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February 1981/\$3



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BROADCAST engineering

The journal of broadcast technology

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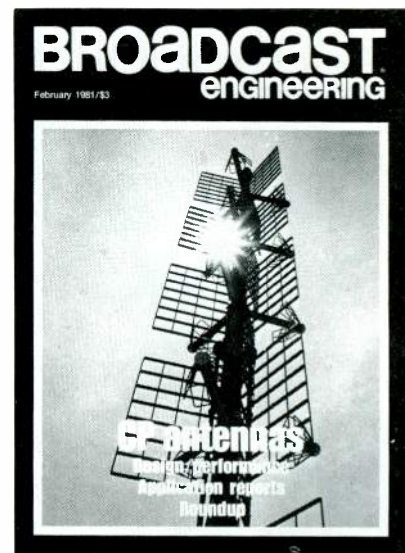
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THE COVER reflects the emphasis this month on circularly polarized (CP) antennas for radio and television broadcasting. The cover photo shows a CP antenna being evaluated on the Harris Corp., Broadcast Products Division, test range near Quincy, IL. Broadcast Engineering's emphasis on CP antennas this month, as shown at the left, includes design and application of CP antennas and a roundup of typical products.

NEXT MONTH

The March issue is scheduled to be devoted to an extensive pre-NAB-'81/Las Vegas convention coverage, including an exclusive introductory article by Chris Payne, assistant to the NAB vice president for engineering.

Additional articles, including BE's new feature—the Field Report—will be included as space permits.

BROADCAST[®] engineering

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FCC update

February 1981



By Wallace E. Johnson
executive director, ABES

With a new administration coming to Washington, much of the corridor talk at the FCC revolves around exchange of the latest information from a "usually reliable source" about who will be chairman of the commission, who will be the bureau chief, division chief, etc. Most of the time these changes do not have a big impact on the engineers as far as their positions are concerned. But it can be expected that a new chairman will change some policies, emphasis and approaches to the many unfinished matters pending.

One such item concerns the possible move of the FCC from its several locations in Washington, DC, to a building in Rosslyn that would house the entire FCC. This matter has been postponed to February, but has stirred up a great deal of controversy because of the manner in which the new site was selected and because of the effect it would have on the people dealing with the agency at a new location.

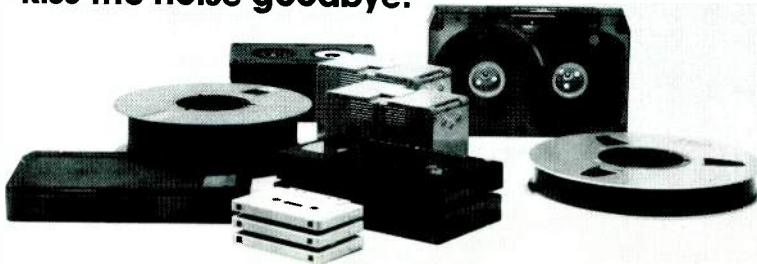
Another major issue that a new chairman would want to consider very early is the state of preparations for the 2nd Conference scheduled in Rio de Janeiro in November for a new AM agreement for the Western Hemisphere. This matter includes the possible shift of channel spacing from 10kHz to 9kHz. There is a great deal of work being done on this within the commission and by various industry working groups. However, the amount of work necessary and time needed to evaluate issues and determine positions is so great that postponement of the 2nd Session may be required. This will require a coordinated effort by both the FCC and the State Department.

AM stereo (Docket D21313) is a controversial issue regarding which of five systems to pick, and whether to let the marketplace determine the system to use. Many broadcasters think AM stereo would give a big boost to AM broadcasting and are urging prompt resolution of the matter. However, a new chairman would want to take a close look at this item and, it is hoped, a decision will be reached shortly after the February 13 reply date.

The Operator Rulemaking (Docket No. 20817) that would eliminate the 1st Class Radio Telephone License stirred up a lot of responses—both pro and con. A lot of comments were filed by operators, and these will be seriously considered by the commission staff in making their recommendations to the commission. Action on this item was to follow the January 5 reply date.

Docket 80-90, which is the commission's Notice of Proposed Rulemaking to increase the availability of commercial FM broadcast assignments by modifying the various classes of FM and the conditions under which they operate, will be a subject of interest to a new chairman, particularly if it is expanded to include the proposal to reduce channel spacing to 150kHz, similar in concept to 9kHz channel spacing in AM. This too is a controversial matter that will require careful analysis and consideration by a new administration at the FCC. □

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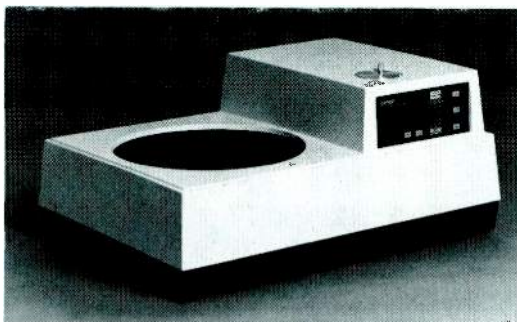


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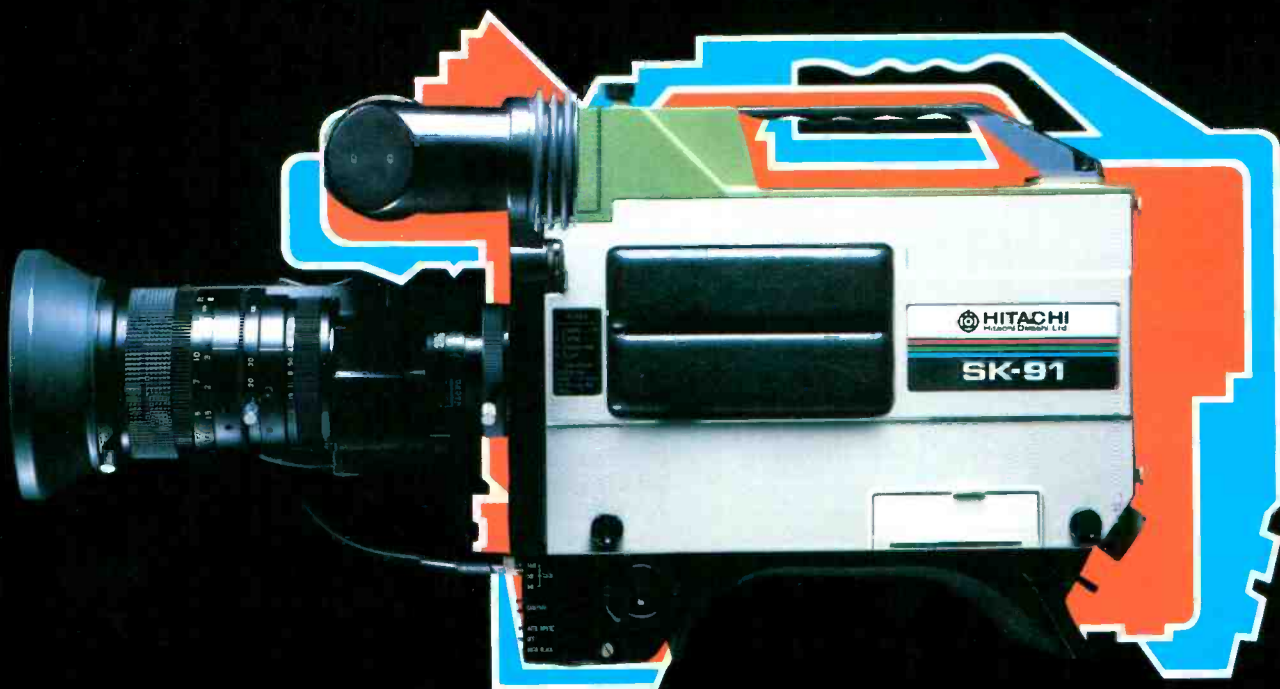


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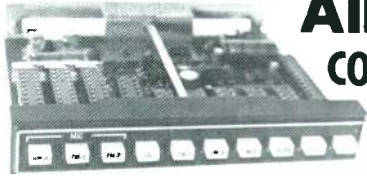
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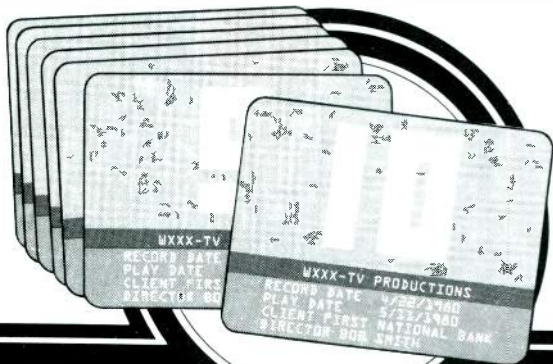
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news

Los Angeles TV station first with digitally recorded simulcast

The first television program simulcast with digitally recorded audio occurred December 25, 1980. The musical program "All That Brass" originated from KCET-TV, the Los Angeles PBS affiliate, with stereo audio broadcast on radio station KPFK (90.7 FM).

Jerry Zellinger, sound mixer and engineer at the Los Angeles TV station, said, "Since the Sony digital system utilizes videotape recorders, we thought it might be an interesting way of not only getting good quality audio, but also of integrating it into our video editing system." Zellinger also said there was no generation loss with digital audio, a factor which preserves the quality of the sound in the step-by-step production process.

Recording for the program was done using the Sony PCM-100 Digital Audio Processor. The Sony digital system can handle approximately 50% more dynamic range than conventional analog recorders.

Wallace Johnson to receive NAB Engineering Award

Wallace "Wally" E. Johnson, executive director, Association for Broadcast Engineering Standards (ABES), Washington, DC, will receive the National Association of Broadcasters' 1981 Engineering Achievement Award at the NAB engineering conference luncheon on Tuesday, April 14. The conference will be held in conjunction with NAB's 59th annual convention April 12-15 at the Las Vegas Convention Center.

Johnson previously was chief of the FCC's Broadcast Bureau. He joined the commission in 1942 as a radio inspector in Seattle, WA, and moved to Washington, DC, in 1943 as a radio engineer. He subsequently served as chief of the Existing Qualities Branch, the New and Changed Facilities Branch, the Broadcast Facilities Division and assistant chief of the Broadcast Bureau. He was Broadcast Bureau chief from 1971 until he joined ABES in November 1979.

Johnson is chairman of the National Radio Systems Committee, a member of the Executive Committee of Broadcast Inter-Association Council, a delegate to the 1980 First Regional Administrative MF Broadcasting Conference (Region 2) in Buenos Aires, and a member of the Association for Federal Communications Commission Engineers. He also is chairman of the Technical Subgroup of the Advisory Committee on Radio Broadcasting and for the past 25 years has been a member of the United States team that negotiated bilateral agreements with Mexico and the North American Regional Broadcasting Agreement (NARBA).

Intelsat V launch sequence successfully completed

The full launch sequence for INTELSAT V—the world's largest and most advanced commercial communications satellite—has been successfully completed.

The launch was completed December 10, in response to commands issued from the satellite control center in Washington, DC, and relayed through an earth station in Fucino, Italy.

The satellite is capable of relaying up to 12,000 simultaneous telephone conversations and two color

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CNN has its headquarters in Atlanta, with bureaus in major cities in the U.S. and abroad. All bureaus have Sony equipment. In fact, CNN owns about 53 BVU-200A editing recorders, 17 BVE-500A editing consoles, and 28 BVU-110 field recorders.

"Our 200A's and 500A's get a real workout in the studio," says Kitchell. "We run them 24 hours a day, week after week. And they're trouble-free. Occasionally we send 200A's out on the road, and they take even more of a beating, knocking around in the back of a truck for hundreds of miles. But we haven't had any problems.

"As for the field recorders, the 110's, Sony equipped them with more functions at a lighter weight than anything previously available. They're the mainstay of our ENG operations.

"Another thing I like about Sony is that the equipment is operator-oriented. Easy to use without a lot of super-technical know-how.

"Sony's U-matic technology is state of the art. That's because the company responds rapidly to the needs of broadcasters. When I have an idea on how to develop the equipment further, I talk to Sony. And Sony listens. That's good news in our business."

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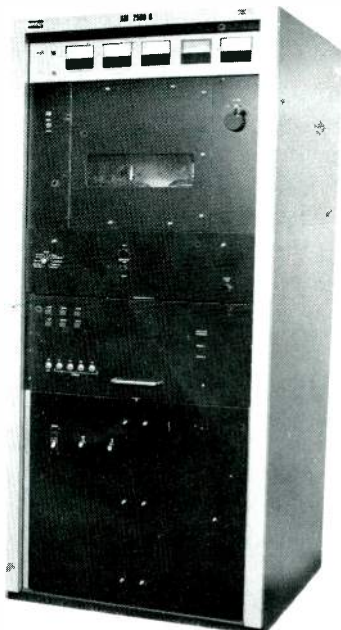
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News

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television channels simultaneously. This is approximately double the capacity of the largest satellites in the present INTELSAT system.

Sony video equipment featured in seminar

At the recent National Association of Educational Broadcasters Convention in Las Vegas, Robert Mueller, national market development manager of Sony Video Products, demonstrated Sony's Video Responder and laser videodisc systems, which offer interactive capabilities, and discussed the programing concepts.

"The basic concept of interactive video is that the program itself is no longer intended to be viewed from beginning to end without interruption. The program is in segments the viewer can choose to watch in various ways, and respond to or make choices during the course of the program that may alter it," Mueller said.

These interactive capabilities can be achieved in both videotape and videodisc formats. The Sony Video Responder system interfaces with current institutional Betamax and U-Matic video equipment. It is a peripheral device the viewer can use to respond to questions, automatically review questions or branch to another video segment for assistance, within the program. An optional printer will record and grade the student's performance.

Victor Duncan host of seminar

Guest speakers Nat Tiffen, Tiffen Manufacturing Corporation, and Bob Benson, Rosco Laboratories, presented a series of slides to an audience of more than 300 in a special seminar headed by the Detroit office of Victor Duncan, Inc.

"Filters for Special Effects" was presented by Nat Tiffen in a slide series beginning with an unfiltered night scene of a city street and its contrast through the use of filters, including star filters, fog filters, low contrast filters and diffusions.

Tiffen discussed such problems as achieving good color correction under fluorescent lights and the difficulties in color and exposure in an overly bright sky. He offered solutions for both situations through use of the Tiffen FL-D filter for fluorescent lights and sky control filter for bright sky.

"Light Control Filters for the Photographer, Cinematographer and Lighting Director," was presented by Bob Benson, who has more than 18 years experience as a professional lighting consultant and designer. Benson also discussed a series of slides, emphasizing the many uses of Rosco gels.

Proposal launched for satellite-to-home subscription TV service

In a first-of-its-kind application filed with the Federal Communications Commission, the Satellite Television Corporation has asked permission to begin construction of satellites to broadcast three channels of pay-TV without commercials directly to the homes of individual subscribers.

Initially, the service would be provided to an area approximating the Eastern Time Zone of the United States. The company intends to extend the satellite subscription television (SSTV) service to all 50 states on a gradual basis. STC said service could begin three to four years after approval by the FCC.



Picture shows Model 5315/32 TV Audio Console customized for WRC-TV, Washington, D.C.

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A circularly polarized antenna replacement for Channel 2-6 Superturnstiles

By Dr. Matti S. Siukola,* Antenna Engineering, RCA Broadcast Systems, Camden, NJ

Since the first VHF circularly polarized antenna was put in operation by WLS-TV atop the Sears Tower in Chicago, there has been an acceleration in antenna design activity by industry suppliers.

A leader in this product development activity, RCA Antenna Engineering, introduced four series of circularly polarized antennas: The Fan Vee antenna for Channels 2-6; two models of the Tetracoil, one of which is a direct replacement for a superturnstile for Channels 7-13; the Quatrefoil for Channels 2-6; and the TBJ Crossed Dipole antenna for Channels 7-13.

While this hardware development work was taking place, a concurrent effort was mounted to determine and evaluate additional product needs. Through feasibility studies, the design of a new VHF circularly polarized antenna resulted, which was introduced at the 1979 NAB show.

This antenna, the TDM (Figure 1), is designed for broad application as a replacement for Superturnstile antennas. There are many Channel 2-6 Superturnstile antennas on existing towers, and many broadcasters who would like to replace their Superturnstile with a new circularly polarized antenna without having to worry about overloading the tower or changing transmission lines. The TDM, as a direct replacement for TF-6 series antennas, was designed to meet these needs.

In the development of the TDM, design criteria goals included: (1) the new antennas should provide a gain of 3, which is about half of that of the Superturnstile antennas, and have the same beamwidth as Superturnstiles; (2) a power rating of 35kW would be required to achieve 100kW ERP for both polarizations; (3) two-line feed is desirable for standby operation; and (4) the windload would have to be less than or equal to that of the Superturnstile antennas.

The advanced development work was completed early in 1979 and produced the dual mode circularly polarized antenna, or TDM-7A series antenna. The principle of this antenna starts with a slanted dipole that produces both vertical and horizontal radiation components

(Figure 2). Several of these in combination in a circular form, as in circularly polarized FM antennas, develop a beautiful circularly polarized radiating system.

For television, however, it would be desirable to place a pole in the middle of the radiating system. But, if a pole is inserted in the middle of an FM type antenna, the axial ratio deteriorates seriously. The original better-than-1dB ratio deteriorates to about 10dB. That condition deterred progress on the new antenna until it was recognized that two simple studs added to each feed point permit changing phase and amplitude relationships between the vertically and horizontally polarized components so that axial ratio can be restored (Figure 3). By adjusting the length of the studs, the length of the dipoles and the slanting angle of the dipoles, very good radiation characteristics for the antenna can be obtained. This provided all the features and characteristics that were desired, including excellent axial ratio.

A further requirement was a gain of 3. To achieve it, seven layers were stacked on the pole. Seven layers were needed because of the spacing of 0.8 wavelengths between the layers. This type of spacing is normally used to get good pattern characteristics, but in this antenna, that is not the case. The 0.8 wavelength results in a mutual coupling between layers, which optimizes the impedance behavior.

The layers are grouped into four upper layers and three lower layers, each fed with a 3-inch transmission line, regular Superturnstile type junction boxes, and copper spirafil semi-flexible cables, three to each layer (Figure 4). The two lines may be connected to existing transmission lines on the tower and combined below at the station with a proper phasing loop to feed the two halves in phase with a combining tee. This system must be fed with a notch diplexer. With this arrangement, when necessary switches are added, standby operation can be provided with either half of the antenna. For 100kW ERP the antenna requires 33.4kW of input power, and this same power can be fed into either half in case of an emergency, simplifying the

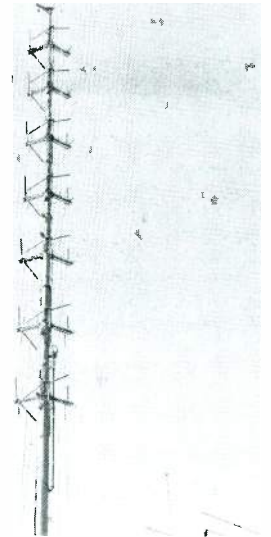


Fig. 1. RCA's VHF circularly polarized antenna, dual mode type TDM. This paper describes the engineering development behind this system.

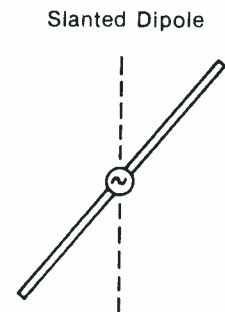


Fig. 2. Slanted dipole, the heart of the TDM antenna, produces the vertical and horizontal radiation components.

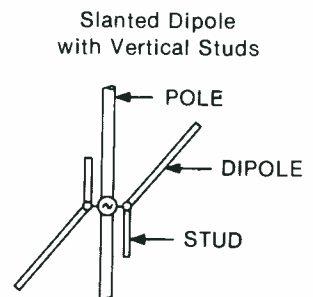


Fig. 3. Two simple studs were added to restore the radiation component axial ratio.

*Published posthumously.



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it a natural for news broadcasting: Performance like horizontal resolution of 500 lines center, a S/N ratio of 52 dB and standard illumination of 200 footcandles at f/3.5. And for even more light-gathering capabilities, there's a 2-position high-gain switch.

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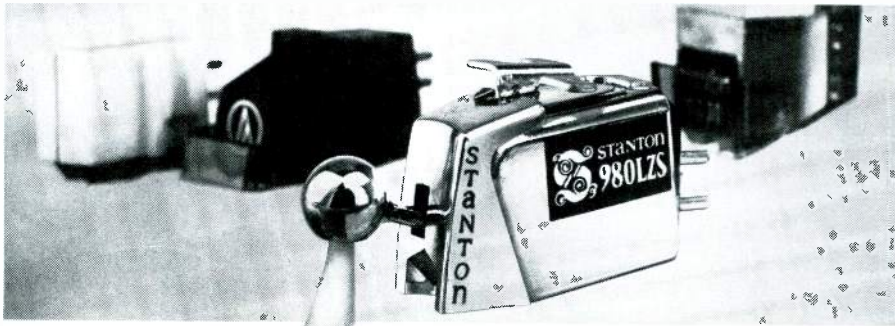
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changeover. If a standby mode is not required, a single line feed could be used by feeding with a single 3-1/8-inch transmission line, and placing the combining network up in the tower top (Figure 5).

The characteristics of the TDM-7A series antenna met its design goals. The circularities of the antenna have been measured on several models. Something better than $\pm 3\text{dB}$ is needed. As shown in Figure 6, the horizontally polarized

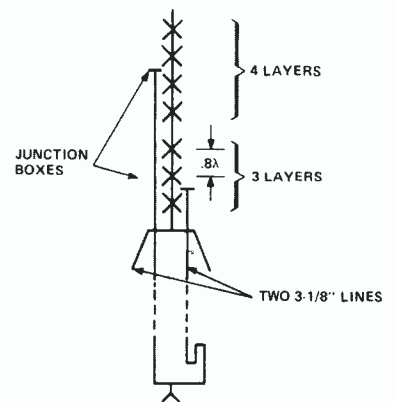


Fig. 4. The TDM-7A series, showing the two line feed and the four upper layers, three lower layers.

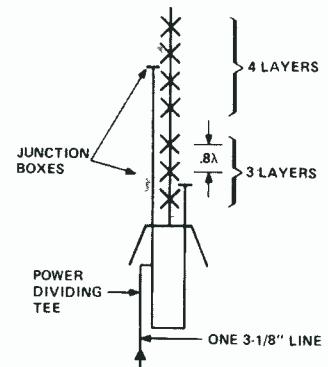
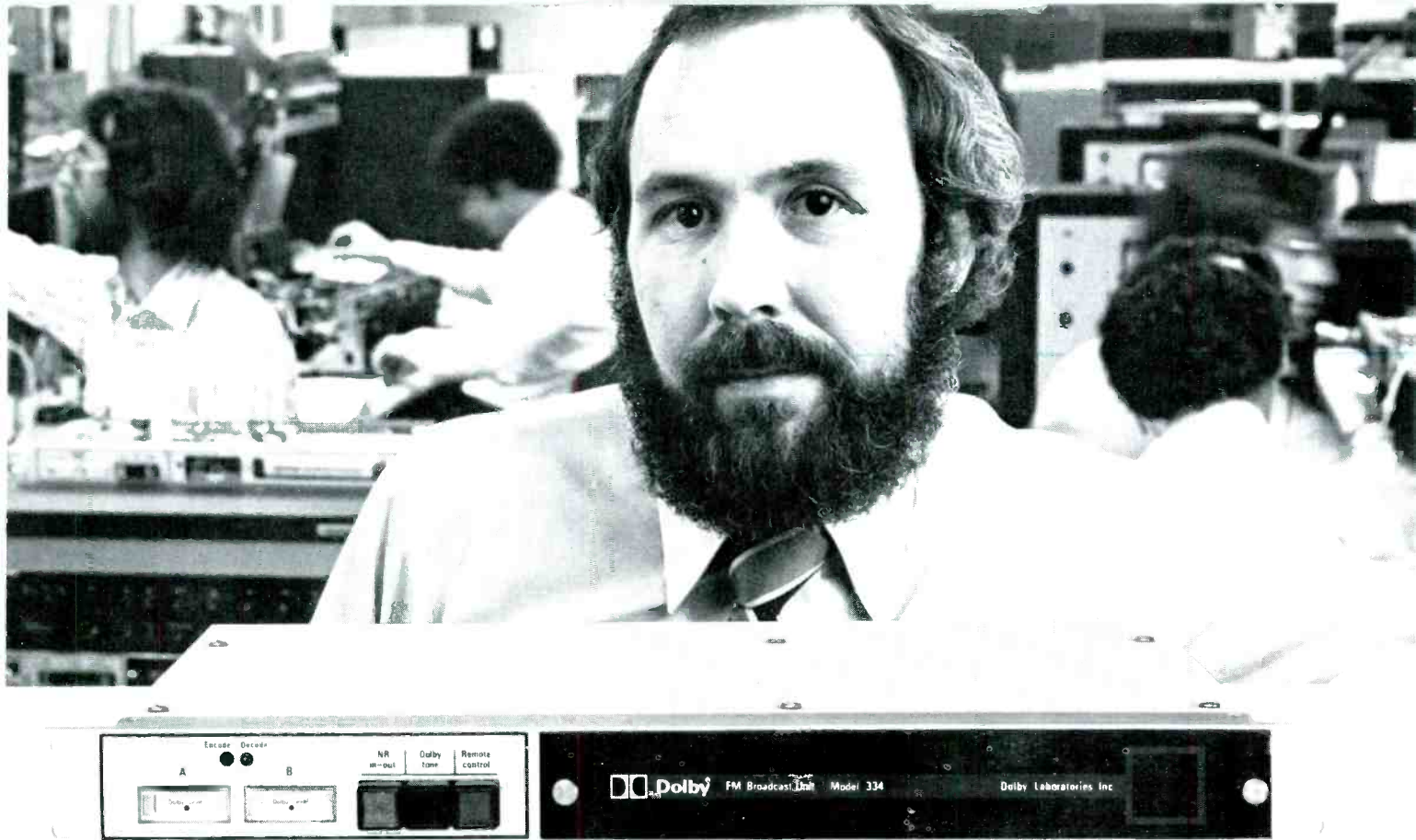


Fig. 5. The TDM-7 series with a single line feed.



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February 1981 *Broadcast Engineering* 15

—— Horizontal Polarized Component
 - - - - Vertical Polarized Component

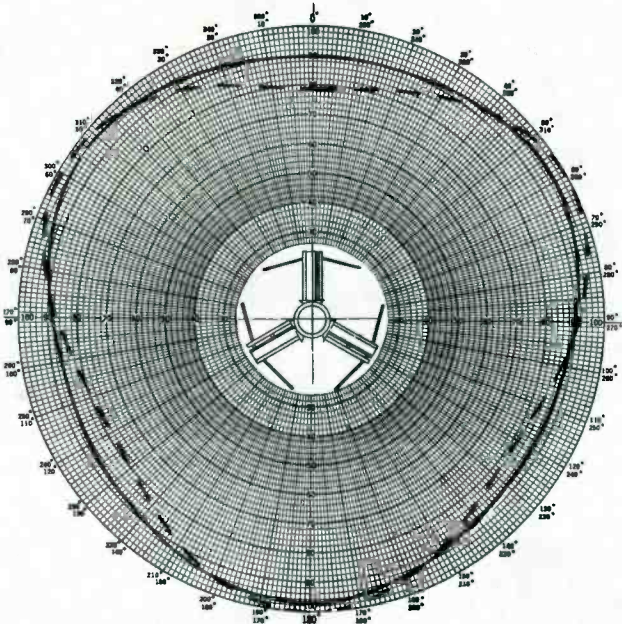


Fig. 6. Measured horizontal radiation field pattern for the TDM-7A series.

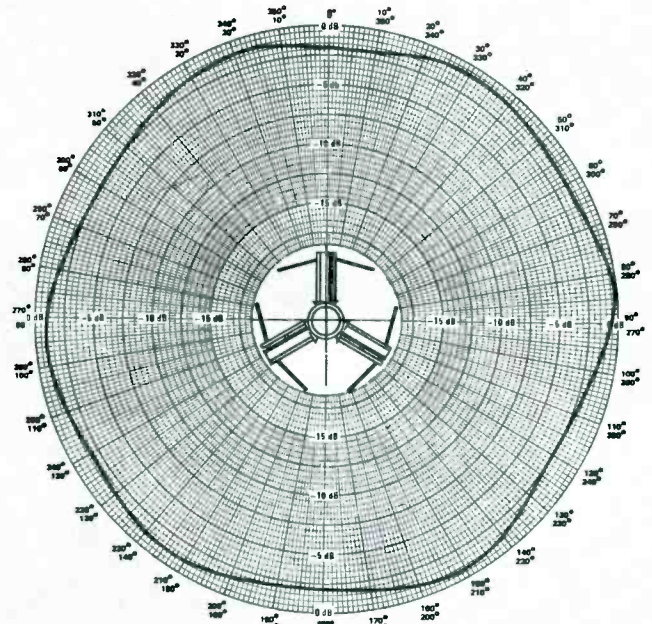


Fig. 7. Measured axial ratio for the TDM-7A series.

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component pattern circularly is about $\pm 0.5\text{dB}$ and that of the vertically polarized component better than $\pm 1\text{dB}$ —excellent values.

For the axial ratio, 6dB or better is needed, and results achieved have been much better than that—on the order of 2.5dB maximum (Figure 7). The vertical patterns, as well as the horizontal patterns, and impedances, were measured on

three layer models to include mutual coupling effects. The overall vertical pattern was calculated from the element and three layer patterns (Figure 8). The beamwidth is about 9-10 degrees, which is the same as that of a six-section Superturnstile.

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Also note the 8% null fill. This derives from the fact that a 50/50 power dividing tee is used between the upper and lower "halves" as well as feedline phasing between the individual layers that also produce 1° of beam tilt. This null fill will be adequate for most of the applications of this antenna, but other values can be obtained by changing the power dividing tee.

The measured impedance, including the mutual coupling, shows a VSWR of better than 1.1 for a bandwidth of about 12% (Figure 9)—more than is needed for Channel 2.

Measurements and analyses indicated that de-icing of the supporting balun is not required. However, both the dipole ends and the stud ends require de-icing. Provision is made to insert heaters into the tips of the radiators and studs, and the cable is fed through the balun tubes to the surface of the pole for connection to the main heater cable. The same power as used in the Superturnstile antennas will also be adequate for the TDM-7A antenna series.

A comparison of the mechanical

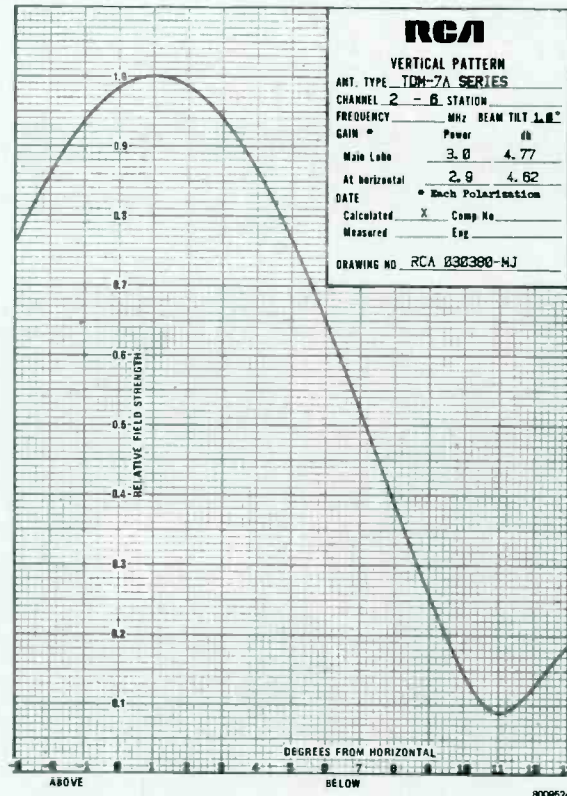
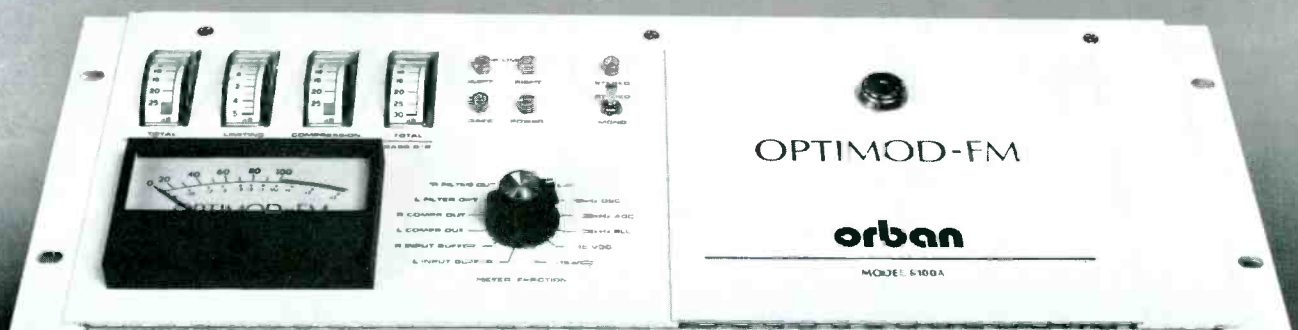


Fig. 8. Vertical pattern for the TDM-7A series calculated for a three layer model.

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parameters between the TDM-7A dual mode series and the Superturnstile or the TF-6 series for each of the channels is shown in Figure 10. H_2 , the pole height above the tower top for the dual mode antenna, is less than that of the Superturnstile antennas. The radiation centers are also lower for the dual mode antenna than for the Superturnstile antenna but they are all within the two meter limit, which facilitates simplified filing with the FCC.

The windloading for the dual mode and the Superturnstile on Channel 2 and Channel 4 are very close. The reactions of Channel 2 antennas are 6600# and 6630#; and Channel 4 antennas 4740# and 4740#, respectively. On other channels, the reaction is more favorable for the Dual Mode. The overturn moments on Channel 2 and Channel 4 are alike for both antenna types. For the other channels, the TDM antenna has lower overturn moment. The only mechanical parameter higher for the Dual Mode antenna is the weight. The weight is somewhat higher than that of the Superturnstile, but weight plays a very minor part in the tower loading

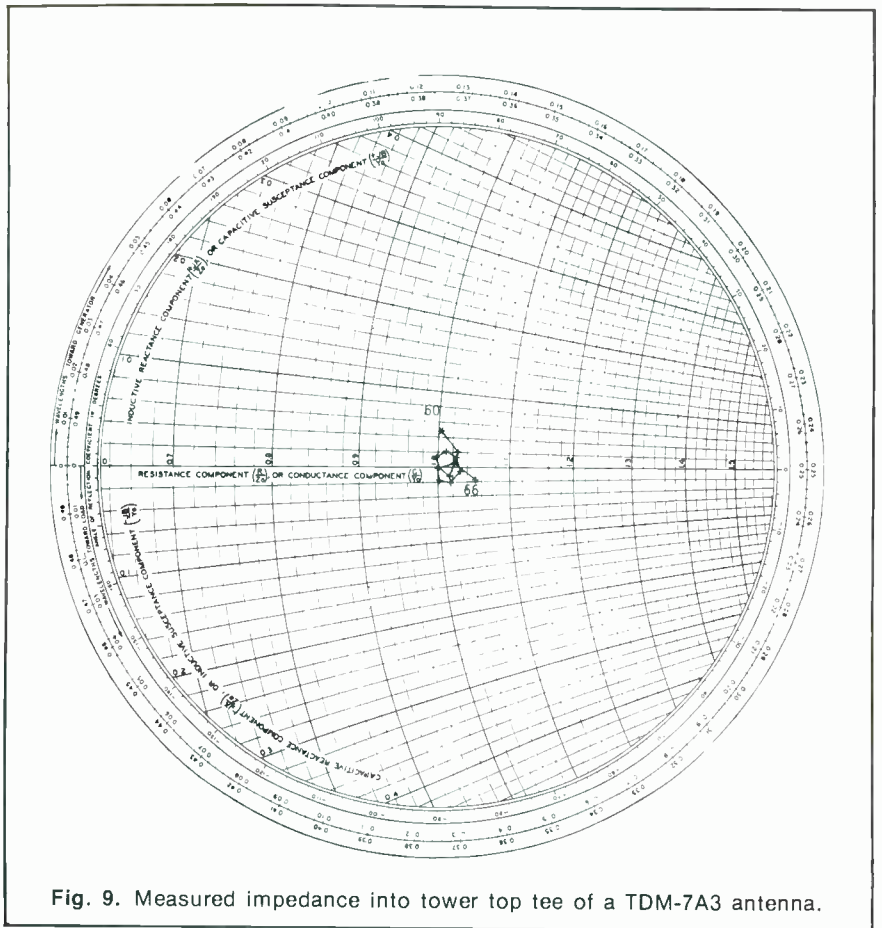
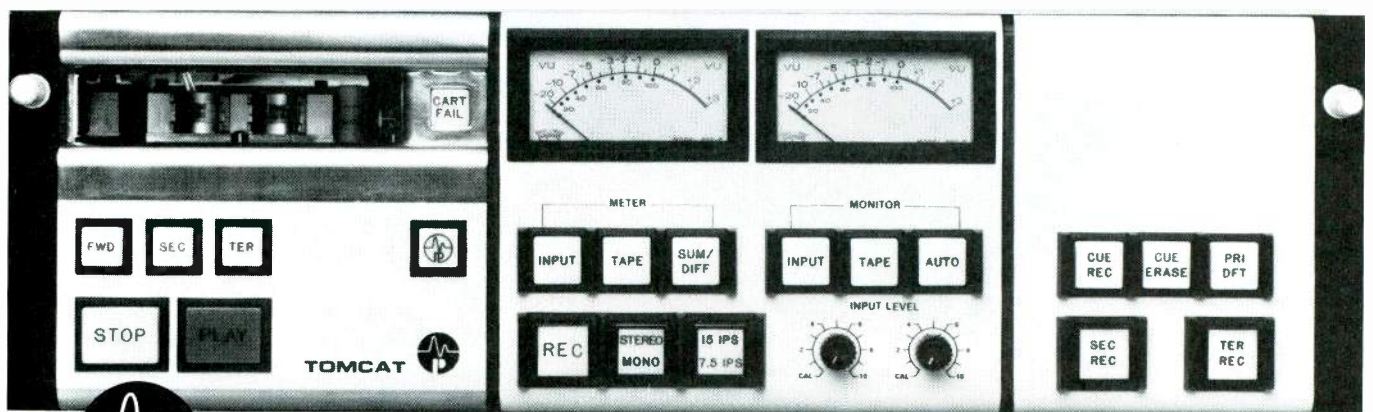


Fig. 9. Measured impedance into tower top tee of a TDM-7A3 antenna.

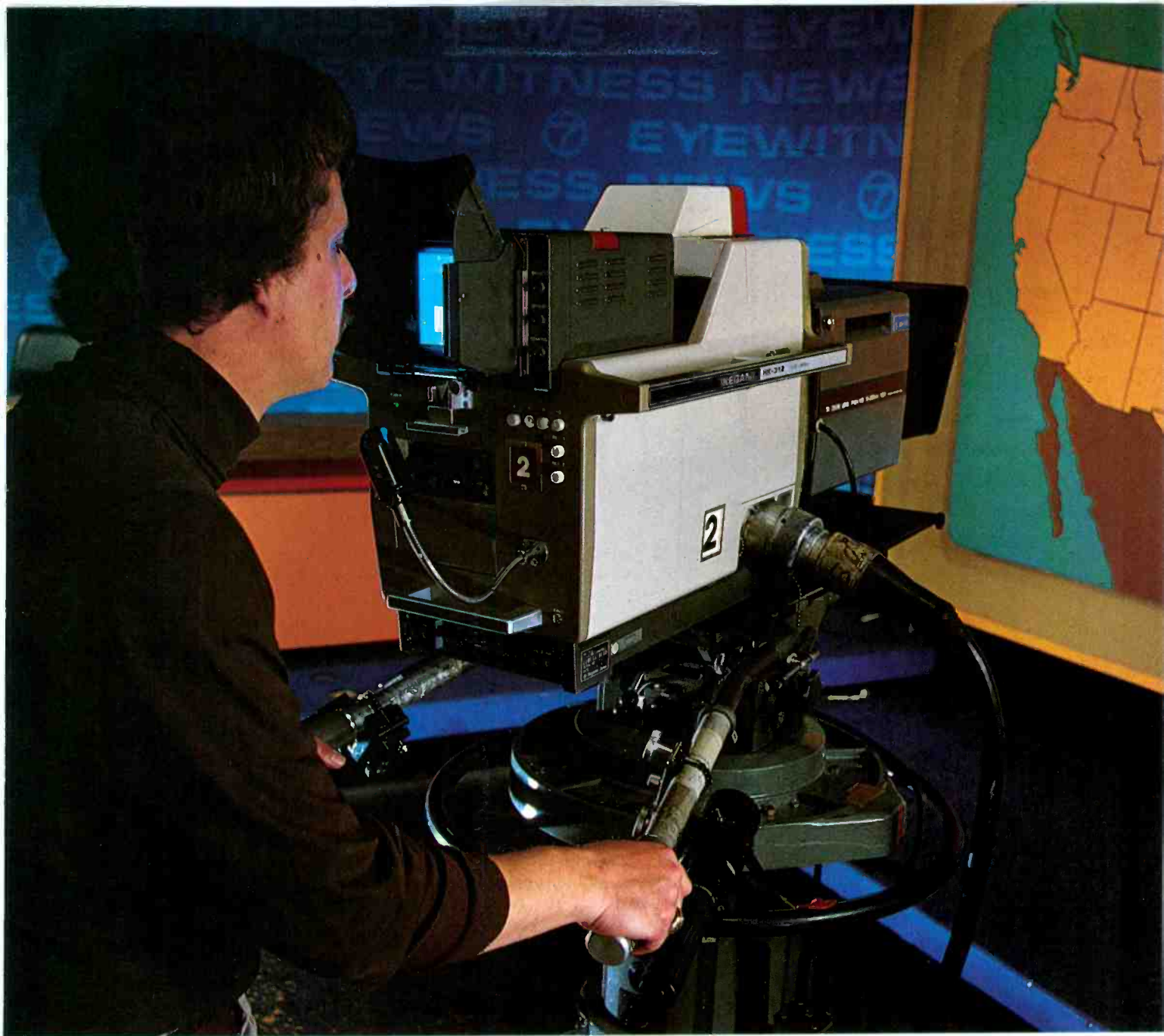
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February 1981 *Broadcast Engineering* 21

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CHAN- NEL	H ₂ (FEET)		H ₃ (FEET)		R ₁ (POUNDS)		M (FT. POUNDS)		W (TONS)	
	TDM-7	TF-6	TDM-7	TF-6	TDM-7	TF-6	TDM-7	TF-6	TDM-7	TF-6
2	96.7	101.0	48.9	51.5	6600	6630	295,880	287,700	9.7	7.0
3	90.0	101.0	46.4	51.5	6150	6630	255,285	287,700	9.4	7.0
4	79.4	82.8	40.3	42.0	4740	4740	176,565	173,000	6.0	5.0
5	71.6	82.8	37.0	42.0	4420	4740	148,900	173,000	5.7	5.0
6	67.9	82.8	35.5	42.0	4150	4740	132,885	173,000	5.5	5.0

WHERE: H₂ HEIGHT OF POLE ABOVE TOWER TOP
H₃ CENTER OF RADIATION
R₁ WIND REACTION AT CENTER OF LOAD AREA (50/33 PSF)
M OVERTURN MOMENT *INCLUDES MOMENT DUE TO POLE DEFLECTION FOR TDM NOT INCLUDED FOR TF-6

W WEIGHT

NOTE DISTANCE FROM TOWER TOP TO BOTTOM OF BURY SECTION IS THE SAME FOR BOTH TDM AND TF ANTENNAS

Fig. 10. Comparison of mechanical features between the TDM-7A dual mode and Superturnstile or TF-6 series antennas for channels 2-6.

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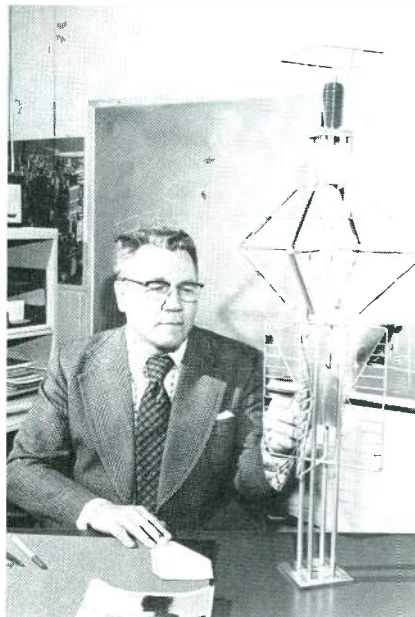
and is not expected to cause any major difficulties.

One more important factor is given in the note at the bottom of Figure 10. It says that the bury length of the Dual Mode antenna is the same as that of the Superturnstile for the same channel. Therefore, in replacing a Superturnstile with a Dual Mode antenna, only the guide flange and the pole socket on the tower need be replaced with new ones supplied.

Conclusion

The TDM-7A Dual Mode circular-

ly polarized antenna is a significant development because it can replace a present six-layer Superturnstile antenna on Channels 2-6 without tower modifications. The windloadings are equal or less than those of six-layer Superturnstiles. Full aperture efficiency is obtained, with no wasted aperture. Omnidirectional standby capability is provided for. It requires less feedlines than the Superturnstiles: three per layer, 21 total. Copper spirafil cable is used. TDM-7A circular antennas are designed to be field assembled for best economy for the broadcaster.



Matti Siukola has more than 33 years of broadcast antenna design experience, 28 of them with RCA. As unit manager of advanced development for RCA's Broadcast Antenna Engineering Center, Dr. Siukola has been a primary contributor to the development, over the past five years, of circularly polarized television broadcast antennas. On September 19 Dr. Siukola died as he was delivering a technical paper to the Institute of Electrical & Electronics Engineers in Washington, DC.

Electro-Voice's Greg Silsby talks about the Sentry 100 studio monitor



Production Studio, WRBR-FM, South Bend, Indiana.

In all the years I spent in broadcast and related studio production work, my greatest frustration was the fact that no manufacturer of loudspeaker systems seemed to know or care enough about the real needs of broadcasters to design a sensible monitor speaker system that was also sensibly priced.

Moving to the other side of the console presented a unique opportunity to change that and E-V was more than willing to listen. When I first described to Electro-Voice engineers what I knew the Sentry 100 had to be, I felt like the proverbial "kid in a candy store." I told them that size was critical. Because working space in the broadcast environment is often limited, the Sentry 100 had to fit in a standard 19" rack, and it had to fit *from the front, not the back*. However, the mounting hardware had to be a separate item so that broadcasters who don't want to rack mount it won't have to pay for the mounting.

The Sentry 100 also had to be very efficient as well as very accurate. It had to be designed so it could be driven to sound pressure levels a rock'n roll D.J. could be happy with by the low output available from a console's internal monitor amplifier.

In the next breath I told them the Sentry 100 had to have a tweeter that wouldn't go up in smoke the first time someone accidentally shifted into fast forward with the tape heads engaged and the monitor amp on. This meant high-frequency power handling capability on the order of five

times that of conventional high frequency drivers.

Not only did it have to have a 3-dB-down point of 45 Hz, but the Sentry 100's response had to extend to 18,000 Hz with no more than a 3-dB variation.

And, since it's just not practical in the real world for the engineer to be directly on-axis of the tweeter, the Sentry 100 must have a uniform polar response. The engineer has to be able to hear exactly the same sound 30° off-axis as he does directly in front of the system.

Since I still had the floor, I decided to go all out and cover the nuisance items and other minor requirements that, when added together, amounted to a major improvement in functional monitor design. I wanted the Sentry 100 equipped with a high-frequency control that offered boost as well as cut, and it had to be mounted on the front of the loudspeaker where it not only could be seen but was accessible with the grille on or off.

I also didn't feel broadcasters should have to pay for form at the expense of function, so the walnut hi-fi cabinet was out. The Sentry 100 had to be attractive, but another furniture-styled cabinet with a fancy polyester or die-cut foam grille wasn't the answer to the broadcast industry's real needs.

And for a close I told E-V's engineers that a studio had to be able to purchase the Sentry 100 for essentially the same money as the current best-selling monitor system.

That was well over a year ago. Since that time I've spent many months listening critically to a parade of darn good prototypes, shaking my head and watching

some of the world's best speaker engineers disappear back into the lab to tweak and tune. And, I spent a lot of time on airplanes heading for places like Los Angeles, Grand Rapids, Charlotte and New York City with black boxes under my arm testing our designs on the ears of broadcast engineers.

The year was both frustrating yet enjoyable, not just for me but for Ray Newman and the other E-V engineers who were working on this project. At this year's NAB show it all turned out to be worth it. The Sentry 100's official rollout was universally accepted, and the pair of Sentry 100's at the Electro-Voice booth was complemented by another 20 Sentry 100's used by other manufacturers exhibiting their own products at the show.

What it all boiled down to when I first started the project was that I knew that the Sentry 100's most important characteristic had to be *sonic integrity*. I knew that if I wasn't happy, you wouldn't be happy. I'm happy.

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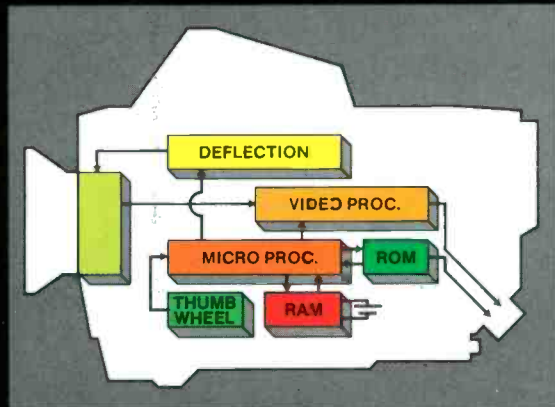
The MSP (Master Set-Up Panel) is the control terminal for the Digicam System. It controls manual set-up of the Digicam, or automatic set-up when the ASU (Automatic Set-Up Unit) is used.

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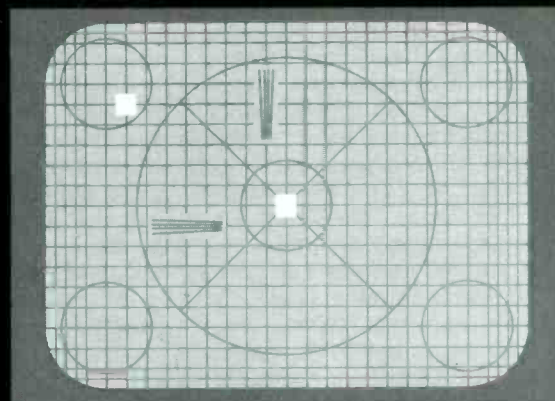
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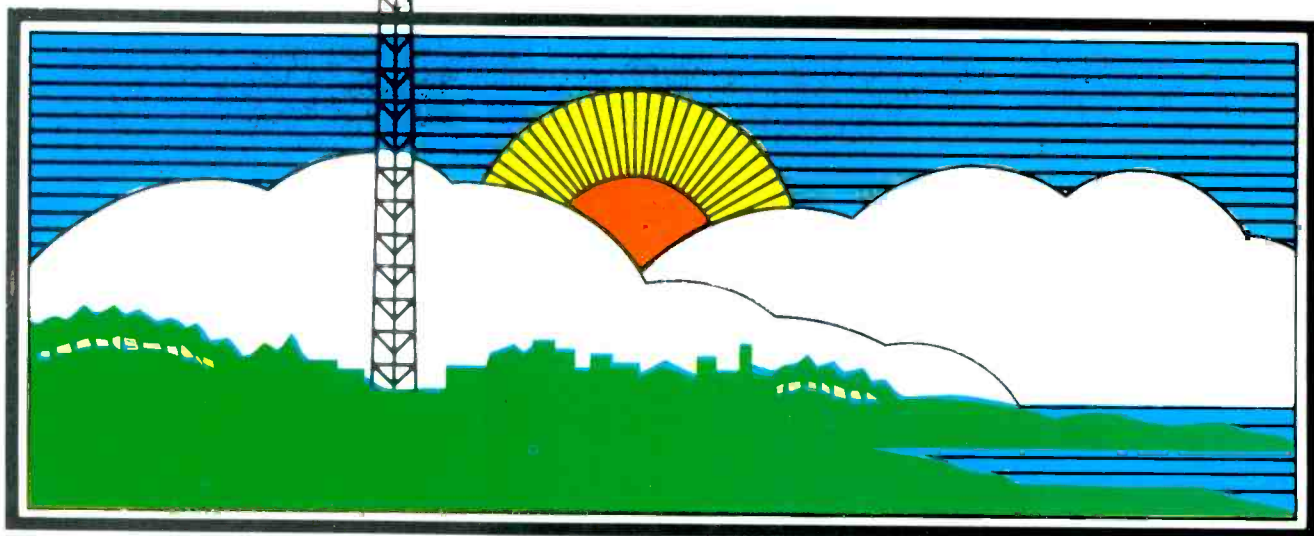


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WITN-TV keeps the building grounds free of grass for easy maintenance.



WITN builds new facilities, goes to CP transmission

WITN-TV is keeping "on top of it all" by broadcasting a powerful, circularly polarized signal from its new 2000-foot tower. The tower, near Grifton, NC, is in the center of WITN's market area (Greenville-New Bern-Washington). The tower seems to represent TV-7's on-going program of providing better service to its market.

\$4 million investment

TV-7's new transmitting system includes the new tower, an RCA TBJ circularly polarized antenna, transmission line, a new transmitter building and a TT-75FH 75kW transmitter. The installation also includes a new RCA FM transmitter and antenna.

Because of its new CP signal and extended reach, the station now covers from beyond Raleigh, NC, to the coast, and from southern Virgin-

ia to below Wilmington, NC. The tower, antenna, transmitter building and equipment represent an investment of more than \$4 million, which is considered unusual for a station operation in NSI Market #86.

In the case of TV-7, maintaining excellent technical facilities has been standard operating procedure since the station went on the air in 1955. The decision to replace the 20-year-old existing transmitting system was made by W. R. Roberson, chairman; Dick Paul, president; and Al Manning, vice president engineering.

"We wanted to build a first class transmitting facility," Roberson said, "and decided on the circularly polarized operation because that seems to be the direction that the broadcast industry is moving. We preferred to go with the most technologically advanced equipment currently available rather than to wait for future developments."

"Since going on air on October 31, 1979, with the new transmitting

system," Paul said, "the results have exceeded our expectations in terms of performance. The decision to invest in the new facility was right, since inflation continues to drive costs upward."

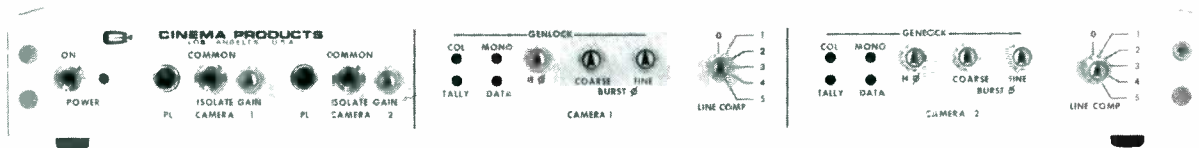
For Manning, the project was an arduous one. Because the tower, the transmitter building, and the equipment installation were all to go on at the same time, he and his crew put in many 15-hour days at the tower site.

Planning communications facilities

Planning and management support are the keys to success in completing a project of this magnitude, Manning said. Much of the planning involved determining what communication facilities would go on the tower. The tower itself was designed to be sturdy enough to withstand hurricane winds and accommodate two television antennas as well as two FM antennas at the top, plus additional communications equipment at various levels on the tower.

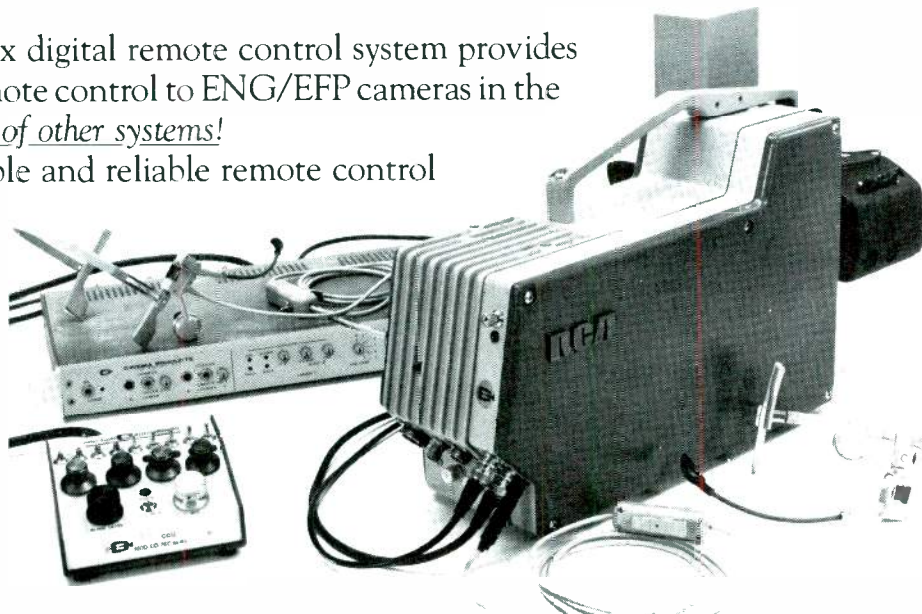
Thanks go to RCA and the staff of WITN, especially Al Manning, vice president of engineering, for help in developing this article.

CO-AX DIGITAL REMOTE CONTROL



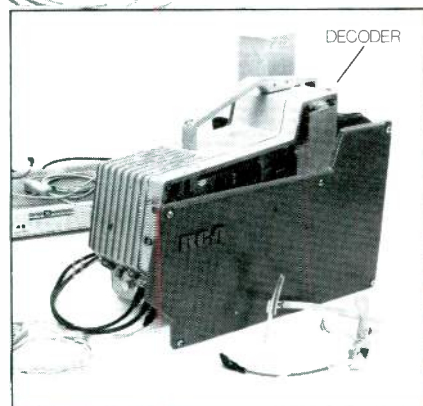
Our new and exciting co-ax digital remote control system provides dependable, studio-like remote control to ENG/EFP cameras in the field *at a fraction of the cost of other systems!*

It is the most affordable and reliable remote control system available on the market today. Easily interfacing with a full range of professional ENG/EFP video cameras currently in use, such as Ikegami HL-77 and HL-79A, RCA TK-76B, NEC MNC-71 cameras, and many more.

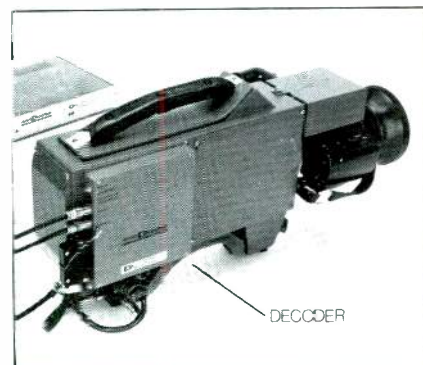


Outstanding Features

- System consists of mini-CCU, analog-to-digital encoder, and digital-to-analog decoder.
- Permits control of all functions normally required in OB van, including genlock.
- Digital encoder (19" rack-mounted) designed to accommodate two mini-CCU's to control two cameras (each equipped with its own decoder).
- Lightweight, camera-mounted decoder features intercom capability.
- Digitally encoded control data relayed to camera-mounted decoder through a simple, lightweight and reliable coaxial cable.
- Eliminates the need for expensive, bulkier, multi-core or triax camera cable, and reduces to a minimum the risks normally associated with the use of such camera cables.
- Low-cost coaxial cable allows complete remote control and camera set-up functions from greater distances with greater safety and utmost reliability.
- System is ideal for all extended shooting situations such as sports events, live concerts, political rallies, etc.



RCA TK-76B shown with decoder neatly "sandwiched" between camera body and door.



Ikegami HL-77 shown with side-mounted decoder.

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28 *Broadcast Engineering* February 1981

WITN-TV7

(When the tower was completed, WITN-TV sold half interest in the structure to Park Broadcasting Inc.) WITN-FM's Type BFJ panel antennas are already in place on the tower. Another circularly polarized TV antenna is scheduled to be installed in the near future. (Also installed on the tower are eight microwave dishes and two-way radio facilities; there is ample capacity for more.)

First TBJ circularly polarized antenna on air

At the top of the tower is the TBJ 13A7R circularly polarized antenna. Designed and constructed by RCA, the TBJ is made up of 13 panels on each of the three facings, a total of 39 panels. TV-7's antenna, as specified by Manning, is designed for use as a primary and as a standby system. It has a split feed to upper and lower sections so that if one section fails it will not take the station off the air. Later the transmission line from the old tower will be dismantled and reinstalled on the new tower to provide additional redundancy.

"This is our weak link at the moment," Manning said. "We've planned redundancy into every facet of the transmission chain to avoid downtime. Failure of the transmission line isn't likely to happen, but I'll feel better when the second one is up."

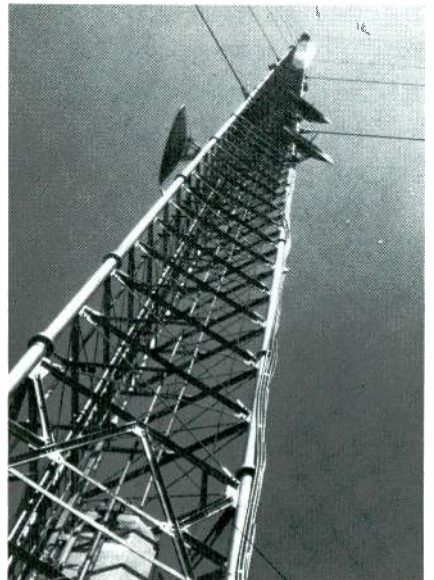
"The new FM antennas are the BFJ panel type, which provide better coverage with improved circularity and no holes. The BTF-40 transmitting system has provided

trouble-free operation, and the station is happy with results achieved with the new system."

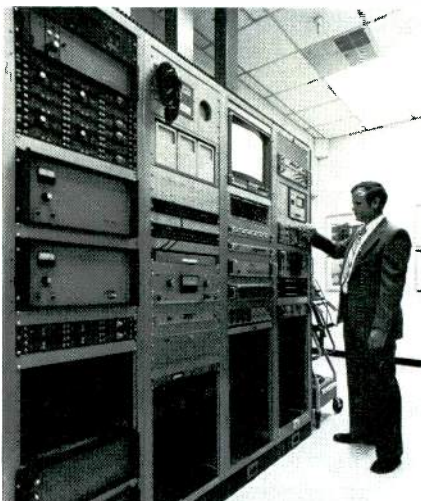
The WITN installation is the first on-air use of the TBJ antenna. Manning noted that this is a lower gain antenna, which provides the advantages of a better signal to all parts of the coverage area.

The purpose of the new tower, according to Paul, was to "improve reception in our service area and to reach out further." This goal was fully accomplished; the coverage area was extended eight miles because of the higher tower. In addition, the signal penetration and saturation was increased substantially, particularly to the north and east, providing a better signal to the coastal areas.

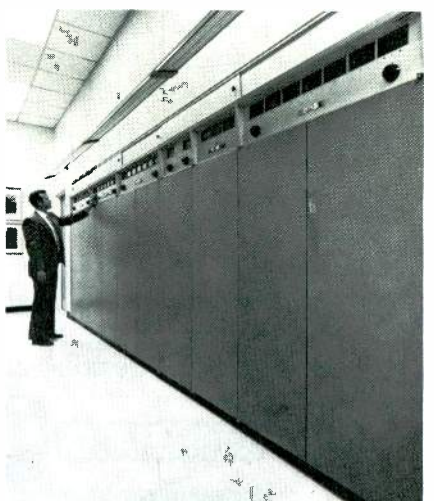
The Arbitron survey made in February 1980 shows a dramatic



WITN-TV's Tall tower reaches high, enabling TV-7 to provide better service and coverage for its market area.

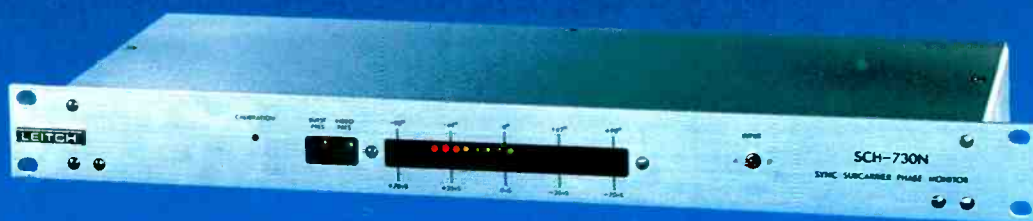


In the transmitter operation/control room, Al Manning, vice president, engineering, checks the transmitter monitoring facilities (left) and the TT-75FH, 75kW transmitter (right).

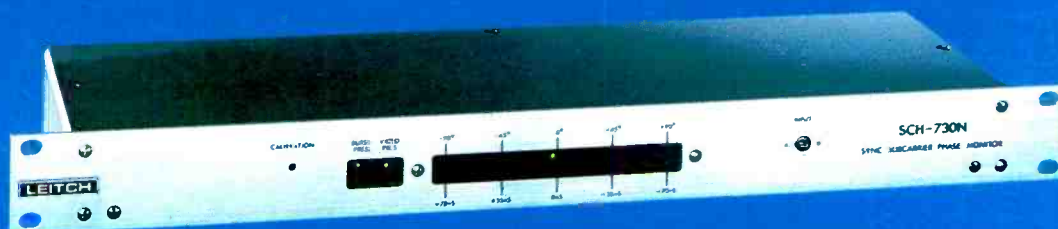


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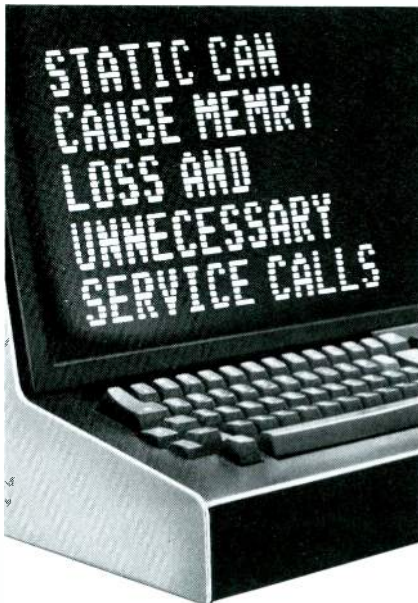
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can create an inexpensive "island of protection" around your delicate electronic equipment, harmlessly draining the static charge from operators and other personnel.



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WITN-TV7

improvement over the one done a year earlier. The difference is a whopping 43% increase in prime time television households over the same period the previous year. Paul also said that WITN-TV, an NBC affiliate, has eight of the top 10 prime-time shows in the market based on the February '80 Arbitron survey.

The transmitter building

The new WITN-TV transmitter building was designed by Edwards Associates, Architects and Planners. The layout was planned and coordinated by Manning, who started with TV-7 as a transmitter operating engineer before moving to the studio and progressing into management. The building is solidly constructed of pre-stressed concrete walls and roof. On top of the roof is a 4-inch concrete slab, then a tar and stone roofing covered with 4-inch by 6-inch timbers to protect the building from falling ice.

The building itself is large and includes facilities for the comfort and convenience of the people working there. There is an office, a lounge/bedroom, bathroom and kitchen.

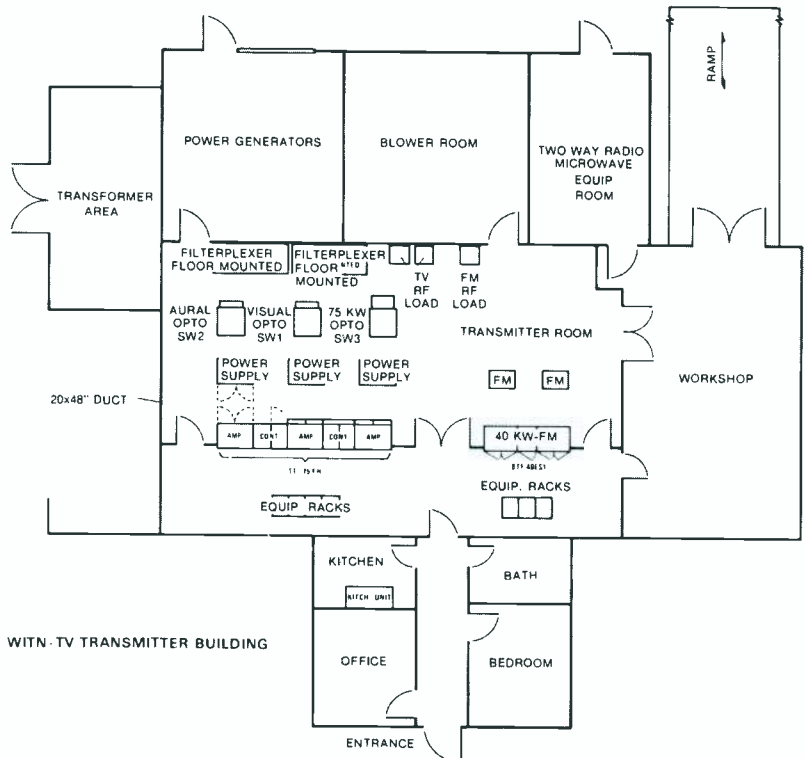
The transmitter operating/control room is a large area housing the

TT-75FH, 75kW television transmitter and the BTF-40 40kW FM transmitter. The front line transmitter cabinets are enclosed so that only the meter panels are in the control area. Opposite the front line cabinets are racks housing the monitoring, test and telemetry equipment for the TV and FM transmitters. Cable runs are from the top of the racks. The racks themselves are free-standing and accessible from the front and rear for maintenance. The FM transmitting system status is shown on a visual display, and the system is set up for automatic switchover.

The rear transmitter cabinets, power supplies, opto-switchers and inside transmission line are all housed in a separate space with



Dick Paul, president, (l.), Al Manning, vice president, engineering, (c), and W.R. Roberson, chairman, (r.), shared responsibility for building WITN-TV's tall tower and new transmitting facility.



WITN-TV transmitter building floor plan.

WAST-TV put a new Harris CBR antenna on their existing tower, and proved that a...

Harris CP^{*} TV antenna's stronger signal increases ratings!

"We were the first network station in the country to change to CP on the same tower as our old antenna," says Frederick Lass, Chief Engineer of Station WAST-TV, Albany, New York. "This unique situation has provided the first quantitative measure of CP performance.

"We have been televising with our new Harris TAC-6H circularly polarized antenna for quite a few months now, and have had plenty of time to gather and analyze results," continues Mr. Lass. "A comparison of ARB November 1978 to November 1979 showed average prime time homes up 23.4%! During this time CBS showed an increase of 9.9%—so our stronger signal was responsible for a ratings increase of 13.5%—and maybe more.

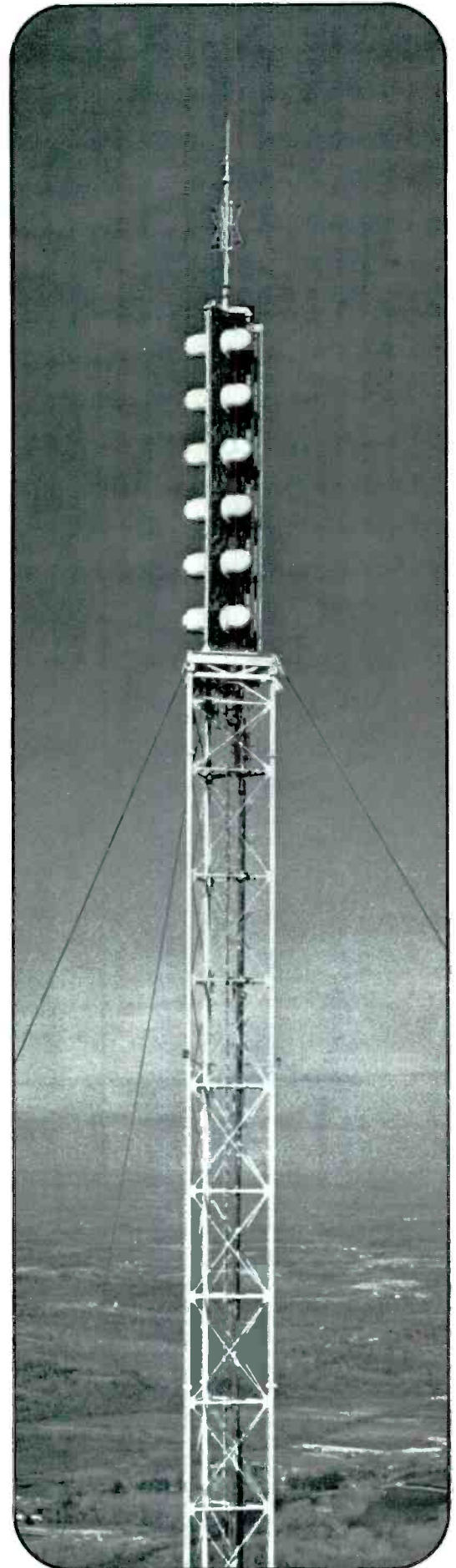
"Also, an overwhelming majority of viewers surveyed have reported improved reception," says Mr. Lass. "Needless to say, we are very happy with what CP has done for us."

For more information on what a Harris CP antenna can do for you, contact Harris Corporation, Broadcast Products Division, P.O. Box 4290, Quincy, Illinois 62301. 217-222-8200.

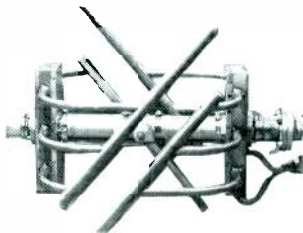
*circularly polarized



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WITN-TV7

18-foot ceilings.

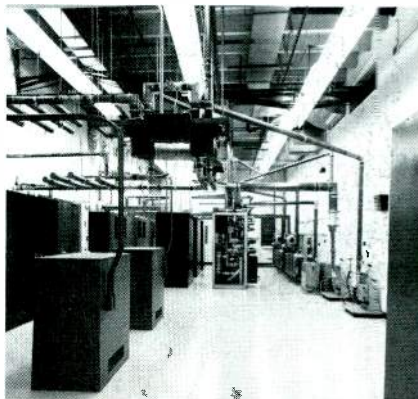
In commenting on the overall transmission system, Manning noted that it was a straightforward installation. Because of careful planning, 95% of everything went into place as planned. Manning, his transmitter supervisor, Tyson Houston, and one technician handled the entire equipment installation, including fitting, cutting and connecting the transmission line and installing the transmitter systems.

The TV and FM lines were installed at the same time. They were laid out for best WSWR and then cut, fit and installed in just eight working days.

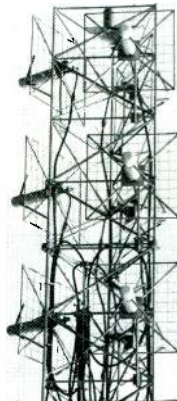
The transmitters arrived on site the last week in August 1979 and the Opto-Switchers were delivered in October. After completion of the installation, the RF system was checked out and it was determined that optimization was not needed.

75kW parallel transmitter system

The 75kW transmitter system is composed of three 25kW transmit-



Rear view of TV-7 transmitter room shows spacious layout. Power supplies for the 40kW FM transmitter are in foreground, with TT-75FH rear cabinets, Opto-Switchers and filter-plexers in background.

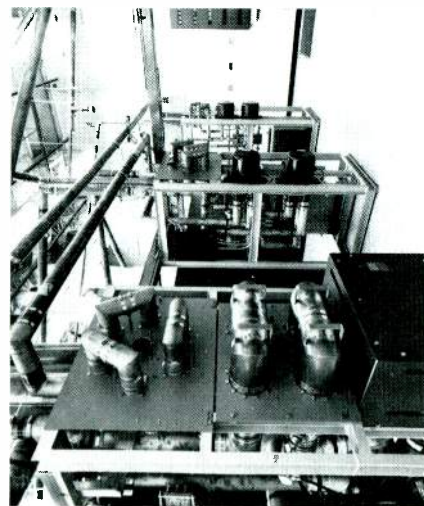


ters in parallel, with combiners and opto-switchers that permit switching any combination of the "A," "B" and "C" transmitters. The system, according to Manning, has worked out extremely well. To deliver the station's maximum 316kW in circularly polarized operation, 62kW of transmitter power are required. All three transmitters are on the air at the same time, operating conservatively, with ample power to spare.

Energy conservation

The air system for the new transmitter building has some unusual features. All outside air is filtered through a system which removes particles as fine as cigarette smoke. It is a positive pressure system, with fresh air being drawn in from the outside, through the filtering system, and then through a plenum to ducts under the transmitters. Each 25kW transmitter, including the power supply, has its own ducts.

During cold weather, provision is made for recirculating warm air to heat the building. When the temperature outside is above 65°, fresh outside air is used; when outside

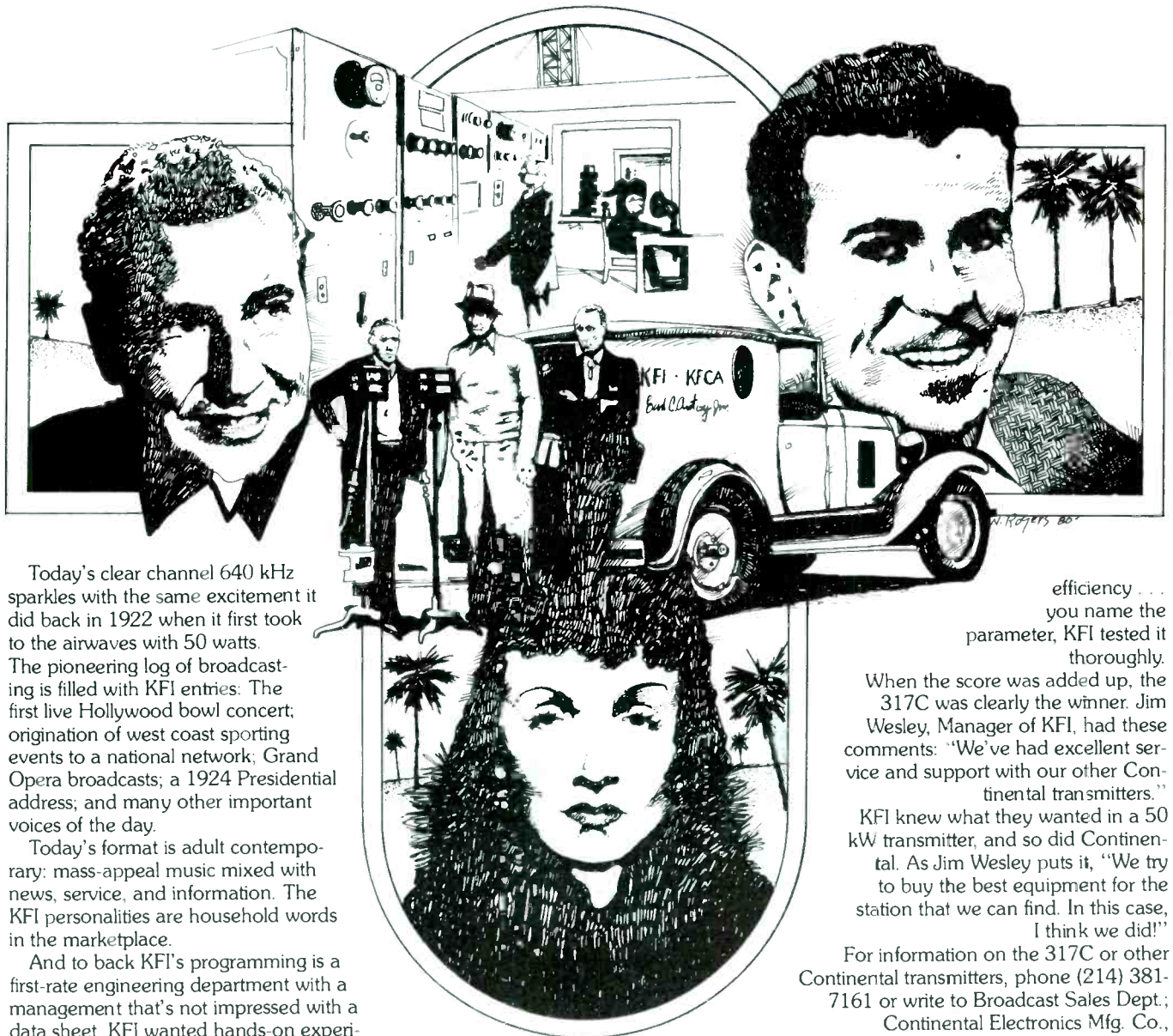


Opto-Switchers and transmission line for TV-7's 75kW transmitter.



WITN's circularly polarized TBJ Panel Antenna stands tall (left) after its long truck ride from RCA's Gibbsboro, NJ, antenna facility (above).

KFI KNOWS EXACTLY WHAT THEY WANT IN A 50 KW TRANSMITTER. SO DOES CONTINENTAL ELECTRONICS!



Today's clear channel 640 kHz sparkles with the same excitement it did back in 1922 when it first took to the airwaves with 50 watts. The pioneering log of broadcasting is filled with KFI entries: The first live Hollywood bowl concert; origination of west coast sporting events to a national network; Grand Opera broadcasts; a 1924 Presidential address; and many other important voices of the day.

Today's format is adult contemporary: mass-appeal music mixed with news, service, and information. The KFI personalities are household words in the marketplace.

And to back KFI's programming is a first-rate engineering department with a management that's not impressed with a data sheet. KFI wanted hands-on experience, so they approached the Continental 317C transmitter and its competition with extensive test requirements.

Example: the 317C was adjusted for 52 kW output and full modulation with a 4 kHz square wave. One hour and forty-five minutes later the transmitter was still operating without any significant changes. Distortion, shift, intermodulation,

efficiency . . . you name the parameter, KFI tested it thoroughly.

When the score was added up, the 317C was clearly the winner. Jim Wesley, Manager of KFI, had these comments: "We've had excellent service and support with our other Continental transmitters."

KFI knew what they wanted in a 50 kW transmitter, and so did Continental. As Jim Wesley puts it, "We try to buy the best equipment for the station that we can find. In this case, I think we did!"

For information on the 317C or other Continental transmitters, phone (214) 381-7161 or write to Broadcast Sales Dept.; Continental Electronics Mfg. Co.,

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Continental Electronics 

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DC control and th

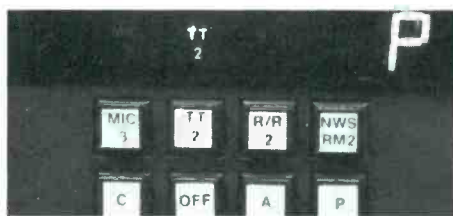


Introduced by Ramko in early 1975, DC control of all audio attenuation and switching has since proven itself so superior to conventional methods of audio control that most manufacturers of consoles are still trying to catch up.

The three major advantages are:

1. The DC controlled console exhibits far less susceptibility to RF pickup and external interference than conventional consoles that control audio directly. The conventional console must route all of its audio from the inputs to the various controlling elements (mixers, switches, etc.) and then finally to the console output. The DC controlled console, on the other hand, eliminates all of this audio wiring and thus reduces the pickup of outside interference.
2. It is also less prone to be affected by mechanical malfunctions or problems such as those from scratchy pots or noisy switches.
3. Since all audio switching is done through DC control (+6V or -6V), all internal and external functions (mute, on air lights, remote equip. start/stop) are programmed by simply setting internally located switches. Only one pot is needed to control both left & right channel audio simultaneously (stereo); thus the tracking error normally associated with dual ganged pots is eliminated.

No soldering or internal wiring is necessary to set up or change the "ON AIR" light relay, muting, or AUX MUTE relay. All of these functions are programmed through internally located switches, which can be changed at any time.



What's happening. At a glance.

The labeled, computer-type, push-buttons and corresponding back-lighted displays afford the operator instant recognition of the next happening, which one to push, and what is happening now or what has already occurred. Although we automatically send you a form (at time of ordering) that enables you to tell us how you would like your console labeled, your unit comes with a full set of additional labeling so that you may easily change at any time desired.

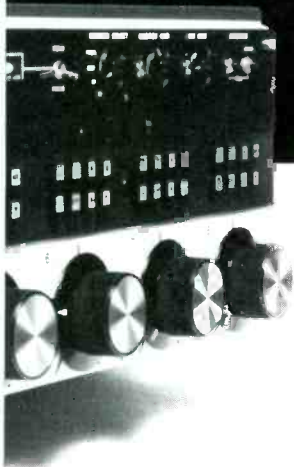
The large LED output mode display has two separate functions. The lighted

decimal point, which lights whenever that mixer is potted down into CUE, is also a blinking warning light whenever this channel has a live microphone activated. The second function of this display tells the operator whether he is in the Program (P), Audition (A), Cue (C) or Off (blank) mode. It is important to note here that the operator has 2 separate means of initiating the Cue mode. One in the normal fashion of potting down and one via the output mode select switch (C). Thus he may go directly to Cue by pushing (C) without having to change the mixer setting.

The exclusive patch panel for selecting input gain offers extraordinary flexibility. At any time, any input can be made to accept anything from a mic level through a line level signal. Not just mic or line level but anywhere in between. Thus on our 10 mixer model you have a minimum of 4,194,304 combinations of mic through line level inputs. And you can accommodate mics and high level inputs or the same mixer simultaneously. You simply plug in the prescribed resistor(s), which are included with your console, and that's it.

All the push-buttons on the console are super-quiet. Not the usual loud, clanking, short-lived mechanical switches. The push-buttons switch and route the audio through solid-state logic, error-free, in less than 2 tenths of 1 millionth of one second. No pops, clicks or momen-

superior console.



Features

- Dual channel
- 5, 8, & 10 mixer versions
- 4 inputs per mixer
- Patch panel gain select inputs
- Back-lit status displays
- Built-in talk back
- Solid state led VU meters
- Mono/phase meter on stereo consoles
- Mono output on stereo consoles
- Custom lettered input push buttons
- Two cue modes (push button and/or pot down)
- Plug in electronics
- Differential balanced inputs and outputs
- DC control—no audio on front panel
- Zero tracking error on stereo consoles
- 3 power supplies w/AC line filtering
- High Z bridging inputs
- Switch selectable cue and mute on all inputs
- Optional digital clock and production timer
- Optional remote equipment start/stop
- 4 year parts and labor warranty
- 2 week trial period

tary feedback with partially actuated switches.



The pure clean difference.

It all comes down to a marked difference in reproduction.

FIRST, all inputs and outputs are solid-state balanced. Unlike transformers they are quite insensitive to impedance mismatches. In fact the mismatches can be millions of times. And can be more than the specified impedance without any noticeable effect on distortion or response. Not so with the average audio transformer as even a couple times mismatch can invalidate the console's performance.

SECOND, our solid-state devices exhibit far less distortion and flatter response than even the finest transformer available today.

THIRD, since the solid-state devices are purely resistive they are much less susceptible to hum, RF and other external interference.

A FOURTH and very large consideration is the LED "VU" meter. This solid-state meter (SSM) has an exceptionally fast response and you can actually see overmodulation peaks. With a mechani-

cal meter you can't. Couple this with the electronic circuit that gives the SSM "VU" ballistics on the decay and you end up with a tighter, cleaner sound than ever before. At the same time, your normal audio power level is still maintained. In addition, the bright red and yellow LED display is legible up to 30 feet away.

Although the mono DC-38's have a meter for each output, we took the stereo versions a step farther. In addition to the left meter and the right meter (switchable, Aud. or Prog.), we included a third to monitor the stereo mix (mono) output.

By throwing a switch located next to it, this meter is converted to a phase check meter and may be used to check the stereo phasing of any and all of the console input sources.

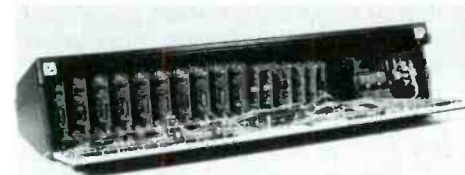


Reliability particulars.

All of the LED's and lamps have a life expectancy of 11 years. The push-button select switches are spec'd by the manufacturer at 20,000,000 operations (1 actuation every 30 seconds, 24 hours a day for over 19 years). The mixer pots are a custom design using glass-hard, conductive plastic. The mechanical construction of these pots is so sturdy

that they tolerate even the heaviest handed operator.

In addition, all of the quad operational amplifiers are burned in for 3 days to insure reliability. Since the power supply is the backbone of your console, you will find not one, but three separate supplies! One for the main audio, one for the monitor amplifiers, and one for the displays. These supplies are fully protected against shorts and over-heating and utilize massive heat sinking rated much higher than necessary.



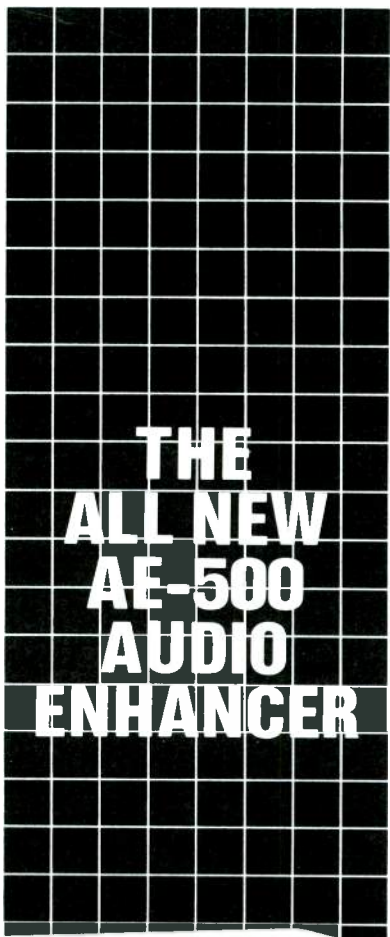
The two week trial.

Put the DC-38 on trial for a full 2 weeks. Put it through a battery of tests or on the air, or both. You'll find that with all that sophistication it's a breeze to use and amazingly rugged.

Write Ramko Research, 11355 Folsom Blvd., Rancho Cordova, CA 95670. Or if you can't wait for the mail, contact your nearest rep or call (916) 635-3600 collect and arrange for a 2 week free trial.

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- DA-100 Audio/Video Dist. Amplifier
- VP-200 Video Processing Amplifier
- VG-375 Videoguard Encoder
- VE-400 Image Enhancer
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WITN-TV7

temperatures are below 65°, the warm inside air is recirculated. The front office/operating area is on a separate air conditioning system so that when the station has completed its planned shift to remote control and the facility is unattended, there will be no need to air condition this space.

A large work area is provided on one side of the building. Double doors of solid steel at the rear of this space open onto a ramp that permits driving of vehicles into the work area. Another large room at the rear of the building has a separate outside entrance. It is reserved for the owners of communications facilities on the tower, who use it for their two-way radio equipment and inside maintenance.

Back-up power for the transmitting plant is provided by a 500kW Caterpillar diesel generator.

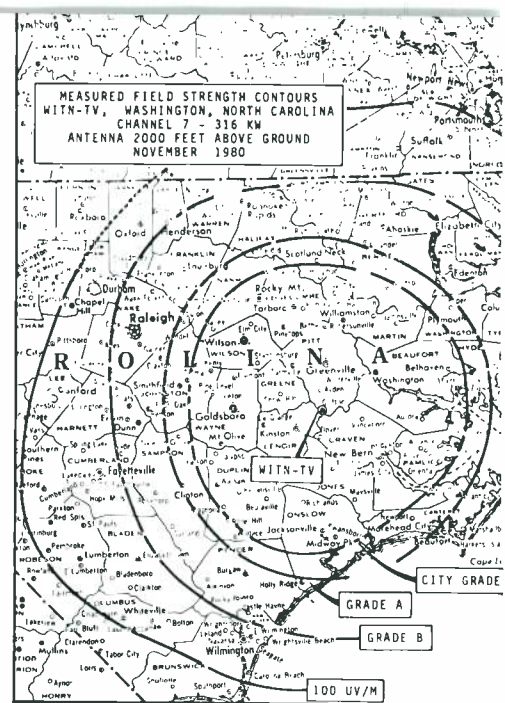
Designed for hurricanes

The WITN tall tower was designed and constructed by Kline Iron and Steel and is said to be the heaviest 2000 foot broadcast tower ever built. Before erecting the tower itself, a major construction project had to be completed. This involved driving more than 500 pilings into the sandy, water-saturated soil, followed by a network of reinforcing steel and hundreds of tons of concrete. The extensive preparation was necessary because of the weight of the tower and its hurricane-belt location.

The new tower has nine anchors, three for each side, with the outer anchors extending 1500 feet from the base. Nine guy wires are provided for each leg.

The time frame for completing the tower and transmitting plant was unusually short. However, because of careful planning, construction and equipment installation, problems were minimal. Roberson noted that contracts were awarded in December 1978, little more than 10 months before the October target date for the new broadcast service.

After months of preparation, the tower base, with its 8 7/8-inch solid steel legs, was set in place on July 1, 1979. The TBJ circularly polarized antenna was lifted into place atop the tower on October 25, less than a week before the established air date. Finally, the last and tallest place of the tall tower—the aircraft beacon for the top—was installed at 3 pm on October 31, 1979, just three hours before air time for the new system.



Keeping on top

In promoting its new CP broadcast operation, WITN-TV made use of all news media—television, radio and print—to advise its viewers of TV-7's extended reach and its brighter, clearer picture. This promotion explained to the TV-7 audience that the tall tower "broadcasted a television signal over 100 miles in all directions:

- reaching more than two million people in nearly one million homes;
- in an area of about 28,150 square miles; and
- offers a better than 20% increase in the station's service."

WITN-TV celebrated its 26th anniversary of broadcasting in September 1980. With the transmission system completed, attention is now being directed to upgrading studio operations. Additions have already been made. Two RCA TK-46 cameras have been acquired, two RCA TK-28 telecine systems are in place, and further equipment acquisitions are in the planning stage.

Some measurements have already been made to show WITN's improved TV coverage with CP antennas, and similar measurements for the FM antennas are planned for this spring. During the field measurements, Manning found that there were no holes in the contour data.

At the receiver, ghosting could still exist with normal rabbit ear antennas, but the signal and color remained steady in moving around in a given room. However, even fringe area reception could be improved with suitable CP receiving antennas. Furthermore, orientation of roof receiving antennas are less critical now that WITN is using its CP antennas for transmission. □

Never Play Naked Records On the Air!

Your records need protection. From minor scratches, dust, dirt, and just too much handling, no matter what your program format.

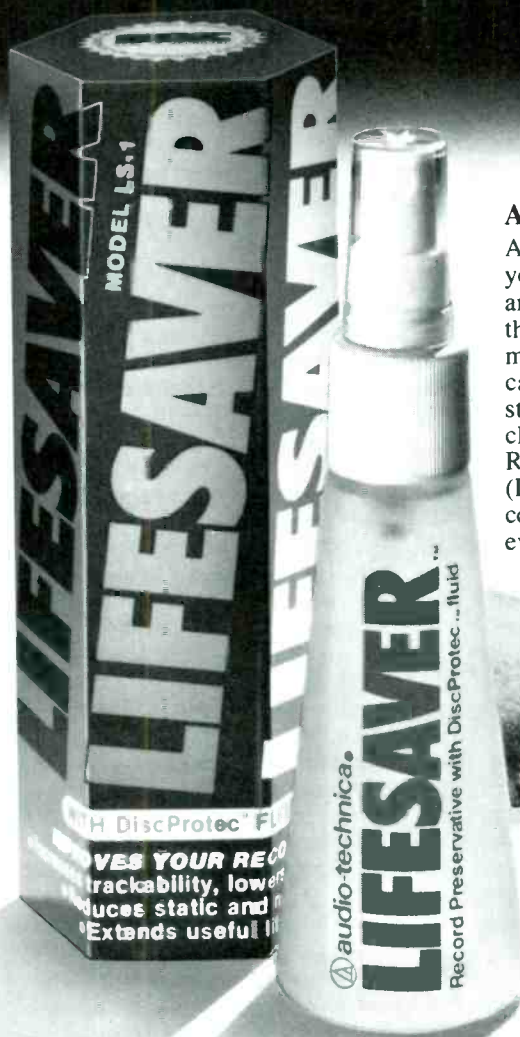
Introducing Lifesaver with Disc-ProTec™ Formula. A one-step record preservative, anti-stat, and dry lubricant. One treatment lasts 50 plays or more (Len Feldman* proved Lifesaver lasts 100 plays, but we'll be conservative).

Records Sound Better Than New

From the very first audition, a Lifesaver-treated record will have less distortion than even a new untreated record. And 50 or even 100 plays later, it will still outperform that new record, with no build-up of record noise!

Fewer Repeats, Repeats, Repeats...

With most Lifesaver treatments, minor scratches and nicks play right through without repeats (no guarantee, but the odds are with us). So if you're into golden oldies, or vintage jazz, or classical music, you don't have to cross your fingers, or do those abrupt fades in the middle of the best part. Nor will you need extra copies of the records on your "heavy playlist."



A Sub-microscopic Coating

A quick "spritz," a gentle buffing, and you've dry-coated the record with an anti-stat/lubricant just microns thick. You can't see it even with a good microscope, you can't hear it, but you can feel the surface get slick and stay slick, and you'll notice no static cling of dust or record sleeves. Record cleaning is actually improved (Lifesaver is unaffected by any common wet or dry methods). And even years later, when you dig through your music library the Lifesaver-treated records will still be protected, still sound great.

Save Records. Save Money

Get the dust, the static, and the minor scratches out of your music library today. Preserve the investment in your music and effects production library. Start using Lifesaver from Audio-Technica today. You'll sound better tomorrow!
AUDIO-TECHNICA U.S., INC.,
1221 Commerce Drive,
Stow, OH 44224. Dept. 21BE.

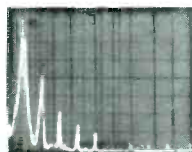


audio-technica.

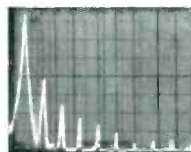
SPECIAL INTRODUCTORY OFFER

To encourage you to prove the effectiveness of Lifesaver treatment, we'll send you a full-sized \$12.95 bottle to treat 60 sides for just \$5.00. Just send this ad (or a copy) and your letterhead. Just one sample to a station, please. And we'll tell you where you can get low-cost refills, plus see and hear other fine Audio-Technica products, including the latest microphones, headphones, other record care products, and the best cartridges and tone arms in the business! Send today.

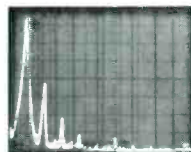
*Here's an excerpt from the Len Feldman report in Audio Magazine. We'll send you the full story with your order.



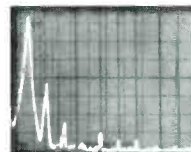
Harmonic distortion of an untreated disc during first playing



Harmonic distortion of an untreated disc after 100 playings



Harmonic distortion of an identical disc, first playing after LIFESAVER treatment. Distortion is immediately reduced.



Harmonic distortion of a LIFESAVER-treated disc after 100 playings. Distortion remains lower than a new, untreated disc.

CP antenna roundup

By Bill Rhodes, editorial director

A growth industry sprung up in 1977 when the FCC amended its television transmission requirements to permit broadcasters to use circularly polarized (CP) signals. The previous requirement was for horizontal polarization, in which the electric field vector remained parallel to the earth's surface. With CP antennas the electric field rotates helically around the axis of the propagating wave. Thus, at any particular point, the electric field may be at any angle with respect to the earth's surface.

In a practical sense circular polarization has provided both broadcasters and listeners certain advantages. Broadcasters have reported significantly improved area coverage with CP transmission—and this was a direct result of listeners receiving higher signal levels and, for TV, clearer pictures.

A major thrust for CP transmission in FM came from broadcasters wanting to achieve better reception in automobiles. Because of its horizontal and vertical wave components, the CP signal has a superior reception for the typical whip antennas on cars.

On the television side, home viewers report improved reception, less critical antenna orientation, reduced ghosting and less co-channel interference. Some results of going to CP transmission for some broadcasters are happier viewers and higher ratings.

The following roundup looks briefly at currently available antennas for CP applications. Detailed data on these antennas may be obtained by contacting the manufacturer or by using the reader service card and the number following each listing.

Bogner Broadcast Equipment
401 Railroad Avenue
Westbury, NY 11590

VHF/UHF CP Antennas

- Low (1.5-3kW) and Medium (3-25kW) power antennas for transla-

Specifications and performance data reported herein are from manufacturers' data. Buyers should consult detailed data sheets before purchasing any of the reviewed products.

tor and low power station (High VHF band III; UHF bands IV and V; SHF for ITFS, MDS, ENG)

- Full line of patterns from omnidirectional to directive for CP low power; wide range of patterns and gains

- High power (up to 220kW input) UHF broadcast antenna line convertible to CP operation as needed

- Multichannel coverage, available as an option, up to five contiguous channels

- Designed to withstand corrosion, wind, rain, ice, snow, lightning and condensation.

Circle (79) on Reply Card

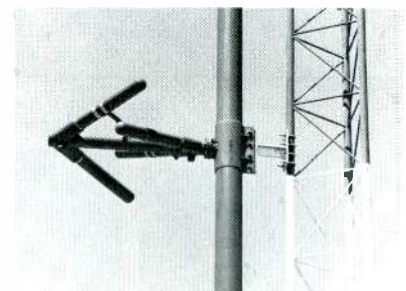
Cetec Broadcast Group
1110 Mark Avenue
Carpinteria, CA 93013

The Cetec Broadcast Group selection of CP antennas includes three models for FM and one for TV. These systems for broadcasters, plus a new TV/CP system under test, are described briefly.

CP antenna for FM broadcast (JHCP)

The JHCP antenna is a circularly polarized FM antenna for the broadcaster who wants extremely high-input power capability, coupled with the patented design that has become an industry standard. This design is sophisticated in concept yet simple in execution. Each bay consists of a radiating element with its associated 6 1/8 inch (15.56 cm) interbay feed line. The element and line are supported by a heavy brass casting which is attached to the support structure by its mounting bracket.

The radiating element consists of four 3-inch (7.62 cm) diameter quarter wave brass arms attached to a 3 1/4 inch brass support internal feed boom by brass castings. The interbay feed lines and boom are pressurized out to the feed point by



the transmission line pressurization system.

- 1-12 bays
- High-power corona-free operation
- 30-80kW safe power rating
- True circular polarization
- Two-year material and workmanship warranty

Circle (80) on Reply Card

CP antenna for FM broadcast (JBCP)

The Jampro model JBCP antenna, manufactured by Cetec Antennas, is a circularly polarized FM antenna designed for applications requiring relative insensitivity to icing along with high antenna input power. The antenna elements are fabricated of high strength thick wall copper with a 3-1/8 inch outside diameter. The



JBCP antenna will handle up to 40kW per bay and up to 120kW per system, depending upon the number of bays, shunt line size and input connector.

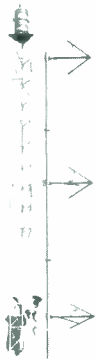
- 1-12 bays
- 40-120 kW safe power rating
- can be diplexed with a VSWR of 1.2 or better.

Circle (81) on Reply Card

CP antenna for FM Broadcast (JSCP Series B)

The Cetec B Series JSCP antenna is an improved version of a circularly polarized FM broadcast antenna that has become one of the industry's most popular CP antennas. Each bay consists of a radiating element with associated 3 1/8-inch (79.4mm) flange, and both are supported by a heavy casting bolted to the mounting bracket for that bay. The interbay feed lines are joined by 3 1/8-inch flanges, using molybdenum disulfide-coated, silver-plated inner conductor connectors for maximum contact life and minimum power loss. These special connectors are also used in the connection between the element and line.

The radiating element consists of four quarter-wave arms attached by bronze castings to a support boom, which also contains the element feed. A tuning cap, incorporating a large-radius tip, is supplied on each arm, which eliminates corona



while facilitating field tuning, even to a slightly different operating frequency.

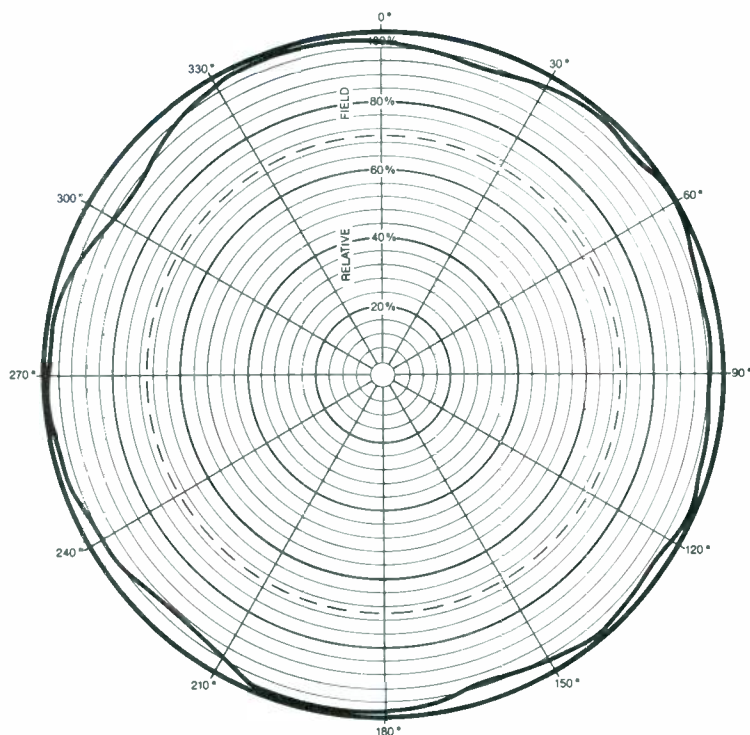
- 1-14 bays
- 10-40kW safe power rating
- Applicable to stereo SCA and quadraphonic broadcasting
- True circular polarization
- Two-year material and workmanship warranty
- Factory-tuned on a "customer" structure
- Custom options available.

Circle (82) on Reply Card

CP antenna for TV broadcast (spiral)

Cetec's circularly polarized Spiral antenna provides the television broadcaster with a proven, in-use

design, featuring good performance in a rugged, simple mechanical structure. The antenna is customized for each application and can be supplied for any single VHF or UHF



Typical measured azimuth pattern for Cetec spiral CP/TV antenna

The machine of the 80's.

THE GARNER 1100

It's no secret that one-inch will be the videotape of the 80's. If you're planning to convert to one-inch, invest in the Garner 1100 degausser to get the maximum use of your one inch tape. With Garner's one-pass, endless belt operation, you get complete erasures at the rate of 13 reels per minute.

Put the Garner 1100 to the test yourself. Use the 1100 for 30 days. If it doesn't live up to your standards, just return it to us.

We're convinced that you'll agree that the Garner 1100 is the machine to handle one-inch degaussing. It's the machine of the 80's.



Dependability... Guaranteed

GARNER INDUSTRIES 4200 North 48th Street, Lincoln, NE 68504 Phone (402) 464-5911

Circle (32) on Reply Card

If we had set out to give you only
the features our competition gives you,
this is where we'd be today.



Most VTR units give you only a fraction of the features you might want from a video tape recorder. So we didn't stop where our competition did. We kept on adding features. Until we developed the most versatile 1" machine on the market.

Compare the 3M TT-7000 VTR and NTC-10 Time Base Corrector to the competition. Nobody puts together more of the features you want than 3M. And once you see our unit, we think you'll agree that buying anything else is like getting half a machine.

The 3M TT-7000 Video Tape Recorder gives you:

- Auto track following (ATF) ¼ reverse through 2x forward (optional).
- Video and sync confidence heads.
- Three channel audio confidence heads.
- Video sync channel.
- All DC motor and servo tape transport.
- 19" rack mountable with full dust cover.
- Front panel plug-in modules.
- Frame accurate insert and assemble editing.
- Dual tape timer with zero memory.
- Tape speed override on front panel.
- Stop tone and cue-up (0, 3, 5, 7 sec. preroll).
- Contact closure and TTL external interface.
- Variable speed forward/reverse shuttle.
- Still frame jog.
- Autochroma and color framing.
- Audio 3 record in play mode (built-in speaker).
- Instant stop action from play or slo-mo (with ATF option).
- Instant audio bias level adjust.
- Video level calibrate marker.
- Preset/Manual tracking select on front panel.
- Fixed precision rabbited drum tape guide.
- And low RF, high temperature and low voltage alarms.

Our Time Base Corrector comes complete with its own list of standard features:

- Sixteen line correction window.
- Ten bit quantizing.
- Four times subcarrier sampling.
- 65 dB signal-to-noise ratio.
- Velocity compensation.
- Digital one line drop out compensator.
- Compact size (8¾" high by 17½" deep by 18½" wide).
- 45 pounds total weight.
- Portable cabinet or rack mountable.
- And front panel plug-in modules.

Add it all up, and you've got the most complete VTR/TBC package on the market. For a free demonstration, call (612) 733-7914 or write 3M/Mincom Division-Video Products, 223-5E 3M Center, St. Paul, MN 55144. In Canada contact 3M Canada, Inc., P.O. Box 5757, London, Ontario, N6A-4T1. In Alaska contact 3M Company, 5331 Minnesota Drive, Anchorage, AK 99502.

Get the complete picture.



3M

Circle (33) on Reply Card

Roundup

channel: 2-70. Dependent upon system requirements, the Spiral is built in either two or three sections and provides omnidirectional, circularly polarized power gains from 2 to 15 (or even higher on special order).



Cetec spiral omnidirectional CP/TV antenna

- Horizontal circularity: ± 1.0 dB VHF; ± 0.5 dB UHF
- Axial ratio: 1.5dB typical
- Beam tilt and null fill standard
- VSWR: less than 1.08 to 1 across 6MHz channel

Circle (83) on Reply Card

Ring Loop CP/TV antenna

As this issue is going to press, Cetec's ring loop CP/TV antenna is undergoing acceptance tests at a station in California. This is a directional antenna with a 0.5 degree mechanical beam tilt. There are 60 feet of ring panels on two sides, and the antenna will have radomes for weather protection.

Circle (84) on Reply Card

Comark Industries
PO Box 229
Southwick Industrial Park
Southwick, MA 01077

Circularly Polarized Antenna (CI-6000)

The FMC series of circularly polarized antennas are basically $1\frac{1}{2}$ turn helices separated one wavelength apart. The radiation centers of both the vertical and horizontal components are identical, giving phase coincidence for true circular polarization.

The series utilizes identical radiating elements for both the lower power (L) and high power (H) series. The L series utilizes $15/8$ -inch feed line while the H series uses $3\frac{1}{8}$ -inch feed line. Both series of antennas are available in

systems that incorporate 1 to 14 elements.

- $1\frac{1}{2}$ turn circular polarized helix (same phase center for horizontal and vertical field components)
- 1.7-inch diameter copper elements minimize corona effects. Allows 20kW testing of basic elements.
- Available $1\frac{5}{8}$ -inch, $3\frac{1}{8}$ -inch as standard feed systems. Larger size feed systems available for special applications.
- Supplied with the triple stub tuner for matching to any supporting structure
- Optional 400W, 230 Vac de-icers available. Shield cable designed for trouble-free service.

Circle (85) on Reply Card

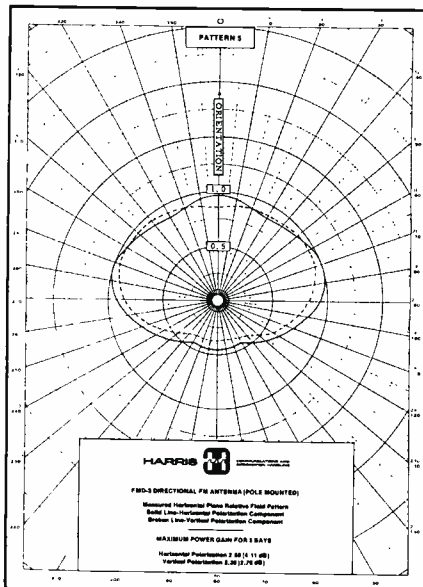
Harris Corp.
Broadcast Products Div.
PO Box 4290
Quincy, IL 62301

Harris offers a line of six circularly polarized FM antennas, each having distinct performance features. A brief summary of each follows.

Direction dual polarized FM antenna [FMD-(x)]

The Harris FMD-(X) is a directional dual polarized FM antenna designed for pole mounting. It is available with up to eight bays and with either $1\frac{5}{8}$ -inch or $3\frac{1}{8}$ -inch EIA 50 Ω female input.

- Up to 40kW power input
- No de-icing required under normal environmental conditions
- Up to eight bays (x = bays)
- Internal feed point to radiating element
- Pattern tested at factory



Pattern for three-bay Harris FMD-3 polarized directional FM antenna

- Field trimming normally not required
 - High power handling capability
 - Brass construction
 - Stainless steel support brackets
 - Wide bandwidth characteristics
- Circle (86) on Reply Card

Super-Power circularly polarized FM antenna (FMH)

The Harris super-power FMH circularly polarized FM antennas feature unusually high power handling capabilities, good bandwidth characteristics and multi-station capability.

- High power handling capability
- Available in three models
- Internal feed point to radiating element
- Arrays up to 12 bays
- Multi-station capability
- Power input to 120kW
- Good bandwidth characteristics
- Brass construction
- Silver plated inner-conductor connectors
- Radiused element tips to avoid corona problems
- Stainless steel support brackets and hardware

Circle (87) on Reply Card

Dual-Cycloid circularly polarized FM antenna (FMS)

With the Harris Dual-Cycloid Type FMS antenna, a station's effective radiated power will still be determined by the signal radiated in the horizontal plane. This is determined by the antenna gain in the horizontal plane multiplied by the power input to the antenna.

Any number of elements from one to 16 may be utilized, providing maximum flexibility in the selection of power gain for a particular installation. Antennas with null fill, beam tilt and special horizontal to vertical power splits (other than 50/50) are available.

- Up to 40kW power input
- 1-16 bays

Circle (88) on Reply Card

Dual-Cycloid II and Dual-Cycloid III circularly polarized FM antennas (FMC)

Harris' Dual-Cycloid II circularly polarized FM antenna provides all of the electrical advantages of the Dual-Cycloid, in a lighter weight, low silhouette design for minimum windloading.

- Input power to 12kW
- 4-12 bays

Designed for lower power stations, Harris' Dual-Cycloid III circularly polarized FM antenna is an end-fed version of the Dual-Cycloid II—it is lighter in weight, and has less windloading.

- Input power to 7.5kW
- 1-8 bays

Circle (89) on Reply Card

Low Power Circularly Polarized FM Antenna (FML)

The Harris low power FML circularly polarized FM antenna features good bandwidth characteristics and the same rugged construction as Harris' higher-power FM antennas.

- Power input handling capability: 9kW end fed; 12kW center fed
- Two versions available
- Excellent bandwidth capability
- 1-14 bays
- Internal feed point to radiating element
- Brass construction
- De-icers not required
- Stainless steel support brackets and hardware
- Hemispherical element tips to avoid corona problems

Circle (90) on Reply Card

Self-supporting circularly polarized FM antenna (FMP)

The Harris FMP self-supporting circularly polarized FM antennas feature unusually high power handling capabilities, excellent bandwidth characteristics and multi-station capability. Because the elements are center mounted, interference from the support pole is eliminated.

- Power input to 64kW
- Center mounting eliminates pole interference
- 1-12 bays
- High power handling capability
- Internal feed point to radiating element
- Multi-station capability
- Good bandwidth characteristics
- No heaters, de-icers or radomes normally required
- Brass construction
- Silver plated inner-conductor connectors
- Radiused element tips to avoid corona problems
- Stainless steel support brackets and hardware

Circle (91) on Reply Card

Harris TV CP Antennas

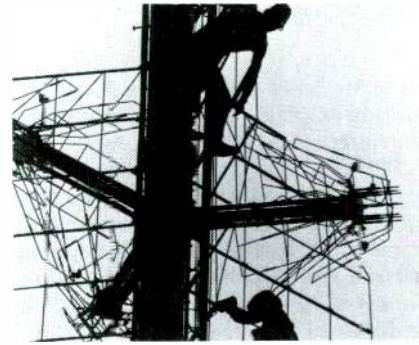
Harris currently offers two circularly polarized TV antenna models—the Cavity Backed Radiator (CBR) and the CPV antenna. Each differs somewhat in individual features.

CPV antenna for TV

The CPV antenna is designed to provide broadcasters with a CP

antenna that provides windloading specifications comparable to Batwing and traveling wave antennas. Now a broadcaster may simply replace his present antenna with a CPV—in most cases with minor modifications to his existing tower. In most cases the tower loading of the CPV is below that of the comparable Batwing or traveling wave antenna.

The CPV offers an excellent axial ratio of within 2dB at any azimuth angle. It has excellent pattern versatility in that both omnidirectional and directional horizontal



The Harris CPV circularly polarized TV antenna during installation at WESH-TV, Daytona Beach, FL. (Photo courtesy of Harris.)

latest
Do you know the score?

UHF TV	NEW STATIONS								1980
BOGNER ANTENNAS	WBTI	KADN	WSFJ	WMDT	WXAO	WHMC	WRTS	KCWY	WHMM
	KMXN	KNDU	WDDD	WFTI	WLYJ	KTBO	WGGN	WVGA	
ALL OTHER ANTENNAS	WUHF	WTVE	KAUT	WFUM	KOKI	WPDE			
	WCGV	WOOD	KNBN	WTJC	WXTV	WLRE			

If you're involved in broadcasting systems you know us. But are you aware that in UHF we're now also the *biggest* as well as the *best*? The fact that a vast majority of all new 1980 UHF TV stations use a Bogner antenna is only part of the story. Since 1964 we have put into broadcast use more than 600 slot arrays, with over thirty 55kw to 200kw slot antennas during the past three years alone. Antennas that are all still meeting their promise — trouble-free, dependable operation with solid coverage.

Put together all the qualities you want in your antenna: exceptional performance, proven durability, economy and on-time delivery, and you'll know the score about Bogner. We have competitors but no equal.

Prove it to yourself. Talk to the stations listed above (or call Len King for the names of all TV stations using Bogner manufactured antennas). Find out first hand why Bogner is the champion of UHF antennas. Bogner Broadcast Equipment Corp., 401 Railroad Avenue, Westbury, New York 11590, (516) 997-7800.

BOGNER

CHAMPIONSHIP BROADCAST ANTENNAS

WBTI-Cincinnati, OH; KMXN-Abuquerque, NM; KADN-Lafayette, LA; KNDU-Yakima, WA; WSFJ-Newark, OH; WDDD-Marion, IL; WMDT-Salisbury, MD; WFTI-Poughkeepsie, NY; WXAO-Jacksonville, FL; WLYJ-Clarksburg, WV; WHMC-Conway, SC; KTBO-Oklahoma City, OK; WRTS-Spartanburg, SC; WGGN-Sandusky, OH; KCWY-Casper, WY; WVGA-Valdosta, GA; WHMM-Washington, DC; WUHF-Rochester, NY; WCGV-Milwaukee, WI; WTVE-Reading, PA; WQOW-Eau Claire, WI; KAUT-Oklahoma City, OK; KNBN-Dallas, TX; WFUM-Flint, MI; WTJC-Springfield, OH; KOKI-Tulsa, OK; WXTV-Greenville, MS; WPDE-Florence, SC; WLRE-Green Bay, WI

SEE US AT NAB BOOTH 517

Circle (34) on Reply Card

Roundup

patterns may be provided. In the omnidirectional mode the antenna provides circularity of $\pm 2\text{dB}$.

The CPV is most commonly configured with a dual line feed, so that upper elements are fed separately from the lower elements. This affords the broadcaster the redundancy of two lines on the tower, in addition to the redundancy of having half the antenna available in the event of failure in the other half. The horizontal/vertical elements are both coincident and separate (as in

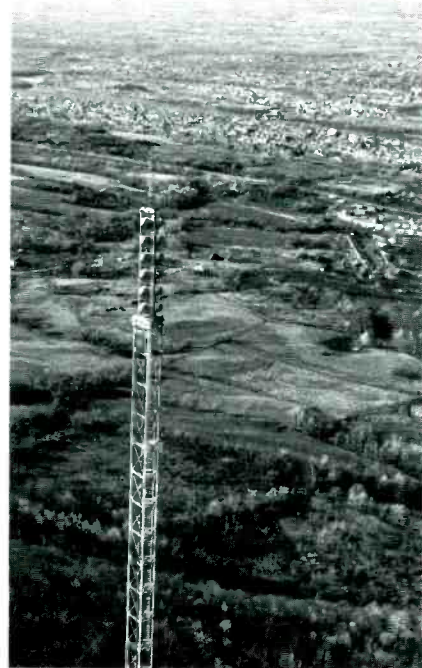
the CBR), affording the versatility inherent in this configuration.

The CPV is available for Channels 2 through 13, and is top mounted.

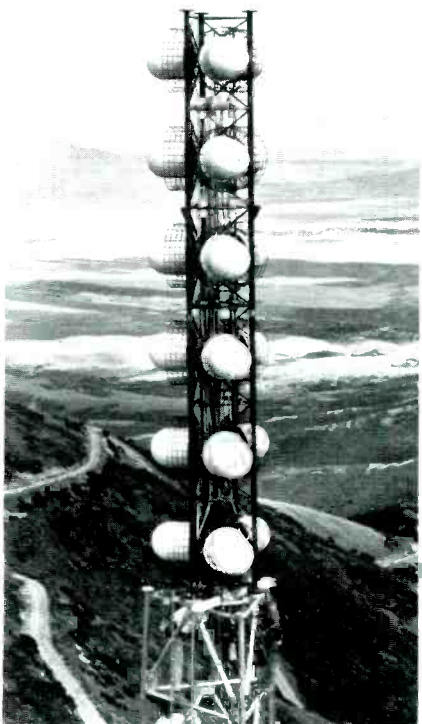
Circle (92) on Reply Card

Cavity backed radiator (CBR)

The Harris Cavity Backed Radiator circularly polarized broadcast TV antenna provides excellent axial ratio characteristics as a direct result of the precise tailoring of the radiated pattern by the cavity. It is also a wide band antenna, which means that it has stable impedance and pattern performance. This offers the capability of multiplexing,



Shown here is WAST's Harris CBR (Cavity Backed Radiator) TV antenna mounted on the station's original tower. Since WAST-TV, Albany, NY, switched to CP in September 1979, responses indicate an overwhelming majority of the station's audience has improved reception, with latest figures showing a jump in ratings as a direct result of its new CP antenna. (Photo courtesy of Harris.)



This Harris Cavity Backed Radiator (CBR) six bay circularly polarized TV antenna at KBYU-TV, Provo, UT, is billed as the first CP TV antenna installed west of the Mississippi. (Photo courtesy of Harris.)

What makes Sky-Hi the best for ENG?

With more than 20 years of experience making Sky-Hi telescoping masts, TMD has a way of making it the best telescoping mast for ENG.

Because they're made of high quality extruded aluminum tubing, because they don't whip when the wind builds up, and because of the other features you see here, Sky-Hi masts have been specified for more than 1000 ENG installations.

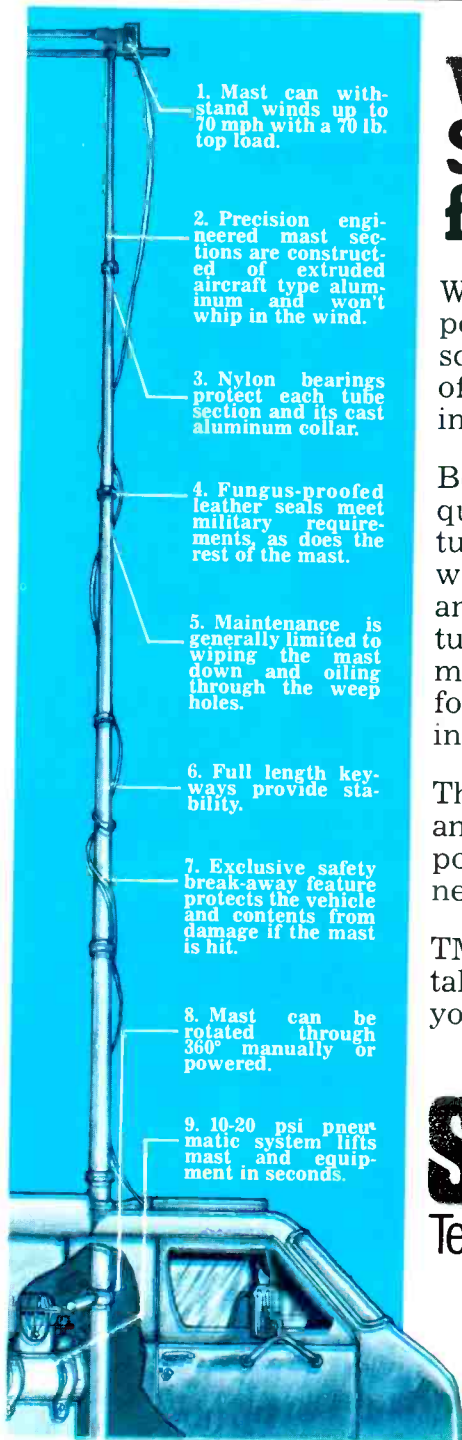
There are many sizes available, and now the 43' mast, the most popular size for ENG, has a new, lower nesting height.

TMD engineers are ready to talk to you about the mast you need.

SKY-HI[®]

Telescoping Mast Division

The Will-Burt Company
249 W. Henry St.
P.O. Box 126
Wooster, Ohio 44691
(216) 262-7010



Circle (35) on Reply Card

THE STUDER STANDARD

Good is not enough, only excellence is adequate.

The Studer A80/RC Mk II. For studio mastering. Or cutting master lacquers. Or broadcast syndication or master film soundtracks. Whenever you need a 1/4-inch master recorder you can base your reputation on, you need a machine built to the unique Studer standard of excellence. The Studer A 80/RC Mk II.

Compare the editing facilities of the A80/RC Mk II with any other master recorder on the market. And the unique Studer real-time (positive and negative) digital tape position indicator and zero-locating feature. Compare the noise level of its electronics. Check out the wide variety of available head configurations, including a pilot tone version with or without resolver for

film sync applications. Vari-speed control (± 7 musical semitones) is standard, as is a monitor panel with built-in speaker/amplifier which lets you cue the tape right at the machine without tying up your monitor system.

As for servicing ease, the A80/RC Mk II is simply incomparable. All the logic boards have LED status indicators so a failure can be spotted instantly. You can even take apart the entire recorder with the two Allen wrenches supplied.

Of course, there aren't any secrets to the incredible rigidity of the die-cast, precision-milled A80 frame and the extraordinary machining tolerances of its stainless steel headblock. Only Willi Studer's characteristic unwillingness to compromise.

Others could make their heads and motors as well, no doubt; they just don't. Servo-controlled reel torque and capstan drive (independent of line frequency or voltage) aren't exactly new concepts. Nor is PROM-logic transport control. But try them all out and see whether you can settle for anything less than the Studer A80/RC Mk II.

Second best is very good today. But not good enough.

Studer Revox America, Inc.
1425 Elm Hill Pike, Nashville, TN 37210
(615) 254-5651
Offices: Los Angeles (213) 780-4234
New York (212) 255-4462
In Canada: Studer Revox Canada, Ltd.

STUDER REVOX
Circle (36) on Reply Card



Roundup

which may take the form of multiple TV channels or a combination of Channel 6 and certain FM frequencies.

The CBR, a panel-type antenna, also offers great horizontal pattern versatility. The antenna can be configured either for an omnidirectional pattern or for a wide variety of directional horizontal patterns. In the omnidirectional mode it provides circularity within ± 2 dB.

Finally, the CBR features coincident and separate horizontal/vertical dipoles. This offers numerous benefits, including a) the capability of providing an excellent axial ratio; and b) the capability of being configured in either a horizontally or circularly polarized mode. In fact, the feed system can be configured at the time of manufacture to provide a switching capability. In the event that a broadcaster has a transmitter problem, he can revert to horizontal polarization at full power.

The CBR is available for Channels 2 through 13, and may be either side or top-mounted.

Circle (93) on Reply Card

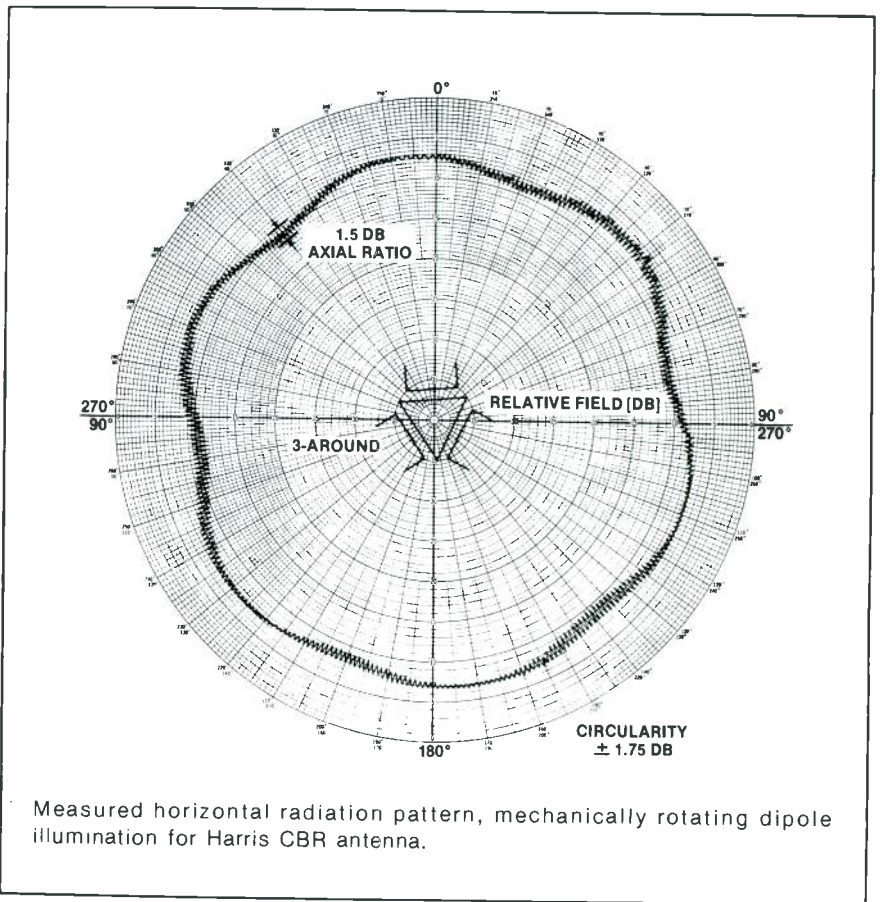
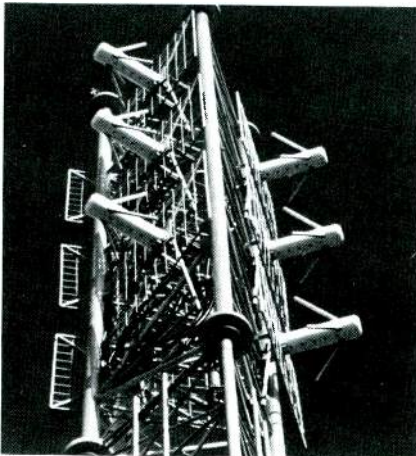
RCA Broadcast Systems Front and Cooper Streets Camden, NJ 08102

RCA offers six circularly polarized antenna designs for the VHF broadcast channels. A brief description of these systems follows.

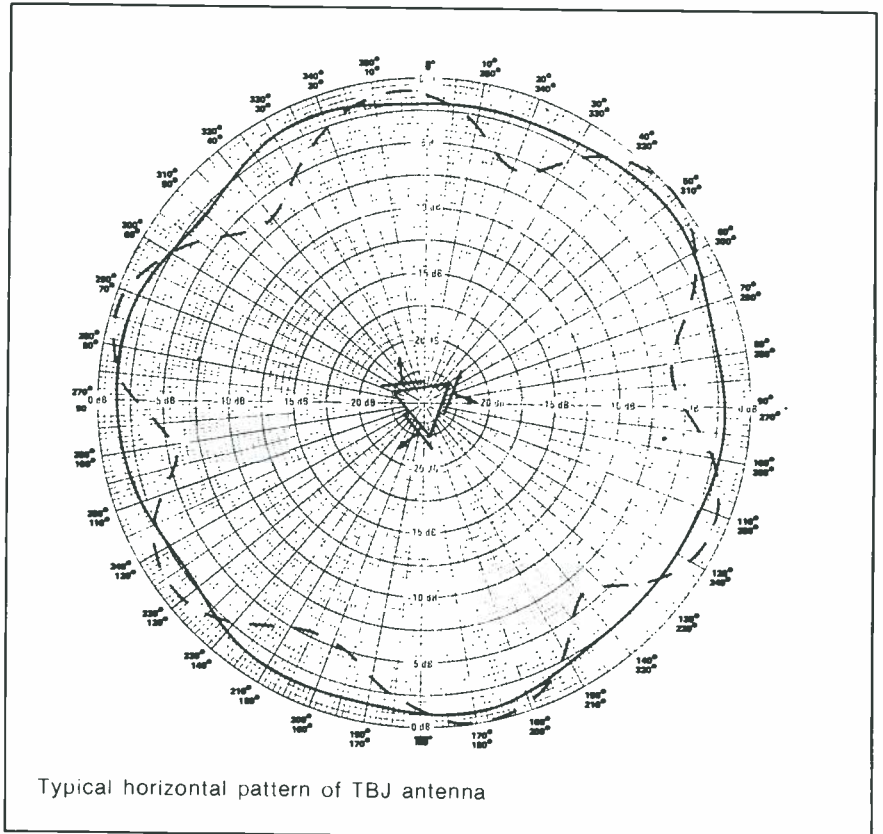
VHF Panel CP Antenna (TBJ)

The RCA TBJ Antenna panels are normally mounted on triangular support towers, and may be used in top-mounted or side-mounted applications.

The TBJ, as a panel antenna, is flexible in meeting pattern requirements. Usually, the panels are



Measured horizontal radiation pattern, mechanically rotating dipole illumination for Harris CBR antenna.



mounted three-around on a triangular tower (4 feet on a side) for omnidirectional service. By altering panel orientation, power distribution or phasing of the panels, or some combination of the three, horizontal

patterns may be achieved to fit specific directional requirements.

- Top-mounted or side-mounted design for Channels 7-13
- Flexible horizontal patterns
- Tailored vertical patterns and

power gains

- Simple panel design utilizing single feedpoint
- Proven feed system components from Superturnstile experience

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VHF Quatrefoil CP Antenna (TBK)

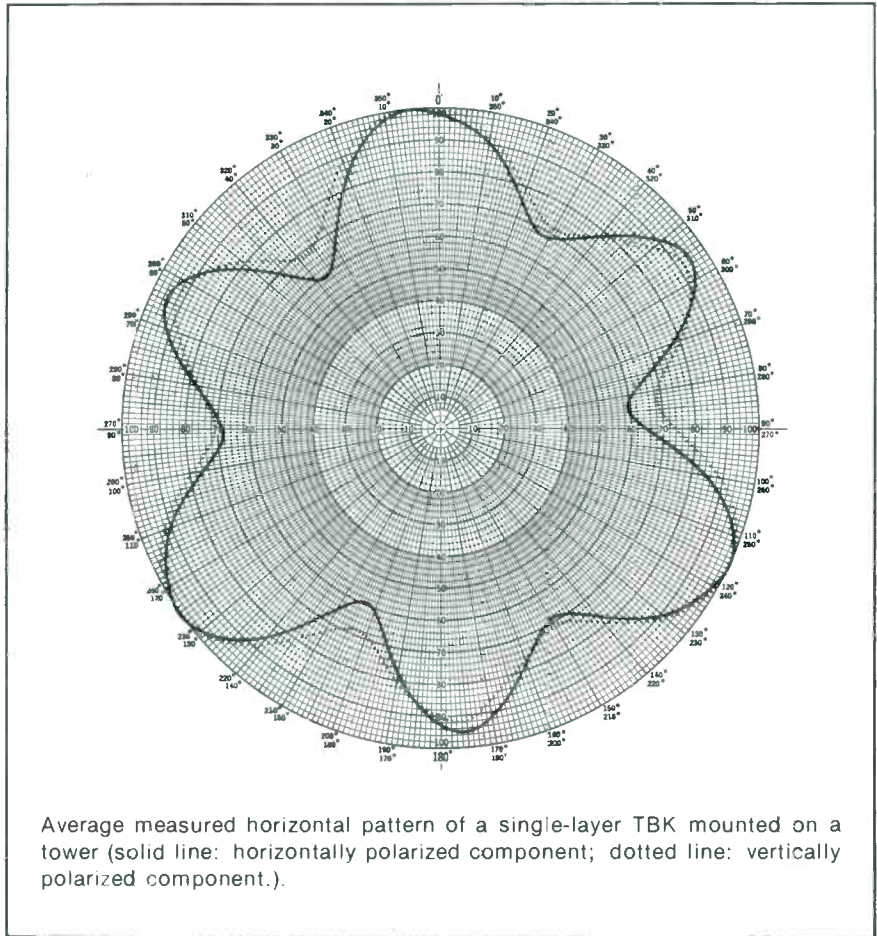
The RCA Quatrefoil antenna is a side-mounted-panel type circularly polarized antenna for VHF Channels 2 through 6.

The omnidirectional Quatrefoil antenna offers the lowband and midband broadcasters excellent operating performance. Directional horizontal patterns are available on a custom basis.

Physically, the standard Quatrefoil antenna is composed of three panel radiators per layer, side mounted on a triangular tower. The antenna is supplied complete with a branch-type feed system and mounting hardware.

Each Quatrefoil panel consists of four ring radiators in front of a rectangular pattern shaping screen. It is from these radiating rings that the antenna gains its name. (Quatrefoil is an architectural term that describes the arrangement of four circles originating from a single point, as in a clover leaf.)

- Power gain of 2.9 per polariza-



Average measured horizontal pattern of a single-layer TBK mounted on a tower (solid line: horizontally polarized component; dotted line: vertically polarized component.)



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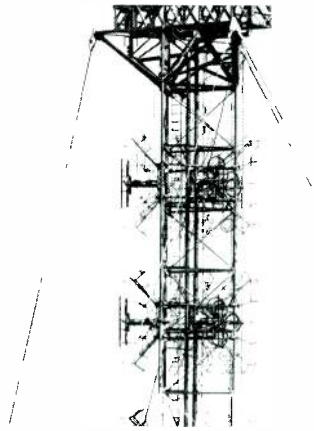


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Roundup



- tion, Channels 2-6
- Panel type antenna
 - Good axial ratio
 - Directional patterns available
 - Radome-protected
 - Excellent horizontal circularity

Circle (95) on Reply Card

UHF Tetra Coil CP Antenna (TCL-12A)

RCA's Tetra Coil Antenna is a circularly polarized VHF highband antenna that combines excellent mechanical and electrical characteristics.

Vertical pattern beam tilt and null fill are supplied as standard with

the Tetra Coil Antenna to provide a more uniform signal especially desirable for antennas in metropolitan areas. Its omnidirectional pattern is circular within ± 1.5 dB or better. The axial ratio is 2.5 dB or better.

- Channels 7-13.
- Power gain 4.6-5.5 per polarization
- Low windload (Equal to RCA 12 bay Superturnstile)
- Good horizontal pattern circularity
- Axial ratio: 2.5 dB or better
- High power handling capability
- Top-mounted design
- Simplified Superturnstile replacement

Circle (96) on Reply Card

VHF Tetra Coil CP Antenna (TCL-16A)

RCA's Tetra Coil Antenna answers the need for a circularly polarized VHF highband antenna that combines excellent electrical characteristics, mechanical simplicity and minimum windloading. It is a top-mounted design for use on VHF Channels 7 through 13.

The TCL-16A antenna is supplied with a power gain of 8 per polarization, providing an economical means to achieve 316kW horizontally polarized ERP when using a 50 or 60kW transmitter.

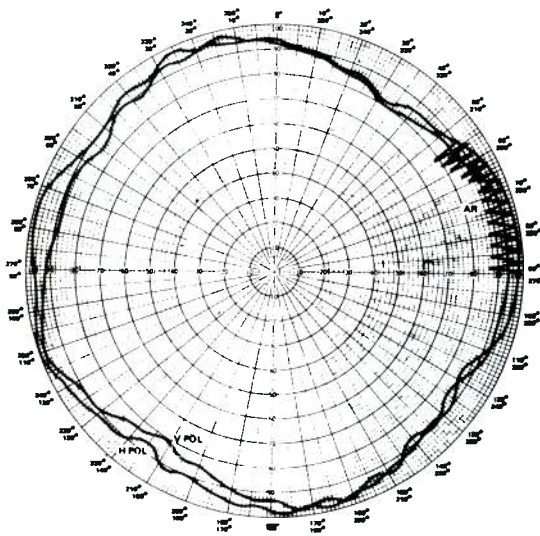
Vertical pattern beam tilt and null fill are supplied as standard with the Tetra Coil antenna to provide a more uniform signal, especially desirable for antennas in metropolitan areas. Its omnidirectional horizontal pattern is circular within ± 1.5 dB or better for both polarizations; the axial ratio of the antenna is 2.5 dB or better.

- Power gain of 8 per polarization, Channels 7-13
- Good horizontal pattern circularity
- Axial ratio: 2.5dB or better
- High power handling capability
- Top-mounted design
- Minimum wind load
- Beam tilt and null fill supplied

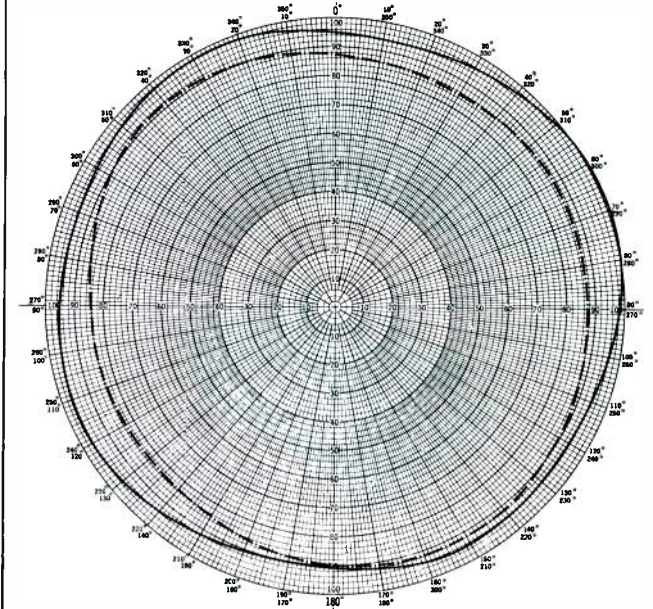
Circle (97) on Reply Card

VHF Dual Mode CP Antenna (TDM)

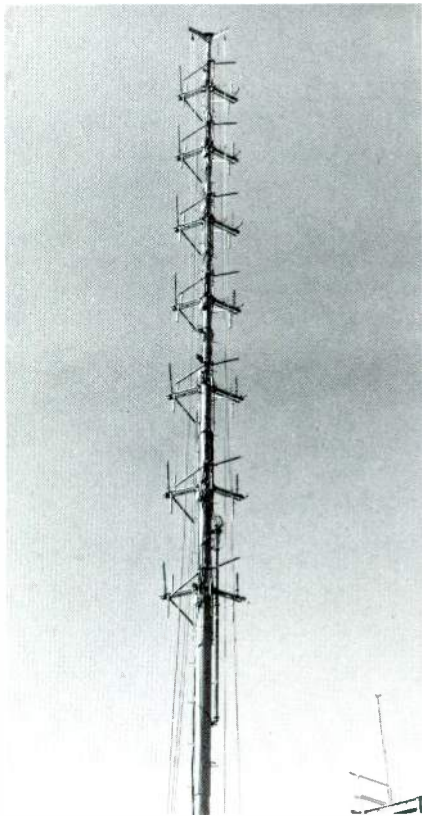
The RCA Dual Mode Antenna is a top-mounted circularly polarized antenna for VHF Channels 2 through



Measured horizontal pattern (single layer)



Measured horizontal pattern of TCL-16A11 (solid line: horizontally polarized component; broken line: vertically polarized component).



band and impedance excellence.

The TFU-CP Pylon can be supplied with de-icer elements and slot covers, or with a fiberglass radome (no de-icers required). The de-icer option may be the best choice for broadcasters using horizontally polarized Pylon antennas, because exact mechanical replacements with regard to length, weight and windload are available in most cases for existing towers.

For new installations or towers with reserve windload capability, the new CP Pylon is offered with radome weather protection.

- Slanted slot Pylon design
- Low relative windload and weight
- High aperture efficiency
- Smooth "G" type vertical patterns
- Good axial ratio and circularity
- 220 kW power capability
- Radome available

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Kathrein panel CP antennas

- True CP with no mounting effects on CP or pattern

6. The standard antenna offered has seven layers with a circularly polarized power gain of 3 per polarization.

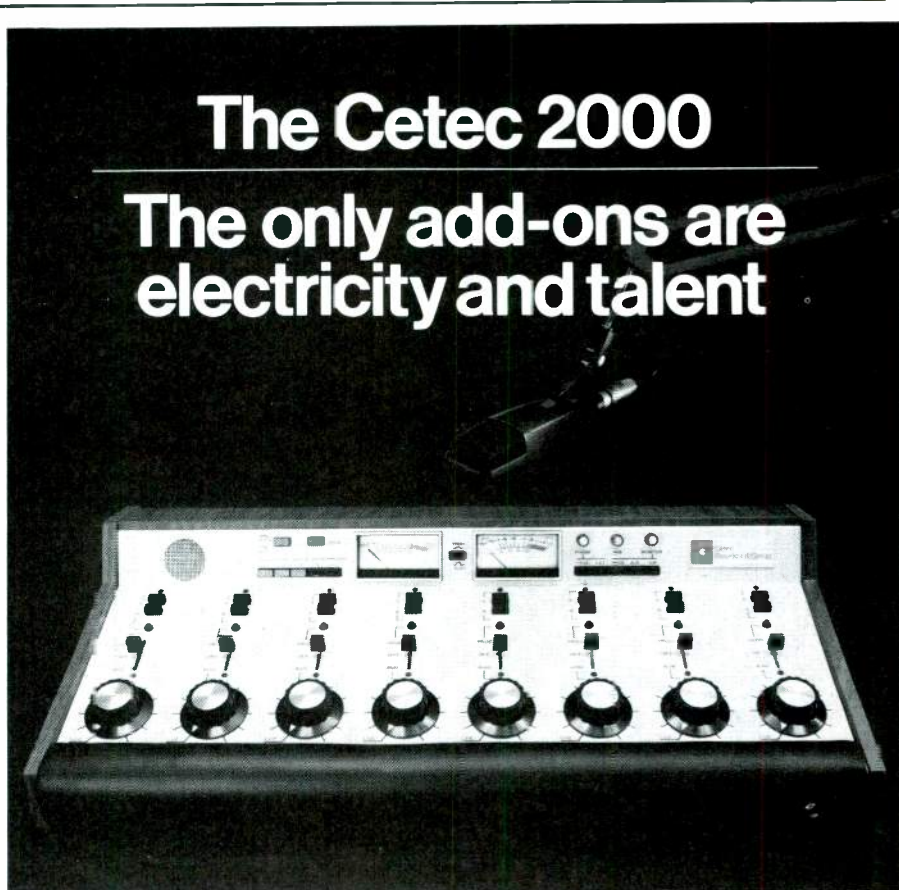
The TDM antenna meets the need for a top-mounted antenna (with low windloading) suitable for replacing Superturnstile antennas with six bays or more on existing towers. Each of its seven layers consist of three dual mode radiators mounted symmetrically around the pole, and each dual mode radiator is fed by one feedline. The complete seven layer circularly polarized antenna uses only 21 feedlines.

- Top-mounted design for Channels 2-6
- Low windload (equal to or less than Superturnstile)
- High aperture efficiency
- Low axial ratio
- Good horizontal pattern circularity
- Power gain of 3 per polarization

Circle (98) on Reply Card

UHF Pylon CP Antenna (TFU-CP)

The RCA UHF Pylon, produced for more than 20 years for UHF-TV broadcasting, is now available with circular polarization as the new RCA TFU-CP slanted slot Pylon. The same flexibilities of power ratings, gains and radiation patterns are retained. The proven UHF Pylon "center-feed" design is employed for pattern stability. In addition, the RCA traveling wave slot-coupling system is incorporated in this new family of antennas to achieve broad-



Cetec introduced these compact consoles about six months ago, and supply is still just barely ahead of demand.

This 2000 family of 5- and 8-mixer mono and stereo consoles has three great characteristics: small size and weight (they're portable); excellent performance specs (with high reliability); and very modest cost (how about more for less, for a change?).

These consoles are ready to go — plug in the inputs and the speakers, and hit the

"on" switch. Monitor amplifier and muting relays are built in.

The 8-mixers (16 inputs) are great production room consoles that easily double as on-air boards. The 5-mixers (10 inputs) are at home in the newsroom, small studio, or on remote site.

Cetec 2000's start at \$1595 for the 5 mixer mono console, and top out at \$3195 for the 8-mixer stereo model.

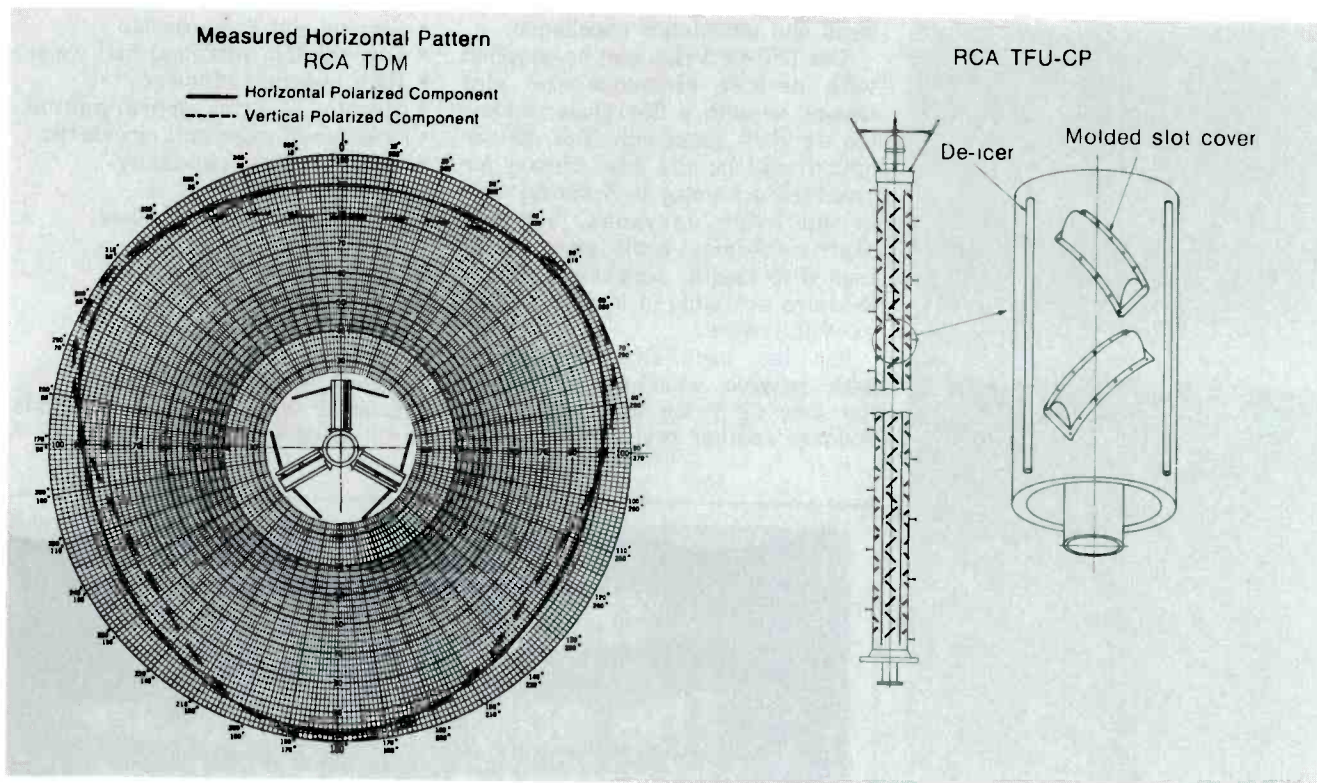
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Roundup

- Tailored directional patterning to reduce multipath distortion
- Broadband 88-108MHz to permit multiplexing several stations on one antenna
- Automating VSWR compensation so that de-icers are not required
- Typical gain: 6.6 dB (circular) for 6 bays of 4 panels.

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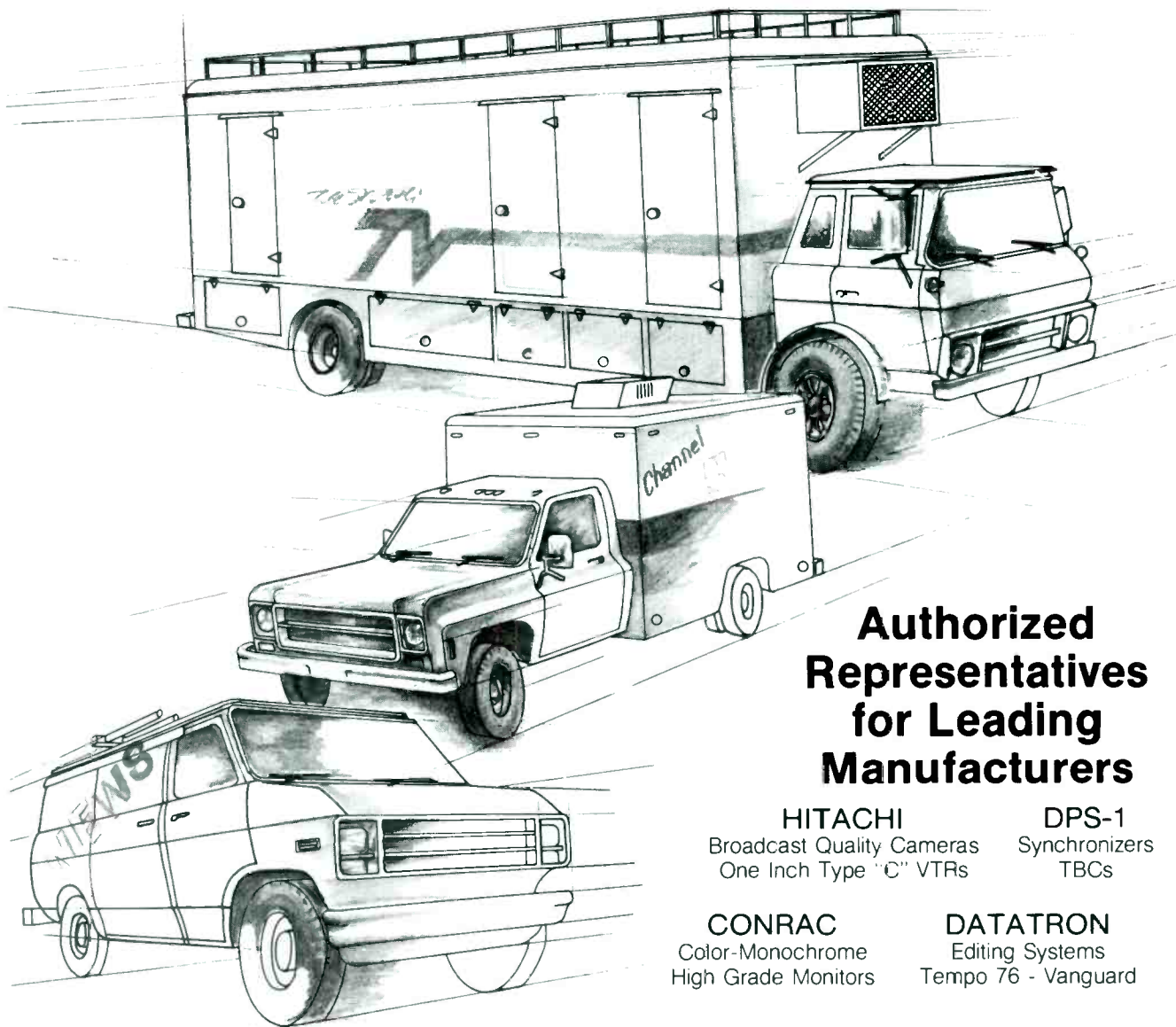
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Sweep method of testing audio equipment: UREI X-Y plotter

By Brad Dick, chief engineer, KANU, Lawrence, KS



Figure 1. The UREI 2000 Sine Wave Frequency Response Module is a combined sweep oscillator and receiver.

This report begins a series of reports on new equipment for radio and television broadcasters. KANU is one of several stations that have agreed to use their resources to evaluate the performance of selected new equipment and report their findings.

Other reports in this series will be published as they are completed. **Broadcast Engineering** has created this series as part of its dedication to providing broadcasters reliable technical information on equipment that affects the business of broadcasting. It is important to note that these reports will be prepared by broadcasters and production facilities for the industry. Participation by manufacturers will be limited to supplying standard data and to lending equipment to the author(s) station(s) conducting the tests—they will not be controlling the content of these reports. **BE** is prepared to publish the pros and cons of new equipment tested and each author is prepared to evaluate an instrument or system.

BE would like to receive comments on this reporting service. To suggest a specific item for testing, write the editor.

Examination of the frequency response of a piece of equipment can often be helpful. Almost everyone who works at a broadcast facility for any length of time, knows

frequency response plots are important. However, to thoroughly examine the frequency response of any equipment requires plotting many discrete frequencies on graph paper and then playing "connect the dots" to see the results.

At the UREI booth at last year's NAB convention, a graphic plotter drawing graphs of the frequency response of an ITC cartridge machine was featured. Investigation revealed that UREI had combined a plotter from H-P, the model 200, with two UREI plug-in modules designed to simplify audio maintenance. These plug-ins, the 2000 Frequency Response Module, and the 2010 Level and Frequency Module, work with the H-P plotter to provide frequency response plots of any audio equipment.

The 2000

The Model 2000, Figure 2, is a combined sweep oscillator and receiver. Used in conjunction with the 200 plotter, the unit will provide the necessary sweep tones and plot the results on standard DIN graph paper. A unique feature of the module is the patented Automatic Slope Sensing Circuit. This circuit senses the slope of the returning signal from the equipment being tested. If that slope is very high, indicated by a rapid change in frequency response, the oscillator drops to a slower sweep rate so that accurate results are assured.

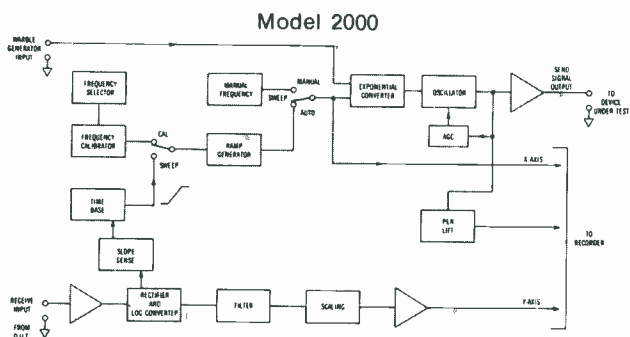


Figure 2. Block diagram of the 2000.

Impedance Measurement

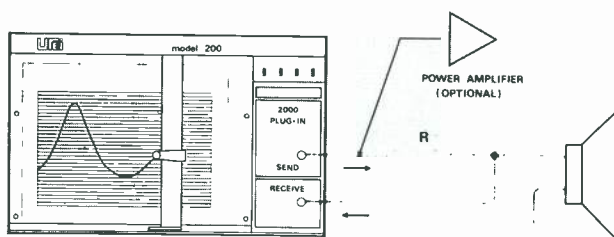


Figure 3. Circuitry to use the 200 Plotter and 2000 Module to check audio monitor impedance.

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KEVLAR can match the strength of steel at only *one-fifth* the weight, so riggers can coil two or three guys over their shoulder at once, greatly speeding installation.

For more information and a list of manufacturers of guy lines of KEVLAR, write: DuPont, Room 38811, Wilmington, DE 19898.

*DuPont registered trademark for its aramid fiber. DuPont makes KEVLAR, not antenna guys.



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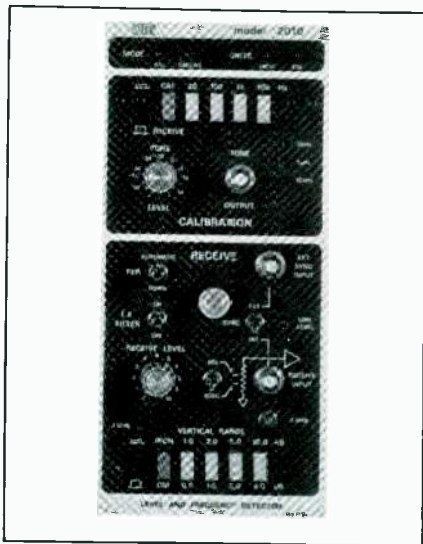


Figure 4. The UREI 2010 Level and Frequency Detector Module has a unique receiver circuit to track the plotted frequency.

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When the frequency response plot is no longer showing rapid changes, the sweep speed is increased to the normal pace. The result is that unexpected dips and peaks in the response curve of the equipment are always faithfully plotted.

The module has a dynamic range of over 60dB and a resolution of 0.05dB. The sweep frequencies are from 20Hz to 20kHz. The oscillator is also controllable in a manual position, allowing the operator to manually sweep any or all of the audio spectrum and view the results on the recorder. The output of the oscillator is very clean and has less than 0.5% distortion. If desired, there are push-buttons to select any of four precise fixed frequencies from the oscillator. The tones can

be used to spot check frequency response or check calibration of the chart recorder. Selected calibrated sweep times are available from 15 to 120 seconds, if desired. Both send and receive levels are adjustable over wide ranges to accommodate almost any piece of equipment. The input is switch-selectable to either 600 Ω terminated, to 50k Ω bridging.

The combination of oscillator and plotter in a small package makes plotting the frequency response of amplifiers and recorders quick and easy. Depending on the device being tested, sweeps can be completed in as little as 15 seconds. The block diagram of the circuit is shown in Figure 2.

Speaker impedance is one test most broadcast engineers will not need to make. However, the test does show some of the versatility of the testing method and equipment.

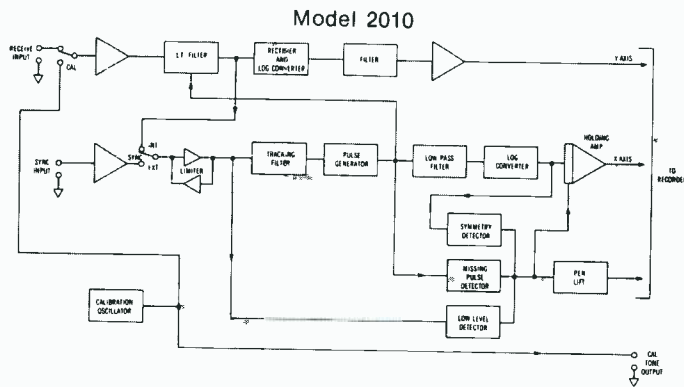


Figure 5. Block diagram of the 2010. Note the Holding Amp and Pen Lift circuits on the right.

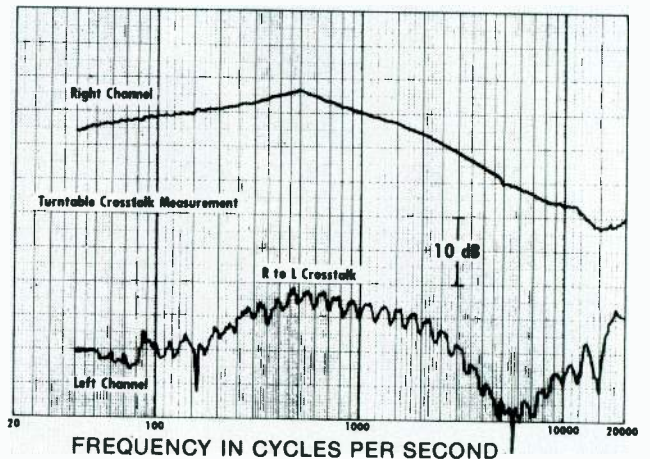


Figure 6. Preamp/cartridge crosstalk measurements with the 2010.



Figure 7. The UREI 20 Warble Generator for acoustical parameter measurements.

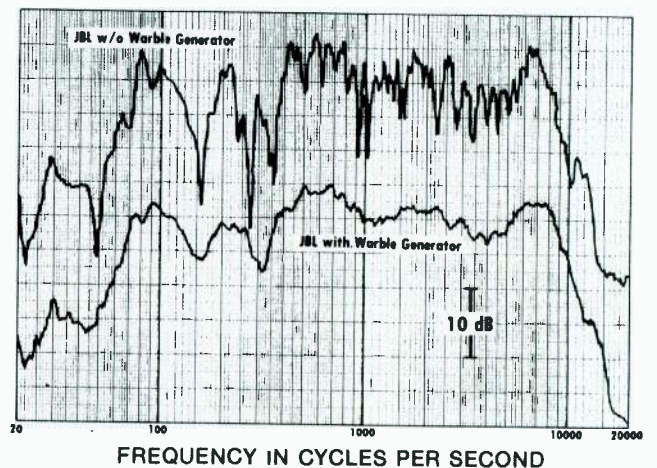


Figure 8. The Warble Generator used for JBL monitor and room frequency measurements in the KANU control room.

DBX HELPS KMJQ WORK MAJIC.

Majic. It's a black format that's living up to its name in several markets across the country. And perhaps the biggest success story is Houston's KMJQ. Back in 1977, KMJQ adopted the Majic format and went from near bottom to #1 in just 2 short Arbitrons.



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"To achieve our goal," explains Chief Operator Leroy Dietrich, "we placed a lot of emphasis on the quality of the sound. By the day we started the Majic format, we had built a technical ability that we think is probably one of the best in the country.

"We hired an audio consultant to get us started," continues Dietrich. "He installed P 303 pre-amps and MC20 moving coil cartridges on SL-1100A turntables. Then he recommended dbx equipment for definition and dynamics."



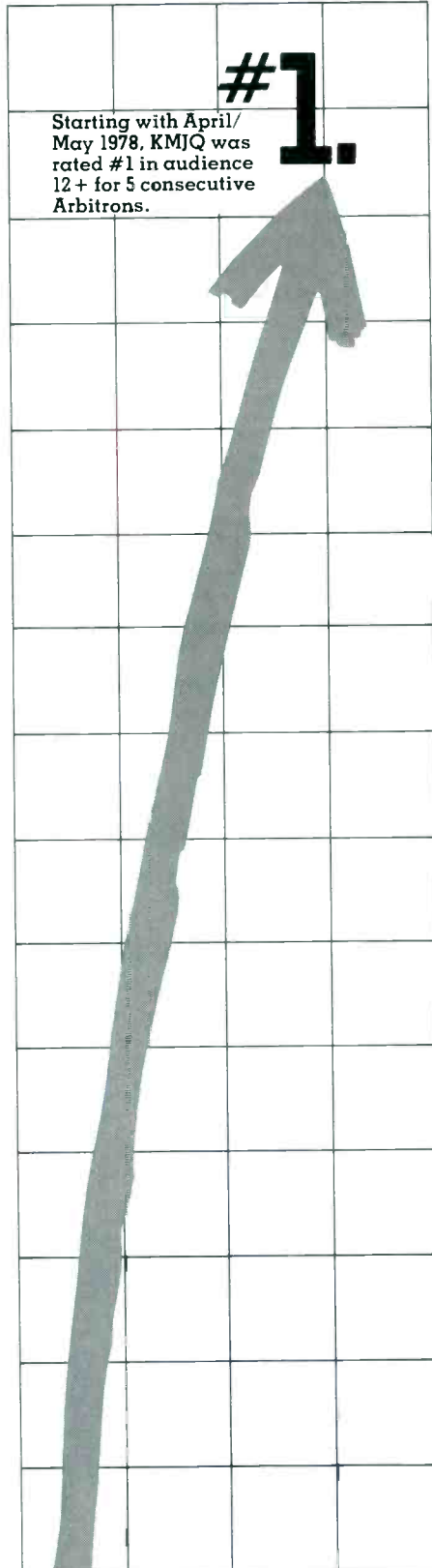
KMJQ installed dbx tape noise reduction on all their cart machines. Not just for their program material, but for their commercials, too. "That keeps our advertisers happy because their commercials sound as clean as our music," says Dietrich. "And



we use a dbx Model 500 subharmonic synthesizer to restore the low end.

It makes the station sound especially well balanced. Even at low listening levels."

KMJQ also needed a compressor/limiter – but they didn't want to ruin the sound quality they had worked so



hard to get. "After hearing how smooth the dbx 165 compressor/limiter works, there is no doubt in my mind that it's the best limiter I've ever heard in my life. We use it on voices, and it gives us the control we need without sounding like we have any control."



As you'd expect, KMJQ has constantly been making subtle technical changes to maintain their leadership position. "Due to competitive forces in the market, we've had to crank our signal up louder. Without dbx tape noise reduction on our carts, the noise would have been cranked up, too. Now I'm happier than ever that we're fully dbx'ed," says Dietrich. "We not only get the sound we want, but the whole system is incredibly reliable – bulletproof."



Dietrich summarizes his feelings about KMJQ's technical product by saying, "A lot of this is subtle stuff, psychoacoustics. But people comment to us that our station sounds more like the record they bought than the other stations do. A psychological thing, agreed. But it all adds up when you start reading the Arbitrons."

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Figure 3 shows how to interconnect the 2000 plotting system to a speaker for measuring its impedance over the audio spectrum. In as little as 10 minutes, the impedance of several speakers can be plotted to properly match the output stage of an amplifier. The most obvious benefit of this testing method is that the interaction of the equipment and frequency is immediately known for all audio frequencies. No amount of spot tone tests could accomplish as much.

The 2010

The model 2010 Level and Frequency Detector Module, shown in Figure 4, also plugs into the 200 mainframe. This module does not have an internal sweep oscillator but instead provides a unique receiver circuit that "tracks" the input frequency for plotting. The 2010 detects the frequency and relative level of the incoming signal and plots that level on the recorder.

The module also has the ability to distinguish between coherent test signals and random signals, such as voice announcements of frequencies on test tapes and records. By using what UREI terms "intelligent" frequency detection circuitry (see Figure 5), the unit will stop plotting upon the start of a voice announcement. The last measured frequency is stored in memory along with the last horizontal position until the signal is updated with a new valid frequency and level reading. The pen is also lifted from the paper during this interval to prevent invalid marketing on the response plot.

The receiver module allows the operator to select either the input signal or an externally applied signal for frequency detection. This allows the user to plot channel separation, crosstalk and other similar parameters. As will be shown later, this feature can provide some very useful information.

The module has a built-in selectable low frequency filter. When measuring crosstalk on turntable systems with high levels of rumble, the filter will remove the low frequency material and permit accurate plotting of the crosstalk level.

For those occasions when an adjustable level tone with precise frequency control is needed, the module has four selectable frequencies of 20, 100, 1000, and 10,000Hz. These tones can be used to check the function of other audio equip-

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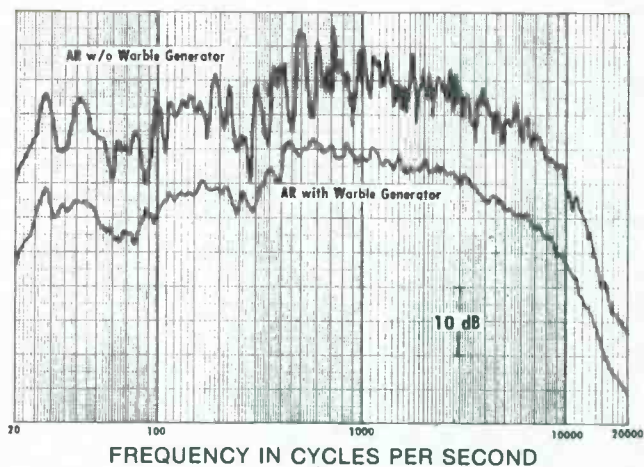


Figure 9. Measurements similar to those of Figure 8 but for AR-3 monitors.

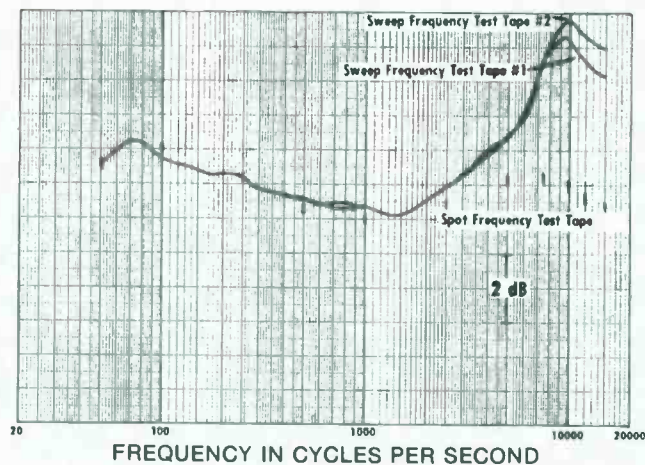


Figure 10. The 2010 used for checking sweep tape performance.

UREI

ment or the horizontal calibration of the plotter.

One test the 2010 can perform that the 2000 cannot is that of turntable preamps and cartridge response. Figure 6 shows the fre-

quency response of the right channel of a Shure M67 and RCA preamp on the upper trace and the output of the left channel, or crosstalk, on the lower trace. In these cases, the external sync input is used and the sync signal is obtained from the left channel output.

UREI also has other equipment that can be used with the 200 plotter. The 2020 dc Input Module provides a hard copy of the relationship between two dc variables. Typical sources for the dc signals would be analyzers, sweep and function generators, and computers. If this unit is used with the 201

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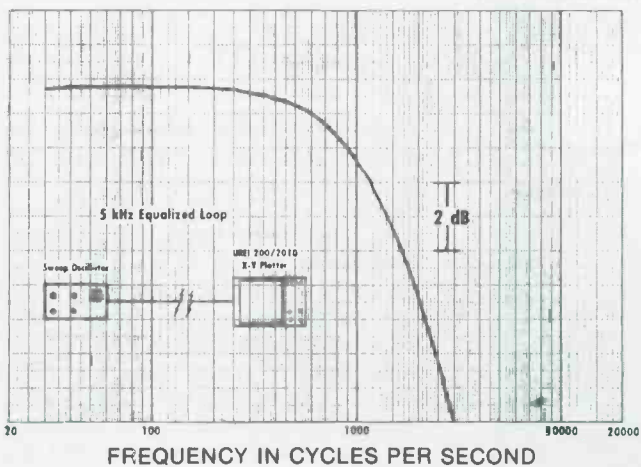


Figure 11. The 2010 used for checking "equalized" telephone lines—before the telephone company took action.

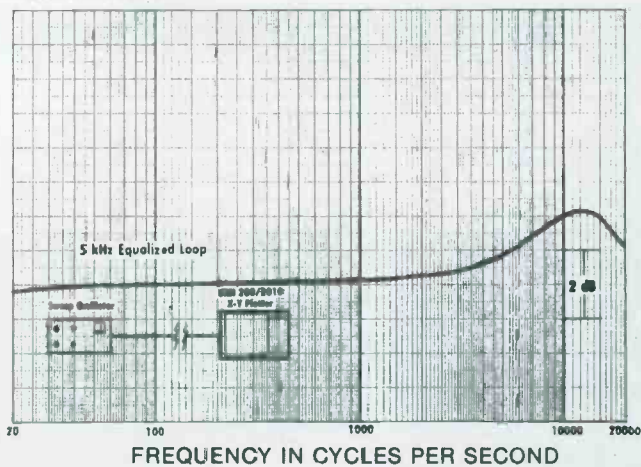


Figure 12. A repeat of the Figure 11 data after the telephone company was moved to action.

display interface mainframe, the combination will provide X, Y and Z information for continuous viewing on oscilloscopes.

The warble generator

For those interested in plotting the frequency response of acoustic parameters, the model 20 Warble

Generator, Figure 7, is required. When connected to the 2000 Module, the sweep signal is frequency modulated from 0 to 0.5 octave. This provides a much more useful signal for acoustic measurements.

Figure 8 shows the effect of using the warble generator in speaker and room frequency response mea-

surements. This figure shows the frequency response of a JBL speaker in a control room at KANU. First the frequency response was plotted without the warble generator. Note the numerous peaks and dips caused by standing waves in the room. The more uniform trace is obtained with the same speaker and

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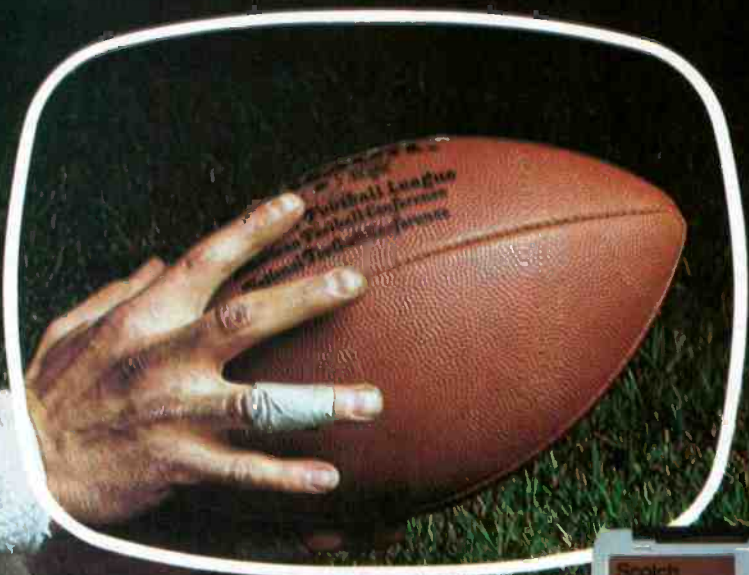
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room combination while using the warble generator. Notice how the warble generator averaged out the cluttered standing wave pattern from the first trace. The result obtained is similar to what might be expected by using pink noise, but the plotting is much quicker and very repeatable. Figure 9 shows the same control room using an AR-3 speaker for the test. For the engineer concerned about obtaining the most accurate response possible from a control room or monitor location, this testing method provides useful information in a short time.

Checking sweep and spot tone tapes

The model 2010 Level and Frequency detector module might prove the most useful in a broadcast situation. The only problem is that some form of sweep must be generated. Several kinds of sweep tapes are available for tape recorder performance maintenance. Sweep tapes are also available for cartridge machines. After using the unit for several weeks, it was found that using sweep tones was much more revealing in terms of equipment performance than discrete tones were. The plotter also saves a lot of time in regular recorder maintenance.

One time the sweep tape method of reel-to-reel recorder maintenance did cause some problems. Several test tapes had been purchased from a reputable manufacturer, including both spot and sweep tapes. However, when the equipment was aligned according to the sweep tape, the frequency response was not correct according to the spot frequency tapes. In checking the two sweep tapes against one another (Figure 10), it was found that the sweep tapes were 2.5dB hotter at the high end than the spot tone tapes. Furthermore, the sweep tapes were not identical. A quick call to the company revealed that they had a problem in the generation process and they replaced the tapes. Had it not been for the plotter, the problem might not have been spotted so quickly.

The engineers who perform the regular maintenance of equipment at KANU find that they prefer to use the 2010 over the 2000. To maximize use of the unit, a self-contained sweep generator was built that sweeps from 15Hz to 24kHz. The battery powered generator can be easily carried to any studio; it

provides a complete record-playback record of any tape recorder in a matter of minutes.

First the sweep test tape is played and the recorded playback response is plotted. Then the generator is used to provide a record-playback response on the same chart paper. Any adjustments necessary are immediately detected and made as required. A final plot of the machine's performance is made for the record and the test is complete. The total time required for a complete test as described above is about 10 minutes. However, if several pieces of equipment must be dragged into a studio and it is necessary to plot discrete tones on paper, an hour or more would be required. Also, having a hard copy of a machine's performance is much more valuable than a list of five or six discrete frequencies and their respective levels.

Checking telephone lines

For stations that make regular use of equalized telephone circuits, the model 2000 offers some interesting possibilities. Many times when ordering an equalized telephone loop it seems that the telephone company has not properly equalized the circuit. It can also be used to check the frequency response of loops to the transmitter. At KANU, a loop from the local football stadium had been used for a couple of weeks. There had been some problems with the installation and the telephone company promised to come back the following week and properly equalize the circuit. After a couple of games, it became obvious that not only was the loop not properly equalized but that the phone company had "forgotten" about the circuit and its problems.

Using the sweep oscillator described earlier, a plot of the loop frequency response was made. Figure 11 shows the result of that test. Obviously, the supposed 5kHz equalized loop did not even come close to meeting specifications. A copy of the loop response and a letter to the company produced some interesting results.

After discussing the loop with the telephone company and showing the equipment to the installers, service improved. Figure 12 shows the result of sweeping a 5kHz loop ordered for basketball season. Apparently efforts were worthwhile; the frequency response of this circuit far exceeds what might be expected for a 5kHz loop.

Now when the telephone company comes out to equalize a loop, it is checked at that time with the installer on the premises. Using this procedure assures both the company and the radio station that the loop meets the required specifications.

The UREI combination of an H-P plotter with their custom modules provides a unique test instrument. Not only is the equipment well built, but the price is reasonable, considering its many features and uses.

The equipment is easy to maintain and comes with an excellent operator and maintenance manual.

Every station should consider the use of sweep methods of measurement, and the UREI system could be the key to that procedure. Those stations not fortunate enough to be able to afford both the 2000 and 2010 modules will face a difficult choice between the two. Both offer unique features, and the station engineer will have to decide which of them are most useful. □


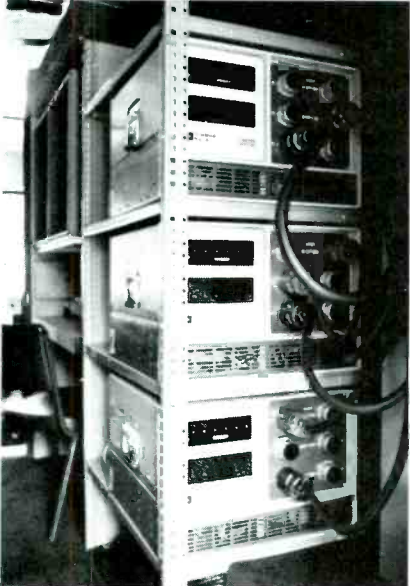
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NRBA highlights: Part II

In November Part I of the NRBA-'80 convention coverage, an address by Karl Eller on "The '80s—A collision of conflicts," was presented. In Part II, the sessions and awards are presented.

The enthusiasm of exhibitors at NRBA this year ranged from overwhelming delight with the response at their booths to solid dissatisfaction. Fortunately, there were more exhibitors happy than not, but NRBA management must listen to

both if this convention is to maintain a high level of exhibitor participation.

Unlike the 1979 convention in Washington, DC, this year the exhibitors offering automation systems seemed more prevalent on the floor—as opposed to being in hospitality suites. In general, they seemed more pleased with participant response than were exhibitors with other types of equipment for radio broadcasters. Another prob-

lem at NRBA conventions, and others as well, is the attendance at exhibits vs. technical sessions. Invariably, when sessions are in progress the exhibit halls are nearly deserted. Yet both exhibits and sessions are needed to satisfy broadcasters' needs. Serious attention should be given by convention planners to find a way to better accommodate both events.

Awards and Addresses



Superstar entertainer Paul Simon appeared in concert to delight the NRBA-'80 attendees. He paused during the performance to address the audience. His personal "thanks to radio" acknowledging his rise to stardom and fortune brought a round of applause.



Commissioner Jim Quello (right), long time friend of Gene Autry, addressed the NRBA-'80 gathering on current issues facing radio. Quello, claimed to be the only commissioner with real broadcast experience, has spent 30 years in broadcasting. His term expires in June 1981, and his future is uncertain. In his address he proclaimed radio to be "the most diversified and creative industry" and that "the time has come to remove all First Amendment limitations on broadcasting." He is shown here after his address talking to Gene Autry and NRBA president Sis Kaplan.



NRBA's most prestigious award, the Golden Radio Award, was given in 1980 to entertainer and broadcaster Gene Autry (on the right). NRBA president Sis Kaplan (center) presented the award and recounted her childhood days when Autry visited her home and chatted with her father. Autry, early in his career, had a program on her father's radio station before going to Hollywood to seek fame and fortune.



Commissioner Anne Jones, addressing the NRBA-'81 expo, proclaimed that radio is indeed "alive and well." She touched on the recent growth in radio advertising and expanded services and observed that, in a competitive market, the station that does not provide adequate service will not survive. She also noted that the FCC has been pondering substantial deregulation of radio in matters of commercialization, nonentertainment programming, ascertainment of community needs, and program logging. "The FCC," she said, "will review all inputs and come up with some answers—but they will not be necessarily agreeable to all." Radio's ability to react instantly to local market needs and tastes, she noted, ensures that radio will always be a part of our lives.



Gene Autry, after receiving his Golden Radio Award, gave a talk touching on both political parties and their candidates. He reflected to his early start with radio, traced radio's astounding growth, and promised to stay around for a long time and watch it grow some more.



Frank Washington, deputy chief, FCC Broadcast Bureau, opened the NRBA-'80 general session with "Greetings From the FCC." The FCC philosophy, he noted, is that "more is better." Seeds for this philosophy were planted in the 1934 Communications Act that directs the FCC to "generally encourage larger and more effective use of radio." In perspective, since 1935, there has been a 13-fold increase in commercial radio. From the FCC's viewpoint, he observed, predicting the future is risky. The 9kHz and drop-ins may create new opportunities for radio, but they do not put profits into perspective. The need for stations is a marketplace demand, not an FCC requirement. He believes that "more is better" will hold true for broadcasters and the public and that "the future is yours."

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NRBA

AM Stereo

By Andy Laird, chief engineer,
KDAY, Los Angeles

AM stereo was one of the hot topics at this year's NRBA convention. All five system proponents were represented in the exhibits and at the well attended panel discussion session, "The Annual Meeting of the Long-suffering AM Stereo Alumni Association." This panel dealt with the AM stereo dilemma. The basic topics covered by the panel were: (1) How did we get to where we are today? and (2) Where do we go from here?

Dave Hershberger of Harris started things off by pointing out AM receiver deficiencies. Narrow IF response and detector problems are responsible for the sounds generally associated with AM. He said that "Harris got the fuzzy end of the lollipop" as far as the initial FCC decision grid was concerned. Several panelists made it clear that the FCC was just getting some idea of what the trade-offs between the proposed systems mean. From Harris's standpoint, mono compatibility of all systems must be considered through the real life situation of narrow bandwidth receivers.

Leonard Kahn of Kahn Communications briefly ran down a list of the attributes of his system and outlined why a marketplace system decision is a must. He said he was convinced that any other method of achieving a decision other than marketplace will drag implementation to at least 1988.

Frank Hilbert of Motorola examined the factors that make selecting a system difficult: (1) He thinks the

complexity of the technical performance trade-offs are just now being realized by the FCC. (2) Because of system changes, new systems introduced, systems being withdrawn, and one proponent not allowing tests by committee (wishing to rely on existing radio station tests), only two of the currently proposed systems have been tested side by side by NAMSRC. (3) Fierce proponent competitiveness, including requests for extensions of time, no standardized testing, and negative attacks on other systems are a big part of the delays. (4) The FCC has not been able to narrow the field because of two major developments: (A) The staff determined that all five systems meet minimum performance criteria. This forces a closer look at each system because the FCC cannot justify its April directive; and (B) One proponent has been very outspoken for a marketplace decision. (5) A result was a further notice of proposed rulemaking. This further notice, he says, clearly challenges the proponents to provide comparable data, to be objective, quantitative and realistic. Numbers alone will not result in a final decision. It will be tempered with engineering judgment. The bad news is the additional delay; the good news is that the framework now exists from which to make the best possible decision.

Bob Streeter of Magnavox stated that the delays encountered in the implementation of AM stereo after the April FCC directive are a result of protests from the other proponents. He said that Magnavox had received great support from receiver manufacturers, which is the other half of the broadcasting business. And the proper performance of receivers will be crucial to the acceptance of AM stereo.

Arno Meyer of Belar said that Belar accepted the FCC's first decision for Magnavox. They weren't happy but wanted to see



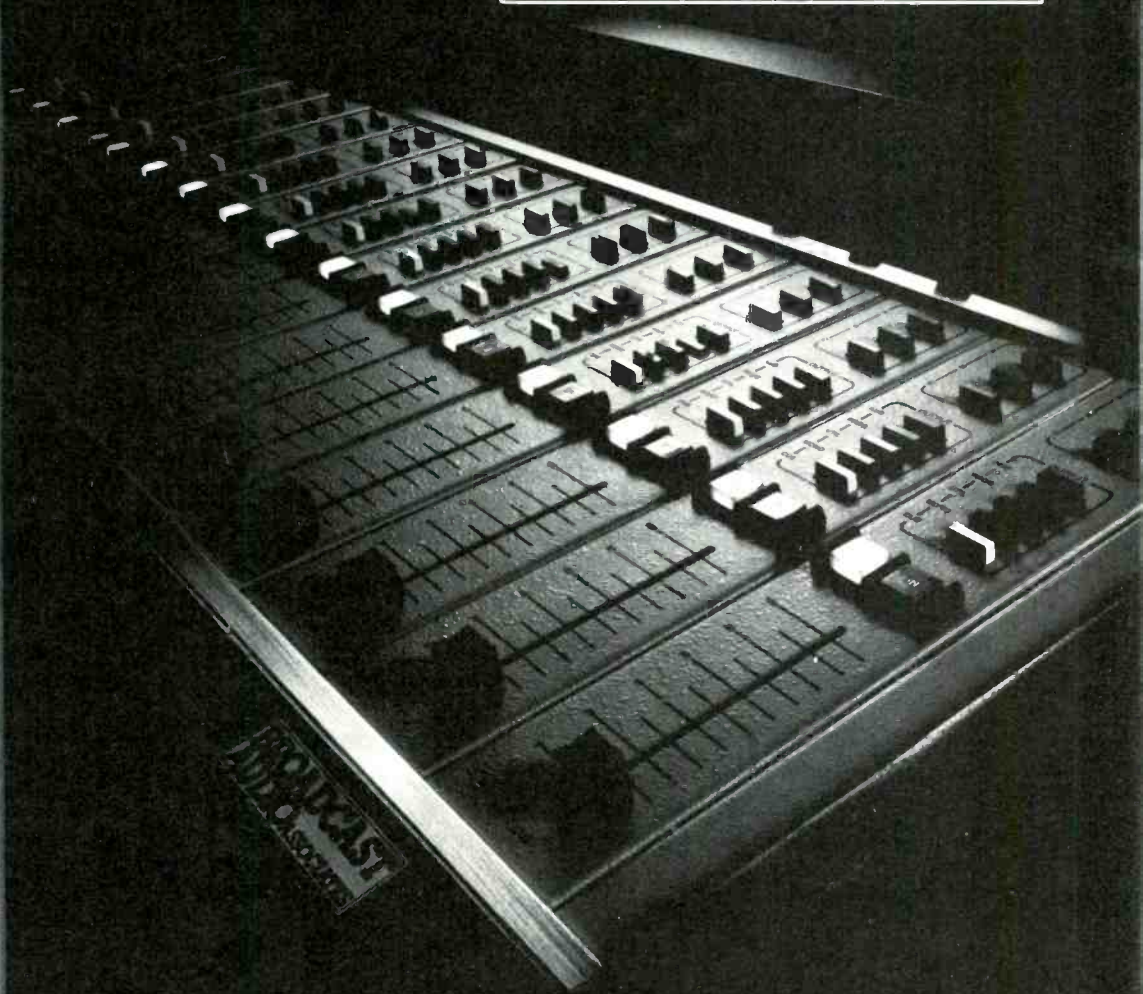
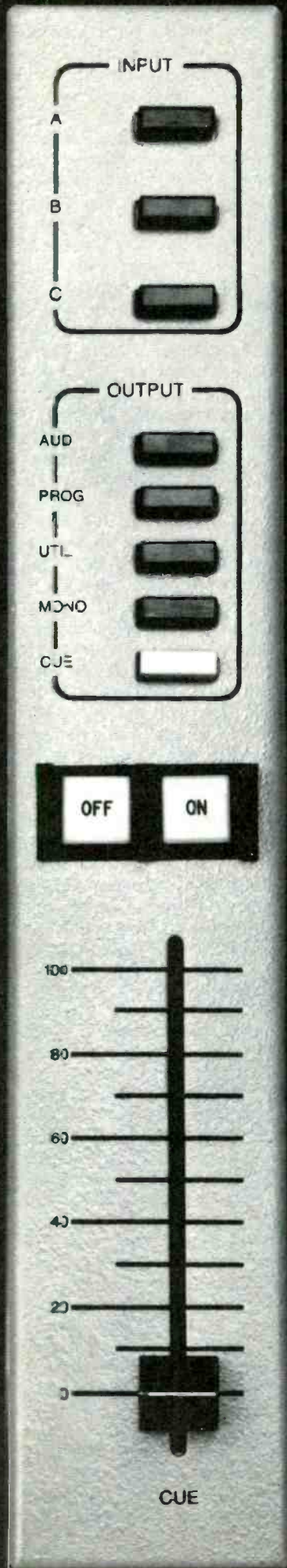
Harrold Kassens (far right), *A. D. Ring & Associates*, moderated the NRBA-'80 engineering session on "The Annual Meeting of the Long-Suffering AM Stereo Alumni Association." Panelists, left to right, were: David Hershberger, *Harris Corp.*; Leonard Kahn, *Kahn Communications*; Frank Hilbert, *Motorola*; Robert Streeter, *Magnavox*; and Arno Meyer, *Belar*.

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AM stereo move on. He said that paragraph 32 of the FCC's proposed notice for further rulemaking shows that the "commission's mind is made up and doesn't want to be confused with the facts." Even the new matrix is open to doubt because of data acceptance practices of the commission in the past. Two years ago Belar filed a motion with the commission to take all systems into the commission labs for tests in the areas the commission questioned.

However, all the proponents objected and the idea was rejected by the commission. This would have forced the commission to participate, and there would have been stereo today.

Is a marketplace decision possible? Hershberger says it will result in confusion for the consumer. For example, note the death of quad. He says that a universal detector will be complex, expensive and have false tripping flaws. He also says that substantial research is needed.

Kahn says he has patents on systems that solve the problems noted by Hershberger and that the

problems are "no big thing."

Here's how Kahn sees a marketplace decision taking place: Three or four months after the commission's go-ahead, the proponents will field equipment. The radio stations will go out to their 1/2mV contour and approve or disapprove the system immediately. The first decision will be made by the broadcasters quickly. The second decision will be made by the receiver manufacturers. If more than one system is being used, (20-30% of one proponent) they will market a universal decoder. Kahn says that making the decision any other way will result in delays until at least 1988 because of the lawsuits that would result from any kind of a commission decision. It's a billion dollar decision. None of the proponents will sit back and not fight in every way possible.

Hilbert says that the universal decoder is good business for receiver manufacturers but that the system differences are significant, requiring a scientific solution. Theory should be the major touchstone, tempered with good engineering judgment and capped with measurements as confirmation, he says. Then after all of this, if it's proven that the best systems are equal, Motorola prefers selection by lottery. He notes, however, that in the past six months its IC division has solved the universal decoder problems; there will be no false decoding. It will take two or three chips as opposed to one for a single-system decoder. There are three problems he sees with a universal decoder: (1) the decoder costs will be two to three times as much, (2) decision time for decoding will be governed by the decision time of the slowest system; and (3) there may not be space in car radios for the additional chips.

Streeter doesn't see how a marketplace decision can work under the circumstances and emphasized that the points made by Hershberger and Hilbert should be examined.

Meyer says a marketplace decision, in the true sense, is not possible. He thinks that, for instance, in a major market area, when the first station goes stereo, the rest are going to follow with the same system. It's the easiest way to compete: just do something better with the same system. Most broadcasters will not go out on a limb, but do jump onto the bandwagon. "That is not a marketplace decision," he said, "it's running scared." Also, in another instance, a marketplace decision could be made by a wealthy proponent who

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could issue equipment on extended free trials, making the price really attractive. This is not the proper way to make the system decision, he said. The Office of Science and Technology and its laboratory has, along with the FCC, he said, failed in its responsibility to the broadcasters and the public.

It was brought out in later questioning that the cost of a high quality universal decoder might be \$4-\$6. However it was pointed out that there will be tremendous pressure on price competitive receiver manufacturers to do it all within the price structure of one chip, resulting in a compromise in decoding performance between systems. The losses could be separation, distortion or coverage.

Industry questions

Would you be willing to submit your system to an industry committee for side by side tests with the other proponents?

Hershberger: Yes. However, it would be difficult to get all the proponents to agree to what the tests should be. If these agreements can be made, Harris is in favor of it.

Kahn: All the information on our system is in the record. It has been tested by nine highly reputable stations. They answered the questions asked by the commission. If the systems go to a committee for tests, the revised timetable for approval moves to a date much later than 1988.

Hilbert: Gathering comparable data is the difficulty in making the decision. The data that the commission wants now is fairly clear. However, an industry committee certifying the same tests on all systems could make the decision more easily.

Streeter: Any technique to expedite the testing would be welcomed if it's fair to all parties and follows the letter of the law.

Meyer: We will participate, but we'll be remembering that this is where we were five years ago.

By this time the discussion became a verbal slug fest. One participant summarized the feelings of many in the session. He said that "the problems between the proponents are extremely minor compared to 2kHz IF bandwidths, which is what the AM broadcaster is fighting now. If we don't have AM stereo on which to hang our hat to pull radio manufacturers into a decent IF, we're lost anyway. If the receiver manufacturers are only worried about one dollar off in the decoder chip, then we've blown it anyway."

Streeter ended the session by noting that the receiver industry is aware and interested in improving the audio image of AM. He invited everyone to the Magnavox booth to listen to a new stereo Pioneer car radio with two IF bandwidths.

On the exhibit floor

Harris and Belar did not have a working stereo demonstration.

Magnavox's Pioneer radio had good separation with no clicks or pops; however, the amount of bass distortion was large. Also, even in the wide bandwidth position, it sounded like the common intermodu-

lation distorted AM. Other Magnavox consumer stereo receivers on display sounded much better; however, they had nowhere near the midrange clarity of an FM station.

At the Kahn booth, Leonard Kahn was playing recordings made off the air of some of the test stations he spoke about. All of the stations demonstrated were highly processed, making it very hard to evaluate the system performance.

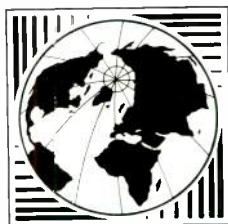
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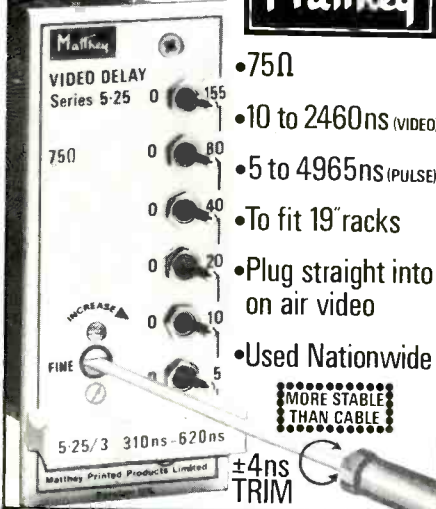
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AM Stereo proponents exhibiting equipment at NRBA included Kahn, Magnavox, and Motorola. Harris and Belar were on hand but did not exhibit their systems.

NRBA

unrestricted bandwidth setup, and it sounded very good. One would have liked to hear how it sounded through a better receiver.

Three observations made from the AM stereo session and exhibit floor were: (1) It's not possible for the five proponents to cooperate in any way with each other to expedite a scientific selection of a system. A governing body looking at the overall best improvements for the AM system (including all the receiver problems), will have to make the decision and defend it through the courts. Kahn is probably right when he says there will be appeals and lawsuits dragging out the final selection. Maybe some kind of compromise having to do with royalties being split between the proponents could help expedite a decision.

(2) The marketplace may not be capable of making a decision that will guarantee that the best system, the one with the most potential improvement for the medium over a long period of time, will be selected.

However, a marketplace decision could work if there is some assurance that the quality of universal decoders used by all radio manufacturers does not compromise the performance of several systems just to be able to save money.

(3) The public's image of AM audio is the result of radio manufacturers' insensitivity to the public's ability to hear the difference in quality between AM and FM. Switching between AM and FM on everything but the very cheapest of tiny radios shows the differences to be substantial. These high distortion and narrow bandwidth AM receiver discussions have gone on for years but no manufacturers have responded in any way with products to help the situation. And along these lines, flat IF response is not the solution. A defined high frequency de-emphasis is required for high quality reception just as in the early days of FM. Narrowband reception is necessary for distance listening, but there is no reason why the millions of people who live in the strong signal areas should have their audio quality limited by the needs of distance listeners. □

122nd SMPTE Technical Conference highlights

By Bill Rhodes, editorial director

- November 9-14, 1980
- New York Hilton
- 8386 total attendance
- 151 exhibitors



Renowned television pioneer Vladimir Zworykin, center, honored the SMPTE convention with a taped interview and a personal appearance. He is seen here, after his brief comments on early television developments, talking to Charles Ginsburg, left, of Ampex and Frederick Remley, SMPTE vice president for television affairs. They are gathered around the Emitron camera (BBC, 1936-54) that served as a model for a special award to the SMPTE for outstanding service.

Attendance at the 122nd Technical Conference and Equipment Exhibit of the Society of Motion Picture and Television Engineers set a new record. So did the number of exhibitors for the New York-based conference—and the figure would have been higher had space not been sold out so exhibitors were turned away.

Enthusiasm of attendees and exhibitors was exceptionally high. This



Incoming SMPTE president Charles E. Anderson, Ampex Corp., alerted members of the press to highlights of the 122nd convention schedule at a special press gathering the day before the opening. He also addressed the opening technical session audience and the awards luncheon attendees.

combination of factors speaks well for the economical health of the motion picture and TV industries. Many broadcasters exhibiting at the SMPTE convention expressed confidence in continued growth in 1981 and planned to announce some surprises at the NAB-'81 exhibit in Las Vegas in April.

The convention was exceptional in all aspects. SMPTE both gave and received some outstanding awards, booked an exciting luncheon speaker for its awards program, assembled an unusual program of technical papers on the history and status of technology, and packed the floor with exhibitors. This report highlights just a few of these activities.

Industry awards

The awards provide a forum for industry leaders to gather and discuss business and technology trends, work on standards, present papers of overviews and on new equipment, exhibit new equipment, listen to guest speakers, and receive and give industry recognition. Additional recognition is provided through election of new SMPTE officers and fellows.

The conference format

Unlike last year's main SMPTE convention in Los Angeles, the 122nd convention in New York was organized under a general theme of "the old and the new." Program chairman Richard S. Marcus, Rombox Productions, was praised by outgoing SMPTE president Robert M. Smith, Du Art Film Laboratories, and incoming president Charles Anderson, Ampex, for organizing an outstanding program coupling history of the television and motion picture industries with future technologies. The packed sessions on historical events indicated the interest in not losing sight of how the industry has grown.

Both the morning and afternoon sessions on Monday, November 9, were devoted to history. The morning session consisted of a two hour presentation by Joe Roizen, Telegen, on a historical sketch of television technology and a film produced in 1926 by the Bell Laboratories explaining the technology of the Vitaphone film sound system. Both portions were well received.

The afternoon session was split



At the press conference preceding the 122nd SMPTE conference, members of SMPTE discussed industry technology with the BE staff. Shown above, left to right, are: Charles Anderson of Ampex and incoming SMPTE president; George Laughead, BE publisher; Bill Rhodes, BE editorial director; Robert Smith of Du Art Film Laboratories and outgoing president of SMPTE; and Roland Zavada of Eastman Kodak and SMPTE engineering vice president.

SMPTTE elects new Fellows

The Board of Governors of SMPTTE, upon the recommendation of the Fellow Membership Award Committee, under the chairmanship of William D. Hedden, Calvin Communications, has conferred the distinguished grade of Fellow Member upon those shown here. The Fellow Awards were presented by SMPTTE President Robert M. Smith at the Fellow's Luncheon during the Society's 122nd Technical Conference.

A Fellow of the Society is one who is no less than 30 years of age and who has, by his proficiency and contributions, attained an outstanding rank among engineers or executives of the motion picture, television or related industries. Those honored are:

Seated (left to right): Norman T. Prisament, president, Magna-Tech Electronic Co.; Robert J. Ringer, president, Image Transform; Joseph Roizen, president, Telegen; Robert D. Augeuste, chief engineer, Cinema Products; Richard J. Stumpf, director, Sound and Electronics Department, Universal Studios.

Standing (left to right): Al Boudouris, chairman of the board, EPRAD; Hartwell T. Sweeney, direc-



tor, Administration and Analysis, Motion Picture and Audiovisual Markets Division, Eastman Kodak; Solomon A. Bongard, deputy director, Cinema & Photo Research Institute (USSR); Koichi Sadashige, director, Engineering Development, Matsushita Electric Industrial Co., and manager,

Matsushita Applied Research Laboratories; Sidney L. Bendell, principal member, Engineering Staff, RCA; Krishna Gopal, proprietor, Processlabs Private Ltd. (Bombay); Lincoln L. Endelman, manager, Test Equipment Engineering, Aerospace Systems, Perkin-Elmer.

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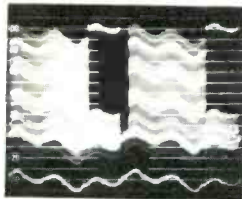
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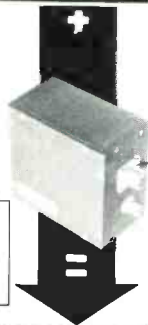
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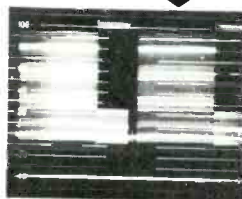
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The history of British television was presented by a trio of British experts: (left to right) Phil Sidey and Bob Longman of the BBC and David Glencross of the IBC.



The Honorable Edward I. Koch, mayor of New York City, welcomed the conferees to New York and cited the city's advances in financial stability.

SMPTE

between television pioneer Vladimir Zworykin and the Royal Television Society (RTS). Zworykin, in a taped interview, commented on the historical developments of television and then appeared in person to give brief remarks and pose with SMPTE officers.

The history of British television evolution was presented for the RTS by a panel of British experts: Phil Sidney and Bob Longman of the BBC, Birmingham; and David Glencross, IBC, London. Although Zworykin's appearance was of exceptional interest, it did not detract from the British presentations with their many humorous sidelights.

The Monday technical programs were split with an outstanding awards luncheon and an address by Edward I. Koch, mayor of New York City.

New technology at SMPTE

The accompanying panel is a comprehensive list of technical papers on new TV technology presented at the 122nd SMPTE Technical Conference and Exhibit. Those interested in the full papers can

watch for them in forthcoming issues of the *SMPTE Journal*.

As shown by the topics, the sessions covered TV signal generation and processing, computer graphic techniques, production and post-production, equipment diagnostics and maintenance, techniques of lighting and sound, videotape recording, and digital video—techniques and progress in standardization. All these sessions were well attended, and the papers were carefully prepared and presented.

Computer graphics

At the 13th Annual SMPTE Television Conference in San Francisco (February, 1979) considerable interest was evident in a few papers on computer graphics. The 122nd conference picked up this interest and devoted an afternoon of papers to the subject—with striking results. The lecture room was packed, even the standing room was taken up. Coincidentally, as graphics were being presented at this session on computer generated art for the US space program, photographs were being carried in the New York newspapers of the fly-by pictures of Saturn being received from the Voyager I spacecraft that was launched in September 1977.

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Maurice Lemoine
awarded David Sarnoff Gold Medal

Maurice G. Lemoine, right, Ampex Corp., was named recipient of the David Sarnoff Gold Medal for 1980 by the SMPTE. Presenting the awards was SMPTE outgoing president Robert Smith, Du Art Film Laboratories. Lemoine was given the award for his leadership in and technical contributions to digital equipment design that have led to the introduction of digital time base correctors for several videotape recorders and, more recently, to the achievement and public demonstration of high quality videotape recording.

SMPTTE

Attendance at this session indicated the industry's interest in electronic techniques for creating graphics and animation.

Digital video

The digital session on the last day of the conference provided an update on the digital emphasis of the 14th Annual SMPTE Television Conference: The Digital Decade held in Toronto on February 12. Note that the status report of the SMPTE Task Force on component digital coding was presented by Frank Davidoff, now retired from CBS. **BE's** April 1980 issue included an industry tribute to Davidoff and expressed hope that he would periodically share his thoughts on digital activities.

As this issue goes to press, there is word that SMPTE is expected to unveil significant digital progress at the 15th Annual Television Conference being held February 6-7 in San Francisco. A replay of this conference, including an update on digital, is scheduled for the April issue.

Exhibits at SMPTE

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Loren L. Ryder
Receives Honorary Membership Award
 Loren L. Ryder, right, Ryder Magnetic Sales Corp., retired, was awarded the Honorary Membership Award for 1980 by SMPTE president Robert Smith, left.



The election of Joseph A. Flaherty, vice president of engineering, CBS Television, to the prestigious position of SMPTE executive vice president was announced at the 122nd SMPTE convention. Shown here addressing leading members of the press before the convention, Flaherty cited SMPTE as being first and foremost an engineering society that nobody takes lightly.

SMPTE receives an award

SMPTE received an award from the Royal Television Society of Great Britain for its outstanding society services. Phil Sidey, left, of the BBC addressed the luncheon gathering, praised the SMPTE activities and delivered the award to Robert Smith, SMPTE president. The award was a miniature replica of the Emitron camera that served the BBC from 1936 to 1954.

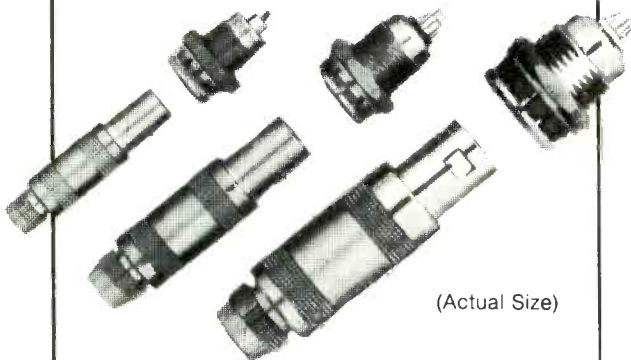


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conference is largely due to the exhibitors that participate in showing the latest in equipment for motion pictures and television.

New equipment for TV shown at the conference will be appearing in **Broadcast Engineering's** new products section in coming months. Also, some of the new products will be covered in **BE's** March issue if they

are scheduled to be shown at NAB-'81.

The 122nd convention was not without grumbles from exhibitors; complaints included inadequate set-up times, lax security that resulted in lost equipment, and crowded aisles. Nevertheless, this conference was a resounding success, with an overall atmosphere of confidence

being expressed in a strong marketplace and in industry prosperity.

Some exhibitors noted that special new products were being readied for introduction at NAB-'81 in Las Vegas. Look forward at NAB-'81 to an increased industry emphasis on electronic graphics and animation. □

Television new technology sessions at SMPTÉ's 122nd Technical Conference and Equipment Exhibit

Tuesday, November 11 Television Signal Generation and Processing

Session chairman: L. Merle Thomas, PBS
Session vice chairman: Robert McCormick, PBS

The Forces at Work Behind the NTSC Standards
Donald G. Fink, *Director Emeritus, Institute of Electrical & Electronics Engineers, Somers, NY*

Predictive Coding of Composite NTSC Color Television Signals
R. C. Brainard, A. N. Netravali and D. E. Pearson, *Bell Laboratories, Holmdel, NJ*

PIL Tubes: The Modern Approach to Color Monitor Design
R. Lawrence, *Lenco Co., Jackson, MO*

A Primer on Television Pick-Up Tubes
Greg Murphy, *Amperex, Slatersville, RI*

Current Developments in Television Camera Tubes
K. Blair Benson, *Video Corp. of America, New York*

Test Materials for the Alignment of Telecine Colorimetry
Richard Corley, *D and S Corley Ltd., Rexdale, Canada*

Character Generators and Allied Species
Eugene Leonard, *Da Vinci Research Group, Port Washington, NY*

Video Disc Replication with Photopolymerizable Resins
R. J. Anderson, D. J. Kerfeld and T. W. Lewis, *3M, St. Paul, MN*

Computer Graphics

Session chairman: Larry Evans, *Ampex Corp.*

An Introduction to Digital Computer Graphics for Television
Thomas Porter, *Ampex Corp., Redwood City, CA*

Interactive Graphics and Real-Time Animation for Television
Richard G. Shoup, *Aurora Imaging Systems, San Francisco*

Assessing Computer Graphics Software
Peter Black, *Xiphias, Santa Monica, CA*

Digital Animation Techniques
Lance Williams, *New York Institute of Technology, Old Westbury, NY*

Computer Graphics in Motion Picture Special Effects
Alvy Ray Smith, *Lucas Films, San Anselmo, CA*

Wednesday, November 12 Television Production and Post-Production

Session chairman: Otis Freeman, *WPIX, Inc.*
Session vice chairman: John E. Neeck, *WPIX, Inc.*

Design Considerations for an Electronic Cinematography Camera
Richard Streeter, *CBS Television, New York*

Zoomlens: History and Present
Frank G. Back, *Retired, Zoomar, LaJolla, CA*

A Lightweight Portable Broadcast Camera with Optional Digital Control
Y. Miyaji, Naotake Morita and Tamotsu Nishizawa, *Toshiba Corp., Sunnyvale, CA*

The Cost of Camera Mobility: Part I—Conventional Cameras; Part II—Lightweight Cameras
W. P. Vinten, *W. Vinten Ltd., Edmunds, Suffolk, England*

Automated Enhancement for Portable ENG Recorders
Yves Faroudja, *Faroudja, Inc., Los Altos, CA*, and Joseph Roizen, *Telegen, Palo Alto, CA*

A New Approach to Space Ships and Aerial Scenes in Television Productions
Reginald King, *Evershed Power Optics Ltd., Surrey, England*

Recent Advances in the Fast Charging of Sealed Nickel Cadmium Batteries
D. C. Hamill and E. K. G. Jamés, *PAG Power Ltd., London, England*

Flying Spot Scanning on 525-line NTSC Standards
John D. Millward, *Rank Cintel, Hertfordshire, England*

Problems of Maintenance

Session chairman: Eugene Leonard, *DaVinci Research Group*

Maintenance and Repair Considerations in Equipment Design
Robert A. Williams, *Ampex Corporation, Redwood City, CA*

Maintenance and Repair Considerations in Systems and Facility Design
Steven A. Smith, *Broadcast Technology Consultants, Mission, KS*

Diagnostic Techniques
J. Peterson, *System Concepts, Salt Lake City, UT*

Selection Training Upgrading and Cherishing of Maintenance Personnel

Norman Rosensheim, *Unitel Production Services, New York*
Documentation and Vender Support
W. Nichol, *KPIX, San Francisco*
Panel Discussion: Eugene Leonard, *DaVinci Research Group, Moderator*

Thursday, November 13 Lighting and Sound for Television and Motion Pictures

Session chairman: E. Carlton Winckler, *Imero Fiorentino Associates*
Session vice chairman: Michael H. Growth, *Eastman Kodak Co.*

The Development of Stereo Magnetic Recording for Film
Hazard E. Reeves, *Reeves Teletape Corp., New York*

The Historical Development of Cinema Architecture and Its Acoustical Effect on Filmsound Recording
Ted Uzzle, *Altec, Anaheim, CA*

CBC Experience in Stereo Broadcasting
James Kitchen, *CBC, Toronto*

A Procedure for Optimizing Photographic Sound Recording Systems
Charles Nalrn, *Communications Technology, Inc., Detroit*

The Divergence of Cinematographic From Still Photographic Lighting Techniques, 1930-1945
Evan William Cameron, *Washington State University, Pullman, WA*

High power Single Ended Discharge Lamps for Film Lighting
R. Hall and B. Preston, *Thorn Lighting Ltd., Leicester, England*

An Innovative Approach to HMI Fixture Design
Edwin S. Clare, *Cinema Products Corp., Los Angeles*, and Joe Tawil, *Great American Market, Woodland Hills, CA*

Videotape Recording

Session chairman: William C. Connolly, *CBS, Inc.*
Session vice chairman: Richard Green, *CBS, Inc.*

The Rise of Mechanical Television, 1901-1930
George Shiers, *Santa Barbara, CA*

The Development of the Ampex Videotape Recorder
Charles P. Ginsburg, *Ampex Corporation, Redwood City, CA*

Videotape Post Production: Operating Procedures 1980
Lawrence J. Kreeger, *EUE Video Services, New York*

The I.V.C. 1-11: A Different Approach
David J. Edmonds and Peter C. Lowten, *International Video Corp., Sunnyvale, CA*

The New RCA One-Inch-Type C Helical VTR
Lee V. Hedlund, *RCA Corp., Camden, NJ*

HBU and Portable HBU Videotape Recorders
Sid McCollum, *Recortec, Mountain View, CA*

Accessory Mechanical/Optical Equipment for Video Production
Warren R. Smith, *Warren R. Smith Company, Ocean Gate, NJ*

Friday, November 14 Digital Television

Session chairman: Robert Butler, *NBC*
Session vice chairman: Robert Mausler, *NBC*

Status Report: SMPTÉ Task Force on Component Digital Coding
Frank Davidoff, *Frank Davidoff, Inc., Lynbrook, NY*

What Do We Expect From Digital Video Equipment?
Frederick M. Remley, *University of Michigan, Ann Arbor, MI*

SMPTÉ Study Group on Digital Television Tape Recording: Progress Report
William G. Connolly, *CBS, New York*

Digital Audio Technology, Today and Tomorrow
Toshi T. Doi, *Sony Corp., Kanagawa, Japan*

VIDEOSCOPE: An Accurate Method for Certifying, Timing, and Analysis of RS-170A Systems
Bruce Blair, *Lenco, Inc., Jackson, MO*

NTSC Color Field Identification
C. E. Spicer, *NBC, New York*

The Advanced Videotape Editing/Dubbing System in NHK
Kensho Sata, Takeshi Ogawa and Iwao Obata, *Japan Broadcasting Corp., Tokyo*

The Squeezezoom Digital Video Effects Unit
Sidney J. Dodd, *VTR Productions Ltd., Toronto*

Progress Report on Standardization of Digital Control Code
Graeme Little, *Ampex Corp., Redwood City, CA*

User Bits for SMPTÉ Time Code
DeWitt Smith, *Amtel Systems, Inc., Doylestown, PA*

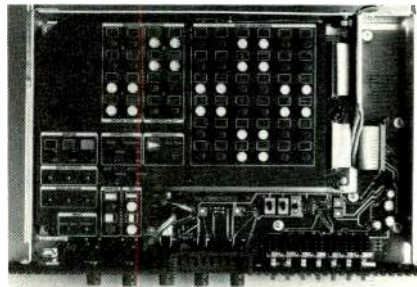
new products

Tektronix introduces 19-inch color monitor

Tektronix is expected to unveil its new high resolution 19-inch video monitor—the Model 690 SR—at NAB-'81. After four years in development, production models are expected to be available early in 1981, and the unit's debut at NAB-'81 will be a major emphasis at the Tektronix booth. The NTSC version will be at NAB-'81; other standards will follow.

A prototype of the 690 SR has been touring the country for editors to see as part of Tektronix's early effort to alert the industry to this new monitor. The prototype shown recently in Kansas City was impressive, exhibiting exceptional resolution and enough adjustment controls to satisfy the most critical engineer. Some of the design and performance features of the 690 SR are:

- Design features/goals:
- Designed to be a reference standard picture monitor with stabilized color balance, stabilized picture, accurate color decoding, high per-



formance color picture tube and excellent color convergence.

- Designed to meet future needs: plug-in decoders, high resolution and adaptability to future standards.
- Designed to be dependable: efficient power supplies, modular construction, easy alignment and rugged construction.

Although the price has not been set for the 690 SR, it will be expensive—probably around \$9000. But pricing is not expected to be a problem because of the competitive advantages Tektronix says is offered by the 690 SR. These include: true

high resolution shadowmask tube (0.31 mm dot triad spacing with no moire problems and precise convergence for critical picture examination (0.5mm).

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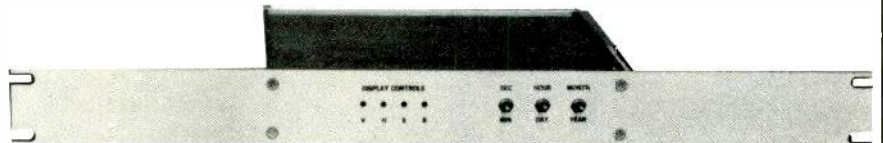
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Weather data formats

Weatherscan International provides radio and television broadcasters with immediate, accurate weather information. The high speed Weatherscan computer system assembles its data from the Federal Aviation "604" weather circuit. The "604" circuit includes reports from



more than 2000 weather stations around the world. Weatherscan translates these complex meteorological codes into a variety of current weather and forecast formats that are sent via telephone transmission to the broadcaster.

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Lavalier microphone

The CO90P, a phantom-powered miniature condenser lavalier microphone, has been introduced by Electro-Voice. The new mic is mounted on a tie clasp and is similar to E-V's CO90 except that it uses an external, or phantom, power supply as opposed to the CO90's internal battery.

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Cases

Cases Inc. has introduced its Endura line of lightweight carrying and shipping cases. The Endura is available in three sizes: 18x14x4 inches, 18x14x6 inches and 18x14x8 inches, and comes either foam filled or with pre-cut inserts for all types of cameras.

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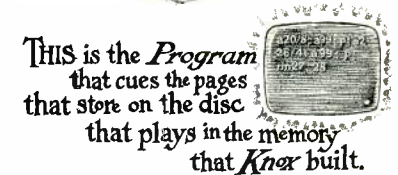
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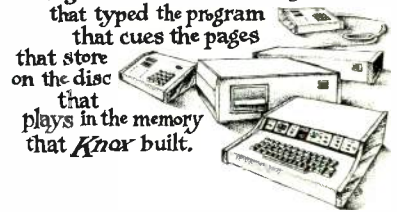
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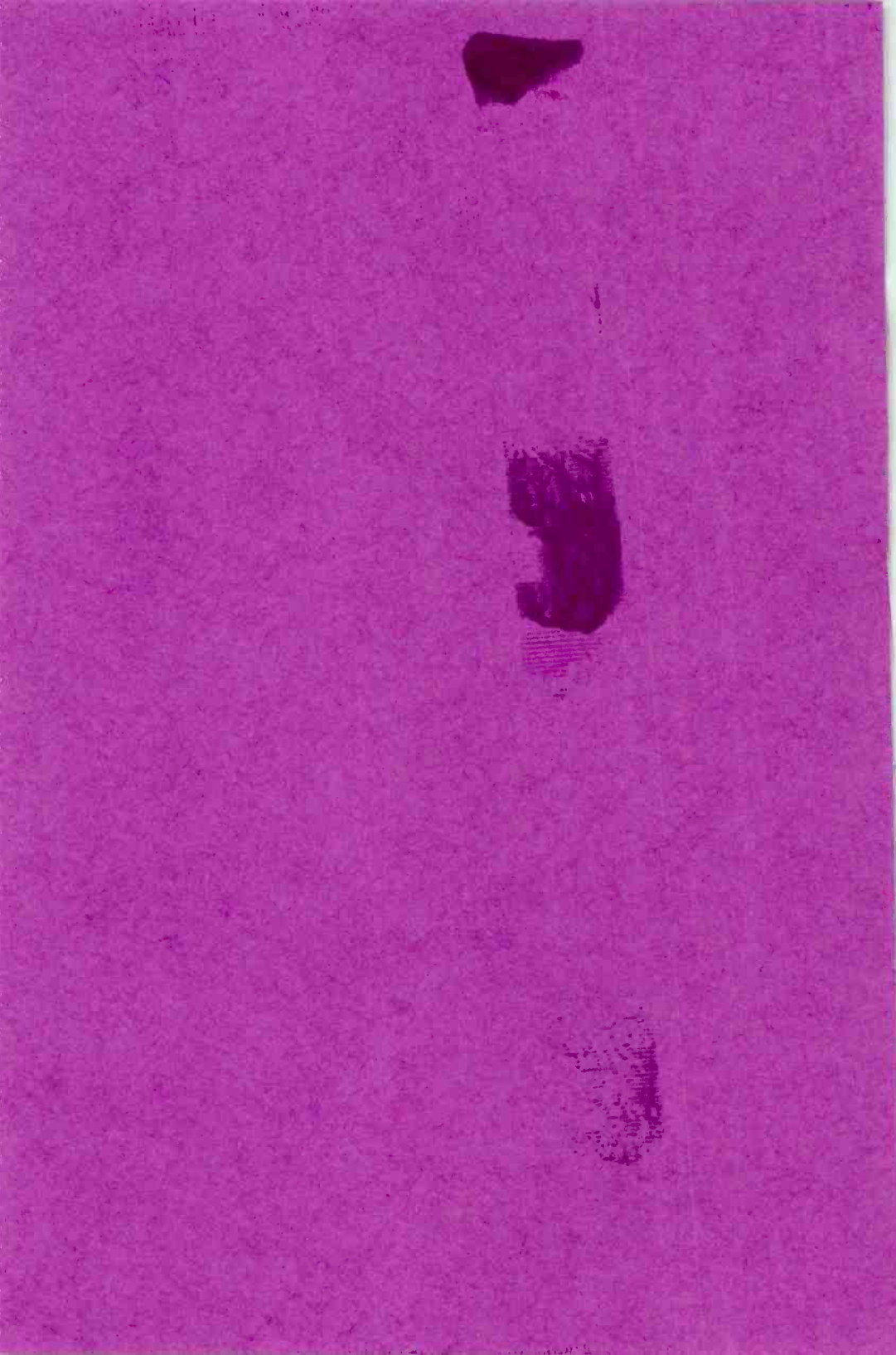
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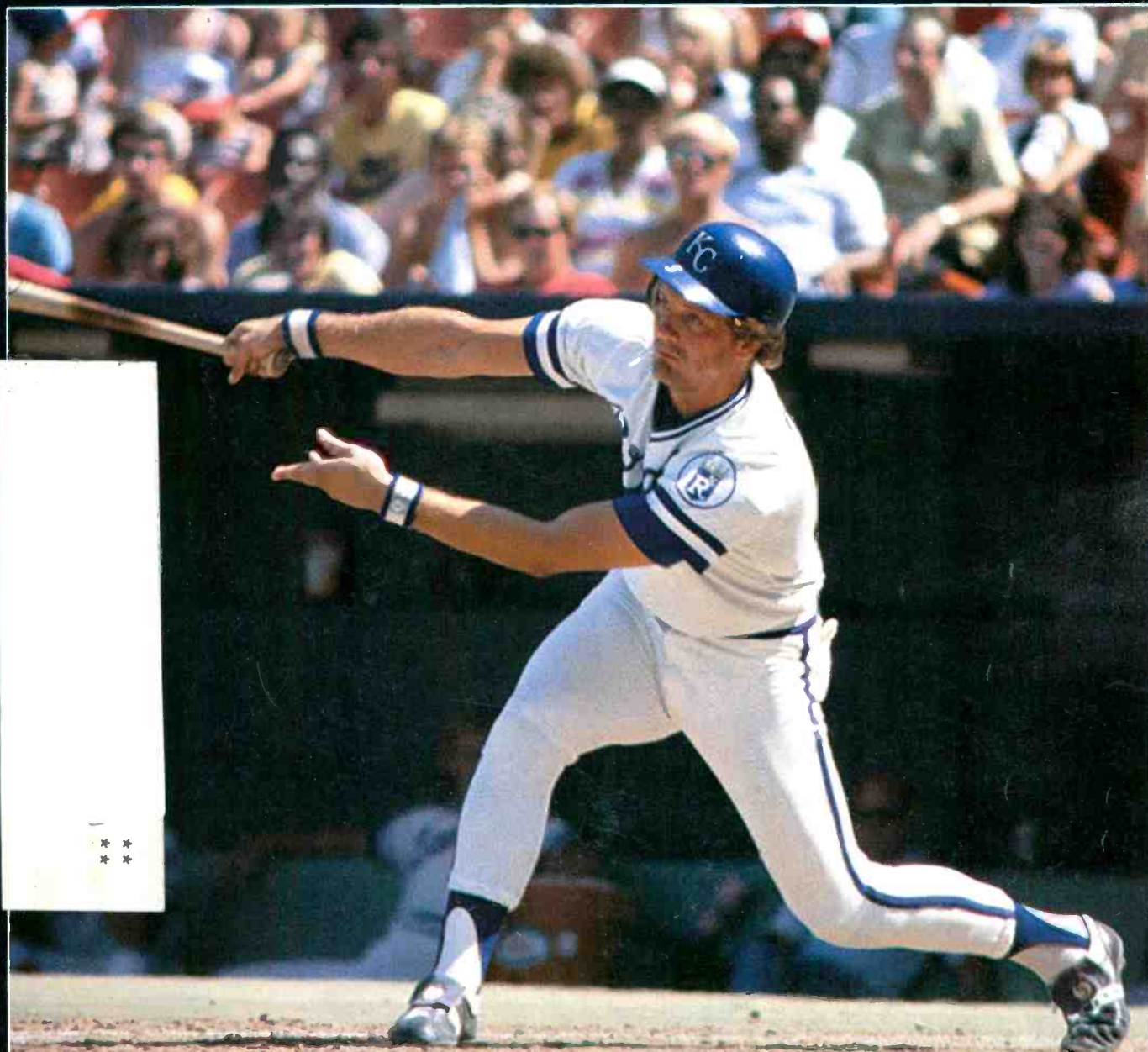
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BROADCAST[®] ENGINEERING

January 1981/\$3



ENG/RENG

World Series

NFL

Camera roundup



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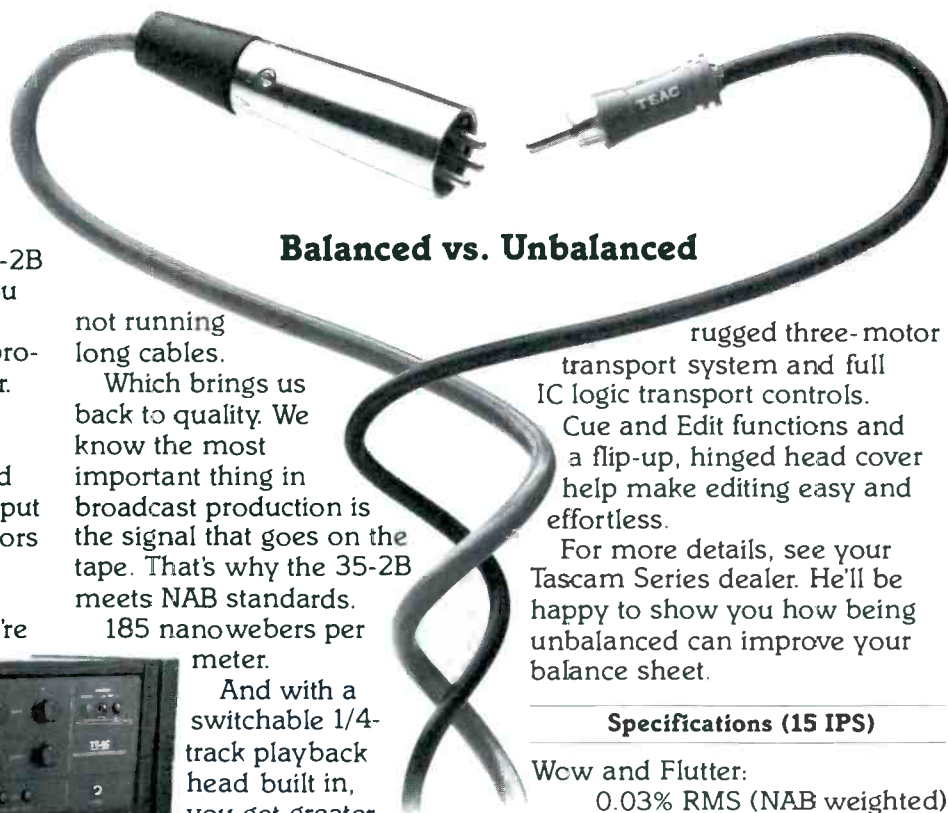
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BROADCAST[®] engineering

The journal of broadcast technology

January 1981 □ Volume 23 □ No. 1

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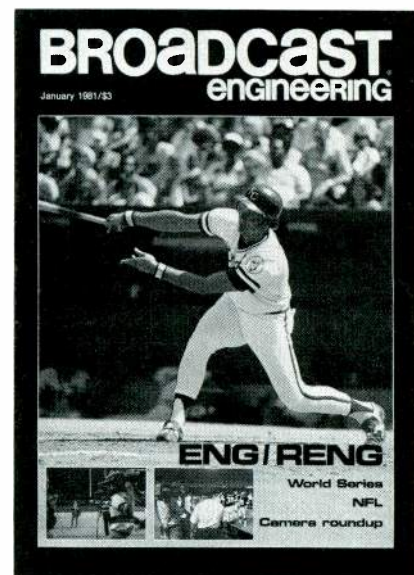
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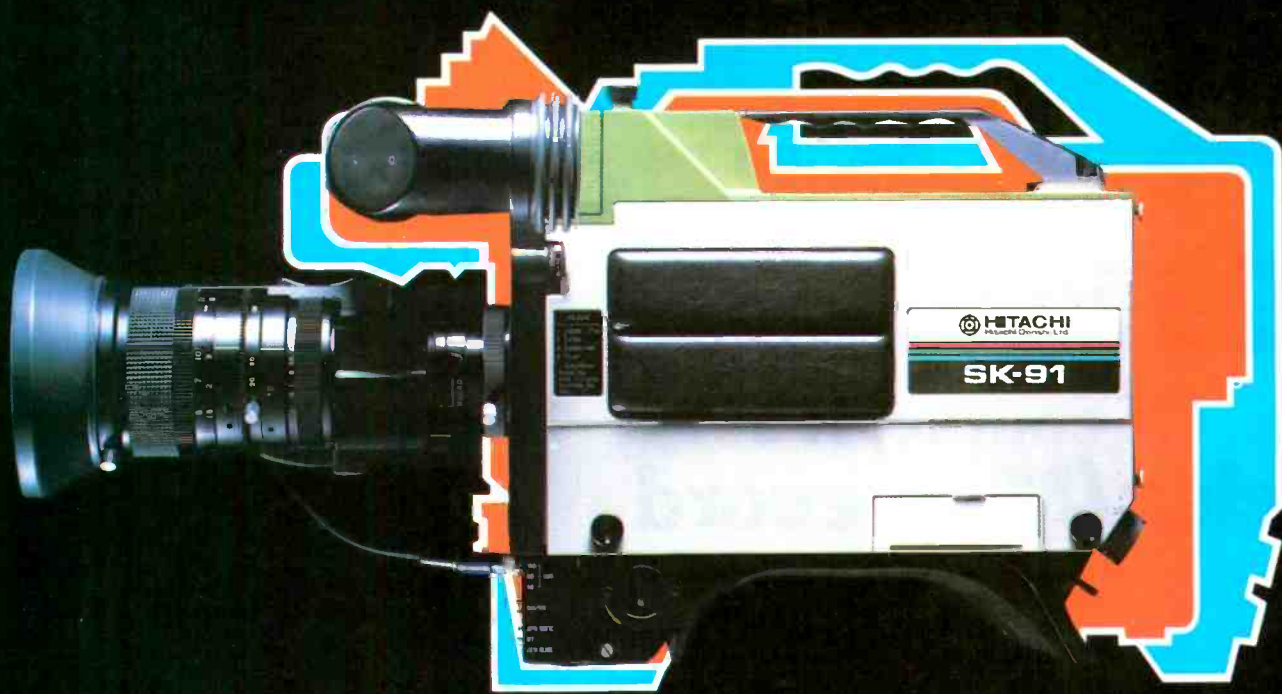


THE COVER this month reflects the emphasis on sports as application of electronic journalism—ENG/RENG (Electronic News Gathering and Radio Electronic News Gathering). Shown is George Brett in the World Series at the Royals Stadium in Kansas City. At bottom left, Bryant Gumbel, NBC pre-game host, prepares for his game introduction; bottom right shows the bench at a Monday Night Football game. Baseball pictures are courtesy of the Kansas City Royals, Chris Vleisides, photographer; football pictures are courtesy of ABC sports. Articles on ENG in this issue cover electronic journalism in sports, ENG helicopter usage, and a roundup of ENG/EFP cameras.

NEXT MONTH

The main emphasis in the February issue will be circularly polarized antennas for radio and television. Covered will be (1) design/performance of CP antennas, (2) application reports on how broadcasters have benefited from CP antennas, and (3) a roundup of CP antenna sources.

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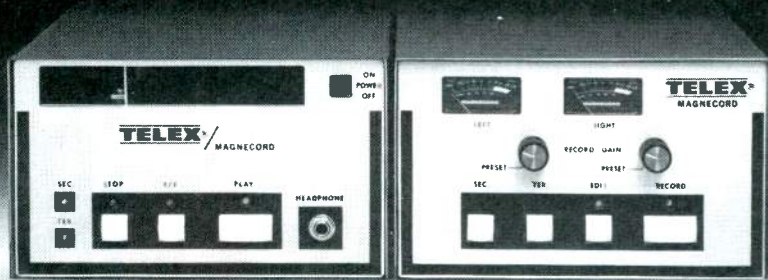
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4 Broadcast Engineering January 1981

BROADCAST[®] engineering

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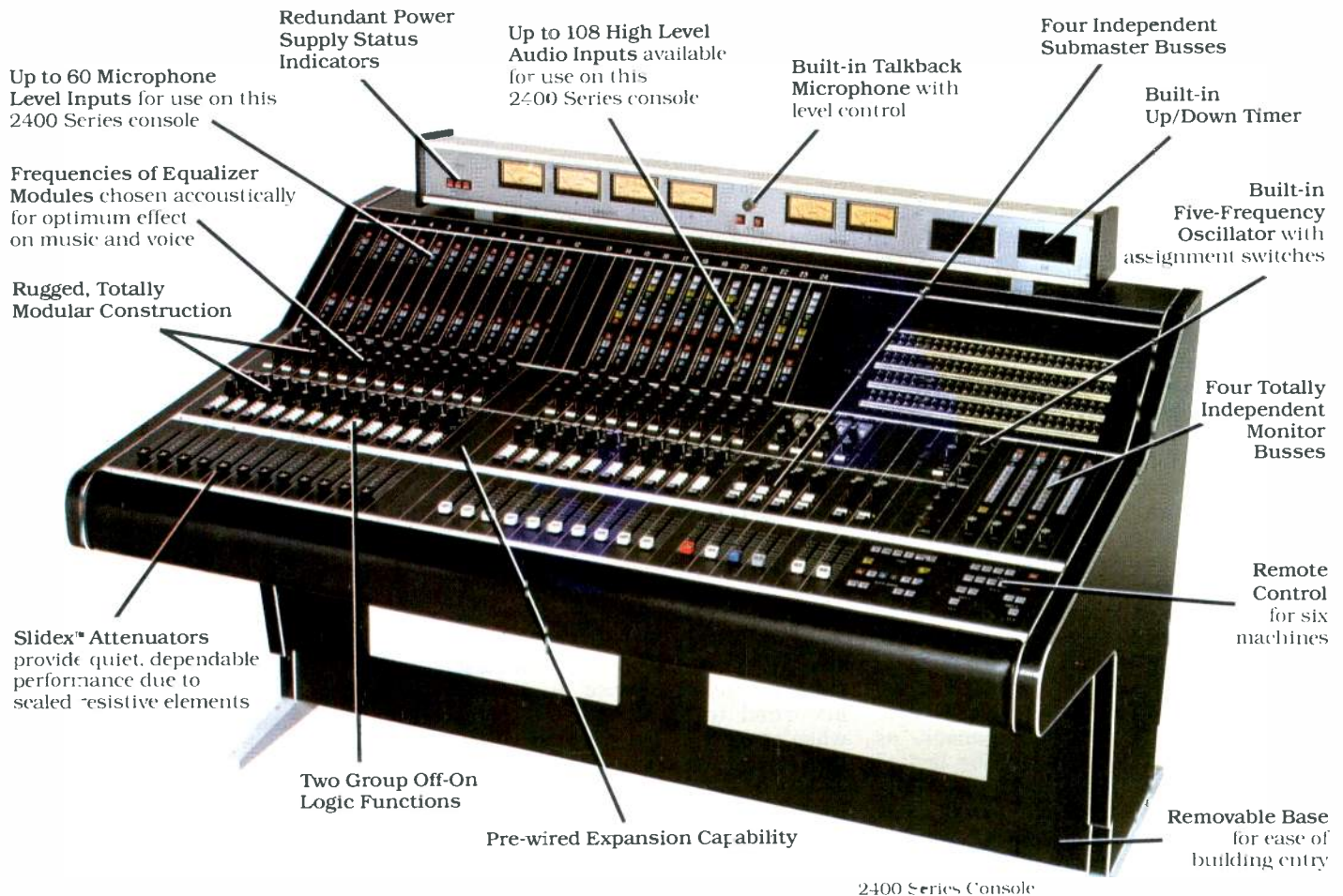
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FCC update

January 1981



Low power television service considered

The FCC is proposing to authorize a new class of broadcast station. Called the Low Power Television Service, it would allow low power stations to operate on any VHF or UHF channel, on a secondary basis to full service stations. The service would consist of existing low power translator stations as well as new stations.

Currently, translator stations pick up the signal of a full service station, boost it and rebroadcast it on another channel. They are not permitted to originate any programming other than emergency warnings and 30 seconds per hour of fund-raising programming. The new low power stations will be permitted to originate programming, to continue to serve a translator function or to provide subscription programming via a scrambled signal.

Stations licensed in the Low Power Television Service would operate on a secondary basis to full service stations. They would not be permitted to cause interference to full service stations, and would be required to vacate the frequency on which they operate if a full service station were licensed on the same frequency. Low power stations, as the name implies, would be limited to operating at a lower power than full service stations. Generally, low power VHF stations would be permitted to operate at 10W of power, and low power UHF stations at 100W.

A low power station would not be required to originate programming, and would not be required to build studio facilities. Should a translator station licensee choose to originate programming, the licensee would be required to have a licensed operator at the station. The commission would not prescribe the amount or types of programming to be carried, and formal log and ascertainment requirements would not apply.

The commission took this action in part because of a recognized need for additional television services, particularly in rural areas of the country, which are underserved by existing stations. The new low

power stations would be a valuable means of providing additional television service in many areas. The low power stations could also provide new, less expensive opportunities for minority groups and individuals to establish and operate specialized stations.

Ownership of low power stations will be open to any party who can meet the citizenship, financial and technical requirements. There will be no limit on the number of stations in common ownership, although the one-to-a-market and duopoly rules will apply. That is, a broadcast licensee would not be permitted to own a low power station within its primary service area. The commission hopes that low power stations will provide openings in the broadcast industry for new and diverse voices. To foster that goal, major television networks will not be permitted to own low power stations. It is hoped that flexibility of programming and operating requirements will enable these stations to be economically viable while offering new and varied types of programming. To encourage minority entry into the broadcast industry, a preference would be accorded to minority applicants when more than one applicant seeks the same channel. Noncommercial applications will also receive a preference in such situations.

Currently, no applications for low power experimental stations will be accepted by the commission, which is retaining an April 24, 1980, freeze on such applications. However, the commission has not placed a freeze on applications for translator stations, and will accept translator applications that include requests for waiver of the existing translator rules, providing the waiver request is supported by a public interest justification.

It is important to note that no final rules for the Low Power Television Service have been adopted. Therefore, only correctly completed applications for translator stations to operate under the existing rules will be accepted for processing. Ordinarily a complete and accurate application cannot be

prepared without the assistance of a qualified broadcast engineer. The Broadcast Bureau has cautioned that incomplete or defective interim applications will be returned without action.

To comment on this proceeding, send an original and five copies of comments to: Secretary, FCC, 1919 M St. NW, Washington, DC 20554. Be sure to include the docket number, BC DOCKET 78-253, on any comments. Comments are due by January 15, 1981, and reply comments are due by March 1, 1981.

For more information about the proposal, contact the Consumer Assistance and Information Office at (202) 632-7000.

Low-Power TV is High Octane

Commentary by Howard Head, A.D. Ring and Associates, Washington, DC.

The hottest thing to hit the television industry since the lifting of the "freeze" in 1952 now turns out to be the FCC's proposal to authorize a new class of low power television station.

Response to the commission's proposal is overwhelming. Lawyers, consulting engineers, frequency search companies, even the commission itself, which has run out of FCC Form 346 on which applications are to be filed, are inundated. Although the commission is attempting to reassure all comers that no preference will be given to applications filed in advance of the adoption of the new rules, the world is full of skeptics, and it seems that everyone is scrambling to find a channel and get an application on file.

The variety of programming is limited only by the imagination. There are proposals for educational networks, pay-TV operations, turning existing TV broadcast stations into "superstations," and service to ethnic groups. In many instances, the commission's proposal has stimulated interest in ordinary translator operation, which is already permitted under existing rules. New ideas are cropping up, including one for "micro-power" operation with powers as low as 1W serving out to only about a mile. □

**Program/audience test
announced for teletext**

The CBS/Broadcast Group, CBS-Owned KNXT, public television station KCET and the Caption Center of WGBH in Boston have announced plans to participate in a program/audience test of teletext in Los Angeles.

The Los Angeles test is designed to measure the various informational, educational and commercial applications of this in-home communications service and it will be carried out in several phases.

To prepare for the test, teletext broadcast equipment will be installed and operating personnel will be trained beginning this month. Actual on-air teletext broadcasting will begin in April when specially equipped television sets will be put in public areas where viewers will be able to see and use the system. Actual in-home use will follow; KNXT will explore the commercial applications and captioning, and KCET will explore ways to enhance the traditional public television programming service.

The KNXT teletext magazine may include local and national news, sports, weather reports, financial information, consumer tips, classified advertising, local tie-ins to national ads, entertainment listings, traffic conditions and captioning for the hearing-impaired.

KCET will be experimenting with a variety of magazines of both an informational and educational nature that will be used in the home, in schools and in a number of other institutions. These magazines will provide such information as cultural events listings, quizzes and games for children, a guide to KCET's broadcast schedule and a wide range of educational material. KCET intends to fully explore the educational potential of the technology with an eye towards possible interactive applications.

The Caption Center of WGBH will prepare captions for selected CBS Television Network programs. Beginning in April, these captioned programs will be broadcast over KNXT. The Caption Center has been captioning television programs for almost 10 years. Its participation in the Los Angeles test will demonstrate the editorial and technical capabilities of the teletext captioning system. A Los Angeles office of the WGBH Caption Center will be opened in early 1981.

Initially, 100 US television receivers will be equipped with teletext decoders. During the life of the experiment, the number of sets may increase.

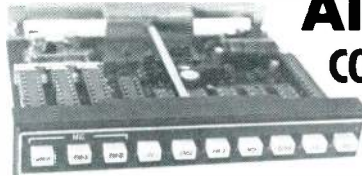
**Communications satellites
launched**

INTELSAT V, the first of a new generation of international telecommunications satellites, has been flown from California to Cape Canaveral, FL, for launch preparations and was scheduled to be launched in early December.

The United States \$35 million satellite is owned and operated by the 105-member-nation International Telecommunications Satellite Organization (INTELSAT).

In its planned stationary orbit 36,000 kilometers (22,300 miles) above the Atlantic Ocean, the new satellite will be able to relay up to 12,000 telephone calls, or their equivalent, and two color television programs simultaneously when it goes into operation later this year.

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1980 Emmys for engineering

Emmy Awards of the National Academy of Television Arts and Sciences have been presented to four major electronics organizations for distinguished achievement in the science of television engineering.

Presentation of the Emmys by NATAS president John Cannon was made at the Third Annual Television Engineering Dinner in September. Receiving the

awards were: Nippon Electric Company, The Panasonic Company, Quantel Limited and Vital Industries.

All four awards related to the introduction, development and implementation of digital techniques for the production of video special effects—a computer-age breakthrough in the science of television picture information.



Left to right: Ike Iizuka, general manager, Panasonic Video Systems, John Cannon, National Academy president, Morris Washington, national sales manager, Panasonic Pro. Video, Ken Kurahashi, president, Panasonic Company and Akisada Ogama, president, Matsushita Communication Industrial, display the Emmy Panasonic and Matsushita Communication Industrial were awarded for the "Video Squeezer," a special video effects system.



Accepting the Emmy for Vital Industries is, right, Christopher Donoyan, president. Congratulating Donoyan is S. A. Basara, RCA division vice president, Broadcast Systems.

Vital Industries was honored with an Emmy from the New York chapter of the National Academy of Television Arts & Sciences. The award was "for the development and implementation of Digital Techniques for the production of video special effects."

Quantel received an Emmy Award for engineering achievement for its DPE 5000 digital production effects system. The company was cited by The National Academy of Television Arts and Sciences "for the development and implementation of digital techniques for the production of video special effects."

The DPE 5000 is a computer-based effects system that allows television pictures to be electronically processed during live broadcasts or in post-production. Pictures may be compressed, enlarged, repositioned, frozen, squeezed in any direction, flipped, tumbled, rotated or otherwise manipulated.



Left to right are K. Nakamura, general manager, North America Division, Nippon Electric Company; T. Imai, general manager, Broadcast & Video Systems Division, NEC; Dr. T. Kawahashi, senior vice president, NEC; and H. Sugimoto, executive vice president, NEC America Inc.

The Nippon Electric Co. Ltd. (NEC) received its second Emmy for Outstanding Engineering Achievement from the National Academy of Television Arts and Sciences. This year's Emmy is for NEC's DVE (Digital Video Effects) System.



George A. Grasso, MCI/Quantel president, (left) and **Richard J. Taylor**, managing director of Quantel Ltd., (center) accept the Emmy from **John Cannon**, Academy president.

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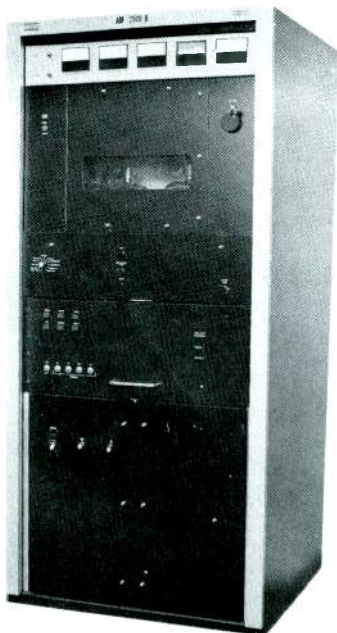
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News

COMSAT holds tour of launch center

COMSAT held a tour of its new \$1.6 million Launch Control Center at COMSAT headquarters at 950 L'Enfant Plaza, S.W., on November 13.

The center was designed to provide launch and orbital control for communications satellites due to be launched in the next 10 years.

Academy speech draws distinguished guests

Many distinguished guests were present when Herbert S. Schlosser, RCA executive vice president in charge of the SelectaVision division, addressed the Academy of Television Arts & Sciences Forum luncheon November 19.

Included among those who accepted invitations for the Century Plaza ATAS Forum session were: John F. Ball, president, Survival Anglia Ltd; Gary Dartnall, president, EMI Videograms Inc.; James N. Fiedler, president, MCA DiscoVision; Larry Finley, vice president, membership & events, ITA; Arthur Friedman, vice chairman, Television/Film Department, UCLA; James Jimirro, president, Walt Disney Telecommunications & Non-Theatrical Co.; Marty Keltz, executive director, Scholastic Productions; Nathaniel T. Kwit Jr., vice president in charge of United Artists video and Special Markets Division; Dr. Charles Lynch, chairman, Division of Radio/Television/Film, Cal State University Northridge; Thomas McDermott, president, Wrather Entertainment International; Jason Rabinovitz, vice president, finance, MGM Film Co.; Robert G. Rehme, president and chief executive officer, Avco Embassy Pictures; Steve Roberts, president, Telecommunications Division, 20th Century-Fox Telecommunications; Sid Sheinberg, president and chief operating officer, MCA Inc.; Grant A. Tinker, president MTM Enterprises; Jerome Wexler, vice president, Finance and Administration, NBC Enterprises, Division; and Mort Zarcoff, vice chairman, Division of Cinema/Television, USC.

Schlosser's speech subject was "The New Medium of VideoDisc."

Color TV record set

United States production of color television sets reached a record level, 2.7 million, in the second quarter of 1980, but many of them were assembled from incomplete receivers produced overseas, the Commerce Department's International Trade Administration reported.

Plane crash takes WUFT off air

WUFT, Gainesville, FL, was temporarily unable to broadcast over the air on Channel 5 because of destruction of the station's transmitting tower and satellite receiving dish October 24 when a small plane crashed into the tower, demolishing the dish.

Programming of WUFT resumed the same day over University City TV Cable via a land line connection. The transmission is continuing, and subscribers to University City are able to receive WUFT programs on Cable Channel 11. With the use of a satellite receiving dish lent to the station by Couch's Electronics, WUFT is able to receive programs transmitted from the Public Broadcasting Service (PBS). □

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National Association
of Broadcasters
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Dates changed for 1981 Radio Programming Conference

The NAB executive committee has resolved the conflict between the dates of the 1981 NAB Radio Programming Conference and the National Radio Broadcasters Association convention. NAB rescheduled its meeting from September 20-23 to

August 16-19 at Chicago's Hyatt Regency Hotel.

"The committee's action was unanimous. It was decided that the change is in the best interest of the radio industry," said NAB joint board chairman Thomas E. Bolger, president, WMTV, Madison, WI.

The committee also determined that the dilemma of diverse representation of the radio industry deserves serious study.

"NAB believes that broadcasting is best served by unified representation before the FCC and Congress and the executive committee hopes the membership will respond with specific recommendations to resolve future conflicts," Bolger said.

Radio committee seeks 'unified voice'

"For the good of the radio industry," the NAB's Metro Market Radio Committee has strongly recommended to the NAB executive committee that the association "take the initiative in bringing about a unified voice speaking for the radio industry as a whole."

At its meeting, the committee, headed by Len Hensel, vice president and general manager, WSM Inc., Nashville, TN, asked the executive committee "to find a mechanism to provide a unified voice for the radio industry in the area of government relations, to explore procedures to minimize the number of radio meetings during the year and to eliminate 'conflict of dates' problems."

The committee also recommended to NAB's joint board of directors that "it take all necessary actions to ensure that members are fully aware of rapidly developing new technologies in broadcasting and communications and to strongly encourage the regulatory and the congressional functions of government to not preclude radio broadcasters from participating in services to the public made possible by these new technologies."

Libel/First Amendment Insurance Plan announced

The NAB has announced a libel insurance plan for broadcasters that includes a First Amendment legal expense option never before available to most license holders.

In making the announcement, Vincent T. Wasilewski, NAB president, said, "increasingly broadcasters have become targets for those who use the courts in attempts to

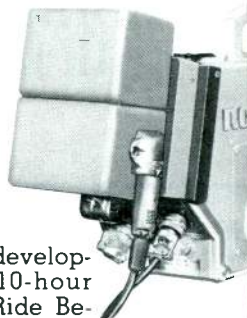
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drain our resources and mute our messages. I believe this plan will become an important tool as we work toward greater programming freedom."

Under the Libel/First Amendment Insurance Plan, sponsored and endorsed by NAB, broad libel and related risks protection both for legal defense and money damages will be available to broadcasters who previously might not have been able to afford the level of coverage

provided by this plan.

The plan offers protection against libel suits brought on by a deliberate statement—a mistake or any remark, on or off air. It also provides coverage for trespass by broadcasters and employees, errors and omissions in advertising and self-promotional copy, the publication of rate cards, program listings, guides and news releases. It also contains First Amendment legal expense insurance.

"Such coverage," said Wasilewski, "is fast becoming a necessity to help broadcasters resist efforts to

restrain their programming and journalistic freedom, to protect reporters' confidential sources in criminal cases, to repel subpoenas and to assist in gaining access to places and information."

CNA Insurance has underwritten the Libel/First Amendment Insurance Plan. Its libel and claims supervisor is Media/Professional Insurance.

NRBA

**National Radio
Broadcasters' Association**

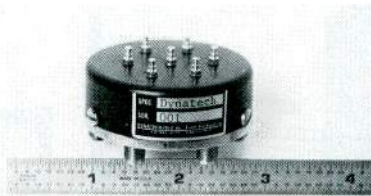
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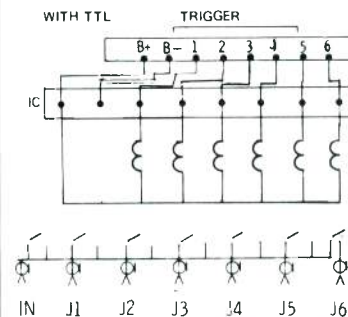
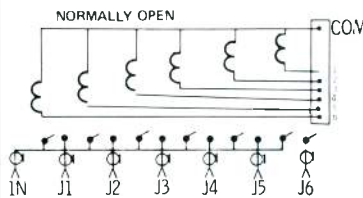
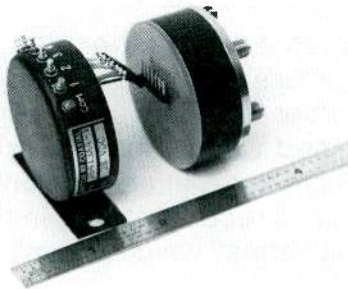
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1. Operating Frequency	100 MHz	500 MHz	1 GHz
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7. Switching Time	500 u/sec		
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10. Operating life	5,000,000 cycles		

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Kaplan urges broadcasters to fight apathy

Speaking at a luncheon meeting of the Ohio Association of Broadcasters on October 30, NRBA's president, Sis Kaplan, urged radio broadcasters to meet head-on the wave of change that will sweep over the radio industry in the '80s and '90s. "Radio in the '80s will be very different from the radio of the '70s and radio in the '90s will be a completely different world compared to the '70s," Kaplan said. "Change brings both danger and opportunities and broadcasters who don't overcome their apathy will be effectively committing suicide."

Kaplan warned that radio faces tremendous pressure from two sides. One is the effect that new technology will have on the industry, the other is the FCC's determination to restructure the present radio system. "We cannot and should not oppose logical and inevitable progress," Kaplan said, "but we must fight with all our strength attempts by government to change our industry in ways that will irreparably damage the world's best radio system."

FCC contracts female ownership study

The FCC has contracted with East Lansing Research Associates Inc. to conduct a \$39,049 study of "Female Ownership of Broadcast Media." All female owners reported on ownership form 323 will be contacted to determine the degree of female involvement in day to day operations. A random sample of 912 AM, 644 FM and 300 television stations will also be surveyed.

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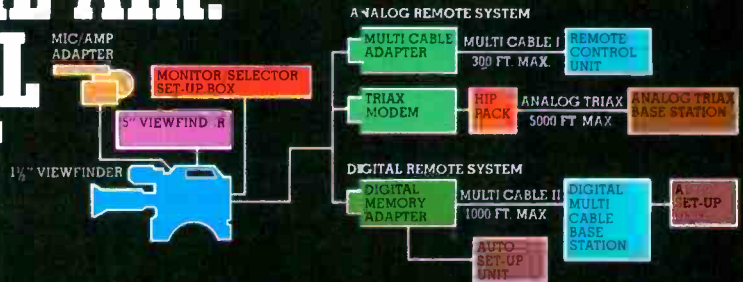
Associations Comparison of Canadian and U.S. 9kHz Separation plans in AM band

Comparison of Canadian and U.S. 9kHz Proposed Separation plans in AM band

Compiled by Ray Livesay, NRBA board member

Old 10kHz Channels			CANADIAN			Old 10kHz Channels			CANADIAN		
	USA Plan						USA Plan				
540 kHz	0	540 kHz	0	540 kHz	1070	+ 1	1071	+ 1	1071 kHz		
550	-1 kHz	549	-1 kHz	549	1080	0	1080	0	1080		
560	-2	558	-2	558	1090	-1	1089	-1	1089		
570	-3	567	-3	567	1100	-2	1098	-2	1098		
580	-4	576	-4	576	1110	-3	1107	-3	1107		
	NEW	585			1120	-4	1116	-4	1116		
590	+ 4	594	-5	585		*NEW*	1125				
600	+ 3	603	-6	594	1130	+ 4	1134	-5	1125		
610	+ 2	612	-7	603	1140	+ 3	1143	-6	1134		
620	+ 1	621	-8	612	1150	+ 2	1152	-7	1143		
630	0	630	-9	621	1160	+ 1	1161	-8	1152		
			NEW	630	1170	0	1170	-9	1161		
			NEW	639				*NEW*	1170		
640	-1	639	+ 8	648				*NEW*	1179		
650	-2	648	+ 7	657	1180 kHz	-1 kHz	1179 kHz	+ 8 kHz	1188		
660	-3	657	+ 6	666	1190	-2	1188	+ 7	1197		
670	-4	666	+ 5	675	1200	-3	1197	+ 6	1206		
	NEW	675			1210	-4	1206	+ 5	1215		
680	+ 4	684	+ 4	684		*NEW*	1215				
690	+ 3	693	+ 3	693	1220	+ 4	1224	+ 4	1224		
700	+ 2	702	+ 2	702	1230	+ 3	1233	+ 3	1233		
710	+ 1	711	+ 1	711	1240	+ 2	1242	+ 2	1242		
720	0	720	0	720	1250	+ 1	1251	+ 1	1251		
730	-1	729	-1	729	1260	0	1260	0	1260		
740	-2	738	-2	738	1270	-1	1269	-1	1269		
750	-3	747	-3	747	1280	-2	1278	-2	1278		
760	-4	756	-4	756	1290	-3	1287	-3	1287		
	NEW	765			1300	-4	1296	-4	1296		
770	+ 4	774	-5	765		*NEW*	1305				
780	+ 3	783	-6	774	1310	+ 4	1314	-5	1305		
790	+ 2	792	-7	783	1320	+ 3	1323	-6	1314		
800	+ 1	801	-8	792	1330	+ 2	1332	-7	1323		
810	0	810	-9	801	1340	+ 1	1341	-8	1332		
			NEW	810	1350	0	1350	-9	1341		
			NEW	819				*NEW*	1350		
820	-1	819	+ 8	828				*NEW*	1359		
830	-2	828	+ 7	837	1360	-1	1359	+ 8	1368		
840	-3	837	+ 6	846	1370	-2	1368	+ 7	1377		
850	-4	846	+ 5	855	1380	-3	1377	+ 6	1386		
	NEW	855			1390	-4	1386	+ 5	1395		
860	+ 4	864	+ 4	864		*NEW*	1395				
870	+ 3	873	+ 3	873	1400	+ 4	1404	+ 4	1404		
880	+ 2	882	+ 2	882	1410	+ 3	1413	+ 3	1413		
890	+ 1	891	+ 1	891	1420	+ 2	1422	+ 2	1422		
900	0	900	0	900	1430	+ 1	1431	+ 1	1431		
910	-1	909	-1	909	1440	0	1440	0	1440		
920	-2	918	-2	918	1450	-1	1449	-1	1449		
930	-3	927	-3	927	1460	-2	1458	-2	1458		
940	-4	936	-4	936	1470	-3	1467	-3	1467		
	NEW	945			1480	-4	1476	-4	1476		
950	+ 4	954	-5	945		*NEW*	1485				
960	+ 3	963	-6	954	1490	+ 4	1494	-5	1485		
970	+ 2	972	-7	963	1500	+ 3	1503	-6	1494		
980	+ 1	981	-8	972	1510	+ 2	1512	-7	1503		
990	0	990	-9	981	1520	+ 1	1521	-8	1512		
			NEW	990				*NEW*	1521		
			NEW	999				*NEW*	1530		
1000	-1	999	+ 8	1008	1530	0	1530	+ 9	1539		
1010	-2	1008	+ 7	1017	1540	-1	1539	+ 8	1548		
1020	-3	1017	+ 6	1026	1550	-2	1548	+ 7	1557		
1030	-4	1026	+ 5	1035	1560	-3	1557	+ 6	1566		
	NEW	1035			1570	-4	1566	+ 5	1575		
1040	+ 4	1044	+ 4	1044		*NEW*	1575				
1050	+ 3	1053	+ 3	1053	1580	+ 4	1584	+ 4	1584		
1060	+ 2	1062	+ 2	1062	1590	+ 3	1593	+ 3	1593		
					1600	+ 2	1602	+ 2	1602		

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Associations

Society of Broadcast Engineers

The Society of Broadcast Engineers is opposing the FCC proposed rulemaking change that would eliminate the First Class RadioTelephone Operator License. The society has strongly encouraged comments from the membership, citing the need for individual opinions so the commission can make an informed decision.

The SBE thinks that the First Class License serves as a useful screening device for potential employees and that the credibility of the license may be improved by reinstatement of the service record. A nominal examination and licensing fee would offset administrative costs.

Potential problems created by elimination of the license include downgrading of the professional status of the broadcast engineer, increased technical violations and interference problems, and possible deadly hazards for untrained personnel.

Colorado Broadcasters Association

An organization called Broadcast Pioneers requires only 20 years of

service to the industry for membership. Because of a move to revitalize this organization and to increase its membership and influence on the broadcasting industry, The Colorado Broadcasters Association, through its board of directors, has recognized the value and purposes of this group of individuals. CBA president Doug Stephens has appointed past president and director George Jeffrey of KKTV in Colorado Springs as the CBA liaison between the association and the pioneers organization.

Every CBA member station was mailed background information and an application. Anyone with 20 or more years service to the industry is eligible.

The purposes of Broadcast Pioneers are:

1. Preserving the history and traditions of broadcasting;
2. To honor broadcasters for what they are doing today; and
3. To influence people to get into broadcasting and to be sure broadcasting is perceived as a profession.

For more information contact George Jeffrey, KKTV, (303) 634-2844.

The Canadian Association of Broadcasters

The CAB is warning against a growing move to begin a pay TV

system in Canada.

The CAB also wants the policy and regulatory leaders in Ottawa to look again at the association's proposal made last March for pay TV linked to rural and remote coverage plans.

Ernest Steele, president of the 400-member association has asked both Communications Minister Francis Fox and the chairman of the Canadian Radio-television and Telecommunications Commission, John Meisel, for meetings with the CAB to discuss and sort out confusing policy statements by government, regulatory and communications industry spokesmen.

Last March the CAB placed a proposal before the CRTC's Therrien committee. It was to create a national Canadian pay service operated by broadcasters to provide pay TV to all Canadians in both languages. It included a package of regular Canadian TV services, such as the English language CTV network and the French language TVA network, to provide new services to remote and rural areas.

Central Canada Broadcasters' Association

At the annual meeting held in Montreal, the 1980-81 officers were elected. They are: past president, Joe McIntyre, CKCO TV, Kitchener, Ontario; president, Larry Cameron, CKWS Television, Kingston, Ontario; vice president, Jeff Guy, CJBK Radio, London, Ontario; secretary/treasurer, Paul Firminger, CHYM Radio, Kitchener, Ontario; papers chairman, Trevor Joice, CHIN Radio, Toronto, Ontario; and publicity chairman, David Gillard, CFOS Radio, Owen Sound, Ontario.

Retiring past president is Austin Reeve of CJOH TV in Ottawa.

Association for Broadcast Engineering Standards

The ABES thinks there is much to be desired in the FCC's present operator licensing activity and has no illusions that persons passing the First Class Operators Examination are certifiably capable of operating a station in accordance with technical rules.

License holders are expected to abide by the applicable technical standards regardless of changes that may be made in Operator Rules. However, abandonment of operator licensing will place many broadcast licensees, especially in smaller markets, in a difficult position, in developing meaningful enforceable technical competence qualification criteria for applicants seeking employment. □

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3:30 Min.	4:00 Min.	4:30 Min.	\$2.75 ea.	\$3.25 ea.	\$4.50 ea.
5:00 Min.	5:30 Min.	6:00 Min.	\$3.00 ea.	\$3.35 ea.	\$4.75 ea.
6:30 Min.	7:30 Min.	8:30 Min.	\$3.25 ea.	\$3.50 ea.	\$5.00 ea.
9:00 Min.	9:30 Min.	10:00 Min.	\$3.50 ea.		

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Farinon Video central receivers continue to gain acceptance by broadcasters who demand the very best in ENG reception.

From the Big Apple to the Golden Gate, from the Windy City to Big D—more and more TV stations including the flagships of the major nets are choosing our 2-GHz FV2CR Central Receiver because of its superior performance, flexibility and reliability. With 21 synthesized channels and an unsurpassed dynamic range, the FV2CR has minimized the problems of weak signals and distortion that in the past spelled disaster to ENG reception.

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For more information, contact HARRIS CORPORATION, Farinon Video, 1680 Bayport Avenue, San Carlos, CA 94070; (415) 595-3500; Telex 34-8491. In Canada, 657 Orly Avenue, Dorval, PQ H9P 1G1; (514) 636-0974; Telex 05-82-1893.



HARRIS
COMMUNICATION AND
INFORMATION PROCESSING



courtesy of ABC Sports

In preparing for Monday Night Football, Howard Cosell and Frank Gifford study the teams and players to bring out the game's finer points.



courtesy of Kansas City Royals, Chris Vleisides photographer

The high-camera behind third base offered an excellent view of the Royals field during the World Series in Kansas City. The cameraman relaxes here during warmup.

ENG/RENG: Behind the scenes in sports coverage

By Bill Rhodes, editorial director

The successful broadcasting of a major sporting event requires in-depth planning, professional talent and an enormous amount of equipment. **BE** went behind the scenes to observe the extensive preparations made to broadcast the World Series held in Kansas City, MO.

- 115-member technical crew
- \$55 million electronic gear
- 324,516 paid attendance
- 390 million television viewers
- Radio broadcasts to foreign countries

The World Series naturally generates excitement. Traditionally, the series is sold out, and the 1980 series was no exception. Game attendance for the six games played totaled 324,516, not counting hundreds of news media personnel. The NBC total estimated viewing audience exceeded 391 million, more than 1200 times as many people watching on television as attended the games themselves. Add to these figures millions that listened to the games on radio in Canada and more than 15 other countries.

Terms used to cover nonprint media coverage of current events are not yet clearly defined. **EJ** is used to generally class the complete field of Electronic Journalism; **ENG**, Electronic News Gathering, to loosely connote TV news gathering; and **RENG** to differentiate Radio Electronic News Gathering.

Behind all the glamour, hundreds of technicians worked feverishly setting up equipment to cover the games. Others organized the commentary provided by Joe Garagiola, Tony Kubek, and Tom Seaver plus the game reporting by Merle Harmon and Ron Luciano.

The crew

Production of the NBC Sports' 1980 World Series coverage was under the direction of Don Ohlmeyer, executive producer, Mike Weisman, coordinating producer, and Harry Coyle, game director. **BE** sat in on one of the late planning sessions directed by Weisman. The production crew and the commentators shared thoughts on what could happen as the game progressed. This was a fascinating session to attend. It was, in essence, NBC's game plan for bringing the most significant facets of baseball to the public. It was evident that the long association of Garagiola with the game and its personalities was invaluable in helping the production crew concentrate on critical aspects of the game and to alert them to potential rharbarbs.

The intensive pre-game planning had one goal: to produce outstanding coverage, both in video and audio, without technical flaws.

Equipment

To implement its coverage of the series in Kansas City, NBC used seven fully equipped trailers. Situated just outside Royals Stadium, these trailers served as a command post for the technical crew and their equipment—including service and maintenance.

Approximately \$55 million worth of electronic gear was used to cover the series in Kansas City alone. Included were: 10 stationary cameras, two hand-held mobile cameras, four slow-motion replay discs, three videotape machines, two still-store machines, two character generators, one video effects system, a production switcher, a host of monitors, and several miles of audio and video cables. Two of the cameras were equipped with microwave links.

Setting up these trailers and preparing the stadium with cameras, announce booths and press booths began four days before the

IN THIS BUSINESS IT PAYS TO BE SENSITIVE.

The new Canon J13x9B is the ideal lens system for every situation.

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to 118mm. Its built-in fluorite element for more accurate color correction. And its minimum object distance as short as 0.8m (31.5"). The lightweight J13x9E is available with a money-saving modular accessory package, giving you all the flexibility you need in the studio or field—now and in the future.

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The Panasonic Diode-Gun Plumbicon Camera. What better way to say broadcast performance.

Whether you're shooting a 9th inning rally, a political rally or a network special, no other ENG/EFP color camera says broadcast more ways than the new Panasonic AK-760.

The AK-760 combines a high-index prism optical system with three $\frac{2}{3}$ " diode-gun Plumbicon® tubes. And since the diode-gun Plumbicon tube has a thinner photoconductive

layer than conventional Plumbicons, the AK-760 offers outstanding resolution (600 lines center). Another advantage of the diode-gun system is the low beam resistance it generates. Add to that the AK-760's built-in bias light and the result is low beam temperature performance even at high beam current. And that also says lower lag.

The AK-760's feedback beam control reduces comet tailing by stabilizing highlights that exceed normal white levels. What it doesn't reduce is dynamic range or horizontal resolution. And because it's only activated during extreme highlights, feedback beam control helps prolong tube life and preserve edge geometry.

The AK-760 also gives

you the edge with a S/N ratio of 54dB at standard illumination of 200 foot-candles at f/4.0. And with the 18dB high-gain switch, all you need is 5 foot-candles at f/1.8.

Mounted on the AK-760's durable die-cast chassis you'll find an impressive array of circuitry like horizontal aperture correction, 2-line vertical enhancement, automatic



white balance and a built-in color conversion filter.

And whether you use it for ENG or EFP, the AK-760 is fully self-contained, and includes genlock, internal sync, adjustable blanking as well as subcarrier and phase controls.

For studio production, you can add an optional remote control unit, 5" CRT viewfinder and zoom lens conversion kit.

Panasonic also makes broadcast quality easy to afford with the AK-750B 3-tube Plumbicon. At \$16,000* it comes complete with 2-line enhancement, a \$2,000 option last year, plus genlock, a rechargeable battery, microphone and VTR cable.

There's also the AK-710. An electronic news-gathering camera at a news-worthy price, \$10,950* its

three Saticon® tubes and high-index prism optical system result in horizontal resolution of 500 lines center and a S/N ratio of 52dB.

Audition the AK-760 along with the entire line of Panasonic broadcast quality cameras. You'll see what we mean when we say broadcast.

For more information about Panasonic broadcast equipment, call your

nearest Panasonic office.

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Plumbicon is a registered trademark of N. V. Philips for TV camera tubes
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 *Manufacturer's suggested price.
 (Lenses not included.)

Panasonic
 VIDEO SYSTEMS DIVISION
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Seven NBC trailers outside the Royals Stadium housed offices and \$55 million worth of electronic gear. Within the trailer compound a 115-member technical crew prepared for airing. Mike Weisman, coordinating producer (center), checked last minute details in the trailers and in the stadium.



Jack Bennett (center) head of NBC technical operations and his supporting technical crew worked for days setting up equipment to televise the series from Royals Stadium in Kansas City. The trailer to the left housed the character generator, slow motion, still store and videotape equipment.

World Series

first game in Kansas City, and preparations remained hectic right up until game time.

Don Baer, vice president, NBC Sports Operations, was responsible for seeing that all technical aspects of the coverage ran smoothly, that the proper technical support person-

nel were available and that equipment operated properly. He gave BE a guided tour of the NBC setup, including the trailers, announce booths and field arrangements.

Choose from two new recording electronics packages from Inovonics.



Model 380 is the upgraded successor to our well-known 375, used in hundreds of studios and stations around the world. With your tape transport and our 380, you have the ultimate analog recorder. Features of the 380 include:

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full compatibility with highest-coercivity tapes.

- Two "workhorse" EQ and bias settings, plus an optimized mode with separate setup for best performance from "super" tapes.
- Compatibility with virtually any combination of transports and heads.
- SYNC reproduce and exclusive auto-mute.
- Remote control of all functions.

The perfect pair.

Use the 380 to create new, ultimate-performance recording equipment, or to give your old tape or mag-film recorder a sound so clean you must hear it to believe it. \$820.00

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Introducing
NEC's all-new

MNC-81A



The "new generation" ENG/EFP camera with a difference!

Get a headstart on the 1980's with NEC's newest "state-of-the-art" ENG/EFP camera: the MNC-81A.

Designed to meet today's more stringent requirements for highest-fidelity color reproduction, the MNC-81A features outstanding colorimetry matched to that of broadcast cameras; with f/1.4 high-transmission prism optics; a choice of pickup tubes: Saticon®, Plumbicon®, or Diode Gun™ Plumbicon®; a signal-to-noise ratio of 54 (± 2) dB; 4-position gain control with up to +18 dB additional gain for low light level operation; plus all the *automatics*, built-in indicators and features that have become standard for broadcast-quality video cameras. And more.

The NEC difference...

Extensive use of LSI hybrid microcircuits developed uniquely by NEC makes the MNC-81A extremely stable in registration and performance, and ultra-reliable in circuit operation.

Low-profile and ultra-lightweight — camera head (without lens, but including 1.5" viewfinder) weighs *less than 11 lbs.* and measures approximately 10¼" x 4" x 13½" — the MNC-81A handles with the ease of a compact 16mm newsfilm camera.

It is well balanced on the shoulder, with a form-fitting adjustable base. And its 1.5" viewfinder telescopes for convenient left or right eye viewing.

Best of all, the MNC-81A is a multi-purpose camera with the widest range of options for studio and field operation. Its sophisticated optional remote control

capabilities include a co-ax digital remote control system for distances up to 5000 feet, as well as fiber optics module and cable adapter for fiber optics video transmission from distances up to 9000 feet.

Quite a difference in operational flexibility and versatility compared to other cameras in its class!

The CP difference...

And, of course, when you buy an MNC-81A, you are automatically covered by Cinema Products' outstanding after-sales service and backup program.

You get an unprecedented full one-year warranty, with no service charge ever for warranty work! You get round-the-clock video service seven days a week. Replacement parts anywhere in the United States within 24 hours... And an easy-term lease/purchase program specifically tailored to your needs.

For complete details on the MNC-81A camera, contact Don Dunbar, Vice President/National Marketing. Call toll-free: 800-421-7468.

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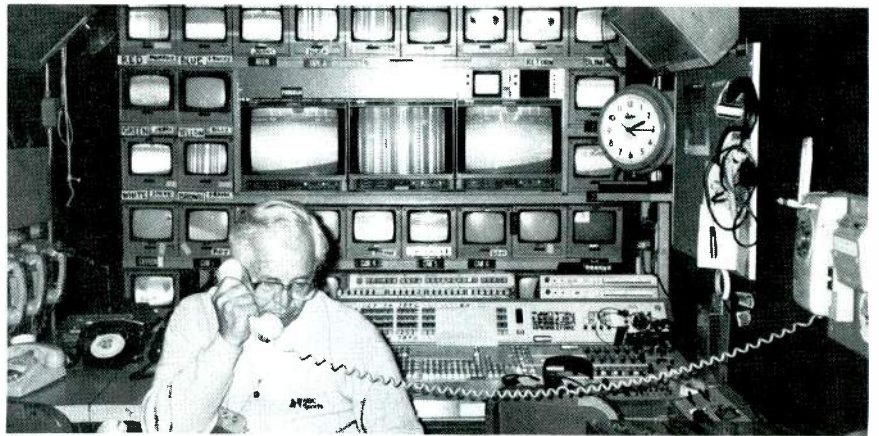
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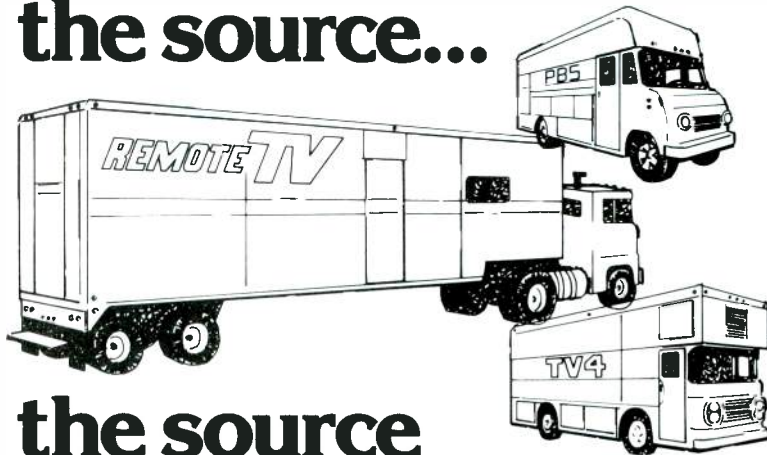
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World Series

The command post for game coverage was inside this fully equipped trailer in the center of the trailer compound. The view here is from the director's chair near the back of the trailer. Telephones gave immediate access to critical areas in the stadium. The broadcast signal was sent from this nerve center to a local terminal, by AT&T long lines to New York, and then out on NBC Network feeds.

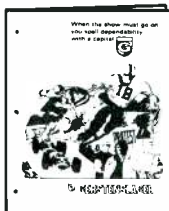


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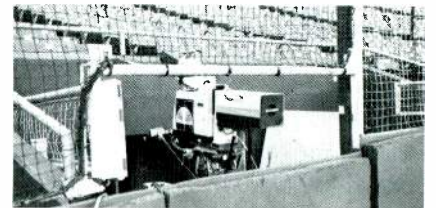
GERSTENSLAGER

The Gerstenslager Company, Wooster, Ohio 44691

Circle (21) on Reply Card



The low, first-base camera dugout was jammed with equipment long before game time.



The low camera behind home plate was reasonably well protected, but the camera operator still had some mobility to adequately cover action at home plate.



This view of the press room was taken from the high first base camera position. The upper level houses the NBC announce booth; the high, first-base camera; and the microwave equipment supporting the mobile field camera crews. Monitors hang outside the announce booth. The lower level is for the working press who beamed radio coverage of the series around the world.

If an exciting new look will improve your station's rating, let the new AniVid system help you achieve it.

Free demo shows you how.

Television is a visual medium, so it's no surprise that new, innovative visual techniques help attract new viewers. Animation is an artform where innovation has always been a way of life, but production time has eliminated it from many broadcast applications.

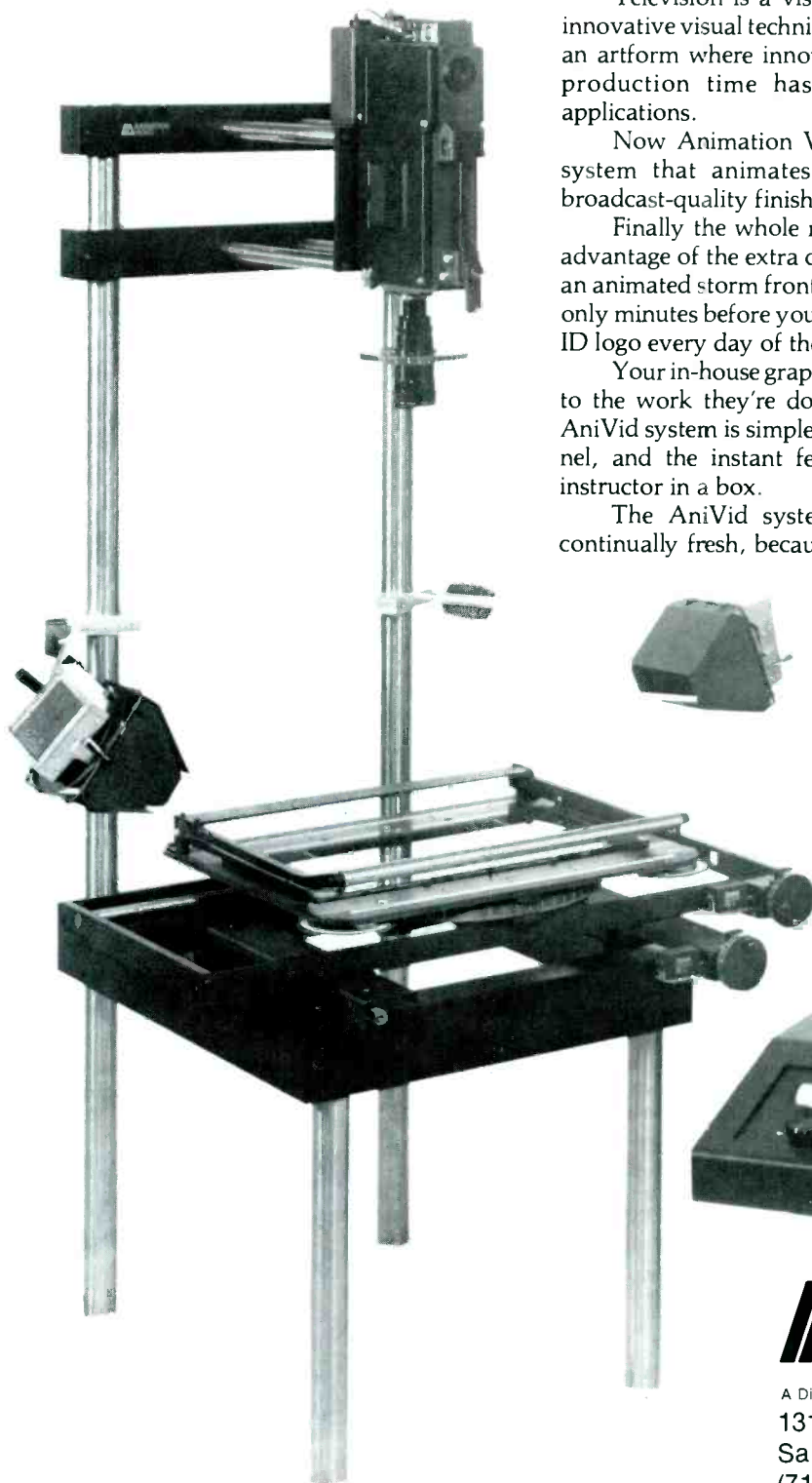
Now Animation Video has developed a revolutionary new system that animates directly onto videotape, producing a broadcast-quality finished product virtually instantly.

Finally the whole range of your broadcast schedule can take advantage of the extra clarity and graphic zing of animation, from an animated storm front moving across the weather map (prepared only minutes before your newscast goes on the air) to a new station ID logo every day of the week.

Your in-house graphic team can add movement and excitement to the work they're doing now with no additional training; the AniVid system is simple to operate, even for non-technical personnel, and the instant feedback makes it virtually an animation instructor in a box.

The AniVid system helps you keep your station's look continually fresh, because animation is a basic tool of the moving image maker's craft, not a high-tech electronic fad. As long as there are artists wielding pencils, brushes, or light pens, the AniVid system will give motion to their concepts, and a distinctive look to your station's graphic image.

Circle the reader service number to receive our brochure; it illustrates the wide variety of techniques and effects possible with the AniVid system. Call us or write on your letterhead, and we'll see that you get a look at our demo reel; it shows you the effects in motion, and how easy they are to produce.



ANIMATION VIDEO

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World Series

Baer pointed out that staffing alone for an event of the series' magnitude is taxing. NBC scouted the country for engineers and camera operators to provide the top technical talent possible—an added assurance of exceptional coverage with a minimum risk of mistakes. About 60 engineers and camera operators were flown in from New York, Los Angeles, Chicago, Houston and Burbank.

The possibility of equipment failure was not overlooked by Baer and

his support staff. Backup equipment plus repair facilities on site were included to assure that every possibility was considered and covered.

Baer's right-hand assistant for coordinating the technical operations was Jack Bennett, manager of NBC Sports Operations. He appeared on local television a few nights before the games started to tell the public about the extent of preparations being made. As game time approached, Baer, Bennett and Mike Weisman checked the trailers and stadium, completing last minute details to make certain everything was ready.

In general, the technical crew

thought setup was accomplished easily. A tunnel running beneath the parking lot provided a handy access tube that made cabling relatively simple compared with other stadiums.

Ironically, the only major problem facing the crew as game time approached was inadequate air conditioning for the trailer housing the slow motion, and character generator and videotape equipment. A local contractor was barely able to install this equipment before air time.

Video and radio coverage

Standing room only tickets were

1980 World Series

EQUIPMENT

10 Hard Camera

H, L 1st; H, L 3rd; H, L Home; Left-Center; H, L Center; Right-Center

2 RF Portables

1 Blimp Camera (RF) — Tentative

2 Locker Room Hard Cameras (only for possible final games)

2 DISC's

3 VPR's or 1100's

Tape Truck — Includes 5 Devices Listed Above

2 ARVIN's (w/one operator)

BVH-500

JUGS Gun

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EV Directional Mikes for Bat-Ball Sounds, Also Glove-Ball Sound at 1st Base.

Crowd Noise Mikes.

Feed from PA System.

Require Audio Tape Recording Facilities, Field Mike to M. U.

Note: Require Two (2) Hand Mikes and One (1) Lavolier, One (1) Monitor, Two (2) Telex With IFB on Field for Possible Pre, Post Game Show and Rain Delay at Each Dugout. Sufficient Cable to Reach Far and Near End of Both Dugouts for Possible Interviews. Monitor to Be Disconnected Before 1st Pitch.

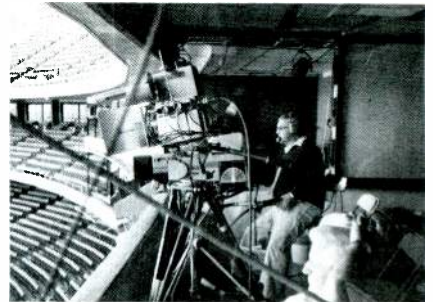
Note: Require Two (2) Hand Mikes — Two (2) Telex and One (1) Monitor — When there is a Chance of the Series Being Over to Cover the Victory Celebration In the Winning Team's Clubhouse.

Note: Require Two (2) Hand Mikes — Two (2) Lavolier Mikes — Two (2) Telex — Monitor — In Rain Delay Area.

Taken from page 15, NBC Sports Production Manual



This is the field as seen from announcer Joe Garagiola's chair in the announce booth. Monitors are hung outside, but at a convenient viewing angle.



The microwave link for mobile cameras on the field and the high, home plate camera were next to the announce booth.



The high camera behind third base offered an excellent view of the entire field.



Beyond ENG

Born into ENG, the HL-79A adapts beautifully to EFP. The accepted leader in ENG, the HL-79A, reinforced its position as the preeminent portable camera at the 1980 Winter Olympics. Scores of HL-79A's covered the ski slopes, the bobsled and luge runs and the skating rinks for the ABC Network. Their performance brilliantly etched into the world's visual memory, is history. But the industry already knows about the HL-79A's capability.

Today, more and more broadcasters are learning that the HL-79A is a superior EFP color camera. Options such as 4½-inch electronic viewfinder with return video, program and intercom audio plus genlock — among other features —

transform it into the ideal camera for sports and special events, commercials and high quality production. Triax equipped, it ranges nearly a mile from its base station. Near-darkness is its frequent habitat; but it has knee control for brilliantly lit scenes too.

Of course, you may need some of its ENG flexibility for EFP too —like its shoulder action shape, 11.2 pound weight, 6-hour clip-on battery.

The specs and automatic features of the HL-79A are equally outstanding. They're yours, along with an eye-opening demonstration, at your Ikegami distributor. Or contact Ikegami Electronics (USA) Inc., 37 Brook Avenue, Maywood,

N.J. 07607, (201) 368-9171. West Coast: 19164 Van Ness Ave., Torrance, CA 90501 (213) 328-2814; Southwest: 330 North Belt East, Suite 228, Houston, TX 77060 (713) 445-0100; Southeast: 552 So. Lee St., Americus, GA 31709 (912) 924-0061.



Ikegami HL-79A

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FOR BROADCAST AUDIO MEASUREMENTS, if you compare features . . .

	Hewlett Packard 339A	Sound Technology 1710A	Potomac Instruments AT-51
AUDIO GENERATOR	Combined With Analyzer	Combined With Analyzer	Separate Unit
Intermodulation test signal	No	Option	Yes
Wow & Flutter test signal	No	No	Yes
Simultaneous L&R Outputs	No	No	Yes
600 ohms and 150 ohms Source	No	Yes	Yes
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
AC Voltmeter Mode	Yes	Yes	Yes
Stereo Phase Meter Mode	No	No	Yes
L/R Amplitude Ratio Mode	No	No	Yes
Wow & Flutter Meter Mode	No	No	Yes

* Limited to 10 dB capture range.



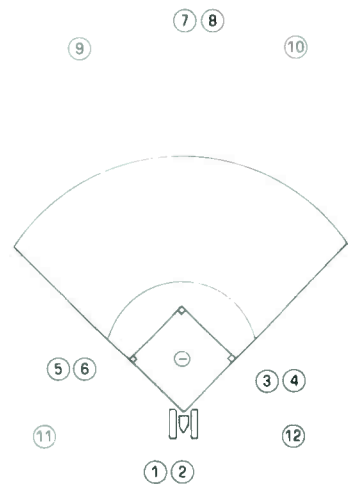
**AT-51
AUDIO TEST
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. . . there is only one logical choice!

World Series

sold for every game of the series. For those persons that watched on television, 215 television stations carried the games. Overseas, live satellite feeds of the NBC-TV broadcasts were carried by the American

1980 WORLD SERIES CAMERA POSITIONS



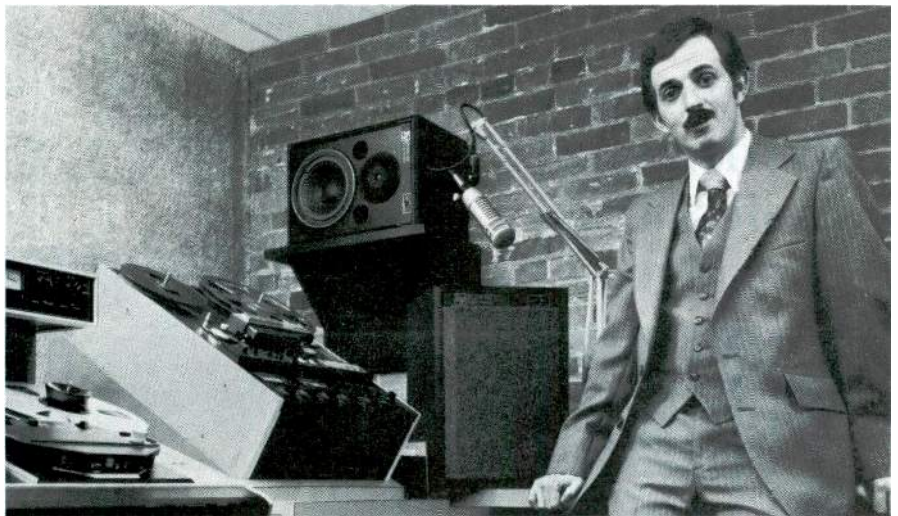
- High behind home plate
- Low behind home plate
- High behind first base
- Low behind first base
- High behind third base
- Low behind third base
- High beyond center field fence
- Low beyond center field fence
- Low beyond left center field fence in line with second base and first base
- Low beyond right center field fence in line with second base and third base
- Hand-held roving camera
- Hand-held roving camera

Courtesy of NBC Sports

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Circle (24) on Reply Card

Electro-Voice's Greg Silsby talks about the Sentry 100 studio monitor



Producer Studio, WRBR-FM, South Bend, Indiana.

In all the years I spent in broadcast and related studio production work, my greatest frustration was the fact that no manufacturer of loudspeaker systems seemed to know or care enough about the real needs of broadcasters to design a sensible monitor speaker system that was also sensibly priced.

Moving to the other side of the console presented a unique opportunity to change that and E-V was more than willing to listen. When I first described to Electro-Voice engineers what I knew the Sentry 100 had to be, I felt like the proverbial "kid in a candy store." I told them that size was critical. Because working space in the broadcast environment is often limited, the Sentry 100 had to fit in a standard 19" rack, and it had to fit *from the front, not the back*. However, the mounting hardware had to be a separate item so that broadcasters who don't want to rack mount it won't have to pay for the mounting.

The Sentry 100 also had to be very efficient as well as very accurate. It had to be designed so it could be driven to sound pressure levels a rock 'n roll D.J. could be happy with by the low output available from a console's internal monitor amplifier.

In the next breath I told them the Sentry 100 had to have a tweeter that wouldn't go up in smoke the first time someone accidentally shifted into fast forward with the tape heads engaged and the monitor amp on. This meant high-frequency power handling capability on the order of five

times that of conventional high frequency drivers.

Not only did it have to have a 3-dB-down point of 45 Hz, but the Sentry 100's response had to extend to 18,000 Hz with no more than a 3-dB variation.

And, since it's just not practical in the real world for the engineer to be directly on-axis of the tweeter, the Sentry 100 must have a uniform polar response. The engineer has to be able to hear exactly the same sound 30° off-axis as he does directly in front of the system.

Since I still had the floor, I decided to go all out and cover the nuisance items and other minor requirements that, when added together, amounted to a major improvement in functional monitor design. I wanted the Sentry 100 equipped with a high-frequency control that offered boost as well as cut, and it had to be mounted on the front of the loudspeaker where it not only could be seen but was accessible with the grille on or off.

I also didn't feel broadcasters should have to pay for form at the expense of function, so the walnut hi-fi cabinet was out. The Sentry 100 had to be attractive, but another furniture-styled cabinet with a fancy polyester or die-cut foam grille wasn't the answer to the broadcast industry's real needs.

And for a close I told E-V's engineers that a studio had to be able to purchase the Sentry 100 for essentially the same money as the current best-selling monitor system.

That was well over a year ago. Since that time I've spent many months listening critically to a parade of darn good prototypes, shaking my head and watching

some of the world's best speaker engineers disappear back into the lab to tweak and tune. And, I spent a lot of time on airplanes heading for places like Los Angeles, Grand Rapids, Charlotte and New York City with black boxes under my arm testing our designs on the ears of broadcast engineers.

The year was both frustrating yet enjoyable, not just for me but for Ray Newman and the other E-V engineers who were working on this project. At this year's NAB show it all turned out to be worth it. The Sentry 100's official rollout was universally accepted, and the pair of Sentry 100's at the Electro-Voice booth was complemented by another 20 Sentry 100's used by other manufacturers exhibiting their own products at the show.

What it all boiled down to when I first started the project was that I knew that the Sentry 100's most important characteristic had to be *sonic integrity*. I knew that if I wasn't happy, you wouldn't be happy. I'm happy.

Market Development Manager,
Professional Markets



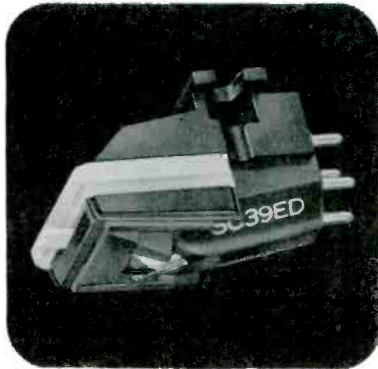
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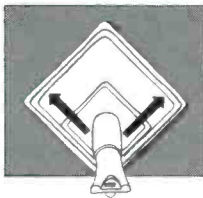
SC39 meets all the demands of professional cartridge users.



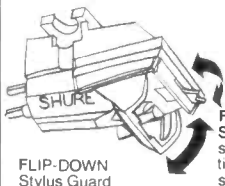
The SC39 offers the professional undistorted playback, even on the toughest-to-track, "hottest" recordings—plus the kind of durability necessary to stand up to the job: even to slip-cuing, backcuing, and occasional stylus abuse.

What's more, the SC39 offers three unique features:

SIDE-GUARD Stylus Deflector: Protects against side-thrusts by withdrawing stylus tip and shank safely into cartridge body.



SIDE-GUARD Stylus Deflector



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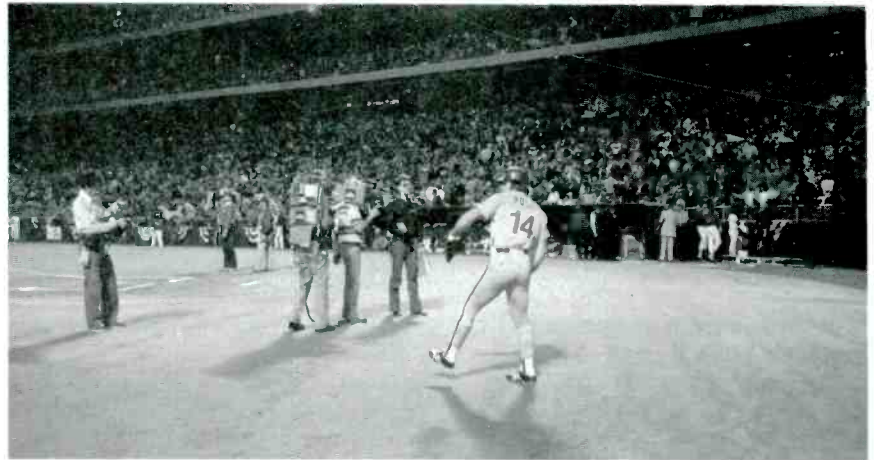
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World Series

Forces Radio and Television Service (AFRTS) to American military installations in West Germany, Italy, Spain, Korea, the Philippines, the

Panama Canal Zone, Japan, Alaska and Guantanamo.

But that wasn't all. Radio was provided for as well. NBC wired the broadcaster's booth with audio feeds so that translators/announcers could broadcast radio coverage to



As game time approached, Pete Rose, Philadelphia 1st baseman, warmed up on the sidelines. Both mobile camera systems are on the field picking up player and fan action.



The stadium was packed well before game time. This view is from the home plate camera looking at the Philadelphia dugout and one of the mobile camera crews.



The home plate camera dugout housed the velocity meter that tracked speed of the pitched balls.

No other 50-MHz oscilloscope gives you as many features as the LBO-517.

Compare the LBO-517 with all other 50-MHz oscilloscopes. Only Leader gives you total capability with:

- Calibrated delayed time-base
- Simultaneous display of main and delayed time-bases.
- Two trigger-view channels.
- 1 mV sensitivity (<10-MHz).
- Alternate/composite triggering.
- Variable trigger hold-off with B-ends-A mode.
- 20 kV accelerating potential dome-mesh CRT.
- Two-year warranty.



It's the surprising leader for under \$2000.



Very low-level signals, complex waveforms, fast pulses at low rep rates, asynchronous signals... no other 50-MHz oscilloscope handles such a wide range of demanding applications, and does it so well as the Leader LBO-517.

Simultaneous Dual Time Base Viewing.

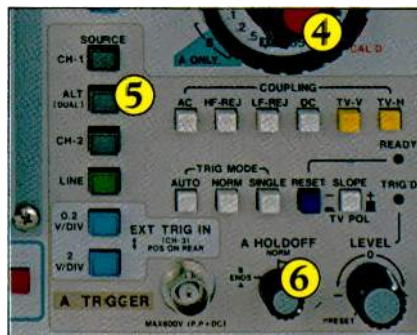
Unlike many other 50-MHz units, the LBO-517 has an alternate time-base mode, ① above. This permits simultaneous viewing of both the main "A" and delayed "B" time bases ②. The delayed time-base is also shown as an intensified portion of the main time-base display ③. Ideal for studying and measuring complex waveforms.

Fast Sweep Rates, Alternate Triggering, Hold-off and B-ends-A Mode.

The LBO-517 provides main sweep rates from 0.5 sec/cm to 0.05 μ sec/cm in 22 steps ④. Delayed sweep rates

are from 0.1 sec/cm to 0.05 μ sec/cm in 20 steps. For displaying very rapid phenomena, both can be increased to 5 nsec/cm with the X10 magnifier.

The LBO-517 also offers alternate (composite) triggering ⑤ for stable viewing of two asynchronous signals, along with variable trigger hold-off with a B-ends-A mode ⑥. Variable hold-off ensures stable triggering of complex signals by ignoring intermediate false trigger points. B-ends-A is used to increase the sweep repetition rate for brighter displays of low-frequency signals.



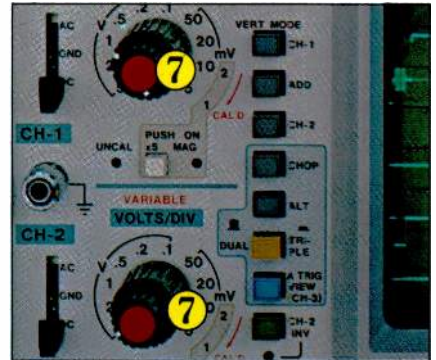
Outstanding Small Signal Performance.

The vertical amplifiers of the LBO-517 offer calibrated deflection coefficients from 5 mV/cm to 5 V/cm in 10 steps ⑦. A X5 vertical multiplier delivers a

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For Demonstration Only Circle (27) on Reply Card

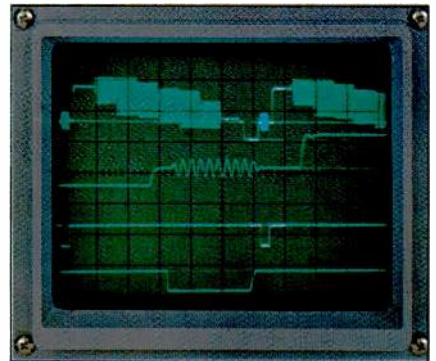
maximum sensitivity of 1 mV/cm up to 10 MHz... 5 times the sensitivity of more expensive oscilloscopes.

An amplified output of channel 1 is also available at a rear panel BNC connector for using the LBO-517's high sensitivity to drive frequency counters and other less sensitive instruments.



Brightest, Sharpest of All.

The LBO-517 uses a recently developed dome-mesh CRT operating with a 20-kV accelerating potential. The result is an exceptionally bright, sharp display... with an illuminated internal graticule.



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(800) 645-5104.

Call today, to get all the facts on the LBO-517, its two-year warranty, the name of your nearest "Select" distributor, or to arrange for an evaluation unit.

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Purchasing agent "I'm naturally looking for maximum value in a video camera. One that delivers a lot of features for the money from a manufacturer I can trust."

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"We can turn out needle-sharp pictures with the KY-2000U. And with options like JVC's remote control unit, it's adaptable to just about any field or studio situation."

"The KY-2000U meets all my criteria for performance and price. And I know I can trust JVC, with their reputation for quality."

"This neat little KY-2000U is less than 12 lbs. with 1.5" viewfinder. Handles nice and easy. And with 52 dB S/N and sensitivity doubling to 12dB, what more could I ask?"

"I can see how the KY-2000U can help me get more out of my people wherever communications is involved."

"What a relief! No more separate genlock. And the Saticon tubes really deliver high sensitivity and resolution, and low lag."



JVC's new KY-2000U 3-tube Saticon camera is a real rarity today: an engineering breakthrough that makes economic sense, too. It has all those features mentioned above. Plus horizontal and vertical contour correction, both standard. Built-in variable blanking circuit and VTR trigger mode select. Broadcast-standard Y.I.Q. encoder. C-mount lens versatility.

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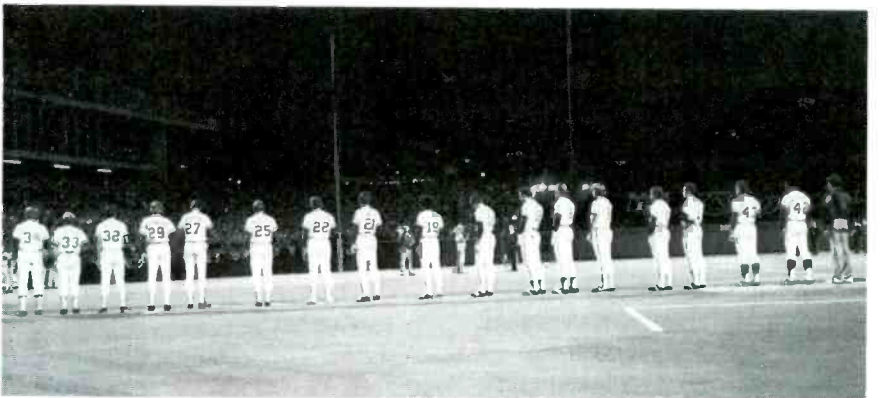
Also, NBC provided clean audio and video signals to Televisa of Mexico City without commercials, over which commentary could be inserted.



Bryant Gumbel, (center), NBC pre-game host, prepares for his game introduction while the mobile camera crew in the foreground checks the announce booth from the field.



Merle Harmon (center), roving reporter, simulates an interview just before game time.



The players for the 1980 World Series have been introduced and the first game in Kansas City is about to begin. The National Anthem is being sung from the pitcher's mound, and a mobile camera crew is there covering it for home viewers. □



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Sports and advances in equipment, a dynamite combination

By Bill Rhodes, editorial director

The rapid rise in popularity of professional and college sports—especially football, basketball and tennis, has placed an unprecedented demand on equipment manufacturers to provide high-quality, advanced design equipment. The industry has responded with a wide spectrum of equipment for television, including portable ENG/EFP color cameras; instant replay, slow motion and freeze frame devices; special effects generators; and character generators. At the 1980 World Series in Kansas City, \$55 million worth of such equipment was brought in to cover the games and a similar set was needed in Philadelphia.

Football

ABC's production of Monday Night Football was created in response to the public's appetite for the games. That appetite was not satisfied by college events on Saturday and professional games on Sunday. Now Monday Night Football has a Thursday edition.

Equipment setup

As this issue is going to press, ABC is setting up equipment for Thursday's edition of Monday Night Football in the Astrodome (game between the Houston Oilers and the Pittsburgh Steelers). **BE** discussed setup preparations with Loren Colten, technical manager, as he directed action in Houston.

Depending on the stadium configuration, ABC uses up to 11 cameras to produce Monday Night Football; seven Philips LDK-5 studio cameras; three Ikegami HL-77 portable cameras with base stations; and one Fernseh camera with microwave linkage (for helicopter or blimp usage). Four of the studio cameras are placed around the top of the stadium, two in the end zones and one on a special golf cart equipped with scissor-adjusted platform for the camera and camera operator.

Three ENG cameras are used on the field, two on the near side and one on the far side. Both use a base

station for control and triax connection to the production van. The remote camera in the helicopter or blimp uses a 2GHz, 7-channel microwave system and an RF dish on top of the stadium.

Setup for telecasting begins two days before game time with positioning, powering and interconnecting of two trucks of equipment. The production truck houses a Grass Valley video switcher, Ward Beck audio console and monitoring equipment to produce the game. The VTR truck contained four Ampex VPR-2 videotape recorders and HS-100C slow motion videodisc recorders for record, slow motion and instant replay; an Arvin Echo system with CVS time base corrector for freeze frame and vital statistics; and two Chyron 4 character generators.

Several million dollars worth of hardware is required to produce Monday Night Football. The increased popularity of the game undoubtedly can be attributed to breadth of the equipment used for telecasting these games, the new dimensions added by instant replay and the talent used for commentary.

Additional coverage

In addition to all this football coverage, ESPN cablecasts the Canadian professional football games. One might ask, how much football can a nation absorb? Perhaps next will come a World Bowl to follow the Super Bowl.

The impact of sports is clear. Television broadcasters have responded vigorously to satisfy the public's intense interest in sporting events. Coupled to this trend equipment manufacturers have enjoyed prosperity by developing new devices to make the events increasingly attractive to viewers.

But don't overlook the additional sports coverage through radio for those who do not have immediate access to television (or who simply prefer radio's strictly verbal description of these events.)

Because of the mounting public

interest in sports, radio broadcasters also have had to place increased emphasis on reporting trends and events in sports. And because audio quality is so vital to radio, these broadcasters have been facing a multitude of problems. Chief among these have been rising costs, overcrowded telephone lines, difficulties in coordinating efforts with the common carriers and backup systems in case of interrupted service.

Fortunately, industry has responded with equipment to help overcome most of these potential problems and save broadcasters setup time and money. At the recent NRBA Convention in Los Angeles, a morning session was devoted to telephone interfacing for talk shows and reporting sports. On the convention floor, Comrex and Kahn Communications demonstrated their equipment to help solve the telephone line problem. (Missing at NRBA-'80 was McCurdy Radio Industries, which also has a system for broadcasters that was displayed at NRBA-'79 in Washington, DC.)

The new equipment helping the radio broadcasters air their remote sports coverage is generally referred to as low frequency telephone extenders or frequency spectrum translators. (See **Broadcast Engineering**, p. 56, August 1979, for a description of a typical system and its technique.)

To see how some broadcasters have benefited from this new technology, **BE** contacted three stations that have extensive sports coverage for their audiences. All three reported savings in costs, reduced down time and greater flexibility in handling their programs.

KMOX/St. Louis

Edwin Karl, director of technical operations, described the depth of KMOX's sports activities and how low frequency extender use has paid off for them. The games they cover are: St. Louis Cardinals baseball and football; St. Louis Blues hockey; St. Louis Steamers

Continued

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Model 3500 Portable Time Code Generator/Reader

Amtel introduces the new, high-performance Model 3500, a portable Video Tape Recorder or belt mountable Time Code Generator/Reader which produces code conforming to the EBU/SMPTE specifications.

- Utilizes standard BNC and XLR connectors.
- Output signal level accommodates balanced or unbalanced audio inputs on portable Video Tape Recorders.
- JAM SYNC Mode allows for generation of continuous Time Code. The locking of additional 3500 portables is also possible to achieve the generation of Time Code for A-B-C Rolls.

- Data entry follows a calculator format permitting one-handed entry of time and/or user bits.
- A single key entry locks out the keyboard.
- Utilizes either standard 'C' cells or rechargeable Nicads and is AC adaptable.

An amazingly compact but powerful Time Code Generator/Reader that will do the job where portability is of prime importance - another reason why the Amtel difference is making waves in the video broadcast industry.



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DC control and th

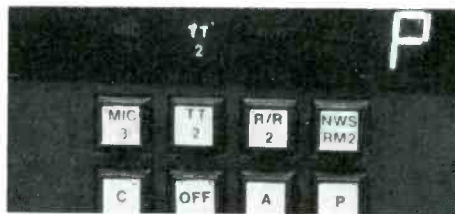


Introduced by Ramko in early 1975, DC control of all audio attenuation and switching has since proven itself so superior to conventional methods of audio control that most manufacturers of consoles are still trying to catch up.

The three major advantages are:

1. The DC controlled console exhibits far less susceptibility to RF pickup and external interference than conventional consoles that control audio directly. The conventional console must route all of its audio from the inputs to the various controlling elements (mixers, switches, etc.) and then finally to the console output. The DC controlled console, on the other hand, eliminates all of this audio wiring and thus reduces the pickup of outside interference.
2. It is also less prone to be affected by mechanical malfunctions or problems such as those from scratchy pots or noisy switches.
3. Since all audio switching is done through DC control (+6V or -6V), all internal and external functions (mute, on air lights, remote equip. start/stop) are programmed by simply setting internally located switches. Only one pot is needed to control both left & right channel audio simultaneously (stereo); thus the tracking error normally associated with dual ganged pots is eliminated.

No soldering or internal wiring is necessary to set up or change the "ON AIR" light relay, muting, or AUX MUTE relay. All of these functions are programmed through internally located switches, which can be changed at any time.



What's happening. At a glance.

The labeled, computer-type, push-buttons and corresponding back-lighted displays afford the operator instant recognition of the next happening, which one to push, and what is happening now or what has already occurred. Although we automatically send you a form (at time of ordering) that enables you to tell us how you would like your console labeled, your unit comes with a full set of additional labeling so that you may easily change at any time desired.

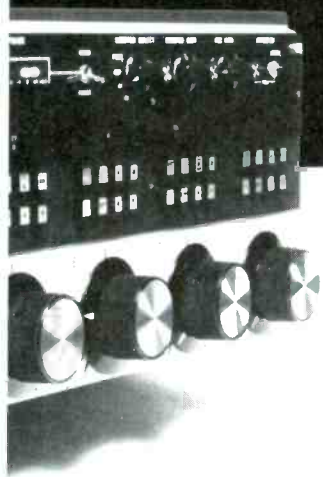
The large LED output mode display has two separate functions. The lighted

decimal point, which lights whenever that mixer is potted down into CUE, is also a blinking warning light whenever this channel has a live microphone activated. The second function of this display tells the operator whether he is in the Program (P), Audition (A), Cue (C) or Off (blank) mode. It is important to note here that the operator has 2 separate means of initiating the Cue mode. One in the normal fashion of potting down and one via the output mode select switch (C). Thus he may go directly to Cue by pushing (C) without having to change the mixer setting.

The exclusive patch panel for selecting input gain offers extraordinary flexibility. At any time, any input can be made to accept anything from a mic level through a line level signal. Not just mic or line level but anywhere in between. Thus on our 10 mixer model you have a minimum of 4,194,304 combinations of mic through line level inputs. And you can accommodate mics and high level inputs or the same mixer simultaneously. You simply plug in the prescribed resistor(s), which are included with your console, and that's it.

All the push-buttons on the console are super-quiet. Not the usual loud, clanking, short-lived mechanical switches. The push-buttons switch and route the audio through solid-state logic, error-free, in less than 2 tenths of 1 millionth of one second. No pops, clicks or momen-

e superior console.



Features

- Dual channel
- 5, 8, & 10 mixer versions
- 4 inputs per mixer
- Patch panel gain select inputs
- Back-lit status displays
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- Mono/phase meter on stereo consoles
- Mono output on stereo consoles
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- Two cue modes (push button and/or pot down)
- Plug in electronics
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- DC control—no audio on front panel
- Zero tracking error on stereo consoles
- 3 power supplies w/AC line filtering
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- Switch selectable cue and mute on all inputs
- Optional digital clock and production timer
- Optional remote equipment start/stop
- 4 year parts and labor warranty
- 2 week trial period

tary feedback with partially actuated switches.



The pure clean difference.

It all comes down to a marked difference in reproduction.

FIRST, all inputs and outputs are solid-state balanced. Unlike transformers they are quite insensitive to impedance mismatches. In fact the mismatches can be millions of times. And can be more than the specified impedance without any noticeable effect on distortion or response. Not so with the average audio transformer as even a couple times mismatch can invalidate the console's performance.

SECOND, our solid-state devices exhibit far less distortion and flatter response than even the finest transformer available today.

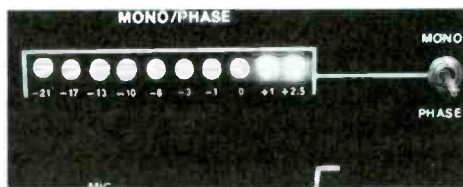
THIRD, since the solid-state devices are purely resistive they are much less susceptible to hum, RF and other external interference.

A FOURTH and very large consideration is the LED "VU" meter. This solid-state meter (SSM) has an exceptionally fast response and you can actually see overmodulation peaks. With a mechani-

cal meter you can't. Couple this with the electronic circuit that gives the SSM "VU" ballistics on the decay and you end up with a tighter, cleaner sound than ever before. At the same time, your normal audio power level is still maintained. In addition, the bright red and yellow LED display is legible up to 30 feet away.

Although the mono DC-38's have a meter for each output, we took the stereo versions a step farther. In addition to the left meter and the right meter (switchable, Aud. or Prog.), we included a third to monitor the stereo mix (mono) output.

By throwing a switch located next to it, this meter is converted to a phase check meter and may be used to check the stereo phasing of any and all of the console input sources.

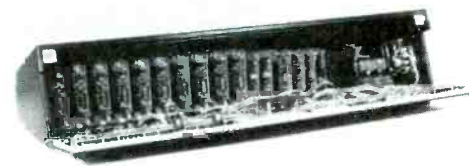


Reliability particulars.

All of the LED's and lamps have a life expectancy of 11 years. The push-button select switches are spec'd by the manufacturer at 20,000,000 operations (1 actuation every 30 seconds, 24 hours a day for over 19 years). The mixer pots are a custom design using glass-hard, conductive plastic. The mechanical construction of these pots is so sturdy

that they tolerate even the heaviest handed operator.

In addition, all of the quad operational amplifiers are burned in for 3 days to insure reliability. Since the power supply is the backbone of your console, you will find not one, but three separate supplies! One for the main audio, one for the monitor amplifiers, and one for the displays. These supplies are fully protected against shorts and over-heating and utilize massive heat sinking rated much higher than necessary.



The two week trial.

Put the DC-38 on trial for a full 2 weeks. Put it through a battery of tests or on the air, or both. You'll find that with all that sophistication it's a breeze to use and amazingly rugged.

Write Ramko Research, 11355 Folsom Blvd., Rancho Cordova, CA 95670. Or if you can't wait for the mail, contact your nearest rep or call (916) 635-3600 collect and arrange for a 2 week free trial.

RAMKO

Sports

Continued

soccer; and University of Missouri football and basketball.

Local games use dedicated telephone lines, but all out-of-town games have been switched over to use of regular telephone lines and a low-frequency extender system using three encoders and two decoders (with a little sweeping at both ends).

The following is an excerpt from a telephone interview with Karl:

BE: How long have you used low frequency extenders and to what advantage?

EK: This is our second season using them and the main advantages are speed and cost savings. Look at our Cardinals game against the Giants in Rutherford, NJ. The producer simply carried the system with him and had a technician hook it up using normal telephone lines. And we could handle any last minute game changes. With former, hard-line interconnects, we would have had to notify Telco in New York, Chicago and St. Louis, and Western Union (for the satellite) of such changes—and the problems could be staggering.

In terms of audio quality, our experience is that with this system

our quality—with very rare exceptions—is almost as good as high-quality equalized lines.

As for cost savings, they are significant. In a 110-station baseball network, plus football and basketball coverage, our telephone costs are high. But using conventional lines our annual savings are 40-50%—and that runs into six figures.

BE: Have you encountered any special situations that have been eased with use of newer equipment?

EK: Oh, yes. Spring training in Florida has been particularly difficult. I think Florida uses barbed wire for outgoing equalized lines. We bypass these lines completely now, and everybody says the signal is improved using our new facilities.

As a further sidelight, downtime has been reduced. Over a 110-station network, our past seasonal downtime of 1½ hours has been reduced by 95%—and that saves a lot of headaches.

WTAE/Pittsburgh

A similar success story was described by Kurt Haass, chief engineer of WTAE, which covers the Pittsburgh Steelers and the University of Pittsburgh games:

BE: What motivated you to try this new technique?

KH: Cost savings, frankly. Using 5kHz equalized lines for our sports-casting was exorbitant. Our annual costs, compared with using former interconnections, have been reduced by 70%.

BE: How about setup time?

KH: Simple. We just order up two telephone for each broadcast—one for sending and one for receiving—and let the system do the rest.

WIOD/Miami

Out-of-town Miami Dolphins football games have been covered for the past two seasons by WIOD/Miami, using normal telephone lines and low frequency extender hardware. James Rayfield, chief engineer, says that cost savings was the main reason for using this equipment, but that increased reliability was another factor:

BE: How about quality of the broadcast sound?

JR: It may not be quite the quality of balanced 5kHz lines, but the signal is quite acceptable. Furthermore, it's far more reliable. We've never had a failure with this system. Even when we were using hard lines for covering the Dolphins we had dial-up backup service standing by as well.

BE: Have the cost savings been significant?

JR: Definitely. We pay so much for the Dolphin rights that if we had to add 15 grand for hard lines we'd be out of business.

BE: Do you save setup time for the games?

JR: Yes, a lot. When we used hard lines, we made sure an engineer checked these out thoroughly hours before game time. If something happened to these during the game, we went to regular backup telephone lines, which are bad for broadcasting without this new gear, but did keep us on the air. Now we don't have to worry about working with the hard-lines people to check out problems. If we lose a regular line, we just re-dial.

Watch for NAB-'81

It is apparent that new instrumentation has helped radio broadcasters air their remotes. As good as this equipment is, improvements are still being made. If you're planning to attend NAB-'81/Las Vegas, pay particular attention to equipment advances that are expected to be demonstrated.

The television broadcaster will also have a lot of new equipment to see at NAB-'81. **BE** will highlight as much of this equipment as possible in the March issue for both readers and attenders. □

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Multipath effects in ENG/EJ systems*

By E. J. Forbes, Microwave Associates Communications Co., Burlington, MA.

Live outside broadcasts, commonly called ENG (Electronic News Gathering), EJ (Electronic Journalism) and by other acronyms, have become routine operating practices by broadcasters. Many stations operate both from vans and helicopters. For a number of good reasons the bulk of these systems are situated in the 2GHz Broadcast Auxiliary Service (BAS) band. A few have been placed in the 7GHz BAS band, largely the result of frequency coordination difficulties.**

*Paper presented at IBC'80, September 20-23, 1980, Brighton, England. Reprinted with permission from the conference proceedings, Conference Publication Number 191, pp. 187-190, Institute of Electrical Engineers, London.

**The author also discusses use of 13GHz systems in Reference 2.

After the passage of a decade, the user became more demanding of performance in the outside broadcast system and now expects to compete with the studio transmitter link (STL) in almost every aspect.

This is in a very difficult propagation model as regards path clearance and range with highly portable, lightweight, self-powered equipment. Manufacturers have been forced to evaluate the mechanism of impairments to optimize systems and meet those goals. That work will be discussed as one extension of previous reports.^{1,2}

System gain

The most easily addressed performance criterion in an ENG/EJ system is the margin to threshold for

an airable picture. In the United States an EIA industry standard³ for an "un-fit for broadcast transmission" (UFB) is a signal-to-noise of 37dB peak-peak/RMS, weighted and excluding synchronizing amplitude. For certain network facilities this video noise threshold may be further tightened to 40dB.

The majority of ENG/EJ receiving FM systems have built-in low noise amplifiers as part of the very high receiving antenna. This is done to cope with the usual long lossy transmission lines that extend down to the microwave receivers. Typically, the resulting effective receiving system noise factor is 3dB, which with the frequency deviation and modulation characteristic will set the EIA threshold received carrier value for UFB at about -83dBm at the antenna terminals.

With that as a criteria one can, by selecting typical transmitting and receiving gains, and a usual transmitter power, prepare a simplistic set of range curves. An example at 2GHz is shown in Figure 1. This accounts for the radio equipment parameters and real antenna pattern. Naturally other gains or output powers, etc., can be arithmetically accommodated.

That example makes a very important assumption—free space clearance with about 60% of the first fresnel zone, and that the receiving antenna has no response factors. One can see the variety of performance variation consequent to antenna characteristics. The effective position of the radio horizon, assuming a 4/3 and smooth earth's radius for any relative altitude, is given in the nomograph of Figure 2. In reality these "coverage" curves, to account for "grazing," should show the expected 6dB excess path loss. In a practical system, effect of obstructions will mount very quickly from a few decibels to 20 to 60dB depending upon the path and the obstruction.

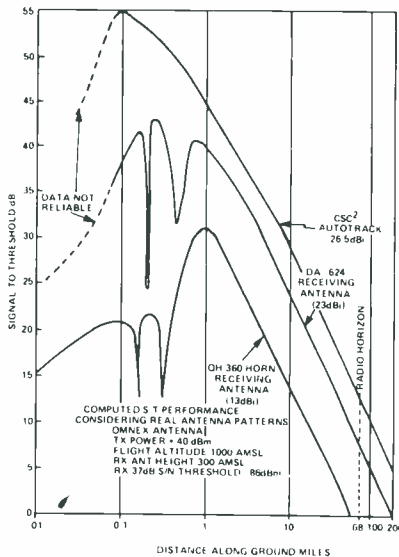


Figure 1 Computed signal-to-threshold performance.

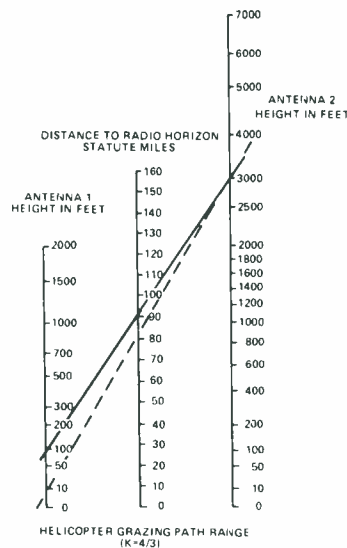


Figure 2 Helicopter grazing path range.

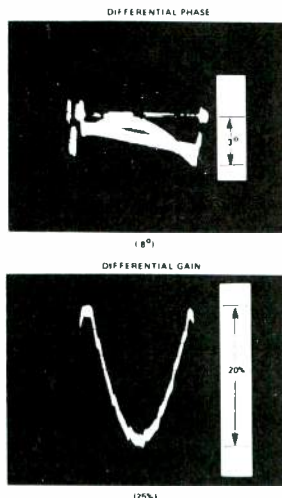


Figure 3 Condition of d_0 min; d_g max. 415 NS - 23 dB echo.

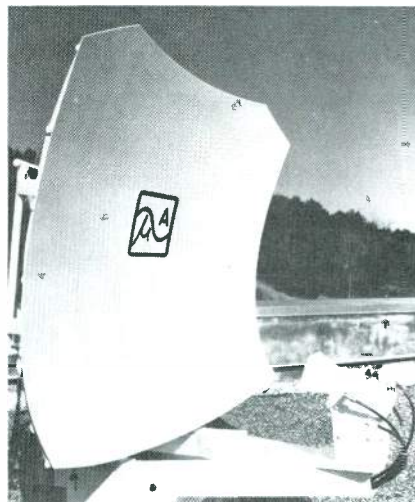


Figure 4 2GHz auto track antenna.

Multipath

The color TV link systems we consider are FM microwave with the US standard 525 line pre-emphasis. The deviation at the cross-over frequency is 8MHz peak-to-peak. When the reflection giving rise to an echo is stationary we find distortion products appearing principally in the chroma portion of the video spectrum.

Previous work in the area has been devoted to comparison of type of modulation⁴ or means of sensing multipath impairments with a non-video means.⁵ One can expect the effect of a single echo on the

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ENG/EJ

nonlinear waveform distortion as follows:

Differential gain =

$$dg (\%) = 100 \left[1 - \left(\frac{1-r}{1+r} \right) \sqrt{\frac{1+r^2+2r \cos \theta}{1+r^2-2r \cos \theta}} \right]$$

Differential phase =

$$d\theta^\circ = \text{TAN}^{-1} \left[\frac{2r}{1-r^2} \text{SIN } \theta \right] \quad (2)$$

where r = echo magnitude wrt principle signal;
 θ = phase angle of the modulated signal of the echo.

Equations (1) and (2) mean that for NTSC standards, the differential phase and gain will progress through a series of noncoincident

maxima as the differential gain and phase for ideal equipment have been computed.

To illustrate the characteristics of modern equipment that include the effect of AM-PM conversion and other distortions, we have made some controlled delay and amplitude measurements. A sample of vector-scope displays reported previously¹ is photographically reproduced in Figure 3.

The conditions of measurement were deliberately chosen to illustrate the predictable variations in distortion with changes in echo timing. The theoretical values for an ideal

receiver have been shown parenthetically. Because there is an intrinsic distortion in the system without multipath, we have shown the baseline by double exposure. If this were a steady state condition for that impairment the picture viewer would be almost unaware of defects in saturated color bars, the variation in the apparent saturation and minor hue errors going unnoticed. In a real system, whether terrestrial or airborne, we experience rapid changes in the differential time of the echo with a consequential modulation of the impairment. Hence, the result is a particularly obvious and disagreeable form of transmission distortion.

This type of distortion is similar to that resulting from nonlinear phase or amplitude effect akin to modems or tuned networks in FM systems. Those familiar with this will recall the benefits derived with a pre-emphasized modulation characteristic. We examined this with regard to possible alleviation of multipath effects. With a modified CCIR 525 line curve, providing 20dB of emphasis (instead of 10dB), we detected a 3/1 reduction in the multipath distortion. This was as predicted, but not without its obvious penalty—slightly impaired signal-to-noise ratio and reduction in signal-to-hum ratio. An alternate standard of pre-emphasis for these specialized systems is deemed worthy of future consideration.

In all, multipath distortion is a form of co-channel interference, and the permissible echo level for a working system must be kept below the allowances of about 24-26dB.

Antenna developments, siting

The 2 and 7GHz ENG/EJ antenna systems prevalent in the United States for terrestrial or airborne service are, for the most part, circularly polarized (CP). This choice was made to take advantage of sense reversal which ideally occurs when the signal is reflected from a surface, plus the discriminating ability of the CP receiving antenna. The discrimination ability is dependent upon the axial ratio (AR) of the receiving antenna and the lack of ellipticity of the wave that must be rejected. In the ideal case about 1dB of AR provides about 25dB of rejection.

The experience at 2GHz had been that the arriving signal is seldom ideal and frequently elliptical to the point of nearly linear or 5 to 10dB AR. If one were to employ a switch-type polarization change receiving system limited to selection of V, H, L or R, there is great



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likelihood that the user may not optimize the received transmission. We have frequently observed that the final accepted but compromised signal was "horizontal" although the origination was from a right circularly polarized antenna with good axial ratio. We chose a design previously discussed¹ to employ a continuous phase shift adjustment technique with a range of a full 360 degrees. This permitted a smooth adjustment through all conditions of polarization. With this polarization adjustment technique, in a rare example, co-channel interference from another station has been successfully "tuned-out."

The airborne ENG/EJ system has further emphasized multipath distortion. The ingredients range from the location of the omni antenna on the airframe to topology of the ENG/EJ receive system, to selection of the antenna. The omni antenna, if it has substantial vertical beamwidth, has an optimum position on the bottom of the airframe. Too close to the skin or nearby struts, the vertical pattern (and the very sensitive axial ratio) will be "modulated" or blocked, losing effectiveness or producing sensitivity to heading. Wide separations from the skin will result in rotor tip-induced chroma modulation (due to the short delayed echo) or worst, possible damage while setting down on a debris littered surface.

Poor airborne experience has been reported with some systems employing the common sectoral horns in a metropolitan area which were previously solely used with terrestrial origination. The source of performance deficiency has been clearly caused by unpredictable long delayed echoes (some being multiple reflection) plus a very wide angle antenna. On the other hand, with a narrow, discriminating rotating antenna consistently better success is experienced with the airborne system.

The axiom, it is safe to say, is that the optimum ENG/EJ receiving antenna for the application of terrestrial and particularly airborne systems is a narrow beam type with as low sidelobes as possible consistent with physical size, to reduce responses to stray echoes. A further operational and logistical improvement is obtained, where considerable daily airborne activity prevails, by use of an automatic tracking antenna, sophisticated and much more expensive. Of course there is a potential manpower savings in the accountability. An example of a 2GHz monopulse antenna with a COSEC² uplooking pattern and ex-

tremely low sidelobes is shown in Figure 4.

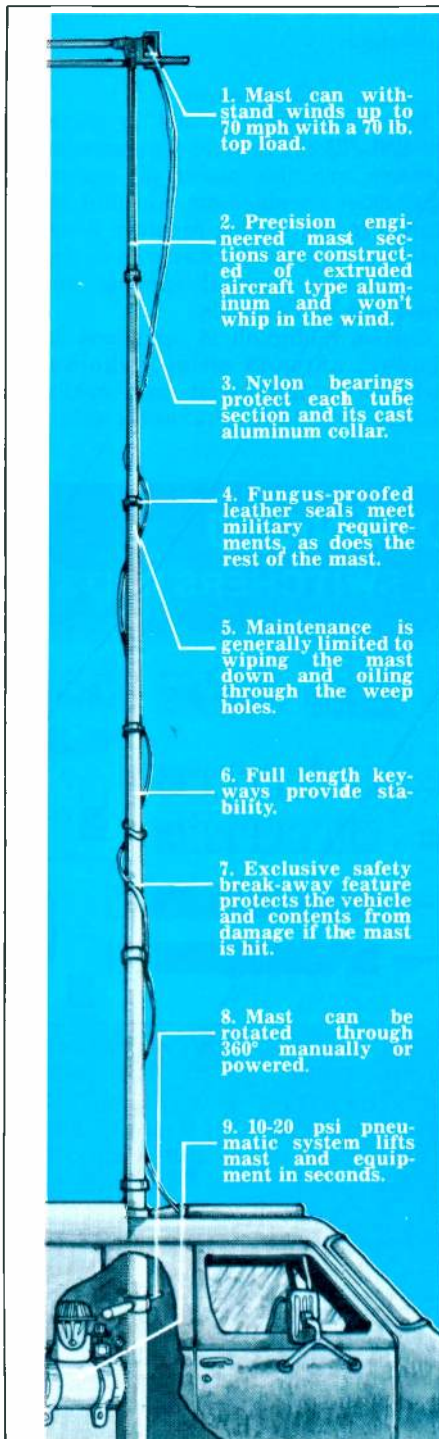
Other techniques

During the course of our evaluations we explored the use of a very high quality 4-channel PCM audio system in place of the traditional analog FM subcarriers. The details of those experiments were discussed previously² in some detail. However, the audio performance was found to be immune to the severe multipath distortion simulations employed in the test series of Figure 3. Comparatively, the intermodulation noise injected into the

analog channels in the same test rendered them consistently unusable.

This glimpse of success in a difficult propagation media plus the ongoing activity in digitized television transmission suggests that an eventual ENG/EJ-oriented and optimum microwave package may be a PCM concept. However, certain operating band allocations will likely require reconsideration by the Regulating Administration before such can be accomplished.

An extremely short-haul form of ENG/EJ is frequently employed, for instance, in the convention hall



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ENG/EJ

complexes or soccer fields. We find a moving cameraman who is self-powered and has no restraining tether. It is intended that his picture and audio information be radio transmitted back to a receiving site not more than 100 to 200 meters distant.

The choice of a low microwave frequency, 1 or 2GHz, with the prevalence of multipath inside a structure with unpredictable reflectance, compels the camera operator to use a semi-directional transmitting antenna. This is a logistical handicap to the operator as to his mobility. He may even lose the sense of direction back to the receiver in a crowd environment.

We explored the use of millimeter waves to capitalize on reflectance inefficiency of interior building surfaces. Our tests at 24GHz used a 40mW transmitter (a frequency modulated Gunn oscillator) and a CP conical horn. The system gain was limited and controlled the range to about 200 meters.

Subjective comparison with a 2GHz system (with the same system gain) and similar radiation charac-

teristics favored the 24GHz model with a test employing a roving source of video. It is difficult to set a criteria of comparison or provide an accurate oral description of results. An A/B test with a videotape and split screen would be a convincing tool. We expect to proceed further in this development, subject to relief by the Regulating Administration and the changes in radio band allocations. An important factor in the favor of these millimetric systems sharing a band with other services is the stop band feature caused by moisture and oxygen plus the built-in blockage by the working location. The future developments will be subsequently published.

Conclusions

Extremely efficient and predictable ENG/EJ microwave transmission systems are the result of mature equipment development. Careful attention to FM analog receiver filtering and overload characteristics permit close channel spacing and great system demands.

System multipath is optimized by prudent antenna siting, whether airborne or terrestrial and seeking lowest side lobe characteristics.

System range is essentially limited by end point and path topology with 150km routinely accomplished.

System developments in the next decade are expected to follow the route of modified analog (or perhaps digital) modulation methods and seek use of millimetric bands.

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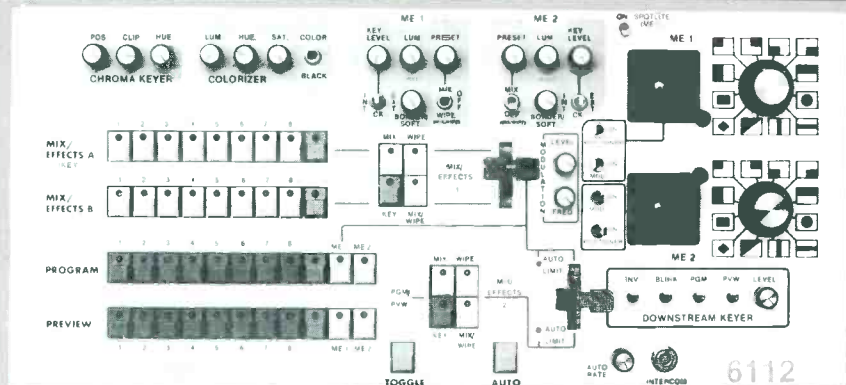
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WBNS in Columbus, OH, is proud of its news coverage and actively promotes its system, including its new stabilized helicopter.

Helicopter ENG technology

Stabilizing the helicopter for ENG— How practical is it?

The January 1980 issue of **Broadcast Engineering** emphasized trends in ENG operations and illustrated camera-stabilization systems to improve ENG telecasting. Now a more sophisticated technique is being used by broadcasters: a method of stabilizing the entire craft instead of just the camera.

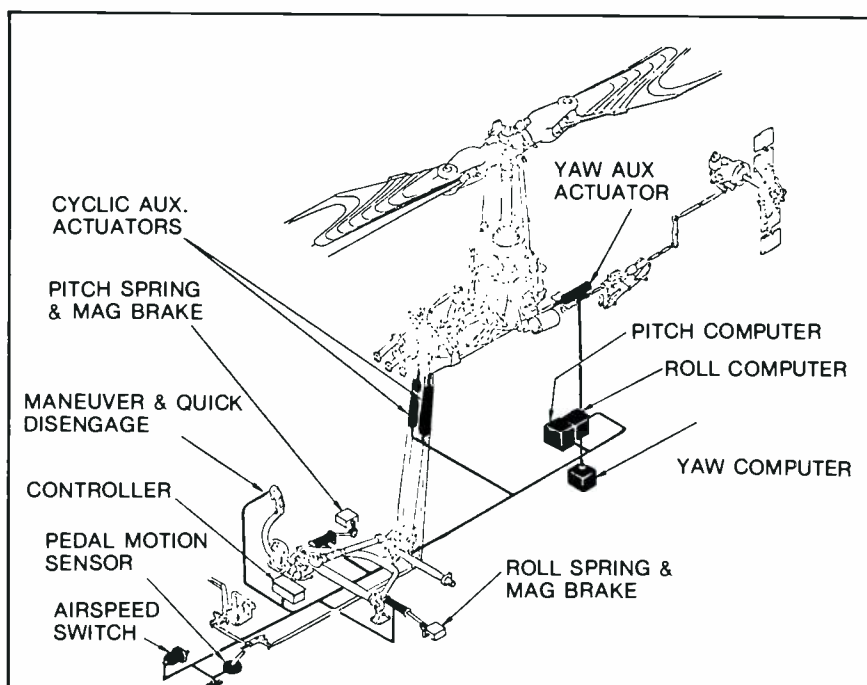
To find how practical the system is **BE** talked to the manufacturer and its users for details.

The helicopter stabilization system is drawing considerable attention among broadcasters because ENG coverage has become a competitive element in broadcasting. The system, known as Ministab, is manufactured by the SFENA Corporation of Grand Prairie, TX.

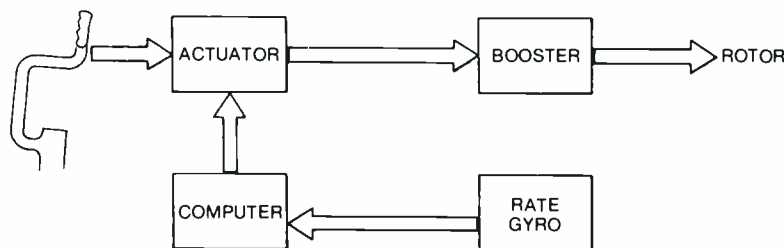
More than 1000 Ministab systems are in service worldwide. Originally developed for the military to stabilize helicopter gun platforms, the Ministab has now found its way into helicopters for all types of applications. In the United States, the system is certified for the Bell 206B Jet Ranger and 206L Long Ranger helicopters.

The Ministab

A 3-axis Ministab system with altitude hold consists of the following key components: three computers for pitch, roll and yaw; three actuators, electro-mechanical; a panel-mounted system controller; an airspeed sensor/switch; an altitude-hold sensor; pilot controls; and stick trim/force feel system. An average system installation takes 3-4 days followed by a 30-minute check-out flight. SFENA has a factory installation center near Bell Helicopter in Texas and has a national dealer network.



A typical stabilization system for a Bell 206 helicopter.



With Ministab series actuators there is no feedback to the controls, but the craft has a natural response to pilot input.

The installed system provides the aircraft with a variety of functional advantages:

- Rate damping on three axis, which minimizes gust disturbances to attitude and smooths craft responses to pilot inputs.
- Attitude and heading retention (integrated rate), which eliminates yaw and attitude excursions, provides hands-off capability and enhances pilot/machine performance;
- Fly-through, in which pilot overrides attitude retention automatically with control input while still maintaining turbulence damping and in which attitude hold re-engages automatically; and
- Dual mode operations, featuring natural hover control laws and natural cruise control laws.

The control "black box" for the Ministab system is simple, consisting of these switches: on-off, altitude, yaw, roll, pitch and test. The heart of the system is made up of three computers. Each computer independently controls one axis, and is equipped with an internal rate gyro. The gyro is sensitive to motion of less than 1/100 of a degree per second compared with a pilot's typical sensitivity threshold of about three degrees per second of motion.

From a station's viewpoint, a stabilized helicopter offers a number of important advantages:

- **Increased usage:** even on turbulent, windy days stabilized helicopters can operate safely and effectively to cover fast-breaking news stories;
- **Improved quality:** in all kinds of weather, rate gyros and computer circuits damp out inherent and external vibrations and craft motions, allowing the camera operator to hold steadier pictures even at telescopic extremes.
- **Increased safety:** stabilization reduces pilot fatigue, resulting in safer operations and more flying hours.

Sister stations WBNS-TV10 in Columbus, OH, and WTHR-TV13 in Indianapolis, IN, both use station-owned Jet Ranger III helicopters equipped with Ministab stabilizers and Tayburn ENG electronics. Terry Ault, chief pilot for both stations, described the system and how the stations use it.

"It's a stabilization system," said Ault, "that irons out all the small air turbulences, but it won't take out the big thermals because they are out of the envelope you're in. Tied into the force trim and attitude hold, you can fly with hands off—and that's important in our fast-paced operations. I handle the

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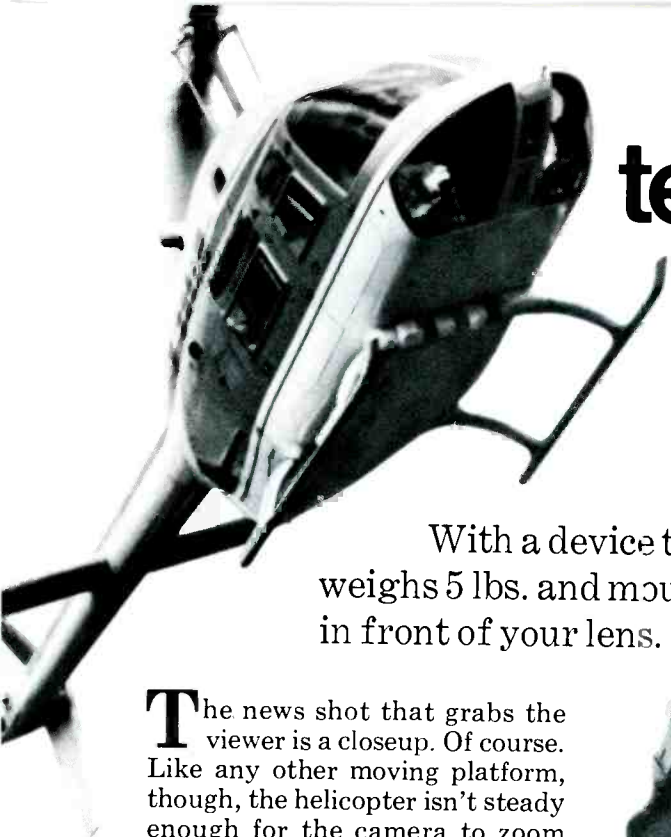


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The news shot that grabs the viewer is a closeup. Of course. Like any other moving platform, though, the helicopter isn't steady enough for the camera to zoom in tight. Needless to say: at the long end of the lens, vibration is magnified.

You pay good money for that helicopter. You should get high-quality images.

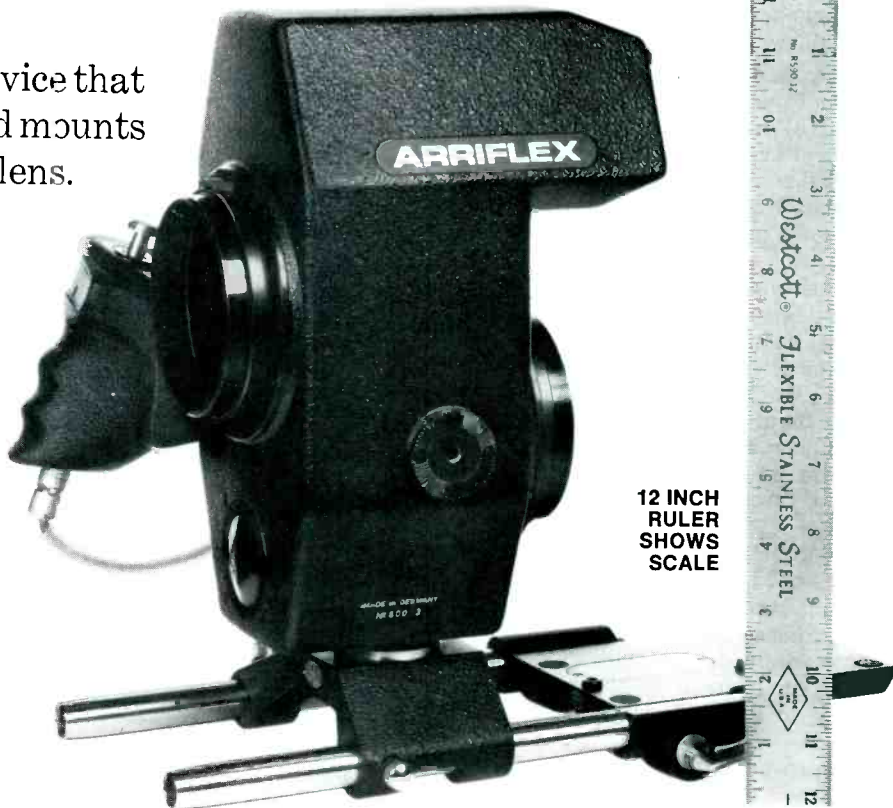
The police, the F.A.A. and the pilot all quite rightly want you to keep a safe distance from the action on the ground. *But you need close shots.* You're paying for the helicopter to make your news operation look good. Shaky pictures don't help.

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Without stabilization, you can't go longer than about the 50mm focal length on your ENG camera. With the Image Stabilizer, depending on air turbulence, you can get smooth shots at 150mm or longer.

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The Image Stabilizer comes with its own Support Plate and bracket. You mount your camera on the Plate and position the Stabilizer in front of your lens. Switch on the Stabilizer. Switch on the camera. Shoot. Any competent cameraman can use it. It works with any camera and with any prime lens longer than about 35mm. (With zoom lenses, the widest focal length varies slightly.)



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mirror is reflected onto another (fixed) mirror and thence into the camera's lens.

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A gyro's directional stability makes it resist off-axis movement — such as panning the camera. If you insist, it tumbles in that direction. British Aerospace, the designers, have turned this tendency to advantage. A precession brake causes the gyro to *lean with* the panning motion, steadily. This is military aerospace technology, ingeniously adapted.



The British Aerospace Steadyscope uses the same stabilization method. Above: surveillance from a NATO army helicopter.

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How well does it work?

In the November 16, 1978 issue of the British magazine *NEW SCIENTIST*, there's an article by Guy Parker on stabilized binoculars. Referring to the Steadyscope, Mr. Parker writes:

Anchored in space

"On pressing the uncage button there is an immediate transformation which is both psychological and optical. The impact is of course greater if one is being shaken in a helicopter, but even on land the image appears in an almost uncanny way to anchor itself in space, even if the instrument is deliberately jiggled about."

Detail resolution

"An optical phenomenon now becomes apparent," writes Mr. Parker. "After the initial pleasure at the disappearance of jitter, the eye seems to demand needle-sharp resolution, now that the visibility of detail is determined mainly by the quality of the optical design. *There is no future for a stabilizer which does not give the highest resolution under all conditions of use.*"

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IMAGE STABILIZER SPECS:

Length (Image Stabilizer alone): 6 5/8 ins. Width: 4 11/16 ins. Height: 9 1/4 ins. Weight (Image Stabilizer alone): 5 lbs. Weight (on Support Plate with 9 1/2 inch rods and with cable-release handle): 7 lbs. 4 oz. Maximum panning speed: approx. 4 degrees/second. Maximum accelerative force: 6g. Equalizes vibration frequencies 1 Hz and higher. Camera lens focal lengths usable with ENG/EFP format: 35mm and longer.



Rear view of Image Stabilizer shows Support Plate with threaded camera mount. Custom brackets are available for various cameras. Stabilizer can be removed from camera in less than two minutes.

No light loss, no image degradation.

There are no lenses or prisms in the Stabilizer. Light rays pass through optical flats front and rear, and reflect off two front-surface mirrors. If you meter the light at the exit port, it measures the same as the light entering.

Doesn't perform miracles. Does work in a car, though, or any other moving base.

The Stabilizer is for making shaky shots smoother, *not* for simulating a rock-steady tripod. Its low mass is vital in the unwieldy g forces inside a helicopter. But that's useful in a car, too, or on horseback... You can get out of the car and continue shooting with a body-brace. And the Stabilizer is quiet enough to shoot sync sound out of doors.

Elegant proof of low mass space-hardware sophistication: a gyroscope powered by one flashlight battery.



To improve a gyroscope's effectiveness, you can increase either its mass or its RPM. For military purposes, British Aerospace had to make it small, light and efficient.

High speed with low mass requires exact dynamic balance, of course. Eccentricity and bearing friction would impair accuracy and soak up power. One measure of the phenomenal precision of this device: The gyroscope—with its double gimbal and mirror—will run about four hours on a 1.5 volt D cell!

Low mass saves money.

A low mass device is likely to be compact. With this one, you can rent a 5 place helicopter at \$300 an hour, and get steady shots *from inside*. No need to hang out of the open door. And no need, either, for a 7 place helicopter at \$400 an hour, or more.



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IMAGING EQUIPMENT SINCE 1917

Helicopter

craft, transmitter and auxiliary equipment, leaving the cameraman free to cover the story. So, we really need something to reduce the pilot work load, and this system does it."

Ault uses the system's attitude and auto pilot functions en route to a scene to get ready for shooting.

"When I get there," he says, "I usually take the attitude hold off and just use the stabilization—in which case I hand-fly it. It's much easier to hand-fly it for the shots, with the stabilization engaged."

One organization looking into using the Ministab system is Alaska Helicopters operating out of Anchorage. Steven Smith, in operations, flew an equipped Jet Ranger from Phoenix to San Diego and was impressed with its exceptional handling.

"In our business," Smith said, "we're often called upon to demonstrate inertial guidance/surveying systems that enable a pilot to hover at 100 feet and maintain second and third order horizontal accuracy. But, with the Ministab system, I was able to maintain a 6-inch square horizontal stability and 0.1-

inch vertical accuracy at a 75-foot altitude. And, the control was achieved effortlessly, eliminating pilot fatigue."

These advantages must be weighed against the system cost. Installed, a two-axis stabilization system would add about \$22,000 to the price of an ENG helicopter and a three-axis stabilization system about \$32,000. If a helicopter is rented for ENG operations, a stabilized craft would have a slightly higher rental rate because of the additional cost of the craft. The added weight to the craft is nominal: about 22 pounds for a two-axis system, 32 pounds for a three-axis system.

Compared with the cost of buying or renting lens stabilizers or sophisticated camera mounts, some stations have found the benefits of improved picture quality and increased helicopter utilization justify the cost.

Hughes Helicopter's new ENG system

Hughes Helicopters publically showed its new cost-cutting ENG

system for the first time at the Radio-Television News Directors Association's 1980 International Conference, held Dec. 3-5 at the Diplomat Hotel in Hollywood, FL.

The low-cost, turn-key system is made possible because of technological breakthroughs by Tayburn Electronics in Carlsbad, CA, manufacturer of the system. The cost of the helicopter and the complete ENG system, including the necessary audio and video management, is approximately \$160,000—a savings of about two-thirds of the cost of the lowest priced ENG-equipped helicopter currently available.

The ENG unit features a total audio management system to interface with TV stations, enabling reporters to broadcast live from the 300C helicopter for the first time.

Development of this system for the 300C makes it the only reciprocating engine helicopter to offer this cost-effective option.

A key breakthrough is the TBT-50 miniature portable ENG microwave transmitter. The mini-transmitter replaces current bulky ENG transmitters, which are too large to fit into the compact 300C. The total weight of the new ENG package is 25 pounds, but the transmitter itself weighs only 22 ounces.

3 Models—6, 8 and 10 mixer dual stereo • Transformer Balanced Inputs and Outputs • 3 Inputs Per Mixer—internal pads allow mic/line selection on the same mixer • Two 4-Input Auxiliary Input Selectors—may be assigned to any mixer • Pre-fader Pushbutton Cue—in addition to normal CCW fader cue position • LED Status Indicators—color coded to aid in instant identification of function selectors • Momentary or Continuous Remote Control Contacts—internally selectable, also controls optional digital timer reset/start • Full Metering Capability—two meters standard, up to four meters and/or digital clocks and timers optionally available, all meters provided with LED peak indicators • Gain Selectable Microphone Preamps—provided with center tap access for phantom condenser microphone power, processor input/output port with buffer amplifier for outboard compressors, limiters, etc. • Programmable Muting Logic—internal pin-programmed matrix allows any selection of monitor and cue muting for the first five mixer positions • Pushbutton Aural Phase Test • Announcer's Microphone Intercom-Air Selector • Full Dual Channel Operation— independent program and audition assignment pushbuttons • Five Monitor Driver Outputs—four muted, one non-muted • All Mixers Switch-Selectable to Mono or Stereo • Ground-Plane Techniques Used Throughout for Increased RF Immunity • Selectable Internal or External Master Level Controls • Accessories and Options—mono mixdown, high impedance (cassette) line input plug-ins, reference oscillator/line input plug-in, additional microphone input plug-ins, digital clock, digital timer, linear faders



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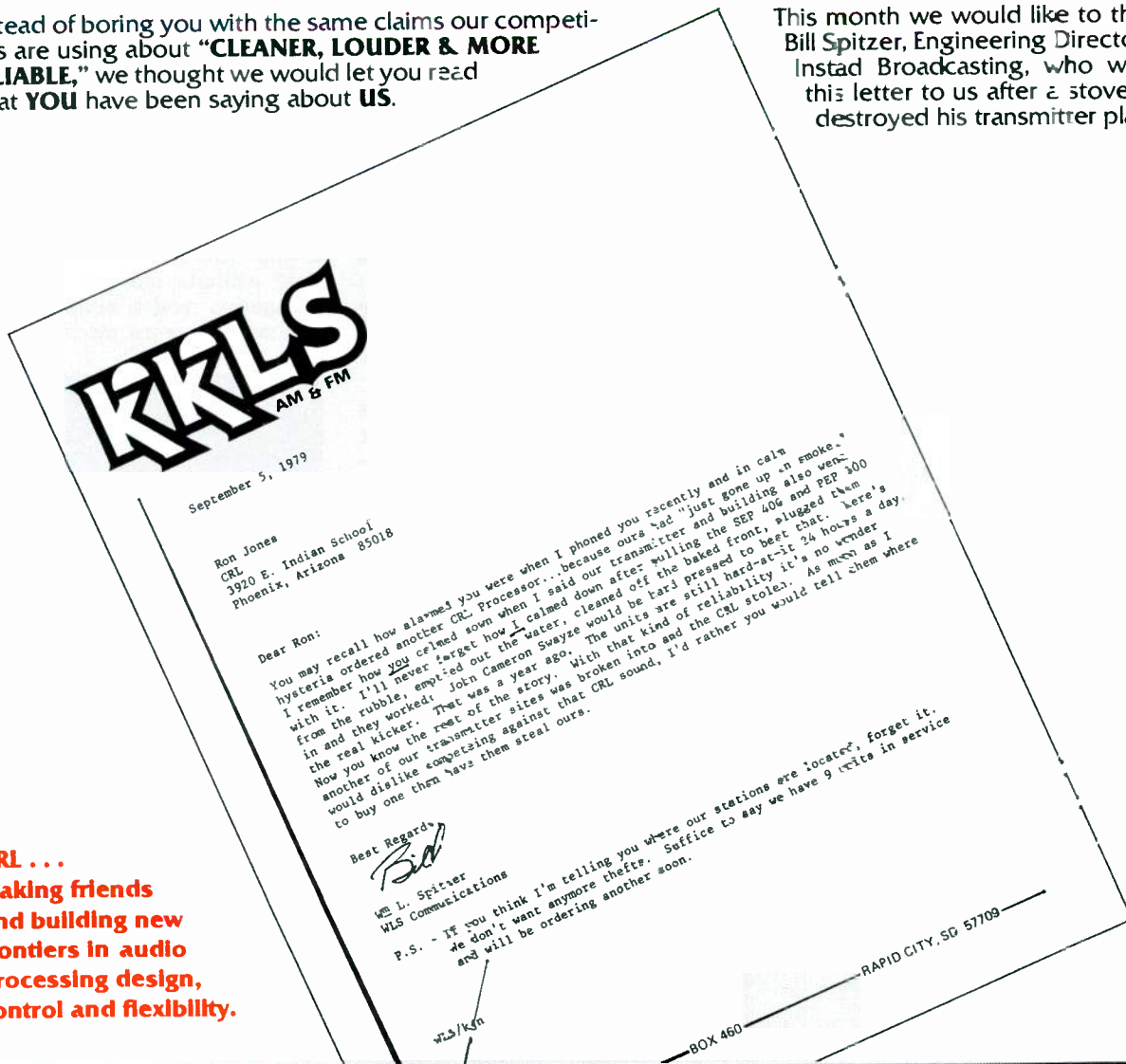
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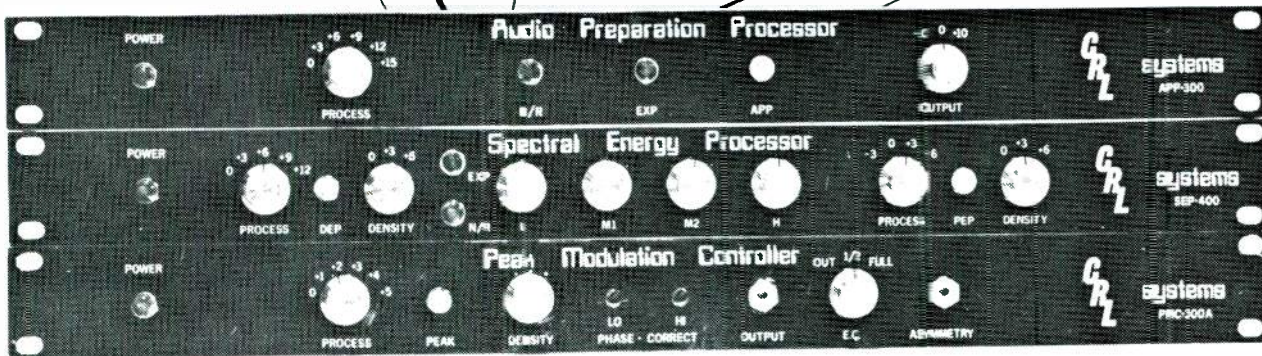
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Instead of boring you with the same claims our competitors are using about **"CLEANER, LOUDER & MORE RELIABLE,"** we thought we would let you read what **YOU** have been saying about **US**.

This month we would like to thank Bill Spitzer, Engineering Director of Instad Broadcasting, who wrote this letter to us after a stove fire destroyed his transmitter plant.



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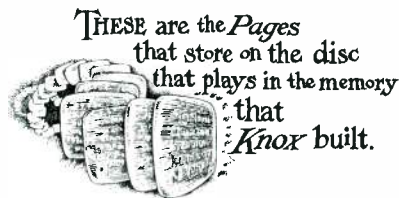
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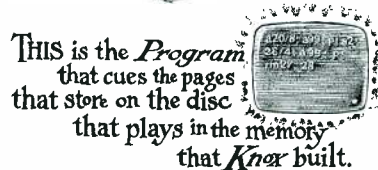
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THIS is the Disc that plays in the memory that Knox built.



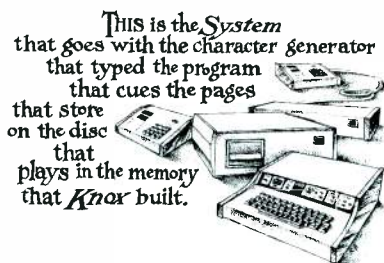
THESE are the Pages that store on the disc that plays in the memory that Knox built.



THIS is the Program that cues the pages that store on the disc that plays in the memory that Knox built.



THIS is the Character Generator that typed the program that cues the pages that store on the disc that plays in the memory that Knox built.



THIS is the System that goes with the character generator that typed the program that cues the pages that store on the disc that plays in the memory that Knox built.

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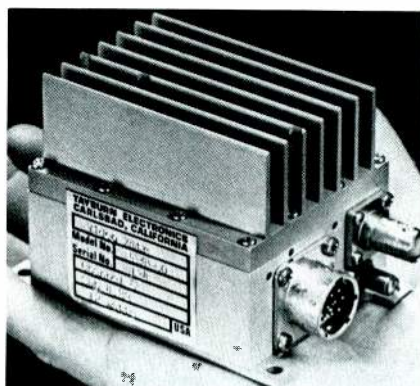
Helicopter

A unique feature of the system is its on-board power supply, which eliminates the need to depend on battery packs for operation. On-board power means longer transmissions and easier operation of the ENG system. Battery packs can be attached to enable news-gathering crews to venture outside the helicopter.

Another feature of the system permits prerecorded videotapes made during earlier flights to be transmitted directly to the system. The system will also be able to receive and retransmit footage shot by other ground crews several miles away, thus increasing the possible coverage areas.

A similar Tayburn ENG package is already in use on the larger five-place Hughes 500D turbine-powered helicopter at KPNX television in Phoenix, AZ. Many stations around the country already use Hughes helicopters for television news gathering and several more stations have ordered Hughes helicopters with ENG equipment.

According to Hughes officials, the



A key breakthrough on the Hughes Helicopters miniaturized system for the 300C is the TBT-50 portable ENG microwave transmitter, manufactured by Tayburn Electronics of Carlsbad, CA.

ENG-equipped 300C could be utilized effectively in approximately 100 TV markets nationwide.

A station that purchased three 300C helicopters for ENG reporting would have a significant edge over those using a single turbine-powered helicopter, because three news events could literally be covered for the price of one.

The 300C can carry a three-man crew for up to three hours of reporting without refueling.

Collins autopilot system

The Collins APS-841H autopilot Micro Line system is described by the manufacturer as offering helicopter operators greater safety and stability for ENG operations, especially for the Hughes 500, Bell 206B Jet Ranger III, 206L-1 Long Ranger II, and the Aerospatiale AStar 350D crafts. Hands-free flying with full-time attitude stability and coupled navigation modes allow the pilot to concentrate more attention on posi-



tioning the helicopter to cover ENG scenes. Shown here on the AStar 350D, a panel-mounted mode controller in the center provides automatic heading, navigation, attitude hold, turbulence and approach modes as well as an optional indicated air speed hold mode to relieve the pilot from routine duties and lessen fatigue. The special turbulence mode improves ride and craft response in rough air. Controls on the cyclic include a circular beep trim switch for minor attitude adjustment; a trim release button for synchronizing the autopilot to a new attitude; and a disengage switch to override the panel-mounted control.

Image stabilizer from Arriflex

Arriflex Corporation has announced the availability of a new image stabilizer that makes steady shots possible anywhere cameras are subjected to unusual shocks or vibrations.

Shown for the first time in the United States at the 121st SMPTE

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Helicopter

Conference in Los Angeles, the unit consists of an optical system governed by a precise, battery powered gyroscope.

Completely self-contained and weighing less than 6 pounds, the Arriflex image stabilizer can be used with a wide range of video or film cameras without the need for special camera or lens modification.

Mounted in front of the taking lens, the Arriflex image stabilizer



will equalize vibration frequencies of 1Hz and higher, and is particularly well suited for airborne operations.

There is no light loss or image degradation through the system, and its use requires no special training or change in the accepted methods of camera operation.

With the ENG/EFP format, focal lengths of 35mm and longer may be used. With the Studio Broadcast Video format, lenses of 75mm and longer can be used.

Commerce introduces CA-214 and CA-300

Lack of coordination in airborne ENG systems and operations has been attacked by two new products from the Commerce Airborne Corporation. The company has called its CA-214 and CA-300 "Airborne System Controllers."

Capable of complete communications and audio management, the

CA-214 is currently serving airborne broadcast needs in many major markets. The units efficiently integrate all two-way communications, cueing, microwave uplinks and downlinks, and on-board intercommunications. With a single dedicated headset, the CA-214 allows fully independent control of all broadcast and communications audio from each crew position.

The newly introduced CA-300 Airborne Video/Audio Switcher features manual and A follow V switching. An integral video DA allows simultaneous taping and microwave transmission from the aircraft. The CA-300 handles camera, VTR, uplink and auxiliary video sources. It also accommodates audio control of VTR and multiple receiver subcarriers.

Both the CA-214 and CA-300 are designed specifically for airborne environments, are fully back-lighted for night operations, and meet all broadcast requirements. Each may be field installed and is supplied with extensive system documentation.

Commerce Airborne also provides consultation and system installation services from its Van Nuys, CA, airport facility. □

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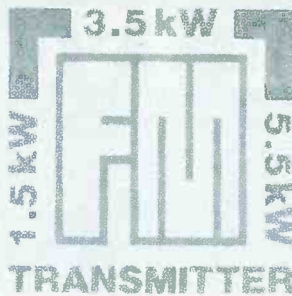
Our 1.5, 3.5, and 5.5 kW FM Transmitters feature a high efficiency, grounded-grid PA. You'll like their stability and trouble-free maintenance.

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The modulation of our on-frequency, direct FM, solid-state exciter is varactor controlled. The possibility of frequency drift is eliminated by a crystal controlled reference oscillator.

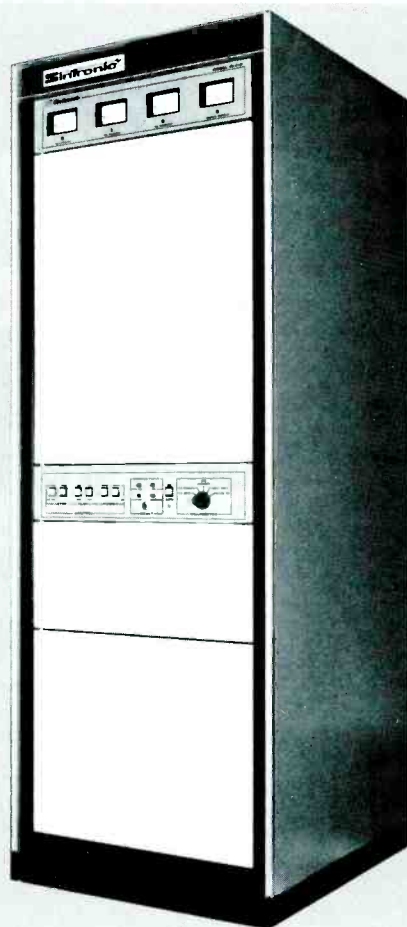
A 12 pulse, 3-phase power supply adds to the reliability of these transmitters by reducing the number of failure prone components.

Such features let you know that this is a "class" product. But once you know that this is also the most attractively priced transmitter on the market, you will agree it almost defies comparison.



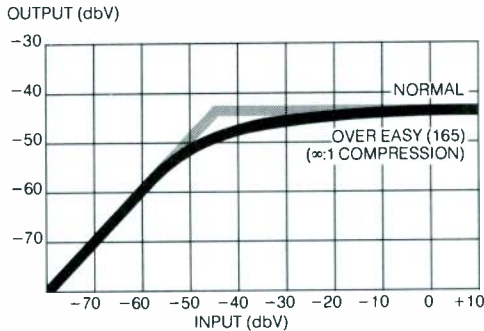
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Highlights of IBC-80, Brighton

By Peter Denby
former head
BBC Studio Design Group

In the August issue, beginning on page 54, is an introduction to IBC-80 and details of its technical program. The author attended various sessions and files the following report on highlights of IBC-80.

September 20-23, 1980
46,280 sq. ft. of floor space
3000 in attendance

In opening the technical sessions of IBC-80, Peter Mothersole, chairman of the Technical Programme Committee, said this year's papers were the best in many years. Certainly the first session on Broadcasting Technology in the '80s bore this out.

Technologies of the '80s

Joseph Flaherty, of the CBS television network and session chairman, reminded the audience of some of the milestones in the development of radio and television and said it was a brave man who would forecast what might happen in another decade.

Dr. Boris Townsend of the UKIBA, the convention's first speaker, said he identified a number of current trends in broadcasting equipment but questioned whether they represented the right goals. LSI made possible much smaller and more complex equipment, but was this what the customer wanted? In Townsend's view there were already too many television cameras to choose from—but didn't include what he needed for ENG. Developments in satellites and home viewing offered the public an increasing number of entertainment channels, but was this what the viewer wanted? For satellite broadcasting to succeed it would have to put out new, not duplicate existing, networks—and, preferably, with higher definition.

Townsend urged that the engineering societies provide leadership

Denby joined the BBC in 1941 as a broadcast engineer. He has been involved in designing broadcasting equipment and facilities, with responsibilities covering audio consoles, video switchers, VTRs, and standards conversion. His latest works have involved plans for introducing digital audio and video into the BBC studios and subtitling for the deaf through teletext. Upon retiring earlier this year, he was the head of the BBC group for studio design and was deputy department head.



The opening session on *Broadcasting Technology in the '80s* was headed by J. A. Flaherty (top photo), CBS Television Network. The meeting room (bottom photo) was packed as IBC-80 got under way. On the front row left to right are: Charles Ginsburg, Ampex; Geoff Phillips, BBC; Mike Butler, Philips Electronic Industries; Boris Townsend, IBA; and T. Nishizawa, NHK.

for the future of the broadcasting industry, before the newer discs and fibers seriously eroded that future.

Dr. Geoffrey Phillips of BBC Research, who started from a consideration of the available radio spectrum, concluded that satisfactory national coverage was only possible for perhaps a maximum of 15 radio and nine television channels, even with the use of satellites. If more were wanted, cable was the

only answer, he said.

Phillips also said that satellites were only appropriate to national (or international) programs; the terrestrial transmitter would continue to be of value for local area or regional broadcasting. Also, he said, legal and cultural differences between nations would be an obstacle to international television.

David Brace of British Telecom Research presented a paper written with his colleague D. J. Heatley on

Happy 25th birthday to video tape
from the people who lit the first candle.



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IBC-80

"Wideband Transmission by Optical Fibre Systems." After outlining the developing fiber network for intercity communication, he described possible ways in which these would be extended to the domestic and business user so as to provide data and video in addition to telephony. It seems that distribution would be centered on flexibility points containing switching facilities controlled by the customer and would use a pulse frequency modulation system.

British Telecom had done considerable research into suitable sources, fibers and circuits and, in particular, had devised a DIL package for terminating the fiber incorporating a micro-optical lens, source and monitor. With these developments, 140Mbit/s signals could be sent reliably and economically up to 9km.

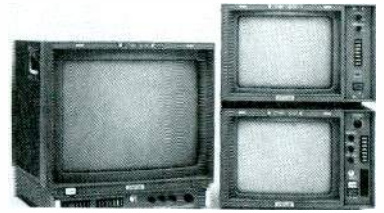
The next speaker took a domestic view of the next decade, and illustrated it with a sketch of the house of 1990. The paper, "The Future of Home Viewing," by Mike Butler of Philips Electronic Industries, foresaw a considerable growth of home viewing, particularly nonbroadcast. His view is that the main room will have a projection

television but with viewers in other rooms available for instruction, entertainment, and games—and with a home information terminal in the study. As a result, in the '80s the home viewer will have a greatly increased choice or, to put it another way, the broadcaster will have more competition.

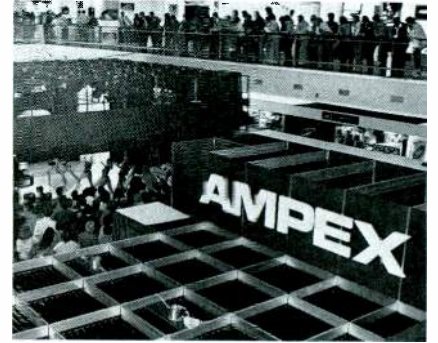
The last presentation in this session, written by T. Fujio, J. Ishida, T. Komoto and T. Nishizawa of Japan, featured a report on the present state of high definition television in the NHK Technical Research Laboratories.

Nishizawa said that since this work began in 1968, NHK has developed cameras and displays, and has carried out transmission tests. The results of subjective tests supported the choice of a 1 m² picture of 5:3 aspect ratio with at least 1100 lines and a system bandwidth of 20MHz. A new high performance Saticon tube had been developed to operate on this standard.

Satellite transmission using a 23GHz frequency was proposed as the best means of transmitting this signal. Because of power limitations to about 1kW, a separate luminance and chrominance system was suggested to give a satisfactory signal-to-noise ratio.



The BARCO third generation of master control monitors: more than 250 were used throughout the IBC-80



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BBC—advances in broadcast technology.



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the AK-710's feedback beam control stabilizes highlights that exceed normal white levels without reducing dynamic range or resolution.

Equally newsworthy is the AK-710's built-in genlock and adjustable horizontal and vertical blanking intervals. With them the AK-710 can double as a system camera. There's also an optional remote control unit, as well as a 5" CRT viewfinder for studio use.

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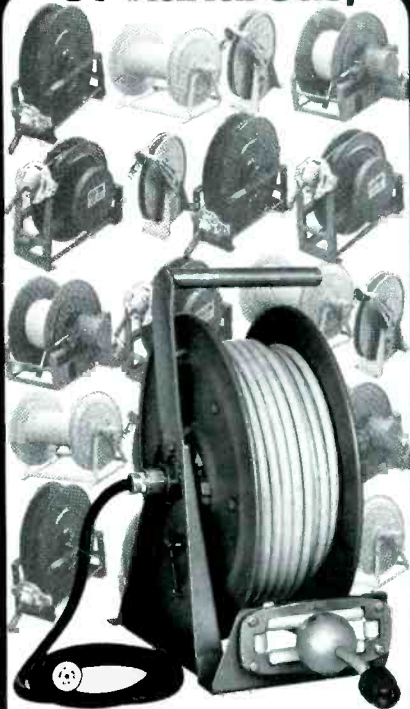
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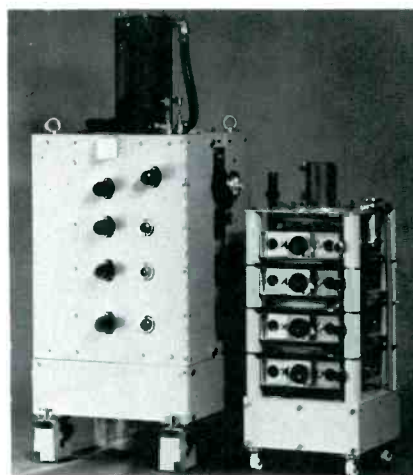
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IBC-80



Bosch FDL60 CCD telecine—just one of its nine product lines displayed.



Philips compact UHF 15kW Klystron.



Central Dynamic switcher (at Pye TVT booth).

Digital television

A matter central to future broadcasting technology is coding standards for digital television and an entire session was devoted to it. Peter Rainger of the BBC served as the chairman.

Howard Jones of the BBC made the first presentation. Jones, who is also chairman of the EBU VI-VID committee, which has been trying to reach a European consensus on coding, explained that the problem was not solely a technical one. He said he had been pleased with the progress that had been made, which had quickly brought the committee to adopt a component coded system with a 12MHz sampling frequency for the luminance signal and two color difference signals each sampled at 4MHz—conveniently referred to as a 12:4:4 system. This would give a total bit rate of 160Mbit/s, or about 140Mbit/s for the active picture. In choosing these factors, two important considerations were that 140Mbit/s is one of the standards laid down for digital transmission and, in the view of manufacturers of videotape recorders, was close to the limit then achievable.

Equipment had been built and demonstrated by a number of countries from which it was concluded that the small imperfections were completely masked by the encoding of the digital signal into PAL for broadcasting. However, in a first implementation, chroma-key was poor, and a wider chroma bandwidth seemed necessary. Jones replayed three videotapes, which, in the uncritical viewing conditions of a convention, seemed to confirm these views.

William Connolly, of the CBS Television Network and chairman of the SMPTE Study Group on Digital Television Tape Recording, said the group had distributed a survey to 1500 users. Although detailed results were not yet available, in brief, most said they wanted a digital VTR to be just like a 1-inch helical machine in size, facilities and cost.

Second, the group had turned its attention to consideration of digital coding standards. This was also stimulated by the interest in Europe in component coding, but SMPTE looked to worldwide compatibility. In particular, Connolly suggested a hierarchy of digital codes. If the sampling frequency (S) was be-

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tween, for instance, 12 and 14.3MHz, and then an S:S:S system would provide the highest quality with S:S/2:S/2 or S:S/4:S/4 as lower standards, perhaps even S/2:S/4:S/4 for ENG.

The final presentation was on digital coding standards for television studios by John Baldwin of the UKIBA. He pointed out that the action of chroma-key on the digital video convoluted together the spectra and caused aliasing, which was present but perhaps acceptable for a 14MHz sampling rate but could be unacceptable at 12MHz. Similarly, many other studio processes were more critical when the sampling rate was close to the Nyquist rate, necessitating sophisticated (and expensive) digital filtering techniques. From such considerations, together with the need for roughly equal horizontal and vertical resolution and compatibility with coded PAL, NTSC and SECAM, Baldwin argued that there was, in fact, little choice available. About 910 samples per line (14.3MHz) seemed optimum taking all these points into consideration.

This point was taken up by the first speaker, Tom Robson, director of engineering, UKIBA. "In rejecting a 12:4:4 system," he said, "the IBA would support an acceptable sampling rate between 13 and 14.7MHz." He also commended a 2:1 ratio of luminance-to-color difference sampling rates.

The recorder industry had three representatives on the panel. Charles Ginsberg of Ampex expressed his personal view that a bit rate of about 160Mbit/s was probably a realistic limit for running a service on machines with full facilities and interchangeability. H. R. Groll of Robert Bosch said that above 80Mbit/s per channel bit errors increased rapidly, needing more sophisticated and more expensive correction and concealment systems: up to 160Mbit/s would need only two channels, but above that rate three or even four would be necessary. He disagreed with Baldwin's figures showing costs increasing by only a few percent. In his view, the machine cost was almost directly proportional to the number of channels used. Bosch was still flexible and not committed to a particular format, but Groll warned broadcasters of the cost of setting a too-high standard incapable of being transmitted. Ken Barratt of Sony Broadcast UK said that his organization, too, was still flexible on the



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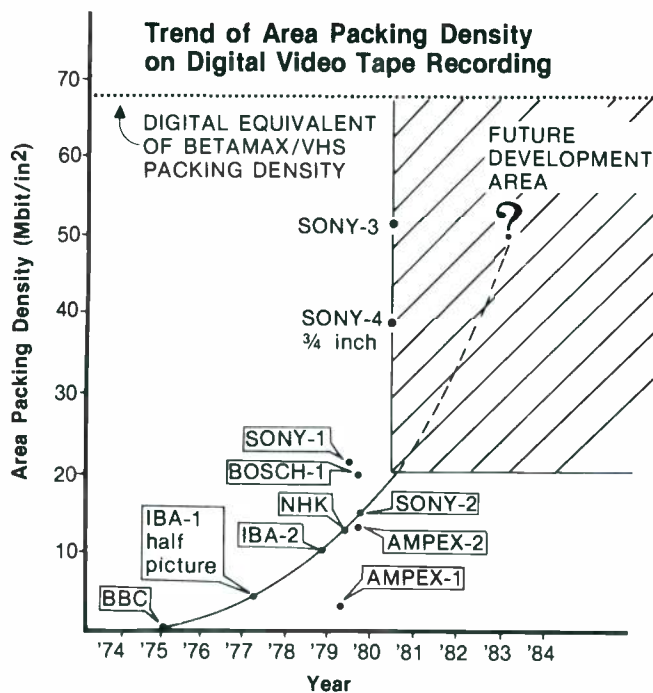
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Packing density for magnetic tape has seen dramatic increases in recent years. (From paper by H. Yoshida, Sony Corp.).

storage session, which included reports from Ampex, Sony and UKIBA. It seems that the equipment manufacturers, having recovered from the surprise of the users wondering what the makers were up to, were more willing to discuss their position—and even to change it.

The first presentation described requirements of DVTRs as found by an EBU questionnaire. Paul Kelly, London Weekend Television, in presenting his analysis of the replies, concluded that the user looked to a machine costing no more, but with all the facilities plus a few more, of today's analog B or C format machine—but which was more economical to operate, line-up and maintain.

A presentation by J.L.E. Baldwin and G.M. Drury (presented by Drury) described the UKIBA recent developments in and thinking on DVTR formats and standards. Their experimental machine was geared to the proposed 12:4:4 EBU standard and recorded 175Mbit/s on two channels using line-locked sampling of the active picture only and 8/10 coding for error detection, correction and concealment. It seemed that this was close to the practical limit for two channels; in fact, some reduction would be useful, though bit rate reduction systems were considered inappropriate in a high quality studio machine.

In formatting this data onto tape there seemed to be a wide choice depending on the number of heads, head drum size, wrap, speed, etc. The IBA work had been done on a modified B format machine using four heads on a 2-inch drum rotating at 312½ rev/s with 180° wrap. This resulted in exactly 25 TV lines per sweep, with a track pitch of 50 microns. The spatial separation of the heads gave better protection against signal impairment caused by tape damage, but greater segmentation made slow motion more difficult.

It was proposed that the audio should be recorded by the video heads and occupy a position at the end of each sweep. Another UKIBA paper by J.B. Watson and P. Barnett described a suitable data system. This was a high quality system not locked to line rate using a sampling rate of 48kHz with 16 bits per sample (though this could easily be reduced to 32kHz). This gave a bit rate per channel of



An experimental CEEFAX page incorporating a high quality still picture. (From BBC Research).

question of bit rate: the more important parameter was packing density so as to minimize tape and equipment bulk.

Broadcasters were represented on the panel by Bob Longman, controller, engineering and operations, BBC Television, and Roger Appleton, chief engineer, London Weekend Television. Longman urged industry to further develop digital equipment and said the digital VTR was essential. In his view 12:4:4 was not a good enough standard, particularly in handling chroma-key. Both he and Appleton said they looked forward to the better quality and reliability of an all-digital studio, recording and distribution system.

The final panelist, Richard Taylor of Quantel, reminded the audience that in signal processing higher bit rates needed more storage with increased power consumption and heat; also, the distribution of these high frequency signals could be a problem. However, he said he welcomed a 2:1 luminance to color difference relationship.

Peter Rainger said he anticipated that some of the outstanding questions would be answered before EBU-VI Committee met early next year.

The digital VTR

Digital videotape recorders figured largely on the last day of the convention in the recording and

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IBC-80

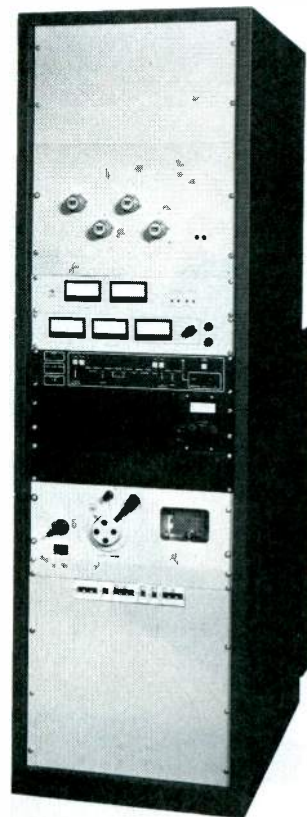
768kbit/s or about 1Mbit/s with error protection. At least three such high quality channels could be accommodated in the video signal, and it was hoped to demonstrate this in the near future.

Ampex's views on DVTR formats were set out in a paper by Dale Dolby, Maurice Lemoine and Michael Felix. In presenting it, Felix concentrated on three points. The first was how narrow a track was acceptable in practice—that is, not in the laboratory, but in the broadcaster's plant. To enable interchange of tapes between machines, to allow for 20-30% mistracking and to get a broadcast-quality picture at variable speed required track widths of about 50 microns. Secondly, in segmenting the picture, consideration must be given to the ease with which auto-tracking can cover a complete field. Drum size, wrap and number of heads (allowing for separate read and write heads) are crucial. Ampex prefers a 4-inch diameter with 180° wrap to facilitate automatic tape threading from a cassette. Finally, Felix gave a number of reasons for preferring the 8/10 block code over the Miller squared error coding, of which an important one was the ability to over-write rather than erase.

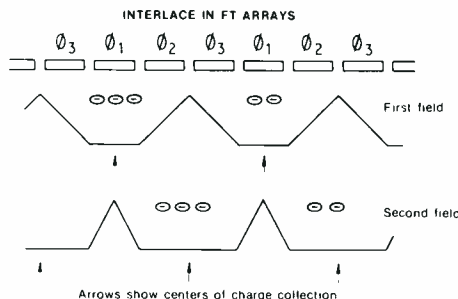
In answer to the alternative views that the VTR will for some years limit the digital standard or that achievable densities are increasing so rapidly as not to be a practical limit, Felix pointed out that tape costs are proportional to bit rate; reel size increases as the square root of bit rate, leading to slower wind and edit times; and equipment costs increase with bit rate. Also, there is a step increase of cost at about 80Mbit/s/channel because of the need for higher speed ICs.

The Sony Corporation presented a paper titled "Digital VTR Error Characteristics and a Proposed Pro-

tection Scheme" by M. Morizono, H. Yoshida, Y. Hashimoto, T. Eguchi and N. Shiota. This described work done with their coded NTSC machine, recording known 30 minute data sequences and analyzing the resulting errors. These showed that short term errors affecting only a few samples predominated though there were a few bursts lasting 6 to 13 lines. These tests were done at a bit rate of 57.6Mbit/s/channel. However, error rate would increase markedly with increased bit rate; also, the errors would get longer. Therefore, better code protection is



Pye TVT, known for its TV transmitters for more than 30 years, introduced its new range of MF and FM equipment at IBC-80. Shown here is the new 10kW Band II FM radio transmitter.



Method of obtaining interlace in type MA-357 CCD image sensor. (D. Burt, GEC Hirst Research Centre).



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cause efficiencies of 45% can be obtained from these 15 and 25kW devices, transmitters employing them can be simpler and smaller.

necessary (Sony used a modified 8/10 block code).

The digital VTR subject is a technical and complex one. The ensuing discussion barely scraped the surface of it, and the published papers merit close study. The session was guided and encouraged by chairman Joseph Roizen. The session with a videotape showed how the highest technology needs the microphone to work, as had been demonstrated in the convention hall at earlier sessions.

Teletext and exhibitors

Further developments and applications of the British invention teletext were described in a number of papers on subtitling for the hearing-impaired and the provision of alternative languages. Of particular interest were examples by the BBC and Telecom Research of means of sending high quality picture information.

It is possible to pick out only a few highlights of the remaining 80 papers and of the new devices shown by more than 110 exhibitors. One of the "Transmitters and Transposers" sessions was largely concerned with the planning of the fourth UKIBA television network and the Marconi and Pye transmitters it will use. These are designed around more efficient broadband klystrons developed by Philips. One of these can cover the entire UHF band from 470 to 860MHz instead of the three required formerly. Be-

New high quality portable cameras employing 2/3 inch tubes were on show. Ampex was showing its BCC 20 studio quality color camera and also gave a presentation on its unique Spatial Error Correction (SEC) registration system. The camera is portable and self-contained with a microprocessor and memory for control settings in the camera head. This stores corrections for 184 areas of the picture. Registration line-up to 0.05% can be achieved manually or automatically, and one master set-up panel can control up to 8 cameras. Additionally, the BCC 20 has a fiber optic RGB interconnection option.

Shown for the first time in the UK was the Bosch KCA100 lightweight color camera. By exchanging units that plug into the back of the basic camera, it can be adapted to ENG, battery operation or remotely controlled from a base station using multi-wire or optical fiber cable.

Also on show was the Sony BVP 330 color camera, a high resolution portable camera intended for ENG, EFP and studio applications. It has several automatic features, including automatic centering. Its good signal-to-noise ratio gives usable pictures in adverse lighting conditions and picture quality is comparable with large format studio cameras.

Looking to the future, D.J. Burt, S.L. Partridge and R.T. Bell of the GEC-Hirst Research Centre de-

Digital Air Temperature
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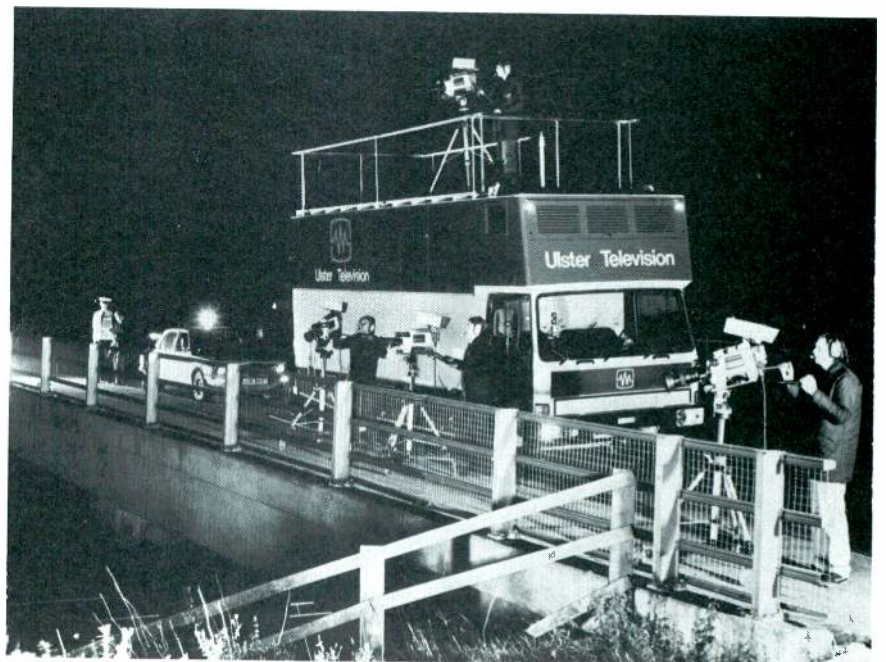



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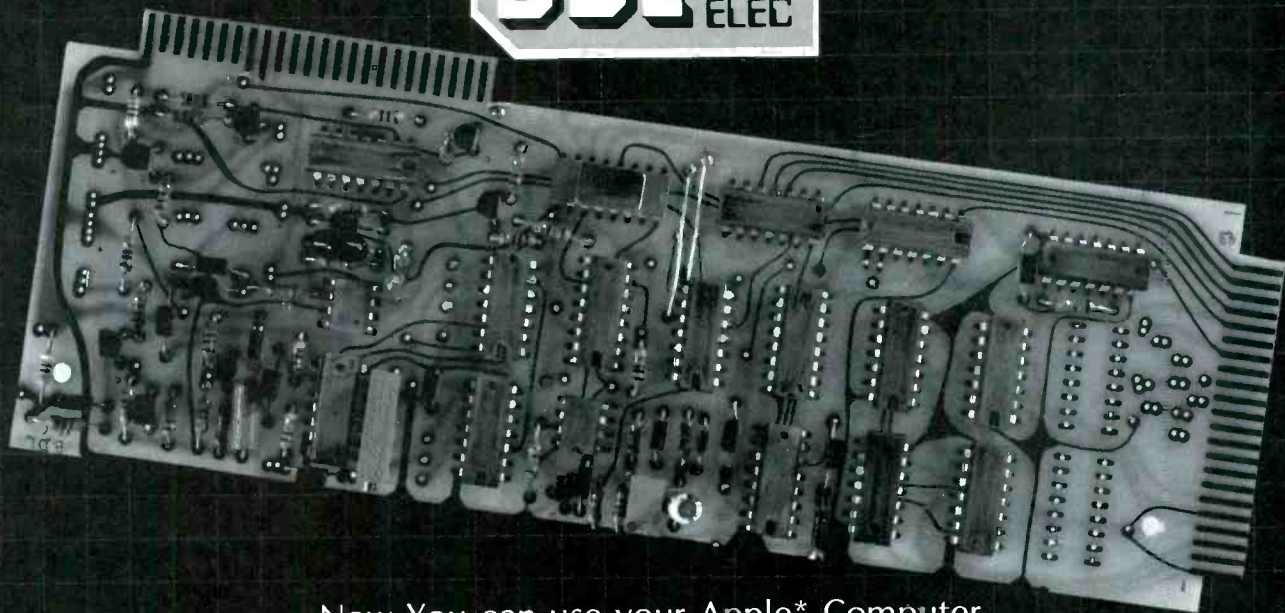
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Sony Broadcast exhibited a new Ulster Outside Broadcast vehicle at IBC-80, its BPM 3501 custom-built vehicle based on a 10-ton Bedford chassis.

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scribed the first commercially available CCD image sensor for TV cameras with full 625 line capability. Figure 11 illustrates how effective lace and interlace are obtained by alternate selection of the charges in groups of three. Burt provided an accurate picture of currently available performance. In particular, he said, more elements were needed along with improved blue response and much better protection against blooming. Even so, he expected to see them introduced progressively in the '80s for home TV, ENG and,

finally, in the TV studio.

Dr. I. Childs of BBC Research related his experience with a solid-state color telecine using CCD line sensors. Experience had shown that the three sensors could be registered to about 0.1% mechanically, but it was necessary to modify the signals to remove sensitivity variations and streaking caused by retention of low level signals.

However, in discussion, Bosch said that these difficulties could be overcome and certainly the FDL60 film scanner which Bosch was showing could provide pictures of the highest quality. In this machine

the film transport is continuous, and the picture after RGB separation in the prism system is scanned line after line by three CCD sensors. The outputs are taken to a digital framestore, which is read to provide the required output television standard. Broadcast quality full color pictures can be obtained when stationary and in forward or reverse, or in slow or normal motion. Even in fast wind a color picture is present to aid searching.

The number attending IBC 80 was more than 3000—a record—and business seemed likely to match it. □

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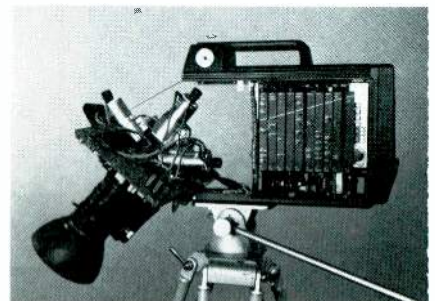
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Joseph Flaherty (left), CBS Television, and Robert Smith, president, Society of Motion Picture and Television Engineers, at the BBC booth, IBC-80.



Sony showed its new BVU-10 portable high-band U-Matic videocassette recorder at IBC-80.

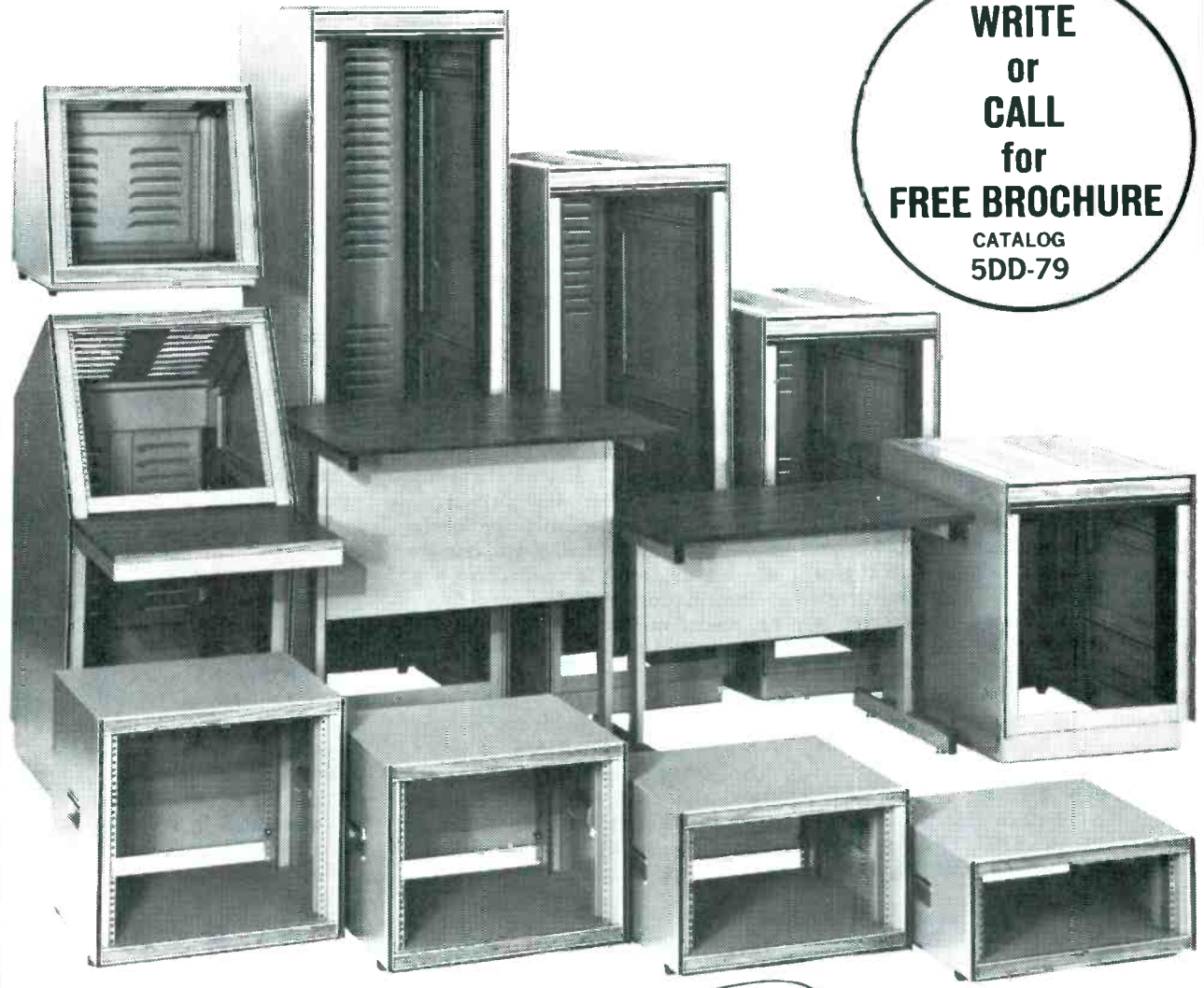


Bosch demonstrated at IBC-80 how easily its KCA 100 camera opens up for maintenance.

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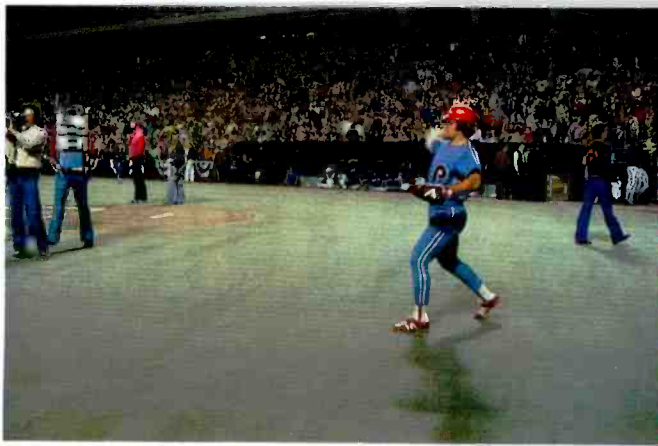
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courtesy of Kansas City Royals, Chris Vleisides photographer



courtesy of ABC Sports

Mobile camera crews have added action to ENG by quickly covering fast-breaking news topics. This portability in equipment has added a striking dimension to televised sports, as illustrated above. On the left, two roving camera crews prepare to cover pre-game points of interest at the 1980 World Series as Philadelphia player Pete Rose warms

up on the sidelines. The crew's efforts are coordinated by producer Mike Weisman in the control trailer outside the stadium. On the right, a similar roving crew picks up a game highlight on the bench at a Monday Night Football game.

ENG/EFP color camera roundup

By Bill Rhodes, editorial director, and John Williszowski, video editor

Cameras and support equipment have become increasingly numerous and competitive as Electronic News Gathering/Electronic Field Production (ENG/EFP) has flourished. The increased demand for high quality, on-site video for use in the accelerated pace of electronic journalism has made the production of lightweight, high quality cameras attractive to manufacturers. The result is a new dimension in color camera capabilities, portability and pricing. In addition, improved technology in the area of videotape editing makes the idea of shooting on location more appealing and more economical than ever before.

To keep readers informed about the latest in ENG/EFP camera developments, **Broadcast Engineer-**

ing has assembled the following camera roundup report of professional camera features and specifications. (Other cameras, designed for consumer/industrial applications, may, under specific circumstances, be acceptable for professional use. However, these cameras are not included in this report.)

Information includes manufacturer, model number, features, specifications and price. Additional data may be obtained by using the reader service card.

Specifications

Note that no industry specification standards exist and that manufacturers present data in different forms. Keep this in mind when comparing camera performance,

and also note that **Broadcast Engineering** assumes no responsibility for changes in specifications or prices.

Weight is given in kilograms and pounds. Unless noted, weights given include all items normally necessary to use the camera in an ENG/EFP situation.

Tube type is listed as follows: V = Vidicon; P = Plumbicon; ACT = Anti-Comet Tail Plumbicon; C = Chainicon; S = Saticon; T = Trinicon; N = Newvicon; L = Liddicon; and DGP = Diode Gun Plumbicon. When more than one tube can be used in a specific camera, they are listed in the order recommended in the manufacturer's specifications.

No attempt has been made to

Company & Model Number	Weight (kg & lbs)	No. of tubes	Tube type & size	S/N ratio dB	Enhancement	Max. gain boost	Horizontal resolution	Registration error Zone 1, Zone 2, Zone 3 (%)	Sensitivity	Geometric Distortion	Price \$
Ampex BCC-20 (analog and digital)	6.8-8.2 kg 15-18 lbs	3	2/3" P,DGP,S	53	H,V 2 line H & V from green	12	50% at 400 TVL	Analog: 0.1, 0.2, 0.4 Digital: 0.05, 0.05 0.05	2000	0.1%	54.4 K
Asaca ACC-2000	10 kg 22 lbs	3	2/3" P,S	50	H, V	9	40% at 400 TVL	0.1, NA, NA	2000	1.5%	.....

Company & Model Number	Weight (kg & lbs)	No. of tubes	Tube type & size	S/N ratio dB	Enhancement	Max. gain boost	Horizontal Resolution	Registration error Zone 1, Zone 2, Zone 3 (%)	Sensitivity	Geometric distortion	Price \$
CEI 310	head: 3.6 kg, 8 lbs, electronics 8.9 kg, 19.5 lbs	3	2/3" S,P,DGP	52	H,V	12	600 TVL	0.1, 0.2, 0.3	105	±1%	45 K
330	head: 3.6 kg, 8 lbs, electronics 8.9 kg, 19.5 lbs	3	2/3" S,P,DGP	52	H,V	12	600 TVL	0.1, 0.2, 0.3	105	±1%	.....
340	head: 3.6 kg, 8 lbs, electronics 8.9 kg, 19.5 lbs	3	2/3" S,P,DGP	52	H,V	12	600 TVL	0.1, 0.2, 0.3	105	±1%	.....
Cinema Products											
MNC-81A	4.9 kg 10.8 lbs	3	2/3" S,P,DGP	54 ±2	H (2 elements) V (2 lines)	18	500 (center)	0.1, 0.2, 0.4	2000 at 60% ref.	2.0%	45.5 K
Fernseh KCA-100	5.5 kg 12.1 lbs	3	2/3" P,DGP	52	H,V	9	DGP ≥ 50% at 500 TVL	0.7, 0.15, —	2000 2500	2.0% 1.0%	35.6 K w/c lens & tubes
Hitachi Denshi FP-40SS	6 kg, 13.2 lbs	3	2/3" P,S	52	2 H	12	550 (center)	0.1, 0.3 0.6	2000	1.5%	23.5 K
SK-91	4.4 kg, 9.7 lbs	3	2/3" P,S,DGP	54-57	H,V 2 line w/noise coring, crispng, comb filtering	18 (center)	500	0.1, 0.2, 0.4	2000	1.2%	37 K
Ikegami Electronics											
HL-79A	6 kg, 13.2 lbs w/o lens	3	2/3" P,S	54	H,V (2 lines)	18	500 (center)	0.1, 0.2, 0.5	1778 at 89.9% ref.	2.0%	45 K
HL-78A	6 kg, 13.2 lbs w/o lens	3	2/3" P,S	54	H,V	18	500 (center)	0.1, 0.2, 0.6	1778 at 89.9% ref.	< 2.0%	< 26 K
International Video											
7000P	7.3 kg 16.1 lbs	3	P (25mm)	>51	H (2 lines) V (1 line)	12	675 (center)	0.06, 0.12, 0.25	2000	< 1.5%	54.5 K
7005P	7.3 kg 16.1 lbs	3	P (25mm)	>51	H (2 lines) V (1 line)	12	675 (center)	0.06, 0.12, 0.25	2000	< 1.5%	60 K
Marconi Electronics											
B3270	7.4 kg 16.3 lbs	3	1"L	52	H,V	12	100% at 400 TVL (cor- rected)	0.07, 0.14, 0.21	2200	< 1.0%	72-76 K

Company & Model Number	Weight (kg & lbs)	No. of tubes	Tube type & size	S/N ratio dB	Enhancement	Max. gain boost	Horizontal resolution	Registration error Zone 1, Zone 2, Zone 3 (%)	Sensitivity	Geometric Distortion	Price \$
Panasonic											
AK-710	5.3 kg 11.7 lbs	3	2/3" S (H-8399)	52	H,V	12	500 (center)	0.1, 0.4, 0.6	2000 at f/3.5	< 2.0%	10.9 K (w/o lens)
AK-750B	7.2 kg 15.8 lbs	3	2/3" P	49	H (1 line) V (2 lines)	6	500 (center)	0.1, 0.3, 0.6	2000	< 1.0%	16 K (w/o lens)
AK-760	6.1 kg 13.4 lbs	3	2/3", DGP	54	H (1 line) V (2 lines)	18	600 (center)	0.1, 0.2, 0.5	2000	4.0%	32 K (w/o lens)
WV-3900	5.5 kg 12.1 lbs	1	1"N	50	H,V (1 line)	9	270 (center)	NA	1400 at f/5.6 70 at f/2.2 + 9 dB gain	NA	4.8 K
Phillips											
LDK-14	5.9 kg 13 lbs	3	2/3"P	50	H,V	12	600 (center)	0.07, 0.14, 0.29	2380	< 1.5%	43.9 K
Video 80	7.8 kg 17.2 lbs	3	2/3"P	52	H,V	12	600 (center)	0.11, 0.14	1205	1.0%	25.3 K
RCA											
TK-76C	6.7 kg 14.7 lbs	3	2/3"P,S	.....	H (1 ele- ment) V (2 lines)	18	600 (center)	0.1, 0.2, 0.5	2500	2.0%	41.5 K
Sharp Electronics											
XC-530	4.3 kg 9.5 lbs	3	2/3"S	47	H	NA	> 500 (center)	0.3, 0.6, 0.8	2500	2.0%	6 K
XC-700	7.0 kg 15.4 lbs	3	2/3"S	52	H,V	12	500 (center)	< 0.1, < 0.4, < 0.8	2150	< 2.0%	11.9 K
Sony											
BVP-330	5.3 kg 11.7 lbs	3	2/3"DGP	57	2 lines w/coring, comb filters, adj. threshold, level varies w/gain	0,9,18	600 50% at 4 MHz	0.1, 0.2, 0.5	2000 at 69% ref.	2%	39.9 K
BVP-300A	5.6 kg 12.3 lbs	3	2/3" P or S	57	2 lines w/coring, comb filters, adj. threshold, level varies w/gain	0,9,18	500 34% at 400	0.1, 0.2, 0.5	2000 (P) 2400 (S) at 69% ref.	1.5%	34.5 K
Thomson CSF											
MC-701	5.1 kg 11.2 lbs	3	2/3"DGP	57	H (2 ele- ments) V (2 lines)	18	600 (center)	0.1, 0.2, 0.5	2000 at f/4.5	1.5%	42.3 K

Roundup

distinguish between classifications within a particular tube type. Specifications on some of the cameras listed recommend broadcast-quality tubes while others recommend industrial tubes. Information concerning the classification of the type of tube recommended should be ob-

tained from the manufacturer.

Sensitivity is given in lux, rated at f/4, 60% reflectance except as noted. One footcandle (fc) = 10.76391 lux (formula courtesy of Eastman Kodak).

Sensitivity is a measurement of the amount of light required for a camera (including lens, prism or dichroic mirror, tubes, pre-amplifiers and electronics) to produce a

video picture containing white information (1 volt peak-to-peak) when reproducing a neutral-colored chip of specified coefficient of reflection. Therefore, the lower the lux value, the more sensitive the camera in question.

Caution should be taken when evaluating sensitivity. There are currently two charts used to measure sensitivity. One uses a 60%

Company & Model Number	Weight (kg & lbs)	No. of tubes	Tube type & size	S/N ratio dB	Enhancement	Max. gain boost	Horizontal resolution	Registration error Zone 1, Zone 2, Zone 3 (%)	Sensitivity	Geometric distortion	Price \$
Toshiba PK-39	8.8 kg 19.3 lbs	3	2/3"P, DGP, S	51	H, V 2 lines w/comb filter & coring	12	550	0.1, 0.2, 0.5	2000 at 3200°K & f/5.6	2%	26.9 K
PK-60	4.3 kg 9.4 lbs	3	2/3"P, DGP, S	54	H, V 2 lines w/comb filter & coring	18	600	0.1, 0.2, 0.5	2000 at 3200°K	2%	34.5 K
US JVC KY-2000U	4.5 kg 9.9 lbs	3	2/3"S	52	H (2) V (1)	12	500 TVL	0.1, 0.4, 0.8	2500 at f/4	NA	9.3 K

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Roundup

reflectance surface as a standard for evaluating sensitivity while the other employs a neutral-colored chip of 89.9%. Sensitivity measured on an 89.9% reflectance chart will appear lower (having greater sensitivity) because of the increased reflectance of the test chart used. This must be taken into account when comparing sensitivity figures.

Signal-to-Noise (S/N) is the ratio of the peak value of the video signal to the value of the noise present, which is usually measured in deci-

bels (dB). The higher the number, the less noisy the picture.

Gain boost is an increase in voltage or power usually expressed in dBs. Gain boost for an ENG/EFP camera enables the camera to produce a usable picture in lower light levels than is normally possible.

Resolution is given as percentage of 100% modulation at 400 TV lines (uncorrected) or in the number of lines discernible using a resolution test wedge located in Zone 1.

Depth of modulation and resolution are limited in most cases only by the pickup tube. Most video

amplifiers are capable of a flat response (100% depth of modulation) at more than 10MHz, or if translated into TV lines, could process the signal necessary to produce a resolution of 1000 TV lines. However, because the pickup tube is incapable of such a response, some amplifiers are limited to approximately 8MHz or 640 TV lines to improve signal-to-noise.

Registration is listed in this roundup as the percentage the registration differs from the ideal. Several manufacturers prefer listing registration in nanoseconds, indicating the difference measured in time that registration of the blue or red channels differ from the green channel. To calculate percentage of registration error when a nanosecond figure is given, use the formula:

$$\frac{\text{Registration error given in nanoseconds (ns)}}{560} = \text{Percentage registration error}$$

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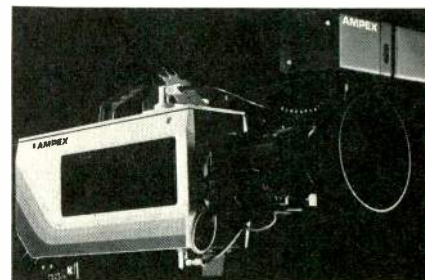
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Ampex—BCC-20 [Analog and Digital]

The Ampex BCC-20 is the first studio quality, self-contained portable color camera with automatic setup capability. The spatial error correction system allows the camera to achieve .05% registration in all three registration zones. The micro-processor and memory functions mounted in the camera head make



the spatial error correction system possible. These functions also allow one master setup panel to control up to eight BCC-20s. It is available with a digital automated setup control accessory to allow completely automatic setup of up to eight cameras.

Circle (100) on Reply Card

Asaca—ACC-2000

Features include quick start with pre-heat system, self-contained microphone amplifier, VTR start/stop switch on the grip, low battery



voltage indicator, tally lamps, self-contained color bar generator, test signal generator and bias light.

Circle (101) on Reply Card

CEI—310

Features include 3-inch viewfinder and universal power supply for portable use, 5-inch viewfinder for



studio use, dynamic beam optimization, auto pedestal, iris window shade, carrying case, remote control battery belt, and registration and picture control to provide professional picture quality under most lighting conditions.

Circle (102) on Reply Card

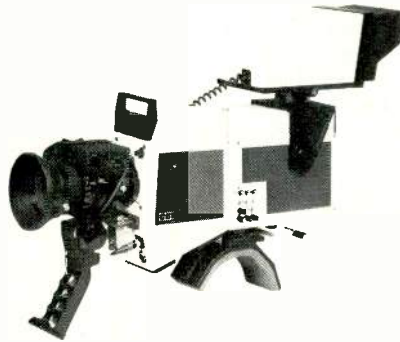
CEI—330

This camera features the same specifications as the 310 but the electronics of the 310 are consolidated into a digital transmission system, permitting the camera to be operated 2400 feet from its electronic unit. The system can be operated up to 2000 feet from the electronics unit by using CEI's remote control package.

Circle (103) on Reply Card

CEI—340

Any existing CEI 310 camera head may be attached to the 340 unit to make a CEI 340 camera. The camera features a microprocessor for automated black and white balance and self-diagnostic operation. The primary design goal be-



hind the development of the CEI 340 was to deliver a self-contained camera.

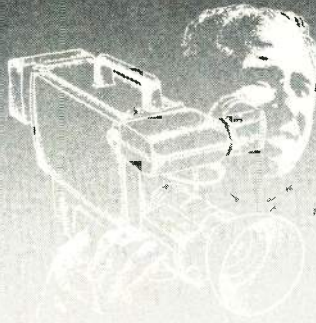
Circle (104) on Reply Card

Cinema Products—MNC-81A

Features new generation of ENG/EFP design for high-fidelity color reproduction, ease of handling, and reliability; choice of three types of pickup tubes (Saticon, Plumbicon, or Diode Gun Plumbicon); built-in four-position optical filter wheel; four-position gain switch with noise reduc-

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the video recorder and the movie camera generator having EBU/IRT standard. The system also includes a playback decoder for checking generators and a frequency/phase comparator for occasional quartz drift calibration.

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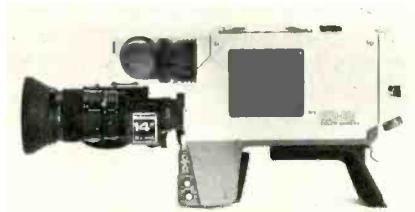
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Circle (68) on Reply Card

Roundup

er (+6, +12, and +18 dB gain); built-in bias light and masking; flare compensation; automatics: white and



black balance, iris, beam control and optional centering control. Full range of accessories includes co-ax digital remote control from 5000 feet or fiber optics control from 10,000 feet.

For information: Cinema Products, 2037 Granville Ave., Los Angeles, CA 90025.

Fernseh—KCA-100

Features include automatic beam control, bias light, four-position filter wheel plus normal/low con-



trast switch. Auto-focus and fiber optic cable available as options.

Circle (105) on Reply Card

Hitachi Denshi—FP-40SS

Hand-held ENG/EFP camera features prism optics, 52 dB S/N, 2 line



image enhancer, auto white balance, 19W power consumption, genlock, RGB outputs, and color bar generator. Available with Saticons or Plumbicons.

Circle (106) on Reply Card

Hitachi Denshi—SK-91

Ultra lightweight ENG/EFP camera available with Saticon, Plumbicon or Diode Gun Tubes. Features include f/1.4 prism optics, 57 dB S/N, 22W power consumption, automatic digital white and black bal-



ance with memory, +9 +18 dB gain switch, 2 fc sensitivity, true ABO

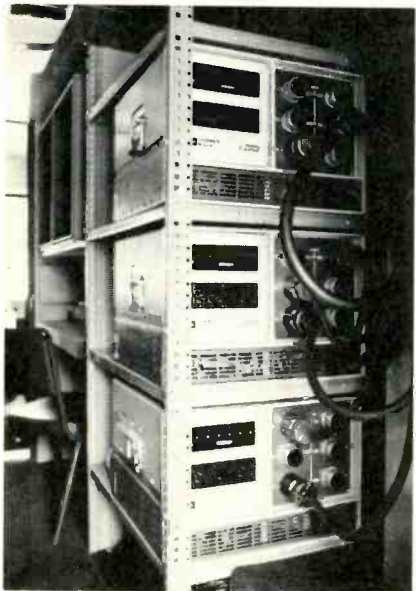
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Circle (107) on Reply Card

Ikegami Electronics—HL-79A

Features 23W power consumption, level suppression (knee control), RS 170A sync, f/1.4 prism



optics, DBS circuitry, shading correction, auto white balance, auto iris closure, split field color bars and RGB output. The HL-79A has triax and multicore capability.

All-in-the-head design can eliminate a separate battery pack and power cable, extending operator's speed and mobility.

Circle (108) on Reply Card

Ikegami Electronics—HL-78A

Features include f/1.4 prism optics, 23W power consumption, RS 170A sync, DBS circuitry, level



suppression (knee control), auto white balance, auto iris closure, adjustable shoulder pad and shading correction.

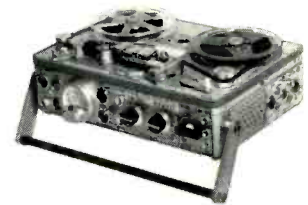
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Ikegami Electronics—HL-79D

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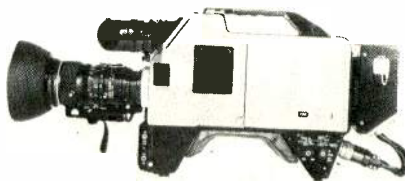
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Circle (71) on Reply Card

Roundup

HL-79D has the following improvements: standard or low-capacitance diode gun pickup tubes, high S/N FET preamps, improved rf shielding, and dynamic beam focus for better corner resolution.

The HL-79D is shown here with snap-lock cable adapter in place of



snap-lock battery. Cable adapter permits use of remote base station with fully automatic and monitoring functions at distances up to 1000 feet.

Circle (110) on Reply Card

International Video [IVC]—7000P

Features variable black stretch, 3-inch viewfinder, gen-lock and optional digital auto black and white balance. Other features include flesh detector, studio CCU, base



station, studio lens adapter and 5-inch viewfinder.

Circle (111) on Reply Card

International Video [IVC]—7005P

Features are the same as the 7000P, plus automatic beam control, lighter cable and connectors and detail gain on control panel.

Circle (112) on Reply Card

Marconi Electronics—B3270

Features automatic registration,

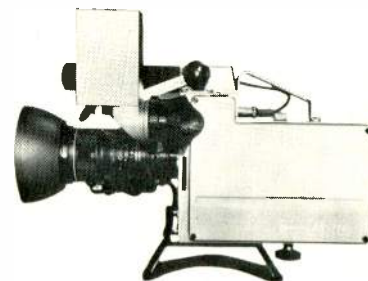


auto black and white balance, auto iris and dynamic centering. Mounting is available for the B3270 for studio lenses.

Circle (113) on Reply Card

Panasonic—AK-710

Features three Saticon tubes w/ bias light, high-index prism optical system, high gain + 6dB and +12dB, RS-170A sync and built-in gen-lock, adjustable horizontal and vertical blanking interval, feedback beam control (FBC), four-position



color conversion filter wheel (3200° K, 4700° K), (6000° K at 25% ND); and closed, detachable and position adjustable 1.5" viewfinder; Y I/Q encoder; built-in color bar generator; automatic white balance.

Circle (114) on Reply Card

Panasonic—AK-750B

Features self-contained portable ENG/EFP operation system use with

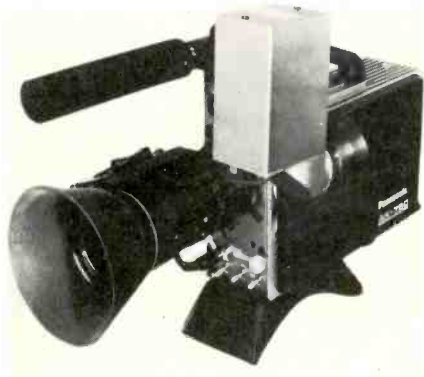


Panasonic ¾-inch VCR NV-9400; operates from three different power sources; Dichroic mirror optical system with parallel arrangement of three ⅔" Plumbicons; Internal RS-170A sync with gen-lock; electronic color temperature conversion with three settings, color temperature conversion filter for 6000° K and color temperature/neutral density filter for 6000° K and 25% light reduction; M type lens mount with standard C mount adaptor.

Circle (115) on Reply Card

Panasonic—AK-760

Features diode-gun Plumbicons with bias lights, high-index prism optics system, auto white balance, feedback beam control (FBC), RS-170A internal sync, built-in gen-lock, high gain + 9 and + 18 dB, adjustable horizontal & vertical blanking intervals, Y I/Q encoder, directional microphone with wind-screen and XLR connector; test



signals: EIA color bar generator/focus wobbling/sawtooth test generator.

Circle (116) on Reply Card

Panasonic—WV-3900

Features self-contained portable operation or studio system operation with optional remote control unit, a single 1-inch Newvicon tube, Internal RS-170A sync with gen-lock operation for EFP use, plus horizontal & subcarrier phase adjustment, auto/manual iris 10:1 power zoom lens 16-160mm F2.2; 4 position



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Ruslang's new RL 2000 VTR Console offers more rack space while taking up less floor space. Constructed of quality materials, this compact unit is attractive and sturdy with the look of expensive walnut furniture. Other wood grain finishes and solid colors to complement your studio decor are available. Add a standard 10½" monitor overbridge that can be expanded to give even more rack space, plus an optional, easy to take off back panel, and you now have the most versatile and best looking console on the market at a fraction of the cost of steel. For complete details, contact . . .

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Circle (72) on Reply Card

January 1981 *Broadcast Engineering* 87

Roundup

color temperature conversion filter wheel, built-in color bar generator; operates from four different power sources.

Circle (117) on Reply Card

Philips—LDK-14

Features automatic iris, auto black and white balance, automatic centering and momentary (spot meter) iris. It also features selectable contrast compression and remote



control facilities, including triax operation.

Circle (118) on Reply Card

Philips—Video 80

Features modular design, permitting conversion to studio, ENG/EFP, telecine or special application.

Circle (119) on Reply Card

RCA—TK-76C

Features switchable contrast compression, + 9, + 18 gain boost.



shock-mounted optics, raintight case, automatic comet tail suppression plus a wide range of available remote control systems.

Circle (120) on Reply Card

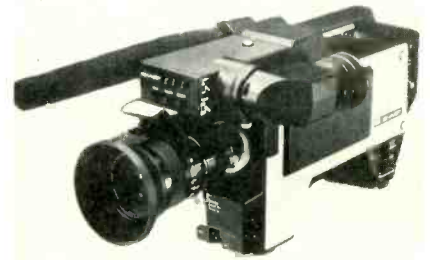
Sharp Electronics—XC-530

Features bonded blocking of three pick-up tubes, plug-in modular circuit boards and dichroic mirror.

Circle (121) on Reply Card

Sharp Electronics—XC-700

Features prism beam splitter, die-case chassis, auto white balance



with memory, dynamic beam optimization and gen-lock capability.

Circle (122) on Reply Card

A revolution in portable power—this new Schneider sealed lead-acid battery drives

TWO ON ONE



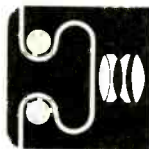
Schneider SLA 14100 (14w/10ah) belt with RCA TK-76 and 100 w sun-gun. Running time: 45 min., camera and light; 2½ to 3 hours, camera only. Model SLA 12100 (12w/10ah) available for 12 volt systems.

No other system can offer this unique ability: a video camera and sun-gun run by one portable battery unit. Think of the advantages. Eliminate the need for two battery units, reducing the news cameraman's weight load, increasing maneuverability in news conference and other low light situations.

Plus all the other advantages of the sealed lead-acid battery—no "memory effect," excellent voltage regulation even in extreme temperatures, low self-discharge, increased reliability with fewer cells for power supply. And all the practical Schneider extras—built-in meter, a charger that won't overcharge, crack resistant naughahyde belts with convenient velcro closure and more.

Send us the make and model number(s) of your equipment for a free two week trial of this revolutionary new portable power source.

Schneider sealed lead-acid batteries—"The Problem Solvers." Battery packs and belts for all film and video cameras and 30 volt lights.



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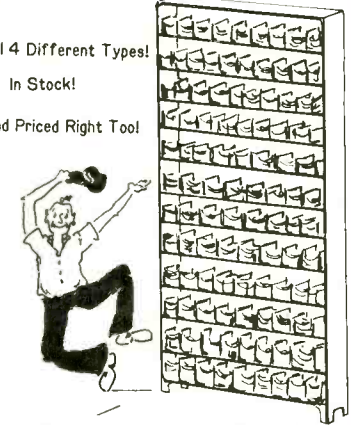
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Circle (74) on Reply Card

Sony—BVP-330

Features include high signal-to-noise ratio (57dB), full RS-170A sync including color frame pulse, automatic centering, black and white balance with operator controlled presets, automatic beam adjust, iris and black level, 23W power consumption, and f/1.4 prism optics. Diode gun Plumbicons and matched enhancer give high resolution. Viewfinder has adjustable front or rear mounting. Magnesium case, microphone input, full systems



compatibility with Sony VTRs. Options include 5-inch VF, CCU, wide range of lenses. (Triax available mid-'81.)

Circle (123) on Reply Card

Sony—BVP-300A

Features include high signal-to-noise ratio (57dB), full RS-170A sync including color frame pulse, automatic black balance, white balance, beam adjust, iris and black level. Choice of Plumbicon (P) or Saticon



(S) tubes. Viewfinder has adjustable front or rear mounting. Full systems compatibility with Sony VTRs. Microphone input. Options include 5-inch viewfinder, CCU, wide range of lenses. (Triax available mid-'81.)

Circle (124) on Reply Card

Thomson-CSF—MC-701

New system combines studio broadcast quality and lightweight portability for a superior picture from the field or in the studio and features a one-piece, three diode-gun tube design for an operational simplicity that is significantly en-

Table Top SMPTE Editing!

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Circle (76) on Reply Card

Roundup



hanced by automatic color balance and new automatic registration centering.

Circle (125) on Reply Card

Toshiba—PK-39

Features modular construction permitting configuration as a one-piece, self-contained ENG camera or a two-piece EFP camera with optional base station. Other features include auto white balance, auto beam control and automatic iris control circuits. It's rugged, light,



moisture-sealed, and self-contained. Everything is built-in: signal processing, color encoder, sync generator, color-bar generator, VITS bar signal, contour enhancement, monitoring and test generators to check the camera's electronics.

Circle (126) on Reply Card

Toshiba—PK-60

An ultra-light, compact, self-contained portable broadcast ENG/EFP color camera that employs innovative digital and analog technology. Camera head frame is made of cast magnesium alloy with aluminum side covers. With the on-board battery in place, the head is counter-balanced.

Automatic beam control greatly reduces the comet-tail effect of high intensity objects by providing beam control to stabilize highlights three



to four f stops in excess of normal peak white levels.

It provides an EIA standard RS-170A Sync Generator with adjustable horizontal and vertical pulse widths to maintain FCC performance requirements.

The digital memory adapter, auto set-up unit, digital base station,

mountable microphone holder with built-in amplifier, multi-cable adapter with analog remote control and the triax/wireless transmission system make the system a flexible camera chain.

Circle (127) on Reply Card

US JVC—KY-2000U

Features auto white balance with eight-bit digital memory, color bar generator, ABC auto beam compensation, +6 and +12dB gain switch, 10:1 auto iris servo zoom lens, four filter turret and gen-lock connector, 2-hour NiCad battery, carrying



case, shoulder pad, 13-foot camera-to-VCR cable, 1.5-inch viewfinder. Options include: 5-inch viewfinder, rear lens controls and remote sync unit with cable lengths up to 980 feet.

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'Grapher' a highlight at conference of Broadcast Financial Management Association

By Peter M. Deuel, Chicago, IL

- September 14-17
- Town and Country Hotel, San Diego, CA
- 871 in attendance

Charting the course of broadcasting's future could become automatic in the future.

The prospect of leafing through page after page of computer print-outs has turned off more than one broadcast executive, but a Menlo Park, CA, company has begun marketing a computer-generated graph-and-chart system that may

change all that.

The company, Marketron, has a "grapher" that converts information stored in the data bank of the company's broadcast clients into multi-colored graphs and charts, making it possible to review at a glance the bottom line of the company's business. There are dozens of possible charts available.

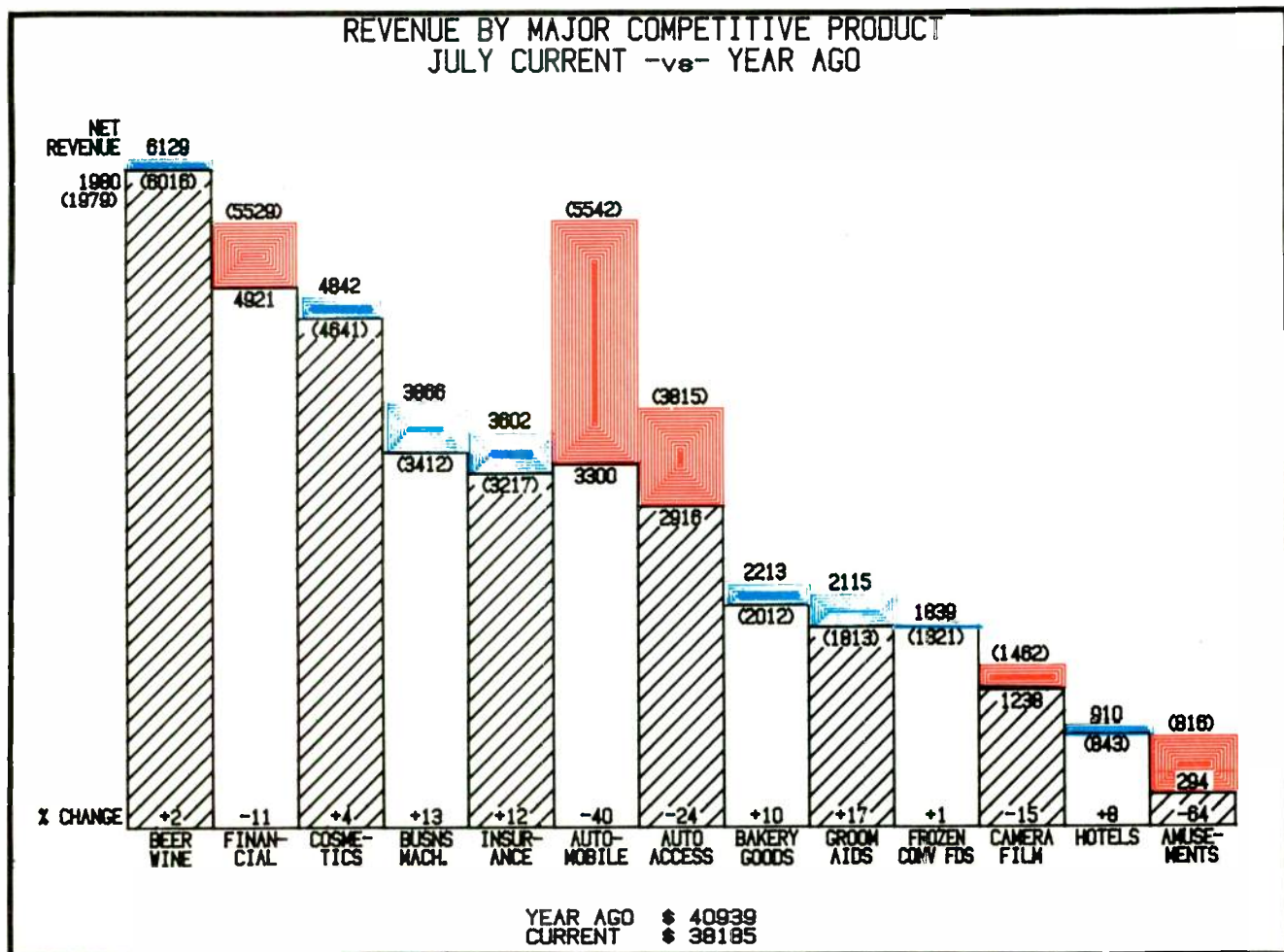
The concept was first developed by architectural firms. Using basic data from a computer, the grapher converts it into code that is read by the processing unit attached to the drawing arm. In this case, Marke-

tron already supplies business and other station departments with ADP services and uses the same data for its graphing product.

Four styluses containing color inks are set into a tray from which the arm retrieves them when the right color code appears in its data stream.

The graphic device was one of the big hits at the recent 20th Annual Conference of the Broadcast Financial Management Association in San Diego's Town and Country Hotel.

Nine companies specializing in data processing systems and ser-



Grapher

VICES to the broadcast industry were among those showing their wares at BFM's gathering, attended by financial executives from radio, television and cable. Total attendance was 871.

Most of the companies, including Marketron, were highlighting products that reflect the expanding role of automation in the day-to-day operation of broadcasting. All were showing enhanced ADP packages that either expand services to additional station departments or begin to draw together what have in the past been separate systems—traffic, sales, financial.

Data Communications Corporation of Memphis was exhibiting what it calls its *Buy Line*, a system that links a station's availabilities submission system with its rep system. Through its Cylix Division, DCC is

also embarking on a satellite transmission system to replace a land-line system for serving its clients.

Computer Concepts Corporation of Shawnee Mission, KS, unveiled its new package that will allow a station to connect a cathode ray tube into its own mainframe to allow remote diagnostics. Among other capabilities, the system would permit a station's engineering staff to conduct field strength testing on antennas from the CRT, according to Greg Dean, president of computer concepts.

Because broadcast automation has often been developed separately among various station departments—accounting and sales have one system, traffic another, and so on—many companies were highlighting their new software interfaces that would bring these systems into sync with one another, saving major data gathering and interpreting chores.

A remote diagnostics package was also being displayed by Station Business Systems of Greenwich, CT. SBS has new software for its BAT computer system that will allow remote service checks of a customer's system. SBS also was featuring its new fixed asset accounting system.

Representatives of Jefferson Data Systems of Charlotte, NC, were discussing packages to perform on-line text editing, inventory feature films and set up a station-rep interface.

Broadcast Management Concepts of San Diego, CA, went all out in providing tools for cash flow control, and its traffic system includes billing for co-op ads.

Sperry-Univac, Miami, FL, was exhibiting a full-service computer system and emphasizing lower prices as a sales tool.

The inevitability of interfacing station system was echoed by both Computer Concepts and by Kaman Sciences (BCS), Colorado Springs, CO.

"Station automation began, in most instances, with a traffic billing function and then moved into further business automation," said Tom Roper of Kaman Sciences. "I can see the situation developing under which everybody in the station can become directly involved in automation."

Kaman is marketing packages that offer that approach by displaying a demographics package through which the sales department can generate in-house availabilities submissions.

Computer Management Systems of Indianapolis also was showing a complete station system that combined sales and financial packages, including providing instant updating of radio logs and up-to-the-minute revenue summaries.

But the name of the game of broadcast computer companies is still raising the bottom line.

"All of us tend to get hung up on how our system works versus somebody else's system," said Dean. "The basic question still is whether we help the bottom line. It all boils down to this: do we generate information that helps a station control its destiny?"

"The only way that can be done is to tie systems together and use information more efficiently to cut station operating costs."

And what's the bottom line cost of Marketron's graphing system? Somewhere in the vicinity of \$20,000 plus regular computer charges. But on a "per-chart" basis, \$22 each. □



Marketron's conference booth.



The "grapher" converts data into a chart.

Ampex, Signal boards approve definitive agreement for merger

The boards of directors of the Ampex Corporation and The Signal Companies Inc. have approved, and the companies have signed, a formal definitive agreement providing for the acquisition of Ampex by Signal through an exchange of common stock.

The merger is subject to approval by the shareholders of each company, a favorable tax ruling and approval by various regulatory agencies. The merger should be consummated this month, following the special shareholders meetings of each company.

Hitachi camera stolen

During the November SMPTE Convention held in New York, the following Hitachi SK-91 color video-camera (#V5693) with a 14x9.5 Fujinon lens (#203242) and accessories were stolen. If you are offered these products or have information on them, call Jack Russell at Hitachi, (516) 921-7200.

Harris acquires Automation Electronics

The Broadcast Products Division of the Harris Corporation has filled out its line of automation systems for radio stations by acquiring Automation Electronics Inc. of Lafayette, IN, for an undisclosed amount.

Automation Electronics produces software for computer-based systems serving the business side of radio stations, such as sales, accounts receivable and payroll. Harris' Broadcast Products Division produces equipment to automate programming at the stations—musical selections, commercials, network news breaks, etc.

Gene T. Whicker, vice president and general manager of the division, said, "This move will allow Harris to market a single integrated system to handle all the automation requirements of radio stations, enabling them to reduce costs, speed operations and improve management control of both programming and business activities."

The entire Automation Electronics operation will relocate to Quincy, IL, and will operate as part of the Broadcast Products Division. Larry E. Zaiser, former AE president, will

become director of automation sales and will continue to manage the operation. He will report to Eugene O. Edwards, vice president of marketing.

Datatron, Sony win patent lawsuit

Datatron has announced the successful conclusion of a patent suit brought by the Convergence Corporation in which Datatron and Sony were co-defendants. The subject of the suit was infringement of a patent on the "joystick" search method used in videotape editing. The court declared the patent invalid and that no infringement existed in fact.

Matsushita to open components manufacturing plant

Plans for opening an electronic components factory in greater Knoxville, TN, have been announced by the Matsushita Electric Corporation of America. The Knoxville facility will manufacture speakers and electrolytic capacitors beginning in early 1982.

The company will eventually employ more than 200 local residents.

Continued...

The machine of the 80's

THE GARNER 1100

It's no secret that one-inch will be the videotape of the 80's. If you're planning to convert to one-inch, invest in the Garner 1100 degausser to get the maximum use of your one inch tape. With Garner's one-pass, endless belt operation, you get complete erasures at the rate of 13 reels per minute.

Put the Garner 1100 to the test yourself. Use the 1100 for 30 days. If it doesn't live up to your standards, just return it to us.

We're convinced that you'll agree that the Garner 1100 is the machine to handle one-inch degaussing. It's the machine of the 80's.

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Business

Continued

Data Check takes over 3M test instrument line

3M's Mincom Division has sold its test instrument business to the Data Check Corporation of San Diego. The sale, completed in late August, assigns Data Check full responsibility for manufacturing, sales and service support for a nine-product line.

The sale includes the following

former 3M models: 610A sweep generator, 6100B test set, 6110 signal analyzer, 6275A FM test set, 6500 recorder test set; 8155A, 8160 and 8100A-W audio flutter meters and the 8300A-W IRIG flutter meter.

Camera sales exceed 2600

Worldwide sales of the Ikegami HL-79A portable color TV camera to the broadcast and high-end production house market exceeded 2600 units in the two year period ending July 31, 1980, according to Ikegami.

Donrey Media Group to purchase KOCM

Donald W. Reynolds, president and chief executive officer of the Donrey Media Group, Fort Smith, AR, has signed an agreement to purchase the assets of KOCM, Newport Beach, CA, from Hutton Broadcasting Inc. The sale is subject to FCC approval.

AVA used by CBS during election coverage

The CBS Television Network inaugurated a major advance in the art of television graphics during its coverage of the presidential election results November 4 when it used the Ampex Video Art (AVA) system to create pictures, maps, charts and other graphics depicting the night's activities. Maps and charts created on the computer-based system were continually updated throughout the night for immediate on-air use.

Ampex signs OEM agreement with Compact Video

Ampex has signed an original equipment manufacturer agreement to supply Compact Video Sales, Inc. with audio and video equipment and accessories for integration into Compact's mobile and studio production systems.

Compact Video Sales plans to incorporate Ampex hardware into their production systems.

The OEM agreement allows Compact to purchase Ampex audio and video hardware, including the VPR-2B helical scan videotape recorder with TBC-2B time base corrector, VPR-20 portable VTR, AVR-2 and AVR-3 recorders/reproducers, BCC-10 studio color camera, BCC-20 portable field production camera, Ampex Video Art (AVA) system, ESS-2 electronic still store system, 4000 Series production switchers, STC-100 multi-point search to cue accessory, SMC-100 slow motion controller, ATR-124/116 multitrack analog recorder and MM-1200 multi-channel recorder.

KTXA opened in December

A new television station, KTXA, began broadcasting in the Dallas/Fort Worth area in December, bringing to Metroplex viewers a broad spectrum of entertainment programming with an emphasis on drama.

Operating with a 5 million watt signal and covering a 70-mile radius, the commercial UHF station will be the state's most powerful, according to station executive Milton Grant and Earl Jones. □

Perfect Audio for ENG!

Logitek's CAS-5 Custom Audio Series console is a complete studio-quality console, yet it's only 19½" wide to fit any ENG set-up! Fully modular with solid-state hall-effect switching and rugged conductive-plastic slide faders, the CAS-5 lets you "go remote" without sacrificing in-studio performance. And Logitek's unbeatable factory back-up makes sure you never get left "out in the cold!"



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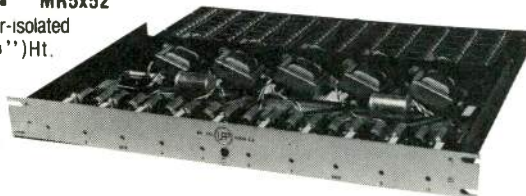
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MR5x5: 5 amplifiers, 5 outputs each.
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Circle (81) on Reply Card

people

Guffy P. Wilkinson, 59, president of Wilkinson Electronics, Inc. Trainer, PA, died October 11, 1980, of a heart attack. He had been active in the radio broadcasting equipment industry since 1946 and for many years was international marketing manager with a major US equipment manufacturer. In 1964, he founded Wilkinson Electronic Inc. which manufactures radio broadcasting equipment for both domestic and international markets.

His son, Lloyd, has succeeded his father in the company.

Fred J. Steurer has been named chief engineer of KSDK, Channel 5, St. Louis, and **Robert L. Wilson** and **James G. Withers** have been named managers of engineering for the station. The three appointed have been engineering supervisors at Channel 5 for the past several years.

Dick Wheeler has been promoted to the position of regional manager of Sony Video Products Company in the Southeast. Wheeler moves into the position previously held by **Phil Hart** who was recently named Eastern zone manager.

Gene R. Sarra has been appointed chief engineer of Microtime Inc. Sarra is a graduate of the University of Hartford School of Engineering and joined Microtime in 1976.

Ron Schiller, engineering supervisor with RKO radio network and WHN-NY has been named operations director for AM-FM.

Gordon L. French has been appointed director of sales at WPHL-TV, Philadelphia.

James M. Sopp has been named marketing manager of Belden Corporation's Electronic Division, and **Charles R. (Rick) Schneidewind** has been promoted to sales development and training manager.

Gary Armour recently joined Dynair Electronics, as sales engineer. Armour was previously with Midwest Telecommunications.

Tangent Systems has made the following changes and additions to its staff: **Gary F. Bailey** to general manager, **Thomas M. Scott** to sales manager, and **Craig N. Olsen** to national sales manager.

The Professional Video Division of US JVC Corp. has named **Michael Messerla** to a new position as national market development manager.

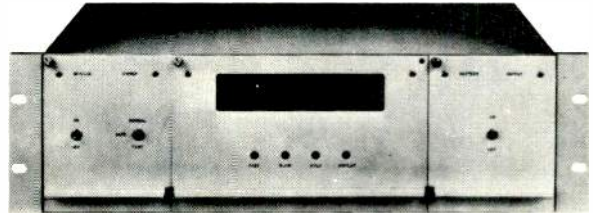
Richard Sirinsky has been appointed marketing manager of the Ampex Corporation's Audio-Video Systems Division. Sirinsky will develop and implement marketing activities for the division's professional audio and videotape recorders, broadcast cameras, switching systems and computerized editing and video storage systems.

The appointments of **Robert F. Zenisek** to vice president-operations and **John W. Crane-Baker** to vice president-treasurer for GTE Lenkurt were announced by company president Herbert K. Krengel.

Continued...

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MASTER CLOCK SYSTEMS



If seeing the same time on all your clocks is important, select **ES 192** - Line Frequency timebase, for only \$312.

If a guaranteed accuracy of three seconds per month is what you want, choose **ES 160**-\$1,005.

How about one second per month? **ES 160/1**-\$1,179.

Or National Bureau of Standards accuracy! **ES 190** is synchronized to Radio Station WWV to provide a Master with unquestioned accuracy. \$1,179 with receiver and antenna.

For a Time/Temperature Master, ask for **ES 196**-\$737.

ESE Master Clock Systems are simple to install. All Masters have a Serial Time Code output, able to drive twenty slave displays without buffering. Slaves range in size from .3" LED to 2" gas discharge displays, priced from \$152 to \$432.

IF YOU ALREADY HAVE A SYSTEM AND WANT TO EXPAND IT, get the **ES 167** Serial Time Code Generator (\$141), then add any number of our low cost slaves.

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Circle (84) on Reply Card

People

Continued

John McPherson has joined Sony Video Products Company as manager of special markets. McPherson had been with Panasonic as national market development manager.

The Audiotronics Corporation announced the appointment of **Wesley M. Mader** as president of the Video Display Division, Spring Lake Park, MN.

Dave Kelsey, president, The Filmways Audio Group, has announced the appointment of **Linda Feldman** to handle marketing for the group. Previously, Feldman was a communications journalist and marketing consultant.

Dynasciences Video Products has announced the appointment of **Richard Brown** as national sales manager. Brown was formerly sales representative for Gray Communications Consultants.

Ramko has announced the addition of **Dennis Brajkovich** to its sales staff.

Dirk B. Freeman has been appointed manager, Western region sales, for RCA Broadcast Systems. Freeman will supervise an organization selling RCA's complete line of radio and television studio and transmitting systems to broadcasters and teleproducers in Western states.

TDK Electronics has announced the appointment of **Douglas G. Booth** to the post of Western district industrial/professional sales manager. Before joining TDK, Booth was with Damark Industries.

Gerri and Don Bowdish have joined MARCOM, Woodland Hills, CA.

Larry H. Kline, vice president of marketing for professional products of The Antenna Specialists Co., has been elected a Fellow of The Radio Club of America. Elevation to the grade of fellow is by recommendation of the club's nominating committee and election by its board of directors.

Joe Shotoku has been appointed to the position of assistant general manager, Panasonic's corporate planning division.

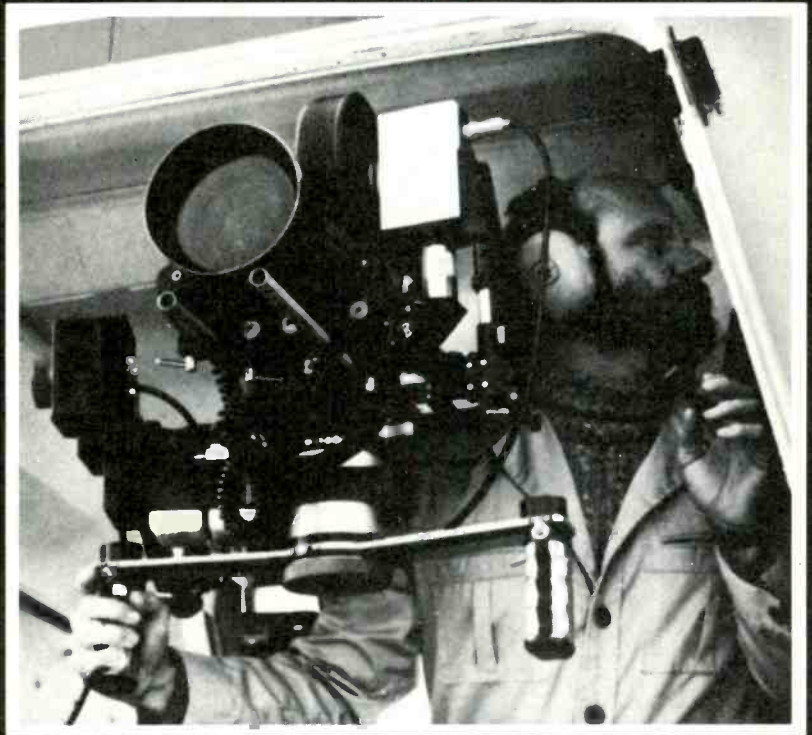
Moseley Associates has announced the appointment of **Fred A. Barbaria** as sales engineer of the marketing department.

John A. McGuire has been named executive vice president of TerraCom, a division of the Loral Corporation.

William J. Hall has been named manager of engineering for TPC Communications. Before joining TPC, Hall was engineering manager for Consolidated Film Industries in Los Angeles.

Logan Enright has been named West Coast regional sales manager for the Professional Video Division of US JVC. Enright comes to the post after three years as a district sales manager in the West Coast branch office. □

MINISTAB brings home the perfect shot... turbulence or not.



It's late in the day. A fast breaking news story calls for live coverage by helicopter. The sky is crystal clear. Photographic conditions excellent. But strong, gusty winds have grounded all the "eyes in the sky" . . . except yours.

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The cameraman, free to concentrate on his shot, zeros in on the tiny ground target. Racking the zoom lens out to telescopic

extreme, he holds the subject motionless in the center of the crosshairs. At the same time, your pilot does a slow, 360-degree turn around the area, finishing with a side pull-away to bring home the perfect shot. Get the picture?

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new products

Television production calculator
Electro & Optical Systems has introduced the television production calculator TPC MK1. It weighs seven ounces and enables editors and production personnel to time pro-

grams (stop watch function), add and subtract time codes, convert film time either 16mm or 35mm to television time and accumulate program running time in a master memory with instant recall.

Circle (200) on Reply Card



AC power line protector
 The MCG Class B1 medium-duty protectors install at the local branch panel (load side) or at the equipment to provide substantial tran-

sient overvoltage protection for one or more pieces of equipment. Operating in nanoseconds, the shunt-connected medium-duty protectors will clamp lightning and transient overvoltages on the ac power lines to safe levels whenever the clamping threshold is exceeded. After each transient, the protector recovers automatically and without power interruption.

Circle (201) on Reply Card



Recorder/reproducers
TEAC's Production Products Group has introduced two new recorder/reproducers in the Tascam Creative Series. The 22-4 is a compact 4-track 15 ips multichannel recorder with sync. The 22-2 is a compact 15 ips half-track recorder. It features function and output select, headphone monitor select, pitch control, optional dbx interface and optional remote pause controls. The 22-2 features expanded scale VU meters, independent monitor

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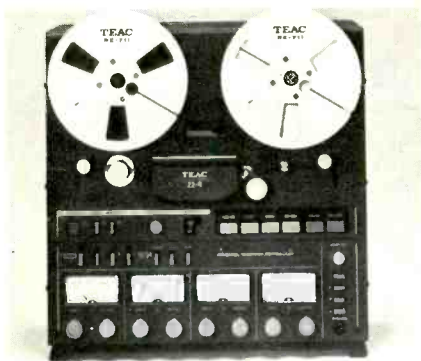
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and record ready controls, detachable head housing and optional remote pause control.

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Isolation transformer

A new isolation transformer, the Monitor ISO-V-AC, model WP-29, by VIZ has the advantages of wide voltage range and constant monitor-



ing of both the input and output voltages. Typical applications include use in design, production and quality control as well as in field service.

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Limiter/compressor/ducker

Valley People has introduced Gain Brain II, a limiter/compressor/ducker. A full complement of front panel controls allows optimum settings for a variety of effects other than normal limit/compress functions. As an interactive gain control device (ducker), settings may be made such that the presence of one program source (such as an announcer) may be made to cause a reliable gain



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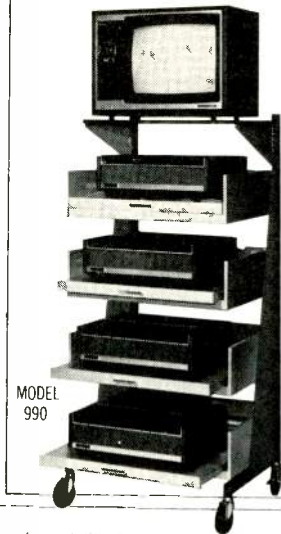
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Instrument catalog

Leader—A number of new oscilloscopes, function generators, and professional video generators are among the featured products in a newly published, 40-page full line catalog.

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Broadcast equipment catalog

Harris—The Broadcast Products Division announces the availability of its latest catalog of television and radio transmitting and allied studio equipment—*Broadcast Equipment Catalog AP-1*. Interested broadcasters may request a free catalog by writing: Harris Corporation, Dept. BE, Broadcast Products Division, Dept. 820, PO Box 4290, Quincy, IL 62301.

Circle (251) on Reply Card

Catalog

Jensen Tools—A catalog of hard-to-find tools for electronic assembly and precision mechanics includes more than 2000 tools of interest to field engineers, technicians, instrument mechanics, locksmiths, watchmakers, and electronic hobbyists.

Circle (252) on Reply Card

Video delay lines and filters catalog

Allen Avionics—Video and pulse delay lines and video filters are presented in recently issued Catalog 13V.

Circle (253) on Reply Card

Supplies catalog

Polyline—A complete line of audio and video reels and boxes highlights the new professional recording and duplicating supplies catalog recently published.

Circle (254) on Reply Card

Application bulletin

Delta Electronics—An 8-page pamphlet titled *Use of the Operating Impedance Bridge* includes schematics and excerpts from speeches and papers.

Circle (255) on Reply Card

Digital video processor

Thomson-CSF Broadcast—Digital video processor, model 9100, is described in a technical bulletin. The DVP-9100 is designed for functional modules. Add-on features may be installed in the field with no wiring changes or recalibration.

Circle (256) on Reply Card

Desktop CRT display

Ledex—Bulletin 2402 describes a desktop CRT display that features a 12-inch rectangular picture and an auxiliary RS232 port to connect slave devices, such as other CRTs, printers, etc.

Circle (257) on Reply Card

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Field Service Engineers

The Grass Valley Group, Inc. a leading manufacturer of television broadcast equipment, is looking for people who want challenging professional positions PLUS the added attraction of working in a small town nestled in the Sierra foothills.

These challenging positions combine chances for U.S. travel plus marketing and engineering career opportunities. Individuals with experience designing and/or maintaining television broadcast systems are required to provide after-sales support for our wide variety of complex systems.

Interested and qualified candidates are invited to send a resume in confidence to Sylvia Smith, The Grass Valley Group, Inc., P.O. Box 1114 Grass Valley, CA 95945. An Equal Opportunity Employer M/F/H.

The Grass Valley Group
A Tektronix Company

HELP WANTED (CONT.)

ENGINEERING AND TECHNICAL SALES POSITIONS

We specialize in the placement of Technical Engineers with Television Stations, Cable TV, Satellite Programmers & Networks, Pay TV, Manufacturers, Industrial TV, CCTV, Production Houses & Dealers. Also, technical sales with Manufacturers & Dealers. All levels, positions & locations nationwide. Employers pay all fees - confidential, professional. Over \$3,000,000.00 in Salaried Positions Placed. Employee & Employer inquiries invited.

PHONE/RESUME - Alan Kornish (717)287-9635

KEY SYSTEMS

106 new bridge center, Kingston, pa. 18704

TRANSMITTER ENGINEER. Minimum two years experience with TV transmitters. Minimum of two years formal training in digital, microprocessors and basic programming. Position involves maintaining and repairing TT50 FH, earth station up link/down link, remote control equipment and ancillary equipment. \$18,250 to \$22,500 depending on experience. Equal Opportunity Employer. KPTV, P.O. Box 3401, Portland, Oregon 97208, (503) 222-9921. 1-81-21

TELEVISION HELP WANTED—TECHNICAL: \$40,000+ FIRST YEAR GUARANTEED. Our company has grown so quickly in the past 5 years, we are in desperate need of a very special person who knows broadcast equipment intimately and has aggressive sales ability. We are diversifying into other areas and need someone to take over the equipment sales division. Responsibilities include sales of new and used broadcast equipment and further development of equipment sales division as business demands. We are a first rate company and believe in paying top dollar for the right person. Call Bill Kitchen, Quality Media Corp., (800) 241-7878. 9-80-TFN

ENGINEERS, TV Systems Engineers, Electronic Technicians, Technical Supervisors, Maintenance. Immediate openings. Experienced. Full time, Full benefits, plus Pension. Excellent Salary plus commissions. Send resume to Technical Operations, Inc., P.O. Box 840, New Hyde Park, N.Y. 11040, or call Personnel Mgr. (516) 352-2238. 9-80-tfn

ASS'T CHIEF for January 1981 hire. Good maintenance experience required, preferably with RCA cameras and videotape machines. Must have management potential. Competitive salary with benefits. Send resume to: WEVU-TV, P.O. Box 6277, Fort Myers, FL 33901 Equal Opportunity Employer. 11-80-31

MAINTENANCE TECHNICIAN needed to join our maintenance team. Must be quality conscious self-motivating technician, with 1st phone and experience in studio and remote maintenance. Top salary and benefits in beautiful Hawaii. Send letter and resume to: Harold Maupin, KHON-TV2, 1170 Auahi Street, Honolulu, HI 96814. An Equal Opportunity Employer. 12-80-21

TRANSMITTER TECHNICIANS—Voice of America has overseas positions available at supervisory and operating levels for experienced transmitter technicians. Duties include operation and maintenance of high power VOA transmitters and related facilities. Applicants must have 3 to 5 years "hands-on" experience in technical operation of broadcast, TV or military fixed-station transmitters. Must be available on a worldwide basis to serve in VOA's radio relay station system. U.S. citizenship required. Starting salary commensurate with qualifications, plus housing and overseas allowances. Full federal fringe benefits apply. Qualified candidates should send standard Federal application form SF-171 to International Communication Agency, MGT/PDE, 1776 Pennsylvania Ave., Washington, D.C. 20547. An Equal Opportunity Employer. 12-80-31

HELP WANTED (CONT.)

CHIEF ENGINEER: Small but growing group has openings for two Chief Engineers, one in the Midwest and one in the Southwest. This is an excellent opportunity for a technically competent self-starter with AM-Directional and FM experience. We offer stability, excellent benefits, state-of-the-art equipment, and a chance to grow professionally. Send resume and salary requirements to Dept. 526, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. An Equal Opportunity Employer. 1-81-11

NEEDED IMMEDIATELY: Control Room Operators and Switchers for new UHF Independent Station. Send Resume to: KOKI-TV, P.O. Box 33223, Tulsa, Oklahoma 74135. Attn.: R. Hardie, Chief Engr. 1-81-21

COMMUNICATIONS TECHNICIANS: Applicants must be proficient in the repair of 3/4" VTRs, color and black and white cameras, other CCTV equipment, and audio visual and security equipment. **ELECTRONICS TECHNICIAN:** Applicant must be proficient in the repair of color CCTV and audio visual equipment. Send resume to University of Miami, P.O. Box 24-8021, Coral Gables, Florida 33124. Equal opportunity affirmative action employer. Excellent benefits including tuition for you and your dependents. Contact: C. R. Dreher (305) 284-5388. 1-81-11

SITUATION WANTED

SEEKING POSITION in Broadcasting. Young, aggressive, 1st Class License. Will relocate. N. Bruno, 2268 Legion Street, Bellmore, New York 11710 516/785-6147. 1-81-11

WANTED

"TEST EQUIPMENT. Second hand field strength metres, spectrum analysers and calibrated aerials required to cover the m.f., v.h.f. (t.v. and f.m.), u.h.f. and microwave bands. Send details to Priestley & Shearman Pty, Limited, Consulting Engineers, P.O. Box 30, Hornsby, N.S.W., Australia, 2077. 1-81-11

WANTED: Pre-1926 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, Ca. 92054, (714) 722-6162. 3-76-tf

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thornclyffe Park Dr., Unit 28, Toronto, Ontario, Canada, M4H 1H2. 416-421-5631. 2-79-tfn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (In Georgia call 404-324-1271). 6-79-tfn

WANTED: Radio Transcriptions 16" E.T.'s, any Eddy Arnold, or other Country 16" or 12" Transcriptions. Will consider others. Interested in Radio Station Libraries to purchase, all speeds of records. Boyd Robeson, 2425 W. Maple, Wichita, Kansas 67213. (316) 942-3673, 722-7765 Eve. 9-80-tfn

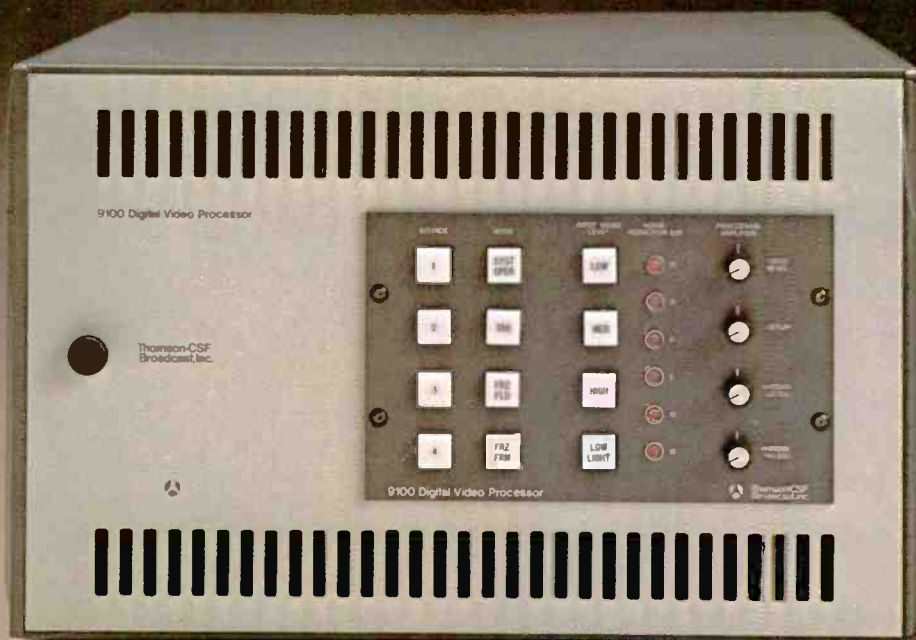
******URGENTLY NEEDED****12AP4 (1803-P4) picture tubes and parts for R.C.A. TRK-12 antique television. Arnold Chase (203) 521-5280. 9-80-51**

WANTED: Sony Tektronix oscilloscope type 323, we pay top dollar. Call or write: John P. Yaninek, Gill Cable TV, 1302 N. 4th Street, San Jose, CA 95112, (408) 288-7304. 1-81-21

WANTED: 250 to 500 watt broadcast transmitter, Gates 250 etc., in good condition, to be used in missionary broadcast station in Central America. Send info to Evangelistic Faith Missions, P.O. Box 609, Bedford, Indiana 47421, C/O Don Moore. 1-81-11

RANK: Mk 3 Telecine Wanted, any model, any condition. Mr. Anthony, (212) 661-0608. Collect. 1-81-31

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Noise Reducer Frame Synchronizer Time Base Corrector.

The new Thomson-CSF 9100 Digital Video Processor gives you all three capabilities — yet costs only slightly more than ordinary systems.

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We've added a frame synchronizer that gives you the added feature of freeze-frame capability. A built-in line-by-line time base corrector for $\frac{3}{4}$ " VTR's. And, a convenient 4 x 1 switcher frees valuable cross-points while a processing amplifier provides complete output signal control.

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plete specifications and/or a demonstration at your facility.

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