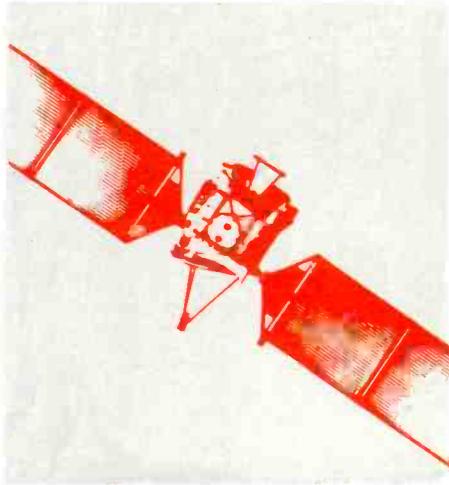
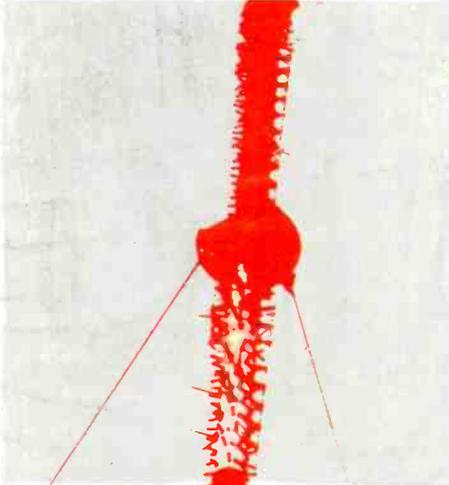


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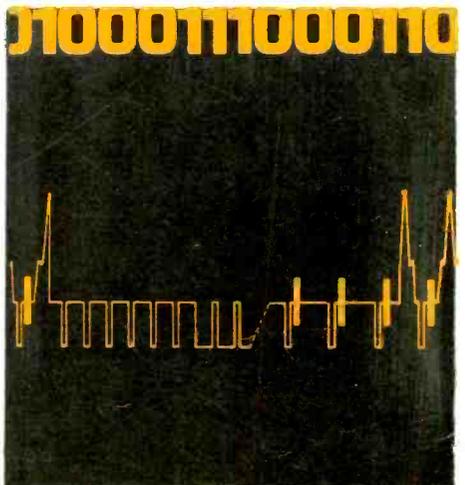
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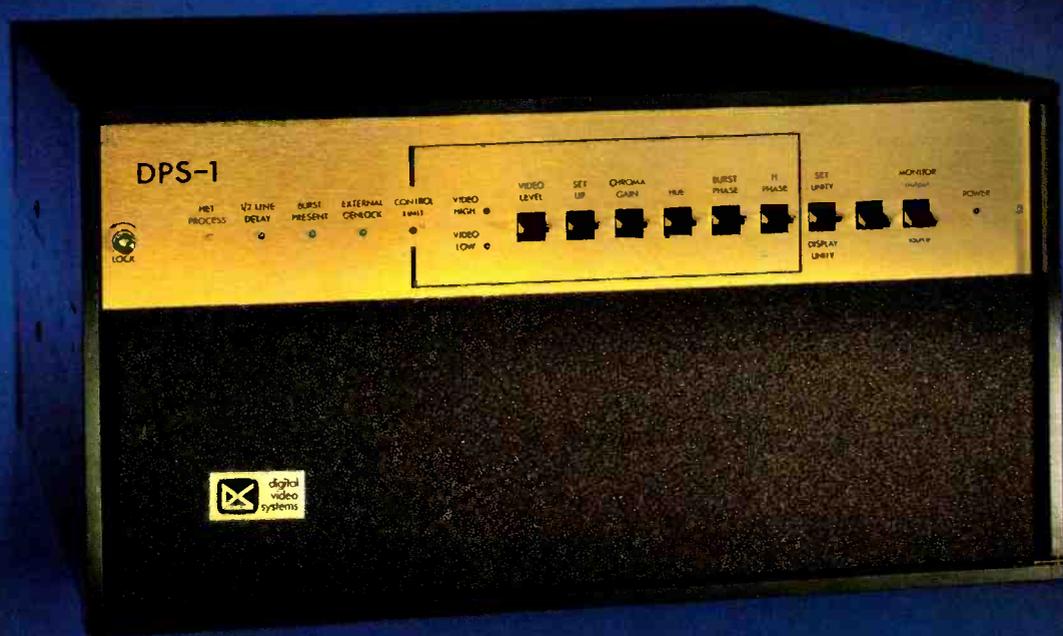
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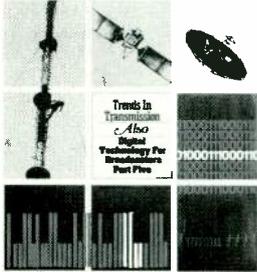
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This month's cover illustrates current trends in broadcasting, from digital technology to radio satellite links and the use of CP antennas in both UHF and VHF transmission.

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BROADCAST INDUSTRY NEWS

FCC Issues Notices On AM Stereo And FM Quad

After having issued a Notice of Inquiry regarding AM stereo, and having received the National AM Stereo Committee's report (along with other comments) some time ago, the FCC issued a Notice of Proposed Rule Making on September 14, 1978.

According to Wilson Lafollette, chief of the engineering branch of the Commission's broadcast bureau in the policy and rules division, "We are leaving all five systems under consideration at this time, so that further comments can be solicited regarding the merits and demerits of each."

An important area of concern is the consideration of bandwidth. Regions one and three of the International Telecommunications Union have already gone to nine kHz spacing. Lafollette said, "We're not saying we are going to change; we want to keep our options open." He went on to say that comments would be expected and welcomed from broadcasters, manufacturers, associations, engineers, and any part of the public that can contribute helpful information concerning the issue.

Regarding FM quad, the FCC rejected a staff-recommended Notice of Proposed Rule Making, with instructions that a further notice of inquiry would be preferred. Lafollette said that with current FM spacing at 200 kHz,

the important question is whether there is any interest or feasibility in going to 150 or even 100 kHz. And what impact would such proposals have on quad? At this point, nobody knows, hence the Further Notice of Inquiry.

Court Rejects SBS License

The U.S. Circuit Court of Appeals overturned the FCC's authorization of Satellite Business Systems (SBS). The court deemed insufficient the FCC's reasons why an evidentiary hearing was not necessary.

Three judges unanimously ruled that the FCC argument for granting a license (that the public interest pre-empted any anti-competitive impact in the industry) was in violation of Section 11 of the Clayton Antitrust Act. The court rejected the agency's right to rely on its expertise in the industry it regulates, saying, "We cannot accept such a broad use of agency expertise in lieu of evidence on the specific issues in the case."

The court ruled that the FCC could proceed in the SBS application without holding an evidentiary hearing only if it could assume all the relevant facts. However, the court contends that the FCC cannot make such assumptions. Furthermore, it could not be assumed that existing anti-competitive elements would be outweighed by the benefits of license approval.

The FCC's licensing of SBS (a joint

venture of IBM, Comsat, and Aetna to handle voice, data, and facsimile communications in a digital format) had been challenged by the Justice Department in a suit consolidated with others filed by Western and another filed jointly by American Satellite Corp. and its parent, Fairchild Industries.

U.S. Court Says No Need For Audio Tapes

In a recent decision, the U.S. Court of Appeals has ruled that Congress does not have the right to order educational broadcasters to maintain audio tapes of programming important to the public. The court ruled five to four that an FCC rule requiring such tapes to be made and held for 60 days by educational broadcasters is unconstitutional.

The importance of the decision extends beyond the issue of audio tapes. The decision indirectly addresses the issue of Congressional control over broadcast programming decisions throughout the industry.

Chief Judge J. Skelly Wright ruled that, "In this case the specter of Government censorship and control hovers, not only over public broadcasting, but over all broadcasting, for if this legislation is constitutional to public broadcasters, similar legislation as to all broadcasting is standing in the wings. If the Government can require the most pervasive and effective information medium in the history of this country to make tapes of its broadcasts for possible Government inspection, in its own self interest that medium will trim its sails to abide the prevailing winds."

The FCC wrote the rule under the auspices of the Public Broadcasting Act. Public broadcasters argued that the rule exceeds the Government's control over public broadcasting, and that the language misses the Congressional intent to ensure that public service programming be fair.

The rule requires that all broadcasters who receive Government funding in any form maintain audio files for 60 days, and make those tapes available to the Government free of charge on demand, and to the public at cost.

The court held that the statute was unconstitutional in that it violated the equal protection guarantees implicit in

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Emmys For Thomson-CSF, CBS And PBS

The National Academy of Television Arts and Sciences has awarded television "Emmys" to Thomson-CSF Laboratories, Inc. and CBS, Inc. for the development of the Digital Noise Reducer (DNR) for color television, and to the Public Broadcasting Corporation for public broadcasting satellite interconnect development.

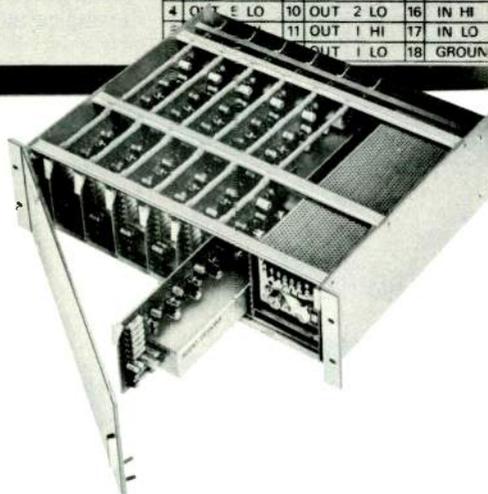
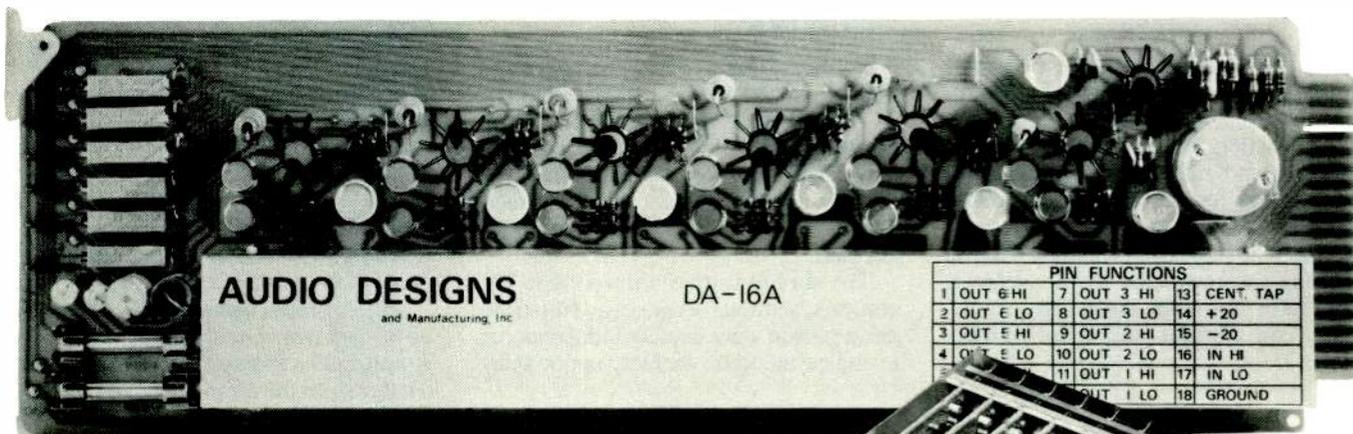
The DNR makes it possible to eliminate picture noise (snow, flicker, or color confetti) during the transmission of TV images to home TV sets. The device examines picture elements for noise, and is able to filter noise out electronically, within nanoseconds. (See story p. 97.)

The DNR, patented by CBS and manufactured, under license by



Receiving Emmys for outstanding technical achievement are (left to right): Renville H. McMann, Jr., president, Thomson-CSF Laboratories, Inc.; J. Kenneth Moore, vice president, CBS Technology Center; and John Ball, vice president of engineering, Public Broadcasting Corp.

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News

the Fifth Amendment—"that there is no basis for a finding that the requirement reasonably relates to any objective to which the government can aspire, and no rational justification has been shown for the disparate treatment it meets out to noncommercial broadcasters who have been aided by Federal funding (as compared to broadcasters who have not received Federal funds, both commercial and noncommercial)."

Staffing of TV News Up, Radio Down

According to a survey by the Radio and Television News Directors Association (RTNDA), a typical television station during 1976-77 added one person to its news staff, while at radio stations, the average newsroom staff either declined or held its own, depending on the market size.

The survey further showed that TV stations without even one full-time news person were usually independents in major markets. In fact, major mar-

kets showed a decrease in news personnel since a similar survey was conducted more than a year and a half ago. This decrease, however, was attributed to a higher than expected response rate in the top ten markets, and may not reflect an actual decrease. Moderately large markets increased the size of their TV news staffs by an average of nearly two persons, while other market categories saw an average personnel increase of about two-thirds of a person.

Typical radio news staffs were made up of just over one full-time news person, usually assisted by a part-timer. The median for radio dropped by more than one person to two and one-half full timers in major markets. The drop could be attributed to the demise of some all-news formats between 1976 and 1977. The median staff for radio was about two in large markets, just over one in medium markets, and well under one full-timer in small markets.

The survey also found that TV newsrooms averaged a little more than four openings during 12 months. The rate of turnover was nearly three times as high in the smallest markets as in the ten largest. In radio, the turnover was about one in three and nearly twice as frequent in small markets as in large.

More than half of the newsmen hired came from other stations. In TV nearly a fourth came from college campuses and in radio a third were hired out of college. The larger the market, the greater the likelihood that a newly hired newsmen came from another station rather than a college campus.

Japan To Introduce Multiplex Sound Broadcasting

According to *Electronic News*, Sept. 4, 1978, multiplex sound broadcasting will be made available in Japan this month. In addition to opening new equipment markets, it will allow Japanese TV viewers to watch foreign movies in either the original language or Japanese dubbed versions. It will also be possible to hear musical programs in stereo.

The Radio Regulatory Council for the Posts & Telecommunications Ministry has given the go-ahead to a government plan which authorizes TV stations to begin multiplex broadcasting techniques. Twenty-four broadcast stations have already applied for licenses.

It is expected that receivers for multiplex broadcasting will be built into TV sets with special multiplex adapters; sold separately with adapters for about \$125 to \$175 for TVs with multiplex terminals; or sold as independent adapters which could be connected to

continued on page 10



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News

stereo systems and used with current model TVs without multiplex terminals.

The Electronic Industry Association of Japan estimates that approximately 30 percent of Japan's present color TV owners will purchase multiplex TVs or adapters in the next three years. Sales revenues are estimated at \$1.4 billion for firms selling built-in multiplexers, \$119 million for separate TV adapters, and \$298 million for stereo adapters.

Policy Statement Rather Than Rule Change On Shared Towers Requested

The NAB filed comments with the FCC asking that it make a policy statement, rather than a rule change, regarding the joint use of television towers by UHF and VHF stations. The Commission had been petitioned by Triangle Telecasters, Inc. to make the granting of a tower construction or modification permit to a VHF station conditional upon that station permitting a UHF sta-

tion to mount an antenna on their tower at the UHF station's request and expense.

The NAB, while supporting Triangle's intent, said that a rule change was unnecessary since no UHF station had complained of being refused a request to mount an antenna on a VHF tower, nor had any comments been filed in support of Triangle's petition. Triangle stated in its petition that such a requirement would help UHF stations by reducing costs associated with tower construction and by reducing "landscape clutter" and "air hazard problems."

It is NAB's contention that a policy statement by the Commission rather than a rule change would accomplish the intended purpose of the petition, without additional paperwork or additional federal involvement. Said NAB, there is a rule which fully protects UHF TV licensess from the possible harm Triangle proposes to eliminate by further rule making.

NAB Endorses Senate Bill Reversing Stanford Daily Case

Donald P. Zeifang, senior vice president for government relations of the National Association of Broadcasters, told a U.S. Senate subcommittee that NAB supports legislation that would reverse the U.S. Supreme Court ruling in the Stanford Daily newsroom raid case.

In May, the Court ruled that the First Amendment allows police officers to perform surprise searches of news offices, without notice or opportunity to raise a judicial challenge, even where it has not been shown that the news organization is involved in criminal activity or is likely to destroy evidence in its possession.

Zeifang told Sen. Birch Bayh (D-Ind), chairman of the Senate Subcommittee on the Constitution, that NAB supports the Senator's bill that would require a subpoena as the sole means by which the police may seize evidence of a crime.

Zeifang said that this approach "accords due respect to our First Amendment rights since it would place the burden on the news media to produce the evidence rather than empower the police to invade our newsrooms. Furthermore, the subpoena proposal recognizes the privacy rights of all citizens, including the press, to be safe in their private abodes and protected from unreasonable searches and seizures."

Bill Monroe, executive producer and moderator of *Meet the Press*, and Thomas Becherer, news director, WBAL-TV, Baltimore, Md., also testified before the subcommittee. Mr.

continued on page 12

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Simultaneous L&R Outputs	No	No	Yes
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Stereo Matrix Switch (L,R, L+R, L-R)	No	No	Yes
Switch to remove signal and terminate line for S+N/N	No	Yes	Yes
10 dB, 1.0 dB, 0.1 dB Step Attenuators	No	Yes	Yes
AUDIO ANALYZER	Combined with Generator	Combined with Generator	Separate Unit
Harmonic Distortion Mode	Yes	Yes	Yes
Automatic Nulling	Yes	Yes	Yes
Automatic Set Level	Yes*	Option*	Yes
Intermodulation Distortion Mode	No	Option	Yes
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News

Monroe said that if the Stanford Daily case is not corrected by Congress, it is going to have "a subversive effect on the vigor of investigative, reform-minded journalism." Mr. Becherer commented that the public has a right to expect investigative reporting, but station management may not be as aggressive under a threat that its files may be searched.

Wisconsin Educational Radio Goes Dolby Statewide

Wisconsin Educational Radio Network (WERN) has switched to an advanced system of operation. The Dolby system provides a substantial improvement in the quality of FM reception. WERN is the first state network in the nation to use the system, according to Bill Woods, director of engineering.

According to technical supervisor Don Moran, the Dolby noise reduction units are presently the only ones approved by the FCC for use on FM transmitters. To facilitate the use of the new system, Dolby calibration tones will be transmitted to enable listeners with external decoders to adjust their receiving equipment. Receivers with internal Dolby do not need this adjustment. Tones will be transmitted twice weekly.

Although approximately 100 FM stations in the country are already "Dolbyized," the Wisconsin network is the only one so far to adopt the system on a statewide basis. The move to do so required installation of a small flat unit approximately the size of a "dress box" on each of the nine transmitters of the Wisconsin Educational Radio Network.

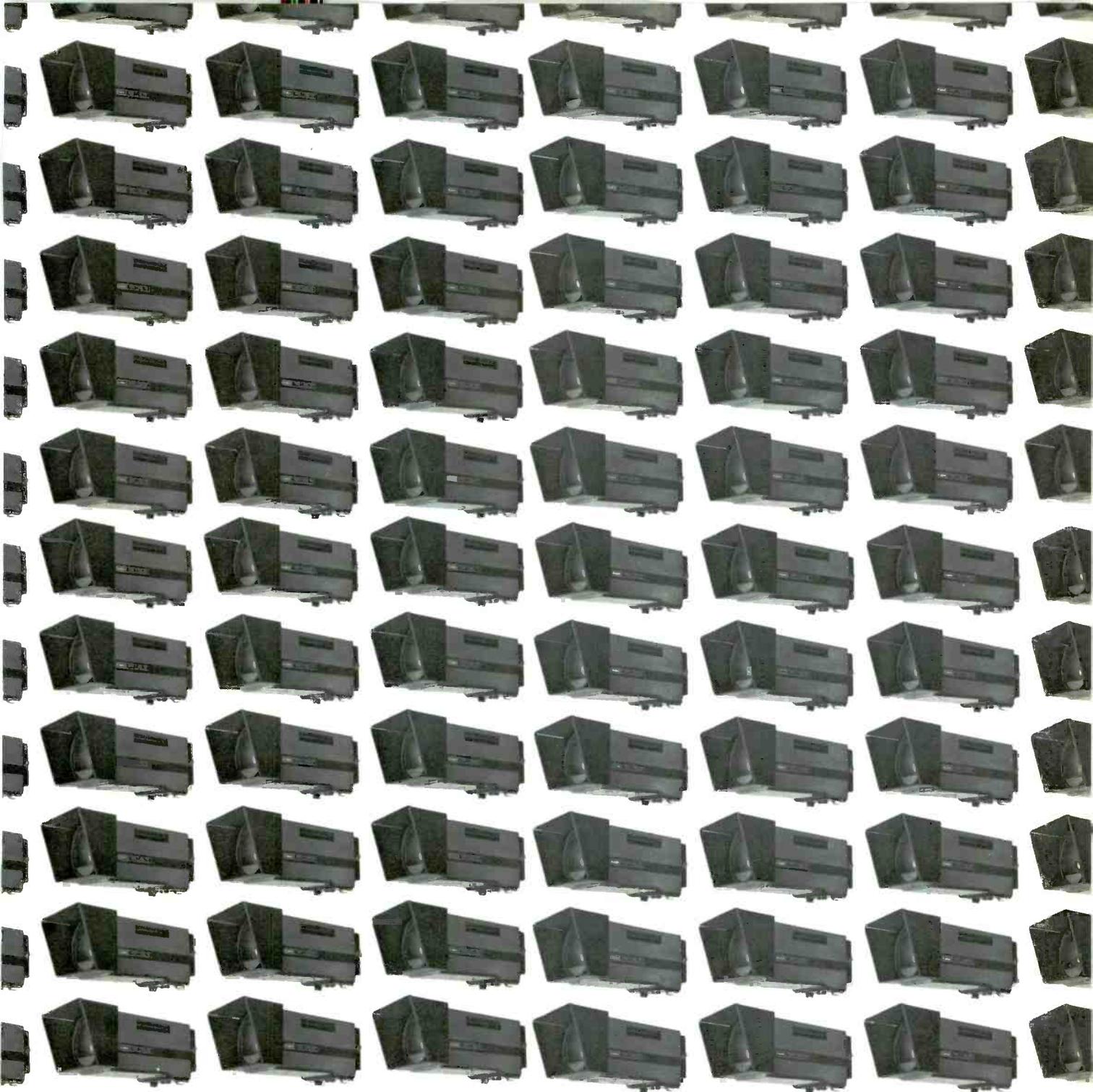
Normal methods of reducing noise usually involve compression of the audio signal, and result in distortion of many of the sounds, particularly the higher frequencies. The Dolby system enables restoration of a high standard of performance to FM broadcasting by allowing dynamic range to be extended. It is reported that music broadcast over the state network will now be much closer to concert quality.

NAB Backs AT&T On Ads

In a filing before the FCC, the NAB said that the regulatory agency should not reverse its long standing policy of allowing the cost of institutional advertising by AT&T and the Associated Bell Systems to be passed along to consumers in the form of rate hikes.

Consumer groups have recently begun to press for regulations that

continued on page 14



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News

would prohibit AT&T and Bell from categorizing institutional advertising expenses as legitimate operating costs upon which their rates to customers are calculated. NAB said that commercial speech enjoys First Amendment protection and that AT&T "is entitled to engage in the unencumbered dissemination of lawful information whether promotional or institutional in nature."

NAB fears that such regulation would involve the Commission in questions of commercial content, and that this could lead to similar treatment of other regulated industries and plunge the Commission into an undesirable role "as chancellor of advertising content."

First Pay-Per-Program TV On The Air

The first over-the-air, per-program, pay TV service has gone on the air over KWHY-TV, Channel 22, Los Angeles.

The service offers current and classic motion pictures to its subscribers every weekday night from 8 p.m., and from 7 p.m. on weekend evenings. During the daytime KWHY will continue its regular programming. The pay-per-program service is called SelecTV, and is operated by American Subscription Television of California, Inc. (ASTC).

In order to make the programming available to some 3.8 million homes in the Los Angeles area, KWHY has increased its transmitter power from 107,000 W ERP to 2.57 million watts ERP — a 25-fold increase which makes KWHY one of Southern California's most powerful television stations. The station transmits from Mount Wilson with an antenna height of 5,896 feet.

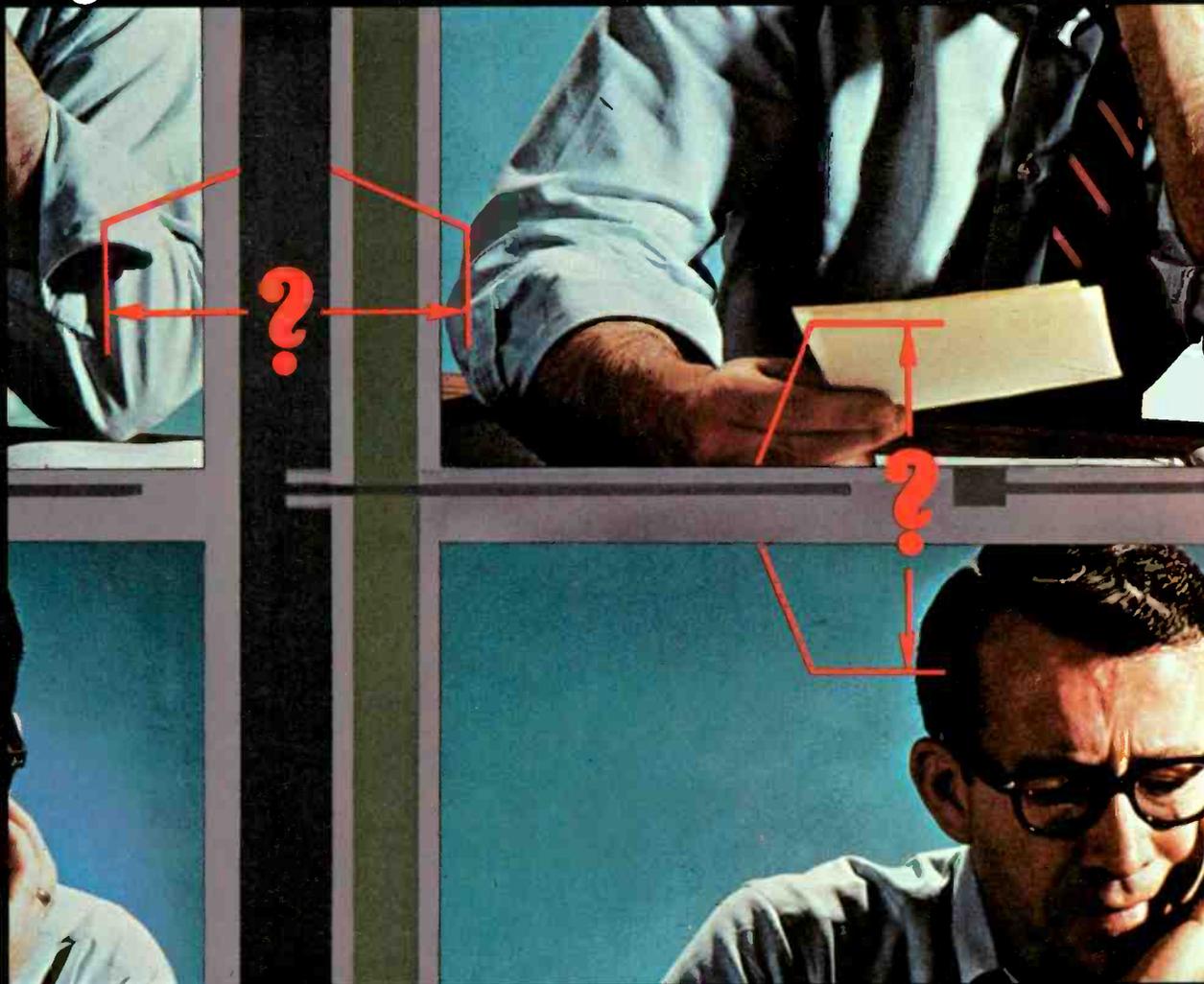
Showtime to Become Viacom/Teleprompter Joint Venture

Showtime, Viacom's pay television subsidiary, will become a joint undertaking of Teleprompter and Viacom on January 1, 1979, according to an announcement by Ralph M. Baruch, president and chief executive officer of Viacom International, Inc., and Jack Kent Cooke, chairman of the board and chief executive officer of Teleprompter Corporation.

The move will effectively double Showtime's pay-TV subscribers (approximately 300,000 anticipated by January) by adding Teleprompter's 300,000 pay subscribers. Teleprompter, the nation's largest cable company, has 1,150,000 basic cable subscribers. Within Teleprompter's 300,000 pay in-

continued on page 18

Synchronize and correct!



Now stop blanking width expansion with the NEC FS-15 FE*

THE PROBLEM

With the advent of ENG, expanded blanking has become more prevalent. The F.C.C. has taken action, and placed a six month modified moratorium on violation citations. During this interim they are hopeful that technology can correct picture distortion caused by excessive horizontal and vertical blanking widths. Time is running out. Will you be ready?

THE SOLUTION

NEC, digital pioneers and developers of the Emmy winning Frame Synchronizer and DVE System, announce the FS-15 FE. Included are all the features of the FS-15 Frame Synchronizer, *plus* fixed expansion capability. As the incoming picture is digitized, it is automatically expanded to compensate for blanking width shrinkage. Expansion increments of 1 to 7% may be selected for accurate video vs. blanking adjustment. Get the full picture today. For complete information call **800-323-6656.**

In Illinois, call (312) 640-3792.

*Patent applied for.

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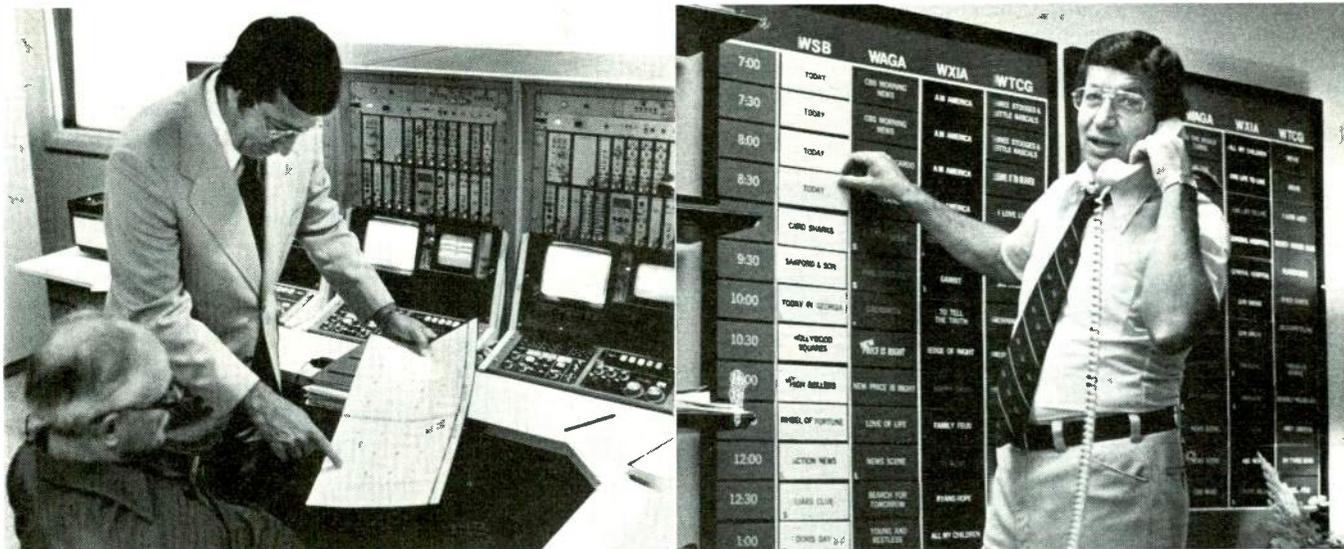
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VAN CANTFORT



"Programming is a reflection of the society we live in."

A. R. Van Cantfort, program manager of WSB-TV, Atlanta, Ga., President, National Association of Television Program Executives, looks at programming from the point of view of a man who speaks both to and for the local audience.

"The program director has got to know his community. If he is a responsible broadcaster, he will. We have a tremendously loyal following, and we earned it. We have a community ascertainment program. Department heads go out and interview community leaders for an hour, one-on-one. They talk about the problems of the community. Every two weeks we have a community affairs luncheon with a group representing a particular problem area. We discuss their problems and how we can help. I make a speech or talk with some community leader about twice a week. There is always feedback. I always wind up with a question-and-answer period. I read every piece of mail that comes to me. The first thing every morning I read the call sheet—it lists every call that comes in complaining about a program. These are some of the ways I stay in touch with the community.

"I look at programming as pretty much a reflection of the society we are in. What we are depicting is what is happening. If you are upset by the amount of violence on television, you really ought to be upset about what is happening in society, and not necessarily blame the messenger. Parents have their responsibility not to just automatically say, 'Go watch TV.' Of course, the broadcasters have responsibility, too. And they have to accept that responsibility. Ours is the only industry in the world that has such a strict voluntary code.

"As long as I am program director, we will have a live local show. The people in Atlanta know they can get on our station. We are here to serve the community.

"I won't buy the premise there is nothing good on television. Nowadays the snob thing to say is, 'My kids don't even know TV exists.' I have to say you are wrong, because your kids are missing a lot of good things.

"Film will never go out of our business. It is the staple. We use both film and tape. Much of the choice has to do with which equipment is available. We might wind up on a given day with everything on film, or everything on tape. If we are going to go into the mountains, I am going to take film because it is more reliable. I don't have to worry about power or electricity or the batteries running down.

"If I were just starting out, I would look into the feature area. I would think of becoming a consumer reporter, an ecology reporter or a specialty reporter.

You can't just say, 'I want to work in TV.' Too many people want the same thing. You have to develop a skill or a specialty.

"If the local broadcaster doesn't make his service important to the community, and himself an asset to the community, somewhere along the line someone is apt to ask, 'What do we need him for?' The local broadcaster has got to stay involved with local programming. We need more choices, and we need to encourage the people willing to take chances."

In our publication, "Telek," leading broadcast industry professionals talk about their experience, and we tell you about our latest technical and product developments. If you would like to be on our mailing list, write Eastman Kodak Company, Dept. 640, 343 State Street, Rochester, New York 14650.



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Kodak... Official motion picture consultant to the 1980 Olympic Winter Games.

News

stallations, approximately 250,000 now receive Home Box Office programming, which will be discontinued as of January 1. HBO would not comment on its future plans for distribution.

The joint venture will maintain Showtime's operating policies and will retain all of its personnel. Showtime currently carries 14 attractions a month, 12 of which are new. Of the 12, 10 are major theatrical features while two are

self-produced shows. Since March, Showtime has distributed shows to its 30 outlets through the RCA Americom satellite system. It recently extended its satellite commitment from six to ten years, expanding its programming to average 12 hours a day.

Median Pay In Private TV Rises to \$20,000

A survey by the International Television Association (ITVA) released in July shows that the median salary in the

non-broadcast, private television industry rose from \$17,500 in 1977 to \$20,000 in the first part of 1978. The analysis is based on responses from 430 members of the ITVA worldwide. The survey found that the top for in-house video users had risen to \$60,000, but lower salaries at the other end of the scale brought the median down to \$20,000.

Errata On IBC Story

In the July issue of *BM/E's* Broadcast Industry News, we inadvertently identified EMI and AEG Telefunken as being among the "smaller" companies participating at IBC. They obviously are not "small" companies, but rank among the largest manufacturers of equipment for broadcasting. *BM/E* apologizes for any misapprehension that may have resulted.

News Briefs

The NAB supports the Pacifica Foundation's request that the Supreme Court rehear the "seven dirty words" case. Whether or not the request is granted, the NAB suggests that the court clarify its opinion regarding Section 326 of the Communications Act, which reads: "Nothing in this chapter shall be understood or construed to give the Commission the power of censorship over the radio communications or signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the Commission which shall interfere with the right of free speech by means of radio communications." NAB noted that the court's opinion suggests that the section only denies the FCC "any power to edit proposed broadcasts in advance." The association went on to say that this language is contrary to the legislative history of the section and prior FCC and court decisions.

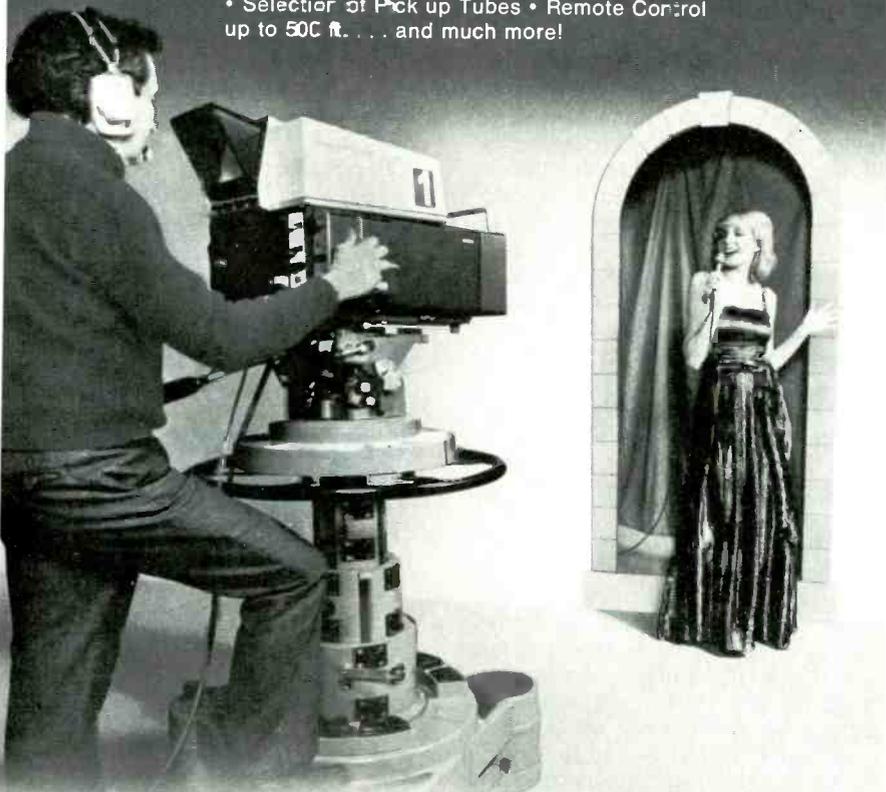
An AM radio broadcast facility, KSKY Corporation Center, Loyalton, Calif., is soon to be constructed. The complex will employ solar energy for water and room heating and air conditioning. Randy Reid, project coordinator for the developer, claims that "this is the only broadcast facility in the world totally master-planned for solar assistance and energy conservation."

California Congressman Don H. Clausen hosted a preview of a **new national broadcast series** by the San Francisco Symphony Orchestra on Capitol Hill. Portions of a master recording of the first stereo broadcast in the series were played for guests in what might very well have been the **first radio preview every held at the Capitol.** . . . The associated Press

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Radio network announced its 600th affiliate with the signing of **WREC, Memphis**. The number of affiliates to date is 609, and AP Radio has asked the FCC to approve a plan to experiment with satellite delivery to 25 stations.

Business Briefs

As an official supplier to the 1980 Olympic Games, **Thomson-CSF will provide the Soviet Union** with a picture and sound switching center which, when put into service, will reportedly be the largest in the world. Other equipment for live coverage and image processing in the SECAM system includes 100 TTV 1515 color cameras, 40 mobile radio links, 39 color telecines, 21 vidfont CGs, and a large number of color video monitors. The contract is valued at approximately \$30 million. . . . **Philips Broadcast Equipment Corp.** has signed a \$2 million contract with the **Gaylord Broadcasting Company**, Okalahoma City, for the supply of 18 LDK-25 studio cameras, four LDK-15Ls, and four LDK-14ENG/EFP cameras. . . . **American Data Corp.**, Huntsville, Ala., Has announced the sale of a multi-stage audio and video distribution switching system to the **Christian Broadcasting Network (CBN)**, Virginia Beach, Va. The Series 900 System, valued at \$525,000, is the largest ever built by the company and will become the heart of CBN's international and domestic satellite broadcasting networks. Initially, the system will be configured for 100 inputs by 50 outputs, but it will have an anticipated field expansion of 220 inputs by 100 outputs.

Bosch-Fernseh has recently completed a \$500,000 sale to Premore Inc., Hollywood. To be used in the production of the CBS-TV show *Alice*, the system will include four studio recorders for use in a computer editing system, and four portable recorders for studio and location taping. . . . **EEV, Inc.**, Elmsford, N.Y., has announced receipt of a \$250,000 order from **CCA Electronics Corp.**, Cherry Hill, N.J., for klystrons and related circuit assemblies to be used with CCA's new line of UHF TV transmitters. . . . **Philips Broadcast Equipment Corp.** has sold a 110 kW UHF transmitter to WXTV, channel 41, N.Y., for installation on the new transmitting tower atop the World Trade Center.

UMC Electronics has appointed Audio Distributors, Inc. as a rep/distributor in the upper midwest. The firm is located at 2342 Division Ave. South, Grand Rapids, Mich. 49507. . . . **Hammond Industries has appointed Sphere Audio**, 478 Devens Drive,

Brentwood, Tenn. 37027 as Beyer Professional Products rep in the southern U.S. . . . **Dr. Ronald C. Colson** has been appointed director of marketing for **Kliegl Bros.**, Long Island City, N.Y. . . . **Jim A. Summers** has been named general manager of **Consolidated Video Systems**, Sunnyvale, Calif.

An agreement in principle has been reached for **Gulton Industries, Inc.**, Metuchen, N.J. (parent company of Electro-Voice, Buchanan, Mich.) to acquire **Technical Audio Products Corp.** (TAPCO), Seattle. TAPCO will

become an operating unit of **Electro-Voice**. . . . **Control Data Corp.**, Minneapolis (parent company of Arbitron) has announced an agreement in principle for the acquisition of **Paperwork Systems, Inc.** (PSI), Bellingham, Wash. PSI offers computer-based services that perform traffic, management, and accounting functions for radio and TV stations. . . . **Outlet Company**, Providence, R.I., has paid \$4.5 million in cash for **KIQQ-FM, Los Angeles**. The FCC approved the license transfer to Outlet Co. on June 26.



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RADIO

PROGRAMMING & PRODUCTION FOR PROFIT

NAB's First Conference On Radio Programming Draws Heavy Industry Attendance

THE FIRST ANNUAL CONFERENCE ON RADIO PROGRAMMING, put on by the National Association of Broadcasters at the Hyatt Regency Hotel in Chicago, August 20 to 23, promises to be, in fact, the first of a long series that will have great acceptance in the industry and usefulness to it.

About 850 radio station programmers, managers, and other executives registered for the conference, more than 700 of them in advance and the rest as walk-ins. Nearly every one of the talk sessions that *BM/E* attended drew a full house, in most cases with standees at the back of the room. This applied to repeat sessions as well as to originals, testifying to the popularity of NAB's choices of topics and of people to lead the discussions.

The natural "exhibit" section of the conference, for syndicators, record companies, and other software producers to show off their wares, did not include a large representation of these sections of the industry. About ten syndicators were on hand, five record companies, the five large radio nets, and some publications in the field. But this was widely regarded as a favorable start for a brand-new conference of untested drawing power. Personnel of several of those firms who were on hand told *BM/E* that the exhibit area, in hospitality suites at the hotel, would really take off at the next conference. And most also expressed high satisfaction with the results of their "exposure" (see story immediately following this on F.R.M. Productions).

The relevance and popularity of the talk sessions sprang from the hard work of the NAB group who put the conference together. Also responsible for the success of the conference was the steering committee of broadcast executives, headed by William O'Shaughnessy, president of WVOX/WRTN in New Rochelle, N.Y. (a man with his own innovative ideas about programming, as noted in this column in the November, 1977 issue). Mr. O'Shaughnessy told *BM/E* they would have considered 400 to 500 registrants

success for this first try. He said that the steering committee got tremendous help from a number of executives in the record industry, from syndicators, and from publications in the field. He reported that one of the most important tributes to the conference came from many of the managers and program directors of the smaller radio stations; they found most valuable and enjoyable the get-togethers with people from other similar stations, to talk about common problems and experiences.

The conference also has an obvious political significance, as a gambit for moderating criticism of the NAB's alleged neglect of the smaller radio stations that make up the larger proportion of its membership. And the conference intensifies the potential for competition between the NAB and the National Radio Broadcasters Association; the latter got a very good turnout of software producers at its last two shows. It will probably be a few years before we know how the software industry will divide its "show patronage" between the two organizations.

A few of the talk sessions that produced valuable give and take between panelists and audience are briefly summarized here. The sessions not covered here had equally provocative topics; some will be taken up in future columns.

A group of record industry presidents reached a kind of consensus that many radio programmers need to be more adventurous, to be aware of audiences' desire for more sophisticated music today, and to follow new trends in music styles and creation. Joseph Smith, chairman of Elektra/Asylum, noted his experience that it was very hard to get new kinds of music on many radio stations. He said the experience of his company with record buyers shows that listeners are ready for more kinds of music than many radio stations are currently giving them.

Neil Bogart, president of Casablanca Records, put in a plea for disco music as one of the big winners in formats for the

continued on page 22



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Electro-Voice backs up the CO90 with the only two-year unconditional warranty in the business. That means Electro-Voice will repair or replace your CO90 when returned to Electro-Voice — *no matter what caused the damage.*

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Radio Programming

future. Clive Davis, president of Arista Records, backed up Smith by saying that radio programmers should use more of their own taste and sophistication, as well as the sophisticated information about new music and its market significance that most record companies provide. He admitted that passive research is important but said it was risky for the radio programmer to depend on it without any other guide to music choice. The programmer has to keep on top of trends, move with audience taste changes, and take some risks based on his own reactions to the music.

In response to a complaint from the floor about the record industry's abandonment of beautiful music, Davis made the industry's case on this. He said beautiful music does not represent the current big talents in music making their own original stuff. So it lacks the excitement, the "fun" of fresh creativity.

Another complaint from the floor was to the effect that record company promotion people do not know which stations are important, particularly in the small markets. Davis admitted that it is hard for the record maker to keep closely on top of changes in local station standings. He advised any station manager who felt he was being overlooked or unfairly treated in any way to get on the phone to the record company promotion department and tell his story.

A complaint about the poor quality of record surfaces brought agreement from several of the record company presidents (who do not do their own pressing) that pressing quality is indeed very low. Davis pointed out that the quality of polyvinyl chloride, the basis for record pressings, went down as a result of the oil shortage in 1976. He said that pressing quality is a problem about which he, and most other record

The conference included a talk session with record company presidents. Pictured above are (left to right) Clive Davis, president of Arista Records, Neil Bogart, president of Casablanca Records, and Dwight Case, moderator, RKO Radio



company executives, are thoroughly aroused, and that much pressure is being put on the major organizations that press records to do something about it. This topic is sure to get hotter as time goes on, with original recording technical quality going sharply upward as digital technology spreads into the industry (see "Recording Industry Starts Digital Mastering," elsewhere in this issue).

A topic that also brought complaints from the platform was the unreliability of various charts, records reviews, tip sheets, etc., for indicating on a current basis what records were being favored by record buyers. Davis was quite specific: he said *Record World* is pretty good, but he called the *Billboard* chart (almost an industry standard for years) misleading, in part because it does not include rack jobber sales in the main chart. He gave his opinion that *Billboard* was not spending enough money to produce a really accurate and up-to-the minute chart.

Smith and Gil Friesen, president of A & M Records, agreed in general with Davis on this topic. Friesen said that none of the record charts are highly accurate, although some have been improving lately. Smith said that some of the tip sheets were better—but that no system that he knows about is telling promptly what is really happening in record sales.

A session that produced a very upbeat view of the radio industry presented presidents of all the major networks to tell about the future as each saw it. Ed Little of Mutual told about the satellite system his network will use (as he has at every industry meeting recently) and how it will multiply the variety of programs available to affiliates, and raise their quality. Before the session was over, all the network executives agreed that the satellite is the network distribution method of the future. Each said his organization was "working on it" but was not ready for announcement of plans. All also said

that satellites will open the way to wide distribution of live concert music of high quality, as just one element of the much greater richness of programming the satellites will bring.

Sam Cook Digges, president of the CBS Radio Network, averred that radio networks are very much alive. He said his organization was going to spend between \$25 million and \$40 million for special programs in the coming years, and expected acceptance of the net's programming to keep going up.

Hal Neal, president of the ABC Radio Networks, said that the future of the networks could be read in the tremendous future that was clearly ahead for individual stations. He noted that a number of FM stations had grown as much as 100 percent in a short time, and that AM stations were also setting growth records.

Jack Thayer of NBC, agreeing that the technology is on the way for great expansion of network services, said that "brainware" must improve too, with fresh creativity producing programming that will intrigue the audiences of the coming decades. He noted, as just one trend that radio programmers ought to be cognizant of, young people's turning inward, becoming interested in "interior exploration." As might have been expected, he got a question from the floor on what went wrong with NIS, the all-news service that NBC started and abandoned. Thayer answered that, as NBC sees it now, the timing was wrong. He did not say what "right" timing would have been.

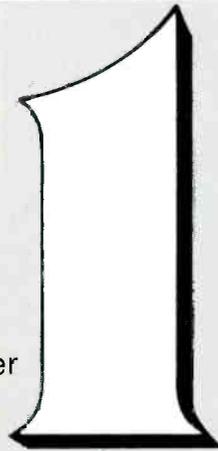
A session, "What's New With The Numbers," brought executives of most of the top radio audience-measurement firms to the platform, each to explain how his organization operates and what it offers to radio managements. Underlying the whole session was one question, no doubt in the minds of most of the listeners but unarticulated from the platform: will any of these organizations be able to break Arbitron's stranglehold on acceptance by the national ad agencies?

The question, naturally, did not get an answer, but Lew Alpert of Burke, Avery Gibson of Trac 7, Jack McCoy of RAM, and Jim Seiler of Mediastat did demonstrate impressive determination, skill, fresh thinking, raising hope for a more competitive situation in this field as time goes on. The major discussion centered around the methods for getting responses from the sampled listeners, still a highly controversial section of the technique.

Arbitron's weekly diary method was criticized, by inference, in Lew Alpert's presentation of Burke's telephone technique for "yesterday listening"; in Trac-7's computer-assisted

continued on page 26

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Circle 118 on Reader Service Card

Radio Programming

interview; and in Jack McCoy's presentation of RAM's one-day diary method. Also up for discussion, with numerous disagreements, were the basics of choosing a sample. All the organizations are frank in acknowledging the existence of "sampling error," and in calling their results "estimates." The arguments arise over the best methods for reducing errors to the lowest possible level.

A partial consensus did emerge on the usefulness of zip code areas in defining demographic areas. Most agreed that zip codes define the demographic divisions better than any other indicator.

Dale Bennet, president of Professional Research Services, Tempe,

Arizona, represented a researcher aimed toward the smaller markets, the stations that cannot afford the more sophisticated audience studies. His studies are based on coincidental telephone calls, using random sampling, which produces results adequate to the needs of stations in very small markets—and at costs they can afford.

Among other sessions at the conference of equal or perhaps greater interest were: "News . . . Radio's Best Weapon"; "Don't Shoot the Sales Manager"; "Care and Feeding of DJ's"; "Programming and Promotion"; "Now Hear This—AM Stereo"; and "How to Switch Formats Without Going Broke." Nearly all the sessions were taped, and any broadcaster interested in any of them should write the NAB for full information on the tapes available. **BM/E**

BM/E's Program Marketplace

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ALMOST ALL THE SYNDICATORS described in this department since it got underway with the January, 1977 issue have been out on the market for three years or more, and have sizable groups of subscribers that give each syndicator the momentum of a successful operation.

F.R.M. Productions, covered this month, is newly-fledged and has just spread its wings to try for the take-off. At the time of a *BM/E* interview, at the NAB Programming Conference in Chicago in late August, F.R.M. was just embarking on a first merchandising program. This market-readiness came at the end of 2½ years of preparation, probably about normal for a carefully assembled syndication operation.

As described by Scott Nossem, the founder and president, the preparation seems most careful and intelligent. F.R.M. ("Fine Rock Music") will have one format only, at least for the foreseeable future: album-oriented rock (AOR). Nossem is after the "grown-up" rock generation, the 18 to 34 year olds who include the teen-age rock fans of the late 50's and the 60's. He himself is a member of this demographic group,

and is clearly in sympathy with their musical tastes, in particular the way those tastes have developed in a decade or so of growth.

He also has the advantage of extensive professional experience in radio programming, as program director for a succession of radio stations, mainly in the midwest, among them WAUR, WMRO, WMDR, and WQFM. This experience has led to a general plan with the following main features.

The basic library consists of about 1200 different selections in constant rotation, day-parted for tempo control, and arranged so that no artist is heard twice during a single day-part. The segments have 15-minute "moods" or "themes," tying the group together, somewhat in the style of many beautiful music programmers, with a sequence of moods carefully devised for sustaining listener interest. There are about 160 of these blocks on hand at all times.

Nossem says that this method is new for rock music. He believes it is highly appropriate for the group that has in large part outgrown "Top 40," the straight hard rock. He says it gives each program a kind of "message"—it is not just music.

The rejection of Top 40 acknowledges the changing tastes of the up-growing group, a fact basic in F.R.M.'s planning, but also testified to by many other syndicators. However, and this is also a generally accepted piece of wis-

continued on page 28

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Circle 119 on Reader Service Card

Radio Programming

dom, these grown-up rock children do not want "esoteric" music: the artists and tunes must be familiar, contemporary, part of the current music scene. Sem, needs to know just where he or she is. There can be no leading them into totally unfamiliar music territory.

With these general precepts as guides, F.R.M. has assembled a very comprehensive series of program sequences. *BM/E* studied the lists cover-

ing several weeks and found the care and completeness of the planning highly impressive. Listening to a sample block of about 15 minutes in length was also impressive, with the selections reinforcing each other for maximum effect.

Nossem points out that there will always be a plentiful supply of AOR music (in contrast to the scarcity of beautiful music on the American market). F.R.M. has already assembled a group of about 4,000 selections, and this keeps growing as new music appears. After the initial library is

supplied to a subscriber, F.R.M. will update it bi-monthly with a sizeable number of new selections. And there will also be frequent transmittal of new "hits" by top artists, sent out as soon as the character of the music becomes established.

The program planning leaves room for the station's own DJs to establish a "local" character for the programs: the operation is "live" in that sense, without a syndicated voice track. Nossem believes that each station must put a strong measure of itself into the programming, making a sustained effort at success. Without that effort toward thorough teamwork with the syndicator, success is unlikely.

The program director, for example, must know his own market well enough to judge how often to use the "hot" new hits that F.R.M. sends him. A tune that has staled as a hit may become part of the permanent programming as a carefully integrated number along with others. The subscriber will always have 80 or more of the current hits on hand to select from. As an aid to the DJ, the material sent out will include data sheets with extensive information about the music, the kind of background on the artist and the tune that knowledgeable AOR fans are likely to want. This can be used in any way the station program director wants.

The main F.R.M. programs will be played from 10½-inch reels, recorded at 7½ ips, with masters and duplicates made on F.R.M.'s own equipment. Duplication is at one to one. This is for the regular program sweeps. The current hits will go out on tape, with individual numbers to be put on carts for more selective use.

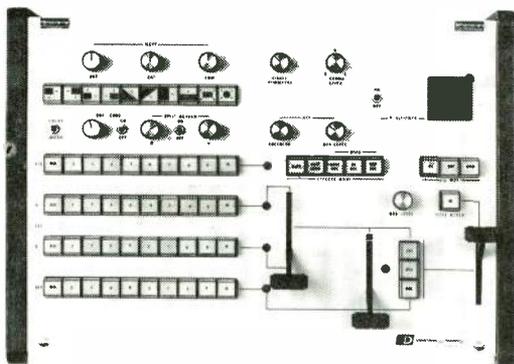
So far, F.R.M. has attacked the merchandising problem with a series of mailings to selected FM stations in the midwest area, and by an appearance, with a hospitality suite, at the NAB Programming Conference. Nossem told *BM/E* that the conference had been very positive for them, developing a considerable number of worthwhile leads. He says he is prepared for the long pull necessary to establish the track record that becomes the best selling lever for a radio syndicator.

Confidence in the long-range future of the operation lies in the continued growth into adulthood of the "rock generation." The oldest members of this group are now around 31, Nossem says. As they get older, they will carry AOR receptivity into the upper age groups. Meanwhile the group will get large additions at the younger end, the teenagers becoming adults. Thus to Nossem (and, incidentally, to a number of others concerned with radio programming) AOR with a strong contemporary bent seems like programming with a large future.

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TELEVISION

PROGRAMMING & PRODUCTION FOR PROFIT

Post Newsweek Stations: Group Ownership Can Lend Itself to Quality Kid Vid Production

OVER THE YEARS, Post Newsweek Stations have produced a wide range of successful children's programs at each of their four stations. It might surprise some people outside the broadcast industry to discover that the quality and quantity of PNS children's productions has been achieved without boycotts, petitions, license challenges or threats. Said Post Newsweek Stations president Joel Chaseman, "I was, I guess, the first broadcaster to go and see Peggy Charren (president of Action For Children's Television) on his own initiative." In essence, what Chaseman told Charren was, "I think you'd do better if you reinforced what you like rather than apply pressure to what you don't like."

Whereas Chaseman believes that these pressure groups provide a valuable point of view, "the 'pressure tactic' is almost self-defeating." Chaseman, who is a member of The National Council on Children's Television, traces his own commitment to quality children's programming back beyond his days with Group W. PNS also has a long record of quality children's programming and a standing corporate policy on the subject that is progressive and productive.

The policy begins with an aggressive ascertainment program that puts responsibility on some one person at each station to go into the community and seek out experts, leaders, and concerned groups dealing with children's interests. This person, in turn, is also charged with the responsibility of putting forth and developing a program for the children in the community being served. The result of this process has been the production of children's programs that range in form from special one-minute PSAs, to two-hour children's programs, to one-hour prime time specials for children. Moreover, there is an openness at the corporate level that has resulted in several cooperative productions, including its currently most successful program, *Marlo and The Magic Movie Machine*, produced at PNS's WFSB, Hartford, and now airing in approximately 80 markets.

Taking advantage of the group ownership structure

Producing children's programs is a

costly endeavor. So, whenever possible, the concept is developed in such a way that any show produced by one station may be used by another. Though the shows tend to grow out of contacts and perceived needs within particular communities, they are provided with sufficient resources to ensure a quality production that might help any one of the PNS stations fulfill its children's programming commitments. An internal "transaction" mechanism permits each station to "sell" its product to any other PNS operation. The "price" is equivalent to what the purchasing station would expect to pay for a program of similar length and quality in its market.

Arthur And Company, produced at PNS's WPLG, Miami, is currently airing on WJXT, Jacksonville, and WFSB, Hartford, as well as in Miami. It was on WTOG, Washington, D.C. until that PNS operation was swapped for what is now WDIV, Detroit, where *Arthur And Company* is expected to begin airing shortly.

Not only is *Arthur And Company* PNS's most widely shown program, it is also the longest running and is now in its eighth year. Jacqualyne Bailey, the show's producer, explains that in Miami, *Arthur And Company* is a two-hour program aired on Saturday and Sunday mornings. The *Arthur And Company* that airs on the other PNS stations is a half-hour segment "produced specifically for the other stations but aired as a segment of the Miami version," according to Bailey.

Arthur And Company is a program that "mixes people and puppets," said Bailey. The puppets are children in the neighborhood, their parents, and a couple of neighborhood characters. People like Jack Metzger play feature roles such as "Mr. Jackson," who does such things as handling the live animals that visit the show and "escorting" the viewers on field trips to the zoo. All in all there are about 20 puppet characters and about four "people" characters. Metzger, in addition to his role as "Mr. Jackson," also does 17 of the puppet character voices. The other three puppet voices are done by Camma Ward, who is the principal puppeteer. Ward actually makes the puppets and per-

forms on the show in a role where she teaches children crafts. "You wouldn't believe," said Bailey, "what she can do with bleach bottles. Camma has more than 200 construction projects using ordinary bleach bottles."

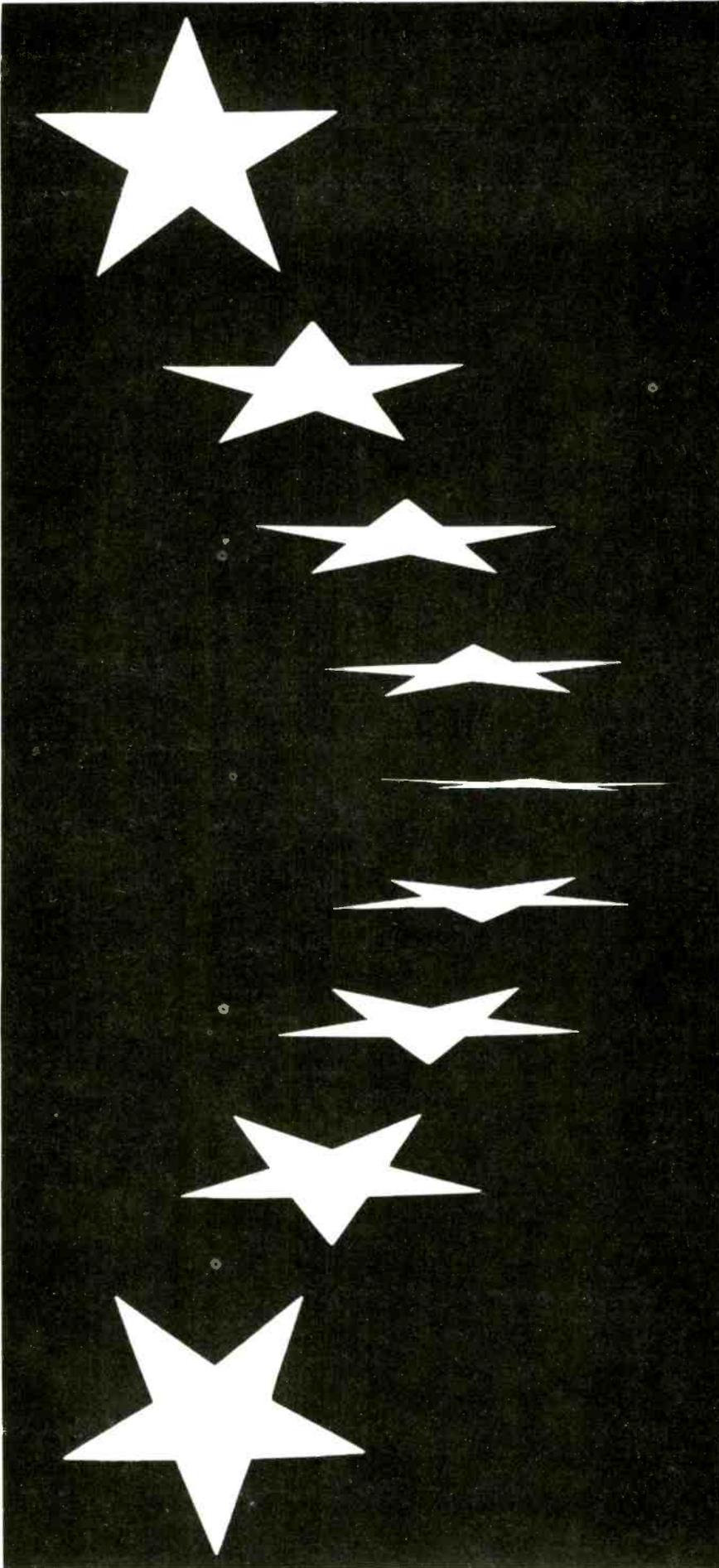
The show takes place in a television control room set. The puppets are "sort of anchoring the show from the control room," said Bailey. In this manner the show goes from segment to segment. There are "special reports" from people like "Mr. Jackson" at the zoo (done on location) and incidents in the neighborhood. Bailey describes the show as dealing with childhood problems like going back to school, meeting new people, sharing, and other social conundrums. "We have one segment," said Bailey, "called 'What Would You Do?'" A recent problem they approached is what you should do if you are invited one place by a friend and then given a conflicting invitation to "a one time only, special thing" by another friend. The episode is structured so that the question is left open and children in the audience are solicited for answers they often get from the children are completely unexpected. "Sometimes they amaze you. We're learning a lot."

The latest innovation for the show, which Bailey describes as "a technology boost," is a mini-cam unit. The addition of the EFP unit has greatly eased the difficulty of getting the show out of the studio and to many of the Miami area's outdoor attractions.

The four hours of *Arthur And Company* produced weekly are admittedly ambitious. "We have a small staff that sometimes chaffs at the effort," said Bailey, "but we do it!" *Arthur And Company*, which was originally targeted to pre-schoolers, now has extended its age guides to 12 years old. As Bailey said, "The show is growing up."

Ed Jones, who is currently program manager at WFSB, Hartford, produced a show at WTOG in Washington, D.C., called *Sneakers*. Some 39 of these shows were put together using what Jones described as a "Laugh-In/magazine format." *Sneakers* has been on the air now for two and a half years,

continued on page 34



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TV Programming

and Jones feels that the format is flexible enough that re-editing segments could lead to another 39 shows with little difficulty. Jones said that *Sneakers* was put together with "a lot of 'today' kind of music, a lot of flair, a lot of production expertise, and a lot of the kinds of tools that are available to television stations."

"We tried to make it as entertaining as possible, as well as to educate and enlighten kids, but the basis has to be entertainment. And we tried to utilize television and the tools television has to offer to make it entertaining," said Jones.

"As you know," said Jones, "local stations in trying to do children's programming have got to spend some bucks, and often times a station doesn't have the kind of dollars to spend on a program that is going to air on a Sunday morning or Saturday afternoon. Frankly, we found ways around that. We utilized the same kinds of materials and electronic effects that were coming in for news and just found ways to incorporate them into a kids' show."

Matching today's technology with yesterday's resources

Another successful approach that is getting a workout at PNS is the use of film library material within the context of a children's show. There are a lot of ways this can be made to work. In *The Vanishing Shadow*, a show that was produced at WJXT, Jacksonville, a 1934 Universal series was revamped to take part in a three-week television reading project.

Professors Solomon and McAndrew of Philadelphia had been experimenting in the Philadelphia school system with the idea of taping network programs, creating written scripts of these programs and then using scripts and programs over a CCTV system to encourage children to read. The project met with some measure of success and they eventually approached Post Newsweek with the idea of doing something similar over commercial television. Ray Hubbard, now retired, was then Post Newsweek's executive vice president for production. He and the professors carried the ball forward. Hubbard went to Hollywood and found *The Vanishing Shadow*, which was a twelve-part serial that had only one theatrical outing.

Meanwhile, the Duval County, Florida, school board was involved, and a program was developed whereby they would help adapt the script of *The Vanishing Shadow* and enlist Duval County sixth and seventh graders into the project. The school board also prepared teachers' guides and trained the teachers in the use of them.

Ken Kaminski of WJXT was put in charge of the production. Though the project from concept to completion took about 2½ years to put together, there was only about four months' work involved in the physical production of the show. A ventriloquist named Ernie and his puppet C.R. were created to host the shows. Electronic effects and character generators were used to highlight important parts of the programs. Eventually, 12 shows were completed and aired at 7:30 p.m. each Monday through Thursday for three consecutive weeks, beginning in mid-April, 1975.

In an attempt to measure the effectiveness of the show, Professor George Mason of the University of Georgia was enlisted to test the reading levels of the sixth and seventh graders before and after the project. In the three weeks that the program aired, students followed the scripts along with the show and discussed each program in class. After the project was completed, Professor Mason found that many of the children had improved their reading skills substantially.

Kaminski, who is now executive producer for WJXT, points out that from a programmer's point of view, the show did pretty well. "We had been running *Bewitched* in that slot and we were getting a 30 rating and a 48 share; *Vanishing Shadow* registered a 27 rating and a 54 share for the three weeks it ran."

The most successful show in the PNS stable is *Marlo and The Magic Movie Machine*. The program is produced at WFSB, Hartford, in cooperation with the Corporation for Entertainment and Learning and Fish Communications. *Marlo* is currently in some 80 markets, including all of the CBS O&O stations as well as three of the four PNS stations.

Marlo began production at WCAU, the CBS station in Philadelphia, but moved its production to WFSB after 13 weeks. Twenty-six of the 39 *Marlo* shows have been produced at WFSB and the fortieth show will kick off the production of the next 13 beginning September 16 at WFSB. According to Bob Garthwaite, producer of *Marlo*, working at WFSB is "just great. It's a great place to work for a lot of reasons. There is a lot of enthusiasm for the show up there on the part of the crew, which makes it much easier to work." Garthwaite, who has been in television production since 1948 and has worked all over the world, said that working at WFSB reminded him of the days of "live" broadcasting where you "kind of looked forward to coming to work on that day."

The Corporation for Entertainment and Learning is a profit oriented company headquartered in New York City that produces numerous educational

and industrial programs in addition to *Marlo*. At the heart of the *Marlo* concept is a 12-million-foot film library acquired by Mert Koplín and Charles Grinker. Koplín and Grinker, who write the *Marlo* show, are also executive vice president and president of CEL, and gathered the film library from all over the world. The footage goes back as far as 1894 and contains everything from some of the early Edison films to "everything they thought was representative of twentieth century America," said Garthwaite.

According to Garthwaite, "The program is intended to instruct and to entertain. It is also, we feel, intended to cause children to ask questions after the show is off." The format of the show involves a character named Marlo, played by Laurie Faso, who operates a "computer type" machine, the "Magic Machine." A dialogue between Marlo and the machine (whose voice is done by Koplín) presents opportunities to run numerous film clips from the CEL library.

The film segments are "routined into the show like commercials," said Garthwaite. All the segments to be used are transferred to videotape cartridge and rolled in as appropriate. "As you might imagine," said Garthwaite, "an enormous amount of film and literary research goes into producing the show." In fact, according to Garthwaite, the writing, research, timing, and often even the camera angles, are all worked out before the production team ever shows up at the WFSB studio.

There is so much material on film that could be invaluable to children that PNS is once again developing a format to bring more of it to its television audiences. Joel Chaseman is currently involved in screening hundreds of short films from all over the world in preparation for a new show, tentatively entitled *Horizons*. Chaseman, in cooperation with Bernice Coe of Coe Films, Ruth Vitale of PNS, and Bea Ottinger of Kline and Company, hopes to gather together enough material to make four one-hour prime time specials for children and their families. The short films will be of various forms and from a wide variety of cultures. Chaseman hopes that they will be able to get a popular host to handle the show and develop enough interest in it to make a go at syndication. Chaseman believes that material such as this has for too long been restricted to the confines of the elite. "The use of prime time television for the best of the world's short films is worth it," said Chaseman.

It seems that to some extent Chaseman's advice to Peggy Charren has been followed. Since that time, several of the PNS productions have been selected for ACT awards. **BM/E**



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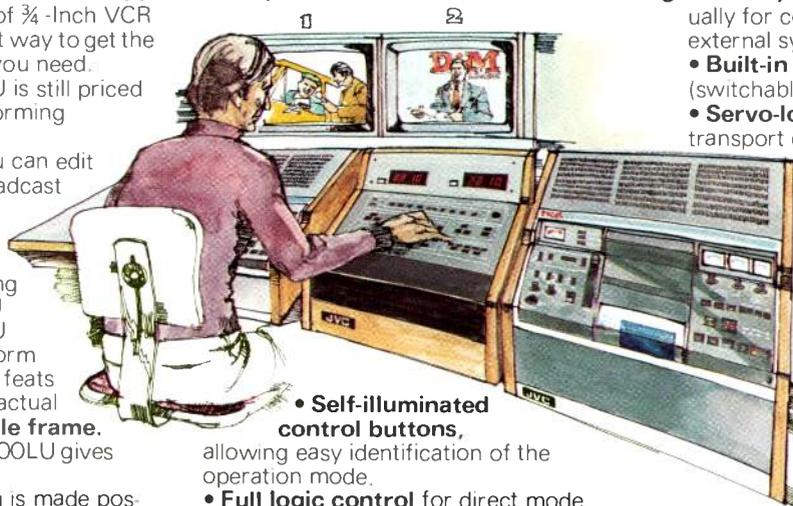
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- **Frame to frame editing** is made possible with the capstan servo/built-in rotary erase head/blanking switcher frame servo design. A design that also ensures true assemble and insert editing with no distortion at the edit points. Plus horizontal sync phase compensation to minimize timing error at the editing points.
- **Variable speed auto-search** lets you perform both high speed and low speed search. You can search at approximately 10 times in fast forward or reverse to find edit points faster. Or slow speed search at 2 times, 1 time, 1/5 time and 1/20 time. Or use the special auto-speed shift feature to automatically slow you down from 2 times, real time, 1/5 time, 1/20 time.
- **Automatic pre-roll** enables you to pre-roll tape between edits, with an automatic on/off switch. Which can come in especially handy during successive assemble edits using camera signals.



- **Self-illuminated control buttons,**

allowing easy identification of the operation mode.

- **Full logic control** for direct mode change without pressing the stop button.
- **Remote control** of all operations, with the optional remote control unit RM-85U.
- **Audio level control with meters,** preventing over-level recording without audible distortion, with attenuator. Also, manual audio level controls let you adjust the audio recording level by checking the level meters.
- **Auto/Manual selection for video recording level control,** adjustable by the automatic gain control circuit or manually by referring to an independent video level meter.
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- **Patented color dubbing switch** for stable color multi-generation dupes.
- **S.C./sync input connector** allows connection of time base corrector and allows for two second pre-roll.
- **Chroma level** can be controlled man-

ually for convenient connection to an external system.

- **Built-in comb-filter** for playback (switchable on-off).
- **Servo-lock indicator** to check the tape transport condition.

- **Counter search mechanism,** permitting Auto-Search of a particular section of the tape.

- **Solid construction for easy maintenance:** both side panels, top and bottom panels are detachable for easy access to the inside.

- **Tracking control meter** for maximum

tracking adjustment.

- **Heavy fan motor** for better circulation.

All that with one editing unit. But when you combine two editing units with our new RM-85U automatic editing control unit, you'll enjoy all the benefits of a total-performance system.

Starting with the kind of control only JVC's RM-85U can give you:

- **Independent LED time counters** for player and recorder, read out edit points in minutes, seconds and frames.
- **Edit-in and edit-out automatic control.** Four built-in memories let you control edit-in and edit-out points of both the player and recorder. And once starting and ending points are determined, accurate editing is memory-controlled automatically.
- **Edit shift control** allows frame-to-frame edit point correction.

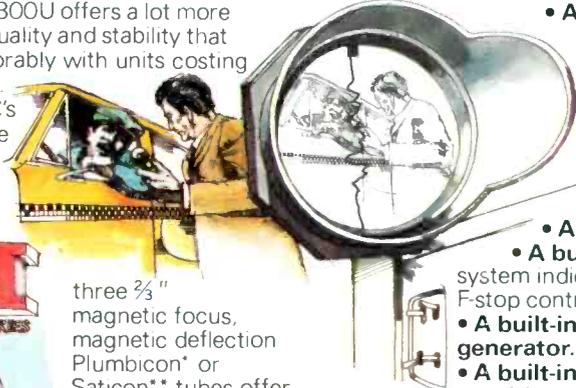


- **Lap time indicated** for each insert edit length by LED display.
- **Edit preview mode available**, for "rehearsals" of actual edits.
- **Edit-in point search mechanism.** After each edit, a Return button rewinds the tape automatically to the edit-in point, so it's easier to check edit conditions.
- **Auto-shift search mechanism** to step down the tape speed automatically, and ensure quick and accurate location of the editing point.
- **Tape safety guard circuit.** Because leaving the unit in the still-frame mode can eventually cause damage to tape or video heads, a tape safety guard circuit places the unit into the stop mode automatically

You demanded more versatility in a moderate-priced, broadcast-quality camera.

And JVC's value-packed CY-8800U goes with you from studio to location.

Our CY-8800U offers a lot more than picture quality and stability that compares favorably with units costing twice as much. Thanks to JVC's technology, the CY-8800U camera, utilizing



three 3/4" magnetic focus, magnetic deflection Plumbicon* or Satcon** tubes offer total flexibility. And a rugged die cast chassis in front and back to hold up under the toughest conditions.



With the **Basic** configuration, it's a compact ENG/EFP camera that's completely self-contained —no CCU required. It's easy to operate, ready to plug into our CR-4400LU/CR-4400U portable recorder, with optional cables available up to 66 feet.

With the **Studio** configuration it's a hard-working studio camera. Just add the RS-8800U remote Synchronizing unit and the large screen, top mounted viewfinder.

And as for big-ticket features, we've built in what the others would let you add on later:

if it is left in the still-frame mode for more than 10 minutes.

- **Selective editing modes**—assemble editing, insert editing for audio channel-1, audio channel-2 or video.
- **Versatile editing capability** offering techniques like "edit-in/out," pre-roll, and automatic pre-roll.

You'll find that nothing in its price class performs anywhere near the CR-8500LU/RM-85U videocassette editing system. And that you'd have to spend a lot more on the competitive unit that offers many of the same features.

That's what we mean by giving video people more of what they want, for less than they expect to pay.

- **A built-in 1.5 Inch adjustable electronic viewfinder** for the convenience of the operator.

- **A built-in battery warning system.**

- **A built-in tally light.**

- **A built-in VSI—video system indicator** for precision F-stop control.

- **A built-in color bar generator.**

- **A built-in +6dB, +12dB sensitivity switch** for low

light level applications.

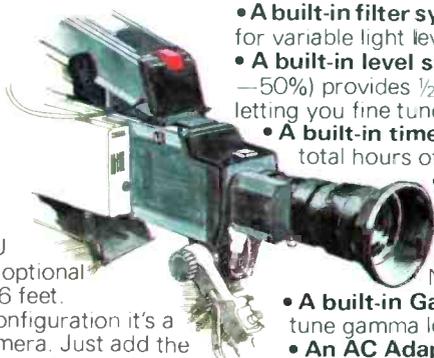
- **A built-in auto white balance.**
- **A built-in fast warm-up capability.**
- **A built-in electrical color temperature adjustment** for different applications (variable from 3000°K to 10,000°K).
- **A built-in filter system** (neutral density) for variable light levels.

- **A built-in level switch** (+50%, 0, -50%) provides 1/2 F-stop adjustment, letting you fine tune for added contrast.
- **A built-in time lapse meter** to show total hours of camera use.

- **A built-in intercom system** for studio applications.
- **An RGB output**, and NTSC encoding (Y, I, Q).

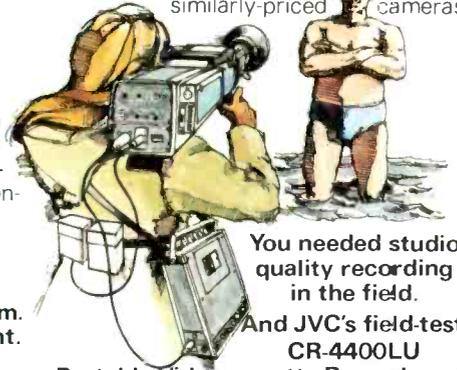
- **A built-in Gamma control** to fine tune gamma level.
- **An AC Adaptor**—standard.

- **Lightweight—17.4 lbs.—portability.**
- **Optional 12-to-1 zoom lens** with automatic iris and power zoom.



- **Built-in horizontal and vertical colour correction circuits.**
- **Signal-to-noise ratio of 49dB, F. 4/3000 lux.**
- **Resolution of 500 lines at center.**
- **Return video** in the viewfinder.
- **A built-in -G circuit** for registration.
- **Minimum illumination F 1.9/300 lux** (+6dB switch on).
- **A comfortable hand grip** to stop and start the recorder. With a switch to operate iris control and a switch for return video.
- **A built-in CCU.**

And that adds up to a lot more features than you'd find in similarly-priced cameras.



You needed studio quality recording in the field.

And JVC's field-tested CR-4400LU

Portable Videocassette Recorder with automatic editing lets you bring your recording/editing capability wherever you need to shoot.

If you spend time on location in either ENG or EFP applications, you need a portable video system that can shoot, edit, and give you something to show in no time flat. Without awkward equipment hassles.

JVC's CR-4400LU is the one to take along when you can't bring a studio.

Because it's the lightweight machine with heavyweight features:

- **Weighs in under 27 lbs.** So you can take it anywhere, and assemble edit on the spot. You enjoy total flexibility. Complete freedom. Fast results.
- **AEF (Automatic Editing Function)** gives you clean assemble edits.
- **Built-in, full color recording and playback circuitry.** No need to buy an adaptor.
- **Low-power consumption** that lets you operate on a miserly 13.5 watts, for longer battery life. A multi-purpose meter checks battery, audio, video and servo levels for precise control of all functions.
- **Flexibility to record with the CY-8800U** or other high quality color cameras

So if you need a field-tested recording system with the features you want at a price you can afford, check out our CR-4400LU Portable Videocassette Recorder:



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A Radio Net For The New Age: National Public Radio Goes To The Satellites

By interconnecting its affiliates nation-wide by satellite, National Public Radio plans to demonstrate the sharply higher levels of quality, flexibility, and economy the satellites can bring to radio.

CULMINATING A NUMBER OF YEARS OF PLANNING, National Public Radio, the central programming service of public radio stations across the country, will start in mid-1979 to reach member stations via satellite, with the whole net to be on the satellites by about January, 1980.

The NPR net will get underway at very roughly the same time as the Mutual Broadcasting System satellite net, described in earlier issues of this magazine. NPR's objectives are obviously somewhat different, being directed toward the needs of public radio stations for a varied complement of non-commercial programming. But the two nets, taken together, will show on a very large scale — Mutual with 500-plus affiliates, NPR with 200, later growing to 300 — what a revolutionary force the satellites are going to be in radio programming in this country.

NPR has turned to the "birds" because of the severe limitations of terrestrial lines for its program distribution. Wide-band stereo programs, for example, have been sent to member stations on tape by third class mail, a process that often takes three weeks or more.

The satellites will eliminate program travel time with programs aired at NPR headquarters for real-time receipt by member stations anywhere in the country. Beyond that, the satellites will allow transmission of several programs simultaneously, starting with up to four programs and eventually reaching 12 simultaneous channels. Further still, the net will provide for origination of programs at many points around the country, for availability on a real-time basis to any other public station that may want them. This decentralization of program origination is one of NPR's main objectives. They want to draw strength and creativity from all areas, for a real variety free of the "made-in-Washington" label.

Initially the net will provide four 15 kHz signals, which can be used for four monophonic programs, two stereo, or one quadraphonic. Eventually the net will carry 12 simultaneous 15 kHz signals, any of which will be selectable by any recipient station. This will give the operation a flexi-

This article is adapted from a paper presented at the Audio Engineering Society convention (Los Angeles, May, 1978) by **Wayne Hetrick**, senior engineer, Research and Development, National Public Radio.

bility far beyond that of any network plan now realizable without the use of satellites.

As first set up, the net will serve 192 stations. The total is expected to grow to more than 300 stations over the next ten years. NPR will make a gradual transition from terrestrial to satellite distribution, with the cut-over to be done in segments as all the radio stations in a given area get their equipment for reception of the satellite signals.

The main origination terminal

NPR's uplink facilities will be installed alongside those of the Public Broadcasting Service's television satellite uplink, at a site in Bren Mar, Virginia, 10 miles southwest of Washington. PBS already has its satellite transmission operation underway from this site. Both services will use the same Western Union (Westar) satellite, but not the same transponder. Two 11-meter antennas both transmit and receive. NPR will use the same 11-meter transmit antenna as PBS, but NPR will also have a 4.5-meter antenna as a backup at the site.

The Bren Mar site will be connected by duplex circuits to NPR's Technical Center on M Street in Washington. Eventually, this connection will provide for the 12 simultaneous broadband circuits that the net will carry.

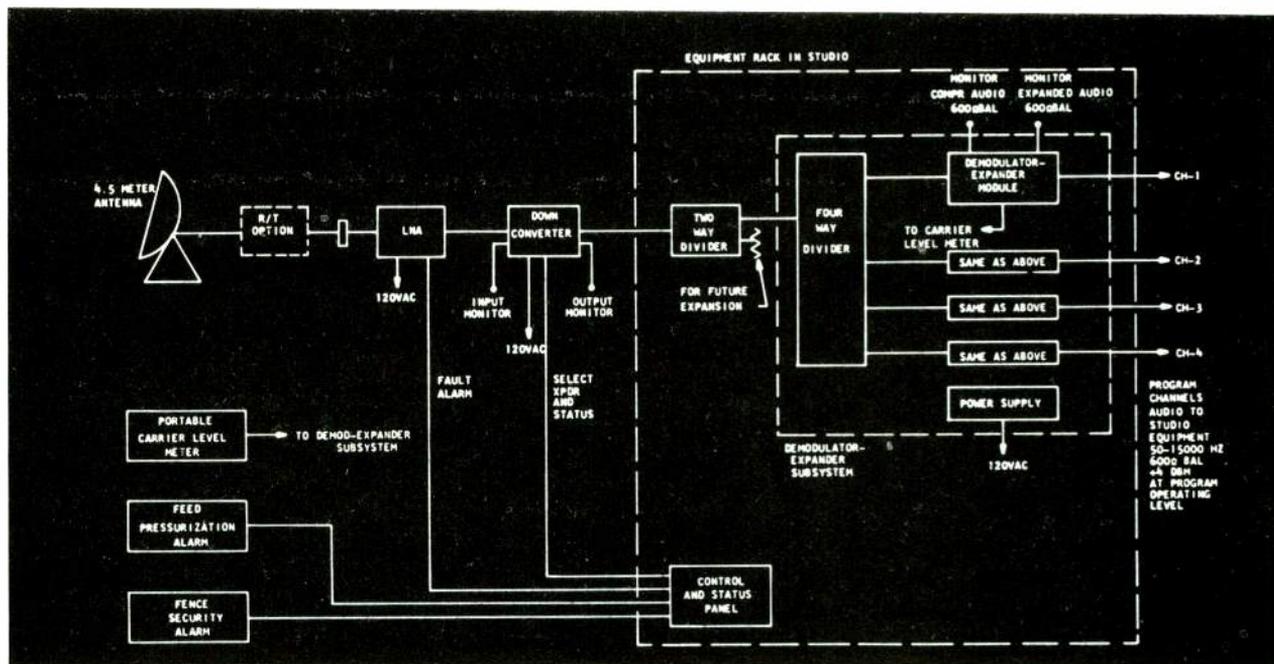
Each of the 15 regional uplink stations now planned will have the capacity to send two simultaneous broadband channels up to the satellite. The system allows for adding additional uplink stations later, if NPR decides to have more. All transmission in the net will be on a single-channel-per-carrier basis, which allows great freedom in assignment of program channels to satellite carriers. Uplink signals will be in the six GHz band; downlink signals are transmitted in the four GHz band.

Receiving earth terminals

Each station will own and control the earth terminal equipment for bringing in the satellite signals. Each terminal has a 4.5-meter antenna, which can be repointed manually if there is a failure in the satellite, or to allow the station to get, from a different satellite, programs contracted for outside of NPR.

The earth terminal will include a receiver subsystem consisting of a down converter and four demodulators, and associated audio expander units which are used in the

Public Radio Goes to Satellites



Block diagram of satellite earth terminal to be supplied for reception to each affiliate of National Public Radio. Transmit capability is added with transmit subsystem put in block marked "R/T Option."

noise reduction system. The down converter is tunable to either of two transponder frequencies, and each demodulator is independently tunable to any of the 12 signals the system will eventually carry.

Both the transmit and receive equipment for the net have been designed and manufactured by Collins Radio Division of Rockwell and selected subcontractors, in close collaboration with the NPR engineering department.

Site location

Each station has suggested a prime location for its receiving antenna. This site, and alternate sites, are being coordinated with transmission in the area in the 3.7 to 4.2 GHz band used for downlink transmission.

In some cases, two or more stations will be able to share one earth terminal in the net, thus reducing costs. Often, though, this will not be possible because of interference, environmental disadvantages, geography, or other reasons.

There is a further sharing possibility: the NPR service can make use of some facilities (antenna, etc.) of a public television earth terminal. About thirty such situations have already been identified in the U.S.

Realizing design objectives

Coming now to some of the technical characteristics

Typical link performance

Nominal carrier-to-noise ratio (at a typical NPR station)	16 dB
Companioner improvement	30 dB
FM improvement (B=5)	26.5 dB
Total signal-to-noise ratio	≥67 dB
Carson's Rule bandwidth	180 kHz
Nominal EIRP (downlink)	16.5 dBW
Nominal G/T	21.4 dB/K
Nominal path loss (30° elevation)	196.3 dB

that make the net such a big advance over earlier radio distribution systems, we note first the design objectives for the audio performance. The overall audio signal-to-noise ratio of signals as received was set for a minimum 67 dB. This was reached in part through the use of a new companding noise reduction system developed especially for NPR. The NPR engineering department studied all extant noise reduction methods, and decided on certain special characteristics they wanted. These were incorporated into the new system in collaboration with a manufacturer of noise reduction equipment. The companding system gains about 30 dB of subjective improvement, reducing the requirements on the net itself. NPR expects that the subjective signal-to-noise ratio, at the receiving stations, will be in excess of 70 dB.

It is worth re-emphasizing, in this connection, the freedom of satellite networking from the unavoidable analog signal degradation in the cascading of many repeaters. A satellite channel has just one repeater, no matter how far the signal is carried. That makes it far easier to maintain top quality performance from input to output.

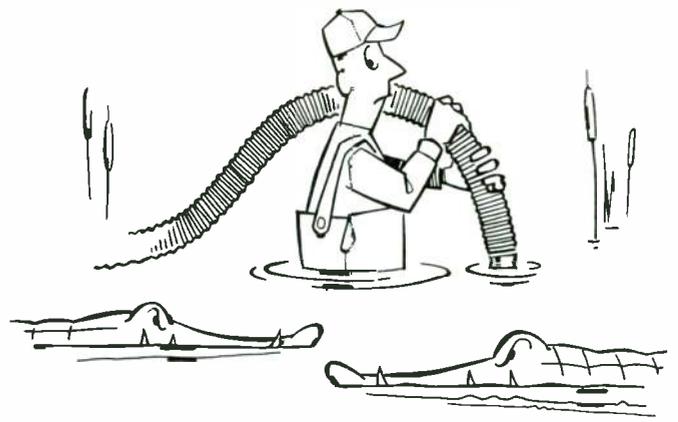
The noise performance and some other important characteristics of a typical link are shown in the accompanying table. Note the figure of 196.3 dB for nominal path loss.

All signals are put onto carriers in the 70 MHz band, using frequency modulation with a peak deviation of 75 kHz. This carrier frequency was chosen because the technology for making high quality 70 MHz modulators is highly developed. In addition, if terrestrial lines are needed to reach broadcast studios from NPR terminals, cable television technology is effective in carrying signals in this band.

NPR chose to use analog rather than digital modulation for several reasons. Their analysis established that a digital signal of the kind they would need would take one and a half to two times as much downlink power as the compar-

continued on page 42

Hello, Harry —

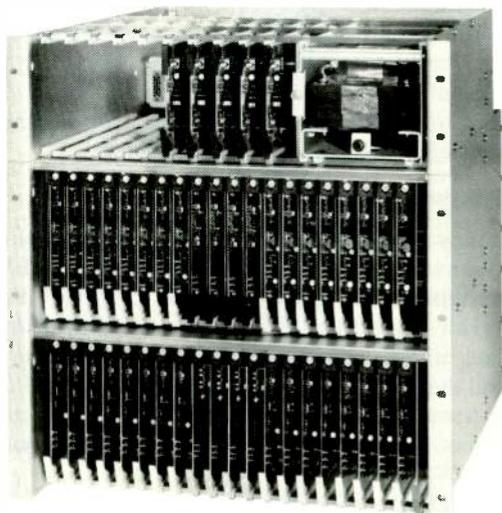


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Public Radio Goes to Satellites

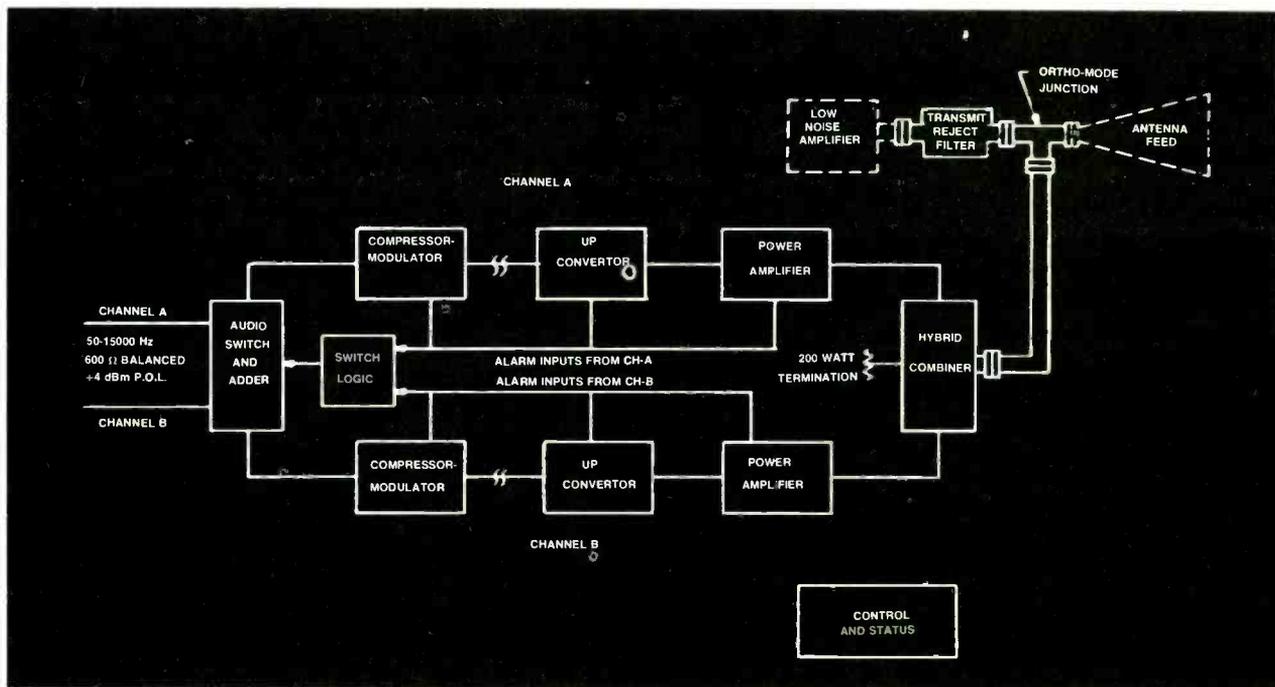


Diagram of transmit subsystem shows equipment added to earth terminal to supply the regional uplink capability. Regional transmitters can put two 15 kHz signals onto net for receipt by any other affiliate

able analog signal, greatly increasing operating costs. The much smaller bandwidth needed for an analog signal also reduced cost and technical requirements. There is also the saving in eliminating coding and decoding equipment.

These facts would not have been persuasive, however, if NPR had found digital transmission essential for the top quality signal they wanted. But with a single "repeater" in the path and their special noise reduction system, NPR was able to reach all the quality objectives.

The four carriers might be at 65, 69, 72, and 74 MHz, and each would be frequency modulated with a different signal. Each would be translated upward to the six GHz band for the trip up to the satellite. Two such carriers would be used for stereo. In other words, this is a totally discrete stereo system, in contrast to the broadcast FM stereo system with its composite signal carrying both left and right signals on one RF channel.

The carriers at the output of the up converter are at a power level of about .01 milliwatt. Power amplification lifts this to the level needed for uplink transmission. At remote 4.5-meter antennas, about 45 watts is needed; at the 11-meter antennas about 6.5 watts is needed at the power amplifier output.

In the regional uplink transmitters, special precautions are needed to separate transmitted and received signals. Each program audio input goes through an audio switch and summing network to a compressor/modulator, then to the transmit channel. If one of the two transmit channels should fail when a stereo signal is being transmitted, the two channels are automatically combined for transmittal together on the remaining good channel.

The power amplifier raises the signal level, with the signal in the six GHz band, to about 45 watts. The two signals go to a combining network, to a diplexer, and thence to the antenna. About 16 watts (+12 dBW) from each channel reaches the antenna. With antenna gain of 46 dB, this results in an effective isotropically radiated power

(EIRP) of about 58 dBW, enough to produce high quality uplink transmission from the regional locations with reasonable operating margins.

Although the diplexer orthomode junction provides a fairly high isolation between the transmitted signal and any incoming signal, there must be additional attenuation of the transmit frequency at the receive port to prevent overloading the low-noise amplifier (LNA) that takes the signal from the antenna. This is accomplished with a filter with at least 50 dB of attenuation for frequencies in the transmit band, around six GHz, and about 0.1 dB insertion loss for the receive frequencies, in the 3.7 to 4.2 GHz band. The combination of this filter with the orthomode junction action puts 80 dB of attenuation in the transmit signal level appearing at the LNA input. Thus, the regional uplink transmitters can be used for transmission without degrading simultaneous reception.

Satellite power output

The power output of the transponder in the satellite, or the "saturated EIRP," is typically about 33 dBW. In practice this must be shared among up to 12 NPR carriers, along with other users. In addition, the power must be "backed off" to minimize intermodulation in the satellite, and there must be an allowance of about 1.5 dB for end-of-transponder-life degradation. The final result is a typical per-carrier satellite output power of about 16.5 dBW or 44.7 watts for the NPR carriers.

This power is subjected to the "path loss" on the way to the receiving antenna. The path loss will vary somewhat depending on the location of the receiver, and has been figured for every location and for the two satellites to be used, Westar I and Westar II. The calculations are based on the "slant ranges," figured from the azimuth and elevation angles from each site to each satellite. Variations are on the order of one dB. In addition, an allo-

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OCTOBER, 1978—BM/E

HITACHI SK-70

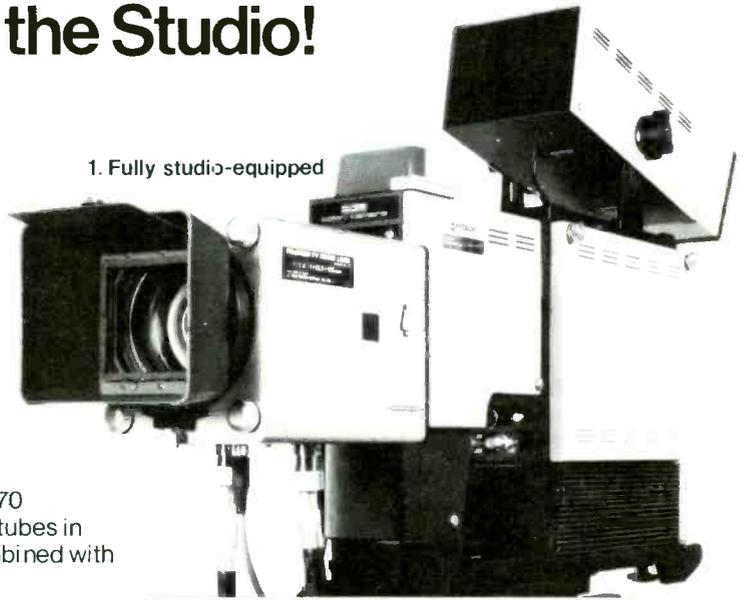
The One Camera That's Right for Both Field Production and the Studio!

The modular SK-70 converts easily from a fully equipped, self-contained color studio camera to a modified studio camera. In the field, the studio version of the SK-70 can be connected directly to a VTR with only a co-axial cable. And for hand-held portability, the camera head features a shoulder mount, an auto-iris portable zoom lens, and a 1.5" viewfinder, along with a DC and process pack. The Digital Command Unit (DCU) with up to 3000 feet of single co-axial cable strongly enhances the capability of the SK-70. Another striking option is a 22:1 zoom lens that can be used for the studio version of the SK-70 in the field.

No matter which configuration you choose from those shown in the photo and three diagrams, the Hitachi SK-70 offers the precision and reliability of three 2/3" Saticon tubes in the camera head to insure excellent picture quality, combined with all the latest advances in broadcast camera technology.

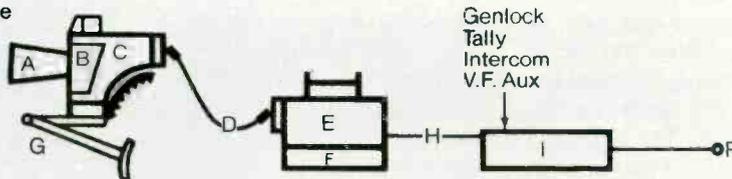
As you can see, our outstanding Hitachi SK-70 is a sound investment for broadcasters, production studios, and universities who need broadcast quality performance in a wide variety of assignments, all for the price of a single camera. We'd be pleased to arrange a demonstration of how the SK-70 can fit the following camera requirements inside or outside your TV studio, and more:

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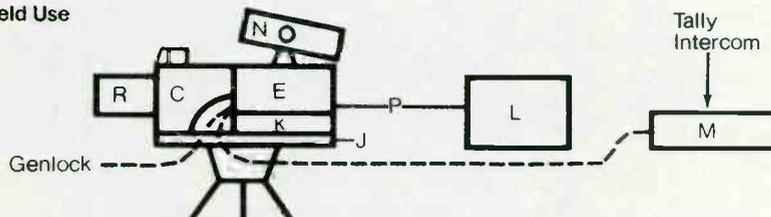


Digital Command Unit (DCU)

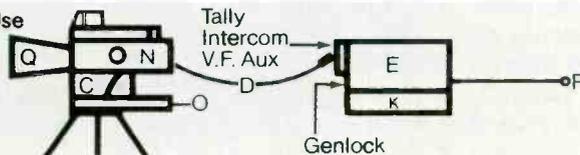
2. Portable Use



3. Field Use



4. Modified Studio Use



A)	Portable lens
B)	1.5" viewfinder
C)	Camera head pack
D)	Camera cable (300 ft.)
E)	Process pack
F)	D.C. pack
G)	Shoulder Mount
H)	Co-axial cable (3000 ft.)
I)	DCU
J)	Mount adapter
K)	A.C. pack
L)	VTR or FPU
M)	Operation panel
N)	5" viewfinder
O)	5" V.F. Mounting Plate
P)	Co-axial cable (video)
Q)	Portable lens w/conversion adapter
R)	Studio lens

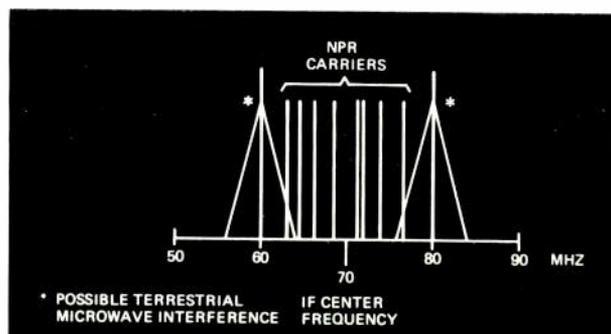


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Public Radio Goes to Satellites



Spectrum placement of NPR carriers, with respect to possible terrestrial microwave carriers, shows how NPR frequencies interleave with microwave frequencies to minimize interference possibilities

wance of 1.1 dB is made for each site to account for departures from ideal propagation which include atmospheric absorption, polarization and earth station pointing error, 0.7 dB; degradation in antenna gain, 0.2 dB; and degradation in LNA noise temperature, 0.2 dB.

A typical net figure for loss over the air path is 196.3 dB, the loss between the satellite and the receiver antennas. Figures differ a few tenths of a dB between the two satellites, as well as from one site to another; in practice, the largest loss from any site to either satellite has been used in the system design.

These losses must be offset by the receiver system design. Antenna gain is about 43.5 dB at midband (four GHz). Antenna gain increases with frequency, but so does propagation loss, at nearly the same rate. Thus no adjustment has to be made in the midband figure for carriers at other frequencies.

In summary, the power level at the receive antenna output port is 16.5 dBW minus 196.3 dBW plus 43.5 dB equals 136.3 dBW. In an FM system, the final signal-to-noise ratio is the function of the carrier-to-noise ratio, as modified by the FM improvement factor. With 200 kHz of receiver noise bandwidth, 15 kHz as the highest modulation frequency, and 75 kHz the peak FM deviation, the improvement factor calculates to 27.0 dB. The signal-to-noise ratio of the bearer channel established for the NPR net had to be at least 41 dB. Thus, the carrier-to-noise ratio had to be at least 41 minus 27 or 14 dB. The system CNR depends mainly on the downlink CNR, since the uplink CNR is much greater because of the greater power available at the transmitting ground terminal. Thus the downlink CNR had to be maintained at no less than 14 dB, and this was accomplished, as already noted.

Receiver noise figures

The antenna noise temperature depends on the elevation angle of the antenna, because that determines the amount of noise power radiated into the antenna from the "hot" earth. The temperature of the earth's surface is around 300 degrees Kelvin, and a significant amount of this heat may enter the antenna through the side lobes. At a typical antenna angle of 40 degrees, the temperature of the NPR antenna will be about 30 degrees Kelvin.

Noise contributions in the receiver downstream from the LNA will generally be quite small, since the LNA has a high gain of about 60 dB. The downstream sources are the down converter and demodulator, and coax and power divider losses.

To cover this downstream noise and all other miscellaneous sources, NPR adds an additional margin of 14 degrees Kelvin to the design. This leads to the specification of the LNA noise temperature, and this will vary from site to site, as already noted. The cost effective solution was to choose among LNAs with a series of standard noise temperatures, for the one giving the needed margin at each site. Available values were 150, 125, 95, or 55 degrees Kelvin, with the higher values the least expensive. In this way the LNA cost and noise figures were matched to the job.

Following the LNA is the down converter, which includes bandpass filters choosing the section of the 500 MHz wide LNA output which corresponds to the transponder transmitting the NPR carriers. The down converter output consists of the group of NPR carriers translated to the 70 MHz band; these are fed to a power divider, which sends each to a separate FM demodulator to recover the original audio signal. Following the demodulator is the expander, which reverses the compression applied to the signal at the transmit site, in the noise reduction system already described.

The choice of frequencies for the NPR system, to minimize the possibility of interference with the terrestrial microwave services which use the same band, was a most important part of the design. The frequency assignments to terrestrial microwave systems are on 20 MHz spacings beginning with 3710 MHz, or 3710, 3730, 3750, etc. Thus, the satellite transponder center frequencies for the downlink have been chosen on 40 MHz steps starting with 3720 to 3760, 3800, etc. This puts about eight MHz on each side of the transponder center frequency which is relatively clear of interference. The NPR carriers make use of this space by occupying these regions on each side of the transponder center frequency.

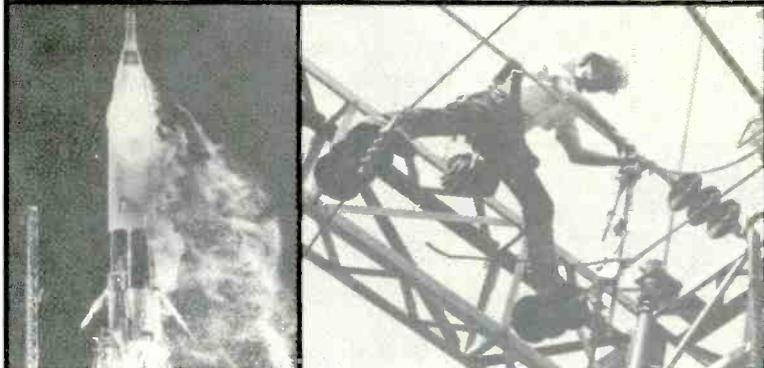
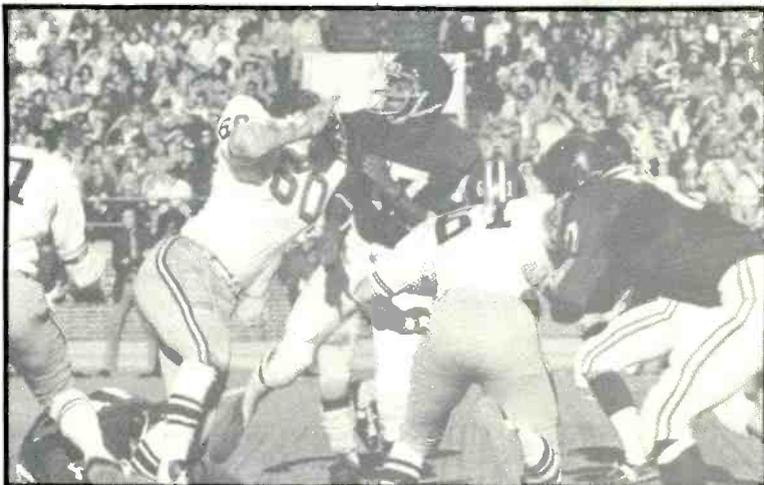
Further, as noted already, each site for an NPR receive terminal will be carefully analyzed for interference. This will be done by putting into a computer all microwave terrestrial links in the vicinity, to determine expected levels of interference at the site. If the computer study indicates a marginal situation, with degradation of the NPR signal likely, actual measurements will be made at the site to verify the interference levels, and determine whether or not the site is acceptable.

When the NPR station studio site is cleared through the interference analysis, the receive terminal can be "co-located" right at the studio, to eliminate any need for a terrestrial link between satellite terminal and studio. If the studio location turns out to be too "noisy" for the satellite terminal, it can be put up to five miles away, with a coaxial cable link to the studio.

In sum — what NPR affiliates will get

The signal which will be routinely available to NPR affiliates, with SNR of at least 70 dB, 15 kHz bandwidth, and vanishing level distortion, will be "state of the art" for a long time to come, and will in fact be beyond the capability of many stations to make full use of for some time. For just one limitation, consider the receivers in automobiles, which make up 20 percent to 40 percent of some stations' audiences. But the existence of this high quality signal will be a sharp and continuing stimulus toward the upgrading of audio quality in broadcasting, both at the transmitting and the receiving end. On that score alone the satellites are powerful movers and shakers for the future.

BM/E



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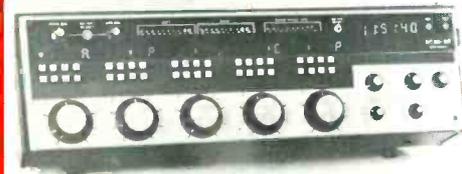
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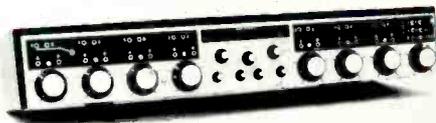
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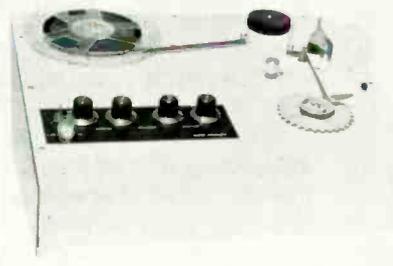
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Progress Report: Circularly Polarized Antennas For TV

They won't simplify your operation, they won't make your license easier to get, and they certainly won't cost you less to run . . . but they sure can make you easier to watch!

A YEAR AND A HALF AGO [see *BM/E*, March, 1977] we reported that: "None of the proponents of CP deny that there are problems to be solved but they have argued, apparently successfully, that these problems cannot be solved by a refusal to go forward . . . Two VHF TV stations, one highband and one lowband, have opted for CP antennas. The stations, WPBT, channel 2, Miami, Florida and KBYU, channel 11, Provo, Utah, are both non-commercial, educational stations." The FCC's at least tacit approval of TV CP was expected momentarily.

Nineteen months later the problems — primarily that transmitting with a CP signal requires twice the power (to transmit a vertical as well as horizontal signal) and therefore costs twice as much — remain unsolved, and are likely to continue so until a vast majority of stations have gone to CP, enabling them to lower their transmission power (since CP receiving antennas significantly increase reception power). The FCC did grant approval, on May 24, 1977, for stations, at their option, to transmit a circularly polarized signal provided it did not increase their effective ERP. A half dozen stations, including WPBT and KBYU, are now on the air with CP, with a half dozen or so more expected within the next six months pending FCC approvals.

No less than four U.S. companies (Bogner Broadcast Equipment, Cetec Jampro, Harris, and RCA) have been granted FCC approvals for their antenna designs, each offering unique advantages for all types of CP applications. We thought, however, that rather than analyzing their respective claims we would talk with stations who were already on-air with CP or who were shortly about to be so. Circular polarization has been around long enough to no longer be a "new fad," and the data provided by these stations should be conclusive enough to convince even the most cynical broadcaster.

WLS-TV: the guinea pig that lived

Though ABC's WLS-TV (channel 7), Chicago, has been on the air with CP since January, 1974 (as a testing ground for both the FCC's review of circular polarization and RCA's development of its CP antenna line), the station did not receive its license until March, 1978. It is now fully operational with an 81.3 kW ERP side mounted panel type RCA prototype CP antenna.

The FCC had laid down three criteria for testing the CP antenna: (1) that it would not exceed the then current A & B Grade contours; (2) that it would not create any co-channel interference; and (3) that tests would have to demonstrate an improvement in reception over horizontally polarized signals. The test results, provided by Neil

Smith of Smith & Powstenko (Washington, D.C. consultants) came in loud and clear! As predicted, the first two criteria were completely satisfied, and results using a CP receive antenna were highly significant. However, Smith also set up rabbit-ears in the standard "v position" and monopoles oriented perfectly vertically. Even with no "fiddling around" to get a better picture, he observed some improvement in 75 percent of the sites tested. And in 25 percent, he observed a one TASO grade or better improvement. Perhaps more significant, though not quantifiable, there was a marked improvement in signal consistency. The familiar viewer situation of adjusting the set only to find, upon sitting down, that the reception was poor again, was largely eliminated. According to Pointer: "We have improved picture reception. We have eliminated or minimized ghosting. We have a higher signal-to-noise ratio. And we do have penetration into difficult spots in the urban area." What more could a station ask?

KBYU and WPBT: one year later

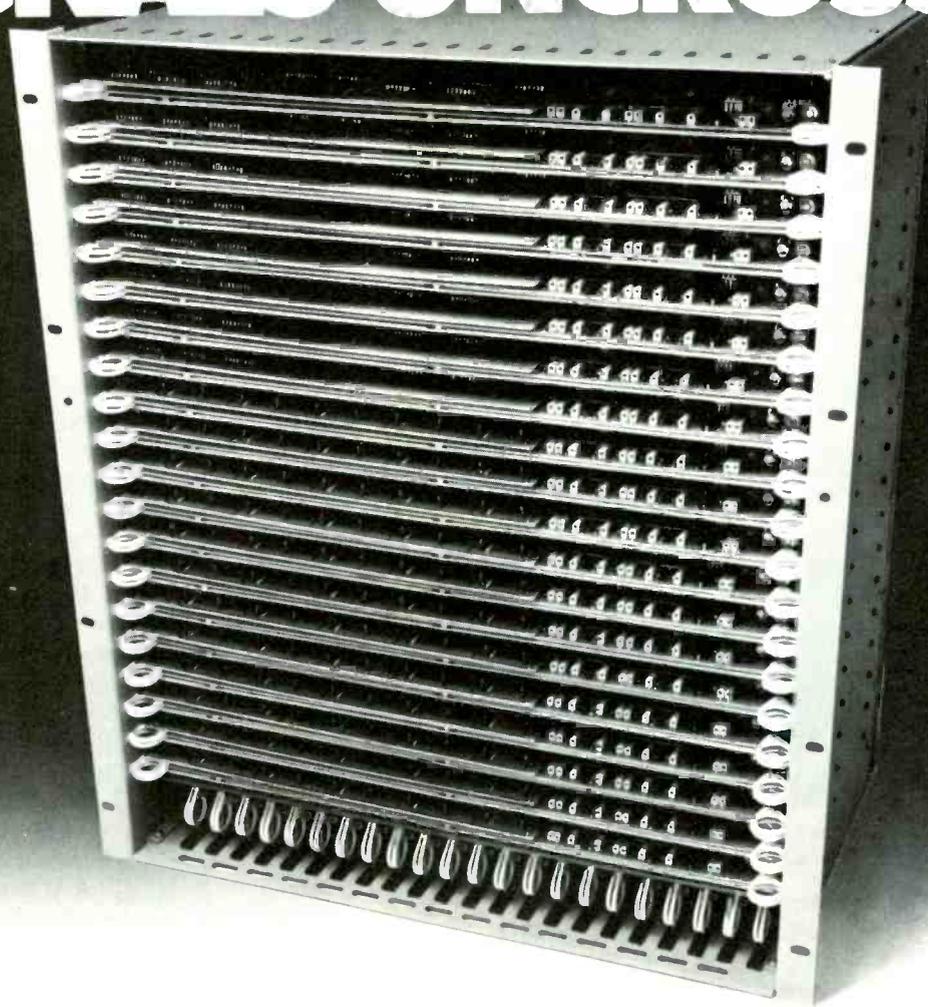
"Driving among the large buildings of Salt Lake City with a battery-operated TV set," claims Ralph Silver, chief engineer of KBYU-TV (channel 11), Provo, Utah, "ours is the only channel which we can watch consistently. The others come in only at intersections. The circularly polarized signal just seems to penetrate all the dark corners."

On-air with CP for just over a year, KBYU installed a Harris six bay cavity-backed radiator on a 75-foot tower high atop an 8600-foot mountain. Arranged on the three sides of the triangular tower, each bay consists of three cavities, yielding a total of 18 cavities, each containing a crossed flat dipole. KBYU is currently transmitting with only half of a Harris 50 kW parallel transmitter, radiating 100 kW ERP; they will shortly marry the two halves of the transmitter, however, yielding a CP system with an ERP of 162 kW. One advantage of the Harris antenna to KBYU was that the station made its decision to go with CP before the FCC had given its final approval; the Harris antenna, with its power divider and separate inputs for the horizontal and vertical, is easily converted from HP to CP. Another advantage of the antenna was the ease with which it could be directionalized to provide the 10 dB null KBYU needed to protect against a channel 11 in Twin Falls.

The other station which we reported in March, 1977 as having committed itself to CP went on-air with RCA's Quatrefoil side-mounted six bay antenna on September

continued on page 50

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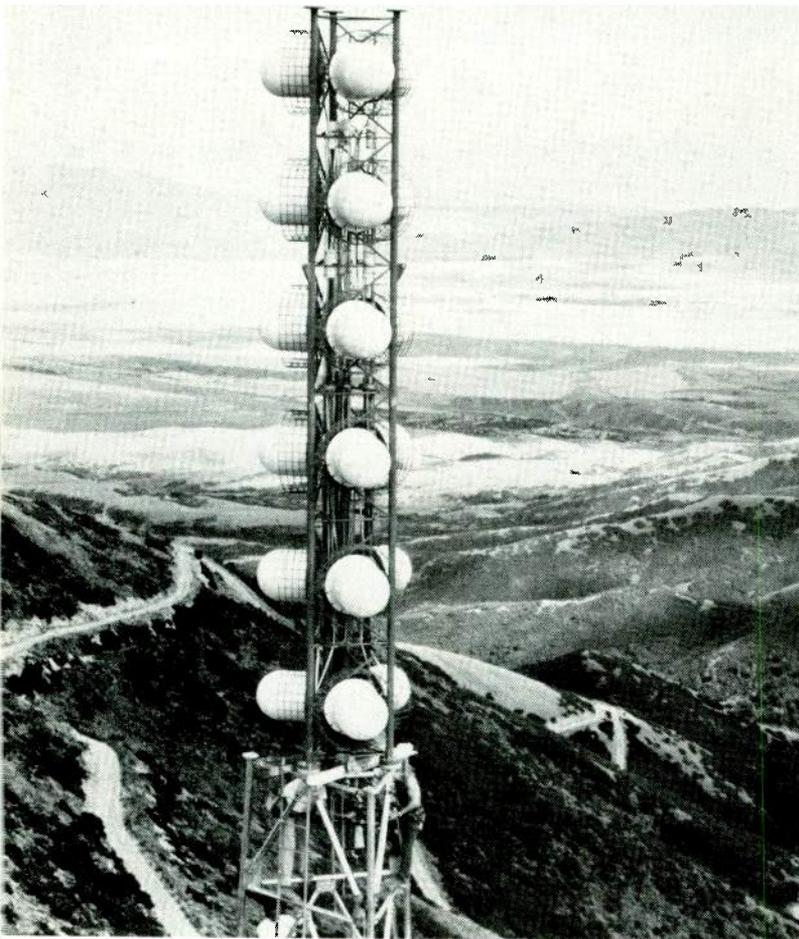
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Circularly Polarized Antennas



KBYU-TV, Provo, Utah, is transmitting an improved television signal with its new Harris CBR circularly polarized antenna

29, 1977. With an antenna gain of 6.64 and a 26.5 kW transmitter, WPBT (channel 2), Miami, achieves its maximum 100 kW ERP in each plane. The antenna is basically omni-directional, with a scant one dB suppression to protect against a channel 2 in Orlando. The 18 panels are mounted on a tower 1048 feet above sea level, but this height includes two UHF antennas mounted on a T-bar above the top of the TBK Quatrefoil. Center of radiation of the CP antenna is slightly over 920 feet.

Both stations are extremely happy with the results. As part of the station's testing, Ralph Silver visited homes in KBYU's deep fringe area — some as far away as 100 miles. With the antenna arrayed horizontally, he was unable to bring in KBYU's signal. However, when he tilted the antenna vertically he was able to bring in a viewable signal. "The vertical component seems to penetrate a lot better," claims Silver. "Having both signal components helps tremendously with fading; when the horizontal fades, you've still got the vertical."

WRAL: doing things a little differently

Lee Poole, chief engineer at WRAL-TV (channel 5), Raleigh, N.C., considers his statements carefully; he knows that the entire broadcasting industry is watching with quiet optimism as the results come in on WRAL's new RCA Fan Vee CP antenna. WRAL went on-air with CP on September 11, and is the latest VHF station, and the

only channel 5, to use CP. Unlike other stations which have converted to circular polarization in the process of relocating their towers or increasing their ERP, WRAL's operation will remain basically similar. The only difference is that the new antenna, radiating 100 kW ERP, is mounted 2000 feet above ground level, whereas the old tower was 1170 feet. But the differences are mathematically predictable, and WRAL will serve as a perfect testing ground for before-and-after studies. As a further test, WRAL left its old antenna operational for a short time to make actual on-air CP/HP comparisons.

The first indication that the folks at WRAL are up to something different is Poole's admission that the tower is strobe lit 24 hours a day. It's not to satisfy any FCC regulation; "We're just proud of it," says Poole. But strobe lighting is only the tip of the iceberg. For two weeks before September 11, WRAL took to the airwaves (both radio and television) and to print advertising to tell the world (or, at least, its viewing audience) that the change was coming and what to look for. It would seem only natural for a station to promote its new CP signal; but other stations we spoke with seemed to have passed on this opportunity. "Circular polarization is a direct benefit to the viewer," explains Poole. "Other technological advances simply make it easier for the broadcaster to do his job. But CP is designed to make television better for the consumer while costing the broadcaster lots extra."

Yet another difference at WRAL is that the station is working actively with JFD Electronics on the development of a circularly polarized receive antenna. WRAL is not content to simply transmit its improved signal, sit back and let people enjoy it. They want to make certain people know about it and get the best signal they can. It remains to be seen whether, in actual home use, the CP-CP system will yield the almost 50 percent (six dB) improvement in received signal predicted. But WRAL is formulating plans to make large-scale purchases of CP receive antennas and put them into the hands of their viewers. However, despite the fact that WRAL's omni-directional antenna does not have to contend with either mountain ranges or large buildings, Poole anticipates one of the largest benefits will be to rabbit-ear and monopole families.

At WRAL the "something different" is obviously "something right." WRAL's commercial competitor, WTVD (channel 11), has recently filed for FCC approval for circular polarization.

WQTV: UHF goes on-air with CP

One of the most exciting developments in CP is the announcement of the first full-power UHF station to actually go on-air with a circularly polarized signal on a regular broadcast basis (excluding, of course, the year-long experiment at KLOC-TV, channel 19, in Modesto, Calif., where Cetec Jampro conducted its original CP antenna tests). The station, WQTV (channel 68), Boston, Mass., is a subsidiary of Universal Subscription Television which has purchased an omnidirectional Spiral CP antenna from Jampro for long-term leasing to Boston Heritage Broadcasting, its subsidiary.

Rinaldo Brutoco, president of Universal Subscription Television, describes the move as "a substantial step forward for UHF, both in coverage area and in quality of reception. We hope," he adds, "that CP will go a great distance to eliminating the 'UHF handicap.' Enough in-

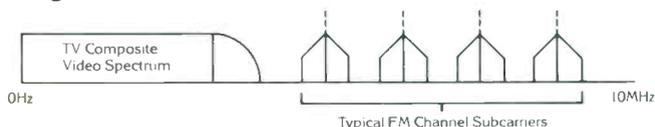
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Tomorrow's super sound. Today's super saver.

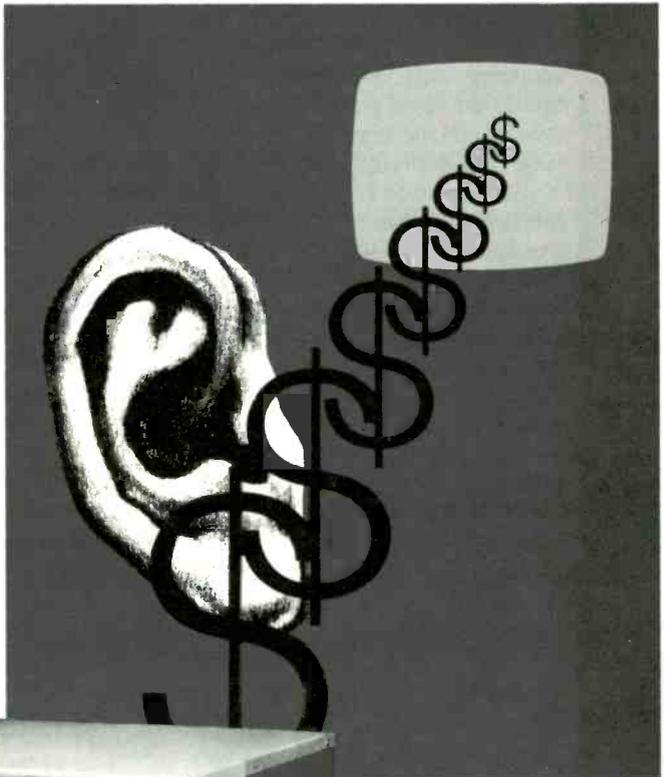
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tem can not only handle TV stereo sound, but also a separate FM stereo broadcast station and a separate AM broadcast station simultaneously! How's that for flexibility and economy.



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Circularly Polarized Antennas

formation has come in already indicating that CP offers improvements for VHF channels; in theory, the technology should work even better for UHF. This is particularly true for ghost rejection in a large urban area such as Boston." The WQTV antenna will be mounted on the Prudential Tower; but the Hancock Tower is just around the corner!

The significance of WQTV's decision, of course, is that for a UHF station, already faced with the high cost of transmitter power, CP operation virtually doubles the operating cost. While VHF's, particularly in the low bands, can usually afford to double their output power in order to add the vertically polarized signal and achieve the same ERP with circular polarization, for UHF stations the increased power is at considerable expense. However, Brutoco's analysis of the finances of the WQTV operation provides some interesting insights: "One of the advantages of the CP antenna, besides its polarity of signal, is that you get to send out your full ERP on both the horizontal and the vertical planes — you're effectively doubling your power. If you believe that there is an advantage in being able to blast out twice as much power (either because you believe that the circular polarity of the signal



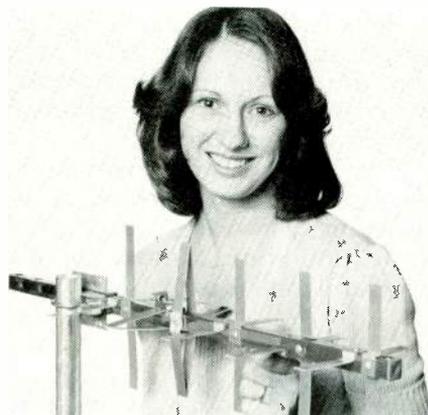
Rigger completes work on Bogner four-bay slot-and-dipole CP antenna for WTVG's 1000 W translator in south tower of World Trade Center, 1,398 feet above sea level. Note in background the north tower mast which will house an array of VHF antennas for the New York area

will tend to diminish or eliminate ghosting, or if you want to get your signal further, then you step back and ask: 'what will be the additional incremental cost?' If you're only going to pick up an extra mile or so in your Grade A contour, the cost probably isn't worth it. If, on the other hand, you're picking up a large additional territory and the quality of the signal in your Grade A contour is going to be substantially improved, then the cost is not that great."

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Circularly Polarized Receive Antennas — Consumers Will Have To Wait A Little Longer

As originally conceived, circular polarization was a transmitter/receiver system where the station's CP transmissions would be matched by a viewer's CP reception. In this way all the benefits of CP could be realized, including maximum reduction of multipath (ghosting) problems in close-in areas because of the ability of CP receive antennas to reject left-hand (reflected) CP signals, and better signal-to-noise ratio in distant areas because of the increased gain in the vertical plane. It appears, however, that as of this writing the major influence on stations' decisions to go with CP is increased penetration into the rabbit-ear and monopole market. This is with the exception of the pay-TV stations discussed in the article, where installation of CP receive antennas is an absolute must for the quality signal demanded by viewers who are paying for their programming, and where the cost of installing the antenna can be passed along to the viewer in the course of the installation of a decoder.



Blonder-Tongue circularly-polarized receiving antenna for channel 60, New York. A similar crossed-Yagi design (four to five percent larger) is being used for channel 68 in Boston

It appears, therefore, that the day when a consumer will be able to walk into an appliance store and purchase a CP antenna is a little way off. The problem, in addition to the increased cost of producing and marketing such an antenna, is that few people possess the necessary equipment or judgment for deciding which type of antenna works best. In the deep fringe areas of a station's contour there is little doubt that an RH CP antenna would produce immediate benefits, no matter how it was installed; misorientation of a CP receive antenna shows far less effect on signal quality. However, in downtown areas likely to contain the bulk of a station's viewers, installation is a major procedure. As we saw with WTVG, RH CP antennas are not always the answer where the only signal that gets through to a particular location may be a left-hand CP signal on its fifth bounce. Consumers have no way of predicting the best configuration for their antenna. Besides, larger rooftop antennas, such as those which would be required for multi-channel CP reception, are prohibited in many urban areas.

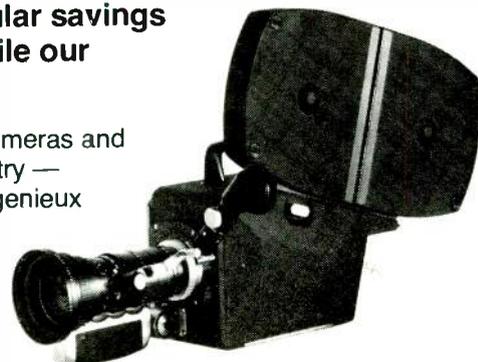
Nonetheless, interest has been shown by four receive antenna manufacturers in producing CP antennas for situations such as pay-TV or WRAL, where the station takes an active interest in putting CP antennas into viewers' hands. The furthest along is Blonder-Tongue, which is currently producing the first commercially manufactured CP receive antenna for channels 60 in New York and 68 in Boston. The Blonder-Tongue model (either left- or right-hand circularly polarized) uses a crossed Yagi design in which three directors, one driven element, and one reflector are incorporated on a single shaft, about 1½ feet long. A phasing harness links the two dipoles which are folded to increase the bandwidth. The antenna achieves a nine dB gain with a single polarization, 12 dB with both horizontal and vertical. The resistance remains at 75 ohms. This is practically the same antenna Blonder-Tongue will be supplying to WQTV in Boston except with a four to five percent increase in size to account for the different frequencies of the two stations.

As for the circularly polarized receive antenna designs of the future, all indications point to the superiority of a spiral as the ideal antenna. However, no manufacturer is yet willing to seriously undertake manufacturing this intricate and costly design, which offers the further disadvantage that its vertical orientation is not only unsightly but adds substantially to installation problems because of its greater windloading.

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Circularly Polarized Antennas

A key feature of the WQTV operation will be the installation of a Blonder-Tongue rooftop-mounted CP receiving antenna/descrambler in each subscriber home — at the cost of \$150 per household, fully installed. Boston Heritage anticipates a 10 percent penetration into the approximately 1,700,000 potential audience in the Boston area. Multiply the \$150 times 170,000 households (\$25.5 million) and you arrive at the cost of installing the system. "We are prepared to deliver a highly sophisticated television signal," adds Brutoco, "one that is very clear, crisp, and unghosted — not a traditional UHF signal. With the 'closed loop' CP system, we can do it. We can make our pay TV signal look as good as anything else on the air. I don't understand why all the UHF TV competitors we have don't go for it automatically."

WTVG/W60AI: STV reaches for the sky

Since the week of January 16, 1978, station WTVG (channel 68 in West Orange, N.J.) and its 1000 W translator for channel 60 in New York City have been quietly making broadcasting history. The transmitter and antenna constitute the first on-air television facility at the World Trade Center; it is the first circularly polarized translator in the world; and it was the first UHF operation to transmit with CP (except for KLOC).

The station is owned by Wometco, which internally leases prime evening hours (from 8:00 p.m. to 2:00 or 2:30 a.m.) for its Wometco Home Television pay-TV movies. During the remainder of the day, WTVG carries a variety of ethnic programming. Operation of the two 1000 W Acrodyne translators is completely automatic, with the transmission between West Orange and the World Trade Center receive antenna carrying information that automatically converts the translated signal into pay-TV mode using the Blonder-Tongue scrambler/descrambler system (both audio and video). 68/60 now has approximately 17,000 subscribers, with new homes being added at the rate of 1000 per week.

The real revolution, of course, is that WTVG, trying to

**TOMORROW,
YOU'LL SEE TV 5 BETTER
WITH YOUR EARS.**

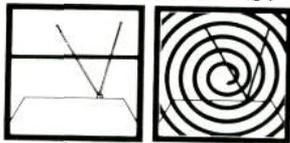


Fig. 1
Fig. 2

Tomorrow TV's will begin broadcasting from our new 3000 SSB Tower. And we'll be sending you a revolutionary new signal called "circular polarization."

Our new signal is so reliable it will be used to back the first picture from the moon.

It is so revolutionary only a handful of stations in the entire country have it.

It's stronger and far more penetrating than ordinary signals. And for those of you who love to see enough to TV 5 to use rabbit ears or a whip, to enjoy there's a considerable difference.

Ordinary TV signals are flat and horizontal to the ground. What's more, they don't touch the signal's hub.

The "hub" of your antenna (Fig. 1) is circularly polarized signal on the other hand, sends that which are like a corker now. Which means more of our new signal hits your antenna (Fig. 2).

The result of all this will be a much better picture on TV 5.

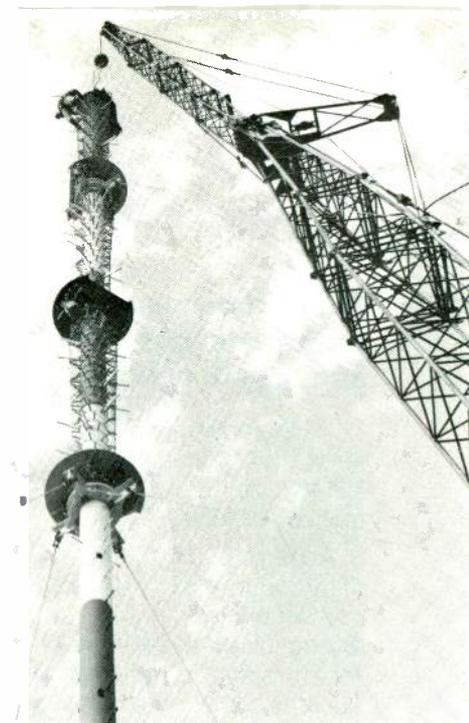
There will be fewer ghosts. Less snow. A lot less fading to time late your dick or cables.

And two other pictures won't be interrupted every time someone walks past your TV set.

So tomorrow, buy your TV set. TV 5 You'll see a picture that's better than ever before.

THE ONE & ONLY 5

Advertisement used in WRAL's print campaign in the local press informing viewers of the station's conversion to circular polarization. Note the primary appeal to rabbit-ear viewers



Giant crane lifts WQTV's Cetec Jampro three-bay CP omnidirectional TV transmitting antenna onto test tower at company's Sacramento range

get a top quality pay-TV signal into one of the most built-up urban areas in the world, chose to go with circular polarization for its translator (and will be studying its results carefully to determine whether to convert its main transmitter to CP also). The four bay slot-and-dipole antenna was manufactured by Bogner Broadcast Equipment, which was the only manufacturer chief engineer Joe Giardina could find who would develop a relatively low-powered CP antenna, and one that would withstand the 200 mph windloading required for the World Trade Center installation. Giardina also insisted that the antenna be supplied with separate inputs for the horizontal and vertical polarizations so that field tests could be carried out comparing HP to CP. Conversion from one to the other is completely automatic with pushbutton controls in the WTC control room. However, the station will shortly establish a microwave link between the New Jersey and New York transmitters, at which time all engineering functions of the translator will be controllable from the main transmitter. The antenna is side-mounted on the existing FM mast (south tower), which was considerably reinforced to withstand the greater weight of the TV antenna.

The station turned to Ike Blonder to design the CP receive antennas which are installed in subscriber homes at a cost of \$75 (plus \$81 for the descrambler/speaker box). The exciting design consists of two crossed Yagis, and is extremely lightweight and easy to install — connected to the descrambler box through coax (and booster if necessary). The antenna is narrowband for the channel 60 reception. An interesting note is that Blonder-Tongue is actually supplying three different antennas to the installation affiliates — one conventional HP, one left-hand circularly polarized, and one RH CP. Installers, using field strength meters, will be able to select the antenna that gives the best results in any particular location.

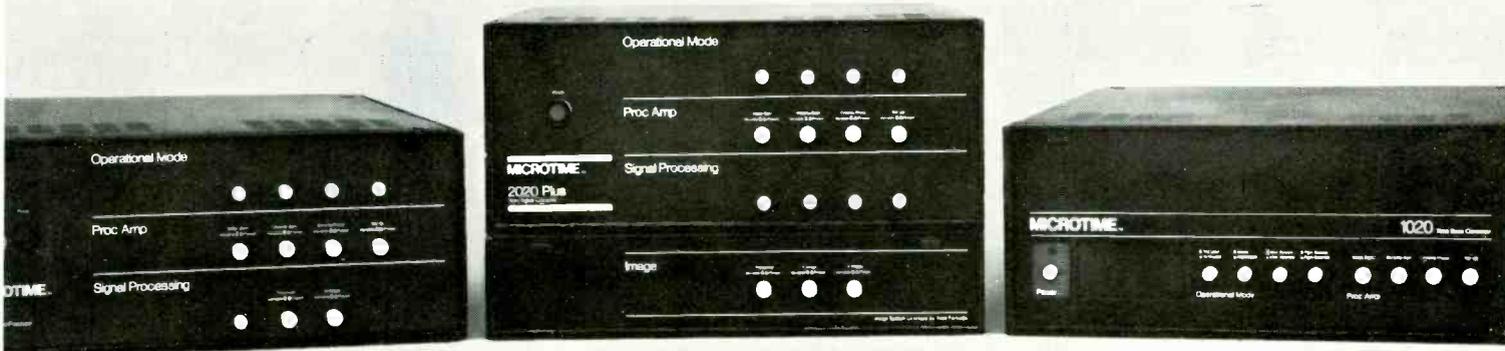
The circular shape of things to come

In the 16 months since the FCC granted approval for circular polarized transmissions, six VHF stations —

continued on page 56

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Circularly Polarized Antennas

Domestic Circularly Polarized TV Transmitting Antennas At A Glance

Note: this chart is intended to serve as a quick guide to currently available CP antennas — who makes them and who is using them. Figures quoted are sometimes engineering estimates and are not intended to reflect field test data.

Mfgr.	Model	Channels Description	Axial Ratio dB	Max. TV Power Input kW (+20% aural)	Power Gain	Cir. within ±dB Installations	Current & Future U.S.
TOP MOUNTED							
Bogner Broadcast Equipment	"B" Series	All; Single row of standard HP slot array plus standard VP dipole array per bay, with pattern conforming directors at each bay to provide vertical tilt and null fill and 9 standard horizontal directional or omnidirectional patterns. Field convertible from HP to CP. Top or side mounting. EXAMPLES: Channels 2-6 (3-6 bays), null filled Channels 7-13 (8-14 bays), null filled UHF (24-32 bays), null filled	2.5 2.5 4.0	100 70 110	3.2/1.6-6.4/3.2 9.2/4.6-7.7/15.4 26.6/13.3-35.0/17.5	1.75 1.75 1.75	**WVII (7) Bangor, Maine **WNYS (9) Syracuse, N.Y. WTVG (68/60 translator) New York
Cetec Jampro	Spiral	All; Varying number of bays each consisting of varying number of spirals fed equal power from base of the bay. Low VSWR achieved in VHF models through use of Wilkinson power divider providing equal feeds to each radiator through lines inside non-reflective support column. Highly omnidirectional EXAMPLES: Channel 2 (2 bays) Channel 7 (2 bays) Channel 10 (3 bays) Channel 19 (3 bays) Channel 68 (3 bays)	1.75 1.09 2.0 2.0 2.0	100 75 75 110 110	3.0/1.5 16.5/8.25 16.74/8.37 48.0/24.0 48.0/24.0	1.0 1.0 1.0 1.0 1.0	*KWTX (10) Waco, Tx. KLOC (19) Modesto, Ca. (1975-76 testing) WTVG (68) Boston
Harris	CPV	2-13; 3 crossed-V flat dipoles per bay mounted at 120° intervals separated by 3 vertical grids for HP beam shaping. HP and VP dipoles fed separately in phase quadrature. Vertical null fill and beam tilt achieved through standard phase distribution techniques. Mechanical tower loading equal to or less than present HP Batwing and traveling wave antennas. Channels 2-6 (with 15 null fill) Channels 7-13 (with 15% null fill)	2.0 2.0	100 100	5.4/2.7 11.4/5.7	2.0 2.0	**WWL (4) New Orleans **WCIX (6) Miami **WOR (9)/WNET (13) New York (diplexed)
RCA	Fan Vee	2-6; 7 layers of dual interlaced turnstile radiators. Each layer consists of 1 bay of HP Batwing Turnstile II radiator and 1 bay of 4 VP double-V full-wave dipoles. Foam dielectric phase quadrature feed system to each radiator.	3.0	60	6.0/3.0	1.5	XETV (6) Tijuana (San Diego area) WRAL (5) Raleigh, N.C. WTTV (4) Bloomington/Indianapolis
	Tetra Coil (TCL)	7-13; 4 interleaved helical radiators wound around each of 3 sections of support pole. Traveling wave principle with top loading of each radiator. Beam tilt and null fill achieved electronically — standard feature.	2.5	40	16.0/8.0	1.5	*WTVG (11) Durham, N.C.
SIDE MOUNTED PANEL TYPES							
Note: Side mounted, panel-type antennas offer the advantage of being extremely variable in their beam shaping abilities. Each consists of a series of panels arrayed on the sides of a tower, with panel size dependent on factors such as gain and frequency. Directionality and beam tilt may be controlled electronically by feeding different power to different radiators, or by physically manipulating the panels, or by a combination of both. Measurements of degree of circularity given below are for a hypothetical situation in which equal power is fed to all panels.							
Cetec Jampro	Ring-panel	All; Flat rectangular reflector panels with differentially spaced rings — minimum of 3, generally 6-7. Single feed per panel, generally center-fed. High directional capability.	2	lowband: 100 highband: 70 UHF 220	maximum 48.0/24.0	1.5	
Harris Corp.	Cavity-Backed Radiator (CBR)	7-13; Circular cavities with crossed dipoles and matching rings above dipoles. Extremely wide bandwidth and hybrid junctions permit multiplexing of 2 or more channels.	2	100 single; 150 multiplexed	unity for single channel or multiplexed	2.0	KBYU (11) Provo, Ut.
RCA	Quatrefoil (TBK)	2-6; 4 ring radiators (2 HP, 2 VP mutually coupled for broadbanding) per bay mounted in front of beam-shaping basket. Omnidirectional standard or directional horizontal patterns available. TWO VERSIONS: TBK-3 (3 bays) TBK-6 (6 bays), 10% null filled	1.4 avg.; 3.0 max.	70 50	3.0/1.5 5.8/2.9	2.5 2.5	WPBT (2) Miami
	TBJ	7-13; 3½-foot square reflector panel to achieve circularity with reasonable tower size (larger tower for given radiator phase-center to array-center) 2 adjustable dipoles per panel with single feed point.	3.0 avg.	varies according to individual specifications	slightly less than .5 per layer	2.5	*WABC (7), New York

**Pending FCC approval. *Antenna not yet installed.

Andrew Alford of Alford Manufacturing Co., Woburn, Ma. has recently patented an antenna design which should be of considerable interest to UHF broadcasters looking into CP. The design, employing two colinear arrays of dipoles fed

from baluns, with a zig-zag between them (25 dB down coupling), is mounted on a metal plate. Plates are then side-mounted to square towers and achieve both high gains and good circularity and axial ratio.

WPBT (channel 2), WTTV (4), WRAL (5), XETV (6), WLS (7) and KBYU (11) — and the two pay-TV UHF stations have converted to CP operations. By the spring of 1979, another six — WWL (New Orleans, channel 4), WABC (New York, channel 7), WVII (Bangor, Maine, channel 7), WOR (New York, channel 9), KWTX (Waco, Texas, channel 10) and WNET (New York, channel 13) — will probably be transmitting with CP pending FCC approvals and antenna delivery. No additional UHFs appear to be in the works at this time.

It seems that there is going to be no immediate rush to go out and convert to circular, though some had predicted this when CP was first being studied. The results with CP are dramatic; but until the public becomes aware of what it is missing — which may in fact occur in a year or two as more and more markets are opened to CP and stations begin to promote their improved signals to advertisers and viewers — conversion to CP will probably continue to happen as part of normal upgrading of facilities. For many broadcasters, increased transmission costs and the continued escalation of utility rates outweigh the advantages they could hope to gain in improved signal. This is particularly the case for UHF, where high-gain antennas are not only costly to install but where a station may have to double a two to three megawatt power input to achieve circular radiation. "There are two things going on with CP," points out Ogden Prestholdt, a partner in A. D. Ring & Associates, a Washington, D.C. consulting engineering firm. "There is the ability of a broadcaster to effectively double his power, and the potential for the benefit to be gained from transmitting in the vertical plane. In a sense, the first benefit may obscure the other. For some

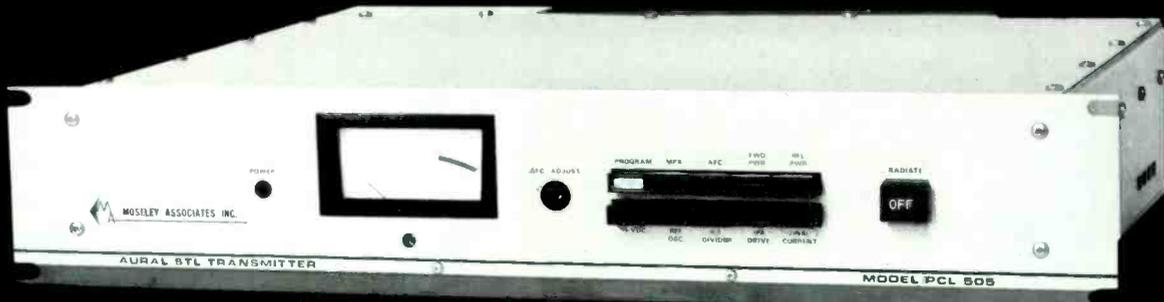
broadcasters, being able to double their power may lead them to overlook the question of whether there are real advantages to being able to transmit a circular signal. The test results simply aren't conclusive at this point."

The coming months will obviously be critical to the future of circular polarization as the results start coming in on WQTV and WRAL, and the New York City World Trade Center television mast (currently halted by a construction strike) becomes functional. WABC, which is expecting delivery of its RCA TBJ panel antenna in mid-September, will be the first to transmit at VHF frequencies in the New York area. Verne Pointer, who would like to be on-air from the new site in the first quarter of 1979, plans an active viewer promotion campaign and is working with CP receive antenna manufacturers; but even before New York area channel 7 viewers experience CP receivers, ABC will pioneer CP receive antennas in Chicago in conjunction with WLS. New York City will also shortly, pending FCC approval, be able to receive WOR (channel 9) and WNET (channel 13) in circular polarization when the stations begin transmitting from the WTC mast with a Harris duplexed antenna.

In short, the conversion to circular polarization may come down to those elusive factors of viewer demand and competition. There is still a largely "wait and see" attitude on the part of broadcasters unwilling to jump on the bandwagon just yet. However, the increasing number of stations converting to CP and the amount of favorable evidence stacking up certainly indicates that CP must be seriously considered by broadcasters looking to make their operation as modern and viewer-oriented as possible.

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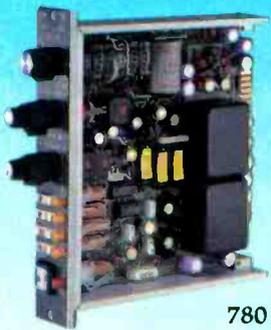


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Can UHF Be First Class?

In just the past few years, things have been looking up for UHF broadcasters. Economically, politically, and technically, things are getting better. But there is still concern over the comparability issue, the FCC WARC position and other challenges to the future of UHF.

IN 1975, CUB (COUNCIL FOR UHF BROADCASTING) and other organizations called for "... a system of television broadcasting in the United States in which distinctions between UHF and VHF concern only engineers; for the viewer, the broadcaster, the advertiser and the educator, there will be a single 82-channel system." In addition, the "Action Plan for Future UHF Development" called on the FCC, broadcasters, Congress, and manufacturers to implement a wide range of actions that would bring their ultimate goal within reach by 1980. With little more than a year left, UHF broadcasting has never been healthier, but more remains to be done to achieve "... a single 82-channel system" than seems possible in the time remaining in this decade.

Perhaps the major recent achievement of CUB was its effort to get the FCC to mandate better television receiver noise figures. In a five to two decision, the FCC has ordered an improvement in UHF television reception in nearly all new televisions effective October 1, 1979. The FCC order calls for a reduction in the maximum receiver noise interference figure from 18 to 14 dB in all new set models submitted to the FCC for certification after October 1, 1979 and for all television sets manufactured after October 1, 1981. The order goes on to call for further reductions at specific dates that would eventually bring the noise figure for UHF receivers down to 12 dB for all sets by 1984, at which time the commission is "more likely" to order yet further reductions to 10 dB.

Dick Block, chairman and founder of CUB, said, "We're very pleased about the tuner," and added that "the Chairman [Ferris] was right behind us all the way." There were dissenting opinions, however, including Commissioner Lee, who has been one of UHF's strongest supporters at the FCC. In his dissent, Lee said, "During all the years I have advocated UHF parity, I have learned that wishful thinking does not make it happen. I am dissenting here because I think the 12 dB standard represents more wishful thinking." Lee's dissent was based primarily on his doubts as to whether the forced reduction might not "create other problems" rather than provide a general improvement, and his fears that scarce research money might be spent on achieving this figure when even better figures might be possible. Said Lee, "... if compliance with this rule diverts research attention from de-

signing the best receiver possible, we may not have done UHF any real good at all."

The importance of improving the UHF tuner cannot be overestimated. In a way, it is the central issue which will answer the question of UHF's ability to reach first class status as one of this nation's broadcast services. There are other technical issues that present problems to UHF. One of the most irksome problems, and probably the last one to get solved, is the enormous power requirements for UHF transmitters. Though there have been significant improvements in the efficiency of klystrons, the power amplifier tubes used in UHF transmitters, these improvements represent only a ten to 14 percent decrease in the utility bills that a UHF broadcaster pays. A 220 kW UHF transmitter, operating 16 hours per day, can cost a UHF broadcaster \$200,000 a year in electricity charges. Though the savings are significant, the UHF broadcaster still finds himself paying almost twice as much to the electric company as his VHF counterpart.

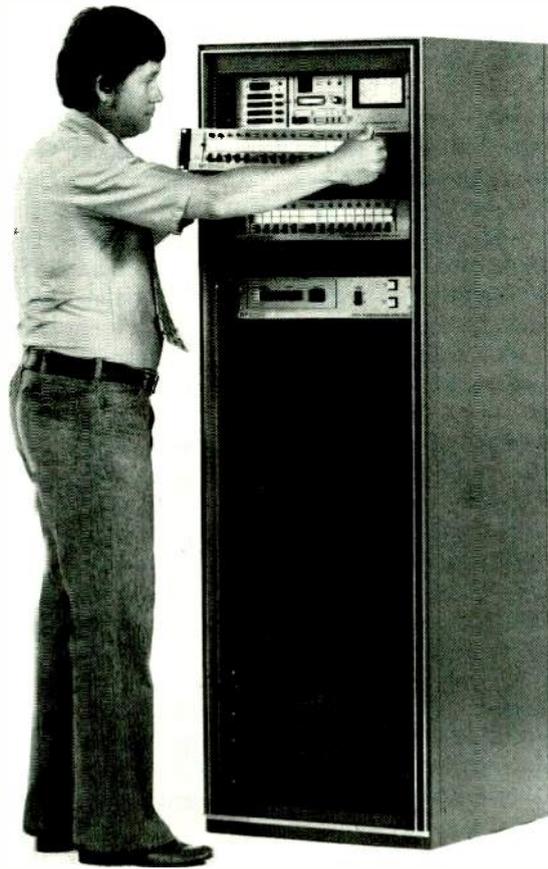
Another technical advancement introduced some two years ago by RCA, the Modulation Anode Pulser, provides another improvement. According to a paper presented at the 1976 NAB by John Bullock of RCA and Robert C. Schmidt of Varian Associates, "... the annual savings, assuming a 16-hour daily operation of a TTU-110 transmitter [using the mod anode pulser], would be estimated at about \$14,000."

Since the time of the introduction of the mod anode pulser, performance has, in fact, been better than generally expected. WITF-TV, Hershey, Penn., for instance, installed the RCA device along with Varian "high efficiency" klystron amplifier tubes in its TTU-60, 60 kW transmitter in the summer of 1977. Since that time, WITF-TV's chief engineer, John Bosak, reports an improvement in power consumption of \$1.58 per hour, which translates into a year-long saving of more than \$10,000.

Other improvements over the last five years include the development of solid state exciters, the SAW filter, and even some modest improvements in the home receiver since detent (click stop) tuning was required by the FCC. According to Carl H. Musson, manager of transmitting equipment engineering and product management for RCA, further research is being carried forward to improve

continued on page 62
OCTOBER, 1978—BME

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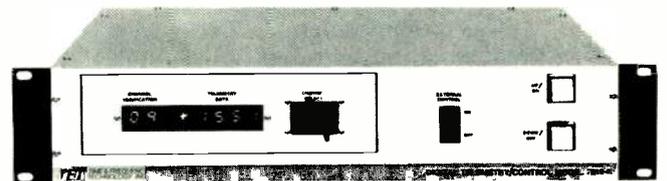
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the efficiency of transmission lines, which are only about half as efficient as their VHF counterparts. Said Musson, "All we've come up with so far is some rather exotic materials, but we hope to make some advances in this area."

The problems, however, do not stop at the transmitter. UHF antennas have been going through a period of improvement, as has understanding about how to optimize the performance of the antennas. As George Townsend of Townsend Associates points out, there have been response cycles by UHF broadcasters over the years, "sometimes going for higher antenna gain and lower power, and then going for lower gain and higher power." Right now, said Townsend, "we are in a swing towards higher power," but many UHFers are also working on improving their antenna sites.

All of this, of course, takes money. Even presuming for a moment that UHF broadcasters could afford to do all the things needed to improve their signals, we are left with the problem of the inadequacy of the home UHF receiving apparatus, including the antenna. It may be that the home antenna may be the most difficult thing to improve, not from a technical standpoint, but because, as Carl Musson puts it, "People are people." They simply may neither understand the need for antennas, nor care enough, nor maintain a properly installed antenna. The best that can be done in this situation is the action by the FCC, which required that television manufacturers provide a fixed UHF antenna with the set whenever a fixed VHF antenna is supplied. This action provides some relief to the viewer who does not intend to obtain an external antenna. The user of roof-mounted antennas will still need to maintain them and see that they are properly installed. There are consumer antennas, such as those manufactured by Winegard, that provide high gain at both the high and low ends of the UHF band, but the amount of relief this will provide to UHF broadcasters depends on consumer awareness and demand.

The strongest regulatory power may still be the marketplace

According to the financial figures published in the Aug. 14, 1978 issue of *Broadcasting*, the industry outperformed itself again. But another story within those figures is the degree of improvement in before-tax revenue reported by UHF stations. While the 474 VHF non-network owned stations showed a 7.7 percent increase in before-tax revenue in 1977, the 181 UHF stations increased their before-tax revenue by 10.4 percent. In fact, UHF television stations outperformed all other classes of television broadcast stations in terms of percent of revenue increase. One UHF independent television station joined the highest rank reported by *Broadcasting*, earning more than \$5 million in before-tax revenue.

One of the most successful UHF station groups is Field Communications, with stations in San Francisco, Detroit, Boston, Philadelphia, and Chicago. All the Field stations are independent and Field president Don Curran reports that each of the stations is in "the solid seven figure profit category."

Prior to 1974, four of the five current Field Communications stations were owned and operated by Kaiser Broadcasting. Field Enterprises of Chicago owned a 22.5 percent interest in the stations. The stations were reporting

an aggregate loss of about \$10 million per year. Said Curran, "We started to turn this thing around in 1974 by applying the same kind of good broadcast principles that any other broadcaster would use."

Curran hired first class manpower and motivated existing people by "convincing them that we could win." Curran and the other Field executives convinced the ownership that it "was not so much a matter of technical disparity of VHF but rather, in our markets, the program disparity." Curran felt that with cable, particularly in markets like Philadelphia and San Francisco where cable penetration was among the highest in the country, and in the flatlands of Chicago and Detroit, and to some extent in Boston, the stations had the technical capabilities to reach many more homes than they were reaching.

According to Curran, "What we needed to do was move forward on the program acquisition front and to make our television stations look as good as our competitors. That did involve the acquisition of quite a bit of electronic hardware." The stations were all about 10 years old at the time, said Curran, and Field invested about \$3 million per year in capital improvements. That investment was almost totally spent on electronic gear, "not bricks and mortar." Curran said that that level of investment continues and will be maintained until such time "as we are 100 percent competitive technically in the markets we serve." The capital expenditures have been concentrated in the areas of transmission improvements and playback hardware. Said Curran, "We were probably about the last major group owner to get videotape cartridge equipment into our stations."

As yet, the Field stations have not felt the need to go to translators to help boost their penetration. "We've been very successful at getting ourselves on a lot of cable systems," said Curran, "so we've been able to do it off of our main all the way down the line. And we've commanded increasingly larger audiences with these five television stations since 1974.

"I might add," continued Curran, "we've been successful in selling these stations and the company has been very, very, handsomely profitable. I can just say we have outperformed the industry in terms of our profit, in ratio to the capitalization. That's the total industry, VHF as well as UHF." By August 1 of last year, Kaiser Industries, which had been operating as a holding company for the stations, was dissolved, and the majority stock holdings were sold to Field Enterprises of Chicago. "We have been very happily associated with them [Field Enterprises] since August 1 of last year," said Curran. "They are so enthusiastic about our success," he added, "that they've given us the marching orders to go ahead and acquire further broadcast properties."

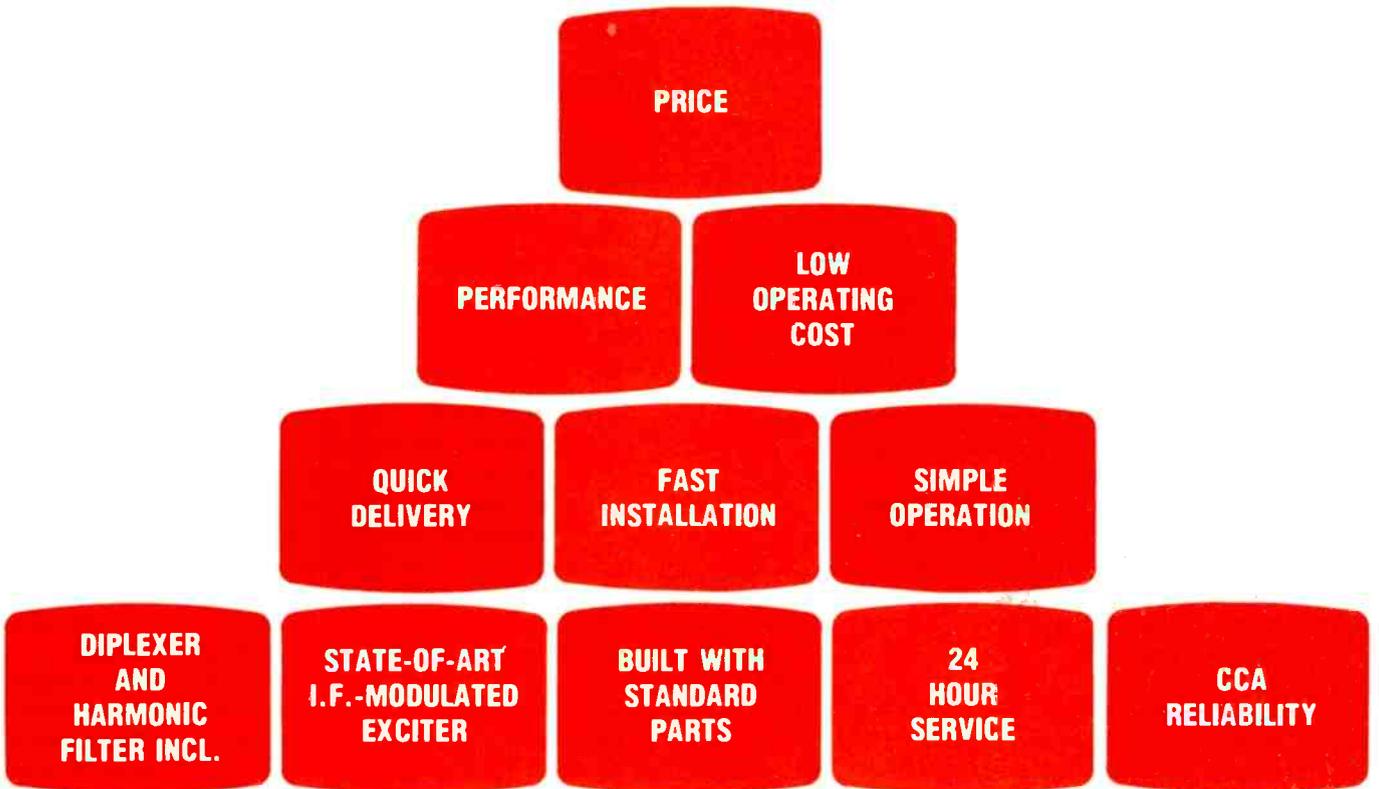
Counter-programming the networks

While getting the physical broadcast plant into shape was essential, success was predicated upon attracting audiences with quality programming and taking advantage of the relatively rigid day-part schedules that accompany network affiliation. A large number of UHF independents are beginning to practice counter-programming, and it seems to be paying off.

The key to this tactic at Field Communications, as at other independents, is concentration of its most attractive product during fringe times. Said Curran, "It is very difficult to sustain competition against the three networks'

continued on page 64

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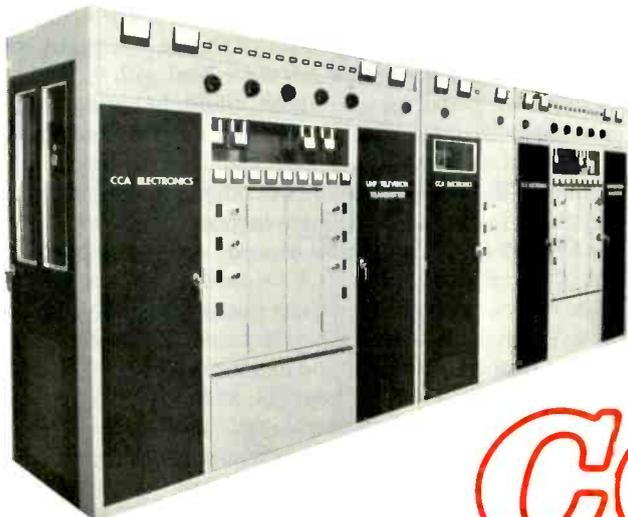
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scheduled prime time programming. Now the exceptions to that can be Operation Prime Time, sporting events, other mini-series, documentary efforts, specials, etcetera . . . So, what we've done is we've concentrated our efforts in the early fringe and late fringe and we've been very successful at that."

In short, the Field stations schedule family entertainment against network news, using programs like *The Mary Tyler Moore Show* in the early fringe, and Norman Lear shows in the late fringe. During prime time, the Field stations try to program sports whenever practicable. At present, their news operation is not particularly ambitious. In Detroit they do schedule a prime time news strip and they feature magazine type news broadcasts at other stations. Their only regular news programming consists of a sign-on and sign-off newscast.

Curran points out that a really high quality newscast represents a major capital and operating expense. Some years ago, a major news effort was launched by the group and met with very unspectacular results. Now, said Curran, "We are going to walk before we run. We will probably expand our news operation as we are able to do so." The most likely Field station to first see this process will be Detroit, where Curran reported the planned acquisition of a satellite news feed.

Like UHF broadcasters everywhere, Curran bristles at the disparity in treatment that UHF gets on the receiver end. While he welcomes FCC rulemakings such as the detent tuner, the improved signal-to-noise requirements, and the legislative actions such as the 1962 All Channel Receiver Act, he sees the possibility of UHFers taking some action on their own. One possible course is for UHF broadcasters to hire an independent testing laboratory to evaluate the quality of television receivers. Such an evaluation would rate TV sets not only on their electrical character but also from a human engineering standpoint. "It isn't good enough to have a detent tuner if the numbers of the UHF stations are so small that the viewer needs a magnifying glass to read it," said Curran. "I think we have a right to inform the public about which television sets do the best job of receiving our signals."

But the real promise of UHF will come mainly from improved program offerings, said Curran. If the programs are there and the public wants to view them, they will start demanding better equipment from the manufacturers. Curran sees innumerable programming opportunities down the road. With improved financial conditions, Curran sees the opportunity to participate in more programming consortiums, such as the one Field Communications is involved in now with New York independent, WPIX, and Goldenwest Broadcasting, owners of KTLA. The purpose of the consortium is to develop late fringe programs. Field is also willing to participate in further OPT efforts and sees the future of satellite communications opening up all sorts of opportunities for independents to participate in simultaneous date and time broadcasts on a regional and even national basis.

"UHF," said Curran, "is no longer the mystery it once was. The kid who used to watch UHF on the weekends to see the cartoons is now a 24 year old head of household, and he understands UHF." This type of viewer wouldn't dream of buying a TV set that didn't have UHF capability. There is currently, in the San Francisco market, a 96 percent penetration for UHF. Curran believes that the four

percent of the audience unable to get UHF is probably the least attractive demographically and probably the least heavy users of television in the first place.

The fortunes of UHF on Capitol Hill

Several matters pending before the Federal government are of great importance to UHF's future, and to the future of broadcasting generally. These include the Communications Act of 1978 (currently in the hearing stage), the position the FCC will take at the upcoming World Administrative Radio Conference of 1979, and the attitude in general of the FCC and Congress.

The FCC in general seems relatively well disposed to the interest of UHF broadcasters. Though there is considerable discontent with the proposed position that the FCC will take at WARC, other actions and intentions seem to be in favor of UHF interest. For one thing, the FCC and Congress are very interested in expanding ownership of broadcast operations to minorities and women. The generally recognized fact is that such expanded opportunities can only come in the UHF band where television is concerned. Though VHF drop-ins could provide some additional assignments, there are not enough to materially affect the current makeup of broadcast ownership.

If, however, the UHF band is going to be a viable vehicle for expanded ownership, it must be at least comparable to VHF in terms of its technical quality and profit potential. To this end, the FCC is concentrating on tuner improvements which might allow for not only improved reception, but also a reduction of the UHF "taboos" that limit the number of UHF's in major markets. It was to this end that the FCC funded the Texas Instruments experimental receiver project. *The Final Report For High Performance TV Receivers*, written by D.L. Ash and C.S. Hartmann of TI, states, "The primary benefit [of this experimental receiver] would be to allow much closer TV channel assignment and hence improved spectrum utilization, particularly for UHF TV where current assignment rules [UHF 'taboos'] prohibit the use of 18 other channels every time a single UHF channel assignment is made."

The results of the experiment produced an electronic tuner that met or exceeded nearly all of the FCC's goals, with the exception of intermodulation performance. Even the intermodulation performance, however, was 10 to 20 dB better than existing electronic tuning systems. According to the report, "it appears that the performance demonstrated would allow elimination of most UHF channel assignment taboos." The taboos that should potentially be maintained, said the report, are associated with the intermodulation performance which could be effectively eliminated in most cases, "through careful frequency assignment and transmitter placement." This tuner, according to the TI report, could be commercially produced and might result in a retail price increase of between \$27 and \$35 per set. This estimate depends on volume production of the electronic devices developed by TI. According to the report, such volume production was unlikely unless the Commission passed rules to require tuners to meet the specifications achieved in the experiment.

All in all, there are so many ifs, ands, or buts, mostly relating to legislation, rulemakings, and market conditions, that the TI tuner may never be commercially viable. Whether the latest FCC order to improve signal-to-noise figures in UHF tuners will regenerate interest in the TI tuner or not, remains to be seen. Many of the performance

continued on page 68

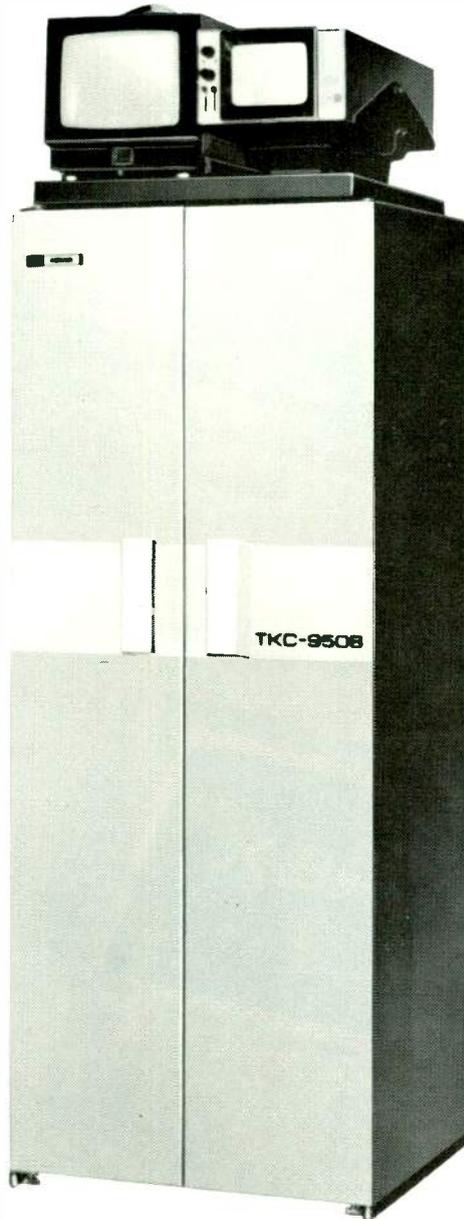
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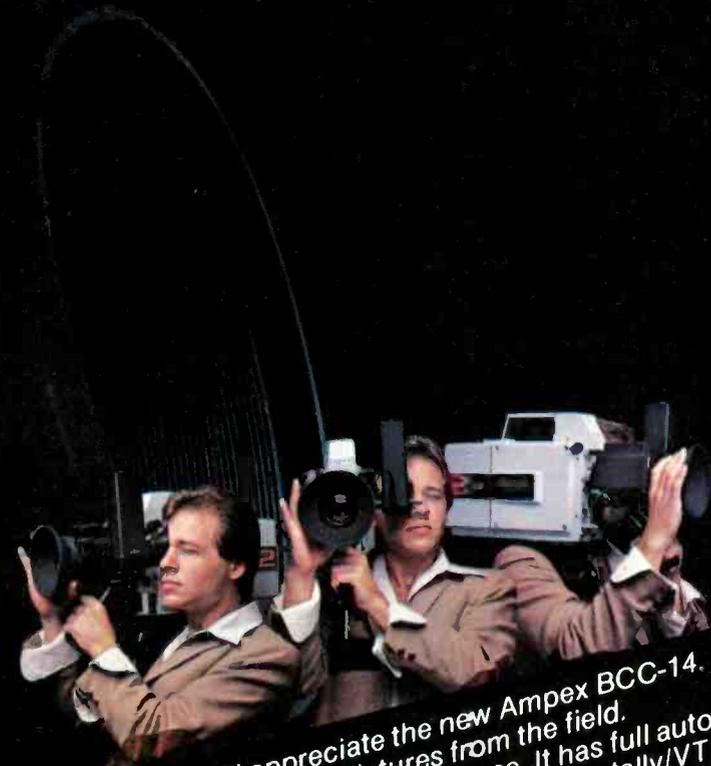


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goals of the TI tuner are not required in the latest FCC order.

Many UHF broadcasters would like to see more such research funded by the FCC, however, and the proposed FCC budget, now before a conference committee, contains provisions for five new positions and \$750,000 to encourage UHF/VHF comparability. The language and appropriation were largely the work of Senator Lowell P. Weiker (Rep., Conn.). According to the *Report on The FCC Budget*, written by the Senate Appropriations Committee, "The Committee has added \$750,000 and five positions because it finds the intent of the All Channel Receiver Act of 1962 has not been realized."

The report went on to say, "UHF television broadcasting remains sorely disadvantaged in the national television system. The Committee directs that the Commission develop a plan for UHF to reach comparability with VHF in as short a time as practicable and that the Commission devote the necessary resources to drafting such a plan in fiscal year 1978 until these additional resources become available in fiscal year 1979." Though this is welcome language to the ears of UHF broadcasters, this language is not in the House version of the FCC appropriation, and the word is that it may not survive the House/Senate conference committee.

Paul Fox, the FCC staff member in the Office of Plans and Policy who is the chief UHF liaison now, said of the proposed appropriation, "There is some reluctance on the part of the House. We are hopeful, but in a sense, not confident."

Fox believes that the Rule and Order concerning receiver noise figures is much better written than earlier regulations on receivers. Manufacturers are required to submit much more detailed information than before. Said Fox, "We will indeed know where their performance is." Fox expressed, however, the desire of the FCC to do some of its own research, but he commented, "... that in part depends on funding."

Regardless of funding, the FCC will be looking towards a variety of tactics by which to bring about UHF comparability. "The tuner," said Fox, "is sort of the initial focus. We are committed to coming up with a labeling program on the noise figure that will, I think, go beyond that limit. If the idea works it will be far more than just the noise figure. It will be a far more detailed set of consumer information." Whether the FCC has jurisdiction to require such labeling or not is a tricky question that will ultimately be decided by the U.S. Court of Appeals.

But, Fox said, "If we get the money on comparability, we're looking at a fairly wide range of options." Among those he mentioned were UHF transmitter efficiency, antenna patterns and placement efficiency, and receiving antennas. According to Fox, "UHF comparability is important—at least that's the message I get from the Commissioners. On the other hand," he continued, "the last thing we want to do is go charging out on a couple of tangents without having looked at the problem more fundamentally." The best way to characterize the FCC's current efforts on UHF comparability "is that we are at the planning and information stage," said Fox.

Many UHF broadcasters, on the other hand, feel that

continued on page 70

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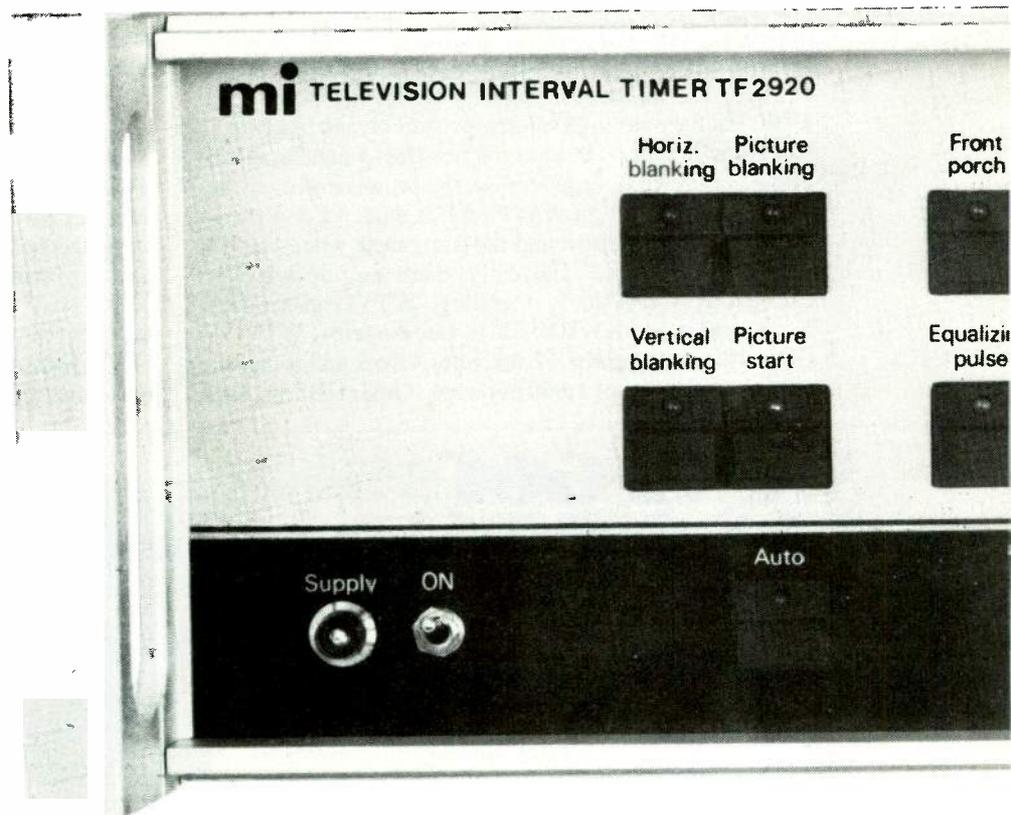
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there is something the FCC could do right now to protect the UHF service. Don Curran, who has cooperated right from the beginning on the development of the FCC's WARC position, comments that "there are some areas that I feel are areas of definite dragging of the heels on the part of the FCC." Fox, on the other hand, maintains that the FCC UHF position for WARC is no more than an attempt to retain a tenable negotiating position. "I think that the best way to look at the WARC position is that we wanted to have a certain amount of flexibility so that we could arrange reasonable and equitable compromises with sovereign, foreign nations," he stated. According to Fox, the U.S. position is no more than an attempt to legitimize decisions already reached in the U.S., such as shifting channels 70 to 83 over to land mobile. Nevertheless, Fox said, "I don't see the WARC thing as a disavowing of UHF. In fact, my own reading of it is just the opposite. The major problem is getting more UHF stations in the major markets—a reduction of the UHF 'taboos.'"

There are numerous bright spots on the horizon for UHF, but the ones to develop most quickly are likely to be economic in nature. Add to the healthier financial condition of many UHF broadcasters the promise of over-the-air subscription TV, and as Paul Fox said, "I don't want to be between the street and the filing desk when pay-TV gets off the ground." Currently, there are just two over-the-air pay TV systems operating, WTVG in the New York market and KWHY-TV in Los Angeles. WTVG is currently serving some 17,000 subscribers and is signing on more at the rate of 1,000 per week. Other UHFers, such

as Channel 68 in Boston, are beginning pay operations. If such an approach is viable, and indications seem to be that it is, pay-TV may be the economic engine that UHF broadcasters have been looking for.

Not only does pay-TV promise to spur revenue for UHF broadcasters, but it also provides a motivation for intense technical improvements. KWHY-TV's transmitter, for instance, has been increased in power from 107,000 watts ERP to 2.57 million watts ERP, the maximum permitted by the FCC at KWHY's antenna height of 5,896 feet. At WTVG the move to pay-TV has prompted the station to acquire a channel 60 translator for its World Trade Center installation in New York City. (See feature story on CP antennas for details). Moreover, the critical reception demands of subscribers to pay-TV have led to engineering practices that far exceed those required by the FCC for normal licensees. The subscription TV installation also includes the placing of a CP receive antenna at the subscriber's home. The installer takes with him a right-hand oriented CP receive antenna, a left-hand oriented CP antenna, and an HP antenna. The antenna which produces the best results is installed after careful testing.

As Carl Musson of RCA pointed out, "Technological improvements in UHF are more likely to be evolutionary than revolutionary." In many ways, UHF is technically superior to VHF, but this superiority has not been exploited because of receiver deficiencies and the sheer cost of operating a UHF station. Much remains to be done before UHF will be a truly first class broadcast service in the U.S., but much is being done. It may be that before the FCC can order UHF comparability, the public will demand it as broadcasters come closer to providing it. **BM/E**

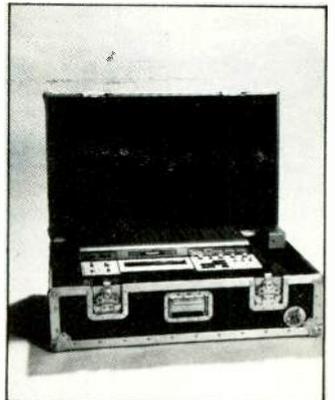
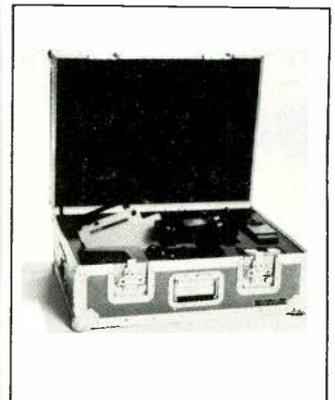
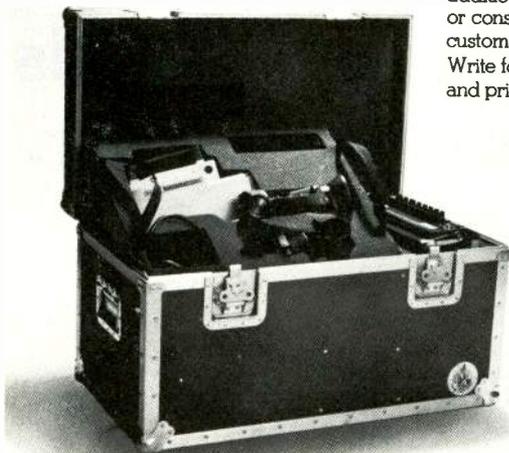
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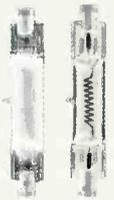
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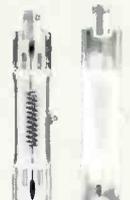


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200W — 800W
Table 1



500W — 1000W
Table 2



1000W
Table 3



1000W 1500W — 2000W
Table 4

COMPACT-FILAMENT DOUBLE-ENDED QUARTZLINE

(Shown 30% of full size)

COMPACT-FILAMENT SINGLE-ENDED QUARTZLINE

(Shown 40% of full size)



600W — 650W
Table 7



250W — 650W
Table 8



500W — 1000W
Table 9

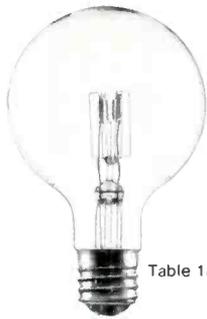
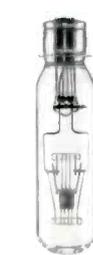


Table 18



2000W



250W — 1000W



500W — 750W



750W — 1000W

Table 11

COMPACT-FILAMENT, SINGLE-ENDED QUARTZLINE AND INCANDESCENT

(Shown 20% of full size)



650W
Table 33



1000W
Table 34



300W — 375W
Table 36



375W — 500W
Table 37



100W
Table 35

PAR AND R LAMPS, QUARTZLINE AND INCANDESCENT

(Shown 20% of full size)



1000W — 1500W
Table 30



Table 29



1000W



500W

250W

Table 28

FLOOD-LIGHT LAMPS, SCREW-BASE QUARTZLINE AND INCANDESCENT

(Shown 14% of full size)

(Shown 35% of full size)



100W — 150W



50W — 100W



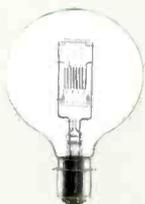
100W



50W — 200W

Table 26 or 27

PLANAR-FILAMENT, S.C. OR D.C. BAYONET BASE QUARTZLINE AND INCANDESCENT



2000W



1000W — 1500W

Table 25

PLANAR OR COMPACT-FILAMENT, MOGUL PREFOCUS BASE INCANDESCENT

(Shown 11% of full size)

(Shown 13% of full size)



100W



250W — 400W



500W

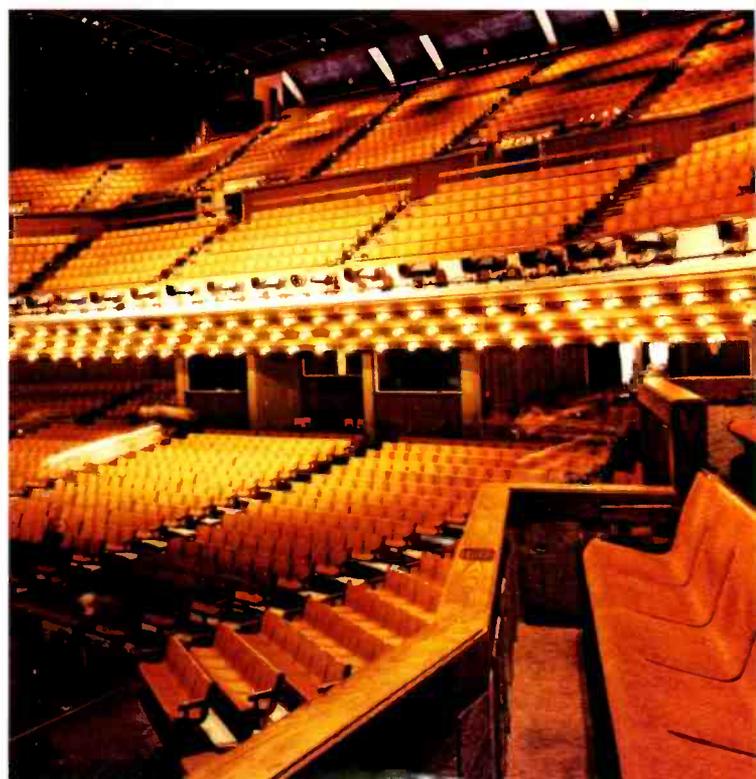
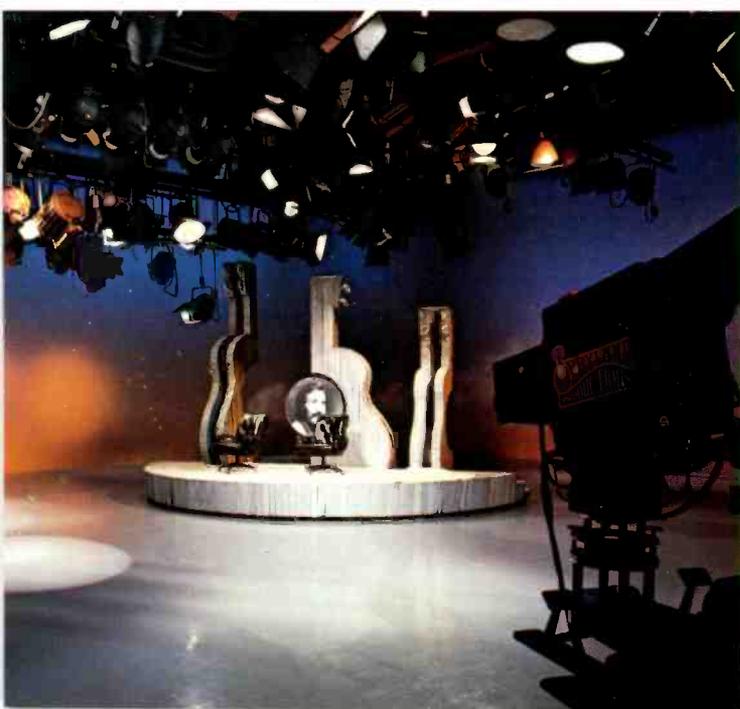
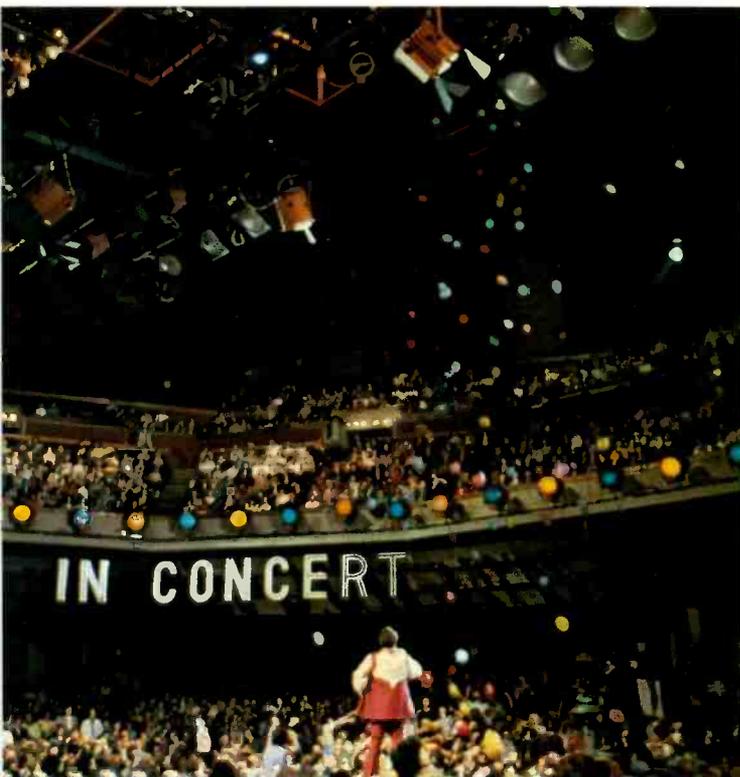
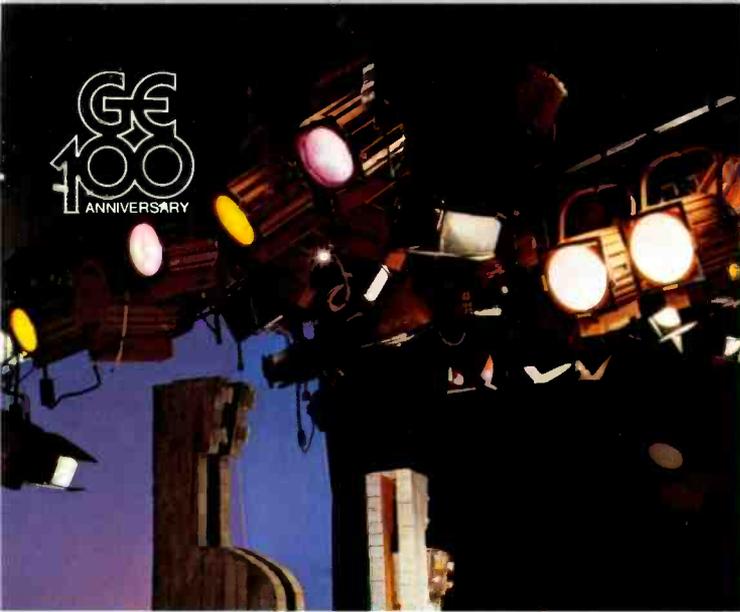
Table 16



500W

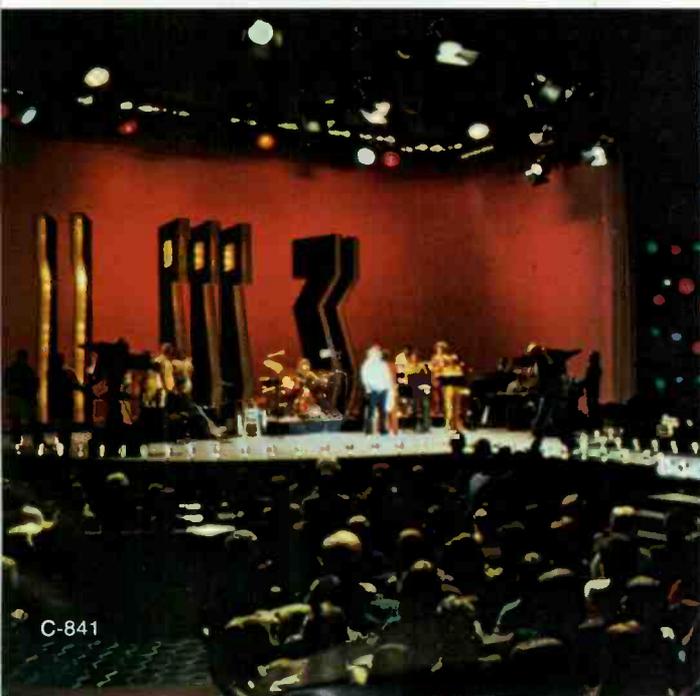
Table 17

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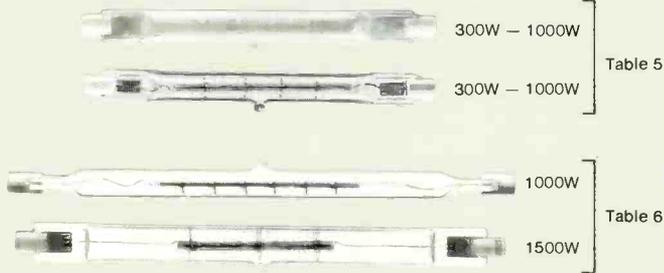
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COMPACT-FILAMENT SINGLE-ENDED QUARTZLINE

(Shown 60% of full size)



2000W
Table 15

1000W — 2100W
Table 13

3000W
Table 14

COMPACT-FILAMENT, SINGLE-ENDED, MOGUL BIPOST QUARTZLINE AND INCANDESCENT

(Shown 11% of full size)

PLANAR-FILAMENT MEDIUM PRE-FOCUS BASE QUARTZLINE AND INCANDESCENT

(Shown 25% of full size)

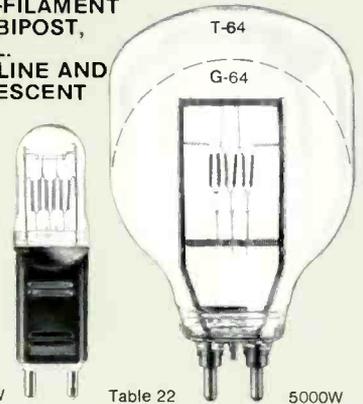


500W 250W — 1000W

Table 24

PLANAR-FILAMENT MOGUL BIPOST, 6 1/2" L.C.L. QUARTZLINE AND INCANDESCENT

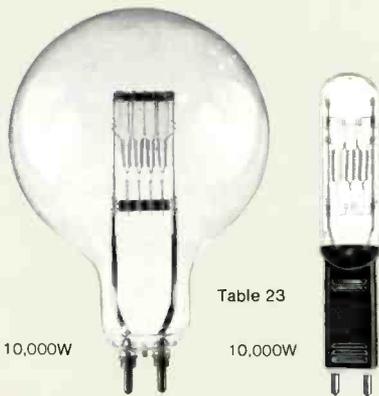
(Shown 15% of full size)



5000W

Table 22

5000W



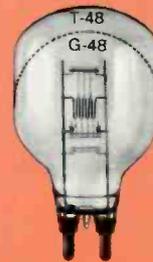
10,000W

Table 23

10,000W

PLANAR-FILAMENT MOGUL BIPOST, 10" L.C.L. QUARTZLINE AND INCANDESCENT

(Shown 12% of full size)



2000W

(Shown 12% of full size)



1000W



1500W — 2000W



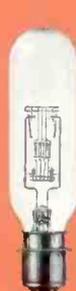
2000W

Table 21

PLANAR-FILAMENT MOGUL BIPOST, 5" L.C.L. QUARTZLINE AND INCANDESCENT

INCANDESCENT LAMPS FOR FOLLOW-SPOTS AND EFFECTS PROJECTORS

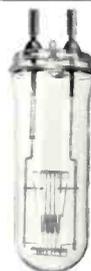
(Shown 15% of full size)



1000W — 1500W
Table 31



2100W
Table 32



500W 750W

Table 12

(Shown 25% of full size)



COMPACT-FILAMENT, SINGLE-ENDED MEDIUM BIPOST 4" L.C.L. INCANDESCENT

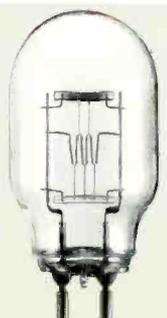


750W — 1000W
Table 19



(Shown 25% of full size)

750W — 1000W



500W — 1000W
Table 20

New Testing Methods Yield AM Transmitter Improvements

Part I: Transient Response and Modulation Capabilities of High Frequencies

By Greg Kornides and Chris Hood

This is Part I of a three-part, in-depth analysis of testing methods for AM transmitters and how modifications can be made based on the results. Part II, "Transient Response and Modulation Capabilities of Low Frequencies," and Part III, "Intermodulation (IM) Distortion Tests," will appear in subsequent issues.

IN A TOP-10 MARKET LIKE PITTSBURGH, the broadcasting media are highly competitive and technically sophisticated. To keep up in these challenging surroundings, WTAE-AM radio has a policy of continually upgrading all facets of its "on-air" sound. WTAE recently installed a new custom air studio with provisions for stereo capability. Special audio processing is used to present the type of sound desirable for the Pittsburgh market.

Under the direction of chief engineer John Romick, the station has embarked on a sequential upgrading of its facilities. The most recent step in this process was analyzing the transmission system for better mono and future stereo performance. The WTAE staff felt that additional improvements could also be made to the transmitted "on-air" sound as perceived by listeners using conventional AM receivers. To this end, they began a testing program to discover if any improvements could be made and how to implement them. Work on the transmission system started in the spring of 1978. The tests to be made were: transient response and modulation capabilities of both high and low frequencies; transmitter intermodulation distortion (IM) measurements; and antenna system transient response checks.

The specialized tests used at WTAE are applicable to every AM transmitter presently in use and have been applied to other transmitters during the last several years with improved transmitter performance and "on-air" sound. With the strong possibility of worthwhile improvements, station management should consider using a testing program of this type.

The transmitters used for the AM operation at WTAE are two Continental Electronics type 315 (5 kW) and a modified Doherty using "impedance modulation." These

transmitters are licensed as alternate mains, the only difference between them being the ability of transmitter number one to reduce output power to one kW for emergencies. They have been in operation for over four years, and have performed very well. The antenna system is a two tower array (directional nights) located just a few miles from downtown Pittsburgh.

High frequency tests

To check the transient response of the transmitters, square-wave pulse analysis was used in order to closely simulate the waveshapes found at the final line outputs of most contemporary audio processing systems. The first test consisted of using two sequential bursts of a 10 kHz square-wave, with a 1/3 second "off" time between burst pairs. The RF sample during this test was taken from the dummy load in order to isolate transmitter performance from the antenna and phasing system. Although the dummy load was slightly reactive in the sidebands, it was felt that this presented a less reactive load for the transmitter than the antenna system would. Many AM dummy loads have inductive reactance at the operating frequency which must be nulled out by using an RF bridge, standard calculations, and a selected series capacitor. Some manufacturers provide the correct value of cancellation capacitor if the operating frequency is specified. A 50 ohm termination was placed at the input to the oscilloscope to provide proper matching for the dummy load RF sample. The tone burst waveform feeding the transmitter was clean, with no evidence of tilting, spiking, overshoots, or glitches. A diagram of the test hookup is seen in Figure 1. A special direct-coupled active transformer with op-amps was used to interface the unbalanced format of the test gear to the balanced 600 ohm input of the transmitter.

The waveform observed during the 10 kHz tone burst test is shown in Figure 2. The positive half of the

continued on page 76

Greg Kornides is a staff engineer and audio specialist at WTAE/WXXK in Pittsburgh, Penn. **Chris Hood** is an independent broadcast consultant residing in Pittsburgh.

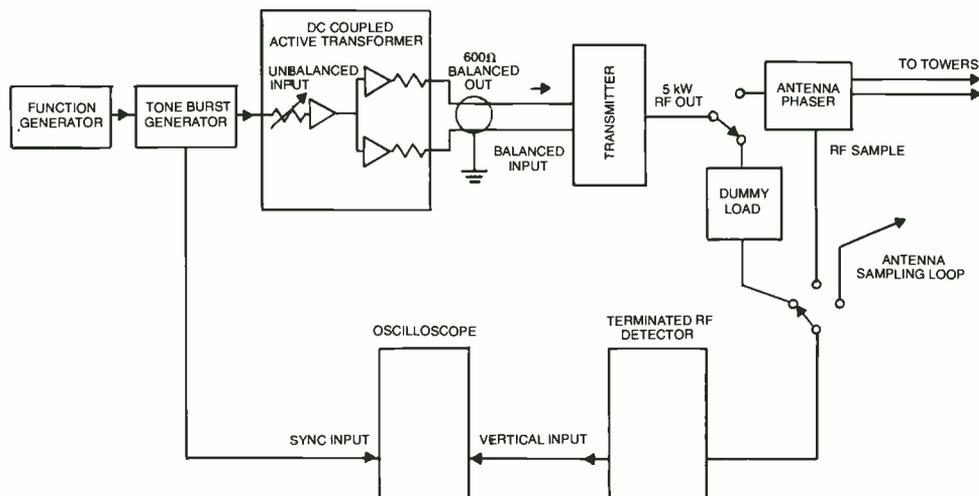


Fig. 1. Diagram of test hookup for all pulse tests

waveform shows less ringing/overshoot than the negative half. The amplitude of the input signal was adjusted for approximately 90 percent negative modulation. Because of the short duration of the tone bursts used, the modulation monitor meter deflected to about 20 percent, while the peak light more closely indicated the actual level present. Ringing of both the positive and negative peaks

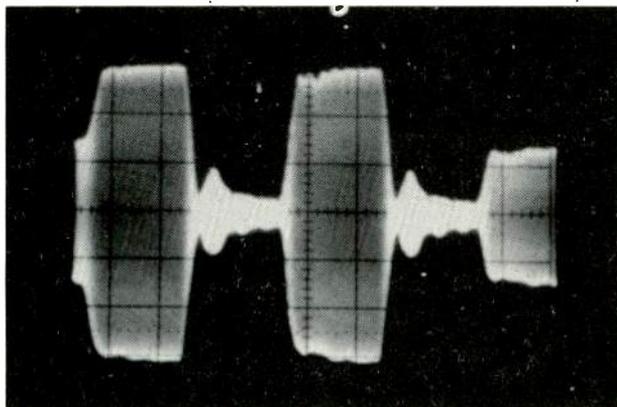


Fig. 2. High frequency pulse results before modification

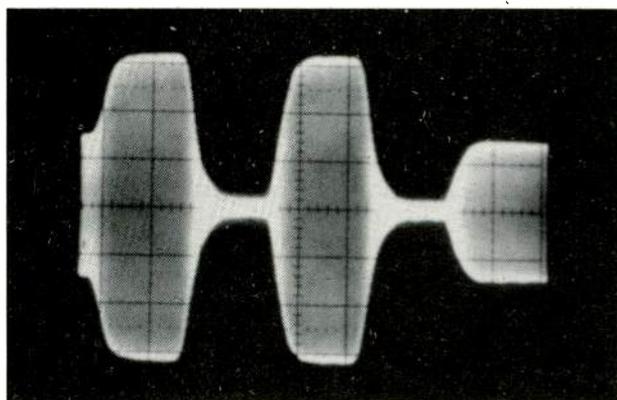


Fig. 3. High frequency pulse results after modification

was observed on the oscilloscope, with the negative peaks being far more pronounced.

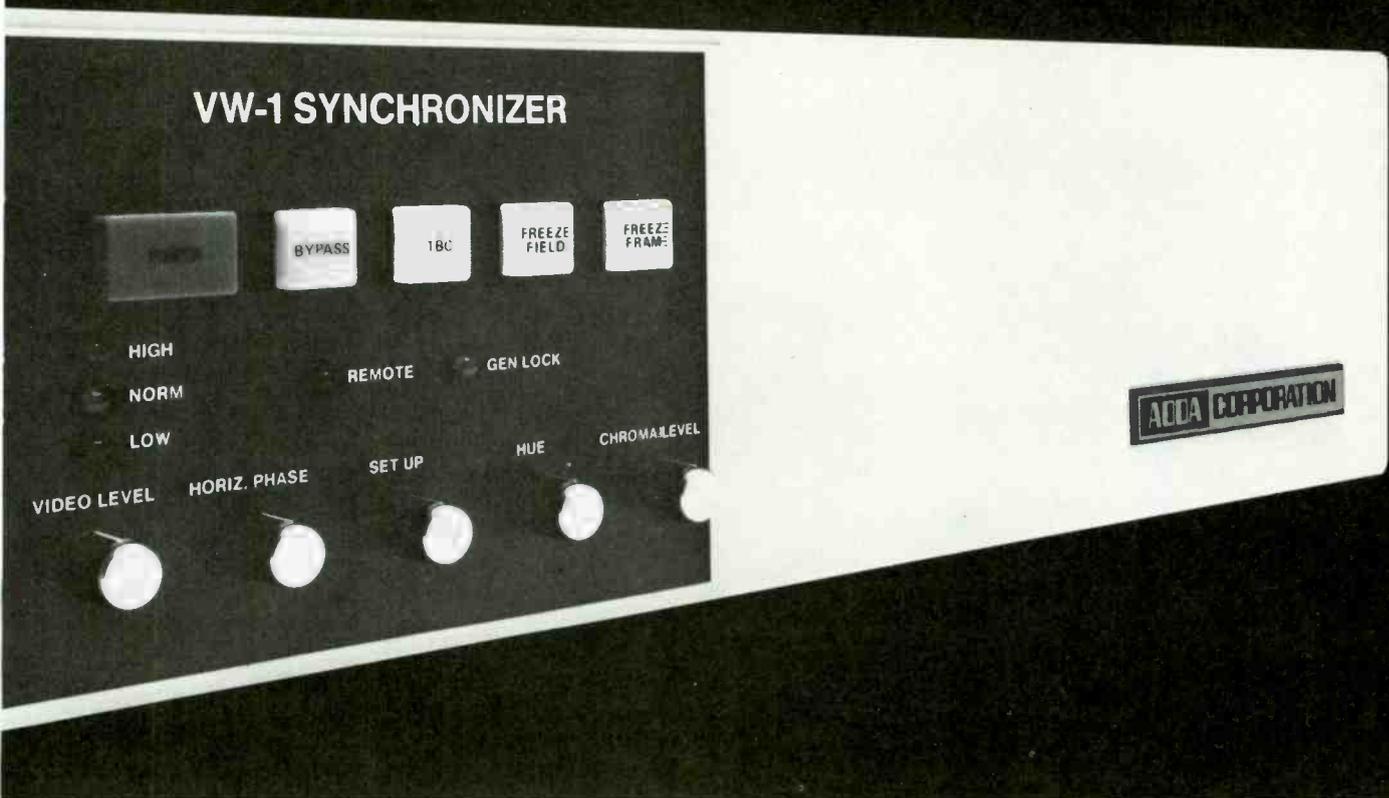
A smoother square-wave without ringing was desired. Experimentation was done on the compensation circuits of the transmitter audio input stage and the RF feedback network. A simple modification was developed which eliminated the ringing problem, with the results shown in Figure 3. The risetime of the wave-form compensation circuit was adjusted to provide a reasonably flat square-wave response to 10 kHz, and a rolloff characteristic beyond that to reduce unwanted out-of-band modulation. The transmitter itself was capable of flat square-wave response beyond 20 kHz, if the compensation was readjusted. But it was felt that for a contemporary music station, a square-wave rolloff beginning at 10 kHz was quite satisfactory and would help prevent unwanted out-of-band modulation and splatter. A frequency response check showed high-frequency sine wave response to 20 kHz. Checks from the antenna system input sample showed similar waveform results as obtained from the dummy load sample.

The modification performed was perfectly acceptable under F.C.C. Rules 2.1001 as a "Class I Permissive Change" on type-accepted transmitting equipment, with no filing necessary. This change did not significantly alter the high-frequency response limits of the transmitters at WTAE.

Many modulation monitors currently available for both AM and FM possess audio overshoots in the peak modulation indicator circuit. When a "square" modulation envelope is detected, the peak indicator may show higher modulation values than those actually existing. With the current practice of remote monitoring, any inaccuracies in the peak-modulation circuits could cause a station's modulation to be run lower than necessary.

Several significant improvements in on-air quality were noticed following this modification: (1) a reduction of raspy or "essey" sound on high frequency sibilant material, with a noticeable improvement of high frequency sound quality; (2) a noticeable reduction of sideband splatter; and (3) an average modulation increase because of a reduction in both positive and negative overshoots. **BM/E**

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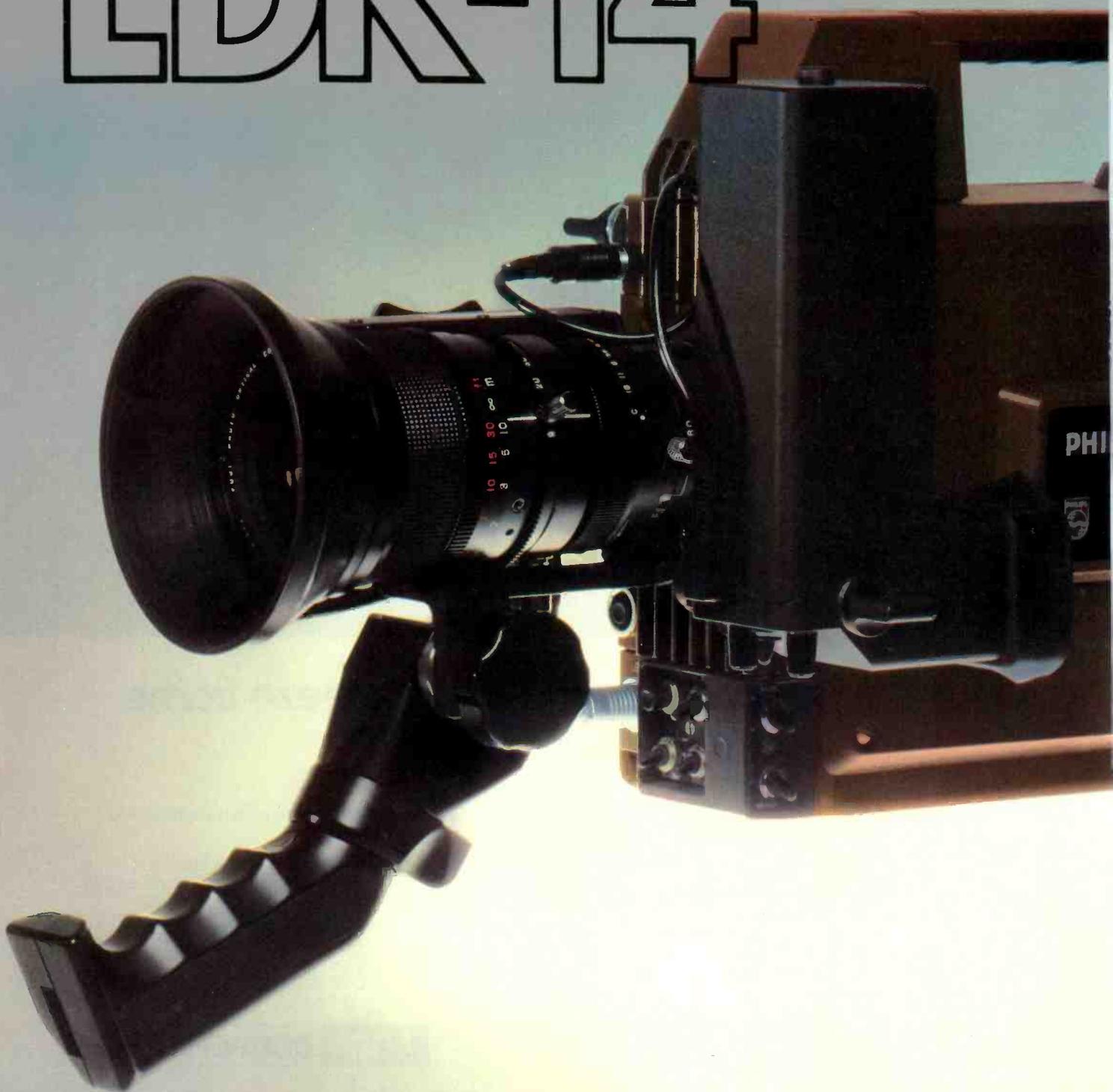
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Two Leaps Ahead For Cable: London, Ontario Trunk Puts Together Fiber Optics And Digital Video

The combination of optical fiber transmission and digital video in a Canadian cable system points the way to low cost nationwide picture transmission.

DIGITAL TELEVISION TRANSMISSION and optical fiber transmission, as we all know, are two of the most potent shapers of the future of telecommunications. The two techniques are yoked together in a cable television trunk in London, Ontario, the first such combination to go into regular cable service anywhere in the world. The results are spectacular: bandwidth of 322 megabits per second on each fiber of the multifiber cable; nearly total immunity to signal degradation from travel over long distances along the cable; and still other advances.

The two techniques have a very productive kind of symbiosis. The optical system provides the very large bandwidth needed for digital television transmission; the digital encoding supplies the insensitivity to cable length, opening the prospect of high-quality picture transmission over 500 to 1000 km, and more.

These leaps ahead in technology obviously have tremendous meaning for cable operators everywhere. For the broadcaster, they add one more piece of evidence of the great advances that are coming along in digital techniques. They also foreshadow long-range developments in telecommunications that every broadcaster ought to have on mental file when he thinks about his own future.

The new trunk runs 7.8 km from the headend to a hub distribution center for Canadian Cablesystems, Ltd. It is due to go into service about the time this magazine is distributed. It was underwritten, to the tune of about \$1.6 million, by a consortium of Canadian firms, including five cable television operators in addition to Canadian Cablesystems, and a manufacturer, Canada Wire and Cable. Together, they call themselves BCN Fiber Optics, Ltd., and for the present will own the trunk jointly. This joining of forces to effect a major cable installation is highly significant in itself. It shows one way the cable industry can cooperate to bring about major advances in technology.

The Canadians in this case were eager for a solid field trial of optical fiber as a means of getting high quality signals over long distances at reasonable cost. They are determined to take broadband telecommunications into every part of their vast country, including sparsely settled areas that cannot support cable television service in its present forms. Optical fiber has interested them for some time as a possible solution to this problem, and the needed trunk was an excellent opportunity to give it a real try.

Another important aspect of the installation is its evi-

dence that the electronics industry is now prepared to supply field-ready optical fiber equipment of advanced technical quality. The systems engineering, the manufacture of the electronics units and the installation of the trunk have been carried out by the Harris Corporation's Electronic Systems Division, of Melbourne, Florida, in collaboration with Cablesystems Engineering of London, Ontario and Camstar, Ltd., subsidiary of Canada Wire and Cable. The systems engineering required extremely sophisticated analysis and comparison among the various design choices, and included computer simulation of complete systems to determine the effects of many possible solutions.

On cost factors, for example, Harris made careful projections several years ahead so that the findings from the London trunk trial would have validity for some time into the future. Significantly, Harris predicted that costs would drop and technical efficiency would rise, so that even better performance was almost sure in future installations.

The cable has been made by Canada Wire and Cable, Ltd., with glass fiber from Corning Glass in Corning, N.Y. A considerable number of other optical fiber installations currently underway or in advanced planning in many parts of the world testify to the commitment of many large electronics firms to full development of optical fiber technology. That opens the way for a rapid expansion of optical fiber use in the next few years. This expansion is coming far faster than the industry expected as little as two or three years ago.

The job and how it is done

The new trunk is designed to carry downstream 12 color video channels, 12 FM stereo channels, plus data channels and "housekeeping" bits; and three video channels upstream. The FM stereo channels are included because London is in a geographic basin that gets poor FM service over the air; Canadian Cablesystems wanted to be in a position to supply the FM signals to subscribers. The existence of room for data channels is most important for the future of cable.

The operator also wanted to be able to expand to 21 video channels, and to extend the trunk as far as desired in 2.6 km segments. The channel expansion is built in by having two spare fibers in the cable. The ability to extend trunk length is inherent in the digital encoding.

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Digital Processing

words, which are one frame apart, must be detected. The output of the A/D converter is applied to the arithmetic logic unit (ALU) built from standard high-speed logic function generator chips. These ICs generate the changing ratios of input and output signals as directed by the PROM coefficient generator. Speed is important here because the arithmetic operations must keep up with the input code words which arrive every 93 ns. The output of the ALU is directed to the D/A converter for conversion back to the

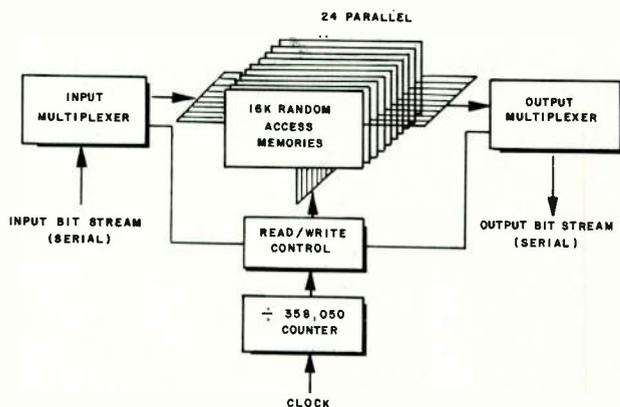


Fig. 2. Frame store logic for the 24 16K memories for each bit line. One of the eight configurations in the frame store

corrected video output and it is also directed into the comb filter chroma inverter.

The chroma inverter filters out and inverts the chroma information on the picture stored in memory. This function is necessary because in the NTSC system the phase of the chroma is changed 180 degrees from frame to frame to facilitate black-white compatibility. Unless it is modified, a false difference would be generated in the motion detector. Thirteen-bit accuracy is employed in the chroma inverter to avoid rounding errors which would show up as spurious motion signals. Data from the inverter are sent to the digital frame store (DFS).

With an approximate capacity of 2.86 megabits, the DFS functions more as an outside shift register than a conventional random access memory. Since it is used only as a delay, instantaneous random access is not a requirement. The operation of the frame store is shown diagrammatically in Figure 2.

Input serial code words are fed into a shift register-latch multiplexer combination before being fed in parallel to the individual RAMs. The actual memory consists of 192 16K NMOS dynamic RAMs organized as 24 16K RAMs for each bit line. The standard commercial RAMs are packaged on four separate PC boards with 48 RAMs per board. Because of multiplexing each RAM operates only a 500 kHz clock rate, thus simplifying trouble shooting.

The Digital Noise Reducer equipment is packaged in a 19-inch wide case that is about 11 inches high and 20 inches deep. Front panel controls and indicators are simple, with the principal control the improvement button that permits up to 15 dB S/N improvement in three dB increments. Only single video input and output lines are

Precise Timing Is The Key To Distortion Free Conversion

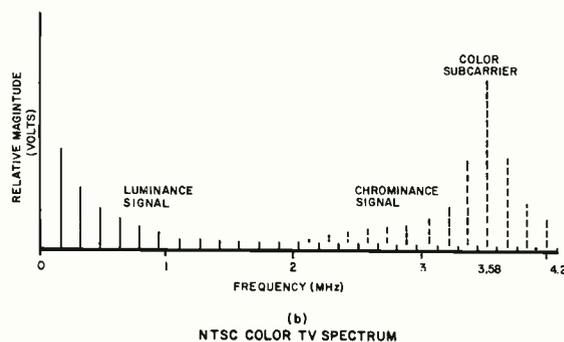
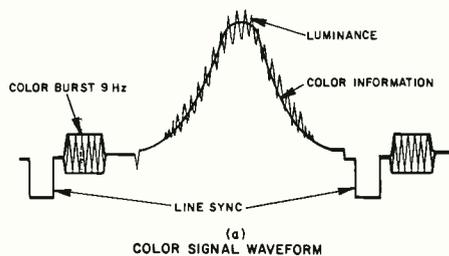
The complexity and distribution of frequencies within the National Television Systems Committee (NTSC) color television signal called for the design and construction of highly accurate, repeatable video analog-to-digital and digital-to-analog conversion. Moreover, precise timing signals based on the chrominance color burst of the NTSC signal are required for reading and writing data into the Digital Frame Store. Both read/write control and address counting signals were derived from a Sync Separator Clock Generator (PALE) to assure precise element by element comparison.

Color is defined in terms of three characteristics: luminance, hue and saturation. Luminance is defined as intensity or brightness and is the basis of monochromatic or black and white transmission. Hue defines the color — red, blue, green, yellow, etc. — and saturation defines the degree of hue to white mixture. For example, pink is low-saturation red and brilliant crimson is high-saturation red.

The NTSC color signal contains information on all three of these characteristics. The system uses the same kind of signal to transmit luminance information for color reception as is used for black-and-white reception. The saturation and hue information is then added to the luminance information. Since three kinds of information, instead of one, are being transmitted simultaneously, controls must be closely held to prevent interaction and distortion.

The basis of all timing in the conversion of the NTSC signal is a reference synchronizing signal or color burst. It consists of approximately nine cycles of color carrier frequency placed on the "back porch" of the horizontal sync signal. The phase relationship between the color subcarrier and the color burst of the same frequency determines the hue of the color.

The frequency of the color subcarrier, 3.58 MHz, is an odd multiple of line frequency (15,734 Hz for color television). The frequency composition of a typical NTSC color signal is shown in diagram (b).



Diagrams for color signal waveform and NTSC color TV spectrum

needed because all necessary timing and control signals are generated internally.

The algorithm for the selection of signal-to-noise improvement is stored in a number of PROMs on the motion detector board. The programming is similar to that which is done for microprocessors. Alterations in the algorithm may be made by removing and replacing from one to four PROMs. Work is continuing on the perfection of the algorithm and it has already been changed several times over the past year and a half.

DNR customers will have access to replacement PROMs resulting from any further refinements. Only a few minutes are required to remove the PROMs from the user's equipment and replace them with a new set for improved performance.

The exact value of signal-to-noise improvement chosen for a specific application depends on the characteristics of the input signal. If the signal is very noisy and too much noise reduction is employed, the results may be unsatisfactory. A picture that is generally quiet may become disconcertingly noisy at abrupt scene changes. By contrast, if the quality of the input signal were better, the high noise effect would not be visible.

A 12 dB improvement appears to be a good compromise setting for most signals. At that setting, signals down to 30 to 36 dB signal-to-noise can be handled without the average viewer being able to discern any visible distortion caused by either motion or noise.

The increasing complexity of digital signal processing circuits makes it essential that the manufacturer of the equipment include built-in diagnostic tools to speed up and minimize the cost of calibration and maintenance.

Several of these aids were provided in the DNR. Both analog and digital ramp generators were included to permit the calibration of the analog-to-digital and digital-to-analog converters without recourse to external signal generators. In addition, there is a built-in memory diagnostic that permits the easy location and replacement of faulty 16K random access memories in the digital store.

An LED display on the edge of the read/write control board indicates the location of a cursor that can be superimposed on the TV picture. If a memory chip should develop a fault that shows up on the picture, the cursor can be moved to locate it. The LED display not only locates the board on which the faulty RAM is located but it indicates the specific device as well. With this fault location scheme and a TV monitor, no oscilloscope is necessary. Repair becomes a matter of replacing the faulty memory.

Numerous applications have been made of the digital noise reducer in a wide range of situations. The DNR has been used to remove noise caused by low light levels from ENG video and to reduce noise in multi-generation tape (both quad and U-type). It has been applied to studio cameras being used for electronic film production, it has been used to reduce film grain in telecines, and it has been used to improve the quality of CATV, microwave, and satellite transmissions. Work on improving the DNR is still in progress. An improvement of an additional two to three dB in signal-to-noise ratio has been achieved, bringing current DNR dynamic improvement to 15 to 18 dB. With continued development, digital noise reduction is likely to find ever wider application in almost every stage of television production.

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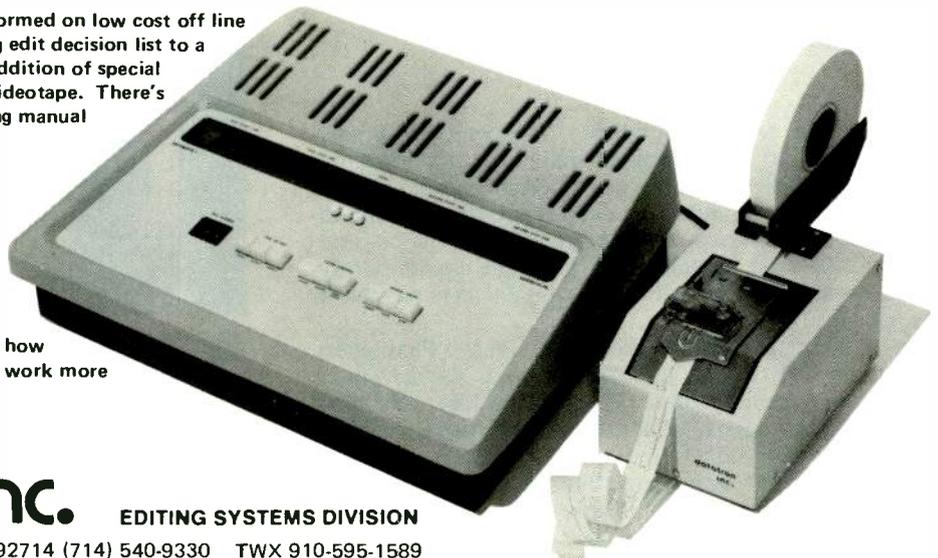
If your off-line editing system doesn't generate an edit decision list that can be input to an on-line system, you're losing time and money going from off-line edited worktapes to on-line edited masters.

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EditMate I is compatible with most helical scan VTRs, and installation is easy, involving NO modifications to your tape decks or your editing system.

Contact us for more information about how EditMate I can help your off-line editor work more effectively for you.



datatron. inc. EDITING SYSTEMS DIVISION

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*4 years ago — the 2/3-inch Plumbicon
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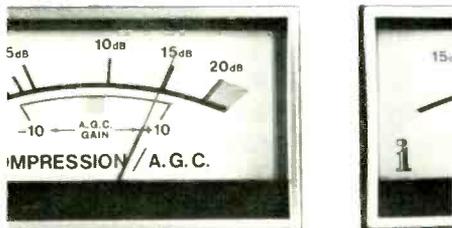
Type XQ1427: Offers significantly higher resolution than earlier versions; modulation depth is 60% typical at 320 TV lines giving sharper, clearer pictures and allowing operation at lower light levels. New gun design and 1500-line mesh construction result in improved registration and geometry, reduction of flare by a factor of 3 and reduced beam landing error.



Type XQ1410: The XQ1410 gained immediate acceptance by the television industry as a significant advance over all previous 30mm tubes. This recognition is based on the XQ1410's dramatic reduction in lag (typically 37% below that of our XQ1020.) The XQ1410 ends color-fringing, greatly reduces picture-smear and gives better dynamic resolution — even under poor lighting conditions. With its internal bias lighting, all three channels can now be balanced for identical lag characteristics. New gun construction gives improved resolution, (60% typical modulation depth at 400 TV lines). New mesh construction results in better geometry and registration and significantly reduces microphony.

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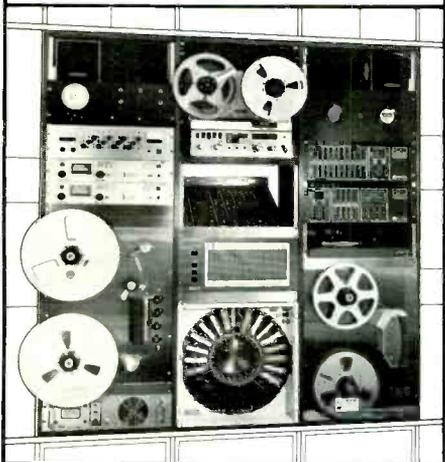
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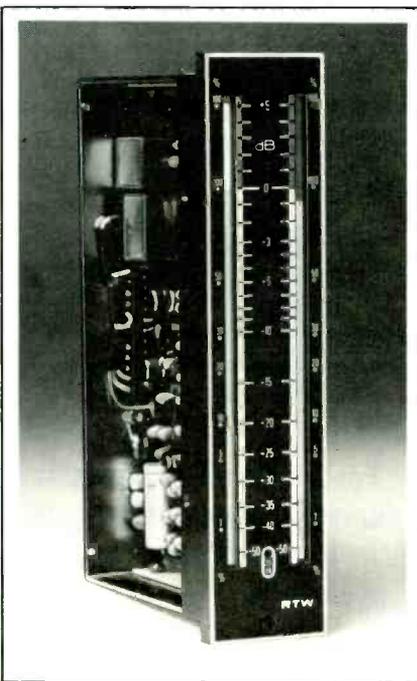


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