field in droves, with almost a dozen presenting products at last year's NAB and several new companies appearing since then. MCI/Quantel brought its framestore and programming technology to bear on its Digital Paint Box (DPB-7000) system, which appears to offer programming features not yet available in other systems, such as a finger painting-like mode. Companies that already had large-scale computers as part of other systems—notably news/weather system designers such as McInnis-Skinner and Weathercaster—began incorporating software that would do more than simply apply symbols to weather maps. In New York City, Digital Effects, a company specializing in the creation of high technology television commercials, co-developed a system with ad agency J. Walter Thomson that is now a commercially available product. Thomson-CSF added a framestore to its Vidifont character generator, yielding the Graphics V. Chyron promises a similar development at this year's NAB. Via Video brought out a new system as recently as the fall SMPTE show, built around a graphics generator from Cromemco, one of the leaders in the computer graphics field.

The primary function of the art/paint system is to copy material from the central computer memory of the data processor (a wide variety of microcomputers ranging from DEC PDP 11/34s and LSI 11/23s to Intel 8085s to the Z80 chips) into the framebuffer, from which it is read out 30 times per second. The most common form of copying, of course, is with a stylus-controlled cursor that has been assigned a shape from the processor's memory and is used to continuously transfer that shape into the framestore (or "rubber stamp" it wherever the stylus is touched down). Colors are copied in the same way. The processor can also be used to create images independently of the cursor, using commands from a computer-style keyboard, connecting two points automatically with a straight line, for example, or creating a mathematically perfect circle as the locus of a point.

The basic painting programs use the stylus "brush" to address the pixels it passes over, translated through the drawing tablet. The processor can also be used, however, for many other graphics tasks. One of the most important is to fill an area with color by planting a "seed" of the color in the midst of a bounded-off area and having it grow outwards, pixel by pixel, until it touches the boundary. In a history mode, the completed image is built up step-by-step as originally created by the artist, with the ability to stop the program at any point and make changes. Most systems incorporate color matching, a mode in which the artist asks the computer to match the color of the image where the stylus is touched down; the artist can then take the color and paint over any offending areas, effectively erasing the unwanted lines and transforming the pixels into the background. In modes such as smear painting, a weighted average of a group of some 3 × 3 pixels under the stylus is automatically averaged and rewritten into the forward-most pixel of the group—producing an effect exactly like finger painting. The stylus can also be used to paint over an image, changing every tint value in a certain direction, or every hue, or any combination of changes desired by the artist.

For many in television, there is also the attraction of

THE FUTURE IS IN CONTROL.



That's the message from Francis Coppola, film father of **The Godfather** and **Apocalypse Now.** Mr. Coppola, the preeminent innovator in applying electronics technology to cinema, believes the future of filmmaking lies in the use of "thinking machines," computers and communication devices that give him precise control over all the elements of film production.

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doing "computer animation." The term generally refers to the use of the computer to provide in-between stages in an animation sequence; if the starting and ending points of the sequence are defined, the computer can be instructed to provide a smooth, straight-line transition between the two points during the time specified for the move, interpolating the data as it does.

The animation that can be most easily achieved on art/paint systems, however, is pseudo-animation, or color map shifting, in which the pixel values are changed by cycling the color map through a range of colors. The effect, somewhat similar to chaser lights

Image produced by Loren Carpenter, formerly of Boeing Aircraft and now working at Lucasfilm. Simulation takes viewer on an extraordinary journey through a completely digital landscape.

seen on a theater marquee, requires no actual additional artwork since the eight-bit pixel address remains unchanged and only the contents of the color map address are shifted. A similar effect can be created by using the stylus as a bitmask, selectively blocking off certain areas of the raster and then having them revealed in a timed sequence. To animate raindrops falling, for example, the artist would create a continuous band of drop-like shapes, then mask them off one by one. The playback sequence would reveal the succession of drops one at a time, giving the effect of a changing image from one frame to the next.

Finally, to avoid confusion, a word must be said about the role of standard digital effects. Digital effects processors—such as the SqueeZoom, DME, DVE, ADO, DPE, and so forth, do, of course, rely on the same kind of framestores that make the art/paint systems possible. And, like the art/paint systems, they offer a means of controlling the digital processing to affect image size, position, and shape. Indeed, the mosaic and comet-tail programs now becoming available, together with digitally created modulation patterns that make images seem to bend around corners, have made digital effects processors very similar to computer graphics processors. The difference is that the effects units are almost always tied into already-existing images—either live or tape—and are used to manipulate the images in some way. Art systems create images from scratch—and, except for their limited animation capabilities, create still, illustration-like images.

Outer limits of digital imaging

On the other side of framestore developments are the full-scale computers used to create the high-resolution graphics demanded by the motion picture industry and also for still artwork used for magazine illustrations. This month's cover was created by Digital Effects, Inc. Digital's computer system has a matrix of 2400 × 3600 pixels—8,640,000 pixels total, or roughly 33 times the resolution of a 512 × 512 framestore.

With this kind of resolution, which may some day reach the ultimate goal of 400 × 4000, or 16,000,000 total, one would not be able to tell the difference between a piece of 70 mm motion picture film that was shot by a camera and one that had been digitally processed and then transformed back into motion picture film with a laser beam modulated by the digital bitstream. This, in fact, is where the various film-oriented special effects wizards are going to work—at companies such as Triple-I (Information International, Inc.), which worked on the movie *Looker,* and MAGI/Synthavision, both of which are working on the Walt Disney film *Tron.*

The same techniques are what interest those at Lucasfilm, Francis Ford Coppola's Zoetrope Studios, and many others in the business—the possibility of creating a digital merging device. In traditional film effects, foreground live action is combined with stop-action or painted backgrounds in a photographic process somewhat like chromakeying. In the new digital process, however, the film containing the foreground action is scanned into the computer database just as if it were a character being entered into a character generator through a font compose program. The foreground action can now be digitally merged with a background scene—either one that has been scanned in from original artwork or one that has been created digitally on the equivalent of an art/paint system. The high-resolution image is then output to film again and intercut with other live action scenes. This process is already being carried out, though on a lesser scale, at Hanna-Barbera. The resulting merged images of cartoon characters against digitally created backgrounds require only a merging program built into a standard framestore since they are intended solely for television viewing.

A number of companies around the country are already using these kinds of techniques in the creation of television commercials—producing both exotic-looking, neon-like and metallic 3D images and also computer-simulated movements. Digital Effects and Abel & Associates have already been mentioned. At Computer Creations in South Bend, IN, an E&S system and a DEC PDP 11/50 are used. At Ghering Aviation in Los Angeles, the output of the computer graphics program is first run up on a line plotter, then photographed on a standard animation setup rather than being recorded directly on film or tape. Acme cartoon in Dallas uses a PDP 11/60 with a DeAnza frame buffer.

Until now computer graphics for industry and digital graphics for the television medium have enjoyed separate but equal developments. Now, with the technologies so close, it may be possible to pool resources and begin to work on systems that will be both affordable and even more useful to broadcasters. **BM/E**

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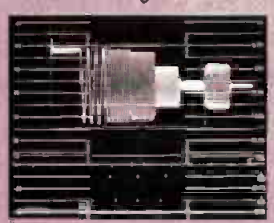
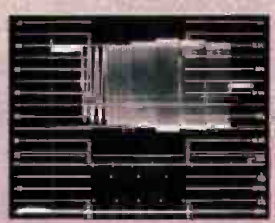


1. Multiburst test signal with conventional bandpass and notch luminance/chrominance separator.



2. Multiburst test signal with Conrac's Comb Filter luminance/chrominance separator.

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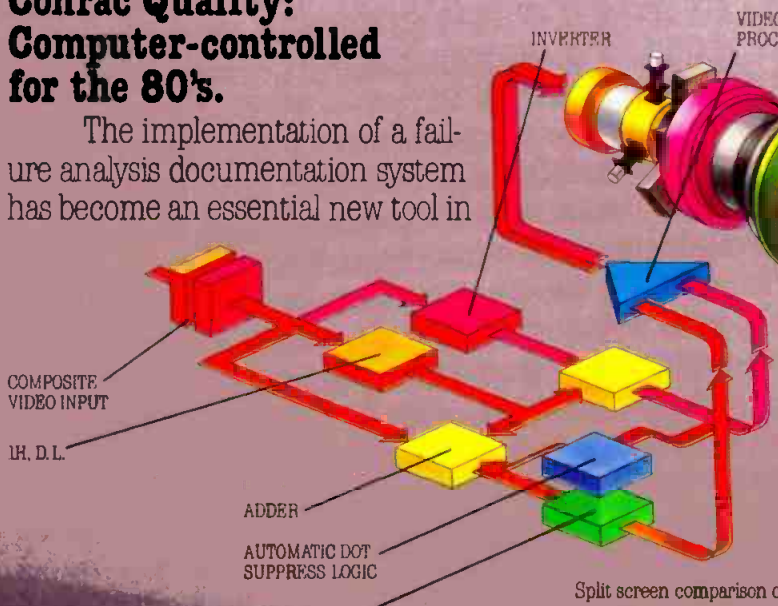
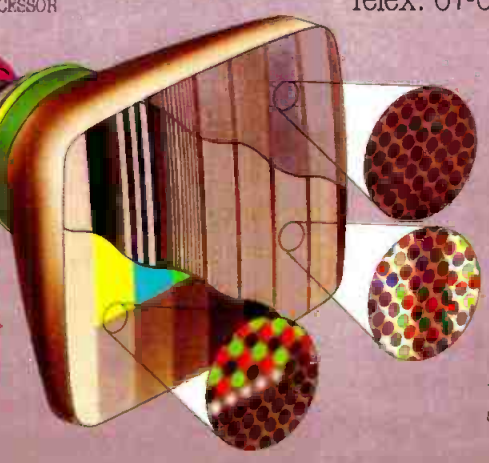


Split screen comparison of CRT display, with and without comb filter



1. Luminance resolution using the conventional notch/filter separator.

2. Luminance resolution using the comb filter separator.

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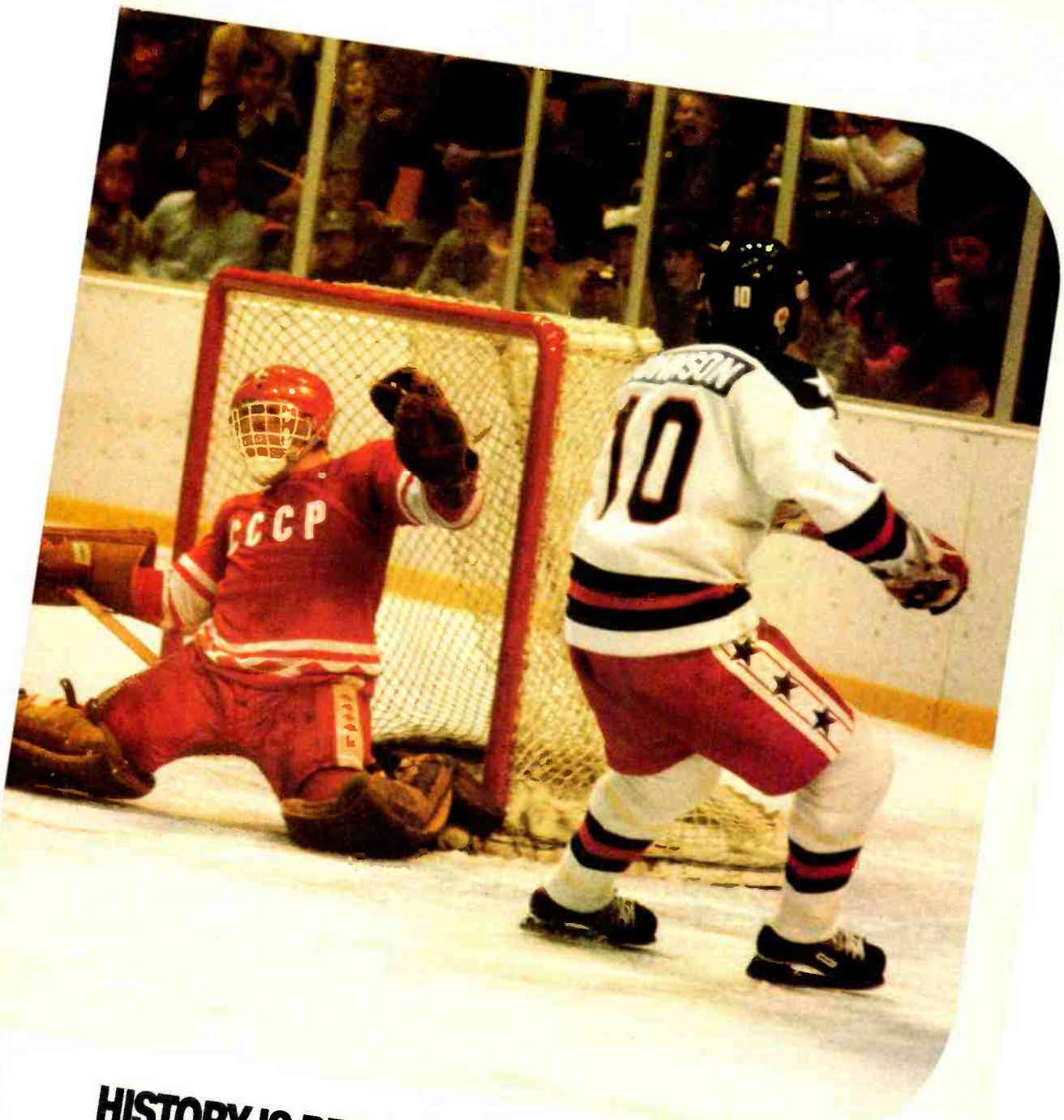

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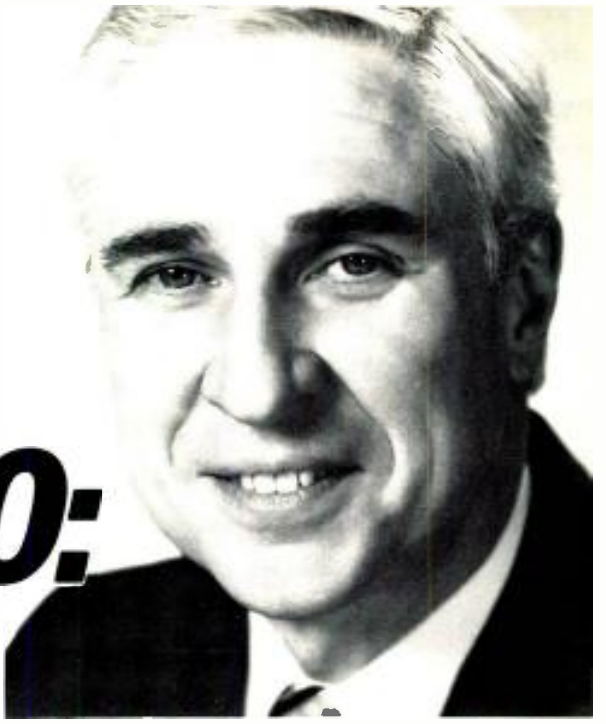


Emil L. Torick, director of audio development for the CBS Technology Center.

DIGITAL AUDIO: A VIEW OF TODAY AND TOMORROW

In an exclusive interview, Emil Torick, director of audio systems technology at the CBS Technology Center, discusses the latest developments in digital audio—including AES standards-setting efforts.

TO GET AN OVERVIEW of the status of digital audio, *BM/E* recently talked with Emil Torick, Director of Audio Systems Technology at the CBS Technology Center in Stamford, CT. Torick, a past president of the Audio Engineering Society, was the principal developer of the Audimax and Volumax, pioneering broadcast audio processors, created at CBS and now marketed by Thomson-CSF. As a member of the AES Digital Audio Technical Committee, he has been deeply involved in the industry's efforts to fix digital audio standards. Torick is also Chairman of Sound Broadcasting for the U.S. delegation to the International Radio Consultative Commitee (CCIR), which held its most recent meetings on radio broadcasting in Geneva in September and October, 1981.

BM/E: Can you give us a thumbnail history of digital audio techniques? Where and when did it start?
Torick: For professional applications, it mainly goes back to the work on delay-line special effects systems by Blesser and Lee at MIT in the early 1970s. They used digital storage methods to hold the delayed signal. These techniques became successful in the market eventually, for example, in the special effects units of Lexicon and others. The adaption of digital technique for recording and reproduction came very quickly after that; the potential was clear.

BM/E: Who picked that up?
Torick: Work started in several places almost simultaneously. The BBC laboratories took off on digital audio early. So did Tom Stockham with his famous "reconstitution" of the Caruso recordings, and a little later with his digital tape machine, the first to get into actual use in this country (see *BM/E*, February, 1977, p. 56). 3M soon teamed up with the BBC and got its machines to the market a few years later. And the Bell Laboratories did massive work on digital audio, leading to the very extensive use of digital transmission in today's telephone system.

The Japanese threw weight into digital audio in the early years, and in just two or three years digital audio development was going on in dozens of laboratories around the world.

BM/E: How did you get involved in the effort to fix on standards?
Torick: The AES became very concerned with the potential proliferation of incompatible digital audio systems. By 1977, in response to encouragement from the technical associations, the AES formed a committee with the intention of helping the industry formulate standards. The feeling was that the enormous potential of digital audio would be diluted or lost in the struggle.

However, at that time, the U.S. Antitrust Division of the Justice Department advised the AES informally that such standardization, if "imposed" on the in-

dustry by a group representing the AES and some manufacturers, might be an illegal restraint of trade. There was also a feeling among some members of the AES that a standard then would be premature—it would tend to freeze out important refinements of the technique.

BM/E: Do you believe the technique is now mature enough to set standards?
Torick: I do, and virtually the whole industry around the world is now eager for standards—some have already been proposed. Striking evidence of that industry sentiment came at the meeting of the AES Digital Audio Committee on November 2, 1981, during the New York Convention. I'll give you some details on that, but first I want to make a point: with the technology in its present state, the adoption of standards will *help* new firms, not hinder them. A company wanting to start in the business now would be at a loss as to which standard to use. As many as seven sampling frequencies are in current or proposed use. A standard would give a firm a secure footing.

BM/E: What are the possible standards that you mentioned?
Torick: At the meeting in November there were representatives of practically every firm with a large commitment to digital audio in this country, Japan, and Europe. Also on hand were representatives of other professional societies with a concern, including observers from SMPTE, who were there because audio standards are now of vital interest to television and motion pictures. The desire is to have digital audio that can instantly become part of the digital standards which the CCIR is adopting for TV.

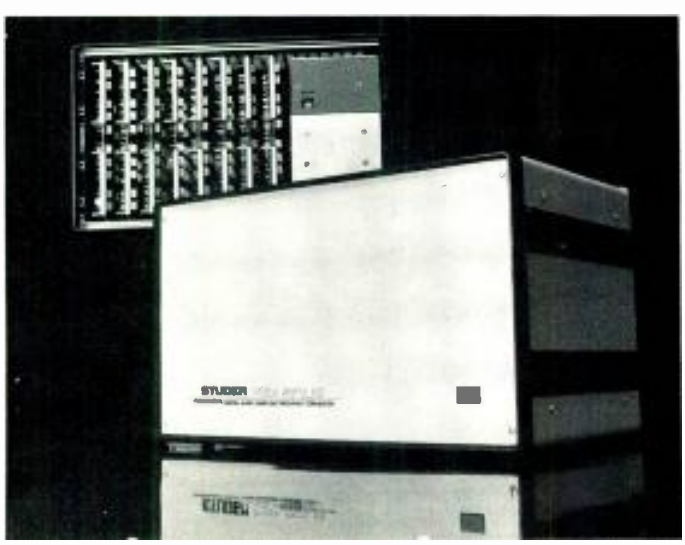
Sony's PCM-3204 is a portable digital recorder.

The resolution that was passed said, in effect, that a sampling frequency of 48 kHz looks like the best for program interchange and compatibility with television and motion picture systems, with 44.1 as an acceptable standard for consumer devices, in both cases with the aim of frequency response to 20 kHz. SMPTE had said that either 48 kHz or 60 kHz would work well for them, but the very large bandwidth needed for 60 kHz would have been wasteful for audio.

BM/E: Has there been any reaction to the 48 kHz consensus?
Torick: Several companies now using other sampling frequencies have said they would move to 48 kHz if it becomes official; 3M was one of them. NHK, the Japanese national broadcast organization, described at the most recent CCIR meeting a tape system using 50.1 kHz, but later said they would "not insist" on that if 48 kHz became the standard.

BM/E: What does this decision mean for digital audio in general?
Torick: It means that within a year or two the track will be cleared for rapid deployment of the technology in sound recording and reproduction, with the ease of program material interchange that standards make possible. To become official, the standard must be drafted and circulated throughout the industry for comment, and then returned to an official body for final editing. But many firms are already anticipating this process—we may be on the standard for all practical purposes before the endorsement process is complete.

BM/E: Where will digital audio be most important?
Torick: We have been talking mostly about sound recording and reproduction, and obviously in that area the technique is going to upgrade fidelity sharply, both



The 3M Multitrack digital recorder (top). Studer's new SFC-16 sampling frequency converter (bottom).

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in professional and consumer products. For example, the digital audio disk will soon carry a top grade of digital audio into the home. Three other important segments of communications that are being, or will be, heavily influenced by digital audio are signal transmission, the broadcast and recording studio, and the voice and music synthesizer.

BM/E: What is happening in transmission?
Torick: In Europe, several national broadcast systems are using digital audio for network transmission, with a bandwidth to 15 kHz and sampling frequency of 32 kHz. In fact, a draft report at the CCIR meeting in September which I attended proposed to standardize these figures for satellite and microwave network operations, along with 14-bit linear encoding, or 14–10 nonlinear encoding if the bandwidth were restricted.

The British are using similar standards in their extensive radio networking with digital transmission. And the Bell System in this country is a massive user of digital audio in telephone circuits. In addition, much radio satellite transmission in this country will use the RCA "ADDA" system of digital transmission.

BM/E: What are the results?
Torick: As it does in sound recording, digital audio lifts the quality of the signal sharply in transmission systems. It also increases reliability. It is more robust than analog coding in the face of the old enemies of the travelling signal—noise, interference, equipment variability, etc.

Mitsubishi X-80 is two- or four-track digital.

BM/E: Is it possible to exploit more fully the use of digital audio in transmission?
Torick: We need, again, standards that will simplify entry. Now a broadcaster delivers an analog signal to the telephone company, which converts it to digital for a network trip, then back to analog for delivery at the other end. But we would gain greatly if the broadcaster could deliver the signal in digital form and take it in digital form at the receiving end, eliminating the A/D and D/A conversions and the degradation of quality they entail.

BM/E: Is this concept anywhere in sight?
Torick: Not yet, but I believe it is sure to come. It depends in part on development of the digital studio, which is the third area of paramount digital importance I noted.

Mitsubishi X-800 is a 32-track digital machine.

Ampex digital system for recording pitch control.

The Sony PCM-3324 is a 24-track digital recorder.

BM/E: What do you mean by the digital studio?
Torick: Whether in a broadcast station or a recording plant, there will be huge gains in fidelity, precision, and accuracy of control when the signal stays in digital form throughout its manipulation within the plant. Everything done there—amplitude control, modulation control, filtering, equalization, processing, etc.—is far better done with a digital signal. There should be no necessity to convert back to analog form until the signal leaves the plant. And even that conversion will be eliminated when the signal on the air is digital, as it may be one day.

BM/E: What is the technology doing for synthesizers?
Torick: As the prices of digital machines come down, the technique will bring to larger and larger audiences new sounds, new kinds of music.

BM/E: Is digital audio reaching the market today in bits and pieces—no pun intended?
Torick: Yes, and we have very much to gain from putting the bits and pieces more closely together. There are a number of bright spots: the movement toward standards coupled with the fact that many developers have independently chosen 16-bit linear encoding to ensure top quality. But we have a lot to do. I am sure that little by little it will get done, because there is tremendous momentum today in the advance of digital audio. Its values are universally understood, and it has the important leverage that in the end it will save money in a many areas of telecommunications. **BM/E**

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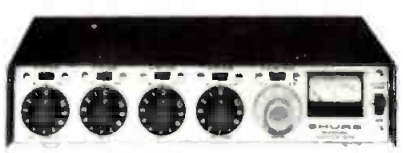

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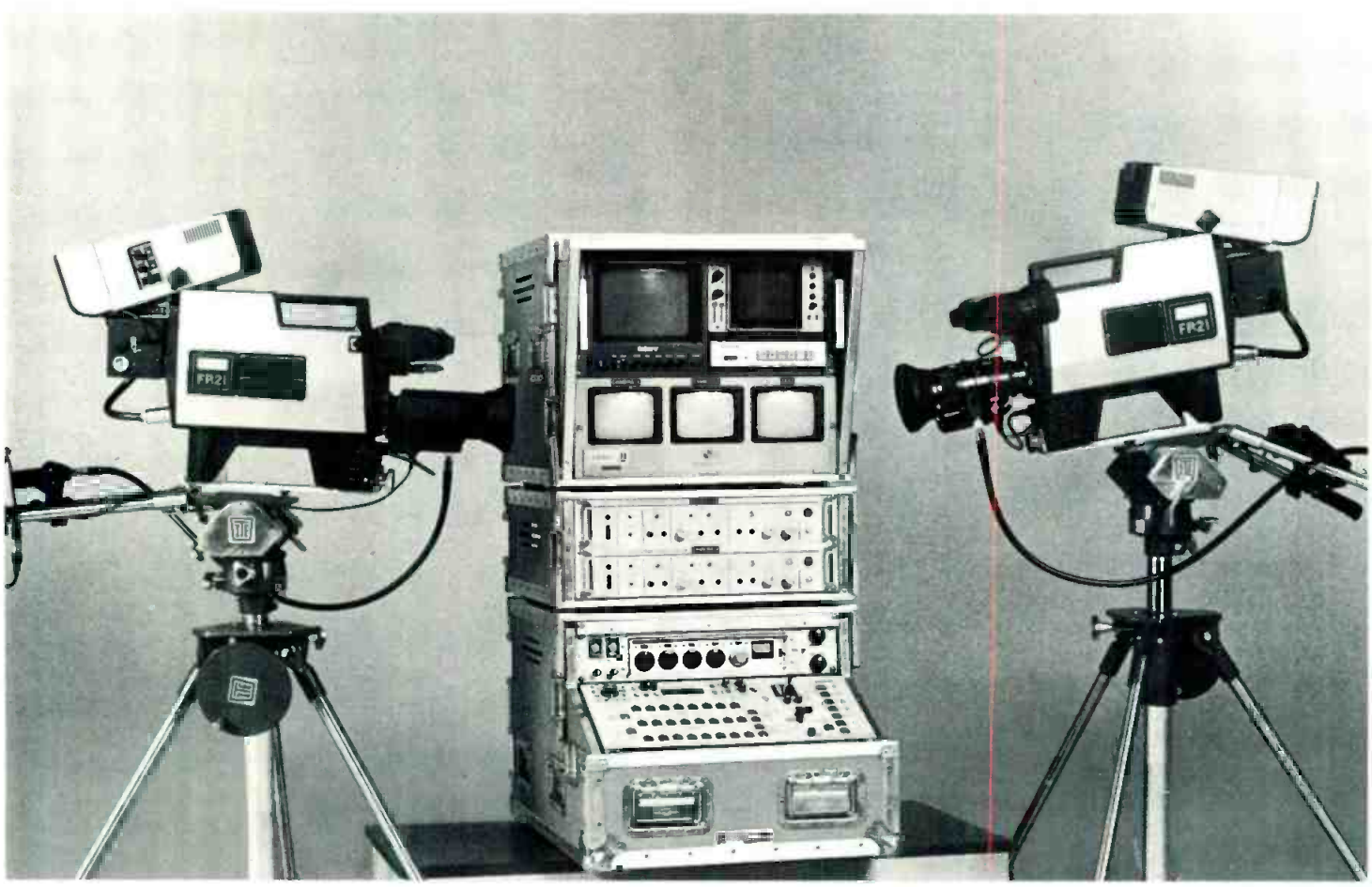

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DIGITAL AUDIO DISCS GLIMMER ON THE HORIZON

A single format for the Digital Audio Disc (DAD), pictured here actual size, has been accepted by nearly all manufacturers around the world, making it certain that audiophiles will eventually enjoy a major improvement in sound fidelity. The performance of the DAD will make it important for radio, too, once the new technology has settled in.

THE POWER OF digital techniques to lift the reproduction of sound far above earlier levels of fidelity has been demonstrated many times in recent years. But the industry's bent for infighting over incompatible systems (encouraged in some cases by regulatory stasis as with AM stereo, four-channel discs, FM quad, and the videodisc) might have caused concern that digital sound would never reach a large public.

It is all the more satisfying, therefore, that in the case of the digital audio disc (DAD), the industry is doing practically everything right. First, there is agreement on a format—a layer of laser-encoded metal encased within plastic, much like an optical videodisc except measuring only around 4.5 inches in diameter. Two of the world's power centers in consumer electronics, Sony of Japan and Philips of The Netherlands, are the joint initiators of a DAD standard, and nearly all other large consumer electronics producers around the world have signified that they are joining the party, most importantly Studer Revox, Pioneer, Matsushita, Crown, Dual, and Nakamichi.

Also crucial is that the format agreed on uses digital technology at close to its current best. The accompanying box shows the main characteristics of the DAD system to be virtually as good in all important respects as those of the tape machines now getting heavy use in making digital recording masters. It will put sound reproduction in the home at the high quality level inherent in the digital technique.

With major technical advances such as improved digital coding and error correction systems, the DAD is aimed at the consumer and will remain so for several years. A number of brands are scheduled to reach markets in Japan and Europe in the fall of this year or early 1983. Introduction in the U.S. is likely to be about a year later, according to R. T. Cavanaugh, vice president of North American Philips.

Impact on broadcasting

The DAD will have enormous impact on the consumer high fidelity market, elevating listener expectations as the machines get into the hands of a sizeable number of users. On that score alone the coming of the DAD will be a crucial event for radio broadcasters. As the DAD reaches a widening public, the radio broadcaster more and more will have to look to the technical quality of the signal on the air.

But the DAD can also give the broadcaster a strong helping hand in the effort to raise quality levels. On several grounds, in addition to superb fidelity, the DAD will be attractive as a program source in a radio station.

The DAD—much in little

The designers of the DAD rejected the idea of a combined video/audio optical system, which seemed logical a few years ago, in favor of a much smaller disc for audio alone, allowing the playback system to be small and thus comparatively inexpensive. Philips was the original developer of this idea with its "Compact Disc" (*BM/E*, July, 1979, p. 12). Discussions between

Philips and Sony subsequently revealed that Sony had developed some coding and error correction ideas that could be excellent for the system. This led to the joint DAD development, in which both Philips and Sony patents are operative. Other manufacturers are getting licences covering all the relevant Sony and Philips patents through the Philips worldwide licensing system.

The optical laser disc diameter is 120 mm, or about 4.7 in. With the coding used, this allows an hour of stereo music to be put on one side of the disc, along with several synchronizing and control signals. In addition, the system is readily adapted to four-channel stereo, with a corresponding reduction in playing time.

The designers kept the laser beam for both recording and playback, altough there were strong proponents of mechanical, groove-based systems that would have been simpler. The full optical system has much more flexibility and capacity than the mechanical systems, however, and the DAD designers accepted the complexity of the laser beam technology.

The laser beam is produced by a semiconductor that in itself is an important advance over the gas lasers used in earlier optical systems. The laser wavelength is about 0.78 micrometers (near the infrared region), and can be focused down to a spot approximately 1 μm in diameter. This establishes the track pitch at around 1.6 μm, with the disc drive maintaining a constant linear velocity of around 1.2 meters per second. The angular velocity starts at 500 rpm at the inside of the disc (where the recording begins) and reduces to 200 rpm at the outside edge.

A recording is made by revolving the disc under the laser beam, which is turned on and off in response to the bit stream of the digital information being fed to it. Each burst from the laser produces a tiny pit, about 1 μm across, in the photosensitive surface of the disc. There are about 20,000 tracks on a fully recorded side—yielding a total of approximately 6 billion bits of

One side of the digital audio disc holds as much music as both sides of an ordinary LP, shown in background.

Philips player for the digital audio disc, like other DAD players coming on the market, feeds into standard hi fi system.

data in the 80 square centimeters of recording surface. This is more than enough space for the hour of stereo music, the redundant information for error correction, and the synchronizing and control signals described below. This packing density is typical of the very high values possible with optical recording, far above those of any other recording system now in use.

Readout with the laser

The master disc, after a recording has been laid down, goes through a series of processes similar in function to those used to make an ordinary phono disc. These processes end up producing a "negative," in which the succession of pits in the spiral track have become tiny protrusions. This is used to stamp out the final copies. After the stamping, each copy gets a layer of very thin metal as a reflective surface. Over this is formed a 1.2 mm layer of transparent plastic.

This layer protects the disc from dirt and minor surface damage. The playback laser beam has a depth of focus of only about 2 μm; thus, the upper surface of the protective layer, 1.2 mm above the signal surface, is totally out of focus. Irregularities and scratches in the upper surface do not influence the signal in any way. The user's fingers, for example, are not prime enemies of good sound; finger grease cannot be picked up.

In playback, the laser beam follows the track from below as the disc is rotated. The succession of reflections from pits and spaces goes back through the optical system to a photo diode, which produces the corresponding digital electrical signals that go to the electronics in the unit. Here the bit stream is decoded and converted back to analog form. The analog output can be fed to any modern high fidelity system (or to line amplifiers in a broadcast plant).

Several control signals are recorded onto the disc along with the program material. One is for the angular velocity of the drive; a synchronising signal 'tells' the motor how fast to turn at each instant. This signal is put onto the disc during the mastering so that the playback speed simply duplicates the recording speed, eliminating elaborate controls on the playback motor to match precise rpm standards.

Correction signals are also put on to keep the laser spot at the right radial position and to keep the beam focused at the reflective surface. Disc eccentricity exceeds many times over the width of the track; without

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correction the spot would skitter over dozens of tracks as the disc wobbles in a radial direction.

The correction system for radial errors picks up a reference signal from the disc and uses it to control a servo that adjusts a mirror in the optical system. This keeps the spot on the right track on the disc. Similarly, an error signal is used to move lenses in the optical system up and down to keep the focus at the disc signal surface.

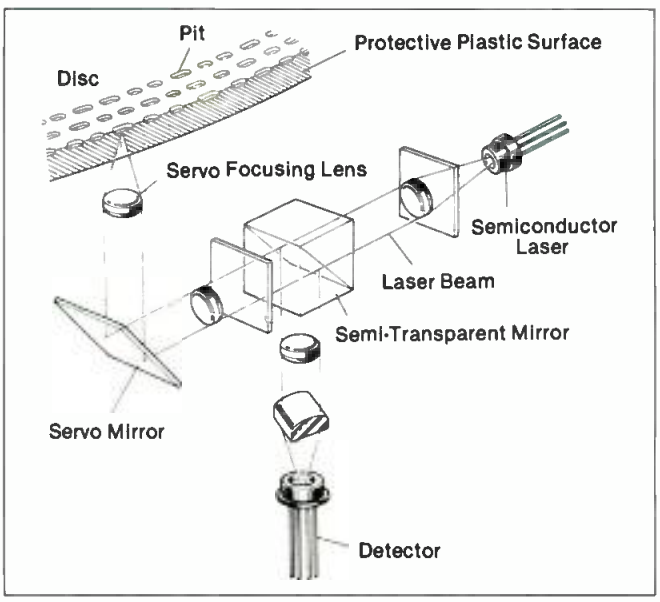
Complex code for pure sound

The basic operation of the DAD is easy to follow because of its similarity to the optical videodisc. The videodisc, however, uses FM modulation and is not a true digital system, while the coding of the signal on the DAD makes it a triumph of complex digital technique.

As shown in the table of characteristics, the A/D converter in recording first produces a 16-bit linear PCM signal with a sampling frequency of 44.1 kHz. Each sample, therefore, consists of a 16-bit digital word. But in order to provide the highest possible signal density on the disc combined with efficient error correction, the information in the original, "data bits," is transferred to a second level of coding, the "channel bits." Each group of eight data bits is mapped onto 14 channel bits according to rules worked out by computer. Additional bits are used for synchronizing, control, and error correction.

The error correction system itself, called "CIRC" (Cross-Interleave Reed Solomon Code), is mathematically directed to keeping coding errors well below obtrusiveness. The main effect of uncorrected errors in digital recording would be a series of click noises in playback, but the coding on the DAD will allow only about one click a year in normal use, according to the developers.

Clearly, the decoding of this signal in the playback is as complex as the encoding. But both Sony and Philips have developed integrated circuit chips that make the actual assembly of the playback unit very simple and its operation reliable. Licensees for the DAD will be able to get the chips for their own production, thus making the path for the DAD even smoother.



In DAD optical system, light from laser is reflected by servo mirror to underside of disc, returns with program information along same path to semi-transparent mirror and detector. Servo mirror is continuously adjusted to keep light spot on track.

Extra: random access

Among the control capabilities is addressable random access to any part of the material on the disc with a display of the disc's "menu." In the consumer market, this will be used for pushbutton selection of segments, plus a LED readout of the selection being played.

For the broadcaster, this is also a highly significant extra. The DAD will be ideal for automation systems. The on-air operation can be programmed under computer control. And, since the disc is so small, handling and storage will be greatly simplified; a library of music on the DAD will take up a small fraction of the space it would occupy on LP discs or broadcast carts.

Finally, where will the software come from? It is apparent to everyone now that no brand-new home entertainment device can succeed unless there is an abundance of attractive software ready at the kick-off date.

Again, the DAD is blessed. Philips owns Polygram, the European recording conglomerate, with an enormous library of music. The Philips record label itself is also a rich source. All of this will be available for transfer to the DAD. Most of it, of course, was recorded in analog form; but Philips will select the very best of the analog master tapes and convert them to digital form. The user will thus, in effect, be taken back to the quality of the master tapes without any signal degradation along the way.

In addition, digital mastering is growing rapidly and the worldwide library of digital originals will probably number 1000 by early this year. One hundred percent digital recordings are the wave of the future.

In Japan, the Sony-CBS joint recording operation will also pour material into the DAD library. Other Japanese record producers are sure to follow suit, with something like 10 brands of DAD players coming on the market in Japan this fall or soon after.

And so the DAD has all the potential for success in the consumer market—both because of the actual benefits it offers listeners and because the industry itself is making an effort to make it work. The plans for broadcast use of the disc are, of course, still in the somewhat distant future. But if the DAD comes into widespead consumer use, radio will not be able to stay far behind. **BM/E**

Main Characteristics of the DAD in Standard Format

Frequency response	flat, 20–20000 Hz
Quantization	16 bits linear
S/N	>90 dB
Dynamic range	>90 dB
Channel separation	>90 dB
Harmonic distortion	<0.05%
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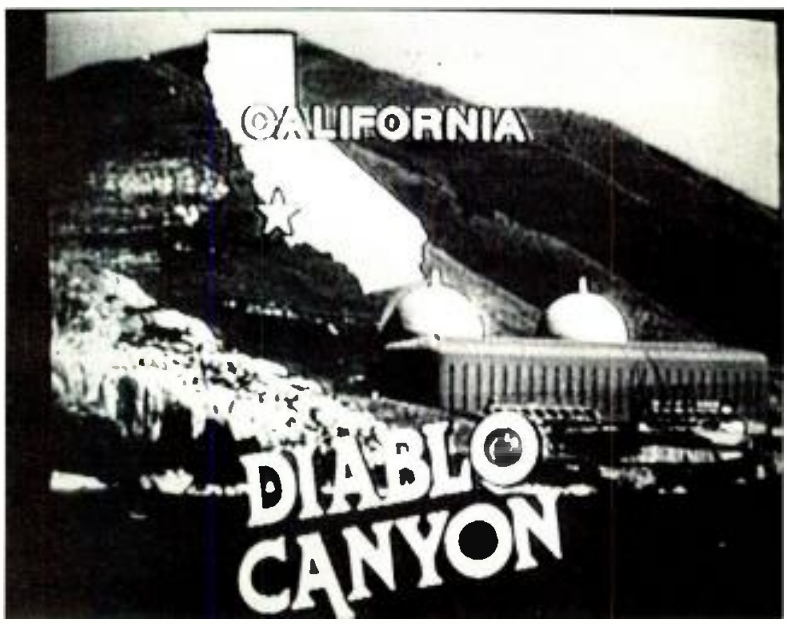
DIGITAL STILL STORES STILL EVOLVING

By Dave Quebbeman

Digital still stores aren't just for storage any more. Users of these systems are putting them to work freezing, squeezing, sequencing, and otherwise transforming basic graphics into dynamic visual displays.



Typical news graphic produced at NBC. Image of canyon area is captured from tape and combined with character generator-created lettering in digital still store.

IT USED TO BE, back in the "old days" of television, that the art director or graphics designer (if there was one) might have had five or 10 pieces of artwork to prepare for the newscast. While the newsfilm was being flown in from a distant city, then processed and edited, there was plenty of time to prepare the art, which would probably be shot off cards by a studio camera.

In today's newsroom, however, upwards of 100 stills may be needed each day, produced by an art department as large as an ad agency's. Turnaround time may be only minutes if the story is being beamed back be satellite or microwave. At the same time, there is a continued push for better-looking, even more informative graphics.

It is in this environment that the digital still store has made such an impact in recent years. Giving its owners the ability to store thousands of stills for instant recall on computer-like disk packs, the still store has also opened up extensive new production capabilities. Operators can now manipulate digital images in the same way that their older counterparts could move around pieces of paper on art cards.

Digital still stores have evolved from their origins as simple slide stores. Systems can now grab frames or fields from tape or live sources, build up stacks of images into an event list as in a master control automation setup, compress and build montages as in a digital effects processor, and manage huge libraries of information—allowing a year's worth or more of slides to be searched in seconds and slides bearing appropriate key words in their captions displayed instantly to the operator.

The digital still store is, in other words, a still *processor* that can both help create and then store and display the vast amount of illustrative material demanded in today's news/weather/sports programs.

Graphics at NBC

At NBC television in New York, Sheldon Hoffman, manager of news graphics systems, has been using ADDA still stores for approximately two and a half years and currently has two ESP-750Cs, which are assigned to network news and sports, and an ESP-100, which serves WNBC-TV. All together, Hoffman's department produces some 100 finished pieces of artwork per day from sources as diverse as book jackets, product shots, live and tape frames, front-lit and back-lit art, and Polaroids. All of it ends up stored on an ESP disk.

The system is also used for composition, with art elements already on file capable of being put back on line, manipulated, and then frozen again. One of Hoffman's favorite examples is a still for a flood, which started out as a freeze frame of a flood scene. A map identifying the location was then added, together with character

Dave Quebbeman is a writer specializing in television-related subjects who lives in Salt Lake City.

generator titles, and the whole image then stored again as a composite still.

To complement the sheer mass of storage possibilities—each disk on the ESP-750 can hold up to 750 stills, with up to 99 disks per disk drive (74,250 stills per drive) and up to three drives per system (222,750 stills total)—NBC has developed its own computer-assisted cataloging system, which is programmed into the network's Univac computer. Each artist working on the graphics staffs of the various programs using the system (*Today, NBC Nightly News, NBC News Update,* and various specials and documentaries) has an area on a disk specially assigned to him or her, and can review stored material with a special "pack review" feature that rapidly sequences through the stored stills for a quick reference.

NBC produces some 100 pieces of artwork daily, most of which are used in a compressed box over the anchor's shoulder.

If a more extensive library search is necessary, the Univac catalog is brought into play. Each slide entered into the system can be provided with an invisible caption identifying when it was entered, the medium from which it came, and the subject matter. The Univac will search the captions according to key works entered by the operator, permitting, for instance, a list of all slides bearing the title "Sadat" that were entered between June, 1980, and July, 1981. The printout can then be used to summon up the stored slides for review. ADDA also manufactures a similar library search system.

According to Hoffman, all controls for the ESP-750Cs are located in a special room within the network graphics arts complex, along with two RCA TK-76 cameras, a Chyron character generator, and a Grass Valley switcher. The ESPs' central electronics packages and disk drives are located elsewhere in the facility.

A semi-on-line tape storage system, for archival purposes, uses a Sony VTR to record up to 12,000 stills, in digital form, on a one-hour reel. Complete time code information is included in the recording process, permitting rapid, random retrieval of stills back to the disk (and to the artist in the graphics department) when necessary. Once the VTR is cued to the selected location, the digitized still can be brought back in about a quarter of a second. While the concept is similar in some ways to ADDA's "ADDABUS" digital transfer process, this particular system was developed in-house by NBC, Hoffman says.

The biggest advantage of the $125,000 system, Hoffman feels, is that it has allowed the graphics department to extend its deadlines and has given it access to video material as a source for graphics. While it was possible (but not easy) to use a frame of newsfilm as a basis for a still, there was really no practical way to duplicate that process after the advent of EJ until the introduction of still store equipment. Further, the high-speed digital systems such as the ESP-750C allow several users to handle a lot of material in a very short time. And regardless of the number of times a still is retrieved, manipulated, and stored again, the quality will never vary.

Osmond Studios produces digital slow mo

Digital still stores are also finding their way into the teleproduction arena. An Ampex ESS-2 system has been in use at Osmond Studios for about three years—primarily for slow motion work, according to Jerry Huber, engineering supervisor at the Orem, UT, facility. The Osmonds' ESS-2, which is a single-channel, single-disk drive version of the digital production unit, can record up to 27 seconds of moving video for playback using any combination of speed and direction, including an instant switch from faster than real time forward to full reverse. "You can't do that on a tape machine," Huber points out. The ESS-2 system, which Ampex describes as the first commercially available digital video recorder, can be equipped with three channels and three disk drives.

Adding a second channel and second drive, which Huber hopes to do early next year, will result in a system "greater than the sum of its parts." That is, in addition to doubling the amount of disk space and allowing two users to play back (but not record) material at the same time, the second channel and disk will also allow still material on disk to be shuffled into any sequence. This consideration becomes important for slow motion applications, since live video frames must be stored on the disk in a continuous sequence of tracks. Having a second drive will allow important stills to be relocated onto adjacent tracks, thus opening a longer "hole" for slow motion operations.

As Huber explains it, the recording concept is very straight forward: one field is recorded per revolution, and to achieve 60 fields per second, the 200 Mb disk runs at 3600 rpm. This is very similar to the arrangement in a standard computer system drive, which is usually locked to the power line frequency.

Since the video is taken directly from the disk (there is no RAM-type frame store), the amount of time required to switch between frames varies with the physical distance between the tracks involved. In most cases the time required is extremely short; the worst case access to any still is less than 70 ms. According to Huber, the ESS-2 automatically inserts a neutral gray picture between stills to minimize the effect of the time delay. Again, with its second channel/second drive, the Osmond's system will be able to shuffle stills down closer together to eliminate the delay entirely; it will also be able to montage stills.

That's the bottom-line of KOMO's NEC Digital Mix Effects System, according to Bob Plummer, Director of Engineering, Fisher Broadcasting.

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Fisher Broadcasting's Director of Engineering Bob Plummer.

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The Osmond facility keeps two disk packs on hand, one formatted for stills and slow motion and one for slow motion only. Total capacity for one disk pack is 814 stills, 27 seconds of motion, or a combination of the two, with 30 stills using the same space as one second of motion (30 tracks). The actual production space is somewhat less, Huber says, since some of the tracks are taken up by housekeeping data.

Three remote control panels are installed at Osmonds Studios (the system will accept up to seven), including one designed especially for slow motion recording and playback. The control panels include alphanumeric LEDs for identification of current disk address (by pack and track number) and general operator prompting.

Control panel for the Ampex ESS system is to right of Grass Valley switcher at the Osmond Studios production facility.

The ESS-2 has provisions for frame grabbing, field/frame record mode, sequence compose, and auto or manual pack review. As a direct visual indication, empty spots on the disk are shown on the system output as a large letter "X."

Osmond director of engineering Pat Brennan believes that the next step for the ESS might be time code control of slow motion sequences, an idea that would fit very nicely into the computerized slow motion control panel now available for the system. All of which, he speculates, could be integrated into his plans for a new one-inch editing suite.

IRIS at WGN

One recently developed digital still store system, the Harris Video Systems IRIS, is now in use at several broadcast and teleproduction facilities, including WGN in Chicago. According to Bob Knudsen, director of engineering for WGN Television and Radio, the station's IRIS system will be expanded from two channels to three early this year.

WGN, which wanted a digital still system to support both its news and production activities, selected the IRIS package primarily because of its multi-channel architecture. The system can have up to six video channels—three read/write and three read-only. In addition, the system can accommodate three users at the same time. Up to eight disk drives can be accessed.

Along with the new third channel, says Knudsen, WGN will add a third disk drive, providing one drive for air, (with 450 stills), one for production, and a third

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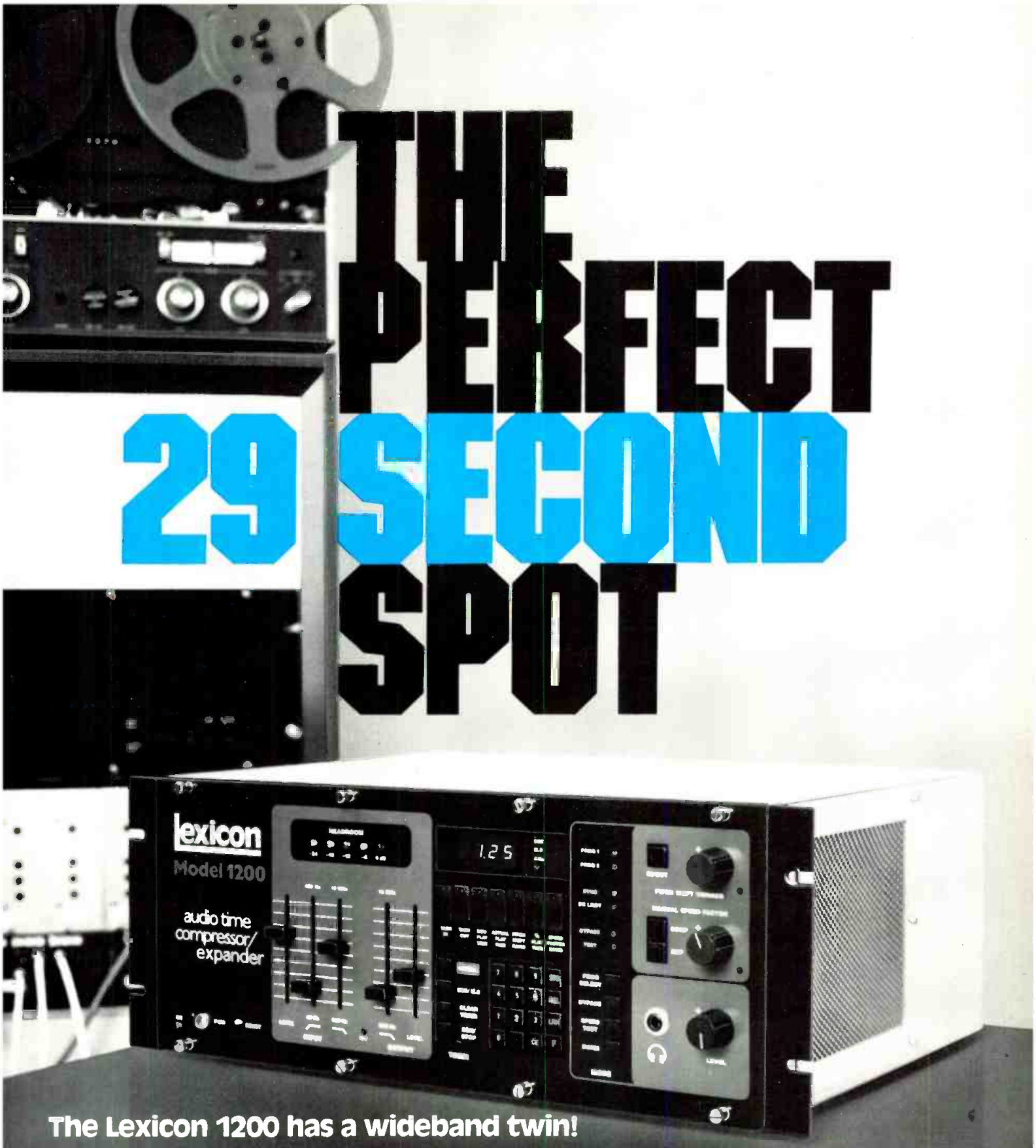

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The Ampex ESS-2 relies on 200 Mbyte disk packs each of which can hold some 8000 stills. KDFW, Dallas, pictured here, has a two-disk drive system.

for backup and transfer operations.

WGN currently has a library of some 8000 opticals; 1200 or 1300 will be transferred to IRIS "air disks" and another 600 or 700 stored on "production disks." The disk drives, manufactured by Control Data, can accept several sizes of disk pacts, with capacities ranging from 97 to 741 stills. Knudsen anticipates having an inventory of four or five packs, some of which will be reserved for archival storage. Looking rather a long way into the future, Knudsen observes that the system could recognize up to 1000 pack numbers, for a total of some 740,000 stills.

The IRIS remote control system provides random access sequencing, via touchpad keys, of any group of stills. In this operation, calling a single number will start the display of a previously composed list. Maximum access time, with two users asking for the same still at the same instant, is one second. Knudsen points out that the image of the previously selected still is maintained through the entire transition to the next picture.

A CRT terminal, which is part of the package, permits alphanumeric keyboard entry of still identification data, and also data retrieval by still number or by any ID string in a 15-character descriptor. A printer is offered as an option.

The system has a built-in compressor/positioner that can reduce any image to 25 percent of its original size and locate it in any position on the screen. A montage can be accomplished by mixing the channels in the small switcher, which along with a Fernseh Compositor character generator and a copy stand using a TK-76 or TK-86 camera, forms the IRIS "graphics compose" station.

The basic advantage of the system, Knudsen says, is its ability to provide multiple users with simultaneous access to a common data base of graphics. The system also has a port for computer control, and Knudsen says that WGN is already making plans to integrate the IRIS into its station automation system.

MCI/Quantel DLS-6000 at ABC

According to Isaac Hersly, newly appointed VP of

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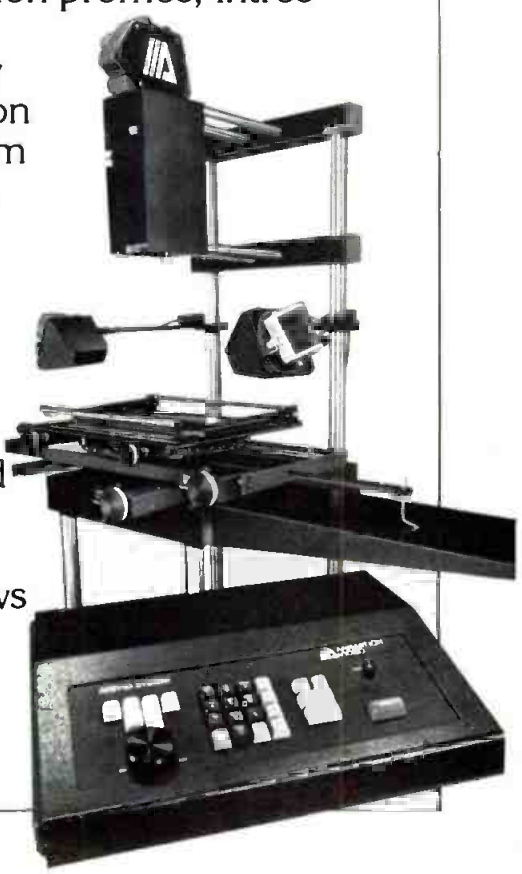

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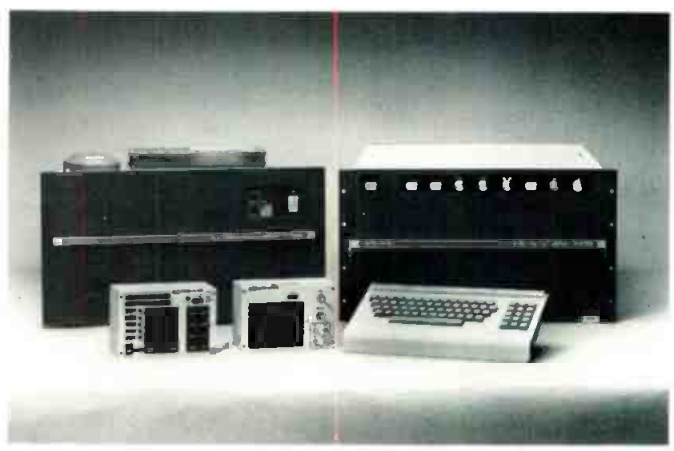
engineering for the ABC Owned Television Stations, ABC, New York, has been working with digital still store systems, including the Ampex ESS, for some years. ABC recently added an MCI/Quantel DLS-6030 with a computerized library system, two outputs plus preview, and special effects, including compression, montaging, cropping, and the ability to change the aspect ratio of a stored image.

Hersly and ABC Equipment Planning Engineer Ron Schlameuss say they are particularly impressed with the compactness, both in terms of physical size and data density, of the Winchester-type (sealed) disk drives used in the MCI/Quantel system. They are also quick to point out the system's ability to off-load all stills from disk to an ordinary U-Matic or one-inch VTR. The off-load recording process, which is entirely digital, can store the complete contents of a disk, including directory information, on a 20-minute cassette.

The Winchester drives, manufactured by Fujitsu,



MCI/Quantel's DLS-6000 incorporates a computer-like keyboard to enter captions and the facility to dump disk information onto a standard video cassette.

can each store 800 fields (400 frames). The DLS-6030 system at ABC has two drives of this type, although the system can accept as many as eight.

The system index is created using a keyboard/CRT terminal, provided as part of the system. At the time of entry, each still is identified by number, name, date, and description; any of these elements can then be used as the basis for an automatic search.

The MCI/Quantel DLS-6030 system also has a rapid visual review capability, called "Browse," that ABC specifically requested. This feature, a kind of electronic version of the familiar light table used for slide sorting, compresses 16 stills at a time for simultaneous display in a 4 × 4 matrix.

ABC worked closely with MCI/Quantel in development of the DLS-6030, first using a prototype model during its coverage of the Royal Wedding in London. The production unit, since delivered to ABC, New York and now in continuous operation, was used extensively during the recent Space Shuttle mission, especially for displaying pictures of the shuttle's interior during some of the more technical discussions.

According to Julius Barnathan, president of ABC's Broadcast Operations and Engineering, ABC has installed five of the DLS-6030 systems and has committed to purchase additional units for delivery in

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1982. Four of the systems will ultimately be installed at ABC's New York headquarters, two at the Washington News Bureau, two at ABC in Hollywood, and two at each of ABC's O&O stations.

The remote control panel for the system, which connects to the mainframe via four-conductor cable, has alphanumeric LED displays to indicate the description, as well as the number, of the still that is on-air. The LED display also identifies the next four stills in the sequence created by the operator.

Another strong point of the system, ABC feels, is the special effects (including compression) capability that is built in. "It just eliminates the need for another black box on the line before you go on into the switcher," says Hersly. "And because the unit has two output channels in addition to preview, you can dissolve in the digital domain between stills directly, without using the switcher." The DLS-6030 also has provisions for setting dwell times and transition rates, he adds.

The Harris IRIS still store can accommodate up to eight disk drives with a total system capacity of 740,000 stills.

Video input to the system is through the main routing switcher, which brings in one of the major sources of material—freeze frames from videotapes. By using the frame grab key, the operator can store up to 99 frames just as quickly as the button can be pressed, then go back to pick out the one he wants to actually store. Frames from old tapes can then be updated with new titles, combined with other stills, and so on.

The ever-present question about what to do with outdated material, while still not solved completely, has certainly been made more manageable by the system's ability to dump stills onto a standard videotape. A further step in that direction, Schlameuss feels, would be to build in a "punch clock" that would automatically mark every still with the date on which it was created. Then, when the time came for a housecleaning, the system could be instructed to bring up everything more than six months old, for example, to determine if the material should be saved, and if so, where.

As for the future, Hersly says that digital still stores may one day replace slide chains altogether—though this is not ABC's intent at this point. But Hersly reflects the views of all broadcasters who have worked with these systems or evaluated them for possible installation: still stores aren't just for storage any more! **BM/E**

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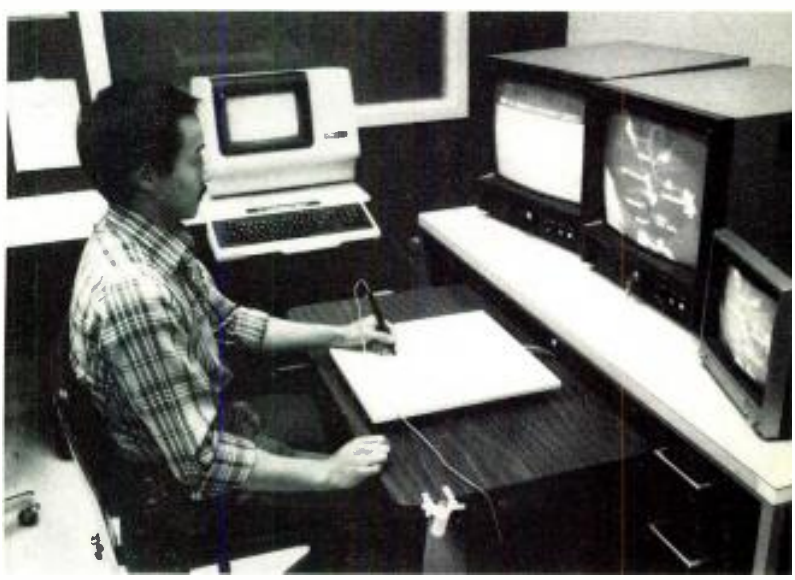
DIGITAL ART/PAINT SYSTEMS: ARE THEY RIGHT FOR YOU?

By Peter Black

The new breed of digital art/paint systems is being widely touted as the ultimate answer to the needs of television graphics. Several systems are currently in place around the country, and users seem to be doing well. But what type of system is most appropriate for your applications? The most expensive is not always the best.

ADDRESSING A SPECIAL conference on computer animation organized by the New York chapter of the Academy of Television Sciences last year, Sheldon Hoffman, manager of news graphics at NBC, suddenly put an industry buzzing with excitement over new digital technology into perspective: "When the news producer comes to me at 2:00 p.m. and tells me he's got to have 40 pieces of artwork prepared for the evening newscast," he observed, "there's only one thing that goes through my mind: get it done—and fast! We have no time for experimenting with a device that's not going to increase our productivity."

Hoffman, who does use digital still stores (see story elsewhere in this Special Report), is investigating the new breed of digital art/paint systems coming onto the market—devices such as the Ampex AVA, Aurora Digital Videographics, MCI/Quantel DPB-7000, Xiphias Videograph, Digital Effects Video Palette, Logica Flair, Weathercaster S-1010, McInnis-Skinner Weathergraphics, Thomson-CSF Vidifont Graphics V, and the rest. But his question is one that is echoing in the minds of virtually all who are facing the same choice: can he justify installing a $200,000 system that will only let a single artist create a maximum of five or six graphics a night? For although everyone marvels at these modern-day drawing boards that seem to allow artists the same creative flexibility as they used to have only with ordinary pen and paper—plus some important additional operating capabilities—the systems have yet to be proved in the broadcast environment.



Artist at work at KRON-TV, San Francisco, creating digital art for news on an Aurora Digital Videograph system.

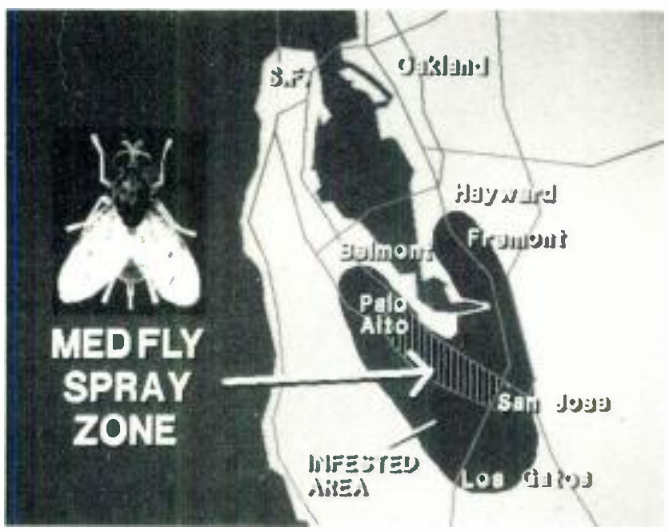
Peter Black is president of Xiphias, Santa Monica based manufacturer of the Videograph digital art system.

Several systems are out in the field—including the Aurora Videographics painter installed recently at KRON-TV in San Francisco, the McInnis-Skinner Weathergraphics program up and running at WHEC in Rochester, NY, and the AVA systems that have been on-line at the CBS Network in New York and Skaggs Telecommunications Services in Salt Lake City for some time. Preliminary reports are that they are finding their place. But whether they will become widespread throughout the industry still remains uncertain.

The technological basis for digital art/paint systems (or electronic palettes as they are sometimes called) is fairly simple, an outgrowth of digital TBC/framestore developments. Using a framestore, in which each pixel of the raster image is controlled by a separate memory location in the framestore matrix, the artist moves a stylus over a magnetically encoded "drawing tablet" individually addressing each memory location in the framestore that it passes over. Since the individual pixel memories generally have an eight-bit resolution, this allows the representation of each pixel as any combination of red, green, and blue, plus many shades of the gray scale.

The various programs written for framestore-based art systems, called algorithms, each affect the pixel displays in a certain way. A program called "fill," for instance, will turn all the pixels within a bounded-off area of the drawing whatever color the artist has chosen. An airbrushing style can be chosen in which all the pixels along a boundary will be automatically "dithered" to produce a soft edging-like effect. Another program allows the selection of a mode in which colors can be blended together as can real paints, with some pixels in the blending area being the color of paint number one, some the color of paint number two, and some the electronically calculated combination of the two.

As with any other digitally based hardware, the only limit to the number and extent of the algorithms is the size of the processing unit and the time necessary to write the programs.



Examples of graphics created at KRON on the Aurora system.

Cost justification

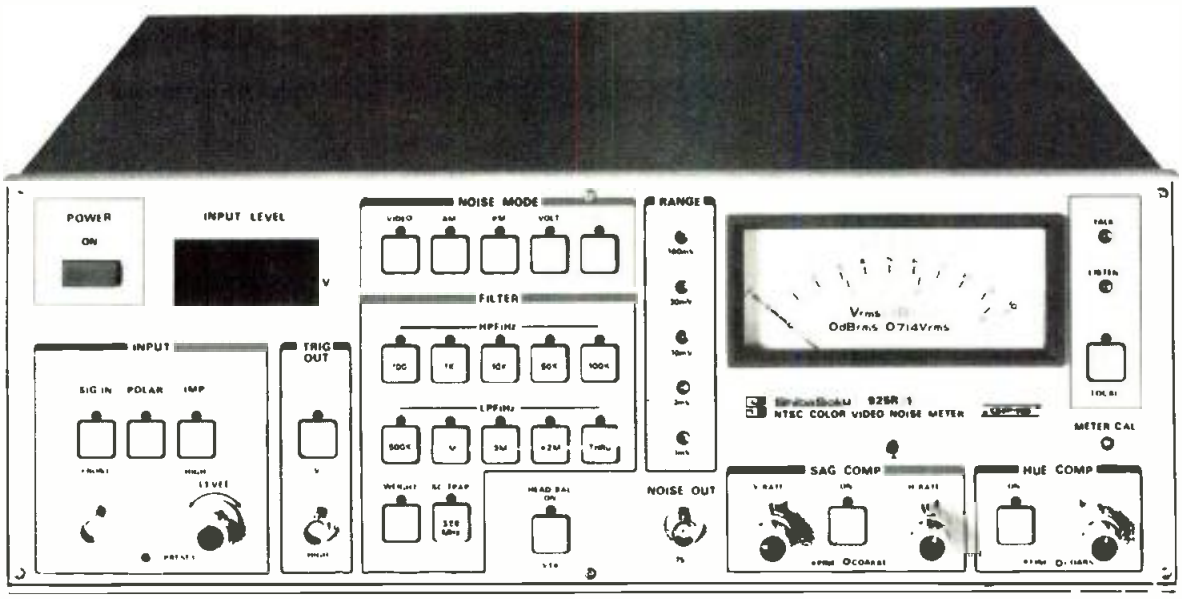
Fortunately, the companies offering these systems have done much of the programming by the time the systems are delivered, allowing even an untrained operator to become familiar with how the system works with only a few hours of practice and experimentation. But this good news is also responsible for the enormous cost of these systems—from under $40,000 to over $200,000, equipped with all the requisite bells and whistles. How can a station justify the expense?

One method is cost displacement. Simply put, is there money already budgeted for a graphics task or new graphics personnel that could be channeled into purchasing an art/paint unit? Perhaps the system can be substituted for a scheduled character generator purchase, though care must be taken to see that the video graphics system can handle the demand for broadcast-quality typefonts in addition to all the other things it does. Chances are a computer graphics system will not substitute for frame storage or a switcher, though some systems have such capabilities in limited form. If a lot of money is going to graphics prepared by outside design houses, that dependence may be reduced significantly by the right computer graphics system.

A more sound method of cost justification is the price/performance argument. How much is spent for each unit of graphic art developed for on-air use? The answer is bound to vary, but many stations, relying on an artist using manual techniques, will end up spending $40 to $60 per graphic (including the artist, the materials, an assistant who carries it to the studio, and the camera or telecine operator who transforms the graphic into video). With a properly designed computer graphics system, these costs may be cut in half, even when the amortized cost of the equipment is considered.

The end result is not only the direct delivery of graphics in video, but a productivity increase that should be at least four times old methods. That means the graphics artist who used to produce two or three illustrations a day should be able to generate 12 or more. This is not completely unrealistic: computer graphics are widely used in American industry to carry out computer-aided design (CAD), often yielding productivity improvements of up to 20 times. That is sometimes enough to recover the system cost in a single year. All depends on the cost of the system and its speed of operation.

One further justification to be considered is, simply, "sizzle." Video graphics systems often feature the ability to do simple animations; they can also significantly improve the "look" of shows and commercials,



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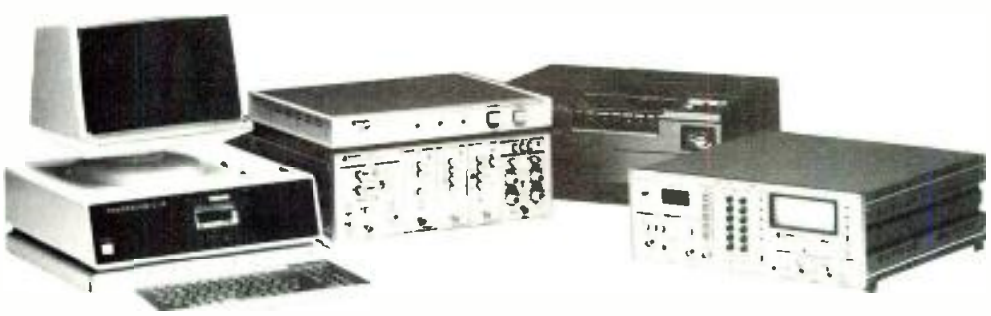

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thus bringing in additional production business. If handled correctly, they can also be made a prmotional hook for news, as were helicopters and ENG equipment in the past.

Systems evaluation

When evaluating a digital art/paint system for station or production facility installation, there are a number of considerations unique to computer graphics systems. Probably the most important are resolution and color capability. Computers create graphics in much the same way as a Times Square marquee: they divide the screen into a grid, with thousands of little digital "light bulbs." The grid elements are called picture elements—pixels, for short. The more pixels there are, the higher the resolution. And the higher the resolution, the less jagged will be the edges of any graphic you may create. A low resolution device like a personal computer display will have very jagged, blocky-looking graphics, whereas more sophisticated systems with more pixels will have more capacity for displaying information.

Pixels are commonly measured both horizontally and vertically. On the vertical axis the number need not exceed 525, simply because NTSC video cannot really handle any more. Horizontal resolution is another matter, and it is in the area of horizontal resolution that great differences can be discerned from one system to another.

DIGITAL ART/PAINT SYSTEMS—

	Ampex AVA	Apple Apple II	Aurora Digital Video-graphics
Resolution (HxV)	768x512	280x192	512x486
Total Pixels	393,216	53,760	248,832
Color Palette	256	16	32
Hardware Microproc.	DEC PDP 11/34	Apple	DEC LSI 11/23
Framestore	Ampex		DeAnza
Scan-In Art	✓		✓
Scan-In Video			✓
Airbrush	✓		✓
Font Create	camera	INA	camera
Color Blending	✓		
Price range	$200,000	$3000	$130,000

INA = Information Not Available

A Quick Reference

(by manufacturer and product)

Digital EFX Video Palette	Dubner	Logica Flair	MCI/ Quantel DPB-7000	McInnis/ Skinner Weather-graphics	N.Y.I.T. Images	Thomson-CSF Graphics V	Via Video System One	Weather-caster Spectra S-1010	Xiphias Video-graph
512x512	1024x525	768x575	INA	640x480	512x487	1088x525	378x241	512x512	640x512
262,144	537,600	441,600	INA	307,200	249,344	571,200	91,098	262,144	327,680
256	256	256	*	256	256	64	16	80	16
DEC PDP 11/34	Intel 8085	Intel 8085	Quantel	HP-1000	DEC PDP 11/23	6809	Cromemco	z-80	Z-80
Lexidata	Dubner	Logica	Quantel	Genisco	Grinnell	Thomson	Via Video	Chromatics	Ramtek
	✓	✓	✓		✓	✓	✓		
		✓	✓		✓	✓			
		✓	✓		✓				
	camera	INA	INA	INA			camera		tablet
		✓	✓		✓		INA		✓
$150,000	$100,000	$90,000	$150,000	$60,000	$120,000	$85,000	$35,000	$70,000	$50,000

* Artist mixes colors from 20 basic "paint pots," stores 12 mixed colors in temporary registers.

Most engineers are accustomed to measuring horizontal resolution in nanoseconds, and some character generator manufacturers will claim resolution in ns when what they are actually quoting is the minimum distance between individual character elements. This is not the crucial issue with a computer graphics system. Rather, the question is how many pixels exist on the horizontal axis of the screen. If there must be a reading in ns, the following ballpark formula may prove useful: divide the number 48,000 (a rough estimate of the number of ns it takes the beam to make one trip across the visible television screen) by the number of horizontal pixels claimed by the manufacturer; 640 pixels should translate into approximately 75 ns. Some manufacturers use a sophisticated technique called "anti-aliasing" to improve the look of their resolution by digitally filling in the spaces created on jagged diagonal or curved lines; but this does not change the basic horizontal resolution of the device.

Scene created on the MCI/Quantel DPB-7000 Digital Paint Box. Notice range of painting styles.

One other important note. When a device that offers resolution in the range of 200 by 300 (VxH) is compared to another with a resolution of 512 by 640, the first assumption may be that the second device gives only about twice as good resolution. In truth the number of pixels increases from 60,000 to almost 328,000—over five times the effective resolution of the first device.

Color displays

Another crucial consideration in acquiring a computer graphics system is the number of colors that can be displayed and broadcast. Computers create these colors by combining red, blue, and green in discrete increments; for example, maximum red and maximum green, when combined with minimum blue, yield yellow. The number of colors a computer can produce depends on how much memory is available for the task. Some computers can only deal in four shades of red, green, and blue and as a result can only come up with 64 colors. Others can handle more shades, and thus can generate many more displayable colors. Some systems with only a few colors try to cheat their way into additional colors by using alternately colored pixels; this almost always causes disturbing noise and moire effects in the video.

The number of available colors is often more than the number of displayable colors, and it may seem as though there is little use for so many colors. What could you possibly do with hundreds or even thousands of colors? The answer is everything, from sophisticated airbrush-like artwork to very complex and sophisticated animation effects. The more colors there are to play with, the better. Unfortunately, color memory costs money, and is one of the principal reasons for the high cost of many of the available computer graphics systems.

Whether numbered in tens, hundreds, or thousands, some of the colors—sometimes as many as one third of them—may be unacceptable for broadcast because they are either too bright or too dark. The best way to check is to have the system in and hook it up to a waveform monitor to check out the actual number of acceptable colors. While the system is hooked up, it can also be checked to see how it performs when called upon to meet broadcast specifications for blanking and sync pulse characteristics. Because the computer grahics industry is still only dimly aware of all of the concerns of the broadcaster, basic technical issues like genlocking and meeting FCC specs are sometimes not completely addressed.

Hardware considerations

Art/paint systems consist of both hardware and software, the latter generally comprising an electronic package, which can be located at the composing terminal or elsewhere in the plant, and various input devices. Common to almost all systems is a magnetically encoded drawing tablet, usually measuring around 11 × 11 inches, though some larger tablets allow a "scratch pad" area around the perimeter of the active drawing area. The artist creates images in the framestore by moving the stylus freehand across the tablet. He can also use it to choose appropriate items in the display of operating modes or colors. In some of the systems, such as Aurora's, the menu choices are actually reproduced on the drawing tablet so the artist merely touches the stylus in the proper area. In other systems, the mode is selected by using the stylus to direct the cursor to the appropriate listing.

Almost all the systems also incorporate a computer-style keyboard, though its operation is generally confined to simply selecting the basic operating mode and also entering alphanumeric characters as with a standard character generator. Sometimes the keyboard is also used to create and position various regular geometric shapes built into the computer's memory.

Another input device found on some of the systems is a digitizer that allows either live, camera video, or videotape images to be fed into the system and automatically digitized. The artist is then free to work on the images exactly as if they had been created digitally in the first place, adding new lines or erasing unwanted

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picture elements. The same kinds of color flooding, airbrushing, and other imaging techniques can also be applied.

In general, it should be remembered that the hardware input devices are merely what are called "peripherals" in the computer industry; the heart of any system is the graphics processor (the central processing unit and memory that control the flow of information) and the framestore. The drawing tablet, the cursor-selectable menu display, and all the other features are merely tools that make it easier for the artist to talk with the processor without having to reprogram it for each new function.

Software developments

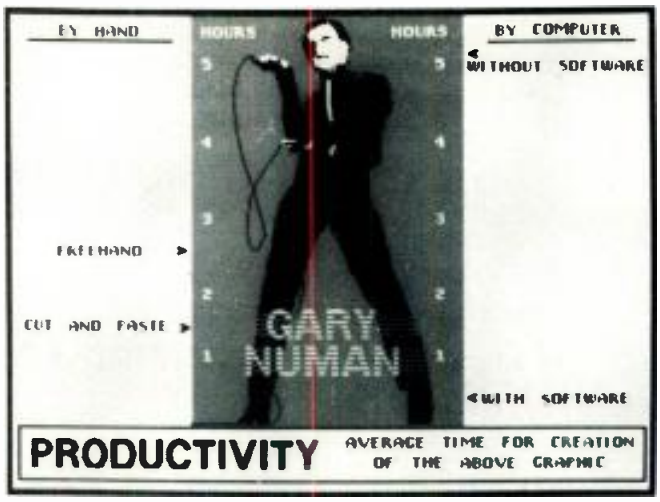
Besides the harware, the other part of a product equation in a computer graphics system is software—the group of coded instructions that make a computer something more than a glorified toaster. The computer is the body, but the software is the mind—the driving force of capabilities and intelligence that give a computer its personality.

Computer software can be created in several different ways. One is the use of a "low-level" language, which is very much the basic tongue of the computer. This machine level programming is very quick in operation, but slow to write and difficult to change if a bug is found, or to modify if some improvement is required. Another way to write sofware is with a "high-level" language. These languages are more like human speech, but have to be run through an interpreter to be put into the machine language; as a result, they are a bit slower in operation. However, they have the special advantage of being much easier to improve and modify. Some of them are even transportable, allowing the software to be transferred from one computer to another with very little trouble. This capability is an important long-term advantage because it frees the user from the expense of retraining and reinvestment in new software when the next generation of hardware comes along.

A reasonably useful computer graphics software package should speed the production of everyday graphics. If production of graphics is high, the system should make the work easy and quick to do. If you want to do weather graphics, the system should archive base maps, and allow the artist to define an inventory of symbols (such as clouds or sunshine) to be rubber-stamped on the map every day. If you do key graphics, will the system automatically insert the graphic into the key area of the screen? The demands are endless, and can only be formed after an analysis is done of exactly what kind of graphics are necessary now, and what directions are to be taken in the future.

Another good measure of the system's capabilities is its speed in handling various graphics tasks. It may, for instance, take several seconds to flood an area with color. And performing "cut and paste" routines—where various elements of an already created image are repeated, or moved around, or mirrored, or inverted, and the like—can be as laborious as doing the task with scissors and glue.

One sweeping generalization is in order: the more intelligent the software, the easier it is to use and the more



Comparison of productivity that can be obtained by using an art/paint system such as the Xiphias Videograph.

valuable it makes the whole system. The simple fact is that an operator gets more done if it's easy to do. Although it is simple to describe, this user friendliness (technically known as ergonomics) is quite difficult to define. It is the "feel" of the system, and does not lend itself to exact measurement.

There are some human factors the software can address, too. The software should anticipate union jurisdiction problems, for example—leaving creative decisions in the hands of non-union artists and setting apart the technical procedures such as cuing, sequencing, and diagnostics, which must be manipulated by the unionized engineering staff.

Other factors to consider

Many criteria must go into deciding which system is best for your operation. Some, such as the hardware, can be dealt with in terms of hard realities such as resolution and color choices. Others are less tangible—the software factors, such as ease of operation. The third set of considerations may at first seem unimportant compared with these two; but they can make a real difference once the purchasing decision is made: What kind of arrangements have been made for training? Is there a clear, well-written, well-illustrated manual that will answer questions without a call to the manufacturer? Is a maintenance program available, for the system will almost certainly break down at some point—and probably follow Murphy's law in its choice of timing? Will the manufacturer be making changes to the system in the future, and will these modifications be easily installed updates to the current system? These questions should be asked by every potential purchaser and answered by the manufacturer as part of even a preliminary investigation.

The future of digital art/paint systems is by no means written in blood (or, indeed, in a digital framestore) at this time. Still to be seen is whether the systems can be successfully integrated within a broadcast or teleproduction plant—and whether they can be economically justified. But if this does prove to be the case, television can take one more giant step into the digital future, working with digital products which fulfill the basic premise of computers in modern life—not eliminating the need for expending energy, but eliminating much of the drudgery that so often interferes with the creative process. **BM/E**

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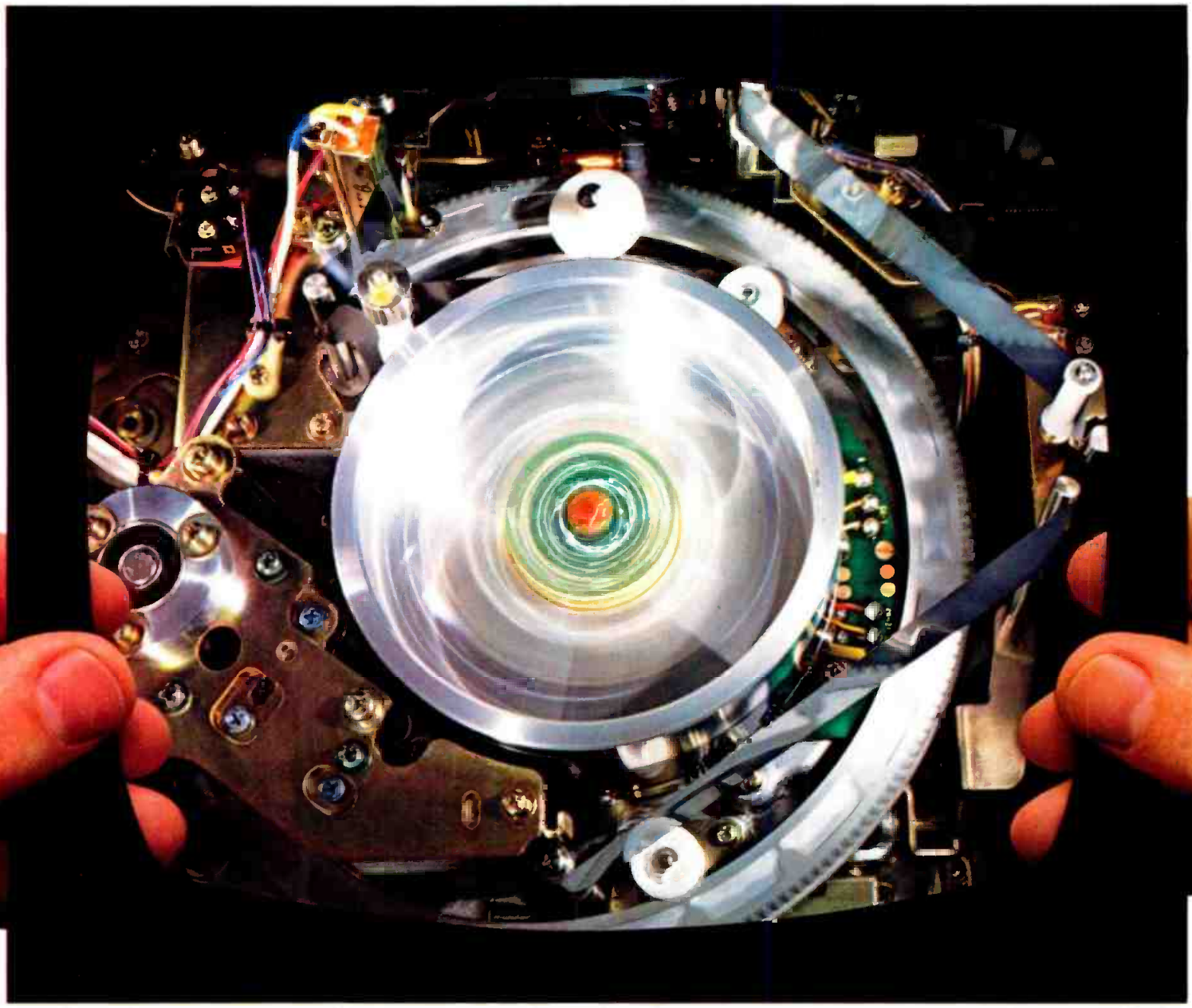

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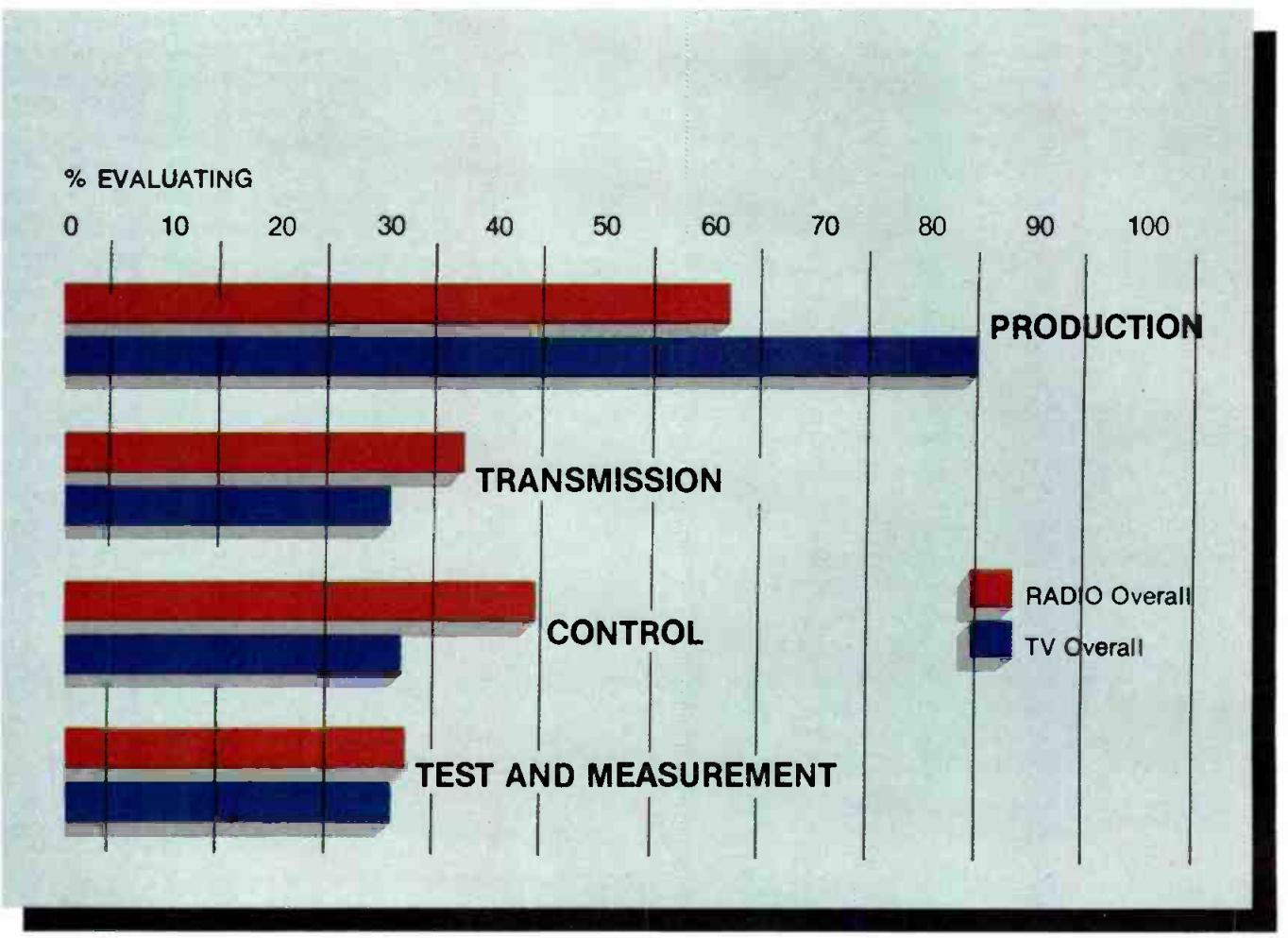
INDUSTRY WILL SPEND, BUT CAUTIOUSLY

Results of the Survey of Broadcast Industry Needs show a wide range of interest in equipment by both radio and TV stations; but the key to their purchases will be reliability.

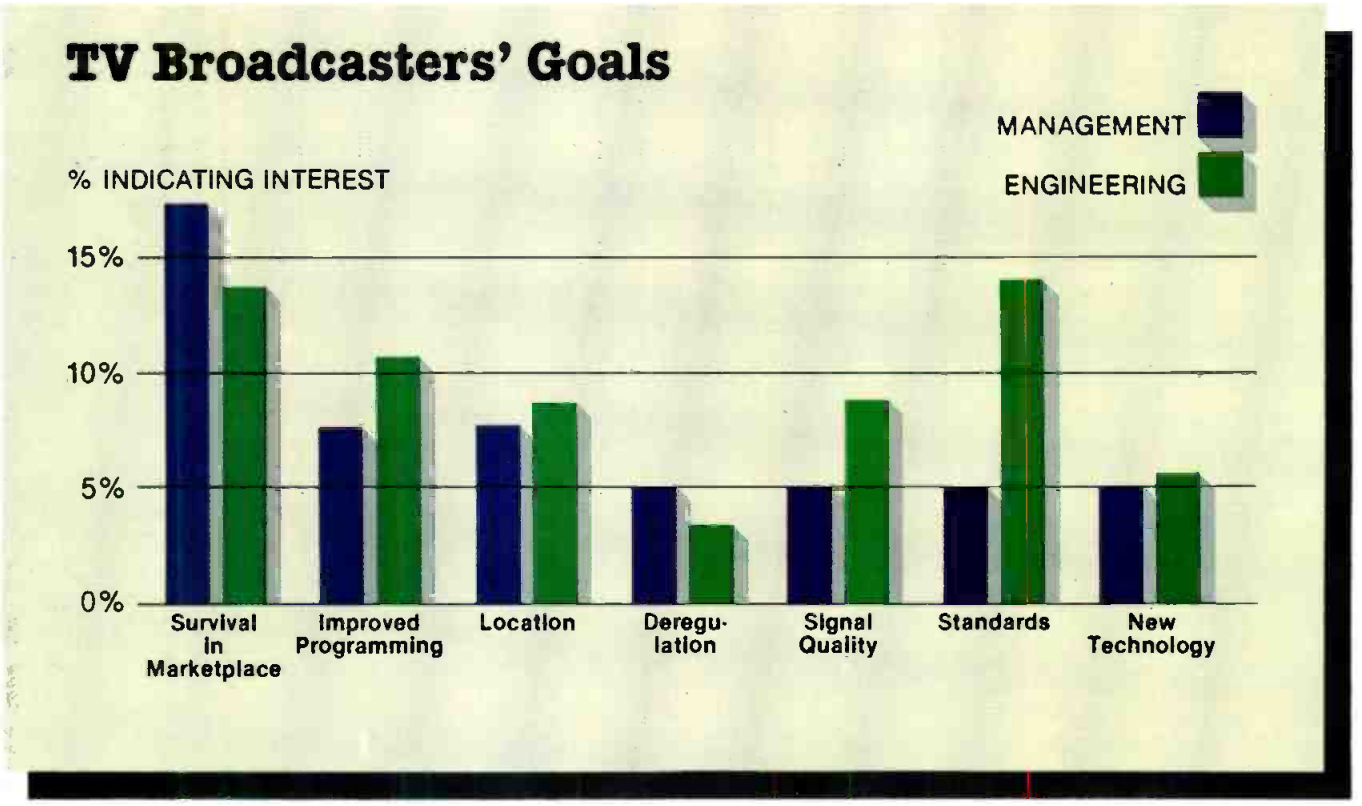
THE INTUITIVE FEELING that the broadcast industry is coming through the recession with most spending plans intact has some solid support in the results of the Twelvth Annual *BM/E* Survey of Broadcast Industry Needs. This sampling of buying plans for the coming year shows that both radio and television managers and engineers will evaluate a wide assortment of equipment with a sharp eye on reliability as a prime buying criterion.

In a nutshell, here's what the survey found:

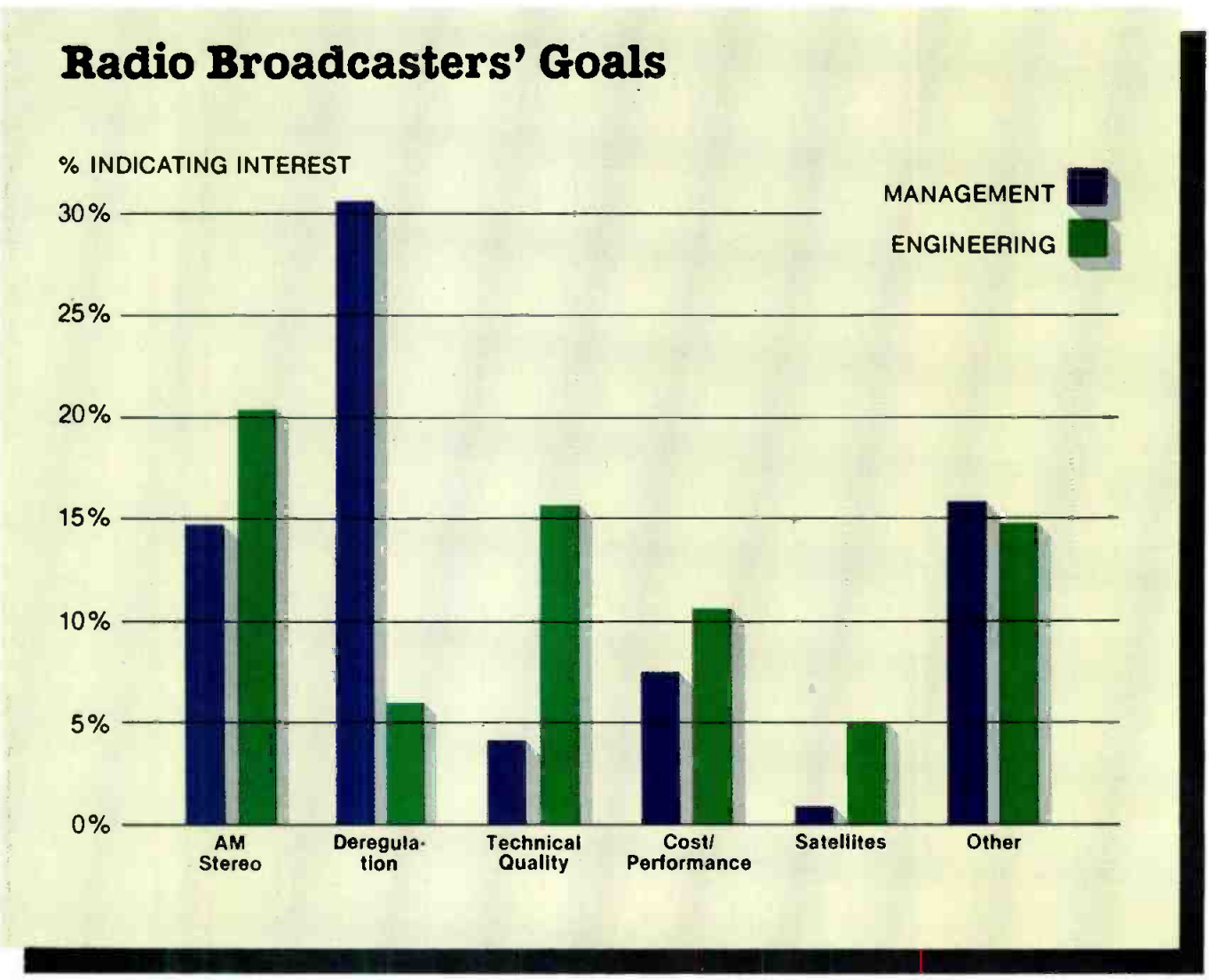
- Attendance at the NAB Convention (April 4–7 in Dallas) will be up for both radio and TV compared to last year.
- Not surprisingly, production equipment will be of most interest to both groups, although control, transmission, and test and measurement gear are not too far behind.
- Intense evaluation will precede purchases. Besides reliability, performance features to improve productivity, ease of maintenance/operation, and, of course, signal quality will influence buying decisions.
- Budgets for TV stations generally will run $500,000 and below. Radio station budgets will be generally in the range of $60,000 and below.
- Top priority among the wide range of equipment by TV stations responding to the questionnaire will be one-in. videotape recorders, with 81% actively inter-



Attention this year for both radio and television will center on production equipment, according to the BM/E Survey of Broadcast Industry Needs.



Both managers and engineers report concern for the survival of broadcast TV in the face of increased competition from other forms of information and entertainment. Not surprisingly, TV engineers are also worried about standards.



While radio management is concerned with deregulation, radio engineers will be involved in potential use of AM stereo. Note too that engineers report a need to watch cost/performance.

ested in purchasing. Among the radio respondents the top priority went to audio processors—82% actively interested—followed closely by tape recorders with 80% actively interested.

Deregulation tops wish list

This year's questionnaire contained a number of opinion questions along with the equipment needs survey. Asked, "What do you consider the most important goal for the broadcast industry during the coming year?" radio management listed deregulation highest. Radio engineers, however, mentioned AM stereo most often. On the same question, television management and engineering were in agreement. They both listed survival in the marketplace as the top priority.

There was little disagreement among those answering on which aspect of the industry the FCC should focus next. Deregulation topped everyone's wish list.

Despite the initial cries of consternation among broadcasters concerning the removal of the first class radiotelephone license, a wide majority of respondents to the *BM/E* survey said that it would have no real effect on their operations.

TV managers and engineers were also asked when they think high-definition television will be in common use. The engineers were uncertain in that equal numbers stated up to five years, from five to 10 years, and "a long time." Most of the managers responding said it would be five to 10 years before HDTV would be commonplace.

Similarly, managers and engineers do not agree on what engineering should focus on this year. Among radio respondents, management said that engineering should focus on satellites and AM stereo. Engineers, on the other hand, said that they should focus on facilities remodeling or building. TV managers said that engineers should focus on satellites, while the TV engineers said that they should focus on digitalization.

Just about everyone agreed on what management should focus during 1982. Leading the list was sales and costs, sometimes referred to as "the bottom line." As for what production departments should focus on, radio management and engineering stressed quality first. TV management emphasized "improved production techniques," while engineers listed special effects first.

Who's going to NAB

Based on the *BM/E* survey, attendance at the NAB Convention will increase this year despite the uncertain economic times. Although only slightly over 50% of the TV managers responding said they attended last year's conference, over 85% said that they will attend this year. Almost 53% of TV engineers responding expect to go to Dallas whereas not quite 39% got to Las Vegas in 1981.

The picture is a little different for the radio respondents. Just under 49% of radio managers plan to attend NAB; 34% of the radio engineers. These figures compared to 28% and 27% respectively for last year.

Almost half of the radio engineers, however, stated that others at the station would attend NAB this year. A quarter of the radio managers said that someone else at the station would go.

NAB is clearly an opportunity to evaluate equipment as the survey respondents indicated. Over 67% of TV management and just over 72% of TV engineers are going to NAB to evaluate specific equipment needs. The same holds true for radio attendees. Over 52% of managers and over 55% of engineers from radio stations will be at NAB to evaluate equipment and vendors.

What will the attendees be evaluating? Some 55% of radio managers and 90% of TV managers will be most interested in production equipment. Almost two-thirds of radio engineers and over three-fourths of the TV engineers responding will also check out production equipment. As the table indicates, highest interest among radio shoppers are audio processors (82% active interest); tape recorders (80% active interest); consoles, mixers (78% active interest); and cartridge players, recorders (71% active interest). Television station people listed one-in. VTRs (81% active interest); ENG cameras (76% active interest); studio/field cameras (74% active interest); and satellite earth station equipment (71% active interest). **BM/E**

Who Responded

Readers participating in this year's *BM/E* Survey of Broadcast Industry Needs represented a good cross section of station size. In the TV group by market size up to 30 ADI responses were 12.5% management, 41.7% for engineering; 31-60 ADI—10% management, 25% engineering; 61-90 ADI—7.5% management, 2.8% engineering; 91-120 ADI—12.5% management, 16.7% engineering; 121-150 ADI—17.5% management, none for engineering; 151-180 ADI—5% management, 2.8% engineering; 181-195—5% management, none for engineering; 196-210—12.5% management, 2.8% engineering.

For radio, 35.2% of managers were from small market stations; 43.7% from medium; and 21.1% from large. Some 25.3% of engineers were from small market stations; 26.4% from medium; and 48.3% from large.

Most of the TV managers and engineers responding represented stations with 31 to 45 total number of personnel. For radio, most of the responses came from managers and engineers working for stations with 20 and under total personnel.

There was also a spread among station types. A majority of TV managers and engineers (72.5% and 83.3% respectively) work at one of the network affiliates, including PBS. Forty-five percent of managers and 50% engineers represented group stations. Over 27% of each came from independents. These percentages are over 100% because some groups or independents also listed affiliates.

Radio managers and engineers were also predominantly from affiliates, 70.7% and 69% respectively. Group stations were represented by 36.6% of managers and 43.6% of engineers. Independents had 48.8% of managers and 39.4% of engineers responding. Again, however, the numbers total more than 100% because many respondents from groups or independents also listed affiliate status.

Overall Radio Equipment Needs

Rank '82	Rank '81[1]		Percent Actively Interested This Year[2]
1	4	Audio Processors	.82
2	2	Tape Recorders/Players (studio)	.80
3	1	Consoles, Mixers	.78
4	5	Cartridge Players, Recorders	.71
5	3	Test Equipment	.63
6	7	Satellite Earth Station Equipment	.61
7	NI	Microphones, Accessories	.58
8	8	Noise Reduction Systems	.56
9	6	Remote Pickup & STL	.52
10	14	Turntables	.51
11	9	Antennas	.50
	9	FM Monitoring Equipment	.50
13	12	Telco Interface Equipment	.49
14	12	FM Transmitters	.45
15	19	Monitor Speakers	.44
16	11	Automation Equipment (studio)	.42
	16	AM Transmitters	.42
18	15	Tape Recorder/Players (field)	.40
19	20	Reverb & Special Effects	.38
20	NI	AM Stereo Studio Equipment	.37
21	17	AM Monitoring Equipment	.31
22	17	ATS Equipment	.30
23	21	Automation Equipment, Business	.27

Overall TV Equipment Needs

Rank '82	Rank '81[1]		Percent Actively Interested This Year[2]
1	1	VTRs (one-in.)	.81
2	3	TV Cameras, ENG	.76
3	10	TV Cameras, Studio/Field	.74
4	2	Satellite Earth Station Equipment	.71
5	7	VTRs (¾-in.)	.66
6	10	Video Monitors	.62
	10	Electronic Still Stores	.62
	NI	Time Base Correctors	.62
9	4	Digital Effects Devices	.60
10	5	Test Equipment	.59
11	8	Frame Synchronizers	.58
	13	TV Cameras, Studio	.58
13	9	Microwave for ENG	.57
14	21	Character Generators	.55
15	18	Noise Reduction Systems	.53
16	NL	Multi-source Video Editors	.52
17	25	Image Enhancers	.48
18	15	Production Switchers (large)	.47
	NL	Simple VTR Editor/Controllers	.47
20	17	Production Switchers (small)	.43
21	22	Audio Consoles, Equipment	.41
	23	Time Code Equipment	.41
	25	Lighting	.41
	27	ENG/EFP Vehicles	.41
25	14	Routing Switchers	.34
	15	Telecines	.34
27	20	Switching Automation	.33
	NI	Master Control	.33
29	18	Remote Control (status, etc.)	.31
30	NL	VTRs (½-in.)	.23
31	NL	Slow Motion Recorders	.21
	29	Transmitters, VHF	.21
33	29	Transmitters, UHF	.19
	NL	Business Automation Systems	.19
35	28	CP Antennas	.18
	30	VTRs (quad)	.18
37	23	ATS	.14

[1]NL means new listing. NI means not included in last year's list.
[2]Percentage checking "very interested" or "some interest."

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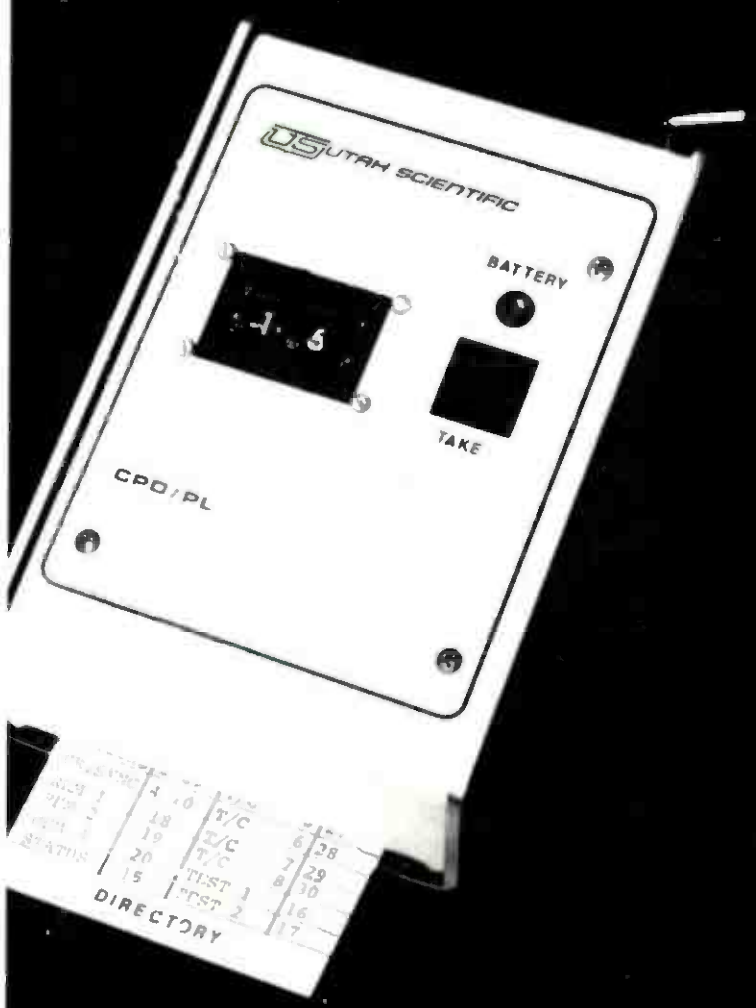

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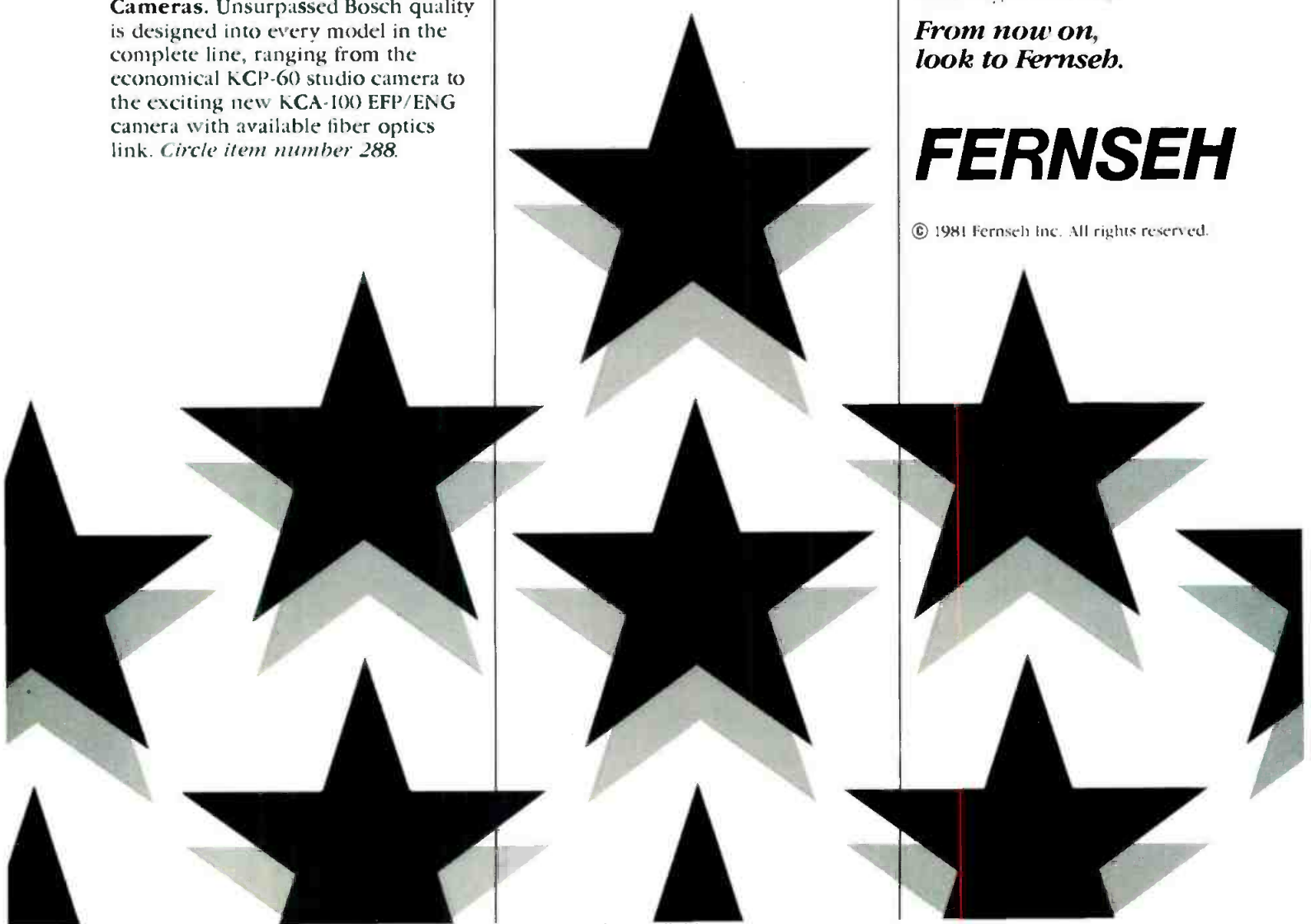

BM/E NEWS FEATURE

SMPTE Winter Conference Set to Examine Tomorrow's Television

WITH A GENERAL conference theme of "tomorrow's television" and four major sessions set to explore some of the hottest issues of today's TV technology, the SMPTE Winter Conference (February 5-6 at Nashville's Opryland Hotel) promises to provide once again the excitement of Winter Conferences of the past.

According to program chairman Larry Brown of WTVF-TV Nashville, the Saturday afternoon session on HDTV will be the "hot topic" of the conference. "Several papers," says Brown, "will deal directly with the problems which most engineers confront in this rapidly growing branch of broadcast technology."

Scheduled for the session are, indeed, several papers seeking to define how HDTV can be incorporated within current broadcast signal parameters. One from the BBC will discuss "HDTV and Compatibility with Existing Standards." A representative from the IBA will likewise discuss "A Compatible High Fidelity Television Standard for Satellite Broadcasting."

Brown also promises a paper from RCA presenting its views on HDTV. Another long-awaited paper will present some of CBS-TV's actual working experiences with HDTV in producing material that might be suitable for motion picture theaters—a joint development program with Twentieth Century-Fox.

Still another area of interest is in optical systems for HDTV cameras, and Jack Dawson of Fujinon will present the results of his company's development program.

Other new technologies

Under the session theme of "new television technologies," attendees will have the opportunity to share some of the very latest developments in the industry. Certainly one of the most exciting will be a presentation by RCA on its Hawkeye single-piece camera/VCR combo, with many speculating that RCA is about to announce a major reconfiguration of its three-channel recorder format; according to RCA, this is not the case.

The recorder that will be discussed in the paper and the model presented at NAB will be essentially the same as RCA has been exhibiting for the past year.

The session may also spark some lively questioning since Sony will also be presenting a paper on its single-piece camera system and the single-tube Betacam camera.

A paper from Amperex and N.V. Philips will discuss "the optimization of a high-quality color camera for ENG/EFP purposes."

Digital technology will, of course, get the lion's share of the treatment at this session on new technologies. The discussion will be led by Ken Davies of CBC, chairman of the working group on digital video standards. Now that digital sampling frequencies have been established, it is expected that SMPTE may begin turning its attention, together with the rest of the industry, towards format-setting for specific items in the digital plant, particularly the digital VTR. Davies's paper may provide some clues as he presents a progress report on his working group's activities. DVTRs will definitely be discussed in a paper by IBA's J.L.E. Baldwin.

Nashville's Opryland Hotel will be the setting for this year's SMPTE Winter Conference.

Digital special effects will naturally figure importantly in the discussion of future technologies. Richard Taylor of MCI/Quantel will discuss the Quantel graphics system, while Peter Black of Xiphias will demonstrate the compatibility of computer graphics systems and alphageometric videotex.

Other papers in the morning session will relate to some of the more technical aspects of digital. Representatives from Japan's NHK and ShibaSoku Co. will discuss "Development of a Precise Registration and Level of TV Signal Measuring Equipment." Representatives from RCA will present "Code Utilization for Component-Coded Digital Video." And William Bucklen of TRW's LSI Products will analyze work being done on new integrated

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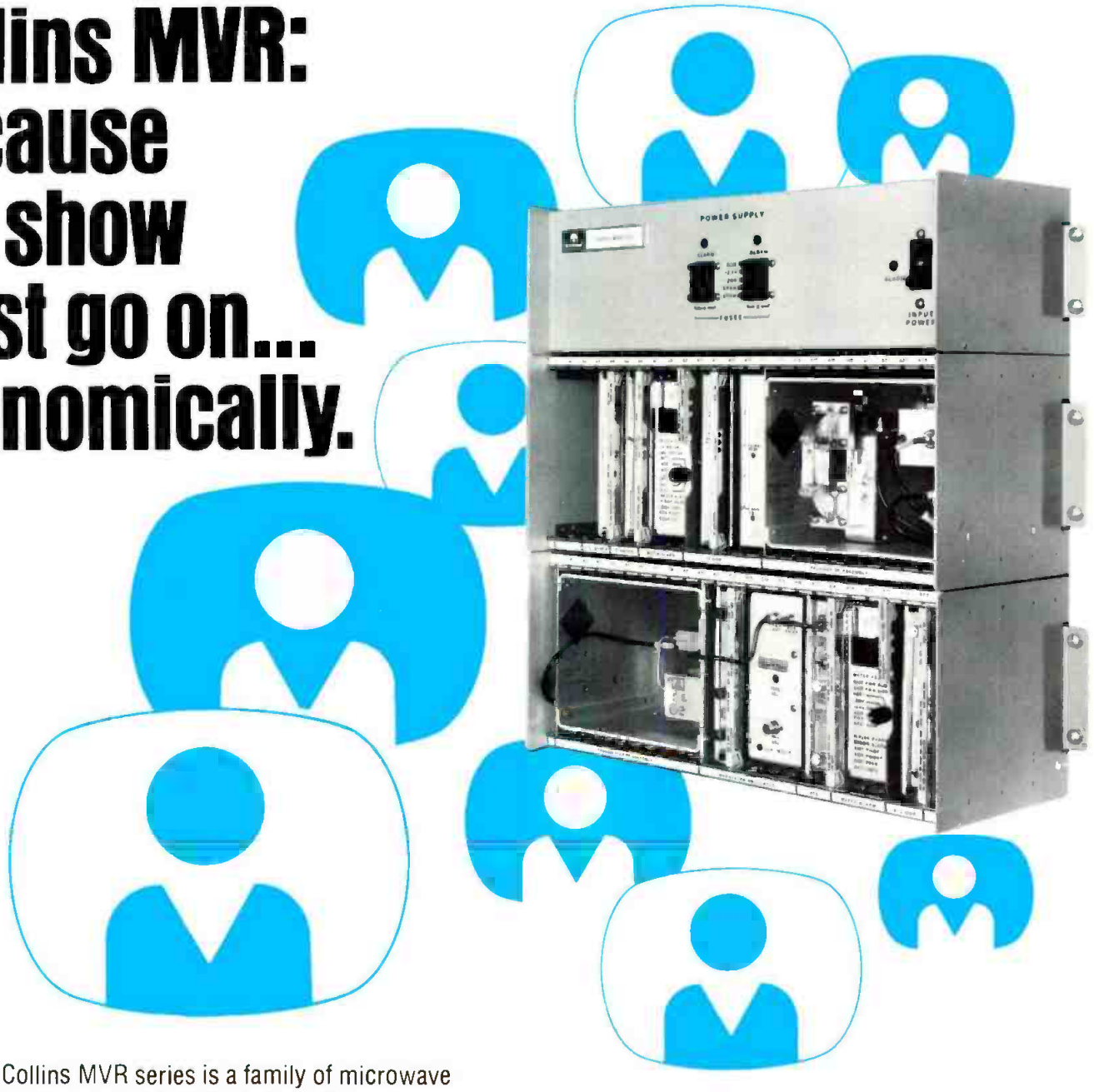

The Collins MVR series is a family of microwave radio equipment packaged in a stackable, simplex, single-channel arrangement for operation in each of the video relay frequency bands — from 2 to 13 GHz.

Through years of providing reliable performance at highly competitive prices, these radios have acquired a reputation as dependable workhorses in a wide range of broadcast, common carrier, government, CATV and corporate applications.

The compact MVR solid-state radio is designed to comply with EIA-RS-250 B Short Haul Requirements, and its modularity permits a wide variety of station configurations. Other features include simplified installation and maintenance, plus AC or DC operation.

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circuits for digital video filters.

TV audio developments

With all the excitement over digital video standards-setting and HDTV, audio for TV seems to have been forgotten temporarily; but it is hoped that Friday afternoon's session, devoted to multichannel and stereo audio developments for TV, will remedy this.

One of the focal points of attention will certainly be the standards-setting efforts by the AES towards digital audio, with three members of SMPTE acting as advisors to AES.

Visitors are expected to pack the exhibition area.

A presentation of the EIA's multichannel sound field test report will kick off the discussion of multichannel sound. This will be followed by a report on the design of multichannel sound at Japan's NHK, which has for some time broadcast stereo audio for television.

Digital control

The corollary to work that has been going on with digital encoding of video and audio, digital control of various pieces of equipment in the television plant has been progressing steadily if less noticably. The session will open with a paper by William E. Bauer of RCA, committee secretary of the SMPTE working group on the standardization of digital control for television equipment. Providing a status report on the standard for the serial interface, this paper could prove to be a milestone in reconciling the industry's difficulties with common interface of all tape transports, editing equipment, machine control, and switching systems.

Other papers in the Saturday morning session will include: "Network of 60 Microcomputers Automates PBS Multichannel Satellite Program Distribution" (PBS); "A Serial Communications Architecture for Real-Time Digital Control" (Ampex); "Machine Control System" (Dynair); "Serial Data Machine Control System" (Fernseh); "The VIMACS System" (Dynamic Technology Ltd.); "A Rationalized Approach to Broadcast Automation" (Central Dynamics); and "Television Station Automation—The Station's Viewpoint" (Digital Services Corp.).

Equipment exhibit narrows

Perhaps reflecting SMPTE president Charles Anderson's desire to keep the associated equipment within reasonable bounds and strictly confined to the technology being discussed in the papers, the list of exhibitors as of late December was quite small. On the list at that time were Ampex, Adams-Smith (time code synchronizers), Camera Mart, Cinema Products (digital camera remote control), Chyron (digital graphics generator), Grass Valley (digital effects and production switchers), Fujinon (lenses), Harrison Systems (digital mixing consoles), Merlin (high-band VTR modification), MCI/Quantel (digital still store and digital effects), Rupert Neve (digital consoles), NEC (digital effects), Thomson-CSF, Sony, and Tele-Cine (lenses). **BM/E**

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The 635A was designed to be used anywhere. Its screw-machined steel case and mechanically nested parts set standards for durability and ruggedness that the competition still strives for. It was the first omnidirectional microphone designed to have a shaped, rather than flat, frequency response. A rolled off bass response combined with a slightly rising high end make it perfect for vocal reproduction. And it was the first microphone of its type to feature an elastomer encased head capsule for reduced handling noise and additional protection from severe mechanical shock.

Despite all the technological advances in the broadcast, recording and sound reinforcement industries, the 635A continues to be the "audio man's screwdriver"- a microphone tool that can be used anytime, anywhere, for almost anything. When a product is designed right to start with, there's no need for it to become obsolete. All Electro-Voice professional microphones are designed with the same goal in mind. That's why people think of Electro-Voice as their microphone expert.

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BM/E NEWS FEATURE

Broadcasters Outperform GNP, Hold Own Against Competition

DESPITE THE economic uncertainties of 1982, broadcasters will do well. The first quarter of 1982 has already been reported prosperous by the networks and the fourth quarter, because it is a political year, is likely to be one of the best ever. National broadcasting is expected to grow 12 percent; local television, which grew 13 percent in 1981, is predicted to advance again 11 to 13 percent for 1982. Many individual broadcasters see their revenues to be even higher.

These reassuring predictions were just a few to be voiced at the Ninth Annual Conference for the Media, December 7-9, 1981, sponsored by

The Outlook for 1982

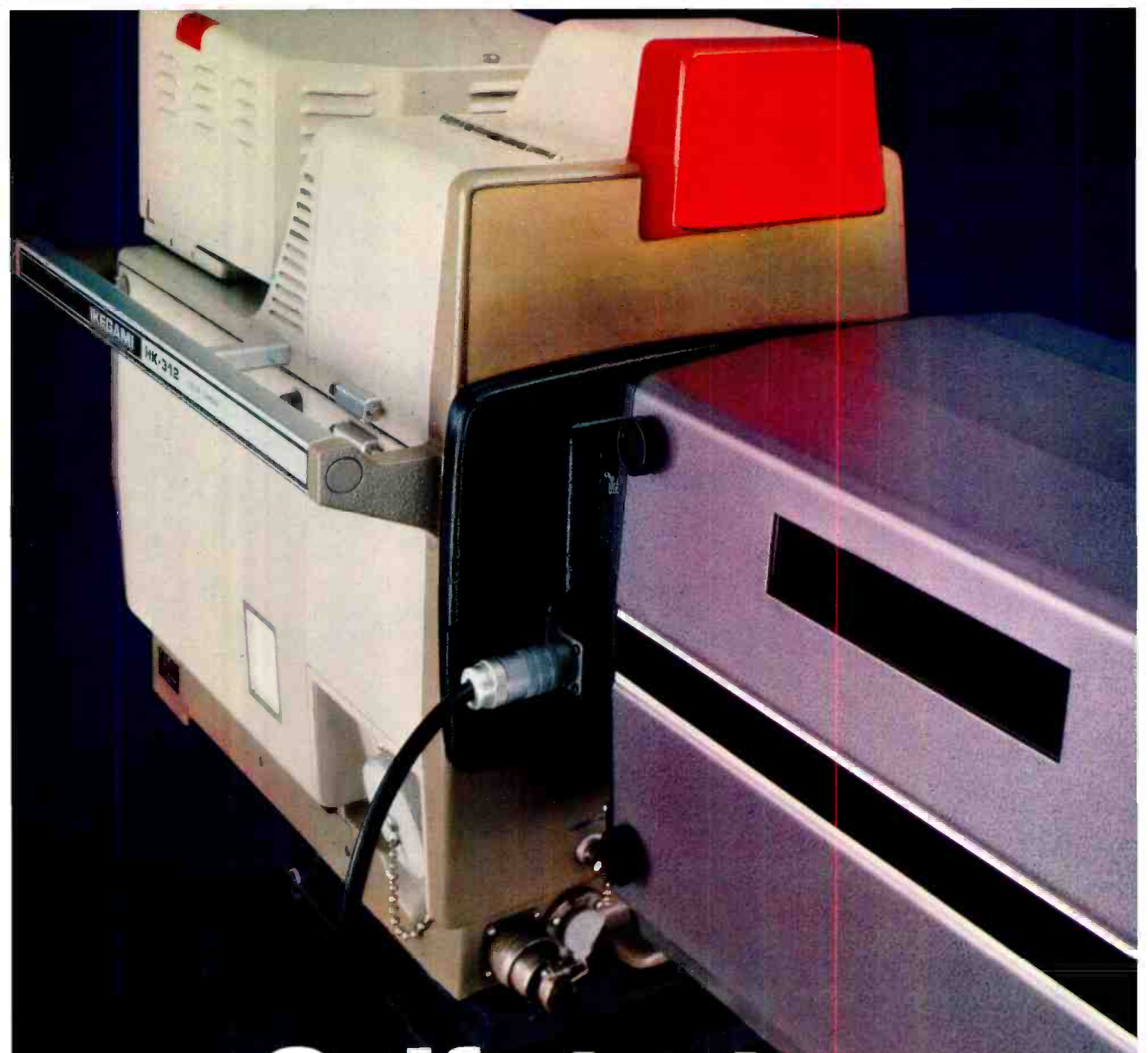
	1982 Forecast ($ millions)	Change Over 1981 (Percent)
Broadcast, National	11,545	12
Print, National	6,915	11
Other, National	19,360	12
All media, Local	30,670	11.9
	$68,490	11.7%

Cable Operators Flying High

Cable operators addressing the Ninth Annual Conference on the Outlook for the Media could not contain their optimism. Edward A. Bennett, senior VP, East Coast operations, Viacom International, Inc., said cable TV will take in $3 billion in revenue for 1982. Between now and 1991, 450,000 miles of new plant will be strung. Eighty percent of homes in suburban areas will take pay cable and each household will pay $75 a month for services which will include basic, pay, and data. At 40 million subscribers, that calculates out to a $36 billion industry in the 1990s, Bennett boasted, while broadcasting will be worth only $32 billion in 1990.

The capital for this expansion will be available, according to Donne E. Fisher, VP-treasurer of Tele-Communications, Inc. The 200 percent increase in cable households to 60 million will require $20 billion in wiring costs. Another $12 billion will be needed to add addressable taps and converters. On top of this, upgrading existing systems will cost $3 billion, for a total of $35 billion in 10 years. It's all possible, Fisher projected, with cash flow from the industry supplying the bulk—$25 billion. The shortfall of $10 billion will come from banks (60%) and long-term lending institutions such as insurance companies (40%), said Fisher.

Cox is banking on data services as the next big income wave after pay cable, claimed Robert C. Wright, president of Cox Cable Communications. For this reason Cox Cable is investing in Indax, a two-way interactive information data exchange system that will embrace such home services as pay-per-view, electronic checkbook writing, shopping by cable, and security alarms, as well as the expected Videotex information services. Wright sees Indax as a tenfold enhancement in the services cable can provide. Cox Cable will be installing the system in its new franchises in Omaha and New Orleans. Indax will also be licensed to other cable operators (United Cable TV included Indax in its bid for the Denver franchise).



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Paine, Webber, Mitchel, Hutchins. All in all it looks like a good year for all advertising media, as the accompanying chart, "The Outlook for 1982" prepared by Robert J. Coen of McCann-Erickson, shows.

Coen, as lead-off speaker, said advertising expenditures as a whole are expected to lead the GNP in growth for 1982 as they have in the past six years. In 1981, advertising growth outperformed the GNP by 1.7 percent. For broadcasters, 1981 turned out to be a better year than Coen predicted 12 months earlier. Although network TV did not grow as well as other segments, both spot TV and radio were strong (see chart, "Total Advertising 1980-1981"). The unusual growth for spot TV, said Coen, came from foods (up 16.3%), automobiles (up 15.8% thanks to rebate sales), airlines (up 17.4% because of many fare reductions), wine (up 77.1% as new brands were introduced), pet foods (up 15.3%), and consumer electronics (up 21.7%). Spot TV prices increased 15 percent, running above consumer price changes, which gained about 8 percent annually. Coen predicted that advertising revenue growth (all media) would be better than expected in the face of terrible economic news: consumer advertising will hold, only advertising for durables related to the housing slump will be down.

Nonetheless, the future cannot remain rosy indefinitely, according to projections supplied by Larry Grossberg, of J. Walter Thompson. Cable TV will slowly erode the networks' hold during prime time. The nets' prime time share will drop from 88 percent in 1981, to 70 percent by 1989 as cable homes increase from 23 million (1981) to 55 million by the end of 1989. At that time, 35 million homes will be paying extra for movie/specials channels. Despite the increase in homes from the present 79.9 million to 95.5 million in 1989 (which assures nearly a steady 43.6 million homes tuned to network TV), the average rating per network will slip from 18.2 percent today to 15.2 percent in 1989.

Notwithstanding cable growth to date, and other technology advances such as videocassette players, there has been no startling defection from one media to another, said Herb Maneloveg of Della Femina, Travisano & Partners. Maneloveg claimed, however, that there has been slow but definite chipping away of present shares as the public adjusts to change and shows a preference for specific lifestyles. Thus, the South is

Total Advertising 1980–1981

	1980 ($ millions)	1981 ($ millions)	Change (Percent)
Network TV	5,130	5,540	8
Spot TV	3,269	3,700	13
Radio, National	954	1,085	14
Local TV	2,967	3,350	13
Magazines	3,149	3,500	11
Newspapers, National	2,353	2,730	16
Newspapers, Local	13,188	14,900	13
Other Media, National	15,430	17,325	13
Other Media, Local	8,140	9,170	13
	$54,580	$61,300	12.3%

doing better than the rest of the nation as people move to the Sun Belt. Coop ad dollars are already going to such places as Miami, Dallas, Phoenix, and Charlotte, Maneloveg said. As lifestyle preferences become more delineated, TV advertising shifts, already apparent in the magazine field, will occur. Magazines that

Robert J. Coen of McCann-Erikson predicted that advertising revenue growth would be better than expected despite current economic news.

have addressed themselves to highly specific audiences—such as business executives or golf enthusiasts—have prospered while their more generalized competitors have slipped behind. Although cable TV has, and will, double or triple, its impact so far has been negligible. This could change, predicted Maneloveg, when cable programs appealing to definable life-styles begin to draw viewers away from weak network fare, such as situation comedies.

Coen concurred that Maneloveg's distinctions were important, but both agreed that 60–70 percent of all TV network time will continue to be guaranteed by national buyers. For the 20–30 percent that will go into spots, advertisers will choose the market and demographics that best suit them.

Group broadcasters see fragments

Group broadcasters generally are doing well, but prosperity is shifting, according to David Henderson, president of Outlook Broadcasting Co., and Gary Stevens, president of Doubleday Broadcasting Co., Inc., speaking respectively to the prospects for TV and radio. Henderson noted that Outlook's stations in the South outperform its property in the Midwest. On the radio side, Stevens described the plight of AM stations, in trouble now that over 60 percent of

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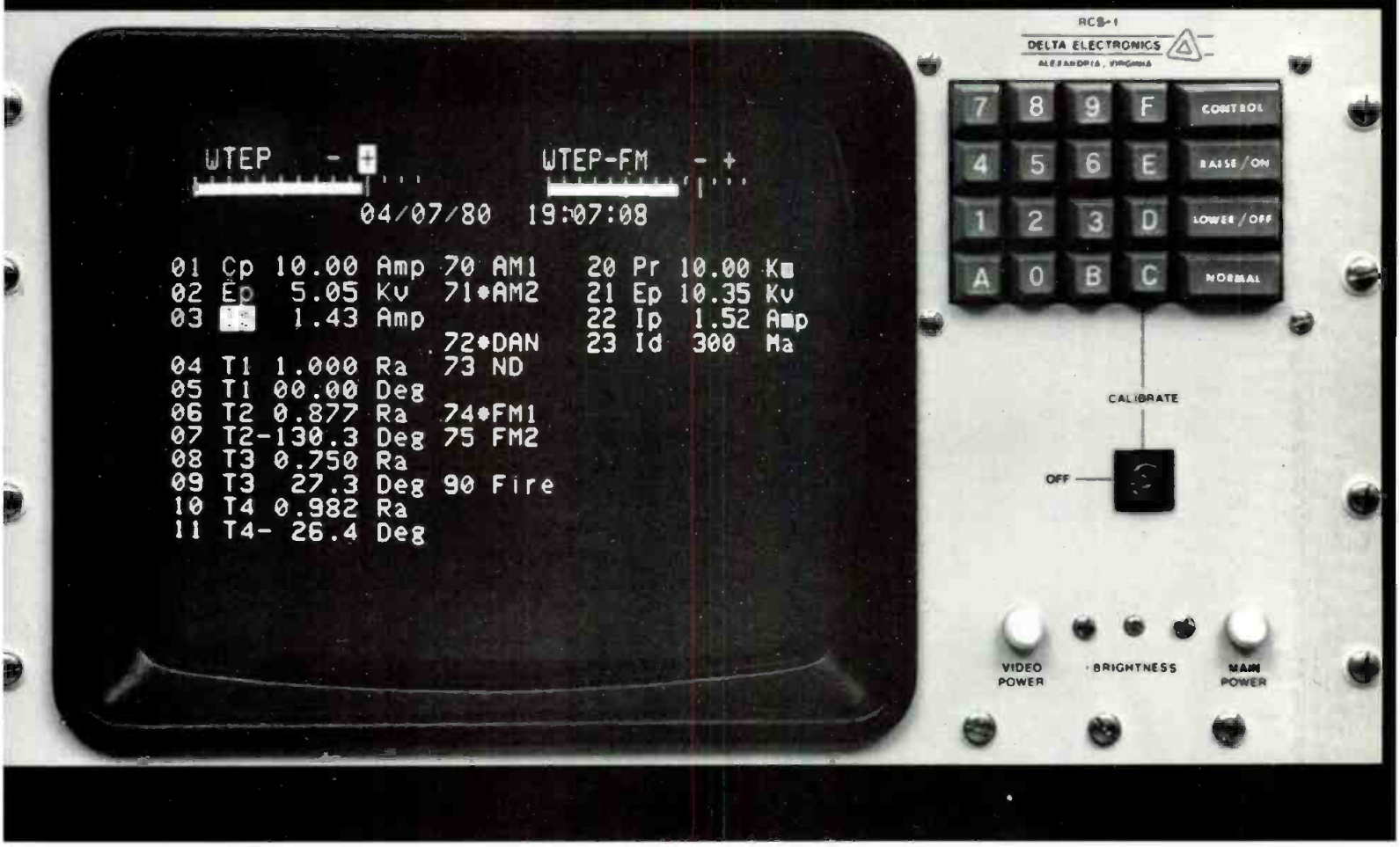

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all listeners tune in the FM band. As group broadcasters scramble to realign their properties, FM stations are selling well over the usual guideline of 2.5× gross or 10× cash flow. AM stereo approval by the FCC will not help, said Stevens, since it comes too late and offers too little improvement.

Although radio revenues are up, ($3.7 billion), the new satellite networks are drawing the dollar, Stevens claimed. Local station owners are not getting their share, he pointed out.

Henderson's outlook for group broadcasters was that of "cautious optimism." Multiple owners as a whole foresee a 13–15 percent volume increase for the coming year, with profits in the same range since costs are expected to be held to rises of no more than 10–12 percent. Henderson said the fourth quarter of 1982 will be one of the best ever.

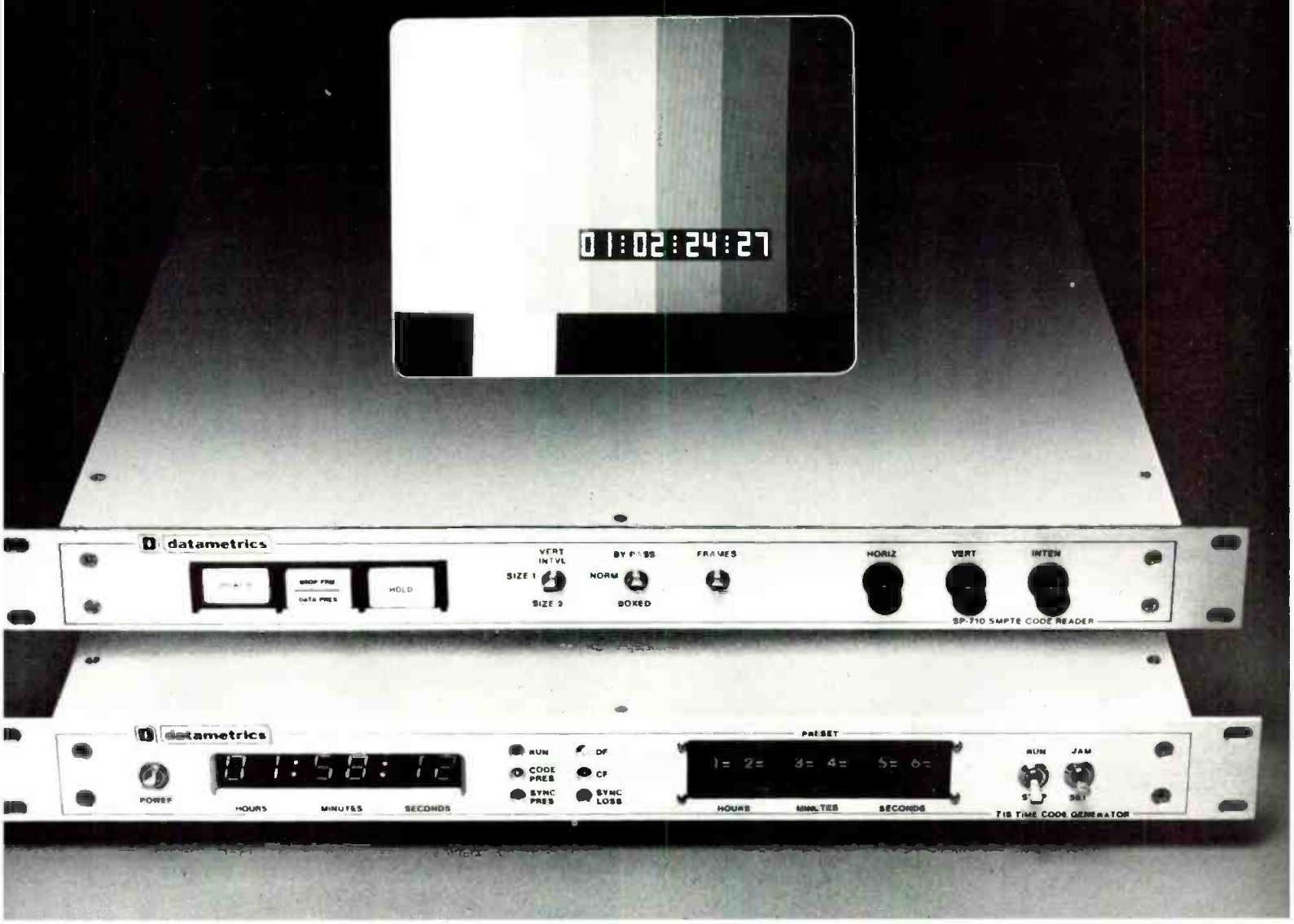
What concerns group owners most, explained Henderson, are (1) the number of stations in the market, (2) where they are located, and (3) network affiliation. Regarding the first consideration, independent VHFers are a factor since they can get 25 percent of an area's advertising dollar. Geography is a growing concern since the South is a positive market and the Midwest a negative one. Network affiliation figures strongly since at the present time there are two winners and one loser.

Political issues are not likely to affect 1982 revenues, but could have an impact after that. If spreading deregulation negates the prime time access rule and the networks expand their news slots, local stations will be hurt badly, according to Henderson. Local news is very important to the top 25 markets, and local broadcasters now sending their own crews to Washington, DC, and elsewhere don't want to see networks expand.

Stevens opined that perhaps the 7-7-7 ownership limitation rule will open up. The Fowler Commission will have to support a change, he said, but the mood of Congress is unknown at this time.

Various organizations presented their prospects for broadcasting profits at the conference. Cox Broadcasting, Harte-Hanks, McGraw-Hill, and Times-Mirror all reported good third quarters for 1981 and all were optimistic about the future. Those with cable TV systems see even greater growth in that sector, but with no immediate harm to broadcasting. (See box, "Cable Operators Flying High.") **BM/E**

Perfect Timing Perfect Price



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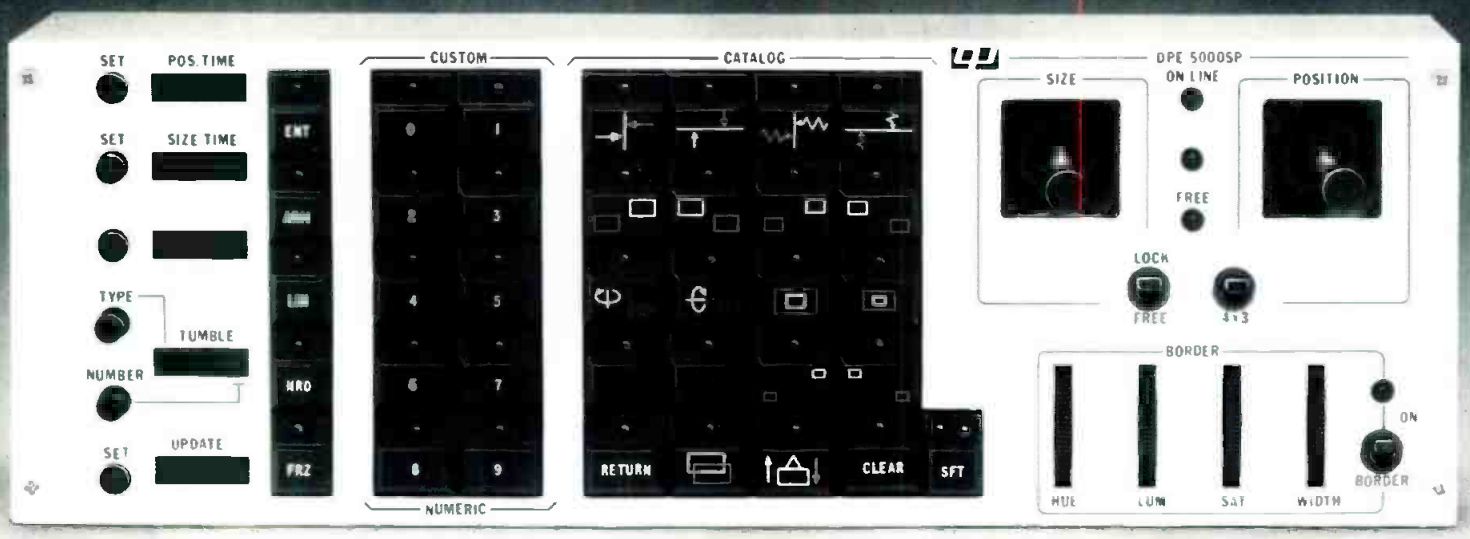
The Quantel DPE 5000/SP.



Now every broadcaster can afford digital effects.

If you've been holding back from digital production effects because the cost seemed too high, hold back no more.

The new Quantel DPE 5000/SP makes digital effects affordable by every broadcaster.

This exciting single-channel system gives you infinite compression. Zoom expansion to 2X normal picture size. Variable picture positioning. Freeze and update. Fixed and variable border generation. Horizontal squeeze. And vertical squeeze.

Not bad for a unit that's only 8¾ inches high. Perfectly sized for your studio—or mobile unit. And with low power dissipation.

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And more yet! Over 40 effects instantly selectable at the touch of a button—pre-programmed catalog effects and custom effects of your own creation.

And a serial interface makes it simple to have multi-station control.

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TAX TIPS

FOR STATIONS

New Depreciation and Tax Credit Rules

By Mark E. Battersby

EVERYONE IS AWARE that inflation has seriously eroded the real value of depreciation allowances at a time when the broadcasting industry needs additional capital. Since broadcasters, or any taxpayer, could in the past deduct only the historic cost of equipment and buildings, inflation usually reduced the real value of the depreciation deductions and frequently resulted in overstated profits on the taxpayer's annual return. This obviously raised the tax bill and substantially reduced the cash flow that was available for modernization or expansion.

But then came the Economic Recovery Act of 1981[1], a major tax reduction bill that most experts believe will free cash for investment in new machinery, equipment, and even new facilities. Surprisingly, the depreciation provisions, which President Reagan is depending on so heavily to turn the economy around, are retroactive to January 1, 1981.

Basically, the new depreciation rules give all businesses faster tax write-offs for investments in both equipment and buildings. The law currently categorizes the various types of investments according to estimates of the so-called "useful life" of each asset. The completely new Accelerated Cost Recovery System permits a faster write-off for all capital expenditures that you make by means of a few greatly simplified and standardized rules. For instance, those cumbersome old "useful life" categories that ranged from two to 60 years have been replaced with four easily identifiable classes, each with a standard schedule of deductions that can be taken over a fixed recovery period.

The new law assigns equipment and even depreciable real estate to classes within recovery periods of three, five, 10, or 15 years—and also allows accelerated depreciation to boot.

Generally, the breakdown appears this way:

- *Three-year property:* This class consists of cars and light trucks, as well as machinery and equipment used in research and development activities. Assets (such as special tools) with a guideline life under the old Asset Depreciation rules of five years or less are also included in this category. Any expenditures for these assets will be written off in a flat three years, according to the new accelerated schedule.
- *Five-year property:* All other outlays for machinery and equipment are automatically assigned to a five-year class. Additions to this class will be written off according to a five-year schedule.
- *10-year property:* This is mostly public utility property for which the old rules required write-offs of 18 years or longer. Real estate covered by the old ADR system, with a lower limit of 10 years or less, can now be written off on an accelerated basis over 10 years.
- *15-year property:* This includes all depreciable real estate that doesn't fall within the ten-year category, including your new studio or transmitter building.

Another innovation is the inclusion in this new tax law of a special first-year write-off designed specifically to help small businesses. Under this special rule, broadcasters can write off as much as $5000 in equipment investments in the year of purchase, rather than taking those write-offs over several years as required under our depreciation system. That first-year allowance will rise, in two steps, to $10,000 by 1986.

Editor's Note: This is the first installment of a brand-new section that will be appearing here monthly. Tax Tips For Stations *will provide both radio and television management with the most up-to-date information available on the complex tax laws affecting stations, including the new depreciation and tax credit rules, advantages and disadvantages of equipment leasing, inheritance taxes, and the like. The author, Mark Battersby, is a tax and financial consultant with offices in Ardmore, PA, who specializes in broadcast operations. He has been a frequent contributor of articles concerning tax laws to* BM/E.

Your comments about this new section are invited on the Reader Service Card.

[1]*Economic Recovery Tax Act of 1981* is a report prepared for NRBA by its general counsel Arent, Fox, Kintner, Plotkin and Kahn, Washington, DC. Broadcasters wishing to see the report—which is relevant to both television and radio stations—should contact the NRBA directly.—Ed.

Tax Tips for Stations

Two questions immediately leap to mind: what will these new lives do to the investment tax credit, and what about accelerated depreciation methods? The answer to the tax credit question is that for investments in the three-year category, you will be entitled to a six percent investment tax credit in the year that the asset is placed in service. Five-year equipment will qualify for a 10 percent tax credit. As is the case with our old tax law, no investment tax credit is allowed for so-called "real property."

As for the faster writeoffs of your new equipment, assets in the three-year and five-year classes can employ the 150 percent declining balance system through the year 1984. That 150 percent figure will also rise in two steps to 200 percent (double-declining balance) by the year 1986 and for all years thereafter. If the asset happens to be a newly constructed building, even faster write-offs using the newly shortened lives are possible.

A key provision of the Economic Recovery Act allows broadcasters to expand the already existing tax advantages of building investments in the early years—when they are usually needed most. Use of 175 percent declining balance depreciation allows you to claim a depreciation write-off equal to 175 percent of the straight-line depreciation method. Of course, under the declining balance method or any accelerated write-off method, later year write-offs will be lower.

Looking further down the road, our lawmakers even saw fit to spell out the specific tax treatment for the gain or loss that ordinarily results from the disposition of those assets that have been written off using these new shorter lives. And, upon any disposition or retirement of an asset, gain or loss will still be recognized for tax purposes.

For property in the three-, five-, and 10-year classes, gain to the extent of any prior recovery allowance will be taxed as ordinary income. Similarly, recapture generally also will apply to the gain on disposition of 15-year property other than residential real estate and low-income housing.

These rules require recapture of gain (as ordinary, fully taxable income) to the extent that the recovery allowances taken are in excess of those allowable under the straight-line method of depreciation. For any 15-year property that a broadcaster has chosen to recover under the flexibility system using the straight-line method (with write-offs divided evenly through the years of depreciation), no recapture will apply.

In other words, when station owners and operators realize gains from the sale of an asset, those gains will be taxed as ordinary income if they fit into the three-year, five-year, or 10-year classes. For nonresidential real estate (which everyone but our lawmakers calls commercial or industrial property), if straight-line depreciation has been elected, gains from the sale may be taxed at lower capital gain rates; if accelerated early-year writeoffs have been used, ordinary tax rates will apply.

As already mentioned, a full regular 10 percent investment tax credit is allowed for all eligible 10-year

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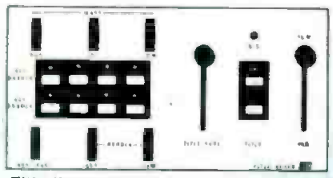

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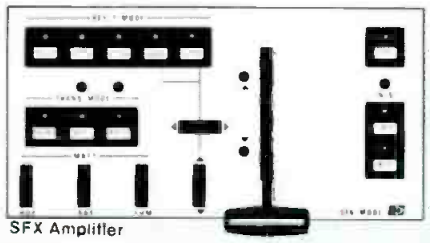

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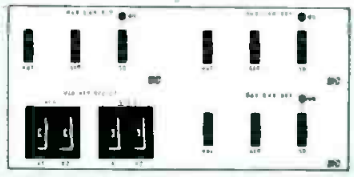

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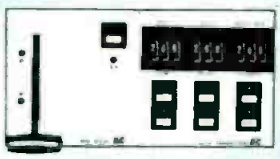

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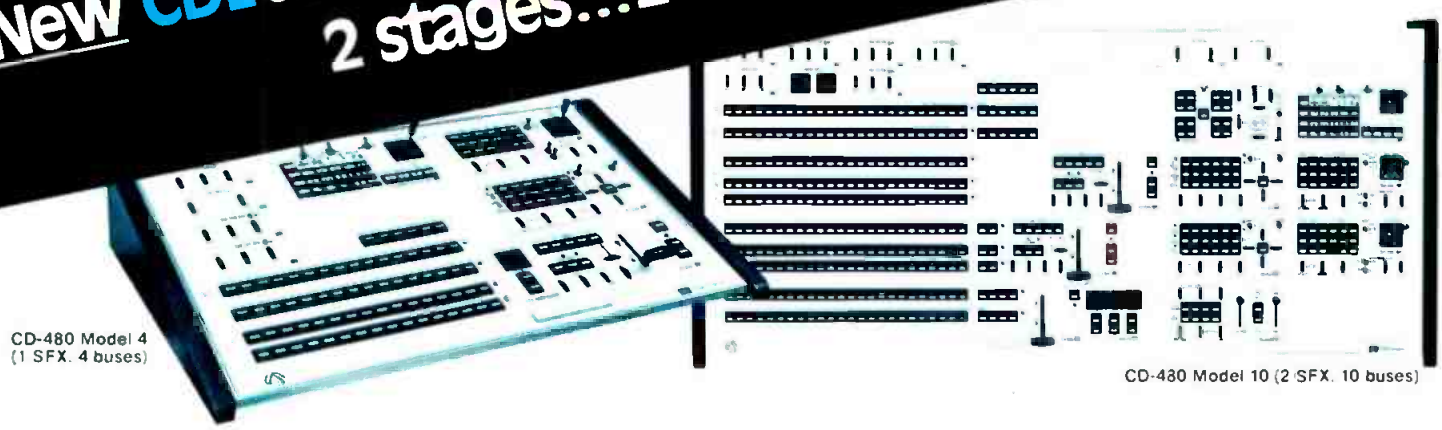

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and five-year personal property and a six percent credit is allowed for all eligible three-year property. Obviously, the amount of the tax credit will no longer depend upon the estimated useful life of the property but, rather, only upon which asset class it falls within.

If, however, the property for which the tax credit has been claimed is not held for at least one full year after it is placed in service, the entire credit will be recaptured. For 10-year and five-year property, 80, 60, 40, or 20 percent of the credit will be recaptured if the asset is not held for at least two, three, four, or five full years, respectively. For three-year property, the recapture percentage will be 67 and 33 percent for a failure to hold it for two or three full years, respectively.

It could well be that the combination of the small business first-year writeoff, accelerated depreciation, the shorter asset lives, and the more liberal investment tax credit will be wasted on stations that are suffering in the present economy. But this tax bill contains something for just about every business.

The new law extends the current carryover for use of both the investment tax credits and the net operating losses—essentially, the time during which these tax breaks may be taken. The final version of that law allows broadcasters to extend to 15 years, from the present seven years, the carryover for use of the investment tax credit and net operating losses.

Finally, the new tax law does not differentiate between new and used equipment or property. In fact, all of the cost recovery rules apply alike to both new and used property—and no estimate of salvage value is required. The law also raises the available investment tax credit for the purchase of used equipment from the old $10,000 level (10 percent credit on the first $100,000 in used equipment purchases).

While the soft economy and the high interest rates will both play an important role in how extensively you utilize these new depreciation and tax credit rules, concentrate on how best to employ these rules within the framework of your overall tax picture. In other words, concentrate on that new equipment you've already acquired or plan to acquire in the normal course of business.

If you acquired equipment before the end of 1981, you can certainly take advantage of the new lower depreciable lives as well as claim the investment tax credit. But don't forget that both the first-year bonus and the amount permitted under the accelerated depreciation methods are scheduled to increase in the next few years. Of course, arguing for an immediate write-off are tax rates that are scheduled to be reduced a little more this year and still more in 1983. So early deductions offset more income, while later deductions may be greater but only offset a lower tax bill.

Obviously, the new rules give you quite a bit to think about and to plan for. The Economic Recovery Act of 1981 has created the potential savings; it is up to you to plan to get the full benefit from them. And now is the time to start. **BM/E**

THE $250,000 CART MACHINE.

by Ray M. Kohfeld, President, Ramko Research

PhaseMaster, The industry's most advanced broadcast reproduction system.

From the beginning of the PhaseMaster cart machine project more than two years ago, we were convinced there was an electronic solution to the problem of stereo phase stability. Consistent stereo reproduction and machine-to-machine compatability could be solved. We believed that for many crucial system parameters, performance could be achieved in a cart system that would meet or exceed the best reel-to-reel machines.

What we didn't realize however, is that the development of the "ultimate" cart machine would cost over a quarter of a million dollars and take thousands of man-hours to accomplish. We finally achieved what we were after—no, what you were after—but not without some very trying times.

Early on, the goals were clear.

By employing leading-edge technology throughout each area of the tape system, we felt that the PhaseMaster could out-perform everything in the audio chain. Right on through the transmitter. The signal-to-noise, distortion and wow and flutter performance criteria had to rival reel-to-reel specs while retaining all the conveniences and benefits of the standard plastic tape cart. The major problems of tape skew and guidance had to be overcome in order to deliver a system which would, once and for all, take care of phase problems. This problem was judged by us to be absolutely critical for proper and consistent stereo reproduction. FM now, and AM just around the corner.

The final goal we set for ourselves was to design a cart system that offered automatic machine-to-machine compatability—an important benefit that to our knowledge no other reel-to-reel, cartridge machine or add-on processing system offers. We believe that it is a significant factor for the broadcaster to be able to pickup anyone's cart at random, record it on any PhaseMaster and then play it back on any PhaseMaster: the program material being precisely locked in-phase. Whatever the phasing of the original source, the signals will be automatically and faithfully reproduced. Ultimately, tape skew, chatter or even head misalignments would no longer be a problem.

Side-to-side stereo shift; holes in the mono mix or worse yet, reception; audio modulation due to tape chatter from the cart: major problems that we've lived with for years. You waste valuable time trying to get around it, cart manufacturers would like you to believe that it's solved in their carts, programming and management don't want to hear about it, and your audiences reach for the dial when your station doesn't sound good because of it.

To have introduced another cart ma-

chine that didn't solve all these persistent problems would have been negligent. To say the least, another mousetrap. As we've stated, the goals were clear from the onset, but not the solution(s).

Our attempts at phase correction: shortcuts aren't our way of doing things.

When we first looked at the problem, there existed only one other means of phase correction. This is an electromechanical approach which adjusts head alignment for each cart prior to the initial recording. Although this is certainly an improvement over what had existed (nothing), we felt it had many shortcomings. It can't correct phasing in real-time, the compatability factor is not high enough, it's overly complex-subject to breakdowns, and it adds valuable, additional time to a producer's already busy schedule of production.

What about stereo matrix?

Another approach which initially offered some technical promise at the outset was stereo matrixing. We went down this road early and discovered that a matrix system not only added unwanted electronic noise (something we were taking great pains to get rid-of) but it did very little to accomplish our goal of machine-to-machine compatibility. These fundamental drawbacks are inherent in this design approach and we eventually discarded it after many attempts to make it do things it just couldn't do.

Cross-correlation and signal injection: not the answers either.

After discarding the stereo matrix approach, we researched the viability of mixing timing signals onto the Left and Right audio tracks. This was closer to what we had in mind but detracted from the end result in that the audio had to be reprocessed which naturally degraded the high quality audio we were aiming for.

The third technique investigated was a cross correlation scheme that is essentially a form of probability theory with user adjustments. This also was eventually dismissed because of its inability to second-guess many complex waveforms and the necessity to readjust for various types of program material.

Although all of these approaches have some merit and have since shown up in the marketplace, the individual shortcomings were too much of a compromise of the promises to ourselves that we could do it better. Much better.

The answer! Perfect phase correction via the Q-track.

The elegantly simple and totally unique answer to the phase-stability problem came because of persistence and, at times, downright obstinence to not accept anything less than what we set out to achieve: picture perfect phase accuracy and stability—an ultimate, real-time correcting solution to the biggest problem the cart system serves up to every broadcaster.

The phasing (or more accurately, time base) correction system in the new PhaseMaster cart machines takes a sample of the upper (Left) audio channel, encodes it and then records it on the cue track without interference to any other information. Upon playback, the encoded signal is reconstructed and compared to its mate on the upper track so that we now have two identical signals to compare with each other. This has been the key. We are now able to compare apples to apples. Dissimilar information normally found in Left and Right audio is no longer a limiting factor. After these two identical signals are compared by a clever signature-determining circuit, a control signal is developed. Any time-base differences between these signals are applied via control signals to timing circuitry in both the Left and Right audio for correction. The result? Phase correction in real-time... measured in microseconds. The heads, the tape or both can be severely out-of-whack and the PhaseMaster's phase compensating electronics don't care. The audio can be complex, sinousoidal or recorded only on one track.

You can record your program material on any PhaseMaster Record/Play machine and rest assured that it will reproduce exactly like the original source no matter it be across the hall or across the world.

Control instrumentation technology helped us find the solution and we're now preparing for patent application.

Compatability with your present system.

The new PhaseMaster also offers you compatability with all your present, previously recorded carts. An easy transition can be made at your own pace without having to rerecord your station's entire library. To state it simply, PhaseMaster now gives you a professional R/P system without the drawbacks you've grown accustomed to.

Last, but not least, the best mechanical design you've ever seen.

The deck is a ⅝" casting for stability, with a stainless steel cover plate for wear-resistance and EMI shielding. A crystal-controlled D.C. servo motor insures timing accuracy to within ±0.05% and, practically no heat generation. The speeds are field selectable: 3¾, 7½, and 15 ips.

Your carts are securely held in position by the edges to prevent distortion, using spring-loaded rollers. Insertion and withdrawal is smooth and positive-feeling. The machined head stack is rock stable, and we've included internal illumination for periodic inspections and maintenance. There are no microswitches to break or jam—and never any start-up wow because the motor is started by an optical sensor as you begin to insert the cart. To keep damaging heat away from the tape, the capstan is ceramic. And bearings have a longer life because the motor doesn't need to run continuously due to the cart sensing design and the ability of the motor to reach full speed by the time the cart is fully inserted. The pinch roller is engaged by an adjustable air-damped solenoid with a teflon coated plunger for fricton-free, quiet operation.

On the PhaseMaster R/P machine you get front panel switch selectable inputs; integral diagnostics for faster, easier maintenance; three cue tones are standard. An automatic 4½ digit timer is standard. Left/Right audio plus phase analysis solid-state meters, motor "out-of-speed" and "already played" indicators are standard, too.

With the kind of performance we didn't compromise.

We've set new standards for wow and flutter: .04-.07%. The amplifier's signal-to-noise is −65dB utilizing dynamic noise reduction without companding or expansion. Frequency Response is ±1.0dB. And, of course, there's balanced I/O's and a +25dBm output capability.

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We call it the $250,000.00 cart machine. That's what we invested on our bottom line to engineer a system that you can have for less than $1,400.00.*

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INTERPRETING THE FCC RULES & REGULATIONS

FCC Proposes Lottery to Choose Applicants

By Lee G. Lovett and Joseph F. Hennessey; Lovett, Hennessey, Stambler & Siebert, P.C., Washington, D.C.

DO YOU REMEMBER the comparative hearing through which you sat to get your license? What about the time and money you might have spent traveling to and from Washington, DC, to attend that hearing? And the large legal bill you received at the end of the hearing? Remember the frustration at the end of it all if, after all, you lost the case? Well, the Commission has proposed to eliminate all that for future applicants. In a notice of proposed rulemaking issued last November, the FCC proposed the elimination of the comparative hearing for new broadcast applicants. Instead, the FCC would substitute a random lottery to choose among mutually exclusive applicants for a particular frequency.

Section 309(a) of the Communications Act requires that the FCC, in choosing among competing applications, select the application that will best serve the public interest, convenience, and necessity.[1] In the landmark *Ashbacker* case in 1945, the U. S. Supreme Court ruled that Section 309 required that the Commission hold a *hearing* whenever there were *competing applicants* for the same frequency.[2] As a result of that decision, the Commission has conducted hearings since then in all cases involving mutually exclusive applicants. Also during that time, hearings have generally become long and more complicated in terms of the issues to be resolved. This has led, in turn, to increasing pressure on both the FCC and the Congress to change the method by which broadcast applicants are chosen. The lottery scheme was one option that has been discussed for some time.

Congress has finally made possible a lottery by amending the language of Section 309. It included the changes in the Omnibus Budget Reconciliation Act of 1981, also known as Gramm-Latta I.[3] The specific language to change the FCC's selection process was buried in the middle of the many budget cuts. The law added a new subsection to Section 309 which reads:

> If there is more than one applicant for any initial license or construction permit which will involve any use of the electromagnetic spectrum, then the Commission, after determining the qualifications of each such applicant under Section 308(b) shall have authority to grant such license or permit to a qualified applicant through the use of a system of random selection.[4]

In other words, Congress has now permitted the FCC to use a lottery as long as the competing applicants meet certain minimum qualifications.

The Commission proposed to apply the new lottery procedure to all television applications, including commercial television, noncommercial educational television, and subscription television. It also proposed to extend the new procedure to future low power TV applications. If the new rules are adopted, the FCC will also thereafter select all AM and FM radio stations (both commercial and noncommercial) in this way. All TV and FM translators would also be chosen in this way.

What about applications that already have been filed? Even if the Commission decides on the proposal as written, there is still the substantial procedural obstacle of those applicants who filed expecting a hearing. The Commission asked for comments from the general public as to how to resolve this question. However, it has proposed that whenever any final order is issued regarding the lottery, all mutually exclusive applications not yet designated for a hearing, as well as all future applications, be covered by the lottery procedure.

As for the actual selection method suggested, the Commission proposed a simple lottery consisting of random drawing of numbered balls from a container. The Commission favors this method because it is "simple, understandable, inexpensive, and appears

[1] 47 U.S.C. §309-(a).
[2] *Ashbacker Radio Corp. v. FCC*, 326 U.S. 327 (1945).
[3] Public *Law No. 97-35, 95 Stat. 736 (August 13, 1981).*
[4] 47 U.S.C. §309(i)(1).

not to be prone to tampering or rigging." The drawing would probably be conducted by the secretary of the Commission.

As simple as this procedure might seem at first glance, complications arise because Congress explicity stated that those minorities which are substantially underrepresented in ownership of broadcast facilities continue to be given some kind of preference in selection.[5] Congress also stated that such preference must be *substantial*. The reason for the concern of Congress is plainly evident: minorities still control fewer than one percent of the 8500 commercial radio and television stations operating in the United States.[6] A clear indication of how the Commission intends to insure such a preference in a lottery must await the final Commission decision. However, several alternatives discussed in the notice include implementing a four to one preference for minority group members, a three to one preference for women (presuming that the Commission determines that women are actually underrepresented in the ownership of broadcasting) and a two to one preference for labor unions, community organizations, and other underrepresented groups. Alternatively, the Commission suggested a two to one preference for *all* underrepresented applicants since no one minority would thereby be favored over another.

The FCC will require proof that minority individuals or groups *own a majority* of the proposed broadcast facility. The Commission proposed fixing a 50% minimum figure for an applicant to qualify for the preferential status. The 50% ownership requirement could be met by aggregated ownership interest from different groups and individuals. That is to say, a broadcaster could show that the applicant corporation was owned 30% by a black shareholder, 20% by a Hispanic shareholder, and 10% by white female shareholders.

The 50% requirement will apply both to corporations and partnerships. However, in the case of limited partnerships, the 50% will be calculated only with respect to *general partners* since by definition limited partners in such a partnership are merely passive investors and cannot control business decisions of the partnership. Large corporations, however, would be excluded from the proposed preferences. Only small corporations, known as Subchapter S corporations, would be eligible for such preferential treatment.

The proposed lottery for competing applications means a radical departure from FCC procedures that were mandated by the Supreme Court in the *Ashbacker* case more than 35 years ago. It is also evidence of the continuing emphasis of the FCC in eliminating the role of government in broadcasting. The importance of this proposed change cannot be underemphasized. We suggest that you keep in contact with communications counsel in this matter, particularly, if you intend to apply for any new facility in the near future. **BM/E**

[5]See 47 U.S.C. §309(i)(3)(A).
[6]*Statement of Policy in Minority Ownership of Broadcast Facilities*, 68 FCC 2nd 979, 981 (1978).

GREAT IDEA CONTEST

Here's a chance to share your own personal solutions to some of broadcasting's most vexing engineering needs: end-of-tape sensing . . . cart deck synchronization . . . on/off-air indication on the mixing board . . . distributing timing pulses . . . and the like.

Each month we will present a specific engineering problem and invite you to submit ideas on how to solve it. Send in descriptions and diagrams of equipment you have already built, or ideas on how you think the problem ought to be solved. *BM/E's* editors will read the entries and select the best for publication — giving readers an opportunity to vote for the idea they consider best. Solutions to Problem 1 appear on p. 111; you can place your vote for the winning solution by using the ballot area on the Reader Service Card.

To attract the most original solutions possible, we will pay $10 for each entry we print. In addition, the winner of each month's competition — the one voted for most often on our Reader Service Card — will receive an engineering slide rule calculator as a prize.

So put on your thinking cap and submit an answer to either of the problems outlined below. Solutions to Problem 3 must be received by February 15, 1982, and will be printed in the April, 1982 issue. Solutions to Problem 4 must be received by March 15, 1982, and will be printed in the May, 1982 issue.

Problem 3:

ELAPSED TIME INDICATOR

Tape recorders and cassette decks (both audio and video) often lack elapsed time or remaining time indicators. What is your design for a device that will provide this information, have instant manual reset, be readable from a distance, and start automatically when the recorder is turned on?

Solutions to Problem 3 must be received by February 15, 1982 and will be printed in the April, 1982, issue.

Problem 4:

BLACK-OUT PROTECTOR

One of the greatest fears among microprocessor users is that the system will crash during blackouts or brownouts, resulting in a loss of memory or actual system damage. Can you design a simple circuit that will sense line voltage drop and automatically supply standby voltage to the appropriate circuits?

Solutions to Problem 4 must be received by March 15, 1982 and will be printed in the May, 1982 issue.

CONTEST RULES

1. **How to Enter:** Submit your ideas on how to solve the problems, together with any schematic diagrams, photographs, or other supporting material. Entries should be roughly 500 words long. Mail the entries to *BM/E's* Great Ideas Contest, 295 Madison Avenue, New York, NY 10017. Use the official entry form or a separate piece of paper with your name, station or facility, address, and telephone number.
2. **Voting and Prizes:** *BM/E's* editors will read all entries and select some for publication; the decision of the editors is final. Those selected for publication will receive a $10 honorarium. Each month, readers will have an opportunity to vote for the solution they consider the best by using the Reader Service Card. *BM/E* will announce the solution receiving the most votes and will award the winner of each month's competition an engineering slide rule calculator.
3. **Eligibility:** All station and production facility personnel are eligible to enter solutions based on equipment already built or on ideas of how the problem should be solved. Consultants are welcome to submit ideas if they indicate at which facility the idea is in use. Manufacturers of equipment are not eligible to enter. Those submitting solutions are urged to think through their ideas carefully to be certain ideas conform to FCC specs and are in line with manufacturers' warranty guidelines.

Mail Official Entry Form to:

BM/E's Great Ideas Contest
295 Madison Avenue, New York, NY 10017

Solution to Problem # _____

Your Name: _____

Title: _____

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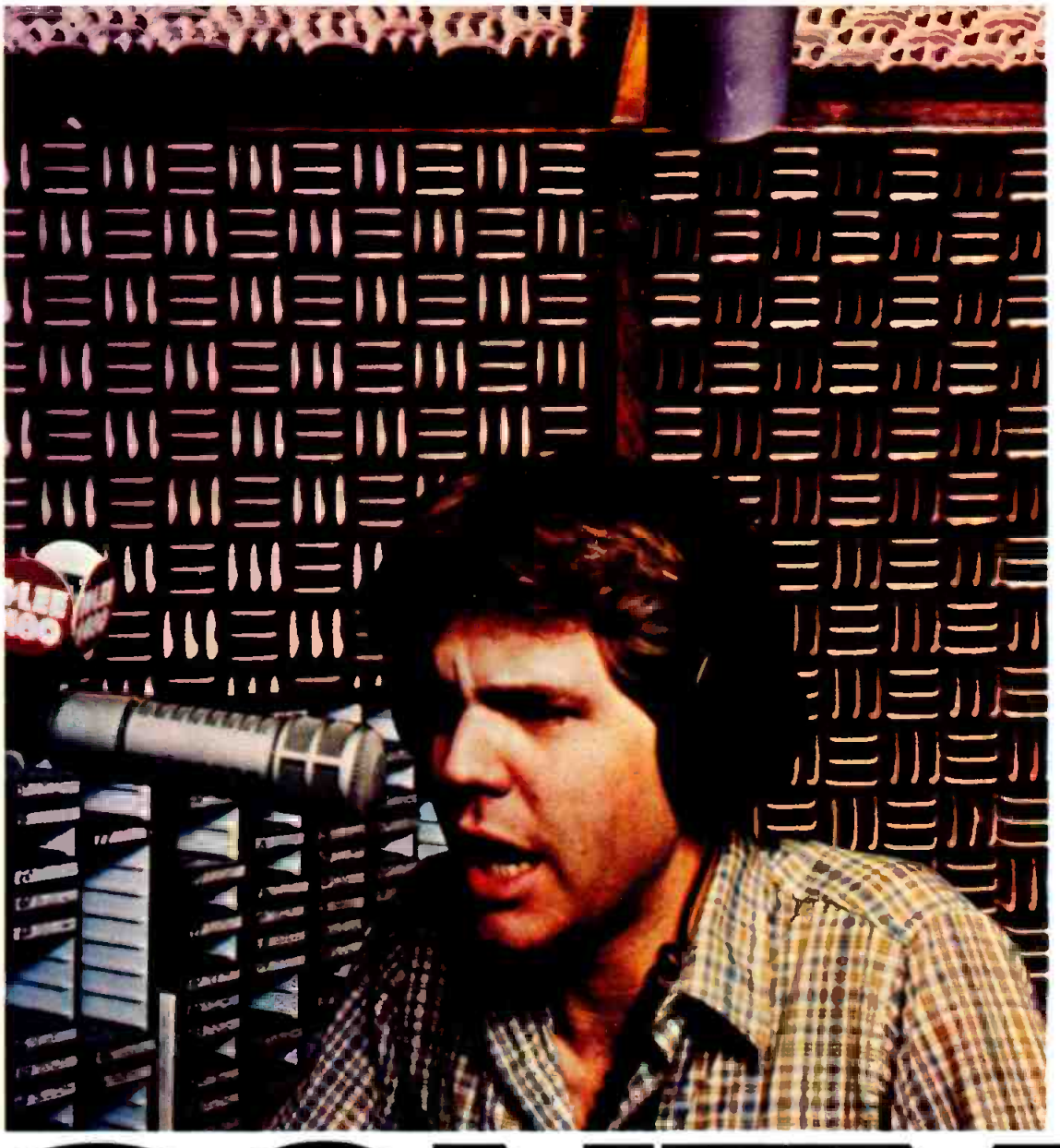

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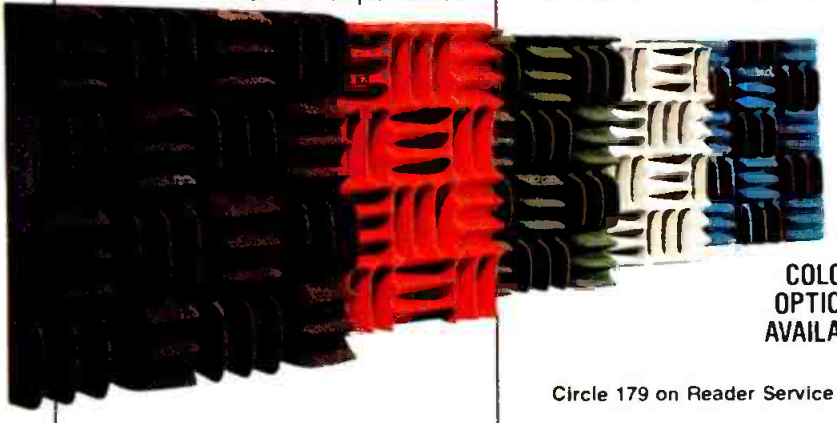

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Circle 180 on Reader Service Card

Solutions to Problem 1:

END-OF-TAPE WARNING

There are many occasions in the use of reel-to-reel tape machines, both on the air and in production, when it is convenient or necessary to give operating personnel a clear warning that a tape on the machine is near its end. Here are three solutions to this problem, submitted by *BM/E's* readers.

Solution A

Allen Kass, Engineer
WISP/WQDW Radio, Kingston, NC

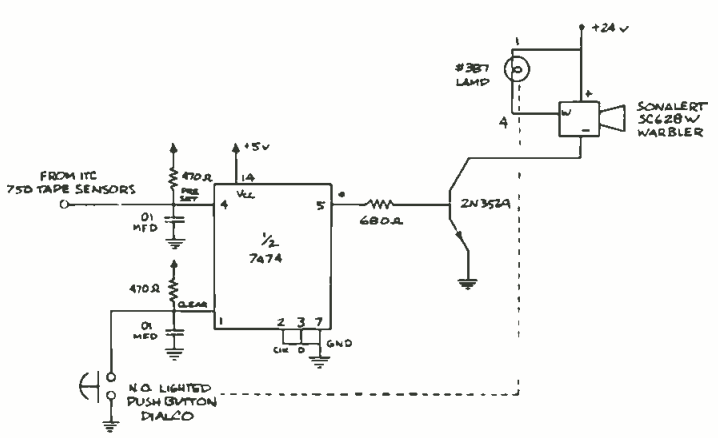
We have used this simple circuit since August, 1978, with eight ITC 750 tape decks in two Schafer 903 automation systems, and it has worked very well.

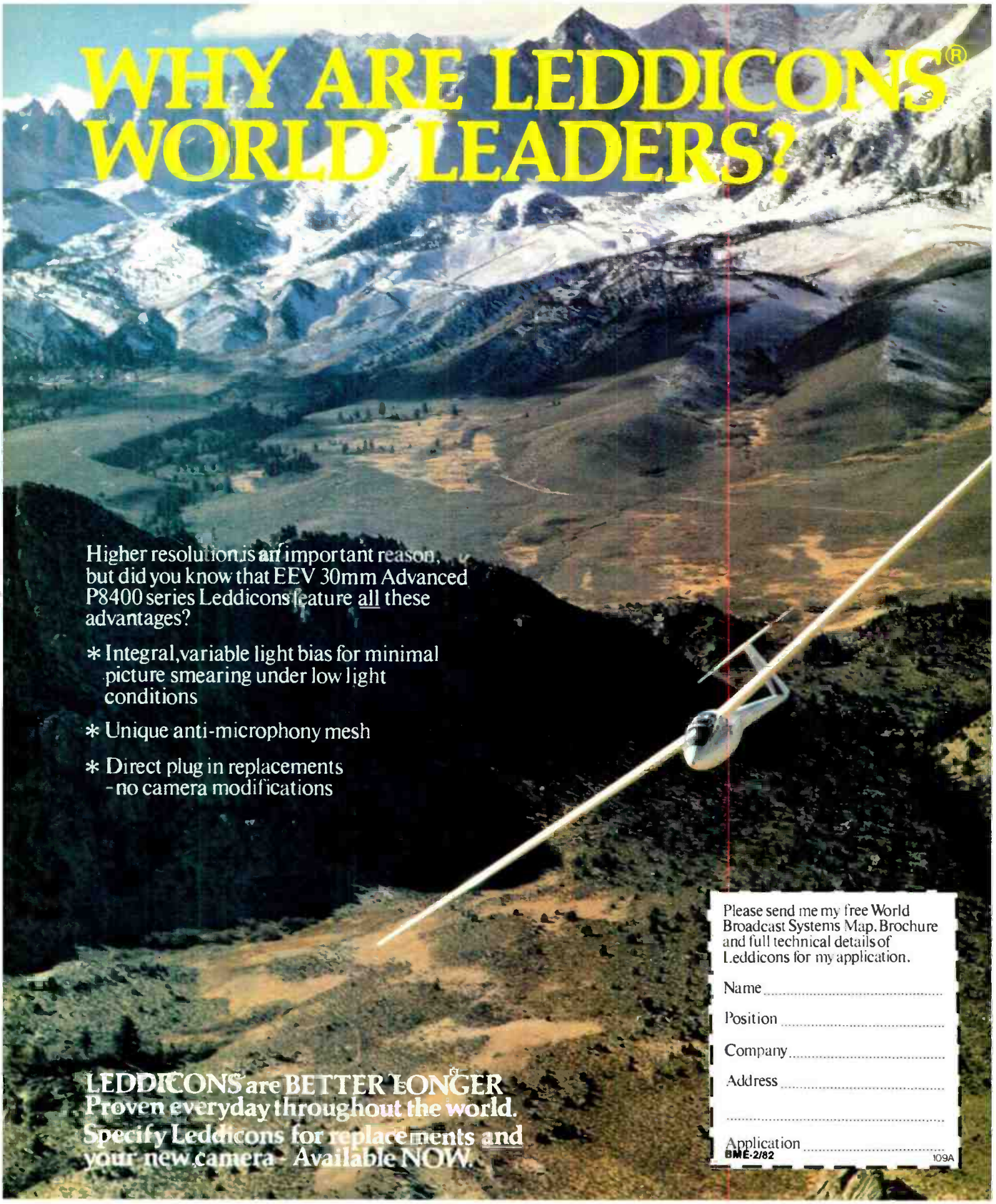
The circuit uses an SN7474 flip-flop as a set-reset latch. The connection to the preset pin (4) is pulled high with a 470 ohm resistor and has a 0.01 μF capacitor to ground to suppress transients and static pickup. This pin connects to all the tape sensor arms on the tape decks.

Metallic sensing foil is placed on all our automation tapes just after the last 25 Hz tone at the end of the tape. When this foil goes across the sensor arm on the decks, this grounds the preset input to the flip-flop, which makes the Q output (5) go high and provides base drive to the 2N3569 transistor. When this happens, the transistor provides a ground for the Sonalert, causing it to sound off. The Sonalert we use is an SC628W, which is a warbler unit. The "W" connection on the Sonalert is connected to the #387 (24 V) lamp in the reset button and will flash alternately with the alarm when triggered.

To reset the alarm, the clear input (1) is used. When pin 1 is pulled low by the reset button, the flip-flop reverts to the state where Q is low, which turns off the Sonalert and the lamp.

The + 5 V dc and + 24 V dc are both derived from the 903 system's power supply. The tape sensor arm connection on the ITC 750 is pin 7 on the J1 (remote) connector.





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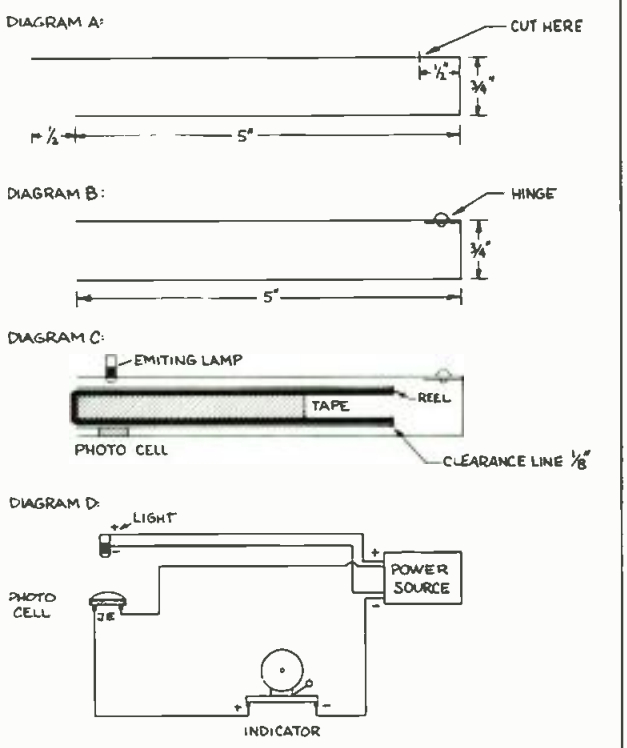
Solution B

Scott E. Putnam, Transmitter Engineer
KSUN-AM, Ogden, UT

My suggestion involves the use of a thin photo eye cell and emitting lamp. The device can be run on an existing or independent power source. Parts needed are: a thin photo cell; sheet metal strip 1/2 × 11 1/4 in. (depending on desired length); miniature emitting lamp; wire; nut/bolt/washer; and audible or visual indicator.

The sheet metal is bent in a "U" shape with a 1/2-in. overhang (see diagram A). Next, cut the top piece 1/2-in.



from the top bend and reaffix it to the bottom piece with a small bolt/washer/nut. Now the top and bottom of the sheet metal should be flush and the top piece can swing like a hinge for changing reels (diagram B).

A thin photo cell is placed on the bottom piece of the sheet metal at the location where the operator wishes to be notified the reel is ending. The lamp is attached directly to the top piece of the sheet metal through a hole (diagram D). The sheet metal is then attached to the tape recorder at a convenient location. When the tape runs out on the reel, the direct light hits the photo cell, closing the plus side of the circuit and activating the warning indicator (diagram C).

The advantage of this device is that it can be individually adapted to any size tape recorder and reel. Also, it

employs very simple parts and wiring, with most components available in the station's electronics shop.

Solution C

W.D. Barker, Chief Engineer
WTLR-FM, State College, PA

This alarm system combines ideas from several sources to form a unique circuit with two tape deck sensing functions. It will alert the operator that a tape has run out, prior to losing audio, via the foil sensing system. If all else fails and the tape deck or system loses audio, the circuit will alert the operator via the audio sensing system. Either mode of alarm activates a common Sonalert that can be remotely located if necessary to alert an operator.

The design utilizes an LM3900 current differencing amplifier that is inexpensive and readily available. In the end-of-tape (foil sensing) mode, the alarm functions by virtue of a section of metallic sensing foil that must be placed on the tail end of each tape being played. When the sensing foil shorts the tape deck sensing posts (which is some cases must be added to the machine), the base of Q1 is shorted to its emitter, which stops Q1 from conducting, letting the collector voltage

rise. The increase is coupled through the 6.8K and 820 ohm voltage divider to the gate of the SCR, causing it to trigger, thus setting off the Sonalert alarm. Normally closed switch S-1B is located at the tape deck(s) so that the operator has to come to the machine to reset the alarm. Several tape deck sensing posts can be paralleled across the base of Q1 for multiple deck operations. The circuit is designed so that even if Q1 fails, the voltage across the sensing posts will not go above approximately 1 V.

In the event that the tape deck, or system, loses audio, the 15 μF capacitor charges to B+ through the 1M potentiometer (which controls the time delay of the alarm). The resulting high pin 1 causes the comparators output, at pin 5, to go high, which, through the 10K and 820 ohm divider, triggers the SCR. The 10K pot, connected to pin 6 through a 1 M resistor, sets the threshold at which the comparator changes state.

We found it advantageous to be able to silence the alarm, during periods of no audio, such as in the morning when tapes were being loaded onto the decks but no program material was being aired. The obvious danger is that if a conventional defeat switch were used, the operator would *always* leave the alarm in the defeat mode. The solution, in this case, was to have the defeat system reset itself whenever audio returned. S-1A is used as the alarm defeat and actually toggles the bistable by putting a high on pin 12. The resulting high on pin 10, which was previously near ground, raises the

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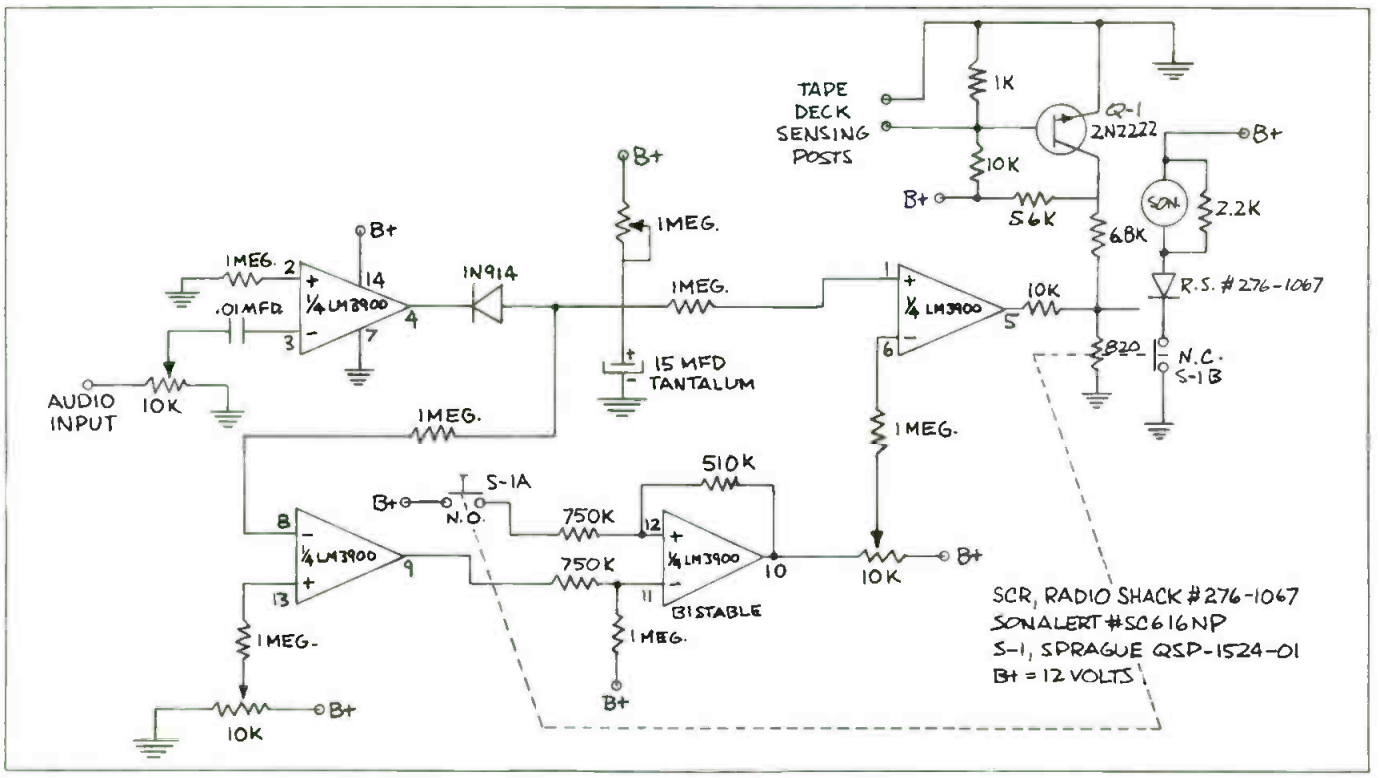
potential on pin 6, inhibiting pin 5 from changing states whatever pin 1 does. Pin 11 is used to reset the bistable whenever audio returns. When audio returns it discharges the 15 μF capacitor, which puts a low on pin 8. This causes the comparator, at pin 9, to output a reset to pin 11, thereby resetting the bistable, which puts pin 10 near ground, enabling the alarm automatically.

By adding a solid state relay in series with the Sonalert, any number of alarm functions can be activated—or you can substitute for the Sonalert a relay that lights lamps, rings bells, and so on.



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250

This NTSC stop action video camera, developed for image motion analysis, incorporates an electro-mechanical

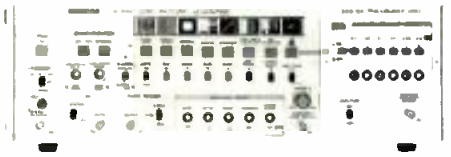
rotary shutter with shutter speeds as fast as one-ten-thousandth of a second. Rugged and portable, it accepts a wide range of telephoto and wide angle lenses with a C mount. A remote control unit is also available. TRITRONICS, INC.

TBC Modification from DVS
251

A new modification, now offered as standard for the Phaser framestore TBC/synchronizer and the DPS-1 TBC, allows consistent, invisible match frame edits in A/B roll post-production from ¾-in. and one-in. tape. The modification also provides joysticking ability by insuring a steady picture in shuttle at any tape speed in both forward and reverse. Equipment already in use may be modified to include this automatic framing feature. DIGITAL VIDEO SYSTEMS.

Video Sync/Test Generators from Leader
252

LCG-400 sync/test generators are available in two versions offering either multiburst (LCG-400M) or sweep marker (LCG-400S). They provide a full range of test signals for monitors, cameras, and VTRs and



sync with all standard composite video signals. Patterns include EIA and full field color bars, five-step staircase, eight color rasters, cross hatch and dot convergence, circle and corner marker with on/off, and variable control of chroma and luminance. Standard ouputs include composite video, subcarrier, black burst, channel 5/6 RF, and separate horizontal and vertical drive ouputs (optional). LEADER INSTRUMENTS CORP.

Wireless Intercom Interface from Cetec Vega
253

With the QX-1 and QX-2 systems, Cetec's Q System wireless intercoms can interface with wired intercom systems, allowing up to seven parties in a full-duplex wireless communica-

tions system. With the QX-1, one party equipped with a QT-1/QR-1 system can become a walkaround full-duplex wireless station within an otherwise wired system. The QX-2 allows from two to six parties, each with a wireless system, to operate within a full-duplex, party-line communications network, with optional interface to a wired IC system. One party can be strapped for priority if operating in a push-to-talk mode. An additional local operator may be plugged into the QX-2 base station. CETEC VEGA.

Artel Fiber Optic ENG Transmitter
254

EN-1000 is a small, battery-powered, portable fiber optic ENG-EFP transmitter that has a camera-to-van range of nearly two miles. The transmitter module clips to the camera operator's belt and connects quickly to standard video, audio, and battery input connectors. It delivers studio-quality video and audio to the SL-2000 receiver located at the van or control center, up to 1.99 miles away. The unit operates on a 12 V dc camera battery

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or power supply and consumes less than 3 W. It weighs approximately one pound and measures seven by 3.6 by 1.6 inches. ARTEL COMMUNICATIONS CORP.

Channelmatic Commercial Verification System
255

CVS-3000A provides a positive method of automatically logging commercials and verifying both the quality of presentation and exact air time and date. The record is an actual

VCR recording. The system is designed to work with the maker's VCR-3001A vertical-interval commercial insert system, which has outputs to drive it. A time-date generator module and a keying message generator module mount in a standard CMF-3000B frame. The tuner portion of a standard portable VHS VCR, capable of remaining in pause mode for long periods, is connected directly to the RF cable feed. Time, date, and so on appear as two lines of small type, which can be positioned anywhere on the screen. $1700 (basic system). CHANNELMATIC, INC.

Video Editor from JVC
256

The microprocessor-based VE-90 videotape editor with joystick control, compatible with most ¾-inch and professional half-inch VCRs, comes

configured with the maker's Tapehandler players and recorders. It operates on control track or standard SMPTE time code and has continuously variable tape speed and single-handed control. Functions include insert and assemble editing, one-second fades to and from black, generation of crystal black, high speed search, cruise, auto-tag, and recall. Also featured is a status display generator. Three configurations are

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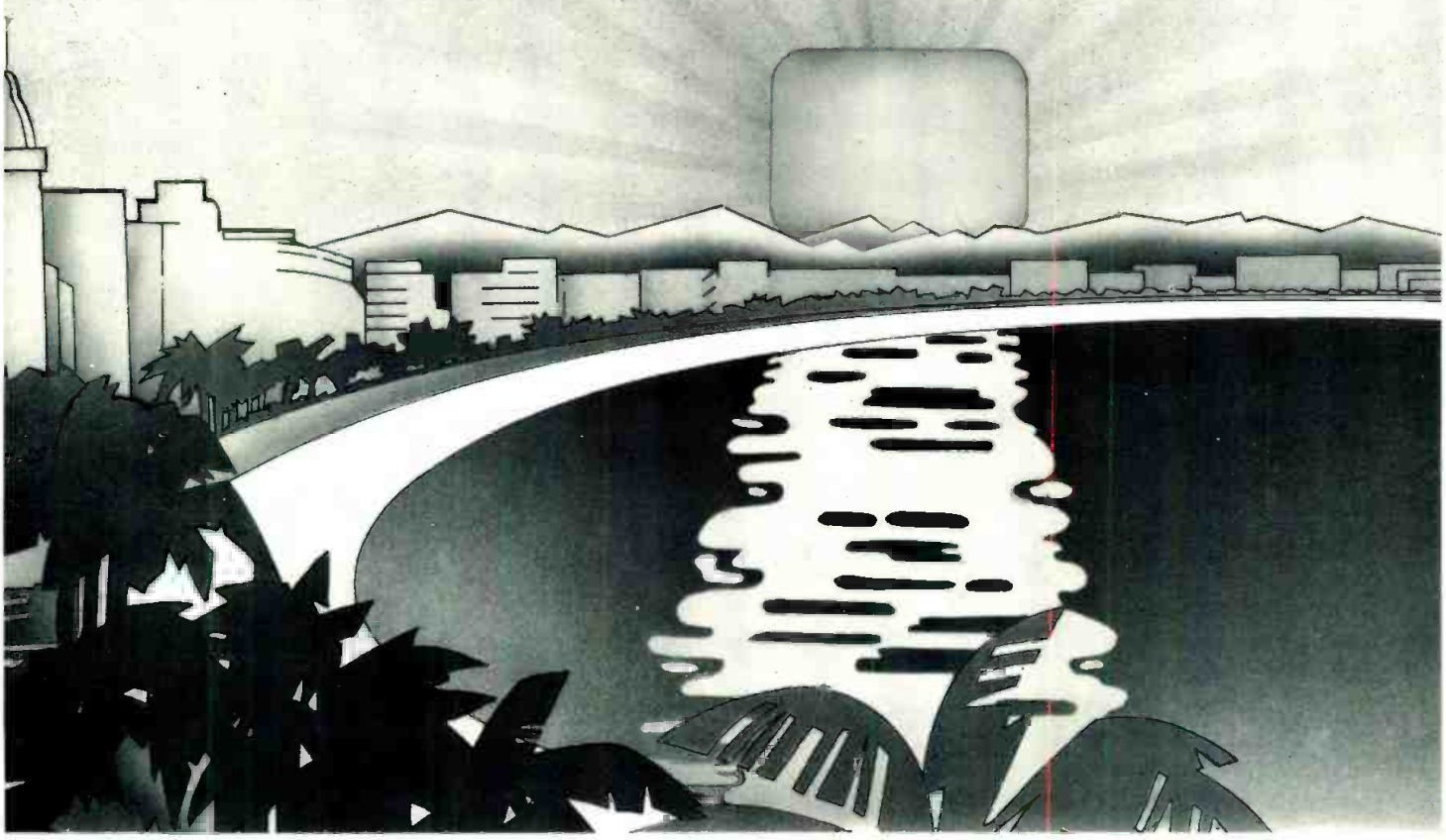

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Program for Adams-Smith Tape Synchronizer 257

A new 24-frame program is available for the TS-605 tape synchronizer, which ties two slave audio recorders to a master VTR. The new program allows the audio recorders to be synchronized to equipment using 24 fps time code while keeping track of real time. ADAMS-SMITH, INC.

Camera Operator Headsets from Clear-Com 258

The CH-41 (single muff) and CH-42 (double muff) camera operator headsets incorporate a rugged dynamic mic and dynamic to carbon

transistorized in-line unit that provides 5 kB more output level than a carbon mic. The circuit is designed so that the usual current will be drawn in the operator's mic circuit, allowing all other mics to operate normally. Compatible with most amplified camera intercoms, the unit features a wide-range dynamic noise-cancelling microphone with blast filter; dynamic to carbon amp; three-way mic switch; flexible boom with mic switch; and six-foot coiled cord with PJ-51 plub. CLEAR-COM INTERCOM SYSTEMS.

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