

AUGUST 1982

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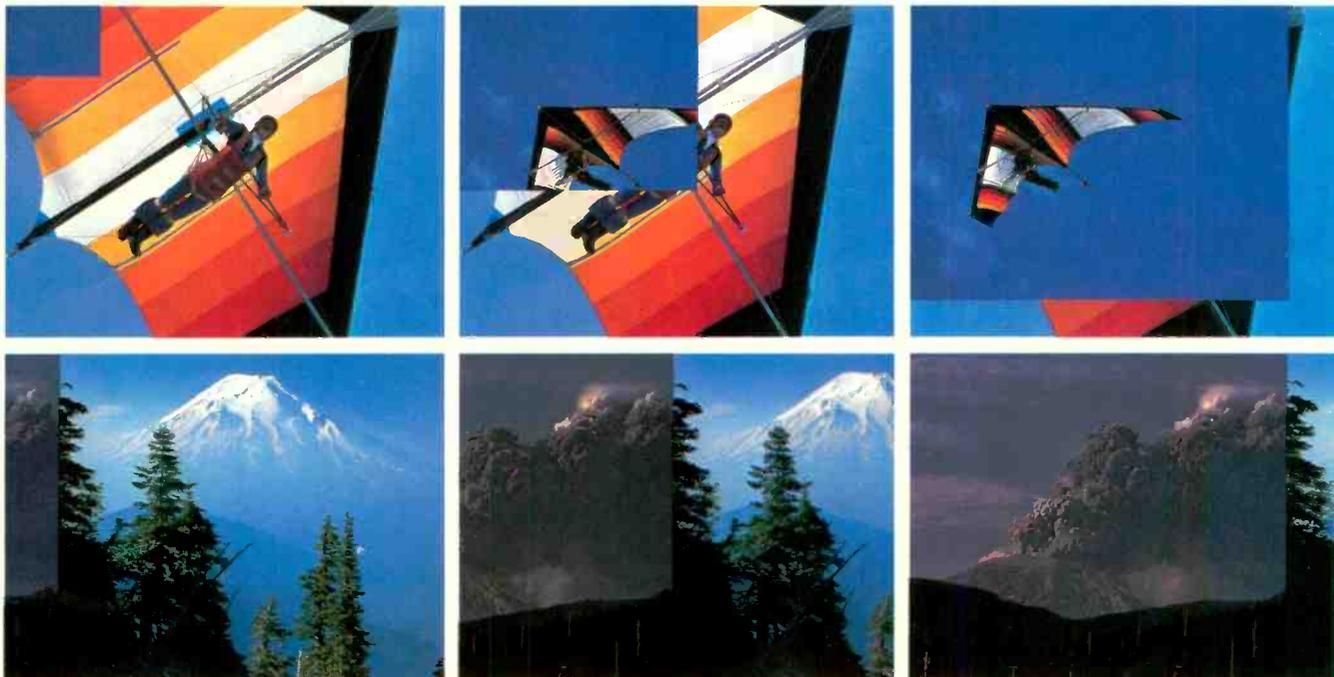
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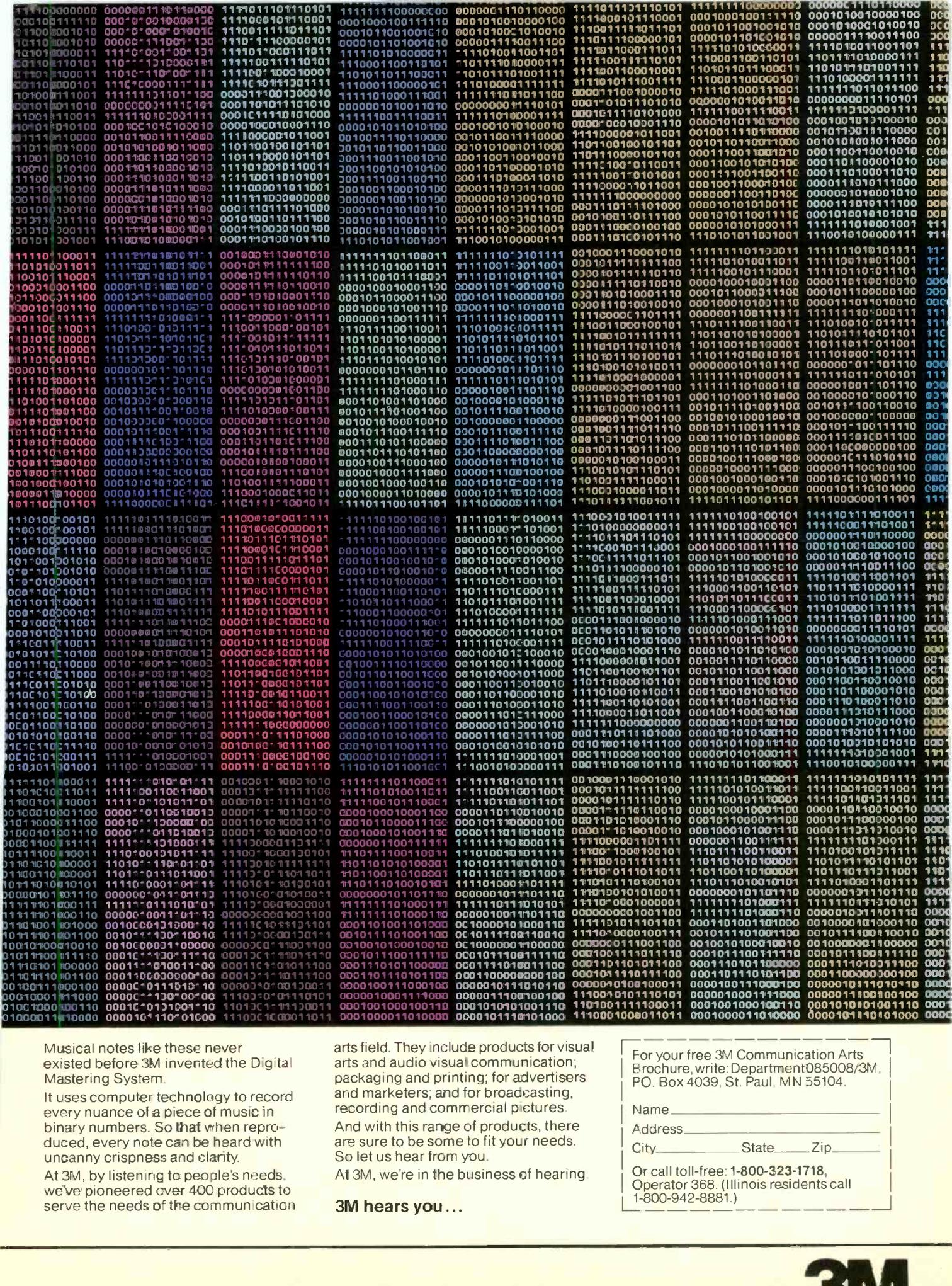
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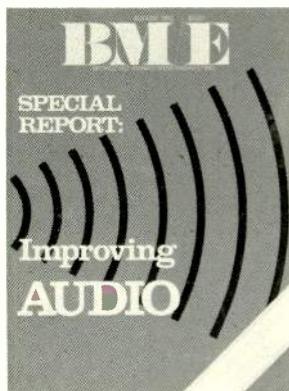
Circle 101 on Reader Service Card



BM/E

BROADCAST MANAGEMENT ENGINEERING

AUGUST 1982/VOLUME 18/NUMBER 8



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THE SOURCE—BM/E's buyer's guide to hundreds of manufacturers and services for the broadcast industry.

The **NEW GREAT IDEA CONTEST** has **EVEN BIGGER PRIZES!** Details on p. 93.

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Publishers: **BM/E—Broadcast Management Engineering**
BM/E's World Broadcast News



BM/E BROADCAST MANAGEMENT ENGINEERING (ISSN 0005-3201) is published monthly by Broadband Information Services Inc. All notices pertaining to undeliverable mail or subscriptions should be addressed to 295 Madison Ave., New York, NY 10017. BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities in the U.S. and Canada. These facilities include AM, FM and TV broadcast stations, CATV systems, ETV stations, networks and studios, audio and video recording studios consultants, etc. Subscription prices to others \$24.00 one year, \$36.00 two years. Foreign \$30.00 one year, \$48.00 two years. Air Mail rates on request. Copyright 1982 by Broadband Information Services, Inc., New York City. Second class postage paid N.Y., N.Y. and additional mailing offices.

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Who Speaks for Audio?

SOME SIX YEARS AGO, members of the AES (Audio Engineering Society), concerned about the rapid proliferation of digital recording formats then under development and recognizing the ultimate value of the digital recording process, began working on a standard for the digital audio signal. Unfortunately, an over-zealous Justice Department took up the cause of a group of manufacturers who felt they were being by-passed, and cautioned AES that its standards-setting activities would be in violation of anti-trust statutes. As a result, the Society's standards-setting movement came to a virtual standstill.

In the light of the new marketplace philosophy and relaxed government interference, and prompted by the success of organizations such as SMPTE in establishing digital video standards, the AES has renewed its efforts.

At present, the Society has two working groups attempting to gain a consensus in the industry about various proposed standards. At the end of their work, assuming that a consensus is indicated, the groups will draft recommendations which will be voted on, and it is hoped ratified, by the Society's members.

Of the two, the working group on sampling frequencies, headed by Emil Torick of the CBS Technology Center (see "Digital Audio: A View of Today and Tomorrow," *BM/E* Feb., p. 43), is the furthest along. Having spent what seems to some to have been a lifetime deliberating among the various proposed frequencies, the group appears to be on the verge of finally drafting a document calling for a 48 kHz sampling frequency standard. This was one of two frequencies which SMPTE had suggested could be interfaced easily with a digital video standard. It is also the frequency which virtually every manufacturer of digital audio equipment has indicated would be acceptable. Even most Japanese manufacturers, who had originally favored higher sampling frequencies of 50, 51, and 52 kHz, are virtually unanimous in saying they would adopt 48 kHz. There is, then, agreement within the industry that the digital sampling frequency will be 48 kHz. Clearly there is a consensus. All that remains is the Working Group's formal standards proposal and the industry vote.

The other working group, headed by Alistair Heaslett of Ampex, is only just getting started in its work—defining the digital interface that will allow one piece of digital equipment to speak with another no matter what the actual format of the individual system. It is this I/O interface that will eventually allow digital ATRs to interface with digital audio processors and digital video recorders and even with digital transmissions. This will become the universal language of digital audio, permitting interface with international program sources (with which the 48 kHz sampling frequency is already compatible).

What the AES must now do is take a cold, hard look at itself and define, as quickly as possible, how it can fulfill its standards-setting responsibilities. As the government backs away from its regulatory and standards-setting role and looks increasingly towards the marketplace to define the rules, it becomes imperative for organizations such as AES to pick up the banner. The same unfortunate outcome of the AM stereo issue must not be allowed to happen to digital audio. Future digital audio developments depend on the speedy development of digital audio standards.

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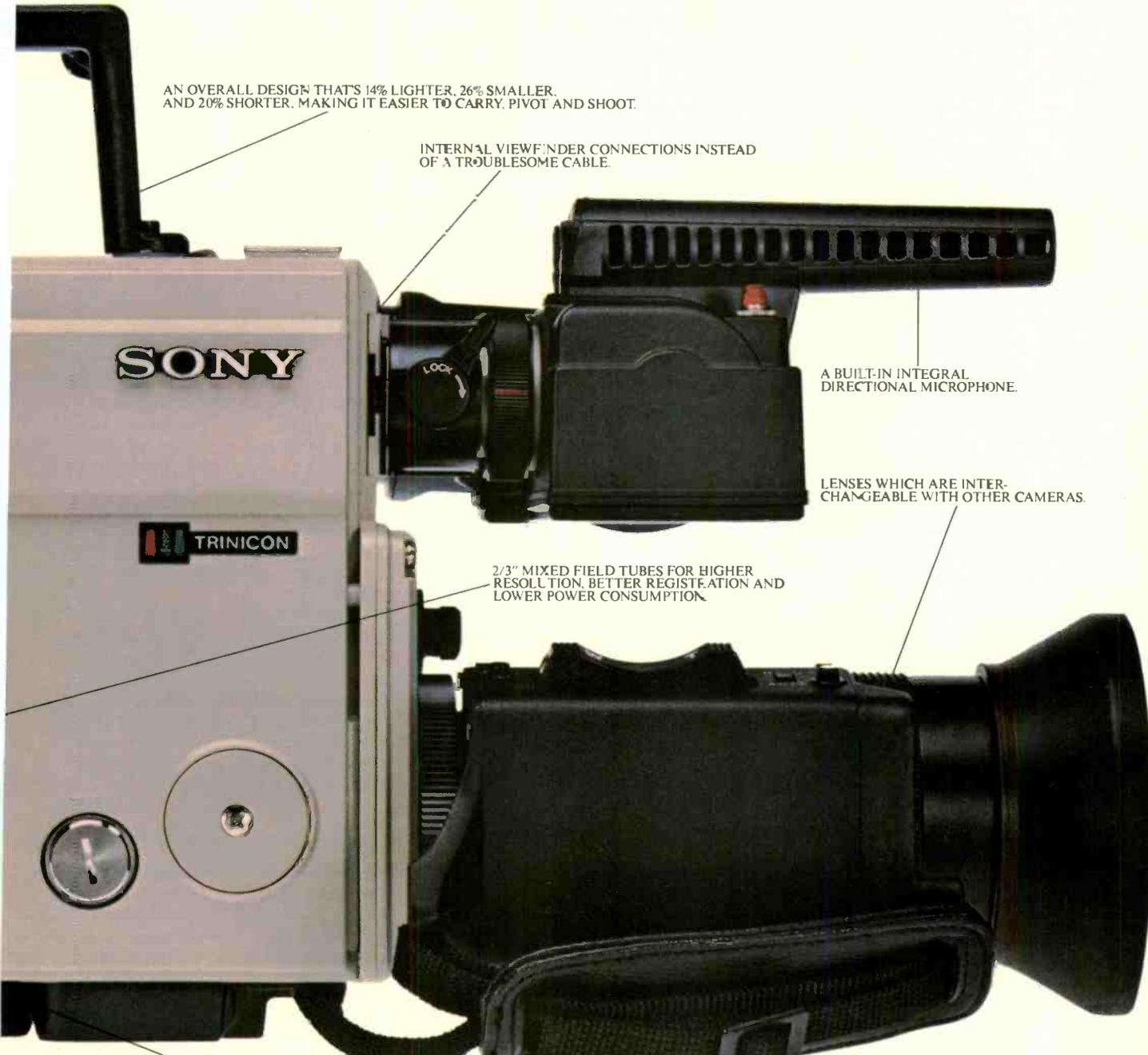
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FCC Unanimously Votes Green Light for DBS

The 12 GHz band has been opened up for interim direct-broadcasting satellite service in the U.S. by unanimous vote of the FCC, to the delight of applicants for DBS systems and the consternation of terrestrial microwave users who currently occupy the band.

Broadcasters also had negative reactions to the FCC move, with NAB terming the action "in direct conflict with [the FCC's] mandate for adequate spectrum management." The association's statement continued, "DBS will hoard the significant amount of 12 GHz spectrum space, leaving little for the current users . . . It will impair the growth of rural broadcast service, and stifle the development of high definition television."

The fate of the terrestrial microwave users had been one of the biggest obstacles in the DBS rulemaking, since the two services would be mutually exclusive. Under the new decision, the microwave users will have to relocate at their own expense, probably to the

12.7 to 13.25 GHz band, over a five-year period. Final determination of their fate will wait for study from the Office of the Chief Scientist, which is analyzing the best position for current users. That report is due in September, 1983.

Even DBS applicants are not all pleased about the way the microwave issue is being handled. Satellite Television Corp., the Comsat subsidiary that was the first to propose a DBS system, reportedly feels that the five-year period is too long and may impede the rapid growth of DBS. (STC recently acquired 36 acres of land near Las Vegas for its planned broadcast center.) Some observers feel that if the microwavers move too slowly, DBS operators may reimburse them to hasten the change of frequency.

The FCC's move opened up 500 MHz of spectrum in the 12 GHz band for downlinks and 500 MHz in the 17 GHz band for uplinks. It set license terms at five years, but imposed no ownership restrictions, technical standards, or guidelines for what type of

service may be offered by DBS operators. The Commission refrained from speculating on the possible effects of DBS on broadcasting, but said that the possible benefits of the new service were such that it should be authorized "in the absence of evidence of an adverse effect." The 500 MHz allocation, the FCC said, would maximize the number of channels receivable by a single dish, lowering viewer costs and increasing competition.

'82 Ad Revenues to Rise Despite Sluggish Recovery

"Advertising in 1982 will certainly grow much faster than the economy," predicted Robert J. Coen, senior vice president of McCann-Erickson USA, at a recent briefing for investment analysts and the business press in New York City. He predicted an average growth of 10.4 percent in advertising in 1982, compared to a 5.6 percent growth rate in the economy as a whole.

Broadcast advertising, however, will do even better, according to Coen, with all categories except spot radio expected to grow 12 to 13 percent over last year. The nine percent growth rate predicted for spot radio is still significantly higher than estimated GNP growth, however, and political spending in this election year may help the picture, Coen suggested.

Network TV ad revenues in the first four months of 1982 rose an average of 13 percent, Coen explained. In the first quarter, spot TV revenues rose 21.5 percent.

A particular area of interest is advertising for video games, which was about \$2 million in 1978. That figure doubled in 1979 and again in 1980, then jumped almost fivefold in 1981 to \$39.3 million—about 90 percent going to television, Coen estimated. Expenditures this year could easily exceed \$100 million, he stated.

Supreme Court Will Rule on Home VCR's Legality

The Supreme Court, in response to a petition from Sony Corp. of America, has agreed to review a lower court decision that found home taping of television programs an infringement of the copyright laws. The case will come before the court next winter, with a final decision unlikely before next summer.

The case, originally brought by Universal Studios and Walt Disney Productions against Sony, its advertising agency, and four Betamax retailers,

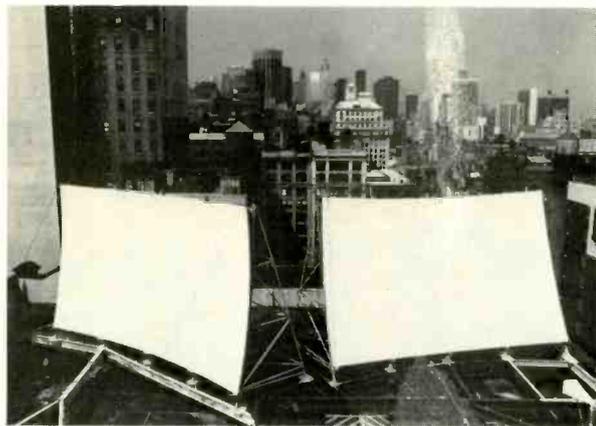
Earth Station Design Wins Engineering Award

An innovative earth station installation in New York City has won one of its designers an engineering award. Robert C. Tenten, director of engineering at Manhattan Cable TV, was honored for excellence in earth station technology by the New York State Commission on Cable Television and the New York State Cable Television Association.

Tenten was cited for his work on Manhattan Cable's new

twin antennas, located atop its downtown headquarters. Each spherical antenna measures 22.5 feet tall and 36 feet wide and is capable of receiving multiple satellite feeds simultaneously. Between them, the two are designed to allow the company to receive up to 38 satellite signals at one time. Each accommodates as many as 19 feed horns.

At startup time, the earth station was equipped to receive signals from seven

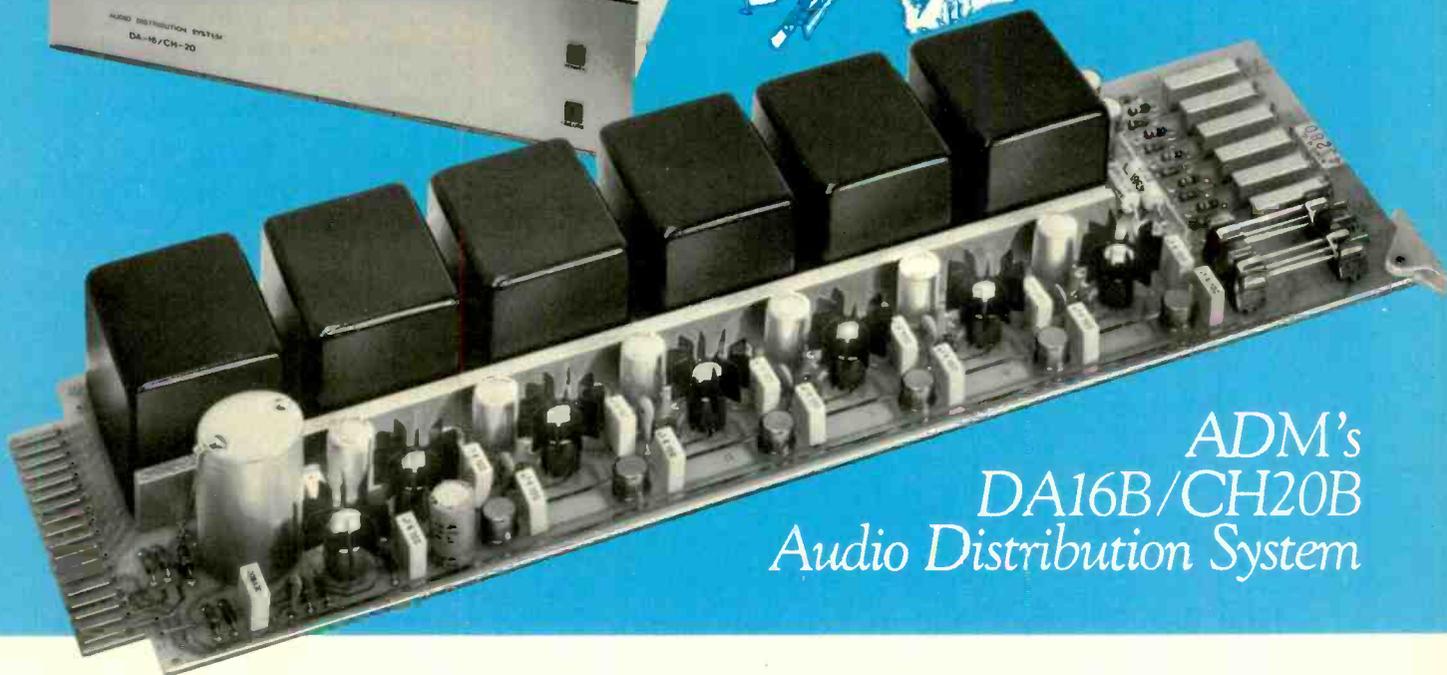


Manhattan Cable TV's twin spherical antennas can receive up to 38 satellites.

satellites—RCA's Satcom 1, 2, 3, and 4, Western Union's Westar 3 and 4, and ANIK 2.

U.S. Tower Co. of Miami, OK, built the antennas to Tenten's specifications and oversaw installation and testing. Tenten, who assisted closely in the conception, design, and development of the earth station, also bore the responsibility for site selection, construction scheduling, and designing the facility.

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charged that home taping constituted unfair use under the copyright laws and claimed Sony was responsible since it knew its products would be used to break the law (see *BM/E*, December 1981, p. 10). The U.S. district court in Los Angeles found against the plaintiffs, but an appeals court in San Francisco overturned that ruling and sent the case back to the lower court for remedy.

As expected, Sony was delighted with the Supreme Court's acceptance of its petition. Company president

Kenji Tamiya asserted, "This case raises important questions affecting the rights of American consumers to utilize and obtain the full benefits of television programs distributed over the public airwaves."

On the other side, the Motion Picture Association of America was less than pleased, with its president, Jack Valenti, commenting that the issue "falls within a congressional province, not a judicial one."

Congressional action remains a strong possibility, however, although

some observers feel Congress may wait for the Supreme Court decision before acting. Two basic remedies have been proposed: writing a home use exemption into the copyright law (favored by the VCR manufacturers) and imposing a tax on all home VCRs and tapes sold, with the proceeds to be divided among program copyright holders (favored by the motion picture industry). Proponents of both solutions recently debated before the Congressional Arts Caucus, with Valenti stating that increased VCR penetration will lower TV ad rates because viewers can edit out commercials. Charles Ferris, the former FCC chairman and now attorney for the Home Recording Rights Coalition, claimed that remote control devices have allowed viewers to avoid commercials for years.

Committee Skips Flaherty; Coleman May Head SMPTE

The SMPTE nominating committee has selected Len Coleman, the society's financial vice president, as its choice for the organization's presidency, bypassing executive vice president Joseph Flaherty of CBS.

Flaherty had been considered a prime candidate to succeed current SMPTE president Charles E. Anderson of Ampex Corp. While conceding that the committee's decision was "controversial," Anderson stated, "It would be entirely inappropriate for me to comment" on possible reasons for Flaherty's omission.

Some observers, however, feel that Flaherty may have been too outspoken for some in the organization. Flaherty is seen as having a strong pro-video stance that does not sit well with SMPTE's film constituency; he is also an active proponent of high definition television, which some broadcasters view as a possible threat.

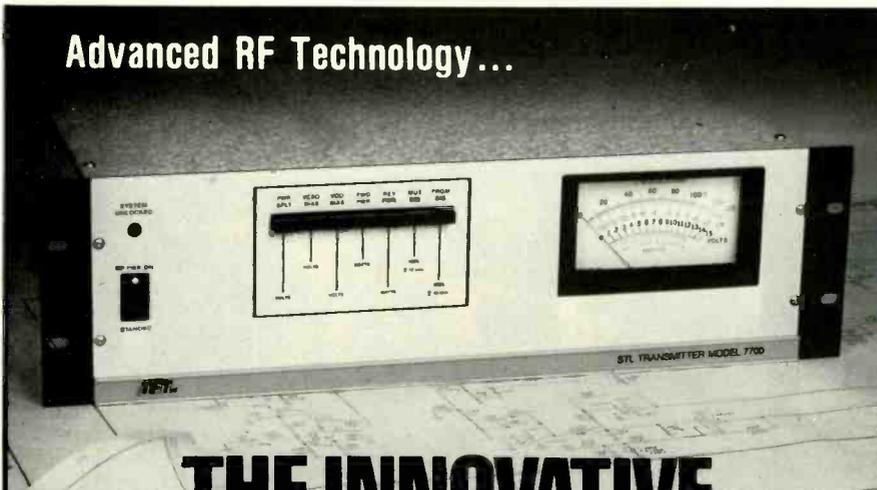
Anderson pointed out that the Board of Governors, if dissatisfied with the nominating committee's list of prospective officers, can delete a name and add another by a three-quarters vote. Also, he said, any member of the society can be nominated by petition; at press time, Anderson believed that a petition to nominate Flaherty was being circulated.

Sony Switches Format on Half-Inch Recorder

Claiming that it is giving broadcasters more of what they want in a half-inch recorder/camera, Sony has adopted a different format for the recorder section of its Betacam system.

"We are not going to manufacture the product we introduced at NAB

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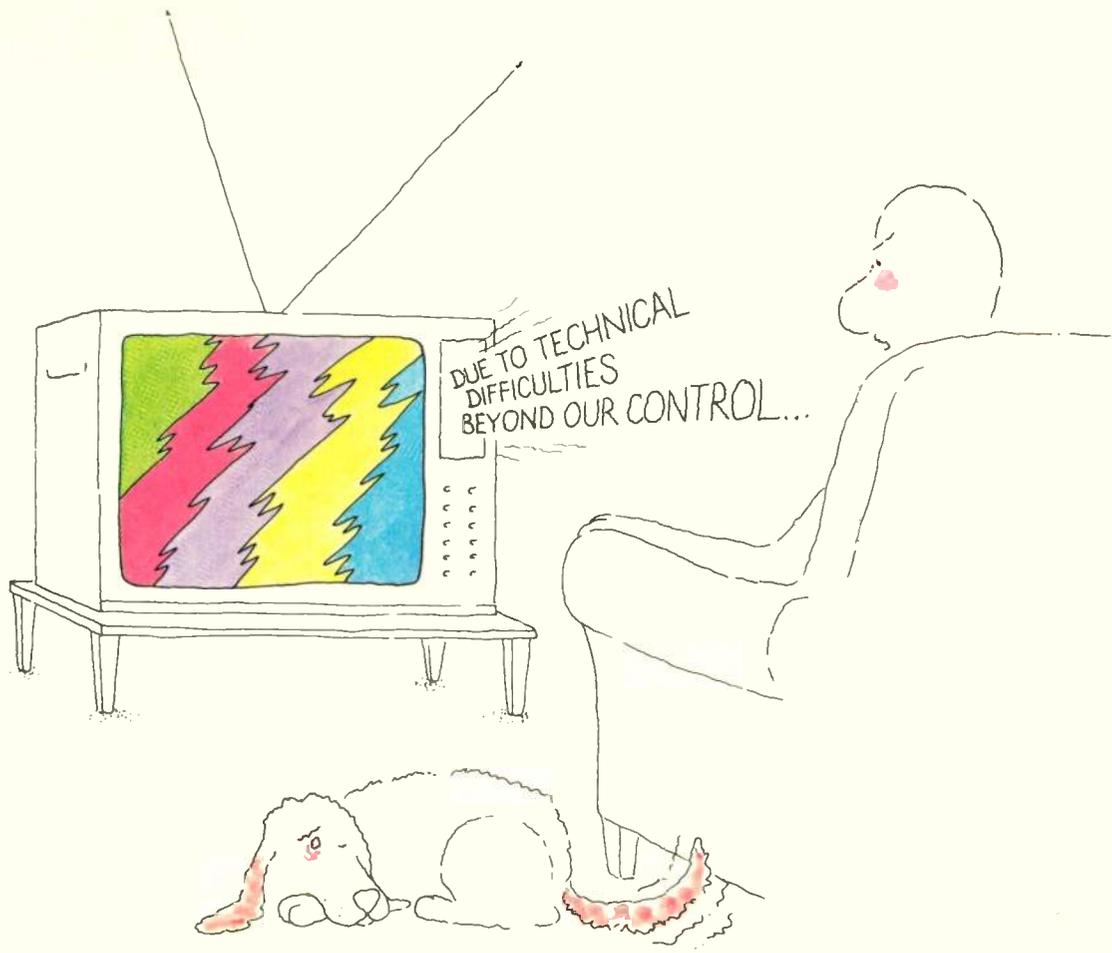
- IF modulated transmitter improves S/N
- Pulse counting discriminator in receivers reduces audio distortion
- Automatic switch over on redundant hot stand-by systems maximize on-air time
- Frequency synthesized transmitters improve frequency stability
- Phase linear filters improve stereo performance
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[1981]. Instead, we will have a new format that has advantages in performance and is adaptable to new worldwide digital standards," Sony Broadcast Products Co. President Neil Vander Dussen announced recently.

Pointing out that Sony has used SMPTE guidelines in making the changes, Vander Dussen added, "The user has told us to go a different way and we've decided to follow that direction."

Sony's move has done nothing to clarify the half-inch VTR standards

bind that SMPTE has been trying to unravel. RCA and Panasonic, together with Hitachi and Ikegami, have petitioned SMPTE to accept their VHS half-inch format as the sole recorder/camera standard. But now Sony has made a counterproposal to the society, basing its argument on Sony's adherence to SMPTE half-inch guidelines.

Meanwhile, the VHS camp has gained a heavyweight backer in the form of Ampex Corp., which has announced it will market the "M-format" half-inch recorder/camera, the Matsu-

shita (Panasonic) system. Ampex will initially market units produced by Matsushita, but intends to manufacture its own version in the future.

Sony has opted for a component recording scheme that uses Y, R-Y, B-Y components and a system of time division multiplexing. The format includes time compression for the R-Y and B-Y signals. According to Sony, the benefits of this approach compared to frequency division multiplex or line sequential time division multiplex are potential commonality among NTSC, PAL, and SECAM, simple interface with the world component digital standard, plus extended and equal chroma component bandwidths.

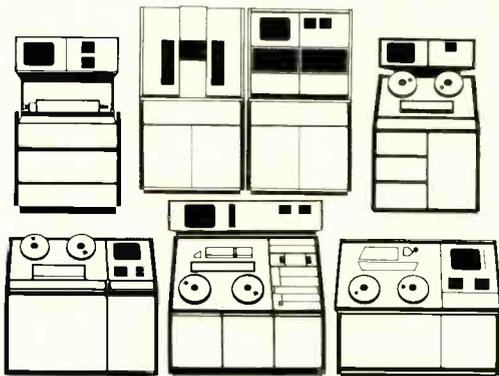
The SMPTE Working Group charged with defining a standard for the half-inch recorders met again in late June to receive the Sony proposal. At its next meeting, August 25 in Chicago, the group will decide on which of the two formats—VHS-based or Beta-based—to suggest as a proposed standard. According to Alex Alden, SMPTE's manager of technical services, the group will almost certainly adopt the VHS type as one of its standards. "But if Sony actually has two or three manufacturers supporting its systems, as it claims," said Alden, "and there is a substantial technical difference between the two formats, then SMPTE will propose standardizing both and letting the marketplace decide." Alden also suggested that if the quarter-inch format being developed by Bosch were presented formally, an other group within SMPTE would certainly review it toward a third standardization proposal.

Godsey Leaves RTNDA; Mell Assumes Presidency

Dean Mell, news director at KHQ-AM/FM/TV, Spokane, assumed his duties as president of RTNDA four months ahead of schedule following the recent resignation of his predecessor, Wayne Godsey. Godsey had stepped down from the post due to his promotion to vice president and general manager of WTMJ-TV, Milwaukee.

Mell, an RTNDA member since 1973, has served the organization as chairman of the investment advisory committee, regional director, and executive committee member. He became president-elect last September and was to have become president when Godsey's term expired in October.

In resigning, Godsey told the board of directors, "I feel strongly that a working news director should be the spokesperson for the organization even though our constitution would permit me to continue to serve as president."



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BUSINESS BRIEFS

Developments involving people in the broadcast industry are highlighted by the appointment of **William Madden** as manager of the newly created Broadcasting and Related Products Department of 3M's Memory Technologies Group. This department includes international Tapetronics, a 3M subsidiary.

Chyron Corporation has appointed **Roi Agneta** to VP, engineering of the TeleSystems Division. . . . At Conrac Corp., **Warren O'Buch** has been named marketing director of the Conrac Division. Precision/Echo has an-

nounced the appointment of **Thomas Parkinson** to VP, marketing.

Two new appointments took place at CEI: **Alan Sheffield** appointed to national sales manager, and **Donald Kline** appointed director of advanced technical development. . . . Comark Communications names **Nathaniel Ostroff** as a member of the board of directors and as operating VP.

Vlahos-Gottschalk has undergone three personnel changes. **Petro Vlahos** is now board chairman, **Paul Vlahos** is now president, and **Pat Smith** moves

from sales manager to VP. **Mario Dieckman** is now VP, marketing for Oak Communications. . . . Comsat elected **Alfred Statham** as VP, corporate affairs; in a related development at Comsat General TeleSystems, **Harold Detlefs** has been appointed VP, marketing.

CBS has elected to install **ADDA's** ESP Still Store systems in its New York broadcast center. In addition to the ESP 750C, it will also install the VIP Digital Video Effects equipment. . . . The New York City Motion Picture Film Editors Union has taken delivery of a **Convergence ECS-103A** editing system. . . . Four new **Dubner Computer Graphic Systems** have been sold to KOMO-TV Seattle, KTVA Anchorage, One Pass Video San Francisco, and Video Post and Transfer, Dallas.

The Voice of America (VOA) has contracted **Logitek Electronic Systems** to manufacture custom audio distribution and monitoring equipment valued at over \$175,000. It will be installed in VOA's new master control facility in Washington, DC

Sony has sold four new BVH 2000 Type C one-inch VTRs to Sun TV in Los Angeles. The new units will be installed in a 40-foot remote truck. . . . Panavideo TV production house has purchased a complete one-inch videotape production and editing system from Sony, including a BVE-5000 editor, three BVH-1100As, and a BVU-800 ENG editing system.

Western Union has sold two transponders on Westar IV to Equatorial Communications Services headquartered in Sunnyvale, CA. . . . **M/A Com DCC** has formed a 24-hour customer service department to handle satellite communications assistance such as spares and replacement parts, warranty repairs, and training. . . . Ford Aerospace, General Electric, Hughes Aircraft, and RCA Astro Electronics have submitted bids to **Satellite Television Corporation (STC)** to construct direct broadcast satellites for STC's satellite to home pay-TV service.

The Warren/Van Pelt Association has a syndication service for smaller market stations that features a maintained playlist, rotation instructions, and copies of all new records added to the list. . . . **The Royal Group**, a new firm in Salt Lake City, has announced two new radio sales programs. Both programs are designed for News/Talk, Adult Contemporary, and MOR radio stations.

A new post-production company has been started by two editors, David Dee and Stan Siegel. It is called **Even Time, Inc.** and is located at 350 West 46 St., NY, NY 10036.

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For starters, the HL-83 is extremely compact and well balanced. It's about the size of competitive one-tube cameras—yet, it's a top quality, three-tube, prism optics design that's truly up to the highest broadcast standards. And it uses proven, readily available components. Inside are $\frac{2}{3}$ " Plumbicon* or Saticon** pickup tubes coupled to

advanced Ikegami circuitry that delivers usable pictures in low light with up to 18 dB of gain. Automatic white balance corrects colorimetry over a wide color temperature range with the touch of a single button—there's no need to fumble with filters. The HL-83 is ready to go when you are—where you are. Simple to set up. Simple to operate. Get set for the action in the standby mode and the camera's up and air-ready in less than two seconds when you hit the switch. And you can keep on shooting for up to 3 hours with an on-board 4 lb. Nicad battery.

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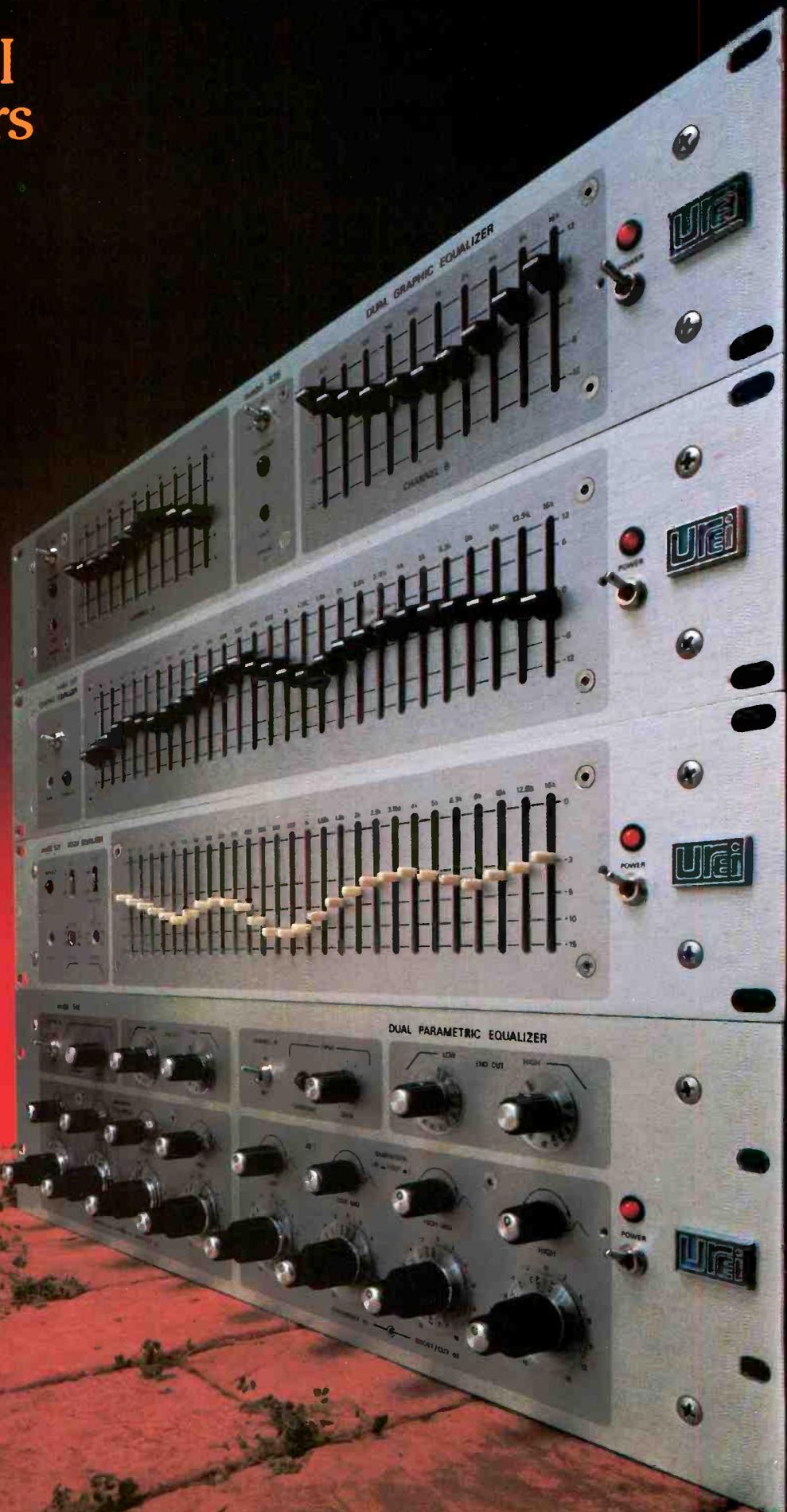
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RADIO

programming & production

NPR Fills Void in Sunday Programming

NATIONAL PUBLIC RADIO'S reputation as an innovator is well known since it became the first full-time, full-service satellite radio network in the United States in 1980 (see *BM/E*, October, 1978, p. 39). NPR continues to make pioneering moves with its new programming package, *The Sunday Show*. The show runs from noon to five o'clock every Sunday, presenting both live and taped material that explores the state of the arts in all forms, from poetry readings to classical music performances, including artists from Frank Zappa to Igor Stravinsky.

"The show started about two years ago as a survey to determine the type of programs member stations wanted during weak Sunday afternoon segments," says Jan Hausrath of NPR Public Information. By and large, what was asked for were arts and classical

programs to supplement what the local affiliates had already scheduled.

Many of these stations have limited staffs and require that the entire show be sent from the outside. Thus it is designed so that an affiliate can take two, three, or the complete five hours of the program. As of the April 4 debut, 145 out of NPR's 260 affiliates were taking the show, and of those 145, 90 were broadcasting the entire five hours.

Each week's broadcast is made up of a number of different segments. Independent producers, from both the affiliates and elsewhere, contribute their efforts, as do the staff producers in Washington, DC. The number of segments in any show depends on the length of the principal event—generally a live performance—but there are regular features with prominent artists presented on a weekly basis.

Scene from Verdi's opera "Ernani," the subject of a behind-the-scenes-look from NPR.



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RADIO PROGRAMMING



David Ossman, charter member of the Firesign Theater, produces *The Sunday Show*.

For instance, Connie Goldman, in her series "Faces," is the arts reporter who has interviewed actress Claudette Colbert, poet James Dickey, and actor Richard Dreyfuss. Another continuing feature is "Audio Art Gallery," with works created for radio by leading audio artists. Fred Calland's "Crazy Quilt" is a regular in the series and is a general potpourri of radio programming.

Special events are also scheduled for holidays and anniversaries such as the Fourth of July and Easter Sunday. On Halloween, the network will broadcast a new thriller written especially for radio in what NPR calls a "three dimensional binaural broadcast for stereo headphones."

David Ossman is both host and executive producer. Ossman is a charter member of the original comedy group The Firesign Theatre and a veteran radio announcer. He meets daily with his staff of about 15 to discuss ideas for each week's show.

Each person at the meeting represents a different category for the network, such as music, art, drama, or other spoken material. At the meeting the production ideas are evaluated in terms of the cost of producing the new segment vs. material already on hand, as well as how the idea will fit into a show with a special theme such as the Halloween Special or the Stravinsky Centenary Concert scheduled for June 13, the producer explains.

At least one major event is scheduled each month, providing Ossman with a central theme on which to build the programming while also offering flexibility for the remaining weeks of the month.



Poet James Dickey appeared on Connie Goldman's interview series "Faces."

Funding for the programs is achieved in two ways. The news and information segments of the broadcasts are underwritten by various companies and contributors with up to \$250,000 in exchange for mention during the day of the program. The second fund, for the performance phase of the program, comes from grants from government organizations such as the National Endowment for the Arts. All money goes to the NPR performance fund and to the Corporation for Public Broadcasting (CPB).

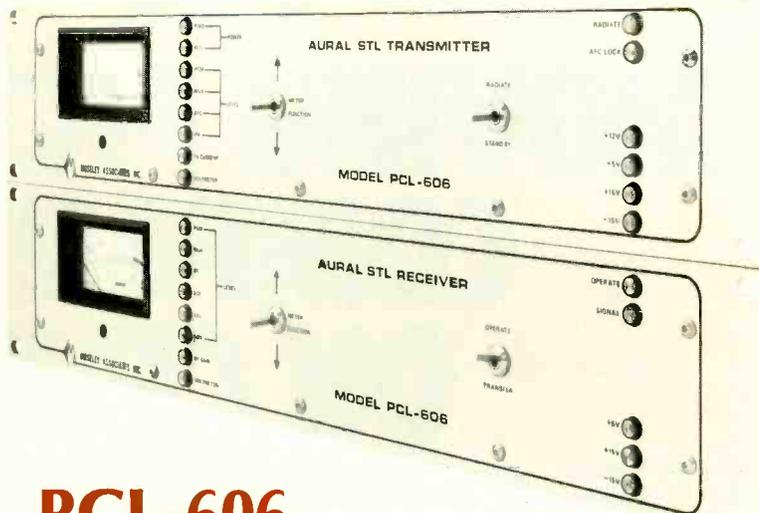
Additional funding will be generated by a new agreement with Western Union whereby excess capacity on satellite channels leased by CPB will be made available to commercial users for the first time. Both NPR and Western Union will be able to market space segment capacity and ground facilities to commercial users, whereas previously they had been restricted to the distribution of non-commercial programming.

The affiliates of course, all receive the satellite broadcasts live. For those who do not have earth station facilities, an arrangement is made with a nearby station with such facilities to receive the signal and relay it to the NPR affiliate via landlines.

With the successful launching of the program on April 4, the network has continued to devise new ways of expressing new ideas. This is the type of innovation that speaks well not only for NPR, but for the future of radio programming as well. NPR director of performance programming John Bos claims, "The Sunday Show is a departure for public radio, one we hope will not only generate involvement from America's arts community but also provide a unique listening experience for the audience."

BM/E

#1 PERFORMER



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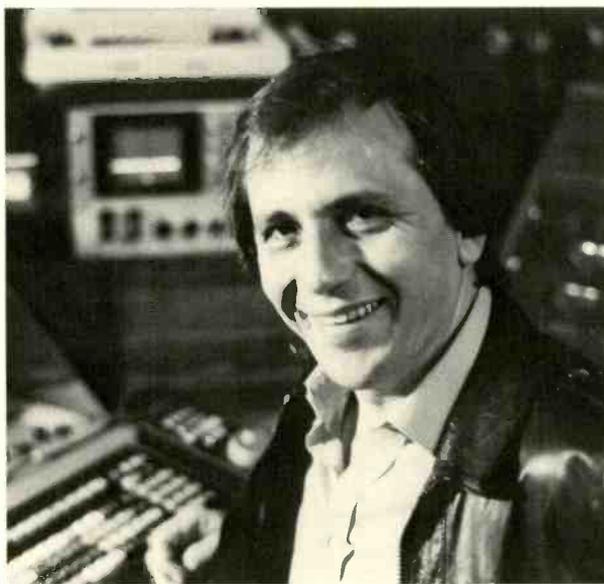
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machines without repatching control cables.

"After a year of operation, due to growing business demands, we decided to install another edit suite. Again, we carefully examined the available editing system to see what was new. We bought another CMX. This second system enabled us to exploit another facet of 340X flexibility. We were now able to delegate machines from one system to the

other as the specific job dictated. System one has three format 'C' VTR's and one quad interfaced. System two has three format 'C' and one format 'B' interfaced. With this mix and the ability to delegate, we haven't yet been caught out by the proliferation of formats, we just 'switch and mix' machines as required.

"Shortly we shall be looking to update our quad edit suites with 'the new technology.' Although we will again look carefully at the market place, it's reassuring to know that so far we have made the right choices with CMX."

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TELEVISION

programming & production

Music Television: Radio Goes Video

CABLE TELEVISION has enjoyed a freedom from program regulation unknown to—and envied by—its over-the-air competitors. A good example of programming that has taken advantage of this freedom is Music Television, the year-old entertainment channel from Warner Amex Satellite Entertainment Co. (WASEC). Innovative in both programming ideas and technology, MTV is heavily indebted to FM radio for its format and operation.

“MTV is simply a radio station with video,” explains Andy Setos, WASEC’s vice president for engineering and operations. The programming consists primarily of what Setos calls video clips, short (four minutes, average) videotapes of rock musicians in performance. The clips are produced by record companies for various promotional uses. In between songs appear

MTV’s video jockeys (VJs, as they are known), commercials, animated jingles, and IDs. The cable operator gets two minutes of local availability per hour; WASEC sells six minutes of national advertising. A smaller portion of the programming includes rock concerts (either taped or live) and interviews with rock personalities.

A special and highly promoted feature of MTV is its audio—top-quality, Dolby-encoded stereo. During the planning for MTV, WASEC realized that stereo was essential for success with young (18–34) rock fans. To bring the stereo audio into subscribers’ homes, WASEC decided to hook into customers’ FM receivers.

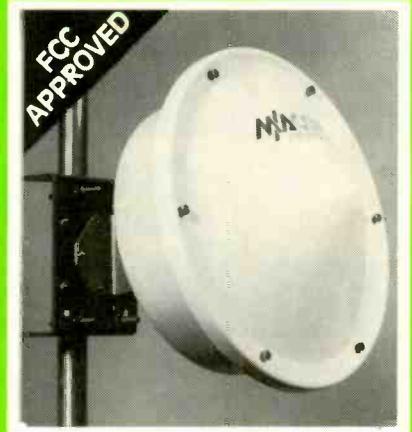
“We found that in the 18–34 age group, which is our audience, 65 percent of cable homes had the stereo in the same room as the television set,”



In MTV's control room, operator segues from one video clip to the next with GVG switcher. Preview monitor is on the upper left, with program monitor next to it.

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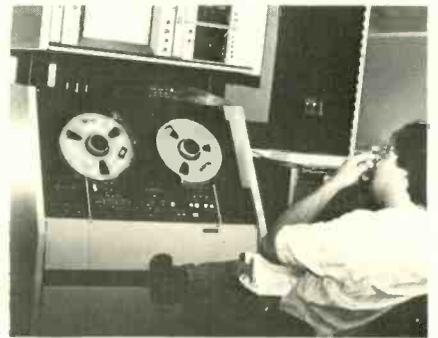
TELEVISION PROGRAMMING

Setos reveals. "We were very heartened by this because it indicated to us that stereo could be as important to MTV as color is to television."

Cable operators who take the service buy a black box that receives the satellite-transmitted audio signal and modulates it into an FM broadcast signal, which goes out over the cable to the FM receiver, where it is received on an unused frequency. This "stereo transmission processor" is available from two manufacturers, Learning Industries of Costa Mesa, CA, and Wegener

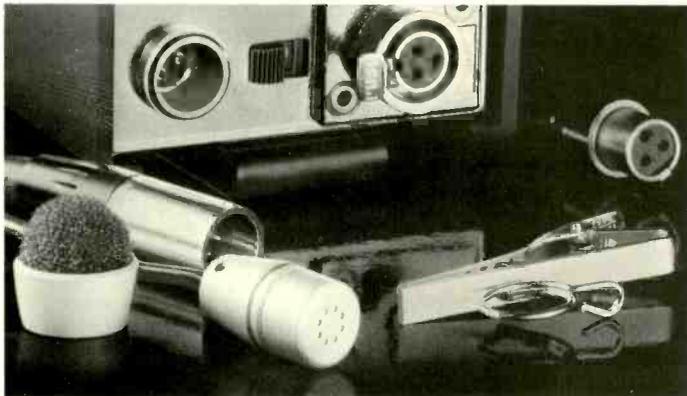
Communications of Norcross, GA, for about \$1500. WASEC strongly urges MTV affiliates to invest in the equipment.

To compensate for CATV operators who balk at providing the stereo hook-up, MTV's signal is fully compatible with regular television audio. "We didn't want to invent a new box," Setos states. "We had to be compatible because MTV had to grow very, very quickly. Otherwise, doing something like this is a very expensive proposition." At press time, MTV was on over



Operator edits interstitial material for *The Movie Channel* between VPR-2 and ACR-25.

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The CO94 also offers exceptional powering flexibility. It can be powered by a standard 9-volt radio-type battery. Or it can be phantom powered from a mixing board, recorder, or in-line supply. The 9-volt battery can even be used as a redundant

power source to "back-up" the phantom power. Plus, the CO94's advanced electronic design permits powering from virtually any DC power supply, capable of delivering between 8 and 50 volts. The internal regulation and filtering will make the CO94's impedance converter swear it's being powered by an over-priced import supply.

These and many other performance features set the CO94 a giant step above the other miniatures you previously had to choose from. The CO94 is a versatile new kind of tool, and just one more reason why you should think of Electro-Voice as your microphone expert.

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600 cable systems with 4 million homes.

MTV goes to great lengths to insure the quality of the audio it transmits. The company pays the record companies to make top-quality dubs of the master tapes, all Dolby-A encoded at 15 ips on quality tape. The tapes then go to Regent Sound in New York City, where they are carefully synced to the monaural track on the videotape. Regent's computers are used to improve the lipsync, if necessary.

Equal time for video

Audio isn't the only part of the MTV product that gets scrupulous attention. The video clips (which cost the record companies anywhere from \$10,000 to \$50,000 to produce, according to Setos) reach MTV in a variety of forms—all tape formats as well as film. Image Transform of Los Angeles transfers the tapes to one-inch, color-correcting and noise-reducing the video by its proprietary methods. The services of Image Transform and Regent Sound are essential to MTV's operation, Setos declares: "Without them, I would have had to start a whole new operation."

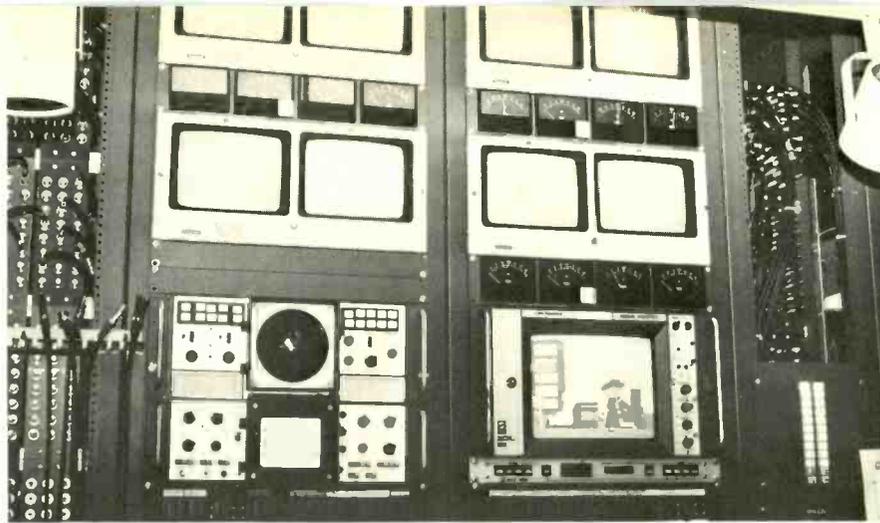
Once the videotape has been synchronized with the audio, MTV titles each clip at the beginning and end with the artist, album name, record company, and copyright owner. MTV's library currently contains about 600 clips produced in this fashion.

The video jockeys are pre-taped in MTV's New York City studio. Because the VJs are taped only 24 hours in advance, their comments can be topical. To contribute to the live feeling, all mistakes are left in.

Putting it together

All the elements for MTV converge at WASEC's new Smithtown, NY, plant on eastern Long Island. Three WASEC services—The Movie Channel, Nickelodeon (a children's channel), and MTV—currently operate out of the Network Operations Center,

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Transmission area for all three channels now on line. Monitoring is by Tektronix and Panasonic.

which occupies 15,000 square feet of the four-acre site. The center will eventually house as many as 10 cable services.

The area had been home to an "antenna farm" of longwire antennas from World War II (now being dismantled), so director of engineering Dom Stasi felt that local residents would raise few objections to the electromagnetic radiation from the satellite transmitting dishes.

Other RF users, however, lost no time in filing 66 interference objections. Most of these were cleared "right away," Stasi says, and eventually all were settled using Compucon's computer facilities in Dallas. A sign of the site's success is that both HBO and Reuters are putting in satellite facilities nearby.

The antennas and buildings were designed as a unit, with each element placed to give a strong diffraction mechanism, resulting in high interference loss. According to Stasi, the "double diffraction" design relies on the rear wall of the building as the main diffracting mechanism, with fencing providing the rest. Total loss is about 60 dB.

Actually, the building forms the interference block for the two 11-meter dishes. These in turn block interference from the seven-meter dish, a TVRO that is being modified to serve as a receiver on an occasional basis, pending FCC approval. Stasi says this dish will be the first transmitter smaller than nine meters to be approved by the FCC for fixed service.

All satellite equipment is from Scientific-Atlanta. The large dishes simultaneously transmit and receive through four-port feed horns and orthogonal transducers; they have cassegrain feeds.

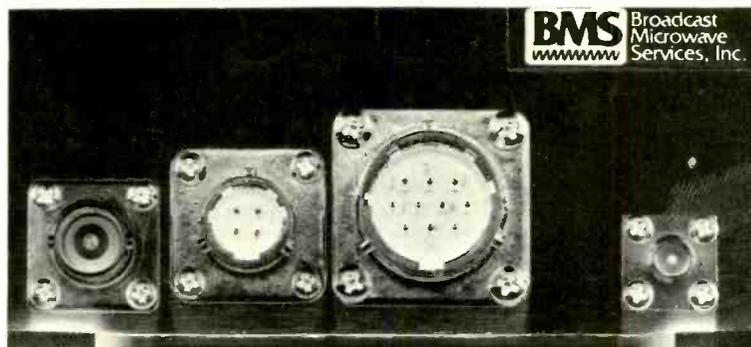
Video adds a dimension

Inside the center, every effort was made to insure that the high quality of the original video and audio would reach viewers unchanged. According to Setos, the MTV operation was de-

signed so that the limiting factor in quality would be the original material, not the studio or transmission equipment. MTV goes to the satellite from a control room equipped with a Grass Valley Group 1600 1X switcher with a DVE Mark II, which provides various digital effects for visual segues. (The less complex Nickelodeon and Movie Channel employ Image Video switchers.)

"In radio there's only one dimension—you time the dissolve and that's it," Setos says of the segues. "In television we have many more possibilities. We can cut, dissolve, wipe, do soft wipes, and do digital effects with

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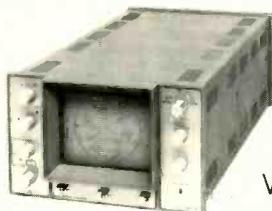
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TV PROGRAMMING

the DVE. In addition, we can do L cuts, little talk-overs in which the music is under the jockey. It runs just like a radio station, with all these elements available to the operator in real time and on a random basis."

Stereo on cart

Also in use are two unique Ampex ACR-25 cart machines, specially modified for stereo by Ampex. (A third stereo ACR-25 is in service at the Movie Channel; the three are the only stereo ACR-25s in the U.S.) Each ACR holds 24 six-minute carts at a time and is associated with a VPR-2B reel-to-reel machine. The VPRs hold the tapes of the VJs and the longer programming, such as concerts (for this purpose they operate with a BVU-200 as backup; automatic switching is provided in case any major parameter is lost).

Other equipment includes Leitch Video sync generators and timing equipment, Tektronix 1900 Series test generators, GVG video DAs, and Drake audio DAs, used because they are readily available in stereo. Stasi says that PPMs are used exclusively for audio because they more closely simulate the human hearing response.

The transmitter room initially contained seven Varian transmitters but three more are due to be installed. Transmission is all Dolby B-encoded; Setos says MTV is the first national network, radio or TV, to use Dolby FM.

Reliability is essential for a live service such as MTV, and for that reason the RF and video sections of the plant are both fully redundant. In addition, temperature and humidity are individually controlled for each room. Biocell air filters filter all air for technical spaces, resulting in what Stasi calls "the cleanest air east of the Pecos." This and a no-smoking rule are designed to increase VTR head life.

MTV reaches cable systems over RCA's Satcom 3-R. Without the satellite, Setos says, a national net like MTV would be impossible.

"Terrestrial transmission is just too expensive for true national networks," he asserts. "Satellite time is easy to get and cheaper than terrestrial transmission. You don't have to paint hundreds of towers, you don't have to mow the grass, you don't have to pay the insurance bills, and there are no maintenance costs once you launch it."

Lack of technical regulation was another boon for MTV, Setos remarks. "It allowed us to do things faster—we don't have to wait two years to get some new product authorized." Aside from that, he says, "We just took what we learned from radio broadcasting and applied it to the new tasks." **BM/E**

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Garrison: "World's Fair coverage will be a pleasure with our new Midwest M22 Mobile Unit equipped with Ikegami cameras."

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WREX-TV Boosts Local Production With TR-800s



WREX is one of four broadcast facilities serving the Rockford, Illinois market. Says Gerry Meinders, Chief Engineer at WREX, "We had clients taking their production to Chicago because of the editing capabilities there. Now, with our 1" TR-800s, WREX can offer the same capabilities here."

WREX sought the most advanced machine available to meet their present and future production and post-production needs. "One of the reasons we like the TR-800 is that it is the most advanced machine available. Being microprocessor controlled, if we want to add to the system, it will be easily done. It's really a total system package."

The TR-800s are being used for commercial production and delayed playback of network programming. The units are equipped with RCA's Supertrack for broadcast quality playback in still and variable play modes. One TR-800 has the RCA Super Search Editor.

"Our clients definitely like our TR-800 quality and our new editing capabilities."

RCA . . . 30-Year Supplier of Custom TV Mobile Units



Hundreds of RCA mobile TV units are in use around the globe. Compacts and trailers; busses and box bodies. Custom-built by RCA, they come in a wide variety of layout configurations, and with equally varied equipment complements.

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The compact van illustrated is a popular, exclusive RCA design. Just under 19 feet long, it is nimble enough to flow with city

traffic, and to fit into tight parking spaces. Yet it has the stamina for cross-country travel. Its flexible design accommodates a full range of equipment variations and layouts with every capability required for on-site origination and taping.

The RCA compacts feature a molded fiberglass shell on a heavy-duty chassis, available with 2 or 4-wheel drive.

Before you start the wheels turning on any mobile TV project, check out RCA's *full service plus* capability.

Energy-Saving Options Available for RCA UHF Transmitters

Numerous design improvements and updates have been incorporated in RCA UHF Transmitters for enhanced performance and operating efficiency.

Three optional devices now available (the Mod Anode Pulser; the Aural Coupler and the Variable Visual Coupler) result in substantial savings in transmitter power consumption. They can be supplied in new RCA transmitters or field retrofitted into existing

TTU-30, 55, 60 and 110 systems with high efficiency klystrons.

The accompanying table lists the typical power usage and savings for the basic transmitters and for each of the options. For a TTU-110C 110 kW Transmitter equipped with all three of these devices, the total saving is typically 116 kW of power. For details on RCA high efficiency UHF Transmitter products, contact your RCA representative.

POWER SAVINGS WITH EFFICIENCY OPTIONS FOR RCA UHF TRANSMITTERS

Transmitter* Model	Basic Transmitter	With Aural Coupler	And Mod-Anode Pulser	And Visual Coupler	Total Power Savings
TTU-30D	120 kW	110 kW	94 kW	88 kW	32 kW
TTU-55C	208 kW	190 kW	160 kW	150 kW	58 kW
TTU-60D	220 kW	200 kW	168 kW	156 kW	64 kW
TTU-110C	411 kW	375 kW	315 kW	295 kW	116 kW

*The models specified are equipped with high efficiency klystrons and solid state exciters.

NOTE: All figures are typical, in kilowatts, based on 10% Aural Power.

HAWKEYE Takes The Lead In Video System Versatility

HAWKEYE is the one multi-purpose matched video system designed to do it all—from field recording to post-production and distribution. Yet, its modular design delivers unprecedented versatility in meeting numerous operational applications and economies. HAWKEYE is the most complete and adaptable video production system available today.

Recording Camera Flexibility

Where split-second timing and up-front access to events are the keys to coverage success, HAWKEYE's HCR-1 Recording Camera offers a striking contrast to conventional field systems. Film camera mobility and recording performance approaching one-inch standards deliver highly desirable results in restrictive environments and under less than desirable operating conditions.

Yet, the HCR-1 is versatile. By attaching a feed cable, live output can be aired while recording. Simple adaptors permit the separation of the HC-1 camera and HR-1 recorder, so that the recorder can be slung over the shoulder, carried on a cart or by another individual.

Camera Choices

HAWKEYE's HC-1 Portable Color Camera operates live, or with other format VTR's, in addition to HAWKEYE's HR-1 portable or HR-2 studio recorders.

A multicore adaptor for the HC-1 allows live production remote control via multicore cable at distances up to 2,000 feet. Another adaptor permits remote control over universal triax cable up to 5,000 feet. Rack mounted processing electronics are in a new compact size, and the operator's remote control panel, smaller than standard RCU's, provides all operating controls. A 4.5-inch viewfinder is also available for use in these configurations.

Field VTR Modes

In the recording camera, the HR-1 Portable VTR is directly coupled to the HC-1 camera. A base-band adaptor for the HR-1 permits operation of the recorder separate from the camera in a two-piece configuration. Another decoding adaptor equips the HR-1 for use



HAWKEYE offers new levels of mobility and reliability as a one-piece video production system.



HAWKEYE's camera and recorder operate as a two-piece system or with other cameras and VTR's.



In the studio or in a van, HAWKEYE is ideal for recording, playback, or broadcasting applications.



HAWKEYE adapts to numerous editing configurations and applications.

with a TK-76, TK-86, and other cameras or video sources with NTSC composite video outputs.

Studio VTR Alternatives

The HR-2 Studio VTR is ideally suited for studio and/or remote productions. It operates with the HC-1, TK-76, TK-86, TK-47 or any camera with composite outputs.

Companion to HAWKEYE recording cameras and field recorders, the HR-2 allows playback of HAWKEYE recorded cassettes for viewing program material. When equipped with the optional built-in HT-1 Digital Time Base Corrector or any TBC, the HR-2 may be used for on-air broadcasts.

Editing Options

Since the HR-2 VTR has standard video inputs and outputs, it can be controlled from a number of editing systems.

In the HAWKEYE editing suite, it serves as the record/playback source for the HE-1 Edit

Controller providing control track editing capability. It may be easily integrated into conventional ENG editing set-ups by simply replacing one 3/4-inch VTR with an HR-2.

HR-2 VTR's employing TBC's may be linked to a switcher/effects system through a computer controlled editor for sophisticated editing capability. Additionally, a TBC equipped HR-2 can be integrated into multi-format post-production systems, via various time code editors.

To find out how HAWKEYE can accommodate your particular requirements, see your RCA Representative. He'll show you how easy it is to step up to new levels of operational convenience and performance with this uniquely versatile video production system.

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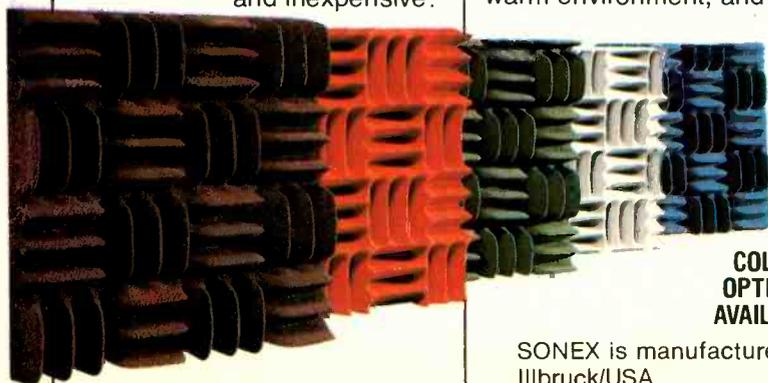
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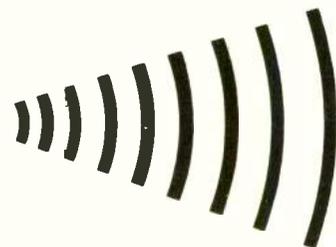
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SPECIAL REPORT:

Improving AUDIO



The broadcast audio industry is being shaped by forces largely outside its control—developments in other media which are having a profound effect on the way broadcasters view their own industry. But whatever their source, the changes are creating in the audio industry a sense of excitement that it has not felt for several years.

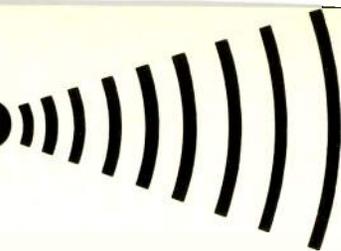
One of the major forces for change is coming from the recording industry, whose business has been faltering for some time. Radio has continued to rely for most of its programming on the record industry, and television, to a lesser extent, is doing the same (see “TV Programming and Production,” p. 27). Despite some original production for radio, and the fact that listeners are turning increasingly to radio as their primary entertainment medium because of the high cost of record purchase, the relationship between the radio and recording industries, insofar as programming is concerned, remains basically unchanged.

But the recording industry *is* indirectly changing radio. One of the most obvious ways is through a large influx of recording studio technicians, producers, and engineers into radio stations as jobs in the recording industry have dried up.

Not only is the talent seeping over, but so is the technology. Recording studios, which until a few years ago had their hands full with record contracts, are now actively seeking clients among radio and TV stations anxious to produce high-quality work. Audio sweetening for television programs produced for the networks is also a major new area of interest for recording studios and post-production sound facilities.

There is even a spillover in terms of equipment. Whereas until a few years ago it was almost unheard of for a radio broadcaster to use a large, automated mixing console or an eight-track recorder

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SURVEY OF BROADCAST QUARTER-INCH ATRS	page 65



in anything but the occasional major concert event, manufacturers now report more and more stations using larger and larger equipment. Partially, of course, this is due to an intensive effort by the equipment manufacturers to "open up the broadcast market." But there is good reason to use better and more sophisticated equipment for everyday productions, especially when there is a talent pool experienced in running it.

Impetus for change is also coming from home video. Consumers can now purchase high-fidelity, stereo sound videocassettes and videodiscs and play them on a deck with audio frequency response equivalent to that of a high-quality audio amplifier. Consumers will demand equal quality from broadcast audio. Audio producers are tuning into this demand, supplying quality radio and TV audio programming produced with at least as much care as products for the home market. Then, too, smart producers realize that today's broadcast product may one day become a home cassette or disc, and require top-quality

sound at that stage. Money spent in quality production at the outset is worth three or four times its value if the production has to be rerecorded later.

Still another force for change is the generally increasing quality of consumer audio amplifiers and receivers, whether used to tune in radio or to play back tapes and records—to say nothing of the astonishing fidelity and quality of the Sony Walkman and its successors. The ears of the American audience are daily becoming more discriminating, and the listeners becoming more demanding. If, for a minimal investment, the consumer can acquire a piece of equipment that provides as much tonal range as his ears can discriminate for some time to come, then the broadcast industry must be at least capable of driving the equipment to that limit.

Broadcasting's future is being influenced by others. But it is certainly no passive spectator. The industry has perceived the challenge—and is in the process of meeting it.

Digital audio developments

Surely one of broadcasting's big concerns for the 1980s is what will become of digital audio. Again, radio broadcasters are only one of the forces involved. The digital audio disc (DAD) is well underway with product intro-

NRBA and NAB Radio Programming Conferences

Another place to look for significant audio developments is at the fall's two big radio conferences, NRBA and NAB Radio Programming Conference.

The theme of this year's NRBA show (Reno, September 12–13) is "Win Big in the '80s". Owners and management will sit down and hammer out some of the formulas to make radio even more profitable in sessions ranging from methods for cost cutting, business computers, and management techniques, to cable TV and satellite technologies. As in previous years, programming and promotion will also receive considerable attention—both in sessions and in various hospitality suites arranged by programming syndicators, the networks, companies supplying IDs and spots, and so forth.

For engineers and production people, there is unfortunately less. As is the case for management attendees, sessions will be held on satellites and on cable—two areas of vital technological concern. The former is a present reality, despite the trouble some of the newer radio networks such as ABC's Superadio are having getting off the ground. But when even traditionalists such as UPI decide they will begin turning toward satellites for data distribution, and when a number of networks are currently distributed via earth stations, satellites are most certainly on the way for more and more radio broadcasters.

The question of cable distribution is a little less obvious. Large-market stations have already cashed in on cable TV's continuous demand for programming, supplying audio backgrounds while the CATV company runs its announcements or classified ads or wire service displays of news. The future may be even brighter than this, however, when one takes into account the demands being made by listeners for high-quality sound. Cable can deliver into the home what broadcast television at present cannot: high-fidelity, stereophonic program material, accomplished by dedicating several cable channels (many system operators now have 100 available) to the transmission of full bandwidth sound. How radio might interface within this environment is not precisely clear at this moment, but it will doubtless become a hot subject for discussion at NRBA.

The conference is also again mounting a hardware exhibit, with over 50 manufacturers currently due to set up exhibits (see the accompanying panel).

Although there will be an exhibit with over 50 manufacturers

showing their wares, its effectiveness has come into question in recent years. Some wonder if the conference should not concentrate on its strong point—the excellent management and programming-oriented sessions—and steer clear of the more technical topics. More and more radio broadcasters attend the NAB show, and indications are that they do most of their buying as a result of those visits; at the NAB, the sessions and the equipment exhibit are kept separate, but equal attention is paid to promoting both. At the NRBA, however, sessions drain the exhibit hall to a mere trickle of attendees, and the manufacturers themselves are calling for NRBA to adopt a new set of ground rules. Last year's show attracted almost 20 more exhibitors, but some of the "big name" equipment manufacturers will be noticeably absent this year.

The same might be said of the fifth annual NAB Radio Programming Conference (August 29–September 1, New Orleans). This event got started when programmers felt they were not getting enough attention from NRBA. The conference has been pushing frantically to get its exhibitor and attendee figures up—2000 from the radio industry are expected in New Orleans, with a still unspecified number of exhibitors. Perhaps the dwindling number of programmers who exhibit at the main NAB show (15 this year as compared with 30 in 1981) indicate that there will be more at the Radio Programming Conference. But it may also prove to be true that radio programmers still don't have a "home" where they feel comfortable. Direct sales rather than trade show exposure may yet prove the best route.

Nonetheless, NAB is making a concerted effort to put on its best show ever. The list of workshop and clinic topics (see full list in accompanying panel) reads like a directory of every conceivable subject of interest to radio broadcasters—including AM stereo, new technologies for program directors, satellites, radio networking, changing demographics and ratings, and so forth.

The conference has also gone in for extended one-on-one opportunities. Programmers will have a chance to meet with nationally known experts in private consultation booths. Then, at a "research fair," programmers will again have an opportunity to have their questions answered by experts in a one-on-one, private meeting. Another RPC highlight will be a "proficiency test" in which programmers will be able to rate themselves on a wide range of important topics.

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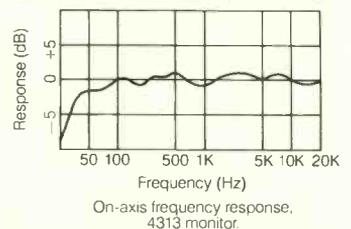
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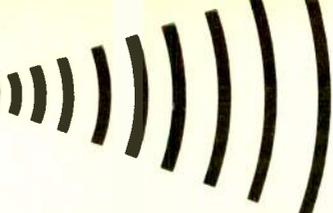
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AUDIO



ductions in the U.S. expected before too long. But it will be some time, perhaps five years, before DAD comes to radio, except for the occasional instance when a station acquires a DAD player to be "the first on the block."

Here, again, it is consumer products that will motivate the radio broadcaster; used to getting enormous bandwidth with virtually no noise on their home players, listeners will begin demanding the same quality of their radio stations—or simply tune them out.

Digital technology in broadcasting, however, eventually could be much larger than the DAD, perhaps extending even to transmission. If the AES can reach agreement on the 48 kHz digital sampling frequency as now seems likely (see the Editorial, p. 8) work can begin on the development of the myriad other components that are needed to record, and perhaps eventually transmit, digital audio.

Just how much work remains to be done can be gauged from some of the response to the AES's premier conference, "The New World of Digital Audio," held early June in Rye, NY. Drawing some 200 attendees from all parts of the industry—radio and TV broadcasters, manufacturers seeking guidance in product development, recording industry producers—the conference laid out some of the benefits and problems the industry will face in going digital.

At present, according to a list circulated at the conference by the RIAA, there are just over 50 facilities around the world currently using digital recorders from five different manufacturers—each different in approach. These are primarily recording studios and record pressing plants; 10 are using the JVC system, four have Mitsubishi equipment, 15 are committed to Sony equipment, four facilities have the Soundstream system, and 18 have one of the 3M digital recorders.

For intraplant recording and mastering, having a non-standard system is perfectly adequate. But as use becomes more widespread, standards must be set in order to achieve the goal of a truly universal interface. The sampling frequency is only the tip of an iceberg that might include a definition of tape width, number of tracks and channels, running speed, error correction and concealment techniques, interfacing of various types of equipment through serial and/or parallel data ports, and much more.

There is, of course, encouragement from the television industry—an outside force, once again, that has helped mold the audio industry to meet its own needs, but with entirely beneficial results. It was television which, through the SMPTE, urged the adoption of the 48 kHz sampling frequency as one that could easily interface with the SMPTE-proposed and adopted digital video sampling scheme. This video standard has now been adopted worldwide, and as work proceeds with the development of actual digital video recording techniques, incorporation of digital audio recording within the video format is being seriously pursued.

It is also worthwhile to note that the TV industry is very

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seriously considering stereo audio—possibly even to incorporate it within current broadcast systems by multiplexing the L and R channels or by digitally encoding them into the vertical blanking interval of the TV frame. Or, stereo audio may have to wait a little longer—until full-fledged digital recording comes along. But in any case it is a major step in the much sought-after improvement in broadcast sound quality and dynamics.

Broadcasters are generally taking this commitment to their future with digital recording more seriously than many expected. The AES conference heard what must have been a first for broadcasting—digitally recorded program material produced by WFMT, Chicago's fine music FM station, using the portable Sony PCM-FI digital recorder. The program material, produced as a trial balloon of what digital recording might mean to broadcasters, consisted of recordings made in the station's own studio, segments of a Milwaukee Symphony concert, and local recitals. (For more details, see the story on field sound recording beginning on p. 55).

Broadcasters *can* use digital with good results if companies such as Sony and the others manufacture hardware that can be afforded by the local station. Mitsubishi certainly thinks so, and has also come out with a brand-new portable/studio digital recording system aimed specifically at the broadcast market (*BM/E*, July, p. 10).

In short, as the stories in this special report indicate, broadcast audio, both radio and TV, is undergoing a major transformation. The impetus for the change, and often the means of the change itself, has come from forces largely outside broadcasting. But broadcasters, responsive to the pressures, have responded. **BM/E**

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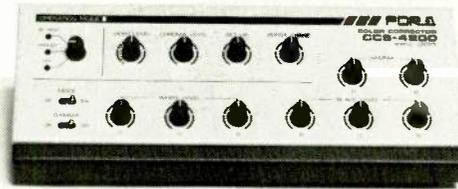
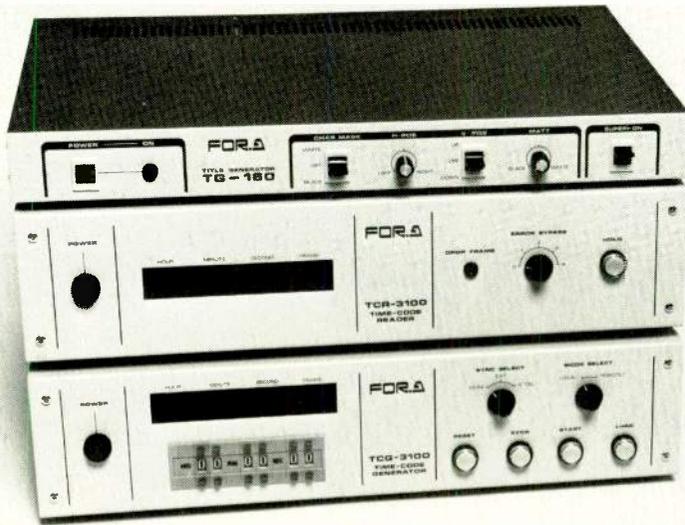


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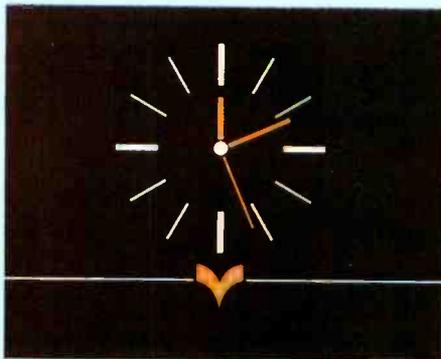
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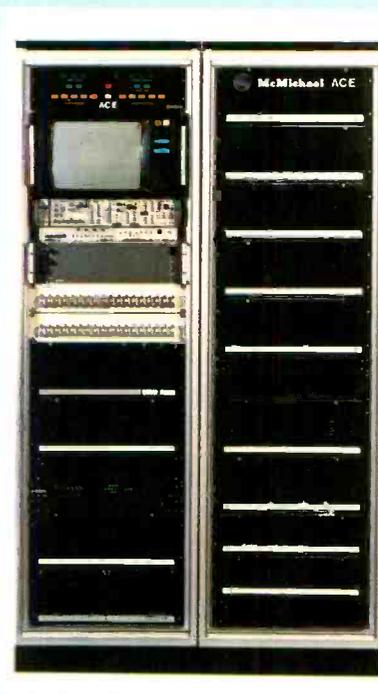
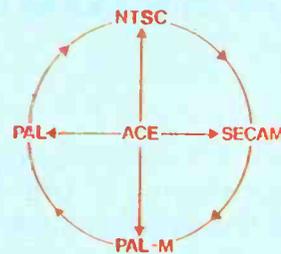
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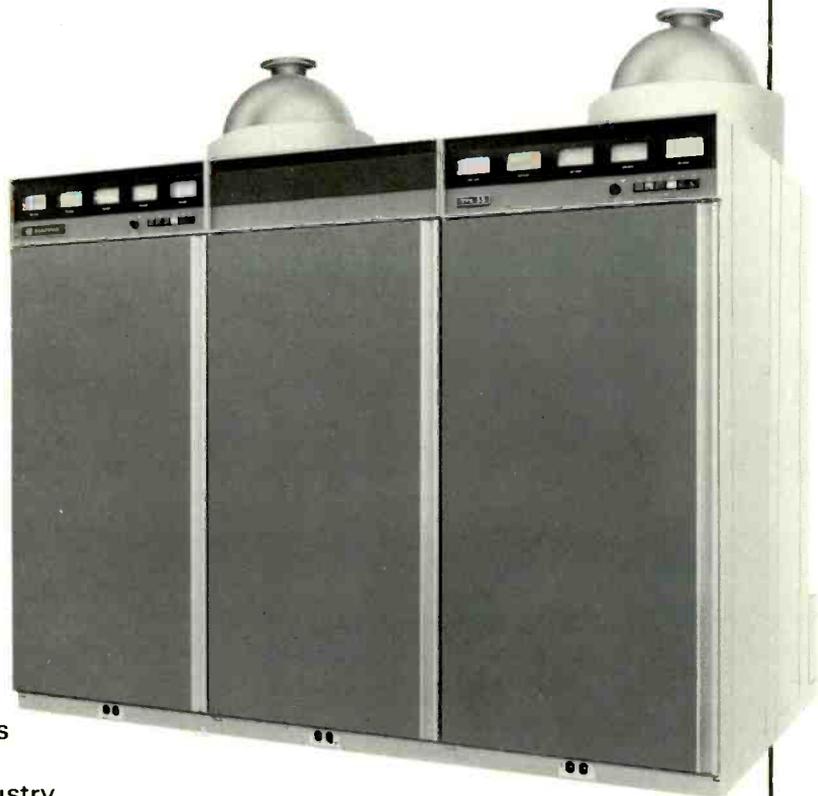
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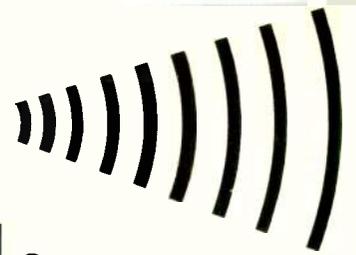
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AUDIO PROCESSING:



Recipe for Better Sound

Thanks to recent technological advances, competition is heating up among radio station operators looking for the perfect combination of loudness and compression, with a little reverb added along the way, that will attract and hold listeners.

WHEN CHIEF ENGINEER A and Program Director B twist the dials on their new multi-band compressor/limiter while listening anxiously to the results on the studio monitor, they are trying for a "sound" that might outdo other stations in attracting and holding listeners. Programming and promotion continue, of course, to be the mainstays of the radio station's operation; but competition for sound quality has become a major element of management and engineering concerns. And advances along several technological fronts now make improved audio quality a tangible reality.

Ingredient one: dense but clean modulation

Reducing the dynamic range of program material is one of the basics in processing. Compression did not start out as a tool in the loudness war, but as a response to the fact that a radio system—AM or FM—cannot handle the full dynamic range of modern recorded material. The program gets lost in the noise at the quiet end, or over-modulates the transmitter at the high end. When the digital disc comes along with its 80 to 90 dB of dynamics, the radio path will be even less adequate.

The fact that reducing the dynamic range increases the modulation density and allows a "louder" signal to be put on the air has been one of the strong spurs to the spread of audio processing. But technical advance in this case does not mean simply making a louder and louder signal available. Within the legal limits—no overmodulation—there are important constraints on the amount of compression used. One is the rise of unwanted side effects, several forms of distortion, as the processing gets steeper. The other is the production of sound quality that will not match the musical tastes of the station's listeners.

Reducing the seriousness of the side effects at any given level of compression has thus been one of the main lines of recent technical advance: the top systems availa-

ble now are far better than any used to be. Those side effects include such disturbing results as "pumping"—sound levels and noise levels rising and falling as though some imp had hold of the console fader—and "breathing," an operational swishing sound. In addition there can be frequency unbalance, poor handling of transient signals, holes in the response, and other noxious performances.

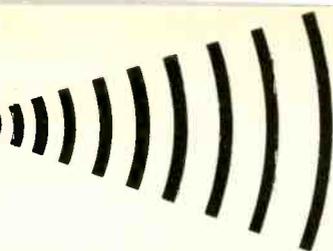
Overall, the worst effect of excessive compression is a kind of "squashed" quality that many listeners dislike. But not all. The "Top 40" listener, the teen-to-early-twenties group, has been delighted, at least in the past, with a steady loud beat and voices and other instruments around it at an unvarying level. A number of stations were highly successful with this approach such as a New York rock station that had a dynamic range around 3 dB. There is now evidence that the old flat-out rock has lost much of its appeal.

At the other extreme is the classical listener who wants the widest dynamic range the station can manage. Classical station managements try to supply it, using just enough compression to produce a signal "loud" enough to reach the intended audience.

Between these two extremes there is a complete range of compromise positions, and each management has to weigh all the complex factors involved to reach a judgment on what is right for the station. If there is any rule of thumb, it is "back off if you've gone too far." But "too far," as suggested, depends on many factors—the kind of music, the sophistication of the processing system, the acuity of the station personnel's hearing as well as of their judgment of the market. *Long and careful listening is the only route to effective adjustment of a compression system.*

Another factor in compression is money. The simplest compression systems are inexpensive, but they are also

AUDIO



the most likely to get the user in trouble when the compression ratio is pushed high. If the radio management wants only small to moderate amounts of compression, it is possible that a simple system will get the station through. But it is necessary in every case to listen critically, whether the system is simple or elaborate, whether the compression ratio used is moderate or steep. Some compression systems are "unsafe at any speed."

Here is a sampling of techniques described by manufacturers of a few of the current compression systems. This is *not* a listing of units on the market, but a selection of some representative approaches to the problems of "dense but clean modulation," the center ring in today's audio processing.

Remember though, that the "GIGO" principle (garbage in, garbage out) applies to heavily processed audio signals. It probably should be the "BIHO" principle, or "bad-in-horrible-out," because audio signals of poor quality are worse after heavy processing. Thus the radio management wanting to use heavy processing as a competitive tool, as so many do today, has a strong incentive

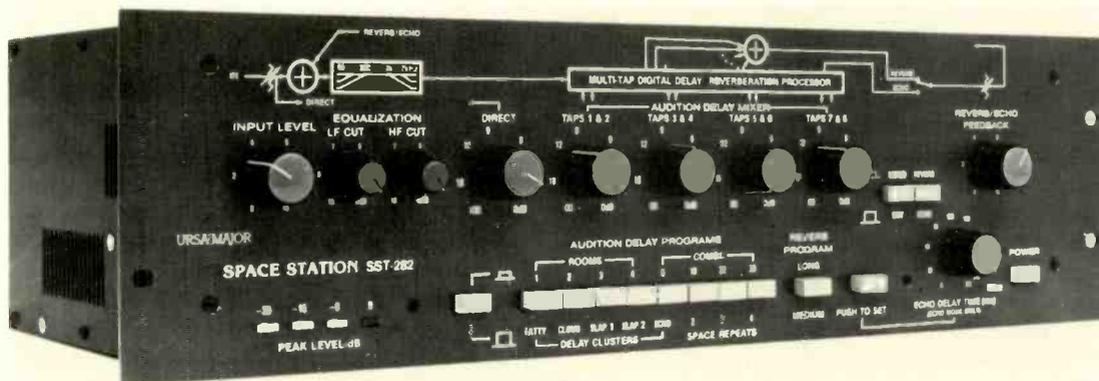
to clean up the audio chain with the best equipment available.

The signal into a compression system must not only be clean but should also be fairly constant in level: variation is likely to bring frequency unbalance and other troubles. Thus a number of the compression systems use a slow, broad AGC stage ahead of the actual compression stages, to keep the signal within a reasonable amplitude range.

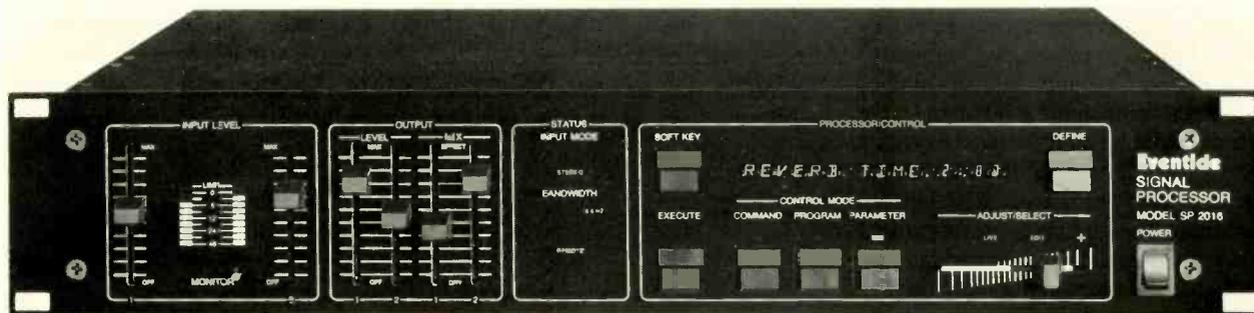
The Inovonics Model 215, the Orban Optimod AM, and the CRL-FM-2 are just a few of the systems that use preliminary slow AGC.

Dividing the spectrum into several bands for the compressor stage has become widespread among the higher-priced systems. This reduces the tendency of a very strong bass sound, for example, to punch a hole in much quieter highs. There is no rule about how many bands are optimum; but if the compression is going to be pushed hard, the system ought to have at least three spectrum bands in the compressor stages. Many of the popular systems meet or better this requirement: Audio and Design's Transdynamic, Gregg Laboratories systems, Orban compressor systems, the CRL units, the Dorrrough DAP-610, and the Harris MSP-90 are some examples.

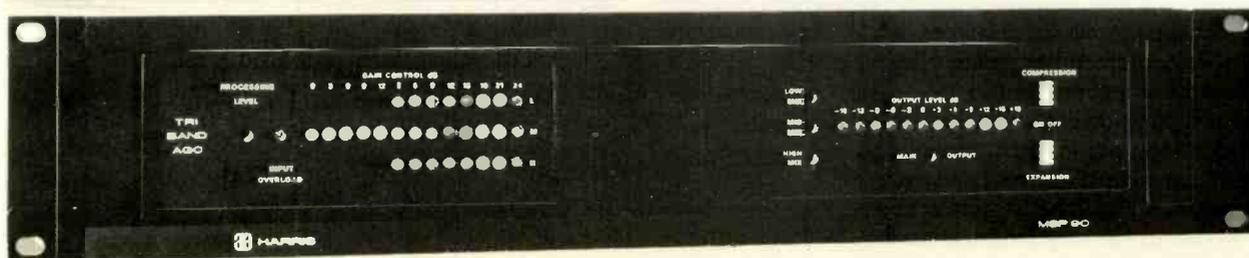
Considerable subtlety enters in the provisions for control of the attack and release times, because these affect the auditory qualities strongly. Some systems, among them the Orban and Audio and Design, allow the user to



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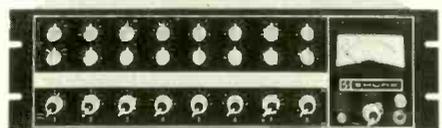
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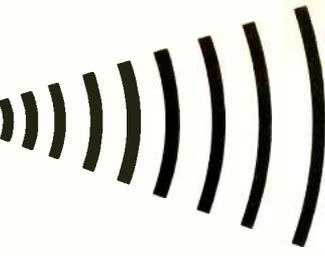
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choose automatic control (action determined by the program material); or the user can take over manual control. This is probably the best approach, particularly if the user will work hard to get the cleanest possible signal through the processing system, which takes the most careful adjustment of all parameters.

Ingredient two: blocking peaks

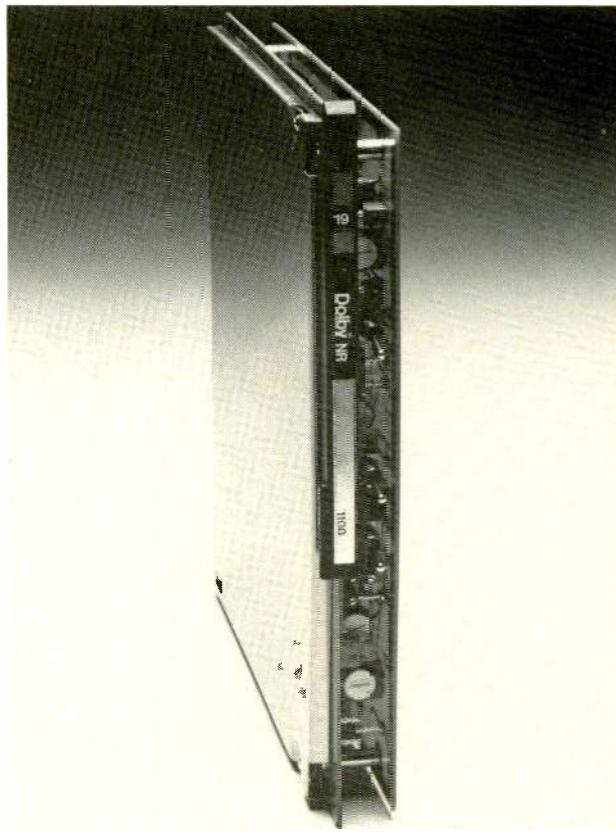
Integral with most of the popular compression systems is a method to keep sharp peaks in the program material from reaching and overmodulating the transmitter since the compression system cannot handle sharp peaks. Controlling peaks has been a familiar part of radio operation for a long time; knocking off the peaks lets the operator get his modulation very much higher than would be possible without that control.

But peak controllers have never been without serious drawbacks, including overshoot, ringing, and phase distortion. There has been a steady advance in the design of limiters and clippers aimed at reducing these drawbacks. A number of the latest processing systems use very elaborate filter and clipper designs intended to block the peaks with fewer spurious additions to, or changes in, the signal than has been possible before. Orban, Harris, Gregg and Audio and Design are among those models in which extraordinary effort has gone into the limiter and clipper designs.

In these systems, and some others, the improvement in the peak control action has given the quality of the final signal a distinct lift. The millenium is not here; but we are closer than we were a short time ago.

Two new methods of blocking peaks have just come on the American market. One is the EMT Model 266 transient limiter, used for some years in Europe and imported here by Gotham Audio of New York. This system delays the program about 3 ms after extracting the control information, so that the control and the signal can reach the control stage together. This makes the control "positive"; no part of the peak can slip through while the control signal is being developed. The response is tailored to prevent perceptible "holes" in the signal and the release time takes account of human hearing parameters.

The other new limiter is the Model CP803 composite processor from Modulation Sciences of Brooklyn, NY. As the name indicates, this system is designed to operate



Compact noise-reduction module holds Dolby Type "A" system.

on the composite signal in FM broadcasting, and does not include the gain-riding, or compression stages. It is transparent to the 19 kHz pilot signal, and thus avoids the constraint to very low processing ratios—about 0.5 dB maximum—imposed on most composite limiters by FCC rules with respect to the pilot. The advantages claimed by the manufacturer are noise-free operation (no gain riding), a high-tech filter system that gives complete control of overshoot peaks and high frequency peaks to allow up to 6 dB more modulation, and the ability to work with or without other processing equipment ahead of it in the audio chain.

Ingredient three: equalizer punch

Most of the more elaborate compressor/limiter systems also include adjustable frequency equalizer circuits that allow broad alteration in the frequency response of the system. Some of the equalization provided is quite specialized. The Orban Optimod-AM, for example, has a frequency-shaping circuit intended to offset the curve of

Lexicon Super Primetime supplies very wide range of special effects.



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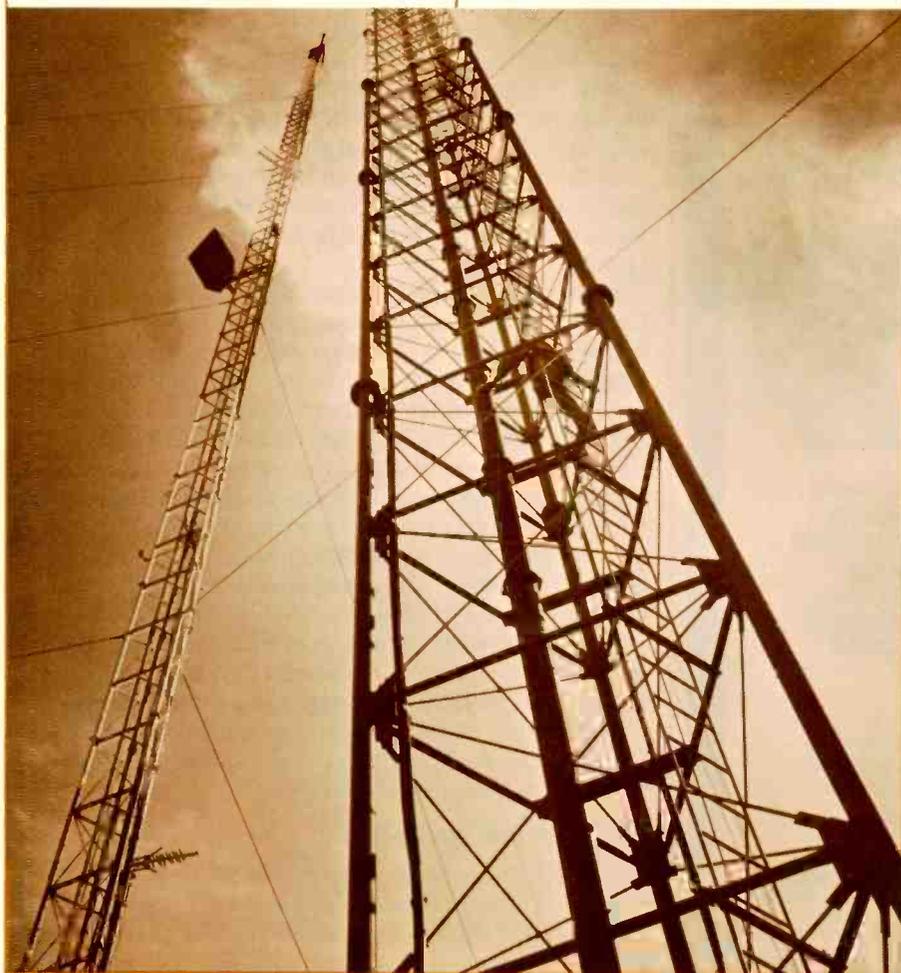
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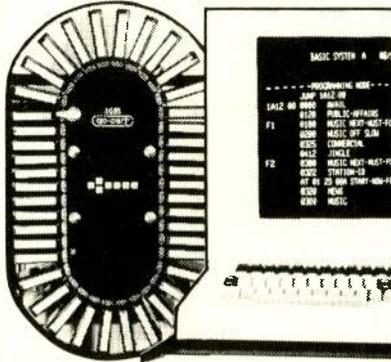
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the average small AM radio. The intention is to get considerably more brightness into the sound the average AM listener is getting from the station. This is in addition to general equalizer controls.

Wide-spectrum control of the frequency balance might seem an "extra" on a compressor/limiter, but it has lately become a much used tool in the "sound" competition. Radio managements use frequency shaping to help them create a brighter or more punchy quality that will grab listeners.

Important is the fact that the technology has lately advanced to supply frequency shaping on the higher-quality systems that introduces very little distortion into the signal.

Ingredient four: fingertip reverb

Artificial reverberation is one of the oldest processing stories in broadcasting and recording. What is new is the application of digital technology to create flexible, all-electronic reverberation.

To simulate natural reverberation with a multiplicity of "fed back" samples of the signal is one of the most difficult design problems, simply because natural reverb is made up of thousands of reflected signals. But the designers of several of the current digital reverb systems have managed to create effects close enough to the "real" to satisfy almost any need for added reverb in broadcasting, recording, etc.

It takes a considerable amount of computer power to do the job, so the top-grade electronic reverb systems are correspondingly expensive. But they have great advantages over the older electromechanical systems in the variety and instant adjustability of reverb character: a good electronic system is, in effect, 10 or 20 or 100 different reverb systems.

Leaders in this development are Eventide, Lexicon, Ursa Major, Marshall Electronics, and Quad Eight. Particularly powerful is the programmable reverb system, which uses software to produce the multi-signal "reflection" and control it for just the effects wanted. Eventide's SP-2016, Lexicon's 224-X, and Ursa Major's 8x32 are all "open-ended" systems that can move into new modes simply by the user's installing new software modules. All the manufacturers named are working on additional modules that upgrade or extend performance in one way or another (Ursa Major, for example, announced four new programs for the 8x32 as this was written).

The programmable reverb systems are at the top of the price bracket. Below the top are systems that produce fewer effects but are close enough in quality to the top systems to satisfy many users at considerably lower cost. Electromechanical systems are lower still in price, but at their best will do a satisfactory job.

Ingredient five: specialties

The techniques for creating electronic artificial reverb overlap to some extent those needed for "special effects," so the two functions are sometimes combined in one system. Special effects is a wide-open category that covers the endless alterations of sound quality producible

with fed-back, delayed, or otherwise altered samples of the signal, combined with frequency shaping and other techniques. Combining the signal with out-of-phase copies of itself can do wondrous things to the quality—for example flanging, a swishing or swimming quality.

There is a basketful: deep space voices, machine-like voices, and literally hundreds of other unnatural sounds with the main functions of grabbing listener attention, stirring his or her excitement.

Special effects have so far proved most useful to broadcasters who produce commercials. The ability to give the commercials a special sonic character for memorability and impressiveness has made special effects worthwhile to many broadcasters. "Consistent strangeness" may be the best operating doctrine to give prominence to the ads of a particular customer.

Ingredient six: quelling noise

Like special effects, noise reduction has proved most useful to broadcasters in the production studio. This applies particularly to the production of recordings on carts, whether for commercials or regular programming.

As everyone knows Dolby and dbx have dominated the noise reduction scene for a number of years. What is new is the Dolby "C" system, which supplies considerably more quieting than the Dolby "B", reaching about 20 dB at the top of the frequency spectrum. This is excellent for cart recording systems, which suffer heavily from tape hiss.

Another system new in this country that should work well in cart recording applications is the Telefunken "High Com," which will be marketed by Straight Wire Audio of Arlington, VA. High Com is also a single-band system with a claim of large quieting, up to 30 dB. It is in heavy use in Europe.

A third new system is the MicMix Dynafex, which will allow new modes of operation in broadcast stations because it does not need encoding-decoding. It can be applied to any program source for what the maker says is noise reduction up to 30 dB. Dynafex uses an updated version of the "sliding filter" technique. The pass band is automatically adjusted to minimize noise at various levels of the signal. This might well prove to be the most practical approach to noise reduction on some kinds of program feeds, for which encoding-decoding are not convenient.

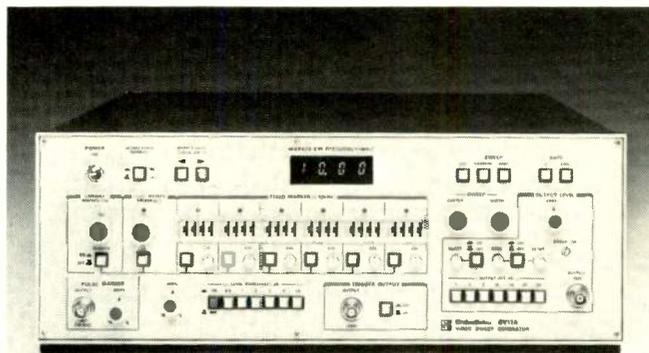
Putting it together

Now that broadcasters can do almost anything they want with processing, what are the applications? Each station will have its own needs. Giving DJ voices more apparent power without raising the actual modulation level is one use for reverb. Adding power and resonance to program material picked up in very "dry" acoustical settings is an obvious application.

Beyond such particular and corrective uses, reverb is often an important element of the mix that establishes the character of the station's sound. In trying to produce a hot, competitive sound the radio operator can mix compression, frequency shaping, and various kinds of reverb in an endless variety of aural stews. Reverb can add punch and power, apparent loudness, "life." The operator, like the good cook with a shelf full of seasonings, has to use all the elements with a light hand, "tasting" often as he goes. The effort can be worthwhile; the station's sound can move up to a fresh attractiveness that may be just what the market will respond to.

BM/E

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Circle 133 on Reader Service Card

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“Finally there’s a ¾-inch recorder that doesn’t just inch along,” says Fred Rheinstein, president of The Post Group.

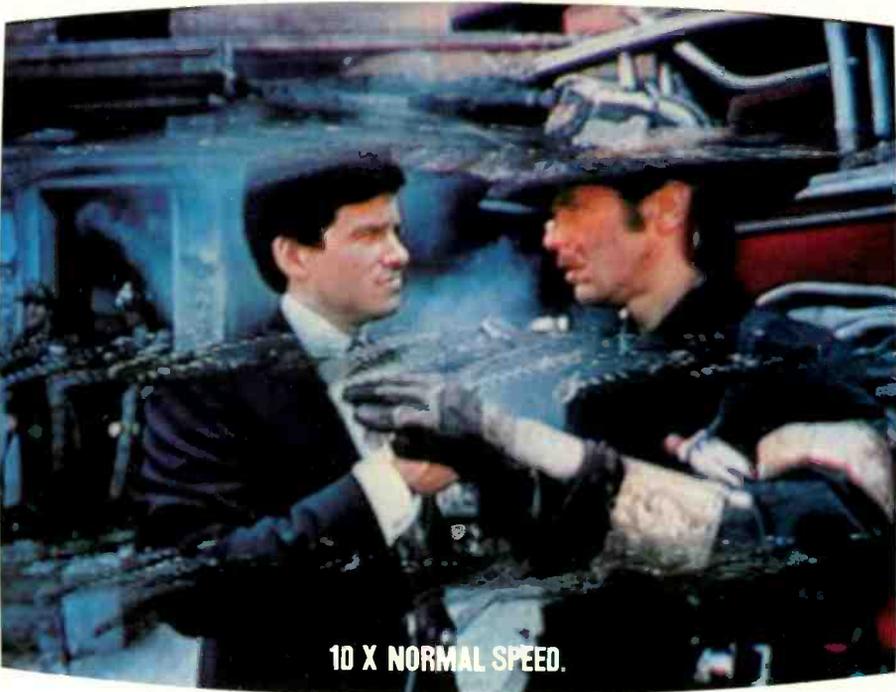
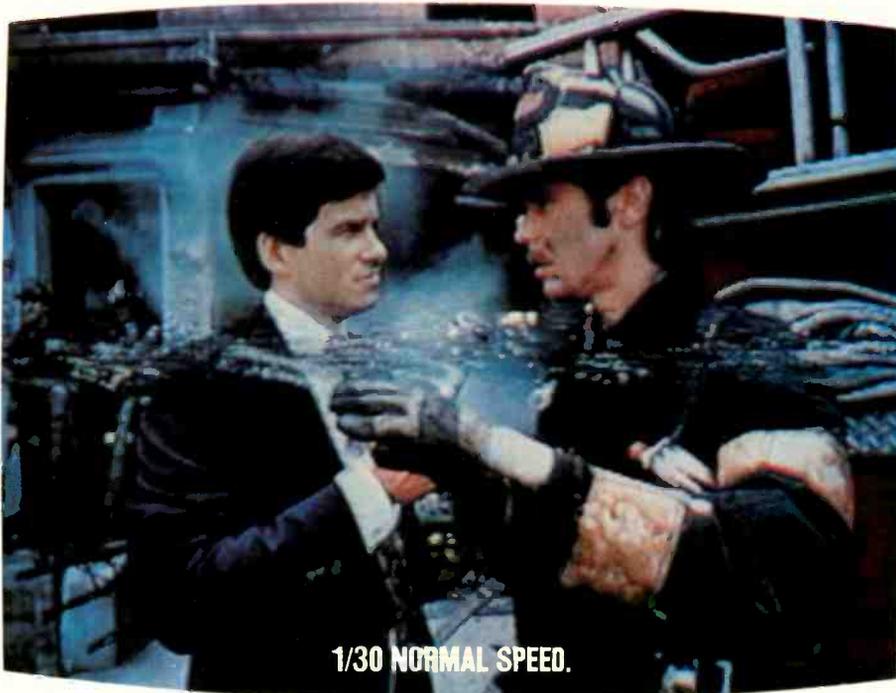
A major post-production facility in Hollywood, The Post Group counts among its clients all three networks, PBS, and major cable TV and syndicated production companies. It will edit the new syndicated children’s show “We’re Moving” entirely on the BVU-800.

“The 800 is amazingly fast. To be able to go backward and forward at 40 times play speed means you can search for your edit points—and find them—more than twice as fast as ever before,” continues Rheinstein. “And this machine goes from its highest speed to a still frame. Instantly. Without slewing or breaking up.

“It also has a direct-drive system, which promises greater reliability and accuracy.

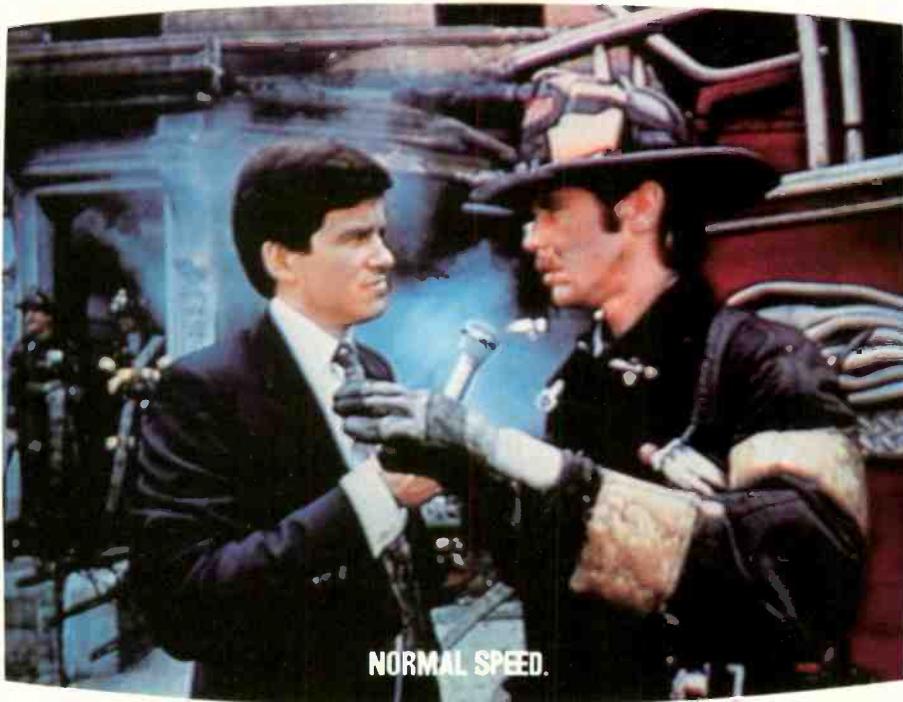
“We have extremely critical clients,” says Rheinstein. “They’re used to the best performance, in terms of picture quality and in terms of flexibility. This new Sony can deliver it.

“It’s the perfect combination of U-matic economy and broadcast quality. It’s a true mastering process; with the BVU-800, there’s no need to transfer to one-inch and lose a generation in order to edit your tape.”



U-MATIC BREAKS SPEED RECORDS."

Fred Rheinstein, THE POST GROUP



Other breakthroughs incorporated in the BVU-800 include its ability to make machine-to-machine cuts without a separate controller; its adjustable, removable edit control panel; and its narrow, front-loading design, which makes rack mounting possible.

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Field Sound Recording Pushes Technology to the Limits



Recording high-fidelity sound in the field has traditionally been hampered by limitations in recording techniques and equipment. Now, the promise of getting studio quality in the field is coming closer to fulfillment.

BRINGING GOOD AUDIO back from a field recording date has always challenged radio and television sound engineers. Broadcasting—especially television—has lagged far behind home audio systems in the quality of its sound reproduction. In the past it often meant that sound quality took second place to other considerations that seemed more important, such as getting a clear picture or being louder than a competing station.

Technology, however, is beginning to remove the limits on broadcast fidelity, simultaneously raising the importance of sound engineering. With high-quality receiving equipment widely in use, radio stations, especially FM stations, are aiming less and less for the typical car radio and more for the home stereo system. Although the vast majority of television receivers continue to incorporate tiny, tinny speakers, the possibilities for quality sound are increasing, spurred by new technologies such as cable and videodiscs.

Both radio and television have benefitted by the availability of 15 kHz program channels from the telephone company, aiding transmission of full-bandwidth sound. The one-inch videotape recorders with their two high-quality audio tracks are helping TV crews bring back more realistic sound, and the development of SMPTE time code has allowed more creative editing back in the studio.

Another significant advance in television audio has been the incorporation of Dolby A noise reduction into the Sony and Ampex Type C VTRs. Dolby makes a noise reduction card that plugs directly into the BVH-1000/1100 or VPR-2, providing 10 dB of noise reduction from 30 Hz upwards, increasing to 15 dB at 9 kHz and above. Most recently, Dolby completely redesigned the entire audio section of the Sony BVH for improved audio; the redesigned audio section and type A NR are all on a single

plug-in card. Dolby has done the same for the Ampex VPR.

TV audio: stepchild no longer?

A sign of the times in audio for video was a recent panel sponsored by the New York chapter of the Videotape Production Association (VPA). Ed Grower of Reeves Teletape/Sound Shop opened by throwing some light on why audio has always taken a back seat to video in television production.

“Some of the bad habits we have overcome in lighting,” Grower explained, “grew out of the fact that videotape evolved from live television, where lighting became a matter of illumination because everything else was life and death. With the luxury of videotape, it has taken quite a while for a lot of talented people to overcome some of those bad habits. By analogy, in audio for live television, it was not a question of sweetening or getting attractive, evocative sound—it was, ‘Oh, God, I hope we hear the words!’”

Most of the bad habits imposed by live television’s technical limitations have been eliminated, Grower feels, but there is still plenty of room for improvement.

Speaking at the same meeting, Mort Dubin of Iris Films, chairman of VPA, commented on why audio has remained the stepchild of video for so long. “A lot of the problem is rhythm,” he opined. “If it’s not in your rhythm to consider a sound mix in videotape, you don’t do it. . . . Also, it goes back to the origin of videotape. Videotape began as a replacement for the live show—it had the connotation of being quick and dirty. You did everything as quickly and as cheaply as you could. Now, as the video medium is growing up and becoming more creative, more money is being put into it and the rhythm is changing.”

Scharff Communications’ Peter Scharff, intimately involved with producing top sound for television (see *BM/E*, April 1982, p. 42), gave the meeting a brief overview of the changing importance of television audio. “A number of years ago,” he recalled, “all television was coming out of a small three-inch speaker. Even if you did a high-quality recording job in New York, by the time it got out over AT&T lines to Kansas it was reduced to very low bandwidth and very high signal-to-noise.” Un-

AUDIO

SMALL AND PORTABLE MIXERS

Mixing sound in the field requires a high-quality portable mixer. This chart lists a selection of small mixers made or distributed in the U.S. with their major specifications and approximate prices. Models vary widely, from hefty, full-featured mixers to compact, lightweight hand-carried models. Which model is appropriate depends on the complexity and nature of the job.

MFR	MODEL	STYLE*	CHANNEL			SPECS					FEATURES					OTHER		
			MODE	INPUT	OUTPUT	dBm		FREQUENCY 20 Hz TO 20 kHz IN dB	THD%	EQ BANDS	PROCESSING & EFFECTS†	FADERS	CUE	TEST TONE	METER	RF SHIELD	POWER	PRICE
SIN MIC	SIN LINE																	
Allen & Heath Brenell	1821	1	S/M	18	6	-118	-118	±1.5		3	no	slide	yes	no	VU	✓	AC/DC	O/R
Ampro/ Scully	AC-12	1	S/M	12	2		-74	±1.5	.5		ABC	rotary, slide	yes				AC	O/R
Arrakis	SC series	1	S/M	8	2		-70	±1	.1		no	slide	yes	yes	VU	✓	AC	O/R
Audio Developments	ADO 45	3	S	6	2	-125		-2	.05	3	no	slide	yes	yes	VU PPM	✓	AC/DC	II
Audio Force	Location Mixer 8	2	S/M	8	2	-127.5	-85	+0, -.5	.08	3	BC	slide	yes	no	VU		AC/DC	II
	Location Mixer 16	2	S/M	16	2	-127.5	-85	+0, -.5	.08	3	BC	slide	yes	no	VU		AC/DC	II
Coherent Comm.	MX 80 B	3	M	4	3	-129	-85	±1	.1	1	A	rotary	yes	yes	VU peak LED	✓	AC/DC	II
Dyma	International	4	M	8	1		-60	±.5	.5		no	slide	yes		VU		AC	O/R
Eela	S 41	3	M	4	2			-3	.05	1	AC	slide	yes		VU	✓	DC	I
Hallikainen Friends	TVA 142	4	M	36		-115	-74	±1	.25		no	rotary	yes	no	VU peak LED	✓	AC	I-III
Industrial Research	Voice Matic	4	M	12	1	-125		±1	.5		no	rotary					AC	O/R
ISI	1002	4	S	10	2	-123	-95	±.5	.5	1	no	slide	yes	yes	VU peak LED		AC	III
Logitek	Audiorack	4	M	6	2	-72	-67	±.5	.05		no	rotary	yes	yes	VU peak	✓	AC/DC	II
MCI	JH-636M	1	S/M	36	24	-129		+0, -.5	.1	3	ABC	slide	yes	yes	VU	✓	AC	O/R
Micro-Trak	Sport IV	3	M	5	1	-60	-60		1		no	rotary	yes	no	VU		AC/DC	I
Ramsa	WR-8112	1	S/M	12	4			±.5	.04	3	AC	slide	yes	yes	LED	✓	AC	O/R
SATT	SAM 82	2	S/M	12	6	-128	-85	+ .5, - 1‡	.2	1	no	slide	yes	yes	VU PPM	✓	AC/DC	II
Shure	SE 30	3	M	5	2	-128		±2	.5		A	rotary	no	yes	VU	✓	AC/DC	I
Sigma	SS-380	1	S	18	7	-125	-70	+0, -1.5	.5	2		slide	yes	yes	VU		AC	III
Sony	MXP 42	3	S/M	4	2	-125		±1	.1		A	rotary	no	yes	VU	✓	AC/DC	O/R
Sound Dynamics	Newspost 300	2	S/M	6	3				.1			rotary	yes	yes	LED	✓	DC	II
Studer	269	1,2	S/M	20	4		-83	±.5	.5	4	ABC	slide	yes	yes	VU PPM	✓	AC/DC	III
Telfax	TFX 131	3	M	4	2	-55	-58	±3	1			rotary	yes	yes	VU	✓	AC/DC	O/R
Transit-O-Sound	TOS-3C	3	M	4	2	-63	-70	±3	.1	1	A	rotary		yes	LED	✓	AC/DC	I
Trident	Trimix	1	S	32	24	-125	-84	±.5	.05	4	A	slide	yes	yes	VU	✓	AC	III
Ultra Audio	MS105	3	M	11	3	-102	-90	±1	.1	1	A	slide	yes	yes	VU	✓	AC	II
UREI	Mod One	1	S/M	10	3	-70	-70	±1	.5		A	slide	yes	yes	VU	✓	AC	O/R
Ward-Beck	R1000	1	S/M	10	2	-124	-78	±1			ABC	slide	yes	yes	VU	✓	AC	III
Yamaha	1532	1	S	32	12		-68	+0, -3	.5	4	ABC	slide	yes	yes	VU	✓	AC	IV

KEY:

* 1 = desktop/console
2 = suitcase
3 = hand carried
4 = rack mount

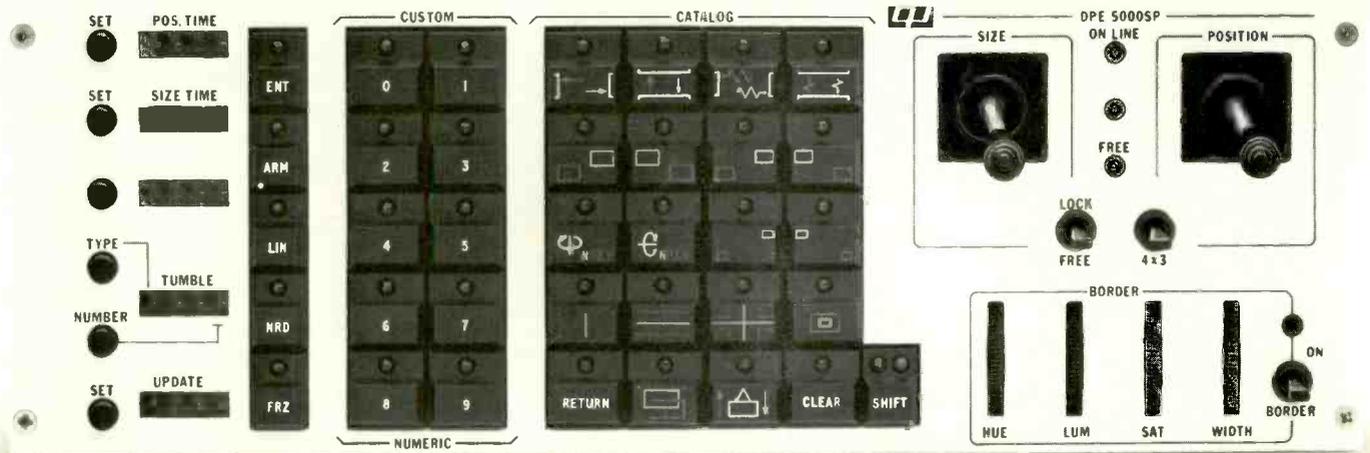
† A = limiter/compressor
B = echo
C = reverb/foldback

Frequency:
‡ means figure
is measured in
40 Hz to 15 kHz range

PRICE:

I = up to \$1500
II = up to \$5000
III = up to \$10,000
IV = over \$10,000

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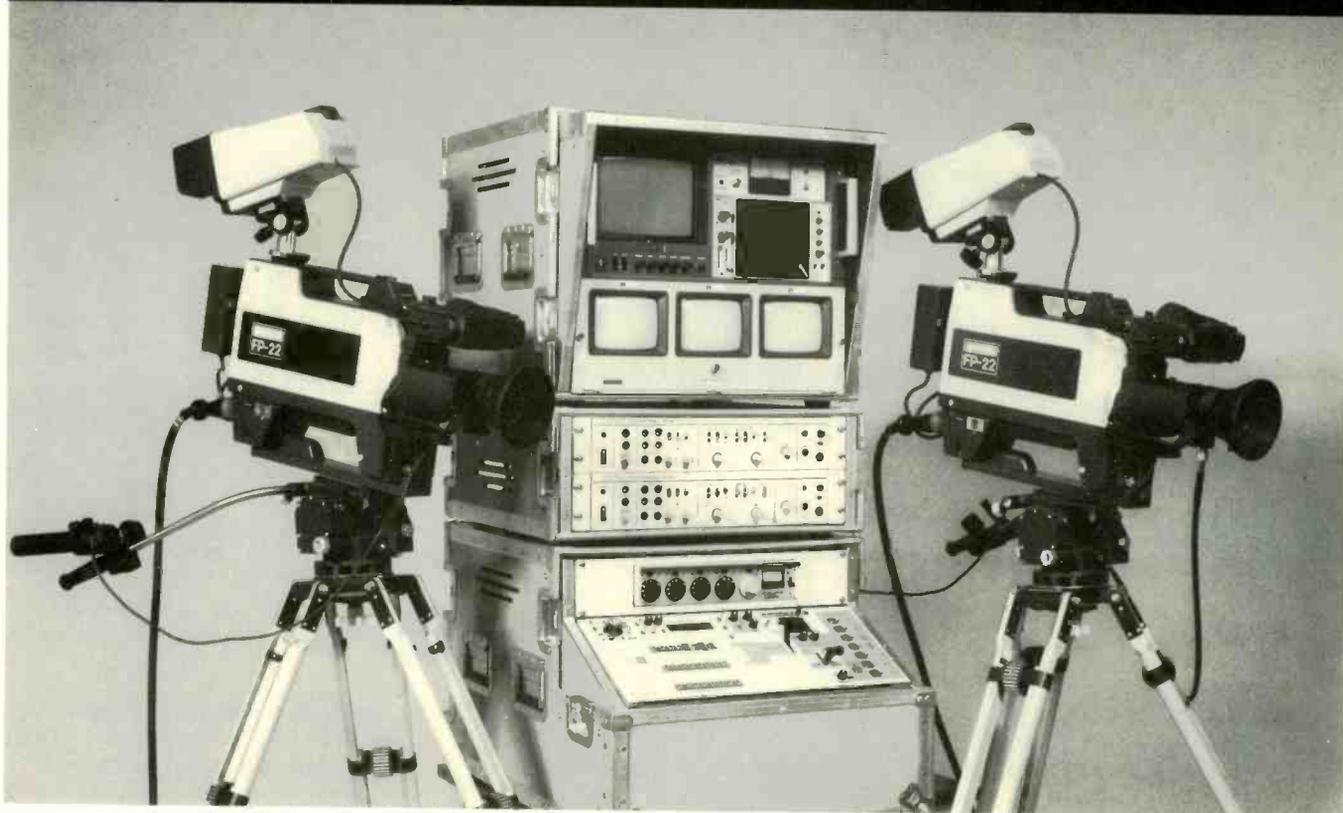
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AUDIO

der such circumstances it's no wonder engineers didn't put all their energy into audio. Now, however, Scharff told the audience, AT&T has made it possible to send high quality audio over 15 kHz program lines, and one-inch videotape has given engineers added flexibility in recording single-system sound.

In a recent interview, Scharff described in greater detail the advances in television sound. Although the oxide on one-inch videotape is optimized for video rather than audio, the audio quality of the tape is far higher than anything achievable with quad tape, he said. In the field, the two tracks, used creatively, can give a much more natural feel to the sound. For example, an RF lavalier mic on an announcer's clothing could go on one track and a shotgun mic, also trained on the announcer, on the other. The tighter, more closely miked sound of the first track could then accompany closeup shots of the announcer, with the other track, with its looser feel and more ambient sound, going with long shots. With this kind of recording, Scharff said, the sound much more closely parallels the action for a more realistic program.

Use of wireless mics in sound recording for video is on the upswing, Scharff notes, spurred by an increase in quality and reliability. Wired and RF intercoms are also coming into increasing use as productions become more complex and communication becomes correspondingly more important.

One of the biggest boons to recording and editing separately recorded sound, Scharff says, is SMPTE time code, which can be recorded on one track of a four-track audio

deck for synchronization with the video.

"To get two stereo tracks of audio, left and right, in sync for videotape, you really need a four-track machine," Scharff insists. "On track four you put the SMPTE code, which you don't want next to the audio because it's so spikey and it tends to creep in. You have vertical drive on track three, then left and right on the remaining two tracks." *Live from Lincoln Center*, which uses the Scharff Communications audio truck, does a stereo recording on four-track in this manner, "basically just as a protection," Scharff says. The audio is recorded on videotape for broadcast, but the existence of the stereo four-track tape allows the producers more flexibility for reselling the show. Since the four-track recordings are usually made without an announcer, the producers can add a European announcer if they sell the show overseas, for example.

Scharff's specialty, however, is multitrack audio recording for television, and he sees double-system recording as justified mainly for this purpose. "With a decent audio board, you can do quality audio right on the videotape," he asserts. "There's really no reason to do double-system if you're recording on videotape, unless you're planning to remix."

Producers should consider the possibility of remixing carefully, though, he warns. "Once you've laid it down on location, on four-track or on videotape, if you then decide the voices aren't loud enough, there ain't a thing you can do. If you do it multitrack, you can change your mind afterwards."

Problems with one-inch

Less enthusiastic about the audio possibilities of one-inch recorders is Chris Newman, an independent audio engineer in the New York area. "Most of the recorders don't have a lot of headroom, so that if you record with

WFMT Serves Digital-to-Go with Portable Processor

Taking field recording quality one step closer to the ultimate, Chicago's fine arts FM station, WFMT, recently broadcast a program of recordings made with Sony's portable digital audio processor. The PCM-F1 works in conjunction with an SL-2000 Betamax video recorder to record a 16-bit digital audio signal with dynamic range of over 86 dB and S/N of 96 dB. Frequency response is flat from 10 to 20,000 Hz (+0.5 dB), harmonic distortion is less than 0.01 percent, and channel separation is greater than 80 dB.

According to Rich Warren, program producer, the procedure for making the digital recordings differed little from normal analog recording. "With the digital processor, the dynamic range is so wide that once the levels are set, you can forget about them," Warren says. "The processor is switchable from 14 bits to 16 bits, but we opted for the 16-bit position with its extra dynamic range."

The one drawback of the portable Sony system, Warren notes, is that tapes can't be edited electronically (this is possible, of course, with Sony's professional digital recording system). For that reason, the station simultaneously recorded a backup analog tape on a Studer A-80R ATR equipped with Dolby-A noise reduction.

The program, which aired June 5, featured excerpts from a concert by the Milwaukee Symphony, material recorded at local recital halls and folk music clubs, and other music recorded live in WFMT's studios. Warren was extremely pleased with the home digital system, which he says "delivers sound quality very close to the professional system."



Sony Betamax VCR sits atop the PCM-F1 in WFMT's studio. Watching as station engineer Larry Rock operates the system are Sony high fidelity national training manager Marc Finer (left) and producer Rich Warren.

AUDIO

any kind of dynamic range you get distortion on wide swings unless you employ limiting before the recorder," Newman complains. He suggests hooking high-quality stereo limiters to the mixer outputs for the video feed to avoid overload on the VTR. The availability of Dolby noise reduction for one-inch recorders is a "delightful" development, he concedes.

Like Scharff, Newman sees great potential in the use of radio microphones for audio recording. One big advantage of radio mics, according to Newman, is that they allow producers to save labor costs: "If you give a guy three or four radio mics he can do a job by himself if pressed." Quality is very good with most of the RF mics he has used, he says, although no transmitter is reliable 100 percent of the time. Newman recalls testing a very expensive RF lavalier mic that, he says, produced extremely high sound quality, but still did not transmit reliably under certain difficult conditions.

Newman also predicts increasing miniaturization of lavaliers. "The most difficult aspect" of miniaturization, he explains, "is the power source. Maybe with these new wafer-thin lithium batteries, they'll be able to do it." Another barrier is the cost of R&D—"big numbers for a very limited market," as Newman puts it. Video, he notes, makes it easier for sound engineers to "hide" small lavaliers

in the open. "If you can't see it on the monitor, you won't see it," he notes. "It's different from looking through the finder of a film camera—you're not necessarily seeing what the film sees." Another positive aspect to sound work for video, Newman explains, is the ability to see in real time exactly what each shot looks like, so that the mix can be appropriate.

Mixing designs also may see some advances, Newman speculates. "Even portable mixers may have more automation," he muses. "And I'm sure the portable mixers will become more rugged, more reliable—and less expensive, hopefully." None of these advances, however, spells any major change in miking or recording technique, and none will make recording foolproof, Newman asserts.

"Everything can be perfect, with your equipment meticulously checked and working perfectly," he says, "but if the surf crashes down at the wrong moment or the airplane flies at the wrong time, forget it. That's luck, and no state of the art can fix that."

WTIC: Streamlined quality for radio

WTIC-AM/FM, Hartford, CT, has a long history of doing audio in the field—its first remote broadcast was back in 1925. Chief engineer Larry Titus says that one of his main jobs has been to simplify remote operations so engineers are unnecessary and talent can run the whole show. "We had 11 engineers when I came to the station five years ago," Titus says. "Now there are only three."

The station is in the field regularly, for both recording and live remotes, Titus says. For events such as the Greater Hartford Open golf tournament, the station uses an

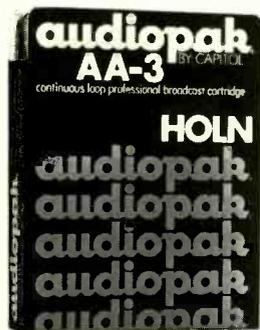
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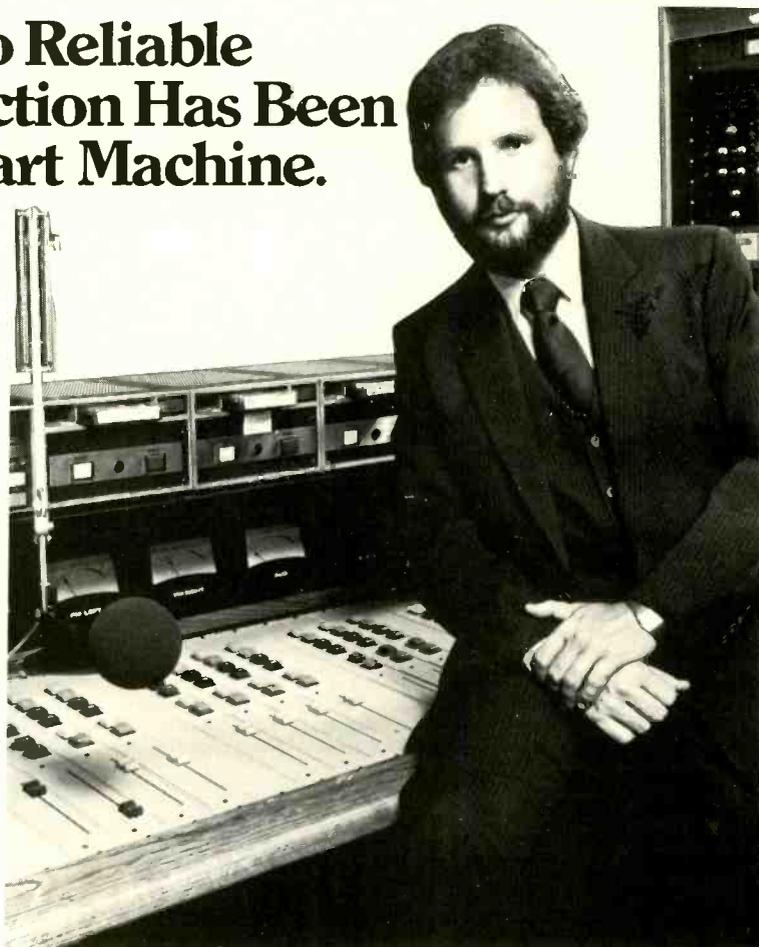
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Chief Engineer, KNIX AM & FM,
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AUDIO

Ampex 351 recorder, which Titus says "takes the abuse nicely. We usually take a stereo or mono deck into the field," Titus explains. "Typically, we don't do multi-track work, although the station is capable of it."

Titus's do-it-yourself philosophy has given the station some innovative equipment. One item is a radio ENG package WTIC uses regularly on its remotes. A Motorola two-way radio, modified for broadcast quality at the station and fitted with small nicad batteries, straps onto the shoulder of the user. On the other side of the package is a box containing an AM/FM radio for audio cuing, complete with push-to-talk switch. The package also has a Telex headset with a lip mic (a hand mic can be substituted if desired); the antenna mounts to the headset. The entire package weighs about two pounds; Titus has built three so far. Because it is so lightweight, the station has actually strapped one to a runner to cover a road race.

To mix sound in the field, the station uses a Sport IV minimixer from Micro-Trak. Titus is extremely pleased with the quality and convenience of the Sport IV, but that didn't stop him from trying to make it a little better. "We color-coded the dials to make it easier for talent to use," he explains, "and we also modified the headphone select." The latter modification, Titus boasts, will be incorporated in Micro-Trak's next model. The lightweight Sport IV has done extensive traveling for WTIC: a talk-

show host took it to Washington, DC one week and did his show from there, and the station's sports director took it to Florida to cover baseball spring training. Neither required an engineer, Titus says.

Clifford Foot, chief engineer at KJR-AM in Seattle, has also found small portable mixers to be the answer for situations where space is at a premium. The station has two Eela portable mixers, a tiny minimixer that has been used for remotes from blimps, for example, and a somewhat larger 6x2 model for remote recording as well as live pickups. Both are distributed in this country by Audio & Design. Foot says he is very pleased with the quality of the Eela mixers; the larger model, S-191, has for each channel three EQ curves, auxiliary effects send, pan pot, mute or solo channel, a phantom send channel (which can feed a hot stage monitor), and a talkback circuit. The whole thing weighs about 15 pounds and has both external power and phantom power for mics. "The mixers seem to be impregnable to RFI," Foot comments.

A new technique that is working well for the station, according to Foot, is a conventional Motorola two-way radio beefed up for high-quality audio by J-Engineering of Conoga Park, CA. The unit provides broadcast quality and helps the station avoid telco lines, with their inherent noise problems.

It is clear that getting the best sound possible has become a top priority in broadcasting, and continued improvement in broadcast audio appears inevitable. As the technology is refined, the standards of both broadcasters and their audiences rise, providing impetus for further growth. Once on the road to high fidelity, broadcasters will find there's no turning back. **BM/E**

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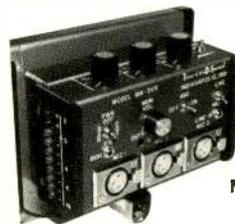
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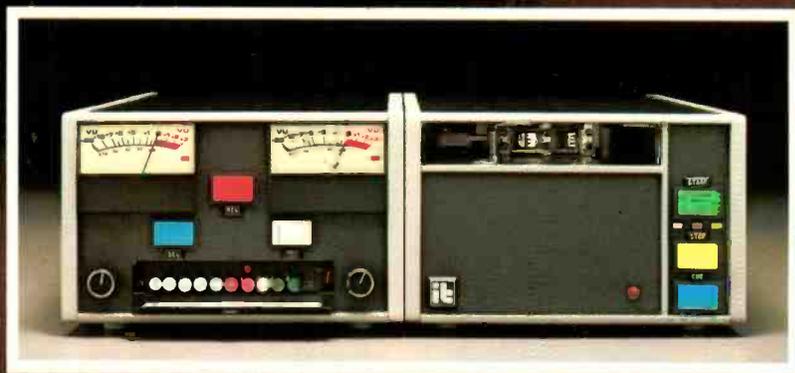
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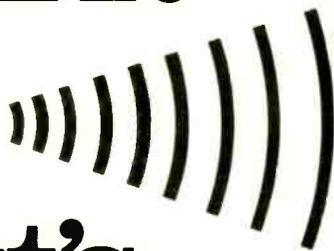
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Quarter-Inch ATR Becomes Broadcast's Recording Workhorse



The number of choices available to audio producers and broadcasters in 1/4-inch ATRs is growing steadily, keeping pace with increased demands for production flexibility. Now there's a choice for every budget and application.

(Left, top to bottom) Ampex's ATR 800 in rolling cabinet; Mitsubishi's X-80 PCM recorder; Studer's new A810. (Right) MCI's JH-100 Series 1/4-inch studio deck; (below) Teac's 44 Series.



AUDIO



PROBABLY NO OTHER PIECE OF EQUIPMENT in a contemporary facility has such a wide range of uses yet is so taken for granted as the 1/4-inch ATR. And despite advances being made in multitrack audio recorders, the "old reliable" 1/4-inch models are still increasing in use in response to the increasing amount of material being produced outside the studio.

The accompanying chart is self-explanatory, and provides both performance and features information about the latest recorders available from over a dozen manufacturers. Only currently-available models of 1/4-inch ATRs designed for production and broadcast applications are included; logging recorders are not. Some additional comments are also in order, however.

One of the most exciting developments in 1/4-inch recording has been Mitsubishi's recent introduction of its X-80 (portable) and X-80A (studio) two-channel digital recorders. Both use standard 1/4-inch tape at 15 ips, offer cut-and-splice editing, and are designed to interface with Mitsubishi's XE-1 electronic editor. These are the only 1/4-inch digital machines currently on the market (Sony's PCM units use 1/2-inch tape). The sampling frequency is 48 kHz with an optional converter for the 44.1 kHz sampling required by the digital audio disk. Other specifications are impressive with unmeasurable wow & flutter, over 90 dB dynamic range, and a 20 Hz to 20 kHz frequency response.

Another new machine with high standards and compact styling is Nagra Magnetic's T-Audio. Nagra has, of course, had a long line of dependable units from the E model to the IV-S, and all of that experience has gone into the T-Audio. This unit takes a 12-inch reel, and has two audio tracks and one sync track. Twin dc servo capstan motors drive the tape and there is a manual servo edit mode plus an interchangeable head block. The T-Audio has selectable search-speed and direction, remote control, and is SMPTE code capable.

Studer also has a distinguished line including the B77 and PR99 models. The newly introduced A810 offers full microprocessor control with digital programming of both the transport and audio systems. There is also an interface for computer control, phase corrected amps, and either transformer or transformerless electronics. A four-address auto locator is built in with four tape spooling speeds, SMPTE code operation, and, of course, stereo capability.

In its 1/4-inch configuration, the Ampex ATR-800 is a mono or two track machine with 11.5-inch DIN reels, dc

(Top to bottom) Nagra's T-Audio has many new features; Otari's 505BQ; the 255 1/4-inch unit from Amprol/Scully. (Bottom right) ITC's durable 770 Series.



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QUARTER-INCH BROADCAST AUDIO TAPE RECORDER/PLAYERS

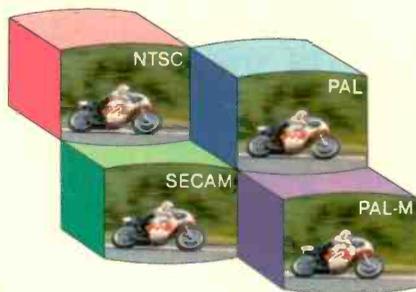
Manufacturer, Models	Tracks record/play	Tape speed (ips)	Max. reel size (in.)	Capstan motor	Features	Price range
Ampex ATR-700	full and 2	3.75, 7.5 or 7.5, 15	10.5	dc servo	dump edit, NAB/IEC EQ select	less than \$3000
ATR-800	full and 2	3.75, 7.5, 15 or 7.5, 15, 30	11.5	dc servo	microprocessor based, EQ select, variable speed	\$3-6000
ATR-100	full and 2	3.75, 7.5, 15, 30	14	dc servo	dump edit, pinch rollerless	\$6-10,000
Ampro/Scully 255	full, 1/2, 2, 1/4	3.75 or 7.5 or 15	10.5	ac hysteresis synchronous	remote control, motion sensing	less than \$3000
250	full, 1/2, 2, 1/4	3.75, 7.5 or 7.5, 15	10.5	ac hysteresis synchronous	mic preamp option, motion sensing	less than \$3000
285B	full, 2, 1/4	3.75, 7.5 or 7.5, 15	10.5	ac hysteresis synchronous	dynamic braking, remote control capability	\$3-6000
280B	full, 1/2, 2, 1/4, 4	3.75, 7.5 or 7.5, 15 or 15, 30	10.5	ac hysteresis synchronous	optional servo motor, TTL logic with 3 relays	\$3-6000
Fostex A-8	8	15	7	dc servo	pitch control, return to zero memory	less than \$3000
ITC 770	full	3.75, 7.5, 15	10.5	dc servo	individual reel motors	less than \$3000
MCI JH-110B	1 to 4	3.75, 7.5, 15	14	dc servo	manual speed for editing	\$3-6000
JH-100BC	2	7.5, 15	11.5	dc servo	microprocessor control for tape timer/locator	\$3-6000
Mitsubishi X-80 (portable) X-80A (studio)	2	15	10	dc servo	PCM digital, electronic edit, error correction, ferrite heads	\$20-30,000
Nagra E	full	3.75 or 7.5	7	dc servo	battery portable	less than \$3000
4.2	full	3.75, 7.5, 15	10.5	dc servo	battery portable	\$3-6000
IV-S	2 (stereo)	3.75, 7.5, 15	10.5	dc servo	stereo, pilot sync, SMPTE	\$3-6000
T-Audio	3	3.75, 7.5, 15, 30	11.8	2 dc servos	changeable head block, remote control	\$6-10,000
Otari MX-5050B	2	3.75, 7.5, 15	10.5	dc servo	dump edit, motion sensing, microprocessor based	less than \$3000
MX-5050-BQII	4	3.75, 7.5, 15	10.5	dc servo	same	less than \$3000
Sound Dynamics SD-100-1	full	3.75, 7.5 or 7.5, 15	10.5	ac	dc servo available, remote control available	less than \$3000
SD-100-2	2 (stereo)	3.75, 7.5 or 7.5, 15	10.5	ac	same	\$3-6000
Studer/Revox B77	2 to 4	15/16 to 15	10.5	ac servo	sound on sound	less than \$3000
PR99	mono to 2	3.75, 7.5 or 7.5, 15	10.5	ac servo	full logic, sound on sound, dump edit, vari-speed	less than \$3000
B67	mono to 2	3.75 to 30	11.1	ac servo	time counter, EQ select	\$3-6000
A810	full and 2	3.75 to 30	11.1	ac servo	microprocessor, SMPTE, stereo	\$6-10,000
Tandberg TD 20A-SE	2 to 4	7.5, 15	10.5	hysteresis synchronous	cueing, equalization	less than \$3000
TD 20A-P	2	7.5, 15	10.5	hysteresis synchronous	edit cutter, carrying case	less than \$3000
TEAC 44	4	7.5, 15	10.5	dc servo	pitch control, EQ	on request
Technics (Panasonic) 1700	2	3.75, 7.5, 15	10.5	3 dc quartz	auto reverse	on request
Telex 1400	4	1 7/8 to 15	7	dc servo	remote control	\$3-6000
3000	4	3.75, 7.5, 15	10.5	synchronous	remote control, auto cue release	\$3-6000

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able LT 1200 Digital TV Standards Converter. The cost performance of this system sets the industry standard. And its reliability in the field as well as in rugged use in broadcast stations has earned the LT 1200 a reputation for dependable performance. Operation is totally automatic and totally simple. For converting NTSC, PAL, SECAM, or PAL-M, leave it to the LT 1200. Wherever you are.

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AUDIO

Motors are hysteresis synchronous, with cueing and self sync. The TD 20A-L has a dc servo motor and an auto system allowing two machines to record up to 48 hours continuously.

Two production machines are offered by Telex, the 1400 which takes a seven-inch reel, and the 3000 with a 10.5-inch reel. The 1400 operates by dc servo with remote control and hand cueing. Four tape speeds are available. Model 3000 has tape speeds of 3.75 to 15 ips and also offers an auto cue release function.

Solid state electronics produce, at 15 ips, a 30 to 22 kHz frequency response in Sound Dynamics' two models, the SD-100-1 and 2. The latter is a stereo version, but all other specifications are the same. The capstan motors are ac with dc servo optional as is remote control and the roll around cabinet. Two tape speeds are available for both units.

International Tapetronics has a long list of accomplishments in the broadcast cartridge business and it also has a useful workhorse in reel-to-reel recorder/reproducers. It comes in either mono or stereo, full or 1/2 track, and uses a dc servo motor with two speeds. The unit boasts a new playback head with improved low frequency response. There are individual reel drive motors and permanently lubricated ball bearings for motor rotation of 1800 rpm.

Technics, with its unique isolated loop open reel tape



Telex's 3000 Series features CMOS logic.

threading, offers only one 1/4-inch machine for use by the broadcast industry. The RS-1700 has a three-motor direct drive tape transport with a single large capstan at the top of the loop. Phase lock and tape tension control are standard as is the interchangeable head assembly and the auto-reverse facility.

Other versatile open reel decks are the 30 and 40 Series by TEAC. They feature two tape speeds and weigh only 20 kg. Wow and flutter is only .06 percent. A return-to-zero function is standard. These machines operate vertically or horizontally and can be rack mounted.

One of the most reliable, on-air playback machines for

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automation is Ampro/Scully's Model 255. Single tape speed operation is standard with a choice of 3.75, 7.5, or 15 ips. Motion sensing logic with three relays and full remote control are available.

Fostex has put eight tracks on 1/4-inch tape with its A-8 reel to reel. The transport controls are IC logic with three dc motors to drive the tape. A useful feature in this unit, which is primarily intended as a music recorder, is shut-off tension arms to prevent tape spills.

Many of these manufacturers produce several models offering various functions at different prices. The preceding information should act as a general guide to what is available rather than a comprehensive listing.



The 1700 is Technics' broadcast machine.



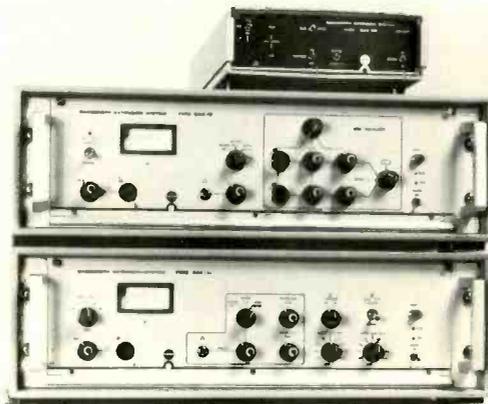
The Fostex A-8 has eight tracks on 1/4-inch tape.

Whatever your budget, there are good 1/4-inch open-reel decks available. The decision ultimately comes down to a question of applications and price/performance factors. **BM/E**

turn your telephone line into a music line, and pay less

5 KHz lines are far from cheap and not always available. So why not use Rood's low-cost alternative, the Bandwidth Extension system (BAX for short), and save money while retaining the same quality?

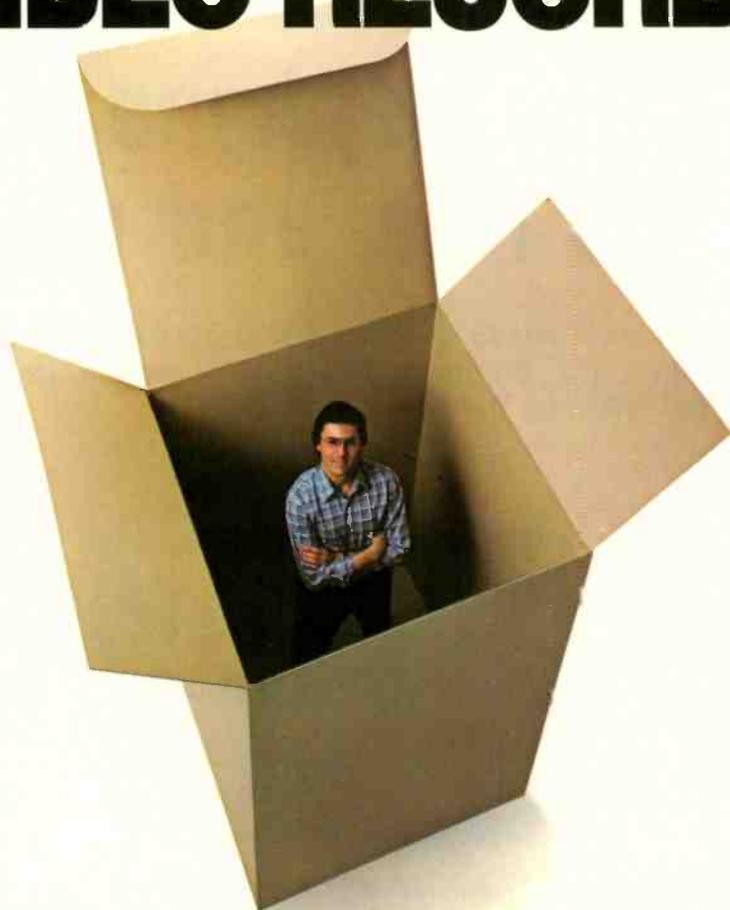
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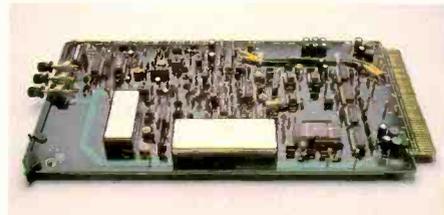
That's why there's no one single BVH-2000.

The BVH-2000 actually allows you to "design" the VTR you need for your own particular applications and budget.

You can choose among three different control panels—ranging from a basic model to one with virtually every possible feature and function.

And the tape transport system, signal system, and control section can either be combined into a single unit, or separated easily and installed in a 19" rack or console.

The BVH-2000 also gives you far greater latitude in setting up your entire recording system. Various remote-control connectors enable you to interface your system in a variety of ways for studio, mobile, and editing configurations. Direct interface with U-matic® and Betacam™ is possible, too. The BVH-2000



A range of plug-in accessories is available also has an optional plug-in time base corrector.

What's more, the BVH-2000's lighter weight and smaller size (almost 50% less than its predecessor) make it as ideal on the road as it is in the studio.

And because of the ever-increasing number of applications requiring longer program times, the BVH-2000 provides up to 2 hours of tape time.

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In the BVH-2000, unlike most other VTR's, microprocessors are used to their full advantage. All data necessary for servo control are channeled into a central processing unit, making the operator's control over all systems and functions simpler and more precise.

Life is made simpler yet by the fact that every necessary function control, metering facility, and electronic module is accessible from the front.

Even the way the tape moves through the recorder has been simplified. One innovation—an extremely precise servo mechanism



The BVH-2000 (shown with Type-III control panel).



Front access to all electronic circuits and modules.

—permits the entrance and exit guide posts to move about 10mm away from the drum during threading. The result is the easiest threading system ever in a 1" video recorder.

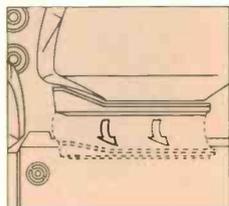
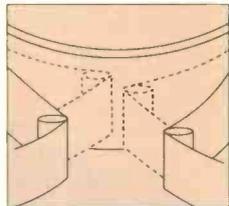
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The BVH-2000 removes much of the mystery from maintenance, too. It literally tells you about malfunctions—usually well before you'd notice them yourself—through a microprocessor-governed self-diagnostic system.

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Most defects can be easily found—allowing for far less complicated maintenance and repairs, and reducing downtime considerably.

And because the best way to simplify maintenance



To simplify threading, guide posts automatically move away from drum, and audio head cover opens.

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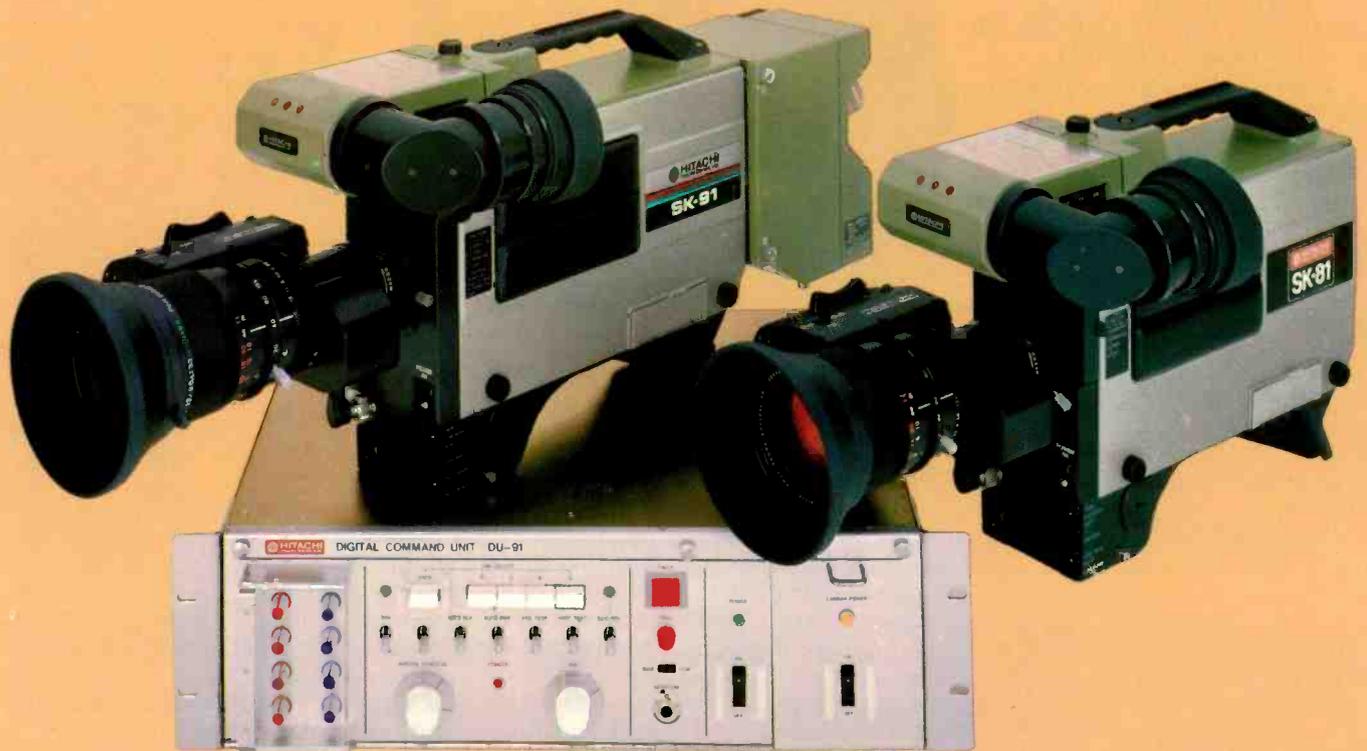


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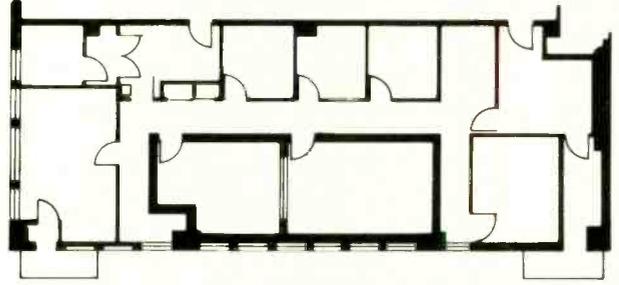
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FACILITIES DESIGN AND ENGINEERING PART 3



FUNCTIONAL PLANNING OF THE TV STATION

BY JAMES G. GARY

A quick tour through just about any television broadcast facility is almost certain to reveal one or more of the common problems that complicate daily operations in today's television stations. The visitor may notice a distressed audio engineer concerned about the noise generated by set construction going on in a prop room directly adjacent to the production studio. A glance into the newsroom may find state-of-the-art weather forecasting equipment dominating workspace that was originally planned for reporters or other support personnel. The station's reception area may provide plenty of comfortable seating for visi-

tors, but offer no means of limiting the general public's access to sensitive areas of the station.

Sadly, many of these typical problems could have been avoided in most cases—if the architects designing the facility had been provided with vital input from station managers and technical experts during the design process. Functional planning is a step-by-step process architects use to work with a station's general manager and chief engineer to assure that the final design of the facility is compatible with the working requirements of each department in the facility.

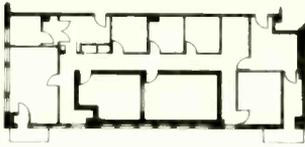
James G. Gary is a principal and the senior facilities planner/programmer with Rees Associates, Inc., Architects, Planners, Engineers, an Oklahoma City-based firm specializing in planning and design for broadcast production facilities.

FIRST THINGS FIRST

"Programming" is the first step in the functional planning process. Programming activities start with individual interviews conducted by the architects to determine how each person at the station performs his job. In con-



Back-to-back MC and engineering lab at KAUT simplify servicing.



FACILITIES DESIGN AND ENGINEERING

ducting these preliminary interviews, it is essential to include the station's key decision makers in addition to all support personnel. In this regard, the general manager and chief engineer play a critical role in identifying the persons who will ultimately have the power to make important decisions regarding final design criteria.

Interviews conducted during the programming process provide information regarding the people, equipment and space required to meet the needs of each of the station's departments. Equally important is the opportunity the process provides to track the history of growth at the station. The data resulting from programming interviews provides the basis for a written description of how each department in the station functions and how trends in the department have developed over the past few years. Using the information, the architects can accurately project the future staffing, equipment, and space requirements of the station as a whole.

Failing to include engineering personnel in the interview process can lead to critical problems in the station's design. For example, directors and technicians may express a preference for a particular brand and model of studio lighting fixture. However, engineers often provide essential input regarding factors such as the availability of replacement parts. In one case, the lights preferred by production personnel had a history of causing downtime due to long waits for parts. Consulting the station's engineers resulted in a compromise and the decision to specify lights with readily available parts.

DETERMINING SPACE REQUIREMENTS

Space planning follows the programming activities. Once the number of people and the specific equipment they need to perform their job functions have been deter-

mined, the area required to house the staff and machines of each department can be established. Having prepared similar tables for each individual department of the station, the next step is to draw functional diagrams that indicate the planned use of each area of all station departments. A functional diagram for the technical management department (Figure 1) provides a check against forgotten provisions for planned activities and helps establish a basis for further discussion with all members of the planning team.

Once functional diagrams are complete for all areas of a station, the architects identify significant relationships between departments by constructing an interdepartmental matrix (Figure 2). This matrix establishes location priorities which will become important in the later phases of the design process. Based on the relationships identified in the interdepartmental matrix, various arrangements of the station's departments are sketched in block diagrams. Block diagrams show the relative size of each department and help to determine the best configuration for the final facility. Using block diagrams, the architects are also able to make decisions regarding such factors as the relative advantages of a single level facility versus a multilevel building, and the most cost-effective means of solving the design problem at hand.

APPLYING THE DATA

By working with station managers and engineers within the systematic structure of the functional planning process, the architects are able to identify the needs of specific departments within the broadcast facility. For example, departments with a history of growth are positioned at the building perimeter to provide room for expansion. Such growth patterns are easily identified by reviewing programming data and making logical projections based on past trends.

Other factors, such as access to natural light and outside views are also taken into account in the planning process. In areas such as traffic, sales, and executive and management business offices, outside light does not interfere with

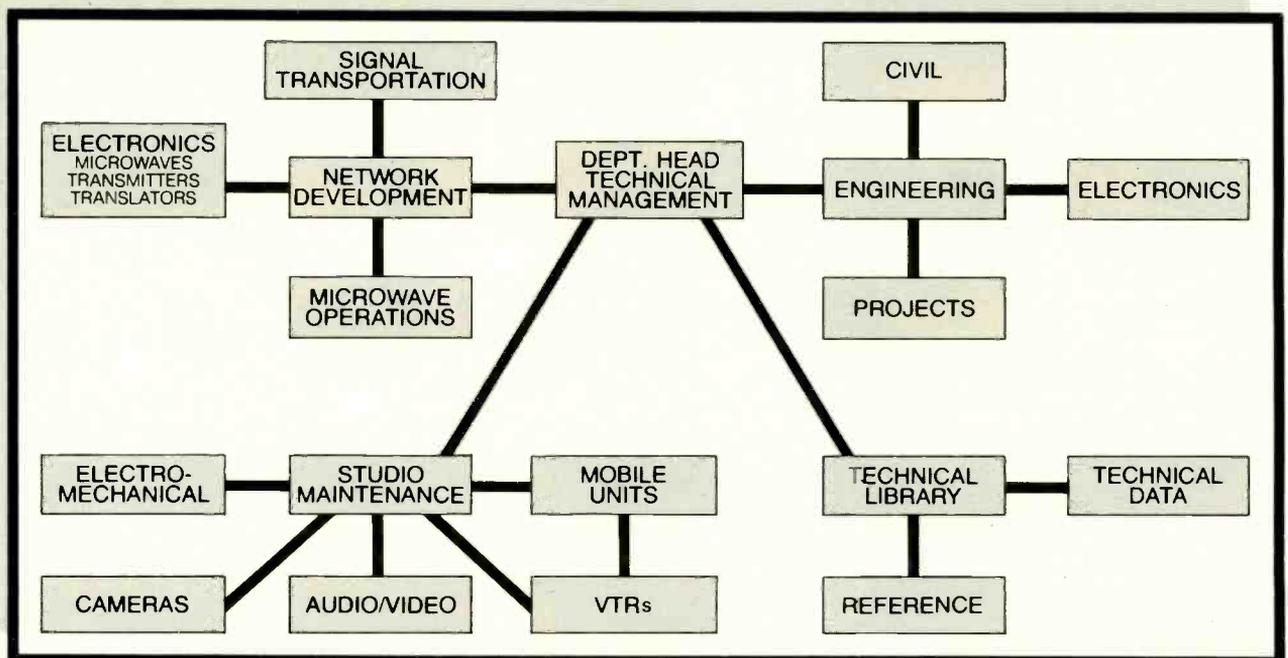


Figure 1. A functional relationship diagram for technical management.

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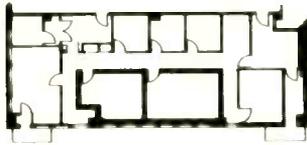
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the daily operations of the departments. However, in technical departments such as master control and tape air, intense sunlight can cause difficulty for technicians concentrating on monitors. Direct sunlight can also damage videotape and create temperature control problems in technical areas. Since people working in technical areas need the psychological relief of daylight and outside views, rooms such as master control should be located next to break rooms. This enables technicians on a short break to catch a glimpse of the outside world before returning to work.

Detailed functional planning also identifies important relationships between departments in the broadcast facility. At KAUT-TV in Oklahoma City, for example, the station's master control area was located adjacent to the

engineering lab. This enabled the architects to position master control equipment racks along a common wall to provide easy access for equipment maintenance and adjustment. Similarly, the station's technical production and engineering areas are located adjacent to news and main production studios, forming a "technical block" that groups related types of activities in a convenient, logical configuration.

Limiting access to sensitive areas of television stations has become an increasingly important design issue in recent years. Often, older facilities require uniformed guards or other full-time personnel to control access to executive offices, sales records, and technical areas of the station. However, considering these security aspects during the functional planning process can eliminate the need for guards and make the station seem like less of a "fortress" to the general public. KAUT-TV's main public entry is an excellent example of a reception area designed for both visual appeal and control. Persons entering the facility encounter a receptionist in a warm, personal setting. Here, a simple "May I help you?" from the person at the

	ADMINISTRATION	TECHNICAL LIBRARY	ENGINEERING	Dept. Head	Section Chiefs	Electronics Lab	Drafting	NETWORK DEVELOPMENT	Dept. Head	Signal Transportation	Regional Coordinator	Engineers	Microwave Lab	Transmitter Lab	Translator Lab	Instrumentation Library	Microwave Operations	STUDIO MAINTENANCE	Dept. Head	Quality Control	Magnetos (VTR'S)	Audio/Video	Cameras	Mobile Units	Electro-Mechanical	
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Regional Coordinator	3	3	4	4	4	4		1	1																	
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Microwave Lab	4	2	3	3	4	4		3	3	3	1															
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Translator Lab	4	2	3	3	4	4		3	3	3	1	1	1													
Instrumentation Library	4	2	3	3	4	4		3	3	3	1	1	1	1												
Microwave Operations	4	4	3	3	4	4		3	3	3	2	2	2	2	3											
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Magnetos (VTR'S)	4	2	3	3	4	4		4	4	4	4	4	4	4	4	4		2	2							
Audio/Video	4	2	3	3	4	4		4	4	4	4	4	4	4	4	4		2	2	1						
Cameras	4	2	3	3	4	4		4	4	4	4	4	4	4	4	4		2	2	1	1					
Mobile Units	4	2	3	3	4	4		4	4	4	4	4	4	4	4	4		2	2	2	2					
Electro-Mechanical	4	2	3	3	4	4		4	4	4	4	4	4	4	4	4		2	2	2	2	2	2			

- 1. Immediate Adjacency
- 2. Close Proximity
- 3. No Strong Relation
- 4. No Relationship

Figure 2. A physical relationship matrix for technical management.

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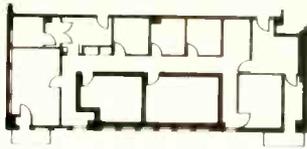
For a firsthand impression of 3M Routing Switchers, check with John Owen, V.P. Television Engineering at Taft Broadcasting. So far, he's only had one complaint: "I wish we would have had them in '76, '77 and '78'".

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front desk replaces the ominous presence of a guard.

On the other hand, some areas of a television station, including sales, traffic, and management offices must be designed in anticipation of a high volume of visitor traffic. Therefore, areas for public and client contact should be designed to provide circulation corridors which route visitors to their destinations, while precluding admittance to controlled areas. Providing windows which give limited views of technical and production operations from public corridors solves the problem of conducting facility tours without interrupting the work in progress at the station.

Similarly, locating station departments with related functions in adjacent areas improves security as well as improving interdepartmental relationships. Technical production areas are most closely tied to programming, promotion and production, news and engineering departments. Engineering areas are best located near operations and news functions. Public affairs departments should be near administrative offices; news near operations; and administrative offices in close proximity to programming, promotion, production, and business office locations. Further design features, such as limiting access to production studios by providing only one interior and one exterior exit, and linking a station's newsroom directly to its news studio, result in the best working relationships with a minimum of interference.

SOLVING UNUSUAL PROBLEMS

In the case of a new facility designed for TV-Chile, management's main concern was to prepare for coverage of the 1987 Pan-American Games. TV-Chile's engineers were also concerned about protecting the station's investment in technical equipment. Since 1969, the station had acquired a large amount of modern equipment, housed in less than adequate conditions. VTRs with an estimated service life of 300 hours, for example, had been lasting as little as 100 hours because of a lack of the ability to control environmental factors such as temperature, humidity, and dust.

The functional planning and space planning process re-

quired the architects to interview some three dozen employees with various job descriptions. The process was made more difficult by the complexity and size of the operation with some 100 transmitters and translators located throughout Chile—the equivalent of a scaled-down U.S. network operation.

At TV-Chile, the first phase of overall facility planning involved the eventual replacement of the entire facility, starting with a major new 8,600 square foot production studio and the replacement of all technical facilities. This initial effort also provided covered parking for the station's 10 mobile studios and video, microwave, audio control, and VTR vans anticipated by the time of the Pan-American Games.

As with TV-Chile, functional planning related to the redesign of an existing facility helps to point out major shortcomings in existing design, while providing design solutions which solve the same problems in new or renovated construction. Housed in an array of single and multilevel buildings on a 7.7 acre site, TV-Chile has experienced rapid and uncontrolled growth in the past. Decisions made as a result of the functional planning process at TV-Chile reflect the requirement of phasing the overall project to keep costs in line with available funds. Therefore, the architects identified certain interim design solutions as the most cost-effective in terms of both structural and staffing efficiency.

The initial planning phase at TV-Chile provided new studio and technical areas; functions which had previously been housed on the second level of the station's existing studio building. Phase I also enables studio equipment maintenance shops to be relocated in ground-level facilities, the same level occupied by new technical areas for master control, continuity, VTRs, telecine, and tape air. This change eliminates the need to carry heavy equipment up or down stairs for repairs. Likewise, moving technical areas and the station's studio maintenance shops frees space for other functions on the second level of existing construction. However, since the building in question will eventually be replaced or used for nothing more than warehouse space or set shops, interim use of this space has been limited to office functions. This decision alleviates the overcrowded conditions in the station's administrative, financial, and management areas and requires less expensive renovation procedures, such as interior painting and the installation of carpeting.



KAUT's reception area affords comfortable visitor seating but limited access to station interior.

The key to identifying the actual needs of a station is the architects' thoroughness in asking questions about how each person at the station should ideally perform his or her job. Typically, engineers are the most up-to-date on new equipment and professional techniques and play an important role in bringing desired items or design features to the attention of the architects. For example, requests for items such as high pressure sodium studio lighting fixtures enable proper lighting levels to be achieved without the heat gain associated with standard fixtures. This, in turn, means that the heating ventilation and air conditioning systems for studios can be sized to handle less extreme variation in studio temperatures, saving both equipment and operating costs.

TECHNICAL REQUIREMENTS

The specification of a particular piece of equipment often influences the selection of other systems or design options for the area in which it is to be housed. The electrical requirements of individual machines often dictate the electrical distribution within a technical area. Locating these machines close to main electrical supplies can simplify installation and maintenance while keeping construction or renovation costs down.

Determining the number and type of tape machines anticipated in a facility in the future can enable the architects to plan access or wiring and the circulation of chilled air to cool associated equipment racks. Working with the chief engineer to establish equipment requirements can also provide a means of evaluating the relative merits of design

options such as providing for cable runs in sub-floor trenches or by means of access flooring.

Seemingly simple decisions such as the color of floor covering materials in studios can be closely tied to the specifications for video cameras. If engineers specify cameras requiring in excess of 200 footcandles for optimum performance, dark floor materials should be used. However, newer cameras which require about 100 footcandles can work well with light floor colors. Extra precautions such as subjecting sample floor materials to in-studio test shots, can eliminate later problems.

Installing sound attenuation materials above the ceilings of control rooms and recording booths helps limit the introduction of unwanted noise into the studios. Set storage and construction areas are often located near studios for convenience. However, if set construction or the delivery of materials is anticipated during production, proper acoustical isolation is essential.

THE BOTTOM LINE

Working with all key employees at a broadcast facility to determine the detailed needs of specific departments and verifying the information gathered by reviewing data with management and engineering officials, is the best way to ensure that the facility will meet the needs of the station at the time it is built. The functional planning process also assures that the station will continue to provide an ideal working environment as new technological developments in equipment and revised operating procedures are incorporated.

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interpreting the FCC rules & regulations

Commission OKs AM Regs

By Harry Cole
Farmer, Wells, McGuinn, Flood & Bechtel

AFTER A PROLONGED period of lagging technologically behind its sister services, that grandfather of broadcast services, AM radio, is finally getting a much-needed shot in the arm. The Commission has recently decided to expand both the number of AM stations *and* the nature of the services they can provide. And, while these changes may be but forerunners to further changes in all of the various broadcast services, it is doubtless comforting to AM broadcasters to finally be getting additional opportunities.

As far as the raw numbers of AM stations are concerned, earlier this summer the Commission took a giant step toward adding a significant number of new daytime-only stations by opening up the 25 Class I-A clear channel frequencies for daytime-only use on a limited basis. Those channels, of course, were initially opened up for expanded full-time use two years ago, after several decades during which one or two stations enjoyed virtually monopolistic control of their respective frequencies at night.

When this opening up of the clear channels occurred in 1980, the Commission specifically declined to accept any new daytime-only applications, whether for new stations or for improvements to existing stations. The idea was to preclude as few new full-time operations as possible, at least until the FCC had a chance to consider how best to deal with daytime protection requirements and possible unlimited-time operation by daytimers already on the clears. Now, after two years, it has been decided that some additional daytimers can be tolerated without any undue effects.

The restrictions imposed on new daytime-only clear channel applications are relatively simple. The station has only to locate itself within the nighttime interference-protected service area—*i.e.*, the 0.5 mV/m 50 percent contour—of the clear channel station already on the frequency to be used. The Commission feels that daytime stations can operate in the “sizeable zone” between daytime and nighttime Class I-A service areas without precluding potential full-time stations, which would be limited by the dominant station’s nighttime protection limits. This involves a substantial area—possibly extending as far as 100 miles from the Class I-A station’s transmitter. Of course, applicants would still have to satisfy the various other technical acceptance rules; but now they are in a position to at least try for use of the clear channels.

However, although the Commission has taken this positive action to increase and, in some cases, improve AM

service, its timing may have been somewhat questionable. The Commission’s AM Branch is still reeling from the 1980 clear channel decision, which generated some 300 applications, the vast majority of which still have not been acted on. To make matters worse, the FCC’s recent action may generate as many as 200 additional applications. After all, the Class I-A stations—within whose nighttime interference-protected contours the new applications will be squeezed—are located in extremely desirable areas. It has been a while since the Commission offered any opportunities for new stations in most of these cities, and it will be surprising if many would-be broadcasters don’t take a shot at one or more of these frequencies, even if they will get, at most, daytime-only facilities.

Of course, these new applications will just be added in with the rest of the full-time applications that have been on file for some time. The AM Branch has only two lawyers at most presently on hand to bear the brunt.

One element that makes the FCC’s decision to accept additional daytime only applications somewhat surprising is that existing daytime-only broadcasters have for years been pressuring the Commission to elevate them to full-time status while the FCC, in response, has committed itself to exploring the options available and to taking whatever action is possible. By creating more daytime-only stations, the Commission is also adding to the pressure it can expect to encounter from the already vocal daytimer lobby.

In addition to expanding the *number* of potential AM stations, the Commission has also recently moved to expand the services they can offer. The Commission has taken another step toward AM-FM equivalence by authorizing AM licensees to utilize their residual carrier for fuel load management purposes. FM licensees were authorized to use their subsidiary communications authorizations (SCAs) for this type of service last year, and now AM licensees, too, may realize some additional revenues from this type of non-broadcast service.

AM and FM fuel load management is based on relatively recent technologies that permit the design of systems with which utility companies can regulate more efficiently their average and peak loads, both residential and industrial. The system includes a master control unit at the radio station and individual receivers/decoders in the various homes and businesses on the system. The master control unit is programmed by the utility company with specific, digital instructions for each individual receiver

FCC RULES & REGULATIONS

and transmitted over the AM carrier (or the FM SCA). The individual receivers pick up the signal, decode it, and automatically carry out the instructions electronically.

Of course, there is no such thing as a free lunch, and just as FM SCA use occupies one FM subcarrier to the exclusion of other signals on that subcarrier, so too does use of AM carriers present some choices for the licensee. This is particularly true in light of two facts. First, the FCC has composed virtually no specific rules and regulations governing AM fuel load management, other than the fairly obvious proposition that such use should not disrupt or degrade the station's regular broadcast service. Second, the various AM stereo systems presently available utilize pilot frequencies that are available for fuel load management. If one station chooses a particular frequency for stereo service, and another nearby station chooses the same frequency for load management, some adverse reception effects could occur in stereo receivers.

While not requiring any particular selection, the Commission has broadly hinted that the frequency opening between 25 and 55 Hz would be appropriate, since the five available AM stereo systems have located their sub-audible pilot tones at 5 Hz (Magnavox), 10 Hz (Belar), 15 Hz (Kahn), 25 Hz (Motorola), and 55-96 Hz (Harris' sweeping tone).

The decision to permit AM stations to provide load management services is indicative of a trend at the Commission toward maximum efficient utilization of the available spectrum, regardless of the traditional "pigeon-

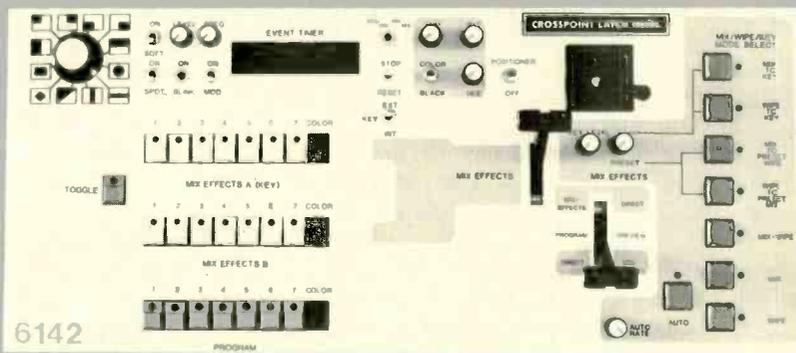
holing" approach taken to spectrum allocation. In other words, the frequency bands allocated to broadcast uses have historically been absolutely restricted to broadcast use. Now, however, the FCC has decided to permit broadcasters to "piggy-back" the non-broadcast load management signals onto their main signal as long as that main signal is not disrupted. In this way efficient use of the frequency space involved is maximized.

In view of this trend, broadcasters should be on the lookout in coming months for the opening of further possible uses of their signals. For instance, it is apparent from a recent Commission action involving a television station's proposed use of its aural subcarrier that the FCC is indeed moving forward with its consideration of multi-channel sound for television. No firm estimates of when action can be expected are available, although some concrete proposals are expected by November, and the Commission's staff is already hard at work on it.

As is apparent from the nature of the load management service, though, potential uses are *not* restricted to broadcasting. Also in the works at the Commission is a proposal for an extremely wide variety of industrial and/or private uses of the FM baseband. This proposal is expected to be ready for comment in the late summer/early fall of this year, and while details have not yet been made public, present indications are that it will give FM licensees a very broad range of opportunities not now available. And changes effected in FM are likely to find their way over to the AM band not long after.

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The 6142 is an extremely stable and versatile switcher. A very useful feature is the program and preview cross-fade. This permits a convenient dissolve from one camera to a previewed effect between two other cameras and then a dissolve to a previewed fourth camera.

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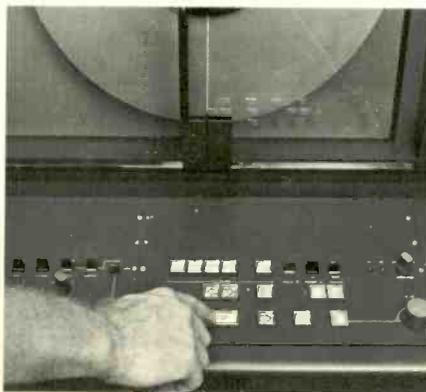
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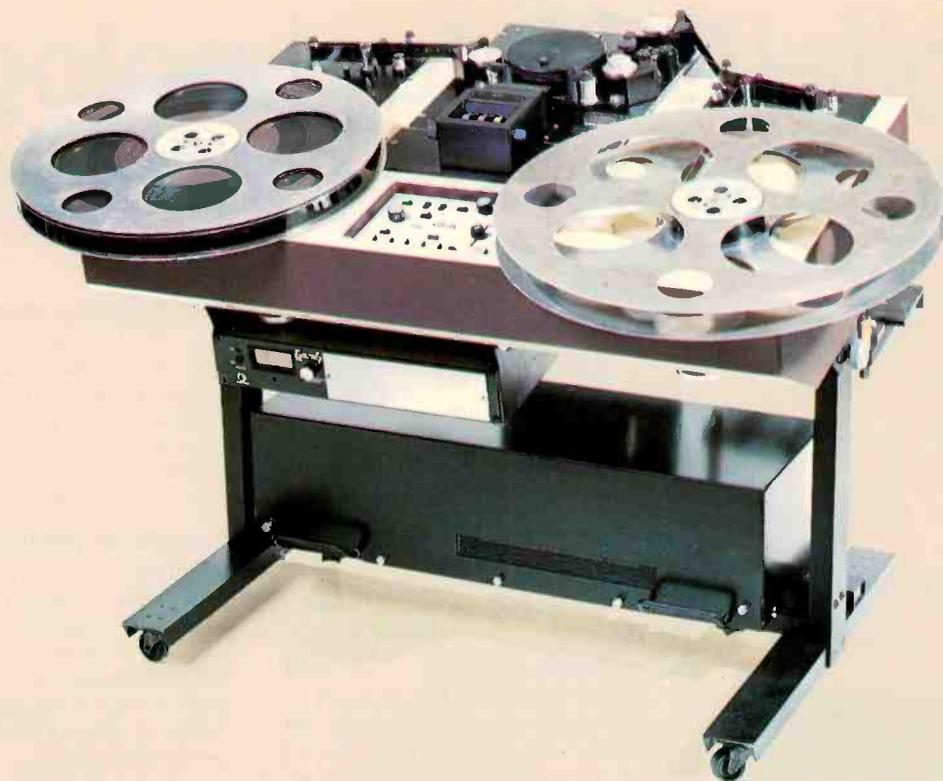
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TAX TIPS for stations

Becoming Your Own Landlord

By Mark E. Battersby

AN INCREASINGLY POPULAR SCHEME in the broadcasting industry is for the owners, principal shareholders, or even the key executives of a station to own the building used by the business. Real estate, after all, is an excellent tax shelter for almost anyone. And when you consider the many benefits to the station, such as low rent and off-balance sheet financing, becoming your own landlord makes a great deal of sense. Unfortunately, as with most tax-related benefits, there are also a few potential problems.

Generally, in the average sale/leaseback transaction, a building will be sold to or constructed by a group of investors who can benefit from the tax advantages. Investors are typically in higher tax brackets and can often take better advantage of the depreciation and other tax incentives than could the business itself.

From the station's standpoint, leases can improve the balance sheet. In fact, most leases in this type of transaction do not appear on the station's balance sheet at all, because they have been structured to meet the strict accounting criteria for operating leases. If the business obtained a mortgage or issued bonds in order to construct its own building, the obligation would of course show up on the books.

In most two-party deals between the business and its principal or principals, the station conveys the real estate to the buyer while simultaneously entering into a lease with the new owners. However, with the increasingly popular three-party deal, an outside financial institution, usually an insurance company, helps finance the deal.

This unique type of arrangement offers advantages far beyond those normally present in a typical sale/leaseback. The buyer-lessor will have tax shelter in the form of depreciation and interest deductions, while the seller-lessee can often receive 100 percent financing.

The insurance company can provide the funds, while avoiding certain lending restrictions normally imposed on traditional real estate loans. However, as one recent Tax Court case illustrates, the buyer-lessor can easily lose this tax shelter if care is not taken to properly structure the deal to insure that the buyer's interest has the required "substantial legal and economic substance."

"Jones" Broadcasting, a large station, had constructed a new transmitter building. To help its own cash-flow situation as well as provide tax relief to several of its major shareholder/officers, Jones Broadcasting worked out a sale/leaseback. "Fourth Main," a so-called "single purpose" financing company, was established specifically to act as the buyer-lessor in the sale/leaseback.

Fourth Main financed the purchase price by selling mortgage notes to insurance companies. These notes were secured by (1) a deed of trust, which conveyed Fourth Main's interest in the property to the Trustees for the insurance companies; and (2) an assignment of the lease and rentals to the trustee.

The property was leased to Jones Broadcasting under a lease for 30 years with renewal options up to an additional 68 years. Rentals were not based on fair market value but, instead, were calculated to provide Fourth Main with sufficient funds to pay 90 percent of its loan from the insurance companies in the first 30 years. After that, the rentals were reduced to 1.5 percent of the purchase price for 23 years, and then 1 percent thereafter. These rents were expected to cover the costs of refinancing the remaining 10 percent of Fourth Main's loan.

Fourth Main then sold, for a nominal price, its interest in the property to a series of limited partnerships made up of its owners and executives. None of the money paid in by the limited partners was applied to the actual purchase. Instead, the sums were used to pay brokerage, promotion, and consulting fees.

The result of this arrangement was that Jones funneled rentals through the partnerships to the insurance companies, while the limited partners used their shares of the partnership's losses resulting from depreciation and interest payments to shelter other income.

As recently as 1978, the U.S. Supreme Court had upheld this unusual type of three-party sale/leaseback arrangement and had allowed depreciation and interest deductions. However, when the U.S. Tax Court applied the Supreme Court criteria to "Jones" Broadcasting, the buyer-lessor lost out.

According to the earlier Supreme Court ruling, a sale/leaseback is considered bona fide when there is "a genuine multiple-party transaction with economic substance which is compelled or encouraged by business or regulatory realities, is imbued with tax-independent considerations, and is not shaped solely by tax avoidance factors that have meaningless labels attached."

With the Jones case, the Tax Court ruled that considerations other than those of a purely tax nature clearly existed between Jones and the insurance companies. However, none existed between Jones and the investors in Fourth Main. There was no economic substance to the deal (other than tax avoidance), said the Court, because "the method of payment could not be expected to quickly yield an equity that the buyer could not prudently abandon."

This determination was apparently based on the Court's finding that the value of the cash flow from rentals was

TAX TIPS

nominal at best. The Court also found that the possibility that the property might have a substantial residual value, should Jones ever abandon the lease, was far too speculative (and highly improbable) to serve as a reasonable basis for investing in the partnerships.

The Court concluded that, at least in the Jones situation, apart from the tax consequences there was no justification for participation in the partnerships and the sale/leaseback. Therefore, the Tax Court ruled that the limited partners had not invested in the property and accordingly had no interest in it. And, since depreciation is predicated on an ownership interest in property, the deductions claimed by the investors were disallowed.

However, before you completely eliminate this excellent strategy from your own tax arsenal, let's take a look at how our all-too-real "Jones" case differed from the earlier project, which had met with high court approval.

(1) Rentals for the initial term in the Supreme Court case completely amortized the mortgage principal. In our Jones case, the rentals only amortized 90 percent of the note's principal, leaving a sizeable balance.

(2) In the earlier case, the rentals were equal to the property's fair market value, and the renewal rentals were too small to produce a profit, especially if applied to refinancing the remaining balloon.

(3) In the earlier situation, \$500,000 of its own money went to the seller-lessee in addition to the financed money. In our Jones case, none of the investor's money went to Jones.

(4) The principals in the Supreme Court case stood to realize a substantial gain if the seller-lessee exercised its repurchase option. By the terms of Jones' repurchase option, the investors could not realize any profit at all.

(5) The executives in the Supreme Court case were a "substantial corporate entity" and had actively participated at arm's length in negotiating the terms of the sale/leaseback. In Jones, the entire transaction was set up before Fourth Main was organized and then sold to executives as a tax shelter.

(6) The executives in the earlier case were personally liable on the mortgage. Fourth Main, in the Jones situation, was not.

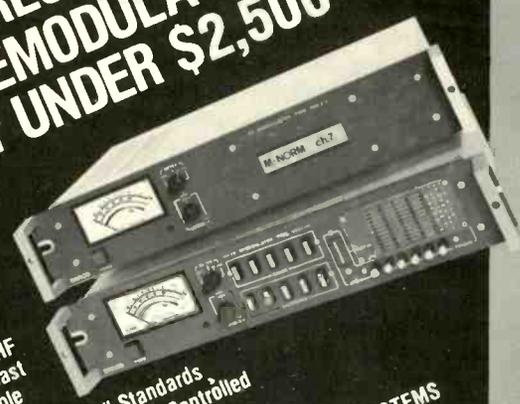
In essence, the organizer's major flaw in Jones was its failure to provide the entity we have been calling Fourth Main—and the limited partnerships—with a profit motive. It also failed to sufficiently establish Fourth Main as an entity with a separate economic interest. The six distinctions made by the Tax Court illustrate how to properly structure your own three-party sale/leaseback.

The mere fact that the buyer-lessor cannot make a substantial profit if the repurchase option is exercised is in itself not really critical. It was important in Jones only because profits on the rents were not being generated. Without the repurchase profit potential, there wasn't any justification for the investment.

All in all, however, becoming your own landlord is a good—and profitable—strategy, if you utilize the advice of others from the planning stage on. **BM/E**

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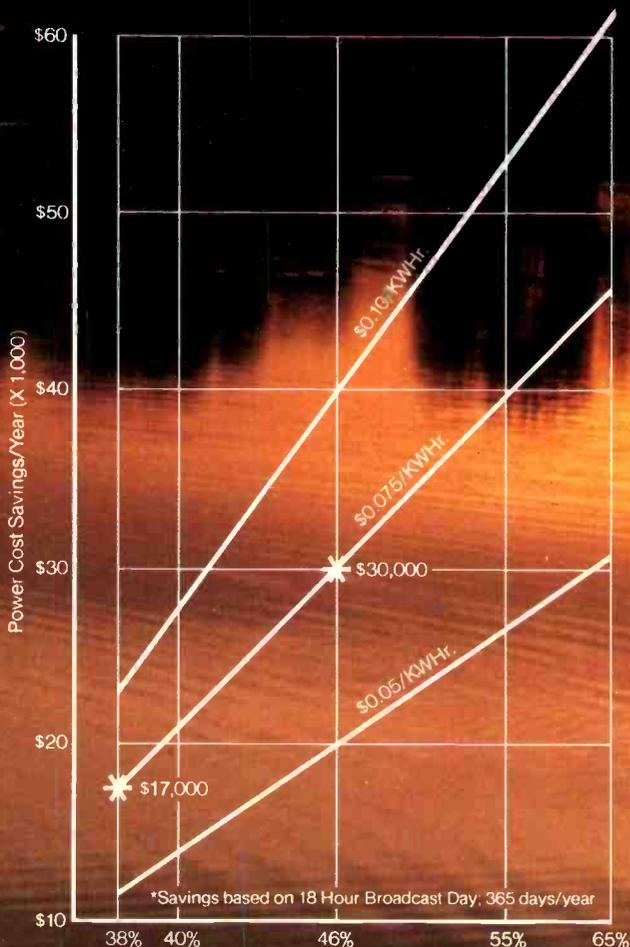
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GREAT IDEA CONTEST

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Problem 10: STL Switchover

Your station uses an STL on UHF to carry the FM stereo program to the transmitter two miles away. A telephone line, previously used as an STL, has been kept as a back-up. Design a simple automatic switching system to transfer the program from the radio to the telco line in case the radio link misbehaves or fails. It should include a warning indicator to tell the operator the switch has occurred.

**Solutions to Problem 10
must be received by
September 17, 1982, and will be
printed in the November 1982 issue**

Problem 11: Cart Automation

The station has three cart machines, bought at various times, so they are not equipped with automatic sequencing circuitry. Design an inexpensive relay and pushbutton system to: (1) Start the second cart when the first finishes; (2) Stop the first and start the second at the push of a button; and (3) Proceed similarly from second to third, and from third back to first, if a switch is set for that. Use the simplest cue tone or other end-of-tape system that will do the job.

**Solutions to Problem 11
must be received by
October 18, 1982, and will be
printed in the December 1982 issue**

Here's a chance to share your own personal solutions to some of broadcasting's most vexing engineering needs

Each month, *BM/E* presents two engineering problems and invites you to submit solutions complete with diagrams. *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 by using the ballot area on the Reader Service Card.

We will pay \$10 for each entry printed. In addition, the solution in each month's competition receiving the most votes on our Reader Service Card will win \$50.00. So put on your thinking cap and submit an answer to either of the problems outlined below . . . and be sure to watch this section for the solutions.

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 a \$50.00 check.
- 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: _____

Station or Facility: _____

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I assert that, to the best of my knowledge, the idea submitted is original with this station or facility, and I hereby give *BM/E* permission to publish the material.

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GREAT IDEAS

SOLUTIONS to problem 7: Intercom/IFB in the on-air console

Instant winner! This month's winning entry was submitted by Lee Barrett, chief engineer, KOJM/KPQX-FM, Havre, MT.

When KOJM/KPQX-FM expanded to a four studio facility, it was necessary to provide communications between studios without wearing out the carpet. The circuit illustrated was designed to fit inside the mixers and provide such communications. The intercom works on a "party-line" principle where all parties hear the conversations, however, muting is provided to prevent unwanted chatter while each studio is on-the-air.

Connection of the intercom is simple. A single balanced pair is used between studios and connects across the terminals labeled IL. The output of the left channel, microphone preamplifier (ahead of the attenuator) is tied to point AI. MA is connected either to the cue bus in the mixer (as is done in our facilities) or in parallel with the monitor amplifier input. An unused remote start pushbutton (normally open) is used to pull the point marked PTT to ground to transmit. Finally, point MS is tied through a spare contact of the monitor mute relay in the mixer (normally open) to ground to allow the open mike to totally mute the intercom.

After the intercom circuits are installed, adjust the transmit gain potentiometers to half range (5k Ohms to ground). Set the cue (or monitor) gain to a normal level in the mixer. While someone in an adjacent studio depresses the PTT pushbutton and talks into the left microphone, adjust the line gain for the desired "talk-over" level. Once the line gain is set, the transmit gains may be further adjusted to equalize levels. Note that the line gain affects both the transmit and receive levels.

The MC3340P used as U2 is muted by pulling point MS to ground through the studio mute relay. This action inhibits any intercom audio while the studio is on-the-air. Relay RL-1 is a Potter-Brumfield R10-E2-Y2-V185 with a 12 V coil. If a 24 V relay is used, R1 may be replaced by a jumper. A

broadcast EQUIPMENT

Audio Console from LPB

The new Benchmark Series from LPB consists of two models, the 2000 and 3000. The series features full modular capability with equalization and processing. The B-2000 has up to 16 stereo input modules, while the B-3000 offers up to 24. Both models are capable of mono, stereo, and four track output.

Input modules feature two separate stereo auxiliary send controls with pre/post selection, as well as EQ select, PFL, and solo select. Metering is with LED peak indicators and a balance indicator when trim is ad-



250

justed away from zero. Output is through a total of eight program busses that can be configured through use of mono, stereo, or four track input, offering many assignment possibilities.

Services. It is arranged into four independently controllable sections. The first section has crosspoints selection, pattern selection, and transition modes assignable to either the editor or switcher control panel. Transition duration is determined in the second section. Presets for the positioners and fader limits are controlled in the next area. In the last section, the transition can be controlled by the editor or manually on the front panel of the unit.

There are no internal setup adjustments and the 920 can be remote controlled from as far away as 10 feet. Edit duration of up to 999 frames is offered with LEDs to indicate operational status.

Lavalier Mic from Countryman Assoc. 252

The Isomax Pro is a new directional lavalier microphone offering either phantom or internal power with balanced output on standard XLR-3 connectors. Other features include

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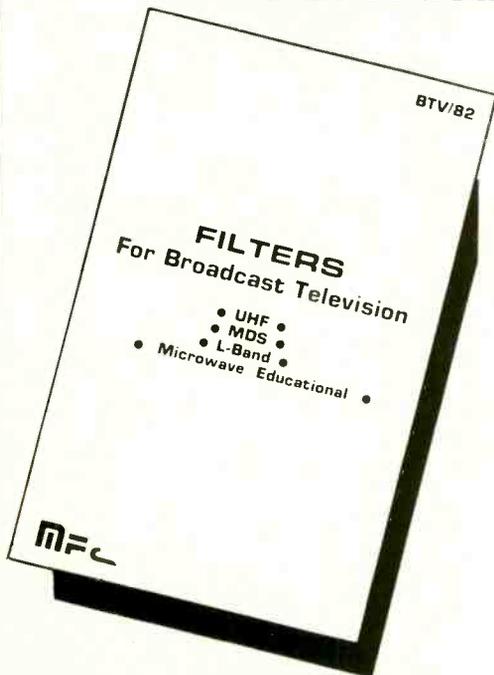
ISI has new Editor Interface

251

The new Model 920 is an editor interface for video switchers from Industrial

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switch-selectable low frequency rolloff and presence peaking, making it useful for voice and music. The microphone lists for \$269.00 with case and tie clip. There is also a clip for two mics available.

Satellite Automation from Microtime **253**

The new Model C-150 Automatic Local Ad Inserter from Microtime was designed for use in satellite applications that require automatic local ad or pro-



gram insertion. The unit is a machine controller, operating up to four VTRs either automatically using coded tones from satellites, or manually from a switch closure command.

The new controller offers multiple selection of satellite network tone decode sequences, adjustable pre-roll cues, and built-in audio-follow-video switcher. The C-150 also has an automatic TBC interface and audio-video bypass default system which detects and bypasses to local slate or message without any loss of video.

Equipment box from Wolf Coach **254**

The Wolf Coach ENG equipment box features three heavy-duty sliding track drawers, a compartment with a piano-hinged door, and an exterior storage shelf for organizing portable TV news equipment. The box weighs 250 lbs. empty and fits into the back of most vans and station wagons. It is made of welded aluminum covered with formica, and lined with carpet padding. Custom foam padding protects specified camera models.

Two new tape heads from Nortronics **255**

The new Maxtrax stereo record and playback heads are three-channel units for 1/4-inch tape and readily fit four popular models of ITC cart machines as

well as the IGM Instacart decks. The new heads are, according to the manufacturer, able to provide better wear, improve S/N by three to four dB, and enhance output efficiency.

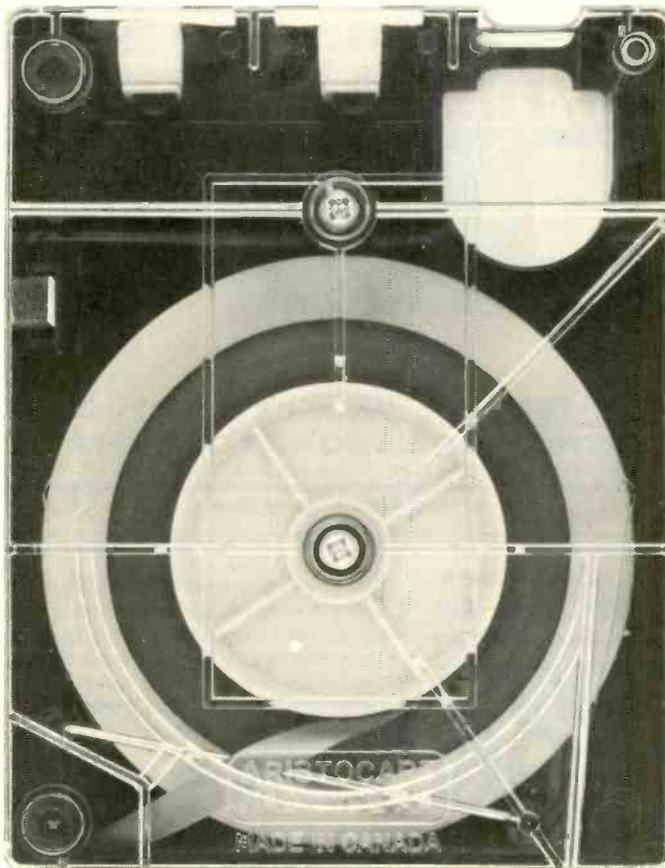
Also new is the Wide Pole Face stereo playback head for late model ITC cart decks. The cylindrical contour face head directly replaces existing heads without deck modification. It provides -50 dB at 1 kHz crosstalk separation.

Modulators from M/A-Com **256**

A new series of broadband single sideband modulators in octave and multi-

octave models has been introduced by M/A-Com. The new units, MAS-6511 Series, have balanced mixers, one quadrature RF output hybrid, one Wilkinson RF input hybrid, and one IF input hybrid, all integrated into a single package.

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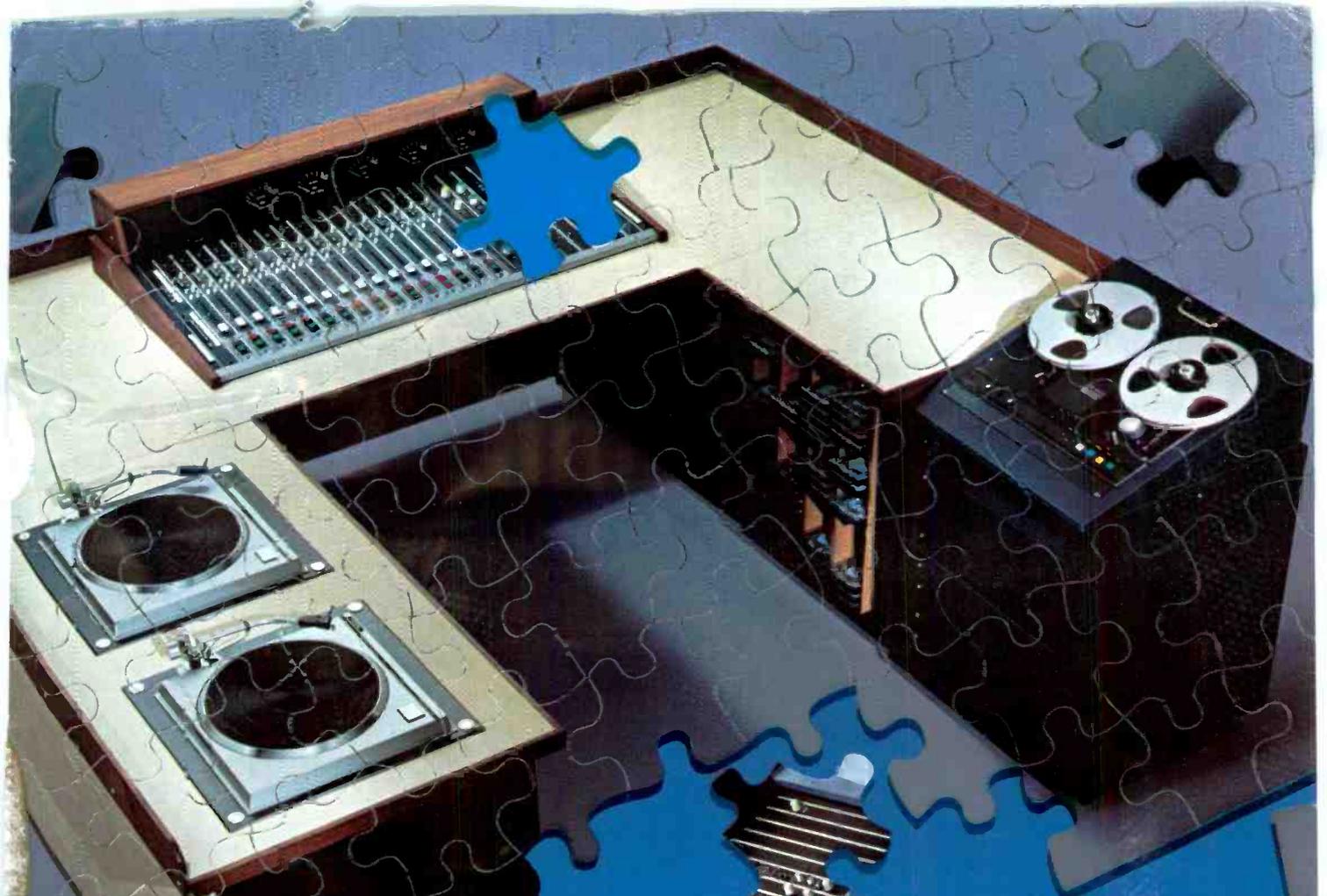
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